*TM 1-1270-476-T

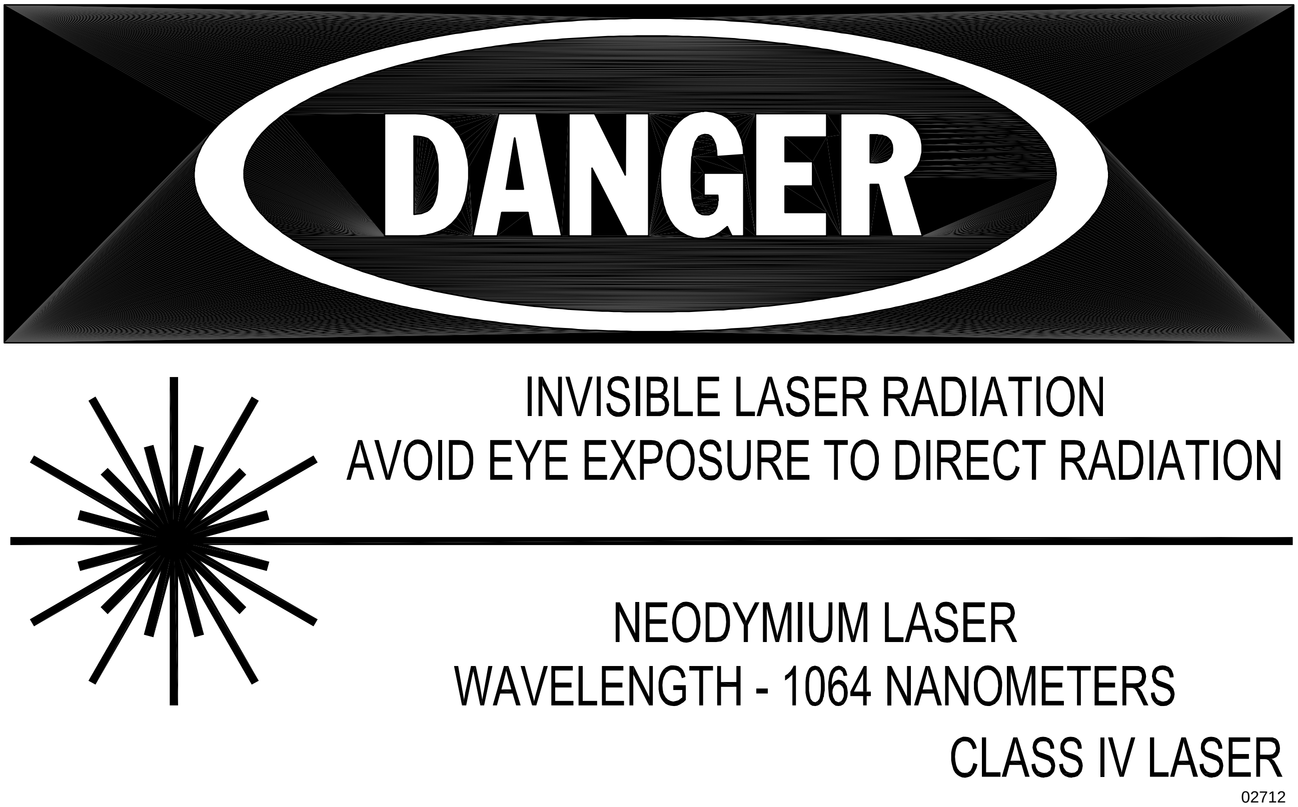
TECHNICAL MANUAL

AVIATION UNIT TROUBLESHOOTING MANUAL
FOR
TARGET ACQUISITION DESIGNATION SIGHT (TADS) ASSEMBLY (NSN 1270-01-142-2855) AN/ASQ-170
AH-64A ATTACK HELICOPTER

*This manual supersedes TM 1-1270-476-T, dated 31 July 1992, including all changes.

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
30 AUGUST 2001



The laser associated with the TADS system is very hazardous. Exposure to the invisible beam or reflections from the beam could cause blindness or serious eye injury.

Procedures in this manual do not require any firing of the laser into open space while on the ground. Boresighting is accomplished in a protective enclosure which prevents exposure to the potentially dangerous laser radiation.

Your supervisor will have laser safety goggles available if any problem presents a possible exposure to the laser radiation. A standard laser safety goggle, NSN 4240-00-258-2054, will provide adequate protection if required. Other laser safety goggles can be used, but should be specific for and labelled with the 1064 nanometer wavelength, and with a neutral density of ND6 or greater.

If you routinely work with rangefinder/designator lasers, you will be included in an occupational vision program in accordance with AR 40-46 and TB MED 524.

WARNING

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

May result if personnel fail to observe safety precautions. Learn the areas containing high voltage in each piece of equipment. Be careful not to contact high-voltage connections when installing or operating this equipment. Before working inside the equipment, turn power off and ground points of high potential before touching them.
For artificial respiration, refer to FM 21-11.

WARNING

RADIATION HAZARD

The anti-reflective coating on all infrared optics contains thorium fluoride which is slightly radioactive. The only potential hazard involves ingestion (swallowing or inhaling) of this coating material. Dispose of broken lenses, etc., in accordance with AR 385-11.

WARNING

HAZARDOUS SOLVENTS

When you use solvents, be sure that the place you work in is well-ventilated. WEAR GLOVES AND EYE PROTECTION. If you don't have good ventilation, read TB MED 223 and use the recommended respiratory (breathing) protection.

DON'T USE FLAMMABLE SOLVENTS AROUND HEAT, OPEN FLAME, OR SPARKS.

IF YOU GET SOLVENT IN YOUR EYES OR ON YOUR SKIN, FLUSH THE SOLVENT AWAY WITH WATER FOR 15 MINUTES; THEN GET MEDICAL HELP.

Freon reacts with highly active free metals such as sodium, barium, or potassium, and may produce toxic byproducts, fires, or explosions. Do not use Freon near highly active free metals.

TOXIC AND FLAMMABLE CHEMICALS

Use the same care for toxic and flammable chemicals as you would for hazardous solvents.

WARNING

NOISE

Sound of running engines (helicopter main engines, APU, AGPU) can exceed U.S. Surgeon General's Noise Limits (TB MED 251). Ear plugs or aviation helmet must be worn when working on helicopter at these times.

LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGE PAGES. DESTROY SUPERSEDED PAGES.

NOTE: The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and change pages are:

Original . . . . . 0 . . . . . 30 August 2001

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 477, CONSISTING OF THE FOLLOWING:

Page No.	*Change No.	Page No.	*Change No.
Title	0		
a - b	0		
A	0		
B Blank	0		
i - iii	0		
iv Blank	0		
1-1 - 1-29	0		
1-30 Blank	0		
2-1 - 2-118	0		
3-1 - 3-273	0		
3-274 Blank	0		
4-1 - 4-21	0		
4-22 Blank	0		
A-1 - A-2	0		
Glossary-1 - Glossary-4	0		
Index-1 - Index-17	0		
Index-18 Blank	0		

*Zero in this column indicates an original page.

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DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 30 AUGUST 2001

AVIATION UNIT TROUBLESHOOTING MANUAL
FOR
TARGET ACQUISITION DESIGNATION SIGHT (TADS) ASSEMBLY (NSN 1270-01-142-2855) AN/ASQ-170 (AH-64A ATTACK HELICOPTER)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any errors or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of this manual directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also send in your comments electronically to our e-mail address: 2028@redstone.army.mil or FAX us at (256) 842-6546/DSN 788-6546. Instructions for sending an electronic 2028 may be found at the end of this TM immediately preceding the hard copy 2028.

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HOW TO USE THIS MANUAL

If you cannot find the information you are looking for, you cannot properly do your job. Take a few minutes to look through this manual. You will find it easier to use once you have become familiar with it.

Each chapter and section is set up to lead you through it step by step. For example:

1. On the chapter page, you will see a listing of the sections in that chapter. Listed under the section titles is a listing of the tasks for that section. Find the task (by title) that you have been assigned. Now, look across from the task title and you will find the paragraph and page number for the task. Notice that the chapter number forms part of the page number.

2. Now that you have located the page number, turn to that page and review the task requirements before starting the procedures.

3. Did you notice that each task or job begins with an initial setup?

   a. INITIAL SETUP lists the configuration, test equipment, tools and special tools, materials/parts, military occupational specialty (MOS), references, safety instructions, condition equipment should be in, and general instructions for you to complete the task. FOLLOWUP lists the procedures to be performed after you have completed the basic task.

   b. Now, what exactly does INITIAL SETUP mean to you? The term “INITIAL SETUP” means, “DO THIS FIRST BEFORE STARTING THE TASK.” Review one of the initial setup tables and become familiar with the requirements.

4. An explanation of the initial setup headings is presented below.

   a. <u>Tools and Special Tools</u>. Special tools needed to perform the task. Be sure to acquire all the tools before you start the task.

   b. <u>Materials/Parts</u>. Materials and parts needed to perform the task. Materials can be found in Appendix C. Next to the name of the material listed in the initial setup you will find an item number. This number matches the item number in column (1) of Appendix C. Be sure to acquire all the materials and parts before you start the task.

   c. <u>Personnel Required</u>. MOS required to do the task. This will also tell you the number of persons needed to perform the task.

5. You can also use the table of contents on page i of this manual to locate page number for chapters, sections, and the appendixes.

6. Let’s see if you understand how to find a specific task. Suppose your supervisor wants you to replace the humidity indicator.

Here’s how you would find it:

   a. Obtain the correct TM for this task: TM 1-8145-476-23. Aviation Unit and Intermediate Maintenance Manual, Target Acquisition Designation Sight Assembly and Pilot Night Vision Sensor Assembly (TADS/PNVS) Shipping and Storage Containers is the correct manual. Look up this task.

   b. Did you find the chapter title on the cover or did you use the table of contents? Remember replacement is an aviation intermediate maintenance task. So, if you located the Aviation Intermediate Maintenance Chapter, you are correct.

HOW TO USE THIS MANUAL (cont)

c. Looking at the section titles listed in the maintenance chapter index, you should have located the page number for the maintenance procedures. Going to that page you found the section index and located the paragraph and page number of the replacement task.

7. Another approach would be to look in the alphabetical index in the rear of the manual. You would find the information listed in several places: “Humidity Indicator Replacement;” or “Replacement, Humidity Indicator.”

8. Using effectivity codes:

a. Effectivity codes designate differences between TADS components. These codes consist of letters that represent various TADS equipment configurations. They are used throughout this manual to aid the TADS troubleshooting effort. The codes are used to designate differences. When used within narrative text, effectivity codes appear within brackets.

Example: Narrative text **[AAA]**.

b. When used inside interconnect diagrams, effectivity codes appear within triangular borders and are placed on the line which represents that particular configuration.

Example: Interconnect diagrams AAA

c. This manual uses these effectivity codes.

Effectivity Code	TADS Configuration
OIP	Optical Improvement Program (OIP) LRUs installed.
TAD	Non-OIP LRUs installed.

Effectivity Code	Helicopter Serial No.
AAG	82-2355 thru 84-24289
ABC	84-24290 and SUBSEQUENT
ABR	82-23355 thru 84-24232
ABS	84-24233 and SUBSEQUENT

d. Use the effectivity code to determine which procedure, or which path in an interconnect diagram or fault isolation procedure, to use.

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE

This manual covers electrical component location and configuration (ECLC), theory of operation, power up, power-down, maintenance operational checks (MOC), wiring interconnects, and fault isolation procedures (FIP) for TADS system functions.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and instructions for completing them are included in DA PAM 738-751, The Army Maintenance Management System-Aviation (TAMMS-A).

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Destruction procedures are in TM 750-244-1-5.

1-4. PREPARATION FOR STORAGE OR SHIPMENT

Refer to TM 1-1270-476-20 for procedures regarding storage and shipment of line replaceable units (LRUs) and electrostatic discharge sensitive (ESDS) devices.

1-5. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Quality assurance information is explained in FM 1-511.

1-6. DEFICIENCY REPORTING

If your equipment needs improvement, let us know. Send us a Quality Deficiency Report (QDR). You, the user, are the only one who can tell us what you don't like about your equipment. Let us know what you don't like about the design. Tell us why a procedure is hard to perform. Put it on Standard Form (SF) 368 (Quality Deficiency Report). Mail it to us at:

Commander
U.S. Army Aviation and Missile Command
ATTN: AMSAM-MMC-MA-NM
Redstone Arsenal, AL 35898-5230

We'll send you a reply.

1-7. CORROSION PREVENTION AND CONTROL (CPC)

a. Corrosion prevention and control (CPC) of Army material is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

b. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

c. If a corrosion problem is identified, it can be reported using SF 368, Quality Deficiency Report. Use of the keywords such as “corrosion,” “rust,” “deterioration,” or “cracking” will assure that the information is identified as a CPC problem. The form should be submitted to: Commander, U.S. Army Armament, Munitions and Chemical Command, ATTN: AMSAV-QF/Customer Feedback Center, Rock Island, IL 61299-6000.

1-8. WARRANTY INFORMATION

Refer to TM 1-1270-476-20.

Section II. TROUBLESHOOTING INFORMATION

1-9. MANUAL CONTENT AND ORGANIZATION

a. Equipment descriptions and theory of operation for systems and functions are presented in chapter 2. Troubleshooting for the system and functions is presented in chapters 3 and 4. Each troubleshooting chapter presents only one system or function.

b. Chapter contents are provided in the chapter index, located at the beginning of every chapter. Before troubleshooting, learn the content and organization of this manual and how it relates to other manuals. For more information on manual content and usage refer to HOW TO USE THIS MANUAL.

1-10. ELECTRICAL DATA

a. Electrical Units. Unless otherwise specified, the values indicated for electrical units in this manual are as follows:

- Phase (Ø)
- Resistance (R) in ohms
- Voltage (E) in volts (V)
- Current (I) in amperes (A)
- Frequency in Hertz (Hz)
- Power in watts (W)

b. Electrical Measurement Tolerances. Unless otherwise specified, tolerances for resistance and voltage are ±10%.

c. Grounds. Except as otherwise indicated (such as chassis ground), all grounds are common AC, DC, and signal grounds.

d. DC Voltage Polarities. DC voltages are positive polarity (+28 VDC, etc.) unless otherwise specified.

e. AC Voltages. All indicated AC voltages are 3Ø, 400 Hz.

f. Circuit Breakers. Circuit breakers are to be at closed (ON) position. Troubleshooting procedures for all circuit breakers and all electrical circuits supplying electrical power to circuit breakers are in TM 1-1520-238-T-6.

g. Signal Names, States, Conditions, and Values. Signal values shown exist for the conditions and states indicated by signal names.

h. Coaxial Cable Resistance Measurements. When both ends of a coaxial cable are disconnected, resistance measurements from the shield to the center conductor should indicate open.

1-10. ELECTRICAL DATA (cont)

i. Electrically Operated Devices. Relays, solenoids, and other electrically activated devices shown in the interconnect diagrams are shown in de-energized state.

j. Terminal Board Connections. Electrical connections at terminal boards are shown (fig. 1-1) as follows:

- Vertical and horizontal lines indicate electrical separation between terminals and blocks of terminals.
- Absence of lines indicates no separations.
- Terminal board connections may be illustrated horizontally, vertically, or a combination of both.

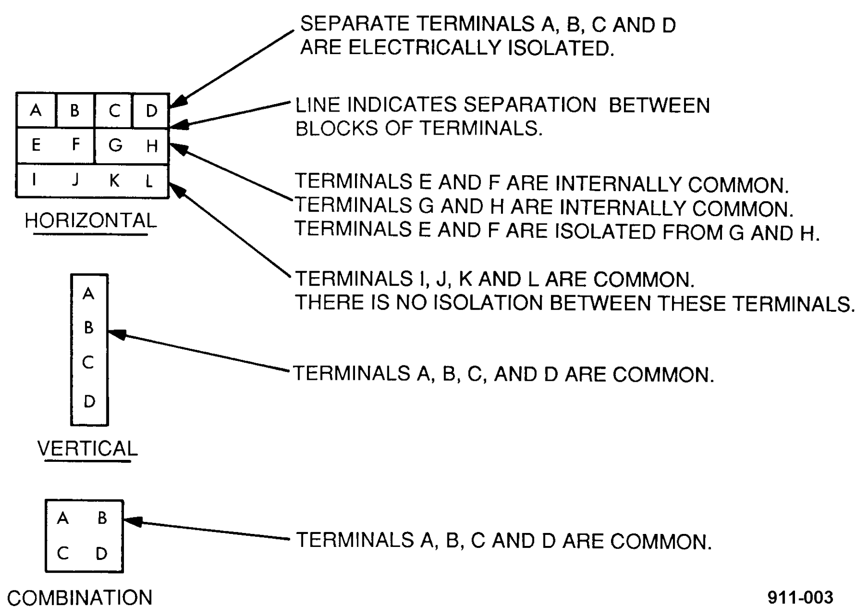


Figure 1-1. Typical Terminal Board Connections

1-11. WIRING INFORMATION

a. Interconnect diagrams in this manual are used for wiring checks. Helicopter reference designators for LRUs are shown in the lower right corner of the LRU on the diagrams. TADS reference designators are shown after the LRU nomenclature in the upper left corner of the LRU. Electrical wiring repairs peculiar to the AH-64A are in TM 1-1520-238-23. Electrical wiring repairs not peculiar to the AH-64A are in TM 55-1500-323-24.

b. The wiring diagram volume, TM 1-1520-238-T-10, contains the following additional information:

(1) Part number index listing reference designator, item name, part number, and wiring harness.

(2) End view of all connectors.

(3) Wiring diagram of AH-64A wire harness including wire numbers, exact connector, terminal board, and ground stud locations, etc., in the helicopter.

1-12. WIRING CHECKS

Where repair or replace wiring or connections is specified, a check is to be made for short or open (as specified) for each wire segment, terminal board, connector pin, and connection over the entire length of wiring between pins or terminals indicated. The electrical interconnect diagram for the equipment being checked is used in making the wiring check. Instructions to repair wire(s) include repair or replacement of wires, connections at end of connector pins, terminals, etc. (all required end-to-end repair and replacement between wiring points specified). The component location and configuration illustration (for the equipment being checked) is used to locate wiring connectors and components in the helicopter.

Section III. TROUBLESHOOTING METHODS

1-13. FAILURE SYMPTOMS AND TROUBLESHOOTING

Troubleshooting begins with failure symptoms. Failure symptoms are organized by system/equipment in the master failures symptom manual TM 1-1520-238-T-2. Use the manual to locate what system(s) the failure is in and perform the appropriate FIPs as directed.

1-14. FAULT DETECTION/LOCATION SYSTEM (FD/LS) CHECK

The fault detection/location system (FD/LS) checks are located in TM 1-1520-238-T-1 along with a description of the FD/LS operating modes and power applications.

1-15. MAINTENANCE OPERATIONAL CHECKS (MOC)

A maintenance operational check (MOC) is provided for each system or function as required. These checks test the system by using operator panel switches, controls, and indicators. When a desired result is not obtained, a reference is made to a FIP or to the multiplex read codes, TM 1-1520-238-T-3, as based on the failure symptom.

1-16. FAULT ISOLATION PROCEDURES (FIP)

The FIPs are referenced from the results of the MOC and depend on the switch control setting of the MOC.

1-17. STARTING TROUBLESHOOTING

a. Refer to TM 1-1520-238-T-2 to determine the proper troubleshooting procedures.

NOTE

If faulty equipment is not known and a failure symptom exists, use failure symptom list in TM 1-1520-238-T-2 to determine what system/equipment has a malfunction.

1-17. STARTING TROUBLESHOOTING (cont)

b. Select the chapter, section, and paragraph to use.

c. For use of external power and ground service utility connectors, refer to TM 1-1520-238-23. If external power is not available, refer to TM 1-1520-238-T-1 for application of the auxiliary power unit (APU). Refer to TM 1-1520-238-23 and TM 55-1730-229-12 for application of external electrical and hydraulic power, and pressurized air. External power is preferred; however, the APU may be used.

d. If circuit breakers do not stay closed during power-up procedures, refer to TM 1-1520-238-T-2 to identify and correct the fault.

e. If power is not available to the equipment during power-up procedures, refer to TM 1-1520-238-T-6 to troubleshoot the electrical system.

f. First perform the FD/LS check in TM 1-1520-238-T-1. If the FD/LS check does not find the fault, do not perform the power-down procedure. Perform the MOC.

g. If there is no FD/LS check, perform the MOC.

h. Troubleshoot using the specific procedures in the selected paragraph.

1-18. DURING TROUBLESHOOTING

CAUTION

When making resistance, open, short, or other ohmmeter checks on circuits, always de-energize the circuit to avoid damage to the meter.

a. Correct faults and repair any equipment where damage is obvious.

CAUTION

Make sure helicopter environmental control system (ECS) fans are operating while electrical power is applied to helicopter to prevent equipment damage.

b. ALWAYS maintain required cooling of units while operating equipment.

1-18. DURING TROUBLESHOOTING (cont)

NOTE

For Information on cooling requirements, refer to the ECS in TM 1-1520-238-T-8.

c. If troubleshooting procedures indicate that an LRU is faulty, it is replaced a second time only under one of the following conditions:

(1) When a preexisting failure in the wiring or system caused the newly replaced LRU to fail and the preexisting failure has been corrected.

(2) The replacement LRU is known to be is known to be OK.

d. The LRU is not to be replaced under any defective and the interconnecting wiring of the following conditions:

(1) If the interconnecting wiring is not absolutely known to be OK.

(2) If the newly replaced LRU is not absolutely known to be defective.

(3) If, under any circumstances, the LRU has already been replaced a second time.

1-19. COMPLETING TROUBLESHOOTING

a. Prior to application of power -

- Connect items disconnected during troubleshooting.
- Reinstall or replace items removed during troubleshooting.

b. To make sure that trouble is corrected -

- If trouble is found and corrected using a FD/LS check, repeat the FD/LS check.
- If trouble is found and corrected using a MOC, repeat the MOC - then perform any applicable FD/LS check.

c. Secure all doors, panels, and opened areas.

Section IV. LRU TROUBLESHOOTING - OFF THE HELICOPTER

1-20. TROUBLESHOOTING LINE REPLACEABLE UNITS (LRUs) AND SHOP REPLACEABLE UNITS (SRUs) OFF THE HELICOPTER

Troubleshooting beyond the scope of this manual for LRUs and SRUs with built-in test equipment, is done with Electronic Equipment Test Facility (EETF) Van (TM 11-6625-3085-12) or at a depot repair facility.

Section V. ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC) INDEX

1-21. ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC)

The ECLC index will help locate electrical components and their connectors on the AH-64A helicopter and TADS, during troubleshooting. This index contains a list of connectors and wiring harness which is shown by component location. Component locations are shown from the helicopter's forward section to its aft sections by horizontal and vertical grid numbers. Connectors are listed numerically in FROM/TO columns of the index. Every connector is referenced to a grid area within the illustrations. Use the index to find connectors on the aircraft as follows:

- Locate the connector reference designator number in the **FROM Connector Ref Des** column of the index.

- Cross-reference the **FROM Connector Ref Des** column with the:

  - • **FROM Component/Harness** column to locate the wiring harness number.

  - • **TO Connector Ref Des** column to locate the mating connector number.

  - • **TO Component/Harness** column to locate the mating wiring harness number.

  - • **Grid Area** column to find the grid zone (within the illustration) depicting the location on the aircraft.

To locate connector P867 on the aircraft for example, find connector P867 in the **FROM Connector Ref Des** column, then refer to the **FROM Component/Harness** column. This column shows that P867 is part of component harness W255, and the **TO Connector/Ref Des** column shows that P867 connects to J2 on TADS LEU A634 **(TO Component/Harness** column). The **Grid Area** column indicates that P867 is shown at illustration grid zone 63D, and that **Access** to the connector is obtained through the L90 door. For detailed information about access, refer to TM 1-1520-238-23 and TM 1-1270-476-20.

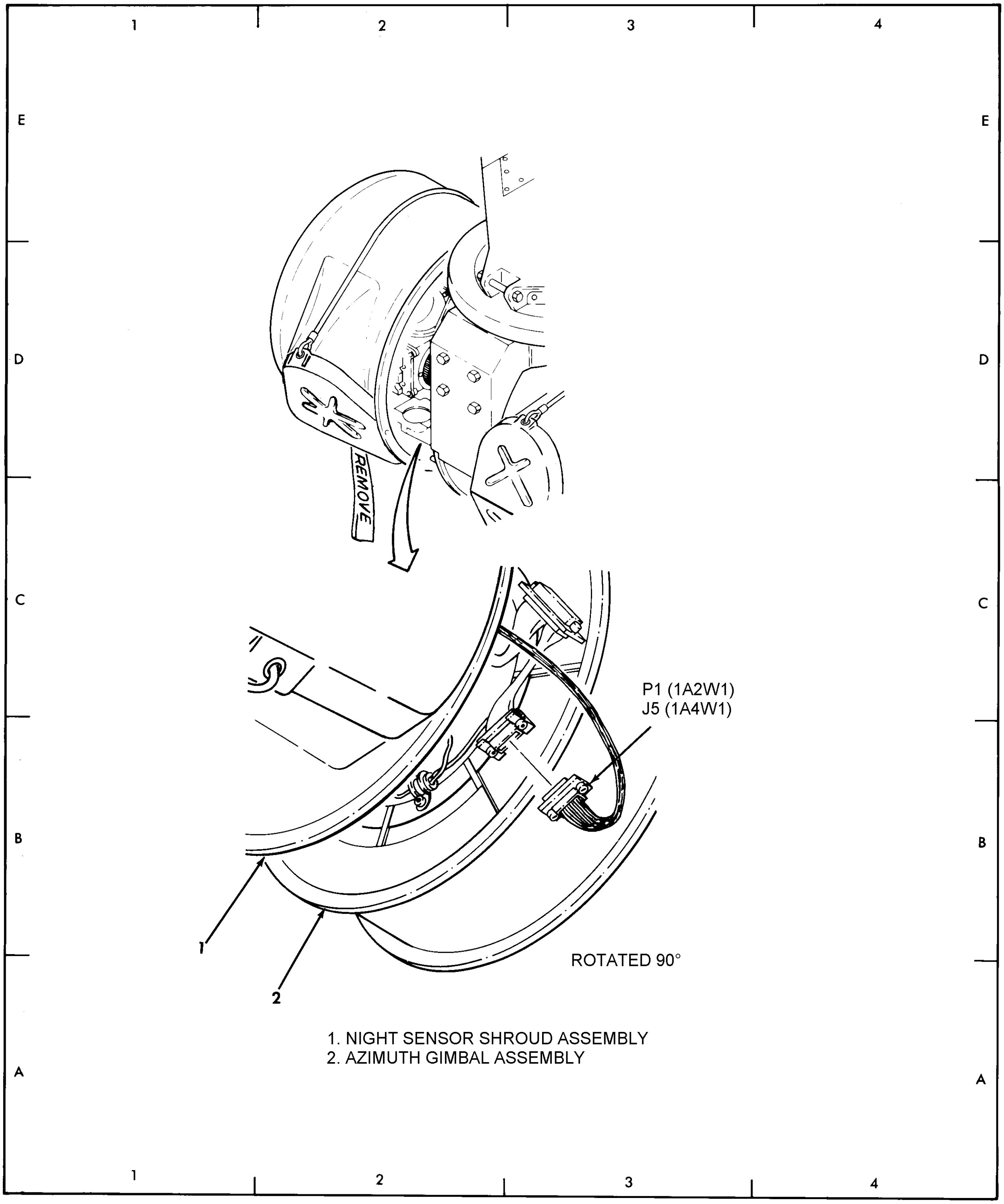
1-21. ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC) (cont)

FROM COLUMN		TO COLUMN			
Connector Ref Des	Component/ Harness	Connector Ref Des	Component/ Harness	Grid Area	Access
P6	1A1	J8	1A1W2	27C	TTA
P1	1A1A1	J12	1A1W2	31B	TTA
P1	1A1A4	J14	1A1W2	23B	TTA LEFT ACCESS COVER
P1	1A1W2	J1	1A1A2	34B	TTA
P2	1A1W2	J2	1A1A2	35B	TTA
P3	1A1W2	J1	1A1A1	34C	TTA
P4	1A1W2	J2	1A1A1	34C	TTA
P5	1A1W2	J1	1A1A3	34B	TTA
P1	1A2W1	J5	1A4W1	2B	NSSA
P1	1A3W10	J2	1A4W1	7C	NSSA
P1	1A4W1	J10	1A1W2	23B	TTA
P10	1A4W1	J1	1A5A1W1	18D	DSSA
P11	1A4W1	J1	1A5A1A1	18D	DSSA
P2	1A4W1	J11	1A1W2	23B	TTA
P3	1A4W1	J9	1A1W2	23C	TTA
P4	1A4W1	J7	1A1W2	23B	TTA
P1	1A4W2	J7	1A4W1	11B	TTA
P2	1A4W2	J1	1A4A4	11B	TTA
P3	1A4W2	J1	1A4A5	11B	TTA
P1	1A5A7	J7	1A5W1	19B	DSSA
P1	1A5A8	J8	1A5W1	19C	DSSA
P1	1A5A9	J9	1A5W1	19B	DSSA
P1	1A5W1	J1	1A4W1	19C	DSSA
P13	1A5W1	J1	1A5A3A4	19B	DSSA
P2	1A5W1	J3	1A4W1	19C	DSSA
P4	1A5W1	J1	1A5A2	19C	DSSA

FROM COLUMN		TO COLUMN			
Connector Ref Des	Component/ Harness	Connector Ref Des	Component/ Harness	Grid Area	Access
P7	1A5W1	J1	1A5A3	19A	DSSA
P1	1A6W1	J8	1A4W1	14B	DSSA
P1	2W1	J1	2W2	55C	CPG STATION
P2	2W1	J1	2A7	59B	CPG STATION
P3	2W1	J1	2A3	59A	CPG STATION
P4	2W1	J3	2A1	51B	CPG STATION
P5	2W1	J1	2A4	47C	CPG STATION
P6	2W1	J1	2A5	46C	CPG STATION
P7	2W1	J2	2A3	58A	CPG STATION
P8	2W1	J1	2A6A5 [TAD]	55B	CPG STATION
P8	2W1	J1	2A6W6 [OIP]	55B	CPG STATION
P1	2W3	J3	2A3	59A	CPG STATION
P2	2W3	J1	2W4	59A	CPG STATION
P1	2W4	J4	2A3	59A	CPG STATION
P2	2W4	J2	2A1	50A	CPG STATION
P1	2W5	J1	2A1	50A	CPG STATION
P2	2W5	J5	2A3	58A	CPG STATION
	COVER	J9	1A1W4	11B	TTA
P523	W117	J523	W255	61A	L60 FAIRING
P537	W117	J537	W255	61A	L60 FAIRING
P673	W117	J3	A63	62C	L60 FAIRING
P668	W255	J4	A61	42C	R40 COVER
P670	W255	J1	A61	42C	R40 COVER
P681	W255	J2	A61	42C	R40 COVER
P699	W255	J3	A61	42C	R40 COVER
P835	W255	J1	1A1W1	39B	R40 COVER

FROM COLUMN		TO COLUMN			
Connector Ref Des	Component/ Harness	Connector Ref Des	Component/ Harness	Grid Area	Access
P836	W255	J2	1A1W1	39B	R40 COVER
P842	W255	J3	1A1W2	38C	L40 COVER
P843	W255	J4	1A1W2	38C	L40 COVER
P844	W255	J5	1A1W2	38C	L40 COVER
P845	W255	J6	1A1W2	38C	L40 COVER
P848	W255	J1	4	62A	L90 DOOR
P849	W255	J2	4	62A	L90 DOOR
P851	W255	J1	3	62D	L90 DOOR
P852	W255	J2	3	62D	L90 DOOR
P853	W255	J3	3	62D	L90 DOOR
P855	W255	J4	3	63D	L90 DOOR
P857	W255	J6	3	62D	L90 DOOR
P861	W255	J7	3	62D	L90 DOOR
P862	W255	J8	3	63D	L90 DOOR
P863	W255	J9	3	63D	L90 D0OR
P864	W255	J3	5W1	63D	L90 DOOR
P867	W255	J2	5W1	63D	L90 DOOR
P868	W255	J4	2W3	43C	L40 COVER
P869	W255	J3	2W3	43C	L40 COVER
P870	W255	J2	2W1	43C	L40 COVER
P871	W255	J1	2W1	43C	L40 COVER
P976	W255	J7	1W1	38B	L40 COVER

1-21. ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC) (cont)



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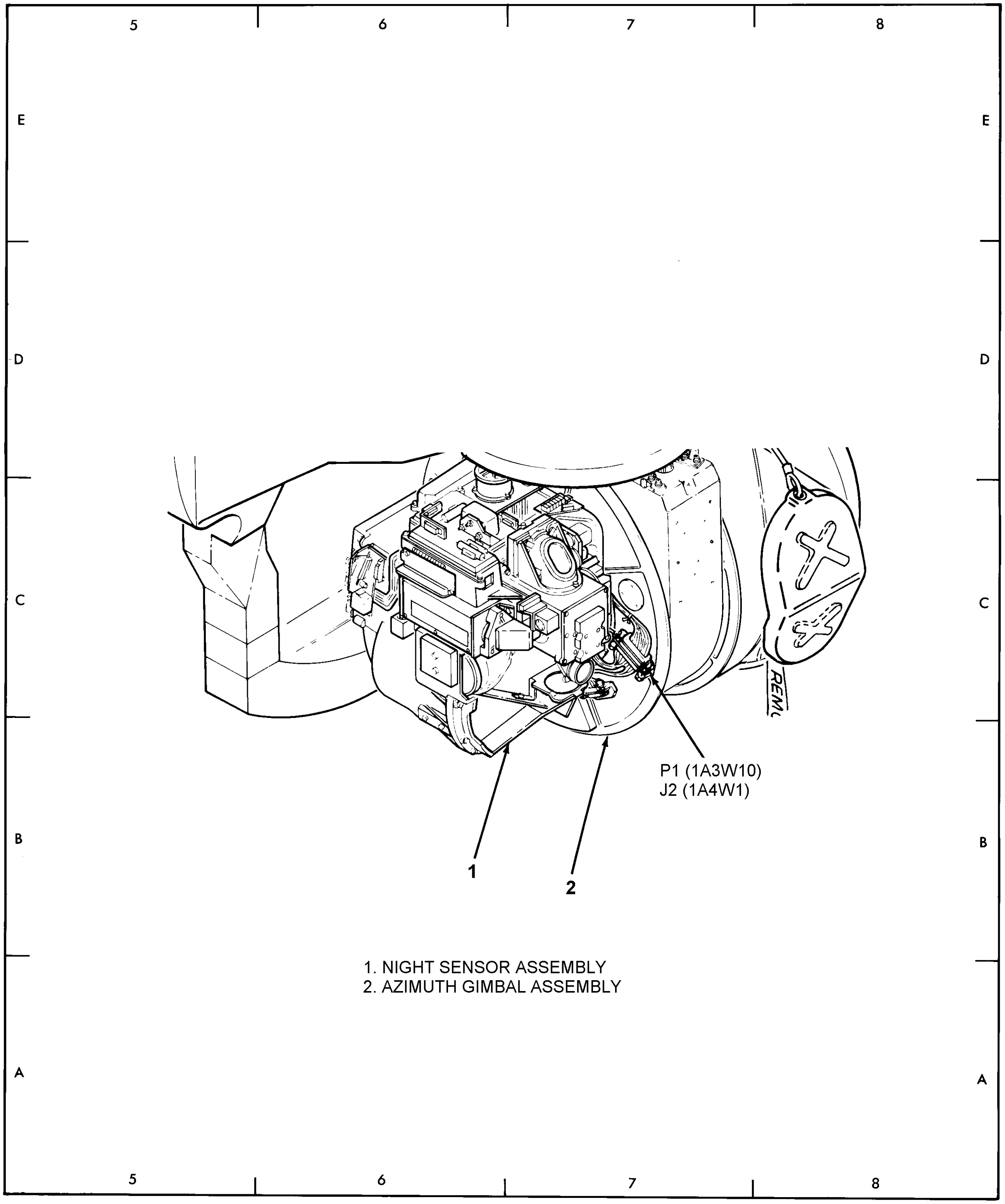
1-21. ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC) (cont)



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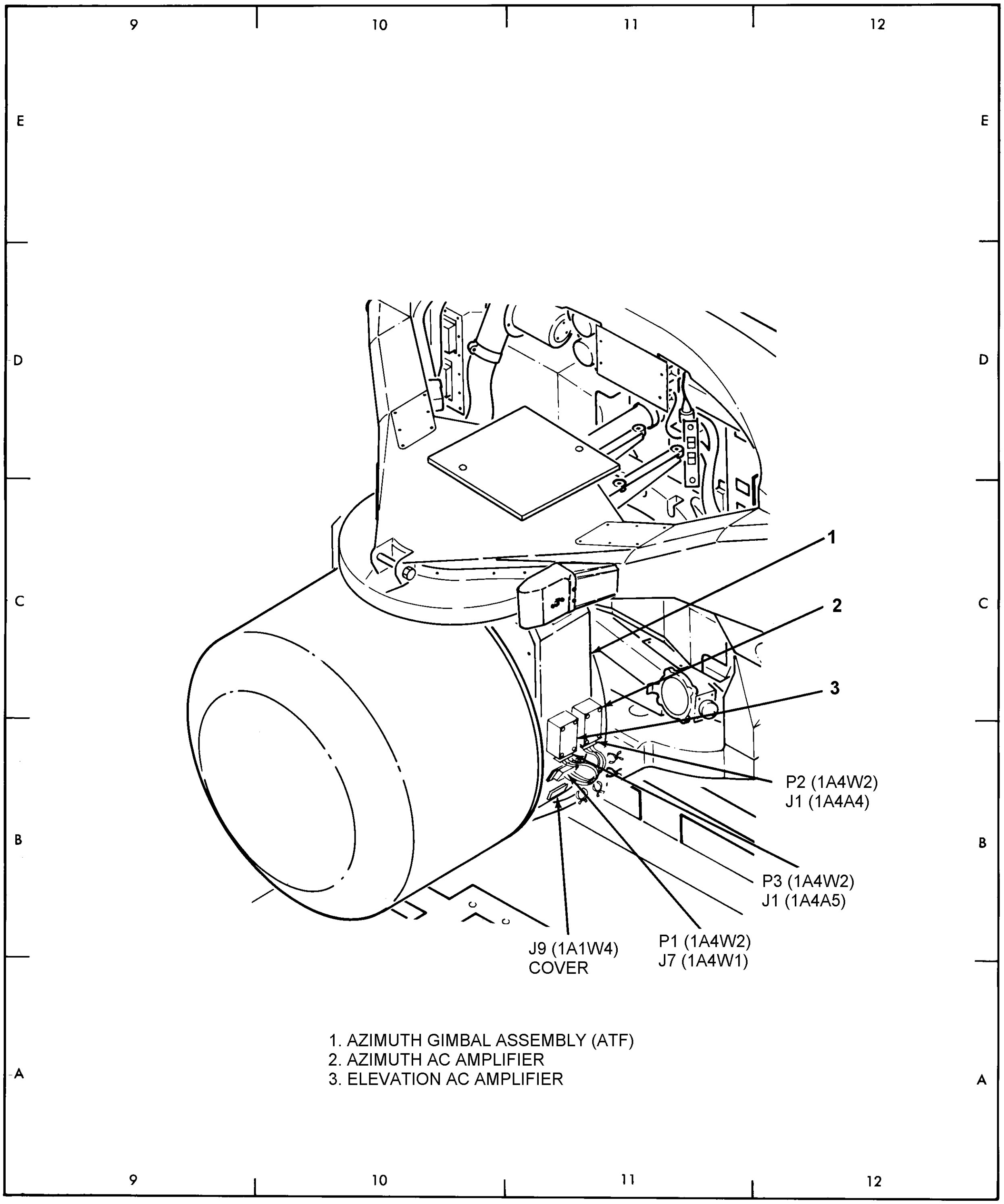

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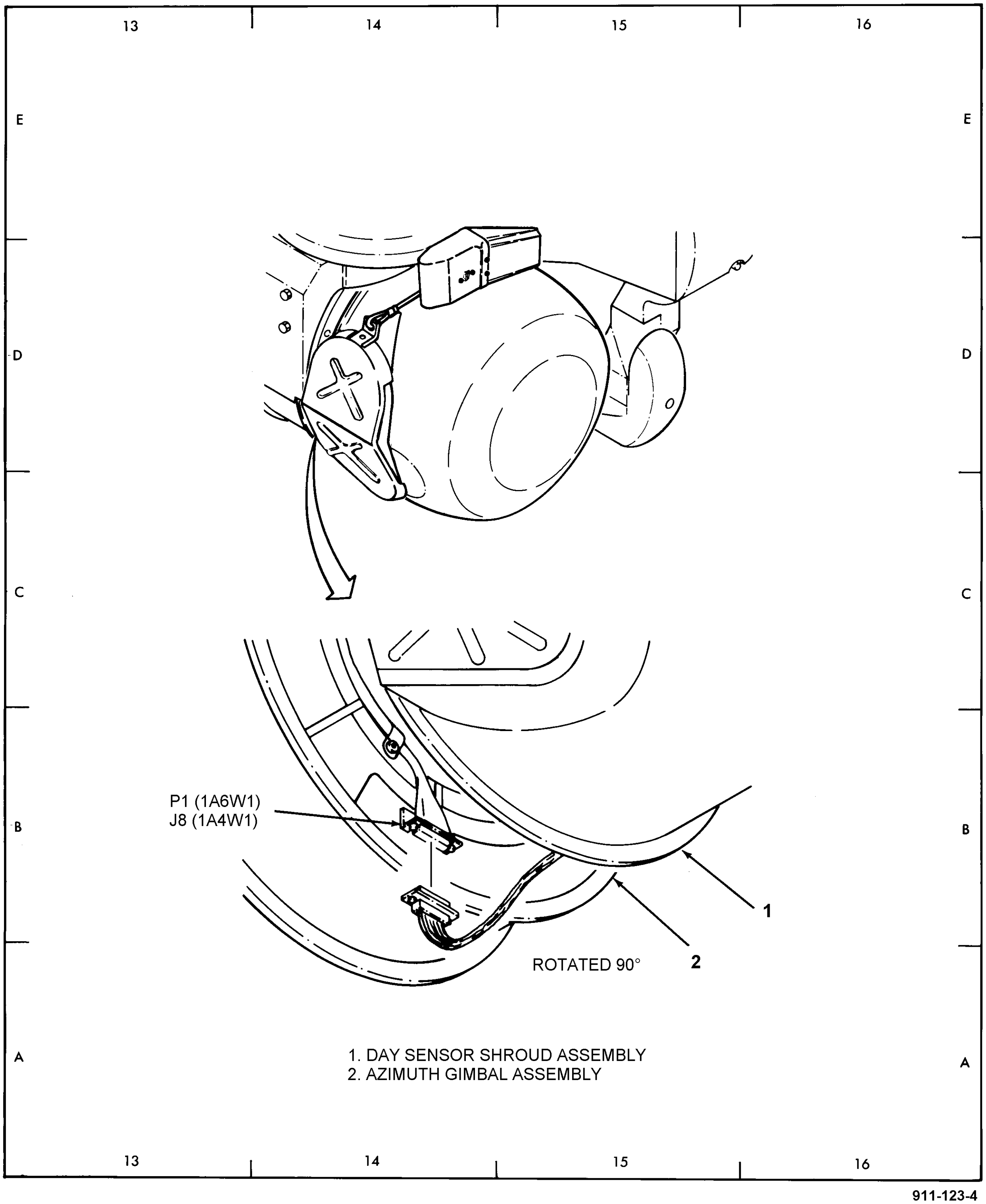

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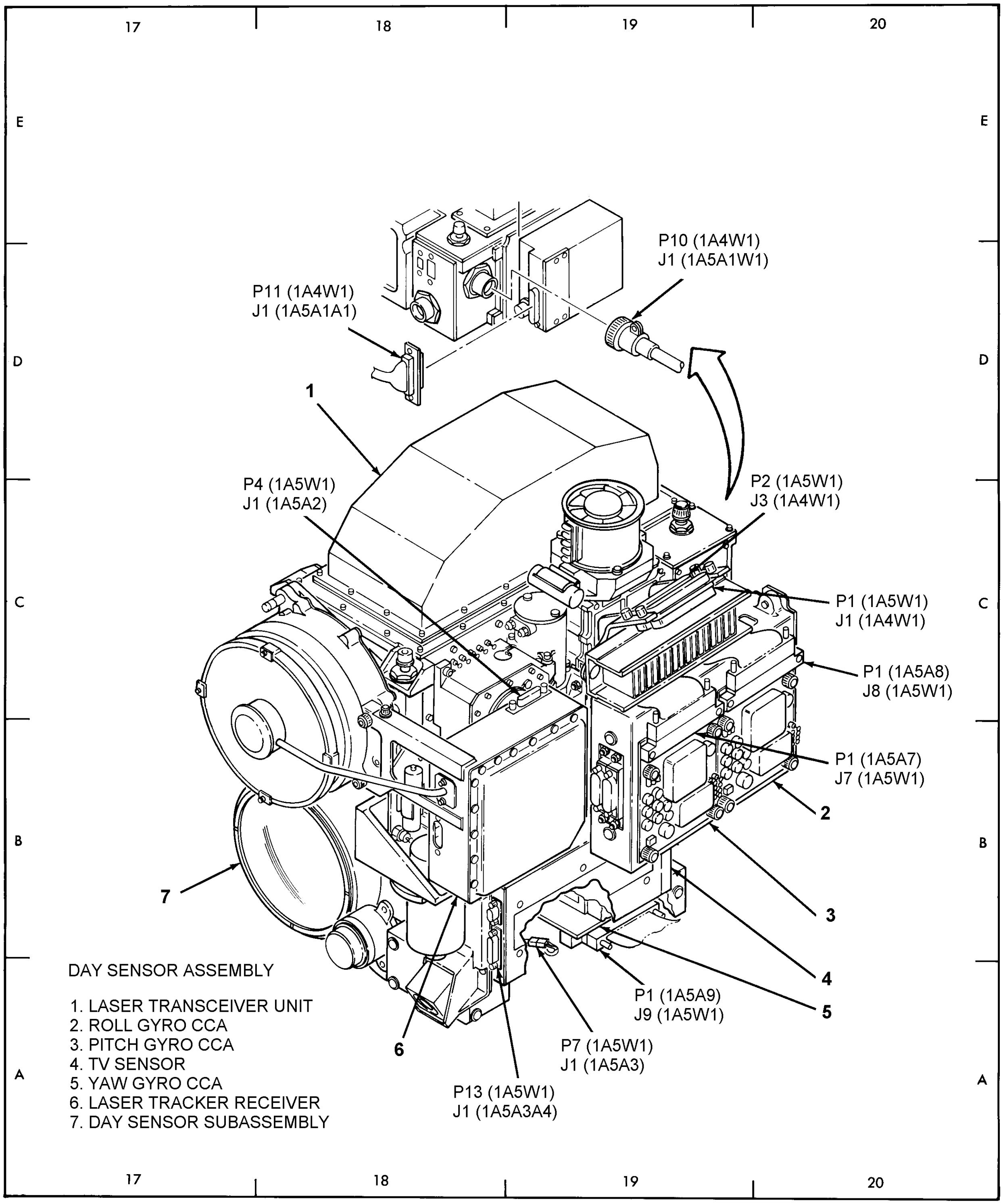

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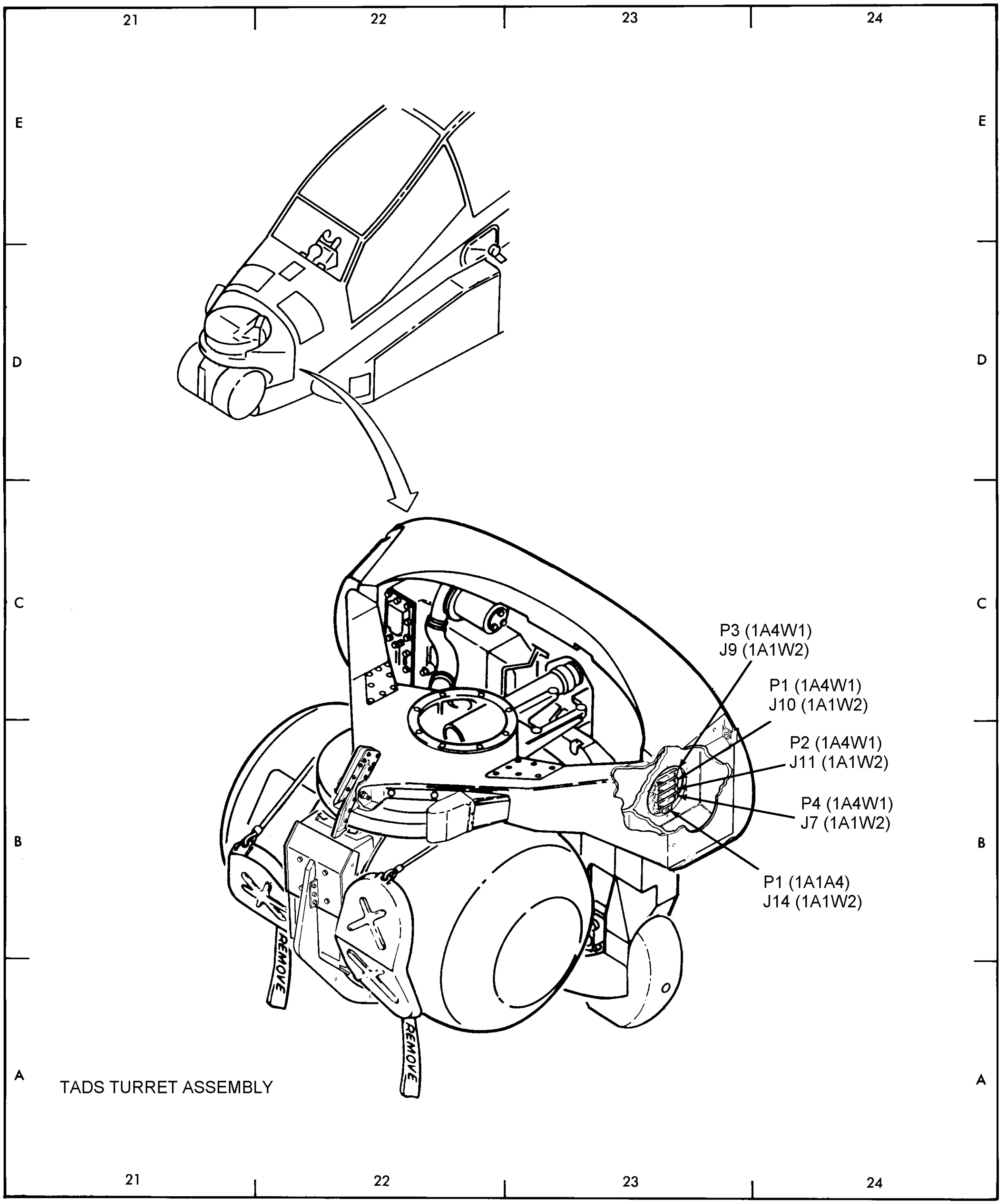

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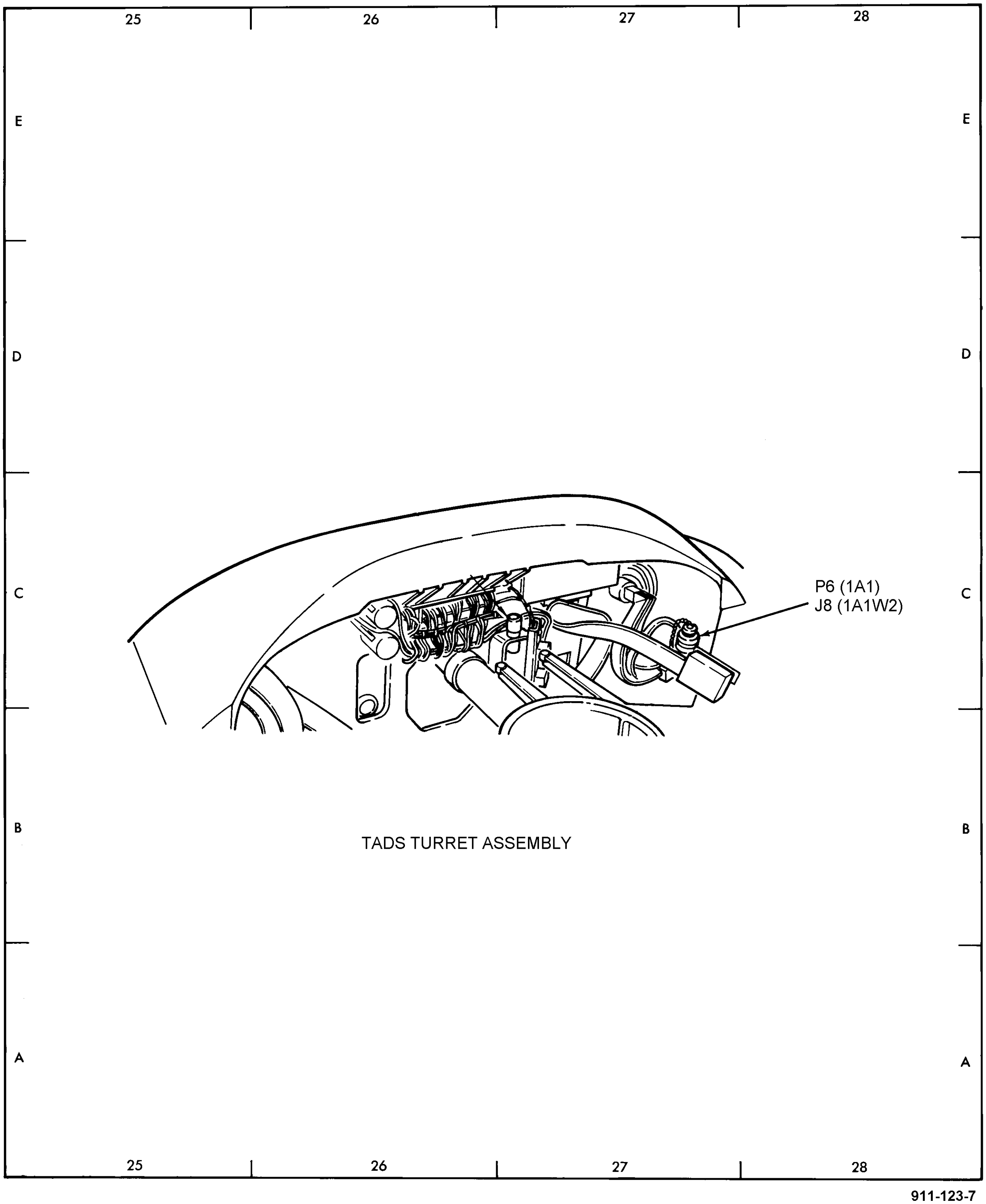
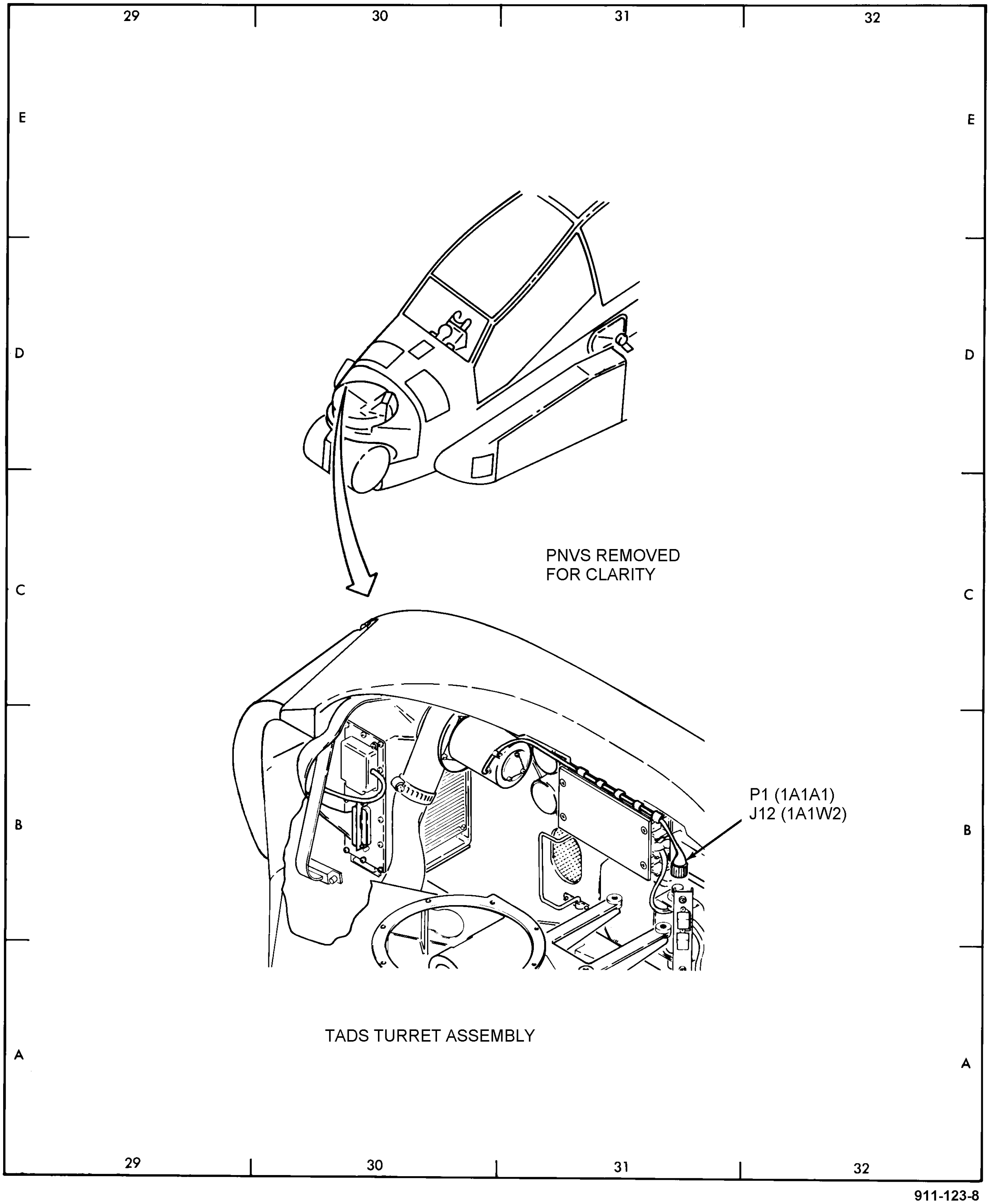
1-21. ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC) (cont)



1-21. ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC) (cont)



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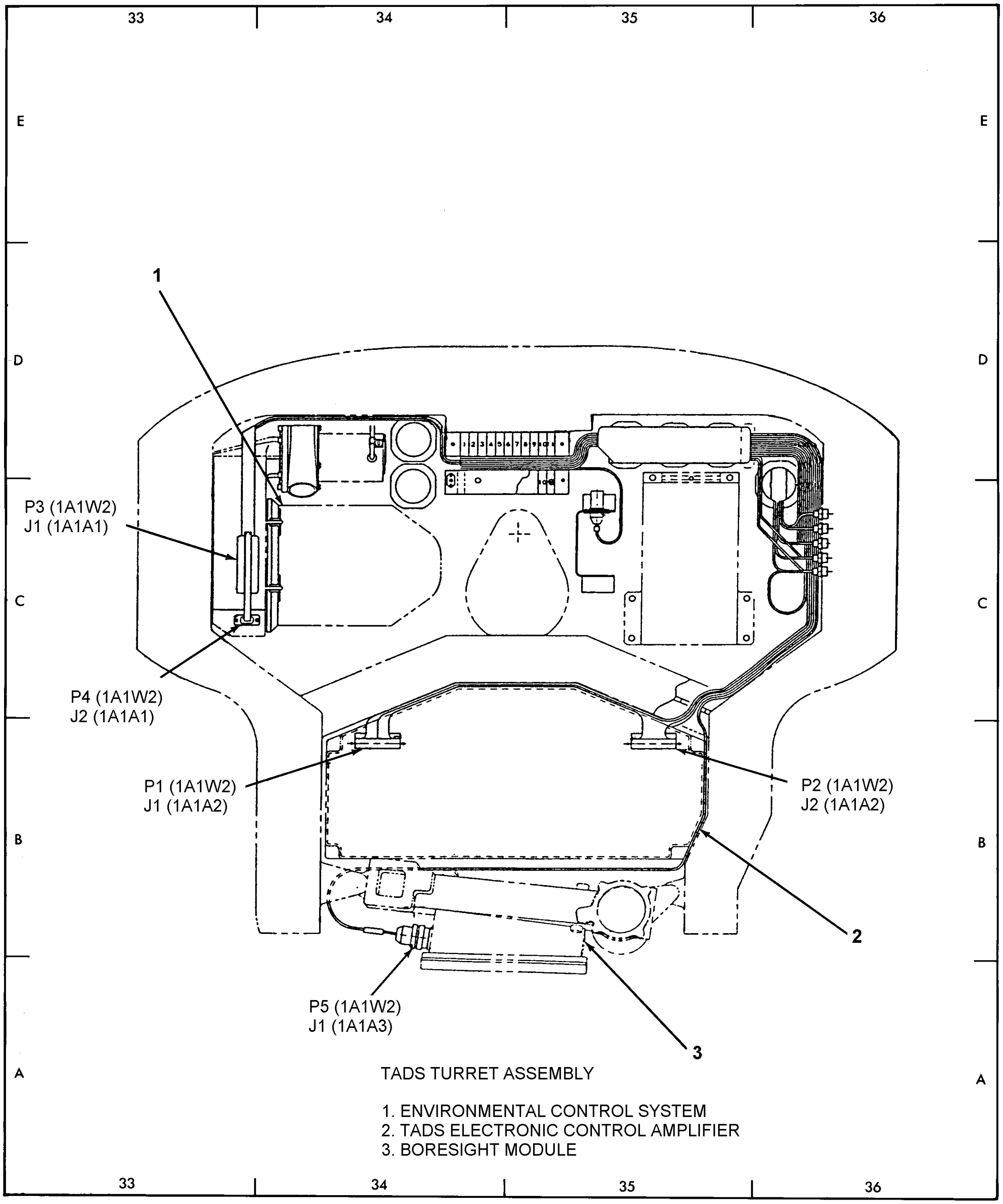

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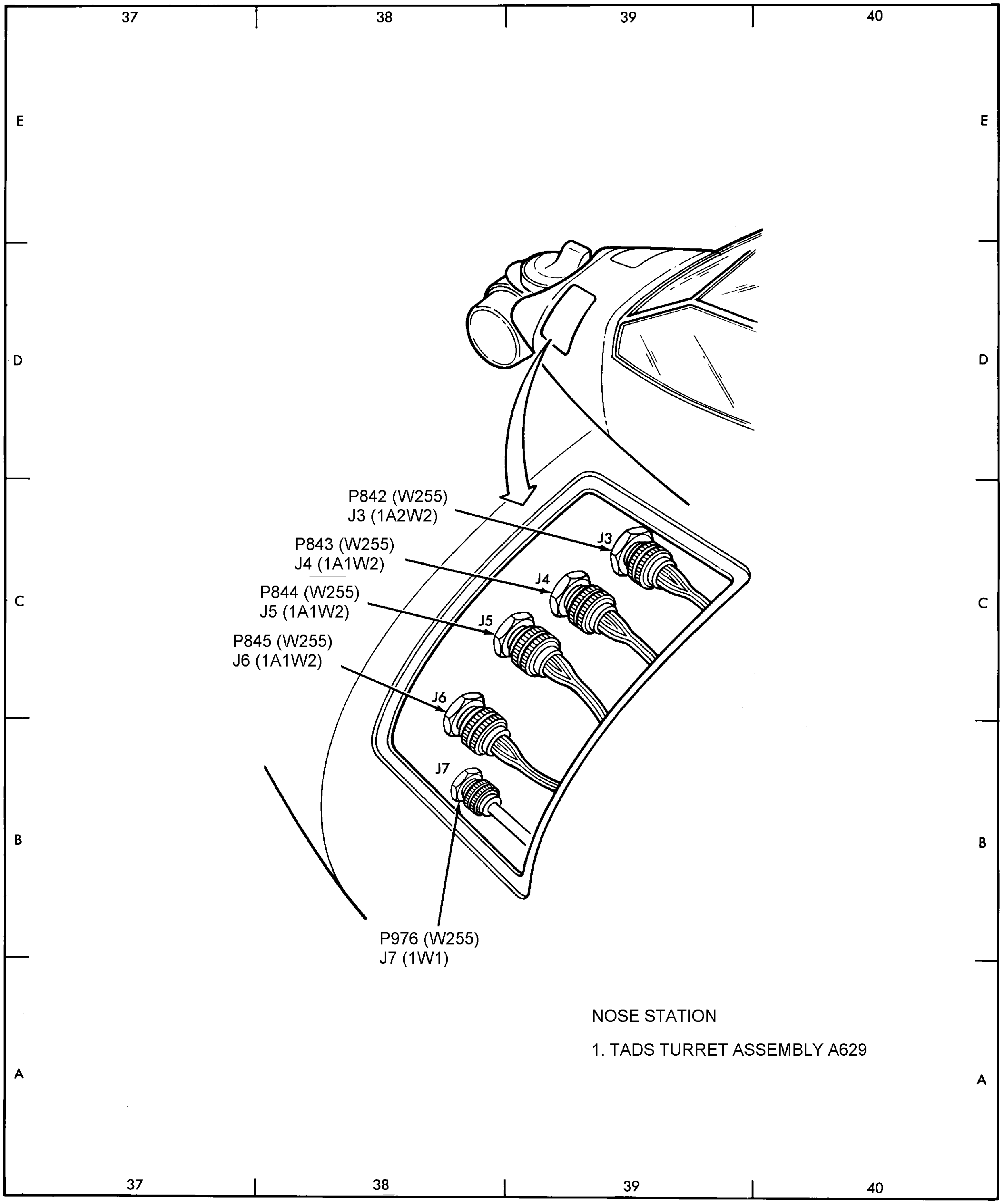

911-123-10

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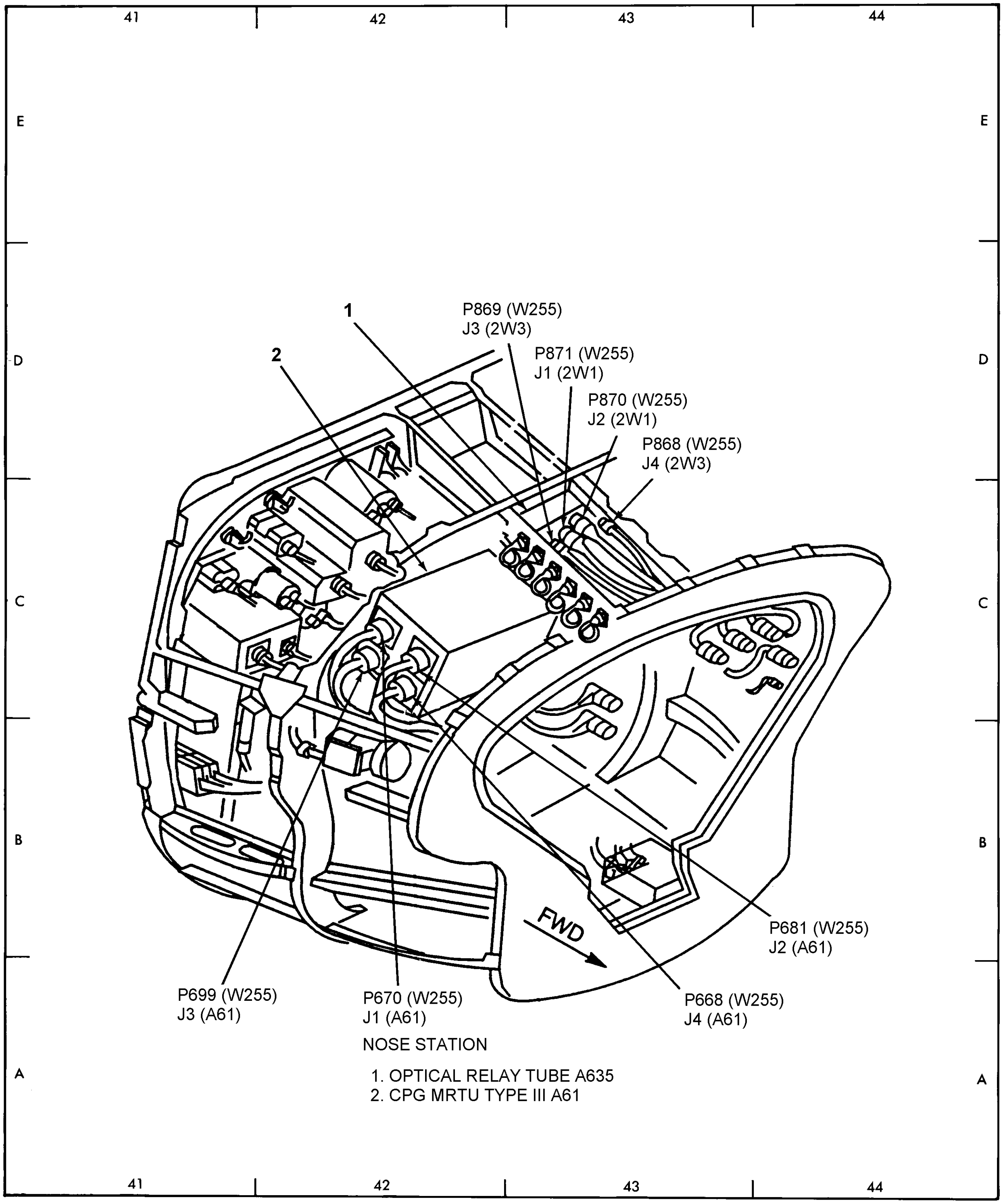

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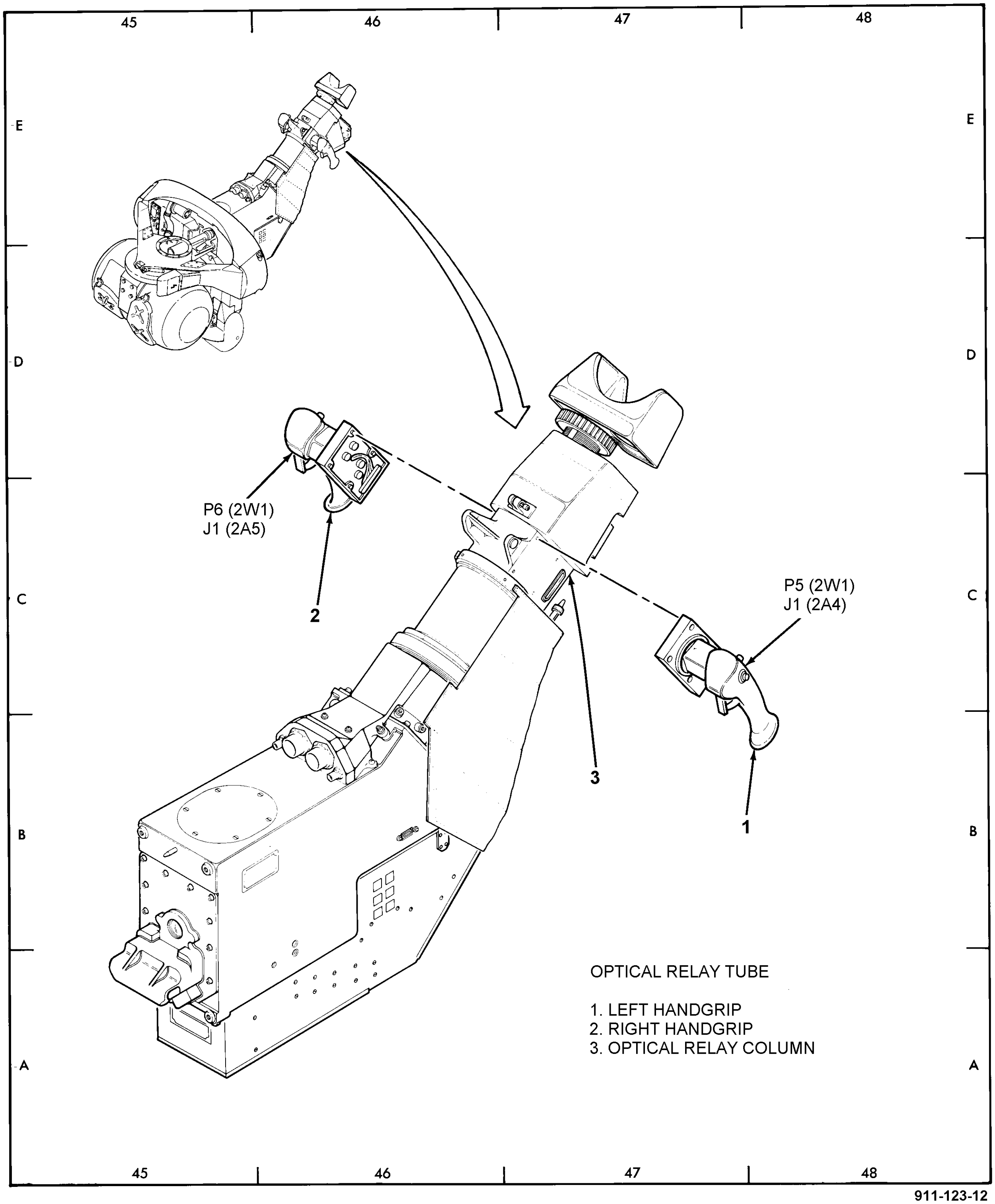
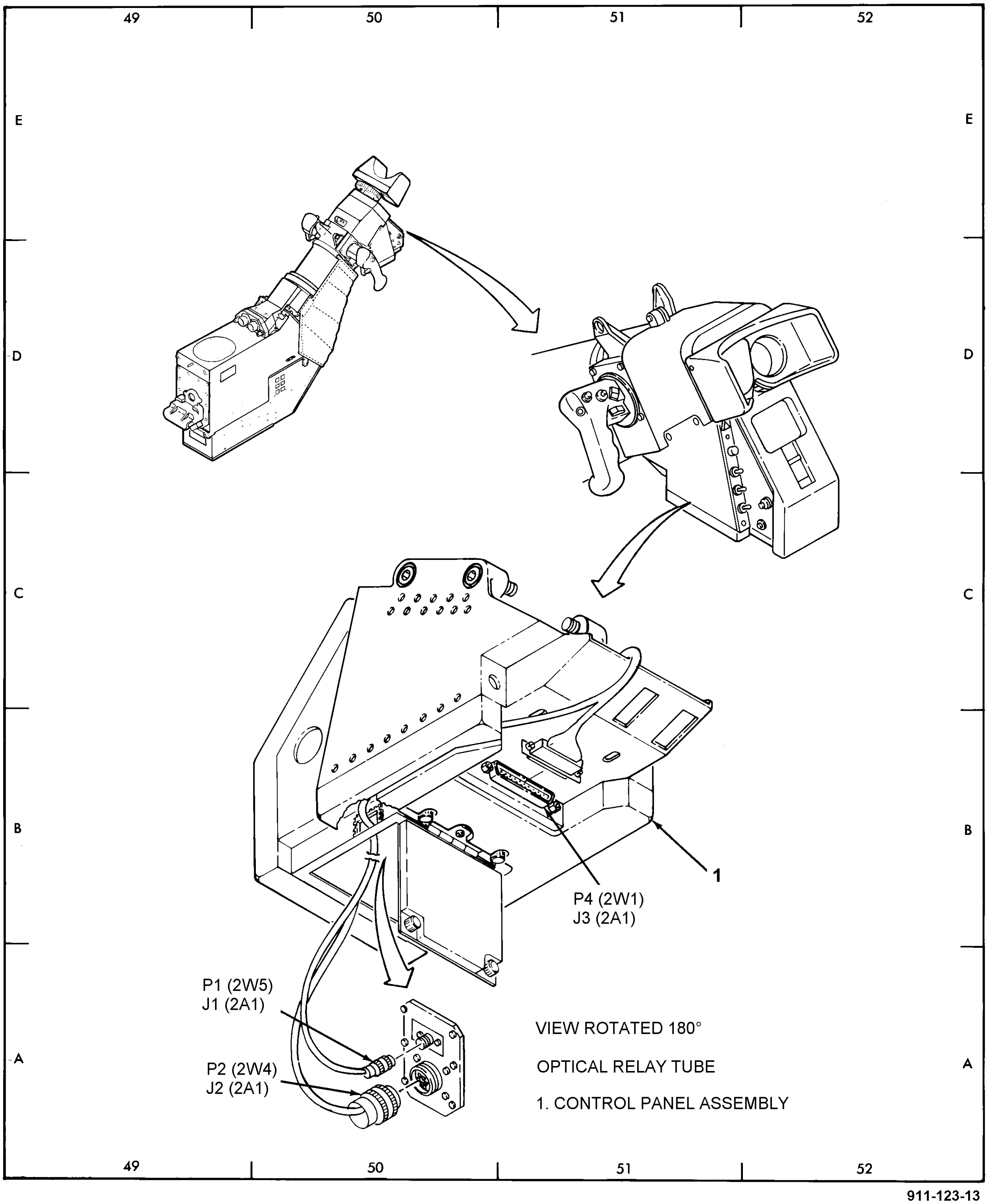
1-21. ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC) (cont)



1-21. ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC) (cont)



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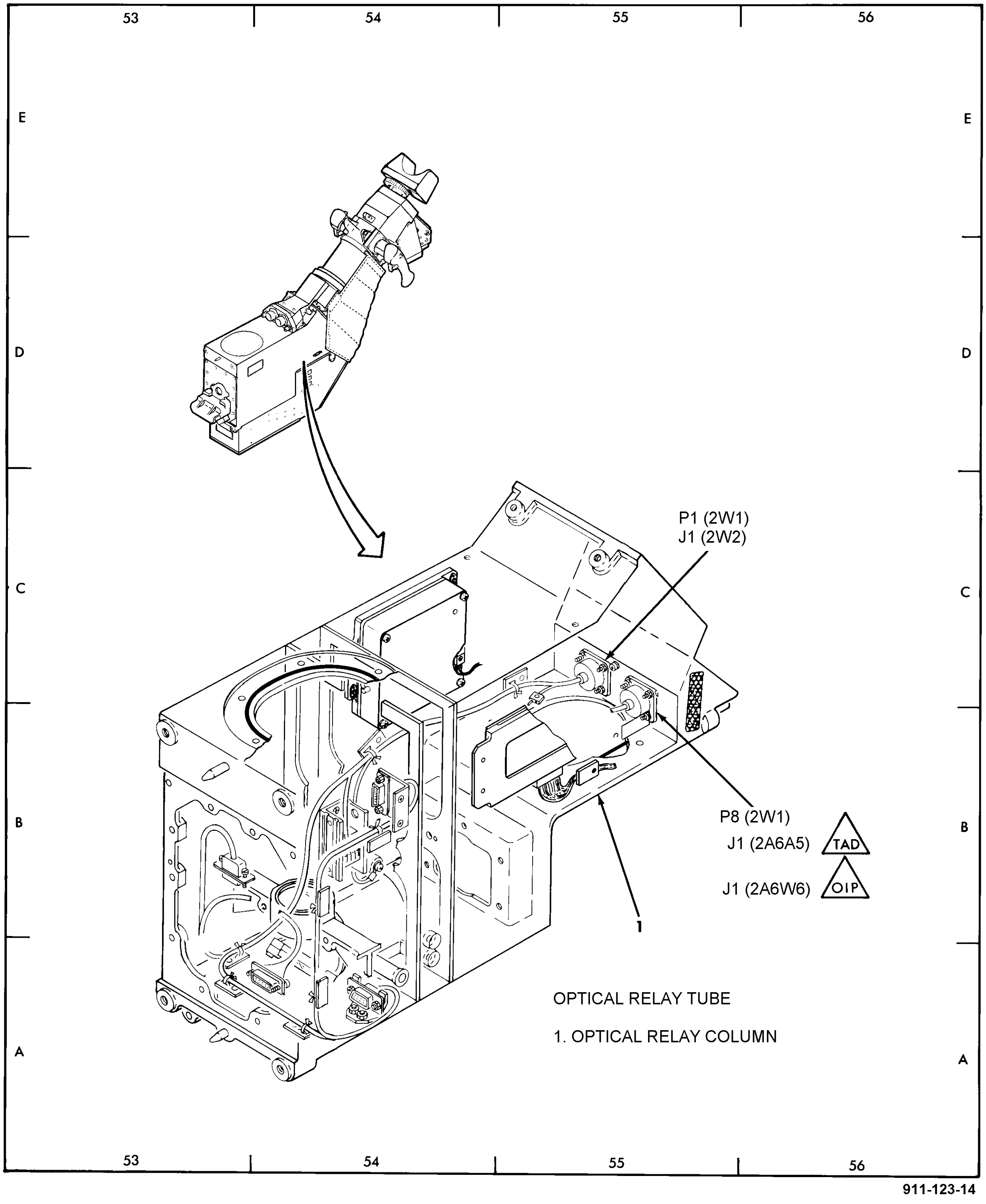

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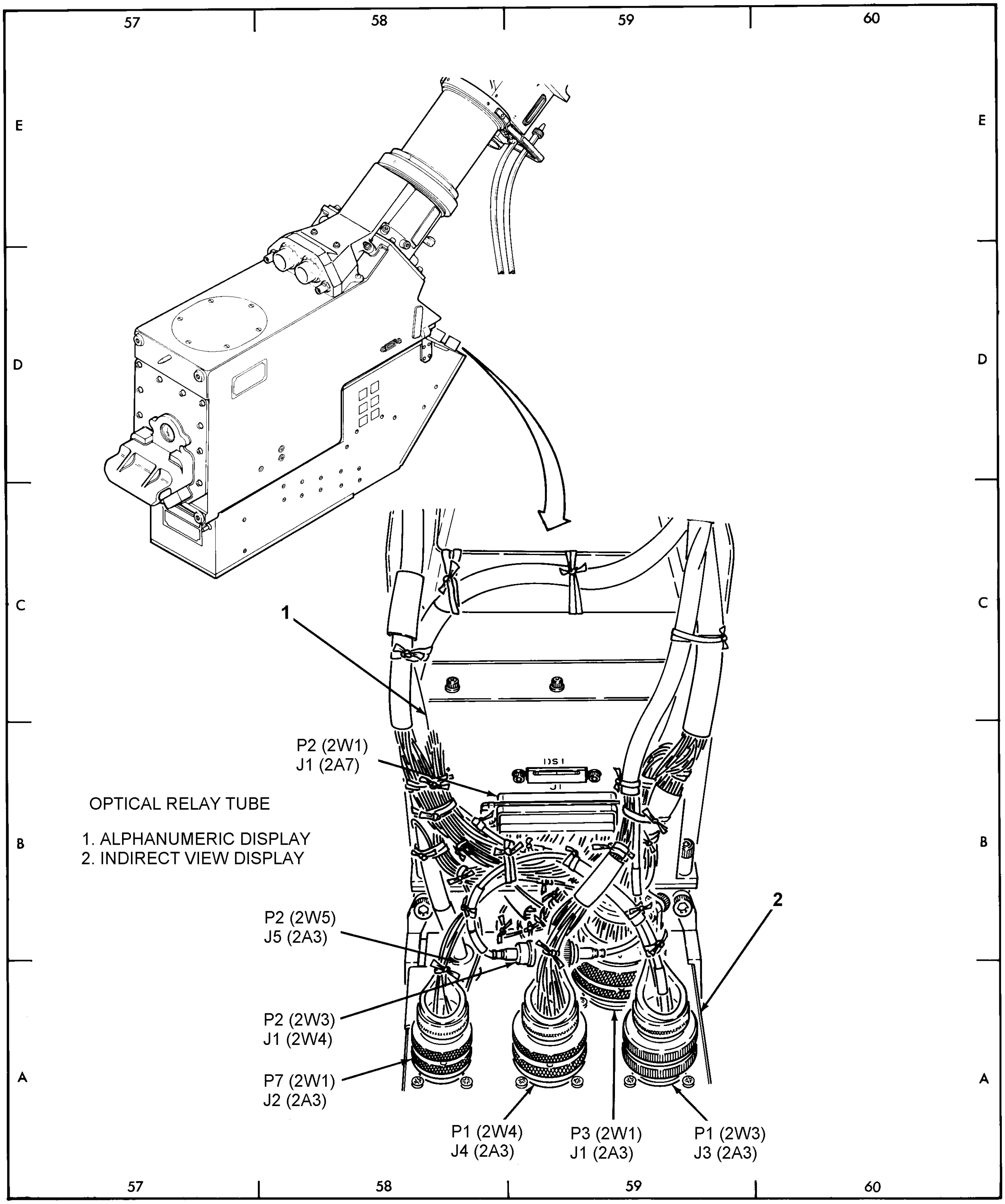

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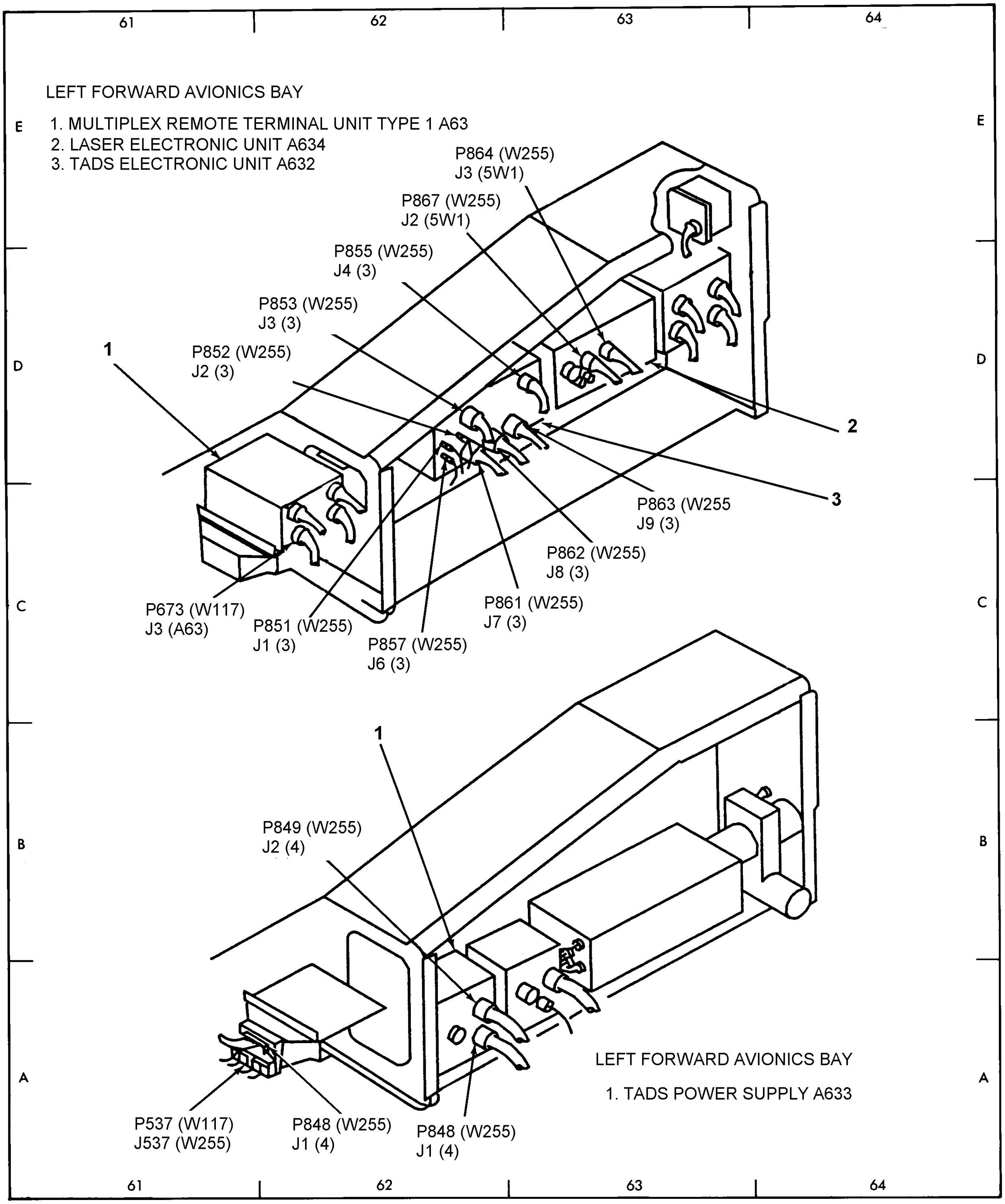
1-21. ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC) (cont)



911-123-16

CHAPTER 2

THEORY OF OPERATION

Section I. GENERAL INFORMATION

2-1. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

a. Characteristics. The TADS assembly is an electro-optical (EO) system that uses direct view optics (DVO), a television (TV) sensor, a laser tracker, a laser rangefinder/designator (LRF/D), and a forward looking infrared (FLIR) sensor for day, night, and adverse weather operations.

b. Capabilities.

(1) FLIR, DVO, or TV can be selected for target viewing and acquisition.

(2) Targets can be tracked automatically or manually. Automatic tracking is performed two ways - image automatic tracking (IAT) or laser spot tracking (LST).

(3) The reflected laser designator return is used by the laser range receiver to determine target range for fire control.

(4) Targets can be designated with standard laser-coded energy.

c. Features

(1) Environmental control system (ECS) assembly maintains optimum operating temperatures.

(2) Anti-ice circuits prevent ice and fog buildup on boresight module and on shroud windows.

(3) Sensor-to-sensor boresight alinement is performed on the ground or in flight.

(4) A fault detection/location system (FD/LS) provides automatic testing to identify faulty line replaceable units (LRUs).

(5) In the event of a PNVS failure, TADS FLIR can be switched to pilot control as emergency backup.

2-2. DESCRIPTION

The TADS assembly is made up of the major components (fig. 2-1) listed below:

- Optical Relay Tube (ORT) Assembly
- Environmental Control System (ECS)
- Laser Electronics Unit (LEU)
- TADS Electronic Unit (TEU)
- TADS Power Supply Assembly
- TADS Electronic Control Amplifier (TECA)
- Boresight Assembly
- Day Sensor Assembly (DSA)
- FLIR Boresight Light Baffle Assembly
- Shroud Rim Clenching Clamps
- Day Sensor and Night Sensor Shroud Assemblies
- TADS Turret Assembly
- Night Sensor Assembly (NSA)

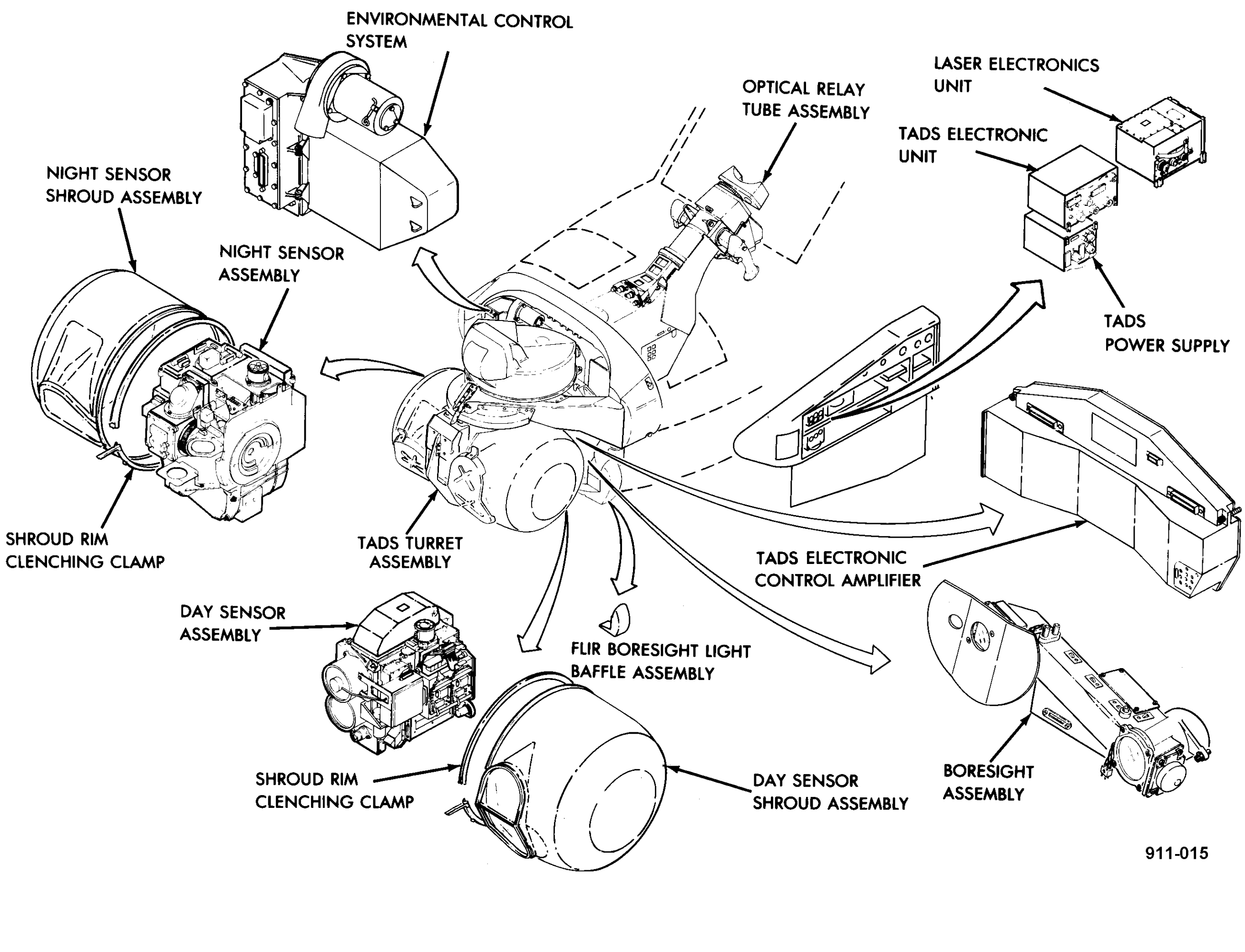


Figure 2-1. TADS Assembly Major Components

2-2. DESCRIPTION (cont)

a. TADS Electronic Unit (TEU). The TEU contains the TADS assembly microprocessor used for helicopter multiplexer interface and circuits used for video processing, target tracking, and the fault detection and location system (FD/LS).

b. Laser Electronic Unit (LEU). The LEU consists of the laser power supply and electronic circuits used for laser tracking, ranging, and target designating.

c. TADS Power Supply. The power supply provides switching control of aircraft power and produces AC and DC voltages used throughout the TADS assembly. It contains circuits that monitor and regulate the power output.

d. TADS Electronic Control Amplifier (TECA). The TECA provides azimuth and elevation drive signals to azimuth gimbal assembly drive motors.

e. FLIR Foresight Light Baffle Assembly. The light baffle assembly blocks light to provide greater contrast during sensor-to-sensor boresight.

f. Day Sensor and Night Sensor Shroud Assemblies. The shroud assemblies are waterproof and dustproof assemblies that cover and protect the TADS NSA and DSA. They contain anti-ice circuitry for the prevention of fog and ice build-up on the shroud windows.

g. Shroud Rim Clenching Clamps. The clamps secure day sensor and night sensor shroud assemblies to the TADS turret assembly. There are two types of rim clenching clamps, type I and type II. The difference between type I and type II is the latch and safety mechanism.

h. Day Sensor Assembly (DSA). The DSA is made up of the major components (fig. 2-2) listed below:

- Laser transceiver unit
- Television sensor assembly
- Roll/pitch/yaw gyro circuit card assemblies
- Day sensor subassembly
- Laser tracker/receiver unit

2-2. DESCRIPTION (cont)

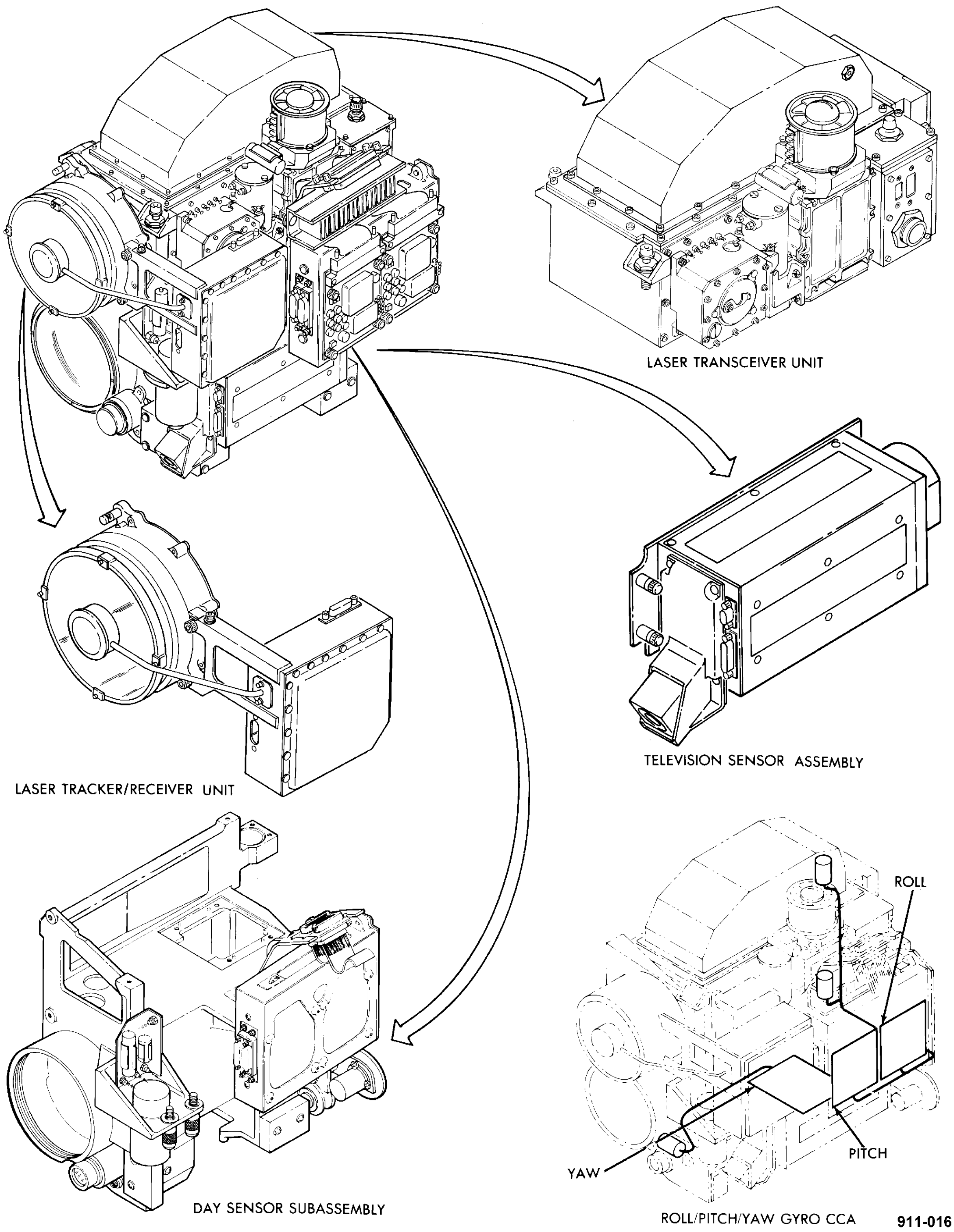


Figure 2-2. Day Sensor Assembly Major Components

2-2. DESCRIPTION (cont)

(1) Day Sensor Subassembly. The day sensor subassembly contains direct view optics (DVO) and day TV optics and provides a mounting surface and interconnect wiring for other DSA major components.

(2) Laser Transceiver Unit (LTU). The LTU assembly contains a laser transmitter and receiver which provides coded pulsed laser energy for target designation and ranging. The unit has a self-contained cooling assembly.

(3) Laser Tracker/Receiver (LT/R) Unit. The LT/R tracks and locks on to the reflected energy generated by either airborne or ground laser designators and provides signals that position the turret assembly to track the laser spot.

(4) Television (TV) Sensor Assembly. The TV sensor assembly is an 875 line/ frame, 30 frame/ second, 2:1 interface high resolution TV camera.

(5) Roll/Pitch/Yaw Gyro Circuit Card Assemblies (CCA). The gyro CCAs provide rate feedback signals to stabilize the turret assembly when the helicopter moves about the roll, pitch, or yaw axis.

i. Boresight Assembly. The boresight assembly provides interface between the DSA and NSA for alining the DVO, TV sensor, and NSA visual multiplexer to the laser spot.

j. TADS Turret Assembly. The TADS turret assembly major components (fig. 2-3) are the azimuth gimbal assembly and aircraft interface assembly (AIA). The assembly also contains electronics, interconnection cables, and optics to interface with other TADS assembly major components.

(1) Azimuth Gimbal Assembly. The azimuth gimbal assembly provides a stable mounting platform for the NSA and DSA. It contains azimuth/elevation drive motors and inner and outer gimbal assemblies for positioning the DSA and NSA.

(2) Aircraft Interface Assembly (AIA). The AIA is the main support structure for TADS and PNVS. Fairing assemblies are provided as part of the AIA to protect turret assembly components and assemblies. The fairing assemblies are the left side, right side, and nose.

(a) Left side fairing assembly. Covers and protects the brake release switch. The fairing is hinged for access to the brake release switch and a lifting eye bolt.

(b) Right side fairing. Covers hardware, TADS identification plate, and PNVS identification plate. The fairing is hinged for access to hardware, identification plates, and a lifting eye bolt.

(c) Nose fairing. Covers and protects the azimuth gimbal assembly drive gear.

2-2. DESCRIPTION (cont)

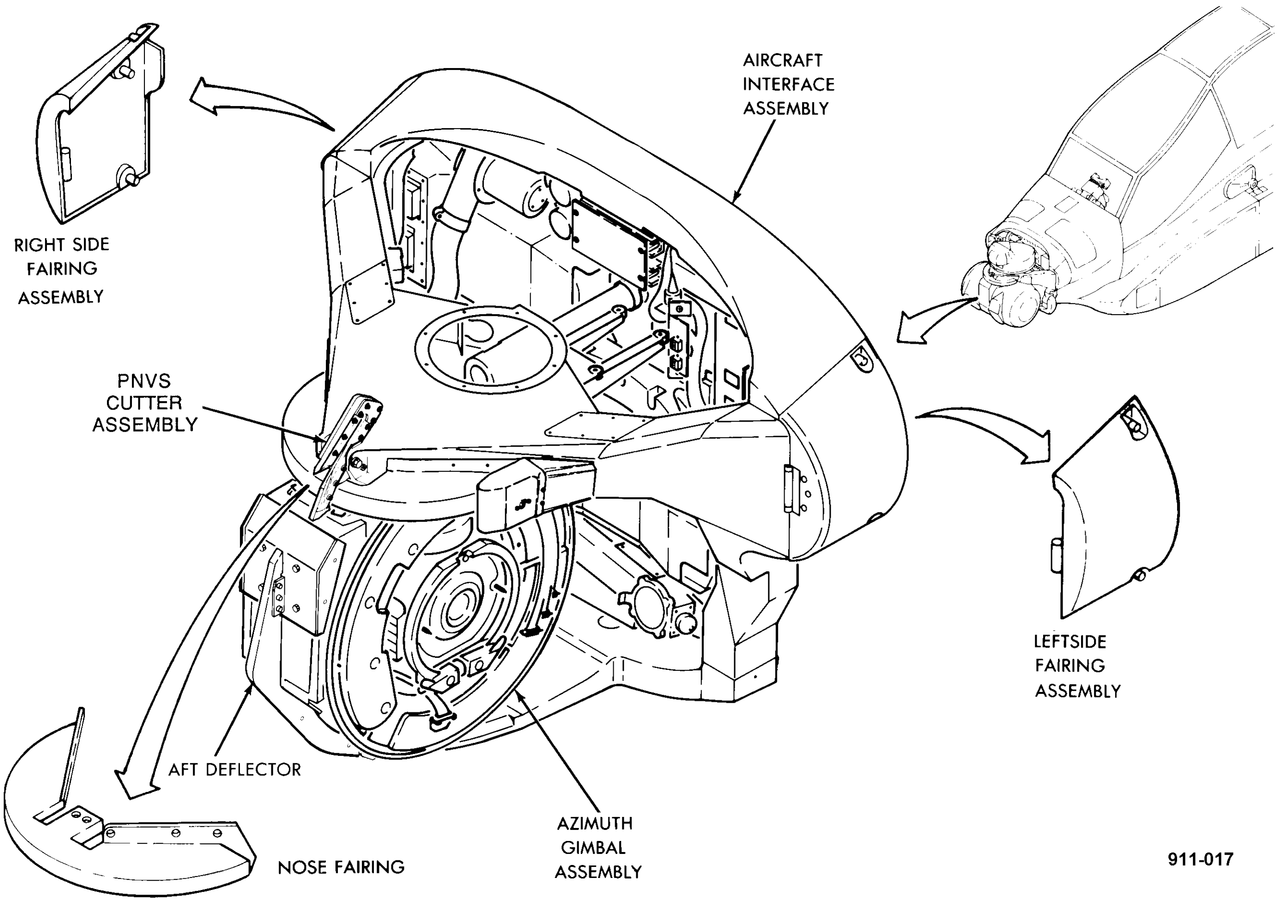


Figure 2-3. TADS Turret Assembly Major Components

(3) PNVS Cutter Assembly. The PNVS cutter assembly is part of the TADS turret assembly, if wire strike protection is incorporated. The PNVS cutter assembly protects the TADS/PNVS system from wire strike.

(4) Forward/Aft Deflector Assemblies. If wirestrike protection is installed, the forward/aft deflector assemblies are part of the TADS turret assembly. The forward/aft deflectors deflect wires over/ under the TADS/PNVS system to cutter assemblies.

k. Night Sensor Assembly (NSA). The NSA is a FLIR detection system used for viewing and tracking targets during night and adverse weather operations.

l. Environmental Control System (ECS). The ECS contains a blower and heating element that draws conditioned cockpit air and forces the air through the turret assembly for temperature control.

2-2. DESCRIPTION (cont)

m. Optical Relay Tube (ORT) Assembly. The ORT assembly contains optics and electronics enabling the CPG to view, by either DVO, TV, or FLIR, the selected scene of interest.

ORT assembly major components (fig. 2-4) are listed below:

- Alphanumeric Display (AND)
- Control Panel
- Left and Right Handgrip (LHG, RHG)
- Eyeshroud Assembly
- Cable Cover Assembly
- Indirect View Display (IVD)
- Optical Relay Column (ORC)
- Eyepiece Assembly

(1) Left and Right Handgrip (LHG. RHG). The handgrips contain controls for operating and controlling the TADS assembly, weapons action, and video recorder.

(2) Control Panel. The control panel contains the heads out display (HOD), controls for FLIR, HOD, video selection, and DVO filter selection, symbology, and AND.

(3) Alphanumeric Display (AND). The AND displays weapons and stores data, selected laser and laser tracker code, failure information, and certain system moding information through the ORT assembly eyepiece assembly.

(4) Eyeshroud Assembly. The eyeshroud assembly is a molded, soft rubber hinged shield that blocks ambient light when the copilot/gunner (CPG) looks through the ORT assembly eyepiece.

(5) Eyepiece Assembly. The eyepiece assembly contains an adjustable focusing ring for obtaining a sharp image when viewing the DVO, AND, and heads down display (HDD).

(6) Indirect View Display (IVD). The IVD houses the electronics for the HDD, HOD, and pechan mirror assembly. The HDD is resident to the IVD. The scene of interest is projected through a window and optically relayed through the lower ORT assembly into the ORT assembly eyepiece where it is reduced by 10X optics to provide the CPG with high resolution viewing capabilities.

(7) Optical Relay Column (ORC). The ORC contains part of the optical path and optical filters used during HDD and DVO viewing.

(8) Cable Cover Assembly. The cable cover assembly protects ORT assembly interconnection cables. It is held in place by hook and pile fasteners.

2-2. DESCRIPTION (cont)

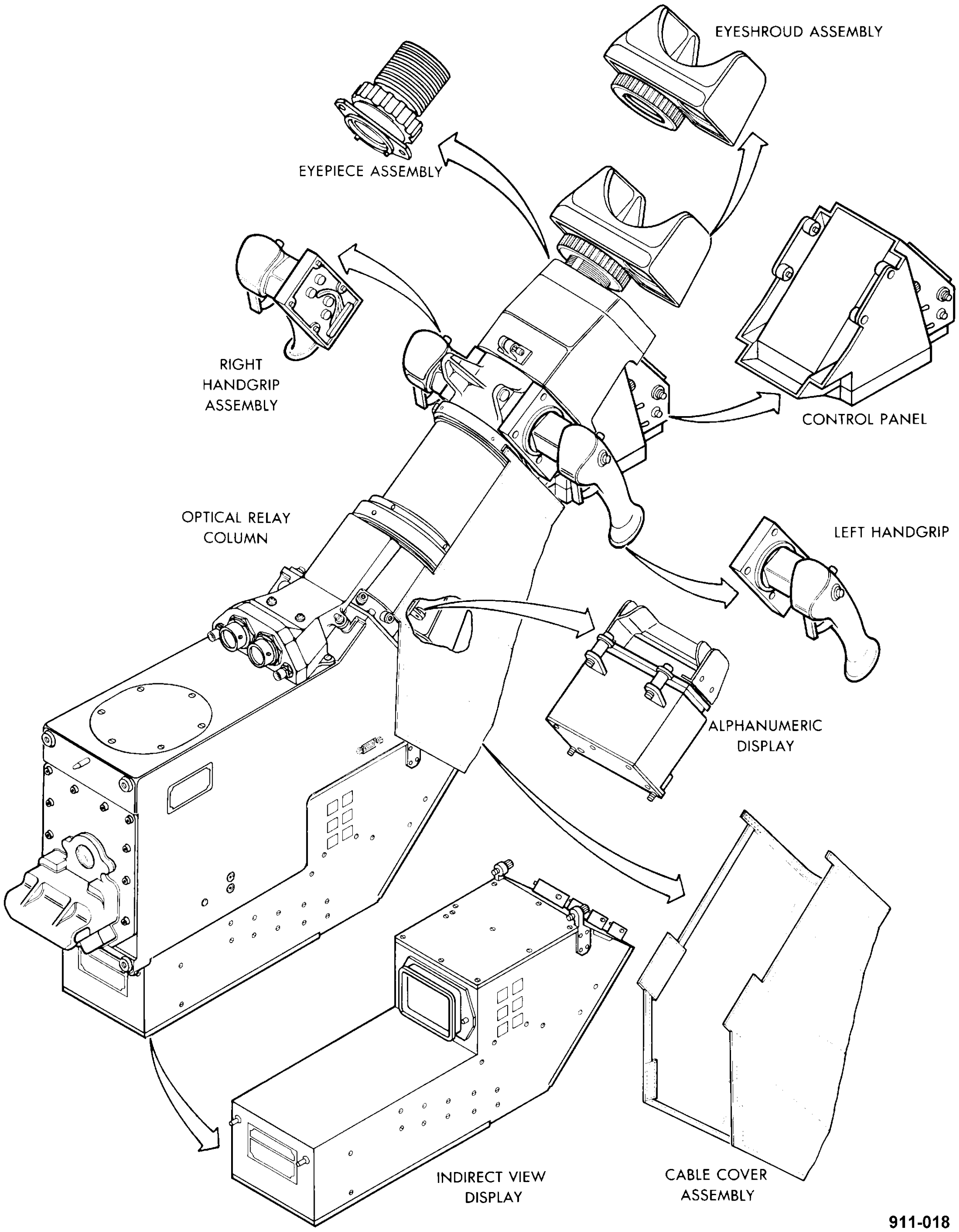


Figure 2-4. Optical Relay Tube Assembly Major Components

2-3. EQUIPMENT DATA

Azimuth slewing range from fixed forward position . . . . 119° cw and ccw

Azimuth stow position from fixed forward position. . . . . 180° ccw

Elevation slewing range from fixed forward position . . . . 34.25° up and 53.75° down

Elevation slewing range from aircraft centerline . . . . 29° up and 59° down

Electrical: 28 VDC15 amperes
115 VAC, 400 Hz,3 Ø . . . . 3010 volt amperes

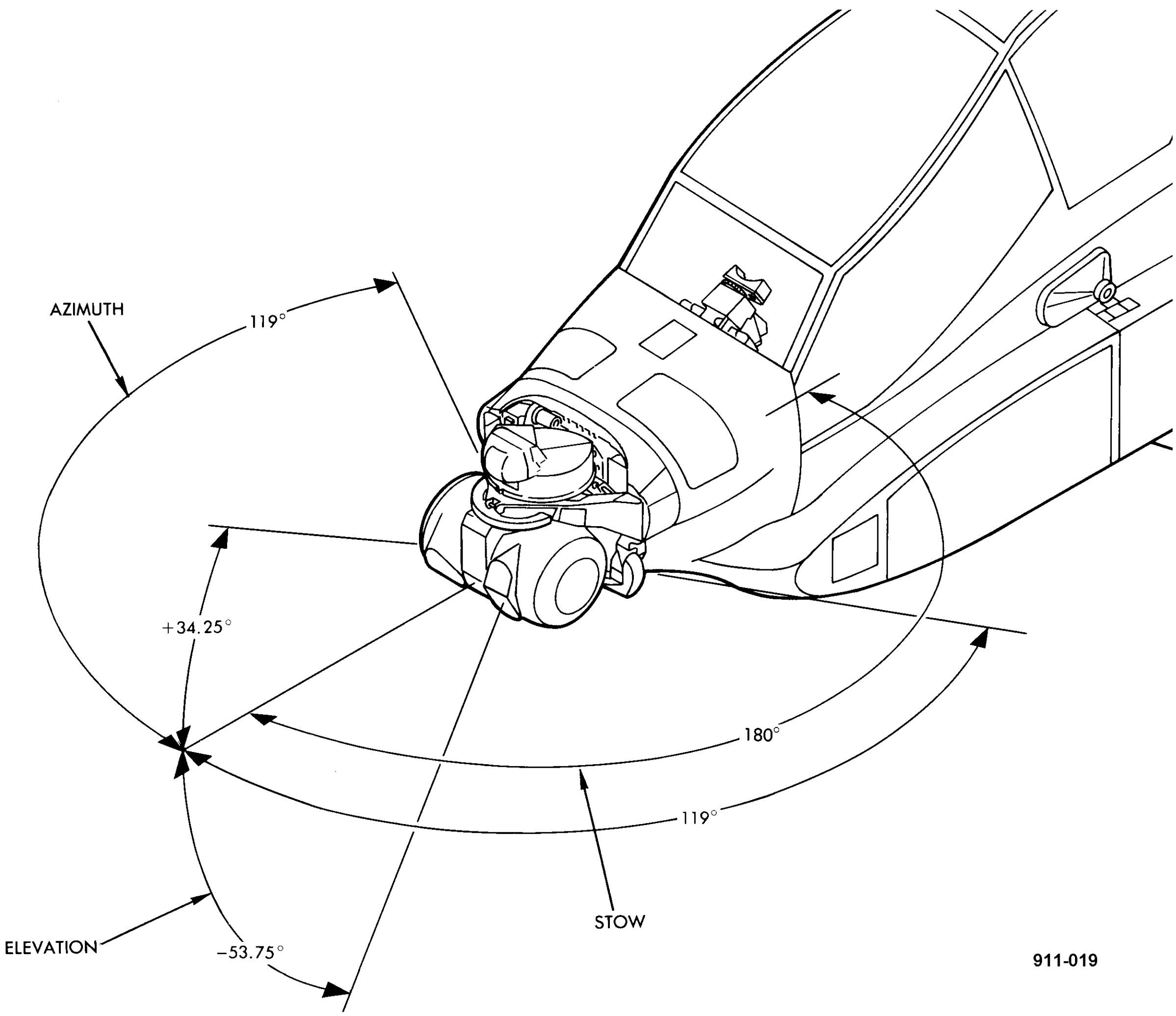


Figure 2-5. TADS Line-of-Sight Angular Travel

2-3. EQUIPMENT DATA (cont)

Equipment	Weight (pounds)	Dimensions (inches)			Container Empty Weight	Gross Weight
		Length	Width	Height		
Day sensor assembly	59	20	20	21	-	59
Roll/Pitch/Yaw gyro circuit card assemblies	1	3	-	4	2	3
Laser tracker/receiver unit	7	9	6	4	59	66
Day sensor subassembly	34	20	20	13	126	160
TV sensor assembly	3	9	5	5	59	62
Laser transceiver unit	14	14	7	9	59	73
Night sensor assembly	55	20	20	13	126	181
Day sensor shroud assembly	13	dia-18	ht-12	90	103	116
Night sensor shroud assembly	15	dia-18	ht-12	90	105	120
Optical relay tube assembly	63	47	13	15	-	-
Optical relay column	34	47	13	15	122	156
Eyepiece assembly	2	5	3	3	2	4
Alphanumeric display	2	6	5	4	2	4
Control panel	5	8	6	10	59	64
Handgrips	3.70	5	3	7	2	5.7
Indirect view display	16	21	18	19	91	107
TADS electronic control amplifier	7	18	9	4	59	66
Laser electronics unit	18	12	11	10	58	76
TADS electronic unit	20	13	10	9	58	78
TADS power supply assembly	23	13	10	9	58	81
Boresight assembly	7	16	5	4	58	65
Environmental control system	6	12	3	5	3	9
Turret assembly	188	27	37	32	186	274
Turret assembly with wire strike incorporated	192	27	37	32	186	278

2-4. SAFETY, CARE, AND HANDLING

a. Safety. The following precautions are necessary to ensure the safety of technicians working on TADS equipment. For more safety precautions refer to TB 385-4, Safety Operating Manual (Maintenance Personnel) Electrical/Electronic Equipment.

(1) It is very important that TADS power is off when performing maintenance. With power on, the laser beam or turret drive circuits can be activated. If that happens -

- The laser beam can cause serious eye injury or blindness.
- The turret assembly rotating under power has enough force to cause serious personal injury.

(2) Helicopter battery power must be available to perform maintenance tasks that require moving the TADS turret assembly. If battery power is not available or would violate safety precautions when connected (i.e., an open fuel cell or fuel line), a brake release power supply assembly must be used. Refer to TM 1-1270-476-20 for use and connection information.

(3) The PNVS azimuth gimbal assembly drive motor is located above and behind the TADS turret assembly. This motor gets very hot (about 250°F (121°C)) during operation and can cause serious burns. If the PNVS has recently been operated, use extreme care when reaching up and behind the TADS turret assembly.

(4) Anti-ice operation is controlled from the anti-ice panels in the pilot and copilot/gunner (CPG) station. During anti-ice operation, electrical current passes through the PNVS and TADS night sensor shroud assembly windows and electrical shock hazard exists on the window surfaces. With TADS or PNVS power on, the anti-ice circuits can be energized; personnel must not touch the window surfaces when power is on.

(5) The anti-reflective coating on all infrared optics contains thorium fluoride which is slightly radioactive. The only potential hazard involves ingestion (swallowing or inhaling) of this coating material. Dispose of broken lenses, etc., in accordance with AR 385-11. If broken item is the night sensor shroud assembly window, refer to TM 1-1270-476-20.

b. Care. Be careful not to touch the optical surfaces of the PNVS or TADS. Also, do not routinely clean the optical surfaces. Cleaning optics too often will wear away the special coating. Only clean optical surfaces when directed by your supervisor.

c. Handling.

(1) <u>Assemblies</u>. When removing and installing assemblies, be careful not to bump one assembly into another or into any optics. Always grasp an assembly firmly to prevent dropping it.

2-4. SAFETY, CARE, AND HANDLING (cont)

(2) Shrouds. The TADS shroud assembly windows and housings are fragile and easily broken or damaged. Use extreme care when handling the TADS shroud assemblies to prevent dropping or jarring the assemblies. Place the TADS shroud assemblies on clean, soft material for temporary storage.

(3) Optical Relay Tube (ORT) Assembly Controls. The ORT assembly control panel GAIN, LVL, AND BRT, and SYM BRT controls are easily damaged. If these controls are forced into mechanical stops, control shafts or knobs can be broken. To prevent damage, use care when adjusting these controls.

d. Special Environmental Conditions.

(1) Extreme Cold. When the outside (ambient) air temperature is -24 to +32°F (-31 to 0°C), TADS warmup time depends on ambient temperature. If the helicopter cockpit temperature is below +40°F (4.4° C) or the helicopter has been cold soaking for a period of time at that temperature or below, the helicopter ECS must be turned on (para (7) below) before TADS is powered up. TADS warmup is performed with TADS in standby. The maximum allowable warmup is 60 minutes at an ambient temperature of -24 °F (-31°C) and decreases linearly with increasing temperature to 15 minutes at +32°F (0°C). Maximum allowable warmup time is 15 minutes from +32 to +131°F (0 to 55°C). Completion of warmup is signalled when built-in test (BIT) discontinues the TADS NOT READY message. Specified performance is immediate on completion of warmup, provided FLIR cooldown is complete. When TADS warmup requires less than the specified warmup time and is completed before FLIR cooldown, specified performance may be degraded until completion of FLIR cooldown.

(2) Extreme Heat. If the helicopter cockpit temperature is above +85°F (29.4°C) or the helicopter has been heat soaking for a period of time at that temperature or above, the helicopter ECS must be turned on (para (7) below) before TADS is powered up. TADS warmup is described in paragraph (1) above. Do not use plastic sheets to cover optics. When temperature is high, the plastic will outgas and contaminate the optics.

(3) High Winds. Do not remove TADS turret assembly, window cover, or shroud assemblies in dry sandy areas when blowing sand or dust prevail. Sand and dirt will pit optical surfaces and damage mechanical components.

(4) Rain and Snow. Do not remove the TADS turret assembly, window covers, or shroud assemblies during rain or snow. Rain or snow will damage exposed components of the aircraft interface assembly and turret assembly.

(5) Salt Air. Avoid removing TADS turret assembly, window covers, or shroud assemblies when in salt air environments. Salt air deposits on optical surfaces will contaminate optical components. When a shroud assembly is removed, check optical surfaces for salt deposits and clean as necessary (TM 1-1270-476-20).

2-4. SAFETY, CARE, AND HANDLING (cont)

(6) Humidity. Keep reusable shipping and storage containers closed when not in use, even when empty. This will prevent the foam insert from absorbing moisture. Any time you are required to handle a container, look at the humidity indicator. If it indicates over 40% humidity, change the desiccant bags (TM 1-8145-476-23).

(7) Conditioned Air. For TADS to meet specified performance requirements, cockpit temperature must be maintained at +40 to +85°F (4.4 to 29.4°C). If cockpit temperature is within limits, TADS will operate to specified performance with an outside (ambient) temperature range of -24 to +131°F (-31 to 55° C). (Refer to para (1) and (2) above.) If the helicopter cockpit temperature is below +40 °F (4.4° C) or above +85 °F (29.4° C) (or the helicopter has been cold or heat soaking for a period of time at or beyond those temperatures), TADS performance will be degraded. The helicopter ECS must be turned on (TM 1-1520-238-23) to maintain proper environmental conditions. A closed loop system forces conditioned air over electronic units in each avionics bay, TADS turret, cockpit, and ORT assembly. When an assembly or electronic unit is removed, conditioned air will dump overboard through the opening. To prevent loss of conditioned air, cover the opening. This allows other assemblies and units to maintain proper operation and prevents damage.

2-5. MULTIPLEX READ CODES

The fire control computer (FCC) generates multiplex read codes (status and control messages) to issue instruction and determine system/LRU status. These codes are reflected in wiring interconnect diagrams and block diagrams. Refer to TM 1-1520-238-T-3 and use these codes to troubleshoot TADS.

Section II. THEORY OF OPERATION

2-6. TARGET DETECTION, RECOGNITION, AND ACQUISITION SYSTEM

The TADS equipment is used to scan the landscape to locate, acquire, and track targets. During daylight, either TV or DVO is used. At night, in bad weather, or while searching for a camouflaged target, FLIR is used. Paragraphs a thru h below describe day TV, DVO, FLIR and target tracking. Paragraph i below gives a brief FD/LS description.

2-6. TARGET DETECTION, RECOGNITION, AND ACQUISITION SYSTEM (cont)

a. Day TV. The day TV (fig. 2-6) is selected with the LHG sensor select switch. TADS video is activated with the copilot/gunner (CPG) fire control panel SIGHT **SELECT** switch. Wide, narrow, or zoom field-of-view (FOV) is selected using the LHG field-of-view switch. These signals are applied to the DSA through the helicopter CPG MRTU type III and the TEU to select day TV. Light from the target image enters the TV sensor through the FOV lens and the automatic light control (ALC) module. The TV sensor changes the light into an electrical signal (video) and sends it to the TEU. The TEU processes the video and sends it to the helicopter symbol generator where symbols are added to the video. This composite video is sent to the ORT assembly for viewing on the HOD or HOD. Composite video can also be viewed on the integrated helmet and display sight system (IHADSS).

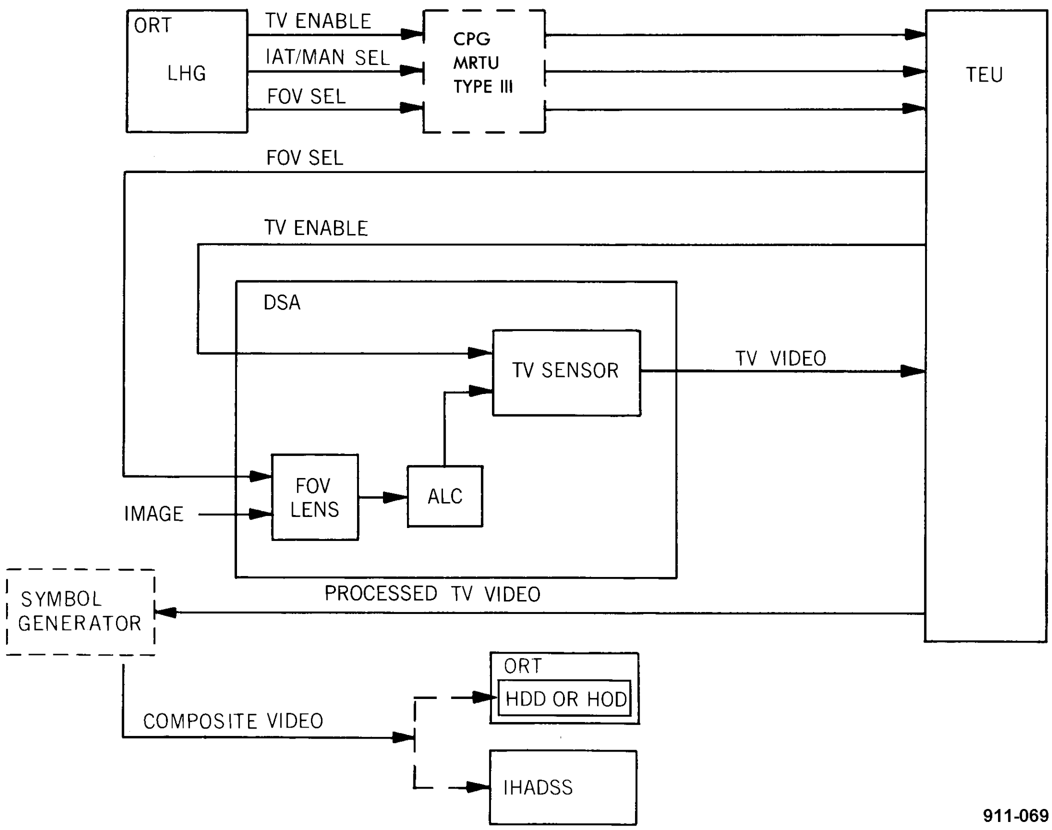


Figure 2-6. Day TV Block Diagram

2-6. TARGET DETECTION, RECOGNITION, AND ACQUISITION SYSTEM (cont)

b. Direct View Optics (DVO). The DVO (fig. 2-7) is viewed through the ORT assembly eyepiece and is selected with the LHG sensor select switch. Wide or narrow FOV is selected using the LHG field-of-view switch. These signals are applied to the DSA through helicopter CPG MRTU type III and the TEU. The target image (light) path is through the DSA optics, azimuth gimbal assembly, and to the ORT assembly eyepiece. A haze or glare filter in the ORT assembly can be selected by the CPG. Filter selection depends on light and weather conditions. A laser filter (located in the ORT assembly) is also in the DVO light path. The ORT assembly pechan prism assembly keeps the target upright for the CPG.

(1) In optical improvement program (OIP) configured TADS systems, additional laser threat optical filters have been added to provide the CPG with eye protection. Coating that provides protection against certain laser threats is applied to fixed optics in the DSA DVO path. The filters are always in place and require no action by the CPG to activate the filters.

(2) In non-OIP configured TADS systems, a contingency filter is installed in the TADS turret assembly DVO path. The contingency filter provides the same level of laser threat eye protection as the OIP configured DSA. Presence of the contingency filter is confirmed by triangular-shaped marks spaced approximately 90 degrees apart around the outer DVO scene. The contingency filter is also installed in OIP configured TADS turrets.

c. Forward Looking Infrared (FLIR). FLIR (fig. 2-8) is used to search for and track heat radiating targets at night or in adverse weather conditions.

(1) FLIR is selected with the LHG sensor select switch. Wide, medium, narrow, or zoom FOV is selected using the LHG field-of-view switch. These signals are applied to the NSA through the helicopter CPG MRTU type III and the TEU. The TEU processes the video and sends it to the symbology generator to add the symbols. This composite video is sent to the ORT assembly for viewing on the HOD or HDD. FLIR composite video can also be viewed on the IHADSS. In the event of a PNVS failure, TADS FLIR can be switched to pilot control as emergency backup. The pilot sets the collective control stick NVS switch to TADS. The TADS assembly is slaved to the pilot helmet LOS and FOV is set to WFOV. The slew rate of the TADS turret assembly is slower than the PNVS turret assembly.

(2) Optical filters are added to the TADS OIP configured NSA. These filters block different laser wavelength bands that can jam the TADS FLIR video (cause it to bloom). The filters are selected using the OIP configured ORT assembly FLTR SEL switch to select no protection (CLEAR) or three different modes of laser threat protection (S, L, or MAX). The CLEAR position is selected for normal FLIR operation. Positions S and L select short or long laser wavelength band filters. The MAX position provides threat protection at both short and long laser wavelength bands simultaneously and can be selected from any other filter position.

2-6. TARGET DETECTION, RECOGNITION, AND ACQUISITION SYSTEM (cont)

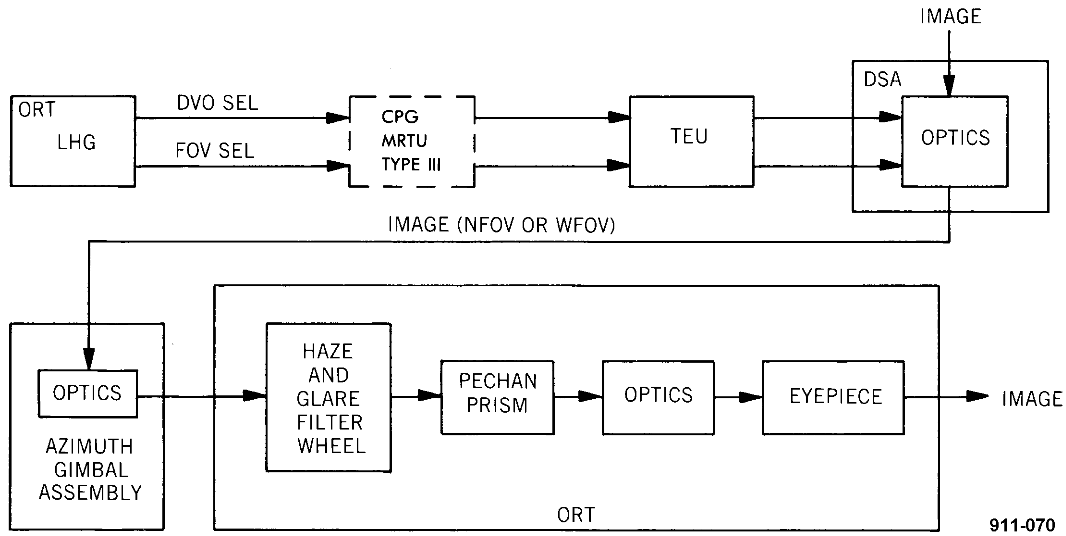


Figure 2-7. Direct View Optics (DVO) Block Diagram

d. Target Tracking. Target tracking keeps the target image in the selected display. Targets can be manually tracked, image automatic tracked, or laser tracked. These target tracking functions are described in paragraphs e thru g below.

e. Manual Tracking. Manual tracking (fig. 2-9) is selected by pressing and releasing the LHG **IAT/MAN** switch. To track the target in manual, the CPG operates the RHG **MAN TRK** (force controller) control in the direction needed to keep the TADS assembly pointed toward the target. The signals go through the CPG MRTU type III and TEU to the TECA. From the TECA, the signals go to turret azimuth and elevation drive motors to drive the turret in the commanded direction.

2-6. TARGET DETECTION, RECOGNITION, AND ACQUISITION SYSTEM (cont)

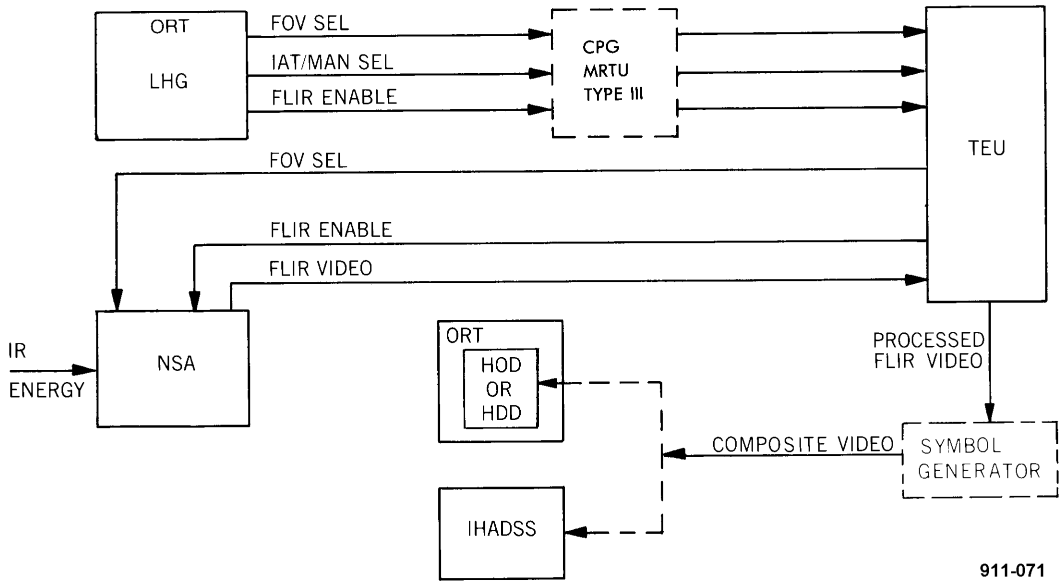


Figure 2-8. Forward Looking Infrared (FLIR) Block Diagram

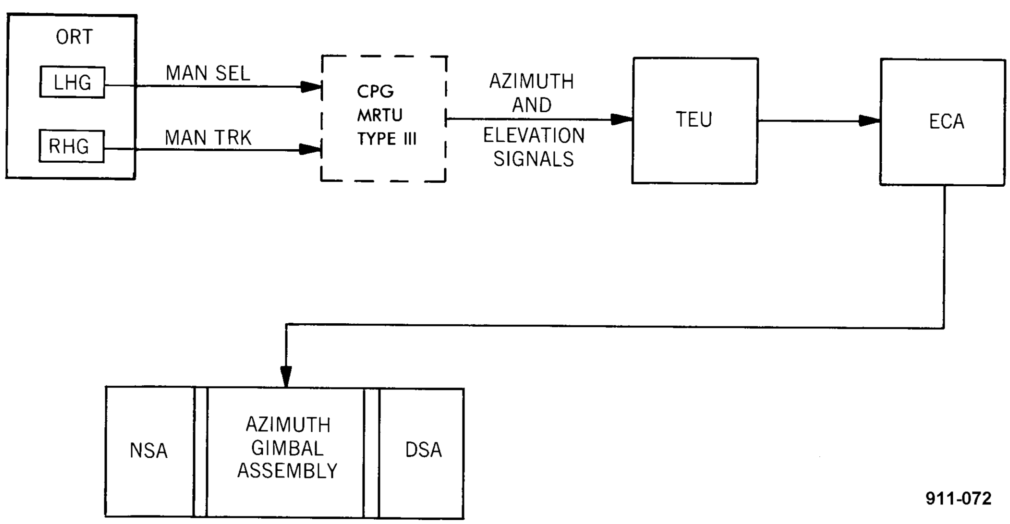


Figure 2-9. Manual Tracking Block Diagram

2-6. TARGET DETECTION, RECOGNITION, AND ACQUISITION SYSTEM (cont)

f. Image Automatic Tracking (IAT). IAT (fig. 2-10) automatically tracks targets detected with day TV or FLIR. Operation is basically the same using either sensor. IAT is selected by setting the LHG **IAT/OFS** switch to **IAT**. As the target moves off center of the display, error signals are generated in the TEU. The error signals are amplified and applied to azimuth and elevation drive motors through the TECA to drive the TADS turret assembly toward the target. Feedback signals are developed in the TADS turret assembly and are fed directly back to the TEU. Feedback reduces the error signals as the turret is driven toward the target. When the image is centered on the display, the azimuth and elevation drive signals are canceled.

NOTE

Note that selecting DVO and activating IAT, with TADS FLIR on, causes DVO to change to NFOV. FLIR NFOV is used for evaluating/tracking the target, however, tracker gates are not visible in DVO. Also, impending breaklock is not detected in DVO. DTV video is displayed on the HOD.

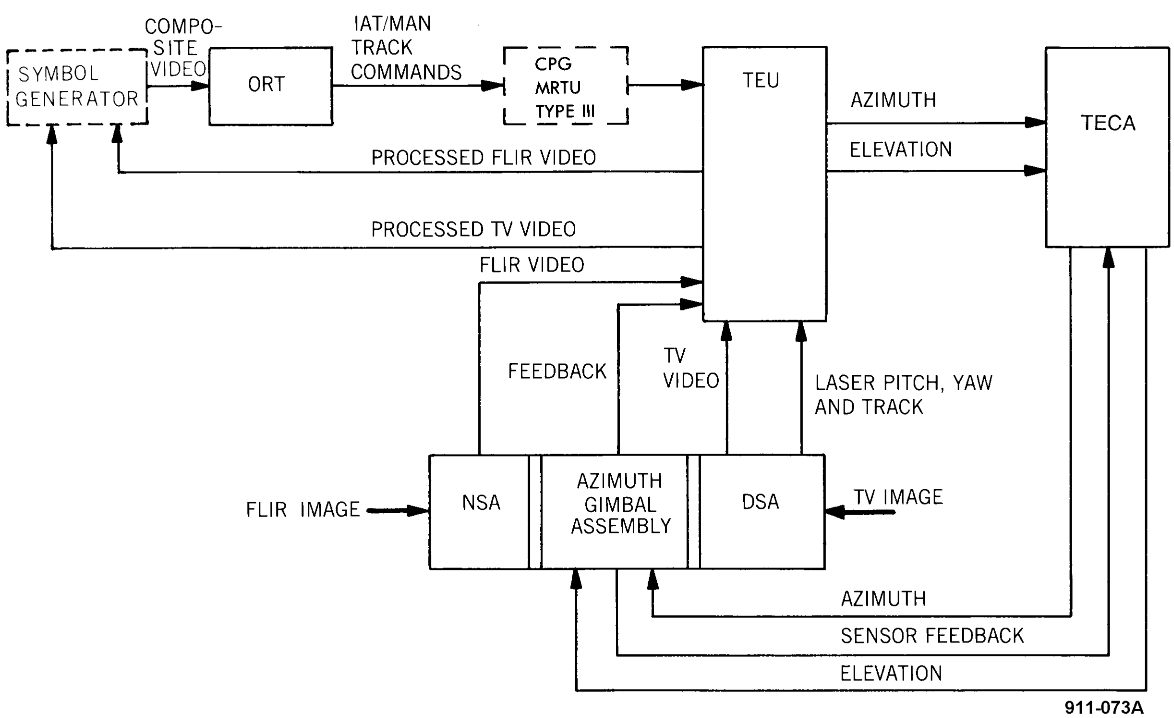


Figure 2-10. Image Automatic Tracking (IAT) Block Diagram

2-6. TARGET DETECTION, RECOGNITION, AND ACQUISITION SYSTEM (cont)

g. Laser Tracking. Laser tracking (fig. 2-11) is selected with the RHG LT switch. This switch also turns on the DSA laser tracker/receiver (LT/R). When tracking manually, if a properly coded laser spot is detected within the LT/R field of view, the LT/R generates signals which override the manual controller and position the selected sensor sight reticle on that spot. Laser automatic tracking tracks laser spots designated by a properly coded remote laser. Laser energy reflected from the target is received by the LT/R. As the target moves, the LT/R generates error signals. These signals are sent to the TEU and changed to azimuth and elevation drive signals. The drive signals, sent to the azimuth and elevation drive motors through the TECA, drive the TADS turret assembly toward the laser spot. Feedback signals are fed back to the TEU through the TECA. Feedback reduces the error signals as the TADS turret assembly nears the center of the laser spot. When the laser spot is centered in the LT/R the azimuth and elevation drive signals are canceled.

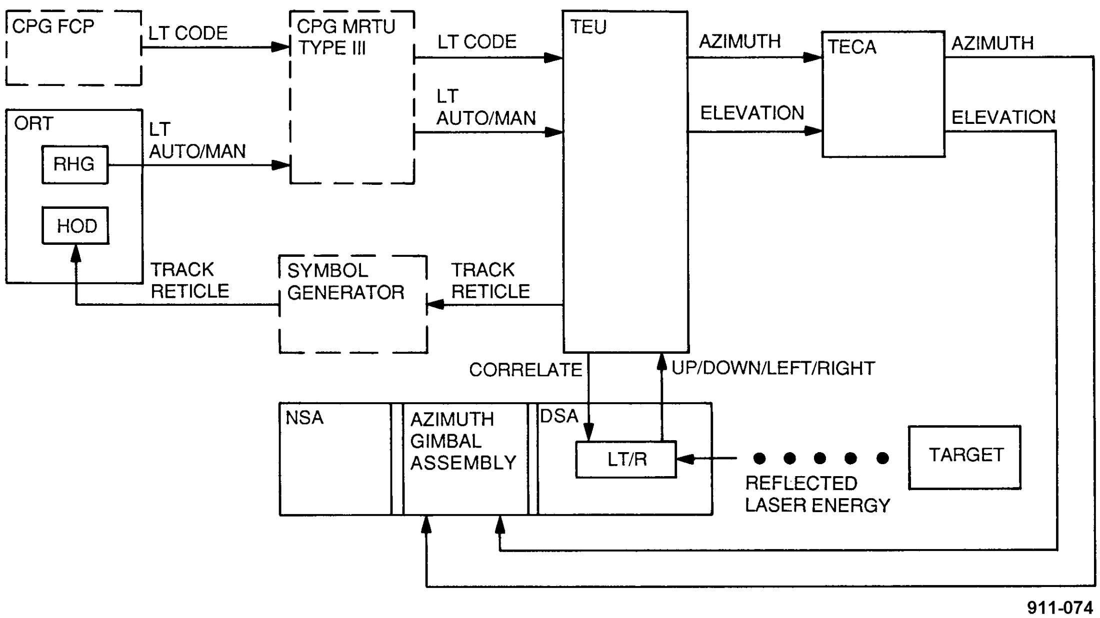


Figure 2-11. Laser Tracking Block Diagram

2-6. TARGET DETECTION, RECOGNITION, AND ACQUISITION SYSTEM (cont)

h. Laser Ranging and Designating. Laser energy striking an object and reflecting from it designates the object as a target. Laser fire signals (fig. 2-12) are sent to the DSA LTU through the CPG MRTU type III, TEU, and LEU. The following conditions must exist to fire the laser:

- CPG circuit breaker panel No. 2 **LASER** circuit breaker closed (in)
- CPG fire control panel **CPG** switch set to **ARM**
- CPG fire control panel **LSR** switch set to **ON**
- Helicopter off the ground
- RHG **LASER TRI**G switch squeezed

For safety, a squat switch on the left main landing gear interrupts laser fire when the helicopter is on the ground. The laser can not be fired on the ground unless the CPG fire control panel **PLT/GND ORIDE** switch is set to **ORIDE** or internal boresight is selected. The laser beam is coded using CPG fire control panel **TADS LASER CODE** switches and the data entry keyboard (DEK) switch set to **CODE**. Reflected laser energy is received and processed by the LTU and sent to the LEU. The LEU processes the received information to determine range. Range data is sent through the fire control computer (FCC) (where it is used to update target data) and symbol generator and is displayed on the ORT assembly HOD or HDD.

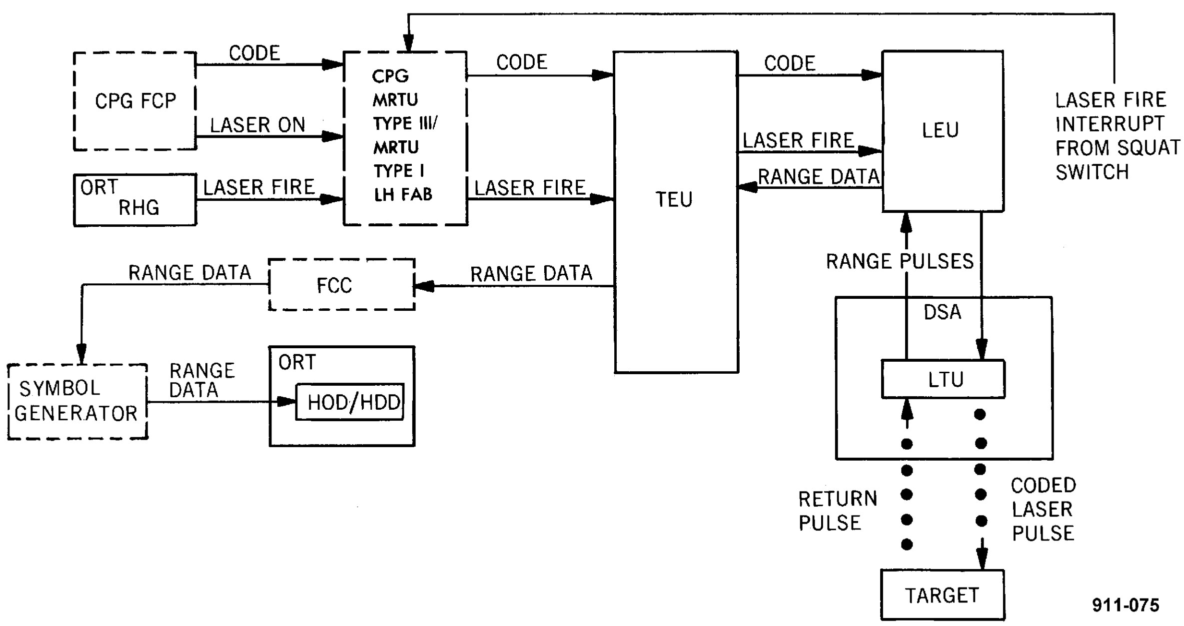


Figure 2-12. Laser Ranging and Designating Block Diagram

2-6. TARGET DETECTION, RECOGNITION, AND ACQUISITION SYSTEM (cont)

i. Fault Detection/Location System (FD/LS). FD/LS is a built-in test (BIT) used to detect faults in TADS assemblies and verify repair after maintenance. There are three parts of FD/LS: start-up, continuous, and initiated.

(1) Start-up BIT is performed immediately when power is first applied to the TADS assembly. This BIT checks out critical computer functions.

(2) Continuous BIT is on when TADS is in operate. This BIT monitors overall system functions.

(3) Initiated BIT requires operator action to perform. The operator can enter a code to test the TADS subsystem function or a code to check TADS assembly LRUs and some SRUs. Some of these tests require the operator to perform certain tasks. These tasks are displayed on the HOD or HDD.

2-7. AC/DC POWER CONTROL AND POWER BIT

The following paragraphs describe power control and BIT used for TADS standby, operate, and power-down. See block diagram fig. 2-13 and wiring interconnect diagram fig. 3-43. Refer to TM 1-5855-265-T for PNVS power control and BIT.

a. Standby. TADS is in standby when the CPG station fire control panel SIGHT SEL switch is set to **STBY** and the **SYSTEM TADS/FLIR OFF** switch is set to TADS. Controls and voltage are applied to TADS assemblies as follows:

(1) The CPG fire control panel applies a sight select standby input to MRTU type I LH FAB.

(2) CPG MRTU type III applies a logic 1 TADS STANDBY to the TADS power supply through MRTU type I LH FAB.

(3) The TADS power supply applies +5 VDC ENABLE to the TADS electronic unit (TEU).

(4) ECS operating voltage is applied to the ECS blower and duct heaters (para 2-8 and 2-9).

(5) TADS standby voltages are applied to TADS assemblies as described in paragraphs 2-8 and 2-9 below.

(6) A TADS power supply delayed operate timer starts when the standby input is applied. The TADS DELAY OP output is logic 0 for approximately 1 minute and changes to a logic 1 after the delay.

(7) When TADS is switched from operate to standby, a logic 0 TADS STOW CMD is applied to the TEU. The TEU commands the TADS turret to stow.

2-7. AC/DC POWER CONTROL AND POWER BIT (cont)

b. Operate. TADS is in operate when the CPG station fire control panel SIGHT SEL switch is set to **TADS** and the **SYSTEM TADS/FLIR OFF** switch is set to **TADS**. (Refer to paragraph c below for TADS operation in the **SYSTEM FLIR OFF** switch position.) Controls and voltage are applied to TADS assemblies as follows:

(1) The CPG fire control panel applies a sight select operate input to MRTU type I LH FAB and a TADS ON input to CPG MRTU type III.

(2) MRTU type I LH FAB applies a logic 1 TADS OPERATE to the TADS power supply.

(3) MRTU type I LH FAB sends a TADS operate message to the TEU.

(4) The TADS power supply applies operating voltages to the TEU (para 2-8 and 2-9).

(5) TADS operating voltages are applied to TADS assemblies as described in paragraphs 2-8 and 2-9 below.

(6) A logic 1 TADS STOW CMO is applied to the TEU.

(7) While TADS DELAY OP is logic 0 to the TEU, the TADS turret is not allowed to be commanded out of stow by the TEU as controlled by the optical relay tube (ORT) assembly right handgrip SLAVE switch. After the time delay has elapsed, TADS DELAY OP changes to a logic 1 and the TADS turret can be commanded out of stow and driven to fixed forward by the TEU. (Refer to paragraph 2-15.)

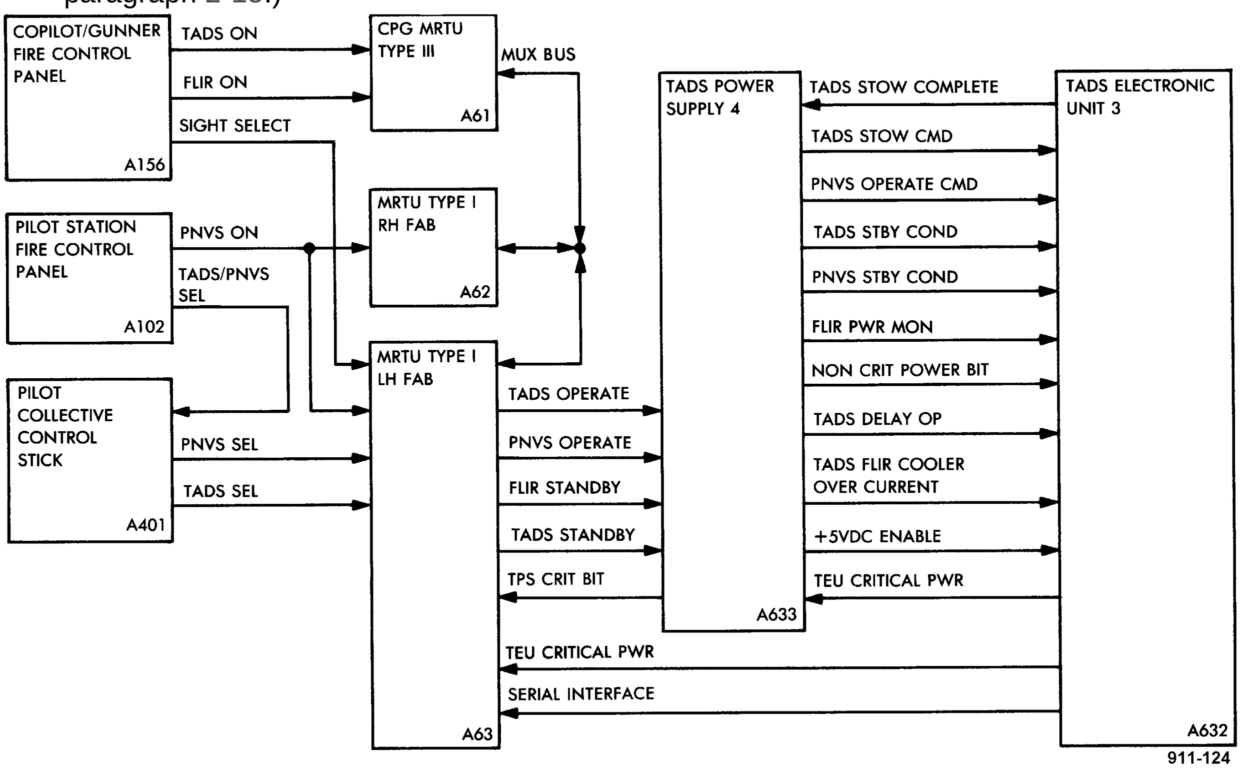


Figure 2-13. AC/DC Power Control and BIT Block Diagram

2-7. AC/DC POWER CONTROL AND POWER BIT (cont)

c. Forward Looking Infrared (FLIR) Power. TADS is in operate and operating voltage is applied to the TADS night sensor assembly when the CPG station fire control panel SIGHT SEL switch is set to **TADS** and the **SYSTEM TADS/FLIR OFF** switch is set to **TADS.** With the switch conditions just described, MRTU type I LH FAB applies a logic 1 FLIR STANDBY input to the TADS power supply and sends a FLIR operate message to the TEU. When the CPG station fire control panel **SYSTEM TADS/FLIR OFF** switch is set to **FLIR OFF**, TADS remains in operate, a FLIR standby message is sent to the TEU, a logic 0 FLIR STANDBY input is applied to the TADS power supply, and operating voltages are removed from the NSA.

d. Power Down. TADS is powered down when the CPG station fire control panel **S1GHT SEL** switch is set to **STBY** and **the SYSTEM TADS/FLIR OFF** switch is set to **OFF.** The TEU commands the TADS turret to stow before power is removed from TADS assemblies and the TEU. For the TEU and TADS to operate for the length of time required to stow the TADS turret and the TEU to store data, logic 0 TADS STANDBY and OPERATE commands to the TADS power supply are overridden by a logic 1 TADS STOW COMPLETE input. After the TADS turret Is stowed and the TEU stores data, the TADS STOW COMPLETE input to the power supply is changed to logic 0, and power is removed from TADS assemblies and the TEU.

e. Power BIT. BIT circuits monitor TADS power supply and TEU voltage outputs. During continuous BIT, BIT circuit inputs and outputs described below are evaluated.

(1) <u>TADS Delayed Operate</u>. When the TEU receives a TADS standby message the TEU delays one minute and reads a logic 1 TADS DELAY OP input. If the TADS DELAY OP input is a logic 0, the TEU sends a TADS POWER SUPPLY NO-GO LH FAB fail message to MRTU type I LH FAB on the serial interface bus. After the TADS DELAY OP command becomes a logic 1, the condition will remain set as long as the TADS power supply TADS STBY COND input is logic 1.

(2) <u>Critical Power BIT</u>. TADS power supply BIT circuits monitor critical voltage outputs, and during normal operation, apply a logic 1 TPS CRIT BIT output to the MRTU type I LH FAB. The TEU CRITICAL PWR input must be a logic 1 to enable the power supply critical power BIT circuit. If any voltage monitored by this circuit is out of tolerance or if the TEU CRITICAL PWR is logic 0, the TPS CRIT BIT output is a logic 0. TEU CRITICAL PWR outputs are connected in the TEU. One TEU CRITICAL PWR output is applied to MRTU type I LH FAB. Critical power outputs monitored by BIT are:

- 15 VDC to the TEU
- ±15 VDC to the ORT assembly indirect view display, right handgrip, and optical relay column
- -5 VDC to the ORT assembly control panel.

2-7. AC/DC POWER CONTROL AND POWER BIT (cont)

(3) Uncritical Power BIT. TADS power supply BIT circuits monitor noncritical voltage outputs. If any voltage monitored by this circuit is out of tolerance, the TEU NON CRIT PWR BIT input to the TEU is logic 1. A logic 1 will cause the TEU to send a TADS POWER SUPPLY NO-GO LH FAB fail message to MRTU type I LH FAB on the serial interface bus. Noncritical power outputs monitored by BIT are:

- 15 VDC to the NSA
- 15 VDC to the TV sensor
- ±14 VDC
- -20 VDC (not used)
- -200 VDC
- 12.6 VAC

(4) TADS Cooler Overcurrent BIT. TADS power supply BIT circuits monitor the TADS NSA cooler/ dewar and fan current and apply a logic 1 TADS COOLER OVERCURRENT input to the TEU during FLIR standby operation. If too much current is detected, a TADS power supply 14 second delay relay energizes and disconnects the AC voltage from the TADS NSA cooler/ dewar and fan. A logic 0 TADS COOLER OVERCURRENT input is applied to the TEU for the overcurrent condition. A TADS NIGHT SENSOR NO-GO NSA message will be sent to MRTU type I LH FAB when the TEU reads a logic 0 TADS COOLER OVERCURRENT input.

(5) TADS FLIR Power BIT. TADS power supply BIT circuits monitor FKLIR operating voltage outputs. If any voltage monitored by this circuit is out of tolerance, the FLIR PWR MON input to the TEU is logic 1. The FLIR PWR MON input is read by the TEU with FLIR in standby or operate. If a FLIR operate message has been received by the TEU on the serial interface but, a logic 1 will cause the TEU to send a TADS POWER SUPPLY NO-GO LH FAB fail message to MRTU type I LH FAB on the serial interface bus. If a FLIR operate message has not been received by the TEU on the serial interface bus, a logic 0 will cause the TEU to send a TADS POWER SUPPLY NO-GO LH FAB fail message to MRTU type I LH FAB on the serial interface bus. FLIR power outputs monitored by BIT are:

- -11 VDC
- ±15.3 VDC
- 14.4 VDC

2-8. AC POWER DISTRIBUTION

Unswitched AC voltage is applied directly and through the TADS power supply to TADS assemblies. Switched AC voltages are applied to TADS assemblies, through the TADS power supply, when TADS is in standby or operate (para 2-7). See block diagrams fig. 2-14 and 2-15 and wiring interconnect diagrams fig. 3-44 and 3-45.

a. Unswitched AC Voltage. Unswitched aircraft 115 VAC is applied to TADS assemblies as follows:

(1) Aircraft 115 VAC is applied to the TADS power supply and ORT assembly from CPG station circuit breaker panel No. 2 **TADS AC** circuit breaker CB3.

(2) 115 VAC, applied to the ORT assembly, is routed to the IVD through relay housing assembly 2A6A5 for independent HOD operation (para 2-12).

(3) 115 VAC is routed directly through the TADS power supply to the ECS. The voltage is switched to ECS duct heaters and fan when TADS or PNVS is in standby (para 2-21).

(4) 115 VAC is stepped down to 12.6 VAC in power components assembly 4A7 and routed to boresight module cue update and day sensor assembly DVO reticle lamps. The 12.6 VAC is applied to the lamps as described in paragraphs 2-11 and 2-22 below.

(5) Aircraft 115 VAC is applied to the LEU from CPG station circuit breaker panel No. 2 LASER circuit breaker CB4. This voltage is switched to the LEU power supply when the laser rangefinder is commanded on (para 2-16).

b. Switched AC Voltage (Standby). When TADS STANDBY is applied to the TADS power supply, AC voltage is applied to TADS assemblies as follows:

(1) Aircraft 115 VAC is switched to the night sensor assembly cooler/dewar and fan through the TADS power supply BITE/control CCA.

(2) 115 VAC, applied to the ORT assembly, is routed to the IVD through relay housing assembly 2A6A5 for HOD operation when TADS is in operate (para 2-12).

(3) 115 VAC ØC is applied to the LTU and day sensor subassembly.

(4) 115 VAC ØB is applied to the LTU and day sensor subassembly.

2-8. AC POWER DISTRIBUTION (cont)

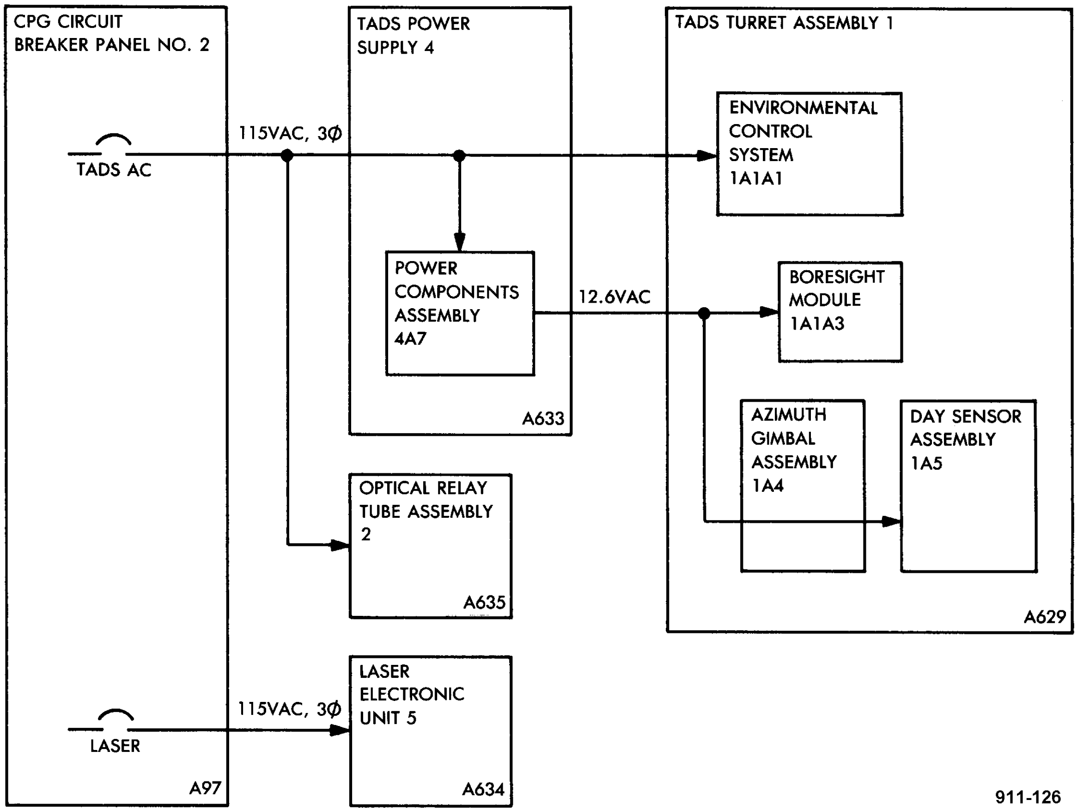


Figure 2-14. AC Power Distribution (Unswitched) Block Diagram

c. Switched AC Voltage (Operate). When TADS OPERATE is applied to the TADS power supply, AC voltage is applied to TADS assemblies as follows:

(1) A power components assembly step-down transformer 26 VAC output (resolver reference) is applied to azimuth gimbal assembly azimuth and elevation resolvers. A 26 VAC resolver reference is also applied to the TEU.

(2) 115 VAC is applied to azimuth gimbal assembly azimuth and elevation drive motors.

2-8. AC POWER DISTRIBUTION (cont)

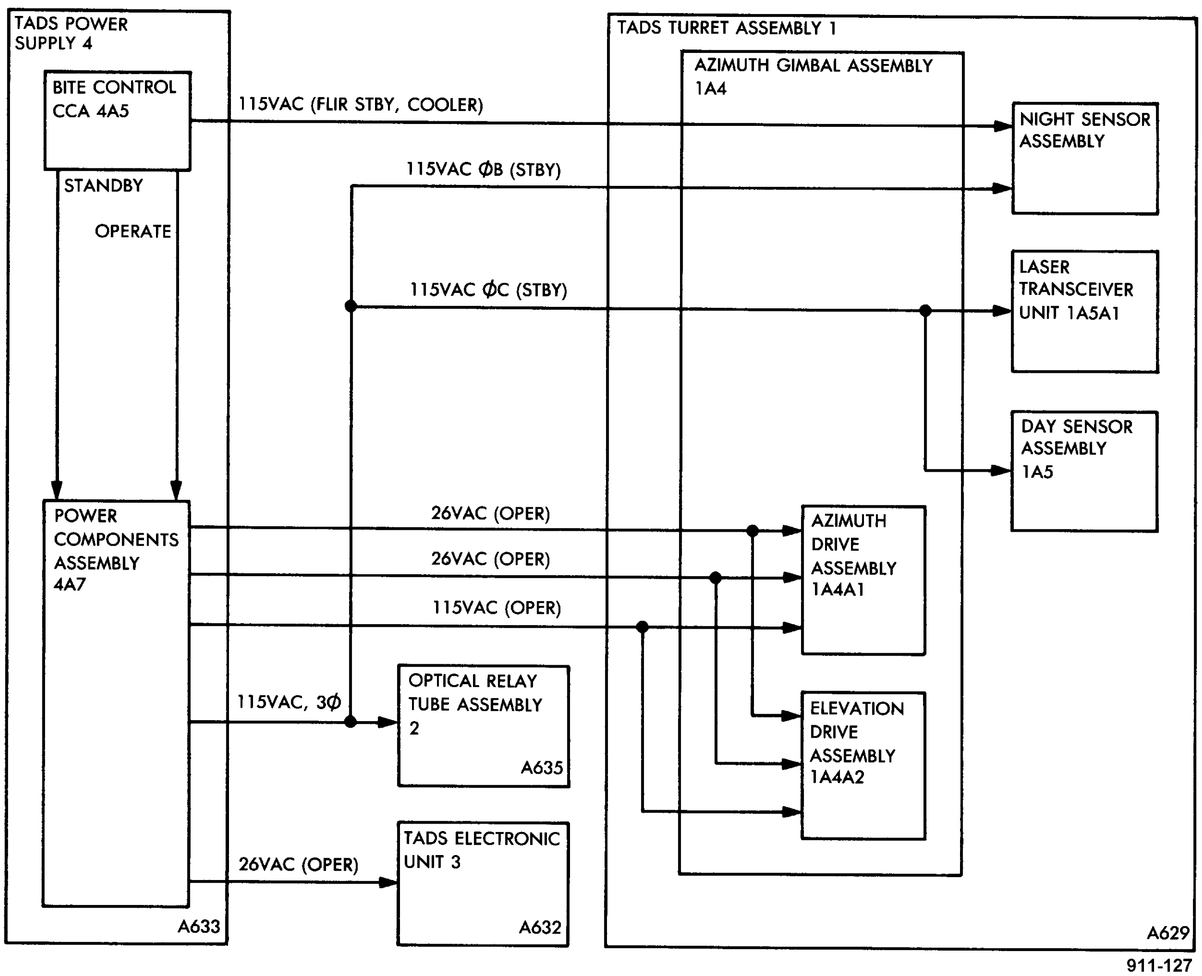


Figure 2-15. AC Power Distribution Diagram (Switched) Block Diagram

2-9. DC POWER DISTRIBUTION

Aircraft 28 VDC, TADS power supply, TEU, and LEU DC output voltages are applied to TADS assemblies in standby and operate (para 2-7). (See block diagrams fig. 2-16 thru 2-21 and wiring interconnect diagrams figures 3-47 thru 3-50.)

NOTE

> For OIP configured systems, one TEU 5 VDC output is replaced with a 5 VDC power supply in the optical relay column. Wiring interconnects for the OIP configured optical relay column are shown on TEU power supply DC power distribution diagrams.

a. Aircraft 28 VDC. Unswitched aircraft 28 VDC is applied to the TADS power supply, ORT assembly, and TECA from CPG station circuit breaker panel No. 2 TADS DC circuit breaker CB2. The unswitched aircraft 28 VDC is also applied to the ECS, TEU, ORT assembly, DSA, LT/R, and NSA, through a TADS power supply isolation diode. When the operate input is applied to the TADS power supply, aircraft 28 VDC is switched to the TECA. The 28 VDC is switched by the TECA to the brake release switch (para 2-19) and elevation and azimuth electronic amplifiers.

b. TADS Power Supply DC Outputs. When TADS OPERATE is applied to the TADS power supply, regulated DC voltages are applied to TADS assemblies as follows:

(1) 15 VDC is applied to the NSA. When the CPG station fire control panel **SYSTEM TADS/FLIR OFF** switch is set to **TADS**, -11 VDC, ±15.3 VDC, and 14.4 VDC are applied to the NSA.

(2) 15 VDC is applied to the DSA TV sensor.

(3) -5 VDC is applied to the DSA electronics assembly.

(4) ±14 VDC and -200 VDC are applied to the LT/R.

(5) ±15 VDC are applied to the TECA, pitch and yaw accelerometers, and pitch, roll, and yaw gyro CCAs.

(6) ±15VDC, -14 VDC, -28 VDC, and -5 VDC are applied to the TEU.

(7) -5 VDC is applied to the ORT assembly control panel.

(8) ±15 VDC are applied to the IVD, right handgrip, and optical relay column.

2-9. DC POWER DISTRIBUTION (cont)

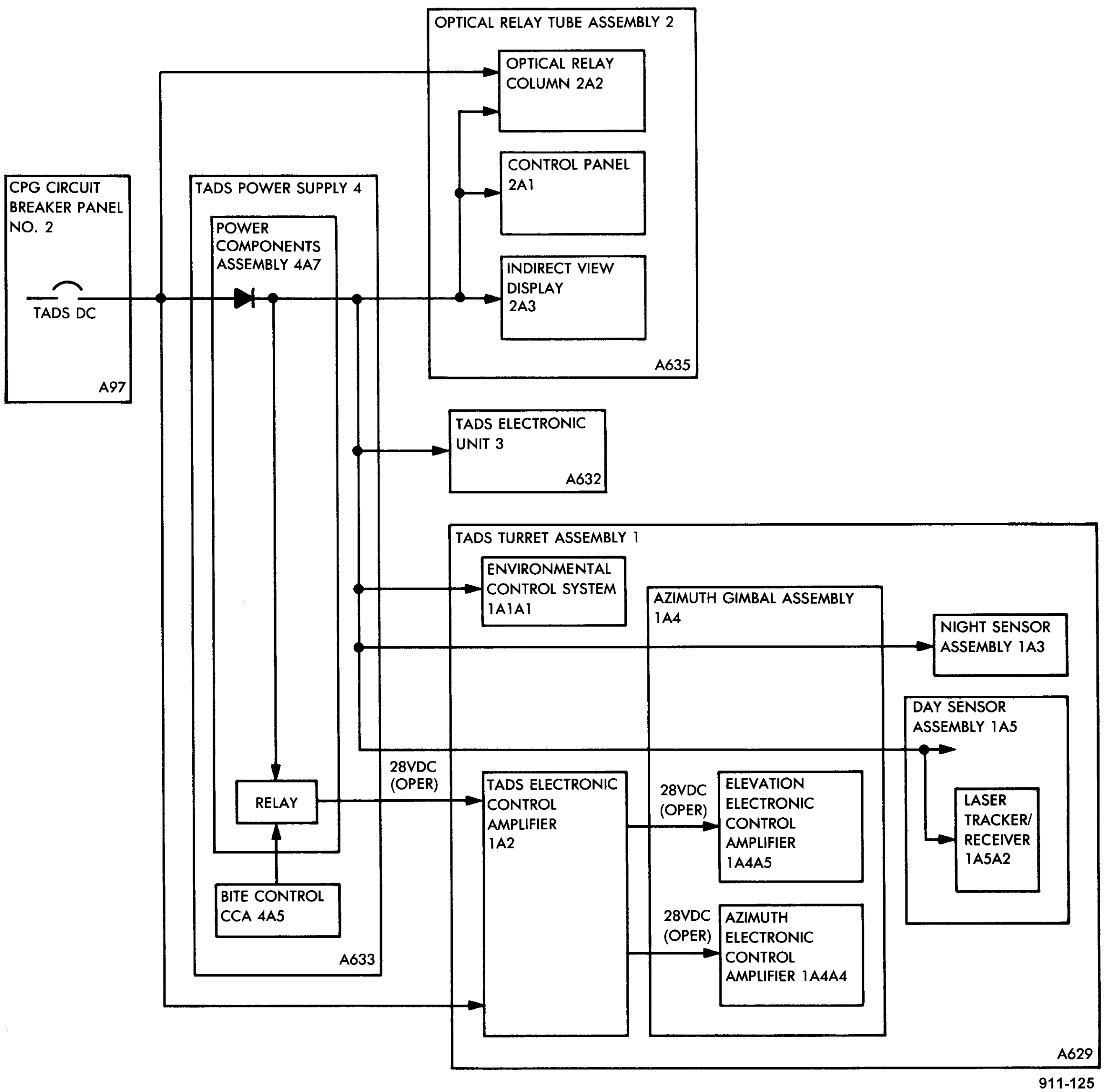


Figure 2-16. Aircraft 28 VDC Power Distribution Block Diagram

2-9. DC POWER DISTRIBUTION (cont)

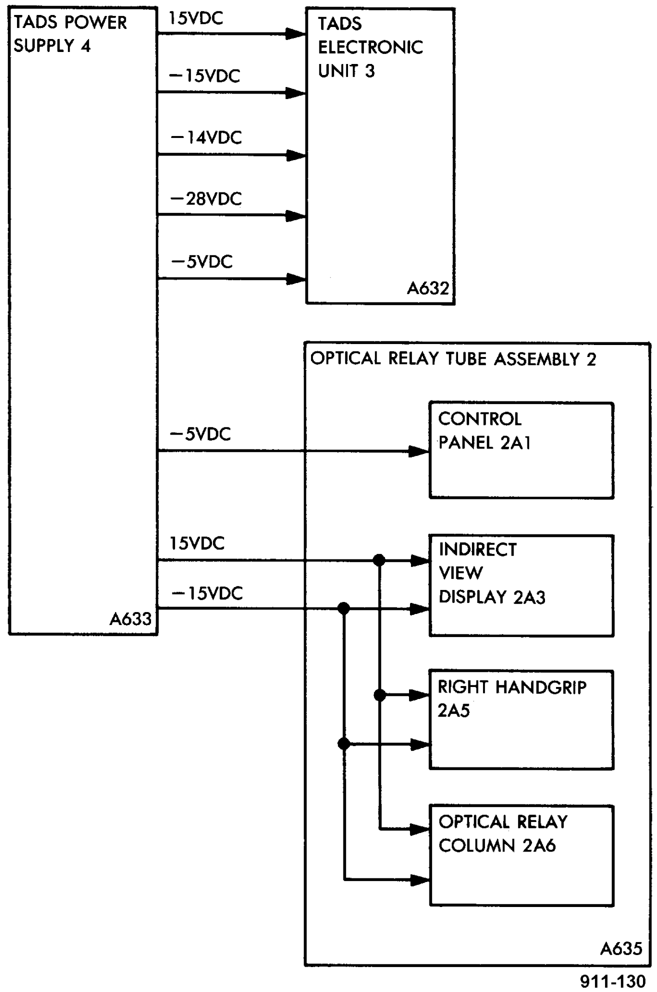


Figure 2-17. TADS Power Supply DC Power Distribution (TEU, ORT) Block Diagram

2-9. DC POWER DISTRIBUTION (cont)

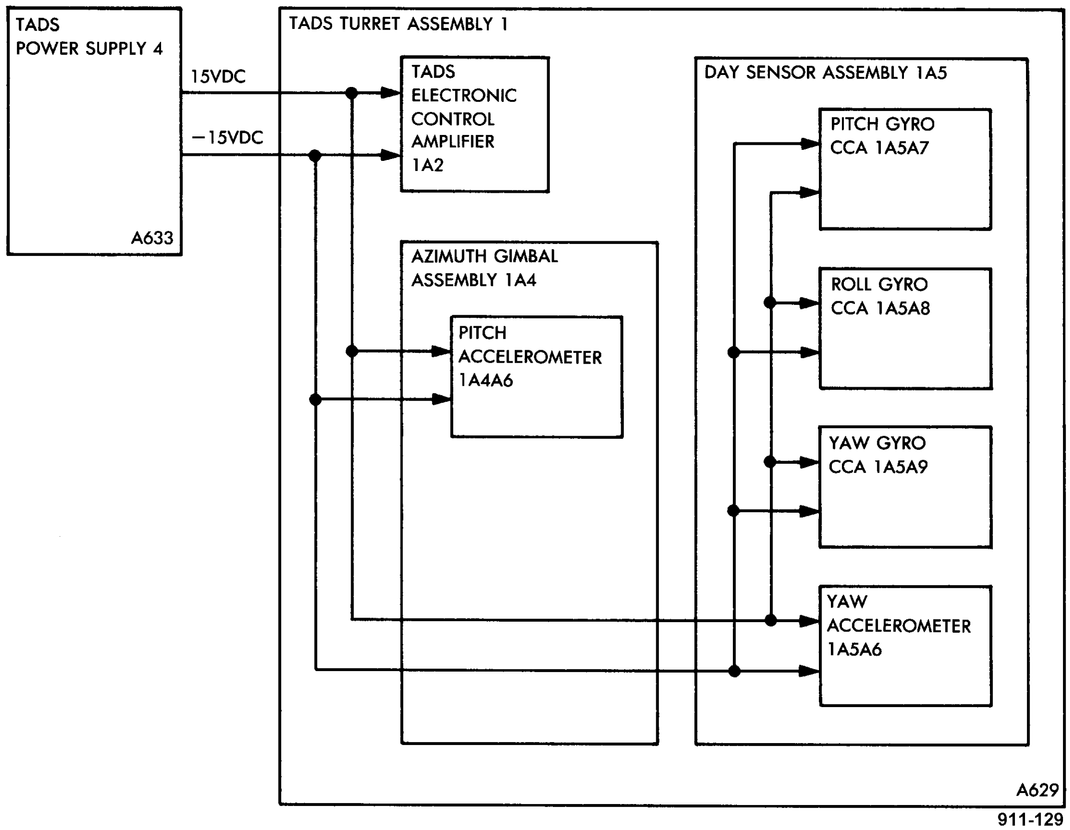


Figure 2-18. TADS Power Supply DC Power Distribution (Servo) Block Diagram

2-9. DC POWER DISTRIBUTION (cont)

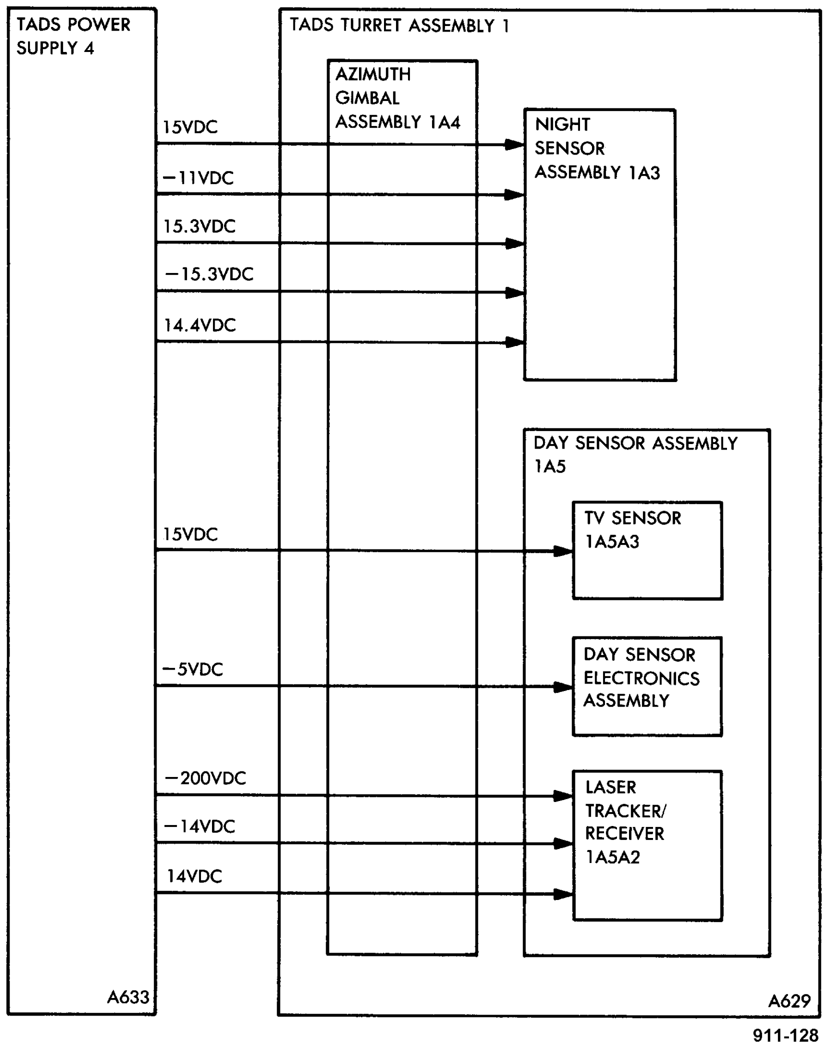


Figure 2-19. TADS Power Supply DC Power Distribution (FLIR, Day TV, Laser Tracker Receiver Block Diagram

2-9. DC POWER DISTRIBUTION (cont)

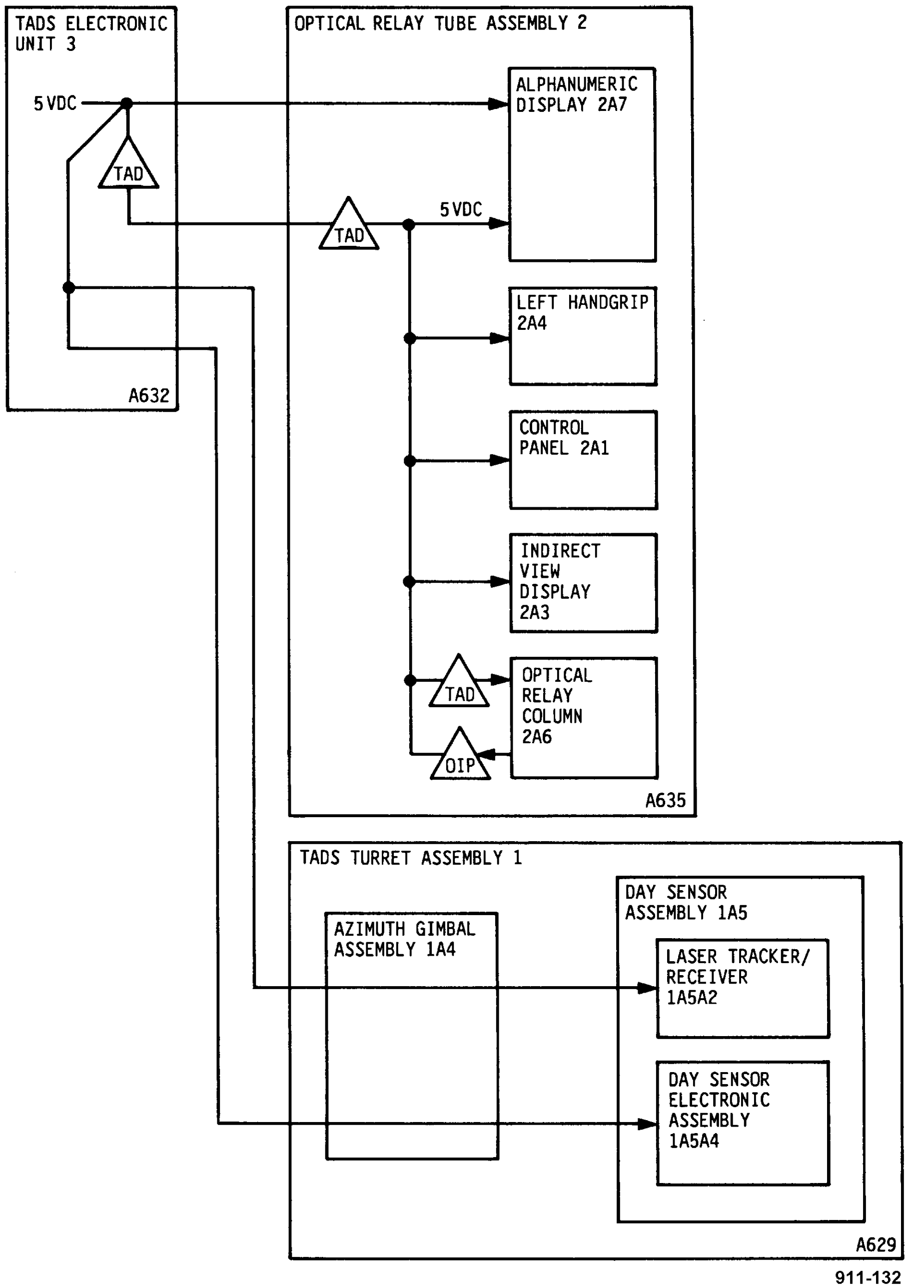


Figure 2-20. TADS Electronic Unit DC Power Distribution Block Diagram

2-9. DC POWER DISTRIBUTION (cont)

c. TADS Electronic Unit DC Outputs. When +5 VDC ENABLE is applied to the TEU, 5 VDC is applied to TADS assemblies as follows:

(1) AND, LT/R, and DSA electronic assembly.

(2) In non-OIP configured systems, TEU 5 VDC is applied to the AND, IVD, left handgrip, ORT assembly control panel, and optical relay column. In OIP configured systems, an optical relay column power supply 5 VDC output is applied to the AND, IVD, left handgrip, and ORT assembly control panel.

d. Laser Electronic Unit DC Outputs. The LEU applies DC voltage to the LTU and laser receiver. 28 VDC (unswitched) is applied to the LTU when 115 VAC is applied to the LEU. When the laser is commanded on, DC voltage is applied to assemblies as follows:

(1) 28 VDC (switched), -15 VDC, 600 VDC, and high voltage (HV) are applied to the LTU. The LEU HV output amplitude is adjusted for each laser transmitter by a preset HV ADJ output from the LTU.

(2) ±15 VDC is applied to the laser receiver.

(3) 600 VDC is applied to the laser receiver.

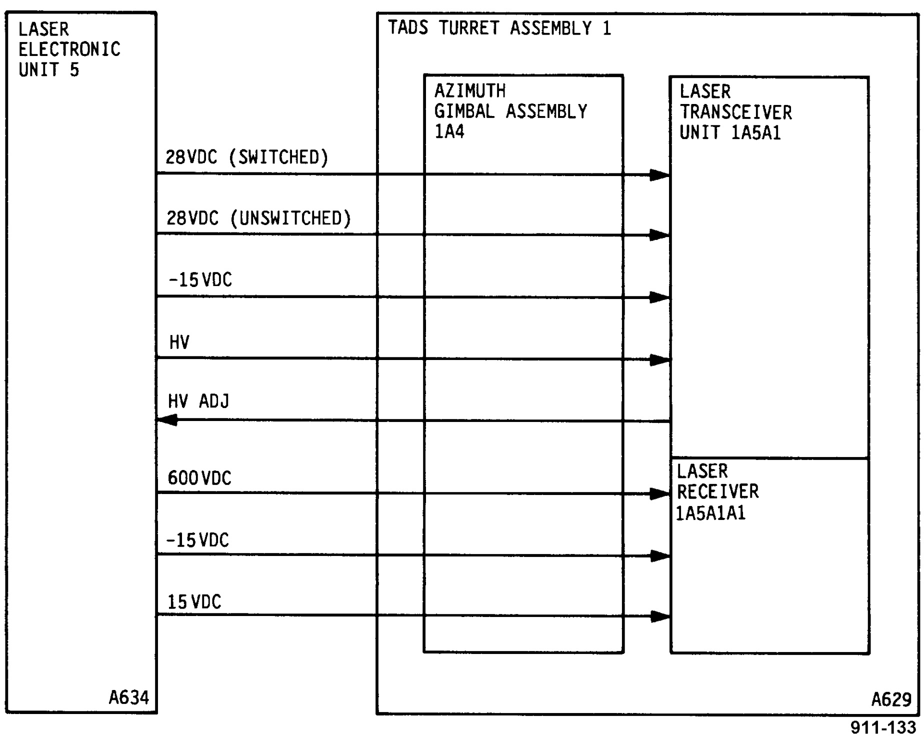


Figure 2-21. Laser Electronic Unit DC Power Distribution Block Diagram

2-10. SERIAL INTERFACES

The TEU and AND use serial interface buses to transfer data between the TEU or AND and MRTUs type I and III respectively. Each serial digital data transfer in either direction between the TEU/AND and the MRTUs is in the form of a message that may consist of 1 to 32 data words. The first word in each data message is dedicated to transfer the numeric value of a predetermined parameter of specific data bits. Each succeeding word in the message is dedicated to the transfer of information. All data transfers are under MRTU control. The TEU and AND to MRTU serial interfaces are identical except that the AND does not send data to the MRTU. (See block diagrams fig. 2-22 and 2-23 and wiring interconnect diagrams fig. 3-51 and 3-52.) The following paragraphs describe the TEU/MRTU type I serial interface signals.

a. Data Transfer from MRTU to TEU. The MRTU type I notifies the TEU that a data transfer to the TEU is to be initiated by changing the REQUEST DISC output from a logic 0 to a logic 1. The TEU notifies the MRTU that it is ready to receive data by changing the ACK DISC output to a logic 1. The REQUEST DISC output remains logic 1 until the last data word on the MRTU type I DATA OUT output has been transferred. After the last word in the message has been transferred, the REQUEST DISC output is changed to logic 0 to notify the TEU that the data transfer is complete. The TEU changes the ACK DISC output to logic 0 to notify the MRTU that the end of the message was recognized.

b. Data Transfer from TEU to MRTU. The MRTU type I notifies the TEU that a data transfer from the TEU to the MRTU is to be initiated by changing the REQUEST DISC and XMIT DISC outputs from a logic 0 to a logic 1. The TEU notifies the MRTU that it is ready to transmit data by changing the ACK DISC output to a logic 1. The XMIT DISC output remains logic 1 until the last data word on the MRTU type I DATA IN input has been transferred. If the MRTU needs to transmit data to the TEU, the XMIT DISC output remains logic 0 until the transfer is complete. After the last word in the message has been transferred, the REQUEST DISC output is changed to logic 0 to notify the TEU that the data transfer is complete. The TEU changes the ACK DISC output to logic 0 to notify the MRTU that the end of the message was recognized.

c. Clock. Data transfer is synchronized by the MRTU type I issuing a burst of 17 clock pulses on the CLOCK output for each data word to be transferred in either direction. Sixteen of the clock pulses are for the serial data bits and one pulse for parity bit. The clock is held at logic 0 for three bit times between data words in a message.

d. Manchester Error. When the MRTU type I detects an invalid condition for a data word that has been transmitted to the TEU, a short logic 1 MANCHESTER ERROR pulse is sent to the TEU immediately after the questionable data word. The MANCHESTER ERROR pulse notifies the TEU that the preceding data word may be incorrect.

e. Subsystem Error. When the TEU detects an invalid condition for a data word that has been transmitted to the MRTU type I, a short logic 1 SUBSYSTEM ERROR pulse is sent to the MRTU immediately after the questionable data word. The SUBSYSTEM ERROR pulse notifies the MRTU that the preceding data word may be incorrect.

2-10. SERIAL INTERFACES (cont)

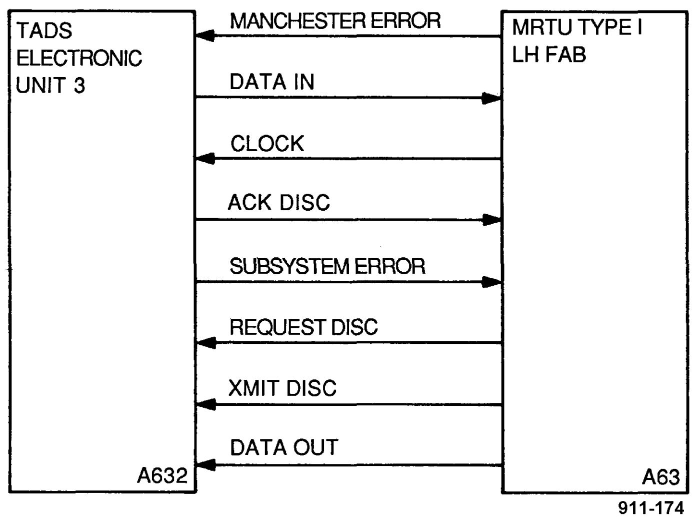


Figure 2-22. TADS Electronic Unit/MRTU Type I LH FAB Serial Interface Block Diagram

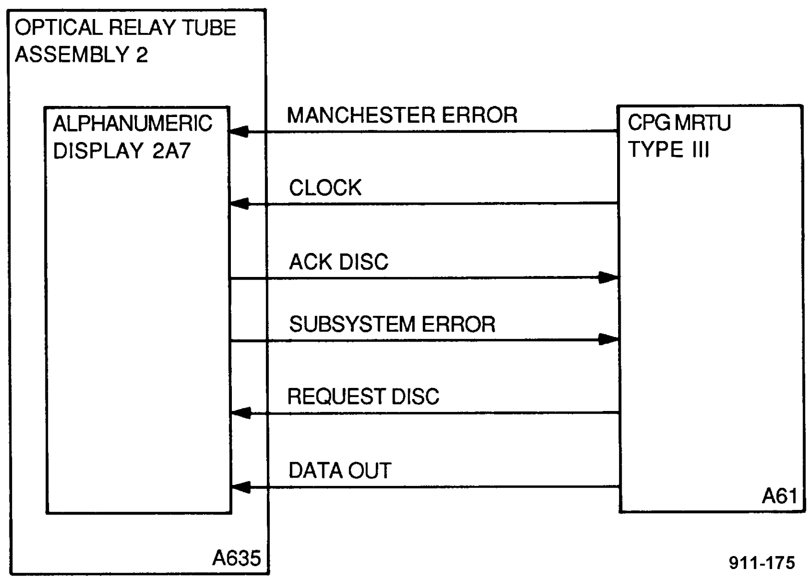


Figure 2-23. Alphanumeric Display/CPG MRTU Type III Serial Interface Block Diagram

2-11. DIRECT VIEW OPTICS (DVO)

DVO provides the CPG with a magnified view of targets through either wide or narrow FOV optics. DVO is selected using the left handgrip sensor select switch. WFOV or NFOV is selected using the left handgrip field-of-view switch. The DVO optical path is through the DSA, azimuth gimbal assembly, and ORT assembly to the ORT assembly eyepiece. Paragraphs a thru f describe the DVO optical path, FOV switching, haze/glare filter switching, pechan prism assembly, and DVO BIT.

a. DVO Optical Path.

(1) DVO NFOV images enter the day sensor shroud lower window (fig. 2-24) and pass through the common aperture to the laser prism. The laser prism reflects laser signals into the LTU and allows optical energy in the DVO and DTV spectrum to pass. A penta prism separates DVO frequencies (wavelength 0.3 to 0.7 microns) from DTV frequencies (0.7 to 0.9 microns). DVO NFOV images continue through a delta prism, DVO boresight field lens assembly, and NFOV reticle to the DVO FOV switching mirror.

(2) DVO WFOV images enter the lower day sensor shroud window and pass through the DVO WFOV optical assembly, rhomboid prism, and WFOV reticle to the FOV switching mirror. The mirror will be in either the NFOV or WFOV path depending on the position of the left handgrip field-of-view switch. From the switching mirror forward, the optical path is the same for both the narrow and wide FOV images. After the switching mirror, the images go through relay optics No. 5 into the turret optics assembly (fig. 2-25). A collimating lens directs the incoming scene onto No. 7 mirror assembly, which is suspended in the center of the inner gimbal cruciform. Imagery is reflected off No. 7 mirror assembly, collimated, and redirected through No. 6 optics assembly to No. 8 fold mirror. The scene is then collimated and redirected by a penta prism in No. 7A optics assembly to No. 10 fold mirror. Penta prisms are used to redirect optical scenes when image reversal is not wanted. From No. 10 fold mirror, the images pass through No. 10 optics assembly and into the field lens assembly. A contingency filter, in the field lens assembly, guards against stray laser energy.

2-11. DIRECT VIEW OPTICS (DVO) (cont)

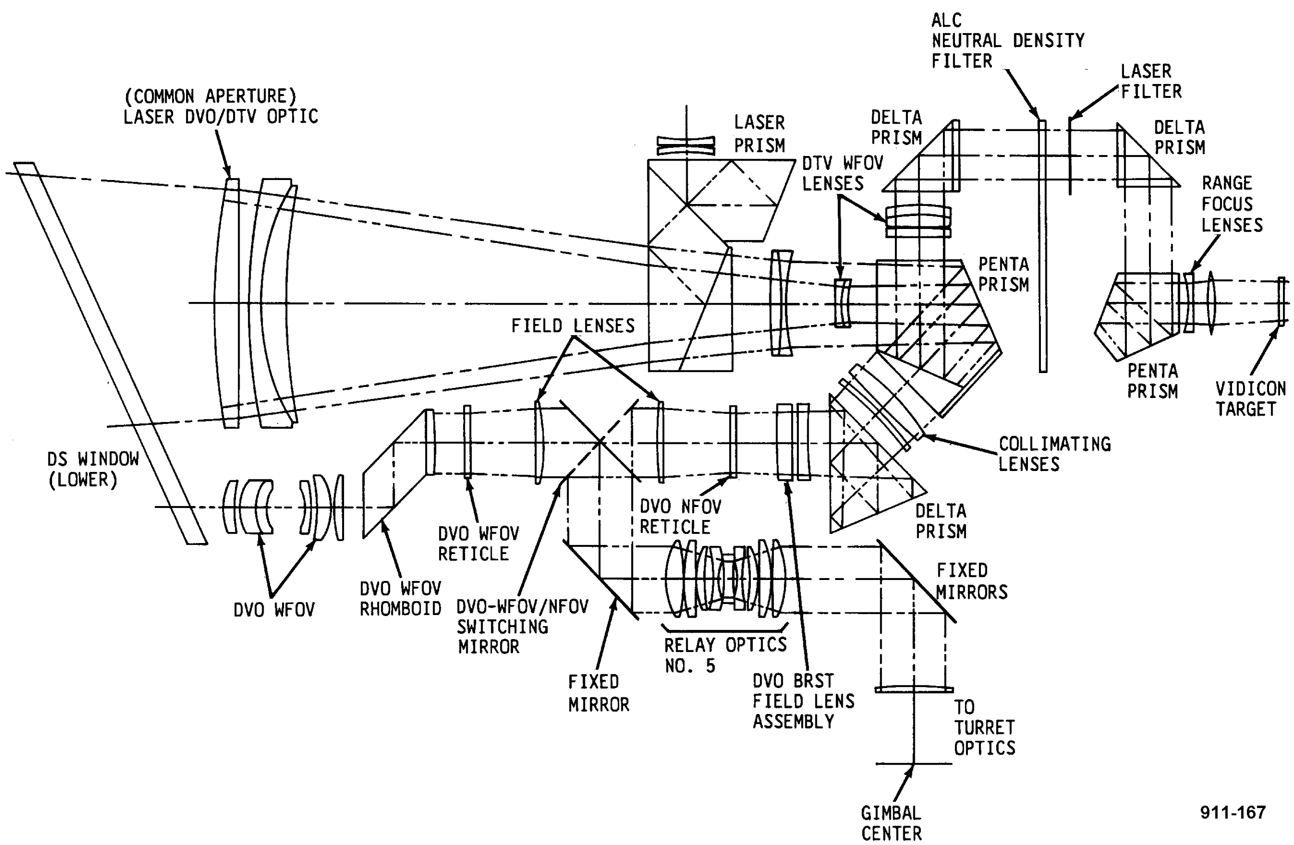


Figure 2-24. Day Sensor Assembly Optical Path

2-11. DIRECT VIEW OPTICS (DVO) (cont)

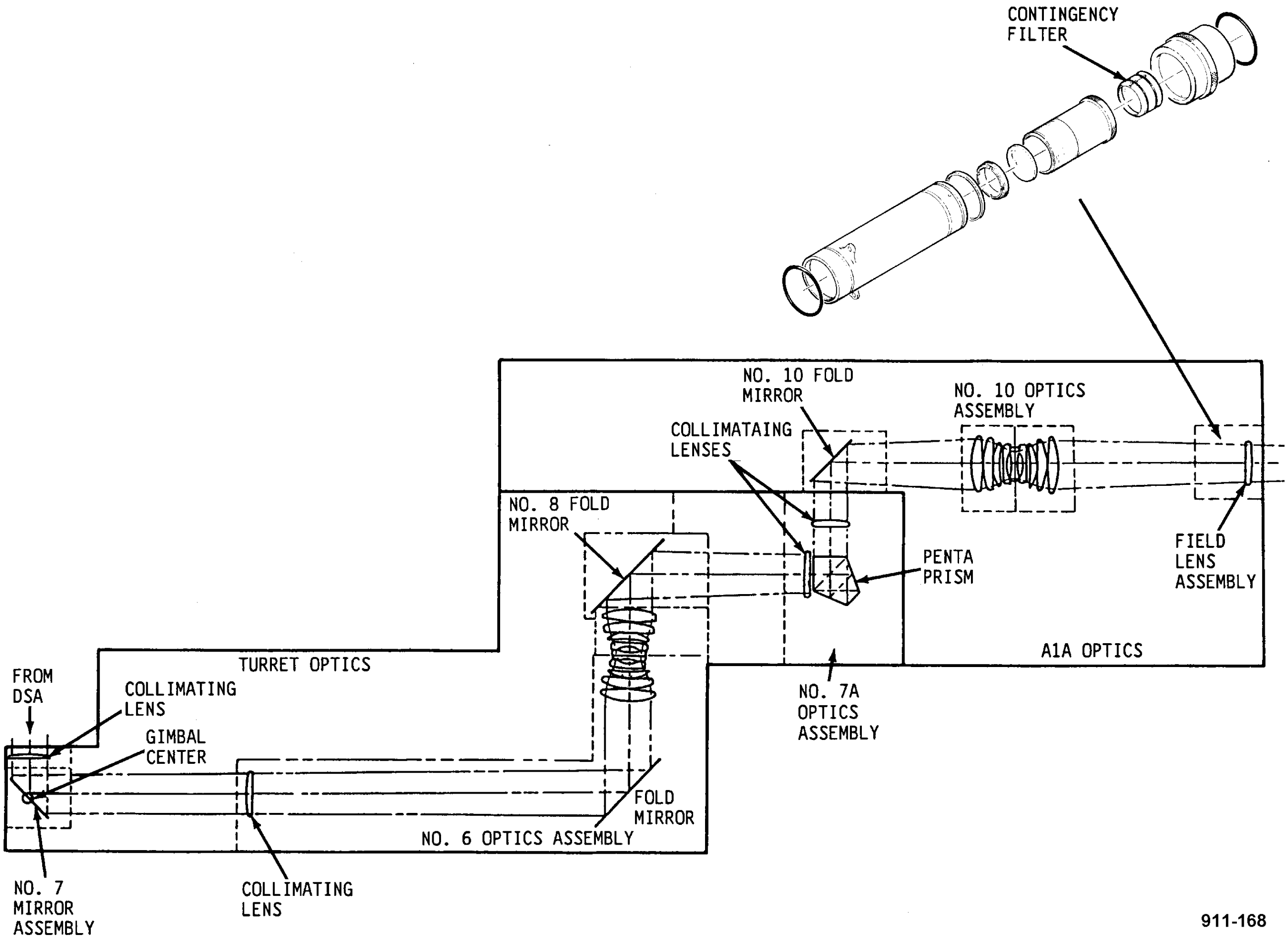


Figure 2-25. TADS Turret Assembly/Aircraft Interface Assembly Optical Path

2-11. DIRECT VIEW OPTICS (DVO) (cont)

(3) The optical scene enters the ORC and passes through the filter wheel assembly (fig. 2-26). Four filter positions - haze, glare, haze/glare, and clear - are provided to compensate for adverse haze and/or glare problems. Filter selection is made by the CPG using the ORT assembly control panel FLTR SEL switch. From the filter wheel, the imagery enters the pechan optics assembly. The pechan prism maintains the DVO scene in an upright position, regardless of turret rotation. The scene is then collimated by the DVO lens cell before entering the penta prism. The penta prism redirects the images into the upper ORC assembly, where it is again collimated and applied to the final mirror assembly. This mirror assembly redirects the optical scene into the eyepiece assembly. A laser filter in the eyepiece assembly protects the operator from stray laser energy which may be present in the optical path. The eyepiece assembly also provides a manual focus control.

b. Field-of-View Switching. The DVO FOV switching mirror, part of the DSA optics, allows the CPG to view target images through either wide (18°) or narrow (3.5°) FOV optics. (See block diagram fig. 2-27 and wiring interconnect diagram fig. 3-69.) FOV selection is made using the left handgrip field-of-view switch. When a field of view is selected, a logic 1 is applied to CPG MRTU type III, which transfers the information to the TEU through MRTU type I LH FAB on the serial interface bus. The TEU applies a logic 1 for NFOV or a logic 0 for WFOV to optical adjust CCA 1A5A4A1 in the day sensor electronic assembly. A logic circuit on the optical adjust CCA 1A5A4A1 applies a narrow or wide FOV command to a driver circuit on ALC servo CCA 1A5A4A2. The driver circuit produces the NFOV or WFOV motor drive signal that switches the FOV mirror to the selected optical path.

c. DVO Reticle. Etched wide and narrow retitles in the DVO optical path (fig. 2-24) al low the CPG to center targets when using DVO. Wide and narrow FOV reticle lamps (fig. 3-69) illuminate the retitles when DVO is selected. DVO is selected using the ORT assembly left handgrip sensor select switch (fig. 2-28).

d. Haze/Glare Filter. The haze/glare filter wheel is located in the forward door assembly of the lower ORC. (See block diagram fig. 2-28 and wiring interconnect diagram fig. 3-71.) It provides four filtering options to compensate for changing weather and light conditions. Filter selection is made using the ORT assembly control panel **FLTR SEL** switch. The four filter selections are haze, glare, a combination haze/ glare, and clear. When a filter is selected by the operator, a corresponding filter select logic is applied to IVD motor driver CCA 2A3A5. The current filter position is compared to the filter select input. If they are different, logic outputs FW1, FW2, and FW3 are generated. Relay driver CCA 2A3A4 converts the logic to drive signals K1, K2, and Q1, that rotate the filter wheel to the selected position.

2-11. DIRECT VIEW OPTICS (DVO) (cont)

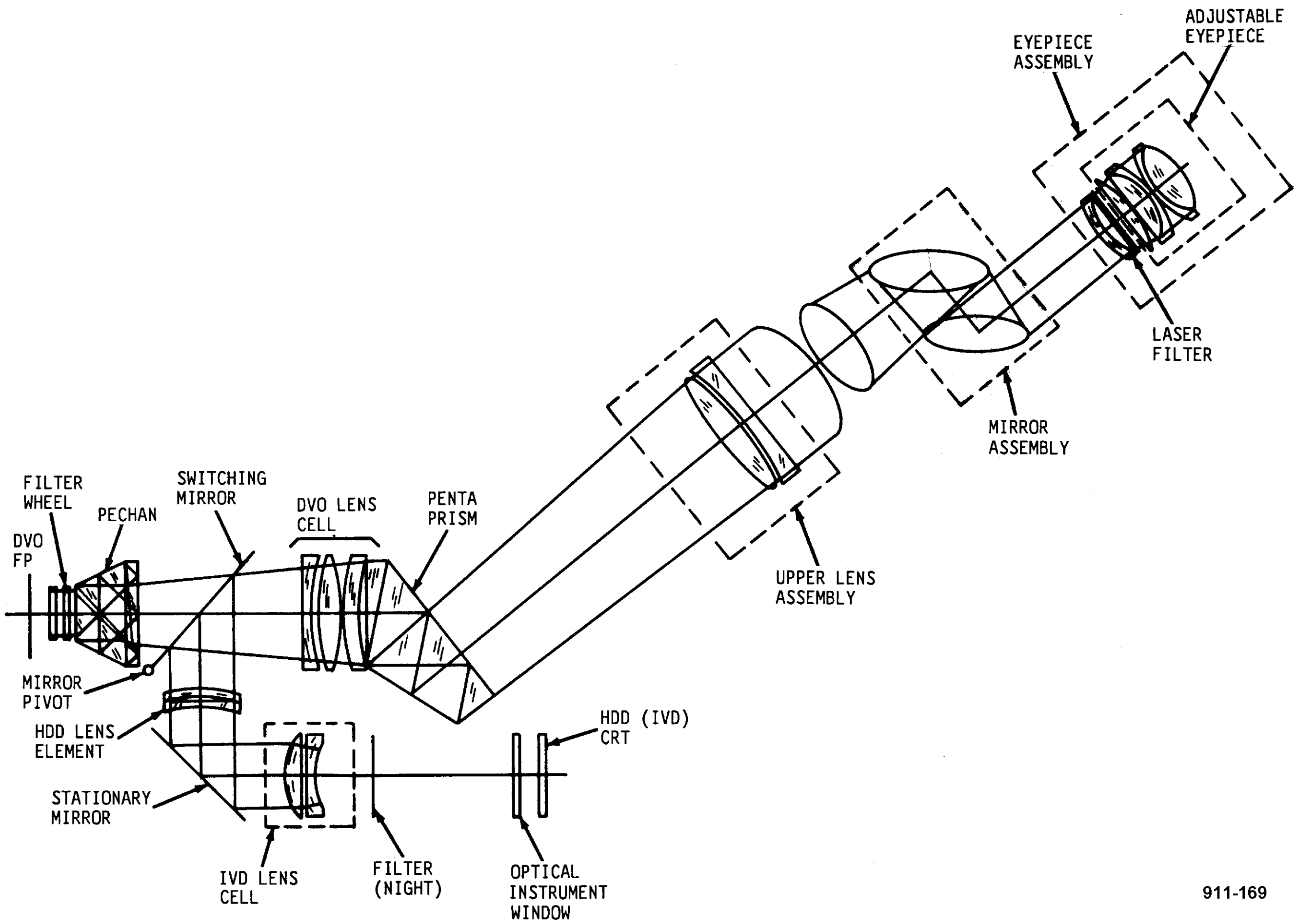


Figure 2-26. ORT Assembly Optical Path

2-11. DIRECT VIEW OPTICS (DVO) (cont)

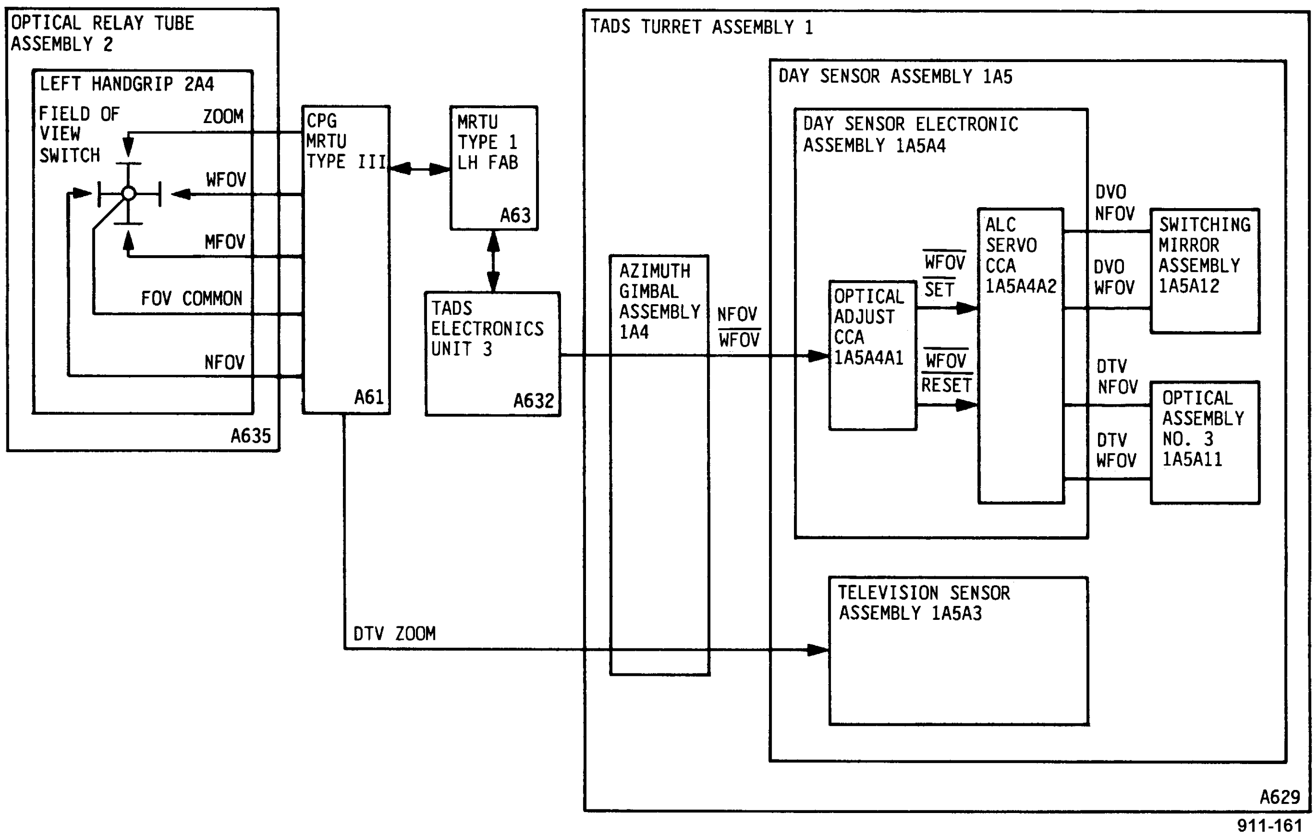


Figure 2-27. DVO/DTV Field-of-View Switching Mirror Block Diagram

2-11. DIRECT VIEW OPTICS (DVO) (cont)

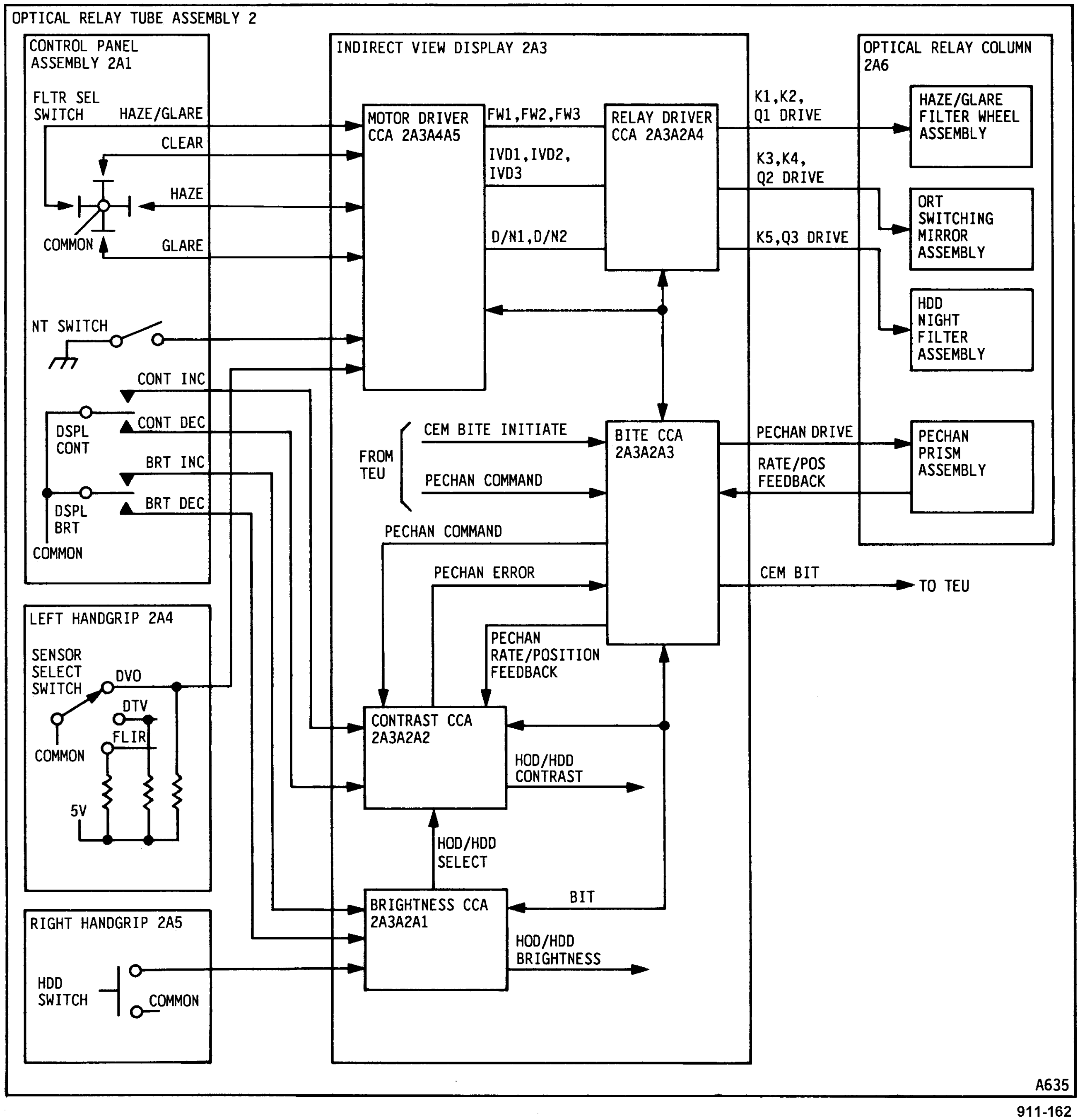


Figure 2-28. Indirect View Display Control Electronics Block Diagram

2-11. DIRECT VIEW OPTICS (DVO) (cont)

e. Pechan Prism Assembly. The pechan prism compensates for rotation introduced into the DVO path by stationary mirrors in the turret optics. (See block diagram fig. 2-28 and wiring interconnect diagram fig. 3-70.) The prism is geared to a DC motor. Rotation of the motor causes the prism and the DVO scene to rotate. The amount of rotation depends on the position of the turret in azimuth and elevation. Turret position information from the servo system is input to the TEU. The TEU then generates the PECHAN COMMAND. This signal is applied to IVD BITE CCA 2A3A3 to identify the position the pechan must be driven to for proper target scene orientation. The PECHAN COMMAND is routed through BITE CCA 2A3A3 to a contrast CCA 2A3A2 summing amplifier circuit, where it is algebraically summed with the current PECHAN POSITION and RATE signals. The resultant output (PECHAN ERROR) is routed back through BITE CCA 2A3A3 as PECHAN DRIVE. When the prism rotates, new RATE and POSITION FEEDBACK signals are routed through BITE CCA 2A3A2 to the contrast CCA 2A3A2 summing amplifier circuit. When the algebraic sum of the three inputs is zero error, the pechan is properly oriented.

f. DVO BIT. The pechan prism and the haze/glare filter are tested by the IVD control electronics module (CEM) during initiated class B BIT, as part of the ORT assembly initiated BIT. (See block diagram fig. 2-29 and wiring interconnect diagrams fig. 3-56 and 3-57.) CEM BIT is initiated when the TEU applies a logic 1 CEM/ORT INITIATE to the IVD. After successful completion of all tests, a logic 0 CEM BIT RESULT is applied to the TEU. If central processing unit (CPU) CCA 3A8 reads a logic 1 CEM BIT RESULT, an IVD-HDD ELECTRONICS NO-GO CPG COMPARTMENT message is sent to MRTU type I LH FAB on the serial interface bus. In addition to the pechan and haze/glare filter, this test checks HOD/HDD brightness and contrast, day/night filter, ORT switching mirror, and mode latch circuits. The rest of the ORT assembly initiated BIT tests are described in paragraph 2-12.

(1) Pechan BIT. During pechan BIT, the pechan summing amplifier network is disconnected from the pechan assembly and tested for one set of polarities. If this test passes, the polarities are reversed and a second test is run. Successful passing of the second test produces a pechan okay condition.

(2) Haze/Glare Filter BIT. During haze/glare filter BIT, the filter wheel is driven to the CLEAR position and then to the HAZE position. Successful completion of both tests produces a haze/glare okay condition.

2-11. DIRECT VIEW OPTICS (DVO) (cont)

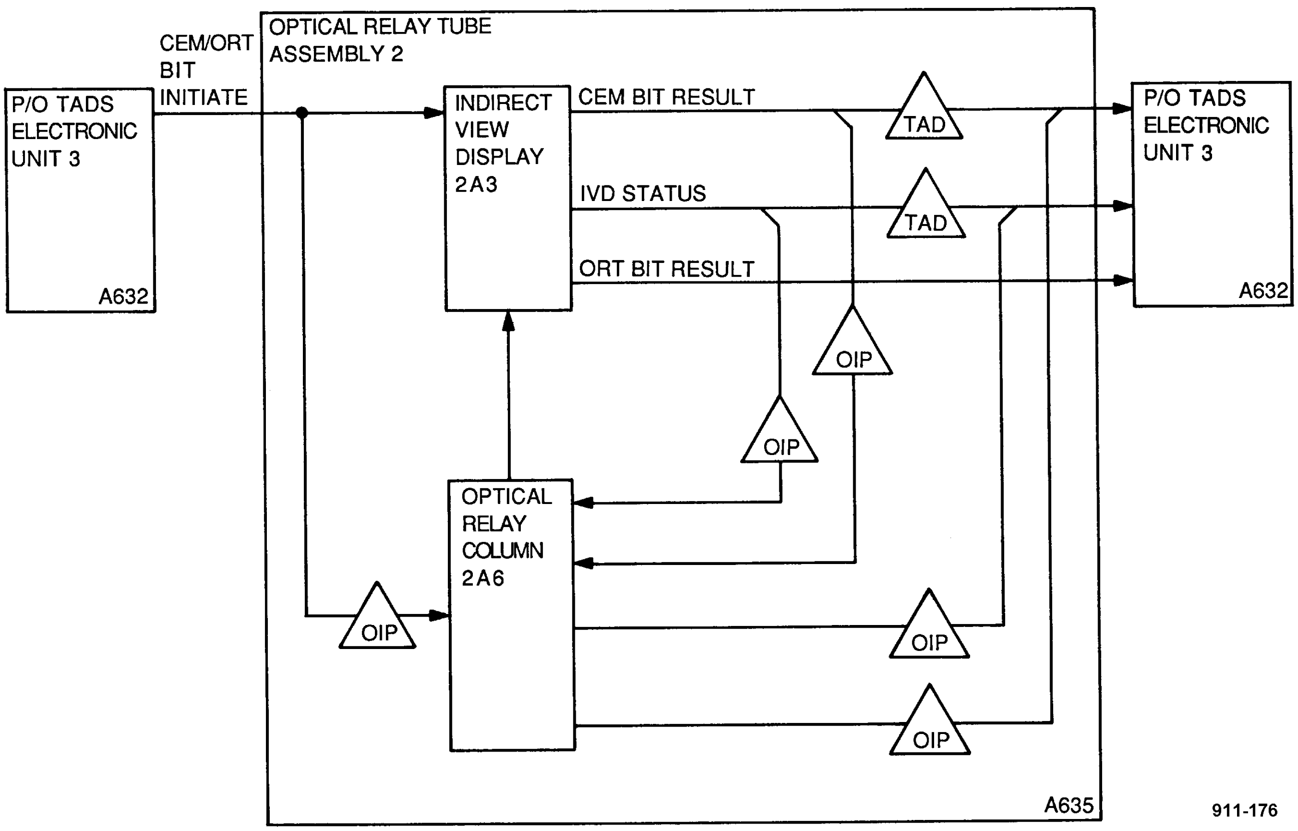


Figure 2-29. CEM/ORT Assembly Initiated BIT and IVD Status Block Diagram

2-12. HEADS OUT DISPLAY (HOD) /HEADS DOWN DISPLAY (HDD)

TADS video can be viewed by the CPG on the HOD or the HOD. The HOD CRT is located in the IVD electronics assembly. HDD video is routed through ORT assembly optics to the eyepiece assembly. The HOD is mounted in the ORT assembly control panel and viewed directly. Paragraphs a thru f describe HOD/HDD video paths, HOD optical path, HOD night filter, ORT assembly switching mirror, HOD/HDD BIT, and independent HOD.

a. Video Path. TADS DTV and FLIR video are routed from the TEU to the helicopter symbol generator. (See block diagram fig. 2-30 and wiring interconnect diagrams fig. 3-53 and 3-60.) The symbol generator receives incoming video, adds symbology as directed by the fire control computer, and routes it to the HOD or HDD. When DTV or FLIR video is selected, the symbol generator VIDEO 1 output is applied to IVD electronics assembly video preamplifier 2A3A2A4. The amplified signal is then applied to relay driver CCA 2A3A2A9 where it is switched to either the HOD or HDD CRT. Grayscale is used by the operator to adjust the brightness and contrast of the CRT displays. Grayscale video is displayed on the CRT as a test pattern consisting of ten horizontal bars ranging in level from black to white. When the ORT assembly control panel GS switch is set to GS, the normal video output from video preamplifier CCA 2A3A2A4 is replaced with the grayscale input from bit pattern generator 2A3A2A4. HOD or HOD selection is made using the ORT assembly right handgrip HDD switch. If HOD is selected, video is applied to the ORT assembly control panel HOD CRT. If HOD is selected, video is routed directly to the IVD electronics assembly HDD CRT. From the CRT, HOD video is routed through the ORT assembly optical assembly to the eyepiece assembly. HOD/HDD brightness and contrast adjustments are made using the ORT assembly control panel DSPL BRT and DSPL CONT controls. (See block diagram fig. 2-28 and wiring interconnect diagram fig. 3-55.) If the symbol generator fails, backup VIDEO 2 is routed from the TEU directly to video preamplifier 2A3A2A4. VIDEO 2 is FLIR video only. No aircraft symbology is present when in the backup mode.

b. HDD Optical Path. HDD video enters the ORT assembly optical relay column through the optical instrument window (fig. 2-26). The video passes through the night filter (when selected) and enters the IVD lens cell. The lens cell focuses the video onto a stationary mirror, where it is reflected 90°, collimated by the HDD lens element, and again reflected 90° by the ORT assembly switching mirror. The HDD optical path is blocked when the switching mirror is in the DVO position. Selection of FLIR or DTV switches the mirror from the DVO path to the HDD path. The rest of the optical path to the eyepiece assembly is the same as the DVO path described in paragraph 2-11.

2-12. HEADS OUT DISPLAY (HOD) /HEADS DOWN DISPLAY (HDD) (cont)

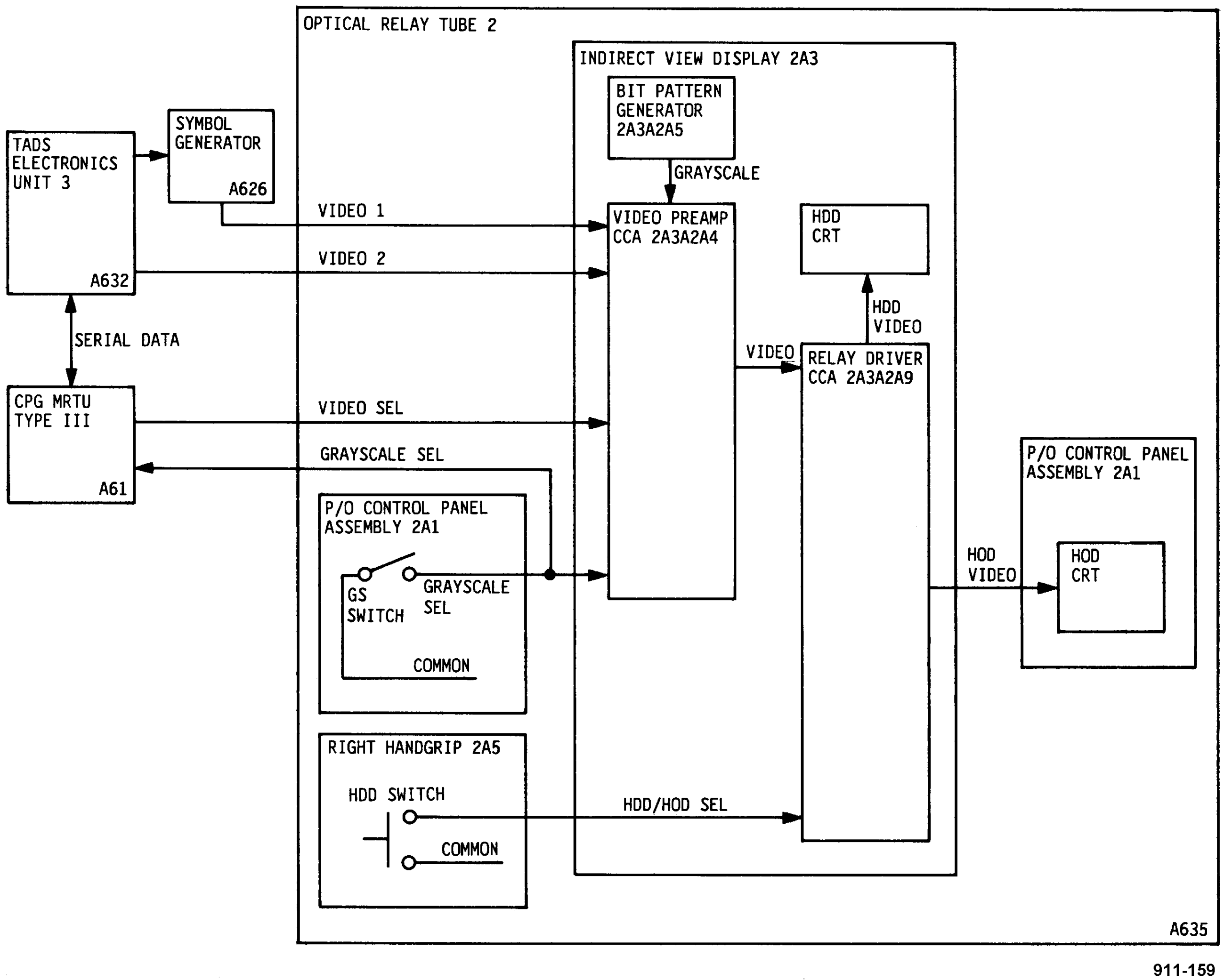


Figure 2-30. HOD/HDD Video Block Diagram

2-12. HEADS OUT DISPLAY (HOD) /HEADS DOWN DISPLAY (HDD) (cont)

c. Night Filter. The night filter is a red optical filter that reduces HDD brightness and allows the CPG to maintain night vision. When power is applied to the system, the night filter is automatically placed in the HDD optical path. When the ORT assembly control panel night **NT** switch is pressed (fig 2-28), IVD electronics assembly motor driver CCA 2A3A2A5 generates logic levels D/N1 and D/N2. These logic outputs are applied to relay driver CCA 2A3A2A4, where they are converted to relay drive voltages K5 and Q3. K5 drive controls the night filter assembly stepper motor relay that determines the direction of motor rotation. Q3 drive controls application of power to the stepper motor and brake. Depending on prior filter selection, pressing the **NT** switch will move the filter into the HDD optical path. Pressing the switch again will remove the filter from the path.

d. ORT Assembly Switching Mirror. The ORT assembly switching mirror allows the CPG to view either the DVO optical path or HDD CRT video through the ORT assembly eyepiece assembly. (See block diagram fig. 2-28 and wiring interconnect diagram fig. 3-59.) HDD video can be DTV or FLIR video. The switching mirror is controlled using the ORT assembly left handgrip sensor select switch. When the switch is set to DVO, the mirror is rotated out of the DVO optical path. When DTV or FLIR is selected, the mirror rotates into the DVO path and allows DTV or FLIR video from the HDD CRT to be viewed. When a sensor (DVO, DTV, or FLIR) is selected, a sensor select output is routed to IVD electronics assembly motor driver CCA 2A3A2A5. The motor driver generates logic outputs IVD1, IVD2, and IVD3 to rotate the mirror into the position selected. Relay driver CCA 2A3A2A4 converts the logic inputs to drive voltages K3, K4, and Q2. K3 and K4 drive outputs control relays which sequence the switching mirror stepper motor. Q2 controls the application of power to the stepper motor and motor brake.

e. HOD/HDD BIT. HOD/HDD brightness and contrast, day/night filter, ORT assembly switching mirror, and mode latch functions are checked by the control electronics module (CEM) during initiated class B BIT, as part of the ORT assembly initiated BIT. IVD/HDD status is monitored by continuous BIT. (See block diagram fig. 2-29 wiring interconnect diagrams fig. 3-56 and 3-57.) CEM BIT is initiated when the TEU applies a logic 1 CEM/ORT INITIATE to the IVD. After successful completion of all tests, a logic 0 CEM BIT RESULT is applied to the TEU. If central processing unit (CPU) CCA 3A8 reads a logic 1 CEM BIT RESULT, an IVD-HDD ELECTRONICS NO-GO CPG COMPARTMENT message is sent to MRTU type 1 LH FAB on the serial interface bus. Testing of the pechan prism and haze/glare filter is described in paragraph 2-11.

(1) <u>CEM BIT</u>. When the CEM receives the CEM/ORT BIT INITIATE input, the brightness and contrast circuits are driven to the maximum and minimum limits. The range of adjustment is then checked. Flags are set indicating the status of the brightness and contrast CCAs. The CEM/ORT BIT INITIATE input causes the ORT assembly switching mirror to rotate into and out of the DVO optical path. The day/night filter is rotated into the HDD optical path. The mode latch BIT circuit checks video to be displayed by momentarily selecting TADS video, then switching to grayscale video. Successful completion produces a mode latch okay condition.

2-12. HEADS OUT DISPLAY (HOD) /HEADS DOWN DISPLAY (HDD) (cont)

(2) IVD/HDD Status BIT. IVD/HDD status BIT verifies that circuits used to generate the HOD/HDD video are operating correctly. HOD/HDD video, high voltage for the selected CRT, and horizontal and vertical blanking signals are checked. If the video circuits are good, a logic 0 IVD STATUS is applied to the TEU. If CPU CCA 3A8 reads a logic 1 IVD STATUS, an IVD-HDD ELECTRONICS NO-GO CPG COMPARTMENT message is sent to MRTU type 1 LH FAB on the serial interface bus.

f. Independent HOD. During normal system operation with TADS power applied, aircraft switched 28 VDC and 115 VAC are applied to the IVD through relay housing assembly 2A6A5. (See block diagram fig. 2-31 wiring interconnect diagrams fig. 3-44 thru 3-47 and 3-53.) When aircraft power is on and TADS is off, the FCC sends an independent HOD message to CPG MRTU type III. The CPG MRTU type III applies a 28 VDC IND HOD CMD to relay housing assembly 2A6A5, causing relay inputs to switch from TADS power to aircraft power. Now aircraft 28 VDC and 115 VAC are applied to the IVD and messages are displayed on the HOD CRT.

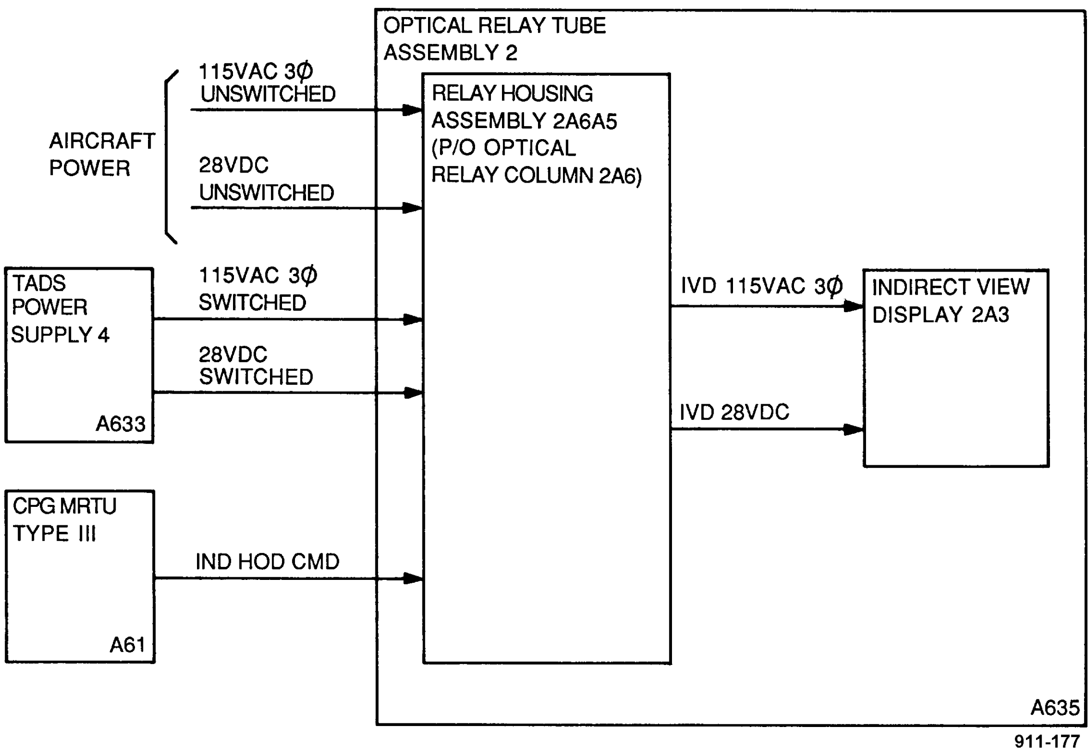


Figure 2-31. Independent HOD Block Diagram

2-13. DAY TV (DTV)

DTV provides the CPG with a black and white picture of the external scene. When using DTV, the CPG can select wide (WFOV, 4), narrow (NFOV, 0.9), or zoom (ZFOV). NFOV and WFOV are produced optically. ZFOV is produced electronically by performing a 50% underscan of the NFOV video. FOV selection is made using the optical relay tube (ORT) assembly left handgrip field-of-view switch. The DTV uses a TV sensor (vidicon) to convert light into video. Paragraphs a thru d describe the DTV optical path, video path, automatic light control (ALC) function, and range focus control.

a. Optical Path. Images enter the day sensor shroud lower window (fig. 2-24) and pass through the common aperture to the laser prism. The laser prism reflects laser energy into the laser transceiver unit and allows DTV images to pass. The two DTV WFOV lenses are mechanically connected and move in or out of the optical path when a FOV selection is made. The penta prism separates the DVO frequencies from the DTV frequencies. From the penta prism, DTV images continue through a delta prism and collimating lens to the ALC neutral density filter wheel. The ALC circuit adjusts the light intensity of optical images being presented to the day sensor camera. A laser filter attenuates stray laser energy to protect the DTV camera. From the filter, optical energy passes through a delta prism, penta prism, and range focus lens assembly. The range focus assembly focuses the optical images onto the vidicon target.

b. Video Path. Optical energy in the 0.7 to 0.9 micron wavelength range is applied to TV sensor 1A5A3. (See block diagram fig. 2-32 and wiring interconnect diagram fig. 3-60.) TV sensor 1A5A3 converts light energy to electrical energy (video). When PNVS is on, the PNVS electronic unit (PEU) sends horizontal and vertical blanking signals to the TADS electronic unit (TEU) (TM 1-5855-265-T). The blanking signals are used to produce encoded sync pulses used for DTV horizontal and vertical deflection. The sync pulses ensure that all system video starts and stops at the same time. TV sensor 1A5A3 produces high resolution, 875 line video that is sent to the TEU for processing. A sample of the output video signal provides the ALC COMMAND input for ALC operation. TEU video processor CCA 3A4 converts the noncomposite video input to a level that will support IAT functions. In addition, the video is mixed with sync and blanking signals to produce composite video. DTV video is then routed to the symbol generator where aircraft symbology is mixed with the video. The composite video output is then routed to the IVD for distribution.

2-13. DAY TV (DTV) (cont)

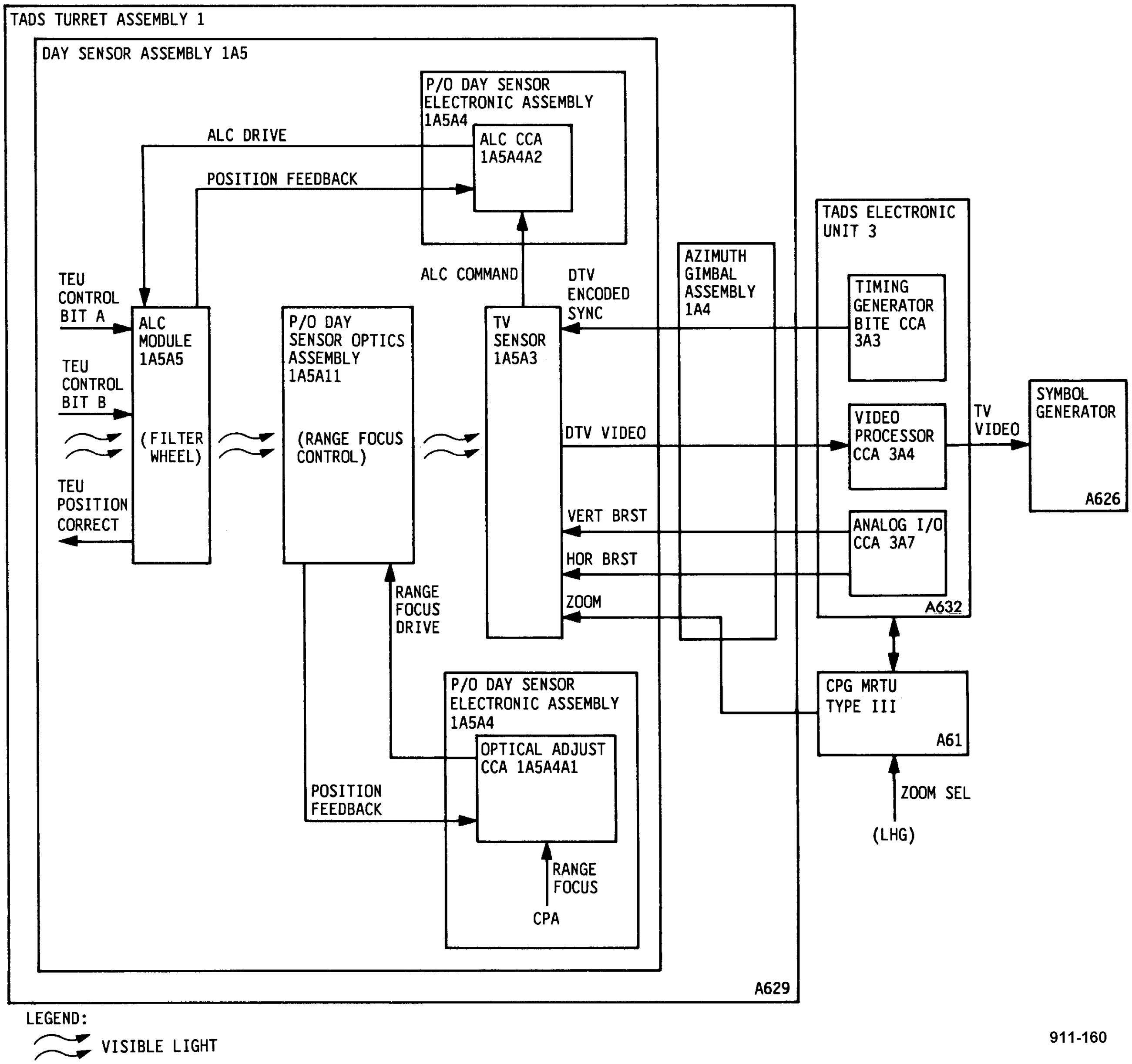


Figure 2-32. DTV Video Block Diagram

2-13. DAY TV (DTV) (cont)

c. Automatic Light Control (ALC). The ALC circuit automatically adjusts the brightness of optical images entering DTV TV sensor 1A5A3. (See block diagram fig. 2-32 and wiring interconnect diagram fig. 3-72.) ALC module 1A5A5 consists of a rotating glass wheel that is coated with a filter material. Rotation of the wheel controls the level of light reaching the camera. The ALC filter wheel motor is geared to the neutral density filter and increases or decreases the light intensity of input imagery as required. As light levels vary, feedback signals are generated which compensate for changes in brightness. BIT circuits test the ALC function during initiated class B BIT.

(1) ALC Operation. DTV optical energy passes through the neutral density filter and is routed to TV sensor 1A5A3. A video detector circuit in TV sensor 1A5A3 detects any change in incoming light intensity and produces a signal proportional to the amount of change. This proportional signal, ALC COMMAND, is routed to the ALC CCA in the day sensor electronic assembly. The POSITION FEEDBACK signal, representing the current filter wheel position, is also applied to the ALC CCA. ALC COMMAND and POSITION FEEDBACK are algebraically summed by the ALC CCA to produce the ALC DRIVE command. ALC DRIVE causes the filter wheel to rotate to the new position.

(2) ALC BIT. During initiated class B BIT, the TEU applies CNTL BIT A and B commands to the ALC CCA 1A5A4A2. (See block diagram fig. 2-33 and wiring interconnect diagram fig. 3-72.) A logic 1 CNTL BIT B enables the ALC test and CNTL BIT A causes the filter wheel to rotate to the maximum (logic 1) and minimum (logic 0) positions. After ALC BIT is initiated, the filter wheel is driven to the maximum position. After a delay, the wheel is driven to the minimum position. When the test is complete and ALC BIT passes, a logic 1 ALC BIT POS output is applied to the TEU. If CPU CCA 3A8 reads a logic 0 ALC BIT POS, a TADS DSA SUB-ASSY NO-GO DSA fail message is sent to the MRTU type 1 LH FAB on the serial interface bus. When the test is complete, a logic 0 CNTL BIT B is sent to ALC CCA to disable the test.

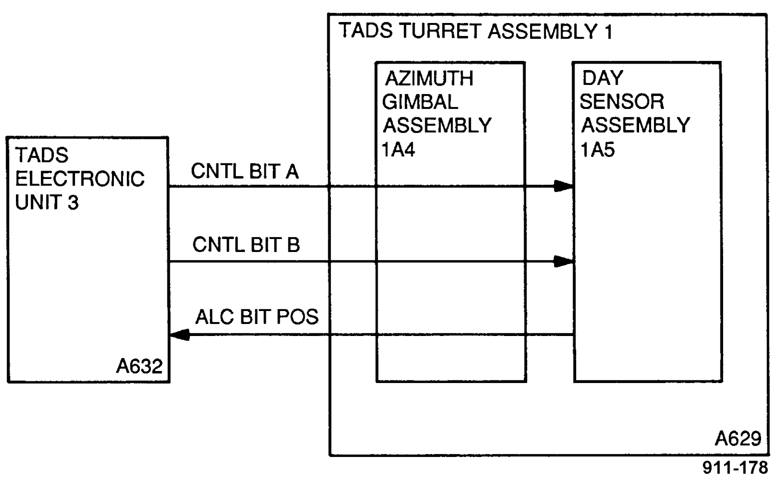


Figure 2-33. ALC BIT Position Block Diagram

2-13. DAY TV (DTV) (cont)

d. Range Focus. DTV images pass through the focus lens assembly prior to entering TV sensor 1A5A3. Range focus adjustments are made using the ORT assembly control panel RNG FOC switch on the control panel assembly. (See block diagram fig. 2-32 and wiring interconnect diagram fig. 3-61.) The DTV RNG FOC command is input to DSA optical adjust CCA 1A5A4A1. The DTV RNG FOC is algebraically summed with the POSITION FEEDBACK signal which represents the current focus lens position. The resultant signal, RANGE FOCUS DRIVE, is applied to the drive motor in the range focus assembly. When the focus lens is repositioned in response to the drive command, the POSITION FEEDBACK signal will be zero. Range focus can only be performed in NFOV or ZOOM and is used only when target distance is 1500 meters or greater.

2-14. NIGHT SENSOR VIDEO

Night sensor assembly FLIR video is used by the CPG to view and track heat radiating targets at night or during adverse weather conditions. FLIR video can also be used by the pilot for backup navigation in case of PNVS failure. The NSA can track targets automatically or manually. Targets can be viewed through NFOV, MFOV, or WFOV field-of-view optics. A zoom option is provided by electronically performing a 50% underscan of the NFOV image. NSA video can be viewed on the HOD or HDD.

a. FLIR. The TADS night sensor assembly receives infrared (IR) images, converts the images into visible light, then processes the visible light to produce a video output.

(1) Narrow Field-of-View. An IR image enters the NSA through the shroud window and is applied to one of three selectable FOV optic assemblies (fig. 2-34). The NFOV (3°) assembly is permanently mounted in a holding fixture in the FLIR optical path. Incoming IR energy is collected by a parabolic mirror in the NSA housing and reflected into the NFOV lens assembly. From the lens assembly, IR energy is directed onto the scanner mirror.

(2) Medium and Wide Field-of-View. Medium (10°) and wide (50°) field-of-view optics assemblies are mechanically moved into the IR optical path when selected. FOV selection is made using ORT assembly left handgrip field-of-view switch. (See block diagram fig. 2-35 and wiring interconnect diagram fig. 3-75.) When either WFOV or MFOV is selected, the NFOV optical path is blocked. FOV CCA 1A3A27 controls the drive motor for wide and medium optics switching assembly movement. A feedback loop between the switching assembly and FOV CCA 1A3A27 indicates which FOV is in use. This information is used for automatic focusing by focus control circuits. FOV position feedback (NSA FOV IND 1 and 2) is also applied to the TEU for FOV BIT.

2-14. NIGHT SENSOR VIDEO (cont)

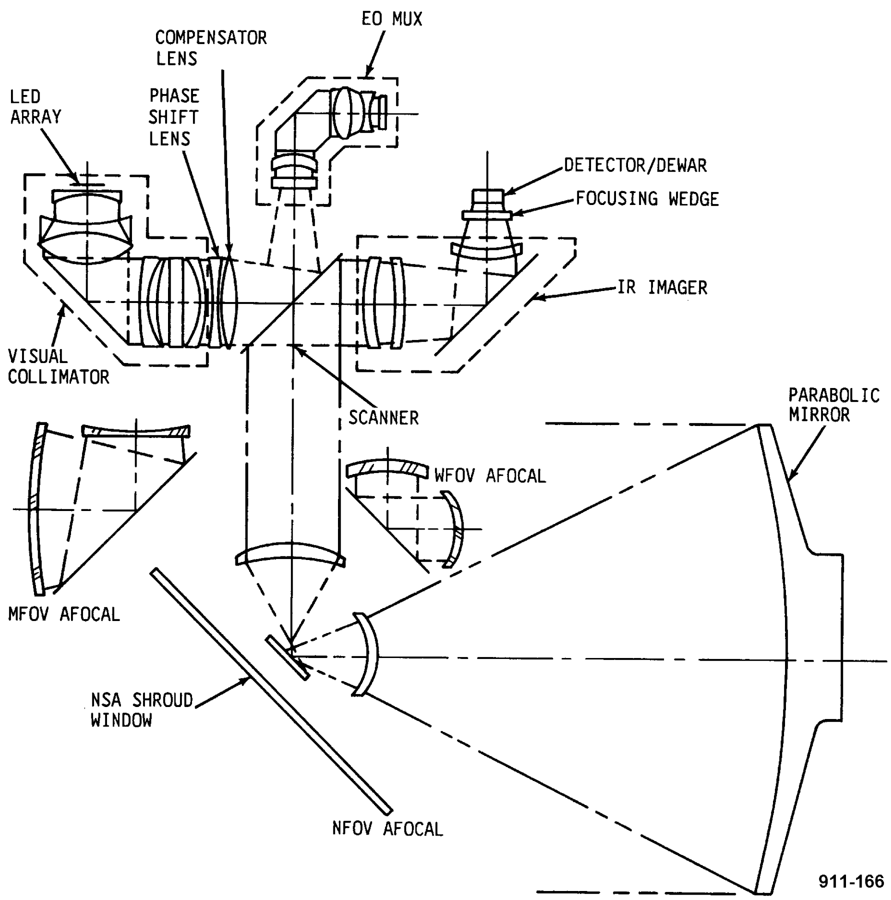


Figure 2-34. Night Sensor Assembly Optical Path

2-14. NIGHT SENSOR VIDEO (cont)

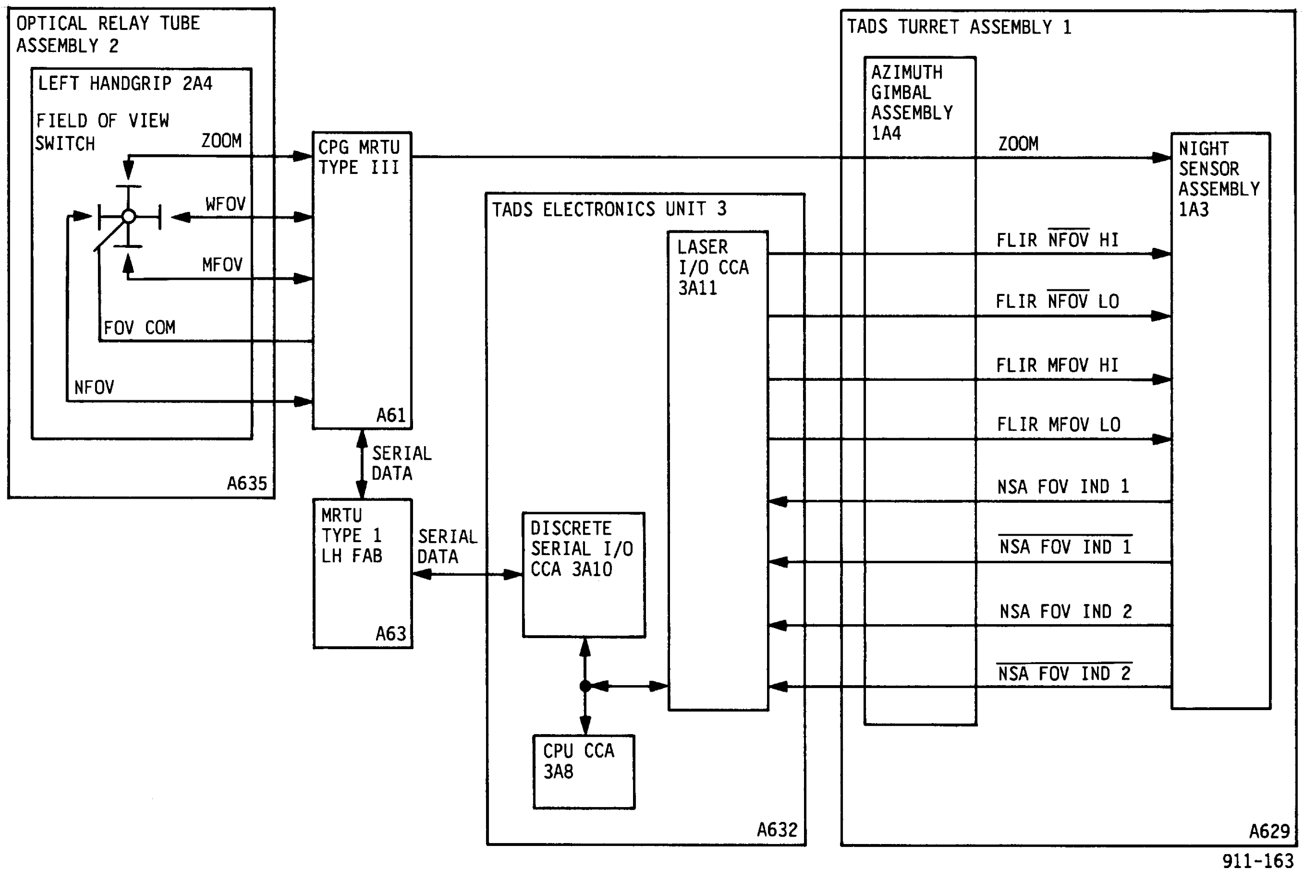


Figure 2-35. Night Sensor Assembly Field-of-View Switching Block Diagram

2-14. NIGHT SENSOR VIDEO (cont)

(3) IR Image Detection. The IR image from the selected FOV optics is scanned and reflected by the scanner mirror to the cooler/dewar assembly through the IR imager and focusing assembly (fig. 2-36). To maintain proper focus with changes in temperature, an IR imager output representing the IR imager mass temperature is applied to the focus control CCA. The image is detected by the cooler/dewar assembly and changed to analog detector outputs.

(a) For the cooler/dewar assembly detectors to work properly and detect small variations in IR levels, the detector array is cooled to 77 K (-321°F (-197°C)). A FLIR NOT COOLED message is displayed on the HOD/HDD until the proper temperature is reached. When the correct temperature is reached, a logic 0 TADS FLIR COOL output is applied to the CPG MRTU type III.

(b) The cooler/dewar assembly array consists of 180 detectors. The IR image is scanned across the array and each detector output represents one horizontal video line (channel). To produce 360 horizontal lines for each video frame, the scanner mirror is driven to two vertical positions. A different part of the image is horizontally scanned across each detector in each vertical position. The scanner mirror drive is synchronized to the video output. The detector outputs vary in amplitude as the scanned IR level changes. The detector outputs are amplified by preamplifiers and post amplifiers before they are applied to the LED emitter assembly.

(4) Conversion to Visible Light. The LED emitter assembly converts post amplifier LED drive outputs to visible light. Red LEDs are illuminated to produce a visible light image for the visual relay/multiplexer assembly. The LED emitter visual light output is collimated, then reflected by the scanner mirror through the compensator lens and phase shift lens to the relay/multiplexer assembly.

(5) Video Output. The visual relay/multiplexer assembly 1A3A33 is a camera used to change the visible light image to an electronic video output. Assembly 1A3A33 also processes the ENCODED SYNC input from the TEU to synchronize scanner mirror operation. Horizontal and vertical boresight inputs from the TEU are used to center the video output. When ZOOM FOV is selected, the center 50% of the NFOV target is expanded to cover the entire normal display. NSA video is applied to the TEU where it is processed, then routed to the aircraft symbol generator. (See block diagram fig. 2-37 and wiring interconnect diagram 3-60.) The symbol generator adds aircraft symbology to the video and routes the composite video to the IVD for distribution.

2-14. NIGHT SENSOR VIDEO (cont)

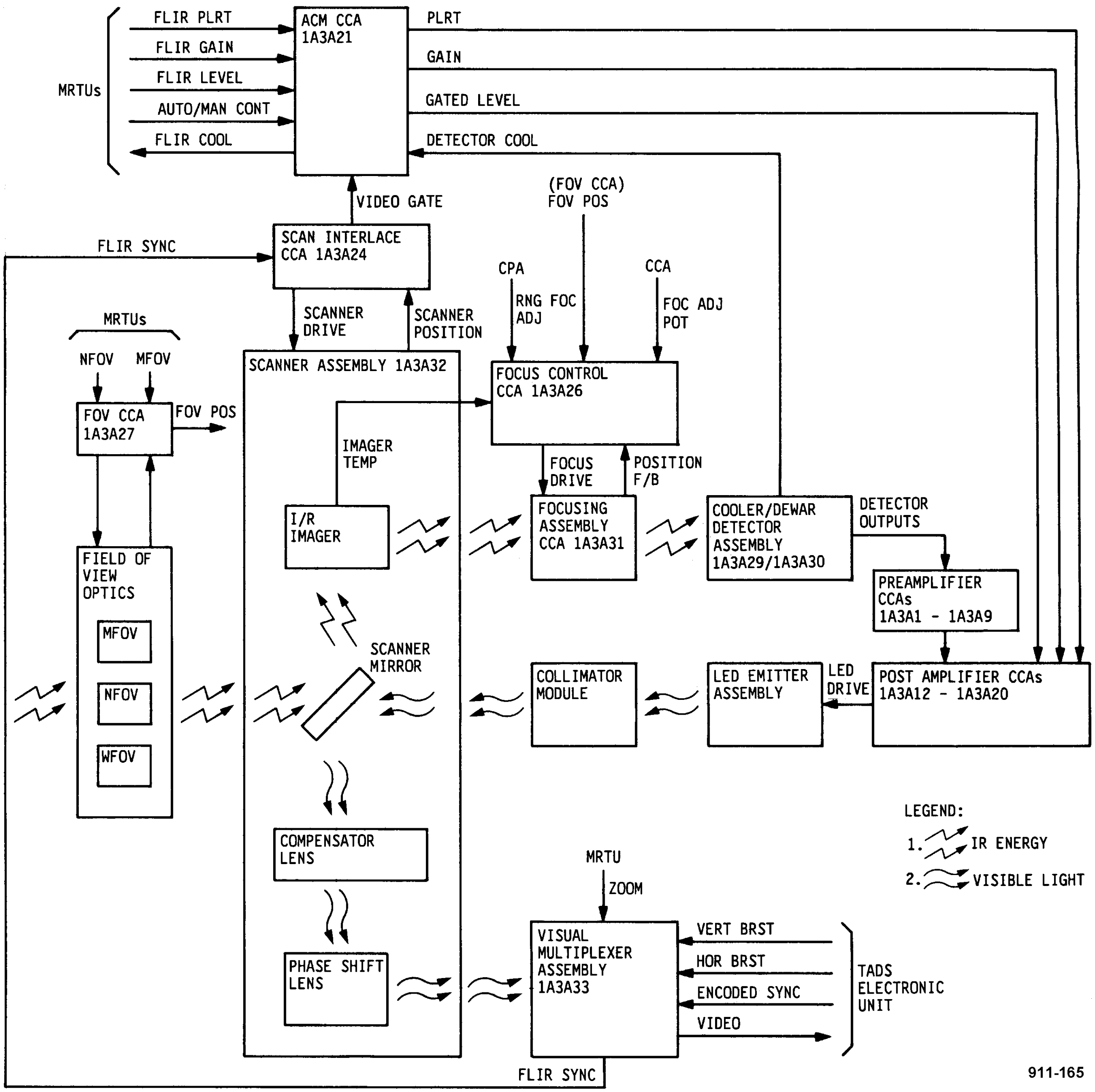


Figure 2-36. Night Sensor Assembly Block Diagram **[TAD]**

2-14. NIGHT SENSOR VIDEO (cont)

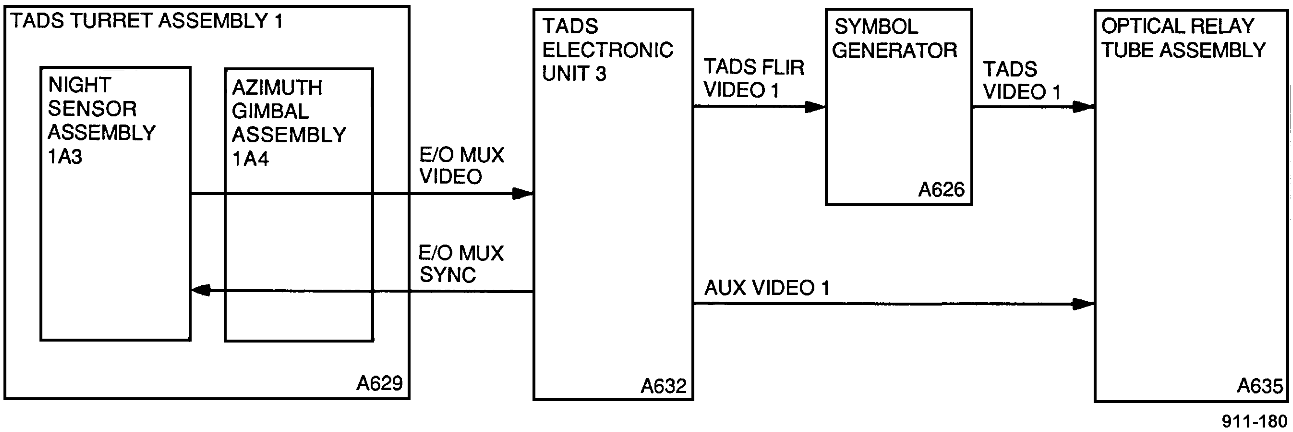


Figure 2-37. NSA Video Path Block Diagram

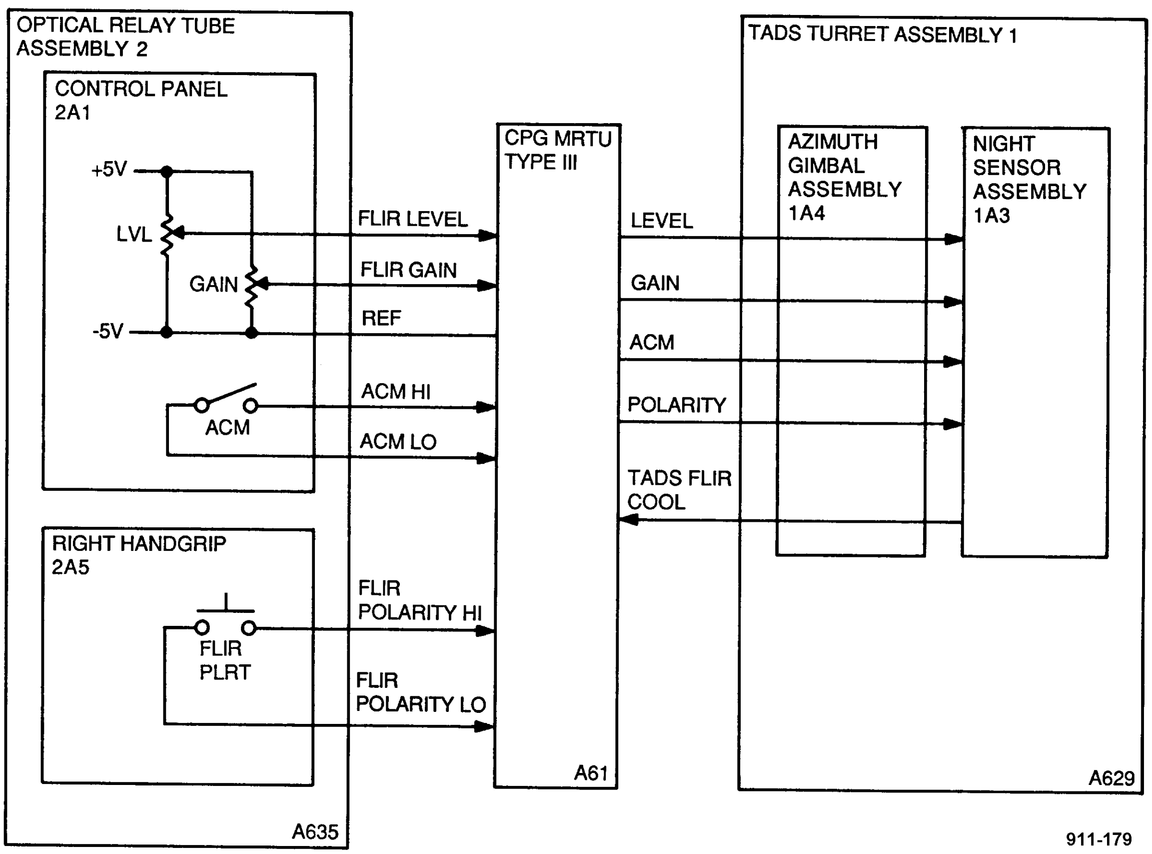


Figure 2-38. NSA Video Control Block Diagram

2-14. NIGHT SENSOR VIDEO (cont)

b. Video Control.

(1) Gain and Level. FLIR gain and level are set to fixed levels or adjusted with ORT assembly control panel adjustments. (See block diagram fig. 2-38 and wiring interconnect diagram fig. 3-73.) If the pilot is using NSA FLIR, pilot station fire control panel controls are used to adjust level and gain. When the ORT assembly **ACM** switch is in the down (off) position, gain and level adjustments are made using **GAIN** and **LVL** controls, also located on the ORT assembly control panel. Gain and level DC analog inputs, from CPG MRTU type III to ACM CCA 1A3A21, vary with the control panel settings. When the **ACM** switch is set to **ACM**, a logic 1 AUTO/MAN input to the night sensor assembly disables the variable inputs and selects fixed gain and level voltages on ACM CCA 1A3A21. Gain and gated level outputs from ACM CCA 1A3A21 are applied to the post amplifiers to control the video output level.

(2) Polarity. White or black hot images are selected by pressing and releasing the ORT assembly right handgrip **FLIR PLRT** switch. Pressing the **FLIR PLRT** switch causes the night sensor assembly FLIR PLRT input from CPG MRTU type III to change polarity. The PLRT output from ACM CCA 1A3A21 is applied to the night sensor assembly post amplifier to select polarity.

(3) Range Focus. The focus control CCA 1A3A26 algebraically sums DC control voltage inputs to provide the FOCUS DRIVE signal for the focusing wedge. A voltage representing the mass temperature of the IR imager is applied to focus control CCA 1A3A26. A change in IR imager temperature will be felt as a voltage change on focus control CCA. A feedback loop in the FOV circuit is also applied to focus control CCA 1A3A26 indicating the FOV being used. An input from focus adjust pot CCA 1A3A37 automatically fine tunes the focus for each FOV selection. Range focus manual adjustments are made using ORT assembly control panel RNG FOC switch. Range focus adjustments can be made only when NFOV or ZFOV is selected and the target is at least 1500 meters down range. Position feedback, indicating the position of the focusing wedge is applied to the focus control CCA 1A3A26. The above inputs are algebraically summed and the resultant output positions the focusing wedge to provide optimum focus of IR energy into the detectors.

2-14. NIGHT SENSOR VIDEO (cont)

c. Video BIT. Video timing signals are monitored during continuous BIT. Video processing circuits and FOV switching are tested during initiated class B BIT.

(1) Video Timing BIT. TEU video timing signals are generated in and monitored by the TEU during continuous BIT. If the TEU detects a timing signal failure, TADS NO-GO, TADS TV NO-GO, and TADS FLIR NO-GO messages are sent to the MRTU type I LH FAB on the serial interface bus.

(2) TADS Video Processing BIT. TEU video processing circuits are tested during TADS initiated class B BIT. The TEU generates synthetic video consisting of a black, white, and gray pattern. When the test is initiated, normal TV video inputs to the TEU are disabled and synthetic video is injected into TEU video processing circuits. The TEU selects FLIR, DTV, and tracker video, and tests black, gray, and white levels of the video selected. If the TEU detects a failure, the TEU will send TADS ELECTRONIC UNIT NO-GO LH FAB and appropriate video fail messages to the MRTU type I LH FAB on the serial interface bus.

(3) TADS Field-of-View BIT. NSA FOV switching (fig. 2-35) is tested during TADS initiated BIT. During this test, the TEU commands the NSA to switch each of the three FOVs. The CPU evaluates return signals NSA FOV IND 1 and NSA FOV IND 2 to verify proper switching. If the test fails, a TADS NIGHT SENSOR NO-GO NSA message is sent to the MRTU type I LH FAB on the serial interface bus.

d. Optical Improvement Program. The optical improvement program provides protection against selected threat lasers. Modifications to the night sensor assembly include the improved optical assembly (IOA) and motor control module (MCM). (See block diagram fig. 2-39 and wiring interconnect diagram fig. 3-74.)

(1) Improved Optical Assembly. The improved optical assembly replaces the I/R imager and focus wedge assembly. A five position spectral filter has been added for operator protection. The five filter selections are clear, maximum (2 positions), short wavelength, and long wavelength. Filter switching is accomplished using the ORT control panel assembly FLTR SEL switch.

(2) Motor Control Module. The motor control module converts TEU command signals to drive signals to move selected IOA filters into position. Feedback signals from the motor control module to the TEU indicate filter positioning is complete.

2-14. NIGHT SENSOR VIDEO (cont)

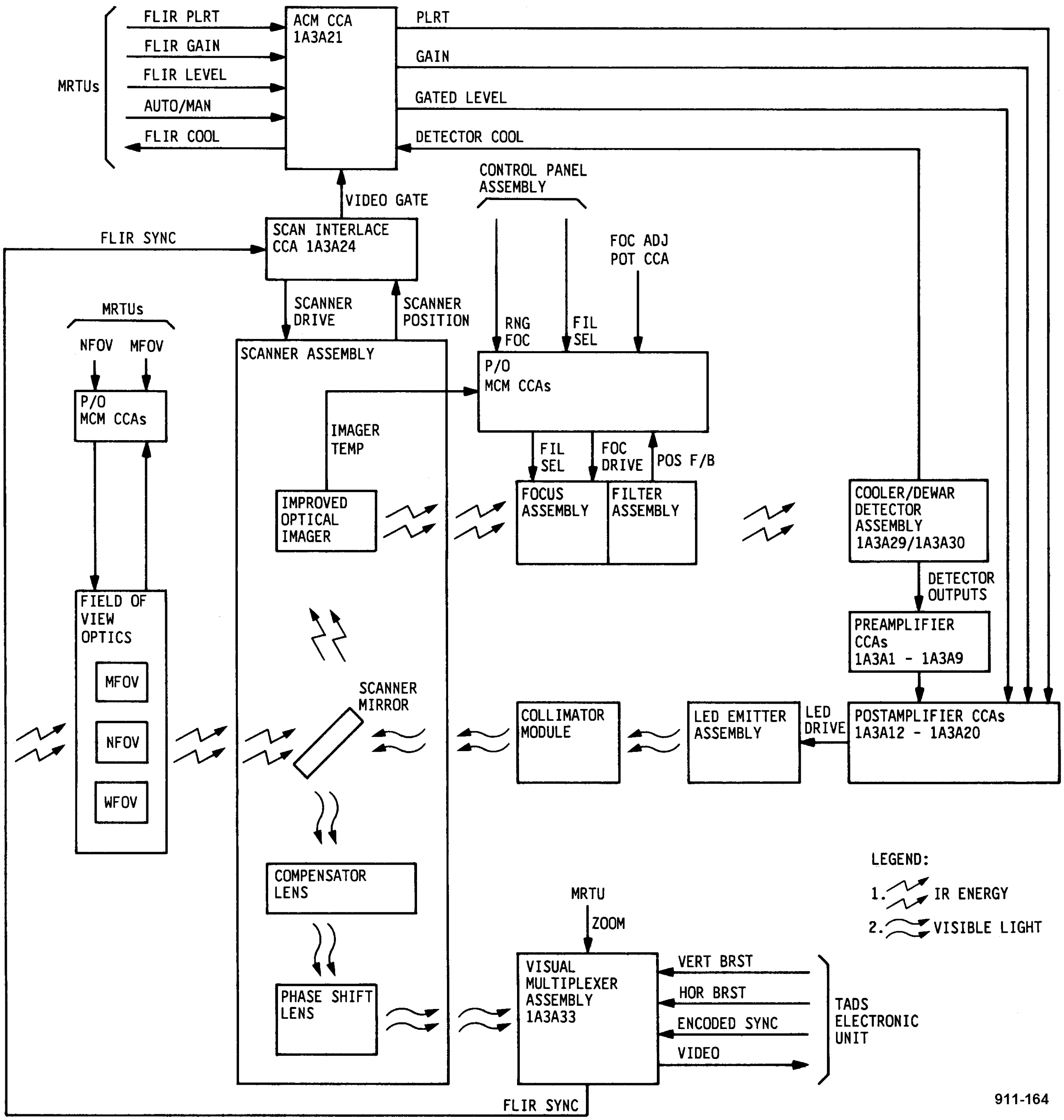


Figure 2-39. Night Sensor Assembly Block Diagram **[OIP]**

2-14. NIGHT SENSOR VIDEO (cont)

(3) Motor Control Module BIT. Motor control module (MCM) operation is tested during TADS initiated BIT. (See block diagram fig. 2-40 and wiring interconnect diagram fig. 3-76.) To initiate the test sequence, TEU logic is applied to the motor control module MCM BIT input. During this test sequence, the IOA filter, FOV switching, and focus circuits are tested. If a test fails, the test is repeated up to two more times before setting the failure condition. If two out of three tests fail, a TADS NIGHT SENSOR NO-GO NSA message is sent to the MRTU type I LH FAB on the serial interface bus.

(a) To test the IOA filter, the filter stepper motor is driven to a limit. When filter position feedback indicates that the limit was reached, the filter motor is driven to the other limit. If the time to reach both limits is longer that the maximum time allowed, a MCM FAIL is applied to the TEU.

(b) The FOV test switches from wide to narrow, narrow to medium, medium to narrow, and from narrow back to wide. If the transition from wide to medium or medium to wide takes longer that the maximum allowable time, a MCM FAIL is applied to the TEU.

(c) During the focus test, the focus stepper motor is driven to a limit. When the focus position feedback indicates that the limit was reached, the focus motor is driven to the other limit. If the time to reach both limits is longer than the maximum time allowed, a MCM FAIL is applied to the TEU.

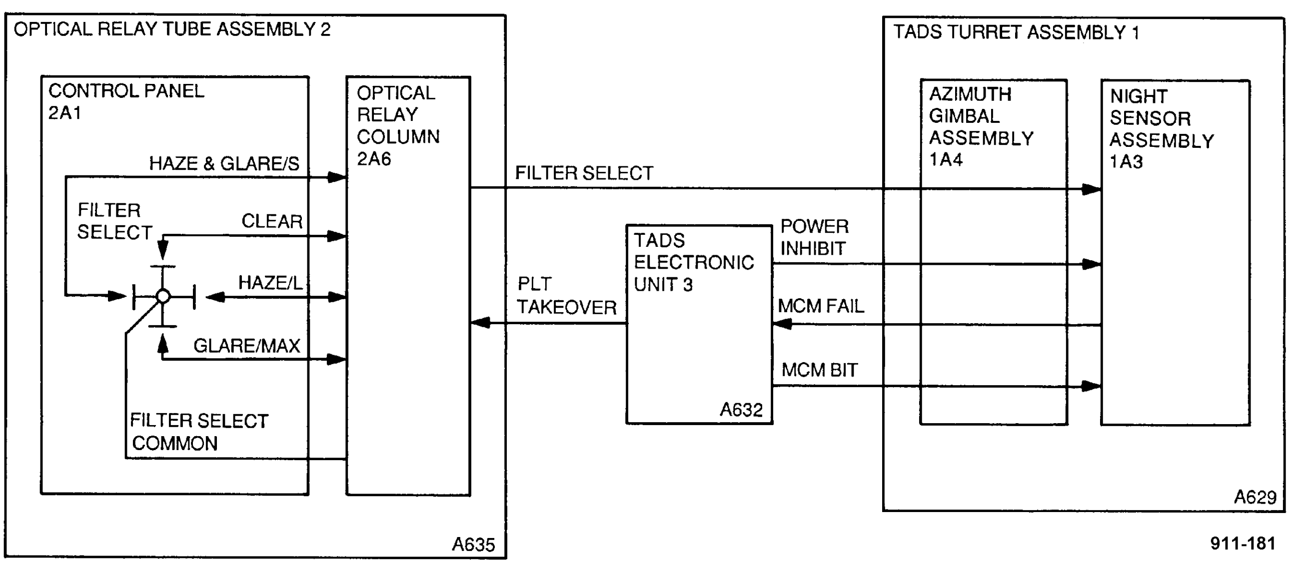


Figure 2-40. Laser Threat Filter and MCM BIT Block Diagram

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS

Target track mode or cued (predetermined) turret position and the TADS servo system, consisting of a stabilized inner and outer gimbal, control TADS turret azimuth and elevation movement. Azimuth and elevation position and rate commands are generated manually through operator use of the ORT assembly right handgrip MAN TRK control or electronically by the TEU. The inner gimbal controls pitch and yaw movement. The outer gimbal is slaved to the inner gimbal and is driven to elevation and azimuth positions as determined by target tracking and servo control position inputs. Maximum inner gimbal movement is +2° and -2° in pitch and yaw. Maximum outer gimbal movement is +120° and -180° in azimuth, +30° and -60° in elevation.

a. Servo Control. TADS turret position and target track rate are determined by target track mode or slaved/cued position information. Target track mode is selected with ORT assembly left and right handgrip switches. (See block diagram fig. 2-41 and wiring interconnect diagram fig. 3-84.) The switch settings are applied to CPG MRTU type III and processed by the FCC. The FCC sends mode of operation and TADS turret rate/position information to the TEU on the serial interface bus. The TEU evaluates the information received from the FCC and applies servo drive to the TADS turret. The TADS turret inner and outer gimbals move to the commanded position and provide rate and position feedback to the TEU and FCC for target tracking updates. The following paragraphs describe manual track, slaved/cued, image auto-track (IAT), and laser track (LT) modes of operation.

(1) Manual Track. Manual track is selected by pressing the ORT assembly left handgrip **IAT/MAN** switch. DC analog turret MANUAL AZIMUTH and ELEVATION RATE commands are adjusted with the right handgrip **MAN TRK** control (fig. 2-42) and applied to CPG MRTU type III. The DC analog rate commands are converted to serial data by CPG MRTU type III and sent to the FCC and MRTU type I LH FAB on the serial interface bus. MRTU type I LH FAB sends the serial data to TEU discrete serial I/O CCA 3A10. Discrete serial I/O CCA 3A10 converts the serial data to parallel data. CPU CCA 3A8 reads the data and stores the data (fig. 2-43) in memory CCA 3A9 random access memory (RAM). The data stored in RAM is updated every 20 milliseconds. Field-of-view (FOV) and SENSOR inputs stored in RAM are read by CPU CCA and processed with the rate command data. CPU CCA 3A8 calculates the turret drive rate required for the selected FOV and sensor and applies digital data to analog I/O CCA 3A7. Analog I/O CCA 3A7 converts the digital data to DC analog rate commands which are applied to inner gimbal servo loop yaw/pitch rate integrating gyros (para b below). The turret will move in the direction commanded until the **MAN TRK** control is released.

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

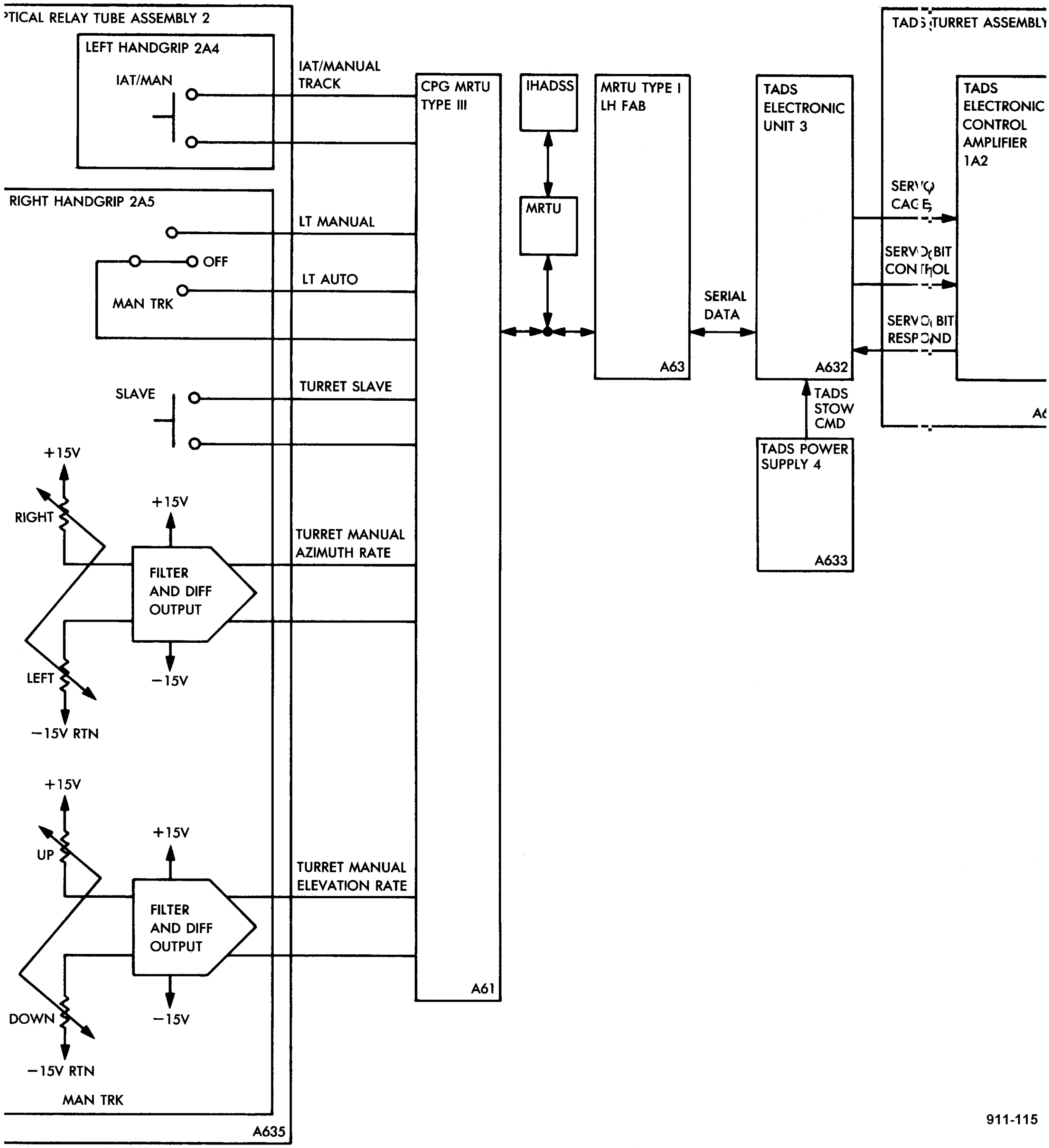


Figure 2-41. TADS Servo Control Block Diagram

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

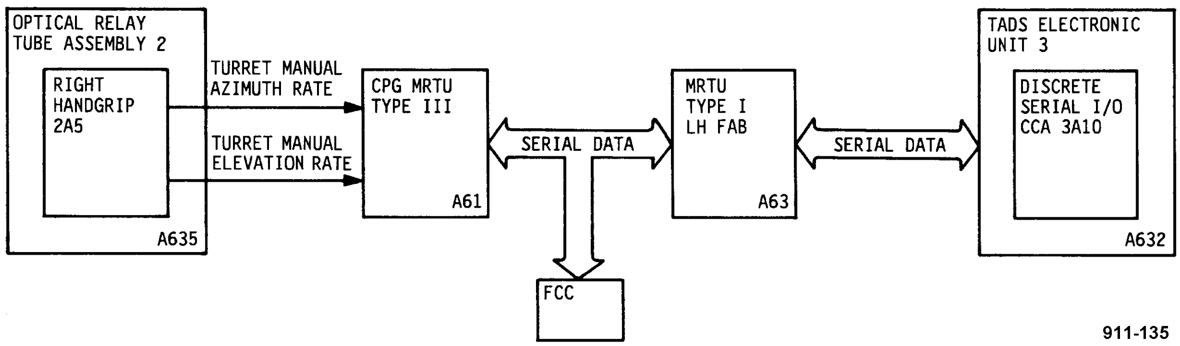


Figure 2-42. Manual Track Mode Input Commands

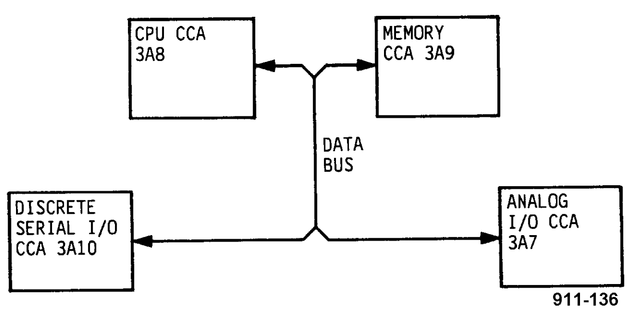


Figure 2-43. Manual Track Mode, TADS Electronic Unit Signal Processing

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(2) Slaved/Cued. In the slaved/cued mode (fig. 2-44), position feedback from the inner and outer gimbal is compared to integrated helmet and display sight system (IHADSS) position inputs or stored TEU cued fixed positions. In slaved mode, position input is determined by pilot or copilot IHADSS LOS. In cued mode, turret position is determined by TEU boresight position or fixed forward data stored in memory. In slaved mode, position data from the pilot or copilot IHADSS is processed by the FCC, sent to the TEU, and processed by the TEU the same as described for manual track in paragraph (1) above. Outer gimbal resolver SIN/COS POSITION outputs (para d below) are converted to digital data by resolver to digital CCA 3A12. CPU CCA 3A8 compares IHADSS LOS or cued position to resolver output data and calculates the difference between IHADSS LOS or cued position and TADS turret position. Digital position digital data from CPU CCA 3A8 is applied to analog I/O CCA 3A7. Analog I/O CCA 3A7 converts the digital data to DC analog rate commands which are applied to inner gimbal servo loop yaw/pitch rate integrating gyros (para b below). The turret will move in the direction commanded to track IHADSS movement or until there is no position error.

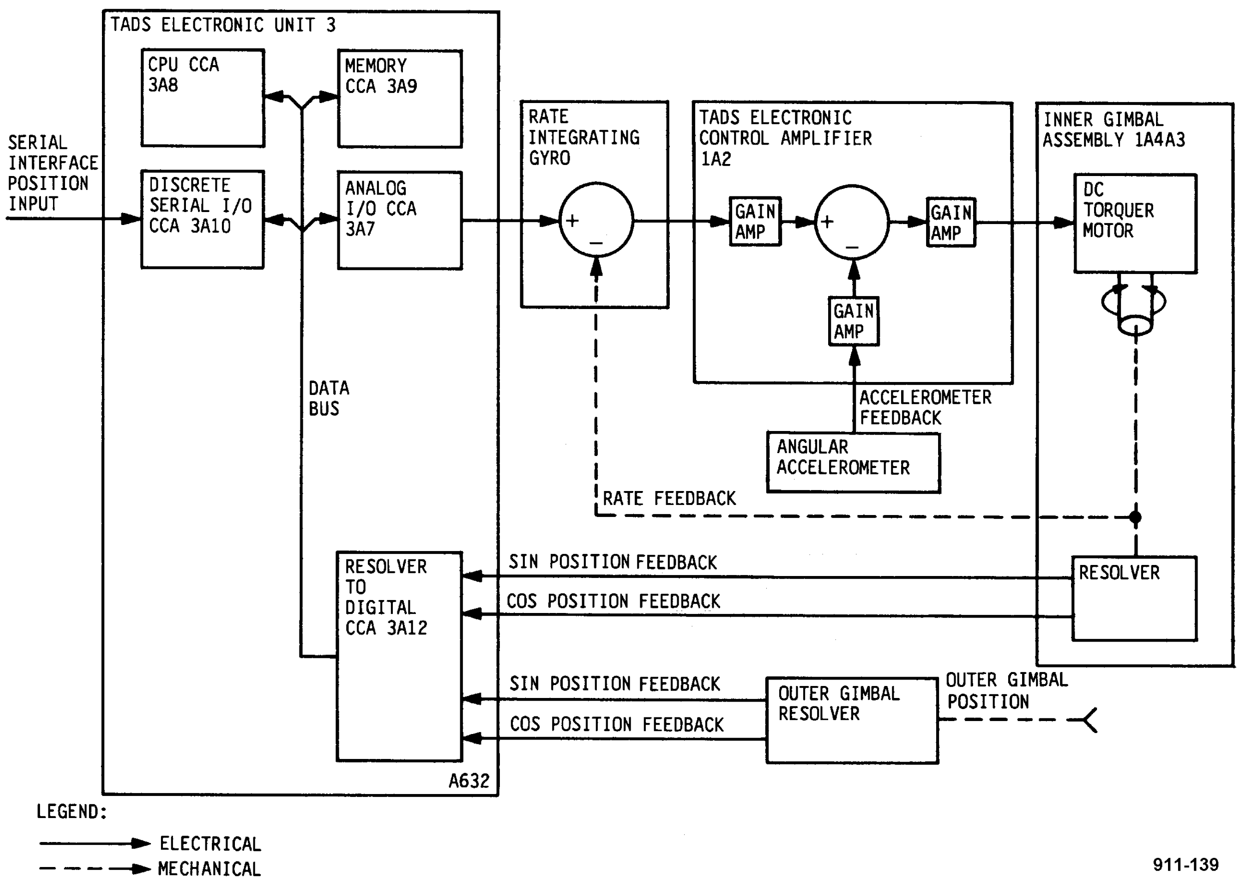


Figure 2-44. Slaved/Cued Mode

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(3) Image Auto-Track (IAT). In the IAT mode (fig. 2-45), position feedback is calculated from day TV or FLIR video. Video processor CCA 3A4 receives synchronized timing signals from timing generator CCA 3A3. The timing signals consist of vertical and horizontal timing pulses that are coincident with video display vertical and horizontal lines. processor CCA 3A4 processes the selected video and sends it to the TEU IAT electronics section. The IAT electronics section consists of digital tracker/processor CCA 3A5 and digital tracker CPU CCA 3A6. The AT electronics section identifies targets within the scene, surrounds the target with tracker gates, and calculates the difference between target centerline and selected FOV center point. The resulting difference data is referred to as X-Y centerline errors. CPU CCA 3A8 reads the X-Y centerline error data and applies it to analog I/O CCA 3A7. The X-Y centerline error is updated 60 times per second by digital tracker CPU CCA 3A6 and CPU CCA 3A8 calculates new error data. Analog I/O CCA 3A7 converts the digital data to DC analog rate commands which are applied to inner gimbal servo loop yaw/pitch rate integrating gyros (para b below). The turret will move in the direction commanded until there is no position error or to track target video movement. As the TADS turret moves to the commanded position, the centerline of the target approaches the center of the selected FOV.

NOTE

Note that selecting DVO and activating IAT, with TADS FLIR on, causes DOV to change to NFOV. FLIR NFOV is used for evaluating/tracking the target, however, tracker gates are not visible in DVO. Also, impending break lock is not detected in DVO. DTV video is displayed on the HOD.

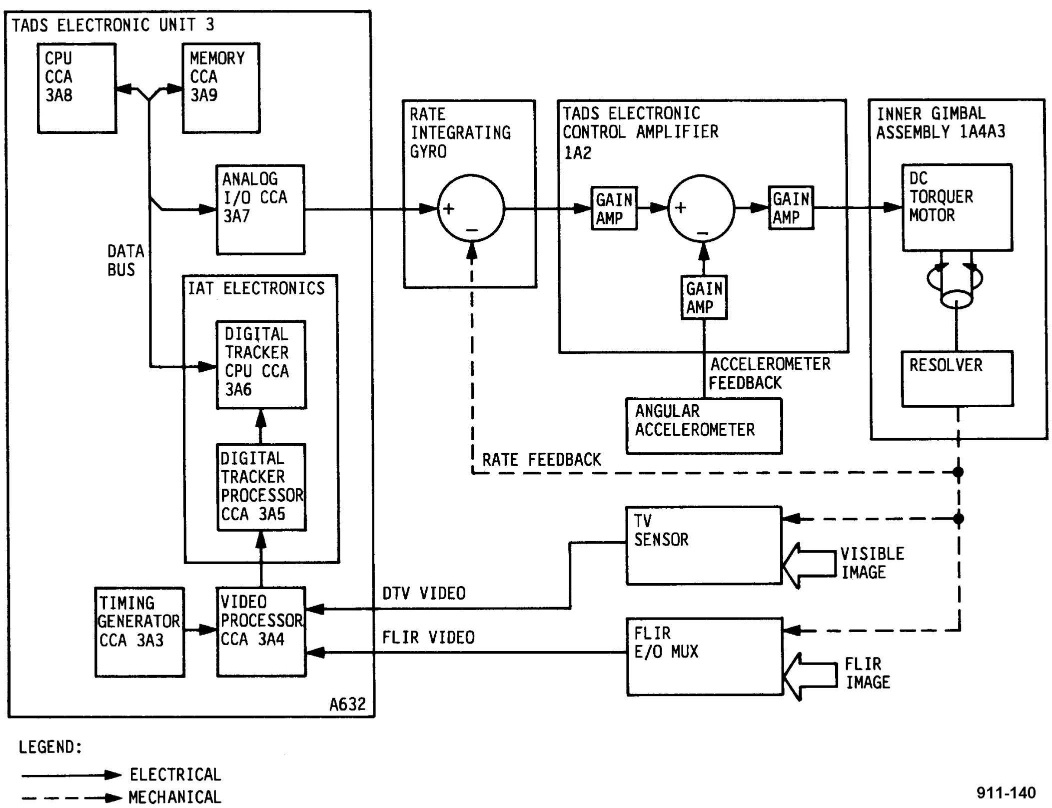


Figure 2-45. Image Auto-Track

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(4) Image Auto-Track Offset. IAT offset is selected by pressing and releasing the ORT assembly left handgrip IAT OFS switch. (See block diagram fig. 2-46 and wiring interconnect diagram fig. 3-84.) In IAT offset, the X-Y centerline is maintained at a position offset to the selected FOV and allows the operator to reposition the turret manually to track an additional target. The IAT electronics (para (3) above) will keep the tracker gates on the original target so when IAT offset is disabled, the TEU defaults to normal IAT mode and the target centerline is brought into coincident with the center of the selected FOV.

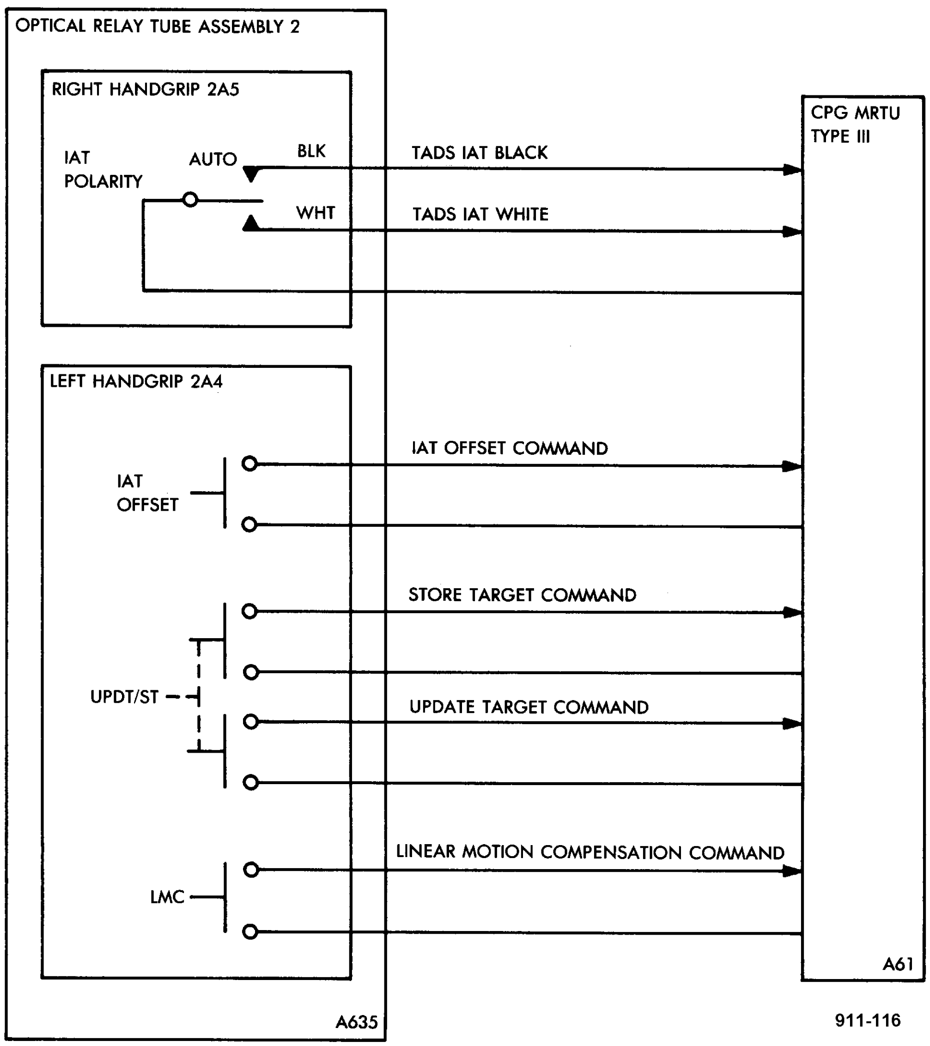


Figure 2-46. Target Track Mode Block Diagram

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(5) Image Auto-Track Polarity. IAT polarity is selected with the ORT assembly right handgrip IAT polarity switch. Switch position outputs are applied to CPG MRTU type III, changed to serial data, and applied to the TEU. White hot, black hot, or automatic target polarity can be selected. When the IAT polarity is set to **AUTO**, target polarity is determined by FLIR polarity settings. If FLIR polarity is black, the IAT electronics will lock on to a black hot target. If FLIR polarity is changed from black to white, the IAT electronics will remain locked on to the target when the target changes to a white hot target. If the IAT polarity switch is set to **WHT** or **BLK**, target polarity is not determined by FLIR polarity. The IAT electronics will lock on to a hot or cold target as selected with the IAT polarity switch.

(6) Laser Track. In laser track mode (fig. 2-47), reflected laser energy from another aircraft or ground laser light designator (GLLD) is used to position the TADS turret. The laser tracker/ receiver (LT/R) is an optical receiver with a four quadrant detector. The objective of the TEU laser track circuits is to detect a valid laser coded input and drive the turret to a position where the reflected laser energy is balanced in all four quadrants of the detector. Laser code and mode of operation are selected by the operator and sent to the TEU on the serial interface bus. The selected laser code is read by CPU CCA 3A8 and sent to LST decoder CCA 3A2 to accept the proper coding. If LT auto mode is selected, the TEU commands the turret to perform a four-bar scan in search of reflected laser energy. In manual mode, turret position is controlled by movement of the ORT assembly right handgrip **MAN TRK** control. As the TADS turret performs the selected scan, reflected laser energy enters the LT/R. The LT/R processes the reflected energy and sends a sum-after-threshold (AT) signal to LST decoder CCA 3A2 which checks for the proper coding. If the proper coding is received, LST decoder CCA 3A2 sends a CORRELATE signal back to the LT/R. This enables the LT/R to output target positioning inputs (up, down, left, or right) to LST decoder CCA 3A2. The positioning inputs are changed to digital data and read by CPU CCA 3A8. The difference in TADS turret position and LT/R position data is calculated by CPU CCA 3A8, changed to pitch and yaw error data, and sent to analog I/O CCA 3A7. The error data is converted to analog rate commands by analog I/O CCA 3A7 which are applied to inner gimbal servo loop yaw/pitch rate gyros (para d below). The turret will move in the direction commanded to track the laser spot or until there is no position error.

(7) Linear Motion Compensation. Linear motion compensation (LMC) compensates for target or aircraft motion to maintain turret track rate. LMC is selected by pressing and releasing the ORT assembly left handgrip **LMC** switch (fig. 2-46). The **LMC** switch output is applied to CPG MRTU type III. The FCC calculates target track rate and motion and sends corrected rate information to the TEU on the serial interface bus. LMC can be used in all selected track modes.

(8) Target Update/Store Commands. The ORT assembly left handgrip target **(UPDT/ST)** store/ update switch (fig. 2-46) applies inputs to CPG MRTU type III which command the FCC to store or update target information. This switch does not directly effect TADS operation.

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

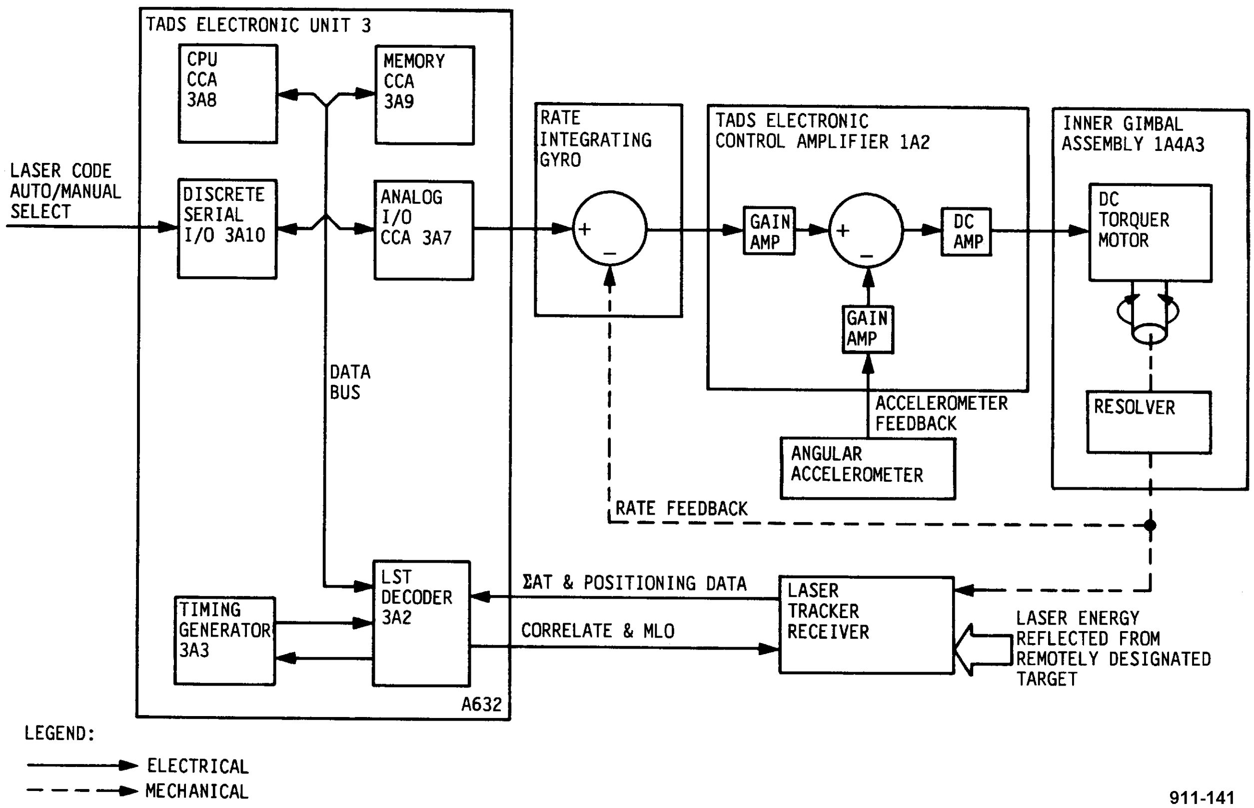


Figure 2-47. Laser Track Mode

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

b. Yaw/Pitch Gyro and Inner Gimbal Servo Loop. Pitch and yaw commands are processed by the TEU, converted to DC analog signals, and applied to pitch and yaw rate integrating gyros. (See block diagrams fig. 2-48 and 2-49 and wiring interconnect diagrams fig. 3-79 and 3-80.) The gyros respond to the rate commands and send pitch and yaw position inputs to the TECA. The TECA processes the position inputs and applies pitch/yaw drive to inner gimbal pitch and yaw torquer motors. The pitch/yaw torquer motors drive the inner gimbal toward the commanded position and the TEU compares gyro rate feedback to the rate command. If the feedback does not equal the rate command, the TEU adjusts pitch/ yaw torquer motor drive to compensate for the difference. Pitch/yaw resolver outputs, representing the angular difference in inner gimbal and outer gimbal alinement, are applied to the TEU. The TEU processes the resolver outputs and applies drive to the outer gimbal servo loop. The following paragraphs describe inner gimbal yaw/pitch gyros, accelerometers, and position feedback.

(1) Pitch/Yaw Gyro Operation. Yaw and pitch gyros stabilize turret movement and produce direction commands for inner gimbal movement. Yaw and pitch gyro CCAs 1A5A8 and 1A5A9 receive 875 Hz drive and 4375 Hz excitation inputs from the TADS power supply. (See block diagram fig. 2-50 and wiring interconnect diagram fig. 3-78.) The excitation and drive inputs are derived from TEU 875 Hz horizontal blanking video timing. The gyro CCA drive input spins a gyro mass wheel. Rate integrating gyros sense 0 - 5 Hz movement in the axis of gyro orientation. When the gyro moves as a result of inertia, the gyro mass wheel stays pointed in the direction of orientation and moves up or down a shaft. Movement up and down the shaft causes coupling between the 4375 Hz excitation input and gyro output windings to produce an AC output that is either in-phase or out-of-phase with the excitation input. The output phase corresponds to the direction of gyro movement and the amplitude increases or decreases as distance from the gyro null changes. The gyro CCA detects the gyro output, produces DC torque, and drives the gyro to keep it on the null. The gyro CCA processes the amount and direction of torque required to drive the gyro to the null. This produces rate outputs to the TEU and FCC (fig. 2-51) and gyro position outputs to the TECA. The inner gimbal is driven as described in paragraph (3) below to stabilize turret movement. Torque is also applied to drive the gyros off null, by way of TEU pitch and yaw commands, to produce inner gimbal movement. The gyro CCA reacts to commanded inputs and turret movement to drive the inner gimbal in the required direction.

(2) Accelerometer Operation. The TADS servo loop also uses two angular accelerometers to help maintain turret stability (fig. 2-52). The angular accelerometers react to 5 - 150 Hz inert forces outside the stabilized platform. Angular accelerator outputs are converted to a DC analog voltage, amplified, and algebraically added to gyro position commands in a TECA summing junction. The stabilized output of the summing junction is amplified and applied to yaw and pitch torquer motors.

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

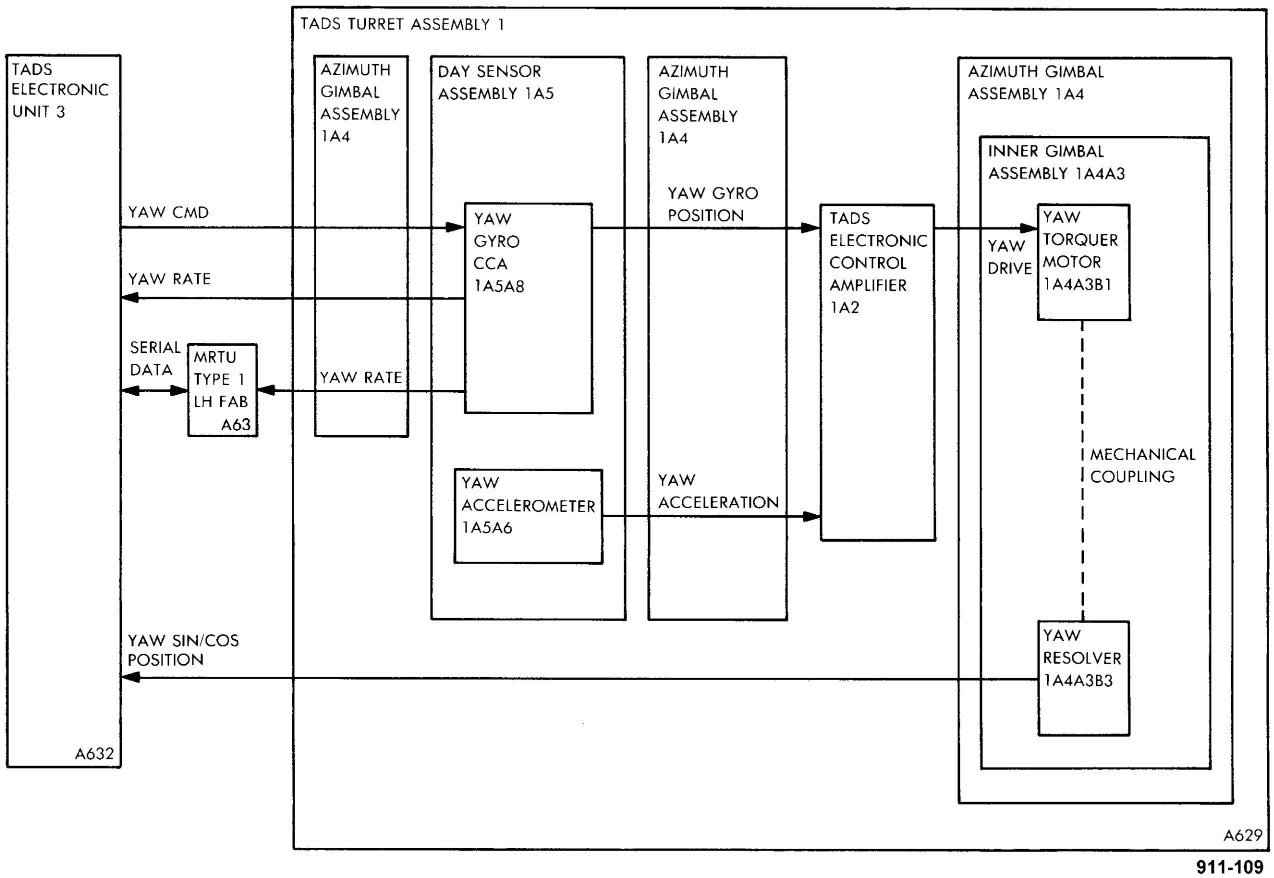


Figure 2-48. Yaw Gyro/Inner Gimbal Servo Loop Block Diagram

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

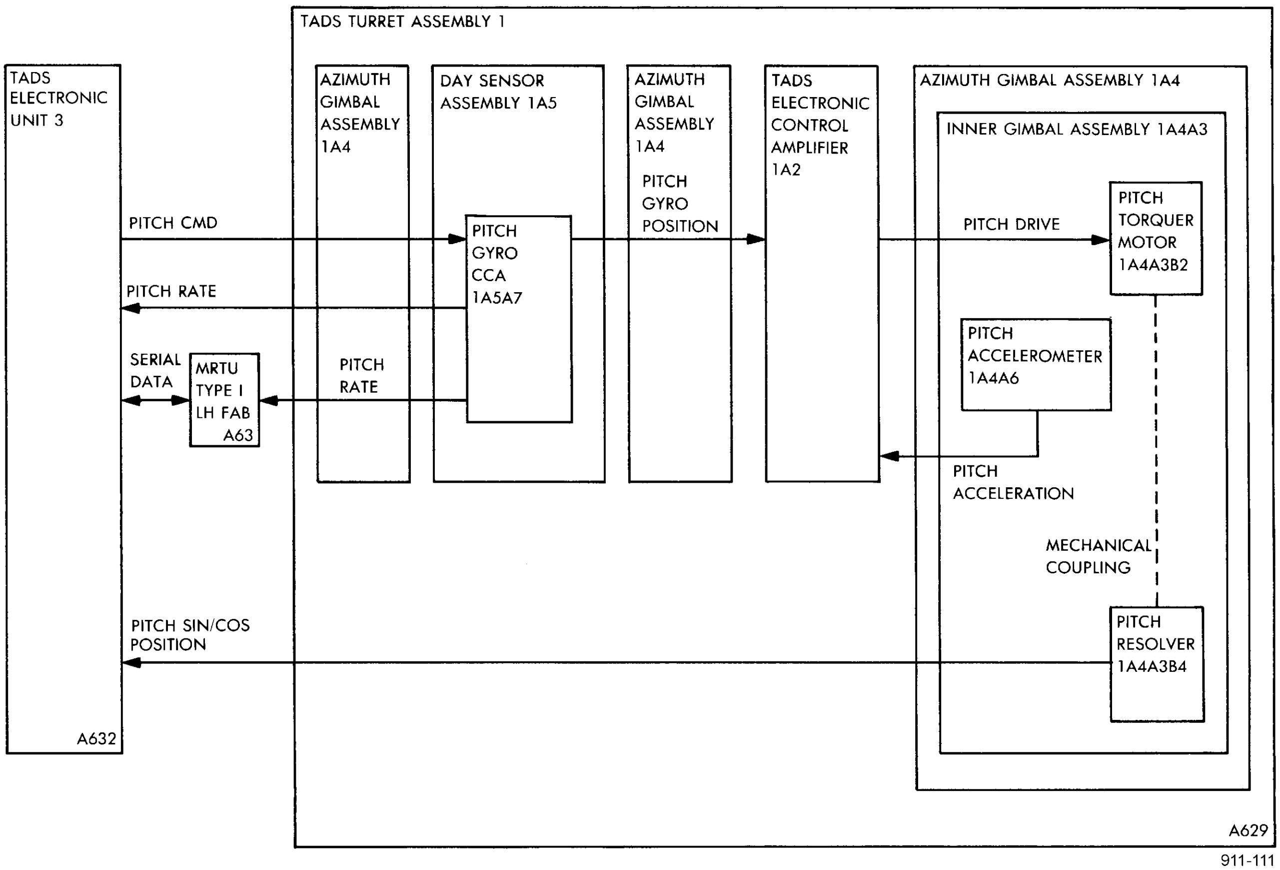


Figure 2-49. Pitch Gyro/Inner Gimbal Servo Loop Block Diagram

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

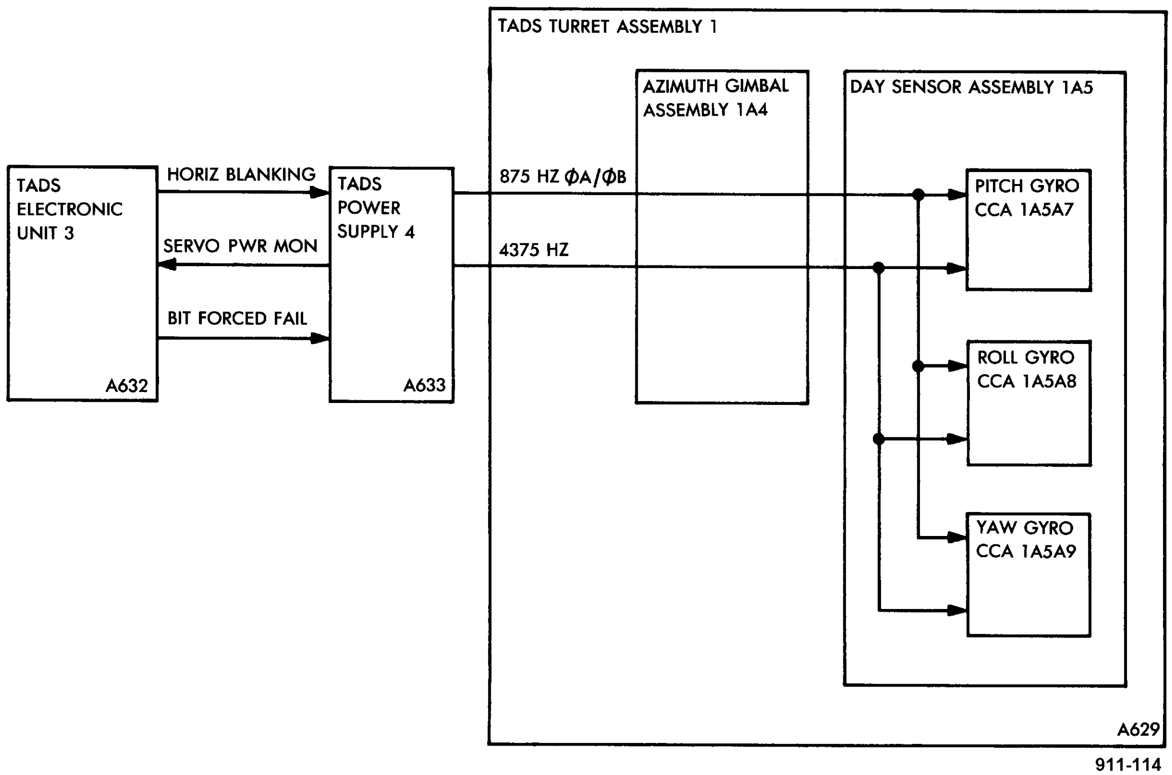


Figure 2-50. Gyro Excitation Block Diagram

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

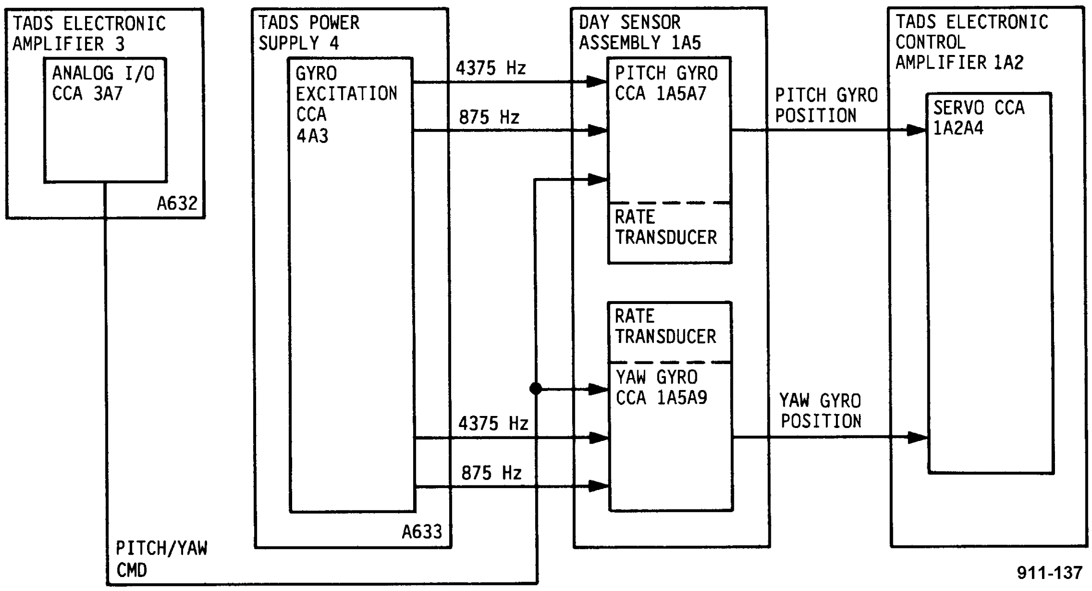


Figure 2-51. Pitch/Yaw Rate Commands

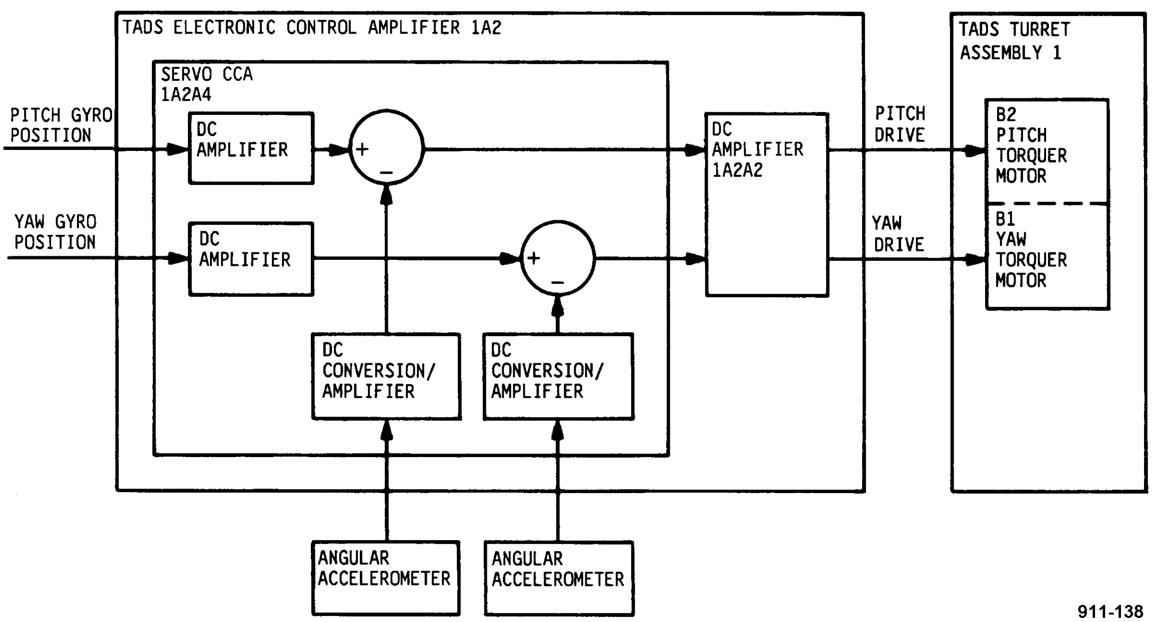


Figure 2-52. Pitch/Yaw Drive Commands

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(3) Inner Gimbal Position. As pitch/yaw torquer motors (fig. 2-53) drive the inner gimbal toward the commanded position, pitch/yaw resolver outputs are applied to the TEU. The resolver outputs represent the angular difference in inner gimbal and outer gimbal alinement. The TEU resolver to digital CCA 3A12 converts the resolver outputs to digital data which is read by CPU CCA 3A8. CPU CCA 3A8 calculates error data like a summing junction with a 0"reference input (fig. 2-54). If the outer gimbal is not in alinement with the inner gimbal, the TEU applies drive to the outer gimbal servo loop to move the outer gimbal into alinement.

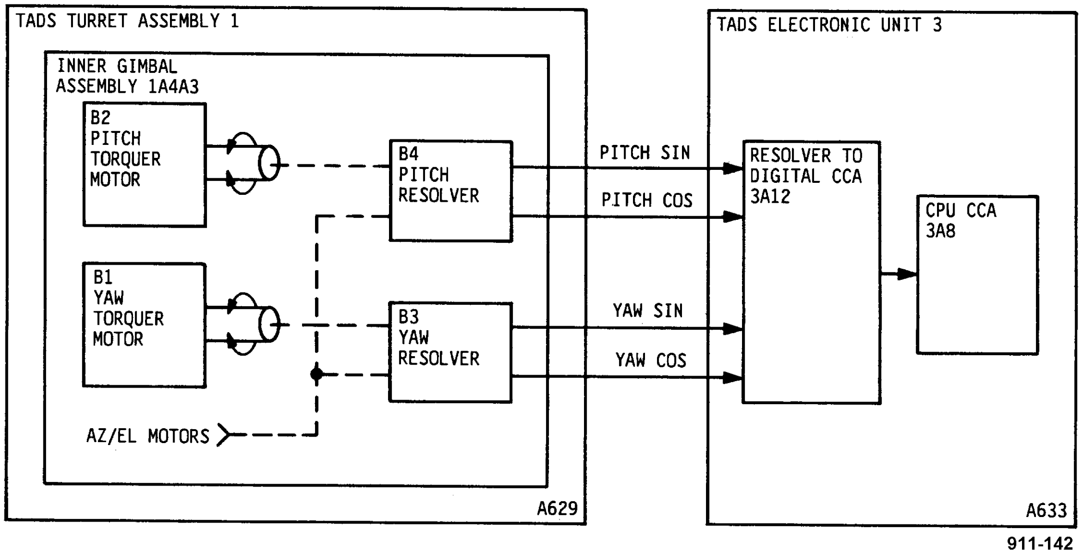


Figure 2-53. Inner Gimbal Servo Loop Position Outputs

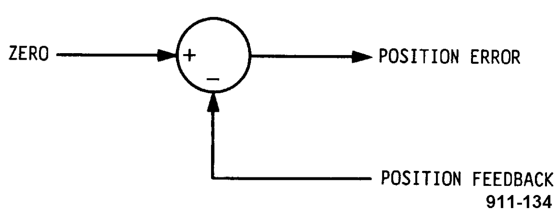


Figure 2-54. Inner Gimbal Servo Loop Summing Junction

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

c. Outer Gimbal Servo Loop. When the inner gimbal moves, the outer gimbal must be driven to stay in alinement with the inner gimbal. (See block diagram fig. 2-55 and wiring interconnect diagrams fig. 3-82 and 3-83.) Inner gimbal pitch and yaw resolver outputs represent the angular difference between the inner gimbal and outer gimbal. If the angle between the inner gimbal and outer gimbal is not zero degrees, azimuth and elevation drive is generated to drive the outer gimbal into alinement with the inner gimbal. The TEU processes the inner gimbal sin/cos feedback and applies azimuth and elevation rate commands to the TECA. The TECA processes the azimuth and elevation rate commands and applies drive to azimuth and elevation drive assemblies. Outer gimbal tachometers and resolvers complete the outer gimbal servo loop. Drive motor azimuth and elevation rate feedback is applied to the TECA to maintain proper outer gimbal speed. Azimuth and elevation resolver sin/cos feedback to the TEU is compared to position data. When the outer gimbal reaches the commanded position, the position feedback will equal input position commands and no more drive will be applied to the TECA. Azimuth and elevation limit switches close when the turret approaches maximum drive limits. When closed, the TECA reduces drive to the azimuth and/or elevation drive motor, the turret is prevented from hitting mechanical stops too hard.

(1) <u>TEU Signal Processing</u>. Outer gimbal azimuth and elevation resolver outputs represent the TADS turret position with respect to the helicopter centerline. The resolver outputs are applied to resolver to digital CCA 3A12 (fig. 2-56) and changed to digital data. CPU CCA 3A8 reads the data and stores it in memory CCA 3A9. Discrete serial I/O CCA 3A10 changes the digital data to serial data and sends the turret position information to the FCC through MRTU type I LH FAB. The FCC uses turret position information to point the selected weapon. If a cued mode of operation is selected, CPU CCA 3A8 calculates the difference between current turret position and the cued position. If there is an error, CPU CCA 3A8 applies error digital data to analog I/O CCA 3A7 where it is changed to DC analog azimuth and elevation rate outputs to the TECA. The resolver outputs are also used to detect when the turret is at an azimuth or elevation limit. If a limit is reached, a LIMITS message is sent to MRTU type I LH FAB on the serial interface bus.

(2) <u>Outer Gimbal Drive</u>. Azimuth and elevation rate commands from the TEU are applied to TECA servo CCA 1A2A4 (fig. 2-57). Servo CCA 1A2A4 sums inner gimbal angular acceleration and yaw/pitch rate with outer gimbal tachometer feedback signals and TEU azimuth and elevation rate commands to produce azimuth and elevation drive. When the inner gimbal begins to move, inner gimbal acceleration inputs start outer gimbal movement. The azimuth and elevation drive commands are applied to AC amplifiers 1A4A4 and 1A4A5 where they are filtered, amplified, and applied to azimuth and elevation drive motor assemblies. The drive motor assemblies move the outer gimbal to the commanded position. Drive motor assembly tachometers generate rate feedback that is applied to TECA servo CCA 1A2A4 to control outer gimbal movement.

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

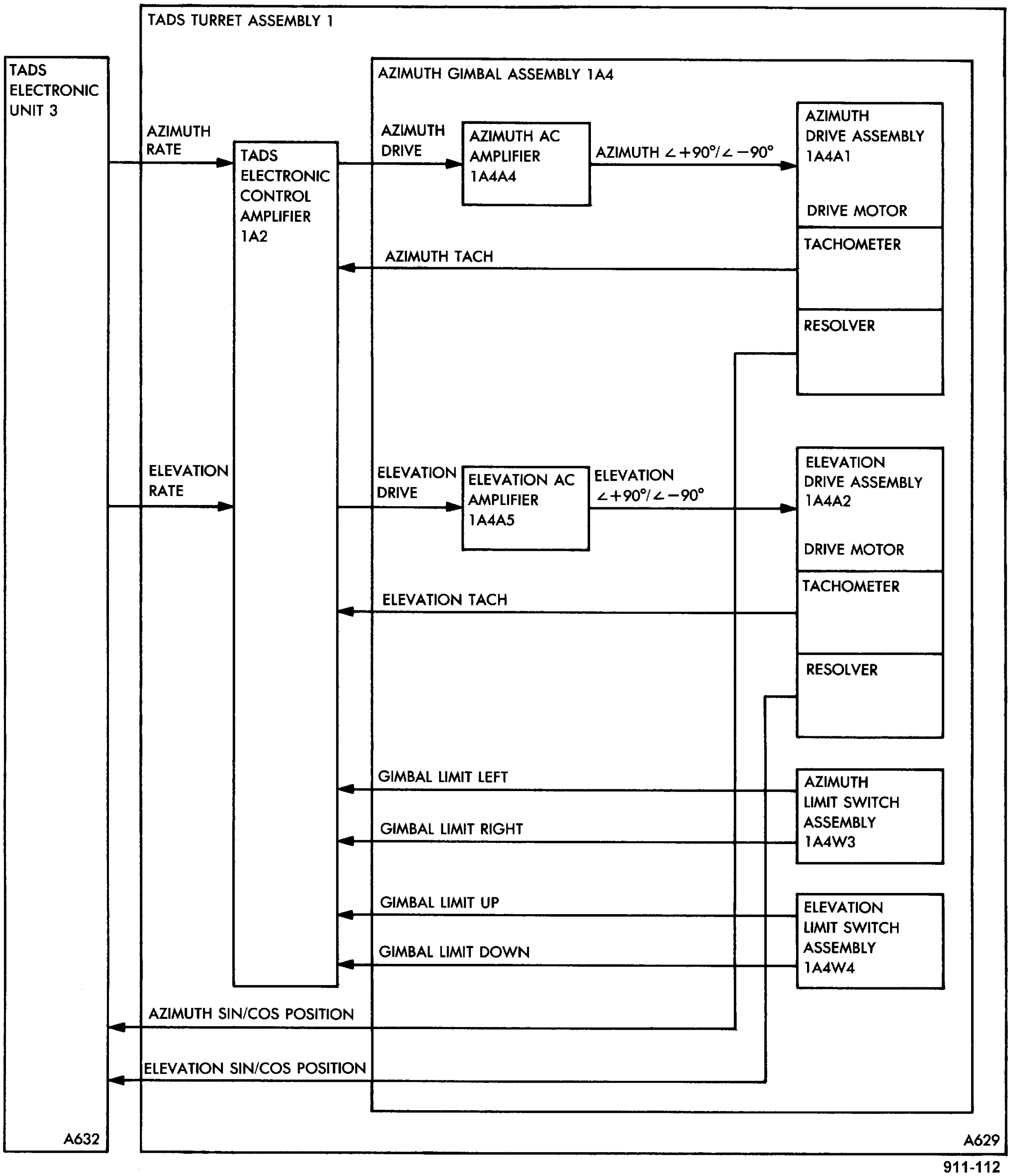


Figure 2-55. Outer Gimbal Azimuth and Elevation Servo Drive Loop Block Diagram

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

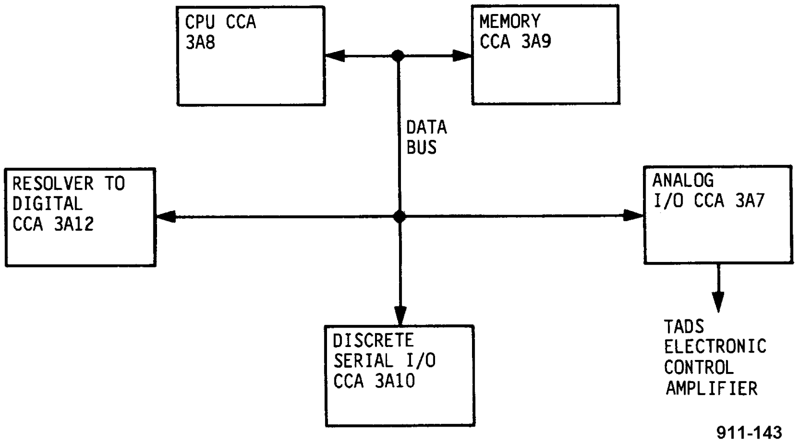


Figure 2-56. Outer Gimbal Servo Loop TEU Signal Processing

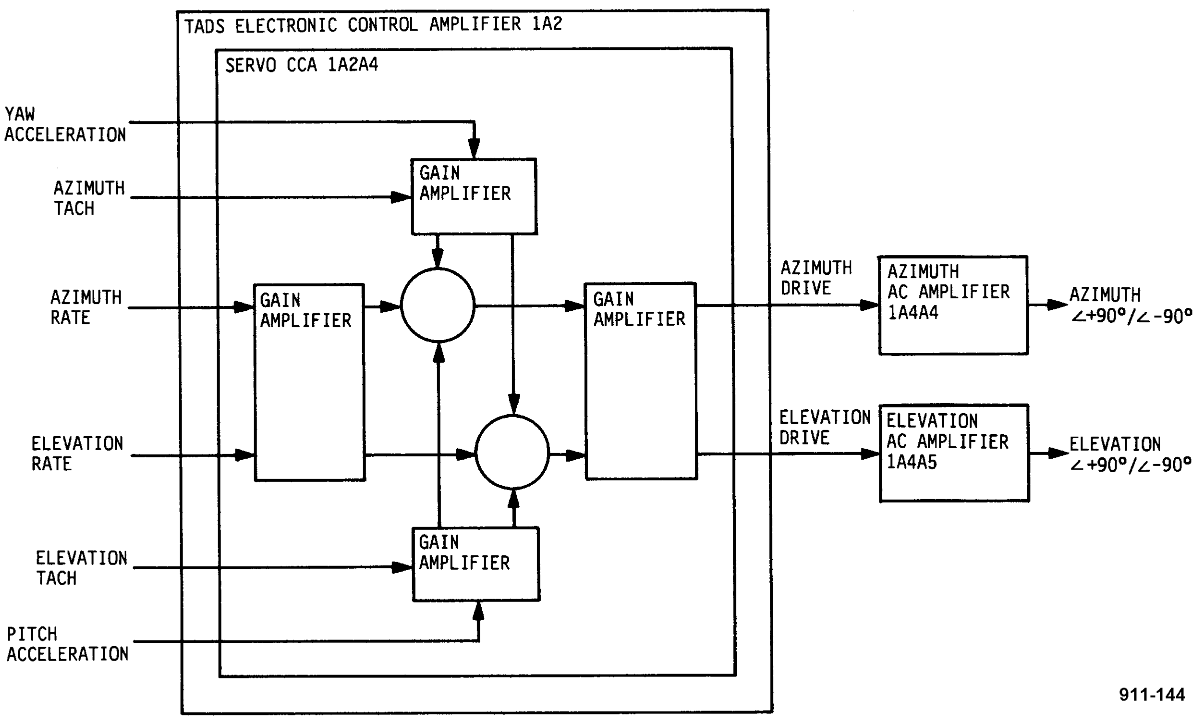


Figure 2-57. Outer Gimbal Servo Loop Drive Commands

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

d. Roll Gyro. The roll gyro stabilizes the TADS turret in the roll axis. (See block diagram fig. 2-58 and wiring interconnect diagram fig. 3-81.) Gyro operation is described in paragraph b above. As the inner and outer gimbals move to commanded positions, roll gyro CCA 1A5A8 senses the displacement of the gyro and sends a ROLL RATE DC analog output to the TEU and FCC. The TEU calculates roll rate data to produce pitch and yaw command signals used to compensate for roll movement. At the same time, CPU CCA 3A8 updates the roll gyro aline output of analog I/O CCA to compensate for Inner gimbal movement. The FCC uses roll rate, along with pitch and yaw rates, to compute pointing angle of the 30 mm chain gun and 2.75 mm rocket launcher.

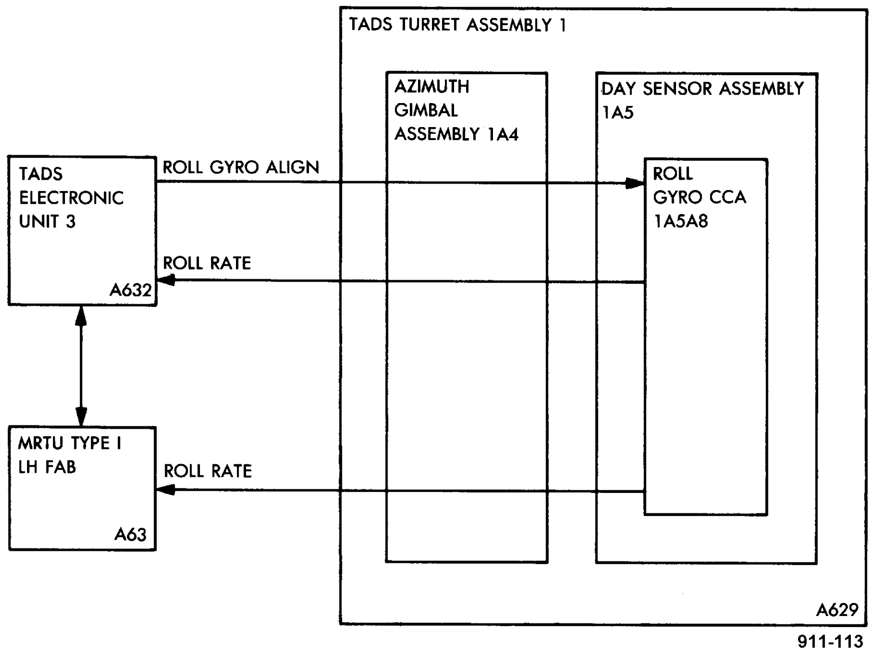


Figure 2-58. Roll Gyro Block Diagram

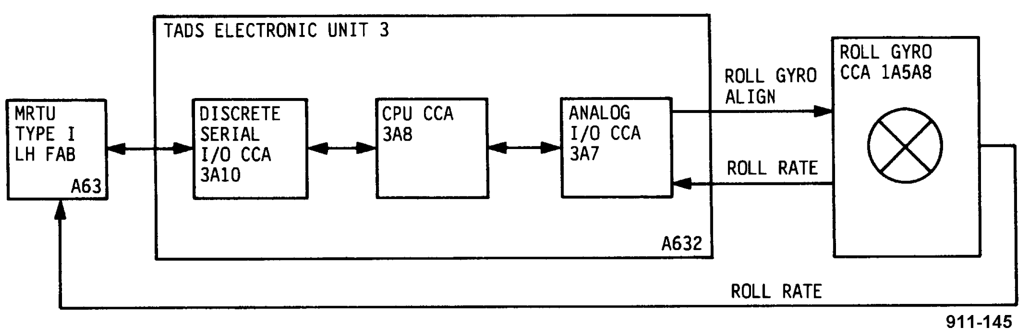


Figure 2-59. Roll Gyro Signal Processing

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

e. TADS Servo Alinement. Servo drift null and automatic performed to correct servo misalinement. Servo drift null manually compensates for servo drift by inputting azimuth and elevation correction using ORT assembly boresight controls. Automatic gyro alinement, is control by the TEU. The TEU compensates for servo drift by adding a constant value to the gyro rate commands.

(1) Servo Drift Null. Servo drift null (fig. 2-60) must be performed when any rate integrating gyro is replaced, the TEU has been replaced, or when the turret drifts off the pointing angle within 30 seconds. Servo drift null is adjusted in manual track with day TV or FLIR in narrow FOV. The ORT assembly control panel boresight enable switch is set to up to initiate the procedure. If servo drift is excessive, azimuth and elevation boresight controls are adjusted to correct the drift. After servo drift is corrected, the boresight enable switch is set to off. The TEU stores correction data and uses the data to adjust gyro rate commands.

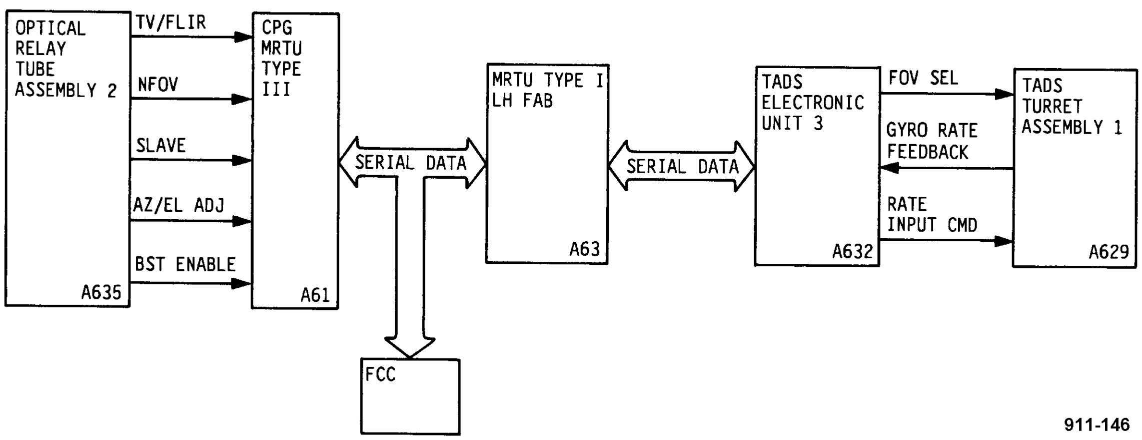


Figure 2-60. Servo Drift Null

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(2) Automatic Gyro Alinement. Automatic gyro alinement (fig. 2-61) is performed when any rate integrating gyro, TEU, or TADS turret assembly has been replaced. Automatic gyro alinement is initiated by way of data entry keyboard (DEK) inputs with TADS in manual track and day TV in NFOV. Automatic gyro alinement consists of roll gyro alinement and pitch and yaw gyro alinement.

(a) Roll Gyro Alinement. Roll gyro alinement alines the roll gyro to the pitch and yaw axis. The FD/LS code selected at the DEK instructs the TEU to drive the turret to fixed forward position, then slews the turret in a simplified search pattern, checking the roll error in the pitch and yaw axis. The TEU then measures the roll rate feedback signal and compares it to the previously established null voltage. If any difference exists, the TEU updates the roll null voltage and stores it in memory.

(b) Pitch and Yaw Gyro Alinement. During pitch and yaw gyro alinement, the TEU measures pitch and yaw error on the roll axis. The TEU commands the turret to a 25 down position and the operator manually locks on a target at least 180 meters away and selects IAT. The TEU then commands the turret to rock on the roll axis. The TEU then measures pitch and yaw rate feedback and compares it to the previously determined null voltage. If any difference exists, the TEU updates the pitch and yaw null voltages and stores them in memory.

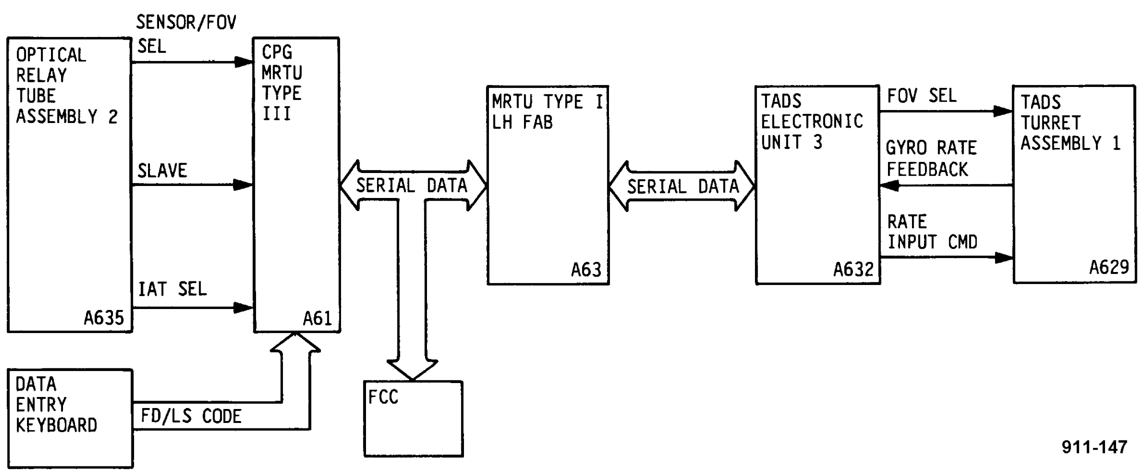


Figure 2-61. Automatic Gyro Alinement

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

f. TADS Servo BIT. TADS servo BIT is performed during start-up BIT, continuous BIT, and initiated BIT.

(1) Start-up BIT. Start-up BIT is run at system power-up and verifies major subsystems of the TADS computer are operational. Tests critical to TADS servo loop operation are the ROM test, analog I/O test, and discrete I/O test.

(a) ROM Test. The ROM test checks memory CCA 3A9 (fig. 2-62). CPU CCA 3A8 reads data stored in memory CCA 3A9 and computes a checksum which is compared to a checksum stored in memory. If the computed checksum does not equal the reference checksum, a TADS NO-GO message is sent to MRTU type I on the serial interface bus.

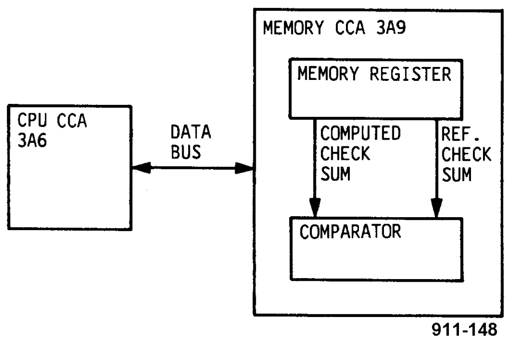


Figure 2-62. Start-Up BIT ROM Test

(b) Analog I/O Test. The analog I/O test checks analog I/O CCA 3A7 (fig. 2-63). CPU CCA 3A8 applies an A/D - D/A BIT initiate signal to analog I/O CCA 3A7 to switch (wrap around) D/A converter outputs to A/D converter inputs. CPU CCA 3A8 then applies a digital word to the D/A converters. The digital word is converted to an analog voltage and applied to the A/D converters. The A/D converter digital output is read by CPU CCA 3A8 and compared to the digital input. If the digital output does not match the digital input, TADS warning, computer subsystem fail, a TADS NO-GO message is sent to MRTU type I LH FAB on the serial interface bus.

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

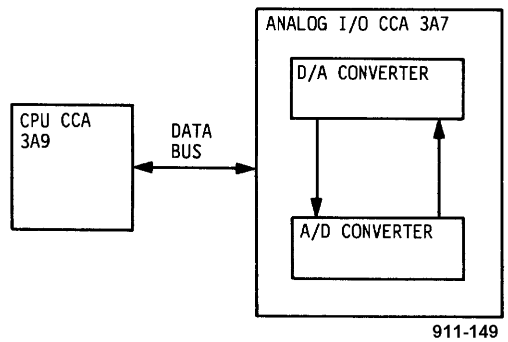


Figure 2-63. Start-Up BIT Analog I/O Test

(c) Discrete I/O Test. The discrete I/O test checks discrete serial I/O CCA 3A10 (fig. 2-64). When commanded by the CPU CCA 3A8, the discrete serial CCA 3A10 wraps around discrete output signals to selected input ports. If data does not wrap around properly for any input, a TADS NO-GO message is sent to MRTU type I LH FAB on the serial interface bus.

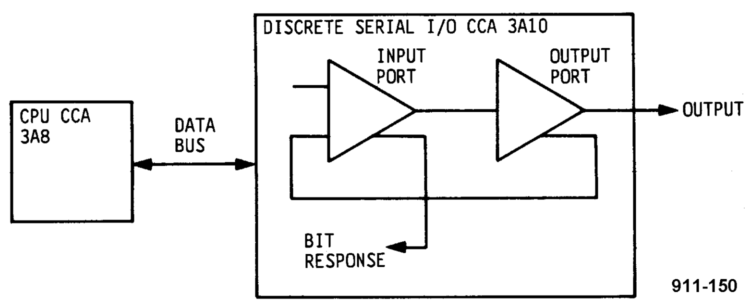


Figure 2-64. Start-Up BIT Discrete I/O Test

(2) Continuous BIT. Continuous BIT is run after start-up BIT during every TADS computer executive cycle. Servo loop BIT performed during continuous BIT are the R/D test, discrete output test, TADS power supply test, and analog I/O test.

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(a) Resolver to Digital Test. The resolver to digital test checks resolver to digital CCA 3A12 (fig. 2-65). Resolver to digital CCA 3A12 steps through 6 TADS and PNVS resolver inputs, converts the signals to digital angles, and stores the results in memory. In addition to the resolver inputs, 30 tangent reference voltage data is stored in memory. Every 2.5 msec CPU CCA 3A8 reads the stored digital angles and updates pointing angles. Every 17.5 - 20 msec CPU CCA 3A8 sends new pointing angles to the FCC and reads the 30° data. If the value of the positioning angle is not equal to 30° tangent and CPU CCA 3A8 has not read 7 or 8 data words since the last pointing angle updates were sent to the FCC, a TADS NO-GO message is sent to MRTU type I LH FAB on the serial interface bus.

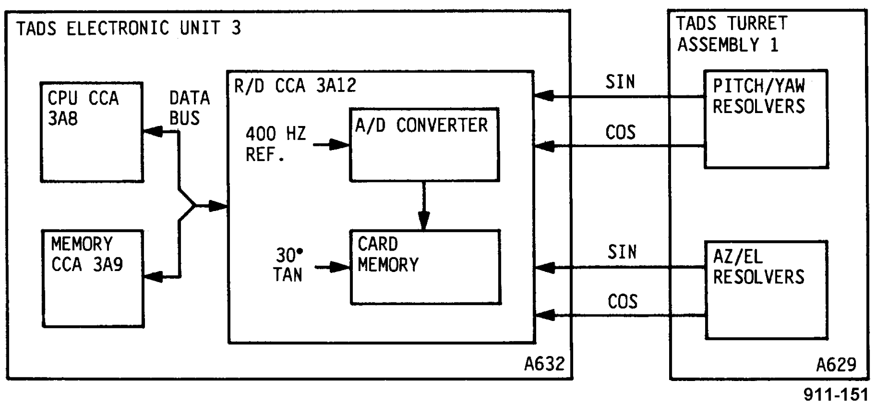


Figure 2-65. Continuous BIT Resolver to Digital Test

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(b) Discrete Output Test. The discrete output test checks CPU CCA 3A8 input and output operation (fig. 2-66). Discrete output data is wrapped around to selected input ports and compared to the output data. The test verifies that the data input matches the data output. If the data does not match, a TADS NO-GO message is sent to MRTU type I LH FAB on the serial interface bus.

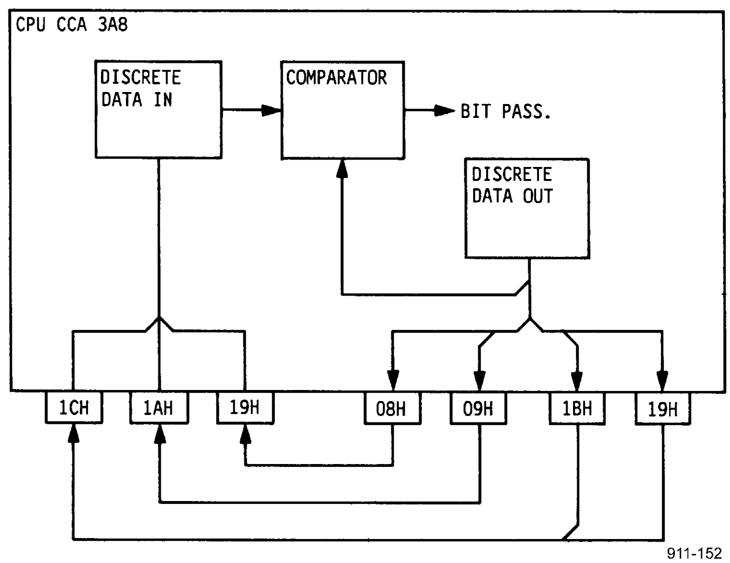


Figure 2-66. Continuous BIT Discrete Output Test

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(c) Servo Power Test. The TADS servo power test monitors servo 28 VDC, 115 VAC, and 875 Hz ØA and ØB gyro drive (fig. 2-67). I/O Laser Interface CCA 3A11 applies a BIT FORCE FAIL input to TADS power supply gyro excitation CCA 4A3 to enable test circuits. The SERVO PWR MON output of gyro excitation CCA 4A3 is normally a logic 0. If 875 Hz ØA and ØB gyro drive, 28 VDC, or 115 VAC are not detected, the SERVO PWR MON output is logic 1, and the TEU sends a TADS POWER SUPPLY NO-GO LH FAB message to MRTU type I LH FAB on the serial interface bus.

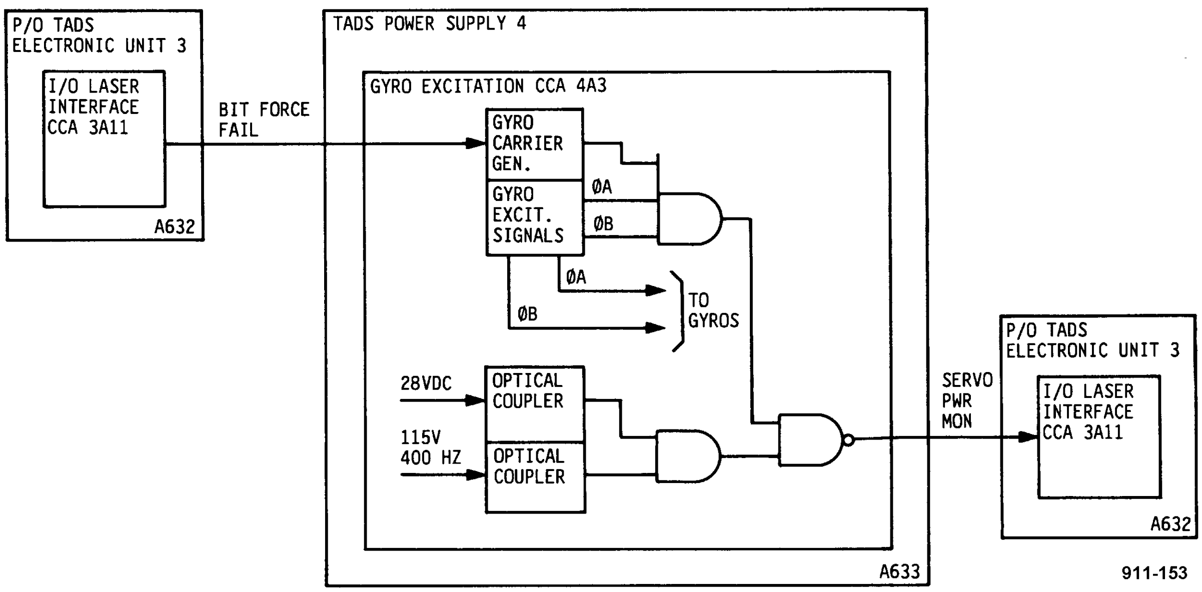


Figure 2-67. Continuous BIT TADS Power Supply Test

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(d) Analog I/O Test. The analog I/O test checks analog I/O CCA 3A7 operation (fig. 2-68). Once every executive cycle CPU CCA 3A8 applies data to timing generator CCA 3A3 which commands 3A3 to apply a A/D-D/A BIT enable input to 3A7. When the enable input is applied to analog I/O CCA 3A7, normal analog inputs and outputs are disabled and the output of the D/A converter is applied to the A/C converter. CPU CCA 3A8 applies a digital input to selected input channels and reads the digital output. CPU CCA 3A8 compares the output data to the input data. If the output data matches the input, a pass condition is set. If a channel fails during 10 consecutive executive cycles, the TEU sends a TADS NO-GO message to MRTU type I LH FAB on the serial interface bus.

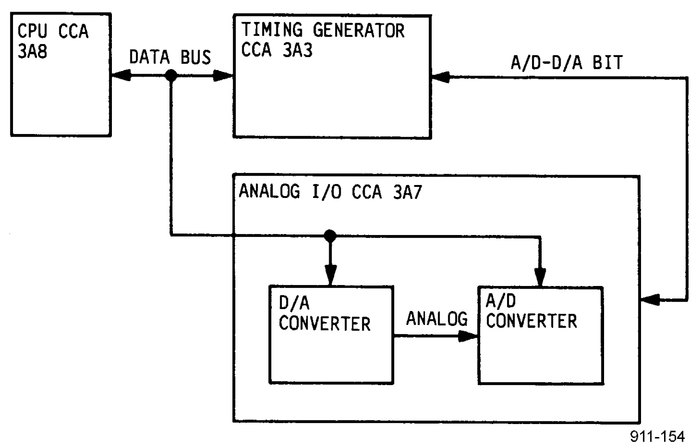


Figure 2-68. Continuous BIT Analog I/O Test

(3) Initiated BIT. Initiated BIT is run on operator request to check TADS subsystem functions. During initiated BIT, the TADS servo loop is tested during the accelerometer test, torquer/servo module test, and servo slew test.

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(a) Accelerometer Test. The accelerometer test checks pitch and yaw accelerometer operation (fig. 2-69). The turret is commanded to fixed forward position and after a 3 second delay to allow the turret to settle, CPU CCA 3A8 reads resolver to digital CCA 3A12 pitch and yaw position data. The output is read every 200 msec for 4 seconds. With no new rate commands from the TEU, the pitch and yaw resolver outputs should not change. If the angular accelerometer sends erroneous outputs to the TECA, the TECA will drive the inner gimbal to a new position. The pitch or yaw resolver output will change. If any yaw position change exceeds tolerance limits during the 4-second window, the TEU sends a TADS DSA SUB-ASSY fail message to MRTU type I LH FAB on the serial interface bus. If any pitch position change exceeds tolerance limits during the 4 second window, the TEU sends a TADS AC TORQUER AMP NO-GO TURRET BULKHEAD fail message to MRTU type I LH FAB on the serial interface bus.

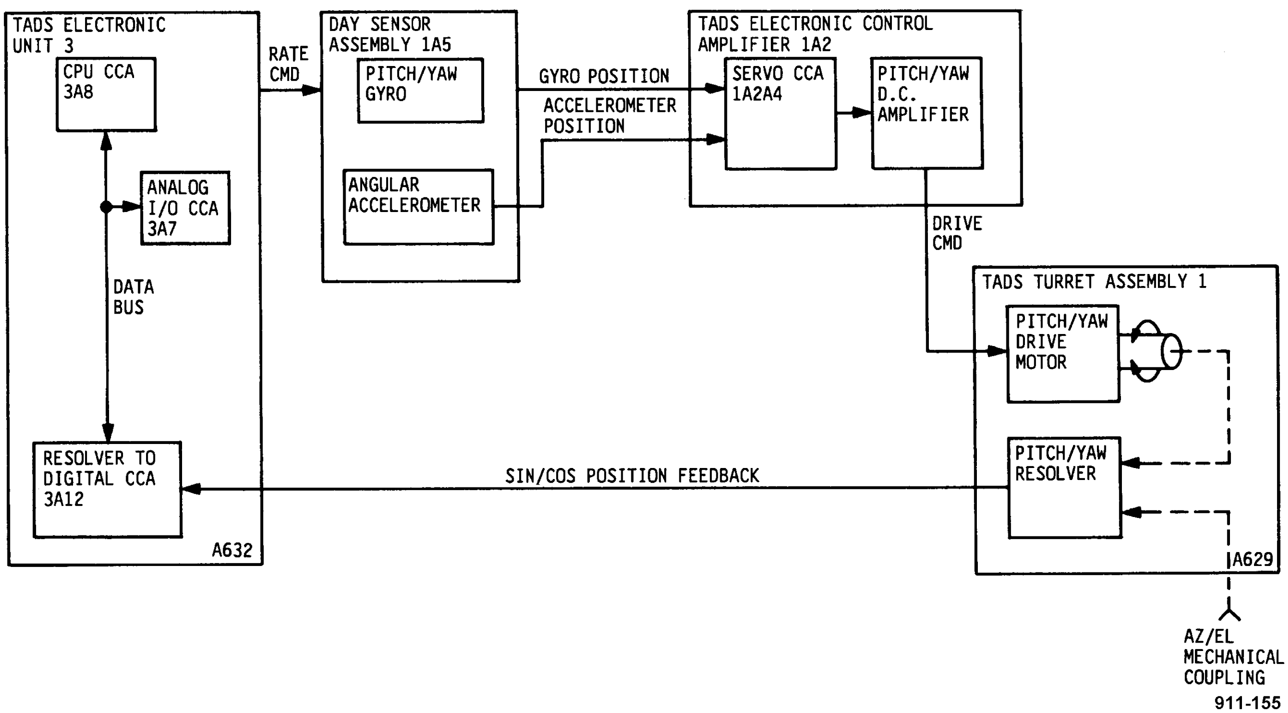


Figure 2-69. Initiated BIT Accelerometer Test

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(b) Torquer/Servo Module Test. The torquer/servo module test checks TECA operation (fig. 2-70). (See wiring interconnect diagram fig. 3-77.) The test is initiated when CPU CCA 3A8 applies a logic 1 SERVO BIT CONTROL to the TECA. TECA BIT tests critical TECA functions automatically and applies the result to the TEU SERVO BIT RESPOND input. The test requires 9 seconds to complete. During the test, the TECA disconnects outer gimbal drive and brake release voltage to prevent outer gimbal movement. The TECA simulates input drive commands and evaluates output drive capability for different servo functions. If the TECA fails any test, the TECA applies a logic 1 SERVO BIT RESPOND fail to the TEU. The TEU sends a TADS TORQ-SERVO MODULE AMP NO-GO TURRET BULKHEAD fail message to MRTU type I LH FAB on the serial interface bus. The SERVO BIT RESPOND input is also read by the TEU 0.1 second after the test is initiated. If the SERVO BIT RESPONSE is a logic 0 pass condition, the fail message described above is sent by the TEU. Also, the inner gimbal is driven to four quadrants during this test. The TEU monitors inner gimbal position and determines if the gimbal reaches the desired quadrant positions. Quadrant data results are evaluated during the servo slew test.

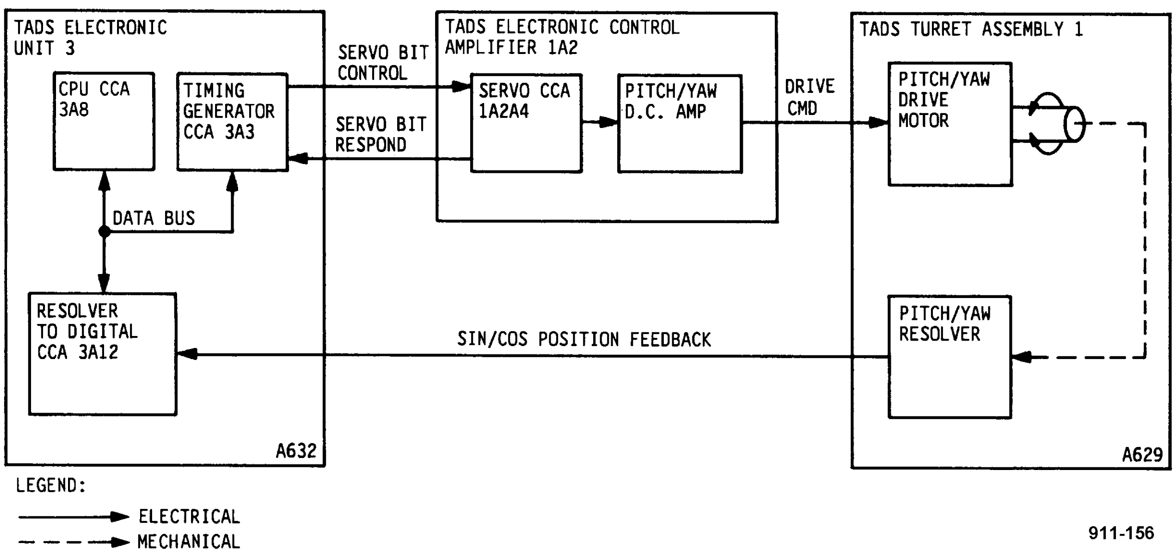


Figure 2-70. Initiated BIT Torquer/Servo Module Test

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(c) Servo Slew Test. The servo slew test checks azimuth/elevation drive motors and roll/pitch/yaw gyros (fig 2-71). If the torquer/servo module quadrant check results are evaluated as bad by the TEU, the TEU sends a TADS AC TORQUER AMP NO-GO TURRET BULKHEAD fail message to MRTU type I LH FAB on the serial interface bus and exits the servo slew test. If quadrant data is good, the data is used during the servo slew test to drive the turret to ten positions within the outer gimbal limits. Each position must be reached within a given amount of time. A failure is indicated if the azimuth and/or the elevation of any commanded position is out of tolerance at the end of maximum time allowed to reach that point. The servo slew test consists of a box slew test, pitch yaw gyro test (para (d) below), and roll gyro test (para (e) below). The box slew test commands the turret in a box pattern to 10 position angles within the outer gimbal limits, first clockwise, then counterclockwise. As the turret is slewed from corner to corner, CPU CCA 3A8 reads position data from resolver to digital CCA 3A12. If every position angle is reached within the allotted time and the turret position angle is within ± 5 mRAD tolerance, the box slew test passes and the roll gyro test is run. If a failure occurs, the box slew test is exited and the pitch/yaw gyro test is run.

(d) Pitch/Yaw Gyro Test. The pitch/yaw gyro test is run if the box slew test fails. The test is divided into 3 parts. First, the test checks if the box slew test failed azimuth or elevation. If it failed in azimuth, the yaw gyro is tested: otherwise the pitch gyro is tested. Second, CPU CCA 3A8 sends a -10 /second rate command to the gyro followed by a 0.14 second delay. If the measured rate feedback from the gyro is not -10 ± 1 /second, the TEU sends a TADS PITCH or YAW GYRO NO-GO DSA fail message to MRTU type I LH FAB on the serial interface bus otherwise the test is repeated for +10 /second. Third, CPU CCA 3A8 sends a -10 /second rate command to the gyro followed by a 2 second delay. During the last 1.28 seconds of the delay, CPU CCA 3A8 reads the rate feedback from the gyro every 20 msec (64 rate samples in all). When the 2 second delay has expired, CPU CCA 3A8 reads the azimuth and/or elevation position data-from resolver to digital CCA 3A12. If the turret did not move 12 in 2 seconds, the TEU sends a TADS AC TORQUER AMP NO-GO TURRET BULKHEAD (outer gimbal) fail message to MRTU type I LH FAB on the serial interface bus. Otherwise, the CPU averages the 64 rate feedback samples and if the average rate is not within ±5°/second, the pitch or yaw fail flag is set. If it passes, the test is repeated for +10 /second rate command. If both rate tests pass, the TEU sends a TADS AC TORQUER AMP NO-GO TURRET BULKHEAD (inner gimbal) fail message to MRTU type I LH FAB on the serial interface bus.

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

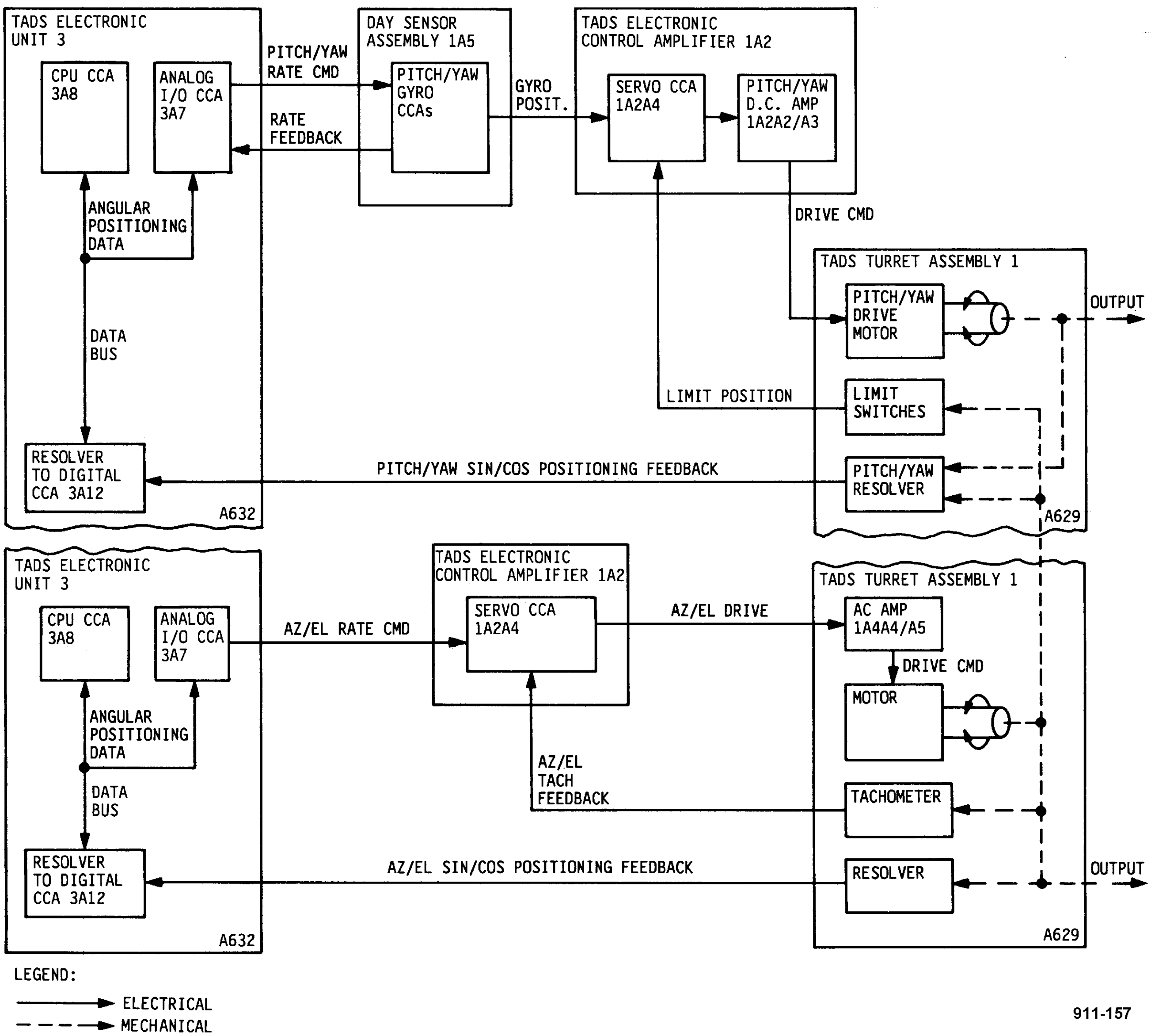


Figure 2-71. Initiated BIT Servo Slew Test

2-15. TARGET TRACKING/GIMBAL SERVO LOOPS (cont)

(e) Roll Gyro Test. The roll gyro test is divided into 2 parts and is only performed if the TADS servo system passes the box slew test (fig. 2-72). CPU CCA 3A8 first applies rate inputs to the TECA of 0° /second pitch and yaw and -5 volt roll correction. After a 60 msec time delay the roll rate output is read. If the roll rate output is not equal to -5 ± 0.2°/second, the roll gyro fail flag is set, otherwise the test is repeated with +5 volt roll correction. The test is repeated with a roll correction of 0 volts. If the roll rate output is not equal to 0° ± 0.2° / second, the roll gyro fail flag is set. In the second part, the turret is commanded to -30º azimuth and -45° elevation. After a 2 second time delay CPU CCA 3A8 sends O° /second pitch and +30° yaw rate commands to the gyros over an 0.8 second time. During the 0.8 second time the roll rate output is sampled every 20 msec: The sampled rate is then compared to an expected value of -21° ± 5°/second. If the values do not match, the roll gyro fail flag is set. Otherwise, the turret is commanded to +30° azimuth-and -45° elevation. After a 2 second time delay CPU CCA 3A8 sends O° /second pitch and -30°" yaw rate commands to the gyros over an 0.8 second time. During the 0.8 second time the roll rate output is sampled every 20 msec: The sampled rate is then compared to an expected value of +21° ±5°/second. If the values do not match, the TEU sends a ROLL GYRO NO-GO DSA fail message to MRTU type I LH FAB on the serial interface bus.

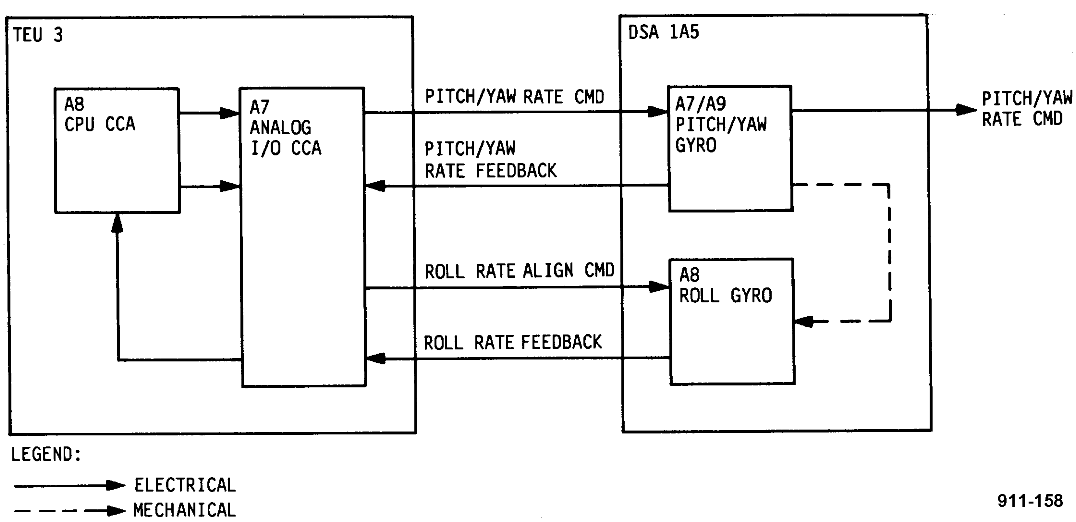


Figure 2-72. Initiated BIT Roll Gyro Test

2-16. LASER RANGING AND DESIGNATION

The TADS laser rangefinder/designator (LRF/D) consists of the LTU, LEU, and interface circuits in the TADS electronic unit (TEU) (fig. 2-73). The LRF/D is commanded on when the CPG control panel LSR switch is set to ON. To range a target, the optical relay tube (ORT) assembly right handgrip LASER TRIG switch is pulled to the first detent. The laser fires three pulses in one second, then stops firing. Range is calculated from the time that the laser was fired to the time when reflected laser light pulses are received. Range is displayed on the high action display. The range indication will increase/decrease for six seconds after the laser stops firing at the rate the helicopter or target was moving. To designate a target, the ORT assembly right handgrip LASER TRIG switch is pulled and held at the second detent. The LRF/D will continuously fire the laser with coded pulses until the trigger is released. The laser code is selected using the CPG fire control panel TADS LASER CODE LRF/D switch. Range is continuously updated on the display while lasing. When lasing is complete, the last valid range is displayed for approximately seven seconds or until new range information is received.

a. Power Application and Interlock. AC and DC power is applied to the LRF/D as described in paragraphs 2-7 thru 2-9. (See block diagram fig. 2-73 and wiring interconnect diagram fig. 3-85.) For the LRD/F to operate, an interlock path must be complete to apply voltage and fire the laser. When the CPG fire control panel LSR switch is set to ON, 28 VDC LRF/D ON/OFF HI is applied to the TEU from MRTU type I LH FAB. The TEU applies 28 VDC LASER ON to LEU relay 5K1 when the ORT assembly right handgrip LASER TRIG switch is pulled to the first detent. For 5K1 to energize and apply 30 115 VAC to the LEU, the DC return for 5K1 through INTERLOCK 1 and 2 must be complete and LRF/D ON/OFF LO must be complete from MRTU type I LH FAB to the TEU 28 VDC return.

b. Laser Code. The laser code is used to establish laser pulse timing and is selected using the CPG fire control panel TADS LASER CODE LRF/D switch. The laser code is applied to CPG MRTU type III and sent to the TEU on the serial interface bus through MRTU type I LH FAB. TEU CPU CCA 3A8 reads the laser code information and applies serial CODE SEL DATA to LEU code generator CCA 5A4 through discrete serial I/O CCA 3A10. Code generator CCA 5A4 converts the serial CODE SEL DATA input to parallel data which is applied to a counter. The counter output changes with different laser code inputs to change the time interval between laser output pulses. Flashlamp, pockets cell, and pulse forming network (PFN) triggers are applied to FD/LS power supply CCA 5A5 to fire the laser transmitter as described in paragraph c below.

2-16. LASER RANGING AND DESIGNATION (cont)

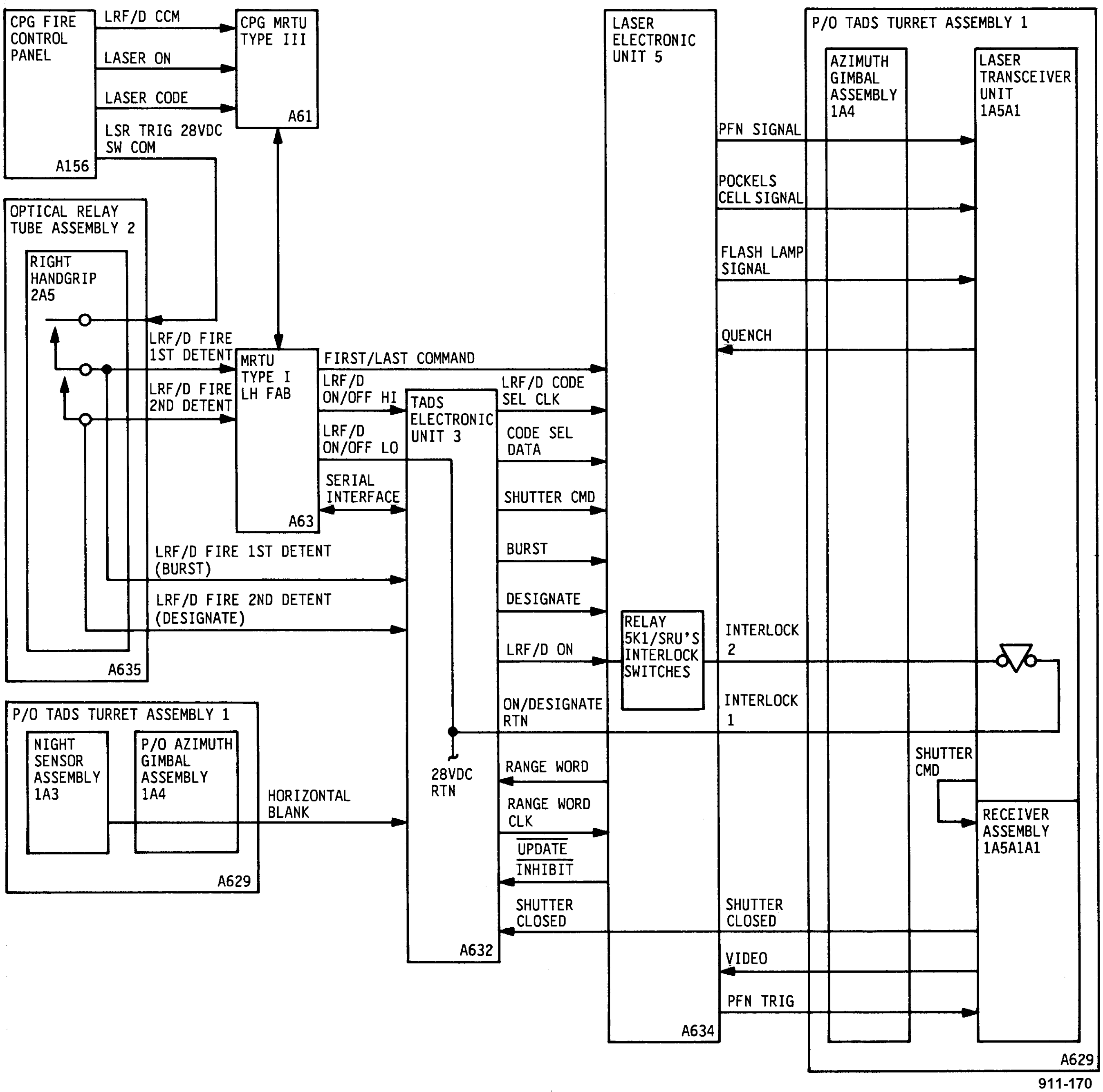


Figure 2-73. LRF/D Block Diagram

2-16. LASER RANGING AND DESIGNATION (cont)

c. Laser Transmitter. The LTU generates laser output pulses on command. This energy is output through the day sensor assembly NFOV lens for target designation. The LRF/D uses the same optical path as the DVO NFOV and the DTV (para 2-11). Laser code information from the fire control system controls laser pulse interval as described in paragraph b above. A HORIZONTAL BLANK input to LEU FD/LS CCA 3A5 from the TADS night sensor assembly synchronizes flashlamp, pockels cell, and PFN triggers to FLIR video. When a BURST or DESIGNATE command from the ORT assembly right handgrip is applied to LEU FD/LS power supply CCA 5A5 through TEU laser I/O CCA 3A11, power, timing, and shutter commands are applied to the LTU in the following sequence:

- The FLASHLAMP SIGNAL trigger is applied to the LTU pulse forming network (PFN) to set up a charging circuit.
- Switched 28 VDC, followed by high voltage. The switched 28 VDC disconnects bleeder resistors from the circuit, and applies high voltage just below the flashpoint to the flashlamp.
- The PFN SIGNAL triggers the PFN which fires the flashlamp to reach full ionization and causes the lamp to flash. If the PFN does not trigger, a QUENCH output from the LTU is applied to the LEU to turnoff the high voltage.
- The POCKELS CELL signal trigger activates the pockels cell and the LTU outputs a laser pulse.

The LTU will output laser energy of the proper code for target designation or rangefinding. Reflected laser energy is changed to video and applied to the LEU, where it is used to provide range data to the TEU and FCC.

d. Laser Receiver and Range. Returned laser energy is focused on a laser receiver detector, detected, and processed to produce the LEU VIDEO input. When the laser is fired, an LEU code generator CCA 5A4 PFN TRIG is applied to the receiver assembly, receiver gain is greatly reduced and a portion of the outgoing energy is felt at the detector. This pulse is processed by the receiver and applied to the LEU range counter CCA 5A2 VIDEO input where it starts a timing sequence to determine range. After a short delay after transmit, receiver circuit gain is returned to normal and the receiver becomes sensitive to small returning laser energy. The receiver processes the return signals and applies them to the LEU VIDEO input. Range counter CCA 5A2 calculates the length of time between the transmitted laser pulse and the return and sends a serial data RANGE WORD output (buffered on range counter receiver CCA 5A3) to TEU discrete serial I/O CCA 3A10. An UPDATE INHIBIT is applied to TEU laser I/O CCA 3A11 while range counter CCA 5A2 is calculating new range data. The TEU sends the range data to MRTU type I LH FAB on the serial interface bus. If range data is erratic, as caused by motion produced by objects other than the intended target, the CPG fire control panel **LRF/D CCM** switch is set to **CCM**. A FIRST/LAST COMMAND from MRTU type I LH FAB is applied to LEU range counter CCA 5A2 to select the first or last return for range data calculations.

2-16. LASER RANGING AND DESIGNATION (cont)

e. LRF/D BIT. BIT monitors critical LRF/D functions during continuous and initiated class A BIT. (See block diagram fig. 2-74 and wiring interconnect diagram fig. 3-87.) Continuous BIT is performed during normal laser operation and internal boresight. Initiated class A BIT checks additional laser functions and can only be performed while the helicopter is airborne.

(1) Continuous BIT.

(a) LEU BIT. During continuous BIT, LEU low voltage power supply -15, 28, 15, and 8 VDC outputs and flashlamp, pockels cell and PFN trigger timing are monitored by LEU FD/LS power supply CCA 5A5. If any power supply output or trigger timing fails a logic 1 LEU FAIL output is applied to TEU I/O laser interface CCA 3A11 through LEU range counter receiver CCA 5A3. If the laser is on and boresight has not been commanded, TEU CPU CCA 3A8 reads the LEU FAIL input. If a logic 1 LEU FAIL is read by CPU CCA 3A8, a TADS LRF-D NO-GO message is sent to MRTU type I LH FAB on the serial interface bus.

(b) LTU BIT. During continuous BIT and while a target is lased, LTU laser output energy is detected by LTU power monitor CCA 1A5A1A3A1 and the detected sample applied to the LEU FD/LS power supply CCA 5A5 LOW POWER input. If laser energy is below 40% of the specified amount, two threshold monitors on FD/LS power supply CCA 5A5 will produce LRF/D LOW PWR and LTU FAIL outputs. The LRF/D LOW PWR output is applied to MRTU type I LH FAB which will produce a LASER POWER LOW message to be displayed. The LTU FAIL output is applied to range counter receiver 5A3 where it is combined with the results of initiated class A BIT during range receiver tests (para (2) below). During continuous BIT, previous range receiver fault results stored in the TEU are evaluated and the FD/LS power supply CCA 5A5 LTU FAIL output will produce a logic 1 LTU FAIL output to the TEU regardless of initiated class A BIT results. A logic 1 LTU FAIL output is applied to TEU I/O laser interface CCA 3A11 through LEU range counter receiver CCA 5A3. If the laser is on and boresight has not been commanded, TEU CPU CCA 3A8 reads the LEU FAIL input. If a logic 1 LEU FAIL is read by CPU CCA 3A8, TADS LRF-D NO-GO and TADS LASER TRACKER NO-GO messages are sent to MRTU type I LH FAB on the serial interface bus. The initiated class A BIT results described above can be reset with a successful completion of a second initiated class A BIT.

2-16. LASER RANGING AND DESIGNATION (cont)

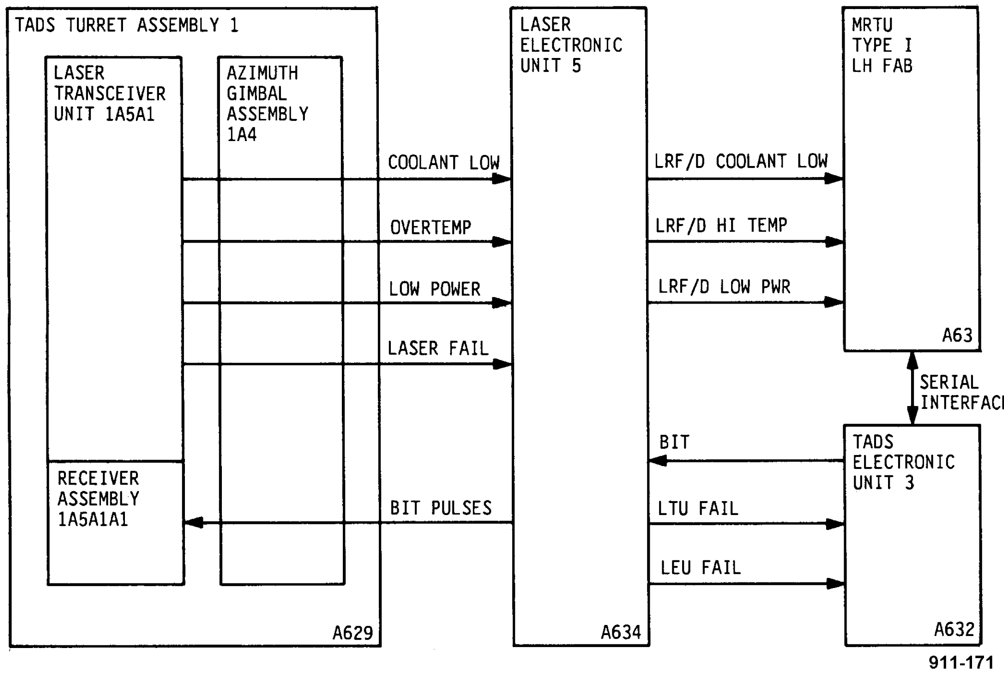


Figure 2-74. LRF/D BIT Block Diagram

(c) LRF/D Coolant Low BIT. Laser coolant level is measured by the LTU coolant level switch. When coolant level is correct, the coolant level switch is open to open the COOLANT LOW input to LEU FD/LS power supply CCA 5A5. The open COOLANT LOW input is pulled down to a logic 0 and level translated to a 5 VDC logic 1 LRF/D COOLANT LOW input to MRTU type I LH FAB. If coolant is low, the coolant level switch is closed to apply 28 VDC to the COOLANT LOW input to LEU FD/LS power supply CCA 5A5. The 28 VDC COOLANT LOW input is inverted and level translated to a 0 VDC, logic 0 input to MRTU type I LH FAB. The logic 0 LRF/D COOLANT LOW output is applied to MRTU type I LH FAB which will produce a LASER COOLANT LOW message to be displayed.

(d) LRF/D Coolant Temperature BIT. Laser coolant temperature is measured by the LTU coolant temperature switch. When coolant level is correct, the coolant temperature switch is open to open the OVERTEMP input to LEU FD/LS power supply CCA 5A5. The open OVERTEMP input is pulled down to a logic 0 and level translated to a 5 VDC, logic 1 LRF/D HI TEMP input to MRTU type I LH FAB. If coolant temperature is over 190°F (87.7°C), the coolant temperature switch is closed to apply 5 VDC to the OVERTEMP input to LEU FD/LS power supply CCA 5A5. The 5 VDC OVERTEMP input is inverted and level translated to a 0 VDC, logic 0 input to MRTU type I LH FAB. The logic 0 LRF/D HI TEMP output is applied to MRTU type I LH FAB which will produce a LASER TEMP message to be displayed.

2-16. LASER RANGING AND DESIGNATION (cont)

(e) Receiver Shutter Status. During internal boresight, the receiver assembly shutter must be closed before the laser is fired. (See block diagram fig. 2-73 and wiring interconnect diagram fig. 3-86.) When internal boresight is performed and the ORT assembly right handgrip LASER TRIG switch is held to the second detent, TEU I/O laser CCA 3A11 applies a logic 1 SHUTTER CMD to LEU code generator CCA 5A4. LEU code generator CCA 5A4 applies a logic 1 BUFFERED SHUTTER CMD to LTU laser cooling unit assembly 1A5A1A3 which applies a DC return to receiver assembly solenoid 1A5A1A1L1 to close the shutter. If the shutter is closed, a DC return (logic 0) is applied to the TEU I/O laser interface CCA 3A11 SHUTTER CLOSED input. If TEU CCA 3A8 reads a logic 1 SHUTTER CLOSED input, the shutter is not closed and the TEU will not allow the laser to fire.

(2) LRF/D Initiated Class A BIT. Initiated class A BIT checks LTU/LEU range receiver and range data processing circuits. (See block diagrams fig. 2-73 and 2-74 and wiring interconnect diagrams fig. 3-86 and 3-87.) Initiated class A BIT is initiated with a logic 0 TEU I/O laser interface CCA 3A11 BIT output to LEU FD/LS power supply CCA 5A5. Two BIT PULSES are applied to LTU receiver assembly 1A5A1A1, which correspond to a range of 6800 meters. Receiver assembly 1A5A1A1 detects these pulses and applies a video output to LEU range counter CCA 5A2. Range data is processed as described in paragraph c above by the TEU to determine if the proper range is obtained. The LTU receiver assembly 1A5A1A1 is monitored by the LTU FAIL threshold detector on FD/LS power supply CCA 5A5 as described in paragraph (1)(b) above. The LTU FAIL output is applied to range counter receiver 5A3 and the result (logic 0 pass) is stored in the TEU for evaluation. TEU CPU CCA 3A8 reads range words until a valid range word is received or until 75 range words are read without the proper range or parity. If the range words do not meet the above criteria, CPU CCA 3A8 reads the LTU FAIL input. If a logic 0 LTU FAIL is read by CPU CCA 3A8, a TADS LASER ELECTRONICS UNIT NO-GO LH FAB message is sent to MRTU type I LH FAB on the serial interface bus. If a logic 1 LTU FAIL is read by CPU CCA 3A8, a TADS LASER TRANSCEIVER NO-GO DSA message is sent to MRTU type I LH FAB on the serial interface bus. If a logic 1 LEU FAIL is read by CPU CCA 3A8, a TADS LASER ELECTRONICS UNIT NO-GO LH FAB message is sent to MRTU type I LH FAB on the serial interface bus.

(3) LRF/D Initiated Class B BIT. LRF/D initiated class B BIT is identical to initiated class A BIT. Refer to paragraph (2) above.

2-17. LASER TRACKER/RECEIVER (LT/R)

The LT/R is a passive sensor that detects reflected laser energy from designated targets. In manual track, the CPG sweeps the TADS turret across an area searching for reflected laser energy using the ORT assembly right handgrip MAN TRK control. When the LT/R detects properly coded energy from a remote laser designator, the LT/R goes into automatic mode and positions the TADS turret so it is pointed at the area of strongest reflections. In AUTO mode, the TEU commands the TADS turret to sweep an area starting at 5° above the initial LOS and 30° to the right. The turret will then sweep 60° to the left. If reflected laser energy of the proper code is not detected, the LOS drops down 10° and the turret sweeps right for 60°. The turret will continue this pattern for a total of four sweeps or bars. If the coded laser energy is not detected, the turret moves to the original LOS and receiver threshold sensitivity is lowered to enable the LT/R to detect a smaller amplitude coded laser reflection. The LT/R then repeats the four bar sweep. When the LT/R detects the properly coded reflected laser energy, the turret servo loop positions the turret so that the laser energy is detected equally in all 4 quadrants. If the LT/R is in use and the CPG fires the laser, the LT/R will be shut down by the TEU. The LT/R consists of optical assembly 1A5A2A1 and signal processor assembly 1A5A2A2.

a. Optical Assembly. Reflected laser energy enters optical assembly 1A5A2A1 (fig. 2-75) through the upper day sensor window, passes through the filter, and into a collector lens. The collector lens refracts the energy to a point on the silvered rear surface of the lens. This curved surface focuses the energy onto a four quadrant detector. (See block diagram fig. 2-76 and wiring interconnect diagram fig. 3-85.) When a target is not centered in the receiver LOS, illumination will be unbalanced in the four quadrants. Detector outputs (QUAD A thru D) are processed by signal processor assembly 1A5A2A2 to produce servo system drive and center the target in the receiver LOS. When the target is centered, detector outputs will be equal in amplitude. A LED driver CCA is used for initiated class A BIT as described in paragraph c below.

b. Signal Processor Assembly. Signal processor assembly 1A5A2A2 processes optical assembly detector outputs and sends a S S AT signal to the TEU LST decoder CCA 3A2 which checks for proper laser coding. If the proper coding is received, LST decoder CCA 3A2 sends a CORRELATE signal back to the LT/R. This enables signal processor assembly 1A5A2A2 to output target positioning inputs (UP, DOWN, LEFT, or RIGHT) to LST decoder CCA 3A2. The TEU will drive the TADS turret until the reflected laser energy illuminates optical assembly 1A5A2A1 four quadrant detector equally (para 2-15). If the received laser code were to change to something other than the proper code, TEU decoder CCA 3A2 applies MLO to signal processor assembly 1A5A2A2 to take the LT/R out of track, the turret will return to automatic track mode.

2-17. LASER TRACKER/RECEIVER (LT/R) (cont)

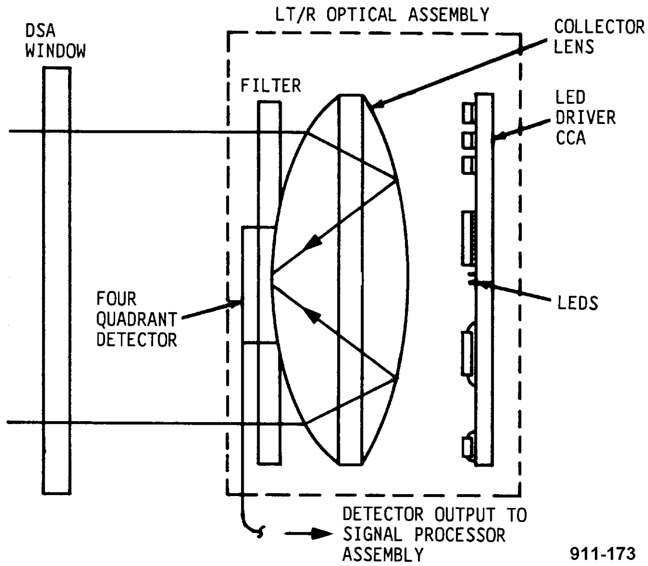


Figure 2-75. LT/R Optical Assembly

c. LT/R BIT. BIT monitors critical LT/R functions during initiated class A and class B BIT. (See block diagram fig. 2-76 and wiring interconnect diagram fig. 3-85 and 3-87.) Initiated class A BIT is only performed when the helicopter is airborne.

(1) LT/R Initiated Class A BIT. Initiated class A BIT checks LT/R tracking and control circuit. Initiated class A BIT is divided into five subroutines: LT initialization, LED pulse test, LT data test, correlate/MLO test, and decorrelate test. LT initialization sets the LED pulse number at 18 and the PRF at 10 Hz. During the LED pulse test, TEU timing video CCA 3A3 applies LED ENABLE and BIT ENABLE inputs to optical assembly LED drive CCA 1A5A1A1 to generate targets at a predetermined PRF. If the TEU fails to output a LED pulse within 60 msec, TADS LASER TRACKER NO-GO and TADS ELECTRONIC UNIT NO-GO LH FAB messages are sent to MRTU type I LH FAB on the serial interface bus. During the LT data test, the TEU reads a LED SENSE logic 1 input. This indicates that the LEDs which simulate laser energy are functioning properly. Next the TEU reads a EAT logic 1 that indicates the laser tracker is processing simulated laser energy. If the logic is correct, the TEU applies a logic 0 CORRELATE input to the LT/R. When the logic 0 correlate input is applied, the LT/R processes position error commands to the TEU. If LED SENSE or XAT logic is not correct and CORRELATE does not exist after 15 pulses, a TADS LASER TRACKER NO-GO message is sent to MRTU type I LH FAB on the serial interface bus. The correlate/MLO test first checks that the logic 0 correlate condition in the LT/R existed within 15 LED pulses. The TEU then reads a MLO logic 1 that is applied to disable TEU error positioning commands to the TADS turret. The TEU also checks position error commands from signal processor assembly 1A5A2A2 and compares them to the known input commands.

2-17. LASER TRACKER/RECEIVER (LT/R) (cont)

If MLO is not correct, TADS LASER TRACKER NO-GO and TADS ELECTRONIC UNIT NO-GO LH FAB messages are sent to MRTU type I LH FAB on the serial interface bus. If position error commands are not correct, a TADS LASER TRACKER NO-GO message is sent to MRTU type I LH FAB on the serial interface bus. The TEU then reads the LED SENSE for an end of pulse logic 1 condition. the TEU then checks that the LT/R returns to a non-tracking state after the last pulse is received. CORRELATE, LED SENSE and MLO logic should be logic 0. If CORRELATE, LED SENSE or MLO logic is logic 1, TADS LASER TRACKER NO-GO and TADS ELECTRONIC UNIT NO-GO LH FAB messages are sent to MRTU type I LH FAB on the serial interface bus.

(2) LT/R Initiated Class B BIT. Initiated class B BIT verifies proper operation of the LT/R. LT/R class B BIT is divided into three subroutines: Initiated class A BIT, code reject test, and LT cage test. Initiated class A BIT is the same as discussed in paragraph (1) above. The code reject test verifies that the LT/R will only track laser energy at the proper code. The BIT control circuitry flashes the LEDs at a PRF different than the input code specifies. For proper operation, correlation should not occur throughout the entire test. If correlation does occur, TADS LASER TRACKER NO-GO and TADS ELECTRONIC UNIT NO-GO LH FAB messages are sent to MRTU type I LH FAB on the serial interface bus. The LT cage test verifies the laser tracker does not process laser energy until enabled to do so. The BIT control circuits flash the LEDs at the correct PRF, set the LED pulse count to 29, and the TEU applies a logic 0 CORRELATE input to disable the LT/R. The test checks to make sure the LED pulses have occurred and that LED SENSE is logic 0. If the TEU fails to output an LED pulse within 60 msec, TADS LASER TRACKER NO-GO and TADS ELECTRONIC UNIT NO-GO LH FAB messages are sent to MRTU type I LH FAB on the serial interface bus. When the pulse count is equal to or less than 18, the TEU applies a logic 1 CORRELATE input to enable the LT/R. The TEU then reads LED SENSE and EAT logic. If correlation does not occur before the pulse count reaches 29, TADS LASER TRACKER NO-GO and TADS ELECTRONIC UNIT NO-GO LH FAB messages are sent to MRTU type I LH FAB on the serial interface bus.

2-17. LASER TRACKER/RECEIVER (LT/R) (cont)

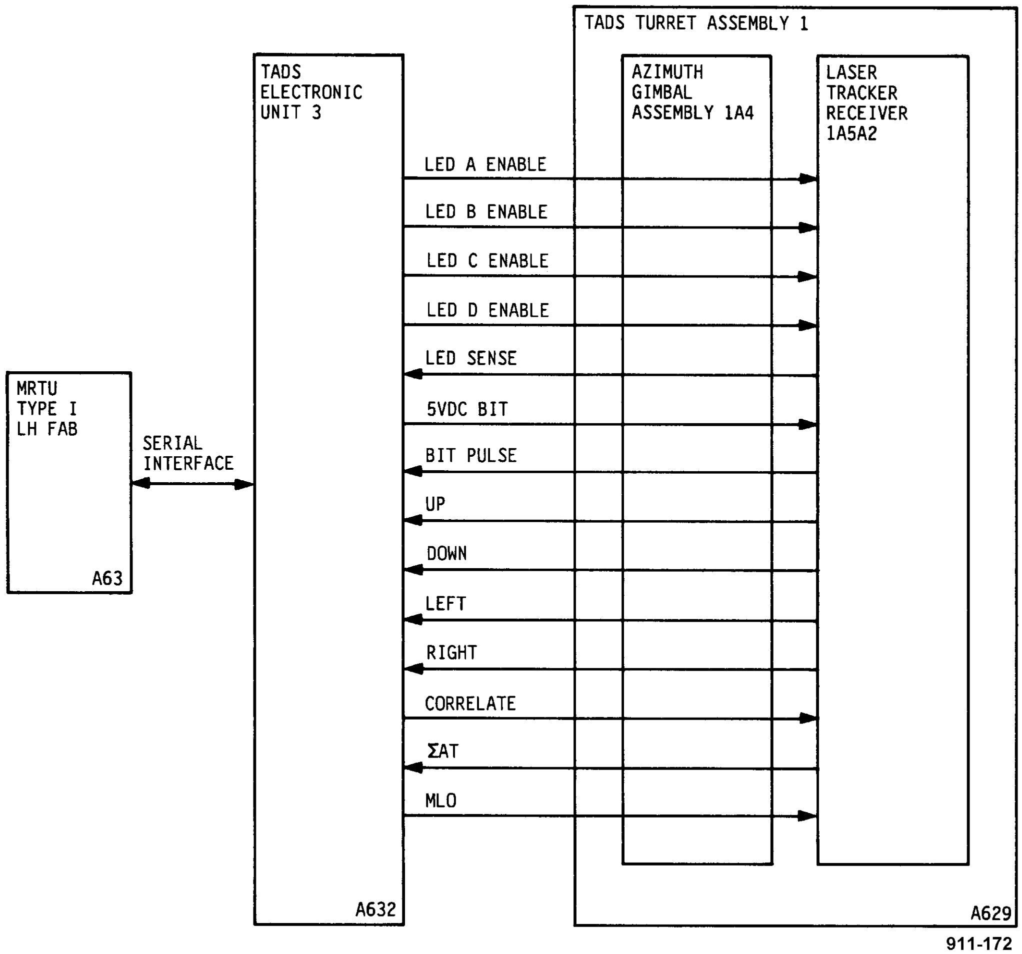


Figure 2-76. Laser Tracker/Receiver Block Diagram

2-18. WEAPON ACTION SWITCH (WAS) AND WEAPON TRIGGER SWITCH

The weapon action switch (WAS) actions missiles, gun, or rockets as the selected armament. The weapon trigger switch has two detents and enables weapons firing. The first detent fires the weapon if there is no performance or safety inhibits. The second detent overrides performance inhibits, but not safety inhibits. (See block diagram fig. 2-77 and wiring interconnect diagram fig. 3-67.) Refer to TM 9-1090-208-23-2 for detailed theory of operation.

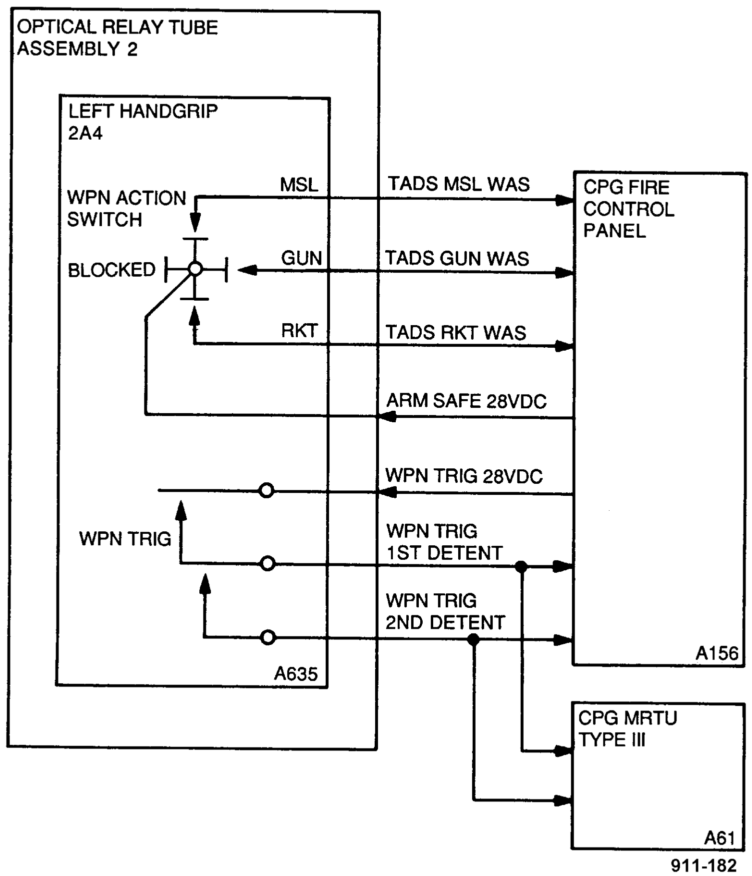


Figure 2-77. Weapon Action Switch and Weapon Trigger Switch Block Diagram

2-19. BRAKE RELEASE

The TADS azimuth gimbal assembly azimuth and elevation drive motors have electronic brakes that must have voltage applied to release the brakes. (See block diagram fig. 2-78 wiring interconnect diagram fig. 3-66.) During normal operation, AZ BRAKE (OPER) is applied to the azimuth gimbal assembly motors through the normally closed contacts of TADS turret brake release switch assembly 1A1A4 BRAKE RELEASE switch. This releases the brakes and allows the TADS turret to rotate, in azimuth and elevation, as commanded through the servo loop circuits. During maintenance, the BRAKE RELEASE switch is held in the normally open position to apply aircraft 28 VDC to the brakes. This releases the brakes and allows the TADS turret to be moved by hand to the desired position. If aircraft power is not available, a TADS/PNVS brake release power supply is connected to TADS turret connector 1A1W2J4 to supply the voltage.

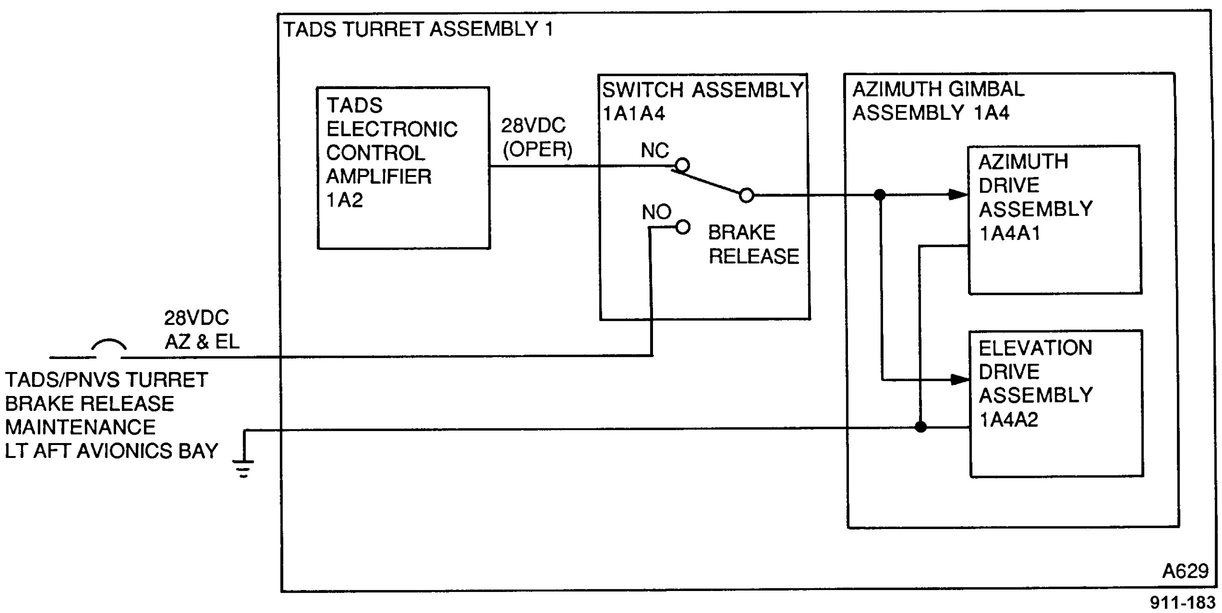


Figure 2-78. TADS Brake Release Block Diagram

2-20. ANTI-ICE

The TADS anti-ice function is selected by the pilot or copilot/gunner (CPG) when icing conditions are present. (See block diagram fig. 2-79 and wiring interconnect diagram fig. 4-12.) When the pilot anti-ice panel or CPG auxiliary TADS/PNVS switch is set to ON and the helicopter is off the ground, 28 VDC is applied to MRTU type I or MRTU type III from aft pilot circuit breaker panel circuit breaker CB70 through contacts of the energized squat relay. The squat relay can be bypassed by setting either TADS/PNVS anti-ice switch to GND. The 28 VDC input to MRTU type I or 111 causes MRTU type I to apply the ANTI-ICE ON input (28 VDC) to the TADS power supply. With the ANTI-ICE ON input to the TADS power supply: (1) 115 VAC ØA WINDOW is applied to the day sensor shroud windows and boresight module windows, (2) 115 VAC ØC WINDOW is applied to the night sensor shroud window, (3) 115 VAC ØA ANTI-ICE is applied to the day sensor shroud heater, (4) 115 VAC ØC ANTI-ICE is applied to the night sensor shroud window frame and shroud heater, and (5) 22 VAC is applied to anti-ice CCAs in all shrouds. The 115 VAC ØA and ØC WINDOW voltages are applied to anti-ice CCAs in the respective assembly.

a. Anti-Ice Power Application. When the ANTI-ICE ON input is applied to TADS power supply bite control CCA 4A5, the ANTI-ICE T < 15 degrees and ANTI-ICE outputs energize two relays on power components assembly 4A7 to switch 115 VAC to the day sensor and night sensor shrouds and boresight module. ANTI-ICE T < 15 degrees switches 115 VAC to the 115 VAC ØA and ØC WINDOW outputs. ANTI-ICE switches 115 VAC to the 115 VAC ØA and ØC ANTI-ICE outputs. The 115 VAC input is also switched to a step-down transformer on 4A7 to produce a 22 VAC output. Bite control CCA 4A5 senses the 115 VAC ØA WINDOW output of 4A7 and applies a logic 0 (DC return) to the TADS power supply TADS WINDOW PWR BIT output.

b. Window Power Control. The TADS power supply output voltages are routed through helicopter wiring harness W255 to the TADS turret assembly where they are distributed to the day sensor and night sensor shroud assemblies and the boresight module. All three assemblies have window heaters and anti-ice CCAs. Day sensor shroud assembly 1A6 anti-ice will be described. 115 VAC ØA WINDOW is applied to day sensor shroud windows and anti-ice CCA 1A6A1 and 22 VAC is applied to 1A6A1. The 22 VAC input to 1A6A1 is used to produce DC operating voltage for the CCA. Anti-ice CCA 1A6A1 adjusts the power applied to each window by sensing the window temperature and changing the amount of time during each 115 VAC ØA WINDOW AC cycle that current is allowed to flow through the windows. The 115 VAC input to 1A6A1 is used to synchronize pulses to triacs on 1A6A1 that apply an AC return to the windows. This supplies power on demand to maintain window temperature above icing conditions.

c. Anti-Ice BIT. Anti-ice CCA 1A6A1 BIT is active only during the first 350 milliseconds after power is applied to the CCA. The BIT circuits, when activated by input voltage, allow full 115 VAC ØA WINDOW AC current to flow through the windows. The current is sensed by 1A6A1 and a DC return (logic 0) is applied to the TADS DAY SHROUD FAIL output through the SHROUD FAIL RETURN. If the proper current is not sensed by 1A6A1, the ØC return is not applied to the fault output. This allows the TEU to pull the fault input up to logic 1 (5 VDC). After the 350 millisecond time period, 1A6A1 begins a soft-start sequence that gradually increases the power applied to the window over a two minute period. After the soft-start sequence, window power is controlled by 1A6A1 to maintain the proper window temperature.

2-20. ANTI-ICE (cont)

d. Shroud Heaters. The day sensor shroud assembly shroud heater is on when shroud temperature is below 55°F (12.7°C) and anti-ice is selected. The shroud heater is not controlled by anti-ice CCA 1A6A1 and does not have any FD/LS BIT. When shroud temperature is below 55°F (12.7°C), the thermostatic switch is closed to allow 115 VAC ØA ANTI-ICE current to flow through the shroud heater. When the shroud temperature rises above 70°F (21.1°C), the thermostatic switch opens and the shroud temperature must fall below 55°F (12.7°C) for the thermostatic switch to close again. The night sensor shroud assembly has a window frame heater and a shroud heater. The boresight module does not have any heaters other than the window.

e. Anti-Ice FD/LS. TADS WINDOW POWER BIT, TADS DAY SHROUD FAIL, NIGHT SHROUD FAIL, and BRST WINDOW MOD FAIL logic is applied to TEU serial/discrete I/O CCA 3A10. During continuous FD/LS, TEU CPU CCA 3A8 reads an anti-ice status word sent through the serial interface bus from MRTU type I and then reads the TADS WINDOW POWER BIT. When the status word indicates that anti-ice has been selected and the WINDOW POWER BIT is logic 0, 3A8 reads the TADS DAY SHROUD FAIL, NIGHT SHROUD FAIL, and BRST WINDOW MOD FAIL bits. If any bit is a logic 1, the TEU sends the appropriate fault message on the serial interface bus to MRTU type I. When all three fault inputs are logic 1 the TEU sends a TADS power supply fail message to MRTU type I on the serial interface bus. If the TADS WINDOW POWER BIT is a logic 0 when the status word indicates that anti-ice has not been selected, the TEU sends a TADS POWER SUPPLY NO-GO LH FAB message to MRTU type 1 on the serial interface bus. BIT circuits can be reset by setting anti-ice switches to OFF and then setting one switch to GND to reapply anti-ice power to the windows.

2-20. ANTI-ICE (cont)

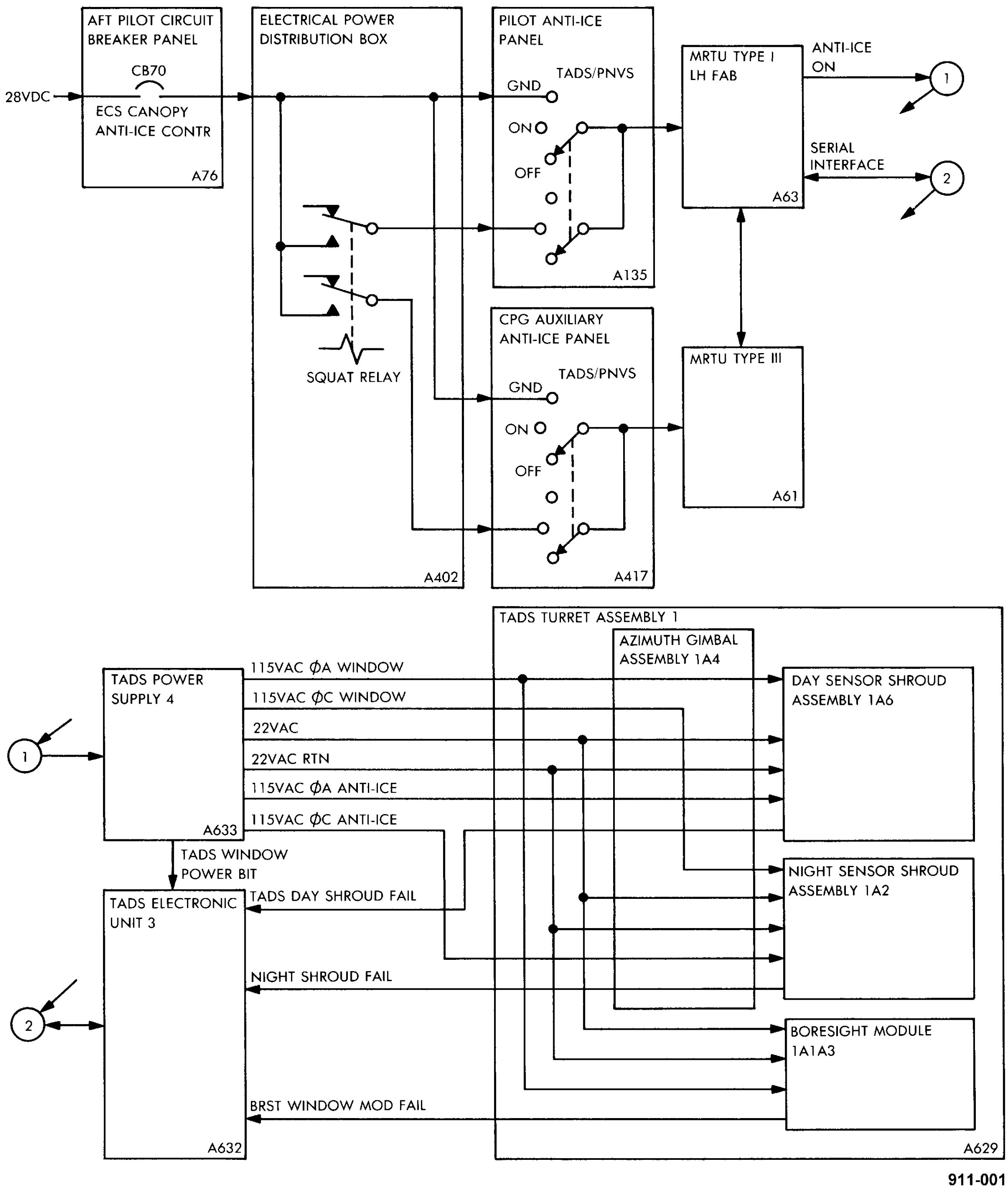


Figure 2-79. Anti-Ice Block Diagram

2-21. ENVIRONMENTAL CONTROL SYSTEM (ECS)

The ECS circulates conditioned air from the helicopter cockpit through the PNVS turret assembly, the TADS NSA, DSA, and TECA (fig. 2-80). With TADS in standby or operate, the ECS blower draws conditioned cockpit air through the filter and into the system. The air is distributed to PNVS and TAOS assemblies through aircraft interface assembly ducting and dumped overboard after it passes over TECA heat sinks. Air circulation is increased with fans distributed throughout the PNVS turret, NSA, and DSA. In cold weather, duct heaters heat the air drawn from the cockpit.

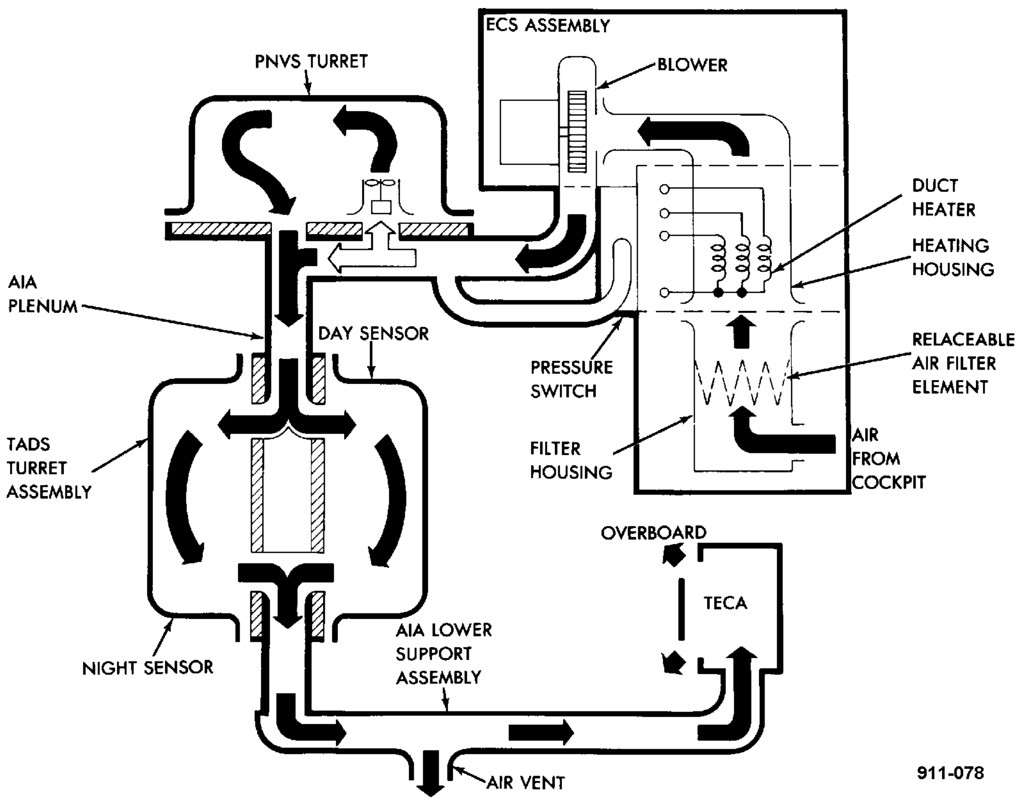


Figure 2-80. Environmental Control System (ECS) Air Flow Diagram

2-21. ENVIRONMENTAL CONTROL SYSTEM (ECS) (cont)

a. Operating Voltage. Aircraft 115 VAC and 28 VDC unswitched is applied (para. 2-7 thru 2-9) to the ECS. When TADS or PNVS is in standby, the 115 VAC input is switched to the ECS blower and duct heaters. The 28 VDC input is used for blower/heater relay control logic.

b. Standby. TADS and PNVS should be brought to operating temperature while the system is in standby. When TADS or PNVS is in standby, the TADS power supply applies a 24 VDC OR'D STANDBY input to an ECS relay. (See block diagram fig. 2-81 and wiring interconnect diagram fig. 3-89.) This applies 115 VAC 30 power to the ECS blower. If the day sensor subassembly chassis is less than 40°F (4.4°C), the heater control thermostatic switch is closed to energize two ECS relays that apply 115 VAC to three duct heaters. When the day sensor subassembly chassis temperature rises above 70°F (21.1°C), the heater control thermostatic switch opens and one ECS relay deenergizes to remove power from duct heaters No. 2 and 3. One ECS relay latches when energized to maintain power to duct heater No. 1 until TADS power is removed. The ECS is protected from duct heater overtemperature conditions by an overtemp thermostatic switch. The overtemp thermostatic switch closes below 215°F (101.6°C) and opens when ECS temperature rises above 250°F (121°C). With the overtemp thermostatic switch open, voltage is removed from the duct heaters. Duct heaters are switched on or off in response to operate commands and anti-ice commands as described in paragraph c below. The blower remains on under all operating conditions.

c. Operate or Anti-Ice. When TADS is in operate or anti-ice is selected (para 2-20), the TADS power supply applies 24 VDC to the ECS TADS OPERATE/ANTI-ICE input. This energizes an ECS relay to remove 115 VAC from duct heater No. 2 and 3. Duct heater No. 1 operates as described in standby.

d. TADS Not Ready. A TADS NOT READY message is displayed when the day sensor chassis temperature is less than 50°F (10°C). A day sensor TADS not ready thermostatic switch is closed below 40°F (4.4°C) and opens when the temperature rises above 50°F (10°C). When the thermostatic switch is closed, a DC return is applied directly through the ECS to the CPG MRTU type III TADS NOT READY input and the TADS NOT READY message is displayed. When the thermostatic switch is open, the DC return is removed from the TADS NOT READY input and the TADS NOT READY message is discontinued.

e. ECS BIT. The TEU reads ECU FAIL 1 thru 3 inputs and evaluates TADS and PNVS operation to determine if the ECS is functioning properly. ECU FAIL 4 and 5 are not evaluated by the TEU. ECU FAIL 1 thru 3 are controlled by thermostatic switches as follows:

- The day sensor assembly heater control thermostatic switch applies a logic 0 to ECU FAIL 1 when heat is required.
- The ECS overtemp thermostatic switch controls a relay that applies a logic 1 to ECU FAIL 2 when ECS duct heater and blower operation are normal.
- The ECS heater on thermostatic switch applies a logic 1 to ECU FAIL 3 when the duct heaters are warm. This thermostatic switch closes at 160°F (71.1°C) and opens at 135°F (57.2°C).

2-21. ENVIRONMENTAL CONTROL SYSTEM (ECS) (cont)

The TEU reads the ECU FAIL inputs, evaluates TADS and PNVS operating mode, and sends a TADS ECS NO-GO fail message to the MRTU type I LH FAB on the serial interface bus for the following conditions:

- Heat required and heaters cold with condition lasting more than 3 minutes.
- No heat required and heaters warm with condition lasting more than 4 minutes.

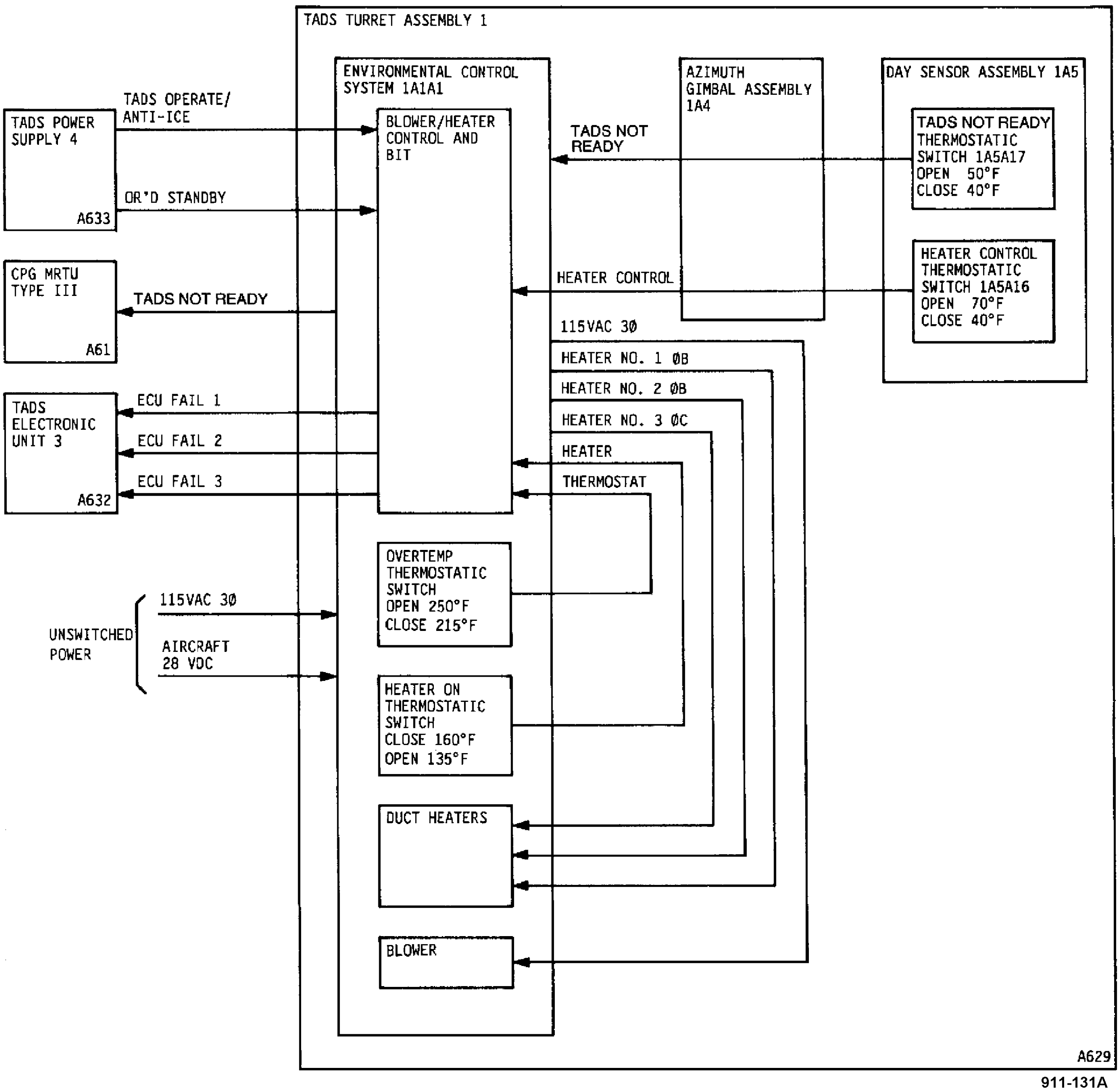


Figure 2-81. Environmental Control System Block Diagram

2-22. BORESIGHT

Boresight alines TADS sensors to a coincident LOS. Boresight includes a cue update, internal boresight, and outfront boresight. Paragraphs a thru d below describe boresight optics, electronics, and FD/LS. See figure 2-82 for boresight module optical path. (See block diagram fig. 2-83 and wiring interconnect diagram fig. 3-88.)

a. Cue Update. Cue update alines the turret with the boresight module by adjusting the turret position until the TV sensor is in alinement with the cue update reticle. Cue update must be accomplished before performing internal and/or outfront boresight. Cue update is selected using the CPG fire control panel BRSIT TADS switch. When selected, MRTU type I LH FAB sends a boresight command on the serial interface bus to the TEU. The TEU applies a BRST LAMP CMD to the boresight module that switches the 12.6 VAC unswitched input to the cue update lamp circuit. Light from the cue update lamp shines through four transducer pie shaped cut outs, and is reflected through the transfer prism and out the boresight module day sensor window to the TV sensor. The operator selects manual track using the ORT assembly right handgrip SLAVE switch; then using the ORT assembly right handgrip MAN TRK control, positions the turret to aline the cue update image in the display. Pressing the SLAVE switch, after the turret is alined, commands the system to internal boresight.

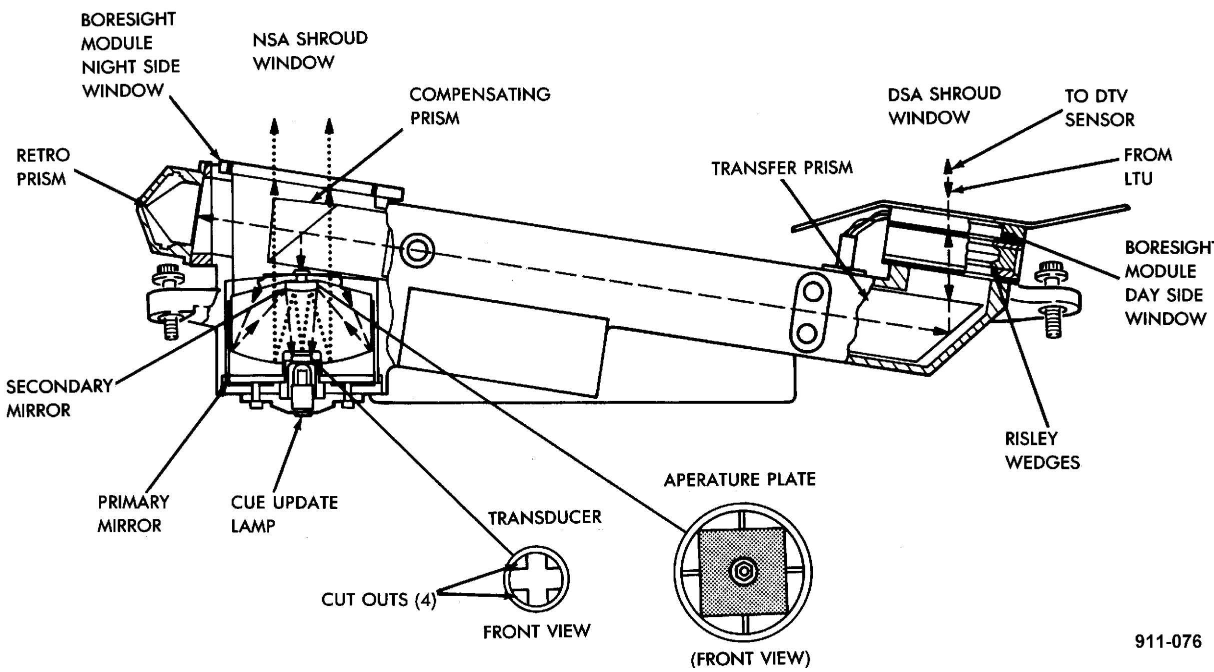


Figure 2-82. Boresight Module Optical Path

2-22. ENVIRONMENTAL CONTROL SYSTEM (ECS) (cont)

b. Internal Boresight. Internal boresight alines the DSA TV sensor to the laser LOS, night sensor assembly FLIR to the laser LOS, and DVO to the TV sensor LOS. These alinements are done in order, in the air or on the ground. When alining the TV sensor or FLIR to the laser LOS, the laser is fired and a spot representing the laser LOS appears on the display. The tracking gates appear and capture the laser spot. The LOS reticle is electronically shifted to be coincident with the laser spot. When completed, the tracking gates will blank. When alining the DVO to the TV sensor LOS, the DVO and TV sensor retitles appear on the display. The DVO boresight adjust switch on the ORT assembly control panel is set until the DVO reticle is coincident with the TV sensor LOS reticle.

(1) Day TV to Laser LOS. DTV to laser LOS internal boresight is initiated when the laser has been armed and turned on and the ORT assembly LASER TRIG switch is held in the second detent while the ORT assembly control panel boresight enable switch is set to the down position. Setting the ORT assembly control panel boresight enable switch to down applies a logic 0 (DC return) to BORESIGHT ENABLE HI through BORESIGHT ENABLE LO. A logic 0 BORESIGHT ENABLE HI is processed by MRTU type III and MRTU type I and a boresight command is sent to the TEU on the serial interface bus. The TEU applies LRS BRST SYNC to LEU code generator CCA 5A4 to set the laser boresight mode. If FD/LS detects that the laser shutter is closed (para d below), the laser is fired into the boresight assembly. Laser energy from the LTU exits the DSA and enters the boresight module. The laser energy travels through the risley wedges and the transfer prism to the compensating prism. The compensating prism reflects approximately 20% of the laser energy for FLIR alinement. Approximately 80% of the laser energy passes through the compensating prism and is reflected back through the boresight module the same way it entered. The laser energy then enters the DSA TV sensor. The laser energy appears as a spot on the DTV video display. The position of the spot, in respect to the DTV reticle, is the difference between the laser and DTV LOS. The TEU captures the laser spot and automatically adjusts the DTV VERT and HORIZ BRST TV sensor raster scan inputs to aline the DTV LOS to the laser LOS. DTV boresight is performed in both narrow and zoom field-of-view.

2-22. BORESIGHT (cont)

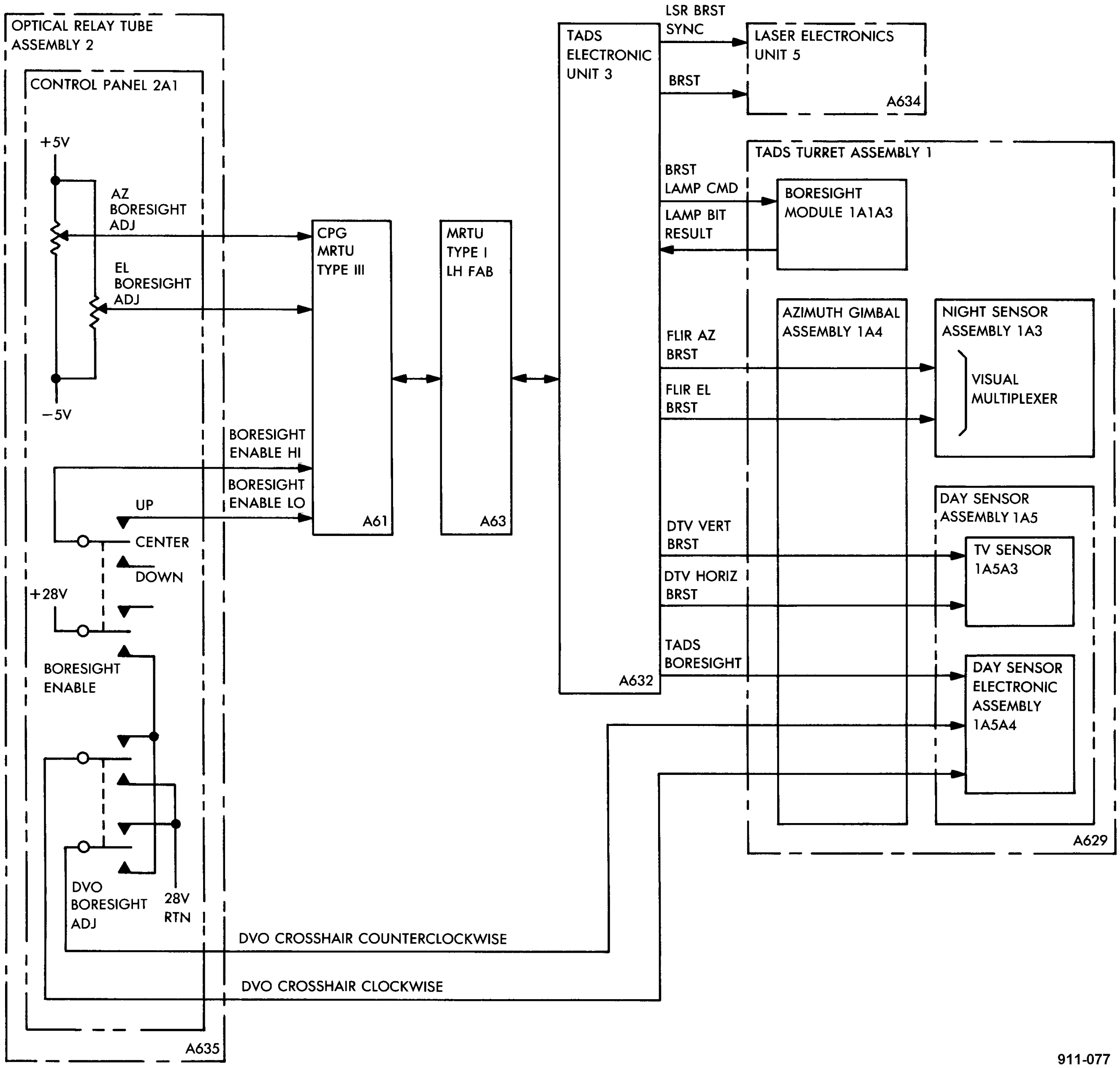


Figure 2-83. Boresight Block Diagram

2-22. BORESIGHT (cont)

(2) FLIR to Laser LOS. FLIR internal boresight to laser LOS is initiated by the same commands as DTV except the operator positions the ORT assembly left handgrip sensor select switch to FLIR and selects white hot with the right hand grip FLIR PLRT switch.

(a) The laser is fired into the boresight module. As described above, 20% of the laser energy is reflected by the compensating prism and strikes the aperture plate where it is diffused. The diffused laser energy is reflected from the primary to the secondary mirror and onto the transducer. As the transducer heats, the IR energy emitted by the transducer and the background is reflected from the secondary to the primary mirror; through and around the aperture plate, compensating prism, and transfer prism to the NSA where it becomes visible to the FLIR. The transducer image appears as a spot in the FLIR video (if necessary, ORT assembly control panel GAIN and LVL controls can be adjusted for best laser spot presentation). The TEU captures the laser spot and makes a subsequent adjustment to the NSA visual multiplexer FLIR AZ and EL BRST raster scan inputs to center the display. TADS FLIR is also boresighted in narrow and zoom FOVs.

(b) If the laser spot is not centered during FLIR boresight, the ORT assembly control panel boresight enable switch is set to the center position while the laser is continuously fired. Adjustments are made to azimuth and elevation position using the azimuth and elevation boresight controls. Analog inputs are processed by CPG MRTU type III and applied to the TEU as serial data to correct the visual multiplexer FLIR AZ and EL BRST raster scan inputs to center the display. The boresight enable switch is set to up after the manual adjustment and the image auto track procedure is continued.

(3) DVO to DTV. DVO to DTV boresight alines the DVO NFOV optical path to the DTV NFOV optical path. DTV boresight must occur prior to DVO boresight. The operator initiates DVO boresight by setting the ORT assembly left handgrip sensor select switch to DVO and the control panel boresight enable switch to down. The TEU sends the TADS BORESIGHT command to day sensor electronics assembly 1A5A4 and 12.6 VAC unswitched is applied to the DVO boresight lamp. Light from the lamp is reflected by the day sensor switching mirror back through the DVO NFOV optical path along with the reticle image. Refer to DVO theory for optical path. The projected image exits the DSA through the common aperture and shroud window to the boresight module. The image follows the same optical path through the boresight module as the laser energy. The retro prism reflects the projected image back through the entry path to the DSA and is displayed on the DTV video display. The display consists of the DVO NFOV reticle and the DTV NFOV reticle. If the retitles are not alined, the DVO boresight adjust switch is set up or down to send DVO CROSSHAIR CLOCKWISE or COUNTERCLOCKWISE to the DSA which rotates the DVO boresight field lens assembly until both retitles are superimposed.

2-22. BORESIGHT (cont)

c. Outfront Boresight. Outfront boresight is performed on the ground and brings the FLIR LOS into coincidence with the TV sensor LOS. An “outfront” target is tracked by FLIR and DTV. Target range, if known, may be entered by the operator. If target range is not known, lasing the target may occur to obtain the range. When the range has been entered, the target is tracked in FLIR with IAT enabled. Next the target is viewed with DTV. When boresight is enabled, (CPG fire control panel BRSIT TADS/OFF switch set to OFF and ORT assembly control panel boresight enable switch set to up), the TEU mixes the FLIR tracker symbology into the DTV video. If a difference exists between the center of two lines-of-sight, adjustments are made to azimuth and elevation position using the azimuth and elevation boresight controls. Analog inputs are processed by CPG MRTU type III and applied to the TEU from MRTU type I as serial data to correct the visual multiplexer FLIR AZ and EL BRST raster scan inputs to center the display.

d. Boresight FD/LS. BIT monitors turret position when boresight is selected, cue update lamp operation during cue update, and laser shutter status before the laser is allowed to fire.

(1) Turret Position. When boresight is selected, the turret is commanded to azimuth and elevation boresight position. Resolver outputs are measured by the TEU to determine if the turret is in the correct position. If the turret position is not correct (7.5 seconds after boresight is initiated) the TEU sends a servo fail message to MRTU type I on the serial interface bus.

(2) Cue Update Lamp. During cue update, current through the boresight module cue update lamp is monitored by BIT. BIT applies a logic 0 (DC return) to the TEU on LAMP BIT RESULT HI when the cue update lamp is on. The TEU reads the LAMP BIT RESULT HI input during continuous BIT. When the TEU reads a boresight command on the serial interface bus from MRTU type I, the TEU reads LAMP BIT RESULT HI after a 120 millisecond delay. If LAMP RESULT HI is a logic 1, a boresight module fail message is sent to MRTU type I on the serial interface bus.

(3) Laser Shutter. Before the laser is enabled, during internal boresight, the laser shutter BIT is evaluated by FD/LS to determine if the shutter is closed. If the shutter is open, the laser cannot be enabled and the TEU sends LTU fail and LRF/D fail messages to MRTU type I on the serial interface bus.

2-23. ALPHANUMERIC DISPLAY (AND)

The AND displays weapon, sighting, and laser system status on the HOD. Characters to be displayed on the HDD are stored in FCC memory and are sent to the AND on the AND/MRTU type III serial interface bus. (Refer to para 2-10). Information received on the serial interface bus is decoded to drive a LED display. The LED image is routed to the ORT assembly eyepiece through a fiber optic cable. AND operation is evaluated during manual FD/LS.

2-24. VIDEO RECORDER SWTCH

The ORT assembly right handgrip VID RCD switch is pressed and released to start or stop the video recorder in play or record. The VID RCD switch is connected through ORT assembly and aircraft wiring to CPG MRTU type III. (See block diagram fig. 2-84 and wiring interconnect diagram fig. 3-68.) The VID RCD switch has no direct effect on TADS operation; however, during operator interactive BIT, switch status is sent to the TEU to test operation. If the switch does not operate, the TEU will send a ORT RIGHT HANDGRIP NO-GO CPG COMPARTMENT message to MRTU type I LH FAB on the serial interface bus.

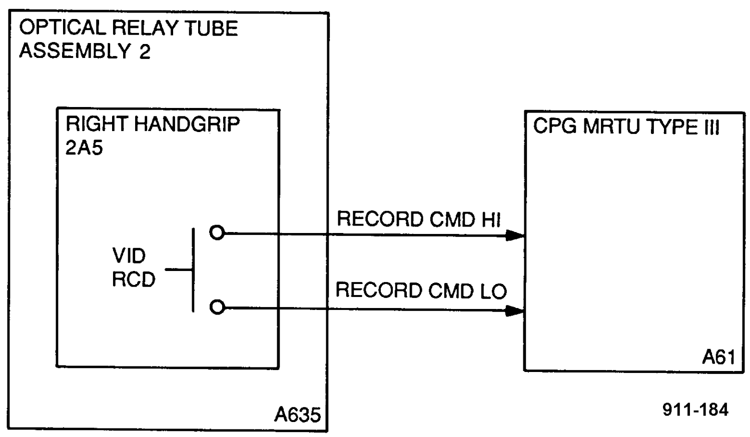


Figure 2-84. Video Recorder Switch Block Diagram

CHAPTER 3

TARGET ACQUISITION DESIGNATION SIGHT

TROUBLESHOOTING PROCEDURES

3-1. INITIAL SWITCH SETTING

INITIAL SETUP

Personnel Required:

68X Aircraft Armament/Electrical Repairer
67R Attack Helicopter Repairer

References:

TM 1-1520-238-23

TM 1-1270-476-20

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

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1. Access copilot/gunner (CPG) station (fig. 3-1) (TM 1-1520-238-23).

2. Set CPG fire control panel switches (fig. 3-2):

Switch	Position
CPG	**OFF**
RKT	**OFF**
GUN	**OFF**
MSL	**OFF**
LSR	**OFF**
SIGHT SELECT	**STBY**
ACQ SEL	**FXD**
LSR MSL CCM	down (off)
BRSIT/IHADSS/IRIS	**OFF**
BRSIT/TADS	**OFF**
MUX	**PRI**
FCC MUX	**ON**
TADS LSR CODE LRF/D	
CCM	**OFF**
SYSTEM FC SYM GEN	**OFF**
SYSTEM IHADSS	**OFF**
SYSTEM TADS/FLIR OFFOFF	

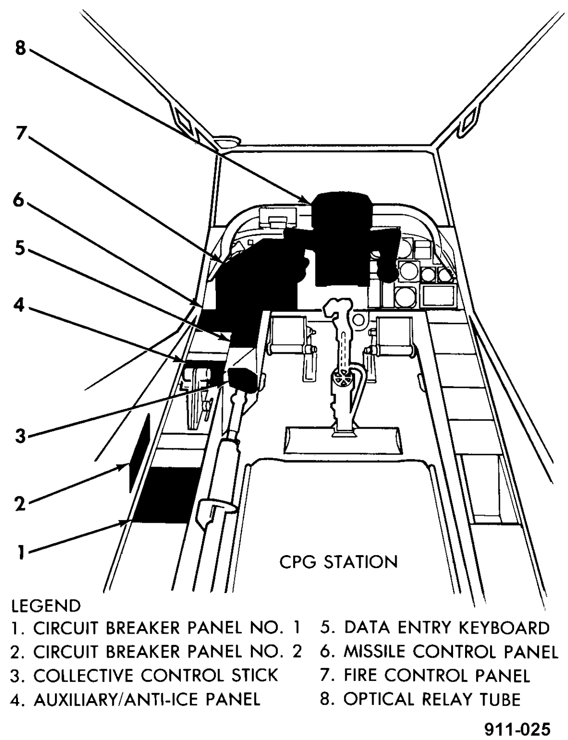

Figure 3-1. CPG Station Panel Location

3-1. INITIAL SWITCH SETTING (cont)

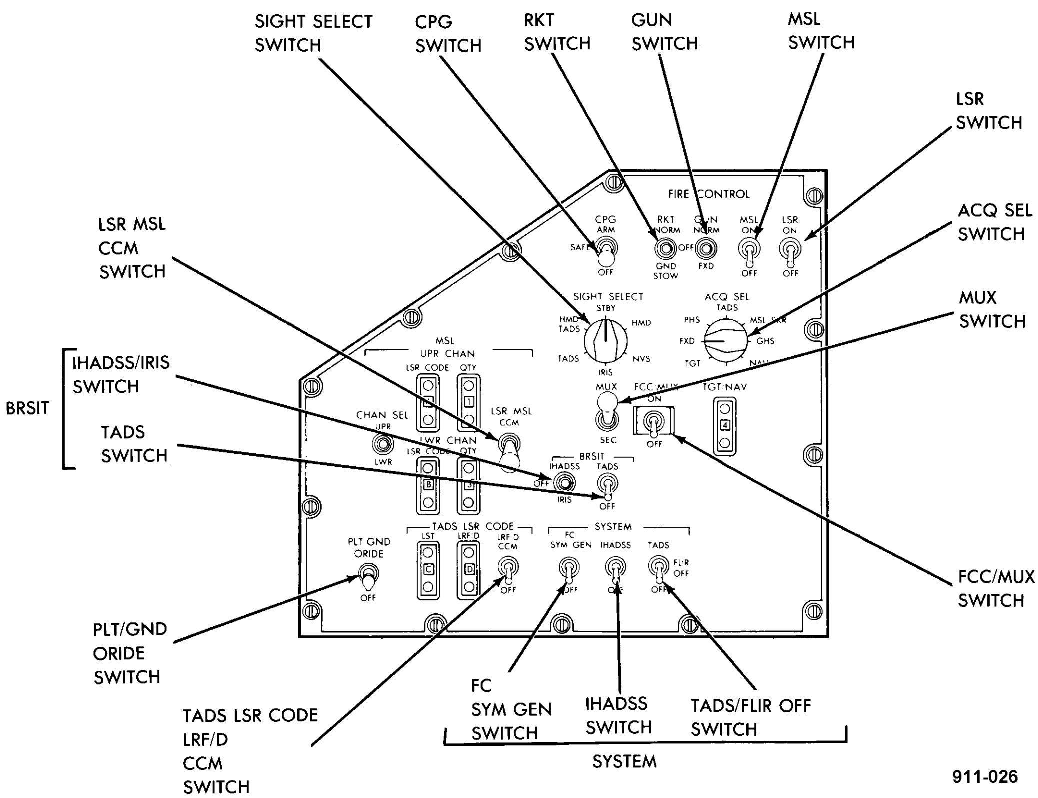

Figure 3-2. CPG Fire Control Panel Control Location

3-1. INITIAL SWITCH SETTING (cont)

3. Set optical relay tube (ORT) assembly left handgrip switches (fig. 3-3):

Switch	Position
Field of view **(Z/W/M/N)**	**W**
Weapon action **(RKT/GUN/MSL)**	center (no weapon)
Sensor Select **(FLIR/TV/DVO)**	**TV**

4. Set ORT control panel controls:

Control	Position
GAIN	full CCW
LVL	full CCW
ACM	down (off)
SYN BRT	full CW
AND BRT	full CW

5. Set ORT right handgrip switches:

Switch	Position
LT	**OFF**
IAT polarity **(WHT/AUTO/BLK)**	**AUTO**

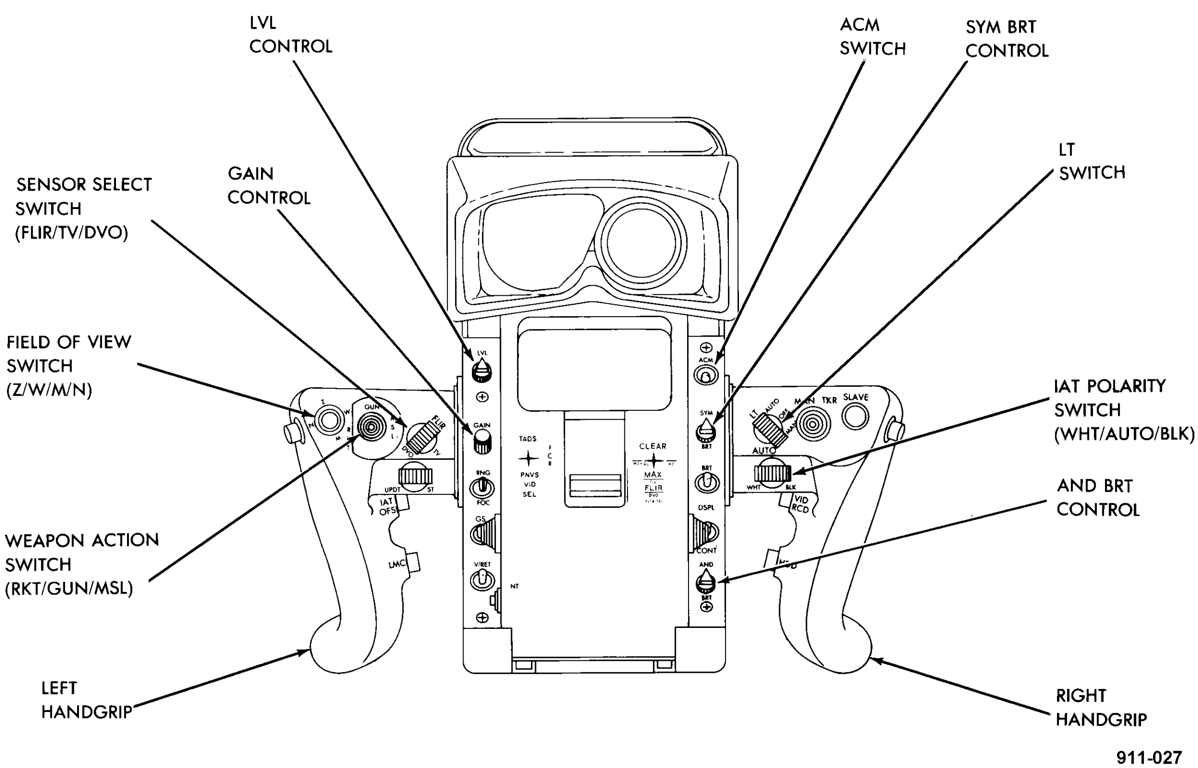

Figure 3-3. Optical Relay Tube Assembly Control Location

3-1. INITIAL SWITCH SETTING (cont)

6. Set CPG collective control stick switches (fig. 3-4):

Switch	Position
NVS	**TADS**
PLRT/BRSIT HMD	center (off)

7. Open circuit breaker panel No. 1 circuit breakers (fig. 3-5):

AWS DC
AWS DC

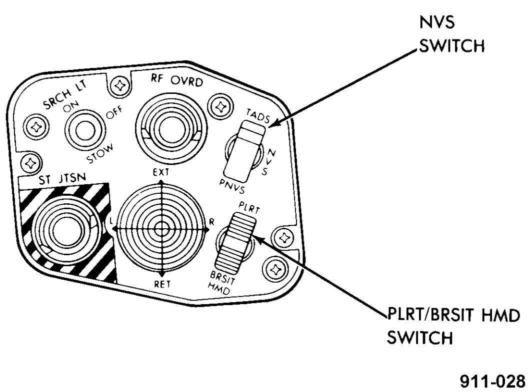

Figure 3-4. CPG/Pilot Collective Control Stick Control Location

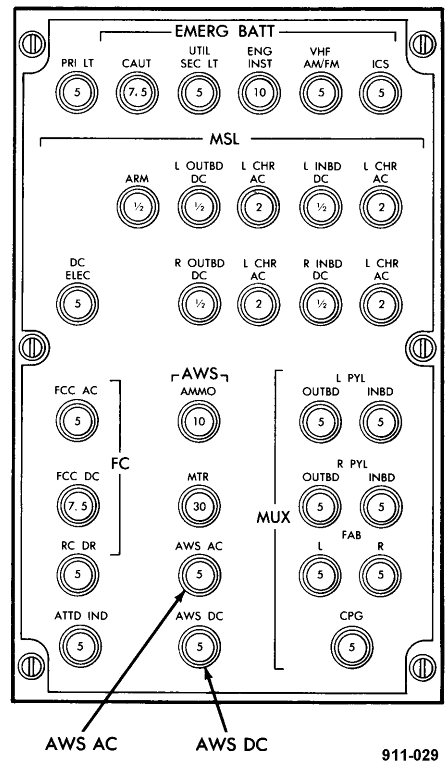

Figure 3-5. Circuit Breaker Panel No. 1 Circuit Breaker Location

3-1. INITIAL SWITCH SETTING (cont)

8. Set auxiliary/anti-ice panel switches (fig. 3-6):

Switch	Position
AUX ADSS	**OFF**
AUX STBY FAN	**OFF**
ANTI-ICE TADS/PNVS	**OFF**

9. Set CPG missile control panel switches (fig. 3-7):

Switch	Position
TYPE	**RF/IR**
MODE	**STBY**
LOAL	**OFF**

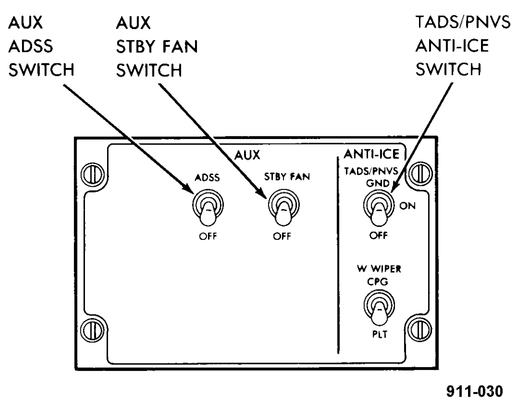

Figure 3-6. Auxiliary/Anti-Ice Panel Control Location

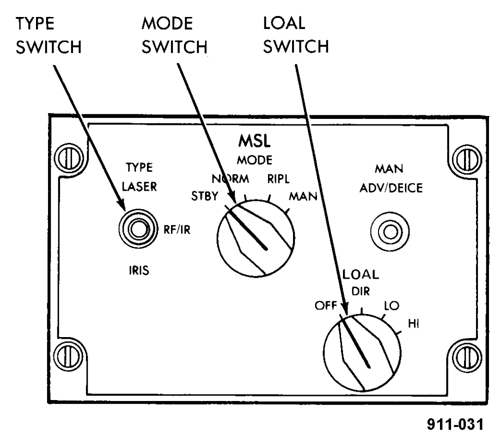

Figure 3-7. CPG Missile Control Panel Control Location

3-1. INITIAL SWITCH SETTING (cont)

10. Set data entry keyboard **DATA ENTRY** switch (fig. 3-8) to **OFF**.

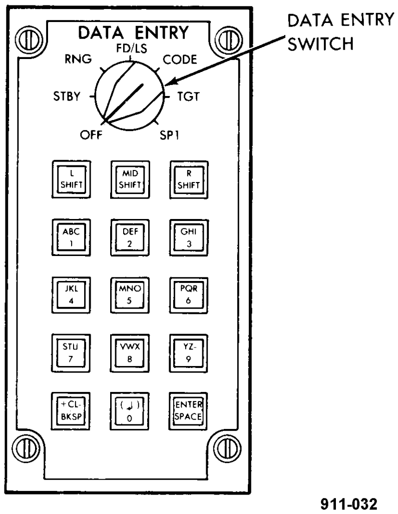

Figure 3-8. Data Entry Keyboard Control Location

11. Open circuit breaker panel No. 2 **LASER** circuit breaker (fig. 3-9).

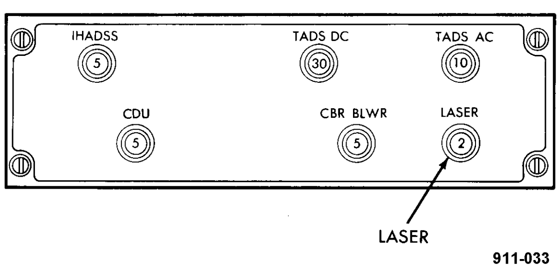

Figure 3-9. Circuit Breaker Panel No. 2 Circuit Breaker Location

12. Access pilot station (fig. 3-10) (TM 1-1520-238-23).

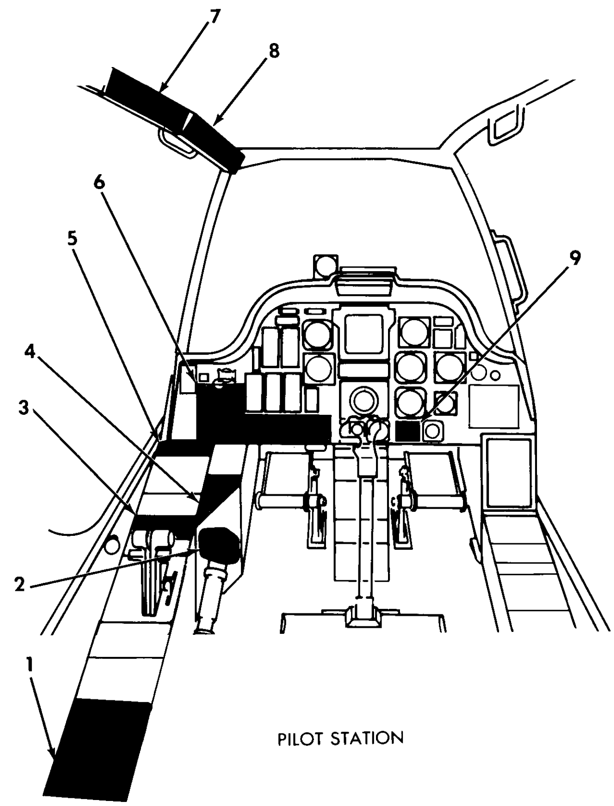

Figure 3-10. Pilot Station Panel Location

3-1. INITIAL SWITCH SETTING (cont)

13. Set pilot fire control panel switches and controls (fig. 3-11):

Switch/Control	Position
MASTER	**OFF**
RKT	**OFF**
GUN	**OFF**
MSL	**OFF**
SIGHT SEL	**STBY**
ACQ SEL	**NVS FXD**
VID SEL	**PLT**
ACM	**OFF**
PNVS	**OFF**

Switch/Control	Position
FLIR VID GAIN	full CCW
FLIR VID LEVEL	full CCW
IHADSS VID SYM BRT	full CCW
IHADSS VID BRT	full CCW
IHADSS VID CONTRAST	full CCW
IHADSS BRSIT	OFF

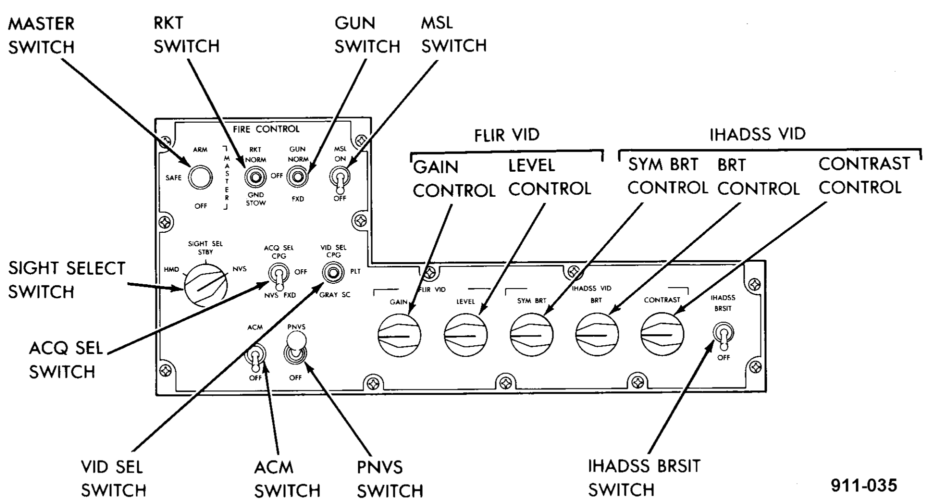

Figure 3-11. Pilot Station Fire Control Panel Control Location

3-1. INITIAL SWITCH SETTING (cont)

14. Set pilot HARS control panel **ALIGN** switch to **OFF** (fig. 3-12).

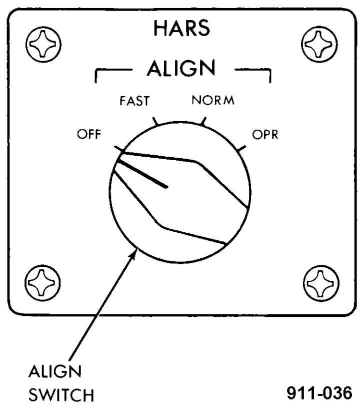

Figure 3-12. HARS Control Panel Control Location

15. Set pilot collective control stick switches (fig. 3-4):

Switch	Position
NVS	**PNVS**
PLRT/BRSIT HMD	center (off)

16. Set anti-ice panel **TADS/PNVS** switch to **OFF** (fig. 3-13).

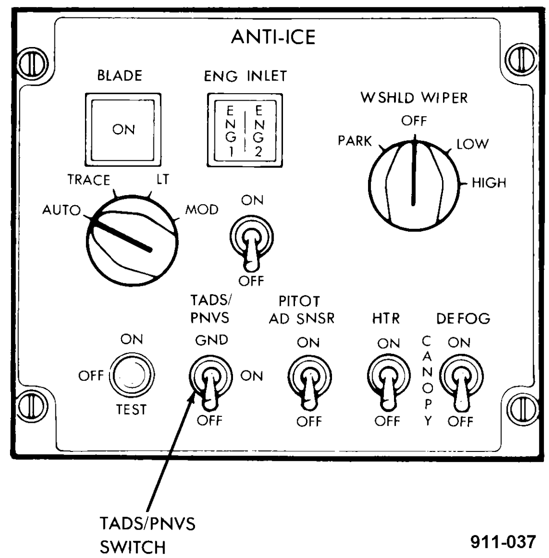

Figure 3-13. Anti-Ice Panel Control Location

3-1. INITIAL SWITCH SETTING (cont)

17. Set electrical power panel **BATT/OFF/EXT PWR** switch to **OFF** (fig. 3-14).

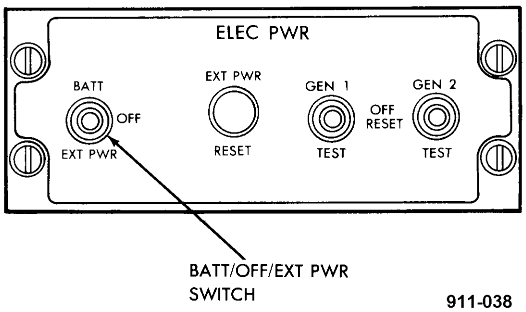

Figure 3-14. Electrical Power Control Panel Control Location

18. Set ECS panel switches (fig. 3-15):

Switch	Position
ENCU	**ON**
NORM/STBY FAN	**NORM**

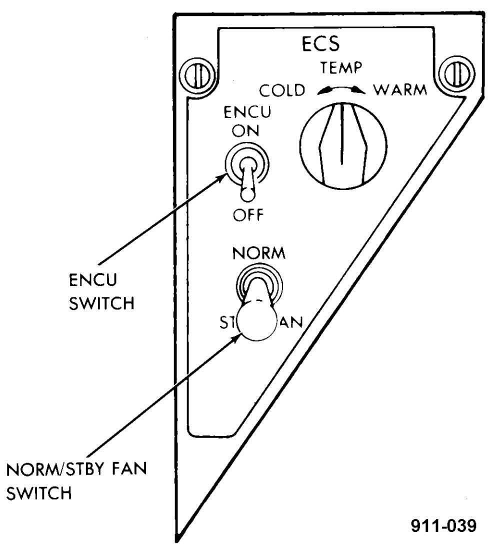

Figure 3-15. ECS Panel Control Location

19. Set pilot missile control panel switches (fig. 3-16):

Switch	Position
LOAL	**OFF**
LSR CODE	center (off)

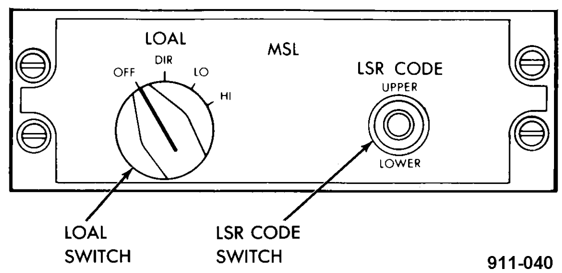

Figure 3-16. Pilot Station Missile Control Panel

3-1. INITIAL SWITCH SETTING (cont)

20. Open center circuit breaker panel circuit breakers (fig. 3-17):

    ASE BUCS
    JETT

21. Open forward circuit breaker panel **MISSION JETT** circuit breaker (fig. 3-18).

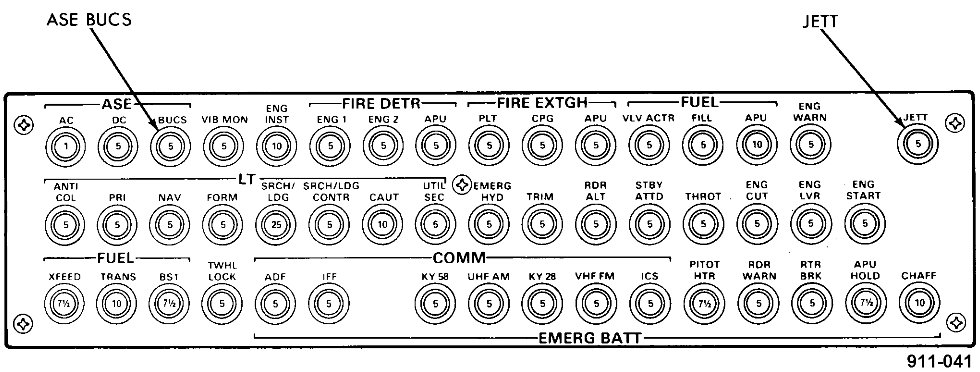

Figure 3-17. Center Circuit Breaker Panel Circuit Breaker Location

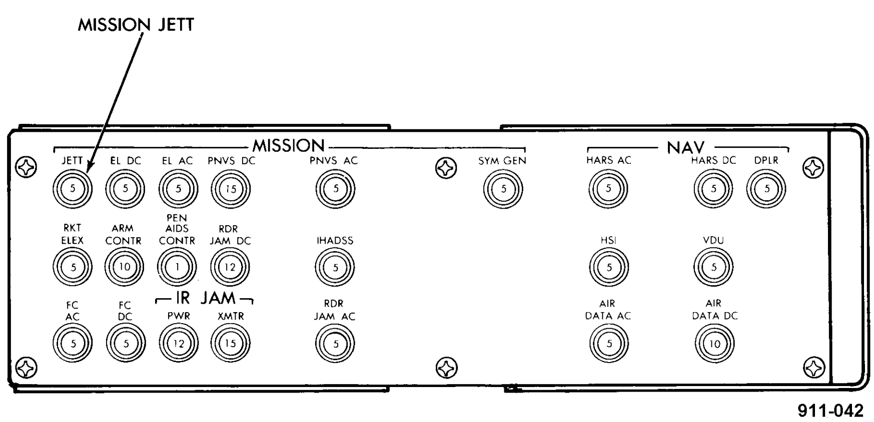

Figure 3-18. Forward Circuit Breaker Panel Circuit Breaker Location

3-2. POWER-UP PROCEDURE

INITIAL SETUP

Personnel Required:

68X Aircraft Armament/Electrical Repairer
67R Attack Helicopter Repairer

References:

TM 1-1520-238-23
TM 1-1520-238-T-1
TM 1-1270-476-20
TM 1-1520-238-T-2

Equipment Conditions:

Ref	Condition
Para 3-1	Initial switch setting performed
TM 1-1270-476-20	TADS window cover assemblies removed

1. Access pilot station (fig. 3-19) (TM 1-1520-238-23).

2. Close aft circuit breaker panel circuit breakers (fig. 3-20):

   ECS AFT FAN
   ECS CAB
   ECS FAB FANS
   POWER XFMR RECT 1
   POWER XFMR RECT 2

3. Close center circuit breaker panel circuit breakers (fig. 3-21):

   ASE AC
   ASE DC

4. Close forward circuit breaker panel circuit breakers (fig. 3-22):

   MISSION FC AC
   MISSION FC DC
   MISSION PNVS DC
   MISSION PNVS AC
   MISSION IHADSS
   MISSION SYM GEN
   NAV HARS AC
   NAV HARS DC

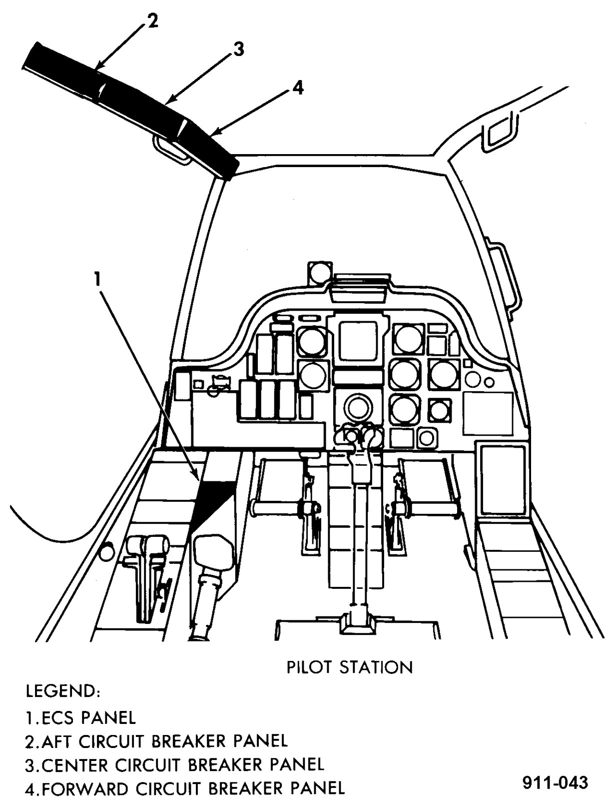

Figure 3-19. Pilot Station Panel Location

3-2. POWER-UP PROCEDURE (cont)

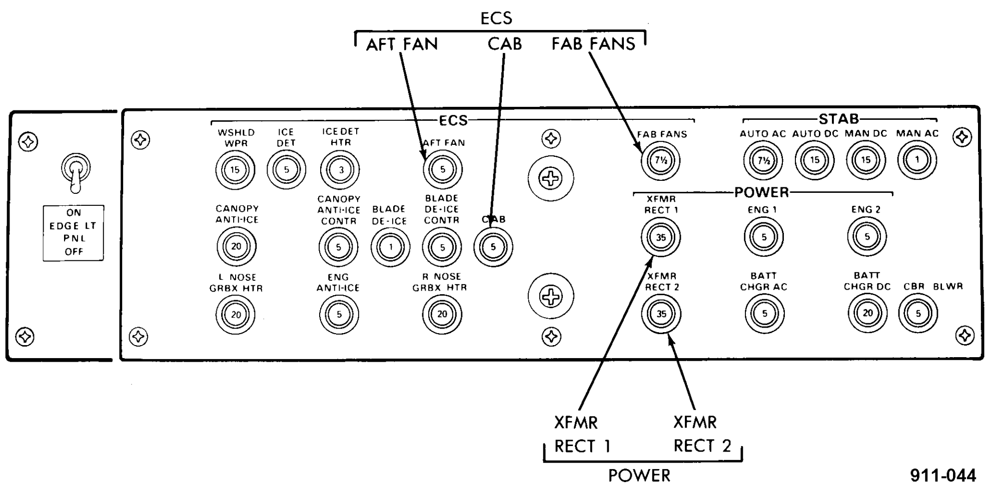

Figure 3-20. Aft Circuit Breaker Panel Circuit Breaker Location

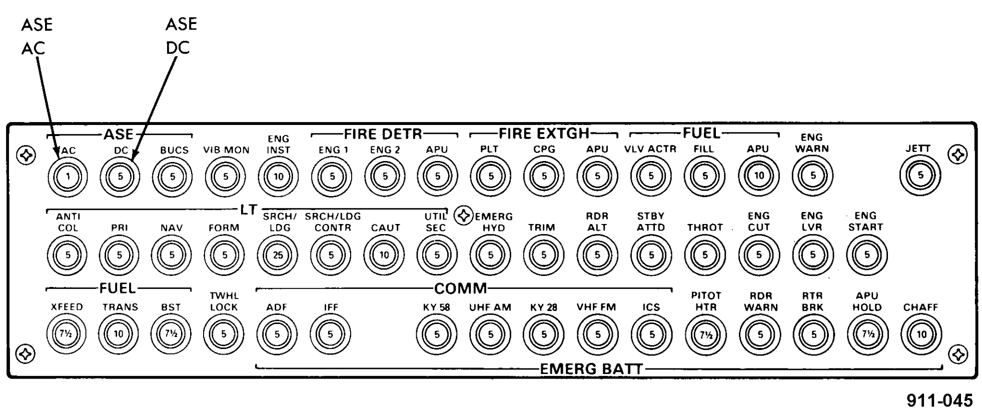

Figure 3-21. Center Circuit Breaker Panel Circuit Breaker Location

3-2. POWER-UP PROCEDURE (cont)

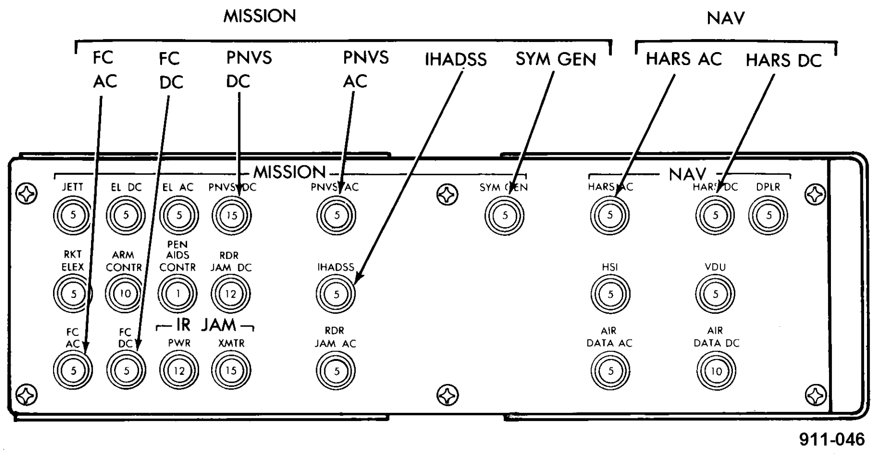

Figure 3-22. Forward Circuit Breaker Panel Circuit Breaker Location

5. Access copilot/gunner (CPG) station (fig. 3-23) (TM 1-1520-238-23).

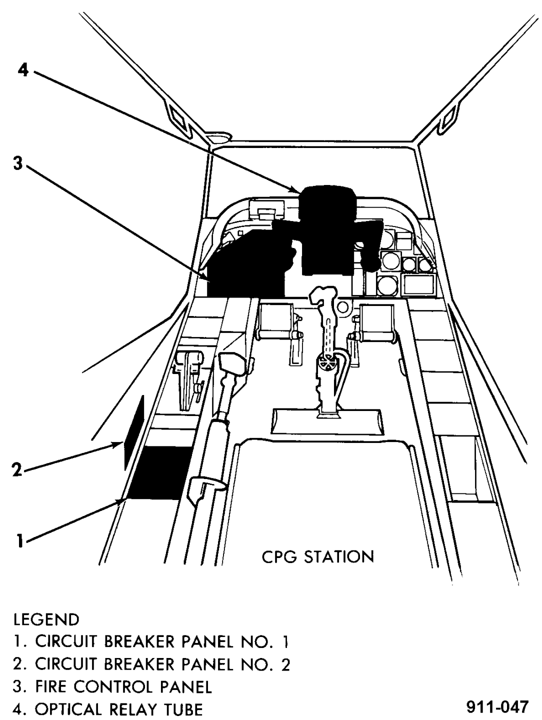

Figure 3-23. CPG Station Panel Location

3-2. POWER-UP PROCEDURE (cont)

6. Close circuit breaker panel No. 1 circuit breakers (fig. 3-24):

   PRI LT
   FC FCC AC
   FC FCC DC
   MUX FAB R
   MUX FAB L
   MUX CPG

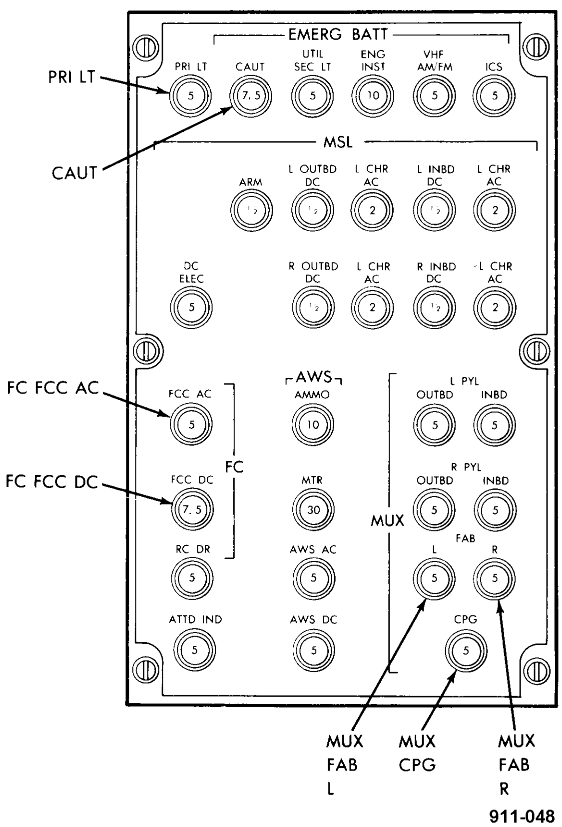

Figure 3-24. Circuit Breaker Panel No. 2 Circuit Breaker Location

7. Close circuit breaker panel No. 2 circuit breakers (fig. 3-25):

   IHADSS
   TADS DC
   TADS AC
   LASER

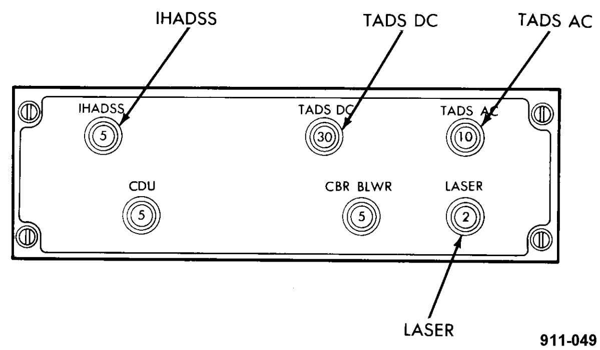

Figure 3-25. Circuit Breaker Panel No. 1 Circuit Breaker Location

8. Operate APU or apply external power - electrical and air (TM 1-1520-238-23).

NOTE

If the following conditions exist, go to step 9; otherwise, go to step 12.

- Cockpit temperature is above 85°F or helicopter has been heat soaking for a period of time at that temperature.
- Cockpit temperature is below 40°F or helicopter has been cold soaking for a period of time at that temperature.

3-2. POWER-UP PROCEDURE (cont)

9. Access pilot station (fig. 3-19) (TM 1-1520-238-23).

10. Adjust **ECS** panel **TEMP** control (fig. 3-26) as desired. Wait 10 to 15 minutes and go to step 11 below.

11. Access CPG station (fig. 3-23) (TM 1-1520-238-23).

12. Set CPG fire control panel switches (fig. 3-27):

Switch	Position
PLT/GND ORIDE	**ORIDE**
CPG	**SAFE**
SYSTEM FC/SYM GEN	**SYM GEN**

13. Verify symbology is displayed on HOD. If symbology is not displayed, refer to paragraph 3-68 for troubleshooting.

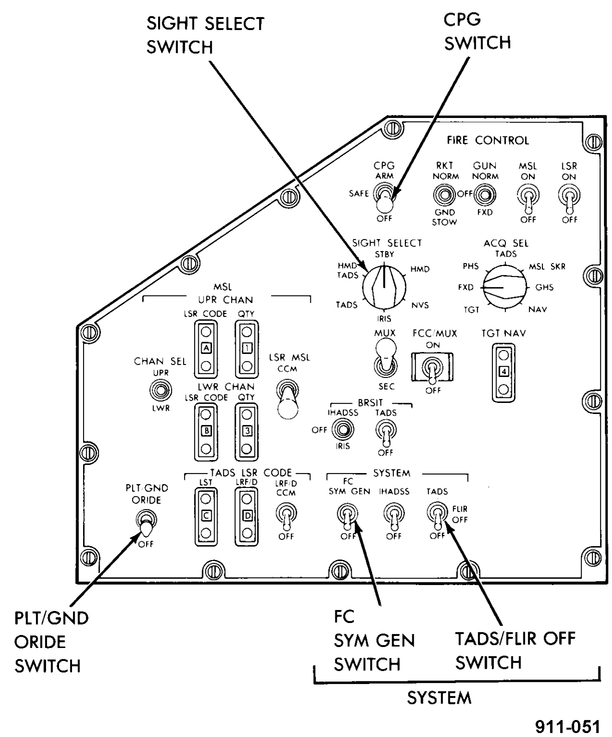

Figure 3-27. CPG Fire Control Panel Control Location

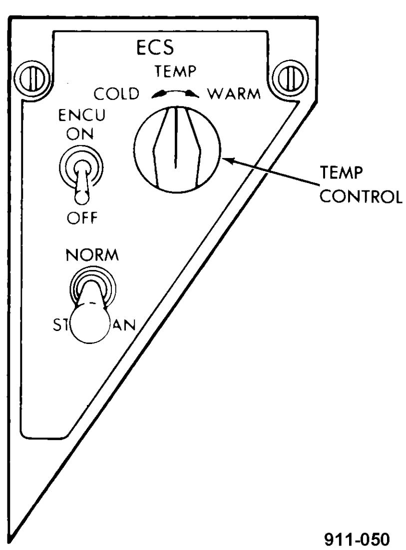

Figure 3-26. ECS Panel Control Location

3-2. POWER-UP PROCEDURE (cont)

WARNING

Stand away from the TADS turret assembly. The TADS turret assembly rotates rapidly when power is applied. Contact with the TADS turret assembly while it is in motion can cause serious injury.

CAUTION

Do not turn the **SYSTEM TADS/FLIR OFF/ OFF** switch to **TADS** immediately after being set to OFF. Damage to the TADS power supply could result.

NOTE

- If symbology is not displayed on HOD, refer to TM 1-1520-238-T-2 for troubleshooting procedures.
- If the **SYSTEM TADS/FLIR OFF** switch was just set to OFF, wait 10 seconds before performing step 14.
- If within 60 seconds after performing steps 14 thru 17 below, a malfunction indication is observed on the copilot caution/warning panel (CWP), the HOD or HDD, or the turret remains in stowed position, perform power-down procedures and then repeat the power-up procedures.

14. Set CPG fire control panel **SYSTEM TADS/ FLIR OFF** switch to **TADS**.

NOTE

TADS can be selected (step 16 below) before completion of step 15 below. However, TADS performance may be degraded until completion of warmup and FLIR cooldown.

15. Wait for HOD or HDD TURRET NOT READY message to discontinue. The maximum allowable warmup time versus ambient temperature is shown in figure 3-28.

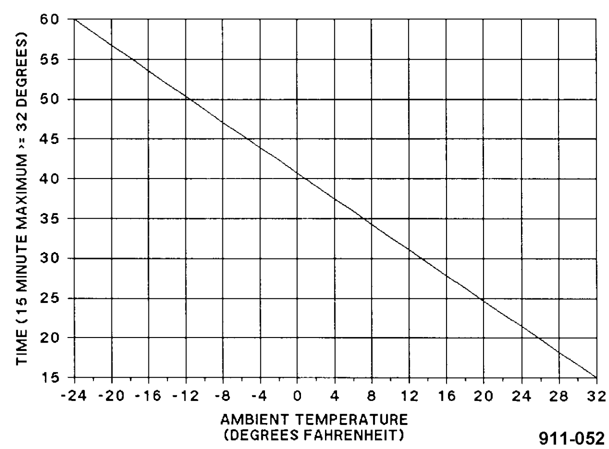

Figure 3-28. TADS Warmup Time Versus Ambient Temperature

3-2. POWER-UP PROCEDURE (cont)

16. Set CPG fire control panel **SIGHT SELECT** switch to **TADS** (fig. 3-27).

CAUTION

Failure to enter TADS interactive FD/LS quickly if TADS turret does not come out of stow could damage TADS assemblies.

17. Press ORT assembly right handgrip **SLAVE** switch (fig. 3-29) as required to bring turret to the fixed forward position. Verify TADS turret assembly comes out of stow to fixed forward position. If TADS turret does not come out of stow, quickly enter TADS interactive FD/LS (TM 1-1520-238-T-1).

END OF TASK

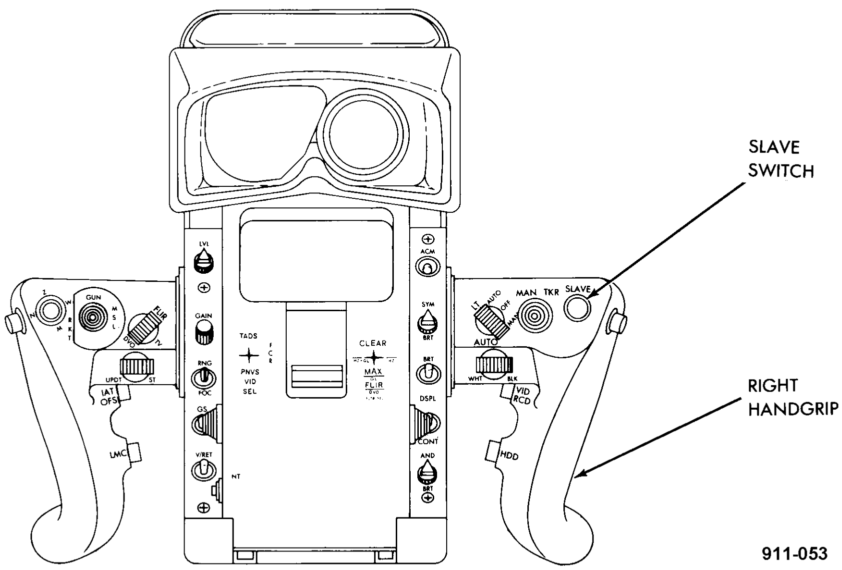

Figure 3-29. Optical Relay Tube Assembly Control Location

3-3. POWER-DOWN PROCEDURE

INITIAL SETUP

Personnel Required:

68X Aircraft Armament/Electrical Repairer
67R Attack Helicopter Repairer

References:

TM 1-1520-238-23

Equipment Conditions:

Maintenance task in progress

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1. Access CPG station (fig. 3-30) (TM 1-1520-238-23).

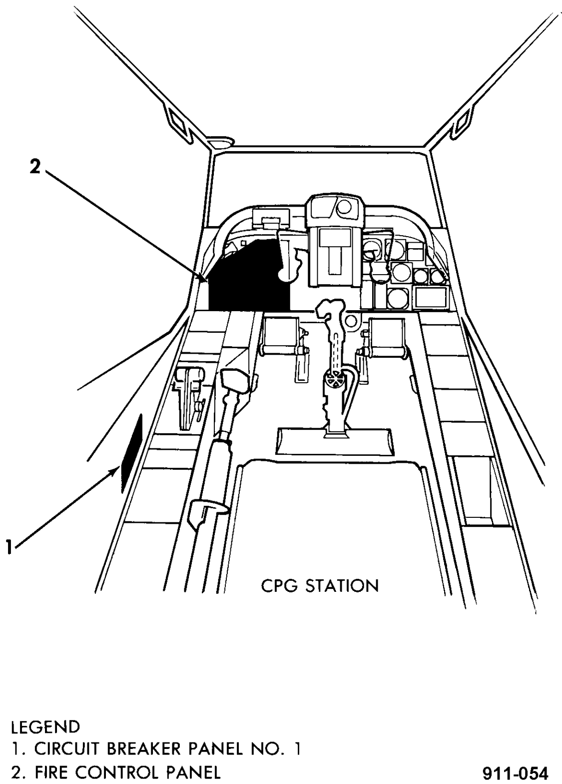


Figure 3-30. CPG Station Panel Location

WARNING

Stand away from the TADS turret assembly. The TADS turret assembly rotates rapidly when power is removed. Contact with the TADS turret assembly while it is in motion can cause serious injury.

2. Set CPG fire control panel switches (fig. 3-31):

<u>Switch</u>	<u>Position</u>
SIGHT SELECT	**STBY**
SYSTEM TADS/FLIR OFF	**OFF**

If TADS turret does not go to stow, perform MOC (para 3-6).

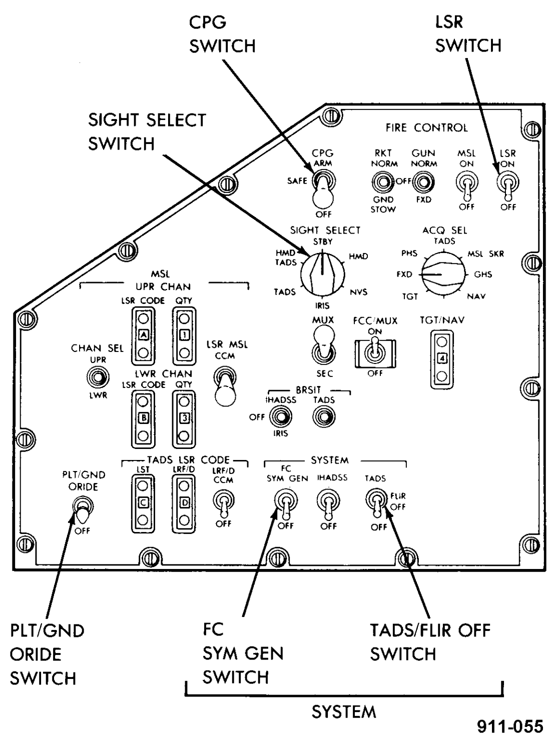


Figure 3-31. CPG Fire Control Panel Control Location

3-3. POWER-DOWN PROCEDURE (cont)

NOTE

If PNVS is powered-up, perform PNVS power-down procedure (TM 1-5855-265-T) before proceeding to step 3.

3. **[TAD]** Make sure TADS power down is complete by observing the alphanumeric display (AND). Do not go to step 4 below until AND indicators go out.

   [OIP] Wait for at least 30 seconds and go to step 4 below.

4. Set CPG fire control panel switches:

Switch	Position
LSR	**OFF**
CPG	**OFF**
PLT/GND ORIDE	**OFF**
SYSTEM FC SYM GEN	**OFF**

5. Open circuit breaker panel No. 2 **LASER** circuit breaker (fig. 3-25).

6. Remove external power - electrical or turn off APU (TM 1-1520-238-23).

7. Access pilot station (fig. 3-10) (TM 1-1520-238-23).

8. Set HARS control **ALIGN** switch (fig. 3-12) to **OFF**.

END OF TASK

3-4. MANUAL FAULT DETECTION/LOCATION SYSTEM (FD/LS)

Manual FD/LS is performed before initiated BIT or in response to direction from FD/LS procedures in TM 1-1520-238-T-1. Manual FD/LS verifies operational status of the HOD, HDD, and AND prior to performing maintenance/fault isolation procedures on TADS and sets up displays for viewing TADS operation.

3-5. FAULT DETECTION/LOCATION SYSTEM (FD/LS)

a. TADS Interactive FD/LS. TADS interactive FD/LS is a combination of continuous monitoring and operator interactive test procedures. Built-in-test (BIT) circuits monitor TADS functions and operator responses to prompts during testing and sends system status information to the TEU for evaluation. The TEU initiates a start-up BIT when power is applied and initiates continuous BIT after start-up BIT is complete. Operator initiated BIT is selected by the technician to evaluate TADS functions. Operator initiated BIT is divided into initiated class A BIT which just checks laser tracker/laser range finder functions and initiated class B BIT which checks the remaining TADS functions along with those functions checked during class A BIT.

b. Start-Up BIT. Start-up BIT checks TEU computer functions and is enabled when power is applied to the TADS. A fault isolated during start-up BIT causes pilot and copilot caution/warning panel **TADS** and/or **PNVS** indicators to flash. A fault also causes FD/LS and TADS FAIL messages to flash on the HOD/HDD. Turning the CPG data entry keyboard (DEK) **DATA ENTRY** switch to **FD/LS** causes a TADS NO-GO fault message to be displayed on the HOD/HDD.

c. Continuous BIT. Continuous BIT continually monitors TADS system status and subsystem functions after start-up BIT is completed. A fault causes FD/LS message to flash on HOD/HDD. Turning the CPG DEK **DATA ENTRY** switch to **FD/LS** after the above described indications occur causes a message such as TADS SERVO SYSTEM NO-GO to appear on HOD/HDD. Pressing the **ENTER/SPACE** key will allow the technician to scroll through the TADS faults identified during BIT. If during flight or on an approved laser safety range the laser is being fired, continuous BIT monitors certain laser functions that are not monitored during initiated class A BIT: laser temp, laser coolant low, and laser power low.

d. Initiated Class A BIT. Initiated class A BIT checks only critical TADS laser tracker and laser range finder/designator (LRF/D) functions while the helicopter is airborne. If a laser tracker or LRF/D fault is detected during continuous BIT, a TADS NO-GO message will be displayed on the HOD/HDD. Entering FD/LS by turning the DEK **DATA ENTRY** switch to **FD/LS** and pressing the **ENTER/SPACE** key will cause either a LASER TRACKER NO-GO or LRF/D NO-GO message to appear on the HOD/HDD. Initiated class A BIT is entered by pressing and releasing any numbered key. This causes a menu to be listed of class A BIT test to be displayed on the HOD/HDD. Press **ENTER/SPACE** key, **ABC/1**, and **JKL/4** to select TADS. This starts initiated class A BIT.

3-5. FAULT DETECTION/LOCATION SYSTEM (FD/LS) (cont)

e. Initiated Class B BIT. Initiated class B BIT is performed by the maintenance technician as directed by FD/LS procedures (TM 1-1520-238-T-1) or during the maintenance operational check procedure (para 3-6). Initiated class B BIT checks TADS subsystem functions for proper operation. Parts of the test require operator interaction by way of manual response to prompts. Prompts are instructions displayed on the HOD/HDD that direct the maintenance technician to:

- Set switches on the optical relay tube (ORT) assembly or aircraft
- Make observations of TADS operational status
- Make Yes/No/Acknowledge responses on the DEK.

Initiated class B BIT is entered the same as initiated class A BIT.

f. Manual MOC. Manual MOC is used by the maintenance technician to verify operational status of the TADS servo system, DVO/pechan alinement, laser operation during boresight, and system internal/ outfront boresight.

g. Display Messages and Prompts. Display messages and prompts are used to aid in testing and fault isolation of TADS LRUs and SRUs. Prompts are used to allow the maintenance technician to decide if a complete TADS subsystem checkout or a specific test, such as “TADS FLIR, MISC SW, or TV/DVO,” is desired. Messages and prompts used during FD/LS are listed in paragraph 3-7. The automatic part of the test requires no maintenance technician interaction. When a fault is isolated during any part of the test, a message appears on the HOD/HDD. The faulty LRU/SRU and its location, such as TADS POWER SUPPLY NO-GO LH FAB, is identified.

3-6. MAINTENANCE OPERATIONAL CHECK

INITIAL SETUP

Personnel Required:

68X Aircraft Armament/Electrical Repairer
67R Attack Helicopter Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-T-1
TM 1-1520-238-T-2
TM 1-1520-238-T-6
TM 1-4931-727-13&P
TM 1-5855-265-T
TM 9-1230-476-20-2
TM 1-1270-476-30
TM 1-1520-238-23

Equipment Conditions:

Ref	Condition
Para 3-2	TADS powered-up

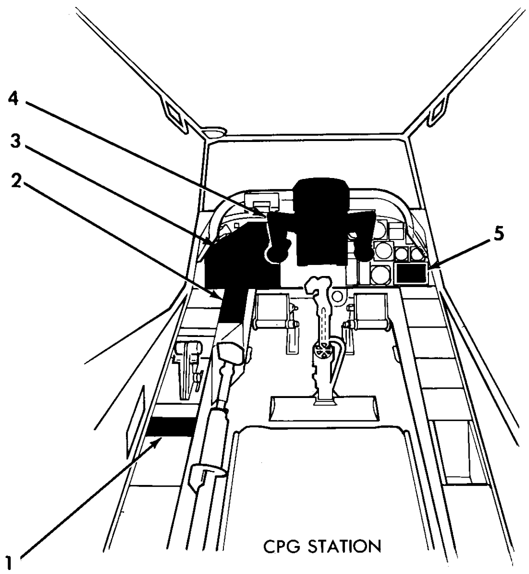
NOTE

Prior to performing any maintenance and/or fault isolation procedures always observe TADS/PNVS caution/warning panel indicators and messages and prompts that are displayed on HOD/HDD. If faults are indicated refer to display messages and prompts (para 3-7) for maintenance and/or fault isolation procedures to correct the fault.

Task	Results
1. Verify that TADS moved to approximate fixed forward position by observing solid crosshairs are centered on display and cueing box is centered on cueing dot during power-up procedure.	If TADS turret did not move to fixed forward: • Perform TADS power-down procedure (para 3-3). • Perform TADS power-up procedure (para 3-2). If fault still exists, enter TADS interactive FD/LS (TM 1-1520-238-T-1). If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P). If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
2. Adjust CPG station (fig. 3-32) instrument light control panel **INST** control to **BRT** (fig. 3-33). Verify ORT assembly control panel edgelights are lit.	If ORT assembly control panel edgelights are not lit, refer to paragraph 3-76 for troubleshooting. If fault still exists, refer to TM 1-1520-238-T-6 for troubleshooting.



LEGEND
1. INSTRUMENT LIGHT CONTROL PANEL
2. DATA ENTRY KEYBOARD
3. FIRE CONTROL PANEL
4. OPTICAL RELAY TUBE
5. CAUTION/WARNING PANEL

911-100

Figure 3-32. CPG Station Panel Location

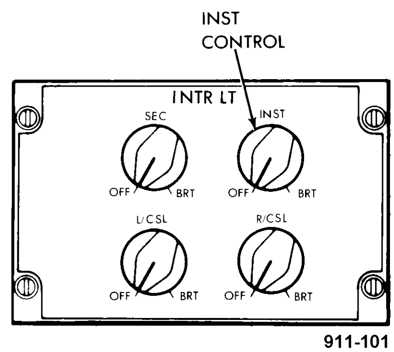


Figure 3-33. Instrument Light Control Panel Control Location

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
3. Adjust ORT assembly control panel **SYM BRT** (fig. 3-34) control fully cw and verify symbology is displayed on HOD. Adjust **SYM BRT** control for best display.	• If symbols are not displayed on HOD, refer to TM 1-1520-238-T-2 for troubleshooting. • If symbology brightness cannot be adjusted, refer to paragraph 3-73 for troubleshooting. • • If fault still exists, replace optical relay column (TM 1-1270-476-20).
4. If TADS NOT READY message is displayed, wait for message to discontinue and go to step 5 below.	If TADS NOT READY message does not discontinue after the allowable time period shown in power-up procedure, refer to paragraph 3-67 for troubleshooting.

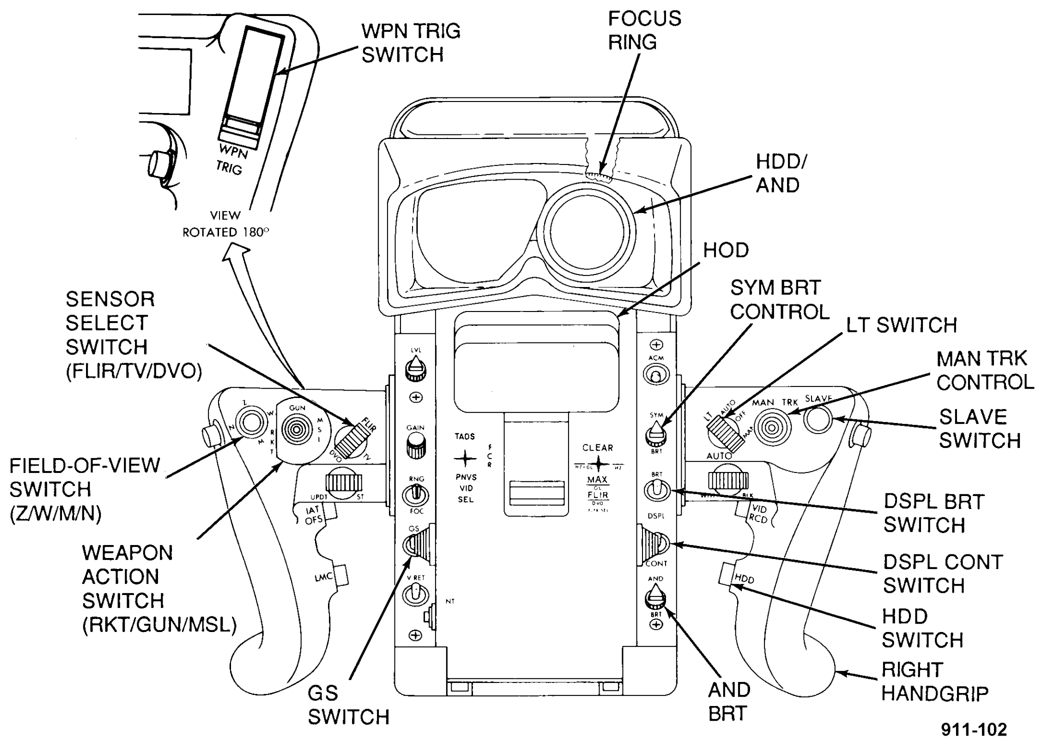


Figure 3-34. Optical Relay Tube Assembly Control Location

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
5. Observe video raster on HOD and verify CPG caution/warning panel TADS warning indicator (fig. 3-35) is not flashing.	If raster is not visible on HOD, hold ORT assembly control panel **DSPL BRT** switch up to increase brightness. If raster is still not visible and warning indicators are not flashing, refer to TM 1-1520-238-T-2 for troubleshooting.

If TADS warning indicator is flashing:

On first no-go:

- Perform TADS power-down procedure (para 3-3).
- Perform TADS power-up procedure (para 3-2).

On second no-go:

Set DEK **DATA ENTRY** switch (fig. 3-36) to **FD/LS**, back to **STBY**, then to FD/LS to clear-erroneous FD/LS messages.

If subsystem failure MUX NO-GO, SYS GEN NO GO, or ECS NO-GO is displayed on HOD/HDD, refer to TM 1-1520-238-T-2 for troubleshooting.

If the smell of smoke is detected:

- Perform TADS power-down procedure (para 3-4).
- Perform helicopter safety procedure (TM 1-1520-238-23).
- Refer to paragraph 3-115 for troubleshooting.

On third no-go:

Replace TADS power supply (TM 1-1270-476-20).

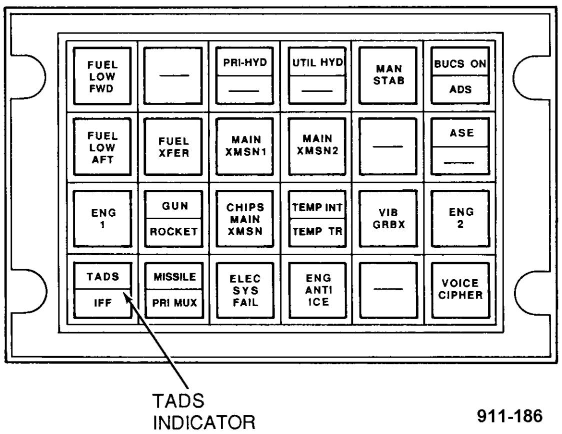


Figure 3-35. CPG Caution/Warning Panel Indicator Location

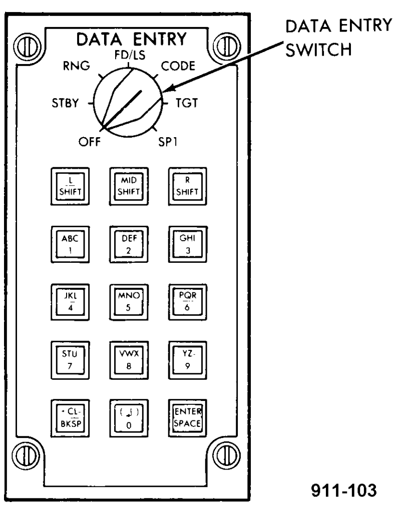


Figure 3-36. Data Entry Keyboard Control Location

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
	On fourth no-go: • If TADS warning indicator (fig. 3-35) is flashing, refer to paragraph 3-55 for troubleshooting. • • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20). • If HOD displays single thin horizontal or vertical line, refer to paragraph 3-85 for troubleshooting. • • If fault still exists, replace ORT assembly control panel (TM 1-1270-476-20).
6. Press and release ORT assembly right handgrip **HDD** switch (fig. 3-34). Verify raster switches from HOD display to HDD display.	If raster does not change displays, enter FD/LS operator interactive tests and select entry point number 3 when prompted (TM 1-1520-238-T-1). If fault still exists, refer to paragraph 3-91 for troubleshooting.
7. Observe AND on HDD and adjust ORT assembly control panel **AND BRT** control fully cw and ccw. Verify AND brightness increases and decreases. Verify AND edgelight is lit.	If AND is not displayed on HDD enter FD/LS operator interactive tests and select entry point 1 when prompted (TM 1-1520-238-T-1). If brightness does not change, refer to paragraph 3-82 for troubleshooting. If AND edgelight is not lit, refer to paragraph 3-84 for troubleshooting.
8. Adjust ORT assembly control panel **AND BRT** control for desired viewing level. Verify AND is fully visible.	If AND is not fully visible, replace optical relay column (TM 1-1270-476-20).

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
9. Adjust ORT assembly focus ring for best AND and video raster image. Verify focus is good for both AND and HDD displays.	If focus ring does not move, replace eyepiece assembly (TM 1-1270-476-20). If display cannot be adjusted within 1/4 turn of focus ring: • Replace optical relay column (TM 1-1270-476-20). • Replace indirect view display (TM 1-1270-476-20).
10. Check AND characters for readability and completeness.	• If AND characters completely missing or have missing segments, replace AND (TM 1-1270-476-20). • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). • If AND display is unstable, replace optical relay column (TM 1-1270-476-20). • • If fault still exists, refer to paragraph 3-83 for troubleshooting.
11. Press ORT assembly right handgrip **HDD** switch to display video raster on HOD.	
12. Press ORT assembly control panel **GS** switch. Observe grayscale on HOD.	If grayscale is not displayed on HOD, enter FD/LS operator interactive tests and select entry point 4 when prompted. If fault still exists, refer to paragraph 3-74 for troubleshooting. If fault still exists, replace ORT assembly control panel (TM 1-1270-476-20).

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
13. Adjust grayscale for 10 shades of gray: a. Hold ORT assembly control panel **DSPL CONT** switch down until grayscale just disappears. b. Hold ORT assembly control panel **DSPL BRT** switch down until raster just disappears. c. Hold ORT assembly control panel **DSPL CONT** switch up until 10 shades of gray are visible. The third bar from top should be same color as background color. d. If necessary, alternately adjust **DSPL CONT** and **DSPL BRT** switches to optimize grayscale.	If grayscale cannot be adjusted, enter FD/LS operator interactive tests and select entry point 2 when prompted. If fault still exists, refer to paragraph 3-72 for troubleshooting.
14. Press and release ORT assembly right handgrip **HDD** switch. Verify grayscale is displayed on HOD. Repeat step 13 to adjust grayscale.	If grayscale is not displayed, enter FD/LS operator interactive tests and select entry point 3 when prompted, If fault still exists, refer to paragraph 3-74 for troubleshooting. If fault still exists, replace ORT control panel (TM 1-1270-476-20).
15. Set ORT assembly control panel **VID SEL** switch to TADS. Verify grayscale is no longer visible on display.	If grayscale does not disappear from HDD, enter FD/LS operator interactive tests and select entry point 5 when prompted. If fault still exists, troubleshoot **VID SEL** switch using DTA ORT switch routine (TM 1-4931-727-13&P). If fault still exists, refer to paragraph 3-74 for troubleshooting. If fault still exists, replace ORT control panel (TM 1-1270-476-20).

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
16. Perform TADS interactive FD/LS (TM 1-1520-238-T-1). When prompted with CONTINUE WITH FULL SYSTEM TEST (Y) or A SUBSYSTEM TEST? (N), respond with yes.	If faults are detected, refer to display messages and prompts, paragraph 3-7 for troubleshooting.
17. Press ORT assembly right handgrip **SLAVE** switch. 18. Operate ORT assembly right handgrip **MAN TRK** control up, down, left, and right. Verify TADS turret moves freely throughout azimuth and elevation limits. Verify LIMITS message appears on HOD as azimuth and elevation limits are reached.	If TADS turret movement is erratic or does not move in azimuth or elevation, refer to servo system malfunctions listed below. Identify the malfunction which best describes TADS turret behavior and troubleshoot TADS servo system fault. • TADS turret movement is erratic or does not move in azimuth or elevation, troubleshoot **MAN TRK** control using DTA ORT switch routine (TM 1-4931-727-13&P). • TADS turret will not move in manual track, other cued servo responses are normal, replace TADS electronic unit (TM 1-1270-476-20). • TADS does not slave or erratic to CPG LOS, perform IHADSS FD/LS (TM 1-1520-238-T-1). • • If fault still exists, perform BRU boresight (TM 9-1230-476-20-1). • • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20). • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
19. Operate ORT assembly right handgrip **MAN TRK** control and center small target in crosshairs. Release **MAN TRK** switch and measure time required for target to drift off display. Time must be greater than 30 seconds.	If turret drift is excessive, perform servo drift null procedure (TM 1-1270-476-20). If fault still exists, refer to the servo system malfunction listed below. Identify the servo system malfunction which best describes TADS turret behavior: • Cannot adjust azimuth servo drift, refer to paragraph 3-77 for troubleshooting. • • If fault still exists, replace electronic control amplifier (TM 1-1270-476-20). • Cannot adjust elevation servo drift, refer to paragraph 3-78 for troubleshooting. • • If fault still exists, replace electronic control amplifier (TM 1-1270-476-20).
20. Set ORT assembly right handgrip **LT** switch to **AUTO.** Verify TADS turret performs four-bar scan.	If TADS turret does not perform four-bar scan, troubleshoot **LT AUTO** switch using DTA ORT switch routine (TM 1-4931-727-13&P). • If fault still exists or turret should suddenly stop and begin drifting, replace laser tracker/receiver (TM 1-1270-476-20). • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
21. Set ORT assembly right handgrip **LT** switch to **OFF.**	
22. Set ORT assembly left handgrip sensor select switch to **FLIR.** Adjust ORT assembly control panel **GAIN** and **LVL** controls for best image.	

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
23. Set CPG fire control panel **SYSTEM FC SYM GEN** switch (fig. 3-37) to **OFF**. Verify backup FLIR video is displayed on HOD.	If FLIR video is not displayed, troubleshoot **FLIR/ TV/DVO** switch using DTA ORT switch routine (TM 1-4931-727-13&P). • If fault still exists, refer to paragraph 3-104 for troubleshooting.
24. Set CPG fire control panel **SYSTEM FC SYM GEN** switch to **ON.**	
25. Press ORT assembly right handgrip **HDD** switch (fig. 3-34) to display video raster on the HDD.	

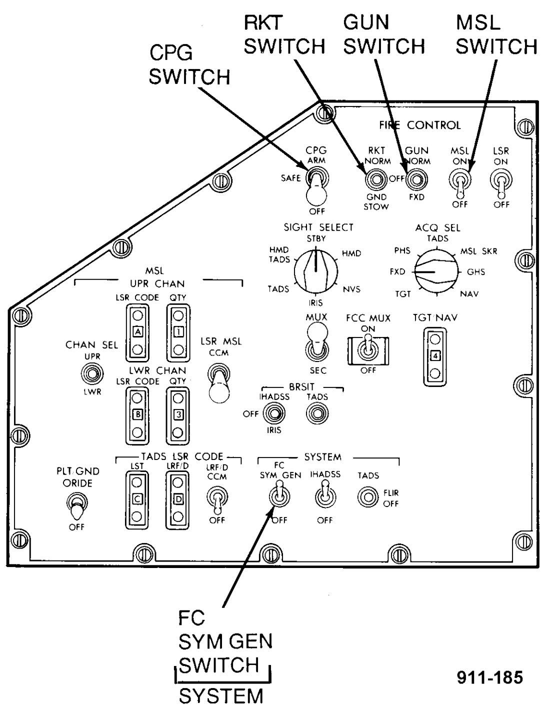


Figure 3-37. CPG Fire Control Panel Control Location

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
26. Set ORT assembly left handgrip sensor select switch to **DVO.** Verify DVO scene and reticle are displayed on HDD.	If DVO scene and reticle are not displayed, troubleshoot **FLIR/TV/DVO** switch using DTA ORT switch routine (TM 1-4931-727-13&P).
27. Operate ORT assembly right handgrip **MAN TRK** control up, down, left, and right. Verify pechan alinement maintains DVO reticle position ±5% during turret movement.	If DVO scene is not displayed on HDD, refer to paragraph 3-92 for troubleshooting. • If DVO reticle is not displayed, refer to paragraph 3-95 for troubleshooting. • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). • If no DVO reticle brightness control with DVO scene normal, refer to paragraph 3-96 for troubleshooting. • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). • DVO scene is not upright, refer to paragraph 3-98 for troubleshooting. • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). If DVO reticle position varies more than ±5%, perform pechan alinement procedure (TM 1-1270-476-20). If fault still exists, enter FD/LS operator interactive tests and select entry point 1 when prompted. If fault still exists, refer to paragraph 3-97 for troubleshooting. If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
28. Set ORT assembly left handgrip sensor select switch to **TV.**	
29. Press ORT assembly right handgrip **HDD** switch to display video raster on HOD.	

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
30. If internal boresight was not performed before entering MOC or MOC was entered as a result of a boresight fault, perform TADS internal boresight procedure (TM 1-1270-476-20).	If unable to boresight DTV, FLIR, or DVO, refer to boresight malfunctions listed below. Identify the boresight malfunction which best describes boresight behavior and troubleshoot TADS boresight fault. • If BORESIGHT MODULE NO-GO TURRET BULKHEAD - appears on HOD during internal boresight, troubleshoot TADS using DTA (TM 1-4931-727-13&P). • • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20). • Unable to perform cue update, troubleshoot TADS using DTA (TM 1-4931-727-13&P). • • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20). • Unable to boresight DTV in NFOV or ZFOV, troubleshoot TADS using DTA (TM 1-4931-727-13&P). • • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20). • Unable to boresight NSA in NFOV or WFOV, reseat NSA and DSA on azimuth gimbal assembly (TM 1-1270-476-20). • • If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P). • • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20). • Unable to fire laser during boresight, refer to paragraph 3-112 for troubleshooting. • • If fault still exists, replace laser electronic unit (TM 1-1270-476-20). • DVO crosshairs will not move during boresight, refer to paragraph 3-113 for troubleshooting.

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
	• Cannot boresight DVO reticle, refer to paragraph 3-114 for troubleshooting.
	• • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
	• Inaccurate or unable to outfront boresight, troubleshoot TADS using DTA (TM 1-4931-727-13&P).
	• • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
	• Cannot enter or inaccurate range data during outfront boresight or system operation, replace TADS electronic unit (TM 1-1270-476-20).
	• • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
	• Laser will not fire, refer to paragraph 3-109 for troubleshooting.
	• • If fault still exists, replace laser electronic unit (TM 1-1270-476-20).
	• • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
	• • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
	• Laser tracker will not lock-on or not coded, troubleshoot TADS using DTA (TM 1-4931-727-13&P).
	• • If fault still exists, replace laser electronic unit (TM 1-1270-476-20).
	• • If fault still exists, replace laser tracker/ receiver (TM 1-1270-476-20).
	• • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
	• Erratic range data, troubleshoot TADS using DTA (TM 1-4931-727-13&P).
	• • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
	• • If fault still exists, replace laser tracker/ receiver (TM 1-1270-476-20).
	• • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
	• No range readout and/or update from laser, refer to paragraph 3-110 for troubleshooting.
	• • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
	• • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
	• Laser trigger second detent inoperative, refer to paragraph 3-111 for troubleshooting.
	• • If fault still exists, replace laser electronic unit (TM 1-1270-476-20).
	• • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
	• Laser spot does not center in FLIR boresight but track gates capture spot, replace boresight module (TM 1-1270-476-20).
	• • If fault still exists, replace night sensor assembly (TM 1-1270-476-20).
	• • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
31. Power-up missile, rocket, and gun systems (TM 9-1090-208-23-2).	
32. Set CPG fire control panel **CPG** switch (fig. 3-37) to **ARM.**	
33. Set DEK **DATA ENTRY** switch (fig. 3-36) to **SP1** and press **RIGHT SHIFT 6** and ENTER.	
34. Set CPG fire control panel **GUN** switch to **NORM** (fig. 3-37).	
NOTE In steps 35 thru 44, XXX indicates that the numbers displayed in these positions should be disregarded when performing these tasks.	
35. Using DEK keyboard (fig. 3-36), enter memory location "000414." Verify BIT code "XXX400" is displayed on HOD.	
36. Press and hold ORT assembly left handgrip **WPN TRIG** switch (fig. 3-34) to first detent and verify BIT code changes to "XXX420".	If BIT code did not change to "XXX420", replace left handgrip (TM 1-1270-476-20). If fault still exists, refer to paragraph 3-88 for troubleshooting.
37. Press and hold ORT assembly left handgrip **WPN TRIG** switch to second detent and verify BIT code changes to "XXX430."	If BIT code did not change to "XXX430", replace left handgrip (TM 1-1270-476-20). If fault still exists, refer to paragraph 3-88 for troubleshooting.
38. Set CPG fire control panel **GUN** switch to **OFF.**	
39. Set CPG fire control panel **RKT** switch to **NORM.**	
40. 40. Using DEK keyboard (fig. 3-36), enter memory location "001555." Verify BIT code "XXX514" is displayed on HOD.	

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
41. Set ORT assembly left handgrip weapon action switch (WAS) (fig. 3-34) to **RKT** and verify BIT code changes to "XXX554."	If BIT code does not change to "XXX554", replace left handgrip (TM 1-1270-476-20). If fault still exists, refer to paragraph 3-87 for troubleshooting.
42. Set CPG fire control panel **RKT** switch (fig. 3-37) to **OFF** and **GUN** switch to **NORM**.	
43. Using DEK keyboard (fig. 3-36), enter memory location "001075". Verify BIT code "XXX306" is displayed on HOD.	
44. Set ORT assembly left handgrip WAS switch (fig. 3-34) to **GUN** and verify BIT code changes to "XXX346".	If BIT code does not change to "XXX346", replace left handgrip (TM 1-1270-476-20). If fault still exists, refer to paragraph 3-87 for troubleshooting.
45. Set CPG fire control panel **GUN** switch (fig. 3-43) to **OFF** and **MSL** switch to **ON**.	
46. Using DEK keyboard (fig. 3-36), enter memory location "000415".	
47. Set ORT assembly left handgrip WAS switch (fig. 3-34) to **MSL** and monitor BIT 4 on HOD. Verify BIT 4 goes HI (1).	If BIT 4 does not go HI replace left handgrip (TM 1-1270-476-20). If fault still exits, refer to paragraph 3-87 for troubleshooting.
48. Power-down missile, rocket, and gun systems (TM 9-1090-208-23-2).	
49. Set CPG fire control panel **MSL** switch (fig. 3-37) of **OFF**.	
50. Set CPG fire control panel CPG switch to **SAFE**.	
51. Set DEK **DATA ENTRY** switch (fig. 3-36) to **OFF**.	

3-6. MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
52. Perform power-down procedure If TADS turret does not go to stow, (para 3-3). Verify TADS turret goes to stow position.	If TADS turret does not go to stow, refer to the servo system malfunctions listed below. Identify the malfunction which best describes the TADS turret behavior and troubleshoot the TADS servo system fault. • TADS turret slews down in stow, troubleshoot TADS using DTA (TM 1-4931-727-13&P). • • If fault still exists, replace TADS electronic control amplifier unit (TM 1-1270-476-20). • TADS turret does not go to stow position with all other servo functions normal, troubleshoot TADS using DTA (TM 1-4931-727-13&P). • • If fault still exists, replace TADS power supply (TM 1-1270-476-20). • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
53. MOC has been completed. If directed to do MOC from another procedure, continue with task in progress.	END OF TASK

3-7. DISPLAY MESSAGES AND PROMPTS

Display messages and prompts are listed in Table 3-1 and displayed during start-up BIT, continuous BIT, and TADS interactive FD/LS on the HOD/HDD. There may be slight differences in the wording of messages and/or prompts. A message provides information and a prompt gives instructions. The messages and prompts are listed in the general sequence in which they may appear. The actual sequence of appearance for messages and prompts depends on computer test in progress and operator response to prompts. As a result, a message or prompt may be listed more than once. The "Remarks **(Reference)**" column describes the messages and prompts and lists corrective action information to correct equipment faults. See figure 3-38 for location of ORT assembly switches and controls.

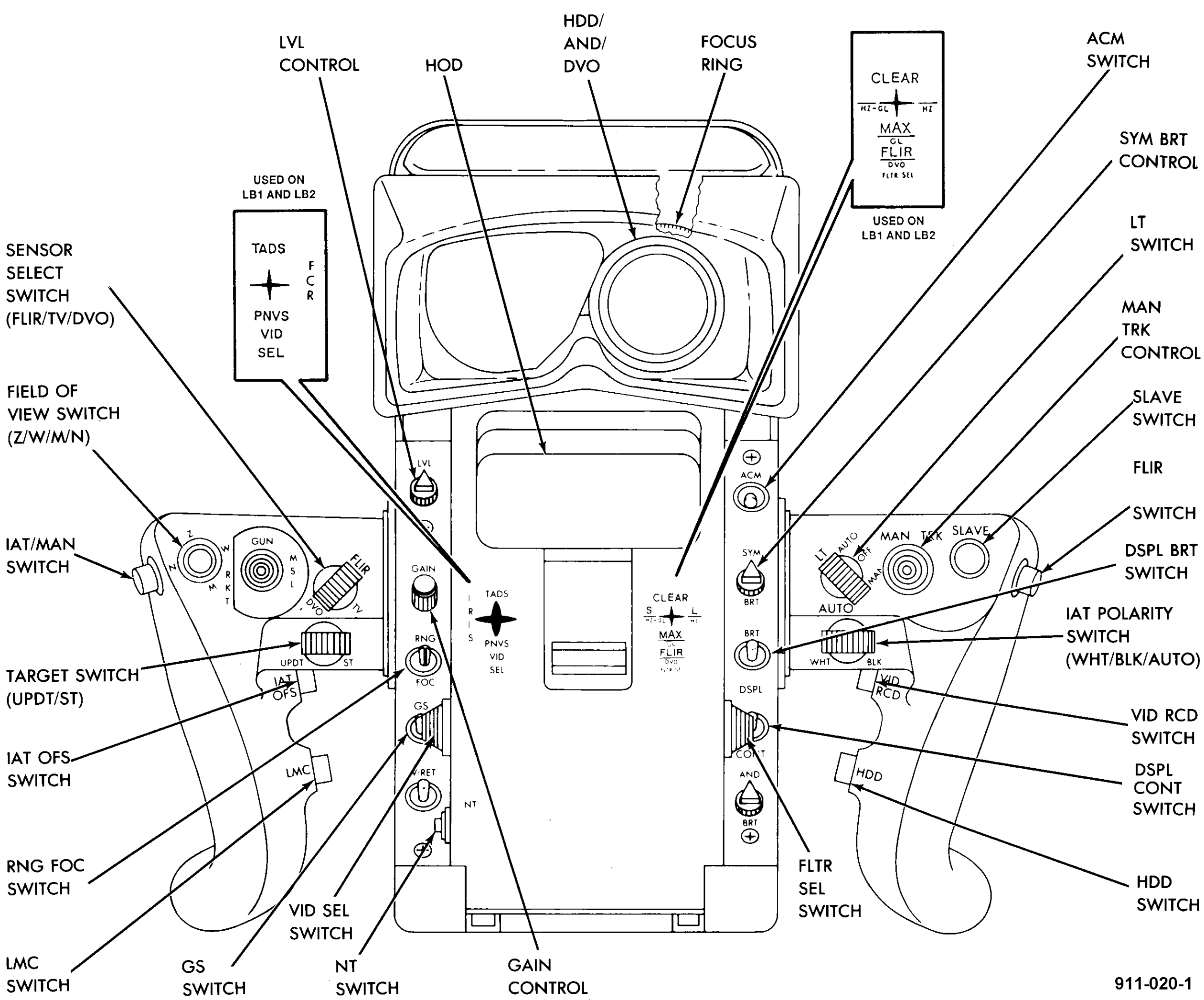


Figure 3-38. Optical Relay Tube Assembly Control and Indicator Location (Sheet 1 of 2)

3-7. DISPLAY MESSAGES AND PROMPTS (cont)

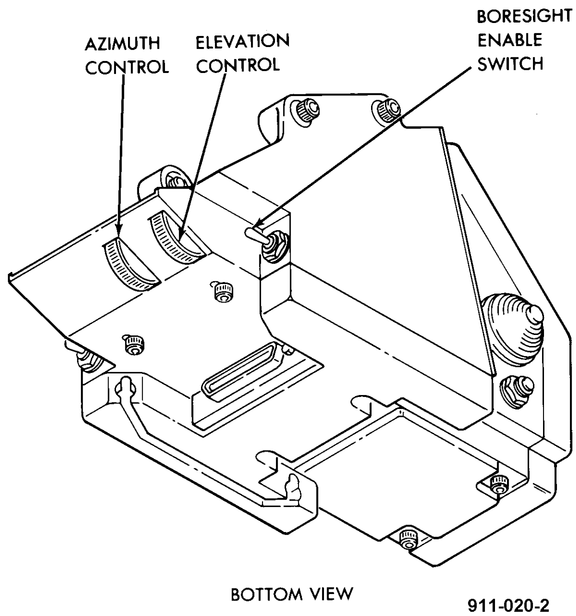


Figure 1-38. Optical Relay Tube Assembly Control and Indicator Location (Sheet 2 of 2)

Table 3-1. Display Messages and Prompts

Item No.	Message/Prompt	Remarks **(Reference)**
1	TADS NO-GO	This message appears if the TADS computer subsystem has failed during continuous BIT. Perform TADS interactive FD/LS check (TM 1-1520-238-T-1).
2	AND NO-GO	This message appears if the AND failed. Perform TADS interactive FD/LS (TM 1-1520-238-T-1). If fault still exists, refer to paragraph 3-56 for troubleshooting. If OIP is installed and fault still exists, replace optical relay column (TM 1-1270-476-20).
3	TADS ECS NO-GO	This message appears if the ECS failed. Perform TADS interactive FD/LS (TM 1-1520-238-T-1). If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
4	TADS LASER TRACKER NO-GO	This message appears if TADS laser tracker failed during continuous BIT. Perform TADS interactive FD/LS (TM 1-1520-238-T-1).

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P).
		If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
		If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
5	TADS LRF/D NO-GO	This message appears if laser range finder/ designator failed during continuous BIT. Perform TADS interactive FD/LS (TM 1-1520-238-T-1).
		If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P).
		If fault still exists, replace laser transceiver unit (TM 1-1270-476-20).
		If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
6	TADS IAT NO-GO	This message appears if IAT subsystem failed during continuous BIT. Perform TADS interactive FD/LS (TM 1-1520-238-T-1).
		If fault still exists, troubleshoot **IAT MANUAL** and **IAT OFFSET** switches using DTA ORT switch routine (TM 1-4931-727-13&P).
		If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
		If fault still exists, refer to the malfunctions listed below. Identify the malfunction which best describes system operation associated with IAT and/or manual tracking fault.
		• Scene moves in circle when IAT offset is commanded, troubleshoot TADS using DTA (TM 1-4931-727-13&P).
		• • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
		• • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
		• • Crosshairs do not center on target when IAT is selected. Track gates not displayed, replace TADS electronic unit (TM 1-1270-476-20).
		• If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		• Track gates not displayed, replace TADS electronic unit (TM 1-1270-476-20).
		• • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
		• Track gates are displayed, but will not lock on good target, replace TADS electronic unit (TM 1-1270-476-20).
		• • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
		• Track gates will not go away, IAT will not deselect, replace TADS electronic unit (TM 1-1270-476-20).
		• • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
7	ORT COLUMN ASSY NO-GO	This message appears if ORT optical relay column failed. Perform TADS interactive FD/LS (TM 1-1520-238-T-1).
8	TADS TV NO-GO	This message appears if TADS TV sensor failed during continuous BIT. Perform TADS interactive FD/LS (TM 1-1520-238-T-1).
9	TADS FLIR NO-GO	This message appears if TADS FLIR subsystem failed during continuous BIT. Perform TADS interactive FD/LS (TM 1-1520-238-T-1).
10	TADS SERVO SYSTEM NO-GO	This message appears if TADS servo system failed during continuous BIT. Perform TADS interactive FD/LS (TM 1-1520-238-T-1).
		If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
		If fault still exists, replace TADS turret assembly (TM 1-1270-476-30).
11	TADS BORESIGHT NO-GO RAM CHECKSUM	This message appears if the FCC has detected an alteration of internal values affecting TADS boresight armonization. The TADS system will function normally but without CBHK correction.
		Reenter captive boresight harmonization kit (CBHK) data using data entry keyboard (DEK) (TM 9-1230-476-20-1).
		If fault still exists, perform boresighting TADS/ PNVS procedure (TM 9-1230-476-20-1).

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
12	GO TO ENTRY POINT 1? (Y/N) (INITIATED) FD/LS WITH OPERATOR INTERACTIVE RESPONSES	This prompt appears after code 14 is entered using the DATA ENTRY KEYBOARD. If the HOD and HDD are both operational, check that grayscale appears when **GS** switch is on and disappears when switch is off. If operational, enter a yes response. Otherwise, enter a no response.
13	GO TO ENTRY POINT 2? (Y/N) (HOD NO-OP, HDD OK)	This prompt appears if response to previous prompt was N. If the HOD is not operational but both the HDD and grayscale (item 12) are operational, enter a yes response. Otherwise, enter a no response.
14	GO TO ENTRY POINT 3? (Y/N) (HDD NO-OP, HOD OK)	This prompt appears if response to previous prompt was N. If the HDD is not operational but both the HOD and grayscale (item 12) are operational, enter a yes response. Otherwise, enter a no response.
15	GO TO ENTRY POINT 4? (Y/N) (GRAYSCALE NOT SELECTABLE)	This prompt appears if response to previous prompt was N. If the grayscale does not appear when the **GS** switch is turned on and the HOD and HDD are operational, enter a yes response. Otherwise, enter a no response.
16	GO TO ENTRY POINT 5? (Y/N) (GRAYSCALE ALWAYS PRESENT)	This prompt appears if response to previous prompt was N. If the grayscale does not disappear when the **GS** switch is turned off and the HOD and HDD are operational, enter a yes response. Otherwise, enter a no response.
17	PUSH VID SEL SW TO TADS, AND RELEASE. (ACK)	This prompt appears if ORT assembly control panel **VID SEL** switch is not set to **TADS** when an entry point is selected in items 12 thru 16. Set **VID SEL** switch to **TADS** and respond as indicated.
18	SET LT SW O(FF). (ACK)	This prompt appears if the ORT assembly right handgrip **LT** switch is not set to **OFF** when an entry point is selected in items 12 thru 16. Set **LT** switch to **OFF** and respond as indicated.
19	SET IAT PLRT SW TO A(UTO). (ACK)	This prompt appears if ORT assembly right handgrip IAT polarity (WHT/AUTO/BLK) switch is not set to AUTO when an entry point is selected in items 12 thru 16. Set IAT polarity switch to AUTO and respond as indicated.
20	SET ACM SW TO OFF. (ACK)	This prompt appears if ORT assembly control panel **ACM** switch is not set to off (down) when an entry point is selected in items 12 thru 16. Set **ACM** switch to off (down position) and respond as indicated.
21	PRESS AND RELEASE LMC SW. (ACK)	This prompt appears if ORT assembly left handgrip **LMC** is not off when an entry point is selected in items 12 thru 16. Press and release **LMC** switch and respond as indicated.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
22	PRESS AND RELEASE IAT/MAN SW. (ACK)	This prompt appears if the IAT system is not in autotrack mode when an entry point is selected in items 12 thru 16. Press and release **IAT/MAN** switch and respond as indicated.
23	SET BORESIGHT ENABLE SW TO OFF. (ACK)	This prompt appears if the ORT assembly control panel boresight enable switch is not set to off (center position) when an entry point is selected in items 12 thru 16. Set boresight enable switch to off (center position) and respond as indicated.
24	ON THE CPG FCP ENSURE: RKT AND GUN SWS ARE OFF, MSL SW IS OFF AND CPG SW IS IN SAFE. (ACK)	This prompt appears when an entry point is selected in items 12 thru 16 and after the switch setting checks in items 17 thru 23 are made. Perform actions as necessary and respond as indicated.
25	TEST IN PROGRESS.	This message appears while initiated Class B automatic tests are in progress.
26	ARE OPERATOR INTER-ACTIVE TESTS REQUIRED? (Y/N)	This prompt appears if entry point 1 was selected in item 12 and no faulty components are found by the TADS initiated Class B automatic tests. Respond with yes or no.
27	PRESS AND RELEASE GS SW.(ACK)	This prompt appears if entry point 4 was selected in item 15 and the grayscale is not on. Press and release ORT assembly control panel **GS** switch and respond as indicated.
28	PROMPT TIMED OUT. REENTER PROMPT (Y) OR EXIT FD/LS. (N)	This prompt appears whenever too much time is taken before responding to a prompt, about 30 seconds. Respond with yes or no.
29	CONTINUE WITH FULL SYSTEM TEST (Y) OR A SUBSYSTEM TEST? (N)	This prompt appears if the response to item 26 was Y. Respond with yes or no.
30	DAY VIDEO/DVO FAULTY? (Y/N)	This prompt appears if response to previous prompt was N. Respond with yes or no.
31	MISC SW FCTNS? (Y/N) (VID REC, LMC, MAN TRK, IAT MAN & PLRT, OFS, LT, SLAVE, UPDT/ST)	This prompt appears if response to previous prompt was N. Respond with yes or no.
32	TADS FLIR FAULTY? (Y/N)	This prompt appears if response to previous prompt was N. Respond with yes or no.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
33	LISTS OF SUBSYSTEM TESTS COMPLETE; VIEW AGAIN (Y) OR EXIT FD/LS. (N)	This prompt appears if response to previous prompt was N. Respond with yes or no.
34	SET SENSOR SEL SW TO TV. (ACK)	This prompt appears if response to item 29 or 30 was Y and the ORT assembly left handgrip sensor select **(FLIR/TV/DVO)** switch is not set to TV. Set sensor select **(FLIR/TV/DVO)** switch to TV and respond as indicated.
35	PUSH TADS FOV SW TO W. (ACK)	This prompt appears if the ORT assembly left handgrip sensor select **(FLIR/TV/DVO)** switch is set to TV, and the FOV **(Z, N, H, W)** switch is not set to **W.** Set FOV **(Z, N, M, W)** switch to **W** and respond as indicated.
36	TURN SYM BRT FULLY CW THEN FULLY CCW. (ACK)	This prompt appears if the ORT assembly left handgrip sensor select **(FLIR/TV/DVO)** switch is set to TV, the FOV **(Z, N, M, W)** switch is set to **W,** and the internal symbology brightness sensing circuit is not set. Observe display and turn **SYM BRT** fully cw then fully ccw. Verify crosshairs and tracker gates are present and intensity changes. Respond as indicated.
37	WERE CROSSHAIRS AND TRACKER GATES PRESENT AND DID THEIR INTENSITY CHANGE? (Y/N)	This prompt appears if the ORT assembly control panel **SYM DRT** control functioned correctly in the last prompt. Observe display and respond with yes or no.
38	IS TV IMAGE PRESENT? (Y/N)	This prompt appears if the ORT assembly left handgrip sensor select **(FLIR/TV/DVO)** switch is set to TV, the FOV **(Z, N, M, W)** switch is set to **W,** and the symbology brightness sensing circuit is set. Observe display and respond with yes or no.
39	IS IMAGE QUALITY ON HOD GOOD? (Y/N)	This message appears if response to previous prompt was Y. Observe display and respond with yes or no. Check display for good video and crosshairs are present. If DTV video is not good, crosshairs are missing, banding and/or blooming visible on display, respond with no.
40	PRESS AND RELEASE HOD SW. IS TV IMAGE PRESENT ON HDD? (Y/N)	This prompt appears if response to previous prompt was Y. Press and release ORT assembly right handgrip **HOD** switch. Observe display and respond with yes or no.
41	VIEW HOD IS NIGHT FILTER PRESENT? (Y/N)	This prompt appears if response to previous prompt was Y. Observe display and respond with yes or no.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
42	PRESS AND RELEASE NT SW. DID THE NIGHT FILTER RETRACT? (Y/N)	This prompt appears if response to previous prompt was Y. Press and release ORT assembly control panel **NT** switch. Observe display and respond with yes or no.
43	PRESS AND RELEASE NT SW. IS NIGHT FIL-TER PRESENT? (Y/N)	This prompt appears if response to item 41 was N. Press and release ORT assembly control panel **NT** switch. Observe display and respond with yes or no.
44	AGAIN PRESS AND RELEASE NT SW. DID THE NIGHT FILTER RETRACT? (Y/N)	This prompt appears if response to last prompt was Y. Press and release ORT assembly control panel **NT** switch. Observe display and respond with yes or no.
45	PRESS AND RELEASE HOD SW. VIEW HOD. PUSH TADS FOV SW TO N. DID SCENE GET LARGER? (Y/N)	This prompt appears if response to item 42 or 44 was Y. Press and release ORT assembly right handgrip **HDD** switch. Push FOV **(Z, N, M, W)** switch to **N.** Observe display and respond with yes or no.
46	PUSH RNG FOC SW UP AND DOWN. DOES RANGE OF FOCUS VARY PROPERLY? (Y/N)	This prompt appears if response to previous prompt was Y, and the **RNG FOC** switch is off (center position). Push ORT assembly control **RNG FOC** switch up and down. Observe display and respond with yes or no.
47	RELEASE RNG FOC SW. (ACK)	This prompt appears if response to previous prompt was Y and the **RNG FOC** switch is not off (center position). Release ORT assembly control panel **RNG FOC** switch and respond as indi-cated.
48	ADJUST RNG FOC SW FOR BEST IMAGE. PUSH TADS FOV SW TO Z. DID SCENE GET LARGER? (Y/N)	This prompt appears if response to item 46 was Y and the **RNG FDC** switch is off (center position). Adjust ORT assembly control panel **RNG FOC** for best image. Push ORT assembly left handgrip FOV **(Z, N, M, W)** switch to Z. Observe display and respond with yes or no.
49	PUSH TADS FOV SW TO W. DID FOV GO TO WIDE? (Y/N)	This prompt appears if response to previous prompt was Y. Set ORT assembly left handgrip FOV **(Z, N, H, W)** to **W.** Observe display and respond with yes or no.
50	SET SENSOR SEL SW TO DVO. IS DVO IMAGE FULLY VISIBLE? (Y/N)	This prompt appears if response to previous prompt was Y. Set ORT assembly left handgrip sensor select **(FLIR/TV/DVO)** switch to **DVO.** Observe display and respond with yes or no. **NOTE** In bright sunlight the illuminated crosshair might not be seen.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
51	VIEW DVO; ADJUST SYM BRT CW THEN CCW. DID CROSSHAIR ILLUMINATION CHANGE? (Y/N)	This prompt appears if response to previous prompt was Y. Adjust ORT assembly control panel **SYM BRT** cw then ccw. Observe DVO and respond with yes or no.
52	ADJUST SYM BRT. ARE CROSSHAIRS AND FAR SCENE IN FOCUS? (Y/ N)	This prompt appears if response to previous prompt (item 51) was Y. Adjust ORT assembly control panel **SYS BRT** for best focus. Observe DVO and respond with yes or no.
53	ADJUST FOCUS RING ON ORT EYEPIECE. DID SLIGHT ADJUSTMENT CORRECT FOCUS? (Y/N)	This prompt appears if response to previous prompt was N. Adjust ORT assembly optical relay column focus ring for best focus. Observe DVO and respond with yes or no.
54	IS DVO IMAGE UPRIGHT AND CROSSHAIR ORIENTA-TION CORRECT? (Y/N)	This prompt appears if response to previous prompt or item 52 was Y. Observe DVO and respond with yes or no.
55	PUSH TADS FOV SW TO N. DID SCENE GET LARGER? (Y/N)	This prompt appears if response to previous prompt was Y. Set ORT assembly left handgrip FOV **(Z, N, M, W)** switch to **N.** Observe DVO and respond with yes or no.
56	VIEW DVO. ADJUST SYM BRT CW THEN CCW. DID CROSSHAIR ILLUMINATION CHANGE? (Y/N)	This prompt appears if response to previous prompt was Y. Adjust ORT assembly control panel **SYM BRT** cw then ccw. Observe DVO and respond with yes or no.
57	ADJUST SYM BRT. ARE CROSSHAIRS AND FAR SCENE IN FOCUS? (Y/N)	This prompt appears if response to previous prompt was Y. Adjust ORT assembly control panel **SYM BRT** for best focus. Observe DVO and respond with yes or no.
58	ADJUST FOCUS RING ON ORT EYEPIECE. DID SLIGHT ADJUSTMENT CORRECT FOCUS? (Y/N)	This prompt appears if response to previous prompt was N. Adjust ORT assembly optical relay column focus ring for best focus. Observe DVO and respond with yes or no.
59	IS DVO IMAGE UPRIGHT AND CROSSHAIR ORIENTATION COR-ECT? (Y/N)	This prompt appears if response to previous prompt or item 57 was Y. Observe DVO and respond with yes or no.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
60	PUSH TADS FOV SW TO W. DID FOV GO TO WIDE? (Y/N)	This prompt appears if response to previous prompt was Y. Set ORT assembly left handgrip FOV **(Z, N, M, W)** switch to **W.** Observe DVO and respond with yes or no.
61	PUSH FLTR SEL SW TO CLEAR. VIEW DVO; PUSH FLTR SEL SW TO HZ. DID FLTR MOVE? (Y/N)	This prompt appears if response to previous prompt was Y. Push ORT assembly control panel **FLTR SEL** switch to **CLEAR,** then to **L/HZ** (TADS or OIP) or **HZ** (LB1 or LB2). Observe DVO and respond with yes or no.
62	VIEW DVO; PUSH FLTR SEL SW TO GL. DID FLTR MOVE? (Y/N)	This prompt appears if response to previous prompt was Y. Push ORT assembly control panel FLTR SEL switch to **MAX/GL.** Observe DVO and respond with yes or no.
63	VIEW DVO; PUSH FLTR SEL SW TO HZ-GL. DID FLTR MOVE? (Y/N)	This prompt appears if response to previous prompt was Y. Push ORT assembly control panel FLTR SEL switch to **S/HZ GL** (TADS or OIP) or **HZ GL** (LB1 or LB2). Observe DVO and respond with yes or no.
64	VIEW DVO. PUSH FLTR SEL SW TO CLEAR. DID FLTR MOVE TO CLEAR? (Y/N)	This prompt appears if response to previous prompt was Y. Push ORT assembly control panel **FLTR SEL** switch to **CLEAR.** Observe DVO and respond with yes or no.
65	DO YOU WISH TO RUN OTHER SUBSYSTEM TESTS? (Y/N)	This prompt appears if response to previous prompt was Y and internal TV/DVO test circuits are set. Respond with yes or no. **NOTE** Some prompts that contain (ACK) responses are automatically acknowledged by the TADS computer when the required actions are performed by the maintenance technician. These prompts do not require an (ACK) response by the technician. When the response is (ACK), look carefully at the HOD. Press and release ENTER/SPACE key **ONLY** if prompt displayed is the same one to which actions were just performed. Failure to respond properly to these prompts will result in erroneous FD/LS messages being displayed.
66	PUSH VID SEL SW TO IRIS. (ACK) or PUSH VID SEL SW TO FCR. (ACK)	This prompt appears if response to items 31 or 64 was yes and internal TV/DVO test circuits are not set. Set ORT assembly control panel **VID SEL** switch to IRIS (TADS or OIP) or **FCR** (LB1 or LB2) and respond as indicated.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		Video will become scrambled after the **VID SEL** switch is set to **IRIS** (TADS or OIP) or **FCR** (LB1 or LB2). Set the **VID SEL** switch back to **TADS.** If video and symbols remain scrambled, replace indirect view display (TM 1-1270-476-20). If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
67	PUSH VID SEL SW TO TADS. (ACK)	This prompt appears if response to previous prompt was Y, and the **VID SEL** switch was pushed to **IRIS** (TADS or OIP) or **FCR** (LB1 or LB2). Push ORT assembly **VID SEL** switch to TADS and respond as indicated. **NOTE** If the TADS is in fixed forward position the LMC switch may have to be pressed several times.
68	PRESS AND RELEASE LMC SW. (ACK)	This prompt appears if the **VID SEL** switch functioned correctly in the previous prompt, and LMC is not off. This prompt also appears if the **VID SEL** switch functioned correctly in item 67, and LMC is off. Press and release ORT assembly left handgrip **LMC** switch and respond as indicated.
69	AGAIN, PRESS AND RELEASE LMC SW. (ACK)	This prompt appears if LMC was turned on in the previous prompt. Press and release ORT assembly left handgrip **LMC** switch and respond as indicated.
70	PRESS AND RELEASE VID RCD SW. (ACK)	This prompt appears if LMC is turned off in the previous prompt, and the **VID RCD** switch is off. Also, this prompt appears if LMC is turned off when response was made to item 68, and the **VID REC** switch is off. Press and release ORT assembly right handgrip **VID REC** switch and respond as indicated.
71	PRESS TARGET SW TO ST (ORE AND RELEASE. (ACK)	This prompt appears if the **VID REC** switch turned on in the previous prompt, and the **UPDT/ST** switch is off. Set ORT assembly left handgrip **UPDT/ST** switch to ST and respond as indicated.
72	PRESS TARGET SW TO UPDT AND RELEASE. (ACK)	This prompt appears if target store is on, and update is off after responding to the previous prompt. Set ORT assembly left handgrip **UPDT/ST** switch to **UPDT** and respond as indicated.
73	PRESS LT SW TO M(AN). (ACK)	This prompt appears if target update is on after responding to the previous prompt, and the **LT** switch is not set to **MAN.** Set ORT assembly right handgrip LT switch to **MAN** and respond as indicated.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
74	PRESS LT SW TO A(UTO). (ACK)	This prompt appears if the **LT** switch functioned correctly in the previous prompt. Set ORT assembly right handgrip **LT** switch to **AUTO** and respond as indicated.
75	SET LT SW TO O(FF). (ACK)	This prompt appears if the **LT** switch functioned correctly in the previous prompt (item 74). Set ORT assembly right handgrip **LT** switch to **OFF** and respond as indicated.
76	PRESS AND RELEASE SLAVE SW. (ACK)	This prompt appears if the **LT** switch functioned correctly in the previous prompt and the **SLAVE** switch is on. This prompt also appears, if the **LT** switch functioned correctly in item 75 and the **SLAVE** switch is off. Press and release ORT assembly right handgrip **SLAVE** switch and respond as indicated.
77	PRESS AND RELEASE SLAVE SW AGAIN. (ACK)	This prompt appears if the **SLAVE** switch is on after responding to the previous prompt. Press and release ORT assembly right handgrip **SLAVE** switch and respond as indicated.
78	PRESS AND RELEASE IAT/MAN SW. (ACK)	This prompt appears as a result of the following: • If the SLAVE switch is off after responding to the previous prompt and autotrack is on. • If the SLAVE switch is off after responding to item 76 and autotrack is on. • If the SLAVE switch is off after responding to item 77 and autotrack is off. • If the SLAVE switch is off after responding to item 76 and autotrack is off. Press and release ORT assembly left handgrip **IAT/MAN** switch and respond as indicated.
79	PRESS AND RELEASE IAT/MAN SW AGAIN. (ACK)	This prompt appears if autotrack is on after responding to the previous prompt. Press and release ORT assembly left handgrip **IAT/MAN** switch and respond as indicated.
80	PRESS AND RELEASE OFS SW. (ACK)	This prompt appears as a result of the following: • If autotrack is off after responding to previous prompt and the **IAT OFS** switch is on. • If autotrack is off after responding to item 78 and the **IAT OFS** switch is on. • If autotrack is on after responding to item 79 and the **IAT OFS** switch is off.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		Press and release ORT assembly left handgrip **IAT OFS** switch and respond as indicated.
81	NOW PRESS AND RELEASE OFS SW AGAIN. (ACK)	This prompt appears if the **IAT OFS** switch is on after responding to previous prompt. Press and release ORT assembly left handgrip **IAT OFS** switch and respond as indicated.
82	PRESS IAT PLRT SW TO W(HT) (ACK)	This prompt appears if the **IAT OFS** switch is off after responding to previous prompt. This prompt also appears if the **IAT OFS** switch is off after responding to item 80. Set ORT assembly right handgrip IAT polarity **(WHT/AUTO/BLK)** switch to **WHT** and respond as indicated.
83	PRESS IAT PLRT SW TO B(LK). (ACK)	This prompt appears if the polarity switch functioned correctly after responding to previous prompt. Set ORT assembly right handgrip IAT polarity **(WHT/AUTO/BLK)** switch to **BLK** and respond as indicated.
84	PRESS IAT PLRT TO A(UTO). (ACK)	This prompt appears if the polarity switch functioned correctly after responding to the previous prompt. Set ORT assembly right handgrip IAT polarity **(WHT/AUTO/BLK)** switch to **AUTO** and respond as indicated.
85	TURN SYM BRT FULLY CW THEN FULLY CCW. (ACK)	This prompt appears if the polarity switch is in automatic after responding to previous prompt, and the internal symbology brightness sensing circuits are not set. Observe display and turn ORT assembly control panel **SYM BRT** fully cw then fully ccw. Verify crosshairs and tracker gates are present and intensity changes. Respond as indicated.
86	WERE CROSSHAIRS AND TRACKER GATES PRESENT AND DID THEIR INTENSITY CHANGE? (Y/N)	This prompt appears if the internal monitoring circuits are set after responding to previous prompt. Observe display and respond with yes or no.
87	FIRMLY PRESS MAN TRK UP, DN, RT THEN LT. (ACK)	This prompt appears if response to the previous prompt was Y, and internal monitoring circuits are set. This prompt also appears if **IAT/MAN** switch is set to automatic after responding to item 84, the internal symbology brightness sensing circuits are set, and internal monitoring circuits are set. Press ORT assembly right handgrip **MAN TRK** switch up, down, right, then left and respond as indicated.
88	PUSH BORESIGHT ENABLE SW UP. (ACK)	This prompt appears if the **MAN TRK** switch functioned correctly in the previous prompt. Set ORT assembly control panel boresight enable switch to the up position and respond as indicated.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
89	RETURN BORESIGHT ENABLE SW TO CEN-TER POSITION. (ACK)	This prompt appears if the boresight enable switch functioned correctly in previous prompt (item 88). Set ORT assembly control panel boresight enable switch to center position and respond as indicated.
90	ROTATE EL ADJUST TO MAX UP. (ACK)	This prompt appears if the boresight enable switch was set to off (center position) in previous prompt. Rotate ORT assembly control panel elevation adjust to maximum up position and respond as indicated.
91	ROTATE EL ADJUST TO MAX DOWN. (ACK)	This prompt appears if the elevation adjust control functioned correctly in previous prompt. Rotate ORT assembly control panel elevation adjust to maximum down position and respond as indicated.
92	ROTATE AZ ADJUST TO MAX UP. (ACK)	This prompt appears if the elevation adjust control functioned correctly in previous prompt. Rotate ORT assembly control panel azimuth adjust to maximum up position and respond as indicated.
93	ROTATE AZ ADJUST TO MAX DOWN. (ACK)	This prompt appears if the azimuth adjust control functioned correctly in previous prompt. Rotate ORT assembly control panel azimuth adjust to maximum down position and respond as indicated.
94	DO YOU WISH TO RUN OTHER SUBSYSTEM TESTS? (Y/N)	This prompt appears if the azimuth adjust control functioned correctly in previous prompt, and internal monitoring circuits are set. Respond with yes or no.
95	SET SENSOR SEL SW TO FLIR. (ACK)	This prompt appears if the azimuth adjust control functioned correctly in item 93, internal monitoring circuits are not set, and the **FLIR/TV/DVO** switch is not set to **FLIR.** This prompt also appears if the response to item 32 was Y and the **FLIR/TV/DVO** switch is not set to **FLIR.** Set ORT assembly left handgrip **FLIR/TV/DVO** switch to **FLIR** and respond as indicated.
96	PUSH ACM SW TO OFF. (ACK)	This prompt appears if the azimuth adjust control functioned correctly in item 93, internal monitoring circuits are not set, the **FLIR/TV/DVO** switch is set to **FLI**R, and the **ACM** switch is on (up position). This prompt also appears if the response to item 32 was Y, the **FLIR/TV/DVO** switch is set to **FLI**R, and the **ACN** switch is on. Push ORT assembly control panel **ACN** switch to off (down position) and respond as indicated.
97	PUSH FLTR SEL SW TO CLEAR. VIEW HOD; PUSH FLTR SEL SW TO MAX. DID FLTR MOVE? (Y/N)	**[OIP]** This prompt appears upon completion of item number 20 and the system is an OIP system. Push ORT assembly control panel FLTR SEL switch to CLEAR. Then push FLTR SEL switch to MAX. Observe HDD and respond with yes or no.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
98	PUSH FLTR SEL SW TO CLEAR. VIEW HDD; PUSH FLTR SEL SW TO S. DID FLTR MOVE? (Y/N)	**[OIP]** This prompt appears if response to previous prompt was Y. Push ORT assembly control panel FLTR SEL switch to CLEAR. Then push FLTR SEL switch to S. Observe HDD and respond with Y or N.
99	PUSH FLTR SEL SW TO CLEAR. VIEW HDD; PUSH FLTR SEL SW TO L. DID FLTR MOVE? (Y/N)	**[OIP]** This prompt appears if response to previous prompt was Y. Push ORT assembly control panel FLTR SEL switch to CLEAR. Then push FLTR SEL switch to L. Observe HDD and respond with Y or N.
100	VIEW HDD; PUSH FLTR SEL SW TO CLEAR. DID FLTR MOVE TO CLEAR? (Y/N)	**[OIP]** This prompt appears if response to previous prompt was Y. Push ORT assembly control panel FLTR SEL switch to CLEAR. Observe HDD and respond with yes or no.
101	SET ACM SW TO ON. PUSH FOV SW TO W. IS FLIR IMAGE VISABLE? (Y/N)	This prompt appears if the ORT assembly control panel azimuth control functioned correctly in item 93, internal monitoring circuits are not set, the left hand-grip sensor select switch is set to **FLIR,** and the ORT assembly control panel **ACM** switch is off (down position). This prompt also appears if the response to item 32 was Y, the sensor select switch is set to **FLI**R, and the **ACM** switch is off. Set **ACM** switch to on and field-of-view switch to W. Observe display and respond with yes or no. Check the display for banding, excessive bad lines, intermittent blanking, and/or FLIR image smearing. If banding, excessive bad lines, intermittent blanking, and/or smearing is evident respond with N. If during normal operation the FLIR image is noisy when laser is fired, replace the laser transceiver unit (TM 1-1270-476-20).
102	SET ACM SW OFF. (ACK)	This prompt appears if the response to previous prompt was Y, the **Z, N, M, W** switch is set to **W,** and the **ACM** switch is on (up position). Set ORT assembly control panel **ACM** switch to off (down position) and respond as indicated.
103	TURN LVL FULLY CW THEN FULLY CCW: CENTER. (ACK)	This prompt appears if the **ACM** switch turned off in responding to previous prompt. Observe display, turn ORT assembly control panel **LVL** fully cw, then fully ccw, and respond as indicated.
104	DID BRT INCREASE THEN DECREASE? (Y/N)	This prompt appears if the brightness **LVL** switch functioned correctly in responding to previous prompt. Respond with yes or no.
105	TURN GAIN FULLY CW THEN FULLY CCW: CENTER. (ACK)	This prompt appears if response to previous prompt was Y. Observe display, turn ORT assembly control panel **GAIN** fully cw, then fully ccw, and respond as indicated.
106	DID CONT INCREASE THEN DECREASE? (Y/N)	This prompt appears if the contrast **GAIN** control functions correctly in response to previous prompt. Respond with yes or no.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
107	ADJUST GAIN AND LVL FOR BEST IMAGE. IS IMAGE QUALITY GOOD? (Y/N)	This prompt appears if response to previous prompt was Y. Adjust ORT assembly control panel **GAIN** and **LVL** for best image. Observe display and respond with yes or no.
108	POOR IMAGES MAY BE DUE TO OUTSIDE CONDI-TIONS. QUALITY MAY ALSO CHANGE WITH FOV CHANGES. (ACK)	This prompt appears if response to previous prompt was N. Respond as indicated.
109	COULD OUTSIDE CONDI-TIONS BE CAUSING BAD CLARITY? (Y/N)	This prompt appears after response is made to previous prompt. Respond with yes or no.
110	DO YOU WISH TO CON-TINUE TESTING? (Y/N)	This prompt appears if response to previous prompt was Y. Respond with yes or no.
111	TURN SYM BRT FULLY CW THEN FULLY CCW. (ACK)	This prompt appears if response to previous prompt or to item 105 was Y and the symbology brightness circuits are not set. Turn ORT assembly control panel **SYM BRT** fully cw, then fully ccw, and respond as indicated.
112	WERE CROSSHAIRS AND TRACKER GATES PRESENT AND DID THEIR INTENSITY CHANGE? (Y/N)	This prompt appears if the **SYM BRT** control functioned correctly in the response to previous prompt. Observe display and respond with yes or no.
113	READJUST SYM BRT. SET ACM SW TO ON. (ACK)	This prompt appears if response to previous prompt was Y. This prompt also appears if response to item 105 was Y and the internal symbology brightness sensing circuits are set. Adjust ORT assembly control panel **SYM BRT**. Set **ACM** to on (up position) and respond as indicated.
114	ADJUST BOTH GAIN AND LVL CW THEN CCW. IS THERE A LARGE CHANGE IN IMAGE CONT OR BRT? (Y/N)	This prompt appears if the **ACM** switch functioned correctly in the response to previous prompt. Adjust ORT assembly control panel **GAIN** and **LVL** cw, then ccw. Observe display and respond with yes or no.
115	SET ACM SW TO OFF. ADJUST GAIN AND LVL FOR BEST IMAGE. (ACK)	This prompt appears if response to previous prompt was N. Set ORT assembly control panel **ACM** switch to off (down position). Adjust **GAIN** and **LVL** for best image and respond as indicated.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
116	PRESS AND RELEASE FLIR PLRT SW. DID FLIR PLRT CHANGE? (Y/N)	This prompt appears following response to previous prompt. Press and release ORT assembly right handgrip FLIR polarity. Observe display and respond with yes or no.
117	PUSH TADS FOV SW TO M. ADJUST GAIN AND LVL. IS IMAGE QUALITY GOOD AND SCENE LARGER? (Y/N)	This prompt appears if response to previous prompt was Y. Push ORT assembly left handgrip **Z, N, M, W** switch to **M.** Adjust **GAIN** and **LVL** for best image. Observe display and respond with yes or no.
118	PUSH TADS FOV SW TO N. ADJUST GAIN AND LVL. IS AND SCENE LARGER? (Y/N)	This prompt appears if response to previous prompt was Y. Push ORT assembly left handgrip **Z, N, M, W** switch to N. Adjust **GAIN** and **LVL** for best image. Observe IMAGE QUALITY GOOD display and respond with yes or no.
119	PUSH RNG FOC SW UP THEN DOWN. DOES RANGE OF FOCUS VARY PROPERLY? (Y/N)	This prompt appears if response to previous prompt was Y, and the **RNG FOC** switch is off (center position). Push ORT assembly control panel **RNG FOC** switch up then down. Observe display and respond with yes or no.
120	RELEASE RNG FOC SW. (ACK)	This prompt appears if response to previous prompt was Y, and the **RNG FOC** switch is not off (center position). Release ORT assembly control panel **RNG FOC** switch and respond as indicated.
121	ADJUST RNG FOC SW FOR BEST IMAGE. IS IMAGE QUALITY GOOD? (ACK)	This prompt appears if response to item 115 was Y, and the **RNG FOC** switch is off (center position). Adjust ORT assembly control panel **RNG FOC** for best image. Observe display and respond with yes or no.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
122	ARE THERE ANY BAD LINES DISPLAYED (NOISY, BLK, OR WHT)? (Y/N)	This prompt appears if response to previous prompt was Y. Observe display (fig. 3-39) and respond with yes or no.

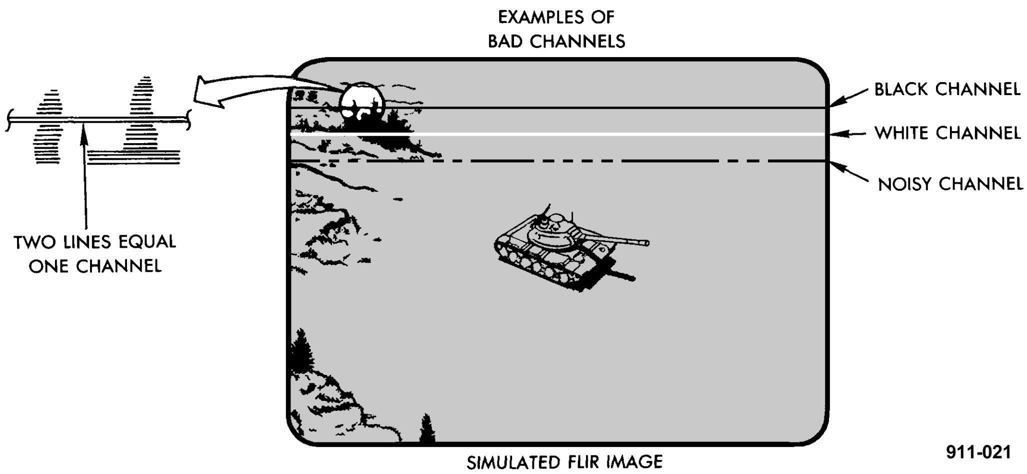


Figure 3-39. Examples of Bad Channels

Item No.	Message/Prompt	Remarks **(Reference)**
123	ARE THERE ANY BAD LINES IN THE CENTER 20% OF THE DISPLAY? (Y/N)	This prompt appears if response to previous prompt was Y. Observe display (fig. 3-40) and respond with yes or no.

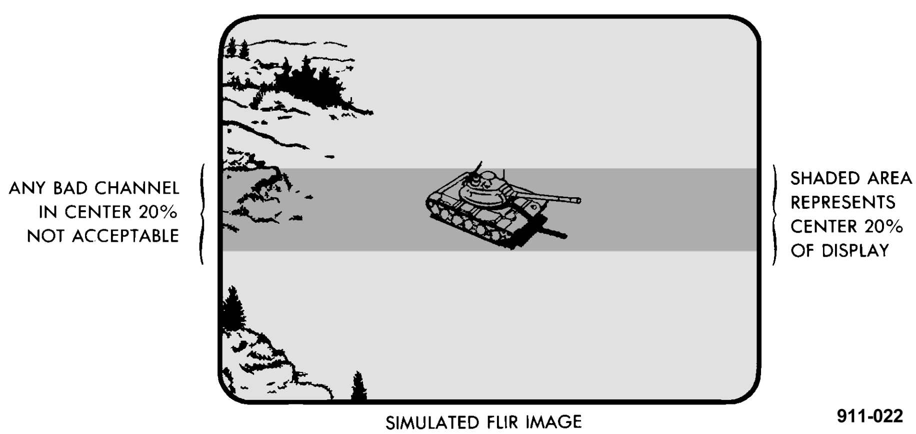


Figure 3-40. Example of Bad Channels in Center 20% of Display

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
124	ARE BAD LINES EXCESSIVE? (Y/N)	This prompt appears if response to previous prompt was N. Observe display (fig. 3-41 and 3-42) and respond with yes or no.

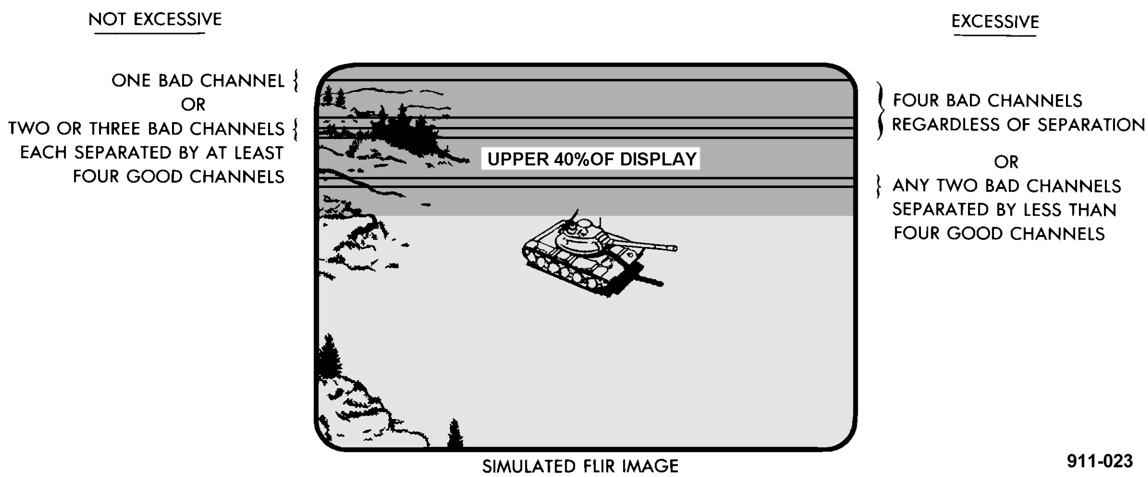


Figure 3-41. Example of Excessive Bad Channels in Upper 40% of Display

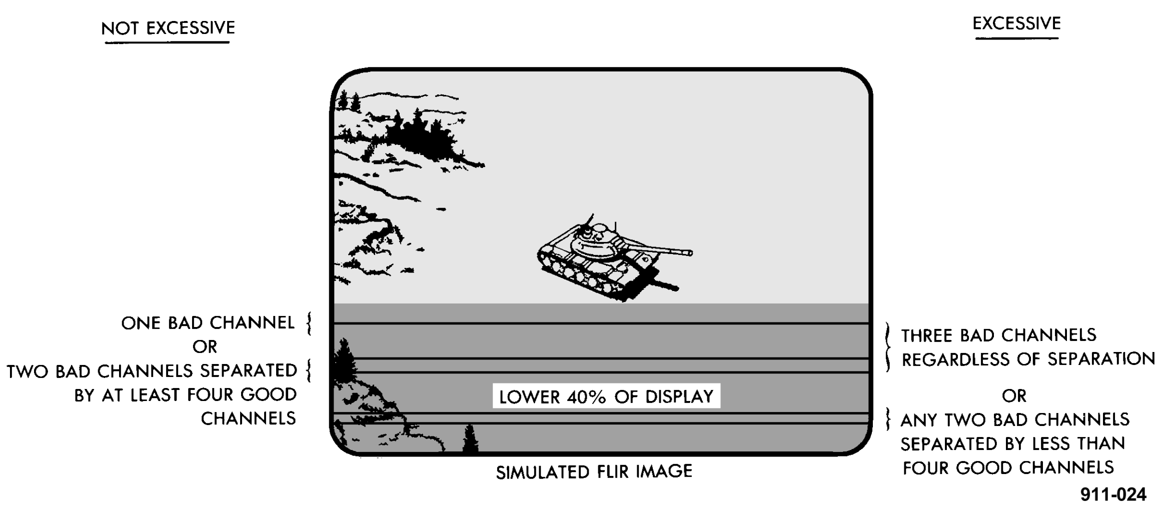


Figure 3-42. Example of Excessive Bad Channels in Lower 40% of Display

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		CAUTION To prevent excessive raster retention, FLIR zoom FOV shall not be activated for more than 2 minutes of continuous operation. Permanent damage may occur if it is engaged for more than 5 minutes.
125	PUSH TADS FOV TO Z. ADJUST GAIN AND LVL. IS IMAGE QUALITY GOOD AND SCENE LARGER? (Y/N)	This prompt appears if response to previous prompt was N. Also, this prompt appears if the response to item 122 was N. Push ORT assembly left handgrip **Z, N, M, W** switch to Z. Adjust **GAIN** and **LVL** for best image. Observe display and respond with yes or no.
126	PUSH TADS FOV SW TO W. DID FOV GO TO WIDE? (Y/N)	This prompt appears if response to previous prompt was Y. Push ORT assembly left handgrip **Z, N, M, W** switch to **W.** Observe display and respond with yes or no.
127	DO YOU WISH TO RUN OTHER SUBSYSTEM TESTS? (Y/N)	This prompt appears if response to previous prompt was Y, and the internal FLIR sensing circuits are set. Respond with yes or no.
128	AND NO-GO CPG COMPARTMENT	This message appears if the alphanumeric display (AND) fails during TADS interactive FD/LS. Replace alphanumeric display assembly (TM 1-1270-476-20). If fault still exists, refer to paragraph 3-57 for troubleshooting. If fault still exists, replace optical relay column (TM 1-1270-476-20).
129	TADS LASER TRANSCEIVER NO-GO DSA	This message appears if the laser transceiver unit failed during TADS interactive FD/LS. Replace laser transceiver unit (TM 1-270-476-20). If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P). If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
130	TADS LASER ELECTRONICS NO-GO LH FAB	This message appears if the laser electronic unit failed during TADS interactive FD/LS. Replace laser electronic unit assembly (TM 1-1270-476-20). If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P).

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
131	TADS POWER SUPPLY NO-GO LH FAB	This message appears if the TADS power supply failed during TADS interactive FD/LS. Replace TADS power supply (TM 1-1270-476-20). If fault occurred after anti-ice was selected, perform anti-ice maintenance operational check (para 4-1). If fault still exists, refer to paragraph 3-58 for troubleshooting.
132	TADS ELECTRONIC UNIT NO-GO LH FAB	This message appears if the TADS electronic unit failed during TADS interactive FD/LS. Replace TADS electronic unit (TM 1-1270-476-20). If fault still exists, refer to paragraph 3-59 for troubleshooting. If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
133	TADS ECS ASSEMBLY NO-GO TURRET BULKHEAD	This message appears if the environmental control system failed. Perform PMCS procedures - environmental control system assembly (TM 1-1270-476-20). If fault still exists, replace environmental control system (TM 1-1270-476-20). If fault still exists, refer to paragraph 3-66 for troubleshooting. If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).
134	TADS IVD/HDD ELECTRONICS NO-GO CPG COMPARTMENT	This message appears if the indirect view display failed during TADS interactive FD/LS. Replace indirect view display (TM 1-1270-476-20). If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P).
135	BORESIGHT MODULE NO-GO TURRET BULKHEAD	This message appears if the boresight module failed during continuous BIT or during internal boresight. Replace boresight assembly (TM 1-1270-476-20). • If fault occurred during anti-ice, perform anti-ice maintenance operational check (para 4-1). • If fault occurred during internal boresight troubleshoot TADS using DTA (TM 1-4931-727-13&P). • • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20).

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
136	TADS TV SHROUD NO-GO DSA	This message appears if anti-ice is selected and the day sensor shroud failed during continuous BIT. Replace day sensor shroud assembly (TM 1-1270-476-20).
		If fault still exists, perform anti-ice maintenance operational check (para 4-1).
137	TADS FLIR SHROUD NO-GO NSA	This message appears if anti-ice is selected and the night sensor shroud failed during continuous BIT. Replace night sensor shroud assembly (TM 1-1270-476-20).
		If fault still exists, perform anti-ice maintenance operational check (para 4-1).
138	TADS LASER TRACKER NO-GO DSA	This message appears If the laser tracker/receiver failed during TADS interactive FD/LS. Replace laser tracker/receiver unit (TM 1-1270-476-20).
		If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P).
		If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
139	TADS TORQ-SERVO MODULE NO-GO TURRET BULKHEAD	This message appears If the TADS electronic control amplifier failed during TADS interactive FD/LS, replace TADS electronic control amplifier (TM 1-1270-476-20).
		If fault still exists, refer to paragraph 3-62 for troubleshooting.
		If fault still exists, replace pitch gyro CCA (TM 1-1270-476-20).
		If fault still exists, replace yaw gyro CCA (TM 1-1270-476-20).
140	TADS PITCH GYRO NO-GO DSA	This message appears if the pitch gyro failed during TADS interactive FD/LS. Replace pitch gyro CCA (TM 1-1270-476-20).
		If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P).
		If fault still exists, replace TADS power supply (TM 1-1270-476-20).
141	TADS YAW GYRO NO-GO DSA	This message appears if the yaw gyro failed during TADS interactive FD/LS. Replace yaw gyro CCA (TM 1-1270-476-20).
		If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P).

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		If fault still exists, replace TADS power supply (TM 1-1270-476-20).
142	TADS ROLL GYRO NO-GO DSA	This message appears if the roll gyro failed during TADS interactive FD/LS. Replace roll gyro CCA (TM 1-1270-476-20). If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P). If fault still exists, replace TADS power supply (TM 1-1270-476-20).
143	TADS DSA SUB-ASSY NO-GO DSA	This message appears if the day sensor subassembly failed during TADS interactive FD/LS. Replace day sensor subassembly (TM 1-1270-476-20). If fault still exists, refer to the malfunctions listed below. Identify the malfunction which best describes system operation associated with the DSA subassembly fault. Perform fault isolation procedure associated with the DSA subassembly fault. DTV FOV will not change and FLIR FOV will not change from WFOV to NFOV or NFOV to WFOV, troubleshoot **Z/N/M/W FOV** switch using DTA ORT switch routine (TM 1-4931-727-13&P). If fault still exists, troubleshoot TADS using DTA (TM 1-4931-7272-13&P). DTV FOV will not change; however FLIR FOV changes properly, refer to paragraph 3-100 for troubleshooting. If fault still exists, replace TADS electronic unit (TM 1-1270-476-20). • No DVO reticle, refer to paragraph 3-95 for troubleshooting. • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). • No DVO reticle brightness control with DVO scene normal, refer to paragraph 3-96 for troubleshooting. • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). • DTV range focus inoperative, refer to paragraph 3-102 for troubleshooting. • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
144	TADS NIGHT SENSOR NO-GO NSA	This message appears if the night sensor assembly failed during TADS Interactive FD/LS. Replace TADS night sensor assembly (TM 1-1270-476-20). If fault still exists, refer to the malfunctions listed below. Identify the malfunction which best describes system operation associated with the night sensor assembly fault. Perform fault isolation procedure associated with the night sensor assembly fault. • FLIR will not switch to MFOV, troubleshoot Z/N/n/U FOV switch using DTA ORT switch routine (TM 1-4931-727-13&P). • • If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P). • • If fault still exists, replace TADS electronic unit (TM 1-1270-476-20). • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). • FLIR range focus Inoperative, troubleshoot TADS using DTA (TM 1-4931-727-13&P). • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		• FLIR image will not change by ORT assembly control panel **LVL** and **GAIN** controls, refer to paragraph 3-107 for troubleshooting. • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). • No FLIR video with symbol generator operational, refer to paragraph 3-103 for troubleshooting. • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). • FLIR polarity will not change, refer to paragraph 3-105 for troubleshooting. • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). • ACM does not work, refer to paragraph 3-106 for troubleshooting. • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2). • FLIR NOT COOLED message will not go away after normal cooldown time (20 minutes). Adjust ORT assembly control panel **LVL** and **GAIN** controls for optimum FLIR image. If FLIR image cannot be adjusted for optimum clarity, replace night sensor assembly (TM 1-1270-476-20). • • If fault still exists, refer to paragraph 3-61 for troubleshooting. • DTV FOV will not change and FLIR FOV will not change from WFOV to NFOV or NFOV to WFOV, troubleshoot **Z/N/M/W FOV** switch using DTA ORT switch routine (TM 1-4931-727-13&P). • • If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P). • • If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
145	ORT COLUMN ASSY NO-GO CPG COMPARTMENT	This message appears if the optical relay column failed during TADS Interactive FD/LS. Replace optical relay column (TM 1-1270-476-20). If fault still exists, troubleshoot TADS using DTA (TM 1-4931-727-13&P).
146	ORT HOD CONTROLS NO-GO CPG COMPARTMENT	This message appears if the ORT assembly control panel failed during TADS interactive FD/LS. Replace control panel (TM 1-1270-476-20). If fault still exists, refer to paragraph 3-60 for troubleshooting.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		If fault still exists, refer to the malfunctions listed below. Identify the malfunction which best describes system operation associated with ORT HOD CONTROLS NO-GO. Perform the fault isolation procedure associated with ORT assembly control panel faults. • Night filter does not change position, refer to paragraph 3-81 for troubleshooting. • Grayscale not displayed, refer to paragraph 3-74 for troubleshooting. • Range focus cannot be adjusted, refer to paragraph 3-70 for troubleshooting. • ORT assembly control panel LVL or GAIN control inoperative, refer to paragraph 3-108 for troubleshooting. • ORT assembly control panel VID SEL switch inoperative: troubleshoot VID SEL switch using DTA ORT switch routine (TM 1-4931-727-13&P). • • If fault still exists, refer to paragraph 3-75 for troubleshooting. • Haze/glare filter does not change position, refer to paragraph 3-99 for troubleshooting. • • If fault still exists, replace optical relay column (TM 1-1270-476-20). • ORT assembly control panel **ACM** switch inoperative, refer to paragraph 3-80 for troubleshooting. • HOD/HDD grayscale cannot be adjusted, refer to paragraph 3-72 for troubleshooting. • Symbology brightness does not change, refer to paragraph 3-73 for troubleshooting. • HOD/HDD brightness cannot be adjusted, refer to paragraph 3-69 for troubleshooting. • HOD/HDD contrast cannot be adjusted, refer to paragraph 3-71 for troubleshooting. • AND has no characters or brightness cannot be adjusted, refer to paragraph 3-82 for troubleshooting. • ORT assembly control panel azimuth control inoperative, refer to paragraph 3-77 for troubleshooting. • ORT assembly control panel elevation control Inoperative, refer to paragraph 3-78 for troubleshooting. • ORT assembly control panel boresight enable switch inoperative, refer to paragraph 3-79 for troubleshooting.
147	TADS AC TORQUER AMP NO-GO TURRET BULKHEAD	This message appears if the TADS turret assembly failed during TADS Interactive FD/LS. Replace TADS turret assembly (TM 1-1270-476-30).

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		If fault still exists, refer to paragraph 3-63 for troubleshooting. If fault still exists, replace TADS electronic unit (TM 1-1270-476-20). If fault still exists, replace TADS turret assembly (TM 1-1270-476-30).
148	TADS TV SENSOR NO-GO DSA	This message appears if the TADS TV sensor failed during TADS interactive FD/LS. Replace television sensor assembly (TM 1-1270-476-20). If fault still exists, refer to the malfunctions listed below. Identify the malfunction which best describes system operation associated with the TV sensor fault. Perform fault isolation procedure associated with the TV sensor fault. No DTV video, troubleshoot FLIR/TV/DVO switch using DTA (TM 1-4931-727-13&P). If fault still exists, refer to paragraph 3-101 for troubleshooting. If fault still exists, replace day sensor subassembly (TM 1-1270-476-20). If fault still exists, replace TADS electronic unit (TM 1-1270-476-20). Video scene not very good, replace indirect view display (TM 1-1270-476-20). DTV image banded, replace TADS electronic unit (TM 1-1270-476-20). • DTV video blooms, replace TADS electronic unit (TM 1-1270-476-20). • • If fault still exists, replace day sensor subassembly (TM 1-1270-476-20). • No DTV crosshairs, replace TADS electronic unit (TM 1-1270-476-20). • • If fault still exists, replace day sensor subassembly (TM 1-1270-476-20).
149	ORT LEFT HANDGRIP NO-GO CPG COMPARTMENT	This message appears if the ORT assembly left handgrip failed during TADS interactive FD/LS. Replace ORT assembly left handgrip (TM 1-1270-476-20).

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		If fault still exists, refer to the malfunctions listed below. Identify the malfunction which best describes system operation associated with left handgrip fault and perform the associated fault isolation procedure. • Left handgrip sensor select switch inoperative, troubleshoot sensor select switch using DTA ORT switch routine (TM 1-4931-727-13&P). • • If fault still exists, refer to paragraph 3-86. • Left handgrip **IAT** switch inoperative, troubleshoot **IAT/MANUAL** switch using DTA ORT switch routine (TM 1-4931-727-13&P). • Left handgrip **LMC** switch inoperative, troubleshoot **LMC** switch using CITA ORT switch routine (TM 1-4931-727-13&P). • Left handgrip **IAT OFS** switch inoperative, troubleshoot **IAT OFS** switch using DTA ORT switch routine (TM 1-4931-727-13&P). • Left handgrip target switch inoperative, troubleshoot TADS using DTA (TM 1-4931-727-13&P). • Left handgrip field-of-view switch inoperative, troubleshoot **Z/N/M/W FOV** switch using DTA ORT switch routine (TM 1-4931-727-13&P).
150	ORT RIGHT HANDGRIP NO-GO CPG COMPART-MENT	This message appears if the ORT assembly right handgrip failed during TADS Interactive FD/LS. Replace ORT assembly right handgrip (TM 1-1270-476-20). If fault still exists, refer to the malfunctions listed below. Identify the malfunction which best describes system operation associated with right handgrip fault and perform the associated fault isolation procedure.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		• Right handgrip LT switch inoperative troubleshoot LT **AUTO/ MAN/OFF** switch using DTA ORT switch routing (TM 1-4931-727-13&P). • • If fault still exists, refer to paragraph 3-89. • Right handgrip **FLIR PLRT** switch inoperative, **F** troubleshoot **LIR PLRT** switch using DTA ORT switch routine (TM 1-4931-727-13&P). • Right handgrip **HDD** switch inoperative, refer to paragraph 3-91. • Right handgrip **VID REC** switch inoperative, refer to paragraph 3-93. • Right handgrip IAT polarity switch inoperative, troubleshoot **IAT WHT/AUTO/BLK** switch using DTA ORT switch routine (TM 1-4931-727-13&P). • Right handgrip **SLAVE** switch inoperative, troubleshoot **SLAVE** switch using DTA ORT switch routine (TM 1-4931-727-13&P). • Right handgrip **MAN TRK** control Inoperative, troubleshoot **MAN TRK** control using DTA ORT switch routine (TM 1-4931-727-13&P).
151	LRF/D COOLANT LOW	This message appears if laser coolant low condition is sensed during laser operation, replace laser transceiver unit (TM 1-1270-476-20). If fault still exists, refer to paragraph 3-64 for troubleshooting. If fault still exists, replace laser electronic unit (TM 1-1270-476-20). If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
152	LRF/D TEMP	This message appears if laser overtemp condition is sensed during laser operation, replace laser transceiver unit (TM 1-1270-476-20). If fault still exists, refer to paragraph 3-65 for troubleshooting. If fault still exists, replace laser electronic unit (TM 1-1270-476-20). If fault still exists, troubleshoot multiplex system (TM 9-1230-476-20-2).
153	LRF/D POWER LOW	This message indicates that laser power is between 40% and 80%, which is acceptable. No maintenance actions are required.

Table 3-1. Display Messages and Prompts (cont)

Item No.	Message/Prompt	Remarks **(Reference)**
		NOTE Modification to the LTU power monitor circuit and elimination of the 80% power threshold are presently being performed. Completion of these modifications will eliminate the LASER POWER LOW message.
154	TADS GO ANY KEY FOR FD/LS	This message appears if the response to item 25 was (N) or if no faults are found when the TADS interactive FD/LS is complete.

3-8. AC/DC POWER CONTROL AND BIT WIRING INTERCONNECT DIAGRAM

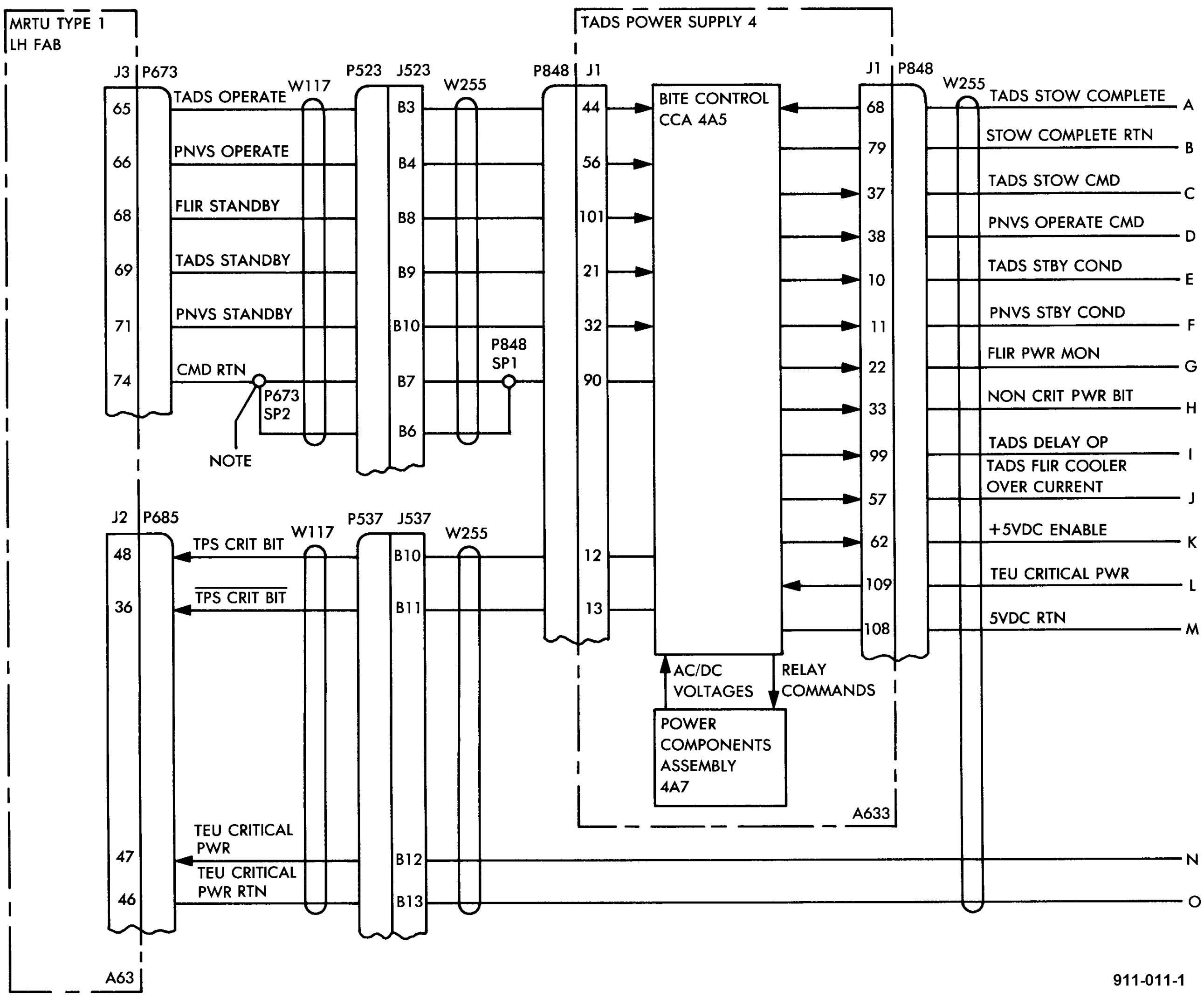


Figure 3-43. AC/DC Power Control and BIT Wiring Interconnect Diagram (Sheet 1 of 2)

3-8. AC/DC POWER CONTROL AND BIT WIRING INTERCONNECT DIAGRAM (cont)

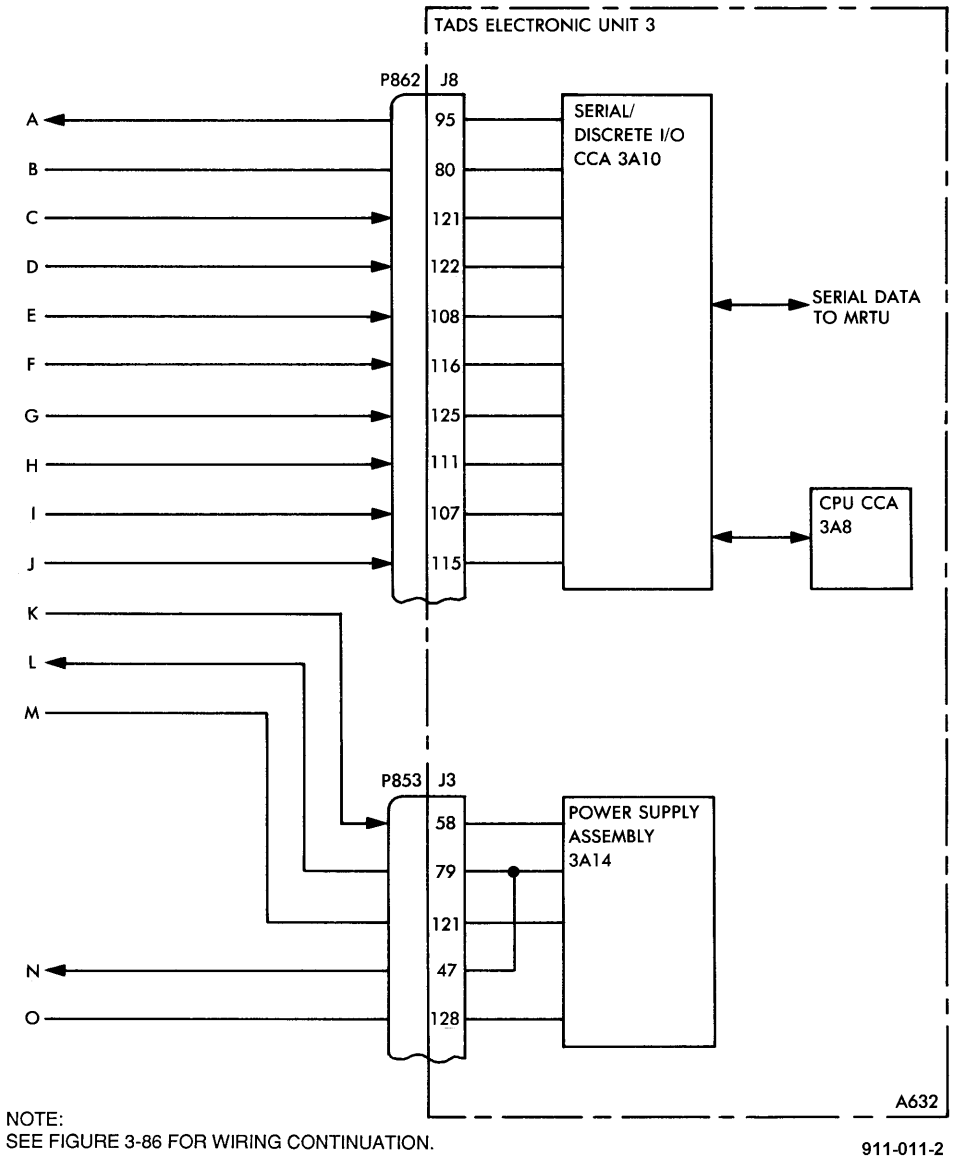


Figure 3-43. AC/DC Power Control and BIT Wiring Interconnect Diagram (Sheet 2 of 2)

3-9. AC POWER DISTRIBUTION (UNSWITCHED) WIRING INTERCONNECT DIAGRAM

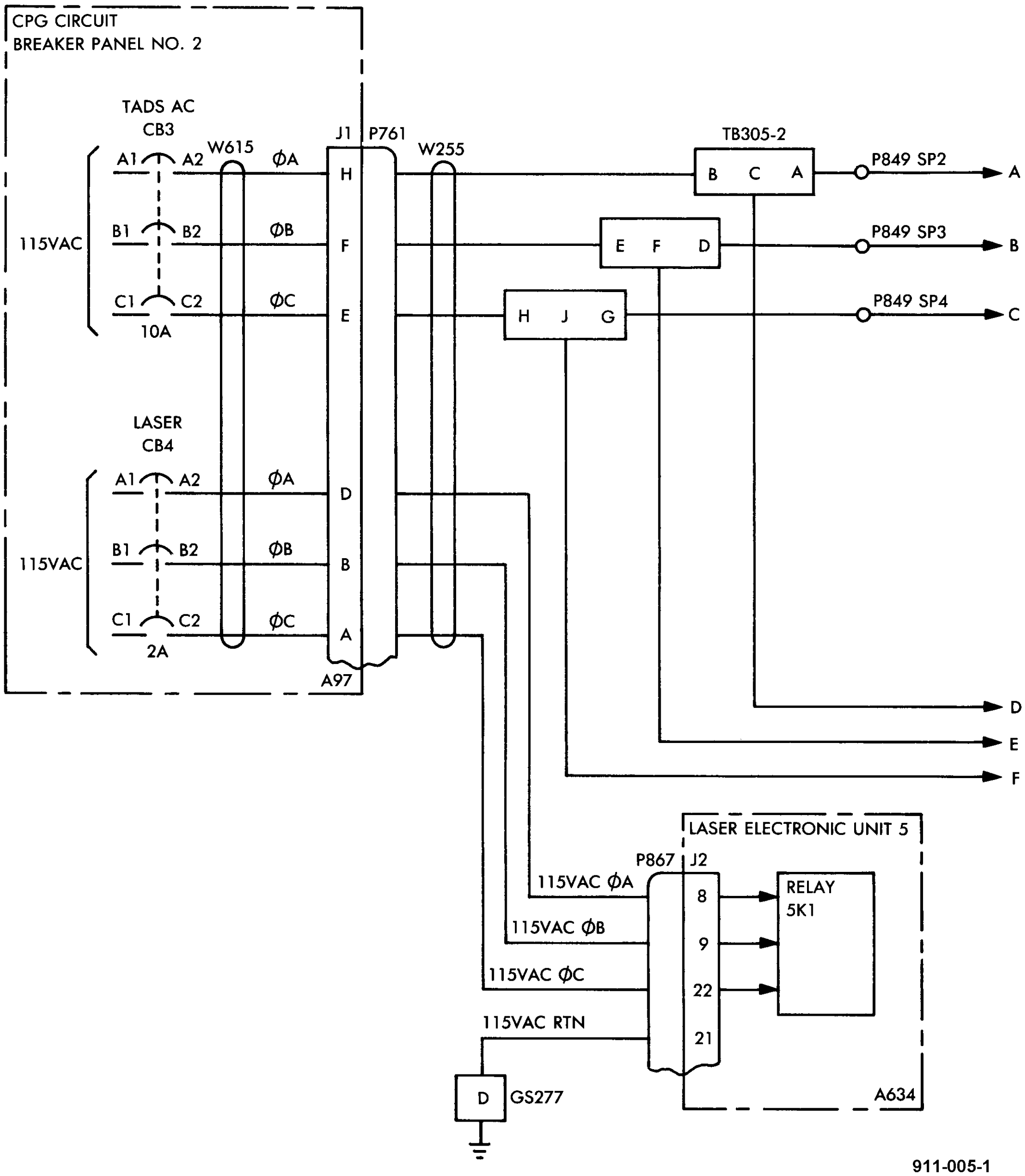


Figure 3-44. AC Power Distribution (Unswitched) Wiring Interconnect Diagram (Sheet 1 of 3)

3-9. AC POWER DISTRIBUTION (UNSWITCHED) WIRING INTERCONNECT DIAGRAM (cont)

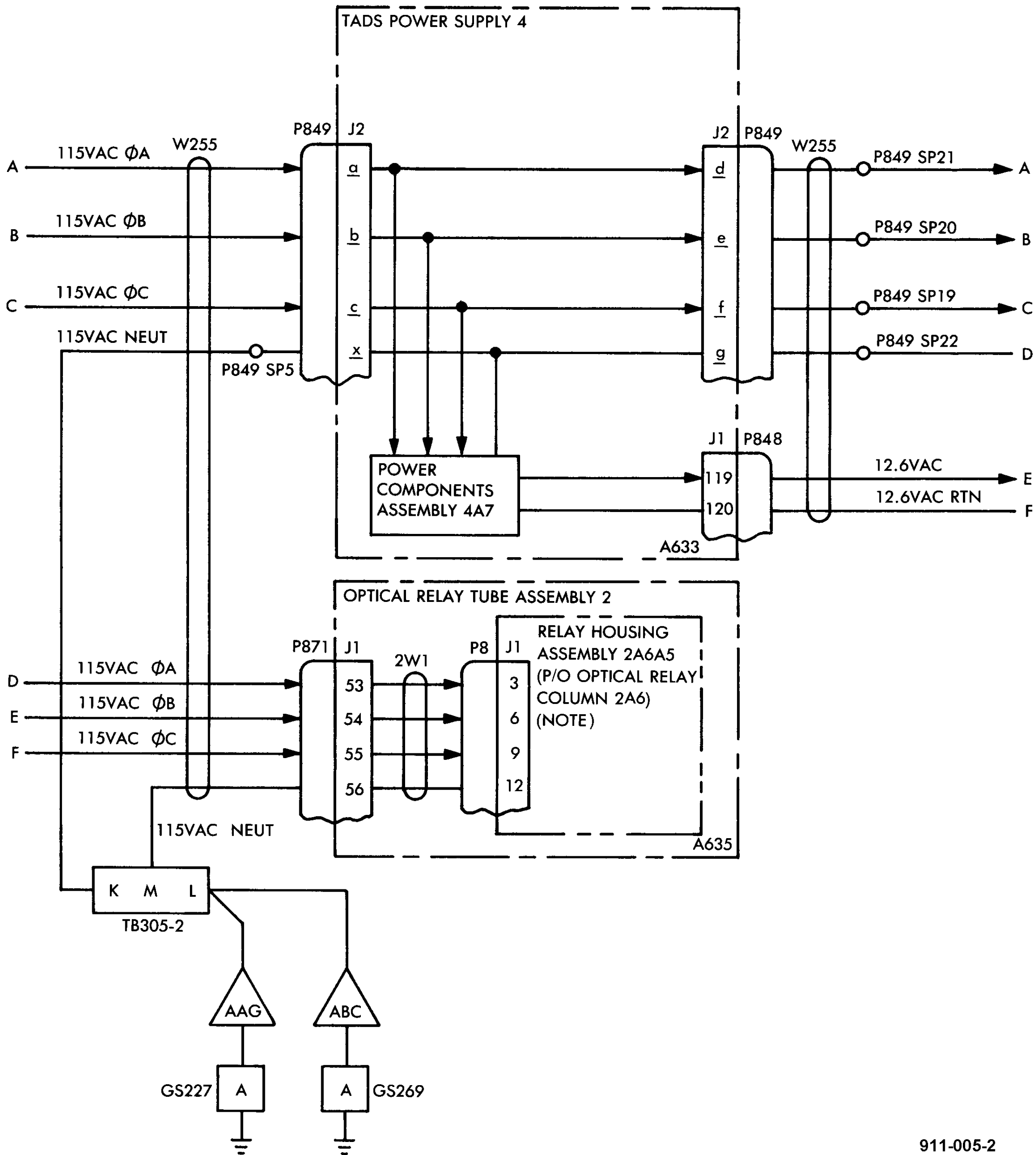


Figure 3-44. AC Power Distribution (Unswitched) Wiring Interconnect Diagram (Sheet 2 of 3)

3-9. AC POWER DISTRIBUTION (UNSWITCHED) WIRING INTERCONNECT DIAGRAM (cont)

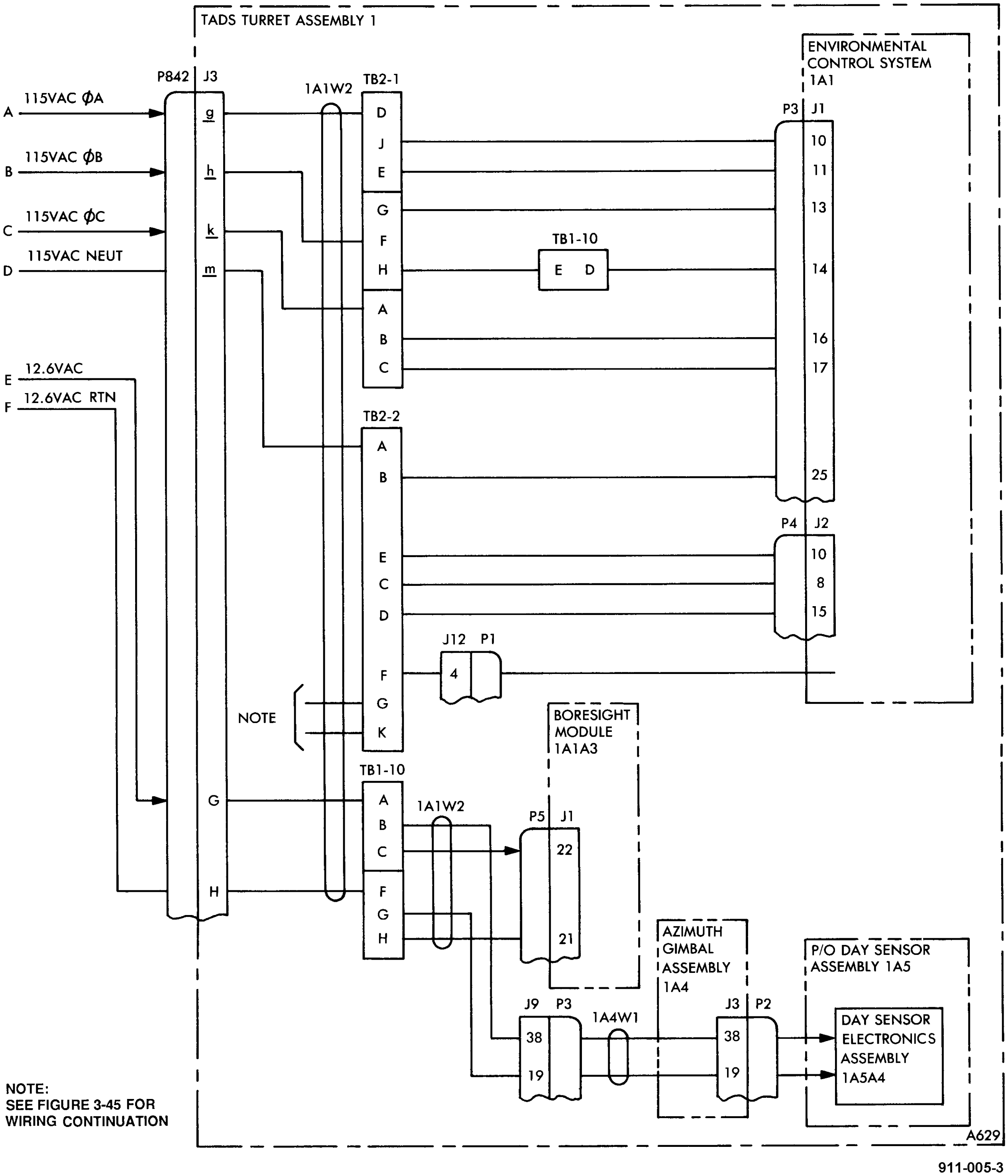


Figure 3-44. AC Power Distribution (Unswitched) Wiring Interconnect Diagram (Sheet 3 of 3)

3-10. AC POWER DISTRIBUTION (SWITCHED) WIRING INTERCONNECT DIAGRAM

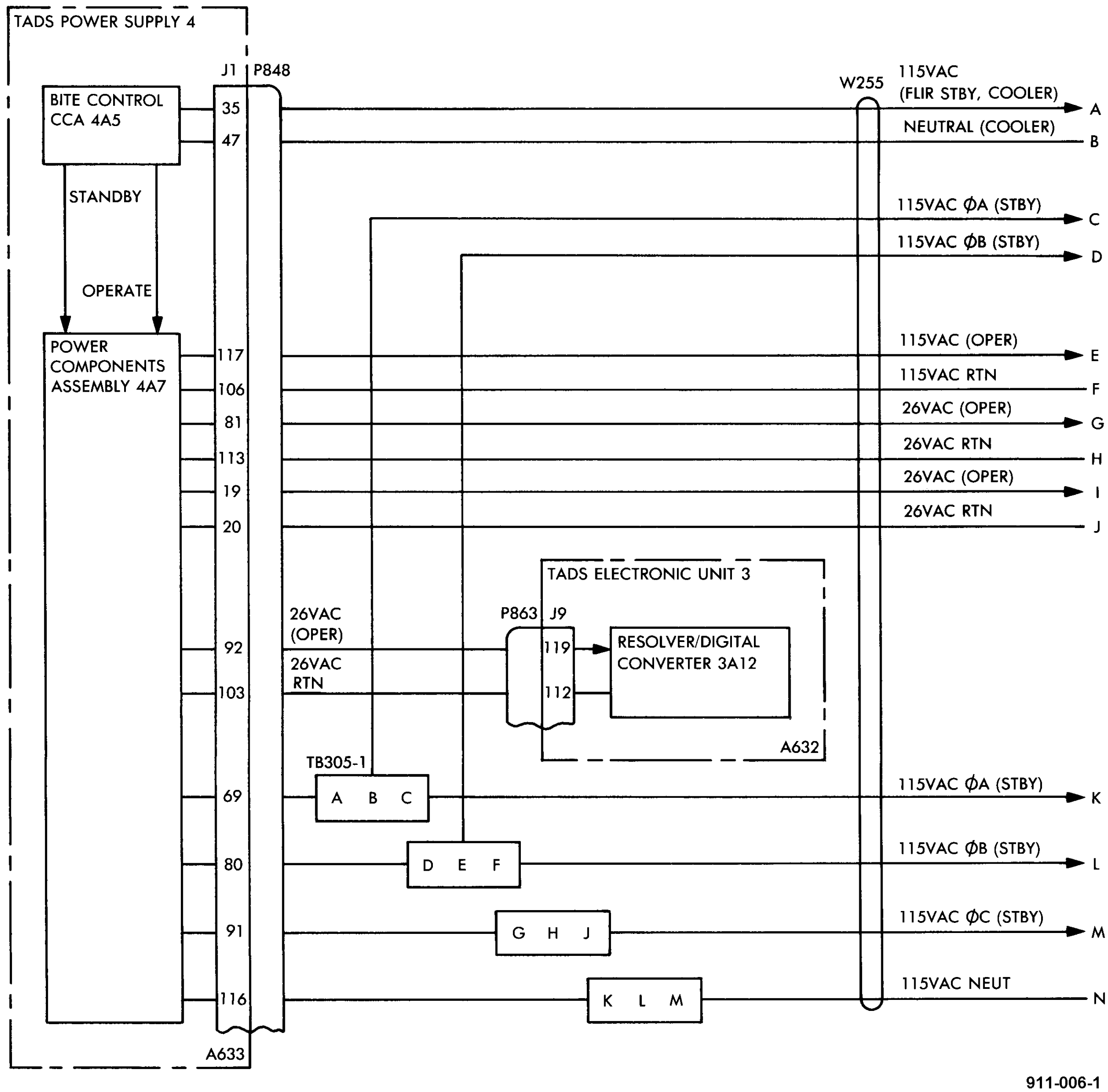


Figure 3-45. AC Power Distribution (Switched) Wiring Interconnect Diagram (Sheet 1 of 3)

3-10. AC POWER DISTRIBUTION (SWITCHED) WIRING INTERCONNECT DIAGRAM (cont)

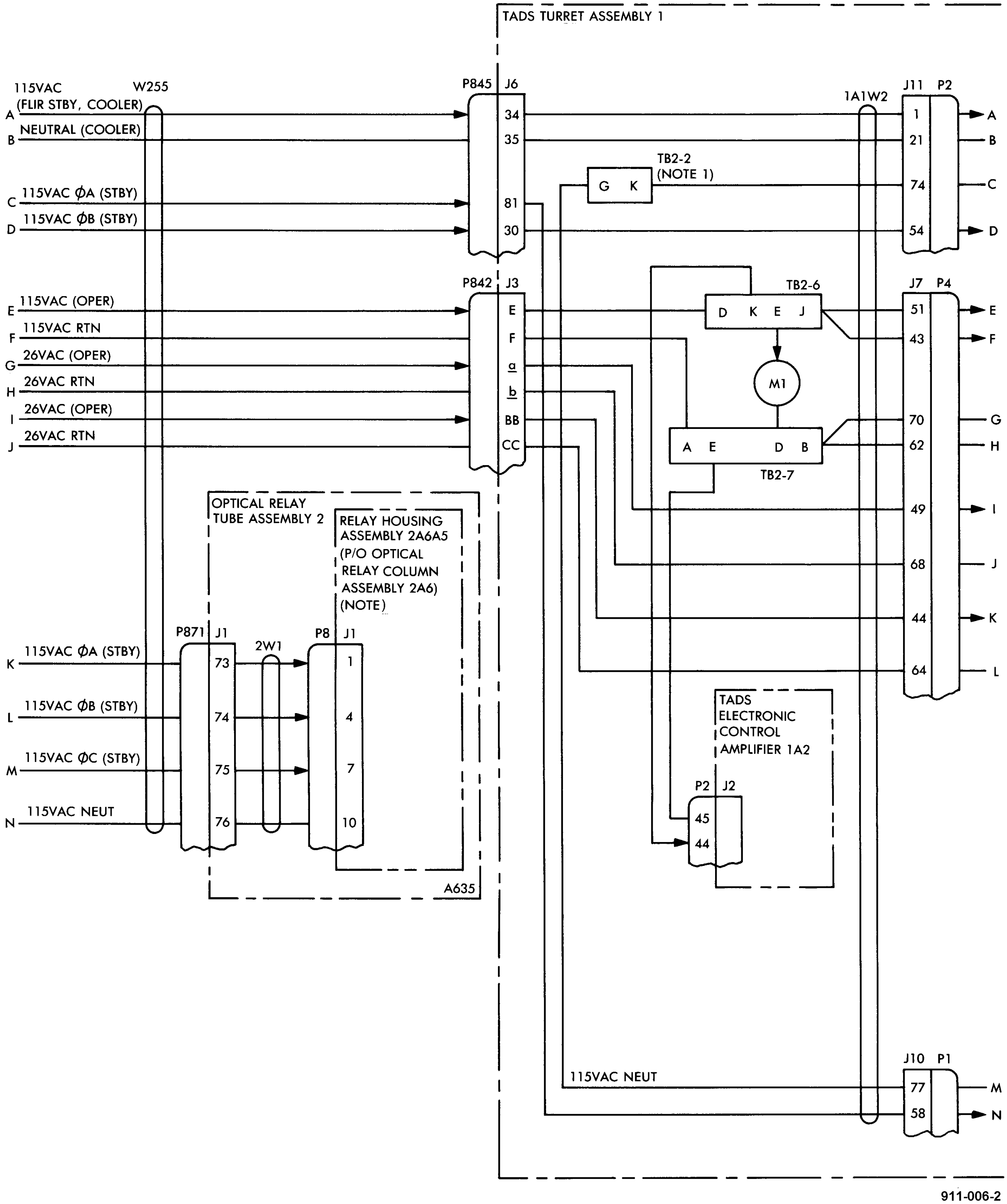
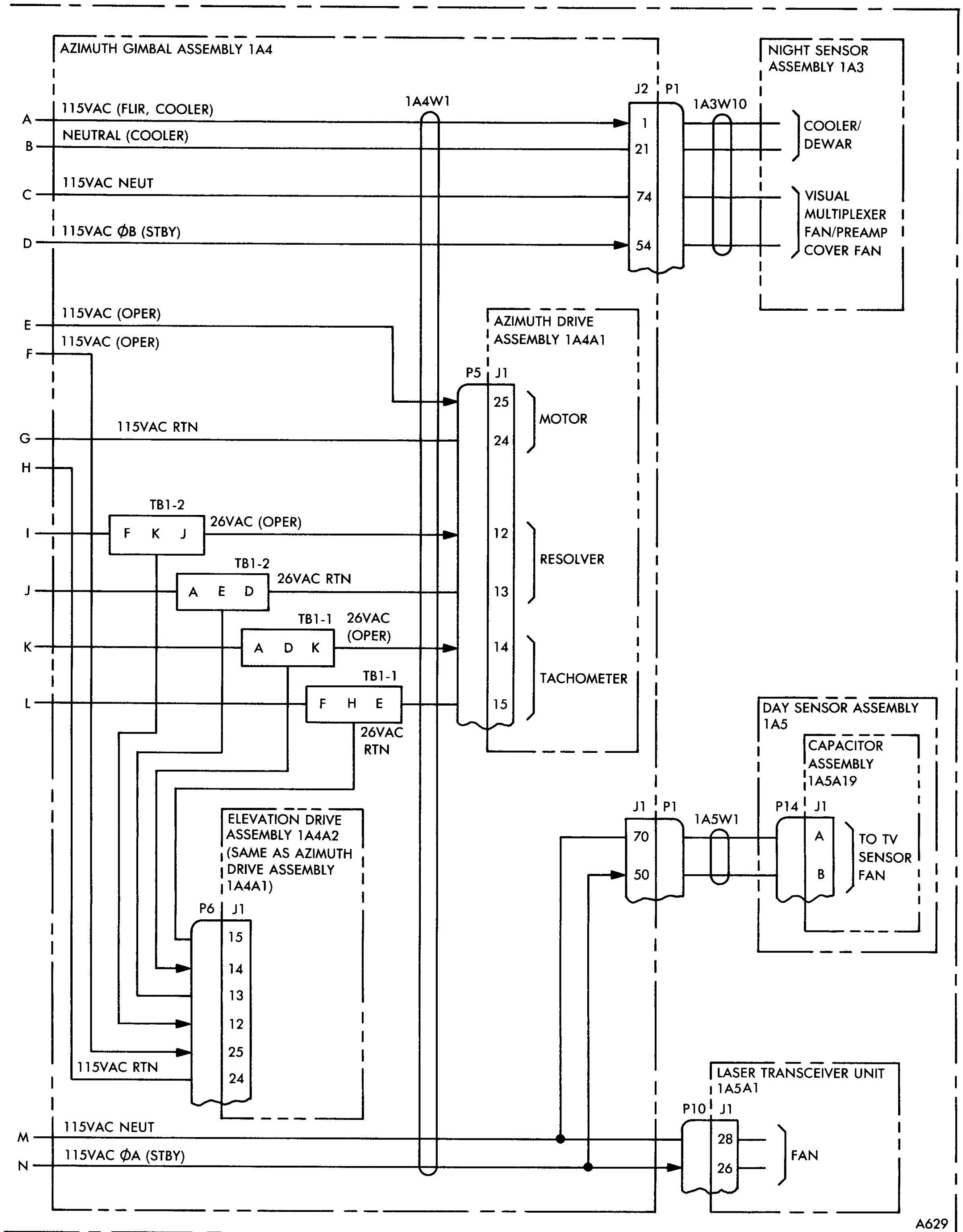


Figure 3-45. AC Power Distribution (Switched) Wiring Interconnect Diagram (Sheet 2 of 3)

3-10. AC POWER DISTRIBUTION (SWITCHED) WIRING INTERCONNECT DIAGRAM (cont)



NOTE:
SEE FIGURE 3-44 FOR WIRING CONTINUATION.

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Figure 3-45. AC Power Distribution (Switched) Wiring Interconnect Diagram (Sheet 3 of 3)

3-11. DC POWER DISTRIBUTION (AIRCRAFT 28 VDC UNSWITCHED) WIRING INTERCONNECT DIAGRAM

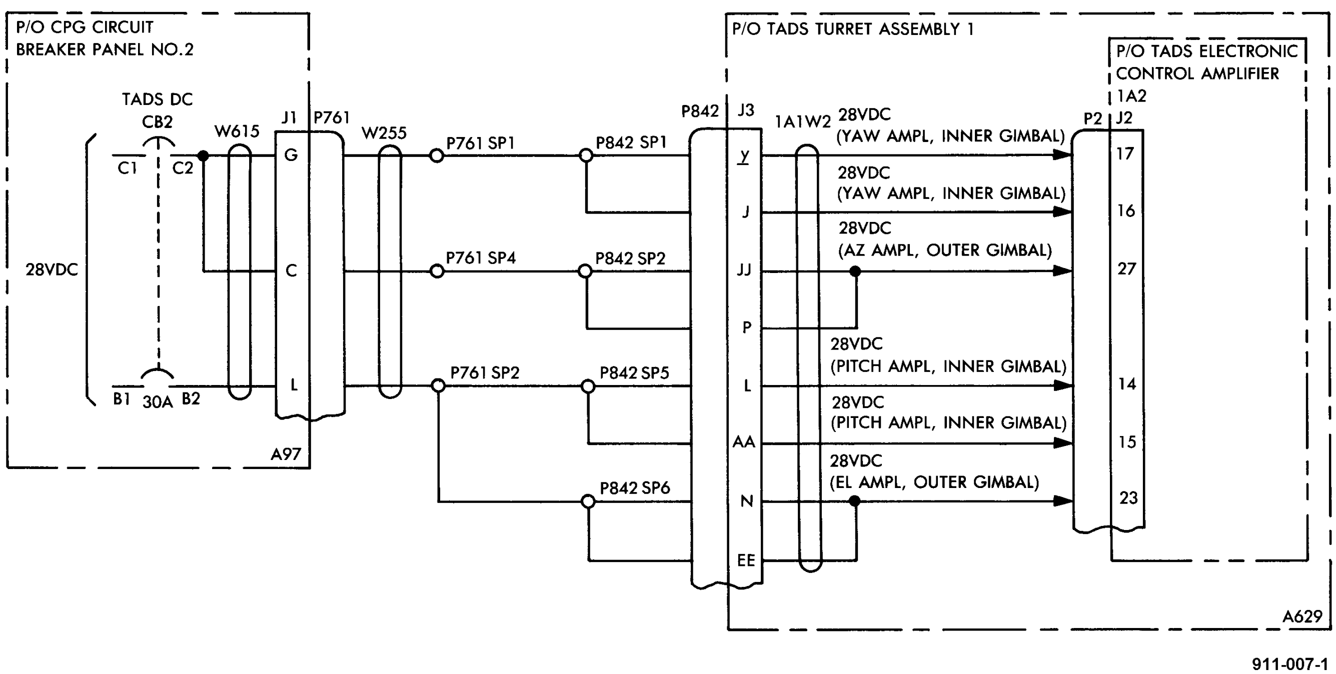


Figure 3-46. DC Power Distribution (Aircraft 28 VDC Unswitched) Wiring Interconnect Diagram (Sheet 1 of 5)

3-11. DC POWER DISTRIBUTION (AIRCRAFT 28 VDC UNSWITCHED) WIRING INTERCONNECT DIAGRAM (cont)

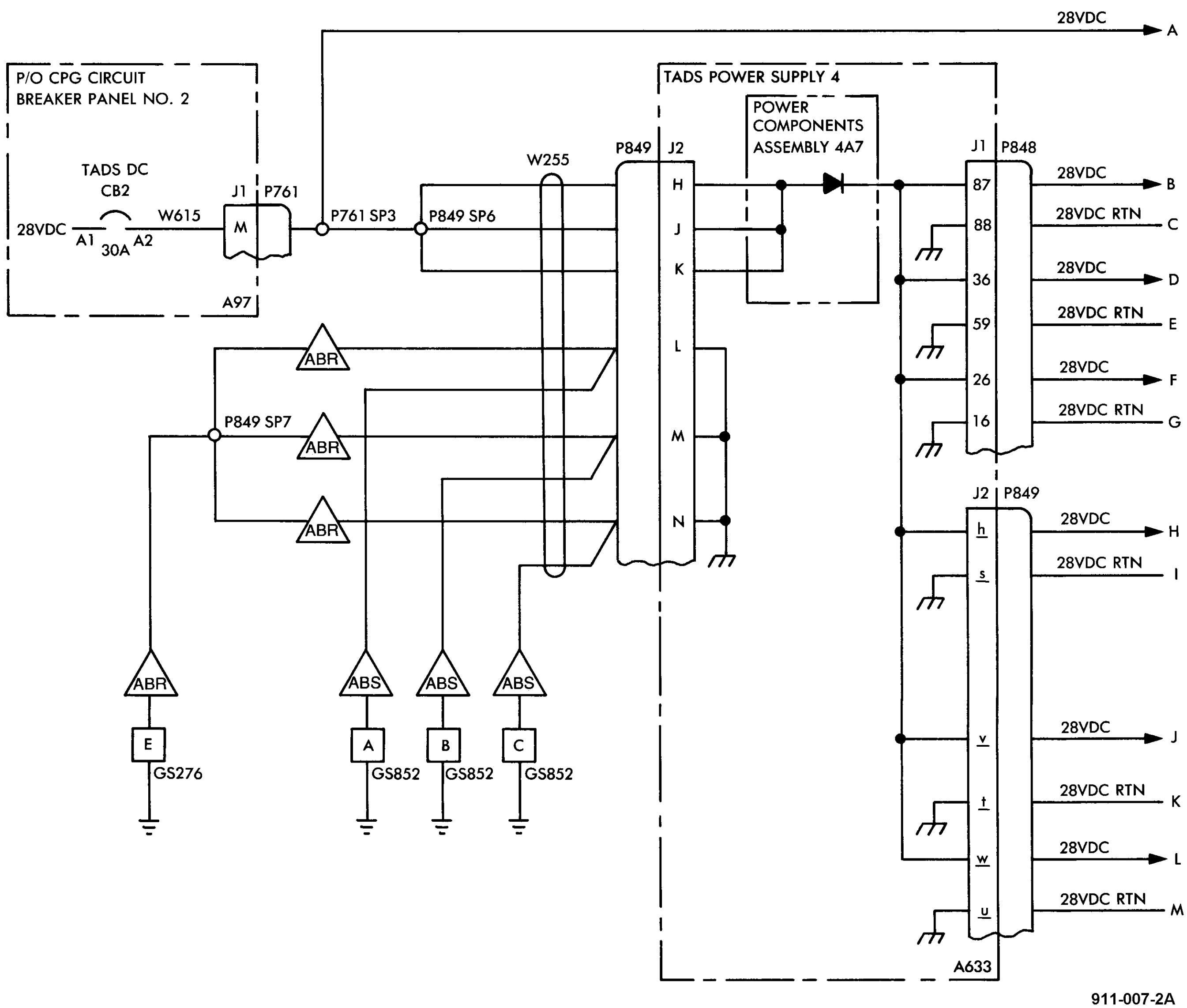


Figure 3-46. DC Power Distribution (Aircraft 28 VDC Unswitched) Wiring Interconnect Diagram (Sheet 2 of 5)

3-11. DC POWER DISTRIBUTION (AIRCRAFT 28 VDC UNSWITCHED) WIRING INTERCONNECT DIAGRAM (cont)

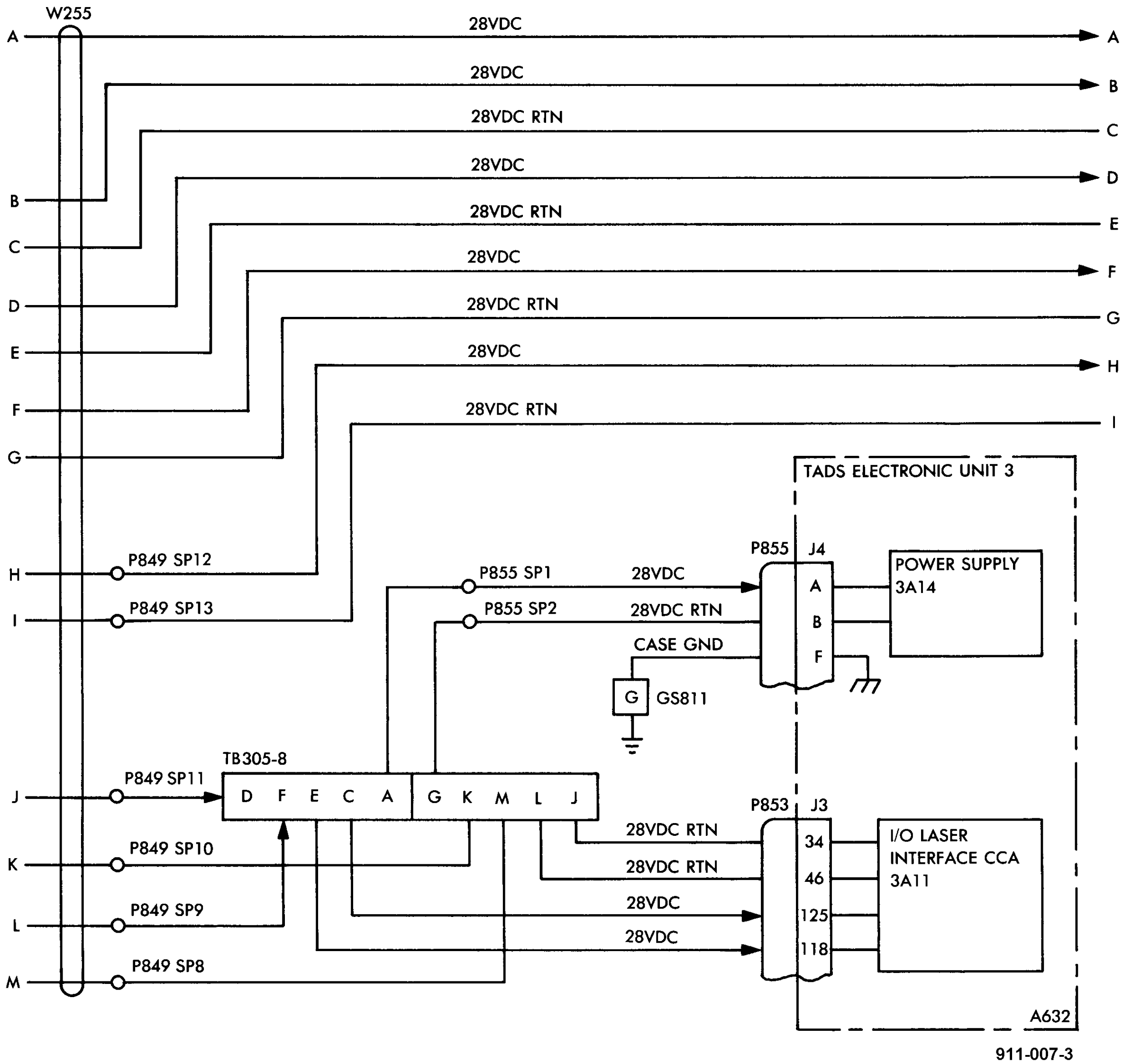


Figure 3-46. DC Power Distribution (Aircraft 28 VDC Unswitched) Wiring Interconnect Diagram (Sheet 3 of 5)

3-11. DC POWER DISTRIBUTION (AIRCRAFT 28 VDC UNSWITCHED) WIRING INTERCONNECT DIAGRAM (cont)

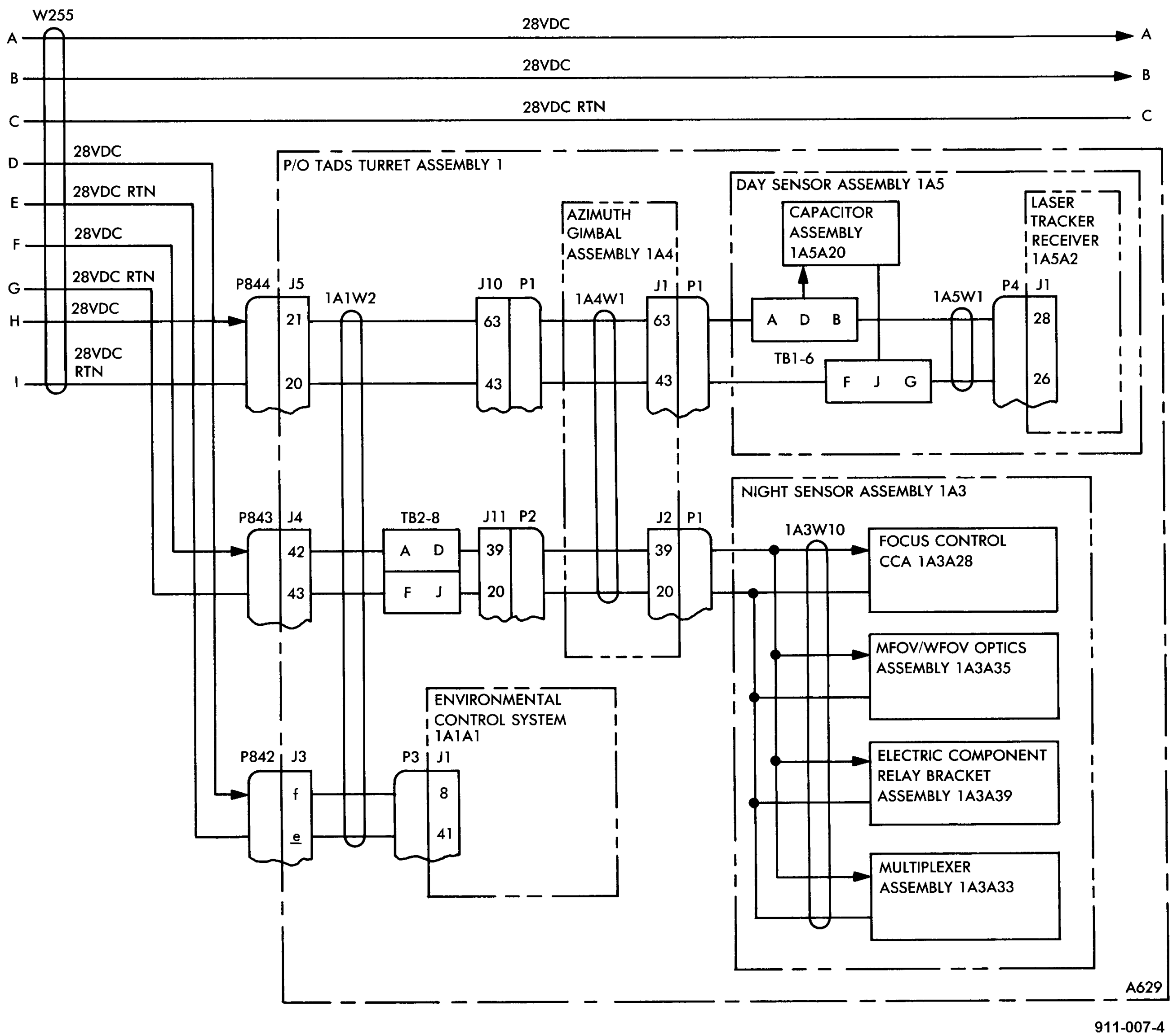


Figure 3-46. DC Power Distribution (Aircraft 28 VDC Unswitched) Wiring Interconnect Diagram (Sheet 4 of 5)

3-11. DC POWER DISTRIBUTION (AIRCRAFT 28 VDC UNSWITCHED) WIRING INTERCONNECT DIAGRAM (cont)

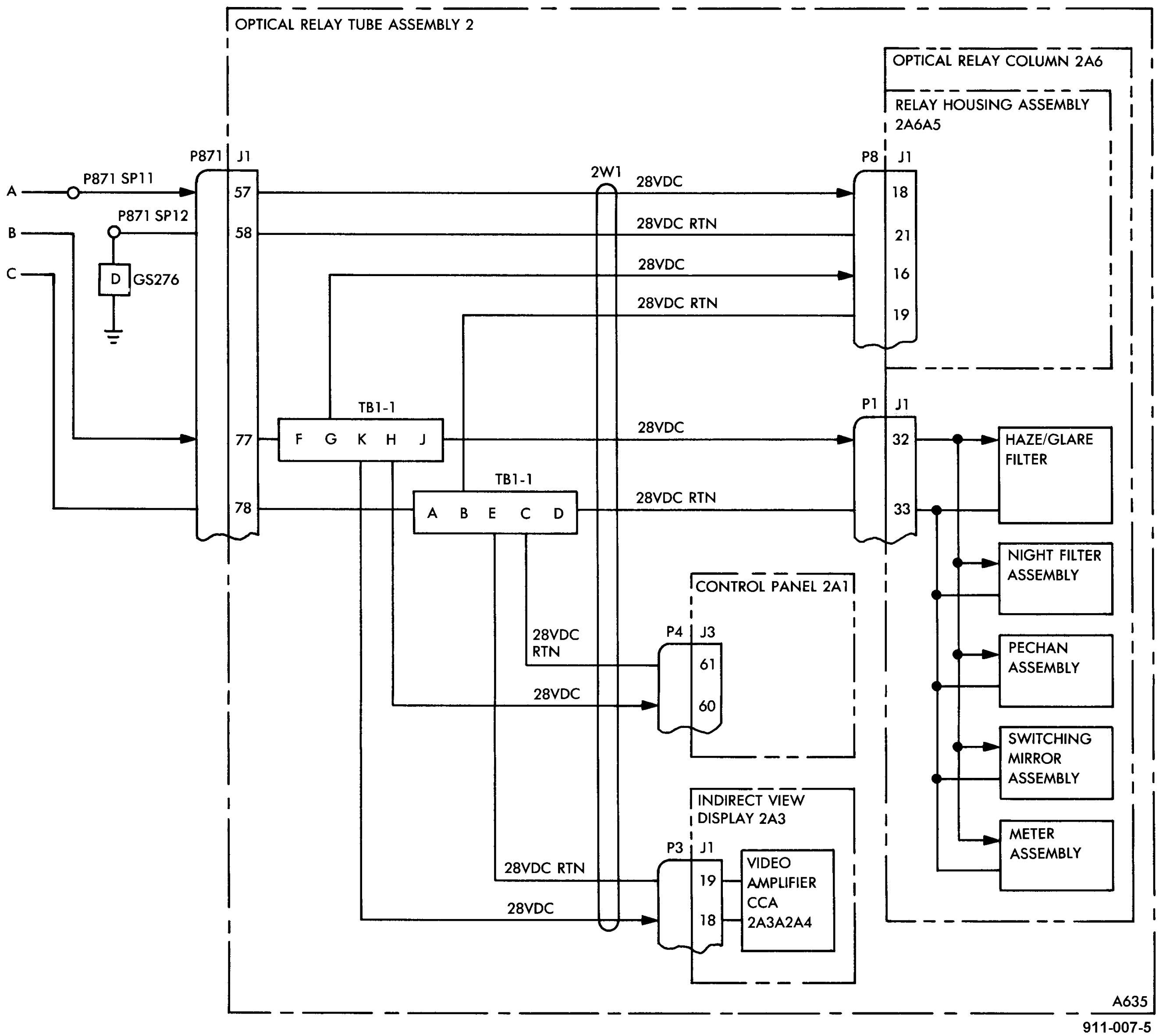


Figure 3-46. DC Power Distribution (Aircraft 28 VDC Unswitched) Wiring Interconnect Diagram (Sheet 5 of 5)

3-12. DC POWER DISTRIBUTION (AIRCRAFT 28 VDC SWITCHED) WIRING INTERCONNECT DIAGRAM

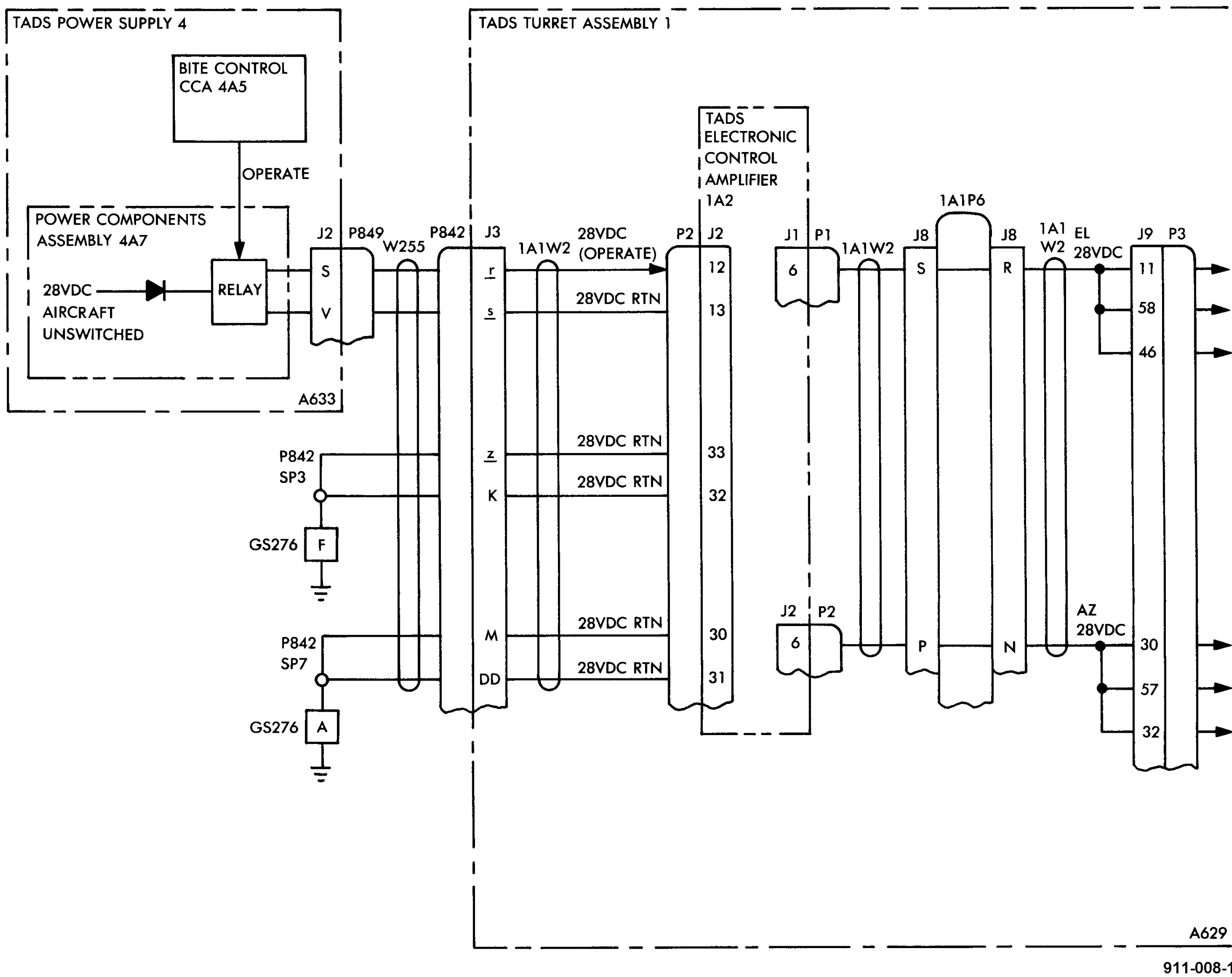


Figure 3-47. DC Power Distribution (Aircraft 28 VDC Switched) Wiring Interconnect Diagram
(Sheet 1 of 2)

3-12. DC POWER DISTRIBUTION (AIRCRAFT 28 VDC SWITCHED) WIRING INTERCONNECT DIAGRAM (cont)

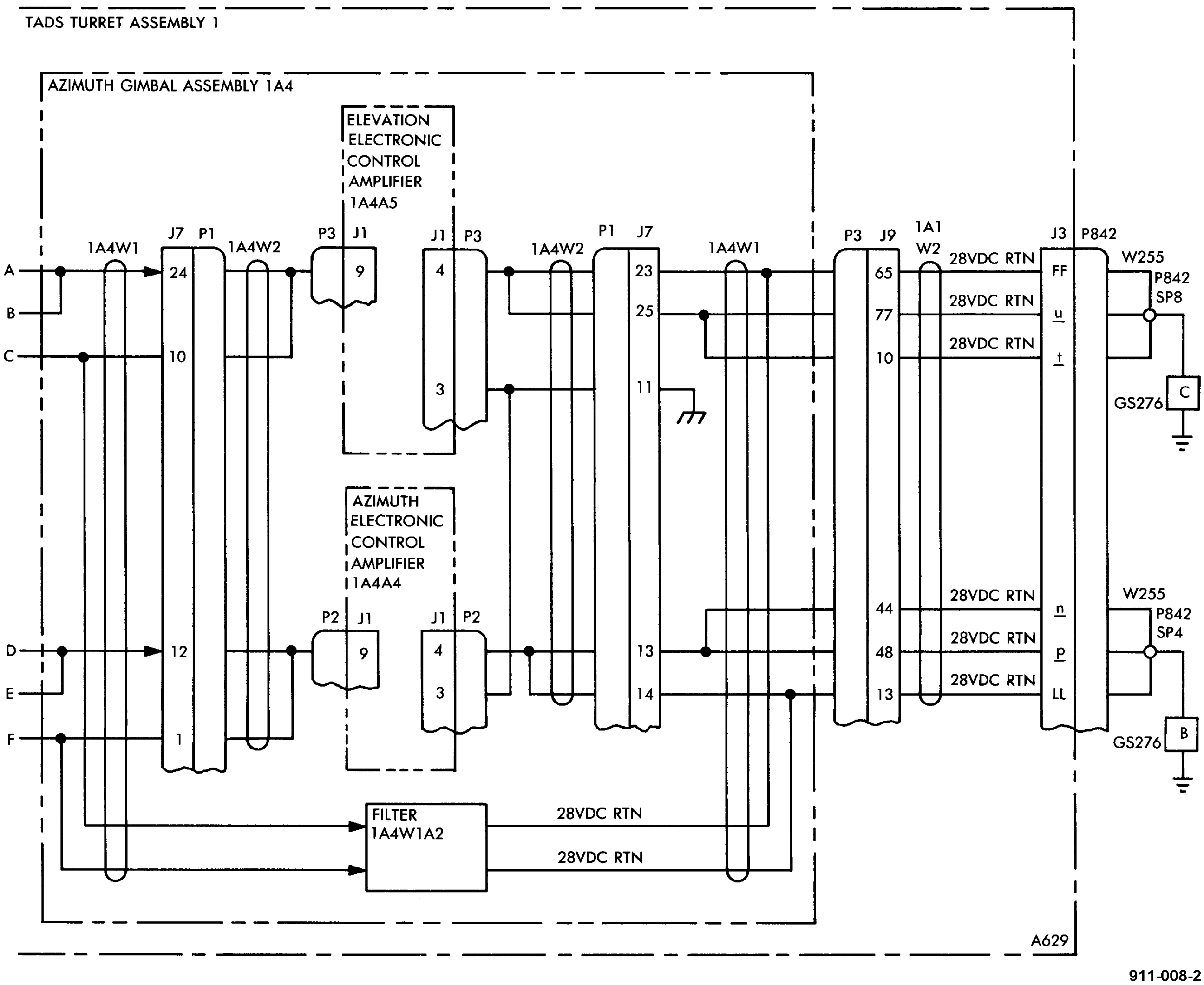


Figure 3-47. DC Power Distribution (Aircraft 28 VDC Switched) Wiring Interconnect Diagram (Sheet 2 of 2)

3-13. DC POWER DISTRIBUTION (TADS POWER SUPPLY) WIRING INTERCONNECT DIAGRAM

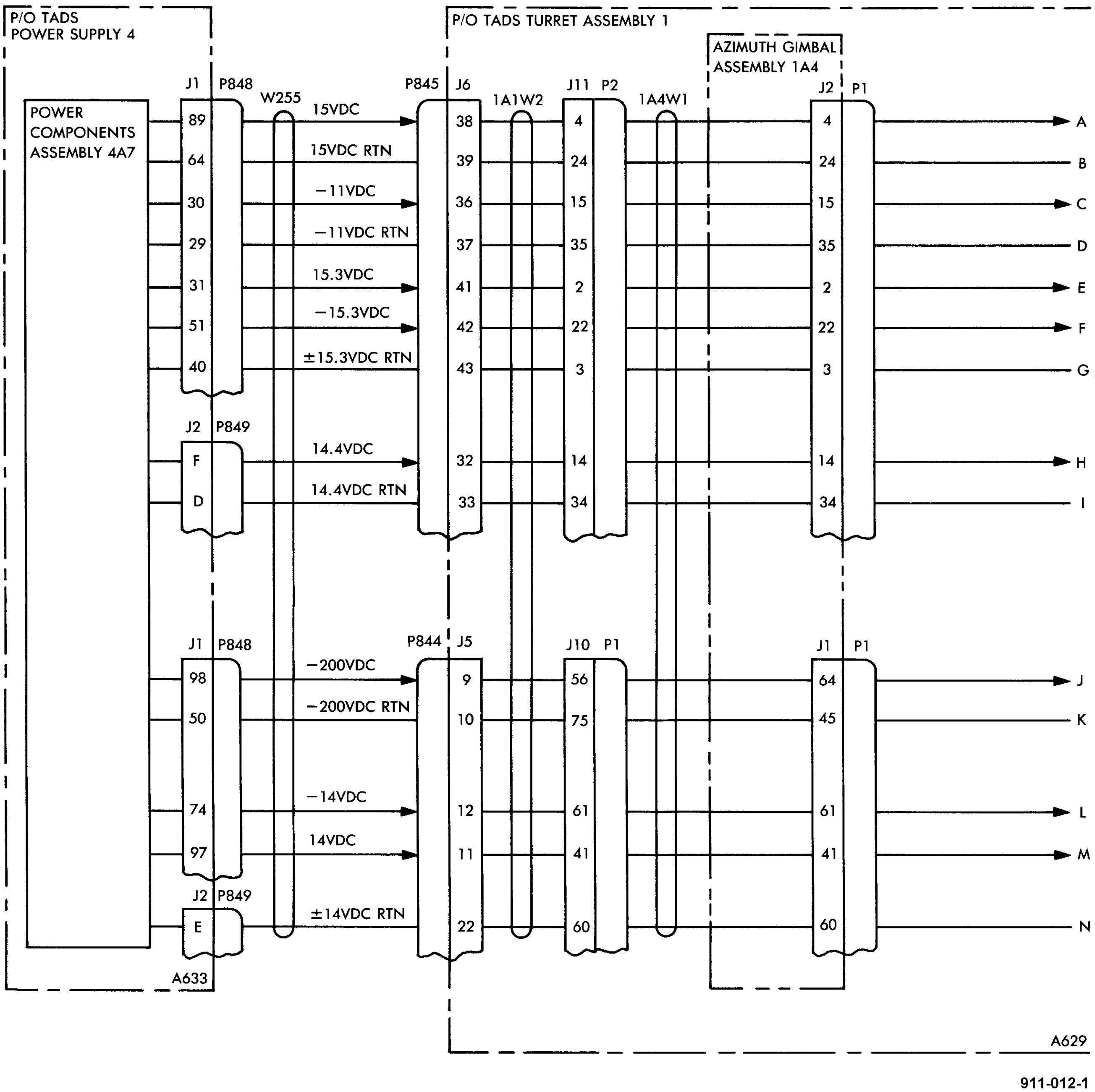


Figure 3-48. DC Power Distribution (TADS Power Supply) Wiring Interconnect Diagram
(Sheet 1 of 7)

3-13. DC POWER DISTRIBUTION (TADS POWER SUPPLY) WIRING INTERCONNECT DIAGRAM (cont)

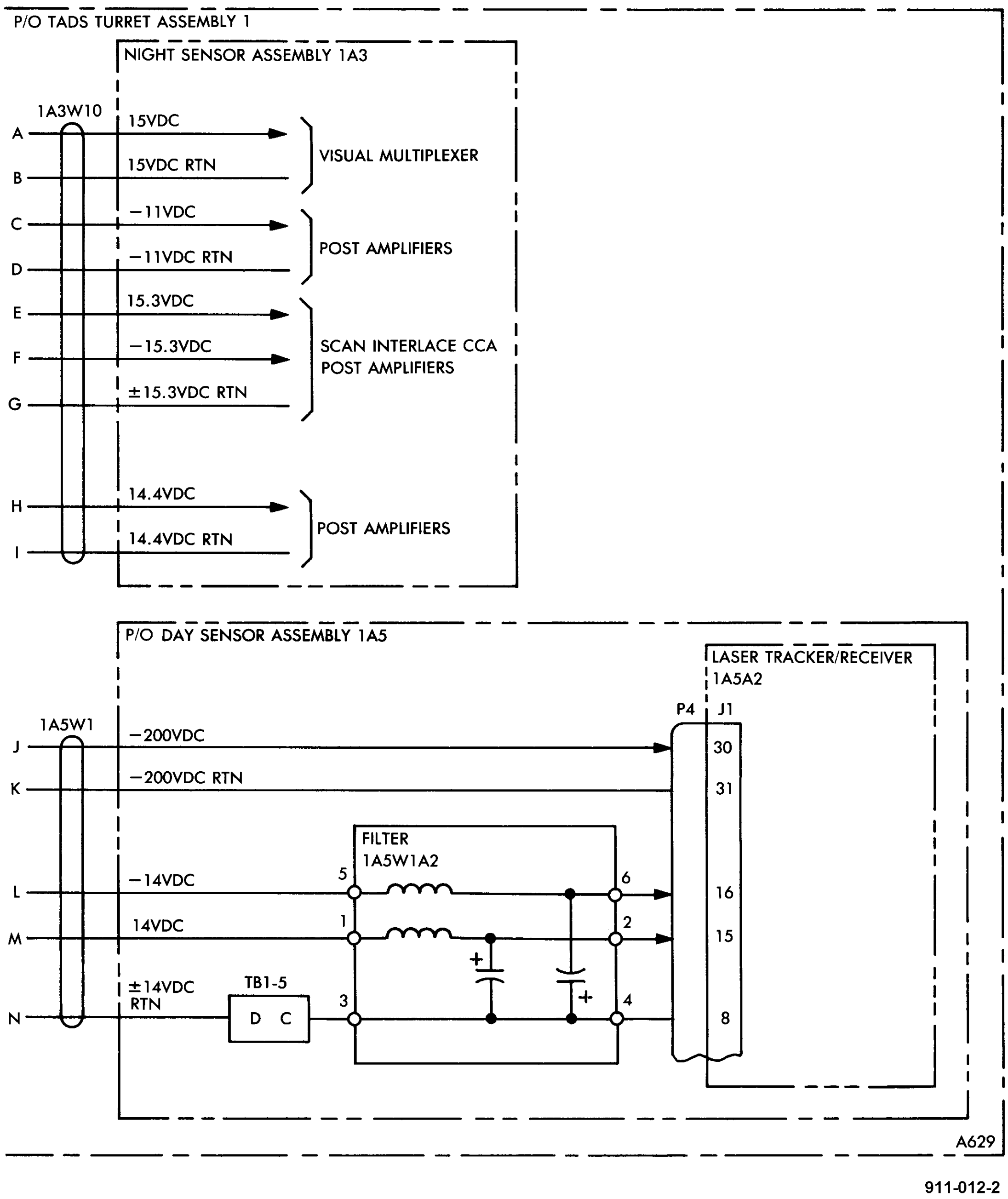


Figure 3-48. DC Power Distribution (TADS Power Supply) Wiring Interconnect Diagram (Sheet 2 of 7)

3-13. DC POWER DISTRIBUTION (TADS POWER SUPPLY) WIRING INTERCONNECT DIAGRAM (cont)

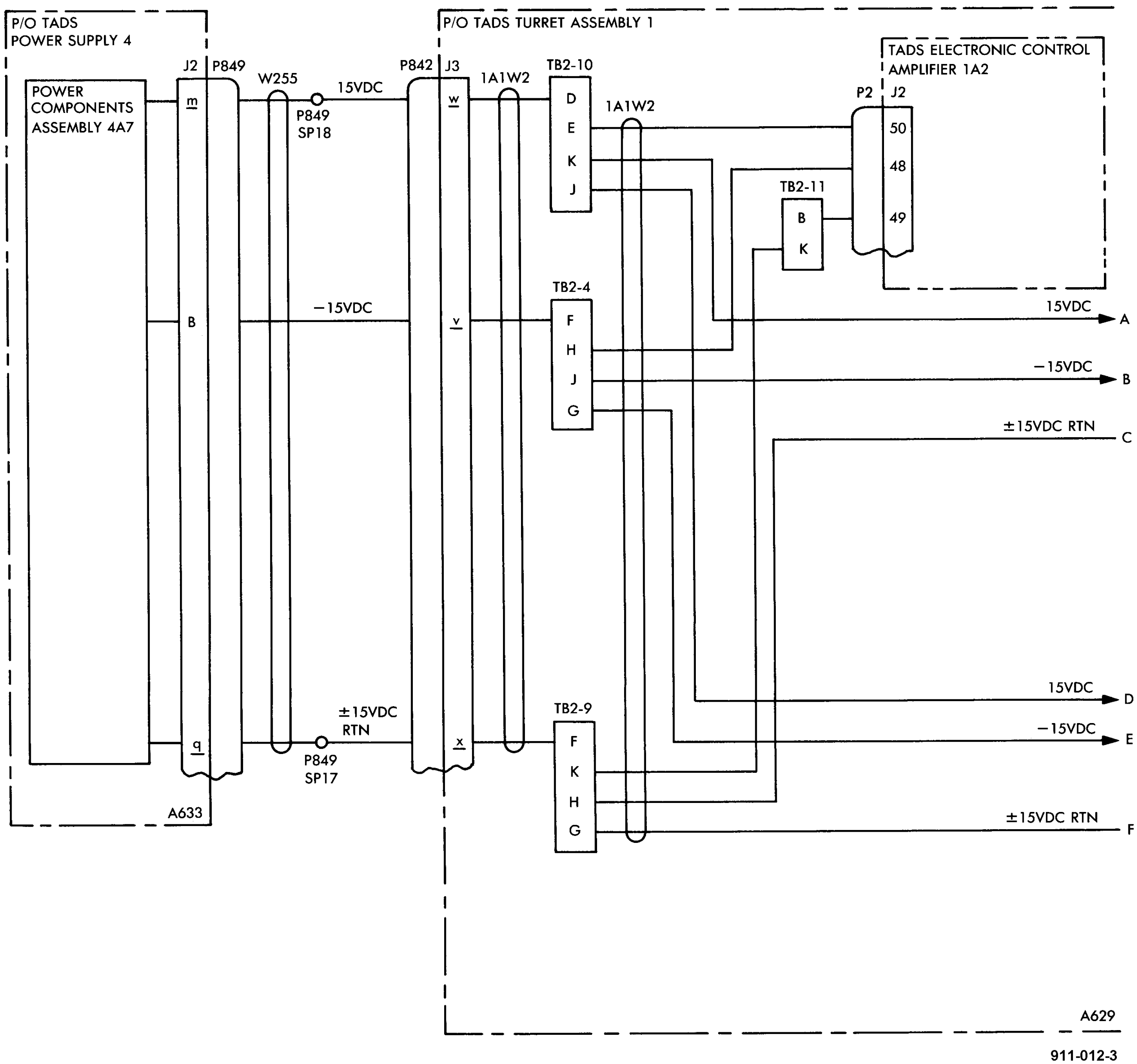


Figure 3-48. DC Power Distribution (TADS Power Supply) Wiring Interconnect Diagram (Sheet 3 of 7)

3-13. DC POWER DISTRIBUTION (TADS POWER SUPPLY) WIRING INTERCONNECT DIAGRAM (cont)

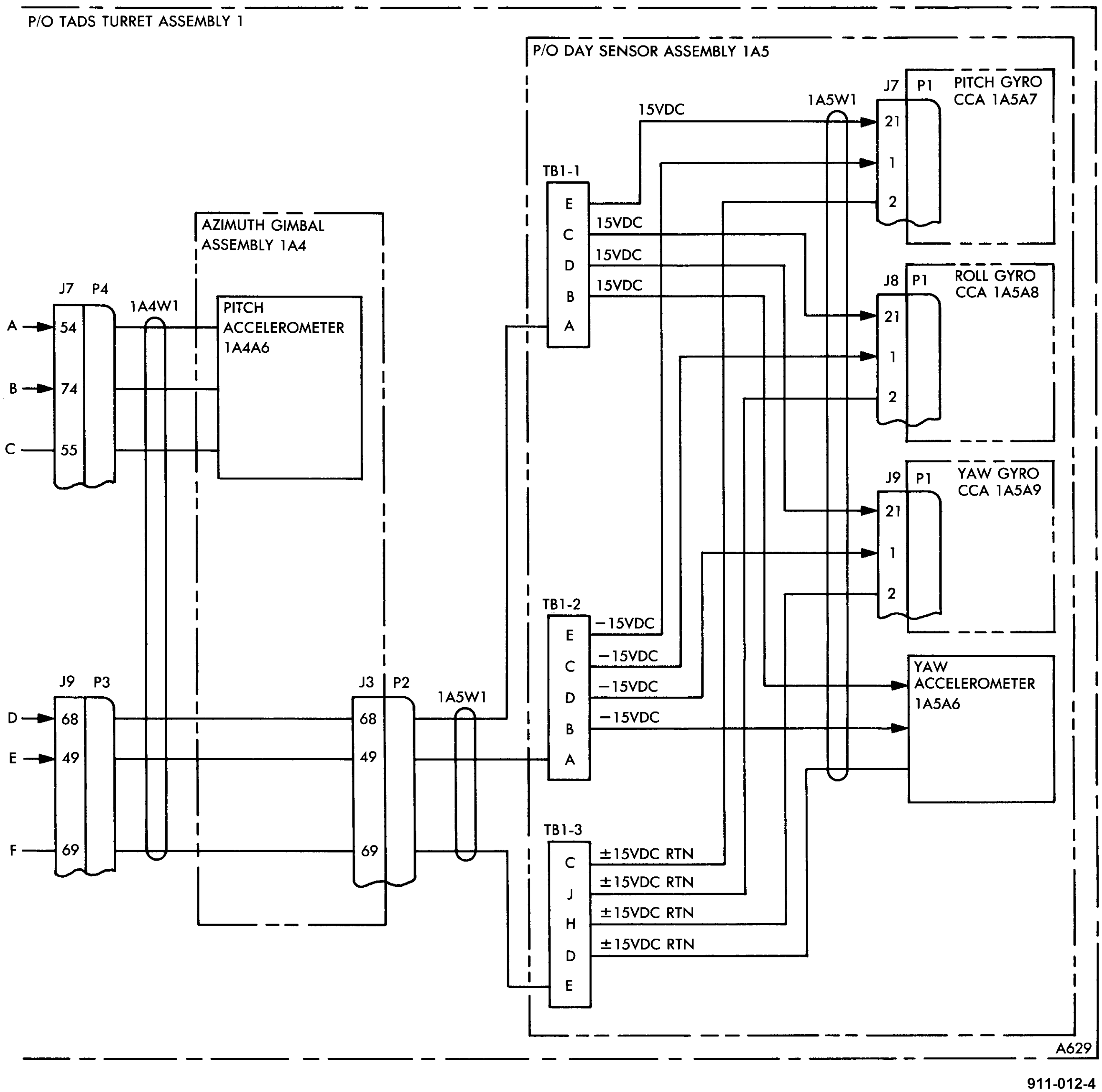


Figure 3-48. DC Power Distribution (TADS Power Supply) Wiring Interconnect Diagram (Sheet 4 of 7)

3-13. DC POWER DISTRIBUTION (TADS POWER SUPPLY) WIRING INTERCONNECT DIAGRAM (cont)

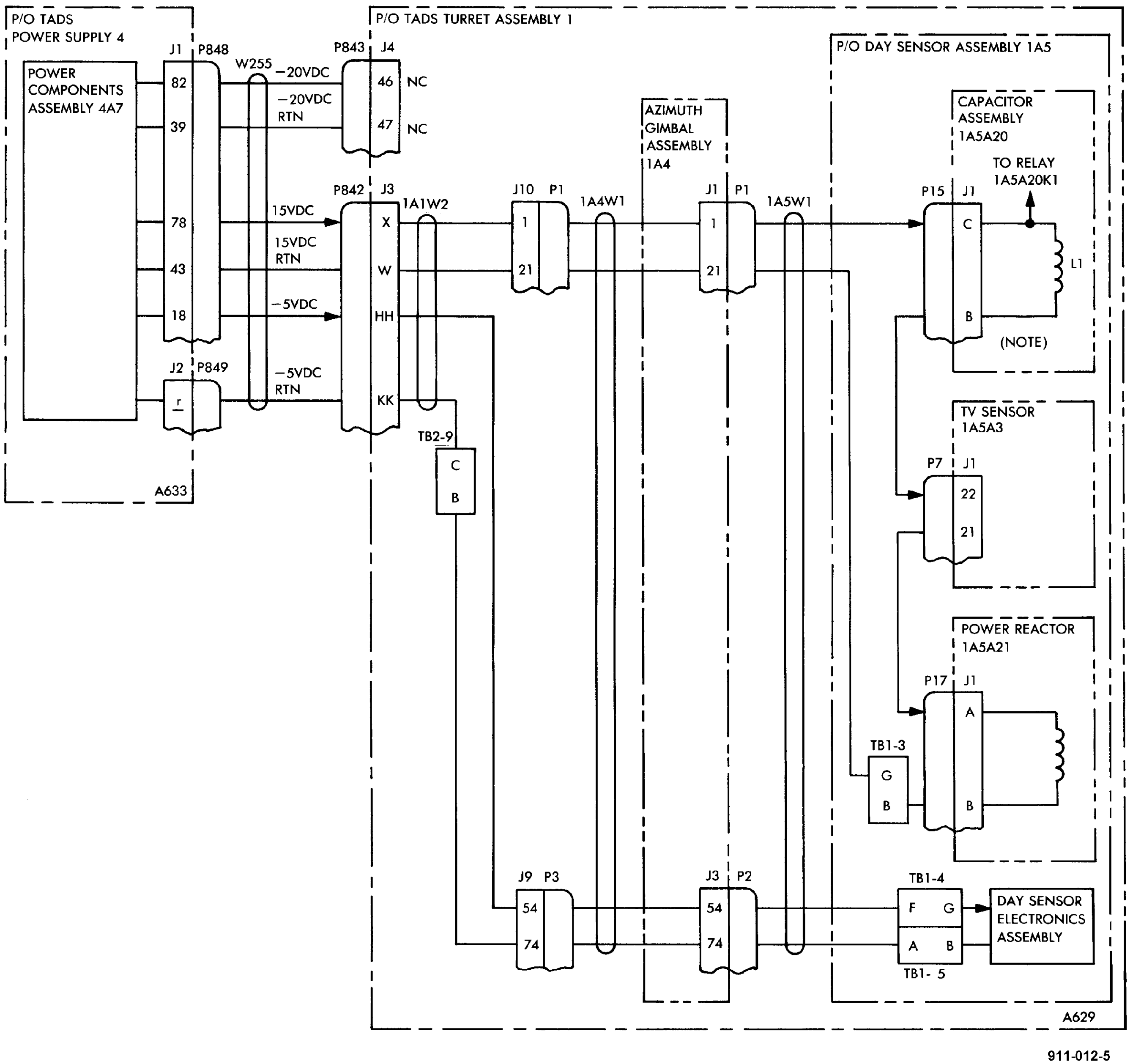


Figure 3-48. DC Power Distribution (TADS Power Supply) Wiring Interconnect Diagram (Sheet 5 of 7)

3-13. DC POWER DISTRIBUTION (TADS POWER SUPPLY) WIRING INTERCONNECT DIAGRAM (cont)

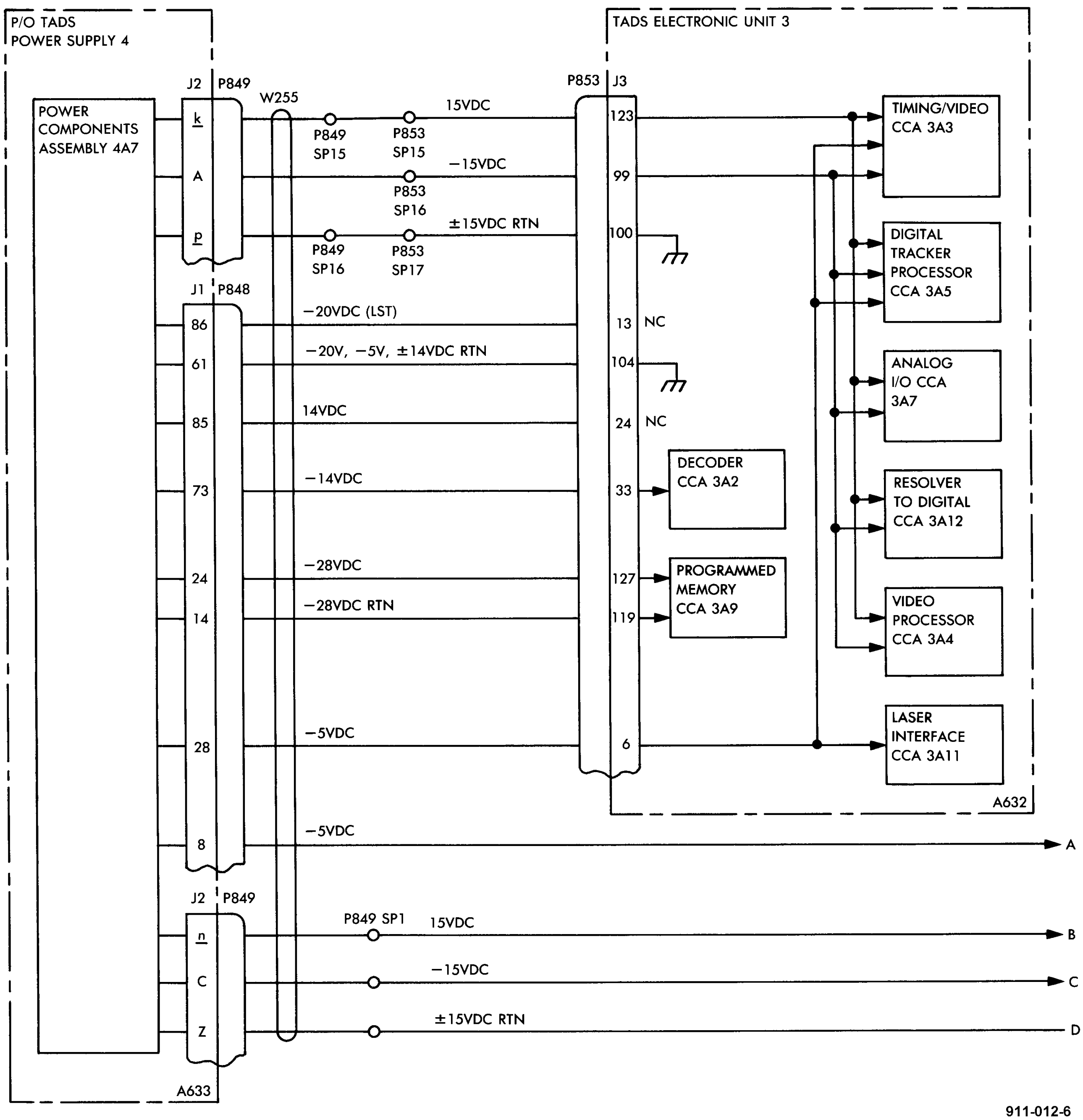


Figure 3-48. DC Power Distribution (TADS Power Supply) Wiring Interconnect Diagram
(Sheet 6 of 7)

3-13. DC POWER DISTRIBUTION (TADS POWER SUPPLY) WIRING INTERCONNECT DIAGRAM (cont)

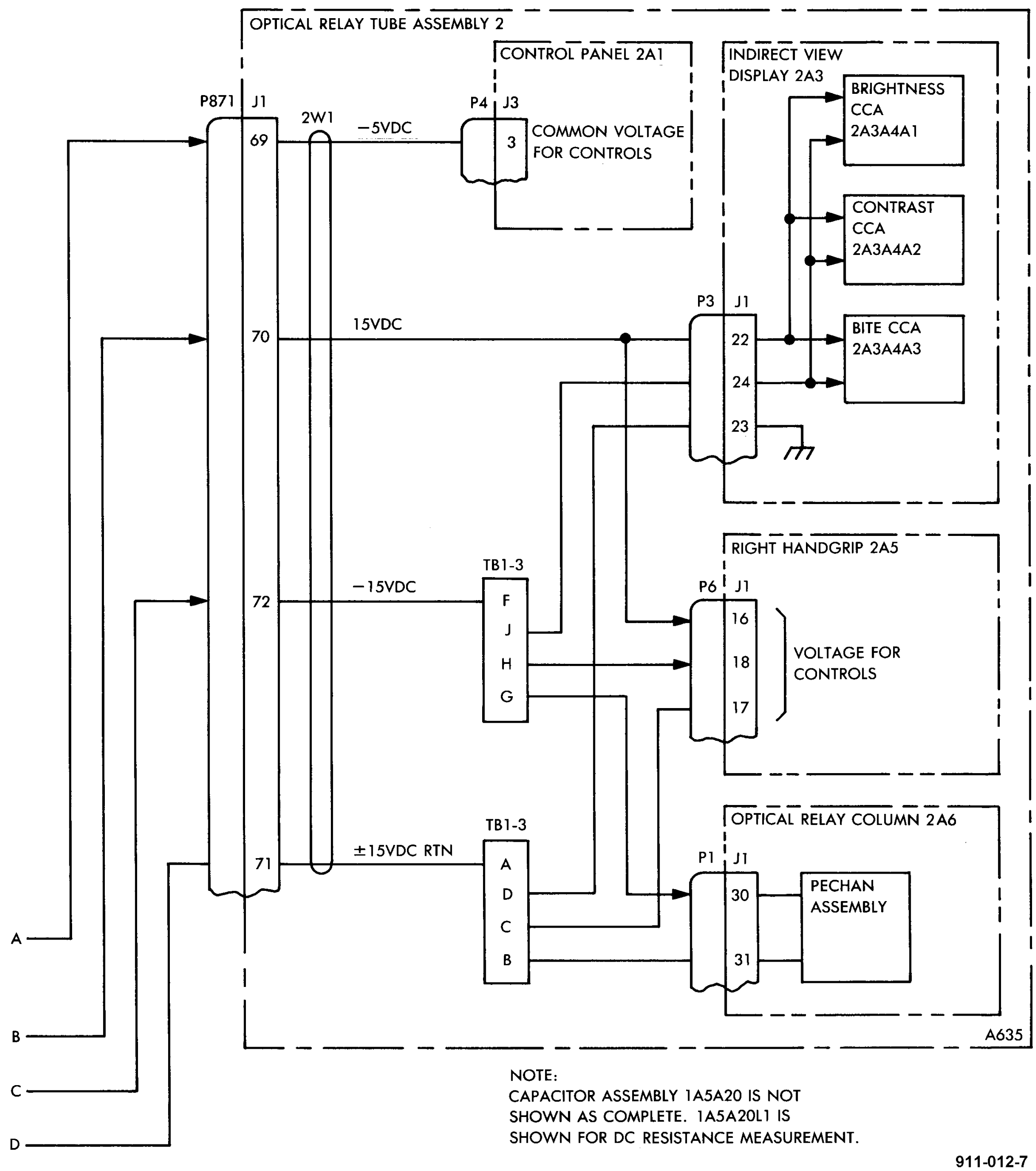


Figure 3-48. DC Power Distribution (TADS Power Supply) Wiring Interconnect Diagram (Sheet 7 of 7)

3-14. DC POWER DISTRIBUTION (TADS ELECTRONIC UNIT POWER SUPPLY) WIRING INTERCONNECT DIAGRAM

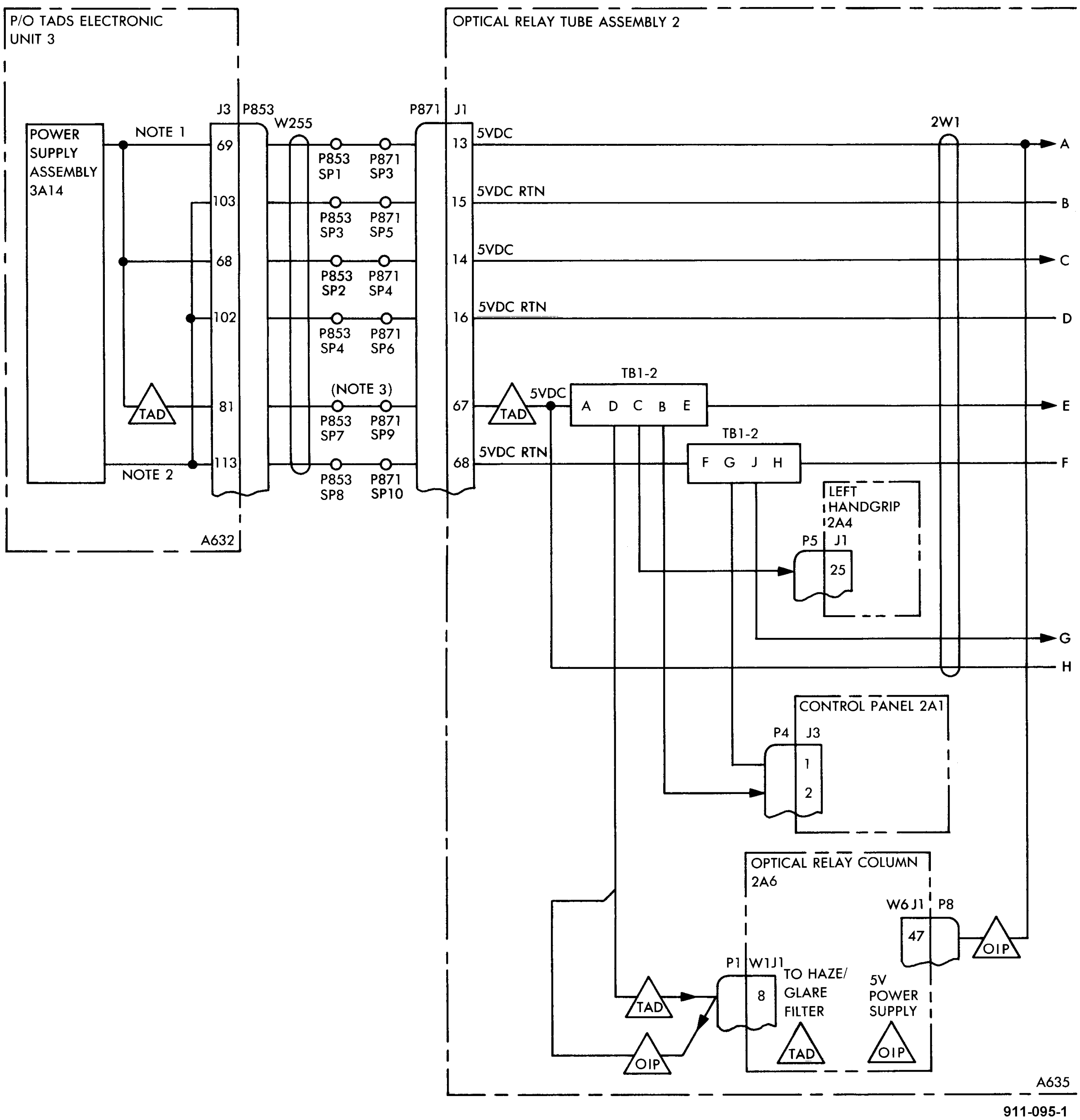


Figure 3-49. DC Power Distribution (TADS Electronic Unit Power Supply) Wiring Interconnect Diagram (Sheet 1 of 3)

3-14. DC POWER DISTRIBUTION (TADS ELECTRONIC UNIT POWER SUPPLY) WIRING INTERCONNECT DIAGRAM (cont)

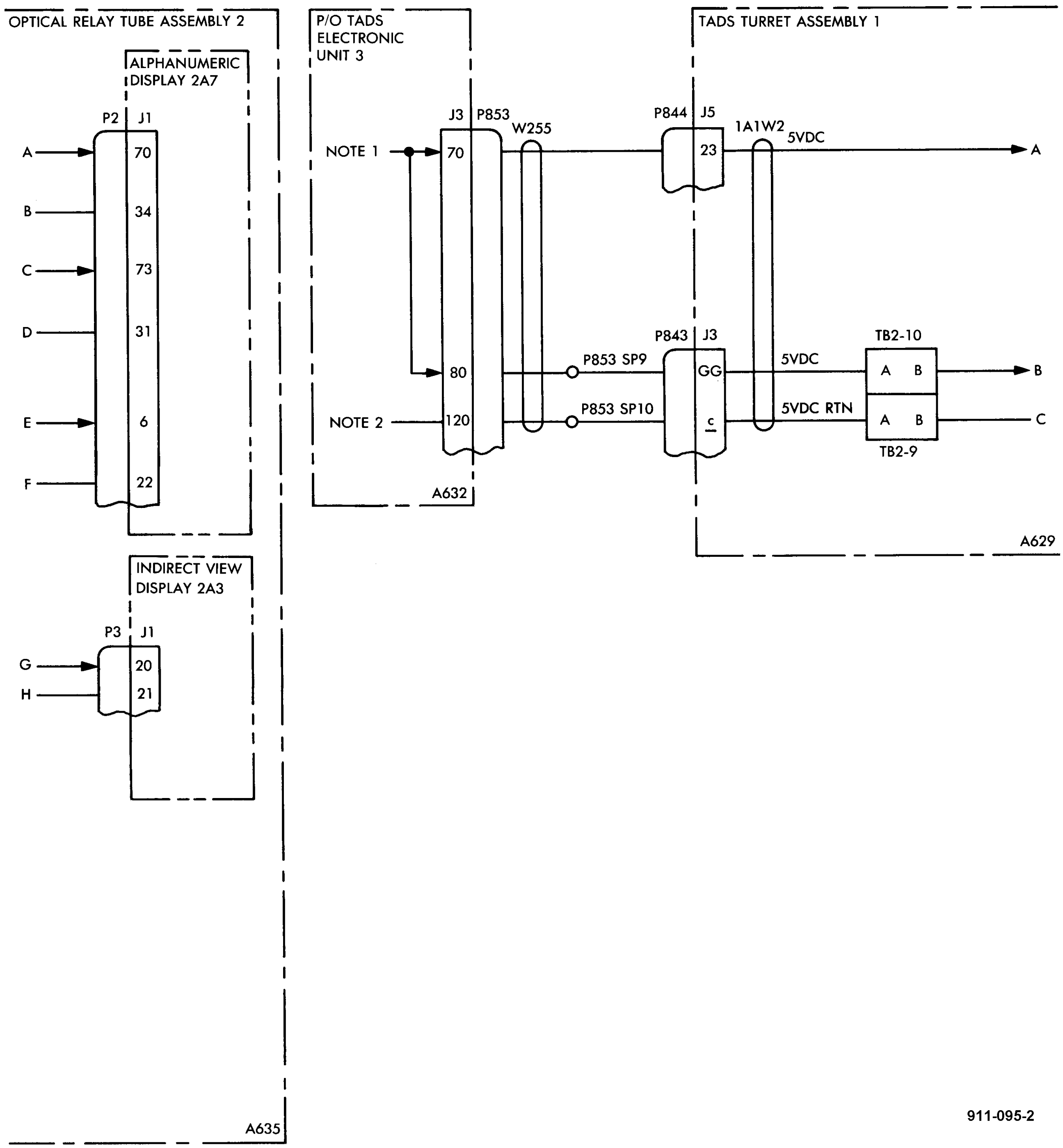
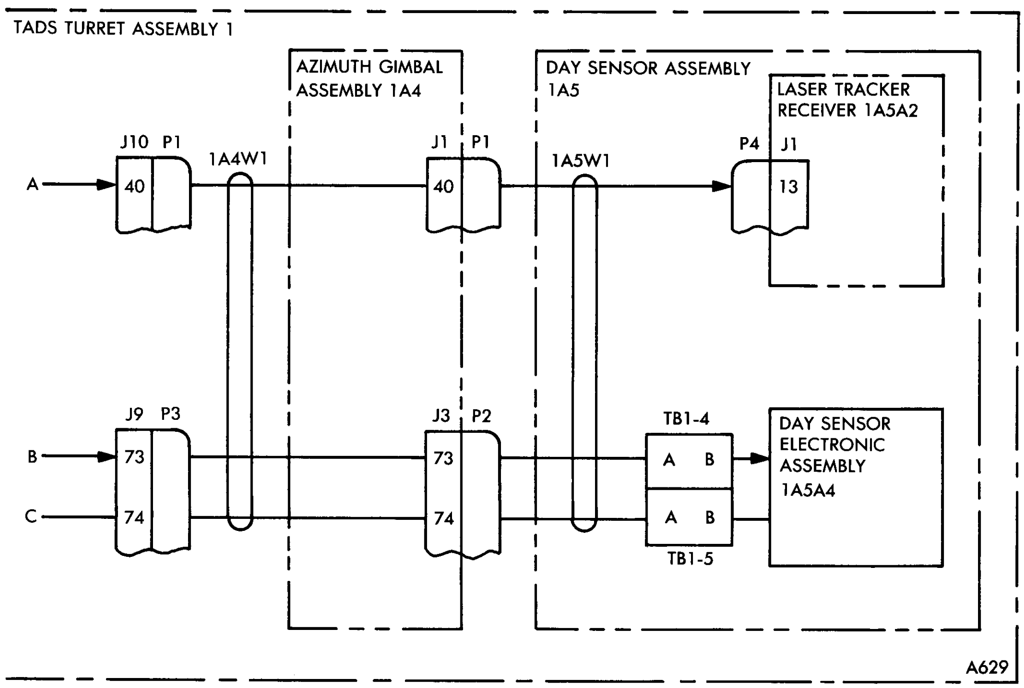


Figure 3-49. DC Power Distribution (TADS Electronic Unit Power Supply) Wiring Interconnect Diagram (Sheet 2 of 3)

3-14. DC POWER DISTRIBUTION (TADS ELECTRONIC UNIT POWER SUPPLY) WIRING INTERCONNECT DIAGRAM (cont)



NOTES:
1. 5 VDC TEU OUTPUTS ARE CONNECTED TOGETHER.
2. 5 VDC RETURNS ARE CONNECTED TOGETHER.
3. SEE FIGURE 3-74 FOR OIP WIRING INTERCONNECT.

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Figure 3-49. DC Power Distribution (TADS Electronic Unit Power Supply) Wiring Interconnect Diagram (Sheet 3 of 3)

3-15. DC POWER DISTRIBUTION (LASER ELECTRONIC UNIT) WIRING INTERCONNECT DIAGRAM

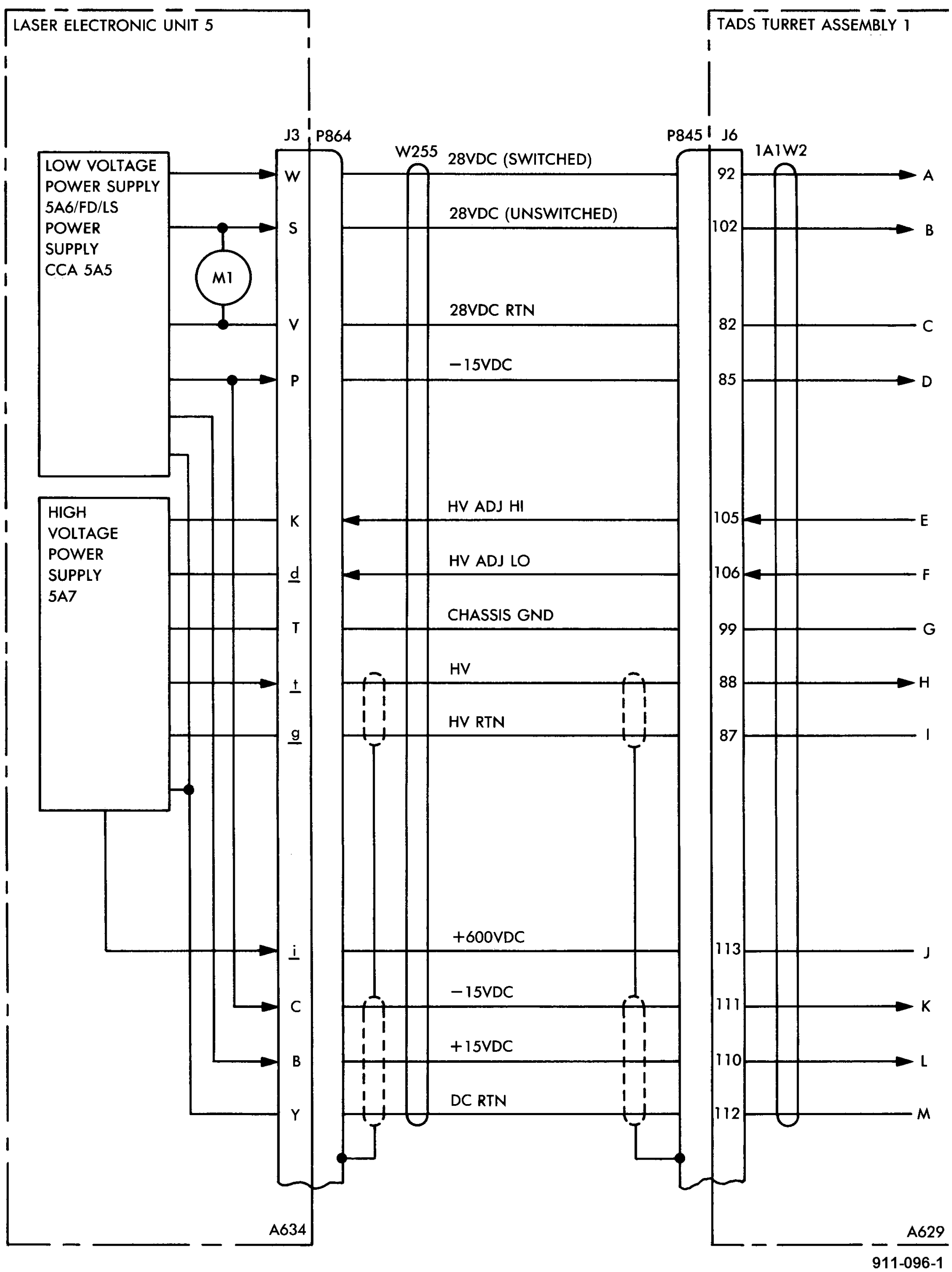


Figure 3-50. DC Power Distribution (Laser Electronic Unit) Wiring Interconnect Diagram (Sheet 1 of 2)

3-15. DC POWER DISTRIBUTION (LASER ELECTRONIC UNIT) WIRING INTERCONNECT DIAGRAM (cont)

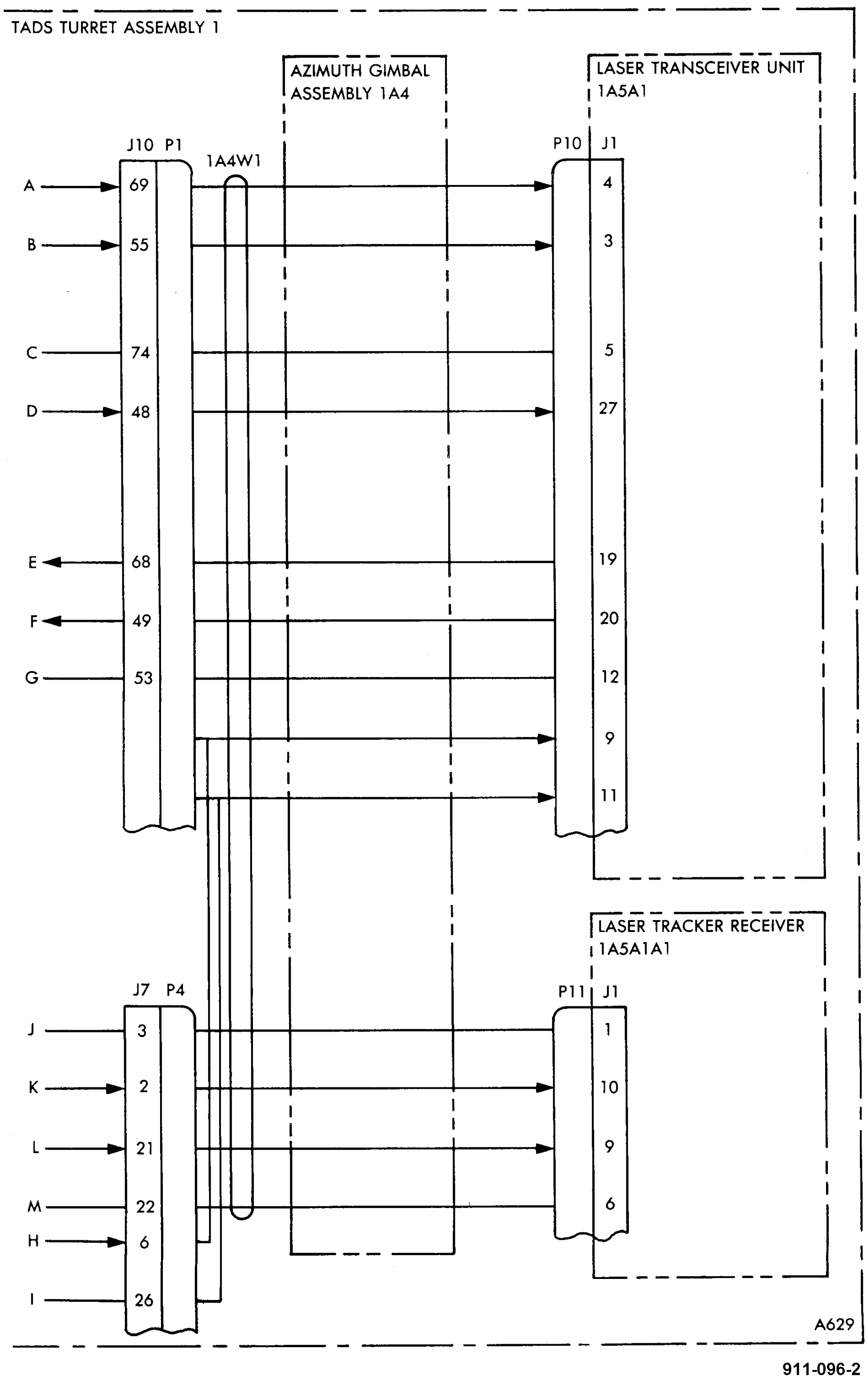


Figure 3-50. DC Power Distribution (Laser Electronic Unit) Wiring Interconnect Diagram (Sheet 2 of 2)

3-16. TADS ELECTRONIC UNIT/MRTU TYPE 1 SERIAL INTERFACE WIRING INTERCONNECT DIAGRAM

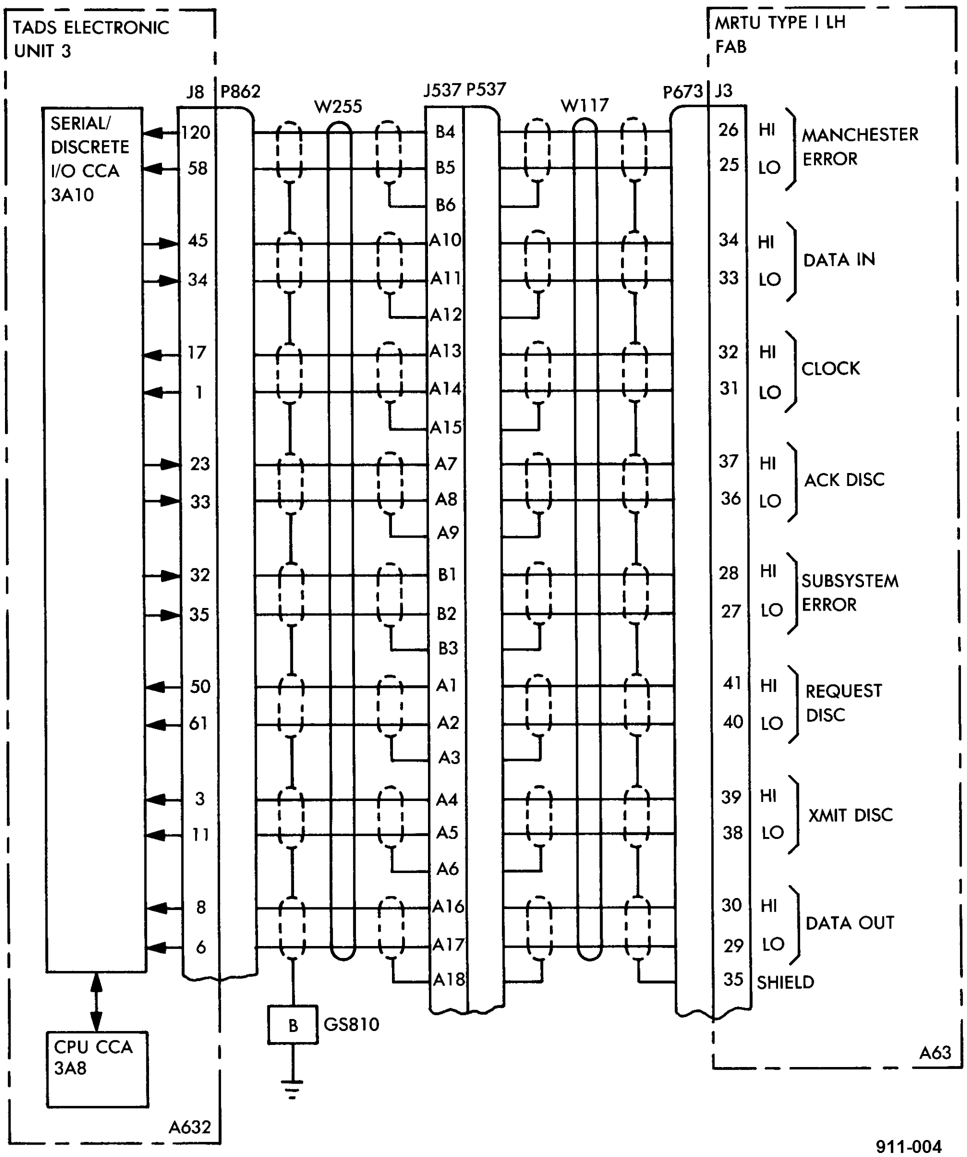


Figure 3-51. TADS Electronic Unit/MRTU Type I Serial Interface Wiring Interconnect Diagram

3-17. ALPHANUMERIC DISPLAY/MRTU TYPE III SERIAL INTERFACE WIRING INTERCONNECT DIAGRAM

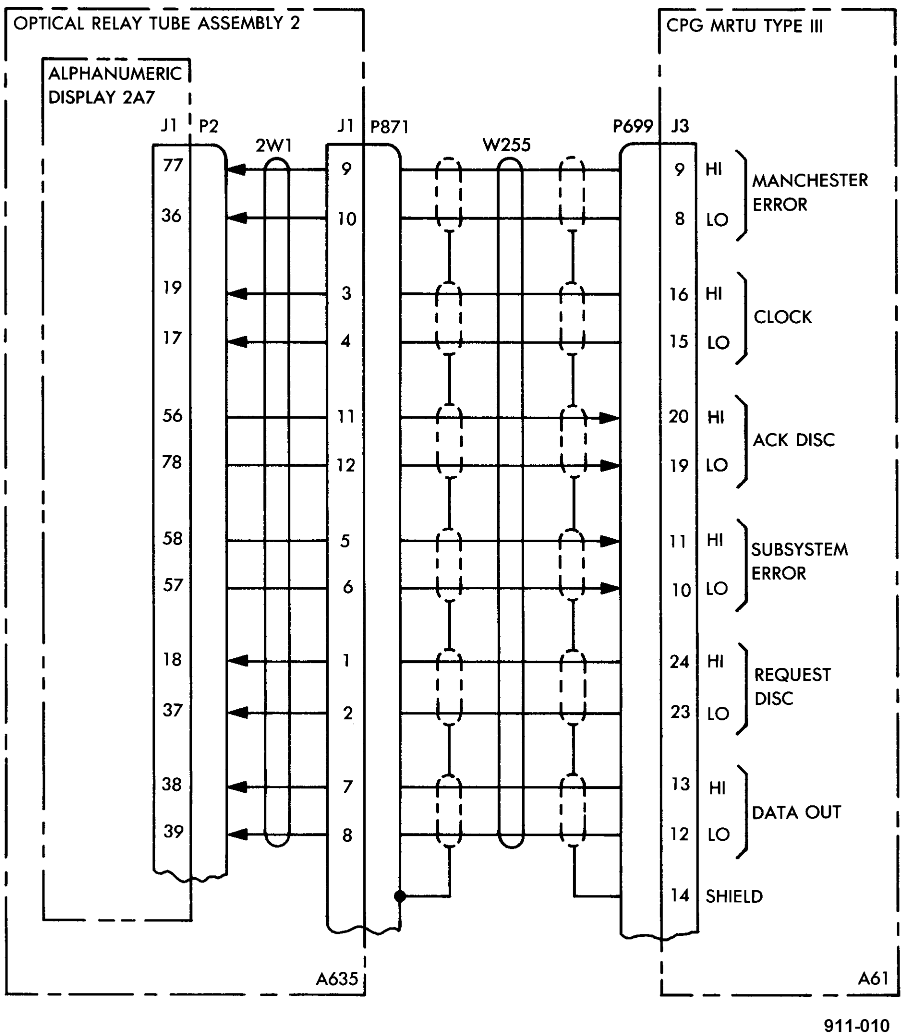
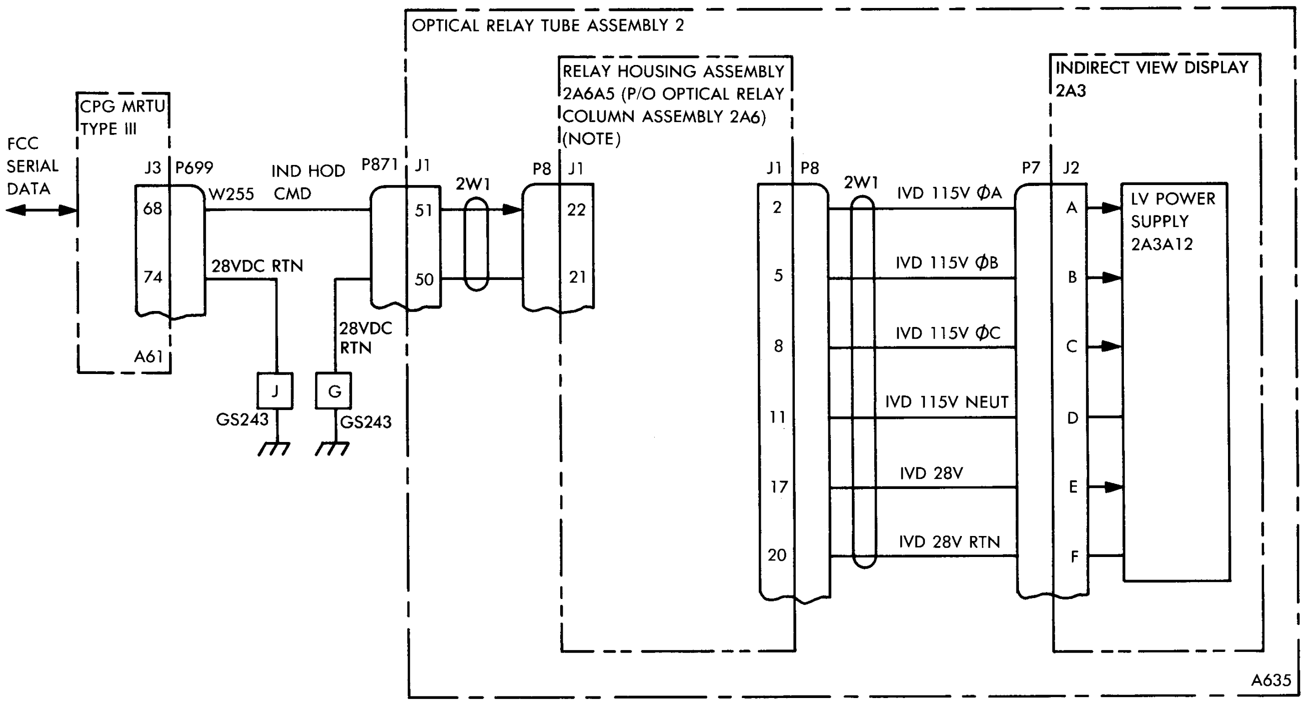


Figure 3-52. Alphanumeric Display/MRTU Type III Serial Interface Wiring Interconnect Diagram

3-18. HOD CONTROL VOLTAGES WIRING INTERCONNECT DIAGRAM



NOTE:
SEE FIGURES 3-44, 3-45, AND 3-46 FOR WIRING CONTINUATION.

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Figure 3-53. HOD Control Voltages Wiring Interconnect Diagram

3-19. HOD/HDD VIDEO WIRING INTERCONNECT DIAGRAM

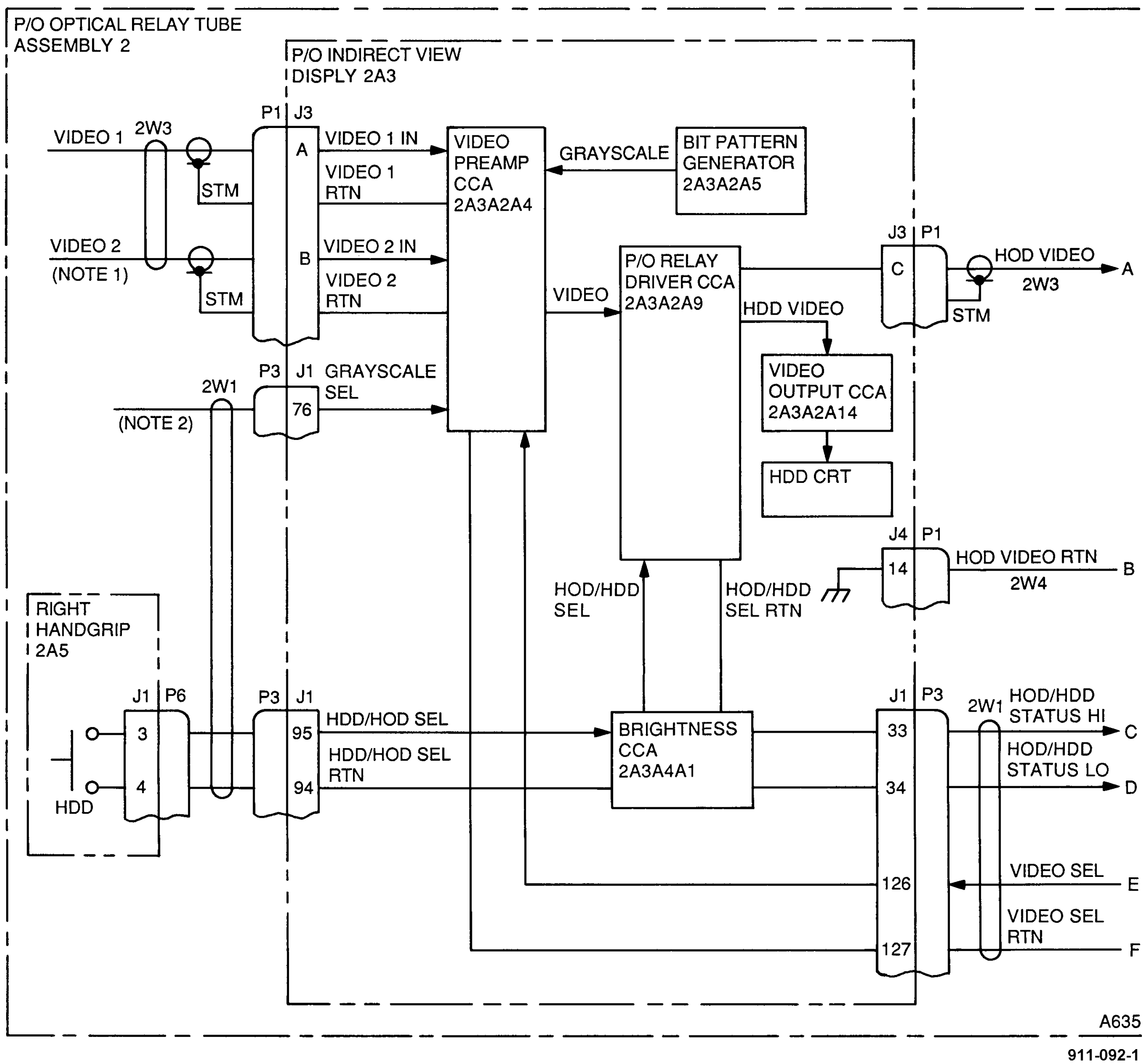


Figure 3-54. HOD/HDD Video Wiring Interconnect Diagram
(Sheet 1 of 3)

3-19. HOD/HDD VIDEO WIRING INTERCONNECT DIAGRAM (cont)

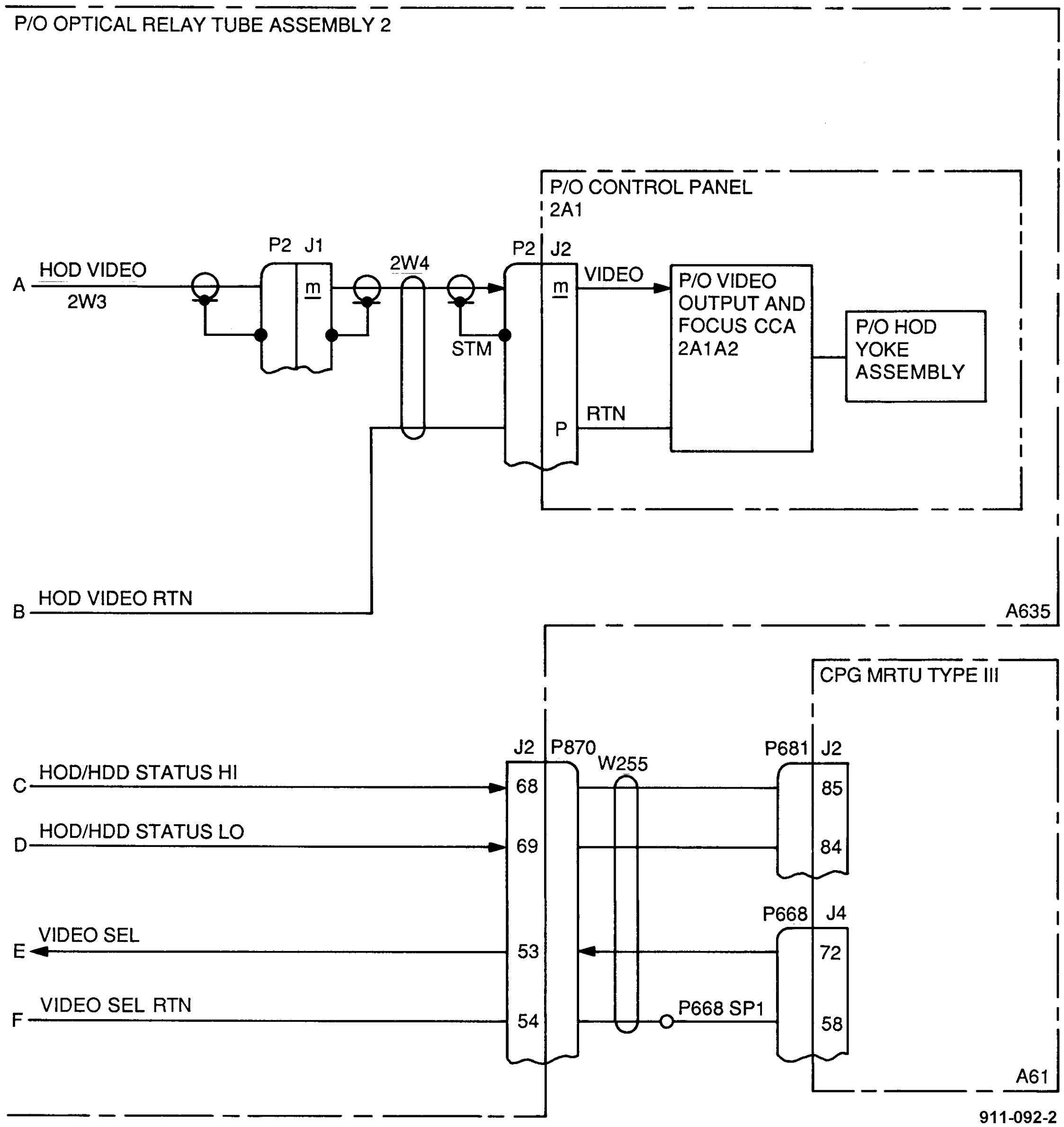
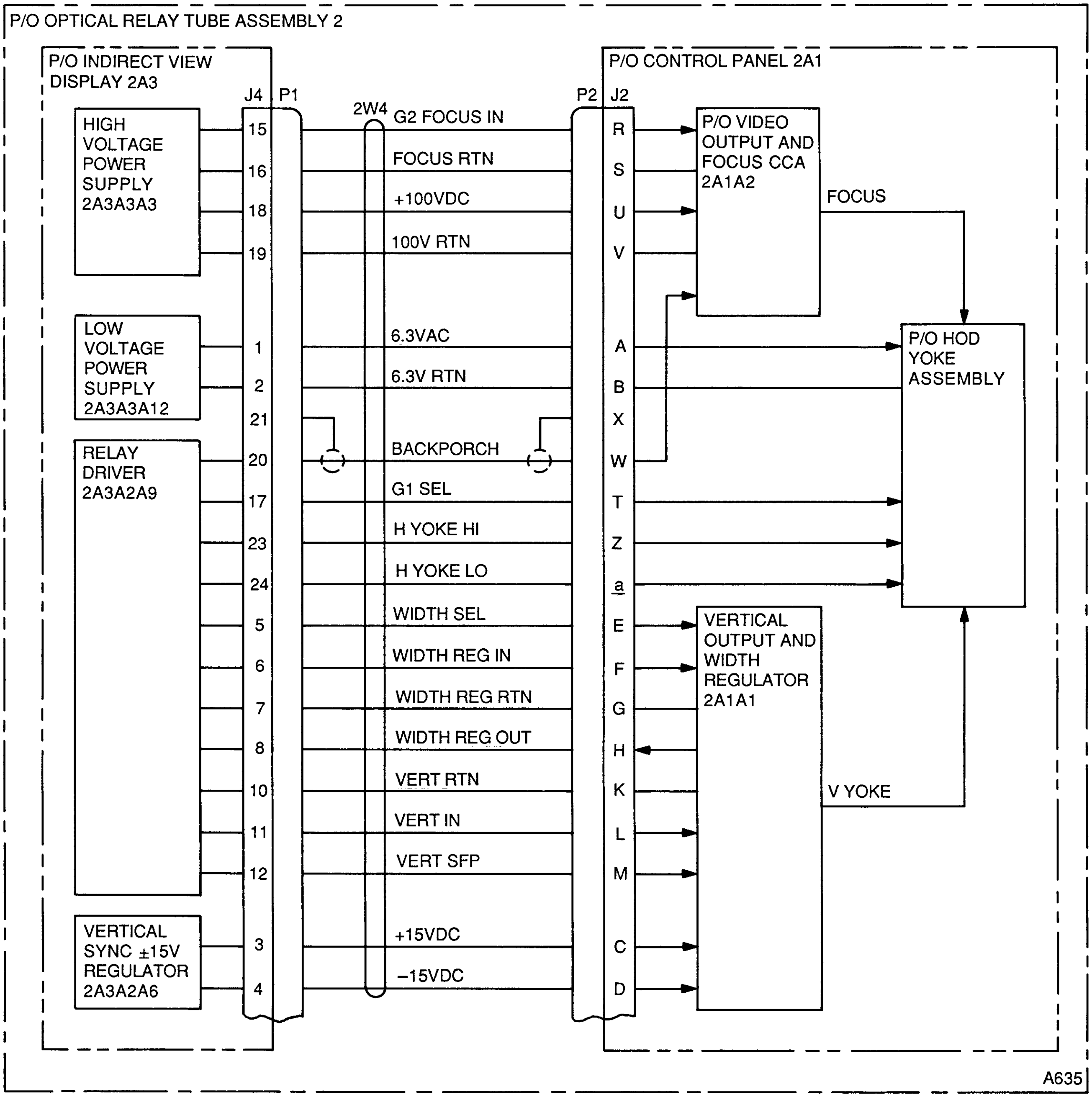


Figure 3-54. HOD/HDD Video Wiring Interconnect Diagram
(Sheet 2 of 3)

3-19. HOD/HDD VIDEO WIRING INTERCONNECT DIAGRAM (cont)

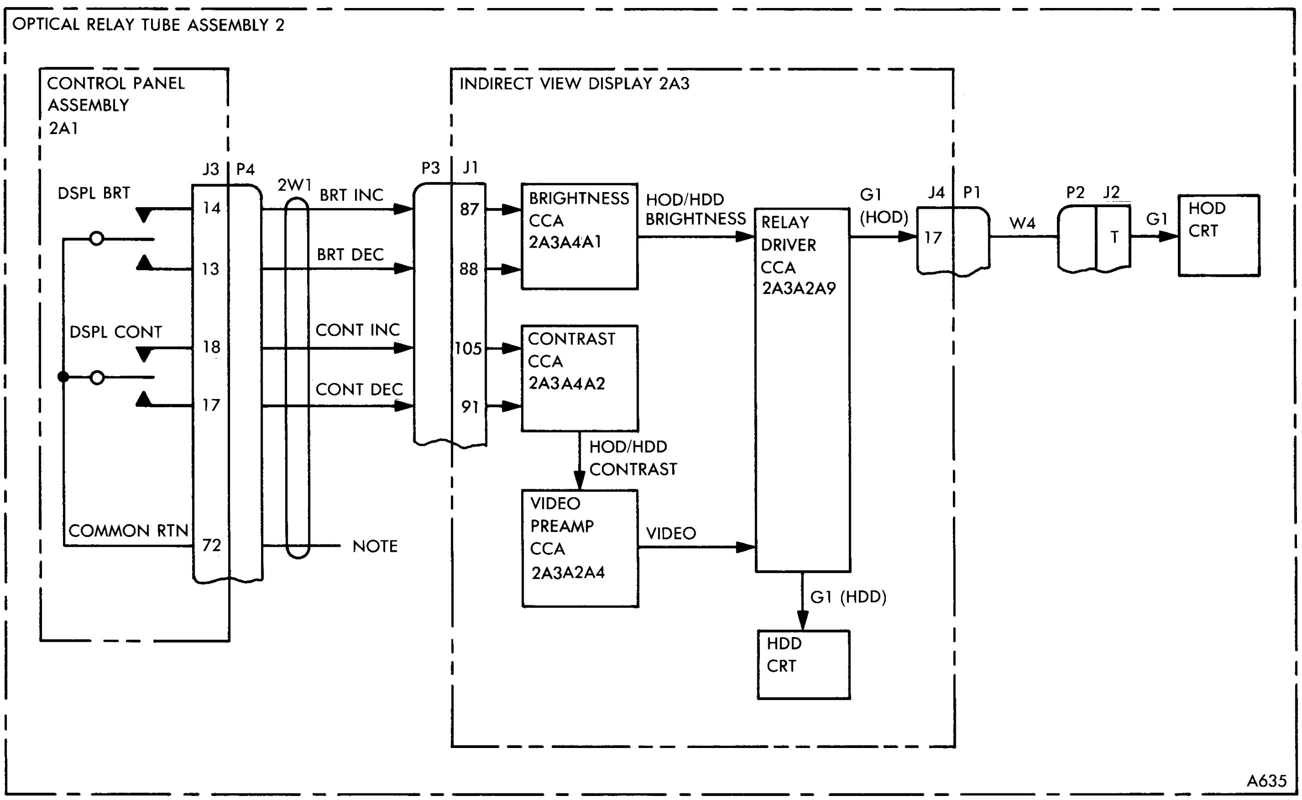


NOTES:
1. SEE FIGURE 3-60 FOR VIDEO 1 AND VIDEO 2 INPUTS.
2. SEE FIGURE 3-57 FOR GRAYSCALE SEL INPUT.

911-092-3

Figure 3-54. HOD/HDD Video Wiring Interconnect Diagram
(Sheet 3 of 3)

3-20. HOD/HDD DISPLAY BRIGHTNESS AND CONTRAST WIRING INTERCONNECT DIAGRAM



NOTE:
SEE FIGURE 3-58 FOR COMMON RETURN
WIRING CONTINUATION.

911-106

Figure 3-55. HOD/HDD Display Brightness and Contrast Wiring Interconnect Diagram

3-21. CEM/ORT ASSEMBLY INITIATED BIT AND IVD STATUS WIRING INTERCONNECT DIAGRAM [TAD]

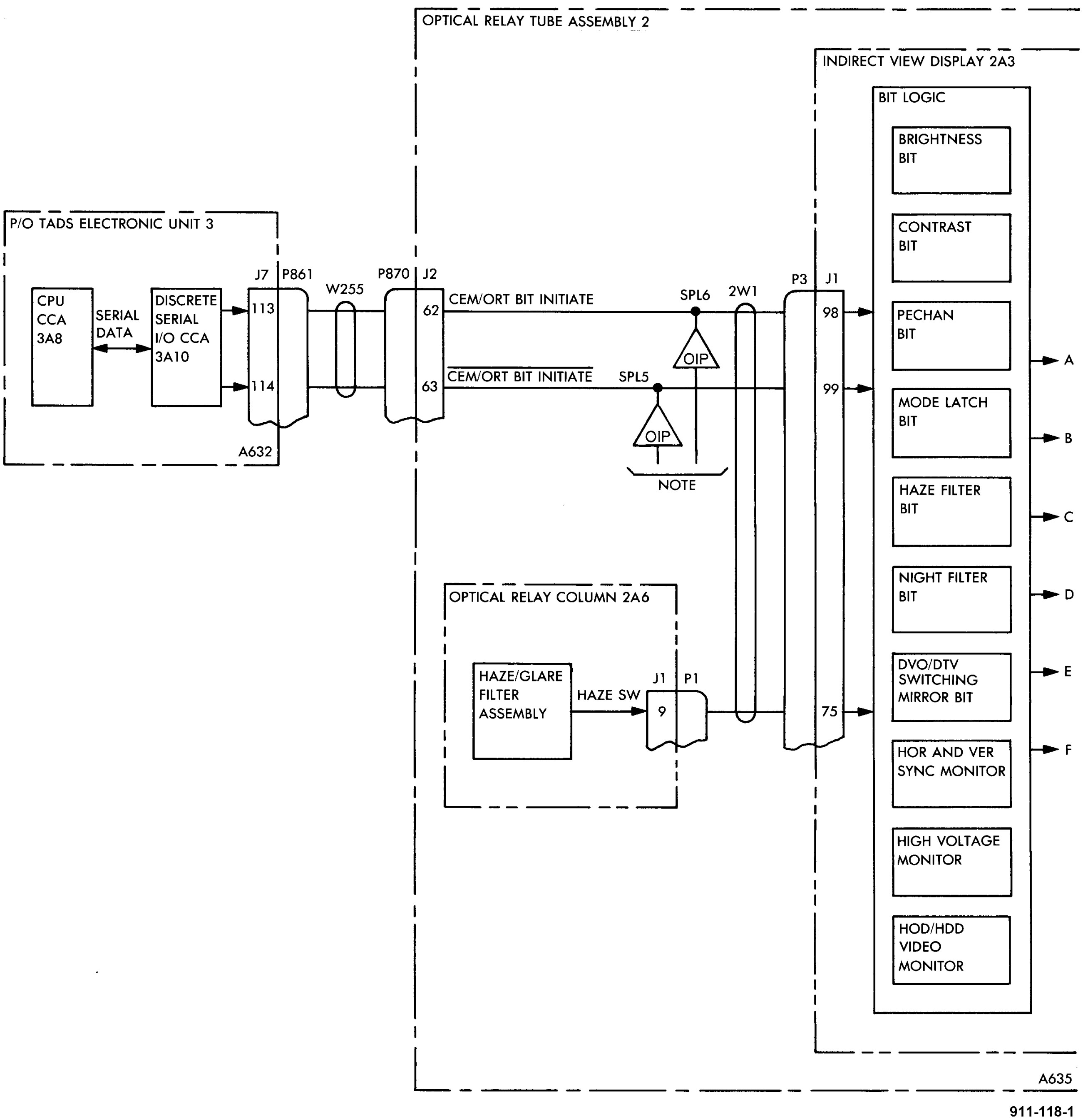


Figure 3-56. CEM/ORT Assembly Initiated BIT and IVD Status Wiring Interconnect Diagram **[TAD]** (Sheet 1 of 2)

3-21. CEM/ORT ASSEMBLY INITIATED BIT AND IVD STATUS WIRING INTERCONNECT DIAGRAM [TAD] (cont)

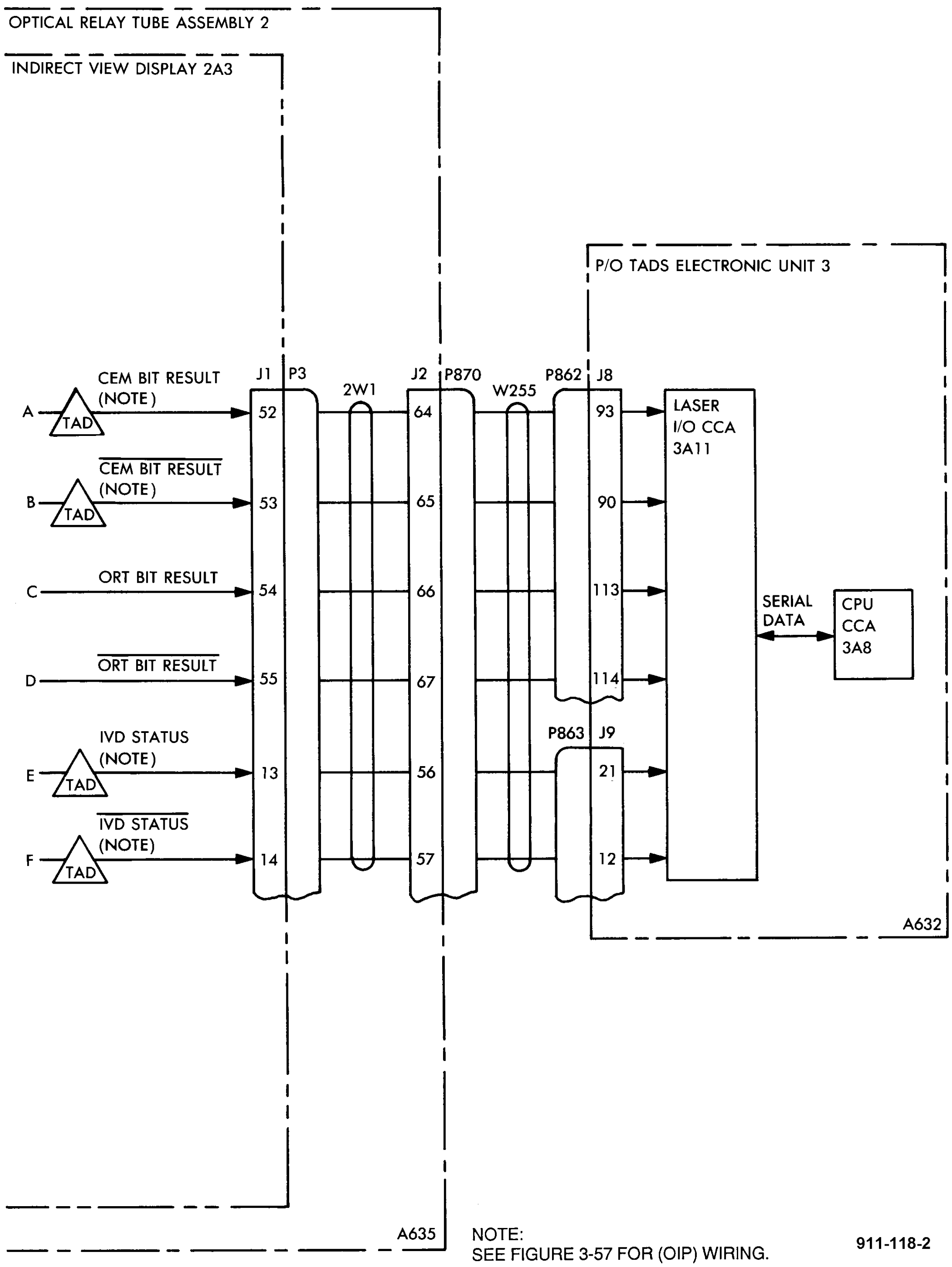


Figure 3-56. CEM/ORT Assembly Initiated BIT and IVD Status Wiring Interconnect Diagram **[TAD]** (Sheet 2 of 2)

3-22. CEM/ORT INITIATED BIT AND IVD STATUS WIRING INTERCONNECT DIAGRAM [OIP]

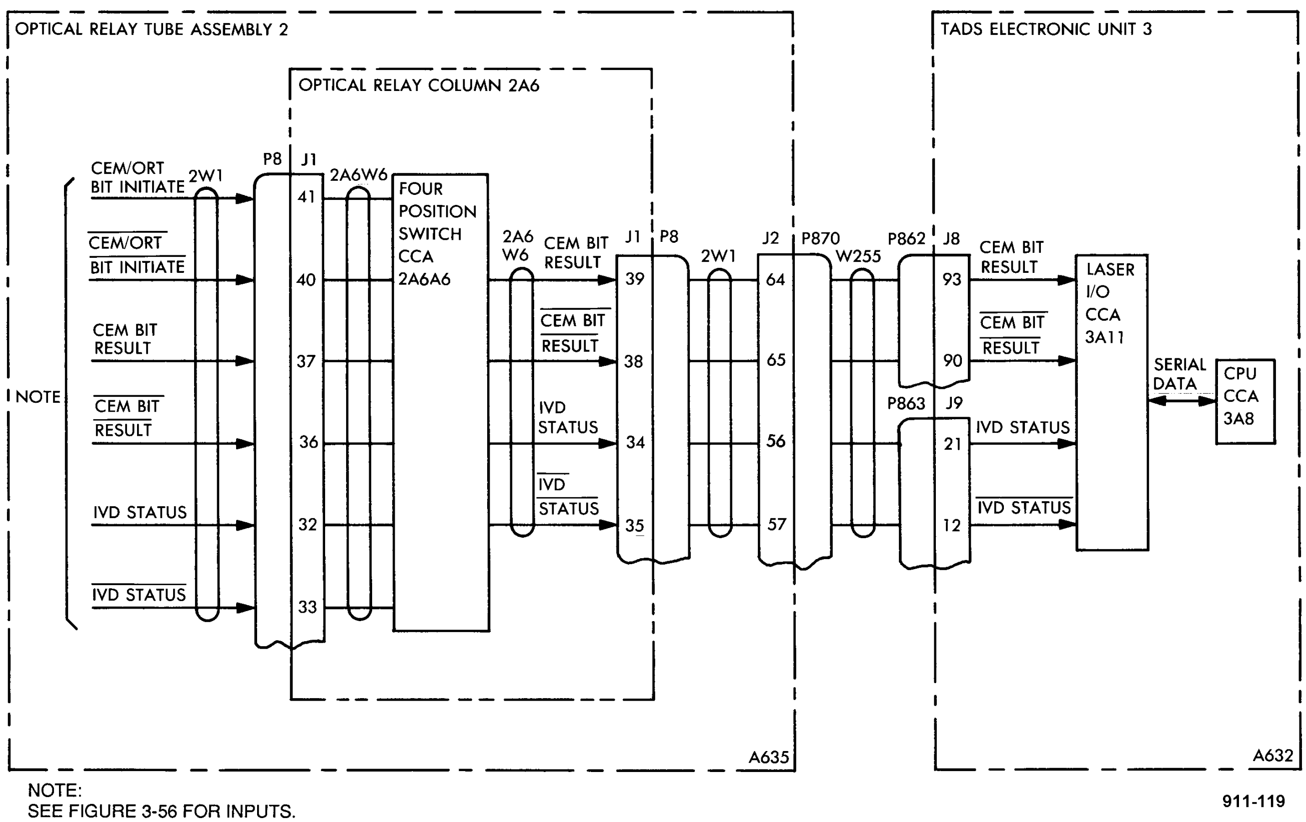


Figure 3-57. CEM/ORT Assembly Initiated BIT and IVD Status Wiring Interconnect Diagram **[OIP]**

3-23. SENSOR/VIDEO SELECT WIRING INTERCONNECT DIAGRAM

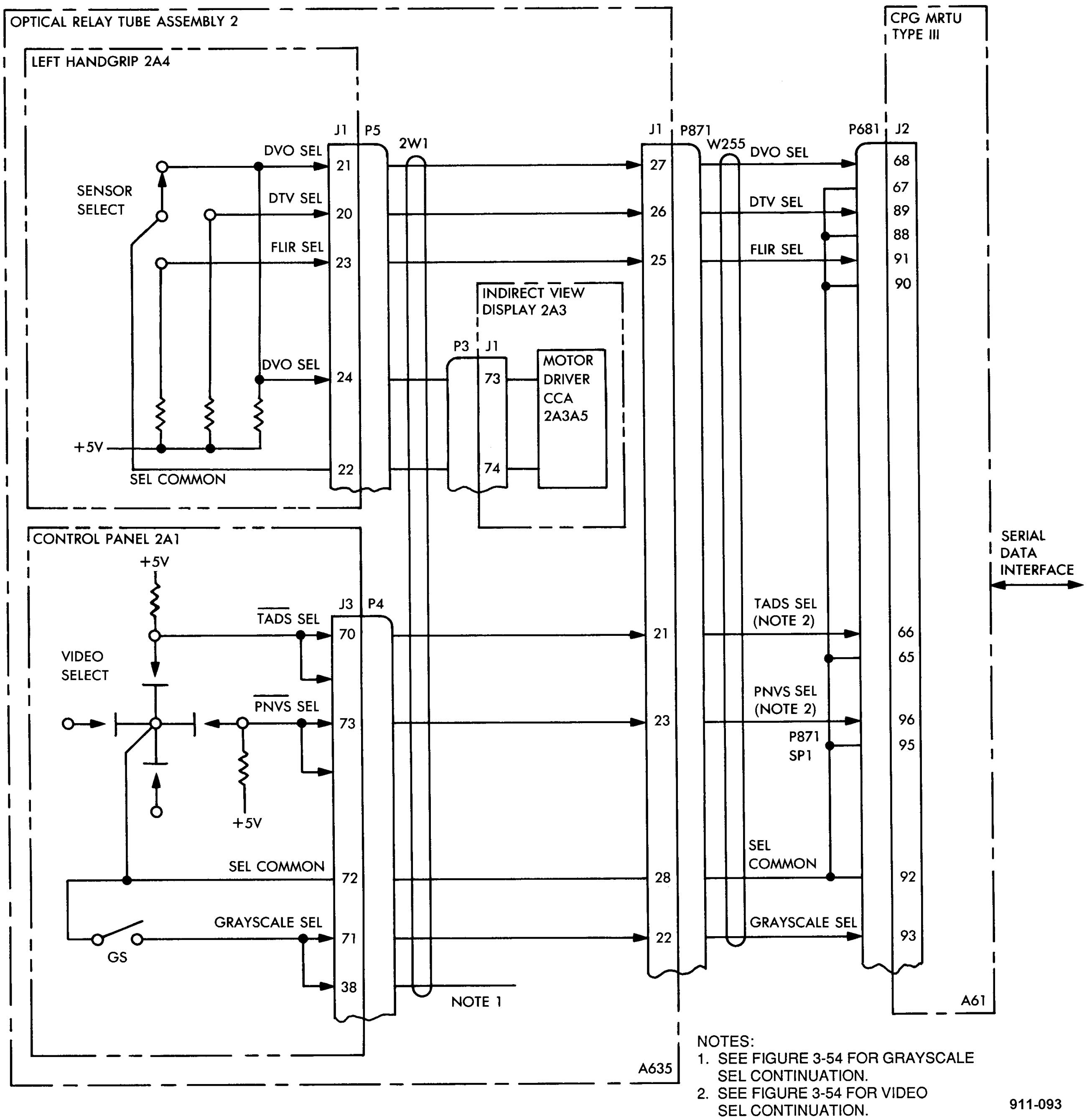


Figure 3-58. Sensor/Video Select Wiring Interconnect Diagram

3-24. OPTICAL RELAY TUBE ASSEMBLY SWITCHING MIRROR ASSEMBLY WIRING INTERCONNECT DIAGRAM

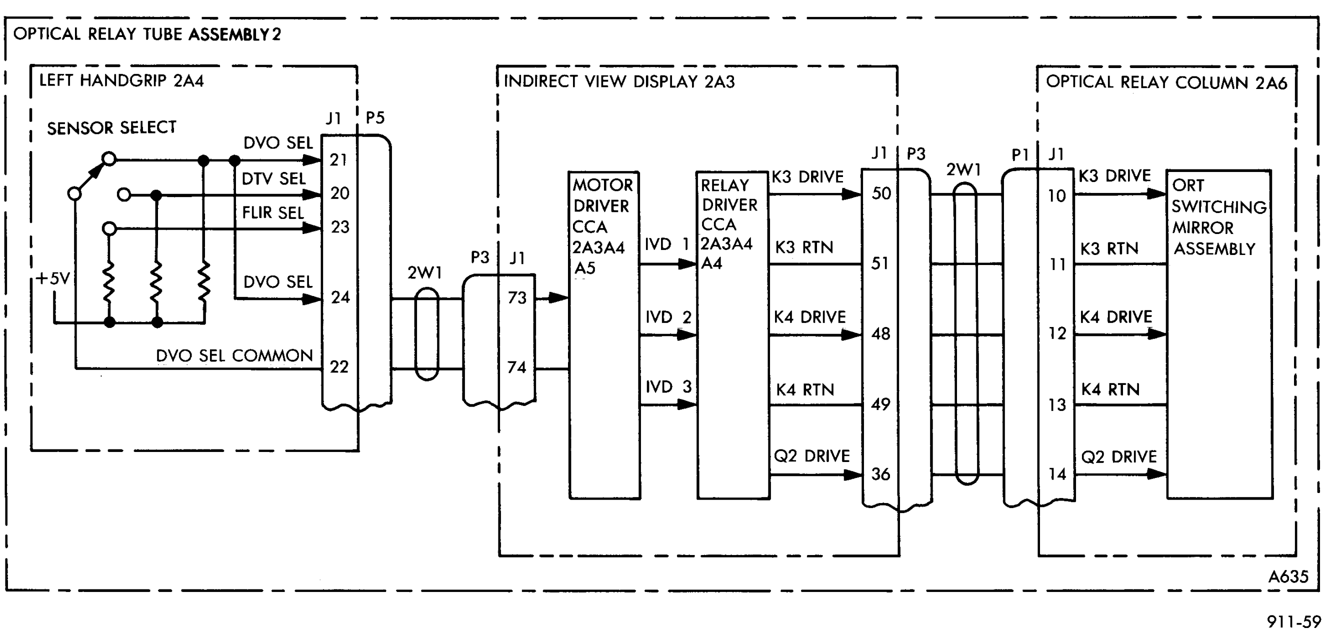


Figure 3-59. Optical Relay Tube Assembly Switching Mirror Assembly Wiring Interconnect Diagram

3-25. TADS VIDEO WIRING INTERCONNECT DIAGRAM

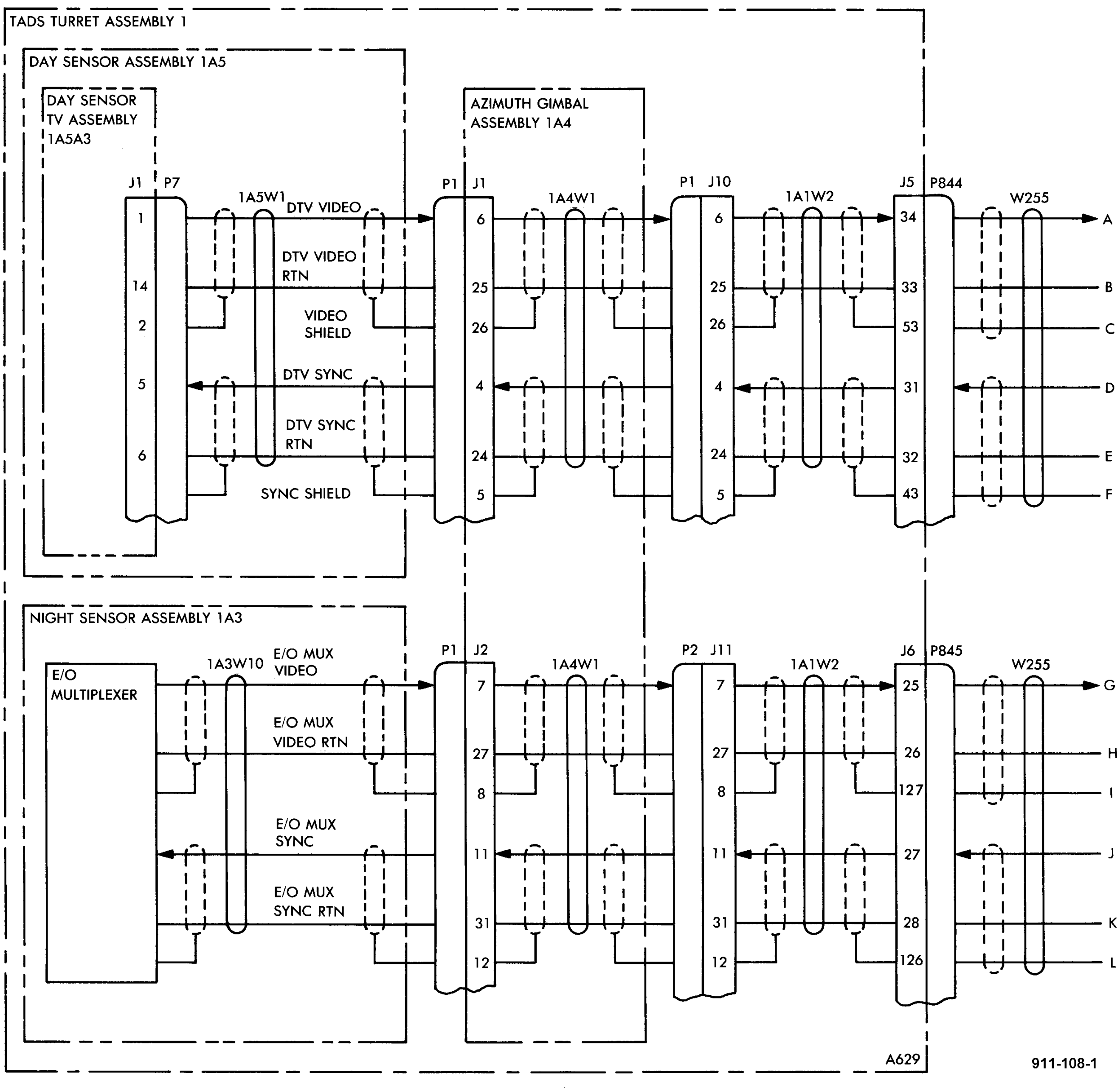


Figure 3-60. TADS Video Wiring Interconnect Diagram (Sheet 1 of 3)

3-25. TADS VIDEO WIRING INTERCONNECT DIAGRAM (cont)

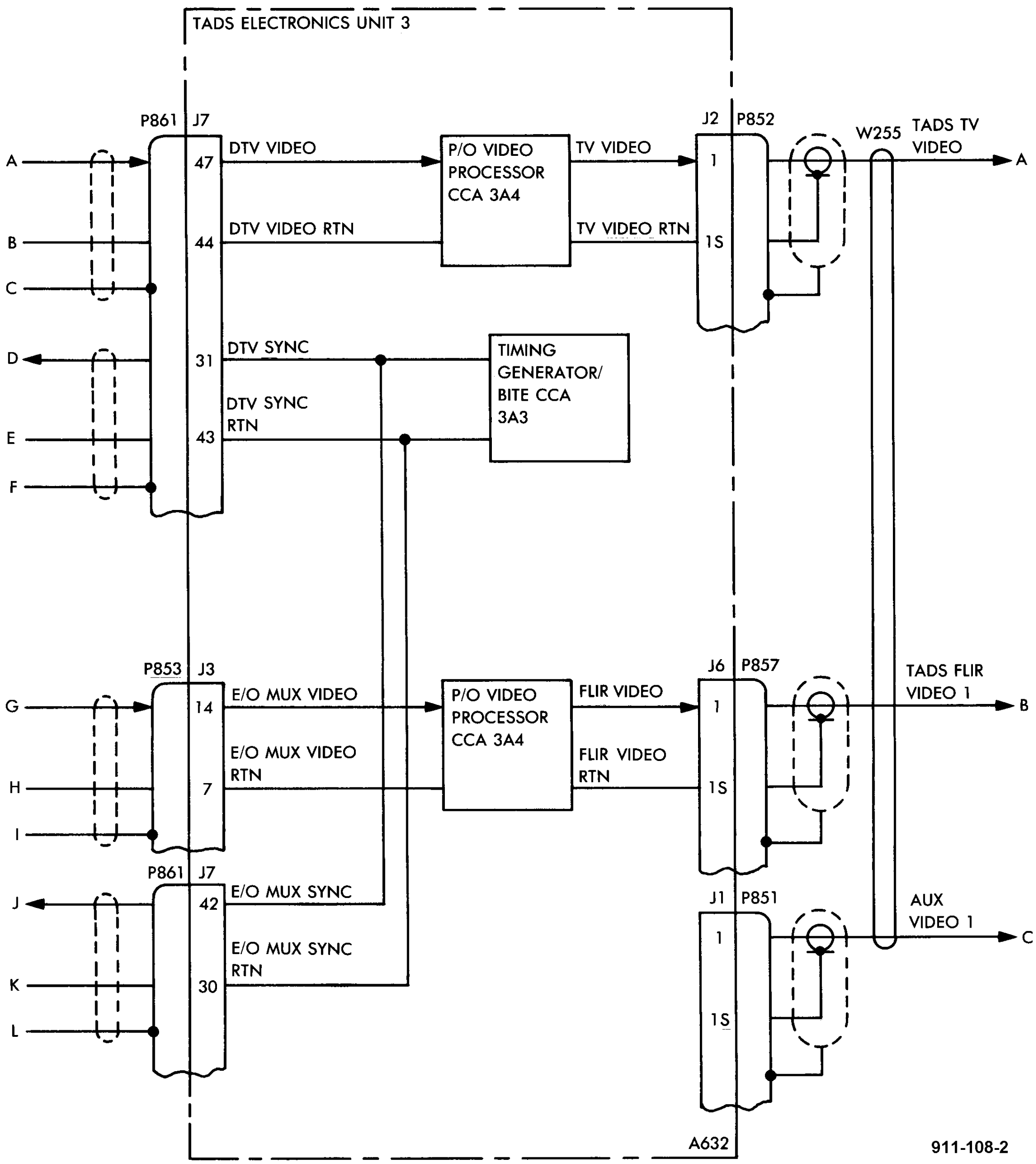


Figure 3-60. TADS Video Wiring Interconnect Diagram (Sheet 2 of 3)

3-25. TADS VIDEO WIRING INTERCONNECT DIAGRAM (cont)

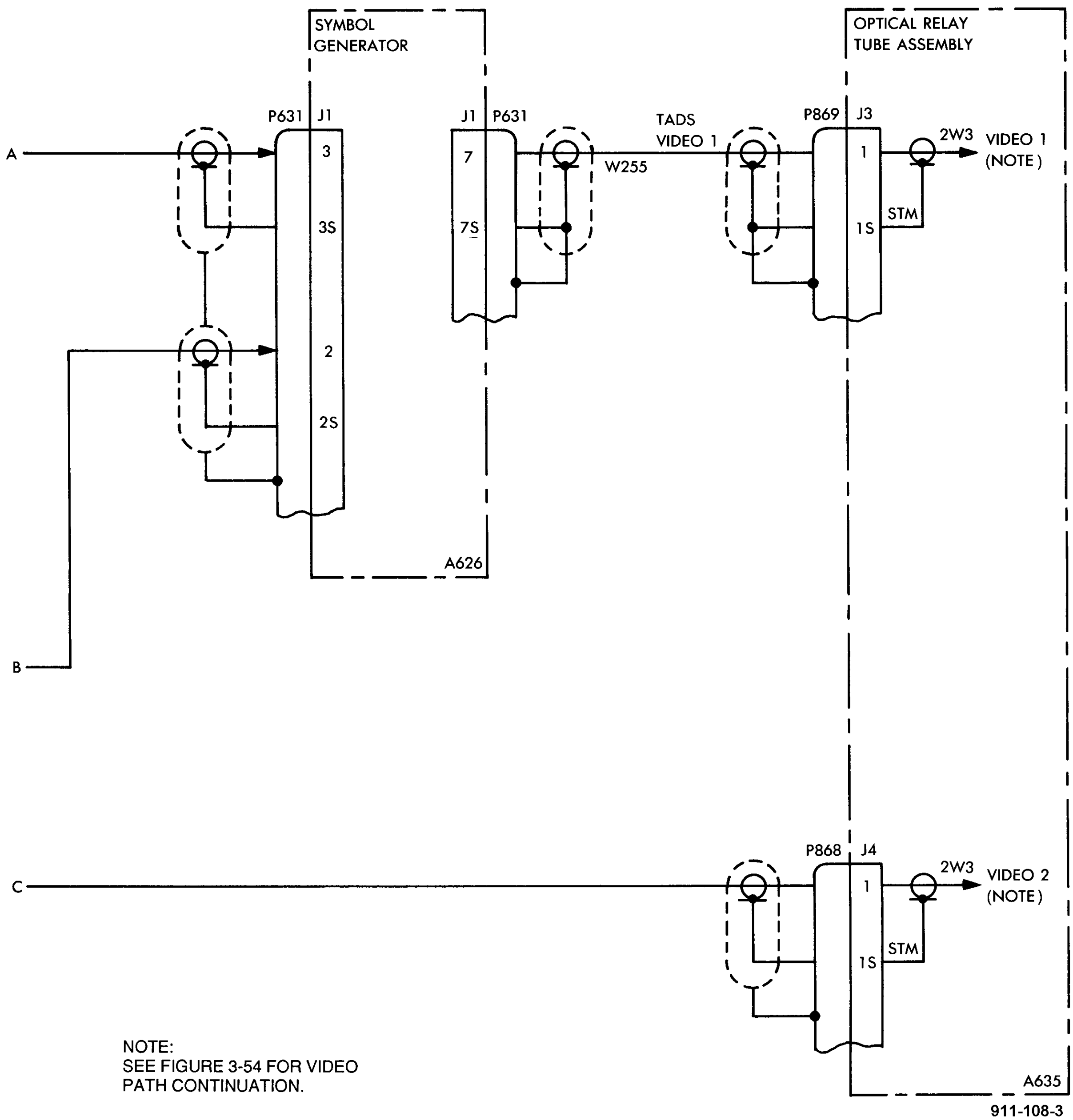


Figure 3-60. TADS Video Wiring Interconnect Diagram (Sheet 3 of 3)

3-26. DTV/NSA RANGE FOCUS WIRING INTERCONNECT DIAGRAM

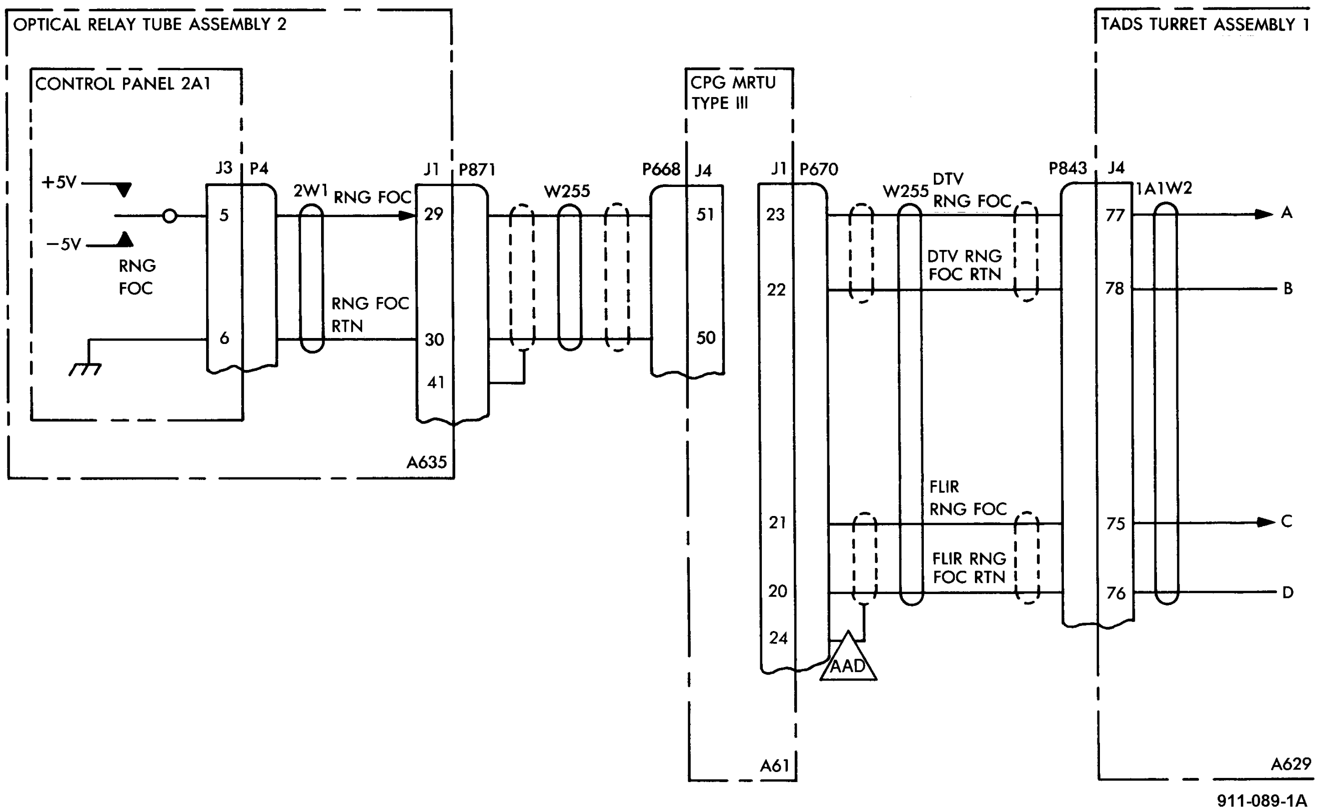


Figure 3-61. DTV/NSA Range Focus Wiring Interconnect Diagram (Sheet 1 of 2)

3-26. DTV/NSA RANGE FOCUS WIRING INTERCONNECT DIAGRAM (cont)

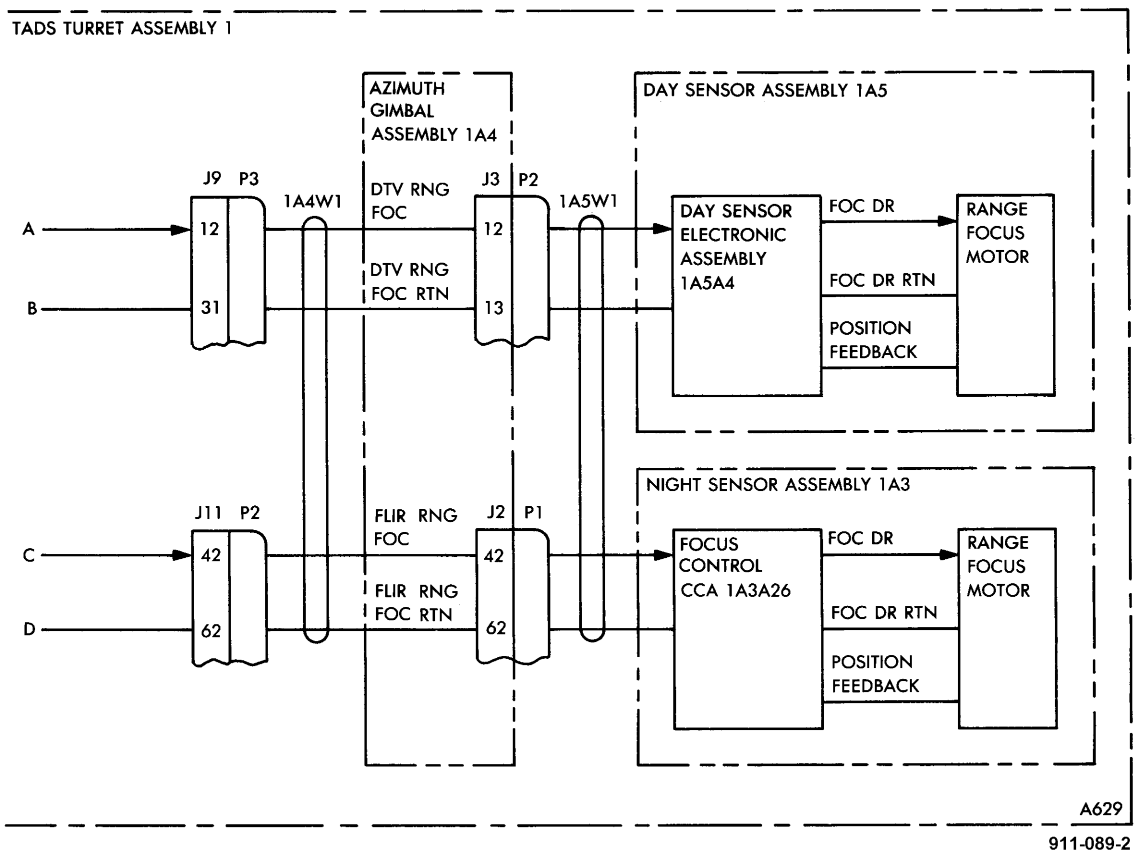


Figure 3-61. DTV/NSA Range Focus Wiring Interconnect Diagram (Sheet 2 of 2)

3-27. NIGHT FILTER WIRING INTERCONNECT DIAGRAM

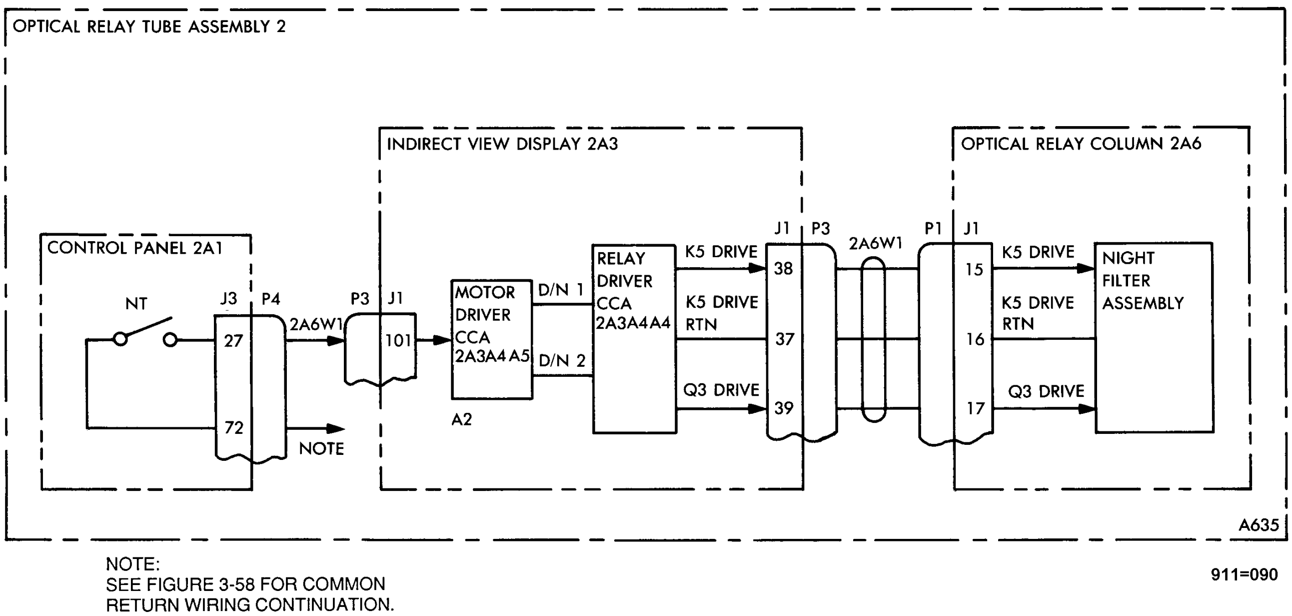
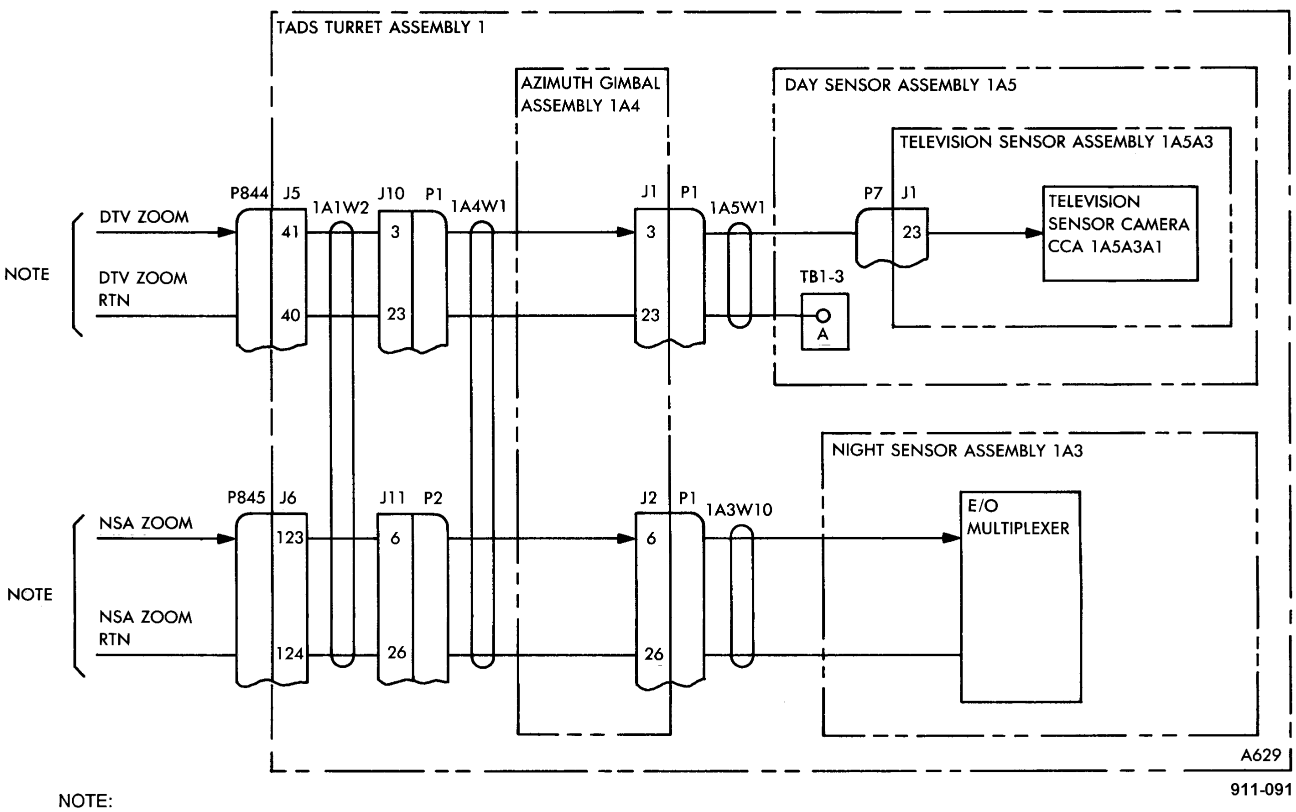


Figure 3-62. Night Filter Wiring Interconnect Diagram

3-28. DTV/NSA ZOOM FIELD-OF-VIEW WIRING INTERCONNECT DIAGRAM



NOTE:
SEE FIGURE 3-69 FOR CONTINUATION OF DSA AND NSA ZOOM FOV SWITCHING INPUTS.

Figure 3-63. DTV/NSA Zoom Field-of-View Wiring Interconnect Diagram

3-29. SYMBOLGY BRIGHTNESS WIRING INTERCONNECT DIAGRAM

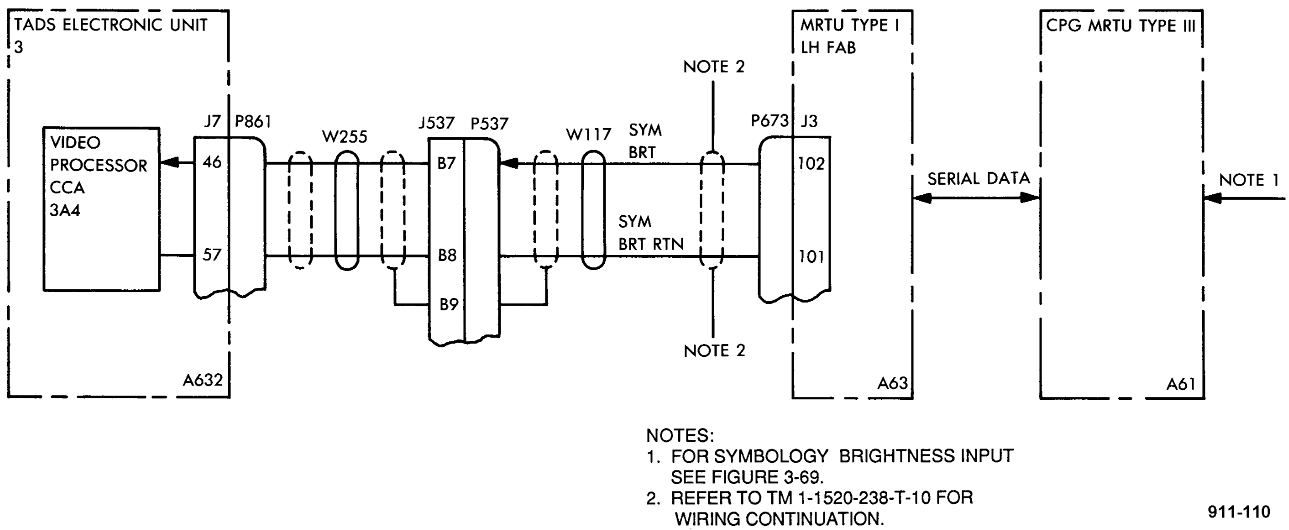


Figure 3-64. Symbology Brightness Wiring Interconnect Diagram

3-30. EDGELIGHT WIRING INTERCONNECT DIAGRAM

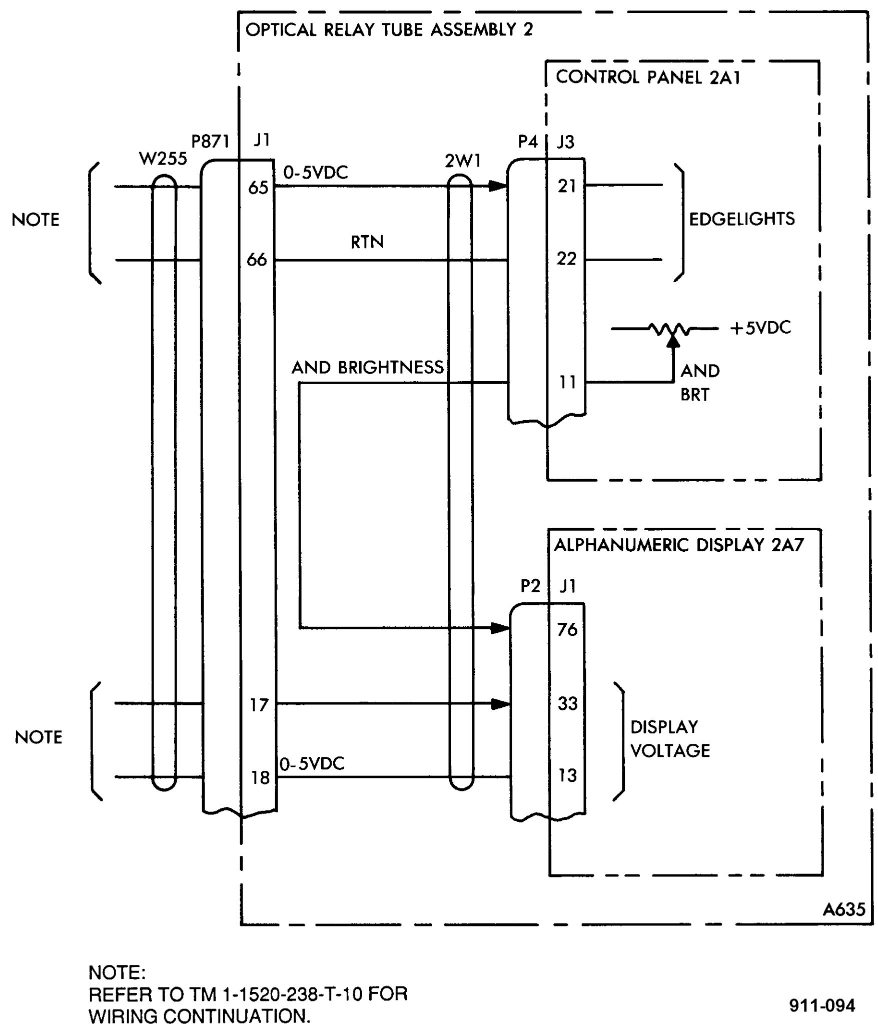


Figure 3-65. Edgelight Wiring Interconnect Diagram

3-31. TADS BRAKE RELEASE WIRING INTERCONNECT DIAGRAM

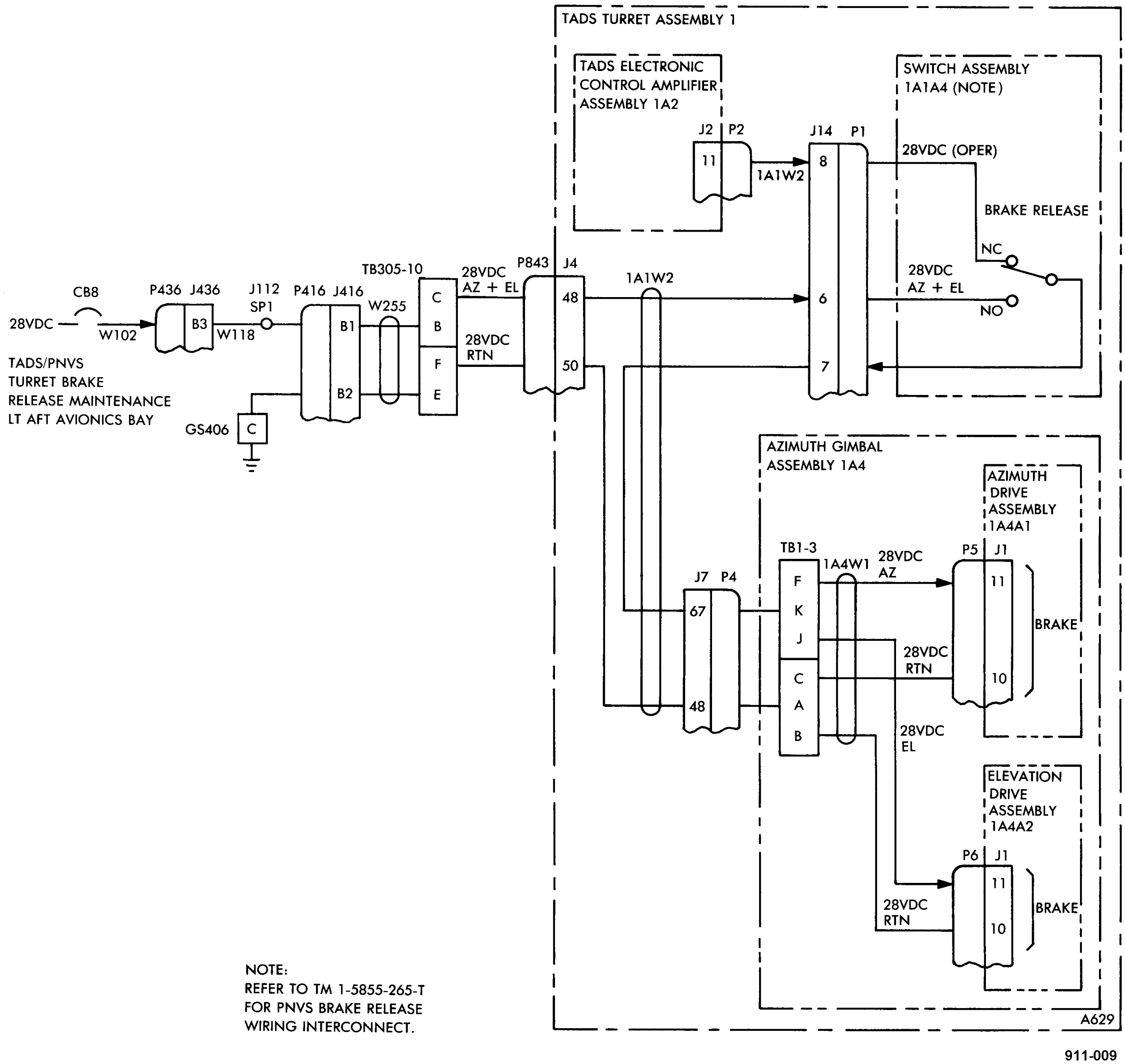


Figure 3-66. TADS Brake Release Wiring Interconnect Diagram

3-32. WEAPON ACTION SWITCH AND WEAPON TRIGGER SWITCH WIRING INTERCONNECT DIAGRAM

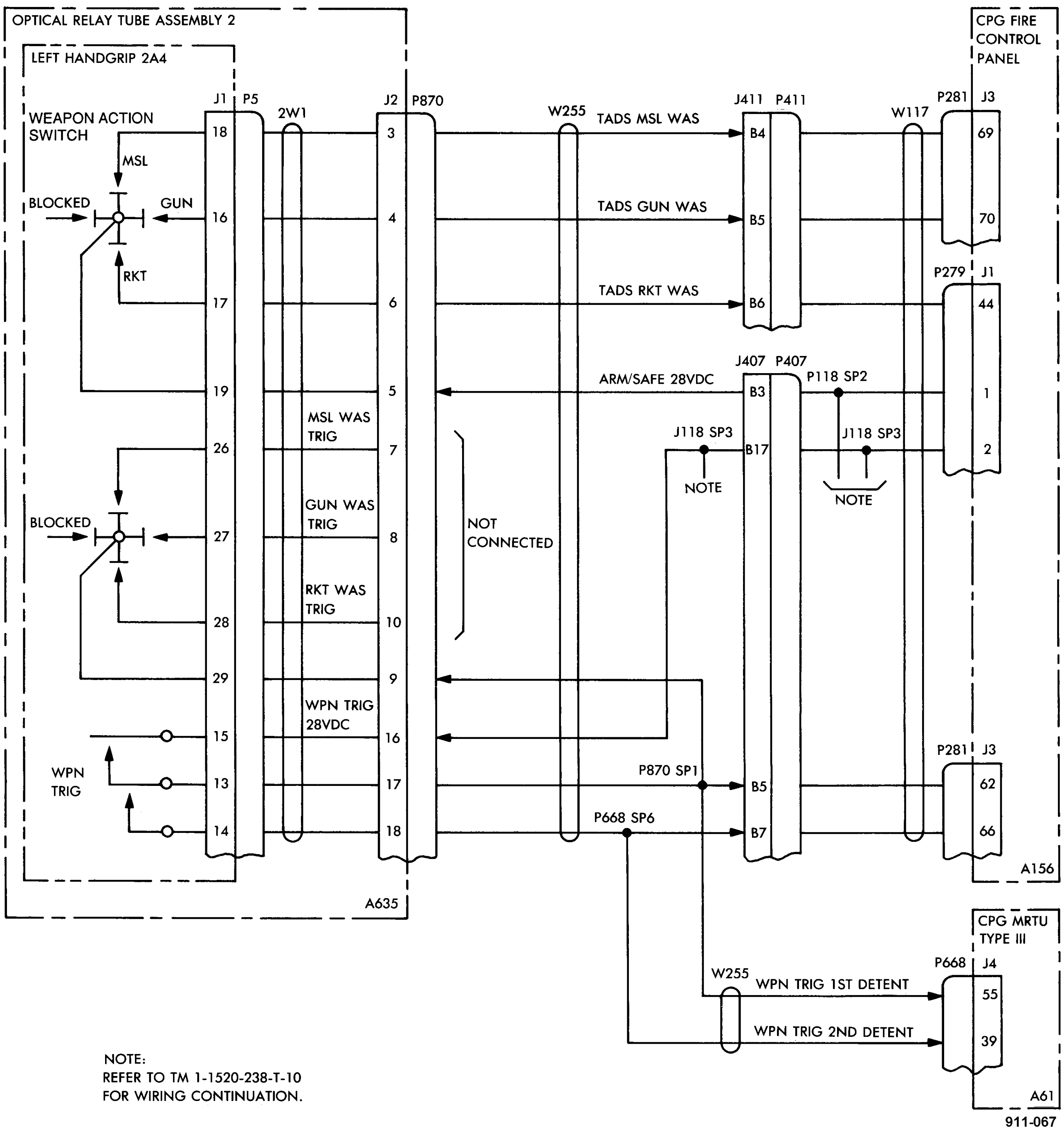


Figure 3-67. Weapon Action Switch and Weapon Trigger Switch Wiring Interconnect Diagram

3-33. VIDEO RECORDER WIRING INTERCONNECT DIAGRAM

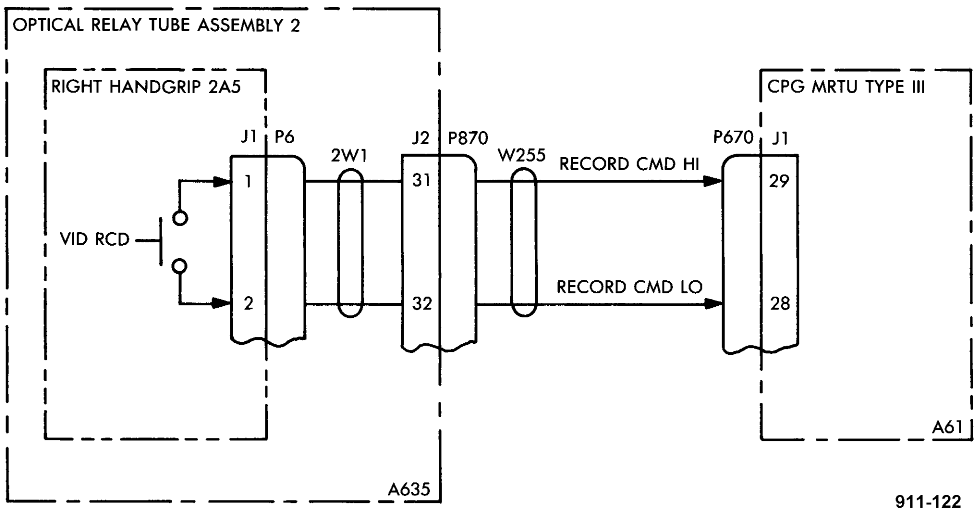


Figure 3-68. Video Recorder Wiring Interconnect Diagram

3-34. DVO/DTV FILED-OF-VIEW SWITCHING AND RETICLE LAMP WIRING INTERCONNECT DIAGRAM

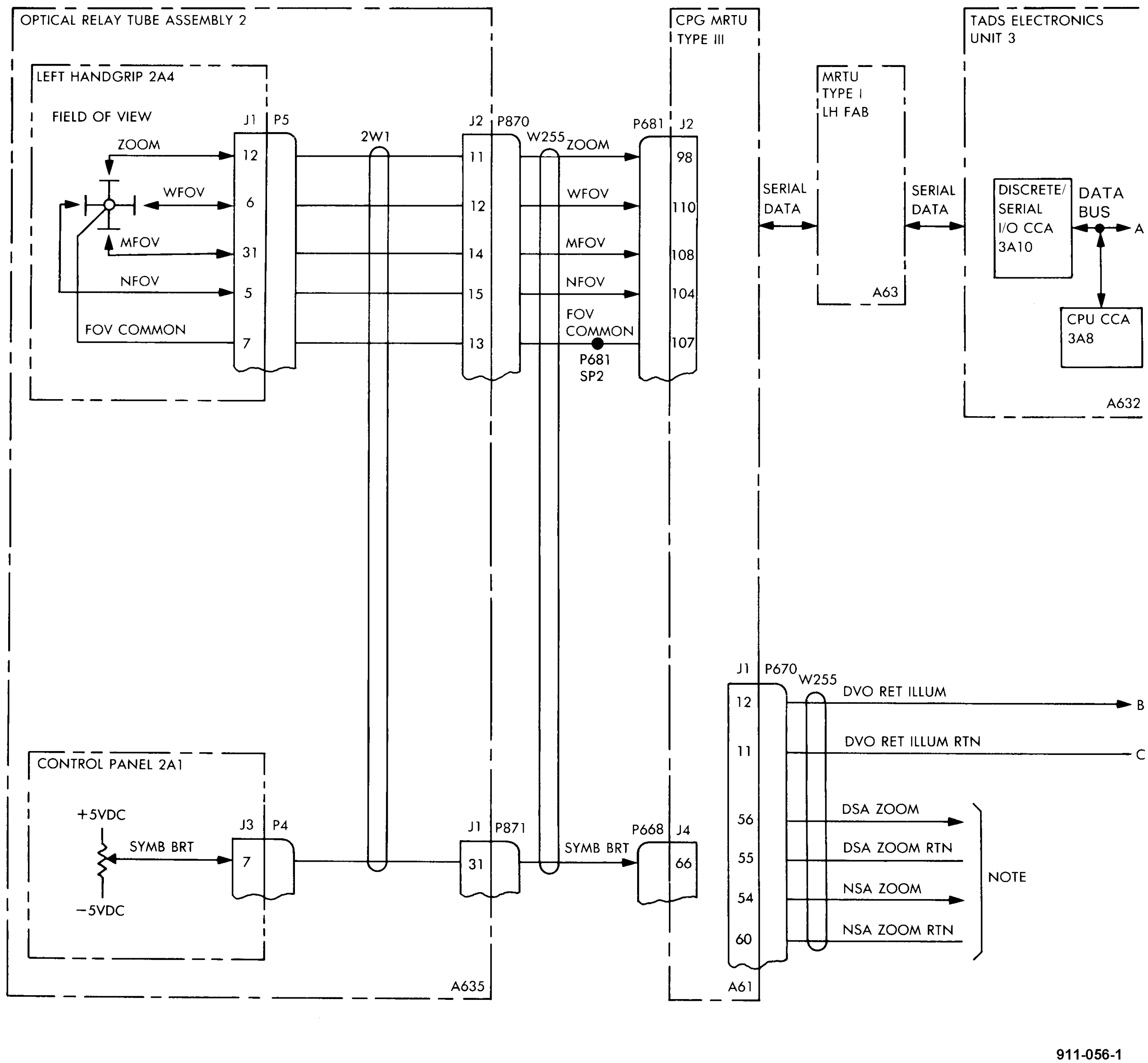
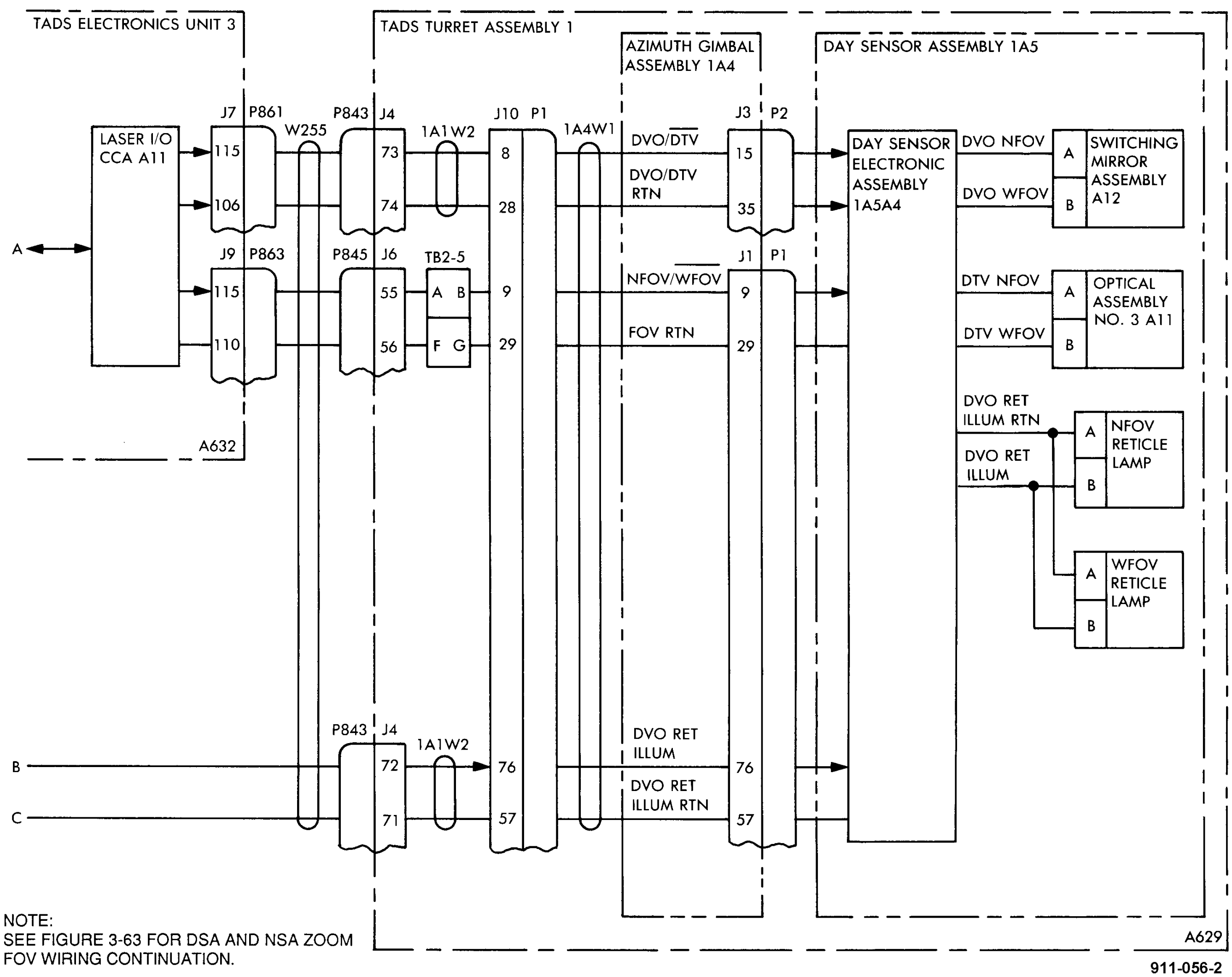


Figure 3-69. DVO/DTV Filed-of-view Switching and Reticle Lamp Wiring Interconnect Diagram (Sheet 1 of 2)

3-34. DVO/DTV FILED-OF-VIEW SWITCHING AND RETICLE LAMP WIRING INTERCONNECT DIAGRAM (cont)



NOTE:
SEE FIGURE 3-63 FOR DSA AND NSA ZOOM FOV WIRING CONTINUATION.

Figure 3-69. DVO/DTV Filed-of-view Switching and Reticle Lamp Wiring Interconnect Diagram (Sheet 2 of 2)

3-35. PECHAN PRISM ASSEMBLY WIRING INTERCONNECT DIAGRAM

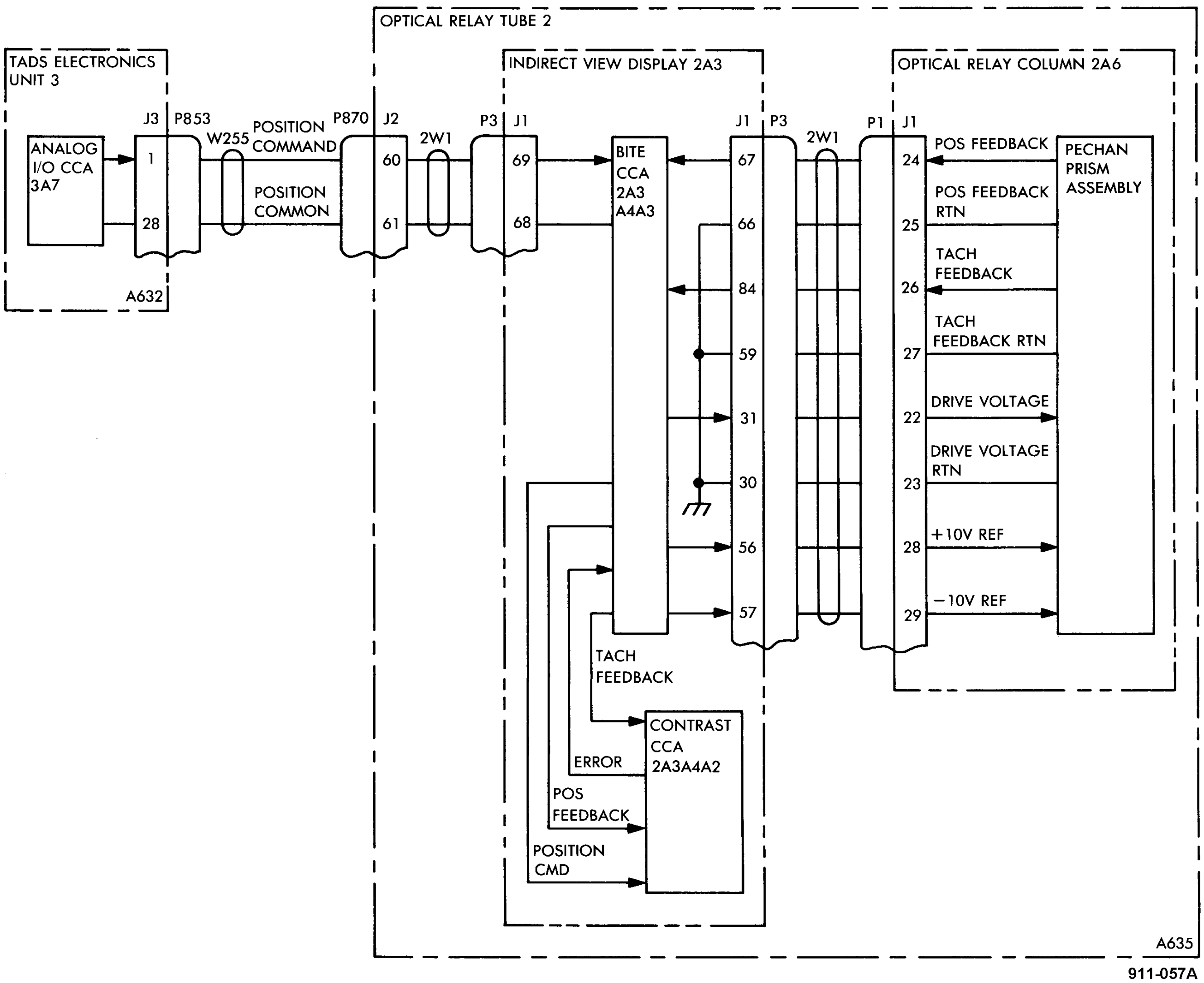


Figure 3-70. Pechan Prism Assembly Wiring Interconnect Diagram

3-36. HAZE/GLARE FILTER ASSEMBLY WIRING INTERCONNECT DIAGRAM [TAD]

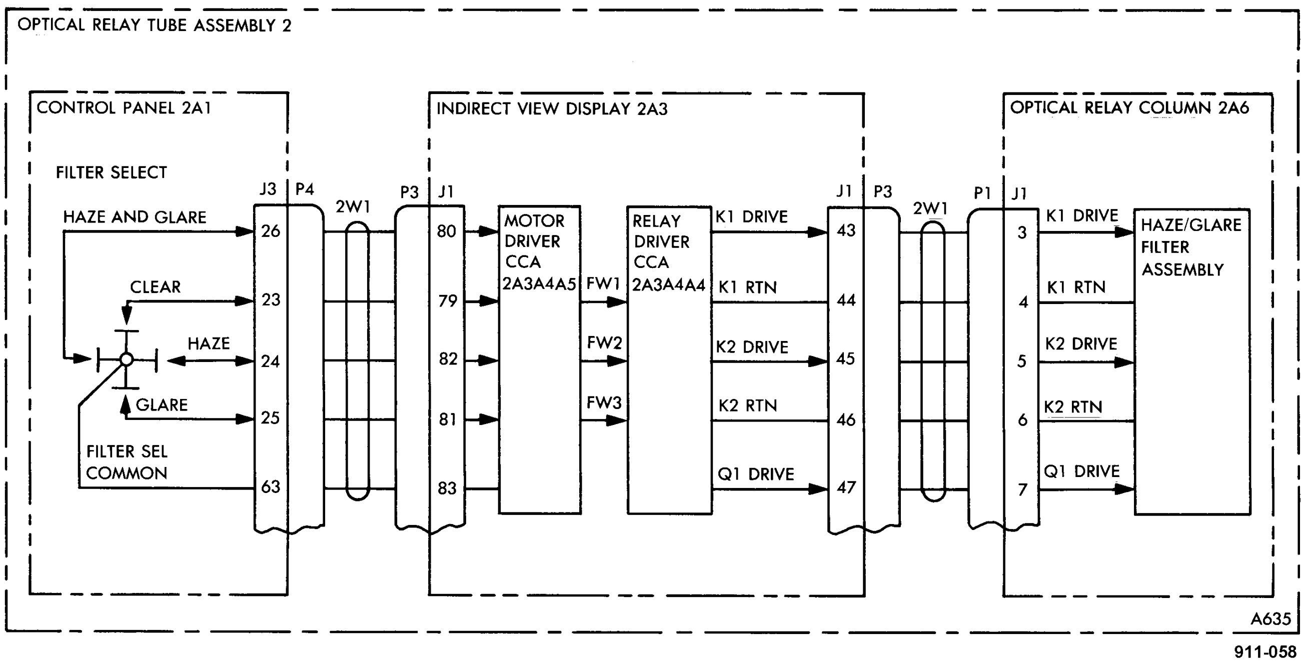


Figure 3-71. Haze/Glare Filter Assembly Wiring Interconnect Diagram **[TAD]**

3-37. ALC BIT POSITION WIRING INTERCONNECT DIAGRAM

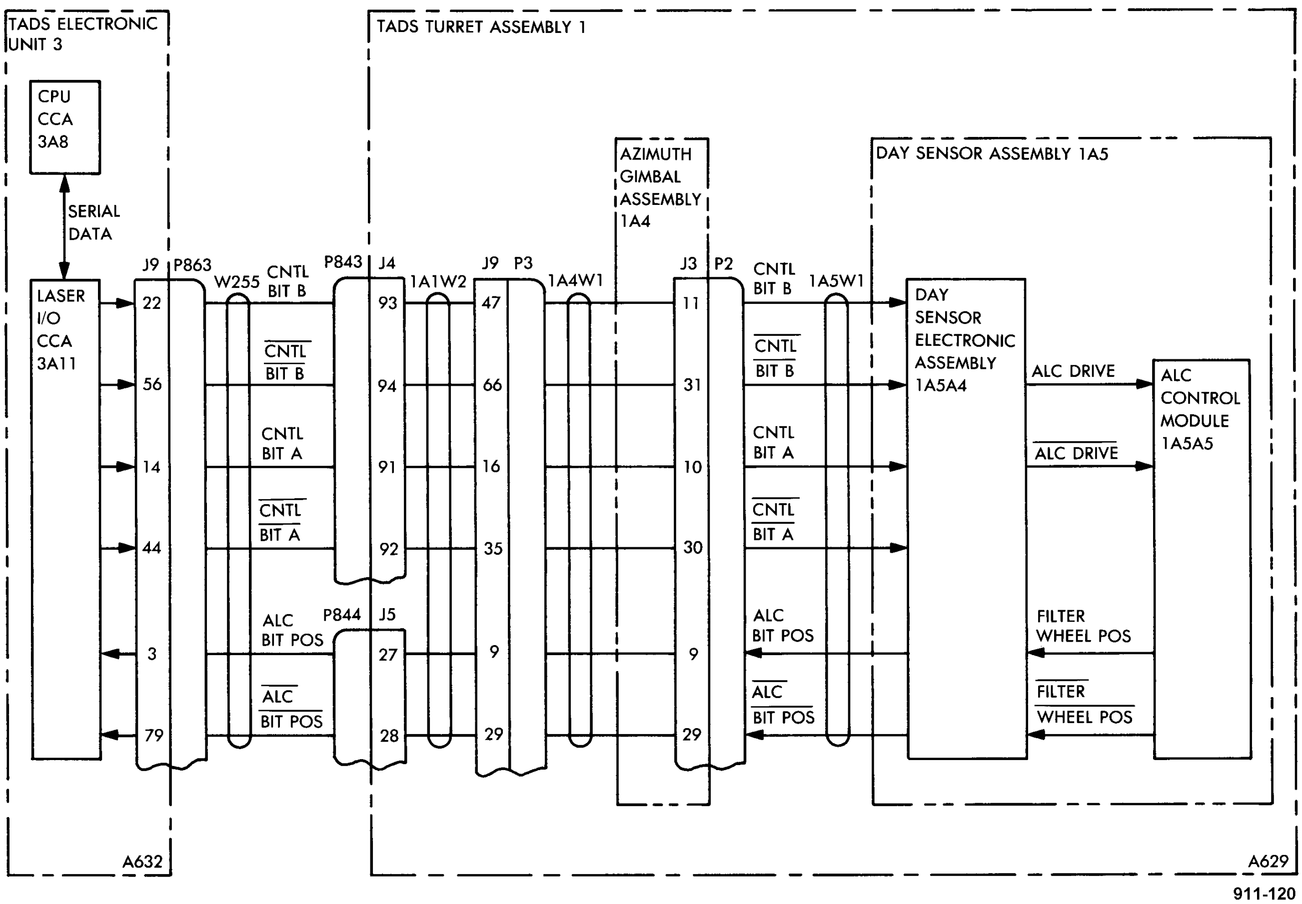


Figure 3-72. ALC BIT Position Wiring Interconnect Diagram

3-38. NSA VIDEO CONTROL WIRING INTERCONNECT DIAGRAM

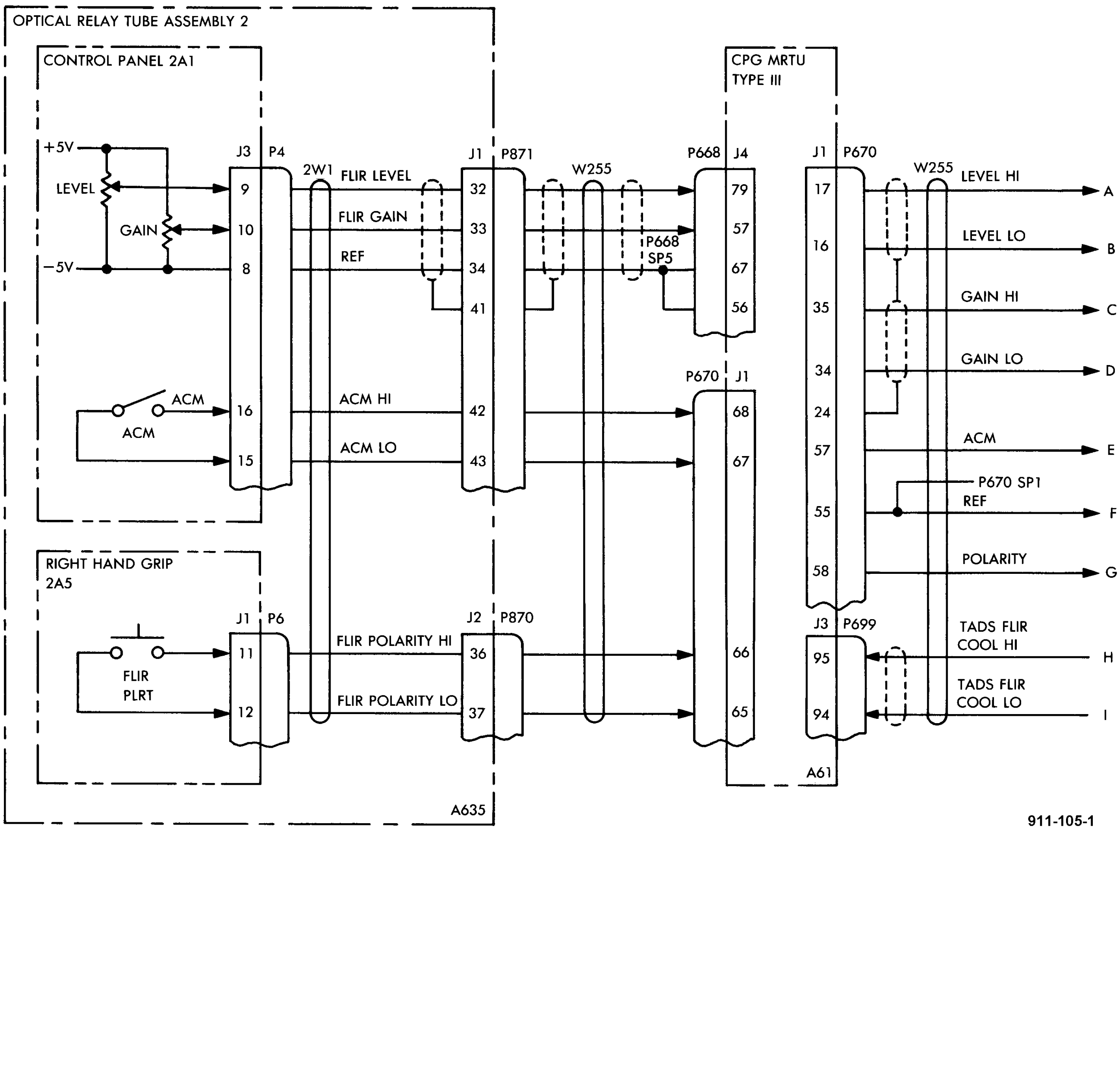


Figure 3-73. NSA Video Control Wiring Interconnect Diagram (Sheet 1 of 2)

3-38. NSA VIDEO CONTROL WIRING INTERCONNECT DIAGRAM (cont)

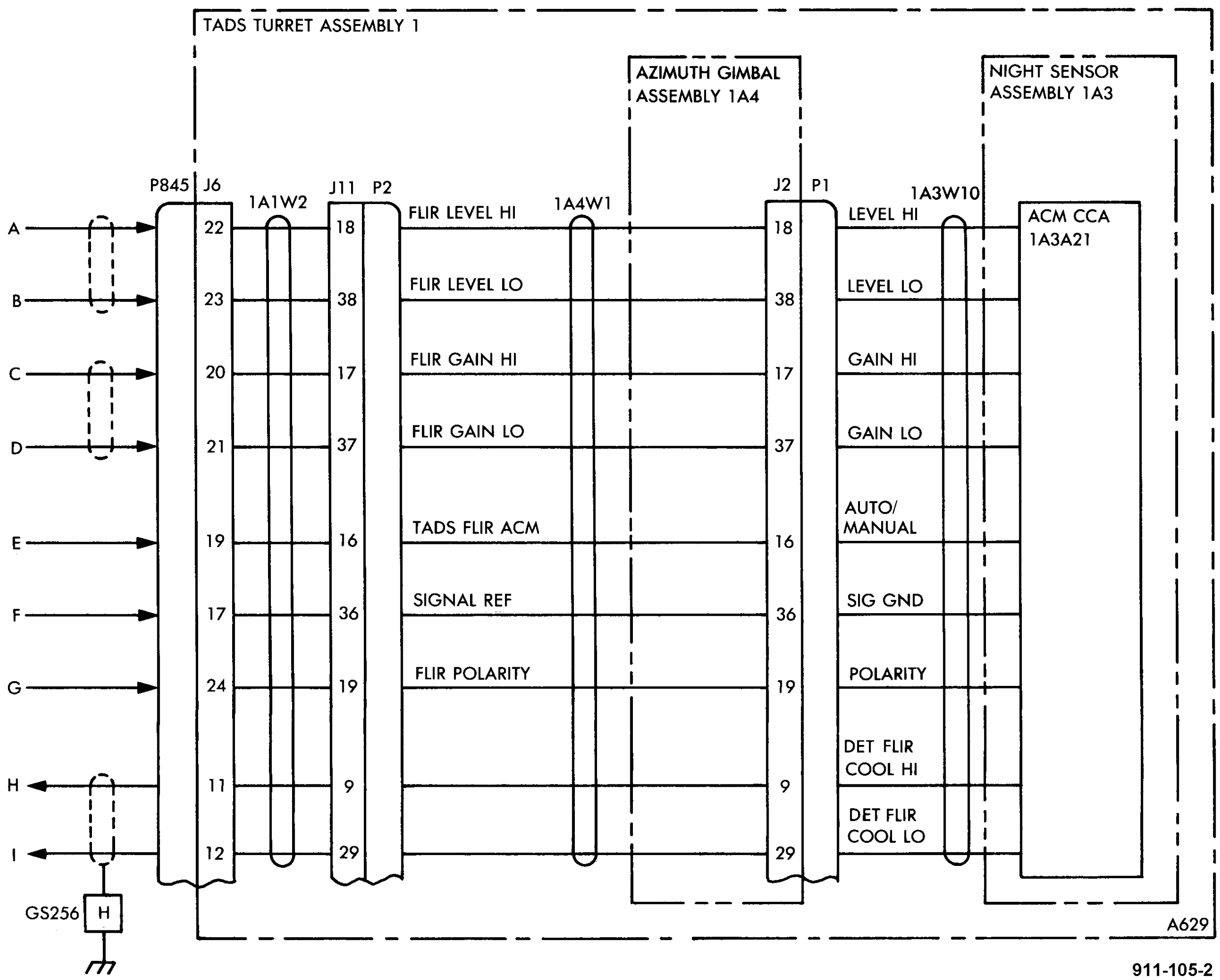
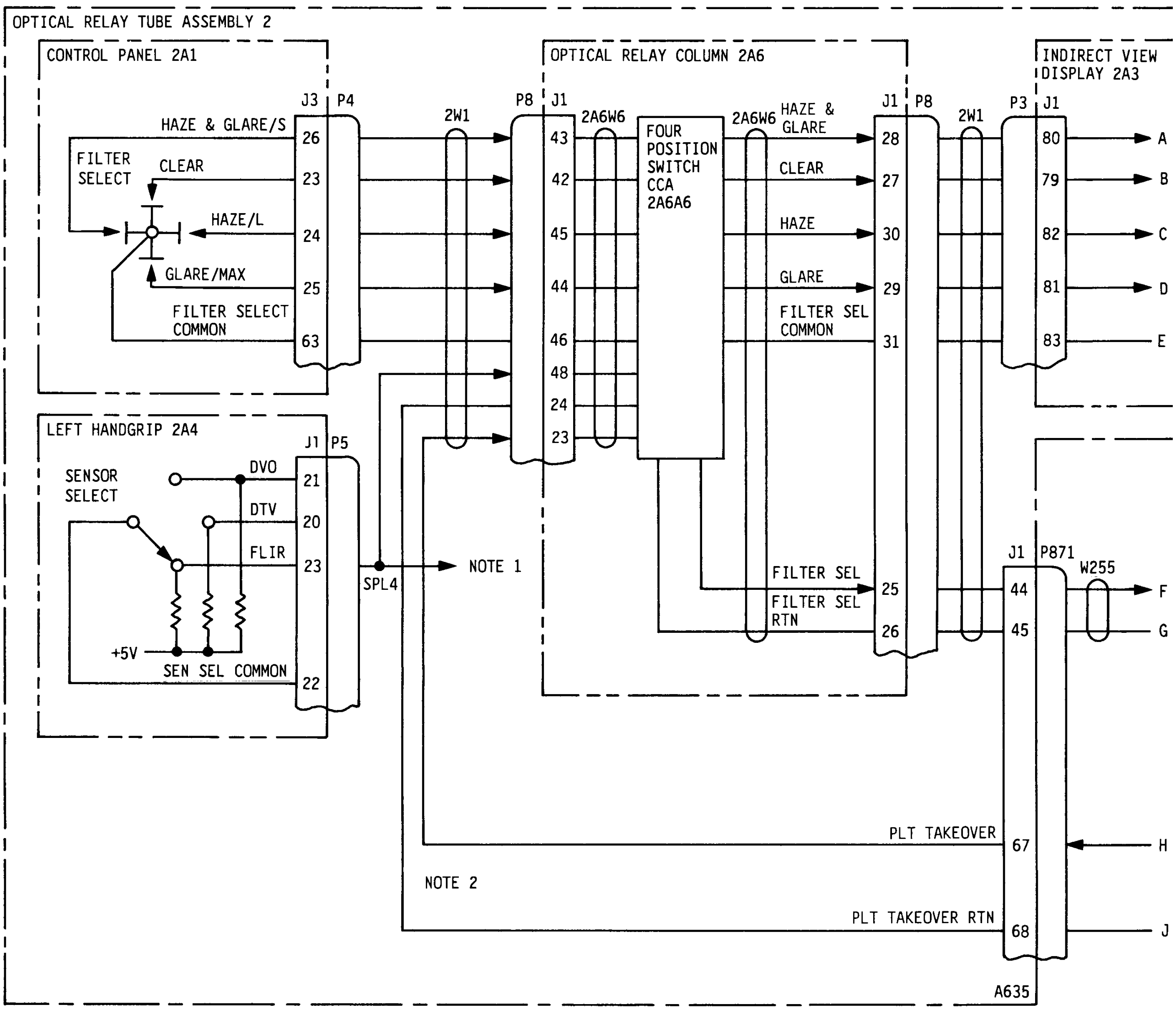


Figure 3-73. NSA Video Control Wiring Interconnect Diagram (Sheet 2 of 2)

3-39. HAZE/GLARE FILTER ASSEMBLY AND LASER THREAT FILTER WIRING INTERCONNECT DIAGRAM



NOTES:
1. SEE FIGURE 3-58 FOR CONTINUATION.
2. SEE FIGURE 3-49 FOR NON-OIP WIRING.

911-117-1

Figure 3-74. Haze/Glare Filter Assembly and Laser Threat Filter Wiring Interconnect Diagram (Sheet 1 of 2)

3-39. HAZE/GLARE FILTER ASSEMBLY AND LASER THREAT FILTER WIRING INTERCONNECT DIAGRAM (cont)

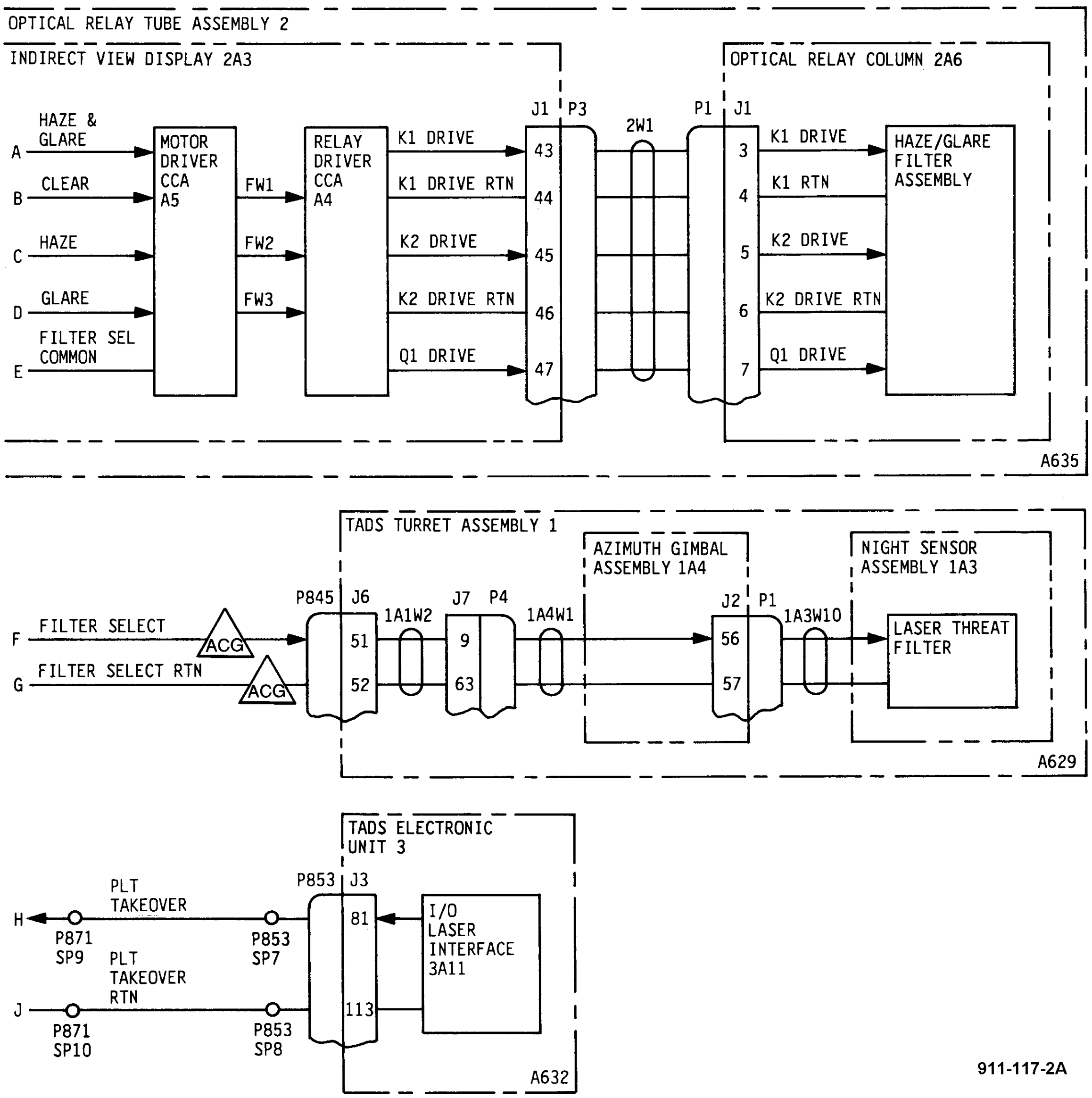


Figure 3-74. Haze/Glare Filter Assembly and Laser Threat Filter Wiring Interconnect Diagram (Sheet 2 of 2)

3-40. NSA FIELD-OF-VIEW WIRING INTERCONNECT DIAGRAM

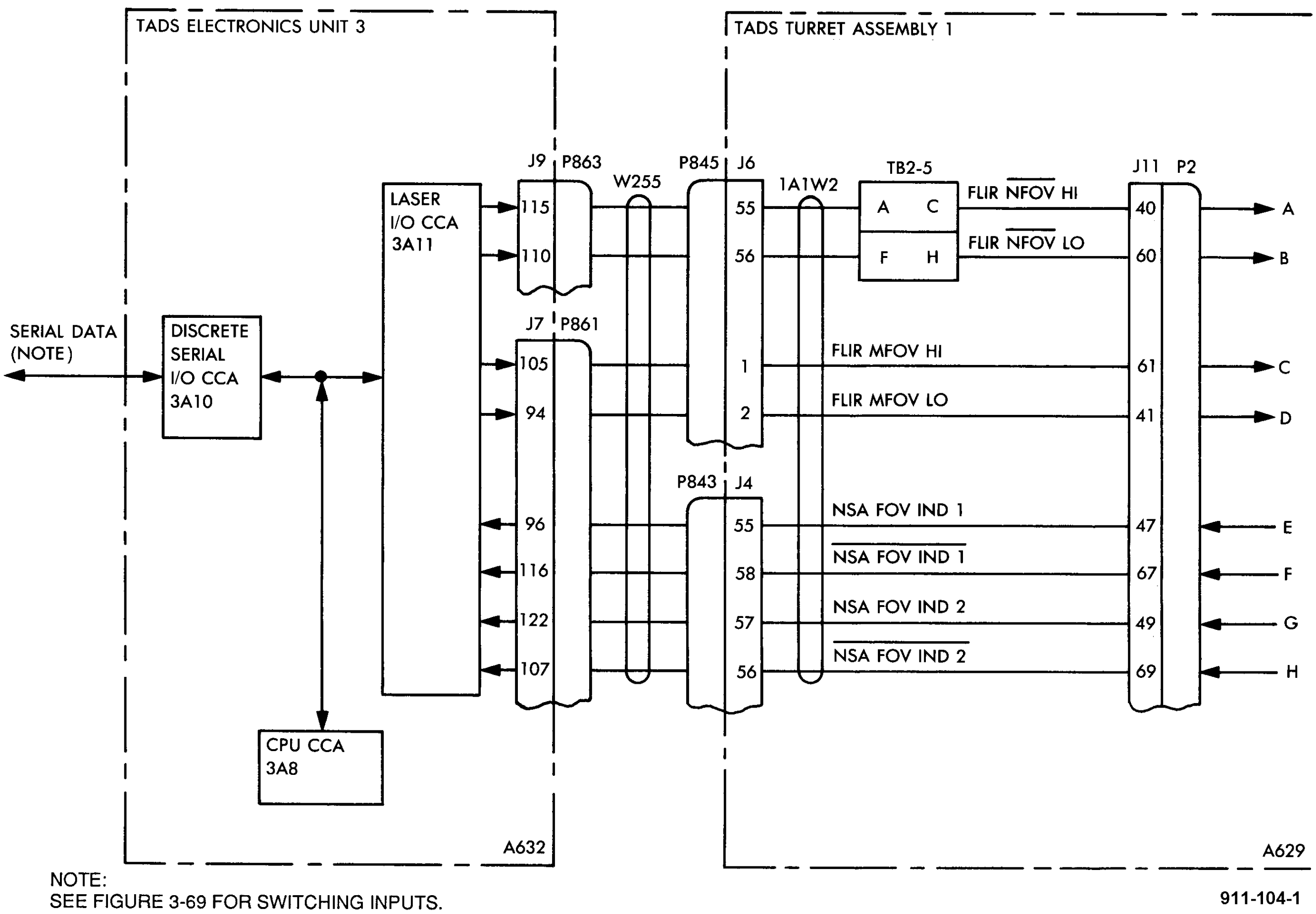


Figure 3-75. NSA Field-of-View Wiring Interconnect Diagram (Sheet 1 of 2)

3-40. NSA FIELD-OF-VIEW WIRING INTERCONNECT DIAGRAM (cont)

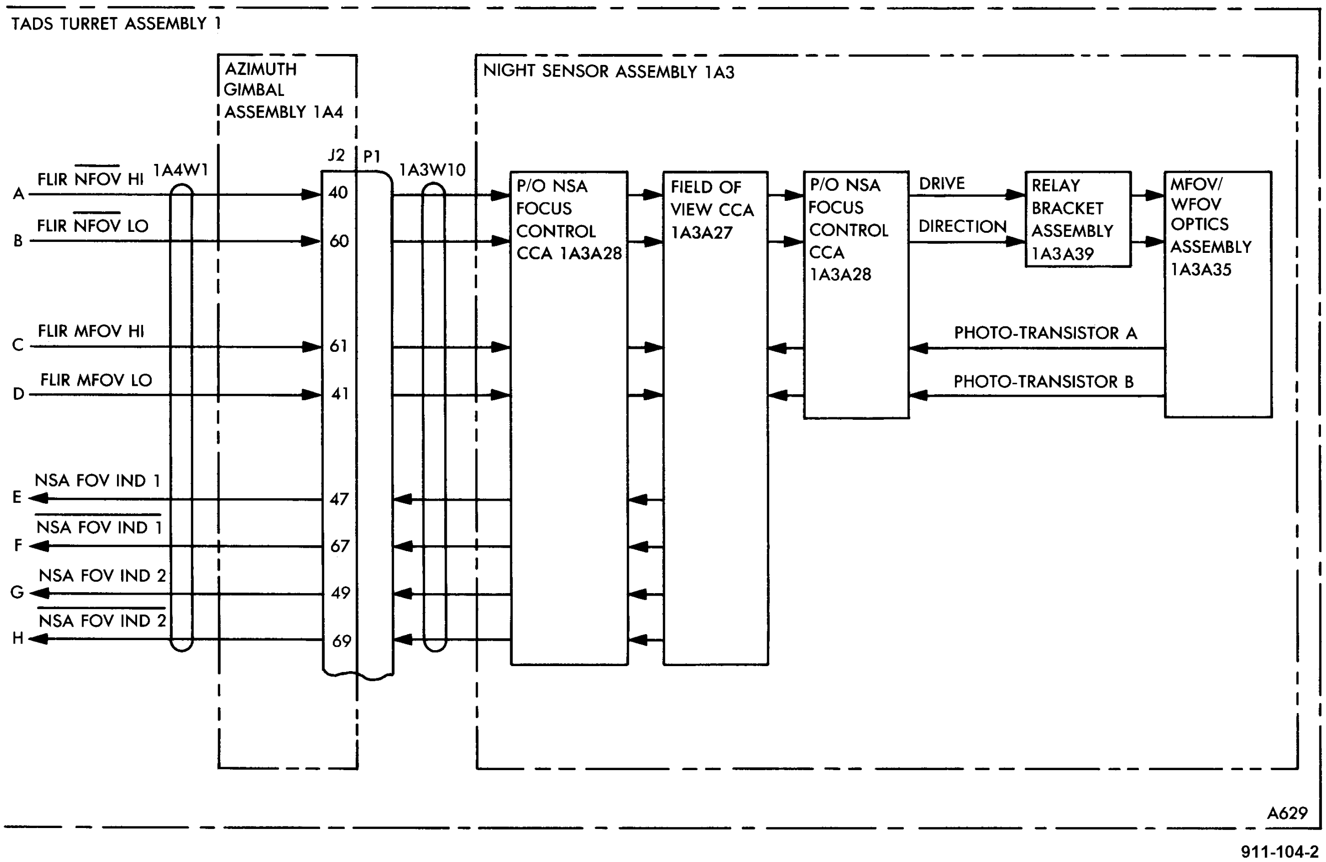


Figure 3-75. NSA Field-of-View Wiring Interconnect Diagram (Sheet 2 of 2)

3-41. MOTOR CONTROL MODULE BIT WIRING INTERCONNECT DIAGRAM

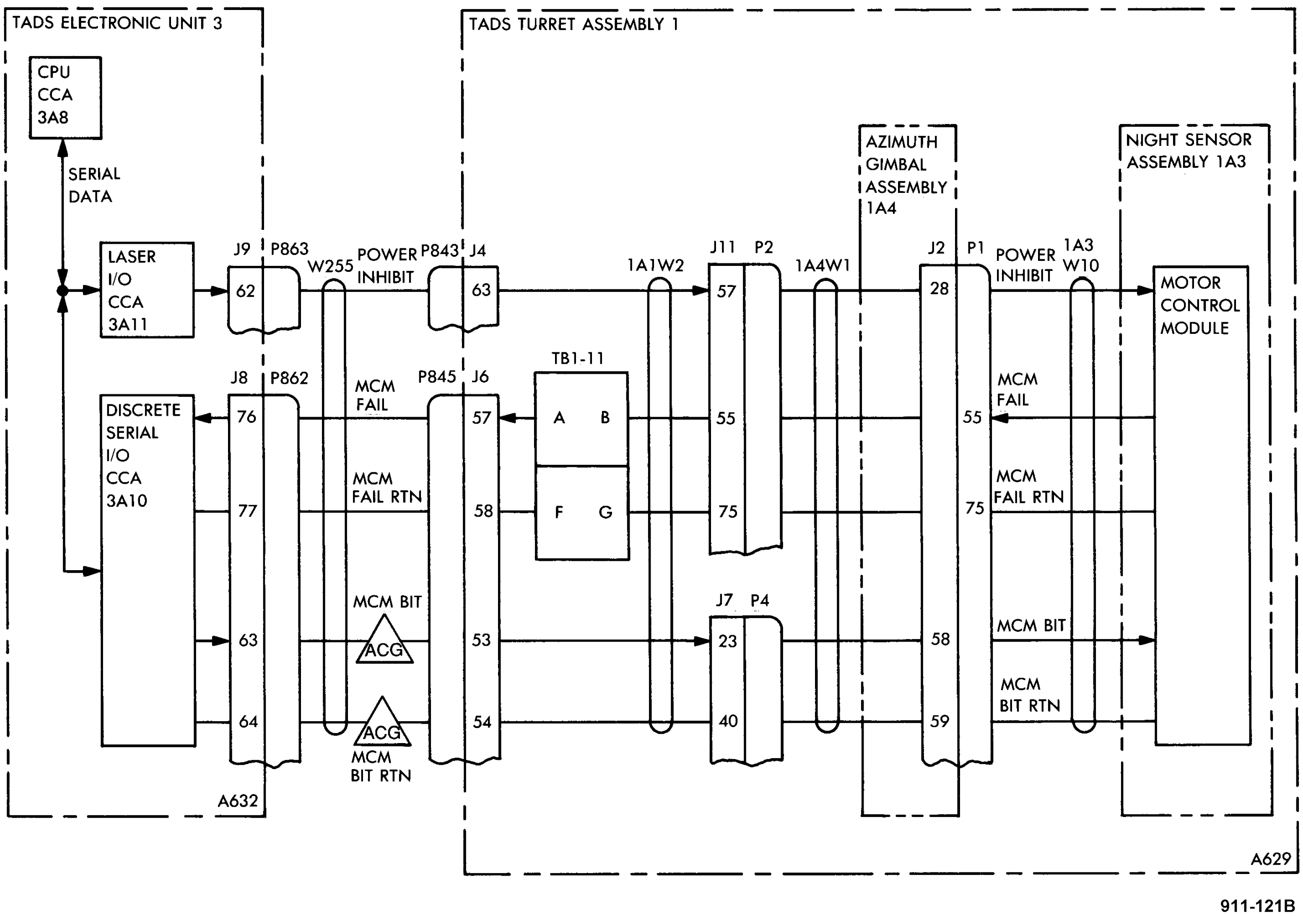


Figure 3-76. Motor Control Module BIT Wiring Interconnect Diagram

3-42. TADS SERVO CONTROL WIRING INTERCONNECT DIAGRAM

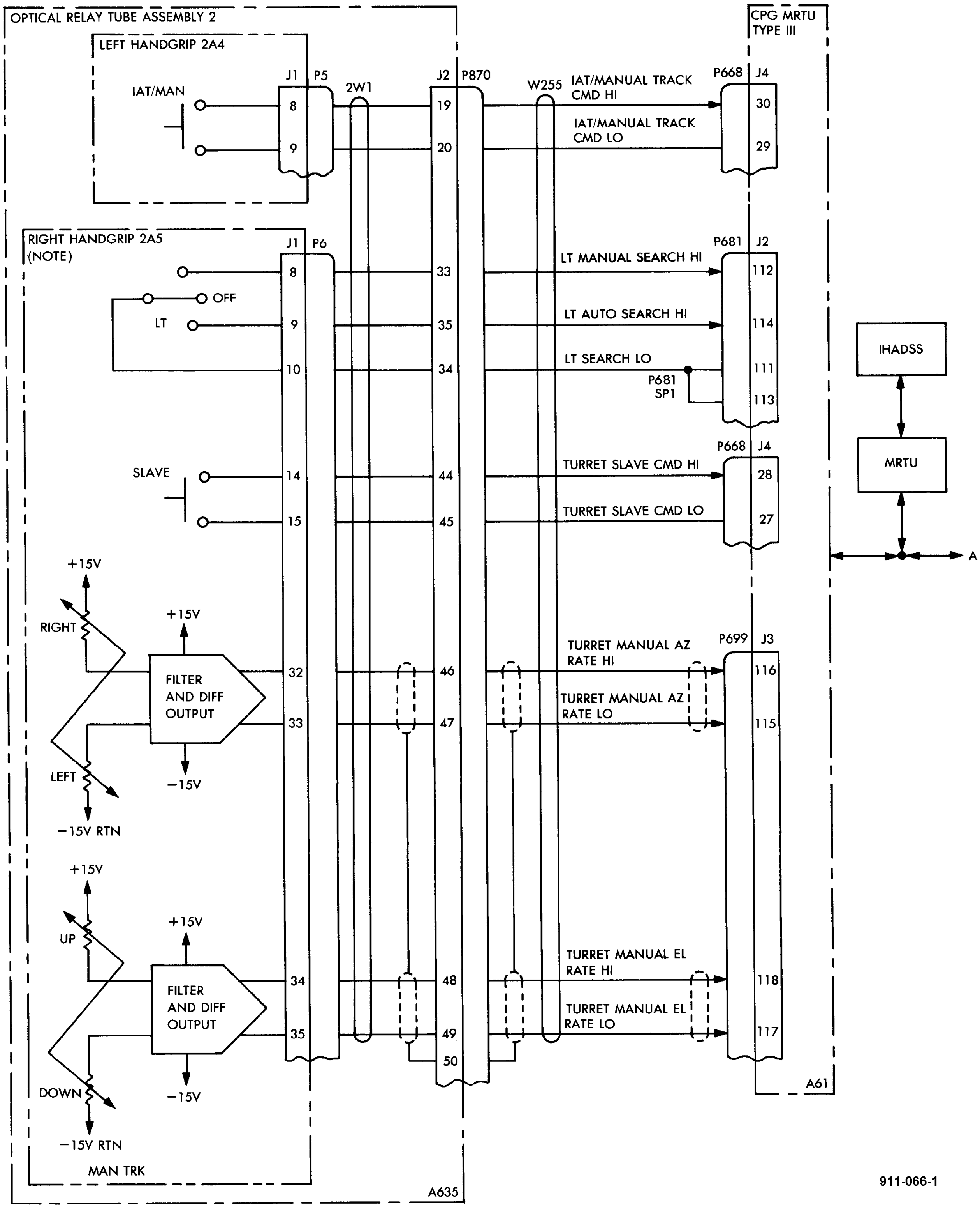
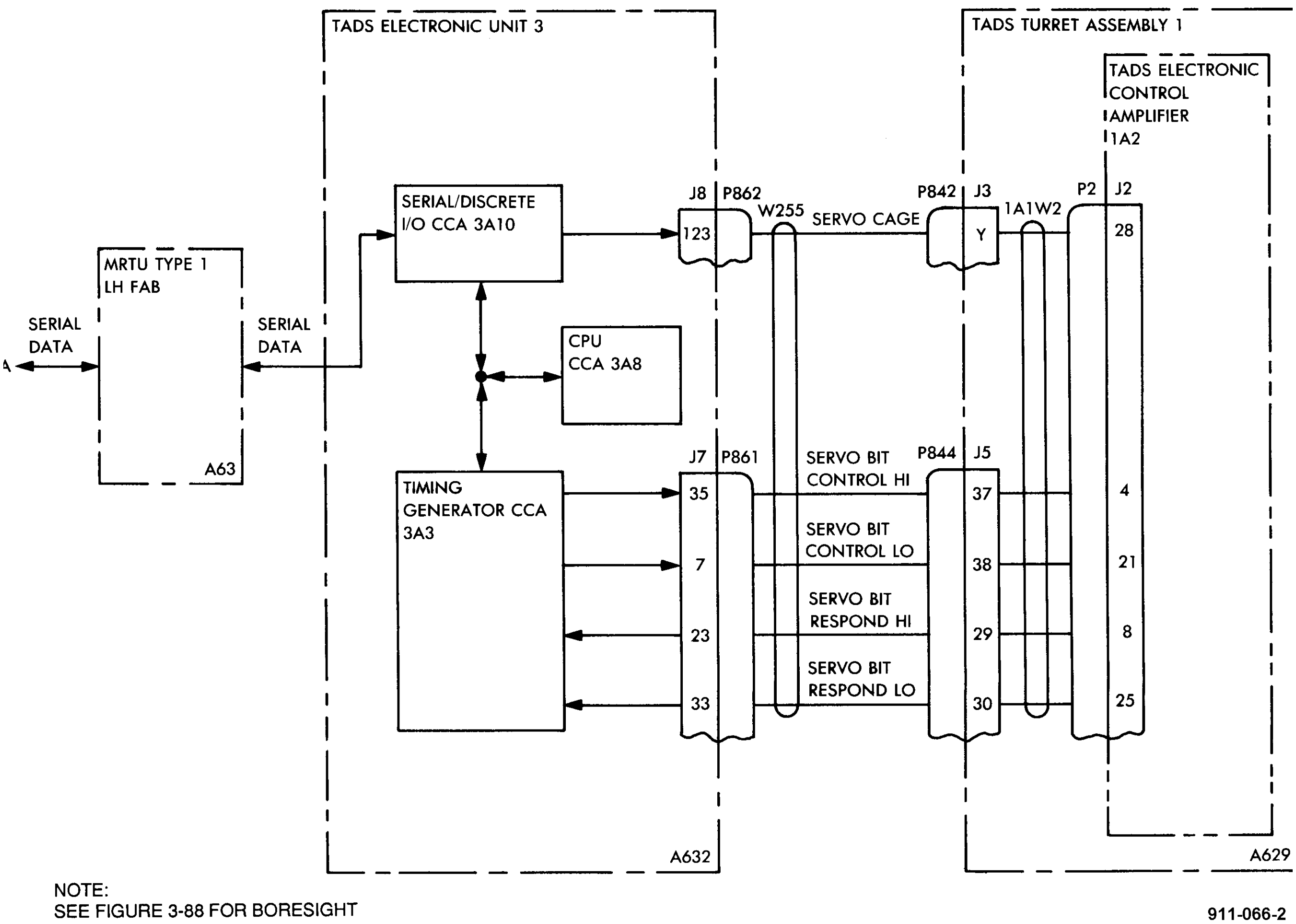


Figure 3-77. TADS Servo Control Wiring Interconnect Diagram (Sheet 1 of 2)

3-42. TADS SERVO CONTROL WIRING INTERCONNECT DIAGRAM (cont)



NOTE:
SEE FIGURE 3-88 FOR BORESIGHT SERVO OUTPUT.

Figure 3-77. TADS Servo Control Wiring Interconnect Diagram (Sheet 2 of 2)

3-43. GYRO EXCITATION WIRING INTERCONNECT DIAGRAM

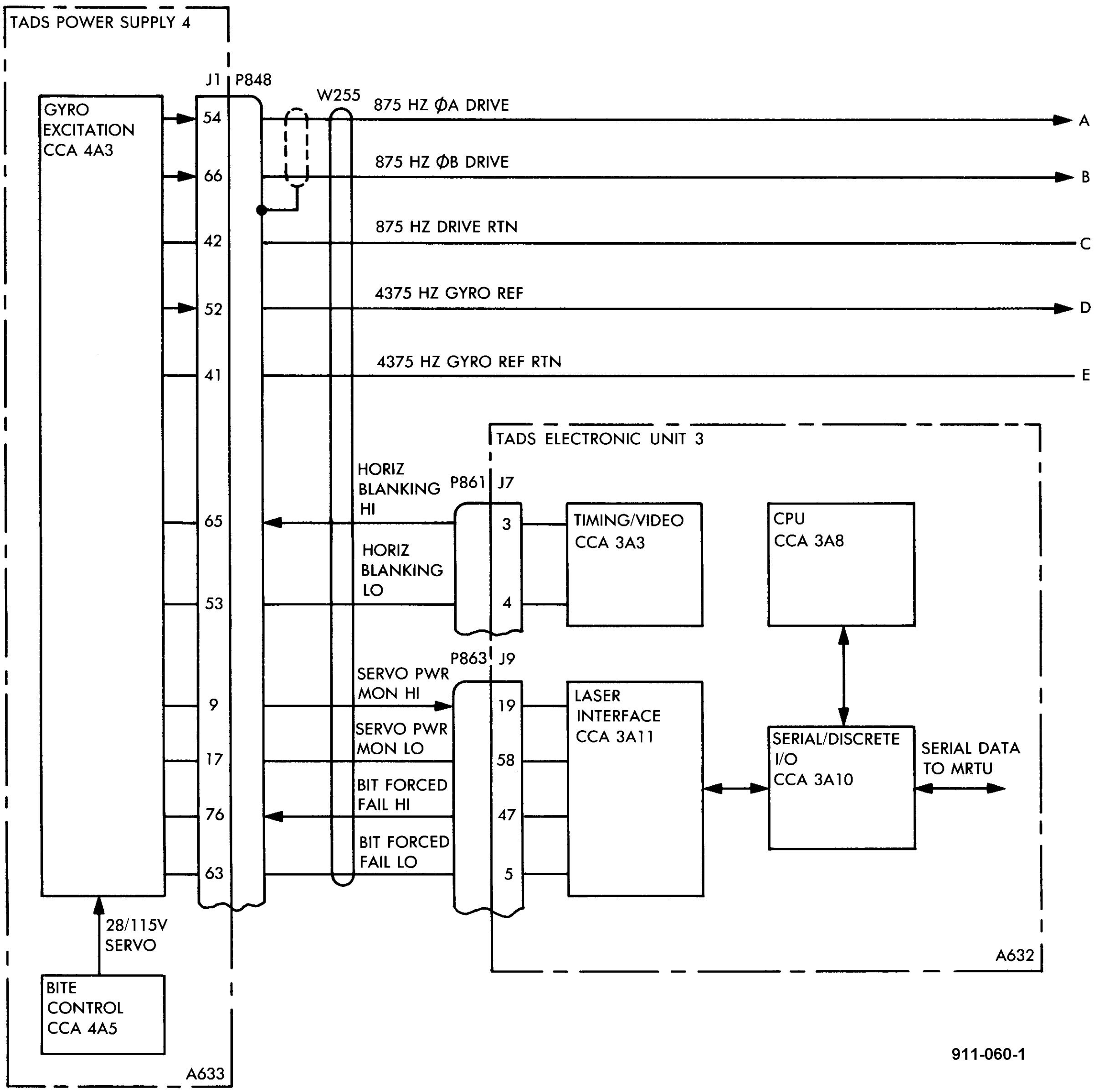


Figure 3-78. Gyro Excitation Wiring Interconnect Diagram (Sheet 1 of 3)

3-43. GYRO EXCITATION WIRING INTERCONNECT DIAGRAM (cont)

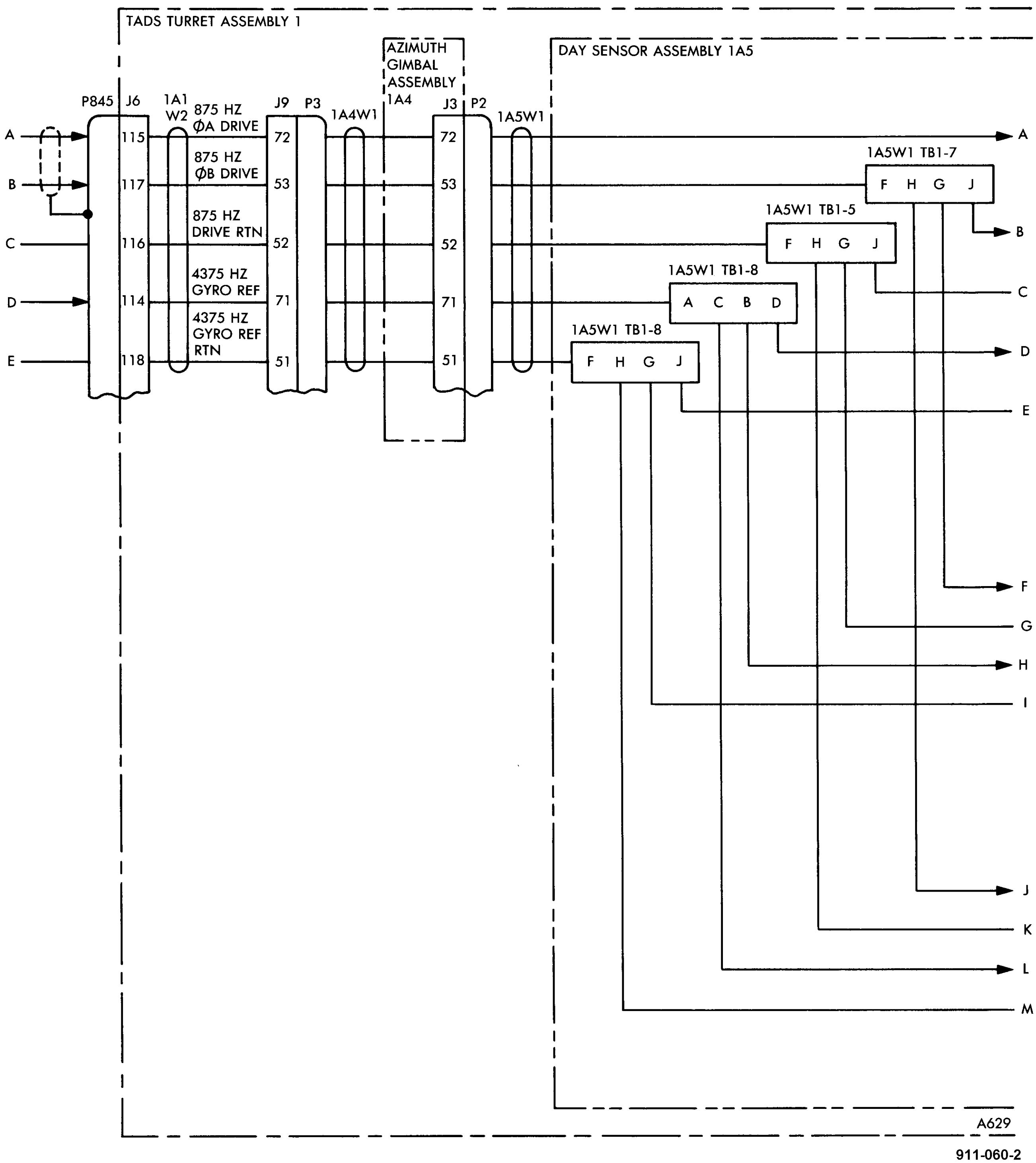


Figure 3-78. Gyro Excitation Wiring Interconnect Diagram (Sheet 2 of 3)

3-43. GYRO EXCITATION WIRING INTERCONNECT DIAGRAM (cont)

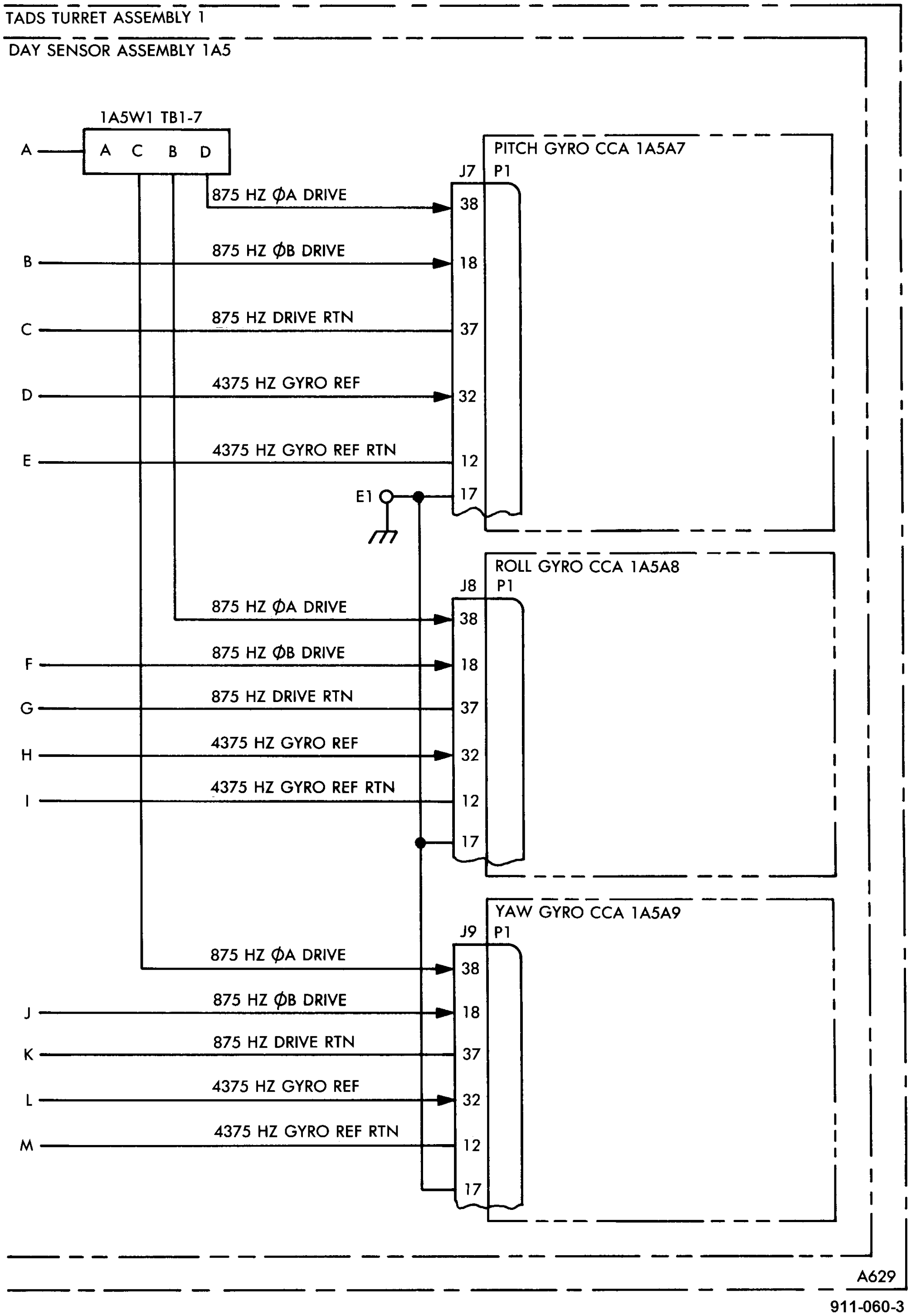


Figure 3-78. Gyro Excitation Wiring Interconnect Diagram (Sheet 3 of 3)

3-44. YAW GYRO/INNER GIMBAL SERVO LOOP WIRING INTERCONNECT DIAGRAM

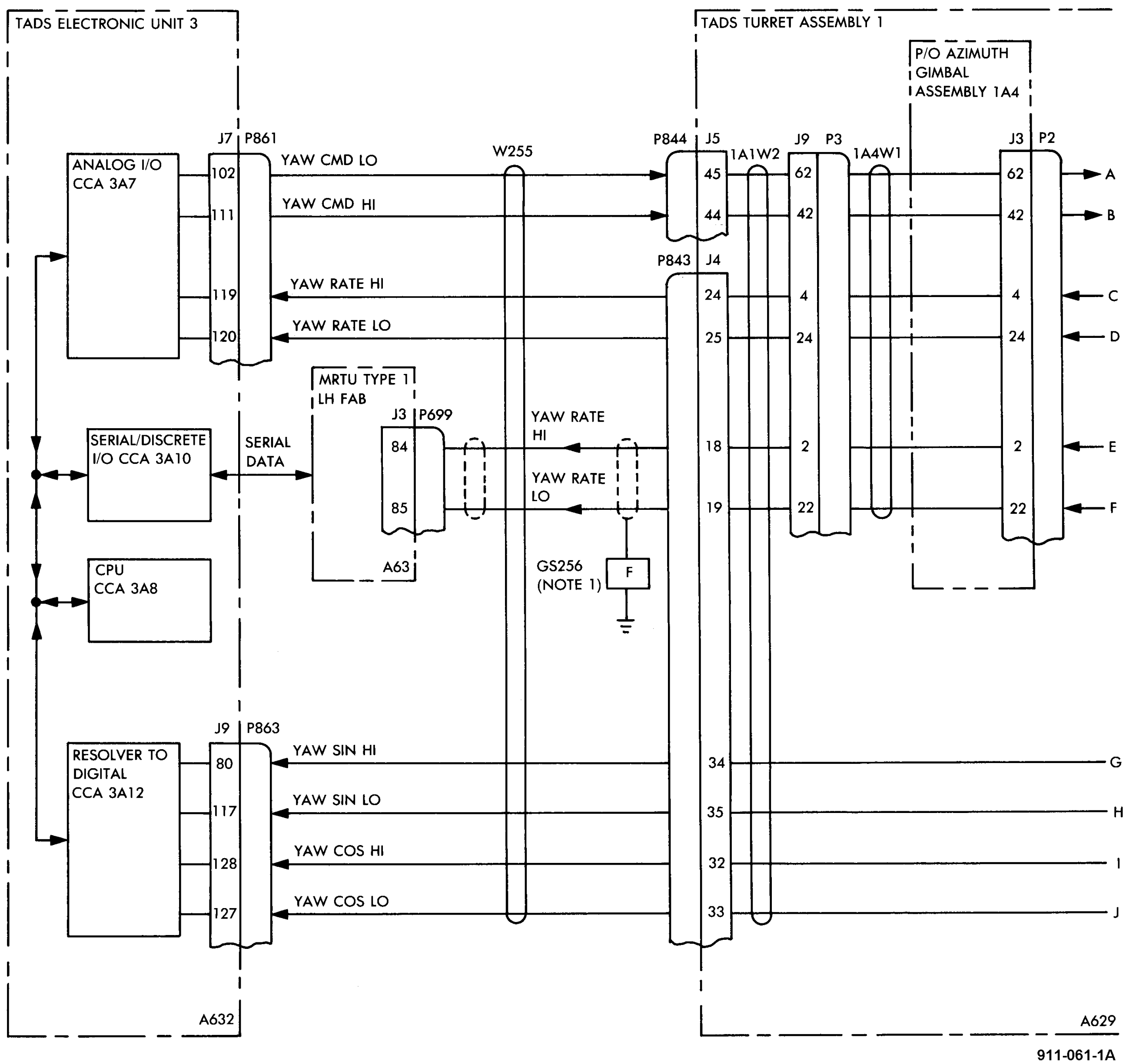


Figure 3-79. Yaw Gyro/Inner Gimbal Servo Loop Wiring Interconnect Diagram (Sheet 1 of 4)

3-44. YAW GYRO/INNER GIMBAL SERVO LOOP WIRING INTERCONNECT DIAGRAM (cont)

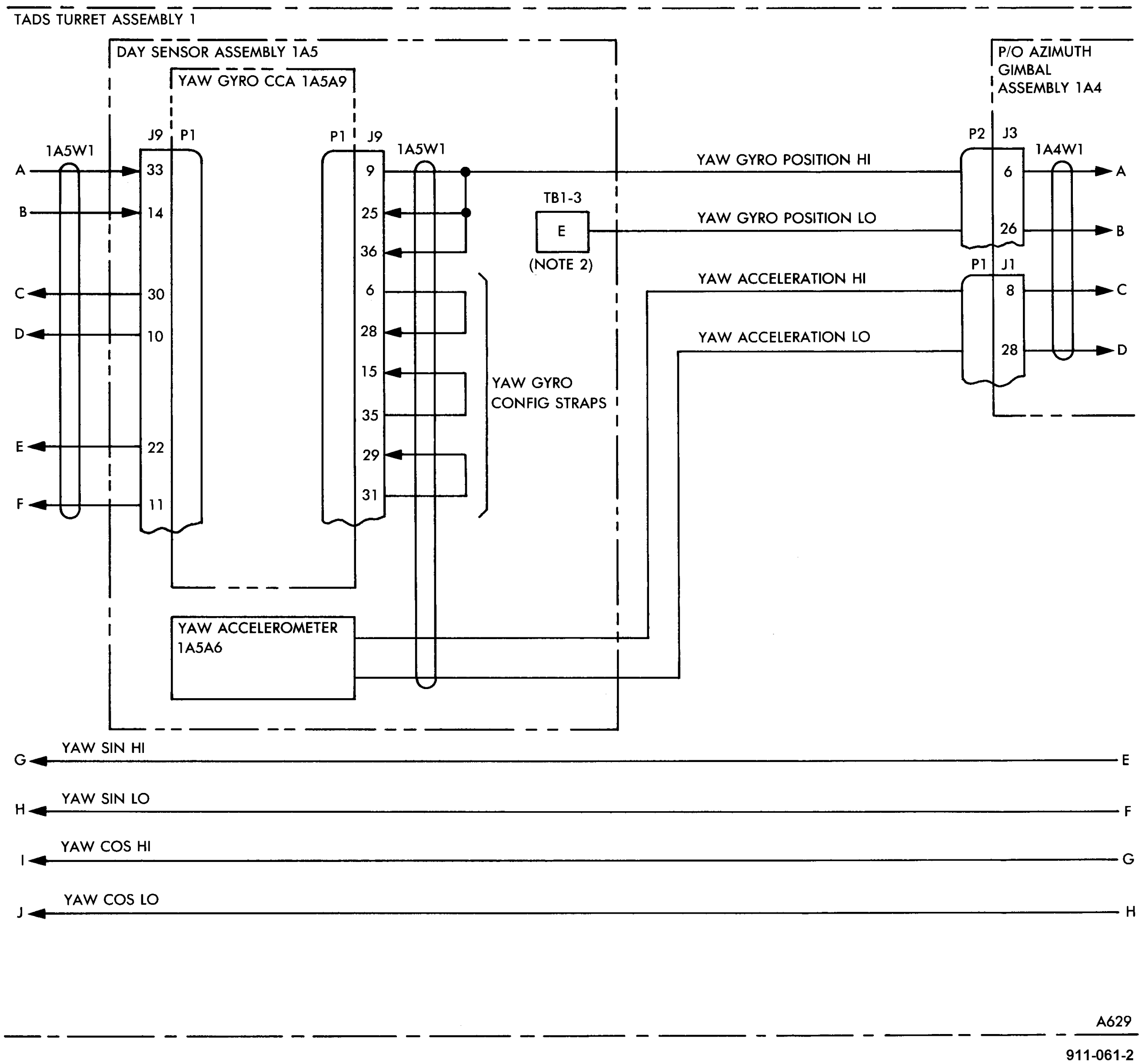


Figure 3-79. Yaw Gyro/Inner Gimbal Servo Loop Wiring Interconnect Diagram (Sheet 2 of 4)

3-44. YAW GYRO/INNER GIMBAL SERVO LOOP WIRING INTERCONNECT DIAGRAM (cont)

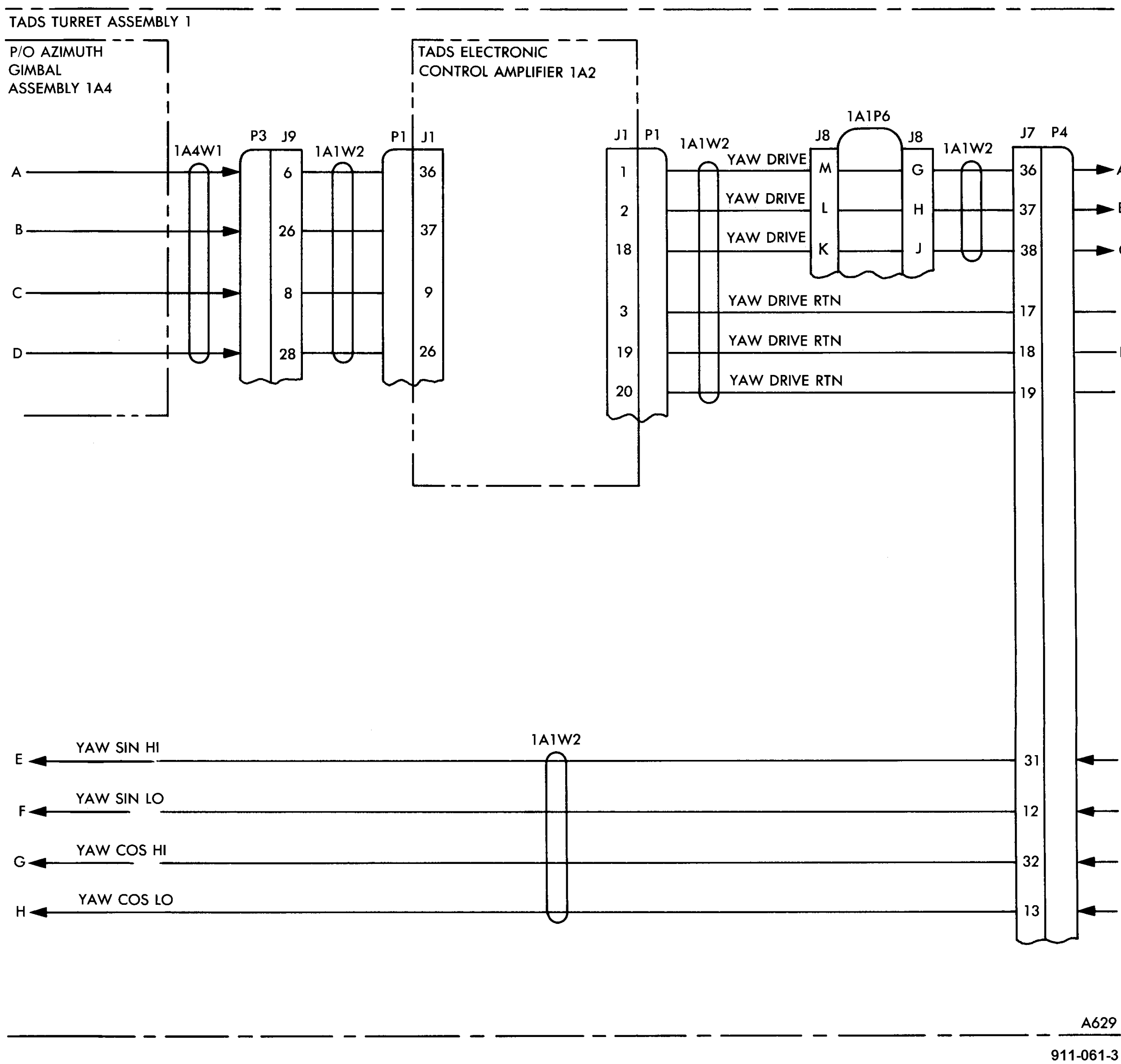
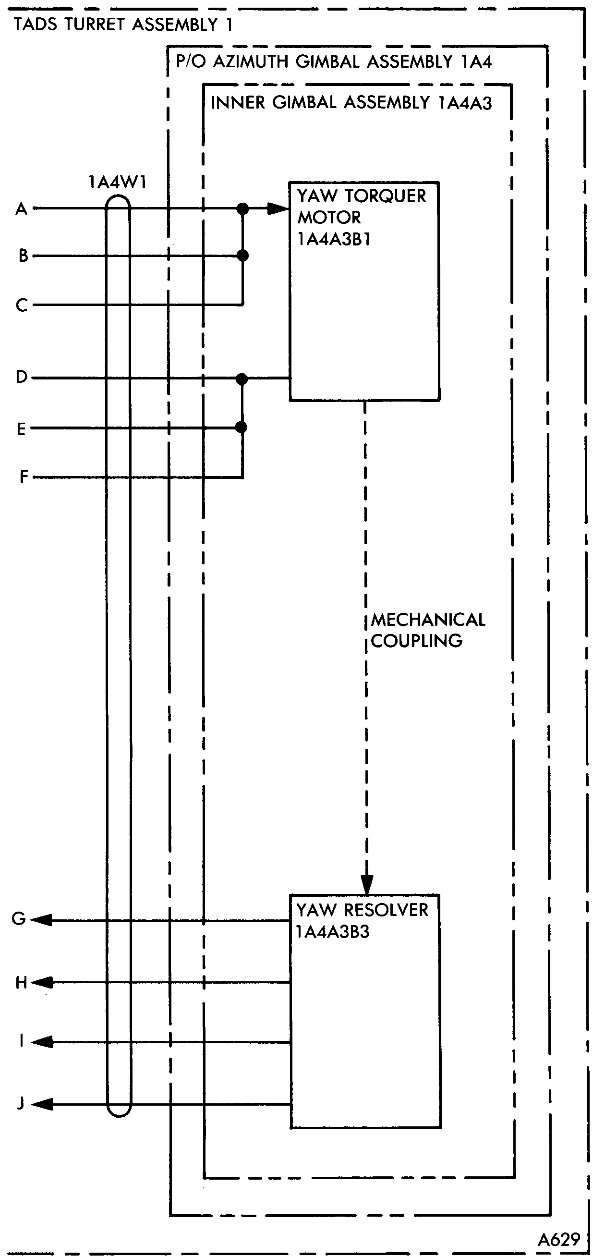


Figure 3-79. Yaw Gyro/Inner Gimbal Servo Loop Wiring Interconnect Diagram (Sheet 3 of 4)

3-44. YAW GYRO/INNER GIMBAL SERVO LOOP WIRING INTERCONNECT DIAGRAM (cont)



NOTES:

1. GS256-F IS COMMON TO YAW, PITCH, AND ROLL GYROS. REFER TO TM 1-1520-238-T-10 FOR WIRING DETAIL.
2. PITCH GYRO POSITION LO IS CONNECTED TO THE ±15VDC RTN. SEE FIGURE 3-80 FOR CONTINUATION.

911-061-4

Figure 3-79. Yaw Gyro/Inner Gimbal Servo Loop Wiring Interconnect Diagram (Sheet 4 of 4)

3-45. PITCH GYRO/INNER GIMBAL SERVO LOOP WIRING INTERCONNECT DIAGRAM

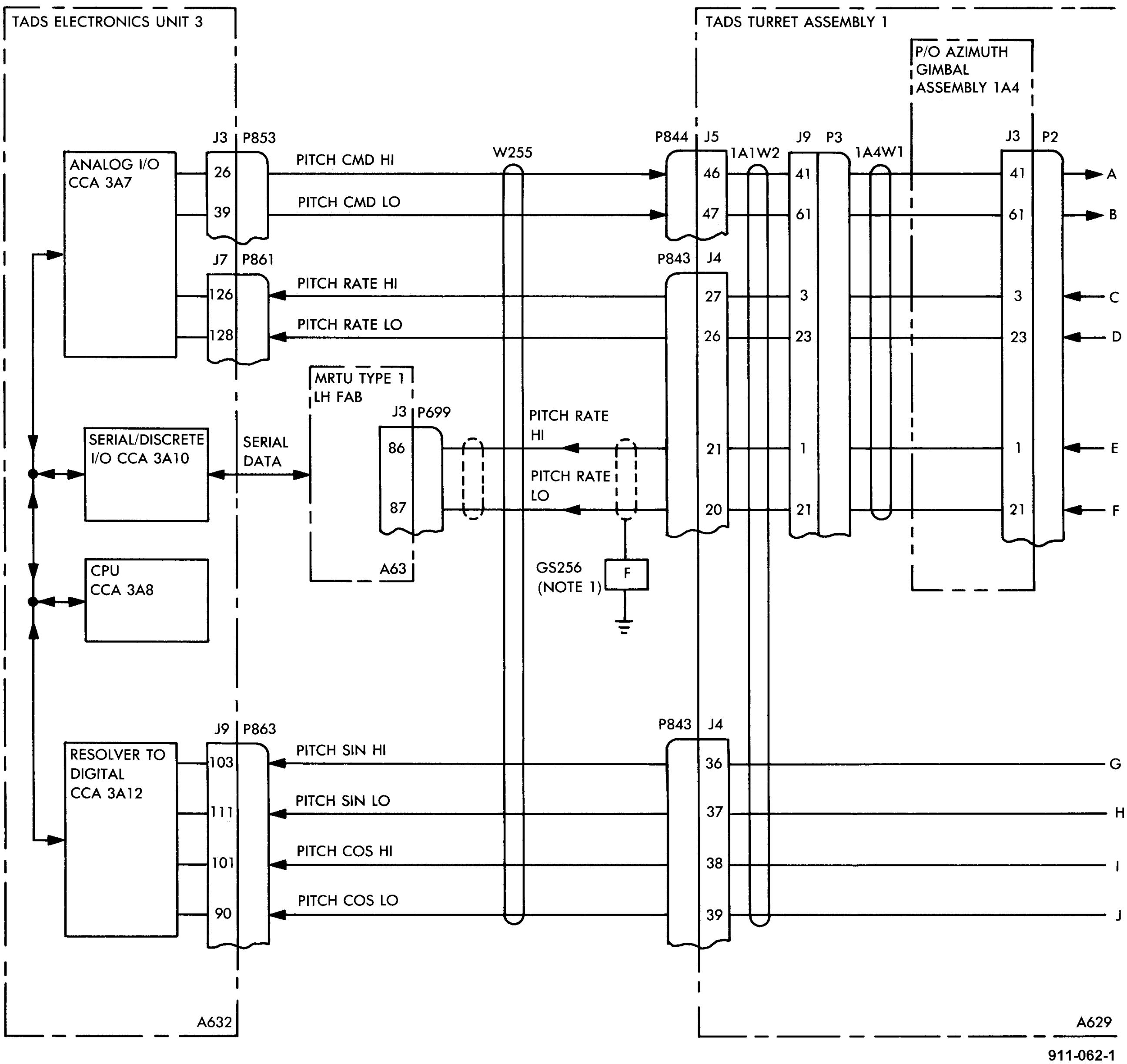
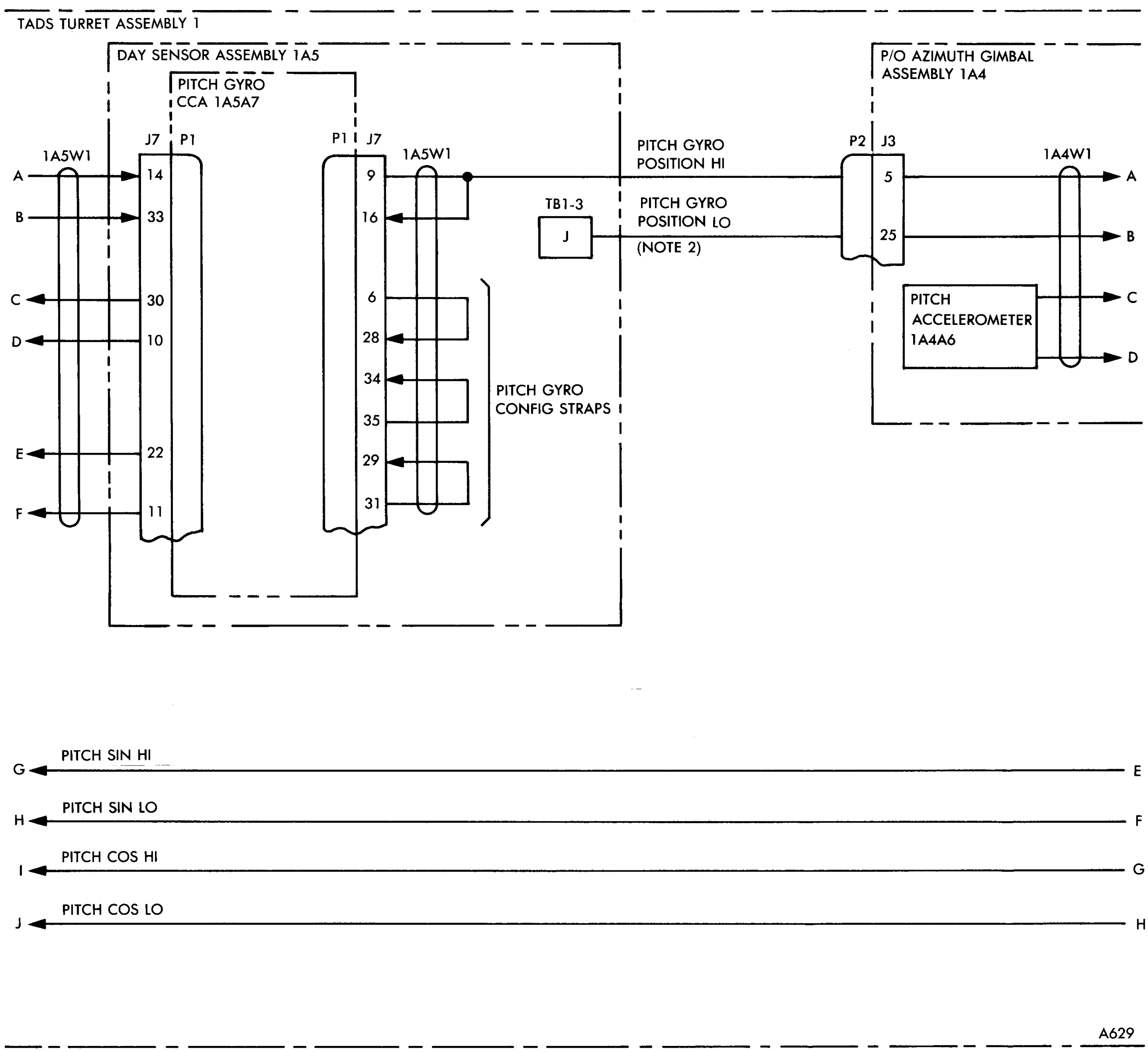


Figure 3-80. Pitch Gyro/Inner Gimbal Servo Loop Wiring Interconnect Diagram (Sheet 1 of 4)

3-45. PITCH GYRO/INNER GIMBAL SERVO LOOP WIRING INTERCONNECT DIAGRAM (cont)



911-062-2

Figure 3-80. Pitch Gyro/Inner Gimbal Servo Loop Wiring Interconnect Diagram (Sheet 2 of 4)

3-45. PITCH GYRO/INNER GIMBAL SERVO LOOP WIRING INTERCONNECT DIAGRAM (cont)

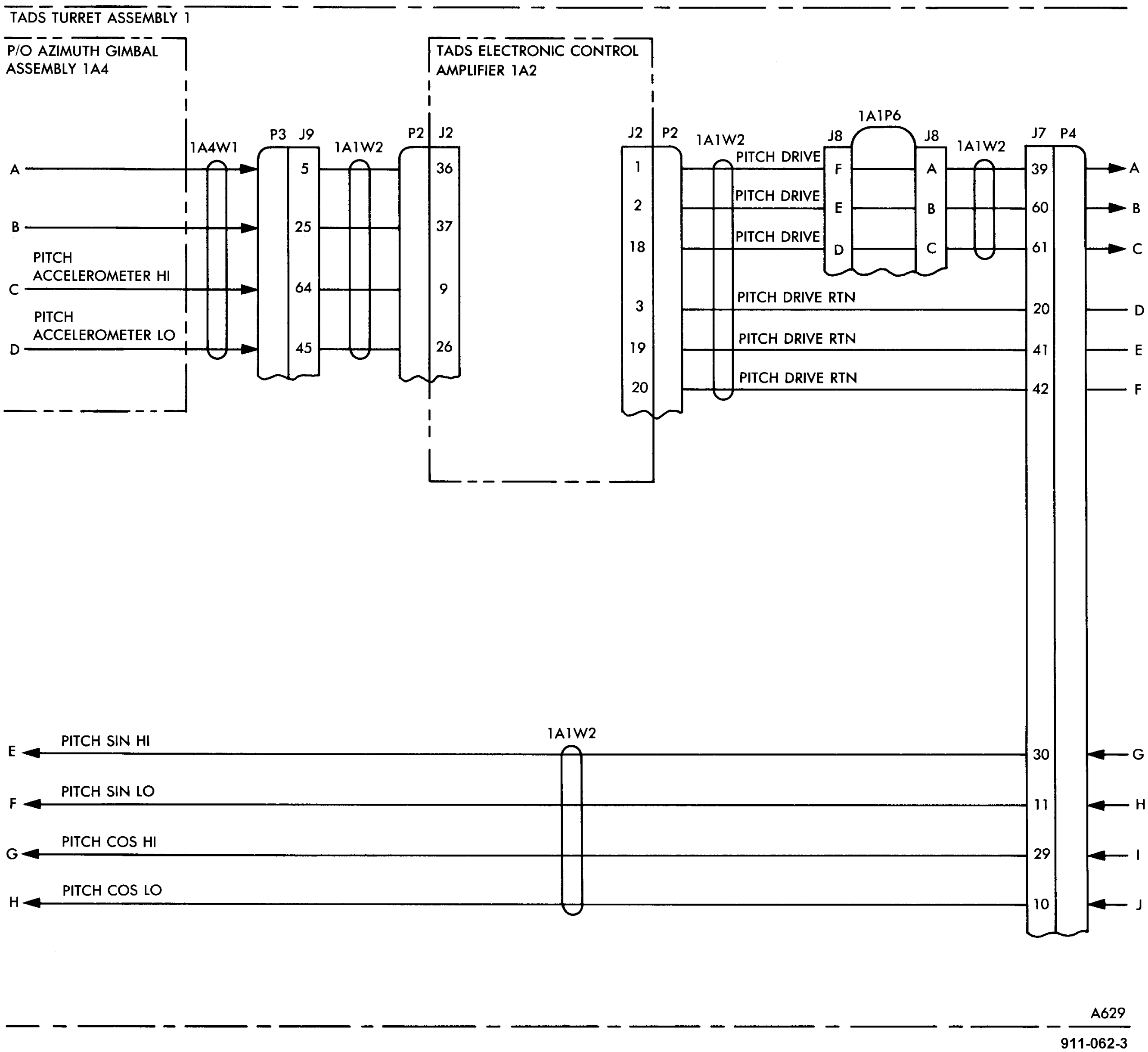
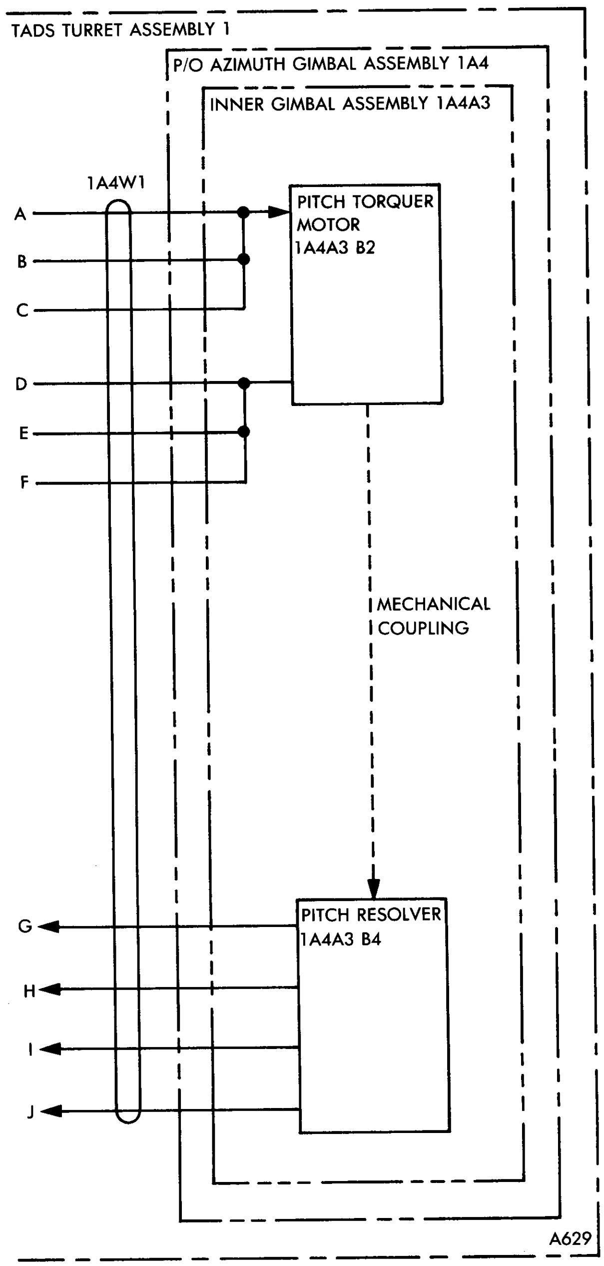


Figure 3-80. Pitch Gyro/Inner Gimbal Servo Loop Wiring Interconnect Diagram (Sheet 3 of 4)

3-45. PITCH GYRO/INNER GIMBAL SERVO LOOP WIRING INTERCONNECT DIAGRAM (cont)



NOTES:
1. GS256-F IS COMMON TO YAW, PITCH, AND ROLL GYROS. REFER TO TM 1-1520-238-T-10 FOR WIRING DETAIL.
2. YAW GYRO POSITION LO IS CONNECTED TO THE ±15VDC RETURN. SEE FIGURE 3-79 FOR WIRING CONTINUATION .

911-062-4

Figure 3-80. Pitch Gyro/Inner Gimbal Servo Loop Wiring Interconnect Diagram (Sheet 4 of 4)

3-46. ROLL GYRO WIRING INTERCONNECT DIAGRAM

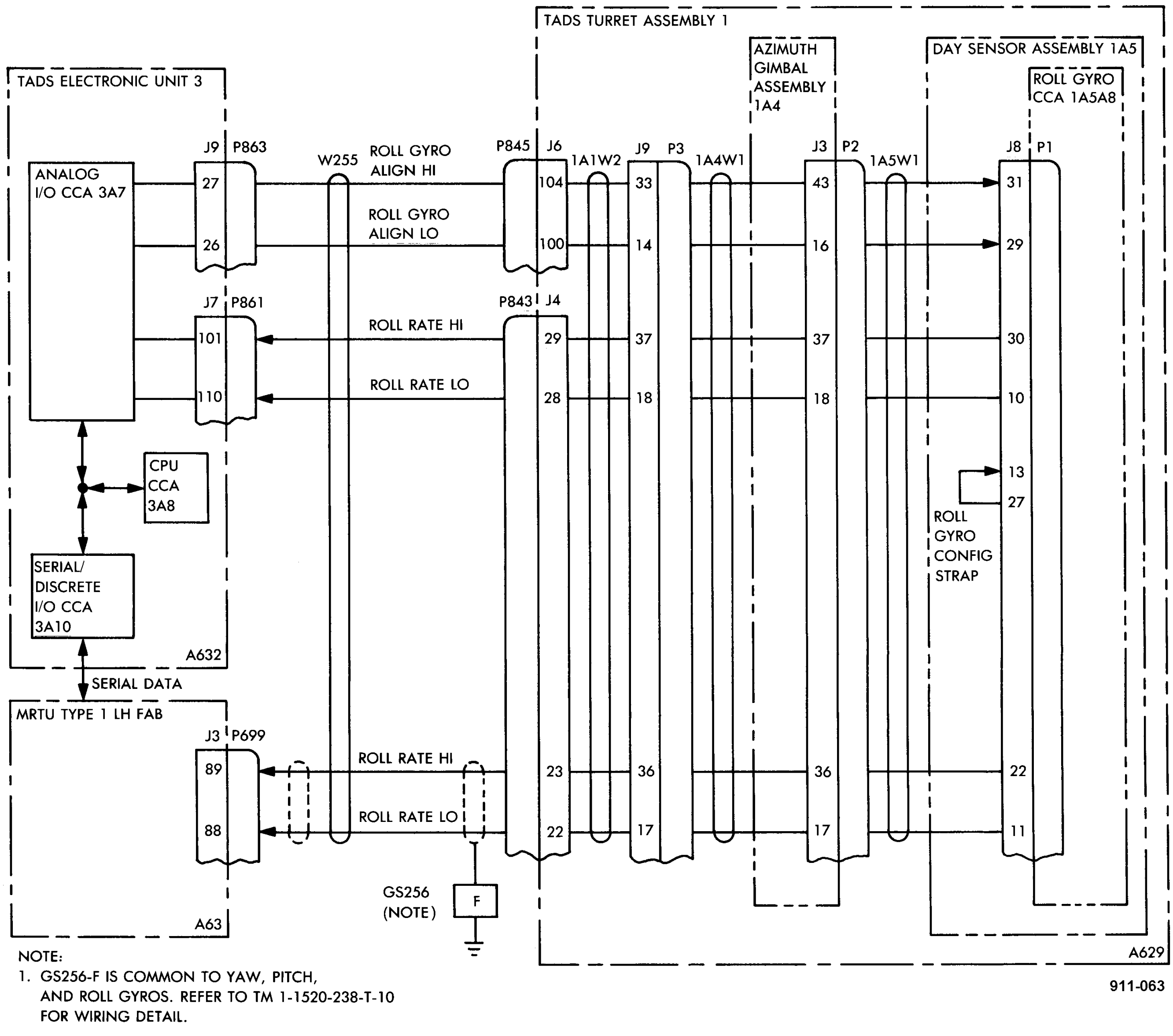


Figure 3-81. Roll Gyro Wiring Interconnect Diagram

3-47. OUTER GIMBAL AZIMUTH DRIVE SERVO LOOP WIRING INTERCONNECT DIAGRAM

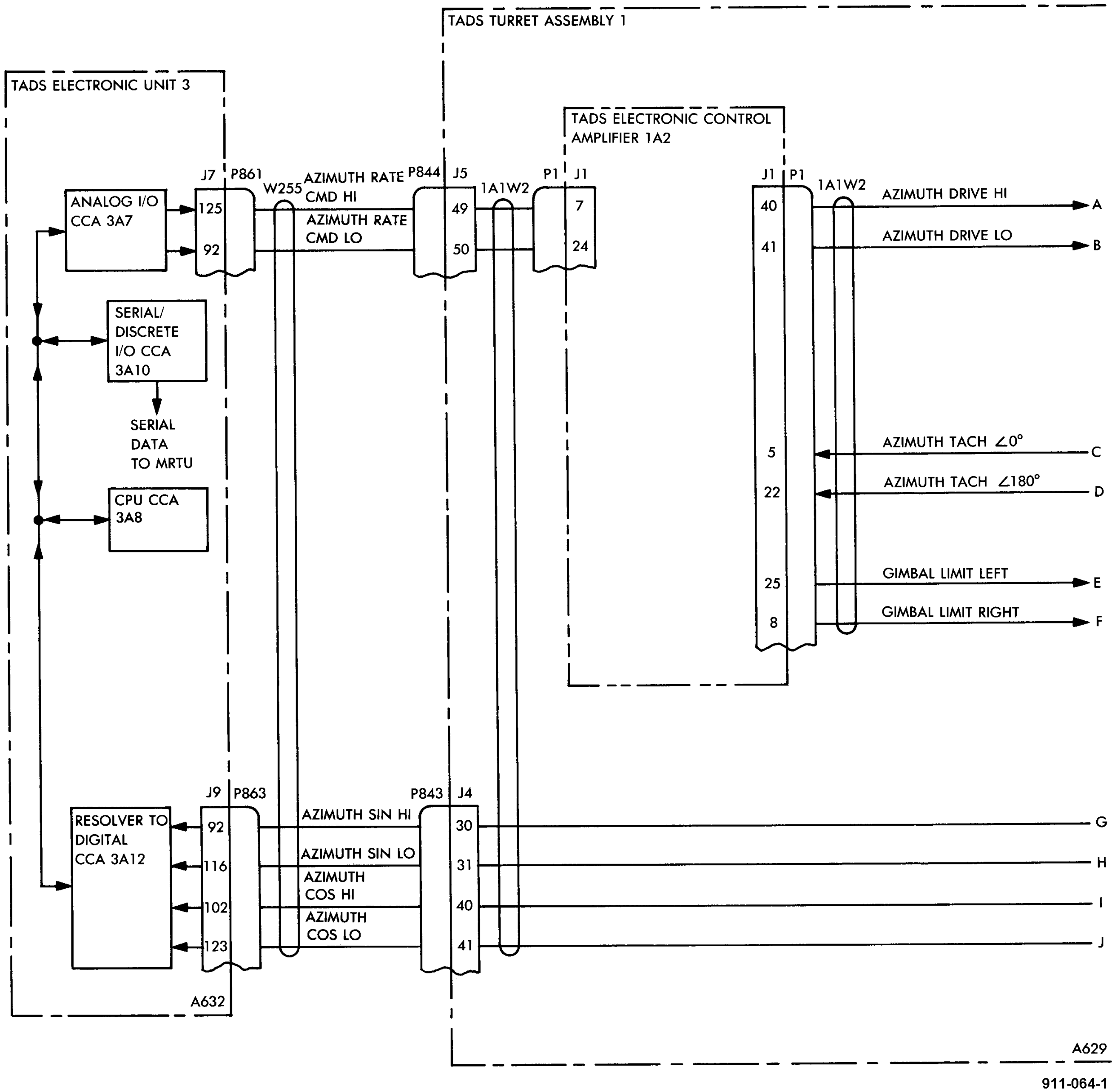


Figure 3-82. Outer Gimbal Azimuth Drive Servo Loop Wiring Interconnect Diagram (Sheet 1 of 3)

3-47. OUTER GIMBAL AZIMUTH DRIVE SERVO LOOP WIRING INTERCONNECT DIAGRAM (cont)

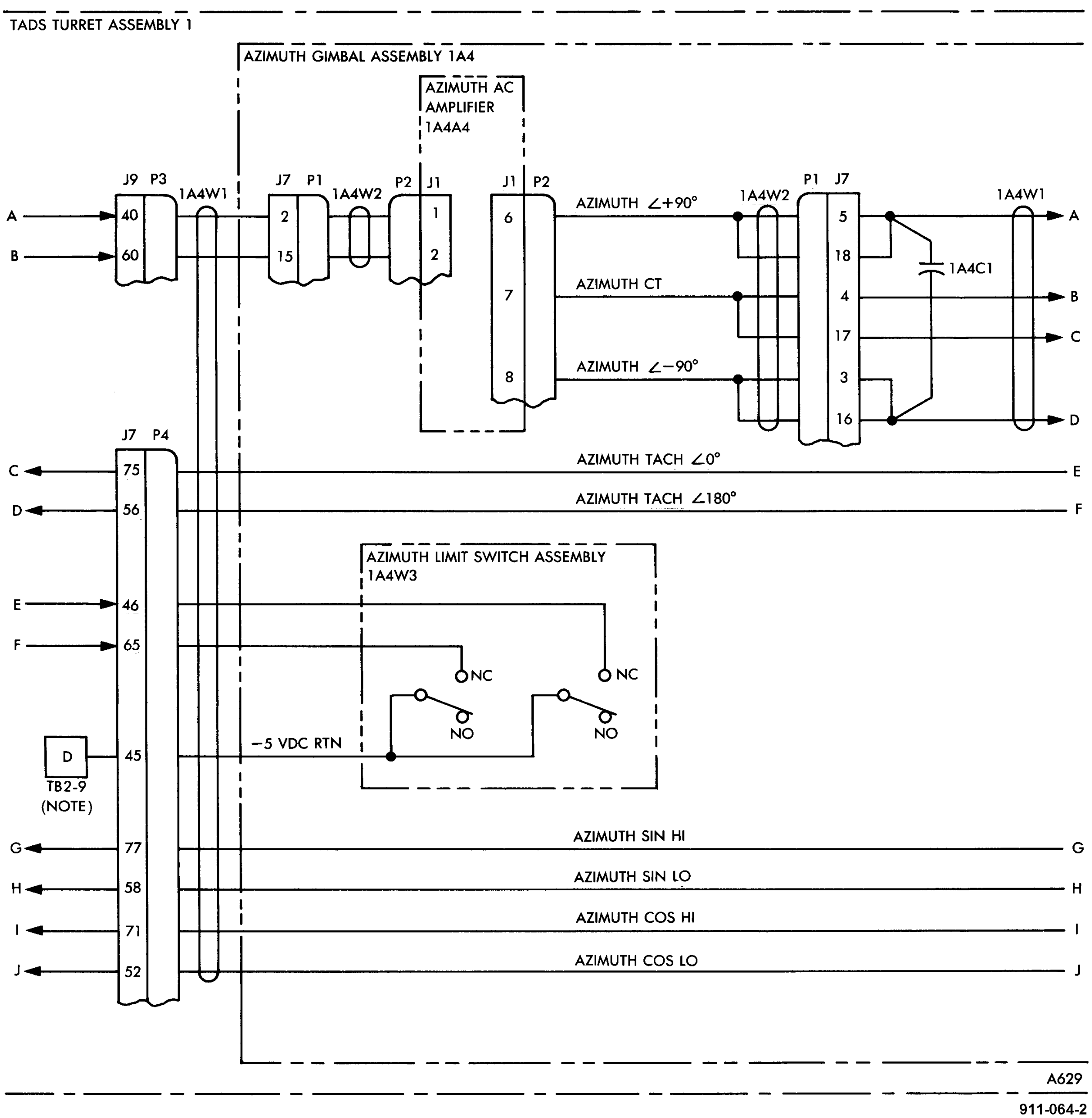
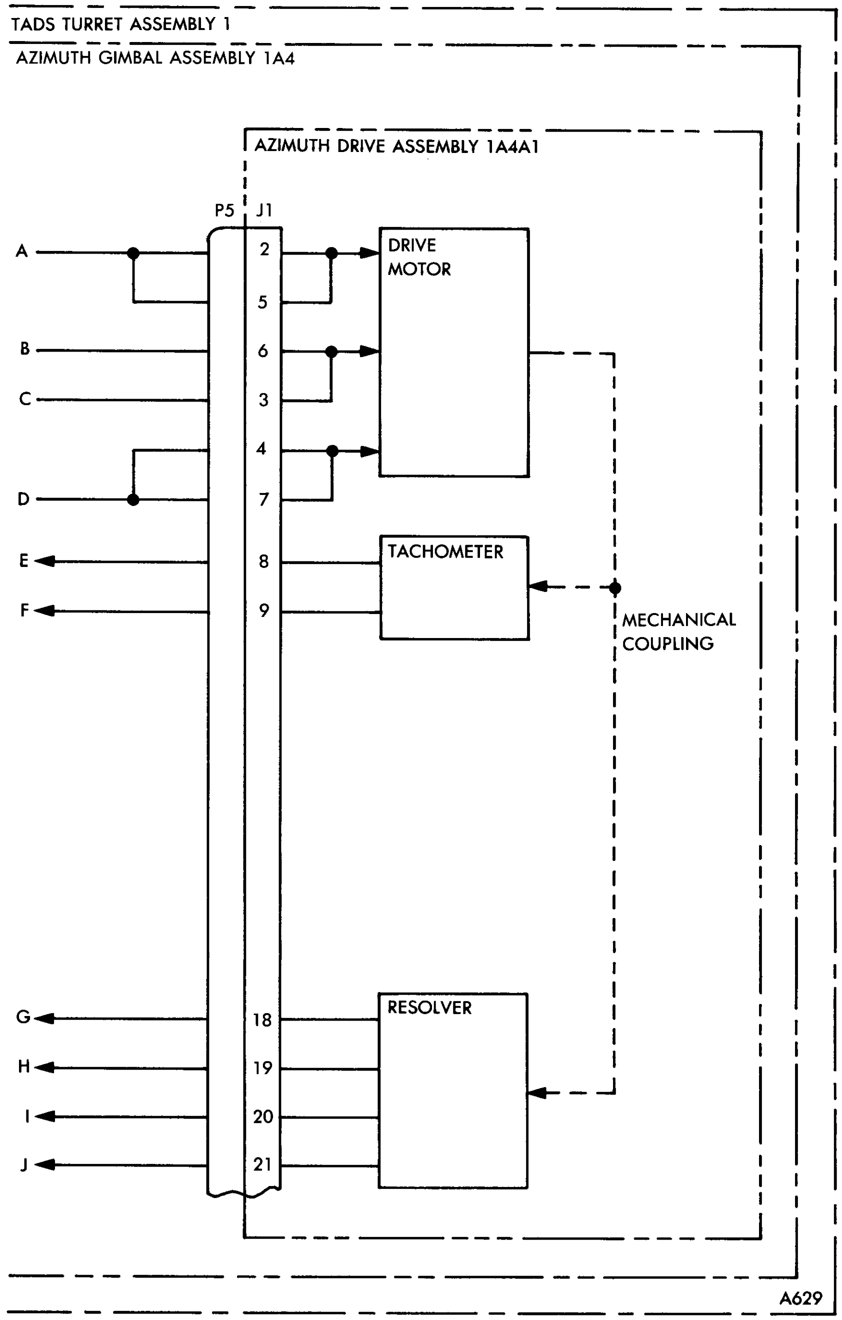


Figure 3-82. Outer Gimbal Azimuth Drive Servo Loop Wiring Interconnect Diagram (Sheet 2 of 3)

3-47. OUTER GIMBAL AZIMUTH DRIVE SERVO LOOP WIRING INTERCONNECT DIAGRAM (cont)



NOTE:
TB2-9 IS CONNECTED TO -5VDC RETURN. SEE FIGURE 3-48 FOR WIRING CONTINUATION.

911-064-3

Figure 3-82. Outer Gimbal Azimuth Drive Servo Loop Wiring Interconnect Diagram (Sheet 3 of 3)

3-48. OUTER GIMBAL ELEVATION DRIVE SERVO LOOP WIRING INTERCONNECT DIAGRAM

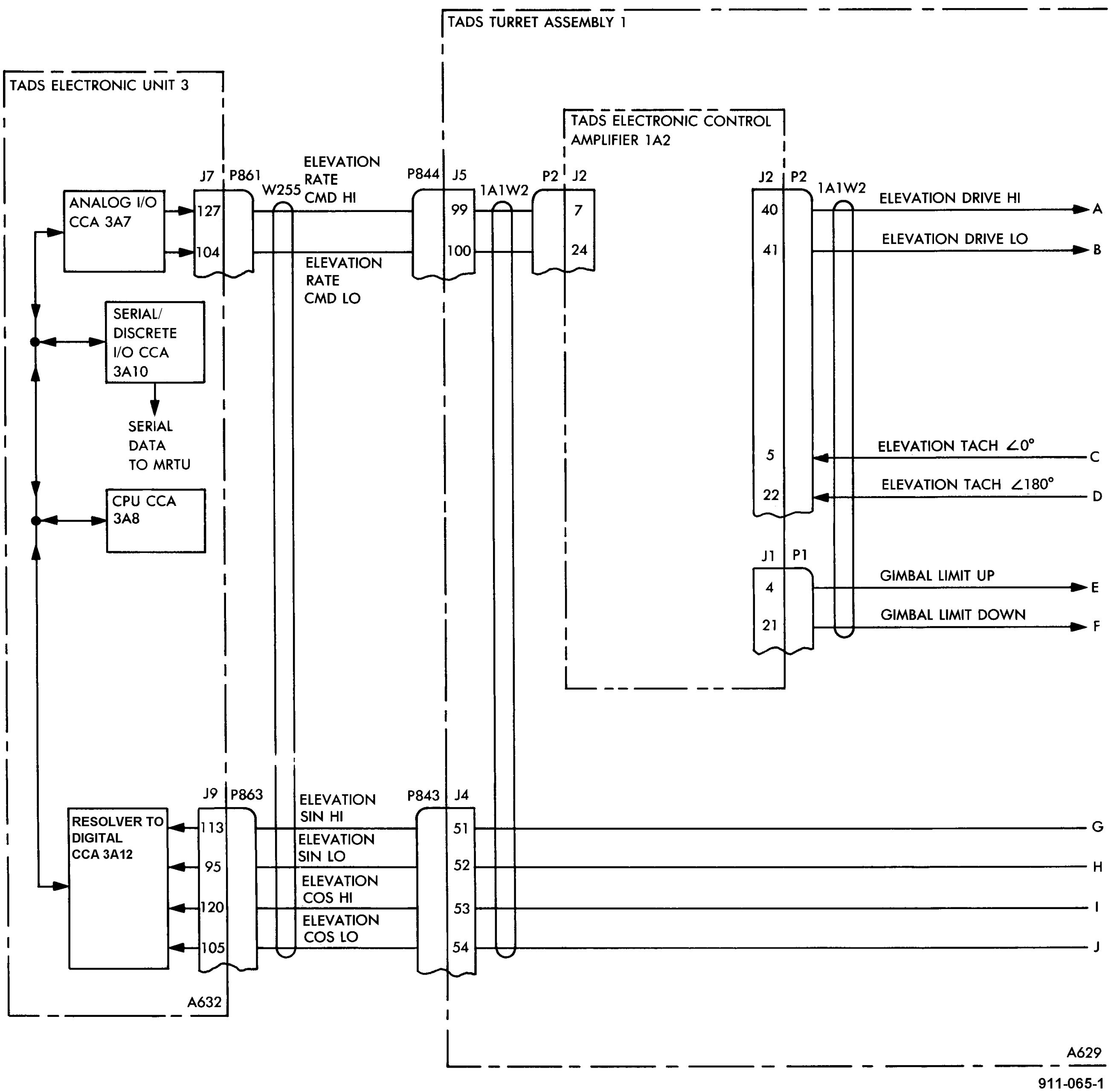


Figure 3-83. Outer Gimbal Elevation Drive Servo Loop Wiring Interconnect Diagram (Sheet 1 of 3)

3-48. OUTER GIMBAL ELEVATION DRIVE SERVO LOOP WIRING INTERCONNECT DIAGRAM (cont)

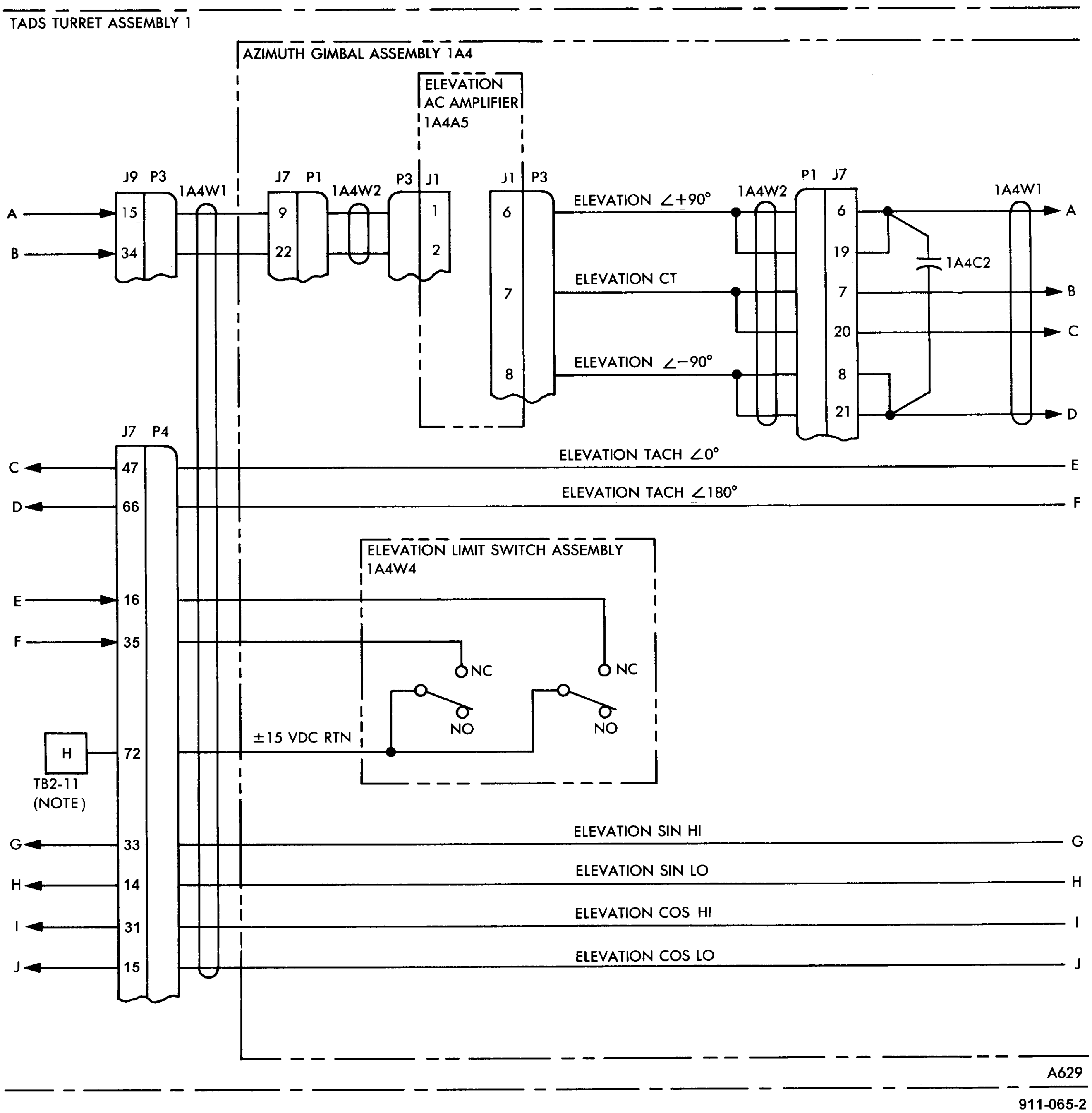


Figure 3-83. Outer Gimbal Elevation Drive Servo Loop Wiring Interconnect Diagram (Sheet 2 of 3)

3-48. OUTER GIMBAL ELEVATION DRIVE SERVO LOOP WIRING INTERCONNECT DIAGRAM (cont)

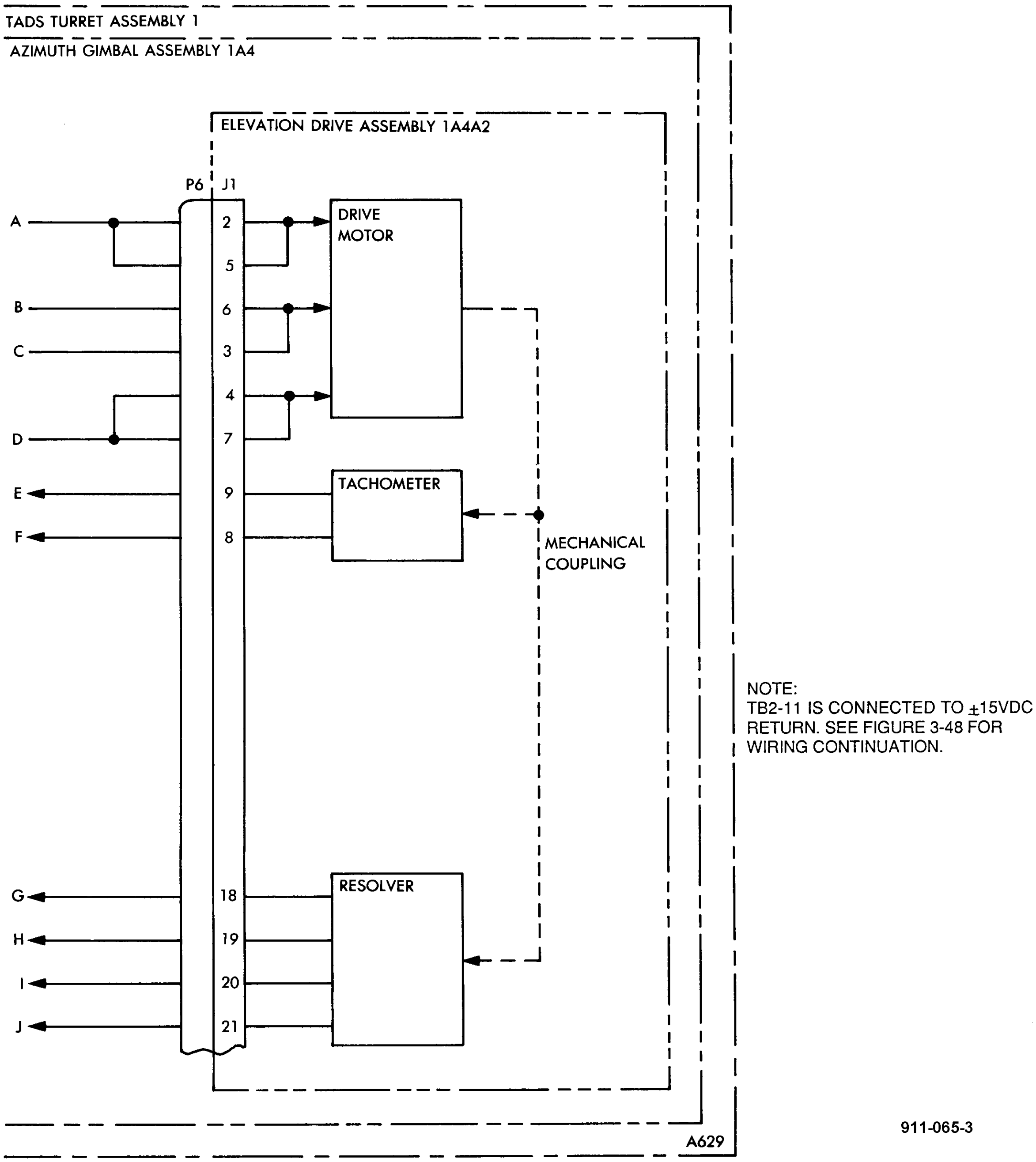


Figure 3-83. Outer Gimbal Elevation Drive Servo Loop Wiring Interconnect Diagram (Sheet 3 of 3)

3-49. TARGET TRACK MODE WIRING INTERCONNECT DIAGRAM

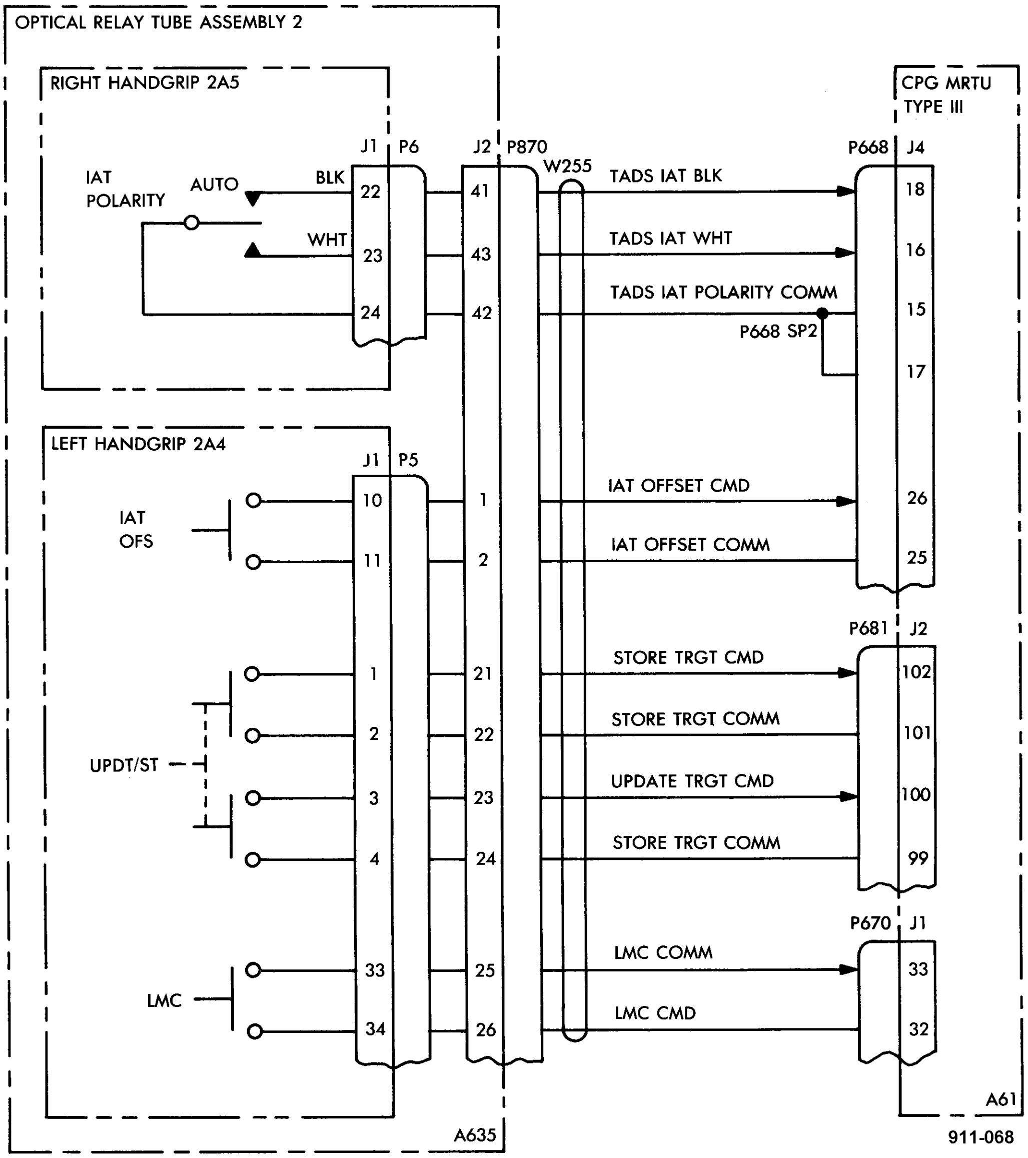


Figure 3-84. Target Track Mode Wiring Interconnect Diagram

3-50. LASER TRACKER/RECEIVER WIRING INTERCONNECT DIAGRAM

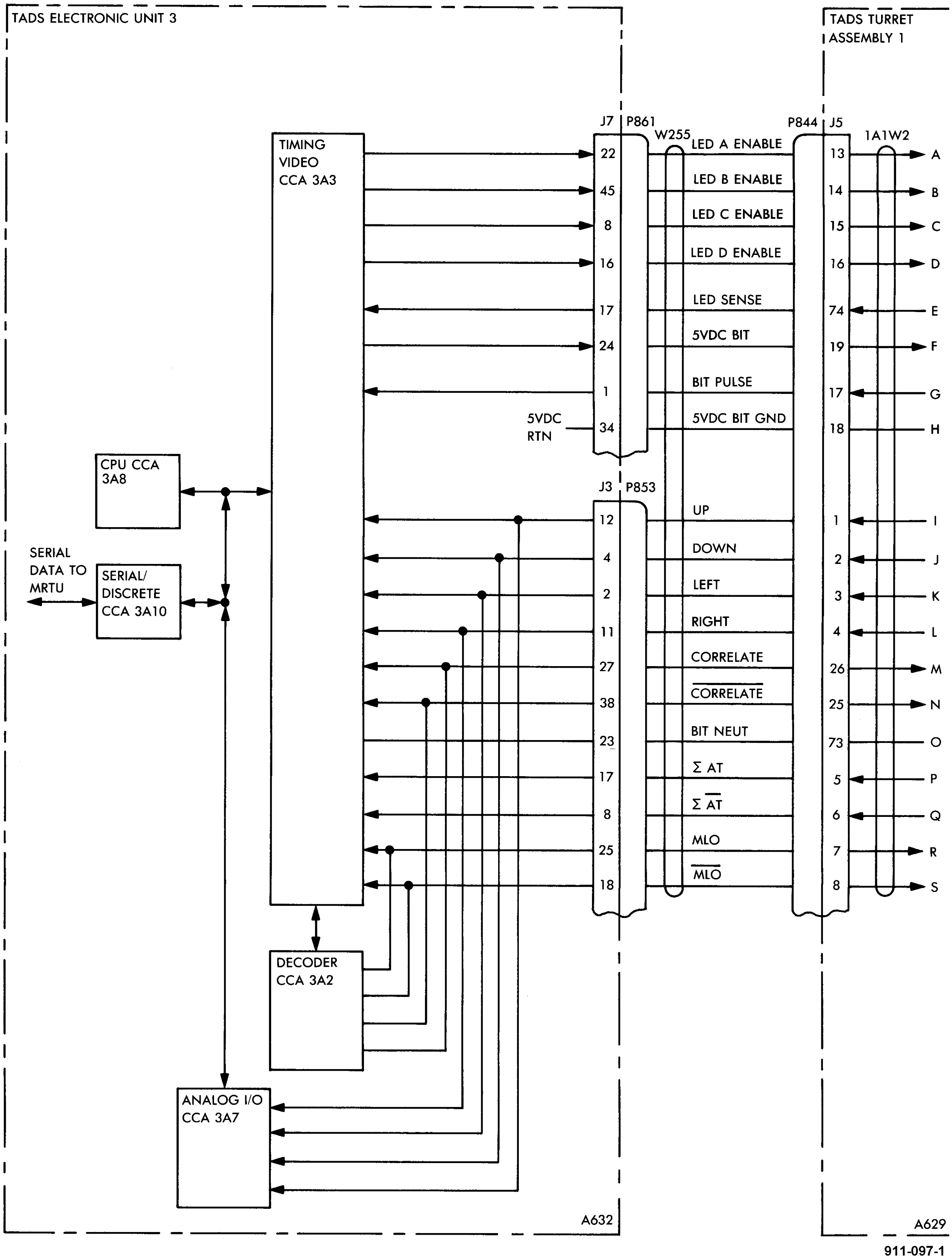


Figure 3-85. Laser Tracker/Receiver Wiring Interconnect Diagram (Sheet 1 of 2)

3-50. LASER TRACKER/RECEIVER WIRING INTERCONNECT DIAGRAM (cont)

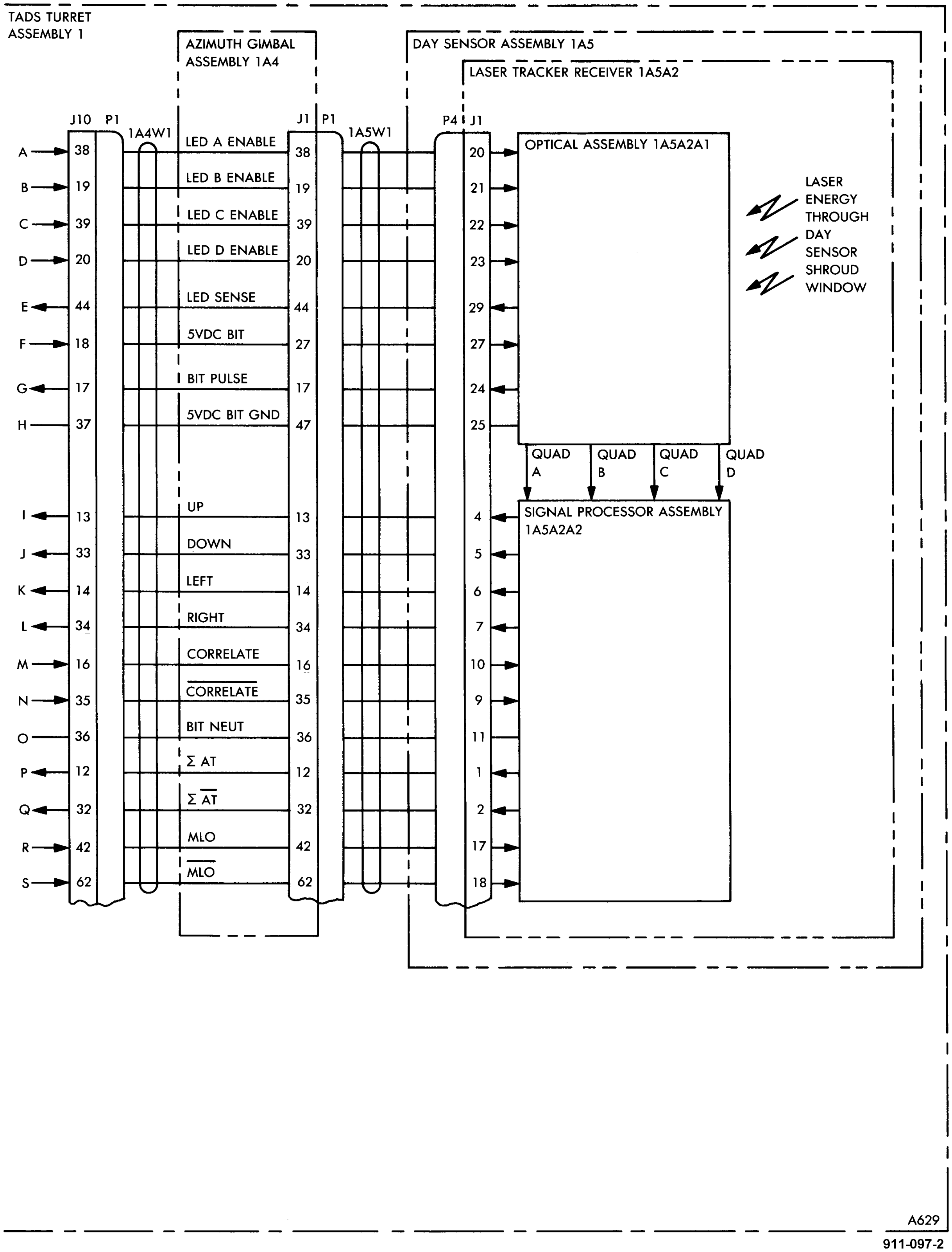


Figure 3-85. Laser Tracker/Receiver Wiring Interconnect Diagram (Sheet 2 of 2)

3-51. LASER TRANSCEIVER UNIT WIRING INTERCONNECT DIAGRAM

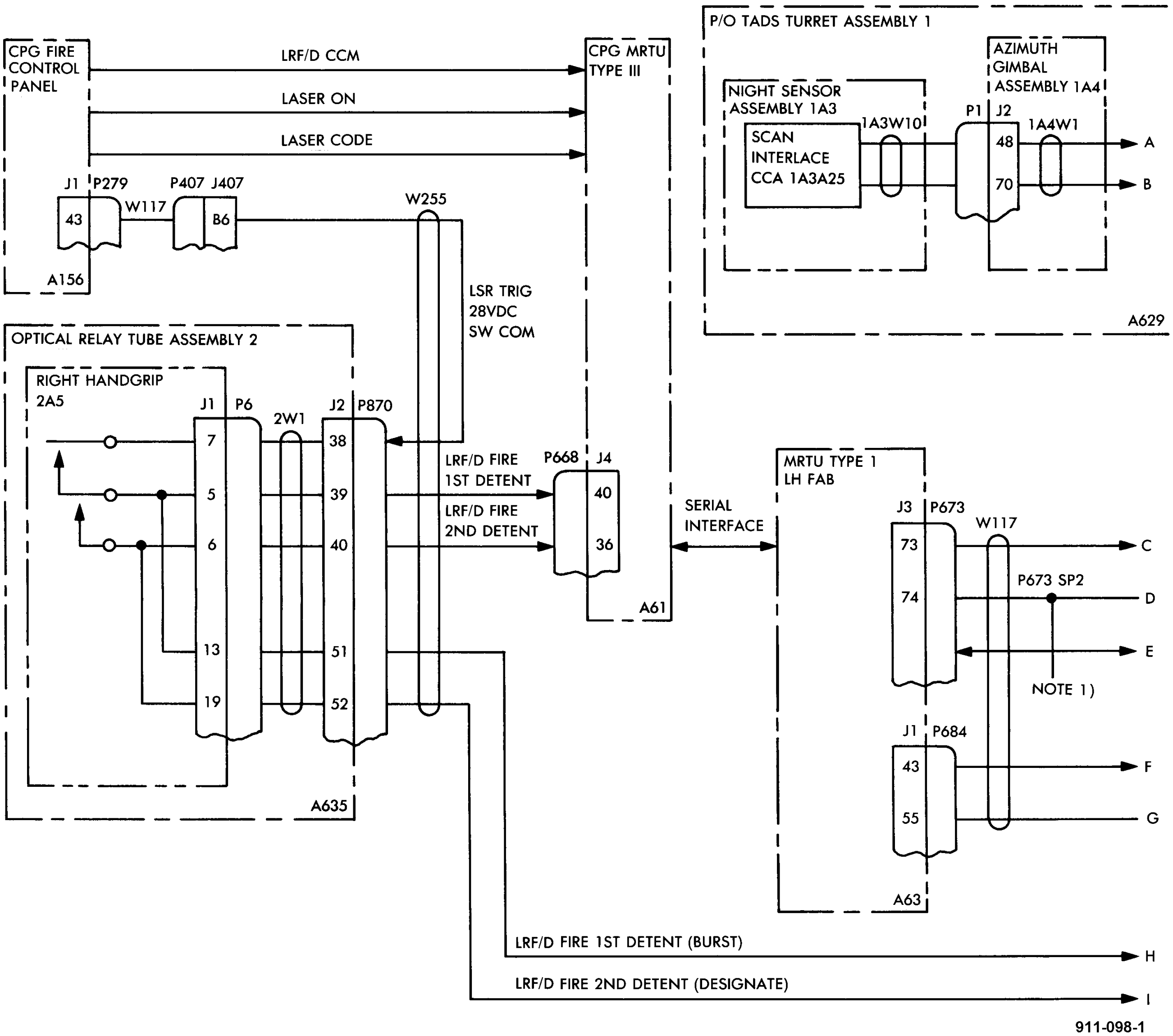


Figure 3-86. Laser Transceiver Unit Wiring Interconnect Diagram (Sheet 1 of 6)

3-51. LASER TRANSCEIVER UNIT WIRING INTERCONNECT DIAGRAM (cont)

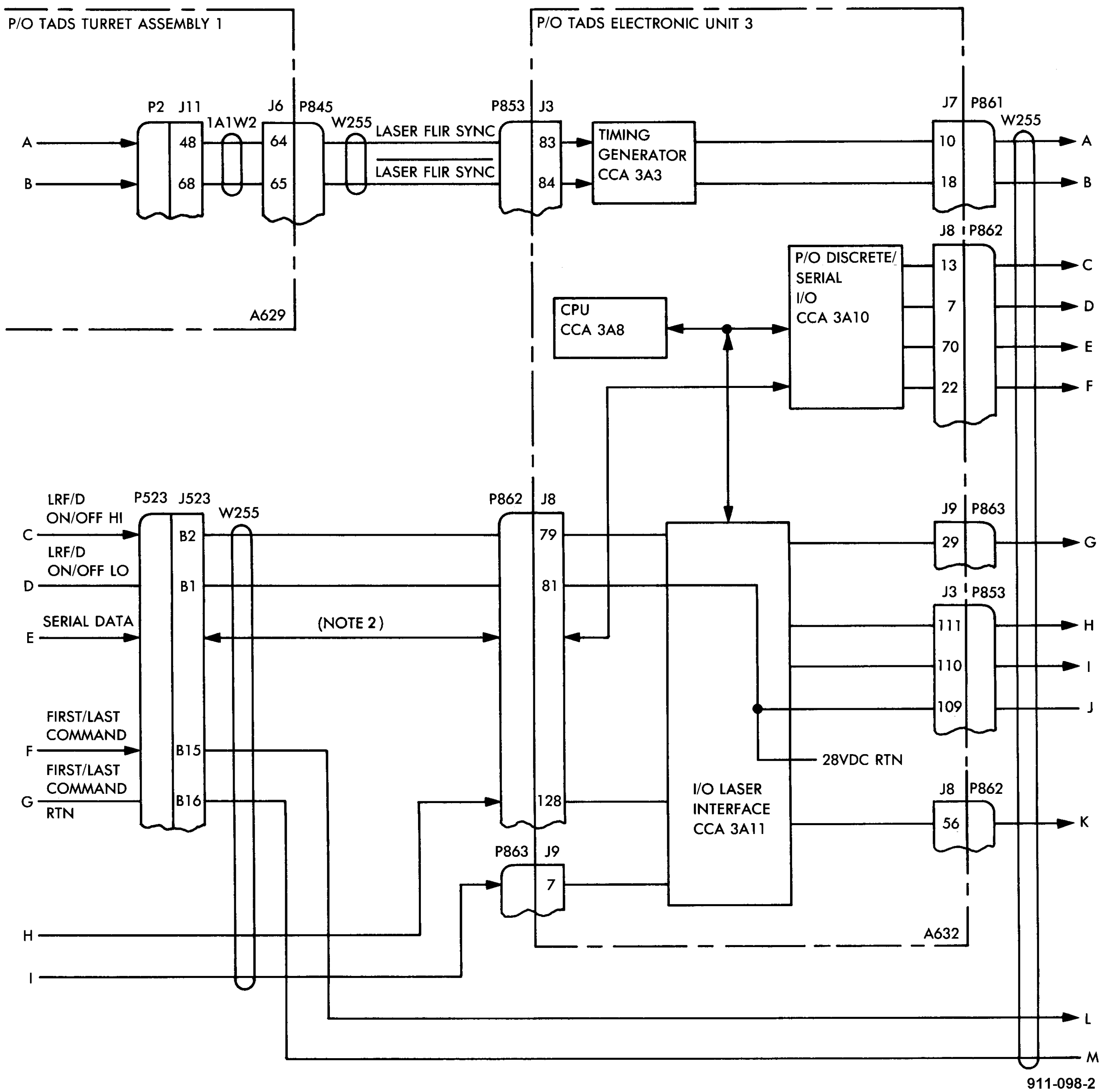


Figure 3-86. Laser Transceiver Unit Wiring Interconnect Diagram (Sheet 2 of 6)

3-51. LASER TRANSCEIVER UNIT WIRING INTERCONNECT DIAGRAM (cont)

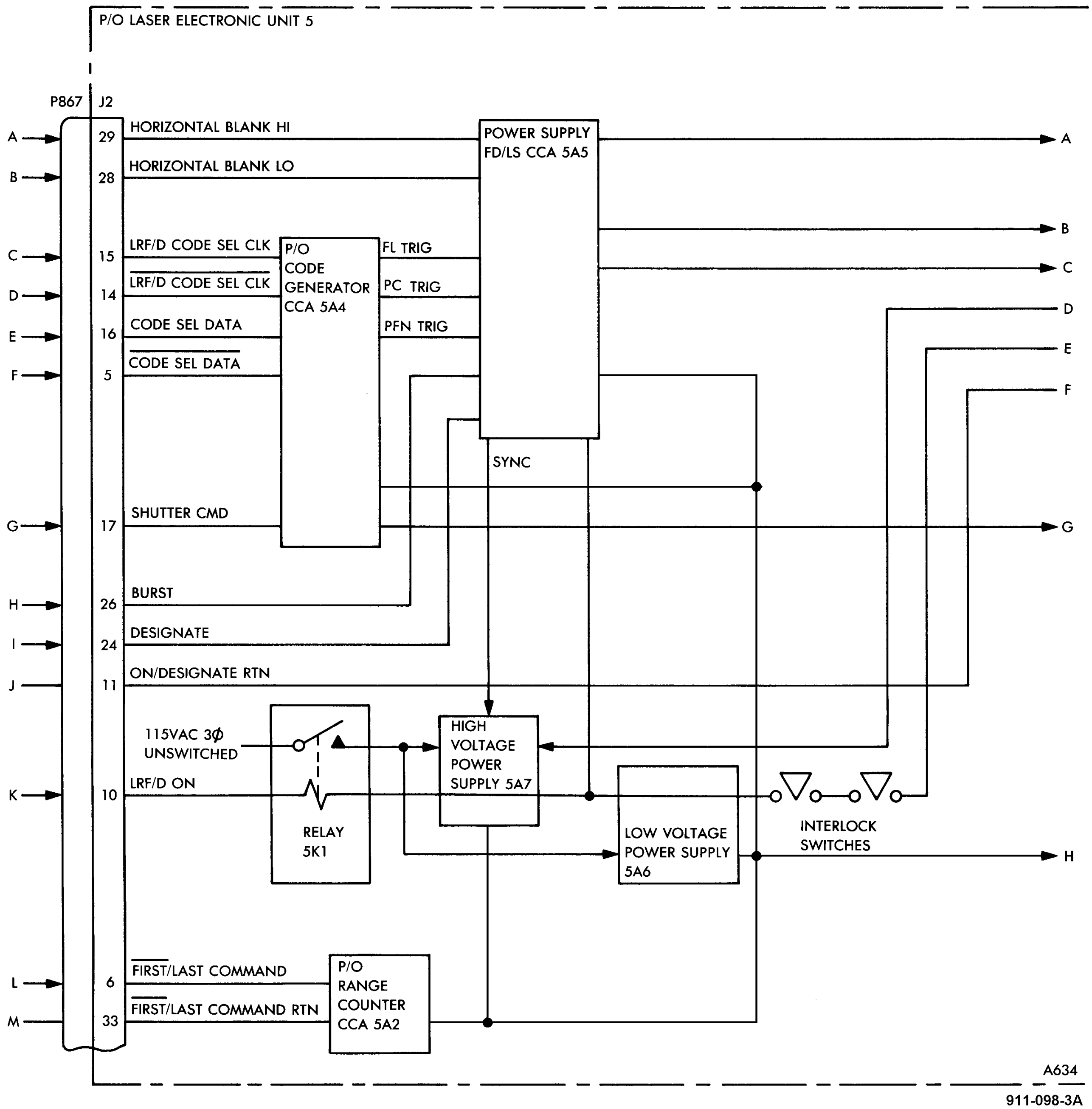


Figure 3-86. Laser Transceiver Unit Wiring Interconnect Diagram (Sheet 3 of 6)

3-51. LASER TRANSCEIVER UNIT WIRING INTERCONNECT DIAGRAM (cont)

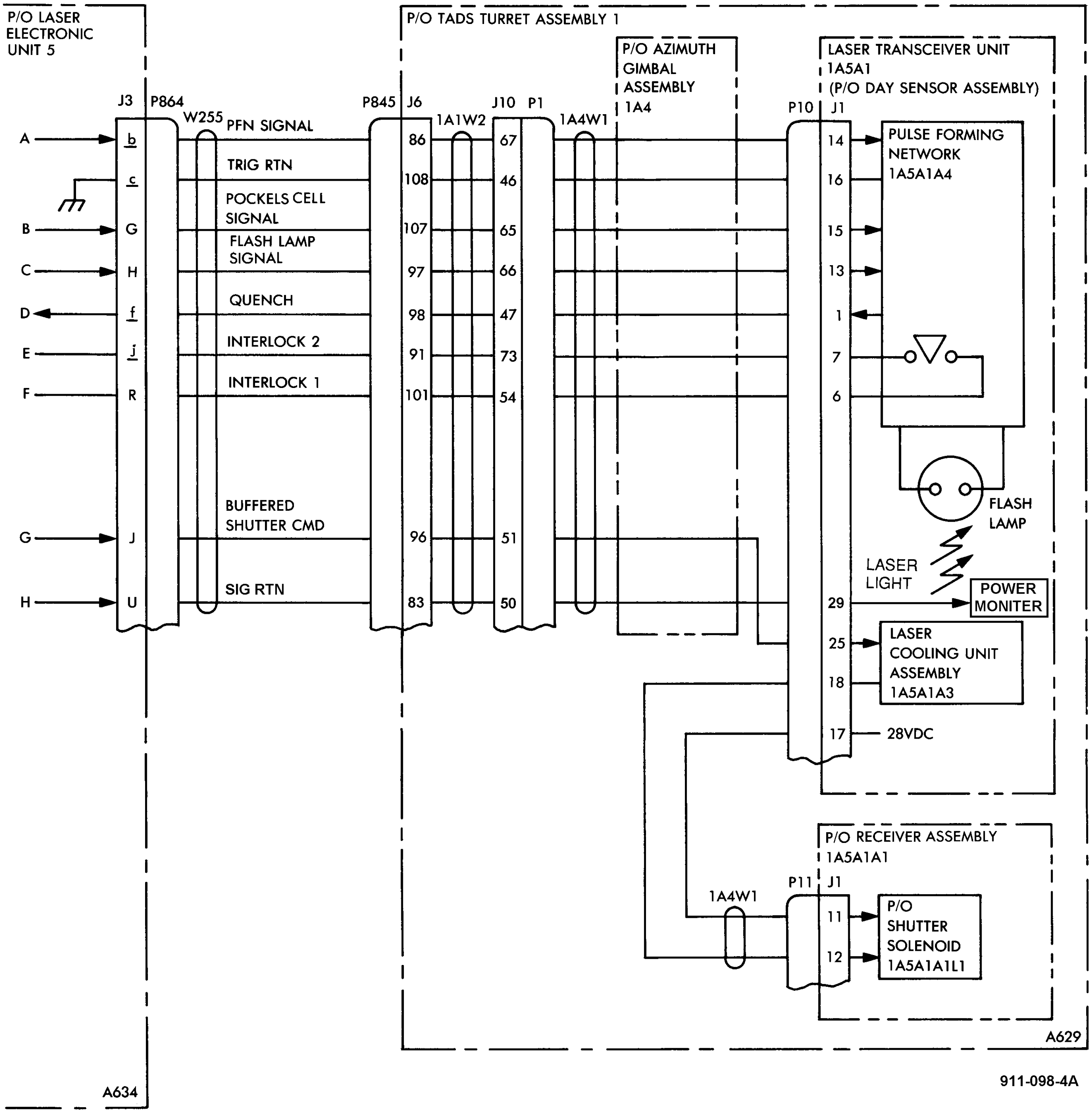


Figure 3-86. Laser Transceiver Unit Wiring Interconnect Diagram (Sheet 4 of 6)

3-51. LASER TRANSCEIVER UNIT WIRING INTERCONNECT DIAGRAM (cont)

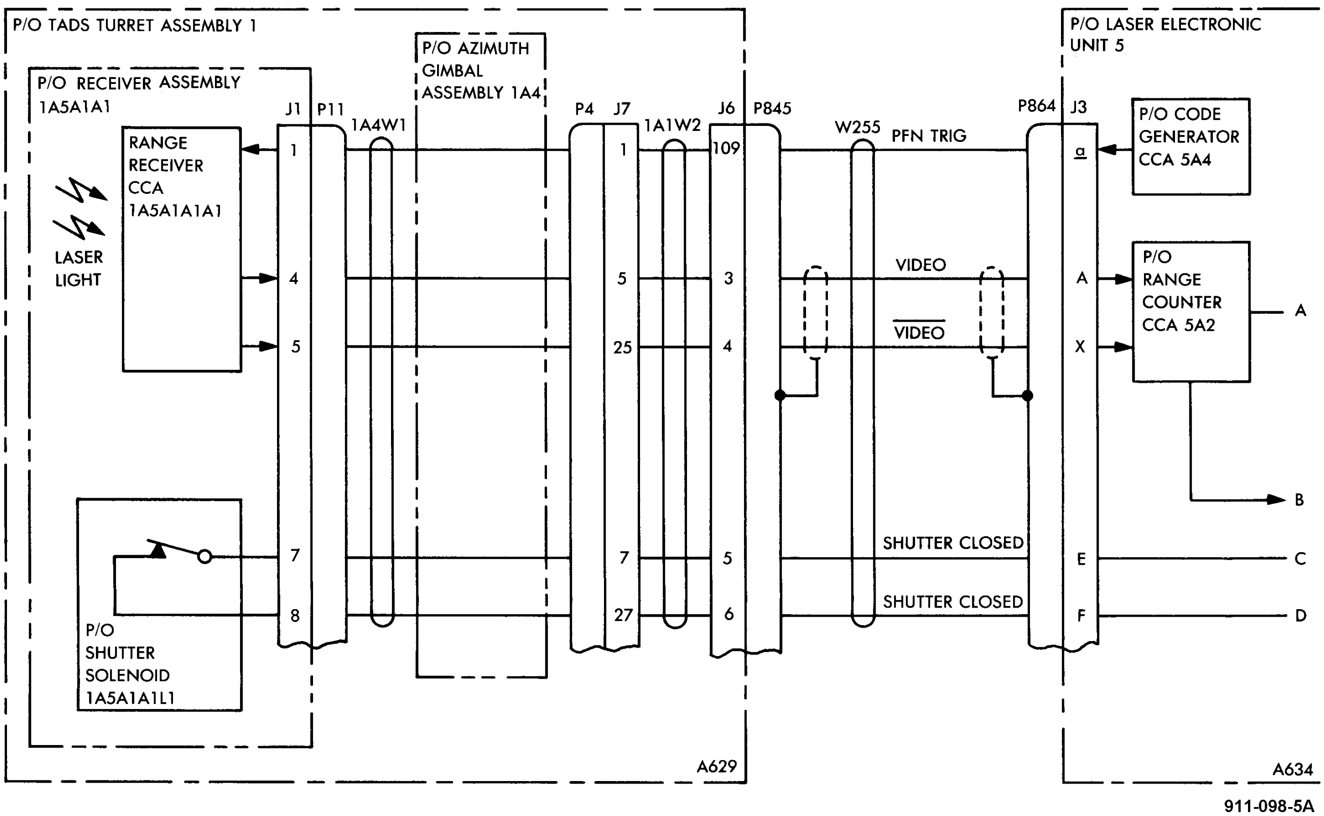


Figure 3-86. Laser Transceiver Unit Wiring Interconnect Diagram (Sheet 5 of 6)

3-51. LASER TRANSCEIVER UNIT WIRING INTERCONNECT DIAGRAM (cont)

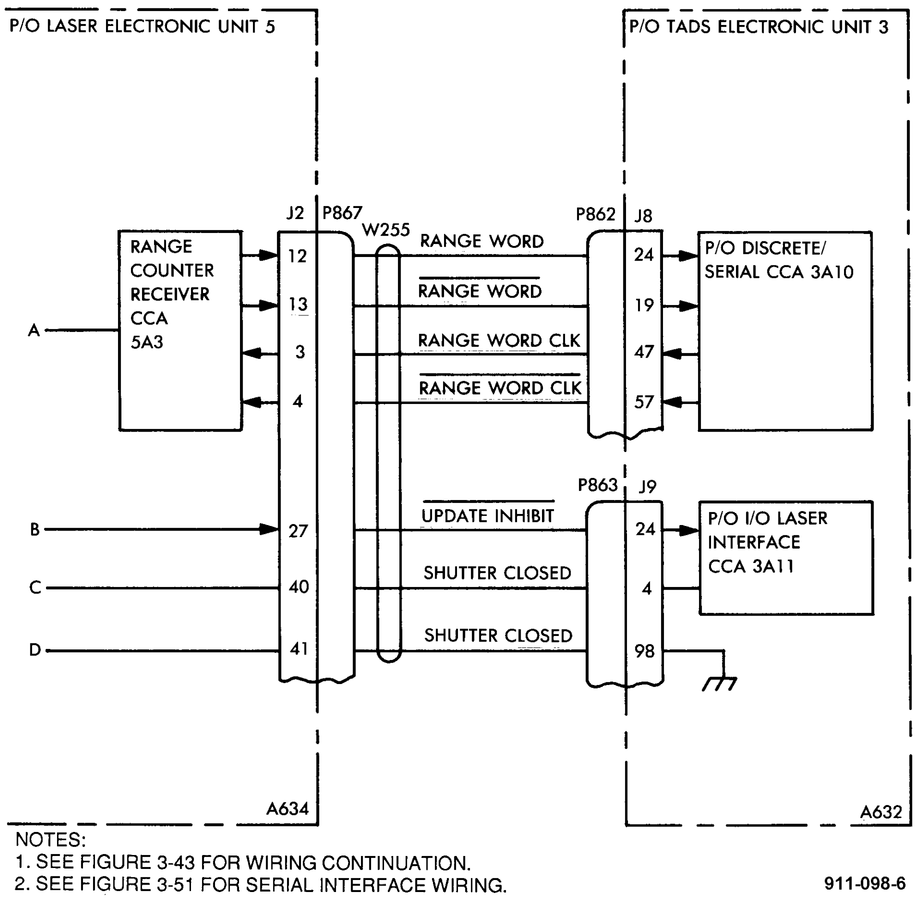


Figure 3-86. Laser Transceiver Unit Wiring Interconnect Diagram (Sheet 6 of 6)

3-52. LASER TRANSCEIVER/ELECTRONIC UNIT BIT WIRING INTERCONNECT DIAGRAM

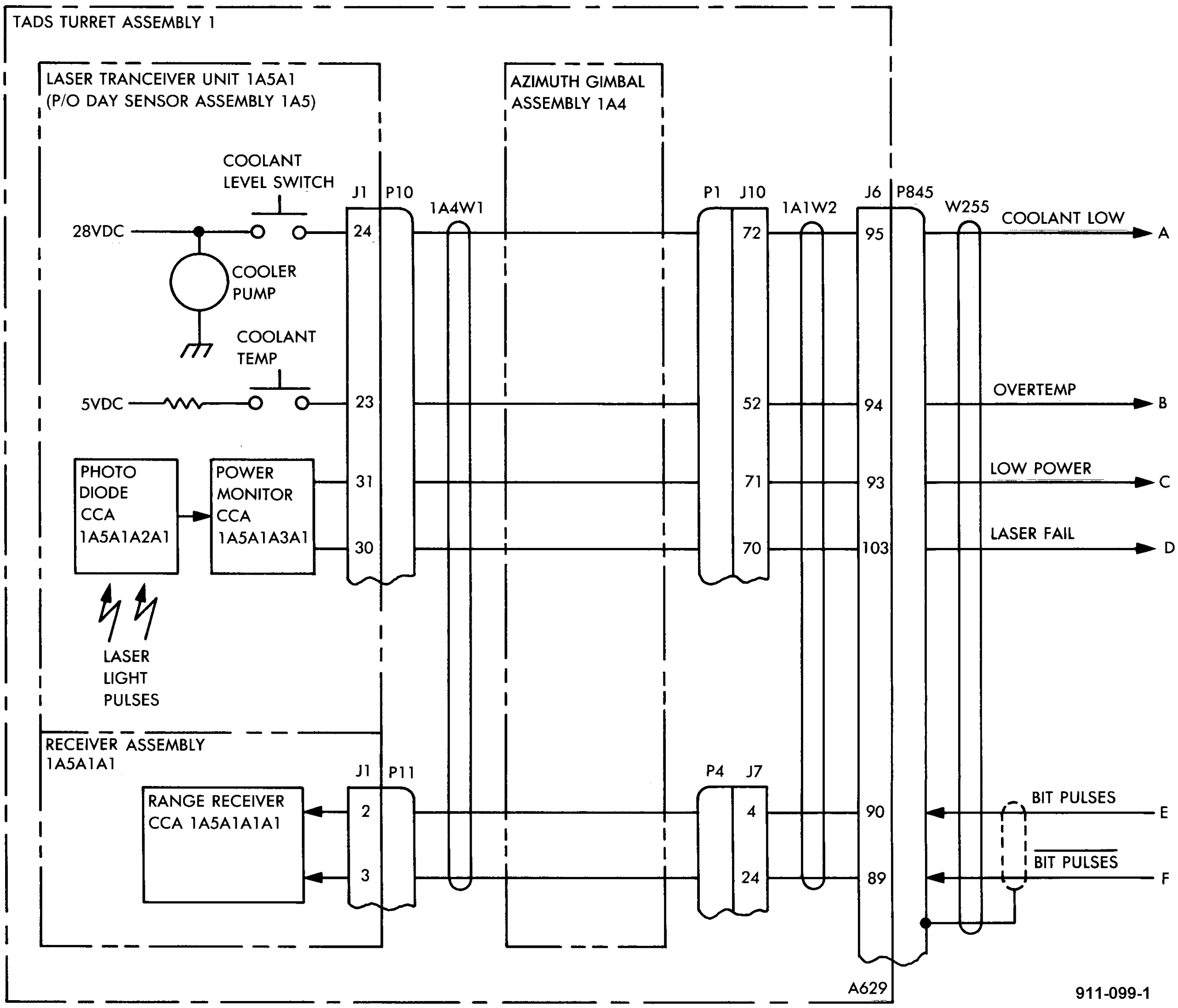


Figure 3-87. Laser Transceiver/Electronic Unit BIT Wiring Interconnect Diagram (Sheet 1 of 2)

3-52. LASER TRANSCEIVER/ELECTRONIC UNIT BIT WIRING INTERCONNECT DIAGRAM (cont)

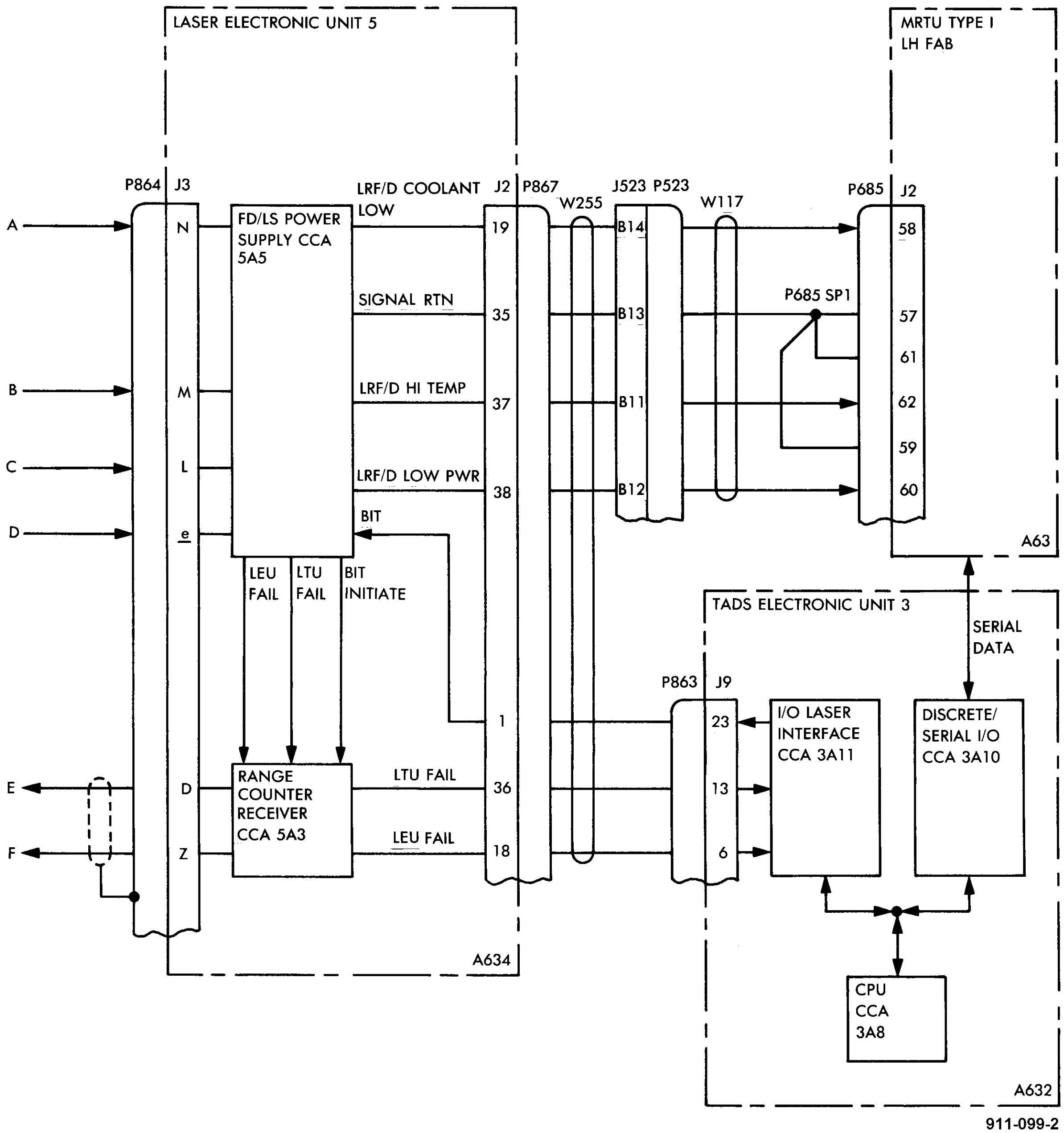


Figure 3-87. Laser Transceiver/Electronic Unit BIT Wiring Interconnect Diagram (Sheet 2 of 2)

3-53. BORESIGHT WIRING INTERCONNECT DIAGRAM

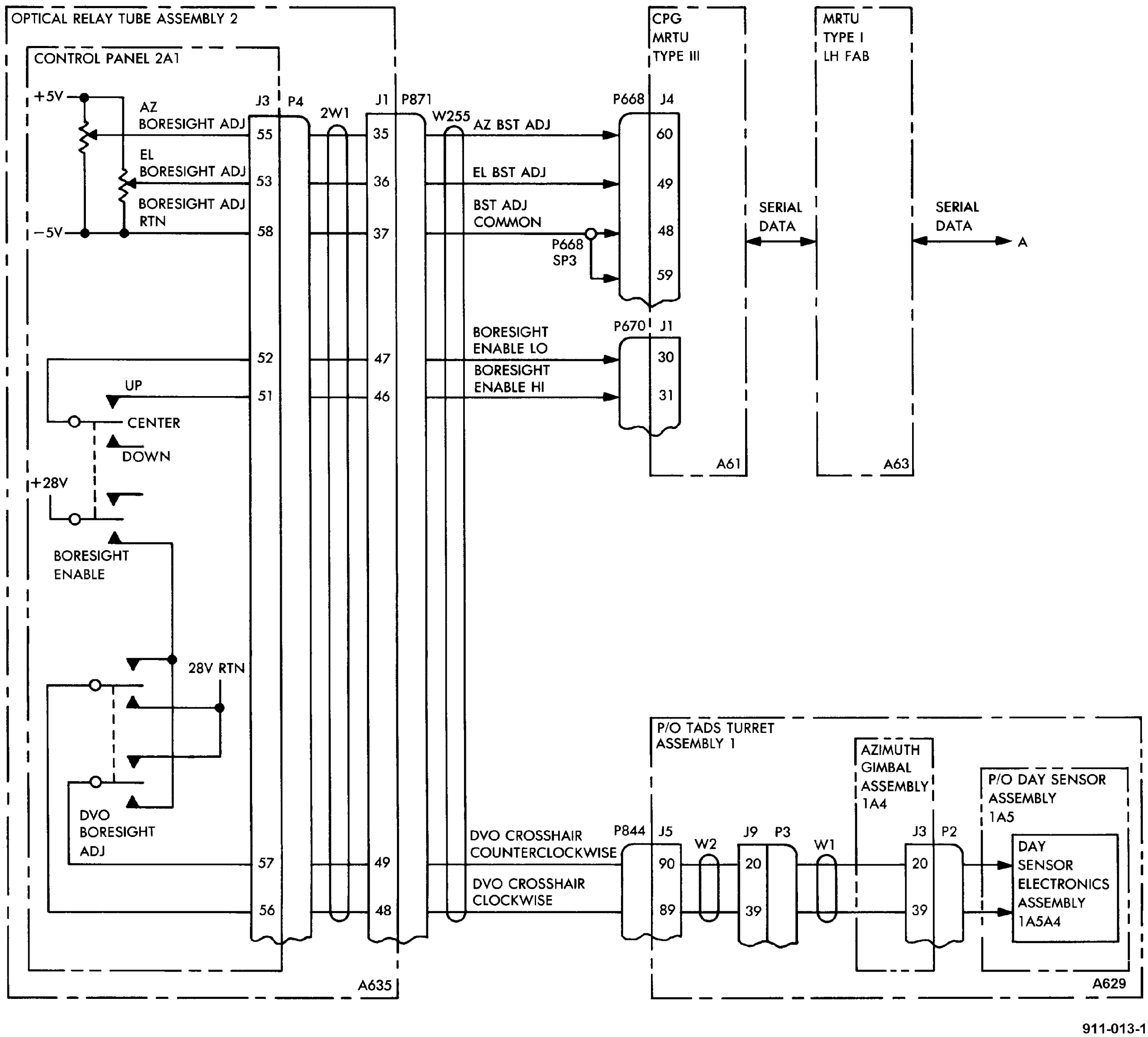


Figure 3-88. Boresight Wiring Interconnect Diagram (Sheet 1 of 2)

3-53. BORESIGHT WIRING INTERCONNECT DIAGRAM (cont)

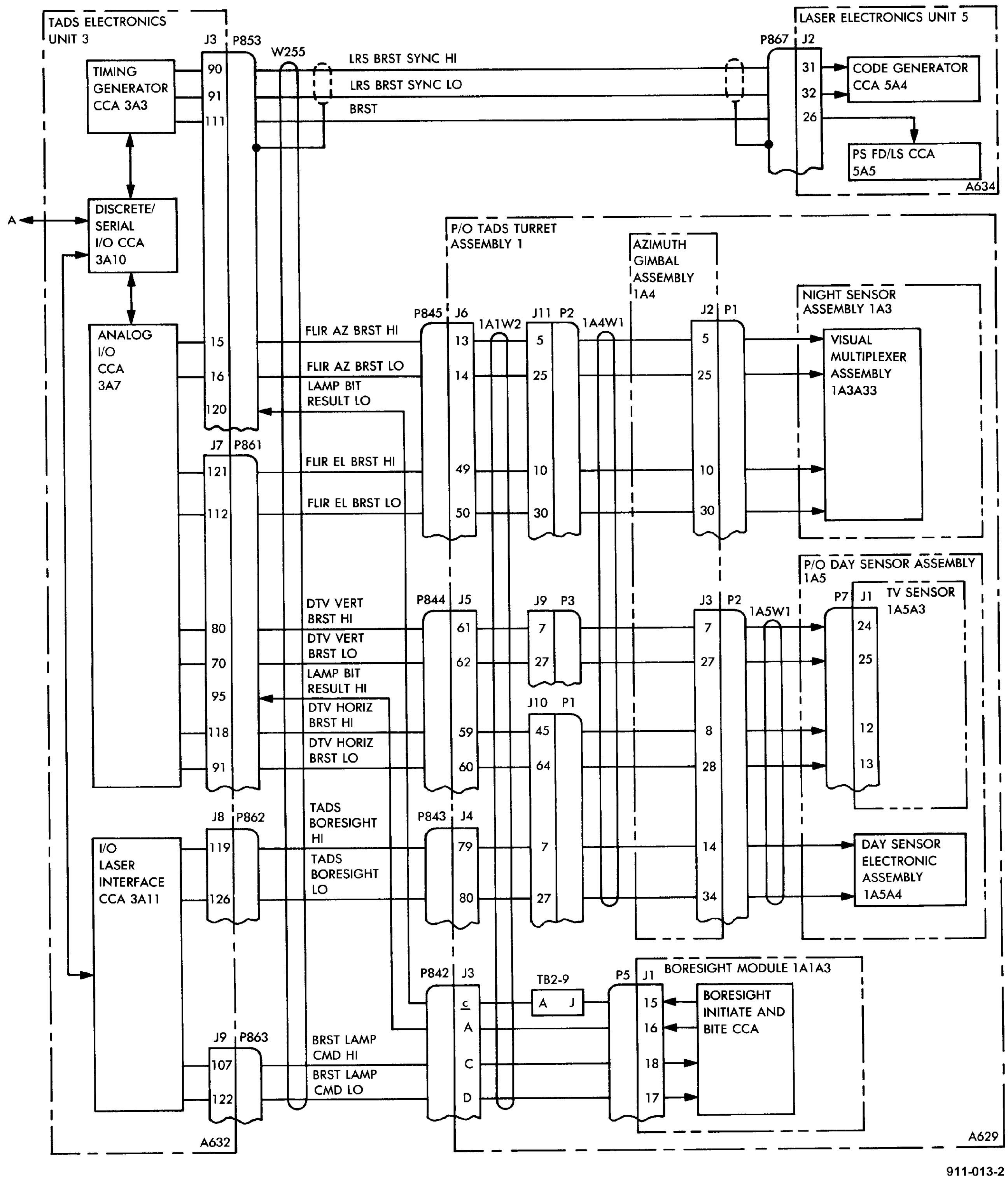


Figure 3-88. Boresight Wiring Interconnect Diagram (Sheet 2 of 2)

3-54. ENVIRONMENTAL CONTROL SYSTEM WIRING INTERCONNECT DIAGRAM

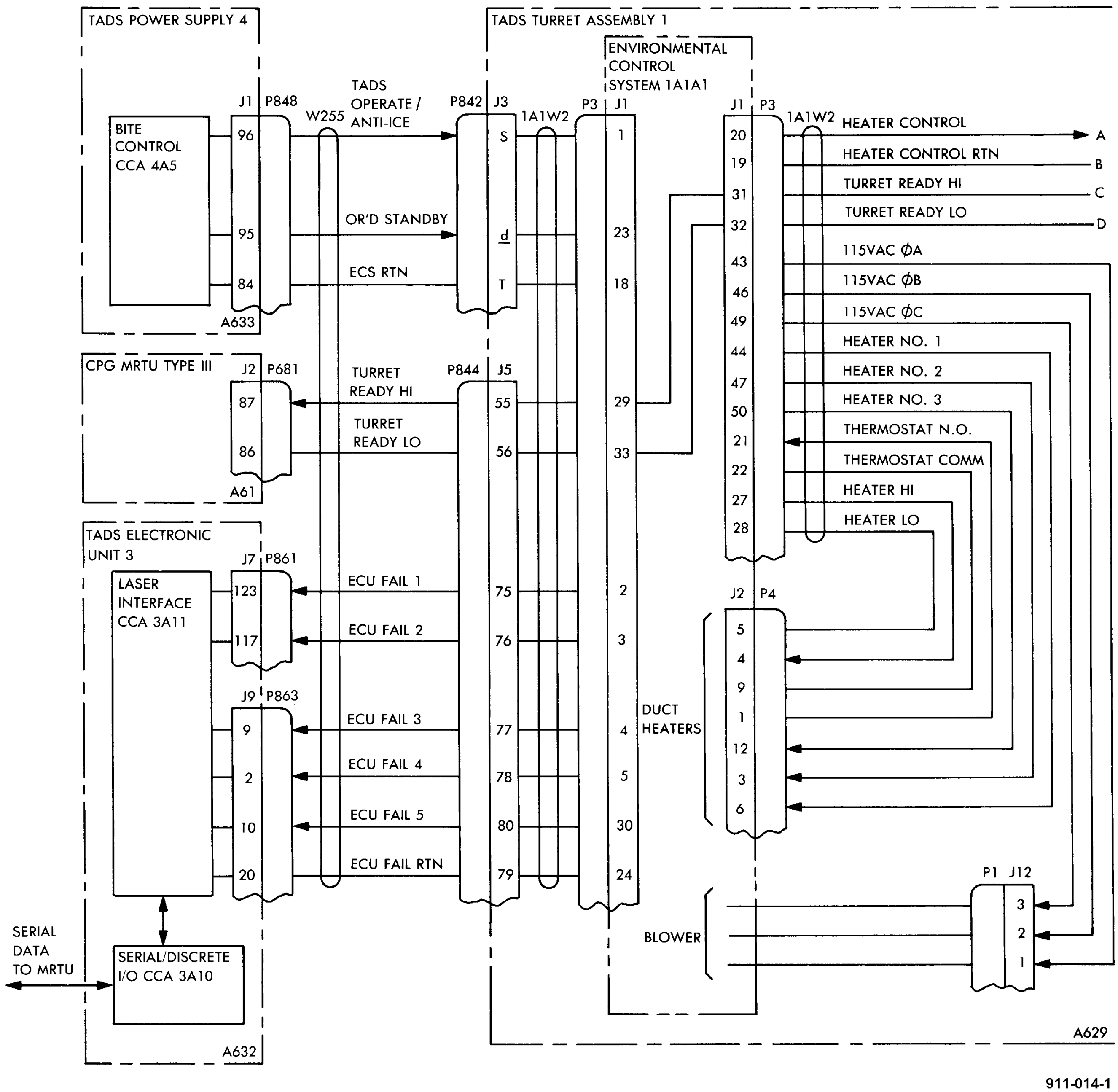


Figure 3-89. Environmental Control System Wiring Interconnect Diagram (Sheet 1 of 2)

3-54. ENVIRONMENTAL CONTROL SYSTEM WIRING INTERCONNECT DIAGRAM (cont)

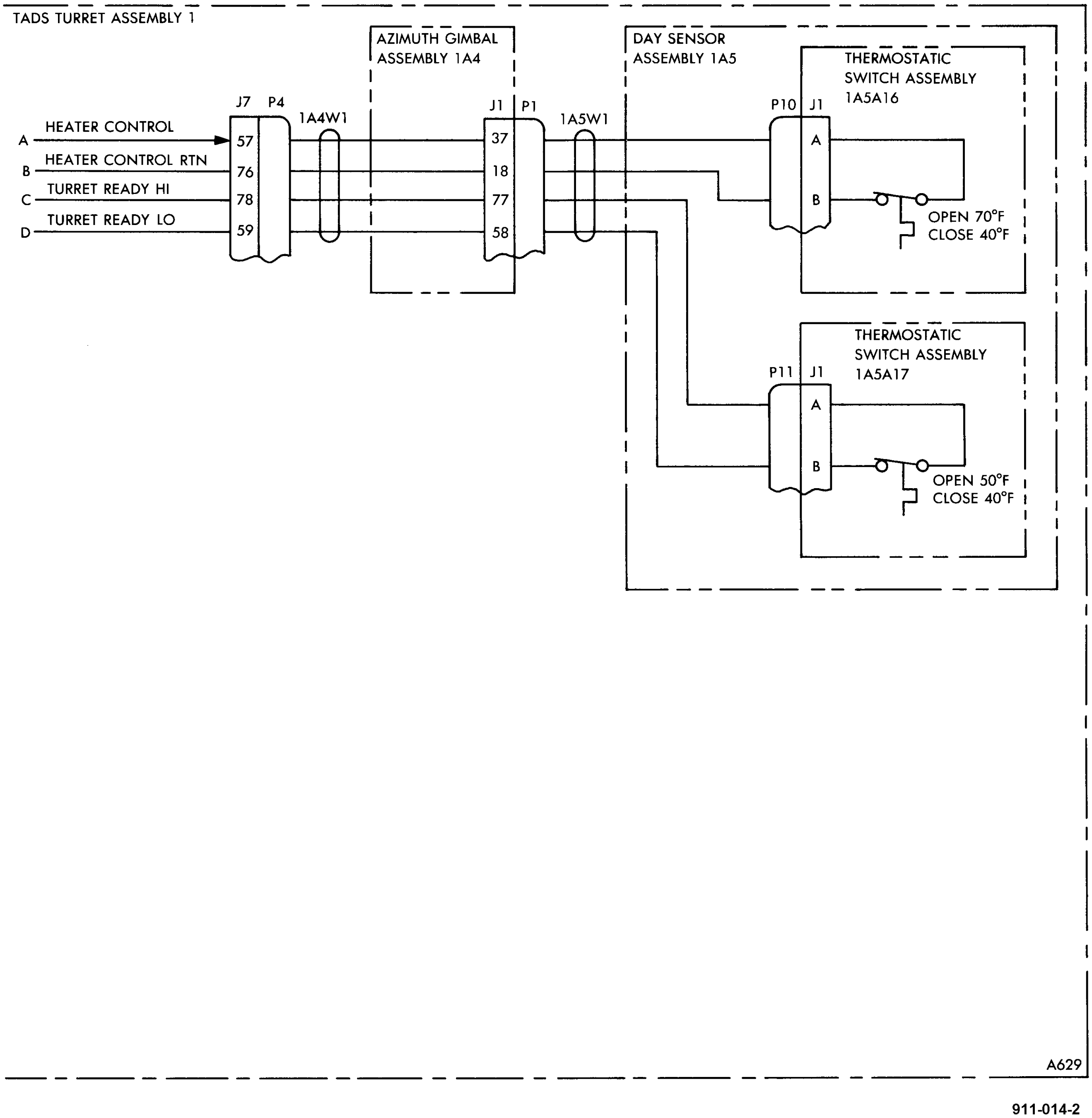


Figure 3-89. Environmental Control System Wiring Interconnect Diagram (Sheet 2 of 2)

3-55. TADS WARNING INDICATOR FLASHING

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-T-3
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-43, 3-48, 3-51

Equipment Conditions:

Ref	Condition
TM 1-1520-238-T-3	Corrective action taken as directed for this fault
TM 1-1520-238-23	Helicopter safed Access provisions - L90 door opened

1. Check for open between:

   P862-120 and P673-26
   P862-58 and P673-25
   P862-45 and P673-34
   P862-34 and P673-33
   P862-17 and P673-32
   P862-1 and P673-31
   P862-23 and P673-37
   P862-33 and P673-36
   P862-32 and P673-28
   P862-35 and P673-27
   P862-50 and P673-41
   P862-61 and P673-40
   P862-3 and P673-39
   P862-11 and P673-38
   P862-8 and P673-30
   P862-6 and P673-29
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 2.

2. Check for short between aircraft ground point and connectors:

   P862-120
   P862-58
   P862-45
   P862-34
   P862-17
   P862-1
   P862-23
   P862-33
   P862-32
   P862-35
   P862-50
   P862-61
   P862-3
   P862-11
   P862-8
   P862-6
   Does short exist?

   YES Leave ohmmeter connected to shorted wire and go to step 3.
   NO Go to step 4.

3-55. TADS WARNING INDICATOR FLASHING (cont)

3. Disconnect P537.
   Does short still exist?

   YES Repair shorted wire between P862 and J537. Perform MOC (para 3-6).
   NO Repair shorted wire between P537 and P673. Perform MOC (para 3-6).

4. Check for open between:

   P848-12 and P685-48
   P848-13 and P685-36
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 5.

5. Check for open between:

   P853-58 and P848-62
   P853-79 and P848-109
   P853-121 and P848-108
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 6.

6. Check for open between:

   P853-123 and P849-k
   P853-99 and P849-A
   P853-100 and P849-p
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 7.

7. Check for open between:

   P673-65 and P848-44
   P673-69 and P848-21
   P673-74 and P848-90
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace TADS power supply (TM 1-1270-476-20).

END OF TASK

3-56. AND NO-GO - APPEARS ON HOD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-49, 3-52

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Disconnect P871 from ORT assembly connector 2W1J1.

2. Disconnect ORT assembly connector 2W1P2 from alphanumeric display connector 2A7J1.

3. Check for open on ORT assembly between:

   2W1P2-77 and 2W1J1-9
   2W1P2-36 and 2W1J1-10
   2W1P2-19 and 2W1J1-3
   2W1P2-17 and 2W1J1-4
   2W1P2-56 and 2W1J1-11
   2W1P2-78 and 2W1J1-12
   2W1P2-58 and 2W1J1-5
   2W1P2-57 and 2W1J1-6
   2W1P2-18 and 2W1J1-1
   2W1P2-37 and 2W1J1-2
   2W1P2-38 and 2W1J1-7
   2W1P2-39 and 2W1J1-8
   2W1P2-70 and 2W1J1-13
   2W1P2-34 and 2W1J1-15
   2W1P2-73 and 2W1J1-14
   2W1P2-31 and 2W1J1-16
   2W1P2-68 and 2W1J1-22
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 4.

4. **[TAD]** Check for open on ORT assembly between 2W1P2-6 and 2W1J1-67.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 5.

3-56. AND NO-GO - APPEARS ON HOD (cont)

5. **[OIP]** Check for open on ORT assembly between 2W1P1-8 and 2W1P2-6.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 6.

6. **[OIP]** Check for open on ORT assembly between 2W1P8-47 and 2W1J1-13.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 7.

7. Connect ORT assembly connector 2W1P2 to alphanumeric display connector 2A7J1.

8. Check for open between:

   P699-9 and P871-9
   P699-8 and P871-10
   P699-16 and P871-3
   P699-15 and P871-4
   P699-20 and P871-11
   P699-19 and P871-12
   P699-11 and P871-5
   P699-10 and P871-6
   P699-24 and P871-1
   P699-23 and P871-2
   P699-13 and P871-7
   P699-12 and P871-8
   P699-14 and P871 backshell
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).

   NO Go to step 9.

9. Check for short between P699-14 and:

   P699-9
   P699-8
   P699-16
   P699-15
   P699-20
   P699-19
   P699-11
   P699-10
   P699-24
   P699-23
   P699-13
   P699-12
   Does short exist?

   YES Repair shorted wire. Perform MOC (para 3-6).
   NO Go to step 10.

10. Check for open between:

    P853-69 and P871-13
    P853-103 and P871-15
    P853-68 and P871-14
    P853-102 and P871-16
    P853-113 and P871-68
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Go to step 11.

11. **[TAD]** Check for open between P853-81 and P871-67.
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Replace TADS electronic unit (TM 1-1270-476-20).

END OF TASK

3-57. AND NO-GO CPG COMPARTMENT - APPEARS ON HOD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-49, 3-52

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Disconnect P871 from ORT assembly connector 2W1J1.

2. Disconnect ORT assembly connector 2W1P2 from alphanumeric display connector 2A7J1.

3. Check for open on ORT assembly between:

   2W1P2-77 and 2W1J1-9
   2W1P2-36 and 2W1J1-10
   2W1P2-19 and 2W1J1-3
   2W1P2-17 and 2W1J1-4
   2W1P2-56 and 2W1J1-11
   2WlP2-78 and 2W1J1-12
   2W1P2-58 and 2W1J1-5
   2W1P2-57 and 2W1J1-6
   2W1P2-18 and 2W1J1-1
   2W1P2-37 and 2W1J1-2
   2W1P2-38 and 2W1J1-7
   2W1P2-39 and 2W1J1-8
   2W1P2-70 and 2W1J1-13
   2W1P2-34 and 2W1J1-15
   2W1P2-73 and 2W1J1-14
   2W1P2-31 and 2W1J1-16
   2W1P2-68 and 2W1J1-22
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 4.

4. **[TAD]** Check for open on ORT assembly between 2W1P2-6 and 2W1J1-67.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 5.

3-57. AND NO-GO CPG COMPARTMENT - APPEARS ON HOD (cont)

5. **[OIP]** Check for open on ORT assembly between 2W1P1-8 and 2W1P2-6.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 6.

6. **[OIP]** Check for open on ORT assembly between 2W1P8-47 and 2W1J1-13.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 7.

7. Connect ORT assembly connector 2W1P2 to alphanumeric display connector 2A7J1.

8. Check for open between:

   P699-9 and P871-9
   P699-8 and P871-10
   P699-16 and P871-3
   P699-15 and P871-4
   P699-20 and P871-11
   P699-19 and P871-12
   P699-11 and P871-5
   P699-10 and P871-6
   P699-24 and P871-1
   P699-23 and P871-2
   P699-13 and P871-7
   P699-12 and P871-8
   P699-14 and P871 backshell
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 9.

9. Check for short between P699-14 and:

   P699-9
   P699-8
   P699-16
   P699-15
   P699-20
   P699-19
   P699-11
   P699-10
   P699-24
   P699-23
   P699-13
   P699-12
   Does short exist?

   YES Repair shorted wire. Perform MOC (para 3-6).
   NO Go to step 11.

10. Check for open between:

    P853-69 and P871-13
    P853-103 and P871-15
    P853-68 and P871-14
    P853-102 and P871-16
    P853-113 and P871-68
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Go to step 11.

11. **[TAD]** Check for open between P853-81 and P871-67.
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Replace TADS electronic unit (TM 1-1270-476-20).

END OF TASK

3-58. TADS POWER SUPPLY NO-GO LH FAB - APPEARS ON HOD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1520-238-1-6
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-43, 3-44, 3-78, 4-12

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L90 door opened External power application electrical

WARNING

- Lethal voltage Is exposed In this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault Isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Check for 115 VAC between:

   P849-a and P849-x
   P849-b and P849-x
   P849-c and P849-x
   Is 115 VAC present?

   YES Go to step 2.

   NO Refer to TM 1-1520-238-T-6 to troubleshoot AC essential bus 1-CPG station.
   Perform MOC (para 3-6).

3-58. TADS POWER SUPPLY NO-GO LH FAB - APPEARS ON HOD (cont)

2. Check for open between:

   P848-68 and P862-95
   P848-79 and P862-80
   P848-37 and P862-121
   P848-10 and P862-108
   P848-22 and P862-125
   P848-33 and P862-111
   P848-99 and P862-107
   P848-57 and P862-115
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 3.

3. Check for open between:

   P848-62 and P853-58
   P848-109 and P853-79
   P848-108 and P853-121
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 4.

4. Check for open between:

   P848-9 and P863-19
   P848-17 and P863-58
   P848-76 and P863-47
   P848-63 and P863-5
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 5.

5. Check for open between P848-45 and P861-90.
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 6.

6. Check for open between:

   P848-12 and P685-48
   P848-13 and P685-36
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 7.

7. Check for open between:

   P848-44 and P673-65
   P848-101 and P673-68
   P848-21 and P673-69
   P848-90 and P673-74
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Replace TADS electronic unit (TM 1-1270-476-20).

END OF TASK

3-59. TADS ELECTRONIC UNIT NO-GO LH FAB - APPEARS ON HOD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1520-238-1-6
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-43, 3-45, 3-46, 3-78, 4-12

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L90 door opened External power application electrical

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Check for 28 VDC between P855-A and P855-B.
   Is 28 VDC present?

   YES Go to step 4.
   NO Go to step 2.

3-59. TADS ELECTRONIC UNIT NO-GO LH FAB - APPEARS ON HOD (cont)

2. Check for 28 VDC between:

   P849-H and P849-L
   P849-J and P849-L
   P849-K and P849-L
   Is 28 VDC present?

   YES Go to step 3.
   NO Refer to TM 1-1520-238-T-6 to troubleshoot DC essential bus 2-CPG station. Perform MOC (para 3-6).

3. Check for open between:

   P849-v and P855-A
   P849-t and P855-B
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace TADS electronic unit (TM 1-1270-476-20).

4. Check for 28 VDC between:

   P853-125 and P853-34
   P853-118 and P853-46
   Is 28 VDC present?

   YES Go to step 7.
   NO Go to step 5.

5. Check for 28 VDC between:

   P849-H and P849-L
   P849-J and P849-L
   P849-K and P849-L
   Is 28 VDC present?

   YES Go to step 6.
   NO Refer to TM 1-1520-238-T-6 to troubleshoot DC essential bus 2-CPG station. Perform MOC (para 3-6).

6. Check for open between:

   P849-v and P853-125
   P849-w and P853-118
   P849-t and P853-34
   P849-u and P853-46
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace TADS electronic unit (TM 1-1270-476-20).

7. Check for open between:

   P848-68 and P862-95
   P848-79 and P862-80
   P848-37 and P862-121
   P848-10 and P862-108
   P848-22 and P862-125
   P848-33 and P862-111
   P848-99 and P862-107
   P848-57 and P862-115
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 8.

8. Check for open between:

   P848-62 and P853-58
   P848-109 and P853-79
   P848-108 and P853-121
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 9.

3-59. TADS ELECTRONIC UNIT NO-GO LH FAB - APPEARS ON HOD (cont)

9. Check for open between:

   P848-9 and P863-19
   P848-17 and P863-58
   P848-76 and P863-47
   P848-63 and P863-5
   Does open exist?

   YES Repair open wire.
        Perform MOC (para 3-6).
   NO   Go to step 10.

10. Check for open between P848-45 and P861-90.
    Does open exist?

    YES Repair open wire.
         Perform MOC (para 3-6).
    NO   Go to step 11.

11. Check for open between:

    P848-12 and P685-48
    P848-13 and P685-36
    Does open exist?

    YES Go to step 12.
    NO   Go to step 13.

12. Check for open between:

    P537-B10 and P685-48
    P537-B11 and P685-36
    Does open exist?

    YES Repair open wire.
         Perform MOC (para 3-6).
    NO   Go to step 13.

13. Check for open between:

    P848-44 and P673-65
    P848-101 and P673-68
    P848-21 and P673-69
    P848-90 and P673-74
    Does open exist?

    YES Repair open wire.
         Perform MOC (para 3-6).
    NO   Replace TADS power supply
         (TM 1-1270-476-20).

END OF TASK

3-60. ORT HOD CONTROLS NO-GO CPG COMPARMENT - APPEARS ON HOD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1520-238-T-6
TM 1-1520-238-23

Associated Wiring Interconnect Diagram:

Fig. 3-46, 3-48, 3-49

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed External power application electrical

WARNING

- Lethal voltage Is exposed In this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Check for 28 VDC between P871-77 and P871-78.
   Is 28 VDC preset?

   YES Go to step 4.
   NO Go to step 2.

2. Check for 28 VDC on TADS power supply between 4J1-87 and 4J1-98.
   Is 28 VDC present?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 3.

3-60. ORT HOD CONTROLS NO-GO CPG COMPARMENT - APPEARS ON HOD (cont)

3. Check for 28 VDC between:

   P849-H and P849-L
   P849-J and P849-L
   P849-K and P849-L
   Is 28 VDC present?

   YES Replace TADS power supply (TM 1-1270-476-20).
   NO Refer to TM 1-1520-238-T-6 to troubleshoot DC essential bus 2-CPG station. Perform MOC (para 3-6).

4. Check for open on ORT assembly between:

   2W1J1-77 and 2W1P4-60
   2W1J1-78 and 2W1P4-61
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 5.

5. Disconnect ORT assembly connector 2W1P4 from control panel connector 2A1J3.

6. Check for open on ORT assembly between:

   2W1P4-3 and 2W1J1-69
   2W1P4-1 and 2W1J1-68
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 7.

7. **[TAD]** Check for open on ORT assembly between 2W1P4-2 and 2W1J1-67.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 10.

8. [OIP] Check for open on ORT assembly between 2W1P1-8 and 2W1P4-2.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 9.

9. **[OIP]** Check for open on ORT assembly between 2W1P8-47 and 2W1J1-13.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 10.

10. Connect ORT assembly connector 2W1P4 to control panel connector 2A1J3.

11. Check for open between P853-113 and P871-68.
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Go to step 12.

12. **[TAD]** Check for open between P853- 81 and P871-67.
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Go to step 13.

13. Check for open between P848-8 and P871-69.
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Replace TADS power supply (TM 1-1270-476-20).

END OF TASK

3-61. FLIR NOT COOLED MESSAGE WILL NOT 60 AWAY AFTER NORMAL COOLDOWN TIME (20 MIN)

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-809-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-45, 3-73

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using the TADS turret continuity test set, test TADS azimuth gimbal assembly wire harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect P845 from TADS turret assembly connector 1A1W2J6.

3. Check for open between:

   P848-35 and P845-34
   P848-47 and P845-35
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 4.

4. Disconnect azimuth gimbal assembly connector 1A4W1P2 from TADS turret assembly connector 1A1W2J11.

5. Check for open on TADS turret assembly between:

   1A1W2J6-34 and 1A1W2J11-1
   1A1W2J6-35 and 1A1W2J11-21
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 6.

6. Check for open between:

   P699-95 and P845-11
   P699-94 and P845-12
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 7.

7. Check for open on TADS turret assembly between:

   1A1W2J6-11 and 1A1W2J11-9
   1A1W2J6-12 and 1A1W2J11-29
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Replace night sensor assembly (TM 1-1270-476-20).

END OF TASK

3-62. TADS TORQU-SERVO MODULE NO-GO TURRET BULKHEAD - APPEARS ON HOD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-T-6
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-46, 3-47, 3-77, 3-78, 3-79, 3-81, 3-82

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS brake release switch, move TADS turret through azimuth and elevation gimbal limits (TM 1-1270-476-20).
   Does turret move through gimbal limits?

   YES Go to step 1.
   NO Troubleshoot TADS brake release switch (para 3-6).

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

2. Disconnect P842 from TADS turret assembly connector 1A1W2J3.

3. Check for 28 VDC between:

   P842-y and P842-z
   P842-J and P842-K
   P842-JJ and P842-LL
   P842-P and P842-n
   P842-L and P842-M
   P842-AA and P842-DD
   P842-N and P842-t
   P842-EE and P842-FF
   Is 28 VDC present?
   YES Go to step 4.
   NO Refer to TM 1-1520-238-T-6 to troubleshoot DC essential bus 2-CPG station. Perform MOC (para 3-6).

3-62. TADS TORQU-SERVO MODULE NO-GO TURRET BULKHEAD - APPEARS ON HOD (cont)

4. Check for open on TADS turret assembly between:

   1A1W2J3-y and 1A1W2P2-17
   1A1W2J3-J and 1A1W2P2-16
   1A1W2J3-JJ and 1A1W2P2-27
   1A1W2J3-P and 1A1W2P2-27
   1A1W2J3-L and 1A1W2P2-14
   1A1W2J3-AA and 1A1W2P2-15
   1A1W2J3-N and 1A1W2P2-23
   1A1W2J3-EE and 1A1W2P2-23
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 5.

5. Connect P842 to TADS turret assembly connector 1A1W2J3.

6. Using the TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 7.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

7. Disconnect azimuth gimbal assembly connector 1A4W1P3 from TADS turret assembly connector 1A1W2J9.

8. Check for open on TADS turret assembly between:

   1A1W2J5-46 and 1A1W2J9-41
   1A1W2J5-47 and 1A1W2J9-61
   1A1W2J5-45 and 1A1W2J9-62
   1A1W2J5-44 and 1A1W2J9-42
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 9.

9. Check for open on TADS turret assembly between:

   1A1W2J4-27 and 1A1W2J9-3
   1A1W2J4-26 and 1A1W2J9-23
   1A1W2J4-24 and 1A1W2J9-4
   1A1W2J4-25 and 1A1W2J9-24
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 10.

10. Check for open on day sensor assembly between:

    1A5W1P2-41 and 1A5W1J7-14
    1A5W1P2-61 and 1A5W1J7-33
    1A5W1P2-3 and 1A5W1J7-30
    1A5W1P2-23 and 1A5W1J7-10
    1A5W1P2-62 and 1A5W1J9-33
    1A5W1P2-42 and 1A5W1J9-14
    1A5W1P2-4 and 1A5W1J9-30
    1A5W1P2-24 and 1A5W1J9-10
    1A5W1P2-72 and 1A5W1J7-38
    1A5W1P2-72 and 1A5W1J9-38
    1A5W1P2-53 and 1A5W1J7-18
    1A5W1P2-53 and 1A5W1J9-18
    1A5W1P2-52 and 1A5W1J7-37
    1A5W1P2-52 and 1A5W1J9-37
    1A5W1P2-71 and 1A5W1J7-32
    1A5W1P2-71 and 1A5W1J9-32
    1A5W1P2-51 and 1A5W1J7-12
    1A5W1P2-51 and 1A5W1J9-12
    1A5W1P2-5 and 1A5W1J7-9
    1A5W1P2-5 and 1A5W1J7-16
    1A5W1P2-6 and 1A5W1J9-9
    1A5W1P2-6 and 1A5W1J9-25
    1A5W1P2-6 and 1A5W1J9-36
    Does open exist?

    YES Replace day sensor subassembly (TM 1-1270-476-20).
    NO Go to step 11.

3-62. TADS TORQU-SERVO MODULE NO-GO TURRET BULKHEAD - APPEARS ON HOD (cont)

11. Disconnect TADS turret assembly connectors 1A1W2P1 and 1A1W2P2 from TADS electronic control amplifier connectors 1A2J1 and 1A2J2, respectively.

12. Check for open on TADS turret assembly between:

    1A1W2J9-6 and 1A1W2P1-36
    1A1W2J9-26 and 1A1W2P1-37
    1A1W2J9-8 and 1A1W2P1-9
    1A1W2J9-28 and 1A1W2P1-26
    1A1W2J9-5 and 1A1W2P2-36
    1A1W2J9-25 and 1A1W2P2-37
    1A1W2J9-64 and 1A1W2P2-9
    1A1W2J9-45 and 1A1W2P2-26
    1A1W2J9-72 and 1A1W2J6-115
    1A1W2J9-53 and 1A1W2J6-117
    1A1W2J9-52 and 1A1W2J6-116
    1A1W2J9-71 and 1A1W2J6-114
    1A1W2J9-51 and 1A1W2J6-118
    1A1W2J3-Y and 1A1W2P2-28
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 13.

13. Connect azimuth gimbal assembly connector 1A4W1P3 to TADS turret assembly connector 1A1W2J9.

14. Disconnect azimuth gimbal assembly connector 1A4W1P4 from TADS turret assembly connector 1A1W2J7.

15. Check for open on TADS turret assembly between:

    1A1W2P1-1 and 1A1W2J7-36
    1A1W2P1-2 and 1A1W2J7-37
    1A1W2P1-18 and 1A1W2J7-38
    1A1W2P1-3 and 1A1W2J7-17
    1A1W2P1-19 and 1A1W2J7-18
    1A1W2P1-20 and 1A1W2J7-19
    1A1W2P2-1 and 1A1W2J7-39
    1A1W2P2-2 and 1A1W2J7-60
    1A1W2P2-18 and 1A1W2J7-61
    1A1W2P2-3 and 1A1W2J7-20
    1A1W2P2-19 and 1A1W2J7-41
    1A1W2P2-20 and 1A1W2J7-42
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 16.

16. Connect TADS turret assembly connectors 1A1W2P1 and 1A1W2P2 to TADS electronic control amplifier connectors 1A2J1 and 1A2J2, respectively.

17. Disconnect P843 from TADS turret assembly connector 1A1W2J4.

3-62. TADS TORQU-SERVO MODULE NO-GO TURRET BULKHEAD - APPEARS ON HOD (cont)

18. Check for open on TADS turret assembly between:

    1A1W2J4-34 and 1A1W2J7-31
    1A1W2J4-35 and 1A1W2J7-12
    1A1W2J4-32 and 1A1W2J7-32
    1A1W2J4-33 and 1A1W2J7-13
    1A1W2J4-36 and 1A1W2J7-30
    1A1W2J4-37 and 1A1W2J7-11
    1A1W2J4-38 and 1A1W2J7-29
    1A1W2J4-39 and 1A1W2J7-10
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 19.

19. Connect azimuth gimbal assembly connector 1A4W1P4 to TADS turret assembly connector 1A1W2J7.

20. Check for open between:

    P843-34 and P863-80
    P843-35 and P863-117
    P843-32 and P863-28
    P843-33 and P863-27
    P843-36 and P863-103
    P843-37 and P863-111
    P843-38 and P863-101
    P843-39 and P863-90
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Go to step 21.

21. Disconnect P861 from TADS electronic unit connector 3J7.

22. Check for open between:

    P843-24 and P861-119
    P843-25 and P861-120
    P843-27 and P851-126
    P843-26 and P851-128
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Go to step 23.

23. Connect P843 to TADS turret assembly connector 1A1W1J4.

24. Disconnect P844 from TADS turret assembly connector 1A1W2J5.

25. Check for open between:

    P844-45 and P861-102
    P844-44 and P861-111
    P844-37 and P861-35
    P844-38 and P861-7
    P844-29 and P861-23
    P844-30 and P861-33
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Go to step 26.

3-62. TADS TORQU-SERVO MODULE NO-GO TURRET BULKHEAD - APPEARS ON HOD (cont)

26. Connect P861 to TADS electronic unit connector 3J7.

27. Check for open between:

    P844-46 and P853-26
    P844-47 and P853-39
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Go to step 28.

28. Connect P844 to TADS turret assembly connector 1A1W2J5.

29. Check for open between:

    P848-54 and P845-115
    P848-66 and P845-117
    P848-42 and P845-116
    P848-52 and P845-114
    P848-41 and P845-118
    P848-65 and P861-3
    P848-53 and P861-4
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Replace TADS electronic unit (TM 1-1270-476-20).

END OF TASK

3-63. TADS AC TORQUER AMP NO-GO TURRET BULKHEAD - APPEARS ON HOD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-74, 3-78, 3-79, 3-81, 3-82

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Check for open on day sensor assembly between:

   1A5W1P2-41 and 1A5W1J7-14
   1A5W1P2-61 and 1A5W1J7-33
   1A5W1P2-3 and 1A5W1J7-30
   1A5H1P2-23 and 1A5W1J7-10
   1A5W1P2-62 and 1A5W1J9-33
   1A5W1P2-42 and 1A5W1J9-14
   1A5W1P2-4 and 1A5W1J9-30
   1A5W1P2-24 and 1A5W1J9-10
   1A5W1P2-5 and 1A5W1J7-9
   1A5W1P2-5 and 1A5W1J7-16
   1A5W1P2-6 and 1A5W1J9-9
   1A5W1P2-6 and 1A5W1J9-25
   1A5W1P2-6 and 1A5W1J9-36
   Does open exist?

   YES Replace day sensor subassembly (TM 1-1270-476-20).
   NO Go to step 2.

2. Disconnect P843 from TADS turret assembly connector 1A1W2J4.

3-63. TADS AC TORQUER AMP NO-GO TURRET BULKHEAD - APPEARS ON HOD (cont)

3. Check for open between:

   P843-34 and P863-80
   P843-35 and P863-117
   P843-32 and P863-128
   P843-33 and P863-127
   P843-36 and P863-103
   P843-37 and P863-111
   P843-38 and P863-101
   P843-39 and P863-90
   P843-30 and P863-92
   P843-31 and P863-116
   P843-40 and P863-102
   P843-41 and P863-123
   P843-51 and P863-113
   P843-52 and P863-95
   P843-53 and P863-120
   P843-54 and P863-105
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 4.

4. Disconnect P861 from TADS electronic unit connector 3J7.

5. Check for open between:

   P843-24 and P861-119
   P843-25 and P861-120
   P843-27 and P861-126
   P843-26 and P861-128
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 6.

6. Connect P843 to TADS turret assembly connector 1A1W2J4.

7. Disconnect P844 from TADS turret assembly connector 1A1W2J5.

8. Check for open between:

   P844-45 and P861-102
   P844-44 and P861-111
   P844-49 and P861-125
   P844-50 and P861-92
   P844-99 and P861-127
   P844-100 and P861-104
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 9.

9. Check for open between:

   P844-46 and P853-26
   P844-47 and P853-39
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 10.

10. Connect P844 to TADS turret assembly connector 1A1W2J5.

11. Check for open between:

   P848-54 and P845-115
   P848-66 and P845-117
   P848-42 and P845-116
   P848-52 and P845-114
   P848-41 and P845-118
   P848-65 and P861-3
   P848-53 and P861-4
   P848-9 and P863-19
   P848-17 and P863-58
   P848-76 and P863-47
   P848-63 and P863-5
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Replace TADS electronic control amplifier (TM 1-1270-476-20).

END OF TASK

3-64. LRF/D COOLANT LOW - APPEARS ON HOD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-87

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Check for open between:

   P685-57 and P867-35
   P685-58 and P867-19
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 3.

3. Check for open between P864-N and P845-95.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 4.

4. Check for open on TADS turret assembly between 1A1W2J6-95 and 1A1W2J10-72.
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Replace laser transceiver unit (TM 1-1270-476-20).

END OF TASK

3-65. LRF/D TEMP - APPEARS ON HOD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagram:

Fig. 3-87

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Check for open between:

   P685-62 and P867-37
   P685-58 and P867-19
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 3.

3. Check for open between P864-M and P845-94.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 4.

4. Check for open on TADS turret assembly between 1A1W2J6-94 and 1A1W2J10-52.
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Replace laser transceiver unit (TM 1-1270-476-20).

END OF TASK

3-66. TADS ECS ASSEMBLY NO-GO TURRET BULKHEAD - APPEARS ON HOD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-T-6
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-44, 3-46, 3-89

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions L40 cover removed External power application - electrical

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting wires and connectors. High current 28 VDC or 115 VAC is present failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Check for 115 VAC between:

   P842-g and P842-m
   P842-h and P842-m
   P842-k and P842-m
   Is 115 VAC present?

   YES Go to step 2.
   NO Refer to TM 1-1520-238-T-6 to troubleshoot AC essential bus 1-CPG station.
   Perform MOC (para 3-6).

3-66. TADS ECS ASSEMBLY NO-GO TURRET BULKHEAD - APPEARS ON HOD (cont)

2. Disconnect TADS turret assembly connector 1A1W2P3 from environmental control system connector 1A1A1J1.

3. Check for open on TADS turret assembly between:

   1A1W2J3-g and 1A1W2P3-10
   1A1W2J3-g and 1A1W2P3-11
   1A1W2J3-h and 1A1W2P3-13
   1A1W2J3-h and 1A1W2P3-14
   1A1H2J3-k and 1A1W2P3-16
   1A1W2J3-k and 1A1W2P3-17
   1A1W2J3-m and 1A1W2P3-25
   Does open exist?

   YES Replace TADS turretassembly (TM 1-1270-476-30).
   NO Go to step 4.

4. Check for 28 VDC between P842-f and P842-e.
   Is 28 VDC present?

   YES Go to step 5.
   NO Go to step 6.

5. Check for open on TADS turret assembly between:

   1AlW2J3-f and 1A1W2P3-8
   1AlW2J3-e and 1A1W2P3-41
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 8.

6. Check for 28 VDC between:

   P849-H and P849-L
   P849-J and P849-L
   P849-K and P849-L
   Is 28 VDC present?

   YES Go to step 7.
   NO Refer to TM 1-1520-238-T-6 to troubleshoot DC essential bus 2-CPG station. Perform MOC (para 3-6).

7. Check for open between:

   P848-36 and P842-f
   P848-59 and P842-e
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace TADS power supply (TM 1-1270-476-20).

8. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1. **Is 1A4W1 good?**

   YES Go to step 9.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

3-66. TADS ECS ASSEMBLY NO-GO TURRET BULKHEAD - APPEARS ON HOD (cont)

9. If day sensor subassembly temperature is more than 70°F (21.1°C) or decreasing from above 70°F (21.1°C) to 40°F (4.4°C), check for open between connectors 1A5W1P1-37 and 1A5W1P1-18. If day sensor subassembly temperature is less than 40°F (4.4°C) or increasing from below 40°F (4.4°C) to 70°F (21.1°C), check for continuity between connectors 1A5W1P1-37 and 1A5W1P1-18.
   Does condition exist?

   YES Go to step 10.
   NO Replace day sensor subassembly (TM 1-1270-476-20).

10. Check for open on TADS turret assembly between:

    1A1W2P3-20 and 1A1W2J7-57
    1A1W2P3-19 and 1A1W2J7-76
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 11.

11. Disconnect TADS turret assembly connector 1A1W2P4 from environmental control system connector 1A1A1J2.

12. Check for open on TADS turret assembly between:

    1A1W2P3-44 and 1A1W2P4-6
    1A1W2P3-47 and 1A1W2P4-3
    1A1W2P3-50 and 1A1W2P4-12
    1A1W2P3-21 and 1A1W2P4-1
    1A1W2P3-22 and 1A1W2P4-9
    1A1W2P3-27 and 1A1W2P4-4
    1A1W2P3-28 and 1A1W2P4-5
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 13.

13. Check for open on TADS turret assembly between:

    1A1W2P3-43 and 1A1W2J12-1
    1A1W2P3-46 and 1A1W2J12-2
    1A1W2P3-49 and 1A1W2J12-3
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 14.

14. Check for open on TADS turret assembly between:

    1A1W2P1-4 and lAlW2J3-m
    1A1W2P3-1 and 1A1W2J3-S
    1A1W2P3-23 and lAlW2J3-d
    1A1W2P3-18 and 1A1W2J3-T
    1A1W2P3-10 and lAlW2J3-g
    1A1W2P3-11 and lAlW2J3-g
    1A1W2P3-13 and lAlW2J3-h
    1A1W2P3-14 and lAlW2J3-h
    1A1W2P3-16 and lAlW2J3-k
    1A1W2P3-17 and lAlW2J3-k
    1A1W2P3-25 and lAlW2J3-m
    1A1W2P3-8 and lAlW2J3-f
    1A1W2P3-41 and lAlW2J3-e
    1A1W2P4-10 and lAlW2J3-m
    1A1W2P4-8 and lAlW2J3-m
    1A1W2P4-15 and lAlW2J3-m
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 15.

15. Connect TADS turret assembly connector 1A1W2P4 to environmental control system connector 1A1A1J2.

3-66. TADS ECS ASSEMBLY NO-GO TURRET BULKHEAD - APPEARS ON HOD (cont)

16. Check for open between:

    P848-96 and P842-S
    P848-95 and P842-d
    P848-84 and P842-T
    Does open exist?

    YES Repair open wire.
    Perform MOC (para 3-6).
    NO Go to step 17.

17. Check for open between:

    P842-g and P849-d
    P842-h and P849-e 19.
    P842-k and P849-f
    P842-m and P849-g
    Does open exist?

    YES Repair open wire.
    Perform MOC (para 3-6).
    NO Go to step 18.

18. Check for open on TADS turret assembly between:

    1A1W2P3-2 and 1A1W2J5-75
    1A1W2P3-3 and 1A1W2J5-76
    1A1W2P3-4 and 1A1W2J5-77
    1A1W2P3-24 and 1A1W2J5-79
    Does open exist?

    YES Replace TADS turret assembly
    (TM 1-1270-476-30).
    NO Go to step 19.

19. Connect TADS turret assembly connector 1A1W2P3 to environmental control system connector 1A1A1J1.

20. Check for open between:

    P861-123 and P844-75
    P861-117 and P844-76
    P863-9 and P844-77
    P863-20 and P844-79
    Does open exist?

    YES Repair open wire.
    Perform MOC (para 3-6).
    NO Replace TADS power supply assembly (TM 1-1270-476-20).

END OF TASK

3-67. TADS NOT READY MESSA6E DISPLAYED AFTER ALLOWABLE WARMUP TIME

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 9-1230-476-20-2
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-89

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. If day sensor subassembly temperature is more than 50°F (10°C) or decreasing from above 50°F (10°C) to 40°F (4.4°C), check for open between connectors 1A5W1P1-77 and 1A5W1P1-58. If day sensor subassembly temperature is less than 40°F (4.4°C) or increasing from below 40°F (4.4°C) to 50°F (10°C), check for continuity between connectors 1A5W1P1-77 and 1A5W1P1-58.
   Does condition exist?

   YES Go to step 3.
   NO Replace day sensor subassembly (TM 1-1270-476-20).

3. Disconnect TADS turret assembly connector 1A1W2P3 from environmental control system connector 1A1A1J1.

4. Check for open on TADS turret assembly between:

   1A1W2P3-31 and 1A1W2J7-78
   1A1W2P3-32 and 1A1W2J7-59
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 5.

5. Check for open on ECS between:

   1A1A1J1-31 and 1A1A1J1-29
   1A1A1J1-32 and 1A1W2J1-33
   Does open exist?

   YES Replace environmental control system (TM 1-1270-476-20).
   NO Go to step 6.

3-67. TADS NOT READY MESSA6E DISPLAYED AFTER ALLOWABLE WARMUP TIME (cont)

6. Check for open on TADS turret assembly between:

   1A1W2P3-29 and 1A1W2J5-55
   1A1W2P3-33 and 1A1W2J3-56
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 7.

7. Connect TADS turret assembly connector 1A1W2P3 to environmental control system connector 1A1A1J1.

8. Check for open between:

   P681-87 and P844-55
   P861-86 and P844-56
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Troubleshoot multiplex system (TM 9-1230-476-20-2).

END OF TASK

3-68. INDEPENDENT HOD INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1520-238-T-6
TM 9-1230-476-20-2
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-44, 3-46, 3-53

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed External power application electrical

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Check for 115 VAC between:

   P871-53 and P871-56
   P871-54 and P871-56
   P871-55 and P871-56
   Is 115 VAC present?

YES	Go to step 2.
NO	Refer to TM 1-1520-238-T-6 to troubleshoot AC essential bus 1-CPG station.

3-68. INDEPENDENT HOD INOPERATIVE (cont)

2. Check for 28 VDC between P871-57 and P871-58.
   Is 28 VDC present?

   YES Go to step 3.
   NO Refer to TM 1-1520-238-T-6 to troubleshoot DC essential bus 2-CPG station.

3. Check for open on ORT assembly between:

   2W1J1-53 and 2W1P8-3
   2W1J1-54 and 2W1P8-6
   2W1J1-55 and 2W1P8-9
   2W1J1-56 and 2W1P8-12
   2W1J1-57 and 2W1P8-18
   2W1J1-58 and 2W1P8-21
   2W1J1-50 and 2W1P8-21
   2W1J1-51 and 2W1P8-22
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 4.

4. Check for open between P871-51 and P699-68.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Troubleshoot multiplex system (TM 9-1230-476-20-2).

END OF TASK

3-69. HOD/HDD BRIGHTNESS CANNOT BE ADJUSTED

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-55

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Disconnect ORT assembly connector 2W1P4 from ORT assembly control panel connector 2A1J3.

2. Disconnect ORT assembly connector 2W1P3 from indirect view display connector 2A3J1.

3. Check for open on ORT assembly between:

   2W1P4-14 and 2W1P3-87
   2W1P4-13 and 2W1P3-88
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 4.

4. Hold ORT assembly control panel **DSPL BRT** switch in the up position and check for open between 2A1J3-14 and 2A1J3-72.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 5.

5. Hold ORT assembly control panel **DSPL BRT** switch in the down position and check for open between ZA1J3-13 and 2A1J3-72.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 6.

6. Connect ORT assembly connector 2W1P4 to ORT assembly control panel connector 2A1J3.

7. Connect ORT assembly connector 2W1P3 to indirect view display connector 2A3J1.

8. Check for open on ORT assembly between 2W4P1-17 and 2W4P2-T.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace indirect view display assembly (TM 1-1270-476-20).

END OF TASK

3-70. RANGE FOCUS CANNOT BE ADJUSTED

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 9-1230-476-20-2
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-48, 3-49, 3-61

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Check for open between:

   P668-51 and P871-29
   P668-50 and P871-30
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 2.

2. Disconnect ORT assembly connector 2W1P4 from ORT assembly control panel connector 2A1J3.

3. Check for open on ORT assembly between:

   2W1J1-29 and 2W1P4-5
   2WlJ1-30 and 2W1P4-6
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 4.

4. Hold ORT assembly control panel **RNG FOC** switch in up position and check for open between 2A1J3-5 and 2A1J3-2.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 5.

5. Hold ORT assembly control panel **RNG FOC** switch in down position and check for open between 2A1J3-5 and 2A1J3-3.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Troubleshoot multiplex system (TM 9-1230-276-20-2).

END OF TASK

3-71. HOD/HDD CONTRAST CANNOT BE ADJUSTED

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Interconnect Wiring Diagrams:

Fig. 3-55

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed
	Access provisions - L40 cover removed

1. Disconnect ORT assembly connector 2W1P4 from ORT assembly control panel connector 2A1J3.

2. Check for open on ORT assembly between:

   2W1P4-18 and 2W1P3-105
   2W1P4-17 and 2W1P3-91
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 3.

3. Hold ORT assembly control panel **DSPL CONT** switch in up position and check for open between 2W1J3-18 and 2W1J3-72.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 4.

4. Hold ORT assembly control panel **DSPL CONT** switch in down position and check for open between 2W1J3-17 and 2W1J3-72.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Replace indirect view display (TM 1-1270-476-20).

END OF TASK

3-72. HOD/HDD GRAYSCALE CANNOT BE ADJUSTED

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-54, 3-58

Equipment Conditions:

Ref	Conditions
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Disconnect ORT assembly connector 2W1P4 from ORT assembly control panel connector 2A1J3.

2. Check for open on ORT assembly between 2W1P4-38 and 2W1P3-76.
   Does open exist?

YES	Replace optical relay column (TM 1-1270-476-20).
NO	Go to step 3.

3. Set ORT assembly control panel GS switch to GS and check for open between:

   2A1J3-38 and 2A1J3-71
   2A1J3-38 and 2A1J3-72
   Does open exist?

YES	Replace ORT assembly control panel (TM-1-1270-476-20).
NO	Replace indirect view display assembly(TM 1-1270-476-20).

END OF TASK

3-73. SYMBOLOGY BRIGHTNESS DOES NOT CHANGE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-48, 3-48, 3-64

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Check for open between P668-66 and P871-31.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 2.

2. Disconnect ORT assembly connector 2W1P4 from ORT assembly control panel connector 2A1J3.

3. Check for open on ORT assembly 2W1J1-31 and 2W1P4-7.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20)
   NO Go to step 4.

4. Measure resistance between ORT assembly control panel connector 2A1J3-3 and 2A1J3-7 while adjusting **SYMB BRT** through entire range.
   Does resistance change?

   YES Go to step 5.
   NO Replace ORT assembly control panel (TM 1-1270-476-20).

5. Measure resistance between ORT assembly control panel connector 2A1J3-2 and 2A1J3-7 while adjusting **SYMB BRT** through entire range.
   Does resistance change?

   YES Go to step 6.
   NO Replace ORT assembly control panel (TM 1-1270-476-20).

6. Connect ORT assembly connector 2W1P4 to ORT assembly control panel connector 2A1J3.

7. Check for open between:

   P861-46 and P673-102
   P861-57 and P673-101
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace TADS electronic unit (TM 1-1270-476-20).

END OF TASK

3-74. GRAYSCALE NOT DISPLAYED

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-54, 3-58

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Disconnect ORT assembly connector 2W1P4 from ORT assembly control panel connector 2A1J3.

2. Check for open on ORT assembly between 2W1P4-38 and 2W1P3-76.
   Does open exist?

YES	Replace optical relay column (TM 1-1270-476-20).
NO	Go to step 3.

3. Set ORT assembly control panel **GS** switch to **GS** and check for open between:

   2A1J3-38 and 2A1J3-71
   2A1J3-38 and 2A1J3-72
   Does open exist?

YES	Replace ORT assembly control panel (TM 1-1270-476-20).
NO	Replace indirect view display assembly(TM 1-1270-476-20).

END OF TASK

3-75. ORT ASSEMBLY CONTROL PANEL VID SEL SWITCH INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23
TM 9-1230-476-20-2

Associated Wiring Interconnect Diagrams:

Fig. 3-58

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Check for open between:

   P681-66 and P871-21
   P681-96 and P871-23
   P681-95 and P871-28
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 2.

2. Disconnect ORT assembly connector 2W1P4 from ORT assembly control panel connectors 2A1J3.

3. Check for open on ORT assembly between:

   2W1J1-28 and 2W1P4-72
   2W1J1-23 and 2W1P4-73
   2W1J1-21 and 2W1P4-70
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 4.

4. Set ORT assembly control panel **VID SEL** switch to **TADS.** Check for open between 2A1J3-70 and 2A1J3-72.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 5.

5. Set ORT assembly control panel **VID SEL** switch to **PNVS.** Check for open between 2A1J3-73 and 2A1J3-72.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.

END OF TASK

3-76. ORT ASSEMBLY CONTROL PANEL EDGELIGHTS NOT LIT

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-T-6
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-65

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed External power application - electrical

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Adjust CPG instrument light control panel **INST** control fully cw.

2. Check for 5 VDC between P871-65 and P871-66.
   Is 5 VDC present?

   YES Go to step 3.
   NO Refer to TM 1-1520-238-T-6 to troubleshoot electrical system.
   Perform MOC (para 3-6).

3. Check for open on ORT assembly

   2W1P4-65 and 2W1J1-21
   2W1P4-66 and 2W1J1-22
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace ORT assembly control panel (TM 1-1270-476-20).

END OF TASK

3-77. ORT ASSEMBLY CONTROL PANEL AZIMUTH CONTROL INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23
TM 9-1230-476-20-2

Associated Wiring Interconnect Diagrams:

Fig. 3-88

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - R40 cover removed

1. Check for open between P668-48 and P668-59.
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 2.

2. Measure resistance between P668-60 and P688-48 while adjusting ORT assembly control panel azimuth control through entire range.
   Does resistance change?

   YES Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.
   NO Go to step 3.

3. Disconnect P871 from ORT assembly connector 2W1J1.

4. Measure resistance between ORT assembly connectors 2W1J1-37 and 2W1J1-35 while adjusting ORT assembly control panel azimuth control through entire range.
   Does resistance change?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 5.

5. Disconnect ORT assembly connector 2W1P4 from control panel connector 2A1J3.

6. Check for open on ORT assembly between:

   2W1J1-37 and 2W1P4-58
   2W1J1-35 and 2W1P4-55
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace ORT assembly control panel (TM 1-1270-476-20).

END OF TASK

3-78. ORT ASSEMBLY CONTROL PANEL ELEVATION CONTROL INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23
TM 9-1230-476-20-2

Associated Wiring Interconnect Diagrams:

Fig. 3-88

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - R40 cover removed

1. Check for open between P668-48 and P668-59.
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 2.

2. Measure resistance between P668-49 and P688-48 while adjusting ORT assembly control panel elevation control through entire range.
   Does resistance change?

   YES Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.
   NO Go to step 3.

3. Disconnect P871 from ORT assembly connector 2W1J1 and measure resistance between 2W1J1-36 and 2W1J1-35 while adjusting ORT assembly control panel elevation control through entire range.
   Does resistance change?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 4.

4. Disconnect ORT assembly connector 2W1P4 from control panel connector 2A1J3.

5. Check for open on ORT assembly between:

   2W1J1-37 and 2WIP4-58
   2W1J1-36 and 2W1P4-53
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace ORT assembly control panel (TM 1-1270-476-20).

END OF TASK

3-79. ORT ASSEMBLY CONTROL PANEL BORESIGHT ENABLE SWITCH INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23
TM 9-1230-476-20-2

Associated Wiring Interconnect Diagrams:

Fig. 3-88

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - R40 cover removed

1. Set ORT assembly control panel boresight enable switch to up and check for open between P670-30 and P670-31.
   Does open exist?

   YES Go to step 2.
   NO Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.

2. Disconnect P871 from ORT assembly connector 2W1J1 and check for open between 2W1J1-46 and 2W1J1-47.
   Does open exist?

   YES Go to step 3.
   NO Repair open wire. Perform MOC (para 3-6).

3. Check for open on ORT assembly between:

   2W1J1-47 and 2W1P4-52
   2W1J1-46 and 2W1P4-51
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace ORT assembly control panel (TM 1-1270-476-20).

END OF TASK

3-80. ORT ASSEMBLY CONTROL PANEL ACM SWITCH INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23
TM 9-1230-476-20-2

Associated Wiring Interconnect Diagrams:

Fig. 3-73

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Disconnect ORT assembly connector 2W1P4 from ORT control panel connector 2A1J3.

2. Set ORT assembly control panel ACM switch to ACM and check for open between 2A1J3-16 and 2A1J3-15.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 3.

3. Disconnect P871 from ORT assembly connector 2W1J1 and check for open between:

   2W1P1-16 and 2W1J1-42
   2W1P4-15 and 2W1J1-43
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 4.

4. Connect ORT assembly connector 2W1P4 to ORT control panel connector 2A1J3.

5. Check for open between:

   P871-42 and P670-68
   P871-43 and P670-67
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.

END OF TASK

3-81. NIGHT FILTER DOES NOT CHANGE POSITION

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1520-238-T-6
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-46, 3-62

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safe Access provisions - L40 cover removed External power application - electrical

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Check for 28 VDC between P871-77 and P871-78.
   Is 28 VDC present?

   YES Go to step 4.
   NO Go to step 2.

2. Check for 28 VDC between 4J1-87 and 4J1-88 on TADS power supply.
   Is 28 VDC present?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 3.

3-81. NIGHT FILTER DOES NOT CHANGE POSITION (cont)

3. Check for 28 VDC between:

   P849-H and P849-L
   P849-J and P849-L
   P849-K and P849-L
   Is 28 VDC present?

   YES Replace TADS power supply (TM 1-1270-476-20).
   NO Refer to TM 1-1520-238-T-6 to troubleshoot DC essential bus 2-CPG station.

4. Check for open on ORT assembly between:

   2WlJ1-77 and 2W1P1-32
   2WlJ1-78 and 2W1P1-33
   Does open exist?

   YES Replace optical relaycolumn (TM 1-1270-476-20).
   NO Go to step 5.

5. Disconnect ORT assembly connector 2W1P3 from indirect view display connector 2A3J1.

6. Disconnect ORT assembly connector 2W1P4 from ORT assembly control panel connector 2A1J3.

7. Check for open on ORT assembly between 2W1P3- 101 and 2W1P4-27.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 8.

8. Press and hold ORT assembly control panel **NT** switch and check for open between 2A1J3-27 and 2A1J3-72.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 9.

9. Connect ORT assembly connector 2W1P4 to ORT assembly control panel connector 2A1J3.

10. Disconnect ORT assembly connector 2W1P1 from optical relay column connector 2A6J1.

11. Check for open on ORT assembly between:

    2W1P3-38 and 2W1P1-15
    2W1P3-37 and 2W1P1-16
    2W1P3-39 and 2W1P1-17
    Does open exist?

    YES Replace optical relay column (TM 1-1270-476-20).
    NO Replace indirect view display assembly (TM 1-1270-476-20).

12. Replace optical relay column (TM 1-1270-476-20).

END OF TASK

3-82. AND HAS NO CHARACTERS OR BRIGHTNESS CANNOT BE ADJUSTED

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-49, 3-65

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Disconnect ORT assembly connector 2W1P2 from alphanumeric display connector 2A7J1.

2. Measure resistance between ORT assembly 2W1P2-6 and 2W1P2-76 while adjusting ORT assembly control panel **AND BRT** control through entire range.
   Does resistance change?

   YES Replace alphanumeric display (TM 1-1270-476-20).
   NO Go to step 3.

3. Check for open on ORT assembly between 2W1P2-76 and 2W1P4-11.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace ORT assembly control panel (TM 1-1270-476-20).

END OF TASK

3-83. AND CHARACTERS UNSTABLE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-49, 3-52, 3-65

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Disconnect ORT assembly connector 2W1P2 from alphanumeric display connector 2A7J1.

2. Disconnect P871 and check for open on ORT assembly between:

   2W1P2-77 and 2W1J1-9
   2W1P2-36 and 2W1J1-10
   2W1P2-19 and 2W1J1-3
   2W1P2-17 and 2W1J1-4
   2W1P2-56 and 2W1J1-11
   2W1P2-78 and 2W1J1-12
   2W1P2-58 and 2W1J1-5
   2W1P2-57 and 2W1J1-6
   2W1P2-18 and 2W1J1-1
   2W1P2-37 and 2W1J1-2
   2W1P2-38 and 2W1J1-7
   2W1P2-39 and 2W1J1-8
   2W1P2-70 and 2W1J1-13
   2W1P2-34 and 2W1J1-15
   2W1P2-73 and 2W1J1-14
   2W1P2-31 and 2W1J1-16
   2W1P2-22 and 2W1J1-68
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 3.

3. **[TAD]** Check for open on ORT assembly between 2W1J1-67 and 2W1P1-6.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 6.

3-83. AND CHARACTERS UNSTABLE (cont)

4. **[OIP]** Check for open on ORT assembly between 2W1P1-8 and 2W1P2-6.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 5.

5. **[OIP]** Check for open on ORT assembly between 2W1P8-47 and 2W1J1-13.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 6.

6. Connect ORT assembly connector 2W1P2 to alphanumeric display connector 2A7J1.

7. Check for open between:

   P699-9 and P871-9
   P699-8 and P871-10
   P699-16 and P871-3
   P699-15 and P871-4
   P699-20 and P871-11
   P699-19 and P871-12
   P699-11 and P871-5
   P699-10 and P871-6
   P699-24 and P871-1
   P699-23 and P871-2
   P699-13 and P871-7
   P699-12 and P871-8
   P699-14 and P871 backshell
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 8.

8. Check for short between P699-14 and:

   P699-9
   P699-8
   P699-16
   P699-15
   P699-20
   P699-19
   P699-11
   P699-10
   P699-24
   P699-23
   P699-13
   P699-12
   Does short exist?

   YES Repair shorted wire. Perform MOC (para 3-6).
   NO Go to step 9.

9. Check for open between:

   P853-69 and P871-13
   P853-103 and P871-15
   P853-68 and P871-14
   P853-102 and P871-16
   P853-113 and P871-68
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO **[TAD]** Go to step 10.
   [OIP] Replace optical relay column (TM 1-1270-476-20).

10. **[TAD]** Check for open between P853-81 and P871-67.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace optical relay column (TM 1-1270-476-20).

END OF TASK

3-84. AND EDGELIGHTS NOT LIT

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1520-238-T-6
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-65

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed External power application - electrical

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Adjust CPG instrument light control panel **INST** control fully cw.

2. Disconnect P871 from ORT assembly connector 2W1J1.

3. Check for 5 VDC between P871-17 and P871-18.
   Is 5 VDC present?

   YES Go to step 4.
   NO Refer to TM 1-1520-238-T-6 to troubleshoot electrical system.

4. Check for open between ORT assembly connectors:

   2W1P2-33 and 2W1J1-17
   2W1P2-13 and 2W1J1-18
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace alphanumeric display (TM 1-1270-476-20).

END OF TASK

3-85. HOD DISPLAYS SINGLE HORIZONTAL OR VERTICAL LINE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-54

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Disconnect ORT assembly connector 2W4P1 from indirect view display assembly connector 2A3J4.

2. Disconnect ORT assembly connector 2W4P2 from ORT assembly control panel connector 2A1J2.

3. Check for open on ORT assembly between:

   2W4P1-1 and 2W4P2-A
   2W4P1-2 and 2W4P2-B
   2W4P1-3 and 2W4P2-C
   2W4P1-4 and 2W4P2-D
   2W4P1-5 and 2W4P2-E
   2W4P1-6 and 2W4P2-F
   2W4P1-7 and 2W4P2-G
   2W4P1-8 and 2W4P2-H
   2W4P1-10 and 2W4P2-K
   2W4P1-11 and 2W4P2-L
   2W4P1-12 and 2W4P2-M
   2W4P1-14 and 2W4P2-P
   2W4P1-15 and 2W4P2-R
   2W4P1-16 and 2W4P2-S
   2W4P1-17 and 2W4P2-T
   2W4P1-18 and 2W4P2-U
   2W4P1-19 and 2W4P2-V
   2W4P1-20 and 2W4P2-W
   2W4P1-22 and 2W4P2-Y
   2W4P1-23 and 2W4P2-Z
   2W4P1-24 and 2W4P2-a
   2W4P1-30 and 2W4P2-g
   2W4P1-31 and 2W4P2-h
   Does open exist?

YES	Replace optical relay column (TM 1-1270-476-20).
NO	Go to step 4.

4. Check for short on ORT assembly between:

   2W4P1-20 and 2W4P1-21
   2W4P2-W and 2W4P2-X
   Does short exist?

YES	Replace optical relay column (TM 1-1270-476-20).
NO	Replace indirect view display assembly (TM 1-1270-476-20).

END OF TASK

3-86. LEFT HANDGRIP SENSOR SELECT SWITCH INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 9-1230-476-20-2
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-58, 3-59

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Check for open between:

   P871-27 and P681-68
   P871-26 and P681-89
   P871-25 and P681-91
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 2.

2. Disconnect ORT assembly connector 2W1P3 from indirect view display connector 2A3J1.

3. Remove left handgrip (TM 1-1270-476-20) and check for open on ORT assembly between:

   2W1P5-20 and 2W1J1-26
   2W1P1-23 and 2W1J1-25
   2W1P5-21 and 2W1J1-27
   2W1P5-22 and 2W1P3-74
   2W1P5-24 and 2W1P3-73
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO If fault was result of DVO function, go to step 4; otherwise, refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.

4. Check for open on ORT assembly between:

   2W1P3-50 and 2W1P1-10
   2W1P3-51 and 2W1P1-11
   2W1P3-48 and 2W1P1-12
   2W1P3-49 and 2W1P1-13
   2W1P3-36 and 2W1P1-14
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace indirect view display (TM 1-1270-476-20).

END OF TASK

3-87. LEFT HANDGRIP WEAPON ACTION SWITCH (WAS) INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23
TM 9-1230-476-20-2

Associated Wiring Interconnect Diagrams:

Fig. 3-67

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Disconnect P870 from ORT assembly connector 2W1J2.

2. Remove left handgrip (TM 1-1270-476-20) and check for open between:

   2W1P5-18 and 2W1J2-3
   2W1P5-16 and 2W1J2-4
   2W1P5-17 and 2W1J2-6
   2W1P5-19 and 2W1J2-5
   Does open exist?

   YES — Replace optical relay column (TM 1-1270-476-20).
   NO — Go to step 3.

3. Reinstall left handgrip (TM 1-1270-476-20) and check for open between aircraft connectors:

   P870-5 and P279-1
   P870-3 and P281-69
   P870-4 and P281-70
   P870-6 and P279-44
   Does open exist?

   YES — Repair open wire. Perform MOC (para 3-6).
   NO — Refer to TM 9-1230-476-20-2 to troubleshoot fire control system.

END OF TASK

3-88. LEFT HANDGRIP WEAPON TRIGGER SNITCH INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 9-1230-476-20-2
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-67

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Disconnect P870 from ORT assembly connector 2W1J2.

2. Remove left handgrip (TM 1-1270-476-20) and check for open between:

   2W1P5-15 and 2W1J2-16
   2W1P5-13 and 2W1J2-17
   2W1P5-14 and 2W1J2-18
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 3.

3. Reinstall left handgrip (TM 1-1270-476-20) and check for open between:

   P668-55 and P870-17
   P668-39 and P870-18
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 4.

4. Check for open between:

   P870-17 and P281-62
   P870-18 and P281-66
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Refer to TM 9-1230-476-20-2 to troubleshoot fire control system.

END OF TASK

3-89. RIGHT HANDGRIP LT SWITCH INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 9-1230-476-20-2
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-77

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - R40 cover removed

1. Set right handgrip **LT** switch to **MAN** and check for open between:

   P681-112 and P681-111
   P681-112 and P681-113
   Does open exist?

   YES Go to step 3.
   NO Go to step 2.

2. Set right handgrip **LT** switch to **AUTO** and check for open between:

   P681-114 and P681-111
   P861-114 and P681-113
   Does open exist?

   YES Go to step 3.
   NO Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.

3. Check for open between:

   P681-112 and P870-33
   P681-114 and P870-35
   P681-111 and P870-34
   P681-113 and P870-34
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 4.

4. Remove right handgrip (TM 1-1270-476-20) and check for open on ORT assembly between:

   2W1J2-33 and 2W1P6-8
   2W1J2-35 and 2W1P6-9
   2W1J2-34 and 2W1P6-10
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.

END OF TASK

3-90. CPG ORT RIGHT HAND GRIP SLAVE SWITCH INOPERATIVE

INITIAL SETUP

Personnel Required:

68X Aircraft Armament/Electrical Repairer (2)

References:

TM 1-1500-204-23-4
TM 1-1520-238-23
TM 1-1520-238-T-6
TM 1-1520-238-T-10
TM 9-1230-476-20-2
TM 1-1270-476-20
TM 9-1427-475-20

Equipment Conditions:

Ref	Condition
TM 9-1427-475-20 Paragraph 2-14	HME System MOC with TSGMS completed
TM 1-1270-476-20	CPG Right Hand Grip replaced

WARNING

Turn off power before detaching or attaching wires and connectors. High current 28V DC and/or 115V AC are present. Failure to do so could result in death or serious injury.

NOTE

After each troubleshooting step, reconnect connectors to their original configuration.

1. Check for continuity between J2-44 and J2-45 on Optical Relay Tube when the Slave Switch on the Right Hand Grip is depressed.
   Does continuity exist?

   YES Go to step 2.
   NO Replace Optical Relay Tube (TM 1-1270-476-20) Perform HME System MOC with TSGMS.

2. Check for open between:

Optical Relay Tube	CPG MRTU Type III
P870-44	P668-28
P870-45	P668-27

   Does open exist?

   YES Repair open wire (TM 1-1500-204-23-4) Perform HME System MOC with TSGMS.
   NO Go to step 3.

3. Disconnect CPG MRTU Type III connector P668 and check for short between:

Optical Relay Tube	Aircraft Ground
P870-44	Ground
P870-45	Ground

   Does short exist?

   YES Repair shorted wire (TM 1-1500-204-23-4) Perform HME System MOC with TSGMS.
   NO Go to step 4.

4. With CPG MRTU Type III connector P668 disconnected, check for short between Optical Relay Tube connector P870-44 and P870-45.
   Does short exist?

   YES Repair shorted wire (TM 1-1500-204-23-4) Perform HME System MOC with TSGMS.
   NO Repair shorted wire (TM 9-1230-476-20-2) Perform HME System MOC with TSGMS.

END OF TASK

3-91. CANNOT SELECT HDD

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One Person to Assist

References:

TM 1-1270-476-20
TM 9-1230-476-20-2
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-53, 3-54

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed External power application-electrical Access provisions-L40 cover removed

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn power off before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Disconnect optical relay column connector 3W1P3 from indirect view display connector 2A3J1. Connect multimeter between 2W1P3-94 and 2W1P3-95. Depress HOD/HDD switch on right handgrip. **Does short exist?**

   YES Replace indirect view display assembly (TM 1-1270-476-20). If IVD replaced, go to step 2.

   NO Go to step 3.

2. Connect multimeter between P871-51 and P871-50. Place **SYSTEM TADS FLIR/OFF** switch to **FLIR OFF. Is 28 VDC present?**

   YES Troubleshoot multiplex system (TM 9-1230-476-20-2).

   NO Replace optical relay column assembly (TM 1-1270-476-20).

3-91. CANNOT SELECT HDD (cont)

3. Remove right hand-grip (TM 1-1270-476-20) and check for open on ORC assembly between:

   2W1P6-3 and 2W1P3-95
   2W1P6-4 and 2WlP3-94
   Does open exist?

YES	Replace optical relay column (TM 1-1270-476-20).
NO	Replace right hand-grip assembly (TM 1-1270-476-20).

END OF TASK

3-92. DVO/HDD WILL NOT SWITCH

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1520-238-T-6
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-46, 3-59

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn power off before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Check 28 VDC between P871-77 and P871-78.
   Is 28 VDC present?

   YES Go to step 4.
   NO Go to step 2.

2. Check for 28 VDC between 4J1-87 and 4J1-88 on TADS power supply.
   Is 28 VDC present?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 3.

3. Check for 28 VDC between:

   P849-H and P849-L
   P849-J and P849-L
   P849-K and P849-L
   Is 28 VDC present?

   YES Replace TADS power supply (TM 1-1270-476-20).
   NO Refer to TM 1-1520-238-T-6 to troubleshoot DC essential electrical system bus 2-CPG station.
   Perform MOC (para 3-6).

3-92. DVO/HDD WILL NOT SWITCH (cont)

4. Check for open on ORT assembly between:

   2W1J1-77 and 2W1P1-32
   2W1J1-78 and 2W1P1-33
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 5.

5. Remove left handgrip (TM 1-1270-476-20) and set sensor select switch to **DVO.** Check for open between 2A4J1-22 and 2A4J1-24.
   Does open exist?

   YES Replace left handgrip (TM 1-1270-476-20).
   NO Go to step 6.

6. Disconnect ORT assembly connector 2W1P3 from indirect view display connector 2A3J1.

7. Check for open on ORT assembly between:

   2W1P5-22 and 2W1P3-74
   2W1P5-24 and 2W1P3-73
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 8.

8. Disconnect ORT assembly connector 2W1P1 from optical relay column connector 2A2J1.

9. Check for open on ORT assembly between:

   2W1P3-50 and 2W1P1-10
   2W1P3-51 and 2W1P1-11
   2W1P3-48 and 2W1P1-12
   2WlP3-49 and 2W1P1-13
   2W1P3-36 and 2W1P1-14
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace indirect view display assembly (TM 1-1270-476-20).

END OF TASK

3-93. VIDEO RECORDER DOES NOT RECORD SELECTED VIDEO

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23
TM 9-1230-476-20-2

Associated Wiring Interconnect Diagrams:

Fig. 3-68

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - R40 cover removed

1. Remove right handgrip (TM 1-1270-476-20) and check for open on ORT assembly between:

   2W1P6-1 and P670-29
   2W1P6-2 and P670-28
   Does open exist?

   YES Go to step 2.
   NO Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.

2. Check for open between:

   P670-29 and P870-31
   P670-28 and P870-32
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace optical relay column (TM 1-1270-476-20).

END OF TASK

3-94. TADS BRAKE RELEASE DOES NOT OPERATE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS Turret Continuity Test Set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1520-238-T-6
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-66

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect azimuth gimbal assembly connector 1A4W1P4 from TADS turret assembly connector 1A1W2J7.

3. Disconnect TADS turret assembly connector 1A1W2P2 from TADS electronic control amplifier connector 1A2J2.

4. Check for open on TADS turret assembly between 1A1W2P2-11 and 1A1W2J7-67.
   Does open exist?

   YES Go to step 8.
   NO Go to step 5.

5. Disconnect P843 and check for open on TADS turret assembly 1A1W2J4-50 and 1A1W2J7-48.
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 6.

6. Hold brake release switch in position to turn TADS turret and check for open between 1A1W2J4-48 and 1A1W2J7-67.
   Does open exist?

   YES Go to step 8.
   NO Go to step 7.

3-94. TADS BRAKE RELEASE DOES NOT OPERATE (cont)

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn power off before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

7. Check for 28 VDC between P843-48 and P843-50.
   Is 28 VDC present?

YES	Go to step 8.
NO	Refer to TM 1-1520-238-1-6 to troubleshoot DC essentialbus 2-CPG station.

8. Connect azimuth gimbal assembly connector 1A1W1P4 to TADS turret assembly connector 1A1W2J7.

9. Connect TADS turret assembly connector 1A1W2P2 to TADS electronic control amplifier connector 1A2J2.

10. Disconnect TADS turret assembly brake release switch assembly connector 1A1A4P1 from TADS turret assembly connector 1A1W2J14.

11. Check for open on switch assembly between 1A1A4P1-8 and 1A1A4P1-7.
    Does open exist?

YES	Replace switch assembly 1A1A4 (TM 1-1270-476-20).
NO	Go to step 12.

12. Hold brake release switch in position to turn TADS turret and check for open between 1A1A4P1-6 and 1A1A4P1-7.
    Does open exist?

YES	Replace switch assembly 1A1A4 (TM 1-1270-476-20).
NO	Replace TADS turret assembly (TM 1-1270-476-30).

END OF TASK

3-95. NO DVO RETICLE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagram:

Fig. 3-48, 3-49, 3-64, 3-69

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Remove ORT assembly control panel (TM 1-1270-476-20) and check for open on ORT assembly between 2W1J1-31 and 2W1P4-7.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 2.

2. Measure resistance between ORT assembly control panel connectors 2A1J3-3 and 2A1J3-7 while adjusting SY193BRT control through entire range.
   Does resistance change?

   YES Go to step 3.
   NO Replace control panel (TM 1-1270-476-20).

3. Measure resistance between ORT assembly control panel connectors 2A1J3-2 and 2A1J3-7 while adjusting SYMB BRT control through entire range.
   Does resistance change?

   YES Go to step 4.
   NO Replace control panel (TM 1-1270-476-20).

4. Check for open between P871-31 and P668-66.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 5.

5. Check for open between:

   P670-12 and P843-72
   P670-11 and P843-71
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 6.

3-95. NO DVO RETICLE (cont)

6. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 7.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

7. Check for open on TADS turret assembly between:

   1A1W2J4-72 and 1A1W2J10-76
   1A1W2J4-71 and 1A1W2J10-57
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Replace day sensor subassembly (TM 1-1270-476-20).

END OF TASK

3-96. NO DVO RETICLE BRIGHTNESS CONTROL WITH DVO SCENE NORMAL

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-69

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Remove control panel assembly (TM 1-1270-476-20) and check for open on ORT assembly between 2W1J1-31 and 2W1P4-7.
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 2.

2. Measure resistance between ORT assembly control panel connectors 2A1J3-3 and 2A1J3-7 while adjusting SYMB BRT control through entire range.
   Does resistance change?

   YES Go to step 3.
   NO Replace control panel (TM 1-1270-476-20).

3. Measure resistance between ORT assembly control panel connectors 2A1J3-2 and 2A1J3-7 while adjusting SWBRT control through entire range.
   Does resistance change?

   YES Go to step 4.
   NO Replace control panel (TM 1-1270-476-20).

4. Check for open between P871-31 and P668-66.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 5.

5. Check for open between:

   P670-12 and P843-72
   P670-11 and P843-71
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 6.

3-96. NO DVO RETICLE BRIGHTNESS CONTROL WITH DVO SCENE NORMAL (cont)

6. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 7.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

7. Disconnect azimuth gimbal assembly connector 1A4W1P1 from TADS turret assembly connector 1A1W2J10.

8. Check for open on TADS turret assembly between:

   1A1W2J4-72 and 1A1W2J10-76
   1A1W2J4-71 and 1A1W2J10-57
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Replace day sensor subassembly (TM 1-1270-476-20).

END OF TASK

3-97. DVO RETICLE POSITION CHANGES AS TURRET SLEWS

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-70

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Check for open between:

   P853-1 and P870-60
   P853-28 and P870-61
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 2.

2. Check for open on ORT assembly between:

   2W1J2-60 and 2W1P3-69
   2W1J2-61 and 2W1P3-68
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 3.

3. Check for open on ORT assembly between:

   2W1P3-67 and 2W1P1-24
   2W1P3-66 and 2W1P1-25
   2W1P3-84 and 2W1P1-26
   2W1P3-59 and 2W1P1-27
   2W1P3-31 and 2W1P1-22
   2W1P3-30 and 2W1P1-23
   2W1P3-56 and 2W1P1-28
   2W1P3-57 and 2W1P1-29
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace indirect view display (TM 1-1270-476-20).

END OF TASK

3-98. DVO SCENE IS NOT UPRIGHT

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-70

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Check for open between:

   P853-1 and P870-60
   P853-28 and P870-61
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 2.

2. Check for open on ORT assembly between:

   2W1J2-60 and 2W1P3-69
   2H1J2-61 and 2W1P3-68
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 3.

3. Check for open on ORT assembly between:

   2W1P3-67 and 2W1P1-24
   2WlP3-66 and 2W1P1-25
   2W1P3-84 and 2W1P1-26
   2W1P3-59 and 2W1P1-27
   2W1P3-31 and 2W1P1-22
   2WlP3-30 and 2W1P1-23
   2W1P3-56 and 2W1P1-28
   2W1P3-57 and 2W1P1-29
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace indirect view display (TM 1-1270-476-20).

END OF TASK

3-99. HAZE/GLARE FILTER DOES NOT CHANGE POSITION

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1520-238-T-6
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-46, 3-71

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed External power application -external

WARNING

- Lethal voltage is exposed in this fault Isolation procedure. Death on contact may result if personnel fall to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Check for 28 VDC between P871-77 and P871-78.
   Is 28 VDC present?

   YES Go to step 5.
   NO Go to step 2.

2. Disconnect P848 from TADS power supply connector 4J1.

3-99. HAZE/GLARE FILTER DOES NOT CHANGE POSITION (cont)

3. Check for 28 VDC on TADS power supply between 4J1-87 and 4J1-88.
   Is 28 VDC present?

   YES Go to step 4.
   NO Replace TADS power supply (TM 1-1270-476-20).

4. Check for 28 VDC between:

   P849-H and P849-L
   P849-J and P849-L
   P849-K and P849-L
   Is 28 VDC present?

   YES Replace TADS power supply (TM 1-1270-476-20).
   NO Refer to TM 1-1520-238-T-6 to troubleshoot DC essential bus 2-CPG station.

5. Check for open on ORT assembly between:

   2W1J1-77 and 2W1P1-32
   2W1J1-78 and 2W1P1-33
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 6.

6. Remove ORT assembly control panel (TM 1-1270-476-20) and set control panel **FLTR SEL** switch to **[TAD] HAZE/GLARE**, **[OIP] HZ-GL**. Check for open between 2A1J3-26 and 2A1J3-63.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 7.

7. Set control panel **FLTR SEL** switch to **CLEAR**. Check for open between 2A1J3-23 and 2A1J3-63.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 8.

8. Set control panel **FLTR SEL** switch to **[TAD] HAZE**, **[OIP] HZ**. Check for open between 2A1J3-24 and 2A1J3-63.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 9.

9. Set control panel **FLTR SEL** switch to **[TAD] GLARE**, **[OIP] GL**. Check for open between 2A1J3-25 and 2A1J3-63.
   Does open exist?

   YES Replace ORT assembly control panel (TM 1-1270-476-20).
   NO Go to step 10.

10. Check for open on ORT assembly between:

    2W1P4-26 and 2W1P3-80
    2W1P4-23 and 2W1P3-79
    2W1P4-24 and 2W1P3-82
    2W1P4-25 and 2W1P3-81
    2W1P4-63 and 2W1P3-83
    Does open exist?

    YES Replace optical relay column (TM 1-1270-476-20).
    NO Replace indirect view display (TM 1-1270-476-20).

END OF TASK

3-100. DTV FOV WILL NOT CHANGE; HOWEVER, FLIR FOV CHANGES PROPERLY

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-69

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

NOTE

If DVO FOV changes properly, go to step 5. If DVO and DTV will not change, go to step 1.

1. Using TADS continuity test set, test TADS azimuth gimbal assembly wire harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect P843 from TADS turret assembly connector 1A1W2J4.

3. Check for open on TADS turret assembly between:

   1A1W2J10-8 and 1A1W2J4-73
   1A1W2J10-28 and 1A1W2J4-74
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 4.

4. Check for open between:

   P843-73 and P861-115
   P843-74 and P861-106
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 5.

5. Check for open between:

   P845-55 and P863-115
   P845-56 and P863-110
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace day sensor subassembly (TM 1-1270-476-20).

END OF TASK

3-101. NO DTV VIDEO

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-60

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wire harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect day sensor assembly connector 1A5W1P7 from TV sensor connector 1A5A3J1.

3. Disconnect day sensor assembly connector 1A5W1P1 from azimuth gimbal assembly connector 1A4W1J1.

4. Check for open on day sensor assembly between:

   1A5W1P7-1 and 1A5W1P1-6
   1A5W1P7-14 and 1A5W1P1-25
   Does open exist?

   YES Replace day sensor subassembly (TM 1-1270-476-20)
   NO Go to step 5.

5. Check for short on DSA between:

   1A5W1P7-2 and 1A5W1P7-1
   1A5W1P7-2 and 1A5W1P7-14
   1A5W1P1-26 and 1A5W1P1-6
   1A5W1P1-26 and 1A5W1P1-25
   Does short exist?

   YES Replace day sensor subassembly (TM 1-1270-476-20).
   NO Go to step 6.

6. Connect day sensor assembly connector 1A5W1P7 to TV sensor connector 1A5A3J1.

7. Connect day sensor assembly connector 1A5W1P1 to azimuth gimbal assembly connector 1A4W1J1.

8. Disconnect P844 from TADS turret assembly connector 1A1W2J5.

3-101. NO DTV VIDEO (cont)

9. Check for open on TADS turret assembly between:

   1A1W2J10-6 and 1A1W2J5-34 12.
   1A1W2J10-25 and 1A1W2J5-33
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 10.

10. Check for open between:

    P844-34 and P861-47
    P844-33 and P861-44
    Does open exist?

    YES Repair open wire.
    Perform MOC (para 3-6).
    NO Go to step 11.

11. Connect P844 to TADS turret assembly connector 1A1W2J5.

12. Check for open between P852-1 and P631-3.
    Does open exist?

    YES Repair open wire.
    Perform MOC (para 3-6).
    NO Go to step 13.

13. Check for short between:

    P852-1 and P852-1S
    P861-3 and P861-3S
    Does short exist?

    YES Repair shorted wire.
    Perform MOC (para 3-6).
    NO Replace TV sensor (TM 1-1270-476-20).

END OF TASK

3-102. DTV RANGE FOCUS INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-61

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using the TADS turret continuity test set, test TADS azimuth gimbal assembly wire harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Check for open between:

   P670-23 and P843-77
   P670-22 and P843-78
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 3.

3. Check for open on TADS turret assembly between:

   1A1W2J4-77 and 1A1W2J9-12
   1A1W2J4-78 and 1A1W2J9-31
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Replace day sensor subassembly (TM 1-1270-476-20).

END OF TASK

3-103. NO FLIR VIDEO (WITH SYMBOL GENERATOR OPERATIONAL)

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-60

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect P845 from TADS turret assembly connector 1A1W2J6.

3. Check for open on TADS turret assembly between:

   1A1W2J11-7 and 1A1W2J6-25
   1A1W2J11-27 and 1A1W2J6-26
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 4.

4. Check for open between:

   P845-25 and P853-14
   P845-26 and P853-7
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 5.

5. Connect P845 to TADS turret assembly connector 1A1W2J6.

6. Check for open between P857-1 and P631-2.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace TADS electronic unit (TM 1-1270-476-20).

END OF TASK

3-104. NO FLIR VIDEO (WITH SYMBOL GENERATOR INOPERATIVE)

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-54, 3-60

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Check for short between:

   P851-1S and P851 backshell
   P868-1S and P868 backshell
   Does short exist?

   YES Repair shorted wire. Perform MOC (para 3-6).
   NO Go to step 2.

2. Check for open between:

   P851-1 and P868-1
   P851-1S and P868-1S
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 3.

3. Disconnect ORT assembly connector 2W3P1 from indirect view display connector 2A3J3.

4. Check for open on ORT assembly between:

   2W3J4-1 and 2W3P1-B
   2W3J4-1S and 2W3P1-backshell
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace indirect view display (TM 1-1270-476-20).

END OF TASK

3-105. FLIR POLARITY WILL NOT CHANGE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-73

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wire harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect P845 from TADS turret assembly connector 1A1W2J6.

3. Check for open on TADS turret assembly between:

   1A1W2J11-19 and 1A1W2J6-24
   1A1W2J11-36 and 1A1W2J6-17
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 4.

4. Check for open between:

   P845-24 and P670-58
   P845-17 and P670-55
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace night sensor assembly (TM 1-1270-476-20).

END OF TASK

3-106. ACM DOES NOT WORK

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-73

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret assembly continuity test set, test TADS azimuth gimbal assembly wire harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect P845 from TADS turret assembly connector 1A1W2J6.

3. Check for open on TADS turret assembly between:

   1A1W2J11-16 and 1A1W2J6-19
   1A1W2J11-36 and 1A1W2J6-17
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 4.

4. Check for open between:

   P845-19 and P670-57
   P845-17 and P670-55
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace night sensor assembly (TM 1-1270-476-20).

END OF TASK

3-107. FLIR IMAGE WILL NOT CHANGE BY ORT ASSEMBLY CONTROL PANEL LVL AND GAIN CONTROLS

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 9-1230-476-20-2
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-73

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wire harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect P845 from TADS turret assembly connector 1A1W2J6.

3. Check for open on TADS turret assembly between:

   1A1W2J11-18 and 1A1W2J6-22
   1A1W2J11-38 and 1A1W2J6-23
   1A1W2J11-17 and 1A1W2J6-20
   1A1W2J11-37 and 1A1W2J6-21
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 4.

4. Check for open between:

   P845-22 and P670-17
   P845-23 and P670-16
   P845-20 and P670-35
   P845-21 and P670-34
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.

END OF TASK

3-108. ORT ASSEMBLY CONTROL PANEL LVL OR GAIN CONTROL INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 9-1230-476-20-2
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-73

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Check for open between:

   P668-79 and P871-32
   P668-57 and P871-33
   P668-67 and P871-34
   P668-56 and P871-34
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 2.

2. Check for short between:

   P871-41 and P871-32
   P871-41 and P871-33
   P871-41 and P871-34
   Does short exist?

   YES Repair shorted wire. Perform MOC (para 3-6).
   NO Go to step 3.

3. Disconnect ORT assembly connector 2W1P4 from ORT assembly control panel connector 2A1J3.

4. Check for open between:

   2W1J1-32 and 2W1P4-9
   2W1J1-33 and 2W1P4-10
   2W1J1-34 and 2W1P4-8
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Go to step 5.

5. Measure resistance between ORT assembly control panel connectors 2A1J3-9 and 2A1J3-8 while adjusting **LVL** control through entire range. **Does resistance change?**

   YES Go to step 6.
   NO Replace ORT assembly control panel (TM 1-1270-476-20).

6. Measure resistance between ORT assembly control panel connectors 2A1J3-10 and 2A1J3-8 while adjusting **GAIN** control through entire range. **Does resistance change?**

   YES Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.
   NO Replace ORT assembly control panel (TM 1-1270-476-20).

END OF TASK

3-109. LASER WILL NOT FIRE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer
One person to assist

References:

TM 1-1270-476-20
TM 1-1520-238-T-6
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-44, 3-50, 3-86

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed External power application - electrical Access provisions - L90 door opened

WARNING

- Lethal voltage is exposed in this fault isolation procedure. Death on contact may result if personnel fail to observe the following safety precautions.
- Remove watches and rings and exercise extreme caution when measuring voltages throughout this procedure.
- Turn off power before disconnecting or connecting wires and connectors. High current 28 VDC or 115 VAC is present. Failure to do so could result in death or serious injury.

CAUTION

Voltage measured during this fault isolation procedure can damage electronic equipment connected to adjacent connector pins. Make sure that test equipment does not contact surrounding connector pins during voltage measurements.

1. Check for 115 VAC between:

   P867-8 and P867-21
   P867-9 and P867-21
   P867-22 and P867-21
   Is 115 VAC present?

YES	Go to step 2.
NO	Refer to TM 1-1520-238-T-6 to troubleshoot AC essential bus 1-CPG station.

3-109. LASER WILL NOT FIRE (cont)

2. Pull and hold right handgrip LASER TRIG switch to second detent. Check for open between:

   P870-38 and P870-39
   P870-38 and P870-40
   P870-38 and P870-51
   P870-38 and P870-52
   Does open exist?

   YES Go to step 3.
   NO Go to step 4.

3. Remove right handgrip (TM 1-1270-476-20). Pull and hold right handgrip LASER TRIG switch to second detent. Check for open between right handgrip connectors:

   2A5J1-7 and 2A5J1-5
   2A5J1-7 and 2A5J1-6
   2A5J1-7 and 2A5J1-13
   2A5J1-7 and 2A5J1-19
   Does open exist?

   YES Replace right handgrip (TM 1-1270-476-20).
   NO Replace optical relay column (TM 1-1270-476-20).

4. Check for open between P870-38 and P279-43.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 5.

5. Using the TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A41W1good?

   YES Go to step 6.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

6. Check for open between:

   P870-51 and P862-128
   P870-52 and P863-7
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 7.

7. Check for open between:

   P862-81 and P673-74
   P862-79 and P673-73
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 8.

8. Check for open between:

   P845-64 and P853-83
   P845-65 and P853-84
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 9.

9. Check for open on TADS turret assembly between:

   1A1W2J11-48 and 1A1W2J6-64
   1A1W2J11-68 and 1A1W2J6-65
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 10.

3-109. LASER WILL NOT FIRE (cont)

10. Check for open between:

    P861-10 and P867-29
    P861-18 and P867-28
    P864-t and P845-88
    P864-g and P845-87
    Does open exist?

    YES Repair open wire.
    Perform MOC (para 3-6).
    NO Go to step 11.

11. Check for open between P863-29 and P867-17.
    Does open exist?

    YES Repair open wire.
    Perform MOC (para 3-6).
    NO Go to step 12.

12. Check for open between:

    P853-111 and P867-26
    P853-110 and P867-24
    P853-109 and P867-11
    Does open exist?

    YES Repair open wire.
    Perform MOC (para 3-6).
    NO Go to step 13.

13. Check for open between P862-56 and P867-10.
    Does open exist?

    YES Repair open wire.
    Perform MOC (para 3-6).
    NO Go to step 14.

14. Check for open between:

    P864-b and P845-86
    P864-c and P845-108
    P864-G and P845-107
    P864-H and P845-97
    P864-f and P845-98
    P864-j and P845-91
    P864-R and P845-101
    P864-J and P845-96
    Does open exist?

    YES Repair open wire.
    Perform MOC (para 3-6).
    NO Go to step 15.

15. Check for open on TADS turret assembly between:

    1A1W2J6-86 and 1A1W2J10-67
    1A1W2J6-108 and 1A1W2J10-46
    1A1W2J6-107 and 1A1W2J10-65
    1A1W2J6-97 and 1A1W2J10-66
    1A1W2J6-98 and 1A1W2J10-47
    1A1W2J6-91 and 1A1W2J10-73
    1A1W2J6-101 and 1A1W2J10-54
    1A1W2J6-96 and 1A1W2J10-51
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Replace laser transceiver unit (TM 1-1270-476-20).

END OF TASK

3-110. NO LASER RANGE READOUT AND/OR UPDATE FROM LASER

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20

TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-86

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 cover removed

1. Disconnect P870 from ORT assembly connector 2W1J2.

2. Pull and hold ORT assembly right handgrip LASER TRIG switch to first detent and check for open between:

   2W1J2-38 and 2W1J2-39
   2W1J2-38 and 2W1J2-51
   Does open exist?

   YES Go to step 3.
   NO Go to step 4.

3. Remove right handgrip (TM 1-1270-476-20). Pull and hold right handgrip LASER TRIG switch to first detent and check for open between:

   2A5J1-7 and 2A5J1-5
   2A5J1-7 and 2A5J1-13
   Does open exist?

   YES Replace right handgrip (TM 1-1270-476-20).
   NO Replace optical relay column (TM 1-1270-476-20).

4. Check for open between P870-51 and P862-128.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 5.

5. Check for open between P853-111 and P867-26.
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Go to step 6.

6. Check for open between:

   P867-12 and P862-24
   P867-13 and P862-19
   P867-3 and P862-47
   P867-4 and P862-57
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace laser electronic unit (TM 1-1270-476-20).

END OF TASK

3-111. LASER TRIGGER SECOND DETENT INOPERATIVE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-86, 3-87

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed Access provisions - L40 & R40 covers removed

1. Disconnect P870 from ORT assembly connector 2W1J2.

2. Check for open between P870-40 and P668-36.
   Does open exist?

   YES Repair open wire.
        Perform MOC (para 3-6).
   NO   Go to step 3.

3. Pull and hold ORT assembly right handgrip LASER TRIG switch in second detent and check for open between ORT assembly connectors:

   2W1J2-38 and 2W1J2-40
   2W1J2-38 and 2W1J2-52
   Does open exist?

   YES Go to step 4.
   NO   Go to step 5.

4. Remove right handgrip (TM 1-1270-476-20). Pull and hold right handgrip LASER TRIG in second detent and check for open between:

   2A5J1-7 and 2A5J1-6
   2A5J1-7 and 2A5J1-19
   Does open exist?

   YES Replace right handgrip (TM 1-1270-476-20).
   NO   Replace optical relay column (TM 1-1270-476-20).

5. Check for open between P870-52 and P863-7.
   Does open exist?

   YES Repair open wire.
        Perform MOC (para 3-6).
   NO   Go to step 6.

6. Check for open between P853-110 and P867-24.
   Does open exist?

   YES Repair open wire.
        Perform MOC (para 3-6).
   NO   Replace TADS electronic unit (TM 1-1270-476-20).

END OF TASK

3-112. UNABLE TO FIRE LASER DURING BORESIGHT

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 9-1230-476-20-2
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-88

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Check for open between:

   P867-31 and P853-90
   P867-32 and P853-91
   P867-26 and P853-111
   Does open exist?

   YES Repair open wire.
   Perform MOC (para 3-6).
   NO Go to step 2.

2. Set ORT assembly control panel boresight enable switch to up. Check for open between P670-30 and P670-31.
   Does open exist?

   YES Go to step 3.
   NO Refer to TM 9-1230-476-20-2 to troubleshoot multiplex system.

3. Check for open on ORT assembly between 2W1J1-46 and 2W1J1-47.
   Does open exist?

   YES Go to step 4.
   NO Repair open wire.
   Perform MOC (para 3-6).

4. Check for open on ORT assembly between:

   2W1J1-47 and 2W1P4-52
   2W1J1-46 and 2W1P4-51
   Does open exist?

   YES Replace optical relay column (TM 1-1270-476-20).
   NO Replace ORT assembly control panel (TM 1-1270-476-20).

END OF TASK

3-113. DVO CROSSHAIRS WILL NOT MOVE DURING BORESIGHT

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-46, 3-88

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect P844 from TADS turret assembly connector 1A1W2J5.

3. Hold ORT assembly control panel DVO boresight adjust switch up and check for open between P844-90 and P844-20.
   Does open exist?

   YES Go to step 13.
   NO Go to step 4.

4. Hold ORT assembly control panel DVO boresight adjust switch down and check for open between P844-89 and P844-20.
   Does open exist?

   YES Go to step 15.
   NO Go to step 5.

5. Hold ORT assembly control panel DVO boresight adjust switch up and check for open between P844-89 and P844-21.
   Does open exist?

   YES Go to step 13.
   NO Go to step 6.

6. Hold ORT assembly control panel DVO boresight adjust switch down and check for open between P844-90 and P844-21.
   Does open exist?

   YES Go to step 15.
   NO Go to step 7.

7. Connect P844 to TADS turret assembly connector 1A1W2J5.

3-113. DVO CROSSHAIRS WILL NOT MOVE DURING BORESIGHT (cont)

8. Disconnect day sensor assembly connectors 1A5W1P1 and 1A5W1P2 from azimuth gimbal assembly connectors 1A4W1J1 and 1A4W1J3, respectively.

9. Hold ORT assembly control panel DVO boresight adjust switch up and check for open on azimuth gimbal assembly between 1A4W1J3-20 and 1A4W1J1-43.
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 10.

10. Hold ORT assembly control panel DVO boresight adjust switch down and check for open on azimuth gimbal assembly between 1A4W1J3-39 and 1A4W1J1-43.
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 11.

11. Hold ORT assembly control panel DVO boresight adjust switch up and check for open on azimuth gimbal assembly between 1A4W1J3-39 and 1A4W1J1-63.
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 12.

12. Hold ORT assembly control panel DVO boresight adjust switch down and check for open on azimuth gimbal assembly between 1A4W1J3-20 and 1A4W1J1-63.
    Does open exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Replace day sensor subassembly (TM 1-1270-476-20).

13. Disconnect P871 from ORT assembly connector 2W1J1.

14. Hold ORT assembly control panel DVO boresight adjust switch up and check for open on ORT assembly between 2W1J1-49 and 2W1J1-78.
    Does open exist?

    YES Go to step 15.
    NO Repair open wire between P871-49 and P844-90 or P871-78 and P844-73. Perform MOC (para 3-6).

15. Disconnect P871 from ORT assembly connector 2W1J1.

3-113. DVO CROSSHAIRS WILL NOT MOVE DURING BORESIGHT (cont)

16. Hold ORT assembly control panel DVO boresight adjust switch down and check for open on ORT assembly between 2W1J1-48 and 2W1J1-78.
Does open exist?

YES	Go to step 20.
NO	Repair open wire between P871-48 and P844-78. Perform MOC (para 3-6).

17. Disconnect P871 from ORT connector 2W1J1.

18. Hold ORT assembly control panel DVO boresight adjust switch up and check for open on ORT assembly between 2W1J1-49 and 2W1J1-78.
Does open exist?

YES	Go to step 20.
NO	Repair open wire between P871-49 and P844-90. Perform MOC (para 3-6).

19. Hold ORT assembly control panel DVO boresight adjust switch down and check for open on ORT assembly between 2W1J1-48 and 2W1J1-77.
Does open exist?

YES	Go to step 20.
NO	Repair open wire between P871-48 and P844-89. Perform MOC (para 3-6).

20. Disconnect ORT assembly connector 2W1P4 from control panel connector 2A1J1.

21. Check for open on ORT assembly connectors between:

2W1P4-57 and 2W1J1-49
2W1P4-56 and 2W1J1-48
2W1P4-61 and 2W1J1-78
2W1P4-60 and 2W1J1-77
Does open exist?

YES	Replace optical relay column (TM 1-1270-476-20).
NO	Replace control panel (TM 1-1270-476-20).

END OF TASK

3-114. CANNOT BORESIGHT DVO RETICLE

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-88

Equipment Conditions:

Ref	Condition
TM 1-1270-476-20	Day TV Internal boresight successful
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect P843 from TADS turret assembly connector 1A1W2J4.

3. Check for open on TADS turret assembly between:

   1A1W2J4-79 and 1A1W2J10-7
   1A1W2J4-80 and 1A1W2J10-27
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 4.

4. Check for open between:

   P843-79 and P862-119
   P843-80 and P862-126
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace day sensor subassembly (TM 1-1270-476-20).

END OF TASK

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP

INITIAL SETUP

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 3-44, 3-45, 3-45, 3-47, 3-48, 4-12

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using the TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Check for short between P849 backshell and:

   P849-d
   P849-e
   P849-f
   Does short exist?

   YES Go to step 3.
   NO Go to step 6.

3. Check for short on TADS turret assembly between 1A1W2J3 backshell and:

   1A1W2J3-g
   1A1W2J3-h
   1A1W2J3-k
   Does short exist?

   YES Go to step 4.
   NO Repair shorted wire. Perform MOC (para 3-6).

4. Disconnect TADS turret assembly connector 1A1W2P3 from environmental control system connector 1A1A1J1.

5. Check for short on environmental control system between 1A1A1J1 backshell and:

   1A1A1J1-10
   1A1A1J1-11
   1A1A1J1-13
   1A1A1J1-14
   1A1A1J1-16
   1A1A1J1-17
   Does short exist?

   YES Replace TADS environmental control system (TM 1-1270-476-20).
   NO Replace TADS turret assembly (TM 1-1270-476-30).

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

6. Check for short between P848 backshell and P848-119.
   Does short exist?

   YES Go to step 7.
   NO Go to step 10.

7. Check for short on TADS turret assembly between 1A1W2J3 backshell and 1A1W2J3-G.
   Does short exist?

   YES Go to step 8.
   NO Repair shorted wire. Perform MOC (para 3-6).

8. Disconnect TADS turret assembly connector 1A1W2P5 from boresight module connector 1A1A3J1.

9. Check for short on boresight module between 1A1A3J1 backshell and 1A1A3J1-22.
   Does short exist?

   YES Replace TADS boresight module (TM 1-1270-476-20).
   NO Replace TADS turret assembly (TM 1-1270-476-30).

10. Check for short between P848 backshell and:

    P848-69
    P848-80
    P848-91
    Does short exist?

    YES Go to step 11.
    NO Go to step 20.

11. Check for short on ORT assembly between 2W1J1 backshell and:

    2W1J1-73
    2W1J1-74
    2W1J1-75
    Does short exist?

    YES Replace optical relay column (TM 1-1270-476-20).
    NO Go to step 12.

12. Check for short on TADS turret assembly between 1A1W2J6 backshell and:

    1A1W2J6-81
    1A1W2J6-30
    Does short exist?

    YES If 1A1W2J6-30 is shorted, go to step 13 below; otherwise, go to step 15 below.
    NO Repair shorted wire. Perform MOC (para 3-6).

13. Disconnect night sensor assembly connector 1A3W10P1 from azimuth gimbal assembly connector 1A4W1J2.

14. Check for short on night sensor assembly between 1A3W10P1 backshell and 1A3W10P1-54.
    Does short exist?

    YES Replace TADS night sensor assembly (TM 1-1270-476-20).
    NO Replace TADS turret assembly (TM 1-1270-476-30).

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

15. Disconnect azimuth gimbal assembly connector 1A4W1P10 from laser transceiver unit connector 5A1J1.

16. Check for short on laser transceiver unit between 5A1J1 backshell and 5A1J1-26.
Does short exist?

    YES Replace TADS laser transceiver unit (TM 1-1270-476-20).
    NO Go to step 17.

17. Connect azimuth gimbal assembly connector 1A4W1P10 to laser transceiver unit connector 5A1J1.

18. Disconnect day sensor assembly connector 1A5W1P1 from azimuth gimbal assembly connector 1A4W1J1.

19. Check for short on day sensor assembly between 1A5W1P1 backshell and 1A5W1P1-50.
Does short exist?

    YES Replace day sensor subassembly (TM 1-1270-476-20).
    NO Replace TADS turret assembly (TM 1-1270-476-30).

20. Check for short between P848 backshell and P848-92.
Does short exist?

    YES Go to step 21.
    NO Go to step 22.

21. Check for short on TADS electronic unit between 3J9 backshell and 3J9-119.
Does short exist?

    YES Replace TADS electronic unit (TM 1-1270-476-20).
    NO Repair shorted wire. Perform MOC (para 3-6).

22. Check for short between P848 backshell and:

    P848-117
    P848-81
    P848-19
Does short exist?

    YES Go to step 23.
    NO Go to step 24.

23. Check for short on TADS turret assembly between 1A1W2J3 backshell and:

    1A1W2J3-E
    1A1W2J3-a
    1A1W2J3-BB
Does short exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Repair shorted wire. Perform MOC (para 3-6).

24. Check for short between P848 backshell and P848-35.
Does short exist?

    YES Go to step 25.
    NO Go to step 28.

25. Check for short on TADS turret assembly between 1A1W2J6 backshell and 1A1W2J6-34.
Does short exist?

    YES Go to step 26.
    NO Repair shorted wire. Perform MOC (para 3-6).

26. Disconnect night sensor assembly connector 1A3W10P1 from azimuth gimbal assembly connector 1A4W1J2.

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

27. Check for short on night sensor assembly between 1A3W10P1 backshell and 1A3W10P1-1.
    Does short exist?

    YES Replace TADS night sensor assembly (TM 1-1270-476-20).
    NO Replace TADS turret assembly (TM 1-1270-476-30).

28. Check for short between P848 backshell and:

    P848-87
    P848-36
    P848-26
    Does short exist?

    YES Go to step 29.
    NO Go to step 36.

29. Check for short on ORT assembly between 2W1J1 backshell and 2W1J1-77.
    Does short exist?

    YES Replace optical relay column (TM 1-1270-476-20).
    NO Go to step 30.

30. Check for short on TADS turret assembly between 1A1W2J5 backshell and 1A1W2J5-21.
    Does short exist?

    YES Go to step 31.
    NO Repair shorted wire. Perform MOC (para 3-6).

31. Disconnect day sensor assembly connector 1A5W1P1 from azimuth gimbal assembly connector 1A4W1J1.

32. Check for short on day sensor assembly between 1A5W1P1 backshell and 1A5W1P1-63.
    Does short exist?

    YES Go to step 33.
    NO Replace TADS turret assembly (TM 1-1270-476-30).

33. Connect day sensor assembly connector 1A5W1P1 to azimuth gimbal assembly connector 1A4W1J1.

34. Disconnect day sensor assembly connector 1A5W1P4 from laser tracker receiver 1A5A2J1.

35. Check for short on laser tracker/receiver between 1A5A2J1 backshell and 1A5A2J1-28.
    Does short exist?

    YES Replace laser tracker receiver (TM 1-1270-476-20).
    NO Replace day sensor subassembly (TM 1-1270-476-20).

36. Check for short between P849 backshell and:

    P849-h
    P849-v
    P849-w
    Does short exist?

    YES Go to step 37.
    NO Go to step 43.

37. Check for short on TADS turret assembly between 1A1W2J3 backshell and 1A1W2J3-f.
    Does short exist?

    YES Go to step 38.
    NO Go to step 40.

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

38. Disconnect TADS turret assembly connector 1A1W2P3 from environmental control system connector 1A1A1J1.

39. Check for short on environmental control system between 1A1A1J1 backshell and 1A1A1J1-8.
Does short exist?

YES	Replace environmental control system (TM 1-1270-476-20).
NO	Replace TADS turret assembly (TM 1-1270-476-30).

40. Check for short on TADS electronic unit between 3J4 backshell and 3J4-A.
Does short exist?

YES	Replace TADS electronic unit (TM 1-1270-476-20).
NO	Go to step 41.

41. Disconnect aircraft connector P853 from TADS electronic unit connector 3J3.

42. Check for short on TADS electronic unit between 3J3 backshell and:

3J3-125
3J3-118
Does short exist?

YES	Replace TADS electronic unit (TM 1-1270-476-20).
NO	Replace TADS turret assembly (TM 1-1270-476-30).

43. Check for short on TADS power supply between 4J2 backshell and 4J2-S.
Does short exist?

YES	Go to step 44.
NO	Go to step 59.

44. Check for short on TADS turret assembly between 1A1W2J3 backshell and 1A1W2J3-r.
Does short exist?

YES	Go to step 45.
NO	Repair shorted wire. Perform MOC (para 3-6).

45. Disconnect TADS turret assembly connector 1A1W2P2 from TADS electronic control amplifier connector 1A2J2.

46. Check for short on TADS turret assembly between 1A1W2P2 backshell and 1A1W2P2-12.
Does short exist?

YES	Replace TADS turret assembly (TM 1-1270-476-30).
NO	Go to step 47.

47. Disconnect TADS turret assembly connector 1A1W2P1 from TADS electronic control amplifier connector 1A2J1.

48. Check for short on TADS turret assembly between 1A1W2P1 backshell and 1A1W2P1-6.
Does short exist?

YES	Go to step 49.
NO	Go to step 53.

49. Disconnect azimuth gimbal assembly connector 1A4W1P3 from TADS turret assembly connector 1A1W2J9.

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

50. Check for short on TADS turret assembly between 1A1W2J9 backshell and:

    1A1W2J9-11
    1A1W2J9-58
    1A1W2J9-46
    Does short exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 51.

51. Disconnect azimuth gimbal assembly connector 1A4W2P3 from elevation electronic control amplifier connector 1A4A5J1.

52. Check for short on azimuth gimbal assembly between 1A4W2P3 backshell and 1A4W2P3-9.
    Does short exist?

    YES Replace TADS turret assembly (TM 1-1270-TM 1-1270-476-30).
    NO Replace elevation electronic control amplifier (TM 1-1270-476-30).

53. Check for short on TADS turret assembly between 1A1W2P2 backshell and 1A1W2P2-6.
    Does short exist?

    YES Go to step 54.
    NO Replace TADS electronic control amplifier (TM 1-1270-476-20).

54. Connect TADS turret assembly connectors 1A1W2P1 and 1A1W2P2 to TADS electronic control amplifier connectors 1A2J1 and 1A2J2, respectively.

55. Disconnect azimuth gimbal assembly connector 1A4W1P3 from TADS turret assembly connector 1A1W2J9.

56. Check for short on TADS turret assembly between 1A1W2J9 backshell and:

    1A1W2J9-30
    1A1W2J9-57
    1A1W2J9-32
    Does short exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 57.

57. Disconnect azimuth gimbal assembly connector 1A4W2P2 from azimuth electronic control amplifier connector 1A4A4J1.

58. Check for short on azimuth gimbal assembly between 1A4W2P2 backshell and 1A4W2P2-9.
    Does short exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Replace elevation electronic control amplifier (TM 1-1270-476-30).

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

59. Check for short between P848 backshell and:

    P848-89
    P848-30
    P848-31
    P848-51
    P848-98
    P848-74
    P848-97
    Does short exist?

    YES — If short is between P848- 89,-30,-31, or -51, go to step 60; otherwise, go to step 65.
    NO — Go to step 73.

60. Check for short on TADS turret assembly between 1A1W2J6 backshell and:

    1A1W2J6-38
    1A1W2J6-36
    1A1W2J6-41
    1A1W2J6-42
    Does short exist?

    YES — Go to step 61.
    NO — Repair shorted wire. Perform MOC (para 3-6).

61. Disconnect azimuth gimbal assembly connector 1A4W1P2 from TADS turret assembly connector 1A1W2J11.

62. Check for short on TADS turret assembly between 1A1W2J11 backshell and:

    1A1W2J11-4
    1A1W2J11-15
    1A1W2J11-2
    1A1W2J11-22
    Does short exist?

    YES — Replace TADS turret assembly (TM 1-1270-476-30).
    NO — Go to step 63.

63. Disconnect night sensor assembly connector 1A3W1OP1 from azimuth gimbal assembly connector 1A4W1J2.

64. Check for short on night sensor assembly between 1A3W10P1 backshell and:

    1A3W10P1-4
    1A3W10P1-15
    1A3W10P1-2
    1A3W10P1-22
    Does short exist?

    YES — Replace night sensor assembly (TM 1-1270-476-20).
    NO — Replace TADS turret assembly (TM 1-1270-476-30).

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

65. Check for short on TADS turret assembly between 1A1W2J5 backshell and:

    1A1W2J5-9
    1A1W2J6-12
    1A1W2J6-11
    Does short exist?

    YES Go to step 66.
    NO Repair shorted wire. Perform MOC (para 3-6).

66. Disconnect azimuth gimbal assembly connector 1A4W1P1 from TADS turret assembly connector 1A1W2J10.

67. Check for short on TADS turret assembly between 1A1W2J10 backshell and:

    1A1W2J10-56
    1A1W2J10-61
    1A1W2J10-41
    Does short exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 68.

68. Disconnect day sensor assembly connector 1A5W1P1 from azimuth gimbal assembly connector 1A4W1J1.

69. Check for short on day sensor assembly between 1A5W1P1 backshell and:

    1A5W1P1-64
    1A5W1P1-61
    1A5W1P1-41
    Does short exist?

    YES If 1A5W1P1-64 is shorted, replace laser transceiver unit (TM 1-1270-476-20). If 1A5W1P1-61/41 is shorted, go to step 70.
    NO Replace TADS turret assembly (TM 1-1270-476-30).

70. Connect day sensor assembly connector 1A5W1P1 to azimuth gimbal assembly connector 1A4W1J1.

71. Disconnect day sensor assembly connector 1A5W1P4 from laser transceiver unit connector 1A5A2J1.

72. Check for short on laser transceiver unit between 1A5A2J1 backshell and:

    1A5A2J1-16
    1A5A2J1-15
    Does short exist?

    YES Replace laser transceiver unit (TM 1-1270-476-20).
    NO Replace day sensor subassembly (TM 1-1270-476-20).

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

73. Check for short between P849 backshell and P849-F.
    Does short exist?

    YES Go to step 74.
    NO Go to step 80.

74. Check for short on TADS turret assembly between 1A1W2J6 backshell and 1A1W2J6-32.
    Does short exist?

    YES Go to step 75.
    NO Repair shorted wire. Perform MOC (para 3-6).

75. Disconnect azimuth gimbal assembly connector 1A4W1P2 from TADS turret assembly connector 1A1W2J11.

76. Check for short on TADS turret assembly between 1A1W2J11 backshell and 1A1W2J11-14.
    Does short exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 77.

77. Connect azimuth gimbal assembly connector 1A4W1P2 to TADS turret assembly connector 1A1W2J11.

78. Disconnect night sensor assembly connector 1A3W10P1 from azimuth gimbal assembly connector 1A4W1J1.

79. Check for short on night sensor assembly between 1A3W10P1 backshell and 1A3W10P1-14.
    Does short exist?

    YES Replace night sensor assembly (TM 1-1270-476-20).
    NO Replace TADS turret assembly (TM 1-1270-476-30).

80. Check for short between P849 backshell and:

    P849-m
    P849-B
    Does short exist?

    YES Go to step 81.
    NO Go to step 101.

81. Check for short on TADS turret assembly between 1A1W2J3 backshell and:

    1A1W2J3-w
    1A1W2J3-v
    Does short exist?

    YES Go to step 82.
    NO Repair shorted wire. Perform MOC (para 3-6).

82. Disconnect TADS turret assembly connector 1A1W2P2 from TADS electronic control amplifier connector 1A2J2.

83. Check for short on TADS turret assembly between 1A1W2P2 backshell and:

    1A1W2P2-50
    1A1W2P2-48
    Does short exist?

    YES Go to step 84.
    NO Replace TADS electronic control amplifier (TM 1-1270-476-20).

84. Connect TADS turret assembly connector 1A1W2P2 to TADS electronic control amplifier connector 1A2J2.

85. Disconnect azimuth gimbal assembly connector 1A4W1P4 from TADS turret assembly connector 1A1W2J7.

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

86. Check for short on TADS turret assembly between 1A1W2J7 backshell and:

    1A1W2J7-54
    1A1W2J7-55
    Does short exist?

    YES Go to step 87.
    NO Replace TADS turret assembly (TM 1-1270-476-30).

87. Connect azimuth gimbal assembly connector 1A4W1P4 to TADS turret assembly connector 1A1W2J7.

88. Disconnect azimuth gimbal assembly connector 1A4W1P3 from TADS turret assembly connector 1A1W2J9.

89. Check for short on TADS turret assembly between 1A1W2J9 backshell and:

    1A1W2J9-68
    1A1W2J9-49
    Does short exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Go to step 90.

90. Connect azimuth gimbal assembly connector 1A4W1P3 to TADS turret assembly connector 1A1W2J9.

91. Disconnect day sensor assembly connector 1A5W1P2 from azimuth gimbal assembly connector 1A4W1J3.

92. Check for short on day sensor assembly between 1A5W1P2 backshell and:

    1A5W1P2-68
    1A5W1P2-49
    Does short exist?

    YES Go to step 93.
    NO Replace TADS turret assembly (TM 1-1270-476-30).

93. Disconnect day sensor assembly connector 1A5W1J7 from pitch gyro CCA connector 1A5A7P1.

94. Check for short on day sensor assembly between 1A5W1P2 backshell and:

    1A5W1P2-68
    1A5W1P2-49
    Does short exist?

    YES Go to step 95.
    NO Replace pitch gyro CCA (TM 1-1270-476-20).

95. Connect day sensor assembly connector 1A5W1J7 to pitch gyro CCA connector 1A5A7P1.

96. Disconnect day sensor assembly connector 1A5W1J8 from roll gyro CCA connector 1A5A8P1.

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

97. Check for short on day sensor assembly between 1A5W1P2 backshell and:

    1A5W1P2-68
    1A5W1P2-49
    Does short exist?

    YES Go to step 98.
    NO Replace roll gyro CCA (TM 1-1270-476-20).

98. Connect day sensor assembly connector 1A5W1J8 to roll gyro CCA connector 1A5A8P1.

99. Disconnect day sensor assembly connector 1A5W1J9 from yaw gyro CCA connector 1A5A9P1.

100. Check for short on day sensor assembly between 1A5W1P2 backshell and:

    1A5W1P2-68
    1A5W1P2-49
    Does short exist?

    YES Replace day sensor subassembly (TM 1-1270-476-20).
    NO Replace yaw gyro CCA (TM 1-1270-476-20).

101. Check for short between P848 backshell and:

    P848-78
    P848-18
    Does short exist?

    YES Go to step 102.
    NO Go to step 107.

102. Check for short on TADS turret assembly between 1A1W2J3 backshell and:

    1A1W1J3-X
    1A1W2J3-HH
    Does short exist?

    YES If 1A1W2J3-HH is shorted, go to step 103; otherwise, go to step 105.
    NO Repair shorted wire. Perform MOC (para 3-6).

103. Disconnect azimuth gimbal assembly connector 1A4W1P3 from TADS turret assembly connector 1A1W2J9.

104. Check for short on TADS turret assembly between 1A1W2J9 backshell and 1A1W2J9-54.
    Does short exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Replace day sensor subassembly (TM 1-1270-476-20).

105. Disconnect azimuth gimbal assembly connector 1A4W1P1 from TADS turret assembly connector 1A1W2J10.

106. Check for short on TADS turret assembly between 1A1W2J10 backshell and 1A1W2J10-1.
    Does short exist?

    YES Replace TADS turret assembly (TM 1-1270-476-30).
    NO Replace day sensor subassembly (TM 1-1270-476-20).

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

107. Check for short between P849 backshell and:

P849-k
P849-A
Does short exist?

YES Go to step 108.
NO Go to step 109.

108. Check for short on TADS electronic unit between 3J3 backshell and:

3J3-123
3J3-99
Does short exist?

YES Replace TADS electronic unit (TM 1-1270-476-20).
NO Repair shorted wire. Perform MOC (para 3-6).

109. Check for short between P848 backshell and:

P848-86
P848-85
P848-73
P848-24
P848-28
Does short exist?

YES Go to step 110.
NO Go to step 111.

110. Check for short on TADS electronic unit between 3J3 backshell and:

3J3-13
3J3-24
3J3-33
3J3-127
3J3-6
Does short exist?

YES Replace TADS electronic unit (TM 1-1270-476-20).
NO Repair shorted wire. Perform MOC (para 3-6).

111. Check for short between P848 backshell and P848-8.
Does short exist?

YES Go to step 112.
NO Go to step 113.

112. Check for short on ORT assembly between 2W1J1 backshell and 2W1J1-69.
Does short exist?

YES Replace ORT assembly control panel (TM 1-1270-476-20).
NO Repair shorted wire. Perform MOC (para 3-6).

113. Check for short between P849 backshell and:

P849-n
P849-C
Does short exist?

YES If P849-n is shorted, go to step 114; otherwise, go to step 117.
NO Go to step 122.

114. Check for short on ORT assembly between 2W1J1 backshell and 2W1J1-70.
Does short exist?

YES Go to step 115.
NO Repair shorted wire. Perform MOC (para 3-6).

115. Disconnect 2W1P3 from indirect view display connector 2A3J1.

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

116. Check for short on ORT assembly between 2W1J1 backshell and 2W1J1-70.
Does short exist?

YES Replace right handgrip (TM 1-1270-476-20).
NO Replace indirect view display (TM 1-1270-476-20).

117. Check for short on ORT assembly between 2W1J1 backshell and 2W1J1-72.
Does short exist?

YES Go to step 118.
NO Repair shorted wire. Perform MOC (para 3-6).

118. Disconnect 2W1P3 from indirect view display connector 2A3J1.

119. Check for short on ORT assembly between 2W1J1 backshell and 2W1J1-72.
Does short exist?

YES Go to step 120.
NO Replace indirect view display (TM 1-1270-476-20).

120. Remove right handgrip (TM 1-1270-476-20).

121. Check for short on ORT assembly between 2W1J1 backshell and 2W1J1-72.
Does short exist?

YES Replace optical relay column (TM 1-1270-476-20).
NO Replace right handgrip (TM 1-1270-476-20).

122. Check for short between P848 backshell and:

P848-83
P848-102
P848-107
P848-118
Does short exist?

YES Go to step 123.
NO Go to step 132.

123. Check for short on TADS turret assembly between 1A1W2J5 backshell and:

1A1W2J5-70
1A1W2J5-71
1A1W2J5-68
1A1W2J5-67
Does short exist?

YES Go to step 124.
NO Repair shorted wire. Perform MOC (para 3-6).

124. Remove day sensor shroud assembly (TM 1-1270-476-20).

125. Check for short on TADS turret assembly between 1A1W2J5 backshell and:

1A1W2J5-70
1A1W2J5-71
1A1W2J5-68
1A1W2J5-67
Does short exist?

YES Replace day sensor shroud assembly (TM 1-1270-476-20).
NO Go to step 126.

3-115. SMELL OF SMOKE DETECTED AFTER TADS POWER-UP (cont)

126. Remove night sensor shroud assembly (TM 1-1270-476-20).

127. Check for short on TADS turret assembly between 1A1W2J5 backshell and:

1A1W2J5-70
1A1W2J5-71
1A1W2J5-68
1A1W2J5-67
Does short exist?

YES Replace night sensor shroud assembly (TM 1-1270-476-20).
NO Go to step 128.

128. Disconnect TADS turret assembly connector 1A1W2P5 from boresight module connector 1A1A3J1.

129. Check for short on TADS turret assembly between 1A1W2J5 backshell and:

1A1W2J5-70
1A1W2J5-71
1A1W2J5-68
1A1W2J5-67
Does short exist?

YES Replace boresight module (TM 1-1270-476-20).
NO Replace TADS turret assembly (TM 1-1270-476-30).

130. Check for short between P848 backshell and:

P848-71
P848-111
Does short exist?

YES Go to step 131.
NO Replace TADS power supply (TM 1-1270-476-20).

131. Check for short on TADS turret assembly between 1A1W2J6 backshell and:

1A1W2J6-60
1A1W2J6-61
Does short exist?

YES Go to step 132.
NO Repair shorted wire. Perform MOC (para 3-6).

132. Remove night sensor shroud assembly (TM 1-1270-476-20).

133. Check for short on TADS turret assembly between 1A1W2J6 backshell and:

1A1W2J6-60
1A1W2J6-61
Does short exist?

YES Replace TADS turret assembly (TM 1-1270-476-30).
NO Replace night sensor shroud assembly (TM 1-1270-476-20).

END OF TASK

CHAPTER 4

ANTI-ICE TROUBLESHOOTING PROCEDURES

4-1. ANTI-ICE - MAINTENANCE OPERATIONAL CHECK

INITIAL SETUP

Personnel Required:

68X Aircraft Armament/Electrical Repairer
67R Helicopter Repairer

References:

TM 1-1270-476-20
TM 1-1520-238-T-1
TM 1-1520-238-T-3
TM 1-1520-238-23

Equipment Conditions:

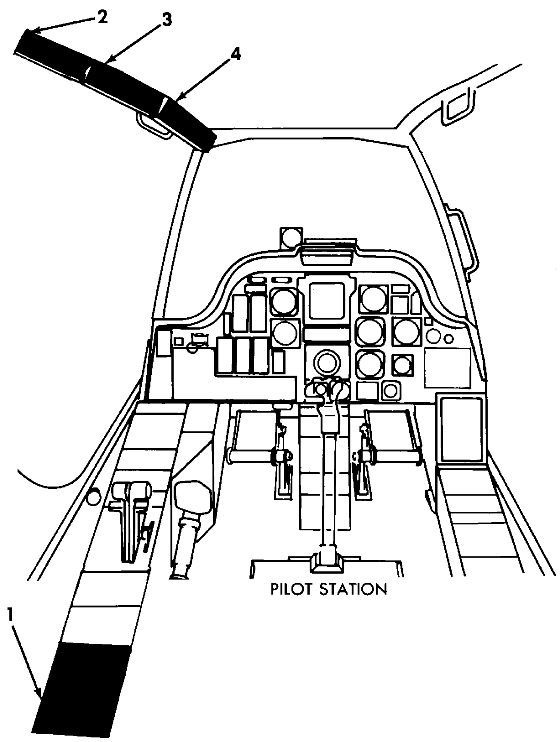
Ref	Condition
TM 1-1520-238-23	Helicopter safed
TM 1-1270-476-20	TADS window cover assemblies removed
Para 3-2	Initial switch settings

NOTE

This maintenance operational check verifies that anti-ice circuits are functioning. If ambient temperature is not cold enough to close the shroud thermostatic switches and ice has not formed on the shrouds, day sensor and night sensor shroud heater operation may be difficult to verify. Window anti-ice will be tested by FD/LS regardless of environment.

Task	Results
1. Access pilot station (fig. 4-1) (TM 1-1520-238-23).	
2. Close pilot station aft circuit breaker panel circuit breakers (fig. 4-2): **ECS FAB FANS** **ECS CAB** **ECS AFT FAN** **POWER XFMR RECT 1** **POWER XFMR RECT 2**	

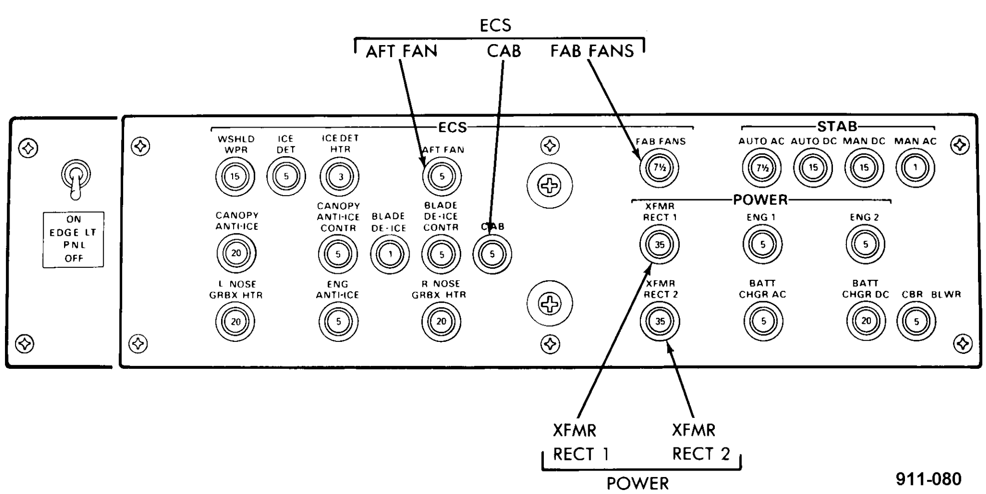
4-1. ANTI-ICE - MAINTENANCE OPERATIONAL CHECK (cont)



LEGEND
1. ANTI-ICE PANEL
2. AFT CIRCUIT BREAKER PANEL
3. CENTER CIRCUIT BREAKER PANEL
4. FORWARD CIRCUIT BREAKER PANEL

911-79

Figure 4-1. Pilot Station Panel Location



911-080

Figure 4-2. AFT Circuit Breaker Panel Circuit Breaker Location

4-1. ANTI-ICE - MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
3. Close pilot center circuit breaker panel circuit breakers (fig. 4-3): **ASE AC** **ASE DC**	
4. Close pilot forward circuit breaker panel circuit breakers (fig. 4-4): **MISSION PNVS DC** **MISSION PNVS AC** **MISSION SYM GEN** **NAV HARS AC** **NAV HARS DC** **MISSION IHADSS** **MISSION FC DC** **MISSION FC AC**	
5. Access copilot/gunner (CPG) station (fig. 4-5) (TM 1-1520-238-23).	
6. Close CPG circuit breaker panel No. 2 circuit breakers (fig. 4-6): **IHADSS** **TADS DC** **TADS AC**	
7. Close CPG circuit breaker panel No.1 circuit breakers (fig. 4-7): **PRI LT** **CAUT** **FC FCC AC** **FC FCC DC** **MUX FAB R** **MUX FAB L** **MUX CPG**	

4-1. ANTI-ICE - MAINTENANCE OPERATIONAL CHECK (cont)

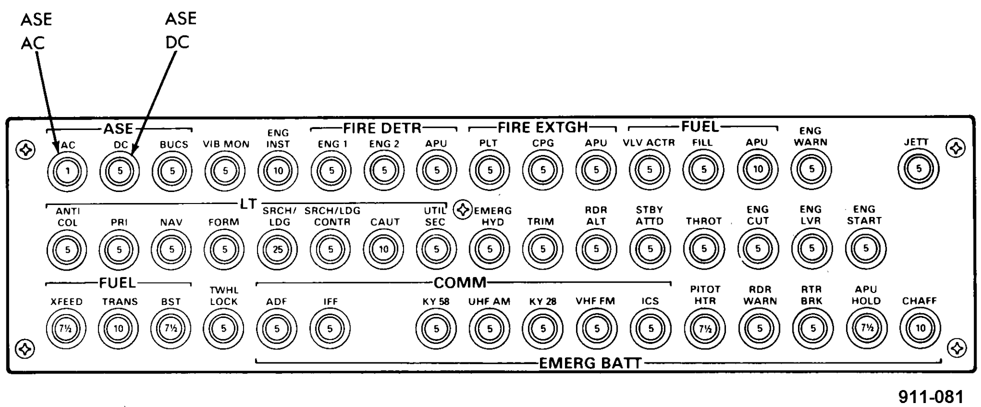


Figure 4-3. Center Circuit Breaker Panel Circuit Breaker Location

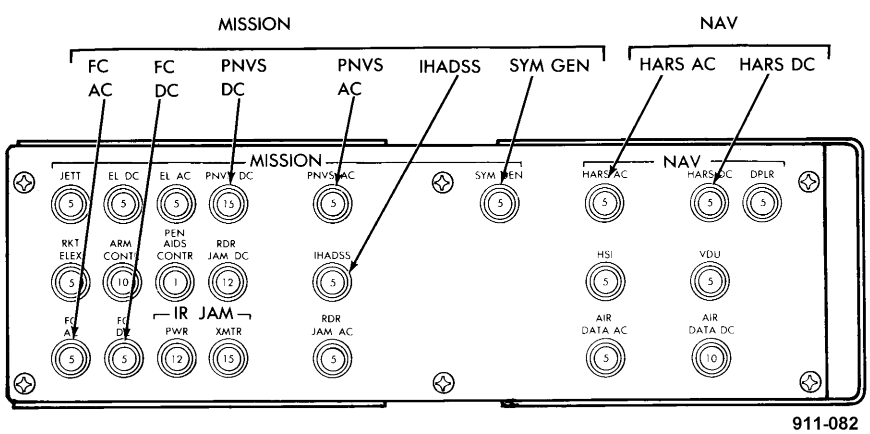


Figure 4-4. Forward Circuit Breaker Panel Circuit Breaker Location

4-1. ANTI-ICE - MAINTENANCE OPERATIONAL CHECK (cont)

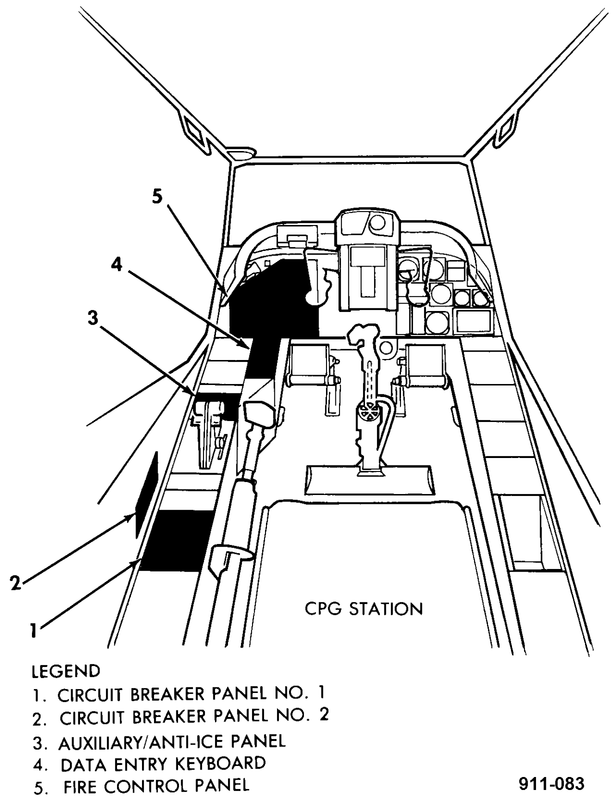


Figure 4-5. CPG Station Panel Location

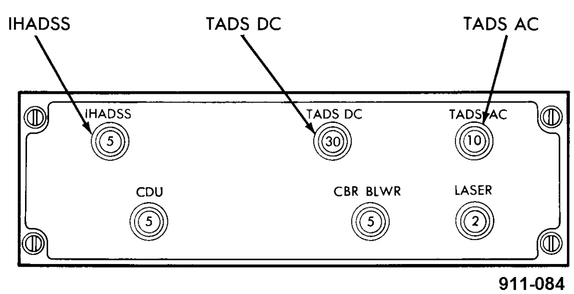


Figure 4-6. Circuit Breaker Panel No. 2 Circuit Breaker Location

4-1. ANTI-ICE - MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
8. Apply external power - electrical or operate APU (TM 1-1520-238-23).	

9. Set CPG fire control panel switches (fig. 4-8):

Switch	Position
CPG	**SAFE**
PLT GND ORIDE	**ON**
SYSTEM FC SYM GEN	**SYM GEN**

WARNING

Stand away from the TADS turret assembly. The TADS turret assembly rotates rapidly when power is applied. Contact with the TADS turret assembly while it is in motion can cause serious injury.

CAUTION

Do not set the **SYSTEM TADS/FLIROFF** switch to **TADS** immediately after being set to **OFF**. Damage to the TADS power supply could result.

NOTE

If the **SYSTEM TADS/FLIR OFF** switch was just set to **OFF**, wait 10 seconds before performing step 10 below.

10. Set CPG fire control panel **SYSTEM TADS/ FLIR OFF** switch to **TADS**.

4-1. ANTI-ICE - MAINTENANCE OPERATIONAL CHECK (cont)

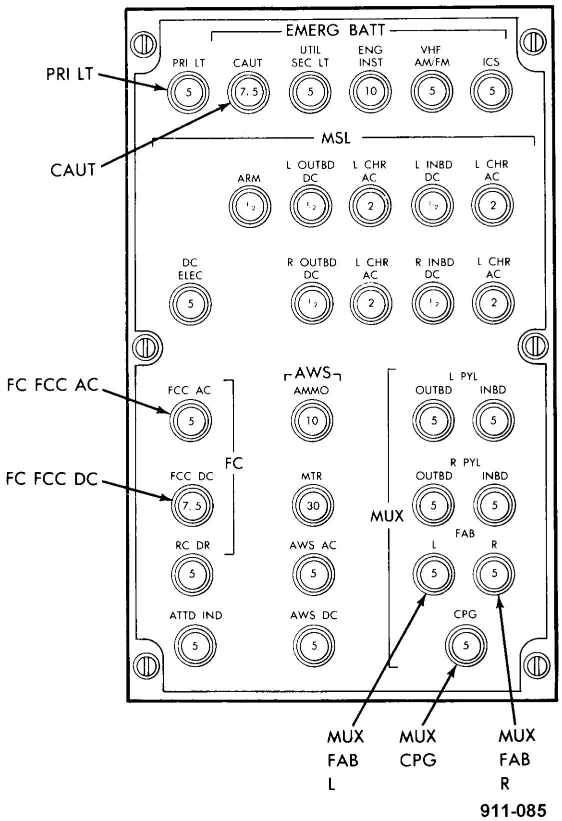


Figure 4-7. Circuit Breaker Panel No. 1 Circuit Breaker Location

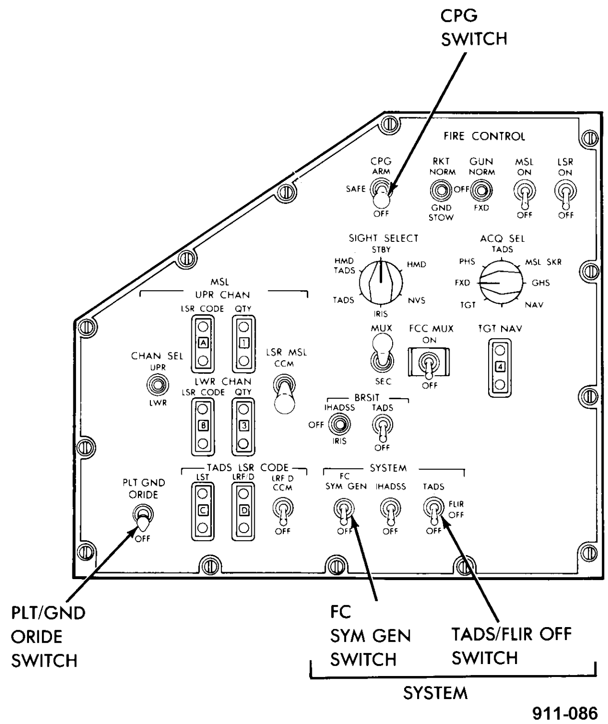


Figure 4-8. CPG Fire Control Panel Control Location

4-1. ANTI-ICE - MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
WARNING • Hazardous voltage is applied to shroud assemblies during this maintenance operational check. • Injury or death on contact may result if personnel touch shrouds while power is applied. • Make sure aircraft power is removed before touching shrouds or starting any fault isolation procedures.	
11. Set auxiliary/anti-ice panel **TADS/PNVS** switch to **GND** (fig. 4-9).	If CPG circuit breaker panel No. 2 **TADS AC** circuit breaker opens, refer to paragraph 4-5. If ice has started to form on day sensor and night sensor shroud assemblies, verify that ice appears to melt around night sensor shroud window frame and above window and above day sensor shroud window. If only one shroud appears to be defective replace defective shroud (TM 1-1270-476-20). If anti-ice appears inoperative on both shrouds, refer to paragraph 4-6 for troubleshooting.

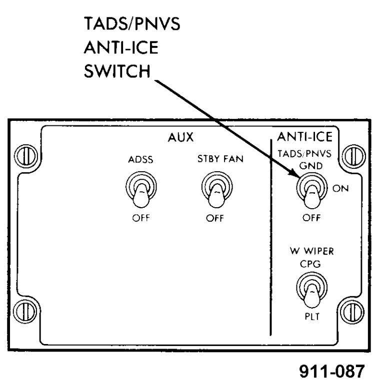


Figure 4-9. Auxiliary/Anti-Ice Control Location Panel

4-1. ANTI-ICE - MAINTENANCE OPERATIONAL CHECK (cont)

Task / **Results**

12. Set DEK **DATA ENTRY** switch to **FD/LS** (fig. 4-10).

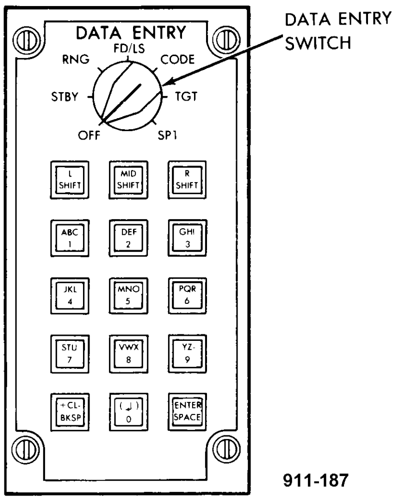


Figure 4-10. Data Entry Keyboard Control Location

Results:

- If TADS FLIR SHROUD NO-GO NSA appears on HOD, replace TADS night sensor shroud assembly (TM 1-1270-476-20).
  - If fault still exists, refer to paragraph 4-3 for troubleshooting.
- If TADS TV SHROUD NO-GO DSA appears on HOD, replace TADS day sensor shroud assembly (TM 1-1270-476-20).
  - If fault still exists, refer to paragraph 4-4 for troubleshooting.
- If TADS BSMOD NO-GO TURRET BULKHEAD appears on HOD, replace TADS boresight module assembly (TM 1-1270-476-20).
  - If fault still exists, refer to paragraph 4-5 for troubleshooting.
- If TADS POWER SUPPLY NO-GO LH FAB appears on HOD, replace TADS power supply assembly (TM 1-1270-476-20).
  - If fault still exists, refer to paragraph 4-6 for troubleshooting.

13. Set DEK D**ATA ENTRY** switch to **OFF**.

14. Set auxiliary/anti-ice panel **TADS/PNVS** switch to **OFF**.

15. Set anti-ice panel **TADS/PNVS** switch to **GND** (fig. 4-11).

Results: If anti-ice appears to be inoperative, refer to TM 1-1520-238-T-3 and troubleshoot pilot anti-ice panel.

16. Set anti-ice panel **TADS/PNVS** switch to **OFF**.

4-1. ANTI-ICE - MAINTENANCE OPERATIONAL CHECK (cont)

Task	Results
17. Perform TADS power down procedure (para 3-3).	
18. Perform helicopter safety procedure (TM 1-1520-238-23).	

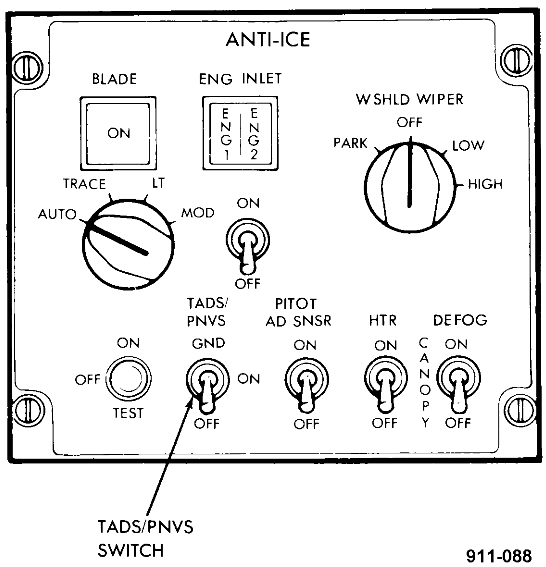


Figure 4-11. Anti-Ice Panel Control Location

END OF TASK

4-2. ANTI-ICE - WIRING INTERCONNECT DIAGRAM

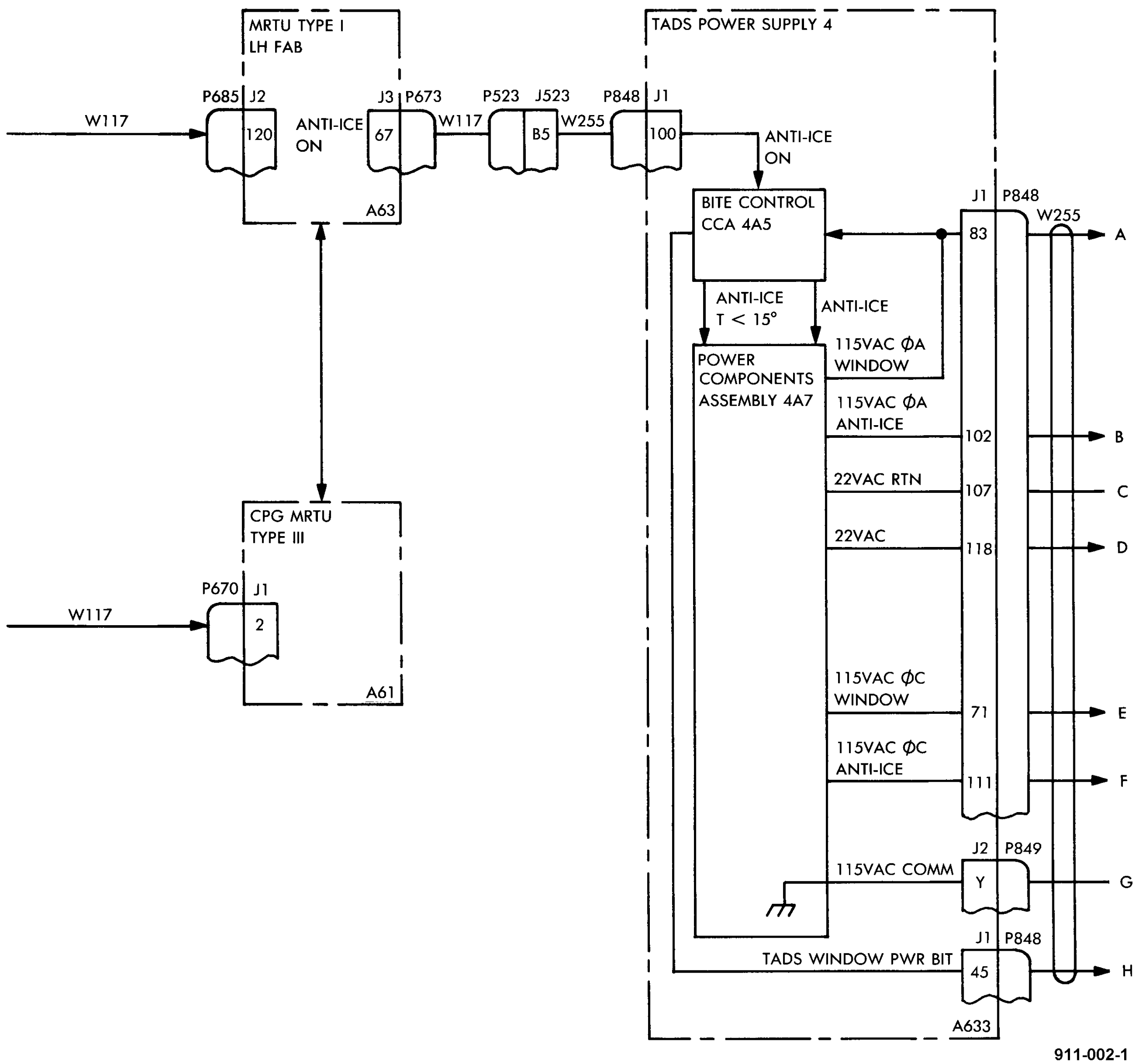


Figure 4-12. Anti-Ice Wiring Interconnect Diagram (Sheet 1 of 3)

4-2. ANTI-ICE - WIRING INTERCONNECT DIAGRAM (cont)

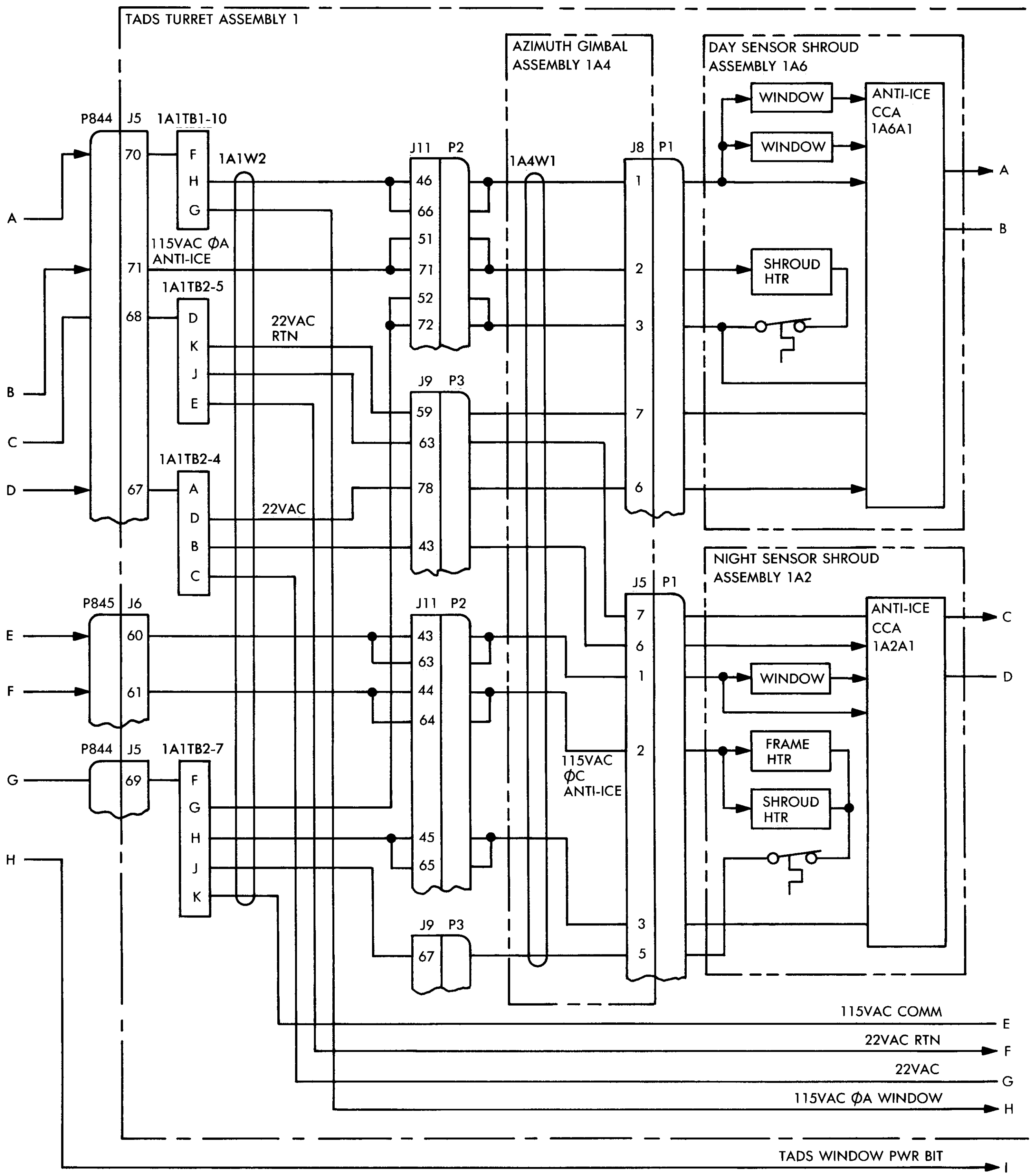


Figure 4-12. Anti-Ice Wiring Interconnect Diagram (Sheet 2 of 3)

4-2. ANTI-ICE - WIRING INTERCONNECT DIAGRAM (cont)

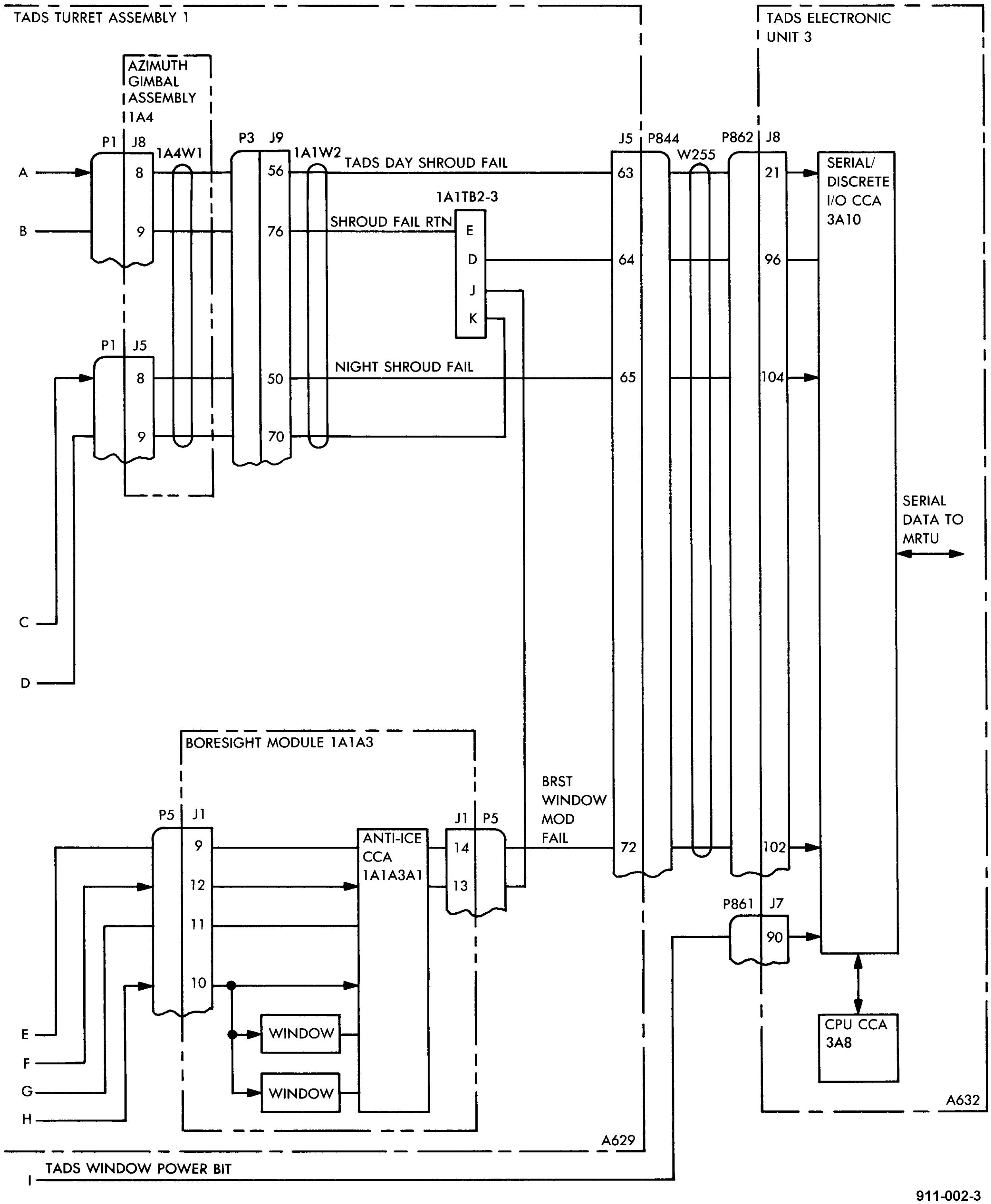


Figure 4-12. Anti-Ice Wiring Interconnect Diagram (3 of 3)

4-3. TADS FLIR SHROUD NO-GO - APPEARS ON HOD

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 4-12

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect P844 and P845 from TADS turret assembly connectors 1A1W2J5 and 1A1W2J6, respectively.

3. Disconnect azimuth gimbal assembly connector 1A4W1P2 from TADS turret assembly connector 1A1W2J11.

4. Check for open on TADS turret assembly between:

   1A1W2J6-60 and 1A1W2J11-43
   1A1W2J6-60 and 1A1W2J11-63
   1A1W2J5-69 and 1A1W2J11-45
   1A1W2J5-69 and 1A1W2J11-65
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 5.

5. Disconnect azimuth gimbal assembly connector 1A4W1P3 from TADS turret assembly connector 1A1W2J9.

6. Check for open on TADS turret assembly between:

   1A1W2J5-67 and 1A1W2J9-43
   1A1W2J5-68 and 1A1W2J9-63
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 7.

4-3. TADS FLIR SHROUD NO-GO - APPEARS ON HOD (cont)

7. Check for open on TADS turret assembly between:

   1A1W2J9-50 and 1A1W2J5-65
   1A1W2J9-70 and 1A1W2J5-64
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 8.

8. Connect azimuth gimbal assembly connector 1A4W1P3 to TADS turret assembly connector 1A1W2J9.

9. Connect azimuth gimbal assembly connector 1A4W2P2 to TADS turret assembly connector 1A1W2J11.

10. Check for open between:

    P848-107 and P844-68
    P848-118 and P844-67
    P848-71 and P845-60
    P849-Y and P844-69
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Go to step 11.

11. Check for open between:

    P844-65 and P862-104
    P844-64 and P862-96
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Replace TADS power supply (TM 1-1270-476-20).

END OF TASK

4-4. TADS TV SHROUD NO-GO DSA - APPEARS ON HOD

Tools:

Nomenclature	Part Number
TADS turret continuity test set	13231232
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 4-12

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Disconnect P844 and P845 from TADS turret assembly connectors 1A1W2J5 and 1A1W2J6, respectively.

3. Disconnect azimuth gimbal assembly connector 1A4W1P2 from TADS turret assembly connector 1A1W2J11.

4. Check for open on TADS turret assembly between:

   1A1W2J5-70 and 1A1W2J11-46
   1A1W2J5-70 and 1A1W2J11-66
   1A1W2J5-69 and 1A1W2J11-52
   1A1W2J5-69 and 1A1W2J11-72
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 5.

5. Disconnect azimuth gimbal assembly connector 1A4W1P3 from TADS turret assembly connector 1A1W2J9.

6. Check for open on TADS turret assembly between:

   1A1W2J5-67 and 1A1W2J9-78
   1A1W2J5-68 and 1A1W2J9-59
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 6.

4-4. TADS TV SHROUD NO-GO DSA - APPEARS ON HOD (cont)

7. Check for open on TADS turret assembly between:

   1A1W2P3-56 and 1A1W2J5-63
   1A1W2P3-76 and 1A1W2J5-64
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 8.

8. Connect azimuth gimbal assembly connector 1A4W1P3 to TADS turret assembly connector 1A1W2J9.

9. Connect azimuth gimbal assembly connector 1A4W1P2 to TADS turret assembly connector 1A1W2J11.

10. Check for open between:

    P848-107 and P844-68
    P848-118 and P844-67
    P848-83 and P844-70
    P849-Y and P844-69
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Go to step 11.

11. Check for open between:

    P844-63 and P862-21
    P844-64 and P862-96
    Does open exist?

    YES Repair open wire. Perform MOC (para 3-6).
    NO Replace TADS power supply (TM 1-1270-476-20).

END OF TASK

4-5. TADS AC CIRCUIT BREAKER OPENS WHEN ANTI-ICE IS SELECTED

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 4-12

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Check for shorts between ground and:

   P848-71
   P848-83
   P848-102
   P848-111
   P848-118
   Does short exist?

   YES Leave ohmmeter connected to shorted wire and go to step 3.
   NO Replace TADS power supply (TM 1-1270-476-20).

3. Remove night sensor assembly shroud (TM 1-1270-476-20).
   Does short still exist?

   YES Go to step 4.
   NO Replace night sensor shroud assembly (TM 1-1270-476-20).

4. Reinstall night sensor assembly shroud (TM 1-1270-476-20).

5. Remove day sensor shroud (TM 1-1270-476-20).
   Does short still exist?

   YES Go to step 6.
   NO Replace day sensor shroud assembly (TM 1-1270-476-20).

6. Reinstall day sensor shroud (TM 1-1270-476-20).

7. Disconnect TADS turret assembly connector 1A1W2P5 from boresight module connector 1A1A3J1.
   Does short still exist?

   YES Go to step 8.
   NO Replace boresight module assembly (TM 1-1270-476-20).

4-5. TADS AC CIRCUIT BREAKER OPENS WHEN ANTI-ICE IS SELECTED (cont)

8. Disconnect P844 and P845 from TADS turret assembly connectors 1A1W2J5 and 1A1W2J6, respectively.
   Does short still exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Repair shorted wire.
   Perform MOC (para 3-6).

END OF TASK

4-6. TADS ANTI-ICE APPEARS INOPERATIVE

Tools:

Nomenclature	Part Number
Aircraft armament repairman tool set	SC5180-95-CL-B09-HR
Multimeter, digital	AN/PSM-45
TADS turret continuity test set	13231232

Personnel Required:

68X Aircraft Armament/Electrical Repairer

References:

TM 1-1270-476-20
TM 1-1270-476-30
TM 1-1520-238-23

Associated Wiring Interconnect Diagrams:

Fig. 4-12

Equipment Conditions:

Ref	Condition
TM 1-1520-238-23	Helicopter safed

1. Using TADS turret continuity test set, test TADS azimuth gimbal assembly wiring harness 1A4W1.
   Is 1A4W1 good?

   YES Go to step 2.
   NO Replace TADS turret assembly (TM 1-1270-476-30).

2. Check for open on TADS turret assembly between:

   1A1W2J5-71 and 1A1W2J11-51
   1A1W2J5-71 and 1A1W2J11-71
   1A1W2J5-69 and 1A1W2J9-67
   1A1W2J6-61 and 1A1W2J11-44
   1A1W2J6-61 and 1A1W2J11-64
   Does open exist?

   YES Replace TADS turret assembly (TM 1-1270-476-30).
   NO Go to step 3.

3. Check for open between:

   P848-102 and P844-71
   P848-111 and P845-61
   Does open exist?

   YES Repair open wire. Perform MOC (para 3-6).
   NO Replace TADS power supply (TM 1-1270-476-20).

END OF TASK

APPENDIX A

REFERENCES

A-1. SCOPE

This appendix lists all army regulations, common tables of allowances, field manuals, forms, pamphlets, technical bulletins and technical manuals referenced in this manual.

A-2. ARMY REGULATIONS

Control of Health Hazards from Lasers and Other High Intensity
Optical Sources . . . . AR 40-46
Ionizing Radiation Protection (Licensing, Control, Transportation,
Disposal, and Radiation Safety) . . . . AR 385-11

A-3. FIELD MANUALS

Army Aircraft Quality Control and Technical Inspection . . . . FM 1-511
First Aid for Soldiers . . . . FM 21-11

A-4. FORMS

Recommended Changes to Publications or Blank Forms . . . . DA Form 2028
Recommended Changes to Equipment Technical Manuals . . . . DA Form 2028-2
Quality Deficiency Report . . . . SF 368

A-5. PAMPHLETS

The Army Maintenance Management System - Aviation (TAMMS-A) . . . . DA Pam 738-751

A-6. TECHNICAL BULLETINS

Respiratory Protection Program (AFOSH STD 161-1) . . . . TB MED 223
U.S. Surgeon General's Noise Limits . . . . TB MED 251
Control of Hazards to Health from Laser Radiation . . . . TB MED 524
Safety Precautions for Main ten ace of Electrical/Electronic Equipment . . . . TB 385-4

REFERENCES (cont)

A-7. TECHNICAL MANUALS

Aviation Unit Maintenance Manual: AH-64A Helicopter, Fire Control System. . . . . . TM 9-1230-476-20-1
Aviation Unit Troubleshooting Manual: AH-64A Helicopter, Fire Control System . . . TM 9-1230-476-20-2
Aviation Unit Maintenance Manual: Target Acquisition Designation
Sight (TADS) Assembly AN/ASQ-170, AH-64A Attack Helicopter . . . . .TM 1-1270-476-20
Aviation Unit Troubleshooting Manual, Pilot Night Vision Sensor (PNVS)
Assembly AN/AAQ-11 AH-64A Helicopter . . . . TM 1-5855-265-T
Technical Escort Information on Chemical Agents and Decontaminating
Procedures (TM 1300-30) . . . . .TM 9-1300-275/2
Aviation Unit and Intermediate Maintenance Manual for Target Acquisition
Designation Sight Assembly/Pilot Night Vision Sensor Assembly (TADS/PNVS)
Shipping and Storage Containers . . . . .TM 1-8145-476-23
Aviation Intermediate Maintenance Manual: Pilot Night Vision Sensor (PNVS)
Assembly AN/AAQ-11, AH-64A Attack Helicopter . . . . .TM 1-5855-265-30
Organizational, DS and GS, and Depot Maintenance Manual: Installation
Practices for Aircraft Electrical and Electronic Wiring . . . . .TM 55-1500-323-24
Aviation Unit and Intermediate Maintenance Manual:
AH-64A Helicopter . . . . TM 1-1520-238-23 Series
Aviation Unit and Intermediate Maintenance Manual:
Symbol Generator; MX-10465/ASQ . . . . .TM 11-5895-1184-23
Procedures for Destruction of Electronic Materiel to Prevent Enemy Use . . . . .TM 750-244-1-5
Operator and Aviation Unit Maintenance Manual: Aviation Ground Unit,
Multi-Output GTED, Electrical, Hydraulic, and Pneumatic . . . . .TM 55-1730-229-12
Technical Manual, Operator and Aviation Unit Maintenance (AVUM)
Deployment, Operation and Teardown Procedures AH-64A Electronic
Equipment Test Facility (EETF) OQ-290(V)2/MSM . . . . .TM 11-6625-3085-12
Aviation Unit Maintenance Manual for Army AH-64A Helicopter Fault
Detection/Location System . . . . TM 1-1520-238-T-1
Aviation Unit Maintenance Manual for Army AH-64A Helicopter Integrated
Troubleshooting Manual . . . . TM 1-1520-238-T-2
Aviation Unit and Intermediate Maintenance Manual for Army AH-64A
Helicopter Multiplex Read Codes . . . . TM 1-1520-238-T-3
Aviation Unit and Intermediate Troubleshooting Manual for
Army AH-64A Helicopter . . . . TM 1-1520-238-T-6
Aviation Unit and Intermediate Troubleshooting Manual for
Army AH-64A Helicopter . . . . TM 1-1520-238-T-8
Aviation Unit and Intermediate Troubleshooting Manual for
Army AH-64A Helicopter Wiring Diagrams . . . . TM 1-1520-238-T-10
Aviation Intermediate Maintenance Manual Target Acquisition Designation
Sight (TADS) Assembly AN/ASQ-170 AH-64A Attack Helicopter . . . . .TM 1-1270-476-30

GLOSSARY

Section I. ABBREVIATIONS

A	Amperes
A/D	Analog to digital
AC	Alternating current
ACK	Acknowledge
ADJ	Adjust
AGPU	Aviation ground power unit
AIA	Aircraft interface assembly
ALC	Automatic light control
AMPL	Amplifier
AND	Alphanumeric display
APU	Auxiliary power unit
AT	After threshold
AUTO	Automatic
AVIM	Aviation intermediate maintenance
AVUM	Aviation unit maintenance
AZ	Azimuth
BIT	Built-in test
BITE	Built-in test equipment
BLK	Black
BRST	Boresight
BRT	Brightness
BST	Boresight
CCA	Circuit card assembly
CEM	Control electronics module
CCW	Counterclockwise
CLK	Clock
CMD	Command
CNTL	Control
COMM	Common
CONFIG	Configuration
CONT	Contrast
CONT	Control
CONTR	Control
COS	Cosine
CPC	Corrosion prevention and control
CPG	Copilot/gunner
CPU	Central processing unit
CRIT	Critical
CRT	Cathode ray tube
CT	Center tap
D/A	Digital to analog
DC	Direct current
DET	Detector
DIFF	Differential
DIR	Direct
DISC	Discrete

GLOSSARY (cont)

DR . . . . . Drive
DSA . . . . . Day sensor assembly
DSPL . . . . . Display
DSSA . . . . . Day sensor shroud assembly
DTV . . . . . Day television
DVO . . . . . Direct view optics
ECLC . . . . . Electronic component location and configuration
ECS . . . . . Environmental control system
ECU . . . . . Environmental control unit
EETF . . . . . Electronic equipment test facility
EIR . . . . . Equipment improvement recommendations
EL . . . . . Elevation
EO . . . . . Electro-optical
ESDS . . . . . Electrostatic discharge sensitive
F. . . . . . Fahrenheit
FAB . . . . . Forward avionics bay
FD/LS. . . . . . Fault detection/location system
FIP . . . . . Fault isolation procedure
FLIR . . . . . Forward looking infrared
FOC . . . . . Focus
FOV . . . . . Field-of-view
GND . . . . . Ground
GS . . . . . Grayscale
HDD . . . . . Heads down display
HI . . . . . High
HOD . . . . . Heads out display
HOR . . . . . Horizontal
HORIZ . . . . . Horizontal
HORZ. . . . . . Horizontal
HTR . . . . . Heater
HV . . . . . High voltage
HZ . . . . . Hertz'
I/O . . . . . Input/output
IAT . . . . . Image automatic tracker
IHADSS . . . . . Integrated helmet and display sight system
ILLUM . . . . . Illumination
IND. . . . . . Independant
IND. . . . . . Indicator
IR . . . . . Infrared
IVD . . . . . Indirect view display
K . . . . . Degrees kelvin
L. . . . . . Long
LED . . . . . Light emitting diode
LEU . . . . . Laser electronics unit
LH . . . . . Left hand
LMC . . . . . Linear motion compensator
LO . . . . . Low
LOS . . . . . Line-of-sight

GLOSSARY (cont)

LRF/D . . . . . . Laser rangefinder/designator
LRU . . . . . . Line replaceable unit
LSR . . . . . . Laser
LST . . . . . . Laser spot tracking
LT . . . . . . Laser tracker
LT . . . . . . Left
LT/R . . . . . . Laser tracker/receiver
LTU . . . . . . Laser transceiver unit
LV . . . . . . Low voltage
MAN . . . . . . Manual
MAX . . . . . . Maximum
MCM . . . . . . Motor control module
MFOV . . . . . . Medium field-of-view
MLO . . . . . . Manual lock out
MOC . . . . . . Maintenance operational check
MOD . . . . . . Module
MON . . . . . . Monitor
MOS . . . . . . Military occupational specialty
mRAD . . . . . . Milliradian
MRTU . . . . . . Multiplex remote terminal unit
MSL . . . . . . Missile
MUX . . . . . . Multiplex
NC . . . . . . Normally closed (switches)
NC . . . . . . Not connected
NEUT . . . . . . Neutral
NFOV . . . . . . Narrow field-of-view
NO . . . . . . Normally open (switches)
NO . . . . . . Number
NSA . . . . . . Night sensor assembly
NSSA . . . . . . Night sensor shroud assembly
NT . . . . . . Night
OIP . . . . . . Optical improvement program
OP . . . . . . Operate
OPER . . . . . . Operate
OR'D . . . . . . Operate or delayed
ORC . . . . . . Optical relay column
ORT . . . . . . Optical relay tube
P/O . . . . . . Part of
PECA . . . . . . PNVS electronic control amplifier
PEU . . . . . . PNVS electronic unit
PFN . . . . . . Pulse forming network
PLRT . . . . . . Polarity
PLT . . . . . . Pilot
PNVS . . . . . . Pilot night vision sensor
QA . . . . . . Quality assurance
QC . . . . . . Quality control
QDR . . . . . . Qulaity deficiency report
QUAD . . . . . . Quandrant

GLOSSARY (cont)

RAM . . . . Random access memory
RCD . . . . Recorder
REF . . . . Reference
RET . . . . Reticle
RH . . . . Right hand
RKT . . . . Rocket
RNG . . . . Range
RTN . . . . Return
S . . . . Short
SEL . . . . Select
SEN . . . . Sensor
SIN . . . . Sine
SH . . . . Sheet
SRU . . . . Shop replaceable unit
ST . . . . Store
STBY . . . . Standby
STDBTY . . . . Standby
SW . . . . Switch
SYM . . . . Symbology
SYNC . . . . Sychronize
TACH . . . . Tachometer
TADS . . . . Target acquisition designation sight
TAMMS-A . . . . The Army maintenance management system - aviation
TECA . . . . TADS electronic control amplifier
TEU . . . . TADS electronic unit
TM . . . . Technical manual
TRGT . . . . Target
TRIG . . . . Trigger
TRK . . . . Track
TV . . . . Television
UPDT . . . . Update
V . . . . Volts
VAC . . . . Volts alternating current
VDC . . . . Volts direct current
VER . . . . Vertical
VERT . . . . Vertical
VID . . . . Video
WAS . . . . Weapon action switch
WFOV . . . . Wide field-of-view
WHT . . . . White
WPN . . . . Weapon
XMIT . . . . Transmit
ZFOV . . . . Zoom field-of-view

Section II. DEFINITION OF UNUSUAL TERMS

TRIAC . . . . Bidirectional gated switch

ALPHABETICAL INDEX

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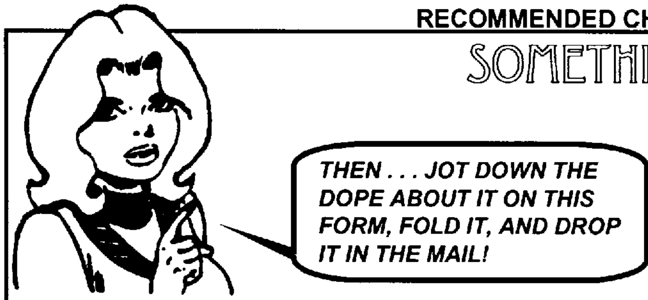

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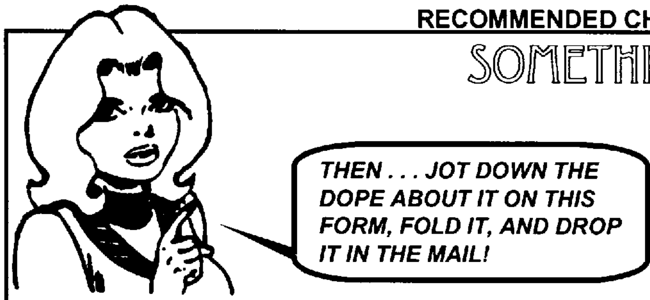

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = 0.39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hect.ometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = 0.15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = 0.035 ounce
1 dekagram = 10 grams = 0.35 ounce
1 hectogram = 10 dekagrams 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Temperature

5/9 (°F-32) = °C
212° Fahrenheit = 100° Celsius
90° Fahrenheit = 32.2° Celsius
32° Fahrenheit = 0° Celsius
9/5 C° +32 = F°

Liquid Measure

1 centiliter = 10 milliliters = 0.34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = 0.155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = 0.386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = 0.06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	To	Multiply by
inches	centimeters	2.540
feet	meters	0.305
yards	meters	0.914
miles	kilometers	1.609
square inches	square centimeters	6.451
square feet	square meters	0.093
square yards	square meters	0.836
square miles	square kilometers	2.590
acres	square hectometers	0.405
cubic feet	cubic meters	0.028
cubic yards	cubic meters	0.765
fluid ounces	milliliters	29,573
pints	liters	0.473
quarts	liters	0.946
gallons	liters	3.785
ounces	grams	28.349
pounds	kilograms	0.454
short tons	metric tons	0.907
pound-feet	newton-meters	1.356
pound-inches	newton-meters	0.11296

To change	To	Multiply by
ounce-inches	newton-meters	0.007062
centimeters	inches	0.394
meters	feet	3.280
meters	yards	1.094
kilometers	miles	0.621
square centimeters	square inches	0.155
square meters	square feet	10.764
square meters	square yards	1.196
square kilometers	square miles	0.386
square hectometers	acres	2.471
cubic meters	cubic feet	35.315
cubic meters	cubic yards	1.308
milliliters	fluid ounces	0.034
liters	pints	2.113
liters	pints	1.057
liters	quarts	0.264
grams	ounces	0.035
kilograms	pounds	2.205
metric tons	short tons	1.102
Newton-meters	pound-feet	0.738
Kilo pascals	pounds per square inch	0.145

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