TM 9-1260-477-34

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DIRECT AND GENERAL SUPPORT

MAINTENANCE MANUAL

FOR

TARGET DESIGNATOR SET, ELECTRO-OPTICAL

AN/TVQ-2

(G/VLLD)

AND

VEHICLE ADAPTER KIT

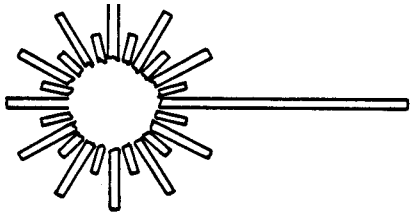
This manual is incomplete without classified Technical Bulletin 9-1260-477-34 (c).

HEADQUARTERS, DEPARTMENT OF THE ARMY

JANUARY 1982

WARNINGS

LASER LIGHT - INVISIBLE



LASER BEAM IS DANGEROUS AND CAN CAUSE BLINDNESS IF IT ENTERS THE EYE -- EITHER DIRECTLY OR REFLECTED FROM A SHINY SURFACE.

- TREAT THE G/VLLD AS A DIRECT FIRE WEAPON, LIKE A RIFLE. Unless you have a backstop it can be hazardous as far as 80 km.
- NEVER LOOK INTO LASER; assume it is always dangerous.
- DO NOT AIM LASER at unprotected people, animals, or flat reflective surfaces.
- WARN PERSONNEL before firing laser or operating your G/VLLD set.
- OPERATE ONLY ON APPROVED LASER RANGES which have been cleared of reflective objects.
- DO NOT RELY SOLELY ON WINDOW COVER to stop the laser beam.
- ALLOW ONLY TRAINED PERSONNEL to operate the G/VLLD, unless properly supervised.
- ALWAYS FOLLOW THE LASER RANGE SAFETY PROCEDURES OF AR 385-63 and TB MED 279.
- APPROVED LASER GOGGLES are reauired ONLY for people who may be exposed to the direct laser beam or its reflection from a flat shiny surface. Goggles should have a density of 4.0 at 1064 mm (5.0 density for people using optical devices like binoculars).

LASER WEAPON — DISCIPLINE

DISCIPLINE

LASER IS A TACTICAL WEAPON AND COUNTER-ORDNANCE CAN FOLLOW IT TO YOUR POSITION.

NON-TACTICAL USE IS STRICTLY FORBIDOEN.

- DESIGNATE ONLY ON COMMAND to reduce your vulnerability and extend battery operating time to a maximum.
- REPORT TO YOUR COMMANDER IF YOU THINK YOU MAY HAVE BEEN HIT BY THE LASER BEAM. You may need an eye examination.

MECHANICAL

A FALLING OBJECT CAN CAUSE INJURY.

- POSITION TRIPOD HEIGHT AT DETENTS OR ABOVE to prevent your G/VLLD from falling over.
- PLACE TRIPOD/TU in backpack properly to prevent head injury.

CHEMICAL

CLEANING SOLVENTS ARE EXTREMELY FLAMMABLE AND TOXIC. THEY CAN CAUSE DEATH IF FUMES ARE INHALED. WORK AREAS SHOULD BE WELL-VENTILATED.

ACCUMULATION OF FLAMMABLE GASES MAY RESULT IN AN EXPLOSION.

- KEEP OPEN FLAMES AWAY when using flammable cleaning solutions.
- BATTERIES MAY EXPLODE if completely discharged too rapidly or improperly charged.
- CHARGE BATTERIES ONLY in well-ventilated area.

Change)
)
No. 5)

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *6 March 1985*

DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL
FOR
TARGET DESIGNATOR SET, ELECTRO-OPTICAL, AN/TVQ-2 (G/VLLD)
(1260-01-046-2843)
A N D
VEHICLE ADAPTER KIT
(1260-082-4981)
(GROUND LASER LOCATOR DESIGNATOR)

TM 9-1260-477-34, 23 January 1982, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the illustration identification number.

Old Pages	New Pages
i, ii	i, ii
2-5, 2-6	2-5, 2-6
2-15, 2-16	2-15, 2-16
3-5 thru 3-10	3-5 thru 3-10
3-23, 3-24	3-23, 3-24
3-31, 3-32	3-31, 3-32
4-17 thru 4-20	4-17 thru 4-20

2. This transmittal sheet should be filed in the front of the publication for reference purposes.

By Order of the Secretary of the Army:

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

Official:

DONALD J. DELANDRO
Brigadier General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-32, Section III, Direct Support and General Support Maintenance requirements for Ground Laser Locator Designator (GLLD).

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No. 4

HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington, D.C., *10 August 1984*

DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL
FOR
TARGET DESIGNATOR SET, ELECTRO-OPTICAL, AN/TVQ-2 (G/VLLD)
(1260-01-046-2843)
AND
VEHICLE ADAPTER KIT
(1260-01-082-4981)

TM 9-1260-477-34, 23 January 1982, is changed as follows:

1. Remove old pages and insert new pages as indicated below.

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3. Added or revised illustrations are indicated by a vertical bar adjacent to the illustration identification number.

Old Pages	New Pages
iii/(iv blank)	iii/(iv blank)
2-13, 2-14	2-13, 2-14

By Order of the Secretary of the Army:

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

Official:

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Major General, United States Army
The Adjutant General

Distribution:

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DEPARTMENT OF THE ARMY
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DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR TARGET DESIGNATOR SET, ELECTRO-OPTICAL, AN/TVQ-2 (G/VLLD) (1260-01-046-2843) AND VEHICLE ADAPTER KIT (1260-01-082-4981)

TM 9-1260-477-34, 23 January 1982, is changed as follows:

1. Remove old pages and insert new pages as indicated below.

2. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the illustration identification number.

Old Pages	New Pages
i thru iii/(iv blank)	i thru iii/(iv blank)
1-1 thru 1-6	1-1 thru 1-6
2-1, 2-2	2-1, 2-2
2-5 thru 2-8	2-5 thru 2-8
2-11 thru 2-14	2-11 thru 2-14
None	2-15, 1-16
3-5 thru 3-10	3-5 thru 3-10
3-13 thru 3-16	3-13 thru 3-16
3-21, 3-22	3-21, 3-22
3-25 thru 3-44	3-25 thru 3-44
3-47 thru 3-52	3-47 thru 3-52
3-55 thru 3-58	3-55 thru 3-58
3-63 thru 3-72	3-63, 3-64 (3-65 thru 3-72 blank)
3-73, 3-74	3-73, 3-74
4-3, 4-4	4-3, 4-4
4-13, 4-14	4-13, 4-14
4-25, 4-26	4-25/(4-26 blank)
4-27 thru 4-32	4-27 thru 4-32
None	4-32.1(4-32.2 blank)
A-1/(A-2 blank)	A-1, A-2
B-3/(B-4 blank)	B-3/(B-4 blank)
I-1, I-2	I-1, I-2
FO-1	FO-1
FO-15 (Sheet 1)	FO-15 (Sheet 1)
FRONT COVER, WARNINGS	FRONT COVER, WARNINGS

3. This transmittal sheet should be filed in front of the publication for reference purposes.

By Order of the Secretary of the Army:

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

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

Distribution:

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HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., *23 January 1982*

DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL

FOR

TARGET DESIGNATOR SET, ELECTRO-OPTICAL
AN/TVQ-2 (G/VLLD)
(1260-01-046-2843)

AND

VEHICLE ADAPTER KIT
(1260-01-082-4981)
(GROUND LASER LOCATOR DESIGNATOR)

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028 (Recommended Changes to DA Publications and Blank Forms) or DA Form 2028-2 (Test) located in the back of the manual and mailing directly to: Conmander, U.S. Army Missile Conunand, ATTN: AMSMI-SNPM, Redstone Arsenal, Alabama 35898-5238. A reply will be furnished direct to you.

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LIST OF TABLES

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1 SCOPE

This manual provides direct support and general support (DS/GS) maintenance instructions for Target Designator Set, Electro-Optical, AN/TVQ-2, also referred to as Ground Vehicular Laser Locator Designator (G/VLLD). Troubleshooting procedures for the G/VLLD set are contained in Chapter 3 and repair procedures are contained in Chapter 4. Personnel of at least MOS grade 45G are required to perform this maintenance. The maintenance of G/VLLD Ground Support Equipment (GSE), except for Battery Charger PP-7286, is contained in TM 9-4931-477-14. Maintenance of the PP-7286 Battery Charger is contained in TM-11-6130-392-34.

1-2. MAINTENANCE FORMS AND RECORDS

a. General. All personnel and organizations responsible for maintaining G/VLLD are responsible for the preparation and distribution of U.S. Army equipment records.

b. Authorization Forms. Forms that are required for maintenance of equipment are listed and explained in TM 38-750. A complete list of Department of the Army (DA) forms is given in DA Pam 310-2.

c. Reports of Accidents. Any accident that injures personnel or damages equipment shall be reported as required by AR 385-40.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs)

If your G/VLLD needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at:

COMMANDER
U.S. Army Missile Command
ATTN: DRSMI-SNEM
Redstone Arsenal, AL 35898

We'll send you a reply.

1-4. ADMINISTRATIVE STORAGE

The battery should be removed from the Laser Designator/Rangefinder (LD/R) before any administrative storage. See TM 740-90-1 for requirements and procedures.

1-5. PREPARATION FOR SHIPMENT

G/VLLD hardware (LD/R, TU, tripod, and transceiver) must be transported in backpack, transit case, or approved container.

1-6. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

Each using organization and/or installation having custody of G/VLLD sets should have a standing operating procedure for G/VLLD set destruction including priorities of demolition, method of demolition, quantities of explosives, and complete instructions for demolition.

The demolition plan should be suitably flexible to cover any situation. Destruction method should consider local deployment of friendly troops, availability of personnel, materials required, time available, etc. Methods are explosives, gunfire, mechanical, burning after demolition, concealment by foliage, burying or throwing into a body of water.

1-7. NOMENCLATURE CROSS-REFERENCE

The common names used throughout this manual for G/VLLD equipment are listed in Table 1-1.

Table 1-1. Nomenclature Cross-reference

Official Nomenclature	Part Number	Common Name
Adapter, Traversing Unit to AN/TAS-4	11559730	Night Sight Mount
Backpack, Laser Designator/ Rangefinder	11508072	LD/R Backpack
Backpack, TU/Tripod	11508073	Tripod/TU Backpack
Battery, Storage BB-704/U	11507792	Battery
Battery Charger	PP-7286/U	Battery Charger
Cable, Assembly, Test	11508261	Test Cable
Cable, Battery Charger	13034390	Battery Charger Cable
Cable, Power	13033955	Van Cable
Cable, Vehicle W2	13033956	Vehicle Cable
Fault Locator	11507815	Fault Locator
Filter Assembly, EMI	11559640	EMI Filter
Kit, Cleaning-External Optics	5952355	Cleaning Kit
Mount, Tripod	11507967	Tripod
Rangefinder-Target Designator, Laser MX-9759/TVQ-2	11507293	LD/R
Target Designator Set, Electro-Optica AN/TVQ-2	11507290	GLLD or G/VLLD
Unit, Traversing	11508020	TU

1-8. LIST OF ABBREVIATIONS

Abbreviations are listed in Table 1-2.

Table 1-2. List of Abbreviations

Abbreviation	Definition
CMPR	Comparator
DMM	Digital Multimeter
EMI	Electro Magnetic Interference
F	Fahrenheit Temperature Scale
F/T	Flashtube
GLLD	Ground Laser Locator Designator
G/VLLD	Ground/Vehicular Laser Locator Designator
HVPS	High Voltage Power Supply
Hz	Hertz (cycles per second)
IFIST	Interim Fire Support Team
LD/R	Laser Designator/Rangefinder
LOS	Line-of-Sight
MIL	Milliradian
MOS	Military Occupational Specialty
N	Nitrogen Gas
OVERTEMP	Over Temperature
Q/S	Q-Switch
PFN	Pulse Forming Network
PS	Power Supply
TAMMS	The Army Maintenance Management System
TOR	Turn-on Reset
TP	Test Point
TU	Traversing Unit

Section II EQUIPMENT DESCRIPTION AND DATA

1-9. GENERAL

The G/VLLD set is used in the field to determine the position of an enemy target and/or to illuminate a target for destruction by laser-seeking ordnance. A detailed description of the G/VLLD set is contained in TM 9-1260-477-12.

1-10. EQUIPMENT DESCRIPTION

a. G/VLLD Set. The G/VLLD set is comprised of the following units:

(1) Laser Designator/Rangef inder (LD/R) (Figure 1-1)

(2) Tripod

(3) Traversing Unit (TU)

(4) Battery

(5) Tripod/TU Backpack

(6) LD/R Backpack

(7) Night Sight Mount

b. Ground Support Equipment (11508482). The ground support equipment necessary for maintenance of the G/VLLD set is as follows:

(1) Battery Charger (TM 11-6130-392-34).

(2) EMI Filter

(3) Purge and Fill Equipment

(4) Battery Charger Cable

(5) Power Cable

(6) Fault Locator

(7) Test Resolver

(8) Circuit Card Extractor

Refer to TM 9-4931-477-14 for GSE operation and maintenance instructions.

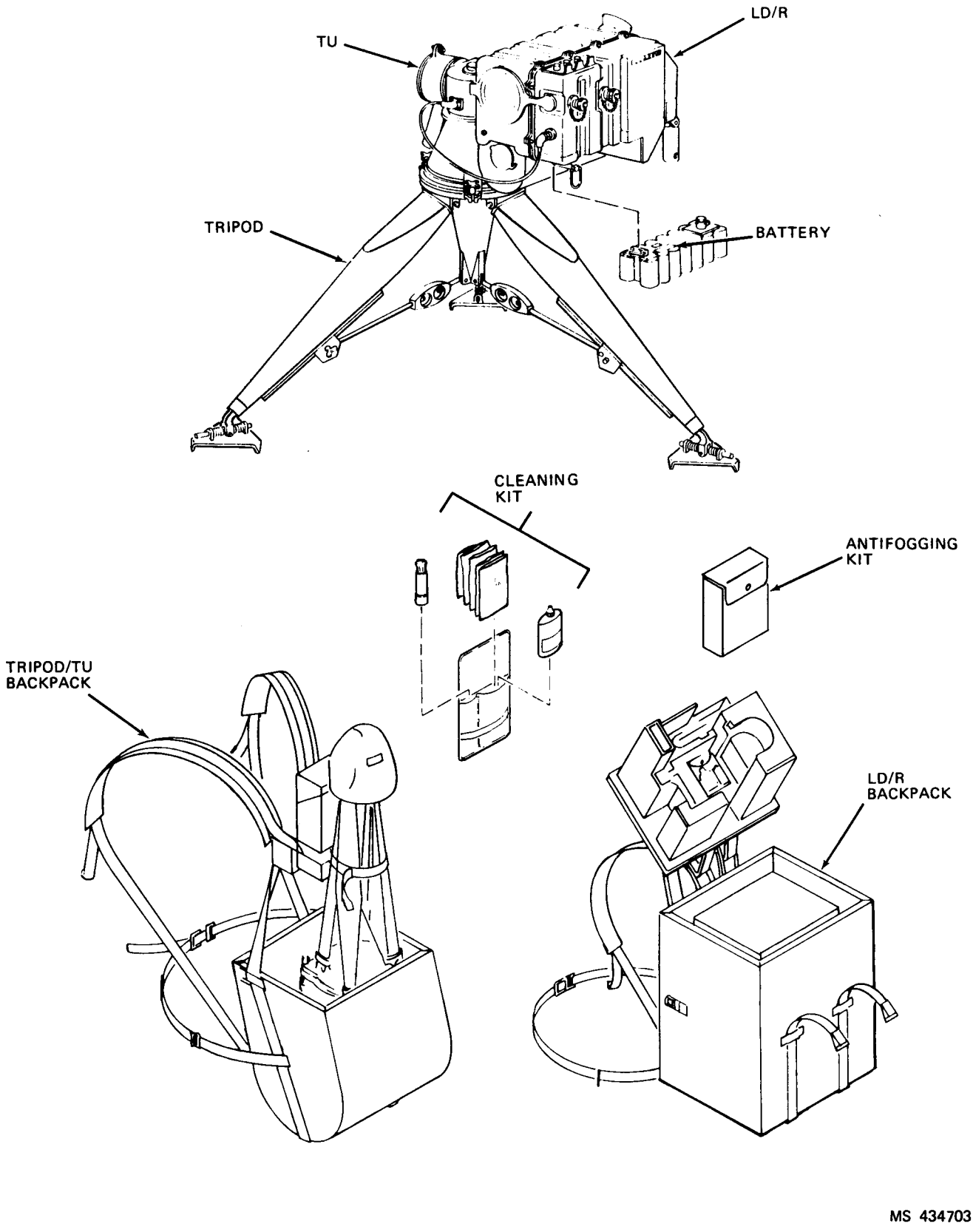


Figure 1-1. G/VLLD Set (Sheet 1 of 3)

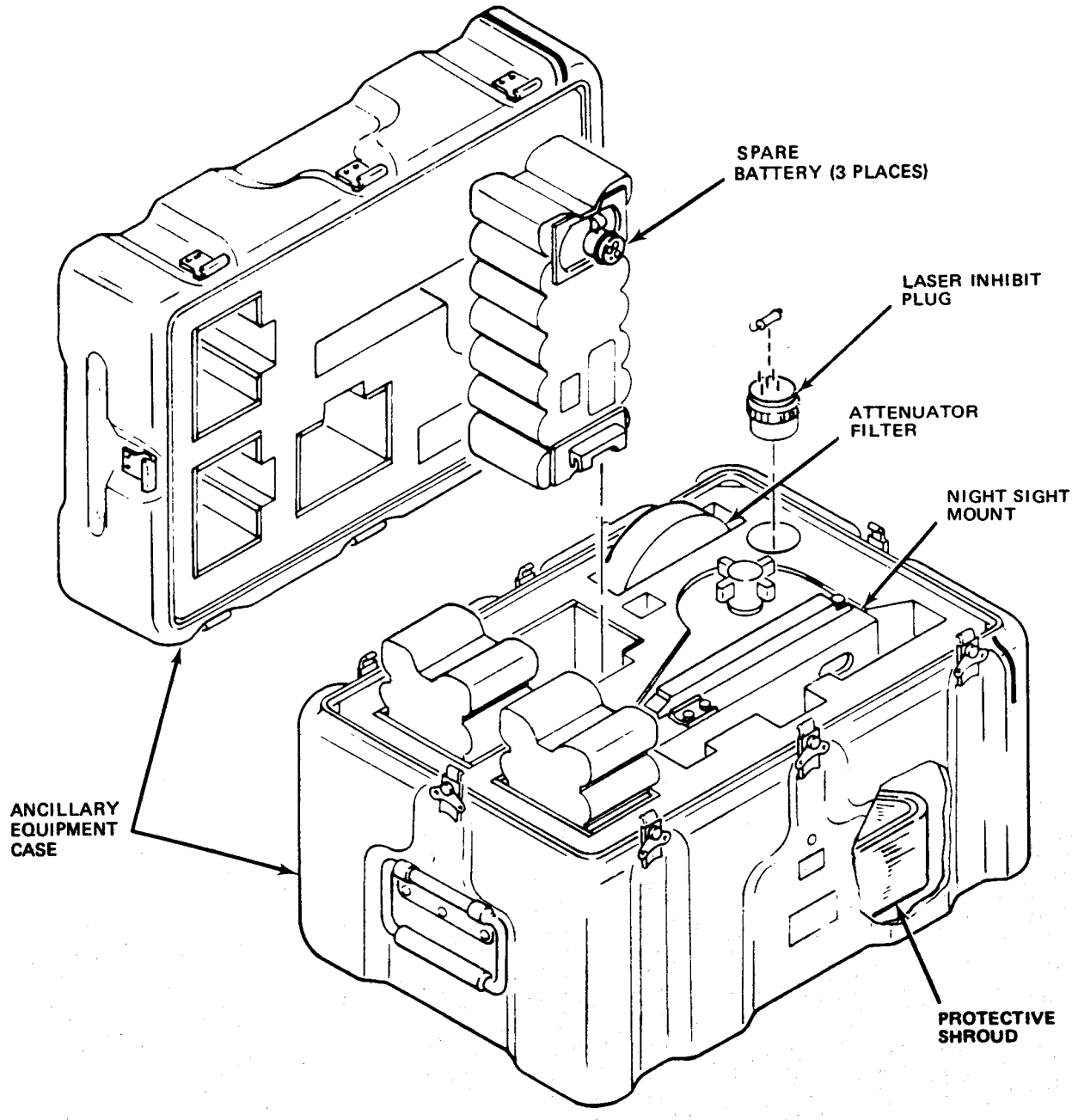


Figure 1-1. G/VLLO Set (Sheet 2 of 3)

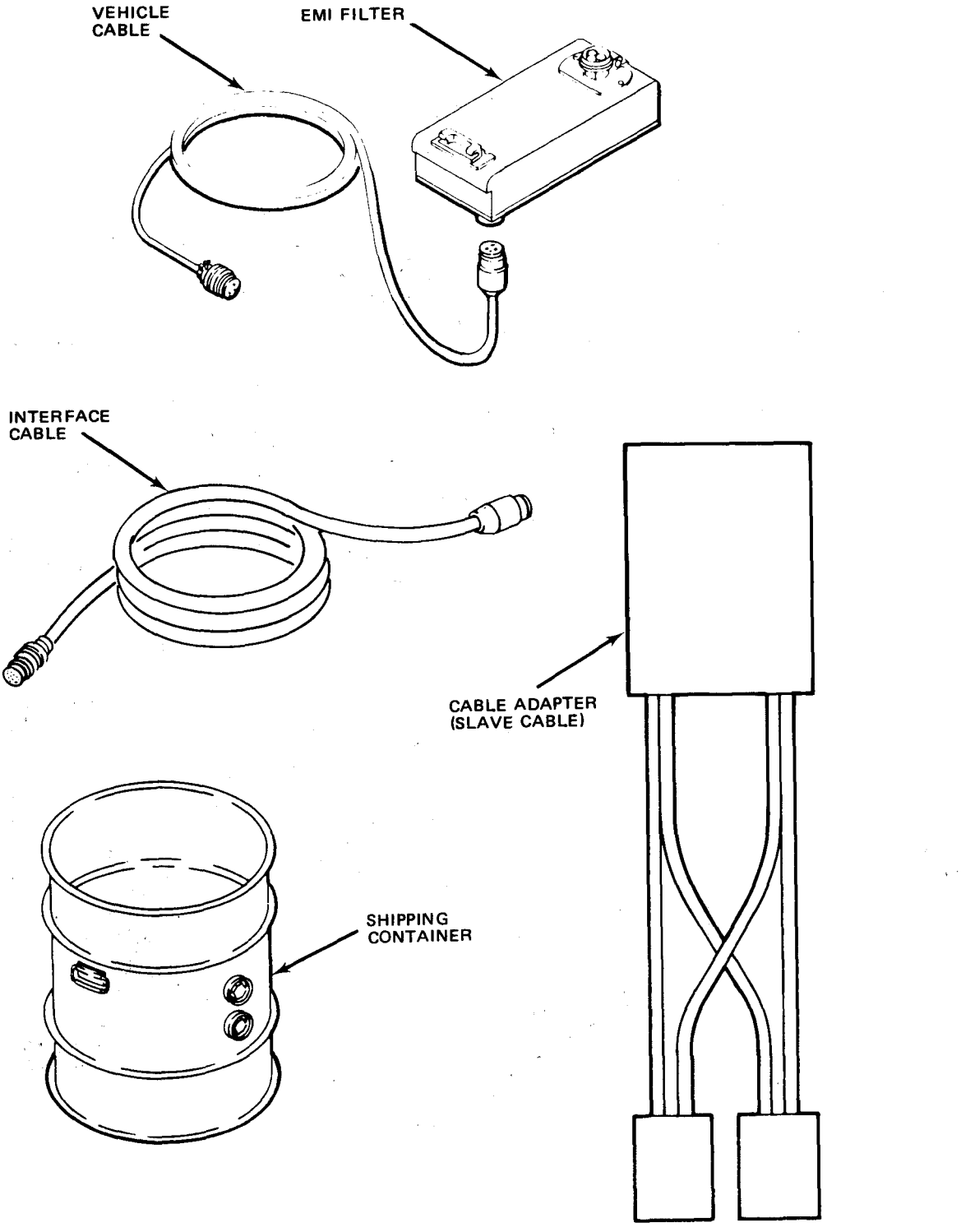


Figure 1-1. G/VLLD Set (Sheet 3 of 3)

CHAPTER 2
MAINTENANCE

Section I. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

2-1. COMMON TOOLS AND EQUIPMENT

The common tools required for maintenance of G/VLLD are contained in the Laser Systems Field Maintenance Tool Kit (NSN 5180-01-048-8570).

2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

a. No special tools are required.

b. Test, measurement, and diagnostic equipment, and support equipment required to maintain your G/VLLD are listed in Table 2-1.

2-3. REPAIR PARTS

Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 9-1260-477-24P.

Table 2-1. Test, Measurement, and Diagnostic Equipment and Support Equipment

Item No.	Name	National Stock Number/Part Number
1	Adapter, Purge Valve	4931-01-056-7976/ 11507835
2	Alligator Clips, Red and Black, 2 sets	- /Mueller, P/N 63C, or equivalent
3	Banana Plug Cords, 4 Ft. Length, 3 sets	- /H. H. Smith P/N 1860-12-102 and 1860-12-103 or equivalent
4	Battery Charger	6931 -01-041 -3490 /PP-7286/U
5	Cable, Battery Charger	1420-01-072-1020/13034390
	Cable, Coaxial 10 ft.	5995-00-857-3361/ -
	Cable, Power	4931-01-075-6380/13033955
8	Electronic Shop Shelter Mounted Avionics, AN/ASM-146B or 189A	4940-00-435-7764 or 4940-00-234-6114/ -
9	Fault Locator	4931-01-046-2835/11507815
10	Fill Valve Extension (Hi Pressure)	4931-01-057-2206/ 1507849
11	Filter Assembly, EMI	1260-01-073-5879/11559640
12	Gas Charging Assembly	4931-01-107-6889/ 11507817
13	Goggles, Model LGS-NDGA	4240-00-258-2054/ -
14	Multi meter, AN/PSM-6B	6625-00-957-4374/ -
15	Oscilloscope, Tektronix 7633	6625-01-093-2261/ -
16	Plug-in, Counter-Timer 7D15	6625-00-392-2604/ -
17	Plug-in, Digital Multimeter 7D13	6625-00-517-6880/ -
18	Plug-in, Dual Trace Amplifier 7A26	6625-00-361-5318/ -
19	Plug-in, Dual Time Base 7B53A	6625-00-261-5139/ -
20	Portable Light with Stand	- /Allied, P/N 564-7500, or equivalent
21	Power Supply, 28 VDC, Variable	6130-00-249-2748/ -
22	Probe, X10 P6105	6625-00-040-0714/ -
23	Probe, X1 P6101	6625-00-463-5241/ -
24	Resolver, Test, 400 Hz	4931-01-075-6310/11508483

Section II. SERVICE UPON RECEIPT OF MATERIAL

2-4. GENERAL

This section contains procedures to be used by maintenance personnel upon receiving G/VLLD sets.

2-5. DUTIES UPON RECEIPT

a. General. The components of your G/VLLD set are packed as a system with a vehicle cable and two spare batteries. The LD/R battery must be removed from shipping container prior to administrative storage.

(1) Inspect equipment when it is received to determine whether the equipment is complete, if the equipment is in operating condition, and that all Modification Work Orders have been implemented.

(2) When handling, inspecting, and maintaining your G/VLLD set, observe the following instructions:

(a) Handle components with care. Certain rough handling could damage optical components.

(b) Do not force levers, knobs, switches, or controls past mechanical stops.

(c) If a component cannot be adjusted or repaired in accordance with authorized procedures, refer the problem to the supporting maintenance unit.

(d) Use only those paints, solvents, cleaning fluids, and other materials which are specifically authorized or recommended for particular operations.

b. Unpacking.

(1) Inspect exteriors of shipping containers for major damage affecting G/VLLD items. Notify your supervisor if damage exists.

NOTE

LD/R shipping drum is reusable. Do not discard.

(2) Make an initial inventory against inventory list or packing slip. Report any discrepancies in accordance with instructions in TM 38-750.

(3) Check stock numbers and/or serial numbers to insure that proper equipment was received.

c. Initial Inspection.

(1) Perform any necessary cleaning in accordance with paragraph 2-7.

d. Servicing. Charged NICAD batteries will discharge during storage. The rate of discharge varies from battery to battery and varies with storage temperature. The storage time or charging interval must be verified at the time of battery issue. No battery should be issued which has been charged and stored for more than 10 days. For situations where storage temperatures are above 70° F, batteries should not be issued which have been charged and stored for more than 5 days.

Section III. GENERAL MAINTENANCE PROCEDURES

2-6. GENERAL

This section contains general maintenance procedures for the G/VLLD set. Tools, equipment, and materials required to perform these procedures are contained in Section I and in the Maintenance Allocation Chart in TM 9-1260-477-12.

2-7. CLEANING

a. General Cleaning Instructions. The G/VLLD set components should always be clean. Otherwise, performance may be degraded, and relatively obvious defects that would be noted in a visual inspection may be hidden by dust, grease, or other foreign matter.

WARNING

Alcohol used in the following procedures is flammable. Keep all flammable materials away from open flames. Failure to do so could result in injury or death.

CAUTION

Do not get alcohol on any rubber parts or sealants. Alcohol may cause rubber parts to deteriorate and may cause some sealants to dissolve.

(1) Metal parts. Use dry, clean wiping rags to remove dust, dirt, grease, moisture, or other foreign matter from the G/VLLD set components. Use a brush to loosen foreign matter from around knobs and indicators. If foreign matter cannot be removed using dry wiping rags, dampen a rag with alcohol and gently wipe the area.

CAUTION

Do not get water onto electrical pins or connections in the following step.

(2) Cables and rubber parts. Clean using a mild detergent and warm water. Dry the parts using a clean, absorbent wiping rag.

b. Cleaning Procedures for Cold Weather Operation. If the temperature is below 0°C (+32°F), add glycerine to cleaning water. This will prevent the water from freezing on the part being cleaned.

2-8. PAINTING

WARNING

Solvent used in the following procedure is toxic and flammable. Keep away from heat and open flame. Use only in a well-ventilated area. Avoid prolonged or repeated breathing of vapor. Avoid prolonged or repeated contact with the skin.

CAUTION

Use masking tape to insure that no paint is applied to bolt holes, attaching surfaces, O-ring grooves, and other non-painted areas.

In general, painting requirements for the G/VLLD are limited to spot painting with enamel. The procedure for spot painting the equipment is as follows:

CAUTION

In spot painting, care must be taken not to obliterate any unit markings.

a. Remove rust and feather edges of area to be painted using 400 grit sandpaper.

b. Clean damaged paint and foreign matter from area to be painted using solvent.

c. Apply two coats of sealing primer on all exposed metal surfaces. Allow primer to dry for two hours before proceeding to next step.

d. Feather edges of primed area using 400 grit sandpaper.

e. Using brush apply two coats of enamel on all primed areas. Allow enamel to dry for twenty four hours before use.

2-9. PANEL MARKINGS

WARNING

Cleaning solvents are toxic, volatile, and flammable. Use only in well-ventilated area away from heat or open flame. Avoid prolonged breathing of vapor and contact with skin.

a. Clean surface to be repainted with xylene.

b. Apply marking using ink (black or white) per MIL-I-43553.

2-10. PURGE AND FILL PROCEDURES

a. LD/R Low Pressure Purge. Procedures for purging and leak check of the are contained in this paragraph. The setup for purging the LD/R is shown in Figure 2-1. Use nitrogen and the purge and fill equipment to perform the following procedures.

(1) Setup.

(a) Connect gas charging assembly to nitrogen cylinder.

(b) Connect purge valve adapter to connection valve.

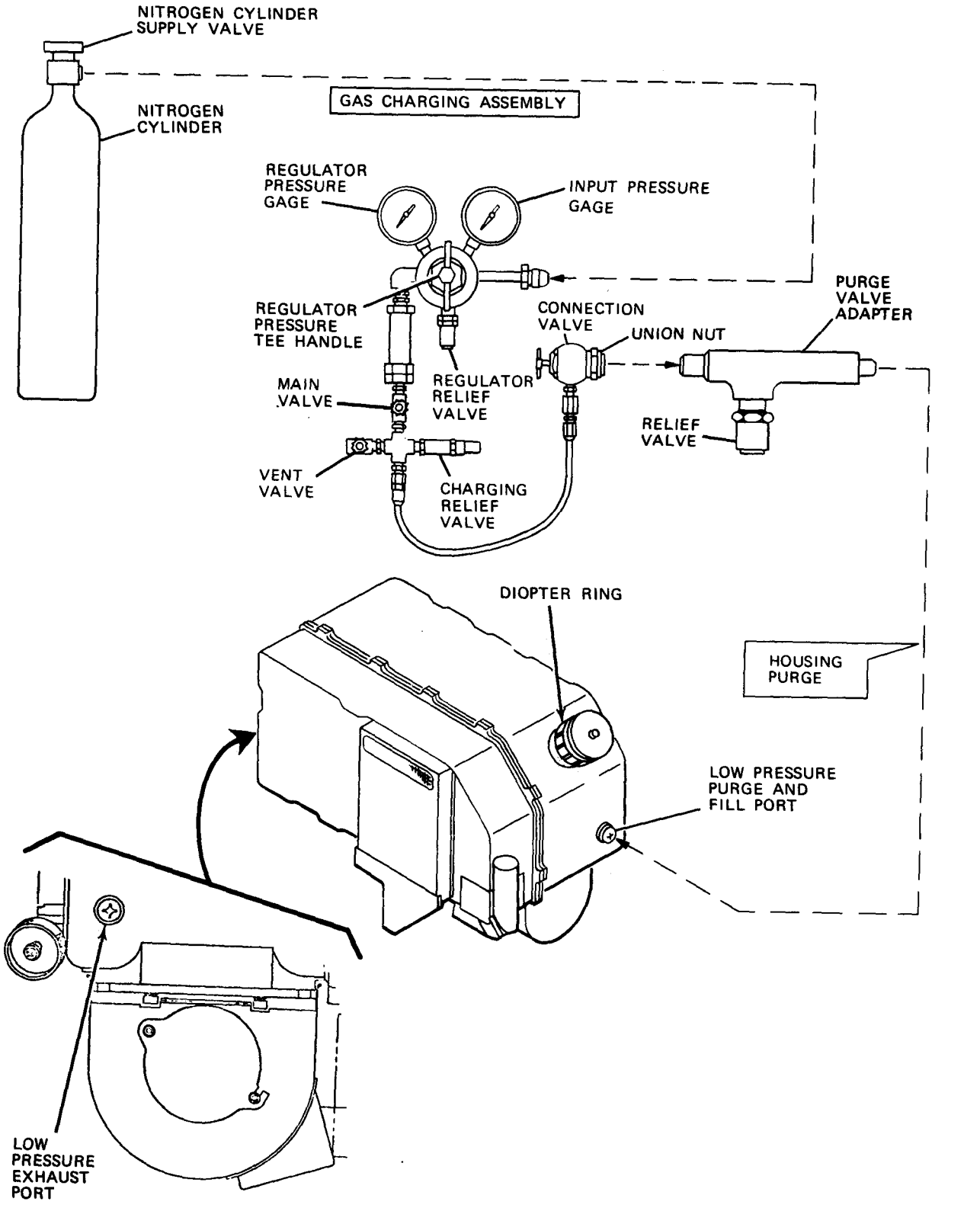


Figure 2-1. LD/R Low Pressure Purge Setup

(c) Turn main valve fully ccw to open position.

(d) Turn vent valve fully cw to closed position.

(e) Turn regulator pressure tee handle fully ccw to closed position.

(f) Turn nitrogen cylinder supply valve ccw to open (input pressure gauge indicates supply pressure).

WARNING

Escaping gas may blow dirt or dust particles into the air. Use caution when venting nitrogen from the gas charging assembly components or LD/R.

(g) Purge the purge and fill equipment components as follows:

1. Slowly turn regulator pressure tee handle cw until nitrogen escapes from purge valve adapter.

2. Allow nitrogen to escape for approximately 5 seconds.

3. Turn main valve fully cw to closed position.

4. Remove purge valve adapter from connector valve.

(2) Low Pressure Purge.

(a) Remove housing low pressure purge and fill port screw. Inspect preformed packing.

(b) Connect purge valve adapter to low pressure purge and fill port.

NOTE

To insure low pressure purge procedure is performed correctly, read steps (c) thru (j) before proceeding.

(c) Connect connection valve to purge valve adapter.

WARNING

Purge valve adapter regulates gas pressure at 5 psig. Nitrogen escaping from purge valve adapter relief valve may blow dirt or dust particles into the air.

(d) Slowly turn main valve ccw until nitrogen starts to escape from purge valve adapter relief valve.

(e) Turn main valve fully cw to closed position.

(f) Remove housing low pressure exhaust port screw; wait approximately 5 seconds and then reinstall it.

(g) Repeat steps (d) thru (f) ten times.

(h) Allow LD/R to thermally stabilize for one hour at room temperature, then vent LD/R by removing low pressure exhaust port screw.

(i) Install low pressure exhaust port screw (torque 15 to 18 inch pounds).

(3) Leak Check.

(a) Perform setup per step (1).

(b) Perform steps (2)(a) thru (2)(e).

(c) Apply leak detection compound to main seam of LD/R housing, around any controls, switches, or indicators that have recently been replaced or repaired, and around the lens aperture and eyepiece.

NOTE

A leak is defined as a continuous stream of bubbles emitted any time within a period of at least 15 minutes. A brush may be used to release bubbles caused by air trapped within cracks and crevices.

(d) Observe the areas covered with leak detection compound to check for leaks. If a leak is detected, perform "End of Purge" steps in subparagraph (4) of this procedure; replace seal(s) in area where leak is detected (or replace damaged items if required); and again perform purge procedures.

(e) Wipe away leak detection compound and dry LD/R using clean absorbent rags.

(4) End of Purge.

(a) If not installed, install housing low pressure exhaust port screw (torque 15 to 18 inch-pounds).

(b) Turn main valve fully cw to closed position.

(c) Disconnect purge valve adapter from connection valve.

(d) Disconnect purge valve adapter from low pressure purge and fill port.

(e) Install low pressure purge and fill port screw (torque 15 to 18 inch-pounds).

(f) Turn nitrogen cylinder supply valve cw to closed position.

WARNING

Nitrogen will escape from connection valve during following steps. Escaping gas may blow dirt or dust particles into the air. Do not point the valve towards eyes or body. Insure nitrogen cylinder supply valve, vent valve, and main valve are in the fully closed position.

(g) Turn main valve fully ccw to open position.

(h) Slowly turn regulator pressure tee handle cw to open position (approximately 2 turns).

(i) Disconnect gas charging assembly from nitrogen cylinder.

(j) Set gas charging assembly controls as follows:

1. Regulator pressure tee handle fully ccw to closed position.

2. Main valve fully cw to closed position.

b. LD/R Depressurization, High Pressure Purge and Fill. Procedures for depressurizing and high pressure purge and fill of the LD/R are contained in this paragraph. The setup is shown in Figure 2-2. Use nitrogen gas and the purge and fill equipment to perform the following procedures.

NOTE

Your G/VLLD should be purged every 180 days. Record date of purge and fill on DA Form 2409.

(1) Depressurization.

(a) Turn regulator pressure tee handle ccw to closed position.

(b) Turn main valve cw to closed position.

(c) Turn vent valve cw to closed position.

(d) Turn connection valve ccw to closed position.

(e) Connect gas charging assembly to nitrogen cylinder.

(f) Remove LD/R access cover.

(g) Remove LD/R valve access end cap.

(h) Remove fill valve extension cap.

CAUTION

The LD/R will be damaged if the fill valve extension is over tightened.

(i) Connect fill valve extension to LD/R check valve. Tighten fingertight.

(j) Connect opposite end of fill valve extension to connection valve union nut. Tighten fingertight. Do not over tighten.

(k) Slowly turn connection valve cw to open position.

WARNING

Nitrogen gas will escape from the vent valve during the following step. Escaping gas may blow dirt or dust particles into the air. Do not point the valve towards eyes or body.

CAUTION

Damage may result to LD/R internal cavity if nitrogen gas is bled too fast.

(l) Slowly open vent valve ccw until escaping nitrogen is no longer audible.

(m) Close vent valve by rotating cw.

(2) Purge and Fill (650 + 20 psig).

(a) Insure regulated pressure tee handle is rotated ccw.

(b) Insure main valve is cw to closed position.

(c) Insure vent valve is cw to closed position.

(d) Turn connection valve fully ccw to closed position.

(e) Turn nitrogen cylinder supply valve ccw to open until input pressure gauge indicates greater than 950 psig.

(f) Turn main valve ccw to open position.

(g) Turn connection valve cw to open position.

(h) Slowly turn regulator pressure tee handle cw until regulated pressure gauge reads 650 psig.

(i) Turn connection valve ccw to closed position.

(j) Turn regulator pressure tee handle until it spins fully.

WARNING

Nitrogen gas will escape from the vent valve during the following step. Escaping gas may blow dirt or dust particles into the air. Do not point valve towards eyes or body.

(k) Slowly turn vent valve ccw towards open position until regulated pressure gauge indicates zero.

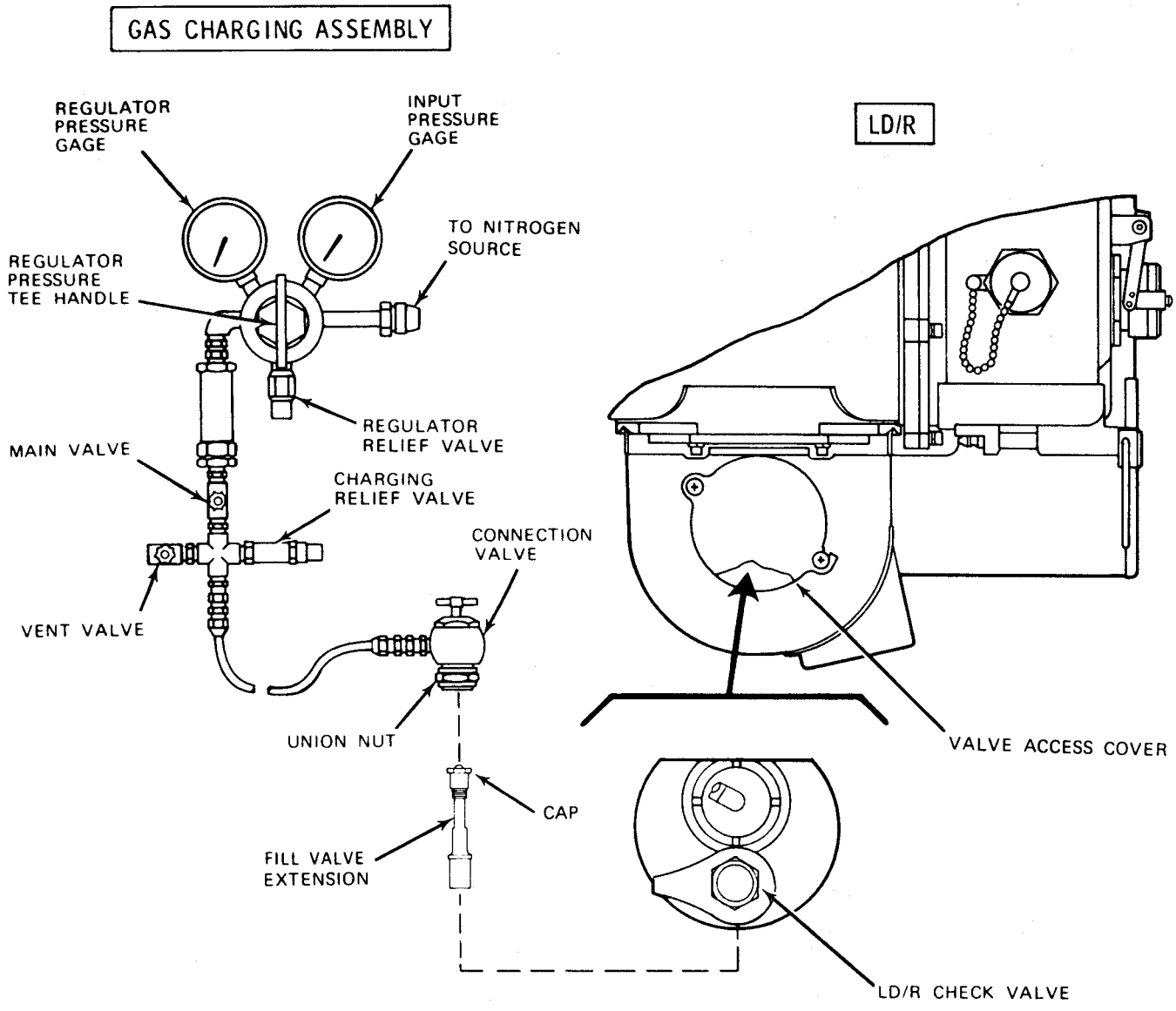


Figure 2-2. LD/R Depressurization, High Pressure Purge, and Fill Setup

CAUTION

Damage may result to LD/R internal cavity if nitrogen gas is bled too fast.

(l) Slowly turn connection valve cw towards open position to complete bleeding the LD/R.

(m) Repeat steps (a) thru (l) three times.

(n) Repeat steps (a) thru (k).

(3) End of Purge and Fill.

WARNING

Nitrogen gas wi ll escape during the following steps. Vent high pressures to zero before breaking any connections.

(a) Turn nitrogen cylinder supply valve cw to closed position.

(b) Slowly turn regulator pressure tee handle cw to open position unt i l input pressure gauge indicates zero.

(c) Disconnect fill valve extension from connection valve union nut.

(d) Disconnect fi ll valve extension from LD/R check valve.

(e) Install fill valve extension cap on fill valve extension.

(f) Replace valve access end cap on LD/R check valve (torque 5 to 6 inch-pounds).

(g) Replace access cover (torque screws 5 to 6 inch-pounds).

(h) Insure date of high pressure purge and fill has been recorded on your DA Form 2409 and is affixed to the LD/R.

2-11. PFN VDC ADJUSTMENT

CAUTION

Do not perform Table 2-2 unless directed to do so by repair procedures.

Table 2-2. PFN VDC Adjustment

Step	Item	Action	Indication	Yes	No
1	Fault Locator	Set HVPS switch S8 to ENABLE.	. . .	. . .	. . .
2	LD/R	Jumper A1A1A1TP2 (Energy Error) to A1A1A1TP1 (Ground).	. . .	. . .	. . .
3	Fault Locator	Set LASER switch S1 to INHIBIT.	. . .	. . .	. . .
4	Fault Locator	Set PRESET RANGE switch S6 to OFF.	. . .	. . .	. . .
5	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
6	Fault Locator	Verify that test cable W1P1 is connected to LD/R 1J1.	. . .	. . .	. . .
7	Fault Locator	Set POWER switch S2 to OFF.	POWER indicator light is OFF.	Go to next step.	Go to TM 9-4931-477-14.
8	Fault Locator	Connect DMM between METER TP4 and RTN.	. . .	. . .	. . .
8.1	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
		WARNING Laser light hazard; observe WARNINGS inside front cover of this manual before proceeding.			
9	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
10	Fault Locator	Set TEST SELECT switch to PFN VDC.	.	. . .	. . .
		WARNING LD/R should not fire in the next step, but may fire if defect exists.			
11	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .

Table 2-2. PFN VDC Adjustment (Cent)

tep	Item	Action	Indication	Yes	No
		NOTE In the following steps a measurement of voltage is made. The measurement is scaled with 1 volt measured equaling 1000 volts (VDC) actual. Example: 0.850 VDC measured equals 850 VDC. This measurement and calculation is compared with the operating voltage shown on the operating voltage label (38, Figure 4-3). The calculation must be equal to the figure on the operating label ±10.			
12	Fault Locator	Using DMM, measure voltage between METER TP4 and RTN.	Measurement multiplied by 1000 equals the operating voltage ±10.	Go to step 14.	Go to next step.
13	LD/R	Adjust (PFN voltage) A1A1R43 until DMM indication multiplied by 1000 is equal to the figure for the operating voltage shown on the operating voltage label.	DMM indication multiplied by 1000 is equal to the figure for the operating voltage shown on the operating voltage label.	Go to next step.	Go to Table 3-10, PFN VDC Fault.
14	Fault Locator/ LD/R	Go to paragraph 4-2.	. . .	. . .	. . .

2-12. IFIST INSTALLATION PROCEDURES

a. General. This paragraph contains installation procedures for the vehicle power cable, night sight vehicle power conditioner, machine gun stowage mount, and cupola lock. The tools and equipment required to perform these procedures are contained in the Maintenance Allocation Chart in TM 9-1260-477-12.

b. Vehicle Power Cable Installation. (Figure FO-1).

(1) Install connector mounting bracket (3).

(a) Find location for connector mounting bracket (3) on inside right hand (curbside) wall of vehicle, 1.38 +.06 inches from ceiling and 46.00 +.06 inches from rear wall.

(b) Using the bracket as a template, mark location of the bottom mounting hole.

(c) Using a center punch, hammer, and No. 7 twist drill, center punch and drill the top and bottom mounting holes to a depth of 0.625 inch.

(d) Tap both holes using a No. 1 Tee wrench and a bottoming 1/4-20 UNC-2B thread cutting tap. Thoroughly clean all metal shavings and residue from the holes.

(e) Position the connector mounting bracket (3) over the mounting holes and secure in place with two hex head capscrews (4) and two flat washers (6) using a 1/4 inch drive ratchet handle, 1/4 inch drive 2 inch extension, and a regular length 7/16 inch double hexagon socket.

(2) Install eye clamps (21).

(a) Find location for two eye clamps (21) on inside right hand (curbside) wall of vehicle 3.00 inches above top of battery box and 2.25 inches to the front of the battery box. Mark the position.

(b) Using a center punch, hammer, and a No. 21 twist drill, center punch and drill the mounting hole to a depth of 0.62 inch.

(c) Tap the mounting hole using a No. 1 Tee wrench and a .190-32 UNF-2B bottoming thread cutting tap. Thoroughly clean all metal shavings and residue from the holes.

(d) Install the clamps over the two 44 inch leads of the two cable assemblies (13) and set aside until ready to install cables.

(3) Prepare ground bracket for cable installation (Figure FO-1).

(a) Find existing ground bracket (24) located near ceiling on inside right hand (curbside) wall above connector bracket (3).

(b) Remove paint on existing bracket (24) where lockwasher (11) contacts surface to insure proper grounding.

NOTE

Some M113A1 vehicles may have radio gear installed which uses the grounding bracket described above. The radio ground lead must be removed from the grounding bracket and relocated to one of the radio speaker mounting screws within reach. Also, the hole in the grounding bracket may require reaming in order to accommodate the mounting bolt.

Some M113A1 vehicles may be received from depot with the grounding bracket removed. For these vehicles, the wall must be drilled and tapped to receive a pan head screw in the approximate position the grounding bracket would occupy if installed. The standard drilling and tapping procedures apply using a 5/16 inch twist drill and 3/8-24 NF 60 Heming thread cutting tap.

(4) Modify battery box (17).

(a) Find location of cable entry holes vehicle battery box (17).

(b) Center punch and drill a pilot hole at ea h location using a center punch, hammer, and a 13/32 inch twist drill.

(c) Using a 3/4 inch knockout punch and die, punch a 3/4 inch hole over the pilot hole drilled in step (b) above.

(d) Install grommets (19).

(5) Mount cable assembly (20).

(a) Position the two cable assembly connectors (13) with key slots up, over the eight connector bracket (.279 - .291 inch diameter) holes (3).

(b) Install eight hex head cap screws (4), flat washers (6), lockwashers (5), and hex nuts (7).

NOTE

The lower connector mounts in the same manner as the upper connector except that the lower screw nearest the curbside wall will also provide mounting for the bead chain and dust cap which protects the contacts of the lower connector when the G/VLLD is dismounted.

(c) Position two eye clamps (21), already placed over the 44 inch leads, over the mounting hole.

(d) Install one panhead screw (22) and one flat washer (23) using a No. 2, 4 inch Phillips screwdriver.

(e) Insert two lug connectors of cable assembly (13) through two grommets (19) in front end of battery box. Connect to nearest battery positive terminal using existing hardware and a 10 inch adjustable open-end wrench.

(f) Place the two 11 inch leads of the cable assemblies (13) over the ground bracket (24).

(g) Install one hexhead screw (9), one flat washer (10), one lockwasher (11), and one hex nut (12) using a 1/2 inch drive ratchet handle with a 1/2 inch drive 9/16 inch socket.

c. Vehicle Power Conditioner (Night Sight VPC) Installation (Figure FO-1).

(1) Install night sight vehicle power conditioner (18).

(a) Find location for VPC (18) on inside ceiling of vehicle near rear right hand corner.

(b) Using a center punch, hammer, and No. 7 twist drill center punch and drill four mounting holes to a depth of 1/4 inch per MS 51830-104L.

(c) Tap the holes using a 1/4-28 UNF thread cutting tap and size No. 1 Tee wrench. Thoroughly clean all metal shavings and residue from the holes.

(d) Install four inserts (16) per MS 51835 using Keensert installation tool, size TD 428L.

(e) Position VPC (18) over inserts (16).

(f) Install four socket head screws (14) and four flat washers (15) using a 9/64 inch hex key wrench.

d. Machine Gun Stowage Mount Installation.

NOTE

Most M113 Vehicles will be provided with curb-side brush guards installed, however, some vehicles are being produced without brush guards. Location of the machine gun stowage mount on vehicles with brush guards will be as shown on figure 2-3 and described in (1) below. For vehicles without brush guards, use figure 2-3.1 and the instructions provided in (2) below.

(1) Install stowage mount (figure 2-3).

(a) Locate curbside brush guard (3).

(b) Remove and retain front and rear hex head cap screws (1) and flat washers (2).

(c) Install eye bolt (4) and flat washer (2) in hole where front hex head cap screw (1) was removed.

(d) Remove and discard rearmost arm of the brush guard (3), using backsaw. Smooth sharp edges using 12 inch flat file.

(e) Locate the stowage mount (5) roadside rear mounting hole over the hole where the brush guard (3) rear hex head cap screw (1) was removed. Using the stowage mount as a guide, mark the locat on of the three holes to be drilled.

(f) Center punch and drill a 1/2 inch deep pilot hole at the location marked in step (e) above using a solid center punch, hand hammer, and 1/4 inch twist drill.

(g) Drill a 13/32 inch hole 1/2 inch deep over each of the pilot holes drilled in step (f) above using a 13/32 inch twist drill.

(h) Tap holes using a coarse .500-13 standard point bottoming thread cutting tap with a No. 2 Tee wrench.

(i) Install stowage mount (5), four hex head cap screws (6) and four flat washers (2), using a 1/2 inch drive ratchet handle, 5 inch extension, and a regular length 3/4 inch double hexagon socket. Torque screws 21 to 23 foot-pounds.

(2) Install stowage mount (figure 2-3.1).

(a) Measure along the curbside of the vehicle from the front of the intake screens toward the rear a distance of 36.5 inches. From the curbside edge, measure inboard a distance of 11.0 inches. Mark the location of the eyebolt hole (5) to be drilled.

NOTE

On some vehicles, a bolt may be installed at this position where the front mounting bolt was reinstalled following removal of the brush guard. Although, the location of this bolt may not be precisely as stated in (a) above, it may be removed and the eyebolt installed as described in (b) below without having to drill and tap a mounting hole.

(b) Center punch and drill a 1/2 inch deep pilot hole at the location marked in step (a) above using a solid center punch, hand hammer, and 1/4 inch twist drill.

(c) Drill a 13/32 inch hole 1/2 inch deep over the pilot hole drilled in step (b) above using a 13/32 inch twist drill.

(d) Tap the hole using a coarse .500-13 standard point bottoming thread cutting tap with a No.2 tee wrench.

(e) Install eyebolt (4) and flat washer (2).

NOTE

It may be necessary to remove the personnel heater air inlet cover before the eyebolt can be installed. When the eyebolt installation is complete, reinstall the personnel heater air inlet cover.

(f) Measure along the curbside of the vehicle from the front of the intake screen toward the rear a distance of 76.5 inches. From the curbside edge, measure inboard, a distance of 5.0 inches. Using stowage mount (3) as a guide, mark the location of four holes (6) to be drilled.

(g) Center punch and drill a 1/2 inch deep pilot hole at the locations marked in step (f) above using a solid center punch, hand hammer, and 1/4 inch twist drill.

(h) Drill a 13/32 inch hole 1/2 inch deep over each of the pilot holes drilled in step (g) above using a 13/32 inch twist drill.

(i) Tap holes using a coarse .500-13 standard point bottoming thread cutting tap with a No. 2 Tee wrench.

(j) Install stowage mount (3) with four hex head cap screws (1) and four flat washers (2) using a 1/2 inch drive ratchet handle, 5 inch extension, and a regular length 3/4 inch double hexagon socket. Torque screws 21 to 23 foot-pounds.

e. Cupola Lock Installation (Figure 2-4).

(1) Locate cupola lock mounting holes (1), (4), and (7). Using angle bracket (8) as a template, position it as shown.

(2) Mark, center punch, and drill one inch deep pilot holes at each of the three holes in the angle bracket (8) using a center punch, a hammer, and a 1/4 inch twist drill.

(3) Using a 13/32 inch twist drill, drill a one inch deep hole over the pilot hole (1) located on top of the cupola hatch.

(4) Tap hole (1) using a coarse 1/2-13 UNC-2B standard point bottoming thread cutting tap and a No. 2 Tee wrench. Thoroughly clean all metal shavings and residue from the hole.

(5) Using a 5/16 inch twist drill bit, drill one inch deep holes over the two pilot holes (4) and (7), located on the periphery of the cupola hatch.

(6) Tap holes (4) and (7) using a 3/8-16 UNC-2B bottomingthread cutting tap with a No. 2 Tee wrench. Thoroughly clean all metal shavings and residue from the holes.

(7) Place the cupola lock over the mounting holes and install washer (3) and screw (2) in the top mounting hole (1). Tighten finger tight.

(8) Install two washers (6) and two screws (5) in holes (4) and (7). Torque screws 22 to 24 foot-pounds.

(9) Torque the top screw (6) 54 to 59 foot-pounds.

f. Vehicle Adapter Kit Locking Pin Installation (Figure 2-2.1).

(1) Locate centerline of the machine gun mount (3), and mark a line from top to bottom of the pintle assembly chamber.

(2) Install vehicle adapter (Pintle) assembly (1) in the machine gun mount and insure that it is fully seated. (See also Figure 4-14.)

(3) Rotate the vehicle adapter assembly until the angle bracket (2) splits the centerline mark established in step (1) above.

(4) Center punch and drill a pilot hole completely through the machine gun mount chamber wall at the location established in step (3) above. Use a center punch, hammer and a 1/4 inch twist drill bit.

(5) Remove vehicle adapter assembly (1) from machine gun mount (3).

(6) Drill a 0.500 inch diameter hole over the pilot hole using 1/2 inch twist drill bit.

(7) Tap the hole drilled in step (6) above using a tapered 9/16 - 12 NC thread cutting tap with a No. 2 Tee wrench.

(8) Install Keensert using a Keensert installation tool, size KNH616 and lock in place.

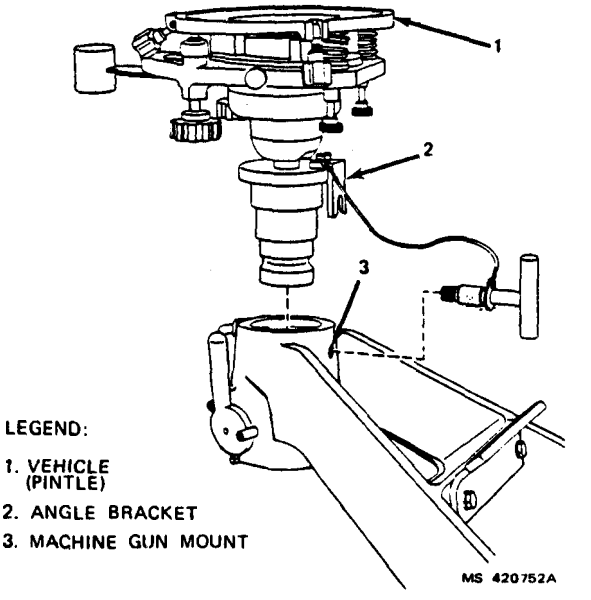
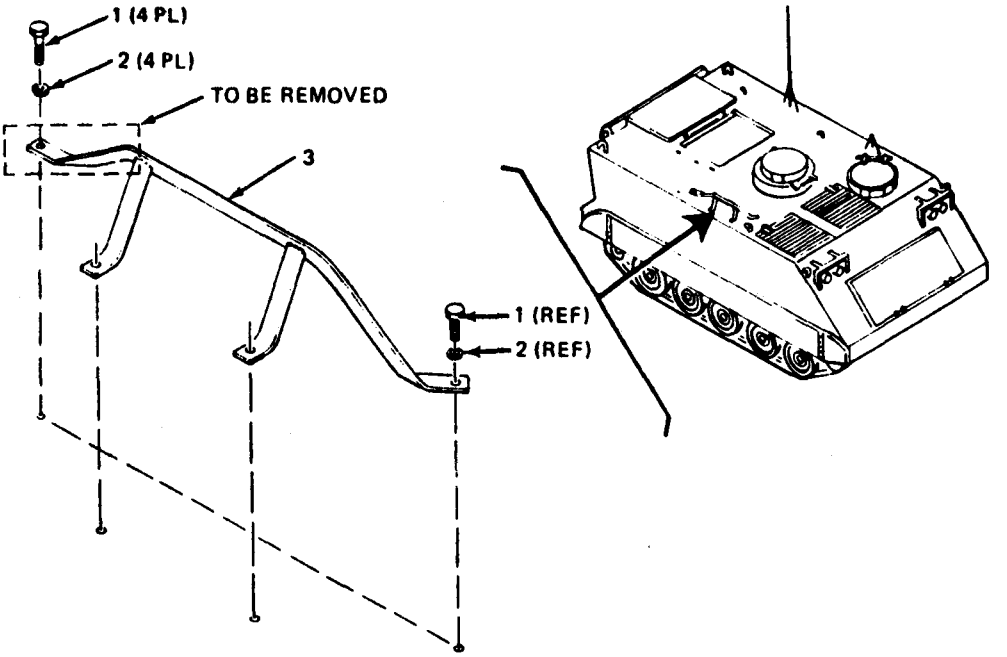


Figure 2-2.1. Vehicle Adapter Kit Locking Pin Installation

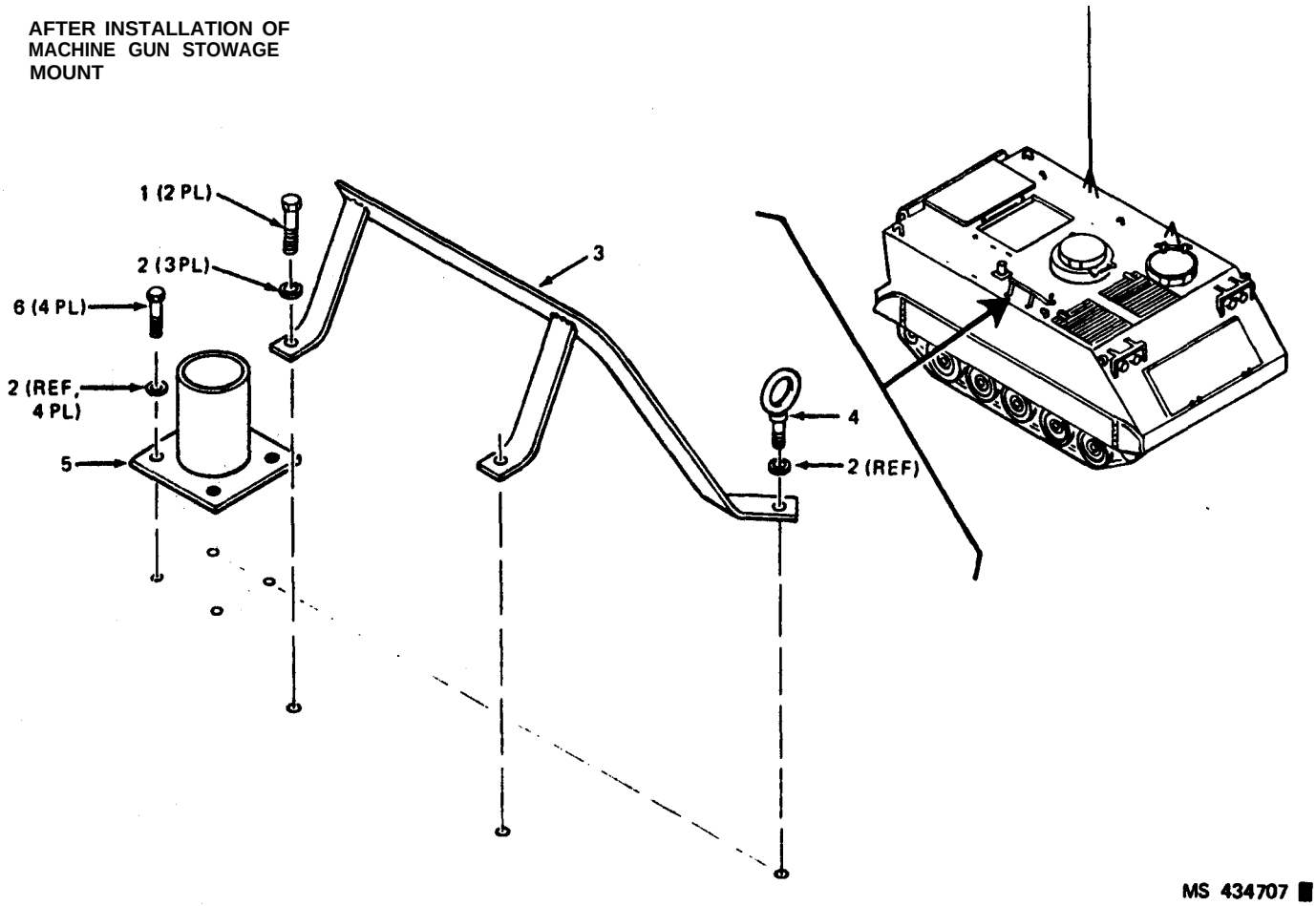
BEFORE INSTALLATION OF MACHINE GUN STOWAGE MOUNT

LEGEND

1. HEX HEAD CAP SCREW
2. FLAT WASHER
3. BRUSH GUARD
4. EYEBOLT
5. MACHINE GUN STOWAGE MOUNT
6. HEX HEAD CAP SCREW

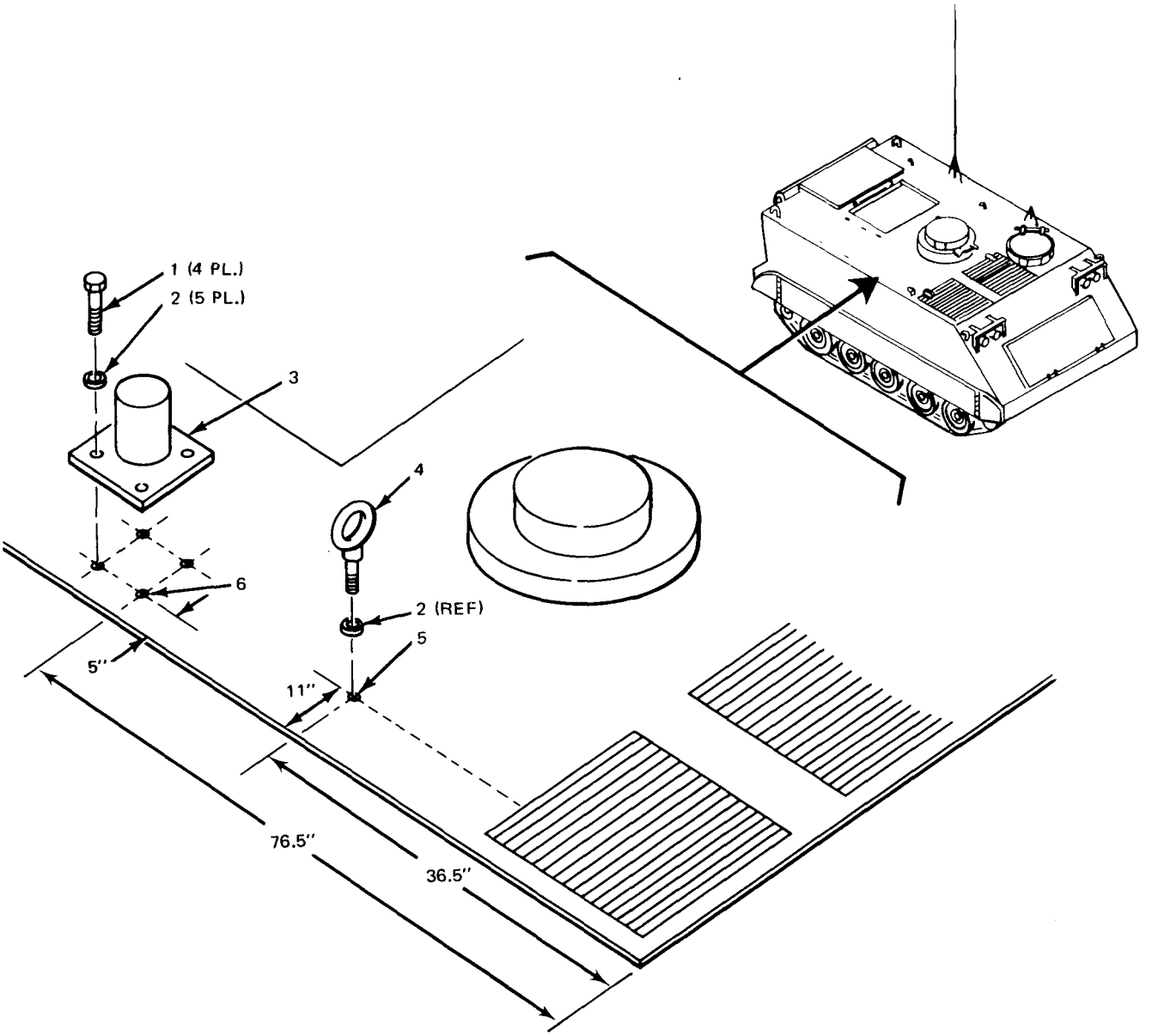


AFTER INSTALLATION OF MACHINE GUN STOWAGE MOUNT



MS 434707

Figure 2-3. .50 Cal Machine Gun Stowage Mount Installation With Brush Guard



LEGEND

1. HEX HEAD CAP SCREW
2. FLAT WASHER
3. STOWAGE MOUNT
4. EYEBOLT
5. EYEBOLT HOLE
6. STOWAGE MOUNT HOLES

MS 434708

Figure 2-3.1. .50 Cal Machine Gun Stowage Mount Installation Without Brush Guard

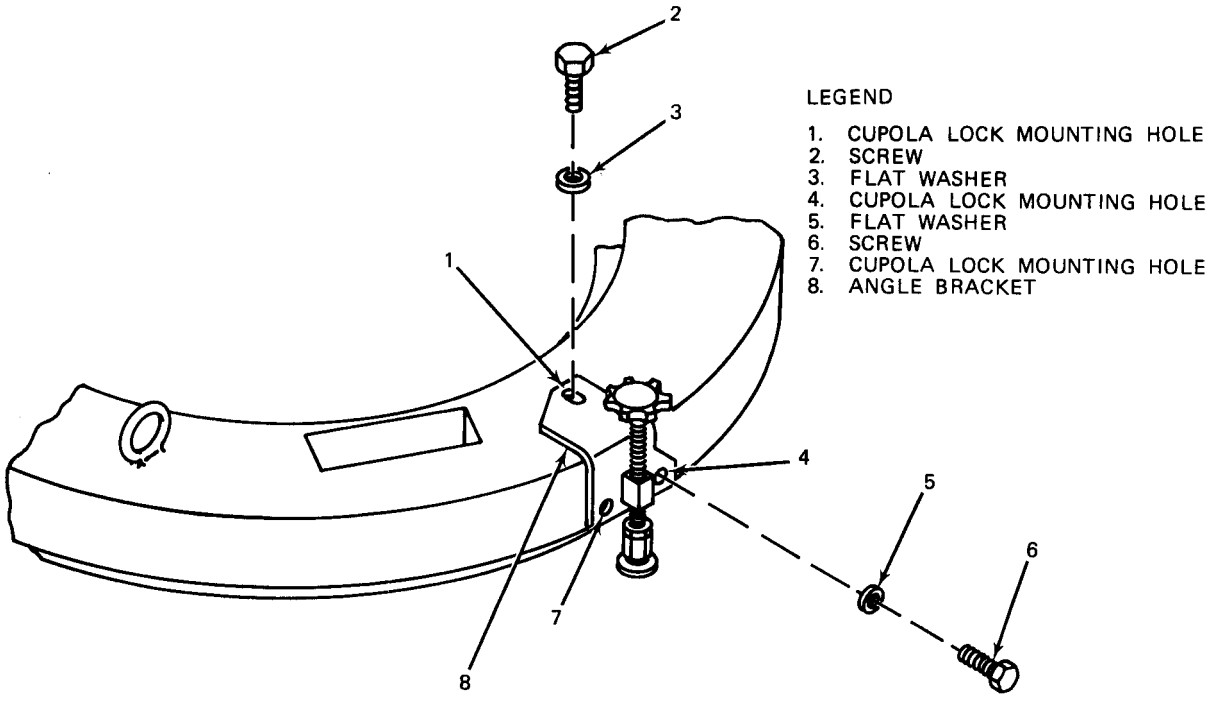


Figure 2-4. Installation of Cupola Lock MS 420746A

2-13. BATTERY CHARGING

a. G/VLLD batteries (BB-704/U are charged using the top of PP-7286/U battery charger and special cable adapter (NSN 1420-01-1020).

b. Refer to TM 11-6130-392-12 for complete instructions on how to use the PP-7286/U battery charger. The following procedures apply to G/VLLD batteries:

(1) Set the charging time and current as follows:

14°F - 39°F : 700 mA for 19 hours

40°F - 100°F : 700 mA for 7 hours

CAUTION

The ridged side of the double banana plug goes to the negative (black) terminal of the battery charger. Reversing this plug will damage equipment when power is applied.

(2) Connect the charging cable between the charger and the battery.

c. Batteries are tested using the discharge analyzer. Refer to TM 11-6130-392-12 for detailed procedures. If, after going through two complete back-to-back charge/discharge cycles, the G/VLLD batteries will still not hold a charge, they are unserviceable. Batteries should be discharged and discarded.

CHAPTER 3
TROUBLESHOOTING

Section I. LD/R TROUBLESHOOTING

3-1. GENERAL

This section contains troubleshooting procedures for the LD/R. Table 2-1 lists the equipment required to perform these procedures.

3-2. BORESIGHT TEST

If G/VLLD was referred to Direct Support for maintenance due to suspected optical misalignment, perform the operator boresight check contained in TM 9-1260-477-12. If the G/VLLD unit passes the boresight check perform LD/R Test Procedure (Table 3-1) before returning the unit to the Organizational level. If the G/VLLD unit does not pass the boresight check, refer the unit to Depot for repair/disposition. Repair LD/R transceiver A2 per paragraph 4-2. Return failed transceiver to Depot.

3-3. LD/R TEST PROCEDURE

The LD/R test procedure (Table 3-1) provides a systematic checkout of the LD/R. Carefully perform the procedure as written and in the sequence as listed. Refer to Figure 3-1 for Test Equipment Set-Up. When performing this procedure, indications which are not listed under the Indication column should be ignored. Any deviations from the normal indications listed are considered faults. Isolation of these faults is detailed in appropriate subfunction fault isolation tables referenced at corresponding steps where faults are indicated. Interconnecting wiring, connectors and switches are fault isolated by using functional diagrams (Figures FO-3 thru FO-14), LD/R wiring diagram (Figure FO-15) and wire list (Appendix C) which are provided. Power faults can be isolated using the power generation fault functional diagram (Figure FO-14). If parts other than mechanical parts are replaced as a result of troubleshooting, perform the LD/R test procedures again to verify proper operation. Ellipses (...), when used in the procedures, indicate an intentional blank or termination of a procedural step.

CAUTION

The optical components of the LD/R are easily contaminated. When the electronics assembly (A1) is opened and is being tested or repaired, cover the transceiver assembly (A2) with a sheet of clear plastic to protect optics from dust, smoke, or other foreign matter. Working area inside maintenance van must be clean before opening the LD/R.

Power Supply Control A1A1A1, Control Card A1A3, Resolver-to-Digital Converter A1A4, Energy Control Card A2A1A6, and Receiver Circuit Card A2A4 are electrostatic sensitive. Protect these cards by wearing grounding wristband when probing. Handling and/or installation of individual cards should be performed at a static-free work station. These cards should be anti-static packaged during handling and storage.

NOTE

Paragraph 2-11 (Table 2-2) must be performed whenever the transceiver assembly (A2), the power supply control circuit card (A1A1A1), and the PFN power supply circuit cards (A1A1W1A3 and A1A1W1A4) are replaced.

In the process of troubleshooting it is often necessary to break conformal coating while probing. Upon completion of troubleshooting recoat damaged surfaces as required. All waveforms are idealized.

All waveforms are idealized.

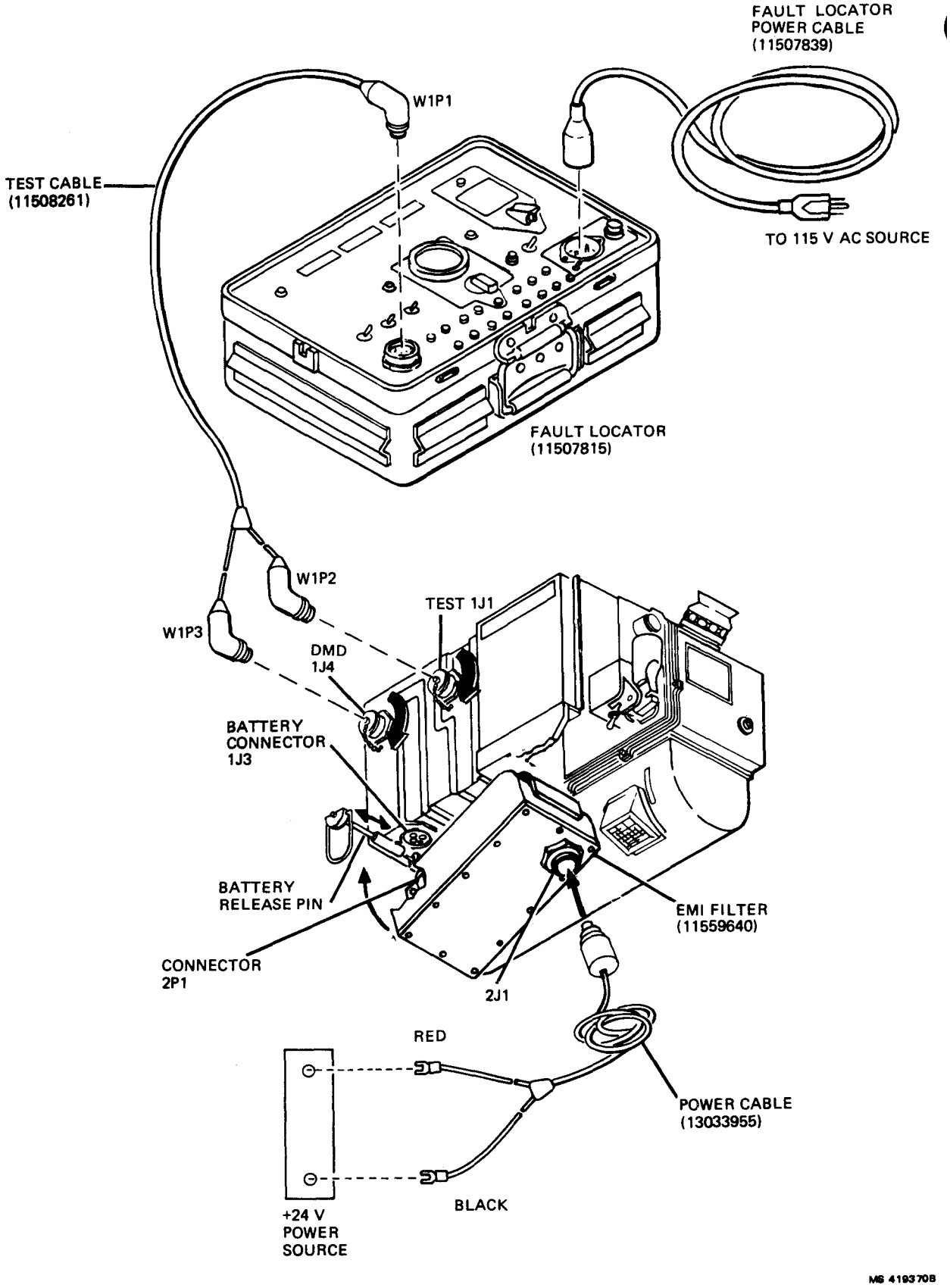


Figure 3-1. Test Equipment Set-Up

Table 3-1. LD/R Test Procedure

tep	Item	Action	Indication	Yes	No
1	Fault Locator	Equalize pressure by depressing relief valve on cover.	. . .	. . .	. . .
2	Fault Locator	Loosen 4 wing nuts.	. . .	. . .	. . .
3	Fault Locator	Push 4 cover clips down and out to clear lip.	. . .	. . .	. . .
4	Fault Locator	Remove and invert cover.	. . .	. . .	. . .
5	Fault Locator	Press 2 inner lid clips on center, then pull on outer clip to open for cables. Remove cables.	. . .	. . .	. . .
6	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
7	LD/R	Remove front window cover on LD/R.			
		WARNING Insure that LD/R POWER switch is OFF and that LD/R fans are not audible. Wear LASER goggles to perform following step.			
8	LD/R	Read above WARNING. Observe EVENTS X100 meter through output window of LD/R. Record EVENTS X100 meter reading for later use.	. . .	. . .	. . .
9	LD/R	Install front window cover on LD/R by pressing around rim of output window. Insure window cover is securely in place.	. . .	. . .	. . .
10	Fault Locator	Insure POWER switch S2 is OFF.			
11	Fault Locator	Connect power cable (female) to POWER J2 connector.	. . .	. . .	. . .
12	Fault Locator	Connect Power cable to 115 VAC three-wire outlet.	. . .	. . .	. . .
		CAUTION Use power cable between LD/R and power supply for maintenance. Do not use jumper cables as polarity is not marked on LD/R 1J3. Damage will result if connections are accidentally reversed.			
13	LD/R	Pull and hold battery release pin.	. . .	. . .	. . .
14	LD/R	Engage EMI filter with battery pivot bracket.	. . .	. . .	. . .

Table 3-1. LD/R Test Procedure (Cont)

Step	Item	Action	Indication	Yes	No
15	LD/R	Rotate EMI filter connector 2P1 into battery connector LD/R 1J3.	. . .	. . .	. . .
16	LD/R	Push battery pin thru polarity key.	. . .	. . .	. . .
17	Power Cable	Connect power cable P1 to EMI filter 2J1 connector.	. . .	. . .	. . .
		CAUTION Insure proper polarity when connecting to power source.			
18	Power Cable	Attach power cable black lug (-) to power supply negative terminal.	. . .	. . .	. . .
19	Power Cable	Attach power cable red lug (+) to power supply positive terminal.	. . .	. . .	. . .
20	LD/R	Set DES/RNG 1/RNG 2 switch to DES.	. . .	. . .	. . .
21	24V Power Supply	Set POWER switch to ON and adjust power supply to 24 VDC.	Normal indication, LD/R fans do not run.	. . .	. . .
		WARNING Laser light hazard when LD/R POWER switch is ON. Observe WARNINGS inside front cover of this manual before proceeding.			
		NOTE DISPLAY BRIGHT may be in TEST detent position or may be defective.			
22	LD/R	Set POWER switch to ON.	If LD/R fans run when power is connected, power relay is stuck in ON position.	Replace A1A1W1K1 per paragraph 4-17.	Go to next step
23	LD/R	Turn DISPLAY BRIGHT control cw to TEST (detent) position.	LD/R fans run.	Go to next step.	Go to Table 3-6 step 68.
24	LD/R	Turn DISPLAY BRIGHT control ccw out of TEST (detent) position.	LD/R fans stop running.	Go to next step.	Replace A1A1W1K1 per paragraph 4-17.

Table 3-1. LD/R Test Procedure (Cont)

Step	Item	Action	Indication	Yes	No
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
25	LD/R	Pull trigger switch and hold for 15 seconds while observing eyepiece.	LD/R fans run and airflow is detected while trigger is held.	Go to next step.	Go to Table 3-3.
			Overtemp light is off.	Go to next step.	Go to Table 3-13 If fault remains go to Table 3-3.
26	(DELETED)				
27	LD/R	Set POWER switch to AZ ADJ and hold.	LD/R fans run.	Go to next step.	Replace A1A1W1S1 per paragraph 4-11.
28	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
29	LD/R	Adjust RETICLE BRIGHT control to desired level in eyepiece. Focus as required.	Eyepiece display: Crosshairs, scale, and AZ, RNG, EL legends illuminate.	Go to next step.	Go to Table 3-4.
30	LD/R	Turn DISPLAY BRIGHT control cw to TEST (detent) position.	Eyepiece display: AZ 8888 RNG 8888 EL -888 Green - Lit Amber - Lit Red - Lit	Go to next step.	Table 3-6.
31	LD/R	Set POWER switch to AZ ADJ and hold.	. . .	. . .	. . .
32	LD/R	Turn DISPLAY BRIGHT control fully ccw (out of TEST) then fully cw.	Eyepiece display dims and brightens.	Go to next step.	Go to Table 3-5.
33	LD/R	. . .	Eyepiece display flashes as control is turned.	Replace A1A3 per paragraph 4-3.	Go to next step
		. . .	Green light is on.	Go to Table 3-7.	Go to next step
34	LD/R	Release POWER switch. Insure that DISPLAY BRIGHT control is not in the TEST position.	. . .	. . .	. . .

Table 3-1. LD/R Test Procedure (Cont)

tep	Item	Action	Indication	Yes	No
35	Fault Locator	Connect test cable W1P1 to TEST J1.	. . .	. . .	. . .
36	LD/R	Remove 1J1 and 1J4 connector covers.	. . .	. . .	. . .
37	Fault Locator	Connect test cable W1P2 to LD/R 1J1. Connect test cable W1P3 to LD/R 1J4.	. . .	. . .	. . .
38	Fault Locator	Set HVPS switch S8 to ENABLE.	. . .	. . .	. . .
39	Fault Locator	Set LASER switch S1 to ENABLE .	. . .	. . .	. . .
40	Fault Locator	Set PRESET RANGE switch S6 to OFF.	. . .	. . .	. . .
41	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
		NOTE Throughout this procedure if the OVERTEMP light (red, blinking) comes on during any laser firing, perform Table 3-13 before proceeding with additional troubleshooting. If not lit proceed with next step.			
42	Fault Locator	Set POWER switch S2 to ON.	POWER indicator lights. OVERTEMP light will illuminate. This is a normal indication.	Go to next step	Go to TM 9-4931-477-14.
43	Fault Locator	Press LAMP TEST switch S7.	All lights illuminate.	Go to next step	Go to TM 9-4931-477-14.
44	Fault Locator	Set TEST SELECT switch to BAT VDC.	. . .	. . .	. . .
45	Fault Locator	Using oscilloscope (15, 17, 23, Table 2-1) connect DMM leads between METER TP4 and RTN.	DMM measurement is +24 ±1.0 VDC.	Go to next step	Adjust power supply. If indication cannot be obtained, troubleshoot power cable and 24V power supply.
			Fault Locator fuse blows.	Go to TM 9-4931-477-14.	. . .

Table 3-1. LD/R Test Procedure (Cont)

Step	Item	Action	Indication	Yes	No
		NOTE The fault locator provides a 5V signal for lighting the green indicator light in the eyepiece. The green indicator light will be lit as long as the fault locator is connected to the LD/R.			
6	LD/R	. . .	Green light is on.	Go to next step.	Go to Table 3-7.
7	LD/R	Set code select switches to 241.	. . .	Go to next step.	Replace faulty code switch(es) per paragraph 4-4.
		WARNING Laser light hazard; observe WARNINGS inside front cover of this manual before proceeding.			
		NOTE The laser will be fired repeatedly in the following steps. To minimize lasing time read through the steps between WARNINGS before proceeding.			
8	Fault Locator	Set TEST SELECT switch to BAT VDC.	TEST SELECT meter indicates in the green band.	Go to next step.	Go to Table 3-9.
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
9	Fault Locator	Set LASER switch S9 to START, then to ON.	OVERTEMP light goes off.	Go to next step.	Go to Table 3-13
50	(DELETED)				
51	Fault Locator	Set Test SELECT switch to the following positions: (1) BAT VDC (2) +15 VDC (3) +5 VDC (4) -15 VDC	TEST SELECT meter indicates in the green band.	Go to next step.	Go to: Table 3-9 Table 3-9 Table 3-9 Table 3-9
52	Fault Locator	Set TEST SELECT switch to -15 VDC. Using oscilloscope (15, 17, 23, Table 2-1) connect DMM leads between METER TP4 and RTN.	. . .	. . .	. . .

Table 3-1. LD/R Test Procedure (Cont)

ep	Item	Action	Indication	Yes	No
3	24V Power Supply	Vary Power Supply between 18 and 26 VDC.	DMM voltage remains between -13.5 and -15.1 VDC.	Go to next step.	Replace LVPS A1A1W1A2 per paragraph 4-7
4	Fault Locator	Set TEST SELECT switch to +15 VDC.	. . .	. . .	. . .
5	24V Power Supply	Vary Power Supply between 18 and 26 VDC.	DMM voltage remains between +13.5 and +15.1 VDC.	Go to next step.	Replace LVPS A1A1W1A2 per paragraph 4-7
6	Fault Locator	Set TEST SELECT switch to +5 VDC.	. . .	. . .	. . .
7	24V Power Supply	Vary Power Supply between 18 and 26 VDC.	DMM voltage remains between +5.5 and +4.5 VDC.	Go to next step.	Replace LVPS A1A1W1A2 per paragraph 4-7
8	24V Power Supply	Adjust Power Supply to 24 VDC.	. . .	. . .	. . .
9	Fault Locator	. . .	OVERTEMP light is off.	Go to Table 3-13.	Go to next step
0	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .

WARNING

Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.

61	LD/R	Pull TRIGGER switch, observe indication, then release TRIGGER switch.	OVERTEMP light on fault locator goes off and LD/R fan operates.	Go to next step.	Replace A1A1W1S3 per paragraph 4-13.
62	Fault Locator	Connect oscilloscope (6, 15, 16, 18, 19, Table 2-1) to SIMMER SENSE J3.	. . .	. . .	. . .

Table 3-1. LD/R Test Procedure (Cont)

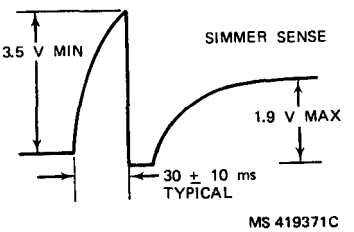
Step	Item	Action	Indication	Yes	No
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
		NOTE To see the signal, LASER switch S9 must be pushed in when the trigger light is on.			
63	Fault Locator	Set LASER switch S9 to START then to ON. Monitor oscilloscope when LASER switch is set to start - pulse only occurs once. Repeat step 63 as necessary to obtain indication. Set oscilloscope as follows: SWEEP 10 ms ATTN 1 volt/cm. SYNC INTERNAL STORAGE FUNCTION (STORAGE then SAVE) POLARITY UP	Oscilloscope display is as shown below.  MS 419371C	Go to next step.	. . .
			Oscilloscope displays a series of pulses.  MS 419372	Replace A2 per paragraph 4-2 and perform PFN VDC adjustment, paragraph 2-11, for new A2.	
			Oscilloscope displays no pulse.	Replace SIMMER POWER supply A2A1A5A1 per paragraph 4-22	
64	Fault Locator	Set LASER switch to OFF.	. . .	. . .	. . .
65	Fault Locator	Disconnect coaxial cable from SIMMER SENSE TP J3 and oscilloscope.	. . .	. . .	. . .
66	Fault Locator	Connect oscilloscope (15,18,19, 22 or 23, Table 2-1) between METER TP4 and RTN.	. . .	. . .	. . .

Table 3-1. LD/R Test Procedure (Cont)

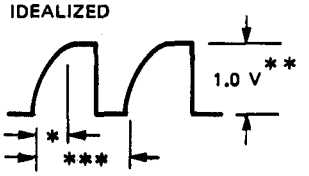
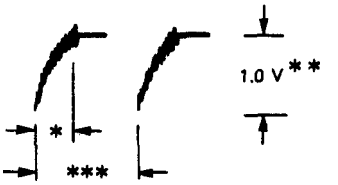
Step	Item	Action	Indication	Yes	No
67	Fault Locator	Set TEST SELECT switch to PFN VDC.	.	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
68	Fault Locator	Set LASER switch S9 to START then to ON.	. . .	. . .	. . .
69	Fault Locator	Set LASER switch S1 to INHIBIT.	TEST SELECT meter reads in green band.	Go to next step.	Go to Table 3-10.
70	Fault Locator	Set LASER switch S1 to ENABLE.	. . .	. . .	. . .
71	Fault Locator	Monitor oscilloscope for PFN voltage signal. Set oscilloscope as follows: ATTN 0.5 volt/cm SWEEP 20 ms SYNC INTERNAL STORAGE FUNCTION COUPLING DC MODE NORM POLARITY UP	Oscilloscope display is as shown below. IDEALIZED  WAVEFORM ACTUALLY SEEN ON SCOPE  PFN VOLTAGE * CHARGE TIME MUST BE LESS THAN 45 ms. ** PULSE AMPLITUDE IS NOT CRITICAL PULSE CLIPPING MUST OCCUR. *** PULSE PERIOD DEPENDS ON CODE SETTING. REFER TO TB 9-1260-477-34. MS 419373C ■	Go to next step.	Go to Table 3-10
72	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .

Table 3-1. LD/R Test Procedure (Cont)

tep	Item	Action	Indication	Yes	No
73	Fault Locator	Disconnect oscilloscope from METER TP4.	.	. . .	. . .
		WARNING Laser wil l be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
74	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
75	Fault Locator	Set TEST SELECT switch to 450 VDC .	TEST SELECT meter indicates in the green band.	Go to next step.	Replace A2 per paragraph 4-2.
76	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
77	Fault Locator	Set TEST SELECT switch to ENERGY ERROR. Connect DMM leads between METER TP4 and RTN.	See note below for normal indication.	Go to next step.	Go to Table 3-11.
		WARNING Laser wil l be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
		NOTE In the following step, the TEST SELECT meter does not have to be in green band. If indication is above or below green band and steady, go to Table 3-11. Indication should be meter varying slowly above or below or within green band after approximately 10 seconds if code select switches are set to 241.			
78	Fault Locator	Set LASER switch S9 to START, then to ON. Monitor DMM.	See NOTE above for normal indication.	Go to next step.	Go to Table 3-11.
		NOTE The DMM indication will vary but must be within the limits of -14 to +14 VDC.			
		. . .	DMM measurement is between -14 and +14 VDC after approximately 10 seconds.	Go to next step.	Go to Table 3-11.
79	(DELETED)				

Table 3-1. LD/R Test Procedure (Cont)

Step	Item	Action	Indication	Yes	No
80	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
81	Fault Locator	Set LASER switch S9 to START, then to ON.	A TRIG indicator blinks continuously.	Go to next step.	Go to Table 3-11.
82	Fault Locator	Set TEST SELECT switch to BAT VDC. Connect DMM leads between METER TP4 and RTN.	DMM meausrement is +24 ±1.0 VDC.	Go to next step.	Adjust Power Supply. If indication cannot be obtained, troubleshoot power cable and 24V Power Supply.
83	LD/R	Observe eyepiece display.	Amber indicator is out.	Go to next step.	Go to Table 3-8.
84	24V Power Supply	Adjust power supply voltage downward until LD/R amber indicator just lights. Do not adjust power supply voltage below 19.5 VDC.	DMM measurement is +20.0 ±0.5 VDC when amber indicator lights.	Go to next step.	Go to Table 3-8.
85	24V Power Supply	Adjust to 24 ±1.0 VDC.	DMM measurement is +24 ±1.0 VDC	. . .	. . .
86	LD/R	. . .	Amber indicator is out.	Go to next step.	Go to Table 3-8.
87	Fault Locator	Set LASER switch S9 to OFF	. . .	. . .	. . .
88	LD/R	Set code select switches to 111.	. . .	. . .	. . .
89	Fault Locator	Refer to TB 9-1260-477-34 for check of code select circuitry.	. . .	. . .	. . .
90	Fault Locator	Set TEST SELECT switch to ENERGY ERROR.	. . .	. . .	. . .

Table 3-1. LD/R Test Procedure (Cont)

:e p	I tem	Action	Indication	Yes	No
)1	Fault Locator	Connect DMM leads between METER TP4 and RTN.	. . .	. . .	. . .
)2	LD/R	Set code select switches to 241.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
)3	Fault Locator	Set LASER switch S9 to START, then to ON.	DMM measure is between -14 and +14 VDC after approximately 10 seconds.	Go to next step.	Go to Table 3-11.
)4	LD/R	Observe eyepiece display.	Red indicator is off.	Go to next step.	Go to Table 3-11.
)5	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
)6	Fault Locator	Disconnect leads from METER TP4 and RTN.	. . .	. . .	. . .
)7	Fault Locator	Set LASER switch S1 to INHIBIT.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
98	Fault Locator	Set LASER switch S9 to START, then ON.	ENERGY FAIL indicator is not on.	Go to next step.	Go to Table 3-11.
99	LD/R	Observe eyepiece display.	Red indicator is lit.	Go to next step.	Go to Table 3-11.
00	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
01	LD/R	Set DES/RNG 1/RNG 2 switch to RNG 1.	. . .	. . .	. . .

Table 3-1. LD/R Test Procedure (Cont)

tep	I tem	Action	Indication	Yes	No
02	Fault Locator	Set LASER switch S1 to ENABLE.	. . .	. . .	. . .
03	Fault Locator	Set PRESET RANGE switch S6 to ON.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
04	Fault Locator	Set LASER switch S9 to START, then to ON.	RANGE readout displays 8150 to 8450.	Go to next step.	Go to Table 3-12.
05	LD/R	. . .	RANGE readout displays same reading as in step 104.	Go to next step.	Go to Table 3-12.
06	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
07	LD/R	Set DES/RNG 1/RNG 2 switch to RNG 2.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely inplace to avoid possibility of scattered laser light from output window.			
08	Fault Locator	Set LASER switch S9 to START, then ON.	RANGE readout displays 8650 to 8950.	Go to next step.	Go to Table 3-12.
09	LD/R	. . .	RANGE readout displays same reading as in step 108.	Go to next step.	Go to Table 3-12.
10	Fault Locator	Set PRESET RANGE switch S6 to OFF.	. . .	. . .	. . .
11	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
12	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .

Table 3-1. LD/R Test Procedure (Cont)

Step	Item	Action	Indication	Yes	No
		WARNING Insure that LD/R POWER switch is OFF and that LD/R fans are not audible. Wear LASER goggles to perform the following step.			
l13	LD/R	Observe EVENTS X100 meter indication.	Meter indication is larger than that recorded in step 8.	Go to next step.	Return transceiver to Depot for repair/ disposition.
l14	LD/R	Remove 1J2 cover and stow on dummy connector above 1J2.	. . .	. . .	. . .
l15	LD/R	Connect test resolver (24, Table 2-1) to 1J2 connector.	. . .	. . .	. . .
l16	LD/R	Set DES/RNG 1/RNG 2 switch to RNG 1.	. . .	. . .	. . .
l17	LD/R	Set POWER switch to AZ ADJ and hold.	. . .	. . .	. . .
		NOTE Adjust test resolver (24, Table 2-1) for zero reading on Fault Locator AZIMUTH readout before performing next step.			
l18	LD/R	Rotate resolver shaft slowly cw and ccw about the zero mark.	AZ readout varies from 0000 to 6399. EL readout varies from -999 to 999.	Go to next step.	Replace RDC A1A4 per paragraph 4-3
l19	LD/R and Fault Locator	Rotate resolver shaft slowly to obtain any EL reading between -999 and 999. Release resolver.	LD/R and fault locator AZ and EL readings are identical.	Go to next step.	Replace RDC A1A4 per paragraph 4-3
l20	LD/R	Release AZ ADJ switch.	. . .	. . .	. . .
l21	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		NOTE LD/R shutdown, steps 122 thru 132, is performed at the end of maintenance on LD/R. Fault locator shutdown, steps 133 thru 140, is performed only if no more LD/Rs are to be tested.			
122	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
123	24V Power Supply	Set power to OFF.	. . .	. . .	. . .

Table 3-1. LD/R Test Procedure (Cont)

Step	Item	Action	Indication	Yes	No
124	LD/R	Remove test resolver from 1J2.	. . .	. . .	. . .
125	LD/R	Reinstall 1J2 connector cover.	. . .	. . .	. . .
126	Power Cable	Remove power cable P1 from EMI filter connector.	. . .	. . .	. . .
127	Power Cable	Remove power cable connectors from 24V power supply.	. . .	. . .	. . .
128	LD/R	Remove test cable W1P2 from 1J1, and W1P3 from 1J4.	. . .	. . .	. . .
129	LD/R	Install 1J1 connector cover and 1J4 connector cover.	. . .	. . .	. . .
130	LD/R	Install window cover by pressing around rim.	. . .	. . .	. . .
131	LD/R	Install eyepiece cover.	. . .	. . .	. . .
132	LD/R	Return LD/R to service.	. . .	. . .	. . .
133	Fault Locator	Remove cable W2P1 from POWER J2 connector.	. . .	. . .	. . .
134	Fault Locator	Remove test cable W1P2 from TEST J1.	. . .	. . .	. . .
135	Fault Locator	Coil two cables and stow in cover.	. . .	. . .	. . .
136	Fault Locator	Close cover lid.	. . .	. . .	. . .
137	Fault Locator	Invert cover and install engaging guides.	. . .	. . .	. . .
138	Fault Locator	Press four cover clips down and in to engage clip.	. . .	. . .	. . .
139	Fault Locator	Tighten four wing nuts.	. . .	. . .	. . .
140	Fault Locator	Store fault locator until needed.	. . .	. . .	. . .

3-4. LD/R TROUBLESHOOTING PROCEDURES

The ellipses (...) when used in the following troubleshooting tables indicate an intentional blank or termination of a procedural step. After a fault is isolated and repaired; perform the LD/R Test Procedure (Table 3-1) to verify proper operation.

3-5. HOW TO READ FUNCTIONAL DIAGRAMS

Table 3-2 contains the symbols to be used to aid in reading the functional diagrams referred to in this chapter. The functional diagrams are located in the foldout section at the end of the manual.

Table 3-2. Symbols

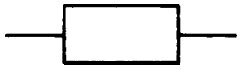
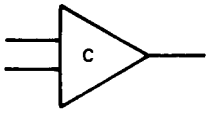
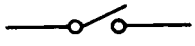
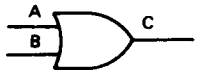
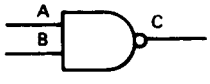
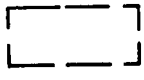
Symbol	Explanation
	Indicates a complete circuit. Writing inside of box defines circuit.
	Indicates a comparator. Output is shown at the apex of the triangle.
	Indicates a contact switch. All contact switches are shown in the open position.
	Indicates two input logical "OR" gate. A B C 0 0 0 1 0 1 0 1 1 1 1 1
	Indicates two input logical "NAND" gate. A B C 0 0 1 1 0 1 0 1 1 1 1 0
	Indicates an inverter/amplifier. Output is shown at the apex of the triangle.
	Dashed lines indicate replaceable items.
MS 419172A	

Table 3-3. LD/R Fans Do Not Run

Step	Item	Action	Indication	Yes	No
		WARNING Laser light hazard; observe WARNINGS inside front cover of this manual before proceeding.			
1	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
		NOTE The fans in the following indication have different pitches, high (internal fan inside pressure vessel) and low (external fan under plenum cover).			
2	LD/R	Pull TRIGGER switch and hold.	High pitch is audible.	Replace A2A3 per paragraph 4-21.	Go to next step.
3	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
4	24V Power Supply	Set power switch to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
5	LD/R	Separate A1 and A2 per paragraph 4-2. Remove Power Supply Control Card A1A1A1 per paragraph 4-5. Do not disconnect connector A1A1W1P2.	. . .	. . .	. . .

Table 3-3. LD/R Fans Do Not Run (Cont)

Step	Item	Action	Indication	Yes	No
6	Trigger Switch	Connect DMM leads between A1A1W1S3-2 and A1A1W1S3-1. See Figure FO-2, Sheet 1.	DMM measurement indicates and open circuit.	to next ep.	Replace A1A1W1S3 per paragraph 4-13.
7	Trigger Switch	Measure continuity between A1A1W1S3-2 and A1A1W1S3-1. (Pull trigger switch while making measurement.)	DMM measurement is less than 2 ohms.	to next ep	Replace A1A1W1S3 per paragraph 4-13.
8	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
9	LD/R	Using DMM, measure continuity between A1A1W1S1-8 and A1A1W1S1-9.	DMM measurement is less than 2 ohms.	to next ep.	Replace A1A1W1S1 per paragraph 4-11.
10	LD/R	Measure continuity between A1A1W1A1-E4 (24V RTN-FAN) and A1A1W1P1-30. Refer to Figure 4-1.	DMM measurement is less than 2 ohms.	to next ep.	Go to step 15.
11	LD/R	Measure continuity between A1A1W1P1-30 (black lead) and A1A1W1P1-63 (red lead). Replace A2 per paragraph 4-2.	DMM measurement indicates $\approx 6\Omega$.	to next ep.	Go to step 15.
12	LD/R	Install A1A1A1 per paragraph 4-5.	. . .	. . .	. . .
13	LD/R	Replace A2 per paragraph 4-2.	. . .	. . .	. . .
14	LD/R	Retest LD/R per Table 3-1.	. . .	. . .	. . .
15	LD/R	A faulty wire(s) is indicated Fault isolate and repair wiring using LD/R wiring diagram Figure FO-15, Sheet 1	. . .	. . .	. . .
16	LD/R	Retest LD/R per Table 3-1.	. . .	. . .	. . .

Table 3-4. Reticle Brightness Fault

tep	Item	Action	Indication	Yes	No
1	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
2	24V Power Supply	Set power switch to OFF.	.	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
3	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
4	LD/R	Using DMM, measure resistance between A1A1W1P1-4 (red lead) and A1A1W1P1-37 (black lead) Refer to Figure 4-1.	DMM measurement is 510 to 5510 ohms.	Replace A2 per paragraph 4-2.	Go to next step
5	LD/R	Remove A1A1A1 per paragraph 4-5 (do not disconnect A1A1W1P2). Remove A1A3 per paragraph 4-3. (Do not disconnect connector A1A1W1P3.)	. . .	. . .	. . .
6	LD/R	Using DMM, measure resistance between A1A1W1A1-E7 and A1A1W1A1-E30. Refer to Figure FO-2, Sheet 3.	DMM measurement is 460 to 560 ohms.	Go to next step.	Replace A1A1W1A1 per paragraph 4-6
7	LD/R	Measure resistance across RETICLE BRIGHT control A1A1W1R1-2 and -3 while varying from cw to ccw. Refer to Figure FO-2, Sheet 1.	DMM measurement is 0 to 5K ohms.	Go to next step.	Replace RETICLE BRIGHT control A1A1W1R1 per paragraph 4-14.
8	LD/R	Measure continuity between A1A1W1S1-8 and A1A1W1S1-9 POWER switch. (Set POWER switch to ON while making measurement; then set to OFF.)	DMM measurement is less than 2 ohms.	Go to next step.	Replace POWER switch A1A1W1S1 per paragraph 4-11.
9	LD/R	Faulty wiring is indicated. Troubleshoot and repair faulty wiring using LD/R wiring diagram Figure FO-15.			
10	LD/R	Install A1A3 per paragraph 4-3.	. . .	. . .	. . .
11	LD/R	Install A1A1A1 per paragraph 4-5.	. . .	. . .	. . .
12	LD/R	Install A2 per paragraph 4-2.	. . .	. . .	. . .

Table 3-5. Display Brightness Fault

Step	Item	Action	Indication	Yes	No
1	LD/R	Release POWER switch to OFF.	. . .	. . .	. . .
2	Fault Locator	Connect test cable W1P1 to TEST J1.	. . .	. . .	. . .
3	LD/R	Remove 1J1 and 1J4 connector covers.	. . .	. . .	. . .
4	Fault Locator	Connect test cable W1P2 to LD/R 1J1. Connect test cable W1P3 to LD/R 1J4.	. . .	. . .	. . .
5	Fault Locator	Set POWER switch S2 to ON.	POWER indicator lights.	Go to next step.	Go to TM 9-4931-477-14.
6	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
7	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
8	Fault Locator	Set TEST SELECT switch to the following positions (1) BAT VDC (2) +15 VDC (3) +5 VDC (4) -15 VDC	TEST SELECT meter indicates in green band.	Go to next step.	Go to Table: 3-9 3-9 3-9 3-9
9	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
10	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
11	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
12	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
13	LD/R	Connect oscilloscope (15, 18,, 19, 22 or 23, Table 2-1) between A1A1W1P1-56 (DISPLAY INHIBIT) and chassis ground. Refer to Figure 4-2, Sheet 1.	. . .	. . .	. . .

Table 3-5. Display Bightness Fault (Cont)

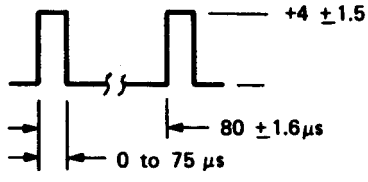
tep	Item	Action	Indication	Yes	No
14	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
15	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
16	Fault Locator	Set LASER switch Sl to INHIBIT.	. . .	. . .	. . .
17	Fault Locator	Set HVPS switch S8 to INHIBIT.	. . .	. . .	. . .
18	LD/R	Set DES/RNG 1/RNG 2 switch to RNG 1 or RNG 2.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at PFN circuits when trigger switch is pulled.			
19	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
20	LD/R	Rotate DISPLAY BRIGHT control from fully ccw to fully cw.	Oscilloscope display is as shown below:  DISPLAY INHIBIT MS 4193768 Pulse width varies as control is rotated.	Replace A2 per para-graph 4-2.	Go to next step.
21	LD/R	Using DMM, measure voltage between A1A3J1 -18 (DISPLAY BRIGHT) and A1A3J1 -56 (Return). Refer to Figure 4-2, Sheet 2.	. . .	. . .	. . .

Table 3-5. Display Brightness Fault (Cont)

tep	Item	Action	Indication	Yes	No
22	LD/R	Rotate DISPLAY BRIGHT control from fully ccw to fully cw.	DMM measurement varies from -4 to +5 VDC.	Go to next step.	Replace DISPLAY BRIGHT control A1A1W1R2 per paragraph 4-15.
23	LD/R	Connect DMM leads between A1A3J1-28 (RNG 1/DES) and A1A3J1-56 (Return). Refer to Figure 4-2, Sheet 2.	DMM measurement is 0.0 to 0.8 VDC.	Set LASER switch S9 on fault locator to OFF. Replace A1A3 per paragraph 4-3.	Set LASER switch S9 on fault locator to OFF. Replace A1A1W1S2 per paragraph 4-12.

Table 3-6. Display Test Fault

tep	I tem	Action	Indication	Yes	No
1	LD/R	Turn DISPLAY BRIGHT switch out of TEST (detent).	. . .	. . .	. . .
2	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
3	Fault Locator	Connect test cable W1P2 to TEST J1.	. . .	. . .	. . .
4	LD/R	Remove 1J1 and 1J4 connector covers.	. . .	. . .	. . .
5	LD/R	Connect test cable W1P2 to LD/R 1J1. Connect test cable W1P3 to LD/R 1J4.	. . .	. . .	. . .
6	LD/R	Set POWER switch to ON. Insure Fault Locator POWER switch S2 is OFF.	. . .	. . .	. . .
7	LD/R	Turn DISPLAY BRIGHT control cw to TEST (detent).	Eyepiece display: AZ 8888, RNG 8888, EL - 888 and amber, red and green lights are all missing (blank display).	io to step 45.	. . .
		. . .	Red, amber and green lights on but display blank.	epl ace A1A3 per paragraph 4-3	. . .
		. . .	Red, amber and green lights on but some numbers missing.	io to step 8.	. . .
		. . .	Segments or red or amber light missing.	eplace A2 er para-graph 4-2.	. . .
		. . .	Eyepiece display: All present except green light off.	io to step 26.	. . .
		. . .	Eyepiece display: Display is blank except green light is lit.	io to step 37.	. . .
8	Fault Locator	Connect DMM to $\overline{\text{TOR}}$ TP15 and RTN.	DMM measurement is 4.0 $\pm$1.5 VDC.	io to ext step.	Replace A1A1A1 per para-graph 4-5
9	LD/R	Turn DISPLAY BRIGHT control out of TEST (detent).	. . .	. . .	. . .

Table 3-6. Display Test Fault (Cent)

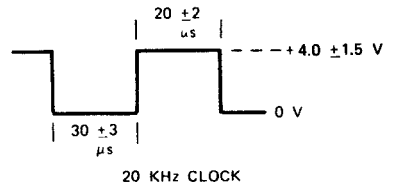
tep	I tem	Action	Indication	Yes	No
10	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
11	Fault Locator	Set LASER switch Sl to INHIBIT	. . .	. . .	. . .
12	Fault Locator	Set HVPS switch S8 to INHIBIT.	. . .	. . .	. . .
13	Fault Locator	Set LASER switch S9 to START, then to ON.			
14	Fault Locator	Connect oscilloscope (15, 18, 19, 22 or 23, Table 2-1) leads between 20 KHz TP7 and RTN.	Oscilloscope display is as shown below: 	Go to next step.	Repl ace A1A3 per paragraph 4-3.
15	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
16	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
17	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
18	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
19	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
20	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
21	LD/ R	Set DISPLAY BRIGHT to TEST (detent) position.	. . .	. . .	. . .
22	LD/R	Connect oscilloscope leads between A1A3J1-13 (DIGIT 8) and A1A3J1 -59 (Return). Refer to Figure 4-2, Sheet 2.	Oscilloscope displays 4.0 ±1.5 V pulses	Go to next step.	Replace A1A3 per paragraph 4-3.
23	LD/R	Connect oscilloscope leads between A1A3J1 -14 (DIGIT 4) and A1A3J1-59 (Return).	Oscilloscope displays 4.0 ±1.5 V pulses.	Go to next step.	Repl ace A1A3 per paragraph 4-3.
24	LD/R	Connect oscilloscope leads between A1A3J1-15 (DIGIT 2) and A1A3J1-59 (Return).	Oscilloscope displays 4.0 ±1.5 V pulses.	Go to next step.	Repl ace A1A3 per paragraph 4-3.

Table 3-6. Display Test Fault (Cont)

tep	Item	Action	Indication	Yes	No
25	LD/ R	Connect oscilloscope leads between A!A3J1-16 (DIGIT 1) and A1A3J1-59 (Return).	Oscilloscope displays 4.0 ±1.5 V pulses.	Replace A2 per paragraph 4-2.	Replace A1A3 per paragraph 4-3.
26	LD/R	Set DISPLAY BRIGHT switch out of TEST (detent).	. . .	. . .	. . .
27	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
28	LD/ R	. . .	Green light will come on in eyepiece display.	Go to step 30.	Go to next step
29	LD/R	Connect DMM leads between A1A1W1P1-20 (FIRE COMMAND) and A1 A1W1P1 -52 (RTN).	DMM measurement is 4.0 ±1.5 VDC	Replace A2 per paragraph 4-2.	Go to next step
30	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
31	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1 A1 W1 P1-61 and A2A2W1J1 -61 for approximately three minutes after power is removed.			
32	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
33	LD/R	Remove A1A3. Do not disconnect connector A1A1W1P3. Refer to Figure 4-2, Sheet 1.	. . .	. . .	. . .
34	LD/R	Set DISPLAY BRIGHT to TEST (detent).	. . .	. . .	. . .
35	LD/R	Connect DMM leads between A1 A1W1A1-E25 and A1 A1 W1 A1-E22 (Return). Refer to Figure FO-2, Sheet 3.	DMM measurement is 4.0 ±1.5 VDC	Go to next step.	Replace LVPS A1A1W1A2 per paragraph 4-7
36	LD/R	Connect DMM leads between A1 A1W1A1-E27 and E-22 (Return). Refer to Figure FO-2, Sheet 3.	DMM measurement is 4.0 ±1.5 VDC.	Replace LVPS Drive A1A1 W1A1 per paragraph 4-6.	Replace DISPLAY BRIGHT control A1 A1 W1 R2 per paragraph 4-15.
37	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
38	LD/R	Turn DISPLAY BRIGHT switch out of TEST.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1 A1 W1 P1-61 and A2A2W1J1 -61 for approximately three minutes after power is removed.			
39	LD/R	Separate A1 and A2 per paragraph 4-2.	. . .	. . .	. . .

Table 3-6. Display Test Fault (Cont)

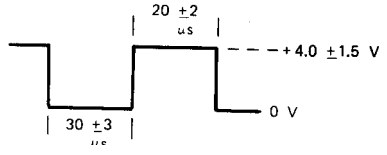
Step	Item	Action	Indication	Yes	No
40	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
41	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
42	LD/R	Connect DMM leads to A1A1W1P1-53 (DISPLAY TEST) and A1A1W1P1-52 (Return). Refer to Figure 4-1.	. . .	. . .	. . .
43	LD/R	Set DISPLAY BRIGHT switch to TEST (detent) position.	DMM measurement is 0.0 to +0.8 VDC.	Replace A2 per paragraph 4-2.	Go to next step.
44	LD/R	Connect DMM leads to A1A1W1A1-E29 and A1A1W1P1-52 (RTN). Refer to Figure FO-2, Sheets 1 and 3.	DMM measurement is 0.0 to 0.8 VDC.	Trouble-shoot and repair faulty wiring using LD/R wiring diagram Figure FO-15.	Replace A1A1 W1A1 per paragraph 4-6
45	Fault Locator	Set TEST SELECT switch to the following positions: (1) BAT VDC (2) +15 VDC (3) +5 VDC (4) -15 VDC	TEST SELECT meter indicates in the green band.	Go to next step.	Go to: Table 3-9 Table 3-9 Table 3-9 Table 3-9
46	LD/R	Turn DISPLAY BRIGHT out of TEST.	. . .	. . .	. . .
47	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
48	Fault Locator	Set LASER switch S1 to INHIBIT	. . .	. . .	. . .
49	Fault Locator	Set HVPS switch S8 to INHIBIT.	. . .	. . .	. . .
50	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
51	Fault Locator	Connect oscilloscope (15, 18, 19, 22 or 23, Table 2-1) leads between 20 KHz TP7 and RTN.	Oscilloscope display is as shown below:  20 KHz CLOCK MS 419420C	Go to next step.	Replace A1A3 per paragraph 4-3
52	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
53	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .

Table 3-6. Display Test Fault (Cont)

Step	Item	Action	Indication	Yes	No
54	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1 A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
55	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
56	LD/R	Remove Power Supply Control Card A1A1A1 per paragraph 4-5. Do not disconnect A1A1W1P2.	. . .	. . .	. . .
57	LD/R	Connect DMM leads between A1A1W1R2 contacts C and D to measure continuity. Refer to Figure FO-2, Sheet 1.	. . .	. . .	. . .
58	LD/R	Turn DISPLAY BRIGHT control to TEST (detent) position and measure switch continuity.	DMM measurement is less than 1 ohm.	Go to next step.	Replace DISPLAY BRIGHT control per paragraph 4-15.
59	LD/R	Connect DMM leads between A1A1W1R2-2 (black lead) and A1A1W1R2-3 (red lead).	. . .	. . .	. . .
60	LD/R	Turn DISPLAY BRIGHT control A1A1W1R2 fully ccw and then fully cw.	DMM measurement is less than 100K ohms.	Go to next step.	Replace DISPLAY BRIGHT control per paragraph 4-15.
61	LD/R	Set POWER switch to ON.	. . .	. .	. . .
62	LD/R	Turn DISPLAY BRIGHT control to TEST (detent) position.			
63	LD/R	Connect oscilloscope leads between A1A3J1 -13 (DIGIT 8) A1A3J1 -59 (Return). Refer to Figure 4-2, Sheets 1 and 2.	Oscilloscope displays 4.0 ±1.5 V pulses.	Go to next step.	Replace A1A3 per paragraph 4-3.
64	LD/R	Connect oscilloscope leads between A1A3J1 -14 (DIGIT 4) and A1A3J1-59 (Return).	Oscilloscope displays 4.0 ±1.5 V pulses.	Go to next step.	Replace A1A3 per paragraph 4-3
65	LD/R	Connect oscilloscope leads between A1A3J1 -15 (DIGIT 2) and A1A3J-59 (Return).	Oscilloscope displays 4.0 ±1.5 V pulses.	Go to next step.	Replace A1A3 per paragraph 4-3
66	LD/R	Install A1A1A1 per paragraph 4-5.	. . .	. . .	. . .

Table 3-6. Display Test Fault (Cont)

tep	Item	Action	Indication	Yes	No
67	LD/R	Set POWER switch to AZ ADJ and hold.	LD/R fans run.	Go to next step.	Go to Table 3-3.
68	LD/R	Set POWER switch to OFF.		. .	. .
		WARNING Voltages in excess of 900 VDC exist at A1 A1 W1 P1-61 and A2A2W1J1 -61 for approximately three minutes after power is removed.			
69	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
70	LD/R	Remove Power Supply Control Card A1A1A1 per paragraph 4-5. Do not disconnect A1A1W1P2.	. . .	. . .	. . .
71	LD/R	Connect DMM leads between A1A1W1R2 contacts C and D to measure continuity. Refer to Figure FO-2, Sheet 1.	. . .	. . .	. . .
72	LD/R	Insure DISPLAY BRIGHT control is in TEST (detent) and measure continuity of switch.	DMM measurement is less than 1 ohm.	Replace relay A1A1 W1 K1 per paragraph 4-17.	Replace DISPLAY BRIGHT control A1A1W1R2 per paragraph 4-15.
73	LD/R	Install A1A1A1 per paragraph 4-5.	. . .	. . .	. . .

Table 3-7. Green Indicator Fault
(Green Light is on all the time.)

Step	Item	Action	Indication	Yes	No
1	LD/R	Set POWER switch to OFF.		. . .	. .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
2	LD/R	Separate A1 and A2 per paragraph 4-2. If fault locator is connected proceed to step 5.	. . .	. . .	. . .
3	LD/R	Set POWER switch to AZ ADJ and hold. Insure DISPLAY BRIGHT control is out of TEST.	. . .	. . .	. . .
4	LD/R	Using DMM measure voltage between A1A1W1P1-20 (FIRE COMMAND) and A1 A1 W1 P1-52 (RTN). Refer to FO-2, Sheet 1.	DMM measurement is 4.0 ±1.5 VDC.	Replace DISPLAY BRIGHT control A1A1 W1 R2 per paragraph 4-15.	Go to next step.
5	LD/R	Remove A1A3 per paragraph 4-3. Do not disconnect connector A1A1 W1 P3. Refer to Figure 4-2, Sheets 1 and 2.	. . .	. . .	. . .
6	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
7	Fault Locator	Set POWER switch S2 to ON.	. . .	. .	. . .
8	LD/R	Set DISPLAY BRIGHT control to TEST (detent).			
9	LD/R	Connect DMM leads between A1 A1 W1 A1-E8 (FIRE COMMAND) and A1 A1 W1 A1-E22 (RTN). Refer to Figure FO-2, Sheet 3.	DMM measurement is 4.0 ±1.5 VDC.	Go to next step.	Faulty wiring is indicated Troubleshoot and repair faulty wiring using LD/R wiring diagram Figure FO-15.
10	LD/R	Turn DISPLAY control out of TEST (detent).	. . .	. . .	. . .
11	LD/R	Connect DMM leads between A1 A1 W1 A1-E3 (FIRE COMMAND) and A1 A1 W1 A1-E22 (RTN). Refer to Figure FO-2, Sheet 3.	DMM measurement is 4.0 ±1.5 VDC.	Go to next step.	Replace LVPS Drive A1A1 W1A1 per paragraph 4-6
12	LD/R	Faulty wire(s) or connector(s) is indicated. Troubleshoot and repair faulty wire(s)/ connector(s) using LD/R wiring diagram Figure FO-15.	. . .	. .	. . .
13	LD/R	Install A1A3 per paragraph 4-3.	. . .	. . .	. . .

Table 3-8, Amber Indicator Fault

Step	Item	Action	Indication	Yes	No
1	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
2	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
3	Fault Locator	Set POWER switch S2 to OFF.		. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1 A1 W1 P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
4	LD/R	Separate A1 from A2 per paragraph 4-2, but keep cable W1 connected.		. . .	. . .
		Laser light hazard; observe WARNINGS inside front cover of this manual before proceeding.			
5	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
6	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
		NOTE If Table 3-8 entered from step 84 of Table 3-1, proceed to step 14.			
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
7	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
8	Fault Locator	Connect DMM leads between METER TP4 and RTN.	. . .	. . .	. . .
9	Fault Locator	Set TEST SELECT switch to BAT VDC.	. . .	. . .	. . .
10	24V Power Supply	Adjust voltage to 20.0 ±0.5 VDC	Amber indicator in LD/R eyepiece is on.	. . .	. . .

Table 3-8. Amber Indicator Fault (Cont)

tep	Item	Action	Indication	Yes	No
11	LD/R	Adjust A1A1A1R25 cw unti l indi - cator goes off, then adjust A1A1A1R25 ccw until amber indi- cator just comes on. Refer to Figure FO-2, Sheet 2.	Amber i ndi cator goes off, then comes on.	Go to next step.	Replace A1A1A1 per para- graph 4-5.
12	Fault Locator	Connect DMM leads between METER TP4 and RTN.	• • •	• • •	• • •
13	24V Power Supply	Adjust voltage to 24 ±1.0 VDC.	Amber indicator in LD/R eyepiece is off.	Retest LD/R	Repeat steps 10 thru 12. If step 13 still fails trouble- shoot and repair faulty wire(s)/ con- nector(s) using LD/R wiring diagram Figure FO-15.
14	LD/R	Connect DMM leads between GND and A1A1W1P1-51. Refer to Figure 4-1.	• • •	• • •	• • •
15	24V Power Supply	Adjust voltage to 19.5 ±1.0 VDC.	DMM indicates 0.2 ±0.2 VDC.	Go to next step.	Replace A1A1A1 per paragraph 4-5. If fault persists, trouble- shoot and repair faulty wire(s)/ con- nector(s) using LD/R wiring diagram Figure FO-15.
16	LD/R	Connect DMM leads between GND and A1A1W1P1-19. Refer to Figure 4-1.	DMM indicates 5.0 ±0.5 VDC.	Replace A2 per para- graph 4-2.	Replace A1A1A1 per paragraph 4-5. If fault persists, trouble- shoot and repair faulty wire(s)/ con- nector(s) using LD/ wiring diagram Figure FO-15.

Table 3-9. BAT VDC,+15 VDC,+5 VDC and/or -15 VDC Fault

tep	Item	Action	Indication	Yes	No
1	Fault Locator	Insure LASER switch Sl is set to INHIBIT.	. . .	. . .	. . .
2	LD/R	Insure DISPLAY BRIGHT is out of TEST.	. . .	. . .	. . .
3	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
4	Fault Locator	Set TEST SELECT switch to BAT VDC. Connect DMM leads between METER TP4 and RTN.	Fault Locator meter within green band. DMM indicates 24 ±1.0 VDC.	Go to next step.	Go to step 27.
5	Fault Locator	Set TEST SELECT switch to the following positions: (1) +15 VDC (2) +5 VDC (3) -15 VDC	All voltages below the green band but not zero.	Replace A1A1A1 per paragraph 4-5.	. . .
			Any one voltage below the green band.	Replace A1A1W1A2 per paragraph 4-7.	. . .
			All voltages are 0 to +0.8 VDC.	Go to next step.	. . .
			All voltages above the green band.	Go to step 17.	. . .
6	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
7	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
8	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .

WARNING

Voltages in excess of 900 VDC exist at A1 A1W1P1 -61 and A2A2W1J1-61 for approximately three minutes after power is removed.

9	LD/R	Separate A1 and A2 per paragraph 4-2.	. . .	. . .	. . .

Table 3-9. BAT VDC, +15 VOC, +5 VDC and/or -15 VDC Fault (Cont)

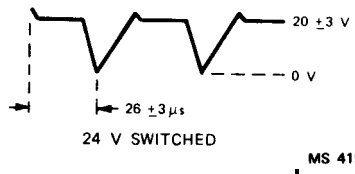
Step	Item	Action	Indication	Yes	No
10	LD/R	Remove A1A1A1 except do not disconnect connector A1A1W1P2. Refer to Figure FO-2, Sheet 1.	. . .	. . .	. . .
11	LD/R	Set DES/RNG 1/RNG 2 switch to DES.	. . .	. . .	. . .
		WARNING Laser light hazard; observe WARNINGS inside front cover of this manual before proceeding.			
12	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
13	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
14	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
15	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) leads between A1A1W1A1-E5 (24V Switched) and A1A1W1A1-E4 (RTN). Observe oscilloscope.	Oscilloscope display is as shown below: 	Replace A1A1W1A2 per paragraph 4-7.	Go to next step

Table 3-9. BAT VOC, +15 VOC, +5 VDC and/or -15 VDC Fault (Cont)

Step	Item	Action	Indication	Yes	No
16	LD/R	Connect oscilloscope leads between A1A1W1A1-E6 and A1A1W1A1-E4 (Return). Observe oscilloscope for PRE-REGULATOR DRIVE signal.	Oscilloscope display is as shown below:	Replace A1A1W1A1 per paragraph 4-6.	Replace A1A1A1 per paragraph 4-5.
17	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
18	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
19	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
20	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
21	LD/R	Remove A1A1A1 per paragraph 4-5 except do not disconnect connector A1A1W1P2.	. . .	. . .	. . .
22	LD/R	Set DES/RNG 1/RNG 2 switch to DES.	. . .	. . .	. . .
23	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
24	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
25	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .

Table 3-9. BAT VDC, +15 VDC, +5 VDC and/or -15 VDC Fault (Cont)

tep	Item	Action	Indication	Yes	No
26	LD/R	Connect oscilloscope between A1A1W1A1-E6 and A1A1W1A1-E4 (Return). Refer to Figure FO-2, Sheet 3.	 PRE-REGULATOR DRIVE MS 419413A A 20 to 28 V switching pulse is present.	Replace A1A1W1A2 per paragraph 4-7. If unit still fails replace A1A1W1A1 per paragraph 4-6.	Replace A1A1A1 per paragraph 4-5.
27	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
28	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
29	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
30	24 V Power Supply	Set POWER switch to OFF.	. . .	. . .	. . .
31	LD/R	Disconnect EMI filter from LD/R.	. . .	. . .	. . .
32	LD/R	Disconnect test cable from LD/R 1J1.	. . .	. . .	. . .
33	L D/R	Set POWER switch to ON.	. . .	. . .	. . .
34	LD/R	Connect DMM leads between 1J5 (+) and 1J1-a (RTN).	DMM measurement is less than 2 ohms.	Faulty fault locator is indicated. Refer to TM 9-4931-477-14.	Replace A1A1W1S1 per paragraph 4-11.

Table 3-10. PFN VDC Fault

ep	Item	Action	Indication	Yes	No
1	Fault Locator	Insure that HVPS switch S8 is set to ENABLE.	. . .	. . .	. . .
2	Fault Locator	Insure that TEST SELECT switch is set to PFN VDC.	. . .	. . .	. . .
3	Fault Locator	Set LASER switch S1 to INHIBIT, and fire laser as needed to obtain indication.	TEST SELECT meter reads in green band.	Go to step 5.	. . .
			TEST SELECT meter reads some output but not in green band.	Go to next step.	. . .
			TEST SELECT meter reads momentary PFN output voltage.	Go to step 51.	. . .
			TEST SELECT meter reads zero output.	Go to step 26.	. . .
4	Fault Locator	Replace A1A1A1 per paragraph 4-5.	. . .	. . .	. . .

WARNING

Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.

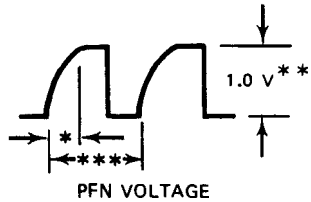
5	Fault Locator	Set LASER switch S1 to ENABLE.	PFN VDC drops then varies when switch LASER switch S1 from INHIBIT to ENABLE.	Go to next step.	Go to step 7.
6	Fault Locator	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between METER RP4 and RTN.	Oscilloscope display is as shown below:  PFN VOLTAGE * CHARGE TIME MUST BE LESS THAN 45 ms. ** PULSE AMPLITUDE IS NOT CRITICAL. PULSE CLIPPING MUST OCCUR. *** PULSE PERIOD DEPENDS ON CODE SETTING. MS4193738 ***See TB 9-1260-477-34 (c)	Retest per Table 3-1.	Go to step 8.

Table 3-10. PFN VDC Fault (Cont)

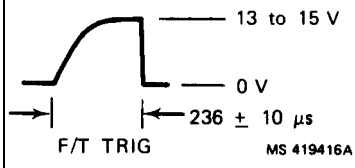
tep	I tem	Action	Indication	Yes	No
7	Fault Locator	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between F/T TRIG TP11 and RTN.	Oscilloscope display is as shown below: 	Replace A2 per paragraph 4-2.	Replace A1A3 per paragraph 4-3.
8	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
9	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
10	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
11	L D/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
		WARNING Laser light hazard; observe WARNINGS inside front cover of this manual before proceeding.			
12	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
13	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
14	Fault Locator	Set TEST SELECT switch to PFN VDC.	. . .	. . .	. . .

Table 3-10. PFN VDC Fault (Cont)

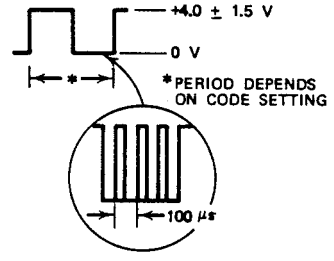
Step	Item	Action	Indication	Yes	No
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
15	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
16	Fault Locator	Set LASER switch S1 to ENABLE.	TEST SELECT meter reads in green band.	. . .	. . .
		NOTE In the following step, waveforms are observed at A1A1A1 TP11, TP9, and TP27 before a decision is made to remove a defective unit.			
17	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A1A1 TP11 and TP1 (RTN). Fire laser as necessary to obtain indication. Refer to Figure FO-2, Sheet 2. Use HVPS ON TP14 on fault locator as external sync in step 17, 18, and 19.	Oscilloscope display is as shown below:  MS 419417B ØA OVERCURRENT *See TB 9-1260-477-34 (C).	. . .	. . .

Table 3-10. PFN VDC Fault (Cont)

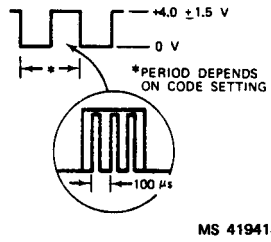
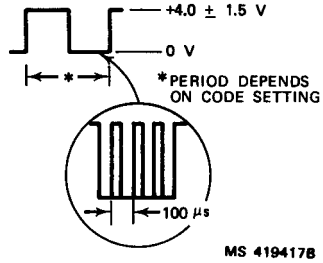
Step	Item	Action	Indication	Yes	No
18	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, and Table 2-1: between A1A1A1 TP9 and TP1 (RTN). Fire laser as necessary to obtain indication. Refer to Figure FO-2, Sheet 2.	Oscilloscope display is as shown below:  ØA ON *See TB 9-1260-477-34 (C).	. . .	. . .
19	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, and Table 2-1) between A1A1A1 TP8 and TP1 (RTN). Fire laser as necessary to obtain indication. Refer to Figure FO-2, Sheet 2.	Oscilloscope display is as shown below:  ØA OFF *See TB 9-1260-477-34 (C).		
			All measurements are a yes in steps 17, 18, and 19.	Go to next step.	Replace A1A1A1 per paragraph 4-5.
20	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .

Table 3-10. PFN VDC Fault (Cont)

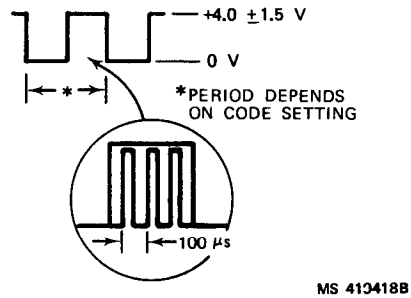
p	Item	Action	Indication	Yes	No
	Fault Locator	Set LASER switch S1 to ENABLE.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
		NOTE In the following step, waveforms are observed at A1A1A1 TP10, TP7, and TP6 before a decision is made to remove a defective unit.			
	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A1A1 TP10 and TP1 (RTN). Fire laser as necessary to obtain indication. Refer to Figure FO-2, Sheet 2. Use $\overline{\text{HVPS ON}}$ TP14 on fault locator as external sync in steps 23, 24, and 25.	Oscilloscope display is as shown below:  $\overline{\text{ØB OVER CURRENT}}$ *See TB 9-1260-477-34 (C).	. . .	. . .

Table 3-10. PFN VDC Fault (Cont)

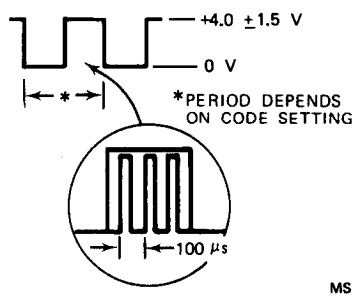
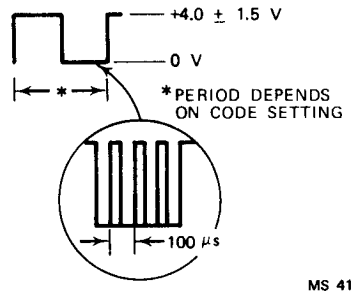
Step	Item	Action	Indication	Yes	No
24	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A1A1 TP7 and TP1 (RTN). Fire laser as necessary to obtain indication. Refer to Figure FO-2, Sheet 2.	Oscilloscope display is as shown below:  ØB ON *See TB 9-1260-477-34 (C).	. . .	. . .
25	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A1A1 TP6 and TP1 (RTN). Fire laser as necessary to obtain indication. Refer to Figure FO-2, Sheet 2.	Oscilloscope display is as shown below:  ØB OFF *See TB 9-1260-477-34 (C).	. . .	. . .
			All measurements are a yes in steps 23, 24, and 25.	Faulty A1A1W1A3 or A1A1W1A4 is indicated. Replace A1A1W1A3 per paragraph 4-8 and retest LD/R. If still fails replace A1A1A1W4 per paragraph 4-9.	Replace A1A1A1 per paragraph 4-5.

Table 3-10. PFN VDC Fault (Cont)

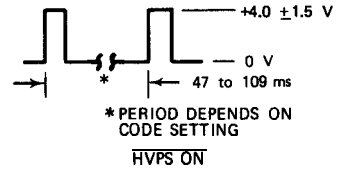
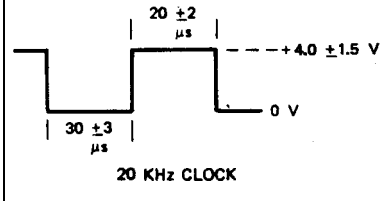
tep	Item	Action	Indication	Yes	No
26	Fault Locator	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between HVPS ON TP14 and RTN.	Oscilloscope display is as shown below:  *Period depends on code setting. *See TB 9-1260-477-34 (C).	Go to next step.	Go to step 33.
27	Fault Locator	Connect oscilloscope (15, 18, 19, 22, or 23 Table 2-1) between 20 KHz CLOCK TP7 and RTN.	Oscilloscope display is as shown below: 	Go to next step.	Replace A1A3 per paragraph 4-3.
28	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
28.1	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A2W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
28.2	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
29	LD/R	Remove A1A3 but do not disconnect connector A1A1W1P2.	. . .	. . .	. . .
30	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
30.1	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
31	LD/R	Connect DMM between A1A1W1A1-E14 (+24V - A1A1W1A4) and A1A1W1A1-E11 (RTN). Refer to Figure FO-2, Sheet 1. (See FO-10).	Measurement indicates 24 ± 1.0 VDC.	Go to next step.	Replace POWER switch A1A1W1S1 per paragraph 4-11.

Table 3-10. PFN VDC Fault (Cont)

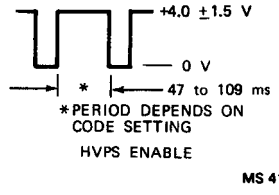
tep	Item	Action	Indication	Yes	No
32	LD/R	Connect DMM between A1A1W1A1-E13 (+24 V-A1A1W1A3) and A1A1W1A1-E11 (RTN). Refer to Figure FO-2, Sheet 3.	DMM measurement is 24 + 1.0 VDC.	Replace A1A1A1 per paragraph 4-5.	Faulty wire(s) is indicated. Troubleshoot wiring using LD/R wiring diagram Figure FO-15, Sheet 1.
33	Fault Locator	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) HVPS ENABLE TP8 and RTN.	Oscilloscope display is as shown below:  *Period depends on code setting *See TB 9-1260-477-34 (C).	Go to next step.	Go to step 42.

Table 3-10. PFN VDC Fault (Cont)

tep	Item	Action	Indication	Yes	No
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
40	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
41	LD/R	Connect DMM leads between A1A3J1-4 (ZERO) and A1A3J1-56 (Return). Refer to Figure 4-2, Sheet 2.	DMM measurement is 0 to +0.8 VDC.	Replace A1A3 per paragraph 4-3.	Replace POWER switch A1A1W1S1 per paragraph 4-11
42	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
43	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
44	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
45	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
46	LD/R	Remove A1A3. Do not disconnect connector A1A1W1P3.	. . .	. . .	. . .
47	Fault Locator	POWER switch S2 to ON.	. . .	. . .	. . .
48	LD/R	POWER switch to ON.	. . .	. . .	. . .

Table 3-10. PFN VDC Fault (Cont)

Step	Item	Action	Indication	Yes	No
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
49	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
50	LD/R	Connect DMM leads between A1A1W1A1-E27 (EXT TRIG) and A1A1W1A1-E22 (Return). Refer to Figure FO-2, Sheet 3.	DMM measurement is 0 to ± 0.8 VDC.	Replace A1A3 per paragraph 4-3.	Replace DISPLAY BRIGHT control A1A1W1R2 per paragraph 4-15.
51	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
52	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
53	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
54	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
		WARNING Laser light hazard; observe WARNINGS inside front cover of this manual before proceeding.			
55	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
56	LD/R	Set POWER switch to ON.	. . .	. . .	. . .

Table 3-10. PFN VDC Fault (Cont)

tep	Item	Action	Indication	Yes	No
		WARNING Laser will be fired in next step; observe WARNINGS inside front cover of this manual before proceeding.			
57	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
58	LD/R	Connect DMM leads between A1A3J1-8 (RNG1/RNG2) and A1A3J1-56 (RTN). Refer to Figure 4-2, Sheet 2.	DMM measurement is 4.0 ± 1.5 VDC.	Go to next step.	Replace A1A3 per paragraph 4-3.
59	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
60	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
61	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
62	24V Power Supply	Set power switch to OFF.	. . .	. . .	. . .
63	LD/R	Remove A1A1A1 per paragraph 4-5. Do not disconnect connector A1A1W1P2.	. . .	. . .	. . .
64	LD/R	Connect DMM leads between DES/RNG 1/RNG 2 switch A1A1W1S2-4 and A1A1W1S2-5.	DMM measurement is less than 2 ohms.	Go to next step.	Replace DES/RNG 1 RNG 2 switch A1A1W1S2 per paragraph 4-12.
65	LD/R	Connect DMM leads between POWER switch A1A1W1S1-5 and A1A1W1S1-6 Set POWER switch to ON to make measurement; then set to OFF. Refer to Figure FO-2, Sheet 1.	DMM measurement is less than 2 ohms.	Install A1A1A1 per paragraph 4-5 and replace A1A3 per paragraph 4-3.	Replace POWER switch A1A1W1S1 per paragraph 4-11,

Table 3-11. Laser Energy Output Fault

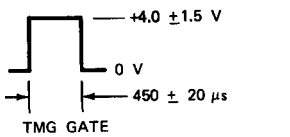
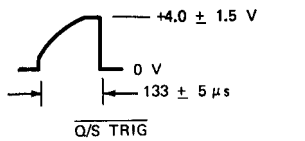
:ep	Item	Action	Indication	Yes	No
		NOTE The laser will be fired repeatedly in the following table. To minimize lasing time read through the table before proceeding.			
1	Fault Locator	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between TMG GATE TP12 and RTN. Use F/T TRIG TP11 on fault locator as external sync.	. . .	. . .	. . .
		Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
2	Fault Locator	Set LASER switch S9 to START, then to ON.	Oscilloscope display is as shown below:  MS 419424	Go to next step.	Replace A1A3 per paragraph 4-3.
3	Fault Locator	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between Q/S TRIG TP2 and RTN.	Oscilloscope display is as shown below:  MS 419425C	Go to step 19.	Go to next step.
4	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
5	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
6	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1 A1 W1 P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
7	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .

Table 3-11. Laser Energy Output Fault (Cont)

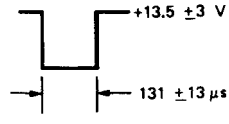
tep	Item	Action	Indication	Yes	No
8	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A3J1-12 (Q/S TRIG) and A1A3J1-56 (RTN). Refer to Figure 4-2, Sheet 2. Use F/T TRIG TP1 on fault locator as external sync.	. . .	. . .	. . .
9	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
10	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
11	Fault Locator	Set LASER switch S9 to START, then to ON.	Oscilloscope display is as shown below: 	Replace A1A3 per paragraph 4-3.	Go to next step.
12	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
13	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
14	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
15	LD/R	Remove A2A2W1P3 connector from A2A4 receiver card. Refer to Figure 4-3. Use F/T TRIG TP11 on fault locator as an external sync.	. . .	. . .	. . .
16	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
17	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .

Table 3-11. Laser Energy Output Fault (Cont)

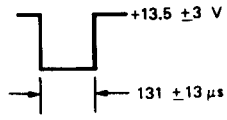
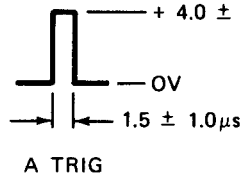
Step	Item	Action	Indication	Yes	No
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
18	Fault Locator	Set LASER switch S9 to START, then to ON.	Oscilloscope display is as shown below: 	Replace A2A4 per paragraph 4-20	Replace A1A3 per paragraph 4-3, and reconnect connector A2A2W1P3.
		NOTE Use oscilloscope memory in the next step to assist in observing display.			
19	Fault Locator	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A TRIG TP1 and RTN. Fire laser as necessary to obtain indication. User $\overline{F/T}$ $\overline{TRIG}$ on fault locator as external sync.	Oscilloscope display is as shown below: 	Go to step 28.	Go to next step.
20	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
21	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
22	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
23	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
		WARNING Laser will be fired in next step; observe WARNINGS inside front cover of this manual before proceeding.			
24	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .

Table 3-11. Laser Energy Output Fault (Cont)

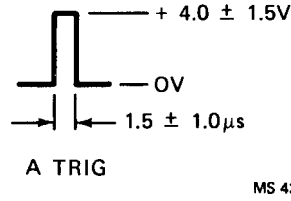
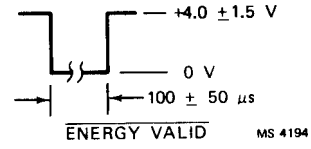
Step	Item	Action	Indication	Yes	No
25	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
26	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A3J1-53 (A TRIG) and A1A3J1-55 (RTN). Use F/T TRIG TP11 on fault locator as external sync.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceedings. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
27	Fault Locator	Set LASER switch S9 to START, then to ON.	Oscilloscope display is as shown below:  	Replace A1A3 per paragraph 4-3.	Replace A2 per paragraph 4-2.
28	Fault Locator	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between ENERGY VALID TP10 and RTN. Fire laser as necessary to obtain indication. Use F/T TRIG TP11 as external sync.	Oscilloscope display is as shown below:  	Go to next step.	Replace A2 per paragraph 4-2.
29	Fault Locator	Set TEST SELECT switch to ENERGY ERROR position. Connect DMM leads between METER TP4 and RTN. Observe indication for approximately one minute, then set LASER switch S9 to OFF.	DMM measurement varies between -14 and +14 VDC. (Is not pegged at upper or lower voltage limit.)	Retest LD/R.	Replace A2 per paragraph 4-2 and retest LD/R.

Table 3-12. Range Readout Fault

Step	Item	Action	Indication	Yes	No
1	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
2	LD/R	Set DES/RNG 1/RNG 2 switch to RNG 1.	. .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
3	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
4	LD/R	. . .	LD/R eyepiece display is blank. (No zeros or numbers.)	Go to step 15.	. . .
		. . .	LD/R eyepiece display flashes once.	Go to step 20.	. .
		. . .	LD/R RNG readout displays 8150 to 8450.	Go to next step.	. . .
		. . .	LD/R RNG readout displays 8650 to 8950. Record reading.	Go to step 40.	Go to step 6.
5	Fault Locator	. . .	RANGE READOUT displays same as LD/R (8150 to 8450).	Go to step 9.	Replace A1A3 per paragraph 4-3
6	Fault Locator	. . .	RANGE READOUT displays 8150 to 8450. Record reading.	Go to step 29.	Go to next step.
7	Fault Locator	Set PRESET RANGE switch S6 to OFF.	. . .	. . .	. . .

Table 3-12. Range Readout Fault (Cont)

Step	Item	Action	Indication	Yes	No
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
8	Fault Locator	Set LASER switch S9 to START then to ON - repeat several times.	RANGE readout displays 0000.	Go to step 50.	Replace A2A4 per paragraph 4-20. If problem not corrected replace LD/R.
9	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
10	LD/R	Turn DISPLAY BRIGHT control fully cw. Do not put in TEST (detent).	. . .	. . .	. . .
11	LD/R	Set DES/RNG 1/RNG 2 switch to RNG 2.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
12	Fault Locator	Set LASER switch S9 to START, then to ON.	RANGE readout displays 8650 to 8950. Record reading.	Retest LD/R	If fault locator RNG display is the same in steps 5 and 12, go to step 40; otherwise go to next step.
			LD/R RNG readout displays same as fault locator RANGE readout (8650 to 8950).	. . .	. . .
13	Fault Locator	Set PRESET RANGE switch S6 to OFF.	. . .	. . .	. . .

Table 3-12. Range Readout Fault (Cont)

Step	Item	Action	Indication	Yes	No
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
14	Fault Locator	Set LASER switch S9 to START, then to ON - repeat several times.	RANGE readout displays 0000.	Go to next step.	Replace A2A4 per paragraph 4-20. If problem not corrected replace LD/R.
15	Fault Locator	Set LASER switch S9 to OFF	. . .	. . .	. . .
16	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
17	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
18	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
19	LD/R	Measure continuity between A1A3J1-28 ($\overline{\text{RNG}}$/DES/$\overline{\text{AZ ADJ}}$) and A1A3J1-56 (RTN).	DMM measurement is less than 2 ohms.	Replace A1A3 per paragraph 4-3.	Replace A1A1W1S2 per paragraph 4-12.
20	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
21	LD/R	Set POWER switch to OFF	. . .	. . .	. . .
22	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
23	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
		WARNING Laser light hazard; observe WARNINGS inside front cover of this manual before proceeding.			
24	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .

Table 3-12. Range Readout Fault (Cont)

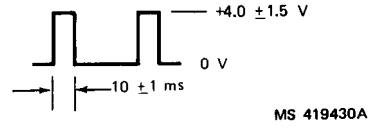
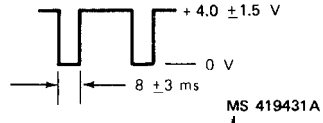
Step	Item	Action	Indication	Yes	No
25	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
26	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A3 TP4 and A1A3J1-56 (RTN). Refer to Figure 4-2, Sheet 2.	. . .	. . .	. . .
		NOTE It may be necessary to fire laser repeatedly to observe pulses in next step.			
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
27	Fault Locator	Set LASER switch S9 to START, then to ON.	Oscilloscope display is as shown below:  CONVERSION START	Go to next step.	Replace A1A3 per paragraph 4-3.
		NOTE It may be necessary to fire laser repeatedly to observe pulse in next step.			
28	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A3 TP5 and A1A3J1-56 (RTN). Refer to Figure 4-2, Sheet 2.	Oscilloscope display is as shown below:  CONVERSION COMPLETE	Replace A1A3 per paragraph 4-3.	Replace A1A4 per paragraph 4-3.
29	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
30	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .

Table 3-12. Range Readout Fault (Cont)

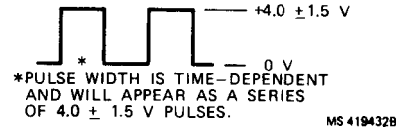
Step	Item	Action	Indication	Yes	No
31	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1 A1 W1 P1-61 and A2A2W1J1 -61 for approximately three minutes after power is removed.			
32	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
		WARNING Laser light hazard; observe WARNINGS inside front cover of this manual before proceeding.			
33	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
34	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
35	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A3J1-32 (DSPL 2) and A1A3J1-56, (RTN). Refer to Figure 4-2, Sheet 2.	. . .	. . .	. . .
		Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
36	Fault Locator	Set LASER switch S9 to START, then to ON.	Oscilloscope display is as shown below:  (Pulse width is time-dependent and will appear as a series of 4.0 ±1.5V pulses.)	Go to next step.	Replace A1A3 per paragraph 4-3.
37	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A3J1-33 (DSPL 4) and A1A3J1-56 (RTN). Refer to Figure 4-2, Sheet 2.	Same as step 36	Go to next step.	Replace A1A3 per paragraph 4-3.

Table 3-12. Range Readout Fault (Cont)

tep	I tem	Action	Indication	Yes	No
38	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A3J1-34 (DSPL 8) and A1A3J1-56 (RTN). Refer to Figure 4-2, Sheet 2.	Same as step 36.	Go to next step	Replace A1 A3 per paragraph 4-3.
39	LD/R	Connect oscilloscope (15, 18, 19, 22, or 23, Table 2-1) between A1A3J1-69 (DSPL 1) and A1A3J1-56 (RTN). Refer to Figure 4-2, Sheet 2.	Same as step 36.	Replace A2 per paragraph 4-2.	Replace A1A3 per paragraph 4-3.
40	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
41	LD/R	Set POWER switch to OFF	. . .	. . .	. . .
42	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
43	LD/R	Insure that DES/RNG 1/RNG 2 switch is set to RNG 2.	. . .	. . .	. . .
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
44	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
45	LD/R	Remove A1A3 per paragraph 4-3a, steps 1 thru 5 only.	. . .	. . .	. . .
46	LD/R	Perform step 47 if both RNG 1 and RNG 2 fault locator readouts display 8150 to 8450. Perform step 48 if fault locator readout displays 8650 to 8950.	. . .	. . .	. . .
47	LD/R	Measure continuity between A1A3J1-8 (RNG 1/RNG 2 and A1A3J1-65 (Return). Refer to Figure 4-2, Sheet 2.	DMM measurement indicates an open circuit.	Replace A1A3 per paragraph 4-3.	Replace DES/RNG 1/RNG 2 switch A1A1W1S2 per paragraph 4-12.
48	LD/R	Set DES/RNG 1/RNG 2 switch to RNG 1.	. . .	. . .	. . .
49	LD/R	Measure continuity between A1A3J1-8 (RNG 1/RNG 2) and A1A3J1-56 (Return).	DMM measurement is less than 2 ohms.	Replace A1A3 per paragraph 4-3.	Replace A1A1W1S2 per paragraph 4-12.
50	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
51	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
52	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .

Table 3-12. Range Readout Fault (Cont)

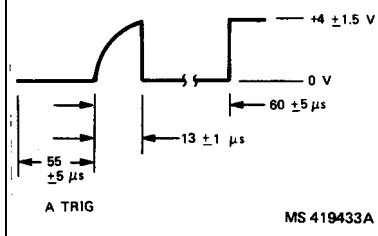
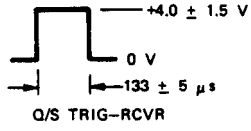
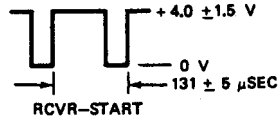
Step	Item	Action	Indication	Yes	No
		WARNING Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.			
53	LD/R	Separate A1 from A2 per paragraph 4-2.	. . .	. . .	. . .
		WARNING Laser light hazard; observe WARNINGS inside front cover of this manual before proceeding.			
54	LD/R	Set DES/RNG 1/RNG 2 switch to RNG 1.	. . .	. . .	. . .
55	Fault Locator	Set POWER switch S2 to ON.	. . .	. . .	. . .
56	Fault Locator	Set PRESET RANGE switch S6 to ON.	. . .	. . .	. . .
57	LD/R	Set POWER switch to ON.	. . .	. . .	. . .
		WARNING Laser will be fired in the next step. Observe WARNINGS inside front cover of this manual before proceeding. Insure front window cover is securely in place to avoid possibility of scattered laser light from output window.			
		NOTE The laser will be fired repeatedly in the following steps. To minimize lasing time read through steps 58 through 74 before proceeding.			
58	Fault Locator	Set LASER switch S9 to START, then to ON.	. . .	. . .	. . .
59	LD/R	Using oscilloscope (15, 18, 19, 22, or 23, Table 2-1) monitor A1A3J1-5 (8000M-TA) and A1A3J1-56 (RTN). Use A TRIG TP1 on fault locator as external trigger for oscilloscope, Refer to Figure 4-2 Sheet.	Oscilloscope display is as shown below: 	Go to step 71.	Go to next step

Table 3-12, Range Readout Fault (Cont)

Step	Item	Action	Indication	Yes	No
60	LD/R	Using oscilloscope, monitor A1A3 TP2 (BUFFERED VIDEO). Use Q/S Trig negative portion on fault locator as external trigger for oscilloscope. Use A1A3J1-56 as RTN. Refer to Figure 4-2, Sheet 2.	A 4.0 ± 1.5 V pulse is present.	Replace A1A3 per paragraph 4-3.	Go to next step.
61	LD/R	Set DES/RNG 1/RNG 2 switch to DES.	. . .	. . .	. . .
62	LD/R	Using oscilloscope, monitor A1A3J1--11 (Q/S TRIG-RCVR). Use F/T TRIG TP11 on fault locator as external trigger for oscilloscope. Use A1A3J1-56 as RTN.	Oscilloscope display is as shown below: 	Go to next step.	Replace A1A3 per paragraph 4-3.
63	LD/R	Using oscilloscope, monitor A1A3J1-10 (RCVR-START). Use HVPS ON TP14 on fault locator as external trigger for oscilloscope.	Oscilloscope display is as shown below: 	Go to next step.	Replace A1A3 per paragraph 4-3.
64	LD/R	Connect DMM leads between A1A1W1P1-18 (DESIGNATE) and A1A1W1P1-30 (Return).	DMM measurement is 4.0 + 1.5 VDC.	Replace A2A4 per paragraph 4-20.	Go to next step.
65	LD/R	Set DES/RNG 1/RNG 2 switch to RNG 1.	. . .	. . .	. . .
66	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
67	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
68	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .

WARNING

Voltages in excess of 900 VDC exist at A1A1W1P1-61 and A2A2W1J1-61 for approximately three minutes after power is removed.

69	LD/R	Separate A1A1W1P1 from A2A2W1J 1.	. . .	. . .	. . .
70	LD/R	Connect DMM leads between A1A1W1P1-18 (DESIGNATE) and A1A1W1P1-30 (Return).	DMM measurement indicates an open circuit.	Replace A2A4 per paragraph 4-20.	Replace A1A1W1S2 per paragraph 4-12.

Table 3-12. Range Readout Fault (Cont)

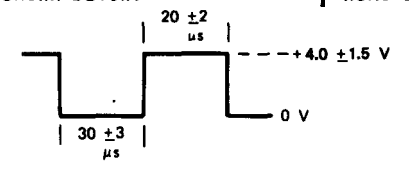
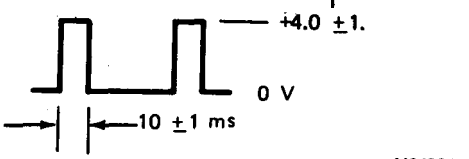
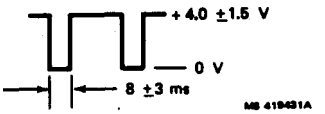
tep	Item	Action	Indication	Yes	No
71	Fault Locator	Using oscilloscope monitor 20 KHz Clock TP7 on fault locator.	Oscilloscope display is as shown below: 	Go to next step.	Replace A1A3 per paragraph 4-3
72	LD/R	Set DES/RNG 1/RNG 2 switch to DES.	. . .	. . .	. . .
73	LD/R	Using oscilloscope, monitor A1A3 TP4.	Oscilloscope display is as shown below:  CONVERSION START	Go to next step.	Replace A1A3 per paragraph 4-3
74	LD/R	Using oscilloscope, monitor A1A3 TP5.	Oscilloscope display is as shown below:  CONVERSION COMPLETE	Replace A1A3 per paragraph 4-3.	Replace A1A4 per paragraph 4-3.

Table 3-13. **Overtemp Fault**

tep	Item	Action	Indication	Yes	No
1	Fault Locator	Set LASER switch S9 to OFF.	. . .	. . .	. . .
2	LD/R	Set POWER switch to OFF.	. . .	. . .	. . .
3	Fault Locator	Set POWER switch S2 to OFF.	. . .	. . .	. . .
4	LD/R	. . .	. . .	Depressurize, purge and charge hi-pressure vessel per paragraph 2-10 and go to next step.	. . .
5	LD/R	Retest per Table 3-1.	Overtemp light goes out initially but comes on during laser firing.	Possible faulty internal fan. Perform Table 3-3 procedures.	Return to LD/R Test Procedure, Table 3-1.

Section II. TU TROUBLESHOOTING

3-6. GENERAL

This section contains troubleshooting procedures for the TU. Table 2-1 lists the equipment required to perform these procedures.

3-7. TU SYMPTOM INDEX

A troubleshooting index that lists common symptoms of TU failures and corrective action to restore operation is contained in Table 3-14. The troubleshooting action column of the table provides references to step-by-step procedures used to fault isolate the malfunction to a failed component or wiring fault.

3-8. TU RESOLVER TROUBLESHOOTING

Table 3-15 is the TU resolver troubleshooting procedure. The ellipses (...) when used in the procedure indicate an intentional blank or termination of a procedural step.

Table 3-14. TU Symptom Index

Item	Failure Symptom	Troubleshooting Action
1	TU resolver fault.	Troubleshoot per Table 3-15.
2	AZ ZERO ADJ knob or shaft mechanical fault.	Replace per paragraph 4-39.
3	AZ ZERO ADJ drive assembly fault.	Replace per paragraph 4-40.
4	Azimuth brake fault.	Replace per paragraph 4-42.
5	Elevation brake fault.	Replace per paragraph 4-36.

Table 3-15. TU Resolver Fault

Step	Item	Action	Indication	Yes	No
1	3W1P1 connector	Measure resistance between pins listed below: 3W1P1 Pins 1) K and E 2) K and F 3) H and A 4) H and G 5) B and C	Measurement indicates as follows: Indications 75 to 80 ohms 75 to 80 ohms 75 to 80 ohms 75 to 80 ohms 28 to 33 ohms	Go to next step.	Go to step 4.
2	3W1P1 connector	Measure resistance between pins listed below: 3W1P1 Pins 1) B and H 2) B and K 3) H and K	Measurment indicates as follows: Indications Greater than 20 megohms Greater than 20 megohms Greater than 20 megohms	Go to next step.	Go to step 4.
3	TU	Replace TU.	. . .	. . .	. . .
4	TU	Remove TU cable assembly per paragraph 4-43.	. . .	. . .	. . .

Table 3-15. TU Resolver Fault (Cont)

Step	Item	Action	Indication	Yes	No
5	TU cable	Measure continuity between the following 3W1P1 and 3W1J1 pins: 3W1P1 — 3W1J1 F — C E — B K — A C — D B — E G — H A — J H — K	Measurement indicates less than 2 ohms.	GO to next step.	Go to step 9.
5.1		Disassemble TU per paragraph 4-43.1a.	. . .	. . .	. . .
6	TU Internal Harness Assembly	Measure resistance between the following P2 pins: P2 Pins 1) S and U 2) T and V 3) P and M 4) R and N	Measurement indicates as follows: Indications 40 to 50 ohms 40 to 50 ohms 75 to 80 ohms 75 to 80 ohms	Go to next step.	Go to step 11.
7	TB1	Measure resistance between the following J2 connector pins: J2 Pins 1) F and P 2) F and R 3) M and J 4) N and H	Measurement indicates less than 2 ohms.	Go to next step.	Go to step 10.
8	TB1	Measure resistance between the following J2 connector pins: J2 Pins 1) C and A 2) B and A 3) E and D 4) V and D 5) T and D 6) U and D 7) S and D	Measurements indicate follows: Indications 75 to 80 ohms 75 to 80 ohms 75 to 80 ohms 75 to 80 ohms Less than 2 ohms Less than 2 ohms Less than 2 ohms	Go to step 12.	Go to step 11.
0	TU cable	Replace cable and perform paragraph 4-43b.	. . .	. . .	. . .

Table 3-15. TU Resolver Fault (Cont)

tep	I tem	Action	Indication	Yes	No
0	TB1	Repair faulty wire; terminal board TB1 pin; or connector J2 pin; then go to step 15.	. . .	. . .	. . .
1	TU	Replace TU.	. . .	. . .	. . .
2	TB1	Measure resistance between the following pins: TB1 J2 1 A 2 B 3 C 4 D 4 S 4 T 4 U 5 E 5 V 6 P 6 R 6 F	Measurement indicates less than 2 ohms.	Go to next step.	Go to step 14
3	TU	Reassemble TU per paragraph 4-43.1b.	. . .	. . .	. . .
4	TU	Repair faulty wire; terminal board TB1 pin; or J2 connector pin; then go to step 15	. . .	. . .	. . .
5	TU	Reassemble TU per. paragraph 4-43.1b.	. . .	. . .	. . .

The data on pages 3-65 through 3-71, including section III, and IV, tables 3-16, 3-17, and 3-18, and paragraphs 3-9 through 3-14 are deleted. Data from page 3-72 is now on page 3-73.

Section V. VEHICLE CABLE AND EMI FILTER TROUBLESHOOTING

3-15. GENERAL

This section contains troubleshooting procedures for the vehicle cable and EMI filter. Table 2-1 lists the equipment required to perform these procedures.

3-16. VEHICLE CABLE AND EMI FILTER SYMPTOM INDEX

A troubleshooting index that lists common symptoms of vehicle cable or EMI filter, failures and corrective action to restore operation, is contained in Table 3-19.

The troubleshooting action column of the table provides references to step-by-step procedures used to fault isolate the malfunction to a failed component or wiring fault.

3-17. EMI FILTER TROUBLESHOOTING

Table 3-21 is the fault isolation procedure for the EMI filter. The ellipsis (...) when used in the table indicates an intentional blank or termination of a procedural step.

Table 3-19. Vehicle Cable/EMI Filter Sympton Index

Item	Failure Symptom	Troubleshooting Action
1	EMI Filter fault/no output or filter action.	Troubleshoot per Table 3-21.
2	Vehicle cable fault/open or shorted wires.	Continuity check per Table 3-20.

Table 3-20. Vehicle Continuity Check

Step	Item	Action	Indication	Yes	No
1	Vehicle Cable	Disconnect P1 from EMI filter connector 2J1 (if attached).	. . .	. . .	. . .
2	Vehicle Cable	Check continuity between the following points: W2P2-A to W2P1-A W2P2-A to W2P1-B W2P2-B to W2P1-C W2P2-B to W2P1-D	Measurement indicates less than 1 ohm.	Go to next step.	Replace vehicle cable.
3	Vehicle Cable	Check continuity between the following points: W2P2-A to W2P1-C W2P2-B to W2P1-A	Measurement indicates an open circuit.	Go to next step.	Replace vehicle cable.
4	Vehicle Cable	Return to service.	. . .	. . .	. . .

Table 3-21. EMI Filter Fault

Step	Item	Action	Indication	Yes	No
		CAUTION When connecting power cable (13033955) to power source, insure that polarity of power cable and power supply match.			
1	Power Cable red lug (+)	Connect to power supply +24 ± 1.0 VDC positive terminal.	. . .	. . .	. . .
2	Power Cable black lug (-)	Connect to power supply +24 + 1.0 VDC negative terminal.	. . .	. . .	. . .
3	EMI Filter	Measure dc volts between + and - terminals of 2P1.	Measurement indicates + 24 + 2.0 VDC.	Go to next step.	Go to step 8.
4	Power Cable red lug (+)	Connect to power supply +24 +1.0 VDC negative terminal.	. . .	. . .	. . .
5	Power Cable black lug (-)	Connect to power supply + 24 + 1.0 VDC positive terminal.	. . .	. . .	. . .
6	EMI Filter	Measure dc volts between + and - terminals of 2P1.	Measurement indicates 0 + 1.0 VDC.	Go to next step.	Go to step 27.
7	EMI Filter	Return to service.	. . .	. . .	. . .
8	Power Cable	Disconnect P1 from 2J1 on f i l ter box.	. . .	. . .	. . .
9	Power Cable	Measure dc volts between the following points: P1-A to P2-Red P1-B to P2-Red P1-C to P2-Black P1-D to P2-Black	Measurements indicate +24 + 2.0 VDC.	Go to step 11.	Go to next step.
10	Power Cable	Replace power cable.	. . .	. . .	. . .
11	EMI Filter	Remove cover assembly per paragraph 4-45a.	. . .	. . .	. . .
12	EMI Filter	Unsolder L2-2 lead from terminal E11.	. . .	. . .	. . .
13	EMI Filter	Measure continuity between L2-2 and E10.	Measurement indicates an open circuit.	Go to next step.	Go to step 32.
14	EMI Filter	Unsolder L1-2 lead from terminal E21.	. . .	. . .	. . .
15	EMI Filter	Measure continuity between L1-2 and E20.	Measurement indicates an open circuit.	Go to next step.	Go to step 42.
16	EMI Filter	Measure continuity between 2J1-D and E24. (+ probe should go to 2J1-D).	Measurement indicates approximately 100 ohms.	Go to next step.	Go to step 26.
17	EMI Filter	Measure continuity between 2J1-C and E22. (+ probe should go to 2J1-C).	Measurement indicates approximately 100 ohms.	Go to next step.	Go to step 25.

Table 3-21. **EMI Filter Fault (Cont)**

:ep	Item	Action	Indication	Yes	No
.8	(DELETED)				
.9	EMI Filter	Measure cont i nui ty between E27 and E26.	Measurement indicates an open circuit.	Go to next step.	Go to step 24.
:0	(DELETED)				
:1	EMI Filter	Measure cont i nui ty between E21 and E24. (+ probe should be connected to E24.)	Measurement indicates approximately 2 ohms.	Go to next step.	Go to step 23.
:2	EMI Fi l ter	Replace C2 (see paragraph 4-50 and Figure 4-9).	. . .	. . .	. . .
:3	EMI Filter	Replace CR3 (see paragraph 4-50 and Figure 4-9).	. . .	. . .	. . .
:4	EMI Filter	Replace C1 (see paragraph 4-50 and Figure 4-9).	. . .	. . .	. . .
:5	EMI Filter	Replace CR2 per paragraph 4-48.	. . .	. . .	. . .
26	EMI Filter	Replace CR1 per paragraph 4-48.	. . .	. . .	. . .
27	EMI Filter	Unsolder L1-2 lead from E21.	. . .	. . .	. . .
28	EMI Filter	Repeat steps 16 thru 21 as necessary.	. . .	. . .	. . .
29	EMI Filter	Sol der al l l eads to proper E terminal.	. . .	. . .	. . .
30	EMI Filter	Reinstall cover assembly and gasket per paragraph 4-45b, steps 4 thru 9.	. . .	. . .	. . .
31	EMI Filter	Retest by performing steps 1 through 7.	. . .	. . .	. . .
32	EMI Fi l ter	Unsolder L2-1 from E9.	. . .	. . .	. . .
33	EMI F i l ter	Measure cont i nui ty between L2-1 and L2-2.	Measurement indicates less than 2 ohms.	Go to next step.	Go to step 37.
34	EMI Filter	Unsolder the following capacitor leads from the specified E terminal. C8 E9 C9 E7 C10 E5 C11 E3 C12 E1	. . .	. . .	. . .

Table 3-21. EMI Filter Fault (Cont)

:ep	Item	Action	Indication	Yes	No
)5	EMI Filter	Measure continuity of each capacitor separately.	Measurement indicates as open circuit for each capacitor.	Go to step 38.	Go to next step.
)6	EMI Fi l ter	Replace shorted capacitor (C8 thru C12) (see paragraph 4-46 and Figure 4-9).	. . .	. . .	. . .
)7	EMI Filter	Replace L2 per paragraph 4-45.	. . .	. . .	. . .
)8	EMI Filter	Replace terminal board per paragraph 4-46.	. . .	. . .	. . .
)9	EMI Filter	Solder al l leads to proper E terminal.	. . .	. . .	. . .
10	EMI Filter	Reinstal l cover assembly and gasket per paragraph 4-45b, steps 4 thru 9.	. . .	. . .	. . .
11	EMI Filter	Retest by performing steps 1 through 7.	. . .	. . .	. . .
42	EMI Filter	Unsolder L1-2 from E21.	. . .	. . .	. . .
43	EMI Filter	Measure continuity between L1-1 and L1-2.	Measurement indicates less than 2 ohms.	Go to next step.	Go to step 47.
44	EMI Filter	Unsolder the following capacitor leads from the specified E terminal. C3 E19 C4 E17 C5 E15 C6 E13 C7 E11	. . .	. . .	. . .
45	EMI F i l ter	Measure cont i nui ty of each capacitor separately.	Measurement indicates an open circuit for each capacitor.	Go to step 48.	Go to next step.
46	EMI Filter	Replace shorted capacitor (C3 thru C7) (see paragraph 4-46 and Figure 4-9).	. . .	. . .	. . .
47	EMI Filter	Replace L1 per paragraph 4-45.	. . .	. . .	. . .
48	EMI F i l ter	Replace terminal board per paragraph 4-46.	. . .	. . .	. . .
49	EMI Filter	Solder al l leads to proper E terminal.	. . .	. . .	. . .
50	EMI Filter	Reinstall cover assembly and gasket per paragraph 4-45b, steps 4 thru 9.	. . .	. . .	. . .
51	EMI Filter	Retest by performing steps 1 through 7.	. . .	. . .	. . .

CHAPTER 4
REPAIR INSTRUCTIONS

Section I. REPAIR OF LD/R

4-1. GENERAL

This section contains repair procedures for the LD/R. The tools, equipment, and materials required to perform these procedures are contained in Table 2-1, Table B-1, and in the Laser Systems Field Maintenance Tool Kit (NSN 5180-01-048-8570). The time required for each repair task is listed in the Maintenance Allocation Chart found in TM 9-1260-477-12.

4-2. LD/R ELECIRONICS ASSEMBLY A1 AND TRANSCEIVER ASSEMBLY A2 REPAIR

The optical components of the LD/R are easily contaminated. Use extreme caution to keep free from dust, smoke, or other foreign matter.

Power Supply Control A1A1A1, Control Card A1A3, Resolver-to-Digital Converter A1A4, Energy Control Card A2A1A6, and Receiver Circuit Card A2A4 are electrostatic sensitive. Protect these cards by wearing grounding wristband when probing. Handling and/or installation of individual cards should be performed at a static-free work station. These cards should be antistatic packaged during handling and storage.

Do not use any items that may damage mating surfaces or gasket seal between A1 and A2.

Do not use cotton rags or other wiping materials with lint.

Working area inside the maintenance van must be clean before opening the LD/R.

a. Removal (Figure 4-1).

WARNING

Insure that LD/R and Fault Locator POWER switches are OFF prior to performing disassembly of LD/R.

(1) Remove 12 screws, lockwashers, and washers.

CAUTION

When units Al and A2 are separated, unit Al must be placed on any convenient object to keep it the same height as unit A2 to avoid strain on cable A1A1W1 between units.

NOTE

For proper cooling tape plenum outlet on A2 visible when A1 is separated from A2. Tape must be removed before reassembly.

(2) Separate electronics assembly A1 from transceiver assembly A2.

WARNING

Voltages in excess of 900 VDC exist at A1A1W1P1 and A2A2W1J1 pin 61 for approximately three minutes after power is removed.

CAUTION

Insure screws are released evenly one turn at a time to avoid damaging connector.

NOTE

When using Table 3-3 thru 3-21, do not perform steps 4-2a.(3) thru 4-2a.(8) unless instructed by the applicable table.

(3) Disconnect A1A1W1P1 from A2A2W1J1 by releasing two jackscrews evenly one turn at a time.

(4) Check exposed surface of gasket. If damage is evident, proceed to step (5). If gasket is in good condition, proceed to step (8).

(5) Remove gasket from groove in A1 mating surface.

(6) Lubricate a new gasket seal with lubricant (28, Table B-1) and install in groove of A1.

(7) Remove excess lubricant from exposed surface of gasket seal.

(8) Inspect mating surfaces of A1 and A2 for signs of damage or obstructions that may cause an improper pressure seal.

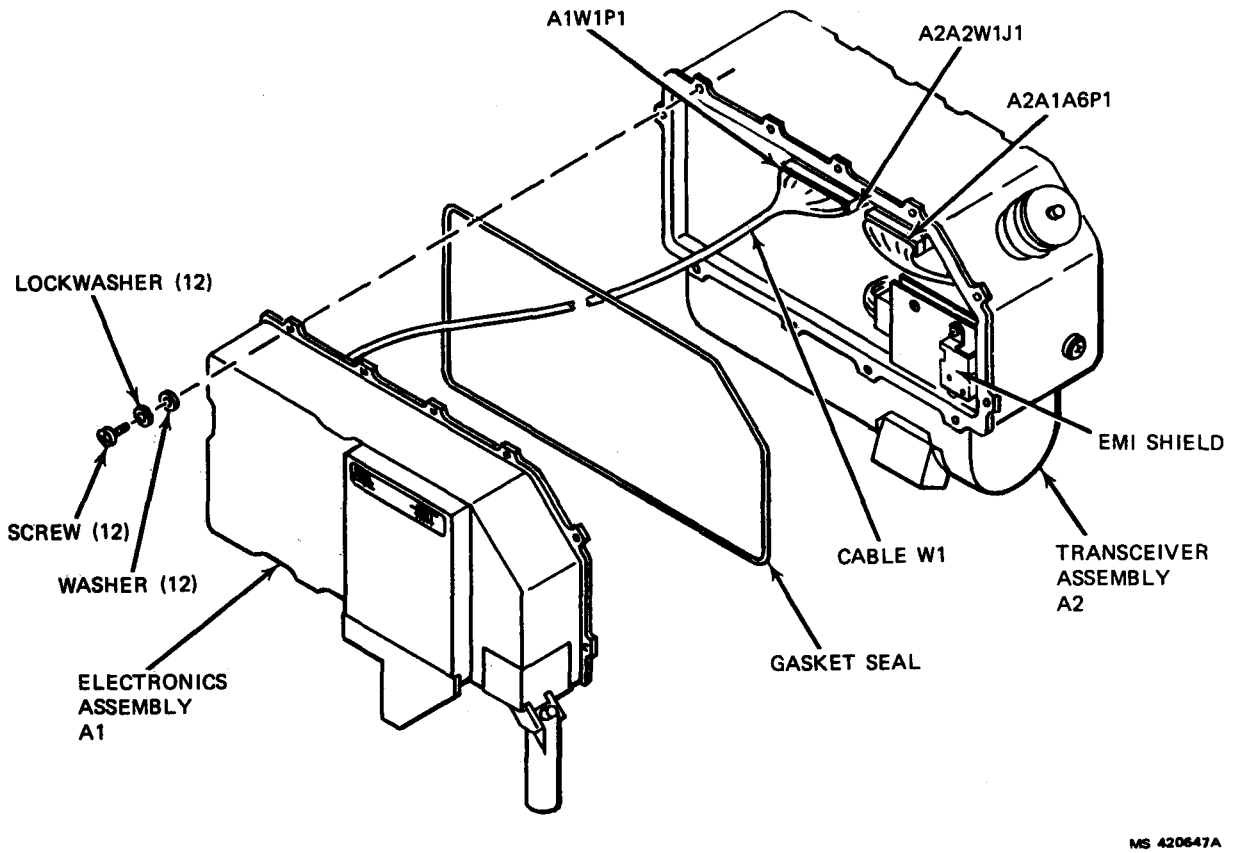


Figure 4-1. LD/R Assemblies **Al and A2**

b. Installation (Figure 4-1).

(1) Lubricate exposed surface of gasket seal in A1 assembly with lubricant (28, Table B-1).

CAUTION

Insure screws are torqued evenly one turn at a time to avoid damaging connector.

(2) Connect A1A1W1P1 to A2A2W1J1 and tighten two jackscrews evenly one turn at a time. Torque jackscrews 5 to 6 inch-pounds.

(3) If A2 is replaced, perform PFN VDC adjustment per paragraph 2-11.

(4) Secure Al to A2 using 12 screws, lock-washers, and washers. Torque screws 6 to 7 inch-pounds.

(5) Purge per paragraph 2-10.

4-3. CONTROL CARD A1A3 AND RESOLVER-TO-DIGITAL CONVERTER A1A4 REPLACEMENT

a. Removal (Figure 4-2, Sheet 1).

CAUTION

Control Card A1A3 and Resolver-to-Digital Converter A1A4 are electrostatic sensitive. Protect these cards by wearing grounding wristband when probing. Handling and/or installation of individual cards should be performed at a static-free work station. These cards should be anti-static packaged during handling and storage.

(1) Separate Al and A2 per paragraph 4-2.

(2) Remove ten screws (17) and washers (18).

(3) Lift control card A1A3 (13).

CAUTION

Insure screws are released evenly one turn at a time to avoid damaging connector.

(4) Release two jackscrews (9) evenly one turn at a time on connector A1A1W1P3 (10).

(5) Separate A1A1W1P3 (10) and A1A3J1 (11).

(6) Remove two screws (19), washers (20), spacers (21), washers (22), lockwashers (23), and nuts (24).

(7) Release two jackscrews (12) on A1A3 to A1A4 connector.

(8) Remove resolver-to-digital converter A1A4 (8).

(9) Release two jackscrews on A1A1W1 and remove connector.

(10) Remove A1A3.

b. Installation (Figure 4-2, Sheet 1).

(1) Install A1A4 (8) by mating A1A3 and A1A4 connectors and tighten jack screws (12) evenly one turn at a time. Torque jackscrews 2 to 3 inch-pounds.

(2) Attach A1A4 (8) to A1A3 (13) using two screws (19), washers (20), spacers (21), washers (22), lockwashers (23), and nuts (24) Torque screws 5 to 6 inch-pounds.

CAUTION

Insure screws are torqued evenly one turn at a time to avoid damaging connector.

(3) Tighten both jackscrews (12) evenly one turn at a time on A1A3 to A1A4 connector.Torque jackscrews 2 to 3 inch-pounds.

(4) Mate A1A1W1P3 (10) and A1A3J1 (11).

(5) Torque both jackscrews (9) on connector A1A1W1P3 (10) 2 to 3 inch-pounds.

(6) Install control card A1A3 (13) and cable clamp (16).

(7) Attach A1A3 (13) and cable clamp (16) with screw (14) and washer (15). Secure A1A3 (13) to housing with 9 screws (17) and washers (18); torque screws 5 to 6 inch-pounds.

(8) Assemble A1 and A2 per paragraph 4-2, but do not perform PFN VDC adjustment.

4-4. CODE SWITCH REPLACEMENT

a. Removal (Figure 4-2, Sheet 1).

(1) Separate A1 from A2 per paragraph 4-2b.

(2) Loosen two setscrews on code switch knob (2).

(3) Remove the locknut (3) and lockwasher (4) from base of code switch (5).

(4) Tag and unsolder wires from code switch (5) terminals.

CAUTION

Do not lose O-ring from rear of the code switch.

(5) Remove the code switch (5) and discard.

b. Installation (Figure 4-2 Sheet 1).

(1) Reconnect and solder tagged wires to code switch (5) terminals.

NOTE

Insure that the O-ring (1) is properly seated in the rear of the code switch (5). If O-ring requires replacement, lubricate with lubricant (28, Table B-1).

(2) Insert code switch (5) through hole in LD/R chassis.

(3) Replace lockwasher (4) and locknut (3) on base of code switch. Tighten locknut.

(4) Replace code switch knob (5) and tighten set screw. Torque setscrew 5 to 6 inch-pounds.

(5) Check for free movement of code switches. Adjust positions as necessary.

(6) Assemble A1 and A2 per paragraph 4-2b, but do not perform PFN VDC adjustment.

4-5. POWER SUPPLY CONTROL A1A1A1 REPLACEMENT

a. Removal (Figure FO-2, Sheet 1).

CAUTION

Power Supply Control A1A1A1 is electrostatic sensitive. Protect this card by wearing grounding wristband when probing. Handling and/or installation of individual cards should be performed at a static-free work station. This card should be antistatic packaged during handling and storage.

(1) Separate A1 from A2 per paragraph 4-2.

(2) Remove 11 screws (3) and flat washers (4).

(3) Lift power supply control A1A1A1 (1).

(4) Release two jackscrews (51) evenly one turn at a time on connector A1A1W1P2 (6).

(5) Separate connectors A1A1W1P2 (6) and A1A1A1J1 (2).

b. Installation (Figure FO-2, Sheet 1).

(1) Mate connectors A1A1W1P2 (6) and A1A1A1J1 (6).

(2) Tighten both jackscrews (51) evenly one turn at a time on connector A1A1W1P2 (6). Torque jackscrews 2 to 3 inch-pounds.

(3) Install power supply control A1A1A1 (1).

(4) Secure A1A1A1 (1) with 11 screws (3) and washers (4). Torque screws 5 to 6 inch-pounds.

(5) Perform PFN VDC adjustment per paragraph 2-11.

(5.1) Perform Amber Indicator Fault per Table 3-8.

(6) Assemble A1 and A2 per paragraph 4-2b.

4-6. LV POWER SUPPLY DRIVE A1A1W1A1 REPLACEMENT

a. Removal (Figure FO-2, Sheet 1).

(1) Remove A1A1A1 per paragraph 4-5a.

(2) Tag and remove connections between A1A1W1A1 (7) terminals and wiring harness.

(3) Remove four screws (50), lockwashers (49), washers (48), and LVPS drive A1 A1W1A1 (7) from housing.

b. Installation (Figure FO-2, Sheet 1).

(1) Install LVPS drive A1A1W1A1 (7) using four screws (50), four lockwashers (49), and four washers (48).

(2) Reconnect and solder wires removed in step 2 above. Remove tags after all soldering is completed.

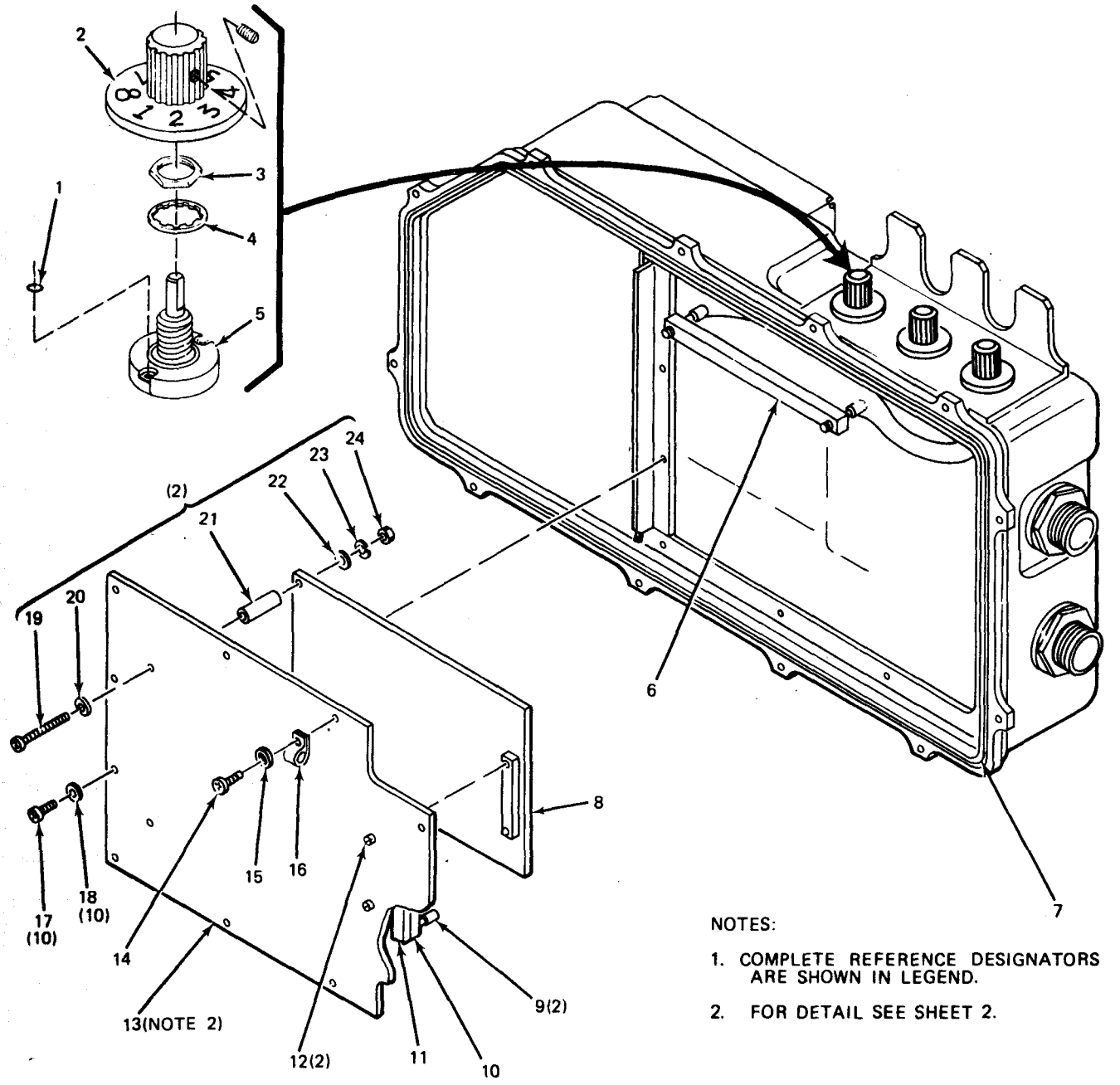
(3) Install A1A1A1 per paragraph 4-5b, but do not perform PFN VDC adjustment.

4-7. LV POWER SUPPLY A1A1W1A2 REPLACEMENT

a. Removal (Figure FO-2, Sheet 1, Detail A).

(1) Remove A1A1A1 per paragraph 4-5a.

(2) Tag and remove connections between A1A1W1A2 (55) of detail A and wiring harness.



1. O-RING SEAL
2. KNOB
3. LOCKNUT
4. LOCKWASHER
5. CODE SWITCH
6. CONNECTOR A1A1W1P1
7. GASKET
8. RESOLVER-TO-DIGITAL CONVERTER A1A4
9. JACKSCREW
10. CONNECTOR A1A1W1P3
11. CONNECTOR A1A3J1
12. JACKSCREW
13. CONTROL CARD A1A3
14. SCREW
15. WASHER
16. CLAMP
17. SCREW
18. WASHER
19. SCREW
20. WASHER
21. SPACER
22. WASHER
23. LOCKWASHER
24. NUT

MS 42064m

Figure 4-2. Electronics Assembly A1 Parts Location (Sheet 1 of 2)

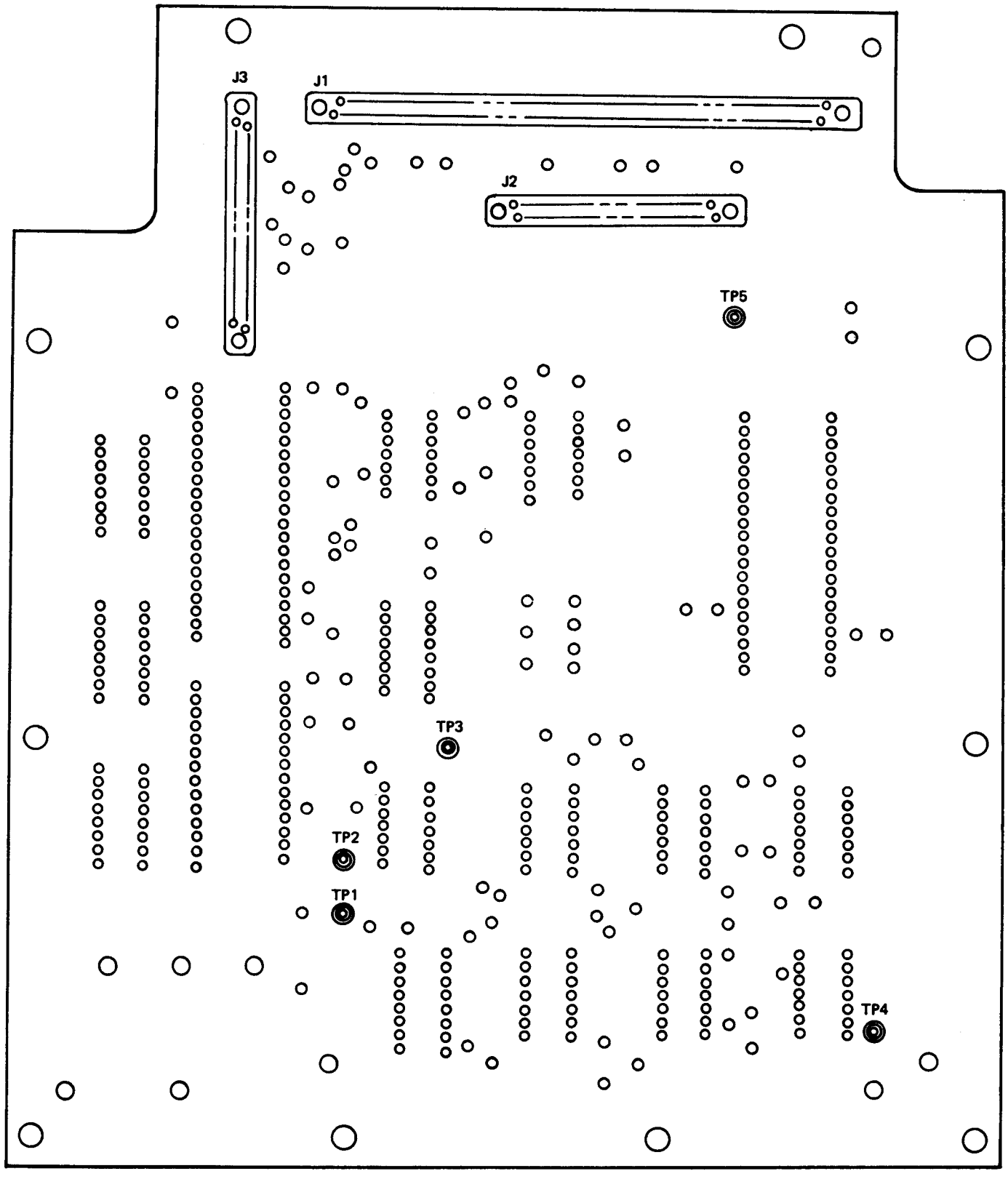


Figure 4-2. Electronics Assembly A1 Parts Location (Sheet 2 of 2)

(3) Remove three screws 52), lockwashers 53), and washers (54).

(4) Lift A1A1W1A2 (55) and insulator (56).

(5) Remove A1A1W1A2 (55) and insulator (56).

b. Installation (figure FO-2, Sheet 1, Detail A).

(1) Install insulator (56).

(2) Secure A1A1W1A2 (55) with three screws (52), lockwashers (53), and washers (54). Torque screws 6 to 7 inch-pounds.

(3) Reconnect wires between A1A1W1A2 (55) and wiring harness.

(4) Install A1A1A1 per paragraph 4-5b, but do not perform PFN VDC adjustment.

4-8. PFN POWER SUPPLY A1A1W1A3 REPLACEMENT

a. Removal (Figure FO-2, Sheet 1, Detail B).

(1) Remove A1A3 and A1A4 per paragraph 4-3a.

(2) Remove A1A1A1 per paragraph 4-5a.

(3) Remove stiffener bar (5).

(4) Tag and remove connections between A1A1W1A3 (60) of detail B and wiring harness.

(5) Remove four screws (57), four lockwashers (58), terminal lug (61), and three washers (59).

(6) Remove A1A1W1A3 (60) and insulator (62).

b. Installation (Figure FO-2, Sheet 1, Detail B).

(1) Install insulator (62) (notch on insulator goes toward top of case toward rear nearest Display Bright).

(2) Reconnect wires between A1A1W1A3 (60) and wiring harness.

(3) Place terminal lug (61) in position indicated in detail B.

(4) Secure A1A1W1A3 (60) with four screws (57), (58), and three washers (59). Torque s h-pounds.

CAUTION

Improper installation of the stiffener bar may result in damage to circuit cards A1A3 and A1A1A1. Be sure stiffener bar (5) is installed on the under side of the electronics assembly housing flange used to secure circuit cards A1A3 and A1A1A1.

(5) Replace stiffener bar (5).

(6) Install A1A3 and A1A4 per paragraph 4-3b.

(7) Install A1A1A1 per paragraph 4-5b.

(8) Adjust PFN VDC per paragraph 2-11.

(9) Purge and charge per paragraph 2-10.

4-9. PFN POWER SUPPLY A1A1W1A4 REPLACEMENT

a. Removal (Figure FO-2, Sheet 1, Datail C).

(1) Remove A1A3 and A1A4 per paragraph 4-3a and remove A1A1A1 per paragraph 4-5a.

(2) Remove stiffener bar (5).

(3) Remove four screws (63), terminal lug (67), four lockwashers (64), and three washers (65).

(4) Tag and remove connections between A1A1W1A4 (66) of detail C and A1A1A1 assembly.

(5) Remove A1A1W1A4 (66) and insulator (68).

b. Installation (Figure FO-2, Sheet 1, Detail C).

(1) Install insulator (68).

(2) Reconnect wires between A1A1W1A4 (66) and wiring harness.

(3) Place terminal lug (67) in position indicated in detail C.

(4) Secure A1A1W1A4 (66) with four screws (63) four lockwashers (64), and three washers (65). Torque screws 6 to 7 inch-pounds.

CAUTION

Improper installation of the stiffener bar may result in damage to circuit cards A1A3 and A1A1A1. Be sure stiffener bar (5) is installed on the under side of the electronics assembly housing flange used to secure circuit cards A1A3 and A1A1A1.

(5) Replace stiffener bar (5).

(6) Install A1A3 and A1A4 per paragraph 4-3b and install A1A1A1 per paragraph 4-5b.

(7) Adjust PFN VDC per paragraph 2-11.

(8) Purge and fill per paragraph 2-10.

4-10. LD/R HANDLE REPAIR

a. Removal (Figure FO-2, Sheet 1, Detail F).

(1) Place handle (78) in stowed position.

(2) Remove lockpin (81) from lockpin assembly (82).

(3) Drive out tapered pin (79) from left to right.

(4) Remove handle (78).

(5) Remove tip (80) from lockpin assembly (82), and remove lockpin (81) and spring (83) from handle.

b. Installation (Figure FO-2, Sheet 1).

(1) Install lockpin (81) and spring (83) into handle (78).

(2) Install tip (80) and torque tip 2 to 3 inch-pounds.

(3) Insert lockpin (81) into lockpin assembly (82).

(4) Insert tapered pin (79) from right to left. Pin to extend equally on either side of support.

4-11. POWER SWITCH A1A1W1S1 REPLACEMENT

a. Removal (Figure FO-2, Sheet 1).

(1) Remove A1A1A1 per paragraph 4-5a.

(2) Remove nut (38) and bushing seal (40).

NOTE

Discard bushing seal.

(3) Remove three screws (52), lockwashers (53), and flat washers (54).

(4) Remove A1A1W1A2 (55) as far as wires will allow so that switch A1A1W1S1 can be removed.

(5) Remove A1A1W1S1 (45).

(6) Tag wires connected to A1A1W1S1 (45) and remove 12 terminal screws (46).

b. Installation (Figure FO-2, Sheet 1).

(1) Discard supplied lockwasher.

(2) Remove 16 terminal screws (46) from A1A1W1S1 (45).

(3) Connect wires to A1A1W1S1 (45) with terminal screws (46). Torque screws 2 to 3 inch-pounds.

(4) Install A1A1W1S1 (45) with new bushing seal (40) and nut (38).

(5) Secure A1A1W1A2 (55) with three screws (52), lockwashers (53), and flat washers (54). Torque screws to 6 to 7 inch-pounds.

(6) Install A1A1A1 per paragraph 4-5b, but do not perform PFN VDC adjustment.

4-12. DES/RNG 1/RNG 2 SWITCH A1A1W1S2 REPLACEMENT

a. Removal (Figure FO-2, Sheet 1).

(1) Remove A1A1A1 per paragraph 4-5a.

(2) Remove nut (37) and bushing seal (36). Discard bushing seal.

(3) Remove A1A1W1S2 (32).

(4) Tag and unsolder wires connected to A1A1W1S2 (32).

b. Installation (Figure FO-2, Sheet 1).

(1) Discard supplied lockwasher.

(2) Solder wires to A1A1W1S2 (32) terminals; use heat shrinkable sleeving over terminals.

(3) Install A1A1W1S2 (32) with new bushing seal (36) and nut (37).

(4) Install A1A1A1 per paragraph 4-5b.

4-13. TRIGGER SWITCH A1A1W1S3 REPLACEMENT

a. Removal (Figure FO-2, Sheet 1).

(1) Remove A1A1A1 per paragraph 4-5a.

(2) Remove nut (35) and bushing seal (34). Discard bushing seal.

(3) Remove A1A1W1S3 (33).

(4) Tag and unsolder wires connected to A1A1W1S3 (33).

b. Installation (Figure FO-2, Sheet 1).

(1) Discard supplied lockwasher.

(2) Solder wires to A1A1W1S3 (33) terminals; use heat shrinkable sleeving over terminals.

(3) Install A1A1W1S3 (33) with new bushing seal (34) and nut (35).

(4) Install A1A1A1 per paragraph 4-5b, but do not perform PFN VDC adjustment.

4-14. RETICLE BRIGHT CONTROL A1A1W1R1 REPLACEMENT

a. Removal (Figure FO-2, Sheet 1).

(1) Remove A1A1A1 per paragraph 4-5a.

(2) Remove knob (39) and nut (41).

(3) Remove A1A1W1R1 (47).

(4) Tag and unsolder wires connected to A1A1W1R1 (47).

b. Installation (Figure FO-2, Sheet 1).

(1) Solder wires to A1A1W1R1 (47) terminals; use heat shrinkable sleeving over terminals.

(2) Install A1A1W1R1 (47), nut, and knob (39).

(3) Insure that preformed packing is installed on A1A1W1R1.

(4) Install A1A1A1 per paragraph 4-5b, but do not perform PFN VDC adjustment.

4-15. DISPLAY BRIGHT CONTROL A1A1W1R2 REPLACEMENT

a. Removal (Figure FO-2, Sheet 1).

(1) Remove A1A1A1 per paragraph 4-5a.

(2) Remove knob (42) and boot (43).

(3) Remove A1A1W1R2 (44).

(4) Tag and unsolder wires connected to A1A1W1R2.

b. Installation (Figure FO-2, Sheet 1).

(1) Solder wires to A1A1W1R2 (44) terminals; use heat shrinkable sleeving over terminals.

(2) Install A1A1W1R2 (44) with boot (43), and knob (42).

(3) Install A1A1A1 per paragraph 4-5b.

4-16. BATTERY CONNECTOR BANANA PLUGS REPLACEMENT

a. Removal (Figure FO-2, Sheet 1, Detail D).

(1) Unscrew and remove three banana plugs (69) using hex driver.

(2) Remove lockwasher (70) from plug (69).

b. Installation (Figure FO-2, Sheet 1, Detail D).

(1) Install lockwasher (70) on threaded portion of banana plug (69).

(2) Install three banana plugs (69) by screwing plug into mount assembly.

4-17. RELAY A1A1W1K1 AND DIODE REPLACEMENT

a. Removal (Figure FO-2, Sheet 1, Detail E).

(1) Remove A1A3 and A1A4 per paragraph 4-3a, steps (1) through (5) only.

(2) Tag and unsolder wires connected to A1A1W1K1 (76).

(3) Remove three screws (72), six washers (73, 74), and two plates (75).

(4) Remove A1A1W1K1 (76).

(5) Unsolder one end of diode.

(6) Raise diode lead and make reverse bias check.

(7) If diode fails, replace.

(8) If diode passes, replace relay.

b. Installation (Figure FO-2, Sheet 1, Detail E). E).

(1) Solder diode (29) to A1A1W1K1 relay terminals with cathode positioned as shown in figure FO-2.

(2) Install A1A1W1K1 (76) using three screws (72), six washers (73, 74), and two plates (75).

(3) Solder wiring to terminals of A1A1W1K1 (76).

(4) Install A1A3 and A1A4 per paragraph 4-3b.

4-18. RELEASE ASSEMBLY AND DETENT PIN REPLACEMENT

a. Removal (Figure FO-2, Sheet 1).

(1) Punch spring pin (26) in flush with release assembly (27) to release.

(2) Remove release assembly (27).

(3) Remove detent pin (21).

b. Installation (Figure FO-2, Sheet 1

(1) Install detent pin (21).

(2) Install release assembly (27).

(3) Install spring pin (26).

4-19. WIRING HARNESS A1A1W1 AND A1 HOUSING REPLACEMENT

a. Removal (Figure FO-2, Sheet 1).

(1) Remove A1A3 and A1A4 per paragraph 4-3a.

(2) Remove A1A1A1 per paragraph 4-5a.

(3) Remove A1A1W1A2 per steps 2 thru 4 of paragraph 4-7a.

(4) Remove A1A1W1A3 per steps 3 thru 6 of paragraph 4-8a.

(5) Remove A1A1W1A4 per steps 2 thru 4 of paragraph 4-9a.

(6) Remove A1A1W1S1 per steps 2 thru 4 of paragraph 4-11a.

(7) Remove 'A1A1W1S2 per steps 2 thru 4 of paragraph 4-12a.

(8) Remove A1A1W1S3 per steps 2 thru 4 of paragraph 4-13a.

(9) Remove A1A1W1R1 per steps 2 thru 4 of paragraph 4-14a.

(10) Remove A1A1W1R2 per steps 2 thru 4 of paragraph 4-15a.

(11) Remove nuts (71.4), lockwashers (71.3), flat washers (71.2), and terminal lugs (71.1) from battery connector.

(12) Remove A1A1W1K1 per steps 2 thru 4 of paragraph 4-17a.

(13) Remove A1A1W1S4.

(14) Remove covers (24, 20, 23) and nuts (25, 19, 22).

(15) Remove four screws (50), lockwashers (49), washers (48), and LVPS drive A1A1W1A1 (7).

(16) Remove A1A1W1 (9) from housing (18) of electronics assembly A1.

b. Installation (Figure FO-2, Sheet 1).

(1) Install A1A1W1 (9) in housing (18).

(2) Insert LVPS drive A1A1W1A1 (7) but do not secure.

(3) Install connectors (1J1 and 1J2) and attach with nuts (25, 19).

(4) Install connector 1J4 and attach with nut (22). Torque nut 8-10 foot-pounds.

(5) Install covers (20, 23, 24).

(6) Install A1A1W1S4.

(7) Install A1A1W1K1 per steps 1 thru 3 of paragraph 4-17b.

(8) Install terminal lugs (71.1), flat washers (71.2), lockwashers (71.3), and nuts (71.4) onto battery connectors.

(9) Install A1A1W1R2 per steps 1 and 2 of paragraph 4-15b.

(10) Install A1A1W1R1 per steps 1 and 2 of paragraph 4-14b.

(11) Install A1A1W1S3 per steps 1 thru 3 of paragraph 4-13b.

(12) Install A1A1W1S2 per steps 1 thru 3 of paragraph 4-12b.

(13) Install A1A1W1S1 per steps 1 thru 4 of paragraph 4-11b.

(14) Install A1A1W1A4 per steps 1 thru 3 of paragraph 4-9b.

(15) Install A1A1W1A3 per steps 1 thru 3 of paragraph 4-8b.

(16) Secure A1A1W1A1 (7) with four screws (50), lockwashers (49) and washers (48). Torque screws 5 to 6 inch-pounds.

(17) Perform point to point continuity check of A1A1W1 per Table C-1.

CAUTION

Improper installation of the stiffener bar may result in damage to circuit cards A1A3 and A1A1A1. Be sure stiffener bar (5) is installed on the under side of the electronics assembly housing flange used to secure circuit cards A1A3 and A1A1A1.

(18) Install stiffener bar (5).

(19) Install A1A1W1A2 per steps 1 thru 3 of paragraph 4-7b.

(20) Install A1A1A1 per paragraph 4-5b. Do not assembly A1 and A2.

(21) Use lacing tape (23, Table B-1) to tie wiring harness bundle.

(22) Install A1A3 and A1A4 per paragraph 4-3b.

4-20. RECEIVER CIRCUIT CARD A2A4 REPLACEMENT

CAUTION

Do not touch optical surfaces of the transceiver assembly A2 with bare hands. If external optical surfaces are dirty, clean per TM 9-1260-477-12.

a. Removal (Figure 4-3).

CAUTION

Receiver Circuit Card A2A4 is eletrostatic sensitive. Protect this card by wearing grounding wristband when probing. Handling and/or installation of individual cards should be performed at a static-free work station. This card should be anti-static packaged during handling and storage.

(1) Separate A1 from A2 per paragraph 4-2.

(2) Loosen two jackscrews (1) on A2A2W1P3(2).

(3) Disconnect A2A2W1P3 (2) from A4J1 (7).

(4) Remove four panhead screws (4), flat washers (6), and lockwashers (5).

(5) Remove EMI shield (40)

CAUTION

Avoid equipment damage when removing A2A4. A slip-fit interface slot exists between A2A4 underside and A2.

(5) Remove A2A4 (3) by smoothly pulling straight up from A2.

b. Installation (Figure 4-3).

CAUTION

Avoid equipment damage when installing A2A4. The interface slip-fit on the underside of A2A4 must be fitted into A2 mating interface.

(1) Install A2A4 (3) straight down into A2.

(2) Install EMI shield (40).

(3) Install four pnhead screws (4), flat washers (6), and lockwashers (5).

(4) Mate connectors A2A2W1P3 (2) and A4J1 (7) of A2A4 (3).

(5) Torque two jackscrews (1) on A2A2W1P3 (2) 2 to 3 inch-pounds.

4-21. BLOWER ASSEMBLY A2A3 REPLACEMENT

CAUTION

Do not touch optical surfaces of the transceiver assembly A2 with bare hands. If external optical surfaces are dirty, clean per TM 9-1260-477-12.

a. Removal (Figure 4-3).

(1) Remove six socket head screws (8), lockwashers (9), and flat washers (10).

(2) Remove plenum assembly(11).

(3) Remove two Phillips head screws (22), lockwashers (23), flat washers (24), and hex nuts (20) from A2A3J1 (25) and A2A5W1P3 (21).

(4) Remove socket head screw (26), flat washer (27), spacer (28), and self-locking nut (18).

(5) Disconnect A2A3J1 (25) from A2A5W1P3 (21). Remove two socket head screws (31), lockwashers (32), flat washers (33), and harness clamp (17) from motor mount clamp (19).

(6) Remove A2A3 (34), and motor mount clamp (19).

(7) Remove damper pad (30), and damper collar (29).

b. Installation (Figure 4-3).

(1) Install damper pad (30), and damper collar (29) on A2A3 (12).

(2) Insert A2A3 (34) into opening of motor mount clamp (19).

(3) Install socket head screw (26), flat washer (27), spacer (28), and self-locking nut (18) (do not tighten). Torque self-locking nut (18) 5 to 6 inch-pounds.

(4) Connect A2A5W1P3 (21) to A2A3J1 (25). Install two socket head screws (31), lockwashers (32), flat washers (33), and harness clamp (17) on motor mount clamp (19).

(5) Install two Phillips head screws (22), lockwashers (23), flat washers (24), and hex nuts (20) on A2A3J1 (25), and A2A5W1P3 (21). Torque 2 to 3 inch-pounds.

(6) Install cable clamp (17). Attach motor mount clamp (19) with two socket head screws (31), lockwashers (32), and flat washers (33).

(7) Install plenum assembly (11) over blower assembly by inserting outlet-throat of A2A3 (34) through seal opening.

(8) Install six socket head screws (8), lockwashers (9), and flat washers (10). Torque 6 to 7 inch-pounds.

4-22. SIMMER POWER SUPPLY A2A1A5K1 REPLACEMENT

CAUTION

Do not touch optical surfaces of the transceiver assembly A2 with bare hands. If external optical surfaces are dirty, clean per TM 9-1260-477-12.

a. Removal (Figure 4-3).

(1) Remove six socket head screws (8), lockwashers (9), and flat washers (10).

(2) Remove Plenum assembly(11).

(3) Remove two stand offs. Lift A2A1A5A1 (13) and supporting bracket.

(4) Remove conformal coating on wires and terminals connected to A2A1A5A1 using knife.

(5) Tag and unsolder wires connected to A2A1A5A1 (13).

(6) Remove A2A1A5A1 (13).

b. Installation (Figure 4-3).

(1) Solder wires to A2A1A5A1 (13) and supporting bracket.

(2) Apply conformal coating to wires and terminals connected to A2A1A5A1.

(3) Install A2A1A5A1 (13) and bracket using five Phillips head screws (15), two flat washers (16), and two lockwashers (14). Install ground wire using Phillips head screw, lockwasher, and flat washer.

CAUTION

Components on Simmer Power Supply can be damaged in the following step. Use great care when installing plenum assembly.

(4) Install plenum assembly (11) by inserting outlet-throat of A2A3 (34) through seal opening.

(5) Install six socket head screws (8), lockwashers (9), and flat washers (10). Torque 6 to 7 inch-pounds.

4-23. WINDOW REPLACEMENT

a. Removal (Figure 4-3).

CAUTION

Do not touch optical surfaces of the transceiver assembly A2 with bare hands. If external optical surfaces are dirty, clean per TM 9-1260-477-12.

(1) Disassemble A1 and A2 per paragraph 4-2a.

(2) Remove window cover retaining ring (36) from transceiver housing.

(3) Remove preformed packing (35) from transceiver housing.

(4) Gently remove window (37) from groove with fingers. Press out from inside A2.

b. Installation (Figure 4-3).

(1) Lubricate preformed packing (35) with lubricant (28, Table B-1).

(2) Replace preformed packing (35) in groove.

(3) Carefully place window (37) into groove. Insure window (37) fits flat against window seat.

(4) Replace retaining ring (36) in groove of the window opening so that black surface of retaining ring is facing outward.

(5) Clean window (37) per TM 9-1260-477-12.

(6) Perform LD/R low pressure purge per paragraph 2-10.

4-24. SWING BOLT ASSEMBLY REPLACEMENT

a. Removal (Figure 4-4).

(1) Remove retaining ring (8) from swing pin (7).

(2) Remove swing pin (7).

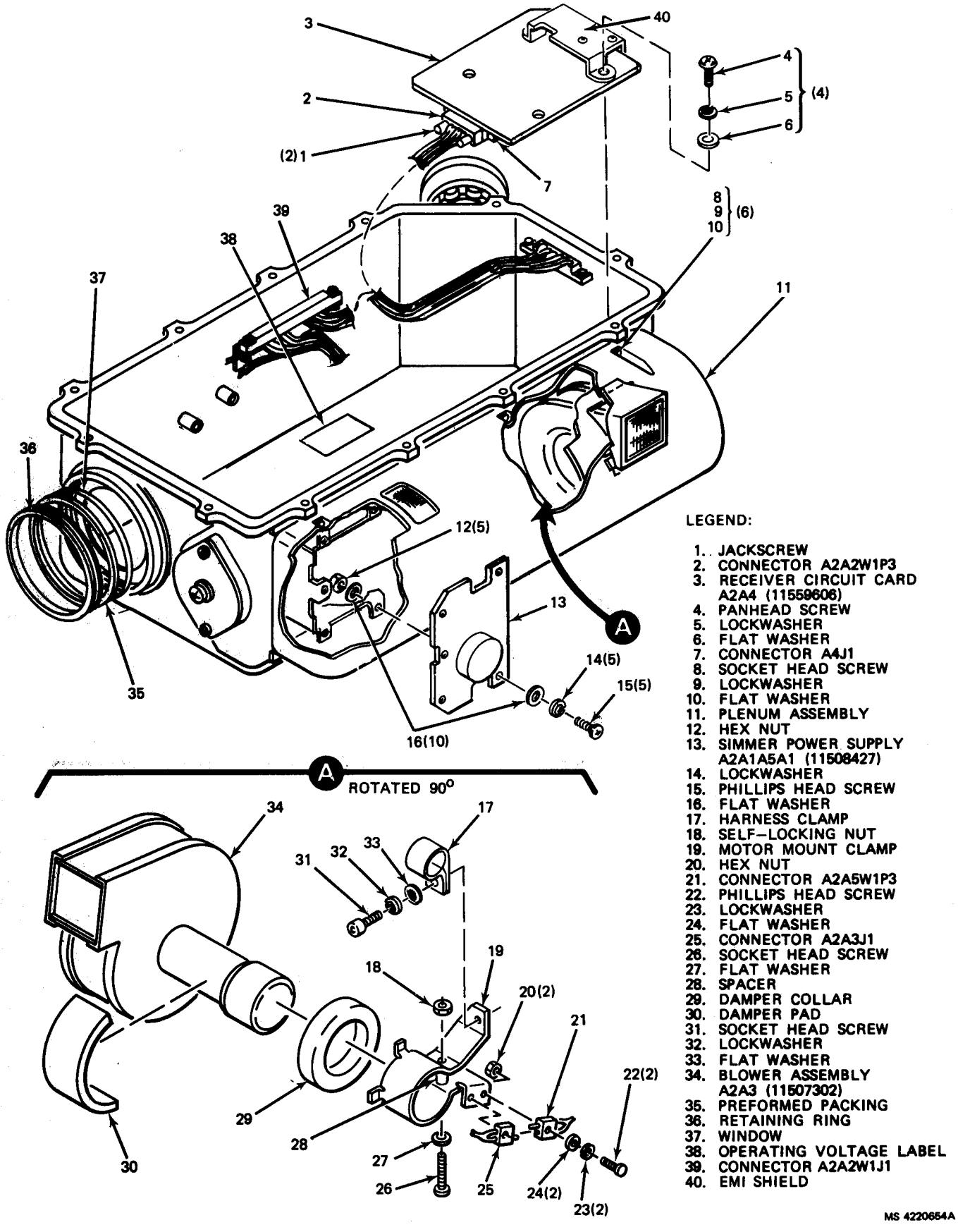
(3) Remove swing bolt (5) and swing bolt spring (6) from mounting flange.

b. Installation (Figure 4-4).

(1) Coat spring pin (7) with zinc chromate,(42, Table B-1).

(2) Position spring (6) in spring bolt flange. Position swing bolt (5) in mounting flange on transceiver housing. Insert swing pin (7) thru swing bolt and spring insuring proper positioning of spring.

(3) Replace retaining ring (8) on swing pin (7).



LEGEND:

1. JACKSCREW
2. CONNECTOR A2A2W1P3
3. RECEIVER CIRCUIT CARD A2A4 (11559606)
4. PANHEAD SCREW
5. LOCKWASHER
6. FLAT WASHER
7. CONNECTOR A4J1
8. SOCKET HEAD SCREW
9. LOCKWASHER
10. FLAT WASHER
11. PLENUM ASSEMBLY
12. HEX NUT
13. SIMMER POWER SUPPLY A2A1A5A1 (11508427)
14. LOCKWASHER
15. PHILLIPS HEAD SCREW
16. FLAT WASHER
17. HARNESS CLAMP
18. SELF–LOCKING NUT
19. MOTOR MOUNT CLAMP
20. HEX NUT
21. CONNECTOR A2A5W1P3
22. PHILLIPS HEAD SCREW
23. LOCKWASHER
24. FLAT WASHER
25. CONNECTOR A2A3J1
26. SOCKET HEAD SCREW
27. FLAT WASHER
28. SPACER
29. DAMPER COLLAR
30. DAMPER PAD
31. SOCKET HEAD SCREW
32. LOCKWASHER
33. FLAT WASHER
34. BLOWER ASSEMBLY A2A3 (11507302)
35. PREFORMED PACKING
36. RETAINING RING
37. WINDOW
38. OPERATING VOLTAGE LABEL
39. CONNECTOR A2A2W1J1
40. EMI SHIELD

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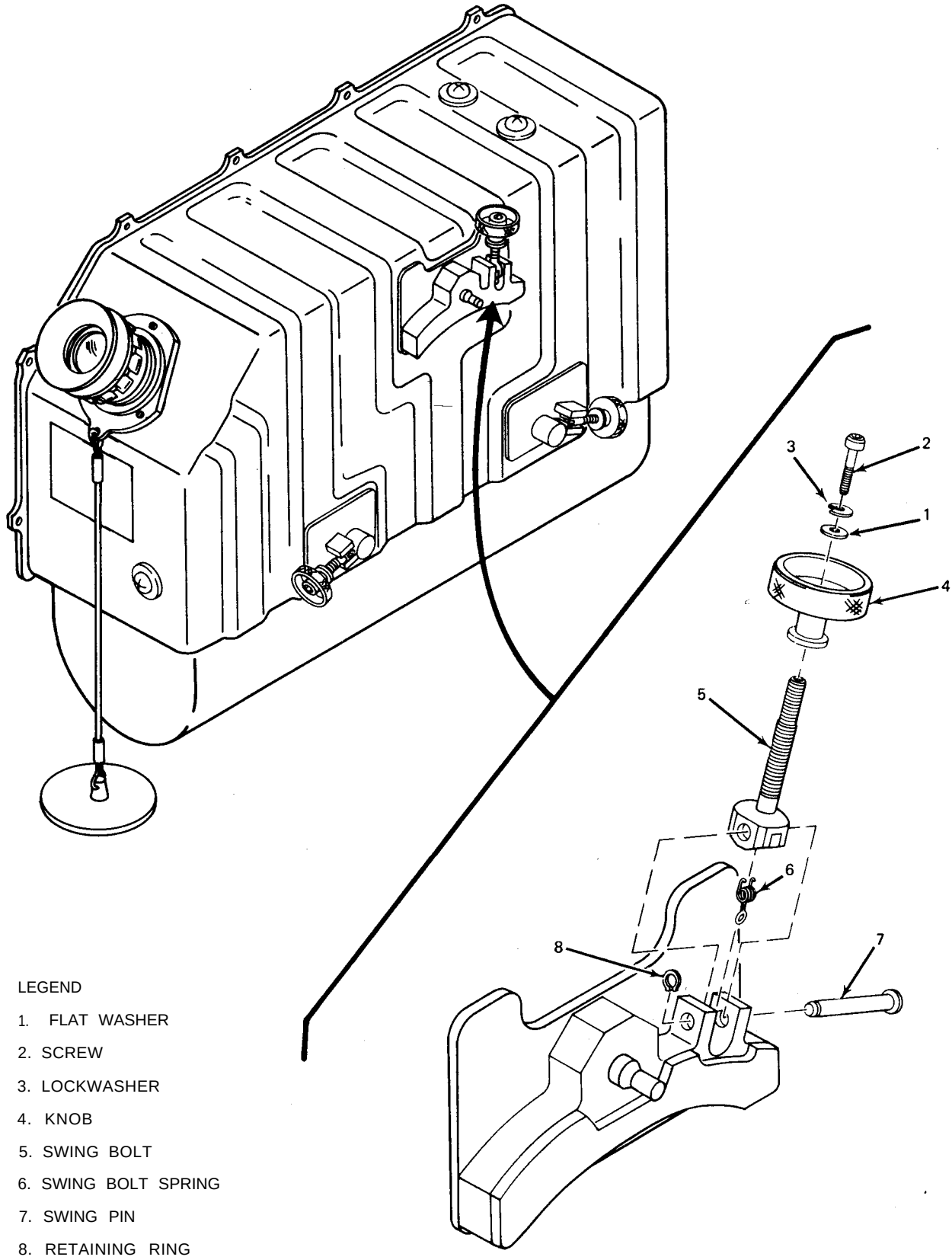
Figure 4-3. Transceiver Assembly A2 Parts Location



LEGEND

1. FLAT WASHER
2. SCREW
3. LOCKWASHER
4. KNOB
5. SWING BOLT
6. SWING BOLT SPRING
7. SWING PIN
8. RETAINING RING

Figure 4-4. Swing Bolt Assembly Pdrts Location

4-25. EYEPIECE ASSEMBLY REPLACEMENT

NOTE

Make sure that the eyepiece cover (5) is in place so that the lens is protected from damage during removal.

a. Removal (Figure 4-5).

(1) Remove three screws (4), lockwashers (3), and flat washers (2).

(2) Pull eyepiece assembly (7) outward from transceiver housing assembly (1).

(3) Carefully remove preformed packing (6) and set it aside in a safe place.

b. Installation (Figure 4-5).

(1) Carefully install preformed packing (6) as shown.

(2) Install eyepiece assembly (7) in transceiver housing assembly (1).

(3) Install three screws (4), flat washers (2), and lockwashers (3). Torque screws 5 to 6 in-lbs.

(4) Purge and fill per paragraph 2-10.

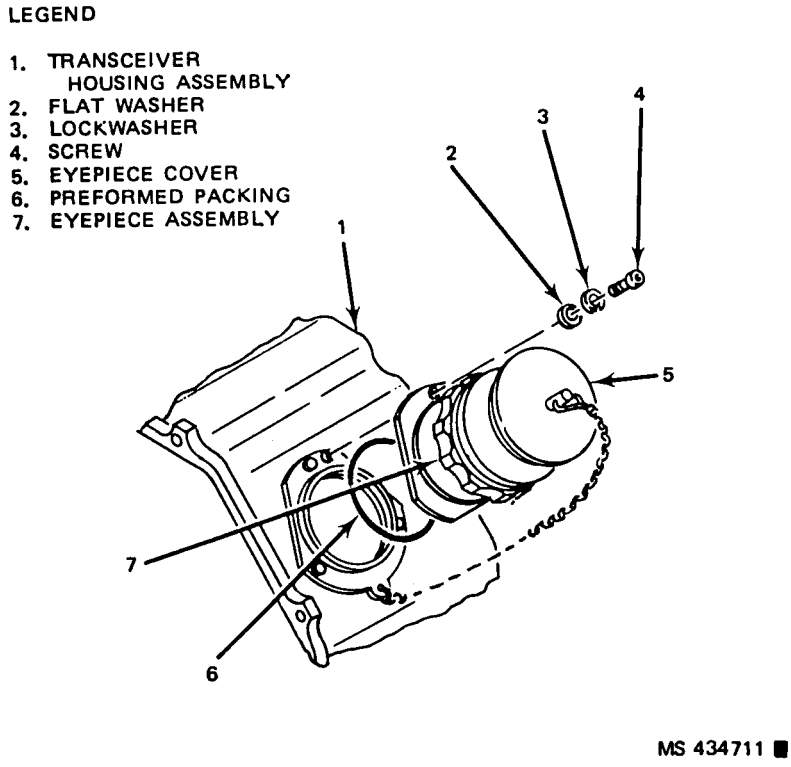


Figure 4-5. Eyepiece Assembly Parts Location

Section II. REPAIR OF TRIPOD

4-26. GENERAL

This section contains repair procedures for the tripod. The tools, equipment, and materials required to perform these procedures are contained in Table B-1 and in the Laser Systems Field Maintenance Tool Kit (NSN 5180-01-048-8570). The time required for each repair task is listed in the Maintenance Allocation Chart found in TM 9-1260-477-12.

4-27. TRIPOD FOOTPADS REPLACEMENT

a. Removal (Figure FO-16).

(1) Remove TU from tripod and set aside.

(2) Use pliers to remove cotter pin (40) and straight pin (39) from tripod leg(s) clevis.

(3) Separate footpad assembly from tripod leg clevis.

(4) Remove tube (35), two springs (37), and spacer (38) from footpad assembly(s).

b. Installation (Figure FO-16).

(1) Install spacer (38), two springs (37), and tube (35) on footpad.

(2) Place tripod leg clevis over spacer (38) and insert straight pin (39) and cotter pin (40) to secure footpad to tripod leg.

4-28. TRIPOD LEG ADJUSTABLE LINK(S) REPLACEMENT

a. Removal (Figure FO-16).

(1) Remove TU from tripod and set aside.

(2) Use pliers and remove cotter pin(s) (46), and straight pin(s) (44) from base of TU Support (1).

(3) Use pliers and remove cotter pin(s) (33), flat washers (41), and straight pin(s) (32), from leg clamp assembly (34).

(4) Remove adjustable link (31).

(5) Refer to paragraph 4-32 for repair/replacement procedures.

b. Installation (Figure FO-16).

(1) Rotate threaded rod (12) and eyebolt (8) into turnbuckle (11) of adjustable link (31) as far as they will go.

(2) Secure adjustable link (31) to base of TU Support (1) by inserting straight pin (44) and cotter pin (46).

NOTE

Head of straight pin must be installed on thumbscrew side of clamp assembly. The flat washers and cotter pin are to be installed on opposite side. Use enough flat washers to minimize axial end play of the straight pin when clamp assembly is secured to the tripod leg.

(3) Loosen threaded rod (12) as required (no more than one-half turn) to align the rodhead and the clamp assembly. Attach adjustable link (31) to clamp assembly (34) using straight pin (32), flat washer (41), and secure using cotter pin (33).

(4) Install TU on tripod.

4-29. TRIPOD LEG(S) CLAMP ASSEMBLY REPLACEMENT

a. Removal (Figure FO-16).

(1) Remove TU from tripod and set aside.

(2) Use pliers to remove cotter pin (33), flat washer (41) and straight pin (32) holding adjustable link (31) to leg clamp assembly (34).

(3) Remove adjustable link (31) from leg clamp assembly (34).

(4) Loosen thumbscrew (28).

(5) Depress leg clamp lock lever (18) and slide leg clamp assembly (34) down tripod leg rail to disengage assembly from tripod leg.

(6) Remove leg clamp assembly (34).

(7) Repair/replace per paragraph 4-29c, d.

b. Installation (Figure FO-16).

(1) Loosen thumbscrew (28) on replacement leg clamp assembly.

NOTE

Be sure leg clamp assembly is not installed backwards.

(2) Depress leg clamp lock lever (18) and slide replacement/repaired leg clamp assembly onto tripod leg rail to notch/upper detent.

(3) Release lock lever (18).

(4) Tighten thumbscrew (28).

(5) Attach adjustable link (31) to clamp assembly (34) using straight pin (32), flat washer (41), and cotter pin (33).

c. Disassembly/Repair (Figure FO-16).

(1) Use punch to remove pin (17) from clamp assembly (34).

(2) Remove spacer(20) from lock lever (18).

(3) Align long dimension of bearing plate (21) with axis of detent plunger (23).

(4) Remove detent plunger assembly (25) through hole in spring tension clip (26).

(5) Remove spring tension clip (26).

(6) Remove cotter pin (29), flat washer (27), and thumbscrew (28).

(7) Remove half leveling clamps (15) and (16).

(8) Remove spring (22) from detent plunger assembly (25).

(9) Use punch to remove spring pin (24) and bearing plate (21) from plunger (23).

(10) Use punch to remove spring pin (19) from lock lever (18).

d. Assembly (Figure FO-16).

(1) Assemble half leveling clamps (15 and 16) and thumbscrew (28) with flat washer (27) and cotter pin (29).

(2) Install spring tension clip (26).

NOTE

Spring pins are to be coated with zinc chromate per MIL-STD-186, Code: 504, (47, Table B-1).

(3) Use punch on spring pin (24) to secure the bearing plate (21) on the detent plunger (23).

(4) Align bearing plate (21) long dimension with axis of detent plunger (23) and install spring (22).

(5) Use punch to install spring pin (24) on lock lever (18) (both ends to project approximately 0.1 inch).

(6) Install detent plunger (23) through hole in spring tension clip (26) and rotate bearing plate (21) so long dimension of bearing plate (21) is normal to axis of detent plunger (23).

(7) Install spacer (20) in lock lever (18) and engage with bearing plate (21) using punch.

(8) Use punch to install spring pin (17).

(9) Install clamp assembly (34) per paragraph 4-29b.

4-30. TRIPOD LEG(S) REPLACEMENT

a. Removal (Figure FO-16).

(1) Remove TU from tripod and set aside.

(2) Remove tripod leg adjustable link per paragraph 4-28a.

(3) Use pliers to remove the two cotter pins (45 and 47) and straight pins (42 and 43) securing tripod leg (13) to TU support (1).

(4) Remove tripod leg (13).

(5) Remove tripod leg leveling clamp assembly (34) per paragraph 4-29a.

(6) Use punch to remove spring pin (30) if it is faulty.

(7) Remove tripod leg footpad per paragraph 4-27a.

(8) Dispose of faulty tripod leg.

b. Installation (Figure FO-16).

(1) Install tripod footpad per paragraph 4-27b.

(2) Install tripod leg clamp assembly (34) per paragraph 4-29b.

(3) If removed in paragraph 4-30, step a. (6) use punch to install new spring pin (30).

(4) Secure tripod leg (13) to TU support (1) using two straight pins (42 and 43) and two cotter pins (45 and 47).

(5) Connect tripod leg adjustable link (31) per paragraph 4-28b.

4-31. TU SUPPORT REPLACEMENT

a. Removal (Figure FO-16).

(1) Remove TU from tripod.

(2) Remove three adjustable links (31) from TU support (1) per paragraph 4-28a.

(3) Use pliers to remove cotter pins (45 and 47) and straight pins (42 and 43) securing the three tripod legs (13) to base of TU support (1).

(4) Return TU support (1) to Depot for repair/ disposition.

b. Installation (Figure FO-16).

(1) Install each of three tripod legs by inserting the straight pins (42 and 43) and cotter pins (45 and 47) in TU support (1).

(2) Secure the three adjustable links (31) to base of TU support (1) per paragraph 4-28b.

4-32. TRIPOD LEG ADJUSTABLE LINK(S) REPAIR

a. Removal (Figure FO-16).

(1) Remove TU from tripod and set aside.

(2) Remove adjustable link (31) per paragraph 4-28a.

b. Disassembly (Figure FO-16).

CAUTION

Use support block to avoid damaging eyebolt.

(1) Use punch on spring pins (9) to remove collar (10) from threaded eyebolt (8).

(2) Remove eyebolt (8) from turnbuckle(11).

(3) Remove threaded rod (12) from turnbuckle(11).

(4) Remove turnbuckle(11).

(5) Dispose of unserviceable part(s).

c. Assembly (Figure FO-16).

(1) Re-thread eyebolt (8) and threaded rod (12) into turnbuckle (11).

(2) Use punch on spring pin (9) to attach collar (10) on threaded eyebolt (8).

(3) Install adjustable link (31) per paragraph 4-28b.

4-33. ATTACH SWING BOLT ASSEMBLY REPLACEMENT

a. Removal (Figure FO-16).

(1) Remove spring pin (6).

(2) Remove attach swing bolt assembly (2).

(3) Remove spring pin (4).

(4) Unscrew attach swing bolt (5) from attach nut (3).

b. Installation (Figure FO-16).

CAUTION

Attach swing bolt (5) used in following step must be adjusted so the spring pin (4), when installed, prevents the attach swing bolt from being unscrewed out of the attach nut.

(1) Screw attach swing bolt (5) into the attach nut (3).

(2) Coat spring pin (4) with zinc chromate, (47, Table B-1).

(3) Install spring pin (4).

(4) Coat spring pin (6) with zinc chromate, (47, Table B-1).

(5) Position attach swing bolt assembly (2) on TU support (1) and install spring pin (6).

Section III. REPAIR OF TRAVERSING UNIT

4-34. GENERAL

This section contains repair procedures for the traversing unit. The tools, equipment, and materials required to perform these procedures are contained in Table B-1 and in the Laser Systems Field Maintenance Tool Kit (NSN 5180-01-048-8570). The time required for each repair task is listed in the Maintenance Allocation Chart found in TM 9-1260-477-12.

4-35. ELEVATION BRAKE KNOB REPLACEMENT

a. Removal (Figure 4-6).

(1) Use punch and remove spring pin (24) from elevation brake knob (25).

(2) Screw elevation brake knob (25) ccw and remove.

b. Installation (Figure 4-6).

(1) Coat spring pin (24) with zinc chromate, (42, Table B-1).

(2) Screw elevation brake knob (25) cw on threaded stud (4).

(3) Use punch and insert spring pin (24) in elevation brake knob (25).

4-36. ELEVATION BRAKE CLAMP REPLACEMENT

a. Removal (Figure 4-6).

(1) Remove elevation brake knob (25) per paragraph 4-35a.

(2) Remove self-locking screw (27) securing elevation brake clamp (26) to TU.

(3) Remove elevation brake clamp (26).

b. Installation (Figure 4-6).

(1) Install elevation brake clamp (26) and attach to TU with self-locking screw (27).

(2) Install elevation brake knob (25) per paragraph 4-35b.

4-37. ELEVATION DAMPER COVER REPLACEMENT

a. Removal (Figure 4-6).

(1) Remove twelve self-locking screws (1).

(2) Remove elevation damper cover (2) and cover gasket (3).

b. Installation (Figure 4-6).

(1) Install cover gasket (3) and elevation damper cover (2).

(2) Install twelve self-locking screws (1). Torque screws 5-6 in-lbs.

4-38. BASE COVER REPLACEMENT

a. Removal (Figure 4-6).

(1) Remove twelve self-locking screws (12).

(2) Remove base cover (11) and gasket (10).

b. Installation (Figure 4-6).

(1) Install gasket (10) and base cover (11). Inspect rings on twelve self-locking screws (12). Replace as necessary.

(2) Install twelve self-locking screws (12).

4-39. AZ ZERO ADJ KNOB AND DRIVE SHAFT REPLACEMENT

a. Removal (Figure 4-6).

(1) Remove base cover per paragraph 4-38a.

(2) Loosen two setscrews (15) on flexible coupling (14) on the drive shaft (22).

(3) Loosen and remove AZ ZERO ADJ knob assembly (23) using wrench on attached nut on AZ ZERO ADJ knob (19)

(4) Loosen two setscrews of (18) flexible coupling (21).

(5) Separate flexible coupling (21) and drive shaft (22) from AZ ZERO ADJ knob (19).

(6) Loosen two setscrews (17) on flexible coupling (21).

(7) Separate flexible coupling (21) from drive shaft (22).

(8) Remove O-ring (20) from AZ ZERO ADJ knob (19).

b. Installation (Figure 4-6).

(1) Lubricate O-ring (20) with lubricant (28, Table B-1).

(2) Install O-ring (20) on AZ ZERO ADJ knob (19).

(3) Assemble drive shaft (22), flexible coupling (21), and AZ ZERO ADJ knob (19).

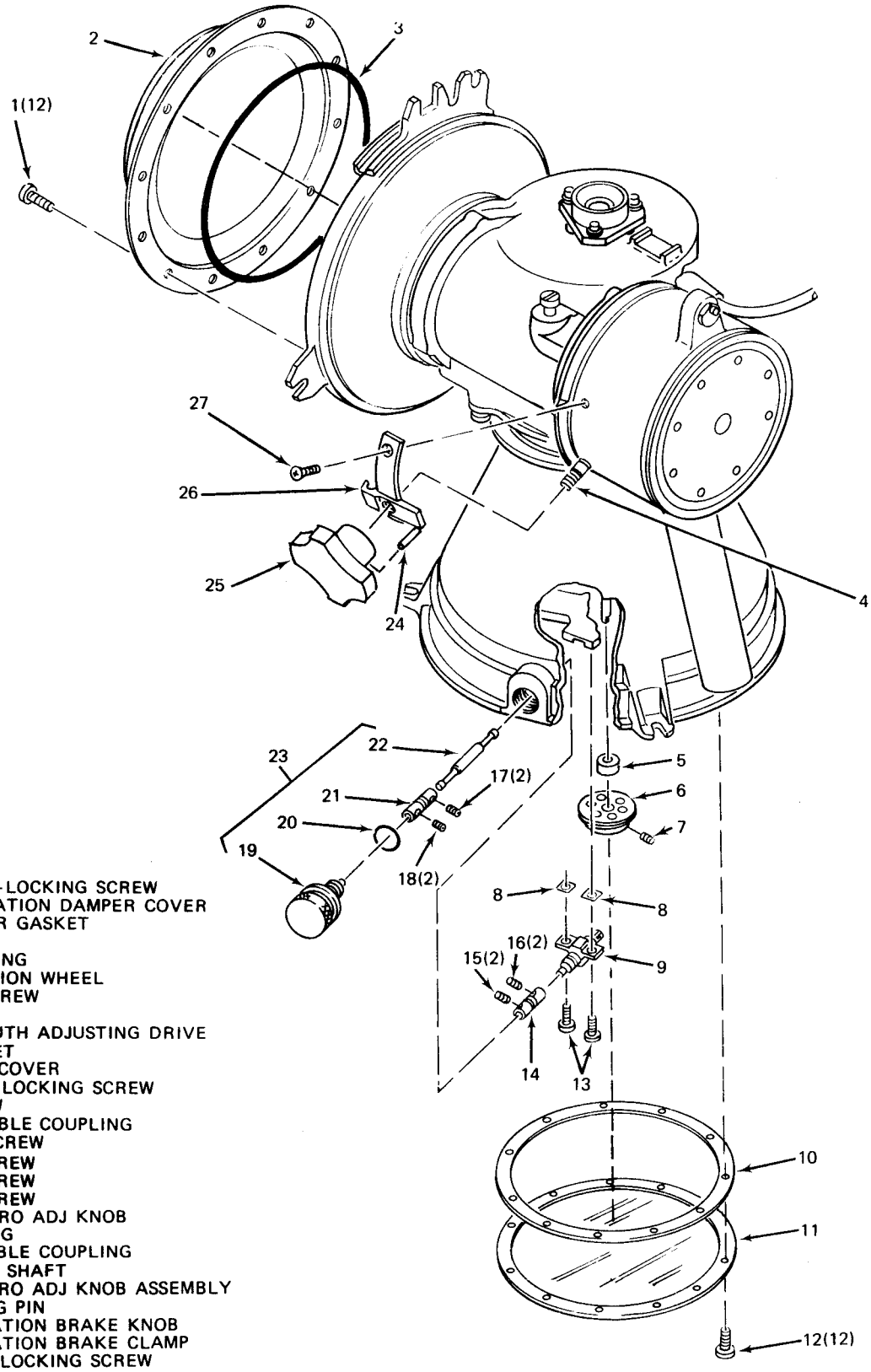
CAUTION

In the following step, tighten setscrews finger-tight. Excessive torque will strip threads.

(4) Tighten four setscrews (17 and 18) of flexible coupling (21) finger-tight.

(5) Insert drive shaft (22) through opening and mate with flexible coupling (14).

(6) Tighten AZ ZERO ADJ knob (19).



LEGEND:

1. SELF–LOCKING SCREW
2. ELEVATION DAMPER COVER
3. COVER GASKET
4. STUD
5. BEARING
6. FRICTION WHEEL
7. SETSCREW
8. SHIM
9. AZIMUTH ADJUSTING DRIVE
10. GASKET
11. BASE COVER
12. SELF–LOCKING SCREW
13. SCREW
14. FLEXIBLE COUPLING
15. SET SCREW
16. SETSCREW
17. SETSCREW
18. SETSCREW
19. AZ ZERO ADJ KNOB
20. O–RING
21. FLEXIBLE COUPLING
22. DRIVE SHAFT
23. AZ ZERO ADJ KNOB ASSEMBLY
24. SPRING PIN
25. ELEVATION BRAKE KNOB
26. ELEVATION BRAKE CLAMP
27. SELF–LOCKING SCREW

Figure 4-6. Traversing Unit Parts Location

4-43. TU CABLE ASSEMBLY REPLACEMENT

a. Removal (Figure 4-7).

(1) Remove four screws (12), lockwashers (11), and flat washers (10).

(2) Pull cable connector (13) out of the TU connector (8).

(3) Carefully remove preformed packing (9) and set it aside in a safe place.

b. Installation (Figure 4-7).

(1) Carefully replace preformed packing (9) as shown.

(2) Connect cable connector (13) to TU connector (8) and tighten two jackscrews evenly, one turn at a time, until finger-tight.

(3) Install four screws (12), flat washers (10), and lockwashers (11) and tighten finger-tight.

4-43.1. INTERNAL WIRING REPAIR

a. Disassembly (Figure 4-7).

(1) Loosen gimbal brake knob (22) to release brake.

(2) Remove six screws (17) lock washers (16), and flat washers (15).

NOTE

A coil of cable within the TU allows 1 to 2 inch separation of elevation gimbal assembly (7) from base (20) for access to jack screws (26) on P2 (27) that secures P2 to J2 (28).

(3) Carefully separate elevation gimbal assembly (7) from base (20) 1 to 2 inches.

(4) Alternately loosen two jack screws (26) and disconnect P2 (27) from J2 (28).

(5) Remove elevation gimbal assembly (7) from base (20) to gain access to terminal board TB1 (25) and connector J2 (28).

b. Assembly (Figure 4-7).

(1) Check exposed surface of O-ring gasket (18). If damage is evident, proceed to step 2. If gasket is in good condition, proceed to step 4.

(2) Remove O-ring gasket (18) from groove in base (20).

(3) Lubricate a new O-ring gasket (18) with lubricant (28, Table B-1) and install in groove of base (20).

(4) Clean mating surfaces of elevation gimbal assembly (7) and base (20).

(5) Connect P2 (27) to J2 (28) by alternately tightening two jack screws (26).

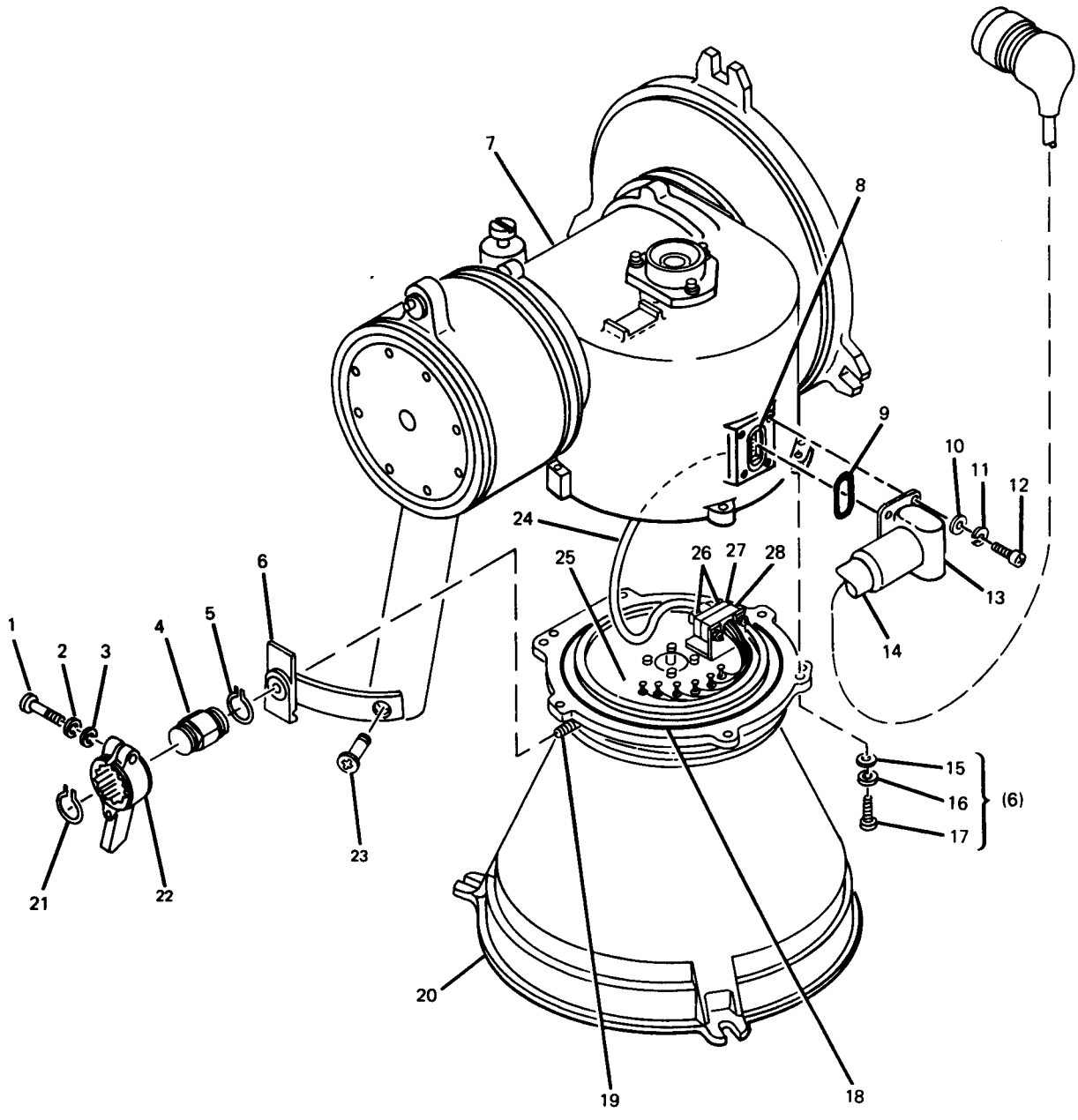
(6) While bringing together the elevation gimbal assembly (7) and base (20) coil cable (24) around edge of terminal board TB1 (25).

(7) Coat six screws (17) with sealing compound (33, Table B-1).

(8) Install six screws (17), lockwashes (16) and flat washers (15). Tighten with fingers.

(9) Insure that gimbal brake knob (22) will hold and release brake within range of movement.

(10) Tighten six screws (17).



LEGEND:

1.	SCREW	10.	FLAT WASHER	19.	STUD
2.	LOCKWASHER	11.	LOCKWASHER	20.	BASE
3.	FLAT WASHER	12.	CAP SCREW	21.	RETAINING RING
4.	GIMBAL BRAKE NUT	13.	TU CABLE ASSEMBLY CONNECTOR	22.	GIMBAL BRAKE KNOB
5.	RETAINING RING			23.	SELF–LOCKING SCREW
6.	AZIMUTH BRAKE CLAMP	14.	TU CABLE ASSEMBLY	24.	CABLE
7.	ELEVATION GIMBAL ASSEMBLY	15.	FLAT WASHER	25.	TERMINAL BOARD TB1
		16.	LOCKWASHER	26.	JACKSCREW
8.	TU CONNECTOR	17.	SCREW	27.	CONNECTOR P2
9.	PREFORMED PACKING	18.	O–RING GASKET	28.	CONNECTOR J2

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Figure 4-7. Azimuth Gimbal Assembly Parts Location

Section IV. REPAIR OF VEHICLE CABLE AND EMI FILTER

4-44. GENERAL

This section contains repair procedures for the vehicle cable and EMI Filter. The tools, equipment, and materials required to perform these procedures are contained in Table B-1 and in the Laser Systems Field Maintenance Tool Kit (NSN 5180-01-048-8570). The time required for each repair task is listed in the Maintenance Allocation Chart found in TM 9-1260-477-12.

4-45. INDUCTOR L1 OR L2 REPLACEMENT

a. Removal (Figure 4-8).

(1) Remove 12 screws (1), lockwashers (2), and flat washers (3).

(2) Remove cover (26) and check condition of gasket (25). If replacement is indicated, proceed to step 3; otherwise proceed to step 7.

(3) Disconnect connector P1 (6) from connector (8).

(4) Remove connector nut (7).

(5) Remove EMI filter connector 2J1 (8) from back side of cover (26).

(6) Remove gasket (25) from cover (26) and discard

(7) Tag and unsolder inductor wires at terminals E19 and E23 for L1 (see Figure 4-9) or E9 and E11 for L2.

(8) Remove four screws (15), lockwashers (16), and flat washers (17) from inductor L1 (18) or L2 (19).

(9) Remove inductor L1 (18) or L2 (19).

b. Installation (Figure 4-8).

(1) Install inductor L1 (18) or L2 (19).

(2) Install four screws (15), lockwashers (16), and flat washers (17). Torque screws 5 to 6 inch-pounds.

(3) Solder inductor wires to terminals E19 and E23 for L1 (see Figure 4-9) or E9 and E11 for L2.

(4) If the gasket (25) was removed from the cover (26), proceed to step 5; otherwise proceed to step 8.

(5) Cement new gasket (25) to cover (26) using primer and adhesive.

(6) Install EMI filter connector 2J1 (8) from back side of cover (26).

(7) Install connector nut (7).

(8) Install cover (26).

(9) Install 12 screws (1), lockwashers (2), and flat washers (3). Torque screws 5 to 6 inch-pounds.

4-46. TERMINAL BOARD REPLACEMENT

a. Removal (Figure 4-8).

(1) Remove cover and gasket (if required) per steps 1 thru 6 of paragraph 4-45a.

(2) Tag and remove all wires connected to terminal board (10).

(3) Remove four screws (24), lockwashers (23), flat washers (22), spacers (21), and one solder lug (9).

(4) Remove terminal board (10).

b. Installation (Figure 4-9).

(1) Install terminal board (10).

(2) Install four screws (24), lockwashers (23), flat washers (22), spacers (21), and solder lug (9).

(3) Solder wires to terminal board (10).

(4) Install cover and new gasket (if required) per steps 4 thru 9 of paragraph 4-45b.

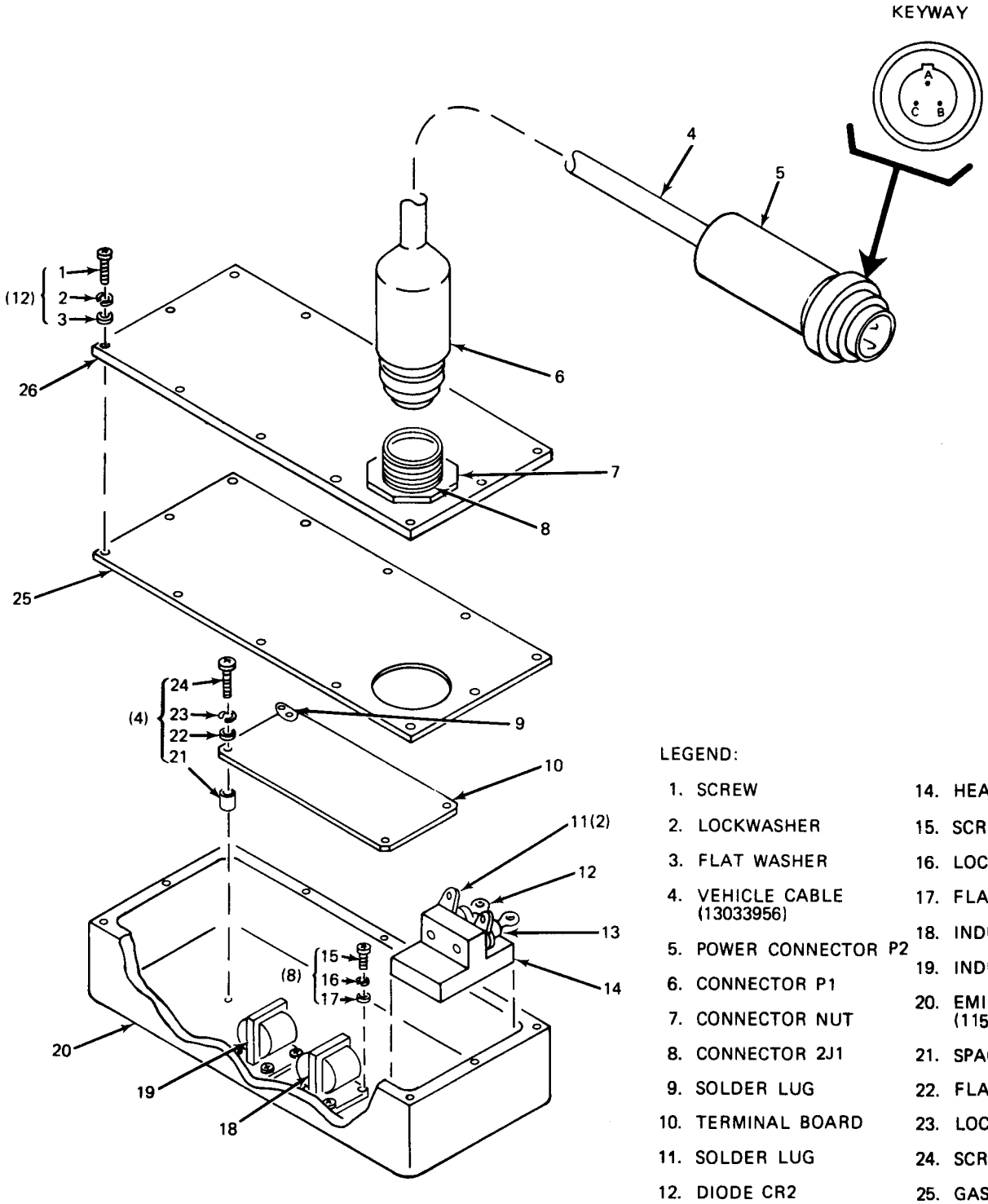
4-47. EMI FILTER CONNECTOR 2J1 REPLACEMENT

a. Removal (Figure 4-8).

(1) Disconnect connector P1 (6) from connector 2J1 (8).

(2) Remove cover and gasket (if required) per steps 1 thru 6 of paragraph 4-45a.

(3) Remove connector nut (7).



LEGEND:

1. SCREW
2. LOCKWASHER
3. FLAT WASHER
4. VEHICLE CABLE (13033956)
5. POWER CONNECTOR P2
6. CONNECTOR P1
7. CONNECTOR NUT
8. CONNECTOR 2J1
9. SOLDER LUG
10. TERMINAL BOARD
11. SOLDER LUG
12. DIODE CR2
13. DIODE CR1
14. HEAT SINK
15. SCREW
16. LOCKWASHER
17. FLAT WASHER
18. INDUCTOR L1
19. INDUCTOR L2
20. EMI FILTER (11559640)
21. SPACER
22. FLAT WASHER
23. LOCKWASHER
24. SCREW
25. GASKET
26. COVER

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Figure 4-8. Vehicle Cable/EMI Filter Parts Location

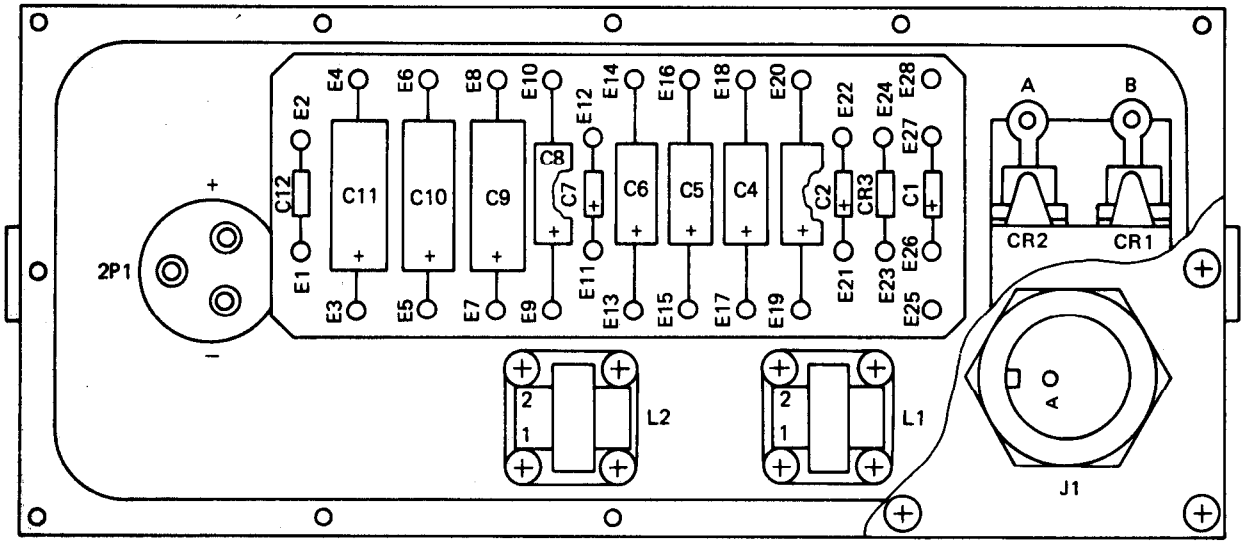


Figure 4-9. EMI Filter Parts Location

(4) Remove EMI filter connector 2J1 (8) from back side of cover (26).

(5) Tag and unsolder wires connected to 2J1 (8).

b. Installation (Figure 4-9).

(1) Solder wires to EMI filter connector 2J1 (8).

(2) If the gasket (25) was removed from the cover (26), perform steps 5 thru 9 of paragraph 4-45b. If the gasket was not removed, perform steps 8 and 9 of paragraph 4-45b.

4-48. DIODE CR1 OR CR2 REPLACEMENT

a. Removal (Figure 4-8).

(1) Remove cover and gasket (if required) per steps 1 thru 6 of paragraph 4-45a.

(2) Tag and unsolder leads to CR1 (13) and/or CR2 (12).

(3) Unscrew diode CR1 (13) and/or CR2 (12) from heat sink (14).

b. Installation (Figure 4-8).

(1) Seal threads of CR1 (13) and or CR2 (12) using sealing compound, (33, Table B-1).

(2) Install solder lug(s) (11), CR1 (13), and/or CR2 (12) in heat sink (14).

(3) Position solder lug(s) (11) approximately as shown in Figure 4-8.

(4) Solder wires to CR1 (13) and/or CR2 (12).

(5) Install cover and new gasket (if required) per steps 4 thru 9 of paragraph 4-45b.

4-49. VEHICLE CABLE REPAIR

a. Removal (Figure 4-8).

(1) Disconnect connector P1 (6) from connector 2J1 (8).

(2) Remove outer shell from power conector P2 (5).

(3) Unsolder leads and remove power connector P2 (5) from cable (4).

b. Installation (Figure 4-8).

(1) Install power connector P2 (5) on cable (4).

(2) Solder three leads as shown in diagram.

(3) Replace outer shell on power connector P2 (5).

(4) Install connector P1 (6) on connector 2J1 (8).

4-50. CAPACITOR C1, C2, OR DIODE CR3 REPLACEMENT

a. Removal (Figure 4-8).

(1) Remove terminal board per paragraph 4-46, a.

(2) Tag and unsolder wires at terminals E26 and E27 for C1 or E21 and E22 for C2 or E23 and E24 for CR3.

(3) Remove C1 or C2 or CR3.

b. Installation (Figure 4-9).

(1) Install C1 or C2 or CR3.

(2) Solder wires to terminals E26 and E27 for C1 or E21 and E22 for C2 or E23 and E24 for CR3.

(3) Install terminal board per paragraph 4-46, b.

Section V, including paragraphs 4-51, 4-52, 4-53 and 4-54 and Figure 4-10 is deleted.

Section III. REPAIR OF ATTENUATOR FILTER AND NIGHT SIGHT MOUNT

4-55. GENERAL

This section contains repair procedure for the attenuator filter and the night sight mount. The tools, equipment, and materials required to perform these tasks are contained in Table B-1 and the Laser Systems Field Maintenance Tool Kit (NSN 5180-01-048-8570).

4-56. ATTENUATOR FILTER REPAIR

a. Removal (Figure 4-11).

(1) Remove lanyard (1) from filter housing (2).

(2) Remove switch cover (3) from lanyard (1).

b. Installation (Figure 4-11).

(1) Attach lanyard (1) to filter housing (2).

(2) Attach switch cover (3) to lanyard (1).

4-57. NIGHT SIGHT MOUNT REPAIR

a. Removal (Figure 4-12).

(1) Locate the part to be removed as shown in Figure 4-12.

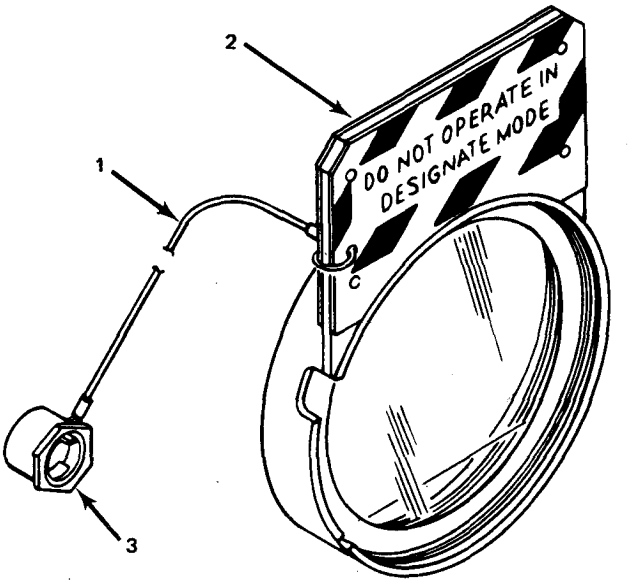
(2) Disconnect the attached items from the part being removed.

b. Installation (Figure 4-12).

(1) Install each part to be replaced with attaching hardware shown in Figure 4-12.

(2) If knob assembly is replaced install setscrew on knob assembly with setscrew on flat side of screw (1). Seal threads of setscrew using sealant (32, Table B-1) and primer (46, Table B-1).

(3) If wire rope or support bar is replaced seal screw threads using sealant (45, Table B-1) and primer (46, Table B-1).



LEGEND

1. LANYARD
2. FILTER HOUSING
3. SWITCH COVER

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Figure 4-11. Attenuator Filter Parts Location

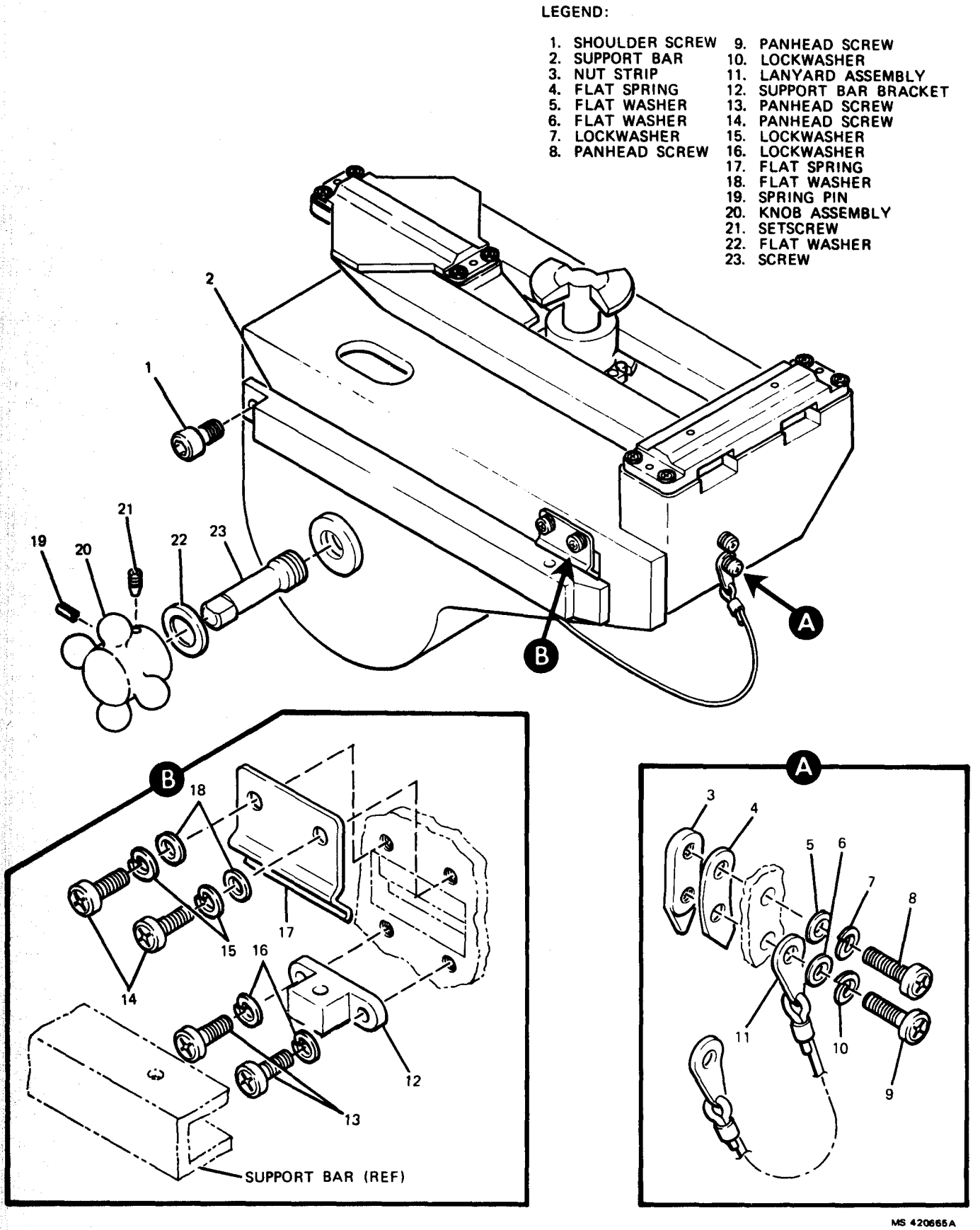


Figure 4-12. Night Sight Mount Parts Location

Section VII. REPAIR OF VEHICLE ADAPTER KIT

4-58. GENERAL

This section contains repair procedures for the M113A1 Vehicle Adapter Assembly. The tools, equipment, and materials required to perform these procedures are contained in Table B-1 and in the Laser Systems Field Maintenance Tool Kit (NSN 5180-01-048-8570). The time required for each repair task is listed in the Maintenance Allocation Chart found in TM 9-1260-477-12.

4-59. LD/R REPLACEMENT

a. Removal (Figure 4-13). Loosen 3 swing bolts (1), disconnect interface cable (4), and lift LD/R (2) off of TU (3). Stow in case.

b. Installation (Figure 4-13). Engage interface bosses on TU and LD/R. Rotate 3 swing bolts (1) into TU notches and tighten cw.

4-60. TU REPLACEMENT

a. Removal (Figure 4-13). Loosen 3 swing bolts (5) and lift TU (3) off Vehicle Adapter Assembly (6). Mount TU on tripod and stow in protective case.

b. Installation (Figure 4-13). Place TU (3) on Vehicle Adapter Assembly (6). Rotate 3 swing bolts (5) into TU notches and tighten cw.

4-61. VEHICLE ADAPTER ASSEMBLY REPLACEMENT

a. Removal (Figure 4-13).

(1) Push travel lockpin (14) into lower latch securing hole (15).

(2) Pull latch (16) back ccw to open position.

(3) Push securing lever (12) cw to release position against stop pin (13).

(4) Remove pintle locking pin (11) from pintle locking hole (10).

(5) Lift Vehicle Adapter Assembly (6) up out of holding chamber (9). Remove Vehicle Adapter Assembly to a suitable work table for further disassembly.

b. Installation (Figure 4-13).

(1) Insert pintle of Vehicle Adapter Assembly (6) into holding chamber (9).

(2) Push pintle locking pin (11) into pintle locking hole (10).

(3) Push securing lever (12) ccw to holding position against stop pin (8).

(4) Push latch (16) back cw to closed position.

(5) Remove travel lockpin (14) from lower latch securing hole (15).

4-62. PINTLE REPLACEMENT

a. Removal (Figure 4-14).

(1) Remove LD/R, TU, and Vehicle Adapter Assembly per paragraphs 4-59, 4-60, and 4-61.

(2) Remove screw (22) and washer (21).

(3) Slide pintle (20) off support ball shaft (28).

b. Installation (Figure 4-14).

(1) Slide pintle (20) onto support ball shaft (28).

(2) Replace screw (22) and washer (21).

(3) Install Vehicle Adapter Assembly per paragraph 4-61, TU per paragraph 4-60, and LD/R per paragraph 4-59.

4-63. SWING BOLT ASSEMBLY REPLACEMENT

a. Removal (Figure 4-14).

(1) Remove LD/R, TU, and Vehicle Adapter Assembly per paragraphs 4-59, 4-60, and 4-61. Place Vehicle Adapter Assembly on a suitable work table.

(2) Remove spring pin (2). Discard.

(3) Remove swing bolt assembly (3).

b. Installation (Figure 4-14).

(1) Position swing bolt assembly.

(2) Install new spring pin (2).

(3) Install Vehicle Adapter Assembly per paragraph 4-61, TU per paragraph 4-60, and LD/R per paragraph 4-59.

4-64. ADJUSTING SCREW REPLACEMENT

a. Removal (Figure 4-14).

(1) Remove LD/R, TU, and Vehicle Adapter Assembly per paragraphs 4-59, 4-60, and 4-61. Place Vehicle Adapter Assembly on a suitable work table.

(2) Screw both locking screws (26) ccw as far as possible.

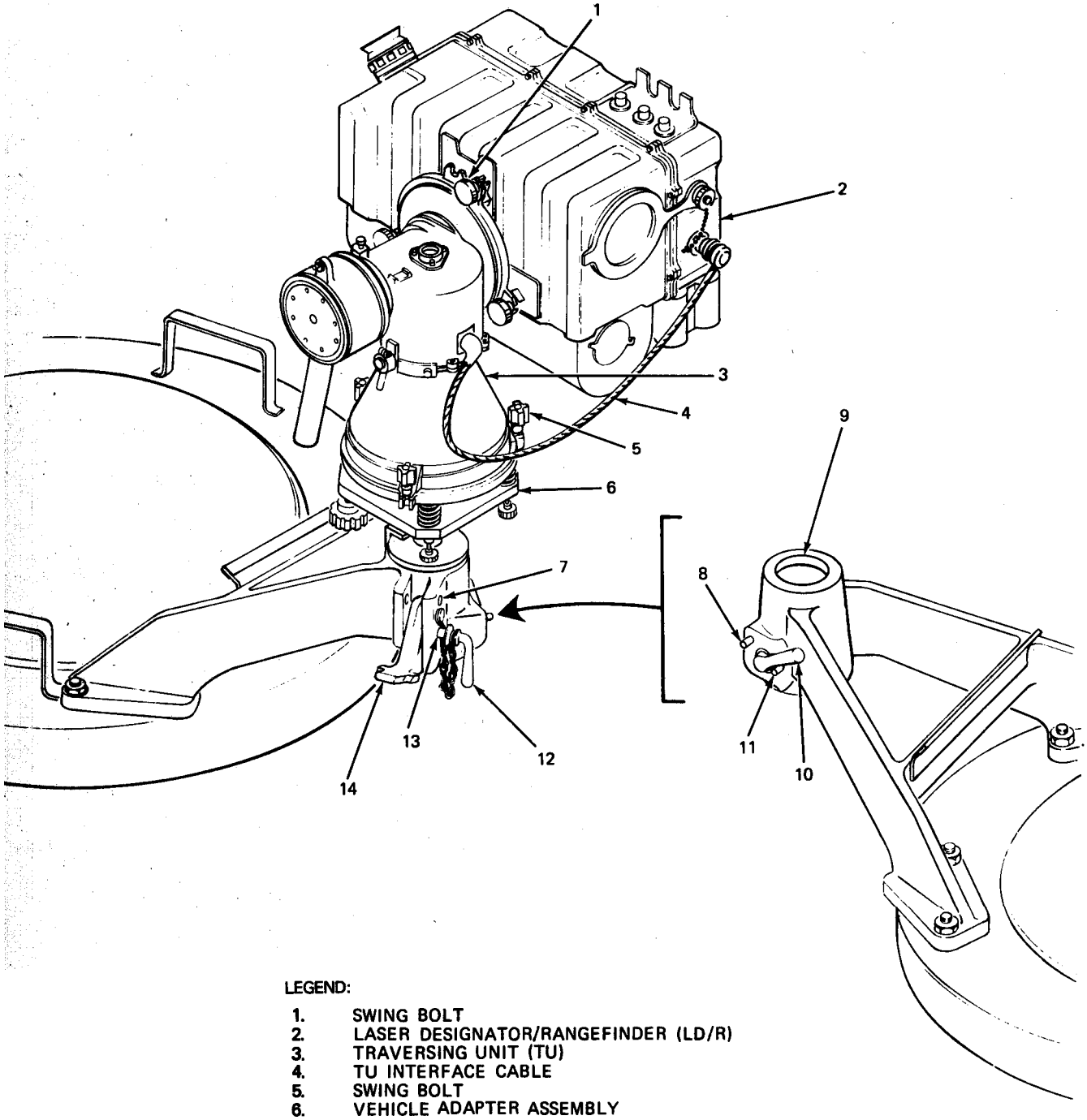
(3) Screw both adjusting screws (14) ccw as far as possible.

(4) Position three "C" clamps over upper (1) and lower (9) flanges. Use the "C" clamps to compress locking screw springs (7) to remove tension on adjusting screws (14).

(5) Drive spring pin (10) out of retainer ring (11). Rotate adjusting screw (14) ccw and remove.

b. Installation (Figure 4-14).

(1) Insert adjusting screw (14) into lower flange (9) and screw cw through flange.



LEGEND:

1. SWING BOLT
2. LASER DESIGNATOR/RANGEFINDER (LD/R)
3. TRAVERSING UNIT (TU)
4. TU INTERFACE CABLE
5. SWING BOLT
6. VEHICLE ADAPTER ASSEMBLY
7. TRAVEL LOCK SECURING HOLE, UPPER
8. STOP PIN, SECURING LEVER
9. HOLDING CHAMBER, MACHINE GUN/VEHICLE ADAPTER
10. SECURING LEVER
11. STOP PIN, SECURING LEVER
12. TRAVEL LOCK PIN
13. TRAVEL LOCK SECURING HOLE, LOWER
14. LATCH

Figure 4-13. LD/R, TU, Vehicle Adapter Kit and Machine Gun Mount Parts Location

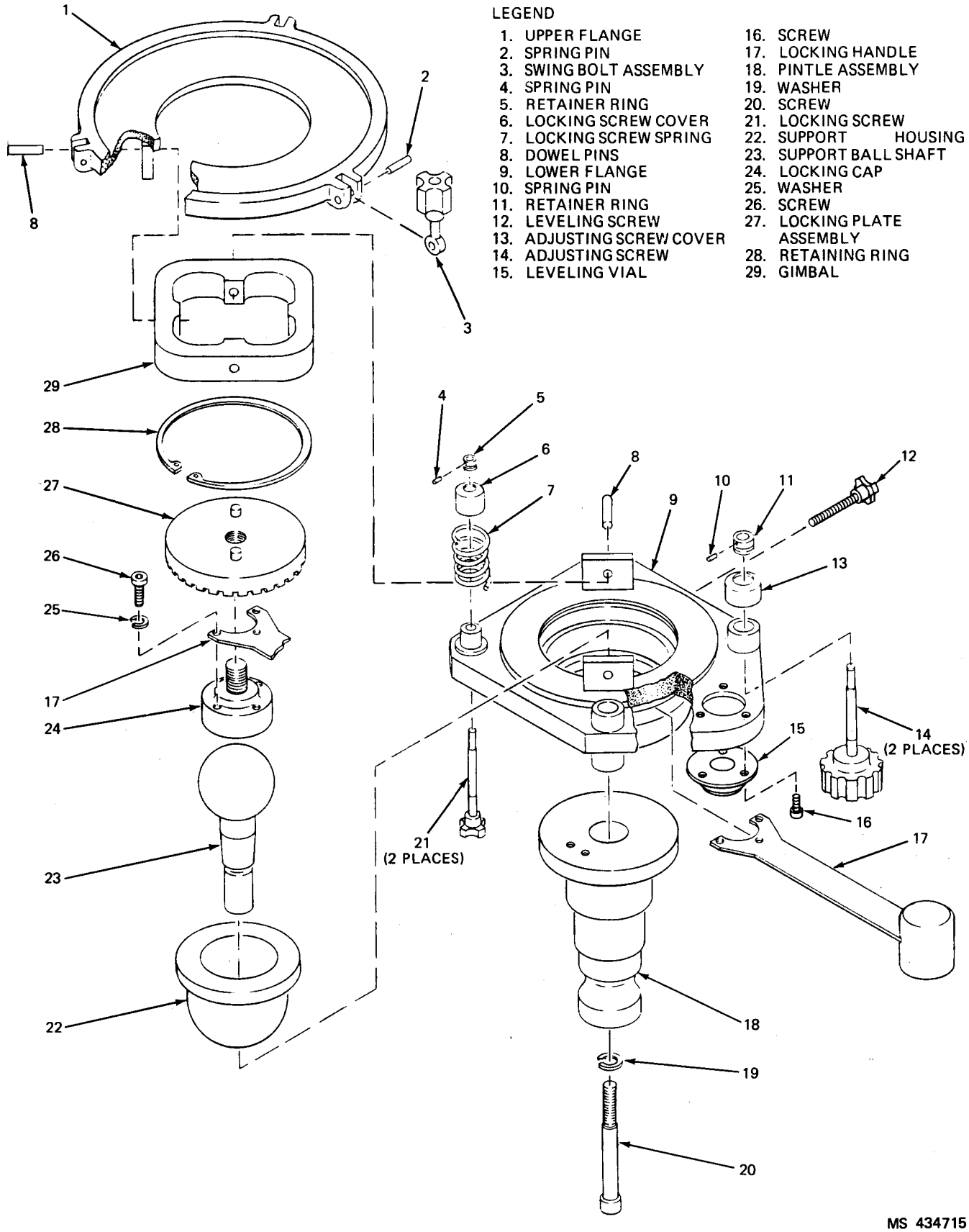


Figure 4-14. Vehicle Adapter Kit Parts Location

(2) Seat retainer ring (11) firmly in place against shoulder on adjusting screw shaft.

(3) Install new spring pin (10) thru retainer ring (11) and adjusting screw shaft (14).

(4) Install adjusting screw cover (13).

(5) Install Vehicle Adapter Assembly per paragraph 4-61, TU per paragraph 4-60, and LD/R per paragraph 4-59.

4-65. LOCKING SCREW ASSEMBLY REPLACEMENT

a. Disassemble (Figure 4-14).

(1) Remove LD/R, TU, and Vehicle Adapter Assembly per paragraphs 4-59, 4-60, and 4-61. Place Vehicle Adapter Assembly on a suitable work table.

(2) Remove both adjusting screws (14) per pararaph 4-60a.

(3) Remove upper flange (1) per paragraph 4-66a.

(4) Insert drive pin punch between spring coils. Drive spring pin (4) out of retainer ring (5). Discard spring pin (4).

(5) Remove locking screw cover (6).

(6) Rotate locking screw (21) completely ccw and remove.

b. Assembly (Figure 4-14).

(1) Insert locking screw (21) into lower flange (9) and screw cw through flange (9).

(2) Seat retainer ring (5) firmly in place against shoulder on locking screw (21) shaft.

(3) Install new spring pin (4) thru retainer ring (5) and locking screw (21) shaft.

(4) Install locking screw cover (6).

(5) Install Vehicle Adapter Assembly per paragraph 4-61, TU per paragraph 4-60, and LD/R per paragraph 4-59.

4-66. GIMBAL AND UPPER FLANGE REPLACEMENT

a. Disassembly (Figure 4-14).

(1) Remove LD/R, TU, and Vehicle Adapter Assembly, paragraphs 4-59, 4-60, and 4-61.

(2) Rotate two adjusting screws (14) and two locklng screws (26) fully ccw.

(3) Position three "C" clamps over upper (1) and lower (9) flanges. Adjust clamps as required to relieve locking screw spring (7) tension on dowel pins (8) Remove four dowel pins (8) by driving in toward open center of gimbal (29). Retain dowel pins (8).

(4) Remove gimbal (29) and upper flange (l).

b. Assembly (Figure 4-14).

(1) Position gimbal (29) in lower flange (9).

(2) Install two dowel pins (8) through open center of gimbal to attach gimbal to lower flange (9).

(3) Position upper flange (1) around gimbal. Position locking screw springs (7).

(4) Position three "C" clamps over upper (1) and lower (9) flanges. Adjust clamps as required to compress locking screw springs (7) and align dowel pin (8) holes on gimbal (29) and upper flange.

(5) Install two dowel pins (8) through open center of gimbal to attach upper flange (1) to gimbal (29). Remove "C" clamps.

(6) Install Vehicle Adapter Assembly per paragraph 4-61, TU per paragraph 4-60, and LD/R per paragraph 4-59.

4-67. LOCKING CAP, SUPPORT BALL, LOCKING HANDLE, AND LOCKING PLATE REPLACEMENT

a. Disassembly (Figure 4-14).

(1) Remove LD/R, TU, and Vehicle Adapter Assembly per paragraphs 4-59, 4-60 and 4-61.

(2) Remove gimbal (29) and upper flange (1) per paragraph 4-66.

(3) Withdraw leveling screw (12) ccw 0.5 inches to unlock-locking plate assembly (27).

(4) Remove retaining ring (28).

(5) Remove locking plate assembly (27) by rotating ccw.

(6) Remove locking handle (17) on locking cap (24) by removing three screws (26) and washers (25).

(7) Remove locking cap (24).

(8) Remove pintle per paragraph 4-62a. Withdraw support ball shaft (23) and support housing (22) thru lower flange (9).

b. Assembly (Figure 4-14).

(1) Position support housing (22) on ball support shaft (23).

(2) Position support housing (22) and support ball shaft (23) in lower flange (9). Attach pintle per paragraph 4-62b.

(3) Position locking cap (24) on support ball (23).

(4) Insert locking handle (17) thru the slot in lower flange (9).

(5) Attach locking handle (17) to locking cap (29) with three screws (31) and washers (30).

(6) Position locking plate assembly (27) with radial grooves down on locking cap (24) by inserting threaded portion of locking cap into threaded center hole in locking plate.

(7) Rotate locking plate assembly (27) fully cw to attach.

(8) Install retaining ring (28) with rounded edges up.

(9) Rotate locking plate assembly fully cw against retaining ring (28).

(10) Turn leveling screw (12) fully cw.

(11) Assemble gimbal (29) and upper flange (1) per paragraph 4-66b.

(12) Install Vehicle Adapter Assembly per paragraph 4-61, TU per paragraph 4-60, and LD/R per paragraph 4-59.

Section VIII. REPAIR OF VEHICLE POWER CABLE, VPC, STOWAGE MOUNT, AND BRUSH GUARD

4-68. GENERAL

a. This section contains repair procedures for the M113A1 vehicle power cable, VPC (Vehicle Power Conditioner), machine gun stowage mount, and brush guard. The tools, equipment, and materials required to perform these procedures are contained in Table B-1 and in the Laser Systems Field Maintenance Tool Kit (NSN 51 80-01-048-8570). The times required to perform the repair tasks are contained in the Maintenance Allocation Chart found in TM 9-1260-477-12.

4.69. VEHICLE POWER CABLE REPLACEMENT

a. Removal (Figure FO-1).

(1) Disconnect LD/R and other power using devices from vehicle power cable (13).

(2) Remove four terminal attachments from vehicle battery terminals inside battery box (17).

(3) Remove eight screws (4), eight lockwashers (5), eight flat washers (6), and eight hex nuts (7).

(4) Remove clamps (21).

(5) Remove vehicle power cables (13) from clamps (21).

(6) Remove screw (9), flat washer (10) lockwasher (11), and nut (12) from ground bracket (24).

b. Installation (Figure FO-1).

(1) Position vehicle power cable (13).

(2) Install eight screws (4), eight lockwashers (5), eight flat washers (6), and eight hex nuts (7).

(3) Install terminal attachments to vehicle battery terminals inside battery box (17).

(4) Place clamps (21) over vehicle power cable (13).

(5) Install clamps (21).

(6) Install screw (9), flat washer (10), lockwasher (11), and nut (12) on ground bracket (24).

4-70. VPC REPLACEMENT

a. Removal (Figure FO-1).

(1) Disconnect night sight and other power using devices from VPC (18).

(2) Remove four screws (14), four flat washers, (15), and four inserts (16).

(3) Remove VPC (18).

b. Installation (Figure FO-1).

(1) Position VPC (18).

(2) Install four screws (14), four flat washers (15), and four inserts (16).

4-71. MACHINE GUN STOWAGE MOUNT REPLACEMENT

a. Removal (Figure 4-15).

(1) Remove four hex head cap screws (1) and flat washers (2).

(2) Remove stowage mount (3).

b. Installation (Figure 4-15).

(1) Position stowage mount (3).

(2) Install four hex head cap screws (1) and four flat washers (2). Torque screws 21 to 23 foot-pounds.

4-72. BRUSH GUARD REPLACEMENT

a. Removal (Figure 4-15).

(1) Remove one eyebolt (6), two hex head cap screws (4), and three flat washers (5) and (7).

(2) Remove brush guard (8).

b. Installation (Figure 4-15).

(1) Position brush guard (8).

(2) Install one eye bolt (6), two hex head cap screws (4), and three flat washers (5) and (7).

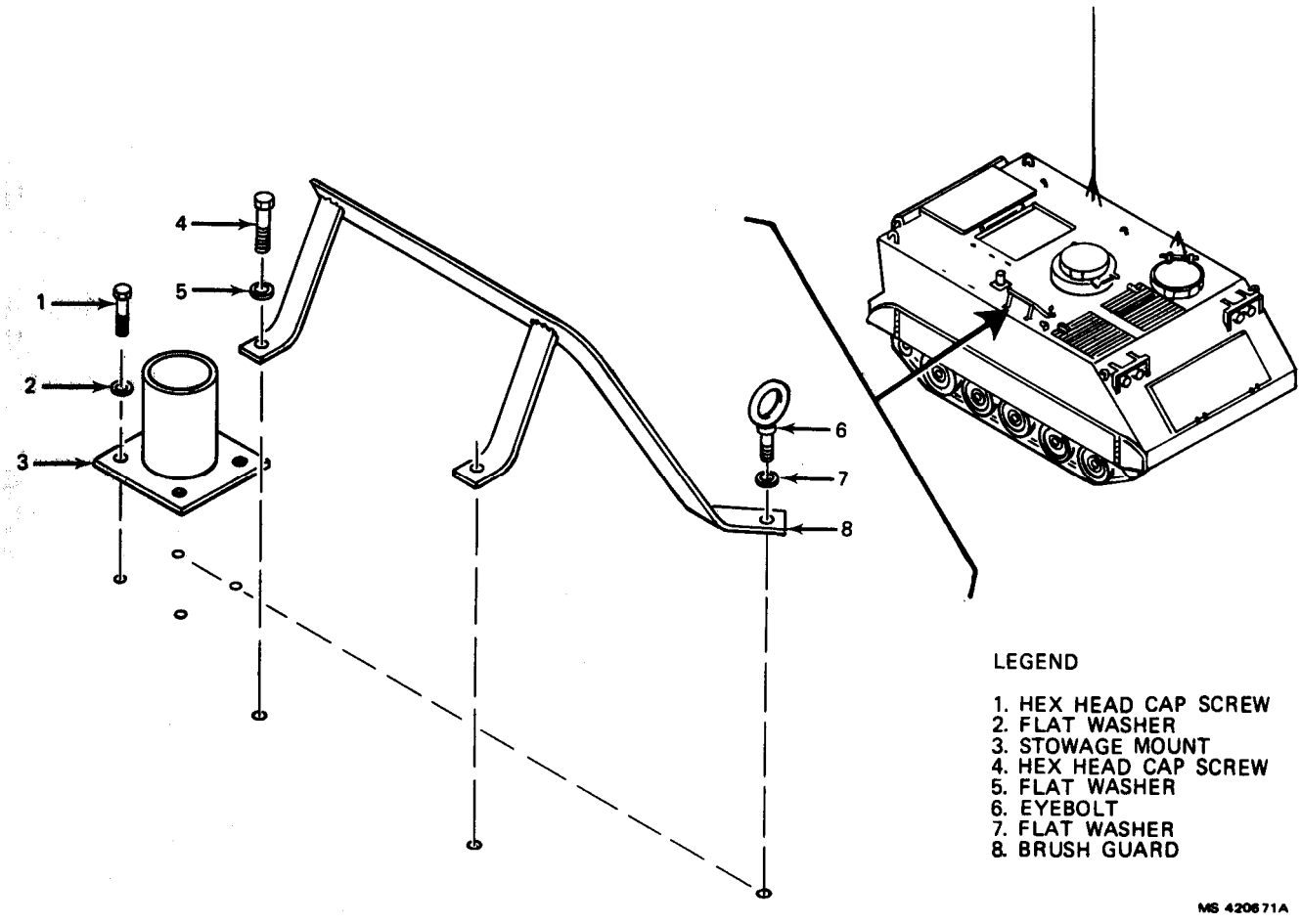


Figure 4-15. .50 Cal Machine Gun Stowage Mount and Brush Guard Parts Location

APPENDIX A
REFERENCES

A-B1. GENERALL

Applicable publication indexes should be consulted frequently for latest changes or revisions to the publications listed in this appendix, and for new publications relating to the material covered in this manual.

A-2. PUBLICATIONS INDEXES

Index of Administrative Publication ..... DA PAM 310-1

Index of Army Motion Pictures, Television Recordings, and Film Strips ..... DA PAM 108-1

Index of Blank Forms ..... DA PAM 310-2

Index of Doctrinal, Training and Organizational Publications ..... DA PAM 310-3

Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders ..... DA PAM 310-4

Index of Modification Work Orders ..... DA PAM 310-7

A-3. TECHNICAL MANUALS

Administrative Storage of Equipment ..... TM 740-90-1

Direct and General Support Maintenance Manual Battery Charger; PP-7286 ..... TM 11-6130-392-34

Direct Support and Maintenance Manual for M113A1, M577A1, M106A1, M125A1, M132A1, M741, XM806E1 ..... TM 9-2300-257-34

Operator Manual for M113A1, M577A1, M106A1, M125A1, M132A1, XM806E1 ..... TM 9-2300-257-10

Operator, Organizational Direct and General Support Maintenance Manual for Target Designator Set, Electro-optical AN/TVQ-2 (G/VLLD) Trainer Set ..... TM 9-6940-477-14

Operator and Organizational Maintenance Manual, Battery Charger; ..... TM 11-6130-392-12

Operator and Organizational Maintenance Manual for Target Designator Set, Electro-optical AN/TVQ-2 (G/VLLD) ..... TM 9-1260-477-12

Operator/Organizational and Direct Support Maintenance Manual Including RPSTL for DIGITAL MESSAGE DEVICE (DMD)AN/PSG-2 ..... TM11-7440-281-13+P

Operator, Organizational, Direct Support and General Support Maintenance Manual for Target Designator Set, Electro-Optical AN/TVQ-2 (G/VLLD) Ground Support Equipment ..... TM 9-4931-477-14

Organizational, Direct Support, and General Support Maintenance RPSTL for Target Designator Set, Electro-Optical AN/TVQ-2 ..... TM 9-1260-477-24P

Technical Bulletin for Direct Support and General Support Maintenance Manual, Target Designator Set, Electro-optical AN/TVQ-2 (G/VLLD) ..... TB 9-1260-477-34(C)

The Army Maintenance Management System (TAMMS) ..... TM 38-750

A-4. FORMS

In addition to the forms required by TM 38-750, the following forms pertain to this material:

Recommended Changes to DA Technical Manuals, Parts List or Supply Manual 7, 8, or 9 ..... DA Form 2028

Report of Damaged or Improper Shipment ..... DD Form 6

Quality Deficiency Report ..... SF 368

Equipment Maintenance Log ..... DA Form 2409

A-5. OTHER PUBLICATIONS

Accident Reporting and Records ..... AR 385-40

Army Safety Program ..... AR 385-10

Chemical, Biological, and Radiological (CBR) Decontamination	TB 3-220
Control of Health Hazards from Laser Radiation	TB MED 279
First Afd for Soldiers	FM 21-11
Noise and Conservation of Hearing	TB MED 251
Policies and Procedures for Firing Ammuunition for Trainino, Tarqet Practice and Combat	AR 385-63
Regulations for Firing Guided Missiles and Heavy Rockets for Training, Target Practice, and Combat	AR 385-62
Safeguarding Defense Information	AR-380-5
Safeguarding Defense Information in Movement of Persons and Things	AR 385-55
Small Unit Procedures in Nuclear, Biological, and Chemical Warfare	FM 21-40

APPENDIX B
EXPENDABLE SUPPLIES AND MATERIALS LIST

B-1. SCOPE

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

B-2. EXPLANATION OF COLUMNS

a. Column 1 - Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App. D").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item.

(enter as applicable)

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

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

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

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

Table B-1. Expendable Supplies and Materials List

(1) Item No.	(2) Level	(3) NSN/PN/Specification	(4) Description	(5) U/M
1	F	7920-00-514-2417	Acid Swabbing Brush	ea
2	F	8040-00-117-8510	Adhesive	qt
3	F	8020-00-224-8025	Artists Brush	ea
4	F	MIL-I-43553	Black or White Ink	bt
5	F	MIL-A-46146, Type II	Conformal Coating	qt
6	F	QQ-W-343	Copper Wire, Type S, 18 AWG Tinned Soft	ft
7	F	QQ-W-343	Copper Wire, Type S, 22 AWG Tinned Soft	ft
8	F	7920-00-205-1711	Cotton Wiping Rags	ea
9	F	M23053-11-104-C	Electrical Sleeving	ft
10	F	M23053-11-107-C	Electrical Sleeving	ft
11	F	M23053-11-108-C	Electrical Sleeving	ft
12	F	M23053-11-113-C	Electrical Sleeving	ft
13	F	MIL-W-16878-4	Electrical Wire, E24, 19 Strands, Teflon Insulated, Color Black	ft
14	F	MIL-W-16878-4	Electrical Wire, E-16, 19 Strands, Teflon Insulated, Color White	ft
15	F	MIL-W-16878-4	Electrical Wire, E20, 19 Strands, Teflon Insulated, Color White	ft
16	F	MIL-W-16878-4	Electrical Wire, E24, 19 Strands, Teflon Insulated, Color White	ft
17	F	MIL-E-52798	Forest Green Enamel	qt
18	F	NSNL	Gloves or Finger Cots	st
19	F	MI L-C-675	Glycerine	gl
20	F	MIL-G-2827	Grease	qt
21	F	6505-00-514-6513	Isopropyl Alcohol	gl
22	F	NSNL	Knife X-acto 378C	ea
23	F	8030-00-149-0262	Lacing Tape, Size I	rl
24	F	6850-00-656-1820	Leak Detection Compound	bt
25	F	NSNL	Masking Tape	rl
26	F	6830-00-656-1596 6830-00-106-1469 Federal Specification BB-N-411, Type I, Grade A or B, Class I 8120-00-985-7275	Nitrogen, Technical (cylinder with gas) Nitrogen, Technical 224 cubic ft (local purchase) Cylinder, Compressed Gas	cy
27	F	NSNL	Nylon or Dacron Rags	ea

Table B-1. Expendable Supplies and Materials List (Cont)

(1) Item No.	(2) Level	(3) NSN/PN/Specification	(4) Description	(5) U/M
28	F	Braycote 601; 3L-38RP	O-ring Lubricant	qt.
29	F	MIL-STD-186, C208	Primer	qt.
30	F	8040-00-118-2695	Primer	qt.
31	F	NSNL	Sandpaper, 400 Grit	10 sh.
32	F	MIL-STD-186, C502 Grade E	Sealant	qt.
33	F	MIL-S-22473	Sealing Compound	qt.
34	F	8030-00-900-2373	Sealing Primer	qt.
35	F	3439-00-522-2625	Solder, Composition, SN-63	rl.
36	F	3439-00-255-4571	Solder Flux	2 oz.
37	F	NSNL	Staking Compound	qt.
38	F	1670-00-687-9919	Teflon Tape 1/4" wide, 2 mil	rl.
39	F	6810-00-257-2488	Solvent	bt.
40	F	Brady Stock TWM-0-49, Tape B-702	Wire Markers	st.
41	F	6901-00-584-4070	Xylene, TT-X-919	gl.
42	F	TT-P-1757; wet unthinned	Zinc Chromate	qt.
43	F	Ajax or equivalent	Detergent	ea.
44	F	MIL-I-23053/5	Shrinkable Sleeving, Class I 0.094, White	10 ft.
45	F	MIL-STD-186, C502 Grade C	Sealant	qt.
46	F	MIL-STD-186, C502 Grade N or T	Primer	qt.
47	F	MIL-STD-186, C504	Zinc Chromate	qt.

APPENDIX C
WIRING LIST

C-l. SCOPE

Table C-1 contains the wiring list for the LD/R. The wiring list contains wire interconnection data and wire size. Also included in the wiring list is the signal name for each wire when applicable.

TABLE C-1. WIRE LIST

ROM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
ONNECTOR 1J1* (ELECTRONICS ASSY)				
A	WHT	A1A1W1A1-E19	22	SHLD RTN
B	WHT	A1 A1 W1 P3-50	24	A-TRIG
C	WHT	A1 A1 W1 P1-50	24	450V SENSE-TA
D	WHT	A1 A1 W1 P3-67	24	$\overline{\text{ENERGY VALID}}$
E	WHT	A1A1W1P2-6	24	ENERGY ERROR
F	WHT	A1A1W1-E18	22	-15V-TA
G	-	A1 A1W1P1-14		SIMMER SENSE
H			24	SPARE
J	WHT	A1A1W1P3-51	24	HVPS ENABLE-TA
K	WHT	A1A1W1P3-46	24	TIMING GATE-TA
L	WHT	A1A1 W1P3-9	24	20 KHZ CLOCK-TA
M	WHT	A1A1W1P3-49	24	$\overline{\text{HVPS INHIBIT}}$
N				SPARE
P	WHT	A1A1W1P3-17	24	$\overline{\text{TOR}}$
R	WHT	A1A1W1P3-38		$\overline{\text{F/T TRIG-TA}}$
S	WHT	A1A1 W1P3-5	24	8000M-TA
T	WHT	A1A1 W1S3-1	22	FIRE REMOTE
U	WHT	A1A1W1P3-48	24	RCVR START-TA
V	WHT	A1A1W1P2-25		$\overline{\text{PFN SENSE-TA}}$
W	WHT	A1A1W1P2-7		$\overline{\text{PFN CHARGED}}$
X	WHT	A1A1W1A1-E23	22	+5V-TA
Y	WHT	A1A1W1A1-E15	22	+15V-TA
Z	WHT	A1A1W1P1-7		$\overline{\text{TPG-INHIBIT}}$
a	WHT	A1A1W1S1-9	22	BAT VOLTAGE
b	WHT	A1A1W1S3-4	22	$\overline{\text{FIRE REMOTE}}$
c	WHT	A1A1W1P3-40		$\overline{\text{HVPS ON}}$
d	WHT	A1A1W1P3-42	24	$\overline{\text{Q/S TRIG-TA}}$
e	WHT	A1A1W1P3-63	24	$\overline{\text{OVER TEMP}}$
f				SPARE
g	WHT	A1 -E22	22	RTN-TA
h				SPARE
j	WHT	A1A1W1P3-3	24	$\overline{\text{VIDEO-TA ENABLE}}$
EXTERNAL CONNECTOR FOR TEST/INTERFACE				

TABLE C-1. WIRE LIST (CONT)

FROM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
CONNECTOR: 1J2* (ELECTRONICS ASSY)				
A	WHT	A1A1W1P3-61	24	ELEVATION SIN
B	WHT	A1A1 W1 P3-21	24	RESOLVER RTN
C	WHT	A1A1 W1 P3-20	24	RESOLVER REF
D				SPARE
E	WHT	A1A1 W1 P3-26	24	AZIMUTH SIN
F	WHT	A1 A1 W1 P3-60	24	AZIMUTH COS
G	WHT	A1A1W1P3-25	24	ELEVATION COS
H	WHT	A1A1W1P3-19	24	ELEVATION 0
J				SPARE
K	WHT	A1A1 W1P3-54	24	AZIMUTH COMMON
*MATES WITH TU CABLE				
CONNECTOR: 1J3* (ELECTRONICS ASSY)				
	WHT	A1A1W1A1-E11	14	+24V RTN
*MATES WITH BATTERY CONNECTOR 2P1				
CONNECTOR: 1J4* (ELECTRONICS ASSY)				
A	BLK	A1A1W1P3-65	24	RTN-DATA LINK
B	WHT	A1A1W1P3-31	24	COMPUTER WORD
C	WHT	A1A1W1A1-E8	22	FIRE CMD
D				SPARE
E				SPARE
F				SPARE
*EXTERNAL CONNECTOR FOR TEST/DMD INTERFACE				
CONNECTOR: 1J5* (ELECTRONICS ASSY)				
	WHT	A1A1W1S1-2	14	24V
*MATES WITH BATTERY CONNECTOR 2P3				
CONNECTOR: 1J6* (ELECTRONICS ASSY)				
				NOT USED
*MATES WITH BATTERY CONNECTOR 2P2				

TABLE C-1. WIRE LIST (CONT)

FROM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
CONNECTOR: A1A1W1P1* (ELECTRONICS ASSY)				
1	WHT	A1A1W1P2-24	22	+24V FILTERED
2	WHT	A1A1W1P3-37	24	$\overline{\text{F/T TRIG}}$
3	WHT	A1A1W1P3-41	24	$\overline{\text{Q/S TRIG}}$
4	WHT	A1A1W1R1-3	22	RETICLE POWER
5	WHT	A1A1W1A1-E16	22	+15V (RCVR)
6	WHT	A1A1W1A1-E21	22	RTN (RCVR)
7	WHT	1J1-Z	24	$\overline{\text{TPG INHIBIT}}$
8	BLK	A1A1W1P1-40 (SHLD)	24	RCVR START SHLD
9	BLK	A1A1W1P1-41 (SHLD)	24	Q/S TRIG-RCVR SHLD
10	WHT	A1A1W1A1-E24	22	ENERGY CONTROL
11	WHT	A1A1W1A1-E20	22	ENERGY CONTROL RTN
12	BLK	A1A1W1P1-44 (SHLD)	24	VIDEO SHLD
13	WHT	A1A1W1P3-66	24	$\overline{\text{ENERGY VALID}}$
14	WHT	1J1-G	22	SIMMER SENSE
15	WHT	A1A1W1P2-36	24	ENERGY DIODE
16	-	-	-	SPARE
17	WHT	A1A1W1P2-56	24	$\overline{\text{TOR}}$
18	WHT	A1A1W1S2-1	24	$\overline{\text{DESIGNATE}}$
19	WHT	A1A1W1P3-23	22	+5V DISPLAY
20	WHT	A1A1W1A1-E3	22	FIRE COMMAND
21	WHT	A1A1W1P3-68	24	$\overline{\text{FAIL DISPLAY}}$

TABLE C-1. WIRE LIST (CONT)

DM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
22	WHT	A1A1W1P3-33	24	DISPLAY 4
23	WHT	A1A1W1P3-69	24	DISPLAY 1
24	WHT	A1A1W1P3-13	24	DIGIT 8
25	WHT	A1A1W1P3-15	24	DIGIT 2
26				SPARE
27	BLK	A1A1W1P1-61 (SHLD)	24	PFN VOLTAGE SHLD
28				DO NOT USE
29				DO NOT USE
30	WHT	A1A1W1A1-E4	22	+24V RTN (FANS)
31	BRN	A1A1W1P3-53	26	A-TRIG
32	WHT	A1A1 W1 A1-E21	22	RTN (HEATER)
33				SPARE
34	WHT	A1A1W1P2-23	22	
35	BLK	A1A1W1P1-2 (SHLD)	24	$\overline{\text{F/T TRIG SHIELD}}$
36	BLK	A1A1W1P1-3 (SHLD)	24	$\overline{\text{Q/S TRIG}}$ SHLD
37	WHT	A1A1W1A1-E12	22	+24V RTN (RETICLE)
38	WHT	A1A1W1A1-E24	22	+5V RCVR
39	WHT	A1A1W1A1-E17	22	-15V RCVR
40	WHT	A1A1W1P3-10	24	RCVR START
41	WHT	A1A1W1P3-11	24	Q/S TRIG-RCVR
42	WHT	A1A1 W1 A1-E16	22	+15V ENERGY CONTROL
43	WHT	A1A1W1A1-E17	22	-15V ENERGY CONTROL
44	BRN	A1A1W1P3-2	26	VIDEO
45	WHT	A1A1W1P3-64	24	$\overline{\text{OVERTEMP}}$
46	BLK	A1A1W1A1-E22	24	RTN
47	BLK	A1A1W1A1-E22	24	RTN
48	WHT	A1A1W1P3-6	24	$\overline{\text{HVPS ON}}$
49	WHT	A1A1W1A1-E15	22	+15V
50	WHT	1J1-C	24	450V SENSE-TA
51	WHT	A1A1 W1 P2-35	24	$\overline{\text{BAT LOW}}$
52	WHT	A1A1 W1 P3-59	22	RTN DISPLAY
53	WHT	A1A1W1P3-27	24	$\overline{\text{DISPLAY TEST}}$
54	WHT	A1A1 W1P3-34	24	DISPLAY 8
55	WHT	A1A1W1P3-32	24	DISPLAY 2
56	WHT	A1A1W1P3-30	24	$\overline{\text{DISPLAY INHIBIT}}$
57	WHT	A1A1W1P3-14	24	DIGIT 4
58	WHT	A1A1W1P3-16	24	DIGIT 1
59	WHT	A1A1W1P2-50	24	+15V SWITCHED
60				DO NOT USE
61	WHT	A1A1W1A3T2-19A	22	PFN VOLTAGE
62				DO NOT USE
63	WHT	A1 A1 W1 A1-TP1	22	+24V FILTERED (FANS)
64	BLK	A1A1W1P1-31 (SHLD)	24	A-TRIG SHIELD
65	WHT	A1 A1 W1 A1-E24	22	+5V (HEATER)
66				SPARE

MATES WITH A2A2W1J1, PIN NUMBERS CORRESPOND

TABLE C-1. WIRE LIST (CONT)

FROM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
CONNECTOR: A1A1W1P2* (ELECTRONICS ASSY)				
1				SPARE
2	-			SPARE
3				SPARE
4	-			SPARE
5	-			SPARE
6	WHT	1J1-E	24	ENERGY ERROR - TA
7	WHT	1J1-W	24	PFN CHARGED
8				SPARE
9	WHT	A1A1W1P3-12	24	Q/S TRIG
10	WHT	A1A1 W1P4-10	24	20 KHZ CLOCK
11	WHT	A1A1W1P3-39	24	$\overline{\text{HVPS ON}}$
12	WHT	A1A1W1A1-E15	22	+15V
13	WHT	A1A1W1A1-E18	22	-15V
14	WHT	A1A1 W1A4T1 -8	24	ØB START DRIVE
15	WHT	A1A1W1A4T1-9	24	$\overline{\text{ØB DRIVE ON}}$
16	WHT	A1A1W1A4T1-12	24	ØB DRIVE RTN
17	WHT	A1A1 W1A4T1-7	24	$\overline{\text{ØB DRIVE OFF}}$
18				SPARE
19	WHT	A1A1W1A3T1-8	24	ØA START DRIVE
20	WHT	A1A1W1A3T1-9	24	$\overline{\text{ØA DRIVE ON}}$
21	WHT	A1A1W1A3T1-12	24	ØA DRIVE RTN
22	WHT	A1A1W1A3T1-7	24	$\overline{\text{ØA DRIVE OFF}}$
23	WHT	A1A1W1P1-34	22	EVENTS COUNTER DRIVE
24	WHT	A1A1W1P1-1	22	EVENTS COUNTER
25	WHT	1J1-V	24	PFN SENSE-TA
26	WHT	A1A1W1A1-E6	22	PRE-REGULATOR DRIVE
27	-			NO CONN
28	WHT	A1 A1W1 P3-44	24	SPARE
29				SPARE
30				SPARE
31				SPARE
32				SPARE
33	-			SPARE
34				SPARE
35	WHT	A1 A1W1P1-51	24	$\overline{\text{BATT LOW}}$
36	WHT	A1A1W1P1-15	24	ENERGY ERROR
37	-			SPARE
38	-			SPARE
39	-			SPARE
40	WHT	A1A1W1A4T1-11	24	ØB CURRENT SENSE

TABLE C-1. WIRE LIST (CONT)

FROM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
41	BLK	A1 A1 W1 A4T2-20B	24	ØB CURRENT SENSE RTN
42	BLK	A1A1W1P2-40, -41 (SHLD)	24	ØB CURRENT SENSE SHLD
43	WHT	A1 A1 W1 A1-E23	22	+5V
44	WHT	A1A1W1A1-E19	22	RTN
45	WHT	A1A1W1A3T2-21A	24	PFN SENSE
46	BLK	A1A1W1A3T2-20B	24	ØA CURRENT SENSE-TA
47	BLK	A1A1W1P2-46, -48 (SHLD)	24	ØA CURRENT SENSE-SHLD
48	WHT	A1A1W1A3T1 -11	24	ØA CURRENT SENSE
49				SPARE
50	WHT	A1A1W1P1-59	24	+15V SWITCHED
51	WHT	A1A1W1A1-E12	22	+24V RTN
52	WHT	A1A1W1A2T1-18	24	LVPS CURRENT SENSE
53	WHT	A1A1W1A2T1-13	24	+15V SENSE
54	WHT	A1A1W1A1-E10	22	+24V FILTERED
55	WHT	A1A1W1A4T2-21A	24	PFN SENSE-TA
56	WHT	A1A1W1P1-17	24	$\overline{\text{TOR}}$
57	WHT	A1A1W1P3-52	24	$\overline{\text{TOR}}$
58				SPARE
59				SPARE
60				SPARE
* CONNECTED DIRECTLY TO A1A1 COMPONENT				
CONNECTOR: A1A1W1P3* (ELECTRONICS ASSY)				
1	BLK	A1A1W1P3-2 (SHLD)	24	VIDEO SHLD
2	BRN	A1A1W1P1-44	26	VIDEO
3	WHT	1J1-j	24	$\overline{\text{VIDEO-TA ENABLE}}$
4	WHT	A1 A1 W1 S3-4	22	ZERO
5	WHT	1J1-S	24	8000M-TA
6	WHT	A1A1W1P1-48	24	$\overline{\text{HVPS ON}}$
7	WHT	A1A1W1A1-E17	22	-15V
8	WHT	A1A1W1S2-5	22	$\overline{\text{RNG}}$/DES/AZ ADJ
9	WHT	1J1-L	24	20KHz CLK-TA
10	WHT	A1A1W1P1-40	24	RCVR START
11	WHT	A1A1 W1 P1-41	24	Q/S TRIG RCVR
12	WHT	A1A1W1P2-9	24	Q/S TRIG
13	WHT	A1A1W1P1-24	24	DIGIT 8
14	WHT	A1A1W1P1-57	24	DIGIT 4
15	WHT	A1A1W1P1-25	24	DIGIT 2
16	WHT	A1A1W1P1-58	24	DIGIT 1
17	WHT	1J1-P	24	$\overline{\text{TOR}}$
18	WHT	A1 A1W1R2-2	22	DISPLAY BRIGHT
19	WHT	1J2-H	24	EL COM
20	WHT	1 J2-C	24	RESOLVER REF

TABLE C-1. WIRE LIST (CONT)

FROM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
21	WHT	1J2-B	24	RESOLVER RTN
22	WHT	A1A1W1A1-E16	22	+15V
23	WHT	A1A1W1P1-19	22	+5V (DISPLAY)
24	WHT	A1 A1 W1 A1-E25	22	+5V
25	WHT	1J2-G	24	EL COS
26	WHT	1J2-E	24	AZ SIN
27	WHT	A1A1W1 P1 -53	24	$\overline{\text{DISPLAY TEST}}$
28	WHT	A1A1W1S2-4	22	RANGE/DES
29				SPARE
30	WHT	A1 A1 W1 P1 -56	24	$\overline{\text{DISPLAY INHIBIT}}$
31	WHT	1J4-B	24	COMPUTER WORD
32	WHT	A1A1 W1 P1 -55	24	DISPLAY 2
33	WHT	A1A1 W1 P1 -22	24	DISPLAY 4
34	WHT	A1A1 W1 P1-54	24	DISPLAY 8
35				SPARE
36	BLK	A1A1W1P3-37 (SHLD)	24	$\overline{\text{F/T TRIG}}$ SHLD
37	WHT	A1A1W1P1-2	24	$\overline{\text{F/T TRIG}}$
38	WHT	1J1-R	24	$\overline{\text{F/T TRIG-TA}}$
39	WHT	A1A1W1P2-11	24	$\overline{\text{HVPS ON}}$
40	WHT	1J1-c	24	$\overline{\text{HVPS ON}}$
41	WHT	A1A1W1P1-3	24	$\overline{\text{Q/S TRIG}}$
42	WHT	1J1-d	24	$\overline{\text{Q/S TRIG-TA}}$
43	BLK	A1A1W1P3-41 (SHLD)	24	$\overline{\text{Q/S TRIG}}$-SHLD
44	WHT	A1A1W1P2-28	24	EVENTS COUNT
45	BLK	A1A1W1P3-10 (SHLD)	24	RCVR START SHLD
46	WHT	1J1-K	24	TIMING GATE - TA
47	BLK	A1A1W1P3-11 (SHLD)	24	Q/S TRIG - RCVR SHLD
48	WHT	1J1-U	24	RCVR START-TA
49	WHT	1J1-M	24	$\overline{\text{HVPS INHIBIT}}$
50	WHT	1J1-B	24	A-TRIG-TA
51	WHT	1J1-J	24	HVPS ENABLE-TA
52	WHT	A1A1W1P2-57	24	$\overline{\text{TOR}}$
53	BRN	A1A1W1P1-31	26	A TRIG
54	WHT	1J2-K	24	AZ COM
55	BLK	A1A1W1P3-53 (SHLD)	24	A TRIG SHLD
56	WHT	A1A1W1A1-E20	22	RTN
57				SPARE
58	WHT	A1A1W1R2-3	22	DISPLAY BRIGHT +5V
59	WHT	A1A1W1P1-52	22	RTN (DISPLAY)
60	WHT	1J2-F	24	AZ COS
61	WHT	1 J2-A	24	EL SIN
62	WHT	A1A1W1A1-E29	22	$\overline{\text{DISPLAY}}$/TEST
63	WHT	1J1-e	24	$\overline{\text{OVERTEMP}}$
64	WHT	A1A1W1 P1 -4!	24	$\overline{\text{OVERTEMP}}$
65	BLK	A1A1W1P3-3' (SHLD)	24	RTN-DATA LINK

TABLE C-1. WIRE LIST (CONT)

ROM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
66	WHT	A1A1W1P1-13	24	$\overline{\text{ENERGY VALID}}$
67	WHT	1J1-D	24	$\overline{\text{ENERGY VALID}}$-TA
68	WHT	A1A1W1P1-21	24	$\overline{\text{FAIL DISPLAY}}$
69	WHT	A1A1W1P1-23	24	DISPLAY 1
70				SPARE
CONNECTS DIRECTLY TO A1A3 CONTROL CARD				
CONNECTOR: A1A1W1P4* (ELECTRONICS ASSY)				
1				DO NOT USE
2	WHT	A1A1W1S6-2	24	
3	WHT	A1A1W1S6-4	24	
4	WHT	A1A1W1S5-2	24	
5	WHT	A1A1W1S5-4	24	
6	WHT	A1A1W1S5-1	24	-
7	WHT	A1A1W1E1-27	24	
8	WHT	A1A1W1S1-12	24	$\overline{\text{RNG}}$/DES
9				NO CONN
10	WHT	A1A1W1P2-10	24	20 KHz CLOCK
11				SPARE
12				SPARE
13				SPARE
14				SPARE
15				SPARE
16				SPARE
17	WHT	A1A1W1S6-1	24	
18	WHT	A1A1W1S7-4	24	
19	WHT	A1A1W1S7-2	24	
20	WHT	A1A1W1S7-1	24	
21	WHT	A1A1W1S5-C	24	
22				SPARE
23				SPARE
24			-	SPARE
25			-	SPARE
26				SPARE
27				SPARE
28				SPARE
29				SPARE
30				DO NOT USE
*CONNECTS DIRECTLY TO A1A3 CONTROL CARD				

TABLE C-1. WIRE LIST (CONT)

ASSEMBLY	COLOR	FROM (PIN)	TO (PIN)	SIZE (AWG)	FUNCTION
LOW VOLTAGE	-	A1A1W1A1-E1	-	-	
POWER SUPPLY	WHT	A1A1W1A1-E2	A1AW1S3-1	22	-
DRIVE	WHT	A1A1W1A1-E2	A1A1W1K1-B1	22	-
*A1A1W1A1	WHT	A1A1W1A1-E3	A1A1W1P1-20	22	FIRE CMD
*NO MATING	WHT	A1A1W1A1-E4	A1A1W1P1-30	22	+24V RTN (FANS)
PLUG	WHT	A1A1W1A1-E4	A1A1W1S3-5	22	-
	WHT	A1A1W1A1-E4	A1A1W1A2-E12	20	24V RTN
	WHT	A1A1W1A1-E5	A1A1W1A2-T1-2	16	+24V SWITCHED
	WHT	A1A1W1A1-E6	A1A1W1P2-26	22	-
	WHT	A1A1W1A1-E7	A1A1W1R1-1	22	-
	WHT	A1A1W1A1-E8	1J4-C	22	FIRE CMD
	WHT	A1A1W1A1-E9	A1A1W1S1-8	22	-
	WHT	A1A1W1A1-E10	A1A1W1P2-54	22	24V FILTERED
	WHT	A1A1W1A1-E11	A1A1W1A4-T2-25	16	24V RTN
	WHT	A1A1W1A1-E11	1J3 (-) LUG	14	24V RTN
	WHT	A1A1W1A1-E11	1J2-J	22	
	WHT	A1A1W1A1-E12	A1A1W1P2-51	22	24V RTN
	WHT	A1A1W1A1-E12	A1A1W1A3-T2-25	16	24V RTN
	WHT	A1A1W1A1-E12	A1A1W1P1-37	22	24V RTN (RETICLE)
	WHT	A1A1W1A1-E13	A1A1W1A3-T2-24	16	+24V
	WHT	A1A1W1A1-E13	A1A1W1S1-3	16	-
	WHT	A1A1W1A1-E14	A1A1W1A4-T2-24	16	+24V
	WHT	A1A1W1A1-E15	A1A1W1P1-49	22	+15V
	WHT	A1A1W1A1-E15	A1A1W1P2-12	22	+15V
	WHT	A1A1W1A1-E15	A1A1W1A2-E9	22	+15V
	WHT	A1A1W1A1-E15	1J1-Y	22	+15V-TA
	WHT	A1A1W1A1-E16	A1A1W1P1-5	22	+15V (RCVR)
LOW VOLTAGE	WHT	A1A1W1A1-E16	A1A1W1P1-42	22	+15V (ENERGY CONTROL)
POWER SUPPLY	WHT	A1A1W1A1-E16	A1A1W1P3-22	22	+15V
DRIVE	WHT	A1A1W1A1-E17	A1A1W1P1-39	22	-15V (RCVR)
A1A1W1A1	WHT	A1A1W1A1-E17	A1A1W1P1-43	22	-15V (ENERGY CONTROL)
	WHT	A1A1W1A1-E17	A1A1W1P3-7	22	-15V
	WHT	A1A1W1A1-E18	1J1-F	22	-15V-TA
	WHT	A1A1W1A1-E18	A1A1W1P2-13	22	-15V
	WHT	A1A1W1A1-E18	A1A1W1A2-E6	22	-15V
	WHT	A1A1W1A1-E19	A1A1W1P2-44	22	RTN
	WHT	A1A1W1A1-E19	1J1-A	22	SHLD RTN
	WHT	A1A1W1A1-E19	A1A1W1A2-E8	22	RTN
	WHT	A1A1W1A1-E20	A1A1W1P1-11	22	RTN (ENERGY CONTROL)
	WHT	A1A1W1A1-E20	A1A1W1P3-56	22	RTN
	WHT	A1A1W1A1-E21	A1A1W1P1-6	22	RTN (RCVR)
	WHT	A1A1W1A1-E21	A1A1W1P1-32	22	RTN (HEATER)
	BLK	A1A1W1A1-E22	A1A1W1P1-46	24	RTN
	BLK	A1A1W1A1-E22	A1A1W1P1-47	24	RTN
	WHT	A1A1W1A1-E22	1J1-g	22	RTN-TA

TABLE C-1. WIRE LIST (CONT)

ISEMBLY	COLOR	FROM (PIN)	TO (PIN)	SIZE (AWG)	FUNCTION
)W VOLTAGE	WHT	A1A1W1A1-E23	A1A1W1P2-43	22	+5V
)WER SUPPLY	WHT	A1A1W1A1-E23	A1A1W1A2-U1-2	22	+5V
IIVE	WHT	A1A1W1A1-E23	1J1-X	22	+5V-TA
	WHT	A1 A1 W1 A1-E24	A1A1W1P1-10	22	+5V (ENERGY CONTROL)
A1W1A1	WHT	A1A1W1A1-E24	A1A1W1 P1 -38	22	+5V (RCVR)
	WHT	A1 A1 W1A1-E24	A1A1W1P1-65	22	+5V (HEATER)
	WHT	A1A1W1A1-E25	A1A1W1P3-24	22	+5V
		A1A1W1A1-E26			
	WHT	A1A1W1A1-E27	A1A1 W1 P4-7	24	$\overline{\text{EXT TRIG}}$
	WHT	A1A1W1A1-E27	A1A1W1R2-D	22	
	WHT	A1 A1 W1A1-E28	A1A1W1K1-X2	24	
	WHT	A1A1 W1 A1-E28	A1A1W1R2-B	22	
	WHT	A1A1W1A1-E29	A1A1W1P3-62	22	$\overline{\text{DISPLAY TEST}}$
	WHT	A1A1W1A1-E30	A1A1W1K1-B2	22	
	WHT	A1A1W1A1-E30	1 J2-D	22	
)W VOLTAGE	WHT	A1A1W1A2-E6	A1A1W1A1-E18	22	-15V
)WER SUPPLY	WHT	A1A1 W1A2-E8	A1A1W1A1-E19	22	RTN
A1A1W1A2	WHT	A1A1W1A2-E9	A1A1W1A1-E15	22	+15V
)NLY EXTERNAL	WHT	A1A1 W1A2-E12	A1A1 W1A1 -E4	20	+24V RTN
IRING IS	WHT	A1A1W1A2-T1-2	A1 A1 W1 A1-E5	16	+24V SWITCHED
ISTED	WHT	A1A1W1A2-T1-13	A1A1W1P2-53	24	+15V SENSE
	WHT	A1A1W1A2-T1-18	A1A1W1P2-52	24	LVPS CUR SENSE
	WHT	A1A1W1A2-U1-2	A1 A1 W1 A1-E23	22	+5V
FN POWER UPPLY	WHT	A1A1W1A3-T1-7	A1A1W1P2-22	24	$\overline{\text{ØA DRIVE OFF}}$
A1A1W1A3	WHT	A1A1W1A3-T1-8	A1A1W1P2-19	24	ØA DRIVE START
)NLY EX-	WHT	A1A1 W1A3-T1-9	A1A1W1P2-20	24	$\overline{\text{ØA DRIVE ON}}$
ERNAL WIRING	WHT	A1A1 W1A3-T1 -11	A1A1W1P2-48	24	ØA CURRENT SENSE
S LISTED	WHT	A1A1W1A3-T1-12	A1A1W1P2-21	24	ØA DRIVE RTN
	WHT	A1A1W1A3-T2-19A	A1A1W1P1-61	22	PFN VOLTAGE
	WHT	A1A1W1A3-T2-19A	A1A1W1A4-T2-19A	22	
	BLK	A1A1W1A3-T2-20B	A1A1 W1A3-T2-19A (SHLD)	24	PFN VOLTAGE SHLD
	BLK	A1A1 W1A3-T2-20B	A1A1W1P2-46	24	CURRENT SENSE RTN
	WHT	A1A1W1A3-T2-21A	A1A1W1P2-45	24	PFN SENSE
	WHT	A1A1W1A3-T2-24	A1 A1W1A1-E13	16	+24V
	WHT	A1A1W1A3-T2-25	A1A1W1A1-E12	16	+24V RTN
FN POWER	WHT	A1A1W1A4-T1-7	A1A1W1P2-17	24	$\overline{\text{ØB DRIVE OFF}}$
UPPLY	WHT	A1 A1 W1A4-T1 -8	A1A1W1P2-14	24	ØB START DRIVE
A1A1W1A4	WHT	A1A1W1A4-T1-9	A1A1W1P2-15	24	$\overline{\text{ØB DRIVE ON}}$
ONLY EXTERNAL	WHT	A1A1W1A4-T1-11	A1A1W1P2-40	24	ØB CURRENT SENSE
IRING	WHT	A1A1W1A4-T1-12	A1A1W1P2-16	24	ØB DRIVE RTN
S LISTED	WHT	A1A1W1A4-T2-19A	A1A1W1A3-T2-19A	22	PFN VOLTAGE
	BLK	A1A1W1A4-T2-20B	A1A1W1A4-T2-19A (SHLD)	24	ØB CURRENT SENSE RTN

TABLE C-1. WIRE LIST (CONT)

ASSEMBLY	COLOR	FROM (PIN)	TO (PIN)	SIZE (AWG)	FUNCTION
	BLK	A1A1W1A4-T2-20B	A1A1W1P2-41	24	-
	WHT	A1A1W1A4-T2-21A	A1A1W1P2-55	24	PFN SENSE
	WHT	A1A1W1A4-T2-24	A1A1W1A1-E14	16	+24V
	WHT	A1A1W1A4-T2-25	A1A1W1A1-E11	16	+24V RTN
RELAY	**COLOR**	**FROM (PIN)**	**TO (PIN)**	**SIZE (AWG)**	**FUNCTION**
RELAY	-	A1A1W1K1-A1	A1A1W1K1-B1	18	-
A1A1W1K1	WHT	A1A1W1K1-A1	A1A1W1S1-7	22	-
	-	A1A1W1K1-A2	A1A1W1K1-X1	18	-
	-	A1A1W1K1-A2	A1A1W1K1-B2	18	-
	WHT	A1A1W1K1-B1	A1A1W1A1-E2	22	-
	-	A1A1W1K1-B1	A1A1W1K1-A1	18	-
	-	A1A1W1K1-B2	A1A1W1K1-A2	18	-
	WHT	A1A1W1K1-B2	A1A1W1A1-E30	22	-
	WHT	A1A1W1K1-X1	A1A1W1S3-2	22	-
	-	A1A1W1K1-X1	A1A1W1K1-A2	18	-
	WHT	A1A1W1K1-X2	A1A1W1A1-E28	24	-
RESISTOR	**COLOR**	**FROM (PIN)**	**TO (PIN)**	**SIZE (AWG)**	**FUNCTION**
RETICLE	WHT	A1A1W1R1-1	A1A1W1A1-E27	22	-
BRIGHTNESS	-	A1A1W1R1-1	A1A1W1R1-2	22	-
A1A1W1R1	-	A1A1W1R1-2	A1A1W1R1-1	22	-
	WHT	A1A1W1R1-3	A1A1W1P1-4	22	RETICLE POWER
DISPLAY BRIGHTNESS	-	A1A1W1R2-1	A1A1W1R2-2	22	-
(PART OF)	-	A1A1W1R2-2	A1A1W1R2-1	22	-
A1A1W1R2	WHT	A1A1W1R2-2	A1A1W1P3-18	22	DISPLAY BRIGHT
	WHT	A1A1W1R2-3	A1A1W1P3-58	22	DISPLAY BRIGHT (+5V)
TEST (DETENT) PART OF	-	A1A1W1R2-A	A1A1W1R2-C	22	-
A1A1W1R2	WHT	A1A1W1R2-A	A1A1W1S1-10	22	-
	WHT	A1A1W1R2-B	A1A1W1A1-E28	22	-
	-	A1A1W1R2-C	A1A1W1R2-A	22	-
	WHT	A1A1W1R2-D	A1A1W1A1-E27	22	-
SWITCH	**COLOR**	**FROM (PIN)**	**TO (PIN)**	**SIZE (AWG)**	**FUNCTION**
ON/OFF/AZ ADJ	-	A1A1W1S1-1	-	-	-
A1A1W1S1	-	A1A1W1S1-2	A1A1W1S1-5	18	-
	WHT	A1A1W1S1-2	1J5 (+) LUG	14	-
	-	A1A1W1S1-3	A1A1W1S1-6	18	-
	WHT	A1A1W1S1-3	A1A1W1A1-E13	16	-

TABLE C-1. WIRE LIST (CONT)

SWITCH	COLOR	FROM (PIN)	TO (PIN)	SIZE (AWG)	FUNCTION
		A1A1W1S1-4			
		A1A1W1S1-5	A1A1W1S1-2	18	
	-	A1A1W1S1-5	A1A1W1S1-8	22	
		A1A1W1S1-6	A1A1W1S1-3	18	
	WHT	A1A1W1S1-7	A1A1W1K1-A1	22	
	WHT	A1A1W1S1-8	A1A1W1A1-E9	22	
		A1A1W1S1-8	A1A1W1S1-5	22	
	WHT	A1A1W1S1-9	A1A1W1S3-2	22	
	WHT	A1A1W1S1-9	1J1-a	22	
	WHT	A1A1W1S1-10	A1A1W1R2-A	22	
	WHT	A1A1W1S1-10	A1A1W1S2-2	22	
	WHT	A1A1W1S1-11	A1A1W1S2-3	22	
	WHT	A1A1W1S1-12	A1A1W1P4-8	24	
ES/RNG 1/ RNG 2 1A1W1S2	WHT	A1A1W1S2-1	A1A1W1P1-18	24	$\overline{\text{DESIGNATE}}$
	WHT	A1A1W1S2-2	A1A1W1S3-5	22	
	WHT	A1A1W1S2-2	A1A1W1S1-10	22	
	WHT	A1A1W1S2-3	A1A1W1S1-11	22	
		A1A1W1S2-3	A1A1W1S2-4	22	
	WHT	A1A1W1S2-4	A1A1W1P3-28	22	RANGE/DES
		A1A1W1S2-4	A1A1W1S2-3	22	
	WHT	A1A1W1S2-5	A1A1W1P3-8	22	$\overline{\text{RNG}}$/DES/ASADJ
		A1A1W1S2-6			
IRE (TRIGGER) 1A1W1S3	WHT	A1A1W1S3-1	1J1-T	22	$\overline{\text{FIRE REMOTE}}$
	WHT	A1A1W1S3-1	A1A1W1A1-E2	22	
	WHT	A1A1W1S3-2	A1A1W1K1-X1	22	
	WHT	A1A1W1S3-2	A1A1W1S1-9	22	
		A1A1W1S3-3			
	WHT	A1A1W1S3-4	1J-b	22	FIRE REMOTE
	WHT	A1A1W1S3-4	A1A1W1P3-4	22	ZERO
	WHT	A1A1W1S3-5	A1A1W1S2-2	22	
	WHT	A1A1W1S3-5	A1A1W1A1-E4	22	
ODE SELECT WITCH 1A1W1S5	WHT	A1A1W1S5-1	A1A1W1P4-6	24	I6
	WHT	A1A1W1S5-2	A1A1W1P4-4	24	I7
		A1A1W1S5-3			
	WHT	A1A1W1S5-4	A1A1W1P4-5	24	I8
	WHT	A1A1W1S5-C	A1A1W1S6-C	24	
	WHT	A1A1W1S5-C	A1A1W1P4-21	24	SWITCH RTN
ODE SELECT WITCH 1A1W1S6	WHT	A1A1W1S6-1	A1A1W1P4-17	24	I3
	WHT	A1A1W1S6-2	A1A1W1P4-2	24	I4
		A1A1W1S6-3			
	WHT	A1A1W1S6-4	A1A1W1P4-3	24	I5
	WHT	A1A1W1S6-C	A1A1W1S5-C	24	SWITCH RTN
	WHT	A1A1W1S6-C	A1A1W1S7-C	24	SWITCH RTN

TABLE C-1. WIRE LIST (CONT)

SWITCH	COLOR	FROM (PIN)	TO (PIN)	SIZE (AWG)	FUNCTION
CODE SELECT	WHT	A1A1W1S7-1	A1A1W1P4-20	24	I0
SWITCH	WHT	A1A1W1S7-2	A1A1W1P4-19	24	I1
A1A1W1S7		A1A1W1S7-3			
	WHT	A1A1W1S7-4	A1A1W1P4-18	24	I2
	WHT	A1A1W1S7-C	A1A1W1S6-C	24	SWITCH RTN

TABLE C-1. WIRE LIST (CONT)

ROM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
CONNECTOR: A2A2W1J1* (TRANSCEIVER HOUSING ASSY)				
1	WHT	A2A2M1 (+)	22	+24V FILTERED
2	WHT	A2A2A1-E1	24	$\overline{\text{F/T TRIG}}$
3	WHT	A2A2W1J3-9	24	$\overline{\text{Q/S TRIG}}$
4	WHT	A2A2W1J3-5	24	RETICLE POWER
5	WHT	A2A2W1P3-8	24	+15V (RCVR)
6	WHT	A2A2W1P3-11	24	RTN (RCVR)
7	WHT	A2A2W1P3-5	24	$\overline{\text{TPG INHIBIT}}$
8	BLK	A2A2W1J1-40 SHLD	24	RCVR START SHLD
9	BLK	A2A2W1J1-41 SHLD	24	Q/S TRIG, RCVR SHLD
10	WHT	A2A2W1J3-7	24	+5V (ENERGY CONTROL)
11	WHT	A2A2W1J3-23	24	RTN (ENERGY CONTROL)
12	BLK	A2A2W1J1-44 SHLD	24	VIDEO SHLD
13	WHT	A2A2W1J3-19	24	$\overline{\text{ENERGY VALID}}$
14	WHT	A2A2W1J2-2B	24	SIMMER SENSE
15	WHT	A2A2W1J3-4	24	ENERGY ERROR
16				SPARE
17	WHT	A2A2W1J3-28	24	$\overline{\text{TOR}}$
18	WHT	A2A2W1P3-4	24	$\overline{\text{DESIGNATE}}$
19	WHT	A2A2W1P2-15	24	+5V (DISPLAY)
20	WHT	A2A2W1P2-20	24	FIRE CMD
21	WHT	A2A2W1P2-9	24	$\overline{\text{FAIL DISPLAY}}$
22	WHT	A2A2W1P2-7	24	DISPLAY 4
23	WHT	A2A2W1P2-2	24	DISPLAY 1
24	WHT	A2A2W1P2-12	24	DIGIT 8
25	WHT	A2A2W1P2-4	24	DIGIT 2
26				SPARE
27	BLK	A2A2W1J1-61 SHLD	24	PFN VOLTAGE RTN SHLD
28				DO NOT USE
29				DO NOT USE
30	WHT	A2A2FL2-1	22	24V RTN (FANS)
31	WHT	A2A2W1J3-10	24	A-TRIG
32	WHT	A2A2W1J2-2E	24	RTN (HEATER)
33				SPARE
34	BLK	A2A2M1 (-)	22	$\overline{\text{EVENTS COUNTER DRIVE}}$
35	BLK	A2A2W1J1-2 SHLD	24	$\overline{\text{F/T TRIG}}$ SHLD
36	BLK	A2A2W1J1-3 SHLD	24	$\overline{\text{Q/S TRIGGER SHLD}}$
37	WHT	A2A2W1J3-20	24	+24V RTN (RETICLE)
38	WHT	A2A2W1P3-2	24	+5V (RCVR)
39	WHT	A2A2W1P3-1	24	-15V (RCVR)
40	WHT	A2A2W1P3-3	24	RCVR START

TABLE C-1. WIRE LIST (CONT)

FROM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
41	WHT	A2A2W1P3-7	24	Q/S TRIG-RCVR
42	WHT	A2A2W1J3-8	24	+15V (ENERGY CONTROL)
43	WHT	A2A2W1J3-22	24	-15V (ENERGY CONTROL)
44		A2A2W1P3-13	24	VIDEO
45	WHT	A2A2W1J3-13	24	$\overline{\text{OVERTEMP}}$
46	BLK	A2A2-E7	24	RTN
47	BLK	A2A2-E6	24	RTN
48	WHT	A2A2W1J3-29	24	$\overline{\text{HVPS ON}}$
49	WHT	A2A2A1-E3	24	+15V
50	WHT	A2A2W1J3-3	24	450V SENSE-TA
51	WHT	A2A2W1P2-10	24	$\overline{\text{BAT LOW}}$
52	BLK	A2A2W1P2-1	24	RTN (DISPLAY)
53	WHT	A2A2W1P2-3	24	$\overline{\text{DISPLAY TEST}}$
54	WHT	A2A2W1P2-5	24	DISPLAY 8
55	WHT	A2A2W1P2-8	24	DISPLAY 2
56	WHT	A2A2W1P2-14	24	$\overline{\text{DISPLAY INHIBIT}}$
57	WHT	A2A2W1P2-13	24	DIGIT 4
58	WHT	A2A2W1P2-6	24	DIGIT 1
59	WHT	A2A2W1J3-6	24	+15V SWITCHED
60	-	-	-	DO NOT USE
61	WHT	A2A3C1-E1 LUG	24	PFN VOLTAGE
62	-	-	-	DO NOT USE
63	WHT	A2A2FL1-1	22	+24V FILTERED (FANS)
64	BLK	A2A2W1J1-31 (SHLD)	24	A-TRIG SHLD
65	WHT	A2A2W1J2-1E	24	+5V (HEATER)
66	-	-	-	SPARE
*MATES WITH A1A1W1P1 WITH CORRESPONDING PIN NUMBERS				
CONNECTOR: A2A2W1J2* (TRANSCEIVER ASSY)				
1A	WHT	A2A2FL1-2	22	+24V FILTERED (FANS)
1B	WHT	A2A2FL2-2	22	24V RTN (FANS)
1C	BLK	A2A2W1P3-3 (SHLD)	24	RCVR START SHLD
1D	WHT	A2A2W1J3-27	24	CAVITY THERMISTOR
1E	WHT	A1A1W1J1-65	24	+5V HEATER
1F	WHT	A2A2W1J3-26	24	EXHAUST THERMISTOR RTN
2A	BLK	A2A2-E5 LUG	24	A2A2FL1-2 CAP. GND
2B	WHT	A1A1W1J1-14	24	SIMMER SENSE
2C	WHT	A2A2W1P3-9	24	$\overline{\text{THRESHOLD OFFSET DRIVE}}$
2D	WHT	A2A2W1J3-12	24	CAVITY THERMISTOR
2E	WHT	A1A1W1J1-32	24	RTN (HEATER)
2F	WHT	A2A2W1J3-11	24	EXHAUST THERMISTOR
*MATES WITH A2A1A5P2 WITH CORRESPONDING PIN LETTERS/NUMBERS				

TABLE C-1. WIRE LIST (CONT)

OM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
NNECTOR : A2A2W1J3* (TRANSCEIVER ASSY)				
1				SPARE
2				SPARE
3	WHT	A2A2W1J1-50	24	450V SENSE-TA
4	WHT	A2A2W1 J1 -15	24	ENERGY ERROR
5	WHT	A2A2W1J1-4	24	RETICLE POWER
6	WHT	A2A2W1J1-59	24	+15V SWITCHED
7	WHT	A2A2W1J1-10	24	+5V (ENERGY CONTROL)
8	WHT	A2A2W1 J1 -42	24	+15V (ENERGY CONTROL)
9	WHT	A2A2W1J1-3	24	$\overline{\text{Q/S TRIG}}$
10	WHT	A2A2W1J1-31	24	A-TRIG
11	WHT	A2A2W1J2-2F	24	EXHAUST THERMISTOR
12	WHT	A2A2W1J2-2D	24	CAVITY THERMISTOR
13	WHT	A2A2W1 J1 -45	24	$\overline{\text{OVERTEMP}}$
14	-			SPARE
15				SPARE
16				SPARE
17				NO CONN (450 V P.S. DRIVE
18	-	-		SPARE
19	WHT	A2A2W1J1-13	24	$\overline{\text{ENERGY VALID}}$
20	BLK	A2A2W1J1-37	24	+24V RTN (RETICLE)
21				SPARE
22	WHT	A2A2W1J1-43	24	-15V (ENERGY CONTROL)
23	BLK	A2A2W1J1-11	24	RTN (ENERGY CONTROL)
24	BLK	A2A2W1J3-9 (SHLD)	24	$\overline{\text{Q/S TRIG}}$ SHIELD
25	BLK	A2A2W1J3-10 (SHLD)	24	A-TRIG SHIELD
26	WHT	A2A2W1J2-1 F	24	EXHAUST THERMISTOR RTN
27	WHT	A2A2W1 J2-1 D	24	CAVITY THERMISTOR RTN
28	WHT	A2A2W1J1 -17	24	$\overline{\text{TOR}}$
29	WHT	A2A2W1J1-48	24	$\overline{\text{HVPS ON}}$
30				SPARE
MATES WITH A2A1A6 WITH CORRESPONDING PIN NUMBERS				
ONNECTOR: A2A2W1P2* (TRANSCE VER ASSY)				
1	BLK	A2A2W1J1-52	24	RTN (DISPLAY
2	WHT	A2A2W1J1-23	24	DISPLAY 1
3	WHT	A2A2W1J1-53	24	$\overline{\text{DISPLAY TEST}}$

TABLE C-1. WIRE LIST (CONT)

FROM (PIN)	COLOR	TO (PIN)	SIZE (AWG)	FUNCTION
4	WHT	A2A2W1J1-25	24	DIGIT 2
5	WHT	A2A2W1 J1 -54	24	DISPLAY 8
6	WHT	A2A2W1 J1 -58	24	DIGIT 1
7	WHT	A2A2W1 J1 -22	24	DISPLAY 4
8	WHT	A2A2W1 J1 -55	24	DISPLAY 2
9	WHT	A2A2W1J1-21	24	$\overline{\text{FAIL DISPLAY}}$
10	WHT	A2A2W1 J1 -51	24	$\overline{\text{BAT LOW}}$
11				SPARE
12	WHT	A2A2W1J1-24	24	DIGIT 8
13	WHT	A2A2W1J1-57	24	DIGIT 4
14	WHT	A2A2W1J1-56	24	$\overline{\text{DISPLAY INHIBIT}}$
15	WHT	A2A2W1J1-19	24	+5V (DISPLAY)
16	WHT	NOT USED	24	NOT USED
17				SPARE
18				SPARE
19				SPARE
20	WHT	A2A2W1 J1 -20	24	FIRE CMD
*MATES WITH A2A2W1P3, WITH CORRESPONDING PIN NUMBERS				
CONNECTOR: A2A2W1P3* (TRANSCEIVER ASSY)				
1	WHT	A2A2W1 J1 -39	24	-15V
2	WHT	A2A2W1J1-38	24	+5V (RCVR)
3	WHT	A2A2W1 J1 -40	24	RCVR START
4	WHT	A2A2W1J1-18	24	$\overline{\text{DESIGNATE}}$
5	WHT	A2A2W1J1-7	24	$\overline{\text{TPG INHIBIT}}$
6				$\overline{\text{COUNT STOP}}$ (DO NOT USE)
7	WHT	A2A2W1 J1 -41	24	Q/S TRIG-RCVR
8	WHT	A2A2W1J1-5	24	+15V (RCVR)
9	WHT	A2A2W1 J2-2C	24	$\overline{\text{THRESHOLD OFFSET DR}}$
10	BLK	A2A2W1 J 2-1 C	24	SHLD RTN
11	WHT	A2A2W1 J1 -6	24	RTN (RCVR)
12	BLK	A2A2W1P3-13 (SHLD)	24	VIDEO SHLD
13	NAT	A2A2W1J1-44	24	VIDEO
14				A TRIG (DO NOT USE)
*MATES WITH A2A4J1 WITH CORRESPONDING PIN NUMBERS				

CONNDR: OTHERS

CONNECTOR	COLOR	FROM (PIN)	TO (PIN)	SIZE (AWG)	FUNCTION
A2A1A1P1*	BLK	A	A2A1A1-E3	24	24V RTN (RETICLE)
*MATES WITH A2A1A6J1 A to B and B to A	WHT	B	A2A1 A1 -E2	24	RETICLE POWER

TABLE C-1. WIRE LIST (CONT)

CONNECTOR	COLOR	FROM (PIN)	TO (PIN)	SIZE (AWG)	FUNCTION
	WHT	1A	A2A1 A5- E3A	40	+24V FILTERED (FANS
A2A1A5W1 P2*	BLK	1B	A2A1A5-E4A	40	+24V RTN (FANS)
	BLK	1C	A2A1A5A1-E23	40	SHLD RTN
*MATES WITH A2A2W1 J2	WHT	1D	A2A1A5-E6A	40	CAVITY THERMISTOR R
WITH CORRESPONDING	WHT	1E	A2A1A5-E5A	40	+5V (HEATER)
LETTERS/NO.	BLK	1F	TB1 -1	40	EXHAUST THERMISTOR
	BLK	2A	SHLD GROUND	40	SHLD GND
	WHT	2B	A2A1A5A1-E17	40	SIMMER SENSE
	BLK	2C	A2A1A5A1-E22	40	SHLD RTN
	WHT	2D	A2A1A5-E1A	40	CAVITY THERMISTOR
	BLK	2E	A2A1A5-E2A	40	RTN HEATER
	WHT	2F	TB1-2	40	EXHAUST THERMISTOR
SIMMER POWER SUPPLY					
A2A1A5A1*	WHT	E7	A2A1A5-E3A	40	+24V
* NO MATING PLUG	BLK	E9	A2A1A5-E4A	40	+24V RTN
	RED	E13	A2A1A5-E7A	40	TRIG OUT
	BLK	E15	A2A1A5A1-E7 & -E9 SHLD	40	SIMMER RTN
	BLK	E16	A2A1A5-E8A	40	TRIG RTN
		E16	A2A1A5A1-E7 & -E9 SHLD	40	
	WHT	E17	A2A1A5W1P2-2B	40	SIMMER SENSE
	WHT	E21	A2A1A5-E12B	40	SIMMER OUT
	WHT	E22	A2A1A5W1 P2-2C	40	THRESHOLD OFFSET DR
A2A1A5W1P3		A			SPARE
*MATES WITH	BLK	B	SHLD GROUND	40	GROUND
A2A3W1J2	BLK	C	A2A1A5A1-E9	40	+24V RTN
C D A B / A B C D	WHT	D	A2A1A5A1-E7	40	+24V FILTERED
BLOWER ASSY					
A2A3J1 *	BLK	A	FAN	22	+24V RTN
MATES WITH A2A1A5W1 P3	RED	B	FAN	22	+24V FILTERED
C D A B / A B C D		C			SPARE
	BLK	D	SHIELD GROUND	22	GROUND
MISC	WHT	A2A2C1-E1	A2A2W1J1-61	24	PFN VOLTAGE
	BLK	A2A2C1-E2	A2A2C1-E1 (SHLD)	24	PFN VOLTAGE RTN
	WHT	A2A2A1 -E1	A2A2W1J1-2	24	F/T TRIG
	BLK	A2A2A1-E2	A2A2A1-E1 (SHLD)	24	F/T TRIG RTN
	WHT	A2A2A1 -E3	A2A2W1 J1 -49	24	+15V

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PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
9-19		9-5	
21-2	step 1C		21-2

SAMPLE

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

"B" Ready Relay K11 is shown with two #9 contacts. That contact which is wired to pin 8 of relay K16 should be changed to contact #10.

Reads: Multimeter B indicates 600 K ohms to 9000 K ohms.

Change to read: Multimeter B indicates 600 K ohms minimum.

Reason: Circuit being checked could measure infinity. Multimeter can read above 9000 K ohms and still be correct.

NOTE TO THE READER:

Your comments will go directly to the writer responsible for this manual, and he will prepare the reply that is returned to you. To help him in his evaluation of your recommendations, please explain the reason for each of your recommendations, unless the reason is obvious.

All comments will be appreciated, and will be given immediate attention. Handwritten comments are acceptable.

For your convenience, blank "tear out" forms, preprinted, addressed, and ready to mail, are included in this manual.

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SP4 John Doe, Autovon 222-222	

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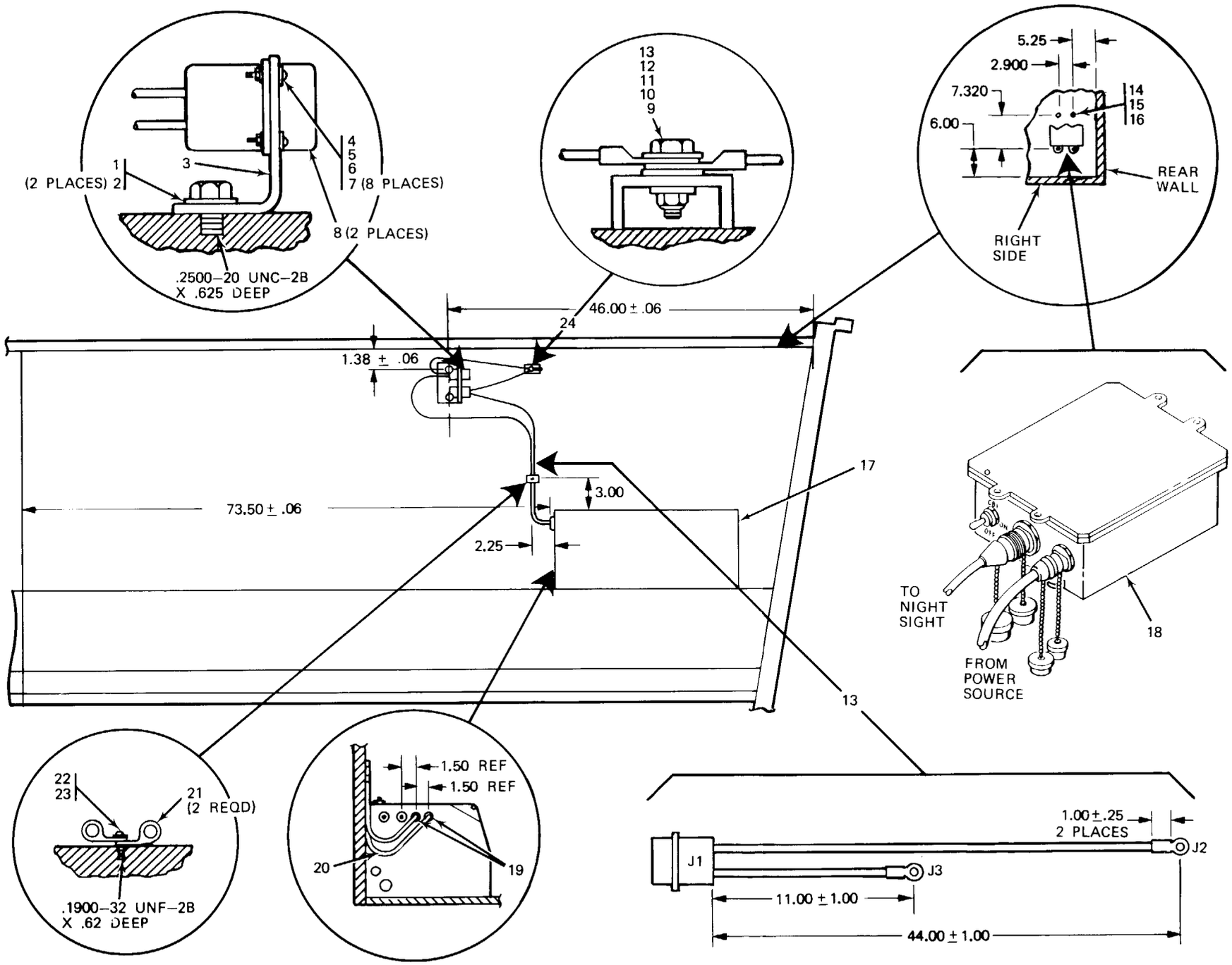
LEGEND:

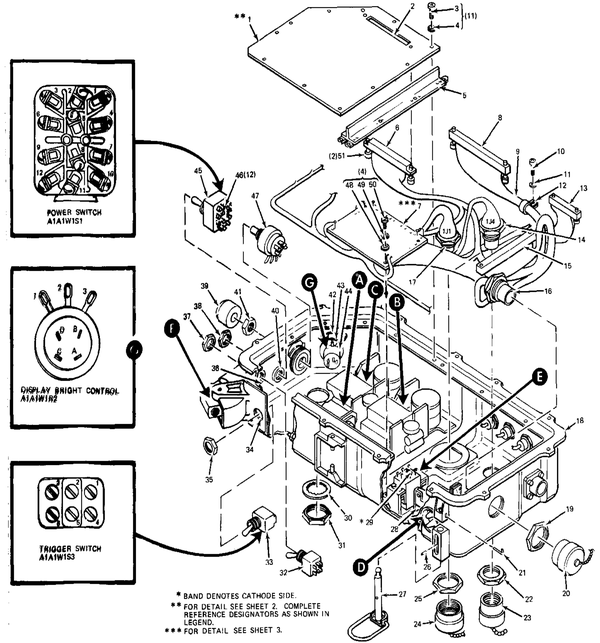
1. HEX HEAD SCREW
2. FLAT WASHER
3. CONNECTOR MOUNTING BRACKET
4. HEX HEAD CAPSCREW
5. LOCKWASHER
6. FLAT WASHER
7. HEX NUT
8. CONNECTOR
9. SCREW
10. FLAT WASHER
11. LOCKWASHER
12. NUT
13. VEHICLE POWER CABLE
14. SOCKET HEAD SCREWS
15. FLAT WASHERS
16. INSERTS
17. BATTERY BOX
18. VEHICLE POWER CONDITIONER
19. GROMMET
20. CABLE ASSEMBLY
21. EYE CLAMP
22. PANHEAD SCREW
23. FLAT WASHER
24. GROUND BRACKET

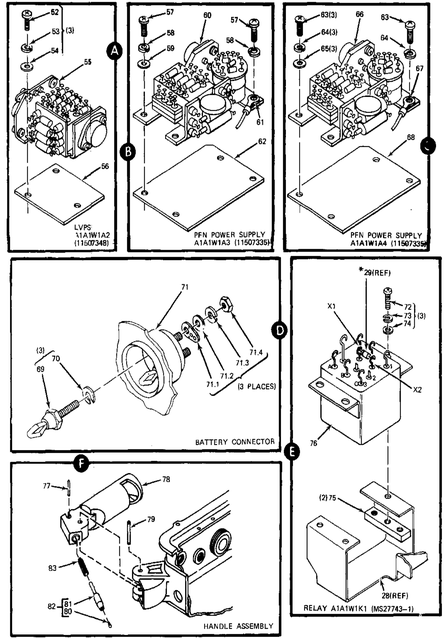
NOTE: DIMENSIONS IN INCHES



MS 434716

Figure FO-1. IFIST Installation Drawing, Vehicle Power Cable, and Vehicle Power Conditioner Parts Location





LEGEND

1. POWER SUPPLY CONTROL A1A1A1 (11508253)
2. CONNECTOR A1A1A1J1
3. SCREW
4. FLAT WASHER
5. STIFFENER BAR
6. CONNECTOR A1A1W1P2
7. LVPS DRIVE A1A1W1A1 (11507339)
8. CONNECTOR A1A1W1P1
9. WIRING HARNESS A1A1W1
10. SCREW
11. WASHER
12. CABLE CLAMP
13. CONNECTOR A1A1W1P4
14. CONNECTOR 1J4
15. CONNECTOR A1A1W1P3
16. CONNECTOR 1J2
17. CONNECTOR 1J1
18. HOUSING
19. NUT
20. COVER
21. DETENT PIN
22. NUT
23. COVER
24. COVER
25. NUT
26. SPRING PIN
27. RELEASE ASSEMBLY
28. MOUNTING BRACKET
29. DIODE
30. LOCKWASHER
31. NUT
32. DES/RNG 1/RNG 2 SWITCH A1A1W1S2
33. TRIGGER SWITCH A1A1W1S3
34. BUSHING SEAL
35. NUT
36. BUSHING SEAL
37. NUT
38. NUT
39. KNOB
40. BUSHING SEAL
41. NUT
42. KNOB
43. BOOT
44. DISPLAY BRIGHT CONTROL A1A1W1R2
45. POWER SWITCH A1A1W1S1
46. TERMINAL SCREW
47. RETICLE BRIGHT CONTROL A1A1W1R1
48. WASHER
49. LOCKWASHER
50. SCREW
51. JACKSCREW
52. SCREW
53. LOCKWASHER
54. WASHER
55. LV POWER SUPPLY A1A1W1A2 (11507348)
56. INSULATOR
57. SCREW
58. LOCKWASHER
59. WASHER
60. PFN POWER SUPPLY A1A1W1A3 (11507335)
61. TERMINAL LUG
62. INSULATOR
63. SCREW
64. LOCKWASHER
65. WASHER
66. PFN POWER SUPPLY A1A1W1A4 (11507335)
67. TERMINAL LUG
68. INSULATOR
69. BANANA PLUG
70. LOCKWASHER
71. BATTERY CONNECTOR
71.1 TERMINAL LUG
71.2 FLAT WASHER
71.3 LOCKWASHER
71.4 NUT
72. SCREW
73. LOCKWASHER
74. FLAT WASHER
75. PLATE
76. RELAY
77. SPRING PIN
78. HANDLE
79. PIN
80. TIP
81. LOCKPIN
82. LOCKPIN ASSEMBLY
83. SPRING

MS 430613

Figure FO-2. Electronics Assembly A1, Power Supplies and Subunit Parts Location (Sheet 1 of 3)

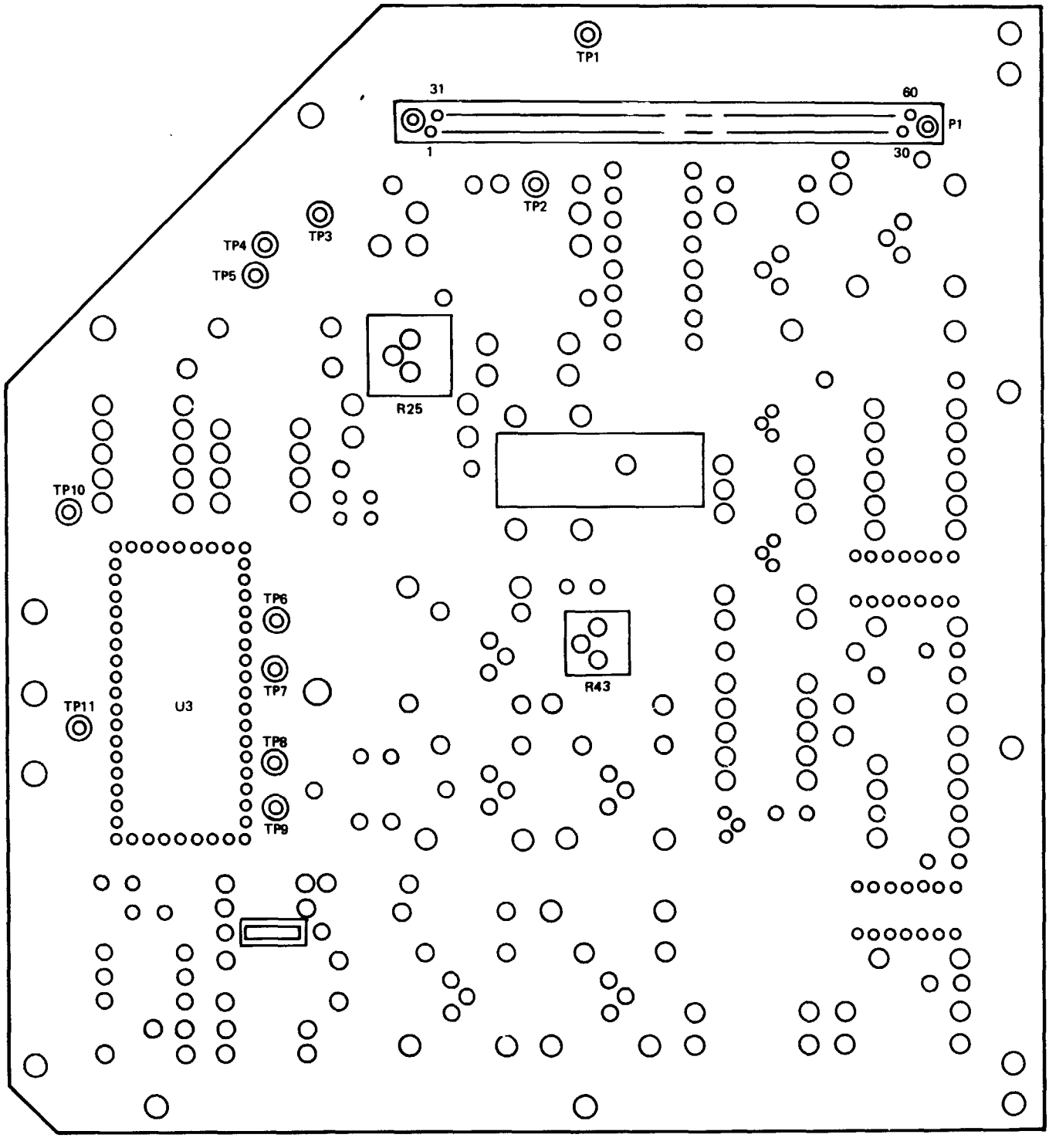
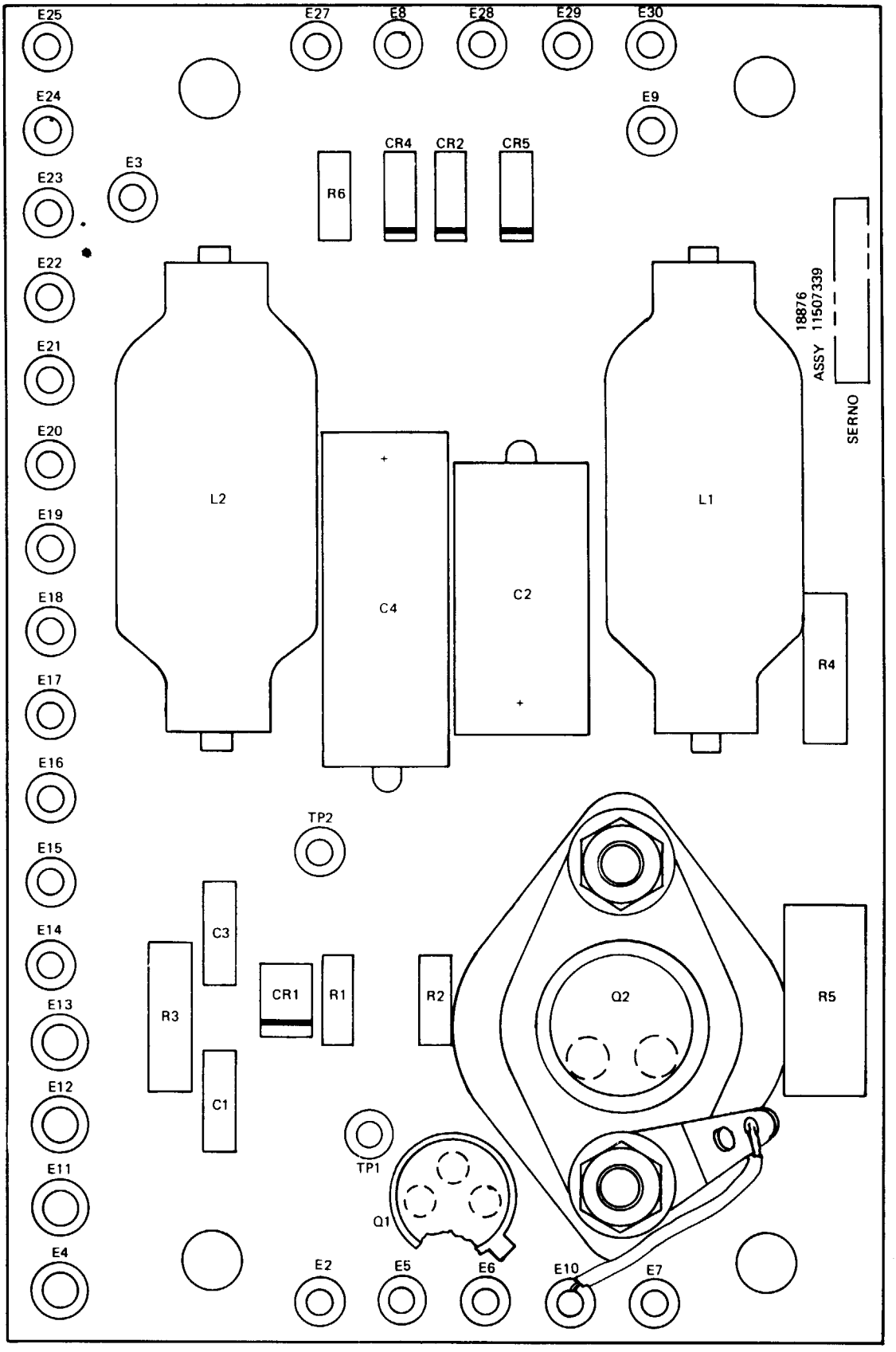


Figure FO-2. Electronics Assembly A1, Power Supplies and Subunit Parts Location (Sheet 2 of 3)



MS 420653A

Figure FO-2. Electronics Assembly A1, Power Supplies and Subunit Parts Location (Sheet 3 of 3)

LD/R FANS FAULT FUNCTIONAL

This functional diagram shows the basic circuitry related to operation of the LD/R cooling fans.

Application of +24V power and the closing of the trigger switch A1A1W1S3 applies power to the blower assembly external fan A2A3B1 and the transmitter heat exchanger assembly internal fan A2A1A5B1. The fans are also activated when the DISPLAY BRIGHT control is turned to TEST (detent) firing the relay and applying 24V to the LVPS drive. Placing the POWER switch in the AZ ADJ position applies +24V directly to the LVPS producing 24V FILTERED (FANS).

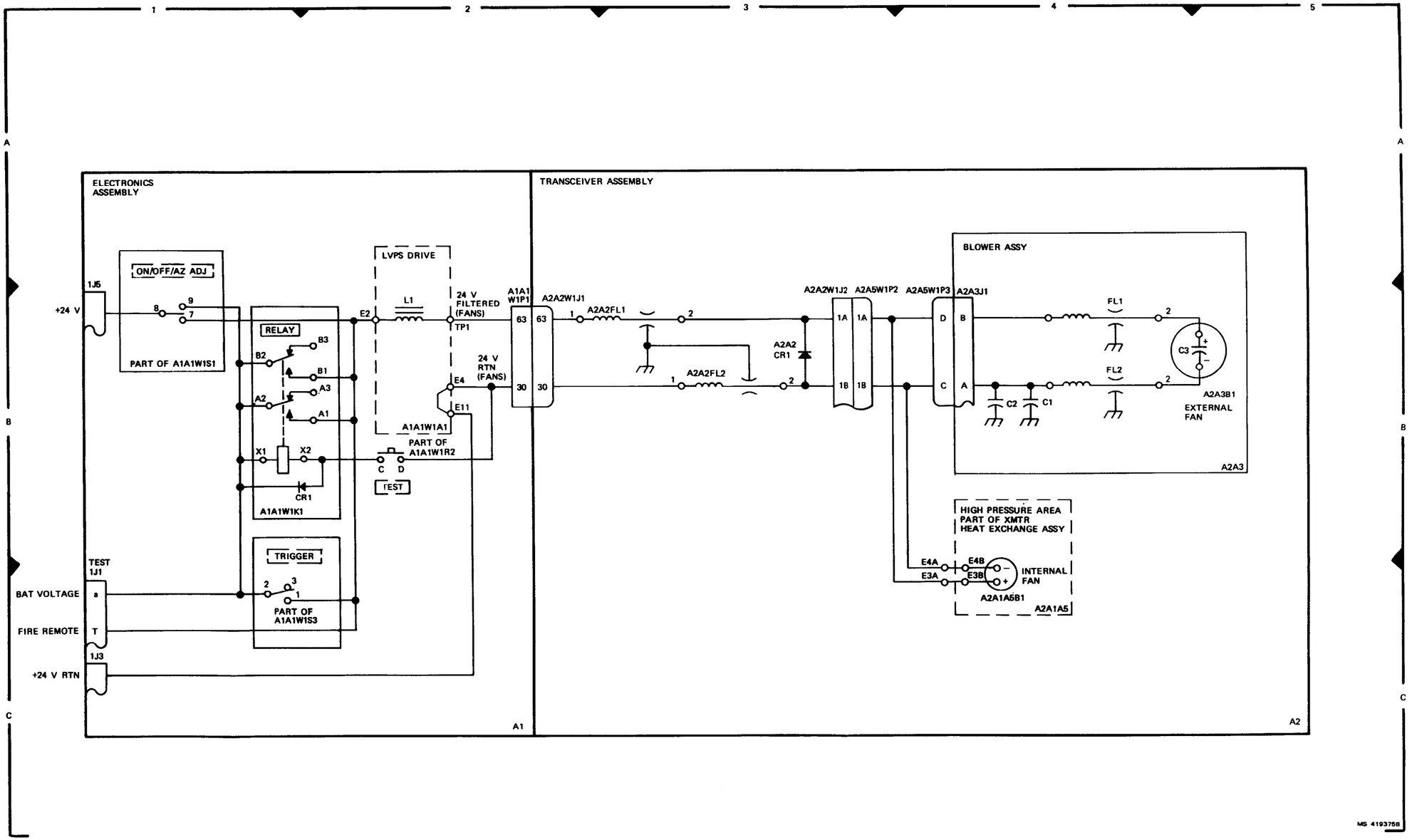


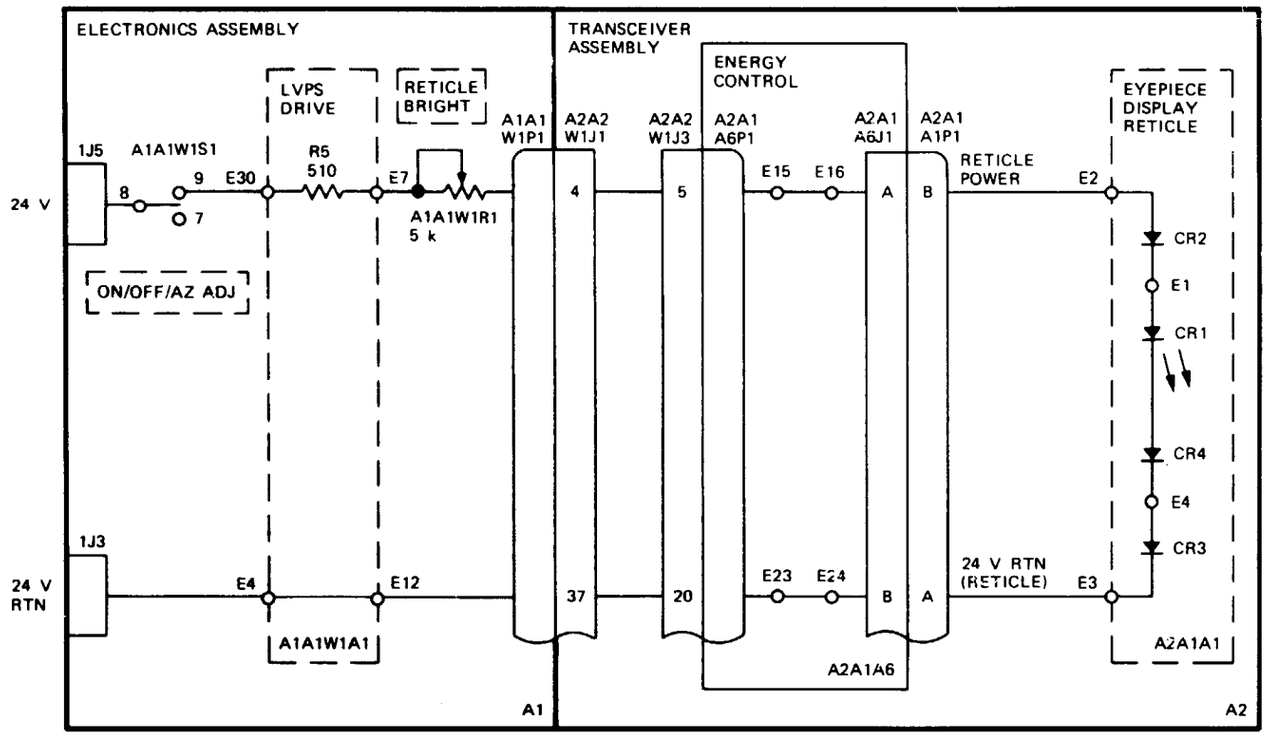
Figure FO-3. LD/R Fans Fault Functional Diagram

Change 1 FO-3

RETICLE BRIGHTNESS FAULT FUNCTIONAL

This functional diagram shows the basic circuitry related to illumination of the eyepiece reticle.

The RETICLE BRIGHT potentiometer controls the illumination of the eyepiece reticle which contains the crosshairs and graduation, AZ, RNG and EL legends as well as the MILS burst scale. The illumination of the reticle lines is accomplished by four LED's (light emitting diodes) located in the reticle assembly. Power (24V) for the LED's is supplied through power switch A1A1W1S1, current limiting resistor A1A1W1R5 and variable resistor A1A1W1R1. A1A1W1R1 functions to control the illumination of the reticle by limiting the voltage applied across the four LED segments.



MS 419377A

FO-4. Reticle Brightness Fault Functional Diagram

DISPLAY BRIGHTNESS FAULT FUNCTIONAL

This functional diagram covers the basic circuitry related to the data display function.

The display assembly A2A1A3 consists of three groups of four digits (7 segment LEDs) three light emitting diodes (LEDs) and decoder/driver circuitry. The display is multiplexed as opposed to hard wired. The DISPLAY word is a four bit BCD word (0-9) specifying the character to be displayed. The DIG word is a four bit BCD word (0-11) specifying the digit to be displayed.

Example if you have the following:

DIGIT	(1→4)	1000	decimal 8
DISPLAY	(1→4)	0111	decimal 7

You would display the decimal digit 8 in the 7th display. The signal $\overline{\text{DISPLAY INHIBIT}}$ when in the low state inhibits the lighting of the 7 segment display. To vary brightness of the display, the $\overline{\text{DISPLAY INHIBIT}}$ line is "pulse width modulated" by circuitry in data control LSI U15. The $\overline{\text{DISPLAY INHIBIT}}$ logic under control of the DISPLAY BRIGHTNESS control A1A1W1R2 strobes the display decoders for the desired brightness.

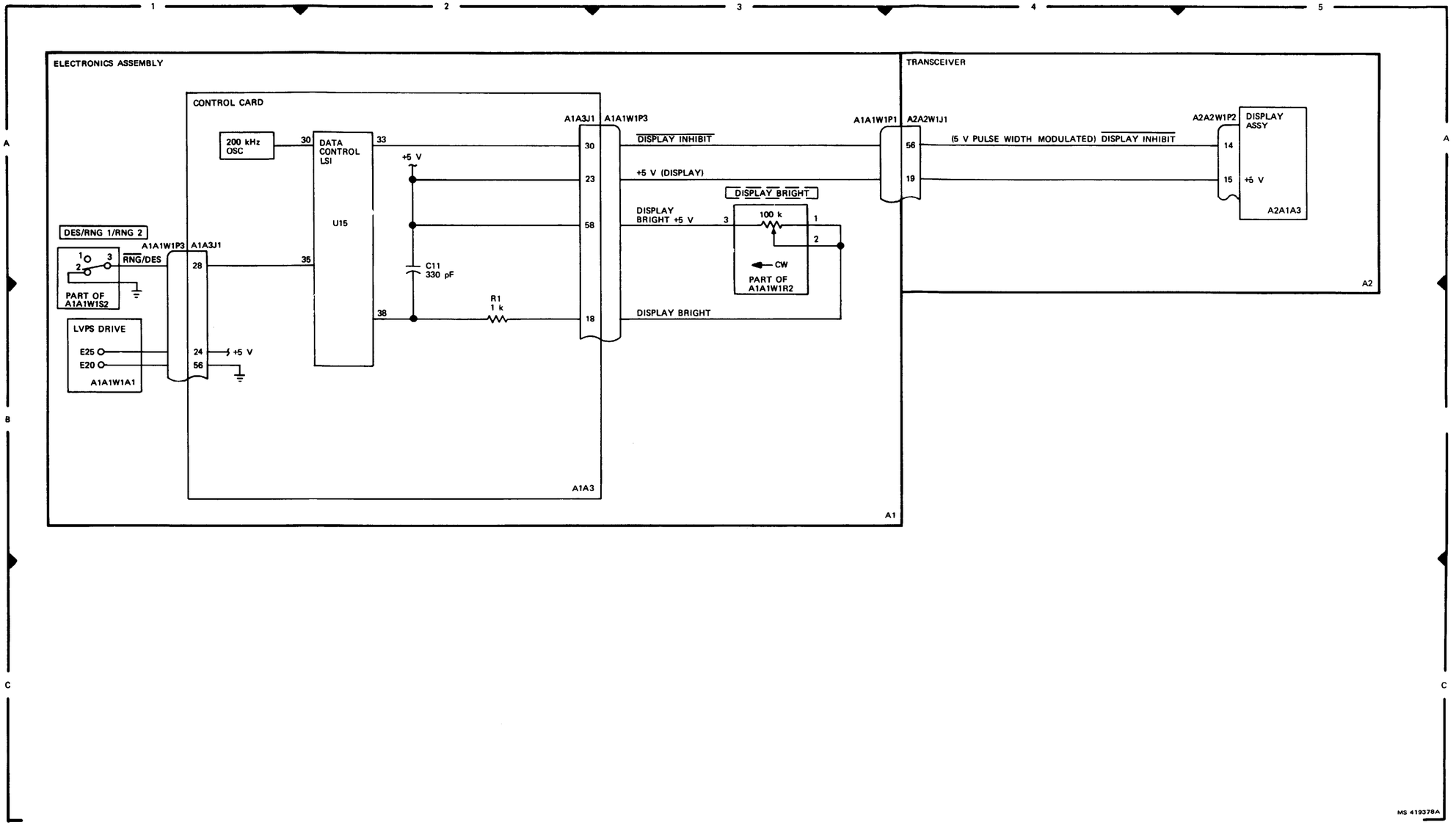


Figure FO-5. Display Brightness Fault Functional Diagram

DISPLAY TEST FAULT FUNCTIONAL

This functional diagram covers the basic circuitry related to test of the display assembly LED segments and indicator lights.

During normal operation of the LD/R, when the POWER switch is ON and DISPLAY BRIGHT control A1A1W1R2 is turned fully clockwise to the TEST (detent) position all eyepiece indicators and readouts are illuminated: the AZ 8888, RNG 8888, EL-888 readouts, amber, red light and green light as well as the reticle are all illuminated.

The DISPLAY TEST signal is initiated by applying ground through DISPLAY BRIGHT control A1A1W1R2, protective diode CR5, power control A1A3 to display assembly A2A1A3 pin 3.

The DISPLAY TEST signal for the green light (FIRE COMMAND) is initiated by removing ground from contacts C and D on DISPLAY BRIGHT control A1A1W1R2, through blocking diode CR4 to display assembly A2A1A3 pin 20. Multiplexed digital outputs from control assembly A1A3 are applied to the display assembly A2A1A3 pins 4, 6, 12, and 13 to illuminate the segments of the numerical readouts.

For test purposes a +5V signal FIRE CMD from the fault locator circuits illuminates the green indicator light at all times when the fault locator is in use.

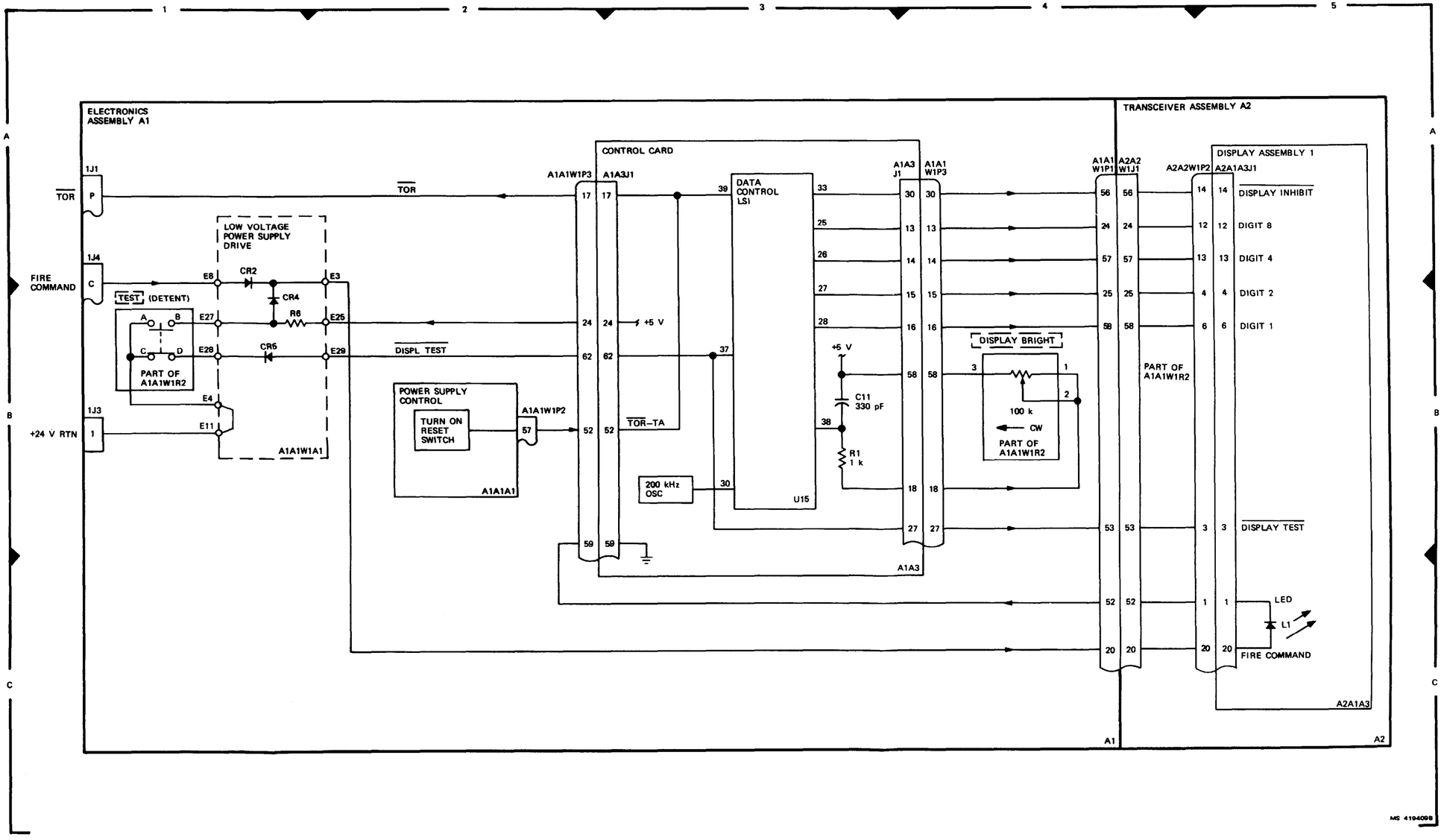
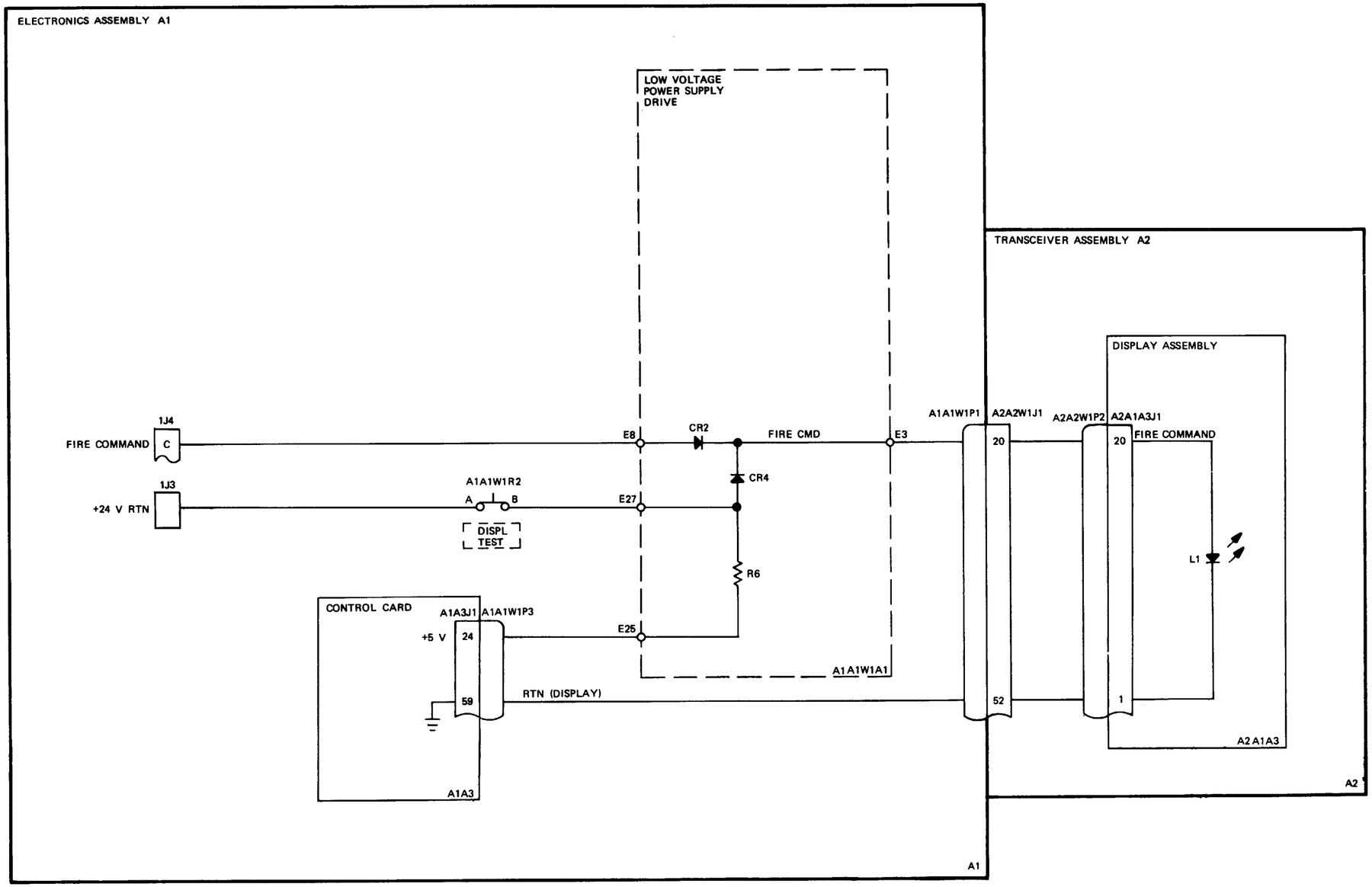


Figure FO-6. Display Test Fault Functional Diagram

GREEN INDICATOR FAULT FUNCTIONAL

This functional diagram covers the basic circuitry related to test and illumination of the FIRE COMMAND indicator L1.

The green indicator light is lit by the FIRE COMMAND. This signal is normally sent by the DMD (Digital Message Device) through the 1J4 connector with the fault locator connected +5V is supplied through 1J4 to the indicator for testing. The green indicator is also lit by placing the DISPLAY BRIGHT control in the TEST position. With the DISPLAY BRIGHT control in the TEST position contacts C and D of A1A1W1R2 are open allowing +5V from control card A1A1W1P3-24 to turn on L1.



MS 4194108

Figure FO-7. Green Indicator Fault Functional Diagram

AMBER INDICATOR FAULT FUNCTIONAL

This functional diagram covers the basic circuitry related to internal test of the LD/R battery voltage level.

The battery low voltage indicator (amber) is lit within the reticle when battery voltage is below 20.5V. The battery voltage is routed through the power switch A1A1W1S1, the filter network in the LVPS drive (A1A1W1A1), and to the pre-regulator drive circuits of the power supply control logic card A1A1A1. Fault Functional (See Figure FO-14, Power Generation Fault Functional Diagram). Within A1A1A1, the battery voltage level is compared to a standard signal in U3 LSI and if the level is 20.5 ± 0.5V and the $\overline{\text{BAT LOW}}$ signal goes low and the amber indicator is lit.

The voltage level at which the battery low indicator is lit can be set by setting the power supply voltage to 20.5V and then adjusting variable resistor A1A1A1R25 on the power supply control card until the amber indicator light just comes on.

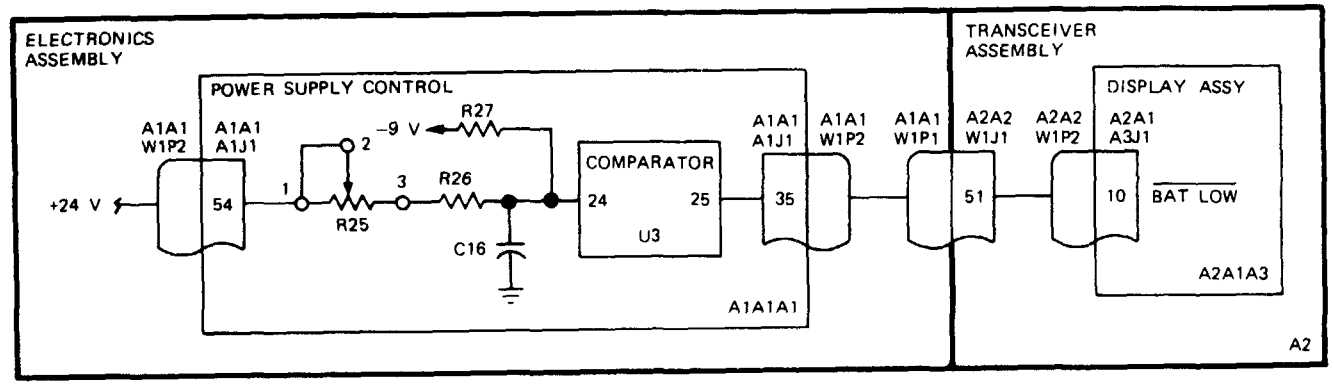


Figure FO-8. Amber Indicator Fault Functional Diagram

BAT VDC, +15 VDC, +5 VDC, AND/OR -15 VDC FAULT FUNCTIONAL

This functional diagram covers the basic circuitry related to low voltage power generation.

System battery (+24V) power is routed to the LVPS Drive A1A1W1A1 when power relay A1A1W1K1 is energized by the trigger switch. The LVPS Drive initially filters the battery power for use in developing low voltage power for the system. The voltage sense and current sense signals control the power output of the DC-to-DC converter as well as supplying control signals to the pre-regulator drive circuits of the power supply control card. The pre-regulator drive circuits provide control/drive signals for regulation of the output of the LVPS Drive circuits.

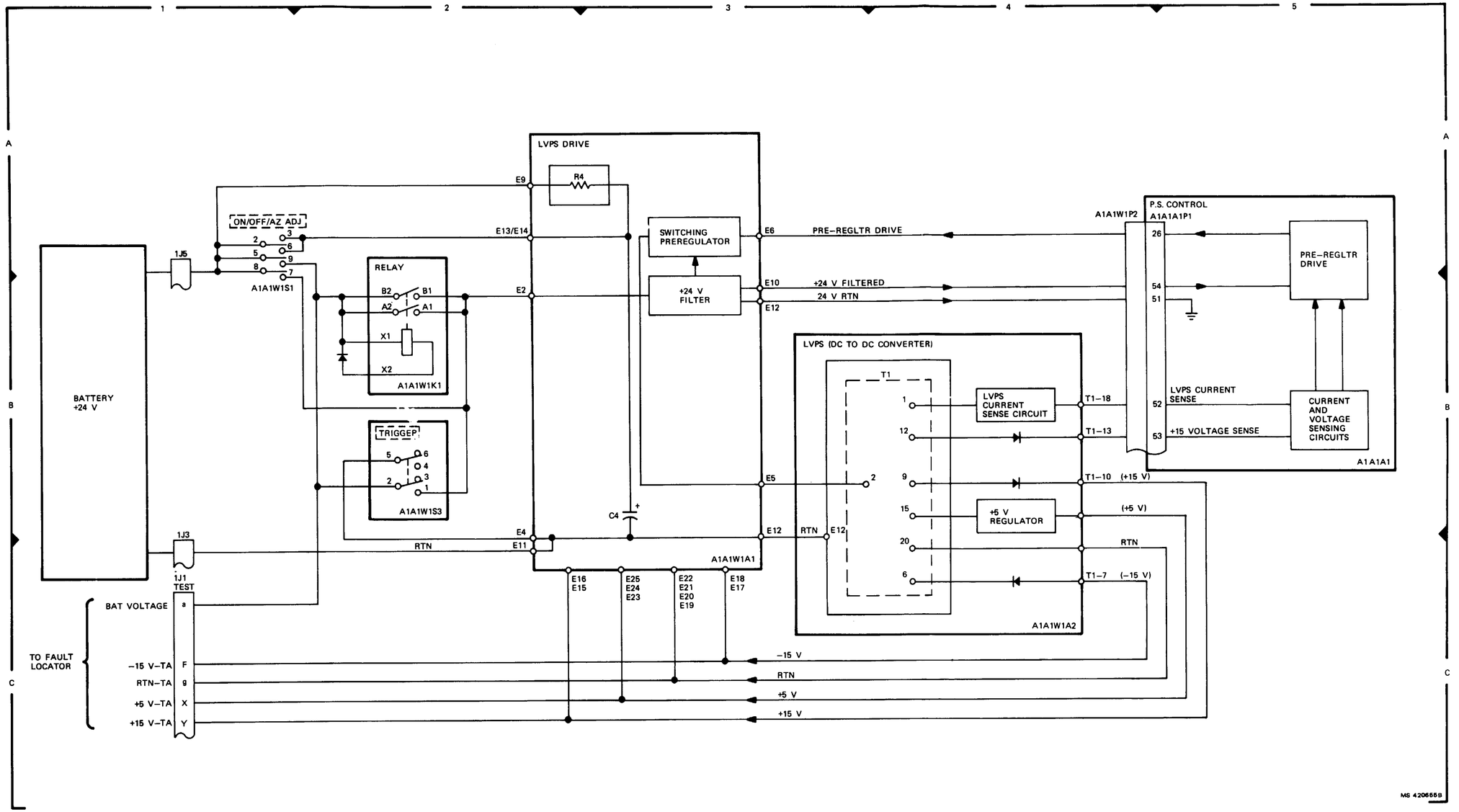


Figure FO-9. Bat VDC, +15 VDC, +5 VDC and/or -15 VDC Fault Functional Diagram

PFN VDC FAULT FUNCTIONAL

This functional diagram covers the basic circuitry related to generation of the PFN energy pulse and PFN output adjustment.

Positioning power switch A1A1W1S1 in the ON position enables the trigger and mode control logic circuits on A1A1. Code timing LS1 U4 on A1A3 generates the HVPS ENABLE signal which is buffered and inverted to become HVPS ON. HVPS ON is used to control power supply gating circuitry on circuit card A1A1A1.

Locate the two PFN power supplies A1A1W1A3 and A1A1W1A4 on this functional. To drive these two PFN power supplies there are two drive circuits (180° out of phase) on A1A1A1. One drive circuit, ØA, controls A1A1W1A1A3 and the other drive circuit, ØB, controls A1A1W1A4. These drive circuits are used to turn transformers T1 on and off. When T1 is on, 24 VDC flows through the primary of T2 and through a current sensing set of transformer windings. The current induced into the secondary of the current sensing windings produces a voltage on the current sense input to the A1A1A1 card. This current sense input turns the PFN driver on and off through a comparator.

Locate the PFN capacitor in the transceiver assembly A2. The two PFN power supplies charge the PFN capacitor until a proper charging voltage is sensed. (A signal PFN SENSE is provided to the fault locator test circuits to monitor the PFN voltage). When a laser pulse is discharged the PFN capacitor discharges through the flashlamp circuit. A portion of the laser energy is measured by the energy diode. This signal is fed into the energy sense comparator of U1 and an ENERGY ERROR signal is generated. The ENERGY ERROR signal, PFN VOLTAGE SENSE, and a reference voltage (set by R43 on A1A1A1) are added together to generate a signal which turns the PFN drive circuitry on or off as needed to correct for improper energy.

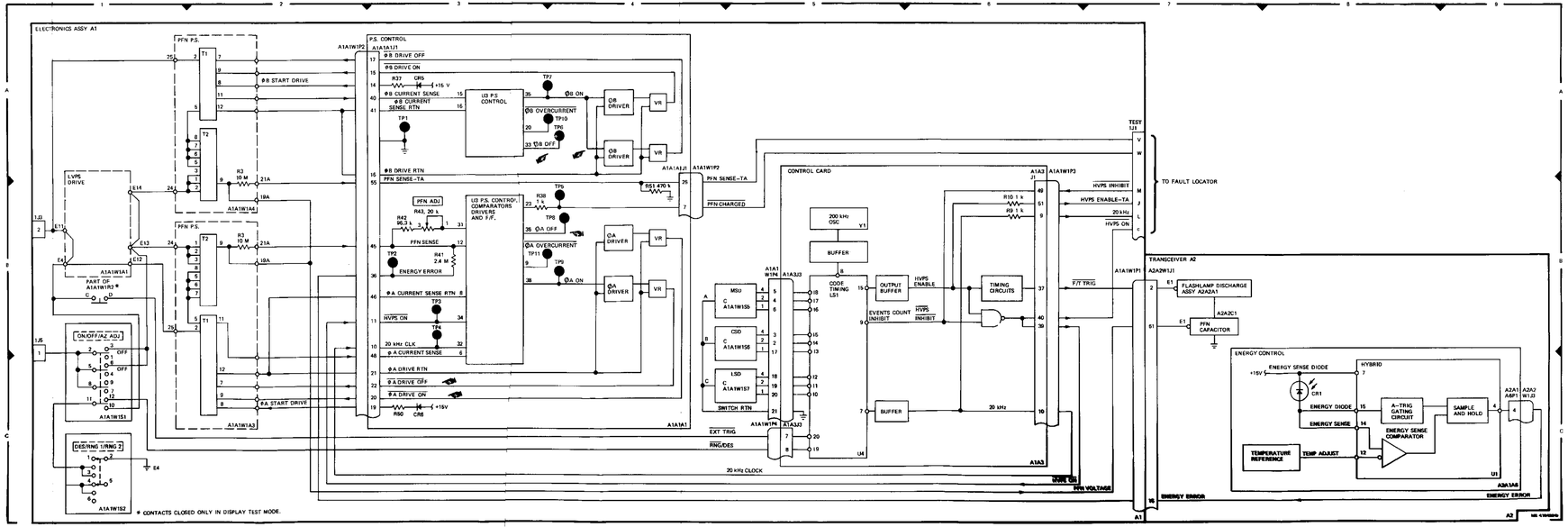


Figure FO-10. PFN VDC Fault Functional Diagram

LASER OUTPUT ENERGY FAULT FUNCTIONAL

This functional diagram covers the basic circuitry related to generation of timing and control signals related to generation of the laser output energy.

When DES/RNG 1/RNG 2 switch A1A1WS2 is set to DES, the command to the timing counters, on Code Timing LSI U4, is to repeat the laser firing sequence the number of times per second as set by the code select switches. The code select switches feed a three digit octal number (111 to 788) into the registers of U4 to control the PRF of the laser during designation.

Locate control card A1A3 on this functional diagram. The 200 kHz clock provides the timing signal for the timing counters and logic circuits. The control card circuitry provides the necessary buffering and time delays to turn on the HVPS and activate the FlashTube and Q-Switch Trigger circuits. This is done with set delays and one shot multivibrators.

Locate the energy sense diode on Energy Control card A2A1A6. Bias is provided by 15 V from the LHPS (not shown). Light entering the diode causes it to conduct in the reverse bias direction proportional to the energy of the incident radiation. Two signals are then produced, ENERGY SENSE and ENERGY DIODE. ENERGY SENSE is used by an energy sense comparator to sample the output laser energy. ENERGY DIODE goes to an A-Trigger gating circuit and produces A-TRIG which is brought out to the fault locator test circuits as a monitor of proper laser operation. A-TRIG is also sent to a sample and hold amplifier where the output of the energy diode is compared to a value set by the temperature adjust line. The output of the sample and hold ENERGY ERROR is brought out to the fault locator test circuits where it can be monitored (the maximum excursion for ENERGY ERROR shall be -14.0 to +14.0 volts after 80 ±20 laser pulses). The ENERGY ERROR voltage is summed with the PFN sense voltage and a reference voltage (on the control card) to form the PFN programming circuit. The programming circuit maintains a constant laser output over the required operating temperature range.

Locate the energy malfunction comparator on the energy control card A2A1A6. The ENERGY SENSE signal is inputted to a comparator where it is compared to a value set by the energy adjust line. If the value is below the valid energy line a signal ENERGY VALID is generated and inputted to the fail logic circuitry on control card A1A3. If the fail logic circuitry senses an ENERGY VALID condition a FAIL DISPLAY signal is generated to light the red indicator light in the eyepiece display assembly A2A1A3.

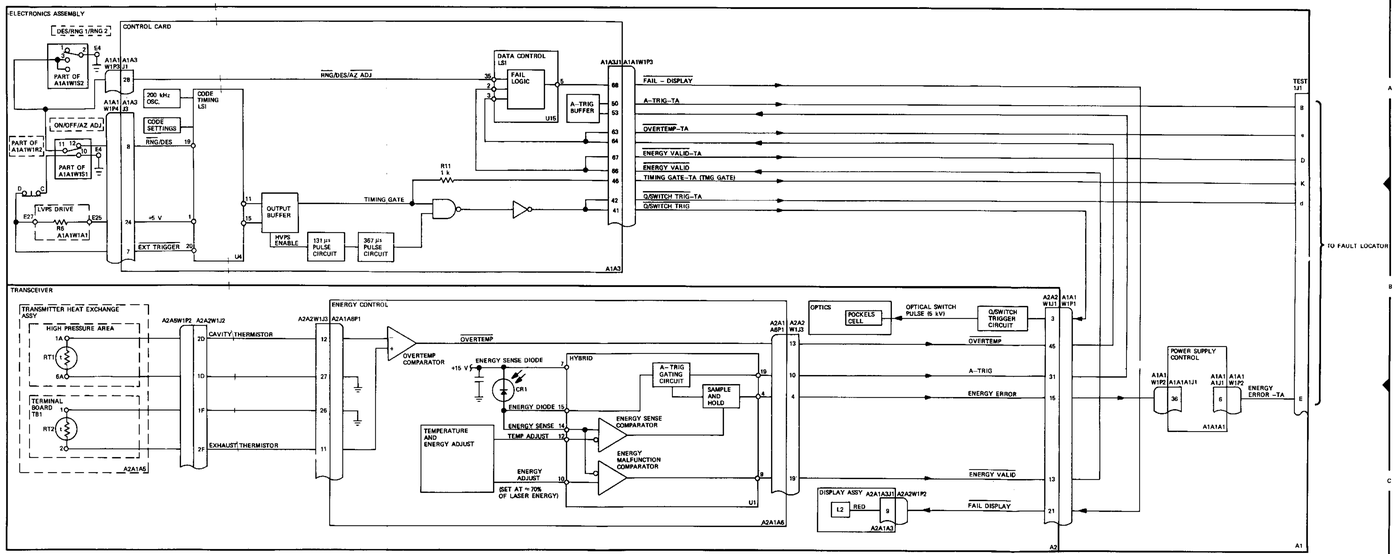


Figure FO-11. Laser Energy Output Fault Functional Diagram

RANGE READOUT FAULT FUNCTIONAL

This functional diagram covers the basic circuitry related to LD/R receiver and ranging functions.

Locate the receiver card (A2A4) on this diagram. The function of the receiver card is to convert laser reflections from targets into digital pulses suitable for determining range information with a high probability of detection and low probability of false readings.

Prior to the time the laser is fired, the receiver is put in a ready state by timing circuitry located on control card A1A3. The leading edge of the RECEIVER START signal begins the conditioning by triggering drive circuitry on A2A4 to generate high voltage (-400 VDC) for the detector avalanche photo diode (not shown). The trailing edge of RECEIVER START triggers circuitry which takes the diode out of avalanche but biases it in a region of high sensitivity for ranging intervals.

A laser pulse reflected from the target is detected by the avalanche diode which generates a current pulse which is converted into a digital pulse. This digital pulse (VIDEO) is sent to the range counter on control card A1A3. The energy sense diode along with gating circuitry produce an A-TRIG pulse. The A-TRIG pulse is ended with the VIDEO pulse to produce a buffered VIDEO which starts the range counter. False range readings are minimized by the Q/S TRIG RECEIVER signal which triggers TPG (Time Program Gain) circuitry to reduce the sensitivity of the receiver for short range targets.

Locate A1A3 on this diagram. Initially when the laser is fired the readout counter is reset to ZERO. In RANGE 1 the second and last video, which should be the target, resets the timing counter and inhibits the video gate from seeing any other pulse. The value in the readout counter is the range of the last pulse.

On a load instruction the data in the readout counter is loaded in parallel into the range shift register.

Locate the RDC on this diagram. The RDC provides a reference signal to the TU resolvers (not shown). The RDC then receives angle data information from the TU resolvers. The RDC converts these resolver inputs into BDC equivalent words. An input instruction SHIFT/LOAD loads the digital data into a serial shift register. On a shift instruction the serial register is shifted into data registers on the Data Control LSI. The data shift is synchronized by the 50 kHz clock.

The Data Control LSI, RDC, and range register form a 48 bit register for the circulating AZ, RNG, EL computer words. The CONVERSION START instruction from the A1A3 control and timing circuitry sets the data display process into action. When CONVERSION START is received a load instruction is generated by the shift load generator and all 48 bits are loaded in parallel. When the CONVERSION COMPLETE signal is received the shift load generator produces the shift command and the data is shifted four bits at a time into the display decoders located on Display Assembly A2A1A3. The AZ, RNG, EL word is then decoded and inputted for display in the eyepiece.

The fault locator access allows for testing of the AZ, RNG, EL computer word and tests a portion of the LD/R range generation circuitry. Computer word logic inputs a parity bit into the AZ, RNG, EL data word. The fault locator circuitry then checks the parity of the data word and allows a visual check of the content of the data word. Simulated range circuitry in the fault locator enables the delay of the 8000 METER signal generated in the LD/R. This delay results in a delayed pulse simulating a range of 8300 meters in RNG 1 and 8800 meters in RNG 2. This output is applied to the LD/R VIDEO ENABLE line simulating a target range.

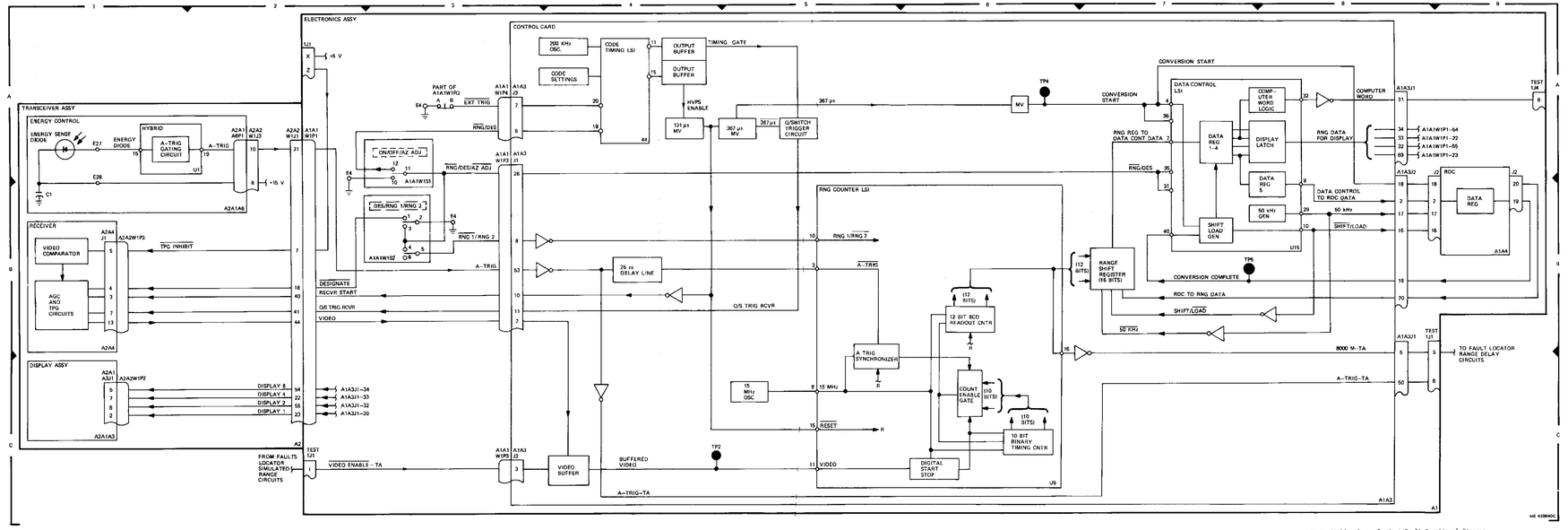


Figure FO-12. Range Readout Fault Functional Diagram

OVERTEMP FAULT FUNCTIONAL

This functional diagram shows the basic circuitry related to cooling and temperature control and fail display indicator logic.

Locate the heat exchanger on this diagram. The heat exchange operation is performed by an internal heat pump and an external cooling fan. Nitrogen coolant at 650 psig is circulated around the flashlamp and laser rod. The cooling gas is circulated by the internal fan which transfers heat from the flashtube and laser rod to external heat exchanger fans. The external fan transfers the heat to ambient air.

Internal cavity thermistor RT1 and external thermistor RT2 sense the relative temperature of the heat exchanger assembly. These thermistors provide temperature feedback to monitor the internal temperature of the cooling vessel and temperature of the external air. As the thermistors are heated, a potential drop occurs across each thermistor proportional to the increase in temperature. These potential differences are monitored by an energy sense comparator on energy control card A2A1A6. If the relative potential difference exceeds a set value an OVERTEMP instruction is sent to fail logic circuitry on control card A1A3. A FAIL DISPLAY signal is generated and inputted to display assembly A2A1A3 producing a fail indication in the eyepiece assembly (blinking red).

A steady red light in the eyepiece assembly occurs whenever the laser output energy is below a set value. The output energy level is sensed by an energy sense diode located in the optics of the LD/R. Low laser output energy sensed will result in an ENERGY ERROR signal (not shown) being developed which will automatically raise the PFN voltage. When laser energy cannot be adjusted within limits an ENERGY VALID signal is generated. A FAIL DISPLAY instruction is sent to the eyepiece display (steady red) indicating low laser output.

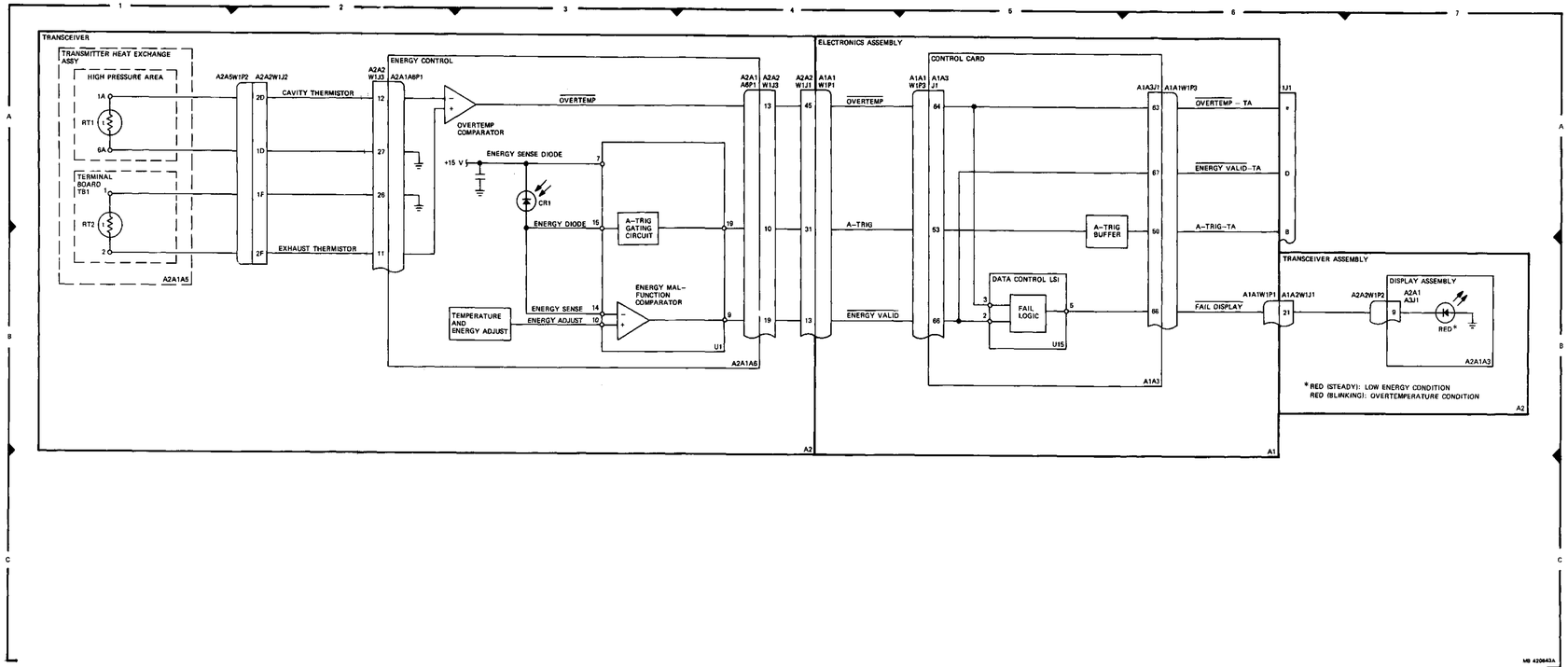


Figure FO-13. Overtemp Fault Functional Diagram

POWER GENERATION FUNCTIONAL

System battery (+24 V) power is routed to the LVPS Drive module when power relay A1A1W1K1 is energized by closing the power switch A1A1W1S1. The LVPS Drive module filters the battery power for use in developing low voltage power for the system and provides drive to the transmitter cooling fans and simmer power supply (not shown).

The pre-regulator drive circuits on the power supply control card provide drive to the switching pre-regulator in the LVPS Drive module. This action turns on the DC-to-DC converter. Voltage sense circuits then control the pre-regulator drive which regulates the output of the converter. +24 VDC is routed via cable A1A1W1P1 to the transceiver assembly fan power circuit. +15 VDC is routed to the transceiver assembly energy diode circuit as a reference voltage and to power the receiver circuit. -15 VDC is routed to the transceiver assembly as a reference voltage for generation of 450 VDC. +5 VDC is distributed to the transceiver assembly to heat the cavity thermistor.

+5 V and ±15 VDC are also distributed from the LVPS to control card A1A3 and to LOVR test connector TJ1 for direct measurement by the fault locator. Drive signals, ØA START DRIVE and ØB START DRIVE, from power supply control card A1A1A1 alternately turn on and off PFN power supplies A1A1W1A3 and A1A1W1A4 until power output is built up to 900 VDC. This voltage is routed to the transceiver assembly PFN (pulse forming network).

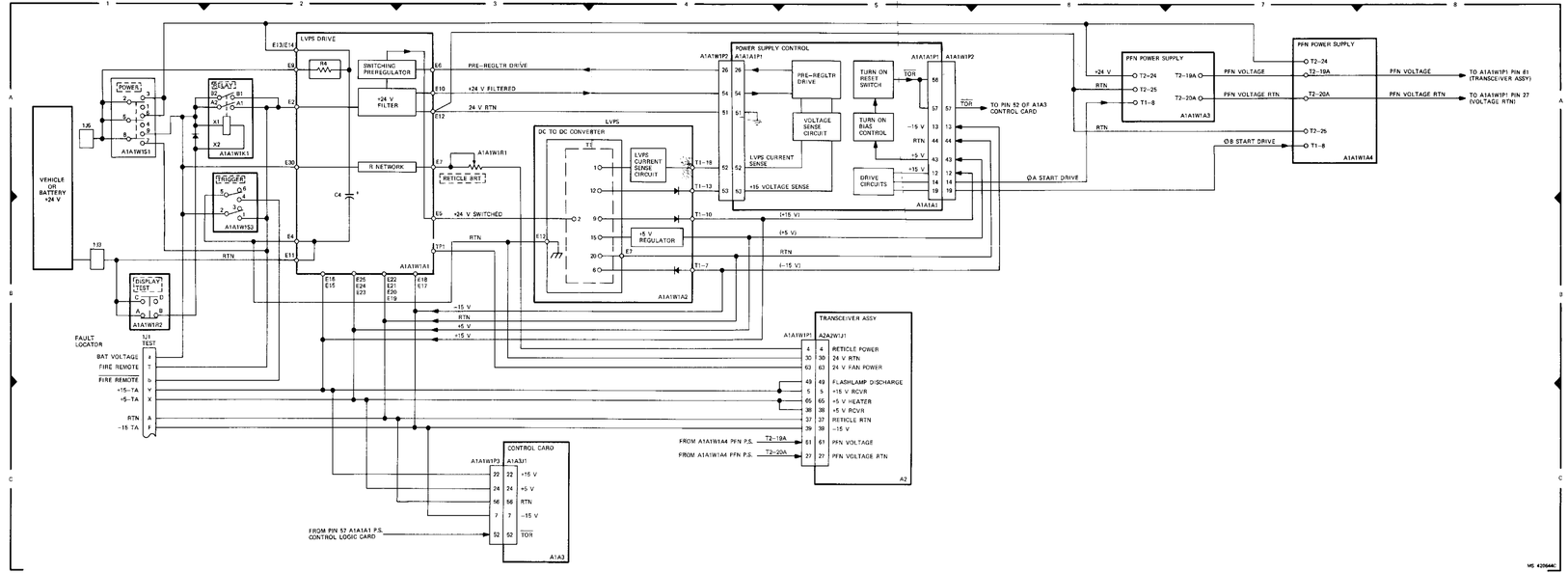


Figure FO-14. Power Generation Fault Functional Diagram

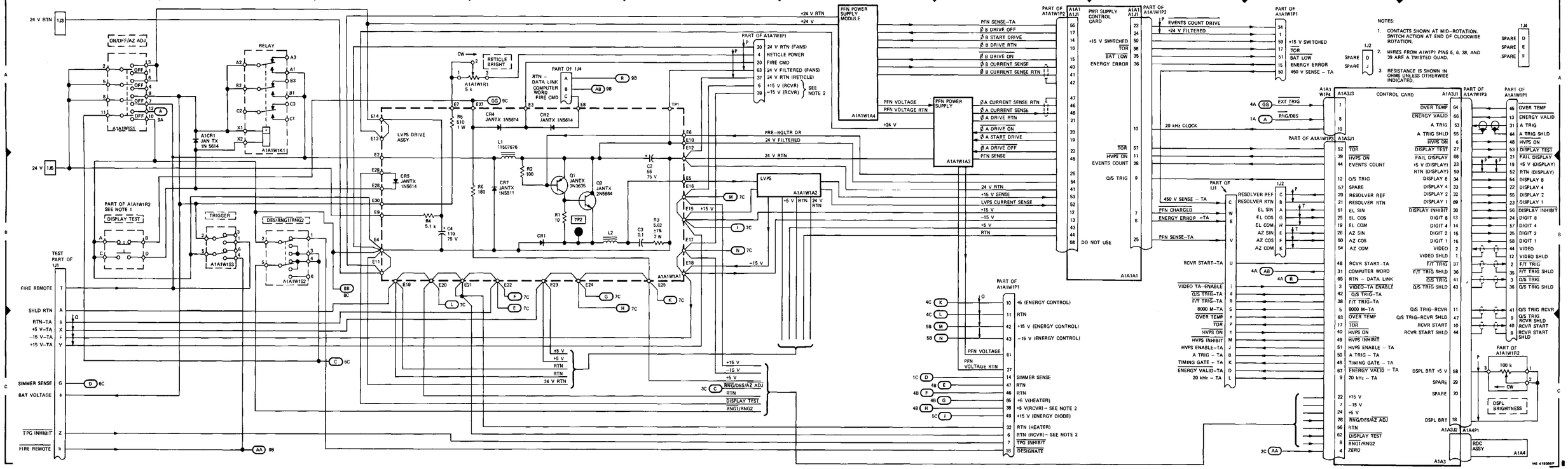


Figure FO-15. LD/R Wiring Diagram (Sheet 1 of 2)