LED-267-53A

LUNAR MODULE

10 & SUB

ELEMENTARY FUNCTIONAL DIAGRAMS

GRUMMAN

NAS 9-1100

THIS MANUAL SUPERSEDES LED-267-53 DATED 15 JANUARY 1970

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I. Preface

This edition of LM Elementary Functional Diagrams was prepared for engineering use as the controlling document on the LM Program. No attempt was made to draw the internal diagram of electronic black boxes, except for some minor portions of circuits that would assist in completing the logic flow through the vehicle wiring. The LM cabin controls & displays as shown in Fig. 1 & 2, the electrical/electronic symbols used on the diagrams are shown in figure 3, and the symbols used for cross-referencing between diagrams are shown in figure 4. To eliminate confusion, since Roman numerals are used to designate vehicle panel numbers on the EFD diagrams, and level three drawings and Arabic numerals are attached to the LM cabin panels, both numbering systems are shown on the panel drawings in this document.

It is expected that this edition and subsequent editions will be updated frequently. Because the diagrams are useful for many purposes it is requested that any constructive criticism be addressed to:

GRUMMAN AEROSPACE CORPORATION
DEPT. 267, LM CONFIGURATION SCHEMATIC SUBSYSTEM (CSS)
BETHPAGE, NEW YORK 11714

II. Reference Documents

For more detailed information related to vehicle wiring, the reader should refer to the following documents:

LM-10 Connector List: LED390-112
LM-10 Circuit List: LED390-113
LM-11 Connector List: LED390-125
LM-11 Circuit List: LED390-126

III. General Notes

1. Bethpage GSE/vehicle interfaces for the ACE carry-on console and integrated workstand may be obtained from Document

   LM-10 LDD 407-40
   LM-11 LDD 407-41
   LM-12 LDD 407-42
   LM-13 LDD 407-43

2. Electrical drawing symbols shown in this document are in accordance with section 15 of the MFSC Drafting Manual, and MIL-STD-15 and GS22B.

III. GENERAL NOTES (Continued)

3. Mechanical drawing symbols shown in this document are in accordance with MSFC-STD-162A, MIL-STD-17, and GS22A.

4. Reference Designations.
Partial reference designations are shown. Prefix with subsystem designation.

A	-	Assembly	K	-	Relay
B	-	Motor, resolver, synchro	L	-	Coil, valve
BT	-	Battery	M	-	Meter
C	-	Capacitor	MP	-	Gyroscope
CB	-	Circuit breaker	MT	-	Transducer
CP	-	Adapter connector (right angle connector)	P	-	Connector, plug
			Q	-	Transistor
CR	-	Diode	R	-	Resistor
DS	-	Indicator light, electro luminescent, floodlights	RT	-	Resistor, current regulating
			S	-	Switch
E	-	Antenna	SQ	-	Pyro squib
F	-	Fuse	T	-	Transformer
FL	-	Flag (talk-back), filter	W	-	Umbilical cable assembly
H	-	Mechanical valves, throttle/jets control	W/G	-	Waveguide
			X	-	Thrust translation controller
HR	-	Heater			
J	-	Connector, recepticle			

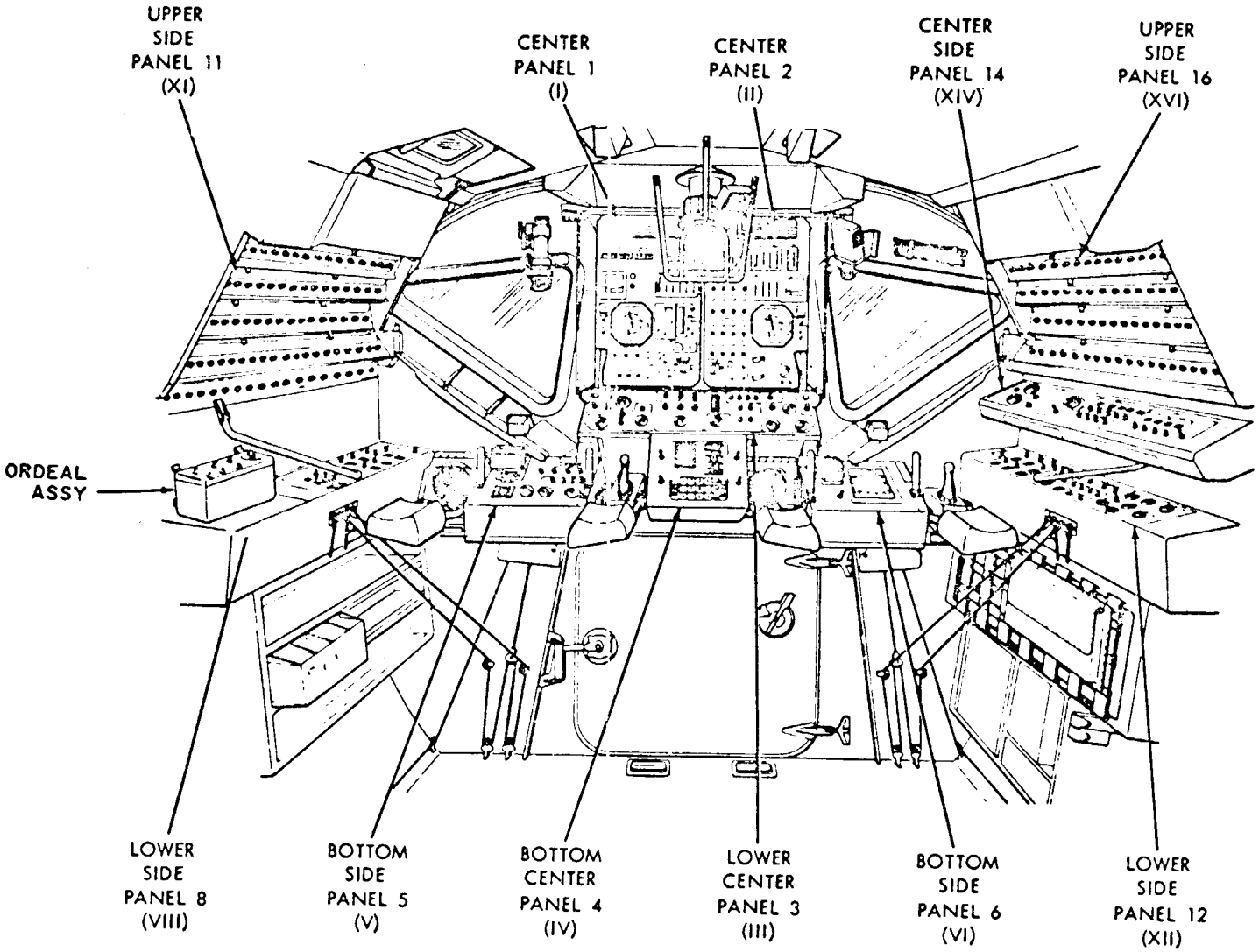


Figure 1. LM Cabin Control and Display Panels

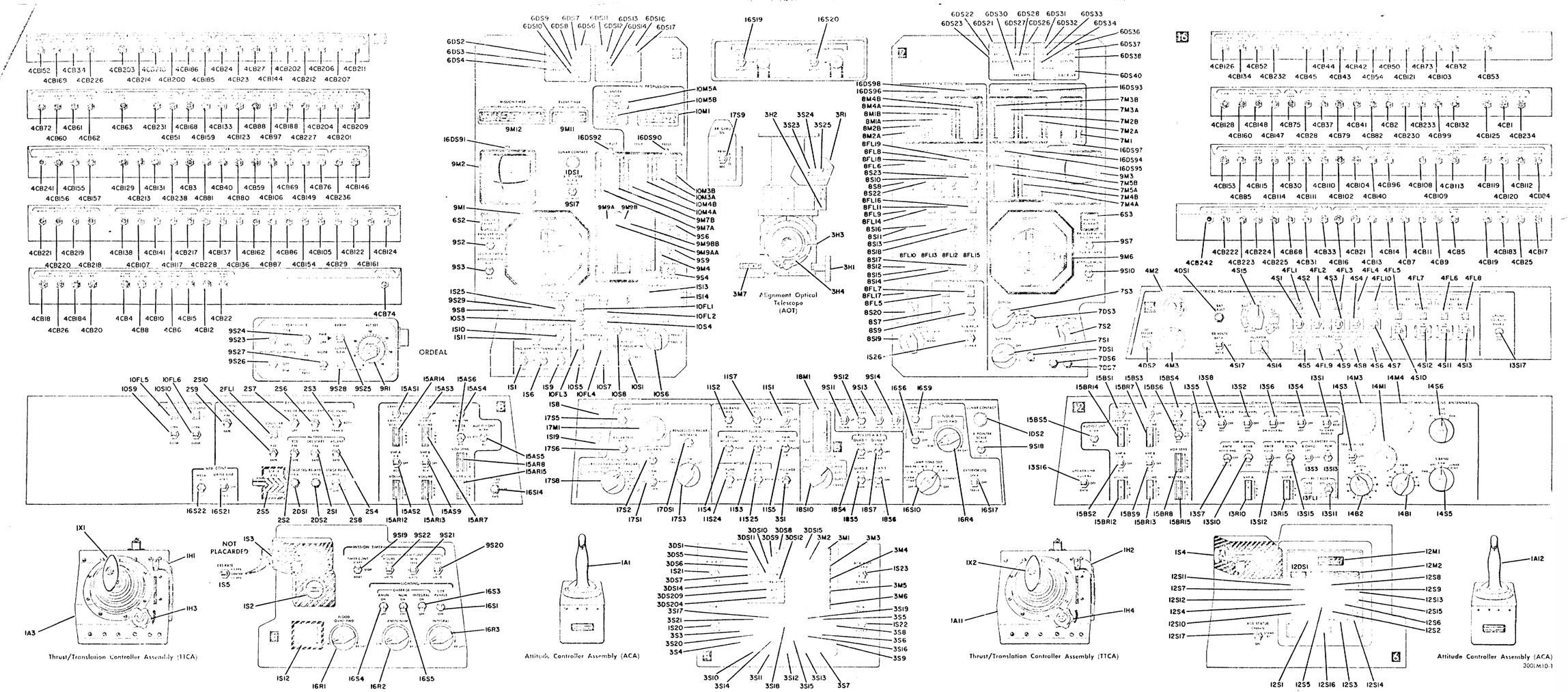


Figure 2. LM Cabin Controls & Displays V

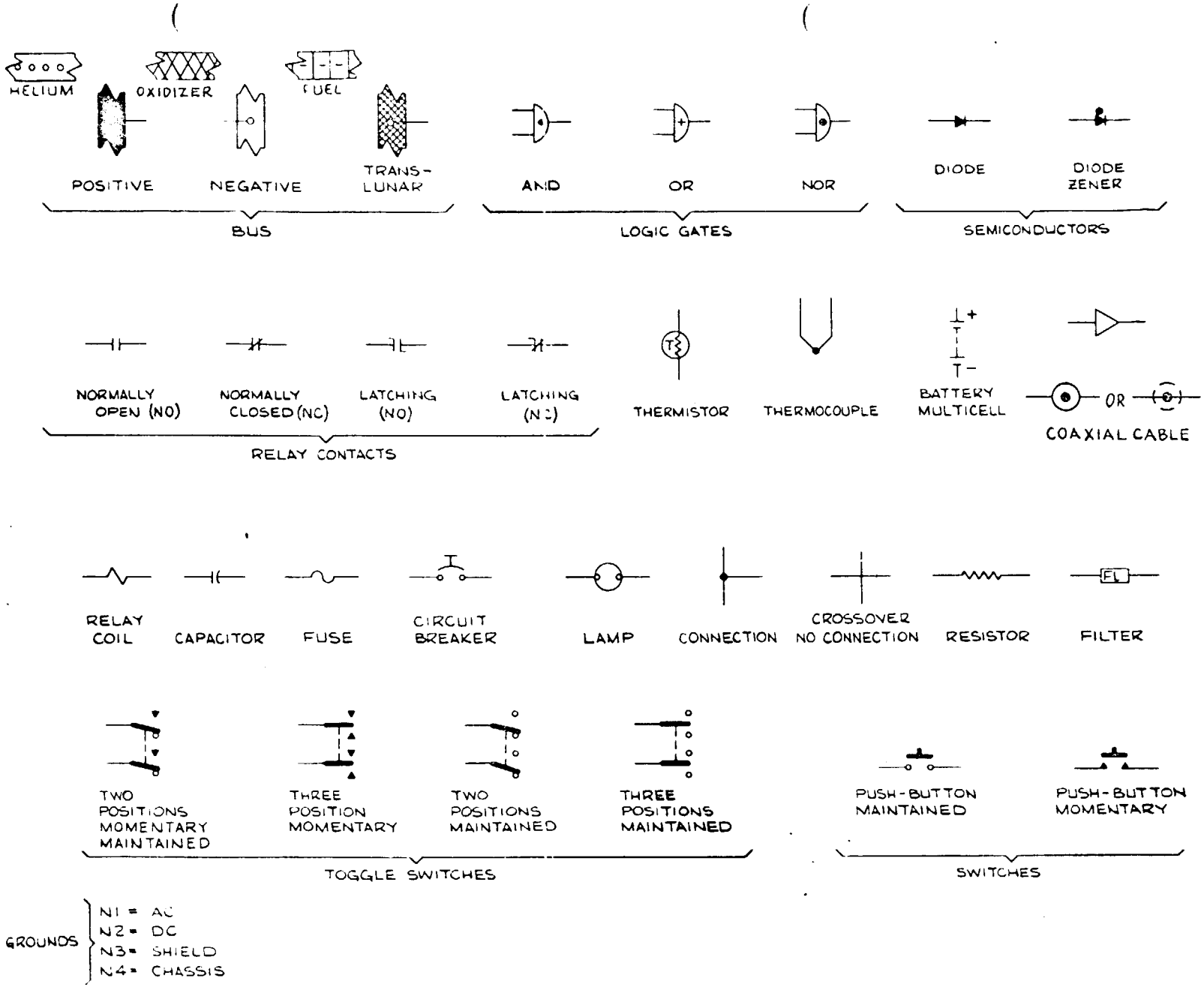


Figure 3. EFD Electrical/Electronic Symbols

1.

TRIANGLE WITH A NUMBER - INDICATES CONTINUATION OF WIRE ON SAME SHEET.

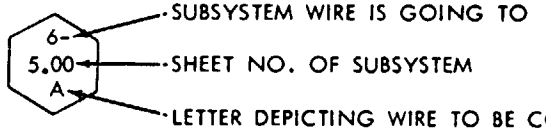
2.

CIRCLE WITH A LETTER - INDICATES CONTINUATION OF WIRE ON DIFFERENT SHEET OF THE SAME SUBSYSTEM GROUPING. SHEET NO. IS INDICATED NEXT TO SYMBOL AS SHOWN IN EXAMPLE.

EX.

3.

HEXAGON WITH SUBSYSTEM GROUP REFERENCE, SHEET NO., AND LETTER - INDICATES CONTINUATION OF WIRE ON DIFFERENT SUBSYSTEM.



4.

HEXAGON WITH SUBSYSTEM REFERENCE AND SHEET NO. - INDICATES CONTINUATION OF A GROUP OF WIRES ON A DIFFERENT SUBSYSTEM.

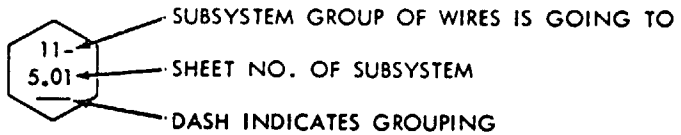


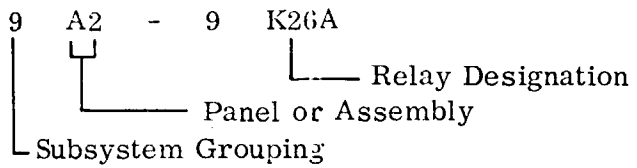
Figure 4. EFD Cross Reference Symbols

IV. Introduction to LM Elementary Functional Diagram Vehicle Relay Index (Table 1)

1. This section is a tabulation of relays appearing on the LM Elementary Functional Diagrams.

2. The table is presented in five columns. The columns and contents of the columns are as follows:

Relay Columns - This column contains the relay number (Subsystem Grouping, Panel or Assembly Designation and Relay Designation), which can be interpreted as follows:



Latching Relay Column - This column contains a "L" to indicate which relays are latching type; thus, the omission of the "L" indicates the relay is of the nonlatching type.

Coil Located on EFD No. (s) Column - This column contains a listing of the Elementary Functional Diagram(s) on which the coil appears.

Contacts Located on EFD No. (3) Column - This column contains a listing of the Elementary Functional Diagrams on which the contacts appear.

Function Column - This column contains a brief function and/or title of the device.

3. The relay location index coding is derived as follows:

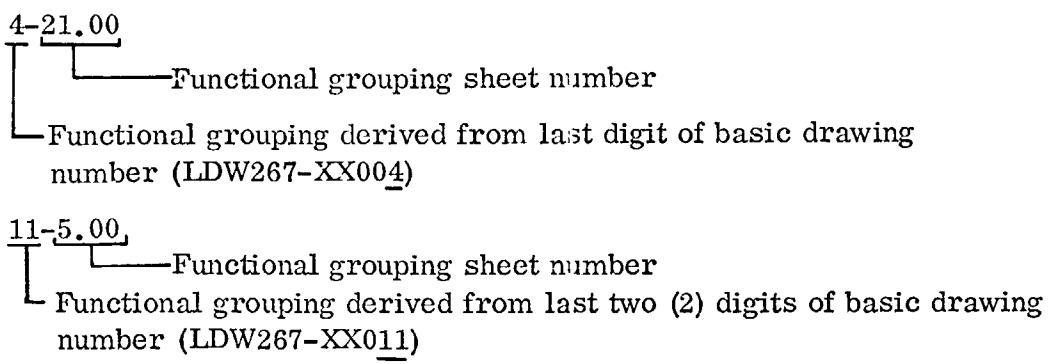


Table 1. LM EFD Relay Index (Sheet 1 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
1A8-K1	L	4-21.00, 11-5.00 11-6.00, 11-7.00	4-21.00, 11-5.00 11-6.00, 11-7.00	PGNS-AGS SEL. CONT.
1A8-K2	L	11-5.00, 11-6.00, 11-7.00	11-5.02, 11-13.00	PGNS-ACS YAW RATE CMD
1A8-K3	L	11-5.00, 11-6.00, 11-7.00	11-5.01, 11-14.00	PGNS-AGS PITCH RATE CMD
1A8-K4	L	11-5.00, 11-6.00, 11-7.00	11-5.01, 11-15.00	PGNS-AGS ROLL RATE CMD
1A8-K5	L	4-21.00, 11-5.00 11-6.00, 11-7.00	4-21.00, 11-15.00	800 Hz PGNS-AGS SEL.
1A8-K6	L	11-5.00, 11-6.00, 11-7.00	11-5.00, 11-6.00, 11-7.00	PGNS-AGS SEL. CONT.
1A8-K7	L	11-5.00, 11-6.00, 11-7.00	3-5.00, 11-23.00	PGNS-AGS SEL
1A8-K8	L	11-5.00, 11-6.00, 11-7.00	1-5.00, 1-5.02, 1-10.00, 12-8.00	PGNS-AGS SEL. FOLLOW UP
1A8-K9	L	11-5.00, 11-6.00, 11-7.00	1-5.00, 1-5.02, 1-10.00	PGNS-AGS SEL.
1A8-K11	L	11-5.00, 11-6.00, 11-7.00	1-5.00, 1-9.00	PGNS-AGS SEL.
1A8-K12	L	11-5.00, 11-6.00, 11-7.00	11-5.00, 11-7.00	28VDC PGNS PREAMPS IN ATCA
1A8-K13	L	11-5.00, 11-6.00, 11-7.00	11-5.00, 11-6.00	28 VDC PGNS PREAMPS IN ATCA
1A8-K14		1-5.00, 1-5.02, 1-6.00	3-5.00	ENGINE ARMED
1A8-K15	L	1-5.00, 1-5.01, 1-5.02, 1-8.00, 1-9.00	1-9.00, 1-20.01, 16-4.01, 16-6.00	ENG FIRE OVERRIDE (SET-RESET)
1A8-K16		1-5.00, 1-11.00	1-5.00, 1-11.00, 1-20.01	DESCENT ENGINE ON
1A8-K17		1-5.00, 1-11.00		DESCENT ENGINE ON
1A8-K19	L	1-5.00, 1-5.01, 1-5.02, 1-8.00, 1-9.00	1-5.00, 1-5.01, 1-5.02, 1-8.00, 1-9.00	ENG FIRE OVERRIDE (SET-RESET)
1A8-K22	L	1-5.00, 1-5.01, 1-5.02, 1-8.00, 1-9.00	1-5.00, 1-5.02, 1-9.00	ENG FIRE OVERRIDE (SET-RESET)
1A8-K23		11-10.00	3-9.00, 11-10.00	STIMULATE STAGING CMD
1A8-K24		11-10.00	3-9.00, 11-10.00	STIMULATE STAGING CMD

Table 1. LM EFD Relay Index (Sheet 2 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
1A9-K1		11-5.03, 11-19.00	11-5.00, 11-10.00, 11-23.00	YAW PULSE DIRECT CONT.
1A9-K3		11-5.03, 11-19.00	11-5.00, 11-10.00, 11-23.00	PITCH PULSE DIRECT CONT.
1A9-K5		11-5.03, 11-19.00	11-5.00, 11-10.00, 11-23.00	ROLL PULSE DIRECT CONT.
1A9-K7		11-5.00, 11-6.00	11-23.00, 12-8.00	PGNS-AGS SEL FOLLOW UP
1A9-K8		11-5.00, 11-7.00	3-5.01, 11-23.00	CONTROLLER OUT OF DETENT
1A9-K9		1-5.00, 1-5.01, 1-7.00	1-5.00, 1-5.02, 1-6.00, 12-8.00	PGNS-AGS SEL. ABORT STAGE
1A9-K10		1-5.00, 1-5.01, 1-7.00	3-5.00, 4-8.00	ABORT STAGE
1A9-K11		1-5.00, 1-5.01, 1-8.00	1-5.00, 1-5.01, 1-12.00	PGNS-AGS SEL.
1A9-K12		1-5.00, 1-5.01, 1-8.00	1-5.00, 1-5.01, 1-12.00	28VDC PGNS PREAMP IN ATCA
1A9-K13		1-5.00, 1-5.01, 1-6.00	1-5.00, 1-5.01, 1-12.00	ABORT STAGE CMD
1A9-K14		1-5.00, 1-5.01, 1-10.00	1-5.00, 1-5.01, 1-12.00	ASC ENG ARM
1A9-K15		1-5.00, 1-11.00	11-5.00, 11-5.01 11-10.00, 11-16.00	DESCENT ENG THRUST
1A9-K16		1-5.00, 1-12.00	1-20.01, 12-8.00	ASCENT ENG ON
1A9-K17		1-5.00, 1-5.02, 1-10.00	1-5.00, 1-5.02, 1-10.00, 1-20.01	AUTO ENG OFF CMD
1A9-K18		1-5.00, 1-5.02, 1-10.00	1-5.00, 1-5.02, 1-10.00, 1-20.01	AUTO ENG ON CMD
1A9-K19		1-5.00, 1-7.00	1-20.01, 2-11.00	ABORT STAGE CMD
1A9-K20		1-5.00, 1-7.00	1-5.00, 1-5.02, 1-9.00, 4-8.00	POWER SWITCHOVER & DE STOP
1A9-K21		1-5.00, 1-7.00	1-5.00, 1-5.01, 1-10.00, 3-5.00	ABORT STAGE CMD
1A9-K22		1-5.00, 1-5.01, 1-6.00	1-5.00, 1-5.01, 1-6.00 1-10.00	AELD RESET

Table 1. LM EFD Relay Index (Sheet 3 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
1A9-K23		1-5.00, 1-5.01, 1-7.00	1-5.00, 1-5.01, 1-6.00, 1-10.00, 11-5.00	ABORT STAGE CMD
1A9-K24		1-5.00, 1-5.02, 1-10.00	1-5.00, 1-5.01, 1-10.00, 11-5.00	AUTO ASC ENG ON CMD
1A9-K25		1-5.00, 1-5.02, 1-10.00	1-5.00, 1-5.01, 1-10.00,	AUTO ASC ENG OFF CMD
1A9-K201		1-5.00, 1-7.00	12-8.00	ABORT STAGE CMD
1A9-K203		1-5.00, 1-12.00	11-5.00, 11-5.01, 11-10.00, 11-16.00	ASC ENG ON CMD
1A9-K204		1-5.00, 1-12.00	11-5.00, 11-5.01, 11-10.00, 11-16.00	ASC ENG ON CMD
1A9-K205		1-5.00, 1-12.00	1-20.01, 12-8.00	ASC ENG ON CMD
1A9-K206		1-5.00, 1-5.01, 1-6.00	1-5.00, 1-5.01, 1-6.00	ENG ARM
1A9-K207		1-5.00, 1-5.01, 1-12.00	1-5.00, 1-12.00	ABORT OR AUTO START
1A10-K1		1-5.00, 1-5.02, 1-6.00	1-5.00, 1-5.02, 1-13.00,	DES ENG ARM
1A10-K2		1-5.00, 1-5.02, 1-6.00	1-15.00	+43 ±15V PWR SUP FAIL
1A10-K3		1-5.00, 1-5.02, 1-9.00	1-5.00, 1-5.02, 1-9.00, 1-10.00	DES ENG MAN STOP
1A10-K4		1-5.00, 1-11.00	1-18.00	PITCH GIMBAL OFF
1A10-K5		1-5.00, 1-11.00	1-17.00	ROLL GIMBAL OFF
1A10-K6		1-5.00, 1-5.02, 1-10.00	1-5.00, 1-5.02, 1-13.00	AUTO DES CONT LATCH
1A10-K7		1-5.00, 1-5.02, 1-9.00	1-5.00, 1-5.02, 1-13.00	DES ENG MAN. START
1A10-K8		1-5.00, 1-11.00	1-5.00, 1-11.00, 1-18.00	PITCH TRIM SHUTDOWN
1A10-K9		1-5.00, 1-11.00	1-5.00, 1-11.00, 1-17.00	ROLL TRIM SHUTDOWN
1A10-K10		1-5.00, 1-5.02, 1-6.00	1-5.00, 1-5.02, 1-13.00	ARM PRE-VALVES
1A10-K13		1-5.00, 1-9.00	1-18.00	PITCH TRIM MODE
1A10-K14		1-5.00, 1-9.00	1-17.00	ROLL TRIM MODE
1A10-K15		1-5.00, 1-9.00	1-16.00	AUTO THRUST DISABLE
1A10-K16		1-5.00, 1-5.02, 1-13.00	1-5.00, 1-11.00	CLOSE ON DES ENG START
1A10-K21		1-18.00	1-19.00, 3-5.01	PITCH TRIM FAIL

Table 1. LM EFD Relay Index (Sheet 4 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
1A10-K22		1-17.00	1-19.00, 3-5.01	ROLL TRIM FAIL
1A10-K23		1-5.00, 1-5.02, 1-6.00	1-5.00, 1-5.02, 1-13.00	DES ENG ARM
1A10-K24		1-5.00, 1-5.02, 1-6.00	1-15.00	+15V PWR SUP FAIL
1A10-K25		1-5.00, 1-5.02, 1-6.00	1-10.00, 1-15.00	400 Hz POWER
1A10-K26		1-15.00	1-5.00, 1-5.02, 1-6.00 1-15.00	TRIM MALF RESET
1A10-K27		1-17.00	1-17.00, 1-18.00	TRIM MALF RESET
1A10-K28		1-5.00, 1-5.02, 1-13.00	1-5.00, 1-5.02, 1-10.00	AUTO DES CONT
1A13-1K1		1-5.00, 1-11.00	1-5.00, 1-11.00	DESCENT ENG THRUSTING
1A13-1K2		1-5.00, 1-11.00	1-5.00, 1-11.00	DESCENT ENG THRUSTING
1A13-1K3		1-5.00, 1-11.00	1-5.00, 1-11.00	DESCENT ENG THRUSTING
1A13-1K4		1-5.00, 1-9.00	1-5.00, 1-7.00, 1-8.00	PITCH GIMBAL OFF
1A13-1K5		1-5.00, 1-7.00	1-5.00, 1-5.02, 1-11.00 1-13.00	DESCENT ENG OVERRIDE
1A13-1K6		1-5.00, 1-5.02, 1-6.00	1-5.00, 1-5.02, 1-13.00	DESCENT ENG START ENABLE
1A13-2K1		1-5.00, 1-11.00	1-5.00, 1-11.00	LUNAR PROBE Y & Z
1A13-2K2		1-5.00, 1-11.00	1-5.00, 1-11.00	LUNAR PROBE Y & Z
1A13-2K3		1-5.00, 1-11.00	1-5.00, 1-11.00	LUNAR PROBE Y & Z
1A13-2K4		1-5.00, 1-5.02, 1-6.00	1-5.00, 1-7.00, 1-8.00	ENG ARM
1A13-2K5		1-5.00, 1-8.00	1-5.00, 1-5.02, 1-11.00, 1-13.00	DESCENT ENG OVERRIDE
1A13-2K6		1-5.00, 1-5.02, 1-6.00	1-5.00, 1-5.02, 1-13.00	DESCENT ENG START ENABLE
1A13-3K7		1-5.00, 1-11.00	1-5.00, 1-11.00	DESCENT ENG THRUSTING
PNL IV B				
1K1		11-5.00, 11-6.00	11-5.02, 11-11.00	TRANSL CMD
1K2		11-5.00, 11-6.00	11-5.01, 11-11.00	TRANSL CMD

Table 1. LM EED Relay Index (Sheet 5 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
PNL IV A				
1K3		11-5.00,11-6.00	11-5.02,11-11.00	TRANSL CMD
1K4		11-5.00,11-6.00	11-5.01,11-11.00	TRANSL CMD
2A1-K1	L	2-5.00	2-7.00,2-11.00	ED BAT ENABLE - DISABLE
2A1-K2	L	2-5.00	2-7.00,2-11.00	DELAY TIMER ENABLE - DISABLE
2A1-K3		2-7.00	2-7.00,2-9.00,2-11.00	CABLE CUTTER
2A1-K4		2-7.00	2-9.00,2-11.00	CABLE CUTTER
2A1-K5		2-7.00	2-9.00,2-11.00	STAGING BOLTS
2A1-K5A		2-7.00	2-9.00,2-11.00	STAGING BOLTS
2A1-K6		2-7.00	2-9.00,2-11.00	ELECT CIRCUIT INTERRUPTERS
2A1-K7		2-5.00	2-9.00,2-11.00	RCS (HE) PRESS
2A1-K8		2-5.00	2-9.00,2-11.00	LANDING GEAR DEPLOY
2A1-K8A		2-5.00	2-9.00,2-11.00	LANDING GEAR DEPLOY
2A1-K9		1-5.00,2-5.00	2-9.00,2-11.00	DESCENT ENG (HE) PRESS
2A1-K10		2-5.00	2-9.00,2-11.00	ASCENT ENG (HE) PRESS TANK 1
2A1-K11		2-5.00	2-9.00,2-11.00	ASCENT ENG (HE) PRESS TANK 2
2A1-K12		2-5.00	2-9.00,2-11.00	SPARE
2A1-K12A		2-5.00	2-9.00,2-11.00	ASCENT ENG (HE) PRESS
2A1-K13		2-5.00	2-9.00,2-11.00	DESCENT ENG (HE) VENT
2A1-K14		2-5.00	2-9.00,2-11.00	DESCENT ENG (HE) PRESS (START)
2A1-K15		2-5.00	2-9.00,2-11.00	DESCENT ENG (HE) PRESS

Table 1. LM EFD Relay Index (Sheet 6 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
2A2 K1	L	2-6.00	2-8.00, 2-11.00	ED BAT ENABLE - DISABLE
2A2-K2	L	2-6.00	2-8.00, 2-11.00	DELAY TIMER ENABLE - DISABLE
2A2-K3		2-8.00	2-8.00, 2-10.00, 2-11.00	CABLE CUTTER
2A2-K4		2-8.00	2-10.00, 2-11.00	CABLE CUTTER
2A2-K5		2-8.00	2-10.00, 2-11.00	STAGING NUTS
2A2-K5A		2-8.00	2-10.00, 2-11.00	STAGING NUTS
2A2-K6		2-8.00	2-10.00, 2-11.00	ELECT CIRCUIT INTERRUPTERS
2A2-K7		2-6.00	2-10.00, 2-11.00	RCS (HE) PRESS
2A2-K8		2-6.00	2-10.00, 2-11.00	LANDING GEAR DEPLOY
2A2-K8A		2-6.00	2-10.00, 2-11.00	LANDING GEAR DEPLOY
2A2-K9		1-5.00, 2-6.00	2-10.00, 2-11.00	DESCENT ENG (HE) PRESS
2A2-K10		2-6.00	2-10.00, 2-11.00	ASCENT ENG (HE) PRESS TANK 1
2A2-K11		2-6.00	2-10.00, 2-11.00	ASCENT ENG (HE) PRESS TANK 2
2A2-K12		2-6.00	2-10.00, 2-11.00	ASCENT ENG (HE) PRESS
2A2-K12A		2-6.00	2-10.00, 2-11.00	ASCENT ENG (HE) PRESS
2A2-K13		2-6.00	2-10.00, 2-11.00	DESCENT ENG (HE) VENT
2A2-K14		2-6.00	2-10.00, 2-11.00	DESCENT ENG (HE) PRESS (START)
2A2-K15		2-6.00	2-10.00, 2-11.00	DESCENT ENG (HE) PRESS
2A3-K1			2-12.00	
2A4-K1			2-12.00	
4A1-SECT-A-AUX	L	4-6.02	4-15.00	BAT. 3 INSTRUMENTATION

Table 1. LM EFD Relay Index (Sheet 7 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
4A1-SECT-A-HV	L	4-6.02	4-5.00, 4-6.02 4-19.00	ENABLES BAT. 3 HIGH VOLTAGE FEED
4A1-SECT-A-LOR		4-6.02	4-6.02	BAT. 3 ISOLATION
4A1-SECT-A-LV	L	4-6.02	4-5.00, 4-6.02 4-9.00, 4-19.00	ENABLES BAT. 3 & LUNAR BAT. 7 LOW VOLTAGE FEED
4A1-SECT-A-OC	L	4-6.02	4-6.02, 4-15.00	BAT. 3 OVERCURRENT PROTECTION
4A1-SECT-A-RC	L	4-6.02	4-15.00	BAT. 3 REVERSE CURRENT PROTECTION
4A1-SECT-B-AUX	L	4-6.03	4-15.00	BAT. 4 INSTRUMENTATION
4A1-SECT-B-HV	L	4-6.03	4-5.00, 4-6.03, 4-19.00	ENABLES BAT. 4 HIGH VOLTAGE FEED
4A1-SECT-B-LOR		4-6.03	4-6.03	BAT. 4 ISOLATION
4A1-SECT-B-LV	L	4-6.03	4-5.00, 4-6.03 4-9.00, 4-19.00	ENABLES BAT. 4 LOW VOLTAGE FEED
4A1-SECT-B-OC	L	4-6.03	4-6.03, 4-15.00	BAT 4 OVERCURRENT PROTECTION
4A1-SECT-B-RC	L	4-6.03	4-15.00	BAT. 4 REVERSE CURRENT PROTECTION
4A2-SECT-A-AUX	L	4-6.00	4-15.00	BAT. 1 INSTRUMENTATION
4A2-SECT-A-HV	L	4-6.00	4-5.00, 4-6.00 4-19.00	ENABLES BAT. 1 HIGH VOLTAGE FEED

Table 1. LM EFD Relay Index (Sheet 8 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
4A2-SECT-A-LOR		4-6.00	4-6.00	BAT. 1 ISOLATION
4A2-SECT-A-LV	L	4-6.00	4-5.00, 4-6.00 4-9.00, 4-19.00	ENABLES BAT. 1 LOW VOLTAGE FEED
4A2-SECT-A-OC	L	4-6.00	4-6.00, 4-15.00	BAT. 1 OVERCURRENT PROTECTION
4A2-SECT-A-RC	L	4-6.00	4-15.00	BAT. 1 REVERSE CURRENT PROTECTION
4A2-SECT-B-AUX	L	4-6.01	4-15.00	BAT. 2 INSTRUMENTATION
4A2-SECT-B-HV	L	4-6.01	4-5.00,4-6.01, 4-19.00	ENABLES BAT. 2HIGH VOLTAGE FEED
4A2-SECT-B-LOR		4-6.01	4-6.01	BAT. 2 ISOLATION
4A2-SECT-B-LV	L	4-6.01	4-5.00, 4-6.01 4-9.00, 4-19.00	ENABLES BAT. 2 & LUNAR BAT. 7 LOW VOLTAGE FEED
4A2-SECT-B-OC	L	4-6.01	4-6.01, 4-15.00	BAT. 2 OVERCURRENT PROTECTION
4A2-SECT-B-RC	L	4-6.01	4-15.00	BAT. 2 REVERSE CURRENT PROTECTION
4A3-ALT-MFC	L	4-7.00	4-5.00, 4-7.00 4-8.00, 4-20.00	ENABLES BAT. 5 ALTERNATE FEED
4A3-NORM-LOR		4-7.00	4-7.00	BAT. 5 ISOLATION (NORMAL)
4A3-NORM-MFC	L	4-7.00	4-5.00,4-7.00,4-8.00 4-15.00, 4-20.00	ENABLES BAT. 5 NORMAL FEED

Table 1. LM EFD Relay Index (Sheet 9 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
4A3-NORM-OC	L	4-7.00	4-7.00, 4-15.00	BAT. 5 OVERCURRENT PROTECTION (NORMAL)
4A3-RC	L	4-7.00	4-15.00	BAT. 5 REVERSE CURRENT PROTECTION
4A4-ALT-MFC	L	4-7.01	4-5.00, 4-7.01 4-8.00, 4-20.00	ENABLE BAT. 6 ALTERNATE FEED
4A4-NORM-LOR		4-7.01	4-7.01	BAT. 6 ISOLATION (NORMAL)
4A4-NORM-MFC	L	4-7.01	4-5.00, 4-7.01 4-8.00, 4-15.00, 4-20.00	ENABLES BAT. 6 NORMAL FEED
4A4-NORM-OC	L	4-7.01	4-7.01, 4-15.00	BAT. 6 OVERCURRENT PROTECTION (NORMAL)
4A4-RC	L	4-7.01	4-15.00	BAT. 6 REVERSE CURRENT PROTECTION
4A5-K1		4-8.00	4-7.00, 4-7.01, 4-8.00	ENABLES ABORT STAGING
4A5-K2		4-8.00	4-7.00, 4-7.01, 4-8.00	ENABLES ABORT STAGING
4A5-DFR	L	4-8.00	4-5.00, 4-8.00, 4-19.00	DEADFACES BATS. 1 & 2
4A5-LDA	L	4-8.00	4-5.00	LDR EXCITATION IND
4A5-LDR	L	4-8.00	4-5.00	ENABLES GROUND FACILITY POWER
4A6-DFR	L	4-8.00	4-5.00, 4-8.00 4-19.00	DEADFACES BATS. 3 & 4

Table 1. LM EFD Relay Index (Sheet 10 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
4A13-K1	L	4-6.02	4-15.00, 4-18.00	DESCENT BAT. 3/LUNAR BAT. 7 CONTROL
4A13-K2	L	4-6.02	4-6.02, 4-15.00	DESCENT BAT. 3/LUNAR BAT. 7 CONTROL
4A13-K3	L	4-6.02	4-18.00	DESCENT BAT. 3/LUNAR BAT. 7 CONTROL
4A13-K4	L	4-6.02	4-6.01, 4-6.02	DESCENT BAT. 3/LUNAR BAT. 7 CONTROL
4A13-K5	L	4-6.01	4-6.01, 4-15.00	DESCENT BAT. 2/LUNAR BAT. 7 CONTROL
4A13-K6	L	4-6.01	4-15.00, 4-18.00	DESCENT BAT. 2/LUNAR BAT. 7 CONTROL
4A13-K7	L	4-6.01	4-6.01, 4-6.02	DESCENT BAT. 2/LUNAR BAT. 7 CONTROL
4A13-K8	L	4-6.01	4-18.00	DESCENT BAT. 2/LUNAR BAT. 7 CONTROL
PNL XI-4K3		4-9.00	4-5.00, 4-9.00, 16-6.00	ENABLES CM POWER TO CDR BUS
PNL XI-4K4		4-9.00	4-5.00, 4-9.00, 16-6.00	ENABLES CM POWER TO CDR BUS
PNL XI-4K6		4-9.00	4-9.00	ENABLES INSTRUMENTATION
7A3-7K5		7-5.00	7-5.00	CABIN FAN, CONT
7A3-7K6		7-5.00	7-16.00	CABIN REPRESS INST
7A3-7K8	L	7-7.00	7-7.00	GLYCOL AUTO TRANSFER

Table 1. LM EFD Relay Index (Sheet 11 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
7A3-7K9		7-7.00	7-15.00, 16-4.01	GLYCOL AUTO TRANSFER
7A4-K12		7-6.00	7-6.00, 7-14.00, 16-4.01	SUIT FAN DIFF
9A5-9K26A		9-7.00	9-5.00, 9-9.00	ENABLES PGNS OR AGS ATTITUDE DATA TO FDAI CDR PANEL
9A5-9K26B		9-7.00	9-5.00, 9-5.01	
9A5-9K26C		9-7.00	9-5.00, 9-5.01	ENABLES PGNS OR AGS ATTITUDE DATA TO FDAI CDR PANEL
9A5-9K26D		9-7.00	9-9.00	
9A5-9K26E		4-21.00, 9-7.00	4-21.00, 9-9.00, 9-14.00	
9A5-9K27A		9-6.00	9-5.00, 9-9.00	ENABLES PNGS OR AGS ATTITUDE DATA TO FDAI LMP PANEL
9A5-9K27B		9-6.00	9-5.00, 9-5.01	
9A5-9K27C		9-6.00	9-5.00, 9-5.01	

Table 1. LM EFD Relay Index (Sheet 12 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
9A5-9K27D		9-6.00	9-9.00	ENABLES PNGS OR AGS ATTITUDE DATA TO FDAI LMP PANEL
9A5-9K27E		4-21.00, 9-6.00	4-21.00, 9-9.00, 9-14.00	
9A5-9K33A		9-6.00	9-9.00	RATE ERROR
9A5-9K33B		4-21.00, 9-6.00	4-21.00, 9-9.00, 9-14.00	RATE ERROR
PNL I				
9K28		9-15.00	9-15.00	RATE ERROR
9K32A		9-10.00	9-11.00	RATE ERROR
9K32B		9-10.00	9-10.00	RATE ERROR
PNL II				
9K29A		9-10.00	3-9.00, 9-12.00	RATE ERROR
9K29B		9-10.00	9-11.00	RATE ERROR
9K30A		9-10.00	9-11.00	RATE ERROR
9K30B		9-10.00	9-10.00	RATE ERROR
9K31A		4-21.00, 9-7.00	4-21.00, 9-9.00, 9-14.00	RATE ERROR
9K31B		9-7.00	9-9.00	RATE ERROR

Table 1. LM EFD Relay Index (Sheet 13 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
9K34A		9-10.00	3-9.00, 9-10.00, 9-12.00	RATE ERROR
9K34B		9-10.00	9-11.00	RATE ERROR
11A1-K1		11-5.01, 11-16.00	11-5.01, 11-16.00	ZERO CROSS DETECTOR
11A1-K2		11-5.01, 11-16.00	11-5.01, 11-16.00	ZERO CROSS DETECTOR
11A1-K3		11-5.02, 11-16.00	11-5.02, 11-16.00	ZERO CROSS DETECTOR
11A1-K8		11-5.00, 11-10.00	11-13.00	MISS SELECT YAW (CMD RATE)
11A1-K9		11-5.00, 11-10.00	11-14.00	MISS SELECT PITCH (CMD RATE)
11A1-K10		11-5.00, 11-10.00	11-15.00	MISS SELECT ROLL (CMD RATE)
11A1-K11		11-5.00, 11-10.00	11-13.00	MISS SELECT YAW (LIMITER)
11A1-K12		11-5.00, 11-10.00	11-14.00	MISS SELECT PITCH (LIMITER)
11A1-K13		11-5.00, 11-10.00	11-15.00	MISS SELECT ROLL (LIMITER)
11A1-K14		11-5.00, 11-10.00	11-13.00	DEAD BAND SELECT YAW
11A1-K15		11-5.00, 11-10.00	11-14.00	DEAD BAND SELECT PITCH
11A1-K16		11-5.00, 11-10.00	11-15.00	DEAD BAND SELECT ROLL
11A1-K19		11-5.00, 11-10.00	11-5.02, 11-13.00	PULSE MODE YAW
11A1-K20		11-5.00, 11-10.00	11-5.01, 11-14.00	PULSE MODE PITCH
11A1-K21		11-5.00, 11-10.00	11-5.01, 11-15.00	PULSE MODE ROLL
15A1-K1A		13-18.00	13-18.00	VHF "A" KEY SUPPLY
15A1-K1B		13-18.00	13-18.00	VHF "B" KEY SUPPLY

Table 1. LM EFD Relay Index (Sheet 14 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
15A1-K2A		13-18.00	13-18.00	VHF "A" KEY SUPPLY
15A1-K2B		13-18.00	13-18.00	VHF "B" KEY SUPPLY
16A5-K1		10.8.00	16-8.00	PROP PRESS
16A5-K2		9-11.00	16-8.00	CROSS POINTER
16A5-K3		9-15.00	16-8.00	THRUSTER
16A5-K4		7-9.00	16-8.00	SUIT & CABIN PRESS
16A5-K5		7-11.00	16-8.00	OX/WATER
16A5-K6		7-13.00	16-8.00	GLYCOL TEMP/PRESS
16A5-K7		8-12.00	16-8.00	RCS PRESSURE
16A5-K8		8-16.02	16-8.00	CROSS POINTER
16A5-K9		9-11.00	16-8.00	RCS QUANTITY
PNL XI				
16K1		16-6.00	16-6.00 16-4.01	28V/6V CONV
17A2-K1		17-8.00	3-11.01, 16-4.01, 17-8.00, 17-18.00	NO TRACK SIGNAL OR DATA GOOD
17A2-K2		17-8.00	3-11.01, 17-8.00	PWR ON/LGC MODE
17A2-K3		17-8.00	3-11.01, 17-8.00	RANGE LOW SCALE FACTOR
17A2-K4		17-8.00	17-8.00	DOPPLER SENSE
17A4-K1		17-14.00	3-11.00, 17-14.00	RANGE DATA GOOD
17A4-K2		17-15.00	3-11.00, 17-14.00	POS #1 INDICATION
17A4-K3		17-15.00	3-11.00, 17-14.00	POS #2 INDICATION
17A4-K4		17-17.00	3-11.00, 17-14.00	RANGE LOW SCALE FACTOR

Table 1. LM EFD Relay Index (Sheet 15 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
17A4-K5		17-14.00	3-11.00, 17-14.00	VELOCITY DATA GOOD
17A4-K11		17-13.00	17-18.00	POWER ON
20A20-K1		8-16.00	8-16.00, 16-4.01	RCS A REGULATOR (WARNING)
20A20-K1(MA)		6-5.00	6-5.00, 6-10.00,	MASTER ALARM CLOSURE
20A20-K2		6-16.00	8-16.00, 16-4.01	RCS B REGULATOR (WARNING)
20A20-K2(MA)		6-5.00	6-5.00	MASTER ALARM CLOSURE
20A20-K3		8-16.02	8-16.02, 16-4.01	RCS (CAUTION)
20A20-K3(MA)		6-5.00	6-5.00	MASTER ALARM CLOSURE
20A20-K4		4-16.00	4-16.00, 16-4.01	DC BUS WARNING
20A20-K5		4-16.00	4-16.00, 16-4.01	INV CAUTION
20A20-K5(MA)		6-5.00	6-5.00	C/WEA POWER SUPPLY ALARM
20A20-K6		4-15.00	4-15.00, 16-4.01	BATTERY CAUTION
20A20-K6(MA)		6-5.00	6-5.00, 16-10.00	C/WEA POWER SUPPLY ALARM
20A20-K7		7-16.00	7-16.00, 16-4.01	CABIN PRESSURE
20A20-K7(MA)		6-5.00	6-5.00, 6-8.01, 16-4.01	C/WEA POWER SUPPLY ALARM
20A20-K8		7-9.00	7-9.00, 16-4.01	SUIT FAN CAU & WARN
20A20-K9		7-16.00	7-16.00, 16-4.01	GLYCOL PUMP PRESS.
20A20-K10		7-9.00	7-9.00, 16-4.01	H_2O SEP CAU & WARN
20A20-K11		7-9.00	7-9.00, 16-4.01	CO_2 CAU & WARN
20A20-K12		7-12.00	7-12.00, 16-4.01	DESCENT/ASCENT H_2O QTY CAU & WARN

Table 1. LM EFD Relay Index (Sheet 16 of 17)

RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
20A20-K13		7-12.00	7-12.00, 16-4.01	PRESS CAU & WARN
20A20-K14		7-10.00	7-10.00, 16-4.01	GLYCOL CAU & WARN
20A20-K15		10-12.00	10-12.00, 16-4.01	ACS PRESS WARNING
20A20-K16		10-12.00	10-12.00, 16-4.01	ASC QTY CAUTION
20A20-K17		10-12.00	10-12.00, 16-4.01	ASC HI REG CAUTION
20A20-K18		10-10.00	10-10.00	DESCENT QTY WARNING
20A20-K19		10-10.00	10-10.00, 16-4.01	DESCENT REQ'D WARNING
20A20-K20		11-21.00	6-10.00, 11-21.00, 16-4.01	CES C/WEA DATA
20A20-K21		11-20.00	11-20.00	PRE AMPS CAUTION
20A20-K22		11-20.00	6-10.00, 11-20.00 16-4.01	CES C/WEA DATA
20A20-K23		1-19.00	1-19.00, 16-4.01	PRE AMPS CAUTION
20A20-K24		3-14.00	3-14.00, 16-4.01	LGC WARNING
20A20-K25		3-14.00	3-14.00, 16-4.01	ISS WARNING
20A20-K26		3-14.00	3-14.00	PONS WARNING
20A20-K27		17-18.00	16-4.01, 17-18.00	L/R CAUTION LTS
20A20-K28		17-18.00	16-4.01, 17-18.00	R/R CAUTION LTS
20A20-K29		12-13.00	6-10.00, 12-13.00, 16-4.01	AGS WARNING
20A20-K30		8-16.01	8-16.01, 16-4.01	RCS HEATER (CAUTION)
20A20-K31		8-16.00	8-16.00, 16-4.01	TCA (WARNING)
20A20-K33		8-15.06	8-15.06	SYS "A" LGC THRUSTER PAIR CMDS QUAD 4
20A20-K34		8-15.07	8-15.07	SYS "B" LGC THRUSTER PAIR CMDS QUAD 4

Table 1. LM EFD Relay Index (Sheet 17 of 17)

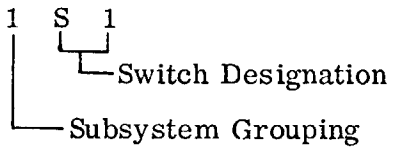
RELAY NO.	INDICATES LATCHING RELAY	COIL LOCATED ON	CONTACT LOCATED ON	FUNCTION
20A20-K35		8-15.04	8-15.04	SYS "A"LGC THRUSTER PAIR CMDS QUAD 3
20A20-K36		8-15.05	8-15.05	SYS "B" LGC THRUSTER PAIR CMDS QUAD 3
20A20-K37		8-15.02	8-15.02	SYS "A" LGC THRUSTER PAIR CMDS QUAD 2
20A20-K38		8-15.03	8-15.03	SYS "A" LGC THRUSTER PAIR CMDS QUAD 2
20A20-K39		8-15.00	8-15.00	SYS "A" LGC THRUSTER PAIR CMDS QUAD 1
20A20-K40		8-15.01	8-15.01	SYS "B" LGC THRUSTER PAIR CMDS QUAD 1
20A20-K44		2-11.00	2-11.00, 16-4.01	MASTER ALARM ED RELAYS
20A20-K45		13-9.00	13-9.00, 16-4.01	CAUTION & WARNING S-BAND RCVR.

V. Introduction to LM Elementary Functional Diagram Vehicle Switch Index (Table 2)

1. This section is a tabulation of switches appearing on the LM Elementary Functional Diagrams.

2. The table is presented in four columns. The columns and contents of the columns are as follows:

Switch No. Column - This column contains the switch number (Subsystem Grouping and Switch Designation), which can be interpreted as follows:



Panel or Location Column - This column indicates panel or location of switch.

Switch Nomenclature Column - This column contains the switch nomenclature as placarded on LM Panels.

Switch Located on EFD No. (s) Column: This column contains a listing of the Elementary Functional Diagrams on which the switch appears.

3. The switch location index coding is derived as follows:

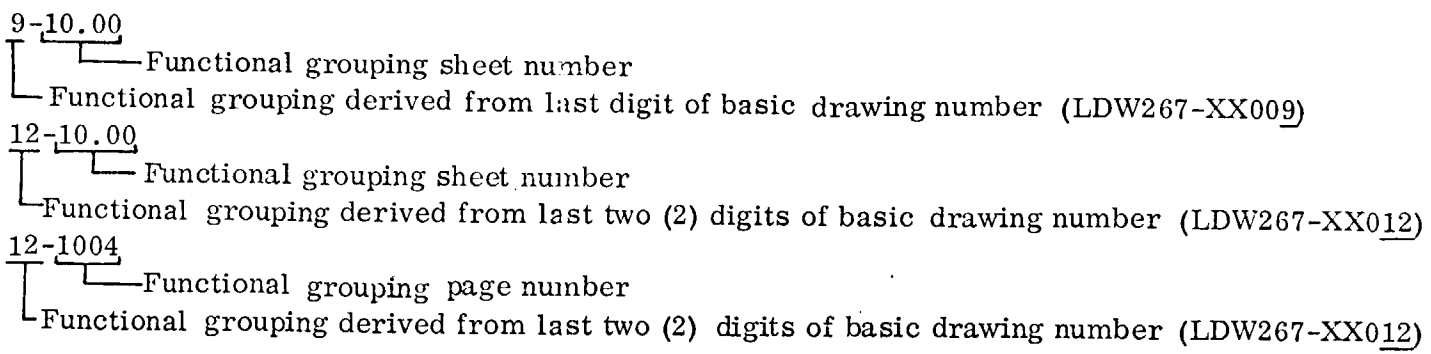


Table 2. LM EFD Switch Index (Sheet 1 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
1S1	I	ENGINE ARM	1-5.00,1-5.01,1-5.02,1-6.00, 1-8.00,1-9.00,1-10.00
1S2	V	ENGINE START	1-5.00,1-5.01,1-5.02,1-8.00
1S3	V	ENGINE STOP (CDR)	1-5.00,1-5.01,1-5.02,1-6.00, 1-9.00,1-10.00,16-4.01,16-6.00
1S4	VI	ENGINE STOP (LMP)	1-5.00,1-5.01,1-5.02,1-6.00, 1-9.00,1-10.00,16-4.01,16-6.00
1S5	V	RATE OF DESCENT	3-9.01
1S6	I	X-TRANSL	11-5.01, 11-16.00
1S8	III	ENGINE GIMBAL	1-5.00,1-11.00,3-5.01
1S9	V	BALANCED COUPLER, UNBALANCED COUPLERS	11-5.00,11-6.00,11-23.00
1S10	I	MANUAL THROTTLE	1-5.00,1-14.00,4-21.00
1S11	I	THRUST CONTROL	1-5.00,1-9.00,3-5.00,9-15.00
1S12	V	+X TRANSL	11-5.03,11-18.00
1S13	I	ABORT	1-5.00,1-5.02,1-6.00,3-5.00,12-8.00
1S14	I	ABORT STAGE	1-5.00,1-5.01,1-7.00,2-5.00,2-6.00
1S15	LDG LEG	LUNAR PROBE +Y	1-5.00,1-11.00
1S16	LDG LEG	LUNAR PROBE -Y	1-5.00,1-11.00
1S18	LDG LEG	LUNAR PROBE -Z	1-5.00,1-11.00
1S19	III	DES ENG OVRD	1-5.00,1-7.00,1-8.00
1S20	IV A	TTCA TRANSLATION	3-10.00,11-5.00,11-6.00
1S21	IV A	ACA/4 JET	11-5.03,11-18.00,11-19.00
1S22	IV B	TTCA TRANSLATION	3-10.00,11-5.00,11-6.00
1S23	IV B	ACA/4 JET	11-5.03,11-18.00,11-19.00
1S25	I	ACA PROP	4-21.00,11-15.00
1S26	II	ACA PROP	4-21.00,11-15.00

Table 2. LM EFD Switch Index (Sheet 2 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
1A1S1	ACA (CDR) 1A1	YAW ATTITUDE CONTROLLER	11-5.00,11-5.02,11-7.00, 11-13.00
1A1S2	ACA(CDR) 1A1	PITCH ATTITUDE CONTROLLER	11-5.00,11-5.01,11-7.00,11-14.00
1A1S3	ACA(CDR) 1A1	ROLL ATTITUDE CONTROLLER	11-5.00,11-5.01,11-7.00,11-15.00
1A1S4	ACA(CDR) 1A1	YAW ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A1S5	ACA(CDR) 1A1	YAW ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A1S6	ACA(CDR) 1A1	PITCH ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A1S7	ACA(CDR) 1A1	PITCH ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A1S8	ACA(CDR) 1A1	ROLL ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A1S9	ACA(CDR) 1A1	ROLL ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A1S10	ACA(CDR) 1A1	YAW ATTITUDE CONTROLLER	11-5.03,11-19.00
1A1S11	ACA(CDR) 1A1	YAW ATTITUDE CONTROLLER	11-5.03,11-19.00
1A1S12	ACA(CDR) 1A1	PITCH ATTITUDE CONTROLLER	11-5.03,11-18.00
1A1S13	ACA(CDR) 1A1	PITCH ATTITUDE CONTROLLER	11-5.03,11-18.00
1A1S14	ACA(CDR) 1A1	ROLL ATTITUDE CONTROLLER	11-5.03,11-18.00

Table 2. LM EFD Switch Index (Sheet 3 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
1A1S15	ACA(CDR) 1A1	ROLL ATTITUDE CONTROLLER	11-5.03,11-18.00
1A3S1	TTC(CDR) 1A3	"X" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.01,11-11.00
1A3S2	TTC(CDR) 1A3	"X" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.01,11-11.00
1A3S3	TTC(CDR) 1A3	"Y" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.02,11-11.00
1A3S4	TTC(CDR) 1A3	"Y" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.02,11-11.00
1A3S5	TTC(CDR) 1A3	"Z" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.02,11-11.00
1A3S6	TTC(CDR) 1A3	"Z" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.02,11-11.00
1A3S7	TTC(CDR) 1A3	THROTTLE JET 1H-1 CONTROL SWITCH	1-5.00,1-14.00
1A11S1	TTC(LMP) 1A11	"X" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.01,11-11.00
1A11S2	TTC(LMP) 1A11	"X" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.01,11-11.00
1A11S3	TTC(LMP) 1A11	"Y" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.02,11-11.00
1A11S4	TTC(LMP) 1A11	"Y" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.02,11-11.00
1A11S5	TTC(LMP) 1A11	"Z" THRUST/TRANSLATION CONTROLLER	3-10.00,11.5.02,11-11.00
1A11S6	TTC(LMP) 1A11	"Z" THRUST/TRANSLATION CONTROLLER	3-10.00,11-5.02,11-11.00

Table 2. LM EFD Switch Index (Sheet 4 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
1A11S7	TTC(LMP) 1A11	THROTTLE JET 1H2 CONTROL SWITCH	1-5.00,1-14.00
1A12S1	ACA(LMP) 1A12	YAW ATTITUDE CONTROLLER	11-5.00,11-5.02,11-6.00,11-13.00
1A12S2	ACA(LMP) 1A12	PITCH ATTITUDE CONTROLLER	11-5.00,11-5.01,11-6.00,11-14.00
1A12S3	ACA(LMP) 1A12	ROLL ATTITUDE CONTROLLER	11-5.00,11-5.01,11-6.00,11-15.00
1A12S4	ACA(LMP) 1A12	YAW ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A12S5	ACA(LMP) 1A12	YAW ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A12S6	ACA(LMP) 1A12	PITCH ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A12S7	ACA(LMP) 1A12	PITCH ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A12S8	ACA(LMP) 1A12	ROLL ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A12S9	ACA(LMP) 1A12	ROLL ATTITUDE CONTROLLER	11-5.03,11-12.00,11-19.00
1A12S10	ACA(LMP) 1A12	YAW ATTITUDE CONTROLLER	11-5.03,11-19.00
1A12S11	ACA(LMP) 1A12	YAW ATTITUDE CONTROLLER	11-5.03,11-19.00
1A12S12	ACA(LMP) 1A12	PITCH ATTITUDE CONTROLLER	11-5.03,11-18.00
1A12S13	ACA(LMP) 1A12	PITCH ATTITUDE CONTROLLER	11-5.03,11-18.00

Table 2. LM EFD Switch Index (Sheet 5 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
1A12S14	ACA(LMP) 1A12	ROLL ATTITUDE CONTROLLER	11-5.03, 11-18.00
1A12S15	ACA(LMP) 1A12	ROLL ATTITUDE CONTROLLER	11-5.03, 11-18.00
2S1	VIII	He PRESS DESCENT START	2-5.00, 2-6.00
2S2	VIII	He PRESS RCS	2-5.00, 2-6.00
2S3	VIII	ASC He SELECT	2-5.00, 2-6.00
2S4	VIII	He PRESS ASCENT	2-5.00, 2-6.00
2S5	VIII	STAGE	2-5.00, 2-6.00
2S6	VIII	DES VENT	2-5.00, 2-6.00
2S7	VIII	MASTER ARM	2-5.00, 2-6.00, 2-11.00
2S8	VIII	STAGE RELAY	2-5.00, 2-6.00
2S9	VIII	DESCENT PRPLNT ISOL VLV	2-5.00, 2-6.00
2S10	VIII	LDG GEAR DEPLOY	2-5.00, 2-6.00
2S12	-	LANDING GEAR DEPLOY -Y RIGHT	2-12.00
2S13	-	LANDING GEAR DEPLOY -Y LEFT	2-12.00
2S14	-	LANDING GEAR DEPLOY -Z RIGHT	2-12.00
2S15	-	LANDING GEAR DEPLOY -Z LEFT	2-12.00
2S16	-	LANDING GEAR DEPLOY +Z RIGHT	2-12.00
2S17	-	LANDING GEAR DEPLOY +Z LEFT	2-12.00
2S18	-	LANDING GEAR DEPLOY +Y RIGHT	2-12.00
2S19	-	LANDING GEAR DEPLOY +Y LEFT	2-12.00
3S1	III	IMU CAGE	3-13.00, 3-1004
3S3	3A5(PNL IV)	VERB	3-1004
3S4	3A5(PNL IV)	NOUN	3-1004
3S5	3A5(PNL IV)	CLR	3-1004
3S6	3A5(PNL IV)	PRO	3-1004

Table 2. LM EFD Switch Index (Sheet 6 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
3S7	3A5(PNL IV)	KEY REL	3-1004
3S8	3A5(PNL IV)	ENTR	3-1004
3S9	3A5(PNL IV)	RSET	3-1004
3S10	3A5(PNL IV)	KEYBOARD 0	3-1004
3S11	3A5(PNL IV)	KEYBOARD 1	3-1004
3S12	3A5(PNL IV)	KEYBOARD 2	3-1004
3S13	3A5(PNL IV)	KEYBOARD 3	3-1004
3S14	3A5(PNL IV)	KEYBOARD 4	3-1004
3S15	3A5(PNL IV)	KEYBOARD 5	3-1004
3S16	3A5(PNL IV)	KEYBOARD 6	3-1004
3S17	3A5(PNL IV)	KEYBOARD 7	3-1004
3S18	3A5(PNL IV)	KEYBOARD 8	3-1004
3S19	3A5(PNL IV)	KEYBOARD 9	3-1004
3S20	3A5(PNL IV)	KEYBOARD -	3-1004
3S21	3A5(PNL IV)	KEYBOARD +	3-1004
4S1	XIV	DES BAT 1 HV	4-6. 00
4S2	XIV	DES BAT 2	4-6. 01
4S3	XIV	DES BAT 3	4-6. 02
4S4	XIV	DES BAT 4 HV	4-6. 03
4S5	XIV	DES BAT 1 LV	4-6. 00
4S6	XIV	LUNAR BAT LMP BUS	4-6. 01
4S7	XIV	LUNAR BAT CDR BUS	4-6. 02
4S8	XIV	DES BAT 4 LV	4-6. 03
4S9	XIV	DES BATS SW	4-8. 00
4S10	XIV	ASC PWR BAT 5 NORM	4-7. 00
4S11	XIV	ASC PWR BAT 6 NORM	4-7. 01
4S12	XIV	ASC PWR BAT 5 BACK-UP	4-7. 00
4S13	XIV	ASC PWR BAT 3 BACK-UP	4-7. 01

Table 2. LM EFD Switch Index (Sheet 7 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
4S14	XIV	INVERTER	4-13. 00, 4-16. 00
4S15	XIV	PWR/TEMP MONITOR	4-15. 00, 4-17. 00, 4-18. 00
4S17	XIV	ED VOLTAGE MONITOR SW	2-7. 00
	GSE	LV/HV RESET	4-9. 00
	CMD MODULE	LM/CM PWR ON	4-9. 00
6S2	I	C/WEA RESET (MANUAL)	6-5. 00
6S3	II	C/WEA RESET (MANUAL)	6-5. 00
7S1	II	SUIT FAN	7-6. 00, 7-14. 00
7S2	II	O_2/H_2O QTY MON	7-11. 00, 7-12. 00
7S3	II	GLYCOL	7-7. 00, 7-10. 00, 7-13. 00, 7-16. 00
8S7	II	MAIN SOV SYS A	8-6. 00
8S8	II	SYS A ASC FEED 1	8-8. 00
8S9	II	MAIN SOV SYS B	8-6. 00
8S10	II	SYS B ASC FEED 1	8-8. 00
8S11	II SYSTEM A	THRUSTER PAIR QUAD 1	3-6. 00, 8-15. 00
8S12	II SYSTEM A	THRUSTER PAIR QUAD 2	3-6. 00, 8-15. 02
8S13	II SYSTEM B	THRUSTER PAIR QUAD 1	3-6. 00, 8-15. 01
8S14	II SYSTEM B	THRUSTER PAIR QUAD 2	3-6. 00, 8-15. 03
8S15	II SYSTEM A	THRUSTER PAIR QUAD 3	3-6. 00, 8-15. 04
8S16	II SYSTEM A	THRUSTER PAIR QUAD 4	3-6. 00, 8-15. 06
8S17	II SYSTEM B	THRUSTER PAIR QUAD 3	3-6. 00, 8-15. 05
8S18	II SYSTEM B	THRUSTER PAIR QUAD 4	3-6. 00, 8-15. 07
8S19	II	TEMP/PRESS MON	8-12. 00, 8-12. 01, 8-13. 00, 8-16. 02, 16-10. 02

Table 2. LM EFD Switch Index (Sheet 8 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
8S20	II	CRSFD	8-8.00
8S22	II	SYS A ASC OXID ASC FEED 2	8-9.00
8S23	II	SYS B ASC OXID ASC FEED 2	8-9.00
9S2	I	RATE/ERR MON (CDR)	4-21.00,9-6.00,9-10.00
9S3	I	ATTITUDE MONITOR (CDR)	4-21.00,9-6.00
9S4	I	RANGE/ALTITUDE MONITOR	9-12.00
9S6	I	GUIDANCE CONTROL	4-21.00,11-5.00,11-6.00,11-7.00
9S7	II	RATE/ERR MON (LMP)	4-21.00,9-7.00,9-10.00
9S8	I	SHAFT/TRUNNION	9-9.00
9S9	I	MODE SELECTOR	9-10.00
9S10	II	ATTITUDE MONITOR (LMP)	4-21.00,9-7.00
9S11	III	RESET/COUNT	9-13.00,9-13.01
9S12	III	TIMER CONTROL	9-13.00,9-13.01
9S13	III	MINUTE SLEW CONTROL	9-13.00,9-13.01
9S14	III	SECOND SLEW CONTROL	9-13.00,9-13.01
9S17	I	X POINTER SCALE (CDR)	9-10.00,9-11.00
9S18	III	X POINTER SCALE (LMP)	9-10.00,9-11.00
9S19	V	TIMER CONTROL	9-13.00,9-13.01
9S20	V	SECOND SLEW CONTROL	9-13.00,9-13.01
9S21	V	MINUTE SLEW CONTROL	9-13.00,9-13.01
9S22	V	HOUR SLEW CONTROL	9-13.00,9-13.01
9S23	ORDEAL	FDAI 1	9-5.00,9-5.01
9S24	ORDEAL	FDAI 2	9-5.00,9-5.01
9S25	ORDEAL	EARTH-PWR-OFF-LUNAR	9-5.00
9S26	ORDEAL	LIGHTING	9-5.00

Table 2. LM EFD Switch Index (Sheet 9 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
9S27	ORDEAL	MODE	9-5. 00
9S28	ORDEAL	SLEW	9-5. 00
9S29	I	RATE SCALE	9-8. 00
10S1	I	PROPELLANT TEMP/PRESS MON SWITCH	10-8. 00
10S3	I	ASC He REG NO. 1	10-5. 00
10S4	I	ASC He REG NO. 2	10-5. 00
10S5	I	DES He REG 1	10-5. 00
10S6	I	He TEMP/PRESS MON	10-7. 00
10S7	I	DES He REG 2	10-5. 00
10S8	I	PRPLNT QTY MONITOR SELECTOR SWITCH	10-9. 00
10S9	VIII	FUEL VENT	10-5. 00
10S10	VIII	OXID VENT	10-5. 00
11S1	III	GYRO TEST	11-5. 00,11-6. 00,11-20. 00
11S2	III	DEAD BAND	9-9. 00,11-5. 00,11-10. 00
11S3	III	PITCH ATTITUDE CONTROL	11-5. 03,11-12. 00,11-19. 00
11S4	III	ROLL ATTITUDE CONTROL	11-5. 03,11-12. 00,11-19. 00
11S5	III	ROLL ATTITUDE CONTROL	11-5. 03,11-12. 00,11-19. 00
11S7	III	GYRO TEST	11-5. 00,11-6. 00
11S24	III	PGNS MODE CONTROL	3-5. 01,11-5. 00,11-7. 00,11-23. 00
11S25	III	AGS MODE CONTROL	11-5. 00,11-6. 00,11-23. 00.12-8. 00
12S1	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S2	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S3	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S4	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S5	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004

Table 2. LM EFD Switch Index (Sheet 10 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
12S6	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S7	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S8	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S9	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S10	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S11	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S12	12A2	PUSH BUTTON DECODING MATRIX	12-10. 00, 12-1004
12S13	12A2	CLEAR	12-10. 00, 12-1004
12S14	12A2	ENTER	12-10. 00, 12-1004
12S15	12A2	READOUT	12-10. 00, 12-1004
12S16	12A2	HOLD	12-10. 00, 12-1004
12S17	VI	AGS STATUS	12-5. 00, 12-6. 00, 12-13. 00, 12-1004
13S1	XII	RANGE/TV FUNCTION	13-9. 00, 13-16. 00
13S2	XII	PWR AMPLIFIER	13-6. 01, 13-15. 00
13S3	XII	BIO-MED	13-13. 00, 13-15. 00
13S4	XII	PCM/KEY FUNCTION	13-15. 00, 13-16. 00
13S5	XII	MODULATE	13-15. 00, 13-16. 00
13S6	XII	VOICE FUNCTION	13-15. 00, 13-16. 00
13S7	XII	RANGE/VOICE	13-18. 00
13S8	XII	XMTR/RCVR	13-6. 01
13S10	XII	VHF "A" RCVR	13-18. 00
13S11	XII	VOICE RECORDER	13-12. 00
13S12	XII	VHF "B" XMTR	13-18. 00
13S13	XII	PCM RATE	6-10. 00
13S15	XII	VHF "B" RCVR	13-18. 00
13S16	XII	UP DATA LINK	13-14. 00
13S17	XIV	UP LINK SQUELCH	13-10. 00
14A2S1	S-BAND ANTENNA	STOW LATCH ARMING SWITCH	13-1004.1, 13-6.00

Table 2. LM EFD Switch Index (Sheet 11 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
14S3	XII	TRACK MODE	13-6.00
14S5	XII	S-BAND ANT SELECT	13-7.00
14S6	XII	VHF ANT SELECT	13-17.00
15AS1	VIII	S-BAND T/R	13-11.00
15AS2	VIII	VHF A	13-11.00
15AS3	VIII	ICS T/R	13-11.00
15AS4	VIII	RELAY ON (CDR)	13-11.00
15AS5	VIII	AUDIO CONTROL (CDR)	13-10.00, 13-11.00, 13-13.00
15AS6	VIII	MODE	13-11.00
15AS9	VIII	VHF B	13-11.00
15AS10	1A1(CDR)	PTT	13-11.00
15AS11	15W3(CDR)	PTT/KEYER	13-11.00, 13-13.00
15BS1	XII	S-BAND T/R	13-11.00
15BS2	XII	VHF A	13-11.00
15BS3	XII	ICS T/R	13-11.00
15BS4	XII	RELAY ON (LMP)	13-11.00
15BS5	XII	AUDIO CONTROL (LMP)	13-10.00 13-11.00, 13-13.00
15BS6	XII	MODE	13-11.00
15BS9	XII	VHF B	13-11.00
16ND10	1A12(LMP)	PTT	13-11.00
15BS11	15W4(LMP)	PTT/KEYER	13-11.00 13-13.00
16S1	V	SIDE PANELS	16-10.03
16S3	V	INTEGRAL OVERRIDE	16-10.00
16S4	V	ANUN OVERRIDE	16-4.01 16-6.00
16S5	V	NUM OVERRIDE	16-10.02
16S6	III	FLOOD	16-5.00
16S9	III	SIDE PANELS	16-10.04

Table 2. LM EFD Switch Index (Sheet 12 of 12)

SWITCH NO.	PANEL OR LOCATION	SWITCH NOMENCLATURE	SWITCH LOCATED ON
16S10	III	LAMP, TONE TEST	6-5.00, 6-7.00, 6-7.01, 6-8.00, 6-8.01, 16-4.01, 16-9.00
16S11		DOCKING HATCH	16-5.00
16S12	SLA/LM PLATE	LM/SLA DOCKING LIGHT PRESSURE SWITCH	16-6.00
16S14	VIII	COAS	16-11.00
16S17	III	TRACK & DOCKING LIGHTS	16-7.00
16S19	16A11	UTILITY LIGHT	16-5.00
16S20	16A11	UTILITY LIGHT	16-5.00
16S21	VIII	HTR CONT URINE LINE	16-12.00
16S22	VIII	HTR CONT MESA	16-12.00
17S1	III	RNDZ RDR SLEW	17-10.00
17S2	III	RNDZ RDR SLEW	17-10.00
17S3	III	RNDZ RDR MODE SELECT	4-21.00, 17-8.00, 17-10.00 17-10.01, 17-18.00
17S5	II	LDG ANT	17-15.00
17S6	III	RNDZ RDR SELF TEST	17-6.00, 17-16.00
17S8	III	TEST/MONITOR	17-7.00
17S9	AOT GUARD RAIL	RNDZ RDR GYRO SEL	17-11.00
18S4	III	SYS A/B-2 QUAD 1	8-11.01
18S5	III	SYS A/B-2 QUAD 2	8-11.01
18S6	III	SYS A/B-2 QUAD 3	8-11.01
18S7	III	SYS A/B-2 QUAD 4	8-11.01
18S10	III	TEMP MONITOR	8-16.01, 8-17.00

VI. Introduction to LM Elementary Functional Diagram Vehicle Measurement Index (Table 3)

1. This section is a tabulation of measurement numbers appearing on the LM Elementary Function Diagrams.

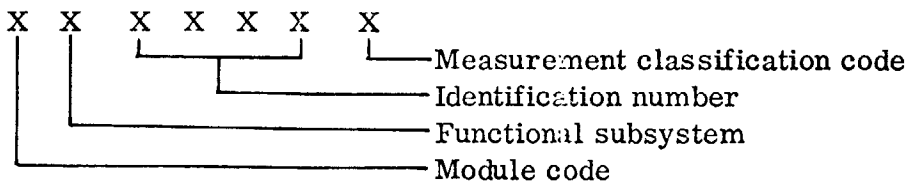
2. This table is presented in three columns. The columns and contents of the columns are as follows:

   Measurement No. Column - This column contains the measurement number.

   Measurement Located on EFD No. (s) Column - This column contains a listing of the Elementary Functional Diagrams on which the measurement appears.

   Function Column - This column contains a description of the measurement.

3. The following defines the measurement index codes.



   a. Module codes

      D - GSE Stimuli
      G - LM
      J - Vehicle Stimuli
      N - GSE AUX or Checkout Equipment

   b. Functional subsystem codes

      C - Electrical Power
      F - Environmental Control
      G - Navigation & Guidance
      H - Stability & Control - CES
      I - Stability & Control - AGS
      L - Scientific Equipment

M - Mechanical Design | Q - Propulsion - Descent Eng | T - Communications

N - Radar | R - Reaction Control | Y - Pyro Technics

P - Propulsion - Ascent Eng

c. Measurement classification codes

B - Phase | H - Position | R - Rate

C - Current | L - Velocity | T - Temperature

D - Vibration | N - Resistance/Continuity | U - Combination

E - Power | P - Pressure | V - Voltage

F - Frequency | Q - Quantity | X - Discrete Event

4. The measurement location index coding is derived as follows:

4-16.00
- 16.00 — Functional grouping sheet number
- 4 — Functional grouping derived from last digit of basic drawing number (LDW267-XX004)

17-6.00
- 6.00 — Functional grouping sheet number
- 17 — Functional grouping derived from last two (2) digits of basic drawing number (LDW267-XX017)

Table 3. LM EFD Measurement Index (Sheet 1 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
DN2001	17-6.00	RR ANTENNA INPUT SIG
DN2002	17-16.00	VELOCITY RECEIVER NO. 1 INPUT
DN2003	17-16.00	VELOCITY RECEIVER NO. 2 INPUT
DN2004	17-16.00	VELOCITY RECEIVER NO. 3 INPUT
DN2005	17-16.00	ALTIMETER RECEIVER INPUT
GC0020X	4-8.00	LM UMB RELEASED
GC0071V	4-16.00,4-17.00,6-11.00	VOLT INVERTER BUS
GC0155F	4-16.00,6-11.00	FREQ INVERTER BUS
GC0201V	4-17.00	VOLT BATTERY NO. 1
GC0202V	4-17.00	VOLT BATTERY NO. 2
GC0203V	4-17.00	VOLT BATTERY NO. 3
GC0204V	4-17.00	VOLT BATTERY NO. 4
GC0205V	4-17.00	VOLT BATTERY NO. 5
GC0206V	4-17.00	VOLT BATTERY NO. 6
GC0301V	4-16.00,4-17.00	VOLT CMD'S BUS
GC0302V	4-16.00	VOLT SYS ENGR'S BUS
GC1201C	4-18.00	CURR BATTERY NO. 1
GC1202C	4-18.00	CURR BATTERY NO. 2
GC1203C	4-18.00	CURR BATTERY NO. 3
GC1204C	4-18.00	CURR BATTERY NO. 4
GC1205C	4-18.00	CURR BATTERY NO. 5
GC1206C	4-18.00	CURR BATTERY NO. 6
GC1207C	4-18.00	CURR LUNAR BATTERY
GC2101	4-6.00	VOLT, PWR SUP, ECA NO. 1, BATT NO. 1
GC2102	4-6.00	VOLT, PWR SUP, ECA NO. 1, BATT NO. 1
GC2103	4-6.00	VOLT, PWR SUP, ECA NO. 1, BATT NO. 1

Table 3. LM EFD Measurement Index (Sheet 2 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GC2104	4-6. 00	VOLT, INVERTER, ECA NO. 1, BATT NO. 1
GC2111	4-6. 01	VOLT, PWR SUP, ECA NO. 1, BATT NO. 2/LUNAR BAT
GC2112	4-6. 01	VOLT, PWR SUP, ECA NO. 1, BATT NO. 2/LUNAR BAT
GC2113	4-6. 01	VOLT, PWR SUP, ECA NO. 1, BATT NO. 2/LUNAR BAT
GC2114	4-6. 01	VOLT, INVERTER, ECA NO. 1, BATT NO. 2/LUNAR BAT
GC2121	4-6. 02	VOLT, PWR SUP, ECA NO. 2, BATT NO. 3/LUNAR BAT
GC2122	4-6. 02	VOLT, PWR SUP, ECA NO. 2, BATT NO. 3/LUNAR BAT
GC2123	4-6. 02	VOLT, PWR SUP, ECA NO. 2, BATT NO. 3/LUNAR BAT
GC2124	4-6. 02	VOLT, INVERTER, ECA NO. 2, BATT NO. 3/LUNAR BAT
GC2131	4-6. 03	VOLT, PWR SUP, ECA NO. 2, BATT NO. 4
GC2132	4-6. 03	VOLT, PWR SUP, ECA NO. 2, BATT NO. 4
GC2133	4-6. 03	VOLT, PWR SUP, ECA NO. 2, BATT NO. 4
GC2134	4-6. 03	VOLT, INVERTER, ECA NO. 2, BATT NO. 4
GC2141	4-7. 00	VOLT, PWR SUP, ECA NO. 3, BATT NO. 5

Table 3. LM EFD Measurement Index (Sheet 3 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GC2142	4-7. 00	VOLT, PWR SUP, ECA NO. 3, BATT NO. 5
GC2143	4-7. 00	VOLT, PWR SUP, ECA NO. 3, BATT NO. 5
GC2144	4-7. 00	VOLT, INVERTER, ECA NO. 3, BATT NO. 5
GC2151	4-7. 01	VOLT, PWR SUP, ECA NO. 4, BATT NO. 6
GC2152	4-7. 01	VOLT, PWR SUP, ECA NO. 4, BATT NO. 6
GC2153	4-7. 01	VOLT, PWR SUP, ECA NO. 4, BATT NO. 6
GC2154	4-7. 01	VOLT, INVERTER, ECA NO. 4, BATT NO. 6
GC3511X	4-15. 00	OVERTEMP BATTERY NO. 1
GC3512X	4-15. 00	OVER TEMP BATTERY NO. 2
GC3513X	4-15. 00	OVER TEMP BATTERY NO. 3
GC3514X	4-15. 00	OVER TEMP BATTERY NO. 4
GC3515X	4-15. 00	OVER TEMP BATTERY NO. 5
GC3516X	4-15. 00	OVER TEMP BATTERY NO. 6
GC3517X	4-15. 00	OVER TEMP LUNAR BAT
GC4301X	4-15. 00	OVER CURR BATTERY NO. 1
GC4302X	4-15. 00	OVER CURR BATTERY NO. 2/ LUNAR BAT
GC4303X	4-15. 00	OVER CURR BATTERY NO. 3/ LUNAR BAT
GC4304X	4-15. 00	OVER CURR BATTERY NO. 4
GC4305X	4-15. 00	OVER CURR BATTERY NO. 5
GC4306X	4-15. 00	OVER CURR BATTERY NO. 6

Table 3. LM EFD Measurement Index (Sheet 4 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GC4321X	4-15. 00	REVERSE CURR BATTERY NO. 1
GC4322X	4-15. 00	REVERSE CURR BATTERY NO. 2/ LUNAR BAT
GC4323X	4-15. 00	REVERSE CURR BATTERY NO. 3/ LUNAR BAT
GC4324X	4-15. 00	REVERSE CURR BATTERY NO. 4
GC4325X	4-15. 00	REVERSE CURR BATTERY NO. 5
GC4326X	4-15. 00	REVERSE CURR BATTERY NO. 6
GC4361X	4-19. 00	HIGH VOLTAGE TAP BATT NO. 1
GC4362X	4-19. 00	LOW VOLTAGE TAP BATT NO. 1
GC4363X	4-19. 00	HIGH VOLTAGE TAP BATT NO. 2
GC4364X	4-19. 00	HIGH VOLTAGE TAP LUNAR BATT
GC4365X	4-19. 00	HIGH VOLTAGE TAP BATT NO. 3
GC4366X	4-19. 00	HIGH VOLTAGE TAP LUNAR BATT
GC4367X	4-19. 00	HIGH VOLTAGE TAP BATT NO. 4
GC4368X	4-19. 00	LOW VOLTAGE TAP BATT NO. 4
GC4369X	4-20. 00	BATT NO. 5 ON COMMANDER'S BUS
GC4370X	4-20. 00	BATT NO. 6 ON COMMANDER'S BUS
GC4371X	4-20. 00	BATT NO. 5 ON LM PILOT'S BUS
GC4372X	4-20. 00	BATT NO. 6 ON LM PILOT'S BUS
GC9520	4-5. 00	LDR EXCITATION INDICATION
GC9539	4-14. 00	PYRO POWER SYSTEM B
GC9540	4-14. 00	PYRO POWER SYSTEM B
GC9541	4-14. 00	PYRO POWER SYSTEM B
GC9542	4-14. 00	PYRO POWER SYSTEM B
GC9543	4-14. 00	PYRO POWER SYSTEM A
GC9544	4-14. 00	PYRO POWER SYSTEM A
GC9545	4-14. 00	PYRO POWER SYSTEM A

Table 3. LM EFD Measurement Index (Sheet 5 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GC9546	4-14.00	PYRO POWER SYSTEM A
GC9547	4-14.00	LOGIC POWER B
GC9549	4-14.00	LOGIC POWER A
GC9961U	4-15.00,6-11.00	BATT NO. 1 MALFUNCTION
GC9962U	4-15.00,6-11.00	BATT NO. 2/LUNAR BAT MALFUNCTION
GC9963U	4-15.00,6-11.00	BATT NO. 3/LUNAR BAT MALFUNCTION
GC9964U	4-15.00,6-11.00	BATT NO. 4 MALFUNCTION
GC9965U	4-15.00,6-11.00	BATT NO. 5 MALFUNCTION
GC9966U	4-15.00,6-11.00	BATT NO. 6 MALFUNCTION
GC9972X	4-15.00	BATT 2 MALF ADV ENABLE
GC9973X	4-15.00	BATT 3 MALF ADV ENABLE
GC9977X	4-15.00	LUNAR BAT MALF ADV ENABLE
GC9992U	4-15.00	BATT 2 MALF
GC9993U	4-15.00	BATT 3 MALF
GC9997U	4-15.00	LUNAR BATT MALF
GF0500P	7-4.01,7-11.00,4-12.01	DESC H_2O TANK NO. 2 PRESS
GF0584P	4-12.01,7-4.03,7-11.00	PRESS DESCENT O_2 TANK #2
GF0587T	7-4.03,7-10.00	(GSE) TEMP DESCENT GOX TANK #2
GF1083X	7-4.03,7-14.00	PRIME SUIT COMPRESSOR FAIL
GF1084X	7-4.00,7-14.00	SPARE SUIT COMPRESSOR FAIL
GF1087X	7-6.00	SELECTED SUIT COMPRESSOR FAIL
GF1111R	7-4.03,7-9.00	RATE H_2O SEPARATOR NO. 1
GF1112R	7-4.03,7-9.00	RATE H_2O SEPARATOR NO. 2
GF1201X	7-4.03,7-14.00	CMDR'S SUIT FLOW CONTROL-DISCNNT
GF1202X	7-4.03,7-14.00	LMP SUIT FLOW CONTROL-DISCNNT
GF1211X	7-4.03,7-14.00	SUIT PRESS RLF VPI CLOSED

Table 3. LM EFD Measurement Index (Sheet 6 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GF1212X	7-4.03,7-14.00	SUIT PRESS RLF VPI OPEN
GF1221X	7-4.03,7-14.00	SUIT DIVERTER VPI CLOSED
GF1231X	7-4.03,7-15.00	CABIN GAS RETURN VPI CLOSED
GF1232X	7-4.03,7-15.00	CABIN GAS RETURN VPI OPEN
GF1241X	7-4.03,7-14.00	CO_2 CARTRIDGE IN SEC POS
GF1242X	7-4.03,7-9.00	CO_2 CARTRIDGE IN SEC POS
GF1281T	7-4.03, 7-10.00	TEMP SUIT INLET
GF1301P	7-4.03,7-9.00	PRESS SUIT OUTLET
GF1521P	7-9.00	PRESS CO_2 PARTIAL
GF1522P	7-9.00	PRESS CO_2 PARTIAL
GF1651T	7-10.00,7-4.02	TEMP CABIN
GF2021P	7-4.02,7-8.00	DEL P, PRIM COOLANT PUMP
GF2041X	7-14.00,7-4.02	PRIMARY COOLANT ACCUM LOW LEVEL
GF2042X	7-4.02,7-10.00	REDUN. COOLANT ACCUM LOW LEVEL
GF2531T	7-4.02,7-10.00	TEMP MAIN W/B COOLANT INLET
GF2571T	7-4.02,7-10.00	TEMP REDUNDANT W/B COOLANT OUT
GF2581T	7-4.02,7-10.00	TEMP MAIN W/B COOLANT OUTLET
GF2681T	7-4.02,7-10.00	TEMP CLNT UPSTREAM OF CRIT ELECT
GF2741P	4-12.00,7-4.02,7-13.00	PRESS, PRIM PUMP DISCHARGE
GF2921P	4-12.00,7-4.02,7-13.00	PRESS, REDUNDANT PUMP DISCHARGE
GF2936X	7-7.00,7-15.00	SELECT COOLANT PUMP FAIL
GF3070X	7-4.03,7-15.00	OX REG VLV 306A EGRESS/CLOSED
GF3071X	7-4.03,7-15.00	OX REG VLV 306A LOCKED CLOSED
GF3073X	7-4.03,7-15.00	OX REG VLV 306B LOCKED CLOSED

Table 3. LM EFD Measurement Index (Sheet 7 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GF3075X	7-4.03, 7-15.00	OX REG VLV 306B EGRESS/CLOSED
GF3571P	7-8.00	PRESS, CABIN
GF3572X	7-16.00	EMER O_2 VALVE ELEC OPEN
GF3582P	4-12.00, 6-11, 7-4.03, 7-11.00	PRESS, ASCENT O_2 TANK NO. 1
GF3583P	4-12.00, 6-11.00, 7-4.03, 7-11.00	PRESS, ASCENT O_2 TANK NO. 2
GF3584P	4-12.00, 6-11.00, 7-4.03, 7-11.00	PRESS, DESCENT O_2 TANK
GF3587T	7-4.03, 7-10.00	TEMP, DESCENT O_2 TANK SURF
GF3591P	7-8.00	PRESS, SAFETY VLV NO. 1 SERVO
GF3592P	7-8.00	PRESS, SAFETY VLV NO. 2 SERVO
GF4101P	7-8.00, 7-4.01	DEL P, MAIN H_2O REG/ARS
GF4500P	4-12.00, 7-4.01, 7-11.00	DESC H_2O TANK NO. 1 PRESS
GF4501P	7-4.01, 7-8.00	PRESS, DES H_2O
GF4502P	4-12.00, 7-4.01, 7-11.00	ASC H_2O TANK NO. 1 PRESS
GF4503P	4-12.00, 7-4.01, 7-11.00	ASC H_2O TANK NO. 2 PRESS
GF4511T	7-4.01, 7-10.00	TEMP, MAIN W/B INLET WATER
GF4585T	7-4.01, 7-13.00	TEMP, ASC TANK #1 WATER LINE
GF4586T	7-4.01, 7-13.00	TEMP, ASC TANK #2 WATER LINE
GF8507V	7-5.00	VOLT, CABIN PRESS LOGIC OUT
GF8509V	7-6.00	VOLT, O_2 REG VLV A AND B SW TEST
GF8541X	7-5.00	SUIT PRESSURE SWITCH NORMAL
GF8542X	7-5.00	SUIT PRESSURE SWITCH LOW
GF8543X	7-5.00	SUIT PRESSURE SWITCH NORMAL
GF8544X	7-5.00	SUIT PRESSURE SWITCH LOW
GF8545X	7-5.00	SUIT PRESSURE SWITCH NORMAL
GF8546X	7-5.00	SUIT PRESSURE SWITCH LOW
GF9100	7-4.02	FTP-O QCK DISC, GLYC PRIME RETURN
GF9101	7-4.02	FTP-I/O QCK DISC, GLYC REDUN FILL
GF9102	7-4.02	FTP-O QCK DISC, GLYC REDUN RETURN
GF9103	7-4.02	FTP-O QCK DISC, GLYC DRIVE FILL

Table 3. LM EFD Measurement Index (Sheet 8 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GF9104	7-4. 01	FTP-I/O H_2O FILL POINT TK 1
GF9105	7-4. 01	FTP-I/O GAS CHARGING VALVE H_2O TK 1
GF9106	7-4. 01	FTP-I/O H_2O FILL POINT TK 2
GF9107	7-4. 01	FTP-I/O GAS CHARGING VALVE H_2O TK 2
GF9108	7-4. 01	FTP-I/O H_2O FILL POINT DESC (TANK 1)
GF9109	7-4. 01	FTP-I/O GAS CHARGING VALVE DESC
GF9113	7-4. 03	SUIT NO. 1 UMBILICAL
GF9114	7-4. 03	SUIT NO. 2 UMBILICAL
GF9117	7-4. 03	FTP-I/O INTERSTAGE DISCONNECT O_2 A/S
GF9118	7-4. 03	FTP-I/O INTERSTAGE DISCONNECT O_2 C/S
GF9119	7-4. 01, 7-4. 02	FTP-I/O MAIN WATER BOILER EXIT 209
GF9147	7-4. 03	FTP-I/O INTERSTAGE DISCONNECT DESC O_2 TANK NO. 2 A/S
GF9148	7-4. 03	FTP-I/O INTERSTAGE DISCONNECT DESC O_2 TANK NO. 2 D/S
GF9191	7-4. 03	FTP-I/O GSE DISC DESC O_2 TANK NO. 2
GF9192	7-4. 03	FTP-I/O GSE APPLY PLSS ACCESS
GF9193	7-4. 04	FTP-I/O GFE O_2 SUPPLY HOSE VEH SIDE
GF9120	7-4. 02	FTP-I/O RED WATER BOILER EXIT 224

Table 3. LM EFD Measurement Index (Sheet 9 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GF9122	7-4.02	FTP-I/O HTS INTERSTAGE DISCONNECT OUT A/S
GF9123	7-4.02	FTP-I/O HTS INTERFACE DISCONNECT OUT D/S
GF9124	7-4.02	FTP-I/O HTS INTERFACE DISCONNECT IN D/S
GF9125	7-4.02	FTP-I/O HTS INTERSTAGE DISCONNECT IN D/S
GF9126	7-4.03	FTP-I/O SUIT WATER BOILER EXIT DUCT
GF9402	7-4.01	FTP-O REDUN H_2O REG FLOW TEST
GF9409	7-4.01	FTP-I/O GAS CHARGING VALVE DESC
GF9408	7-4.01	FTP-I/O H_2O FILL POINT DESC (TANK 2)
GF9171	7-4.03	FTP-I/O O_2 TANK NO. 1 SUPPLY FILL VALVE
GF9172	7-4.03	FTP-I/O O_2 TANK NO. 2 SUPPLY FILL VALVE
GF9986U	7-14.00	COOLANT ACCUM
GF9993U	7-9.00	LIOH SELECT/HIGH CO_2 (7DS6) ADV
GF9997U	7-13.00	PRESS, PRIM PUMP DISCHARGE
GF9998U	7-10.00, 7-13.00	TEMP, SELECTED COOLANT LOOP
GF9999U	7-4.03, 7-9.00	RATE, SELECTED H_2O SEPARATOR
GG0001X	3-20.00	PGNS DOWNLINK DATA (TO T/M)
GG0117H	3-9.00, 9-12.00	POS ALTITUDE (LGC)
GG0118L	3-9.00, 9-12.00	VEL ALTITUDE RATE (LGC)

Table 3. LM EFD Measurement Index (Sheet 10 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
G G0119L	3-18.00, 9-11.00	VEL FORWARD (LGC)
GG0120L	3-18.00, 9-11.00	VEL LATERAL LGC
GG1040V	3-12.00	VOLT, +120 VDC PULSE TORQUE REF
GG1110V	3-12.00	VOLT +2.5 VDC TM BIAS PCM
GG1201V	3-12.01	VOLT, IMU +28V 800 HZ 1P-CD SUPPLY
GG1331V	3-12.00	VOLT 3200 HZ, +28 V SUPPLY
GG1513X	3-12.01	IMU STANDBY/OFF
GG1523X	3-12.01	LGC OPERATE
GG2001V	3-12.00	VOLT, X PIPA S.G. OUTPUT IN PHASE - 2.5
GG2021V	3-12.00	VOLT, Y PIPA S.G. OUTPUT IN PHASE - 2.5
GG2041V	3-12.00	VOLT, Z PIPA S.G. OUTPUT IN PHASE
GG2107V	3-12.00	VOLT, IG SERVO ERROR IN PHASE
GG2112V	3-12.01	VOLT, IG 1X RES OUTPUT SIN
GG2113V	3-12.01	VOLT, IG 1X RES OUTPUT COS

Table 3. LM EFD Measurement Index (Sheet 11 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GG2122V	3-16. 00, 9-5. 01	VOLT, IG 1X RES OUTPUT SIN
GG2123V	3-16. 00, 9-5. 01	VOLT, IG 1X RES OUTPUT COS
GG2137V	3-12. 00	VOLT, MG SERVO ERROR IN PHASE
GG2142V	3-12. 01	VOLT, MG 1X RES OUTPUT SIN
GG2143V	3-12. 01	VOLT, MG 1X RES OUTPUT COX
GG2152V	3-16. 00, 9-5. 01	VOLT, MG 1X RES OUTPUT SIN
GG2153V	3-16. 00, 9-5. 01	VOLT, MG 1X RES OUTPUT COS
GG2167V	3-12. 00	VOLT, OG SERVO ERROR IN PHASE
GG2172V	3-12. 01	VOLT, OG 1X RES OUTPUT SIN
GG2173V	3-12. 01	VOLT, OG 1X RES OUTPUT COS
GG2182V	3-16. 00, 9-5. 01	VOLT, OG 1X RES OUTPUT SIN
GG2183V	3-16. 00, 9-5. 01	VOLT, OG 1X RES OUTPUT COS
GG2217V	3-18. 00, 9-9. 00	VOLT, PITCH ATTITUDE ERROR (PGNS)
GG2219V	3-12. 00	VOLT, PITCH CDU DAC OUT
GG2247V	3-18. 00, 9-9. 00	VOLT, ROLL ATTITUDE ERROR (PGNS)
[illegible]	3-12. 00	VOLT, YAW CDU DAC OUTPUT
[illegible]	3-18. 00, 9-9. 00	VOLT, YAW ATTITUDE ERROR (PGNS)
GG2279V	3-12. 00	VOLT, ROLL CDU DAC OUTPUT
GG2300T	3-12. 01	TEMP PIPA
GG3304V	3-12. 01	VOLT, RDR SHAFT 1XRES OUTPUT SIN
GG3305V	3-12. 01	VOLT, RDR SHAFT 1XRES OUTPUT COS
GG3324V	3-12. 01	VOLT, RDR TRUN 1XRES OUTPUT SIN

Table 3. LM EFD Measurement Index (Sheet 12 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GG3325V	3-12. 01	VOLT, RDR TRUN 1XRES OUTPUT COS
GG9001X	3-14. 00	LGC WARNING
GG9002X	3-14. 00	ISS WARNING
GG9006V	3-13. 00	VOLT, IMU TEMP OUT OF LIMITS
GH1204X	11-23. 00	ACA OUT OF DETENT
GH1211V	1-16. 00	VOLT, AUTO THROTTLE INCREASE 3. 2 KPPS
GH1212V	1-16. 00	VOLT, AUTO THROTTLE DECREASE 3. 2 KPPS
GH1214X	1-20. 01	AUTO ENG "ON" CMD
GH1217X	1-20. 01	AUTO ENG "OFF" CMD
GH1230X	1-20. 00	ASC ENG ARM COMMANDED (FROM PANEL)
GH1240V	11-16. 00, 11-22. 00	VOLT "X" TRANS CMD
GH1241V	11-16. 00, 11-22. 00	VOLT "Y" TRANS CMD
GH1242V	11-16. 00, 11-22. 00	VOLT "Z" TRANS CMD
GH1247V	11-22. 00	VOLT, YAW LOGIC INPUT ERROR
GH1248V	11-14. 00, 11-22. 00	VOLT, PITCH LOGIC INPUT ERROR
GH1249V	11-15. 00, 11-22. 00	VOLT, ROLL LOGIC INPUT ERROR
GH1260X	1-20. 01, 6-11. 00	ASC ENG ON/OFF TO PROP
GH1283X	1-20. 01, 6-11. 00	ABORT STAGE COMMANDED
GH1286X	1-20. 01	ENGINE FIRE OVERRIDE
GH1301X	1-20. 01, 6-11. 00	DESC ENG "ON" TO PROP
GH1311V	1-20. 00, 9-15. 00	VOLT, MANUAL THRUST CMD
GH1313V	1-20. 00	VOLT, PITCH GDA POS (RET/EXT)
GH1314V	1-20. 00	VOLT, ROLL GDA POS (EXT/RET)
GH1318X	1-18. 00	PITCH TRIM EXTEND FROM LGC

Table 3. LM EFD Measurement Index (Sheet 13 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GH1319X	1-18. 00	PITCH TRIM RETRACT FROM LGC
GH1320X	1-18. 00	PITCH GDA (EXT/RET)
GH1323X	1-19. 00	PITCH TRIM FAIL
GH1330X	1-19. 00	ROLL TRIM FAIL
GH1331V	1-20. 00, 9-15. 00	VOLT, AUTO THRUST CMD
GH1343X	1-17. 00	ROLL TRIM EXTEND FROM LGC
GH1344X	1-17. 00	ROLL TRIM RETRACT FROM LGC
GH1345X	1-17. 00	ROLL GDA (RET/EXT)
GH1348X	1-13. 00, 1-20. 00	DESC ENG ARM (DECA OUT) 28 VDC
GH1349V	1-15. 00	DESC ENG ARM (DECA OUT) 15 VDC
GH1397V	11-13. 00	VOLT, YAW RATE GYRO NULL 800 HZ
GH1398V	11-14. 00	VOLT PITCH RATE GYRO NULL 800 HZ
GH1399V	11-15. 00	VOLT, ROLL RATE GYRO NULL 800 HZ
GH1401V	6-11. 00, 11-9. 00, 11-20. 00	VOLT, RGA SPN MTR LINE A-B 800 HZ
GH1402V	6-11. 00, 11-9. 00, 11-20. 00	VOLT, RGA SPN MTR LINE B-C 800 HZ
GH1403V	6-11. 00, 11-9. 00, 11-20. 00	VOLT, RGA SPN MTR LINE C-A 800 HZ
GH1405V	6-11. 00, 11-9. 00, 11-20. 00	VOLT, RGA PICKOFF 800 HZ EXCITATION
GH1406V	6-11. 00, 11-8. 00, 11-21. 00	VOLT +15 VDC SUPPLY
GH1407V	6-11. 00, 11-8. 00, 11-21. 00	VOLT -15 VDC SUPPLY
GH1408V	6-11. 00, 11-8. 00, 11-21. 00	VOLT +4. 3 VDC SUPPLY
GH1418V	11-17. 00	VOLT, JET NO. 4u DRIVER OUTPUT
GH1419V	11-17. 00	VOLT, JET NO. 4d DRIVER OUTPUT

Table 3. LM EFD Measurement Index (Sheet 14 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GH1420V	11-17. 00	VOLT, JET NO. 4f DRIVER OUTPUT
GH1421V	11-17. 00	VOLT, JET NO. 4s DRIVER OUTPUT
GH1422V	11-17. 00	VOLT, JET NO. 3u DRIVER OUTPUT
GH1423V	11-17. 00	VOLT, JET NO. 3d DRIVER OUTPUT
GH1424V	11-17. 00	VOLT, JET NO. 3f DRIVER OUTPUT
GH1425V	11-17. 00	VOLT, JET NO. 3s DRIVER OUTPUT
GH1426V	11-17. 00	VOLT, JET NO. 2u DRIVER OUTPUT
GH1427V	11-17. 00	VOLT, JET NO. 2d DRIVER OUTPUT
GH1428V	11-17. 00	VOLT, JET NO. 2f DRIVER OUTPUT
GH1429V	11-17. 00	VOLT, JET NO. 2s DRIVER OUTPUT
GH1430V	11-17. 00	VOLT, JET NO. 1u DRIVER OUTPUT
GH1431V	11-17. 00	VOLT, JET NO. 1d DRIVER OUTPUT
GH1432V	11-17. 00	VOLT, JET NO. 1f DRIVER OUTPUT
GH1433V	11-17. 00	VOLT, JET NO. 1s DRIVER OUTPUT
GH1434V	11-17. 00	VOLT, LGC JET CMD NO. 4u
GH1435V	11-17. 00	VOLT, LGC JET CMD NO. 4d
GH1436V	11-17. 00	VOLT, LGC JET CMD NO. 4f
GH1437V	11-17. 00	VOLT, LGC JET CMD NO. 4s
GH1438V	11-17. 00	VOLT, LGC JET CMD NO. 3u
GH1439V	11-17. 00	VOLT, LGC JET CMD NO. 3d
GH1440V	11-17. 00	VOLT, LGC JET CMD NO. 3f
GH1441V	11-17. 00	VOLT, LGC JET CMD NO. 3s
GH1442V	11-17. 00	VOLT, LGC JET CMD NO. 2u
GH1443V	11-17. 00	VOLT, LGC JET CMD NO. 2d
GH1444V	11-17. 00	VOLT, LGC JET CMD NO. 2f
GH1445V	11-17. 00	VOLT, LGC JET CMD NO. 2s
GH1446V	11-17. 00	VOLT, LGC JET CMD NO. 1u
GH1447V	11-17. 00	VOLT, LGC JET CMD NO. 1d
GH1448V	11-17. 00	VOLT, LGC JET CMD NO. 1f

Table 3. LM EFD Measurement Index (Sheet 15 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GH1449V	11-17.00	VOLT, LGC JET CMD NO. 1s
GH1450V	11-14.00	VOLT, PITCH TRIM ERROR
GH1452V	11-15.00	VOLT, ROLL TRIM ERROR
GH1453V	11-13.00	VOLT, YAW DEMODULATOR OUTPUT
GH1455V	11-13.00, 11-22.00	VOLT, YAW ATTITUDE ERROR 800 HZ
GH1456V	11-14.00, 11-22.00	VOLT, PITCH ATTITUDE ERROR 800 HZ
GH1457V	11-15.00, 11-22.00	VOLT, ROLL ATTITUDE ERROR 800 HZ
GH1461V	11-13.00, 11-22.00	VOLT, YAW RG SIG (800 HZ)
GH1462V	11-14.00, 11-22.00	VOLT, PITCH RG SIG (800 HZ)
GH1463V	11-15.00, 11-22.00	VOLT, ROLL RG SIG (800 HZ)
GH1488V	6-11.00, 11-8.00, 11-20.00	VOLT, PRIMARY -4.7 VDC
GH1489V	6-11.00, 11-8.00, 11-20.00	VOLT, BACK UP -4.7 VDC
GH1492V	11-8.00	VOLT -4 VDC SUPPLY
GH1493V	6-11.00, 11-8.00, 11-21.00	VOLT +6 VDC SUPPLY
GH1494V	6-11.00, 11-8.00, 11-21.00	VOLT -6 VDC SUPPLY
GH1497V	9-8.00, 11-13.00	VOLT, YAW RGA SIG 800 HZ
GH1498V	9-8.00, 11-14.00	VOLT, PITCH RGA SIG 800 HZ
GH1499V	9-8.00, 11-15.00	VOLT, ROLL RGA SIG 800 HZ
GH1501X	11-6.00	ROLL RGA SMRD ON TORQUER LINE
GH1502X	11-6.00	PITCH RGA SMRD ON TORQUER LINE
GH1503X	11-6.00	YAW GRA SMRD ON TORQUER LINE
GH1603X	11-10.00	DEAD BAND SELECT
GH1621X	11-23.00	GUIDANCE SELECT SW (AGS)
GH1628X	11-23.00	ROLL ATT CON SEL (PULSED/ DIRECT)

Table 3. LM EFD Measurement Index (Sheet 16 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GH1629X	11-23. 00	PITCH ATT CON SEL (PULSED/ DIRECT)
GH1630X	11-23. 00	YAW ATT CON SEL (PULSED/ DIRECT)
GH1641X	11-23. 00	AGS MODE SELECT (AUTO)
GH1642X	11-23. 00	AGS MODE SELECT (ATT HOLD)
GH1643X	11-23. 00	PGNS MODE SELECT (AUTO)
GH1644X	11-23. 00	PGNS MODE SELECT (ATT HOLD)
GH1852V	1-14. 00	VOLT, MANUAL THROTTLE CMD
GH1893X	11-23. 00	X TRANSLATION OVER RIDE
GH1896X	11-23. 00	UNBALANCED COUPLES
GH7000	11-14. 00	PITCH NARROW DEADBAND OUT
GH7001	11-15. 00	ROLL NARROW DEADBAND OUT
GH7002	11-13. 00	YAW NARROW DEADBAND OUT
GH7003	11-16. 00	SUMMING AMPLIFIER NO. 1 OUT
GH7004	11-16. 00	SUMMING AMPLIFIER NO. 2 OUT
GH7005	11-16. 00	SUMMING AMPLIFIER NO. 3 OUT
GH7006	11-16. 00	SUMMING AMPLIFIER NO. 4 OUT
GH7007	11-16. 00	SUMMING AMPLIFIER NO. 5 OUT
GH7008	11-16. 00	SUMMING AMPLIFIER NO. 6 OUT
GH7009	11-16. 00	SUMMING AMPLIFIER NO. 7 OUT
GH7010	11-16. 00	SUMMING AMPLIFIER NO. 8 OUT
GH7011	11-9. 00	800 HZ 1 PHASE (90 DEG L)
GH7012	11-8. 00	+2. 6 VDC REF
GH7013	11-8. 00	+8. 4 VDC REF
GH7014	11-8. 00	+28 VDC FILTERED
GH7016	11-16. 00	ZERO CROSSOVER DET OUTPUT Y1
GH7017	11-16. 00	ZERO CROSSOVER DET OUTPUT Y2

Table 3. LM EFD Measurement Index (Sheet 17 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GH7018	11-16. 00	ZERO CROSSOVER DET OUTPUT Z1
GH7019	11-16. 00	ZERO CROSSOVER DET OUTPUT Z2
GH7020	11-16. 00	YAW LOGIC (R-D) INPUT
GH7050V	1-15. 00	AUX POWER FAILURE
GH7051V	1-15. 00	+4. 3 VDC
GH7053V	1-15. 00	-15 VDC
GH7054V	1-15. 00	ATCA POWER FAIL
GH7055V	1-13. 00	+28 VDC
GH7056V	1-13. 00	+28 VDC START
GI0001X	12-13. 00	AGS DOWNLINK DATA (TO T/M)
GI3137X	12-6. 00	ΔVY (Y INCREMENTAL VELOCITY)
GI3138X	12-6. 00	ΔVZ (Z INCREMENTAL VELOCITY)
GI3151V	9-5. 00, 12-11. 00	VOLT, SIN ALP (TO TOT ATT DISP 400 HZ)
GI3152V	9-5. 00, 12-11. 00	VOLT, COS ALP (TO TOT ATT DISP 400 HZ)
GI3153V	9-5. 00, 12-11. 00	VOLT, SIN BET (TO TOT ATT DISP 400 HZ)
GI3154V	9-5. 00, 12-11. 00	VOLT, COS BET (TO TOT ATT DISP 400 HZ)
GI3155V	9-5. 00, 12-11. 00	VOLT, SIN GAM (TO TOT ATT DISP 400 HZ)
GI3156V	9-5. 00, 12-11. 00	VOLT, COS GAM (TO TOT ATT DISP 400 HZ)
GI3166V	9-9. 00, 12-12. 00	VOLT, EX (YAW ATT ERR TO DISP)
GI3167V	9-9. 00, 12-12. 00	VOLT, EY (PITCH ATT ERR TO DISP)
GI3168V	9-9. 00, 12-12. 00	VOLT, EZ (ROLL ATT ERR TO DISP)
GI3171X	12-6. 00	Δ INTEGRAL P (YAW INCRMT ANGLE)

Table 3. LM EFD Measurement Index (Sheet 18 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GI3172X	12-6.00	ΔINTEGRAL R (ROLL INCRMT ANGLE)
GI3173X	12-6.00	ΔINTEGRAL Q (PITCH INCRMT ANGLE)
GI3175X	12-6.00	ASA CLOCK
GI3176T	12-13.00	BLOCK TEMP REF
GI3177X	12-7.00	CDU ZERO
GI3178X	12-7.00	+ΔAIG (FROM PGNS)
GI3179X	12-7.00	-ΔAIG (FROM PGNS)
GI3180X	12-7.00	+ΔAMG (FROM PGNS)
GI3181X	12-7.00	-ΔAMG (FROM PGNS)
GI3182X	12-7.00	+ΔAOG (FROM PGNS)
GI3183X	12-7.00	-ΔAOG (FROM PGNS)
GI3184X	12-9.00	AGS INITIALIZATION (DOWNLINK DATA) DIGITAL CODE
GI3196X	12-9.00	PGNS DOWNLINK SHIFT PULSES
GI3198X	12-9.00	PGNS DOWNLINK STOP PULSES
GI3203H	9-12.00,12-11.00	POS, ALT TO DISPLAY
GI3204L	9-12.00,12-11.00	VEL, ALT RATE TO DISPLAY
GI3205L	9-11.00,12-11.00	VEL, VY (LATERAL VEL TO DISPLAY)
GI3211V	12-5.00	+13.5 VDC
GI3212V	12-5.00	+4 VDC (STANDBY)
GI3213V	12-5.00	-2 VDC (STANDBY)
GI3214V	6-11.00,12-13.00	+28 VDC ASA
GI3215V	6-11.00,12-13.00	+12 VDC ASA
GI3216V	12-6.00	-12 VDC ASA
GI3217V	12-5.00	+6 VDC
GI3224V	12-5.00	-18 VDC

Table 3. LM EFD Measurement Index (Sheet 19 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GI3225V	12-5. 00	-13. 5 VDC
GI3228V	12-5. 00	+4 VDC OPERATE
GI3229V	12-5. 00	-2 VDC OPERATE
GI3232V	12-13. 00	AEA TEST MODE FAIL
GI3233F	6-11. 00, 12-13. 00	FREQ, ASA 28 V/400 HZ
GI3301T	12-13. 00	ASA TEMP
GI3305X	12-13. 00	AGS CONDITION (WARMUP)
GI3306X	12-13. 00	AGS CONDITION (STANDBY)
GI3311X	12-6. 00	DELTA VS (X INCREMENTAL VELOCITY)
GI3340V	12-12. 00	EX (YAW ATT ERROR NULL)
GI3341V	12-12. 00	EY (PITCH ATT ERROR NULL)
GI3342V	12-12. 00	EZ (ROLL ATT ERROR NULL)
GI3343X	12-6. 00	X-GYRO SMRD
GI3344X	12-6. 00	Y-GYRO SMRD
GI3345X	12-6. 00	Z-GYRO SMRD
GI3351V	12-5. 00	-3 TO -4. 5 VDC (TO DEDA)
GI3352V	12-5. 00	+4 to +5 VDC (TO DEDA)
GI3353X	12-10. 00	DEDA DATA (TO DEDA)
GI3354X	12-10. 00	DEDA ADDRESS/DATA (FROM DEDA)
GI3355X	12-10. 00	DEDA SHIFT PULSES (FROM DEDA)
GI3356X	12-10. 00	SHIFT 4 BITS IN (TO DEDA)
GI3357X	12-10. 00	SHIFT 4 BITS OUT (TO DEDA)
GI3358F	12-10. 00	DEDA CLOCK (TO DEDA) 128 KPPS
GI3401V	12-11. 00	SIN ALP (TO TOT ATT DISPLAY)
GI3402V	12-11. 00	COS ALP (TO TOT ATT DISPLAY)
GI3403V	12-11. 00	SIN BET (TO TOT ATT DISPLAY)
GI3404V	12-11. 00	COS BET (TO TOT ATT DISPLAY)
GI3405V	12-11. 00	SIN GAM (TO TOT ATT DISPLAY)

Table 3. LM EFD Measurement Index (Sheet 20 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GI3406V	12-11. 00	COS GAM (TO TOT ATT DISPLAY)
GI7001F	12-12. 00	INT CLOCK (50 PPS)
GI7002	12-5. 00	800 HZ 1 VRMS
GI7003	12-5. 00	400 HZ 1 VRMS
GI7005	12-6. 00	Z ACCL PREAMP OUTPUT
GI7007	12-6. 00	Y ACCL PREAMP OUTPUT
GI7009	12-6. 00	X ACCL PREAMP OUTPUT
GI7010	12-6. 00	FINE TEMP HTR VOLT
GI7011	12-6. 00	FAST WARMUP HTR VOLT
GI7012V	12-6. 00	+28 VDC
GI7013V	12-6. 00	-12 VDC
GI7014V	12-6. 00	-6 VDC
GI7015V	12-6. 00	+4 VDC
GI7016	12-6. 00	1 KPPS
GI7017F	12-6. 00	GYRO SIG GEN EXCITATION
GI7019V	12-6. 00	-2 VDC UTILITY (ASA)
GI7021	12-6. 00	X GYRO PREAMP OUTPUT
GI7022	12-6. 00	Y GYRO PREAMP OUTPUT
GI7023	12-6. 00	Z GYRO PREAMP OUTPUT
GI7024	12-6. 00	X GYRO THERMISTOR
GI7025	12-6. 00	Y GYRO THERMISTOR
GI7026	12-6. 00	Z GYRO THERMISTOR
GI7030X	12-12. 00	OUTPUT REGISTER LOADED
GI7031X	12-12. 00	GSE INPUT REGISTER UNLOADED
GI7032X	12-12. 00	OUTPUT TERMINATED
GI7034X	12-12. 00	GSE DATA OUT 100 KPPS
GI7037X	12-12. 00	AGS DOWNLINK BIT SYNC PULSES
GI7038X	12-12. 00	AGS DOWNLINK STOP PULSES
GI7039L	12-11. 00	VEL, VY (LAT VEL TO DISPLAY)

Table 3. LM EFD Measurement Index (Sheet 21 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GI7040V	12-5. 00	VOLT, +14 VDC (AEA)
GI7045	12-6. 00	Z ACCEL DEMOD OUTPUT
GI7046	12-6. 00	Y ACCEL DEMOD OUTPUT
GI7047	12-6. 00	X ACCEL DEMOD OUTPUT
GI7048	12-6. 00	X GYRO DEMOD OUTPUT
GI7049	12-6. 00	Y GYRO DEMOD OUTPUT
GI7050	12-6. 00	Z GYRO DEMOD OUTPUT
GI7051X	12-6. 00	DELTA INTEGRAL R (ROLL INCR ANG)
GI7052X	12-6. 00	DELTA INTEGRAL Q (PITCH INCR ANG)
GI7053X	12-6. 00	DELTA VX (X INCREMENTAL VELOCITY)
GI7054X	12-6. 00	DELTA VY (Y INCREMENTAL VELOCITY)
GI7055X	12-6. 00	DELTA VZ (Z INCREMENTAL VELOCITY)
GI7056	12-12. 00	ASA CLOCK
GI7060X	12-6. 00	DELTA INTEGRAL P (YAW INCR ANG)
GL0220F	6-12. 00	FREQ TE SYNC (RO9) TO DISPLAY
GL0221	6-12. 00	SERIAL TIME NRZ TO DSEA, RO1 TP
GL0222	6-12. 00	FREQ, TE SYNC (RO2) TO AGS
GL0223	6-12. 00	FREQ, TE SYNC (RO3) TO COMM
GL0224	6-12. 00	FREQ, TE SYNC (RO4) TO EPS
GL0225	6-12. 00	FREQ, TE SYNC (RO5) TO EPS
GL0226	6-12. 00	FREQ, TE SYNC (RO6) TO EPS
GL0227	6-12. 00	FREQ, TE SYNC (RO7) TO CES
GL0228	6-12. 00	FREQ, TE SYNC (RO8) TO DISP
GL0236	6-12. 00	50 PPS START SIGNAL (DO8) TO LGC

Table 3. LM EFD Measurement Index (Sheet 22 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GL0237	6-12.00	2 KPPS BIT SYNC SIG (DO10) TO LGC
GL0238	6-12.00	50 PPS STOP SIG (DO9) TO LGC
GL0241	6-12.00	1200 PPS BIT SIG TO AGS ON
GL0242	6-12.00	50 PPS STOP SIG TO AGS ON
GL0243	6-12.00	AGS SER DATA NO 1C2 TO PCMTE ON
GL0261	6-12.00	40 BIT SER SYNC 2, TO AEA, DO12 TP
GL0262	6-12.00	40 BIT SER STOP 2, TO AEA, DO11 TP
GL0263	6-12.00	SUB FRAME SYNC TO ACE, DO7 TP
GL0264	6-12.00	SUB CARRIER 2, TO ACE, DO6 TP
GL0265	6-12.00	SUB CARRIER1, TO COMM, DO5 TP
GL0266	6-12.00	DATA RATE TIMING TO ACE, DO4 TP
GL0267	6-12.00	HI-HI LEVEL LO1 TP
GL0268	6-12.00	R-Z DATA, TO ACE, DO2 TP
GL0269	6-12.00	NRZ DATA, TO COMM, DO1 TP
GL0270	6-12.00	SPLIT PHASE DATA, TO COMM, DO3 TP
GL0300	6-10.00	FRAME SYNCH + ID
GL0302	6-10.00	FORMAT ID
GL0400X	6-10.00	INTERNAL OSC FAILURE DETECT SIG NO. 1
GL0401V	6-10.00	VOLT, CALIB 85 PCT HL
GL0402V	6-10.00	VOLT, CALIB 15 PCT HL
GL0422	6-10.00	INTERNAL OSC FAILURE DETECT SIG NO. 2
GL0423	6-10.00	INTERNAL OSC FAILURE DETECT SIG NO. 3
GL0501W	6-10.00	TIME, MISSION ELAPSED
GL0801	6-12.00	1024 KHZ TIMING SIG TO PCMTE OFF OR ON

Table 3. LM EFD Measurement Index (Sheet 23 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GL0802	6-12.00	LGC SERIAL DATA NO. 1C1 TO PCMTE
GL4022X	6-7.00, 10-12.00	(6DS2) ASCENT LOW PRESSURE
GL4023X	6-7.00, 10-10.00	(6DS3) PRESS HE REG OUT MNFLD
GL4024X	6-7.00, 10-10.00	(6DS4) LOW DESC PROP QUANT
GL4026X	6-7.00, 11-20.00	(6DS6) CES AC PWR SUPPLY FAIL
GL4027X	6-7.00, 11-21.00	(6DS7) CES DC PWR SUPPLY FAIL
GL4028X	6-7.00, 12-13.00	(6DS8) AGS POWER SUPPLY FAIL
GL4029X	3-14.00, 6-7.00	(6DS9) N AND G LGC WARNING
GL4030X	3-14.00, 6-7.00	(6DS10) N AND G INTERNAL REFERENCE
GL4031X	6-7.01, 8-16.00	(6DS11) RCS, TCA JET FAIL WARNING
GL4032X	6-7.01, 8-16.00	(6DS12) PRESS, RCS HE REG A OUT WARNING
GL4033X	6-7.01, 8-16.00	(6DS13) PRESS, RCS HE REG B OUT WARNING
GL4034X	4-16.00, 6-7.01	(6DS14) DC BUS VOLTAGE LOW
GL4036X	6-7.01, 7-16.00	(6DS16) CABIN WARNING
GL4037X	6-7.01, 7-9.00	(6DS17) SUIT/FAN WARNING
GL4041X	6-8.00, 10-12.00	(6DS21) ASC HI P, REG OUT MNFLD
GL4042X	6-8.00, 10-12.00	(6DS22) ASC LOW PROP QUANT
GL4043X	1-19.00, 6-8.00	(6DS23) ENGINE GIMBAL CAUTION
GL4045X	3-14.00, 6-8.00	(6DS25) PGNS CAUTION (NOT USED)
GL4046X	4-16.00, 6-8.00	(6DS26) EPS INVERTER CAUTION
GL4047X	4-15.00, 6-8.00	(6DS27) EPS BATTERY CAUTION
GL4048X	6-8.00, 17-18.00	(6DS28) RR DATA NO GOOD
GL4049X	6-8.00, 17-18.00	(6DS29) LDG RADAR DATA NO GOOD (NOT USED)
GL4050X	6-8.00, 11-20.00	(6DS30) PRE AMPS

Table 3. LM EFD Measurement Index (Sheet 24 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GL4051X	2-11. 00, 6-8. 01	(6DS31) EXPLOSIVE DEVICES MALFUNCTION
GL4052X	6-8. 01, 8-16. 02	(6DS32) RCS CAUTION
GL4053X	6-8. 01, 8-16. 01	(6DS33) HEATER CAUTION
GL4054X	6-10. 00	(6DS34) DC AND WE POWER CAUTION
GL4056X	6-8. 01, 7-16. 00	(6DS36) ECS CAUTION
GL4057X	6-8. 01, 7-12. 00	(6DS37) ECS O_2 ACCUM PRESS
GL4058X	6-8. 01, 7-10. 00	(6DS38) GLYCOL CAUTION
GL4059X	6-8. 01, 7-12. 00	(6DS39) DESC-ASC TANK H_2O QUANTITY
GL4060X	6-8. 01, 13-9. 00	(6DS40) S-BAND RCVR (AGC ALARM)
GL4069X	6-10. 00	C AND WEA MASTER ALARM 1D
GL4121	13-12. 00	MONITOR TRACK NO. 2 AND NO. 3
GL4122	13-12. 00	MONITOR TRACK NO. 3 AND NO. 4
GL4201	13-12. 00	DSEA MONITOR HEAD OUTPUT
GL4203	13-12. 00	VOLT, DSEA RECORD MONITOR (TIME)
GL4301	13-12. 00	DSEA TCD INPUT
GL4302	13-12. 00	DSEA VOICE INPUT
GL4305	13-12. 00	DSEA +12 VDC
GL4306	13-12. 00	DSEA RECORD INDICATOR
GL4310	13-12. 00	DSEA RECORD CMD PWR (VOX)
GL4312	13-12. 00	MONITOR TRACK NO. 4
GL4314	13-12. 00	MONITOR TRACK NO. 2
GL4315	13-12. 00	REVERSE COMPLETE
GL4316	13-12. 00	FORWARD COMPLETE
GL4317	13-12. 00	DSEA -5 VDC
GL6101	6-12. 00	1024 KPPS COUNTER NO. 1T. P.
GL6102	6-12. 00	1024 KPPS COUNTER NO. 2T. P.

Table 3. LM EFD Measurement Index (Sheet 25 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GL6103	6-12. 00	1024 KPPS COUNTER NO. 3T. P.
GL6104	6-12. 00	51. 2 KPPS COUNTER NO. 1T. P.
GL6105	6-12. 00	51. 2 KPPS COUNTER NO. 2T. P.
GL6106	6-12. 00	51. 2 KPPS COUNTER NO. 3T. P.
GL6107	6-12. 00	51. 2 KPPS COUNTER NO. 1T. P.
GL6108	6-12. 00	51. 2 KPPS COUNTER NO. 2T. P.
GL6109	6-12. 00	51. 2 KPPS COUNTER NO. 3T. P.
GL6110	6-12. 00	6. 4 KPPS COUNTER NO. 1T. P.
GL6111	6-12. 00	6. 4 KPPS COUNTER NO. 2T. P.
GL6112	6-12. 00	6. 4 KPPS COUNTER NO. 3T. P.
GL6113	6-12. 00	1. 6 KPPS COUNTER NO. 1T. P.
GL6114	6-12. 00	1. 6 KPPS COUNTER NO. 2T. P.
GL6115	6-12. 00	1. 6 KPPS COUNTER NO. 3T. P.
GL6116	6-12. 00	100 HZ COUNTER NO. 1 T. P.
GL6117	6-12. 00	100 HZ COUNTER NO. 2 T. P.
GL6118	6-12. 00	100 HZ COUNTER NO. 3 T. P.
GL6119	6-12. 00	10 HZ COUNTER NO. 1 T. P.
GL6120	6-12. 00	10 HZ COUNTER NO. 2 T. P.
GL6121	6-12. 00	10 HZ COUNTER NO. 3 T. P.
GL6201	6-12. 00	SAMPLE GATE COMMAND AKI TP
GL6202	6-12. 00	BIT RATE AC3 TP
GL6204	6-12. 00	READ CODER COMMAND ABI TP
GL6205	6-12. 00	REDUCE MODE DIG PWR STROBE R2 TP
GL6206	6-12. 00	REDUCE MODE ANLG PWR STROBE R1 TP
GL6207	6-12. 00	NORM MODE DIGITAL PWR STROBE N2 TP

Table 3. LM EFD Measurement Index (Sheet 26 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GL6208	6-12. 00	NORM MODE ANLG PWR STROBE N1 TP
GL6209	6-12. 00	+D6 DIGITAL POWER SUPPLY TP
GL6210	6-12. 00	PWR SUPPLY MAIN SW TP
GL6211	6-12. 00	FRAME 1 OF 4 TP
GL6212	6-12. 00	FRAME 1 OF 5 TP
GL6213	6-12. 00	FRAME 1 OF 8 TP
GL6214	6-12. 00	WORD 1 TO 16 TP
GL6215	6-12. 00	WORD 1 TO 16 OF 128 TP
GL6216	6-12. 00	NORMAL TP
GL6217	6-12. 00	6. 4KPPS TG9 TP
GL6218	6-12. 00	MODE SEL B1 STAB OUT +F24 TP
GL8006V	6-12. 00	VOLT, MA RELAY DRIVER OUT NO. 1
GL8007V	6-12. 00	VOLT, MA RELAY DRIVER OUT NO. 2
GL8008V	6-12. 00	VOLT, MA RELAY DRIVER OUT NO. 3
GL8101V	6-12. 00, 8-16. 00	RELAY DRIVER NO. 1 INPUT
GL8102V	6-12. 00, 8-16. 00	RELAY DRIVER NO. 2 INPUT
GL8103V	6-12. 00, 8-16. 02	RELAY DRIVER NO. 3 INPUT
GL8104V	4-16. 00, 6-12. 00	RELAY DRIVER NO. 4 INPUT
GL8105V	4-16. 00, 6-12. 00	RELAY DRIVER NO. 5 INPUT
GL8106V	4-15. 00, 6-12. 00	RELAY DRIVER NO. 6 INPUT
GL8107V	6-12. 00, 7-16. 00	RELAY DRIVER NO. 7 INPUT
GL8108V	6-12. 00, 7-9. 00	RELAY DRIVER NO. 8 INPUT
GL8109V	6-12. 00, 7-16. 00	RELAY DRIVER NO. 9 INPUT
GL8110V	6-12. 00	RELAY DRIVER NO. 10 INPUT
GL8111V	6-12. 00	RELAY DRIVER NO. 11 INPUT
GL8112V	6-12. 00, 7-12. 00	RELAY DRIVER NO. 12 INPUT
GL8113V	6-12. 00, 7-12. 00	RELAY DRIVER NO. 13 INPUT
GL8114V	6-12. 00, 7-10. 00	RELAY DRIVER NO. 14 INPUT

Table 3. LM EFD Measurement Index (Sheet 27 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GL8115V	6-12. 00, 10-12. 00	RELAY DRIVER NO. 15 INPUT
GL8116V	6-12. 00, 10-12. 00	RELAY DRIVER NO. 16 INPUT
GL8117V	6-12. 00, 10-12. 00	RELAY DRIVER NO. 17 INPUT
GL8118V	6-12. 00, 10-10. 00	RELAY DRIVER NO. 18 INPUT
GL8119V	6-12. 00, 10-10. 00	RELAY DRIVER NO. 19 INPUT
GL8120V	6-12. 00, 11-21. 00	RELAY DRIVER NO. 20 INPUT
GL8121V	6-12. 00, 11-20. 00	RELAY DRIVER NO. 21 INPUT
GL8122V	6-12. 00, 11-20. 00	RELAY DRIVER NO. 22 INPUT
GL8123V	1-19. 00, 6-12. 00	RELAY DRIVER NO. 23 INPUT
GL8124V	3-14. 00, 6-12. 00	RELAY DRIVER NO. 24 INPUT
GL8125V	3-14. 00, 6-12. 00	RELAY DRIVER NO. 25 INPUT
GL8126V	3-14. 00, 6-12. 00	RELAY DRIVER NO. 26 INPUT
GL8127V	6-12. 00, 17-18. 00	RELAY DRIVER NO. 27 INPUT
GL8128V	6-12. 00, 17-18. 00	RELAY DRIVER NO. 28 INPUT
GL8129V	6-12. 00, 12-13. 00	RELAY DRIVER NO. 29 INPUT
GL8130V	6-12. 00, 8-16. 01	RELAY DRIVER NO. 30 INPUT
GL8131V	6-12. 00, 8-16. 00	RELAY DRIVER NO. 31 INPUT
GL8132V	6-12. 00	RELAY DRIVER NO. 32 INPUT
GL8133V	6-12. 00, 8-15. 06	RELAY DRIVER NO. 33 INPUT
GL8134V	6-12. 00, 8-15. 07	RELAY DRIVER NO. 34 INPUT
GL8135V	6-12. 00, 8-15. 04	RELAY DRIVER NO. 35 INPUT
GL8136V	6-12. 00, 8-15. 05	RELAY DRIVER NO. 36 INPUT
GL8137V	6-12. 00, 8-15. 02	RELAY DRIVER NO. 37 INPUT
GL8138V	6-12. 00, 8-15. 03	RELAY DRIVER NO. 38 INPUT
GL8139V	6-12. 00, 8-15. 00	RELAY DRIVER NO. 39 INPUT
GL8140V	6-12. 00, 8-15. 01	RELAY DRIVER NO. 40 INPUT
GL8141V	6-12. 00	IND NO. 28 TEST POINT A
GL8142V	6-12. 00	IND NO. 28 TEST POINT B
GL8143V	6-12. 00	IND NO. 28 TEST POINT C

Table 3. LM EFD Measurement Index (Sheet 28 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GL8144V	6-12. 00	IND NO. 28 TEST POINT D
GL8147V	6-12. 00	MASTER ALARM F/F INPUT 3
GL8151V	6-12. 00	FLAG AND ADVISORY R/D OUTPUTS
GL8152V	6-12. 00	POWER SUPPLY OUTPUT -3 VOLTS
GL8153V	6-12. 00	POWER SUPPLY OUTPUT +4 VOLTS
GL8154V	6-12. 00	POWER SUPPLY OUTPUT +9 VOLTS
GL8155V	6-12. 00	POWER SUPPLY OUTPUT +23 VOLTS
GL8156V	6-12. 00	POWER SUPPLY WARN CIRCUIT (INH)
GL8157V	6-12. 00	POWER SUPPLY TEST POINT A
GL8158V	6-12. 00	POWER SUPPLY TEST POINT B
GL8159V	6-12. 00	POWER SUPPLY TEST POINT C
GL8160V	6-12. 00	POWER SUPPLY TEST POINT D
GL8161V	2-11. 00,6-12. 00	RELAY DRIVER 44 INPUT
GL8162V	6-12. 00,13-9. 00	RELAY DRIVER 45 INPUT
GL8163V	6-12. 00	RELAY DRIVER 46 INPUT
GL8164V	6-12. 00	RELAY DRIVER 47 INPUT
GL8165V	6-12. 00	ELECT SW TEST POINT 1
GL8166V	6-12. 00	ELECT SW TEST POINT 2
GL8167V	6-12. 00	ELECT SW TEST POINT 3
GL8168V	6-12. 00	ELECT SW TEST POINT 4
GL8169V	6-12. 00	ELECT SW TEST POINT 5
GL8170V	6-12. 00	ELECT SW TEST POINT 6
GL8171V	6-12. 00	ELECT SW TEST POINT 7
GL8275U	6-9. 00	RGT CASK TEMP
GL8276T	6-9. 00	ON PAD RTG CASK SURFACE TEMP
GL8277T	6-9. 00	FLT RTG CASK SHLD TEMP COLD SIDE
GL9001	4-15. 00	BATTERY FAULT. (4DS1)
GL9002U	7-12. 00	ASC TANKS WATER QTY UNEQUAL

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MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GL9501U	8-15. 06	TCA FAILURE PAIR QUAD 4A
GL9502U	8-15. 07	TCA FAILURE PAIR QUAD 4B
GL9503U	8-15. 04	TCA FAILURE PAIR QUAD 3A
GL9504U	8-15. 05	TCA FAILURE PAIR QUAD 3B
GL9505U	8-15. 02	TCA FAILURE PAIR QUAD 2A
GL9506U	8-15. 03	TCA FAILURE PAIR QUAD 2B
GL9507U	8-15. 00	TCA FAILURE PAIR QUAD 1A
GL9508U	8-15. 01	TCA FAILURE PAIR QUAD 1B
GM0041X	2-12. 00	LAND GEAR -Y LS DEPLOY LOCK
GM0042X	2-12. 00	LAND GEAR -Y RS DEPLOY LOCK
GM0043X	2-12. 00	LAND GEAR -Z LS DEPLOY LOCK
GM0044X	2-12. 00	LAND GEAR -Z RS DEPLOY LOCK
GM0045X	2-12. 00	LAND GEAR +Z LS DEPLOY LOCK
GM0046X	2-12. 00	LAND GEAR +Z RS DEPLOY LOCK
GM0047X	2-12. 00	LAND GEAR +Y LS DEPLOY LOCK
GM0048X	2-12. 00	LAND GEAR +Y RS DEPLOY LOCK
GM2431X	1-11. 00	+Y LEG LUNAR CONTACT
GM2432X	1-11. 00	-Y LEG LUNAR CONTACT
GM2434X	1-11. 00	-Z LEG LUNAR CONTACT
GM5000U	2-12. 00	LAND LEG DEPLOYED
GN7521X	6-11. 00, 17-18. 00	LR RANGE DATA NO GOOD
GN7523L	9-12. 00	VEL, LR VXA A VEL OR (ALT RATE)
GN7524L	9-11. 00, 17-17. 00	VEL, LR VYA A VEL
GN7525L	9-11. 00, 17-17. 00	VEL, LR VZA A VEL
GN7527H	9-12. 00, 17-17. 00	POS LR RANGE DATA (DISP)
GN7528	17-8. 00	RR PHASE LOCK SIGNAL
GN7529V	17-14. 00	VOLT, LR RANGE GATE STROBE
GN7530V	17-14. 00	VOLT, LR VXA GATE STROBE
GN7531V	17-14. 00	VOLT, LR VYA GATE STROBE

Table 3. LM EFD Measurement Index (Sheet 30 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GN7532V	17-14. 00	VOLT, LR VZA GATE STROBE
GN7533V	17-15. 00	VOLT, LR LGC ANTENNA POSITION CMD
GN7534V	17-14. 00	VOLT, LR RESET STROBE
GN7535V	17-14. 00	VOLT, LR COUNTER READOUT COMMAND
GN7536V	17-14. 00	VOLT, LR COUNTER OUTPUT (0)
GN7537V	17-14. 00	VOLT, LR COUNTER OUTPUT (1)
GN7545E	17-17. 00	POWER, LR VEL XMTR RF POWER OUT
GN7546E	17-17. 00	POWER, LR ALT XMTR RF POWER OUT
GN7547V	17-14. 00	VOLT D1 TRACKER LOCK
GN7548V	17-14. 00	VOLT D2 TRACKER LOCK
GN7549V	17-14. 00	VOLT D3 TRACKER LOCK
GN7550V	17-14. 00	VOLT LR ALT TRACKER LOCK
GN7552X	17-15. 00	LR POS NO. 1 CMD (MANUAL)
GN7553X	17-15. 00	LR POS NO. 2 CMD (MANUAL)
GN7557X	6-11. 00,17-18. 00	LR VEL SENSOR DATA NO GOOD
GN7563T	6-11. 00,8-16. 01,8-17. 06,17-18. 00	TEMP, LR ANTENNA
GN7567V	17-16. 00	VOLT, LR GAIN STATE D1
GN7568V	17-16. 00	VOLT, LR GAIN STATE D2
GN7569V	17-16. 00	VOLT, LR GAIN STATE D3
GN7570V	17-16. 00	VOLT, LR GAIN STATE D4
GN7571V	17-13. 00	VOLT, LR (-25VDC)
GN7572V	17-13. 00	VOLT, LR (+25 VDC)
GN7573V	17-13. 00	VOLT, LR (+25 VDC) (SSC)
GN7574V	17-13. 00	VOLT, LR (+4 VDC)
GN7575V	17-13. 00	VOLT, LR (-2 VDC)

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MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GN7576V	17-15. 00	LR ANTENNA POSITION NO. 1 IND
GN7577V	17-15. 00	LR ANTENNA POSITION NO. 2 IND
GN7582E	17-17. 00	POWER LR VEL XMTR RF POWER OUTPUT
GN7583E	17-17. 00	POWER LR ALT XMTR RF POWER OUTPUT
GN7584V	17-17. 00	VOLT, LR MODE RANGE MOD CONTROL
GN7585F	17-16. 00	FREQ LR SELF TEST
GN7586F	17-17. 00	FREQ LR RANGE TRANS BLANKING (SIG)
GN7589V	17-16. 00	VOLT, D1 AT ANGLE 0 DEGREES
GN7590V	17-16. 00	VOLT, D2 AT ANGLE 0 DEGREES
GN7591V	17-16. 00	VOLT, D3 AT ANGLE 0 DEGREES
GN7592V	17-16. 00	VOLT, FR AT ANGLE 0 DEGREES
GN7593V	17-16. 00	VOLT, D1 AT ANGLE 90 DEGREES
GN7594V	17-16. 00	VOLT, D2 AT ANGLE 90 DEGREES
GN7595V	17-16. 00	VOLT, D3 AT ANGLE 90 DEGREES
GN7596V	17-16. 00	VOLT, FR AT ANGLE 90 DEGREES
GN7599F	17-16. 00	FREQ, LR SELF TEST ALTIMETER
GN7609H	9-9. 00	POS, RR SHAFT ANGLE 1X
GN7610R	9-11. 00, 17-10. 00	RATE, RR SHAFT ANGLE RATE
GN7611H	9-9. 00	POS, RR TRUNNION ANGLE 1X
GN7612R	9-11. 00, 17-10. 00	RATE, RR TRUNNION ANGLE RATE
GN7613H	9-12. 00, 17-9. 00	POS, RR RANGE (TRANSPONDER MODE)
GN7614L	9-12. 00, 17-8. 00, 17-9. 00	VEL, RR RANGE RATE (PRF)
GN7615V	17-10. 00	VOLT, RR AUTO ANGLE TRACK ENABLE

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MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GN7618V	17-5. 00	VOLT, RR +4 VDC
GN7619V	17-5. 00	VOLT, RR +6 VDC
GN7620V	17-5. 00	VOLT, RR +12 VDC
GN7621X	17-18. 00	RR NO TRACK INDICATION
GN7623V	17-9. 00	VOLT, RR RANGE STROBE
GN7624V	17-9. 00	VOLT, RR RANGE RATE STROBE
GN7625V	17-9. 00	VOLT, RR RESET STROBE
GN7626X	17-9. 00	RR COUNTER READOUT COMMAND
GN7627V	17-9. 00	VOLT, RR 0 DATA
GN7628V	17-9. 00	VOLT, RR 1 DATA
GN7629V	17-5. 00	VOLT, RR +12 VDC
GN7630V	17-5. 00	VOLT, RR +25 VDC
GN7631V	17-5. 00	VOLT, RR 25 VDC (MULTIPLIER CHAIN)
GN7636V	17-8. 00	VOLT, RR RANGE LOW SCALE FACTOR
GN7637V	17-8. 00	RR POWER ON AND MODE SW IN LGC
GN7638V	17-12. 00	VOLT, RR TRUNNION 16X RES SINE
GN7639V	17-12. 00	VOLT, RR SHAFT 16X RES SINE
GN7642E	17-7. 00	PWR, RR RF POWER OUTPUT
GN7644V	17-7. 00	VOLT, RR ATM OUTPUT (TRUNNION)
GN7645V	17-7. 00	VOLT, RR ATM OUTPUT (TRUNNION) ERROR SIG
GN7646V	17-7. 00	VOLT, RR ATM OUTPUT (SHAFT)
GN7647V	17-7. 00	VOLT, RR ATM OUTPUT (SHAFT) ERROR SIG
GN7648V	17-7. 00	VOLT, RR ATM OUTPUT (AGC)
GN7649V	17-11. 00	VOLT, RR SHAFT MOTOR SINE
GN7650V	17-11. 00	VOLT, RR TRUN MOTOR SINE

Table 3. LM EFD Measurement Index (Sheet 33 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GN7652V	17-11.00	VOLT, RR SHAFT MOTOR COS
GN7653V	17-11.00	VOLT, RR TRUN MOTOR COS
GN7655V	17-11.00	VOLT, RR 15 VRMS AC POWER 1PH
GN7656V	17-11.00	VOLT, RR 15 VRMS AC POWER 2PH
GN7681F	7-6.00	FREQ, RR TONE NO. 3
GN7682F	17-6.00	FREQ, RR TONE NO. 2
GN7683F	17-6.00	FREQ, RR TONE NO. 1
GN7686V	17-10.01	VOLT, RR 28V/15 800HZ REF
GN7696F	17-8.00	FREQ, RR, REF (SYNTHESIZER)
GN7698V	17-12.00	VOLT, RR TRUNNION 16X RES COS
GN7699V	17-12.00	VOLT, RR SHAFT 16X RES COS
GN7723T	6-11.00,8-16.01,8-17.00,17-18.00	TEMP, RR ANTENNA
GN7724	17-11.00	RR SHAFT COMPENSATED GYRO ERROR
GN7725	17-11.00	RR SHAFT TRUNNION COMPENSATED GYRO ERROR
GN7726	17-10.00	RR SHAFT MANUAL SLEW INPUT
GN7727	17-10.00	RR TRUN MANUAL SLEW INPUT
GN7728	17-7.00	RR 1.7 MHZ IF SIGNAL (TRUNNION)
GN7729	17-7.00	RR 1.7 MHZ IF SIGNAL (REFERENCE)
GN7730	17-7.00	RR 1.7 MHZ IF SIGNAL (SHAFT)
GN7731	17-17.00	RANGE MARKER RESET
GP0001P	4-12.00,6-11.00,10-4.01,10-7.00	PRESS, He SUPPLY TANK NO. 1
GP0002P	4-12.00,6-11.00,10-4.01,10-7.00	PRESS, He SUPPLY TANK NO. 2
GP0018P	4-12.00,10-4.01,10-7.00	PRESS, REG OUT MANIFOLD
GP0025P	4-12.00,6-11.00,10-4.01,10-12.00	PRESS, REG OUT MANIFOLD
GP0041P	10-4.01, 10-9.00, 4-12.01	PRESS NO. 2 HE SUPPLY TANK NO. 1
GP0042P	10-4.01, 10-9.00, 4-12.01	PRESS NO. 2 HE SUPPLY TANK NO. 2
GP0318X	10-4.01,10-6.00	He PRI LINE SOL VALVE CLOSED

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MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GP0320X	10-4. 01, 10-6. 00	He SEC LINE SOL VALVE CLOSED
GP0501P	4-12. 01, 10-4. 01, 10-8. 00	PRESS FUEL TANK ULLAGE
GP0718T	10-4. 02, 10-8. 00	TEMP, FUEL TANK FUEL BULK
GP0908X	4-12. 00, 6-11. 00, 10-4. 02. 10-12. 00	FUEL TANK LOW LEVEL
GP1001P	4-12. 01, 10-4. 01, 10-8. 00	PRESS, OX TANK ULLAGE
GP1218T	10-4. 02, 10-8. 00	TEMP, OX TANK OX BULK
GP1408X	4-12. 00, 6-11. 00, 10-4. 02, 10-12. 00	OX TANK LEVEL LOW
GP1501P	4-12. 00, 6-11. 00, 10-4. 02, 10-12. 00	PRESS, FUEL ISOL VALVE INLET
GP1503P	4-12. 00, 6-11. 00, 10-4. 02, 10-12. 00	PRESS, OX ISOL VALVE INLET
GP1801X	10-4. 02, 10-11. 00	ISOL VALVE A NOT OPEN
GP1802X	6-11. 00, 10-4. 02	ISOL VALVE B NOT OPEN
GP1805X	10-4. 02, 10-11. 00	BIPROP VALVE A NOT OPEN
GP1806X	10-4. 02, 10-11. 00	BIPROP VALVE B NOT OPEN
GP1811X	10-4. 02, 10-11. 00	ISOL VALVE A NOT CLOSED
GP1812X	10-4. 02, 10-11. 00	ISOL VALVE B NOT CLOSED
GP1813X	10-4. 02, 10-11. 00	BIPROP VALVE A NOT CLOSED
GP1814X	10-4. 02, 10-11. 00	BIPROP VALVE B NOT CLOSED
GP2010P	4-12. 00, 10-4. 02, 10-11. 00	PRESS, THRUST CHAMBER
GP2910T	10-4. 01, 10-10. 00	TRANSDUCER TEMP He TANK NO. 1
GP2911T	10-4. 01, 10-10. 00	TRANSDUCER TEMP He TANK NO. 2
GP2997U	10-4. 02, 10-11. 00	ISOL/BIPROP VALVES A DELTA POS
GP2998U	10-4. 02, 10-11. 00	ISOL/BIPROP VALVES B DELTA POS
GP7551X	10-4. 02, 10-11. 00	PROP SOL VALVE A OPEN
GP7552X	10-4. 02, 10-11. 00	PROP SOL VALVE B OPEN
GP9401	10-4. 01	FILL He LEFT
GP9402	10-4. 01	FILL He RIGHT
GP9406	10-4. 01	TEST HIGH PRESS He
GP9425	10-4. 01	FTP-I/O, TEST LOW PRESS He

Table 3. LM EFD Measurement Index (Sheet 35 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GP9430	10-4. 01	FTP-I/O, TEST A CHK VLV OXID
GP9431	10-4. 01	FTP-I/O, TEST B CHK VLV OXID
GP9432	10-4. 01	FTP-I/O, TEST A CHK VLV FUEL
GP9433	10-4. 01	FTP-I/O, TEST B CHK VLV FUEL
GP9440	10-4. 01	FTP-I/O, TEST CHK VLV OUT OXID
GP9441	10-4. 01	FTP-I/O, TEST CHK VLV OUT FUEL
GP9442	10-4. 01	FTP-I/O, VENT OXID
GP9443	10-4. 01	FTP-I/O, VENT FUEL
GP9444	10-4. 01	FTP-I/O, TEST RELIEF VLV OXID
GP9445	10-4. 01	FTP-I/O, TEST RELIEF VLV FUEL
GP9446	10-4. 01	FTP-O, DUMP RELIEF VLV OXID
GP9447	10-4. 01	FTP-O, DUMP RELIEF VLV FUEL
GP9450	10-4. 02	FTP-C, PRESS OXID TANK
GP9451	10-4. 02	FTP-C, PRESS FUEL TANK
GP9452	10-4. 02	FTP-I/O, FILL & DRAIN OXID
GP9453	10-4. 02	FTP-I/O, FILL & DRAIN FUEL
GP9455	10-4. 02	FTP-I/O, TEST S/O PRE-VALVE
GP9458	8-4. 00,10-4. 02	FTP-I/O, BLEED RCS INTER-CONNECT OXID
GP9459	8-4. 00,10-4. 02	FTP-I/O, BLEED RCS INTER-CONNECT FUEL
GP9463	10-4. 02	FTP-I/O, BLEED INTERFACE OXID
GP9464	10-4. 02	FTP-I/O, BLEED INTERFACE FUEL
GP9471	10-4. 02	FTP-I/O, DRAIN ISOL SOL A
GP9472	10-4. 02	FTP-I/O, DRAIN ISOL SOL B
GP9473	10-4. 02	FTP-I/O, DRAIN B1 PROP A
GP9474	10-4. 02	FTP-I/O, DRAIN B1 PROP B
GP9476	10-4. 02	FTP-O, DRAIN ENG VLV SEAL OXID
GP9477	10-4. 02	FTP-O, DRAIN ENG VLV SEAL FUEL

Table 3. LM EFD Measurement Index (Sheet 36 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GQ3015P	4-12.01,10-4.03,10-7.00	PRESS, AMB He PRE PRESS BOTTLE
GQ3018P	4-12.00,8-11.00,10-4.03,10-10.00	PRESS, He REG OUT MANIFOLD
GQ3025P	4-12.00,10-4.03,10-7.00	PRESS, He REG OUT MANIFOLD
GQ3309X	10-4.03,10-6.00	He PRI SOL VALVE CLOSED
GQ3310X	10-4.03,10-6.00	He SEC SOL VALVE OPEN
GQ3435P	4-12.00,10-4.03,10-7.00	PRESS, SUPER/CRIT He SUPPLY TANK
GQ3436P	4-12.00,10-4.03,10-7.00	PRESS, SUPER/CRIT He SUPPLY TANK
GQ3500X	10-4.03,10-6.00	FUEL VENT SOL VALVE OPEN
GQ3501P	4-12.01,10-4.03,10-8.00	PRESS ULLAGE FUEL TANK NO. 1
GQ3541T	10-4.03,10-10.00	TEMP He TANK START BOTTLE
GQ3603Q	10-4.03,10-10.00	QUANTITY, FUEL TANK NO. 1
GQ3604Q	10-4.03,10-10.00	QUANTITY, FUEL TANK NO. 2
GQ3605Q	10-4.03,10-9.00	QUANTITY, FUEL TANK SELECTED 1 OR 2
GQ3611P	4-12.00,10-4.03,10-8.00	PRESS ENGINE INTERFACE FUEL
GQ3718T	10-4.03,10-8.00	TEMP FUEL TANK NO. 1 FUEL BULK
GQ3719T	10-4.03,10-8.00	TEMP FUEL TANK NO. 2 FUEL BULK
GQ4000X	10-4.03,10-6.00	OXID VENT SOL VALVE OPEN
GQ4001P	4-12.01,10-4.03,10-8.00	PRESS, OX TANK NO. 1 ULLAGE
GQ4103Q	10-4.03,10-10.00	QUANTITY, OXID TANK NO. 1
GQ4104Q	10-4.03,10-10.00	QUANTITY, OXID TANK NO. 2
GQ4105Q	10-4.03,10-9.00	QUANTITY, OXID TANK SELECTED NO. 1 OR NO. 2
GQ4111P	4-12.00,10-4.03,10-8.00	PRESS, ENGINE INTERFACE OXID
GQ4218T	10-4.03,10-8.00	TEMP, OX TANK NO. 1 OX BULK
GQ4219T	10-4.03,10-8.00	TEMP, OX TANK NO. 2 OX BULK

Table 3. LM EFD Measurement Index (Sheet 37 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GQ4455X	10-4. 03, 10-10. 00	PROPELLANT TANK LQD LEVEL LOW
GQ6297V	10-13. 00	VOLT, PRE-VALVE A CURR SHUNT
GQ6299V	10-13. 00	VOLT, PRE-VALVE B CURR SHUNT
GQ6331V	10-13. 00	VOLT, SHUT OFF VALVE A CURR SHUNT
GQ6332V	10-13. 00	VOLT, RET, S/O VALVE A CURR SHUNT
GQ6333V	10-13. 00	VOLT, SHUT OFF VALVE B CURR SHUNT
GQ6334V	10-13. 00	VOLT, RET S/O VALVE B CURR SHUNT
GQ6335V	10-13. 00	VOLT, SHUT OFF VALVE C CURR SHUNT
GQ6336V	10-13. 00	VOLT, RET S/O VALVE C CURR SHUNT
GQ6337V	10-13. 00	VOLT, SHUT OFF VALV D CURR SHUNT
GQ6338V	10-13. 00	VOLT, RET S/O VALVE D CURR SHUNT
GQ6441V	1-16. 00, 10-13. 00	VOLT, CHAN 1 MOTOR CURR SHUNT
GQ6442V	1-16. 00, 10-13. 00	VOLT, RET CHAN 1 MOTOR, CURR SHUNT
GQ6643V	1-16. 00, 10-13. 00	VOLT, CHAN 2 MOTOR, CURR SHUNT
GQ6444V	1-16. 00, 10-13. 00	VOLT, RET CHAN 2 MOTOR, CURR SHUNT
GQ6445V	1-16. 00, 10-13. 00	VOLT, CHAN 3 MOTOR, CURR SHUNT
GQ6446V	1-16. 00, 10-13. 00	VOLT, RET CHAN 3 MOTOR, CURR SHUNT

Table 3. LM EFD Measurement Index (Sheet 38 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GQ6510P	4-12.00,9-15.00,10-4.03,10-13.00	PRESS, THRUST CHAMBER
GQ6806H	10-4.03,10-13.00	POS, VARIABLE INJECTOR ACTUATOR
GQ7498U	10-13.00	SHUTOFF VALVES A/B DELTA POS
GQ7499U	10-13.00	SHUTOFF VALVES C/D DELTA POS
GQ9401	10-4.03	FTP-I/O FILL SUPER/CRIT He
GQ9403	10-4.03	FTP-I/O TEST RELIEF SUPER/CRIT He
GQ9404	10-4.03	FTP-I/O PRESS STAB SUPER/CRIT He
GQ9405	10-4.03	FTP-I/O TEST DOWNSTREAM EXP VLV SUPER/CRIT He
GQ9407	10-4.03	FTP-O VENT SUPER/CRIT He
GQ9408	10-4.03	FTP-O DUMP RELIEF VLV SUPER/CRIT He
GQ9409	10-4.03	FTP-I/O TEST UPSTREAM EXP VLV SUPER/CRIT He
GQ9415	10-4.03	FTP-I/O FILL AMBIENT HELIUM
GQ9425	10-4.03	FTP-I/O TEST LOW PRESS He
GQ9430	10-4.03	FTP-I/O TEST A CHK VLV OXID
GQ9431	10-4.03	FTP-I/O TEST B CHK VLV OXID
GQ9432	10-4.03	FTP-I/O TEST A CHK VLV FUEL
GQ9433	10-4.03	FTP-I/O TEST B CHK VLV FUEL
GQ9440	10-4.03	FTP-I/O TEST CHK VLV OUT OXID
GQ9441	10-4.03	FTP-I/O TEST CHK VLV OUT FUEL
GQ9442	10-4.03	FTP-I/O VENT OXID
GQ9443	10-4.03	FTP-I/O VENT FUEL
GQ9444	10-4.03	FTP-I/O TEST RELIEF VALVE OXID
GQ9445	10-4.03	FTP-I/O TEST RELIEF VALVE FUEL
GQ9446	10-4.03	FTP-O DUMP RELIEF VALVE OXID

Table 3. LM EFD Measurement Index (Sheet 39 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GQ9447	10-4. 03	FTP-I/O DUMP RELIEF VALVE FUEL
GQ9448	10-4. 03	FTP-I/O TEST LUNAR DUMP OXID
GQ9449	10-4. 03	FTP-I/O TEST LUNAR DUMP FUEL
GQ9450	10-4. 03	FTP-I/O PRESS OXID TANK
GQ9451	10-4. 03	FTP-I/O PRESS FUEL TANK
GQ9452	10-4. 03	FTP-I/O FILL & DRAIN OXID
GQ9453	10-4. 03	FTP-I/O FILL & DRAIN FUEL
GQ9461	10-4. 03	FTP-O PRESS OXID INTERFACE
GQ9462	10-4. 03	FTP-O PRESS FUEL INTERFACE
GQ9463	10-4. 03	FTP-I/O BLEED INTERFACE OXID
GQ9464	10-4. 03	FTP-I/O BLEED INTERFACE FUEL
GQ9471	10-4. 03	FTP-I/O DRAIN ENG SOL A
GQ9472	10-4. 03	FTP-I/O DRAIN ENG SOL B
GQ9473	10-4. 03	FTP-I/O DRAIN ENG SOL C
GQ9474	10-4. 03	FTP-I/O DRAIN ENG SOL D
GQ9475	10-4. 03	FTP-I/O TEST S/O PRE-VALVE
GQ9476	10-4. 03	FTP-O DRAIN ENG FEED OXID
GQ9477	10-4. 03	FTP-O DRAIN ENG FEED FUEL
GQ9478	10-4. 03	FTP-I/O BLEED ENG OXID
GQ9479	10-4. 03	FTP-I/O BLEED ENG FUEL
GQ9481	10-4. 03	FTP-O DESC ENG ACTUATOR VENT PORT
GR1035Q	8-4. 00, 8-16. 02	QTY PROPELLANT SYS A
GR1095Q	8-4. 00, 8-16. 02	QTY PROPELLANT SYS B
GR1101P	4-12. 00, 6-11. 00, 8-4. 00, 8-12. 00	PRESS, He TANK A
GR1102P	4-12. 00, 8-4. 00, 8-12. 01	PRESS, He TANK B
GR1151T	8-4. 00, 8-13. 00	TEMP, He TANK "A" (LOADING)
GR1152T	8-4. 00, 8-13. 00	TEMP, He TANK "B" (LOADING)
GR1201P	4-12. 00, 8-4. 00, 8-12. 00	PRESS He REG "A" OUTPUT

Table 3. LM EFD Measurement Index (Sheet 40 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GR1202P	4-12.00,8-4.00,8-12.01	PRESS He REG "B" OUTPUT'
GR2121T	8-4.00,8-13.00	TEMP FUEL TANK "A"
GR2122T	8-4.00,8-13.00	TEMP FUEL TANK "B"
GR2201P	4-12.00,8-4.00,8-12.00	PRESS "A" FUEL MNFLD
GR2202P	4-12.00, 8-4.00, 8-12.01	PRESS "B" FUEL MNFLD
GR2361X	8-4.00,8-14.00	FUEL MNFLD X FEED VALVE NOT CLOSED
GR2362X	8-4.00,8-14.00	OX MNFLD X FEED VALVE NOT CLOSED
GR2461X	8-4.00,8-14.01	FUEL MAIN FEED S/O "A" CLOSED
GR2462X	8-4.00,8-14.01	FUEL MAIN FEED S/O "B" CLOSED
GR3201P	4-12.00,8-4.00,8-12.00	PRESS "A" OXID MNFLD
GR3202P	4-12.00,8-4.00,8-12.01	PRESS "B" OXID MNFLD
GR3461X	8-4.00,8-14.01	OXID MAIN FEED S/O "A" CLOSED
GR3462X	8-4.00,8-14.01	OXID MAIN FEED S/O "B" CLOSED
GR5031P	8-4.00,8-15.07	PRESS THRUST CHAMBER NO. 4u
GR5032P	8-4.00,8-15.06	PRESS THRUST CHAMBER NO. 4d
GR5033P	8-4.00,8-15.07	PRESS THRUST CHAMBER NO. 4f
GR5034P	8-4.00,8-15.06	PRESS THRUST CHAMBER NO. 4s
GR5035P	8-4.00,8-15.04	PRESS THRUST CHAMBER NO. 3u
GR5036P	8-4.00,8-15.05	PRESS THRUST CHAMBER NO. 3d
GR5037P	8-4.00,8-15.05	PRESS THRUST CHAMBER NO. 3f
GR5038P	8-4.00,8-15.04	PRESS THRUST CHAMBER NO. 3s
GR5039P	8-4.00,8-15.03	PRESS THRUST CHAMBER NO. 2u
GR5040P	8-4.00,8-15.02	PRESS THRUST CHAMBER NO. 2d
GR5041P	8-4.00,8-15.02	PRESS THRUST CHAMBER NO. 2f
GR5042P	8-4.00,8-15.03	PRESS THRUST CHAMBER NO. 2s
GR5043P	8-4.00,8-15.00	PRESS THRUST CHAMBER NO. 1u
GR5044P	8-4.00,8-15.01	PRESS THRUST CHAMBER NO. 1d

Table 3. LM EFD Measurement Index (Sheet 41 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GR5045P	8-4.00,8-15.00	PRESS THRUST CHAMBER NO. 1f
GR5046P	8-4.00,8-15.01	PRESS THRUST CHAMBER NO. 1s
GR6001T	6-11.00,8-4.00,8-16.01,8-17.00	TEMP QUAD CLUSTER NO. 4
GR6002T	6-11.00,8-4.00,8-16.01,8-17.00	TEMP QUAD CLUSTER NO. 3
GR6003T	6-11.00,8-4.00,8-16.01,8-17.00	TEMP QUAD CLUSTER NO. 2
GR6004T	6-11.00,8-4.00,8-16.01,8-17.00	TEMP QUAD CLUSTER NO. 1
GR6201	8-4.00	FTP-I/O He FILL & VENT DISC A
GR6202	8-4.00	FTP-I/O He FILL & VENT DISC B
GR6211	8-4.00	FTP-I/O He INLET TEST DISC A
GR6212	8-4.00	FTP-I/O He INLET TEST DISC B
GR6233	8-4.00	FTP-I/O REG OUTLET TEST DISC A
GR6234	8-4.00	FTP-I/O REG OUTLET TEST DISC B
GR6241	8-4.00	FTP-I/O FUEL CHECK TEST DISC A1
GR6242	8-4.00	FTP-I/O FUEL CHECK TEST DISC A2
GR6243	8-4.00	FTP-I/O FUEL CHECK TEST DISC B1
GR6244	8-4.00	FTP-I/O FUEL CHECK TEST DISC B2
GR6251	8-4.00	FTP-I/O OXID CHECK TEST DISC A1
GR6252	8-4.00	FTP-I/O OXID CHECK TEST DISC A2
GR6253	8-4.00	FTP-I/O OXID CHECK TEST DISC B1
GR6254	8-4.00	FTP-I/O OXID CHECK TEST DISC B2
GR6261	8-4.00	FTP-I/O FUEL RELIEF TEST DISC A
GR6262	8-4.00	FTP-I/O OXID RELIEF TEST DISC A
GR6263	8-4.00	FTP-I/O FUEL RELIEF TEST DISC B
GR6264	8-4.00	FTP-I/O OXID RELIEF TEST DISC B
GR6271	8-4.00	FTP-I/O FUEL RELIEF VENT PORT A
GR6272	8-4.00	FTP-I/O OXID RELIEF VENT PORT A
GR6273	8-4.00	FTP-I/O FUEL RELIEF VENT PORT B
GR6274	8-4.00	FTP-I/O OXID RELIEF VENT PORT B

Table 3. LM EFD Measurement Index (Sheet 42 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GR6281	8-4.00	FTP-I/O FUEL TANK VENT DISC A
GR6282	8-4.00	FTP-I/O OXID TANK VENT DISC A
GR6283	8-4.00	FTP-I/O FUEL TANK VENT DISC B
GR6284	8-4.00	FTP-I/O OXID TANK VENT DISC B
GR6301	8-4.00	FTP-I/O FUEL TANK BLEED DISC A
GR6302	8-4.00	FTP-I/O OXID TANK BLEED DISC A
GR6303	8-4.00	FTP-I/O FUEL TANK BLEED DISC B
FR6304	8-4.00	FTP-I/O OXID TANK BLEED DISC B
GR6311	8-4.00	FTP-I/O FUEL TANK FILL DISC A
GR6312	8-4.00	FTP-I/O OXID TANK FILL DISC A
GR6313	8-4.00	FTP-I/O FUEL TANK FILL DISC B
GR6314	8-4.00	FTP-I/O OXID TANK FILL DISC B
GR6321	8-4.00	FTP-I/O FUEL MNFLD SVC DISC A
GR6322	8-4.00	FTP-I/O OXID MNFLD SVC DISC A
GR6323	8-4.00	FTP-I/O FUEL MNFLD SVC DISC B
GR6324	8-4.00	FTP-I/O OXID MNFLD SVC DISC B
GR7001X	8-4.00, 8-14.00	PRI ASC INTCNNCT FUEL VL "A" OPEN
GR7002X	8-4.00, 8-14.00	PRI ASC INTCNNCT FUEL VL "B" OPEN
GR7003X	8-4.00, 8-14.00	PRI ASC INTCNNCT OXID VL "A" OPEN
GR7004X	8-4.00, 8-14.00	PRI ASC INTCNNCT OXID VL "B" OPEN
GR7009X	8-4.00, 8-14.00	SEC ASC INTCNNCT OXID VL "A" OPEN
GR7010X	8-4.00, 8-14.00	SEC ASC INTCNNCT FL VL "A" OPEN
GR7011X	8-4.00, 8-14.00	SEC ASC INTCNNCT OX VL "B" OPEN
GR7012X	8-4.00, 8-14.00	SEC ASC INTCNNCT FL VL "B" OPEN
GR7121V	8-10.03	VOLT, FUEL INJECTOR VALVE NO. 4u
GR7122V	8-10.03	VOLT, FUEL INJECTOR VALVE NO. 4d
GR7123V	8-10.03	VOLT, FUEL INJECTOR VALVE NO 4f

Table 3. LM EFD Measurement Index (Sheet 43 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GR7124V	8-10. 03	VOLT, FUEL INJECTOR VALVE NO. 4s
GR7125V	8-10. 02	VOLT, FUEL INJECTOR VALVE NO. 3u
GR7126V	8-10. 02	VLLT, FUEL INJECTOR VALVE NO. 3d
GR7127V	8-10. 02	VOLT, FUEL INJECTOR VALVE NO. 3f
GR7128V	8-10. 02	VOLT, FUEL INJECTOR VALVE NO. 3s
GR7129V	8-10. 01	VOLT, FUEL INJECTOR VALVE NO. 2u
GR7130V	8-10. 01	VOLT, FUEL INJECTOR VALVE NO. 2d
GR7131V	8-10. 01	VOLT, FUEL INJECTOR VALVE NO. 2f
GR7132V	8-10. 01	VOLT, FUEL INJECTOR VALVE NO. 2s
GR7133V	8-10. 00	VOLT, FUEL INJECTOR VALVE NO. 1u
GR7134V	8-10. 00	VOLT, FUEL INJECTOR VALVE NO. 1d
GR7135V	8-10. 00	VOLT, FUEL INJECTOR VALVE NO. 1f
GR7136V	8-10. 00	VOLT, FUEL INJECTOR VALVE NO. 1s
GR7261V	8-10. 03	VOLT, OXID INJECTOR VALVE NO. 4u
GR7262V	8-10. 03	VOLT, OXID INJECTOR VALVE NO. 4d
GR7263V	8-10. 03	VOLT, OXID INJECTOR VALVE NO. 4f
GR7264V	8-10. 03	VOLT, OXID INJECTOR VALVE NO. 4s
GR7265V	8-10. 02	VOLT, OXID INJECTOR VALVE NO. 3u
GR7266V	8-10. 02	VOLT, OXID INJECTOR VALVE NO. 3d
GR7267V	8-10. 02	VOLT, OXID INJECTOR VALVE NO. 3f
GR7268V	8-10. 02	VOLT, OXID INJECTOR VALVE NO. 3s
GR7269V	8-10. 01	VOLT, OXID INJECTOR VALVE NO. 2u
GR7270V	8-10. 01	VOLT, OXID INJECTOR VALVE NO. 2d
GR7271V	8-10. 01	VOLT, OXID INJECTOR VALVE NO. 2f
GR7272V	8-10. 01	VOLT, OXID INJECTOR VALVE NO. 2s
GR7273V	8-10. 00	VOLT, OXID INJECTOR VALVE NO. 1u
GR7274V	8-10. 00	VOLT, OXID INJECTOR VALVE NO. 1d
GR7275V	8-10. 00	VOLT, OXID INJECTOR VALVE NO. 1f
GR7276V	8-10. 00	VOLT, OXID INJECTOR VALVE NO. 1s

Table 3. LM EFD Measurement Index (Sheet 44 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GR9609U	8-14. 01	MAIN PROP VALVES "A" CLOSED
GR9610U	8-14. 01	MAIN PROP VALVES "B" CLOSED
GR9613U	8-14. 00	MNFLD X FEED VALVES NOT CLOSED
GR9631U	8-14. 00	SYS "A" FUEL INTCNNCT VALVES OPEN
GR9632U	8-14. 00	SYS "B" FUEL INTCNNCT VALVES OPEN
GR9641U	8-14. 00	SYS "A" OX INTCNNCT VALVES OPEN
GR9642U	8-14. 00	SYS "B" OX INTCNNCT VALVES OPEN
GR9661X	8-15. 00	TCA PAIR 4A DISABLED
GR9662X	8-15. 07	TCA PAIR 4B DISABLED
GR9663X	8-15. 04	TCA PAIR 3A DISABLED
GR9664X	8-15. 05	TCA PAIR 3B DISABLED
GR9665X	8-15. 02	TCA PAIR 2A DISABLED
GR9666X	8-15. 03	TCA PAIR 2B DISABLED
GR9667X	8-15. 00	TCA PAIR 1A DISABLED
GR9668X	9-15. 01	TCA PAIR 1B DISABLED
GT0105	13-15. 00	PCM NRZ DATA IN
GT0106	13-15. 00	SYNC SIGNAL IN
GT0107	13-19. 00	PCM SPLIT PHASE IN
GT0108	13-15. 00	SUBCARRIER REF SIGNAL
GT0161V	13-10. 00	VOLT, BACKUP VOICE
GT0163	13-10. 00	RECEIVED VHF A VOICE
GT0164V	13-10. 00	RECEIVED VHF B VOICE/EMU DATA
GT0206X	13-6. 01	PA RECYCLING SIG NO 1
GT0207X	13-6. 01	PA RECYCLING SIG NO 2
GT0224C	13-6. 01	CURR S-BAND PWR AMP ANODE NO 1

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GT0225C	13-6. 01	CURR S-BAND PWR AMP ANODE NO 2
GT0441X	13-14. 00	DUA VERIFY
GT0451H	13-8. 00	POSITION GIMBAL PICKOFF OUTPUT Y
GT0452H	13-8. 00	POSITION GIMBAL PICKOFF OUTPUT X
GT0454T	6-11. 00,8-16. 01,8-17. 00,12-8. 00	TEMP S-BAND ST ANT ELECT ASSY
GT0455V	13-6. 00	28VDC S-BAND HEATER VOLTAGE
GT0504V	13-12. 00	VOLT S-BAND RECEIVER AGC
GT0555V	13-10. 00	S-BAND RECEIVER SUBCARRIER OUT
GT0604V	13-19. 00	VHF RCVR "A" AGC
GT0605V	13-19. 00	VHF RCVR "B" AGC
GT0660V	13-8. 00	VOLT TRACKING AGC & COMM
GT0662V	13-8. 00	ST ANT X GIMBAL SERVO OUT AT 0 DEG
GT0663V	13-8. 00	ST ANT X GIMBAL SERVO OUT AT 90 DEG
GT0664V	13-8. 00	ST ANT Y GIMBAL SERVO OUT AT 0 DEG
GT0665V	13-8. 00	ST ANT Y GIMBAL SERVO OUT AT 90 DEG
GT0707C	13-6. 01	S-BAND P. A. NO 1 HEATER CURRENT
GT0708C	13-6. 01	S-BAND P. A. NO 2 HEATER CURRENT
GT0711V	13-8. 00	100 CYCLE SYNC SIGNAL
GT0712V	13-8. 00	50 CYCLE SYNC SIGNAL
GT0992B	13-9. 00	PHASE, ST PH ER, SLCTD S-BAND XPNDR

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GT0993E	13-16. 00	S-BAND XMTR TLM DET RF PWR
GT0994V	13-9. 00	VOLT, SELECTED S-BAND RCVR AGC
GT9501	13-7. 00	S-BAND ERECTABLE ANT IN/OUT RF
GT9502	13-7. 00	S-BAND IN-FLT ANT NO 1 IN/OUT RF
GT9503	13-7. 00	S-BAND IN-FLT ANT NO 2 IN/OUT RF
GT9504	13-8. 00	S-BAND STEER ANT IN/OUT RF
GT9506	13-17. 00	VHF EVA IN/OUT RF
GT0507	13-17. 00	VHF IN-FLT ANT NO 1, CONN IN/ OUT RF
GT9508	13-17. 00	VHF IN-FLT ANT NO 2, CONN IN/ OUT RF
GT9509	6-5. 00	AUDIO WARNING (CDR) (P316-55)
GT9510	6-5. 00	AUDIO WARNING (LMP) (P317-55)
GT9511	13-13. 00	LEFT MIKE PWR CDR (P316-22)
GT9512	13-13. 00	RIGHT MIKE PWR CDR (P316-39)
GT9513	13-13. 00	BIOMED PWR CDR (P316-53)
GT9514	13-13. 00	LEFT MIKE PWR LMP (P317-22)
GT9515	13-13. 00	RIGHT MIKE PWR LMP (P317-39)
GT9516	13-13. 00	BIOMED PWR LMP (P316-53)
GT9517	13-13. 00	HEADSET NO 1 SPACE SUIT NO 1 (CDR) (P316-3)
GT9518	13-13. 00	HEADSET NO 2 SPACE SUIT NO 2 (LMP) (P317-3)
GY0050X	1-20. 00	ABORT COMMANDED
GY0101N	2-7. 00	SYS A EED CONTINUITY
GY0102N	2-8. 00	SYS B EED CONTINUITY
GY0123X	2-7. 00	SYS A STAGING RELAY CLOSED
GY0124X	2-8. 00	SYS B STAGING RELAY CLOSED
GY0201X	2-11. 00	ED SYS A RELAY TRANSFER

Table 3. LM EFD Measurement Index (Sheet 47 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
GY0202X	2-11. 00	ED SYS B RELAY TRANSFER
GY0231X	2-11. 00	SYS A EED RELS 2K7-2K15 CLOSED
GY0232X	2-11. 00	SYS B EED RELS 2K7-2K15 CLOSED
GY0701V	2-7. 00	SYS A ED BATTERY VOLTAGE
GY0702V	2-8. 00	SYS B ED BATTERY VOLTAGE
GY0703	4-17. 00	SELECTED ED BATTERY VOLTAGE
JC9501	4-5. 00	BATT NO. 1 HV POWER IN
JC9502	4-5. 00	BATT NO. 1 LV POWER IN
JC9503	4-5. 00	BATT NO. 2 HV POWER IN
JC9505	4-5. 00	BATT NO. 3 HV POWER IN
JC9506	4-5. 00	LUNAR BATT POWER IN
JC9507	4-5. 00	BATT NO. 4 HV POWER IN
JC9508	4-5. 00	BATT NO. 4 LV POWER IN
JC9509	4-5. 00	BATT NO. 5 POWER IN
JC9510	4-5. 00	BATT NO. 6 POWER IN
JC9511	4-9. 00	LM POWER ON SYS B CMD
JC9512	4-5. 00	CM POWER ON SYS B CMD
JC9513	4-9. 00	LM POWER ON SYS A CMD
JC9514	4-5. 00	CM POWER ON SYS A CMD
JC9515	4-5. 00	GSE POWER INPUT
JC9532	4-5. 00	CDR BUS 28 VDC POWER IN
JC9533	4-5. 00	LM PILOT BUS 28 VDC POWER IN
JC9534	4-13. 00	GSE AC BUS POWER IN
JC9881V	4-6. 00	REV/OVER CURR OPERATE BATT NO. 1
JC9882V	4-6. 01	REV/OVERCURR OPERATE BATT NO. 2/LUNAR BATT
JC9883V	4-6. 02	REV/OVERCURR OPERATE BATT NO. 3/LUNAR BATT

Table 3. LM EFD Measurement Index (Sheet 48 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
JC9884V	4-6.03	REV/OVER CURR OPERATE BATT NO. 4
JC9885V	4-7.00	REV/OVER CURR OPERATE BATT NO.5
JC9886V	4-7.01	REV/OVER CURR OPERATE BATT NO. 6
JC9891V	4-9.00	VOLT, LOW/HIGH VOLTAGE TAPS OFF
JC9892V	4-9.00	VOLT, LOW VOLTAGE TAPS ON
JC9893V	4-8.00	VOLT, LUT DEADFACE RELAY SET
JC9894V	4-8.00	VOLT, LUT DEADFACE RELAY RESET
JF8521V	7-5.00	VOLT, CABIN FAN
JF8522V	7-5.00	VOLT, CABIN FAN
JF8535V	7-6.00	VOLT, SUIT FAN NO. 2
JF8536V	7-6.00	VOLT, SUIT FAN NO. 1
JF9110	7-4.01	GFE CHARGING PLSS H_2O
JF9111	7-4.03	SUIT NO. 1 UMBILICAL
JF9112	7-4.03	SUIT NO. 2 UMBILICAL
JF9137	7-4.02	FTP 1 W/C ACCUM REF PORT (VAC 2 TO 4 PSIA)
JF9151	7-4.03	FTP-I O_2 PRESS RLF VLV DES TK FAIL CP-PRIME
JF9152	7-4.03	FTP-I O_2 PRESS RLF VLV DES TK FAIL CP-SEC
JF9153	7-4.03	FTP-I O_2 FILL PRESS RLF VLV FAIL CP-PRIME

Table 3. LM EFD Measurement Index (Sheet 49 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
JF9154	7-4.03	FTP-I O_2 FILL PRESS RLF VLV FAIL OP-SEC
JF9155	7-4.03	FTP-I O_2 HIGH PRESS REG FAIL OP-PRIME
JF9156	7-4.03	FTP-I O_2 HIGH PRESS REG FAIL OP-SEC
JF9167	7-4.03	FTF-I INTERSTAGE DISCONNECT DESC O_2 TANK NO. 2 A/S
JF9168	7-4.03	FTF-I INTERSTAGE DISCONNECT DESC O_2 TANK NO. 2 D/S
JF9181	7-4.03	FTF-I O_2 TANK NO. 2 HIGH PRESS REG FAIL OP-PRIME
JF9182	7-4.02	FTF-I HTS INTERSTAGE DIS-CONNECT OUT A/S
JF9183	7-4.02	FTF-I HTS INTERFACE DIS-CONNECT OUT D/S
JF9184	7-4.02	FTF-I HTS INTERFACE DISCONNECT IN A/S
JF9185	7-4.02	FTF-I HTS INTERSTAGE DIS-CONNECT IN D/S
JF9186	7-4.03	FTF-I O_2 TANK NO. 2 HIGH PRESS REG FAIL OP-SEC
JF9187	7-4.03	FTF-I O_2 TANK NO. 2 PRESS RLF VLV DES TK FAIL OP-PRIME
JF9188	7-4.03	FTF-I O_2 TANK NO. 2 PRESS RLF VLV DES TK FAIL OP-SEC
JF9197	7-4.03	FTF-INTERSTAGE INTERCONNECT O_2 A/S
JF9198	7-4.03	FTF-I INTERSTAGE DISCONNECT O_2 D/S

Table 3. LM EFD Measurement Index (Sheet 50 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
JF9555	7-4. 03, 7-4. 04	FTP-I O_2 SUPPLY PLSS DISC
JH9001	1-17. 00	GIMBAL TRIM MALFUNCTION RESET
JH9003	11-16. 00	X TRANSLATION CMD TO ATCA (STIM)
JH9004	11-16. 00	Y TRANSLATION CMD TO ATCA (STIM)
JH9005	11-16. 00	Z TRANSLATION CMD TO ATCA (STIM)
JI7027X	12-9. 00	GSE (INPUT REGISTER LOADED)
JI7028X	12-9. 00	GSE (DATA/COMMAND)
JI7029X	12-9. 00	GSE DATA RECEIVED
JI7033X	12-9. 00	GSE DATA IN
JI7035X	12-9. 00	GSE SHIFT PULSES
JI7043X	13-9. 00	GSE IN USE
JI7075	12-6. 00	SELF TEST PTSA
JI7101V	12-6. 00	AUX HTR PWR (PTMU)
JL0404	6-12. 00	INTERNAL OSC CHECKOUT POINT 1
JL0405	6-12. 00	INTERNAL OSC CHECKOUT POINT 2
JL8506	13-12.00	DSEA RESET CMD
JL8793	4-9. 00	OPERATIONAL INSTR POWER CONTROL
JN9001	17-11. 00	GYRO 1 AND 2 ACTIVATE
JN9002	17-7. 00	RCVR (SHAFT ERROR) INPUT SIG
JN9003	17-7. 00	RCVR (SUM) INPUT SIG
JN9004	17-7. 00	RCVR (TRUNNION ERROR) INPUT SIG
JN9012	17-17. 00	LR DEVIATION INHIBIT
JN9013	17-11. 00	GYRO 3 AND 4 ACTIVATE
JP9410	10-4. 01	FTP-I, SENSE PRI UPSTREAM REG

Table 3. LM EFD Measurement Index (Sheet 51 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
JP9411	10-4. 01	FTP-I, SENSE PRI DOWNSTREAM REG
JP9412	10-4. 01	FTP-I, SENSE SEC UPSTREAM REG
JP9413	10-4. 01	FTP-I, SENSE SEC DOWNSTREAM REG
JP9480	10-4. 02	FTP-I CONNECT OXID FEED
JP9482	10-4. 02	FTP-I CONNECT FUEL FEED
JQ9023V	10-4. 03, 10-9. 00	VOLT, PQGS FUEL TANK NO. 1 QUANTITY
JQ9024V	10-4. 03, 10-9. 00	VOLT, PQGS FUEL TANK NO. 2 QUANTITY
JQ9033V	10-4. 03, 10-9. 00	VOLT, PQGS OXID TANK NO. 1 QUANTITY
JQ9034V	10-4. 03, 10-9. 00	VOLT, PQGS OXID TANK NO. 2 QUANTITY
JQ9037X	10-4. 03, 10-9. 00	PQGS SENSOR TEST DRY
JQ9039X	10-4. 03, 10-9. 00	PQGS SENSOR OUTPUT INHIBIT
JQ9041V	1-16. 00, 10-13. 00	VOLT, CHANNEL 1 PWR AMP SIM FAIL
JQ9042V	1-16. 00, 10-13. 00	VOLT, CHANNEL 2 PWR AMP SIM FAIL
JQ9043V	1-16. 00, 10-13. 00	VOLT, CHANNEL 3 PWR AMP SIM FAIL
JQ9051V	1-16. 00, 10-13. 00	VOLT, CHANNEL 1 PRE AMP SIM FAIL
JQ9053V	1-16. 00, 10-13. 00	VOLT, CHANNEL 2 PRE AMP SIM FAIL
JQ9055V	1-16. 00, 10-13. 00	VOLT, CHANNEL 3 PRE AMP SIM FAIL
JQ9410	10-4. 03	FTP-I SENSOR PRI REG

Table 3. LM EFD Measurement Index (Sheet 52 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
JQ9412	10-4. 03	FTP-I SENSOR SEC REG
JQ9480	10-4. 03	FTP-I CONNECT OXID FEED
JQ9482	10-4. 03	FTP-I CONNECT FUEL FEED
JR6231	8-4. 00	FTP-I/PRI HR REG VENT PORT A
JR6232	8-4. 00	FTP-I PRI He REG VENT PORT B
JR6235	8-4. 00	FTP-I/O SEC He REG VENT PORT A
JR6236	8-4. 00	FTP-I/O SEC He REG VENT PORT B
JR9512V	8-10. 03	VOLT, SEC COIL INJECT VLVS NO. 4u
JR9513V	8-10. 03	VOLT, SEC COIL INJECT VLVS NO. 4d
JR9514V	8-10. 03	VOLT, SEC COIL INJECT VLVS NO. 4f
JR9515V	8-10. 03	VOLT, SEC COIL INJECT VLVS NO. 4s
JR9516V	8-10. 02	VOLT, SEC COIL INJECT VLVS NO. 3u
JR9517V	8-10. 02	VOLT, SEC COIL INJECT VLVS NO. 3d
JR9518V	8-10. 02	VOLT, SEC COIL INJECT VLVS NO. 3f
JR9519V	8-10. 02	VOLT, SEC COIL INJECT VLVS NO. 3s
JR9520V	8-10. 01	VOLT, SEC COIL INJECT VLVS NO. 2u
JR9521V	8-10. 01	VOLT, SEC COIL INJECT VLVS NO. 2d
JR9522V	8-10. 01	VOLT, SEC COIL INJECT VLVS NO. 2f
JR9523V	8-10. 01	VOLT, SEC COIL INJECT VLVS NO. 2s
JR9524V	8-10. 00	VOLT, SEC COIL INJECT VLVS NO. 1u
JR9525V	8-10. 00	VOLT, SEC COIL INJECT VLVS NO. 1d
JR9526V	8-10. 00	VOLT, SEC COIL INJECT VLVS NO. 1f
JR9527V	8-10. 00	VOLT, SEC COIL INJECT VLVS NO. 1s
JR9531V	4-11. 00,8-10. 03	RCS PRI FUEL + OXID VALVES PR4A
JR9532V	4-10. 00,8-10. 03	RCS PRI FUEL + OXID VALVES PR4B
JR9533V	4-11. 00,8-10. 02	RCS PRI FUEL + OXID VALVES PR3A
JR9534V	4-10. 00,8-10. 02	RCS PRI FUEL + OXID VALVES PR3B
JR9535V	4-11. 00,8-10. 01	RCS PRI FUEL + OXID VALVES PR2A

Table 3. LM EFD Measurement Index (Sheet 53 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
JR9536V	4-10.00,8-10.01	RCS PPI FUEL + OXID VALVES PR2B
JR9537V	4-11.00,8-10.00	RCS PRI FUEL + OXID VALVES PR1A
JR9538V	4-10.00,8-10.00	RCS PRI FUEL + OXID VALVES PR1B
JT8001	13-19.00	VHF XMTR "A" CW CONTROL
JT8002	13-19.00	VHF XMTR "B" CW CONTROL
JT8003V	13-6.01	VOLT, P.A. OPER POINT TEST, PRI
JT8005V	13-6.01	VOLT, P.A. OPER POINT TEST, SEC
JT9519	13-13.00	BIOMED EKG SIG, LMP
JT9520	13-10.00	MIKE INPUT SPACE SUIT NO. 2 (LMP)
JT9522	13-13.00	BIOMED EKG SIG, CDR
JT9523	13-10.00	MIKE INPUT CDR SPACE SUIT
JY8501V	2-7.00	VOLT, SYS A ELEC CKT INT REL CLOSED
JY8502V	2-8.00	VOLT, SYS B ELEC CKT INT REL CLOSED
JY8503V	2-7.00	VOLT, SYS A INTERLOCK RELAY OPEN
JY8504V	2-8.00	VOLT, SYS B INTERLOCK RELAY OPEN
JY8511V	2-8.00	VOLT, SYS B STAG NUTS RELAY CLOSED
JY8512V	2-7.00	VOLT, SYS A STAG BOLTS RELAY CLOSED
JY8521V	2-7.00	VOLT, SYS A CABLE CUTTER REL CLOSED
JY8522V	2-8.00	VOLT, SYS B CABLE CUTTER REL CLOSED

Table 3. LM EFD Measurement Index (Sheet 54 of 54)

MEASUREMENT NO.	MEASUREMENT NO. LOCATED	FUNCTION
JY8541V	2-5. 00	VOLT, SYS A, D. E., He PRESS REL CLOSED
JY8542V	2-6. 00	VOLT, SYS B, D. E., He PRESS REL CLOSED
JY8551V	2-5. 00	VOLT, SYS A, A. E., He PRESS REL CLOSED
JY8552V	2-6. 00	VOLT, SYS B, A. E., He PRESS REL CLOSED
JY8553V	2-5. 00	VOLT, SYS A, A. E., He PRESS TK1 REL CLOSED
JY8554V	2-6. 00	VOLT, SYS B, A. E., He PRESS TK1 REL CLOSED
JY8555V	2-5. 00	VOLT, SYS A, A. E., He PRESS TK2 REL CLOSED
JY8556V	2-6. 00	VOLT, SYS B, A. E., He PRESS TK2 REL CLOSED
NN0003E	17-6. 00	RR POWER OUT
NN0005	17-17. 00	VELOCITY TRANSMITTER POWER
NN0006	17-17. 00	BLANKING SIGNAL

VII. Introduction to LM Elementary Functional Diagram Vehicle Connector Index (Table 4)

1. This section is a tabulation of connectors appearing on the Elementary Functional Diagrams.

2. The data is presented in two columns. The columns and contents of the columns are as follows:

   Connector Number (J or P) Column - This column contains the reference designation of the plug or jack.

   Located on EFD No. (s) Column - This column contains a listing of the Elementary Functional Diagrams on which the connector appears.

3. The connector location index is derived as follows:

   3-7.00
   - 7.00 — Functional grouping sheet number
   - 3 — Functional grouping derived from last digit of basic drawing number (LDW 267-XX003)

   16-6.00
   - 6.00 — Functional grouping sheet number
   - 16 — Functional grouping derived from last two (2) digits of basic drawing number (LDW 267-XX016)

Table 4. LM EFD Connector Index (Sheet 1 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON
1	3-7. 00, 16-6. 00, 16-9. 00, 16-10. 00, 16-10. 02, 16-10. 03, 16-10. 04
3A	4-13. 00, 6-9. 00
3B	4-13. 00, 6-9. 00
**9	4-9. 00, 4-14. 00
**10	3-10. 00, 4-9. 00, 4-14. 00
15	2-11. 00, 3-14. 00, 4-8. 00, 4-12. 00 4-16. 00, 4-17. 00, 6-5. 00, 6-7. 00 6-7. 01, 6-8. 01, 6-9. 00, 7-9. 00 7-10. 00, 7-12. 00, 7-16. 00, 8-15. 00 8-15. 02, 8-15. 04, 8-16. 00, 8-16. 01 8-16. 02, 8-17. 00, 9-13. 00, 9-13. 01 9-15. 00, 10-10. 00, 10-12. 00, 11-7. 00, 11-20. 00, 11-21. 00 11-23. 00, 12-5. 00, 12-13. 00 17-18. 00, 13-9. 00
**23	4-9. 00, 4-14. 00
**24	4-9. 00, 4-14. 00
26A	4-3. 00, 4-17. 00, 4-18. 00, 4-20. 00, 4-7. 00, 4-7. 01, 4-15. 00
26B	4-8. 00, 4-15. 00, 4-17. 00, 4-18. 00, 4-20. 00
27 (4A3)	4-7. 00
27 (4A4)	4-7. 01
28A	4-15. 00, 4-17. 00
28B	4-15. 00, 4-17. 00
29A	4-5. 00, 4-6. 00, 4-9. 00, 4-15. 00, 4-17. 00, 4-18. 00, 4-19. 00
29B	4-5. 00, 4-6. 02, 4-9. 00, 4-15. 00 4-17. 00, 4-18. 00, 4-19. 00
30A	4-5. 00, 4-6. 01, 4-9. 00, 4-15. 00, 4-17. 00, 4-18. 00, 4-19. 00
30B	4-5. 00, 4-6. 03, 4-9. 00, 4-15. 00, 4-17. 00, 4-18. 00, 4-19. 00
*31 (4A2)	4-6. 00
*31 (4A1)	4-6. 02
*32 (4A2)	4-6. 01

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 2 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
*32 (4A1)	4-6. 03	39	4-11. 01, 4-12. 00, 4-15. 00, 7-5. 00, 7-7. 00, 16-6. 00, 16-9. 00
33A	4-15. 00	41	1-19. 00, 3-14. 00, 4-15. 00, 4-16. 00, 6-5. 00, 6-8. 00, 7-7. 00, 7-9. 00, 7-14. 00, 10-12. 00, 11-20. 00, 17-18. 00
33B	4-15. 00	42	1-12. 00, 4-10. 00, 4-10. 01, 4-12. 00, 4-15. 00, 7-5. 00, 7-6. 00, 7-7. 00, 7-9. 00, 8-6. 00, 8-8. 00, 8-12. 00
33C	4-15. 00	43	1-6. 00, 1-11. 00, 8-10. 00, 8-10. 01, 8-10. 02, 8-10. 03, 10-11. 00, 12-5. 00, 12-6. 00
33D	4-15. 00	45	8-10. 00, 8-10. 01, 8-10. 02, 8-10. 03, 10-11. 00, 11-7. 00
33E	4-15. 00	46	1-11. 00, 4-10. 00, 4-10. 01, 4-13. 00, 8-10. 00, 8-10. 01, 8-10. 02, 8-10. 03, 12-5. 00. 13-6. 01
34	4-6. 00, 4-6. 01, 4-6. 02, 4-6. 03, 4-7. 00, 4-8. 00, 4-19. 00	55	1-6. 00, 1-10. 00, 10-5. 00, 10-6. 00, 10-7. 00, 10-8. 00, 10-9. 00
35	1-16. 00, 7-9. 00, 7-10. 00, 7-11. 00, 7-12. 00, 7-13. 00, 8-13. 00, 8-15. 04, 8-15. 05, 8-15. 06, 8-15. 07		
37	7-6. 00, 7-7. 00, 7-16. 00, 8-9. 00, 8-12. 00, 8-15. 03, 8-15. 05, 8-15. 07		
38	1-6. 00, 4-5. 00, 4-8. 00, 4-9. 00 4-10. 00, 4-10. 01, 4-12. 00, 6-5. 00 8-16. 02, 8-17. 00, 9-7. 00, 9-10. 00 9-13. 00, 9-13. 01, 10-6. 00, 10-9. 00 16-5. 00, 16-6. 00, 16-9. 00, 16-11. 00		

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 3 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
56	1-6.00,1-10.00,1-11.00,1-20.00, 4-16.00,6-7.01,6-9.00,7-9.00, 7-16.00,8-16.00,9-6.00,9-9.00, 9-10.00,9-11.00,9-12.00,9-13.00, 9-13.01,9-15.00,11-16.00	63	1-6.00,1-9.00,1-10.00,12-5.00, 12-6.00,12-13.00,16-6.00,16-9.00, 16-10.01
57	3-9.00,6-5.00,9-5.00,9-5.01, 9-9.00,9-10.00,9-11.00,9-12.00, 9-14.00,11-15.00,16-8.00, 16-10.01	64	2-11.00,2-12.00,13-10.00,13-11.00, 13-13.00,16-6.00,16-9.00,16-10.03, 16-11.00,16-12.00
58	9-10.00,9-11.00,9-13.00,9-13.01, 16-7.00,17-6.00,17-7.00,17-8.00, 17-10.00,17-10.01,17-15.00, 17-16.00,17-18.00	65	13-10.00,13-11.00,13-12.00, 13-18.00,16-10.04
59	1-8.00,3-9.01,9-13.01,9-13.00, 11-18.00,16-5.00,16-6.00,16-9.00, 16-10.00	67	4-7.01,4-8.06,4-9.00
60	1-6.00,4-5.00,4-9.00,4-11.00, 4-11.01,4-13.00,9-6.00,9-7.00, 9-10.00,9-12.00,9-13.00,9-13.01, 9-15.00,10-7.00,11-7.00,12-5.00, 16-5.00,16-10.00,16-10.02, 16-10.03,17-7.00	68	4-8.00,4-19.00
		69	1-6.00,1-9.00,1-10.00,11-23.00, 16-5.00,16-6.00,16-9.00,16-10.00, 16-10.02,16-10.03
		70	3-13.00,3-18.00,4-9.00,4-11.01
		71	8-15.02,8-15.04,16-12.00,17-13.00
		72	4-10.00,4-10.01,7-6.00,8-7.00, 12-6.00,16-7.00,16-12.00
		73	1-11.00,4-13.00,8-10.00,8-10.01, 8-10.02,8-10.03,12-5.00,13-6.01

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 4 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
74	2-7.00,4-5.00,4-6.03,4-7.00, 4-10.01,4-19.00,4-20.00	88 (Cont)	9-13.01,9-14.00,11-15.00,17-9.00, 17-17.00
76	6-10.00,13-5.00,13-6.00, 13-6.01,13-8.00,13-10.00, 13-11.00,13-12.00,13-13.00, 13-15.00,13-18.00	89	4-13.00,8-11.00,17-5.00
		**93	6-9.00
		**95	3-13.00,4-8.00,4-9.00,6-9.00
80	4-5.00,4-10.01	96	4-11.01,4-13.00
81	4-5.00,4-11.01	97	4-10.01,4-13.00
83	6-10.00,13-18.00,13-11.00, 13-10.00,13-12.00,13-5.00, 13-8.00,13-6.01,13-13.00, 13-6.00,13-15.00	98	4-12.00,7-11.00,7-13.00,8-12.00, 8-12.01,10-7.00,10-8.00,10-10.00, 10-11.00,10-12.00,10-13.00
**85	6-5.00,13-13.00,13-11.00, 13-10.00	98A	4-12.01,7-8.00,7-11.00,10-7.00, 10-8.00, 10-9.00
**86	6-5.00,13-10.00,13-11.00,13-13.00	99	4-9.00,4-11.00,4-11.01,4-13.00, 8-11.00,17-5.00,17-13.00
87	1-7.00,4-6.00,4-7.01,4-10.00, 4-10.01,8-9.00,8-11.01,10-5.00, 11-6.00,13-10.00,13-12.00, 13-18.00,16-5.00,16-10.04	101	1-20.00,4-18.00,8-15.01, 8-15.03,8-15.04,8-15.05, 8-15.06,8-15.07,8-16.01, 9-8.00,11-16.00,11-20.00,11-23.00, 12-5.00,12-10.00,12-11.00
88	3-9.00,9-9.00,9-12.00,9-13.00,		

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 5 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON
103	13-6.00, 13-6.01, 13-14.00, 13-15.00, 13-18.00
105	1-7.00, 1-8.00, 1-9.00, 1-12.00, 3-7.00, 4-6.00, 4-7.01, 4-8.00, 4-11.00, 4-11.01, 4-13.00, 7-7.00, 9-5.01, 10-5.00, 11-18.00, 13-18.00, 16-5.00
143	4-9.00, 4-14.00, 8-17.00, 16-6.00, 17-13.00
144	4-9.00, 4-14.00
148	2-7.00, 4-7.01, 4-10.00, 4-10.01, 4-15.00, 4-16.00, 4-17.00, 4-18.00, 6-5.00, 6-6.00, 13-5.00, 13-18.00, 13.6.00
156	11-23.00
*166	4-5.00, 4-10.00, 8-10.00, 8-10.01, 8-10.02, 8-10.03
*167	4-5.00, 4-11.00, 4-13.00, 8-10.00, 8-10.01, 8-10.02, 8-10.03
168A	16-5.00
168B	16-5.00
173	1-6.00, 1-10.00, 1-11.00, 1-13.00, 2-6.00, 3-11.00, 4-5.00, 4-6.01, 4-6.03, 4-9.00, 4-14.00, 4-15.00, 4-17.00, 4-18.00, 4-19.00, 6-9.00, 10-5.00, 10-6.00, 10-7.00, 10-8.00, 10-9.00, 10-13.00, 13-5.00, 16-12.00, 17-5.00, 17-16.00, 17-17.00, 17-18.00
174	1-7.00, 1-8.00, 1-9.00, 1-11.00, 1-13.00, 1-14.00, 1-15.00, 1-16.00, 1-17.00, 1-18.00, 1-19.00, 1-20.00, 2-5.00, 2-7.00, 2-11.00, 2-12.00, 3-5.01, 3-9.00, 3-9.01, 4-5.00, 4-6.00, 4-6.02, 4-6.03, 4-8.00, 4-9.00, 4-15.00, 4-17.00, 4-18.00, 4-19.00, 7-11.00, 10-7.00, 10-8.00, 10-10.00, 10-13.00, 11-10.00, 12-8.00, 16-12.00, 17-13.00
176	4-14.00
177	4-14.00
178 (TWO)	16-5.00
180	11-9.00, 12-5.00, 17-10.01

*GSE Connector
**Umbilical Connector

c
REV. A

Table 4. LM EFD Connector Index (Sheet 6 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON EFD NO. (S)	CONNECTOR NO. (J OR P)	LOCATED ON
181	1-14. 00, 9-14. 00, 11-15. 00	189	1-6. 00, 1-7. 00, 1-10. 00, 3-5. 00, 3-14. 00, 6-5. 00, 6-7. 00, 9-6. 00, 9-8. 00, 9-9. 00, 10-6. 00, 10-7. 00, 10-9. 00, 10-10. 00, 10-12. 00, 11-7. 00, 11-20. 00, 11-21. 00, 12-13. 00, 16-10. 01, 16-10. 02
182	1-19. 00, 3-14. 00, 4-15. 00, 4-16. 00, 6-5. 00, 6-8. 00, 7-8. 00, 7-9. 00, 7-10. 00, 7-14. 00, 7-15. 00, 7-16. 00, 10-12. 00, 11-20. 00, 17-18. 00		
183	2-12. 00, 4-7. 01, 6-9. 00, 13-9. 00, 13-11. 00, 13-12. 00, 13-13. 00, 13-15. 00, 13-16. 00, 13-18. 00	190	1-16. 00, 2-11. 00, 6-8. 01, 8-15. 00, 8-15. 02, 8-15. 04, 8-15. 05, 8-15. 06 8-16. 01, 8-16. 02, 9-7. 00, 9-8. 00, 9-9. 00, 9-10. 00, 9-11. 00, 16-10. 02
184	1-10. 00, 3-5. 01, 3-16. 00, 11-6. 00, 11-8. 00, 11-11. 00, 11-13. 00, 11-14. 00, 11-15. 00, 12-8. 00, 16-7.00 17-6. 00, 17-7. 00, 17-8. 00, 17-10. 00, 17-10. 01, 17-15. 00, 17-16. 00, 17-18. 00	191	1-11. 00, 3-5. 01, 11-7. 00, 11-10. 00, 16-5. 00, 16-10. 00, 16-10. 04, 17-7. 00, 17-10. 01, 17-18. 00
		194	1-15. 00, 2-12. 00, 4-5. 00, 4-6. 00, 4-7. 01, 4-8. 00, 4-11. 00, 4-11. 01, 4-13. 00, 4-16. 00, 6-6. 00, 13-5. 00, 13-6. 00, 13-12. 00, 13-14. 00, 13-18. 00, 16-11. 00, 16-12. 00
185	1-14. 00, 2-11. 00, 11-6. 00, 17-9. 00, 17-10-00, 17-12. 00, 17-17. 00		
186	1-15. 00, 2-11. 00, 4-5. 00, 4-6. 00, 4-7. 01, 4-8. 00, 4-15. 00, 4-16. 00, 4-17. 00, 4-18. 00, 6-5. 00, 6-6. 00, 11-10. 00, 13-14. 00, 17-11. 00	196	1-8. 00, 1-9. 00, 1-14. 00, 1-20. 00, 6-7. 00, 6-7. 01, 9-5. 00, 9-5. 01, 9-9. 00, 9-10. 00, 9-11. 00, 9-12. 00 9-15. 00, 10-8. 00, 11-6. 00, 11-7. 00, 11-16. 00, 12-8. 00, 16-8. 00, 16-9. 00
187	7-10. 00, 8-12. 00, 8-12. 01, 8-14. 00, 8-14. 01, 8-15. 00, 8-15. 01, 8-15. 02, 8-15. 03, 8-16. 02		

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 7 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
198	13-5.00,13-6.00,13-9.00, 13-10.00,13-11.00,13-12.00, 13-13.00,13-15.00,13-16.00, 13-18.00	215	3-17.00,3-21.00
		216	3-15.00,3-16.00,3-21.00,3-13.00
		217	3-12.00,3-12.01,3-13.00,3-14.00, 3-20.00,6-9.00
200	3-11.01,17-5.00,17-6.00,17-8.00, 17-9.00,17-10.00,17-18.00		
		218	3-5.01,3-8.00,3-9.01,3-18.00, 3-20.00,12-7.00
201	17-6.00,17-7.00		
*202	17-5.00,17-6.00,17-7.00,17-8.00, 17-9.00,17-10.00,17-10.01, 17-11.00,17-12.00	219	3-9.00,3-9.01,3-12.00,3-13.00, 3-15.00,3-16.00,17-10.00
		220	3-5.00,3-5.01,3-6.00,3-7.00, 3-8.00,3-9.01,3-10.00
205	17-12.00		
206	3-11.00,17-14.00,17-15.00, 17-16.00,17-17.00,17-18.00	221	3-14.00,3-19.00
		222	3-13.00,3-18.00
*207	17-13.00,17-14.00,17-15.00, 17-16.00,17-17.00	223	3-13.00,3-15.00,3-21.00
208	3-18.00,17-5.00,17-6.00,17-11.00, 17-12.00,17-18.00	224	3-11.00,3-11.01,3-18.00,17-12.00
		225	3-17.00
209	17-6.00,17-7.00		
		226	3-16.00
214	17-13.00,17-15.00,17-16.00, 17-17.00,17-18.00	227	3-13.00,3-15.00,3-16.00,3-21.00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 8 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
228	3-13.00,3-15.00,3-21.00	243	3-20.00
229	3-14.00,3-19.00,16-6.00, 16-10.00,16-10.01,17-8.00, 17-15.00	*255	17-6.00
		257	4-9.00,4-11.01,12-5.00,17-5.00
230	3-13.00	258	17-18.00
231	3-7.00,16-10.01	*263	17-5.00
*233	17-6.00,17-7.00,17-8.00	304	8-6.00,8-8.00,8-9.00,8-15.00, 8-15.06
234	17-13.00,17-15.00,17-16.00, 17-17.00	305	7-6.00,8-6.00,8-7.00,8-8.00, 8-15.02,8-15.04
235	17-6.00	306	8-8.00,8-8.00,8-15.01
236	17-6.00, 17-5.00	**316	6-5.00,13-13.00,13-10.00,13-13.01, 13-17.00
238	17-5.00,17-7.00,17-10.00, 17-11.00,17-12.00	**317	6-5.00,13-13.00,13-10.00,13-13.01, 13-17.00
239	17-5.00		
240	3-18.00,17-5.00,17-7.00, 17-10.00,17-10.01,17-12.00	319	8-6.00,8-8.00,8-9.00,8-15.01. 8-15.03,8-15.05,10-11.00
241	17-5.00,17-6.00,17-7.00, 17-11.00,17-12.00	320	4-11.00,7-6.00,8-7.00,8-9.00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 9 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON
321	4-11. 00, 4-11. 01, 7-6. 00, 8-6. 00, 8-7. 00, 8-8. 00, 17-13. 00
350	17-17. 00
352	13-17. 00
368	13-14.00
371A	13-7. 00
371B	13-17. 00
372A	13-7. 00
372B	13-17. 00
373A	13-7. 00
373B	13-17. 00
374A	13-7. 00
374B	13-17. 00
375A	13-7. 00
375B	13-17. 00
379	13-16. 00
379A	13-6. 01, 13-9. 00, 13-16. 00
380	13-9. 00
381	13-16. 00
383	13-6. 01, 13-7. 00
384	13-7. 00
385	13-7. 00
386	13-7. 00
*387	13-6. 01
388	13-18. 00
389	13-18. 00
390	13-17. 00
391	13-5. 00, 13-10. 00, 13-11. 00, 13-15. 00
*393	13-10. 00, 13-15. 00
400	2-5. 00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 10 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
401	2-6. 00	421A	2-9. 00
402	2-5. 00	421B	2-10. 00
403	2-6. 00	422A	2-9. 00
406	2-5. 00	422B	2-10. 00
407	2-6. 00	423A	2-9. 00
416A	2-5. 00	423B	2-10. 00
416B	2-6. 00	424A	2-9. 00
417A	2-9. 00	424B	2-10. 00
417B	2-10. 00	425A	2-9. 00
418A	2-9. 00	425B	2-10. 00
418B	2-10. 00	426A	2-9. 00
419A	2-9. 00	426B	2-10. 00
419B	2-10. 00	*428A	2-5. 00, 2-7. 00
420A	2-9. 00	*428B	2-6. 00, 2-8. 00
420B	2-10. 00	429A	2-7. 00, 2-11. 00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 11 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
429B	2-8.00, 2-11.00	446	2-10.00
430	2-9.00	447	2-10.00
431	2-9.00	448	2-10.00
432	2-9.00	451	2-10.00
433	2-9.00	452	2-10.00
434	2-9.00	453	2-10.00
435	2-9.00	454	2-10.00
438	2-9.00	455	2-10.00
439	2-10.00	456	2-9.00
440	2-10.00	457	2-9.00
441	2-10.00	458	2-9.00
442	2-10.00	459	2-9.00
443	2-9.00	460	2-9.00
444	2-9.00	461	2-10.00
445	2-10.00	462	2-9.00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 12 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
463	2-9. 00	479A	2-9. 00
464	2-10. 00	479B	2-10. 00
465	2-10. 00	481A	2-7. 00
468	2-5. 00	481B	2-8. 00
469	2-6. 00	482A	2-5. 00
474A	2-9. 00	482B	2-6. 00
474B	2-10. 00	485A	2-9. 00
475A	2-9. 00	485B	2-10. 00
475B	2-10. 00	486A	2 -9. 00
476A	2-9. 00	486B	2-10. 00
476B	2-10. 00	487A	2-9. 00
477A	2-9. 00	487B	2-10. 00
477B	2-10. 00	488A	2-9. 00
478A	2-9. 00	488B	2-10. 00
478B	2-10. 00	494	2-5. 00, 4-11. 00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 13 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
495	2-6. 00, 4-10. 00	610	9-5. 01. 9-6. 00, 9-9. 00, 9-14. 00
*556	10-9. 00	611	3-9. 00, 9-12. 00, 17-9. 00, 17-17. 00,
560	1-13. 00, 10-13. 00	612	9-5. 00, 9-5. 01
561	1-16. 00, 10-13. 00	701	3-8. 00, 6-9. 00, 9-8. 00, 11-6. 00, 11-7. 00, 11-8. 00, 11-9. 00, 11-10. 00, 11-13. 00, 11-14. 00, 11-15. 00, 11-16. 00, 11-17. 00
*562	1-16. 00, 10-13. 00		
565	10-7. 00		
*566	10-10. 00	*702	11-6. 00, 11-8. 00, 11-9. 00, 11-13. 00, 11-14. 00, 11-15. 00, 11-16. 00, 11-17. 00
567	10-13. 00		
602	9-5. 00, 9-5. 01, 9-14. 00	*703	8-10. 00, 8-10. 01, 8-10. 02, 8-10. 03, 11-8. 00, 11-17. 00
604	6-9. 00, 9-13. 00, 9-13. 01	704	11-6. 00, 11-9. 00
607	4-5. 00, 4-6. 00, 4-6. 01, 4-6. 02, 4-6. 03, 4-7. 00, 4-8. 00, 4-14. 00	706A	1-14. 00, 3-10. 00, 11-11. 00
		706B	1-14. 00, 3-10. 00, 11-11. 00
608	1-6. 00, 1-10. 00, 1-16. 00, 3-11. 00, 4-8. 00, 10-7. 00, 10-8. 00, 10-10. 00, 10-13. 00, 17-17. 00	708A	11-12. 00, 11-18. 00, 11-19. 00
		708B	11-12. 00, 11-18. 00, 11-19. 00
609	9-5. 00, 9-5. 01, 9-6. 00, 9-7. 00, 9-9. 00, 9-14. 00		

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 14 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON
709A	11-7. 00, 11-12. 00, 11-13. 00, 11-14. 00, 11-15. 00, 13-11. 00
709B	11-6. 00, 11-12. 00, 11-13. 00, 11-14. 00, 11-15. 00, 13-11. 00
716A	1-18. 00
716B	1-17. 00
*720	12-6. 00, 12-13. 00
721	12-6. 00
*722	12-6. 00, 12-13. 00
725	12-5. 00, 12-12. 00
*726	12-5. 00, 12-6. 00, 12-10. 00, 12-11. 00, 12-12. 00
727	1-13. 00
*728	1-13. 00, 1-14. 00, 1-15. 00, 1-16. 00, 1-17. 00, 1-18. 00
730	12-5. 00, 12-10. 00, 16-9. 00, 16-10. 01, 16-10. 02, 16-6. 00
735	8-15. 00, 11-8. 00, 11-10. 00, 11-11. 00, 11-13. 00, 11-14. 00, 11-15. 00, 11-17. 00, 11-20. 00, 11-21. 00, 11-22. 00
737	1-6. 00, 1-9. 00, 1-10. 00, 1-11. 00, 1-14. 00, 1-15. 00, 1-16. 00, 1-17. 00, 1-18. 00, 1-19. 00, 1-20. 00, 3-5. 01, 12-8. 00
741	1-7. 00, 1-8. 00, 1-9. 00, 1-11. 00, 1-12. 00, 1-20. 01, 2-11. 00, 4-8. 00, 9-9. 00, 11-10. 00, 11-16. 00, 11-23. 00, 12-8. 00
742	1-6. 00, 1-7. 00, 1-10. 00, 1-12. 00, 1-16. 00, 3-5. 00, 3-5. 01, 4-8. 00, 11-7. 00, 11-10. 00, 11-11. 00, 11-12. 00, 11-16. 00, 12-8. 00
743	9-9. 00, 11-6. 00, 11-12. 00, 11-19. 00 11-23. 00, 12-8. 00
747	1-6. 00, 1-9. 00, 1-10. 00, 1-11. 00, 3-5. 00, 11-7. 00, 11-8. 00, 11-11. 00, 11-13. 00, 11-14. 00, 11-15. 00, 12-8. 00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 15 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON
748	1-8. 00, 1-9. 00, 1-10. 00, 1-11. 00, 1-20. 01, 3-9. 00, 6-5. 00, 11-6. 00, 11-10. 00, 11-11. 00, 11-13. 00, 11-14. 00, 11-15. 00, 11-23. 00, 16-6. 00
750	7-5. 00, 7-6. 00, 7-7. 00, 7-15. 00, 7-16. 00
751	7-9. 00, 7-10. 00, 7-14. 00, 7-15. 00
752	7-14. 00, 7-15. 00, 7-16. 00
761	7-5. 00
763	7-5. 00, 7-6. 00, 7-9. 00
764	7-6. 00
*765	7-5. 00, 7-6. 00
766	7-7. 00
769	7-8. 00, 7-9. 00
771	10-5. 00
772	1-13. 00, 1-5. 00, 12-6. 00, 16-7. 00
773	1-13. 00, 4-11. 00, 8-9. 00, 10-5. 00
774	10-5. 00
*779	7-10. 00
780	7-7. 00, 7-16. 00
781	7-6. 00
785	7-5. 00
786	7-5. 00
787	7-8. 00
788	7-10. 00
800	16-7. 00
801	16-7. 00
803	1-7. 00, 1-8. 00, 10-5. 00
804	3-6. 00, 6-5. 00, 6-8. 00, 6-8. [illegible], 7-9. 00, 7-10. 00, 7-12. 00, 7-16. 00, 8-15. 01, 8-15. 0[illegible] 8-15. 07, 8-16. 02, 13-9. 00, 16-8. 0[illegible] 16-9. 00, 16-10. 01

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 16 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON
805	6-5. 00, 6-8. 00, 6-8. 01, 8-16. 01, 8-17. 00, 9-9. 00, 11-6. 00, 11-20. 00, 11-23. 00, 16-6. 00, 16-7. 00, 16-8. 00, 16-9. 00, 16-10. 00
806	16-11. 00
807	7-7. 00, 7-9. 00, 7-11. 00, 7-13. 00, 8-12. 00, 8-16. 02, 9-11. 00
808	8-9. 00
812	16-11. 00
850	4-16. 00, 7-9. 00, 7-10. 00, 7-12. 00, 8-16. 00, 8-16. 01, 8-16. 02, 10-10. 00, 10-12. 00, 11-20. 00, 11-21. 00, 12-13. 00, 13-9. 00
851	1-19. 00, 1-20. 01, 2-11. 00, 2-12. 00, 3-14. 00, 4-15. 00, 4-16. 00, 6-5. 00, 7-9. 00, 7-10. 00, 7-16. 00, 8-15. 00, 8-15. 01, 8-15. 02, 8-15. 03, 8-15. 04, 8-15. 05, 8-15. 06, 8-15. 07, 8-16. 00, 8-16. 01, 10-10. 00, 10-12. 00, 12-13. 00, 13-9. 00, 17-18. 00
852	1-20. 00, 7-12. 00, 8-15. 00, 8-15. 01, 8-15. 02, 8-15. 03, 8-15. 04, 8-15. 05, 8-15. 06, 8-15. 07, 8-16. 01, 8-16. 02, 11-20. 00, 12-13. 00
853	1-19. 00, 2-11. 00, 3-14. 00, 4-15. 00, 4-16. 00, 6-5. 00, 6-7. 00, 6-7. 01, 6-8. 00, 6-8. 01, 6-10. 00, 7-9. 00, 7-10. 00, 7-12. 00, 7-16. 00, 8-15. 00, 8-15. 01, 8-15. 02, 8-15. 03, 8-15. 04, 8-15. 05, 8-15. 06, 8-15. 07, 8-16. 00, 8-16. 01, 8-16. 02, 10-10. 00, 10-12. 00, 11-20. 00, 11-21. 00, 12-13. 00, 13-9. 00, 17-13. 00
*854	6-12. 00, 11-20. 00, 11-21. 00
856	1-20. 00, 2-11. 00, 4-16. 00, 6-11. 00, 7-9. 00, 7-10. 00, 7-11. 00, 8-12. 00, 8-12. 01, 8-14. 01, 8-15. 00, 8-15. 01, 8-15. 02, 8-15. 03, 8-15. 04, 8-15. 05, 8-15. 06, 8-15. 07, 8-17. 00, 10-7. 00, 10-10. 00, 10-12. 00, 11-20. 00, 12-13. 00, 13-9. 00, 17-18. 00
857	1-20. 00, 4-17. 00, 7-9. 00, 7-10. 00, 7-11. 00, 8-12. 00, 8-12. 01, 8-14. 00, 8-17. 00, 10-7. 00, 10-8. 00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 17 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON EFD NO. (S)
858	1-20.00, 2-11.00, 2-12.00, 7-12.00, 7-16.00, 8-14.00, 8-14.01, 8-15.00, 8-15.01, 8-15.02, 8-15.03, 8-15.04, 8-15.05, 8-15.06, 8-15.07, 10-6.00
859	1-20.00, 7-9.00, 7-11.00, 8-12.00, 8-12.01, 8-15.00, 8-15.01, 8-15.02, 8-15.03, 8-15.04, 8-15.05, 8-15.06, 8-15.07, 10-7.00, 10-12.00, 11-20.00, 11-23.00, 12-13.00, 17-18.00
860	1-20.00, 2-11.00, 2-12.00, 8-14.00, 8-14.01, 8-15.00, 8-15.01, 8-15.02, 8-15.03, 8-15.04, 8-15.05, 8-15.06, 8-15.07, 10-6.00, 11-10.00, 11-23.00
870	3-20.00, 6-9.00, 6-10.00, 11-9.00, 12-13.00, 13-15.00, 13-18.00
871	13-14.00
872	1-20.01, 4-15.00, 4-19.00, 4-20.00, 7-14.00, 7-15.00, 10-10.00, 10-11.00, 10-13.00, 11-23.00
873	1-20.00, 2-11.00, 2-12.00, 8-14.00, 8-14.01, 8-15.00, 8-15.01, 8-15.02, 8-15.03, 8-15.04, 8-15.05, 8-15.06, 8-15.07, 10-6.00, 11-10.00, 11-23.00
874	3-12.01, 6-10.00, 12-13.00
875	1-19.00, 1-20.01, 3-14.00, 7-14.00, 7-16.00, 10-12.00, 11-23.00, 12-13.00, 17-18.00
877	4-18.00, 7-8.00, 7-13.00, 8-12.00, 8-12.01, 10-7.00, 10-8.00, 10-9.00, 10-13.00
878	3-12.00, 3-12.01, 6-10.00, 7-13.00, 8-16.02, 8-17.00, 10-10.00
879	1-20.00, 2-12.00, 4-17.00, 6-9.00, 7-10.00, 7-11.00, 7-13.00, 8-13.00, 11-22.00, 16-12.00
880	1-20.00, 4-16.00, 7-9.00, 7-10.00, 7-11.00, 8-12.00, 8-12.01, 8-17.00, 10-7.00, 10-8.00, 10-10.00, 10-12.00, 12-13.00, 13-9.00, 17-18.00

*GSE Connector
**Umbilical Connector

		CONNECTOR NO. (J OR P)	LOCATED ON
	4-17.00,4-18.00,6-6.00,6-10.00, 7-8.00,7-11.00,10-7.00,10-9.00, 10-10.00, 10-11.00, 10-13.00, 12-1.00, 12-13.00	900	13-12.00
		901	13-12.00
*882	6-12.00	914	6-10.00
885	1-19.00,1-20.01,3-14.00,4-15.00, 4-16.00,6-10.00,6-11.00,7-11.00, 7-14.00,7-16.00,8-17.00,10-10.00, 10-12.00,11-20.00,11-21.00, 12-13.00,17-18.00	950	1-20.00,2-11.00,2-12.00,7-10.00, 7-11.00,8-14.01,10-6.00,10-8.00, 11-10.00,12-13.00
886	4-15.00,4-17.00,4-19.00,4-20.00, 7-11.00,7-15.00,8-13.00,8-17.00, 10-10.00	952	1-20.00,4-16.00,7-9.00,7-10.00, 7-11.00,8-12.00,8-12.01,8-17.00, 10-7.00,10-8.00,10-10.00,10-12.00, 12-13.00,13-9.00,17-18.00
887	1-20.00,1-20.01,4-16.00,4-17.00, 6-10.00,6-11.00,7-10.00,11-20.00, 11-21.00,11-22.00,11-23.00, 12-13.00,16-12.00	953	1-20.00,4-16.00,8-15.02,8-15.03, 8-15.04,8-15.05,8-15.06,8-15.07, 8-17.00,10-7.00,10-10.00,10-12.00, 12-13.00
888	1-20.01,4-19.00,4-20.00,4-15.00, 7-14.00,7-15.00,10-10.00, 10-11.00,10-13.00,11-23.00	954	6-6.00, 7-10.00, 10-8.00
889	1-19.00,1-20.01,3-14.00,7-14.00, 7-16.00,10-12.00,11-23.00, 12-13.00,17-18.00	955	4-17.00, 7-12.00, 7-16.00, 8-14.00, 8-15.00, 8-15.01, 8-15.02, 8-15.03, 13-9.00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 19 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
970	1-19.00, 3-14.00, 4-19.00, 4-20.00, 7-14.00, 11-22.00, 11-23.00, 12-13.00	1105B	13-7.00
		1107	13-7.00
971	2-12.00, 4-17.00, 6-9.00, 6-10.00, 7-10.00, 7-13.00, 8-13.00, 8-17.00, 10-11.00, 10-13.00, 16-12.00	1110	13-7.00
		1111	13-8.00
		1113	13-7.00
972	1-20.00, 2-12.00, 4-17.00, 6-9.00, 7-10.00, 7-11.00, 7-13.00, 8-13.00, 11-22.00, 16-12.00	1114A	13-17.00
		1114B	13-17.00
973	6-6.00, 7-13.00	1116	13-17.00
974	4-15.00, 6-10.00, 6-11.00, 7-11.00, 7-14.00, 7-15.00, 7-16.00, 10-10.00, 10-12.00, 11-23.00, 17-18.00	1119	13-17.00
		1123	13-17.00
1018	13-17.00	1126	13-17.00
1101	13-7.00	1127	13-5.00, 13-16.00
1103	13-7.00	1133	13-5.00, 13-16.00
1104	13-7.00	1138	13-19.00
1105A	13-7.00	1139	13-19.00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 20 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON
1143	13-6. 00, 13-8. 00
1144	13-6. 00, 13-8. 00
1145	6-9. 00, 13-5. 00, 13-10. 00, 13-11. 00, 13-15. 00
1146	13-18. 00
1147	13-18. 00
1149	13-7. 00
1171	13-8. 00
1172	13-8. 00
1180	13-19. 00
*1181	13-19. 00
1182	13-16. 00
1400	3-18. 00, 6-7. 00, 6-7. 01, 9-9. 00, 11-6. 00, 11-12. 00, 11-23. 00, 12-8. 00, 17-8. 00, 17-10. 00, 17-10. 01, 17-15. 00
1401	3-13. 00, 10-5. 00, 10-6. 00, 11-6. 00, 11-12. 00, 11-18. 00, 11-19. 00, 16-5. 00, 16-7. 00, 16-10. 00, 16-10. 04
1404	12-5. 00, 12-6. 00, 12-7. 00, 12-8. 00, 12-9. 00, 12-11. 00, 12-12. 00, 12-13. 00
1405	12-5. 00
1406	1-10. 00, 12-5. 00, 12-10. 00, 12-11. 00, 12-12. 00, 12-13. 00
1407	12-7. 00, 12-9. 00, 12-11. 00, 12-12. 00
1409	1-8. 00, 1-9. 00, 11-6. 00, 11-8. 00, 11-11. 00, 11-13. 00, 11-14. 00, 11-15. 00
1410	1-9. 00, 1-11. 00, 1-20. 00, 1-20. 01, 3-9. 00, 4-8. 00, 9-9. 00, 11-9. 00, 11-10. 00, 11-13. 00, 11-14. 00, 11-15. 00, 11-23. 00, 12-8. 00, 13-5. 00, 16-12. 00
*1411	8-10. 00, 8-10. 01, 8-10. 02, 8-10. 03, 10-11. 00, 11-6. 00, 11-10. 00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 21 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
1416	1-7. 00, 1-8. 00, 1-11. 00, 3-5. 01, 8-11. 01, 11-18. 00, 11-19. 00	1604	2-10. 00
1419	4-5. 00, 4-9. 00, 4-11. 00, 4-11. 01, 4-13. 00, 8-10. 00, 8-10. 01, 8-10. 02, 8-10. 03, 11-7. 00, 13-6. 01	1605	2-9. 00
1420	1-6. 00, 1-9. 00, 1-11. 00, 1-13. 00	1606	2-9. 00
1421	1-6. 00, 1-7. 00, 1-8. 00, 1-11. 00, 1-13. 00	1607A	2-9. 00
1425	3-10. 00, 11-6. 00, 11-11. 00, 16-10. 01	1607B	2-10. 00
1426	3-10. 00, 11-6. 00, 11-11. 00, 16-10. 01	1608A	2-9. 00
1427	11-18. 00, 11-19. 00	1608B	2-10. 00
1428	11-18. 00, 11-19. 00	1609A	2-9. 00
1600	2-9. 00	1609B	2-10. 00
1601	2-10. 00	1610	2-10. 00
1602	2-9. 00	1611A	2-9. 00
1603	2-10. 00	1611B	2-10. 00
		1612A	2-9. 00
		1612B	2-10. 00
		1613	2-9. 00

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 22 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
1614	2-9. 00	1632	2-10. 00
1615	2-10. 00	1633	2-10. 00
1616	2-10. 00	1657	2-9. 00
1617	2-10. 00	1658	2-9. 00
1618	2-10. 00	1659	2-9. 00
1619	2-10. 00	1660	2-9. 00
1620	2-9. 00	1661	2-9. 00
1623	2-10. 00	1662	2-9. 00
1624	2-10. 00	1663	2-9. 00
1625	2-10. 00	1800	2-11. 00,3-13. 00,3-14. 00,3-20,00, 4-12. 00,4-16. 00,4-17. 00,4-18. 00,
1626	2-10. 00		6-9. 00,7-9. 00,7-10. 00,7-14. 00, 8-13. 00,11-20. 00,12-5. 00,12-13. 00,
1627	2-10. 00		17-10. 01,17-18. 00
1628	2-10. 00	1801	2-12. 00,3-5. 01,4-15. 00,6-5. 00, 6-6. 00,7-11. 00,7-15. 00,7-16. 00,
1629	2-10. 00		8-15. 00,8-16. 01,8-17. 00,10-10. 00, 11-7. 00,11-8. 00,11-11. 00,11-13. 00
1631	2-10. 00		

*GSE Connector
**Umbilical Connector

Table 4. LM EFD Connector Index (Sheet 23 of 23)

CONNECTOR NO. (J OR P)	LOCATED ON	CONNECTOR NO. (J OR P)	LOCATED ON
1801 (Cont)	8-15.02, 8-15.04, 10-10.00, 11-14.00, 11-15.00, 17-16.00, 17-18.00	1812	10-5.00, 10-6.00, 16-12.00
		1813	4-11.00, 4-13.00, 9-5.00
1802	11-9.00, 12-5.00, 12-6.00, 12-13.00		
		1816	4-7.01, 13-6.00, 13-15.00, 13-18.00, 13-19.00
1803	2-7.00, 4-7.00, 4-8.00, 4-9.00, 17-13.00		
		1817	7-7.00
1804	2-11.00, 4-7.01, 4-8.00, 4-19.00, 4-20.00, 6-9.00, 6-10.00, 8-17.00, 13-6.00, 13-9.00, 13-10.00, 13-14.00, 13-15.00, 13-18.00	1818	3-5.00, 3-5.01, 3-8.00, 3-9.01
		1819	1-13.00, 4-10.00, 4-6.00, 4-6.01, 4-8.00, 4-6.03, 4-6.02, 4-10.01
1805	2-12.00, 4-8.00, 13-9.00, 13-16.00	*1822	8-13.00, 10-10.00
1808	1-14.00, 10-6.00, 10-7.00, 10-8.00 10-9.00, 17-7.00, 17-15.00	1825	1-6.00, 1-7.00, 1-8.00, 1-11.00, 10-5.00, 10-6.00
1809	1-7.00, 1-8.00, 1-11.00, 8-11.01, 10-5.00, 10-6.00, 11-18.00, 11-19.00	1828	4-18.00, 4-17.00
		1835	16-12.00
1810	1-12.00, 16-6.00, 16-9.00	1836	4-18.00, 4-17.00, 4-15.00, 4-9.00, 4-5.00, 4-6.01, 4-6.03, 4-6.02
1811	7-9.00, 7-11.00, 7-13.00, 8-12.00, 8-16.02, 9-11.00, 9-15.00, 10-8.00, 16-8.00	1837	4-18.00, 4-17.00, 4-15.00, 4-9.00, 4-6.03, 4-6.02, 4-6.01, 4-5.00

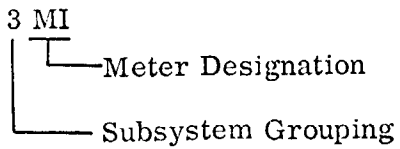
*GSE Connector
**Umbilical Connector

VIII. Introduction to LM Elementary Functional Diagram Vehicle Meter, Indicator and Display Index (Table 5)

1. This section is a tabulation of meters and indicators appearing on the LM Elementary Functional Diagrams.

2. The table is presented in four columns. The columns and contents of the columns are as follows:

Meter No. Column - This column contains the meter number (Subsystem Grouping & Meter Designation), which can be interpreted as follows:

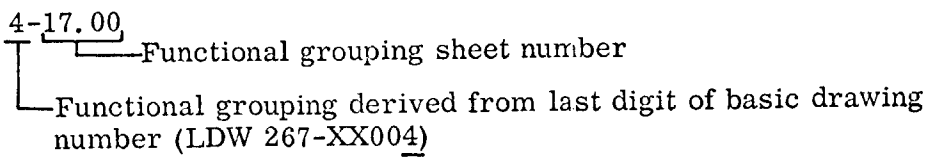


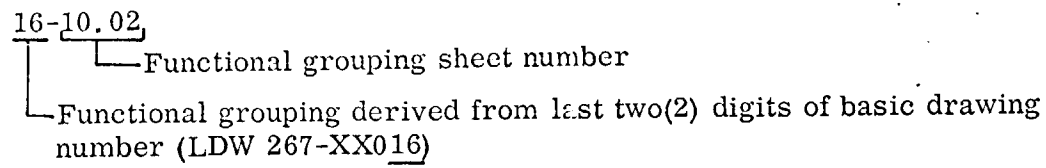
Panel or Location Column - This column indicates the Panel, Meter or Display is located on.

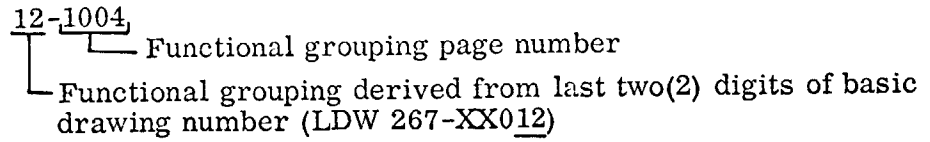
Function Column - This column contains a brief function and/or title of meter.

Meter Located on Column - This column contains a listing of elementary functional diagrams on which meter appears and/or name of display.

3. The meter, indicator and display location index coding is derived as follows:







METER NO.	PANEL & LOCATION	FUNCTION	LOCATION
3M1	IV	PROG DISPLAY	NOT SHOWN (ON DSKY)
3M2	IV	VERB DISPLAY	NOT SHOWN (ON DSKY)
3M3	IV	NOUN DISPLAY	NOT SHOWN (ON DSKY)
3M4	IV	DATA DISPLAY (R1)	NOT SHOWN (ON DSKY)
3M5	IV	DATA DISPLAY (R2)	NOT SHOWN (ON DSKY)
3M6	IV	DATA DISPLAY (R3)	NOT SHOWN (ON DSKY)
3M7	AOT	AOT COUNTER	3-1004.1
4M2	XIV	VOLT METER	4-17.00, 16-10.04
4M3	XIV	AMMETER	4-18.00, 16-10.04
7M1	II	CO_2 PARTIAL PRESSURE INDICATOR	7-9.00, 16-10.00
7M2	II	CABIN/SUIT PRESSURE INDICATOR	7-9.00, 16-10.00
7M3	II	CABIN/SUIT TEMPERATURE INDICATOR	7-10.00, 16-10.00
7M4	II	OXYGEN/WATER QUANTITY INDICATOR	7-11.00, 16-10.00
[illegible]	II	GLYCOL PRESSURE/TEMP INDICATOR	7-13.00, 16-10.00

Table 5. LM EFD Meter, Indicator & Display Index (Sheet 2 of 4)

METER NO.	PANEL OR LOCATION	FUNCTION	LOCATION
8M1	II	PRESSURE INDICATOR SYSTEM A AND B	8-12. 00, 8-12. 01, 16-10. 00, 16-10. 02
8M2	II	TEMPERATURE INDICATOR SYSTEMS A AND B	8-13. 00, 16-10. 00
8M4	II	QUANTITY INDICATOR SYSTEM A AND B	8-16. 02, 16-10. 00
9M1	I	FLIGHT DIRECTOR ATTITUDE INDICATOR (CDR)	4-21. 00, 4-22. 00, 9-5. 00, 9-5. 01, 9-6. 00, 9-8. 00, 9-9. 00, 9-14. 00, 16-10. 00
9M2	I	X POINTER (CDR) INDICATOR	9-10. 00, 9-11. 00, 16-10. 00
9M3	II	X POINTER (LMP)	9-10. 00, 9-11. 00, 16-10. 00
9M4	I	THRUST/WEIGHT INDICATOR	9-12. 00, 16-10. 00
9M6	II	FLIGHT DIRECTOR ATTITUDE INDICATOR (LMP)	4-21. 00, 4-22. 00, 9-5. 00, 9-5. 01, 9-7. 00, 9-8. 00, 9-9. 00, 9-14. 00, 16-10. 00
9M7	I	THRUST INDICATOR	9-15. 00, 16-10. 00
9M9	I	ALTITUDE/RANGE INDICATOR	9-12. 00, 17-9. 00, 6-9. 00, 16-10. 00, 16-10. 02

Table 5. [illegible] & Display Index (Sheet 3 of 4)

[illegible]	[illegible]	[illegible]NCTION	LOCATION
9M11	I	EVENT TIMER INDICATOR, 4 PLACE DIGITAL DISPLAY	6-9.00, 9-13.00, 9-13.01, 16-10.02
9M12	I	MISSION TIMER	6-9.00, 9-13.00, 9-13.01, 16-10.02
10M1	I	HELIUM INDICATOR 4 PLACE DIGITAL DISPLAY	10-7.00, 16-10.02
10M3	I	PRESSURE IND (FUEL) PRESSURE IND (OXID)	10-8.00, 16-10.00
10M4	I	TEMP INDICATOR (FUEL) TEMP INDICATOR (OXID)	10-8.00, 16-10.00
10M5	I	OXIDIZER QUANTITY INDICATOR, FUEL QUANTITY IND, 2 PLACE DIGITAL DISPLAYS	10-9.00, 16-10.02
12M1	VI	ADDRESS INDICATOR	12-1004, 16-10.02, 12-10.00
12M2	VI	DATA INDICATOR	12-1004, 16-10.02, 12-10.00
14M1	XII	SIGNAL STRENGTH IND	13-12.00, 16-10.04
14M3	XII	ANTENNA PITCH IND	13-8.00, 16-10.04

Table 5. LM EFD Meter, Indicator & Display Index (Sheet 4 of 4)

METER NO.	PANEL OR LOCATION	FUNCTION	LOCATION
14M4	XII	ANTENNA YAW IND	13-8.00,16-10.04
17M1	III	SIGNAL STRENGTH METER	16-10.00,17-7.00
18M1	III	TEMP° F	8-17.00,16-10.00

IX. Introduction to LM Elementary Functional Diagram Vehicle Indicator, and Light Index (Table 6)

1. This section is a tabulation of indicator lights and lights appearing on the LM Elementary Functional Diagrams.

2. The table is presented in four columns. The columns and contents of the columns are as follows:

Indicator Light No. Column - This column contains the indicator light number (Subsystem Grouping & Light Designation), which can be interpreted as follows:

1 DS1
- DS1 — Light Designation
- 1 — Subsystem Grouping

Panel or Location Column - This column indicates panel or location of light.

Function Column - This column contains a brief function and/or title of light.

Light Located on Column - This column contains a listing of Elementary Diagrams on which lights appear and/or name of display.

3. The indicator, and light location index coding is derived as follows:

1-5.00
- 5.00 — Functional grouping sheet number
- 1 — Functional grouping derived from last digit of basic drawing number (LDW267-XX001)

16-4.01
- 4.01 — Functional grouping sheet number
- 16 — Functional grouping derived from last two (2) digits of basic drawing number (LDW267-XX016)

3-1004
- 1004 — Functional grouping page number
- 3 — Functional grouping derived from last digit of basic drawing number (LDW267-XX003)

Table 6. LM EFD Indicator, and Light Index (Sheet 1 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
1DS1	I	LUNAR CONTACT LIGHT (CDR)	1-5. 00, 1-14. 00
1DS2	III	LUNAR CONTACT LIGHT (LMP)	1-5. 00, 1-14. 00
2DS1	VIII	STAGE SEQUENCE RELAY SYS A CAUTION LIGHT (YELLOW)	2-11. 00, 16-4. 01 16-6. 00
2DS2	VIII	STAGE SEQUENCE RELAY SYS B CAUTION LIGHT (YELLOW)	2-11. 00, 16-4. 01
3DS1	IV	"UPLINK ACTIVITY" STATUS LIGHT (WHITE)	3-1004
3DS5	IV	"NO ATTITUDE" STATUS LIGHT (WHITE)	3-1004
3DS6	IV	"STAND BY" STATUS LIGHT (WHITE)	3-1004
3DS7	IV	"KEY REL" STATUS LIGHT (WHITE)	3-1004
3DS8	IV	"TEMP" CAUTION LIGHT (YELLOW)	3-1004
3DS9	IV	"GIMBAL LOCK" CAUTION LIGHT (YELLOW)	3-1004
3DS10	IV	"PROGRAM" CAUTION LIGHT (YELLOW)	3-1004
3DS11	IV	"RESTART" CAUTION LIGHT (YELLOW)	3-1004
3DS12	IV	"TRACKER" CAUTION LIGHT (YELLOW)	3-1004

Table 6. LM EFD Indicator, and Light Index (Sheet 2 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
3DS14	IV	"OPERATOR ERROR" STATUS LIGHT (WHITE)	3-1004
3DS15	IV	"COMPUTER ACTIVITY" STATUS LIGHT (WHITE)	3-1004
3DS16	IV	"ALTITUDE LIGHT" (YELLOW)	3-1004
3DS17	IV	"VELOCITY LIGHT" (YELLOW)	3-1004
4DS1	XIV	BATTERY FAULT COMPONENT CAUTION	4-15.00,16-4.01, 16-6.00
4DS2	XIV	DC BUSS FAULT COMPONENT CAUTION LIGHT	4-15.00,16-4.01
6DS1	I	SPARE	6-7.00,16-4.01
6DS2	I	ASCENT PROPULSION LOW PRESS WARNING LIGHT (RED)	6-7.00,10-12.00 16-4.01
6DS3	I	HI/LOW HELIUM REG OUTLET PRESS WARNING LIGHT (RED)	6-7.00,10-10.00 16-4.01
6DS4	I	DESCENT PROPELLANT LOW QUANTITY WARNING LIGHT (RED)	6-7.00,10-10.00
6DS5	I	SPARE	6-7.00,16-4.01
6DS6	I	CONTROL ELECTRONICS SECTION AC VOLTAGE FAILURE WARNING LIGHT (RED)	6-7.00,11-20.00 16-4.01

Table 6. LM EFD Indicator, and Light Index (Sheet 3 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
6DS7	I	CONTROL ELECTRONICS SECTION DC VOLTAGE FAILURE WARNING LIGHT (RED)	6-7.00, 11-21.00, 16-4.01
6DS8	I	AGS FAILURE WARNING LIGHT (RED)	6-7.00, 16-4.01
6DS9	I	LGC FAILURE WARNING LIGHT (RED)	6-7.00, 16-4.01
6DS10	I	INERTIAL SUBSYSTEM FAILURE WARNING LIGHT (RED)	6-7.00, 16-4.01
6DS11	I	RCS TCA WARNING LIGHT (RED)	6-7.01, 8-16.00, 16-4.01
6DS12	I	RCS "A" REGULATOR FAILURE WARNING LIGHT (RED)	6-7.01, 8-16.00, 16-4.01
6DS13	I	RCS "B" REGULATOR FAILURE WARNING LIGHT (RED)	6-7.01, 8-16.00, 16-4.01
6DS14	I	DC BUS VOLTAGE FAILURE WARNING	4-16.00, 6-7.01, 16-4.01
6DS15	I	SPARE	6-7.01, 16-4.01
6DS16	I	CABIN LOW PRESS WARNING LIGHT (RED)	6-7.01, 7-16.00, 16-4.01

Table 6. LM EFD Indicator, and Light Index (Sheet 4 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
6DS17	I	SUIT/FAN LOW PRESS. WARNING LIGHT (RED)	6-7. 01, 7-9. 00, 16-4. 01
6DS18	I	SPARE	6-7. 01, 16-4. 01
6DS19	I	SPARE	6-7. 01, 16-4. 01
6DS20	I	SPARE	6-7. 01, 16-4. 01
6DS21	II	HIGH HE REG OUTLET PRESS CAUTION LIGHT (YELLOW)	6-8. 00, 10-12. 00 16-4. 01
6DS22	II	ASCENT PROPELLANT LOW QUANTITY CAUTION LIGHT (YELLOW)	6-8. 00, 10-12. 00 16-4. 01
6DS23	II	AUTOMATIC GIMBAL FAILURE CAUTION LIGHT (YELLOW)	1-19. 00, 6-8. 00, 16-4. 01
6DS24	II	SPARE	6-8. 00, 16-4. 01
6DS25	II	NOT USED	6-8. 00, 16-4. 01
6DS26	II	INVERTER FAILURE CAUTION LIGHT (YELLOW)	4-16. 00, 6-8. 00, 16-4. 01
6DS27	II	BATTERY FAILURE CAUTION LIGHT (YELLOW)	4-15. 00, 6-8. 00, 16-4. 01

Table 6. LM EFD Indicator, and Light Index (Sheet 5 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
6DS28	II	RENDEZVOUS RADAR DATA FAILURE CAUTION LIGHT (YELLOW)	6-8.00,16-4.01, 17-18.00
6DS29	II	NOT USED	6-8.00,16-4.01, 17-18.00
6DS30	II	PRE AMPS POWER FAILURE CAUTION LIGHT (YELLOW)	6-8.00,11-20.00, 16-4.01
6DS31	II	EXPLOSIVE DEVICES SUBSYSTEM RELAY FAILURES CAUTION LIGHT (YELLOW)	2-11.00,6-8.01, 16-4.01
6DS32	II	RCS FAILURE CAUTION LIGHT (YELLOW)	6-8.01,8-16.02, 16-4.01
6DS33	II	HEATER FAILURE CAUTION LIGHT (YELLOW)	6-8.01,8-16.01, 16-4.01
6DS34	II	C/WEA REG POWER FAILURE CAUTION LIGHT (YELLOW)	6-8.01,16-4.01
6DS35	II	SPARE	6-8.01,16-4.01
6DS36	II	ECS FAILURE CAUTION LIGHT (YELLOW)	6-8.01,7-16.00, 16-4.01
6DS37	II	OXYGEN QUANTITY CAUTION LIGHT (YELLOW)	6-8.01,7-12.00, 16-4.01

Table 6. LM EFD Indicator, and Light Index (Sheet 6 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
6DS38	II	GLYCOL FAILURE CAUTION LIGHT (YELLOW)	6-8. 01, 7-10. 00, 16-4. 01
6DS39	II	NOT USED	6-8. 01, 7-12. 00, 16-4. 01
6DS40	II	S-BD RCVR FAILURE CAUTION LIGHT (YELLOW)	6-8. 01, 13-9. 00, 16-4. 01
7DS1	II	SUIT CIRCUIT FAN COMPONENT CAUTION LIGHT (YELLOW)	6-8. 00, 7-6. 00, 16-4. 01
7DS3	II	GLYCOL PUMP COMPONENT CAUTION LIGHT (YELLOW)	6-8. 00, 7-7. 00, 16-4. 01
7DS6	II	CO_2 PARTIAL PRESSURE COMPONENT CAUTION LIGHT (YELLOW)	6-8. 00, 7-9. 00, 16-4. 01
7DS7	II	WATER SEPARATION COMPONENT CAUTION LIGHT (YELLOW)	6-8. 00, 7-9. 00, 16-4. 01
12DS1	VI	OPERATOR ERROR STATUS LIGHT (WHITE)	12-1004, 16-6. 00
16DS23	Port Side	DOCKING LIGHTS PORT (RED)	16-4. 01, 16-7. 00
16DS24	Stbd Side	DOCKING LIGHTS STBD (GRN)	16-4. 01, 16-7. 00
16DS25	Aft	DOCKING LIGHTS AFT (WHITE)	16-4. 01, 16-7. 00

Table 6. LM EFD Indicator, and Light Index (Sheet 7 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
16DS26	(Port Side) Fwd	DOCKING LIGHTS FWD (LEFT SIDE) (YELLOW)	16-4. 01, 16-7. 00
16DS27	(Stbd Side) Fwd	DOCKING LIGHTS FWD (RIGHT SIDE) (WHITE)	16-4. 01, 16-7. 00
16DS36	X	FLOOD LIGHTS PNL	16-5. 00
16DS37	X	FLOOD LIGHT PNL	16-5. 00
16DS38	X	FLOOD LIGHT PNL	16-5. 00
16DS39	X	FLOOD LIGHT PNL	16-5. 00
16DS40	X	FLOOD LIGHT PNL	16-5. 00
16DS41	X	FLOOD LIGHT PNL	16-5. 00
16DS55	XVI	FLOOD LIGHT PNL	16-5. 00
16DS56	XVI	FLOOD LIGHT PNL	16-5. 00
16DS57	XVI	FLOOD LIGHT PNL	16-5. 00
16DS58	XVI	FLOOD LIGHT PNL	16-5. 00
16DS59	XVI	FLOOD LIGHT PNL	16-5. 00

Table 6. LM EFD Indicator, and Light Index (Sheet 8 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
16DS60	XVI	FLOOD LIGHT PNL	16-5. 00
16DS61	XIV	FLOOD LIGHT PNL	16-5. 00
16DS62	XIV	FLOOD LIGHT PNL	16-5. 00
16DS63	OVHD. Fwd (Port Side)	FLOOD LTS CDR MAIN CONSOLE	16-5. 00
16DS64	OVHD Fwd (Port Side)	FLOOD LIGHTS PNL	16-5. 00
16DS65	OVHD Fwd (Stbd Side)	FLOOD LIGHTS PNL	16-5. 00
16DS66	OVHD Fwd (Stbd Side)	FLOOD LIGHTS PNL	16-5. 00
16DS67	X	FLOOD LIGHTS PNL	16-5. 00
16DS68	X	FLOOD LIGHTS PNL	16-5. 00
16DS69	X	FLOOD LIGHTS PNL	16-5. 00
16DS70	X	FLOOD LIGHTS PNL	16-5. 00

Table 6. LM EFD Indicator, and Light Index (Sheet 9 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
16DS71	X	FLOOD LIGHTS PNL	16-5. 00
16DS72	X	FLOOD LIGHTS PNL	16-5. 00
16DS73	X	FLOOD LIGHTS PNL	16-5. 00
16DS74	X	FLOOD LIGHTS PNL	16-5. 00
16DS75	XVI	FLOOD LIGHTS PNL	16-5. 00
16DS76	XVI	FLOOD LIGHTS PNL	16-5. 00
16DS77	XVI	FLOOD LIGHTS PNL	16-5. 00
16DS78	XVI	FLOOD LIGHTS PNL	16-5. 00
16DS79	XVI	FLOOD LIGHTS PNL	16-5. 00
16DS80	XVI	FLOOD LIGHTS PNL	16-5. 00
16DS81	XVI	FLOOD LIGHTS PNL	16-5. 00
16DS82	XVI	FLOOD LIGHTS PNL	16-5. 00
16DS83	X	FLOOD LIGHTS PNL	16-5. 00
16DS86	X	FLOOD LIGHTS PNL	16-5. 00
16DS87	X	FLOOD LIGHTS PNL	16-5. 00

Table 6. LM EFD Indicator, and Light Index (Sheet 10 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
16DS88	X	FLOOD LIGHTS PNL	16-5. 00
16DS90	I	10M3 PROP PRESS INDICATOR (RED) POWER FAILURE LIGHT	16-8. 00
16DS91	I	9M2 CROSS POINTERS INDICATOR (RED) (POWER FAILURE LIGHT)	16-8. 00
16DS92	I	9M7 THRUST INDICATOR (RED) (POWER FAILURE LIGHT)	16-8. 00
16DS93	II	7M2 SUIT & CABIN PRESS INDICATOR (RED) (POWER FAILURE LIGHT)	16-8. 00
16DS94	II	7M4 O_2/H_2O INDICATOR (RED) (POWER FAILURE LIGHT)	16-8. 00
16DS95	II	7M5 GLYCOL TEMP & PRESS INDICATOR POWER FAILURE LIGHT (RED)	16-8. 00
16DS96	II	8M1 RCS PRESS INDICATOR (RED) (POWER FAILURE LIGHT)	16-8. 00
16DS97	II	CROSS POINTER INDICATOR 9M3 (RED) (POWER FAILURE LIGHT)	16-8. 00
16DS98	II	8M4 RCS QUANTITY IND POWER FAILURE LIGHT (RED)	16-8. 00

Table 6. LM EFD Indicator, and Light Index (Sheet 11 of 11)

INDICATOR LIGHT NO.	PANEL OR LOCATION	FUNCTION	LIGHT LOCATED ON
16DS104	-	PORTABLE UTILITY LIGHT	16-5.00
16DS105	-	PORTABLE UTILITY LIGHT	16-5.00
16A3	-	TRACKING LIGHT FLASH HEAD	16-7.00
17DS1	III	NO TRACK LIGHT COMPONENT CAUTION LIGHT (YELLOW)	16-4.01, 16-6.00, 17-18.00

X. Introduction to LM Elementary Functional Diagram Vehicle Flag Index (Table 7)

1. This section is a tabulation of flags appearing on the LM Elementary Functional Diagrams.

2. The table is presented in four columns. The columns and contents of the columns are as follows:

   Flag No. Column - This column contains the flag number (Subsystem Grouping & Flag Designation), which can be interpreted as follows:

   2 FL1
   - FL1 → Flag Designation
   - 2 → Subsystem Grouping

   Panel Column - This column indicates Panel, Flag appears on.

   Function Column - This column contains a brief function and/or title of Flag.

   Flag Located on Column - This column contains a listing of Elementary Functional Diagrams on which Flags appear.

3. The flag location index coding is derived as follows:

   2-12.00
   - 12.00 → Functional grouping sheet number
   - 2 → Functional grouping derived from last digit of basic drawing number (LDW267-XX002)

   16-10.03
   - 10.03 → Functional grouping sheet number
   - 16 → Functional grouping derived from last two (2) digits of basic drawing number (LDW267-XX016)

Table 7. LM EFD Flag Index (Sheet 1 of 3)

FLAG NO.	PANEL	FUNCTION	FLAGS LOCATED ON
2FL1	VIII	LANDING GEAR DEPLOY, 2 POSITION FLAG	2-12. 00, 16-10. 03
4FL1	XIV	DESCENT BATTERY #1 STATUS 3 POSITION FLAG	4-19. 00, 16-10. 04
4FL2	XIV	DESCENT BATTERY #2 STATUS 3 POSITION FLAG	4-19. 00, 16-10. 04
4FL3	XIV	DESCENT BATTERY #3 STATUS 3 POSITION FLAG	4-19. 00, 16-10. 04
4FL4	XIV	DESCENT BATTERY #4 STATUS 3 POSITION FLAG	4-19. 00, 16-10. 04
4FL5	XIV	ASCENT BATTERY #5 NORMAL FEED STATUS 2 POSITION FLAG	4-20. 00, 16-10. 04
4FL6	XIV	ASCENT BATTERY #6 NORMAL FEED STATUS 2 POSITION FLAG	4-20. 00, 16-10. 04
4FL7	XIV	ASCENT BATTERY #5 BACK UP FEED STATUS 2 POSITION FLAG	4-20. 00, 16-10. 04
4FL8	XIV	ASCENT BATTERY #6 BACK UP FEED STATUS 2 POSITION FLAG	4-20. 00, 16-10. 04
4FL9	XIV	DESCENT BATTERY STATUS 2 POSITION FLAG	4-19. 00, 16-10. 04
4FL10	XIV	LUNAR BATTERY STATUS 3 POSITION FLAG	4-19. 00, 16-10. 04
8FL5	II	MAIN SHUT OFF VALVE STATUS, SYSTEM A, 2 POSITION FLAG	8-14. 01, 16-10. 01

Table 7. LM EFD Flag Index (Sheet 2 of 3)

FLAG NO.	PANEL	FUNCTION	FLAGS LOCATED ON
8FL6	II	ASCENT FUEL STATUS, SYSTEM A, 2 POSITION FLAG	8-14. 00, 16-10. 01
8FL7	II	MAIN SHUT OFF VALVE STATUS, SYSTEM B, 2 POSITION FLAG	8-14. 01, 16-10. 01
8FL8	II	ASCENT FUEL STATUS, SYSTEM B, 2 POSITION FLAG	8-14. 00, 16-10. 01
8FL9	II	LGC THRUSTER PAIR CMD STATUS, QUAD. 1, SYSTEM A, 3 POSITION FLAG	8-15. 00, 16-10. 01
8FL10	II	LGC THRUSTER PAIR CMD STATUS, QUAD. 2, SYSTEM A, 3 POSITION FLAG	8-15. 02, 16-10. 01
8FL11	II	LGC THRUSTER PAIR CMD STATUS, QUAD. 1, SYSTEM B, 3 POSITION FLAG	8-15. 01, 16-10. 01
8FL12	II	LGC THRUSTER PAIR CMD STATUS, QUAD. 2, SYSTEM B, 3 POSITION FLAG	8-15. 03, 16-10. 01
8FL13	II	LGC THRUSTER PAIR CMD STATUS, QUAD. 3, SYSTEM A, 3 POSITION FLAG	8-15. 04, 16-10. 01
8FL14	II	LGC THRUSTER PAIR CMD STATUS, QUAD. 4, SYSTEM A, 3 POSITION FLAG	8-15. 06, 16-10. 01
8FL15	II	LGC THRUSTER PAIR CMD STATUS, QUAD. 3, SYSTEM B, 3 POSITION FLAG	8-15. 05, 16-10. 01

Table 7. LM EFD Flag Index (Sheet 3 of 3)

FLAG NO.	PANEL	FUNCTION	FLAGS LOCATED ON
8FL16	II	LGC THRUSTER PAIR CMD STATUS, QUAD. 4, SYSTEM B, 3 POSITION FLAG	8-15. 07, 16-10. 01
8FL17	II	CROSS FEED STATUS, 2 POSITION FLAG	8-14. 00, 16-10. 01
8FL18	II	ASCENT OXIDIZER STATUS, SYSTEM A, 2 POSITION FLAG	8-14. 00, 16-10. 01
8FL19	II	ASCENT OXIDIZER STATUS, SYSTEM B, 2 POSITION FLAG	8-14. 00, 16-10. 01
10FL1	I	ASCENT HELIUM REGULATOR STATUS #1, 2 POSITION FLAG	10-6. 00, 16-10. 01
10FL2	I	ASCENT HELIUM REGULATOR STATUS #2, 2 POSITION FLAG	10-6. 00, 16-10. 01
10FL3	I	DESCENT HELIUM REGULATOR STATUS #1, 2 POSITION STATUS FLAG	10-6. 00, 16-10. 01
10FL4	I	DESCENT HELIUM REGULATOR STATUS #2, 2 POSITION STATUS FLAG	10-6. 00, 16-10. 01
10FL5	VIII	FUEL VENT STATUS, 2 POSITION STATUS FLAG	10-6. 00, 16-10. 03
10FL6	VIII	OXIDIZER VENT STATUS, 2 POSITION STATUS FLAG	10-6. 00, 16-10. 03
13FL1	XII	TAPE STATUS, 2 POSITION FLAG	13-12. 00, 16-10. 04

XI. Introduction to LM Elementary Functional Diagram Vehicle LM Controls Index (Table 8)

1. This section is a tabulation of LM controls appearing on the LM Elementary Functional Diagrams.

2. The table is presented in three columns. The columns and contents of the columns are as follows:

   Control No. Column - This column contains the control number (Subsystem Grouping & Control Designation), which can be interpreted as follows:

   1 A1
   - A1 — Control Designation
   - 1 — Subsystem Grouping

   Function Column - This column contains a brief function and/or title of control.

   Control Located on Column - This column contains a listing of Elementary Functional diagrams on which control appears and/or location of control.

3. The LM controls location index coding is derived as follows:

   1-5.00
   - 5.00 — Functional grouping sheet number
   - 1 — Functional grouping derived from last digit of basic drawing number (LDW267-XX001)

   13-8.00
   - 8.00 — Functional grouping sheet number
   - 13 — Functional grouping derived from last two (2) digits of basic drawing number (LDW267-XX013)

   3-1004.1
   - 1004.1 — Functional grouping page number
   - 3 — Functional grouping derived from last digit of basic drawing number (LDW267-XX003)

Table 8. LM EFD Control Index (Sheet 1 of 3)

CONTROL NO.	FUNCTION	CONTROL LOCATED ON
13R10	VHF A SQUELCH CONTROL THUMBWHEEL	13-18. 00
13R15	VHF B SQUELCH CONTROL THUMBWHEEL	13-18. 00
14B1	YAW SLEW CONTROL (CONTINUOUS ROTARY CONTROL WITH POSITIVE STOP)	13-8. 00
14B2	PITCH SLEW CONTROL (CONTINUOUS ROTARY CONTROL WITH POSITIVE STOP)	13-8. 00
15AR7 (15BR7)	ICS VOLUME CONTROL THUMBWHEEL	13-11. 00
15AR8 (15BR8)	VOX SENSITIVITY THUMBWHEEL	13-11. 00
15AR12 (15BR12)	VHF A VOLUME CONTROL THUMBWHEEL	13-11. 00
15AR13 (15BR13)	VHF B VOLUME CONTROL THUMBWHEEL	13-11. 00
15AR14 (15BR14)	S BAND VOLUME CONTROL THUMBWHEEL	13-11. 00
15AR15 (15BR15)	MASTER VOLUME CONTROL THUMBWHEEL	13-13. 00

Table 8. LM EFD Control Index (Sheet 2 of 3)

CONTROL NO.	FUNCTION	CONTROL LOCATED ON
15AR16 (15BR16) 15AR17 (15BR17)	CDR AND LMP AUDIO CONTROL	13-13. 00
16R1	FLOODLIGHTING CONTROL OVHD/FWD CONTINUOUS	16-5. 00
16R3	INTERNAL LIGHTING CONTROL CONTINUOUS ROTARY	16-10. 00
16R2	ANUN/NUM CONTROL	16-4. 01, 16-6. 00, 16-10. 00, 16-10. 02
16R4	FLOOD LIGHTING CONTROL OVHD/FWD CONTINUOUS ROTARY	16-5. 00
1A1	ATTITUDE CONTROLLER (CDR)	11-5. 00, 11-5. 01, 11-5. 02, 11-7. 00, 11-12. 00, 11-13. 00, 11-14. 00, 11-15. 00, 11-18. 00, 11-19. 00
1A12	ATTITUDE CONTROLLER (LMP)	11-5. 00, 11-5. 01, 11-5. 02, 11-6. 00, 11-12. 00, 11-13. 00, 11-14. 00, 11-15. 00, 11-18. 00, 11-19. 00
1A3 (1X1)	THRUST/TRANSLATION CONTROLLER (CDR)	1-5. 00, 1-14. 00, 11-5. 01, 11-11. 00

Table 8. LM EFD Control Index (Sheet 3 of 3)

CONTROL NO.	FUNCTION	CONTROL LOCATED ON
1A11 (1X2)	THRUST/TRANSLATION CONTROLLER (LMP)	1-5.00, 1-14.00, 11-5.02, 11-11.00
1H1	THROTTLE/JETS CONTROL SELECT LEVER (CDR) 2 POSITION	1-5.00, 1-14.00
1H2	THROTTLE/JETS CONTROL SELECT LEVER (LMP) 2 POSITION	1-5.00, 1-14.00
1H3	THROTTLE FRICTION ROTARY CONTROLLER (CDR)	1-1004.1
1H4	THROTTLE FRICTION ROTARY CONTROLLER (LMP)	1-1004.1
3H1	RETICLE CONTROL CONTINUOUS ROTARY	3-1004.1
3H2	AZIMUTH CONTROL 6 POSITION ROTARY	3-1004.1
3H3	EYEPIECE ADJUST LEVER	3-1004.1
3H4	EYEPIECE LOCK	3-1004.1
3R1	RETICLE ILLUMINATION CONTROL CONTINUOUS ROTARY	3-1004.1
9R1	ALTITUDE SET CONTINUOUS ROTARY	9-5.00

XII. Introduction to LM Elementary Functional Diagram Vehicle Valve Index (Table 9)

1. This section is a tabulation of valves appearing on the LM Elementary Functional Diagrams.

2. The table is presented in three columns. The columns and contents of the columns are as follows:

Valve No. Column - This column contains the valve number (Subsystem Grouping and Valve Designation), which can be interpreted as follows:

7 H1
- H1 — Valve Designation
- 7 — Subsystem Grouping

Function Column - This column contains a brief function and/or title of valve.

Valve Located on Column - This column contains a listing of Elementary Functional Diagrams on which valve appears.

3. The valve location index coding is derived as follows:

7-4.03
- 4.03 — Functional grouping sheet number
- 7 — Functional grouping derived from last digit of basic drawing number (LDW267-XX007)

7-1004.5
- 1004.5 — Functional grouping page number
- 7 — Functional grouping derived from last digit of basic drawing number (LDW267-XX007)

Table 9. LM ECD Valve Index (Sheet 1 of 2)

VALVE NO.	FUNCTION	VALVE LOCATED ON
7H1	ATMOSPHERE REVITALIZATION SECTION PRESSURE REGULATOR "A" 4 POSITION VALVE	7-4. 03
7H2	ATMOSPHERE REVITALIZATION SECTION PRESSURE REGULATOR "B" 4 POSITION VALVE	7-4. 03
7H3	CABIN REPRESSURIZATION VALVE 3 POSITION	7-4. 03
7H4	PLSS FILL VALVE 2 POSITION	7-4. 03
7H5	#2 ASCENT OXYGEN VALVE	7-4. 03
7H6	SUIT ISOL VALVE (CDR) 2 POSITION	7-4. 03
7H7	SUIT ISOL VALVE (LMP) 2 POSITION	7-4. 03
7H8	SUIT GAS DIVERTER VALVE 2 POSITION "T" HANDLE	7-4. 03
7H9	SUIT CIRCUIT RELIEF VALVE 3 POSITION	7-4. 03
7H10	WATER SEPARATOR SELECT VALVE 2 POSITION "T" HANDLE	7-4. 03
7H11	CABIN RELIEF AND DUMP VALVE 3 POSITION BAR LEVER	7-1004. 5
7H13	ASCENT DRINK WATER VALVE 2 POSITION	7-4. 01
7H14	WATER TANK SELECT VALVE 3 POSITION FOLD OUT HAND CRANK	7-4. 01

Table 9. LM EFD Valve Index (Sheet 2 of 2)

VALVE NO.	FUNCTION	VALVE LOCATED ON
7H15	DESCENT OXYGEN VALVE 2 POSITION	7-4. 03
7H16	PRIMARY EVAP FLOW VALVE 2 POSITION	7-4. 01
7H17	CABIN GAS RETURN VALVE 3 POSITION	7-4. 03
7H18	SECONDARY EVAP FLOW VALVE 2 POSITION	7-4. 01
7H19	CO_2 CANISTER SELECT VALVE 2 POSITION BAR LEVER	7-4. 03
7H20	CABIN RELIEF AND 3 POSITION BAR LEVER	7-1004. 5
7H21	#1 ASCENT OXYGEN VALVE, 2 POSITION	7-4. 03
7H22	SUIT TEMPERATURE CONTROL VALVE, MODULATING VALVE	7-4. 02
7H23	PRIMARY CANISTER VENT BUTTON, 2 MOMENTARY PUSH BUTTONS	7-4. 05
7H24	SECONDARY CANISTER VENT BUTTON, 2 MOMENTARY PUSH BUTTONS	7-4. 05
7H25	PRIMARY EVAP FLOW #1, 2 POSITION VALVE	7-4. 01
7H26	DESCENT DRINK/PLSS FILL WATER VALVE 2 POSITION	7-4. 01
7H27	LIQUID GARMENT COOLING TEMP CONTROL VALVE	7-4. 02
7H29	O_2 SHUT OFF VALVE	7-4. 03

XIII. Introduction to LM Elementary Functional Diagram Vehicle El Patch & Strip Index (Table 10)

1. This section is a tabulation of EL Patches & Strips appearing on the LM Elementary Functional Diagrams.

2. The table is presented in four columns. The columns and contents of the columns are as follows:

   El Patch & Strip No. Column - This column contains the El Patch & Strip Number (Subsystem Grouping & El Patch & Strip Designation), which can be interpreted as follows:

   16 DS1
   - DS1 — El Patch & Strip Designation
   - 16 — Subsystem Grouping

   Panel Column - This column indicates panel El Patches & Strips appear on.

   Description Column - This column describes whether it is a El Patch or Strip.

   Located on Column - This column contains a listing of Elementary Functional Diagrams on which El Patches & Strips appear.

3. The EL patch & strip location index coding is derived as follows:

   16-10.01
   - 10.01 — Functional grouping sheet number
   - 16 — Functional grouping derived from last two (2) digits of basic drawing number (LDW267-XX016)

Table 10. LM FFD El Patch & Strip Index (Sheet 1 of 4)

EL PATCH & STRIP NO.	PANEL	DESCRIPTION	LOCATED ON
16DS1	I	EL PATCH	16-10. 01
16DS2	I	EL PATCH	16-10. 01
16DS3	I	EL PATCH	16-10. 01
16DS4	I	EL PATCH	16-10. 01
16DS5	I	EL PATCH	16-10. 01
16DS6	II	EL PATCH	16-10. 01
16DS7	II	EL PATCH	16-10. 01
16DS8	II	EL PATCH	16-10. 01
16DS9	II	EL PATCH	16-10. 01
16DS10	V	EL PATCH	16-10. 00
16DS12	VIII	EL PATCH	16-10. 03
16DS13	VIII	EL PATCH	16-10. 03
16DS14	VI	EL PATCH	16-10. 01

Table 10. LM EFD El Patch & Strip Index (Sheet 2 of 4)

EL PATCH & STRIP NO.	PANEL	DESCRIPTION	LOCATED ON
16DS16	III	EL PATCH	16-10. 00
16DS17	III	EL PATCH	16-10. 00
16DS18	III	EL PATCH	16-10. 00
16DS19	XII	EL PATCH	16-10. 04
16DS20	XII	EL PATCH	16-10. 04
16DS21	XII	EL PATCH	16-10. 04
16DS28	XI	EL STRIP NO. 1	16-10. 03
16DS29	XI	EL STRIP NO. 2	16-10. 03
16DS30	XI	EL STRIP NO. 3	16-10. 03
16DS31	XI	EL STRIP NO. 4	16-10. 03
16DS32	XI	EL STRIP NO. 5	16-10. 03
16DS33	XI	EL STRIP NO. 6	16-10. 03
16DS34	XI	EL STRIP NO. 7	16-10. 03
16DS35	XI	EL STRIP NO. 8	16-10. 03

Table 10. LM EFD El Patch & Strip Index (Sheet 3 of 4)

EL PATCH & STRIP NO.	PANEL	DESCRIPTION	LOCATED ON
16DS44	XIV & XVI	EL STRIP NO. 1	16-10. 04
16DS45	XIV & XVI	EL STRIP NO. 2	16-10. 04
16DS46	XIV & XVI	EL STRIP NO. 3	16-10. 04
16DS47	XIV & XVI	EL STRIP NO. 4	16-10. 04
16DS48	XIV & XVI	EL STRIP NO. 5	16-10. 04
16DS49	XIV & XVI	EL STRIP NO. 6	16-10. 04
16DS50	XIV & XVI	EL STRIP NO. 7	16-10. 04
16DS51	XIV & XVI	EL STRIP NO. 8	16-10. 04
16DS52	XIV & XVI	EL PATCH	16-10. 04
16DS53	XIV & XVI	EL PATCH	16-10. 04
16DS54	XIV & XVI	EL PATCH	16-10. 04
16DS84	XI	EL STRIP NO. 9	16-10. 03
16DS85	XI	EL STRIP NO. 10	16-10. 03
16DS99	XII	EL PATCH	16-10. 04

Table 10. LM EFD El Patch & Strip Index (Sheet 4 of 4)

EL PATCH & STRIP NO.	PANEL	DESCRIPTION	LOCATED ON
16DS100	XIV & XVI	EL PATCH	16-10. 04
16DS101	VIII	EL PATCH	16-10. 03
16DS102	IVA	EL PATCH	16-10. 01
16DS103	IVB	EL PATCH	16-10. 01
16DS106	VIII	EL PATCH	16-10. 03

LM ELEMENTARY FUNCTIONAL DIAGRAM

(Functional Grouping No. 1)

ENGINE/THRUST CONTROL (CES)

(REF LDW 267-60001 A)

Applicable Documents

ITEM NAME	DWG. NO.	REV.	E.O.'s
Engine/Thrust Control (CES)	LDW300-56003	H	

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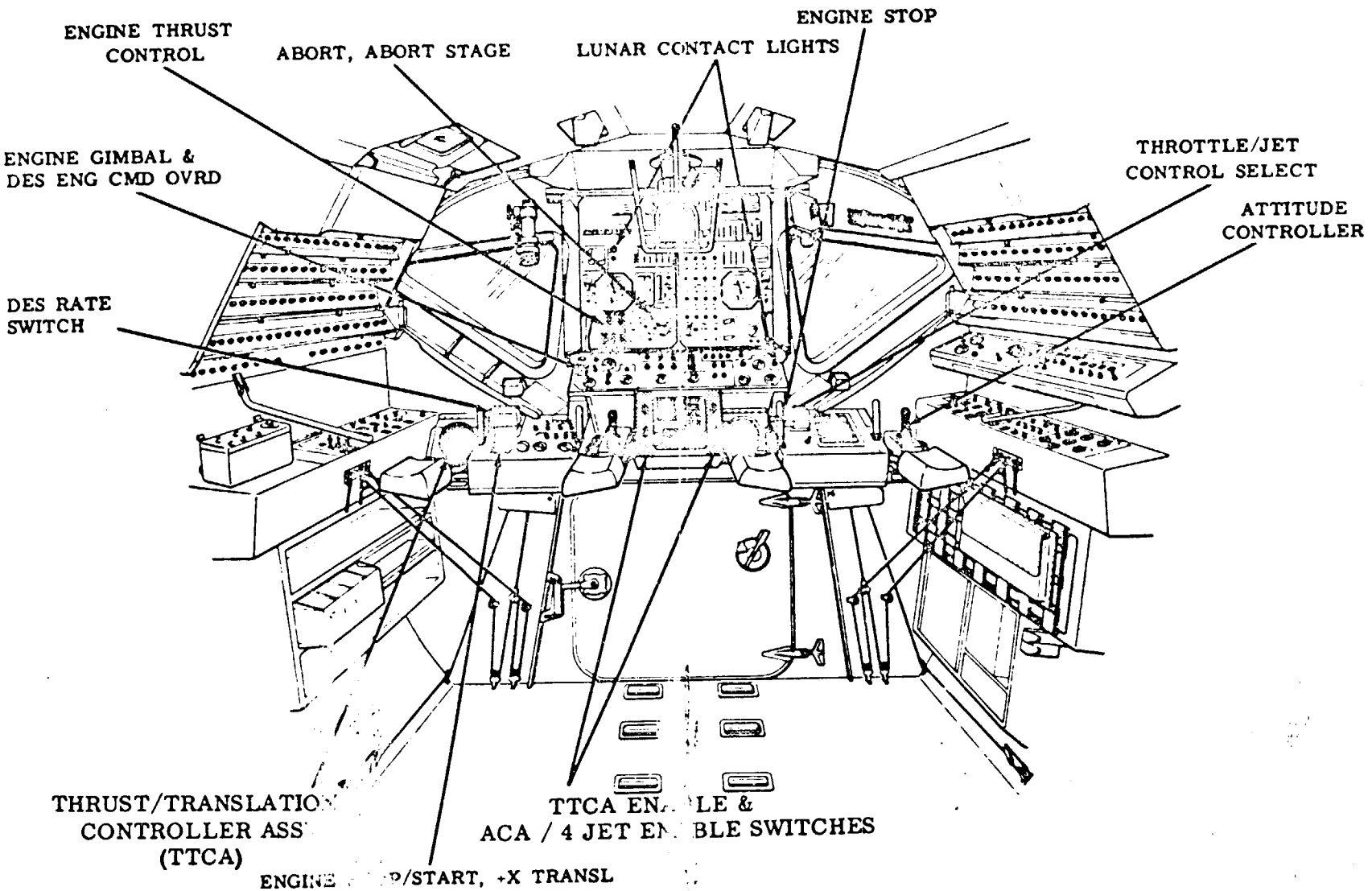
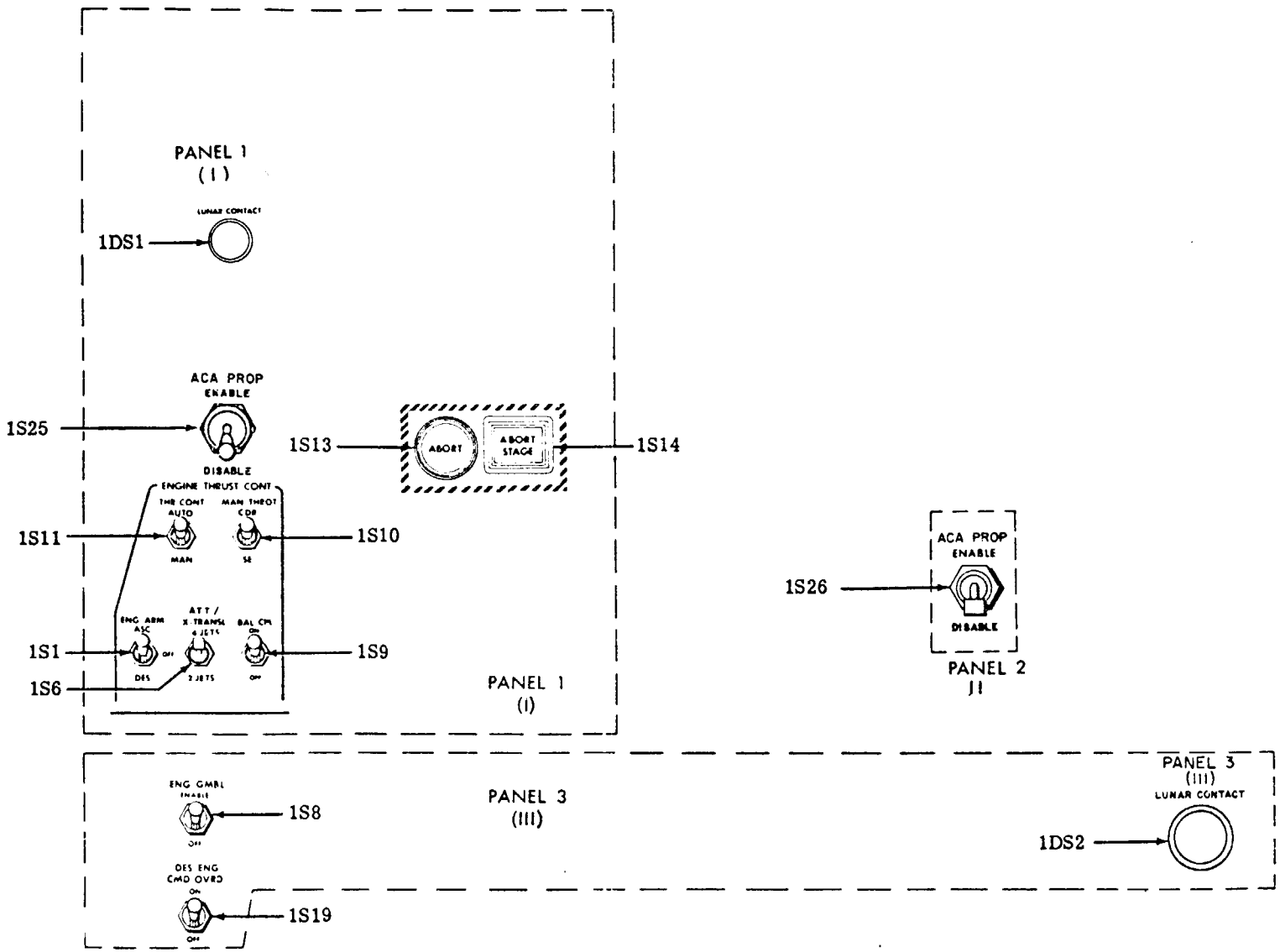
ITEM NAME	DWG. NO.
a) Cover Sheet	1-1001
b) Applicable Documents, Table of Contents and Notes	1-1002 & 1-1002.1
c) Cabin Location of Engine/Thrust Controls and Indicators	1-1003
d) Engine/Thrust Controls and Indicators Layout	1-1004 & 1-1004.1
e) Engine/Thrust Controls and Indicators (Functional Grouping I)	1-1005 1-1005.1 1-1005.2 1-1005.3 1-1005.4 1-1005.5 1-1005.6 1-1005.7
f) CES Engine/Thrust Block Diagram	1-1005.8
g) CES/Engine/Thrust Controls Elementary Schematic	LDW267-60001 SH 4.00
h) CES Ascent Engine Start and Stop	LDW267-60001 SH 5.00
i) CES Descent Engine Start and Stop	LDW267-60001 SH 5.01A
j) CES Descent Engine Arm and Control	LDW267-60001 SH 5.02A
k) CES Descent Engine Abort Control	LDW267-60001 SH 6.00
l) CES Ascent and Descent Engine Manual Start Control	LDW267-60001 SH 7.00
m) CES Ascent and Descent Engine Manual Start & Stop Control	LDW267-60001 SH 8.00
n) CES Ascent Engine Auto Start and Stop Control	LDW267-60001 SH 9.00 LDW267-60001 SH 10.00

2. Table of Contents (continued)

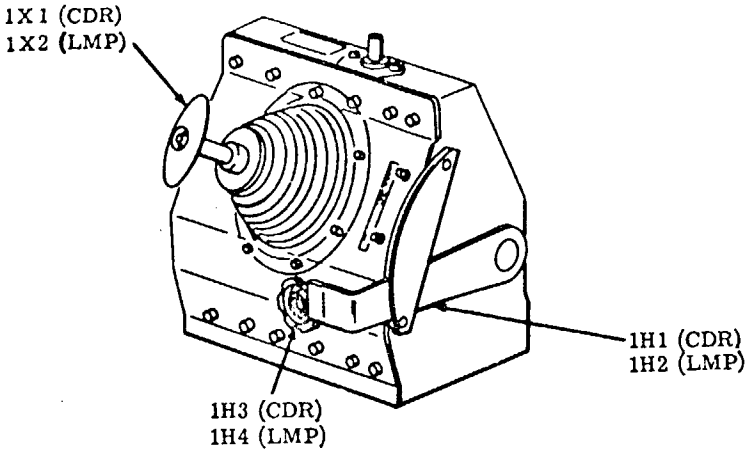
ITEM NAME		DWG. No.
o)	CES Ascent and Descent Engine Start and Stop Control	LDW267-60001 SH 11.00
p)	CES Ascent Engine Start Circuit	LDW267-60001 SH 12.00A
q)	CES Descent Engine Start Circuit	LDW267-60001 SH 13.00
r)	CES Descent Engine Thrust Manual Throttle Control	LDW267-60001 SH 14.00
s)	CES Engine Thrust Power Monitor Throttle Control Roll and Trim Failure	LDW267-60001 SH 15.00
t)	CES Throttle Control	LDW267-60001 SH 16.00
u)	CES Engine Thrust Gimbal Control Roll Trim Drive	LDW267-60001 SH 17.00
v)	CES Engine Thrust Gimbal Control Pitch Trim Drive	LDW267-60001 SH 18.00
w)	CES Engine Thrust Pitch and Roll Trim Fail	LDW267-60001 SH 19.00
x)	CES OI Engine Thrust	LDW267-60001 SH 20.00
y)	CES OI Engine Thrust	LDW267-60001 SH 20.01



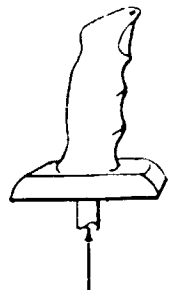
Cabin Location of Engine/Thrust Controls and Indicators



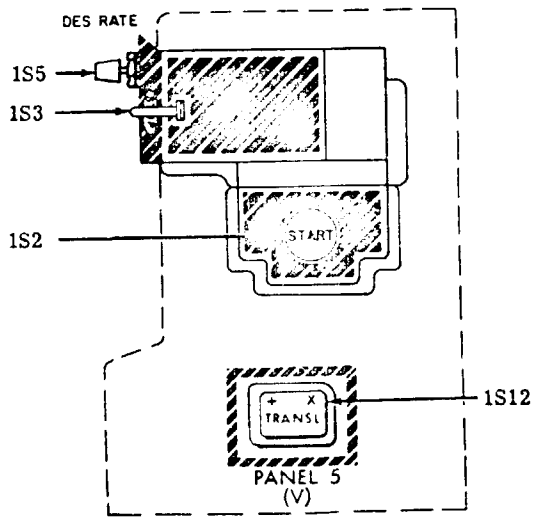
Engine/Thrust Controls and Indicators Layout

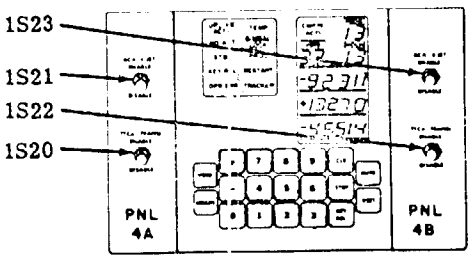


THRUST/TRANSLATION
CONTROLLER ASSY (TTCH) 1A3 (CDR) 1A11 (LMP)

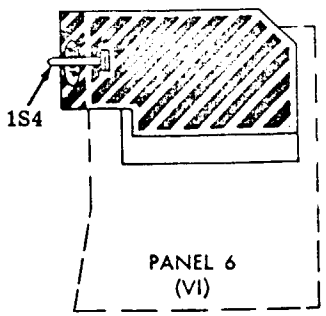


ATTITUDE CONTROLLER
ASSY (ACA) 1A1 (CDR) 1A12 (LMP)





PANEL 4
(IV)



Engine/Thrust Controls and Indicators Layout

SUBSYSTEM: ENGINE/THRUST CONTROLS & INDICATORS (FUNCTIONAL GROUPING 1)

Code	Control/Indicator	Function
1S1	ENGINE ARM SWITCH 3-POSITION TOGGLE LOCK-LOCK-LOCK	This three-position toggle (ASC-OFF-DES) provides arming signals to the engines. The ASC position provides an arming signal enabling firing of the ascent engine while simultaneously signalling the LGC that the engine is armed. In the OFF position the arming signals are removed from the engine valves and the LGC. In the DES position the descent engine is armed and the LGC is notified that the engine is armed. However, regardless of the position of this switch, the appropriate engine will be armed if 1S13 or 1S14 is actuated.
1S2	ENGINE START SWITCH GUARDED PUSHBUTTON MOMENTARY	This pushbutton, located at the Commander's station, provides a manual start capability for immediate firing of either the descent or ascent engine, depending upon the position of 1S1. Once actuated, the engine fire command continues and the button is illuminated red. Activation of 1S3 or 1S4 interrupts the override function and extinguishes the light.
1S3 & 1S4	ENGINE STOP SWITCH (CDR) ENGINE STOP SWITCH (LMP) GUARDED PUSHBUTTONS MAINTAIN	One pushbutton (1S3) is located at the Commander's station and one (1S4) is located at the LM Pilot's station. Each pushbutton sends a discrete stop signal to the descent and ascent engines independent of the position of 1S1. On a lunar landing mission, it will be depressed on lunar landing after the lunar contact lights (1DS1 and 1DS2) are illuminated. When actuated, the button illuminates red. Switch (1S3) & (1S4) should not be reset unless the engine has been dearmed. The switch is reset by depressing it a second time.

SUBSYSTEM: ENGINE/THRUST CONTROLS & INDICATORS (FUNCTIONAL GROUPING 1)

Code	Control/Indicator	Function
1S5	RATE OF DESCENT SWITCH 3-POSITION TOGGLE MOM-MAIN-MOM	This switch permits the adjustment of vehicle rate of descent under PGNS authority in fixed increments. Each switch actuation provides a discrete pulse, changing the rate of descent by 1 foot per second. A switch actuation in the +X direction decreases the rate of descent by 1 foot per second, and a switch actuation in the -X direction increases the rate of descent by 1 foot per second. Vehicle response to these commands is monitored on the Alt Rate meter (9M9) or on DSKY.
1S6	X-TRANSLATION SWITCH 2-POSITION TOGGLE MAIN-MAIN	This two-position toggle (4 JETS-2 JETS) selects the number of jets that will be utilized in X-axis translation maneuvers. This control can only be used with the AGS system.
1S8	ENGINE GIMBAL 2-POSITION TOGGLE LOCK-LOCK	This two-position toggle (ENABLE-OFF) is located on structural panel III. In the ENABLE position, gimbal trim signals are enabled to position the descent engine in pitch and roll axes. In the OFF position, power is interrupted to the gimbal drive actuators, thus disabling the gimbal drive capability.
1S9	BALANCED COUPLES SWITCH 2-POSITION TOGGLE LOCK-LOCK	This two-position toggle (ON-OFF) selects either balanced pairs of RCS jets in a couple or unbalanced X-axis RCS jets for use in maintaining pitch and roll attitude during the ascent engine thrust phase when the AGS is in the guidance loop. This switch is normally in the ON position (balanced couples) during the initial phases of lunar ascent. This provides maximum stabilization and control over any center of gravity thrust vector misalignment. After some appropriate minimum burn time when the balanced couples operation is no longer

SUBSYSTEM: ENGINE/THRUST CONTROLS & INDICATORS (FUNCTIONAL GROUPING 1)

Code	Control/Indicator	Function
1S9 (Cont.)		required, the switch can be positioned to OFF to conserve fuel during powered ascent. During coast periods the switch should be placed in the ON position.
1S10	MANUAL THROTTLE SWITCH 2-POSITION TOGGLE LOCK-LOCK	This two-position toggle (CDR-LMP) selects the controller (1X1 or 1X2) which will be used for manual descent engine thrust level adjustment if its corresponding select lever (1H1 or 1H2) is in the THROTTLE position. Thus, in the CDR position, only the Commander's Controller (1X1) is enabled to adjust descent engine thrust level, and in the LMP position only the LM Pilot's Controller (1X2) is enabled.
1S11	THRUST CONTROL SWITCH 2-POSITION TOGGLE LOCK-LOCK	This two position toggle (AUTO-MAN) provides the capability for switching from automatic throttle control (LGC) to manual throttle control (selected TTCA). In the AUTO position LGC thrust commands are summed with the manual command signals (TTCA selected by MAN THROTTLE switch 1S10). The TTCA always provides at least a 10% command since it cannot be set below this level. In the AUTO position the THRUST indicator displays the LGC command plus a 10% fixed bias which is summed with the LGC signal to compensate for this 10% fixed command from the TTCA. Manual throttle commands may be introduced by displacing the active TTCA. This would cause the displayed % THRUST CMD to decrease as only the LGC commands plus the fixed bias are displayed in the AUTO position.

SUBSYSTEM: ENGINE THRUST CONTROLS & INDICATORS (FUNCTIONAL GROUPING 1)

Code	Control/Indicator	Function
1S11 (Cont.)		In the MAN position, LGC throttle commands to the descent engine are interrupted and only manual commands are displayed on the THRUST indicator. The THRUST CMD display will indicate a minimum value of 10% when power is applied to the meter.
1S12	+X AXIS TRANSLATION SWITCH GUARDED PUSHBUTTON MOMENTARY	This pushbutton is located at the Commander's station. When it is held in the depressed position it provides 4 jet translation in the +X direction by energizing the RCS secondary coils. Upon release of the button the signal is removed from the coils, terminating the jet firings.
1S13	ABORT SWITCH GUARDED PUSHBUTTON MAINTAIN	This pushbutton is activated to initiate an abort using the descent engine. Activation of this switch causes the following events to occur at the appropriate times: (a) a command signal is sent to arm the descent engine, (b) a signal is sent via instrumentation to telemetry indicating that the vehicle is preparing for an abort, and (c) a signal is sent to the LGC and AGS to compute and execute the abort trajectory by using the abort program. It is reset by depressing a second time. NOTE: The ABORT switch does not perform descent engine pressurization. Pressurized by Master Arm SW2S7, DES Propellant Isol Valve SW2S9 & DES Start He Press SW2S1.
1S14	ABORT STAGE SWITCH GUARDED PUSHBUTTON MAINTAIN	This pushbutton is activated to initiate an abort using only the ascent engine. Activation of this switch will cause the following events to occur at the appropriate times: (a) a command signal is sent to the

SUBSYSTEM: ENGINE/THRUST CONTROLS & INDICATORS (FUNCTIONAL GROUPING 1)

Code	Control/Indicator	Function
1S14 (Cont.)		electro-explosive devices to pressurize the ascent engine, (b) a signal is sent to the LGC and AGS to compute and execute the abort trajectory using the abort stage program, (c) a signal is sent via instrumentation to telemetry indicating that the vehicle is preparing to stage for an abort, (d) the descent engine is shut down, (e) EPS is sent a signal allowing the ascent batteries to assume all loads, and (f) an Abort Stage Delay is initiated. During the Abort Stage Delay, the ascent engine is inhibited from firing to enable descent engine thrust decay. At the termination of the delay, the guidance system selected issues an engine ON command and a "stage" command is sent to E. D. to initiate staging, and an ascent engine on command is sent to APS to turn on the Ascent engine. The ABORT stage button is reset by depressing a second time.
1S15 (1S16) (1S18)	LUNAR PROBE (+Y) (LUNAR PROBE (-Y)) (LUNAR PROBE (-Z))	The (3) Lunar Probes attached to the (+Y) (-Y) & (-Z) landing gear footpads are electro-mechanical devices. At the final stage of powered descent (just prior to landing) the Lunar Probe switch is activated (via contact with Lunar surface) and enables illumination of the Lunar contact lights 1DS1 & 1DS2, this is the signal for the astronauts to shut down the descent engine which automatically will deactivate the "Lunar contact" lights.
1S19	DESCENT ENGINE COMMAND OVERRIDE SWITCH 2-POSITION TOGGLE LOCK-LOCK	This two-position toggle (ON-OFF) in the ON position provides a 28 VDC alternate power source to the descent engine shut-off valves to prevent engine shut down should there occur a loss of DECA power (4CB69) as the vehicle enters the dead-mans zone. The OFF position interrupts this alternate power path.

SUBSYSTEM: ENGINE/THRUST CONTROLS & INDICATORS (FUNCTIONAL GROUPING 1)

Code	Control/Indicator	Function
1S20	TTCA/TRANSL SWITCH (CDR)	This two-position (ENABLE-DISABLE) toggle switch at left hand side of DSKY panel in the nominal (ENABLE) position permits normal operation of TTCA. In the DISABLE position the translation control function of TTCA is disconnected.
1S21	ACA/4 JET SWITCH (CDR)	This two-position (ENABLE-DISABLE) toggle switch at the left hand side of DSKY panel in its nominal (ENABLE) position permits normal four-jet direct attitude control function (hardover position) of ACA and is operated in conjunction with similar (LMP's) switch at right hand side.
1S22	TTCA/TRANSL SWITCH (LMP)	This two-position (ENABLE-DISABLE) toggle switch at right hand side of DSKY panel operates in a similar manner to 1S20 on the CDR's side. When both are in the nominal (ENABLE) position TTCA can operate normally. Either switch in DISABLE position disconnects the TTCA translation control function.
1S23	ACA/4 JET SWITCH (LMP)	This two-position (ENABLE-DISABLE) toggle switch at the right side of DSKY panel functions similar to that of 1S21 on the CDR's side of DSKY panel. When both are in nominal ENABLE position the ACA operates normally, but if either is in the DISABLE position then the four-jet direct attitude control function (hardover position of ACA is disengaged).

SUBSYSTEM: ENGINE/THRUST CONTROLS & INDICATORS (FUNCTIONAL GROUPING 1)

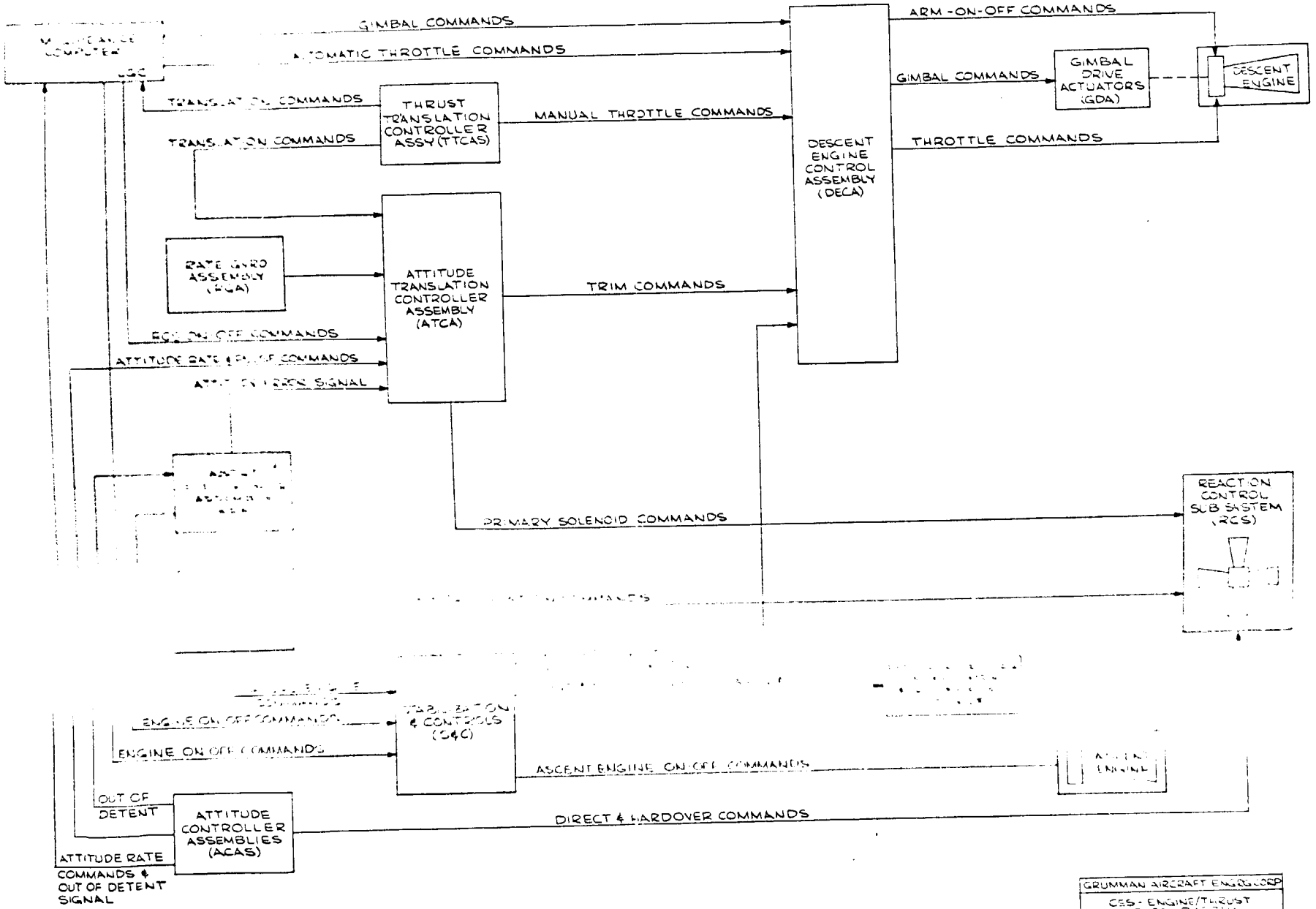
Code	Control/Indicator	Function
1S25	ACA PROP 2 POSITION TOGGLE SWITCH	Commander's - two-position (ENABLE-DISABLE) toggle sw enables isolation 28 volts, 800 Hz to ACA transducer primary coil. The ENABLE position, enables normal operation of the ACA proportional rate mode. The DISABLE position, disables the ACA proportional rate command capability. When in "DISABLE" the attitude hold mode (proportional rate commands) function of the ACA is inoperative.
1S26	ACA PROP 2 POSITION TOGGLE SWITCH	LM Pilot's two-position (ENABLE-DISABLE) toggle switch enables isolation 28 volts, 800 Hz to ACA transducer primary coil. The ENABLE position, enables normal operation of the ACA proportional rate mode. The DISABLE position, disables the ACA proportional rate command. When in "DISABLE" the attitude hold mode (proportional rate commands) function of the ACA is inoperative.
1A1 1A12	ATTITUDE CONTROLLER (CDR) ATTITUDE CONTROLLER (LMP)	There are two 3-axis attitude Controllers; one at the Commander's station, the other at the LM Pilot's station. Both provide attitude command signals to the vehicle as appropriate for the mode of stabilization and control selected by the Attitude Mode control (11S6) as modified by GUID CONT (9S6) and ATTITUDE CONTROL (11S3, 4, 5) switches.
1X1 1X2	THRUST/TRANSLATION CONTROLLER (CDR) THRUST/TRANSLATION CONTROLLER (LMP)	One Thrust/Translation Controller is located at the Commander's station and one at the LM Pilot's station. Each controller always provides the crew with translation capability along the Y and Z body axes. X-axis translation capability is added to the CDR's or LMP's controller when the Throttle/Jets select lever (1H1 or 1H2) is positioned to JETS. Thrust control of the descent engine is provided

SUBSYSTEM: ENGINE/THRUST CONTROLS & INDICATORS (FUNCTIONAL GROUPING 1)

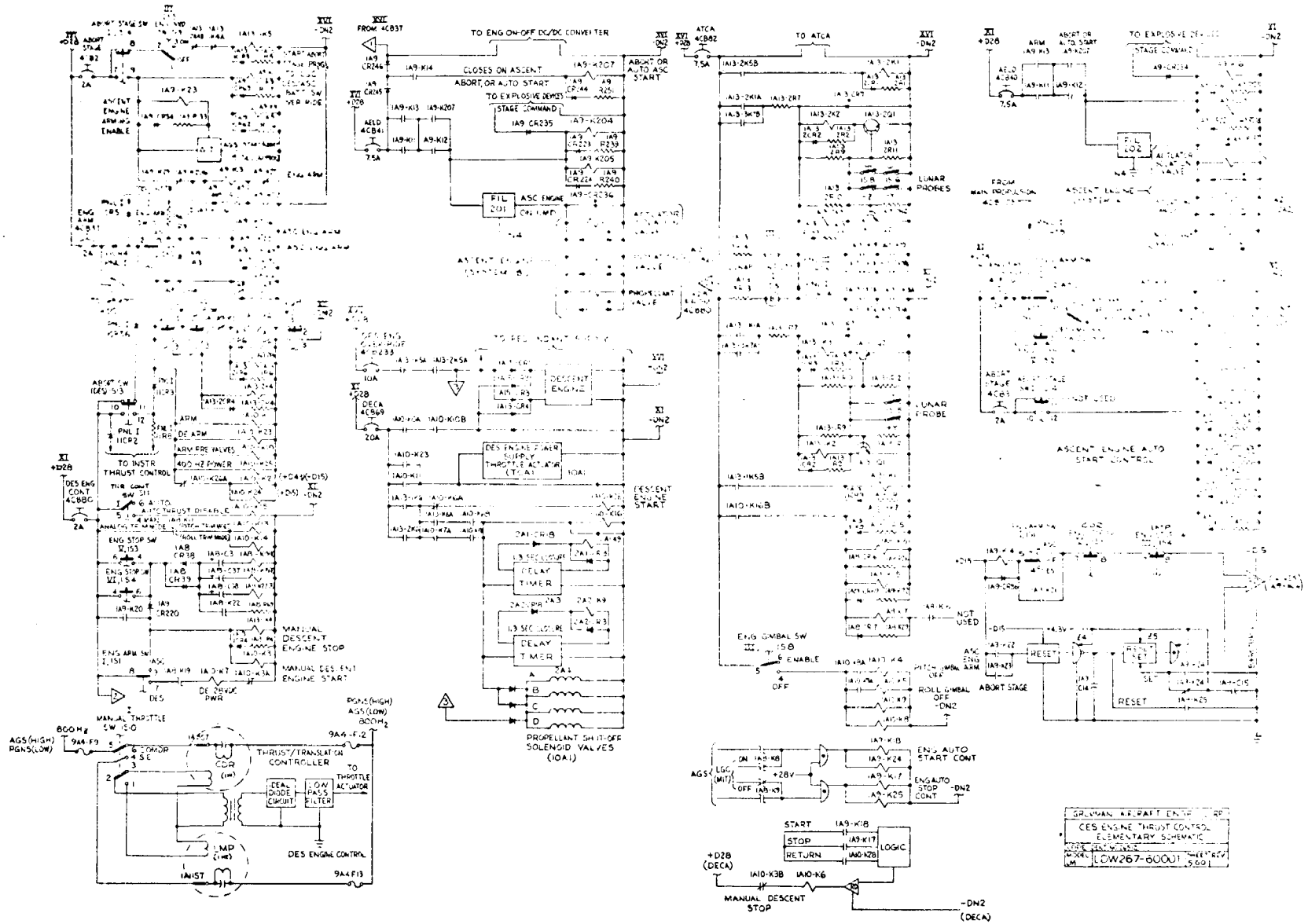
Code	Control/Indicator	Function
1X1 & 1X2 (Cont.)		to the CDR's controller when 1H1 is in the THROTTLE position and 1S10 is positioned to CDR. Thrust control of the engine is enabled with the LMP's controller when 1H2 is in THROTTLE and 1S10 is positioned to LMP. The force required to move the THRUST TRANSLATION CONTROLLER (1X1 or 1X2) in the ± direction when in the THROTTLE position is determined by the setting of the THROTTLE FRICTION ROTARY CONTROLLER (1H3 or 1H4).
1H1 1H2	THROTTLE/JETS CONTROL SELECT LEVER (CDR) THROTTLE/JETS CONTROL SELECT LEVER (LMP) TWO 2-POSITION LEVERS	Each of these two-position levers (THROTTLE-JETS) is associated with its respective Thrust/Translation Controller (1X1 or 1X2). The THROTTLE position selects the manual descent engine throttling capability of the controller. The JETS position selects the RCS X-axis translation capability. However, if both 1H1 and 1H2 are placed in the THROTTLE position, only the controller selected on 1S10 will provide throttle commands.
1H3 1H4	THROTTLE FRICTION ROTARY CONTROLLER (CDR) THROTTLE FRICTION ROTARY CONTROLLER (LMP)	Each of these rotarys (FRICTION) varies the force required to move the associated THRUST TRANSLATION CONTROLLER (1X1 or 1X2) in the ±X direction. They are only operative when the associated THROTTLE/JETS control SELECT LEVER (1H1 or 1H2) is in the THROTTLE position. The force required to move the THRUST TRANSLATION CONTROLLER (1X1 or 1X2) varies from a minimum of between 1/4 and 1 lb. to a maximum of between 2-1/2 and 3-1/2 lbs.

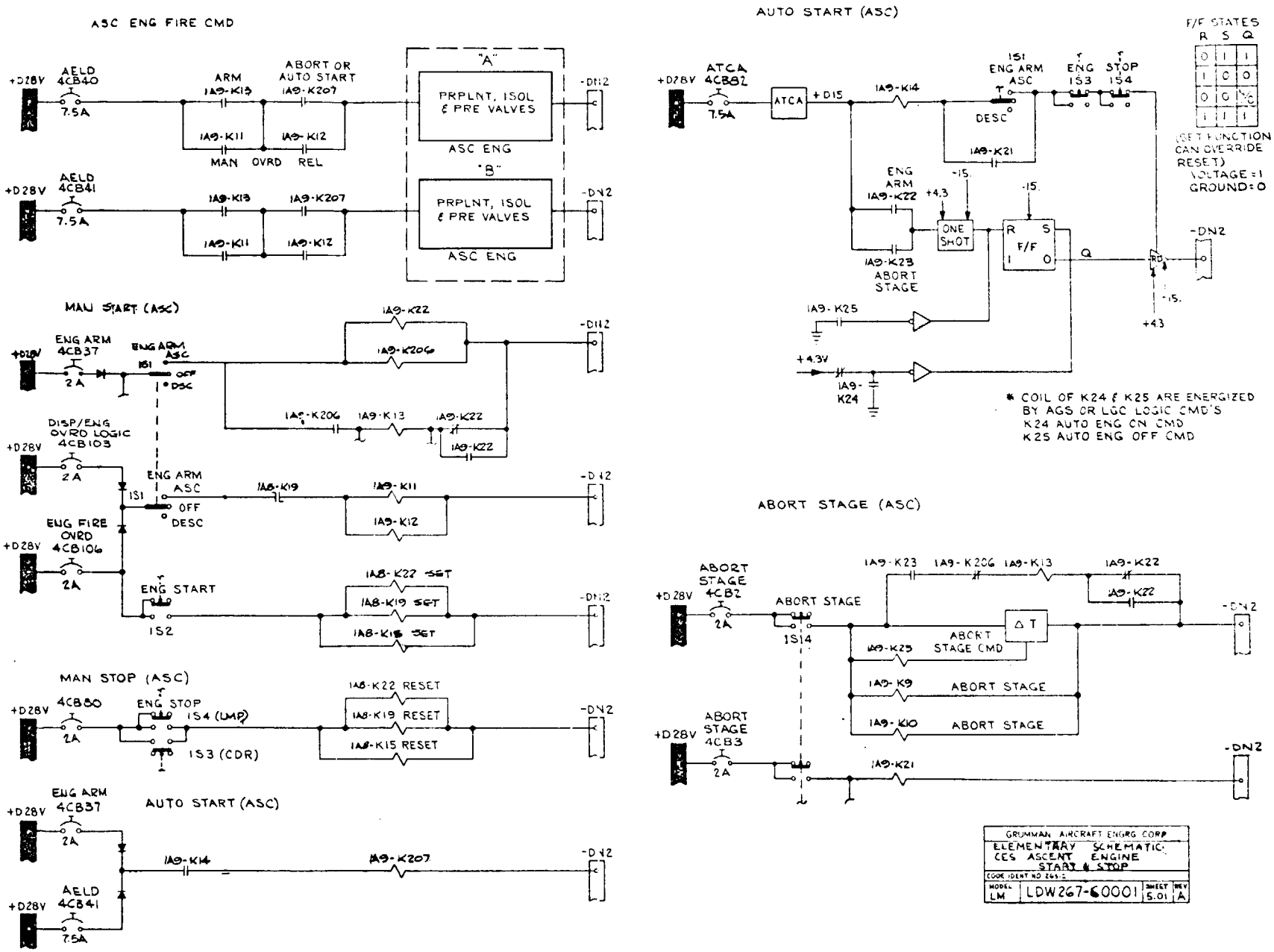
SUBSYSTEM: ENGINE/THRUST CONTROLS & INDICATORS (FUNCTIONAL GROUPING 1)

Code	Control/Indicator	Function
1DS1- 1DS2-	LUNAR CONTACT LIGHT (CDR) LUNAR CONTACT LIGHT (LMP)	One light is located at the Commander's station and one is located at the LM Pilot's station. Both illuminate blue when a probe on the vehicle's landing gear touches the lunar surface. This provides positive feedback to the crew that the descent engine should be turned off. These lights will extinguish when either 1S3 or 1S4 is actuated which causes the stop logic to interrupt power to the light.



GRUMMAN AIRCRAFT ENG. CORP.		
CES - ENGINE/THRUST BLOCK DIAGRAM		
CODE IDENT NO. 71511		SHEET NO. REV
MODEL LM	LDW267-60001	4.00


ABORT STAGE SW
ABORT STAGE
ASCENT ENGINE ARMING ENABLE
ENG ARM
ARM
DE ARM
ARM PRE VALVES
TO INSTR THRUST CONTROL
THR CONT SW
AUTO THRUST DISABLE
ENG STOP SW
ENG ARM SW
MANUAL DESCENT ENGINE STOP
MANUAL DESCENT ENGINE START
DES
DE DRIVER PWR
MANUAL THROTTLE SW
THRUST/TRANSLATION CONTROLLER
CDR
LMP
DES ENGINE CONTROL
TO THROTTLE ACTUATOR
DECA DIODE CIRCUIT
LOW PASS FILTER
TO ENG ON-OFF DC/DC CONVERTER
CLOSES ON ASCENT
ABORT, OR AUTO START
TO EXPLOSIVE DEVICES
STAGE COMMAND
ABORT OR AUTO ASC START
ASC ENGINE
ASCENT ENGINE (SYSTEM B)
PROPELLANT VALVE
DESCENT ENGINE
DES ENGINE POWER SUPPLY THROTTLE ACTUATOR (TCA)
DESCENT ENGINE START
DELAY TIMER
PROPELLANT SHUT-OFF SOLENOID VALVES (10A1)
ATCA
TO ATCA
LUNAR PROBE
ENG GIMBAL SW
ENABLE
OFF
ROLL GIMBAL OFF
PITCH GIMBAL OFF
ENG AUTO START CONT
ENG AUTO STOP CONT
START
STOP
RETURN
LOGIC
MANUAL DESCENT STOP
ARM
ABORT OR AUTO START
TO EXPLOSIVE DEVICES
STAGE COMMAND
ASCENT ENGINE AUTO START CONTROL
ABORT STAGE
RESET
NOT USED
GRUMMAN AIRCRAFT ENG. CORP.
CES ENGINE THRUST CONTROL ELEMENTARY SCHEMATIC
LOW267-60001



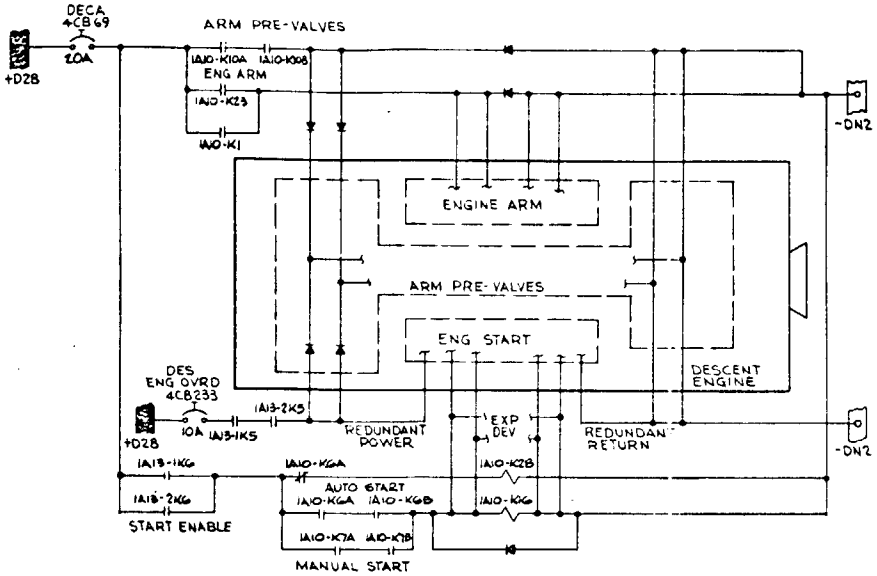
GRUMMAN AIRCRAFT ENGRG CORP

ELEMENTARY SCHEMATIC
CES ASCENT ENGINE START & STOP

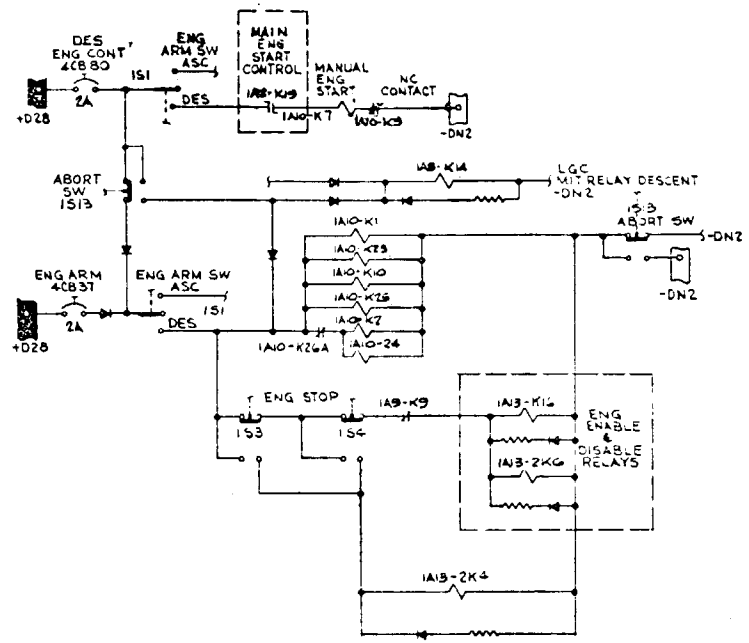
CODE IDENT NO 26515

MODEL		SHEET	REV
LM	LDW267-60001	5.01	A

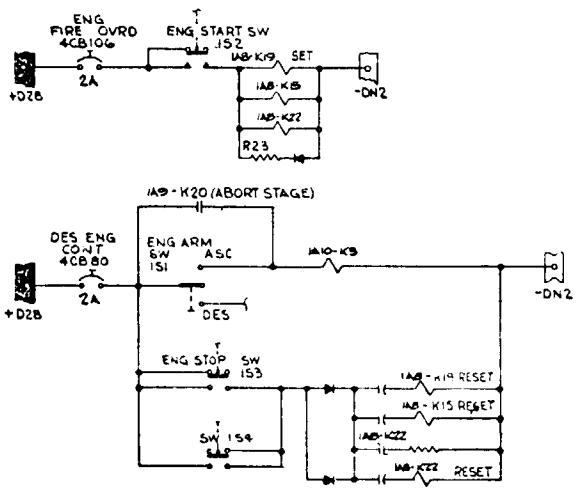
PARTIAL CIRCUITRY SHOWN FOR REFERENCE ONLY



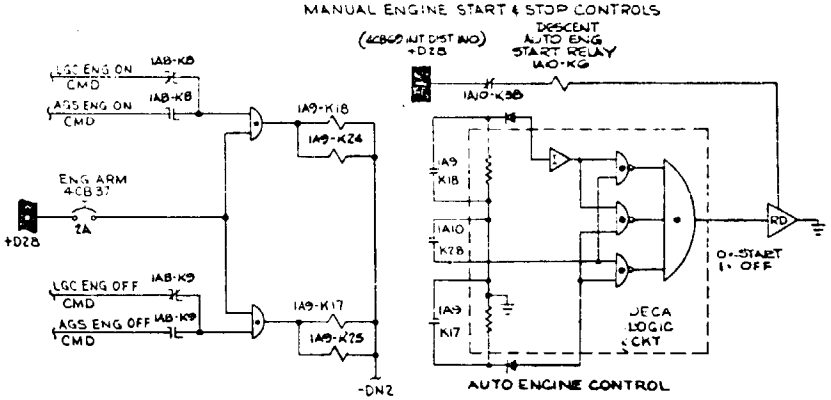
POWER TO PRIMARY DESCENT ENGINE START VALVES



MANUAL ENGINE START & STOP CONTROLS



MANUAL ENGINE START & STOP CONTROLS



AUTO ENGINE CONTROL

PARTIAL CIRCUITRY SHOWN FOR REFERENCE ONLY.

CONTACTS OF 1AB-K18 DE ON K18 DE OFF

0(OPEN)	0(OPEN)	MAINTAINS PREVIOUS POSITION
0	1	DE-ENERGIZED
1	0	ENERGIZED
1	1	MAINTAINS ENERGIZED POSITION
1*	1*	DE-ENERGIZED
0*	0*	ENERGIZED

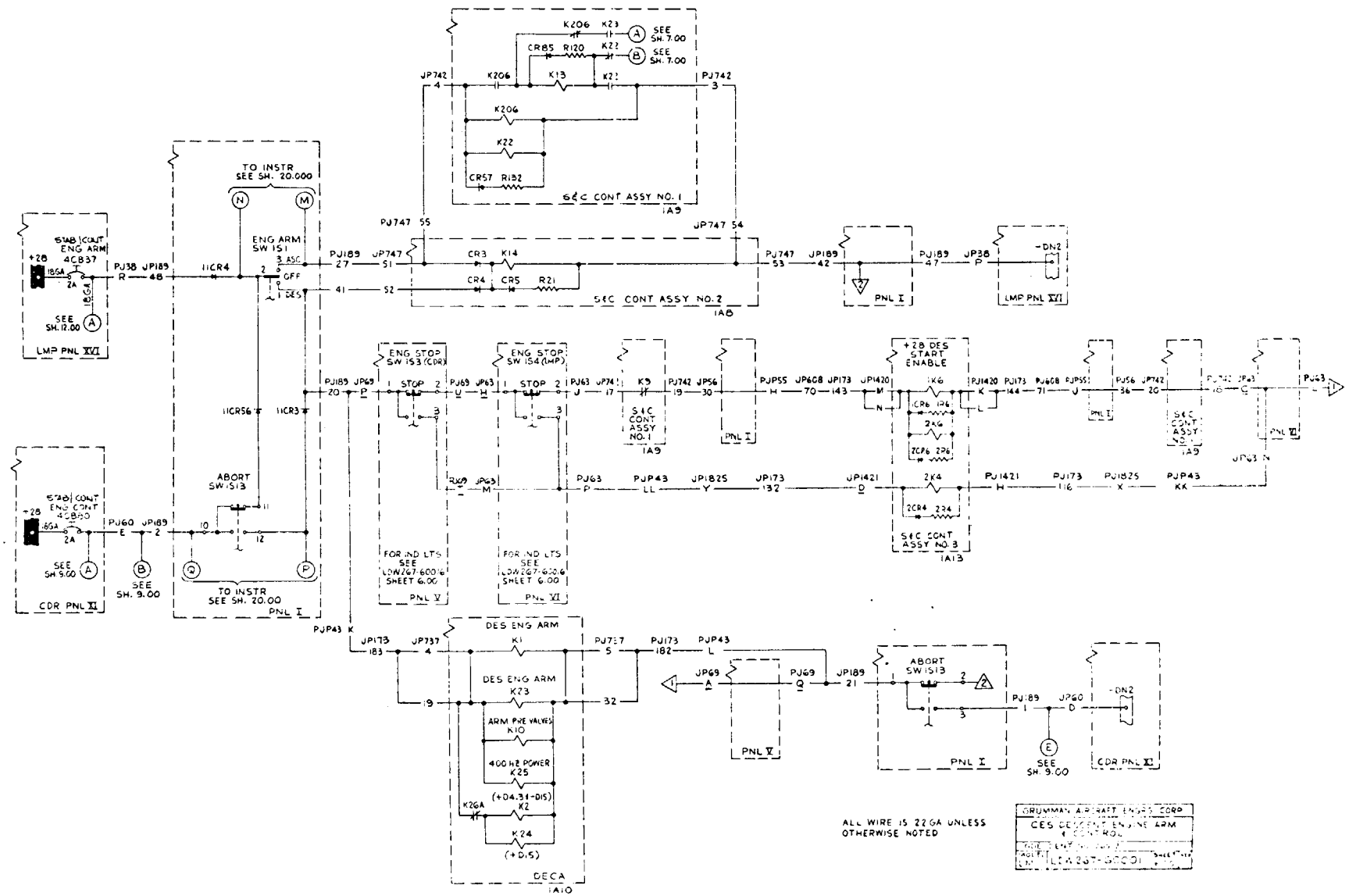
INPUT TO 1AB-K18 STATE WHEN RELAY IS ACTUATED (DE-K18 = OPEN)

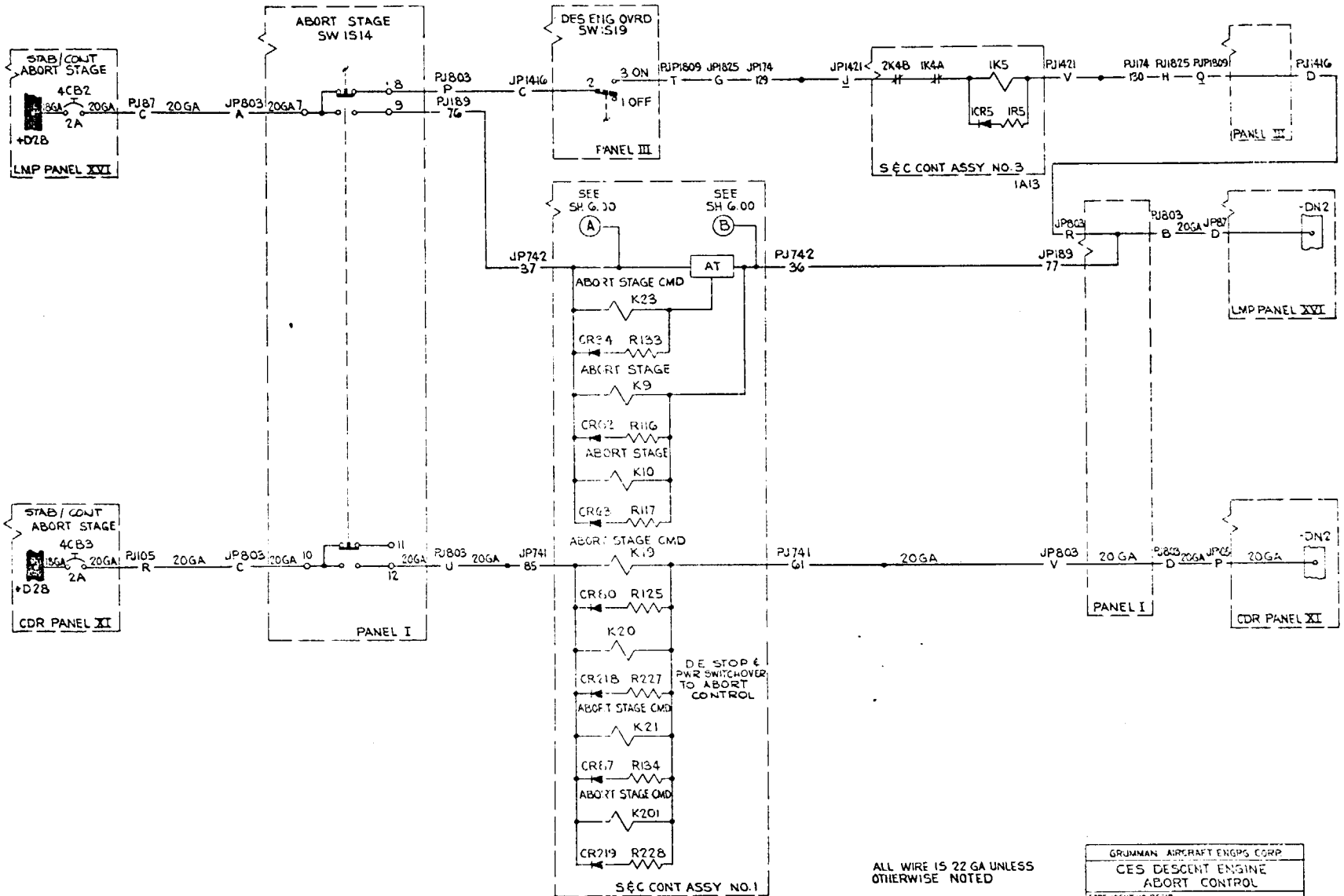
0 = GND = START
1 = OPEN DE MUM = STOP

GRUMMAN AIRCRAFT ENGRG CORP

ELEMENTARY SCHEMATIC
LEES DESCENT ENGINE
START & STOP

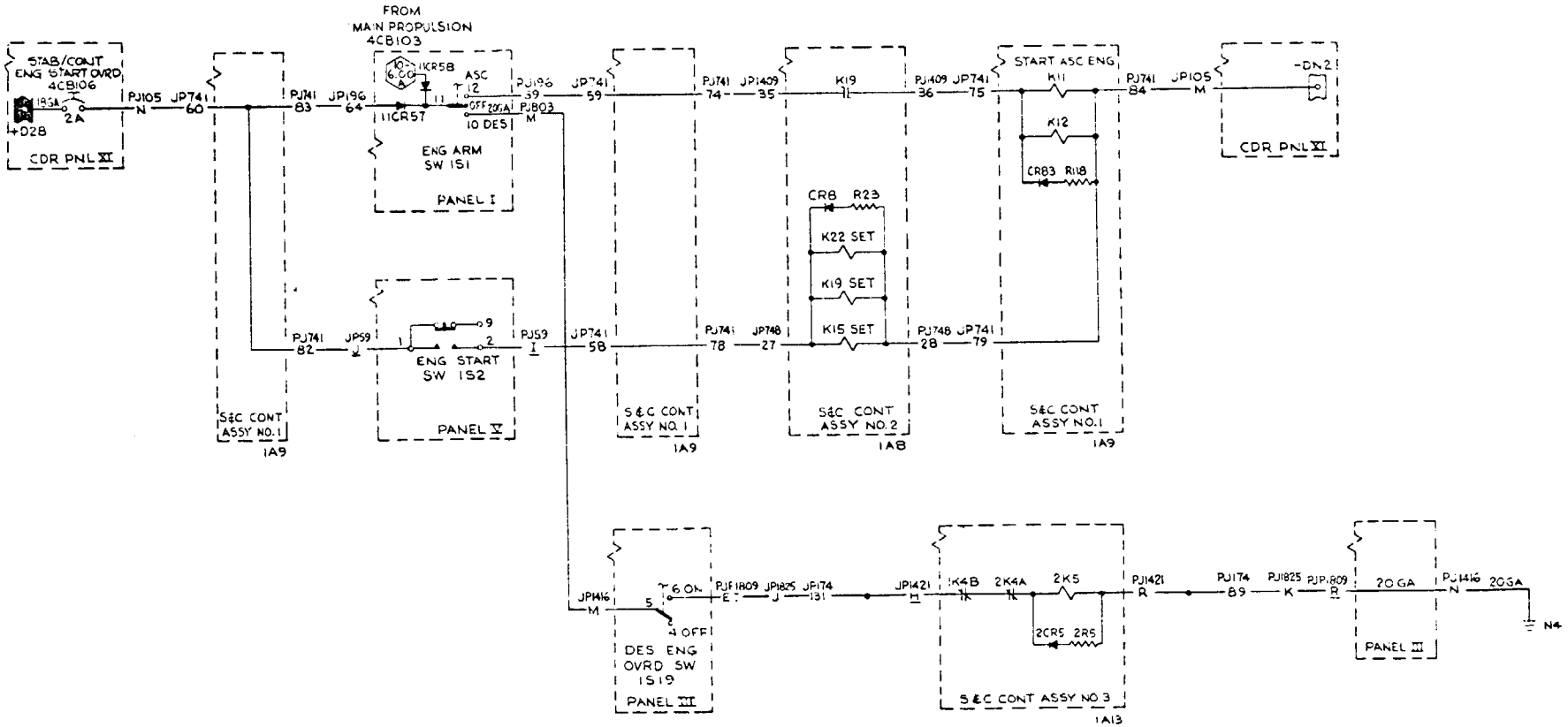
DW267-60001 REV A


K206
K23
SEE SH. 7.00
CR85
R120
K22
SEE SH. 7.00
JP742
4
K206
K13
K22
PJ742
3
K206
K22
CR57
R132
SEC CONT ASSY NO. 1
1A9
PJ747 55
JP747 54
TO INSTR SEE SH. 20.000
N
M
STAB CONT ENG ARM 4CB37
+28
18GA
2A
18GA
SEE SH. 12.00
A
LMP PNL XVI
PJ38 JP189
R 48
11CR4
ENG ARM SW 1S1
3 ASC
2
OFF
1 DES
PJ189
27
JP747
51
41
52
CR3
K14
CR4
CR5
R21
SEC CONT ASSY NO. 2
1A8
PJ747
53
JP189
42
PNL I
PJ189
47
JP38
P
-DN2
LMP PNL XVI
ENG STOP SW 1S3 (CDR)
ENG STOP SW 1S4 (LMP)
STOP
PJ189 JP69
Z0
P
PJ69 JP63
U
H
PJ63 JP741
J
17
K9
PJ742 JP56
19
30
SEC CONT ASSY NO. 1
1A9
PNL I
PJP55 JP608 JP173 JP1420
H 70 143 M
+28 DES START ENABLE
1K6
CR6 1Z6
2Z6
ZCR6 2Z6
N
PJ1420 PJ173 PJ608 PJP55
K 144 71 J
PNL I
PJ56 JP742
36 20
SEC CONT ASSY NO. 3
1A9
PJ742 JP43
18 C
PNL VI
PJ43
1
JP43 N
11CR56
11CR3
ABORT SW 1S13
STAB CONT ENG CONT 4CB20
+28
18GA
2A
PJ60 JP189
E 2
10
11
12
SEE SH. 9.00
A
B
SEE SH. 9.00
CDR PNL XI
Q
P
TO INSTR SEE SH. 20.00
PNL I
RX9 JP63
M
PJ63
P
PJP43
LL
JP1825
Y
JP173
132
JP1421
D
2K4
2CR4 2Z4
SEC CONT ASSY NO. 3
1A13
PJ1421
H
PJ173
116
JP1825
X
PJP43
KK
FOR ND LTS SEE LDW267-60016 SHEET 6.00
PNL V
FOR ND LTS SEE LDW267-60016 SHEET 6.00
PNL VI
PJP43 K
DES ENG ARM
K1
JP173 JP737
183 4
PJ737
5
PJ173
182
PJP43
L
DES ENG ARM
K23
19
32
ARM PRE VALVES
K10
400 HZ POWER
K25
(+04.3 I-DIS)
K2
K2GA
K24
(+DIS)
DECA
1A10
1
JP69
A
PJ69
Q
JP189
21
PNL V
ABORT SW 1S13
2
3
PJ189
1
JP60
D
-DN2
E
SEE SH. 9.00
CDR PNL XI
PNL I
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGR'G CORP
CES DESCENT ENGINE ARM & CONTROL
LEM 2-37-60001



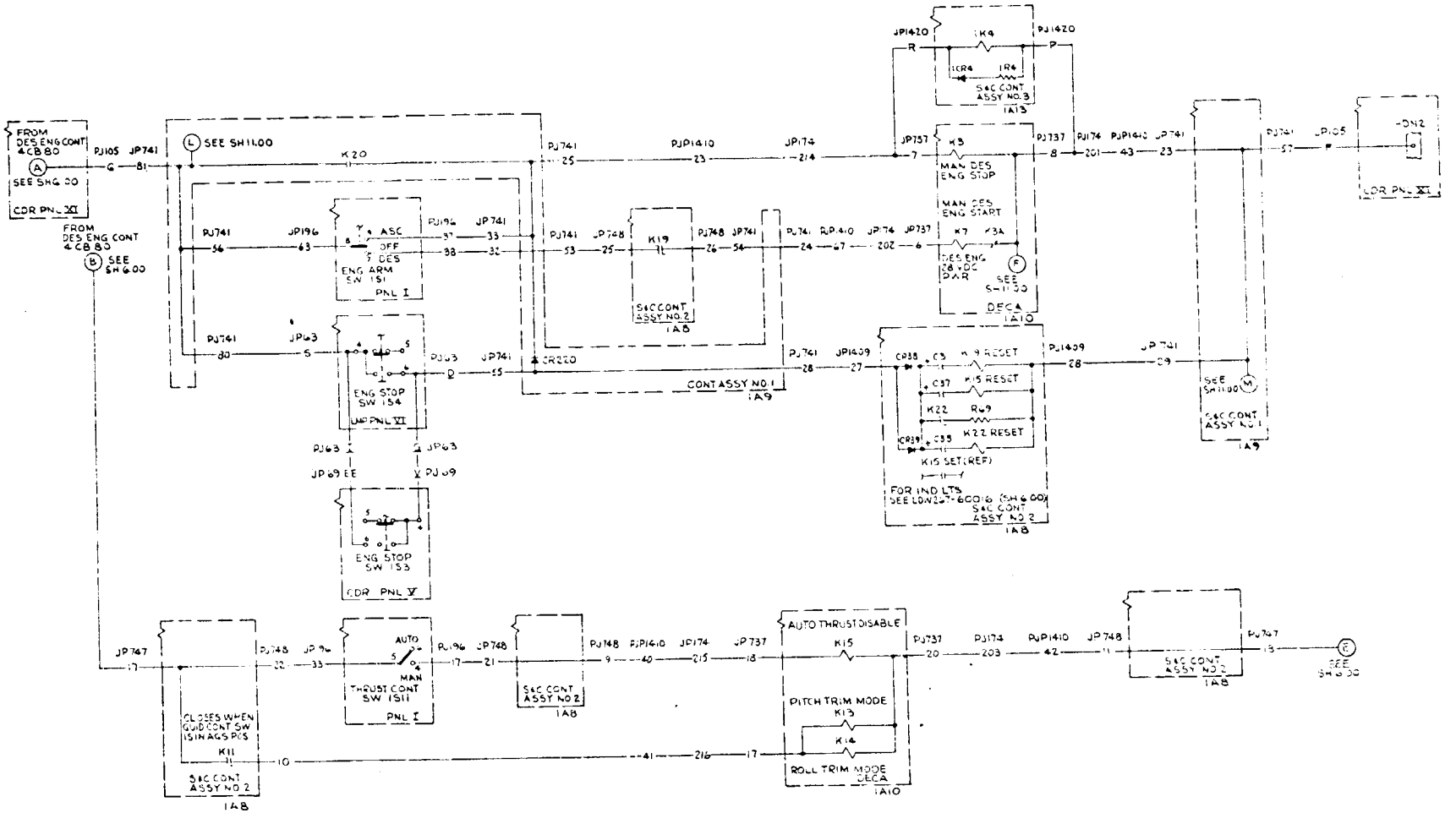
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP		
CES DESCENT ENGINE ABORT CONTROL		
CODE IDENT NO. 70412		
MODEL LM	LDW267-60001	SHEET 7 OF 0 REV

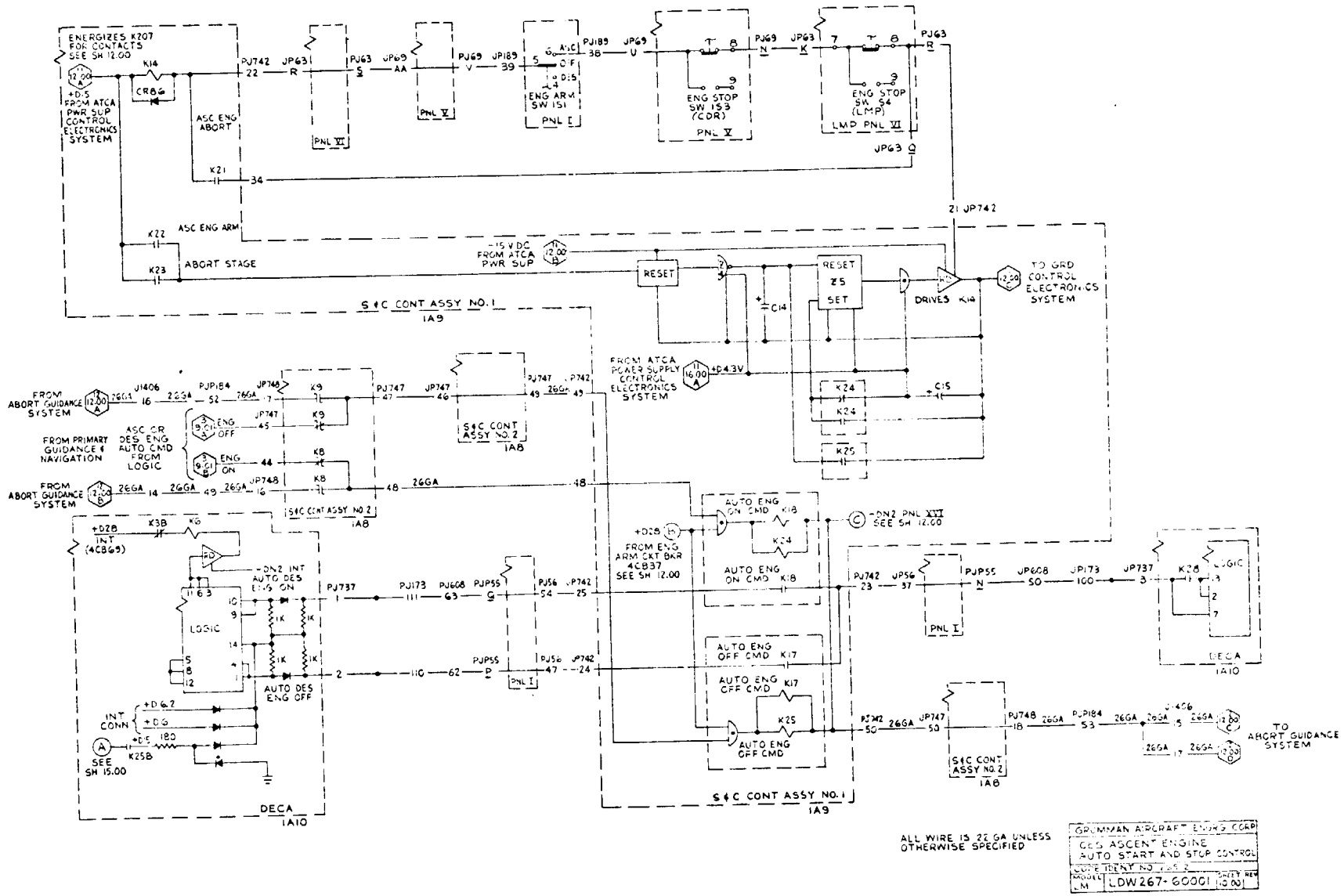


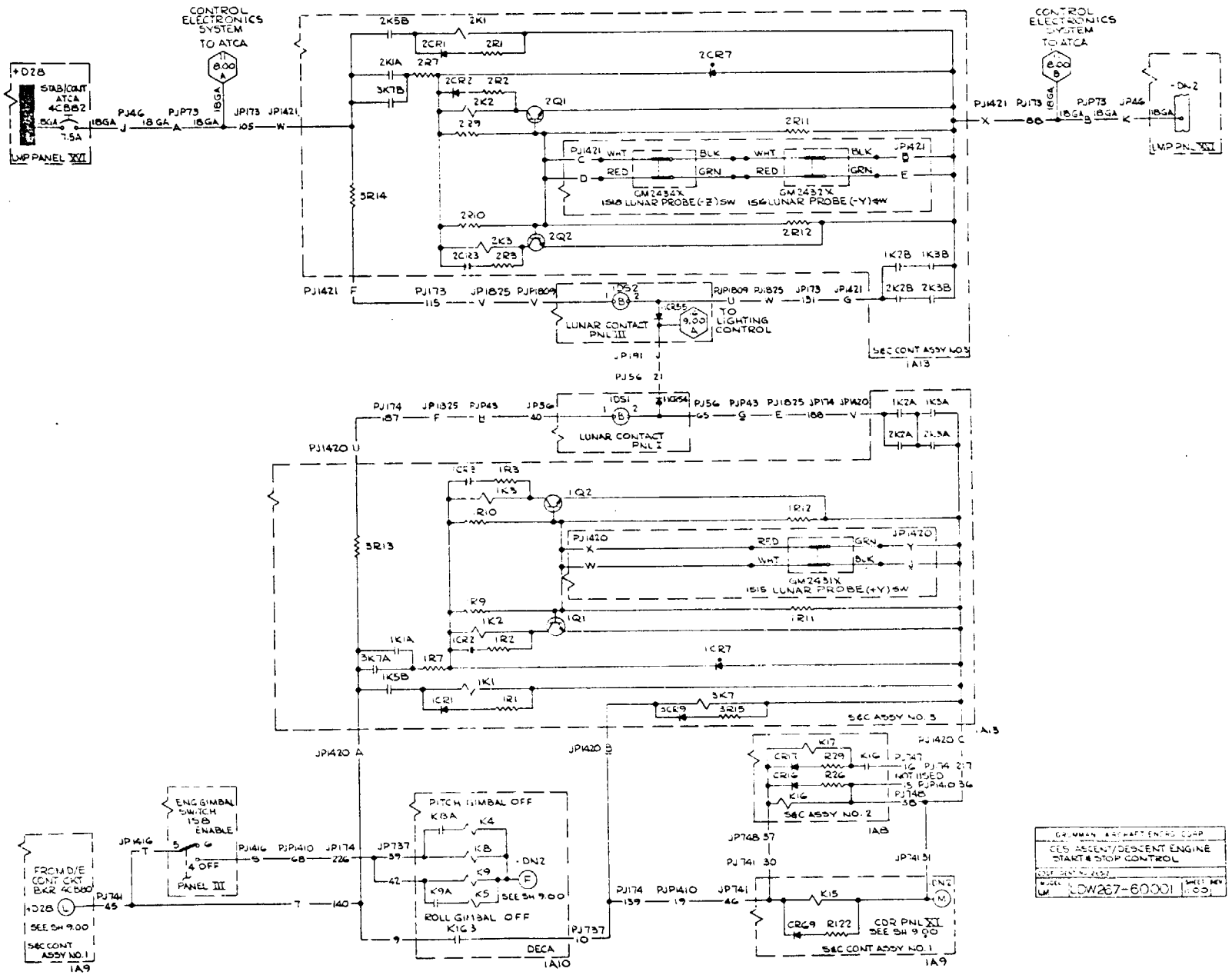
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGRG CORP	
CES ASCENT & DESCENT ENGINE MANUAL START CONTROL	
CODE IDENT NO. 24955	
MODEL LM	LDW267-60001 SHEET REV 8.00



GRUMMAN AIRCRAFT ENGR'G CORP
LEM ASCENT STAGE LIGHT ENGINE
MANUAL START & STOP CONTROL
SIZE D
LOW 2-6GO11 REV S


ENERGIZES K207 FOR CONTACTS SEE SH 12.00
+D5 FROM ATCA PWR SUP CONTROL ELECTRONICS SYSTEM
K14
CR86
ASC ENG ABORT
K21
ASC ENG ARM
K22
ABORT STAGE
K23
ENG ARM SW 151
ENG STOP SW 153 (CDR)
ENG STOP SW 54 (LMP)
LMP PNL VI
PNL V
PNL I
PNL VI
JPG3 Q
21 JP742
-15 V DC FROM ATCA PWR SUP
RESET
SET
DRIVES K14
TO GRD CONTROL ELECTRONICS SYSTEM
C14
C15
S&C CONT ASSY NO. 1
1A9
FROM ATCA POWER SUPPLY CONTROL ELECTRONICS SYSTEM
+D4.3V
FROM ABORT GUIDANCE SYSTEM
FROM PRIMARY GUIDANCE & NAVIGATION
ASC OR DES ENG AUTO CMD FROM LOGIC
ENG OFF
ENG ON
K9
K8
K24
K25
S&C CONT ASSY NO. 2
1A8
+D28 INT (4CB69)
K3B
K6
-DN2 INT AUTO DES ENG ON
LOGIC
AUTO DES ENG OFF
INT CONN
+D6.2
+D6
+D5
180
K25B
SEE SH 15.00
DECA
1A10
FROM ENG ARM CKT BKR 4CB37 SEE SH 12.00
AUTO ENG ON CMD K18
AUTO ENG OFF CMD K17
-DN2 PNL XVI SEE SH 12.00
TO ABORT GUIDANCE SYSTEM
ALL WIRE IS 22 GA UNLESS OTHERWISE SPECIFIED
GRUMMAN AIRCRAFT ENGG CORP
DES ASCENT ENGINE AUTO START AND STOP CONTROL
LDW267-60001

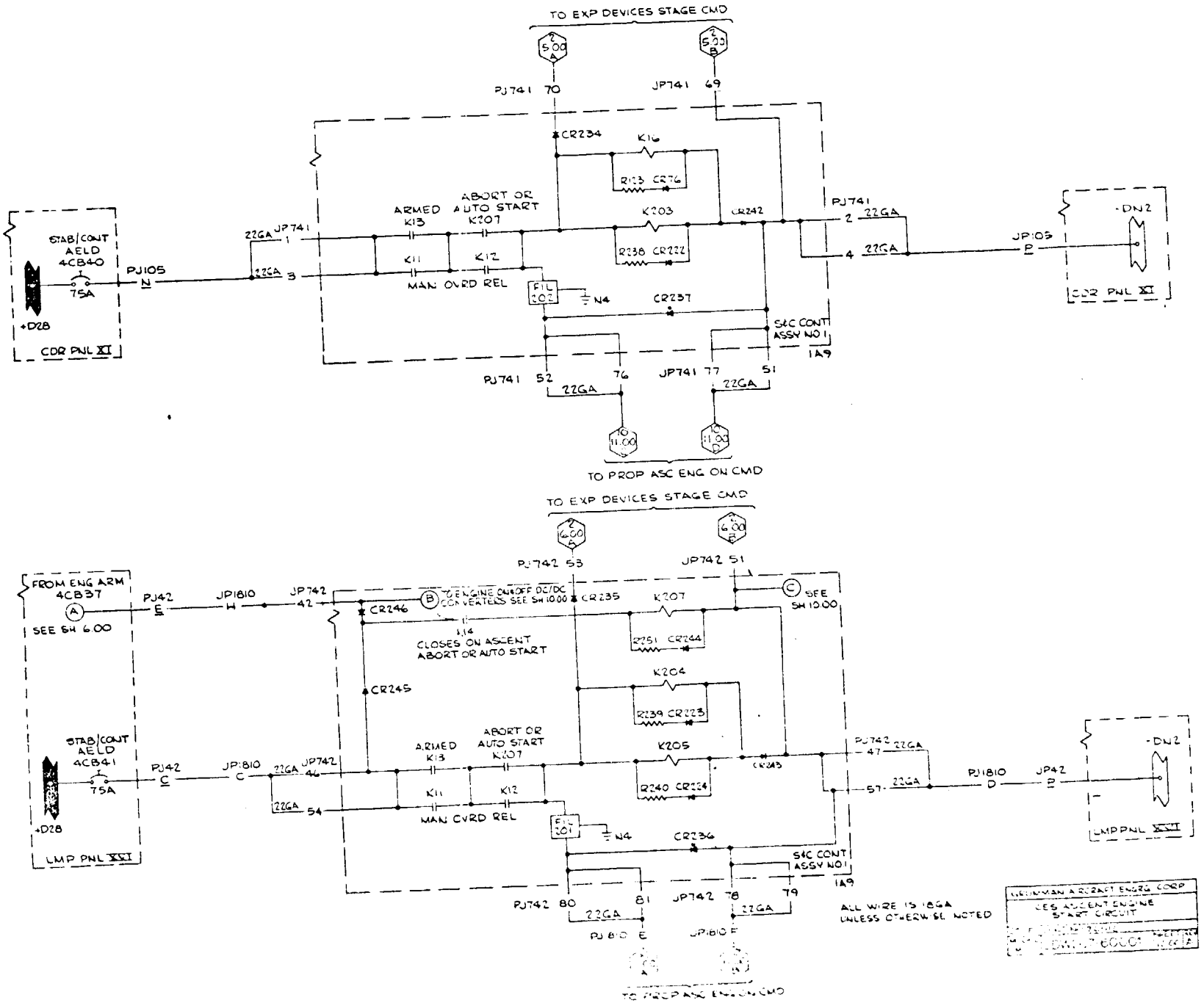


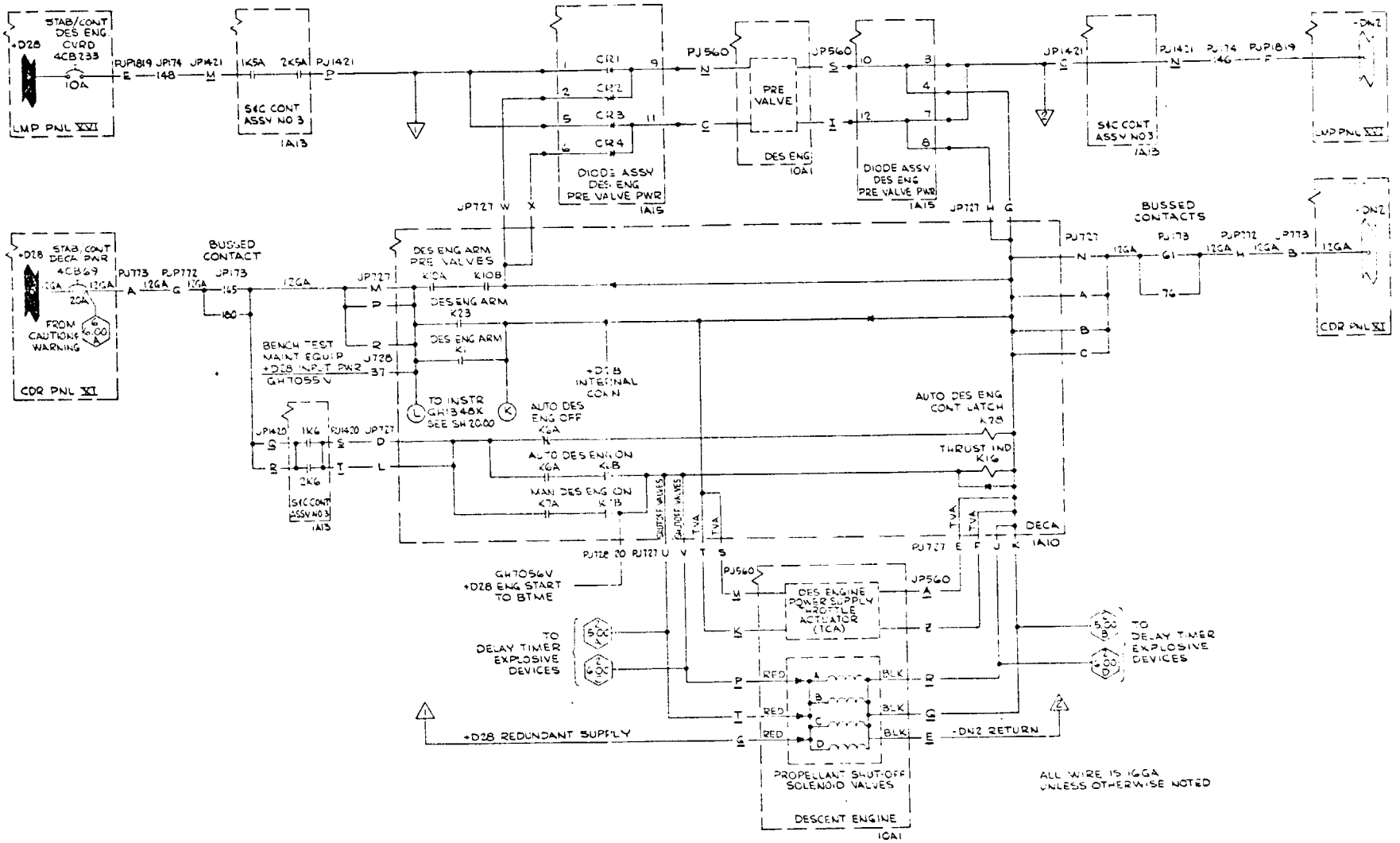
GRUMMAN AIRCRAFT ENGINEERING CORP

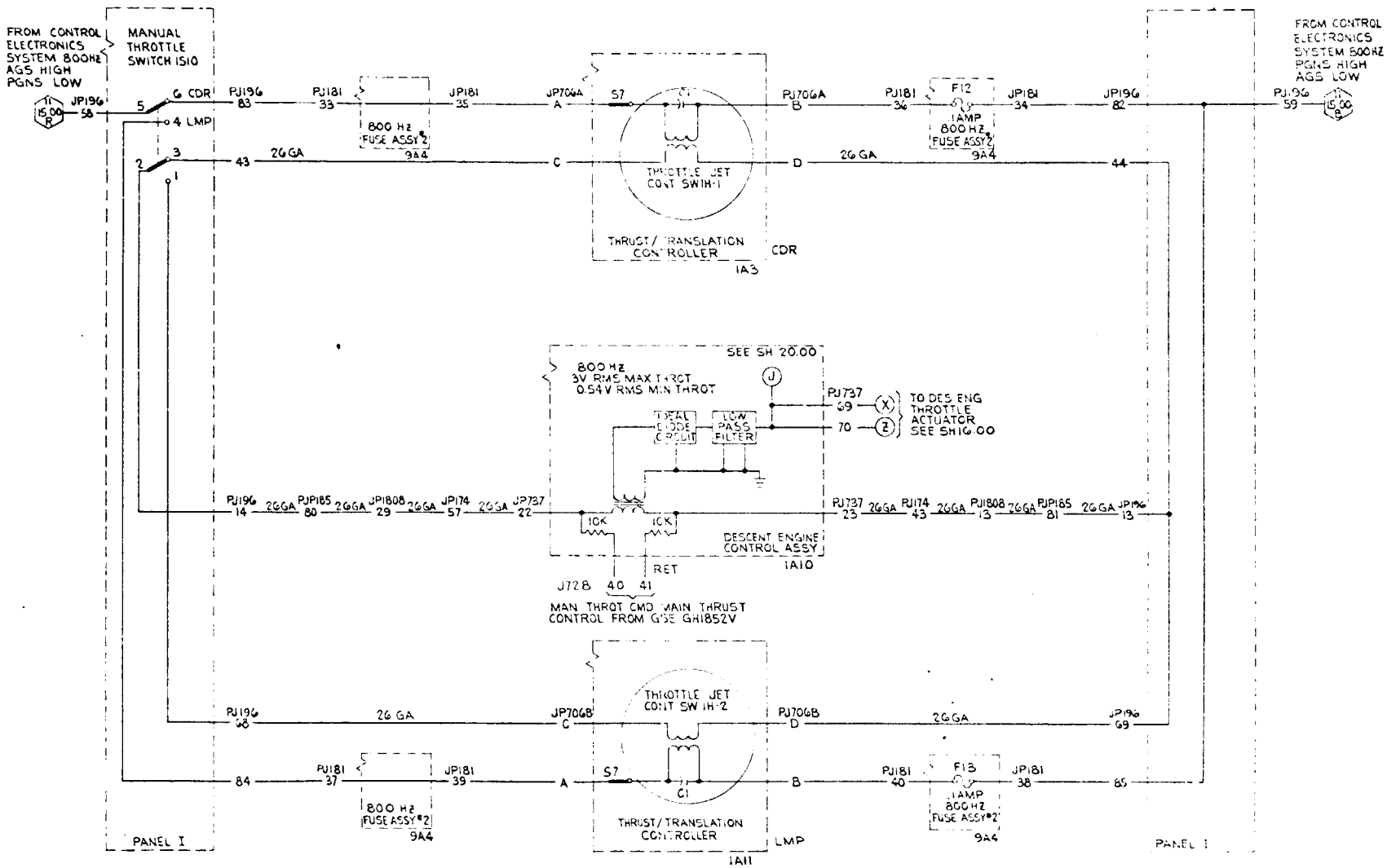
CES ASCENT/DESCENT ENGINE START & STOP CONTROL

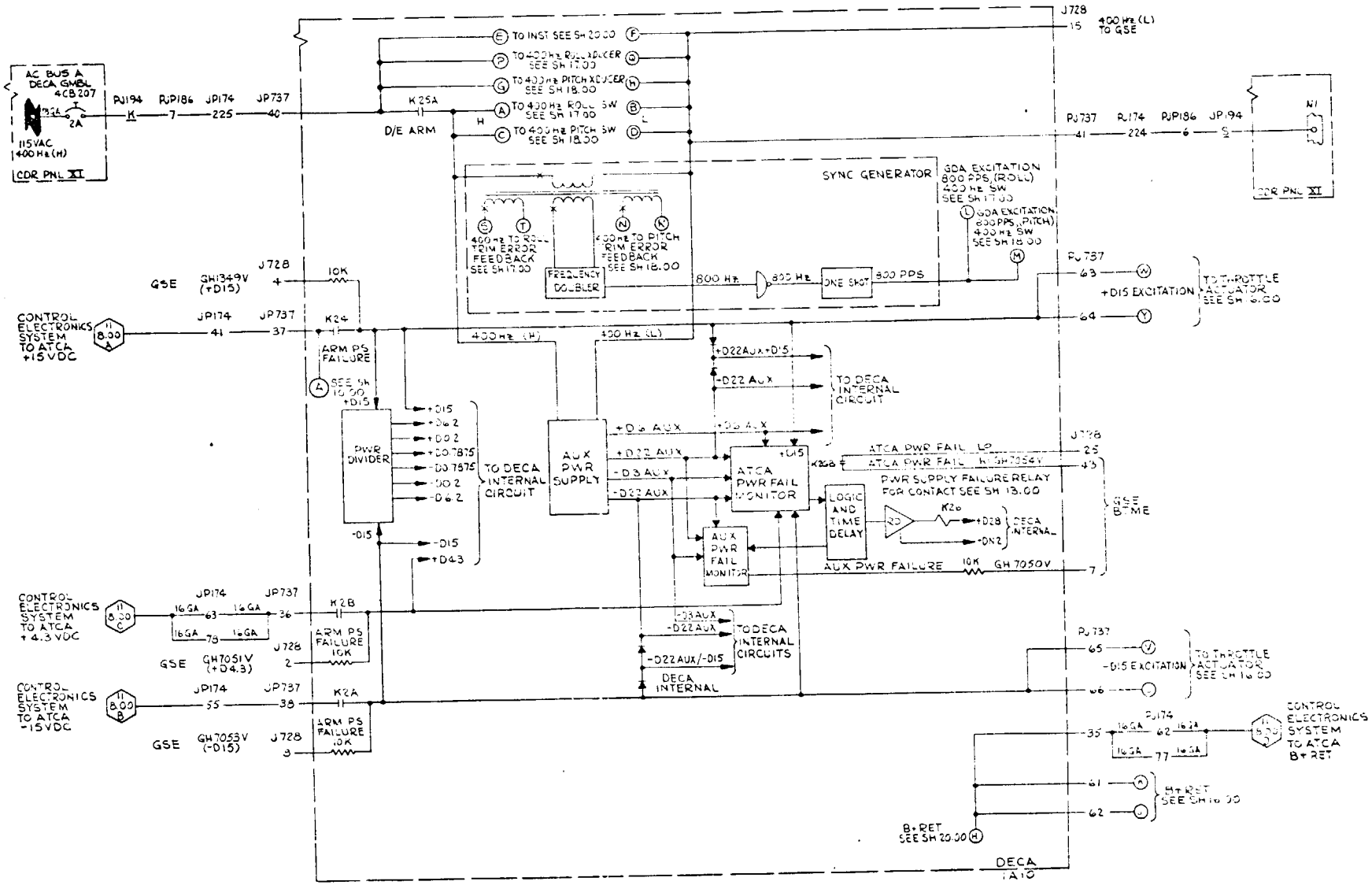
LDW267-60001

ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

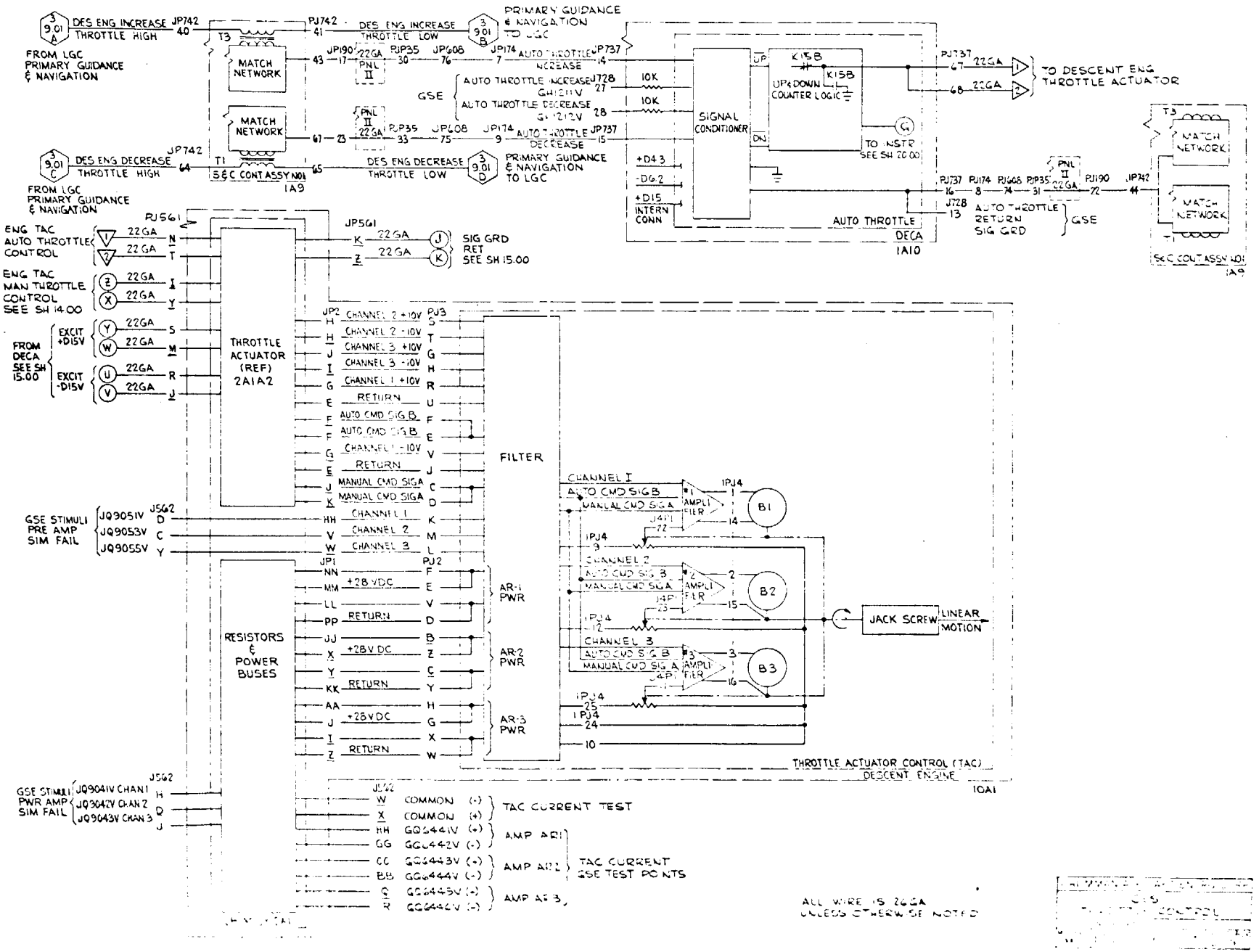

TO EXP DEVICES STAGE CMD
5.00 A
5.03 B
PJ741 70
JP741 69
CR234
K16
R133 CR276
ABORT OR AUTO START K207
ARMED K13
K203
CR242
R238 CR232
PJ741 2 22GA
4 22GA
JP105 P
CDR PNL XI
STAB/CONT AELD 4CB40
75A
+D28
PJ105 N
22GA JP741 1
22GA 3
K11
K12
MAN OVRD REL
FIL 202
N4
CR237
S&C CONT ASSY NO 1 1A9
PJ741 52 76
JP741 77 51
22GA
11.00 C
11.03 D
TO PROP ASC ENG ON CMD
TO EXP DEVICES STAGE CMD
6.00 A
6.03 B
PJ742 53
JP742 51
FROM ENG ARM 4CB37
A
SEE SH 6.00
PJ42 E
JP1810 H
JP742 42
CR246
B
TO ENGINE ON/OFF DC/DC CONVERTERS SEE SH 10.00
CR235
K207
C
SEE SH 10.00
K14 CLOSES ON ASCENT ABORT OR AUTO START
22Z51 CR244
K204
CR245
R239 CR223
STAB/CONT AELD 4CB41
75A
+D28
PJ42 C
JP1810 C
22GA JP742 46
22GA 54
ARMED K13
ABORT OR AUTO START K207
K205
CR243
R240 CR224
K11
K12
MAN OVRD REL
FIL 201
N4
CR236
S&C CONT ASSY NO 1 1A9
PJ742 47 22GA
57 22GA
PJ1810 D
JP42 P
-DN2
LMP PNL XVII
LMP PNL XVI
PJ742 80 81
JP742 78 79
22GA
PJ1810 E
JP1810 F
TO PROP ASC ENG ON CMD
ALL WIRE IS 18GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
CES ASCENT ENGINE START CIRCUIT

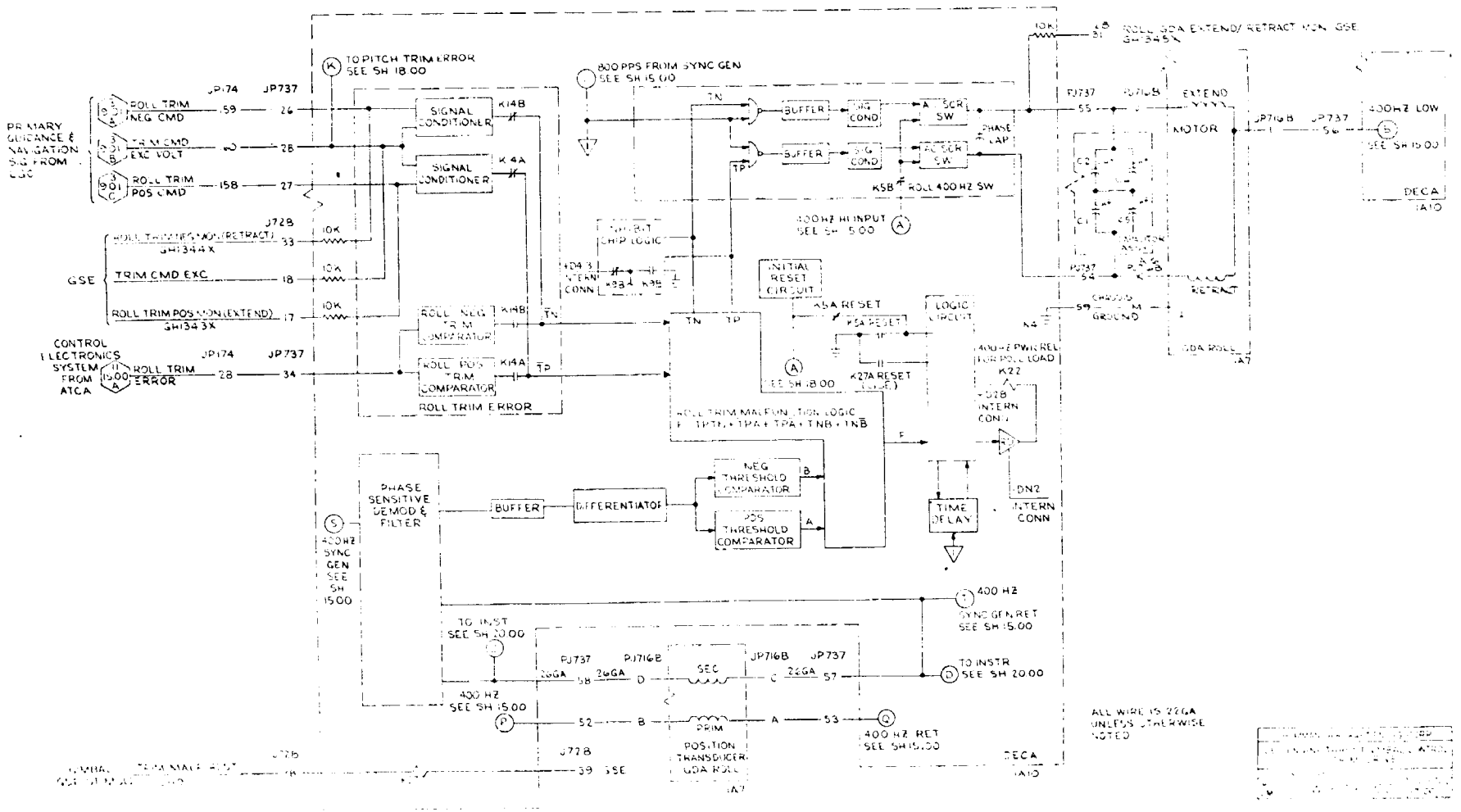

+D28
STAB/CONT DES ENG CVRD 4CB233
10A
LMP PNL XXI
PJP1819 JP174 JP1421
148
1K5A 2K5A PJ1421
S&C CONT ASSY NO 3
1A13
CR1
CR2
CR3
CR4
DIODE ASSY DES ENG PRE VALVE PWR
1A15
PJ560
PRE VALVE
DES ENG 10A1
JP560
DIODE ASSY DES ENG PRE VALVE PWR
1A15
JP1421
PJ1421 PJ174 PJP1819
146
-DN2
LMP PNL XXI
JP727 W X
JP727 H G
BUSSED CONTACTS
PJ727
PJ773 PJP772 JP773
12GA
61
76
-DN2
CDR PNL XI
+D28 STAB CONT DECA PWR 4CB69
10A
20A
FROM CAUTION & WARNING
CDR PNL XI
PJ773 PJP772 JP173
12GA
BUSSED CONTACT
145
160
JP727
DES ENG ARM PRE VALVES
K10A K10B
DES ENG ARM K23
DES ENG ARM K1
BENCH TEST MAINT EQUIP +D28 INPUT PWR GH7055V
J728
37
TO INSTR GH1346X SEE SH 20.00
AUTO DES ENG OFF K6A
+D28 INTERNAL CONN
AUTO DES ENG CONT LATCH K28
THRUST IND K16
JP1420 1K6 PJ1420 JP727
2K6
S&C CONT ASSY NO 3
1A13
AUTO DES ENG ON K6A K6B
MAN DES ENG ON K7A K7B
SHUTOFF VALVES
PROP VALVES
TVA
PJ728 20 PJ727 U V T S
PJ727 E F J K
DECA 1A10
GH7056V +D28 ENG START TO BTME
PJ560
JP560
DES ENGINE POWER SUPPLY THROTTLE ACTUATOR (TCA)
TO DELAY TIMER EXPLOSIVE DEVICES
5DC
6DC
RED
BLK
+D28 REDUNDANT SUPPLY
-DN2 RETURN
PROPELLANT SHUT-OFF SOLENOID VALVES
DESCENT ENGINE
1OA1
ALL WIRE IS 16GA UNLESS OTHERWISE NOTED
CES DESCENT ENGINE START CIRCUIT

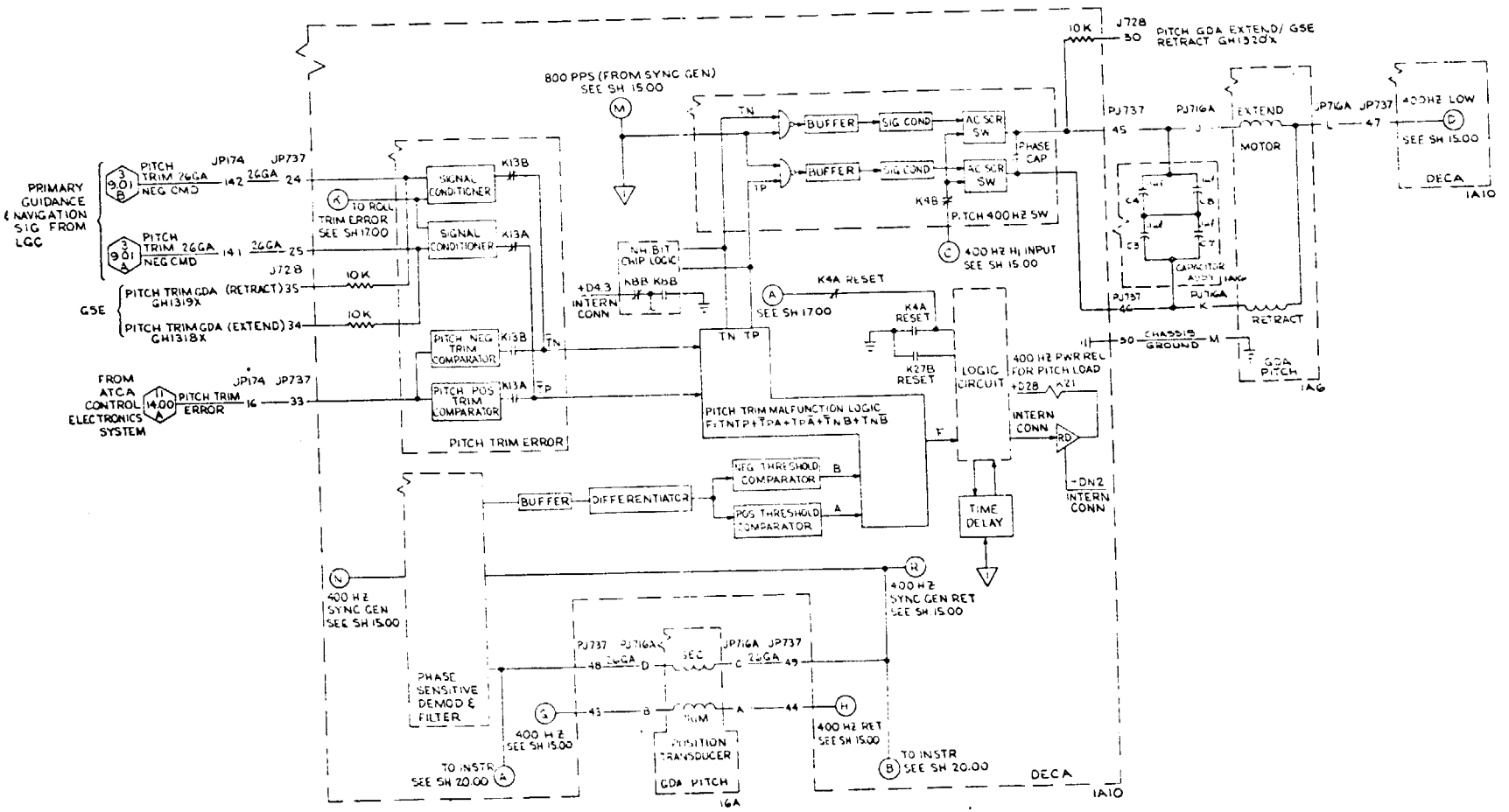

FROM CONTROL ELECTRONICS SYSTEM 800HZ AGS HIGH PGNS LOW
MANUAL THROTTLE SWITCH 1S10
JP196 58
5
6 CDR
4 LMP
2
3
1
PJ196 83
PJ181 33
800 HZ FUSE ASSY #2 9A4
JP181 35
JP706A A
S7
C1
PJ706A B
PJ181 36
F12 1AMP 800 HZ FUSE ASSY #2 9A4
JP181 34
JP196 82
PJ196 59
JP196
FROM CONTROL ELECTRONICS SYSTEM 800HZ PGNS HIGH AGS LOW
43
26 GA
C
THROTTLE JET CONT SWITH-1
D
26 GA
44
THRUST/TRANSLATION CONTROLLER
CDR
1A3
SEE SH 20.00
800 HZ
3V RMS MAX THROT
0.54V RMS MIN THROT
J
PJ737 69
X
70
Z
TO DES ENG THROTTLE ACTUATOR SEE SH16.00
IDEAL DIODE CIRCUIT
LOW PASS FILTER
PJ196 14
26GA
PJP185 80
26GA
JPJ808 29
26GA
JP174 57
26GA
JP737 22
10K
10K
PJ737 23
26GA
PJ174 43
26GA
PJ1808 13
26GA
PJP185 81
26GA
JPJ96 13
DESCENT ENGINE CONTROL ASSY
1A10
RET
J728 40 41
MAN THROT CMD MAIN THRUST CONTROL FROM GSE GH1852V
THROTTLE JET CONT SW TH-2
PJ196 68
26 GA
JP706B C
PJ706B D
26GA
JP196 69
84
PJ181 37
800 HZ FUSE ASSY #2 9A4
JP181 39
A
S7
C1
B
PJ181 40
F13 1AMP 800 HZ FUSE ASSY #2 9A4
JP181 38
85
THRUST/TRANSLATION CONTROLLER
LMP
1A11
PANEL I
PANEL I
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED



ALL WIRE IS 20GA UNLESS OTHERWISE NOTED.

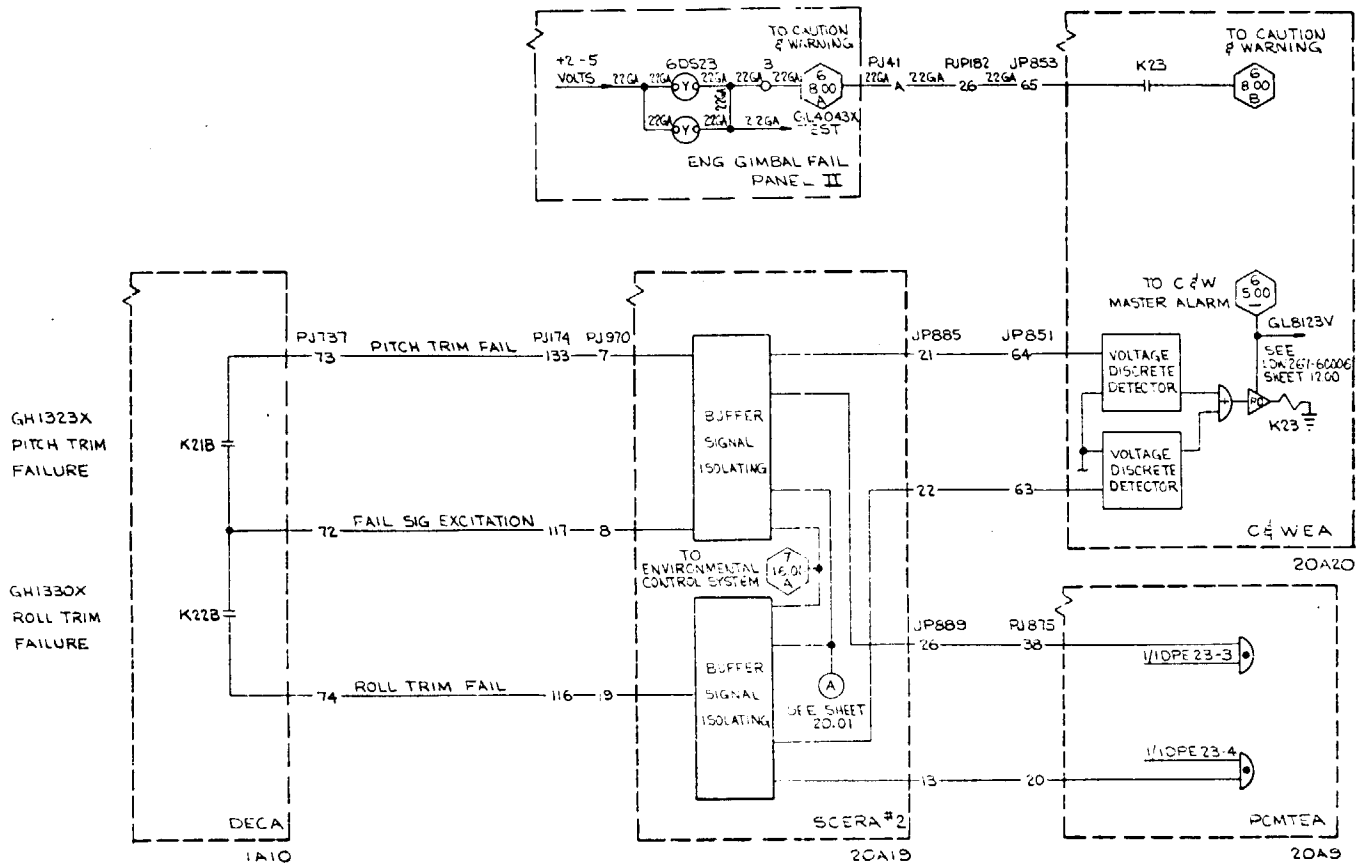

DES ENG INCREASE THROTTLE HIGH
FROM LGC PRIMARY GUIDANCE & NAVIGATION
MATCH NETWORK
DES ENG INCREASE THROTTLE LOW
PRIMARY GUIDANCE & NAVIGATION TO LGC
AUTO THROTTLE INCREASE
AUTO THROTTLE DECREASE
GSE
SIGNAL CONDITIONER
UP & DOWN COUNTER LOGIC
TO DESCENT ENG THROTTLE ACTUATOR
TO INSTR SEE SH 20.00
DES ENG DECREASE THROTTLE HIGH
DES ENG DECREASE THROTTLE LOW
S&C CONT ASSY NO1
+D43
-D62
+D15
INTERN CONN
AUTO THROTTLE RETURN SIG GRD
DECA
ENG TAC AUTO THROTTLE CONTROL
ENG TAC MAN THROTTLE CONTROL SEE SH 14.00
FROM DECA SEE SH 15.00
EXCIT +D15V
EXCIT -D15V
THROTTLE ACTUATOR (REF) 2A1A2
SIG GRD RET SEE SH 15.00
CHANNEL 2 +10V
CHANNEL 2 -10V
CHANNEL 3 +10V
CHANNEL 3 -10V
CHANNEL 1 +10V
RETURN
AUTO CMD SIG B
MANUAL CMD SIG A
FILTER
GSE STIMULI PRE AMP SIM FAIL
JQ9051V
JQ9053V
JQ9055V
CHANNEL 1
CHANNEL 2
CHANNEL 3
RESISTORS & POWER BUSES
+28 VDC
+28V DC
AR-1 PWR
AR-2 PWR
AR-3 PWR
CHANNEL 1
CHANNEL 2
CHANNEL 3
AMPLI FIER
B1
B2
B3
JACK SCREW
LINEAR MOTION
THROTTLE ACTUATOR CONTROL (TAC) DESCENT ENGINE
GSE STIMULI PWR AMP SIM FAIL
JQ9041V CHAN 1
JQ9042V CHAN 2
JQ9043V CHAN 3
TAC CURRENT TEST
COMMON (-)
COMMON (+)
AMP AR1
AMP AR2
AMP AR3
TAC CURRENT GSE TEST POINTS
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED


PRIMARY GUIDANCE & NAVIGATION S/S FROM LSC
ROLL TRIM NEG CMD
TRIM CMD EXC VOLT
ROLL TRIM POS CMD
GSE
TRIM CMD EXC
CONTROL ELECTRONICS SYSTEM FROM ATCA
ROLL TRIM ERROR
SIGNAL CONDITIONER
SIGNAL CONDITIONER
ROLL NEG TRIM COMPARATOR
ROLL POS TRIM COMPARATOR
ROLL TRIM ERROR
TO PITCH TRIM ERROR SEE SH 18.00
800 PPS FROM SYNC GEN SEE SH 15.00
BUFFER
BUFFER
SIG COND
SIG COND
AC SCR SW
AC SCR SW
PHASE LAP
K5B ROLL 400 HZ SW
400 HZ HI INPUT SEE SH 5.00
INITIAL RESET CIRCUIT
A5A RESET
K27A RESET
LOGIC CIRCUIT
400 HZ PWR REL FOR ROLL LOAD
K22
ROLL TRIM MALFUNCTION LOGIC
PHASE SENSITIVE DEMOD & FILTER
BUFFER
DIFFERENTIATOR
NEG THRESHOLD COMPARATOR
POS THRESHOLD COMPARATOR
TIME DELAY
400 HZ SYNC GEN SEE SH 15.00
TO INST SEE SH 20.00
400 HZ SEE SH 15.00
SEC
PRIM
POSITION TRANSDUCER GDA ROLL
400 HZ RET SEE SH 15.00
TO INSTR SEE SH 20.00
ROLL GDA EXTEND/ RETRACT MON GSE
EXTEND
MOTOR
RETRACT
GDA ROLL
400HZ LOW SEE SH 15.00
DECA
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

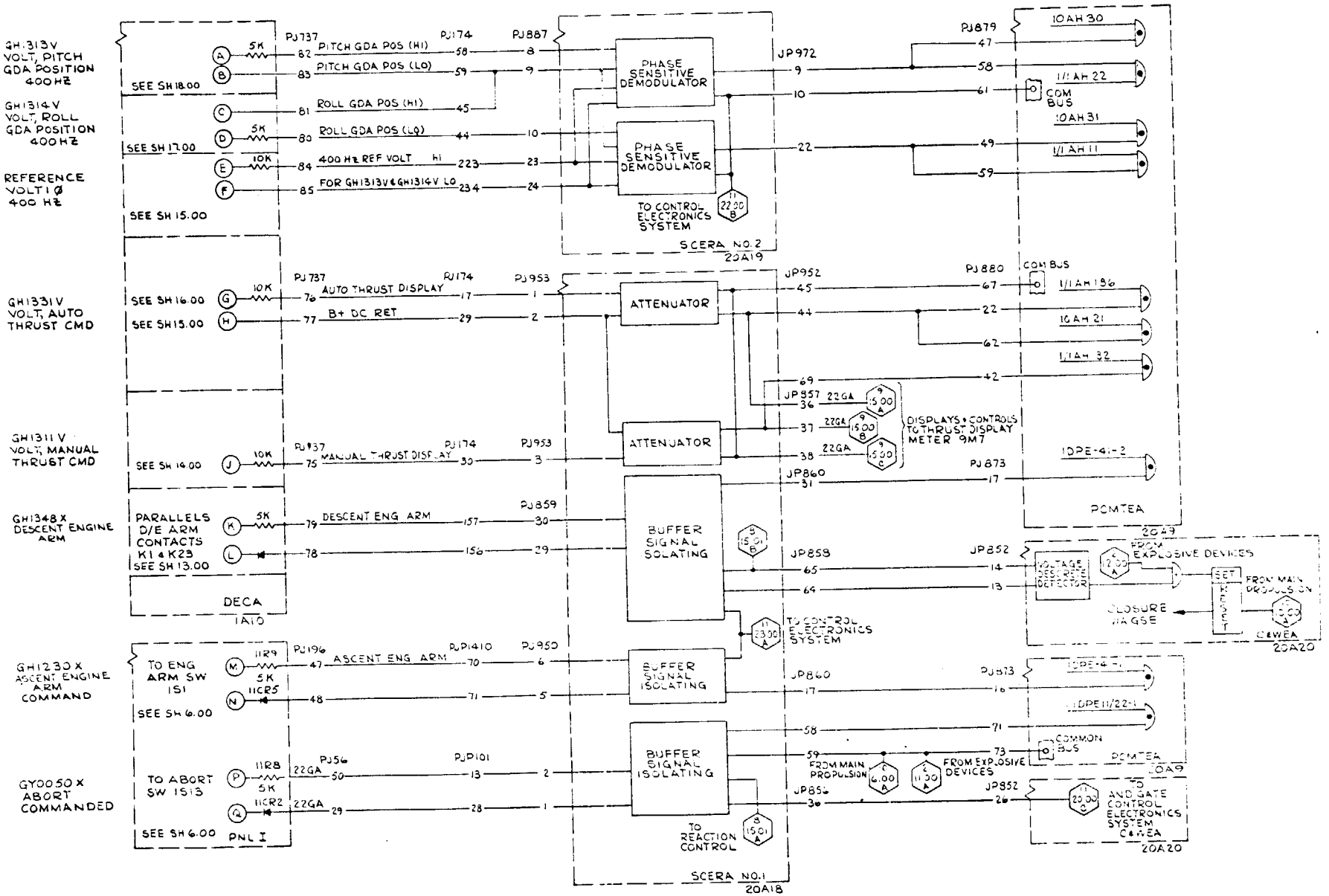


ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGINEERING CORP
GDC ENGINE THRUST SMALL CONTROL PITCH
SCALE DWG SIZE

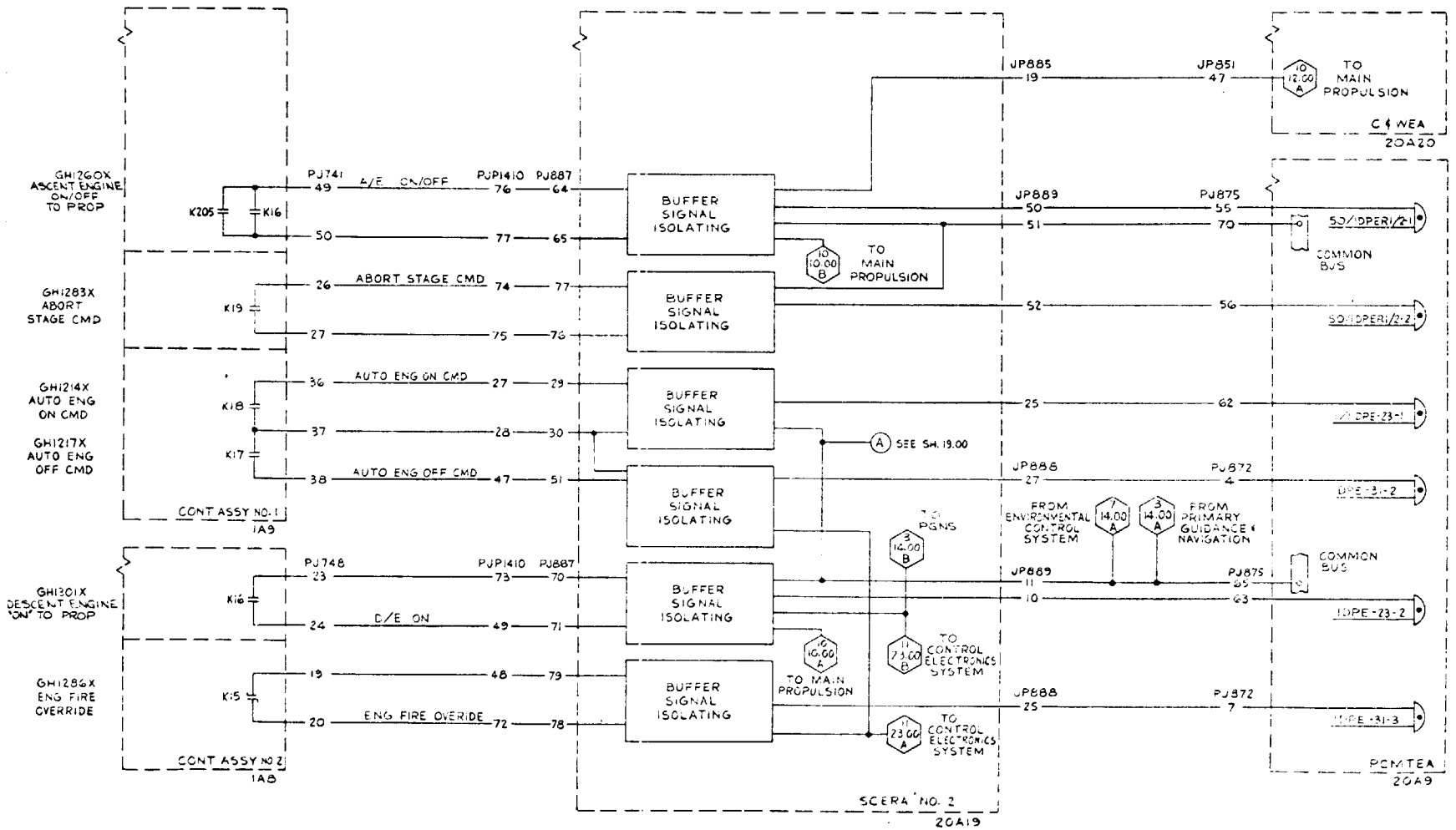


ALL WIRE IS 26 GAGE UNLESS OTHERWISE NOTED.



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGRG CORP	
CES	
OI ENGINE THRUST	
CODE IDENT NO. 26512	
MODEL LM	LDW207-6000
SHEET REV	20.00


GH126OX ASCENT ENGINE ON/OFF TO PROP
PJ741
49
A/E ON/OFF
PJP1410
76
PJ887
64
K205
K16
50
77
65
GH1283X ABORT STAGE CMD
26
ABORT STAGE CMD
74
77
K19
27
75
76
GH1214X AUTO ENG ON CMD
GH1217X AUTO ENG OFF CMD
36
AUTO ENG ON CMD
27
29
K18
37
28
30
K17
38
AUTO ENG OFF CMD
47
51
CONT ASSY NO. 1
1A9
GH1301X DESCENT ENGINE "ON" TO PROP
PJ748
23
PJP1410
73
PJ887
70
K16
24
D/E ON
49
71
GH1286X ENG FIRE OVERRIDE
19
48
79
K15
20
ENG FIRE OVERIDE
72
78
CONT ASSY NO 2
1A8
BUFFER SIGNAL ISOLATING
BUFFER SIGNAL ISOLATING
BUFFER SIGNAL ISOLATING
BUFFER SIGNAL ISOLATING
BUFFER SIGNAL ISOLATING
BUFFER SIGNAL ISOLATING
SCERA NO. 2
2OA19
JP885
19
JP851
47
10 12.00 A
TO MAIN PROPULSION
C & WEA
2OA20
JP889
50
51
PJ875
55
70
10 10.00 B
TO MAIN PROPULSION
SO/IOPER1/2-1
COMMON BUS
52
56
SO/IOPER1/2-2
25
62
IOPE-23-1
A SEE SH. 19.00
JP886
27
PJ872
4
IOPE-31-2
FROM ENVIRONMENTAL CONTROL SYSTEM
1 14.00 A
3 14.00 A
FROM PRIMARY GUIDANCE & NAVIGATION
3 14.00 B
TO PGNS
COMMON BUS
JP869
11
10
PJ875
65
63
IOPE-23-2
10 10.00 A
TO MAIN PROPULSION
11 23.00 B
TO CONTROL ELECTRONICS SYSTEM
JP888
25
PJ872
7
IOPE-31-3
11 23.00 A
TO CONTROL ELECTRONICS SYSTEM
PCM TEA
2OA9
ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED
GRUMMAN AEROSPACE CORP

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 2)

MECHANICAL DESIGN

EXPLOSIVE DEVICES

[illegible] NO)

1. Applicable Documents

Level Three Drawings

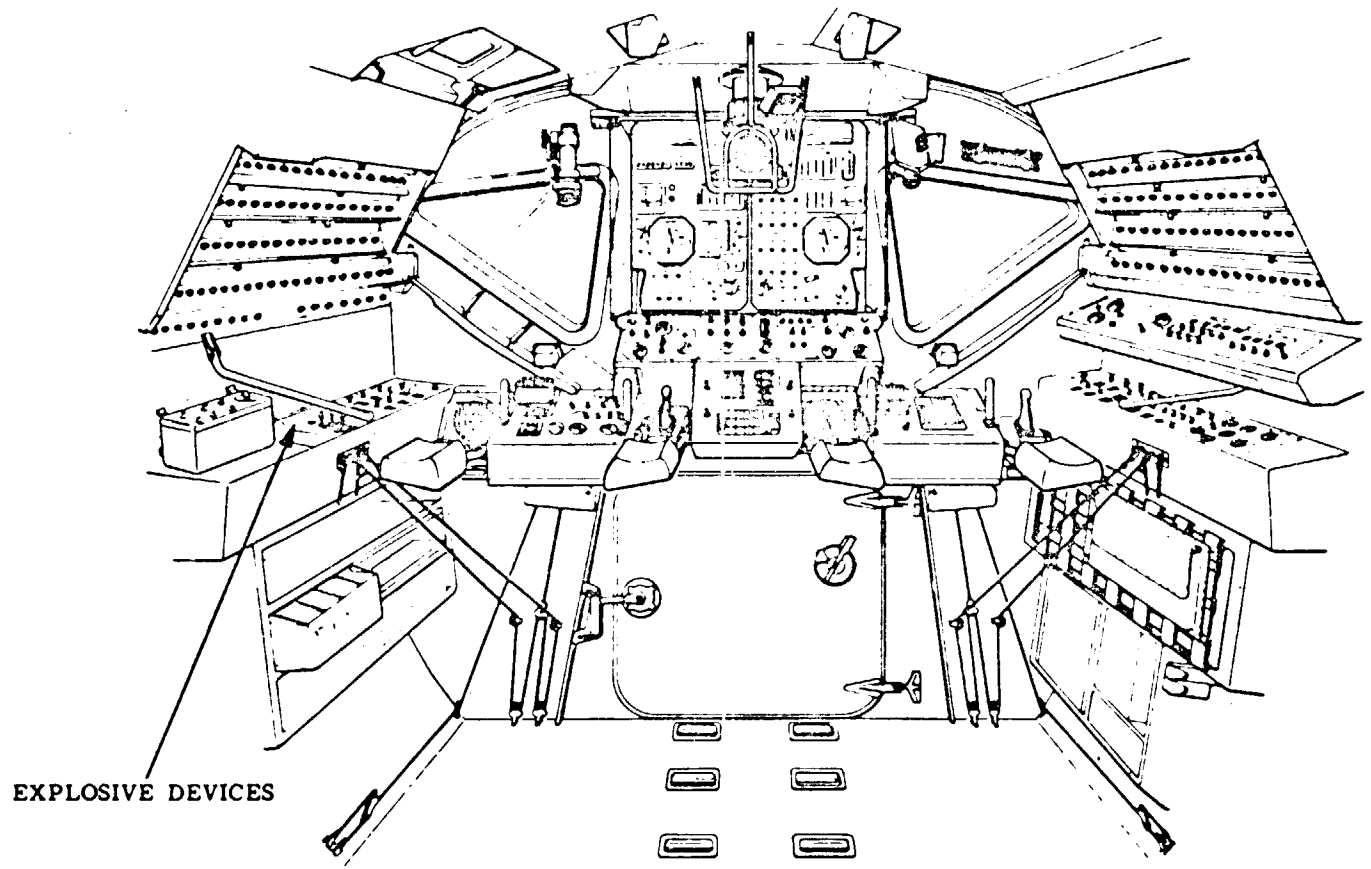
ITEM NAME	DWG. NO.	REV.	E. O. 's
Mechanical Design Sub-System	LDW320-60001	A	

2. Table of Contents

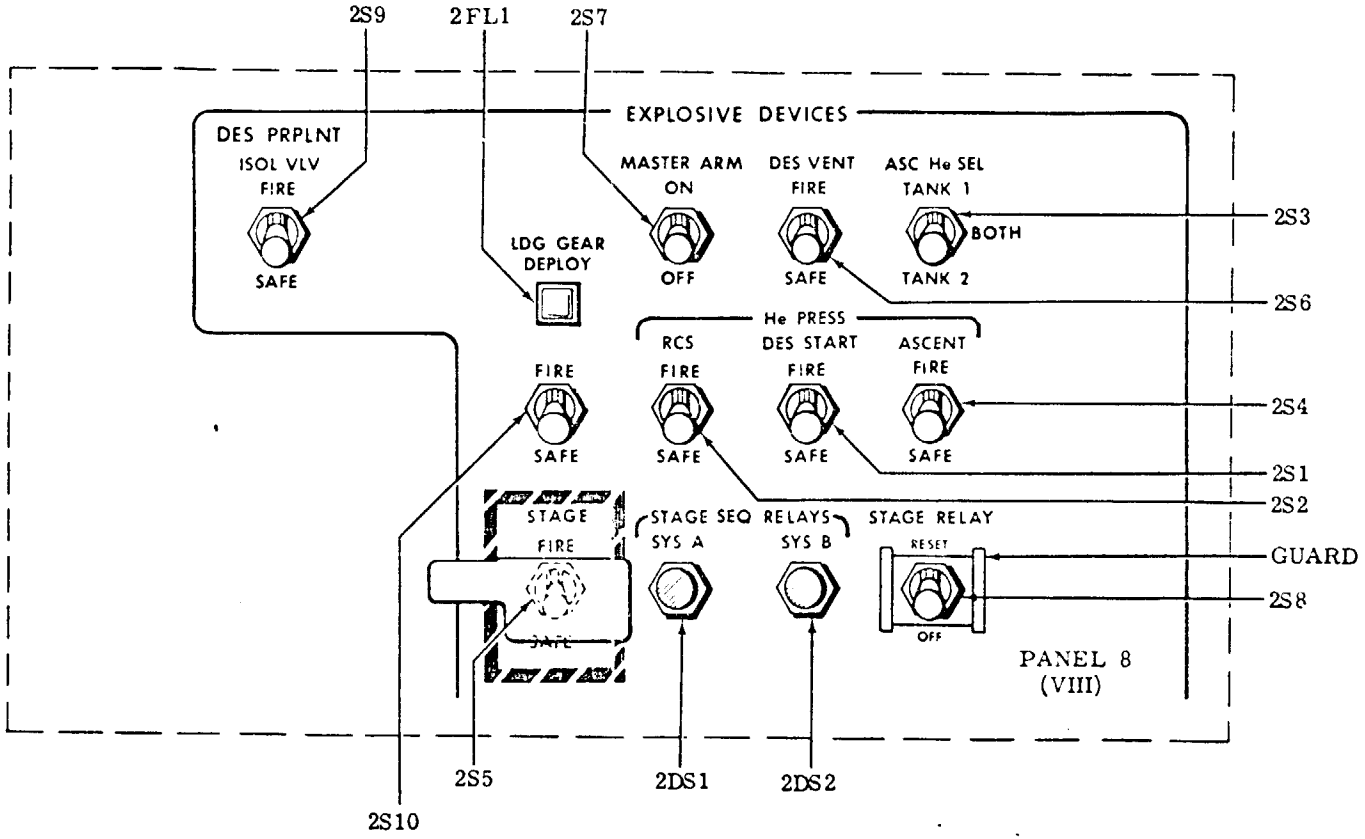
	ITEM NAME	DWG. NO.
a)	Cover Sheet	2-1001
b)	Applicable Documents, Table of Contents, Notes, and Applicable Revisions	2-1002 & 2-1002.1
c)	Cabin Location of Explosive Devices Controls and Indicators	2-1003
d)	Mechanical Design-Explosive Devices Controls and Indicators Layout	2-1004
e)	Mechanical Design-Explosive Devices Controls/Indicators/Functional Description	2-1005 thru 2-1005.2
f)	Mechanical Design-Explosive Devices Block Diagram	LDW267-60002 SH 4.00
g)	Mechanical Design-Explosive Devices Panel Control System "A"	LDW267-60002 SH 5.00
h)	Mechanical Design-Explosive Deivces Panel Control System "B"	LDW267-60002 SH 6.00
i)	Mechanical Design-Explosive Devices Battery Control System "A"	LDW267-60002 SH 7.00
j)	Mechanical Design-Explosive Devices Battery Control System "B"	LDW267-60002 SH 8.00
k)	Mechanical Design-Explosive Devices Squib Control System "A"	LDW267-60002 SH 9.00
l)	Mechanical Design-Explosive Devices Squib Control System "B"	LDW267-60002 SH 10.00
m)	Mechanical Design-Operational Instrumentation Signals to PCMTEA, CAUTION & WARNING	LDW267-60002 SH 11.00
n)	Mechanical Design-Operational Instrumentation Landing Gear & Delay Timer	LDW267-60002 SH 12.00

3. Applicable Revisions

Rev.	Sheet No.	LCD	Description
A	2-1004 2-1005.1	5157F	Addition of circuit breaker guards on panels 11 and 16.



Cabin Location of Explosive Devices Controls and Indicators



Explosive Devices Controls and Indicators Layout

SUBSYSTEM: MECHANICAL DESIGN - EXPLOSIVE DEVICES (FUNCTIONAL GROUPING 2)

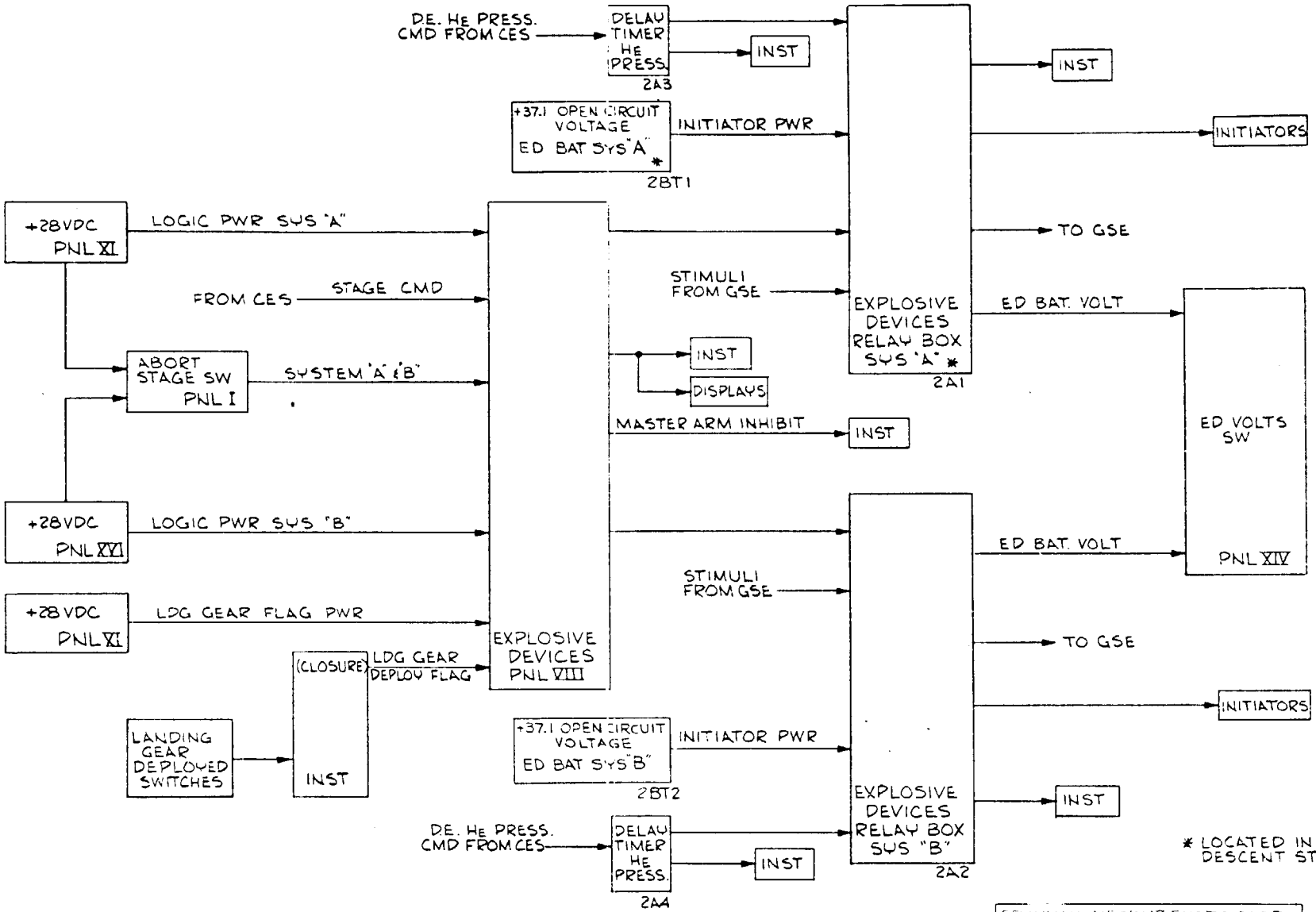
Code	Control/Indicator	Function
2S1	DESCENT START He PRESS SWITCH 2-POSITION TOGGLE MOM-LOCK	This two-position toggle (FIRE-SAFE) activates the squib valves to permit helium flow from the ambient helium storage tank for start pressurization of the descent propulsion subsystem. 2S9 must be activated prior to activating this control to allow the helium regulator to see maximum ullage volume.
2S2	He PRESS RCS SWITCH 2-POSITION TOGGLE MOM-LOCK	This two-position toggle (FIRE-SAFE) actuates squib valves which permit helium to flow from the RCS helium tanks to pressurize the Reaction Control Subsystem. Positive feedback of the firing of the squibs is provided by a nominal pressure reading on the Reaction Control Subsystem's Pressure Indicator (8M1A and 8M1B).
2S3	ASCENT HELIUM SELECT SWITCH 3-POSITION TOGGLE LOCK-LOCK-LOCK	This three-position toggle (TANK 1-BOTH-TANK 2) selects the squib valves of either Ascent Helium Tank 1 or 2, or both, for firing by use of 2S4.
2S4	He PRESS ASCENT SWITCH 2-POSITION TOGGLE MOM-LOCK	This two-position toggle (FIRE-SAFE) actuates the compatibility valves squibs and the Ascent Helium tank(s) selected by 2S3. Actuation of these squib valves will pressurize the Ascent Propulsion Subsystem. Positive feedback of the firing of the squibs is provided by a nominal pressure reading on 10M3A and 10M3B.
2S5	STAGE SWITCH 2-POSITION GUARDED TOGGLE LOCK-LOCK	This guarded two-position toggle (FIRE-SAFE) actuates the explosive devices which separate the descent stage from the ascent stage. This control will only be used when staging is desired without firing the ascent engine.

SUBSYSTEM: MECHANICAL DESIGN - EXPLOSIVE DEVICES (FUNCTIONAL GROUPING 2)

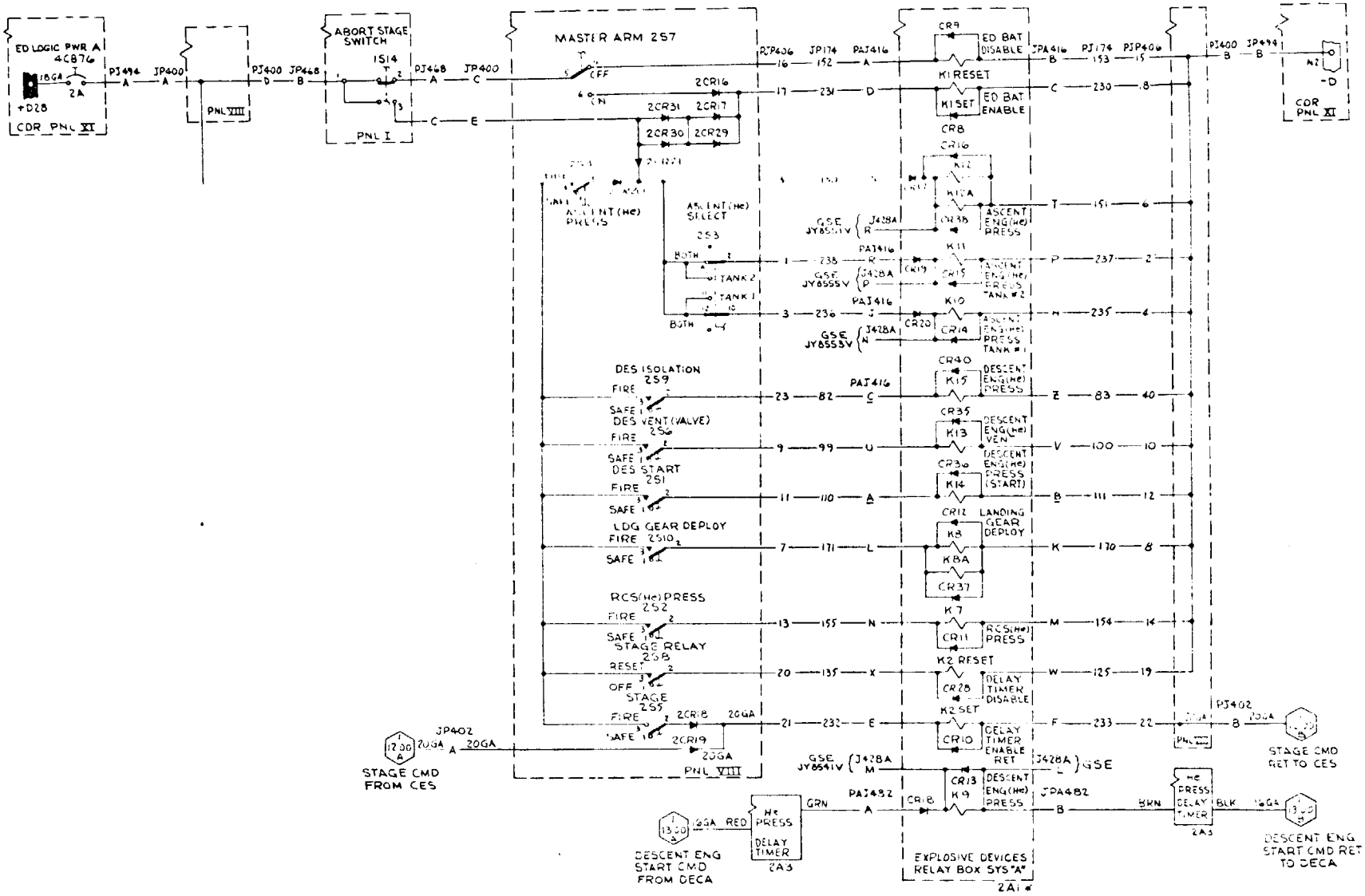
Code	Control/Indicator	Function
2S6	DESCENT VENT SWITCH 2-POSITION TOGGLE MOM-LOCK	This two-position toggle (FIRE-SAFE) activates the squib valves which enable venting of the descent propulsion propellant tanks and helium pressurant through the subsequent activation of the DESCENT FUEL VENT SWITCH (10S9) and the DESCENT OXIDIZER VENT SWITCH (10S10).
2S7	MASTER ARM SWITCH 2-POSITION TOGGLE LOCK-LOCK	This two-position toggle (ON-OFF) enables the firing of all vehicle explosive devices by actuating redundant relays that apply E. D. Battery power to the E. D. busses. Thus, this switch must be in the ON position in order for 2S1, 2S2, 2S4, 2S5, 2S6, 2S9, and 2S10 to perform their designated functions. The ON position also inhibits actuation of ED RELAYS CAUTION LIGHT (6DS31). See Functional Grouping No. 4 for E. D. Battery voltage monitoring.
2S8	STAGE RELAY SWITCH 2-POSITION TOGGLE MOM-LOCK	This guarded two position toggle (RESET-OFF) provides a capability for manual reset of the stage relays.
2S9	DES PRPLNT ISOL VLV 2-POSITION TOGGLE MOM-LOCK	This two position toggle (FIRE-SAFE) actuates the fuel and oxidizer compatability squib which allow the fuel and oxidizer tanks to be pressured after activation of the 2S1 switch.
2S10	LANDING GEAR DEPLOY SWITCH 2-POSITION TOGGLE MOM-LOCK	This two-position toggle (FIRE-SAFE) actuates the explosive devices which release the stowed landing gear. Positive feedback of landing gear deployment is provided by 2FL1.

SUBSYSTEM: MECHANICAL DESIGN - EXPLOSIVE DEVICES (FUNCTIONAL GROUPING 2)

Code	Control/Indicator	Function
2DS1 2DS2	STAGE SEQ RELAYS SYS A STAGE SEQ RELAYS SYS B COMPONENT CAUTION LIGHTS	Each light illuminates if a relay closure occurs in its systems (A or B) stage sequence relay chain. Should either light illuminate because of a stage relay failure, activation of 2S8 to the RESET position will extinguish the light if the stage relay is reset.
2FL1	LANDING GEAR STATUS 2-POSITION FLAG	This two-position flag (GREY-BARBERPOLE) indicates stowed (BARBERPOLE) or deployed (GREY) status of the LM landing gear, as sensed at all four landing struts.



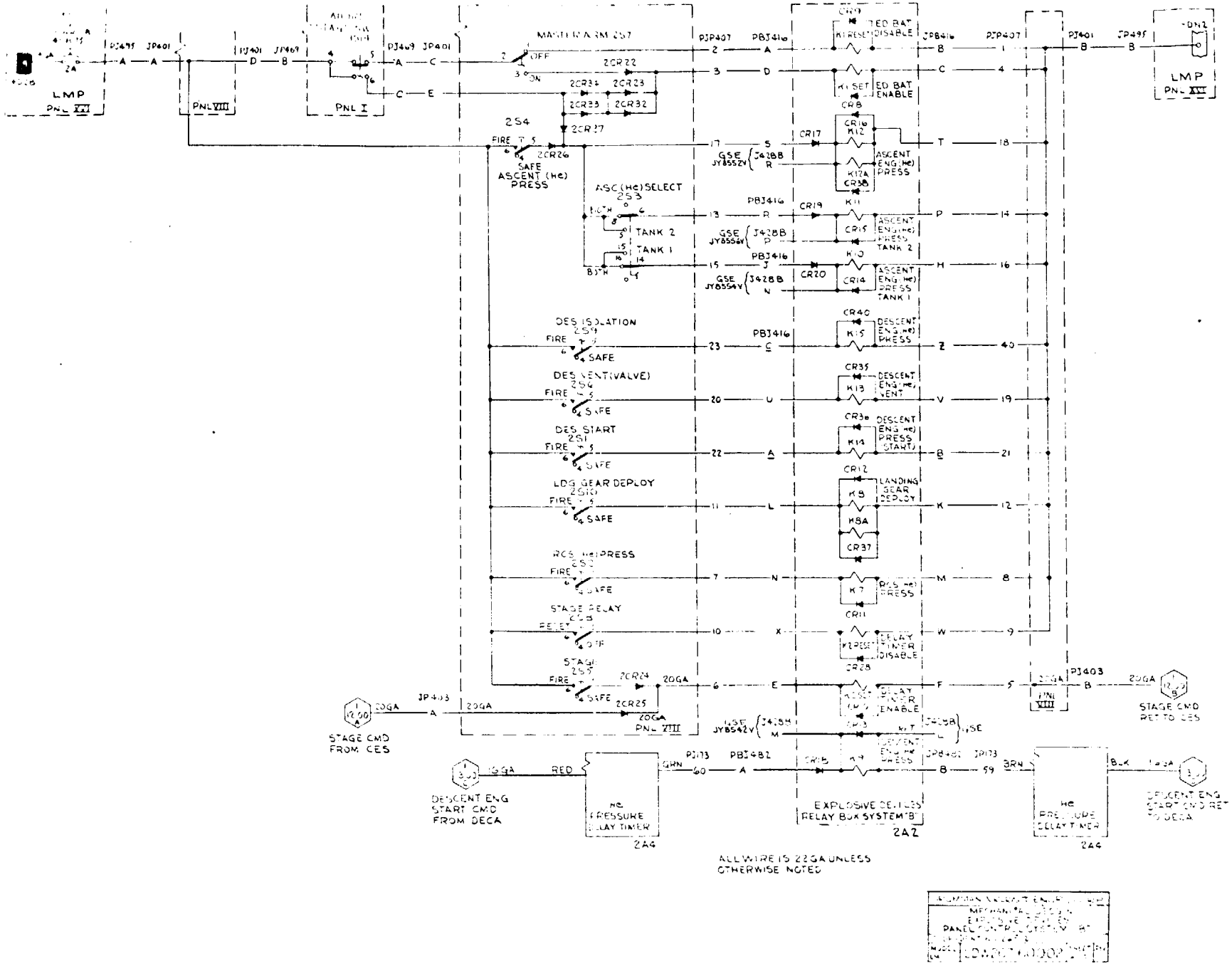
GRUMMAN AIRCRAFT ENGRG CORP			
MECHANICAL DESIGN EXPLOSIVE DEVICES BLOCK DIAGRAM			
CODE IDENT NO 26572			
MODEL LM	LDW267-60002	SHEET 400	REV

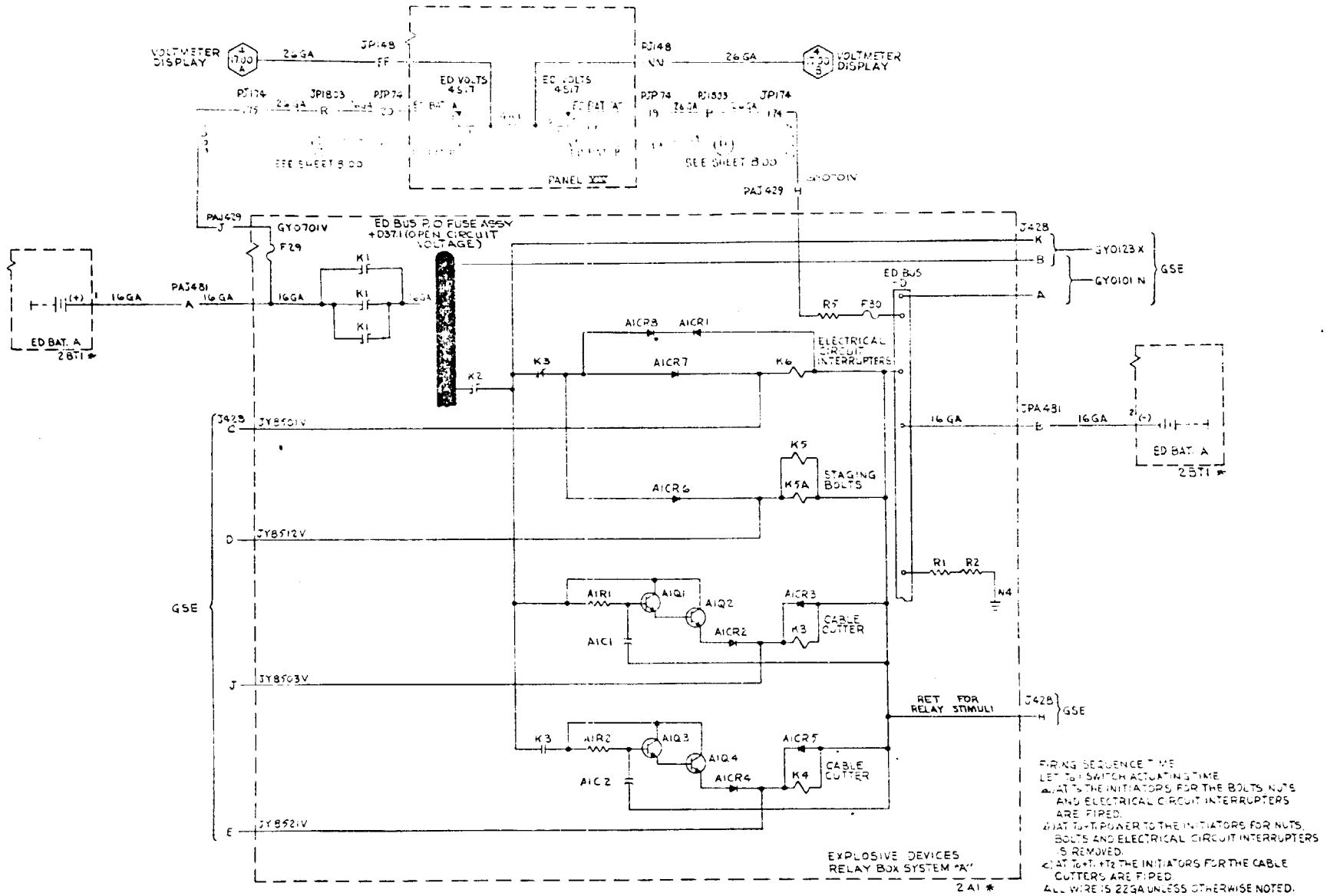


ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

* LOCATED IN THE DESCENT STAGE

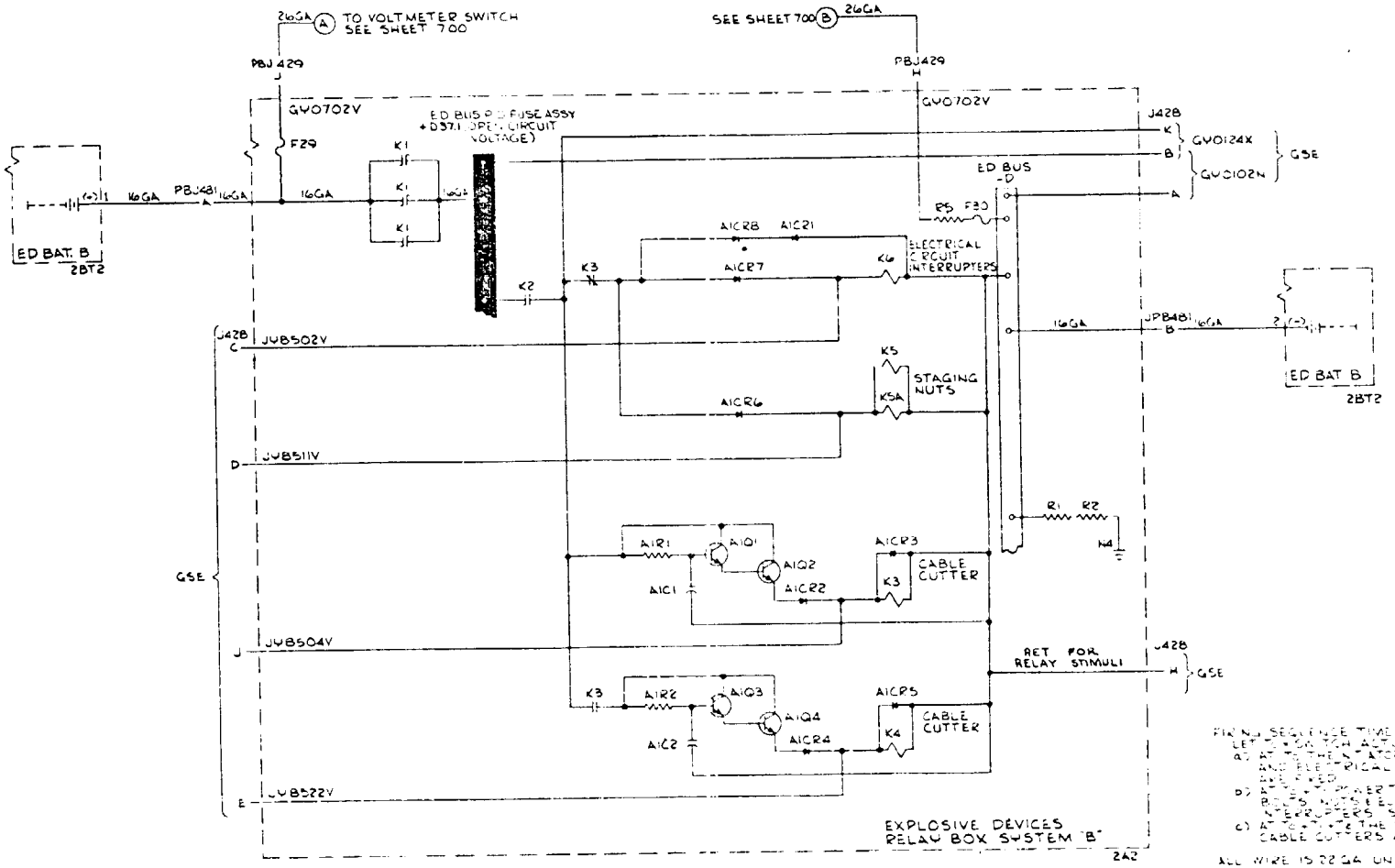
GRUMMAN AIRCRAFT ENGINEERING CORP
MECHANICAL DESIGN
ELECTRIC CENTER
PANEL INSTALLATION
NO.
SIZE
FSCM NO.


LMP
PNL XV
PNL VIII
PNL I
MASTER ARM 2S7
OFF
ON
2S4
FIRE
SAFE
ASCENT (He) PRESS
ASC (He) SELECT
2S3
BOTH
TANK 2
TANK 1
DES ISOLATION
2S9
DES VENT(VALVE)
2S6
DES START
2S1
LDG GEAR DEPLOY
2S10
RCS He PRESS
2S5
STAGE RELAY
2C8
RESET
STAGE
2S7
TED BAT DISABLE
K1 RESET
TED BAT ENABLE
K12
ASCENT ENG(He) PRESS
K12A
K11
ASCENT ENG(He) PRESS TANK 2
K10
ASCENT ENG(He) PRESS TANK 1
K15
DESCENT ENG(He) PRESS
K13
DESCENT ENG(He) VENT
K14
DESCENT ENG He PRESS (START)
K9
LANDING GEAR DEPLOY
K8A
K7
RCS He PRESS
K2
RESET
DELAY TIMER DISABLE
K3
DELAY TIMER ENABLE
K4
DESCENT ENG He PRESS
GSE JY8552V J428B R
GSE JY8555V J428B P
GSE JY8554V J428B N
GSE JY8542V J428B M
GSE J428B L
STAGE CMD FROM CES
STAGE CMD RET TO CES
DESCENT ENG START CMD FROM DECA
DESCENT ENG START CMD RET TO DECA
He PRESSURE DELAY TIMER
2A4
EXPLOSIVE DEVICES RELAY BOX SYSTEM 'B'
2A2
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED



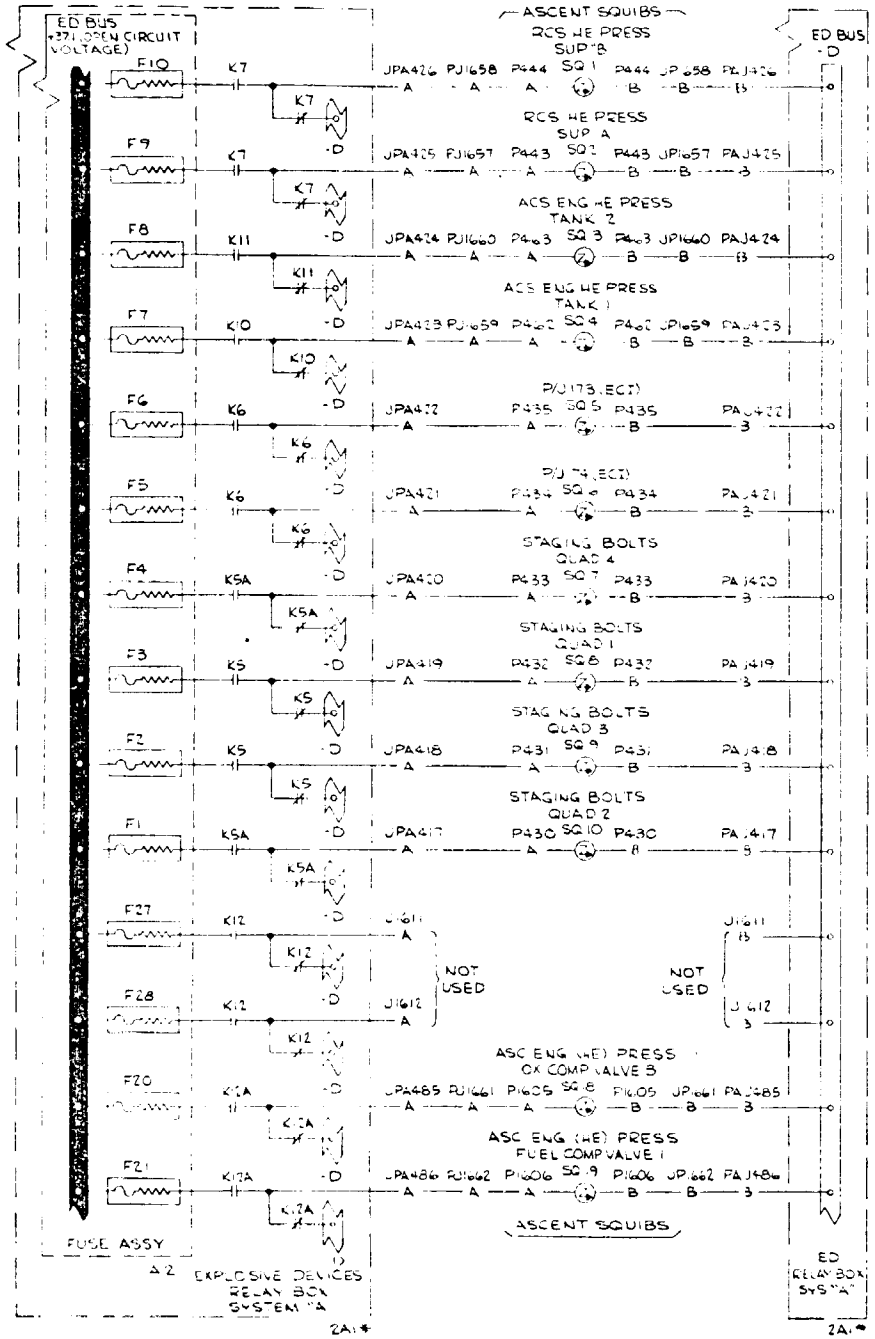
FIRING SEQUENCE TIME
LET T_0 = SWITCH ACTUATING TIME
T_1 AT T_0 THE INITIATORS FOR THE BOLTS, NUTS AND ELECTRICAL CIRCUIT INTERRUPTERS ARE FIRED.
T_2 AT T_0+T_1 POWER TO THE INITIATORS FOR NUTS, BOLTS AND ELECTRICAL CIRCUIT INTERRUPTERS IS REMOVED.
T_3 AT T_0+T_1+T_2 THE INITIATORS FOR THE CABLE CUTTERS ARE FIRED.
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.
* LOCATED IN DESCENT STAGE

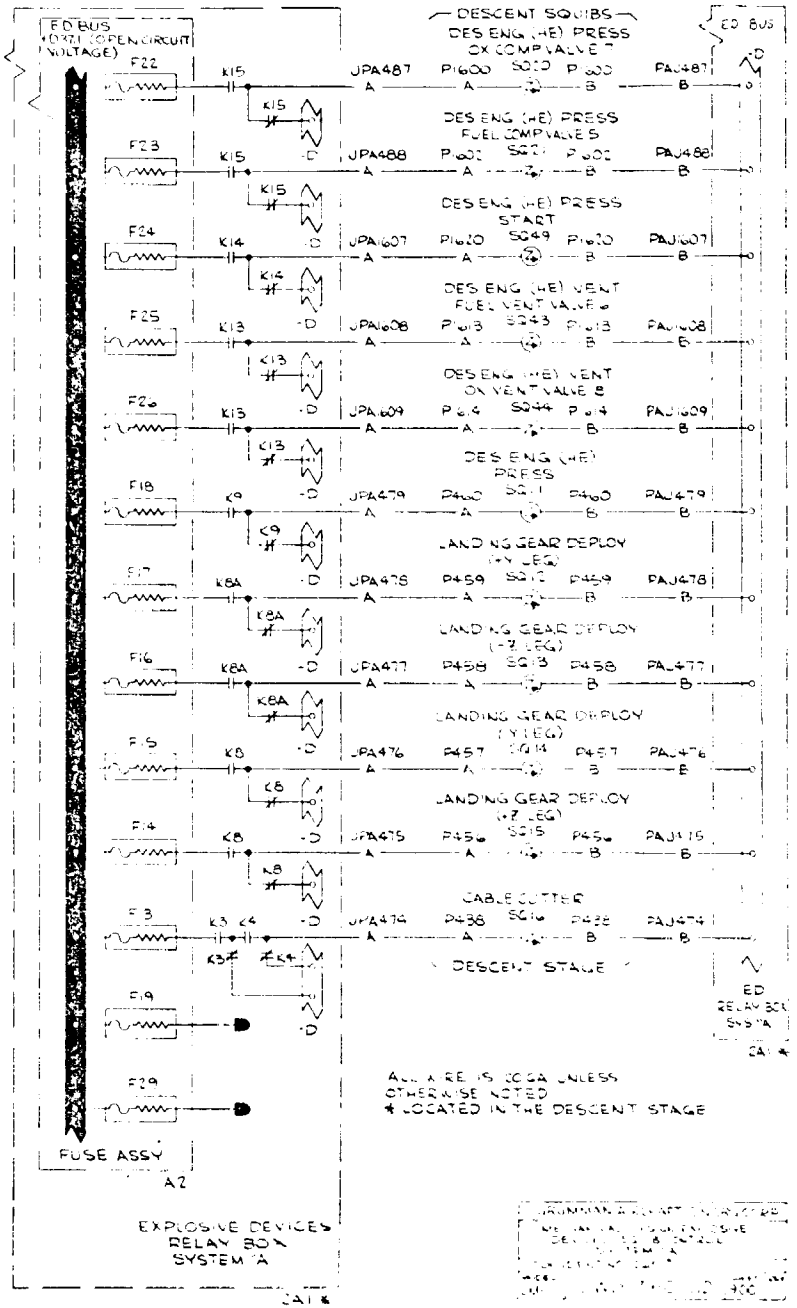
GRUMMAN AEROSPACE ENGINEERING			
MECHANICAL DESIGN-EXPLOSIVE DEVICES-BATTERY CONTROL SYS "A"			
CODE IDENT NO. 14512			
MODEL	LDW 267-60002	SHEET 705	REV

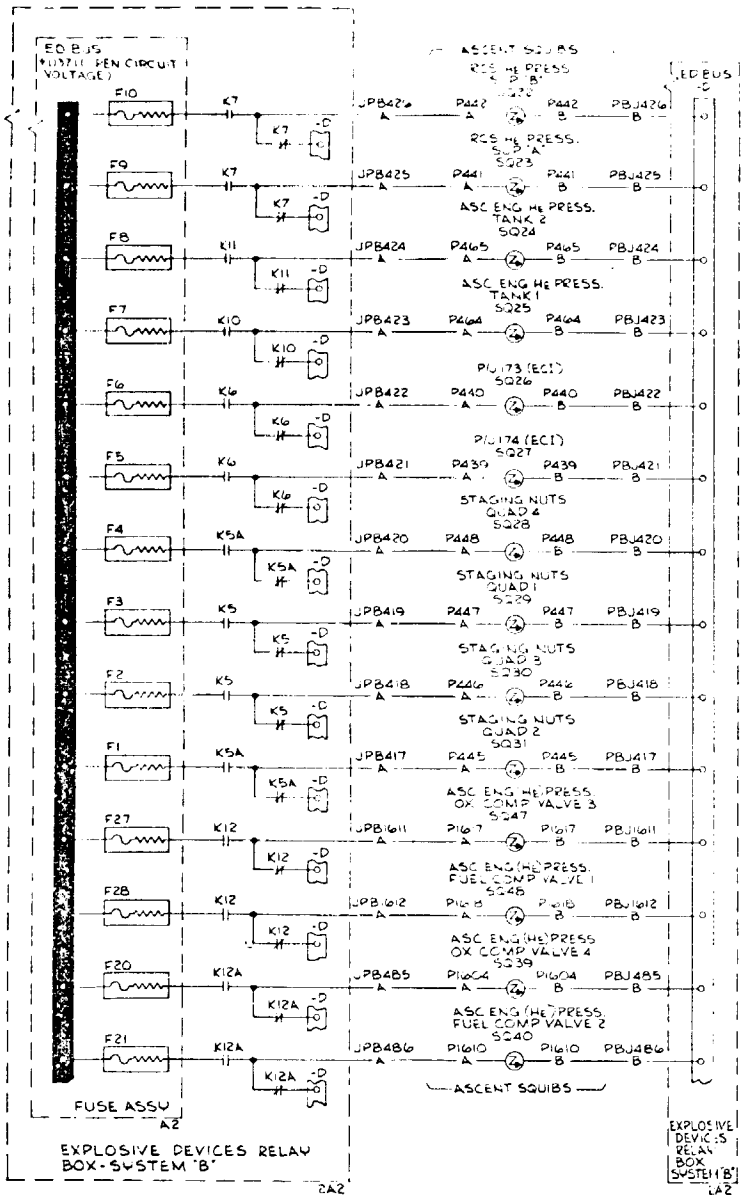


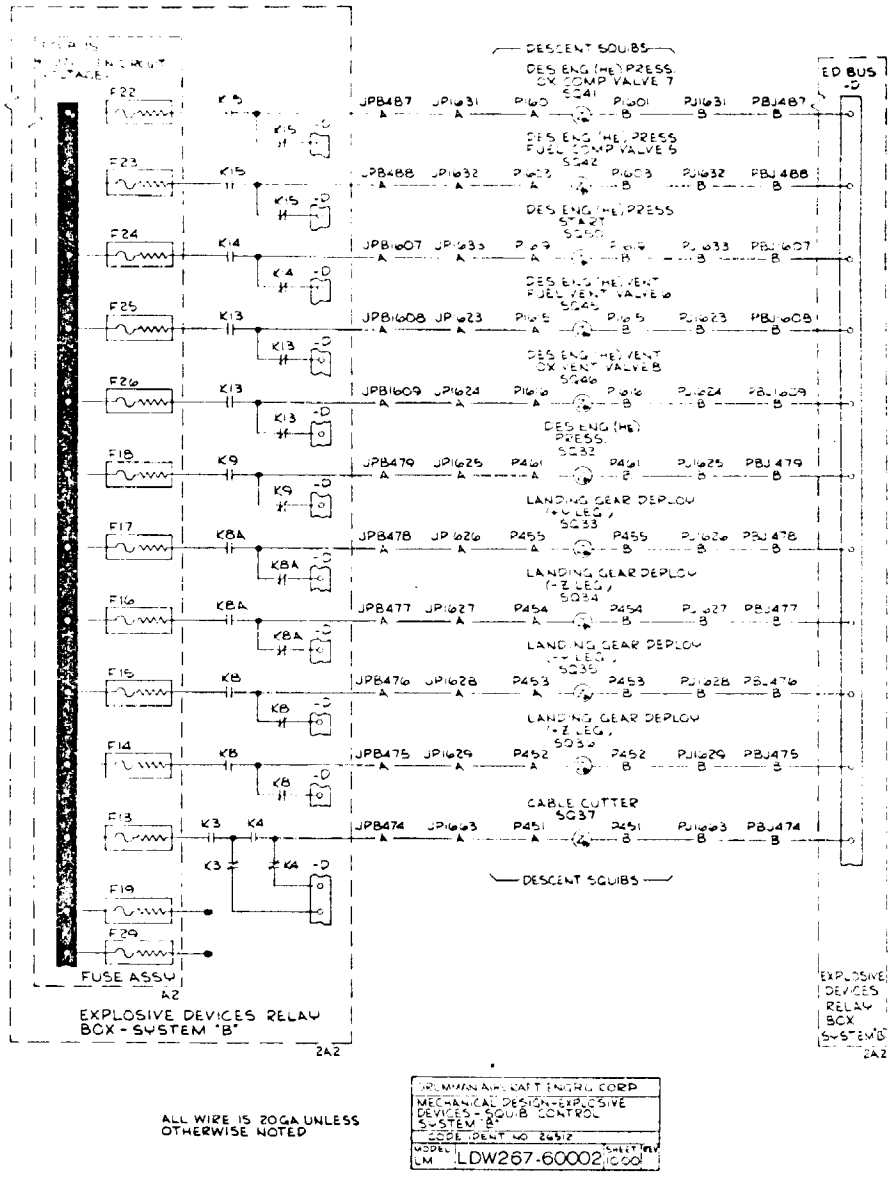
FIRING SEQUENCE TIME
LETTER DESIGNATION ALLOCATING TIME
a) AT T=0 THE INITIATORS FOR THE BOLTS, NUTS AND ELECTRICAL CIRCUIT INTERRUPTERS ARE FIRED.
b) AT T=[illegible] POWER TO THE INITIATORS FOR BOLTS, NUTS & ELECTRICAL CIRCUIT INTERRUPTERS IS REMOVED.
c) AT T=[illegible] THE INITIATORS FOR THE CABLE CUTTERS ARE FIRED.

ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED


ED BUS
(32V OPEN CIRCUIT VOLTAGE)
ASCENT SQUIBS
RCS HE PRESS SUP B
RCS HE PRESS SUP A
ACS ENG HE PRESS TANK 2
ACS ENG HE PRESS TANK 1
P/U 73 (ECT)
P/U 74 (ECT)
STAGING BOLTS QUAD 4
STAGING BOLTS QUAD 1
STAGING BOLTS QUAD 3
STAGING BOLTS QUAD 2
NOT USED
NOT USED
ASC ENG (HE) PRESS OX COMP VALVE B
ASC ENG (HE) PRESS FUEL COMP VALVE 1
ASCENT SQUIBS
ED BUS
FUSE ASSY
A2
EXPLOSIVE DEVICES RELAY BOX SYSTEM "A"
2A1*
ED RELAY BOX SYS "A"
2A1*

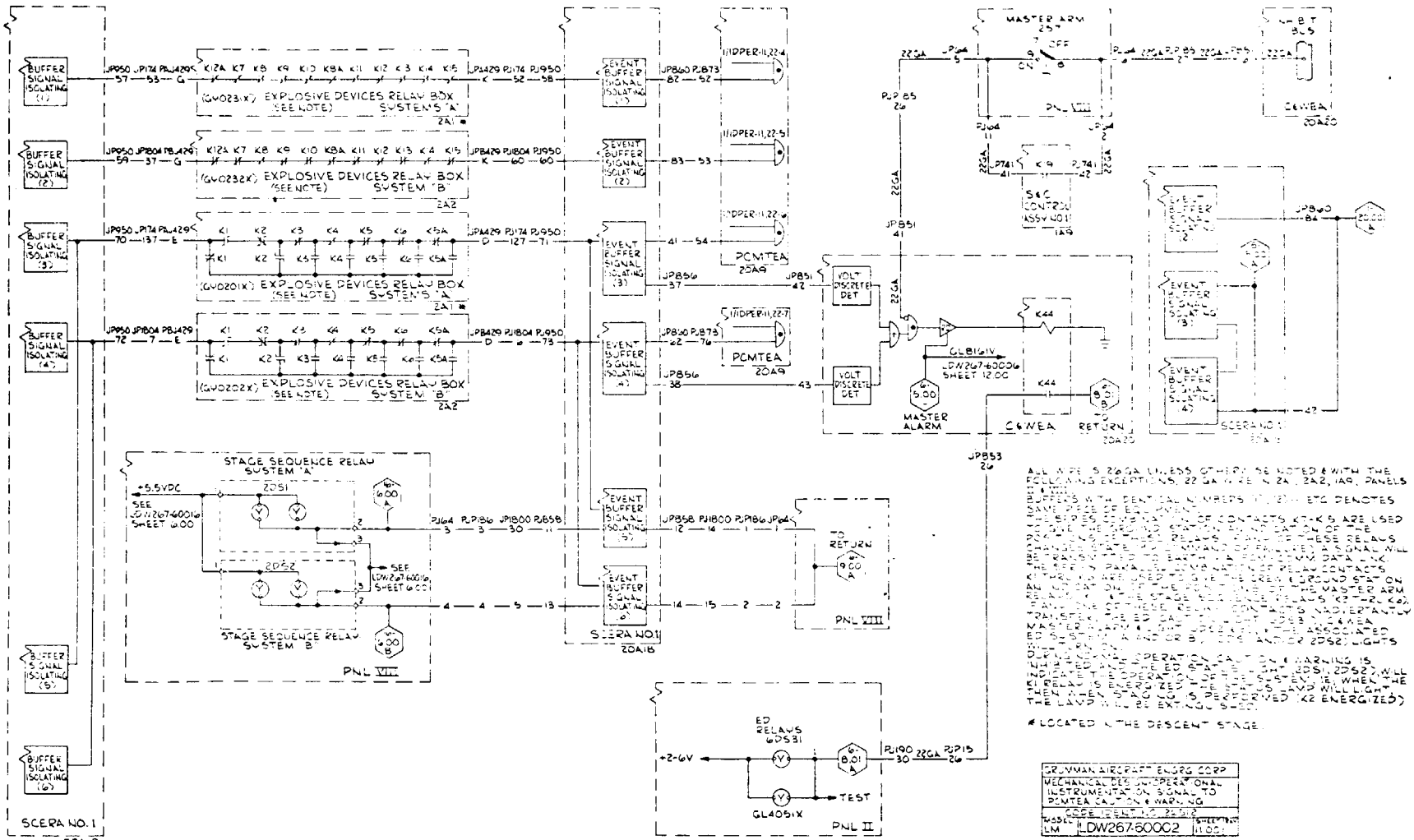

ED BUS
(32V OPEN CIRCUIT VOLTAGE)
DESCENT SQUIBS
DES ENG (HE) PRESS OX COMP VALVE 2
DES ENG (HE) PRESS FUEL COMP VALVE 2
DES ENG (HE) PRESS START
DES ENG (HE) VENT FUEL VENT VALVE 2
DES ENG (HE) VENT OX VENT VALVE 2
DES ENG (HE) PRESS
LANDING GEAR DEPLOY (+Y LEG)
LANDING GEAR DEPLOY (-Y LEG)
LANDING GEAR DEPLOY (+Z LEG)
LANDING GEAR DEPLOY (-Z LEG)
CABLE CUTTER
DESCENT STAGE
ED RELAY BOX SYS "A"
2A1*
ALL K RELAYS 2C93A UNLESS OTHERWISE NOTED
* LOCATED IN THE DESCENT STAGE
FUSE ASSY
A2
EXPLOSIVE DEVICES RELAY BOX SYSTEM "A"
2A1*





ALL WIRE IS 20GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG. CORP
MECHANICAL DESIGN-EXPLOSIVE DEVICES-SQUIB CONTROL SYSTEM 'B'
CODE IDENT NO 24512
MODEL LM LDW267-60002 1000



ALL WIRES 26GA UNLESS OTHERWISE NOTED & WITH THE FOLLOWING EXCEPTIONS. 22 GA WIRES IN 2A1, 2A2, 1A9, PANELS VIII & II.

BUFFERS WITH PENTAGONAL NUMBERS (1), (2), ETC DENOTES SAME PIECE OF EQUIPMENT.

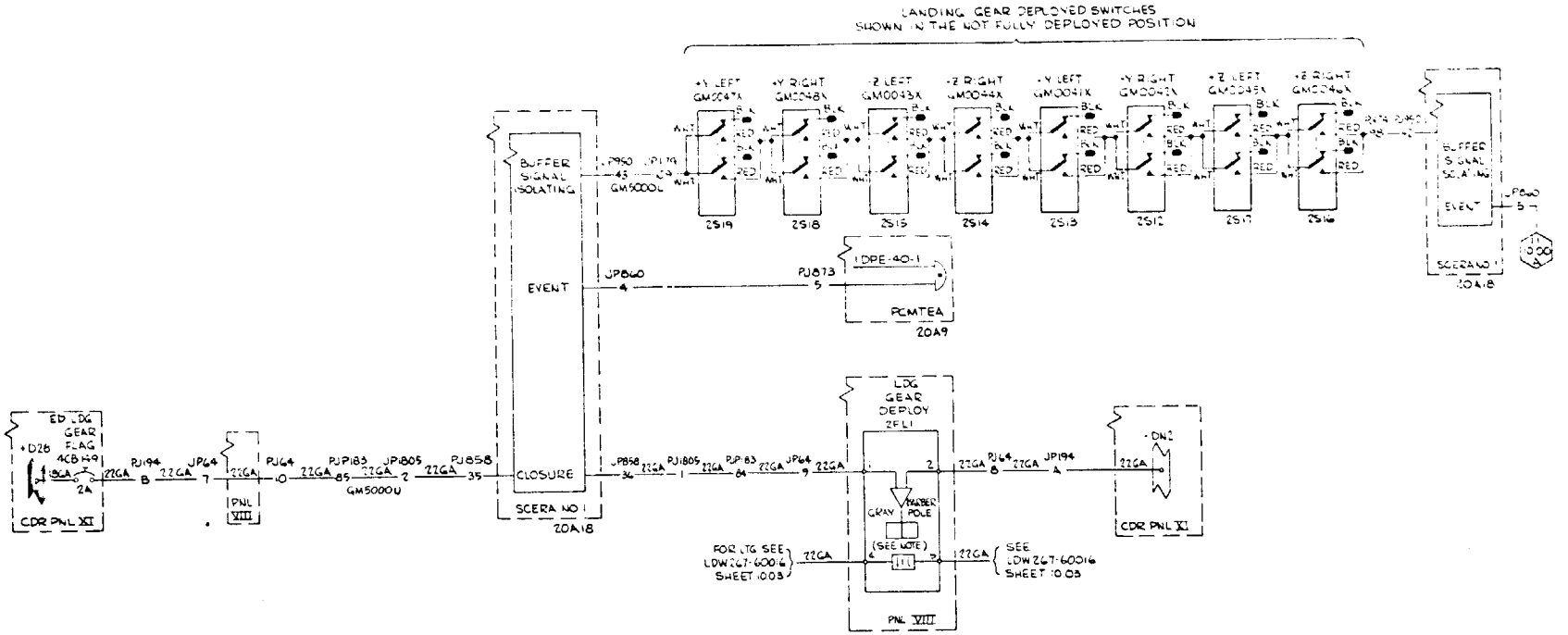
THE SIX SYSTEM 'A' AND 'B' CONTACTS K7-K15 ARE USED TO ENABLE THE FIRING STATION AND INDICATION OF THE FIRING CIRCUIT. THESE RELAYS ONLY OPERATE IF THESE RELAYS CHANGE STATE, AN INVALID OR FALSE FIRING SIGNAL WILL NOT TRANSMIT TO EARTH A FALSE MM DATA LINK.

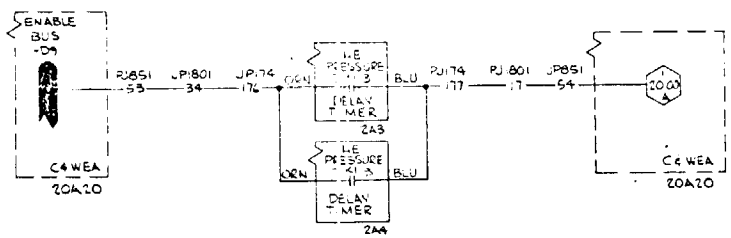
THE SEVEN PANEL ILLUMINATION RELAY CONTACTS K1-K6 ARE USED TO GIVE THE CREW GROUND STATION AN INDICATION OF THE OPERATION OF THE MASTER ARM SWITCH & THE STAGE SEQUENCE RELAYS (K1-K6). FAILURE OF THESE RELAYS TO OPERATE WOULD ADVERSELY TRADITIONALLY THE ED CAPABILITY OF THE 2DS1 & C&WEA MASTER ALARM. ONCE OPERATED, THE ASSOCIATED ED SYSTEM A AND/OR B, ENG ARM (2DS2) LIGHTS WOULD TURN ON.

DURING NORMAL OPERATION (ALL SYSTEMS GO) A WARNING IS INDICATED AND ARMED STATUS LIGHT (2DS1, 2DS2) WILL INDICATE THE OPERATIONAL STATUS OF THE SYSTEM. IE: WHEN THE RELAY IS ENERGIZED THE ASSOCIATED LAMP WILL LIGHT. THEN WHEN STAGING IS PERFORMED (K2 ENERGIZED) THE LAMP WILL BE EXTINGUISHED.

* LOCATED IN THE DESCENT STAGE.

GRUMMAN AIRCRAFT ENGRG CORP	
MECHANICAL DESIGN OPERATIONAL INSTRUMENTATION SIGNAL TO PCMTEA CAUTION & WARNING	
CODE IDENT NO 24161	
ASSEM LM	LDW267-60002 SHEET NO 1.00





ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

WHEN ALL THE LANDING GEARS ARE DEPLOYED, THE FLAG (2EL1) WILL SHOW GRAY. DEPLOYED. IF THE SAME WEIGHT-ON-GROUND STATION WILL RECEIVE AN AIR/GROUND DATA LINK ZONE DISCRETE FROM THE RCV, CONFIRMING ZONE 1 OR MORE LANDING LEGS DO NOT DEPLOY, RCV COMMAND, THE FLAG (2EL1) WILL NOT CHANGE STATE, INDICATING A FAILURE.

CONTRACTOR	GULFSTREAM AEROSPACE CORP.
SUBJECT	WEIGHT ON WHEELS SYSTEM INSTRUMENTATION LANDING GEAR DELAY TIMER
SIZE	DENT NO.
D	LDW267-60002
SHEET	200

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 3)

PRIMARY GUIDANCE AND NAVIGATION SUBSYSTEMS (PGNS)

(REF LDW 267-57003 B)

1. Applicable Documents

Level Three Drawings

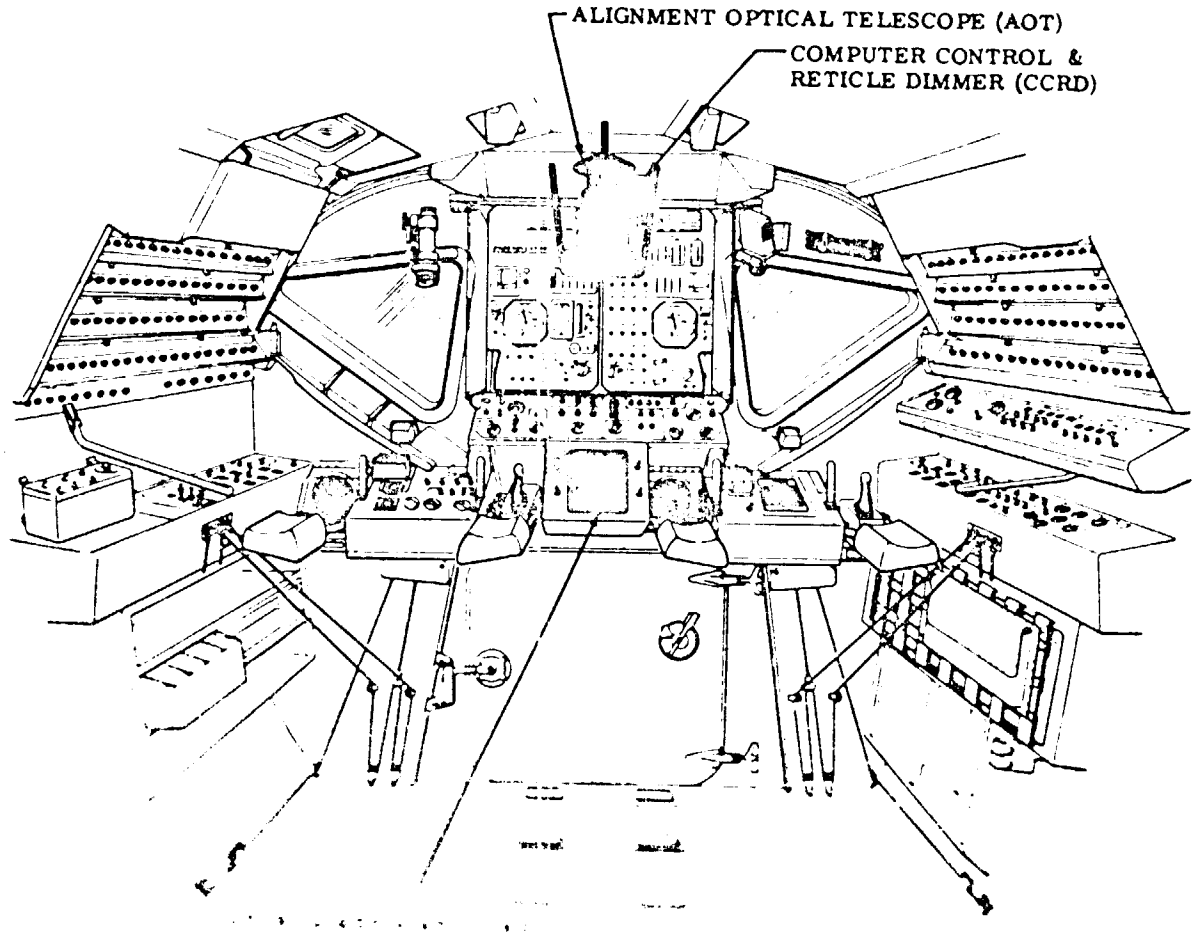
ITEM NAME	DWG. NO.	REV.	E. O.'s
Primary Guidance Navigation and Control	LDW370-54001	M	

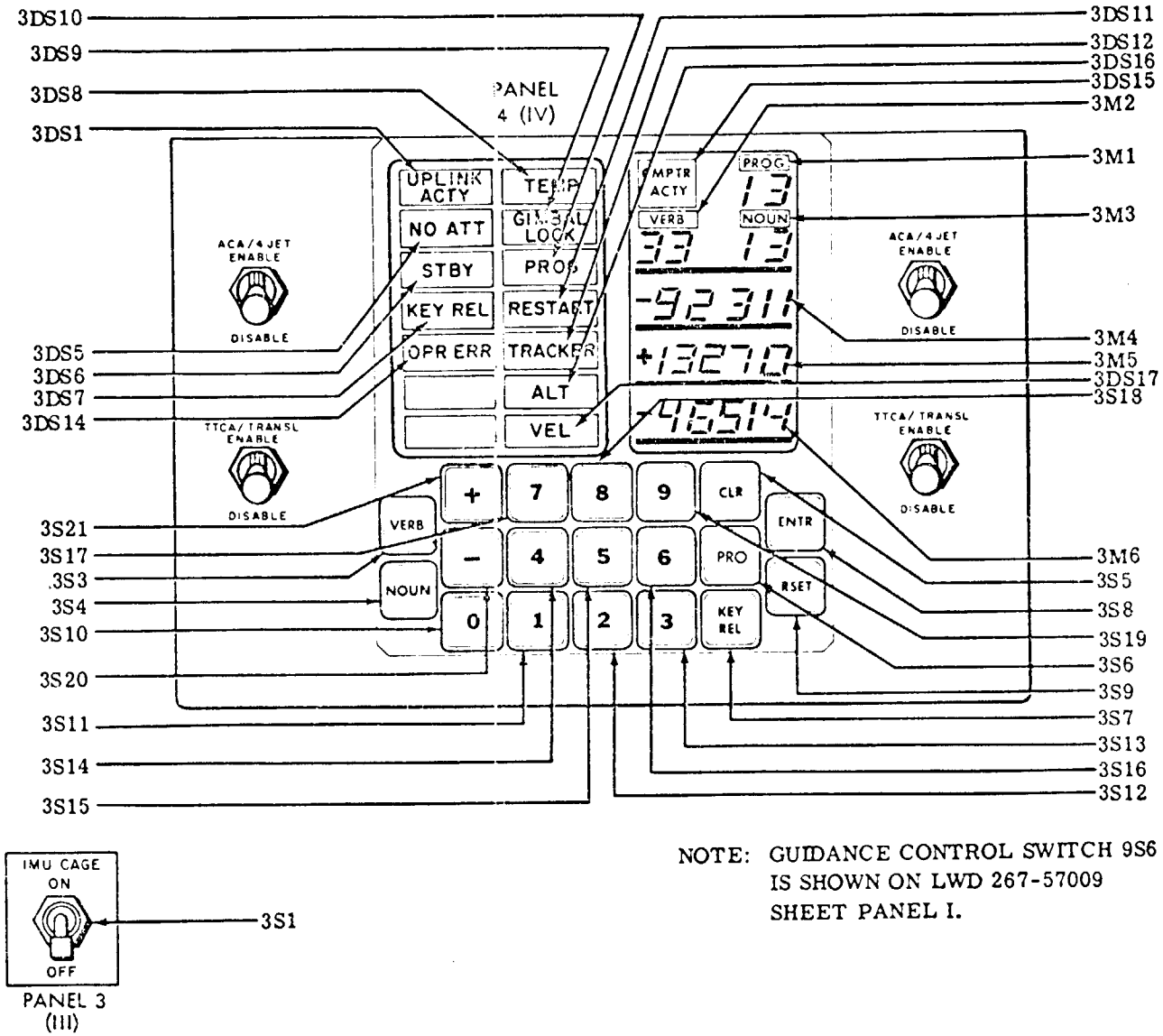
2. Table of Contents

ITEM NAME	DWG. NO.
a) Cover Sheet	3-1001
b) Applicable Documents, Table of Contents	3-1002
	3-1002.1
c) Cabin Location of PGNS (MIT)-GN & C Controls & Indicators	3-1003
d) DSKY Controls & Indicators Layout	3-1004
e) AOT Controls & Indicator Layout	3-1004.1
f) PGNS (MIT)-GN & C Controls & Indicators Functional Description	3-1005
	3-1005.1
	3-1005.2
	3-1005.3
	3-1005.4
	3-1005.5
	3-1005.6
g) PGNS (MIT)-GN & C Block Diagram	LDW267-57003 SH 4.00
h) PGNS (MIT)-GN & C LGC Signals from Control Electronics Sys.	LDW267-57003 SH 5.00B
	LDW267-57003 SH 5.01B
i) PGNS (MIT)-GN & C LGC Signals from RCS	LDW267-57003 SH 6.00B
j) PGNS (MIT)-GN & C AOT Pwr Supply & Signals to LGC	LDW267-57003 SH 7.00B
k) PGNS (MIT)-GN & C LGC Translation Rotation & Thruster On-Off Commands	LDW267-57003 SH 8.00B
l) PGNS (MIT)-GN & C Descent Rate Monitoring	LDW267-57003 SH 9.00A
m) PGNS (MIT)-GN & C LGC Signals for Gimbal Throttle Engine On-Off & Rate of Descent Control	LDW267-57003 SH 9.01

2. Table of Contents (Continued)

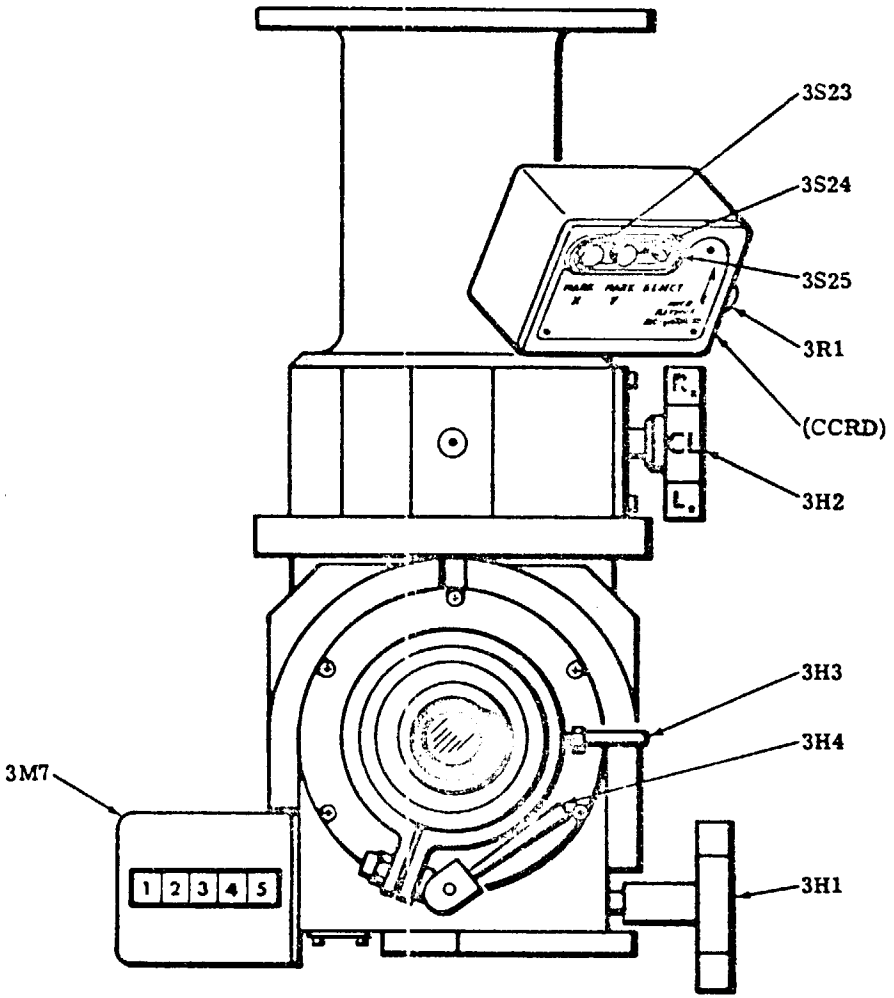
ITEM NAME	DWG. NO.
n) PGNS (MIT)-GN & C CES Translation Signals to LGC	LDW267-57003 SH 10.00B
o) PGNS (MIT)-GN & C Input & Output Signals for LGC & Landing & Rendezvous Radar	LDW267-57003 SH 11.00B LDW267-57003 SH 11.01B
p) PGNS (MIT)-GN & C Oper Inst.	LDW267-57003 SH 12.00B & LDW267-57003 SH 12.01B
q) PGNS (MIT)-GN & C LGC, PSA IMU Power Supply	LDW267-57003 SH 13.00B
r) PGNS (MIT)-GN & C Instr & C/W OP Alarm Indication	LDW267-57003 SH 14.00B
s) PGNS (MIT)-GN & C Power Distribution from PSA	LDW267-57003 SH 15.00B
t) PGNS (MIT)-GN & C Gimbal Signals from IMU	LDW267-57003 SH 16.00B
u) PGNS (MIT)-GN & C Velocity Signals Between LGC & PTA	LDW267-57003 SH 17.00B
v) PGNS (MIT)-GN & C CDU Signals with Rendezvous Radar FADI & AGS	LDW267-57003 SH 18.00
w) PGNS (MIT)-GN & C Signals Between DSKY & LGC, RR, LR, INT. LTG & PSA	LDW267-57003 SH 19.00B
x) PGNS (MIT)-GN & C PCMTEA, SCA & LGC Interface	LDW267-57003 SH 20.00B
y) PGNS (MIT)-GN & C IMU & PTA Signals to SCA	LDW267-57003 SH 21.00


ALIGNMENT OPTICAL TELESCOPE (AOT)
COMPUTER CONTROL &
RETICLE DIMMER (CCRD)



NOTE: GUIDANCE CONTROL SWITCH 9S6 IS SHOWN ON LWD 267-57009 SHEET PANEL I.

DSKY Controls & Indicators Layout



(3A3) AOT Controls & Indicator Layout

SUBSYSTEM: PRIMARY GUIDANCE AND NAVIGATION (PGNS) (FUNCTIONAL GROUPING 3)

Code	Control/Indicator	Function
3S1	IMU CAGE SWITCH 2-POSITION MOMENTARY TOGGLE ON-OFF	The IMU cage mode is an emergency backup mode which in the ON position allows the astronaut to recover a tumbling IMU by setting the gimbals to zero. During this mode, the 1X gimbal resolver sine winding outputs are fed through the CDU to the gimbal servo amplifiers to drive the gimbals until the resolver signals are nulled.
3S3	VERB SWITCH MOMENTARY PUSHBUTTON	Pushing the button indicates that the next two numerical characters keyed in are to be interpreted by the LGC as the verb code.
3S4	NOUN SWITCH MOMENTARY PUSHBUTTON	Pushing the button indicates that the next two numerical characters keyed in are to be interpreted by the LGC as the noun code.
3S5	CLR SWITCH MOMENTARY PUSHBUTTON	Used during a data loading sequence to erase the information being loaded into DATA display register R_1, R_2, or R_3. It allows the operator to clear the register in the event of an error in loading.
3S6	PRO SWITCH MOMENTARY PUSHBUTTON	Depressing PRO when STBY is illuminated will place the computer in the Operate mode and STBY will extinguish. Depressing PRO when STBY is not illuminated is a command to the LGC to proceed with the program. (An alternative to a VERB 33 DSKY entry).

SUBSYSTEM: PRIMARY GUIDANCE AND NAVIGATION (PGNS) (FUNCTIONAL GROUPING 3)

Code	Control/Indicator	Function
3S7	KEY REL SWITCH MOMENTARY PUSHBUTTON	Depressing KEY REL in response to KEY REL (3DS7) illumination will permit information supplied by a LGC program to be displayed on the DSKY. The KEY REL button is depressed subsequent to inserting information into DSKY.
3S8	ENTR SWITCH MOMENTARY PUSHBUTTON	(1) To execute the verb/noun displayed on the VERB and NOUN registers. (2) To enter data words loaded into the data register (R_1, R_2 or R_3) via switches 3S10 through 3S21.
3S9	RSET SWITCH MOMENTARY PUSHBUTTON	Enables turn off of alarm conditions on the DSKY providing the alarm condition has been corrected.
3S10 through 3S21	KEYBOARD SWITCHES MOMENTARY PUSHBUTTONS	Numerical keys 0 thru 9 (pushbutton switches 3S10 thru 3S19) when depressed, enter data, address codes and action request codes into the LGC. The algebraic sign keys + and - (pushbutton switches 3S20 and 3S21) when depressed informs the LGC that the following data is decimal and indicates the sign of the data. These switches (3S10 through 3S21) are used to control the LGC mode of operation manually. (The LGC is normally in the automatic mode of operation and is put in the automatic mode when circuit breaker 4CB122 is turned on.) Typical examples of these modes are: Update lift-off time, zero and align CDU, and display, Inertial CDU angles outer, inner and middle gimbals.

Code	Control/Indicator	Function
3M1	PROG DISPLAY	Displays code number 00 to 99 of current program. NOTE: A program is a block of logic sequences.
3M2	VERB DISPLAY	Displays code number 00 to 99 of current verb. NOTE: A verb indicates what action is to be taken.
3M3	NOUN DISPLAY	Displays code number 00 to 99 of current noun. NOTE: A noun indicates to what an action is applied.
3M4	DATA DISPLAY (R1)	Displays decimal data (outputs from LGC or manually inserted data) including a plus or minus sign. Octal data is presented without the sign. Every position in each data display need not be filled.
3M5	DATA DISPLAY (R2)	Displays decimal data (outputs from LGC or manually inserted data) including a plus or minus sign. Octal data is presented without the sign. Every position in each data display need not be filled.

SUBSYSTEM: PRIMARY GUIDANCE AND NAVIGATION (PGNS) (FUNCTIONAL GROUPING 3)

Code	Control/Indicator	Function
3M6	DATA DISPLAY (R3)	Displays decimal data (outputs from LGC or manually inserted data) including a plus or minus sign. Octal data is presented without the sign. Every position in each data display need not be filled.
3DS1	"UPLINK ACTIVITY" STATUS LIGHT (WHITE)	Energized by the first character of a Digital Uplink message received by the LGC. If it is not extinguished by the termination of uplink transmission which is signified by the end of computer activity, (no further motion on the DSKY register), it should be extinguished by crew use of the RSET or KEY REL buttons when the uplink transmission is complete.
3DS5	"NO ATTITUDE" STATUS LIGHT (WHITE)	Illuminates to indicate that attitude reference data is not available from the IMU. This condition can result for example, when the ISS is not powered or when the IMU is caged. This light illuminates during coarse alignment.
3DS6	"STANDBY" STATUS LIGHT (WHITE)	Illuminates when LGC is in a standby mode. Extinguishes when the LGC is in the operate mode or OFF.
3DS7	"KEY REL" STATUS LIGHT (WHITE)	Illuminates when an internal sequence attempts to use the DSKY, but finds it busy due to independent operator action (any keyboard depression except RSET or KEY REL).

SUBSYSTEM: PRIMARY GUIDANCE AND NAVIGATION (PGNS) (FUNCTIONAL GROUPING 3)

Code	Control/Indicator	Function
3DS8	"TEMP CAUTION" LIGHT (YELLOW)	Illuminates to indicate that the IMU stable member temperature is outside of design limits (126^{o}F to 134^{o}F $\pm 5^{o}$F).
3DS9	"GIMBAL LOCK" CAUTION LIGHT (YELLOW)	Illuminates to indicate the IMU middle gimbal angle (MGA) is in excess of $\pm 70^{o}$ from its zero position. NOTE: When the MGA exceeds $\pm 85^{o}$ from its zero position, the LGC automatically commands a coarse alignment & illuminates the "No Attitude" light on the DSKY.
3DS10	"PROGRAM CAUTION" LIGHT (YELLOW)	Illuminates to indicate a program check has failed. This indicator is controlled by a computer program.
3DS11	"RESTART" CAUTION LIGHT (YELLOW)	Illuminates if internal detection circuits in LGC signifies a program abort (a program abort is not be be confused with a LM abort; it is a LGC main alarm condition which indicates that the program has stopped and LGC is attempting a restart).
3DS12	"TRACKER CAUTION" LIGHT (YELLOW)	Illuminates if one of the following conditions exist: 1. Rendezvous Radar (RR) CDU failure (when the rendezvous radar is in the LGC mode). 2. A RR "data no good" discrete is present when auto track is enabled.

SUBSYSTEM: PRIMARY GUIDANCE AND NAVIGATION (PGNS) (FUNCTIONAL GROUPING 3)

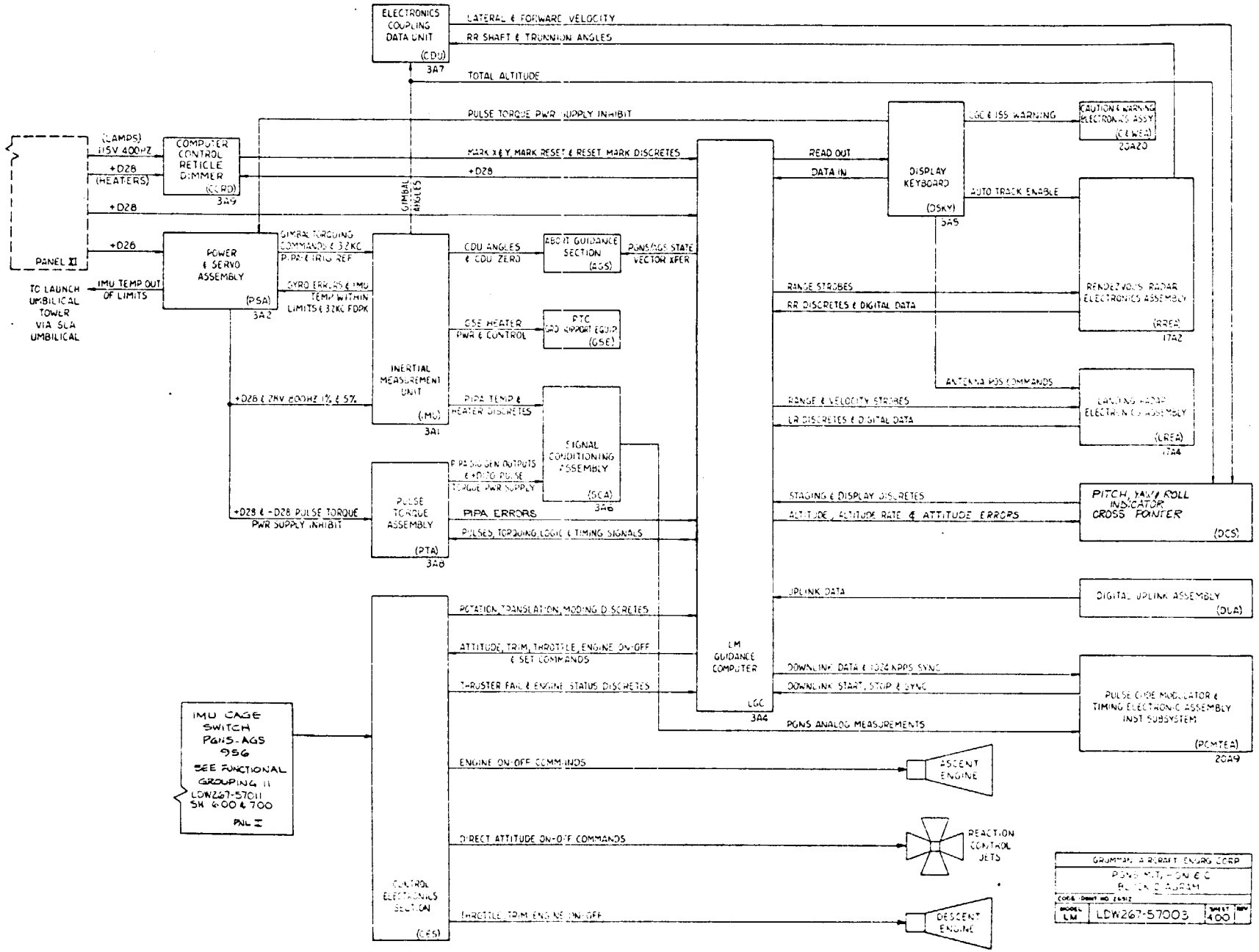
Code	Control/Indicator	Function
3DS14	"OPERATOR ERROR" STATUS LIGHT (WHITE)	Illuminates to indicate that the astronaut has performed an improper sequence of key depressions on DSKY.
3DS15	"COMPUTER ACTIVITY" STATUS LIGHT (WHITE)	Signifies computer activity in processing data.
3DS16	"ALTITUDE LIGHT" (YELLOW)	Steady: Illuminates to indicate to the astronauts that the LGC has lost Landing Radar altitude data good discretes. Flashing: Illuminates to indicate to the astronauts that the altitude data supplied by the LR to the LGC does not agree proportionally to previous data.
3DS17	"VELOCITY LIGHT" (YELLOW)	Steady: Illuminates to indicate to the astronauts that the LGC has lost Landing Radar velocity data good discretes. Flashing: Illuminates to indicate to the astronauts that the velocity data supplied by the LR to the LGC does not agree proportionally to previous data.
3A3	AOT ALIGNMENT OPTICAL TELESCOPE	The AOT is used inflight and on the lunar surface to obtain star direction for the determination of inertial orientation. AOT provides updated information to the LGC as to the position of LM for such activities as docking.

SUBSYSTEM: PRIMARY GUIDANCE AND NAVIGATION (PGNS) (FUNCTIONAL GROUPING 3)

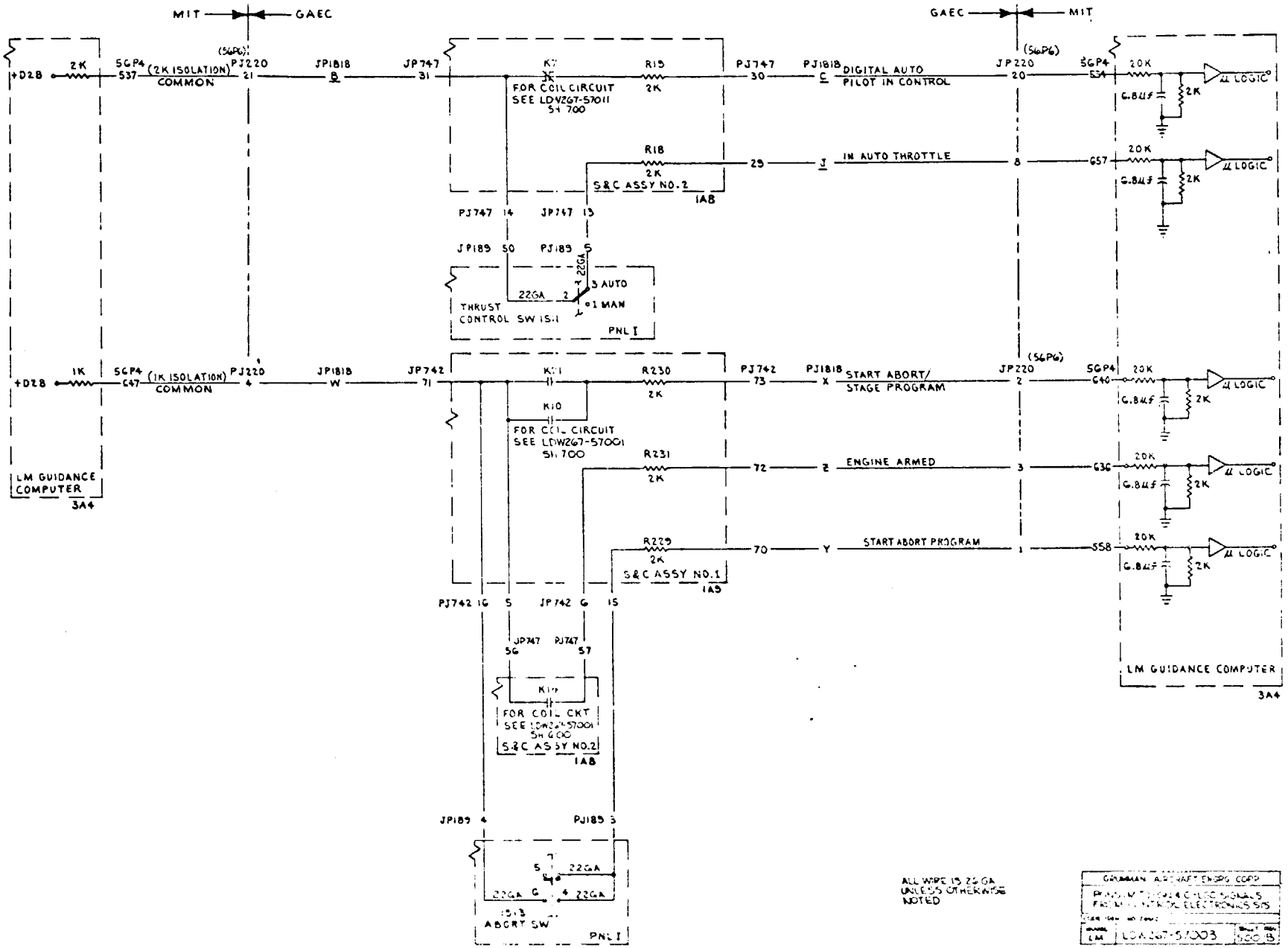
Code	Control/Indicator	Function
3H3	EYEPIECE ADJUST LEVER	This lever moves the eyepiece toward or away from the eye of the observer for focusing.
3S23	MARK X SWITCH MOMENTARY PUSHBUTTON	Depression of this pushbutton sends a signal to the LGC indicating that the star is aligned on the X reticle position.
3S24	MARK Y SWITCH MOMENTARY PUSHBUTTON	Depression of this pushbutton sends a signal to the LGC indicating that the star is aligned on the Y reticle position.
3S25	REJECT SWITCH MOMENTARY PUSHBUTTON	Depression of this pushbutton sends a signal to the LGC indicating that the last Mark signal was incorrect and no action is to be taken until a new Mark signal is received.
3R1	RETICLE ILLUMINATION CONTROL CONTINUOUS ROTARY	This continuous rotary (OFF-BRIGHT) controls the brightness of the AOT reticle.
3H1	RETICLE CONTROL CONTINUOUS ROTARY	This continuous rotary control rotates the AOT reticle. The rotary is used for the following: 1. To zero the AOT Counter. 2. To superimpose the X line on the target star. 3. To superimpose the spiral on the target star.

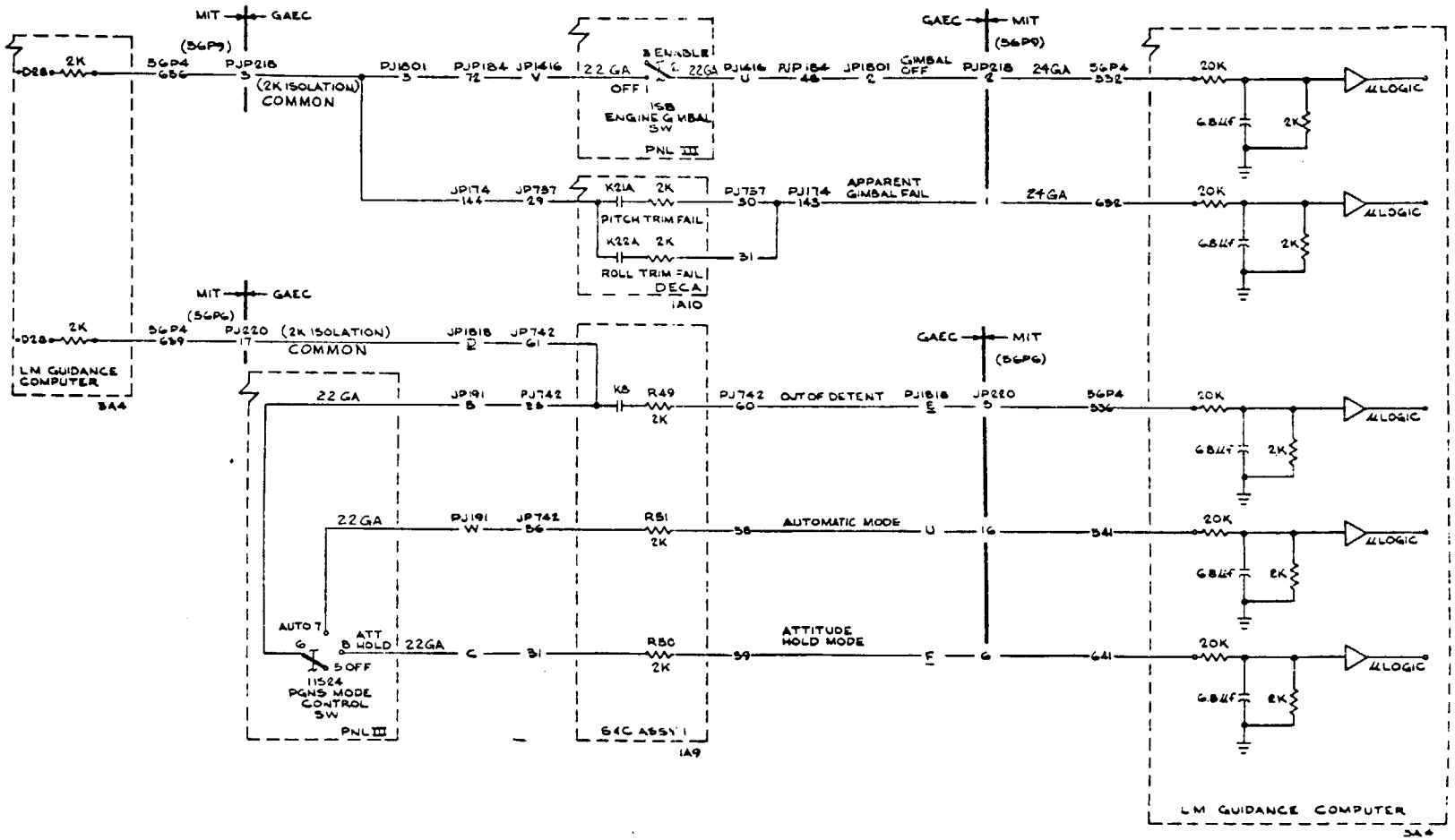
SUBSYSTEM: PRIMARY GUIDANCE AND NAVIGATION (PGNS) (FUNCTIONAL GROUPING 3)

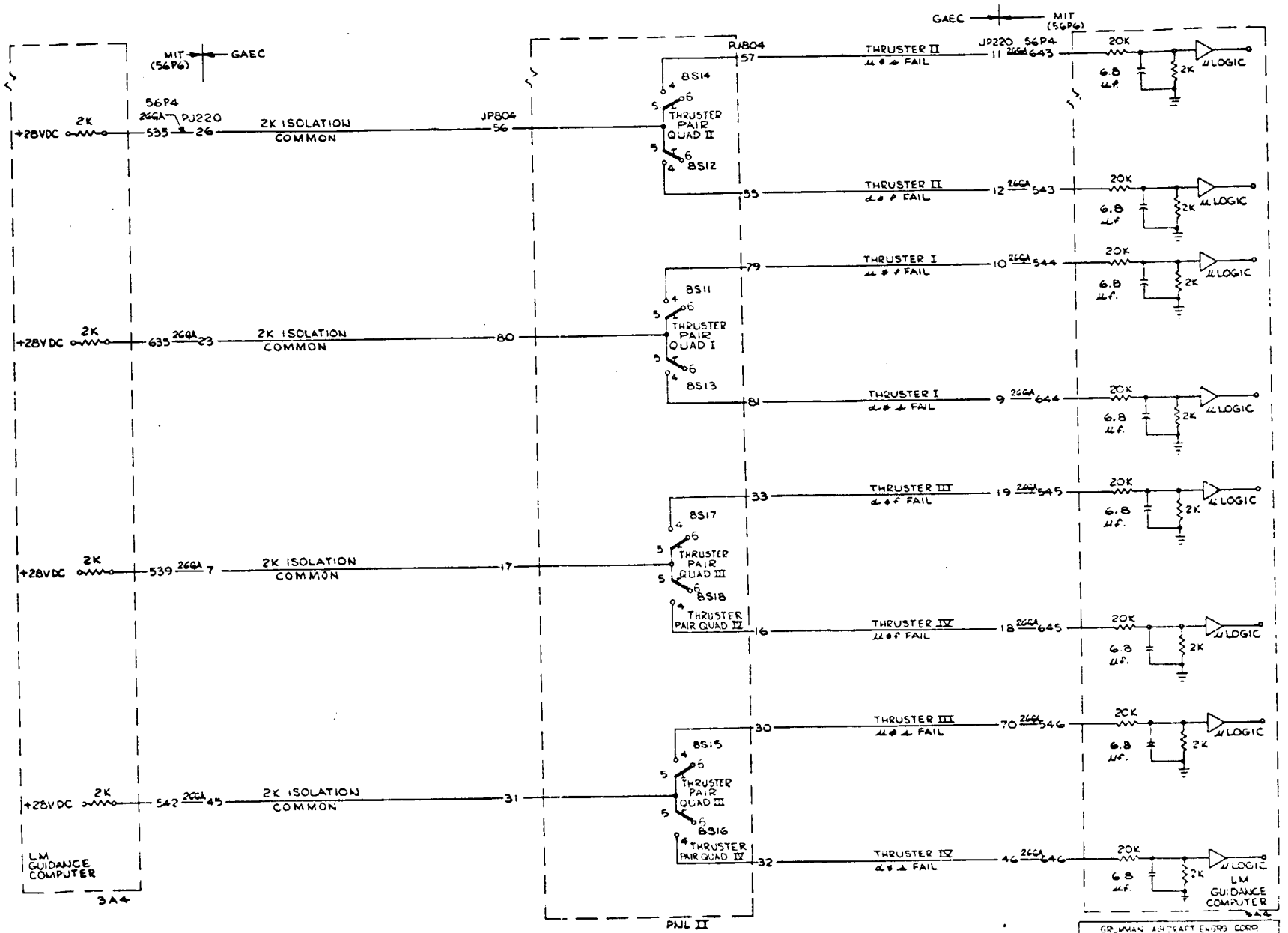
Code	Control/Indicator	Function
3H2	AZIMUTH CONTROL 6-POSITION ROTARY	This six position rotary switch (FL-F-FR-RL-R-RR) controls a rotating prism in the AOT. Rotating the prism permits the viewer to view any of six 60^{o} sectors, Front Left (FL), Forward (F) and Front Right (FR), Rear Left (RL), Rear (R) and Rear Right (RR). NOTE: The position of the image on the screen will shift as the rotary is switched to a new position. This is normal as the AOT does not provide compensation for the prism movement.
3M7	AOT COUNTER 4-PLACE DIGITAL DISPLAY	This four-digit indicator displays, in degrees, the rotation of the Reticle Control Knob. The extreme right digit displays tenths of degrees.
3H4	EYEPIECE LOCK	This lever locks the eyepiece in one of its positions as selected by the crew.

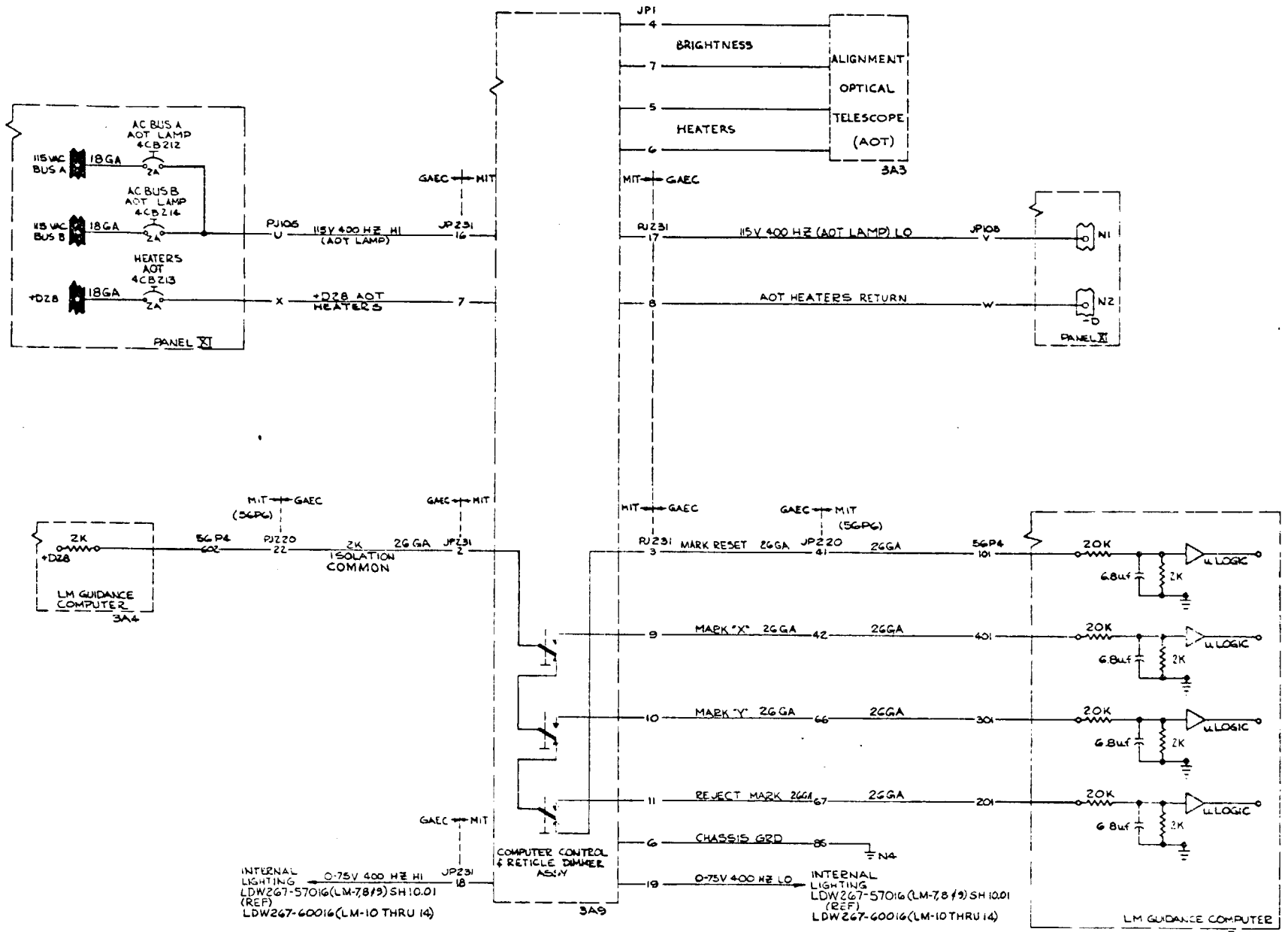


GRUMMAN AIRCRAFT ENGRG CORP
PGNS M.T. - SN & C
BLOCK DIAGRAM
CODE IDENT NO 24582
MODEL LM | LDW267-57003 | SHEET 400 | REV


MIT
GAEC
GAEC
MIT
+D28
2K
SGP4
537
(2K ISOLATION)
COMMON
(SGP6)
PJ220
21
JP1818
B
JP747
31
K7
FOR COIL CIRCUIT
SEE LDW267-57011
SH 700
R15
2K
PJ747
30
PJ1818
C
DIGITAL AUTO
PILOT IN CONTROL
JP220
20
(SGP6)
SGP4
534
20K
G.8μF
2K
μ LOGIC
R18
2K
29
J
IN AUTO THROTTLE
8
G57
S&C ASSY NO.2
1AB
PJ747 14
JP747 13
JP189 50
PJ189 5
22GA
3 AUTO
1 MAN
THRUST
CONTROL SW 1S1
PNL I
+D28
1K
SGP4
C47
(1K ISOLATION)
COMMON
PJ220
4
JP1818
W
JP742
71
K11
K10
FOR COIL CIRCUIT
SEE LDW267-57001
SH 700
R230
2K
PJ742
73
X
START ABORT/
STAGE PROGRAM
JP220
2
(SGP6)
SGP4
C40
R231
2K
72
Z
ENGINE ARMED
3
G36
R229
2K
70
Y
START ABORT PROGRAM
1
S58
S&C ASSY NO.1
1A9
PJ742 16
5
JP742 6
15
JP747
5G
PJ747
57
K12
FOR COIL CKT
SEE LDW267-57001
SH 600
S&C ASSY NO.2
1AB
JP189 4
PJ189 3
22GA
22GA
22GA
ABORT SW
1S13
PNL I
LM GUIDANCE
COMPUTER
3A4
LM GUIDANCE COMPUTER
3A4
ALL WIRE IS 22 GA
UNLESS OTHERWISE
NOTED
GRUMMAN AIRCRAFT ENGRG CORP
LDW267-57003
SCD B

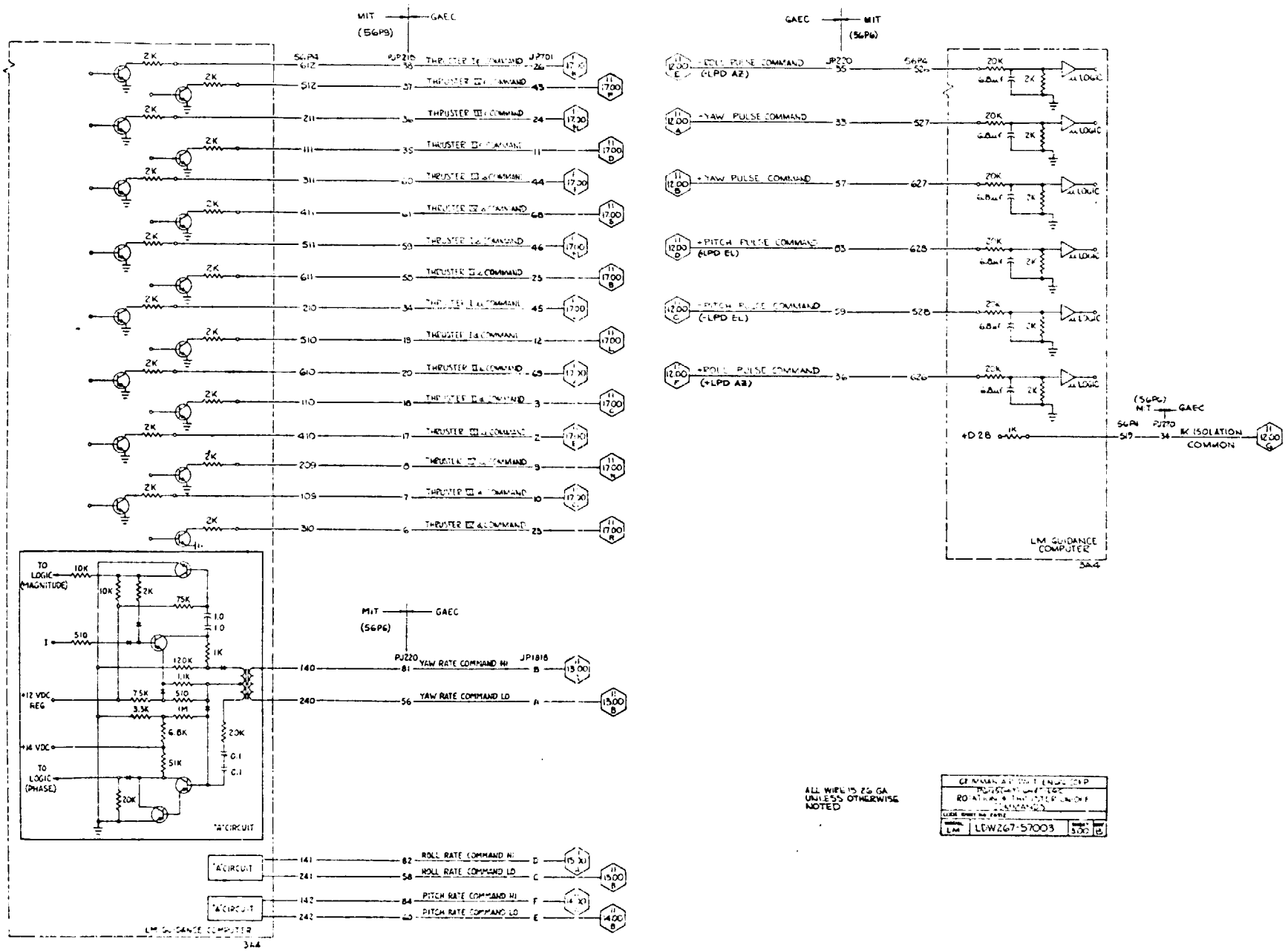

MIT
GAEC
(56P9)
2K
D28
56P4
656
PJP218
5
(2K ISOLATION)
COMMON
PJ1801
3
PJP184
72
JP1416
V
22 GA
ENABLE
OFF
ISS ENGINE GIMBAL SW
PNL III
22GA
PJ1416
U
PJP184
48
JP1801
C
GIMBAL OFF
PJP218
8
24GA
56P4
552
20K
.68μF
2K
μLOGIC
JP174
144
JP737
29
K21A
2K
PITCH TRIM FAIL
K22A
2K
ROLL TRIM FAIL
DECA
1A10
PJ737
30
PJ174
143
APPARENT GIMBAL FAIL
24GA
692
31
(56P6)
56P4
639
PJ220
17
(2K ISOLATION)
COMMON
JP1818
E
JP742
61
LM GUIDANCE COMPUTER
3A4
22 GA
JP191
B
JP742
28
K8
R49
2K
PJ742
60
OUT OF DETENT
PJ1818
E
JP220
5
536
22GA
PJ191
W
JP742
56
R51
2K
58
AUTOMATIC MODE
U
16
541
AUTO
ATT
B HOLD
OFF
11524
PGNS MODE CONTROL SW
PNL III
22GA
C
31
R50
2K
59
ATTITUDE HOLD MODE
F
6
641
64C ASSY 1
1A9
LM GUIDANCE COMPUTER
3A4

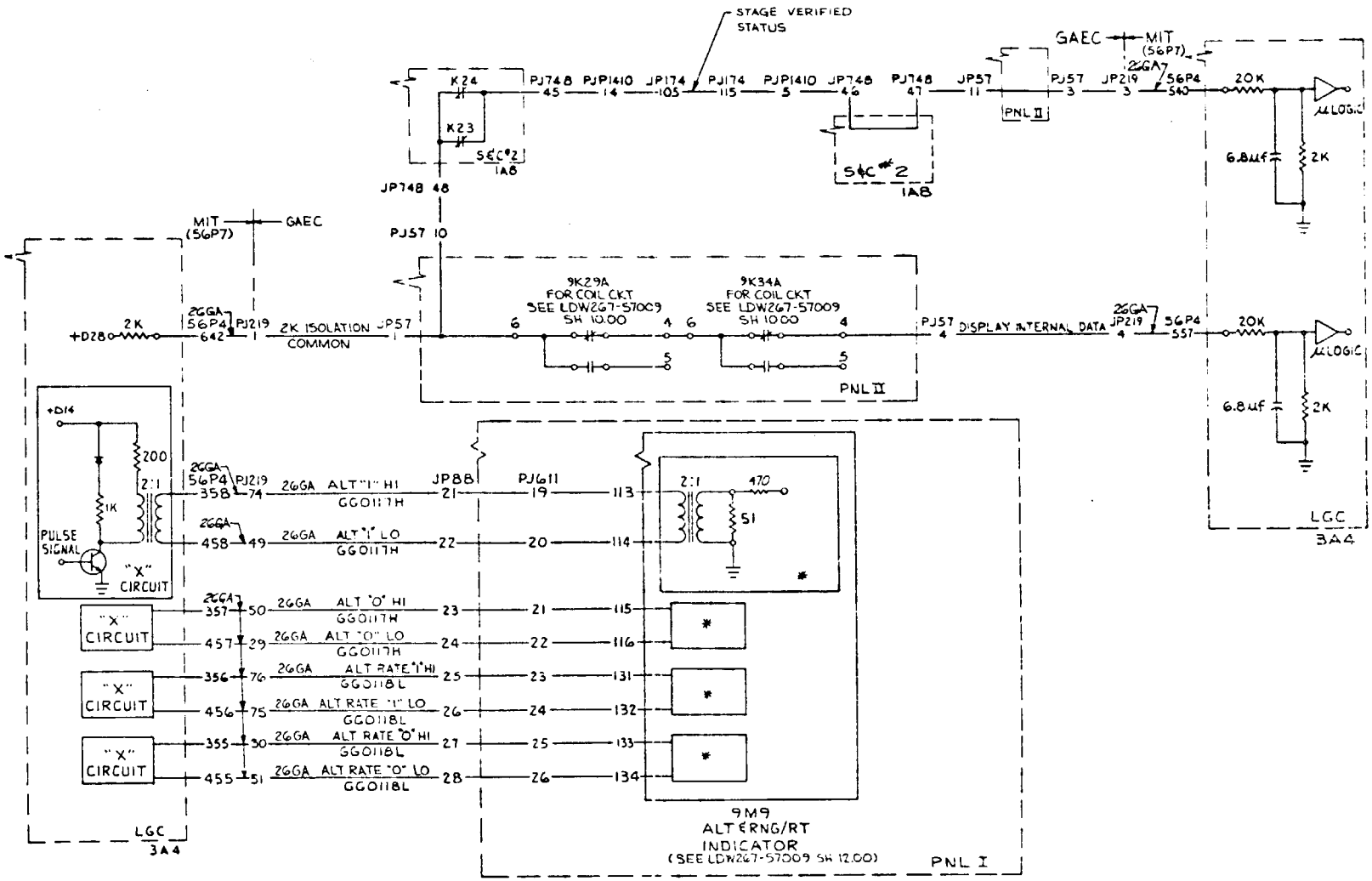

MIT (56P6)
GAEC
56P4
22GA
PJ220
+28VDC
2K
535
26
2K ISOLATION COMMON
JP804
56
PJ804
BS14
THRUSTER PAIR QUAD II
BS12
57
THRUSTER II FAIL
JP220 56P4
11 22GA 643
20K
6.8 µf
2K
µ LOGIC
55
12 22GA 543
BS11
THRUSTER PAIR QUAD I
BS13
79
THRUSTER I FAIL
10 22GA 544
635 22GA 23
80
81
9 22GA 644
BS17
THRUSTER PAIR QUAD III
BS18
THRUSTER PAIR QUAD IV
33
THRUSTER III FAIL
19 22GA 545
539 22GA 7
17
16
THRUSTER IV FAIL
18 22GA 645
BS15
BS16
30
THRUSTER III FAIL
70 22GA 546
542 22GA 45
31
32
THRUSTER IV FAIL
46 22GA 646
LM GUIDANCE COMPUTER
3A4
PNL II
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
PCA(MIT) SH. 4 C
LOGIC SIGNALS FROM RCS
LM
LDW267-57303
600 B



ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP			
PGNS(MIT)-GN & C-AOT PWR SUPPLY & SIGNALS TO LGC			
CODE IDENT NO 25512			
MODEL LM	LDW267-57003	SHEET 700	REV B


MIT (56P8) GAEC
2K
56P8 612 PJP210 55 THRUSTER +Z COMMAND JP2701 26
512 57 THRUSTER +X COMMAND 43
211 36 THRUSTER -Y COMMAND 24
111 35 THRUSTER -Z COMMAND 11
311 60 THRUSTER -X COMMAND 44
411 61 THRUSTER +Y COMMAND 28
511 59 THRUSTER +Z COMMAND 46
611 58 THRUSTER +X COMMAND 25
210 34 THRUSTER -Y COMMAND 45
510 19 THRUSTER -Z COMMAND 12
610 20 THRUSTER -X COMMAND 29
110 18 THRUSTER +Y COMMAND 3
410 17 THRUSTER +Z COMMAND 2
209 8 THRUSTER +X COMMAND 9
109 7 THRUSTER -Y COMMAND 10
310 6 THRUSTER -Z COMMAND 25
TO LOGIC (MAGNITUDE)
10K
2K
75K
1.0
1.0
I
510
1K
120K
1.1K
+12 VDC REG
7.5K
510
3.3K
1M
6.8K
20K
+14 VDC
51K
0.1
0.1
TO LOGIC (PHASE)
20K
*A/C CIRCUIT
LM GUIDANCE COMPUTER
344
MIT (56P6) GAEC
PJ220 81 YAW RATE COMMAND HI JP1818 B
140
240 56 YAW RATE COMMAND LO A
141 82 ROLL RATE COMMAND HI D
241 58 ROLL RATE COMMAND LO C
142 84 PITCH RATE COMMAND HI F
242 60 PITCH RATE COMMAND LO E
GAEC MIT (56P6)
+ROLL PULSE COMMAND (+LPD AZ) JP220 55 56P6 52
+YAW PULSE COMMAND 33 527
+YAW PULSE COMMAND 57 627
+PITCH PULSE COMMAND (LPD EL) 83 628
+PITCH PULSE COMMAND (-LPD EL) 59 528
+ROLL PULSE COMMAND (+LPD AZ) 36 626
20K
6.8μF
2K
LOGIC
+D28
1K
(56P6) MIT GAEC
56P6 519 PJ220 34 RK ISOLATION COMMON
LM GUIDANCE COMPUTER
344
ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED
LDW267-57003



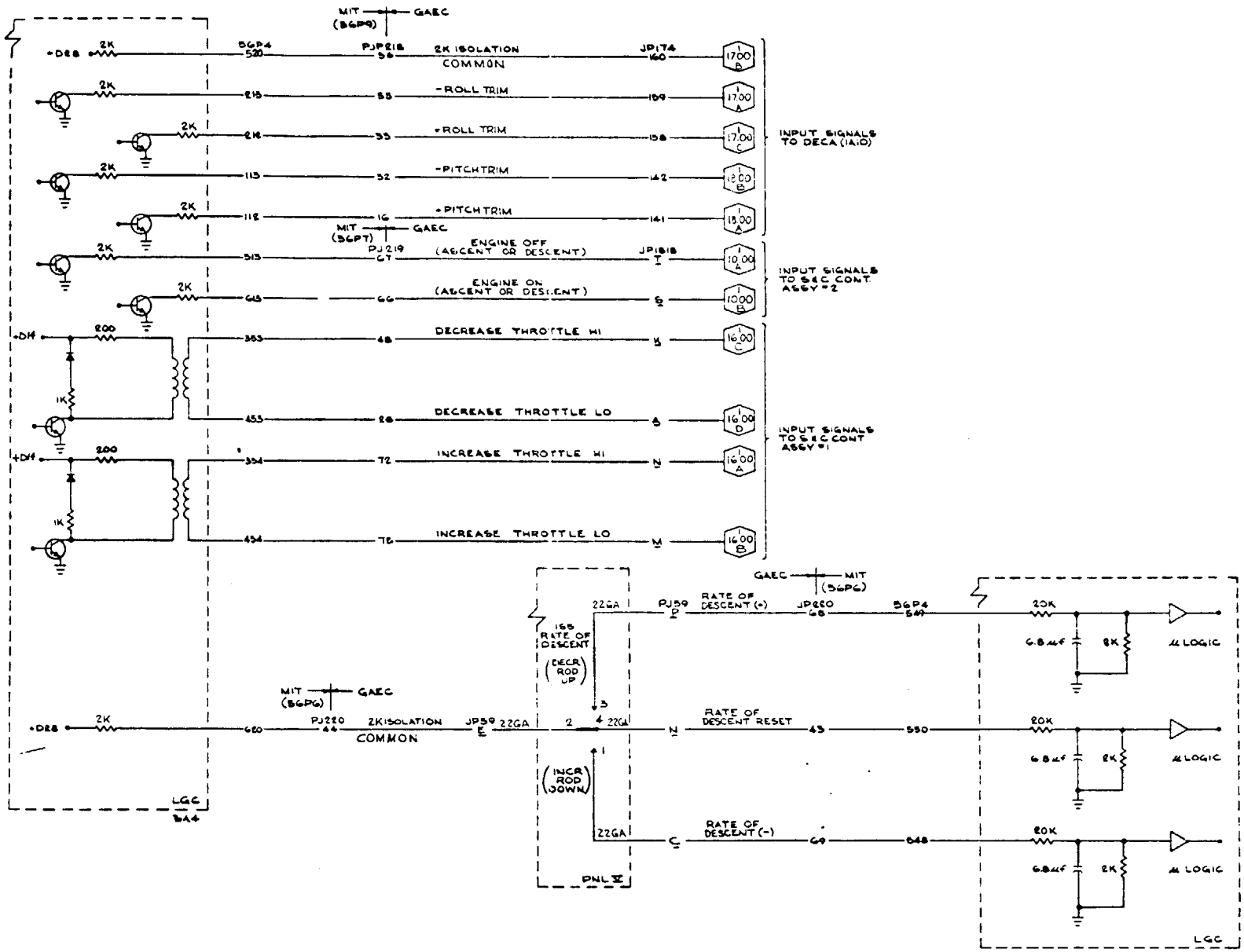
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

* DENOTES SAME CIRCUIT AS ABOVE

GRUMMAN AIRCRAFT ENGRG CORP

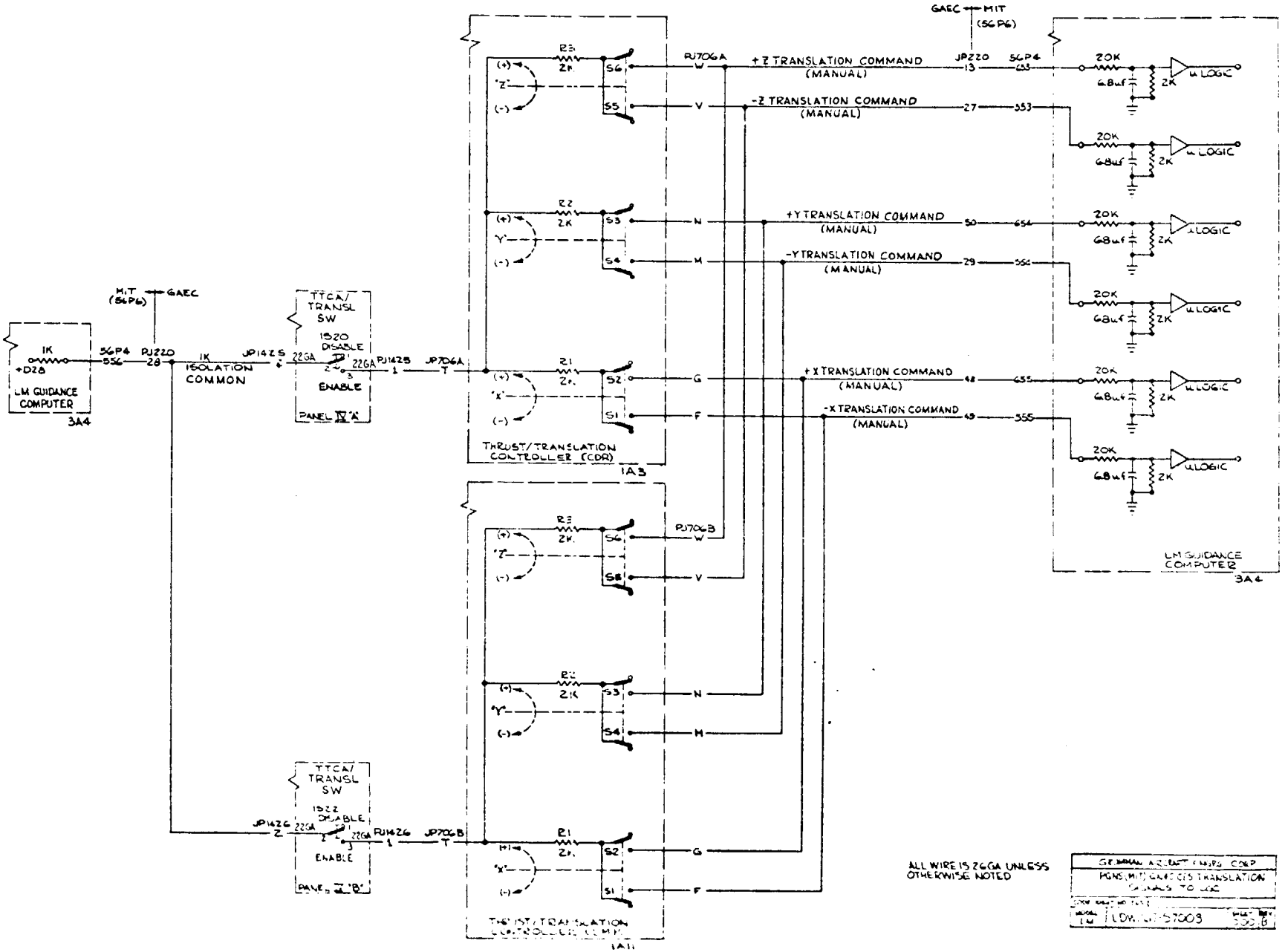
P(M&MIT)-GAEC DESCENT RATE MONITORING

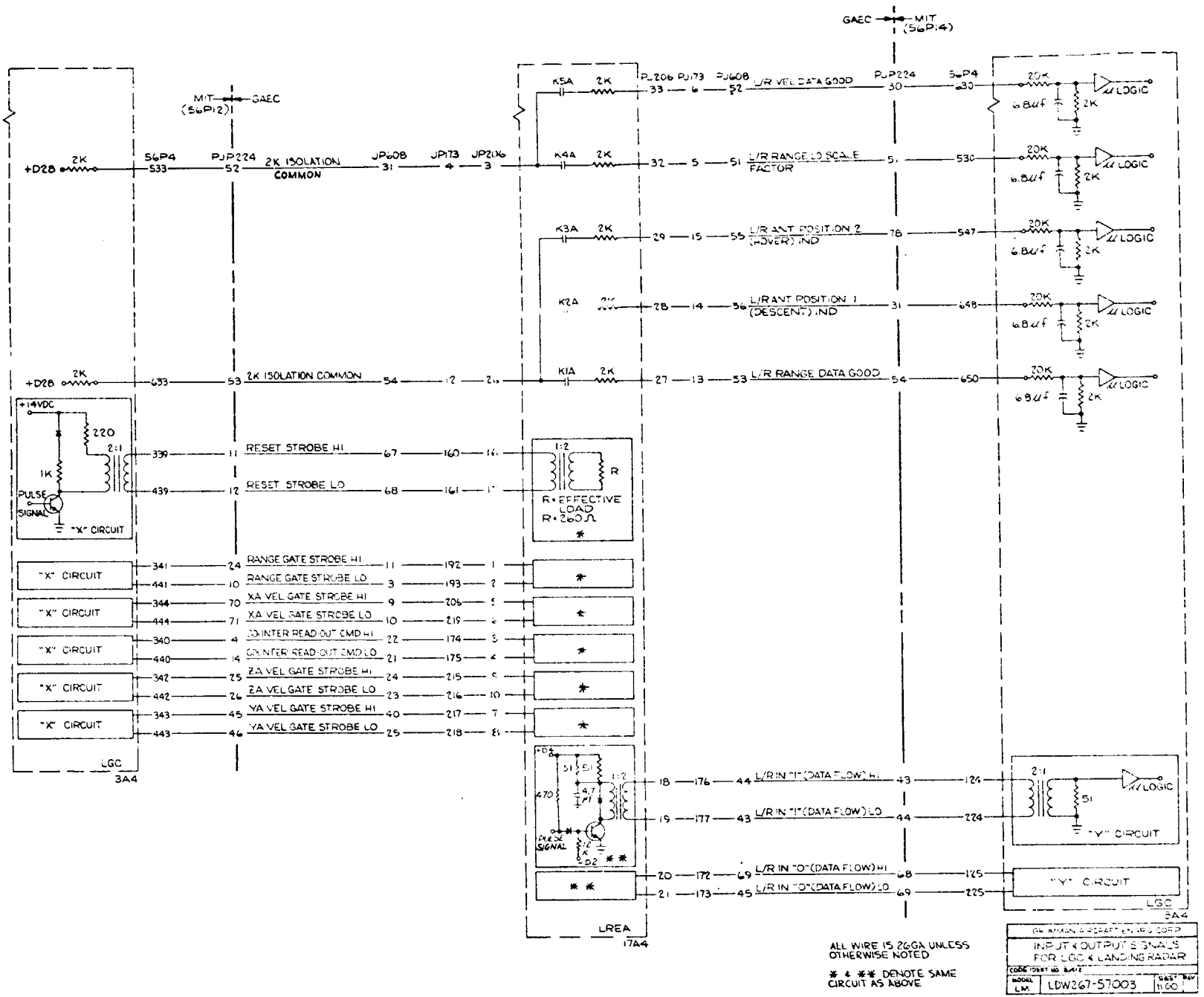
LM | LDW267-57003 | A

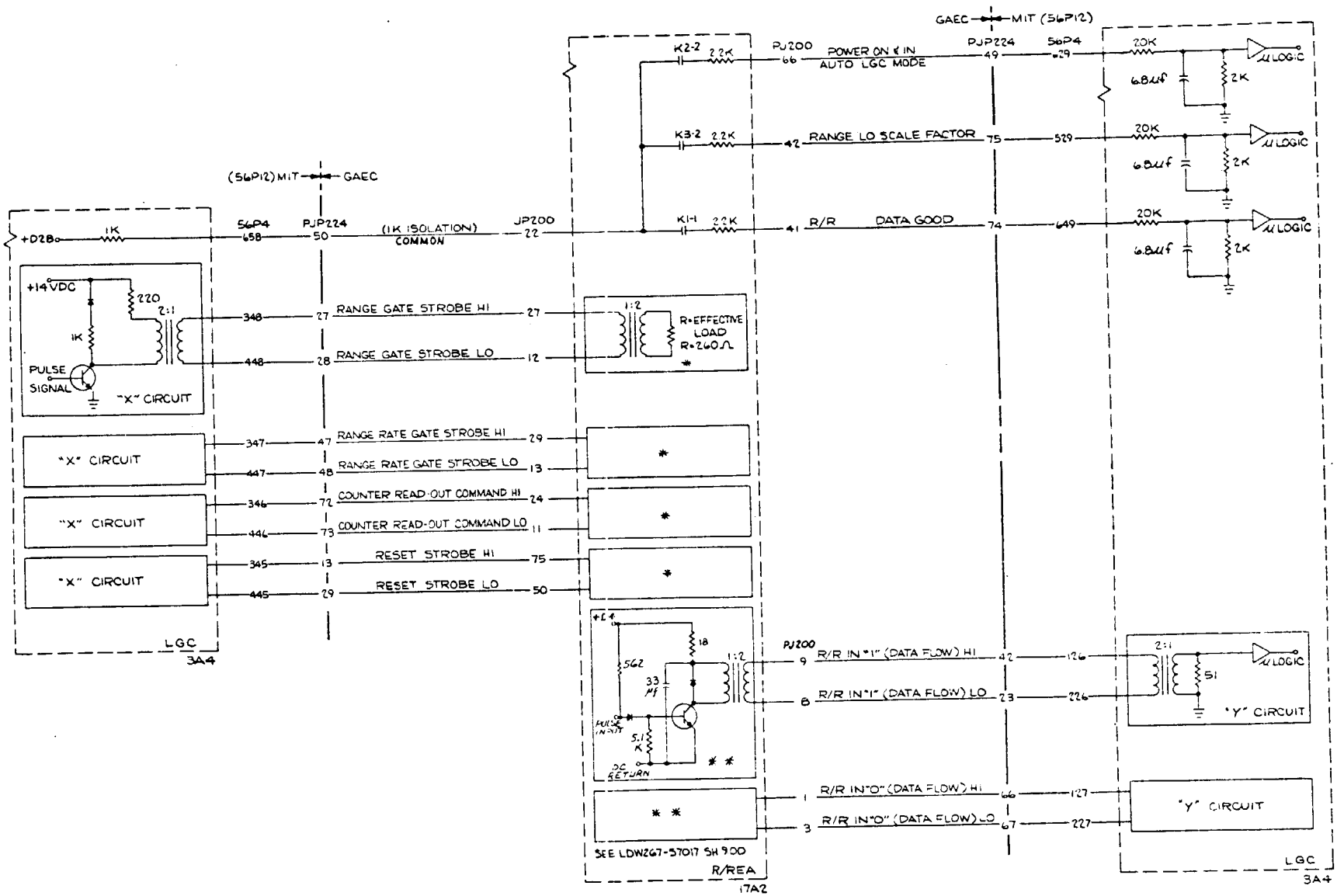


ALL WIRE IS 26GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP			
PGNS(MIT)/GAEC LGC SIGNALS FOR GIMBLE THROTTLE ENABLE ON OFF & RATE OF DESCENT CONTROL			
CODE IDENT NO.	DWG NO.		
MODEL LM	LDW267-57003	SHEET 1901	REV


MIT (56P6)
GAEC
IK
+D28
LM GUIDANCE COMPUTER
3A4
56P4
556
PJ220
28
IK ISOLATION COMMON
JP1425
4
22GA
TTCA/ TRANSL SW
1520 DISABLE
ENABLE
PANEL 'A'
PJ1425
1
JP706A
T
THRUST/TRANSLATION CONTROLLER (CDR)
1A3
R3 2K
R2 2K
R1 2K
S6
S5
S3
S4
S2
S1
(+)
(-)
"Z"
"Y"
"X"
PJ706A
W
V
N
M
G
F
+Z TRANSLATION COMMAND (MANUAL)
-Z TRANSLATION COMMAND (MANUAL)
+Y TRANSLATION COMMAND (MANUAL)
-Y TRANSLATION COMMAND (MANUAL)
+X TRANSLATION COMMAND (MANUAL)
-X TRANSLATION COMMAND (MANUAL)
JPZ20
13
27
50
29
48
49
56P4
653
553
654
554
655
555
20K
6.8μf
2K
μ LOGIC
LM GUIDANCE COMPUTER
3A4
PJ706B
JP1426
Z
22GA
PJ1426
JP706B
TTCA/ TRANSL SW
1522 DISABLE
ENABLE
PANEL 'B'
THRUST/TRANSLATION CONTROLLER (LMP)
1A1
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
PGNS (MIT) GAEC DIS TRANSLATION SIGNALS TO LGC
LDW 2575003
SHT 3 OF 8


GAEC
MIT (56P14)
MIT (56P12)
GAEC
+D28
2K
S6P4
PJP224
2K ISOLATION COMMON
JP608
JP173
JP206
K5A
K4A
K3A
K2A
K1A
PJ206 PJ173 PJ608
L/R VEL DATA GOOD
L/R RANGE LO SCALE FACTOR
L/R ANT POSITION 2 (HOVER) IND
L/R ANT POSITION 1 (DESCENT) IND
L/R RANGE DATA GOOD
20K
6.8uf
LOGIC
+14VDC
220
2:1
1K
PULSE SIGNAL
"X" CIRCUIT
RESET STROBE HI
RESET STROBE LO
1:2
R
R = EFFECTIVE LOAD
R = 260Ω
RANGE GATE STROBE HI
RANGE GATE STROBE LO
XA VEL GATE STROBE HI
XA VEL GATE STROBE LO
COUNTER READ-OUT CMD HI
COUNTER READ-OUT CMD LO
ZA VEL GATE STROBE HI
ZA VEL GATE STROBE LO
YA VEL GATE STROBE HI
YA VEL GATE STROBE LO
LGC
3A4
LREA
17A4
L/R IN "I" (DATA FLOW) HI
L/R IN "I" (DATA FLOW) LO
L/R IN "O" (DATA FLOW) HI
L/R IN "O" (DATA FLOW) LO
"Y" CIRCUIT
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED
* & ** DENOTE SAME CIRCUIT AS ABOVE
INPUT & OUTPUT SIGNALS FOR LGC & LANDING RADAR
LDW267-57003



ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED

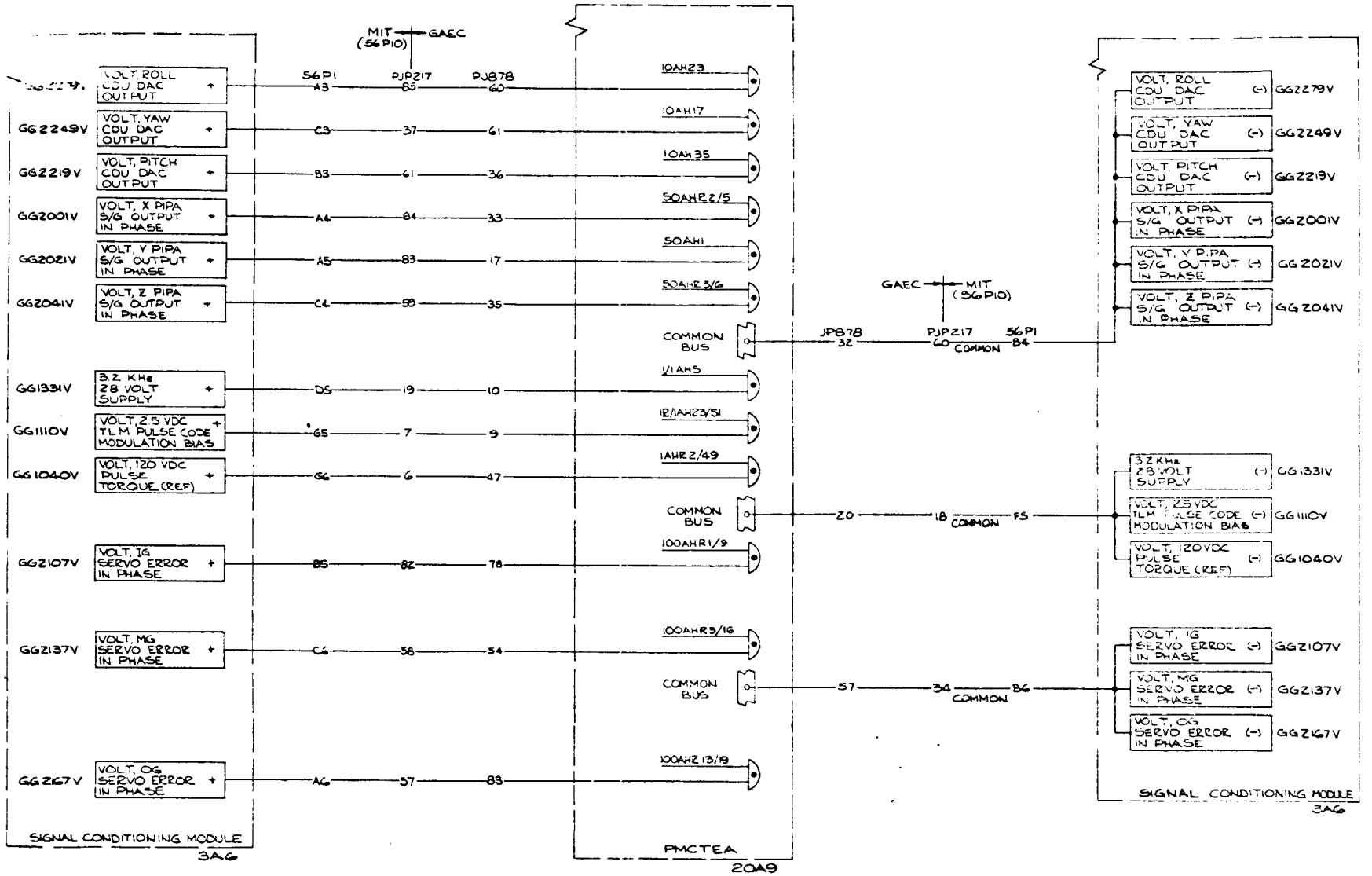
* & ** DENOTE SAME CIRCUIT AS ABOVE

GRUMMAN AIRCRAFT ENGRG CORP

M.I.T. SYS. C. INPUT & OUTPUT SIGNALS BETWEEN LGC & PERIPHEROUS RADAR

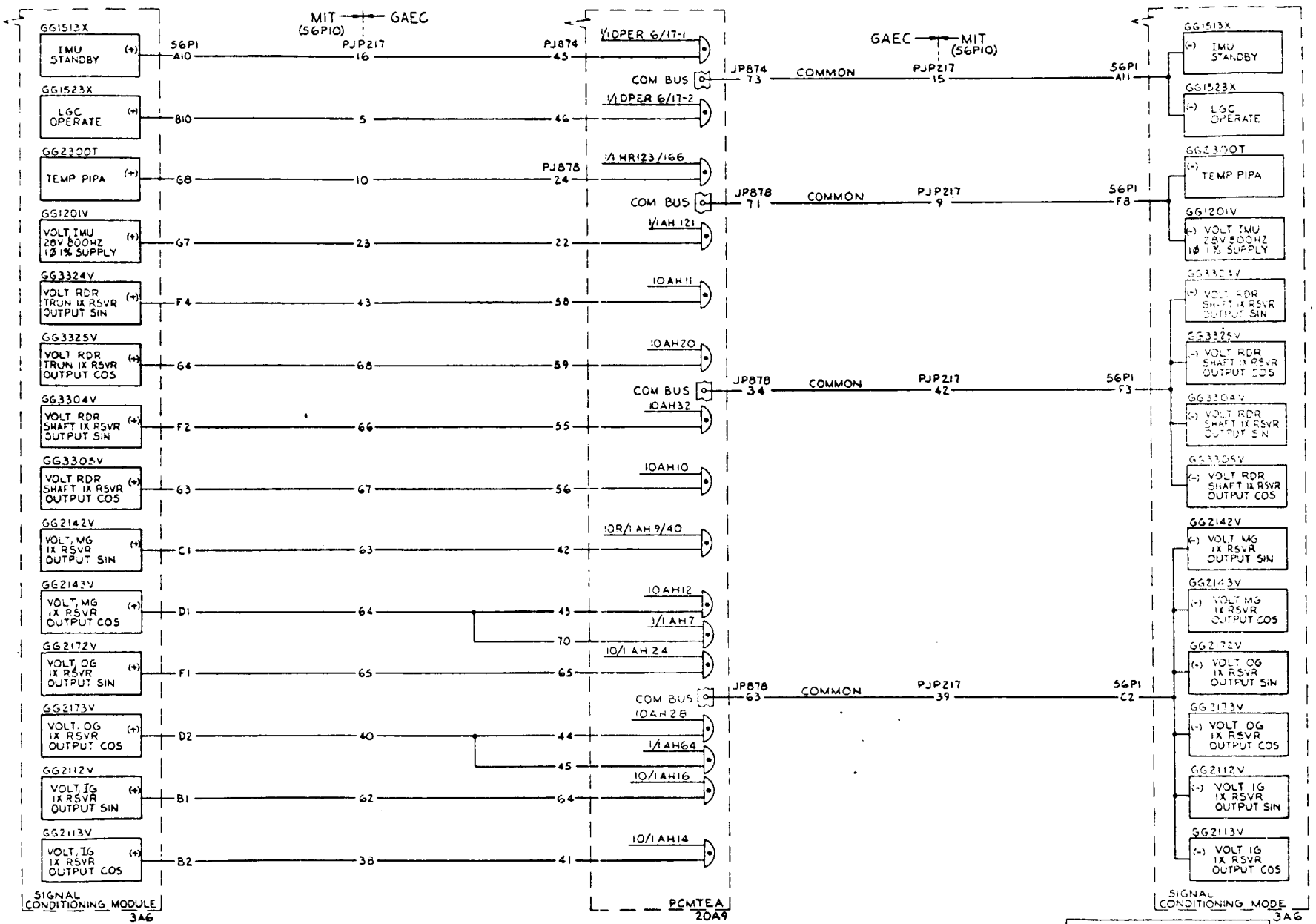
CODE IDENT. NO. 78452

MODEL	DRAWING NO.	SHEET	REV
LM	LDW267-57003	NO. 01	B



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP	
PGNS(MIT) G N&C OPER INST	
CODE IDENT NO 24624	
MODEL LM	LDW267-57003 SHEET 1200 REV B



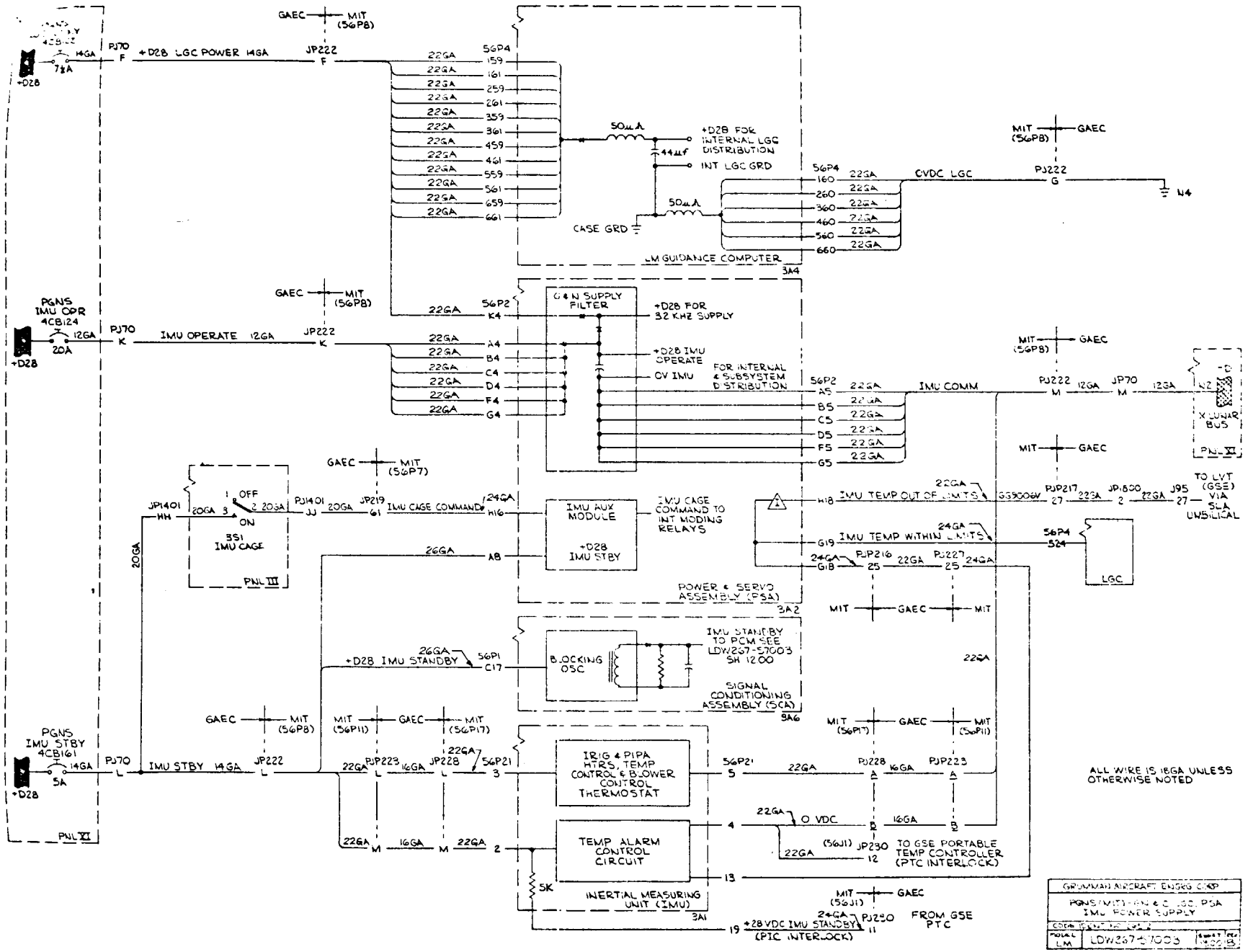
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED

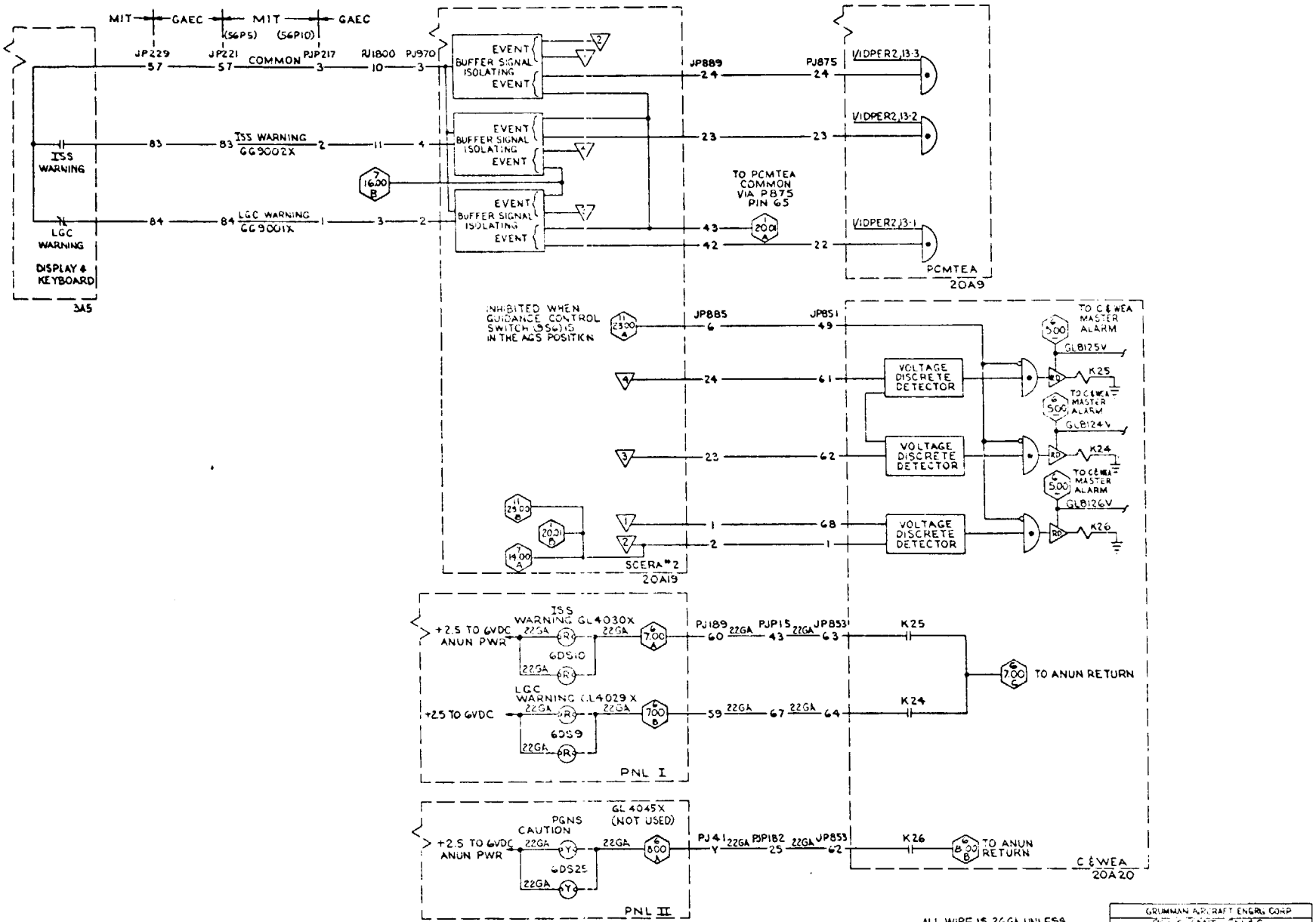
GRUMMAN AIRCRAFT ENGRG CORP

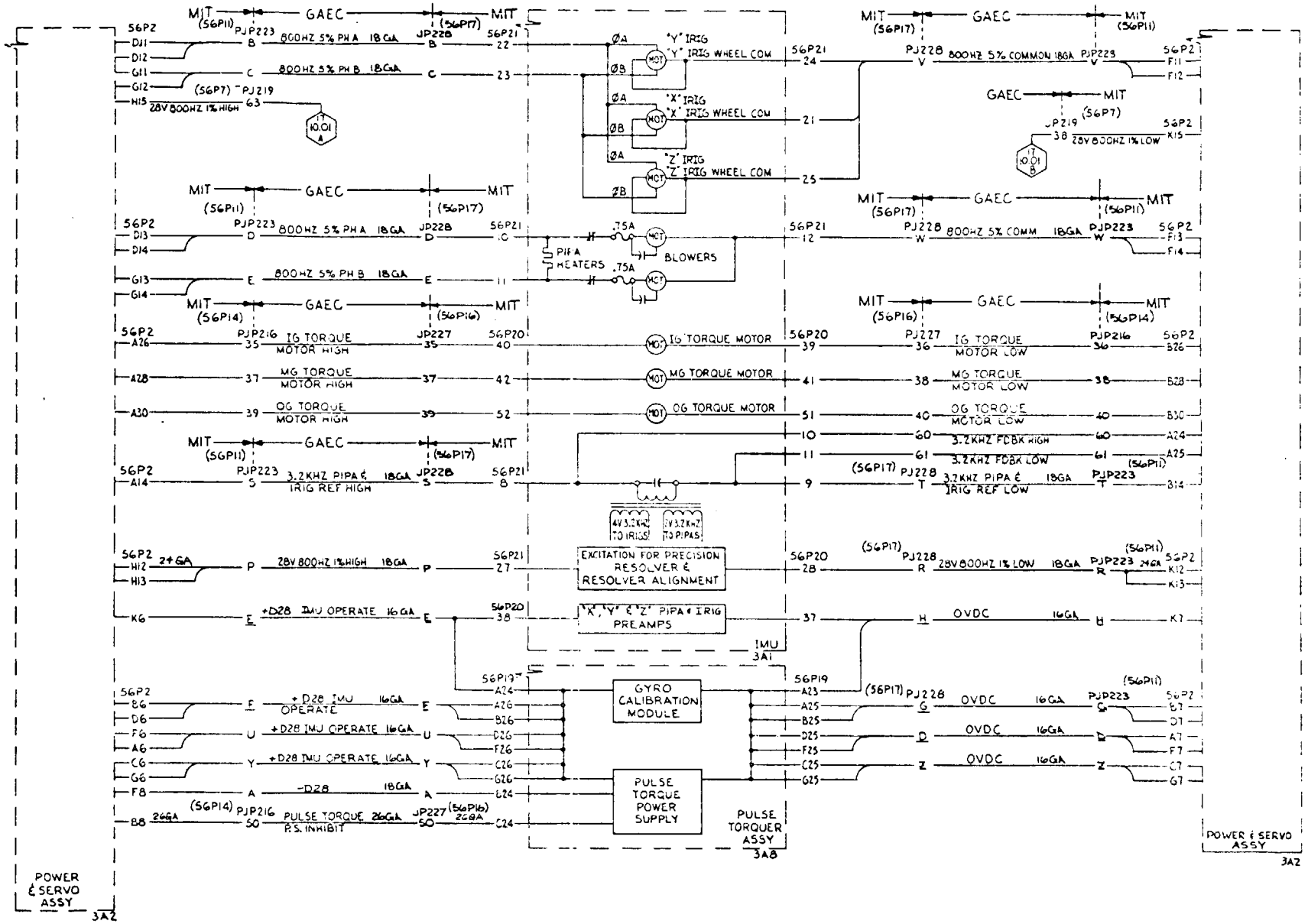
PGNS (MIT) GN & C OPERATIONAL INSTRUMENTATION

CODE IDENT NO. 78812

MODEL	LDW267-57003	SHEET	REV
LM		1201	B

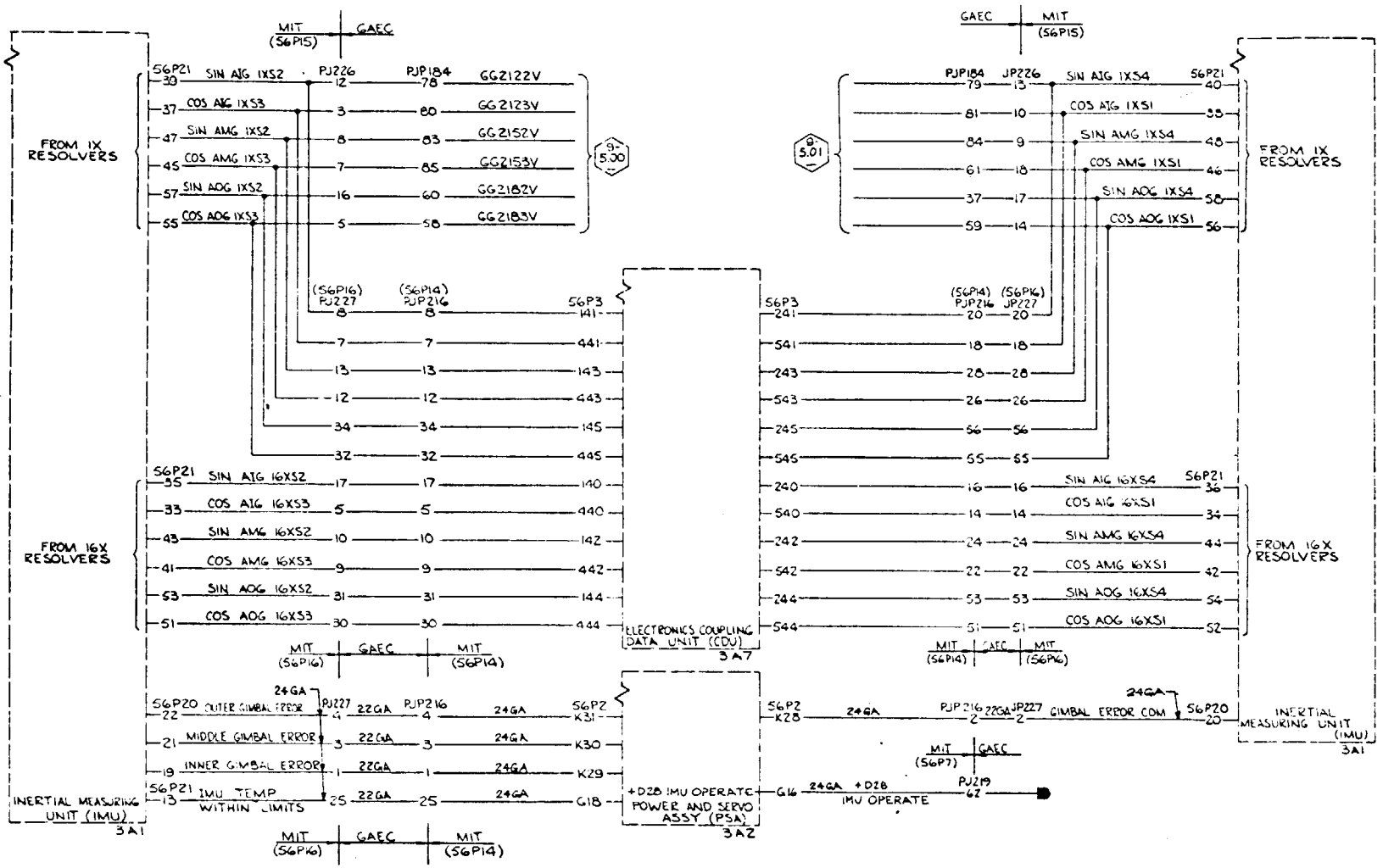

+D28
4CB122
14GA
7½A
PJ70
F
+D28 LGC POWER 14GA
GAEC
MIT (56P8)
JP222
F
22GA
56P4
159
161
259
261
359
361
459
461
559
561
659
661
50μA
+D28 FOR INTERNAL LGC DISTRIBUTION
44μf
INT LGC GRD
CASE GRD
50μA
56P4
160
260
360
460
560
660
22GA
CVDC LGC
MIT (56P8)
GAEC
PJ222
G
N4
LM GUIDANCE COMPUTER
3A4
PGNS IMU OPR 4CB124
12GA
2OA
+D28
PJ70
K
IMU OPERATE 12GA
JP222
K
56P2
K4
A4
B4
C4
D4
F4
G4
G & N SUPPLY FILTER
+D28 FOR 3.2 KHZ SUPPLY
+D28 IMU OPERATE
OV IMU
FOR INTERNAL & SUBSYSTEM DISTRIBUTION
56P2
A5
B5
C5
D5
F5
G5
IMU COMM
PJ222
M
12GA
JP70
M
12GA
X LUNAR BUS
PNL XI
MIT (56P8)
GAEC
MIT (56P7)
GAEC
JP1401
HH
20GA
3
OFF
1
2
ON
20GA
PJ1401
JJ
20GA
JP219
61
IMU CAGE COMMAND
24GA
H16
IMU AUX MODULE
+D28 IMU STBY
IMU CAGE COMMAND TO INT MODING RELAYS
351 IMU CAGE
PNL III
20GA
26GA
A8
H18
IMU TEMP OUT OF LIMITS
22GA
GG9006V
PJP217
27
22GA
JP1800
2
22GA
J95
27
TO LVT (GSE) VIA SLA UMBILICAL
G19
IMU TEMP WITHIN LIMITS
24GA
56P4
524
LGC
24GA
G18
PJP216
25
22GA
PJ227
25
24GA
POWER & SERVO ASSEMBLY (PSA)
3A2
MIT
GAEC
MIT
+D28 IMU STANDBY
26GA
56P1
C17
BLOCKING OSC
IMU STANDBY TO PCM SEE LDW267-57003 SH 12 00
SIGNAL CONDITIONING ASSEMBLY (SCA)
9A6
22GA
MIT (56P8)
GAEC
MIT (56P11)
MIT (56P11)
GAEC
MIT (56P17)
MIT (56P17)
GAEC
MIT (56P11)
PGNS IMU STBY 4CB161
14GA
5A
+D28
PJ70
L
IMU STBY 14GA
JP222
L
22GA
PJP223
L
16GA
JP228
L
22GA
56P21
3
IRIG & PIPA HTRS, TEMP CONTROL & BLOWER CONTROL THERMOSTAT
56P21
5
22GA
PJ228
A
16GA
PJP223
A
22GA
0 VDC
4
16GA
B
B
(56J1)
JP230
12
TO GSE PORTABLE TEMP CONTROLLER (PTC INTERLOCK)
22GA
22GA
M
16GA
M
22GA
2
TEMP ALARM CONTROL CIRCUIT
13
5K
INERTIAL MEASURING UNIT (IMU)
3A1
MIT (56J1)
GAEC
24GA
PJ250
11
19
+28 VDC IMU STANDBY (PIC INTERLOCK)
FROM GSE PTC
ALL WIRE IS 16GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
PGNS (MIT) PWR & C, LGC, PSA IMU POWER SUPPLY
LM
LDW267-57003


MIT
GAEC
MIT
GAEC
(S6P5)
(S6P10)
JP229
JP221
COMMON
PJP217
RJ1800
PJ970
57
57
3
10
3
ISS WARNING
LGC WARNING
DISPLAY & KEYBOARD
3A5
83
83
ISS WARNING GG9002X
2
11
4
84
84
LGC WARNING GG9001X
1
3
2
EVENT BUFFER SIGNAL ISOLATING EVENT
EVENT BUFFER SIGNAL ISOLATING EVENT
EVENT BUFFER SIGNAL ISOLATING EVENT
16.00 B
JP889
PJ875
24
24
23
23
43
42
22
TO PCMTEA COMMON VIA P875 PIN 65
20.01 A
V1DPER2,13-3
V1DPER2,13-2
V1DPER2,13-1
PCMTEA
20A9
INHIBITED WHEN GUIDANCE CONTROL SWITCH (S6S15) IN THE AGS POSITION
23.00 A
JP885
JP851
6
49
24
61
23
62
1
68
2
1
VOLTAGE DISCRETE DETECTOR
VOLTAGE DISCRETE DETECTOR
VOLTAGE DISCRETE DETECTOR
TO C&WEA MASTER ALARM
5.00
GLB125V
K25
GLB124V
K24
GLB126V
K26
29.00 B
20.01 B
14.00 A
SCERA #2
20A19
C&WEA
20A20
+2.5 TO 6VDC ANUN PWR
ISS WARNING GL4030X
22GA
6DS10
7.00 A
PJ189
60
PJP15
43
JPB53
63
K25
7.00 C
TO ANUN RETURN
LGC WARNING GL4029X
6DS9
7.00 B
59
67
64
K24
PNL I
PGNS CAUTION
GL 4045X (NOT USED)
6DS25
8.00 A
PJ41
Y
PJP1B2
25
JPB53
62
K26
8.00 B
TO ANUN RETURN
PNL II
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
PGNS TM/TRANSFER & CAUTION & WARNING ALARM INSTALLATION
MODEL LM
LDW267-57003
SHEET 14.00
REV E



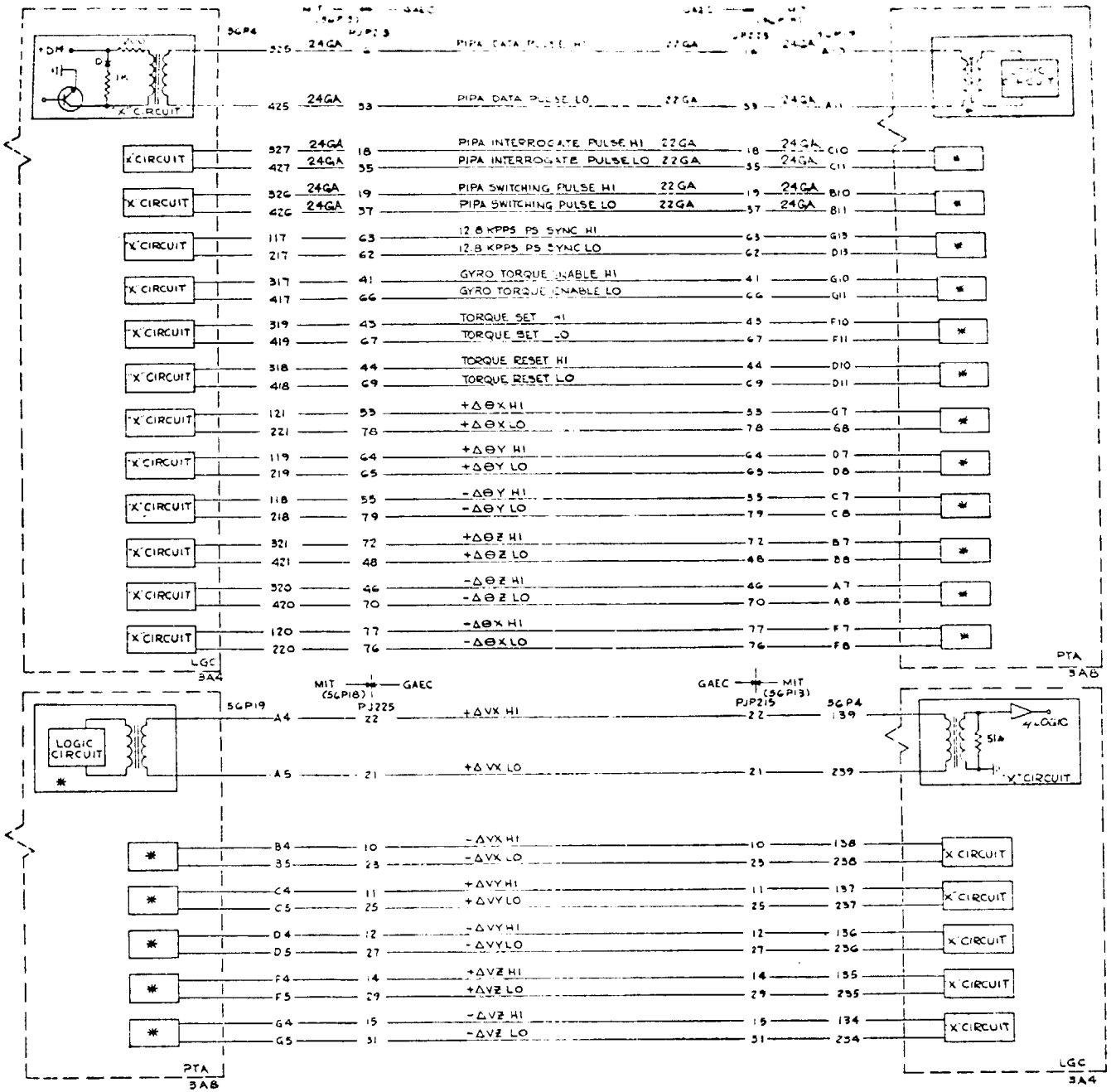
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP			
PGNS (MIT) GNC POWER DISTRIBUTION FROM PSA			
CODE IDENT NO 24931			
MODEL LM	LDW267-57003	SHEET 5.00	REV B



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP		
PGNS (MIT) GN/C GIMBAL SIGNALS FROM IMU		
CODE IDENT NO. 71612		
MODEL LM	LDW267-57003	SHEET 1600 REV B

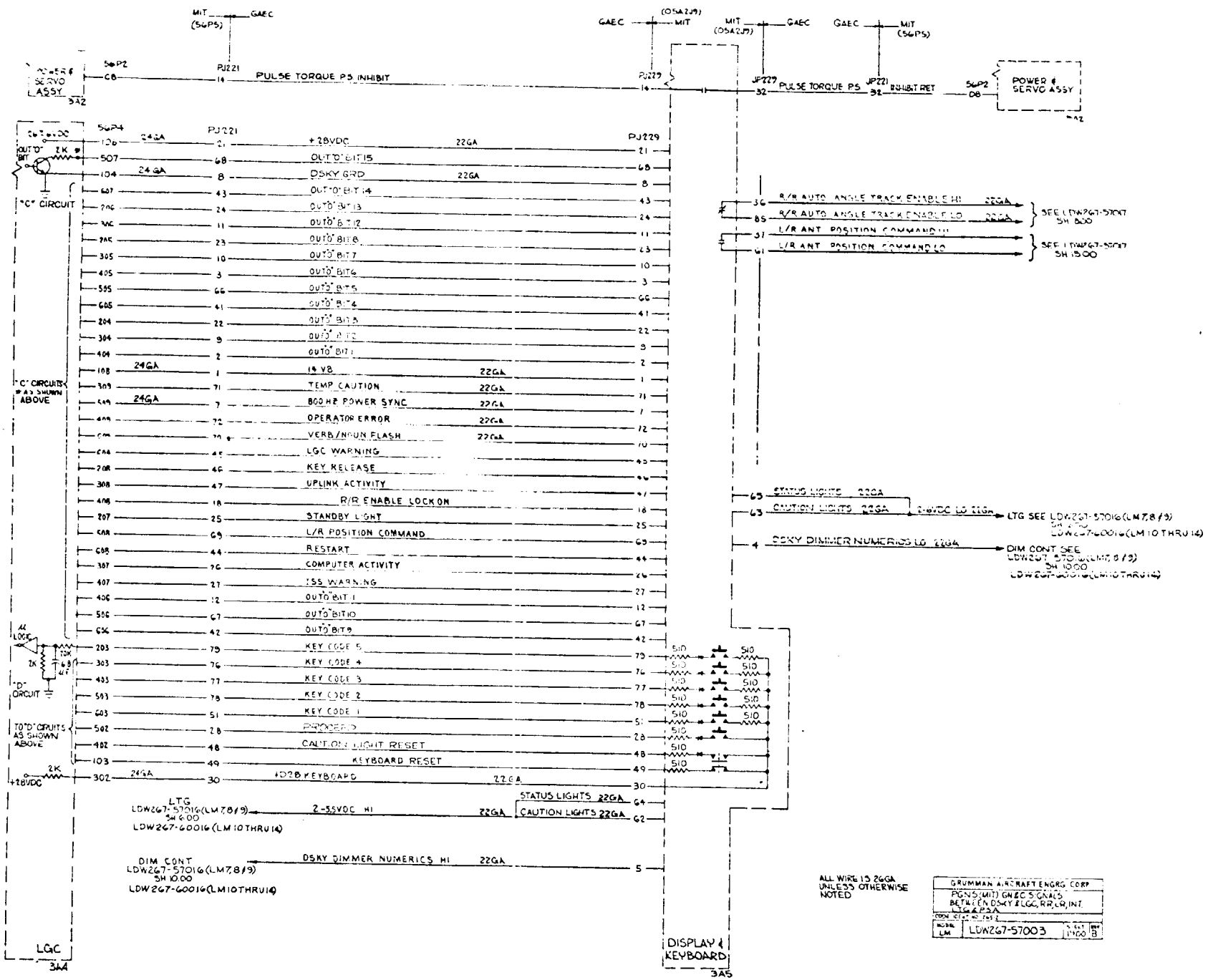


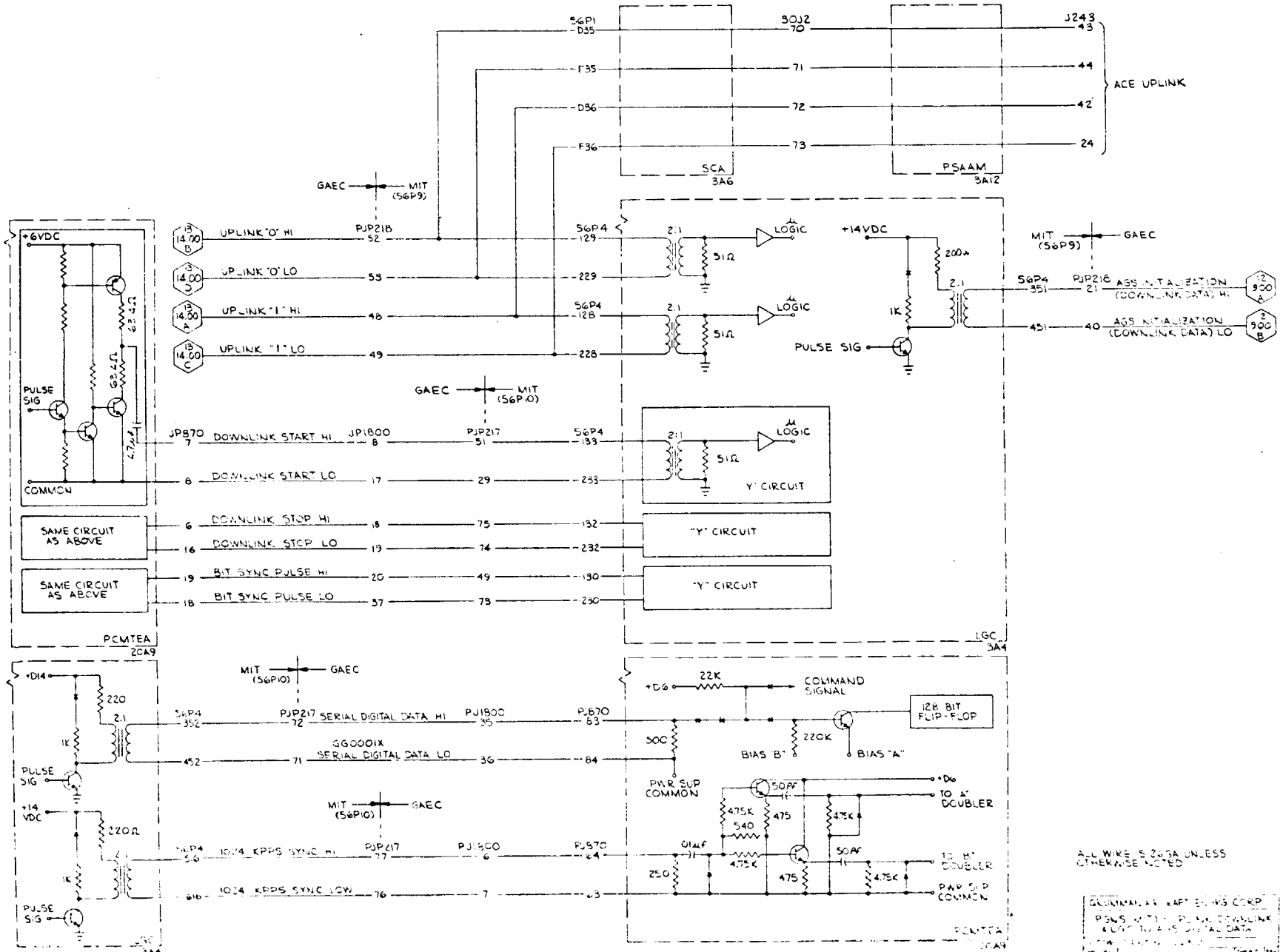
ALL WIRE IS 24GA UNLESS OTHERWISE NOTED

* DENOTES SAME CIRCUIT AS ABOVE

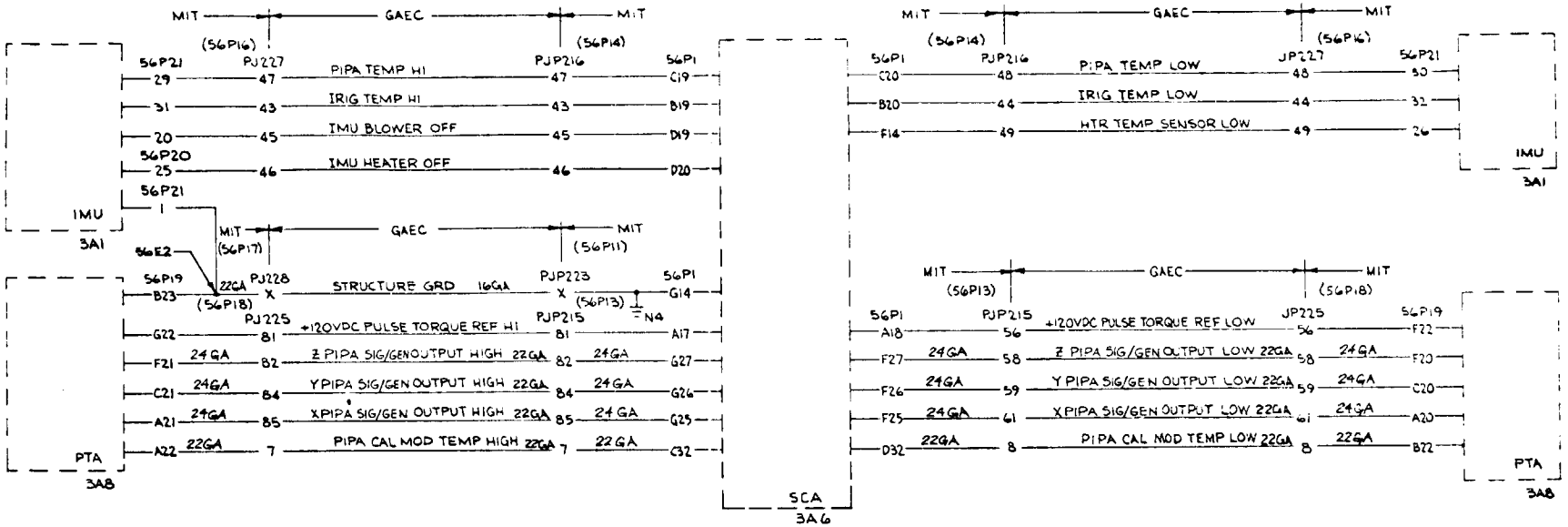
GRUMMAN AEROSPACE ENGRG CORP			
PGNS(M TSGN & C VELOCITY SIGNALS BETWEEN LGC & PTA			
CODE IDENT NO 71225			
MODEL LM	LDW267-57003	SHEET 17 OF 00	REV B

GAEC — MIT (56P12)
J240 PJP224 56P3
68 — 81 — SHAFT SIN 16X RSVR HI — 46
67 — 82 — SHAFT COS 16X RSVR HI — 446
44 — 84 — TRUNNION SIN 16X RSVR HI — 148
43 — 62 — TRUNNION COS 16X RSVR HI — 448
J208
13 — 16 — SHAFT SIN 1X RSVR HI — 147
14 — 18 — SHAFT COS 1X RSVR HI — 447
11 — 21 — TRUNNION SIN 1X RSVR HI — 149
J240
46 — 64 — TRUNNION COS 1X RSVR HI — 449
RSVR SIGNALS FROM RADAR SEE LDW267-57017 SH 12.00
MIT (56P12) — GAEC
56P3 PJP224 J240
246 — SHAFT SIN 16X RSVR LO — 56 — 66
546 — SHAFT COS 16X RSVR LO — 55 — 65
248 — TRUNNION SIN 16X RSVR LO — 60 — 42
548 — TRUNNION COS 16X RSVR LO — 38 — 41
J208
247 — SHAFT SIN 1X RSVR LO — 6 — 4
547 — SHAFT COS 1X RSVR LO — 36 — 5
249 — TRUNNION SIN 1X RSVR LO — 8 — 10
549 — TRUNNION COS 1X RSVR LO — 65 — J240 45
RSVR SIGNALS TO RADAR SEE LDW267-57017 SH 12.00
GAEC — MIT (56P7)
J1400 JPZ19 56P3
20 — 81 — SHAFT ERROR ANGLE CMD HI — 433
36 — 34 — TRUNNION ERROR ANGLE CMD HI — 134
SEE LDW267-57017 SH 10.00
MIT (56P7) — GAEC — MIT (56P7)
56P3 PJ219
237 — FORWARD VELOCITY HI GG0119L — 82 — 9 11.00 A
437 — LATERAL VELOCITY HI GG0120L — 84 — 9 11.00 C
132 — eY (PITCH ERROR) HI GG2217V — 78 — 9 9.00 A
432 — eZ (ROLL ERROR) HI GG2247V — 79 — 9 9.00 E
133 — eX (YAW ERROR) HI GG2277V — 16 — 9 9.00 D
JPZ19 56P3
9 11.00 B — 58 — FORWARD VELOCITY LO — 337
9 11.00 D — 59 — LATERAL VELOCITY LO — 537
9 9.00 B — 53 — eY (PITCH ERROR) LO — 232
9 9.00 F — 55 — eZ (ROLL ERROR) LO — 532
9 9.00 C — 32 — eX (YAW ERROR) LO — 233
CDU 3A7
MIT (56P8) — GAEC
22GA
56P3 — CDU COMMON — 22GA — PJ222 C — 14 GA — JP70 C — MGA
NZ -D
PNL XI
MIT — GAEC
PJ219 — JM00
236 — 436 — 533 — SHAFT ERROR ANGLE CMD LO — 56 — 19
234 — TRUNNION ERROR ANGLE CMD LO — 17 — 37
SEE LDW267-57017 SH 10.00
MIT (56P9) — GAEC
PJ218
+14VDC
200Ω
1K
2:1
PULSE SIG
"X" CIRCUIT
56P3
115 — +ΔΘGIG HI — 46
215 — +ΔΘGIG LO — 47
315 — -ΔΘGIG HI — 30
415 — -ΔΘGIG LO — 31
316 — +ΔΦGOG HI — 29
416 — +ΔΦGOG LO — 50
516 — -ΔΦGOG HI — 27
616 — -ΔΦGOG LO — 28
515 — +ΔΨGMG HI — 4
615 — +ΔΨGMG LO — 5
116 — -ΔΨGMG HI — 25
216 — -ΔΨGMG LO — 11
117 — CDU ZERO 51.2 KPPS HI — 22
217 — CDU ZERO 51.2 KPPS LO — 23
12 7.00
CDU 3A7
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.
GRUMMAN AIRCRAFT ENGRG CORP
PGNS(MIT)GN&C CDU SIGNALS WITH RENDEZVOUS RADAR, FDAI & ASS
CODE IDENT NO. 24612
MODEL LM
LDW267-57003
SHEET 1800
REV


MIT (56P5) GAEC
GAEC (05A2J9) MIT
MIT (05A2J9) GAEC
GAEC MIT (56P5)
POWER & SERVO ASSY 3A2
56P2 CB
PJ221 14
PULSE TORQUE P5 INHIBIT
PJ229 14
JP229 32
PULSE TORQUE P5
JP221 32
INHIBIT RET
56P2 DB
POWER & SERVO ASSY 3A2
56P4 106
24GA
PJ221 21
+28VDC
22GA
PJ229 21
OUT'O' BIT 15 68
DSKY GRD 8
OUT'O' BIT 14 43
OUT'O' BIT 13 24
OUT'O' BIT 12 11
OUT'O' BIT 8 23
OUT'O' BIT 7 10
OUT'O' BIT 6 3
OUT'O' BIT 5 66
OUT'O' BIT 4 41
OUT'O' BIT 3 22
OUT'O' BIT 2 9
OUT'O' BIT 1 2
19 V 8 1
TEMP CAUTION 71
800 HZ POWER SYNC 7
OPERATOR ERROR 72
VERB/NOUN FLASH 70
LGC WARNING 45
KEY RELEASE 46
UPLINK ACTIVITY 47
R/R ENABLE LOCK ON 18
STANDBY LIGHT 25
L/R POSITION COMMAND 69
RESTART 44
COMPUTER ACTIVITY 26
ISS WARNING 27
OUT'O' BIT 11 12
OUT'O' BIT 10 67
OUT'O' BIT 9 42
KEY CODE 5 79
KEY CODE 4 76
KEY CODE 3 77
KEY CODE 2 78
KEY CODE 1 51
PROCEED 28
CAUTION LIGHT RESET 48
KEYBOARD RESET 49
+28VDC 2K 302 24GA
+D28 KEYBOARD 30
22GA
"C" CIRCUIT
"C" CIRCUITS AS SHOWN ABOVE
"D" CIRCUIT
"D" CIRCUITS AS SHOWN ABOVE
OUT'O' BIT 2K
ALL LOGIC
10K
1K
6.8
47
510
LGC 3A4
DISPLAY & KEYBOARD 3A5
R/R AUTO ANGLE TRACK ENABLE HI 36 22GA
R/R AUTO ANGLE TRACK ENABLE LO 85 22GA
SEE LDW267-57001 SH 8.00
L/R ANT POSITION COMMAND HI 37
L/R ANT POSITION COMMAND LO 61
SEE LDW267-57001 SH 15.00
STATUS LIGHTS 22GA 65
CAUTION LIGHTS 22GA 63
2.8VDC LO 22GA
LTG SEE LDW267-57016(LM7,8/9) SH 6.00 LDW267-60016(LM10 THRU 14)
DSKY DIMMER NUMERICS LO 22GA 4
DIM CONT SEE LDW267-57016(LM7,8/9) SH 10.00 LDW267-60016(LM10 THRU 14)
LTG LDW267-57016(LM7,8/9) SH 6.00 LDW267-60016(LM10 THRU 14)
2.55VDC HI 22GA
STATUS LIGHTS 22GA 64
CAUTION LIGHTS 22GA 62
DIM CONT LDW267-57016(LM7,8/9) SH 10.00 LDW267-60016(LM10 THRU 14)
DSKY DIMMER NUMERICS HI 22GA 5
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
PGNS(MIT) GN&C S.GNALS BETWEEN DSKY & LGC, RR, LR, INT. LTG & P3A
MODEL LM
LDW267-57003
SHT 1 OF 1
REV B



ALL WIRES 2443A UNLESS OTHERWISE NOTED



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP	
PGNS(MIT) GN&C, IMU/PTA SIGNALS TO SCA	
CODE IDENT NO 80878	
MODEL LM	LDW267-57C03
SHEET NO	2.00

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 4)

ELECTRICAL POWER SUBSYSTEM

(REF LDW 267-60004 A)

1. Applicable Documents

Level Three Drawings

ITEM NAME	DWG. NO.	REV.	E.O.'s
EPS	LDW390-60001	A	

2. Table of Contents

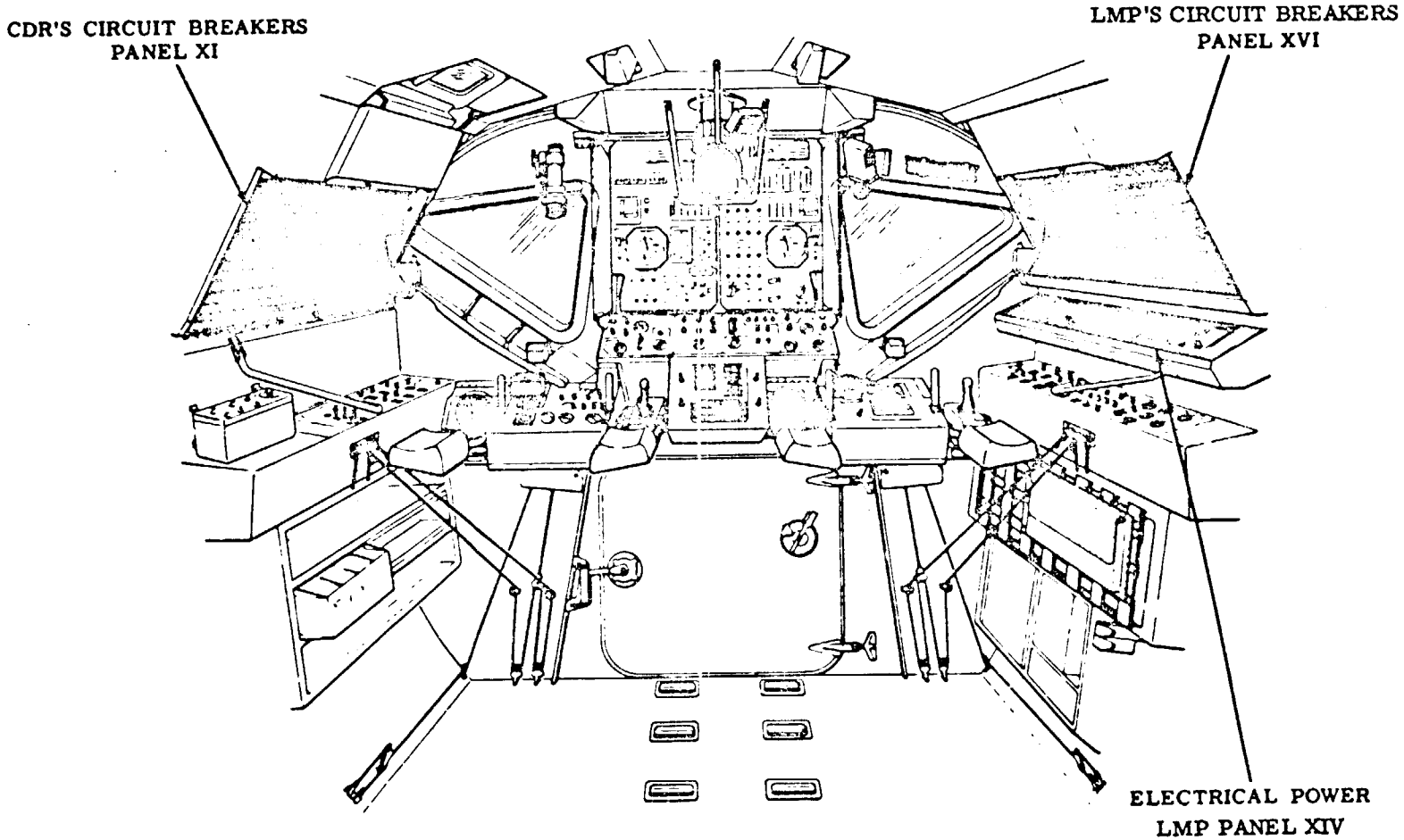
ITEM NAME	DWG. NO.
a) Cover Sheet	4-1001
b) Applicable Documents, Table of Contents, Notes and Applicable Revisions	4-1002 & 4-1002.1
c) Cabin Location of Electrical Power Subsystem	4-1003
d) Electrical Power Subsystem Controls and Indicators Layout	4-1004 thru 4-1004.2
e) Electrical Power Subsystem Control and Indicator Functional Description	4-1005 thru 4-1005.26
f) EPS-Block Diagram	LDW267-60004 SH 4.00
g) EPS-DC Power System	LDW267-60004 SH 5.00
h) EPS-ECA Bat. 1 Switching for 5 Descent Batteries	LDW267-60004 SH 6.00A
i) EPS-ECA Bat. 2/Lunar Bat. Switching for 5 Descent Batteries	LDW267-60004 SH 6.01A
j) EPS-ECA Bat. 3/Lunar Bat. Switching for 5 Descent Batteries	LDW267-60004 SH 6.02
k) EPS-ECA Bat. 4 Switching for 5 Descent Batteries	LDW267-60004 SH 6.03
l) EPS-Ascent ECA 3 Control	LDW267-60004 SH 7.00A
m) EPS-Ascent ECA 4 Control	LDW267-60004 SH 7.01A
n) EPS-Abort & Deadfacing Control	LDW267-60004 SH 8.00

2. Table of Contents (Continued)

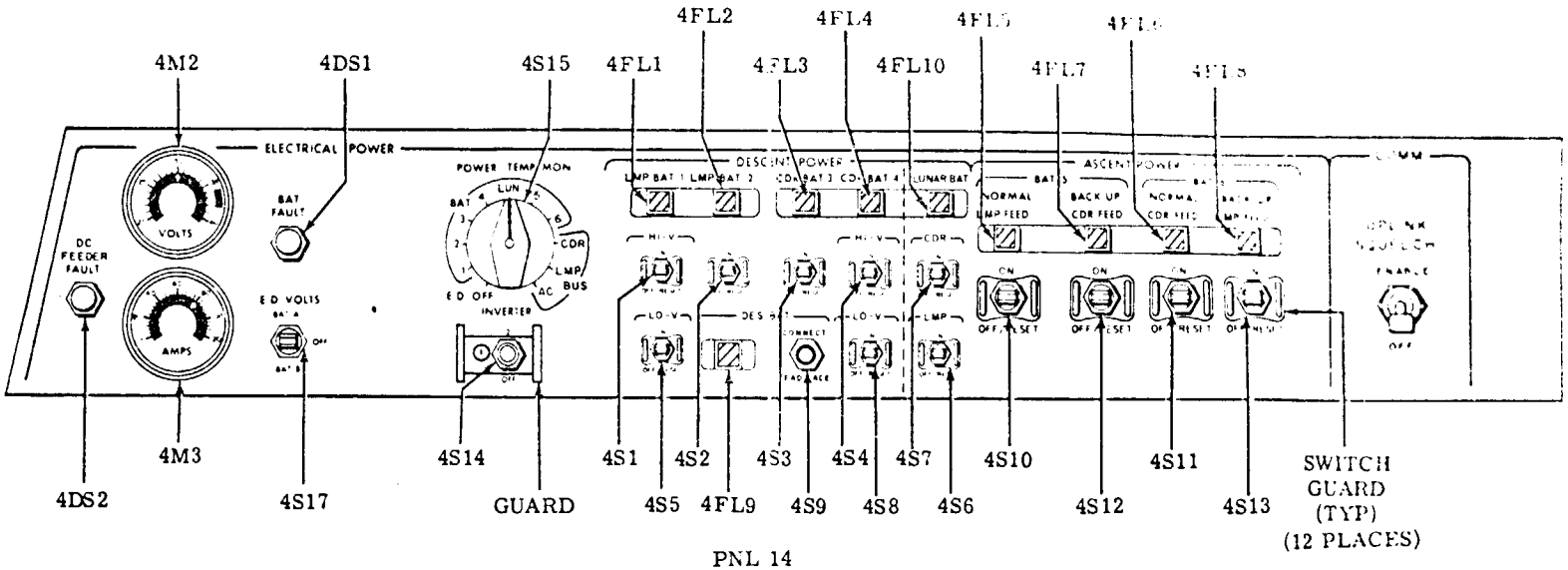
	ITEM NAME	DWG. NO.
o)	EPS-Prelaunch & CM Control	LDW267-60004 SH 9.00A
p)	EPS-LMP Panel XVI DC BUS Distribution	LDW267-60004 SH 10.00 A
q)	EPS-LMP Panel XVI DC BUS Distribution	LDW267-60004 SH 10.01 A
r)	EPS-CDR Panel XI DC BUS Distribution	LDW267-60004 SH 11.00
s)	EPS-CDR Panel XI DC BUS Distribution	LDW267-60004 SH 11.01 A
t)	EPS-Sensor Power Fuse Assembly 4A9	LDW267-60004 SH 12.00 A
u)	EPS-Sensor Power Fuse Assembly 4A10	LDW267-60004 SH 12.01 A
v)	EPS-AC Power System, Distribution & Window Heaters	LDW267-60004 SH 13.00 A
w)	EPS-Intervehicle Wiring Systems A&B	LDW267-60004 SH 14.00
x)	EPS-Battery & Bus Fault Indication Circuit	LDW267-60004 SH 15.00 A
y)	EPS-Caution & Warning	LDW267-60004 SH 16.00
z)	EPS-Voltage Monitoring	LDW267-60004 SH 17.00
aa)	EPS-Battery Current Monitoring	LDW267-60004 SH 18.00
bb)	EPS-Descent Battery Status Display	LDW267-60004 SH 19.00 A
cc)	EPS-Ascent Battery Status Display	LDW267-60004 SH 20.00 A
dd)	EPS-800 Hz Power Distribution	LDW267-60004 SH 21.00
ee)	EPS-800 Hz Power Distribution Block Diagram	LDW267-60004 SH 22.00

3. Applicable Revisions

Rev	Sheet No.	LCD	Description
A	4-1004 4-1005.2	5157F	Addition of circuit breaker guards on panels 11 and 16
	4-13.00	5395	Window heater bus leads replacement and window stress studies
	4-12.01	5502	Transducer installation for APS helium pressure and H_2O line temperature

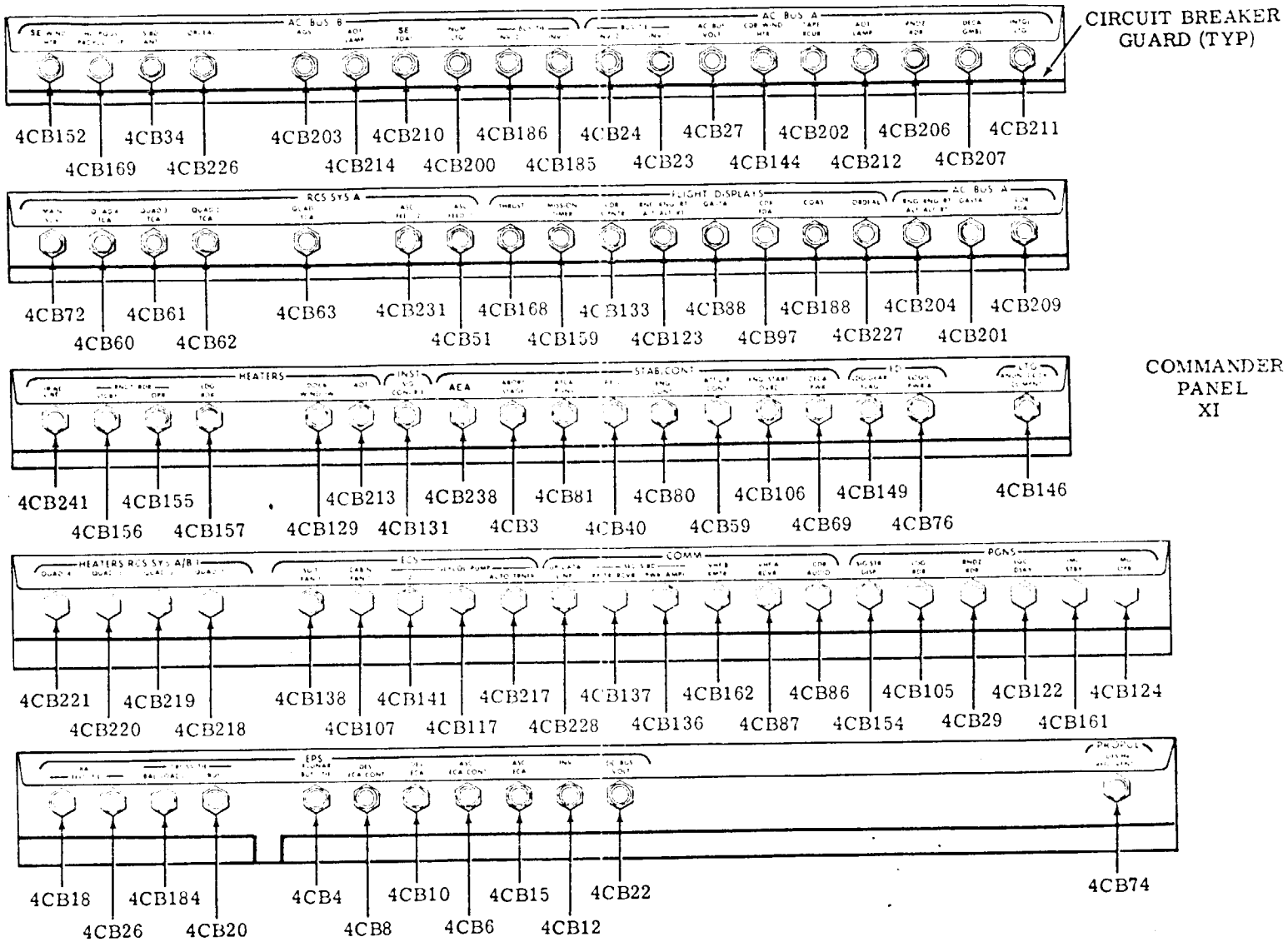


Cabin Location of Electrical Power Subsystem Controls and Indicators

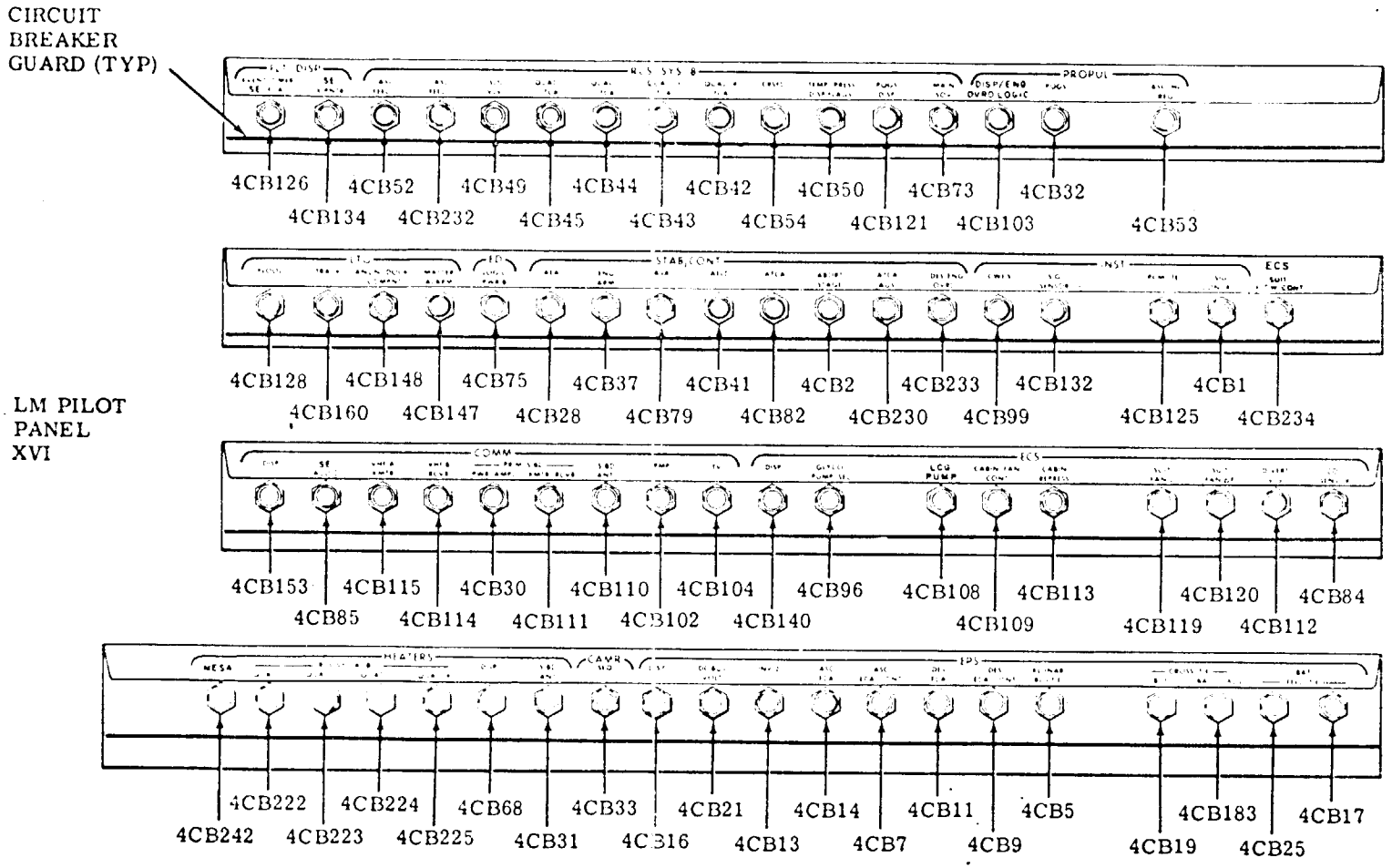


PNL 14
(XIV)

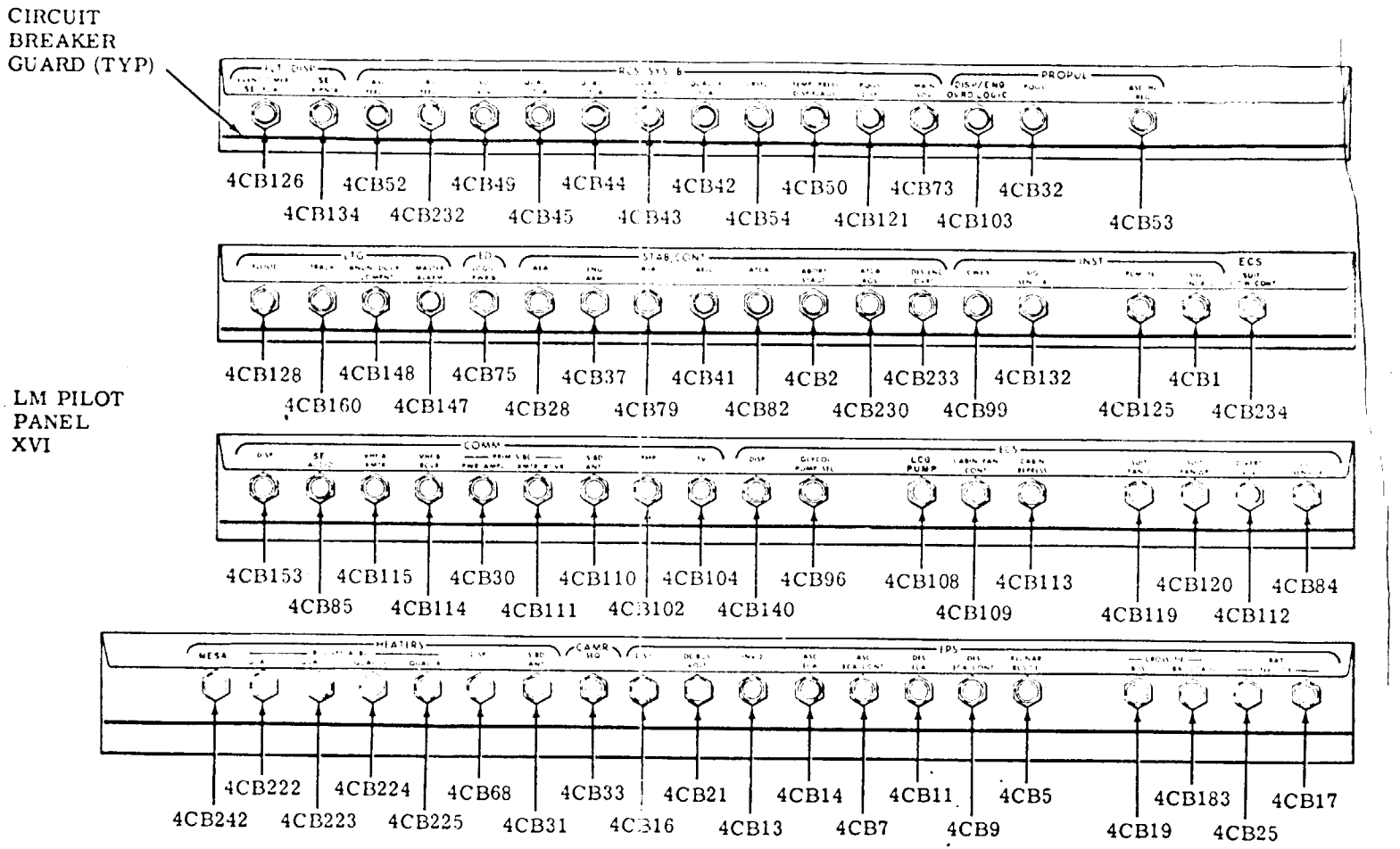
Electrical Power Subsystem Controls and Indicators Layout



Electrical Power Subsystem Controls and Indicators Layout



Electrical Power Subsystem Controls and Indicators Layout



Electrical Power Subsystem Controls and Indicators Layout

ECS Control and Indicators Layout (deleted)

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Code	Control/Indicator	Function
4S1	DESCENT POWER LMP BAT. 1 HI-V SWITCH	This three position switch selects the high voltage tap in one position, and disconnects the high voltage or low voltage battery power tap from the LMP bus in the other position. Positive feedback of the status is provided by a status flag 4FL1. This switch shall be provided with a switch guard.
4S2	DESCENT POWER LMP BAT. 2	This three position switch places Bat. 2 on the LMP bus in one position, and disconnects Bat. 2 from the LMP bus in the other position. Positive feedback of the status is provided by a status flag 4FL2. This switch shall be provided with a switch guard.
4S3	DESCENT POWER CDR BAT. 3	This three position switch places Bat. 3 on the CDR bus in one position, and disconnects Bat. 3 from the CDR bus in the other position. Positive feedback of the status is provided by a status flag 4FL3. This switch shall be provided with a switch guard.
4S4	DESCENT POWER CDR BAT. 4 HI-V SWITCH	This three position switch selects the high voltage tap in one position, and disconnects the high voltage or low voltage battery power tap from the CDR bus in the other position. Positive feedback of the status is provided by a status flag 4FL4. This switch shall be provided with a switch guard.
4S5	DESCENT POWER LMP BAT. 1 LO-V SWITCH	This three position switch selects the low voltage tap in one position, and disconnects the low voltage or high voltage battery power tap from the LMP bus in the other position. Positive feedback of the status is provided by a status flag 4FL1. This switch shall be provided with a switch guard.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Code	Control/Indicator	Function
4S6	DESCENT POWER LUNAR BAT. LMP	This three position switch places lunar Bat. on the LMP bus in one position, and disconnects the lunar Bat. and Bat. 2 from the LMP bus in the other position. Positive feedback of the status is provided by a status flag 4FL10. This switch shall be provided with a switch guard.
4S7	DESCENT POWER LUNAR BAT. CDR	This three position switch places lunar Bat. on the CDR bus in one position, and disconnects the lunar Bat. and Bat. 3 from the CDR bus in the other position. Positive feedback of the status is provided by a status flag 4FL10. This switch shall be provided with a switch guard.
4S8	DESCENT POWER CDR BAT. 4 LO-V SWITCH	This three position switch selects the low voltage tap in one position, and disconnects the low voltage or high voltage battery power tap from the CDR bus in the other position. Positive feedback of the status is provided by a status flag 4FL4. This switch shall be provided with a switch guard.
4S9	DESCENT BATTERIES SWITCH 3-POSITION TOGGLE MOM (CONNECT - MAINTAIN-LOCK MOM (DEADFACE)	This three-position toggle enables power interruption of the descent batteries feed path to the ascent stage. The switch is normally placed in the CONNECT position and then released, thus allowing power flow from the descent batteries to the ascent stage. Selecting the DEAD-FACE position initiates the deadface relays, thus isolating the descent batteries upstream from the staging guillotine (ascent side). The switch may be placed in the CONNECT position again and the descent battery power feed path is restored. Positive indication of descent battery connection is provided by display flag 4FL9.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Code	Control/Indicator	Function
4S10 4S11	ASCENT BATTERY #5 - NORMAL LMP FEED SWITCH ASCENT BATTERY #6 - NORMAL CDR FEED SWITCH TWO 3-POSITION TOGGLES MOM-MAIN-MOM	These three-position toggles (ON-OFF/RESET) normally control ascent battery #5 and ascent battery #6 power feed paths to the LM Pilot and Commanders DC buses respectively. Selecting the ON position will place the battery on the line. Selecting the OFF/RESET position disconnects the battery from the line and resets the contactors in the Electronic Control Assembly (ECA) for overcurrent protection. The ECA connects the battery to the DC bus and will disconnect the battery in the event of an overcurrent. Positive indication of the tripped status of each battery is provided by display flags 4FL5 and 4FL6.
4S12 4S13	BATTERY #5 BACKUP CDR FEED SWITCH BATTERY #6 BACKUP LMP FEED SWITCH TWO 3-POSITION TOGGLES MOM-MAIN-MOM	These three-position toggles (ON-OFF/RESET) control the ascent battery #5 and ascent battery #6 backup feed paths to the Commanders and LM Pilot DC buses respectively. Selecting the ON position will place the battery on the line via the backup feed path. Selecting the OFF/RESET position disconnects the battery backup feed path from the line. The ECA connects the battery to the DC bus. In the event of battery #6 failure 4S12 will be placed to ON. Positive indication of this backup feed path operation is provided by display flag 4FL7. In the event of battery #5 failure 4S13 will be placed to ON. Positive indication of this backup feed path operation is provided by display flag 4FL8.
4S14	INVERTER SWITCH 3-POSITION TOGGLE LOCK-LOCK-LOCK	This guarded three-position toggle (2-1-OFF) controls AC power to the AC bus. Selecting the INV 1 position permits the #1 inverter to supply power to the AC busses. Selecting the INV 2 position permits the #2 inverter to supply power to the AC busses.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Code	Control/Indicator	Function
4S15	POWER/TEMPERATURE MONITOR SELECTOR SWITCH 11-POSITION ROTARY	This eleven position rotary (ED/OFF-BAT: 1 -2 -3 -4 -LUN -5 -6 -BUS: CDR-LMP-AC) enables voltage-current monitoring of batteries 1 through 6, lunar bat. and voltage monitoring of the CDR, LMP of AC busses on meters 4M2 and 4M3. Additionally, over-temperature and current fault monitoring is enabled whenever the switch is in any position 1 through 6, LUN and that particular battery is, in fact, in an over-temperature, reverse or over current condition. This condition is indicated by illumination of the battery fault component caution light (4DS1). Selecting the ED/OFF position enables ED voltage monitoring on 4M2 when 4S17 is utilized.
4S17	ED VOLTAGE MONITOR SWITCH 3-POSITION TOGGLE MOM-MAIN-MOM	This three-position toggle (BAT A OFF BAT B) enables ED voltage monitoring of each pyrotechnics battery provided 4S15 is in the ED/OFF position. BAT A position enables monitoring BAT A. BAT B position enables monitoring BAT B.
4M2	VOLTMETER	This meter will indicate the voltage of any of the seven EPS batteries, two pyrotechnic batteries, the LMP the CDR or AC bus depending on the position of 4S15 and 4S17.
4M3	AMMETER	This meter will indicate the current of any of the seven EPS batteries depending on the position of 4S15. Descent battery current is meter heading divided by 2. Ascent battery current is read directly.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Code	Control/Indicator	Function
4FL1 4FL4	DESCENT LMP BATTERY #1 STATUS DESCENT CDR BATTERY #4 STATUS TWO 3-POSITION FLAGS	Each flag (GRAY-LO-BARBERPOLE) indicates that the battery High Voltage Tap is on the line when the GRAY position is in view. The Low Voltage Tap is on the line when the LO position is in view. The battery is off the line when the BARBERPOLE position is in view.
4FL2	DESCENT LMP BATTERY #2 STATUS 2-POSITION FLAG	This flag (GRAY-BARBERPOLE) when the GRAY is in view indicates LMP Bat. 2 power is on the LMP bus. In the BARBERPOLE position LMP Bat. 2 power is not feeding the LMP bus.
4FL3	DESCENT CDR BATTERY #3 STATUS 2-POSITION FLAG	This flag (GRAY-BARBERPOLE) when the GRAY is in view indicates CDR Bat. 3 power is on the CDR bus. In the BARBERPOLE position CDR Bat. 3 power is not feeding the CDR bus.
4FL5	ASCENT BATTERY #5 NORMAL LMP FEED STATUS 2-POSITION FLAG	This flag (GRAY-BARBERPOLE) indicates that battery #5 is powering the LM Pilot bus through this normal feed path when the GRAY position is in view. In the BARBERPOLE position, battery #5 is not feeding the LM Pilot bus.
4FL6	ASCENT BATTERY #6 NORMAL CDR FEED STATUS 2-POSITION FLAG	This flag (GRAY-BARBERPOLE) indicates that battery #6 is powering the Commander's bus through this normal feed path when the GRAY position is in view. In the BARBERPOLE position, battery #6 is not feeding the Commander's bus.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Code	Control/Indicator	Function
4FL7	ASCENT BATTERY #5 BACKUP CDR FEED STATUS 2-POSITION FLAG	This flag (GRAY-BARBERPOLE) indicates that battery #5 is powering the Commander's bus through this backup feed path when the GRAY position is in view. In the BARBERPOLE position, battery #5 is not feeding the Commander's bus.
4FL8	ASCENT BATTERY #6 BACKUP LMP FEED STATUS 2-POSITION FLAG	This flag (GRAY-BARBERPOLE) indicates that battery #6 is powering the LM Pilot's bus through this backup feed path when the GRAY position is in view. In the BARBERPOLE position, battery #6 is not feeding the LM Pilot's bus.
4FL9	DESCENT DEADFACE BATTERY STATUS 2-POSITION FLAG	This flag (GRAY-BARBERPOLE) indicates whether the descent deadface has been accomplished. The GRAY position indicates that the descent battery feeders are connected to the ascent stage. The BARBERPOLE position indicates that the descent batteries have been disconnected and deadfaced from the ascent stage feeders.
4FL10	DESCENT LUNAR BATTERY STATUS 3-POSITION FLAG	This three position flag indicates the power feed path of the lunar battery. a) BARBERPOLE indicates power off b) CDR position in view - Bat. on CDR bus c) LMP position in view - Bat. on LMP bus.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Code	Control/Indicator	Function
4DS1	BATTERY FAULT COMPONENT CAUTION LIGHT	This light illuminates to indicate a particular battery overtemperature, reverse current, or over-current condition when 4S15 is placed to that battery position and one of the above malfunction conditions exist. A battery over-temperature, reverse current, or over-current condition will illuminate the (BATTERY) caution annunciator (6DS27) and cause the astronaut to determine the battery problem by using 4S15.
4DS2	DC FEEDER FAULT COMPONENT CAUTION LIGHT	This light illuminates to indicate either a DC bus or Main Feeder line grounded.

NOTE: The primary function of the circuit breaker within the LM is to provide electrical protection. Some of the circuit breakers may also serve as ON-OFF controls. Breakers are located on the Commander's Circuit Breaker Panel and the LM Pilot Circuit Breaker Panel.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Explosive Devices				
4CB75	LOGIC PWR B		X	All explosive devices toggle switches & ED relays.
4CB76	LOGIC PWR A	X		All explosive devices toggle switches & ED relays.
4CB149	LDG GEAR FLAG	X		Landing gear status indicator (2FL1).
Primary Guidance and Navigation				
4CB29	RNDZ RDR	X		This circuit breaker serves as the ON-OFF control for providing prime power to the rendezvous radar.
4CB105	LDG RDR	X		This circuit breaker serves as the ON-OFF control for providing prime power to the landing radar.
4CB122	LGC/DSKY	X		This circuit breaker serves as the ON-OFF control for providing prime power for the LGC & DSKY.
4CB124	IMU OPR	X		This circuit breaker serves as the ON-OFF control for providing prime power to the IMU, PSA, PTA & CDU.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Primary Guidance and Navigation (Cont.)				
4CB154	SIG STR DISP	X		Signal Strength meter (17M1).
4CB161	IMU STBY	X		This circuit breaker serves as the ON-OFF control for the PIPA and Inertial Reference Integrating gyro control heaters.
4CB206	AC BUS A RNDZ RDR	X		This circuit breaker serves as the ON-OFF control for providing prime (AC) power to the rendezvous radar. (AC BUS A)
4CB212	AC BUS A AOT LAMP	X		These circuit breakers serve as the ON-OFF control for providing prime redundant power to the AOT lamp (AC).
4CB214	AC BUS B AOT LAMP	X		
Environmental Control				
4CB84	CO_2 SENSOR		X	CO_2 sensor.
4CB96	GLYCOL PUMP SEC		X	Secondary glycol pump.
4CB107	CABIN FAN	X		Cabin fan.
4CB108	LCG PUMP		X	LCG Pump.
4CB109	CABIN FAN CONT		X	Cabin differential pressure sensor, O_2 pressure regulator valve and relay.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Environment Control (Cont.)				
4CB112	DIVERT VLV		X	Suit circuit diverter valve, cabin differential pressure sensor, O_2 pressure regulator valve.
4CB113	CABIN REPRESS		X	Cabin repressurization and emergency O_2 valve, cabin differential pressure sensor, O_2 pressure regulator valve and relay.
4CB117	GLYCOL PUMP 1	X		Glycol pump #1.
4CB119	SUIT FAN 2		X	Suit fan #2.
4CB120	SUIT FAN ΔP		X	Fan differential pressure sensor and relay.
4CB138	SUIT FAN 1	X		Suit fan #1.
4CB140	DISP		X	ECS displays: i.e., CO_2 Partial Pressure indicator (7M1), Cabin Temperature and Suit Temperature indicator (7M3), Cabin Pressure and Suit Pressure Indicator (7M2), Glycol Pressure and Glycol Temperature indicator (7M5), Oxygen Quantity and Water Quantity indicator (7M4).
4CB141	GLYCOL PUMP 2	X		Glycol pump #2.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Environment Control (Cont.)				
4CB217	GLYCOL PUMP AUTO TRNFR	X		Energizes transfer relay to automatically switch pumps when low ΔP appears across pumps.
4CB234	SUIT FLOW CONT		X	Energizes relay and subsequently applies DC power to SUIT ISOL valves.
Reaction Control				
4CB42	SYS B QUAD 4 - TCA		X	TCA Fuel and Oxidizer valves of Quad 4, System B.
4CB43	SYS B QUAD 3 - TCA		X	TCA Fuel and Oxidizer valves of Quad 3, System B.
4CB44	SYS B QUAD 2 - TCA		X	TCA Fuel and Oxidizer valves of Quad 2, System B.
4CB45	SYS B QUAD 1 - TCA		X	TCA Fuel and Oxidizer valves of Quad 1, System B.
4CB50	SYS B TEMP/PRESS DISP-FLAGS		X	All status flags (8FL5 to 8FL19 and temperature and Pressure indicators 8M1 and 8M2).

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Reaction Control (Cont.)				
4CB51	SYS A ASC FEED 1	X		Primary RCS/APS interconnect Oxidizer and Fuel valves of System A.
4CB52	SYS B ASC FEED 1		X	Primary RCS/APS interconnect Oxidizer and Fuel valves of System B.
4CB54	SYS B CRSFD		X	Oxidizer and Fuel crossfeed valves. (2 valves).
4CB60	SYS A QUAD 4 - TCA	X		TCA Fuel and Oxidizer valves of Quad 4, System A.
4CB61	SYS A QUAD 3 - TCA	X		TCA Fuel and Oxidizer valves of Quad 3, System A.
4CB62	SYS A QUAD 2 - TCA	X		TCA Fuel and Oxidizer valves of Quad 2, System A.
4CB63	SYS A QUAD 1 - TCA	X		TCA Fuel and Oxidizer valves of Quad 1, System A.
4CB72	SYS A MAIN SOV	X		Oxidizer and Fuel main shutoff valves of System A. (2 valves)
4CB73	SYS B MAIN SOV		X	Oxidizer and Fuel main shutoff valves of System B. (2 valves)

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Reaction Control (Cont.)				
4CB121	SYS B PQGS/DISP		X	Propellant Quantity Gaging Control Unit Assembly, and indicator (8M4).
4CB231	SYS A ASC FEED 2	X		Secondary RCS/APS Interconnect Oxidizer and Fuel valves of System A.
4CB232	SYS B ASC FEED 2		X	Secondary RCS/APS Interconnect Oxidizer and Fuel valves of System B.
Flight Displays				
4CB88	GASTA	X		Gimbal angle sequencing transformation assembly.
4CB97	CDR FDAI	X		Attitude indicator assembly (9M1).
4CB123	RND/RNG RT ALT/ALT RT	X		Range/Altitude indicator (9M9).
4CB126	EVENT TIMER/ SE FDAI		X	Event timer (9M11) and attitude indicator assembly (9M6).
4CB133	CDR X-PNTR	X		Cross Pointer (9M2).
4CB134	SE X-PNTR		X	Cross Pointer (9M3).

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Flight Displays (Cont.)				
4CB159	MISSION TIMER	X		Mission Timer display (9M12).
4CB168	THRUST	X		Thrust Indicator (9M7).
4CB188	COAS	X		Crew Mans Optical Alignment Sight.
4CB201	AC BUS A GASTA	X		Gimbal angle sequencing transformation assembly.
4CB204	AC BUS A RNG/RNG RT ALT/ALT RT	X		Range/Altitude indicator (9M9).
4CB209	AC BUS A CDR FDAI	X		Sphere drive system of the Attitude Indicator Assembly (9M1).
4CB210	AC BUS B SE FDAI	X		Sphere drive system of the Attitude Indicator Assembly (9M6).
4CB226	AC BUS B ORDEAL	X		This circuit breaker serves as the ON-OFF control for providing prime (AC) power to the ORDEAL.
4CB227	ORDEAL	X		This circuit breaker serves as the ON-OFF control for providing prime power to the ORDEAL.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Propulsion				
4CB32	PQGS		X	Descent propulsion quantity gaging system.
4CB53	ASC He REG		X	Latching Helium solenoid valves 1 and 2.
4CB74	DES He REG/VENT	X		Latching Helium solenoid valves 1 and 2 and fuel and oxidizer vent solenoid valves.
4CB103	DISP/ENG OVRD LOGIC		X	Fuel and Oxidizer Pressure indicator (10M3), Fuel and Oxidizer Temperature Indicator (10M4) and flags (10FL1 through 10FL4).
4CB169	AC BUS B He/PQGS PROPUL DISP	X		Helium Temp/Press indicator (10M1) and descent propellant QTY DISP (10M5).
Stabilization and Control				
4CB2	ABORT STAGE		X	Abort Staging Electronics.
4CB3	ABORT STAGE	X		Abort Staging Electronics.
4CB28	AEA		X	Abort Electronics Assembly; and DEDA power when AGS status switch (12S17) is in operate.
4CB238	AEA	X		

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Stabilization and Control (Cont.)				
4CB37	ENG ARM		X	Powers Engine Arm switch.
4CB40	AELD	X		Ascent engine latching device, ascent engine, & stage command to ED.
4CB41	AELD		X	Ascent engine latching device, ascent engine, & stage command to ED.
4CB59	ATT DIR CONT	X		Attitude Controllers for direct firing of RCS.
4CB69	DECA PWR	X		Descent Engine Control Assembly & descent engine.
4CB79	ASA		X	Abort Sensor Assembly.
4CB80	ENG CONT	X		(1) Lunar Contact Light (1DS2) and Probe switches. (2) Auto switching from wide to narrow deadband with engine "on". (3) Auto switching from two to four jets with engine "on". (4) CES analog control of GDA's when in AGS.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Stabilization and Control (Cont.)				
4CB80 (Cont.)				(5) Disables auto thrust control when in AGS. (6) Resets Engine Start switches. (7) Redundant power for stopping Descent Engine manually and when staging.
4CB81	ATCA (PGNS)	X		Provides redundant power to Jet Drivers. Provides power to relays in S&C assembly to allow switching from AGS to PGNS.
4CB82	ATCA		X	Attitude/Translation Control Assembly, and Lunar contact light (1DS1) and Probe switches.
4CB106	ENG START OVRD	X		Engine Start Switch and redundant power for Ascent Engine Arming Circuit.
4CB203	AC BUS B AGS	X		Abort Electronics Assy. (Outputs to FDAI)
4CB207	AC BUS A DECA GMBL	X		Descent Engine GDA's and for auxiliary power within the DECA.
4CB230	ATCA (AGS)		X	Applies DC power through Guidance Control Switch to SELECT AGS and bias power to ATCA. Also supplies DC power through MODE CONTROL and BAL CPL switches to ATCA preamplifiers.

SUBSYSTEM ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Stabilization and Control (Cont.)				
4CB233	DES ENG OVRD		X	Redundant DC power feed for DES ENG actuator valves.
Communications				
4CB33	FEDM S-BD PWR AMPL		X	S-BAND Power Amplifier and Diplexer (Power Supply #1).
4CB34	AC BUS B S-BD ANT	X		AC Electronics section of the S-BAND steerable Antenna Assembly.
4CB85	SE AUDIO		X	SPA Audio Center #2 which feeds the LM Pilot's space suit microphone amplifiers and biomedical sensors. This circuit breaker also serves as an ON-OFF control for Audio Center #2.
4CB86	CDR AUDIO	X		SPA Audio Center #1 which feeds the Commander's space suit microphone amplifiers and biomedical sensors. This circuit breaker also serves as an ON-OFF control for Audio Center #1.
4CB87	VHF A RCVR	X		VHF A XCVRS & Diplexer Assembly.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Communications (Cont.)				
4CB102	PMP		X	Pre-modulation Processor portion of the Signal Processing Assembly. This circuit breaker serves as the ON-OFF control for the PMP.
4CB104	TV		X	Portable Television Camera. This circuit breaker serves as the ON-OFF control for the TV camera. Television transmission requires: (1) That the S-Band power amplifier controlled by switch 13S2, be energized. (2) That the S-Band erectable antenna be connected. (3) That the S-Band antenna select switch (14S5) be in the LUNAR STAY position. (4) That 13S8 be in the PRIM or SEC position. (5) That 13S6 be in either the VOICE or OFF position.
4CB110	S-BD ANT		X	DC Electronics section of the S-BAND Steerable Antenna Assembly.
4CB111	PRIM S-BD XMTR/RCVR		X	S-BAND XCVR, primary transmitter, receiver (portions of the PMP for key functions).

Subsystem Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Communications (Cont.)				
4CB114	VHF B RCVR		X	VHF B XCVRS & Diplexer Assembly.
4CB115	VHF A XMTR		X	VHF A XCVRS & Diplexer Assembly.
4CB136	SEC S-BD PWR AMPL	X		S-BAND Power Amplifier and Diplexer (Power Supply #2).
4CB137	SEC S-BD XMTR/RCVR	X		S-BAND XCVR secondary transmitter & receiver (portions of the PMP for key functions).
4CB153	DISP		X	The Communication's Displays, i.e., Signal Strength Meter (14M1), Antenna Pitch Meter (14M3) and the Antenna Yaw Meter (14M4).
4CB162	VHF B XMTR	X		VHF B XCVRS & Diplexer Assembly.
4CB228	UP DATA LINK	X		Digital Uplink Assembly.
Lighting				
4CB128	FLOOD		X	Floodlights & Utility Lights.
4CB146	ANUN/DOCK COMPNT	X		LCA which supplies power for Caution/Warning Annunciators (6DS1 through 6DS40), Component Caution Lights (2DS1, 2DS2, 4DS1, 4DS2, 7DS1, 7DS3, 7DS6, 7DS7, 12DS1, 17DS1) Display

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Lighting (Cont.)				
4CB146 (Cont.)				Power Failure Indicators (16DS90 through 16DS98) and the Docking Lights. This circuit breaker except for Docking Lights also serve as ON-OFF control for the components listed above.
4CB147	MASTER ALARM		X	The two master alarm lights and the tone generator.
4CB148	ANNUN/DOCK/ COMPNT		X	Alternate power supply for 4CB146.
4CB236	UTILITY	X		Two utility lights (16DS104 & 16DS105)
4CB160	TRACK		X	Tracking Lights.
4CB200	AC BUS B NUM LTG	X		LCA supplies pwr to the numeric displays (3M1, 3M2, 3M3, 3M4, 3M5, 3M6, 9M11, 9M12, 10M1, 10M5A, 10M5B, 12M1, and 12M2).
4CB211	AC BUS A INTGL LTG	X		LCA supplies pwr to all integral lighting.
Heaters				
4CB31	S-BD ANT		X	S-band Antenna Heater.

System Code	Panel Nomenclature	[illegible] CDR	[illegible] LMP	Component(s) Served
Heaters (Cont.)				
4CB68	DISP		X	QUAD ENG TEMP Display (18M1).
4CB129	DOCK WINDOW	X		Powers docking window heater.
4CB144	AC BUS A CDR WIND HTR	X		Powers Commander's window heater.
4CB152	AC BUS B SE WIND HTR	X		Powers LM Pilot's window heater.
4CB155	RNDZ RDR OPR	X		Provides prime power to the Rendezvous Radar Heater Control Circuit which maintains operating temperature of antenna components and oven assembly.
4CB156	RNDZ RDR STBY	X		Provides prime power to the Rendezvous Radar Heater Control Circuit which maintains standby temperature of the antenna components.
4CB157	LDG RDR	X		Landing Radar Heater Control Circuit.
4CB213	AOT	X		AOT Heater.
4CB215	QUAD 1 RCS SYS A/B-1	X		System 1 RCS A and B Engine heaters in Quad 1.
4CB219	QUAD 2 RCS SYS A/B-1	X		System 1 RCS A and B Engine heaters in Quad 2.

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Heaters (Cont.)				
4CB220	QUAD 3 RCS SYS A/B-1	X		System 1 RCS A and B Engine heaters in Quad 3.
4CB221	QUAD 4 RCS SYS A/B-1	X		System 1 RCS A and B Engine heaters in Quad 4.
4CB222	QUAD 1 RCS SYS A/B-2		X	System 2 RCS A and B Engine heaters in Quad 1.
4CB223	QUAD 2 RCS SYS A/B-2		X	System 2 RCS A and B Engine heaters in Quad 2.
4CB224	QUAD 3 RCS SYS A/B-2		X	System 2 RCS A and B Engine heaters in Quad 3.
4CB225	QUAD 4 RCS SYS A/B-2		X	System 2 RCS A and B Engine heaters in Quad 4.
4CB241	URINE LINE	X		Two 15 watt heaters on waste management system.
4CB242	MESA		X	Six 25 watt heaters for auto temperature controls.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Electrical Power				
4CB4	XLUNAR BUS TIE	X		Switches CDR's bus translunar loads to LM ground.
4CB5	XLUNAR BUS TIE		X	Switches LMP's bus translunar loads to LM ground.
4CB6	ASC ECA CONT	X		Powers switches to control Ascent ECA contactor coils, and Dead face contactor coils. (4S9 thru 4S13).
4CB7	ASC ECA CONT		X	Powers switches to control Ascent ECA contactor coils, and Dead face contactor coils. (4S9 thru 4S13).
4CB8	DES ECA CONT	X		Powers switches to control Descent ECA contactor coils. (4S1 thru 4S8).
4CB9	DES ECA CONT		X	Powers switches to control Descent ECA contactor coils. (4S1 thru 4S8).
4CB10	DES ECA	X		Powers both Descent Electronic Control Assemblies.
4CB11	DES ECA		X	Powers both Descent Electronic Control Assemblies.
4CB12	INV 1	X		AC Inverter #1.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

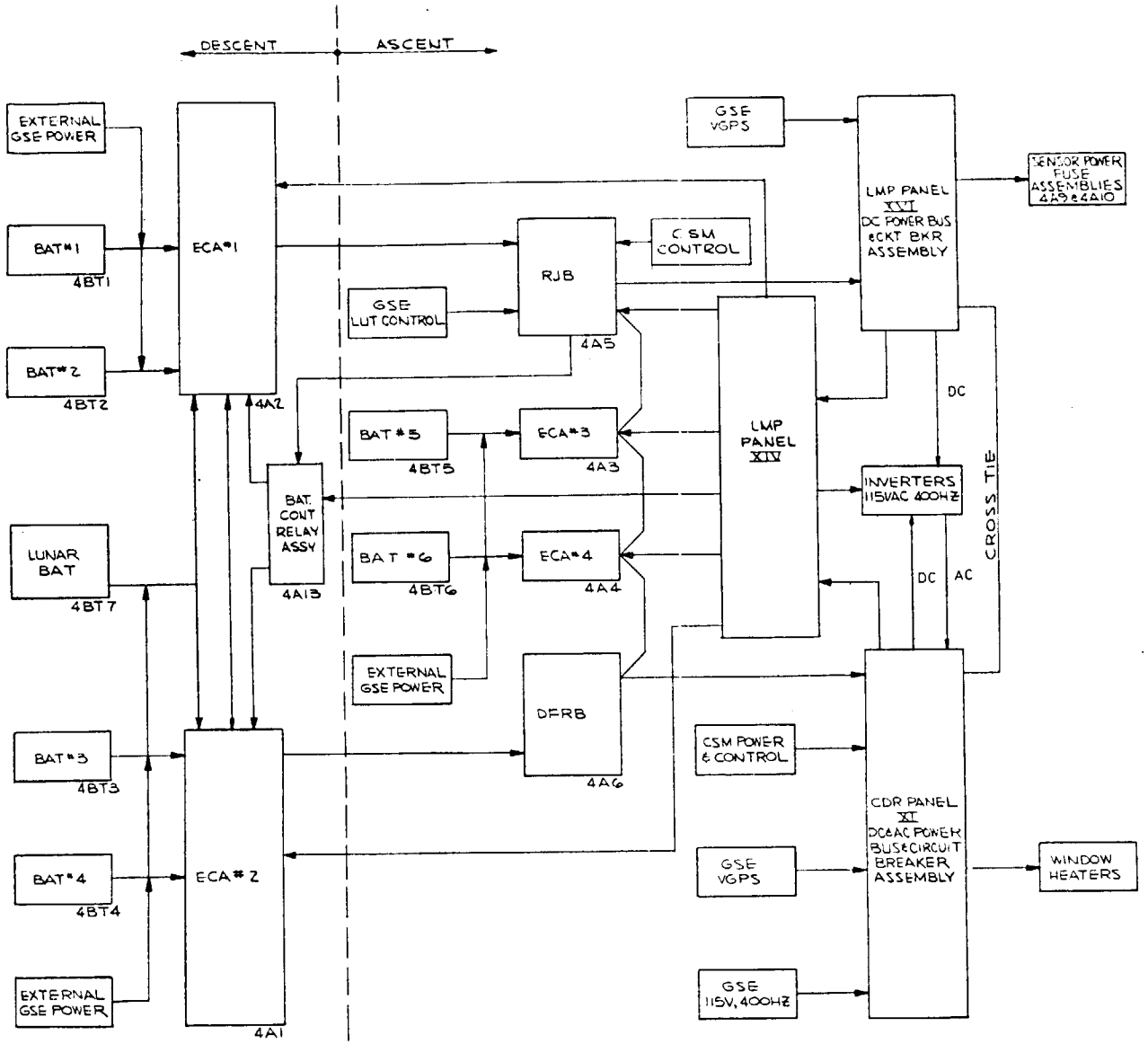
Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Electrical Power (Cont.)				
4CB13	INV 2		X	AC Inverter #2.
4CB14	ASC ECA		X	Powers both Ascent Electronic Control Assemblies.
4CB15	ASC ECA	X		Powers both Ascent Electronic Control Assemblies.
4CB16	DISP		X	The Electrical Power System Displays (4M2 and 4M3) and flags (4FL1 through 4FL9).
4CB17	BAT FEED TIE		X	Ties Batteries 1, 2, and 5 normal and 6 alternate to the LM Pilot Bus.
4CB18	BAT FEED TIE	X		Ties Batteries 3, 4, and 6 normal and 5 alternate to the Commander's Bus.
4CB19	CROSS TIE BUS		X	Ties LMP Bus to CDR Bus in the event of Feeder failure.
4CB20	CROSS TIE BUS	X		
4CB21	DC BUS VOLT		X	DC Bus voltage instrumentation and DC Bus fault light.
4CB22	DC BUS VOLT	X		DC Bus voltage instrumentation, DC Bus fault light and OI during Prelaunch (4K6).
4CB23	AC BUS A BUS TIE INV 1	X		Connects Inverter Output through Inverter Switch (4S14) to AC Bus A.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

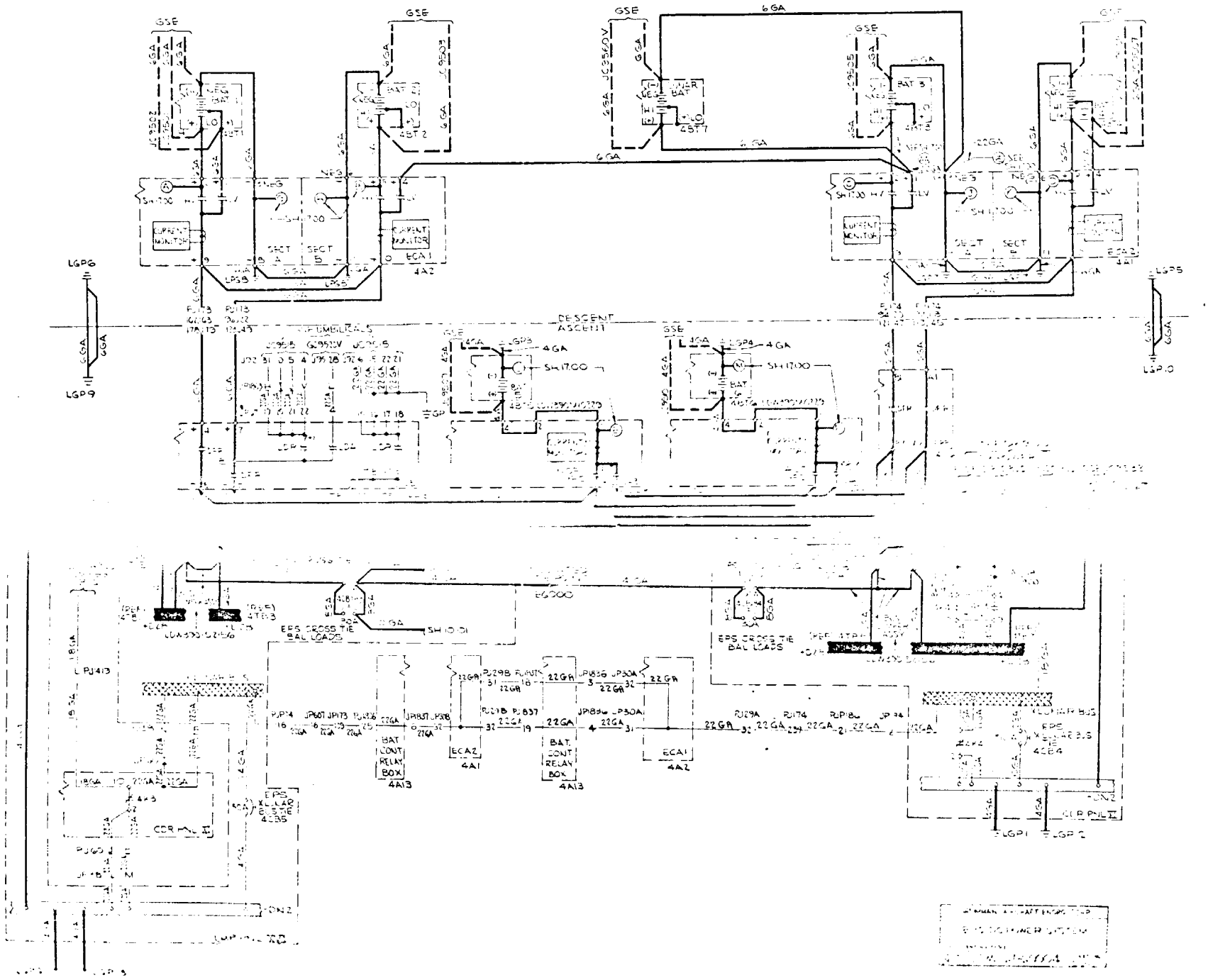
Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Electrical Power (Cont.)				
4CB24	BUS TIE INV 2	X		Connects Inverter Output through Inverter Switch (4S14) to AC Bus A.
4CB25	BAT FEED TIE		X	Ties Batteries 1, 2, 5 normal and 6 alternate to the LM Pilot Bus.
4CB26	BAT FEED TIE	X		Ties Batteries 3, 4, and 6 normal and 5 alternate to the Commander's Bus.
4CB27	AC BUS A AC BUS VOLT	X		AC Bus A voltage instrumentation (AC).
4CB183	CROSS TIE BAL LOADS		X	Ties LMP Bus to CDR Bus for parallel battery operation.
4CB184	CROSS TIE BAL LOADS	X		
4CB185	AC BUS B BUS TIE INV 1	X		Connects Inverter output through Inverter switch (4S14) to AC BUS B.
4CB186	AC BUS B BUS TIE INV 2	X		Connects Inverter output through Inverter switch (4S14) to AC BUS B.
Instrumentation				
4CB1	SIG CONDR 2		X	Electronic Replaceable Assembly #2.
4CB99	CWEA		X	Caution and Warning Electronics Assembly.

SUBSYSTEM: ELECTRICAL POWER (FUNCTIONAL GROUPING 4)

Subsystem/Code	Panel Nomenclature	Panel Location CDR	Panel Location LMP	Component(s) Served
Instrumentation (Cont.)				
4CB125	PCM/TE		X	Pulse code modulator and Timing Electronics Circuit.
4CB131	SIG CONDR 1	X		Electronic Replaceable Assembly #1.
4CB132	SIG SENSOR		X	All pre-conditioned transducers.
4CB202	AC BUS A TAPE RCDR	X		Connects Data Storage Electronics Assembly to AC Bus A.
Camera				
4CB33	SEQ		X	Sequence camera Enabling control.



GRUMMAN AIRCRAFT ENGRG CORP	
EPS BLOCK DIAGRAM	
CODE IDENT NO. 26312	
MODEL LM	LDW267-60004 SHEET 4.00 REV


GSE
6GA
LGP6
LGP9
LGP5
LGP10
DESCENT
ASCENT
SECT A
SECT B
SH1700
EPS CROSS TIE BAL LOADS
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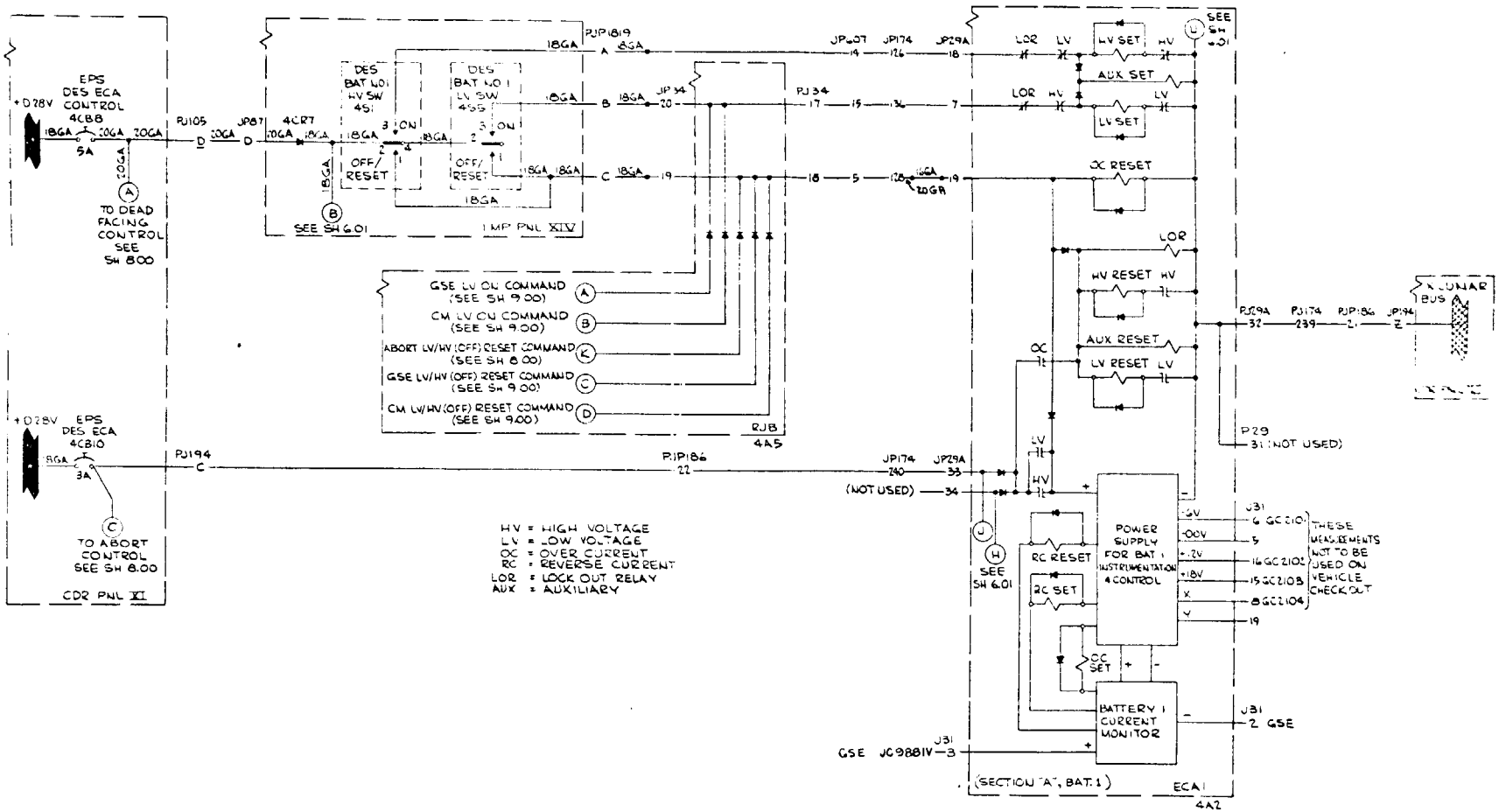
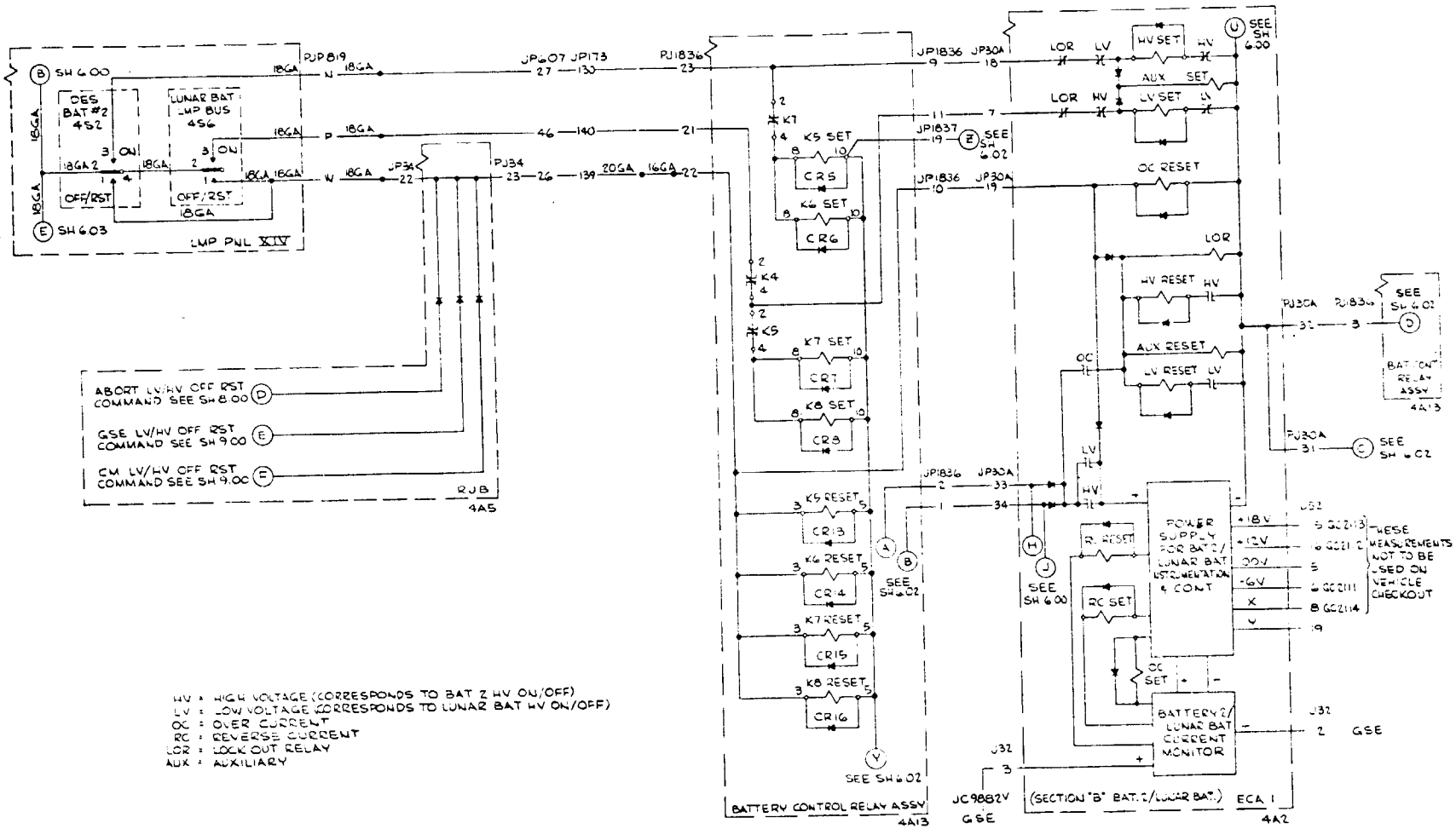
CDR PNL II
LGP1
LGP2



ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP	
ECA-BAT 1 SWITCHING FOR 5 DESCENT BATTERIES	
CODE IDENT NO 26512	
MODEL LM	LDW267-60004 SHEET SER 6.00 A



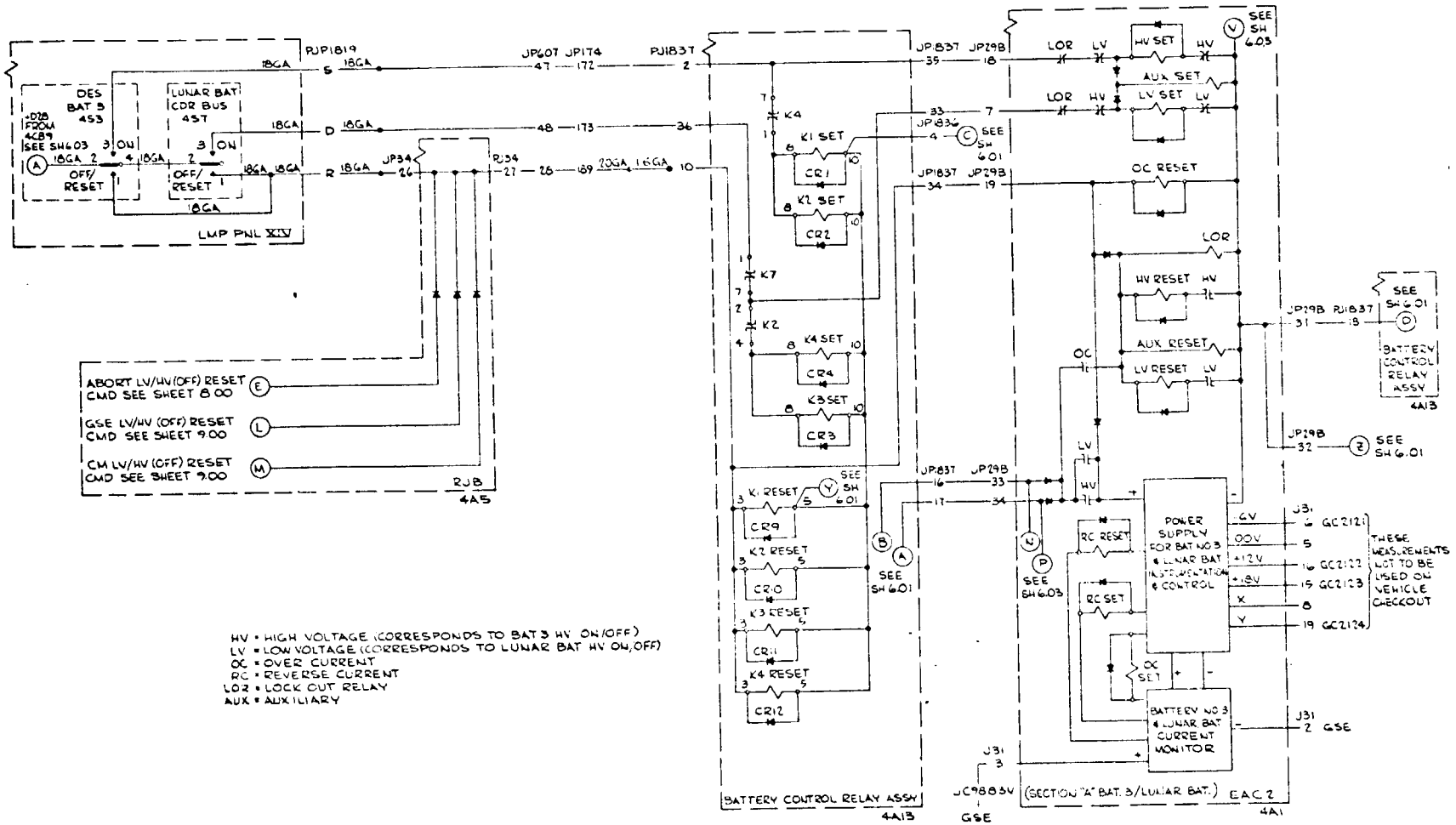
HV = HIGH VOLTAGE (CORRESPONDS TO BAT 2 HV ON/OFF)
LV = LOW VOLTAGE (CORRESPONDS TO LUNAR BAT HV ON/OFF)
OC = OVER CURRENT
RC = REVERSE CURRENT
LOR = LOCK OUT RELAY
AUX = AUXILIARY

ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED

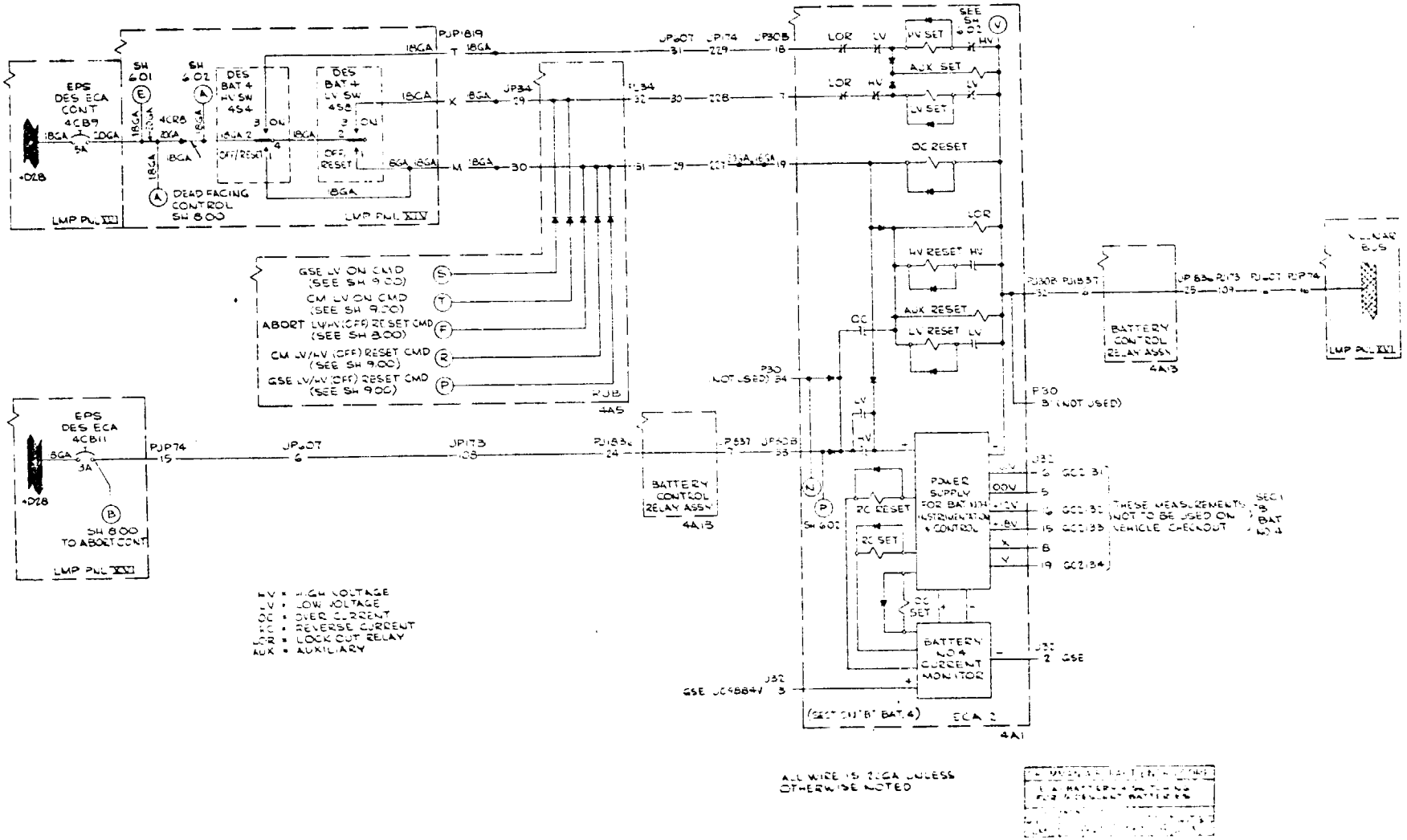
GRUMMAN AIRCRAFT ENGINEERING CORP

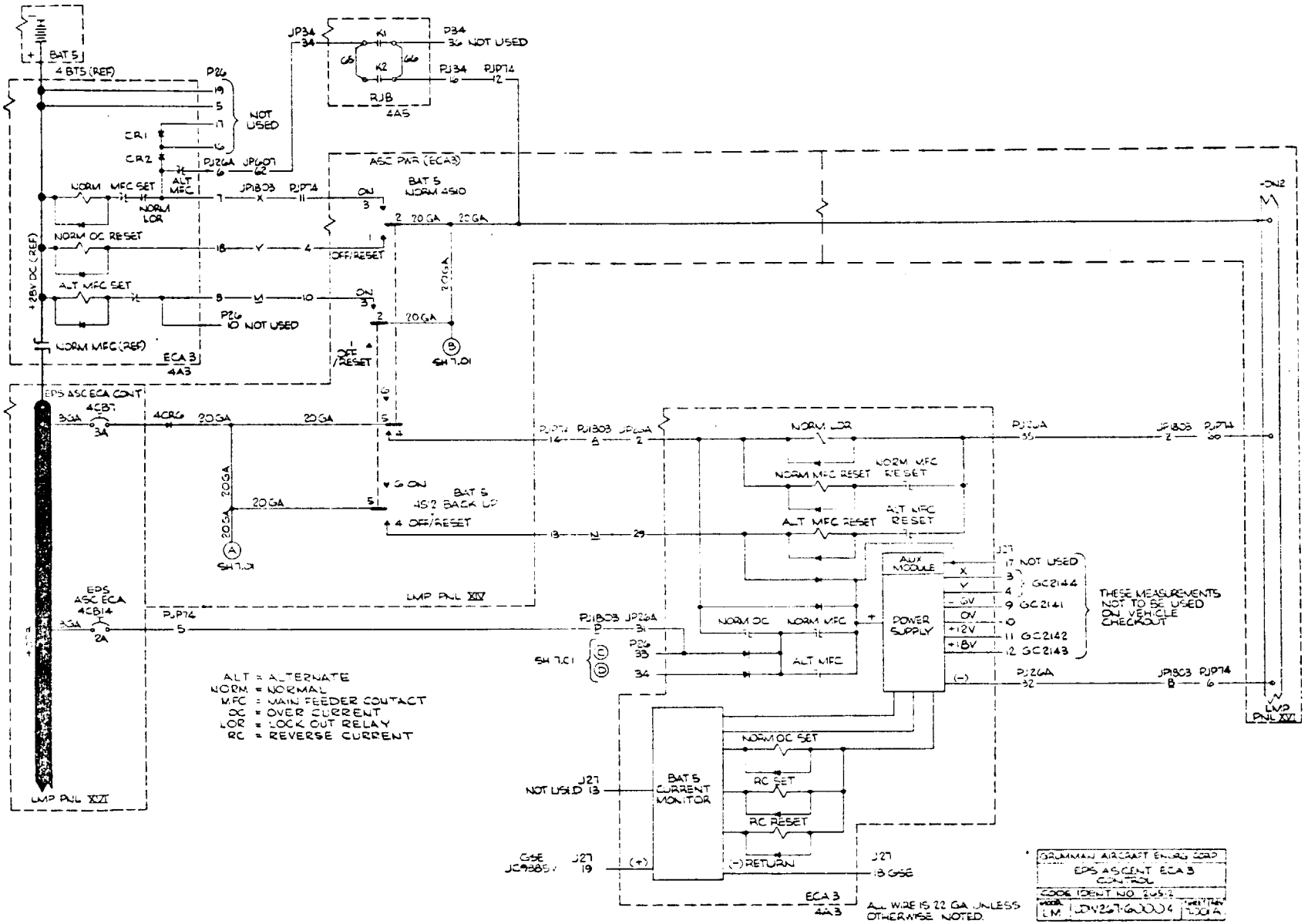
ECA-BAT 2/LUNAR BAT SWITCHING FOR 5 CELLENT BATTERIES

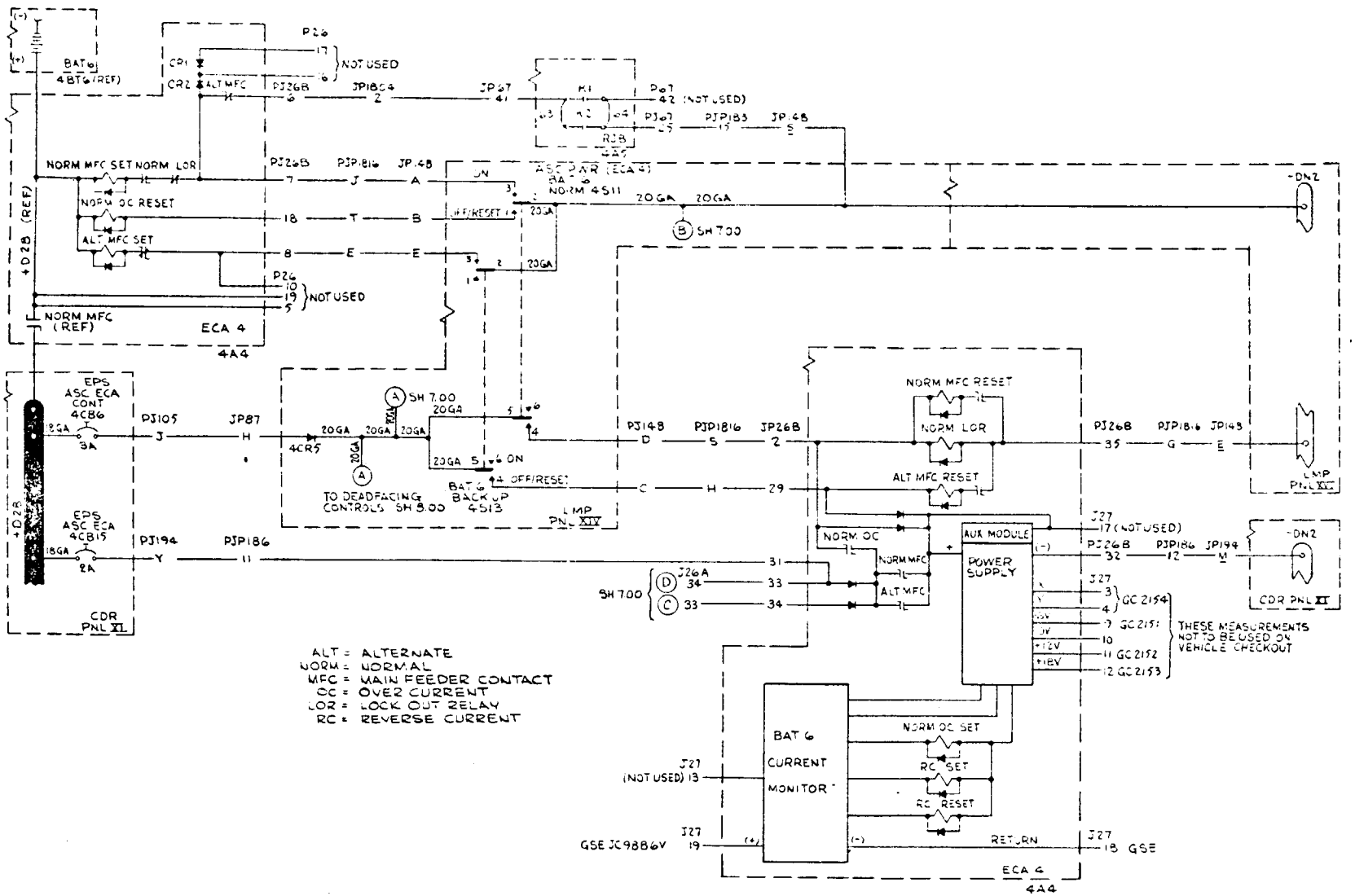
LDW267-60004



GRUMMAN AIRCRAFT ENGRG CORP	
ECA - BAT 3/LUNAR BAT SWITCHING FOR 5 DESCENT BATTERIES	
MODEL IDENTIFICATION	
MODEL LM	LDW267-50004
SHEET 6.02	REV


EPS DES ECA CONT 4CB9
SH 601
SH 602
DES BAT 4 HV SW 454
DES BAT 4 LV SW 458
DEAD FACING CONTROL SH 800
LMP PNL XIII
LMP PNL XIV
PJP1819
+D28
GSE LV ON CMD (SEE SH 9.00)
CM LV ON CMD (SEE SH 9.00)
ABORT LV/HV (OFF) RESET CMD (SEE SH 800)
CM LV/HV (OFF) RESET CMD (SEE SH 9.00)
GSE LV/HV (OFF) RESET CMD (SEE SH 9.00)
PJ1B 4A5
EPS DES ECA 4CB11
SH 800 TO ABORT CONT
LMP PNL XVI
BATTERY CONTROL RELAY ASSY 4A13
LOR
LV
HV SET
AUX SET
LV SET
OC RESET
HV RESET HV
AUX RESET
LV RESET LV
OC
RC RESET
RC SET
POWER SUPPLY FOR BAT NO 4 INSTRUMENTATION & CONTROL
OC SET
BATTERY NO 4 CURRENT MONITOR
GSE
ECA 2 4A1
P30 NOT USED
P30 B (NOT USED)
THESE MEASUREMENTS NOT TO BE USED ON VEHICLE CHECKOUT
HV = HIGH VOLTAGE
LV = LOW VOLTAGE
OC = OVER CURRENT
RC = REVERSE CURRENT
LOR = LOCK OUT RELAY
AUX = AUXILIARY
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

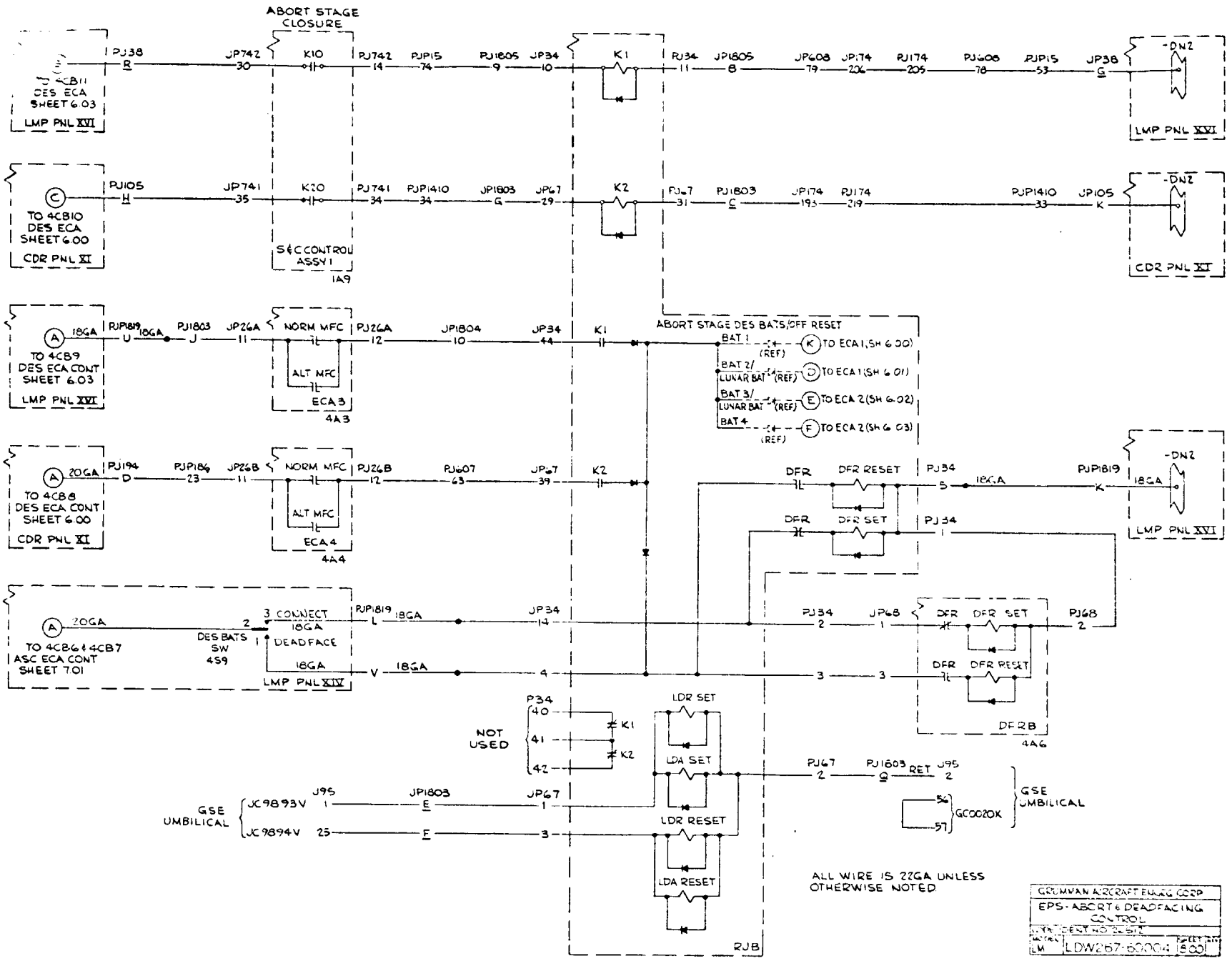

BAT 5
4 BT5 (REF)
P26
NOT USED
CR1
CR2
P226A
JP607
K1
K2
K3
K4
RJB
4A5
JP34
P34
NOT USED
PJ34
PJP74
ASC PWR (ECA3)
BAT 5 NORM 4S10
NORM MFC SET
ALT MFC
NORM LOR
JP1803
PJP74
ON
NORM OC RESET
ALT MFC SET
+28V DC (REF)
NORM MFC (REF)
ECA 3
4A3
OFF/RESET
20GA
SH 7.01
EPS ASC ECA CONT
4CB7
3GA
3A
4CR6
4CB14
2A
LMP PNL XXI
LMP PNL XIV
LMP PNL XV
NORM LOR
NORM MFC RESET
ALT MFC RESET
AUX MODULE
POWER SUPPLY
NORM OC
NORM MFC
ALT MFC
J27
NOT USED
GC2144
GC2141
GC2142
GC2143
THESE MEASUREMENTS NOT TO BE USED ON VEHICLE CHECKOUT
BAT 5 CURRENT MONITOR
NORM OC SET
RC SET
RC RESET
RETURN
GSE JC9385
ALT = ALTERNATE
NORM = NORMAL
MFC = MAIN FEEDER CONTACT
OC = OVER CURRENT
LOR = LOCK OUT RELAY
RC = REVERSE CURRENT
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.
GRUMMAN AIRCRAFT ENGRG CORP
EPS ASCENT ECA 3 CONTROL
CODE IDENT NO 80572
LDW267-60004
SHEET NO 1 OF 1

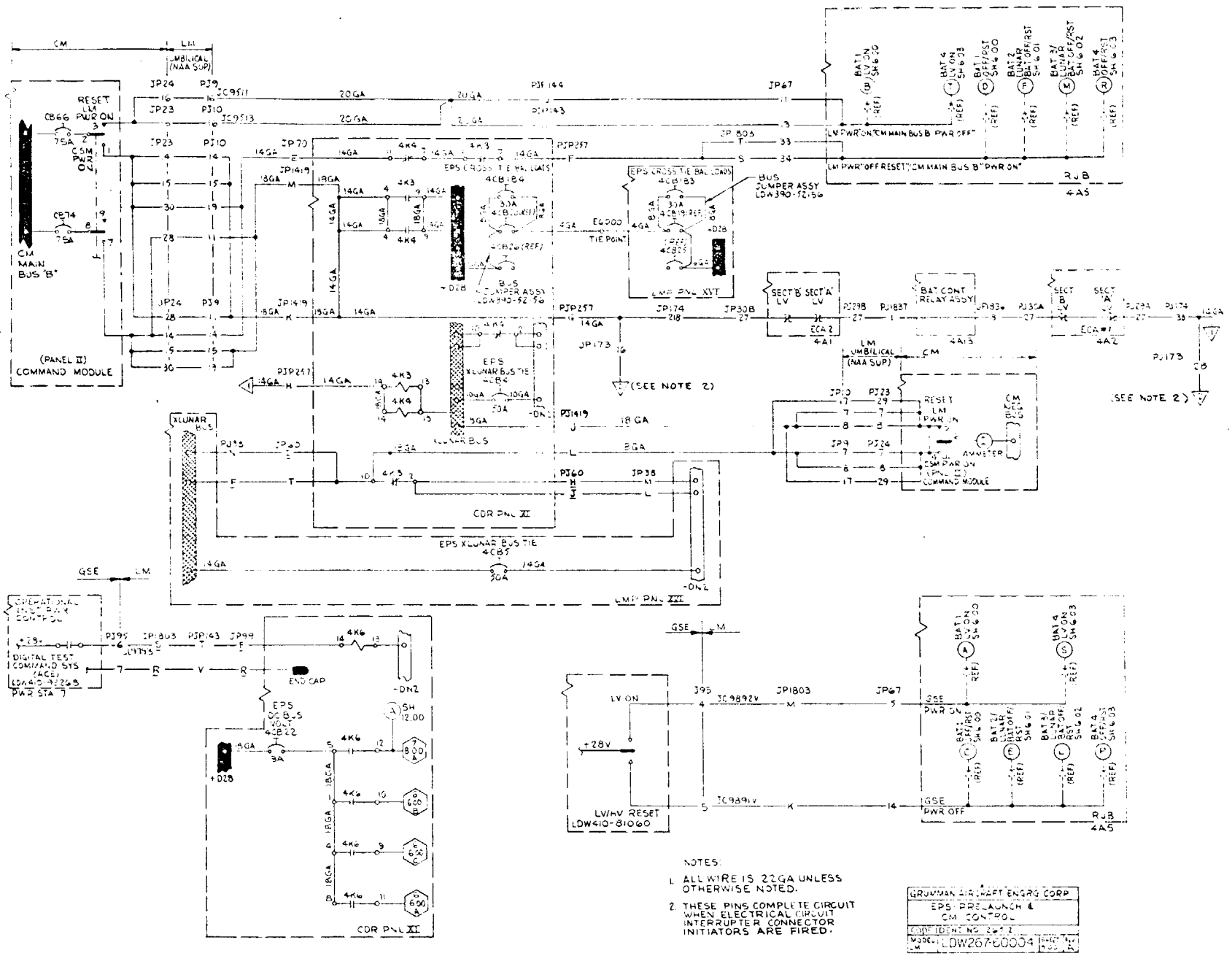


ALT = ALTERNATE
NORM = NORMAL
MFC = MAIN FEEDER CONTACT
OC = OVER CURRENT
LOR = LOCK OUT RELAY
RC = REVERSE CURRENT

ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGRG CORP			
EPS-ASCENT ECA 4 CONTROL			
CODE IDENT NO. 80542			
MODEL LM	LDW267 60004	SHEET 7 OF	REV A

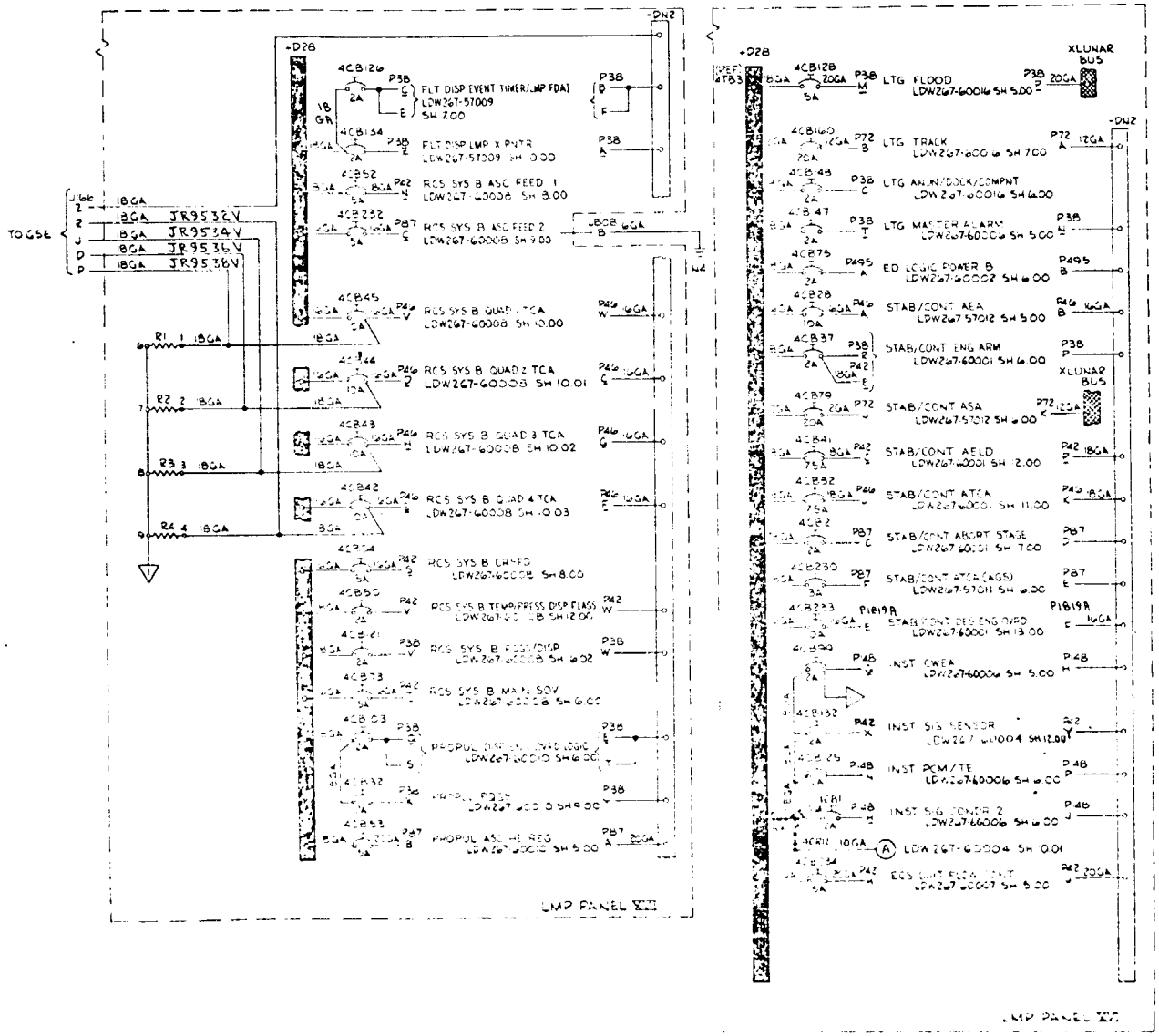

ABORT STAGE CLOSURE
TO 4CB11 DES ECA SHEET 6.03
LMP PNL XVI
PJ38 R
JP742 30
K10
PJ742 14
PJP15 74
PJ1805 9
JP34 10
K1
PJ34 11
JP1805 8
JP608 79
JP174 206
PJ174 205
PJ608 78
PJP15 53
JP38 G
-DN2
LMP PNL XVI
TO 4CB10 DES ECA SHEET 6.00
CDR PNL XI
PJ105 H
JP741 35
K20
PJ741 34
PJP1410 34
JP1803 G
JP67 29
K2
PJ67 31
PJ1803 C
JP174 193
PJ174 219
PJP1410 33
JP105 K
-DN2
CDR PNL XI
S&C CONTROL ASSY 1
1A9
TO 4CB9 DES ECA CONT SHEET 6.03
LMP PNL XVI
18GA
PJP1819 U
18GA
PJ1803 J
JP26A 11
NORM MFC
ALT MFC
ECA 3
4A3
PJ26A 12
JP1804 10
JP34 44
K1
ABORT STAGE DES BATS/OFF RESET
BAT 1 (REF) K TO ECA 1 (SH 6.00)
BAT 2/LUNAR BAT (REF) D TO ECA 1 (SH 6.01)
BAT 3/LUNAR BAT (REF) E TO ECA 2 (SH 6.02)
BAT 4 (REF) F TO ECA 2 (SH 6.03)
TO 4CB8 DES ECA CONT SHEET 6.00
CDR PNL XI
20GA
PJ194 D
PJP186 23
JP26B 11
NORM MFC
ALT MFC
ECA 4
4A4
PJ26B 12
PJ607 63
JP67 39
K2
DFR
DFR RESET
PJ34 5
18GA
PJP1819 K
18GA
-DN2
LMP PNL XVI
DFR
DFR SET
PJ34 1
TO 4CB6 & 4CB7 ASC ECA CONT SHEET 7.01
20GA
2
DES BATS SW 459
1
3 CONNECT
18GA
DEADFACE
18GA
LMP PNL XIV
PJP1819 L
18GA
V
18GA
JP34 14
4
PJ34 2
JP68 1
DFR
DFR SET
PJ68 2
DFR
DFR RESET
3
3
DFRB
4A6
NOT USED
P34 40
41
42
K1
K2
LDR SET
LDA SET
LDR RESET
LDA RESET
PJ67 2
PJ1803 G
RET
J95 2
56
57
GC0020K
GSE UMBILICAL
GSE UMBILICAL
JC9893V
JC9894V
J95 1
25
JP1803 E
F
JP67 1
3
RJB
4A5
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENG'G CORP
EPS - ABORT & DEADFACING CONTROL
LDW267-60004
SHEET 5 OF 8

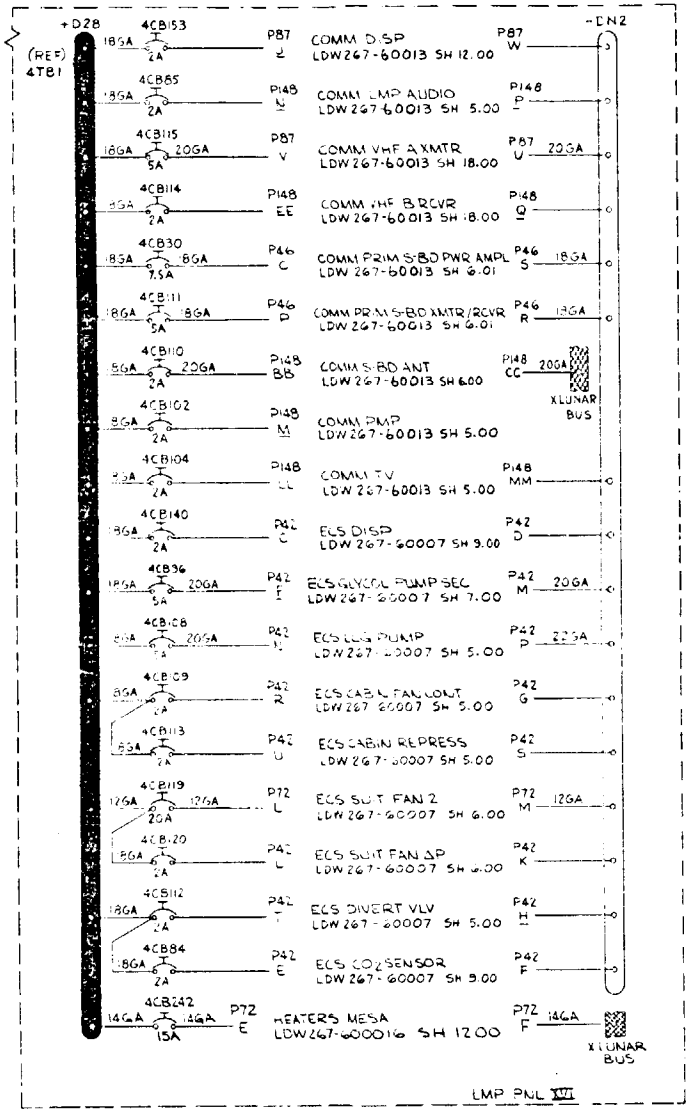


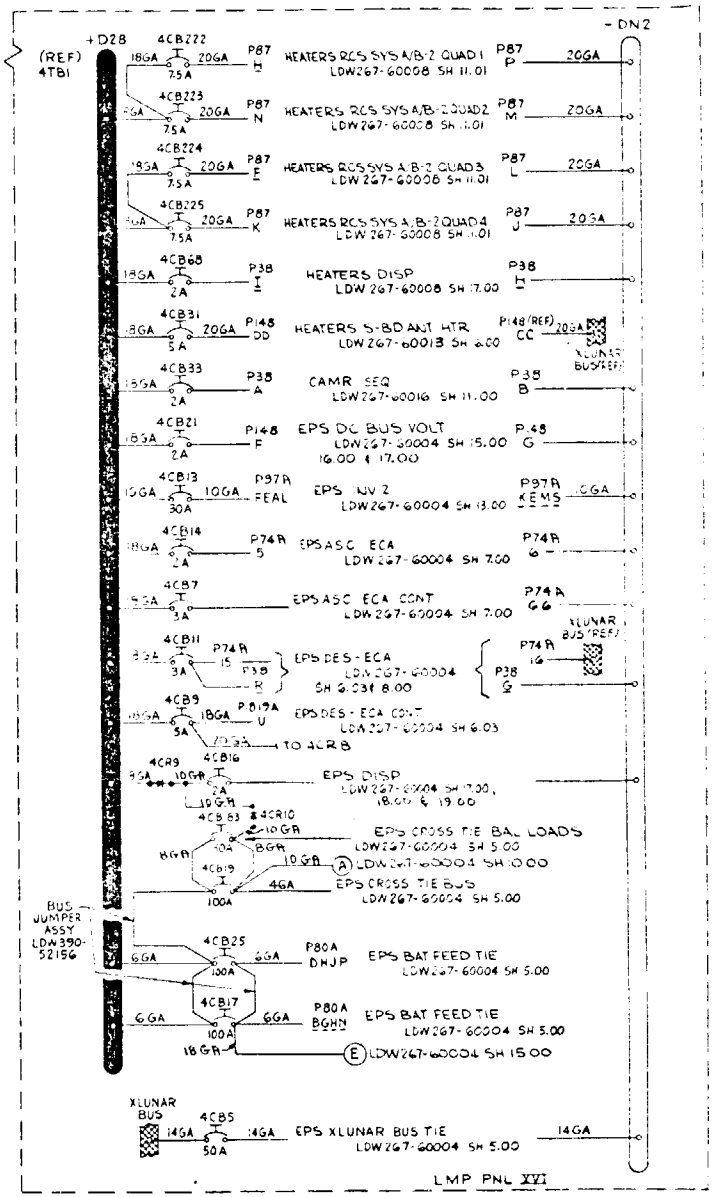
NOTES:

1. ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.
2. THESE PINS COMPLETE CIRCUIT WHEN ELECTRICAL CIRCUIT INTERRUPTER CONNECTOR INITIATORS ARE FIRED.

GRUMMAN AIRCRAFT ENGRG CORP	
EPS PRELAUNCH & CM CONTROL	
CONFIDENCE NO. 2 of 2	
MODEL LM	LDW267-60004

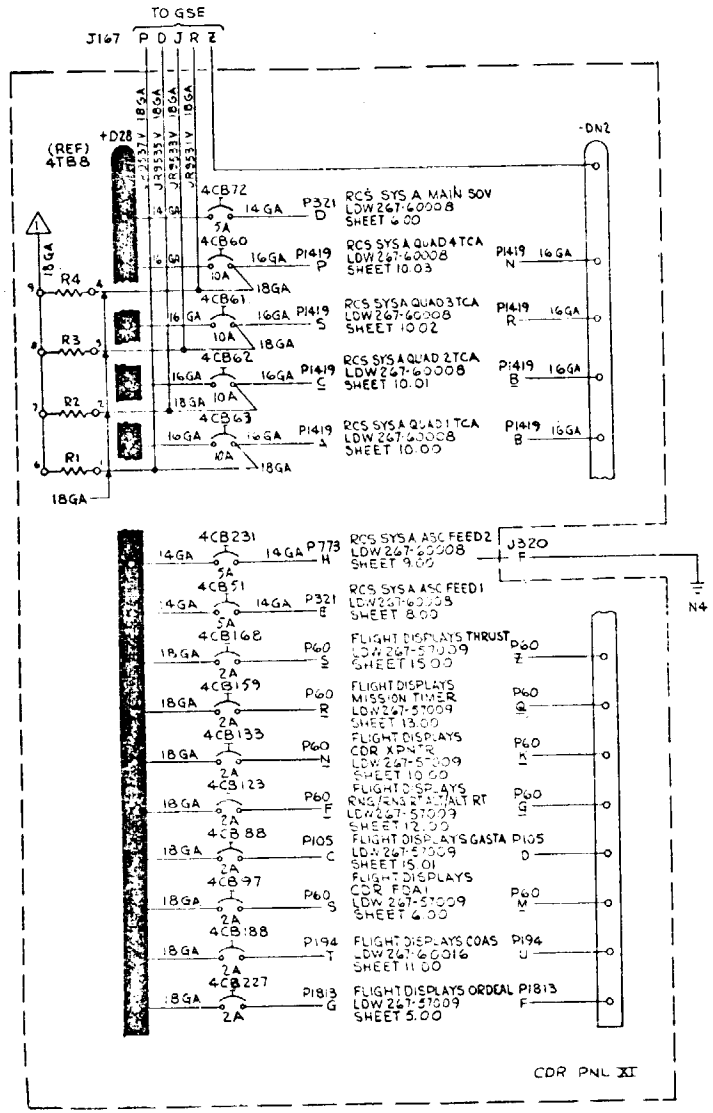

-D28
-DN2
LMP PANEL XII
TO GSE
J166
18GA JR9532V
18GA JR9534V
18GA JR9536V
18GA JR9538V
R1 1 18GA
R2 2 18GA
R3 3 18GA
R4 4 18GA
4CB126 FLT DISP EVENT TIMER/LMP FDAI LDW267-57009 SH 7.00
4CB134 FLT DISP LMP X PNTR LDW267-57009 SH 10.00
4CB52 RCS SYS B ASC FEED 1 LDW267-60006 SH 8.00
4CB232 RCS SYS B ASC FEED 2 LDW267-60006 SH 9.00
4CB45 RCS SYS B QUAD 1 TCA LDW267-60008 SH 10.00
4CB44 RCS SYS B QUAD 2 TCA LDW267-60008 SH 10.01
4CB43 RCS SYS B QUAD 3 TCA LDW267-60008 SH 10.02
4CB42 RCS SYS B QUAD 4 TCA LDW267-60008 SH 10.03
4CB54 RCS SYS B CRYFD LDW267-60008 SH 8.00
4CB50 RCS SYS B TEMP/PRESS DISP FLAGS LDW267-60008 SH 12.00
4CB21 RCS SYS B FDAI/DISP LDW267-60008 SH 9.02
4CB73 RCS SYS B MAIN SOV LDW267-60008 SH 6.00
4CB103 PROPUL DISP LOGIC LDW267-60010 SH 6.00
4CB132 PROPUL PQGS LDW267-60010 SH 9.00
4CB153 PROPUL ASC HE REG LDW267-60010 SH 5.00
4CB808 16GA
W4
P38 FLT DISP EVENT TIMER
P38 FLT DISP LMP X PNTR
P42 RCS SYS B ASC FEED 1
P87 RCS SYS B ASC FEED 2
P46 RCS SYS B QUAD 1 TCA
P46 RCS SYS B QUAD 2 TCA
P46 RCS SYS B QUAD 3 TCA
P46 RCS SYS B QUAD 4 TCA
P42 RCS SYS B CRYFD
P42 RCS SYS B TEMP/PRESS DISP FLAGS
P38 RCS SYS B FDAI/DISP
P42 RCS SYS B MAIN SOV
P38 PROPUL DISP LOGIC
P38 PROPUL PQGS
P87 PROPUL ASC HE REG
-D28
-DN2
(REF) 4TB3
XLUNAR BUS
4CB128 P38 LTG FLOOD LDW267-60016 SH 5.00
4CB160 P72 LTG TRACK LDW267-60016 SH 7.00
4CB48 P38 LTG ANUN/DOCK/COMPNT LDW267-60016 SH 6.00
4CB47 P38 LTG MASTER ALARM LDW267-60006 SH 5.00
4CB75 P495 ED LOGIC POWER B LDW267-60002 SH 6.00
4CB28 P46 STAB/CONT AEA LDW267-57012 SH 5.00
4CB37 P38 P42 STAB/CONT ENG ARM LDW267-60001 SH 6.00
4CB79 P72 STAB/CONT ASA LDW267-57012 SH 6.00
4CB41 P42 STAB/CONT AELD LDW267-60001 SH 12.00
4CB32 P46 STAB/CONT ATCA LDW267-60001 SH 11.00
4CB2 P87 STAB/CONT ABORT STAGE LDW267-60001 SH 7.00
4CB230 P87 STAB/CONT ATCA(AGS) LDW267-57011 SH 6.00
4CB233 P1819A STAB/CONT DES ENG/RCD LDW267-60001 SH 13.00
4CB30 P48 INST CWEA LDW267-60006 SH 5.00
4CB132 P42 INST SIG SENSOR LDW267-60004 SH 12.00
4CB25 P48 INST PCM/TE LDW267-60006 SH 6.00
4CB1 P48 INST S/C CONTR 2 LDW267-60006 SH 6.00
4CB34 P42 ECS SUIT FLOW LDW267-60007 SH 5.00
P72 LTG FLOOD
P72 LTG TRACK
P38 LTG ANUN/DOCK/COMPNT
P38 LTG MASTER ALARM
P495 ED LOGIC POWER B
P46 STAB/CONT AEA
P38 P42 STAB/CONT ENG ARM
XLUNAR BUS
P72 STAB/CONT ASA
P42 STAB/CONT AELD
P46 STAB/CONT ATCA
P87 STAB/CONT ABORT STAGE
P87 STAB/CONT ATCA(AGS)
P1819A STAB/CONT DES ENG/RCD
P48 INST CWEA
P42 INST SIG SENSOR
P48 INST PCM/TE
P48 INST S/C CONTR 2
P42 ECS SUIT FLOW
LMP PANEL XII
ALL W PE 5 22GA UNLESS OTHERWISE NOTED
LDW267-60004

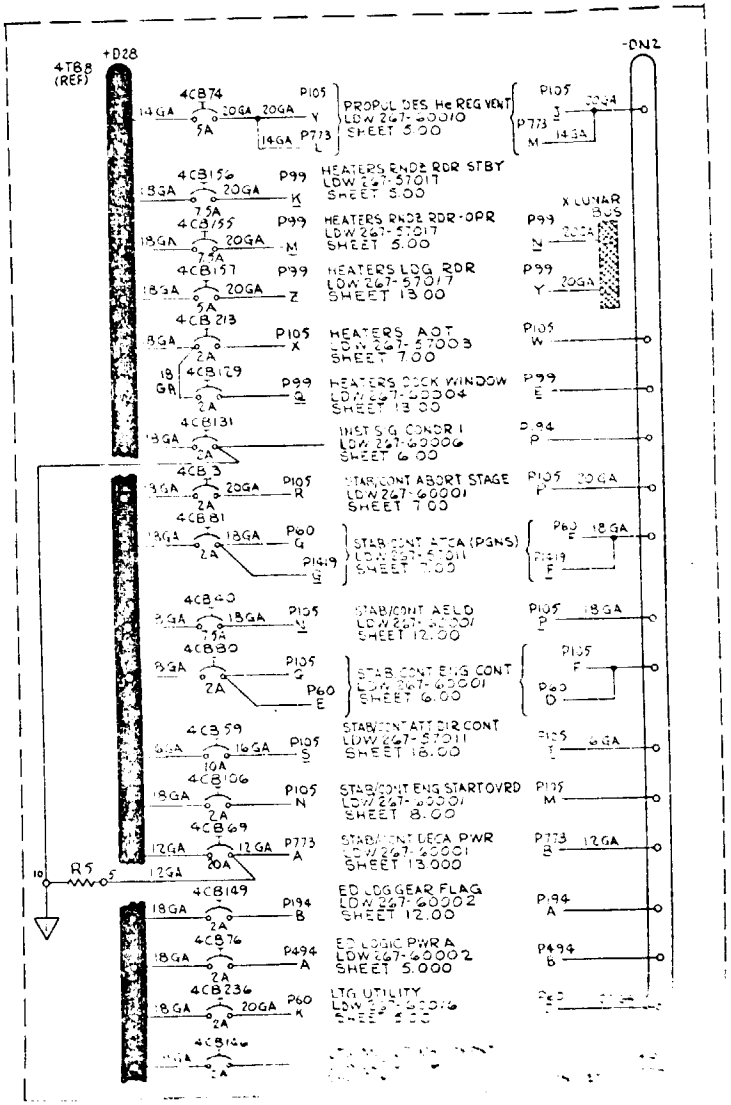


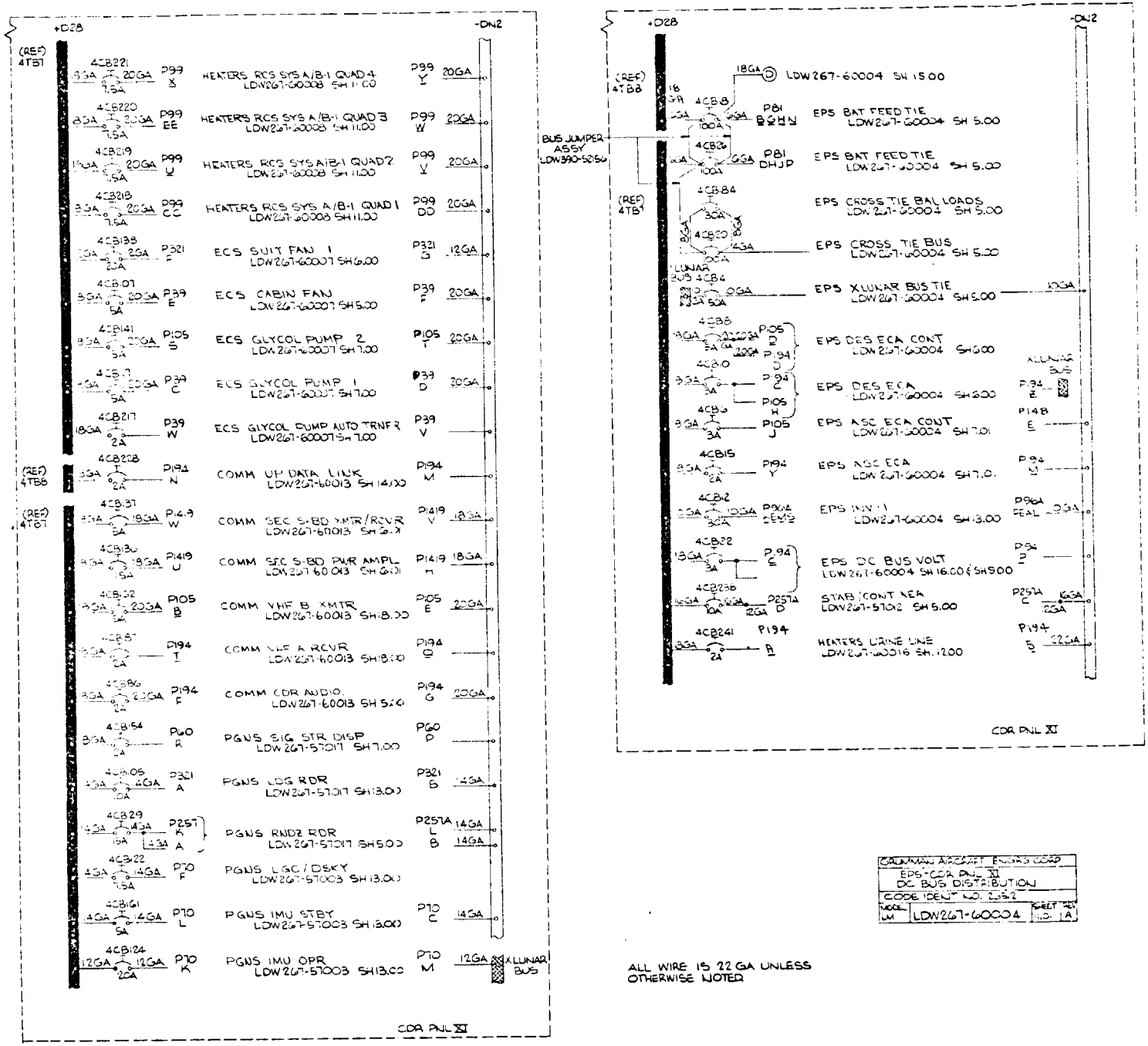


ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

GRUMMAN AEROSPACE ENGRG CORP
EPS - LMP PNL XVI
ELECTRICAL INTERCONNECTION
LDW267-60004 SH 5.01

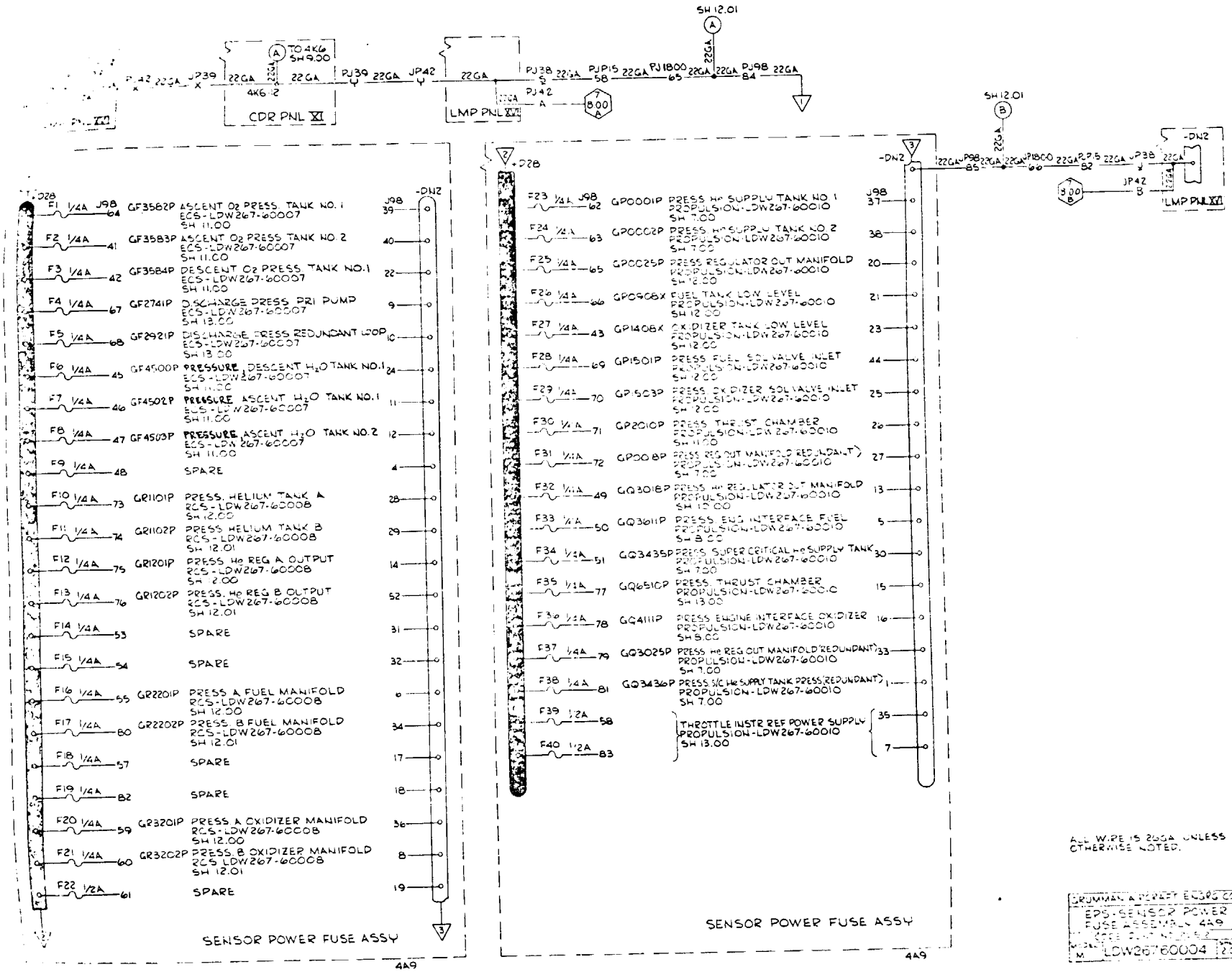

TO GSE
J167 P D J R Z
+D28
(REF) 4TB8
-DN2
4CB72 14GA P321 D RCS SYS A MAIN SOV LDW267-60008 SHEET 6.00
4CB60 16GA P1419 P RCS SYS A QUAD 4 TCA LDW267-60008 SHEET 10.03
4CB61 16GA P1419 S RCS SYS A QUAD 3 TCA LDW267-60008 SHEET 10.02
4CB62 16GA P1419 C RCS SYS A QUAD 2 TCA LDW267-60008 SHEET 10.01
4CB63 16GA P1419 A RCS SYS A QUAD 1 TCA LDW267-60008 SHEET 10.00
P1419 16GA N
P1419 16GA R
P1419 16GA B
P1419 16GA B
R4
R3
R2
R1
18GA
4CB231 14GA P773 H RCS SYS A SC FEED 2 LDW267-60008 SHEET 9.00
J320 F
N4
4CB51 14GA P321 E RCS SYS A SC FEED 1 LDW267-60008 SHEET 8.00
4CB168 18GA P60 S FLIGHT DISPLAYS THRUST LDW267-57009 SHEET 15.00 P60 Z
4CB159 18GA P60 R FLIGHT DISPLAYS MISSION TIMER LDW267-57009 SHEET 13.00 P60 Q
4CB133 18GA P60 N FLIGHT DISPLAYS CDR XPNTR LDW267-57009 SHEET 10.00 P60 N
4CB123 18GA P60 L FLIGHT DISPLAYS RNG/RNG RT/ALT RT LDW267-57009 SHEET 12.00 P60 G
4CB88 18GA P105 C FLIGHT DISPLAYS GASTA LDW267-57009 SHEET 15.01 P105 D
4CB97 18GA P60 S FLIGHT DISPLAYS CDR FDAI LDW267-57009 SHEET 6.00 P60 M
4CB188 18GA P194 T FLIGHT DISPLAYS COAS LDW267-60016 SHEET 11.00 P194 U
4CB227 18GA P1813 G FLIGHT DISPLAYS ORDEAL LDW267-57009 SHEET 5.00 P1813 F
CDR PNL XI


+D28
4TB8 (REF)
-DN2
4CB74 14GA 5A 20GA P105 Y PROPUL DES He REG VENT LDW267-60010 SHEET 5.00 P105 J 20GA P773 M 14GA
4CB156 18GA 7.5A 20GA P99 K HEATERS RNDZ RDR STBY LDW267-57017 SHEET 5.00
4CB155 18GA 7.5A 20GA P99 M HEATERS RNDZ RDR-OPR LDW267-57017 SHEET 5.00
4CB157 18GA 5A 20GA P99 Z HEATERS LOG RDR LDW267-57017 SHEET 13.00
X LUNAR BUS
P99 N 20GA
P99 Y 20GA
4CB213 18GA 2A P105 X HEATERS AOT LDW267-57003 SHEET 7.00 P105 W
4CB129 18GA 2A P99 Q HEATERS DOCK WINDOW LDW267-60004 SHEET 13.00 P99 E
4CB131 18GA 2A HEATERS CONDR 1 LDW267-60006 SHEET 6.00 P94 P
4CB3 18GA 2A 20GA P105 R STAB/CONT ABORT STAGE LDW267-60001 SHEET 7.00 P105 P 20GA
4CB81 18GA 2A 18GA P60 G P1419 G STAB/CONT ATCA (PGNS) LDW267-57011 SHEET 7.00 P60 E 18GA P1419 F
4CB40 18GA 7.5A 18GA P105 V STAB/CONT AELD LDW267-60001 SHEET 12.00 P105 P 18GA
4CB80 18GA 2A P105 G P60 E STAB/CONT ENG CONT LDW267-60001 SHEET 6.00 P105 F P60 D
4CB59 18GA 10A 16GA P105 S STAB/CONT ATT DIR CONT LDW267-57011 SHEET 16.00 P105 T 16GA
4CB106 18GA 2A P105 N STAB/CONT ENG STARTOVRD LDW267-60001 SHEET 8.00 P105 M
4CB69 12GA 20A 12GA P773 A STAB/CONT DECA PWR LDW267-60001 SHEET 13.000 P773 B 12GA
R5
4CB149 18GA 2A P194 B ED LOG GEAR FLAG LDW267-60002 SHEET 12.00 P94 A
4CB76 18GA 2A P494 A ED LOGIC PWR A LDW267-60002 SHEET 5.000 P494 B
4CB236 18GA 2A 20GA P60 K LTG UTILITY LDW267-60016 SHEET 5.00 P60



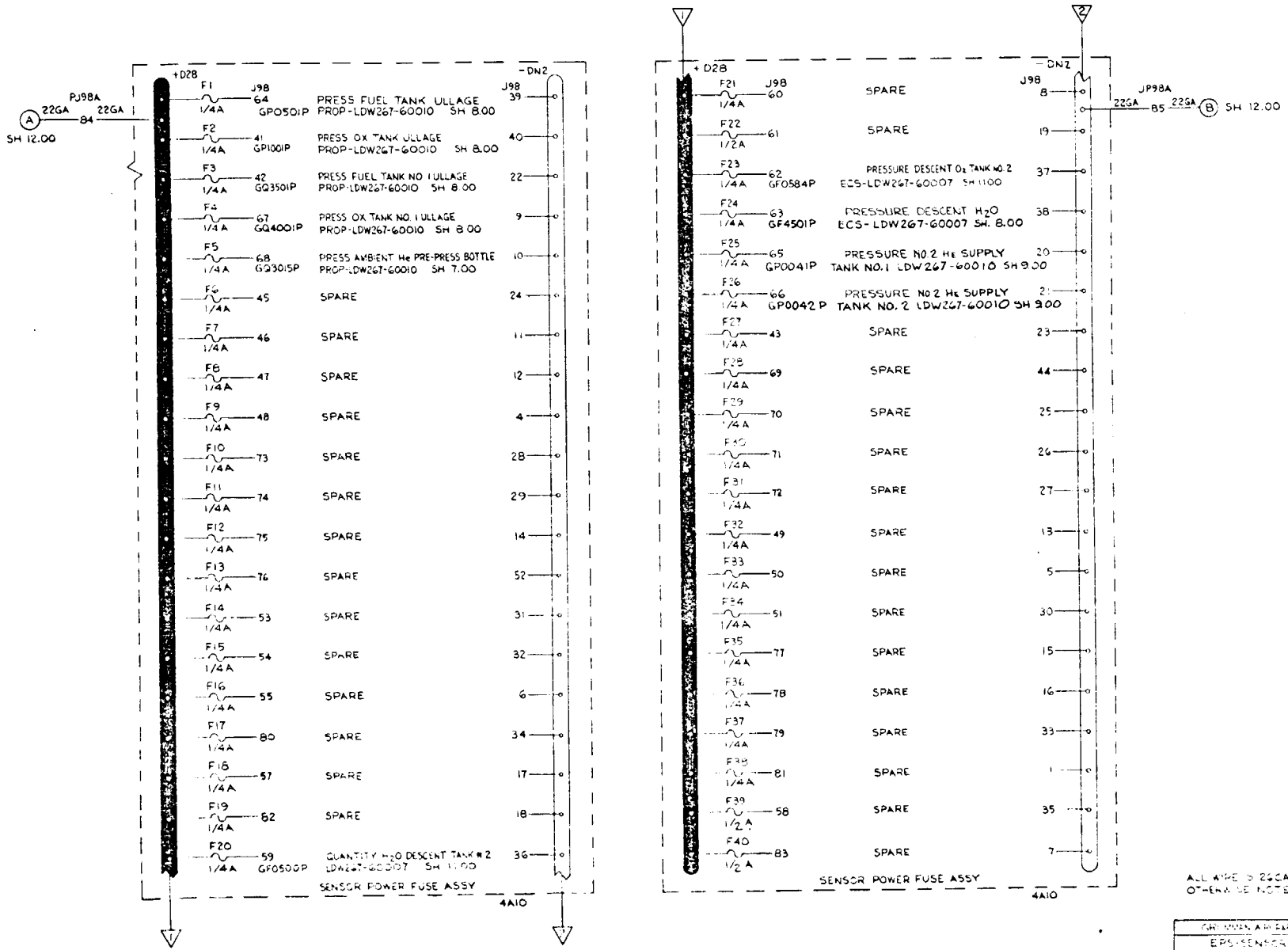
GRUMMAN AIRCRAFT ENGRG CORP	
EPS-CDR PNL XI DC BUS DISTRIBUTION	
CODE IDENT NO. 24582	
SIZE M	LDW267-60004
SHEET NO. 1A	

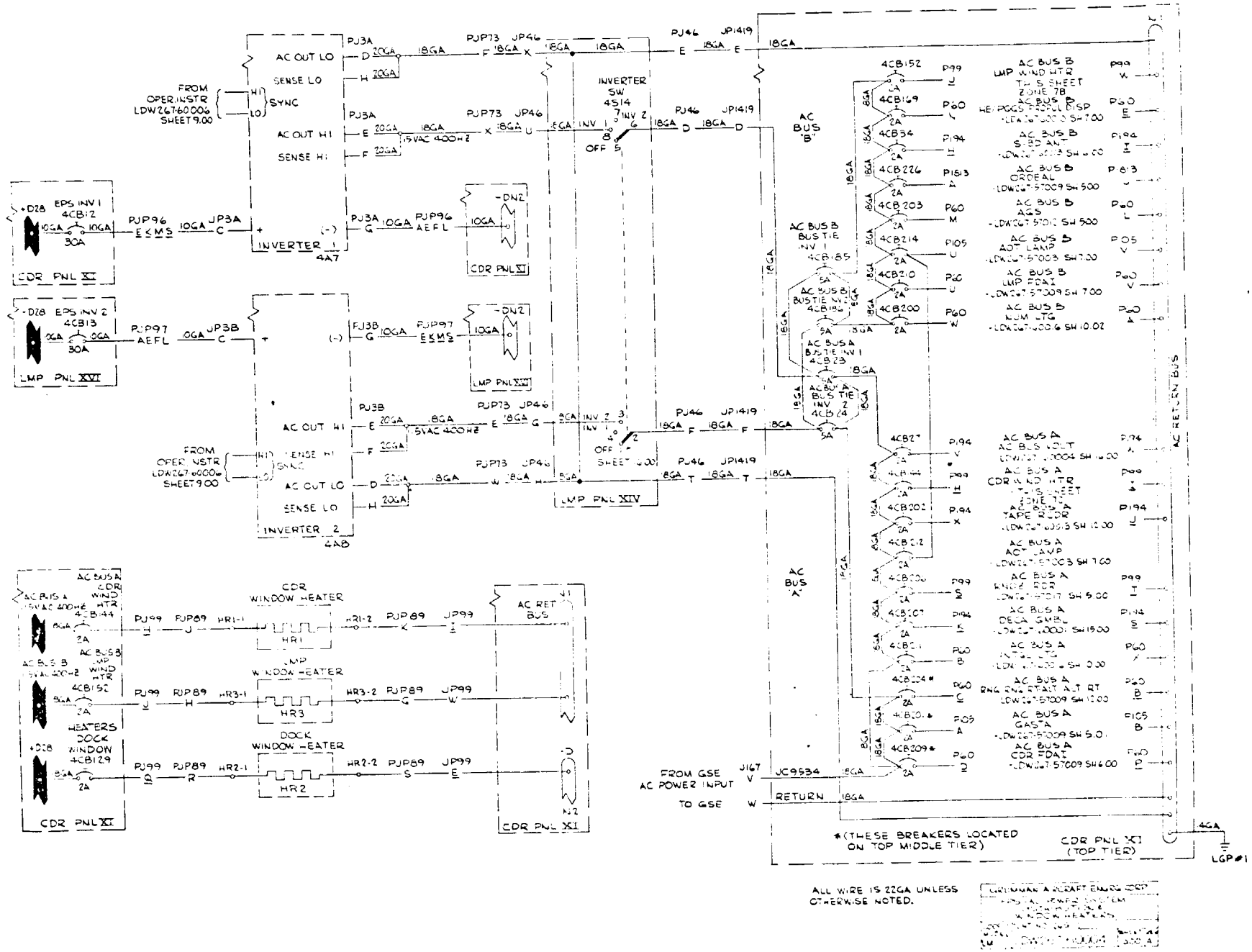
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED

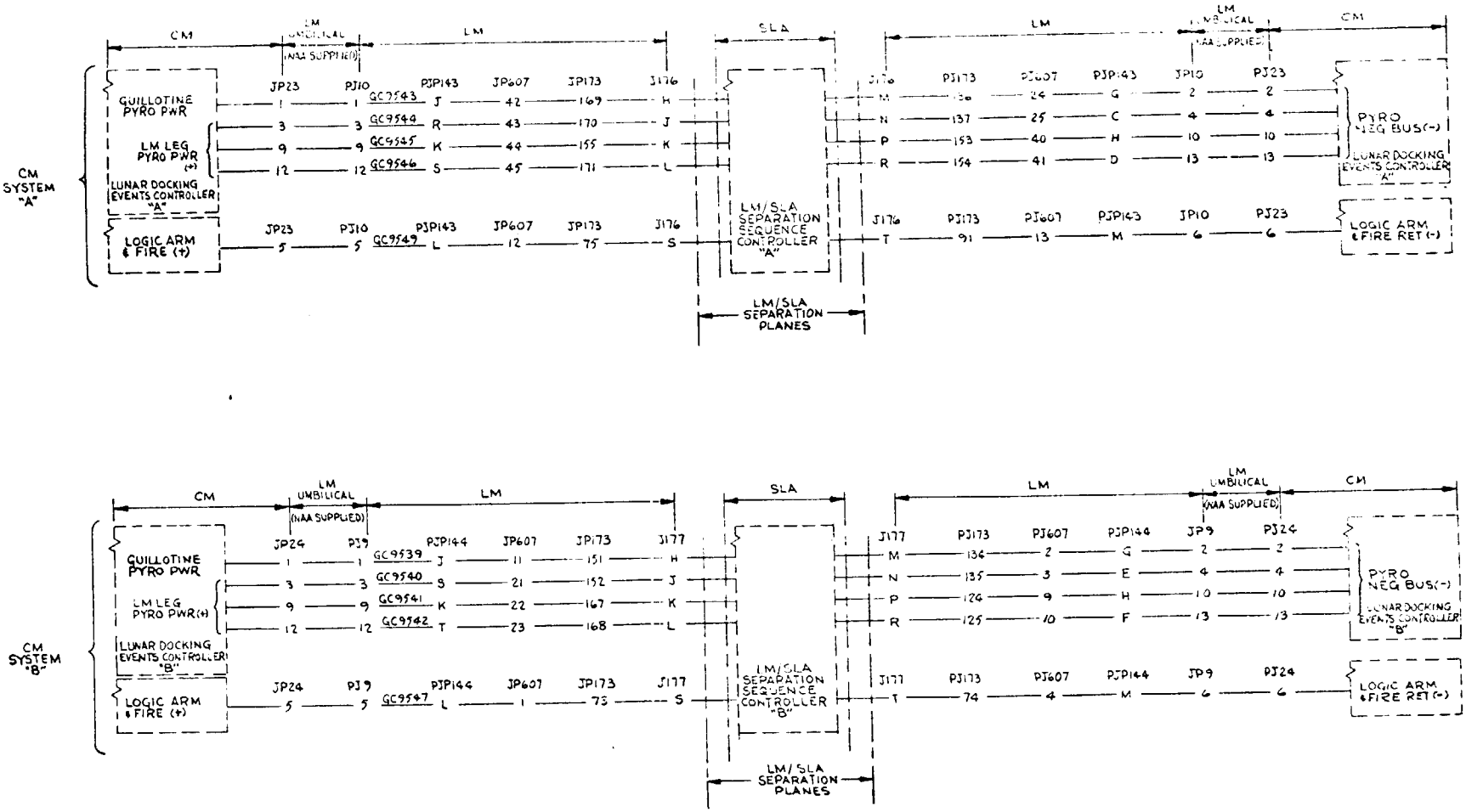


ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.

GRUMMAN AEROSPACE CORP	
EPS-SENSOR POWER FUSE ASSEMBLY 4A9	
CODE IDENT NO 14934	
MODEL M	LDW267-60004 REV A

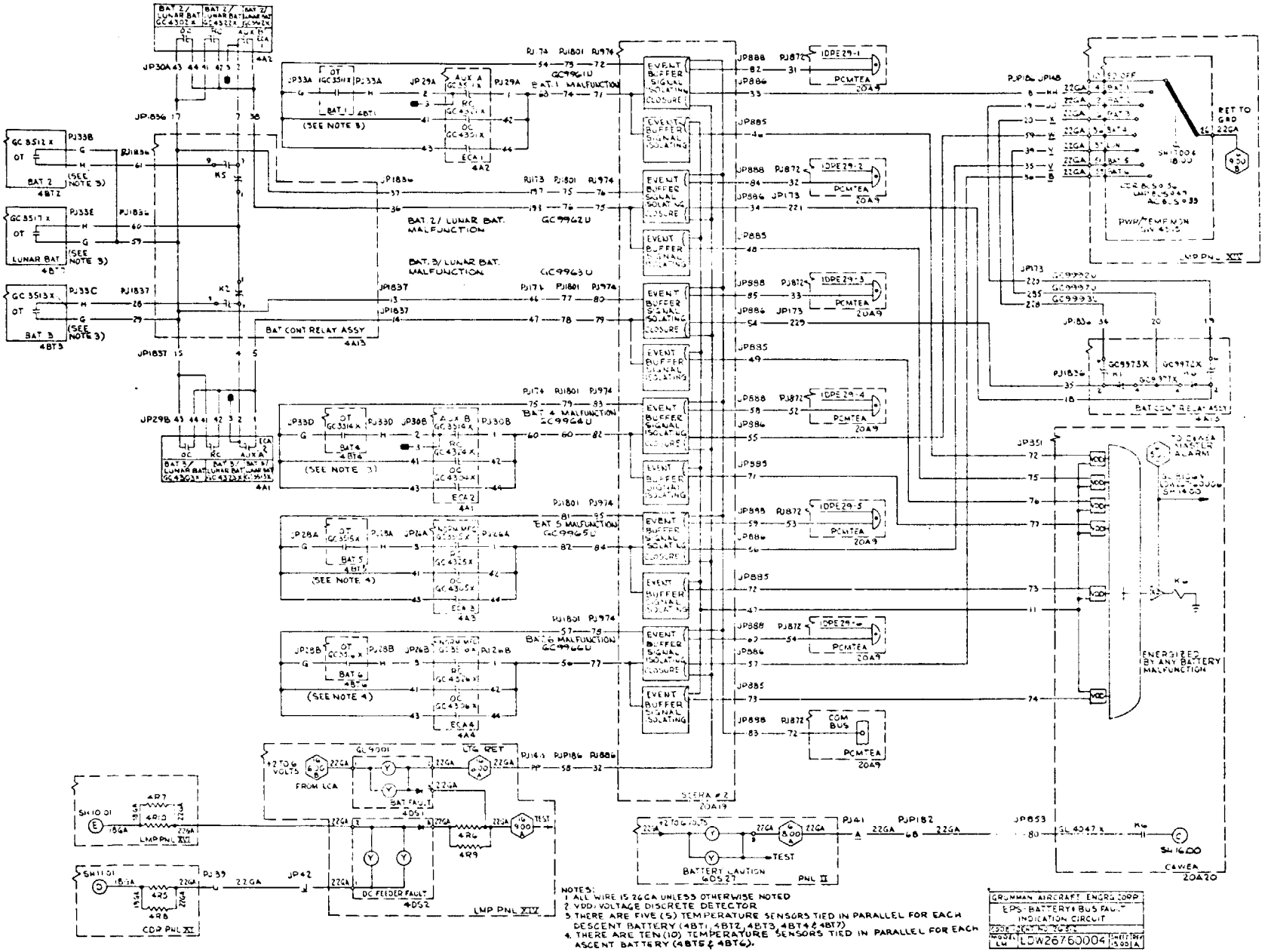

+D28
-DN2
PJ98A
22GA
22GA
A
84
SH 12.00
J98
F1 1/4A 64 GP0501P PRESS FUEL TANK ULLAGE PROP-LDW267-60010 SH 8.00 39
F2 1/4A 41 GP1001P PRESS OX TANK ULLAGE PROP-LDW267-60010 SH 8.00 40
F3 1/4A 42 GQ3501P PRESS FUEL TANK NO 1 ULLAGE PROP-LDW267-60010 SH 8.00 22
F4 1/4A 67 GQ4001P PRESS OX TANK NO. 1 ULLAGE PROP-LDW267-60010 SH 8.00 9
F5 1/4A 68 GQ3015P PRESS AMBIENT He PRE-PRESS BOTTLE PROP-LDW267-60010 SH 7.00 10
F6 1/4A 45 SPARE 24
F7 1/4A 46 SPARE 11
F8 1/4A 47 SPARE 12
F9 1/4A 48 SPARE 4
F10 1/4A 73 SPARE 28
F11 1/4A 74 SPARE 29
F12 1/4A 75 SPARE 14
F13 1/4A 76 SPARE 52
F14 1/4A 53 SPARE 31
F15 1/4A 54 SPARE 32
F16 1/4A 55 SPARE 6
F17 1/4A 80 SPARE 34
F18 1/4A 57 SPARE 17
F19 1/4A 82 SPARE 18
F20 1/4A 59 GF0500P QUANTITY H2O DESCENT TANK #2 LDW267-60007 SH 11.00 36
SENSOR POWER FUSE ASSY
4A10
+D28
-DN2
J98
F21 1/4A 60 SPARE 8
F22 1/2A 61 SPARE 19
F23 1/4A 62 GF0584P PRESSURE DESCENT O2 TANK NO 2 ECS-LDW267-60007 SH 11.00 37
F24 1/4A 63 GF4501P PRESSURE DESCENT H2O ECS-LDW267-60007 SH. 8.00 38
F25 1/4A 65 GP0041P PRESSURE NO 2 He SUPPLY TANK NO.1 LDW267-60010 SH 9.00 20
F26 1/4A 66 GP0042P PRESSURE NO 2 He SUPPLY TANK NO. 2 LDW267-60010 SH 9.00 21
F27 1/4A 43 SPARE 23
F28 1/4A 69 SPARE 44
F29 1/4A 70 SPARE 25
F30 1/4A 71 SPARE 26
F31 1/4A 72 SPARE 27
F32 1/4A 49 SPARE 13
F33 1/4A 50 SPARE 5
F34 1/4A 51 SPARE 30
F35 1/4A 77 SPARE 15
F36 1/4A 78 SPARE 16
F37 1/4A 79 SPARE 33
F38 1/4A 81 SPARE 1
F39 1/2A 58 SPARE 35
F40 1/2A 83 SPARE 7
SENSOR POWER FUSE ASSY
4A10
J98
JP98A
22GA
85
22GA
B
SH 12.00
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
GRUMMAN AEROSPACE CORP
EPS SENSOR POWER FUSE ASSY 4A10

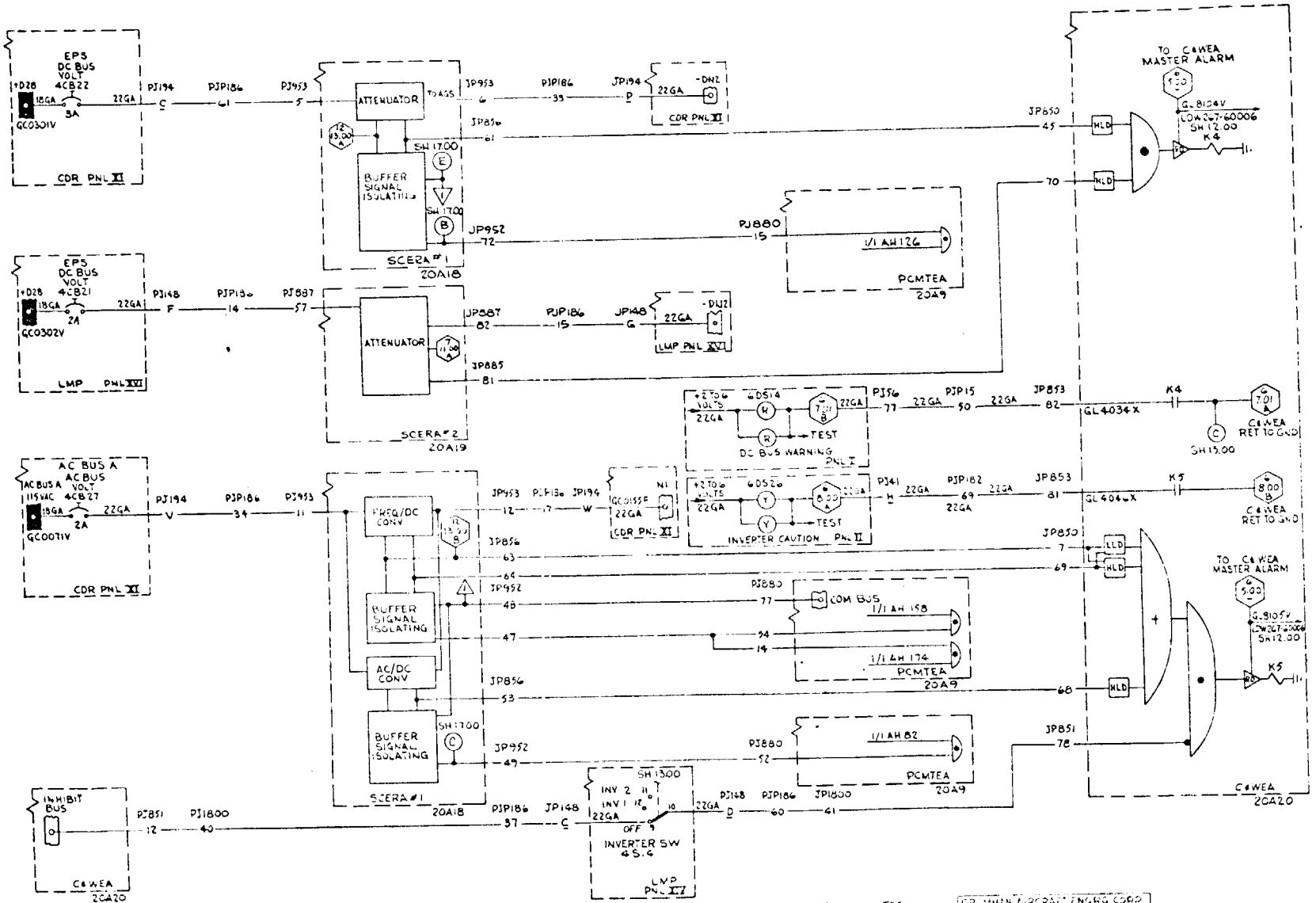

AC OUT LO
SENSE LO
SYNC
AC OUT HI
SENSE HI
INVERTER 1
4A7
INVERTER 2
4A8
FROM OPER INSTR LDW267-60006 SHEET 9.00
EPS INV 1 4CB12
EPS INV 2 4CB13
CDR PNL XI
LMP PNL XVI
CDR PNL XI
LMP PNL XVI
INVERTER SW 4S14
OFF
AC BUS B
AC BUS A
AC BUS B BUS TIE INV 1 4CB185
AC BUS B BUS TIE INV 2 4CB186
AC BUS A BUS TIE INV 1 4CB23
AC BUS A BUS TIE INV 2 4CB24
AC BUS B LMP WIND HTR T/S SHEET ZONE 7B
AC BUS B SABD ANT
AC BUS B ORDEAL
AC BUS B AGS
AC BUS B ADT LAMP
AC BUS B LMP FDAI
AC BUS B NUM LTG
AC BUS A AC BUS VOLT
AC BUS A CDR WIND HTR T/S SHEET ZONE 7C
AC BUS A TAPE RCDR
AC BUS A ADT LAMP
AC BUS A KNOB RDR
AC BUS A DECA GIMBL
AC BUS A GAS A
AC BUS A CDR FDAI
AC RETURN BUS
FROM GSE AC POWER INPUT
TO GSE
RETURN
*(THESE BREAKERS LOCATED ON TOP MIDDLE TIER)
CDR PNL XI (TOP TIER)
LGP #1
AC BUS A CDR WIND HTR 4CB144
AC BUS B LMP WIND HTR 4CB152
+D28 HEATERS DOCK WINDOW 4CB129
CDR WINDOW HEATER
LMP WINDOW HEATER
DOCK WINDOW HEATER
HR1
HR3
HR2
AC RET BUS
CDR PNL XI
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.



ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

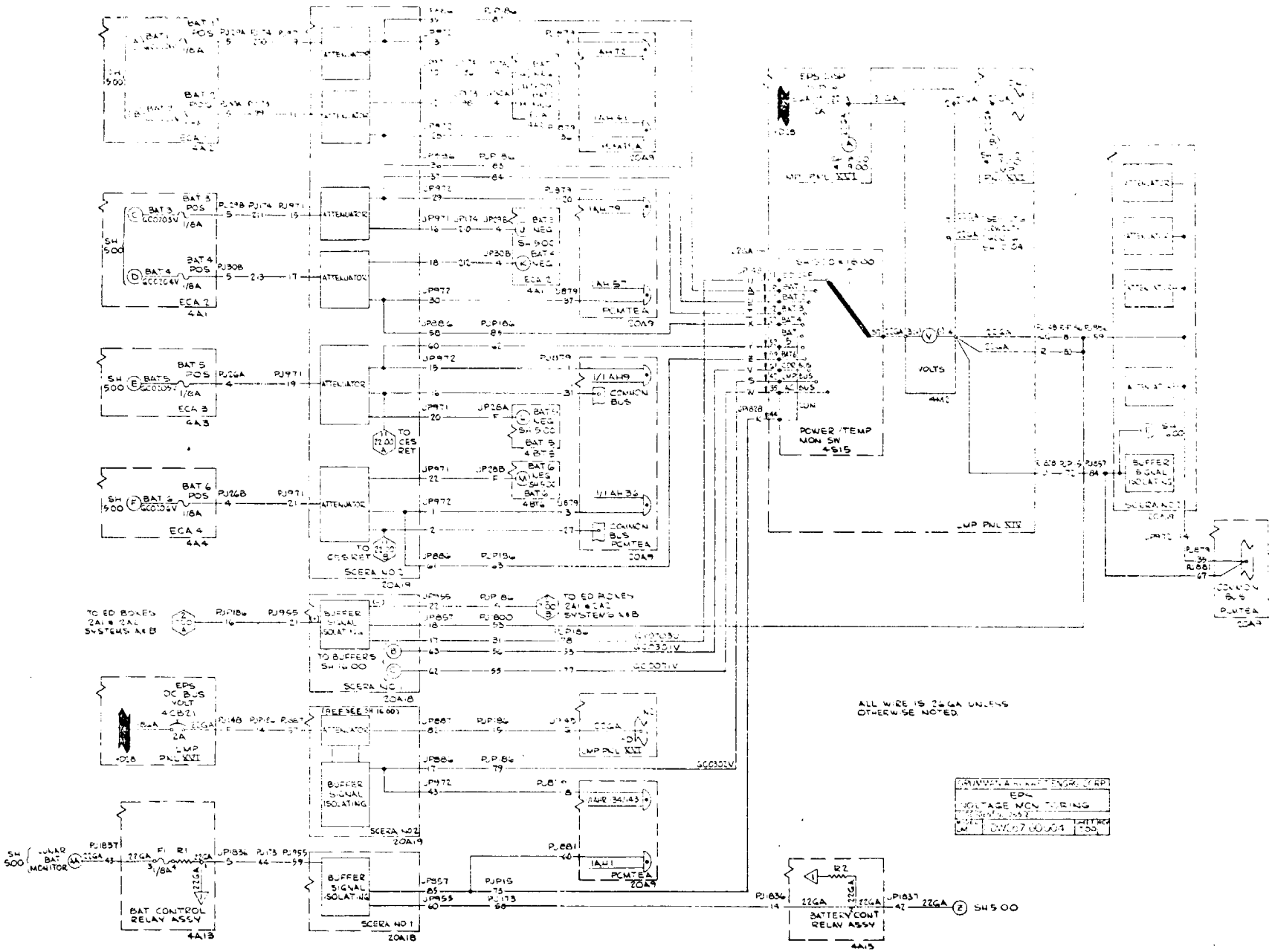
GRUMMAN AIRCRAFT ENGRG CORP			
EPS-INTERVEHICLE WIRING SYSTEMS A & B			
CODE IDENT NO. 24-512			
MODEL LM	LDW267-60004	SHEET 14 OF 69	REV

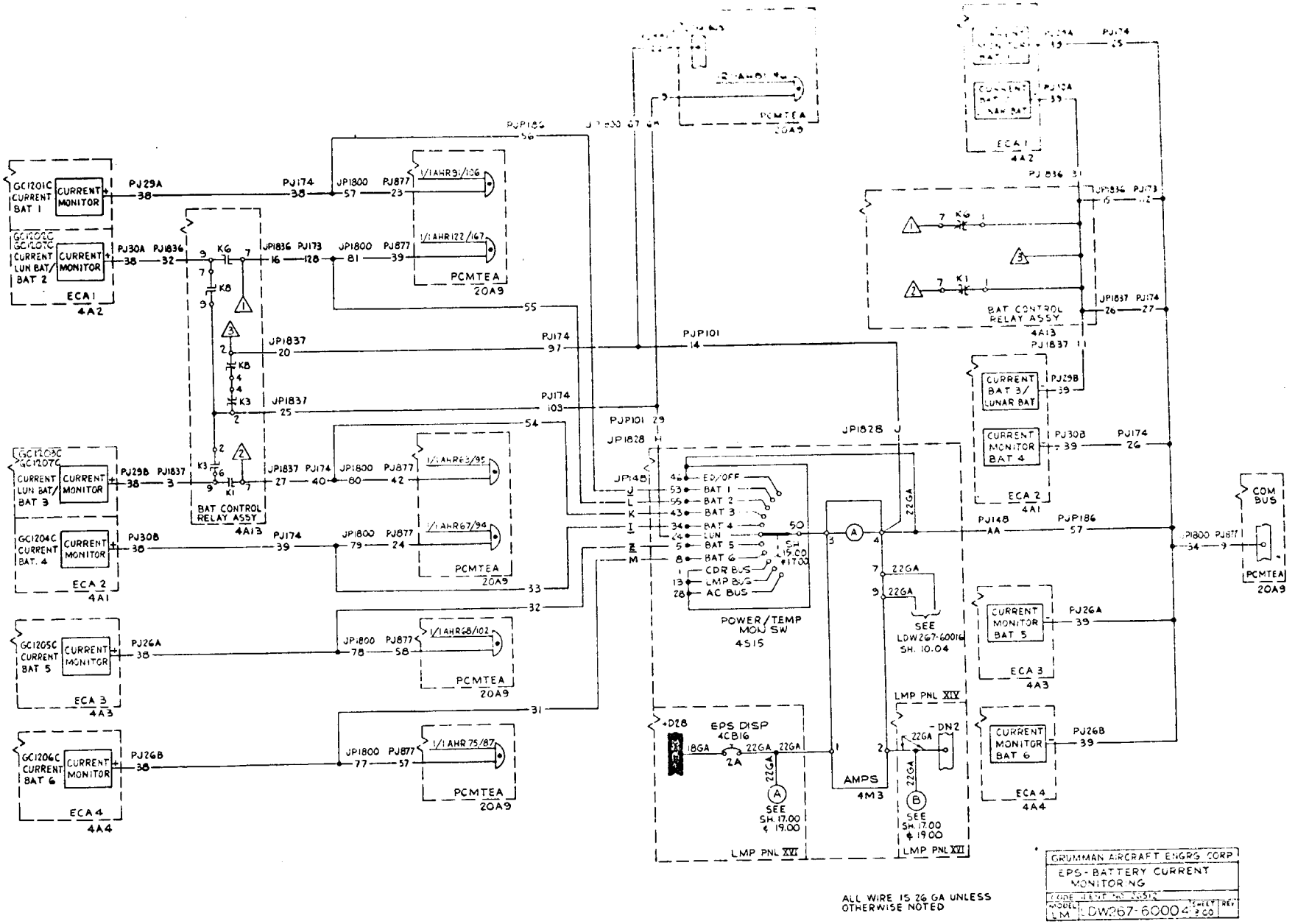

BAT 2/ LUNAR BAT. MALFUNCTION GC9962U
BAT 3/ LUNAR BAT. MALFUNCTION GC9963U
BAT 4 MALFUNCTION GC9964U
BAT 5 MALFUNCTION GC9965U
BAT 6 MALFUNCTION GC9966U
BAT CONT RELAY ASSY 4A15
EVENT BUFFER SIGNAL ISOLATING CLOSURE
PCMTEA 20A9
COMBUS PCMTEA 20A9
ECA #2 20A19
CAWEA 20A20
ENERGIZED BY ANY BATTERY MALFUNCTION
BATTERY CAUTION GDS27
DC FEEDER FAULT 4DS2
BAT FAULT 4DS1
LMP PNL XIV
CDP PNL XI
PNL II
NOTES:
1 ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
2 VDD VOLTAGE DISCRETE DETECTOR
3 THERE ARE FIVE (5) TEMPERATURE SENSORS TIED IN PARALLEL FOR EACH DESCENT BATTERY (4BT1, 4BT2, 4BT3, 4BT4 & 4BT7)
4. THERE ARE TEN (10) TEMPERATURE SENSORS TIED IN PARALLEL FOR EACH ASCENT BATTERY (4BT5 & 4BT6).
GRUMMAN AIRCRAFT ENGRG CORP
EPS-BATTERY & BUS FAULT INDICATION CIRCUIT
LDW26760004



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.
HLD = HIGH LEVEL DETECTOR
LLD = LOW LEVEL DETECTOR

GRUMMAN AIRCRAFT ENGRG CORP
EPS
CAUTION & WARNING


ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.
EPS VOLTAGE MON TIMING
POWER/TEMP MON SW 4S15
BAT CONTROL RELAY ASSY 4A13
BATTERY CONT RELAY ASSY 4A15
SCERA NO 1 20A18
SCERA NO 2 20A19
SCERA NO 3 20A20
PCMTEA 20A9
VOLTS 4M2
LMP PNL XXI
LMP PNL XXII
TO ED BOXES 2A1 & 2A2 SYSTEMS A & B
TO BUFFERS SH 500
TO CES RET
ATTENUATOR
BUFFER SIGNAL ISOLATING
BAT 1 POS
BAT 2 POS
BAT 3 POS
BAT 4 POS
BAT 5 POS
BAT 6 POS
ECA 1 4A1
ECA 2 4A2
ECA 3 4A3
ECA 4 4A4
SH 500

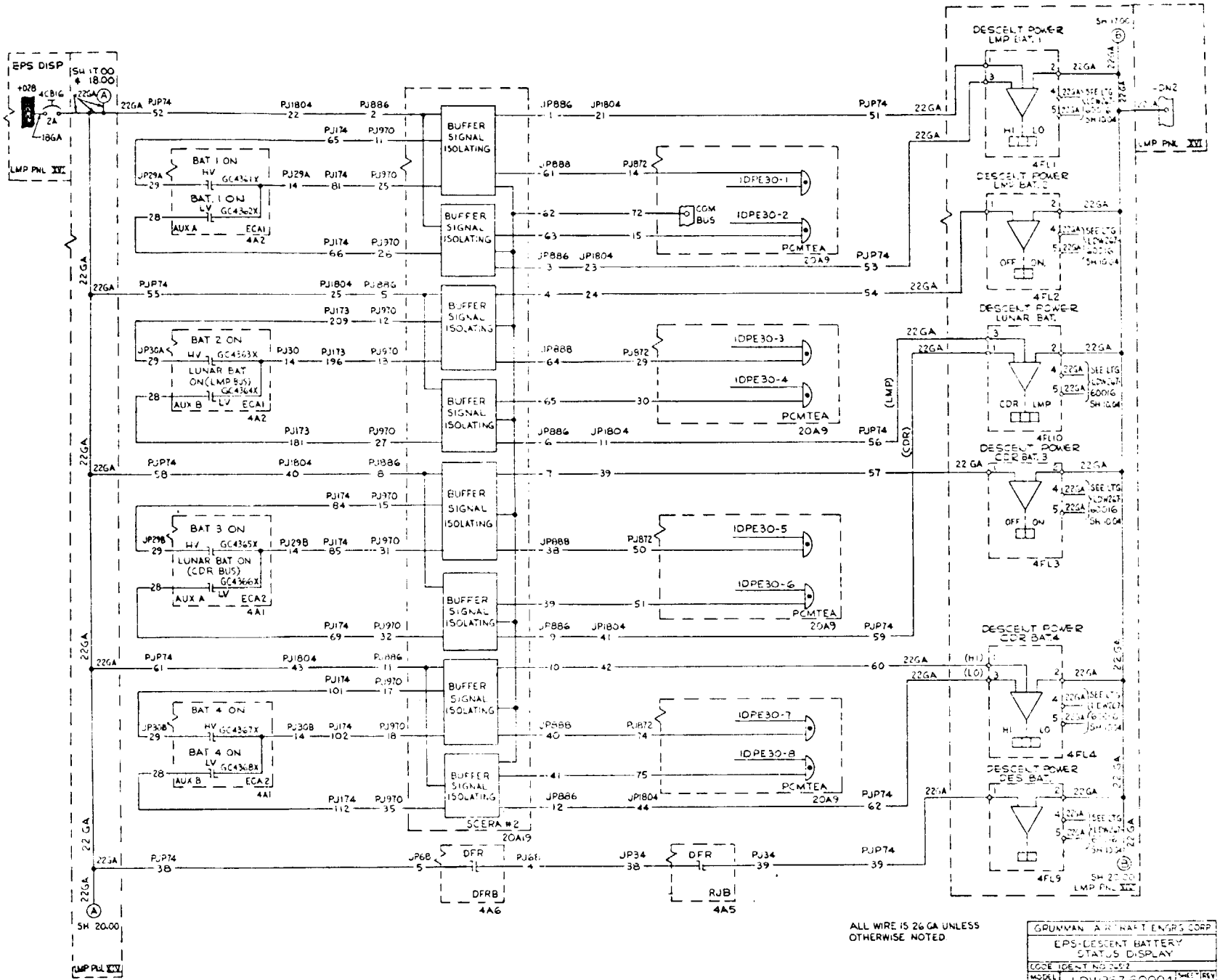


ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP

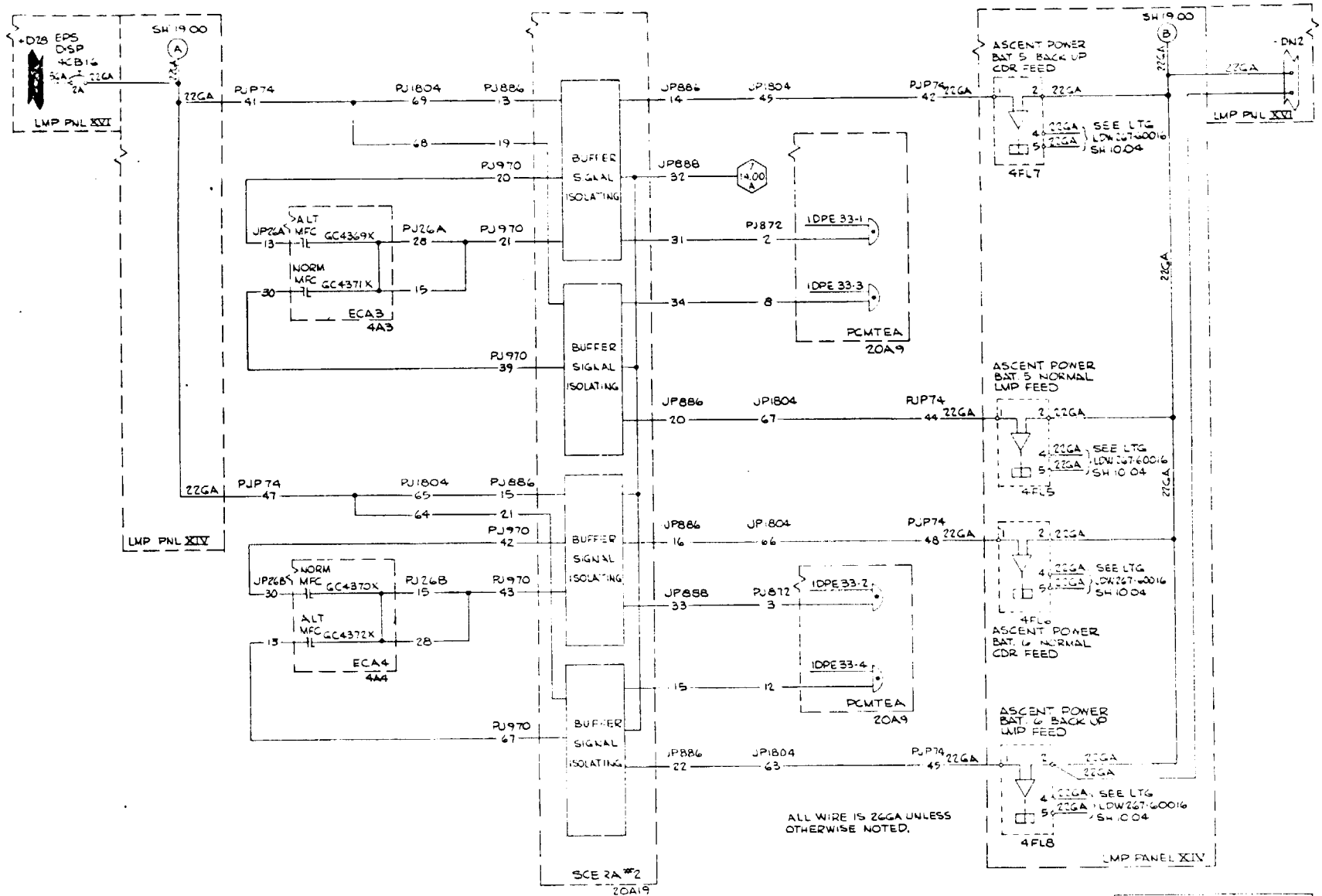
EPS - BATTERY CURRENT MONITORING

MODEL LM DW267-6000 4 SHEET 2 OF 60 REV



ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP	
EPS-DESCENT BATTERY STATUS DISPLAY	
CODE IDENT NO 80582	
MODEL LM-	LDW267-60004
SHEET 900	REV A

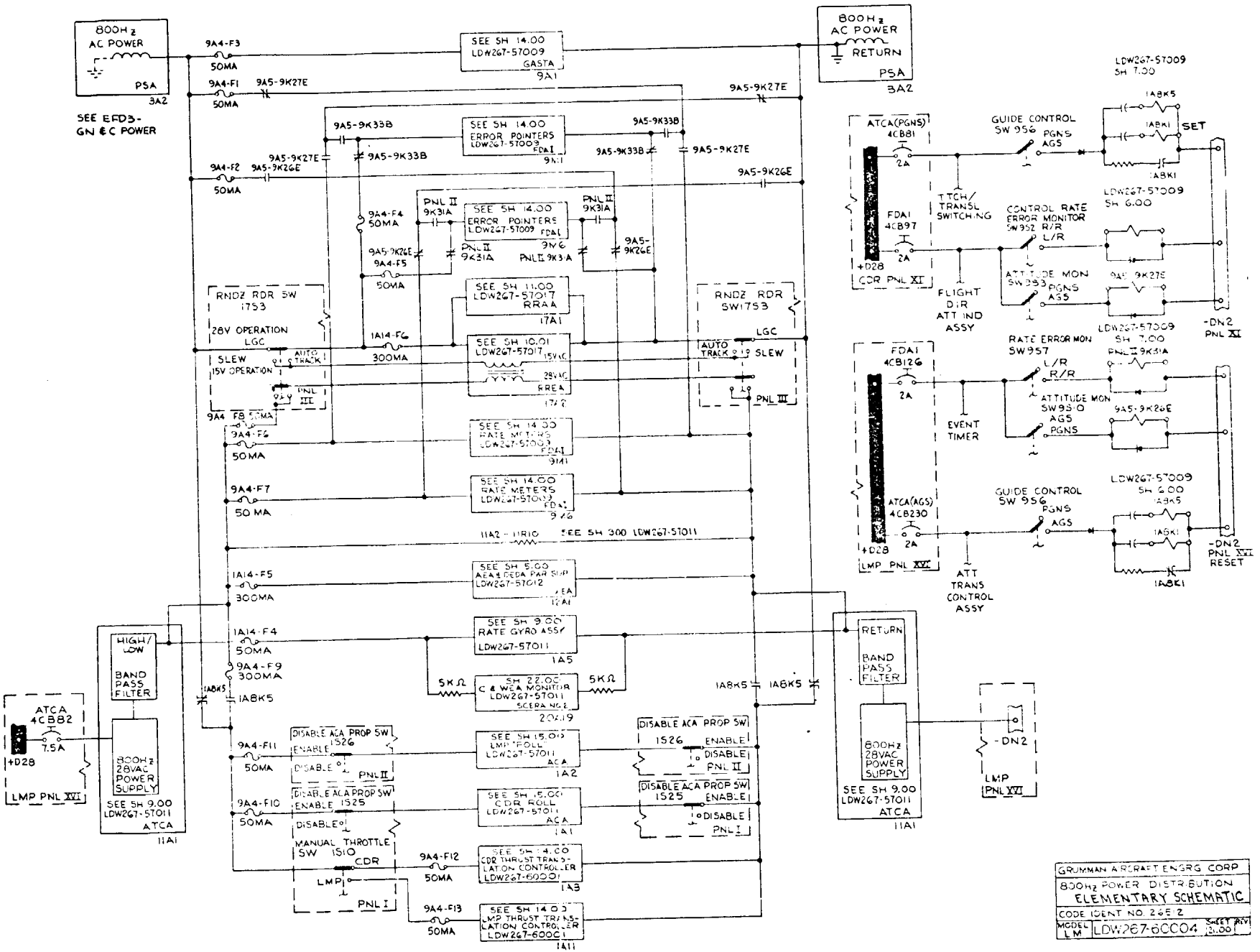


GRUMMAN AIRCRAFT ENG'G CORP

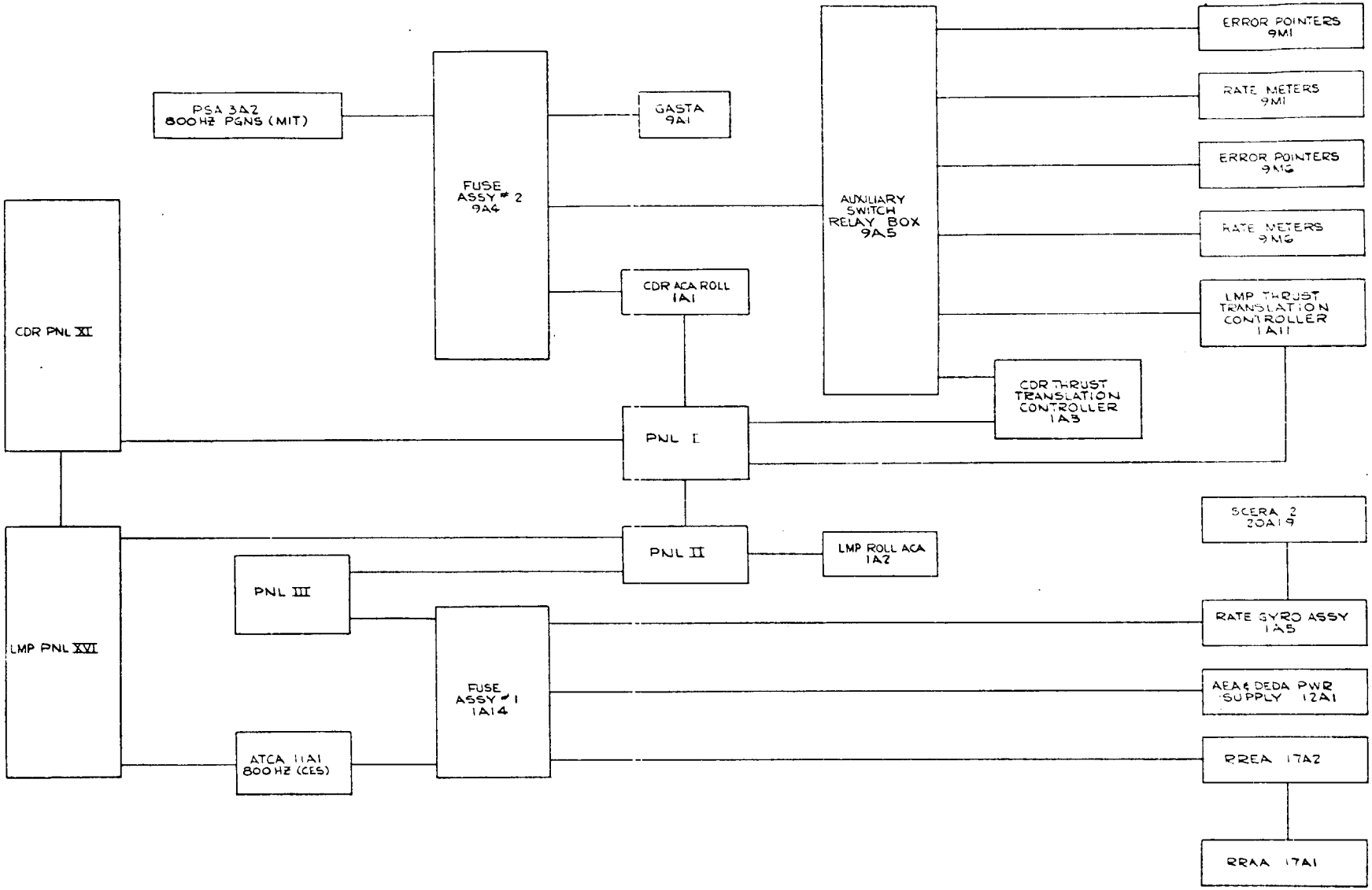
EPS - ASCENT BATTERY STATUS DISPLAY

CODE IDENT NO. DWG NO. SHEET NO.

LM LDW267-60004 SCD A



GRUMMAN AIRCRAFT ENGRG. CORP	
800Hz POWER DISTRIBUTION	
ELEMENTARY SCHEMATIC	
CODE IDENT NO. 24582	
MODEL LM	LDW267-6CC04 SHEET NO. 3.00



GRUMMAN AIRCRAFT ENG. CORP.

EPS 1400 & 2
POWER DISTRIBUTION
BLOCK DIAGRAM

LM LDW-2-7

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 6)

OPERATIONAL INSTRUMENTATION

POWER AND CONTROL

(REF LDW 267-60006A)

1. Applicable Documents

Level Three Drawings

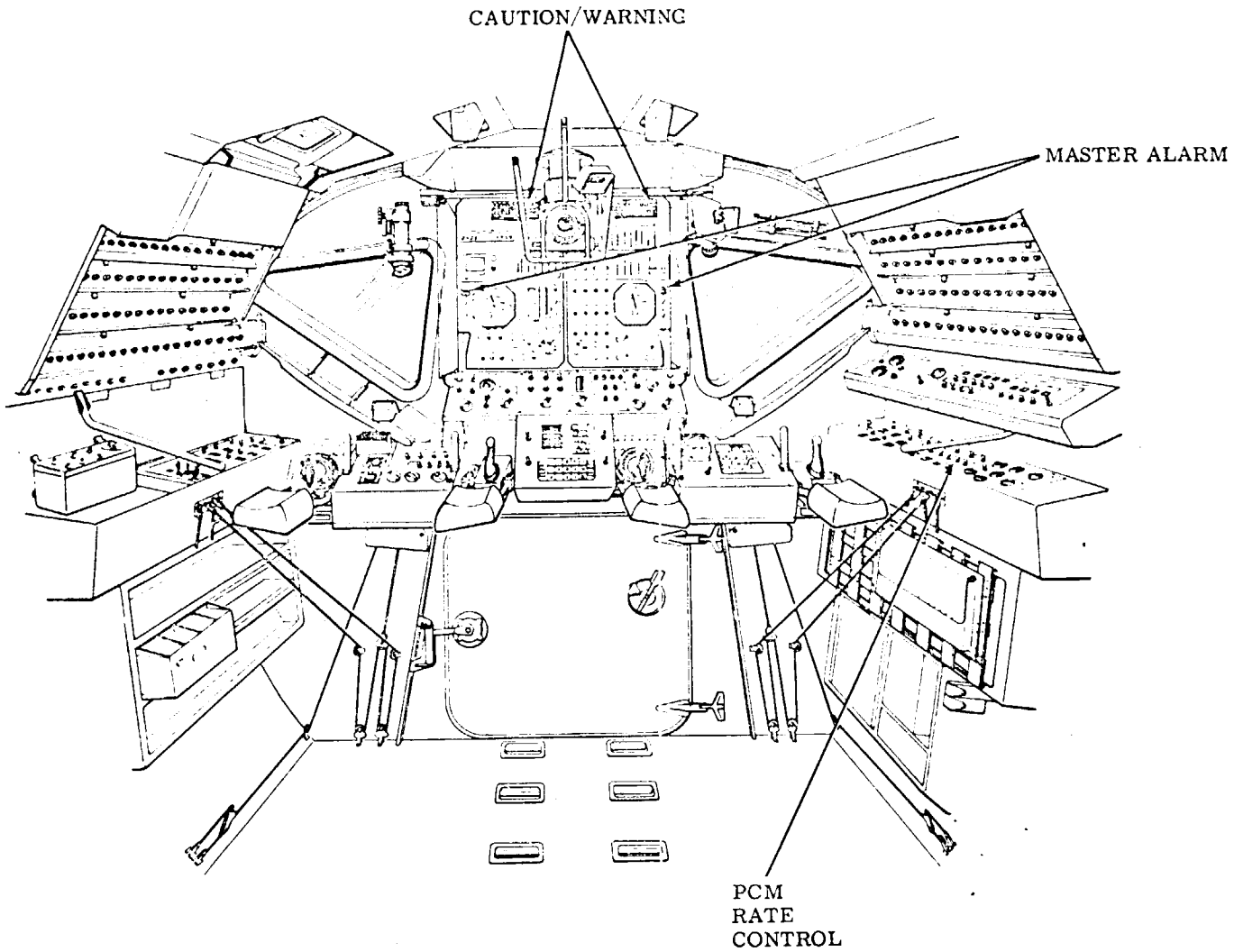
ITEM NAME	DWG. NO.	REV.	E.O.'s
Operational Instrumentation Power & Control	LDW360-60001	A	

2. Table of Contents

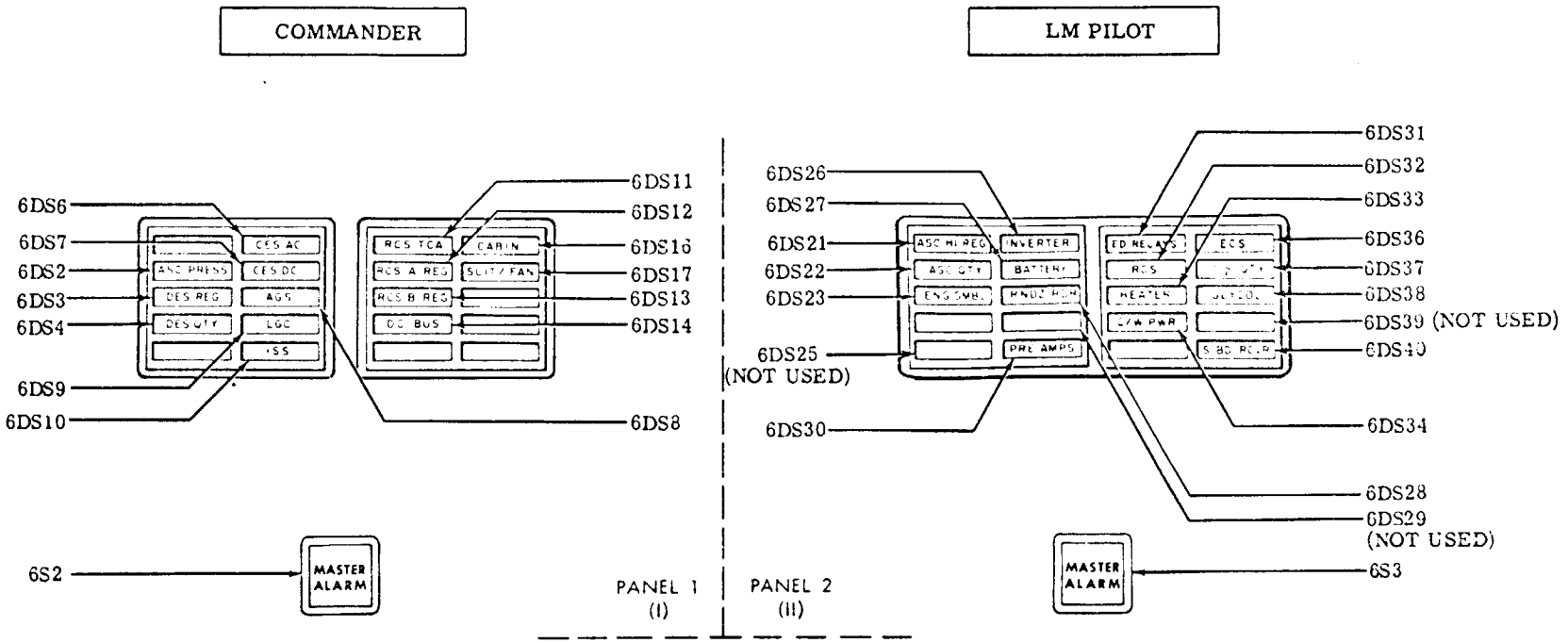
ITEM NAME	DWG. NO.
a) Cover Sheet	6-1001
b) Applicable Documents, Table of Contents, and Notes & Revisions	6-1002 & 6-1002.1
c) Cabin Location of Caution and Warning Controls and Indicators	6-1003
d) Caution and Warning Controls and Indicators Layout	6-1004
e) Caution and Warning Controls and Indicators Functional Description	6-1005 thru 6-1005.8
f) O.I. Power and Control C&WEA Operation	LDW267-60006 SH 4.00A
g) O.I. Power and Control Functional Block Diagram	LDW267-60006 SH 4.01
h) O.I. Power and Control Block Diagram	LDW267-60006 SH 4.02
i) O.I. Power and Control Master Alarm Control	LDW267-60006 SH 5.00A
j) O.I. Power and Control SCERA & PCM Power	LDW267-60006 SH 6.00
k) O.I. Power and Control PNL I Warn IND-Test	LDW267-60006 SH 7.00
l) O.I. Power and Control PNL I Warn IND-Test	LDW267-60006 SH 7.01
m) O.I. Power and Control PNL II Caution Indication Test	LDW267-60006 SH 8.00
n) O.I. Power and Control PNL II Caution Indication Test	LDW267-60006 SH 8.01A
o) O.I. Power and Control PCM Timing Electronics Portion	LDW267-60006 SH 9.00
p) O.I. Power and Control PCM OSC Failure & Timing Pulse	LDW267-60006 SH 10.00A
q) O.I. Power and Control SCERA Test Points	LDW267-60006 SH 11.00
r) O.I. Power and Control GSE/BTME Test Points to PCMTEA & C/WEA	LDW267-60006 SH 12.00

3. Applicable Revisions

Rev.	Sheet No.	LCD	Description
A	6-1004 6-4.00 6-5.00 6-8.01	5374A	Replacement of the water quantity measuring device (WQMD) with an absolute pressure transducer



Cabin Location of Caution and Warning Controls and Indicators



Caution and Warning Controls and Indicators Layout

SUBSYSTEM: OPERATIONAL INSTRUMENTATION (FUNCTIONAL GROUPING 6)

Code	Control/Indicator	Function
6S2 6S3	MASTER ALARM SWITCH-LIGHT (CDR) MASTER ALARM SWITCH-LIGHT (LMP) MOMENTARY PUSHBUTTON	These two pushbutton indicators, one located on each of the main panels, along with the caution/warning array light(s) (6DS1 through 6DS40) and the audible tone (6T1), are actuated by malfunction conditions or out-of-tolerance signals or by a loss of power to the C/WEA. Depression of either switch will extinguish both red lights and terminate the audible tone, but will have no effect on the illuminated annunciator light(s). Due to existing circuitry these lights will not be activated along with caution/warning array light 6DS4. If C/WEA power is lost, these lights are extinguished by the opening of 4CB147 (master alarm LM Pilot C&WEA 3A pnl XVI)
6T1	AUDIBLE TONE	This 3KHZ tone is initiated in conjunction with the illumination of master alarm indicator 6S2 and 6S3 and the caution/warning array lights. The tone is interrupted with the depression of either of these switch-lights. This tone will not be initiated if C/WEA light 6DS4 is activated. If the tone is initiated in conjunction with C/WEA reg power caution light 6DS34, it is interrupted when 4CB147 is opened.
6DS2	ASCENT PROPULSION LOW PRESS WARNING LIGHT (RED)	The (ASC PRESS) warning light is illuminated if either, (1) the pressure in either of two ascent helium tanks falls below 2773 psia prior to staging; or (2) if the blanket pressure in the fuel or oxidizer lines at the bi-propellant valves of the ascent stage decays below 120 psia. If illuminated by low helium pressure, this light is extinguished by a signal from a dead face switch resulting from separation of the descent and ascent stages; if illuminated by low fuel or oxidizer pressure, the light is extinguished only by restoration of pressure.

SUBSYSTEM: OPERATIONAL INSTRUMENTATION (FUNCTIONAL GROUPING 6)

Code	Control/Indicator	Function
6DS3	HI/LOW HELIUM REG OUTLET PRESS WARNING LIGHT (RED)	The (DES REG) warning light is illuminated if the pressure within the descent helium lines downstream of the regulators rises above 260 psia or falls below 220 psia. It is enabled by the DES ENG "ON" command. The light is extinguished when nominal pressures are restored or staging is accomplished (deadface switch).
6DS4	DESCENT PROPELLANT LOW QUANTITY WARNING LIGHT (RED)	The (DES QTY) warning light is illuminated if, prior to staging, the fuel or oxidizer in the descent tanks falls below a quantity such that approximately 2 minutes of burning time remains at 25% thrust. The master alarm indicator and 3KHZ tone are disabled if this light is illuminated.
6DS6	CONTROL ELECTRONICS SECTION AC VOLTAGE FAILURE WARNING LIGHT (RED)	The (CES AC) warning light is illuminated if either of the AC voltages (single phase 28V 800 hz or three phase 26 V 800 hz) in the Control Electronics Section of the STAB/CONT subsystem is out of tolerance. The light is extinguished when the Gyro Test Control switch (11S1) is actuated to either the POS RT or NEG RT position.
6DS7	CONTROL ELECTRONICS SECTION DC VOLTAGE FAILURE WARNING LIGHT (RED)	The (CES DC) warning light is illuminated if the DC voltage of one or more of the DC power supplies (+15 V, -15 V, +4.3 V, +6 V, -6 V) in the Control Electronics Section of the STAB/CONT subsystem is out of tolerance. The light is extinguished when Gyro Test Control Switch (11S1) is actuated to either the POS RT or NEG RT position.

SUBSYSTEM: OPERATIONAL INSTRUMENTATION (FUNCTIONAL GROUPING 6)

Code	Control/Indicator	Function
6DS8	AGS FAILURE WARNING LIGHT (RED)	The (AGS) warning light is illuminated if: (1) a failure is sensed in any of the following ASA power supplies: +28V, +12V, or 28V 400 hz, or (2) if a fail signal is generated by the AEA test assembly, or (3) if an ASA heater failure opens the +12V power supply. The signals to illuminate this light are inhibited if the AGS status switch (12S7) is in the OFF or STANDBY POSITION.
6DS9	LGC FAILURE WARNING LIGHT (RED)	The (LGC) warning light is illuminated if: (1) a power failure is sensed in any of the following LGC power supplies: +28V, +3V, +13V, or (2) two types of scaler failures, or (3) restart or counter failures during LGC operate periods or in response to an alarm test program. The light is extinguished by either: (1) restoration of nominal voltage, (2) placing the Guidance Control switch (9S6) to the AGS position.
6DS10	INERTIAL SUBSYSTEM FAILURE WARNING LIGHTS (RED)	The ISS warning light is illuminated if a failure of any of the following occurs: (1) failure of 3.2 KHz power supply. (2) Failure of PIPA during main engine thrusting. (3) Gimbal servo error and tolerances. (4) Failure of the CDU. The light is extinguished by either an in value condition restored or Guidance Control Switch (9S6) in AGS position.
6DS11	RCS TCA WARNING LIGHT (RED)	The (RCS TCA) warning light is illuminated if: (1) There is a primary coil command to fire a specific thruster in the absence of chamber pressure at the thruster, or (2) if chamber pressure is present in the absence of an "ON" command, or (3) if opposing

SUBSYSTEM: OPERATIONAL INSTRUMENTATION (FUNCTIONAL GROUPING 6)

Code	Control/Indicator	Function
6DS11 (cont.)		colinear jets are on simultaneously. The light is extinguished when the isolation valve associated with the failed TCA is closed.
6DS12 6DS13	RCS "A" REGULATOR FAILURE WARNING LIGHT (RED) RCS "B" REGULATOR FAILURE WARNING LIGHT (RED)	The (RCS A REG) warning light is illuminated if the pressure in the helium line of the pressurized RCS System A rises above 205 psia or falls below 165 psia. The light is extinguished when the nominal pressure is restored or if the main shutoff solenoid valves of System A (as operated by the System A Main Shutoff Switch (8S7) are closed. The (RCS B REG) warning light for System B is illuminated and extinguished in an identical manner as the (RCS A REG) warning light, as operated by the System B Main Shutoff Switch (8S9).
6DS14	DC BUS VOLTAGE FAILURE WARNING LIGHT (RED)	The (DC BUS) warning light is illuminated if a low voltage condition (< 26.5V) occurs on either the Commander's or the LM Pilot's DC electrical bus. The light is extinguished by restoration of a nominal voltage condition.
6DS16	CABIN LOW PRESSURE WARNING LIGHT (RED)	The (CABIN) warning light is illuminated if the cabin pressure falls below 4.15±.3 psia. The light is extinguished when cabin pressure is restored to a level greater than 4.65 ±.25 psia. This indicator will not operate during periods of intentional cabin depressurization (When the EGRESS or CLOSE position is selected on both Atmosphere Revitalization Section Pressure Regulator Valves (7H1 and 7H2).

SUBSYSTEM: OPERATIONAL INSTRUMENTATION (FUNCTIONAL GROUPING 6)

Code	Control/Indicator	Function
6DS17	SUIT/FAN LOW PRESSURE WARNING LIGHT (RED)	The (SUIT/FAN) warning light is illuminated if either: (1) the pressure within the suit falls below 3.12 psia or (2) if the #2 suit circulating fan fails. If illuminated by low suit pressure, it is extinguished by restoration of a nominal pressure. If illuminated because of #2 fan failure, the light is extinguished by deactivation of the Suit Fan P Control circuit breaker (4CD120).
6DS21	HIGH He REG OUTLET PRESS CAUTION LIGHT (YELLOW)	The (ASC HI REG) caution light is illuminated if the helium pressure downstream of the regulators in the ascent helium lines is greater than 220 psia. The light is extinguished when pressure is reduced to a nominal value.
6DS22	ASCENT PROPELLANT LOW QUANTITY CAUTION LIGHT (YELLOW)	The (ASC QTY) caution light is illuminated if the level of ascent fuel or oxidizer in the ascent tanks reaches a value such that approximately 10 seconds burning time remains. The signal is intended to permit the crew to manually shut down the ascent engine to avoid possible explosive effects resulting from depletion of either fuel or oxidizer before the other, and to indicate that ascent engine thrusting is not available for midcourse correction or rendezvous braking. These low level signals are enabled only if the ascent engine is on.
6DS23	AUTOMATIC GIMBAL FAILURE CAUTION LIGHT (YELLOW)	The (ENG GMBL) caution light is illuminated if a difference between the gimbal drive signal and gimbal response from the Y or Z-axis trim function is sensed. This signal is enabled only if the Descent Engine is armed and the ENG GMBL switch (1S8) is in the enable position. Additionally, the signal is disabled following staging (deadface switch).

SUBSYSTEM: OPERATIONAL INSTRUMENTATION (FUNCTIONAL GROUPING 6)

Code	Control/Indicator	Function
6DS25	NOT USED LIGHT (YELLOW)	Light is wired to C & WEA, but no C & WEA function exists.
6DS26	INVERTER FAILURE CAUTION LIGHT (YELLOW)	The (INVERTER) caution light is illuminated either: (1) if the AC bus voltage is <112V or (2) if the AC bus frequency is < 398 hz or > 402 hz. The light is extinguished when within tolerance conditions are restored, or if the AC Power switch (4S14) is turned off.
6DS27	BATTERY FAILURE CAUTION LIGHT (YELLOW)	The (BATTERY) caution light is illuminated if an over-current, reverse-current, or over-temperature condition occurs in any of the four descent or two ascent batteries. The light is extinguished when nominal conditions are restored or if the affected battery is turned off.
6DS28	RENDEZVOUS RADAR DATA FAILURE CAUTION LIGHT (YELLOW)	The (RNDZ RDR) caution light is illuminated if a rendezvous radar data-not-good conditon occurs. The light is extinguished when a "Data Good" condition is restored, or if the rendezvous radar is turned off or if the RNDZ RDR mode switch is (17S3) placed to any position other than AUTO TRACK. The RNDZ RDR caution is enabled only when the RNDZ RDR mode switch is in the AUTO TRACK position.
6DS29	NOT USED LIGHT (YELLOW)	Light is wired to C & WEA, but no C & WEA function exists.

SUBSYSTEM: OPERATIONAL INSTRUMENTATION (FUNCTIONAL GROUPING 6)

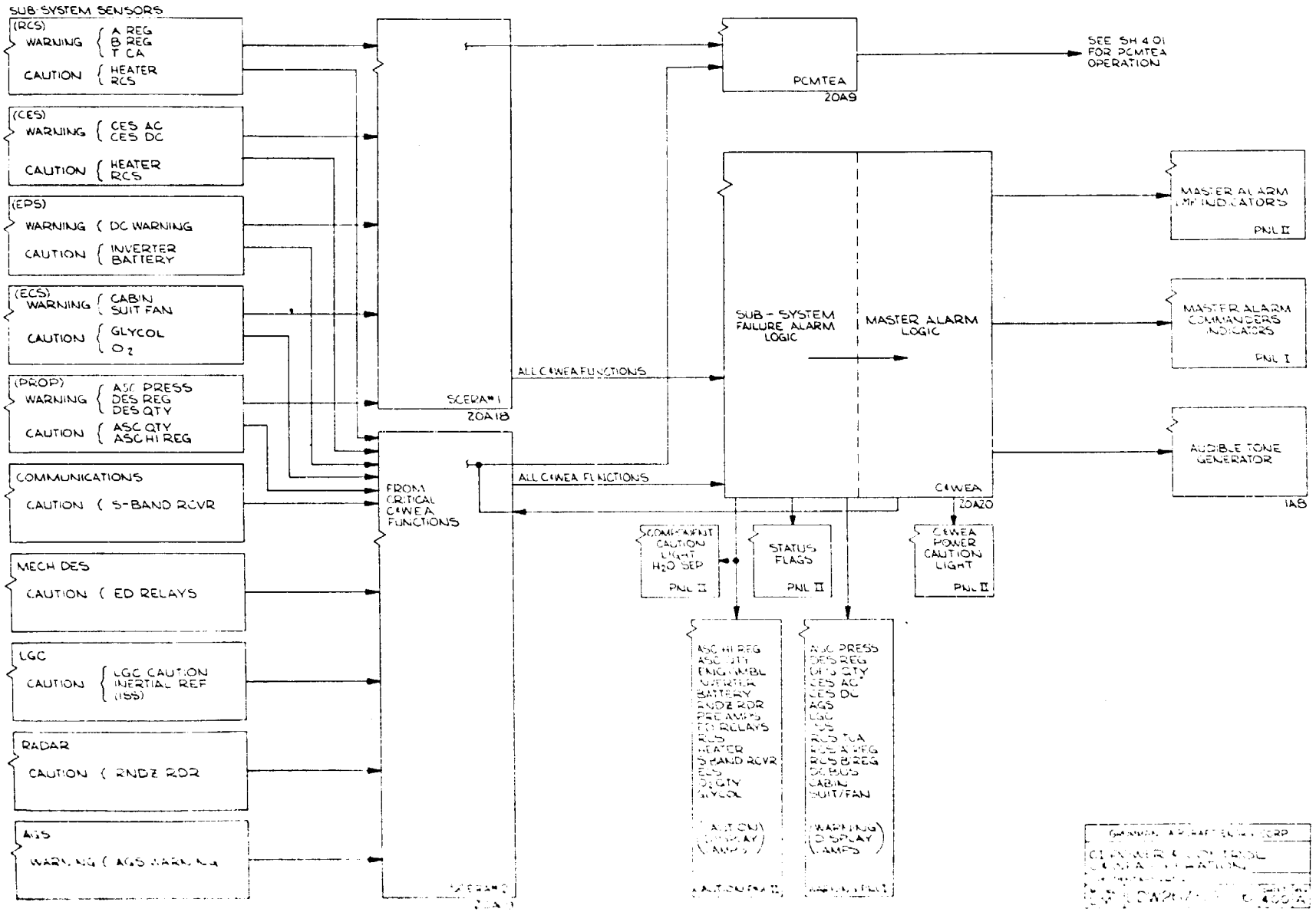
Code	Control/Indicator	Function
6DS30	PREAMPS POWER FAILURE CAUTION LIGHT (YELLOW)	The (PRE AMPS) caution light is illuminated by an out-of-tolerance condition in either of two parallel redundant -4.7 ± .5V regulated supplies which supply bias voltage to the ATCA solenoid driver. This light is extinguished either by the stage deadface switch or by actuation of the Abort pushbutton (1S13).
6DS31	EXPLOSIVE DEVICES SUBSYSTEM RELAY FAILURES CAUTION LIGHT	The (ED RELAYS) caution light is illuminated if a failure of any of the following EDS relays occur; SYSTEM A or SYSTEM B: Arming relay, stage relay, sequence relay, nuts or bolts firing relay, ECI firing relay or guillotine firing relay. If the failure occurred in the stage relays, positioning the stage relay switch (2S8) to the RESET position will extinguish the light. The light is inhibited if the MASTER ARM switch (2S7) is in the ON position or if ABORT STAGE is commanded.
6DS32	RCS FAILURE CAUTION LIGHT (YELLOW)	The (RCS) caution light is illuminated if the pressure of the helium tank in either RCS system drops below 1700 psia. The light is extinguished by selecting the He position of the RCS Temp/Press Monitor switch (8S19).
6DS33	HEATER FAILURE CAUTION LIGHT (YELLOW)	The (HEATER) caution light is illuminated by an out-of-tolerance temperature condition in: (1) the S-band antenna electronic drive assembly ($< -64.08^{\circ}F$ or $> 153.63^{\circ}F$) or (2) the rendezvous radar assembly ($< -50,07^{\circ}F$ or $> 147.69^{\circ}F$). The light is extinguished by positioning the Temperature Monitor switch (18S10) to the affected heater assembly position.

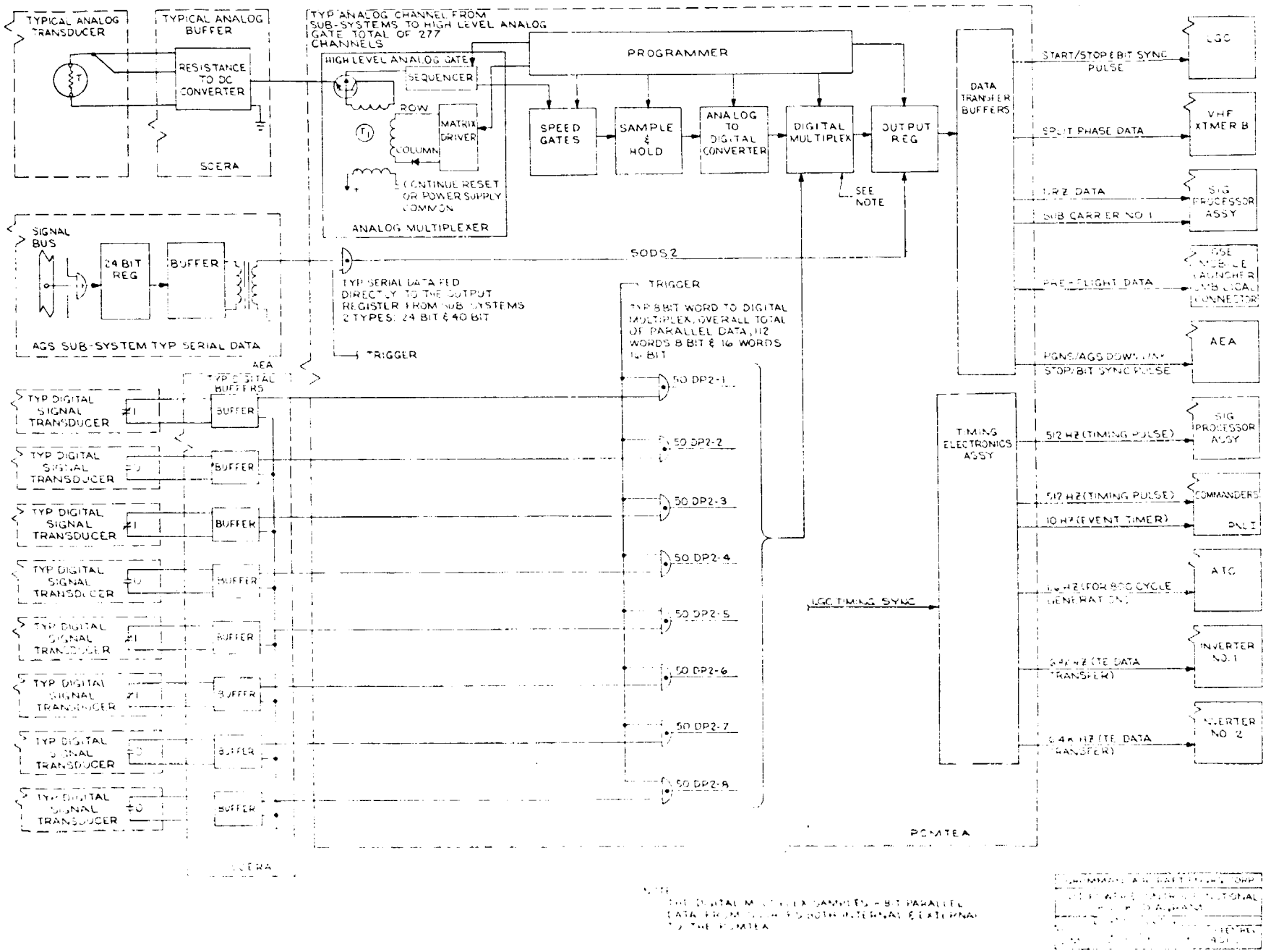
SUBSYSTEM: OPERATIONAL INSTRUMENTATION (FUNCTIONAL GROUPING 6)

Code	Control/Indicator	Function
6DS34	C/WEA REG POWER FAILURE CAUTION LIGHT (YELLOW)	The (C/WEA PWR) caution light is illuminated if any one or more of the following regulated power supplies fail: +9V, +23V, +4V, -3V, -2.3V, +2.3V. The light is extinguished only by restoration of nominal power to the C/WEA. Unlike the other C/WEA lights, this light is undimmable. Depressing 6S2 or 6S3 will not terminate either master alarm indicators or 3KHz tone when used in conjunction with this light.
6DS36	ECS FAILURE CAUTION LIGHT (YELLOW)	The (ECS) caution light is illuminated by any of the following malfunctions: glycol pump failure; CO_2 partial pressure greater than 7.6 mm of mercury; water separator failure; or suit fan #1 failure. The light is extinguished by correction of the malfunction which illuminated it as follows: restoration of glycol pump pressure as a result of selecting #2 pump or selecting the INST (SEC) position if #2 has failed; or restoration of nominal CO_2 partial pressure level; or restoration of nominal water separator speed; or selection of the #2 suit fan.
6DS37	OXYGEN QUANTITY CAUTION LIGHT (YELLOW)	The (O_2 QTY) caution light is illuminated if a low quantity condition (< 135 psia) occurs in the descent oxygen tank, or if a less than full quantity condition (< 682.4 and < 681.6 psia) occurs in ascent oxygen tank, #2 and #1 respectively or if a low quantity condition (< 99.6 psia) occurs in ascent tank #1. The light is extinguished by momentarily positioning the O_2/H_2O QTY MON switch (7S2) to the C/WEA RESET position. The descent tank low quantity signal and the ascent tanks less than full signals are inhibited following staging (dead-face switch).

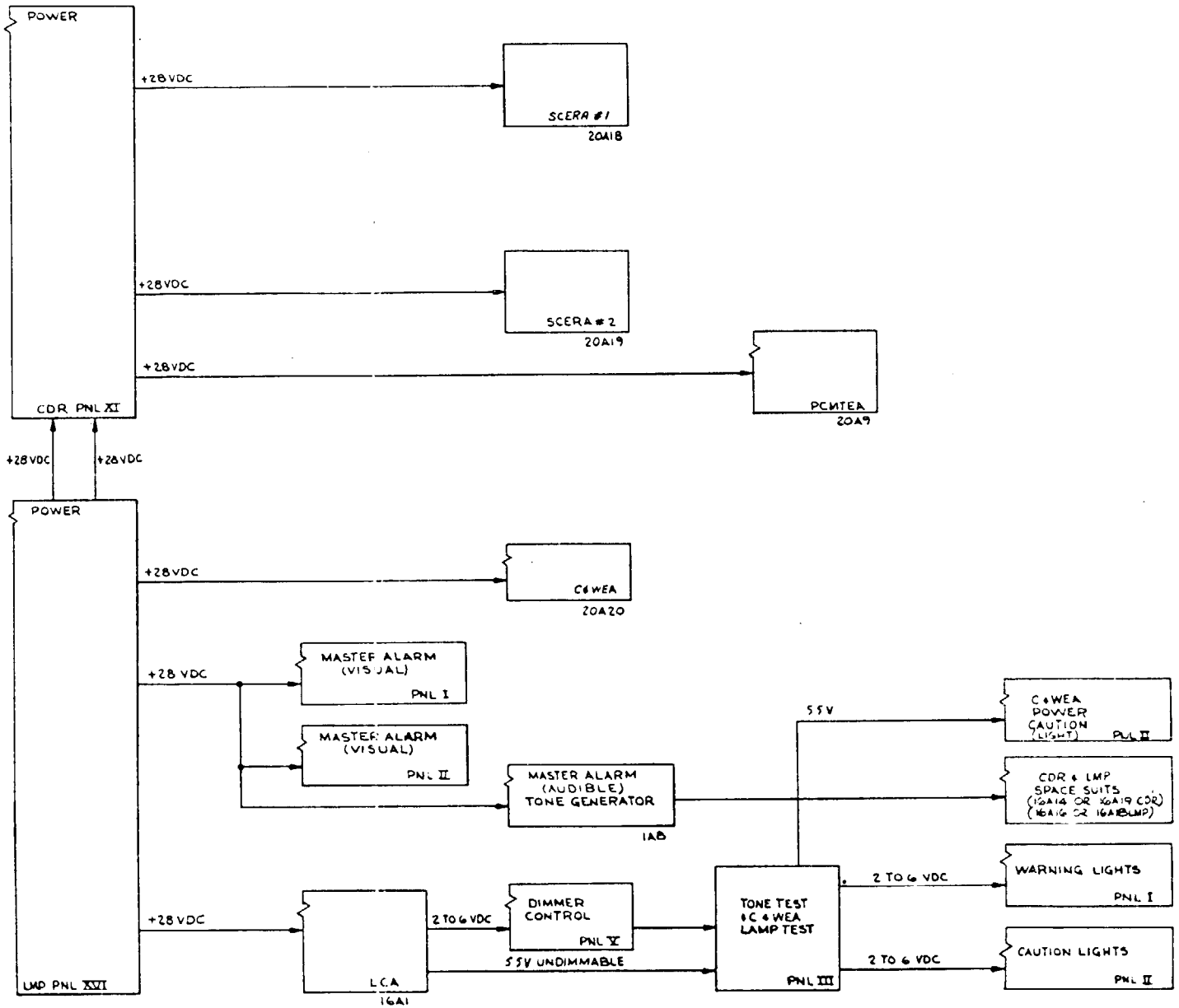
SUBSYSTEM: OPERATIONAL INSTRUMENTATION (FUNCTIONAL GROUPING 6)

Code	Control/Indicator	Function
6DS38	GLYCOL FAILURE CAUTION LIGHT (YELLOW)	The (GLYCOL) caution light is illuminated by either of two malfunctions: (1) low glycol quantity in the primary coolant loop; or (2) high glycol temperature in the primary loop (> 49.98°F) as sensed at the glycol water evaporator outlet. Both signals are inhibited following selection of the INST (SEC) position of the Glycol Pump switch (7S3). If illuminated by the high temperature condition, restoration of the temperature to a nominal level also extinguishes the light.
6DS39	NOT USED LIGHT (YELLOW)	Light is wired to C/WEA, but no C/WEA function exists.
6DS40	S-BD RCVR FAILURE CAUTION LIGHT	The (S-BD RCVR) caution light is illuminated by loss of the Automatic Gain Control signal in the Receiver. Positioning the Range/TV Function switch (13S1) to the OFF/RESET position extinguishes the light. The light is enabled only if the Range/TV function switch (13S1) is in the TV/C/WEA ENABLE position.

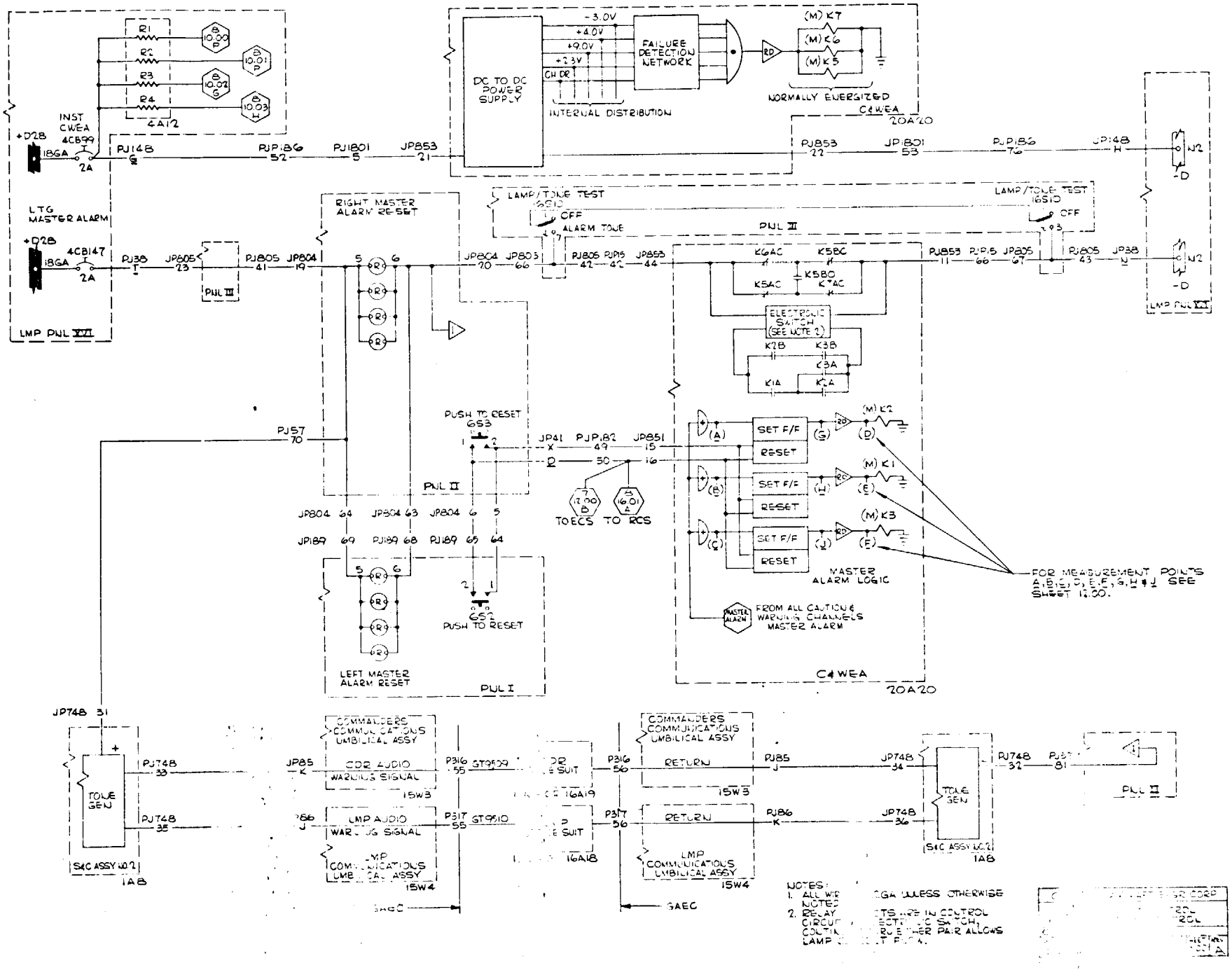

SUB-SYSTEM SENSORS
(RCS)
WARNING
A REG
B REG
T CA
CAUTION
HEATER
RCS
(CES)
WARNING
CES AC
CES DC
CAUTION
HEATER
RCS
(EPS)
WARNING
DC WARNING
CAUTION
INVERTER
BATTERY
(ECS)
WARNING
CABIN
SUIT FAN
CAUTION
GLYCOL
O2
(PROP)
WARNING
ASC PRESS
DES REG
DES QTY
CAUTION
ASC QTY
ASC HI REG
COMMUNICATIONS
CAUTION
S-BAND RCVR
MECH DES
CAUTION
ED RELAYS
LGC
CAUTION
LGC CAUTION
INERTIAL REF
(155)
RADAR
CAUTION
RNDZ RDR
AGS
WARNING
SCERA #1
20A18
FROM CRITICAL C*WEA FUNCTIONS
ALL C*WEA FUNCTIONS
ALL C*WEA FUNCTIONS
PCMTEA
20A9
SEE SH 401 FOR PCMTEA OPERATION
SUB-SYSTEM FAILURE ALARM LOGIC
MASTER ALARM LOGIC
C*WEA
20A20
MASTER ALARM INDICATORS
PNL II
MASTER ALARM COMMANDERS INDICATORS
PNL I
AUDIBLE TONE GENERATOR
1A8
COMPONENT CAUTION LIGHT H2O SEP
PNL II
STATUS FLAGS
PNL II
C*WEA POWER CAUTION LIGHT
PNL II
ASC HI REG
ASC QTY
ENG GIMBL
INVERTER
BATTERY
RNDZ RDR
PREAMPS
ED RELAYS
RCS
HEATER
S BAND RCVR
ECS
DES QTY
GLYCOL
(CAUTION DISPLAY LAMPS)
ASC PRESS
DES REG
DES QTY
CES AC
CES DC
AGS
LGC
RCS TCA
RCS A REG
RCS B REG
DC BUS
CABIN
SUIT/FAN
(WARNING DISPLAY LAMPS)

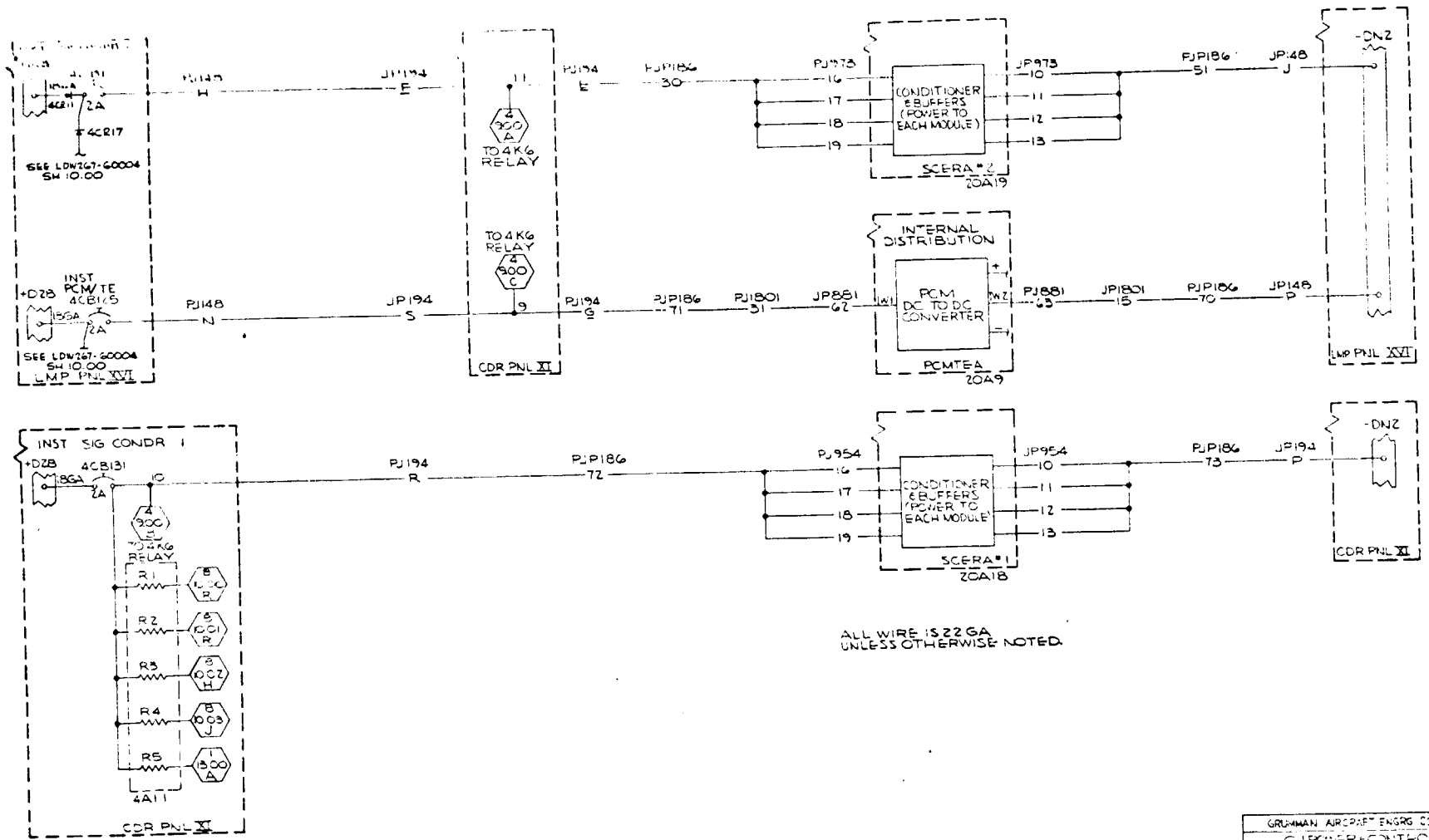


NOTE
THE DIGITAL MULTIPLEX SAMPLES 8 BIT PARALLEL DATA FROM ... SUB-SYSTEMS (INTERNAL & EXTERNAL) & THE PCMTEA



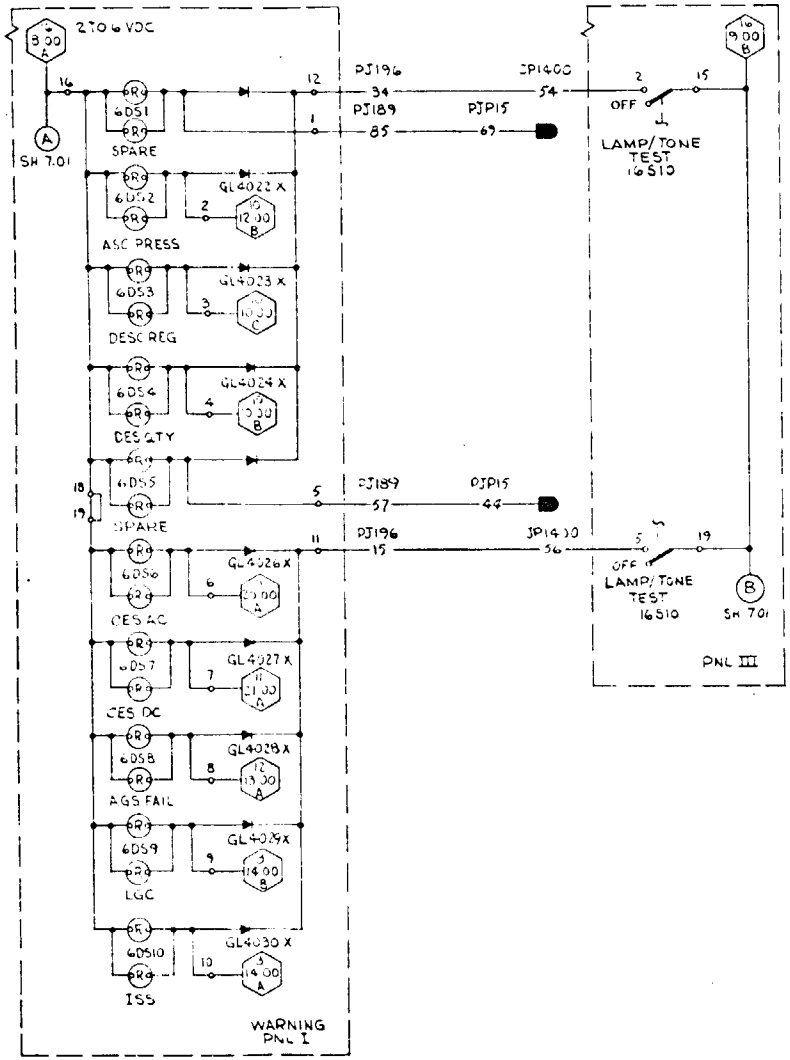
GRUMMAN AIRCRAFT ENGRG CORP
O I POWER & CONTROL
BLOCK DIAGRAM
CODE IDENT NO 78472
LM | LDW267-60006 | SHEET 4 OF | REV

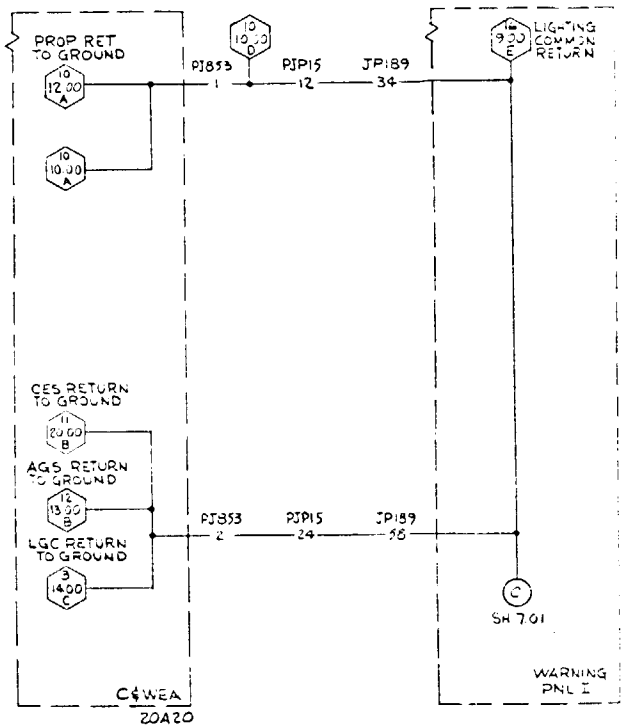

DC TO DC POWER SUPPLY
-3.0V
+4.0V
+9.0V
+23V
CH DR
FAILURE DETECTION NETWORK
RD
(M) K7
(M) K6
(M) K5
NORMALLY ENERGIZED
INTERNAL DISTRIBUTION
C4 WEA
20A20
INST CWEA
4CB99
+D2B
18GA
2A
LTG MASTER ALARM
4CB147
LMP PNL XXII
RIGHT MASTER ALARM RESET
LAMP/TONE TEST
16S10
OFF
ALARM TONE
PNL III
PNL II
PNL I
LEFT MASTER ALARM RESET
PUSH TO RESET
6S3
6S2
ELECTRONIC SWITCH (SEE NOTE 2)
SET F/F
RESET
MASTER ALARM LOGIC
FROM ALL CAUTION & WARNING CHANNELS MASTER ALARM
FOR MEASUREMENT POINTS A,B,C,D,E,F,G,H & J SEE SHEET 12.00.
TO ECS
TO RCS
COMMANDERS COMMUNICATIONS UMBILICAL ASSY
CDR AUDIO WARNING SIGNAL
LMP AUDIO WARNING SIGNAL
RETURN
TONE GEN
S&C ASSY NO 2
1AB
15W3
15W4
16A19
16A18
GAEC
NOTES:
1. ALL WIRE GA UNLESS OTHERWISE NOTED
2. RELAY CONTACTS ARE IN CONTROL CIRCUIT ELECTRONIC SWITCH CONTROL TRUE EITHER PAIR ALLOWS LAMP



ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.

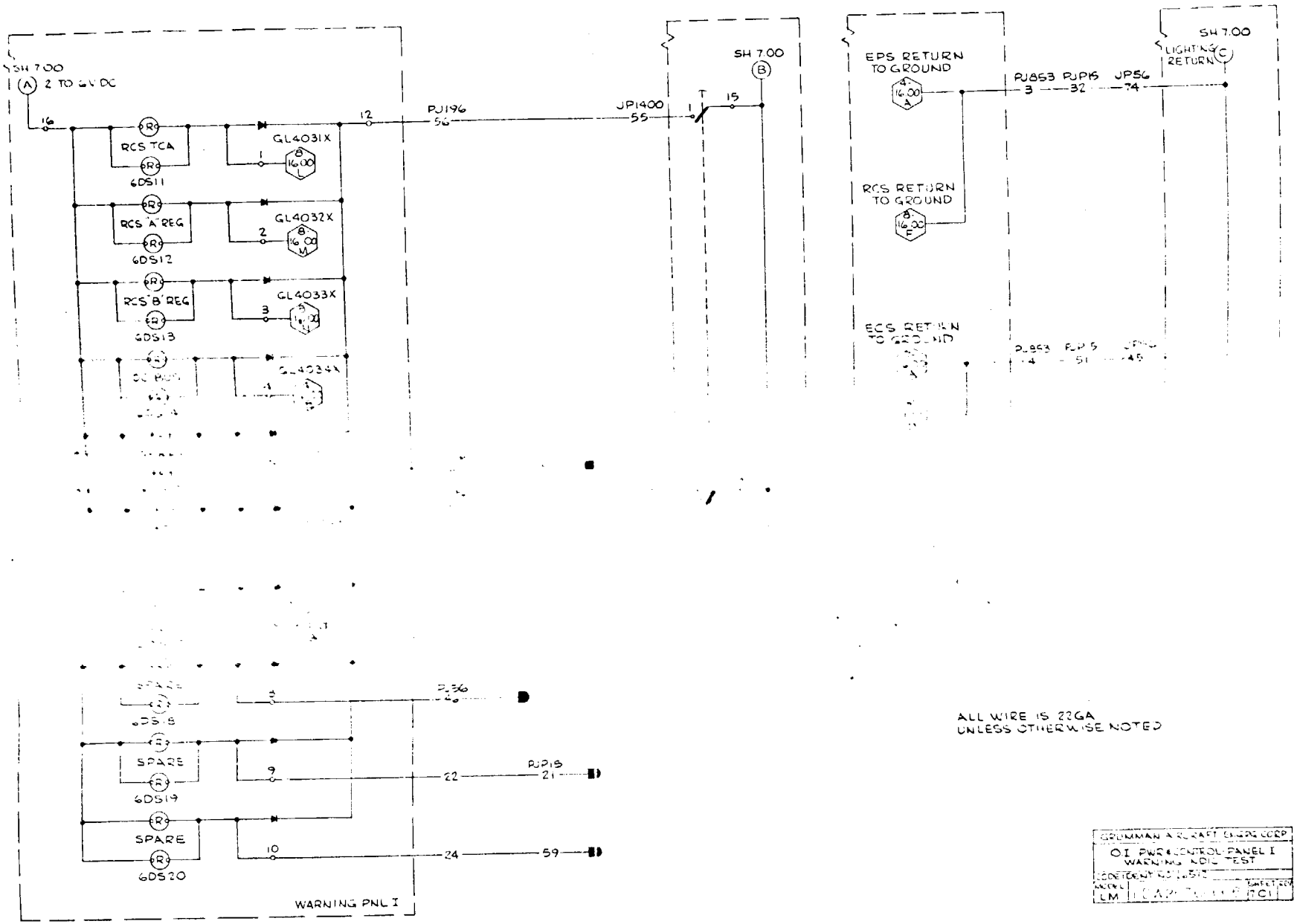
GRUMMAN AIRCRAFT ENGRG CORP	
C.L. POWER & CONTROL SCERA & PCM POWER	
CODE IDENT NO 24012	
MODEL LM	LDW267-60006 SHEET NO 600





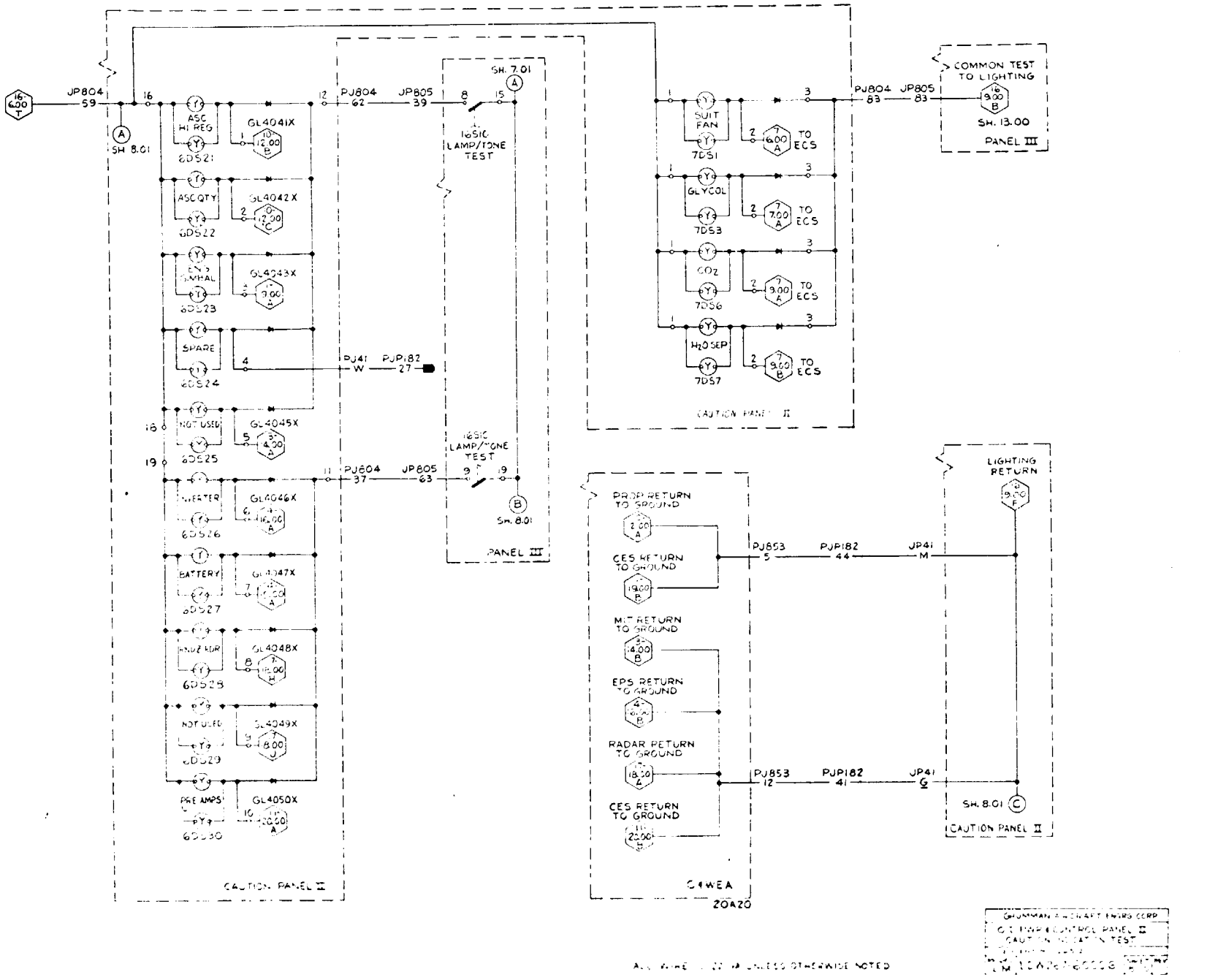
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP			
CEI PWR CONT PANEL I WARNING IND TEST			
CODE IDENT NO. 26512			
MODEL LM	LDW267-60006	SHEET 7.06	REV



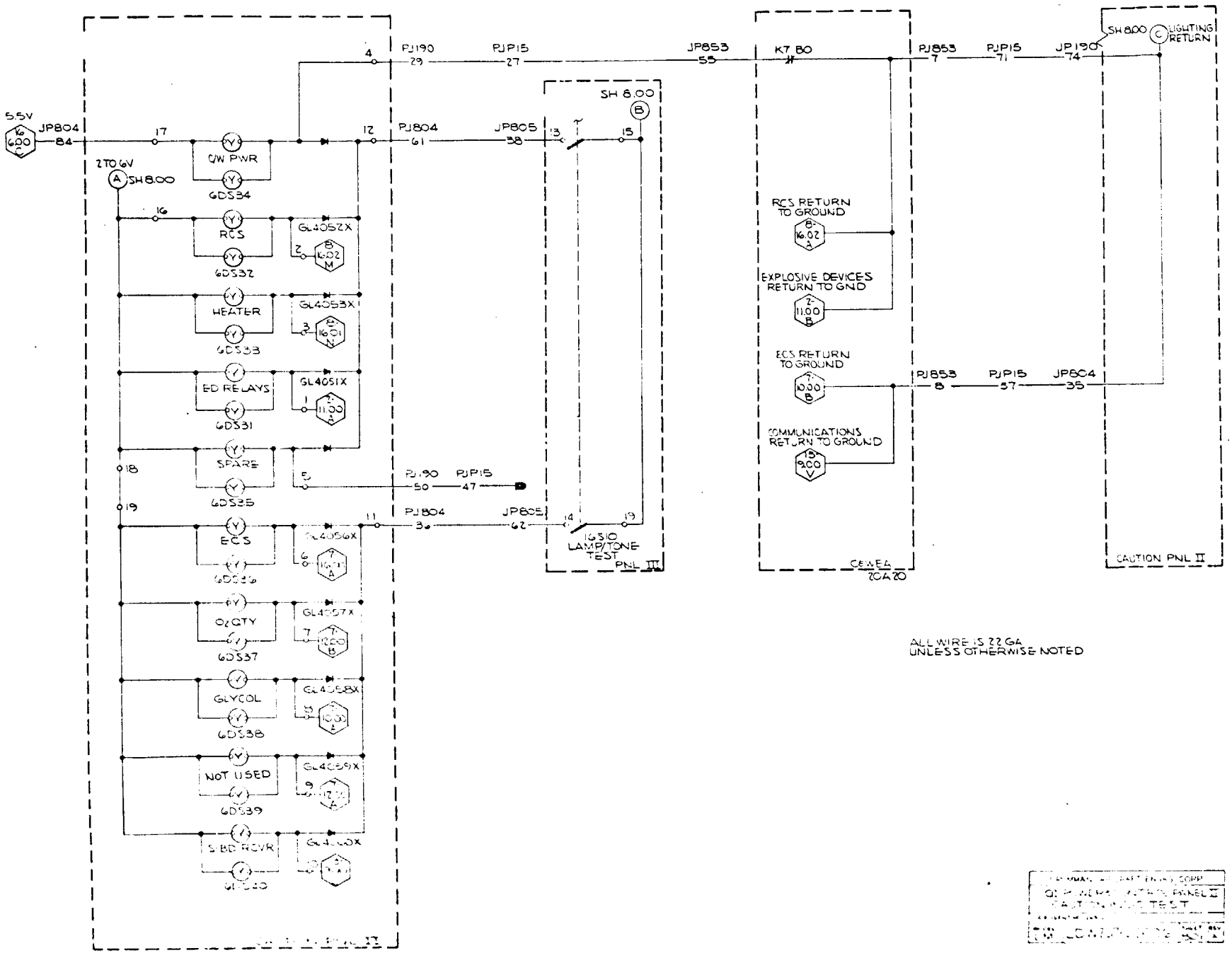
ALL WIRE IS 22GA
UNLESS OTHERWISE NOTED

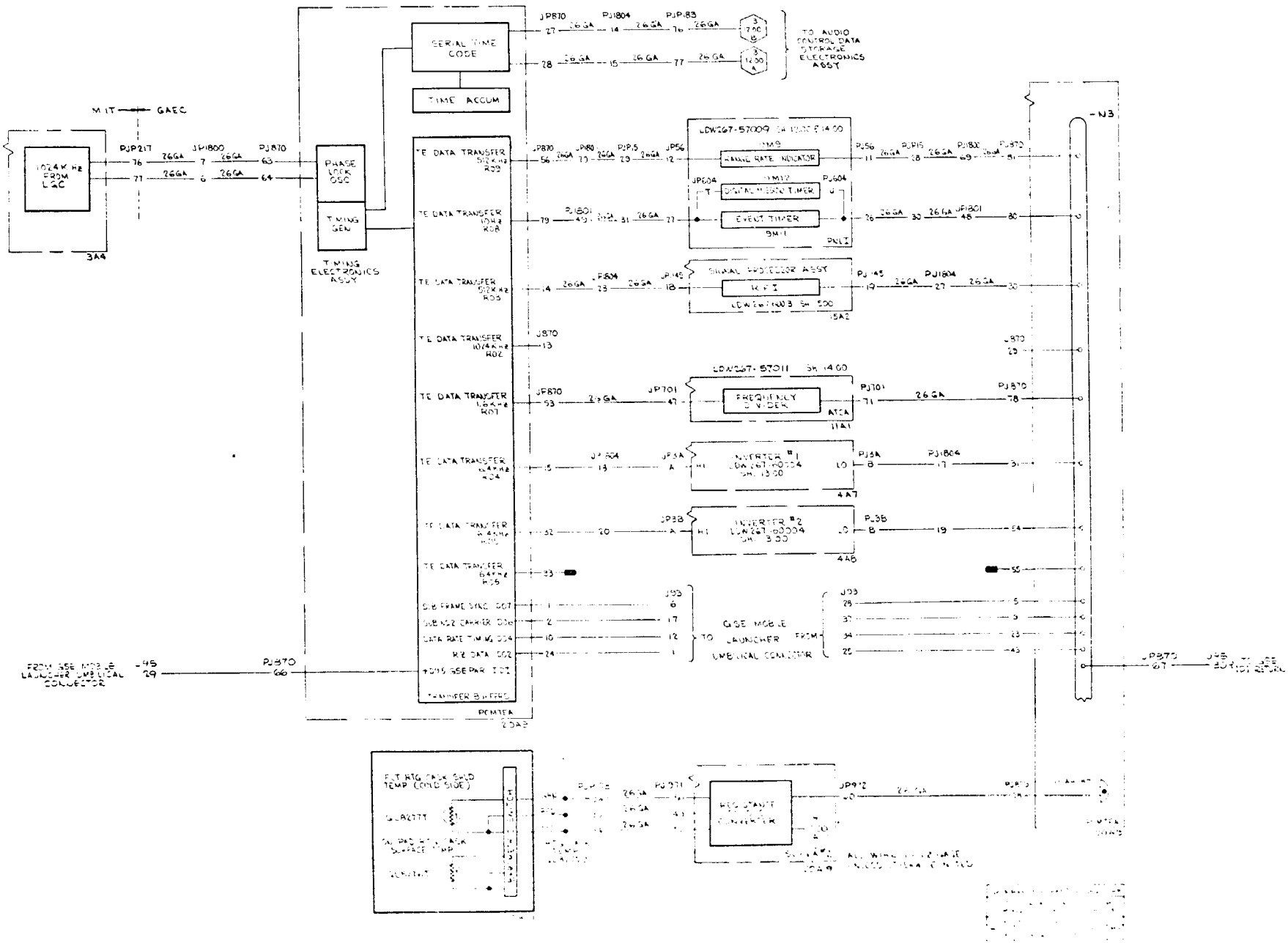
GRUMMAN AIRCRAFT ENGINEERING CORP
01 PWR & CONTROL PANEL I
WARNING ANNUNCIATOR TEST
CONTRACT NO. NAS9-
SIZE LM
SHEET NO. 7C1

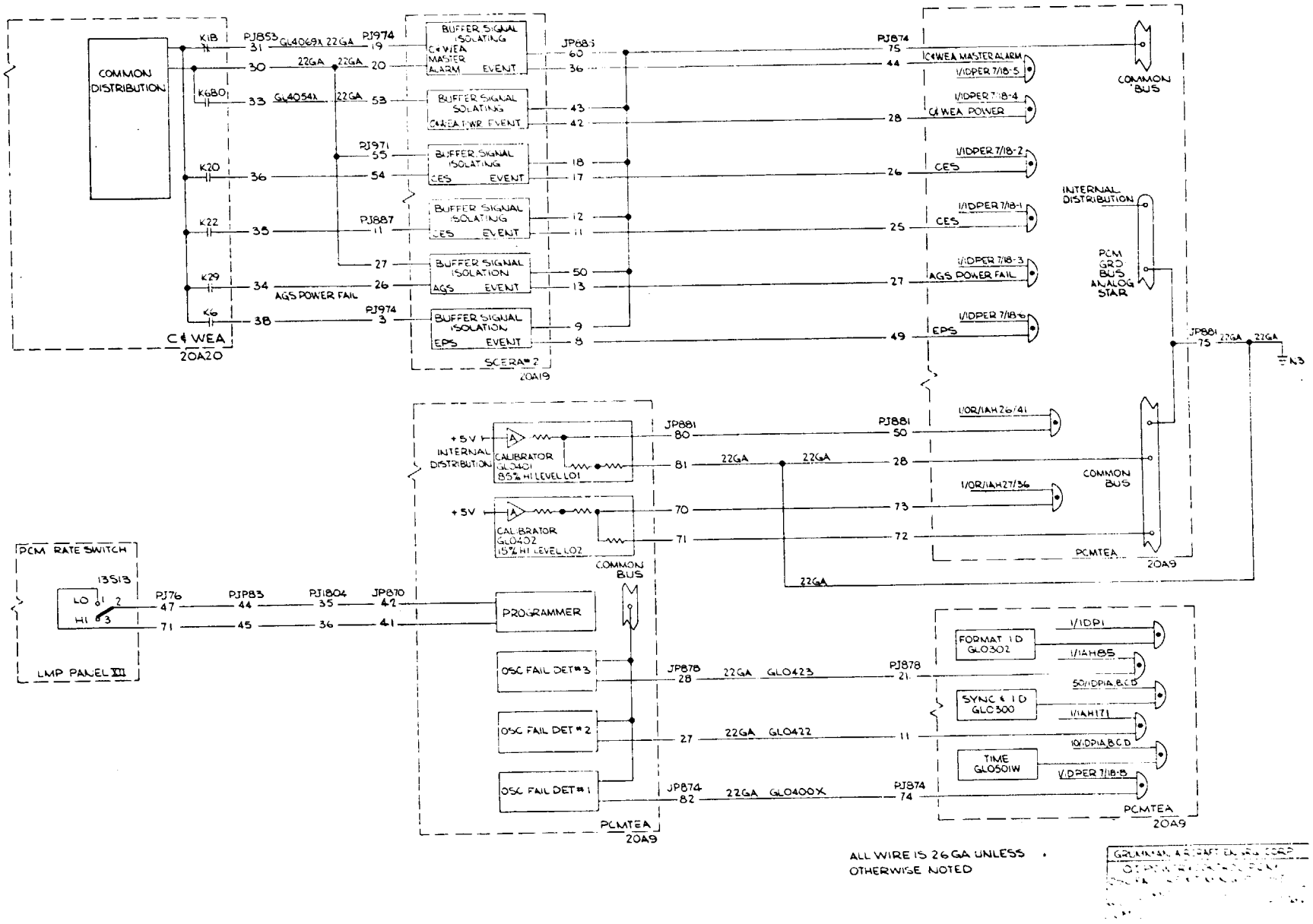


ALL WIRE ... AWG UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP
C-2 MAIN CONTROL PANEL II
CAUTION LIGHTS TEST

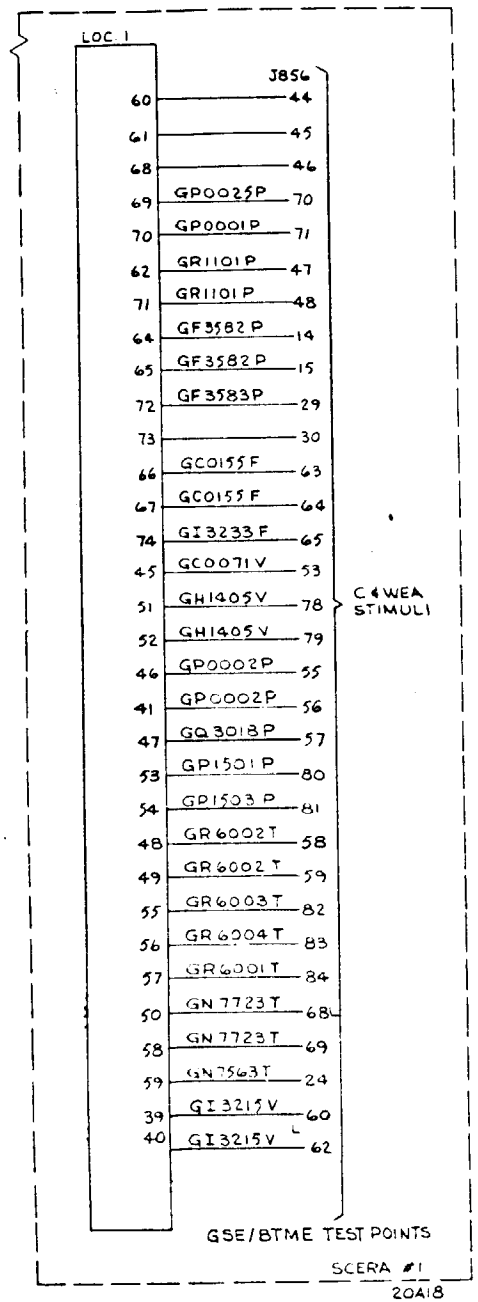

5.5V
JP804
84
17
C/W PWR
6DS34
2TO6V
SH 8.00
16
RCS
6DS32
GL4052X
HEATER
6DS33
GL4053X
ED RELAYS
6DS31
GL4051X
SPARE
6DS35
18
19
ECS
6DS36
GL4056X
O2 QTY
6DS37
GL4057X
GLYCOL
6DS38
GL4058X
NOT USED
6DS39
GL4059X
S BD RCVR
GL4060X
4
PJ190
29
PJP15
27
JP853
55
12
PJ804
61
JP805
38
13
15
SH 8.00
B
5
PJ190
50
PJP15
47
11
PJ804
36
JP805
62
14
19
16310
LAMP/TONE
TEST
PNL III
K7 80
RCS RETURN
TO GROUND
EXPLOSIVE DEVICES
RETURN TO GND
ECS RETURN
TO GROUND
COMMUNICATIONS
RETURN TO GROUND
CEMEA
20A20
PJ853
7
PJP15
71
JP190
74
SH 8.00
C
LIGHTING
RETURN
PJ853
8
PJP15
57
JP804
35
CAUTION PNL II
ALL WIRES 22 GA
UNLESS OTHERWISE NOTED

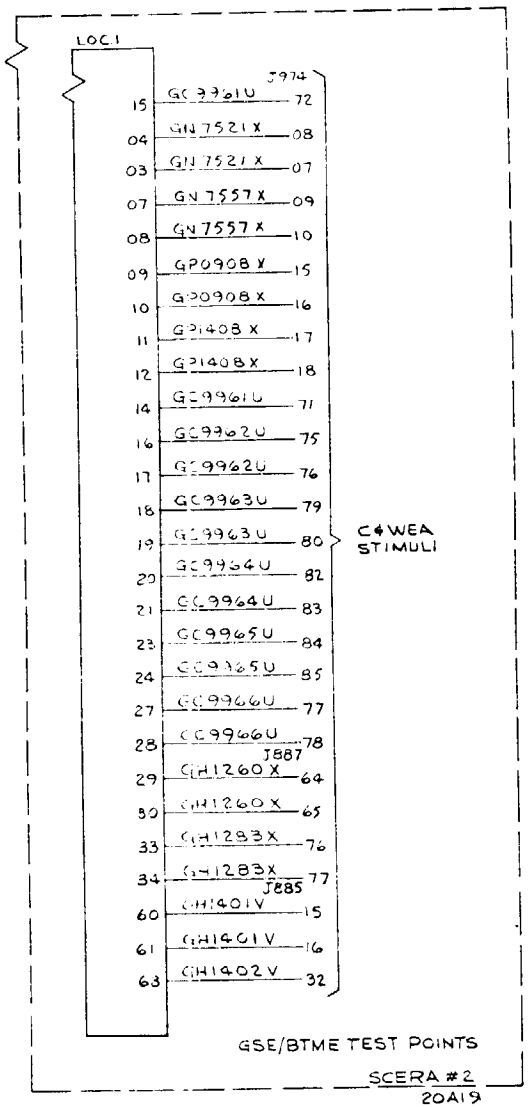

M.I.T.
GAEC
1024K HZ FROM LGC
PHASE LOCK OSC
TIMING GEN
TIMING ELECTRONICS ASSY
3A9
SERIAL TIME CODE
TIME ACCUM
TO AUDIO CONTROL DATA STORAGE ELECTRONICS ASSY
TE DATA TRANSFER 512K HZ R09
TE DATA TRANSFER 102.4 HZ R08
TE DATA TRANSFER 512K HZ R05
TE DATA TRANSFER 102.4K HZ R02
TE DATA TRANSFER 1.6K HZ R01
TE DATA TRANSFER 6.4K HZ R04
TE DATA TRANSFER 6.4K HZ R03
TE DATA TRANSFER 6.4K HZ R06
SUB FRAME SYNC D07
SUB SZ CARRIER D06
DATA RATE TIMING D04
R/I DATA D02
+5V GSE PWR D01
TRANSFER BUFFER
PCMTEA
2DA2
LDW267-57009 SH 12.00 & 14.00
TM9
MAJOR RATE INDICATOR
TM12
DIGITAL MISSION TIMER
EVENT TIMER
BM11
PN12
SIGNAL PROCESSOR ASSY
R.F.I.
LDW267NW3 SH 500
15A2
LDW267-57011 SH 14.00
FREQUENCY DIVIDER
ATCA
11A1
INVERTER #1
LDW267-60004
SH 13.00
4A7
INVERTER #2
LDW267-60004
SH 3.00
4A6
GSE MOBILE LAUNCHER UMBILICAL CONNECTOR
FROM GSE MOBILE LAUNCHER UMBILICAL CONNECTOR
-N3
-N5
PJ870
66
29
FLT RTG CASE SHLD TEMP (COLD SIDE)
CASE TEMP
REG 28 VOLT DC CONVERTER
ALL WIRES 26 GAGE

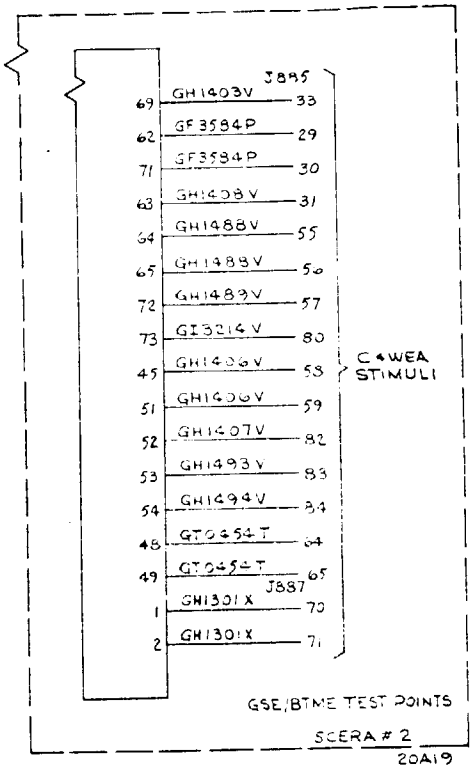


ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED

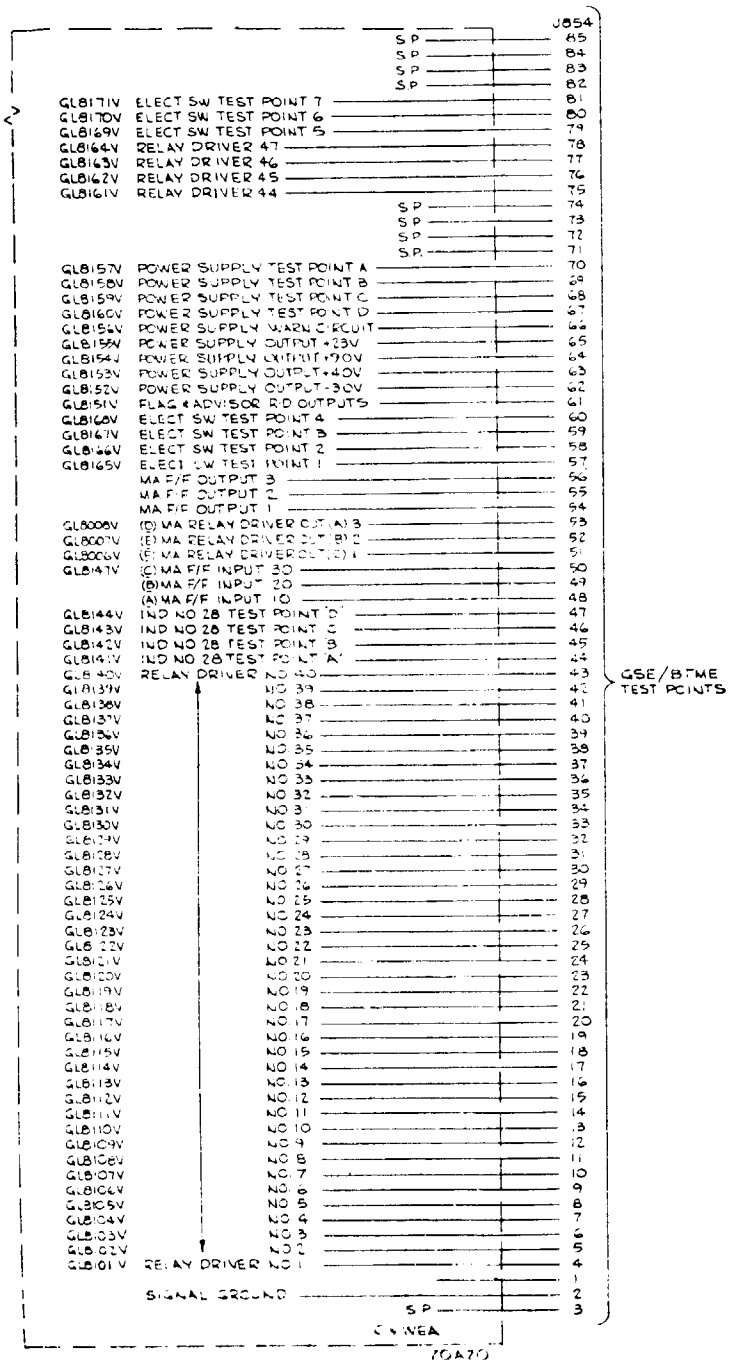
GRUMMAN AEROSPACE CORP

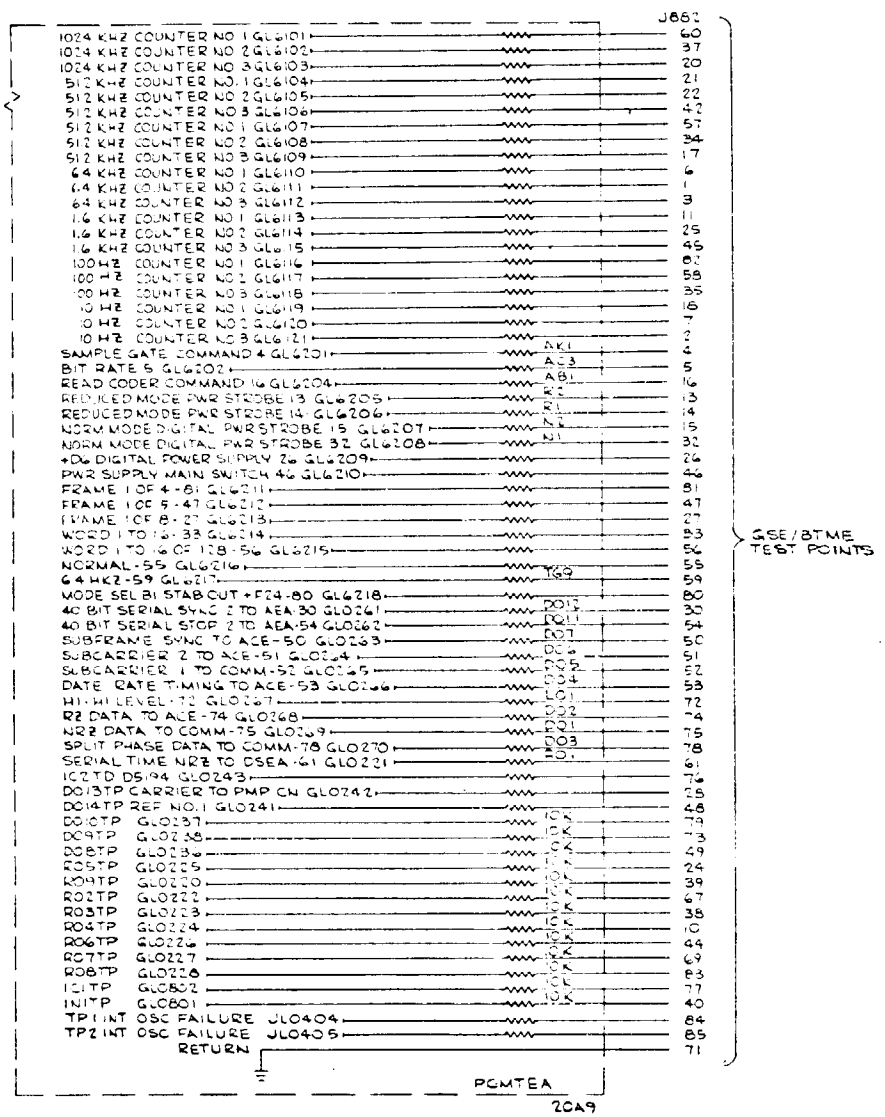






GRUMMAN AIRCRAFT ENGRG CORP		
SI POWER & CONTROL SCERA TEST POINTS		
CODE IDENT NO. 26512		
MODEL LM	LDW267-60006	SHEET NO. 5 REV





GENERAL DYNAMICS/CONVAIR AEROSPACE DIVISION
ELECTRICAL SYSTEMS
GSE BTME TEST POINTS TO PCMTEA & CWEA
SIZE IDENT NO. DRAWING
MODEL LM LOWELL, MASS. SHEET OF

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 7)

ENVIRONMENTAL CONTROL SUBSYSTEM

(REF LDW267-60007 A)

1. Applicable Documents

Level Three Drawings

ITEM NAME	DWG. NO.	REV.	E.O.'s
ECS	LDW330-60001	B	

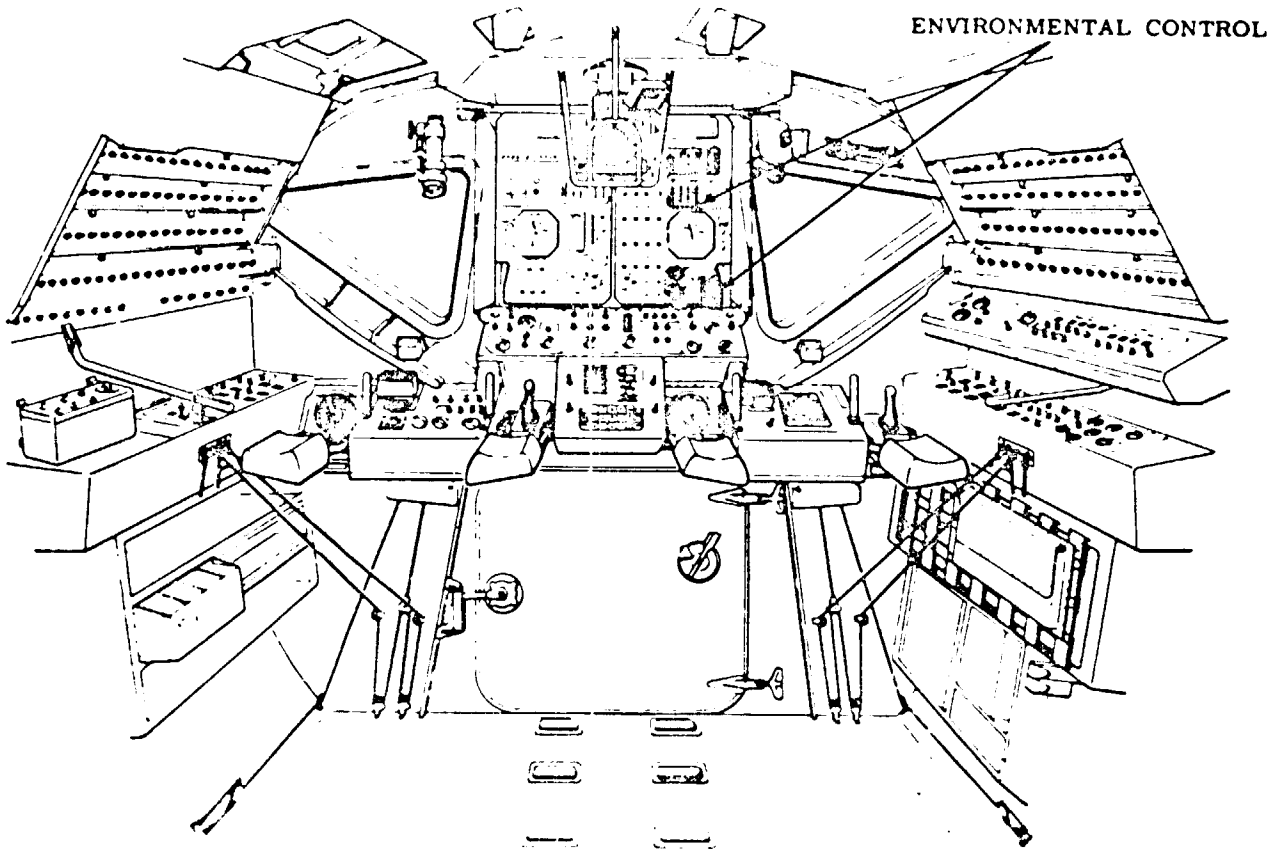
2. Table of Contents

ITEM NAME	DWG. NO.
a) Cover Sheet	7-1001
b) Applicable Documents, Table of Contents and Revisions	7-1002 & 7-1002.1
c) Cabin Location of ECS Controls and Indicators	7-1003 & 7-1003.1
d) ECS-Controls and Indicators Layout	7-1004
	7-1004.1
	7-1004.2
	7-1004.3
	7-1004.4
e) ECS-Controls and Indicator Functional Description	7-1004.5
	7-1005
	7-1005.1
	7-1005.2
	7-1005.3
	7-1005.4
	7-1005.5
	7-1005.6
	7-1005.7
	7-1005.8
	7-1005.9
	7-1005.10
	7-1005.11
f) ECS-Block Diagram	LDW267-60007 SH 4.00A
g) ECS-H_2O Management Section Fluid Schematic	LDW267-60007 SH 4.01
h) ECS-Pri & Sec Glycol Loops System Fluid Schematic	LDW267-60007 SH 4.02A
i) ECS-ARS & OSC PCS Systems Fluid Schematic	LDW267-60007 SH 4.03A
j) ECS-PLSS, SLSS Space Suit & Waste Management Interface	LDW267-60007 SH 4.04A
k) ECS-Cabin Fans, Oxygen Supply, Pressure Control & Suit Flow Controls	LDW267-60007 SH 5.00

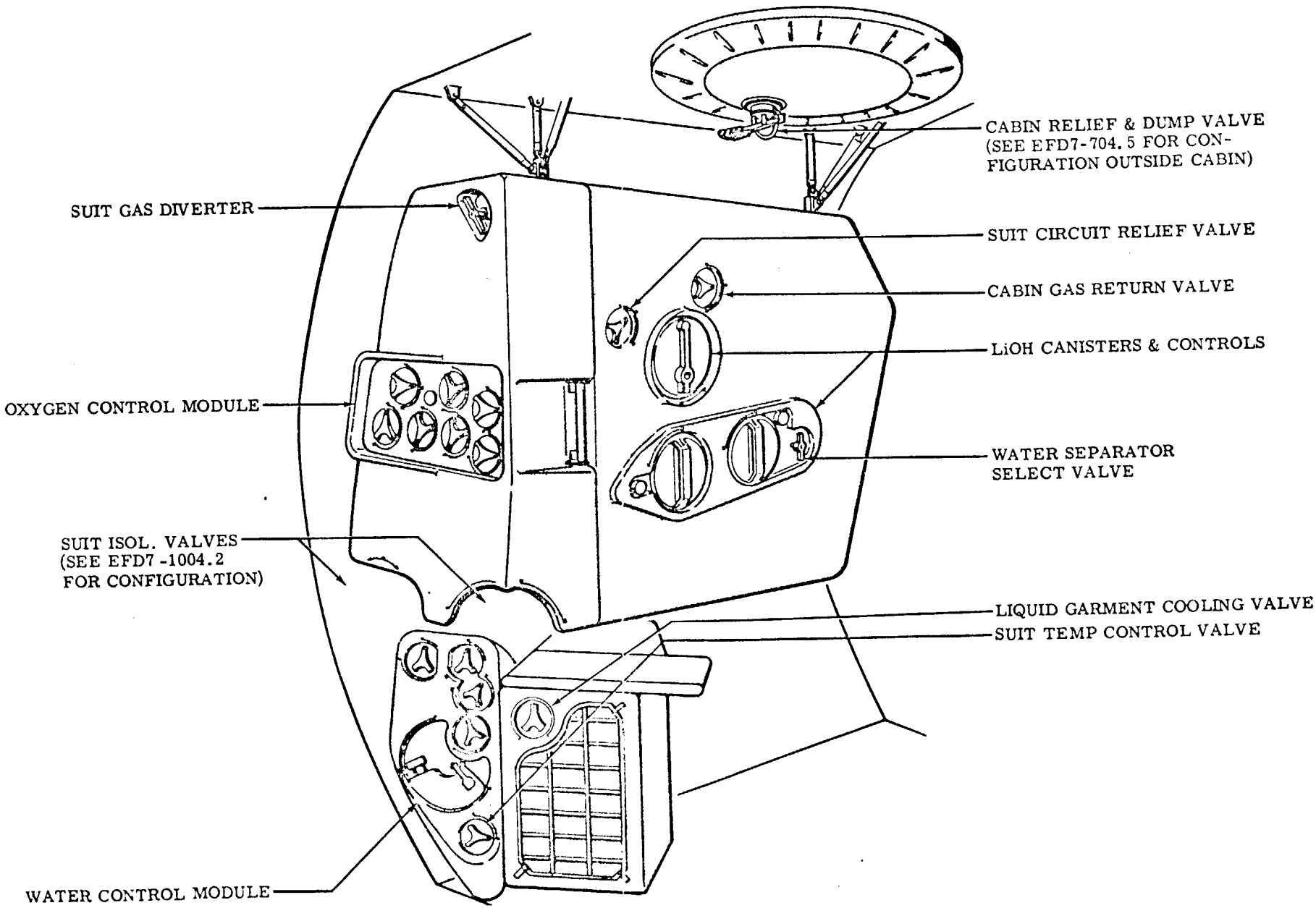
ITEM NAME	DWG. NO.
l) ECS-Suit Fans Control Caution & Warning, O_2 Suit Control	LDW267-60007 SH 6.00A
m) ECS-Glycol Pump Control & Caution and Warning	LDW267-60007 SH 7.00
n) ECS-Press Sensors, No. 1 and 2 Press Safety Valve Main H_2O Reg & O_2 Manifold & Cabin Press	LDW267-60007 SH 8.00A
o) ECS-CO_2, H_2O, Partial Pressure and Press Suit Outlet Indicator	LDW267-60007 SH 9.00
p) ECS-Temp Sensors, Heat Transport Section, Cabin and Suit Temp Indicators	LDW267-60007 SH 10.00A
q) ECS-OI H_2O-O_2 Quantity Indication	LDW267-60007 SH 11.00A
r) ECS-OI H_2O-O_2 Quantity (Caution and Warning)	LDW267-60007 SH 12.00A
s) ECS-OI Glycol Quantity Indication & H_2O Line Temps	LDW267-60007 SH 13.00A
t) ECS-OI to PCMTEA - Suit Circuit Controls	LDW267-60007 SH 14.00A
u) ECS-OI to PCMTEA - Suit Circuit Controls	LDW267-60007 SH 15.00
v) ECS-OI Repressurization Valve Control & Glycol Pump Diff'l Caution and Warning	LDW267-60007 SH 16.00A

3. Applicable Revisions

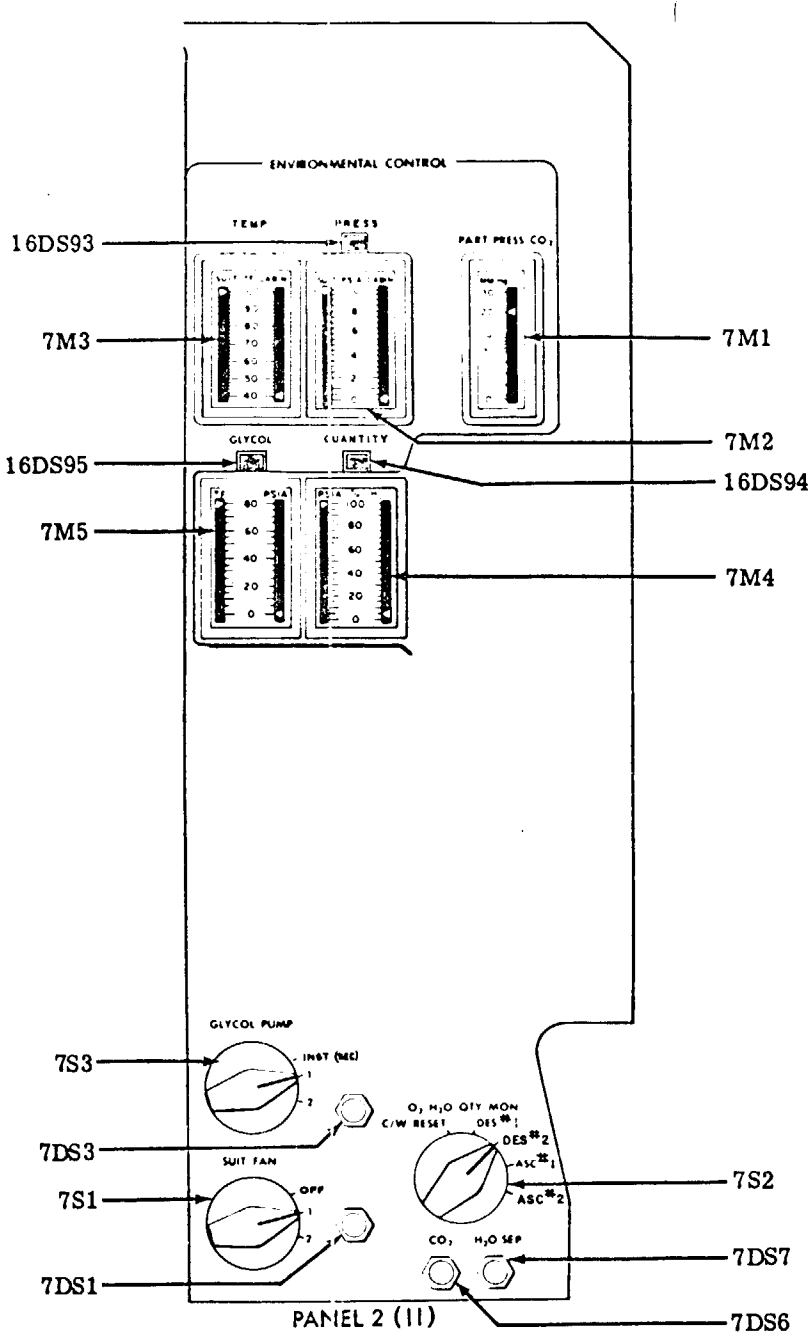
Rev.	Sheet No.	LCD	Description
A	7-4.02	5255	Reduction of cabin noise for LMMP sleep period
	7-4.04	5264B	Implementation of interface requirements associated with replacement of OPS with SLSS
	7-4.03 7-4.04	5362	Change of PLSS O_2QD's from GFE to CFE
	7-11.00 7-12.00	5374	Replacement of the water quantity measuring device (WQMD) with an absolute pressure transducer
	7-4.03	5388A	O_2 umbilical modification
	7-4.04	5432	Incorporation of a by-pass relief valve into LMMP waste management system
	7-4.04	5443A	Umbilical stowage (Buddy System)
	7-4.01 7-13.00	5502	Transducer installation for APS helium pressure and H_2O line temperature



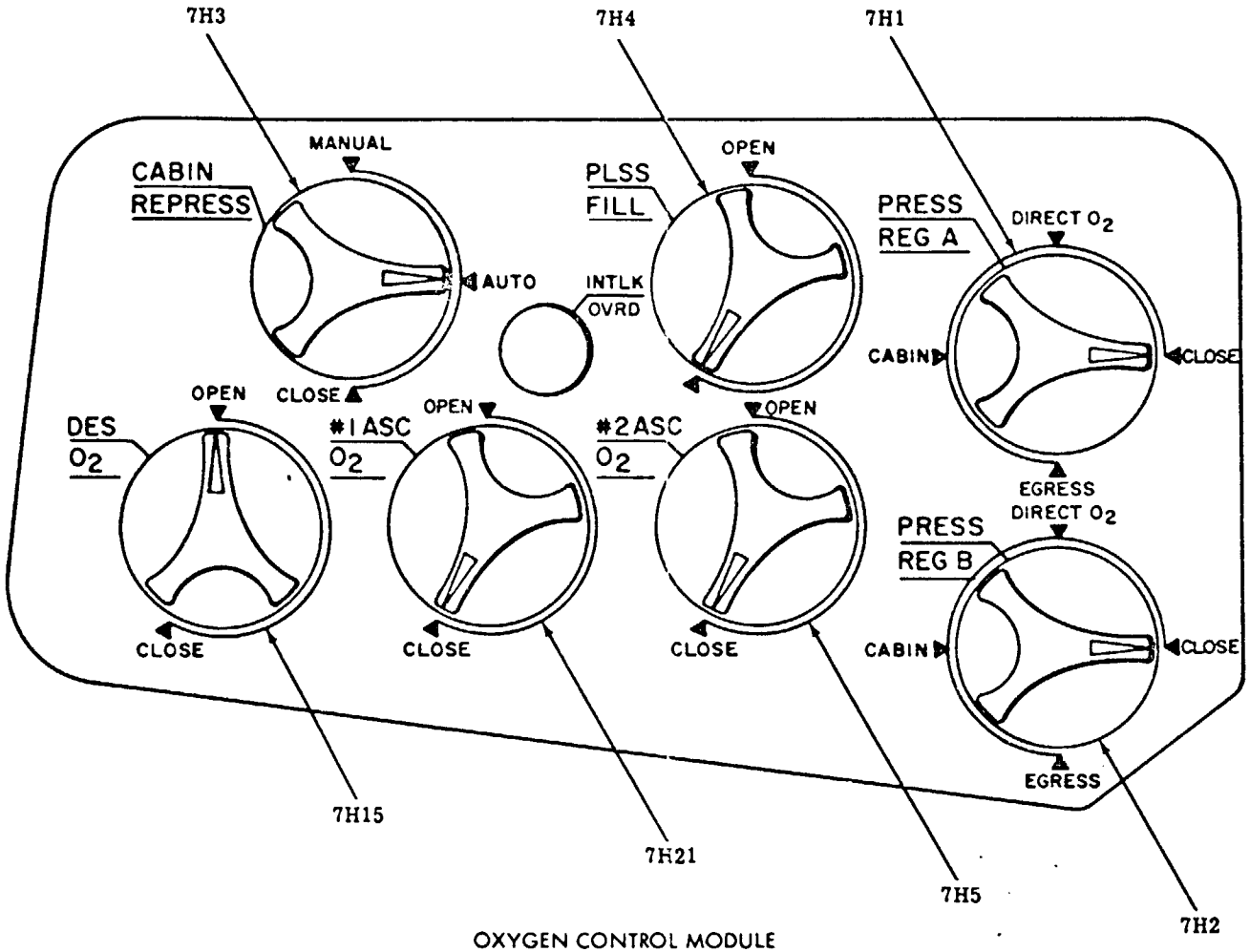
Cabin Location of ECS Controls and Indicators



Cabin Location of ECS Controls and Indicators

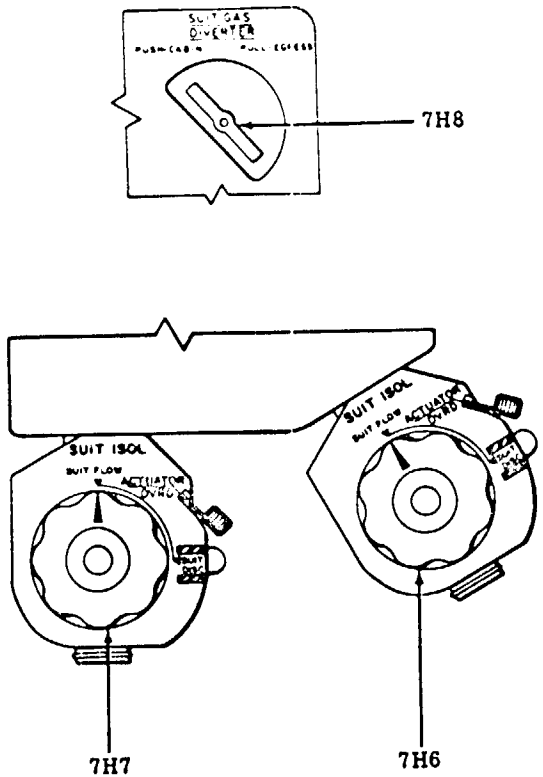


ECS Control and Indicators Layout

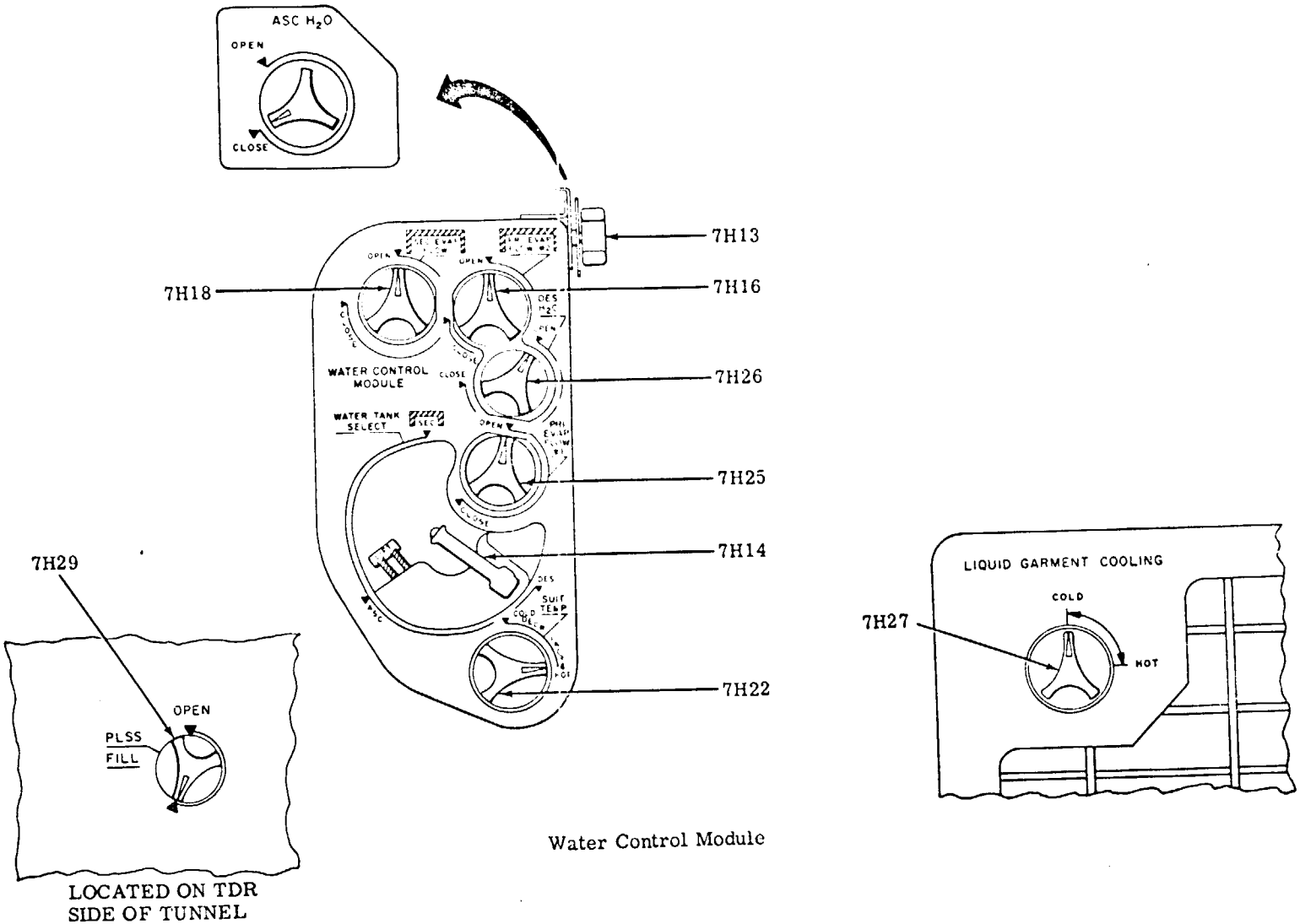


OXYGEN CONTROL MODULE

ECS Controls and Indicators Layout

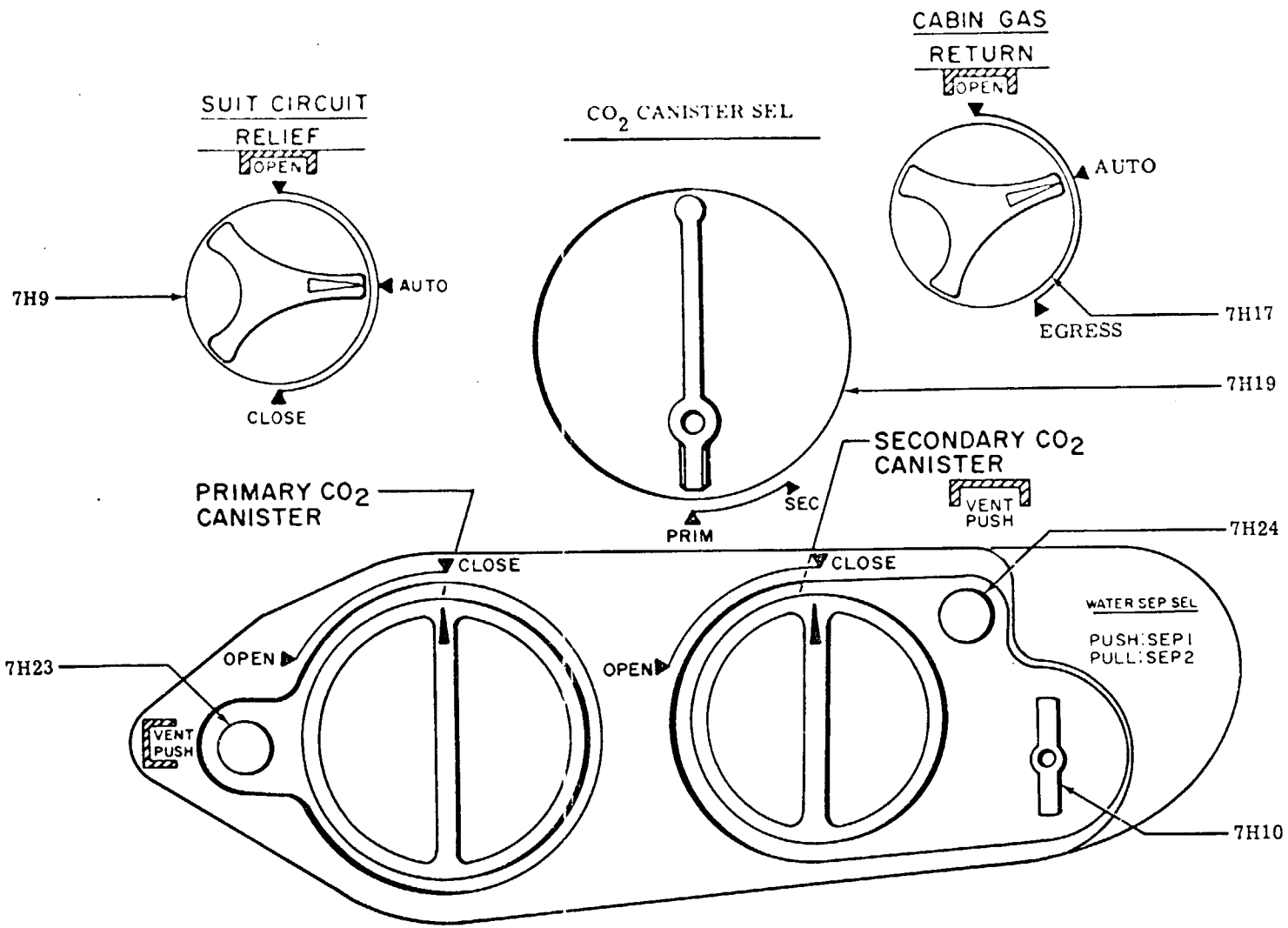


ECS Controls and Indicators Layout



Water Control Module

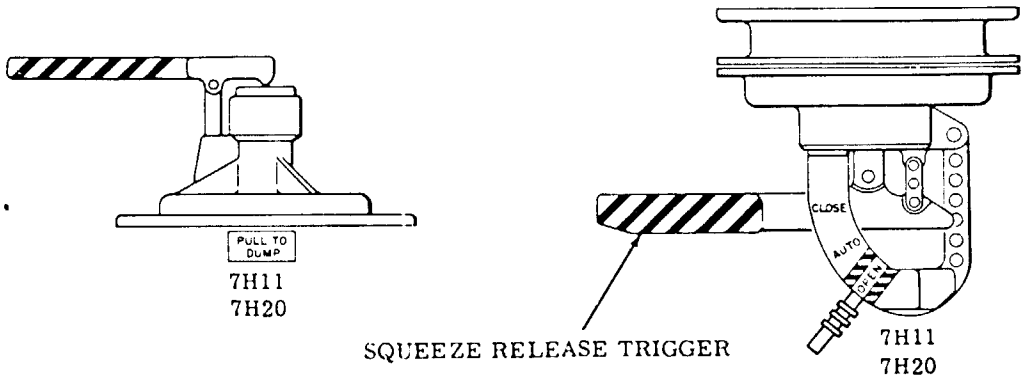
ECS Controls and Indicators Layout



ECS Controls and Indicators Layout

OUTSIDE HATCH INSTALLATION

INSIDE HATCH INSTALLATION



7H11
7H20

SQUEEZE RELEASE TRIGGER

7H11
7H20

(7H11 & 7H20 ARE SAME CONFIGURATION)

Cabin Relief and Dump Valves

Code	Control/Indicator	Function
7S1	SUIT FAN SELECT SWITCH 3-POSITION ROTARY	This three-position rotary (OFF-1-2) selects either of two suit fans to circulate breathing oxygen in the suit circuit. In the nominal condition, fan #1 is selected and operating. Failure of fan #1 results in illumination of the SUIT FAN component caution light (7DS1) as well as activation of the ECS caution light (6DS36). Selection of the 2 position activates the #2 fan. The selection of #2 fan extinguishes the ECS caution light, and illuminates the SUIT FAN warning light and the SUIT FAN component caution light. Restoration of the proper Δ P extinguishes the SUIT FAN component caution light and the SUIT/FAN warning light. Subsequent failure of #2 fan illuminates the SUIT/FAN warnirg light, and the SUIT FAN component caution light. The OFF position interrupts power to both fans.
7S2	O_2/H_2O QTY MON SWITCH 5-POSITION ROTARY	This five-position rotary (C/W RESET-DES #1-DES #2-ASC #1-ASC #2) selects for monitoring on 7M4 the percent remaining in the descent or ascent oxygen and water storage tanks. Selection of the C/W RESET position routes a signal to the CWEA to extinguish either the O_2 QTY caution light (6DS37), the WATER QTY caution light (6DS39) or the AGS warning light (6DS8) if any one is illuminated.
7S3	GYLCOL PUMP SELECT SWITCH 3-POSITION ROTARY	This three-position rotary INST (SEC), 1, 2 selects either of two circulating pumps in the primary collant loop or the inst. in the secondary loop. In the nominal condition, with the switch in the 1 position, #1 pump will be operating. Failure of this pump results in the illumination of the GLYCOL pump component caution light (7DS3), and activation of the ECS caution light (6DS36). Selection of the 2 position activates the #2 pump; after the Δ P is restored the component caution and ECS caution lights are extinguished. Should the #2 pump fail, the caution lights will illuminate. Selection of the INST (SEC) position will extinguish the ECS caution light, but the glycol pump component caution light will remain illuminated. To operate the redundant loop pump circuit breaker 4CB96 must be depressed.

SUBSYSTEM: ENVIRONMENTAL CONTROL (FUNCTIONAL GROUPING 7)

Code	Control/Indicator	Function
7M1	CO_2 PARTIAL PRESSURE INDICATOR	This indicator displays the partial pressure of carbon dioxide in the suit circuit.
7M2	CABIN/SUIT PRESSURE INDICATOR	This indicator displays cabin pressure, and suit outlet pressure as sensed downstream of the suit isolation valves.
7M3	CABIN/SUIT TEMPERATURE INDICATOR	This indicator displays the temperature of the cabin, and the temperature of the gas to both suits as sensed downstream of the suit circuit regenerative heat exchanger.
7M4	OXYGEN/WATER QUANTITY INDICATOR	This indicator displays the percent remaining in the descent or ascent oxygen and water storage tanks, as selected by 7S2.
7M5	GLYCOL PRESSURE/TEMPERATURE INDICATOR	This indicator normally displays the glycol pump discharge pressure and the glycol pump inlet temperature in the primary loop. However, following failure of the primary loop and upon selection of the INST (SEC) position on 7S3 this indicator displays secondary glycol pump discharge pressure and secondary coolant loop glycol temperature, as sensed downstream of the secondary water sublimator.
7DS1	SUIT CIRCUIT FAN COMPONENT CAUTION LIGHT	This light illuminates to indicate a low Δ P across the suit fan assembly resulting from malfunction of the operating suit fan. Return to normal Δ P, normally accomplished by selection of the other fan, (using 7S1) extinguishes the light. It will illuminate again if a subsequent failure occurs in the selected fan.

SUBSYSTEM: ENVIRONMENTAL CONTROL (FUNCTIONAL GROUPING 7)

Code	Control/Indicator	Function
7DS3	CLYCOL PUMP COMPONENT CAUTION LIGHT	This light illuminates to indicate low Δ P across the operating glycol pump (1 or 2) in the primary loop and is extinguished by restoration of normal Δ P. It also illuminates to indicate that glycol pump 2 is running as a result of the automatic glycol pump switching circuit when the GLYCOL switch (7S3) is in position 1. The light is extinguished by the selection of position 2 on switch 7S3 and restoration of Δ P to 7 ± 2 PSID across the selected pump. The light is also illuminated whenever 7S3 is in the INST (SEC) position.
7DS6	CO_2 PARTIAL PRESSURE COMPONENT CAUTION LIGHT	This light illuminates to indicate that the CO_2 partial pressure in the suit circuit exceeds 4.3 to 9.5 mmHg in the 5.0 PSIA mode or 5.4 to 12.6 mmHg in the 3.7 PSIA mode. The light also illuminates if the secondary canister is selected by 7H19. This light will remain illuminated until: (1) 7H19 is positioned to the primary canister position and (2) the CO_2 partial pressure has been restored to a within-tolerance condition. The latter can be accomplished by replacing the primary cartridge.
7DS7	WATER SEPARATOR COMPONENT CAUTION LIGHT	This light illuminates to indicate a low speed (< 800RPM) and an imminent failure condition in the selected water separator. The light remains illuminated until the speed is restored to normal in one of the water separators.

SUBSYSTEM: ENVIRONMENTAL CONTROL (FUNCTIONAL GROUPING 7)

Code	Control/Indicator	Function
7H1 7H2	ATMOSPHERE REVITALIZATION SECTION PRESSURE REGULATOR - "A" ATMOSPHERE REVITALIZATION SECTION PRESSURE REGULATOR "B" TWO 4-POSITION VALVES	The 4 positions are: EGRESS-CABIN-DIRECT O_2-CLOSE. In the DIRECT O_2 position unregulated flow of oxygen is permitted into the suit circuit. The CABIN position regulates oxygen flow into the suit circuit to maintain a pressure of 4.8 ± .2 psia. This mode is selected during normal pressurized cabin operations. The EGRESS position regulates oxygen flow into the suit circuit to maintain a pressure of 3.8 ± .2 psia. This mode is selected during egress operations when the cabin is unpressurized. The CLOSE position prevents oxygen flow to the suit circuit. Positive feedback of the results of actuation of this control is provided by 7M2. Both of these controls are normally placed in either the CABIN or EGRESS position simultaneously. These regulators are in parallel and either one can accomplish the regulation function. The CLOSE position is selected when one of the regulator valves fails open or the ECS is deactivated. The DIRECT O_2 position is selected if the CABIN or EGRESS positions have failed to supply to the suit circuit or during a leak check of the ECS.
7H3	CABIN REPRESSURIZATION VALVE 3-POSITION VALVE	The three positions of this valve are: (MANUAL-AUTO-CLOSE). In the MANUAL position, there is an unregulated flow of oxygen into the cabin from the oxygen manifold. The AUTO position enables the valve to respond to inputs from the cabin pressure switch and the low suit circuit pressure sensor. The valve opens fully whenever cabin pressure drops below 3.70 - 4.45, and closes as cabin pressure rises above 4.40 - 5.00 psia. It is also opened when suit circuit pressure falls to 2.9 - 3.4 psia with the cabin pressure switch closed, and closes when the pressure increases to 3.0 - 3.5 psia. If both 7H1 and 7H2 are in either the EGRESS or CLOSE position the automatic activation

SUBSYSTEM: ENVIRONMENTAL CONTROL (FUNCTIONAL GROUPING 7)

Code	Control/Indicator	Function
7H3 (Cont.)		of 7H3 by the cabin pressure switch is disabled, unless the suit pressure falls to 2.9 - 3.4 psia. The CLOSE position prevents oxygen flow into the cabin from the oxygen manifold.
7H4	PLSS FILL VALVE LOW PRESSURE 2-POSITION VALVE	This valve (OPEN-CLOSE), in the OPEN position, permits flow of low press oxygen to the primary oxygen storage tank in the PLSS. The CLOSE position prevents flow of oxygen to the PLSS oxygen storage tank.
7H5 7H15 7H21	#2 ASCENT OXYGEN VALVE DESCENT OXYGEN VALVE #1 ASCENT OXYGEN VALVE THREE 2-POSITION VALVES	These valves (OPEN-CLOSE), in the OPEN position, permit flow of oxygen from their respective oxygen tanks to the oxygen manifold. The descent oxygen tank is used first, and then the ascent #1 and the ascent #2 oxygen tanks in that order. The CLOSE position prevents flow of oxygen. In order for the ascent oxygen valves to be placed in the OPEN position, the descent oxygen valve must be placed in the CLOSE position due to a mechanical interlock in the system to prevent ascent oxygen from flowing to the empty descent oxygen tank. In the event that the Descent O_2 valve will not close, an override of the mechanical interlock is provided so that the Ascent O_2 valves can be opened. This would be performed after vehicle staging.
7H6 7H7	SUIT ISOL. VALVE (CDR) SUIT ISOL. VALVE (LMP) TWO 2-POSITION VALVES	These controls (SUIT FLOW-SUIT DISC.), located at the junction of the suit umbilical and the suit circuit are two position round handle valves. They are operated in conjunction with a suit O_2 flow control, mounted directly on the suit, which will be referred to as the Body Flow Valve. In the SUIT FLOW position suit circuit flow (12 cfm min.)/per suit will be directed to the helmet down over the astronauts body into ducts at the flow suit extremities and back to the return umbilical.

SUBSYSTEM: ENVIRONMENTAL CONTROL (FUNCTIONAL GROUPING 7)

Code	Control/Indicator	Function
7H6 7H7 (Cont.)		NOTE: When operating from the PLSS the Body Flow Valve on the suit will be in the CLOSE position, thus allowing the 6 cfm PLSS flow to pass entirely to the helmet. The SUIT DISCONNECT position will prevent suit circuit oxygen flow to the space suit at the connector and the flow will bypass the suit and flow directly to the downstream portion of the suit circuit. 7H6 controls flow through the CDR's suit and 7H7 controls flow through the LMP's suit.
7H8	SUIT GAS DIVERTER VALVE 2-POSITION "T" HANDLE	This control (PUSH: CABIN-PULL: EGRESS), in the PUSH: CABIN position, permits the gas flow in the suit circuit downstream of 7H6 and 7H7 to pass into the cabin. This is done during CABIN operation so that the suit circuit will provide sufficient air flow to maintain the CO_2 and humidity level of the cabin within limits. This valve has provision for automatic closure by a signal from the cabin pressure switch whenever cabin pressure drops below 3.70-4.45 psia. This valve will also close automatically whenever 7H1 and 7H2 are in the EGRESS position. In the PULL: EGRESS position the gas flow in the suit circuit is prevented from passing into the cabin.
7H9	SUIT CIRCUIT RELIEF VALVE 3-POSITION VALVE	This control (OPEN-AUTO-CLOSE) precludes the overpressurization of the suit circuit and the space suit. The AUTO position permits the valve to be operated by an aneroid device in response to suit circuit pressure. The valve is fully open with a suit pressure of 4.7 psia or greater, and fully closed whenever the suit pressure is less than 4.3 psia. The OPEN position manually overrides the automatic mode to open the valve fully. The CLOSE position manually overrides the automatic mode to close the valve fully.

SUBSYSTEM: ENVIRONMENTAL CONTROL (FUNCTIONAL GROUPING 7)

Code	Control/Indicator	Function
7H10	WATER SEPARATOR SELECT VALVE 2-POSITION "T" HANDLE	This control (PUSH: SEP 1 - PULL: SEP 2) permits the selection of either of two water separators which separate the condensed moisture in the gas centrifugally (as they are driven by the suit circuit gas flow) and normally vents this water to the primary water sublimator. In abort mode the sep. water will be vented to the sec. water sublimator. The PUSH: SEP 1 position selects the #1 seperator and the PULL: SEP 2 position selects the #2 separator. Separator #1 will normally be on-line.
7H11 7H20	CABIN RELIEF AND DUMP VALVE TWO 3-POSITION BAR LEVERS	These controls (CLOSE-AUTO-OPEN) provide the dual function of cabin depressurization and cabin pressure relief. There is one control on each LM hatch. The normal position for this control is the AUTO position, which allows the valve to act as a pressure relief device. An aneroid sensor within the valve causes the valve to open at a pressure of 5.25 psia or greater thus bleeding off excess cabin pressure. The CLOSE position permits manual override of the automatic position and serves to close the relief valve in the event of failure of the automatic feature. The OPEN position also overrides the AUTO position and permits the crew to dump the cabin pressure. A squeeze trigger on the Dump Valve Control handle must be depressed to unlock the control handle before it can be moved to another position. This same dump valve, also has a two-position control handle on the outside of the hatch. This outside handle has the legend, PULL TO DUMP and is spring loaded to close. Pulling and holding the handle out for approximately 180 sec. will dump the LM cabin pressure. This "out" position of the outside handle is comparable to the OPEN position of the inside handle. The spring loaded "in" position of the outside handle is comparable to the AUTO position of the inside handle.

SUBSYSTEM: ENVIRONMENTAL CONTROL (FUNCTIONAL GROUPING 7)

Code	Control/Indicator	Function
7H11 7H20 (Cont.)		NOTE: Dumps in 310 sec. thru one valve with bacteria filter, and 120 sec. thru two valves, one with filter. Two valves without filters dumps in 90 seconds. FWD. hatch has removable filter; upper hatch has NONE.)
7H27	LIQUID GARMENT COOLING VALVE	This control valve (COLD-HOT) is used to control the water temp. at the inlet to the liquid cooled garment. In the COLD position all of the cooling water from the liquid cooled garment is routed through the water/water-glycol heat exchanger. If the cooling water should become too cold the control is turned clockwise toward the HOT position until the inlet temperature to the liquid cooled garment reaches a comfortable level. In the HOT position all of the cooling water bypasses the water/water-glycol heat exchanger and provides maximum water temperature at the inlet to the liquid cooled garment.
7H29	PLSS FILL VALVE (HIGH PRESSURE) 2-POSITION VALVE	This valve (OPEN-CLOSE), in the OPEN position, permits flow of high pressure oxygen to the primary oxygen storage tank in the PLSS. The CLOSE position prevents flow of oxygen to the PLSS oxygen storage tank.
7H13	ASCENT DRINK WATER VALVE 2-POSITION VALVE	This control (OPEN-CLOSE) is used to control water flow for drinking and food preparation. the OPEN position supplies water to the water hose and the CLOSE position prevents water flow to the water hose.

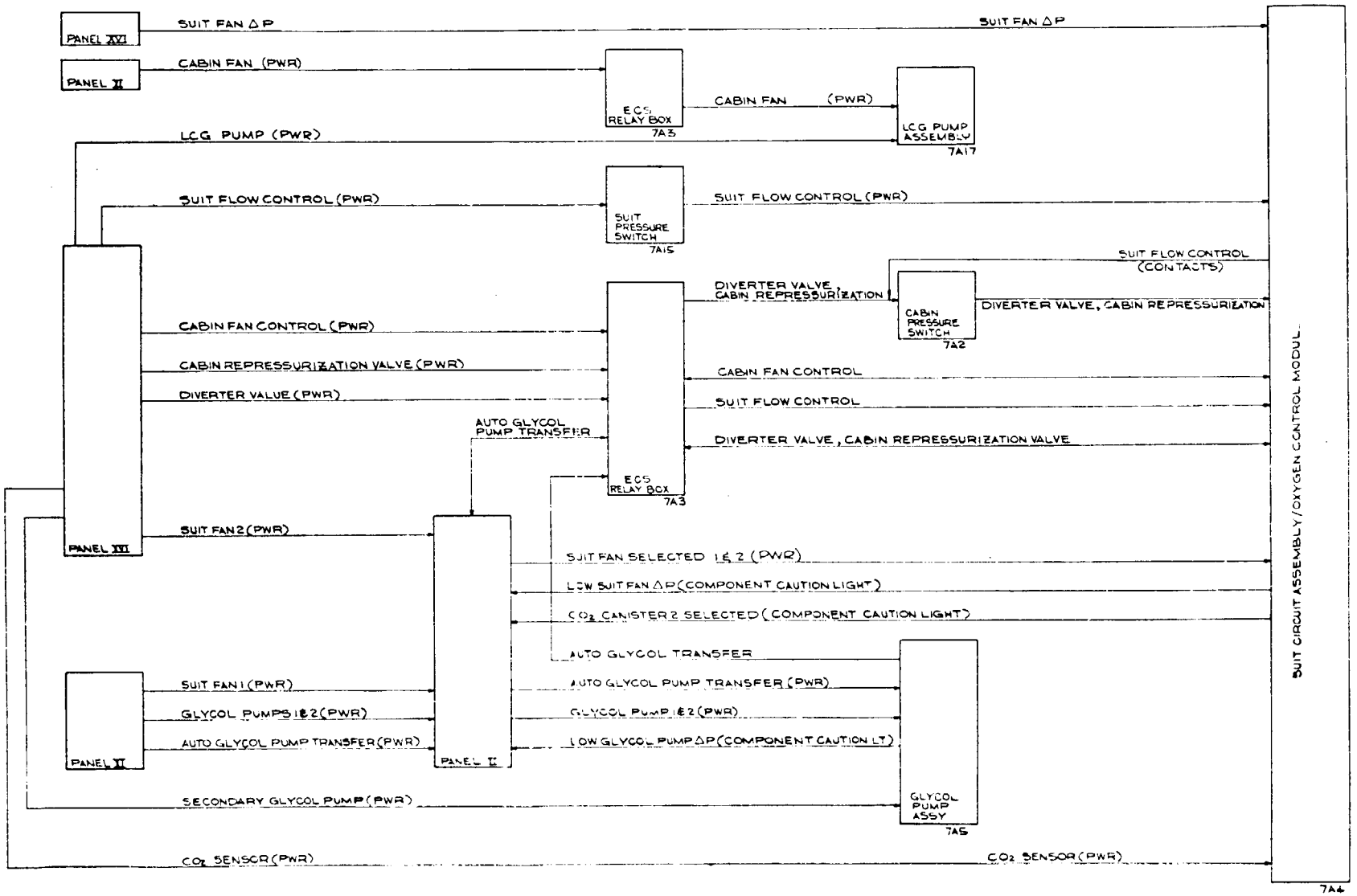
SUBSYSTEM: ENVIRONMENTAL CONTROL (FUNCTIONAL GROUPING 7)

Code	Control/Indicator	Function
7H14	WATER TANK SELECT VALVE 3-POSITION FOLD-OUT HAND CRANK	This control (DES-ASC-SEC) in the DES position selects the descent water tank to provide water for the primary water sublimators for the period between manning and pre-lunar ascent. Upon manning, the primary water feed valve is opened allowing water from the descent tank to flow to the primary water sublimator. The ASC position selects both ascent water tanks to provide water for the primary water subliminators and 7H13. To place 7H14 in the SEC position, a safety trigger near the handle must be manually tripped. This position: (1) diverts all water from the water separators to the secondary water sublimator and (2) could allow all water flow from the water tanks to the primary water sublimator.
7H16	PRIMARY EVAP FLOW #2 VALVE 2-POSITION VALVE	This valve (OPEN-CLOSE) in the OPEN position, controls the flow of water to the primary sublimator when the second water regulator is selected.
7H17	CABIN GAS RETURN VALVE 3-POSITION VALVE	This control (OPEN-AUTO-EGRESS) provides for the return of cabin gas back into the suit circuit under normal operations or provides suit circuit integrity when the cabin is unpressurized. In the OPEN position cabin gas is fed back into the suit circuit for revitalization. The AUTO position allows gas flow into, but not out of, the suit circuit. This is accomplished through the use of a one way check valve. The EGRESS position provides an override closed of the one way check valve, thus insuring suit circuit integrity during unpressurized cabin operations.

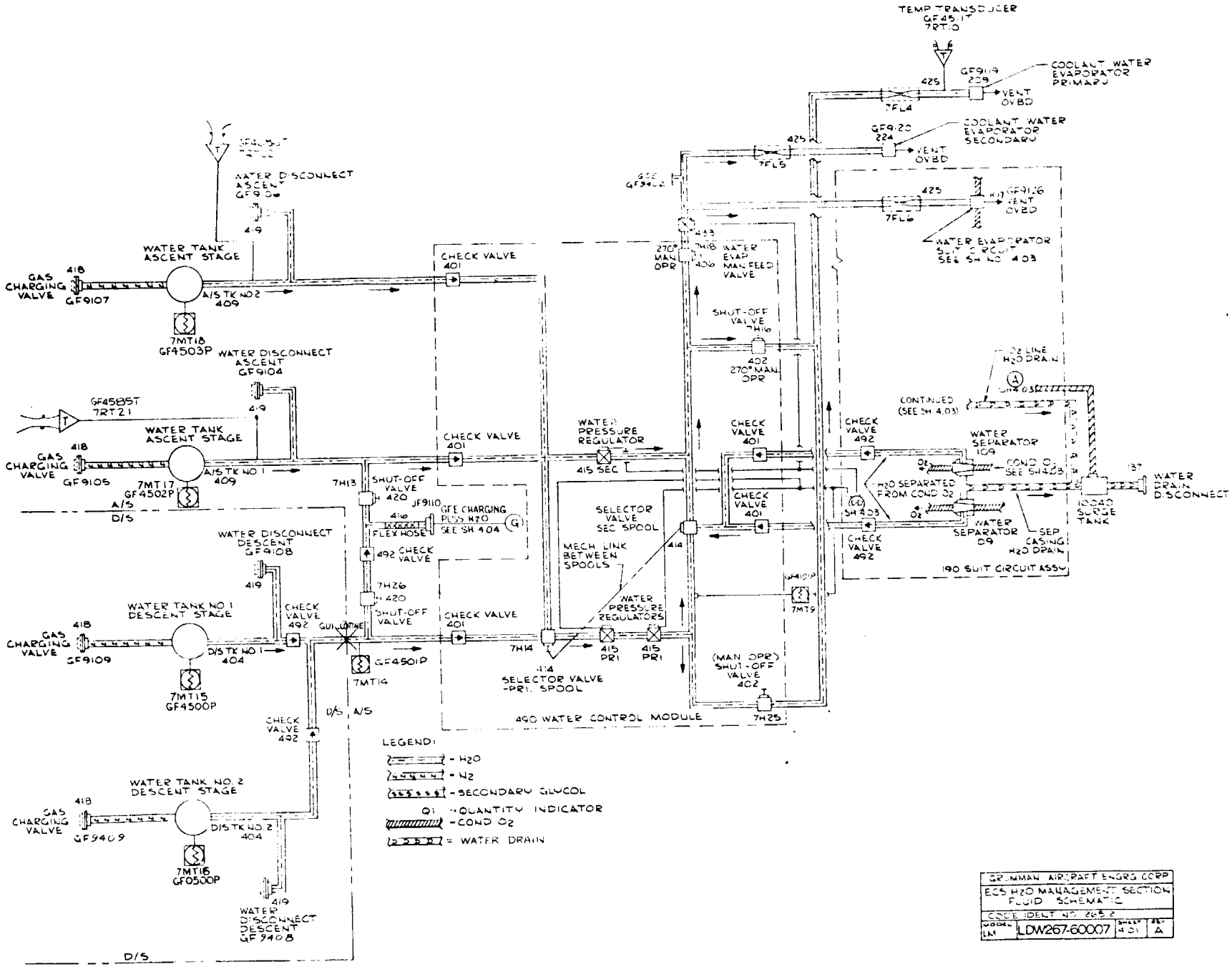
Code	Control/Indicator	Function
7H18	SECONDARY EVAP FLOW VALVE 2-POSITION VALVE	This control (OPEN-CLOSE) provides a flow of water to the secondary water sublimator and suit circuit sublimator to maintain temperature limits for the secondary glycol loop. The OPEN position permits full water flow to the secondary glycol water sublimator, and suit circuit sublimator. The CLOSE position prevents water flow to the sublimator and is the normal position for this valve. The glycol temperature is displayed on 7M5.
7H19	CO_2 CANISTER SELECT VALVE 2-POSITION BAR LEVER	This control (PRIMARY-SECONDARY), in the PRIMARY position, allows the suit circuit gas to flow through the primary LiOH canister thereby removing CO_2 and noxious gases from the suit circuit gas. Selecting the SECONDARY position permits the suit circuit gas to flow through the secondary LiOH canister while changing the primary canister.
7H22	SUIT TEMPERATURE CONTROL VALVE MODULATING	This control (COLD-HOT) permits the regulation of suit circuit temperature by varying the flow rate of glycol through the suit regenerative heat exchanger. When the handle is turned in the HOT direction (clockwise), a greater amount of glycol is diverted to the suit regenerative heat exchanger in order to increase suit circuit gas temperature. Turning the handle in the COLD direction (counterclockwise) decreases the amount of glycol flowing through the suit regenerative heat exchanger, thereby decreasing suit circuit gas temperature.

SUBSYSTEM: ENVIRONMENTAL CONTROL (FUNCTIONAL GROUPING 7)

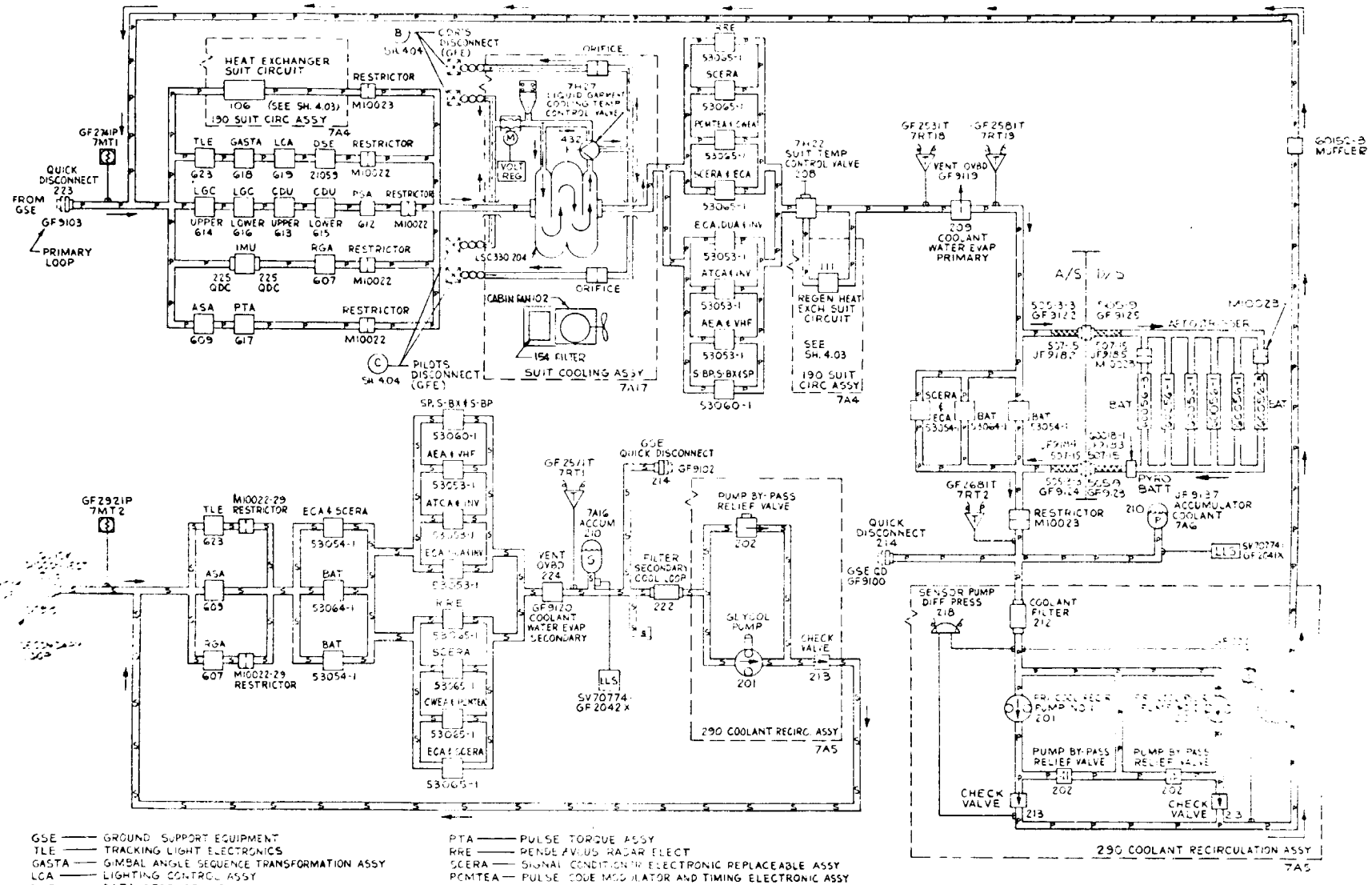
Code	Control Indicator	Function
7H23 7H24	PRIMARY CANISTER VENT BUTTON SECONDARY CANISTER VENT BUTTON 2-MOMENTARY PUSHBUTTONS	These pushbuttons (VENT PUSH) are associated with the primary and secondary LiOH canistors respectively. When the button is depressed, the gas within a canister is vented thus diminishing the internal pressure within the canister and facilitating removal of the cover from the canister. NOTE: 7H19 must be placed to the opposite canister position from the one which is to have its cartridge replaced before the correct pushbutton is actuated.
7H25	PRIMARY EVAP FLOW #1 2-POSITION VALVE	This control (OPEN-CLOSE) permits the flow of water from the water manifold to the primary water sublimator. When the LM is first manned, this control is set to the OPEN position allowing flow to the primary water sublimator. Setting the control to CLOSE will shut off the flow to the primary water sublimator. The control is located on the water control module.
7H26	DESCENT DRINK/PLSS FILL WATER VALVE 2-POSITION VALVE	This control (OPEN-CLOSE) is used to control water flow from the descent tank for drinking and food preparation and to fill the PLSS reservoir. The OPEN position supplies water to the water hose and the CLOSE position prevents water flow to the water hose.
16DS93	SUIT/CABIN PRESS IND (7M2) POWER FAILURE LIGHT	See EFD16-1005.4
16DS94	O_2/H_2O QUANTITY IND (7M4) POWER FAILURE LIGHT	See EFD16-1005.4
16DS95	GLYCOL TEMP/PRESS IND (7M5) POWER FAILURE LIGHT	See EFD16-1005.4



GRUMMAN AIRCRAFT ENGR'G CORP
ECS
BLOCK DIAGRAM
LDA-760007



GRUMMAN AIRCRAFT ENGRG CORP			
ECS H2O MANAGEMENT SECTION FLUID SCHEMATIC			
CODE IDENT NO. 26522			
DRAWING LM	LDW267-60007	SHEET 4.01	REV A

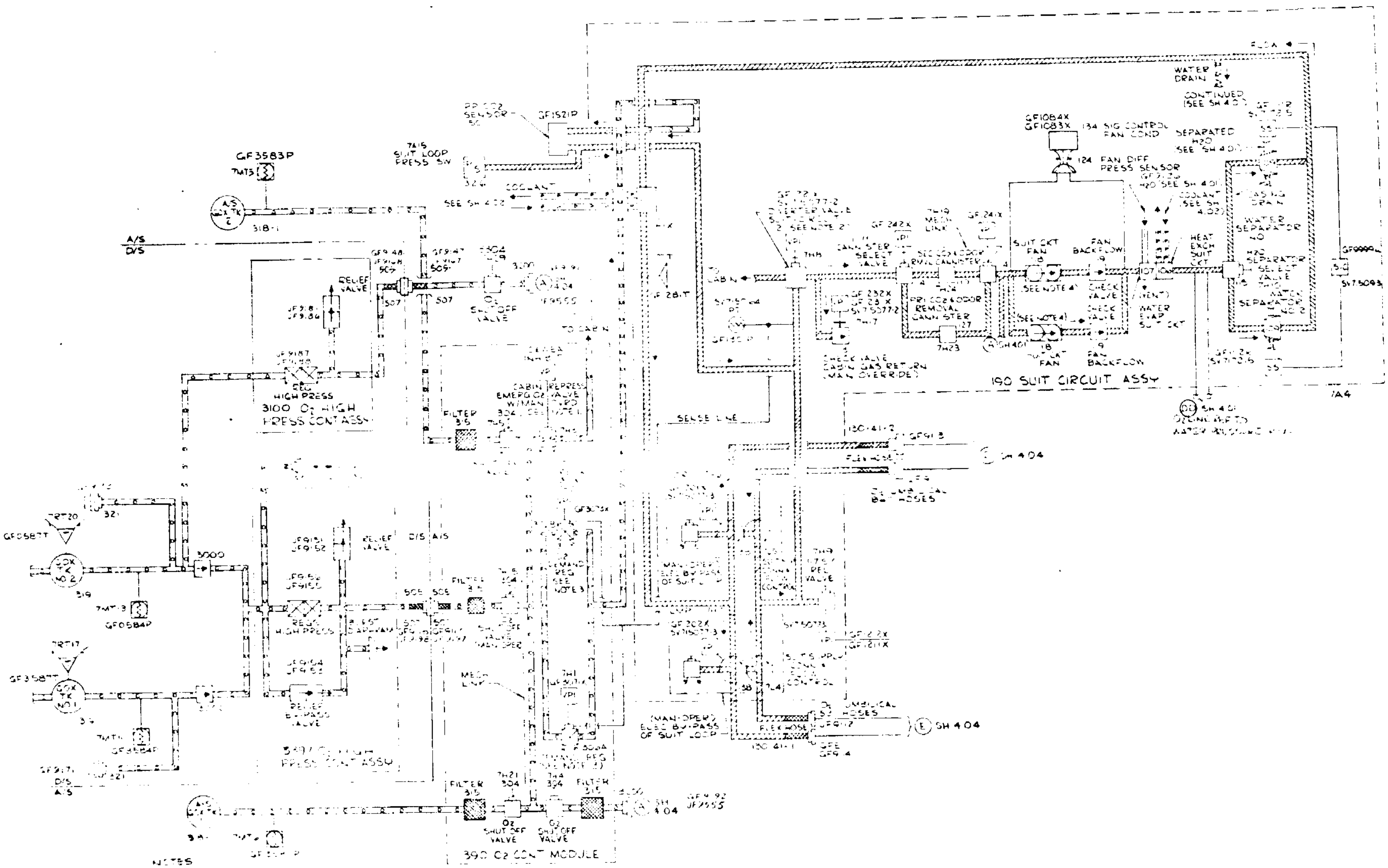


GSE —— GROUND SUPPORT EQUIPMENT
TLE —— TRACKING LIGHT ELECTRONICS
GASTA —— GIMBAL ANGLE SEQUENCE TRANSFORMATION ASSY
LCA —— LIGHTING CONTROL ASSY
DSE —— DATA STORAGE ELEC ASSY
LGC —— LM GUIDANCE COMPUTER
CDU —— COUPLING DATA UNIT
PSA —— POWER SERVO ASSY
IMU —— INERTIAL MEASURING UNIT
RGA —— RATE GYRO ASSY
ASA —— ABORT SENSOR ASSY

PTA —— PULSE TORQUE ASSY
RRE —— RENDEZVOUS RADAR ELECT
SCERA —— SIGNAL CONDITIONER ELECTRONIC REPLACEABLE ASSY
PCMTEA —— PULSE CODE MODULATOR AND TIMING ELECTRONIC ASSY
ECA —— ELECTRONIC CONTROL ASSY
ATCA —— ATTITUDE AND TRANSLATION CONTROL ASSY
AEA —— ABORT ELECTRONICS ASSY
S-BP —— S-BAND POWER AMPLIFIER DIPLEXER
LLS —— LOW LEVEL SENSOR
BAT —— BATTERY
PBAT —— PYROTECHNIC BATTERIES

LEGEND
= PRIMARY GLYCOL
= SECONDARY GLYCOL
= H_2O

GRUMMAN AIRCRAFT ENGRG CORP			
ECS PRI & SEC GLYCOL LOOPS SYSTEM FLUID SCHEMATIC			
CORE SYST NO. 1			
MODEL	LDW267-60007	SHEET NO. 4.02	REV LTR A
LM			



NOTES

1. EMERGENCY ... VALVE MAY BE MANUALLY ... OVERRIDES ... WHEN ELECTRICALLY ... INHIBITS ... ONLY.
2. ... ENERGIZING COIL
3. ... REDUCED VOLTAGE

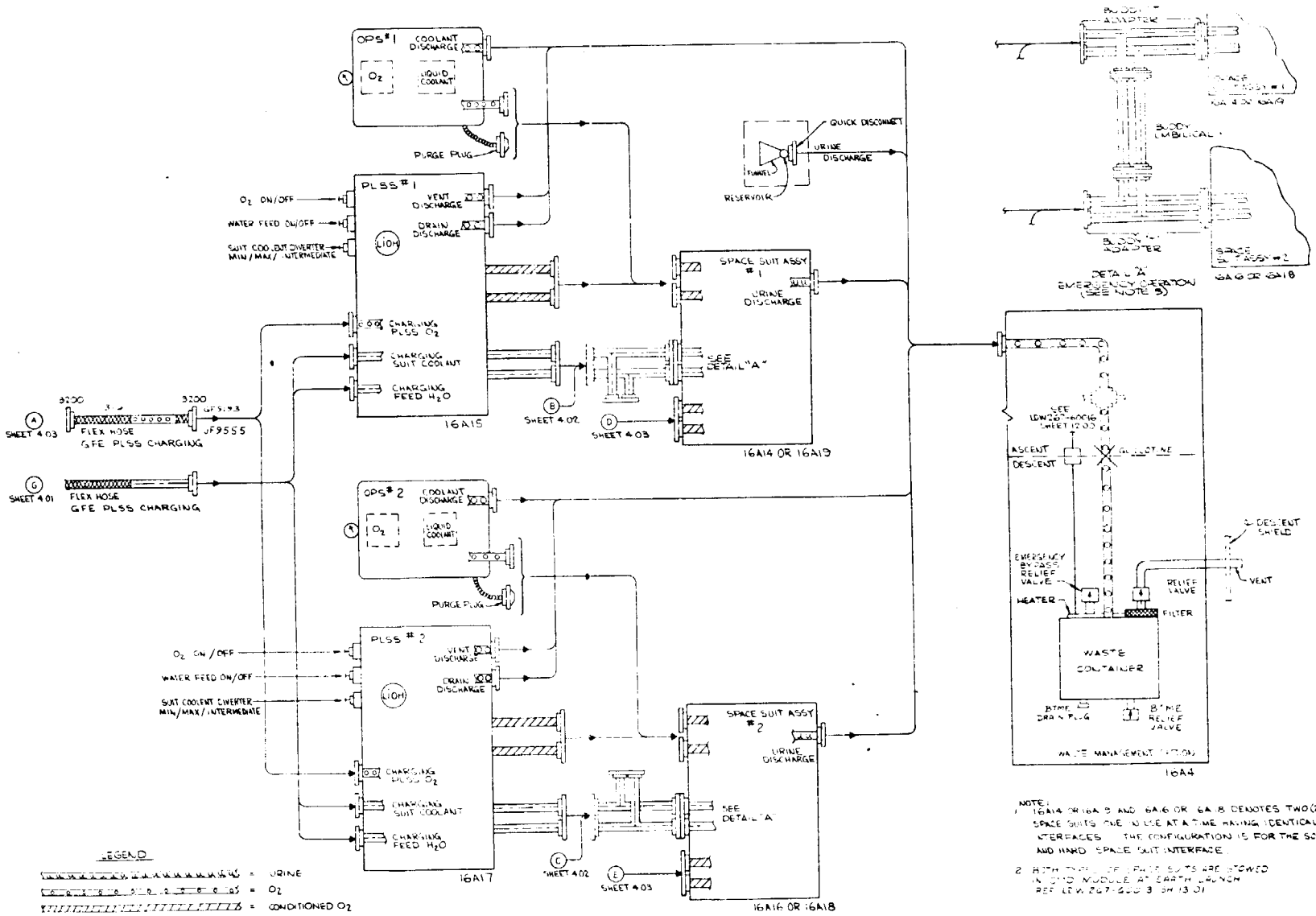
GOX = GASEOUS OXYGEN
VPI = VALVE POSITION INDICATOR
SS = SPEED SENSOR
SC = SIGNAL CONDITIONER

LEGEND

CONDITIONED O2

WATER DRAIN

GRUMMAN AIRCRAFT ENGRG CORP
ECS ... PCS
SYSTEM FLUID SCHEMATIC
LDW267-60007



NOTES: (CONT.)

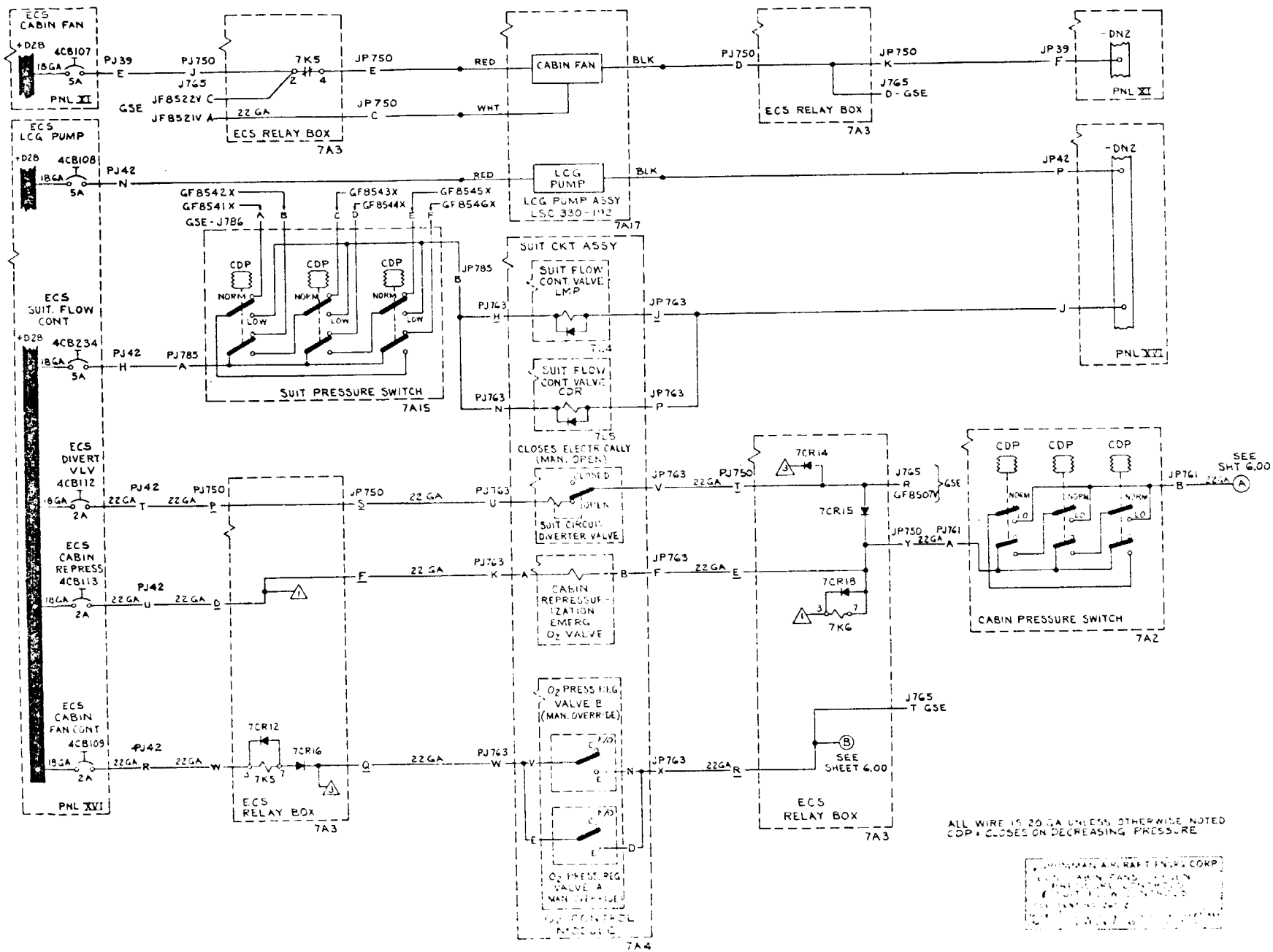
3. THE BUDDY UMBILICAL IS TO BE USED IN THE EVENT OF A PLSS COOLANT OR OXYGEN LOOP FAILURE. WHEN NEEDED THE BUDDY UMBILICAL WILL MATE WITH THE AVAILABLE QUICK DISCONNECT ON THE BUDDY T ADAPTER.

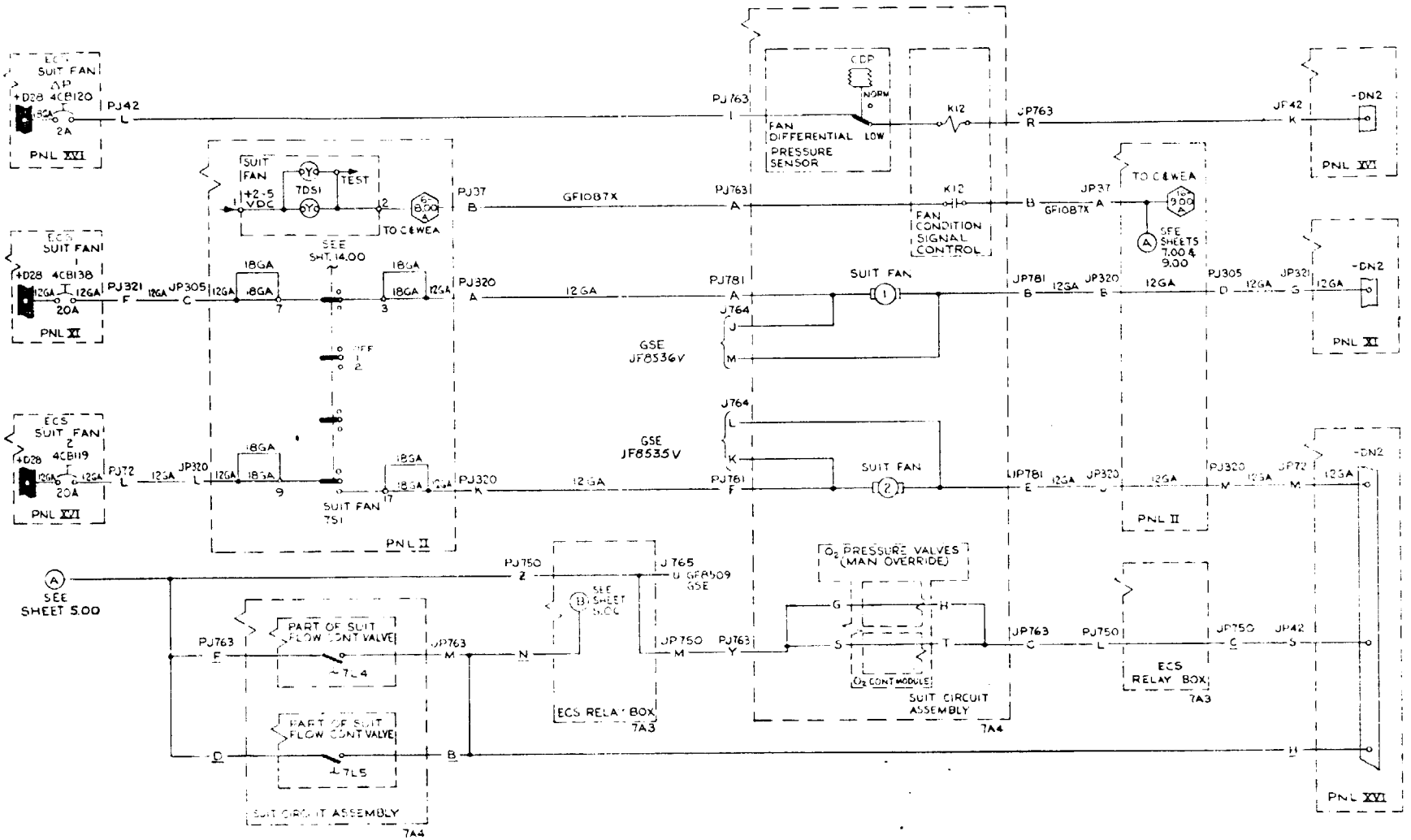
NOTE:

1. 16A14 OR 16A13 AND 16A6 OR 16A8 DENOTES TWO (2) SPACE SUITS ONE IN USE AT A TIME HAVING IDENTICAL INTERFACES. THE CONFIGURATION IS FOR THE SOFT AND HARD SPACE SUIT INTERFACE.

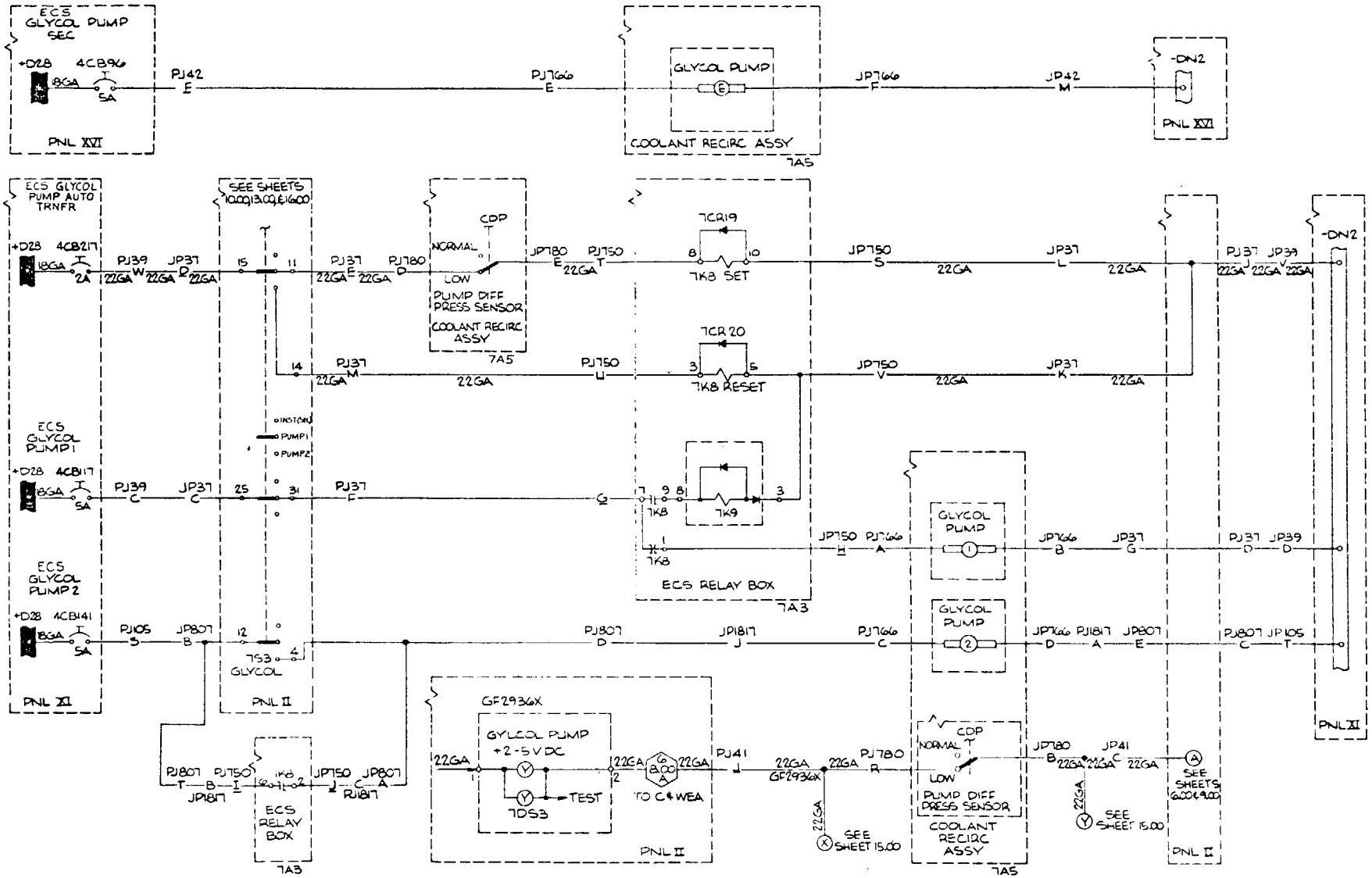
2. BOTH [illegible] SPACE SUITS ARE STOWED IN STD MODULE AT EARTH LANDING REF LDW 267-600 3 SH 13 01

GRUMMAN AIRCRAFT ENGG. CORP.			
E.C.S. - PLSS, SLSS SPACE SUIT/WASTE MANAGEMENT INTRFC			
CODE	SCALE NO. NONE		
MODEL LM	LDW 267 - 60007	SHEET 4 04	REV A


ECS CABIN FAN
+DZB
4CB107
18GA
5A
PNL XI
PJ39
E
PJ750
J
J765
7K5
Z
4
JP750
E
RED
CABIN FAN
BLK
PJ750
D
JP750
K
J765
D - GSE
ECS RELAY BOX
7A3
JP39
F
-DN2
PNL XI
GSE
JF8522V C
JF8521V A
22 GA
JP750
C
WHT
ECS LCG PUMP
+DZB
4CB108
18GA
5A
PJ42
N
RED
LCG PUMP
LCG PUMP ASSY
LSC 330-192
7A17
BLK
JP42
P
-DN2
PNL XVI
GF8542X
GF8541X
GSE-J786
GF8543X
GF8544X
GF8545X
GF8546X
A
B
C
D
E
F
CDP
NORM
LOW
SUIT PRESSURE SWITCH
7A15
JP785
B
SUIT CKT ASSY
SUIT FLOW CONT VALVE LMP
7L4
PJ763
H
JP763
J
J
ECS SUIT. FLOW CONT
+DZB
4CB234
18GA
5A
PJ42
H
PJ785
A
SUIT FLOW CONT VALVE CDR
7L5
PJ763
N
JP763
P
CLOSES ELECTRICALLY (MAN. OPEN)
ECS DIVERT VLV
4CB112
18GA
2A
PJ42
22GA
T
PJ750
P
JP750
S
22 GA
PJ763
U
CLOSED
OPEN
SUIT CIRCUIT DIVERTER VALVE
JP763
V
22GA
T
PJ750
7CR14
J765
R
GSE
GF8507V
7CR15
JP750
Y
22GA
PJ761
A
CDP
NORM
LO
JP761
B
22GA
A
SEE SHT 6.00
CABIN PRESSURE SWITCH
7A2
ECS CABIN REPRESS
4CB113
18GA
2A
PJ42
22GA
U
22GA
D
F
22 GA
PJ763
K
A
CABIN REPRESSURIZATION EMERG O2 VALVE
B
JP763
F
22GA
E
7CR18
7K6
ECS CABIN FAN CONT
4CB109
18GA
2A
PJ42
22GA
R
22GA
W
7CR12
7K5
7CR16
Q
22GA
PJ763
W
V
O2 PRESS REG VALVE B (MAN. OVERRIDE)
O2 PRESS REG VALVE A MAN. OVERRIDE
O2 CONTROL MODULE
7A4
N
JP763
X
22GA
R
J765
T GSE
B
SEE SHEET 6.00
ECS RELAY BOX
7A3
PNL XVI
ECS RELAY BOX
7A3
ALL WIRE IS 20 GA UNLESS OTHERWISE NOTED
CDP - CLOSES ON DECREASING PRESSURE



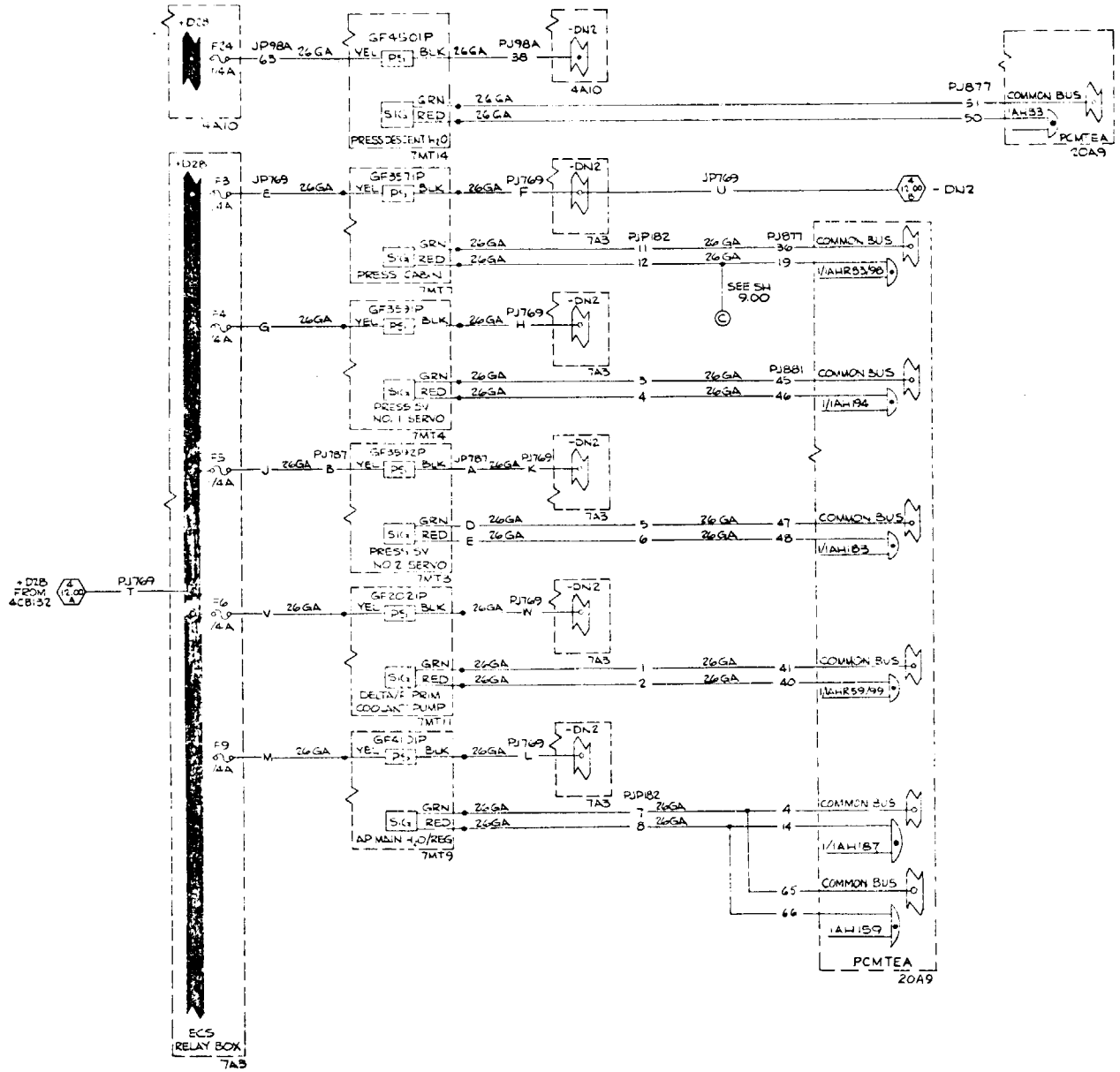
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
CDP = CLOSES ON DECREASING PRESSURE



ALL WIRE IS 20 GA UNLESS OTHERWISE NOTED

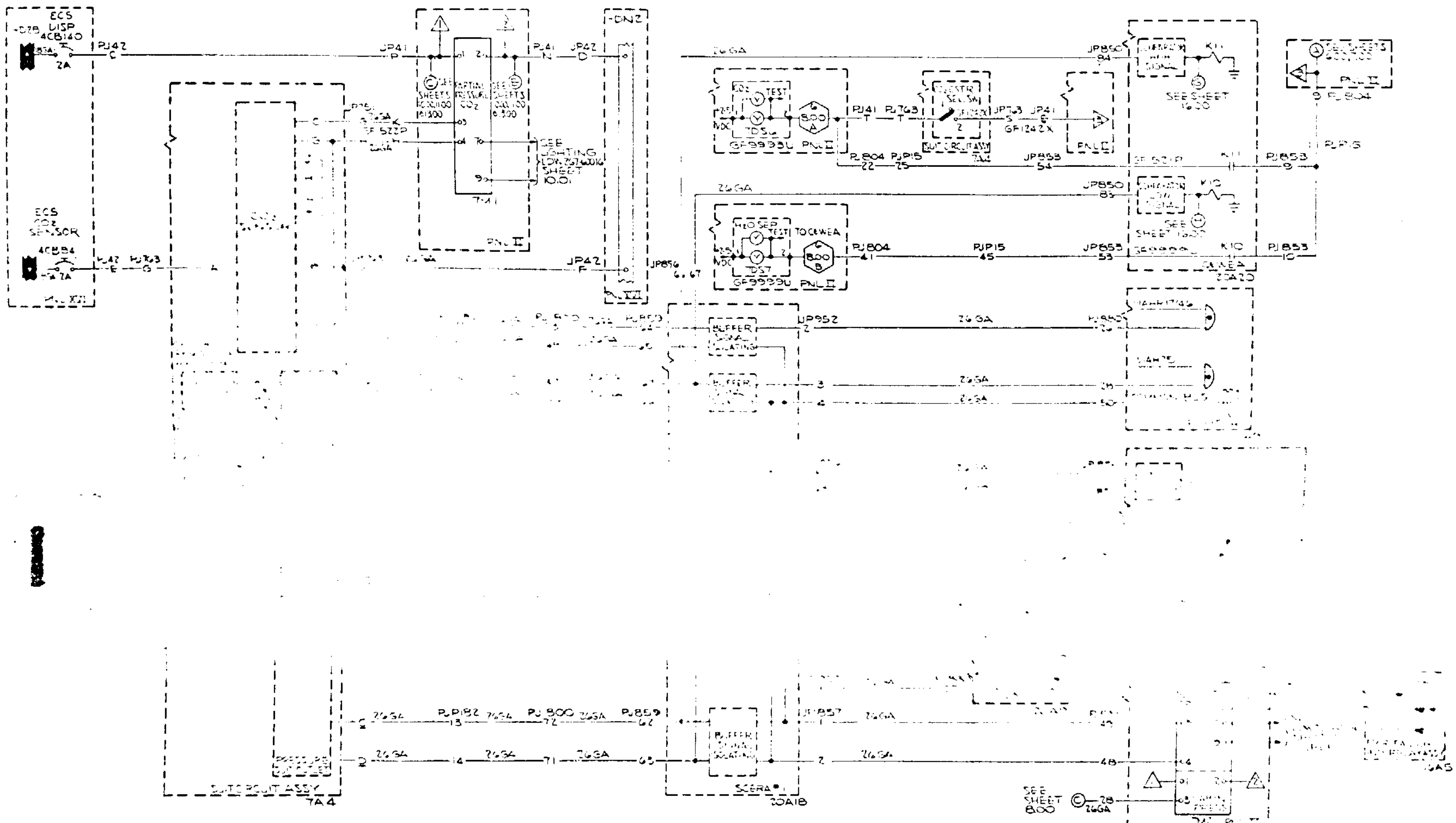
CDP = CLOSES ON DECREASING PRESSURE

GRUMMAN AIRCRAFT ENGRG CORP			
ECS-GLYCOL PUMP CONTROL & CAUTION AND WARNING			
CODE IDENT NO. 26512			
MODEL M	LDW267-60007	SHEET 1.00	REV

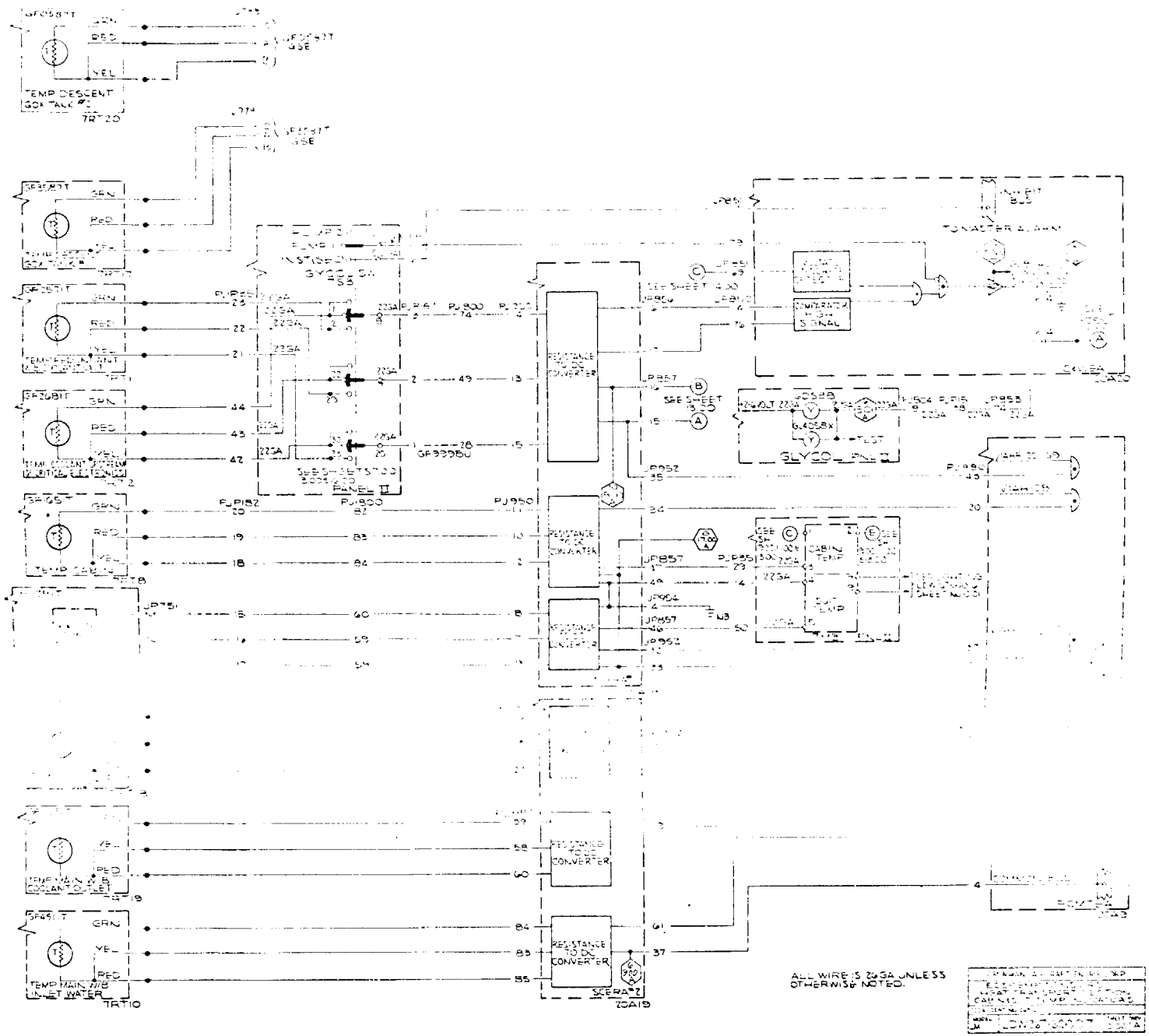


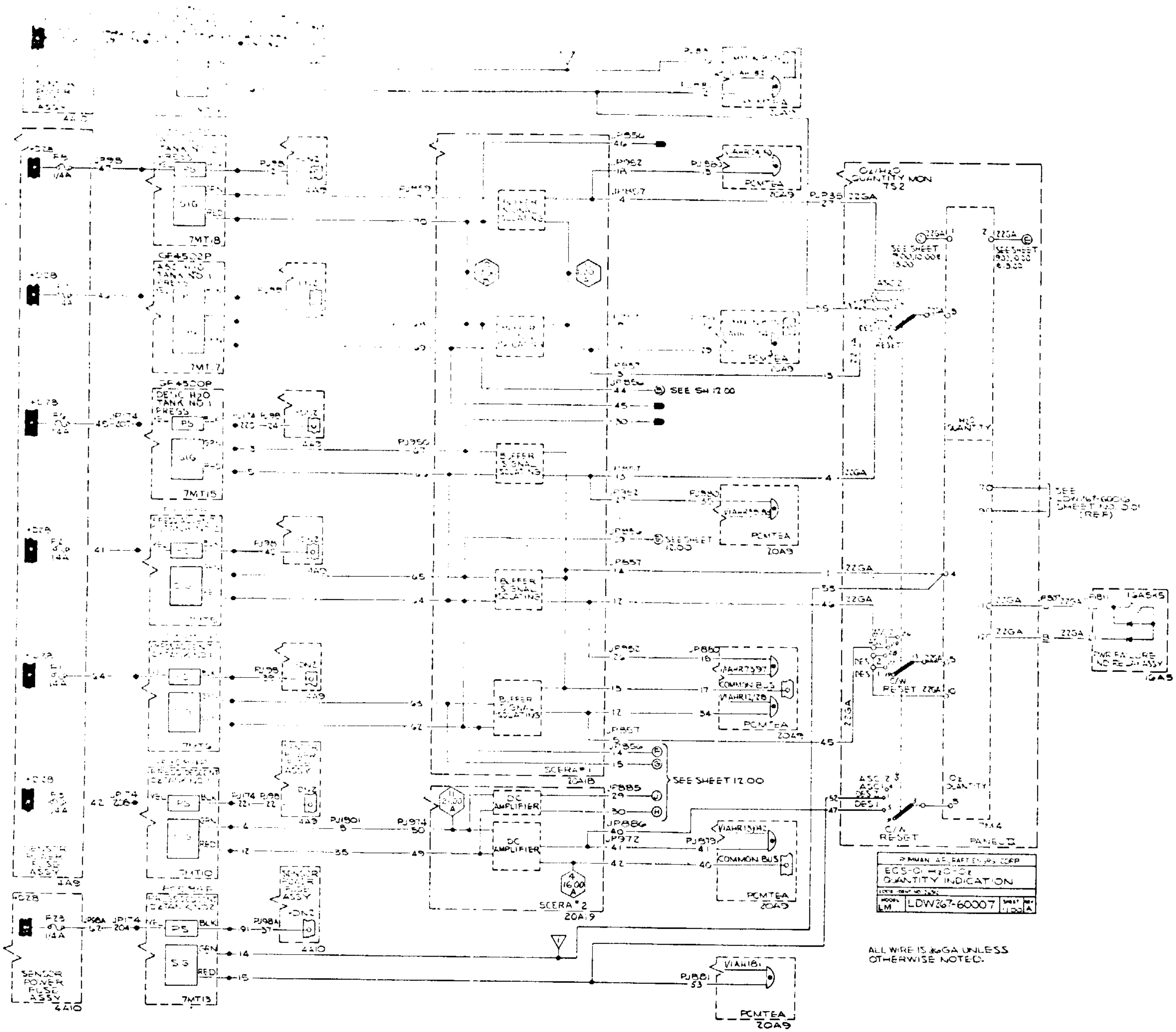
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT & AGRG CORP	
ECS PRESSURE SENSOR #1 & 2 PRESS	
SAFETY, T MAN H2O, AFT & O2	
MANIFOLD AND CABIN PRESS	
CODE IDENT NO 14932	
MODEL LM	LCDN 267-60007 SHEET 800 REV A



ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.


TEMP DESCENT CONTROL
TRT20
TEMP MAIN W/B COOLANT OUTLET
TRT19
TEMP MAIN W/B INLET WATER
TRT10
TEMP COOLANT SYSTEM
TEMP CABIN
GLYCO
CABIN TEMP
RESISTANCE TO DC CONVERTER
ALL WIRE IS 20GA UNLESS OTHERWISE NOTED.

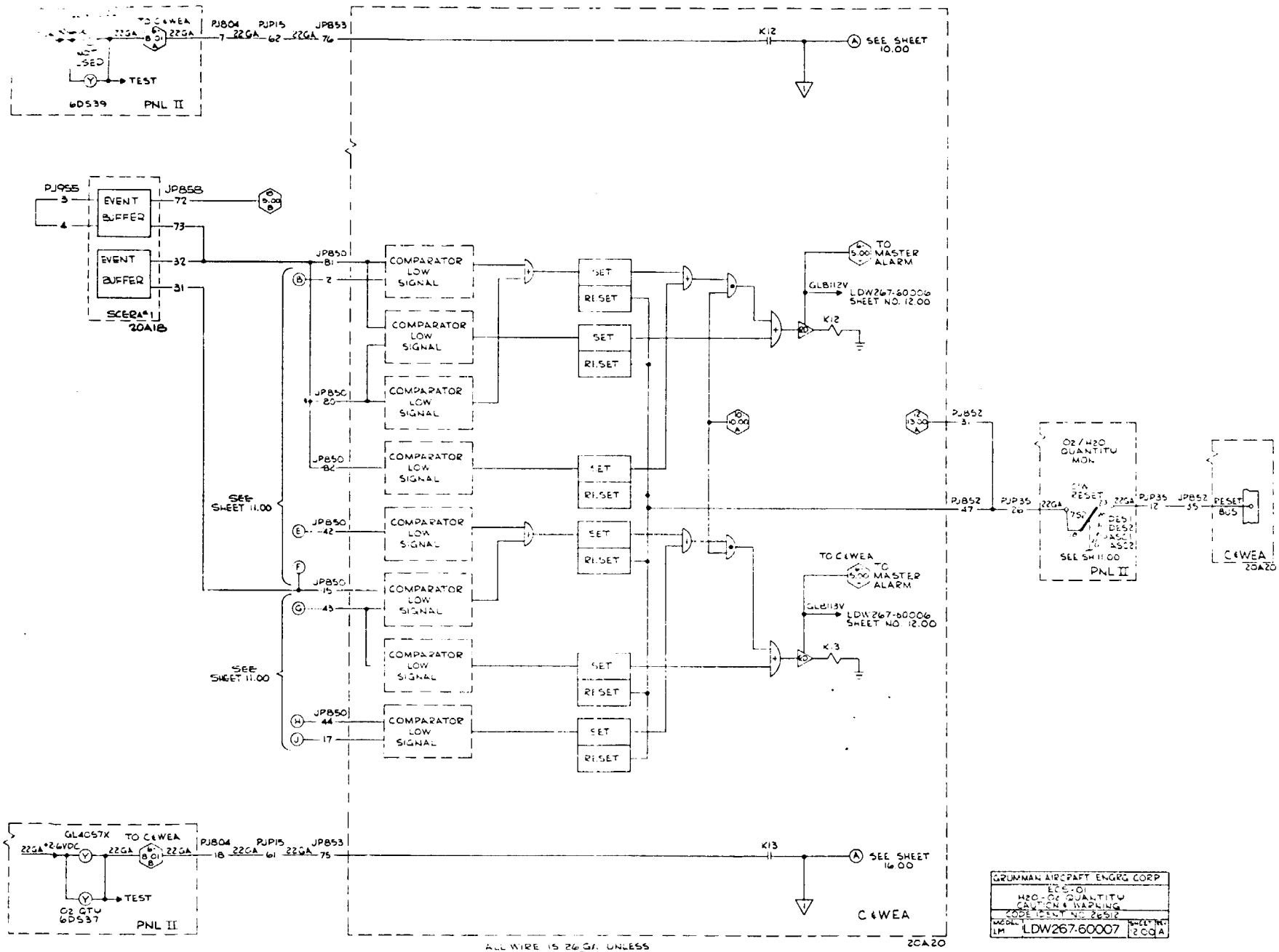


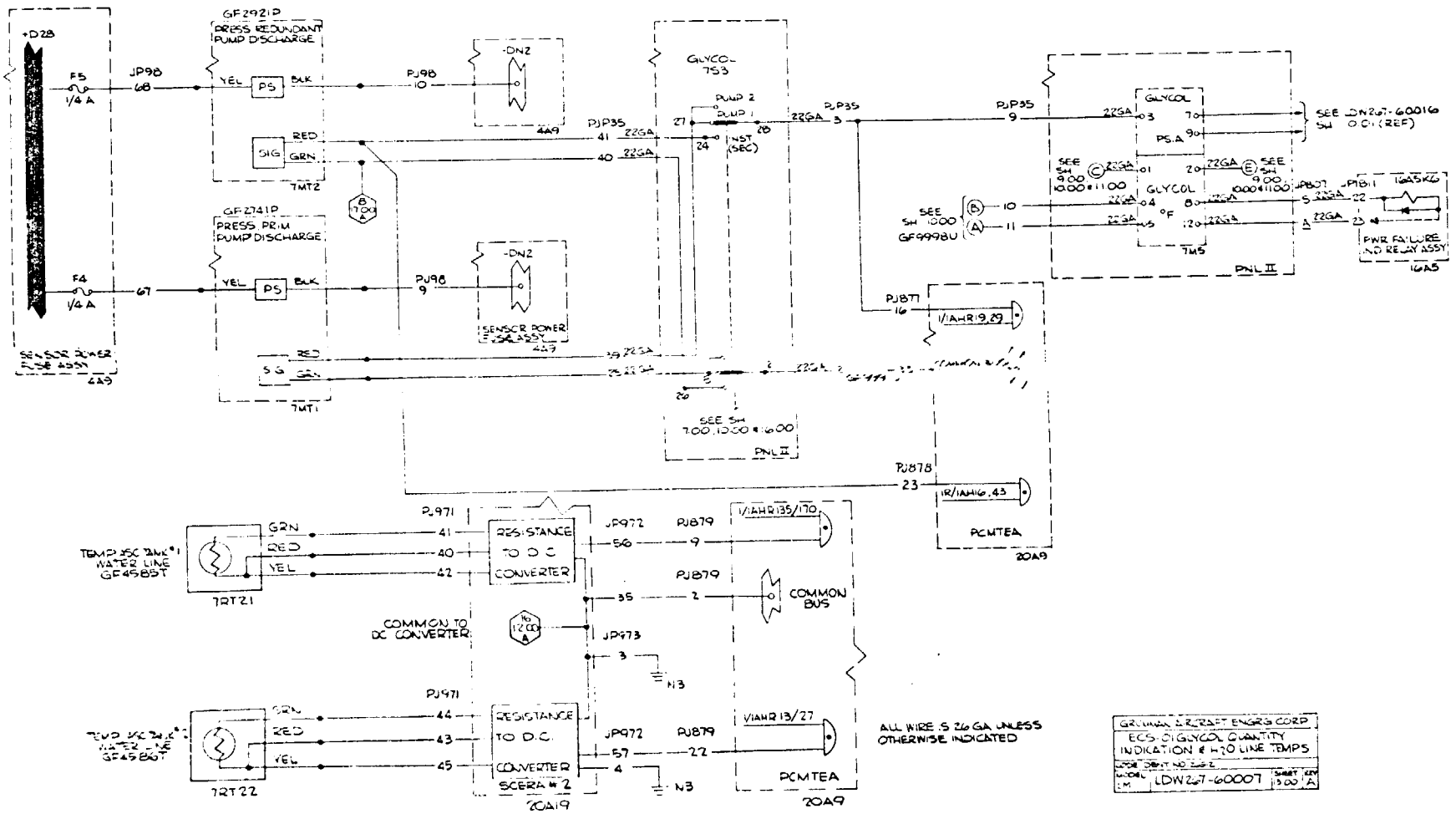
GRUMMAN AIRCRAFT ENGRS CORP

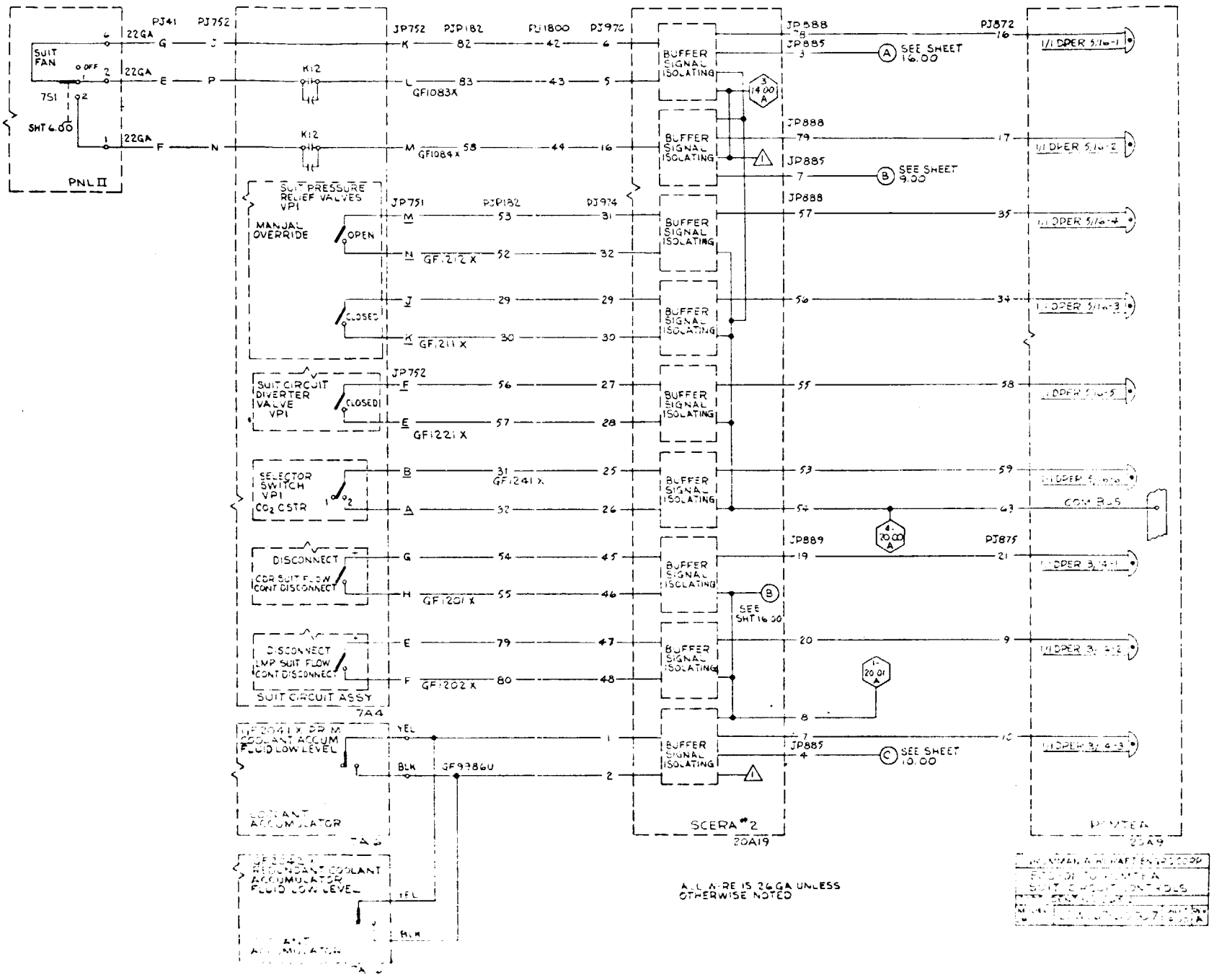
ECS-01 H_2O-O_2 QUANTITY INDICATION

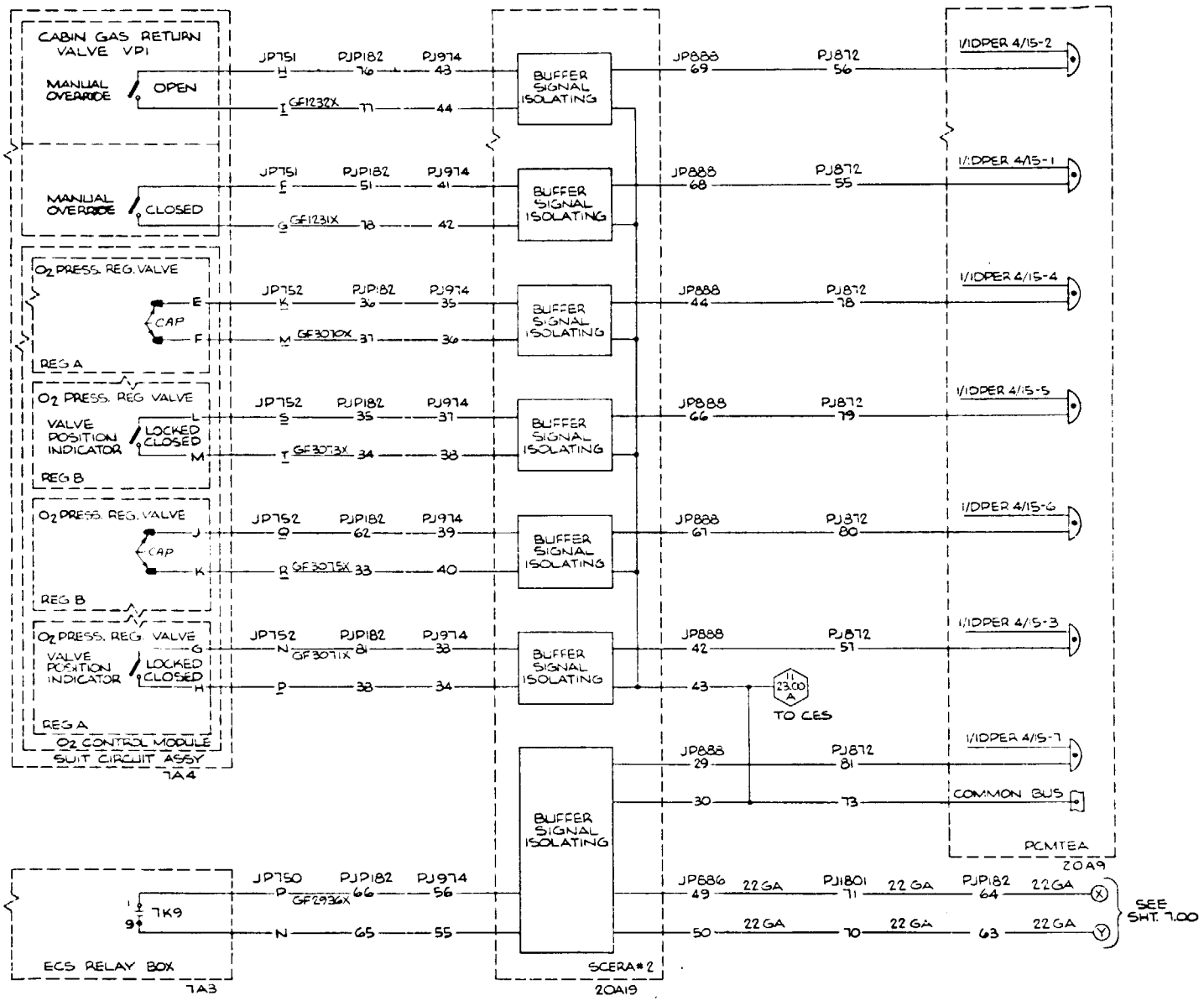
MODEL LM — LDW267-60007 — REV A

ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.


TO C&WEA
22GA
PJ804
PJP15
JPB53
7
22GA
62
22GA
76
K12
SEE SHEET 10.00
TEST
6DS39
PNL II
PJ955
3
4
EVENT BUFFER
JPB58
72
73
EVENT BUFFER
32
31
SCERA#1
20A18
JPB50
81
2
80
82
42
15
43
17
44
COMPARATOR LOW SIGNAL
SET
RESET
TO MASTER ALARM
GLB112V
LDW267-60006 SHEET NO. 12.00
K12
K13
SEE SHEET 11.00
PJB52
3
47
PJP35
26
12
35
22GA
O2/H2O QUANTITY MON.
SEE SH 11.00
PNL II
PESET BUS
C&WEA
20A20
GL4057X
22GA+26VDC
O2 QTY 6DS37
PJ804
PJP15
JPB53
18
61
75
SEE SHEET 16.00
C&WEA
ALL WIRE IS 26 GA. UNLESS OTHERWISE NOTED.
20A20
GRUMMAN AIRCRAFT ENGRG CORP
H2O-O2 QUANTITY CAUTION & WARNING
CODE IDENT NO. 26512
LDW267-60007
SHEET NO. 2 OF A

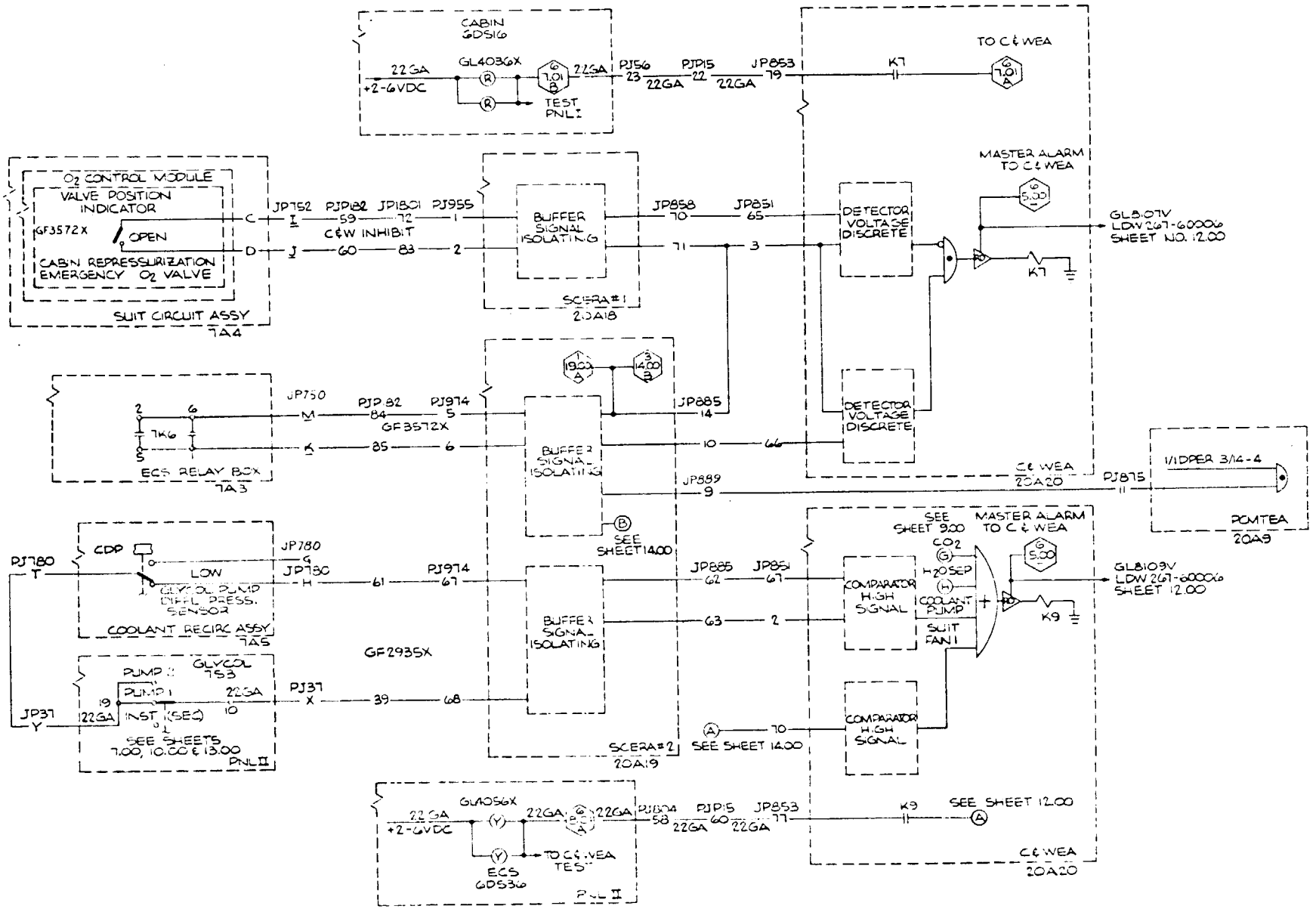

+D28
F5
1/4 A
JP98
68
GF2921P
PRESS REDUNDANT PUMP DISCHARGE
YEL
PS
BLK
PJ98
10
-DN2
4A9
RED
SIG
GRN
TMT2
PJP35
41
22GA
40
22GA
GLYCOL-753
PUMP 2
PUMP 1
27
28
24
NST (SEC)
PJP35
22GA
5
PJP35
9
22GA
GLYCOL
03
07
PS.A
09
SEE DN267-60016 SH 001 (REF)
SEE SH 900 1000 & 1100
C
22GA
01
20
22GA
E
SEE SH 900
GLYCOL
04
08
22GA
PJB07
PJB11
16A5K6
SEE SH 1300 GF9998U
B
10
A
11
°F
05
20
22GA
A
22GA
23
PWR FAILURE NO RELAY ASSY
16A5
TM5
PNL II
GF2741P
PRESS PRIM PUMP DISCHARGE
F4
1/4 A
67
YEL
PS
BLK
PJ98
9
-DN2
SENSOR POWER SUPPLY ASSY
4A9
SENSOR POWER SUPPLY ASSY
4A9
RED
SIG
GRN
TMT1
PJB77
16
1/1AHR19,29
PJB78
23
1R/1AH16,43
SEE SH 700,1000 & 1600
PNL II
PCMTEA
20A9
PJ971
TEMP SNSR PNL #1 WATER LINE GF45B5T
GRN
RED
YEL
41
40
42
RESISTANCE TO D C CONVERTER
JP972
56
PJB79
9
1/1AHR135/170
7RT21
PJB79
35
2
COMMON BUS
COMMON TO DC CONVERTER
NO 12 GA
JP973
3
N3
PJ971
TEMP SNSR PNL #2 WATER LINE GF45B6T
GRN
RED
YEL
44
43
45
RESISTANCE TO D.C. CONVERTER SCERA # 2
JP972
57
4
PJB79
22
1/1AHR13/27
N3
7RT22
20A19
PCMTEA
20A9
ALL WIRE'S 26 GA UNLESS OTHERWISE INDICATED
GRUMMAN AEROSPACE ENGRG CORP
ECS-DI GLYCOL QUANTITY INDICATION & H20 LINE TEMPS
LDW267-60007
SHEET 1 OF 1


PNL II
SUIT FAN
OFF
7S1
SHT 6.00
22GA
PJ41
PJ752
JP752
PJP182
PJ1800
PJ970
K12
GF1083X
GF1084X
SUIT PRESSURE RELIEF VALVES VP1
MANUAL OVERRIDE
OPEN
CLOSED
JP751
PJP182
PJ974
GF1212X
GF1211X
SUIT CIRCUIT DIVERTER VALVE VP1
GF1221X
SELECTOR SWITCH VP1
CO2 CSTR
GF1241X
DISCONNECT
CDR SUIT FLOW CONT DISCONNECT
GF1201X
DISCONNECT LMP SUIT FLOW CONT DISCONNECT
GF1202X
SUIT CIRCUIT ASSY
7A4
GF2041X OR M COOLANT ACCUM FLUID LOW LEVEL
COOLANT ACCUMULATOR
7A5
GF2042X REDUNDANT COOLANT ACCUMULATOR FLUID LOW LEVEL
YEL
BLK
GF9986U
BUFFER SIGNAL ISOLATING
JP888
JP885
JP889
PJ872
PJ875
SEE SHEET 16.00
SEE SHEET 9.00
SEE SHT 16.50
SEE SHEET 10.00
COM BUS
SCERA #2
20A19
PRINTER
20A9
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED



ALL WIRE IS 26 GAGE UNLESS OTERWISE NOTED.

GRUMMAN AIRCRAFT ENGR CORP	
ECS-01 TO PCMTEA SUIT CIRCUIT CONTROLS	
CODE IDENT. NO. 26512	
MODEL LM	LDW267-60007 SHEET 15.10 REV


CABIN GDS16
22 GA
+2-6VDC
GL4036X
TEST PNL I
22GA
PJ156
23
22GA
PJP15
22
22GA
JP853
79
K7
TO C&W EA
O2 CONTROL MODULE
VALVE POSITION INDICATOR
GF3572X
OPEN
CABIN REPRESSURIZATION EMERGENCY O2 VALVE
SUIT CIRCUIT ASSY
7A4
JP752
C
I
59
72
1
PJP82
JP1801
PJ955
C&W INHIBIT
D
J
60
83
2
BUFFER SIGNAL ISOLATING
SCERA#1
2DA18
JP858
70
71
JP851
65
3
DETECTOR VOLTAGE DISCRETE
MASTER ALARM TO C&W EA
GL5107V
LDW267-60006
SHEET NO. 12.00
K7
ECS RELAY BOX
7A3
JP750
M
84
5
85
6
GF3572X
JP885
14
10
66
JP889
9
PJ875
11
C&W EA
20A20
1/4 DPER 3/14-4
PCMTEA
20A9
SEE SHEET 14.00
CDP
LOW
GLYCOL PUMP DIFFL PRESS. SENSOR
COOLANT RECIRC ASSY
7A5
PJ780
T
JP780
G
H
61
67
PJ974
JP885
62
JP851
67
COMPARATOR HIGH SIGNAL
CO2
H2OSEP
COOLANT PUMP
SUIT FAN1
K9
GL8109V
LDW267-60006
SHEET 12.00
GF2935X
GLYCOL 7S3
PUMP 2
PUMP 1
19
22GA
INST (SEC)
10
PJ37
X
39
68
JP37
Y
22GA
SEE SHEETS 7.00, 10.00 & 13.00
PNL II
BUFFER SIGNAL ISOLATING
63
2
SCERA#2
20A19
A
70
SEE SHEET 14.00
COMPARATOR HIGH SIGNAL
GL4056X
22 GA
+2-6VDC
Y
22GA
PJ804
58
22GA
PJP15
60
22GA
JP853
77
K9
SEE SHEET 12.00
ECS GDS36
TO C&W EA TEST
PNL II
C&W EA
20A20
ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED.

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 8)

REACTION CONTROL SUBSYSTEM

(REF LDW 267-60008A)

S-1001
REV. A

1. Applicable Documents

Level Three Drawings

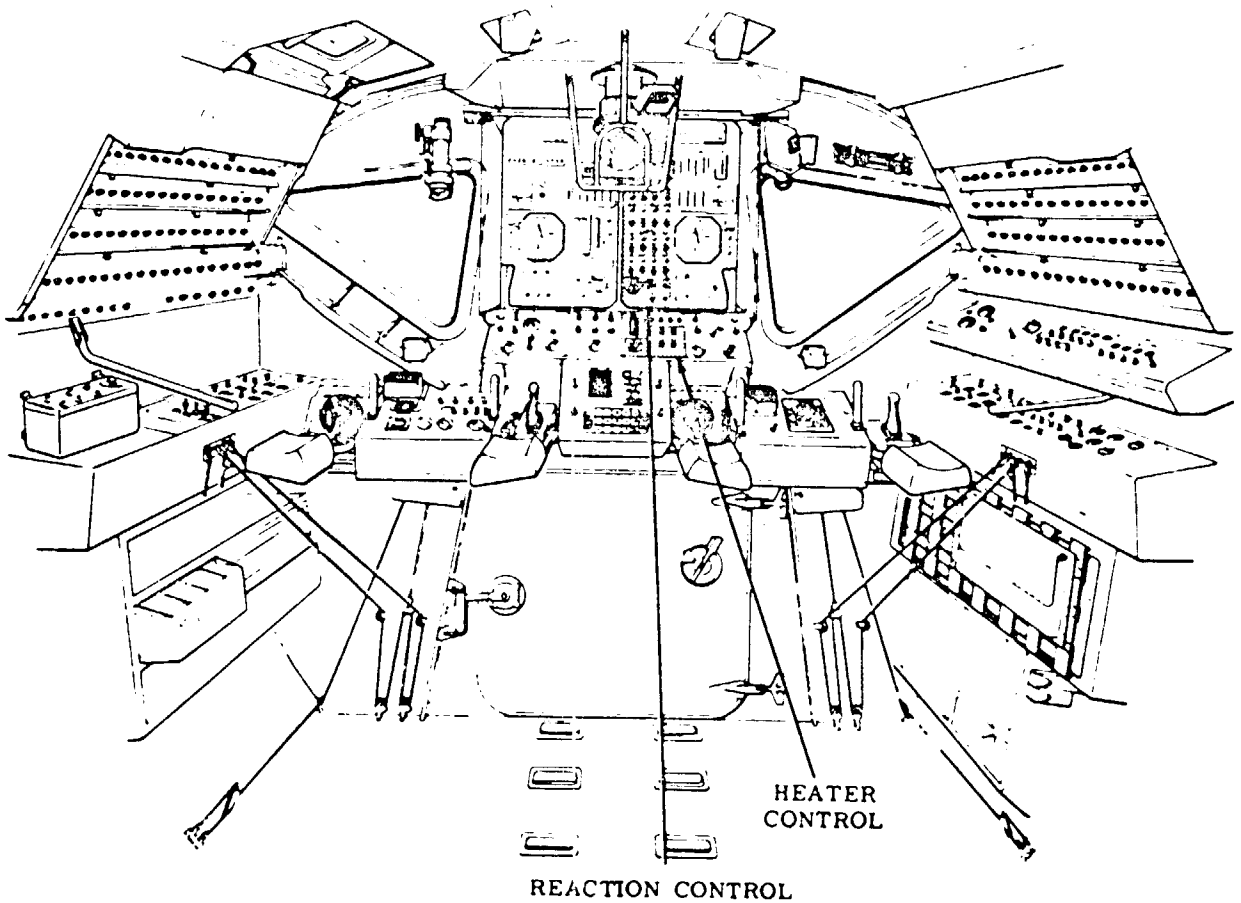
ITEM NAME	DWG. NO.	REV.	E.O.'s
RCS	LDW310-60001	A	

2. Table of Contents

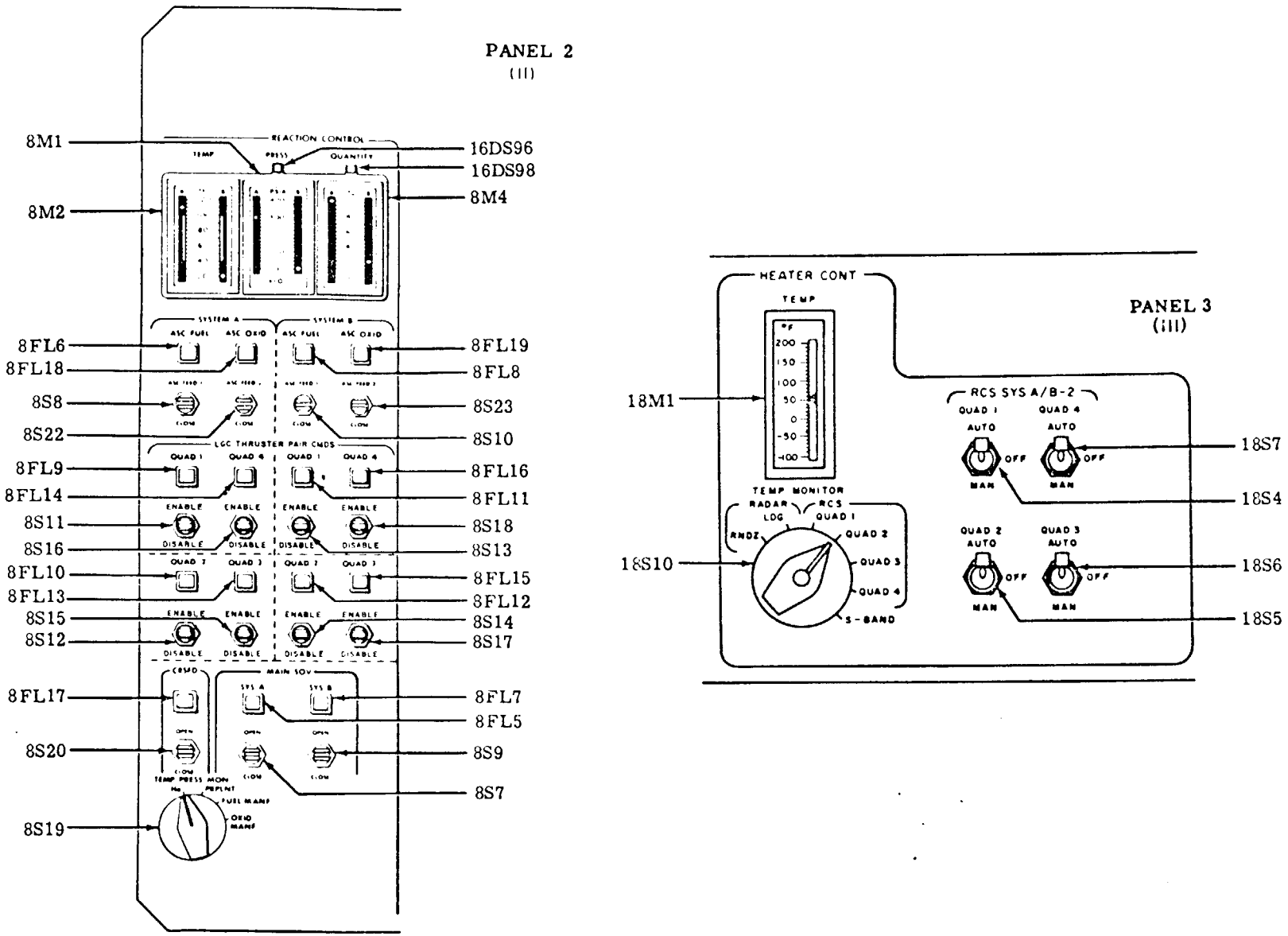
ITEM NAME		DWG. NO.
a)	Cover Sheet	8-1001
b)	Applicable Documents	8-1002 & 8-1002.1
c)	Cabin Location of RCS Controls and Indicators	8-1003
d)	RCS Controls and Indicators and Thrusting Layout	8-1004 & 8-1004.1
e)	RCS Controls and Indicators Functional Description	8-1005 thru 8-1005.5
f)	RCS Fluid Schematic	LDW267-60008 SH 4.00A
g)	RCS-Thruster Actuation & Propellant Valve Control Functional Block Diagram	LDW267-60008 SH 5.00
h)	RCS-Main Shutoff Valves System A&B	LDW267-60008 SH 6.00
i)	RCS-Spare Wiring (Left in LM-10 Vehicle)	LDW267-60008 SH 7.00
j)	RCS-Pri RCS/APS Interconnect Valves Systems "A" & "B" and Crossfeed Valve	LDW267-60008 SH 8.00
k)	RCS-Sec RCS/APS Interconnect Valves Systems A & B	LDW267-60008 SH 9.00
l)	RCS-Thrust Chamber Assembly Valves Quad 1 Systems "A" & "B"	LDW267-60008 SH 10.00
m)	RCS-Thrust Chamber Assembly Valves Quad 2 Systems "A" & "B"	LDW267-60008 SH 10.01
n)	RCS-Thrust Chamber Assembly Valves Quad 3 Systems "A" & "B"	LDW267-60008 SH 10.02

2. Table of Contents (Continued)

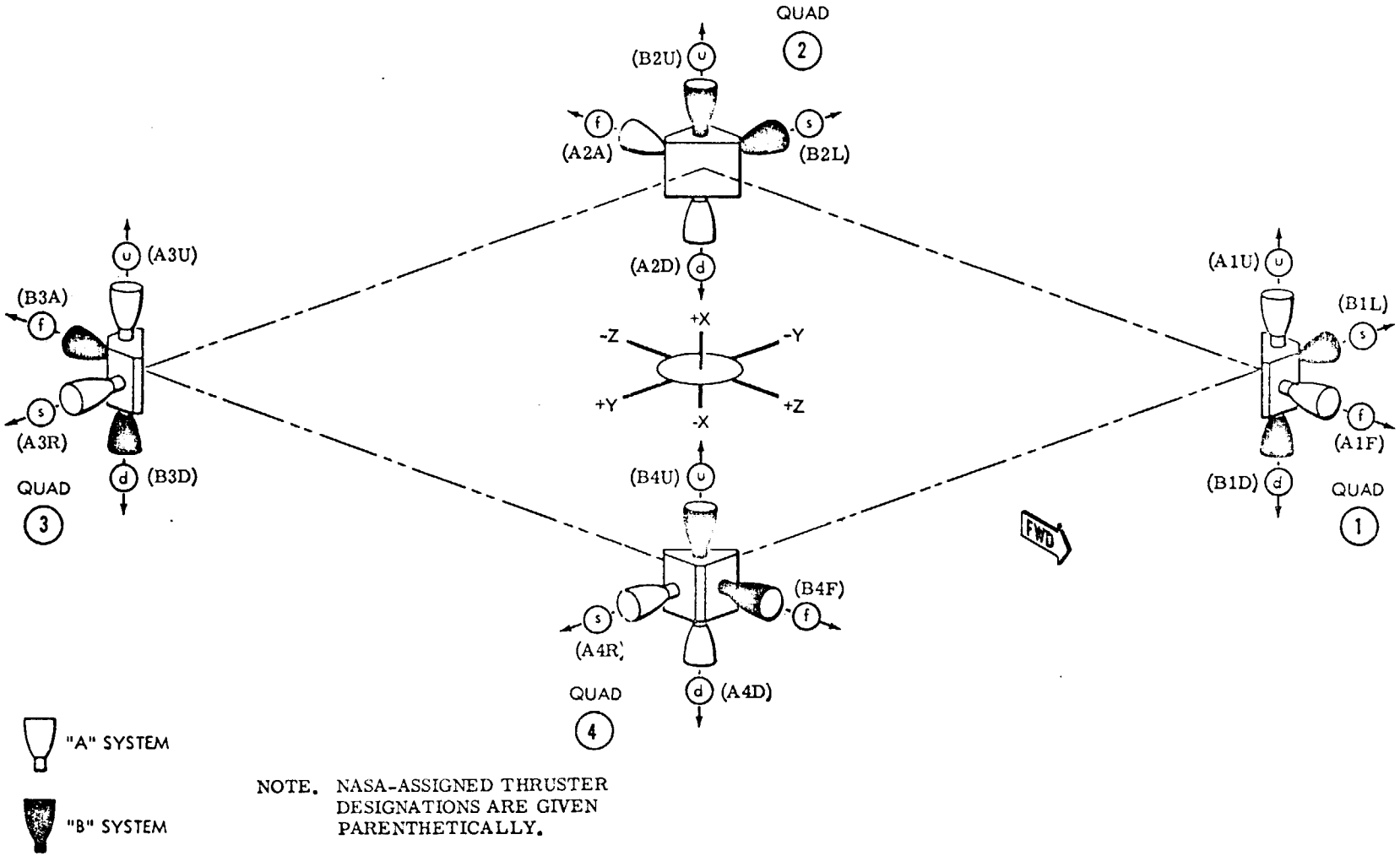
	ITEM NAME	DWG NO.
o)	RCS-Thrust Chamber Assembly Valves Quad 4 Systems "A" & "B"	LDW267-60008 SH 10.03
p)	RCS-Cluster Heaters System 1	LDW267-60008 SH 11.00
q)	RCS-Cluster Heaters System 2	LDW267-60008 SH 11.01
r)	RCS-Pressure Instrumentation - System "A"	LDW267-60008 SH 12.00
s)	RCS-Pressure Instrumentation - System "B"	LDW267-60008 SH 12.01
t)	RCS-Temperature Instrumentation for He & Fuel Tanks - Systems "A" & "B"	LDW267-60008 SH 13.00
u)	RCS-Crossfeed & Interconnect Valve Status Instrumentation	LDW267-60008 SH 14.00
v)	RCS-Main Shutoff Valve Status Instrumentation	LDW267-60008 SH 14.01
w)	RCS-Quad 1A Thruster Pair Alarm Ckt & Instrumentation Status	LDW267-60008 SH 15.00
x)	RCS-Quad 1B Thruster Pair Alarm Ckt & Instrumentation Status	LDW267-60008 SH 15.01
y)	RCS-Quad 2A Thruster Pair Alarm Ckt & Instrumentation Status	LDW267-60008 SH 15.02
z)	RCS-Quad 2B Thruster Pair Alarm Ckt & Instrumentation Status	LDW267-60008 SH 15.03
aa)	RCS-Quad 3A Thruster Pair Alarm Ckt & Instrumentation Status	LDW267-60008 SH 15.04
ab)	RCS-Quad 3B Thruster Pair Alarm Ckt & Instrumentation Status	LDW267-60008 SH 15.05
ac)	RCS-Quad 4A Thruster Pair Alarm Ckt & Instrumentation Status	LDW267-60008 SH 15.06
ad)	RCS-Quad 4B Thruster Pair Alarm Ckt & Instrumentation Status	LDW267-60008 SH 15.07
ae)	RCS-Warning Alarms	LDW267-60008 SH 16.00A
af)	RCS-Heater Caution Alarm	LDW267-60008 SH 16.01
ag)	RCS-Caution Alarm and PQMD Power & Display	LDW267-60008 SH 16.02
ah)	RCS-Thruster Quad Heaters R/R, L/R and S-Band Ant. Temperature Indication	LDW267-60008 SH 17.00



Cabin Location of RCS Controls and Indicators



RCS Controls and Indicators Layout



NOTE. NASA-ASSIGNED THRUSTER DESIGNATIONS ARE GIVEN PARENTHETICALLY.

RCS Thrusting Layout

SUBSYSTEM: REACTION CONTROL (FUNCTIONAL GROUPING 8)

Code	Control/Indicator	Function
8S7 8S9	MAIN SHUTOFF VALVE SWITCH: SYSTEM A MAIN SHUTOFF VALVE SWITCH: SYSTEM B (TWO 3-POSITION TOGGLES MOMENTARY-LOCK-MOMENTARY)	Each of these three-position toggles (OPEN-OFF-CLOSE) simultaneously actuates a pair of latch-type solenoid-operated fuel and oxidizer shutoff valves which control the flow of propellant downstream of the propellant tanks. These valves are normally open except for the following circumstances: (a) during the nominal lunar ascent burn these valves are closed by moving switches 8S7 and 8S9 to the CLOSE position prior to ascent engine ignition; ten seconds prior to ascent engine shutdown, these valves are reopened by moving 8S7 and 8S9 to the OPEN position. (b) If a malfunction exists in one of the systems (either "A" or "B"), propellant flow in the malfunctioning system can be interrupted by moving the appropriate toggle to the CLOSE position. These switches are locked in the OFF (center) position and momentarily held in the OPEN or CLOSE position. Positive feedback of the solenoid valve position is displayed by 8FL5 and 8FL7 for systems A & B respectively.
8S8 8S10 8S22	ASCENT FEED 1 SWITCH: SYSTEM A ASCENT FEED 1 SWITCH: SYSTEM B ASCENT FEED 2 SWITCH: SYSTEM A	Each of these three-position toggles (OPEN-OFF-CLOSE) actuates a pair of latch-type solenoid-operated fuel and oxidizer valves which enable the flow of propellant from the Ascent Propulsion tanks to the RCS manifolds. Each propellant line has a Primary (1) and a Secondary (2) solenoid-operated valve in series in order to insure shut-off of Ascent Propellant fluids at the completion of Interconnect operation. During normal RCS operation the Secondary valves are closed and the primary valves are open. During the nominal lunar ascent burn the Secondary valves are opened by moving switches 8S22 and 8S23 to the OPEN position prior to ascent engine ignition. Ten seconds prior to ascent engine shutdown either the Primary of Secondary or both sets of valves are closed by moving switches 8S8 and 8S10 or 8S22 and

SUBSYSTEM: REACTION CONTROL (FUNCTIONAL GROUPING 8)

Code	Control/Indicator	Function
8S23	ASCENT FEED 2 SWITCH: SYSTEM B (FOUR 3-POSITION TOGGLES MOMENTARY-LOCK-MOMENTARY)	8S23, or both sets, to the CLOSE position. Flag numbers 8FL6, 8FL8, 8FL18, and 8FL19 indicate the status of the two valves in series (Primary and Secondary) respectively of each propellant interconnect line.
	LGC THRUSTER PAIR CMDS	Each of the two-position toggle switches (ENABLE-DISABLE) have the following capabilities: 1. In the ENABLE position shall provide normal LGC command of jet firing. 2. In the DISABLE position shall: a. Provide signals to LGC to inhibit firing commands to the selected jets. b. Inhibit the CWEA and remove TCA failed indications by extinguishing RCS TCA warning lights and re-setting the quad TCA talkbacks. c. Provide switch status information for telemetry.
8S11	THRUSTER PAIR SWITCH, QUAD #1; SYSTEM A	
8S12	THRUSTER PAIR SWITCH, QUAD #2; SYSTEM A	
8S13	THRUSTER PAIR SWITCH, QUAD #1; SYSTEM B	
8S14	THRUSTER PAIR SWITCH, QUAD #2; SYSTEM B	
8S15	THRUSTER PAIR SWITCH, QUAD #3; SYSTEM A	
8S16	THRUSTER PAIR SWITCH, QUAD #4; SYSTEM A	
8S17	THRUSTER PAIR SWITCH, QUAD #3; SYSTEM B	
8S18	THRUSTER PAIR SWITCH, QUAD #4; SYSTEM B EIGHT 2-POSITION TOGGLES ENABLE-DISABLE	

SUBSYSTEM: REACTION CONTROL (FUNCTIONAL GROUPING 8)

Code	Control/Indicator	Function
8S19	TEMPERATURE/PRESSURE MONITOR SELECT SWITCH (4-POSITION ROTARY)	This four-position rotary (He-PRPLNT-FUEL MANF-OXID MANF) is used to select for monitoring, the pressures and temperatures of Systems A and B on indicators 8M1 and 8M2. In the H_e position, pressures of the helium tanks are displayed. In the PRPLNT position, the fuel and oxidizer tank pressures, as sensed at the helium regulator outlet, and the bulk propellant temperature, as sensed in the fuel tank, are displayed. The System A and B fuel and oxidizer manifold pressures are displayed on 8M1 in the FUEL MANF and OXID MANF positions respectively. In these two positions the temperature pointers on 8M2 will deflect to the lowest graduation mark since manifold temperatures are not sensed.
8S20	CROSSFEED SWITCH (3-POSITION TOGGLE MOMENTARY-LOCK-MOMENTARY)	This three-position toggle (OPEN-OFF-CLOSE) controls two latch-type, solenoid-operated fuel and oxidizer valves located in a crossfeed piping arrangement between System A and System B. These solenoid valves are normally closed except when the feed section of either System A or System B malfunctions (upstream of the main shutoff valves) requiring closure of the appropriate main shutoff valves. The crossfeed valves are then opened by moving 8S20 to the OPEN position. This permits fuel and oxidizer to flow through the operative feed section to the thrust chambers of both systems. 8FL17 indicates the status of the crossfeed valves.

SUBSYSTEM: REACTION CONTROL (FUNCTIONAL GROUPING 8)

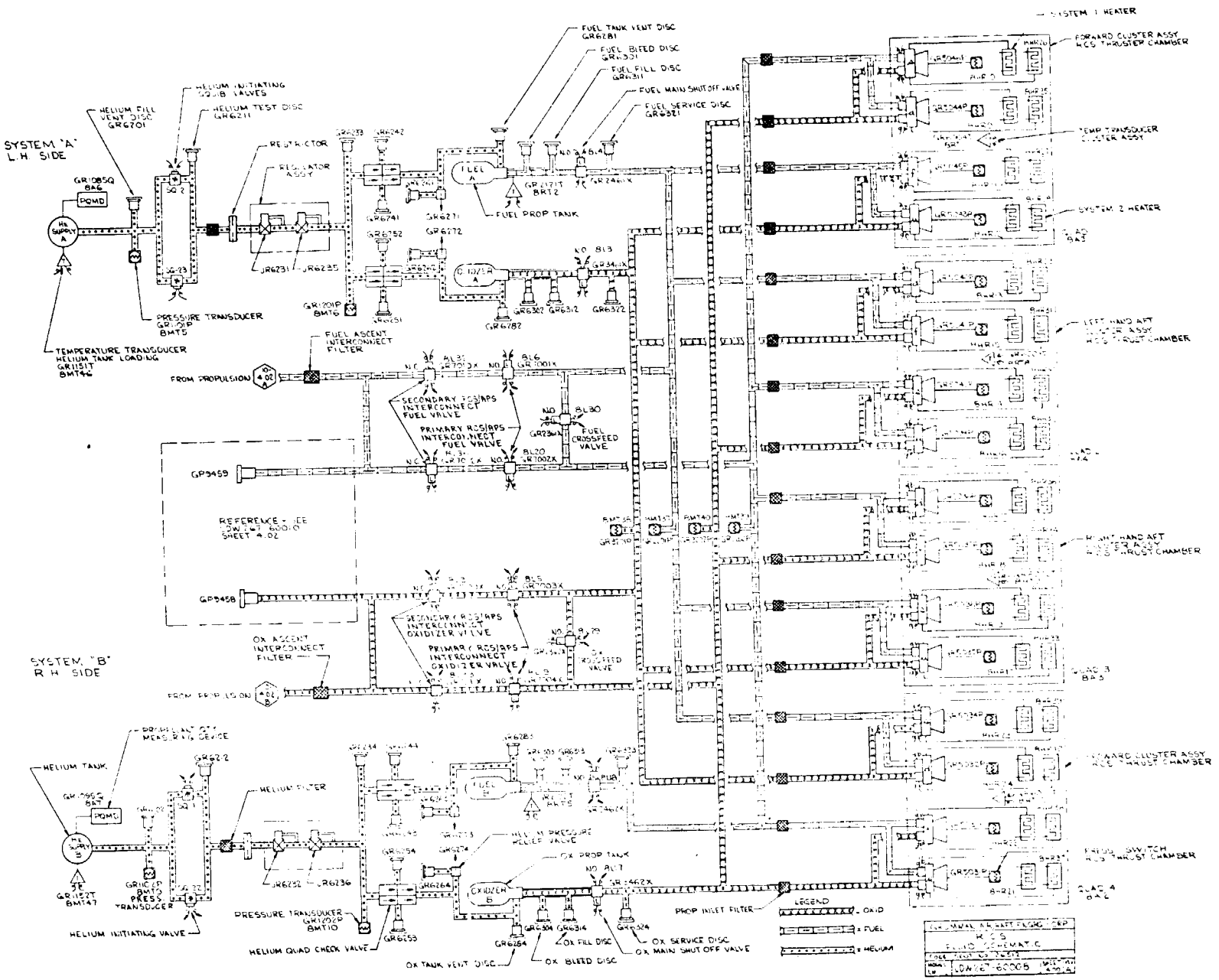
Code	Control/Indicator	Function
8M1	PRESSURE INDICATOR, SYSTEMS A & B	This indicator displays the pressures in the helium tanks or at the outlet of the helium pressure regulators just upstream of the propellant tanks, or in the fuel or oxidizer manifolds of system A and B, as selected by 8S19.
8M2	TEMPERATURE INDICATOR, SYSTEMS A & B	This indicator displays the temperatures in the fuel tanks of systems A and B as selected by 8S19.
8M4	QUANTITY INDICATOR, SYSTEMS A & B	This indicator displays the Propellant Quantity remaining in system A and System B continuously.
8FL5 8FL7	MAIN SHUTOFF VALVE STATUS; SYSTEM A MAIN SHUTOFF VALVE STATUS; SYSTEM B (TWO 2-POSITION FLAGS)	Each of these two-position flags (GREY-BARBERPOLE) indicates the open (GREY) or closed (BARBERPOLE) status of its respective pair of latch-type solenoid-operated fuel and oxidizer valves as controlled by 8S7 and 8S9.
8FL6 8FL8 8FL18 8FL19	ASCENT FUEL STATUS; SYSTEM A ASCENT FUEL STATUS; SYSTEM B ASCENT OXIDIZER STATUS; SYSTEM A ASCENT OXIDIZER STATUS; SYSTEM B (FOUR 2-POSITION FLAGS)	Each of these two-position flags (GREY-BARBERPOLE) indicates the OPEN (GREY) or CLOSED (BARBERPOLE) status respectively of each of the four ascent propellant interconnect lines (two oxidizer and two fuel). If either one or both of the solenoid valves in a single fuel or oxidizer line are closed, the appropriate flag indicates closed. When both solenoid valves in the line are open the flag indicates open.

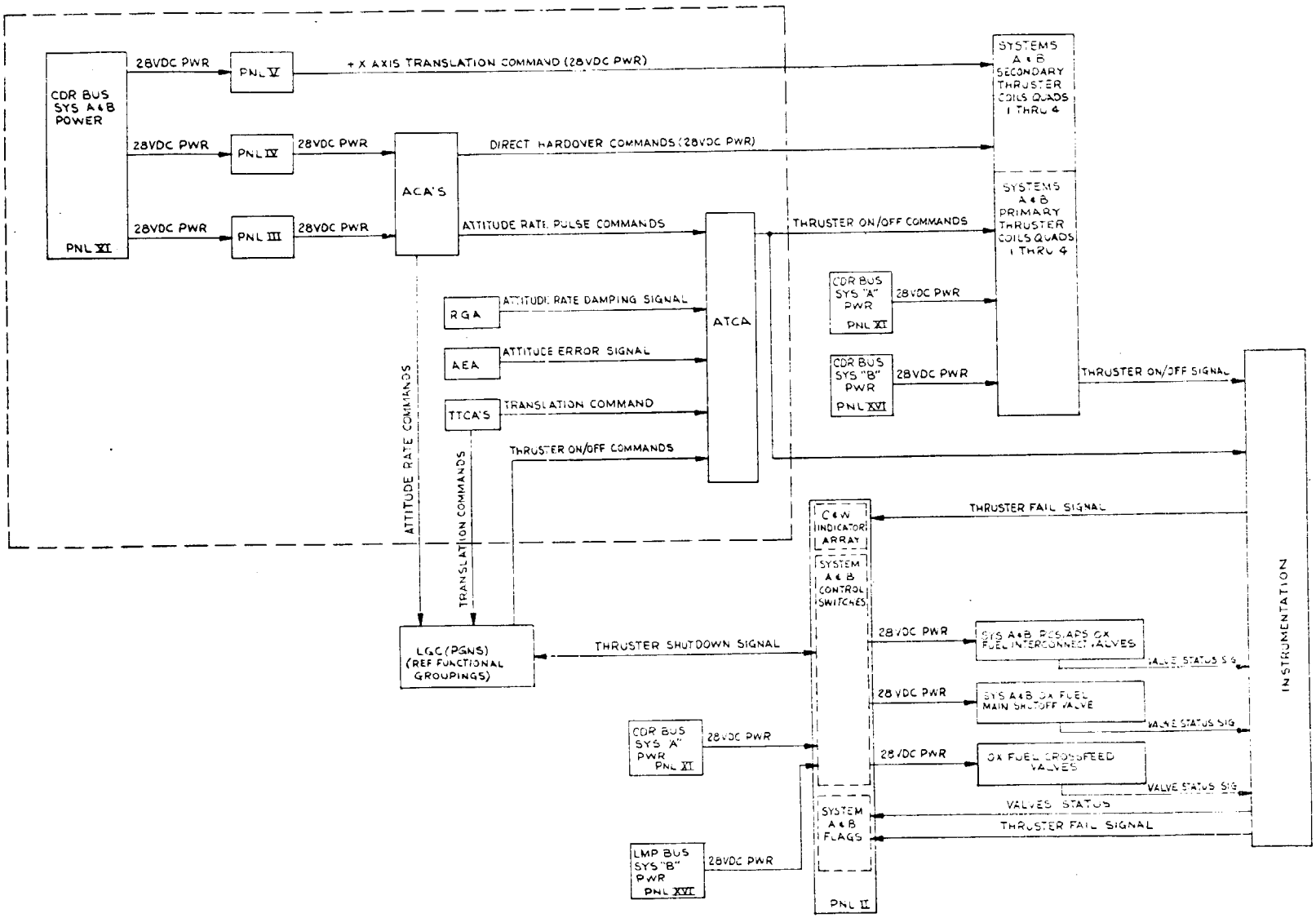
SUBSYSTEM: REACTION CONTROL (FUNCTIONAL GROUPING 8)

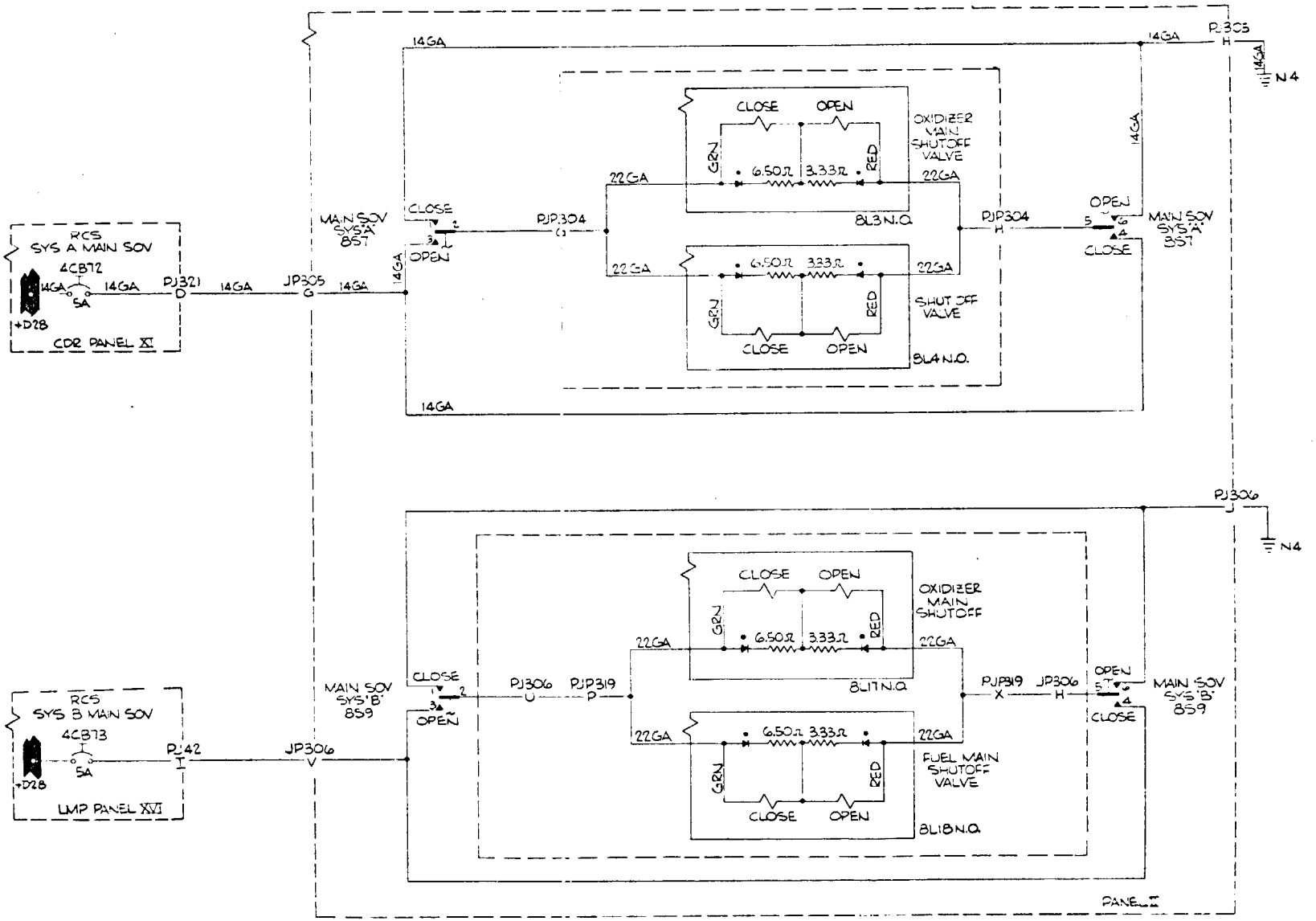
Code	Control/Indicator	Function
8FL9 8FL10 8FL11 8FL12 8FL13 8FL14 8FL15 8FL16	LGC THRUSTER PAIR CMD STATUS, QUAD #1; SYSTEM A LGC THRUSTER PAIR CMD STATUS, QUAD #2; SYSTEM A LGC THRUSTER PAIR CMD STATUS, QUAD #1; SYSTEM B LGC THRUSTER PAIR CMD STATUS, QUAD #2; SYSTEM B LGC THRUSTER PAIR CMD STATUS, QUAD #3; SYSTEM A LGC THRUSTER PAIR CMD STATUS, QUAD #4; SYSTEM A LGC THRUSTER PAIR CMD STATUS, QUAD #3; SYSTEM B LGC THRUSTER PAIR CMD STATUS, QUAD #4; SYSTEM B (EIGHT 3-POSITION FLAGS)	Each of these flags (GREY-BARBERPOLE-RED) normally indicates the enable (GREY) or disable (BARBERPOLE) status of the associated pair of LGC commands. (These commands control engine firing.) The eight flags also incorporate a third (RED) position which serves to localize a failure to TCA pair in either system.
8FL17	CROSSFEED STATUS (2-POSITION FLAG)	This two-position flag (GREY-BARBERPOLE) indicates the open (GREY) or closed (BARBERPOLE) status of the latch-type solenoid-operated fuel and oxidizer crossfeed valves as controlled by 8S20.

SUBSYSTEM: REACTION CONTROL (FUNCTIONAL GROUPING 8)

Code	Control/Indicator	Function
18S4 18S5 18S6 18S7	RCS QUAD 1 HEATER SWITCH RCS QUAD 2 HEATER SWITCH RCS QUAD 3 HEATER SWITCH RCS QUAD 4 HEATER SWITCH (FOUR 3-POSITION TOGGLES MAIN-MAIN-MAIN)	Each of these switches (AUTO-OFF-MAN) controls the system 2 heaters within one Quad of RCS engines. The AUTO position provides system 2 automatic temperature control of each engine in a Quad. The OFF position interrupts power to the heaters of system 2 in the respective Quad. The MAN position bypasses the automatic control and turns the heaters on continuously. The temperature of a Quad may be monitored by selecting the appropriate position on 18S10 and reading the value displayed on 18M1. Note that a redundant heater system 1 also controls the RCS engine temperatures automatically. There are no manual overrides to System 1 operation except OFF, which can be accomplished by opening the system 1 circuit breakers. The automatic temperature control will maintain engine injector temperatures at 120°F.
18S10	TEMPERATURE MONITOR SELECT SWITCH (7-POSITION ROTARY)	This seven-position rotary (RADAR: RNDZ-LDG; RCS: QUAD 1 - QUAD 2-QUAD 3-QUAD 4; COMM: S-BAND) selects the rendezvous or landing radar antenna assembly, the RCS quads, or the S-Band antenna assembly for temperature monitoring.
18M1	TEMPERATURE INDICATOR	This indicator displays the temperature, in degrees Fahrenheit, of the radar antenna assemblies or RCS quads or S-Band antenna assembly as selected by switch 18S10.
16DS96	RCS PRESS IND (8M1) POWER FAILURE LIGHT	SEE EFD16-1005.4
16DS98	RCS QUANTITY IND (8M4) POWER FAILURE LIGHT	SEE EFD16-1005.4


SYSTEM "A"
L.H. SIDE
SYSTEM "B"
R.H. SIDE
HELIUM FILL VENT DISC GR6701
HELIUM INITIATING SOLENOID VALVES
HELIUM TEST DISC GR6211
REGULATOR
REGULATOR ASSY
PRESSURE TRANSDUCER GR1015P BMT5
TEMPERATURE TRANSDUCER HELIUM TANK LOADING GR1151T BMT4C
FUEL TANK VENT DISC GR6781
FUEL BLEED DISC GR6301
FUEL FILL DISC GR6311
FUEL MAIN SHUT OFF VALVE
FUEL SERVICE DISC GR6321
FUEL PROP TANK
FUEL ASCENT INTERCONNECT FILTER
FROM PROPULSION
SECONDARY RCS/APS INTERCONNECT FUEL VALVE
PRIMARY RCS/APS INTERCONNECT FUEL VALVE
FUEL CROSSFEED VALVE
REFERENCE SEE DWG NO 60010 SHEET 4.02
OX ASCENT INTERCONNECT FILTER
SECONDARY RCS/APS INTERCONNECT OXIDIZER VALVE
PRIMARY RCS/APS INTERCONNECT OXIDIZER VALVE
OX CROSSFEED VALVE
HELIUM TANK
PROPELLANT QTY MEASURING DEVICE
HELIUM FILTER
PRESS TRANSDUCER GR1012T BMT7
HELIUM INITIATING VALVE
PRESSURE TRANSDUCER GR1002P BMT10
HELIUM QUAD CHECK VALVE
HELIUM PRESSURE RELIEF VALVE
OX PROP TANK
OX TANK VENT DISC
OX BLEED DISC
OX FILL DISC
OX SERVICE DISC
OX MAIN SHUT OFF VALVE
PROP INLET FILTER
SYSTEM 1 HEATER
SYSTEM 2 HEATER
FORWARD CLUSTER ASSY
TEMP TRANSDUCER CLUSTER ASSY
LEFT HAND AFT CLUSTER ASSY
RIGHT HAND AFT CLUSTER ASSY
FORWARD CLUSTER ASSY
PRESS SWITCH
LEGEND
OXID
FUEL
HELIUM


CDR BUS SYS A&B POWER
PNL XI
28VDC PWR
PNL V
+X AXIS TRANSLATION COMMAND (28VDC PWR)
28VDC PWR
PNL IV
28VDC PWR
ACA'S
DIRECT HARDOVER COMMANDS (28VDC PWR)
28VDC PWR
PNL III
28VDC PWR
ATTITUDE RATE PULSE COMMANDS
SYSTEMS A&B SECONDARY THRUSTER COILS QUADS 1 THRU 4
SYSTEMS A&B PRIMARY THRUSTER COILS QUADS 1 THRU 4
THRUSTER ON/OFF COMMANDS
RGA
ATTITUDE RATE DAMPING SIGNAL
AEA
ATTITUDE ERROR SIGNAL
TTCA'S
TRANSLATION COMMAND
THRUSTER ON/OFF COMMANDS
ATCA
CDR BUS SYS "A" PWR
PNL XI
28VDC PWR
CDR BUS SYS "B" PWR
PNL XVI
28VDC PWR
THRUSTER ON/OFF SIGNAL
ATTITUDE RATE COMMANDS
TRANSLATION COMMANDS
C&W INDICATOR ARRAY
THRUSTER FAIL SIGNAL
SYSTEM A&B CONTROL SWITCHES
LGC (PGNS) (REF FUNCTIONAL GROUPINGS)
THRUSTER SHUTDOWN SIGNAL
28VDC PWR
SYS A&B RCS, APS OX FUEL INTERCONNECT VALVES
VALVE STATUS SIG
28VDC PWR
SYS A&B OX FUEL MAIN SHUTOFF VALVE
VALVE STATUS SIG
28VDC PWR
OX FUEL CROSSFEED VALVES
VALVE STATUS SIG
CDR BUS SYS "A" PWR
PNL XI
28VDC PWR
VALVES STATUS
SYSTEM A&B FLAGS
THRUSTER FAIL SIGNAL
LMP BUS SYS "B" PWR
PNL XVI
28VDC PWR
PNL II
INSTRUMENTATION

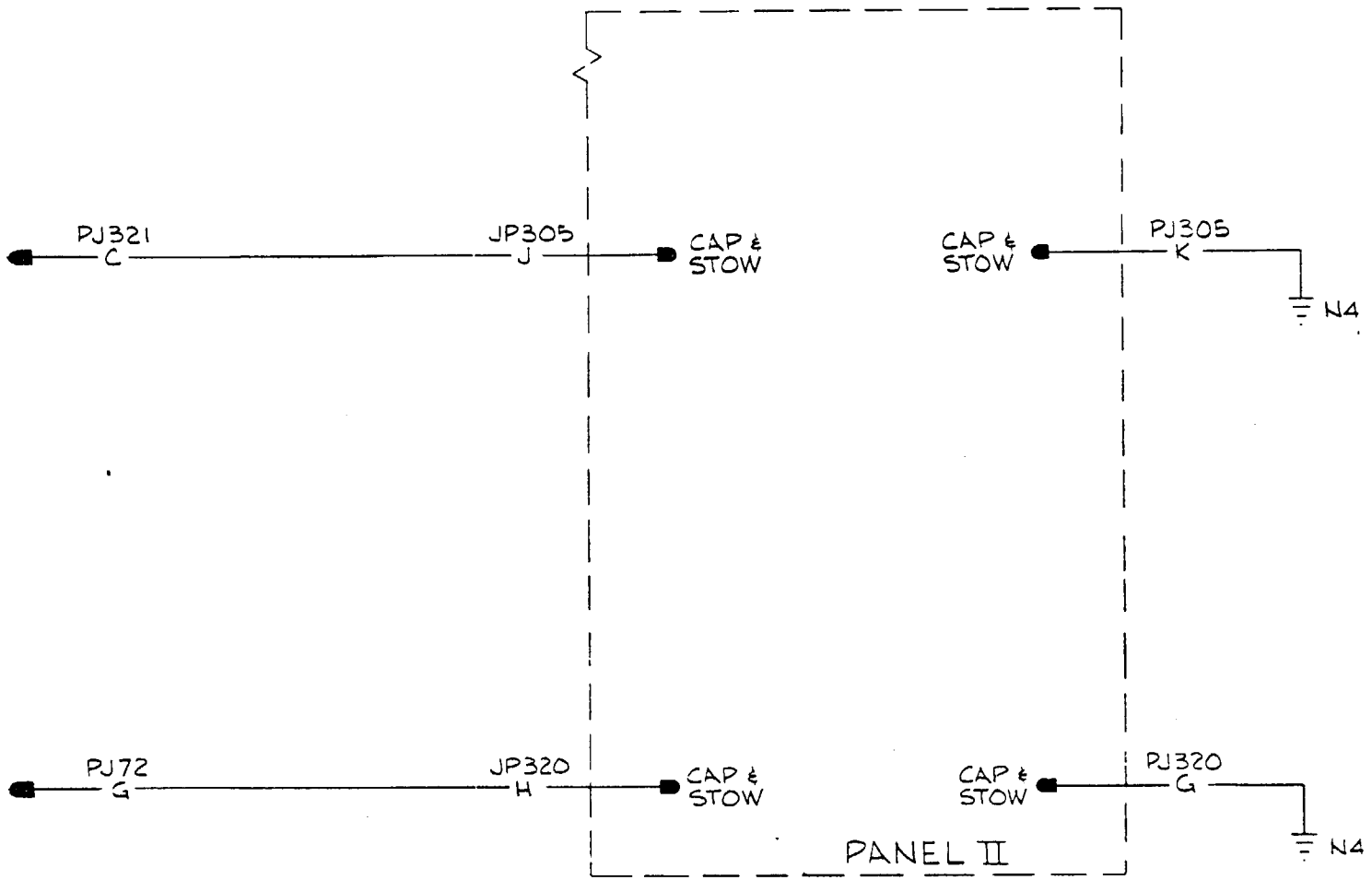


ALL WIRE IS 16 GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGRG CORP

RCS MAIN SHUTOFF VALVES EXISTING A & B

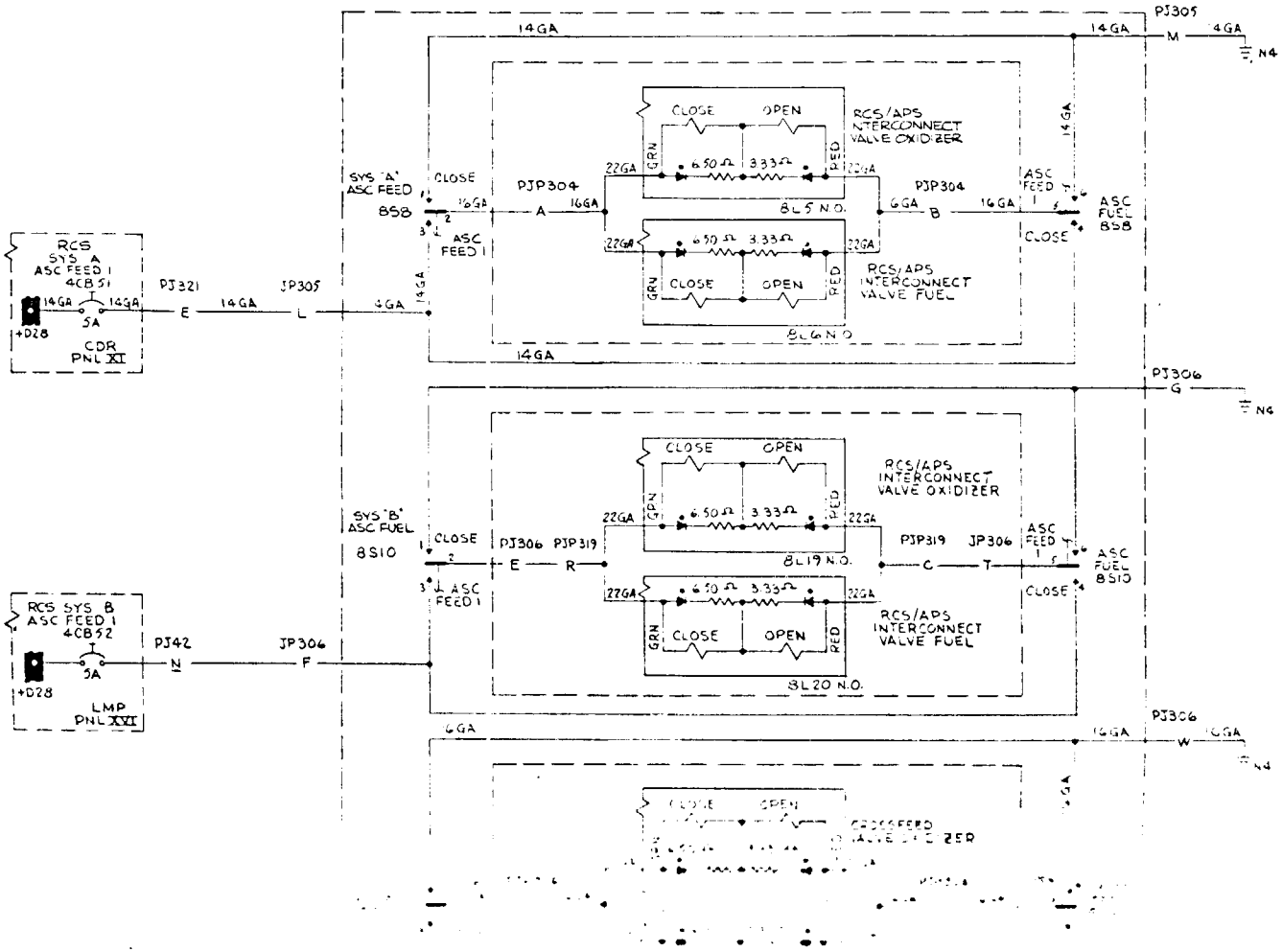
LOMS

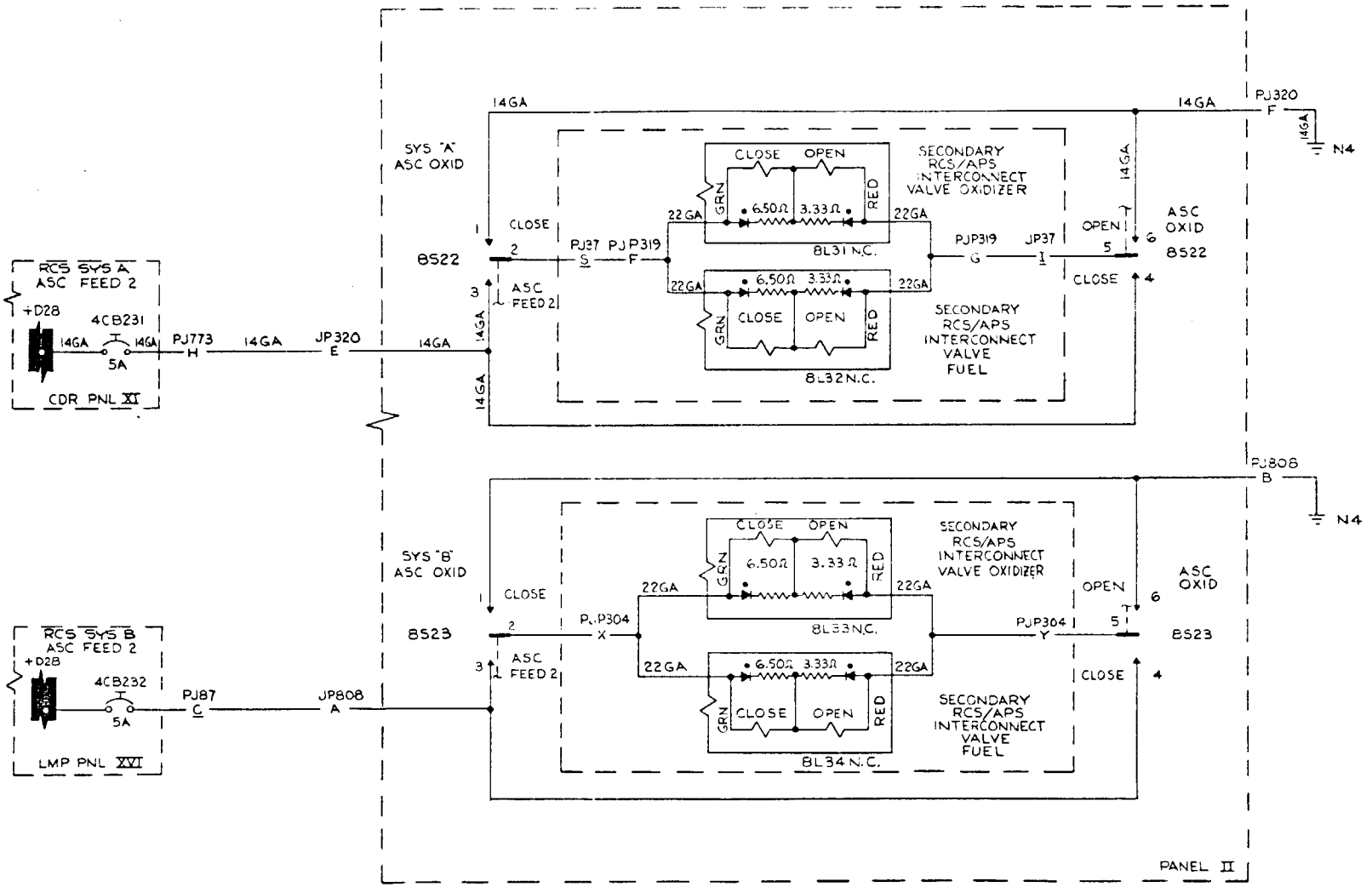


THIS SHEET FOR LM-[illegible] ONLY

ALL WIRE IS 14 GA UNLESS OTHERWISE NOTED.

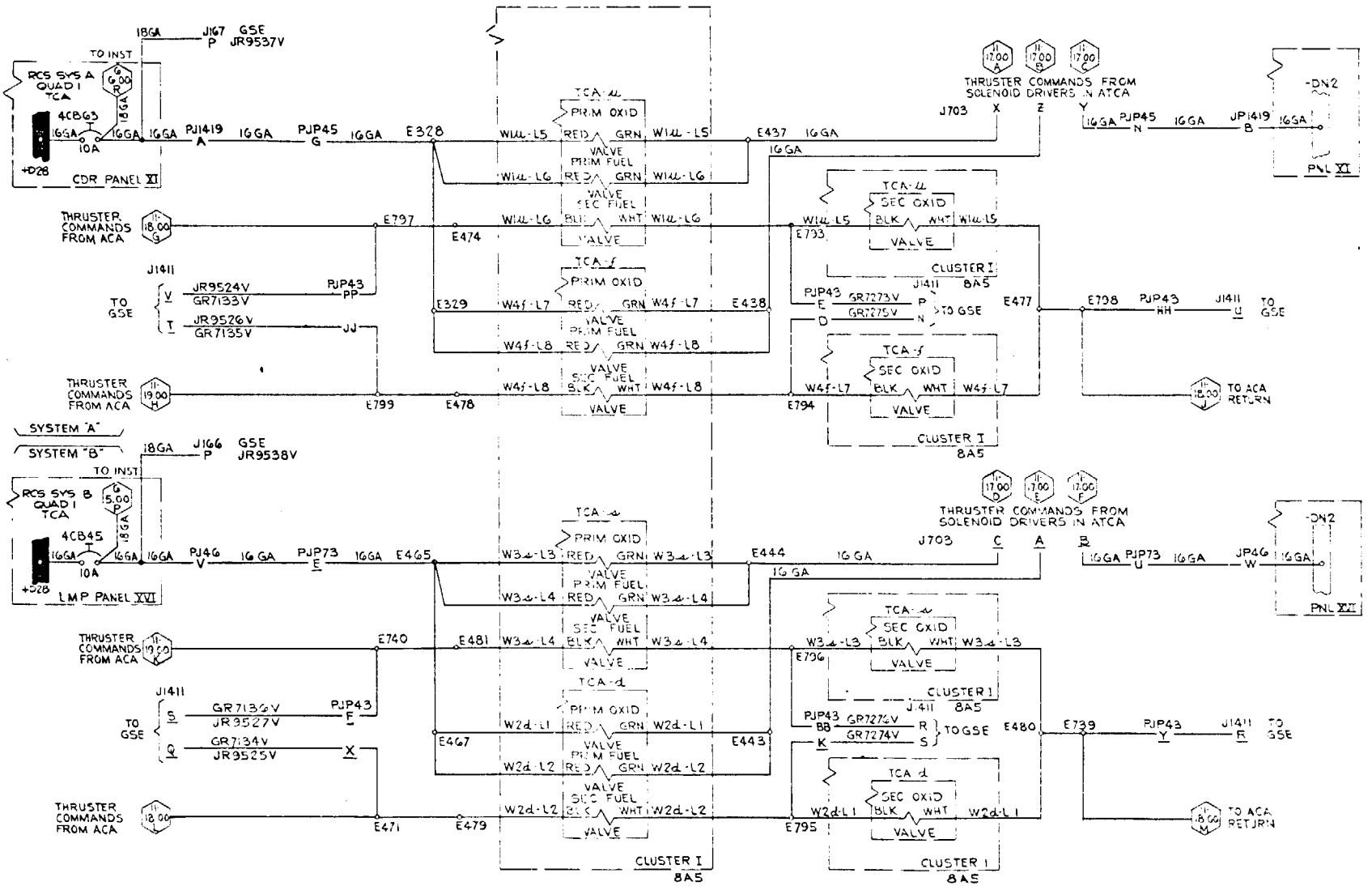
[illegible] GRUMMAN AIRCRAFT ENGINEERING CORP
[illegible] CS - SPARE WIRES
[illegible] EFT IN LM-10 VEHICLE
[illegible] CODE IDENT NO.
[illegible] W267-603 [illegible]

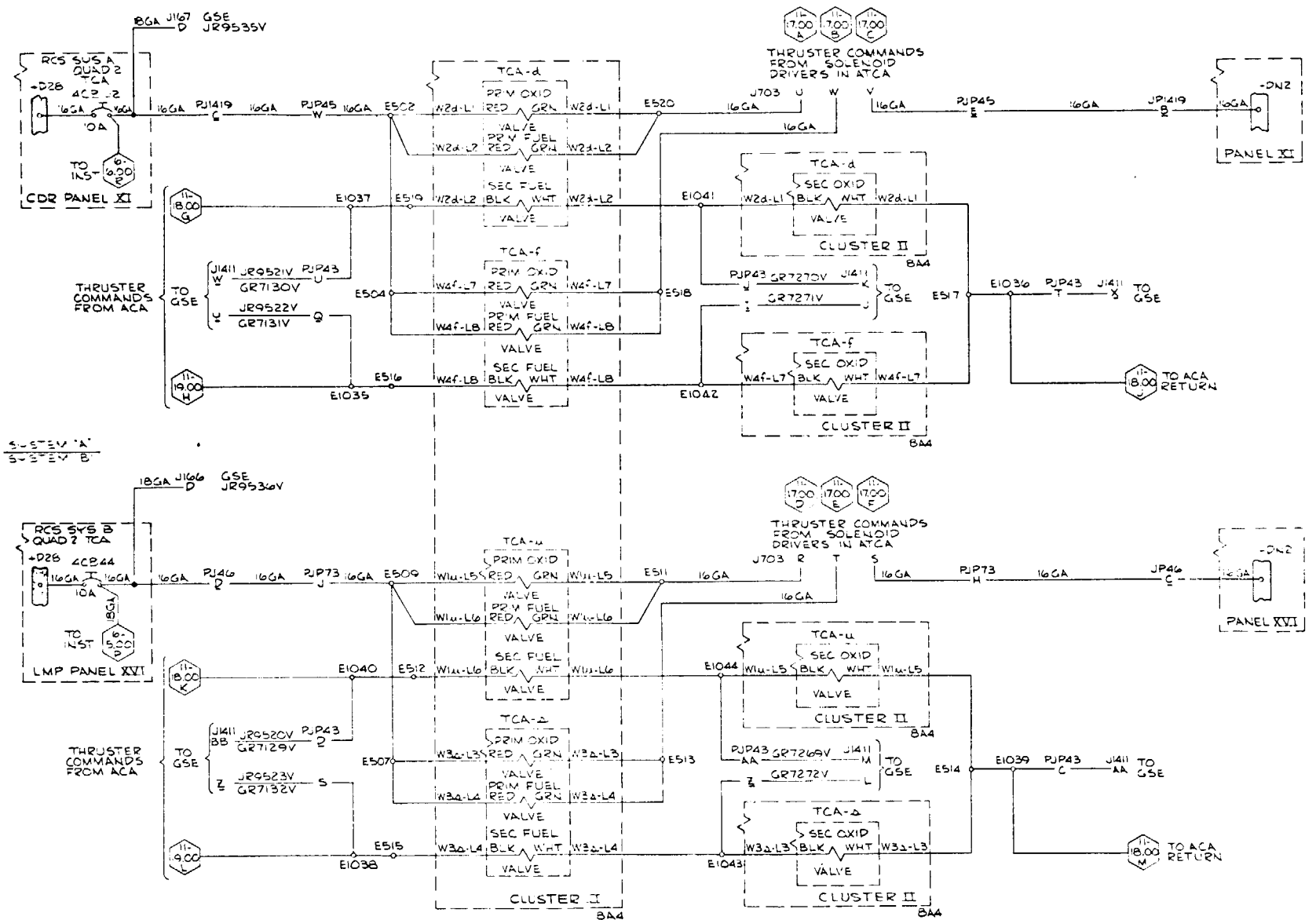

RCS
SYS A
ASC FEED 1
4CB51
14GA
14GA
5A
+D28
CDR
PNL XI
PJ321
E
14GA
JP305
L
6GA
14GA
SYS 'A'
ASC FEED
8S8
CLOSE
1
2
3
ASC
FEED 1
16GA
PJP304
A
16GA
CLOSE
OPEN
RCS/APS
INTERCONNECT
VALVE OXIDIZER
GRN
RED
22GA
650Ω
333Ω
8L5 N.O.
8L6 N.C.
RCS/APS
INTERCONNECT
VALVE FUEL
PJP304
B
6GA
16GA
ASC
FEED 1
ASC
FUEL
8S8
14GA
PJ305
M
4GA
N4
PJ306
G
N4
SYS 'B'
ASC FUEL
8S10
PJ306
E
PJP319
R
8L19 N.O.
PJP319
C
JP306
T
ASC
FEED 1
ASC
FUEL
8S10
8L20 N.O.
RCS SYS B
ASC FEED 1
4CB52
5A
+D28
LMP
PNL XVII
PJ42
N
JP306
F
6GA
16GA
PJ306
W
16GA
N4

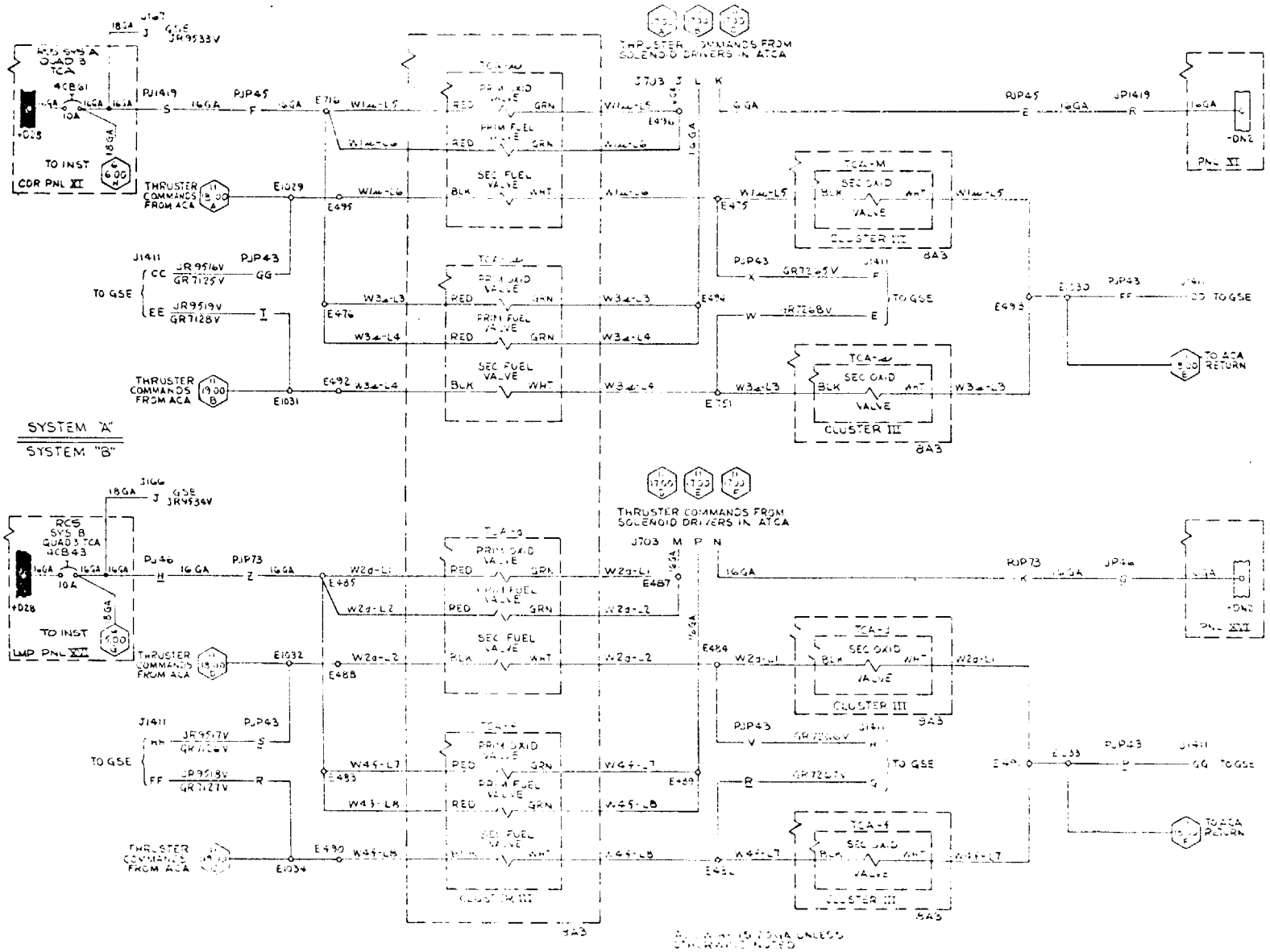


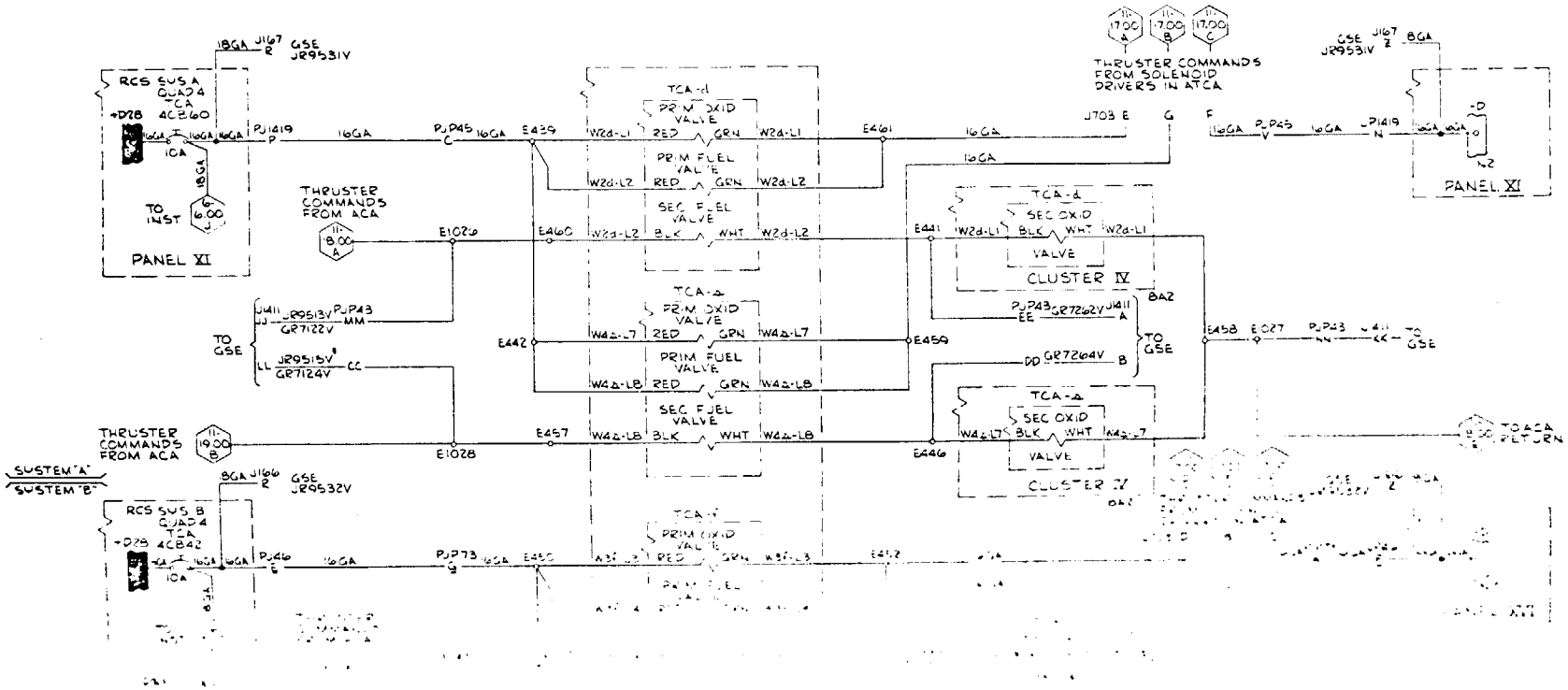
ALL WIRE IS 16 GA UNLESS
OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGRG CORP

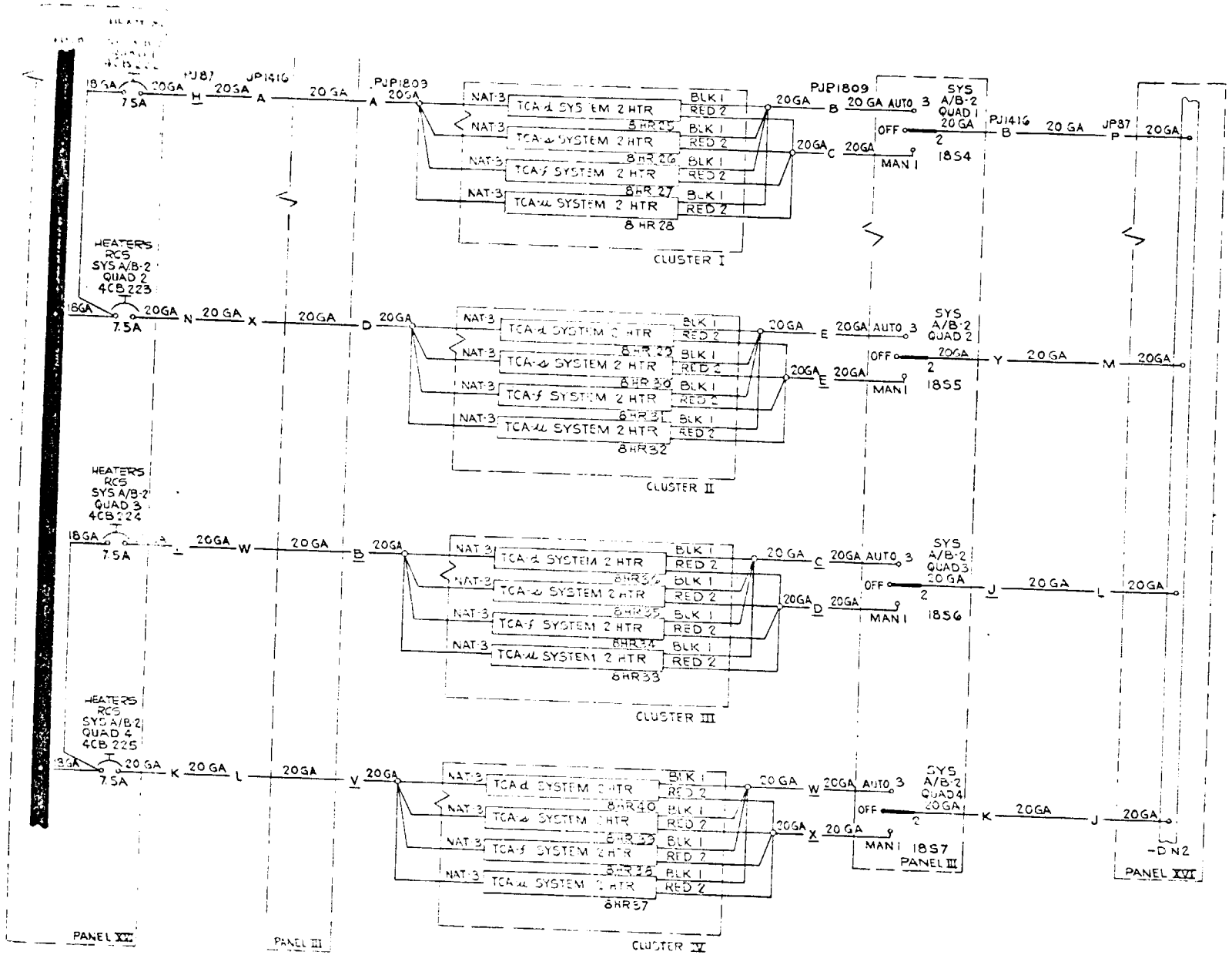

SYSTEM "A"
SYSTEM "B"
18GA J167 GSE P JR9537V
TO INST
RCS SYS A QUAD I TCA
4CB63
10A
+D28
CDR PANEL XI
PJ1419 A
PJP45 G
E328
E437
THRUSTER COMMANDS FROM SOLENOID DRIVERS IN ATCA
J703 X Z Y
PJP45 N
JP1419 B
-DN2
PNL XI
TCA-u
PRIM OXID VALVE
PRIM FUEL VALVE
SEC FUEL VALVE
SEC OXID VALVE
CLUSTER I 8A5
THRUSTER COMMANDS FROM ACA
E797
E474
E793
E733
J1411 V JR9524V GR7133V PJP43 PP
J1411 T JR9526V GR7135V JJ
TCA-f
E329
E438
E477
E708
PJP43 HH
J1411 U
TO GSE
PJP43 E GR7273V P
PJP43 D GR7275V N
THRUSTER COMMANDS FROM ACA
E799
E478
E794
TO ACA RETURN
18GA J166 GSE P JR9538V
RCS SYS B QUAD I TCA
4CB45
LMP PANEL XVI
PJ46 V
PJP73 E
E465
E444
PJP73 U
JP46 W
PNL XVI
TCA-a
TCA-d
E740
E481
E796
E480
E739
J1411 S GR7136V JR9527V PJP43 F
J1411 Q GR7134V JR9525V X
PJP43 BB GR7276V R
PJP43 K GR7274V S
TO GSE
E467
E443
E471
E479
E795
PJP43 Y
J1411 R
TO ACA RETURN
ALL WIRE IS 20 GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
RCS THRUST CHAMBER ASSEMBLY VALVES QUAD I SYSTEMS "A" & "B"
MODEL LDW727-60008
SHEET REV 200


SYSTEM A
SYSTEM B
RCS SYS A QUAD 2 TCA
RCS SYS B QUAD 2 TCA
CDR PANEL XI
LMP PANEL XVI
PANEL XI
PANEL XVI
THRUSTER COMMANDS FROM ACA
THRUSTER COMMANDS FROM SOLENOID DRIVERS IN ATCA
TO GSE
TO ACA RETURN
TO INST
TCA-d
TCA-f
TCA-u
TCA-a
PRIM OXID VALVE
PRIM FUEL VALVE
SEC FUEL VALVE
SEC OXID VALVE
CLUSTER I
CLUSTER II
ALL WIRE IS 20GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
RCS THRUST CHAMBER ASSEMBLY VALVES QUAD 2 SYSTEM A & B
CODE IDENT NO 22532
MODEL LDW267-60003


SYSTEM "A"
SYSTEM "B"
THRUSTER COMMANDS FROM SOLENOID DRIVERS IN ATCA
TO GSE
TO ACA RETURN
TO INST
CDR PNL XI
LMP PNL XII
CLUSTER III
TCA-M
TCA-J
TCA-K
TCA-L
SEC OXID VALVE
PRIM OXID VALVE
PRIM FUEL VALVE
SEC FUEL VALVE
RED
GRN
BLK
WHT
-DN2
+D28
10A
16GA
18GA
8A3

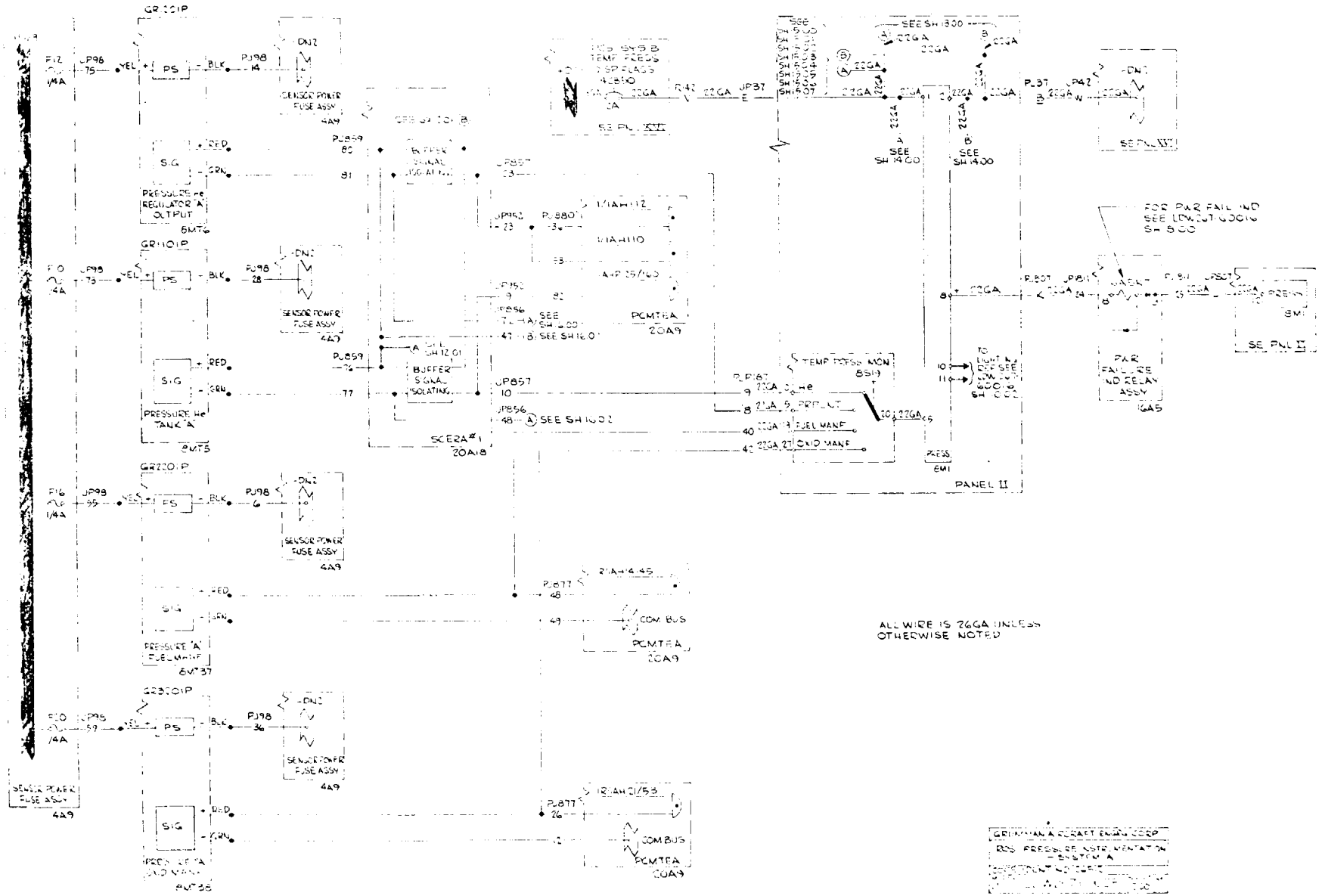

THRUSTER COMMANDS FROM SOLENOID DRIVERS IN ATCA
RCS SUS A QUAD 4 TCA 4CB160
PANEL XI
THRUSTER COMMANDS FROM ACA
TO INST
TO GSE
TCA-1
PRIM OXID VALVE
PRIM FUEL VALVE
SEC FUEL VALVE
TCA-2
SEC OXID VALVE
CLUSTER IV
TCA-3
CLUSTER V
TO ACA RETURN
SYSTEM "A"
SYSTEM "B"
RCS SUS B QUAD 4 TCA 4CB142
PANEL XII

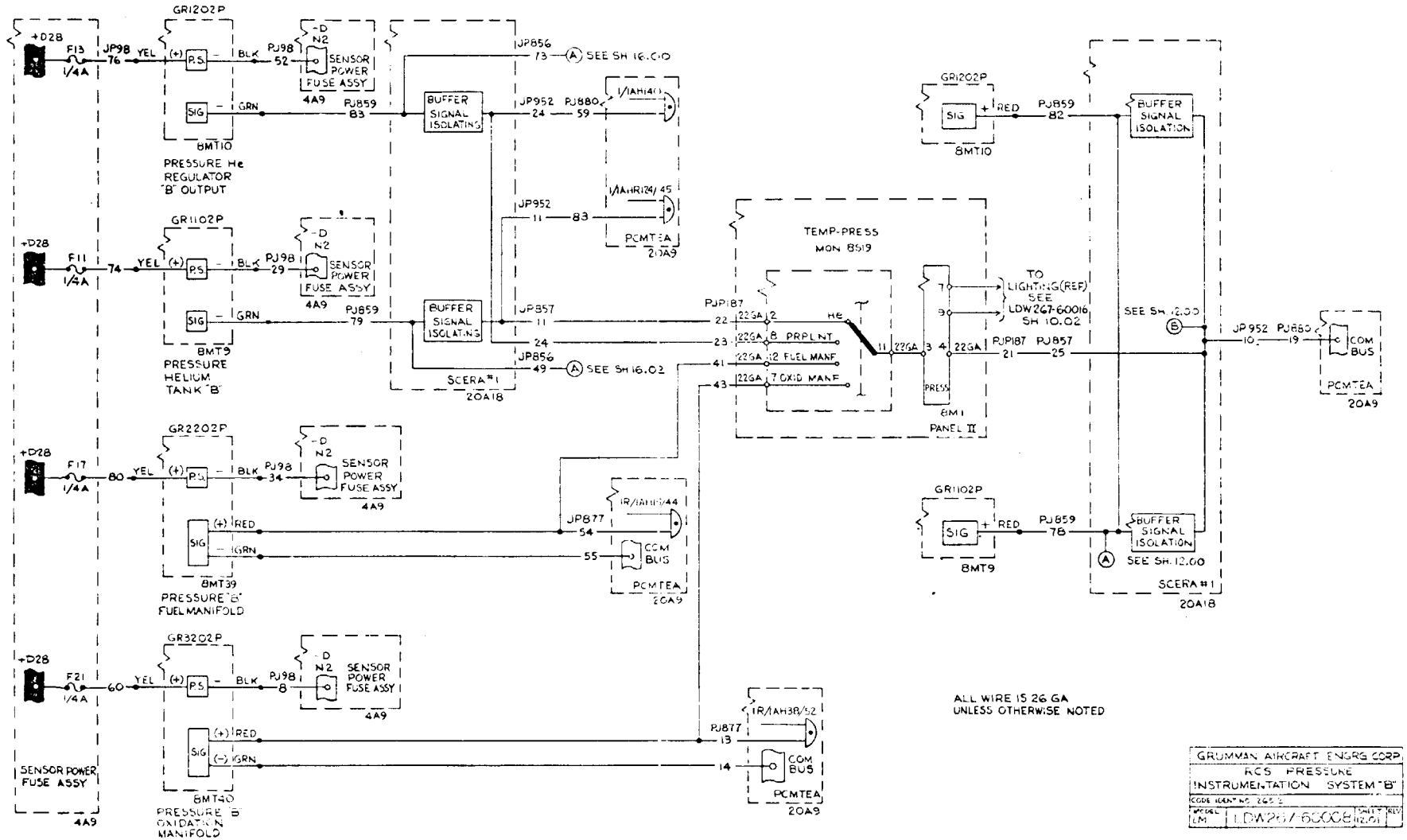
HEATERS RCS SYS A/B-1 QUAD 1 4CB218
HEATERS RCS SYS A B-1 QUAD 2 4CB219
HEATERS RCS SYS A/B-1 QUAD 3 4CB220
HEATERS RCS SYS A/B-1 QUAD 4 4CB221
8GA
20GA
7.5A
+32B
PJ99
PJP89
CC
M
U
A
EE
C
X
E
20GA
NAT-5
BLK-4
TCA d SYSTEM I HEATER 8HR9
TCA a SYSTEM I HEATER 8HR10
TCA f SYSTEM I HEATER 8HR11
TCA w SYSTEM I HEATER 8HR12
TCA o SYSTEM I HEATER 8HR13
TCA a SYSTEM I HEATER 8HR14
TCA f SYSTEM I HEATER 8HR15
TCA w SYSTEM I HEATER 8HR16
TCA d SYSTEM I HEATER 8HR20
TCA a SYSTEM I HEATER 8HR19
TCA f SYSTEM I HEATER 8HR18
TCA w SYSTEM I HEATER 8HR17
TCA d SYSTEM I HEATER 8HR24
TCA a SYSTEM I HEATER 8HR23
TCA w SYSTEM I HEATER 8HR21
CLUSTER I
CLUSTER II
CLUSTER III
L
B
D
F
JP99
DD
V
W
Y



ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.

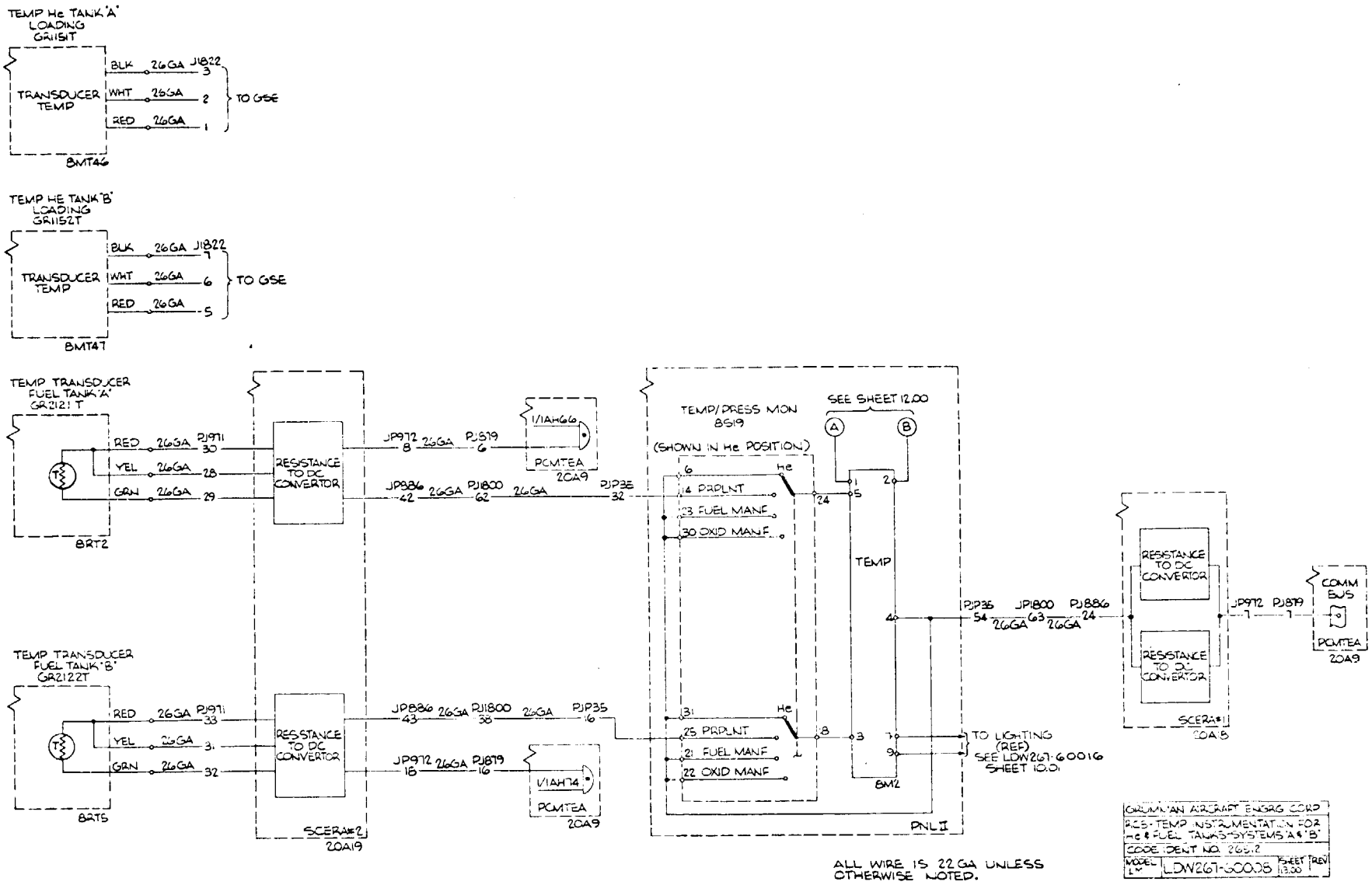
GRUMMAN AIRCRAFT ENGRG CORP
RCS CLUSTER HEATERS SYSTEM "2"
LDW207-60008

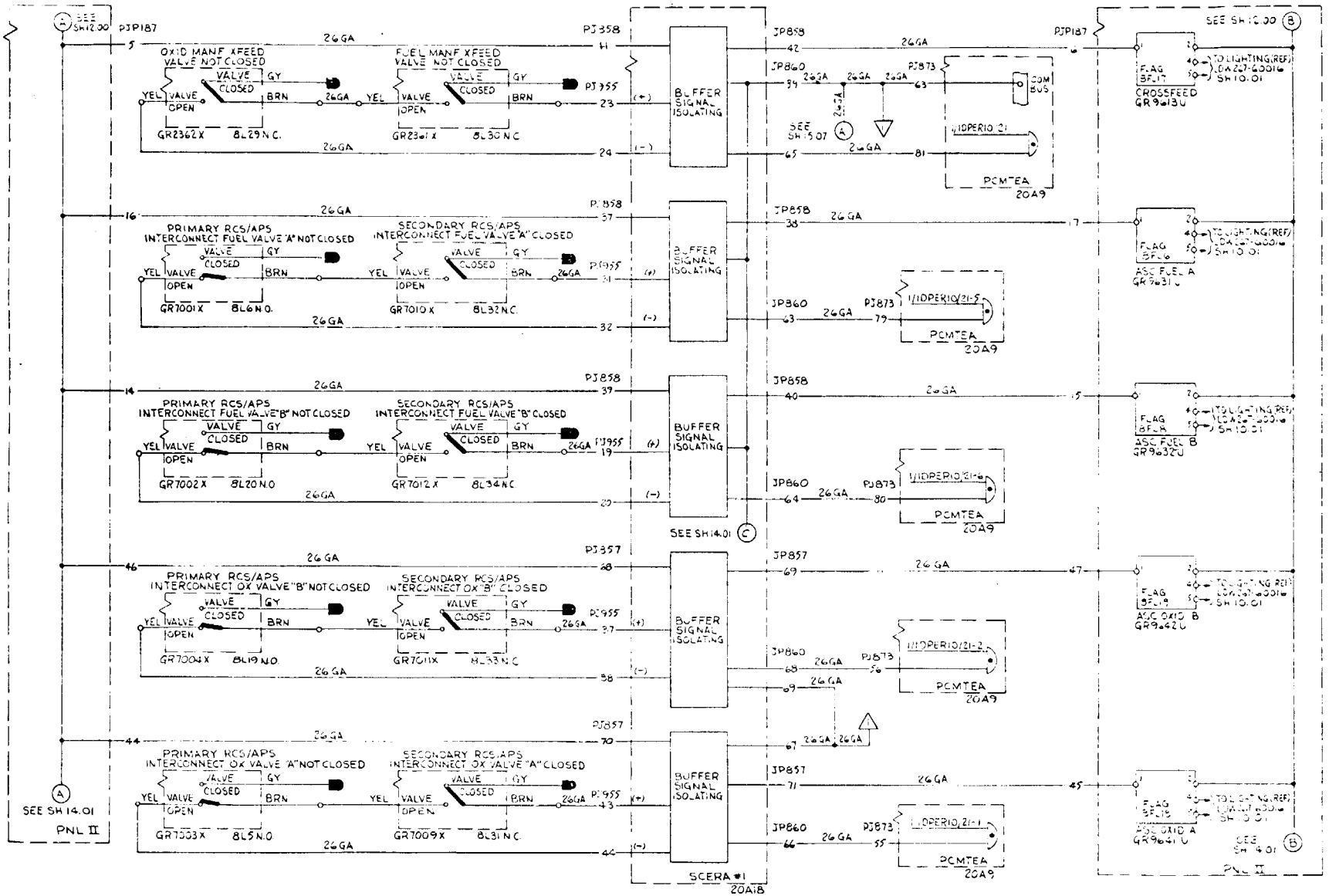

GR201P
GR101P
GR201P
GR301P
SENSOR POWER FUSE ASSY 4A9
PRESSURE He REGULATOR 'A' OUTPUT 8MT6
PRESSURE He TANK 'A' 8MT5
PRESSURE 'A' FUEL MANF 8MT37
PRESS 'A' OXID MANF 8MT38
BUFFER SIGNAL ISOLATING
SCERA #1 20A18
PCMTRA 20A9
COM BUS
TEMP PRESS MON BSP
PANEL II
PAR FAILURE IND RELAY ASSY 16A5
FOR PAR FAIL IND SEE LOW OUTGOING SH 500
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED
GRUMMAN AEROSPACE CORP
ROS PRESSURE INSTRUMENTATION SYSTEM A

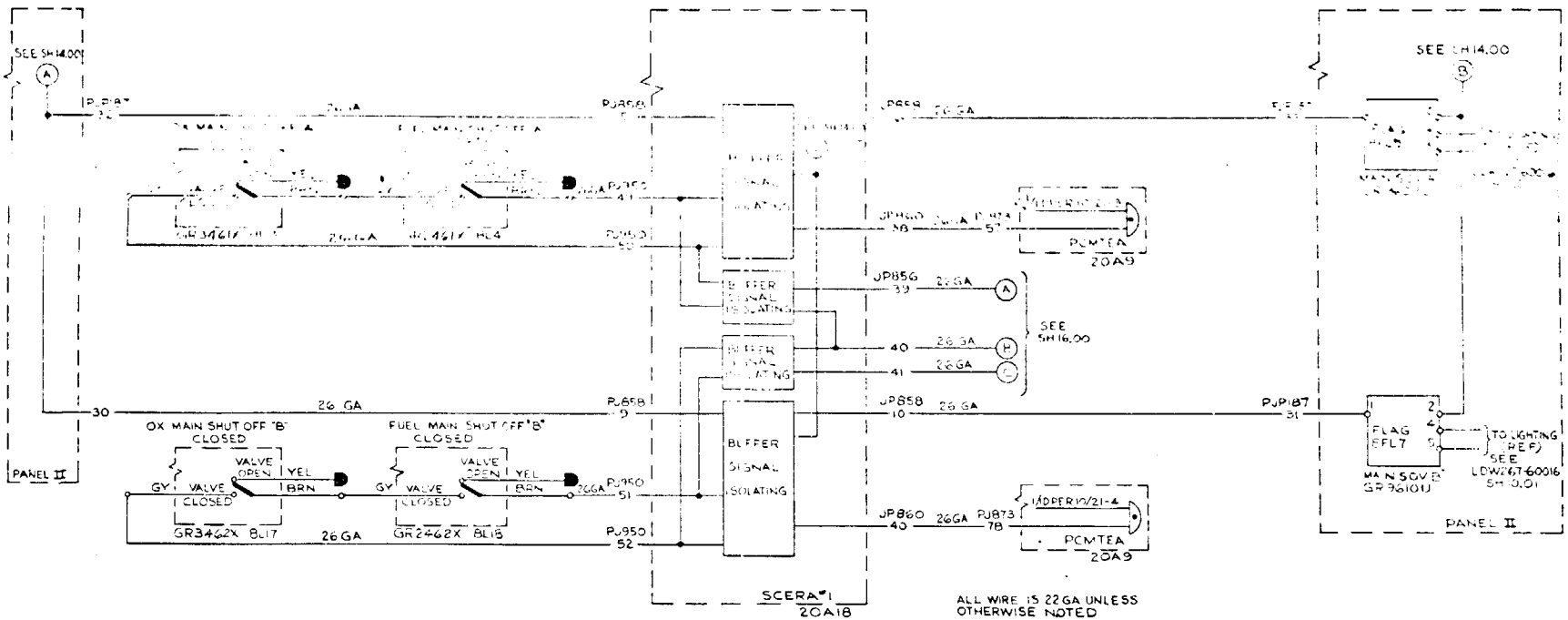


ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED

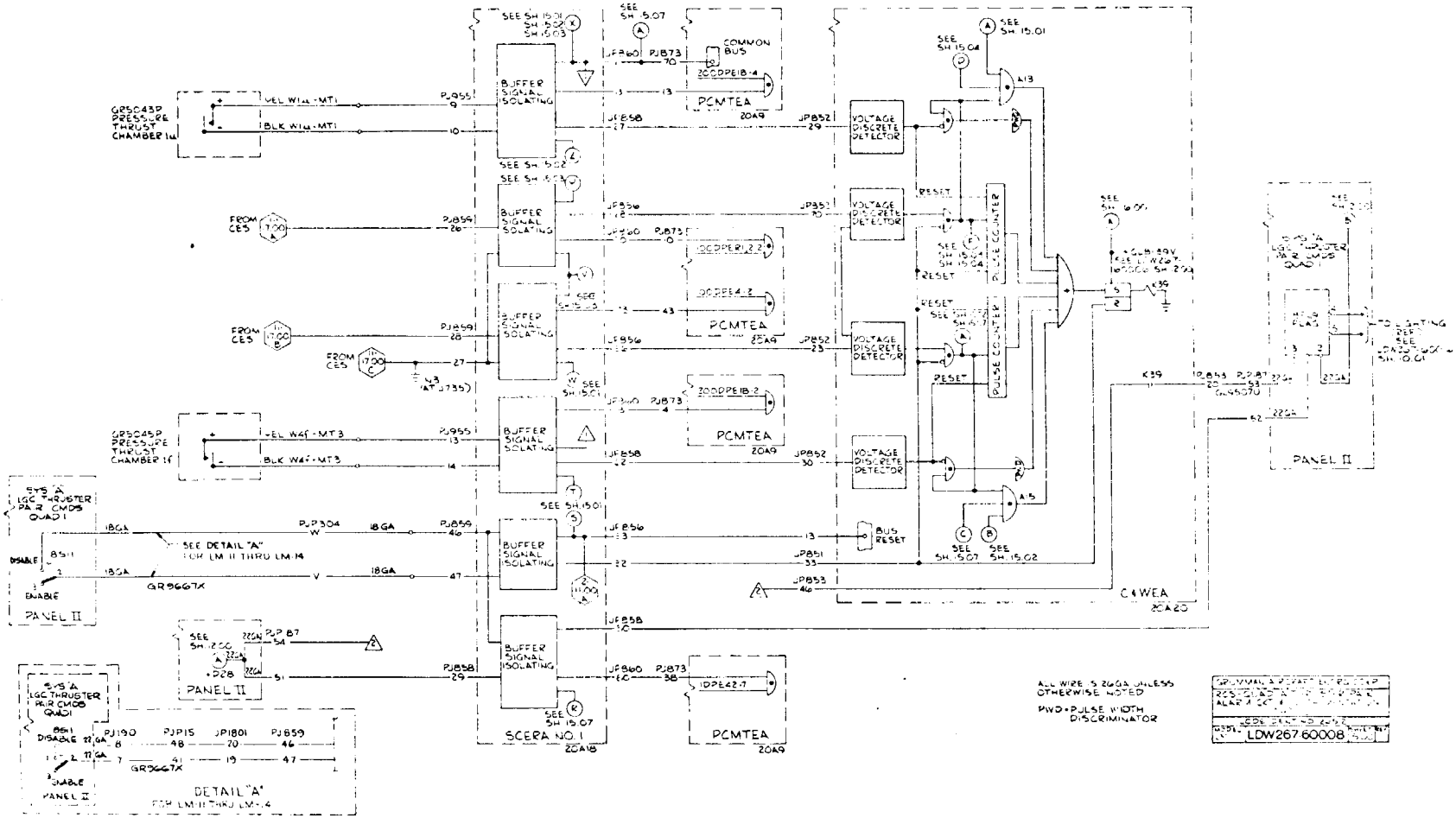
GRUMMAN AIRCRAFT ENGRG CORP		
RCS PRESSURE INSTRUMENTATION SYSTEM "B"		
CODE IDENT NO. 26512		
SPACE LEM	LDW267-60006	SHEET 12.01 REV

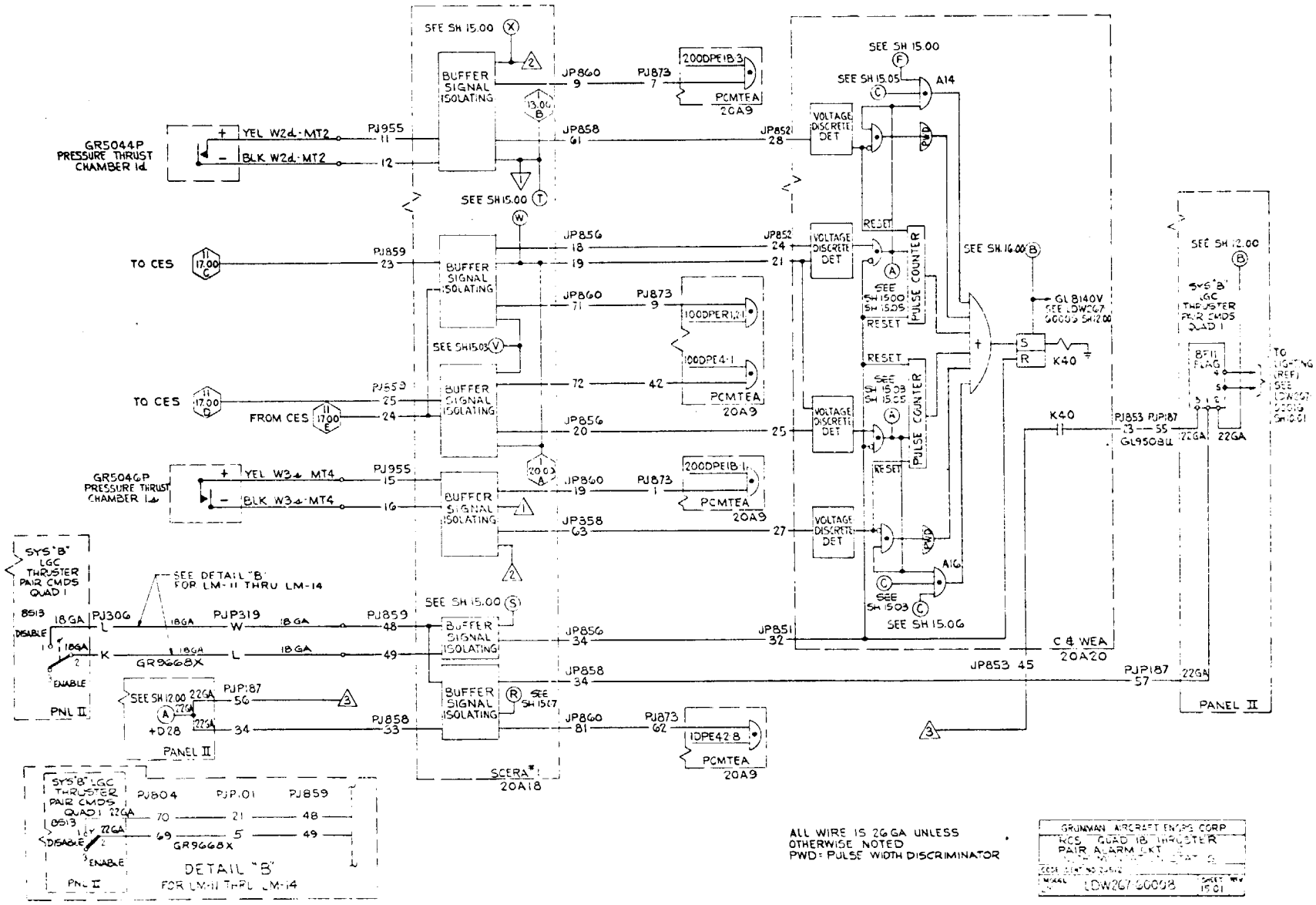

TEMP He TANK 'A'
LOADING
GR115T
TRANSDUCER TEMP
BLK 26GA J1822 3
WHT 26GA 2
RED 26GA 1
TO GSE
8MT46
TEMP He TANK 'B'
LOADING
GR115ZT
TRANSDUCER TEMP
BLK 26GA J1822 7
WHT 26GA 6
RED 26GA 5
TO GSE
8MT47
TEMP TRANSDUCER
FUEL TANK 'A'
GR212 T
RED 26GA PJ911 30
YEL 26GA 28
GRN 26GA 29
8RT2
RESISTANCE TO DC CONVERTOR
SCERA#2
20A19
JP972 26GA PJ879 8 6
1/1AH66
PCMTEA
20A9
JP886 26GA PJ1800 62 26GA PJP3E 42 32
TEMP/PRESS MON
8S19
(SHOWN IN He POSITION)
SEE SHEET 12.00
A
B
6
He
14 PRPLNT
13 FUEL MANF
30 OXID MANF
24
1
2
5
TEMP
4
PJP35 54 26GA JP1800 63 26GA PJ886 24
RESISTANCE TO DC CONVERTOR
RESISTANCE TO DC CONVERTOR
SCERA#1
20A5
JP972 7 PJ879 7
COMM BUS
PCMTEA
20A9
TEMP TRANSDUCER
FUEL TANK 'B'
GR212T
RED 26GA PJ911 33
YEL 26GA 31
GRN 26GA 32
8RT5
RESISTANCE TO DC CONVERTOR
JP886 26GA PJ1800 43 38 26GA PJP35 16
JP972 26GA PJ879 18 16
VIAH74
PCMTEA
20A9
31
He
25 PRPLNT
21 FUEL MANF
22 OXID MANF
8
3
7
9
TO LIGHTING (REF)
SEE LDW267-60016
SHEET 10.01
8M2
PNL II
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.
GRUMMAN AIRCRAFT ENGRG CORP
RCS-TEMP INSTRUMENTATION FOR He & FUEL TANKS 'SYSTEMS A & B'
CODE IDENT NO. 86512
MODEL LM
LDW267-60005
SHEET 13.00
REV

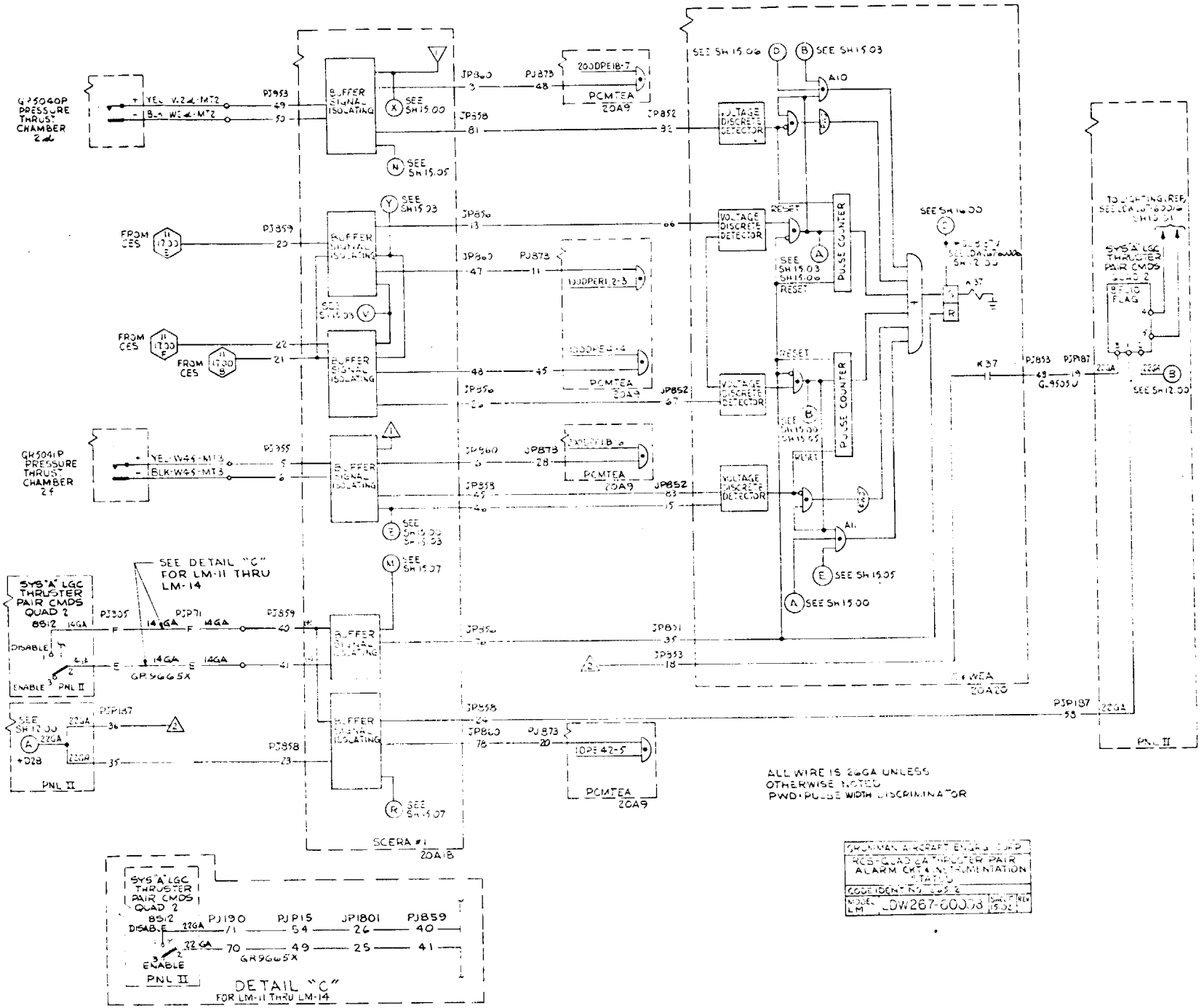

SEE SH 12.00
PJP187
5
26GA
PJ358
11
OXID MANF XFEED VALVE NOT CLOSED
FUEL MANF XFEED VALVE NOT CLOSED
VALVE CLOSED
VALVE OPEN
YEL
GY
BRN
GR2362X
BL29N.C.
GR2361X
BL30N.C.
PJ955
23
24
(+)
(-)
BUFFER SIGNAL ISOLATING
JP858
42
JP860
34
PJ873
63
COM BUS
SEE SH 15.07
1/1DPERIO 21
65
81
PCMTEA 20A9
PJP187
SEE SH 12.00
FLAG BF17
CROSSFEED GR9613U
TO LIGHTING(REF) LDA27-60016 SH 10.01
16
PRIMARY RCS/APS INTERCONNECT FUEL VALVE "A" NOT CLOSED
SECONDARY RCS/APS INTERCONNECT FUEL VALVE "A" CLOSED
GR7001X
BL6N.O.
GR7010X
BL32N.C.
31
32
JP858
38
63
79
1/1DPERIO(21-5
FLAG BF16
ASC FUEL A GR9631U
14
PRIMARY RCS/APS INTERCONNECT FUEL VALVE "B" NOT CLOSED
SECONDARY RCS/APS INTERCONNECT FUEL VALVE "B" CLOSED
GR7002X
BL20N.O
GR7012X
BL34N.C
19
20
JP858
40
JP860
64
80
1/1DPERIO,21-6
FLAG BF18
ASC FUEL B GR9632U
SEE SH 14.01
C
46
PRIMARY RCS/APS INTERCONNECT OX VALVE "B" NOT CLOSED
SECONDARY RCS/APS INTERCONNECT OX "B" CLOSED
GR7004X
BL19N.O.
GR7011X
BL33N.C.
37
38
PJ857
68
JP857
69
JP860
68
69
67
1/1DPERIO(21-2
FLAG BF19
ASC OXID B GR9642U
44
PRIMARY RCS/APS INTERCONNECT OX VALVE "A" NOT CLOSED
SECONDARY RCS/APS INTERCONNECT OX VALVE "A" CLOSED
GR7003X
BL5N.O.
GR7009X
BL31N.C.
43
44
70
71
66
55
1/1DPERIO,21-1
FLAG BF15
ASC OXID A GR9641U
SEE SH 14.01
A
PNL II
SCERA #1 20A18
SEE SH 14.01
B
PNL II
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
RCS-CROSSFEED & INTERCONNECT VALVE STATUS INSTRUMENTATION
SIZE
DENT NO
MODEL LDW26Y-60003
SHEET



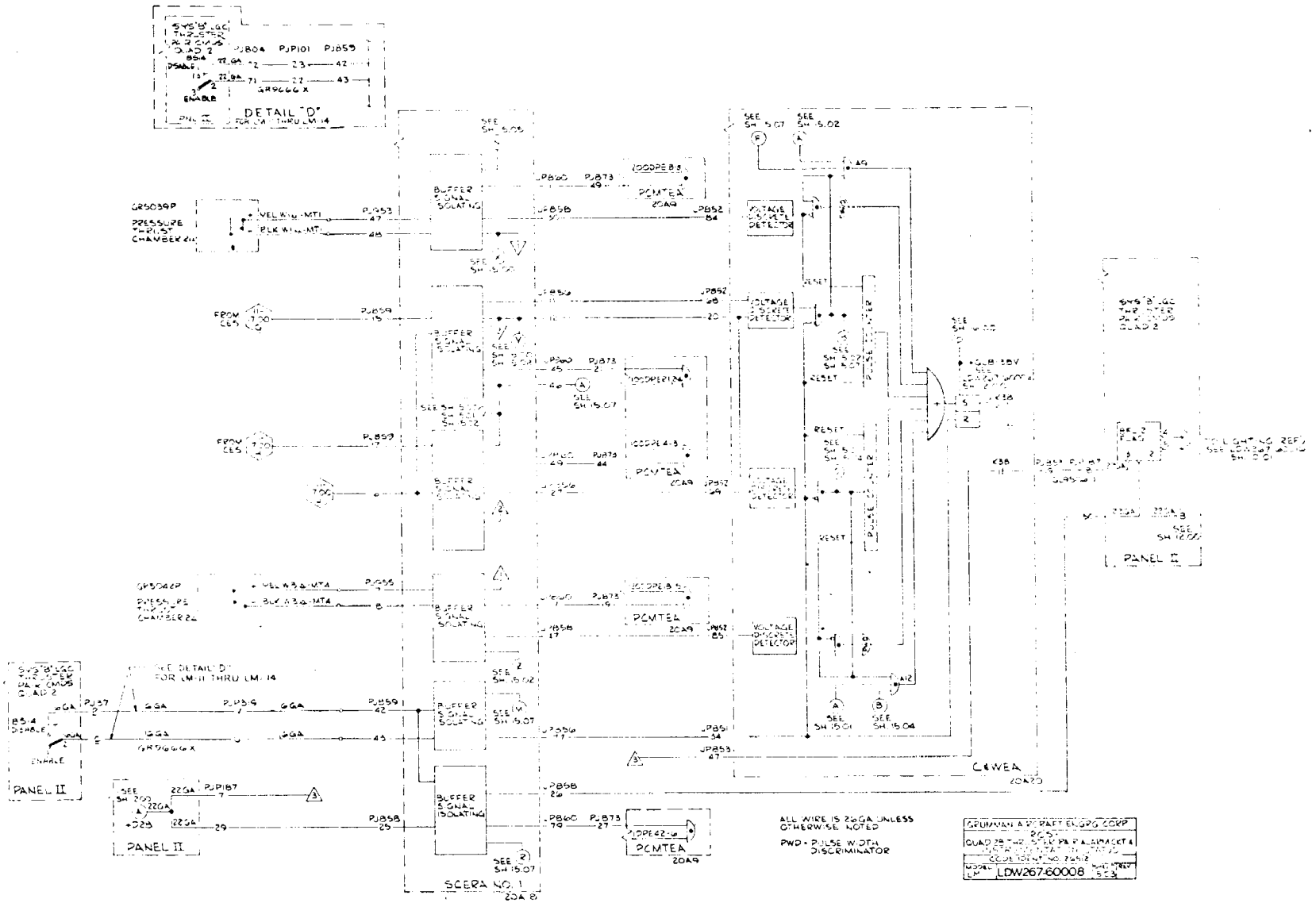
GRUMMAN AEROSPACE ENERGY CORP.	
RCS - MAIN SHUTOFF VALVE STATUS INSTRUMENTATION	
CODE IDENT NO. 26512	
MODEL LM	LDW267-60008
SHEET	REV 14.01

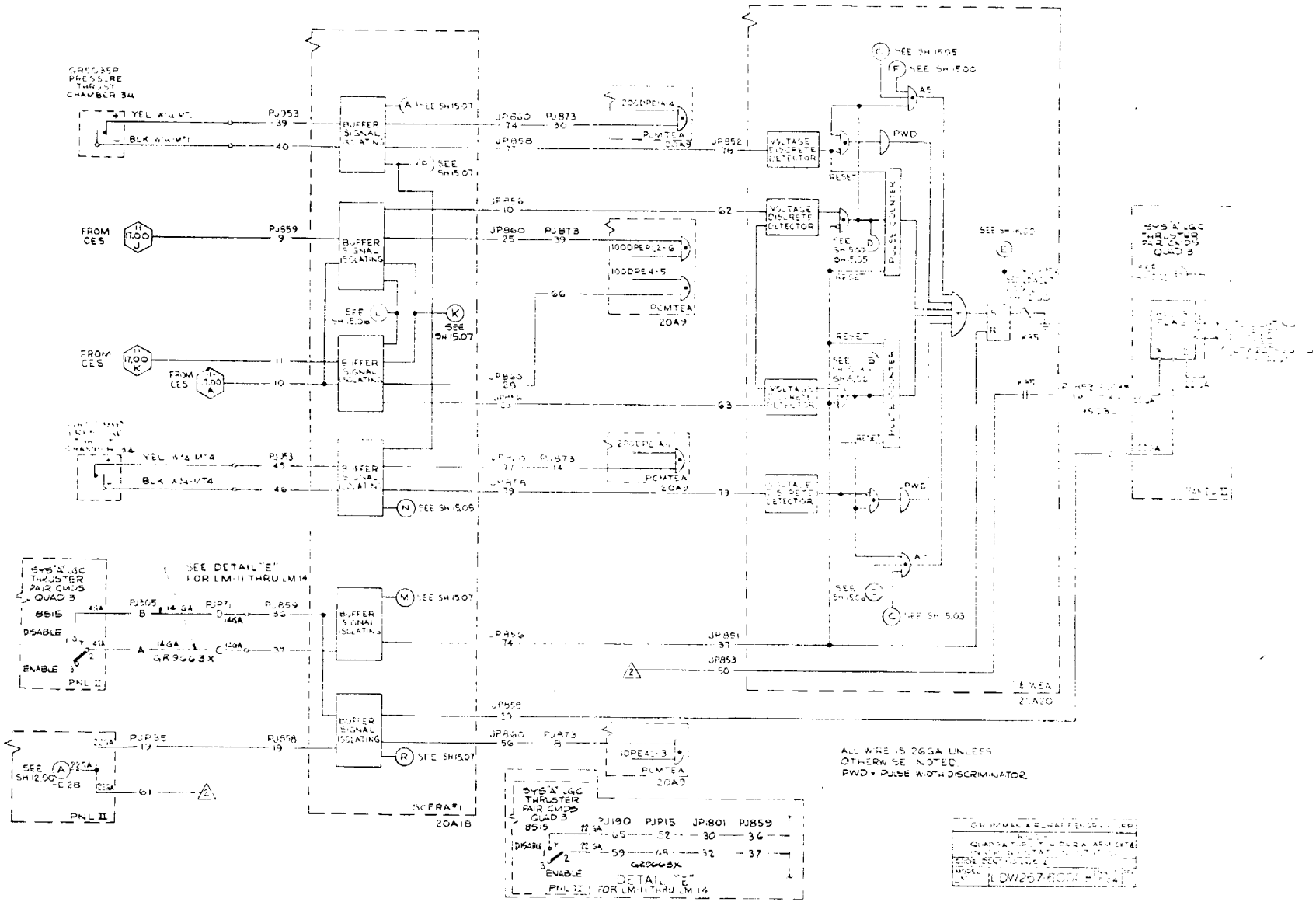

BUFFER SIGNAL ISOLATING
VOLTAGE DISCRETE DETECTOR
PCMTEA
COMMON BUS
PULSE COUNTER
BUS RESET
SCERA NO. 1
C&WEA
PANEL II
DETAIL "A"
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED
PWD=PULSE WIDTH DISCRIMINATOR
LDW267-60008

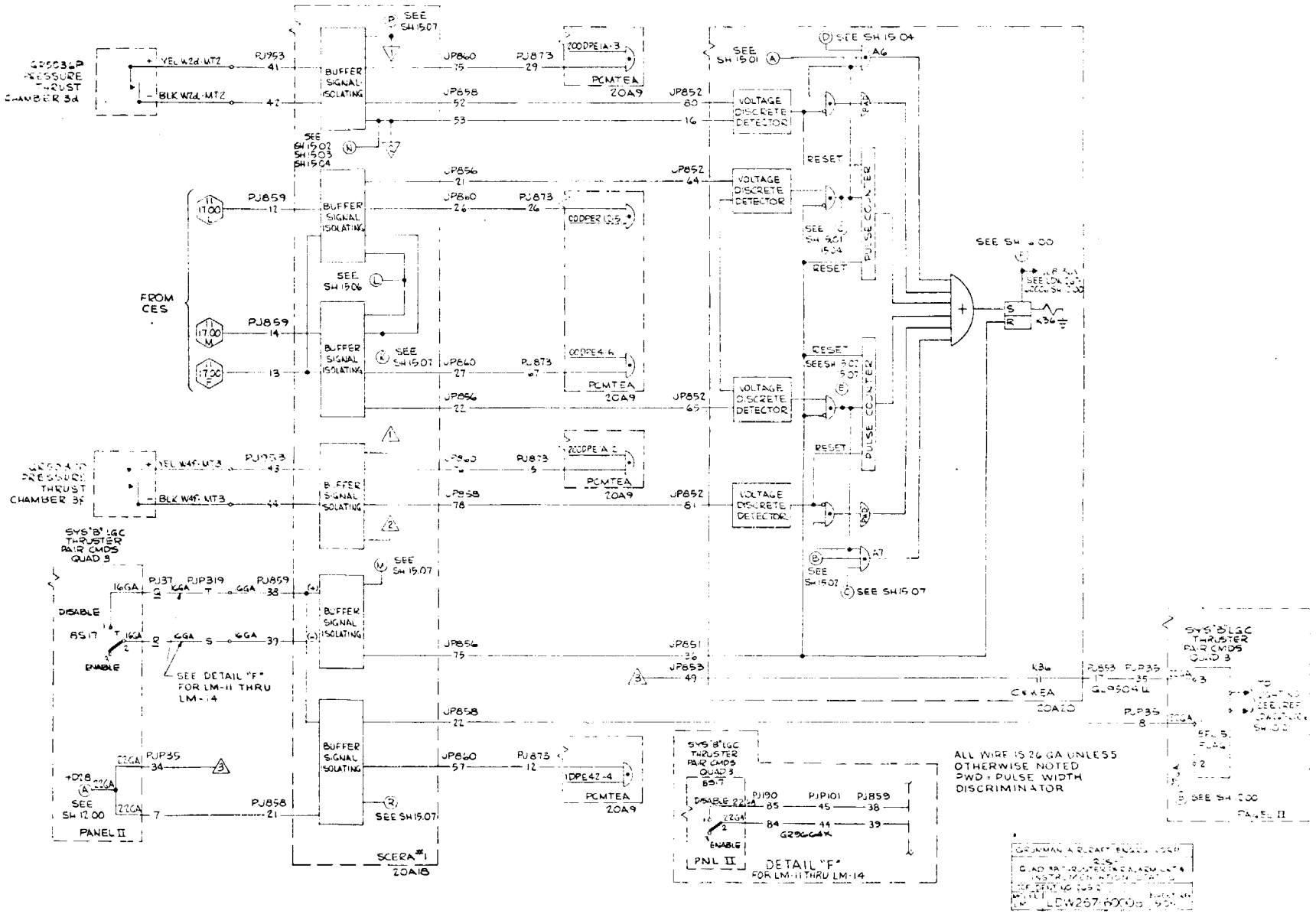

SEE SH 15.00
BUFFER SIGNAL ISOLATING
200DPEIB3
PCMTEA 20A9
GR5044P PRESSURE THRUST CHAMBER Id
YEL W2d-MT2
BLK W2d-MT2
PJ955
JP860
PJ873
JP858
JP852
VOLTAGE DISCRETE DET
SEE SH 15.05
A14
SEE SH 15.00
TO CES
FROM CES
PJ859
JP856
100DPE1,21
100DPE4-1
RESET
PULSE COUNTER
SEE SH 15.03
SEE SH 16.00
GL 8140V
K40
GR5046P PRESSURE THRUST CHAMBER I
YEL W3d-MT4
BLK W3d-MT4
200DPEIB1
JP858
JP851
A16
SEE SH 15.06
C & WEA 20A20
JP853 45
PJP187
22GA
PANEL II
SYS "B" LGC THRUSTER PAIR CMDS QUAD I
SEE DETAIL "B" FOR LM-11 THRU LM-14
8513
18GA
PJ306
PJP319
PJ859
DISABLE
ENABLE
GR9668X
PNL II
SEE SH 12.00
PJP187
+D28
PANEL II
100DPE42-8
SCERA* 20A18
SEE SH 15.07
PJ804
PJP101
PJ859
22GA
DETAIL "B"
FOR LM-11 THRU LM-14
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED
PWD= PULSE WIDTH DISCRIMINATOR
GRUMMAN AIRCRAFT ENGRG CORP
LDW267 60008
SHEET 19.01

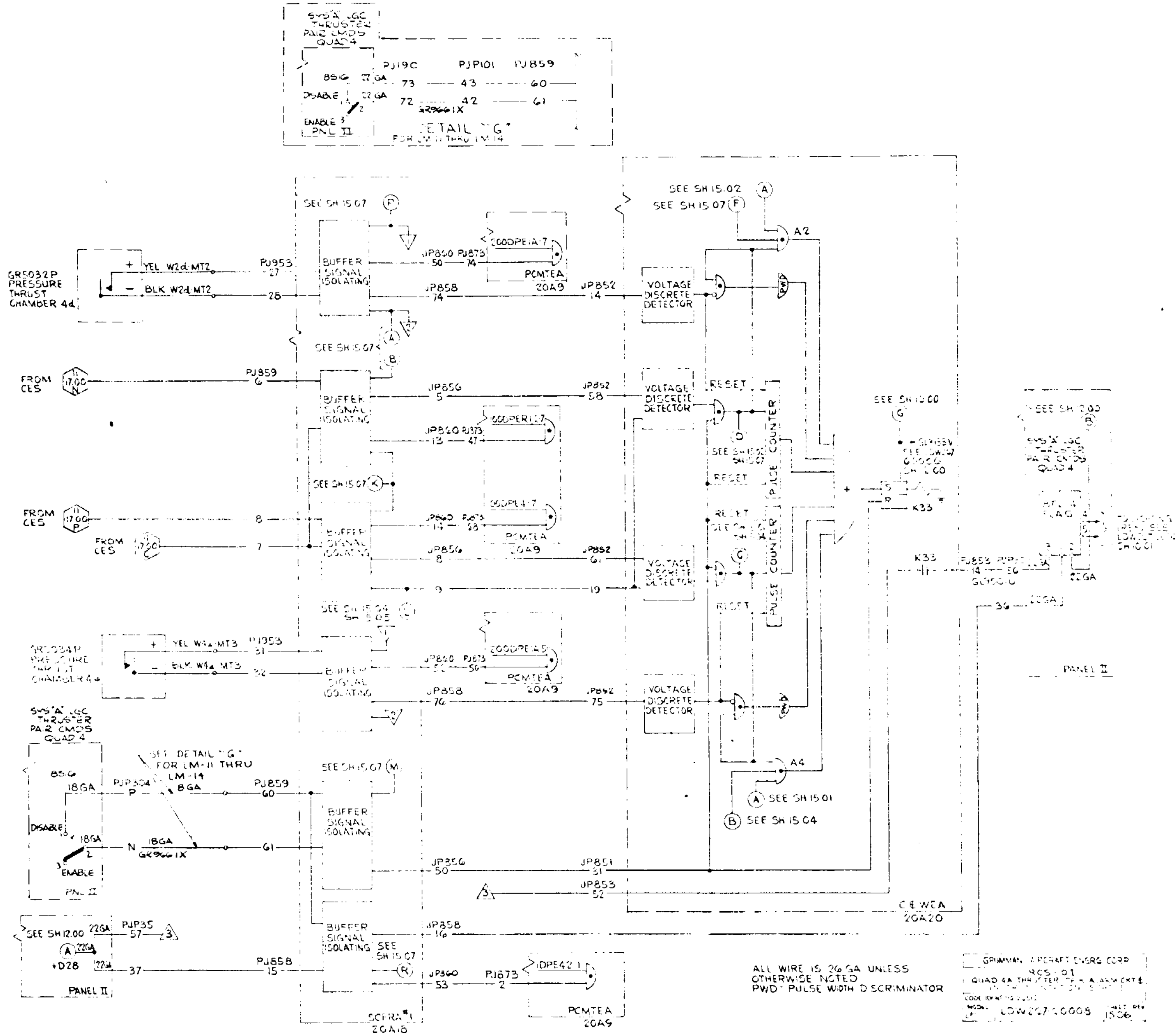


GRUMMAN AIRCRAFT ENGR'G CORP	
RCS/DPS GAS THRUSTER PAIR ALARM CMD & INSTRUMENTATION STATUS	
CODE IDENT NO 81205	
MODEL LM	LDW267-60003 SHEET 15.02 REV


DETAIL "D"
PANEL II
SCERA NO. 1
CEWEA
PCMTEA
BUFFER SIGNAL ISOLATING
VOLTAGE LEVEL DETECTOR
PULSE WIDTH DISCRIMINATOR
RESET
ENABLE
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED
PWD - PULSE WIDTH DISCRIMINATOR
GRUMMAN AEROSPACE CORP
LDW267600008

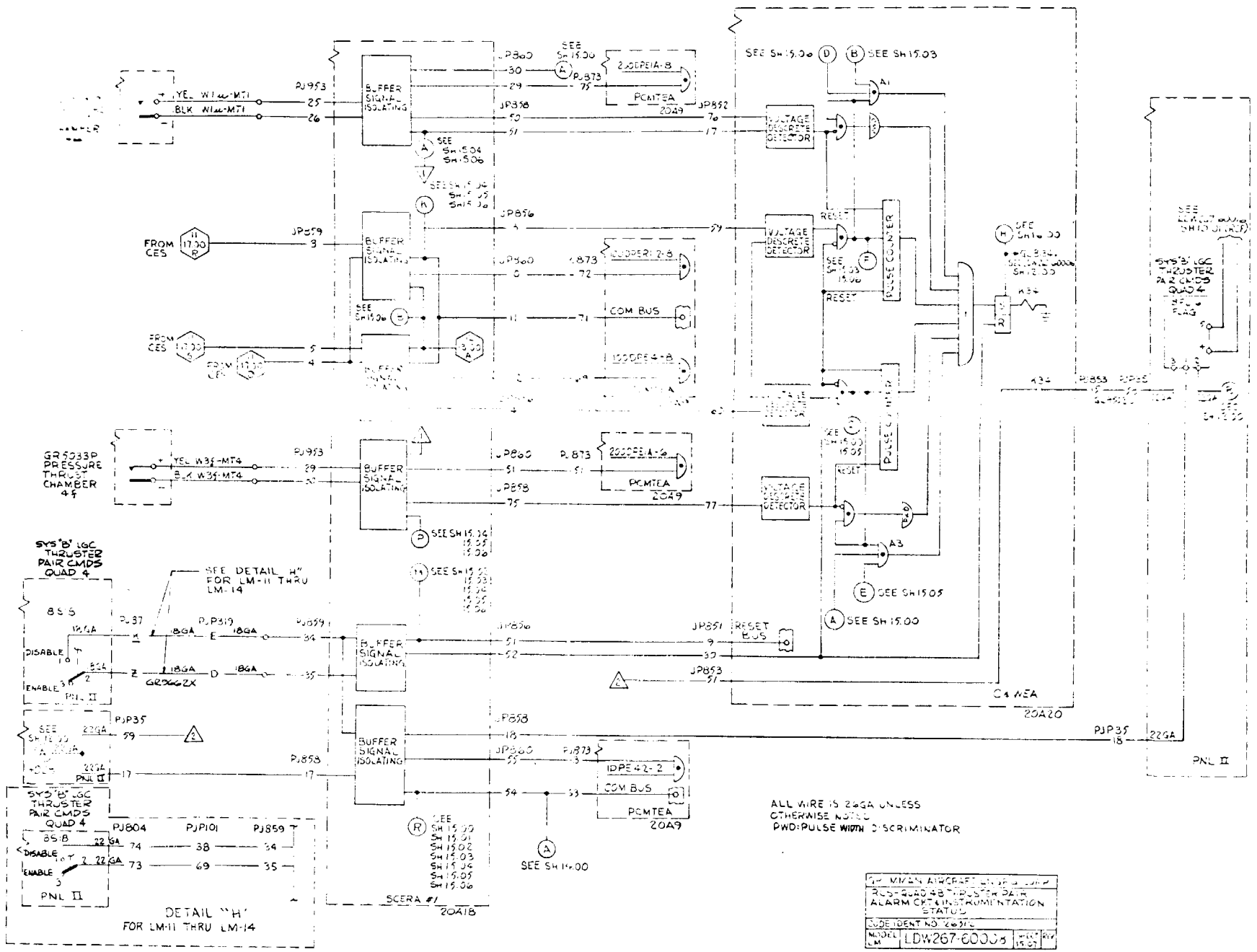

BUFFER SIGNAL ISOLATING
VOLTAGE DISCRETE DETECTOR
PWD
RESET
PULSE COUNTER
FROM CES
SEE DETAIL "E" FOR LM-11 THRU LM-14
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED
PWD = PULSE WIDTH DISCRIMINATOR


GP50360
PRESSURE
THRUST
CHAMBER 3d
YEL W2d-MT2
BLK W2d-MT2
PJ953
41
42
BUFFER
SIGNAL
ISOLATING
SEE
SH 15 07
SEE
SH 15 02
SH 15 03
SH 15 04
JP860
15
PJ873
29
200DPE1A-3
PCMTEA
20A9
JP858
52
53
JP852
80
16
VOLTAGE
DISCRETE
DETECTOR
SEE
SH 15 01
SEE SH 15 04
A6
RESET
PULSE COUNTER
SEE
SH 15 01
SH 15 04
SEE SH 15 00
SEE SH 15 00
+15 V
SEE CONN SH 15 00
S
R
4.36Ω
JP856
21
64
PJ859
12
17.00
L
JP860
26
PJ873
26
COPPER 10-5
FROM
CES
SEE
SH 15 06
PJ859
14
17.00
M
13
17.00
F
JP860
27
PJ873
27
COPPE4-6
JP856
22
JP852
65
SEE
SH 15 07
SEE SH 15 01
SH 15 04
PJ953
43
44
GP50361
PRESSURE
THRUST
CHAMBER 3f
YEL W4f-MT3
BLK W4f-MT3
JP860
5
PJ873
5
200DPE1A-2
JP858
78
JP852
81
SYS 'B' LGC
THRUSTER
PAIR CMDS
QUAD 3
PJ37
PJP319
PJ859
16GA
16GA
6GA
6GA
38
DISABLE
BS17
ENABLE
SEE DETAIL "F"
FOR LM-11 THRU
LM-14
JP856
75
JP851
26
JP853
49
4.36Ω
11
PJ853
17
PJP35
35
GL95046
C&SEA
20A20
PJP35
8
22GA
SYS 'B' LGC
THRUSTER
PAIR CMDS
QUAD 3
SEE REF
SEE SH 15 00
SYS B
SEE SH 15 00
PANEL II
JP858
22
JP860
57
PJ873
12
1DPE42-4
PCMTEA
20A9
22GA
PJP35
34
+D18
22GA
SEE
SH 12 00
22GA
7
PJ858
21
SEE SH 15 07
SCERA #1
20A18
PANEL II
SYS 'B' LGC
THRUSTER
PAIR CMDS
QUAD 3
BS17
DISABLE 22GA
ENABLE
PJP190
85
PJP101
45
PJ859
38
84
44
39
G2966-4X
PNL II
DETAIL "F"
FOR LM-11 THRU LM-14
ALL WIRE IS 26 GA UNLESS
OTHERWISE NOTED
PWD = PULSE WIDTH
DISCRIMINATOR
GRUMMAN AIRCRAFT ENGINEERING CORP
SYS
G AND N THRUSTER DRIVER ASSEMBLY
INSTRUMENTATION DIAGRAM
SEE DRWG 1005
MODEL
LM
LDW267-60003
REV

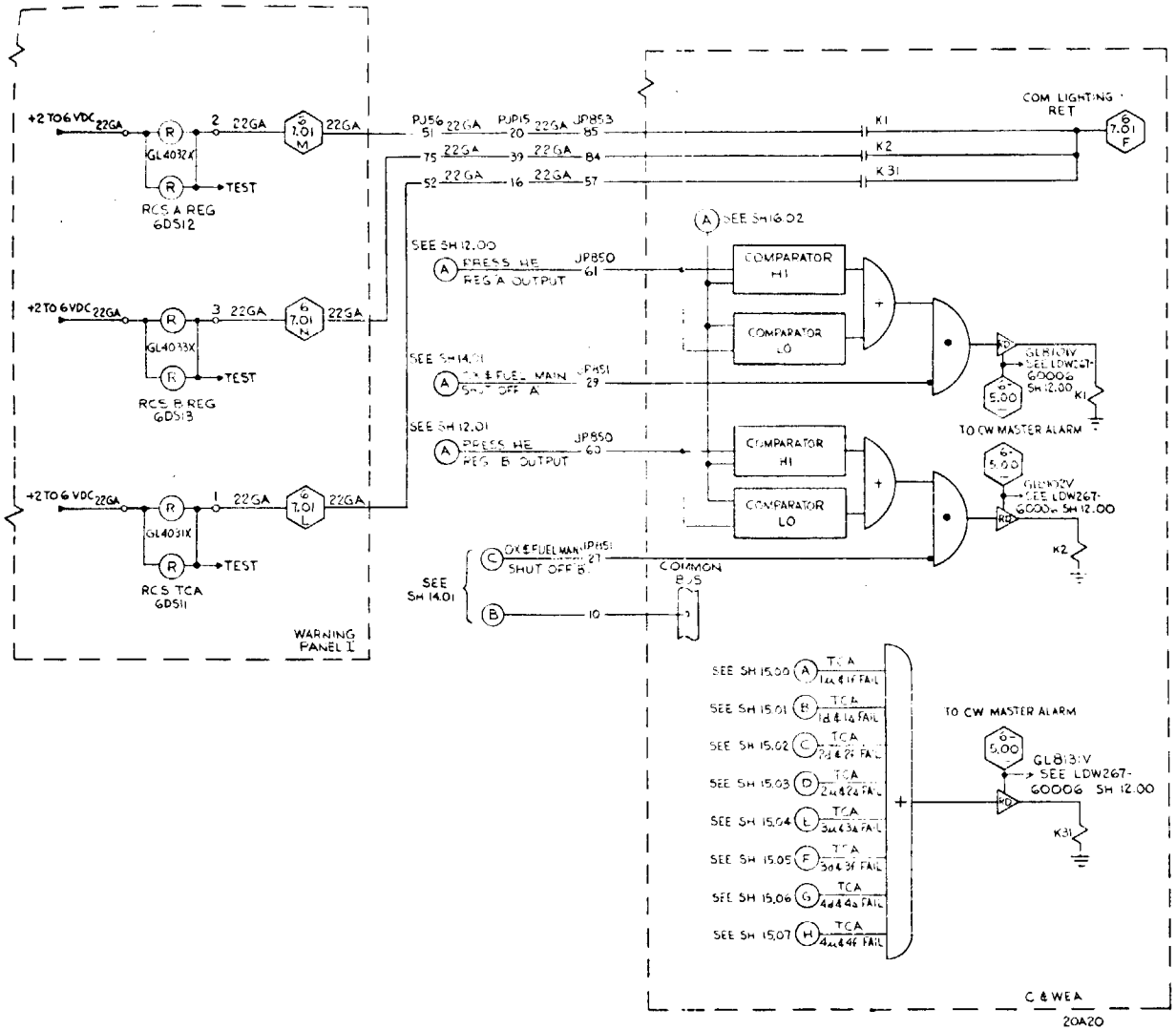


ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED
PWD - PULSE WIDTH DISCRIMINATOR

GRUMMAN AIRCRAFT ENGRG CORP
RCS - 01
QUAD 4A THRUSTER CHAMBER ALARM CKT
LDW267-40005
15.06



GE MIKAN AIRCRAFT SPACECRAFT DEPT	
RCS-QUAD 4B THRUSTER PAIR ALARM CKT & INSTRUMENTATION STATUS	
SUBIDENT NO 2631G	
MODEL LM	LDW267-60006



ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED.

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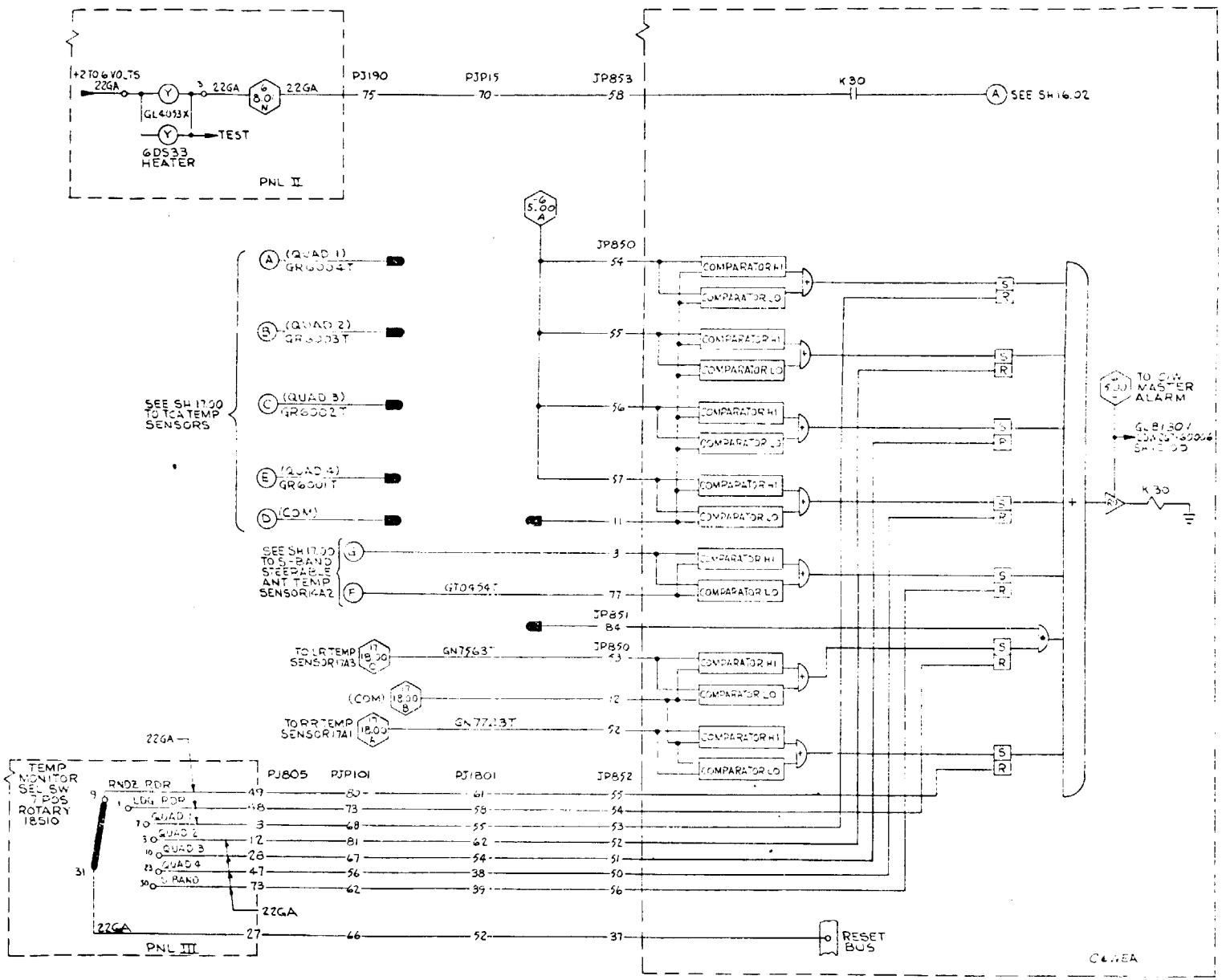
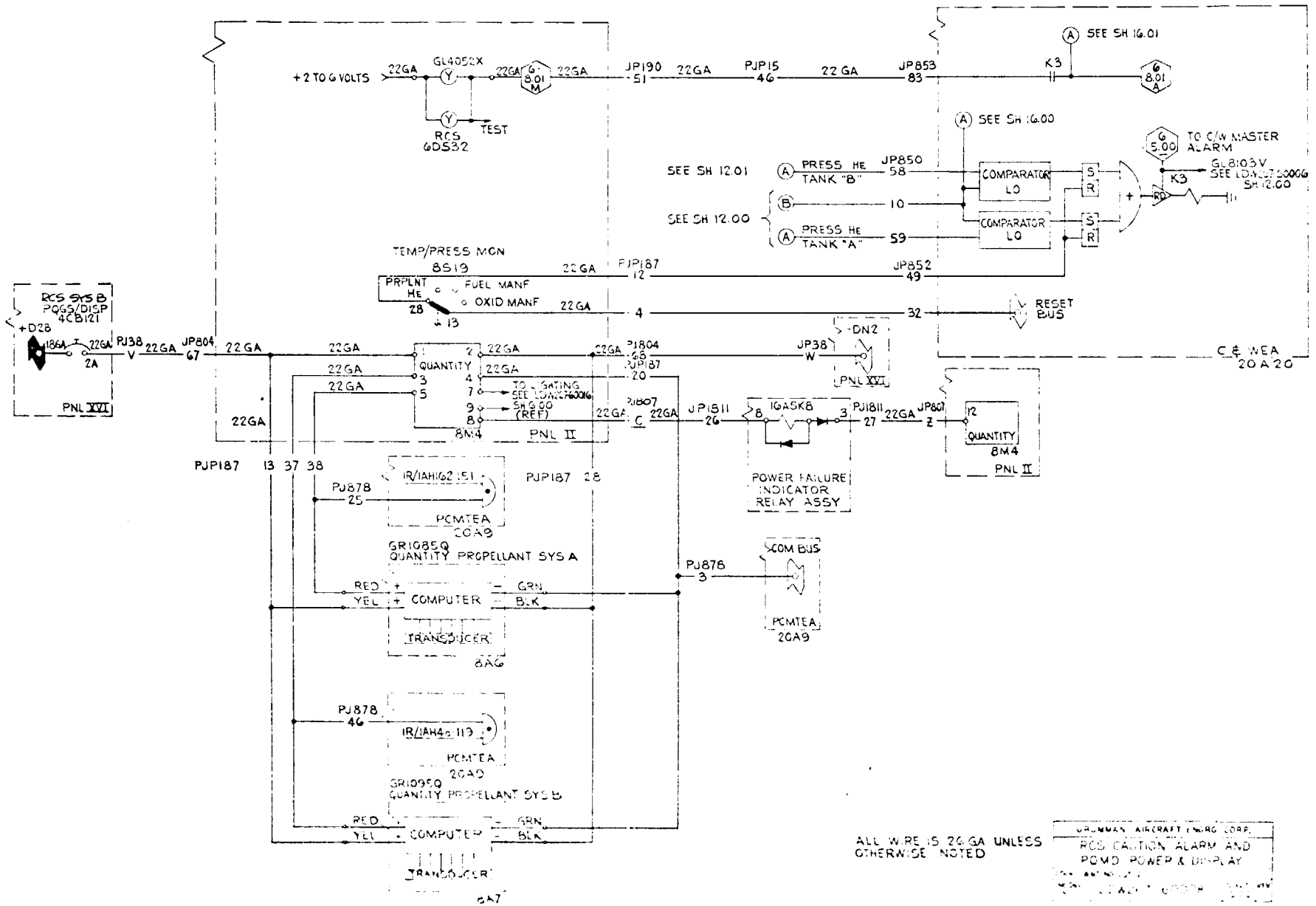
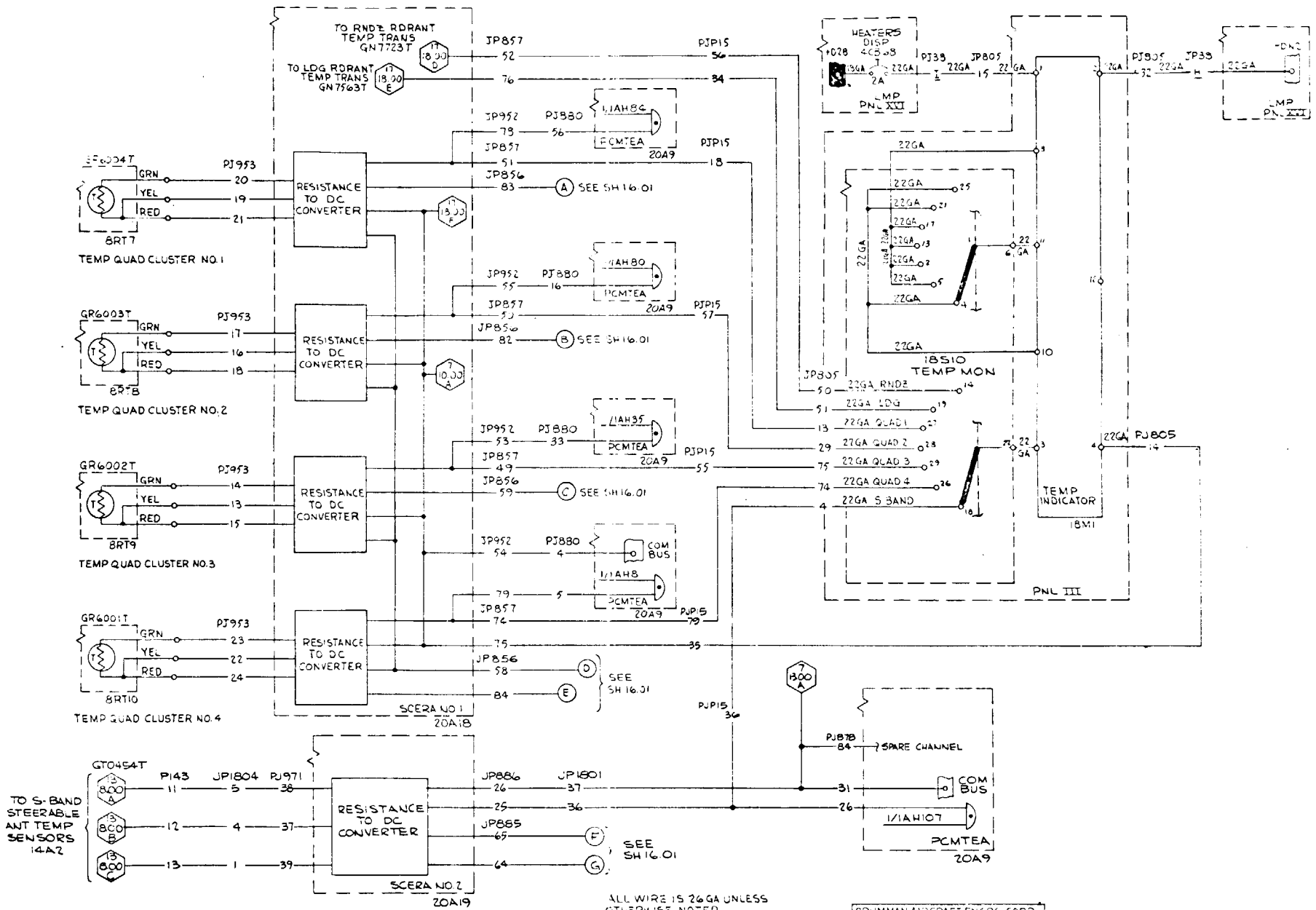
RCS - WARNING ALARMS	
CODE IDENT NO 81876	
MODEL 1M	LDW276 SH 004



ALL WIRE IS 26GA UNLESS
OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGR. CORP.
POST-HEATER
CAUTION ALARM
CODE IDENT NO. (CAGE)
MODEL LM LEM 267-50003 SHEET REV


+2 TO 6 VOLTS
22GA
GL4052X
RCS 6DS32
TEST
JP190 51
PJP15 46
JP853 83
SEE SH 16.01
K3
TO C/W MASTER ALARM
GL8103V
SEE SH 12.00
SEE SH 12.01
PRESS HE TANK "B"
JP850 58
COMPARATOR LO
SEE SH 12.00
PRESS HE TANK "A"
59
TEMP/PRESS MON 8S19
PRPLNT HE
FUEL MANF
OXID MANF
PJP187 12
JP852 49
4
32
RESET BUS
RCS SYS B PQGS/DISP 4CB121
+D28
PJ38 V
JP804 67
QUANTITY
TO GATING SEE LDN 276006 SH 6.00 (REF)
8M4
PNL II
PNL XVI
C & WEA 20A20
PJ807
JP1811 26
1GASK8
PJ1811 27
JP807 Z
PJP187 13 37 38
PJP187 28
PJ878 25
IR/IAH162-151
PCMTEA 20A9
POWER FAILURE INDICATOR RELAY ASSY
GR1085Q QUANTITY PROPELLANT SYS A
RED
YEL
COMPUTER
GRN
BLK
TRANSDUCER
8A6
PJ878 3
COM BUS
PJ878 46
IR/IAH42-113
GR1095Q QUANTITY PROPELLANT SYS B
8A7
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP.
RCS CAUTION ALARM AND PQMD POWER & DISPLAY



GRUMMAN AIRCRAFT ENGRG CORP	
RCS THRUSTER QUAD HEATERS R/R UR4 S-BAND ANT TEMPERATURE INDICATION	
CODE IDENT NO 26512	
MODEL LM	LDW267-60008

LM ELEMENTARY FUNCTIONAL

DIAGRAMS

(Functional Grouping No. 9)

FLIGHT GUIDANCE DISPLAYS AND CONTROLS

(REF LDW 267-57009 C)

1. Applicable Documents

Level Three Drawings

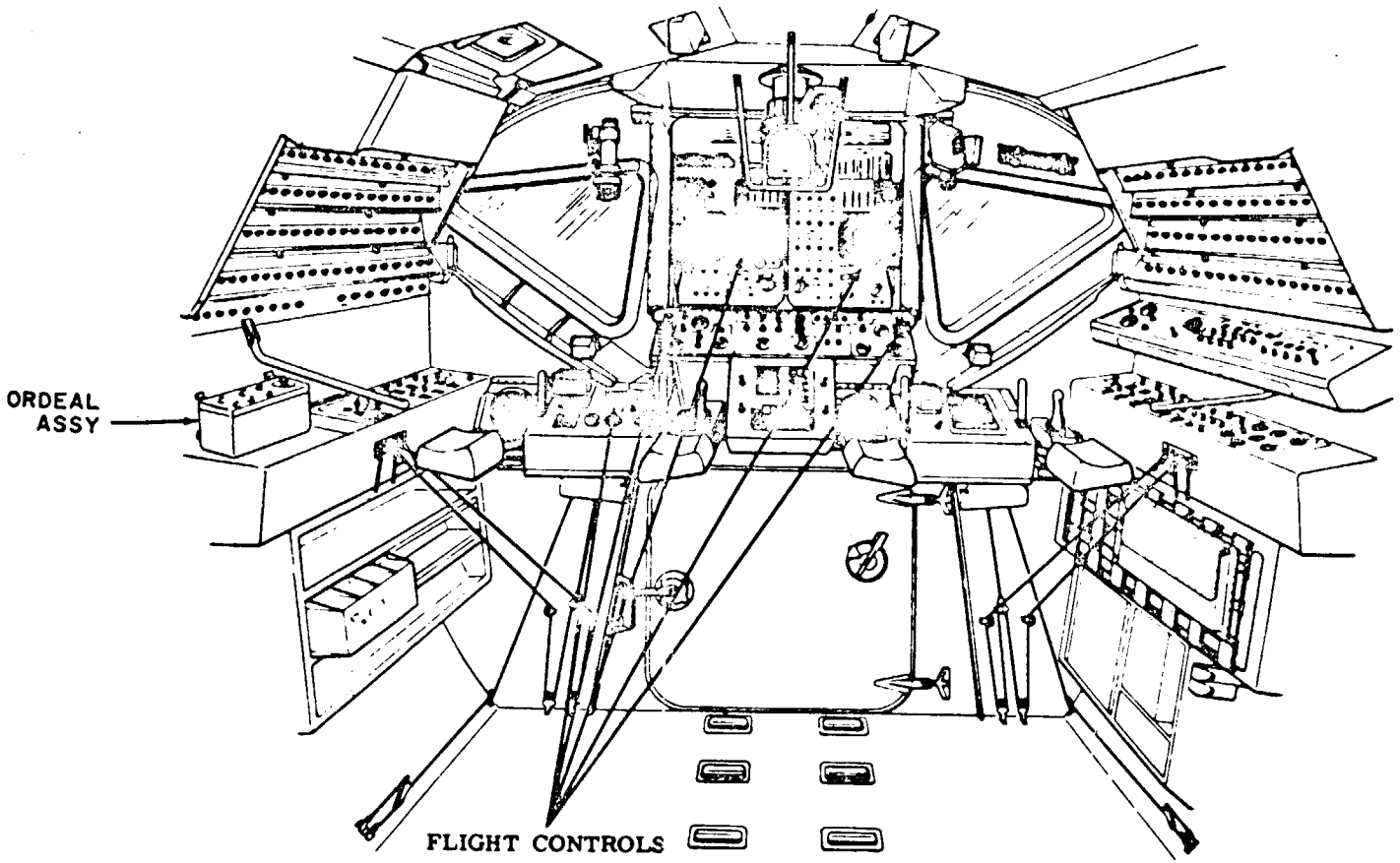
ITEM NAME	DWG. NO.	REV.	E.O.'s
Displays and Controls	LDW350-54000	N	

2. Table of Contents

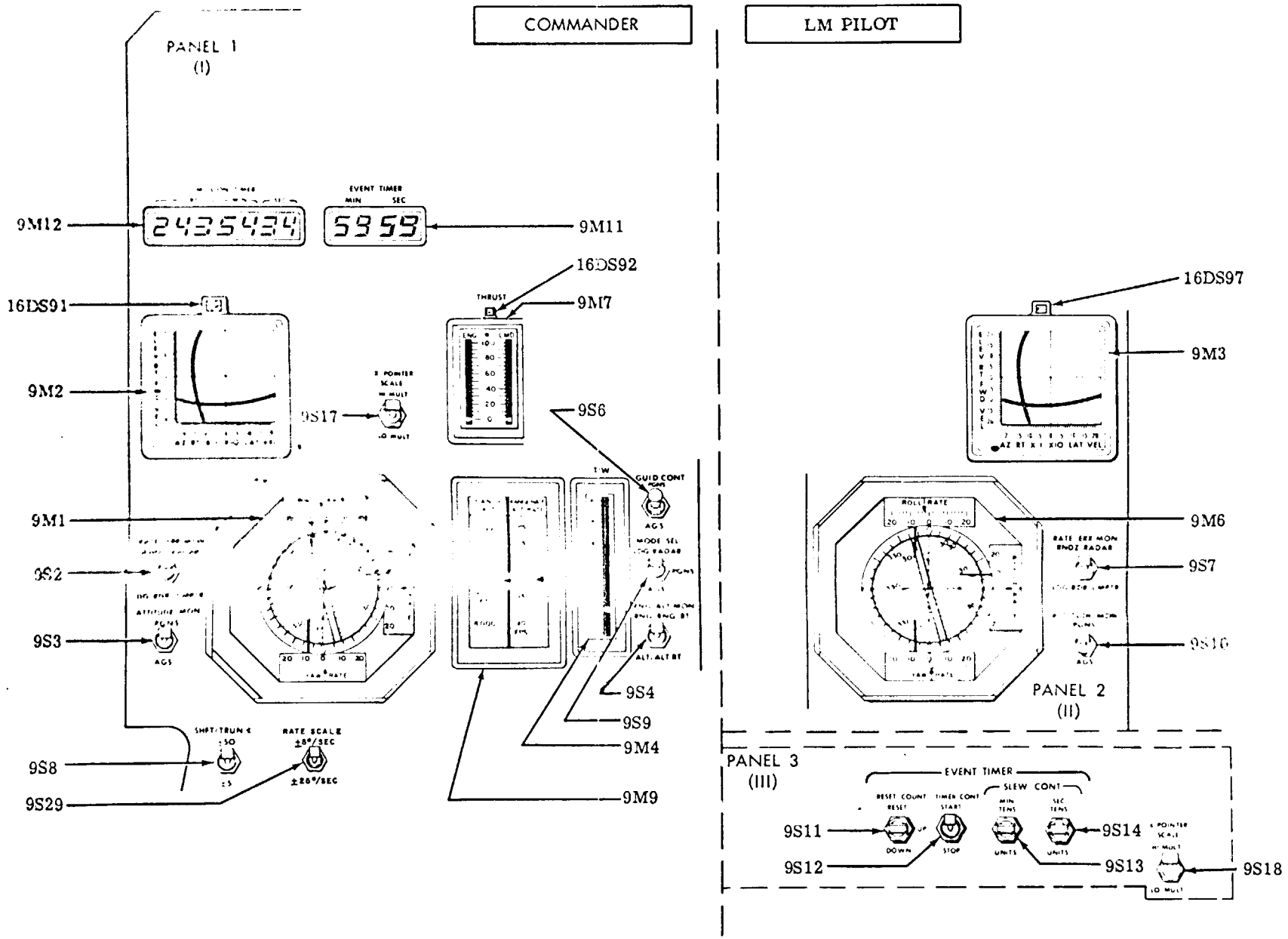
ITEM NAME	DWG. NO.
a) Cover Sheet	9-1001
b) Applicable Documents, Table of Contents, Notes, and Revisions	9-1002 & 9-1002.1
c) Cabin Location of Flight Guidance Displays and Controls	9-1003
d) Flight Guidance Displays and Controls Indicators Layout	9-1004 & 1004.1
e) Flight Guidance Displays and Controls Functional Description	9-1005 thru 1005.10
f) Flight Guidance D&C Block Diagram	LDW267-57009 SH 4.00B
g) Flight Guidance D&C FDAI Sphere Drive System Data Inputs from AGS & PGNS	LDW267-57009 SH 5.00B & 5.01B
h) Flight Guidance D&C CDR FDAI Power Supply and Data Selection Control	LDW267-57009 SH 6.00A
i) Flight Guidance D&C LMP FDAI Power Supply and Data Selection Control	LDW267-57009 SH 7.00B
j) Flight Guidance D&C LMP & CDR FDAI Roll, Pitch and Yaw Rate Signals	LDW267-57009 SH 8.00B
k) Flight Guidance D&C Signals to Yaw, Pitch & Roll FDAI Error Meters	LDW267-57009 SH 9.00B
l) Flight Guidance D&C Lighting and Power Supply and Data Selection Control for Cross-Pointer	LDW267-57009 SH 10.00B
m) Flight Guidance D&C Cross-Pointer Data Inputs	LDW267-57009 SH 11.00B
n) Flight Guidance D&C Range/Range Rate & Altitude/Altitude Rate Data Inputs to Range/Range Rate Indicator	LDW267-57009 SH 12.00B
o) Flight Guidance D&C Mission and Event Timers - Power and Control	LDW267-57009 SH 13.00C
p) Flight Guidance D&C Mission and Event Timers & EMI Filter - Power and Control	LDW267-57009 SH 13.01C
q) Flight Guidance D&C GASTA, and FDAI (Error & Rate Meters) 800 Hz Fusing & Distribution	LDW267-57009 SH 14.00B
r) Flight Guidance D&C Thrust Display Data Inputs	LDW267-57009 SH 15. 00B

3. Applicable Revisions

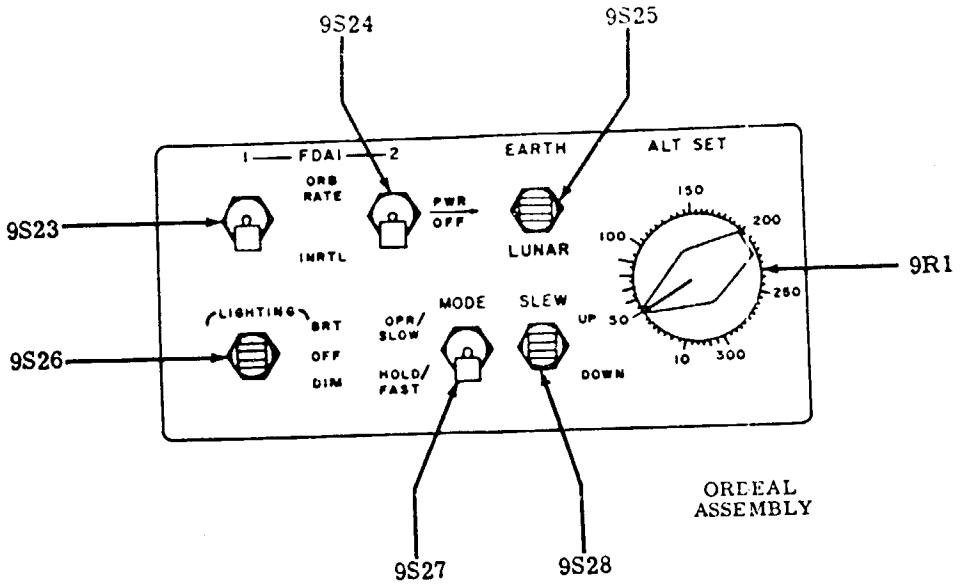
Rev	Sheet No.	LCD	Description
A	9-13.00 9-13.01	5449A	Reinstallation of Mission Clock and EMI filter assy (KEARFOTT)

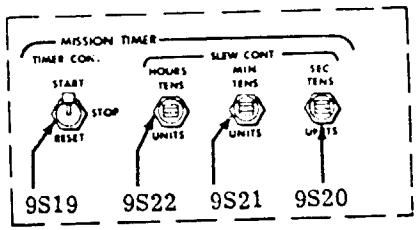


Cabin Location of Flight Guidance Displays and Controls



Flight Guidance Displays & Controls Indicators Layout





PANEL 5
(V)

Flight Guidance Displays and Controls Indicators Layout

SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

Code	Control/Indicator	Function
9S2 9S7	RATE/ERR MON SWITCH (CDR) RATE/ERR MON SWITCH (LMP) TWO 2-POSITION TOGGLES MAIN-MAIN	The functions of 9S2, 9S7, 9S3, 9S10 and 9S9 are all inter-related. Switches 9S2 and 9S3 will affect the CMDRS FDAI and CROSSPOINTER and 9S7 and 9S10 will affect the LMP FDAI and CROSSPOINTER. The following combinations will yield the noted results: 1. RATE ERR MON (9S2, 9S7) - RNDZ RADAR position ATTITUDE MON (9S3, 9S10) - PGNS position (a) PGNS attitude signals via GASTA to the FDAI ball (b) Shaft and trunnion angles from RNDZ radar antenna to the FDAI pitch and yaw error meters 2. RATE ERR MON (9S2, 9S7) - LDG RADAR/CMPTR position ATTITUDE MON (9S3, 9S10) - PGNS position (a) PGNS attitude signals via GASTA to the FDAI ball (b) Pitch, yaw & roll error signals from PGNS to the FDAI error meters/or pitch, yaw & roll rates (± 1.25°/sec) signals from PGNS to error meters 3. RATE ERR MON (9S2, 9S7) - RNDZ RADAR position ATTITUDE MON (9S3, 9S10) - AGS position (a) AGS attitude signals to the FDAI ball (b) Shaft and trunnion angles from RNDZ RADAR antenna to the FDAI pitch and yaw error meters 4. RATE ERR MON (9S2, 9S7) - LDG RADAR/COMPTR position ATTITUDE MON (9S3, 9S10) - AGS position (a) AGS attitude signals to the FDAI ball (b) Pitch, yaw & roll error signals from AGS to the FDAI error meters
9S3 9S10	ATTITUDE MON SWITCH (CDR) ATTITUDE MON SWITCH (LMP) TWO 2-POSITION TOGGLES MAIN-MAIN	
9S9	MODE SEL SWITCH 3 POSITION TOGGLE MAIN-MAIN-MAIN	

SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

Code	Control/Indicator	Function
9S2 9S7 (Cont) 9S3 9S10 (Cont) 9S9 (Cont)		5. RATE ERROR MON (9S2, 9S7) - RNDZ RADAR position (a) LOS shaft angle rate from RNDZ RADAR to the cross-pointer horizontal pointer (b) LOS trunnion angle rate from RNDZ RADAR to the cross-pointer vertical pointer (c) AZ rate and EL rate lights on the crosspointer will be illuminated. 6. RATE ERR MON (9S2, 9S7) - LDG RADAR position MODE SEL (9S9) - LDG RADAR position (a) Forward velocity (VZA) from LDG RADAR to the cross-pointer horizontal pointer (b) Lateral velocity (VYA) from LDG RADAR to the cross-pointer vertical pointer. (c) FWD VEL and LAT VEL lights on crosspointer illuminated 7. RATE ERR MON (9S2, 9S7) - LDG RADAR position MODE SEL (9S9) - PGNS position (a) Forward velocity from PGNS (CDU) to the crosspointer horizontal pointer (b) Lateral velocity from PGNS (CDU) to the crosspointer vertical pointer (c) FWD VEL and LAT.VEL lights on crosspointer illuminated 8. RATE ERR MON (9S2, 9S7) - LDG RADAR position MODE SEL (9S9) - AGS position

SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

Code	Control/Indicator	Function
9S2 9S7 (Cont) 9S3 9S10 (Cont) 9S9 (Cont)		(a) No input to crosspointer horizontal pointer (b) Lateral velocity from AGS to the crosspointer vertical pointer (c) LAT VEL light on the crosspointer illuminated NOTE: RATE ERR MON switches (9S2 and/or 9S7) in the RNDZ RADAR position will override all inputs from the MODE SEL switch (9S9), therefore with 9S2 and/or 9S7 in RNDZ RADAR, only shaft and trunnion angle rates will be displayed on the crosspointer. See Step 5.
9S4	RNG/ALT MON SWITCH 2 POSITION TOGGLE MAIN-MAIN	This two position toggle (RNG/RNG RT-ALT/ALT/ALT/RT) selects the proper display legend (RNG/RNG RT-ALT/ALT RT) on the range indicator 9M9. In the RNG/RNG RT position, range and range rate data from RNDZ RADAR is displayed on 9M9. In the ALT/ALT RT position, data from whatever source is selected by 9S9 (LDG RDR-PGNS-AGS) will be displayed on 9M9.
9S6	GUID CONT SWITCH 2-POSITION TOGGLE LOCK-LOCK	This two-position toggle (PGNS-AGS) selects either PGNS or AGS for guidance control of the LM.
9S8	SHFT/TRUN SWITCH 2-POSITION TOGGLE MAIN-MAIN	This two-position toggle ($\pm 50^{o}$ - $\pm 5^{o}$) selects the range of Rendezvous Radar Shaft and Trunnion angles to be displayed on the pitch and yaw error needles of 9M1 and/or 9M6 when 9S2 and/or 9S7 are placed in the RNDZ/RADAR position. In the $\pm 50^{o}$ position each graduation represents 10^{o}. In the $\pm 5^{o}$ position the last graduation represents 5^{o}, but due to the non-linear scale the intermediate graduations represent approximately 1^{o}.

SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

Code	Control/Indicator	Function
9S11	RESET/COUNT SWITCH 3-POSITION TOGGLE MOM-MAIN-MAIN	This three-position toggle (RESET-UP-DOWN) is used to reset the Event Timer and select the direction in which the timer will count. The momentary spring loaded RESET position immediately resets 9M11 to zero. Zero is maintained until a start pulse is initiated by activation of 9S12. In the UP position the timer will count in an increasing direction to 59 minutes and 59 seconds, return to zero and begin counting up again. In the DOWN position the timer will count in a decreasing direction from a preset value to 0 minutes and 0 seconds, return to 59 minutes and 59 seconds and count down again.
9S12	TIMER CONTROL SWITCH 2-POSITION TOGGLE MAIN-MAIN	This is a two-position toggle (START-STOP) switch. In the START position the Event Timer will begin counting in a direction selected by 9S11. In the STOP position the count is stopped and frozen until either the START position is again selected or the RESET/COUNT switch is placed in the reset position, in which case it remains at zero until the start position is again selected.
9S13 9S14	MIN SLEW CONTROL SWITCH SEC SLEW CONTROL SWITCH TWO 3-POSITION TOGGLES MOM-MAIN-MOM	These toggles are used to set the four digits of 9M11. They have two momentary springs loaded positions (TENS-UNITS) which permit resetting each of the four digits independently. Positioning 9S13 to the TENS position slews the tens column digit of the minutes pair at the rate of 2 digits per second as long as the toggle is held in this position. In the UNITS position the unit column digit of the minutes pair is changed at a rate of 2 digits per second. All digits change in an increasing direction, regardless of the position of 9S11. In the center maintain position the slewing function is disabled. 9S14 is used in the same manner to set the seconds pair of digits on the Events Timer Indicator.

SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

Code	Control/Indicator	Function
9S17 9S18	X-POINTER SCALE SWITCH (CDR) X-POINTER SCALE SWITCH (LMP) TWO 2-POSITION TOGGLES MAIN-MAIN	These two-position toggles (HI MULT-LO MULT) control the scale range of 9M2 and 9M3. When LOS rates are displayed, the HI MULT position will provide a scale of ±20 mrad/sec., and the LO MULT position will illuminate the "X. 1" multiplier to provide a scale of ±2 mrad/sec. When horizontal velocities are displayed, the HI MULT position will illuminate the "X. 10" multiplier to provide a scale of ±200 ft/sec. The LO MULT position will provide a scale of ±20 ft/sec. 9S17 controls scale range input to 9M2; and 9S18 controls scale range inputs to 9M3.
9S19	TIMER CONTROL 3-POSITION TOGGLE MAIN-MAIN-MOM	This three-position toggle (START-STOP-RESET) is maintained in the START and STOP positions and momentary in the RESET position. The START position enables the clock to count in an upward direction from any number pre-set by the slew controls (9S20, 9S21, and 9S22). In the STOP position, the count is stopped and frozen. Returning to the START position continues the count. The momentary spring loaded RESET position resets all numbers to zero.
9S20 9S21 9S22	SECONDS SLEW CONTROL MINUTES SLEW CONTROL HOURS SLEW CONTROL THREE 3-POSITION TOGGLES MOM-MAIN-MOM	These three-position toggles have two momentary spring loaded positions (TENS-UNITS) which permit the selection of any digits for the mission timer. Positioning 9S22 to the TENS position slews the tens column digit of the hours at the rate of 2 digits per second as long as the toggle is held in this position. The hundreds digit of the hours is also controlled by the TENS position of 9S22, changing one digit for every 5 seconds of slew. In the UNITS position, the unit column digit of the hours is changed at a rate of 2 digits per second. All digits change in an increasing direction. In the center position, the slewing function is stopped. 9S21 and 9S20 are used in the same manner to set the minutes and seconds digits, and slew at the rate of 2 digits per second.

SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

Code	Control/Indicator	Function
9S23 9S24	FDAI 1 SWITCH FDAI 2 SWITCH TWO 2-POSITION TOGGLES MAIN-MAIN	These two-position toggles (ORB RATE-INRTL) when placed in the ORB RATE position provide a pitch angle input to their respective FDAI which causes the FDAI to display total attitude with respect to a local horizontal reference frame. When the toggle is placed in the INRTL position, the ORDEAL is bypassed and the FDAI displays total spacecraft altitude with respect to an inertial reference frame.
9S25	EARTH-PWR OFF-LUNAR 3-POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (EARTH-PWR OFF-LUNAR) is used in conjunction with 9R1 to insert an appropriate scale factor into the ORDEAL electronics. In the lunar position, power is applied to the ordeal and the lunar rate logic circuitry is activated. In the POWER OFF position, AC&DC power is removed from the ordeal. When the switch is in the EARTH position, the earth rate logic circuitry is activated.
9S26	LIGHTING SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (BRT-OFF-DIM) controls the brightness of the ORDEAL EL panel lighting.
9S27	MODE SWITCH 2-POSITION TOGGLE MAIN-MAIN	This two-position toggle (OPR/SLOW-HOLD/FAST) is used in conjunction with 9S28 to insert and maintain the proper angular offset into the FDAI's. The HOLD/FAST slew position in conjunction with the UP and DOWN positions permits slewing at an orbital rate X200 in the plus or minus direction. This is used as a course adjustment. The OPR/SLOW position in conjunction with the UP and DOWN position permits slewing at an orbital rate X10 in the plus or minus direction. This is used for fine adjustment. When the switch is placed to the OPR/SLOW position in conjunction with the center maintain position of 9S28, the ORDEAL slews at the orbital rate.

SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

Code	Control/Indicator	Function
9S28	SLEW SWITCH 3-POSITION TOGGLE MOM-MAIN-MOM	This three-position toggle (UP-DOWN) is used to slew the pitch indication on the FDAI in the plus or minus direction at a rate dependent on the position of 9S27. When this switch is in the center, maintain position and 9S27 is in the OPR/SLOW position the ORDEAL will slew at the orbital rate and the FDAI will display total attitude with respect to a local horizontal reference frame. With this switch (9S28) in the center, maintained position and 9S27 in the HOLD/FAST position, the ordeal will hold and not slew at the orbital rate.
9S29	RATE SCALE SWITCH 2-POSITION TOGGLE MAIN-MAIN	This two-position toggle ($\pm5^{o}$/SEC - $\pm25^{o}$/SEC) selects the range of the pitch, yaw and roll rate signals into the rate needles of 9M1 and 9M6. In the $\pm5^{o}$/SEC position, a full scale deflection of the rate needles indicates a rate of $\pm5^{o}$/second. In the $\pm25^{o}$/SEC position, a full scale deflection of the rate needles indicates a rate of $\pm25^{o}$/SEC. Less than full scale deflection needle positions are linearly proportional to pitch, yaw and roll rates of less than $\pm5^{o}$/SEC or $\pm25^{o}$/SEC, respectively.
9R1	ALT SET CONTINUOUS ROTARY	This continuous rotary (10 to 310) nautical miles is used to insert the LM orbital altitude into the ORDEAL.

SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

Code	Control/Indicator	Function
9M1 9M6	FLIGHT DIRECTOR ATTITUDE INDICATOR (CDR) FLIGHT DIRECTOR ATTITUDE INDICATOR (LMP)	Each of these indicators displays: (1) vehicle Attitude, Attitude Rates and Attitude errors or (2) vehicle Attitude, Attitude Rates and Rendezvous Radar Antenna Shaft and Trunnion angles, depending upon the position of 9S2 and 9S7. The position of 9S3 and 9S10 will select either PGNS or AGS as the source of displayed vehicle Attitude and Attitude errors for 9M1 and 9M6 respectively. The attitude rate information displayed on the three meters surrounding the ball is always obtained from the CES rate gyros. The Shaft and Trunnion angles are displayed respectively on the pitch and yaw error needles of 9M1 and/or 9M6 when 9S2 and/or 9S7 is in the RNDZ RADAR position.
9M2 9M3	X-POINTER (CDR) X-POINTER (LMP)	These indicators display: (1) Forward and Lateral Velocity, (2) Lateral Velocity only or (3) Rendezvous Radar LOS Elevation and Azimuth angular rates. What is displayed on 9M2 is a function of the position of 9S2 and 9S9 and what is displayed on 9M3 is a function of the position of 9S7 and 9S9. Forward and Lateral Velocities are measured in the horizontal plane along the LM Z and Y body axis when the source driving the display is the PGNS. When the Landing Radar is the driving source the Forward and Lateral Velocities are coincident with LM Z and Y body axis velocities. This is true only when the radar beams are coincident with the vehicle body axis (from Hi-Gate to Touchdown phase). When the AGS system is the driving source, Lateral velocity is the only information displayed and is vehicle Y body axis velocity. When Rendezvous Radar is selected LOS rates are displayed.

SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

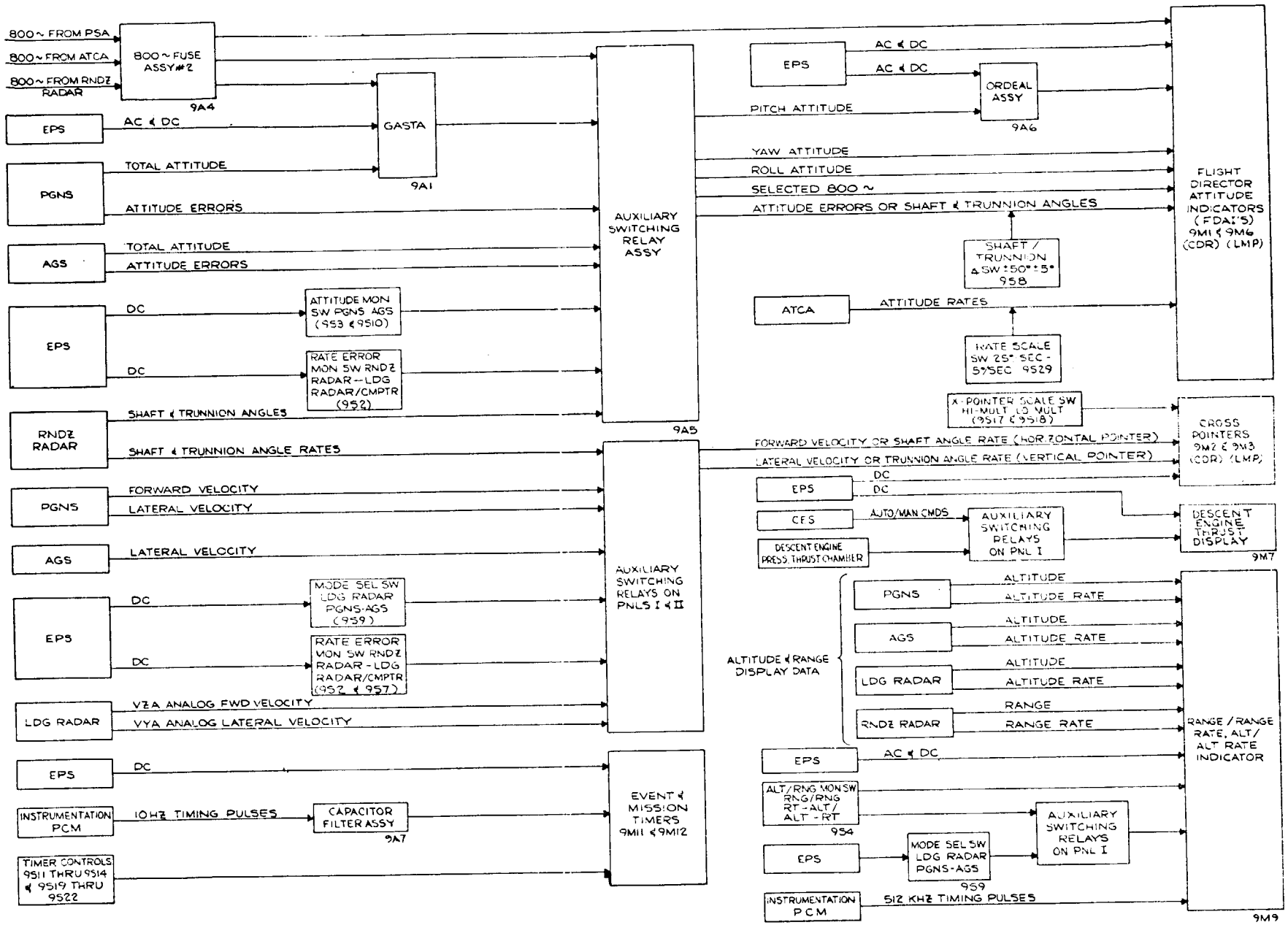
Code	Control/Indicator	Function
9M4	THRUST/WEIGHT INDICATOR	This indicator is a self-contained accelerometer which displays instantaneous X-axis acceleration in lunar "g" units (1 "g" = 5.23 ft/sec^2). The instrument may be used to provide a gross check on engine performance since any given throttle setting will provide a specific acceleration when the vehicle has a given mass.
9M7	THRUST INDICATOR	This is a dual vertical indicator with left and right pointers. The left pointer displays descent engine chamber pressure which corresponds to thrust. The right pointer displays the level of throttle commands (via TTCA) or LGC thrust commands. THRUST CONT switch 1S11 selects either the MANUAL or AUTO modes of operation. If the MANUAL mode is selected by 1S11, then the right pointer will indicate either the CDR's or LMP's throttle command depending on the position of the MAN THROT switch 1S10. Both meter scales read from 0 to 100%. When 1S11 is in the MANUAL mode, and the TTCA is set to minimum, the indicators right pointer will indicate 10% (minimum output of TTCA). Increasing the TTCA will correspondingly increase this reading. At this time, the left and right pointers should be aligned and continue to track. With 1S11 set to the AUTO position, and the GUID CONT switch (9S6) set to PGNS, the actual thrust command to the engine is the sum of the thrust commands from the LGC and the TTCA. However, the THRUST INDICATOR right pointer will indicate only the LGC command. Therefore, with the TTCA set to minimum and 1S11 in AUTO, there should be no divergence between the left and right pointers. A divergence would indicate a malfunction (engine not responding to commands) or that manual authority is being introduced (via the TTCA). When manual control is introduced, the right pointer will continually decrease since the LGC will automatically decrease its command proportionately. When the TTCA control is set to the original LGC command, the right pointer

SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

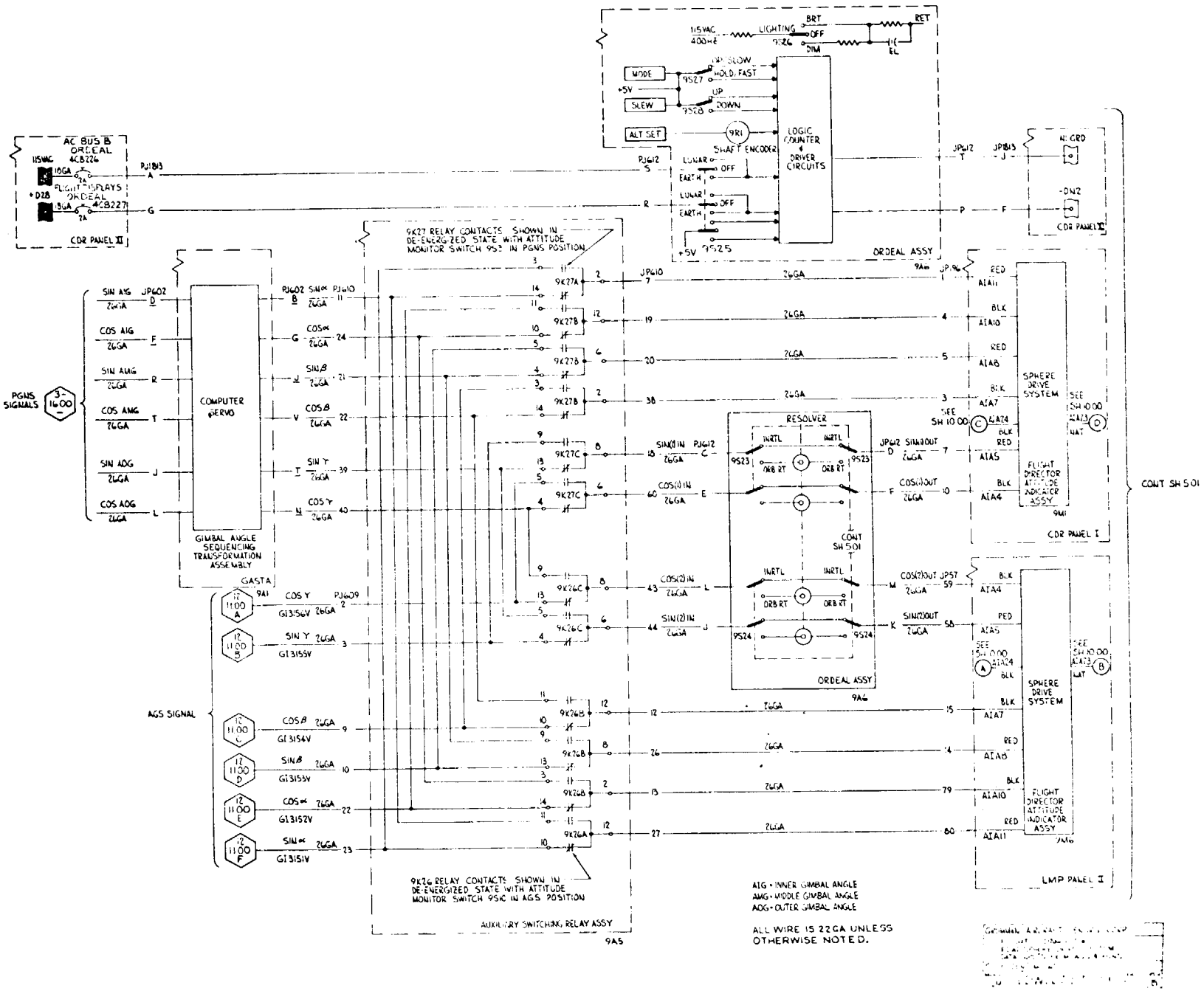
Code	Control/Indicator	Function
9M7 (Cont)		will indicate 10%. At this time, 1S11 may be placed to MANUAL, whereby the left and right pointers will be aligned and the descent engine is in full manual control. If the GUID CONT switch (9S6) is in the AGS position, the ascent engine is controlled only by the TTCA.
9M9	ALTITUDE/RANGE INDICATOR	This indicator will display either Range/Range Rate information or Alt/Alt Rate information as selected by 9S4. The Range/Range Rate data are from the Rendezvous Radar. The Altitude/Altitude Rate information is from one of three sources; the Landing Radar, PGNS or AGS as selected by 9S9. When Landing Radar information is selected, true altitude and altitude rate data are available from Lo-Gate to Touchdown if the LM X axis is vertical. When either PGNS or AGS is selected inertially derived altitude and altitude rate data are available for display. Prior to Lo-Gate the most reliable altitude data will be available from PGNS providing the LGC and the radar are functioning accurately.
9M11	EVENT TIMER INDICATOR 4-PLACE DIGITAL DISPLAY	This four digit indicator displays time in minutes and seconds. It is capable of counting up or down. The maximum time displayed is 59 minutes, 59 seconds. 9S11, 9S12, 9S13 and 9S14 control the operation and settings of this display.
9M12	MISSION TIMER	This seven digit indicator displays time in hours, minutes and seconds. It is capable of only counting up. The maximum time displayed is 999 hours, 59 minutes and 59 seconds. 9S19, 9S20, 9S21, 9S22 control the operation and settings of this display.

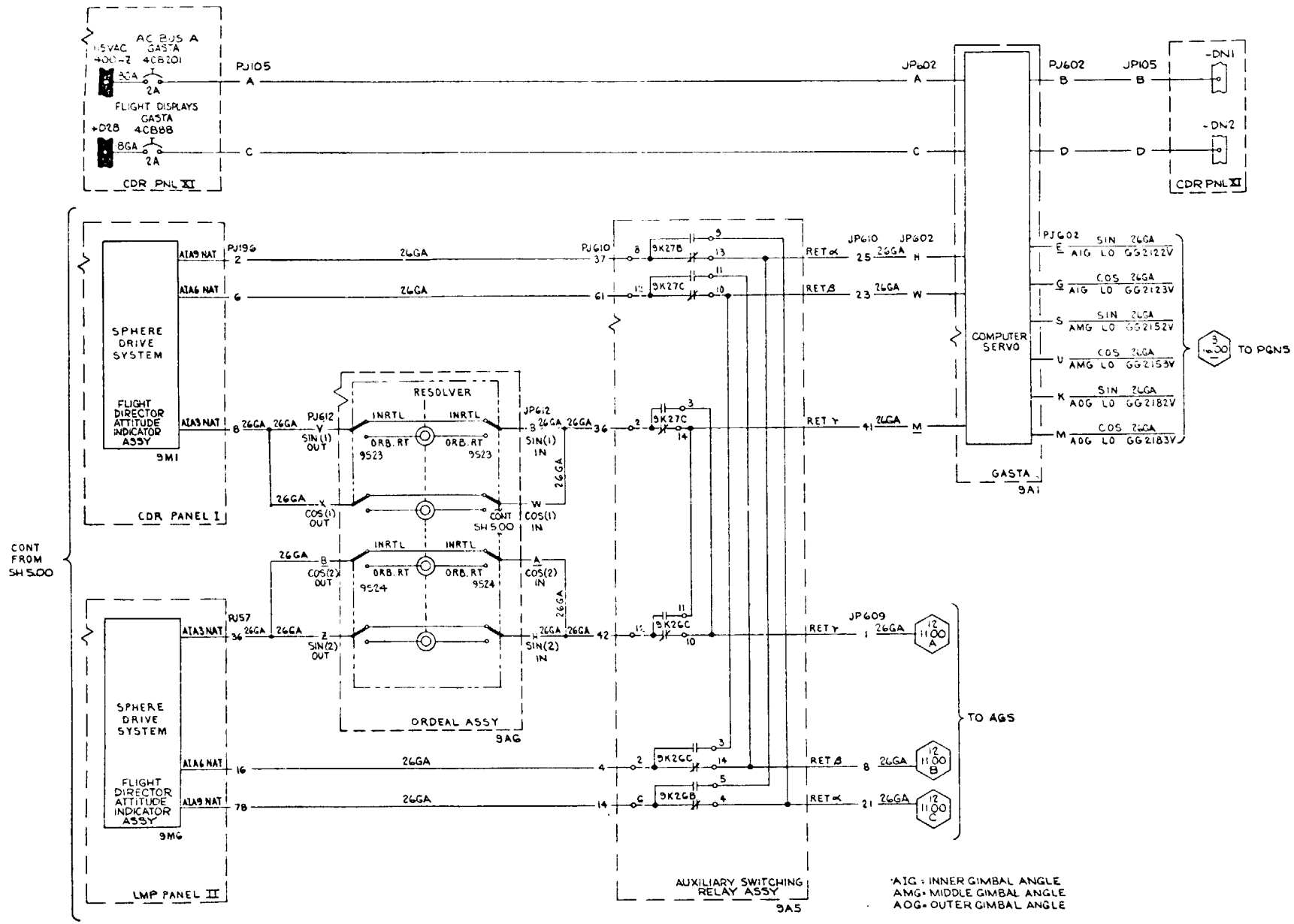
SUBSYSTEM: FLIGHT GUIDANCE DISPLAYS & CONTROLS (FUNCTIONAL GROUPING 9)

Code	Control/Indicator	Function
16DS91	CDR CROSS POINTER INDICATOR (9M2) POWER FAILURE LIGHT	SEE EFD16-1005.3
16DS92	THRUST INDICATOR (9M7) POWER FAILURE LIGHT	SEE EFD16-1005.4
16DS97	LMP CROSS POINTER IND (9M3) POWER FAILURE LIGHT	



GRUMMAN AIRCRAFT ENGRG CORP	
FLIGHT GUIDANCE D&C BLOCK DIAGRAM	
CODE IDENT NO 20312	
MODEL LM	LDW267-57009 SHEET 4.00 REV B

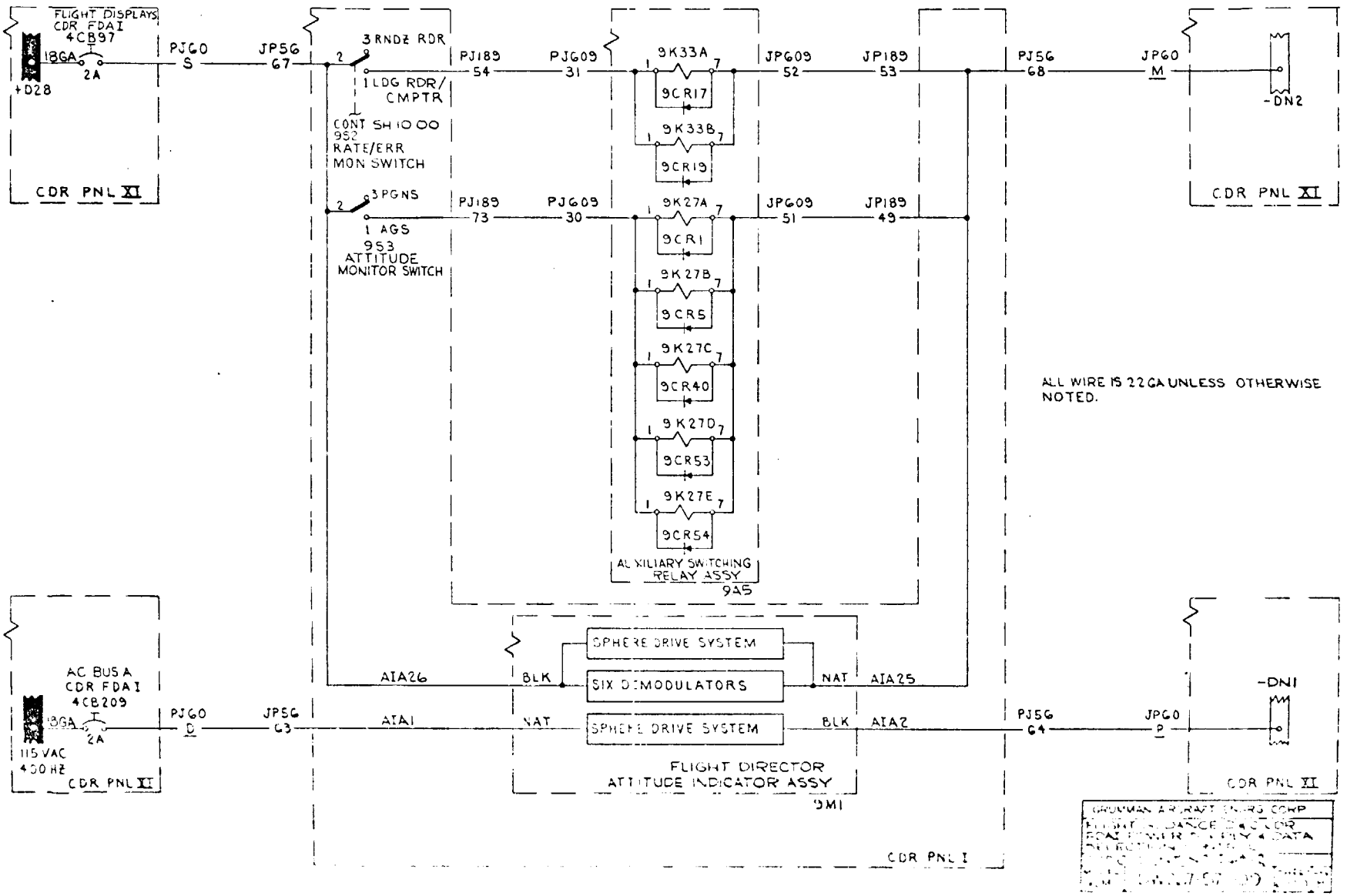

AC BUS B ORDEAL 4CB226
115VAC
10GA
2A
+D28
5GA
2A
FLIGHT DISPLAYS ORDEAL 4CB227
CDR PANEL II
PJ1B3
A
G
PJ612
S
R
115VAC 400HZ
LIGHTING
BRT
OFF
DIM
RET
EL
9526
MODE
9527
HOLD, FAST
SLEW
9528
UP
DOWN
+5V
ALT SET
9R1
SHAFT ENCODER
LUNAR
EARTH
OFF
9525
LOGIC COUNTER & DRIVER CIRCUITS
ORDEAL ASSY
9A6
JP612
T
P
JP1B3
J
F
N GRD
-DN2
CDR PANEL II
9K27 RELAY CONTACTS SHOWN IN DE-ENERGIZED STATE WITH ATTITUDE MONITOR SWITCH 95I IN PGNS POSITION
SIN AIG JP602 2wTA D
COS AIG 26GA F
SIN AMG 26GA R
COS AMG 26GA T
SIN AOG 26GA J
COS AOG 26GA L
COMPUTER SERVO
GIMBAL ANGLE SEQUENCING TRANSFORMATION ASSEMBLY
PJ602 SIN∝ PJ610 B 26GA
COS∝ G 26GA 24
SIN∃ J 26GA 21
COS∃ V 26GA 22
SIN γ T 26GA 39
COS γ M 26GA 40
PGNS SIGNALS
3-16.00
9K27A
9K27B
9K27B
9K27B
9K27C
9K27C
9K26C
9K26C
9K26B
9K26B
9K26B
9K26A
JP610
7
19
20
38
15
60
43
44
12
26
13
27
26GA
AIA11 RED
AIA10 BLK
AIA8 RED
AIA7 BLK
AIA5 RED
AIA4 BLK
SPHERE DRIVE SYSTEM
FLIGHT DIRECTOR ATTITUDE INDICATOR ASSY
9M1
CDR PANEL I
SEE SH 10.00
SIN(1)IN PJ612 C 26GA
COS(1)IN E 26GA
SIN(1)OUT JP612 D 26GA
COS(1)OUT F 26GA
RESOLVER
INRTL
ORB RT
9523
9524
ORDEAL ASSY
9A6
CONT SH 501 T
COS(2)IN L 26GA
SIN(2)IN J 26GA
COS(2)OUT JP57 M 26GA
SIN(2)OUT K 26GA
59
58
AIA4 BLK
AIA5 RED
AIA9 BLK
AIA7 BLK
AIA6 RED
AIA10 BLK
AIA11 RED
SPHERE DRIVE SYSTEM
FLIGHT DIRECTOR ATTITUDE INDICATOR ASSY
9M6
LMP PANEL I
CONT SH 501
GASTA
12 11.00 A
COS Y PJ609 2 26GA
G13156V
12 11.00 B
SIN Y 26GA 3
G13155V
AGS SIGNAL
12 11.00 C
COS∃ 26GA 9
G13154V
12 11.00 D
SIN∃ 26GA 10
G13153V
12 11.00 E
COS∝ 26GA 22
G13152V
12 11.00 F
SIN∝ 26GA 23
G13151V
9K26 RELAY CONTACTS SHOWN IN DE-ENERGIZED STATE WITH ATTITUDE MONITOR SWITCH 95IC IN AGS POSITION
AUXILIARY SWITCHING RELAY ASSY
9A5
AIG = INNER GIMBAL ANGLE
AMG = MIDDLE GIMBAL ANGLE
AOG = OUTER GIMBAL ANGLE
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

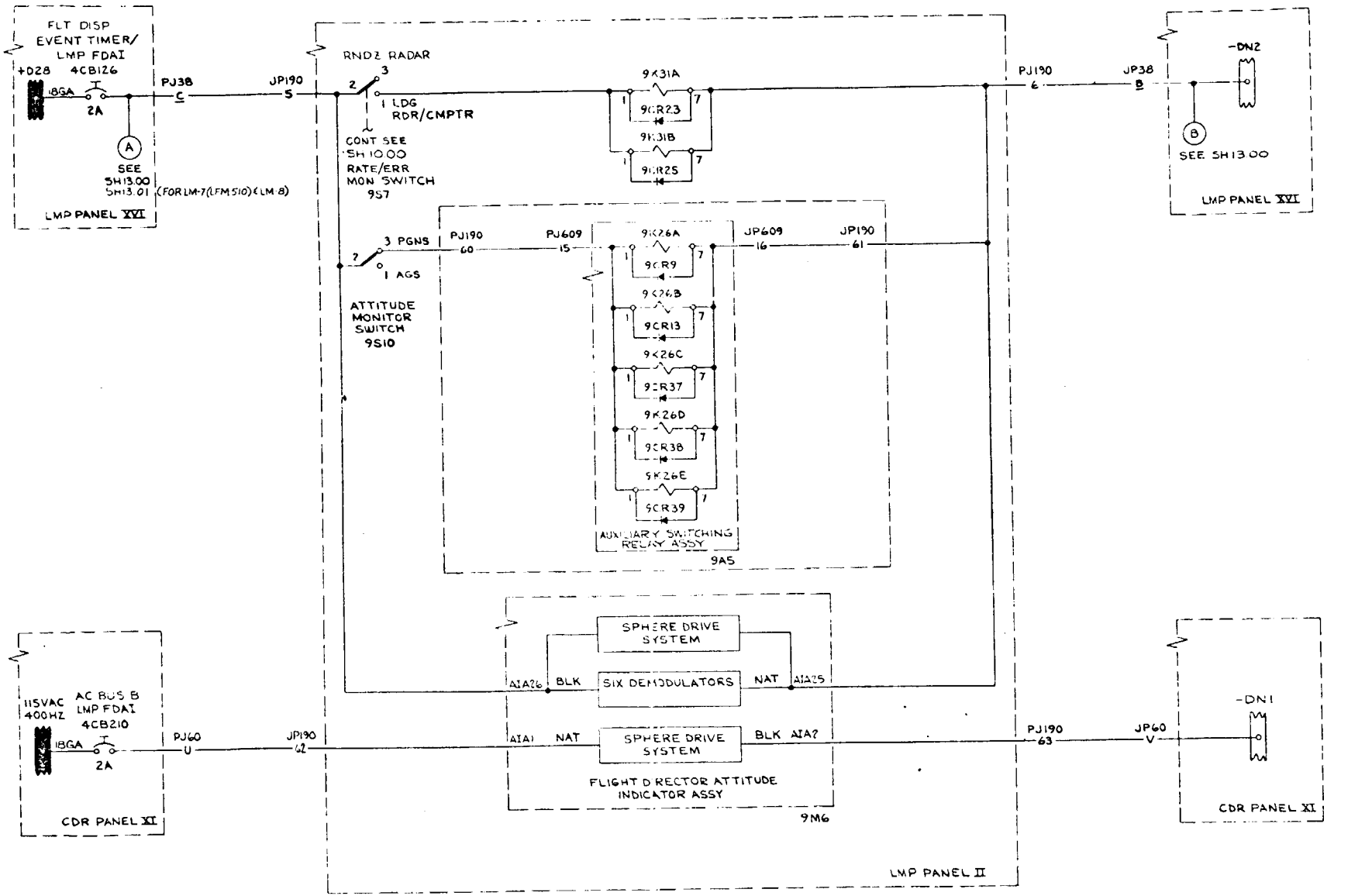


*AIG = INNER GIMBAL ANGLE
AMG = MIDDLE GIMBAL ANGLE
AOG = OUTER GIMBAL ANGLE

ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

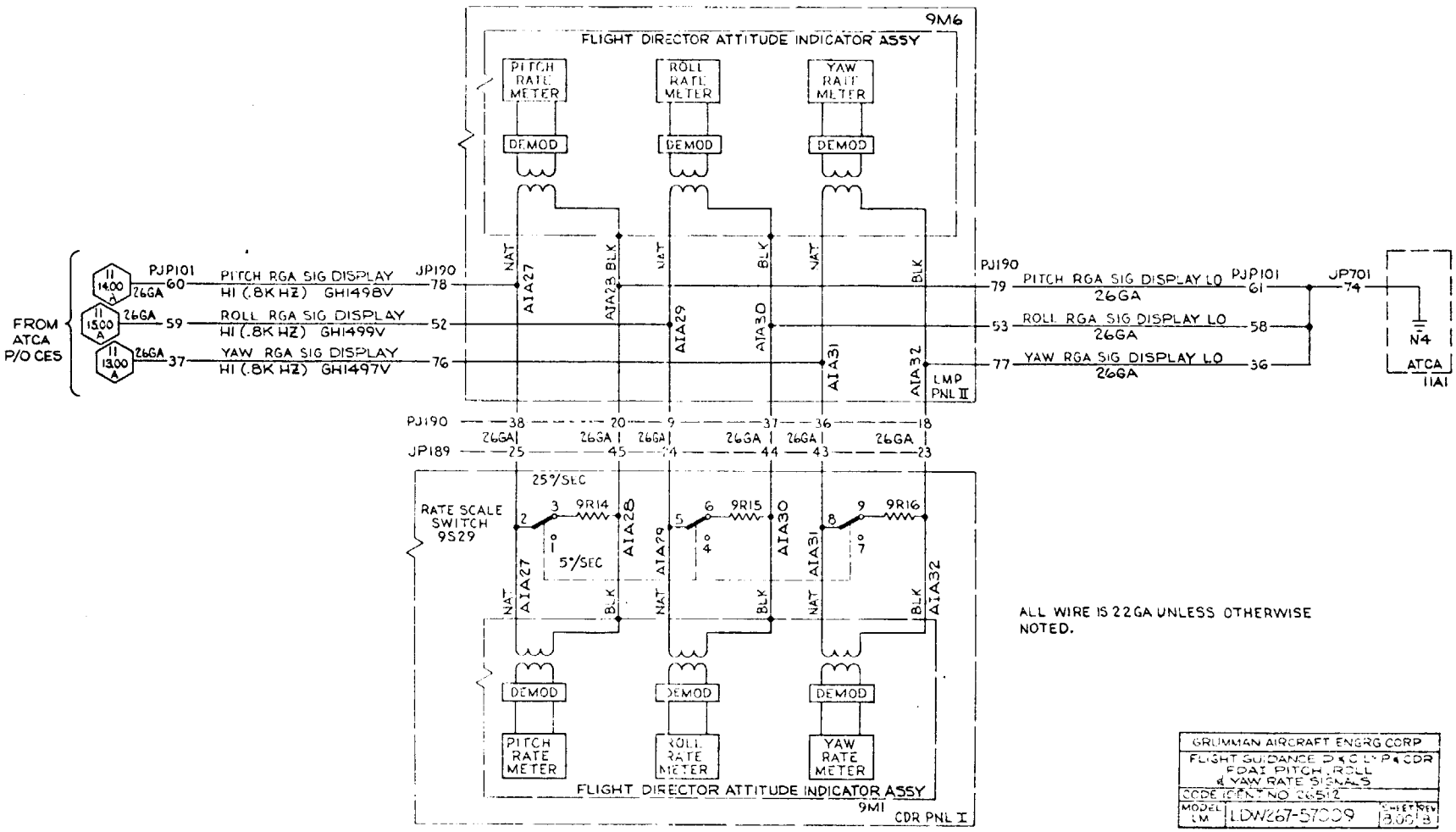
GRUMMAN AIRCRAFT ENGRG CORP	
FLIGHT GUIDANCE D&C FDAI SPHERE DRIVE SYSTEM DATA INPUTS FROM AGS & PGNS	
CODE IDENT NO. 78512	
MODEL LM	LDW267-57009
SHEET NO. 501	REV B

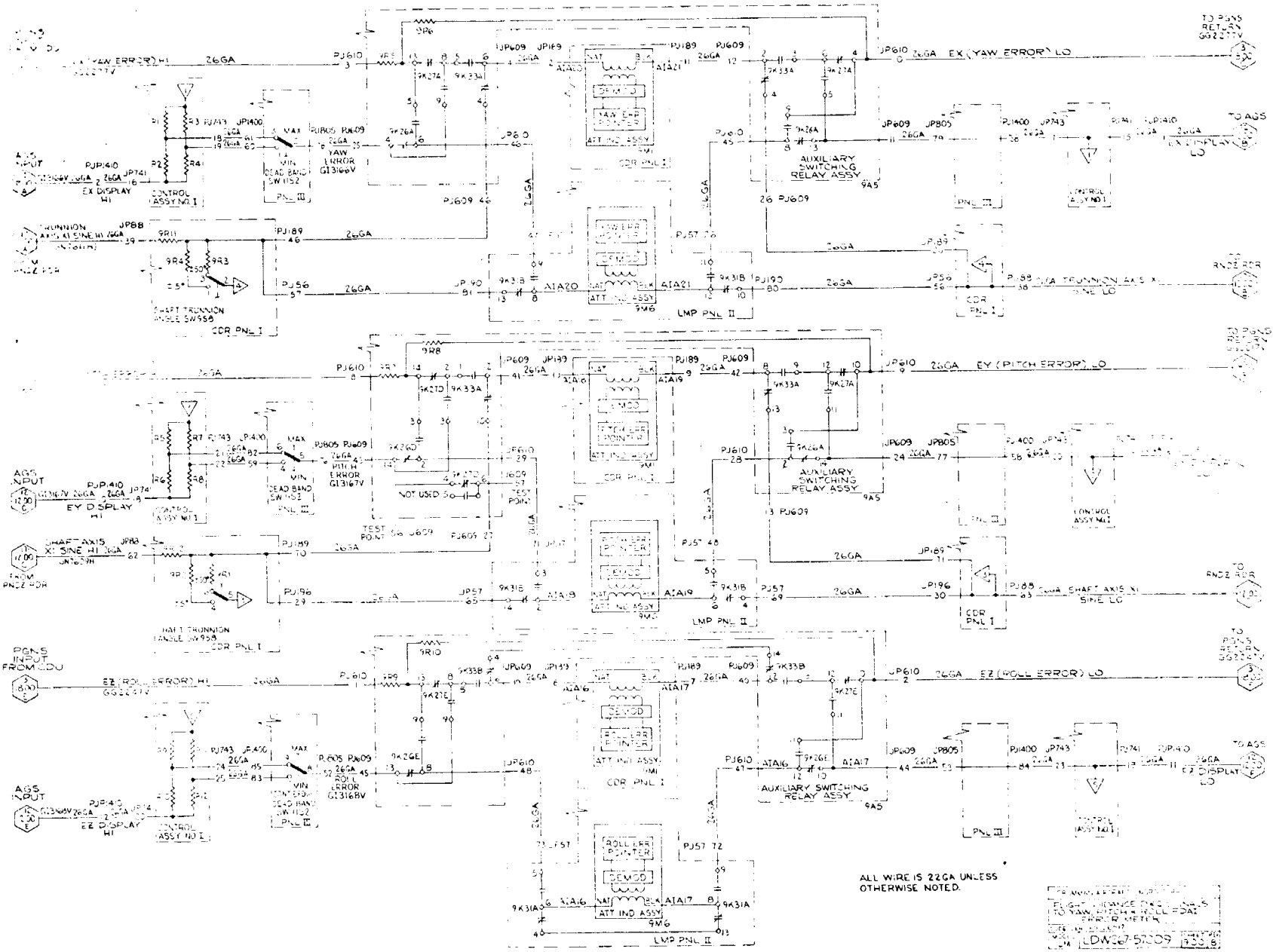

FLIGHT DISPLAYS
CDR FDAI
4CB97
18GA
2A
+D28
CDR PNL XI
PJG0
S
JPSG
G7
3 RNDZ RDR
1 LDG RDR/
CMPTR
CONT SH 10 00
952
RATE/ERR
MON SWITCH
3 PGNS
1 AGS
953
ATTITUDE
MONITOR SWITCH
PJ189
54
PJG09
31
9K33A
9CR17
9K33B
9CR19
JPG09
52
JP189
53
PJ5G
68
JPG0
M
-DN2
CDR PNL XI
PJ189
73
PJG09
30
9K27A
9CR1
9K27B
9CR5
9K27C
9CR40
9K27D
9CR53
9K27E
9CR54
JPG09
51
JP189
49
AUXILIARY SWITCHING
RELAY ASSY
945
ALL WIRE IS 22 GA UNLESS OTHERWISE
NOTED.
AC BUS A
CDR FDAI
4CB209
18GA
2A
115 VAC
400 HZ
CDR PNL XI
PJG0
D
JPSG
G3
AIA1
AIA26
BLK
SPHERE DRIVE SYSTEM
SIX DEMODULATORS
SPHERE DRIVE SYSTEM
NAT
NAT
BLK
AIA25
AIA2
FLIGHT DIRECTOR
ATTITUDE INDICATOR ASSY
9M1
CDR PNL I
PJ5G
G4
JPG0
P
-DN1
CDR PNL XI

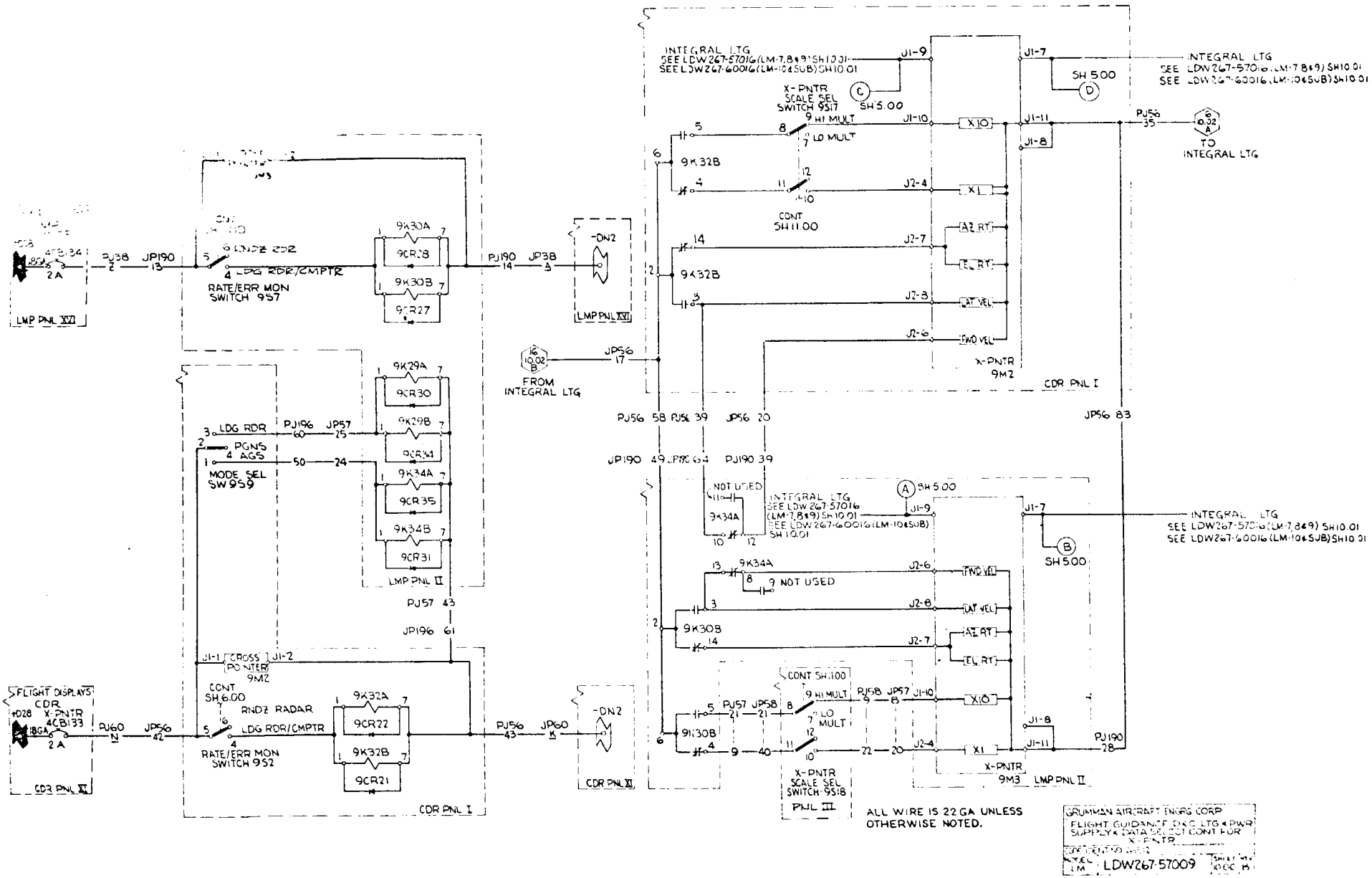


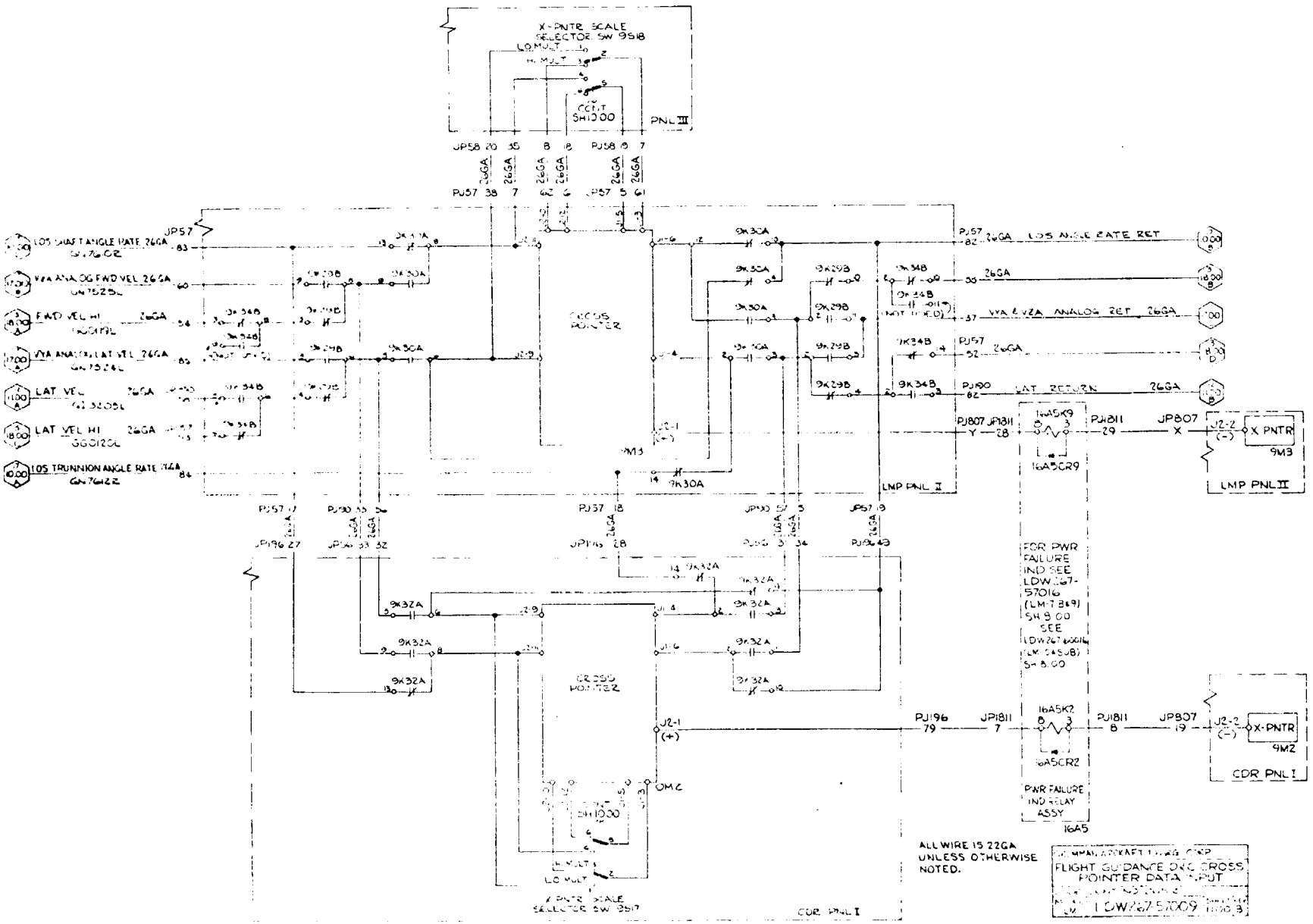
ALL WIRE IS 22GA UNLESS
OTHERWISE NOTED.

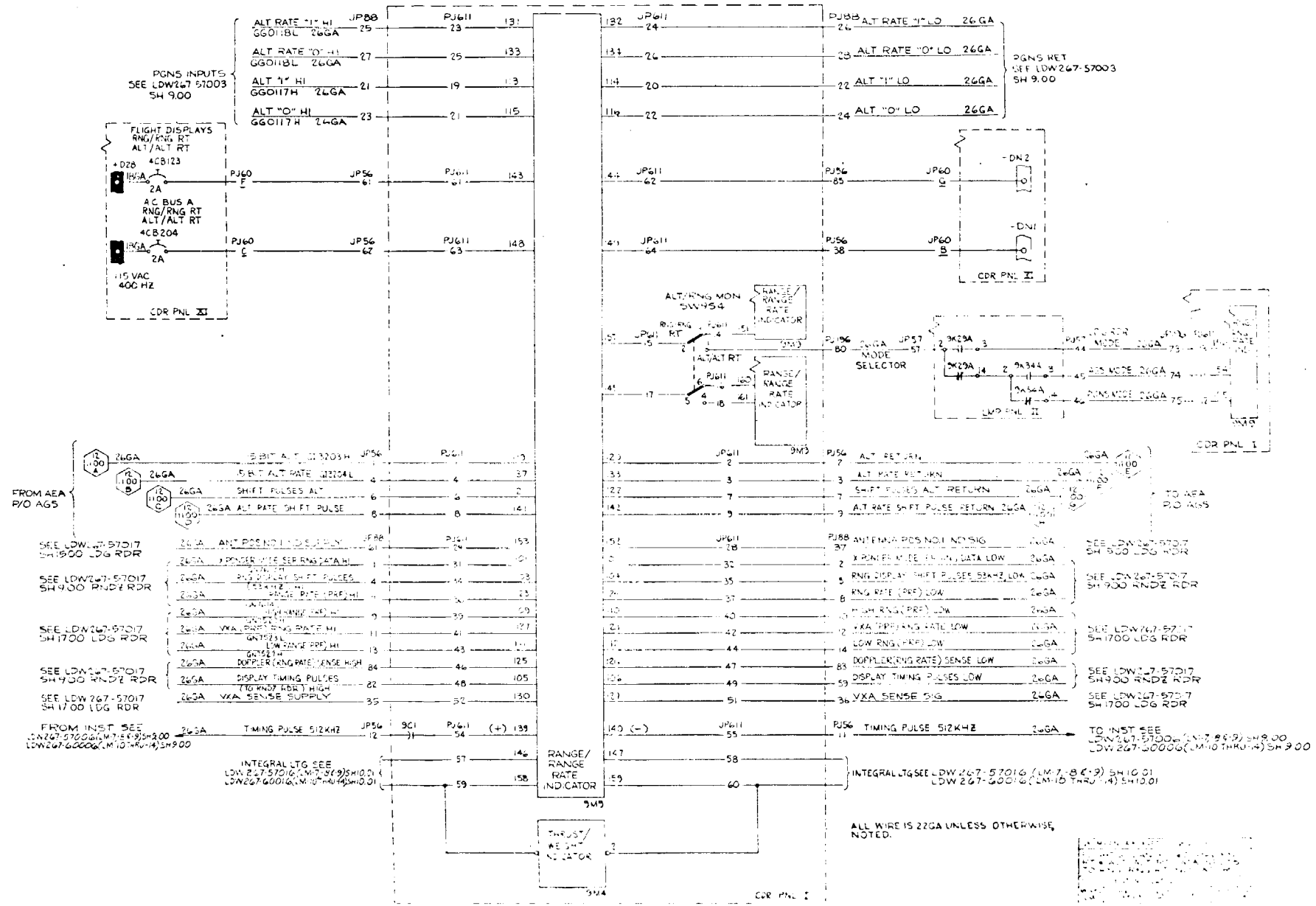
GRUMMAN AIRCRAFT ENGRG CORP	
FLIGHT GUIDANCE D&C	
LMP FDAI POWER SUPPLY	
& DATA SELECTION CONTROL	
ASSY IDENT NO 2-5012	SHEET
MODEL LM	LDW2-7-5009 REV B

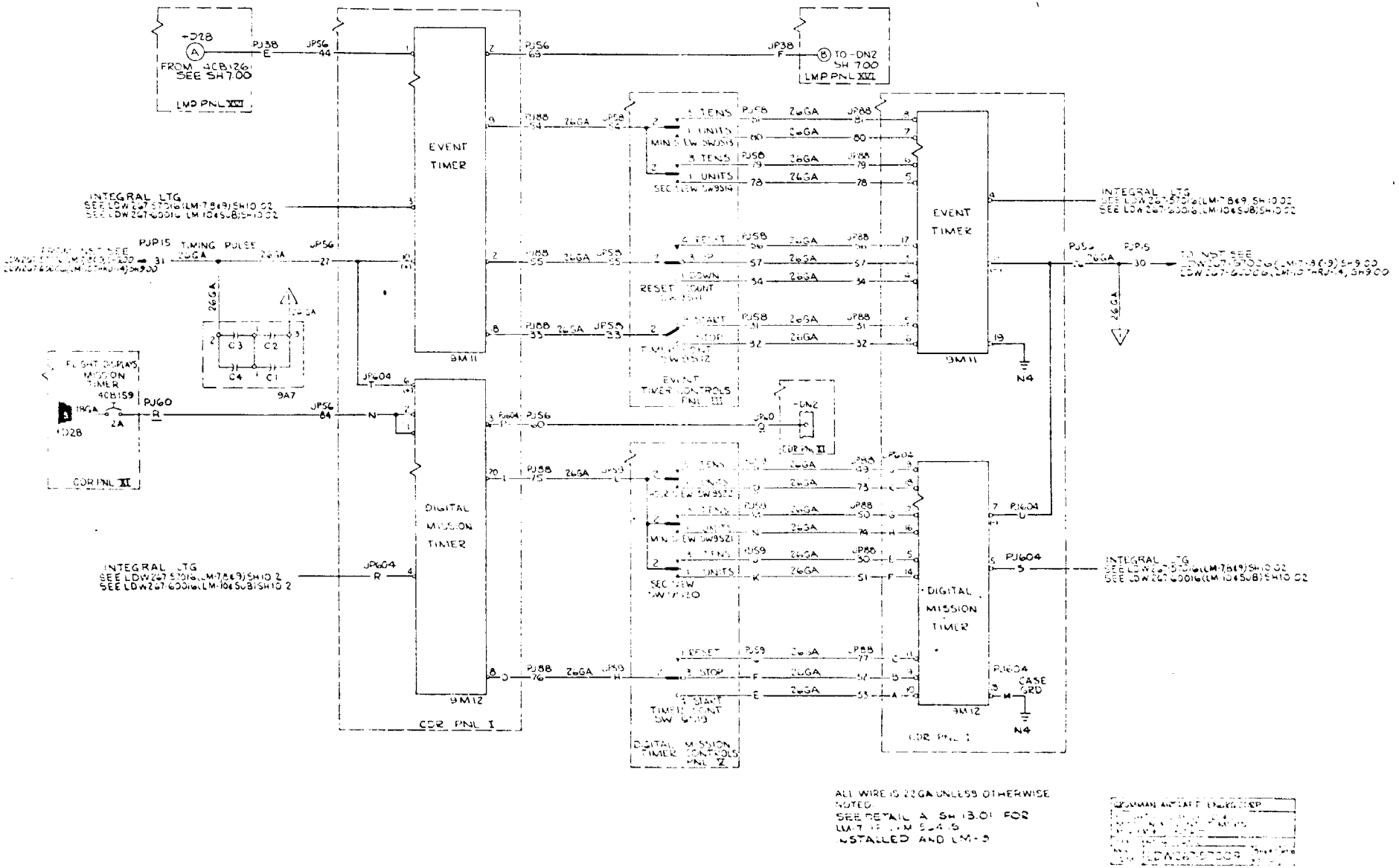

9M6
FLIGHT DIRECTOR ATTITUDE INDICATOR ASSY
PITCH RATE METER
ROLL RATE METER
YAW RATE METER
DEMOD
FROM ATCA P/O CES
PJP101
PITCH RGA SIG DISPLAY HI (.8K HZ) GH1498V
ROLL RGA SIG DISPLAY HI (.8K HZ) GH1499V
YAW RGA SIG DISPLAY HI (.8K HZ) GH1497V
26GA
JP190
PJ190
PITCH RGA SIG DISPLAY LO 26GA
ROLL RGA SIG DISPLAY LO 26GA
YAW RGA SIG DISPLAY LO 26GA
PJP101
JP701
N4
ATCA 11A1
LMP PNL II
A1A27
A1A28
A1A29
A1A30
A1A31
A1A32
NAT
BLK
JP189
RATE SCALE SWITCH 9S29
25°/SEC
5°/SEC
9R14
9R15
9R16
9M1
CDR PNL I
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.
GRUMMAN AIRCRAFT ENGRG CORP
FLIGHT GUIDANCE P & C L Y P & CDR FDAI PITCH, ROLL & YAW RATE SIGNALS
CODE IDENT NO 06512
MODEL LM
LDW267-57009
SHEET REV 3.09 3


ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.
AUXILIARY SWITCHING RELAY ASSY
CONTROL ASSY NO 1
CDR PNL I
LMP PNL II
PNL III
TO AGS
TO PGNS RETURN GG22277
AGS INPUT
EX DISPLAY HI
EX DISPLAY LO
EY DISPLAY HI
EY DISPLAY LO
EZ DISPLAY HI
EZ DISPLAY LO
SHAFT TRUNNION ANGLE SW 958
SHAFT AXIS XI SINE HI
SHAFT AXIS XI SINE LO
TRUNNION AXIS XI SINE LO
FROM PNZ HDR
TO PNZ HDR
ATT IND ASSY 9M6
SERVO
YAW ERR POINTER
PITCH ERR POINTER
ROLL ERR POINTER
YAW ERROR GI3166V
PITCH ERROR GI3167V
ROLL ERROR GI3168V
DEAD BAND SW 1152
NOT USED
TEST POINT
FLIGHT INSTRUMENT DISPLAYS TO PGNS PITCH & ROLL RESOLVER SYNCHRO METER
LDW267-57009


INTEGRAL LTG
SEE LDW 267-57016 (LM-7,8&9) SH10.01
SEE LDW 267-60016 (LM-10&SUB) SH10.01
X-PNTR SCALE SEL SWITCH 9S17
HI MULT
LO MULT
9K32B
CONT SH 11.00
X-PNTR 9M2
CDR PNL I
FROM INTEGRAL LTG
RATE/ERR MON SWITCH 9S7
LDG RDR/CMPTR
RNDZ RDR
LMP PNL XVI
9K30A
9CR28
9K30B
9CR27
9K29A
9CR30
9K29B
9CR34
9K34A
9CR35
9K34B
9CR31
LMP PNL II
LDG RDR
PGNS
AGS
MODE SEL SW 9S9
NOT USED
9K34A
9K30B
CONT SH 6.00
RNDZ RADAR
RATE/ERR MON SWITCH 9S2
9K32A
9CR22
9K32B
9CR21
CDR PNL XI
CDR PNL XII
CROSS POINTER 9M2
X-PNTR SCALE SEL SWITCH 9S18
PNL III
X-PNTR 9M3
LMP PNL II
TO INTEGRAL LTG
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.
GRUMMAN AIRCRAFT ENGRG CORP
FLIGHT GUIDANCE, DSC, LTG & PWR SUPPLY & DATA SELECT CONT FOR X-PNTR
LDW267-57009


X-PNTR SCALE SELECTOR SW 9S18
LO MULT
HI MULT
CCVT SH 1 OF 3
PNL III
JP58 20 35 8 18 PJ58 6 7
PJ57 38 7 JP57 5 6
JP57
LOS CHAST ANGLE RATE 26GA
GN76G2R
VXA AVA OG FWD VEL 26GA
GN75Z5L
FWD VEL HI 26GA
GG0129L
VYA ANALOG LAT VEL 26GA
GN75Z4L
LAT VEL 26GA
GG0128L
LAT VEL HI 26GA
GG0128L
LOS TRUNNION ANGLE RATE 26GA
GN76H2R
9K30A
9K29B
9K34B
CROSS POINTER
9M3
LMP PNL II
PJ57 82 26GA LOS ANGLE RATE RET
26GA
VXA & VZA ANALOG RET 26GA
PJ57 52 26GA
PJ80 62 LAT RETURN 26GA
PJ807 JP1811 Y 28
16A5K9
16A5CR9
PJ1811 29
JP807 X
J2-2 (-) X PNTR 9M3
LMP PNL II
PJ57 17 PJ80 33 32 PJ37 18 JP80 5 3 JP57 19
JP1196 27 JP1196 33 32 JP1196 28 JP80 5 34 PJ80 43
9K32A
CROSS POINTER
FOR PWR FAILURE IND SEE LDW 267-57016 (LM-7 &9) SH 9.00 SEE LDW 267 60016 (LM-2 &5 &8) SH 8.00
J2-1 (+)
PJ196 79
JP1811 7
16A5K2
16A5CR2
PJ1811 8
JP807 19
J2-2 (-) X-PNTR 9M2
CDR PNL I
PWR FAILURE IND RELAY ASSY
16A5
9M4
SH 1 OF 3
HI MULT
LO MULT
X PNTR SCALE SELECTOR SW 9S17
CDR PNL I
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.
FLIGHT GUIDANCE DXC CROSS POINTER DATA INPUT
LDW267-57009

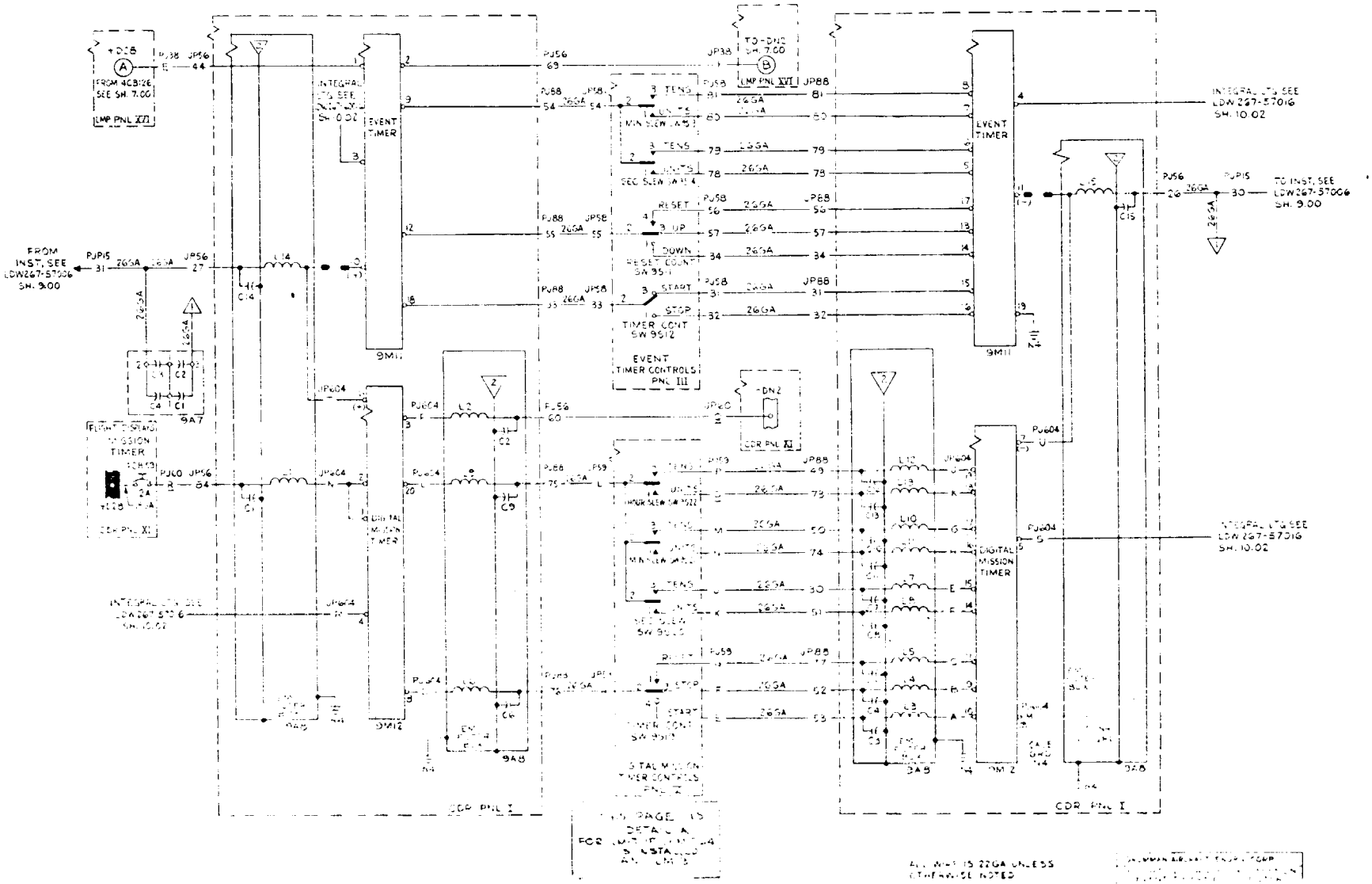

PGNS INPUTS
SEE LDW267-57003 SH 9.00
ALT RATE "1" HI GG0118L 26GA
ALT RATE "0" HI GG0118L 26GA
ALT "1" HI GG0117H 24GA
ALT "0" HI GG0117H 24GA
ALT RATE "1" LO 26GA
ALT RATE "0" LO 26GA
ALT "1" LO 26GA
ALT "0" LO 26GA
PGNS RET
SEE LDW267-57003 SH 9.00
FLIGHT DISPLAYS
RNG/RNG RT
ALT/ALT RT
+D28
4CB123
2A
A.C. BUS A
RNG/RNG RT
ALT/ALT RT
4CB204
2A
115 VAC
400 HZ
CDR PNL XI
PJ60
JP56
PJ611
JP611
PJ56
JP60
-DN2
-DN1
CDR PNL II
ALT/RNG MON SW954
RANGE/RANGE RATE INDICATOR
ALT/ALT RT
MODE SELECTOR
9M3
CDR PNL I
FROM AEA P/O AGS
TO AEA P/O AGS
13 BIT A.T. J3203H
13 BIT ALT RATE J3204L
SHIFT PULSES ALT
ALT RATE SHIFT PULSE
ALT RETURN
ALT RATE RETURN
SHIFT PULSES ALT RETURN
ALT RATE SHIFT PULSE RETURN 26GA
ANT POS NO 1 DISPLAY
X PONDER MODE SEL RNG DATA HI
RNG DISPLAY SHIFT PULSES
RNG RATE (PRF) HI
VXA (PRF) RNG RATE HI
LOW RANGE (PRF) HI
DOPPLER (RNG RATE) SENSE HIGH
DISPLAY TIMING PULSES
VXA SENSE SUPPLY
ANTENNA POS NO 1 NO SIG
X PONDER MODE SEL RNG DATA LOW
RNG DISPLAY SHIFT PULSES LOW
RNG RATE (PRF) LOW
HIGH RNG (PRF) LOW
VXA (PRF) RNG RATE LOW
LOW RNG (PRF) LOW
DOPPLER (RNG RATE) SENSE LOW
DISPLAY TIMING PULSES LOW
VXA SENSE SIG
SEE LDW267-57017 SH1900 LDG RDR
SEE LDW267-57017 SH900 RNDZ RDR
SEE LDW267-57017 SH1700 LDG RDR
TIMING PULSE 512KHZ
FROM INST SEE LDW267-57006 (LM-7, 8 & 9) SH 9.00 LDW267-60006 (LM-10 THRU 14) SH 9.00
TO INST SEE LDW267-57006 (LM-7, 8 & 9) SH 9.00 LDW267-60006 (LM-10 THRU 14) SH 9.00
INTEGRAL LTG SEE LDW267-57016 (LM-7, 8 & 9) SH10.01 LDW267-60016 (LM-10 THRU 14) SH10.01
INTEGRAL LTG SEE LDW267-57016 (LM-7, 8 & 9) SH10.01 LDW267-60016 (LM-10 THRU 14) SH10.01
RANGE/RANGE RATE INDICATOR
9M3
THRUST/ATT SW INDICATOR
9M4
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

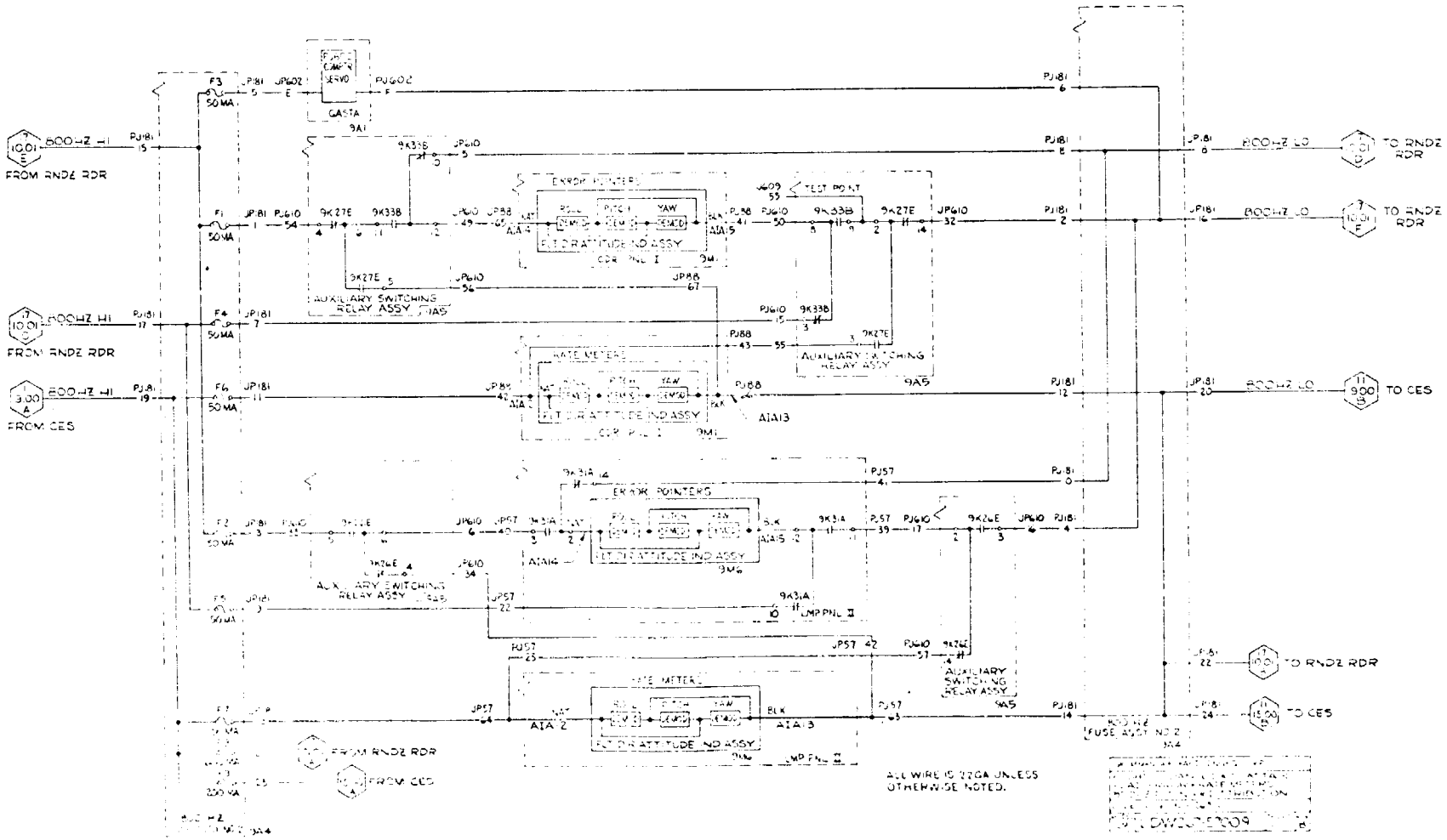


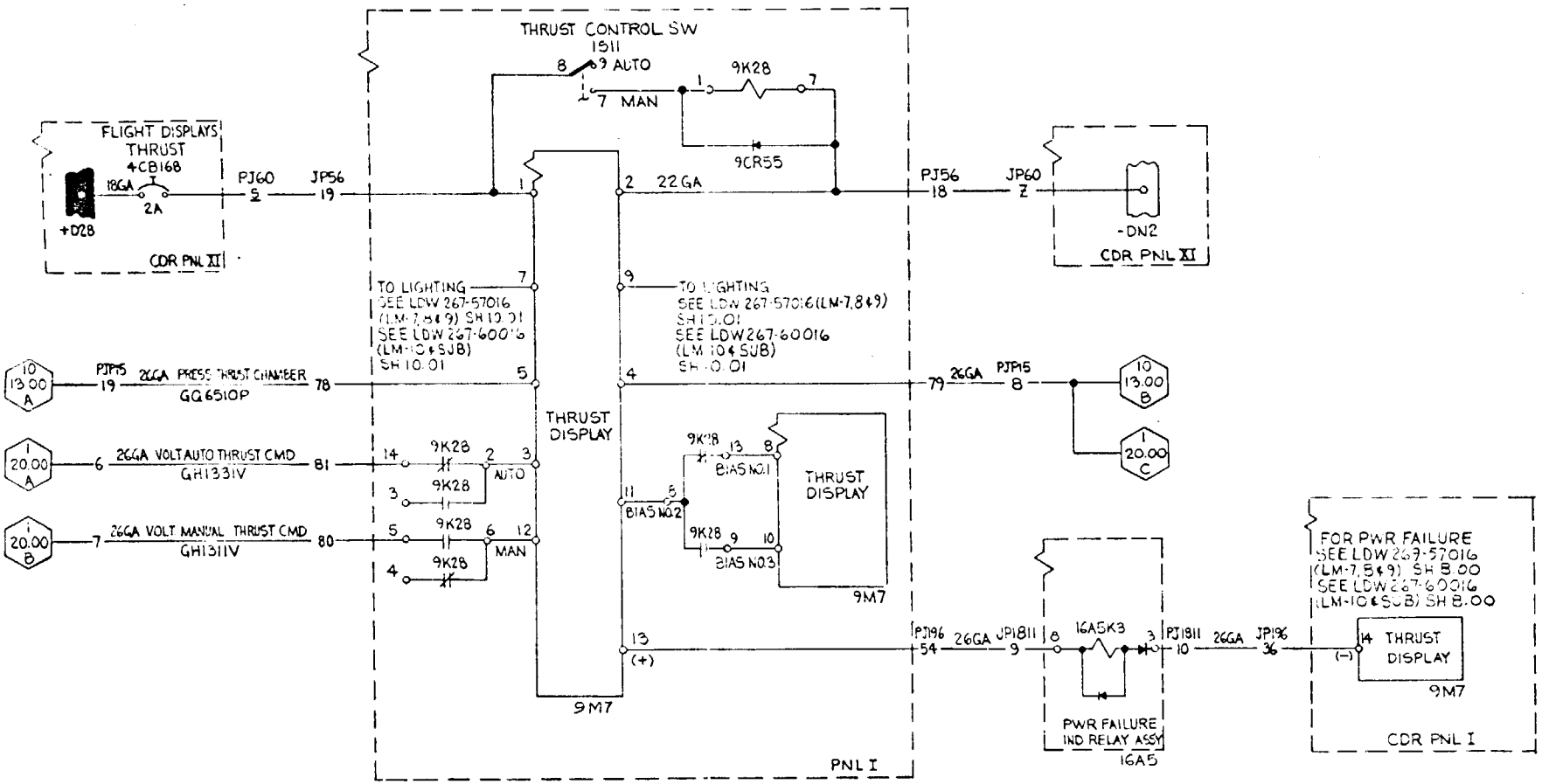
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.
SEE DETAIL A SH 13.01 FOR LM-7 IF LM 5 & 6 INSTALLED AND LM-9

GRUMMAN AIRCRAFT ENGINEERING

LDW 267-57006


EVENT TIMER
DIGITAL MISSION TIMER
EVENT TIMER CONTROLS PNL III
CDR PNL I
CDR PNL XI
LMP PNL XVI
TO-DNC SH. 7.00
-DN2
FROM INST, SEE LDW267-57006 SH. 9.00
TO INST, SEE LDW267-57006 SH. 9.00
INTEGRAL TO SEE LDW 267-57016 SH. 10.02
TENS
UNITS
RESET
UP
DOWN
START
STOP
MIN SLEW SW 9511
SEC SLEW SW 9510
RESET CONT SW 9511
TIMER CONT SW 9512
HOUR SLEW SW 9522
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED


800 HZ HI
FROM RNDZ RDR
800 HZ HI
FROM RNDZ RDR
800 HZ HI
FROM CES
F3 50 MA
F4 50 MA
F6 50 MA
F2 50 MA
F5 50 MA
F7 200 MA
F8 200 MA
GASTA
9A1
ERROR POINTERS
RATE METERS
FLT DIR ATTITUDE IND ASSY
CDR PNL I
9M1
AUXILIARY SWITCHING RELAY ASSY
9A5
AUXILIARY SWITCHING RELAY ASSY
9A6
LMP PNL II
9M6
TEST POINT
800 HZ FUSE ASST NO 2
9A4
TO RNDZ RDR
TO RNDZ RDR
TO CES
TO RNDZ RDR
TO CES
FROM RNDZ RDR
FROM CES
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.



ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGRG CORP			
FLIGHT GUIDANCE D&C THRUST DISPLAY DATA INPUTS			
CODE IDENT NO 20512			
MODEL LM	LDW267-57009	SHEET 15.00	REV S

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 10)

MAIN PROPULSION

(REF LDW 267-60010 A)

1. Applicable Documents

Level Three Drawings

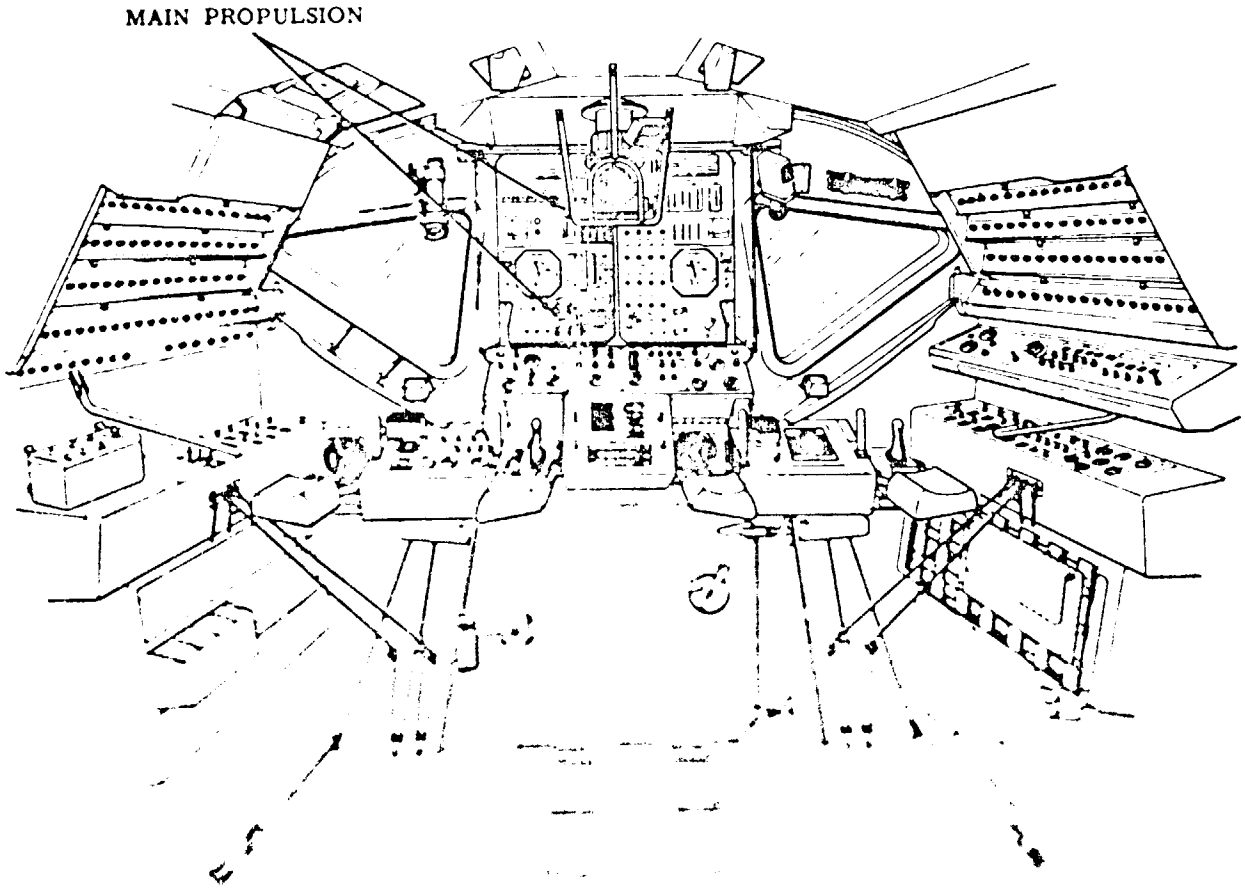
ITEM NAME	DWG. NO.	REV.	E.O.'s
Propulsion	LWD270-60001	B	A8

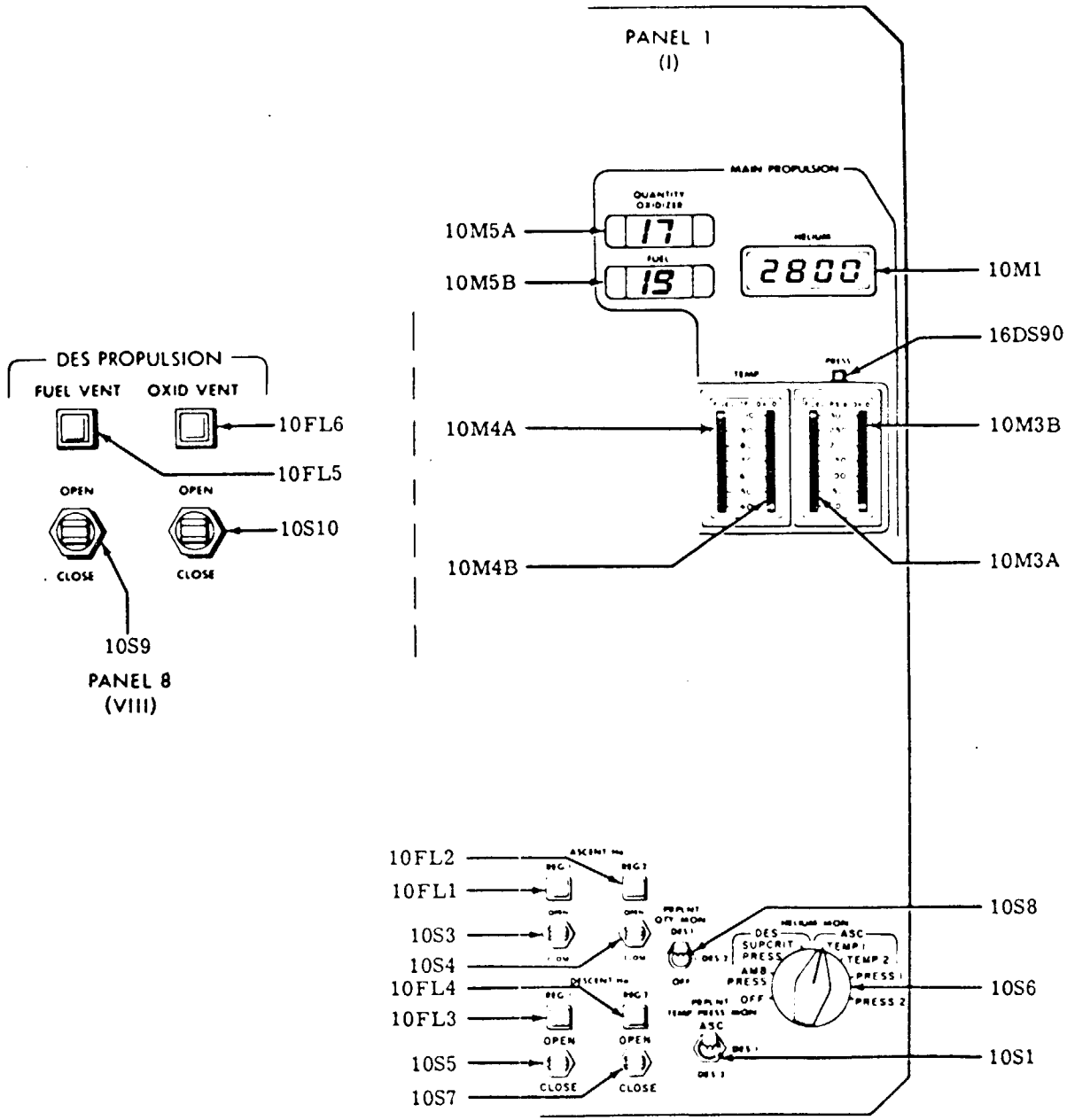
2. Table of Contents

ITEM NAME	SHEET NO.
a) Cover Sheet	10-1001
b) Applicable Documents and Table of Contents & Revisions	10-1002 & 10-1002.1
c) Cabin Location of Main Propulsion Controls and Indicators	10-1003
d) Main Propulsion Controls and Indicators Layout	10-1004
e) Main Propulsion Controls and Indicator Functional Description	10-1005
	10-1005.1
	10-1005.2
	10-1005.3
f) Propulsion-Ascent/Descent Block Diagram	LDW267-60010 SH 4.00
g) Propulsion-Ascent Fluid Schematic Pressurization	LDW267-60010 SH 4.01A
h) Propulsion-Ascent Fluid Schematic (Feed)	LDW267-60010 SH 4.02A
i) Propulsion-Descent Fluid Schematic	LDW267-60010 SH 4.03A
j) Propulsion-He Regulator Solenoid Valves	LDW267-60010 SH 5.00
k) Propulsion-OI Ascent and Descent He Valves & Fuel & Oxide Vent Valve Display	LDW267-60010 SH 6.00
l) Propulsion-OI Helium Tank Temperature and Pressure Monitoring	LDW267-60010 SH 7.00A
m) Propulsion-OI Fuel and Oxide Tank Temperature and Pressure Monitoring	LDW267-60010 SH 8.00A
n) Propulsion-Propellant Quantity Gaging & He Tanks Press	LDW267-60010 SH 9.00A
o) Propulsion-Propellant Quantity OI and Warning Indication	LDW267-60010 SH 10.00A
p) Propulsion-OI Ascent Solenoid Valve Position Indicating Circuits	LDW267-60010 SH 11.00A
q) Propulsion-OI Ascent Oxidizer and Fuel Level Caution and Warning	LDW267-60010 SH 12.00
r) Propulsion-OI Descent Solenoid Valve Position Indicating Circuits	LDW267-60010 SH 13.00

3. Applicable Revisions

Rev.	Sheet No.	LCD	Description
A	10-4.03	5263A	Fabrication of a heat exchanger by-pass exchanger
	10-10.00	5378B	Increased telemetry sampling rate on PQGS
	10-1002 10-4.01 10-7.00 10-9.00	5502	Transducer installation for APS helium pressure and H_2O line temperature


MAIN PROPULSION



Main Propulsion Controls and Indicators Layout

SUBSYSTEM: MAIN PROPULSION (FUNCTIONAL GROUPING 10)

Code	Control/Indicator	Function
10S1	PROPELLANT TEMPERATURE/ PRESSURE MONITOR SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (ASC-DES 1 - DES 2) selects for monitoring on 10M3 the propellant tank pressures, and on 10M4, propellant tank temperatures. In the ASC position, ascent tank pressures and temperatures are displayed. In the DES positions propellant temperatures and pressures are displayed as follows: DES 1 - Temp: in fuel tank #1 and oxidizer tank #1. Pressure: both fuel tanks at common inlet and both oxidizer tanks at their common inlet. DES 2 - Temp: in fuel tank #2 and oxidizer tank #2. Pressure: same as DES 1.
10S3 10S4	ASCENT HELIUM REGULATOR #1 SWITCH ASCENT HELIUM REGULATOR #2 SWITCH TWO 3-POSITION TOGGLES MOM-MAIN-MOM	Each of these three-position toggles (OPEN-CLOSE) controls a latch-type solenoid-operated valve located upstream of each helium pressure regulator. The solenoid valves are normally in the opened position. Selecting the OPEN position will actuate the associated shutoff valve, opening it and enabling helium to flow through the regulator. Selecting the CLOSE position will actuate the associated shutoff valve, closing it and isolating that leg. Positive feedback of the solenoid valve position is provided by the status of 10FL1 and 10FL2.
10S5 10S7	DESCENT HELIUM REGULATOR #1 SWITCH DESCENT HELIUM REGULATOR #2 SWITCH TWO 3-POSITION TOGGLES MOM-MAIN-MOM	Each of these three-position toggles (OPEN-CLOSE) controls a latch type solenoid-operated valve upstream of each helium pressure regulator. The solenoid valve associated with 10S5 is normally in the opened position while the solenoid valve associated with 10S7 is normally in the closed position. Selecting the OPEN position will actuate the associated shutoff valve, opening it and

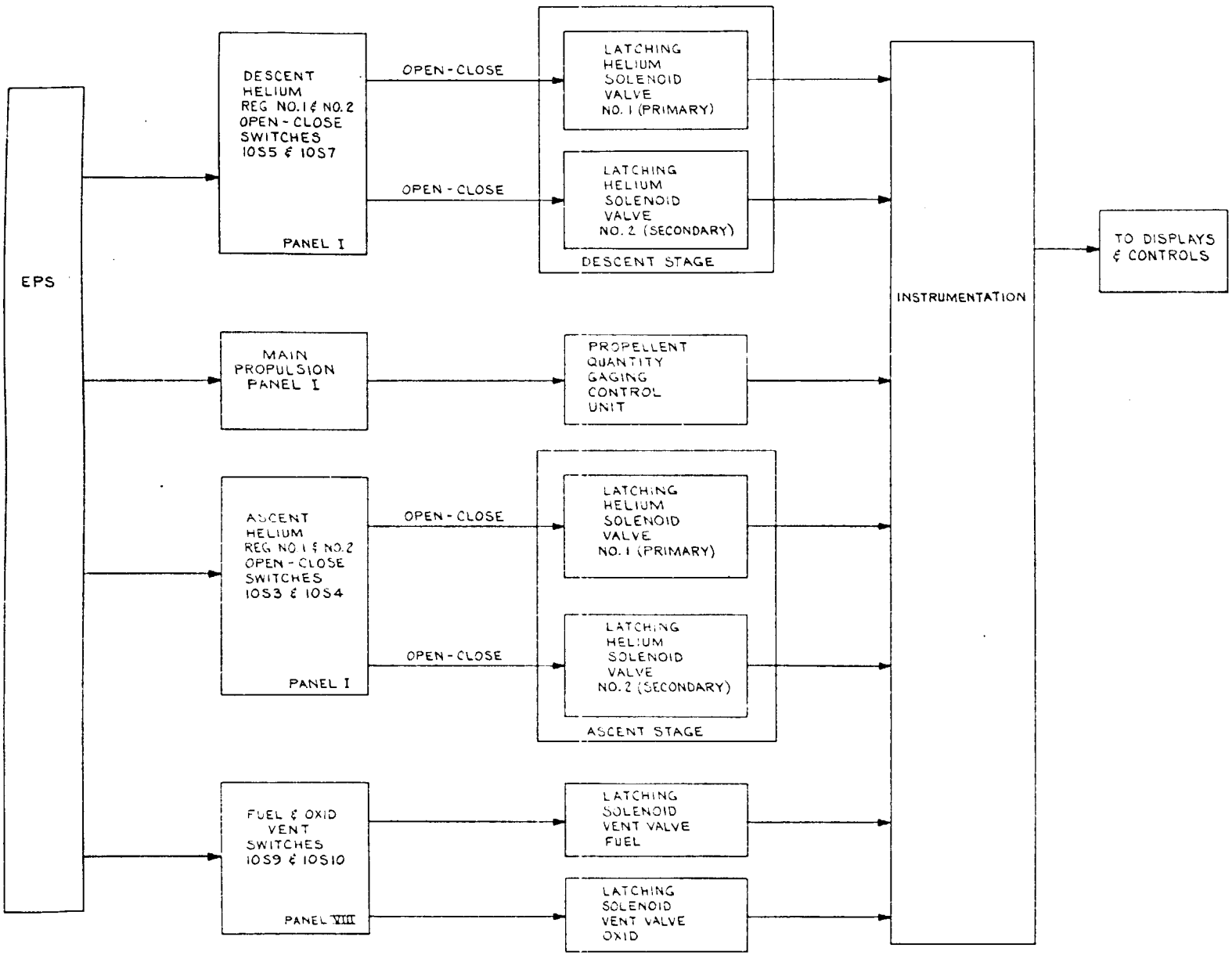
Code	Control/Indicator	Function
10S5 10S7 (Cont.)		enabling helium to flow through the regulator. Selecting the CLOSE position will actuate the associated shutoff valve, closing it and isolating that leg. Positive indication of the solenoid valve position is provided by the status of 10FL3 and 10FL4.
10S6	HELIUM MONITOR SWITCH 7-POSITION ROTARY	This seven-position rotary switch (DES: OFF, AMB PRESS, SUPCRIT PRESS, ASC: - TEMP 1 - TEMP 2 - PRESS 1 - PRESS 2) enables monitoring temperatures and pressures on 10M1. In the DES: OFF position, power to the display is interrupted. In the DES: AMB press position pressure in the ambient helium tank is monitored. In the DES: SUPCRIT PRESS position, the pressure of the supercritical helium in the descent tank is monitored. Selection of the ascent switch positions permits similar monitoring of ambient helium, except that pressures are sensed at two independent manifolds downstream of the tanks and upstream of the squib valves.
10S8	PROPELLANT QUANTITY MON SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (DES 1 - DES 2 - OFF) selects a pair of descent tanks for monitoring the percent of oxidizer and fuel quantities remaining in the tanks on indicator 10M5. Selecting the DES 1 position enables the outputs from the quantity gaging probes of oxidizer tank #1 and fuel tank #1 to be displayed on 10M5. Selecting the DES 2 position enables the outputs from the quantity gaging probes of oxidizer tank #2 and fuel tank #2 to be displayed on 10M5. In the OFF position, DC power is removed from the gaging system and no quantities are displayed on 10M5.

SUBSYSTEM: MAIN PROPULSION (FUNCTIONAL GROUPING 10)

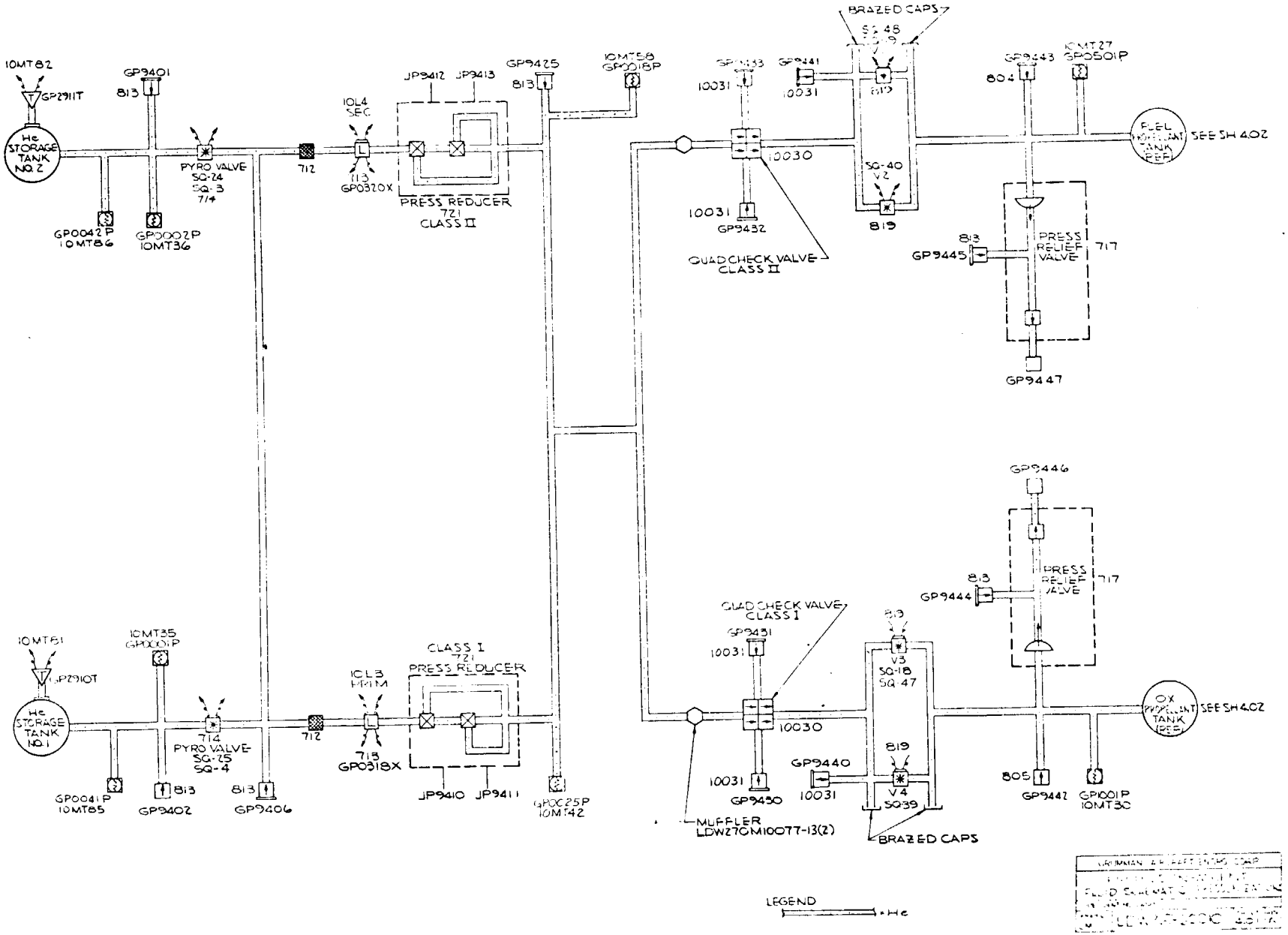
Code	Control/Indicator	Function
10S9	FUEL VENT SWITCH 3-POSITION TOGGLE MON-MAIN-MOM	This three-position toggle (OPEN-CLOSE) enables venting of pressure from the descent fuel tanks and helium pressurization section. Selecting the OPEN position will actuate the associated shutoff valve opening it and enable venting. Selecting the CLOSE position will actuate the associated shutoff valve closing it and preventing venting. Positive feedback of the solenoid valve position is provided by the status of 10FL5.
10S10	OXID VENT SWITCH 3-POSITION TOGGLE MOM-MAIN-MOM	This three position toggle (OPEN-CLOSE) enables venting of pressure from the descent oxidizer tanks and helium pressurization section. Selecting the OPEN position will actuate the associated shutoff valve opening it and enable venting. Selecting the CLOSE position will actuate the associated shutoff valve closing it and preventing venting. Positive feedback of the solenoid valve position is provided by the status of 10FL6.
10M1	HELIUM INDICATOR 4-PLACE DIGITAL DISPLAY	This display indicates descent ambient helium tank pressure, supercritical helium tank pressure or ascent ambient helium tank temperature and pressures as selected by 10S6.
10M3	PRESSURE INDICATOR (FUEL) PRESSURE INDICATOR (OXID)	This dual scale indicator displays fuel and oxidizer pressure for the ascent or descent propellant system as selected by 10S1.
10M4	TEMPERATURE INDICATOR (FUEL) TEMPERATURE INDICATOR (OXID)	This dual scale indicator displays fuel and oxidizer temperatures for the ascent or descent propellant system as selected by 10S1.

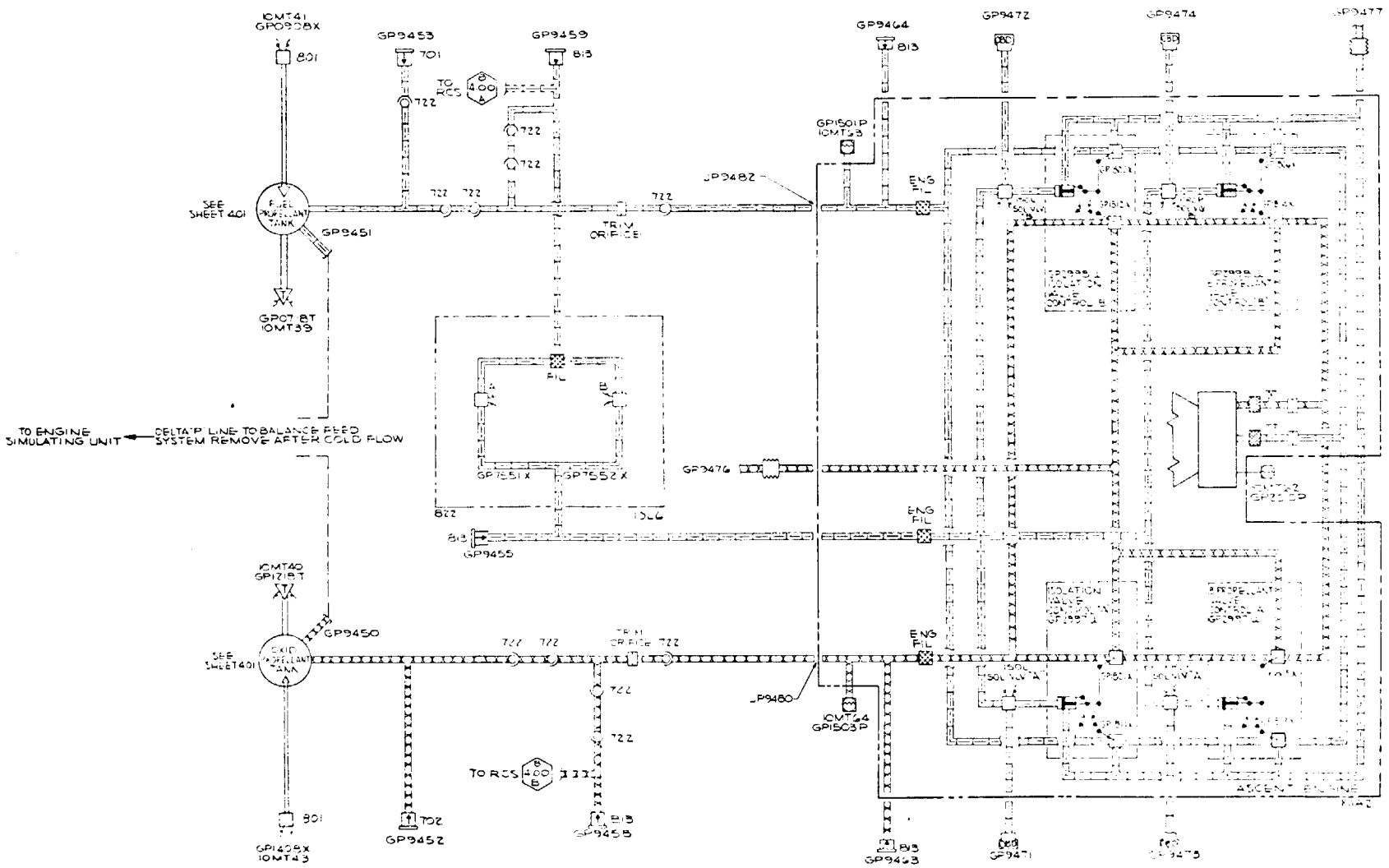
SUBSYSTEM: MAIN PROPULSION (FUNCTIONAL GROUPING 10)

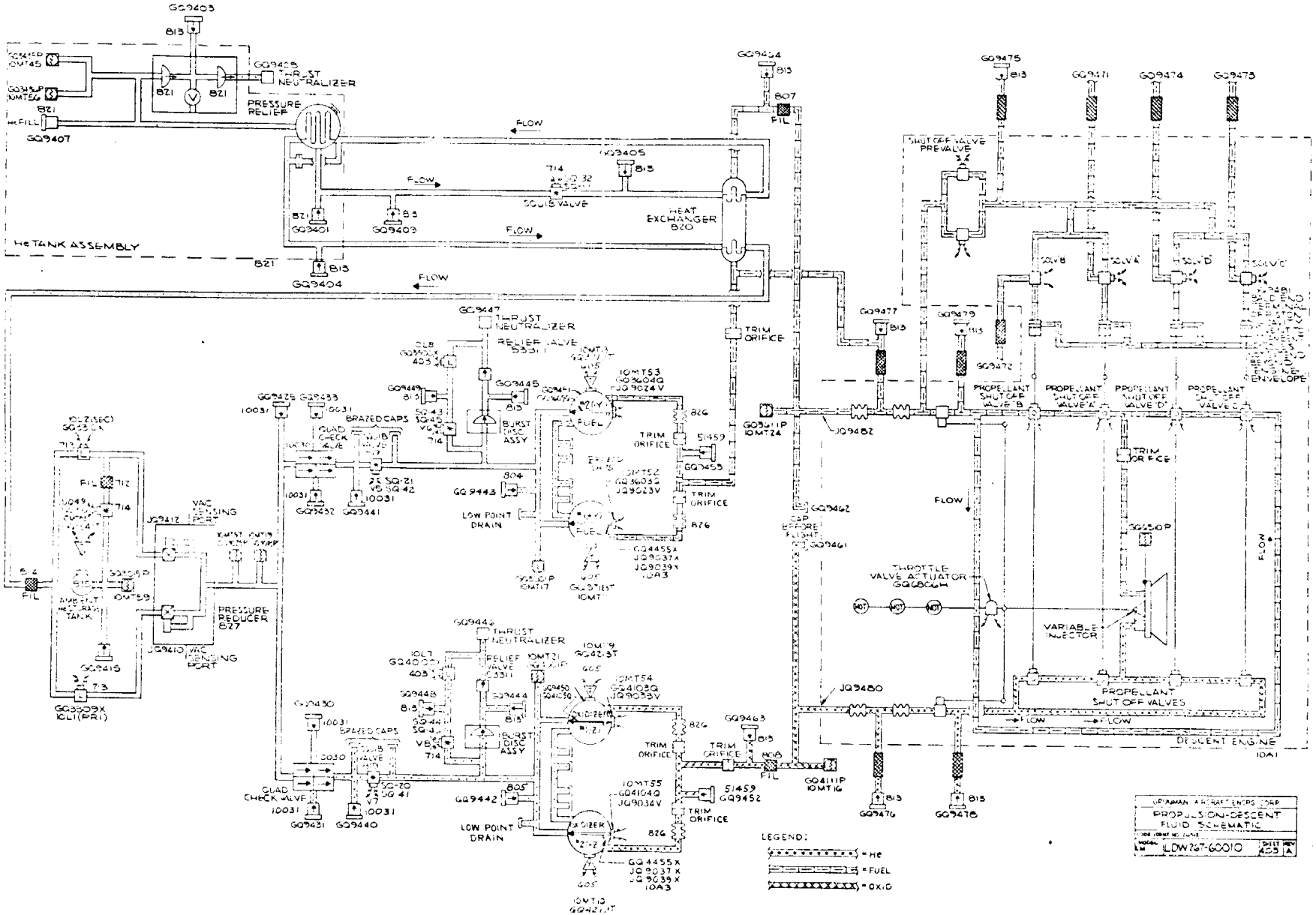
Code	Control/Indicator	Function
10M5	OXIDIZER QUANTITY INDICATOR FUEL QUANTITY INDICATOR TWO 2-PLACE DIGITAL DISPLAYS	These indicators display the percentage of usable oxidizer and fuel quantities remaining in the descent tanks only, as selected by 10S8.
10FL1 10FL2	ACENT HELIUM REGULATOR STATUS #1 ASCENT HELIUM REGULATOR STATUS #2 TWO 2-POSITION STATUS FLAGS	Each of these two-position flags (GREY-BARBERPOLE) indicates the open (GREY) or closed (BARBERPOLE) status of its respective latch-type solenoid-operated valve, as controlled by 10S3 and 10S4.
10FL3 10FL4	DESCENT HELIUM REGULATOR STATUS #1 DESCENT HELIUM REGULATOR STATUS #2 TWO 2-POSITION STATUS FLAGS	Each of these two-position flags (GREY-BARBERPOLE) indicates the open (GREY) or closed (BARBERPOLE) status of its respective latch-type solenoid-operated valve, as controlled by 10S5 and 10S7.
10FL5 10FL6	FUEL VENT STATUS OXIDIZER VENT STATUS TWO 2-POSITION STATUS FLAGS	Each of these two-position flags (GREY-BARBERPOLE) indicates the open (GREY) or closed (BARBERPOLE) status of its respective latch-type solenoid-operated valve as controlled by 10S9 and 10S10.
16DS90	PROPULSION PRESS INDICATOR (10M3) POWER FAILURE LIGHT	SEE EFD16-1005.3

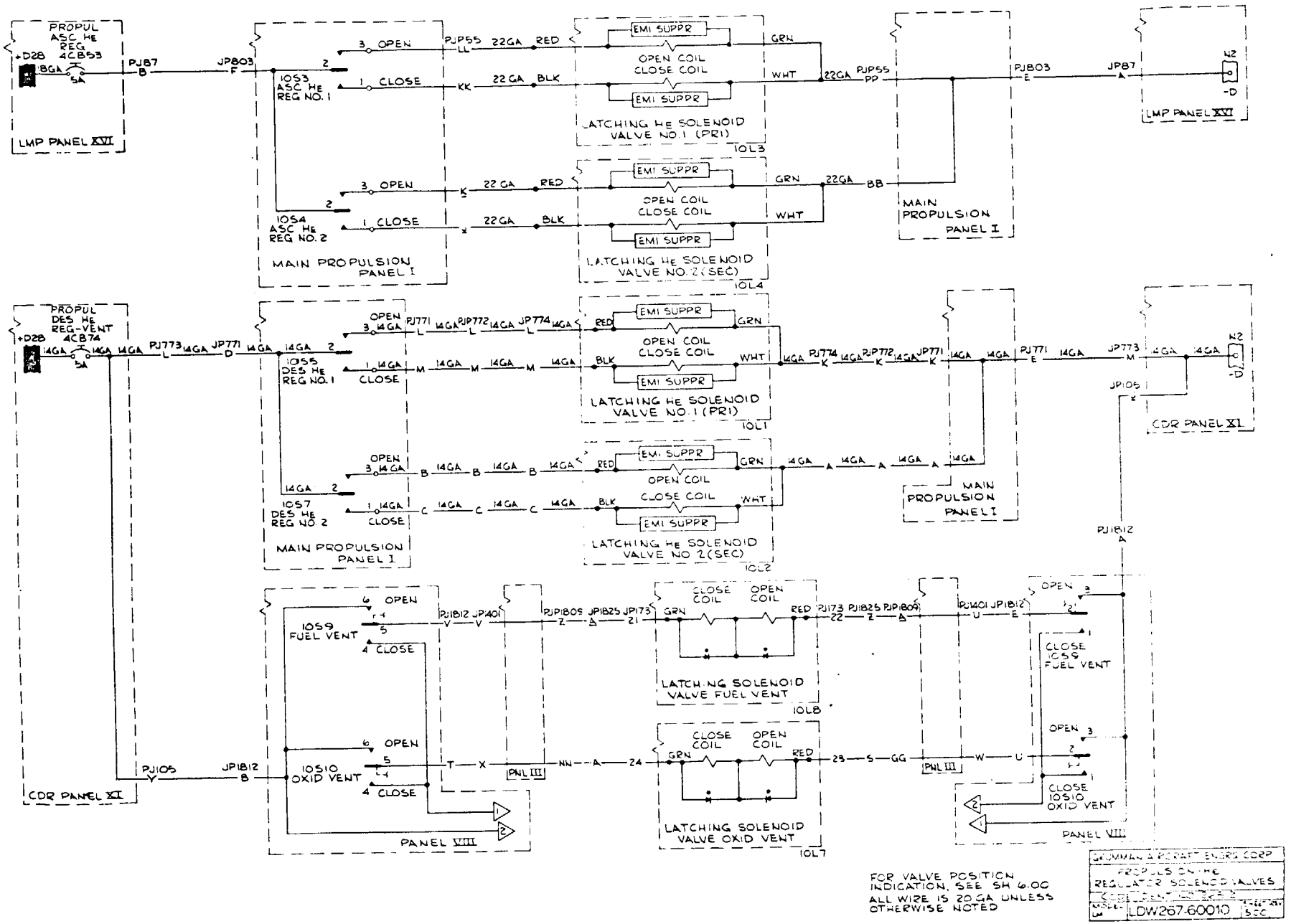


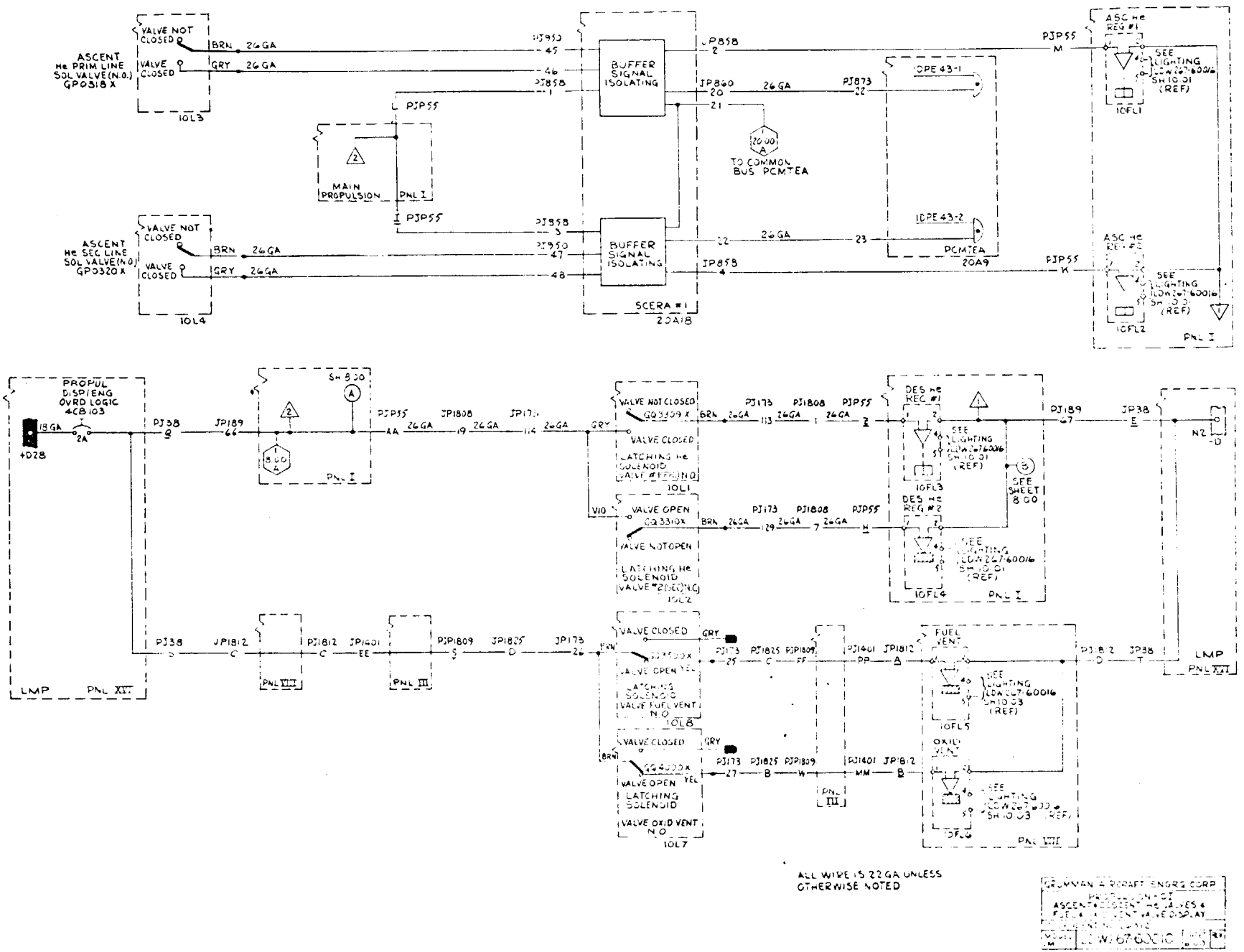
GRUMMAN AIRCRAFT ENGRG CORP
PROPULSION ASCENT/ DESCENT
BLOCK DIAGRAM


10MT82
GP2911T
He STORAGE TANK NO.2
GP9401
813
PYRO VALVE SQ-24 SQ-3 714
712
10L4 SEC
113 GP0320X
JP9412 JP9413
PRESS REDUCER 721 CLASS II
GP9435
813
10MT58 GP0018P
GP0042P 10MT86
GP0002P 10MT36
10MT81
GP2910T
He STORAGE TANK NO.1
10MT85 GP0001P
10MT35 GP0003P
714
PYRO VALVE SQ-25 SQ-4
712
10L3 MRM
718 GP0318X
CLASS I 721 PRESS REDUCER
JP9410 JP9411
GP0025P 10MT42
GP9402
GP9406
813
BRAZED CAPS
SQ-48 SQ-9 V1
GP9433
GP9441
10031
10030
SQ-40 V2
819
GP9432
GUAD CHECK VALVE CLASS II
GP9443
804
10MT27 GP0501P
FUEL PROPELLANT TANK (REF)
SEE SH 402
PRESS RELIEF VALVE 717
GP9445
GP9447
GP9446
GP9444
GUAD CHECK VALVE CLASS I
GP9431
V3 SQ-18 SQ-47
V4 SQ39
GP9440
GP9430
MUFFLER LDW270M10077-13(2)
BRAZED CAPS
OX PROPELLANT TANK (REF)
SEE SH 402
GP9442
GP1001P 10MT30
LEGEND
He


TO ENGINE SIMULATING UNIT
DELTA P LINE TO BALANCE FEED SYSTEM REMOVE AFTER COLD FLOW
SEE SHEET 401
SEE SHEET 401
TO RCS
TO RCS
TRIM ORIFICE
TRIM ORIFICE
ENG PIC
ENG PIC
ENG PIC
ASCENT PROPELLANT


He TANK ASSEMBLY
PRESSURE RELIEF
THRUST NEUTRALIZER
HEAT EXCHANGER 820
SQUIB VALVE
FLOW
TRIM ORIFICE
RELIEF VALVE 533-1
BURST DISC ASSY
BRAZED CAPS
QUAD CHECK VALVE
LOW POINT DRAIN
PRESSURE REDUCER 827
VAC SENSING PORT
AMBIENT HELIUM TANK
SHUT OFF VALVE PREVALVE
PROPELLANT SHUTOFF VALVE 'B'
PROPELLANT SHUTOFF VALVE 'A'
PROPELLANT SHUTOFF VALVE 'D'
PROPELLANT SHUTOFF VALVE 'C'
PROPELLANT SHUT OFF VALVES
THROTTLE VALVE ACTUATOR GG6804M
VARIABLE INJECTOR
CAP BEFORE FLIGHT
DESCENT ENGINE 10A1
LEGEND:
= He
= FUEL
= OXID


PROPUL ASC HE REG 4CB53
+D28
18GA
5A
LMP PANEL XVII
PJ87 B
JP803 F
1053 ASC HE REG NO. 1
1054 ASC HE REG NO. 2
MAIN PROPULSION PANEL I
3 OPEN
1 CLOSE
2
PJP55 LL
22GA RED
KK 22GA BLK
K 22GA RED
X 22GA BLK
EMI SUPPR
OPEN COIL
CLOSE COIL
GRN
WHT
22GA PJP55 PP
LATCHING HE SOLENOID VALVE NO. 1 (PRI)
10L3
LATCHING HE SOLENOID VALVE NO. 2 (SEC)
10L4
22GA BB
MAIN PROPULSION PANEL I
PJ803 E
JP87 A
N2
-D
LMP PANEL XVI
PROPUL DES HE REG-VENT 4CB74
+D28
14GA
5A
PJ773 L
JP771 D
1055 DES HE REG NO. 1
1057 DES HE REG NO. 2
MAIN PROPULSION PANEL I
OPEN
CLOSE
14GA
PJ771 L
PJP772 L
JP774 L
M 14GA
B 14GA
C 14GA
RED
BLK
LATCHING HE SOLENOID VALVE NO. 1 (PRI)
10L1
LATCHING HE SOLENOID VALVE NO 2 (SEC)
10L2
PJ774 K
PJP772 K
JP771 K
MAIN PROPULSION PANEL I
PJ771 E
JP773 M
JP105
CDR PANEL XI
PJ105 V
JP1812 B
CDR PANEL XI
6 OPEN
4 CLOSE
1059 FUEL VENT
1059 OXID VENT
PJ1812 V
JP401 V
PJP1805 Z
JP1825 A
JP173 21
PANEL VIII
PNL III
T X
NN A 24
CLOSE COIL
OPEN COIL
GRN
RED
LATCHING SOLENOID VALVE FUEL VENT
10L8
LATCHING SOLENOID VALVE OXID VENT
10L7
PJ173 22
PJP1805 Z
JP1825 A
PJ1401 U
JP1812 E
PJ1812 A
CLOSE 1059 FUEL VENT
CLOSE 1059 OXID VENT
PANEL VIII
FOR VALVE POSITION INDICATION, SEE SH 6.00
ALL WIRE IS 20 GA UNLESS OTHERWISE NOTED
GRUMMAN AEROSPACE CORP
PROPULSION HE REGULATOR SOLENOID VALVES
SCHEMATIC DIAGRAM
LDW267-60010
SCALE NONE
SHEET 6.01
SEC

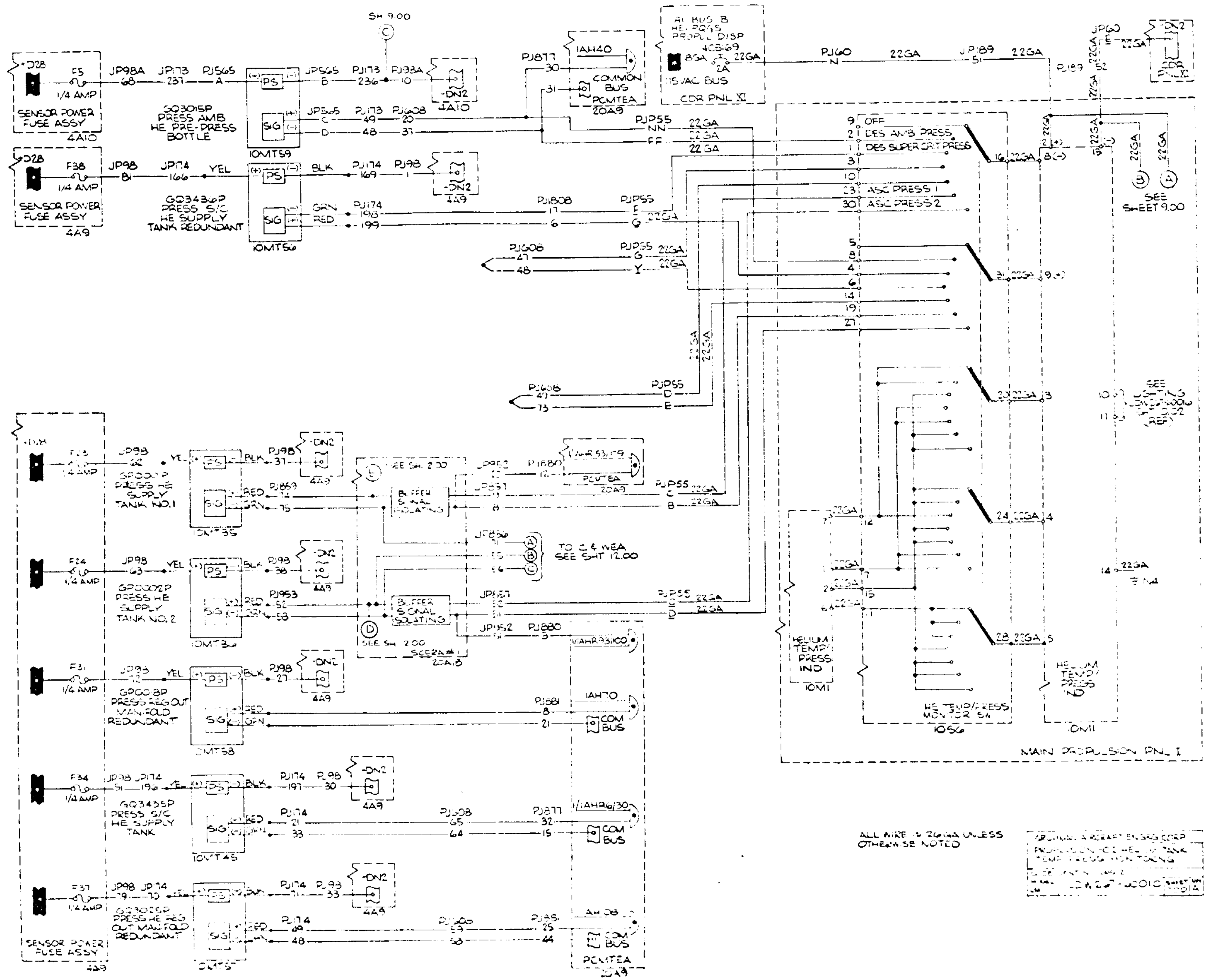


ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED

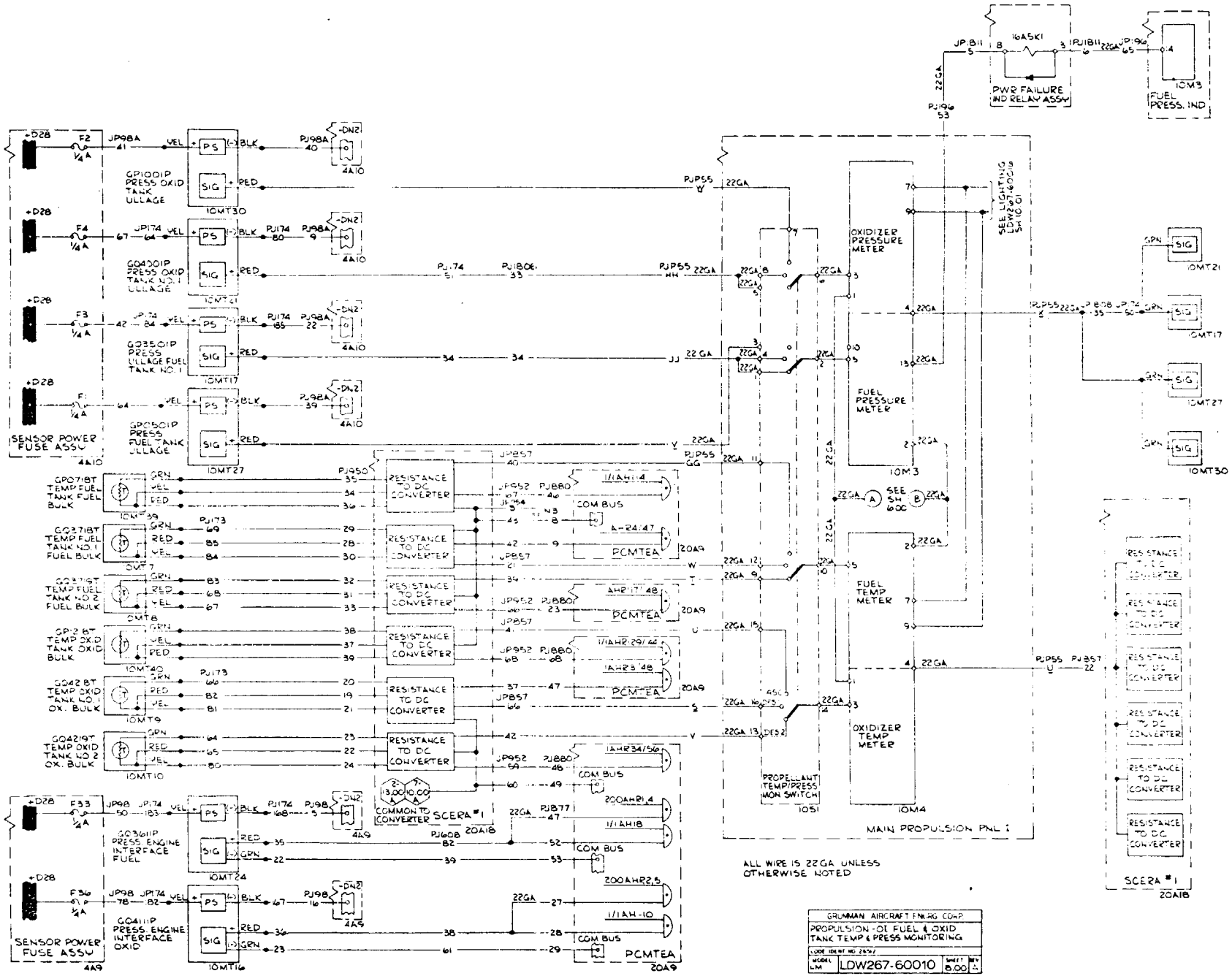
GRUMMAN AEROSPACE CORP

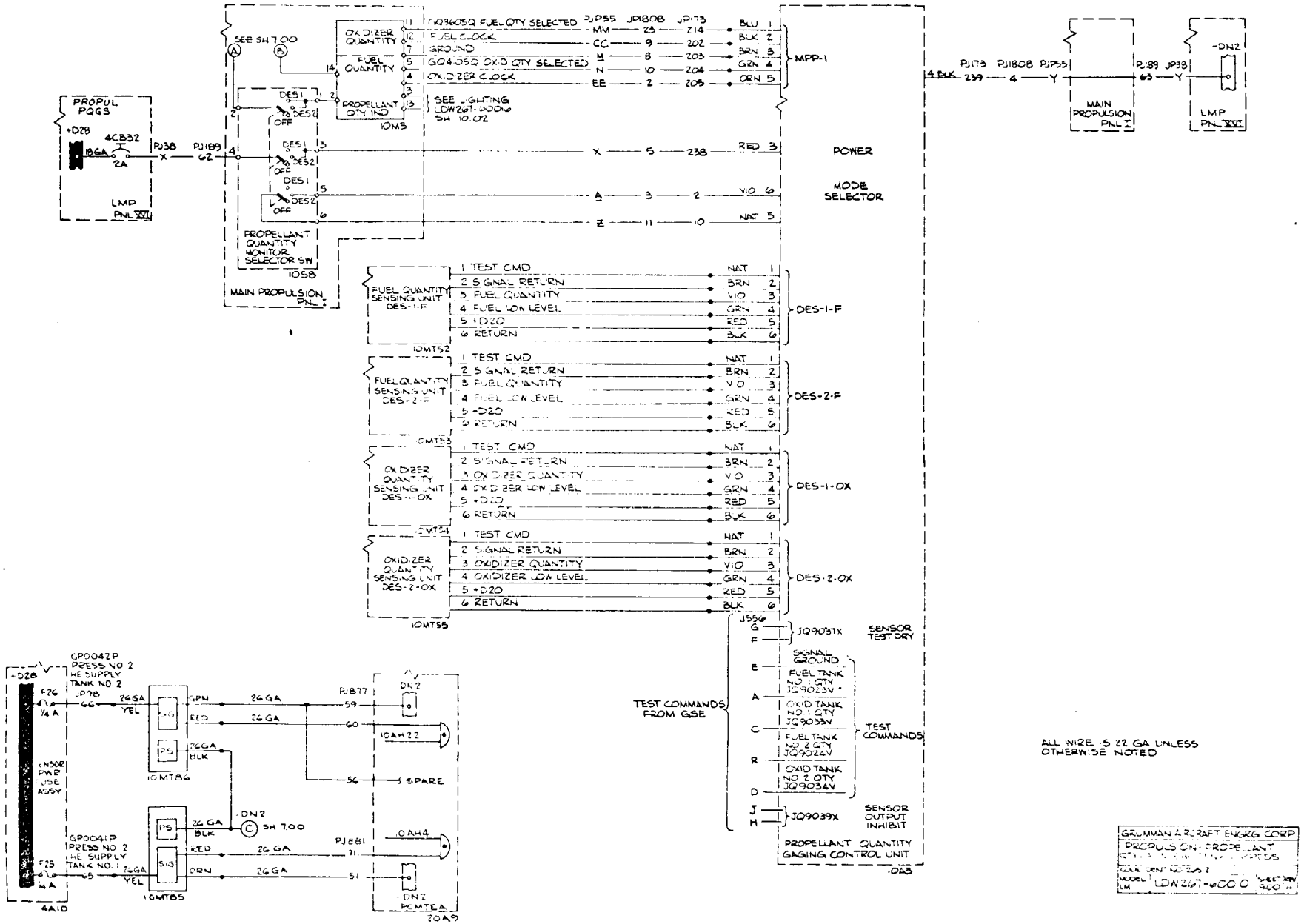
PROPULSION SYST ASCENT & DESCENT He VALVES & FUEL & OXIDIZER VALVE DISPLAY

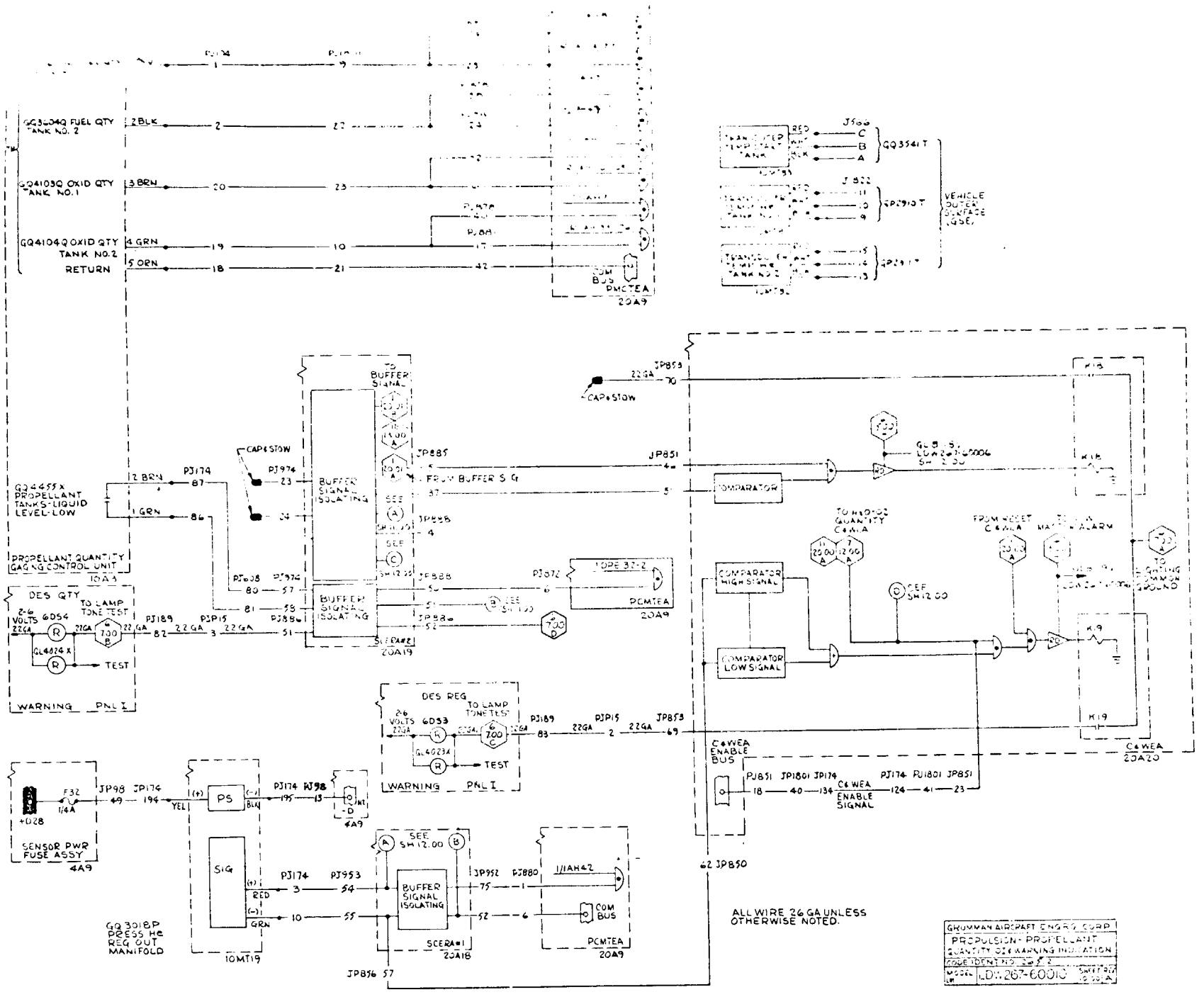
LDW 267-60016 REV

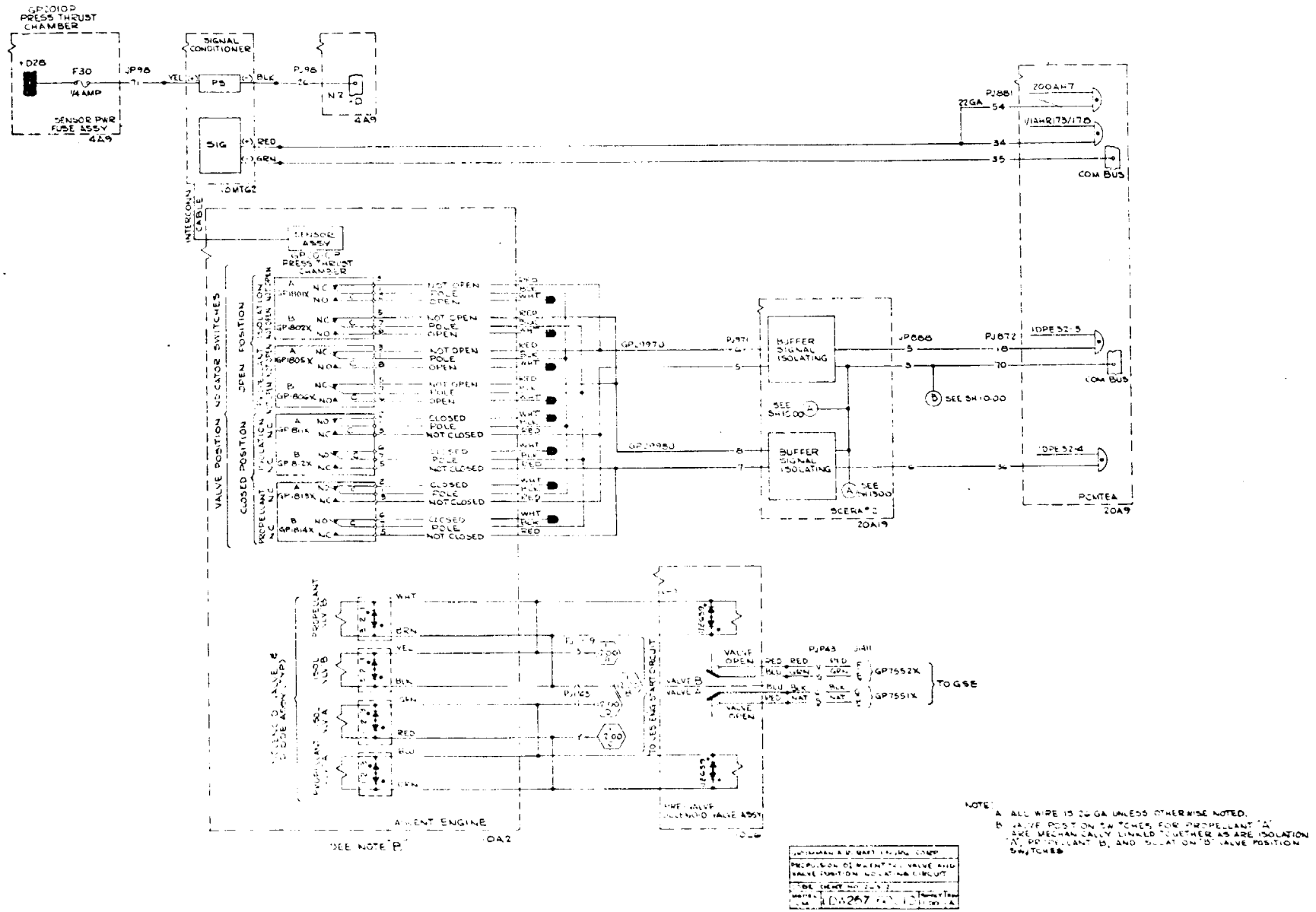


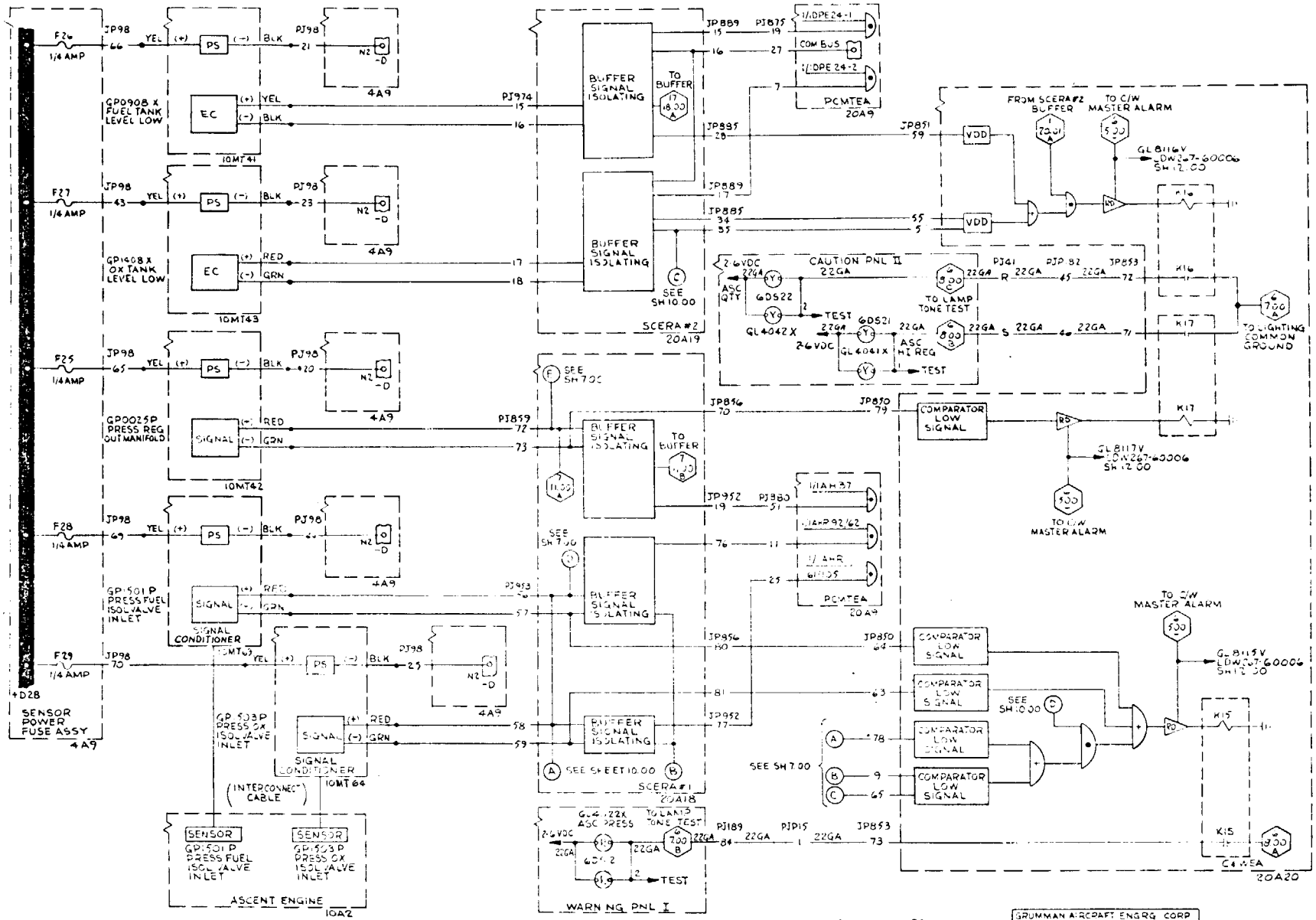
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED


+D28
F2
¼ A
JP98A
41
VEL
PS
SIG
BLK
RED
PJ98A
40
-DN2
4A10
GP1001P
PRESS OXID
TANK
ULLAGE
10MT30
F4
JP174
67
64
PJ174
80
9
GQ4301P
PRESS OXID
TANK NO.1
ULLAGE
10MT21
F3
42
84
185
22
GQ3501P
PRESS
ULLAGE FUEL
TANK NO.1
10MT17
F1
64
39
GP0501P
PRESS
FUEL TANK
ULLAGE
10MT27
SENSOR POWER
FUSE ASSY
4A10
PJP55
W
22GA
JJ
GG
OXIDIZER
PRESSURE
METER
FUEL
PRESSURE
METER
FUEL
TEMP
METER
OXIDIZER
TEMP
METER
10M3
10M4
SEE LIGHTING
LDW267-60018
SH 10 01
SEE
SH
6.00
GPN
SIG
10MT21
10MT17
10MT27
10MT30
JP:B11
5
16A5K1
PJJB11
22GA
JP:96
65
PWR FAILURE
IND RELAY ASSY
FUEL
PRESS. IND
PJ196
53
GP0718T
TEMP FUEL
TANK FUEL
BULK
10MT39
PJ950
35
34
36
RESISTANCE
TO DC
CONVERTER
GQ3718T
TEMP FUEL
TANK NO.1
FUEL BULK
SUMP 7
PJ173
69
85
84
29
28
30
GQ3718T
TEMP FUEL
TANK NO.2
FUEL BULK
10MT8
83
68
67
32
31
33
GP:2 BT
TEMP OXID
TANK OXID
BULK
10MT40
38
37
39
GQ42 BT
TEMP OXID
TANK NO.1
OX. BULK
10MT9
PJ173
66
82
81
20
19
21
GQ42I9T
TEMP OXID
TANK NO.2
OX. BULK
10MT10
64
65
80
23
22
24
JP952
PJB80
COM BUS
PCMTEA
20A9
1/1AH14
A-24:47
1AHR17/48
1AHR29/42
1AHR23/48
1AHR34/56
200AHR14
1/1AH18
200AHR2,5
1/1AH-10
JP857
40
W
T
U
S
V
DES 2
DES 1
PROPELLANT
TEMP/PRESS
MON SWITCH
10S1
MAIN PROPULSION PNL 1
SCERA #1
20A18
COMMON TO
CONVERTER SCERA #1
PJ608
PJB77
47
F33
JP98
50
JP174
183
168
5
GQ3611P
PRESS ENGINE
INTERFACE
FUEL
10MT24
4A9
F36
78
82
67
16
GQ4111P
PRESS ENGINE
INTERFACE
OXID
10MT16
SENSOR POWER
FUSE ASSY
4A9
ALL WIRE IS 22GA UNLESS
OTHERWISE NOTED
GRUMMAN AIRCRAFT ENG'RG CORP
PROPULSION - OI FUEL & OXID
TANK TEMP & PRESS MONITORING
CODE IDENT NO. 28392
MODEL
LM
LDW267-60010
SHEET
6.00
REV


PROPUL PQGS
+D28
4CB32
10GA
2A
LMP PNL XV
PJ38
PJ189
MAIN PROPULSION PNL 1
SEE SH 7.00
OXIDIZER QUANTITY
FUEL QUANTITY
PROPELLANT QTY IND
10M5
SEE LIGHTING LDW26T-0006 SH 10.02
DES1
DES2
OFF
PROPELLANT QUANTITY MONITOR SELECTOR SW
10S8
G03605Q FUEL QTY SELECTED
FUEL CLOCK
GROUND
G04105Q OXID QTY SELECTED
OXIDIZER CLOCK
PJP55
JP1808
JP173
MPP-1
POWER
MODE SELECTOR
-DN2
MAIN PROPULSION PNL 1
LMP PNL XV
FUEL QUANTITY SENSING UNIT DES-1-F
10MT52
DES-1-F
FUEL QUANTITY SENSING UNIT DES-2-F
10MT53
DES-2-F
OXIDIZER QUANTITY SENSING UNIT DES-1-OX
10MT54
DES-1-OX
OXIDIZER QUANTITY SENSING UNIT DES-2-OX
10MT55
DES-2-OX
TEST CMD
SIGNAL RETURN
FUEL QUANTITY
FUEL LOW LEVEL
+D20
RETURN
OXIDIZER QUANTITY
OXIDIZER LOW LEVEL
J556
JQ9037X
SENSOR TEST DRY
SIGNAL GROUND
FUEL TANK NO 1 QTY JQ9023V
OXID TANK NO 1 QTY JQ9033V
FUEL TANK NO 2 QTY JQ9024V
OXID TANK NO 2 QTY JQ9034V
TEST COMMANDS
JQ9039X
SENSOR OUTPUT INHIBIT
TEST COMMANDS FROM GSE
PROPELLANT QUANTITY GAGING CONTROL UNIT
10A3
GP0042P PRESS NO 2 HE SUPPLY TANK NO 2
GP0041P PRESS NO 2 HE SUPPLY TANK NO 1
SENSOR PWR FUSE ASSY
F26
F25
4A10
10MT86
10MT85
SPARE
10AH22
10AH4
PJB77
PJB81
-DN2
SH 7.00
PEMTEA
20A9
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
PROPULSION PROPELLANT
MODEL LM
LDW26T-6000
SHEET XIV


GQ3604Q FUEL QTY TANK NO. 2
GQ4103Q OXID QTY TANK NO. 1
GQ4104Q OXID QTY TANK NO. 2
RETURN
COM BUS PMCTEA 20A9
VEHICLE OUTER SURFACE (USE)
GQ4455X PROPELLANT TANKS LIQUID LEVEL LOW
PROPELLANT QUANTITY GAGING CONTROL UNIT 10A3
BUFFER SIGNAL ISOLATING
CAP & STOW
FROM BUFFER S G
COMPARATOR
COMPARATOR HIGH SIGNAL
COMPARATOR LOW SIGNAL
TO MINIMUM QUANTITY C&WEA
FROM RESET C&WEA
TO C&WEA MASTER ALARM
TO LIGHTING COMMON GROUND
DES QTY
DES REG
TO LAMP TONE TEST
WARNING PNL I
TEST
C&WEA ENABLE BUS
C&WEA ENABLE SIGNAL
C&WEA 20A20
SENSOR PWR FUSE ASSY 4A9
PS
SIG
GQ3018P PRESS He REG OUT MANIFOLD 10MT19
BUFFER SIGNAL ISOLATING
SCERA#1 20A18
PCMTEA 20A9
ALL WIRE 26 GA UNLESS OTHERWISE NOTED.
GRUMMAN AIRCRAFT ENGR'G CORP
PROPULSION - PROPELLANT QUANTITY & WARNING INDICATION
LDM 267-60010

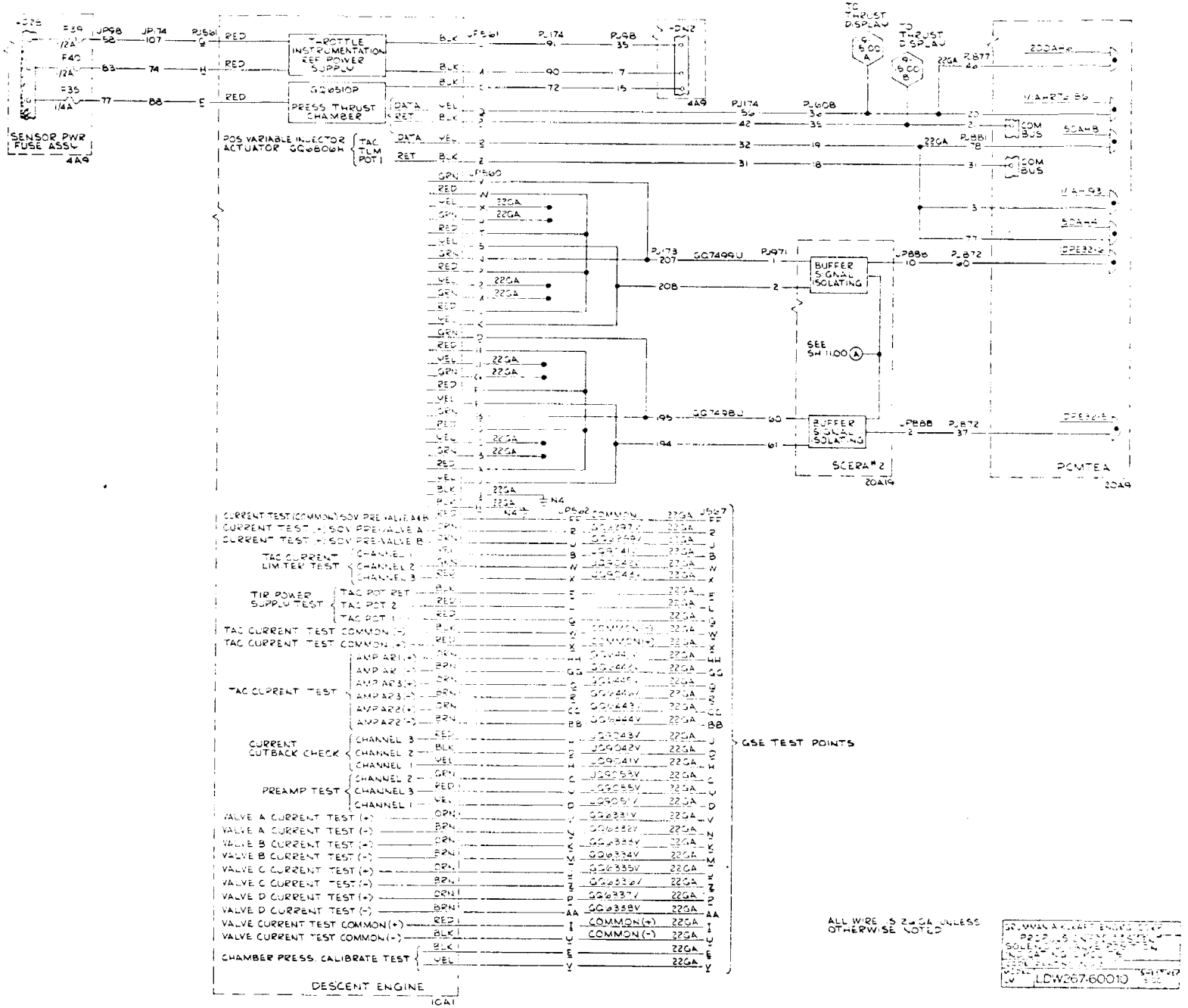

GP1010P
PRESS THRUST CHAMBER
+D28
F30
1/4 AMP
SENSOR PWR FUSE 35V
4A9
JP98
YEL (+)
SIGNAL CONDITIONER
P5
BLK (-)
PJ98
26
N2
4A9
SIG
(+) RED
(-) GRN
10MTG2
INTERCONN CABLE
SENSOR ASSY
GP1010P
PRESS THRUST CHAMBER
VALVE POSITION INDICATOR SWITCHES
OPEN POSITION
CLOSED POSITION
PROPELLANT ISOLATION
PROPELLANT A
PROPELLANT B
GP1801X
GP1802X
GP1805X
GP1806X
GP1811X
GP1812X
GP1815X
GP1814X
NOT OPEN POLE OPEN
CLOSED POLE NOT CLOSED
WHT
RED
BLK
GP1997J
GP1998J
PJ871
BUFFER SIGNAL ISOLATING
JP880
PJ872
SEE SH 10.00
SEE SH 15.00
SEE SH 19.00
1DPE32-5
1DPE32-4
COM BUS
PCMTEA
20A9
9CERA*C
20A19
PROPELLANT VALVE A
PROPELLANT VALVE B
ISOLATION VALVE A
ISOLATION VALVE B
PJP43
J411
VALVE OPEN
VALVE CLOSED
GP7552X
GP7551X
TO GSE
TO SEQUENCING CIRCUIT
PJ1K43
P1K43
A ENT ENGINE
SEE NOTE P
0A2
1DPE VALVE SOLENOID VALVE ASSY
NOTE:
A ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED.
B VALVE POSITION SWITCHES FOR PROPELLANT 'A' ARE MECHANICALLY LINKED TOGETHER AS ARE ISOLATION 'A', PROPELLANT 'B', AND ISOLATION 'B' VALVE POSITION SWITCHES.



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED

VDD = VOLTAGE DISCRETE DETECTOR

GRUMMAN AIRCRAFT ENGRG CORP	
PROPULSION - DESCENT OX DILER & FUEL LEVEL CAUTION & WARNING	
CODE IDENT NO. 26512	
MODEL LM	LDW267-60010 SHEET 7.00 REV


SENSOR PWR FUSE ASSY
4A9
F39
F40
F35
JP98
JP74
PJ560
THROTTLE INSTRUMENTATION EEP POWER SUPPLY
GQ6510P PRESS THRUST CHAMBER
POS VARIABLE INJECTOR ACTUATOR GQ6606H
TAC TLM POT
DATA
RET
JP560
PJ174
PJ98
PJ460B
PJ88I
PJ173
PJ971
PJ872
PJ888
GQ7499J
GQ7498J
BUFFER SIGNAL ISOLATING
SEE SH 11.00
SCERA#2
20A19
TO THRUST DISPLAY
COM BUS
PCMTEA
20A9
JP560 COMMON
GSE TEST POINTS
CURRENT TEST (COMMON) SOV PREVALVE A&B
CURRENT TEST (+) SOV PREVALVE A
CURRENT TEST (+) SOV PREVALVE B
TAC CURRENT LIMITER TEST
TIP POWER SUPPLY TEST
TAC POT RET
TAC POT 2
TAC POT 1
TAC CURRENT TEST COMMON (-)
TAC CURRENT TEST COMMON (+)
TAC CURRENT TEST
CURRENT CUTBACK CHECK
PREAMP TEST
VALVE A CURRENT TEST (+)
VALVE A CURRENT TEST (-)
VALVE B CURRENT TEST (+)
VALVE B CURRENT TEST (-)
VALVE C CURRENT TEST (+)
VALVE C CURRENT TEST (-)
VALVE D CURRENT TEST (+)
VALVE D CURRENT TEST (-)
VALVE CURRENT TEST COMMON (+)
VALVE CURRENT TEST COMMON (-)
CHAMBER PRESS. CALIBRATE TEST
DESCENT ENGINE
1CA1
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
LDW267-60010

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 11)

CONTROL ELECTRONICS SECTION (S & C)

(REF LDW267-57011 C)

1. Applicable Documents

Level Three Drawings

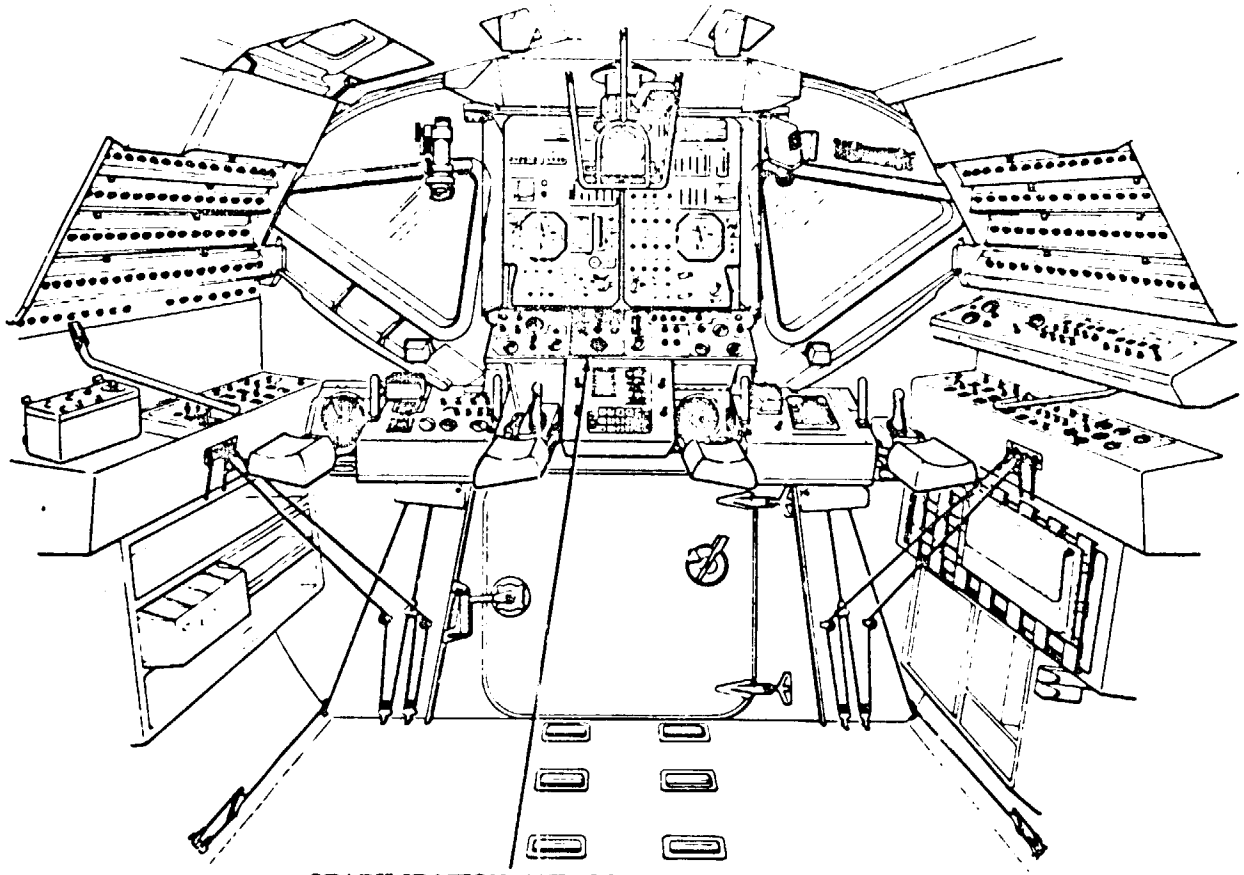
ITEM NAME	DWG. NO.	REV.	E.O.'s
CES	LDW300-56003	H	

2. Table of Contents

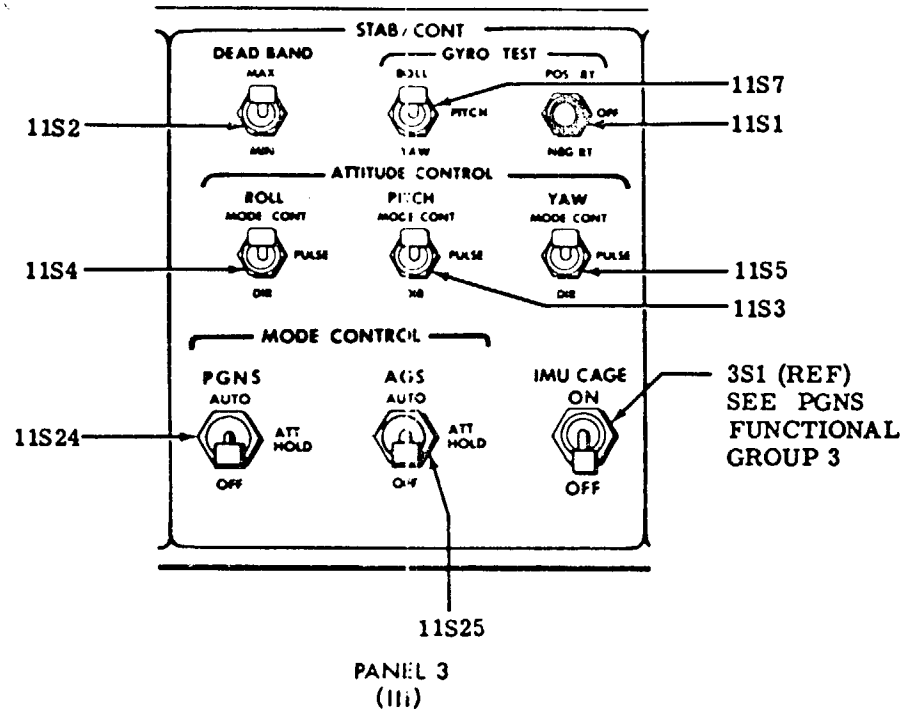
ITEM NAME	DWG. NO.
a) Cover Sheet	11-1001
b) Application Documents, Table of Contents and Notes	11-1002 & 11-1002.1
c) Cabin Location of CES Control and Indicators	11-1003
d) CES Controls and Indicators Layout	11-1004
e) CES Controls and Indicators Functional Description	11-1005 thru 11-1005.5
f) CES-STAB and Control Block Diagram	LDW267-57011 SH 4.00C
g) CES-S & C/RCS Engine Thrust Control Elementary Schematic	LDW267-57011 SH 5.00B, 5.01, 5.02, & 5.03
h) CES-STAB and Control Thruster Enable Power, Gyro Rate Signals & AGS Select	LDW267-57011 SH 6.00C
i) CES-STAB and Control Thruster Enable Power and PGNS Select	LDW267-57011 SH 7.00B
j) CES-STAB and Control ATCA DC Power Supply	LDW267-57011 SH 8.00B
k) CES-STAB and Control 800 HZ Power Supply and Gyro Rate Signals	LDW267-57011 SH 9.00B
l) CES-STAB and Control Mission Pulse Mode and Dead Band Select Relays	LDW267-57011 SH 10.00B
m) CES-STAB and Control "X", "Y", and "Z" Translation to ATCA	LDW267-57011 SH 11.00C
n) CES-STAB and Control Attitude Control-Roll, Pitch and Yaw from AGA	LDW267-57011 SH 12.00B
o) CES-STAB and Control Yaw Rate and Yaw Attitude Error Control Commands	LDW267-57011 SH 13.00B
p) CES-STAB and Control Pitch Rate and Pitch Attitude Error Control Commands	LDW267-57011 SH 14.00B
q) CES-STAB and Control Roll Rate and Roll Attitude Error Control Commands	LDW267-57011 SH 15.00B
r) CES-STAB and Control ATCA Horizontal and Vertical Thruster Control	LDW267-57011 SH 16.00B
s) CES-STAB and Control Thruster Primary Solenoid Driver Control	LDW267-57011 SH 17.00A

2. Table of Contents (Continued)

ITEM NAME		DWG. NO.
t)	CES-STAB and Control Thruster Secondary Solenoids Manual Select (Roll and Pitch)	LDW267-57011 SH 18.00B
u)	CES-STAB and Control Thruster CES Solenoids Manual Select Yaw (Pitch and Roll)	LDW267-57011 SH 19.00B
v)	CES-STAB and Control Caution and Warning	LDW267-57011 SH 20.00B
w)	CES-STAB and Control Caution and Warning	LDW267-57011 SH 21.00A
x)	CES-STAB and Control OI	LDW267-57011 SH 22.00B
y)	CES-STAB and Control PGNS and AGS Mode Control to OI	LDW267-57011 SH 23.00B



Cabin Location of CES Controls and Indicators



PANEL 3
(III)

CES Controls and Indicators Layout

SUBSYSTEM: STABILIZATION AND CONTROL (FUNCTIONAL GROUPING 11)

Code	Control/Indicator	Function
11S1	GYRO TEST CONTROL SWITCH 3-POSITION TOGGLE MOM-LOCK-MOM	This three-position toggle (POS RT - OFF -NEG RT) enables a test signal to be applied to the rate gyro selected by 11S7. It is maintained in the OFF position and momentarily held in the other two. When this switch is held in the POS RT position, a $\pm 5^{o}$/sec attitude rate will be indicated on the appropriate rate needles of the Flight Director Attitude Indicators (9M1 and 9M6). The NEG RT position produces the opposite effect. In OFF, no test signal is produced.
11S2	DEADBAND SWITCH 2-POSITION TOGGLE MAIN-MAIN	This two-position toggle (MAX-MIN) selects either a large amplitude limit cycle (MAX) for the attitude control system, to conserve RCS fuel during coasting flight, or a narrow deadband (MIN) for periods when accurate manual control is required. Regardless of this switch position the minimum deadband will operate during main engine thrusting. This switch is not functional when the PGNS is in use. But dead band output modes (logic error input) can also be tracked for AGS analog inputs.
11S3 11S4 11S5	PITCH ATTITUDE CONTROL SWITCH ROLL ATTITUDE CONTROL SWITCH YAW ATTITUDE CONTROL SWITCH THREE 3-POSITION TOGGLES MAIN-MAIN-MAIN	The three ATTITUDE CONTROL switches, one for each axis, each having three positions (MODE CONT-PUSE-DIR), are normally in the MODE CONT position while PGNS is the guidance authority. This allows use of the proportional mode of the attitude controller while in ATT HOLD. When the MODE CONTROL PGNS switch (11S24), is in AUTO, the LGC supplies attitude commands to maneuver the vehicle. Placing the MODE CONTROL PGNS switch (11S24) to ATT HOLD or AUTO allows use of the DIR mode in any axis. Each axis must be positioned to DIR independently. Displacing an attitude controller (1A1 or 1A12) one fourth of full

Code	Control/Indicator	Function
11S3 11S4 11S5 (Cont.)		throw commands a 2 jet firing in the axis selected. This usage is not recommended, as it results in an open loop acceleration that is opposed by the DAP above the command rate. The PULSE position is inoperative while under PGNS guidance authority. When AGS is the guidance authority, the MODE CONT positions of the ATTITUDE CONTROL switches function in the same manner as in PGNS. That is, when AUTO is selected on the MODE CONTROL switch, automatic attitude commands are issued by the guidance authority (PGNS or AGS). When ATT HOLD is selected on the MODE CONTROL switch, displacing either attitude controller to the out of detent position commands on angular rate proportional to the displacement. Under AGS control, the PULSE and DIR modes differ only in the way the reaction jets fire. When PULSE is selected, two jets in the appropriate axis fire at a constant pulsed rate for as long as the attitude controller is displaced more than one fourth of full throw. When DIR is selected, two jets in the appropriate axis fire continuously for as long as the Attitude Controller is displaced more than one fourth of full throw. Both PULSE and DIR provide open-loop acceleration. The rates produced by PULSE or DIR commands must be nulled to zero by inducing an opposite acceleration command, and the attitude is not automatically maintained until the ATTITUDE CONTROL switch is returned to MODE CONT. When the MODE CONT switch is in the OFF position, only the DIR position of 11S3, 11S4 and 11S5 are operative. Selecting DIR

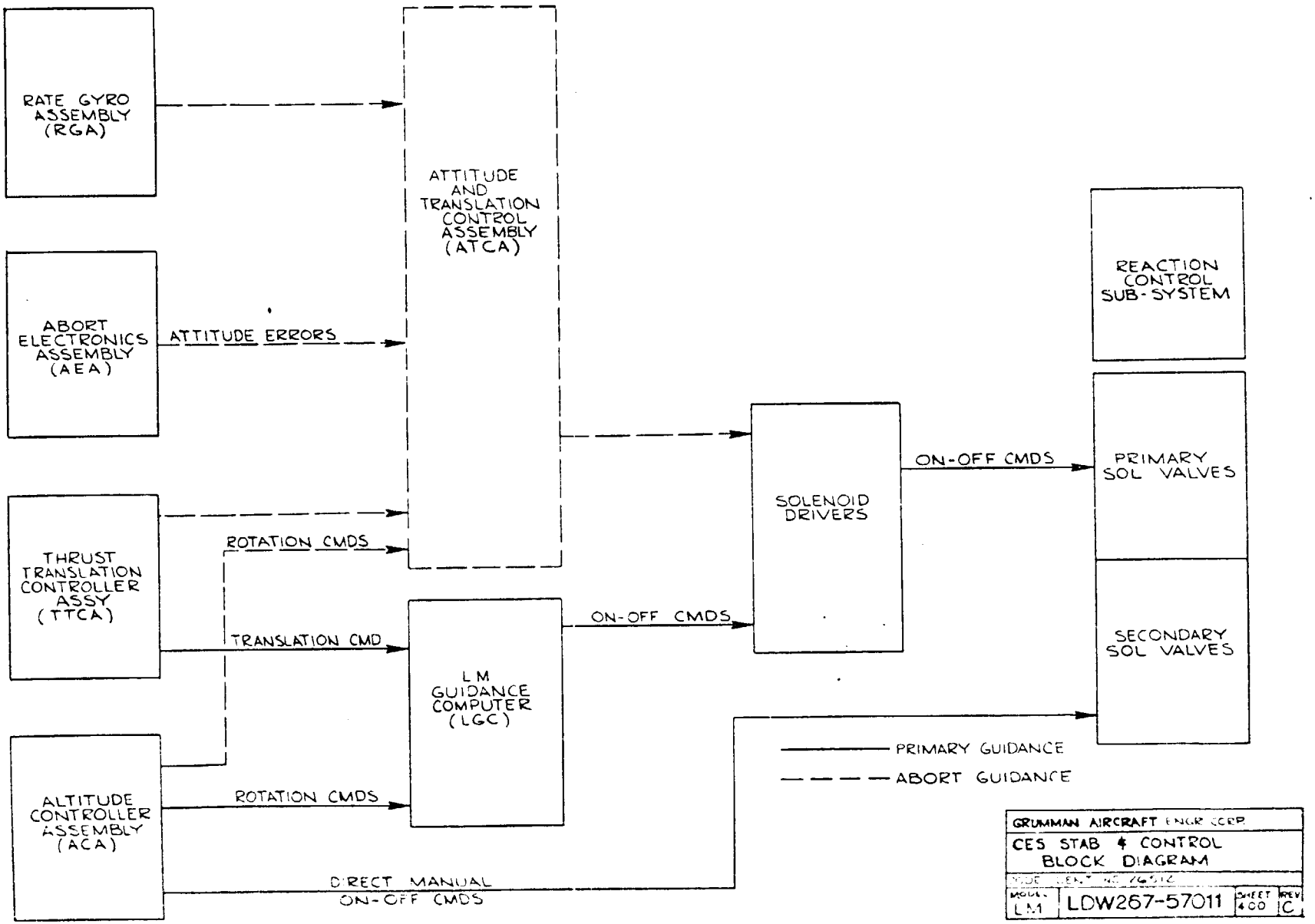
Code	Control/Indicator	Function
11S3 11S4 11S5 (Cont.)		produces two jet open loop accelerations when an Attitude Controller is displaced more than one fourth of full throw. This is irrespective of the guidance authority.
11S7	GYRO TEST SELECT SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (ROLL-PITCH-YAW) associated with 11S1, selects the rate gyro which is to be tested. The test output is displayed as described for switch 11S1.
11S24	PGNS ATTITUDE MODE CONTROL SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	The three-positions (OFF-ATT HOLD-AUTO) are associated with the ATTITUDE CONTROL switches (11S3, 11S4 and 11S5) and the GUID CONT switch (9S6). Thus it affects the usage of the attitude controllers (1A1 and 1A12) and the firing of the RCS jets. When the OFF position is selected, PGNS guidance authority (as selected on 9S6) can not command RCS firing to maintain or change attitude. The attitude controller cannot command proportional mode or pulse mode maneuvers. The attitude controllers can command four jet hard over firing of the RCS, and if DIR is selected on 11S3, 11S4, or 11S5, 2 jet firing in the appropriate axis. The translation controllers are not enabled. The ATT HOLD position is used to maintain attitude and to allow manual adjustment of attitude at commanded rates, which will then be maintained automatically. Neither automatic attitude or translation maneuvers are provided in ATT HOLD, nor are automatic

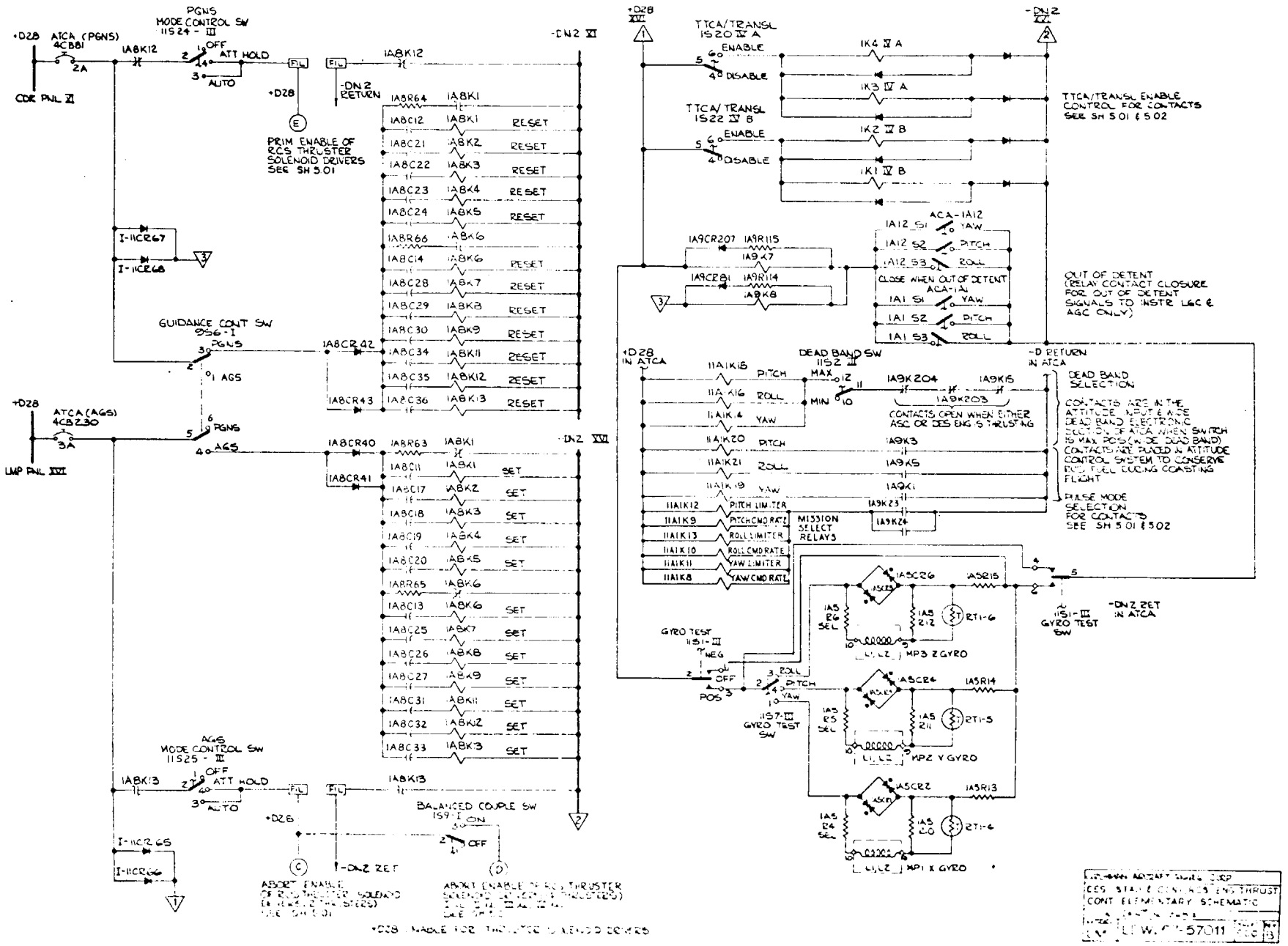
Code	Control/Indicator	Function
11S24 (Cont.)		APS or DPS starts and stops. The attitude is changed by commanding an angular rate proportional to the displacement of an attitude controller (1A1, or 1A12). With PGNS as the guidance authority, PULSE is inoperative, and while not recommended, DIR provides an open loop acceleration. The translation controllers are enabled while the MODE CONTROL switch is in ATT HOLD. In the AUTO position, the guidance authority (PSNS) issues RCS commands via ATCA to maintain and/or change the vehicles attitude, and the PGNS performs RCS translation. The guidance authority will also stop and start the main propulsion systems, and vary the DPS thrust as required. With PGNS as the guidance authority and MODE CONTROL 11S24 in AUTO, attitude controller proportional commands are normally ineffective, except for certain LGC determined periods of the mission. Selecting DIR on one or more of the ATTITUDE CONTROL switches (11S3, 11S4 or 11S5) will cause opposing jets to fire when the attitude controllers are displaced more than one fourth of full throw. The LGC will command jets to fire in opposition to both DIR and hard over commands.
11S25	AGS ATTITUDE MODE CONTROL SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	The three-positions (OFF-ATT-HOLD-AUTO) are associated with the ATTITUDE CONTROL switches (11S3, 11S4 and 11S5) and the GUID CONT switch (9S6). Thus it affects the usage of the attitude controllers (1A1 and 1A12) and the firing of the RCS jets.

SUBSYSTEM: STABILIZATION AND CONTROL (FUNCTIONAL GROUPING 11)

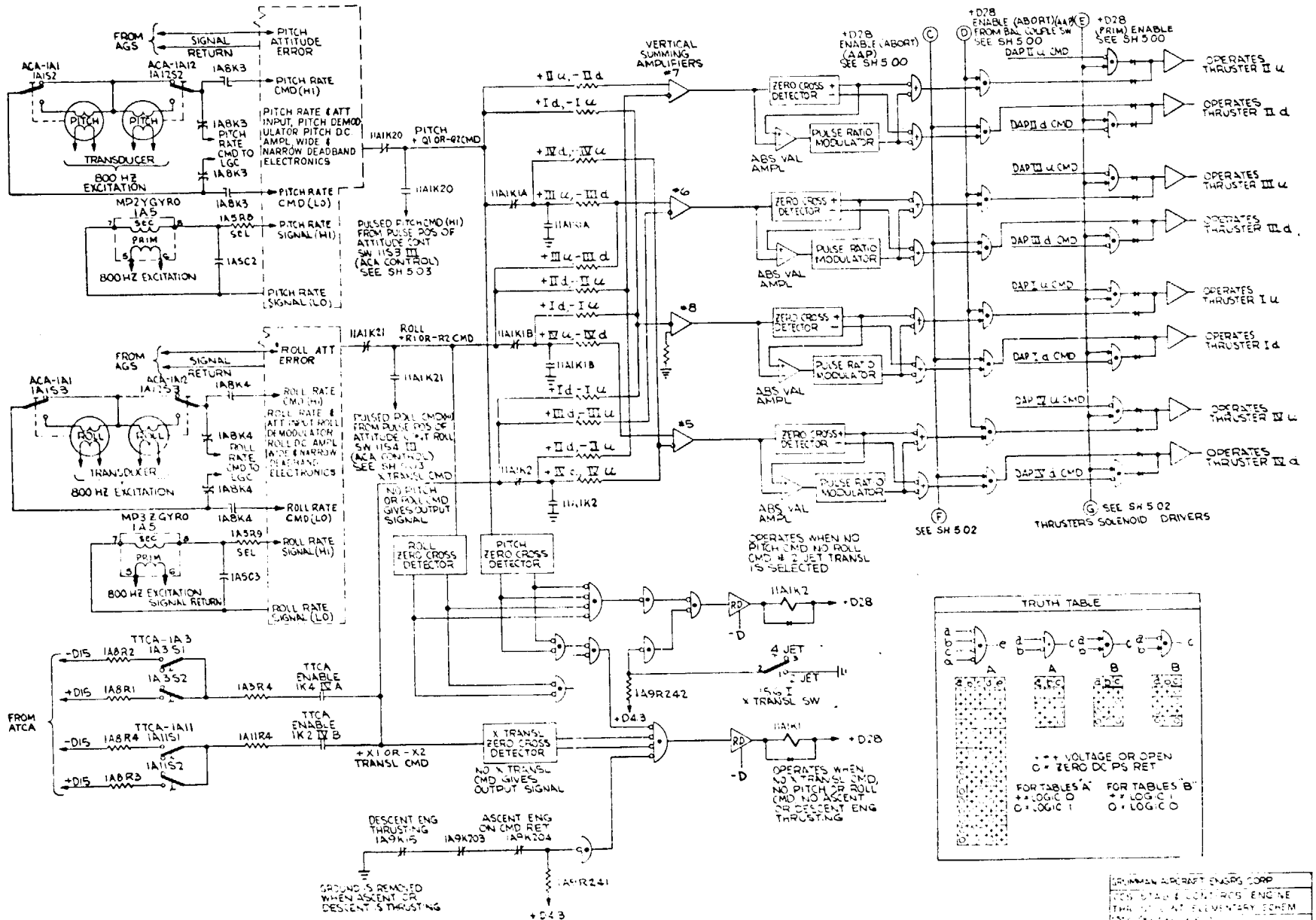
Code	Control/Indicator	Function
11S25 (Cont.)		When the OFF position is selected, AGS guidance authority (as selected on 9S6) cannot command RCS firing to maintain or change attitude. The attitude controller cannot command proportional mode or pulse mode maneuvers. The attitude controllers can command four jet hard over firing of the RCS, and if DIR is selected on 11S3, 11S4, or 11S5, 2 jet firing in the appropriate axis. The translation controllers are not enabled. The ATT HOLD position is used to maintain attitude and to allow manual adjustment of attitude at commanded rates, which will then be maintained automatically. Neither automatic attitude or translation maneuvers are provided in ATT HOLD nor are automatic APS or DPS starts and stops. The attitude is changed by commanding an angular rate proportional to the displacement of an attitude controller (1A1, or 1A12). (1) With AGS as the guidance authority, both PULSE and DIR (as selected on 11S3, 11S4, or 11S5) provide open loop acceleration when an attitude controller is displaced more than one fourth of full throw. The rate created by a DIR or PULSE mode RCS firing must first be nulled to zero by inducing an opposite acceleration command. Attitude is not automatically maintained until the ATTITUDE CONTROL switch is returned to the MODE CONT position. In the AUTO position, the guidance authority (AGS) issues RCS commands to maintain and/or change the vehicles attitude.

Code	Control/Indicator	Function
11S25 (Cont.)		(2) AGS - The AUTO mode allows the AEA to initiate attitude maneuvers. Ullage maneuvers prior to a main engine burn must be commanded manually. This is also true for AGS controlled aborts that are initiated via the ABORT switch (1S13) or the ABORT STAGE switch (1S14). Assuming the ullage maneuver has occurred, AGS will start or stop a main propulsion system burn in AUTO mode. Displacing an attitude controller to the out of a detent position results in conflicting commands. PULSE and DIR modes produce open loop acceleration when an attitude controller is displaced more than one fourth of full throw, and drifting while in detent. The hard over mode will cause opposing jets to fire when attitude switches (11S3, 4, 5) are in MODE CONT. The translation controllers function normally.

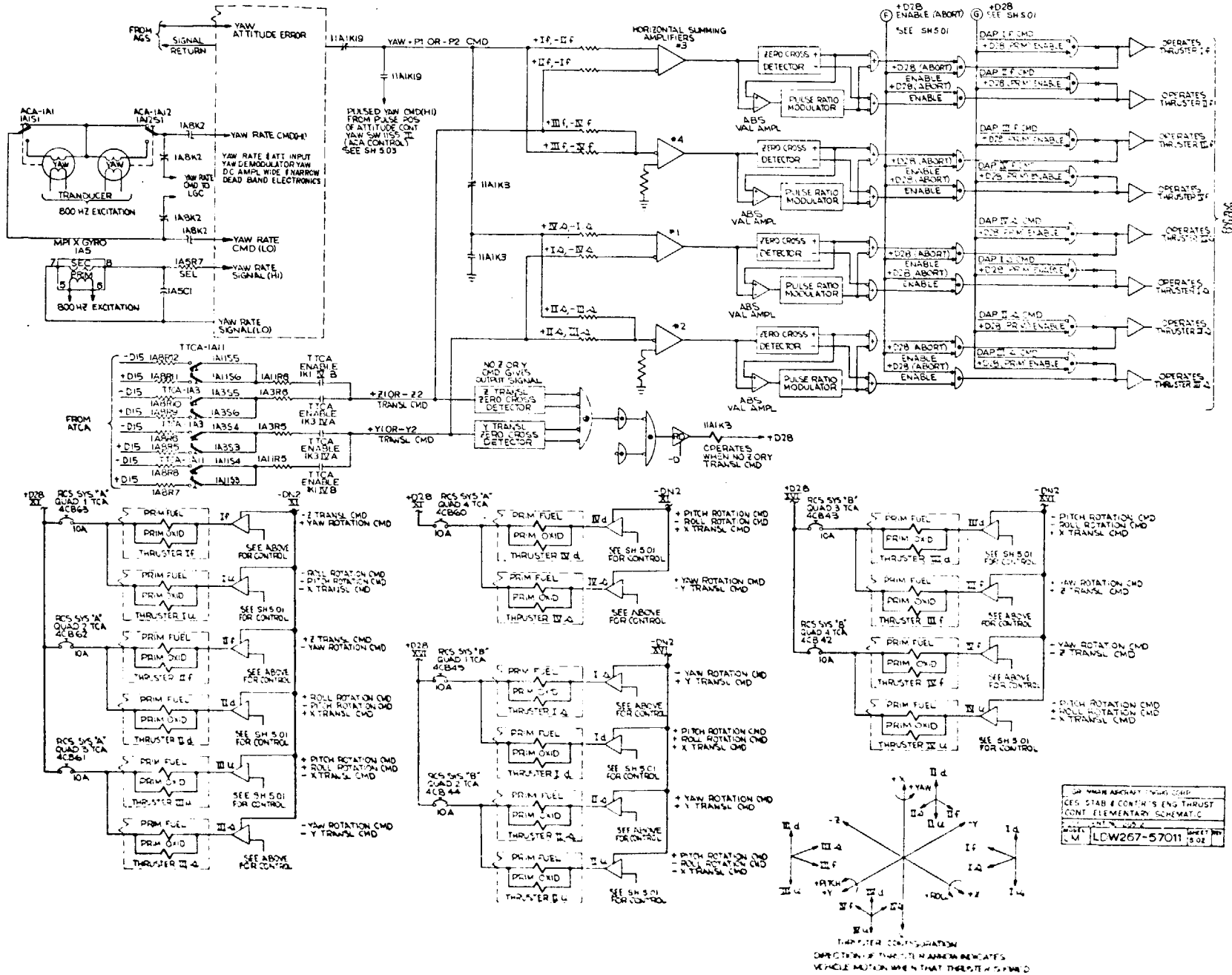

RATE GYRO ASSEMBLY (RGA)
ABORT ELECTRONICS ASSEMBLY (AEA)
ATTITUDE ERRORS
THRUST TRANSLATION CONTROLLER ASSY (TTCA)
ROTATION CMDS
TRANSLATION CMD
ALTITUDE CONTROLLER ASSEMBLY (ACA)
ROTATION CMDS
ATTITUDE AND TRANSLATION CONTROL ASSEMBLY (ATCA)
LM GUIDANCE COMPUTER (LGC)
ON-OFF CMDS
SOLENOID DRIVERS
ON-OFF CMDS
REACTION CONTROL SUB-SYSTEM
PRIMARY SOL VALVES
SECONDARY SOL VALVES
DIRECT MANUAL ON-OFF CMDS
PRIMARY GUIDANCE
ABORT GUIDANCE
GRUMMAN AIRCRAFT ENGR CORP
CES STAB & CONTROL BLOCK DIAGRAM
MODEL LM
LDW267-57011
SHEET 400
REV C

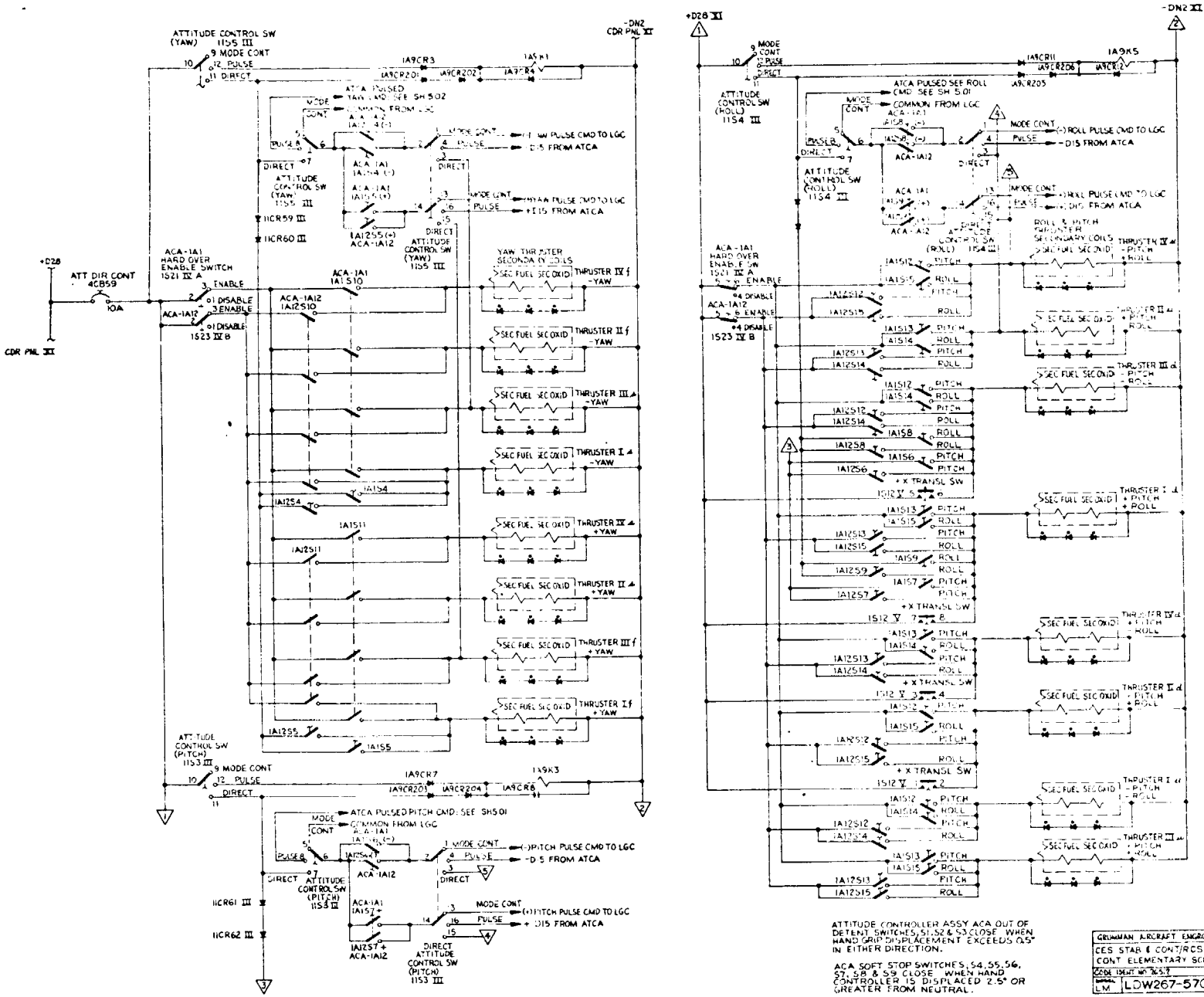


	GEES STAGE CONTROL ENGINE THRUST CONT ELEMENTARY SCHEMATIC
	LEW. 57011



GRUMMAN AIRCRAFT ENGRG CORP
ICS STAB & CONTROL ENGINE
THRUSTER ATT ELEVENTARY SCHEM
SIZE E CAGE CODE 14447
DWG NO LEM 2267-57011 SHT REV


FROM AGS
SIGNAL RETURN
YAW ATTITUDE ERROR
YAW + P1 OR - P2 CMD
PULSED YAW CMD(HI) FROM PULSE POS OF ATTITUDE CONT YAW SW (155 ACA CONTROL) SEE SH 5.03
ACA-1A1 1A1S1
ACA-1A2 1A2S1
YAW RATE CMD(HI)
YAW RATE & ATT INPUT YAW DEMODULATOR YAW DC AMPL WIDE & NARROW DEAD BAND ELECTRONICS
YAW RATE CMD TO LGC
TRANDUCER
800 HZ EXCITATION
MPI X GYRO 1A5
YAW RATE CMD (LO)
YAW RATE SIGNAL (HI)
YAW RATE SIGNAL(LO)
HORIZONTAL SUMMING AMPLIFIERS #3
#4
#1
#2
ZERO CROSS DETECTOR
PULSE RATIO MODULATOR
ABS VAL AMPL
+D28 ENABLE (ABORT)
SEE SH 5.01
DAP I F CMD
DAP II F CMD
DAP III F CMD
DAP IV F CMD
DAP I Q CMD
DAP II Q CMD
DAP III Q CMD
DAP IV Q CMD
OPERATES THRUSTER I F
OPERATES THRUSTER II F
OPERATES THRUSTER III F
OPERATES THRUSTER IV F
OPERATES THRUSTER I Q
OPERATES THRUSTER II Q
OPERATES THRUSTER III Q
OPERATES THRUSTER IV Q
SEE BELOW FOR THRUSTER SOLENOID VALVE CONTROL CKTS
FROM ATCA
TTCA-1A11
+Z OR - Z2 TRANSL CMD
+Y OR - Y2 TRANSL CMD
NO Z OR Y CMD GIVES OUTPUT SIGNAL
Z TRANSL ZERO CROSS DETECTOR
Y TRANSL ZERO CROSS DETECTOR
OPERATES WHEN NO Z OR Y TRANSL CMD
RCS SYS "A" QUAD 1 TCA 4CB63
RCS SYS "A" QUAD 2 TCA 4CB62
RCS SYS "A" QUAD 3 TCA 4CB61
RCS SYS "A" QUAD 4 TCA 4CB60
RCS SYS "B" QUAD 1 TCA 4CB45
RCS SYS "B" QUAD 2 TCA 4CB44
RCS SYS "B" QUAD 3 TCA 4CB43
RCS SYS "B" QUAD 4 TCA 4CB42
PRIM FUEL
PRIM OXID
- Z TRANSL CMD + YAW ROTATION CMD
- ROLL ROTATION CMD - PITCH ROTATION CMD + X TRANSL CMD
+ Z TRANSL CMD - YAW ROTATION CMD
+ ROLL ROTATION CMD - PITCH ROTATION CMD + X TRANSL CMD
+ PITCH ROTATION CMD + ROLL ROTATION CMD - X TRANSL CMD
- YAW ROTATION CMD - Y TRANSL CMD
+ PITCH ROTATION CMD + ROLL ROTATION CMD + X TRANSL CMD
+ YAW ROTATION CMD + Y TRANSL CMD
- YAW ROTATION CMD + Y TRANSL CMD
- PITCH ROTATION CMD + ROLL ROTATION CMD + X TRANSL CMD
+ YAW ROTATION CMD - Z TRANSL CMD
- PITCH ROTATION CMD + ROLL ROTATION CMD + X TRANSL CMD
SEE ABOVE FOR CONTROL
SEE SH 5.01 FOR CONTROL
THRUSTER CONFIGURATION
DIRECTION OF THRUSTER ARROW INDICATES VEHICLE MOTION WHEN THAT THRUSTER IS FIRED
LDW267-57011

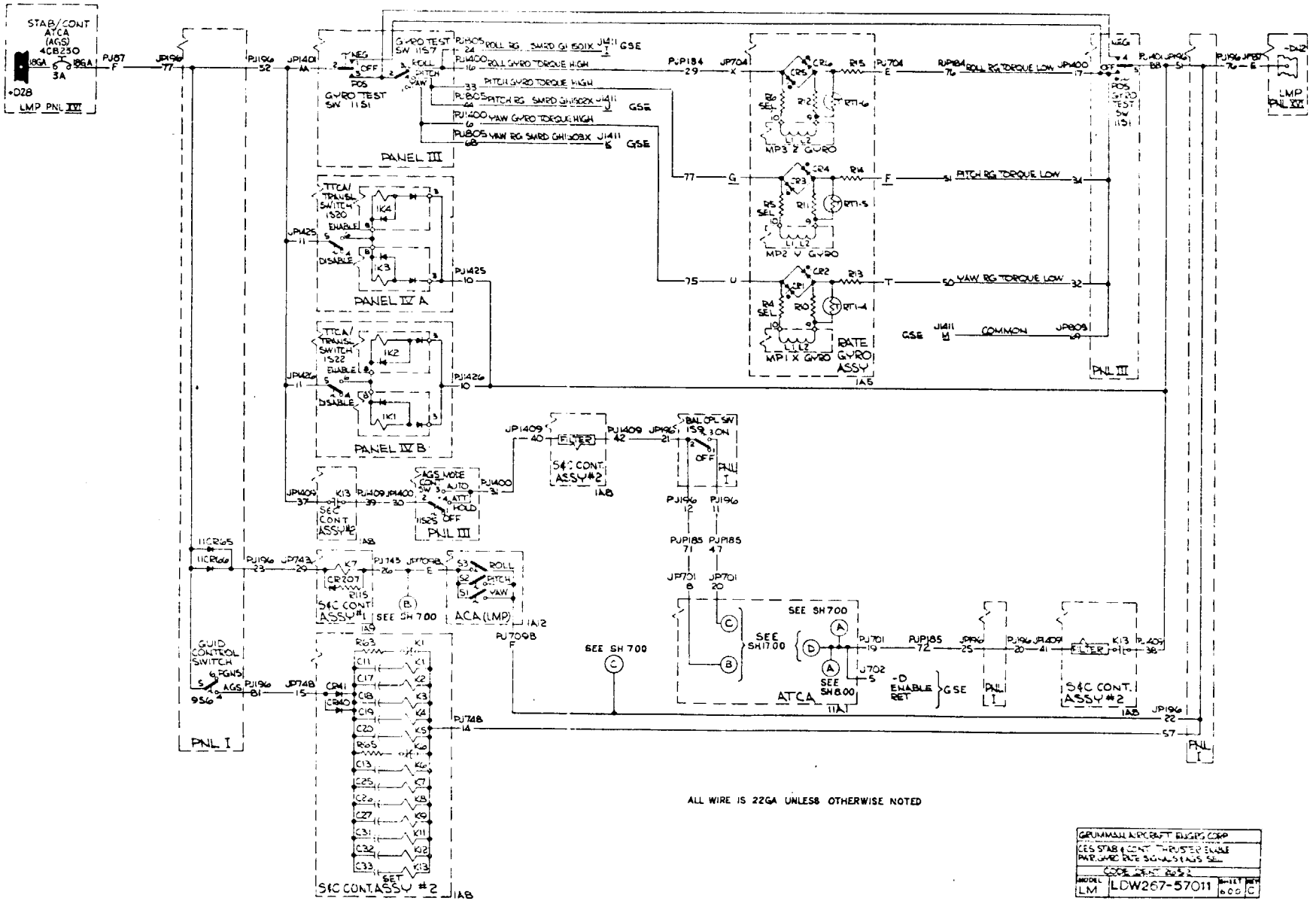


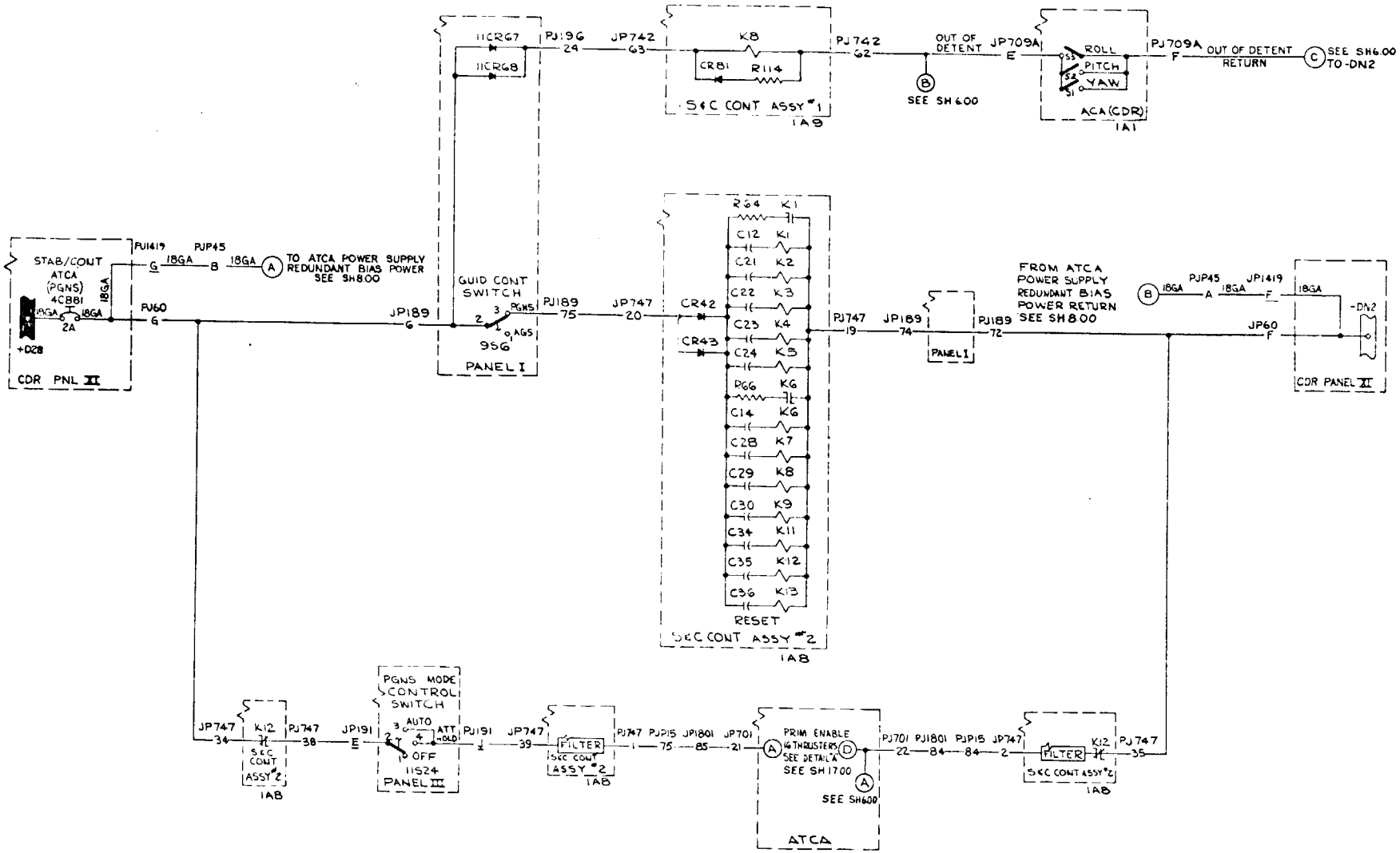
ATTITUDE CONTROLLER ASSY ACA OUT OF DETENT SWITCHES S1, S2 & S3 CLOSE WHEN HAND GRIP DISPLACEMENT EXCEEDS 0.5° IN EITHER DIRECTION.

ACA SOFT STOP SWITCHES, S4, S5, S6, S7, S8 & S9 CLOSE WHEN HAND CONTROLLER IS DISPLACED 2.5° OR GREATER FROM NEUTRAL.

ACA HARD OVER SWITCHES, S10, S11, S12, S13, S14 & S15 CLOSE WHEN HAND CONTROLLER IS DISPLACED 12° OR GREATER.

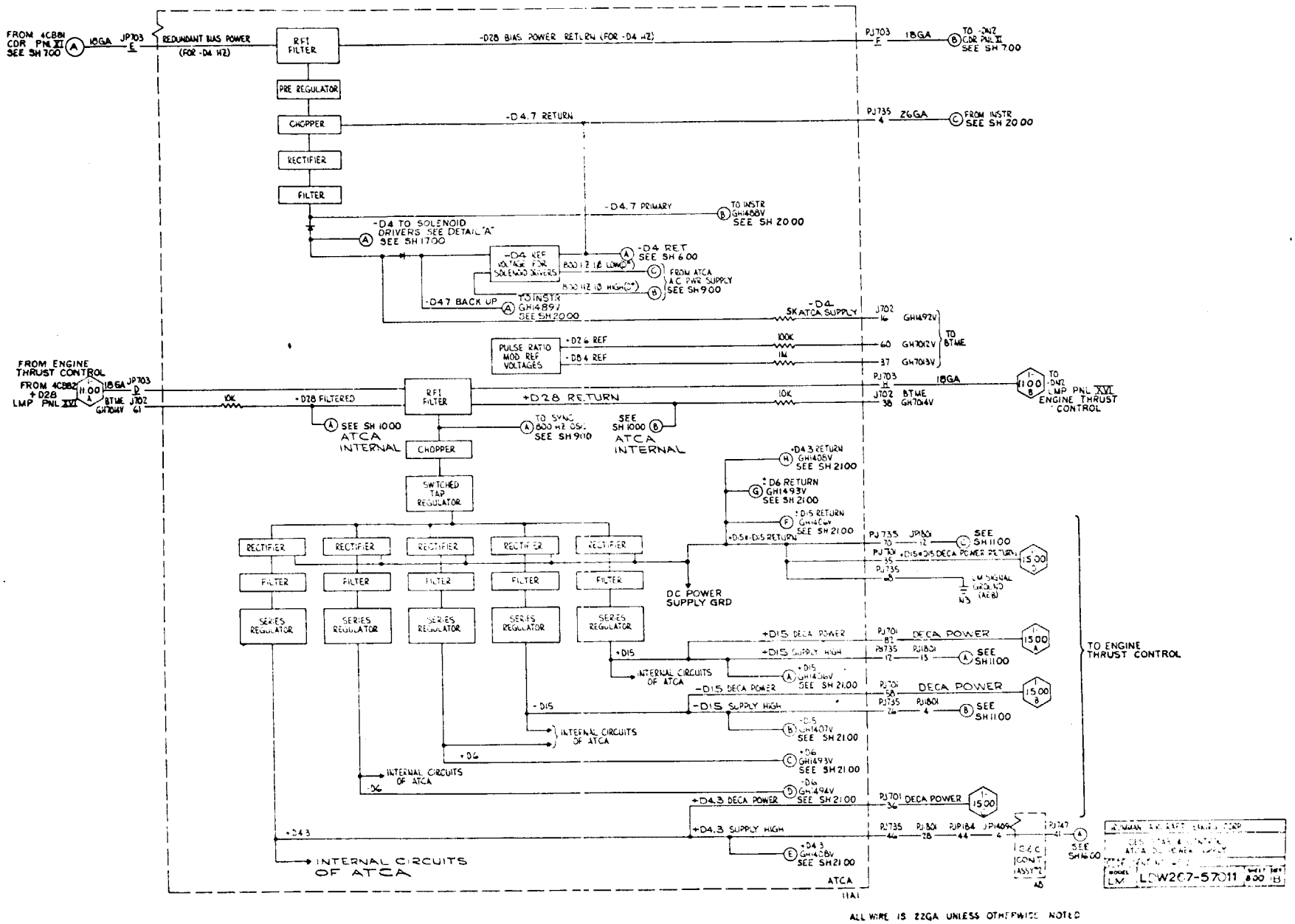
GRUMMAN AIRCRAFT ENGRG CORP	
CES STAB & CONT/RCS ENG THRUST CONT ELEMENTARY SCHEMATIC	
CODE IDENT NO 71468	
SIZE LM	LDW267-57011 SHEET 5.03 REV

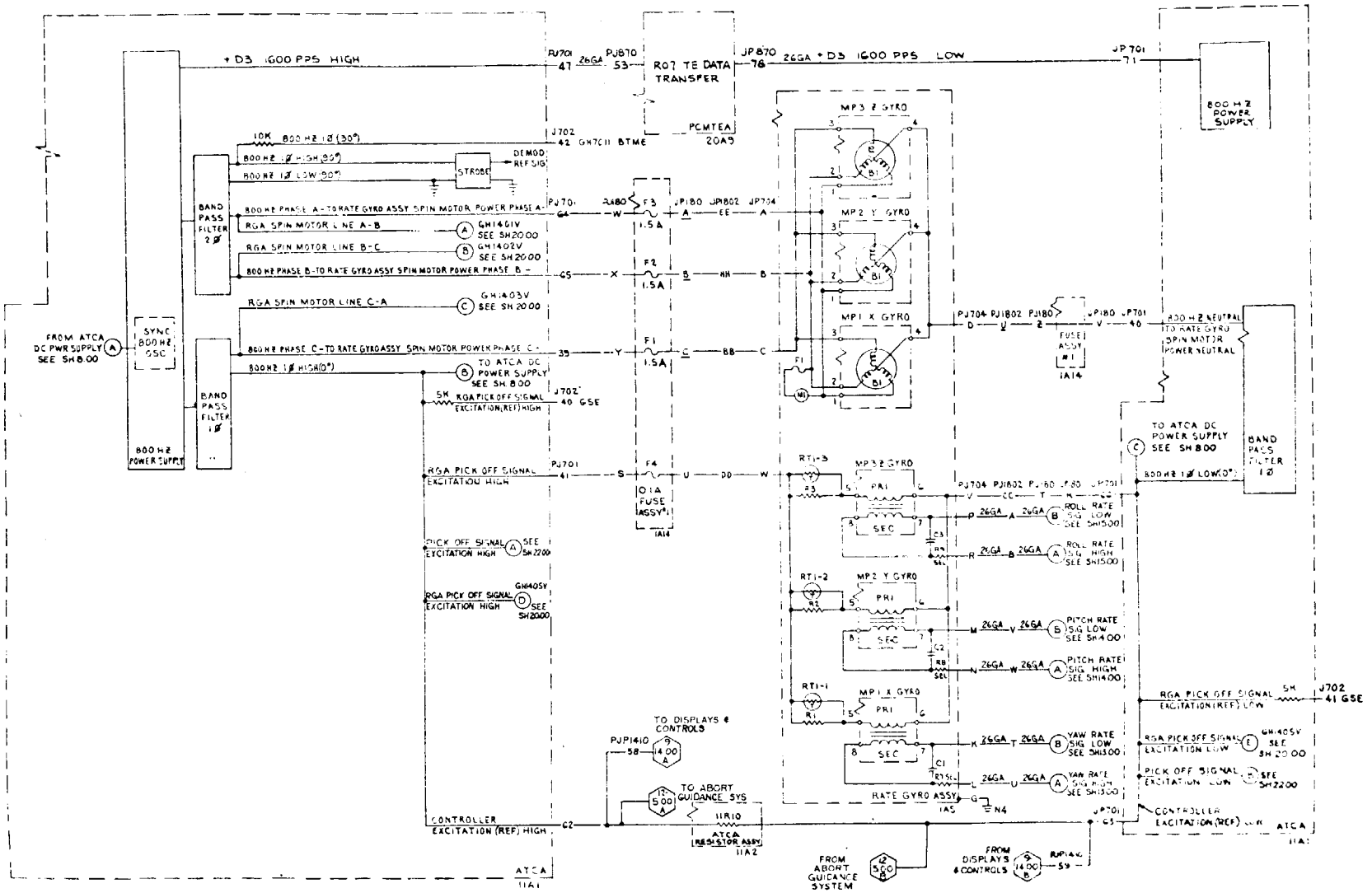

STAB/CONT ATCA (AGS) 4GB230
3A
+D28
LMP PNL IV
PANEL III
GYRO TEST SW 1151
PANEL IV A
PANEL IV B
TTCA/ TRANSL SWITCH 1S20
TTCA/ TRANSL SWITCH 1S22
ENABLE
DISABLE
S&C CONT ASSY #1
S&C CONT ASSY #2
ACA (LMP)
RATE GYRO ASSY 1A5
MP3 Z GYRO
MP2 Y GYRO
MP1 X GYRO
ROLL RG TORQUE LOW
PITCH RG TORQUE LOW
YAW RG TORQUE LOW
COMMON
BAL CPL SW 1S9
AGS MODE SW 1S25
GUID CONTROL SWITCH 9S6
ATCA
SEE SH 700
SEE SH 17.00
SEE SH 8.00
PNL I
PNL III
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
CES STAB & CONT THRUSTER ENABLE PWR, GYRO RATE SIGNALS & AGS SEL
LM
LDW267-57011
SHEET 6 OF 6
REV C

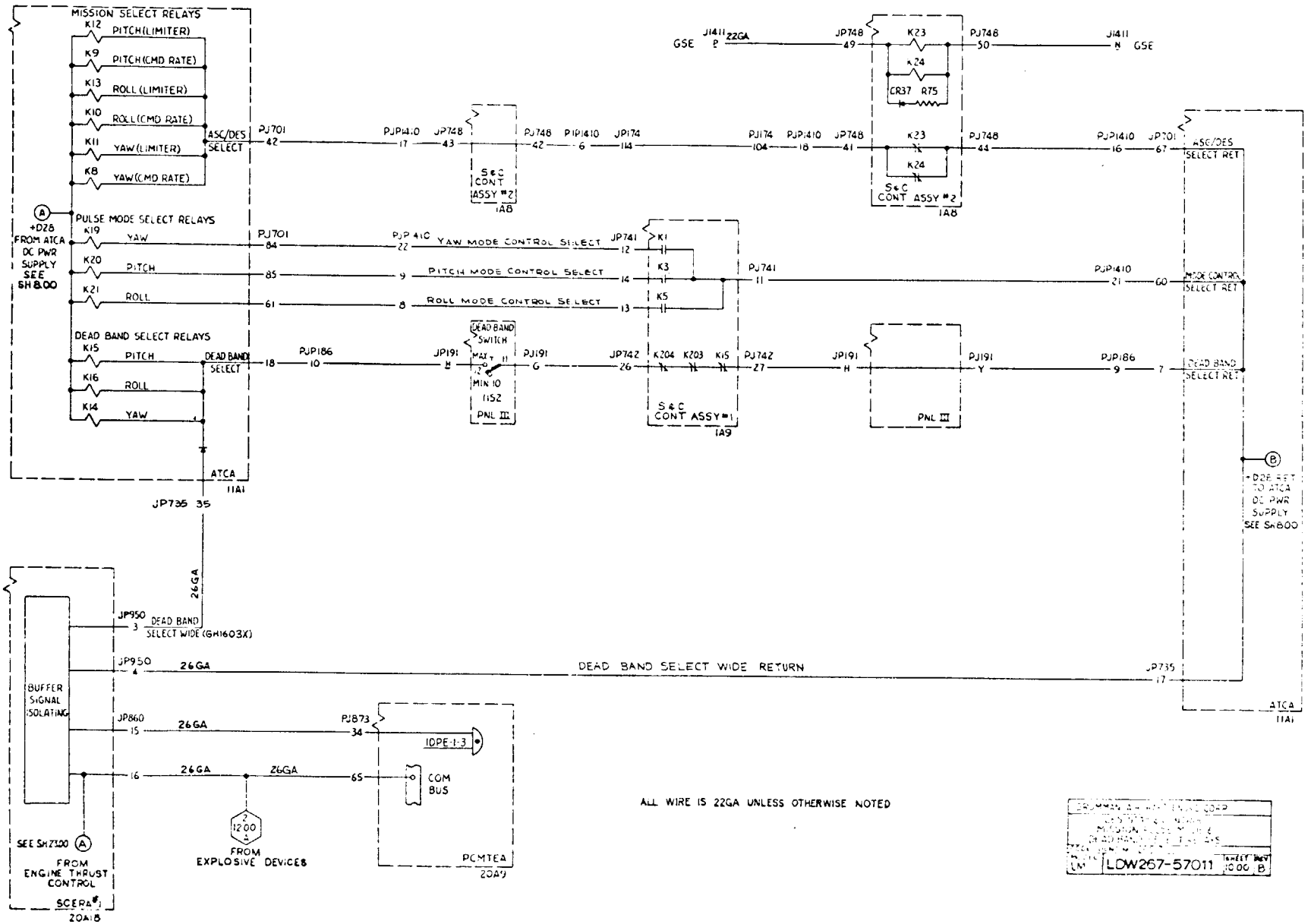


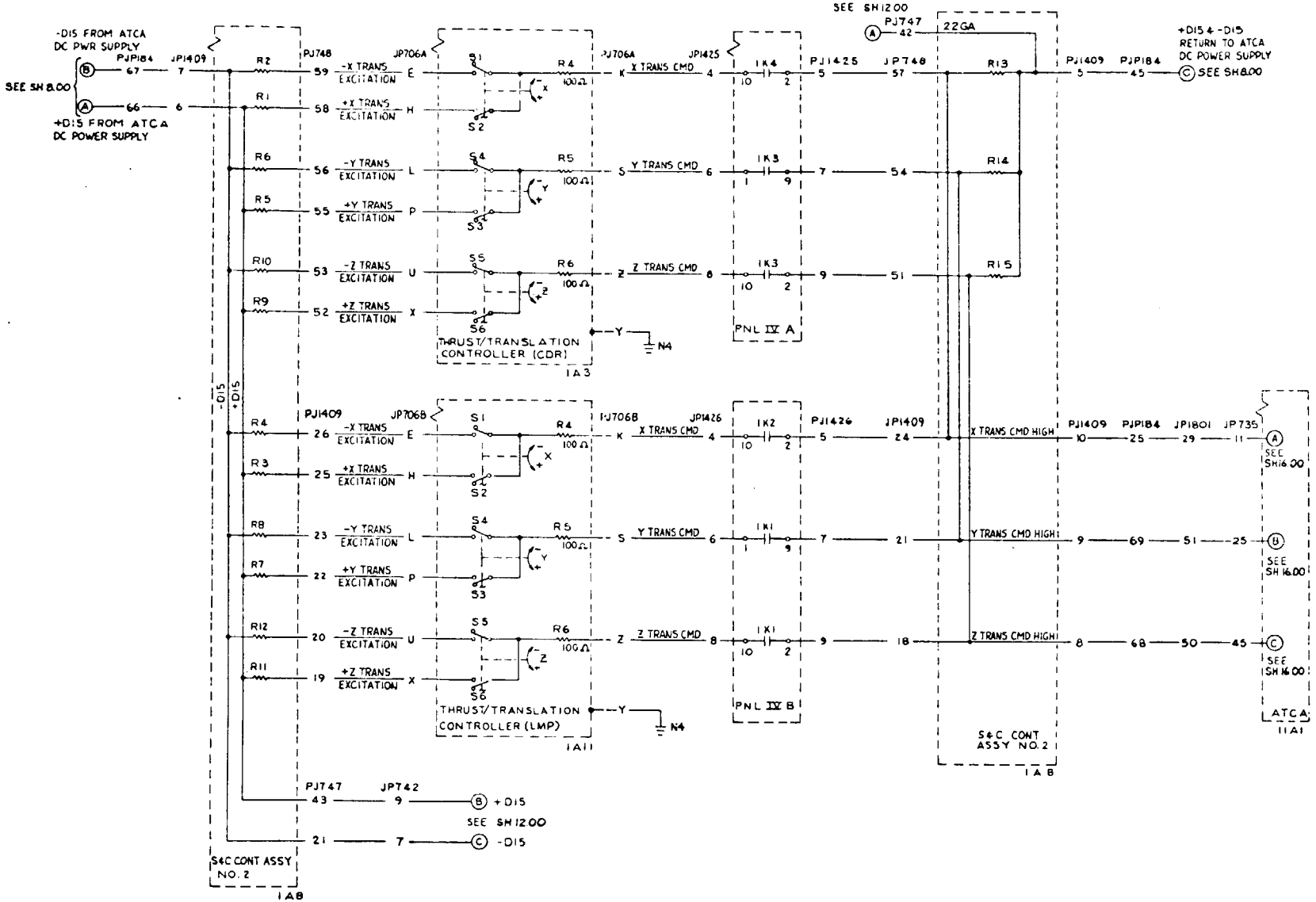
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGR. CORP	
CES STAB & CONTROL THRUSTER ENABLE POWER & PGNS SELECT	
CODE IDENT NO 80 [illegible] 2	
MODEL LM	LDW267-57011 SHEET 700 REV B


FROM 4CB8N CDR PNL XI SEE SH 700
18GA JP703 E
REDUNDANT BIAS POWER (FOR -D4 HZ)
RFI FILTER
PRE REGULATOR
CHOPPER
RECTIFIER
FILTER
-D28 BIAS POWER RETURN (FOR -D4 HZ)
PJ703 F 18GA TO -D4Z CDR PNL II SEE SH 700
-D4.7 RETURN
PJ735 Z6GA FROM INSTR SEE SH 2000
-D4.7 PRIMARY
TO INSTR GH1408V SEE SH 2000
-D4 TO SOLENOID DRIVERS SEE DETAIL "A" SEE SH 1700
-D4 REF VOLTAGE FOR SOLENOID DRIVERS
800 HZ 18 LOW
800 HZ 18 HIGH
FROM ATCA A.C. PWR SUPPLY SEE SH 900
-D4 RET SEE SH 600
-D4.7 BACK UP
TO INSTR GH1499V SEE SH 2000
-D4 5K ATCA SUPPLY
J702 16 GH1492V
PULSE RATIO MOD REF VOLTAGES
+D2.6 REF
-D8.4 REF
100K
1M
60 GH7012V
37 GH7013V
TO BTME
FROM ENGINE THRUST CONTROL
FROM 4CB82 +D28 LMP PNL XVI
11.00 A 18GA JP703 D
BTME J702 61 GH7014V
10K
+D28 FILTERED
RFI FILTER
+D28 RETURN
10K
J702 38 BTME GH7014V
PJ703 H 18GA
1-100 B TO -D4Z LMP PNL XVI ENGINE THRUST CONTROL
SEE SH 1000 ATCA INTERNAL
TO SYNC 800 HZ OSC. SEE SH 9100
SEE SH 1000 ATCA INTERNAL
CHOPPER
SWITCHED TAP REGULATOR
+D4.3 RETURN GH1408V SEE SH 2100
+D6 RETURN GH1493V SEE SH 2100
+D15 RETURN GH1406V SEE SH 2100
+D15 & -D15 RETURN
PJ735 JP801 10 12 SEE SH 1100
PJ701 +D15 & -D15 DECA POWER RETURN 35
1-500 B
PJ735 28
LM SIGNAL GROUND (AEB)
N3
RECTIFIER
FILTER
SERIES REGULATOR
DC POWER SUPPLY GRD
+D15 DECA POWER
PJ701 82 DECA POWER
1-500 A
+D15 SUPPLY HIGH
PJ735 12 PJ801 13 SEE SH 1100
+D15 GH1406V SEE SH 2100
INTERNAL CIRCUITS OF ATCA
-D15 DECA POWER
PJ701 58 DECA POWER
1-500 B
-D15 SUPPLY HIGH
PJ735 2 PJ801 4 SEE SH 1100
-D15 GH1407V SEE SH 2100
+D6
+D6 GH1493V SEE SH 2100
-D6
-D4 GH1494V SEE SH 2100
+D4.3 DECA POWER
PJ701 36 DECA POWER
1-500
+D4.3 SUPPLY HIGH
PJ735 46 PJ801 28 PJP184 44 JP1409 4
PJ747 41 A SEE SH 1600
C&C CONT ASSY 2 45
+D4.3
+D4.3 GH1408V SEE SH 2100
TO ENGINE THRUST CONTROL
ATCA
11A1
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
LDW207-57011

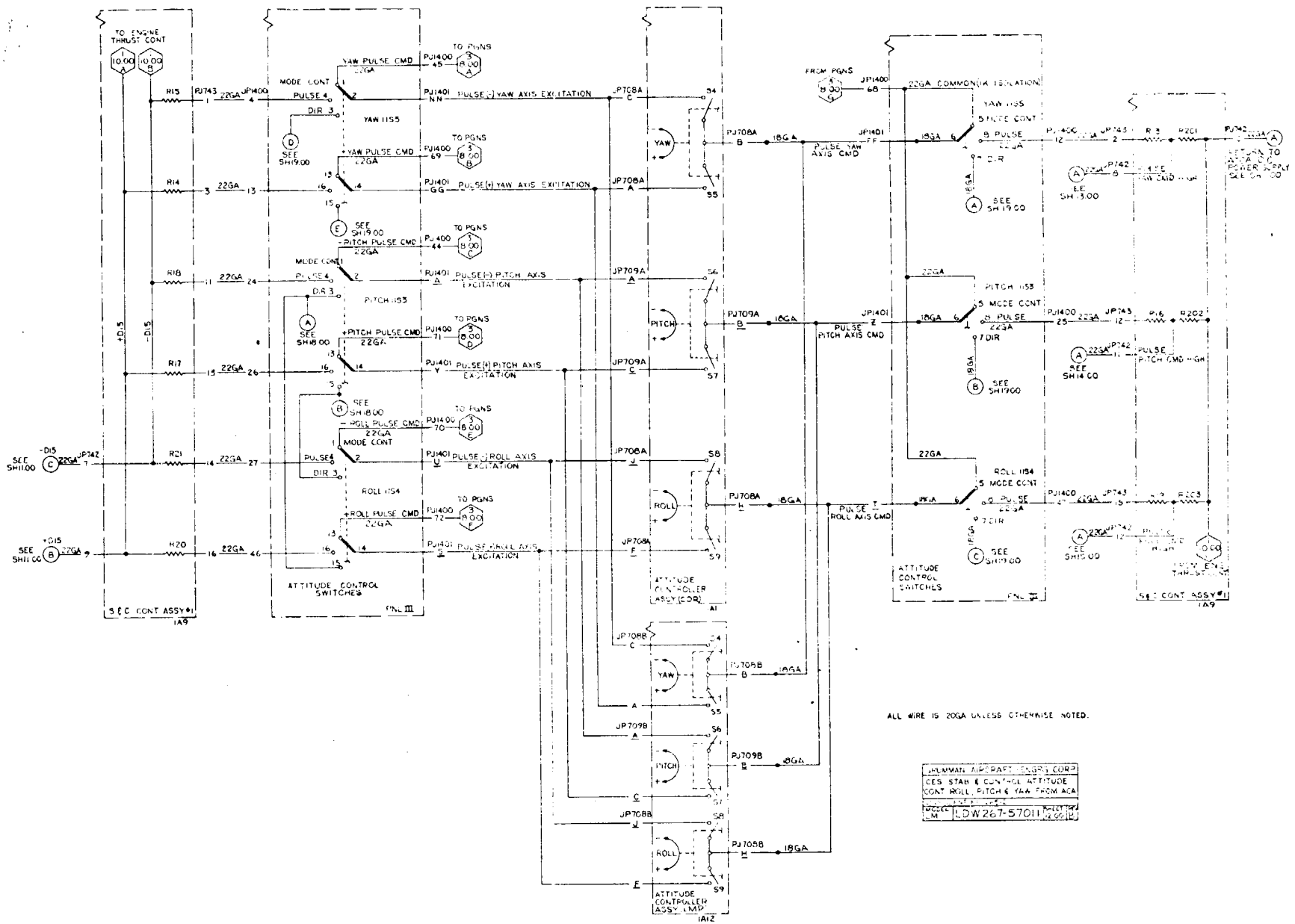

+D3 1600 PPS HIGH
PJ701 47 26GA PJ870 53
ROTE DATA TRANSFER
PCMTEA 20A5
JP870 78 26GA +D3 1600 PPS LOW
JP701 71
800 HZ POWER SUPPLY
10K 800 HZ 1Ø (30°)
800 HZ 1Ø HIGH (30°)
800 HZ 1Ø LOW (30°)
STROBE
DEMOD REF SIG
J702 42 GN7C11 BTME
BAND PASS FILTER 2Ø
800 HZ PHASE A - TO RATE GYRO ASSY SPIN MOTOR POWER PHASE A -
RGA SPIN MOTOR LINE A-B
RGA SPIN MOTOR LINE B-C
800 HZ PHASE B - TO RATE GYRO ASSY SPIN MOTOR POWER PHASE B -
RGA SPIN MOTOR LINE C-A
800 HZ PHASE C - TO RATE GYRO ASSY SPIN MOTOR POWER PHASE C -
800 HZ 1Ø HIGH (0°)
PJ701 64 G5 39
26B0 F3 1.5A F2 1.5A F1 1.5A
JP180 JP802 JP704
A EE A
B HH B
C BB C
MP3 Z GYRO
MP2 Y GYRO
MP1 X GYRO
PJ704 PJ1802 PJ180 JP180 JP701
D U Z V 40
FUSE ASSY #1 1A14
800 HZ NEUTRAL TO RATE GYRO SPIN MOTOR POWER NEUTRAL
FROM ATCA DC PWR SUPPLY SEE SH 8.00
SYNC 800 HZ OSC
800 HZ POWER SUPPLY
TO ATCA DC POWER SUPPLY SEE SH 800
J702 40 GSE
5K RGA PICK OFF SIGNAL EXCITATION (REF) HIGH
RGA PICK OFF SIGNAL EXCITATION HIGH
PJ701 41 S F4 1.0A FUSE ASSY #1 1A14 U DD W
RT1-3 MP3 Z GYRO PRI SEC
RT1-2 MP2 Y GYRO PRI SEC
RT1-1 MP1 X GYRO PRI SEC
RATE GYRO ASSY 1A5
ROLL RATE SIG LOW SEE SH1500
ROLL RATE SIG HIGH SEE SH1500
PITCH RATE SIG LOW SEE SH1400
PITCH RATE SIG HIGH SEE SH1400
YAW RATE SIG LOW SEE SH1300
YAW RATE SIG HIGH SEE SH1300
PICK OFF SIGNAL EXCITATION HIGH SEE SH2200
RGA PICK OFF SIGNAL EXCITATION HIGH GM1405V SEE SH2000
RGA PICK OFF SIGNAL EXCITATION (REF) LOW 5K J702 41 GSE
RGA PICK OFF SIGNAL EXCITATION LOW GM1405V SEE SH 2000
PICK OFF SIGNAL EXCITATION LOW SEE SH2200
CONTROLLER EXCITATION (REF) LOW
TO DISPLAYS & CONTROLS
PJP1410 58 14.00 A
TO ABORT GUIDANCE SYS
5.00 A
11R10
ATCA RESISTOR ASSY 11A2
CONTROLLER EXCITATION (REF) HIGH C2
ATCA 11A1
FROM ABORT GUIDANCE SYSTEM
FROM DISPLAYS & CONTROLS 14.00 B PJP1410 59
ATCA 11A1
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED


MISSION SELECT RELAYS
K12 PITCH(LIMITER)
K9 PITCH(CMD RATE)
K13 ROLL (LIMITER)
K10 ROLL(CMD RATE)
K11 YAW(LIMITER)
K8 YAW(CMD RATE)
ASC/DES SELECT
PULSE MODE SELECT RELAYS
K19 YAW
K20 PITCH
K21 ROLL
+D28 FROM ATCA DC PWR SUPPLY SEE SH 8.00
DEAD BAND SELECT RELAYS
K15 PITCH
K16 ROLL
K14 YAW
DEAD BAND SELECT
ATCA 11A1
JP735 35
PJ701 42
PJP1410 17
JP748 43
S&C CONT ASSY #2 1A8
PJ748 42
PJP1410 6
JP174 114
PJ174 104
PJP1410 18
JP748 41
K23
K24
CR37 R75
S&C CONT ASSY #2 1A8
GSE P J1411 22GA JP748 49
PJ748 50 J1411 N GSE
PJ748 44
PJP1410 16
JP701 67
ASC/DES SELECT RET
PJ701 84
PJP410 22
YAW MODE CONTROL SELECT
JP741 12
K1
K3
K5
PJ741 11
PJP1410 21
60
MODE CONTROL SELECT RET
PITCH MODE CONTROL SELECT 14
ROLL MODE CONTROL SELECT 13
PJ701 85
9
PJ701 61
8
PJP186 18
10
JP191 M
DEAD BAND SWITCH
MAX 11
MIN 10
1152
PNL III
PJ191 G
JP742 26
K204 K203 K15
PJ742 27
S&C CONT ASSY #1 1A9
JP191 H
PNL III
PJ191 Y
PJP186 9
7
DEAD BAND SELECT RET
B
+D28 RET TO ATCA DC PWR SUPPLY SEE SH 8.00
26GA
JP950 3
DEAD BAND SELECT WIDE (GH1603X)
JP950 4
26GA
DEAD BAND SELECT WIDE RETURN
JP735 17
ATCA 11A1
BUFFER SIGNAL ISOLATING
JP860 15
26GA
PJ873 34
IDPE-1-3
16
26GA
26GA
65
COM BUS
PCMTEA 20A9
SEE SH 2100 A
FROM ENGINE THRUST CONTROL
SCERA 20A18
2 1200 A
FROM EXPLOSIVE DEVICES
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
LDW267-57011
SHEET REV 1000 B



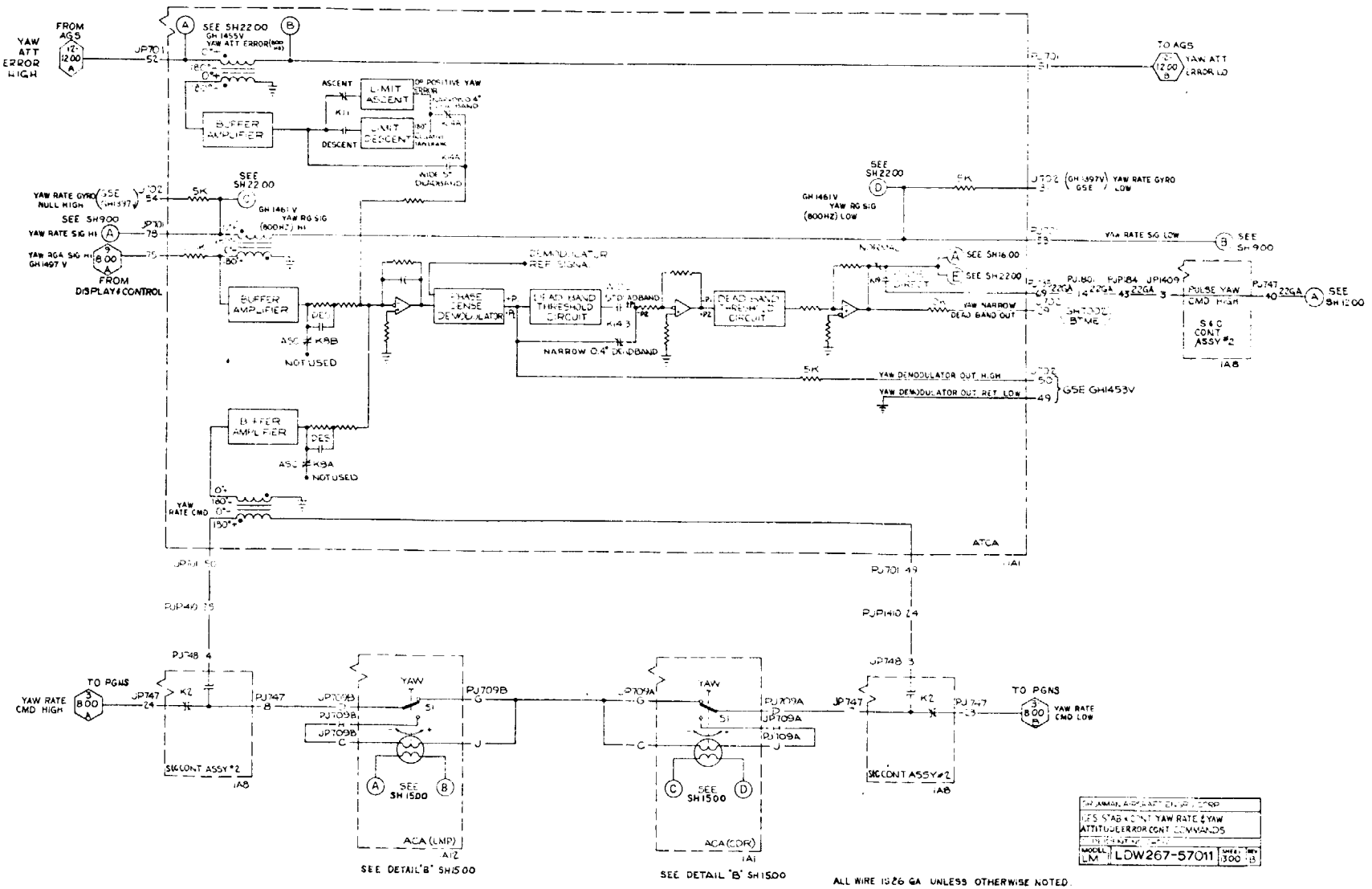
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

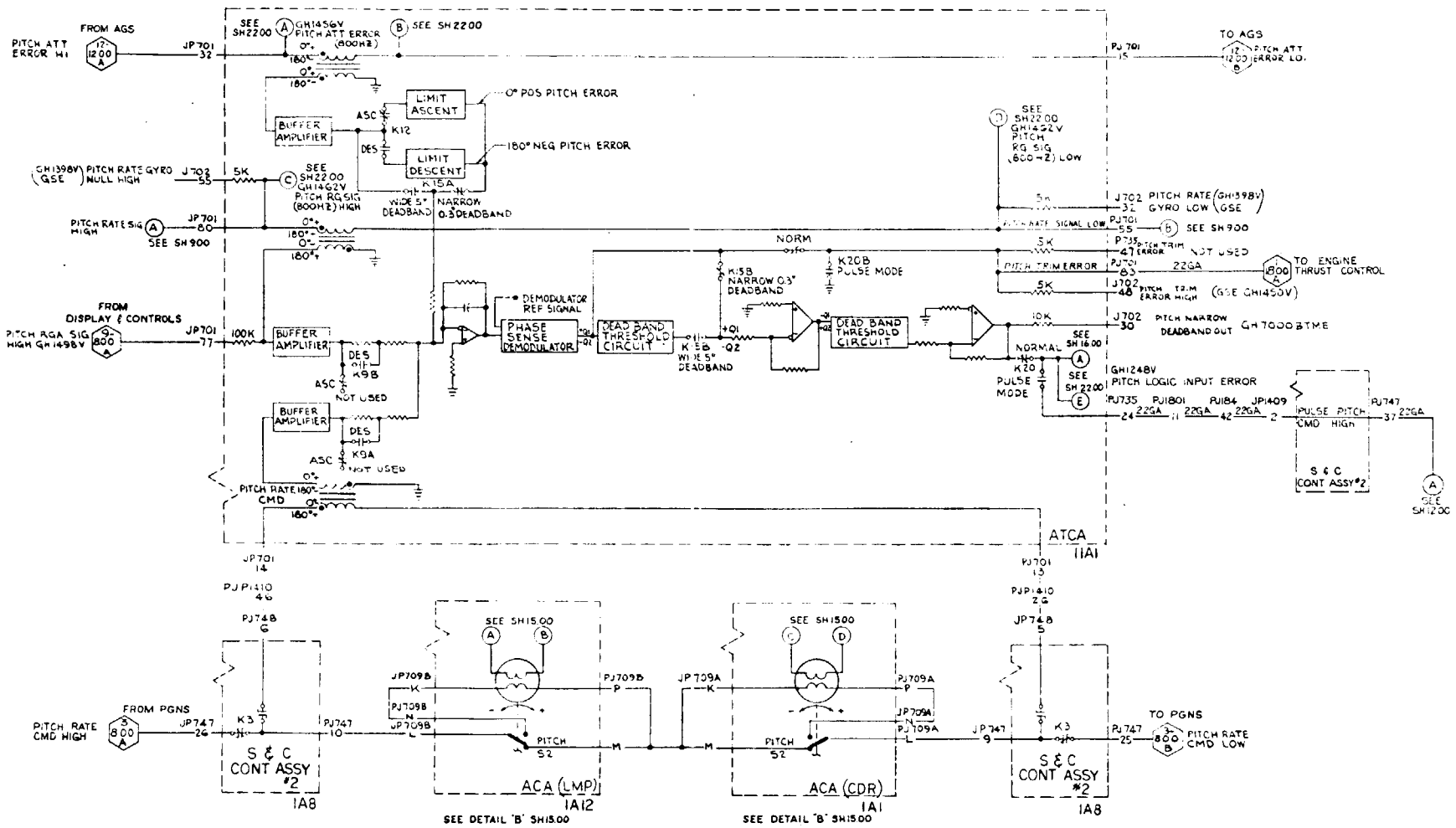
GRUMMAN AIRCRAFT ENGRG CORP			
CES STAB & CONTROL X, Y & Z TRANSLATION TO ATCA			
COG. IDENT NO. 36582			
MODEL LM	LDW267-57011	SHEET 100	REV C



ALL WIRE IS 20GA UNLESS OTHERWISE NOTED.

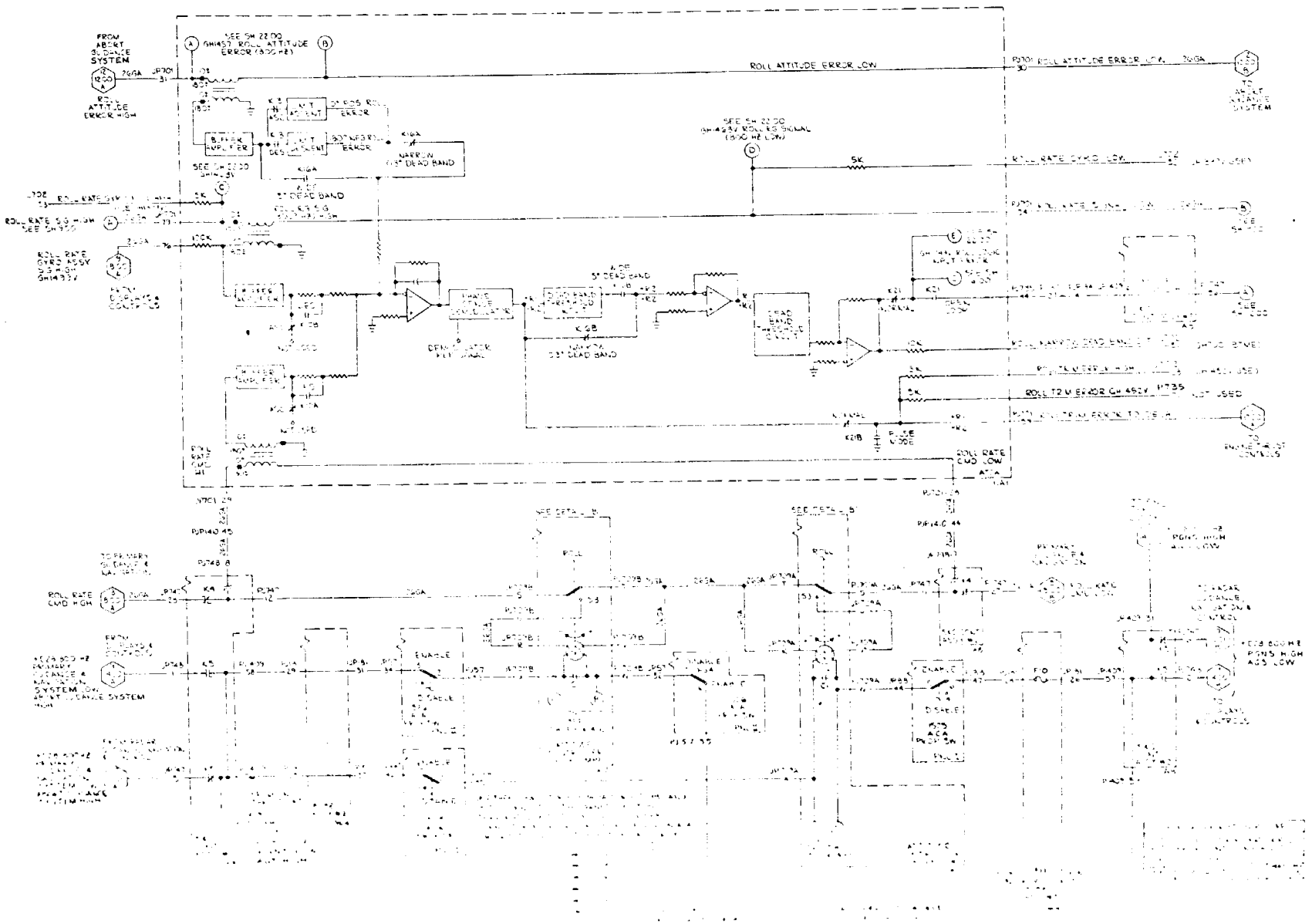
HUGHES AIRCRAFT (ASROC) CORP	
CES STAB & CONTROL ATTITUDE CONT ROLL, PITCH & YAW FROM ACA	
MODEL M	LDW267-57011

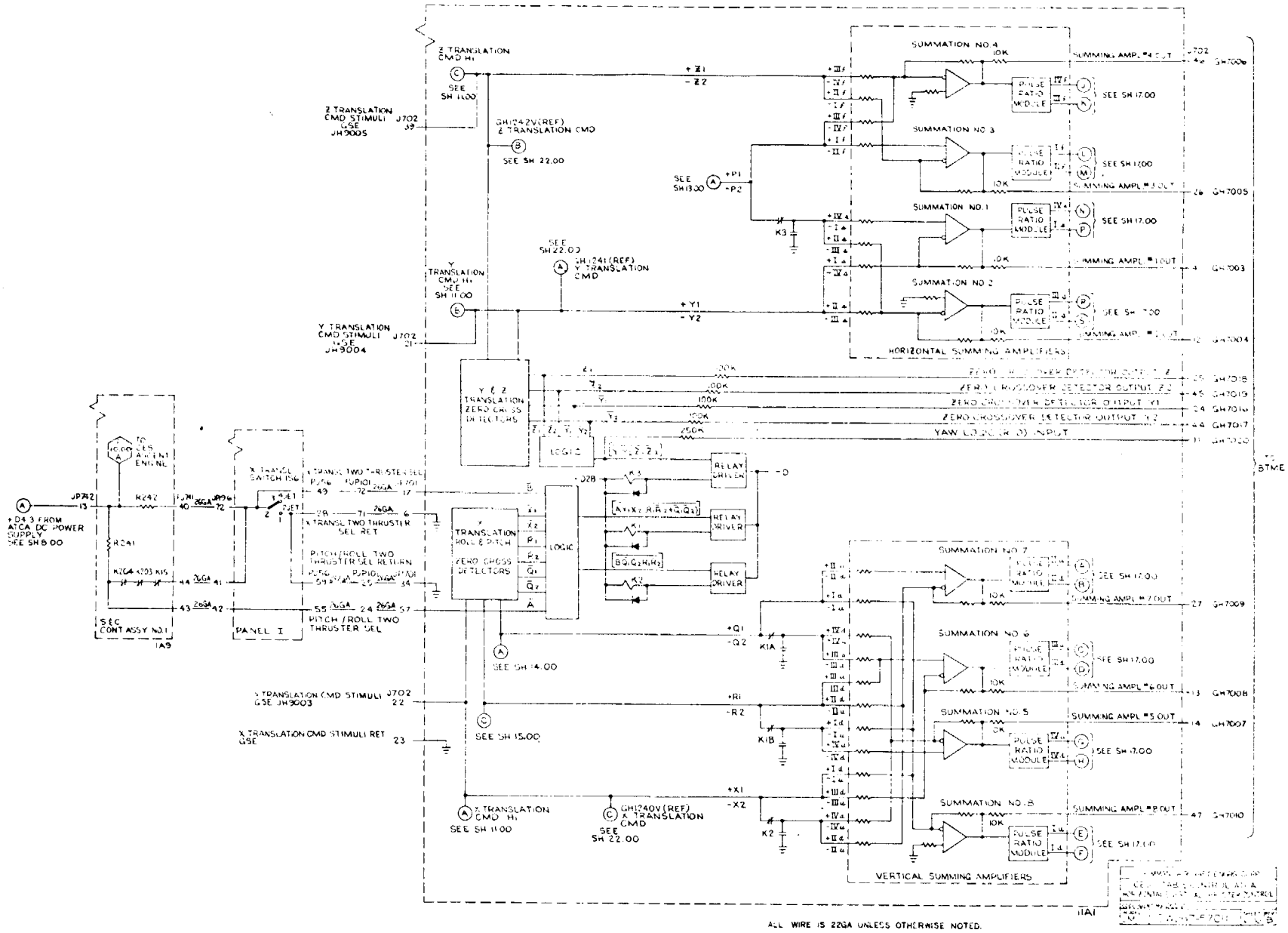

FROM AGS
YAW ATT ERROR HIGH
SEE SH22 00
YAW ATT ERROR(800 HZ)
TO AGS
YAW ATT ERROR LO
LIMIT ASCENT
LIMIT DESCENT
BUFFER AMPLIFIER
YAW RATE GYRO NULL HIGH
SEE SH900
YAW RATE SIG HI
YAW RGA SIG HI GH1497 V
FROM DISPLAY & CONTROL
GH 1461 V YAW RG SIG (800HZ) HI
GH1461V YAW RG SIG (800HZ) LOW
YAW RATE GYRO (GH1497V) GSE / LOW
YAW RATE SIG LOW
DEMODULATOR REF SIGNA
PHASE SENSE DEMODULATOR
DEAD BAND THRESHOLD CIRCUIT
DEAD BAND HYSTERESIS CIRCUIT
NARROW 0.4° DEADBAND
YAW NARROW DEAD BAND OUT
YAW DEMODULATOR OUT HIGH
YAW DEMODULATOR OUT RET LOW
GSE GH1453V
PULSE YAW CMD HIGH
S & C CONT ASSY #2
NOT USED
YAW RATE CMD
ATCA
TO PGNS
YAW RATE CMD HIGH
YAW RATE CMD LOW
SIG CONT ASSY #2
ACA (LMP)
ACA (CDR)
SEE DETAIL 'B' SH1500
SEE DETAIL 'B' SH1500
ALL WIRE 1826 GA UNLESS OTHERWISE NOTED.
GRUMMAN AIRCRAFT ENGINEERING CORP
LES STAB & CONT YAW RATE & YAW ATTITUDE ERROR CONT COMMANDS
MODEL LM
LDW267-57011
SHEET 300
REV B

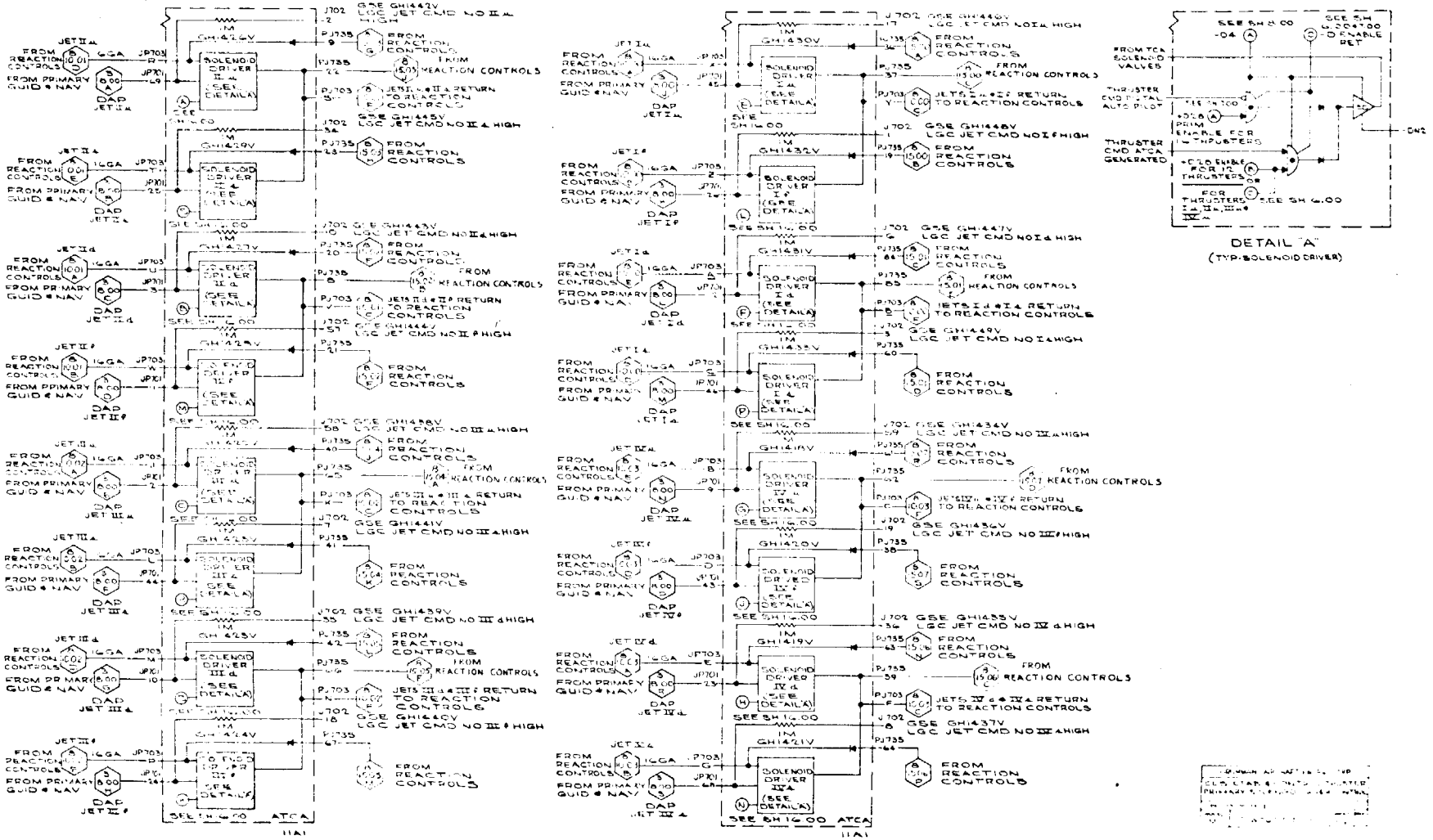


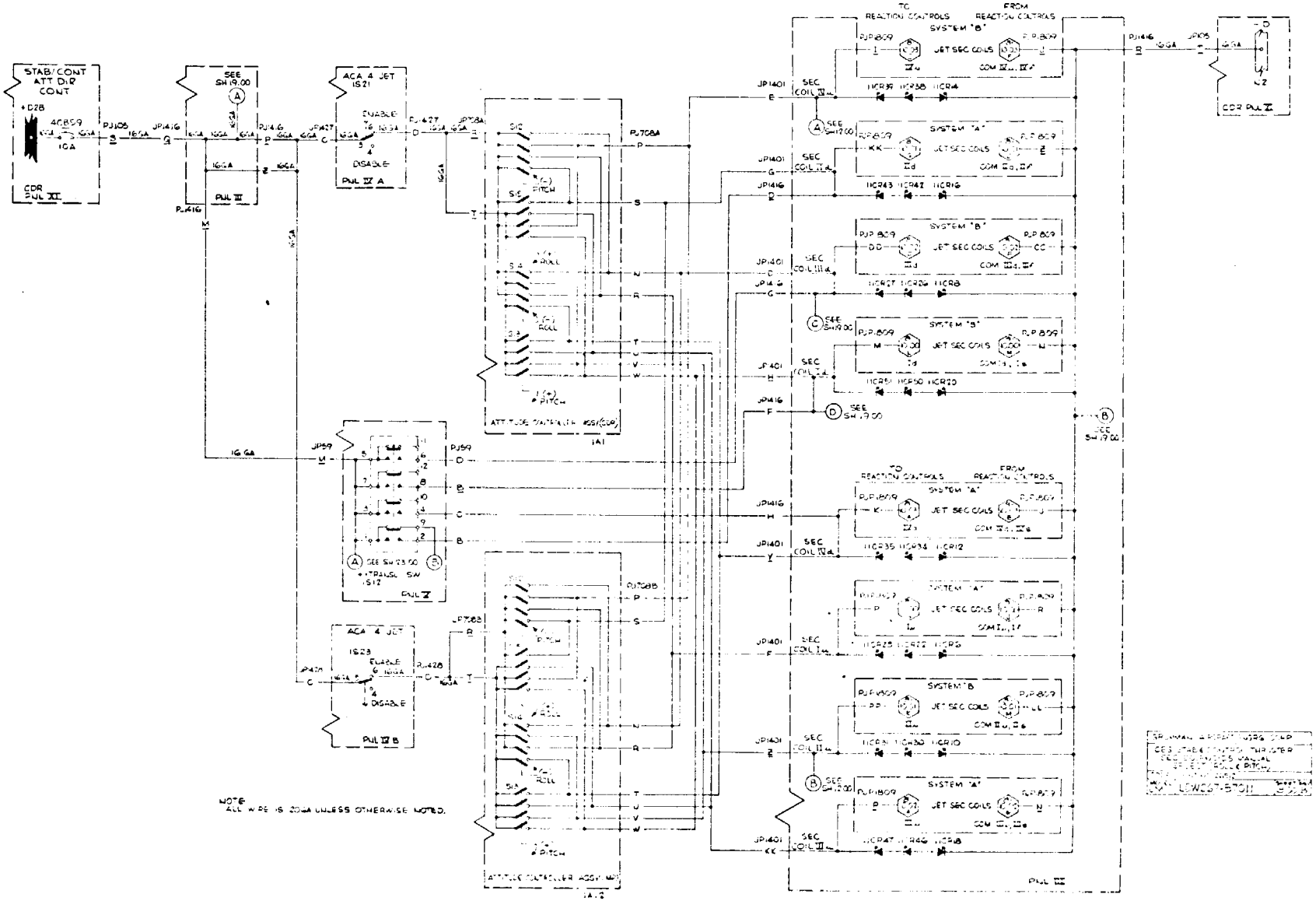
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.

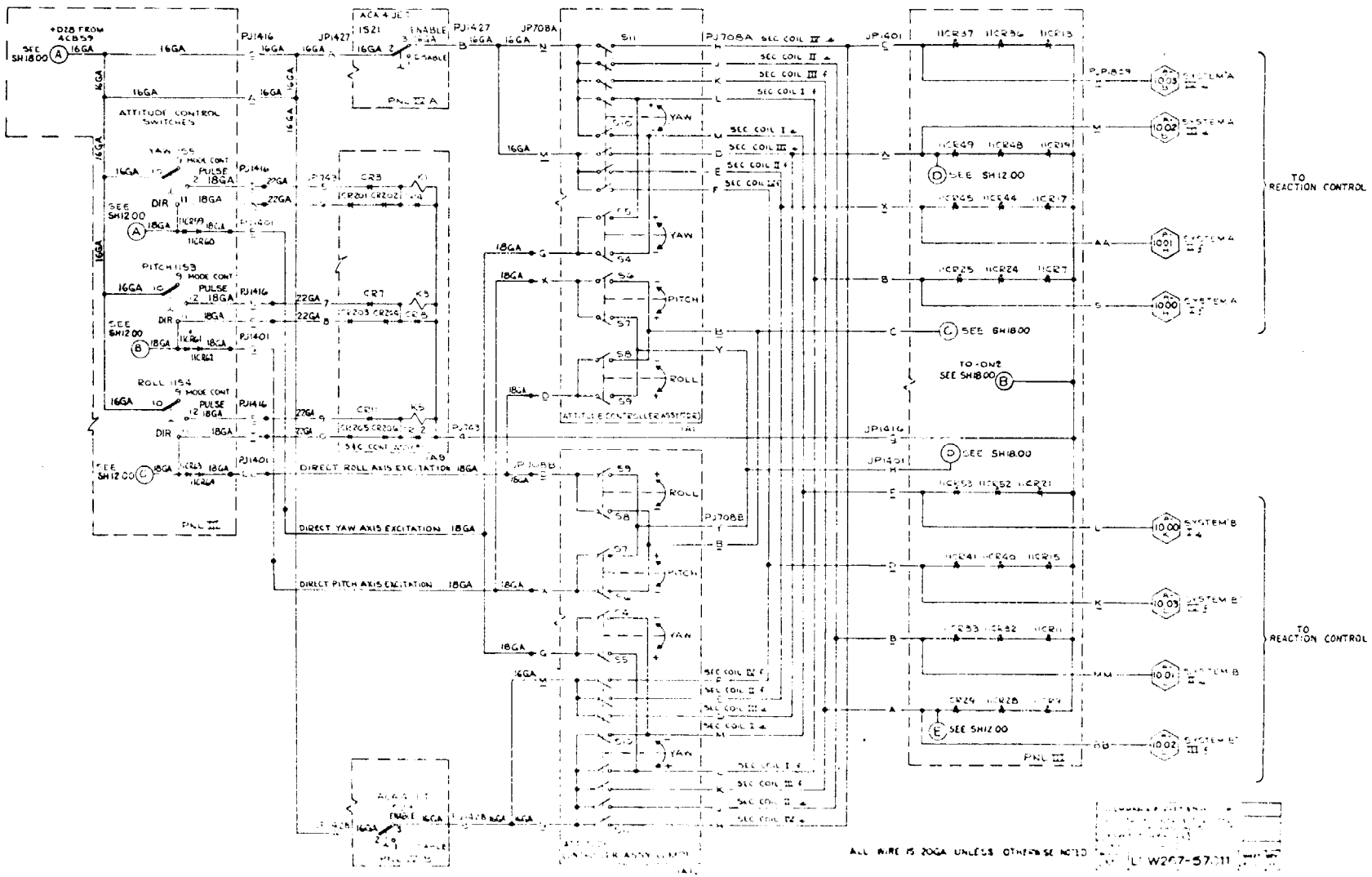
LEM 2-57-11

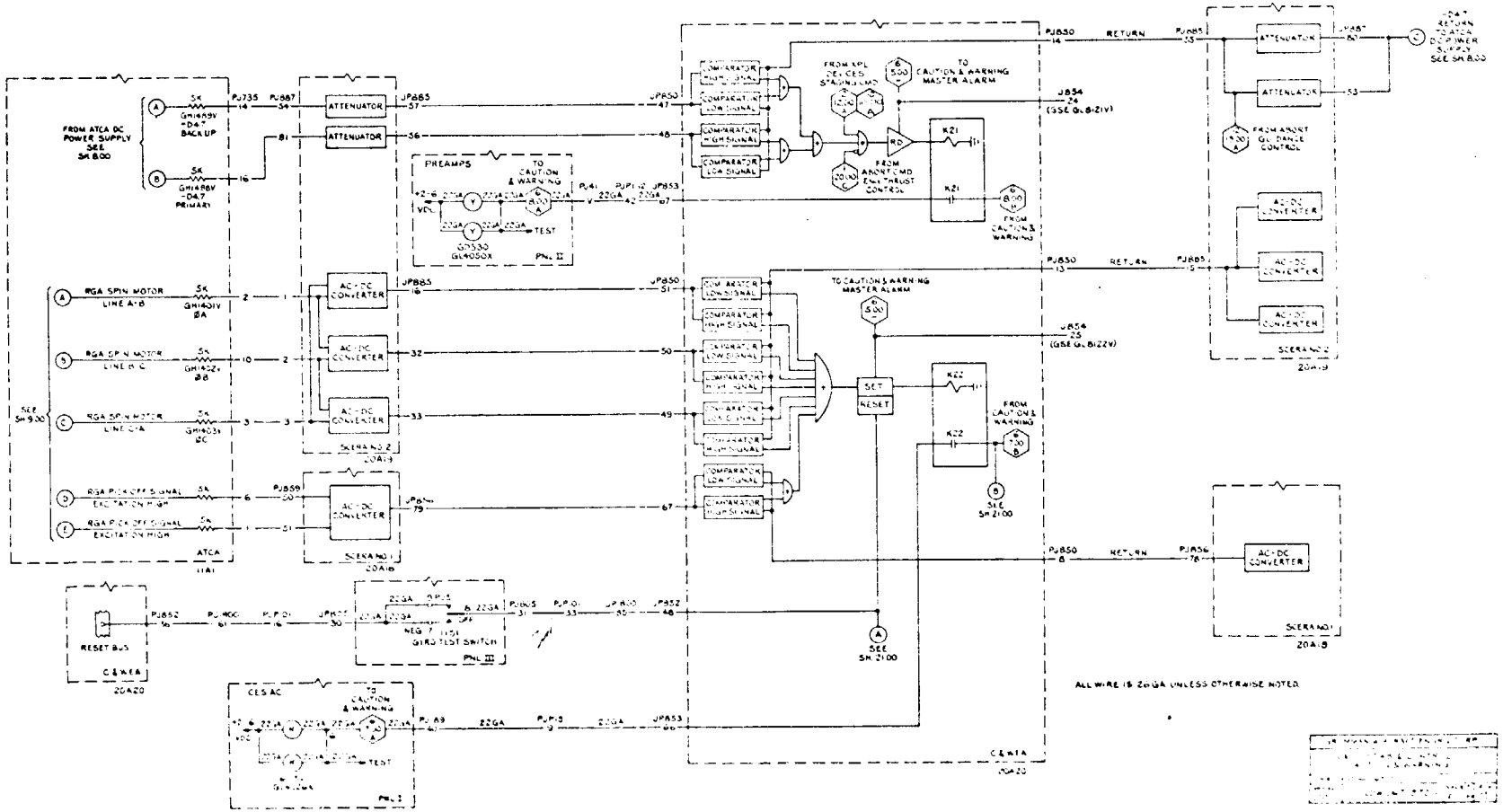

FROM ABERT GUIDANCE SYSTEM
ROLL ATTITUDE ERROR HIGH
SEE SH 22.00 (SH1457 ROLL ATTITUDE ERROR (800 HZ))
ROLL ATTITUDE ERROR LOW
TO ABERT GUIDANCE SYSTEM
SEE SH 22.20 (SH1483 ROLL EG SIGNAL (800 HZ LOW))
ROLL RATE CMD LOW
ROLL RATE 5.0 HIGH SEE SH 22.0
ROLL RATE GYRO ASSY 2.5 HIGH SH1493
ROLL RATE CMD HIGH
ROLL T2 M ERROR SH 1493 H735
TO ENGINE THRUST CONTROLS
ROLL RATE CMD LOW
FROM ABERT GUIDANCE SYSTEM
ROLL RATE CMD HIGH
TO ABERT GUIDANCE SYSTEM
ROLL RATE CMD LOW

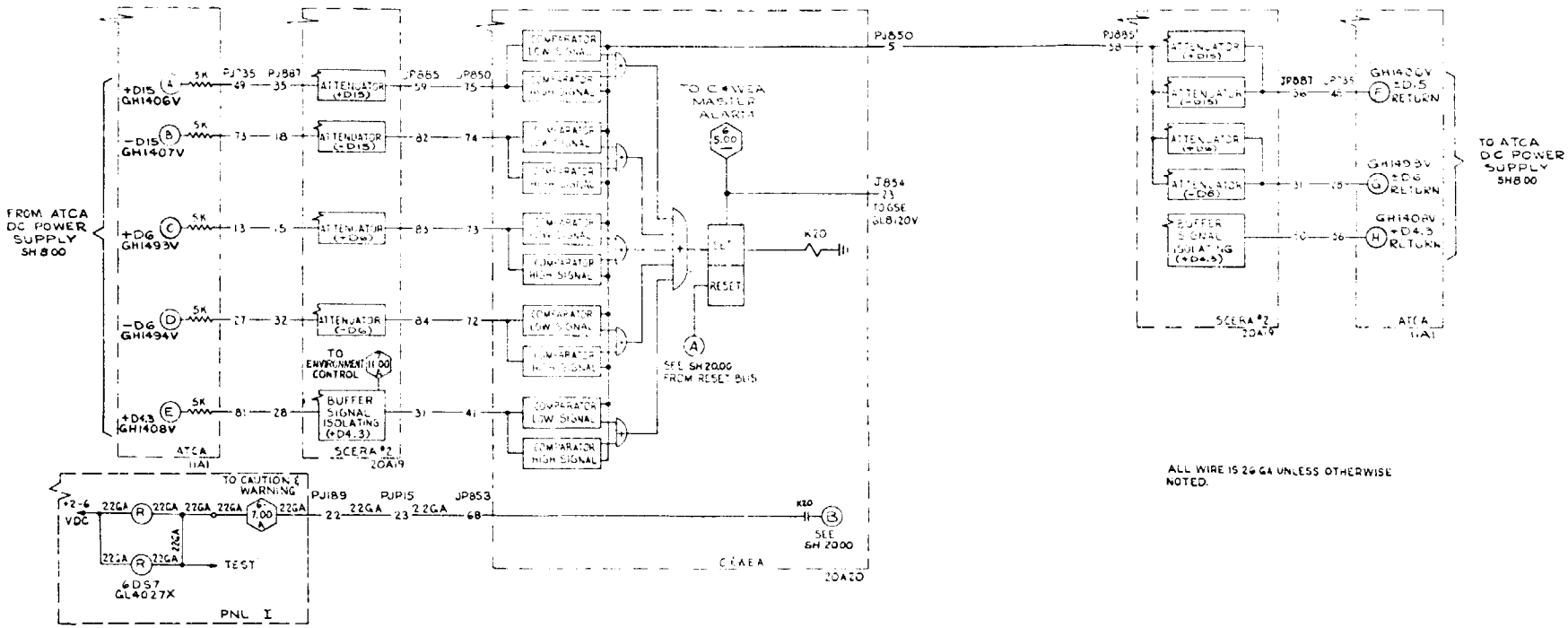

Z TRANSLATION CMD HI
SEE SH 11.00
+Z1
-Z2
Z TRANSLATION CMD STIMULI J702 GSE JH9005
GH1242V(REF) Z TRANSLATION CMD
SEE SH 22.00
SEE SH 13.00
+P1
-P2
K3
SUMMATION NO 4
SUMMATION NO 3
SUMMATION NO 1
SUMMATION NO 2
10K
PULSE RATIO MODULE
SEE SH 17.00
SUMMING AMPL #4 OUT
SUMMING AMPL #3 OUT
SUMMING AMPL #1 OUT
SUMMING AMPL #2 OUT
HORIZONTAL SUMMING AMPLIFIERS
SEE SH 22.00
GH1241(REF) Y TRANSLATION CMD
Y TRANSLATION CMD HI SEE SH 11.00
+Y1
-Y2
Y TRANSLATION CMD STIMULI J702 GSE JH9004
Y Θ Z TRANSLATION ZERO CROSS DETECTORS
100K
250K
ZERO CROSSOVER DETECTOR OUTPUT Z2
ZERO CROSSOVER DETECTOR OUTPUT Y2
ZERO CROSSOVER DETECTOR OUTPUT Y1
ZERO CROSSOVER DETECTOR OUTPUT X2
YAW LOGIC (R-D) INPUT
LOGIC
RELAY DRIVER
+28
-D
TO STME
+D43 FROM ATCA DC POWER SUPPLY SEE SH 8.00
TO +28V ESS AMENT ENGINE
JP242
K242
K241
K244 K245 K15
SEC CONT ASSY NO 1
1A9
X TRANSL SWITCH
PANEL 1
X TRANSL TWO THRUSTER SEL RET
PITCH/ROLL TWO THRUSTER SEL RETURN
PITCH /ROLL TWO THRUSTER SEL
X TRANSLATION ROLL & PITCH ZERO CROSS DETECTORS
+Q1
-Q2
K1A
SEE SH 14.00
X TRANSLATION CMD STIMULI J702 GSE JH9003
X TRANSLATION CMD STIMULI RET GSE
+R1
-R2
K1B
SEE SH 15.00
+X1
-X2
K2
X TRANSLATION CMD HI
SEE SH 11.00
GH1240V(REF) X TRANSLATION CMD
SEE SH 22.00
SUMMATION NO 7
SUMMATION NO 6
SUMMATION NO 5
SUMMATION NO 8
SUMMING AMPL #7 OUT
SUMMING AMPL #6 OUT
SUMMING AMPL #5 OUT
SUMMING AMPL #8 OUT
VERTICAL SUMMING AMPLIFIERS
1A1
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.


DETAIL "A"
(TYP. SOLENOID DRIVER)


STAB/CONT ATT DIR CONT
CDR PNL XI
ACA 4 JET
ENABLE
DISABLE
PNL IV A
PNL III
PNL IV B
PNL V
ATTITUDE CONTROLLER ASSY (CDR)
ATTITUDE CONTROLLER ASSY (MP)
PITCH
ROLL
YAW
TRANSL SW
TO REACTION CONTROLS SYSTEM "B"
FROM REACTION CONTROLS SYSTEM "B"
TO REACTION CONTROLS SYSTEM "A"
FROM REACTION CONTROLS SYSTEM "A"
JET SEC COILS
SEC COIL
PNL III
CDR PNL V
NOTE
ALL WIRE IS 20GA UNLESS OTHERWISE NOTED.


ATTITUDE CONTROL SWITCHES
YAW 11S5
PITCH 11S3
ROLL 11S4
ATTITUDE CONTROLLER ASSY (PCA)
DIRECT ROLL AXIS EXCITATION 18GA
DIRECT YAW AXIS EXCITATION 18GA
DIRECT PITCH AXIS EXCITATION 18GA
TO REACTION CONTROL
TO REACTION CONTROL
ALL WIRE IS 20GA UNLESS OTHERWISE NOTED
LW207-57011

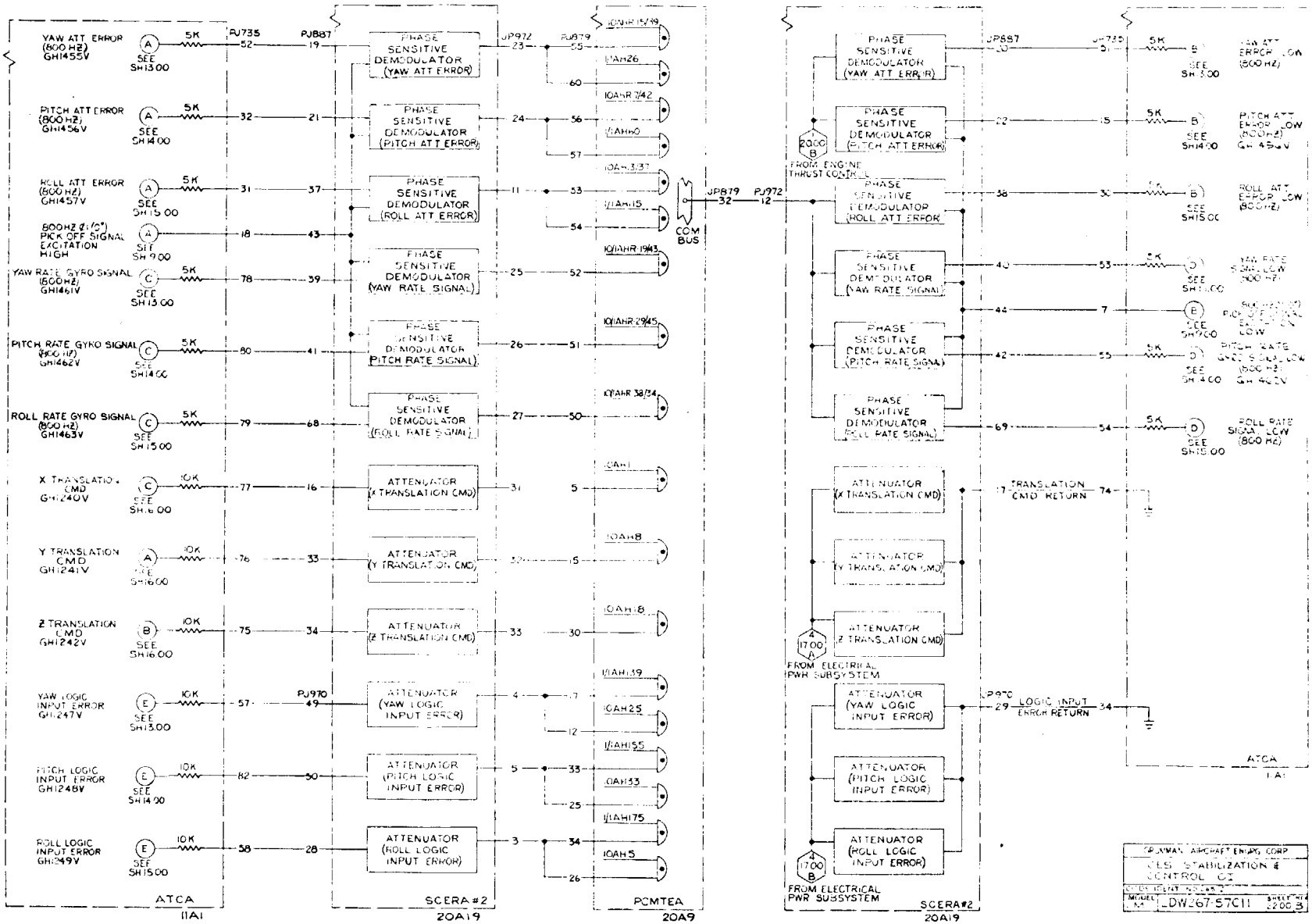

FROM ATCA DC POWER SUPPLY SEE SH 8.00
RGA SPIN MOTOR LINE A-B
RGA SPIN MOTOR LINE B-C
RGA SPIN MOTOR LINE C-A
RGA PICK OFF SIGNAL EXCITATION HIGH
RGA PICK OFF SIGNAL EXCITATION HIGH
ATTENUATOR
ATTENUATOR
AC-DC CONVERTER
AC-DC CONVERTER
AC-DC CONVERTER
AC-DC CONVERTER
PREAMPS
TO CAUTION & WARNING
GT330 GL40S0X
PNL II
TEST
COMPARATOR LOW SIGNAL
COMPARATOR HIGH SIGNAL
COMPARATOR LOW SIGNAL
COMPARATOR HIGH SIGNAL
COMPARATOR LOW SIGNAL
COMPARATOR HIGH SIGNAL
COMPARATOR LOW SIGNAL
COMPARATOR HIGH SIGNAL
FROM XPL DEVICES STAGING LMD
TO CAUTION & WARNING MASTER ALARM
RD
SET
RESET
K21
K21
K22
K22
FROM ABORT/CMD ENG THRUST CONTROL
FROM CAUTION & WARNING
FROM CAUTION & WARNING
SEE SH 21.00
SEE SH 9.00
RESET BUS
C&WEA
20A20
NEG 7 (-15)
GIRO TEST SWITCH
PNL III
SEE SH 21.00
CES AC
TO CAUTION & WARNING
GT330 GL40S0X
PNL I
C&WEA
20A20
RETURN
RETURN
RETURN
RETURN
ATTENUATOR
ATTENUATOR
FROM ABORT GUIDANCE CONTROL
AC-DC CONVERTER
AC-DC CONVERTER
AC-DC CONVERTER
SCERA NO 2
20A19
AC-DC CONVERTER
SCERA NO 1
20A19
ALL WIRE IS 20GA UNLESS OTHERWISE NOTED

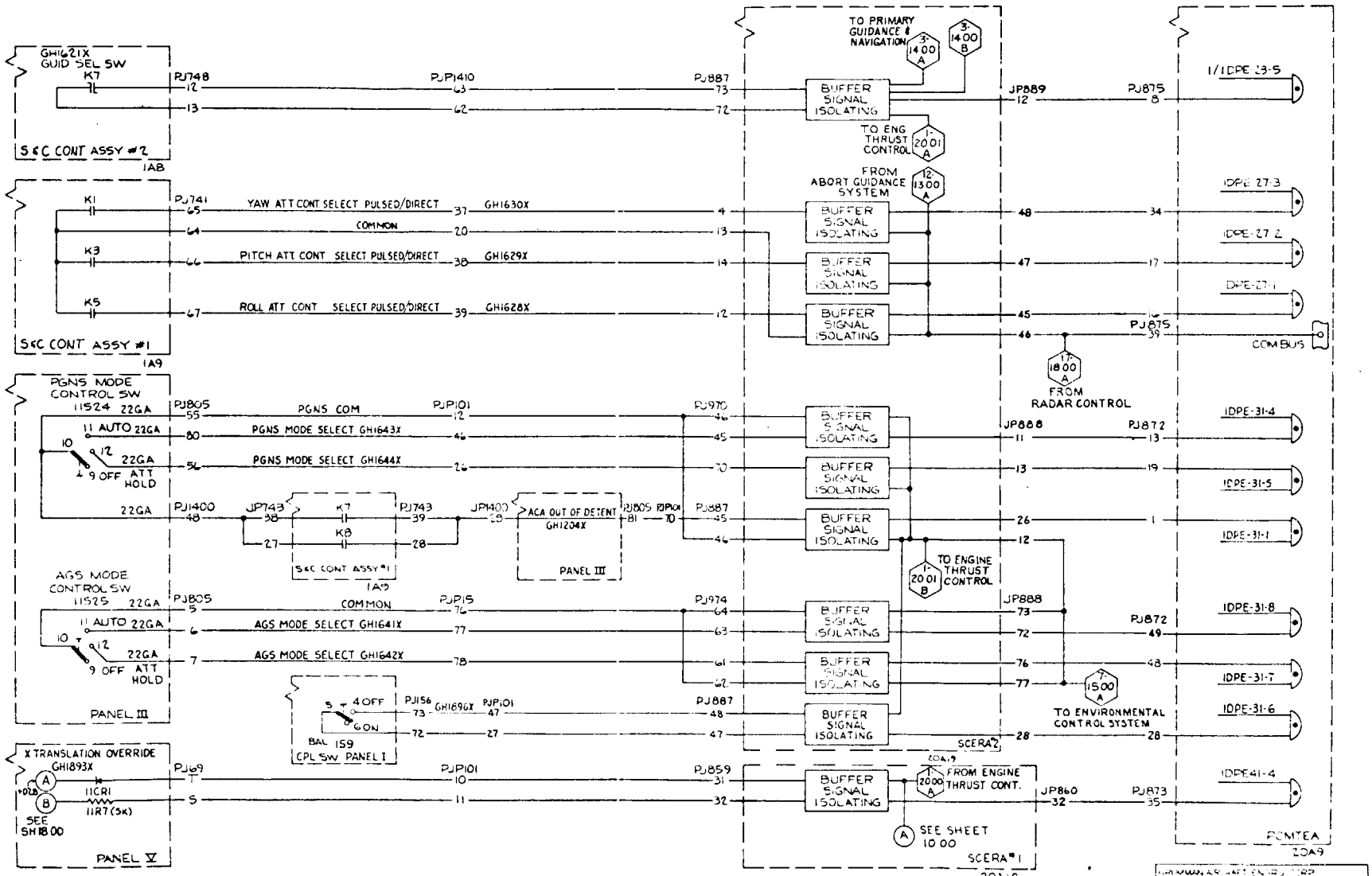


GRUMMAN AIRCRAFT ENGG CORP

CES STAB & CONTROL
CAUTION & WARNING

MODEL		SHEET	REV
LM	LDW267-57011	2100	A


YAW ATT ERROR (800 HZ) GH1455V
PITCH ATT ERROR (800 HZ) GH1456V
ROLL ATT ERROR (800 HZ) GH1457V
800HZ @ 1 (0°) PICK OFF SIGNAL EXCITATION HIGH
YAW RATE GYRO SIGNAL (800 HZ) GH1461V
PITCH RATE GYRO SIGNAL (800 HZ) GH1462V
ROLL RATE GYRO SIGNAL (800 HZ) GH1463V
X TRANSLATION CMD GH1240V
Y TRANSLATION CMD GH1241V
Z TRANSLATION CMD GH1242V
YAW LOGIC INPUT ERROR GH1247V
PITCH LOGIC INPUT ERROR GH1248V
ROLL LOGIC INPUT ERROR GH1249V
5K
10K
SEE SH13.00
SEE SH14.00
SEE SH15.00
SEE SH9.00
SEE SH16.00
PJ735
PJ887
PJ970
PHASE SENSITIVE DEMODULATOR (YAW ATT ERROR)
PHASE SENSITIVE DEMODULATOR (PITCH ATT ERROR)
PHASE SENSITIVE DEMODULATOR (ROLL ATT ERROR)
PHASE SENSITIVE DEMODULATOR (YAW RATE SIGNAL)
PHASE SENSITIVE DEMODULATOR (PITCH RATE SIGNAL)
PHASE SENSITIVE DEMODULATOR (ROLL RATE SIGNAL)
ATTENUATOR (X TRANSLATION CMD)
ATTENUATOR (Y TRANSLATION CMD)
ATTENUATOR (Z TRANSLATION CMD)
ATTENUATOR (YAW LOGIC INPUT ERROR)
ATTENUATOR (PITCH LOGIC INPUT ERROR)
ATTENUATOR (ROLL LOGIC INPUT ERROR)
JP972
JP879
10AH15/49
1/AH26
10AH7/42
1/AH40
10AH3/37
1/AH15
10/AHR19/43
10/AHR29/45
10/AHR38/34
10AH1
10AH8
10AH18
1/AH139
10AH25
1/AH155
10AH33
1/AH175
10AH5
COM BUS
ATCA
11A1
SCERA #2
20A19
PCMTEA
20A9
JP887
JP735
2 2000 B
FROM ENGINE THRUST CONTROL
4 1700 A
FROM ELECTRICAL PWR SUBSYSTEM
4 1700 B
FROM ELECTRICAL PWR SUBSYSTEM
X TRANSLATION CMD RETURN
JP970
29 LOGIC INPUT ERROR RETURN
YAW ATT ERROR LOW (800 HZ)
PITCH ATT ERROR LOW (800 HZ)
ROLL ATT ERROR LOW (800 HZ)
YAW RATE SIGNAL LOW (800 HZ)
PITCH RATE SIGNAL LOW (800 HZ)
ROLL RATE SIGNAL LOW (800 HZ)
SEE SH 5.00
SEE SH14.00
SEE SH15.00
SEE SH9.00
SEE SH 4.00
SEE SH15.00
ATCA
11A1
SCERA#2
20A19
GRUMMAN AIRCRAFT ENGG CORP
YES STABILIZATION & CONTROL CKT
DWG NO 10-DW267-57C11
SHEET 20C3



ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED.

LOW267-57011

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 12)

ABORT GUIDANCE SYSTEM

(REF LDW267-57012B)

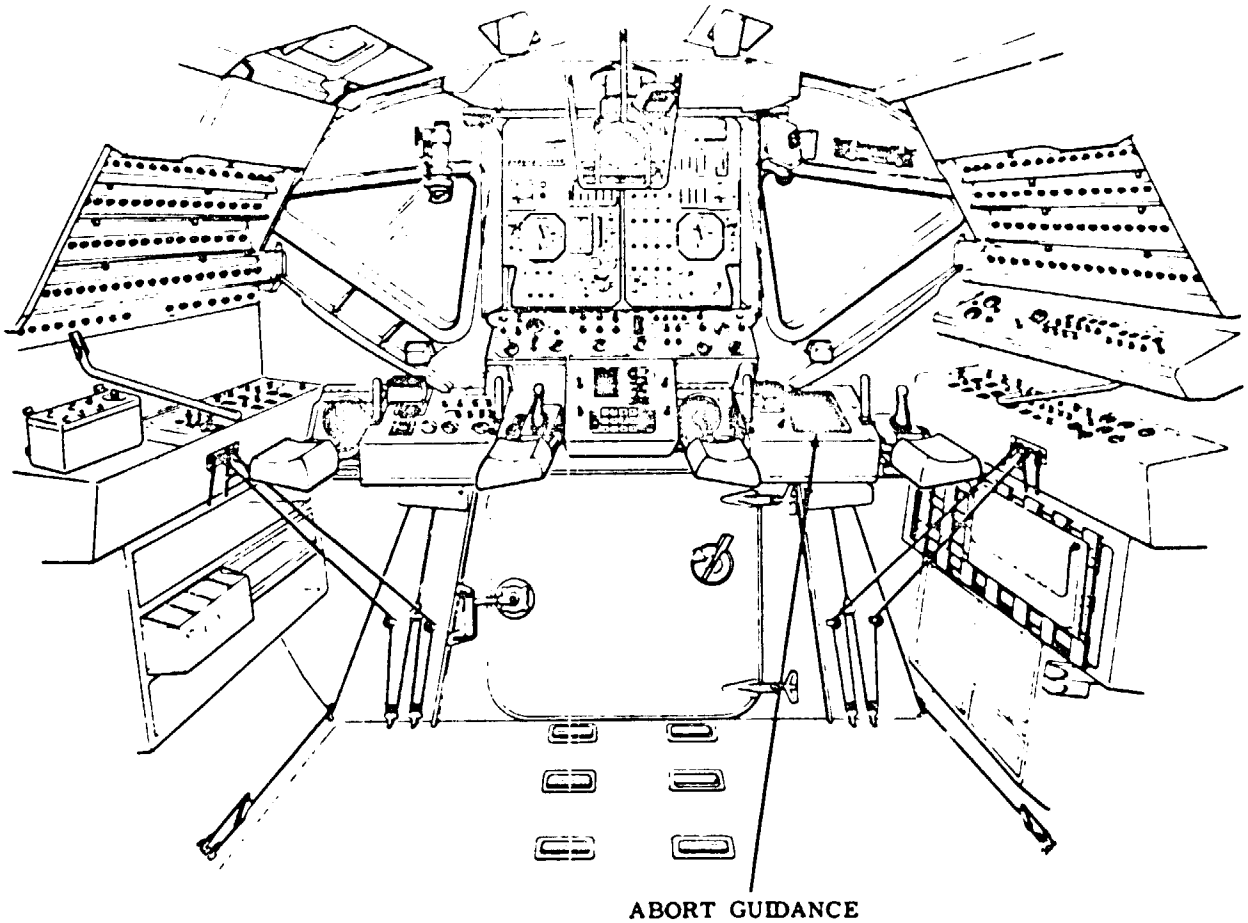
1. Applicable Documents

Level Three Drawings

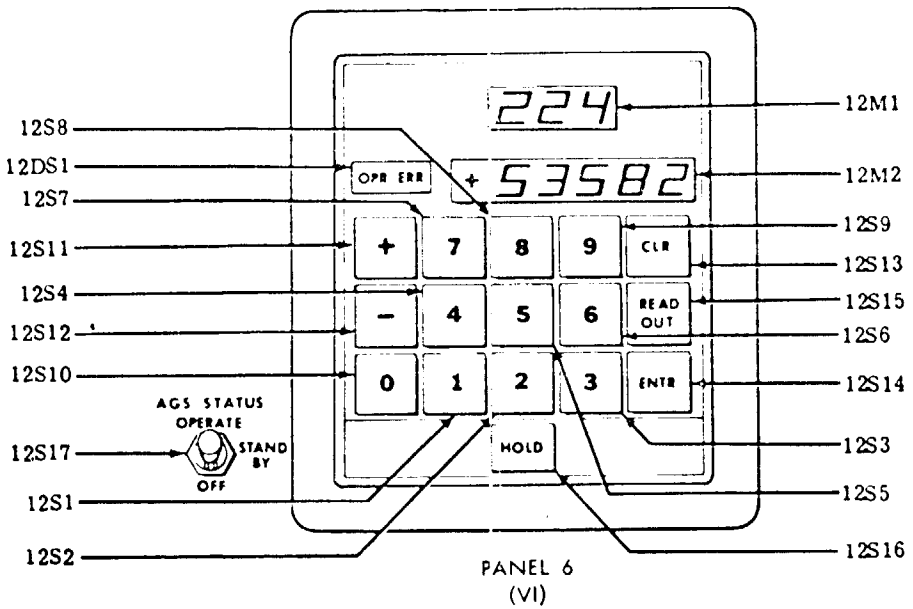
ITEM NAME	DWG. NO.	REV.	E.O.'s
Abort Guidance System	LDW300-54002	J	

2. Table of Contents

ITEM NAME	DWG. NO.
a) Cover Sheet	12-1001
b) Application Documents, Table of Contents and Revision	12-1002
c) Cabin Location of AGS Controls and Indicators	12-1003
d) AGS Controls and Indicators Layout - DEDA (Data Entry Display Assy)	12-1004
e) AGS Controls and Indicators Functional Description	12-1005
	12-1005.1
	12-1005.2
f) AGS - Block Diagram	LDW 267-57012 SH 4.00
g) AGS - Power Distribution (AEA)	LDW 267-57012 SH 5.00B
h) AGS - GYRO-Accelerometer Inputs to AEA-BTME and GSE	LDW 267-57012 SH 6.00B
i) AGS - LGC/CDU to AEA Signals	LDW 267-57012 SH 7.00
j) AGS-CES to AEA Signals	LDW 267-57012 SH 8.00
k) AGS-GSE Data Inputs	LDW 267-57012 SH 9.00
l) AGS-DEDA Signals	LDW 267-57012 SH 10.00B
m) AGS-DATA Output to Display	LDW 267-57012 SH 11.00
n) AGS-Attitude Error and Engine Signals	LDW 267-57012 SH 12.00
o) AGS-OI Warning Indication	LDW 267-57012 SH 13.00A



Cabin Location of AGS Control and Indicators



PANEL 6
(VI)

NOTE: GUIDANCE CONTROL SWITCH 9S6
IS SHOWN ON EFD9-1004 PANEL I.

AGS Controls and Indicators Layout - DEDA

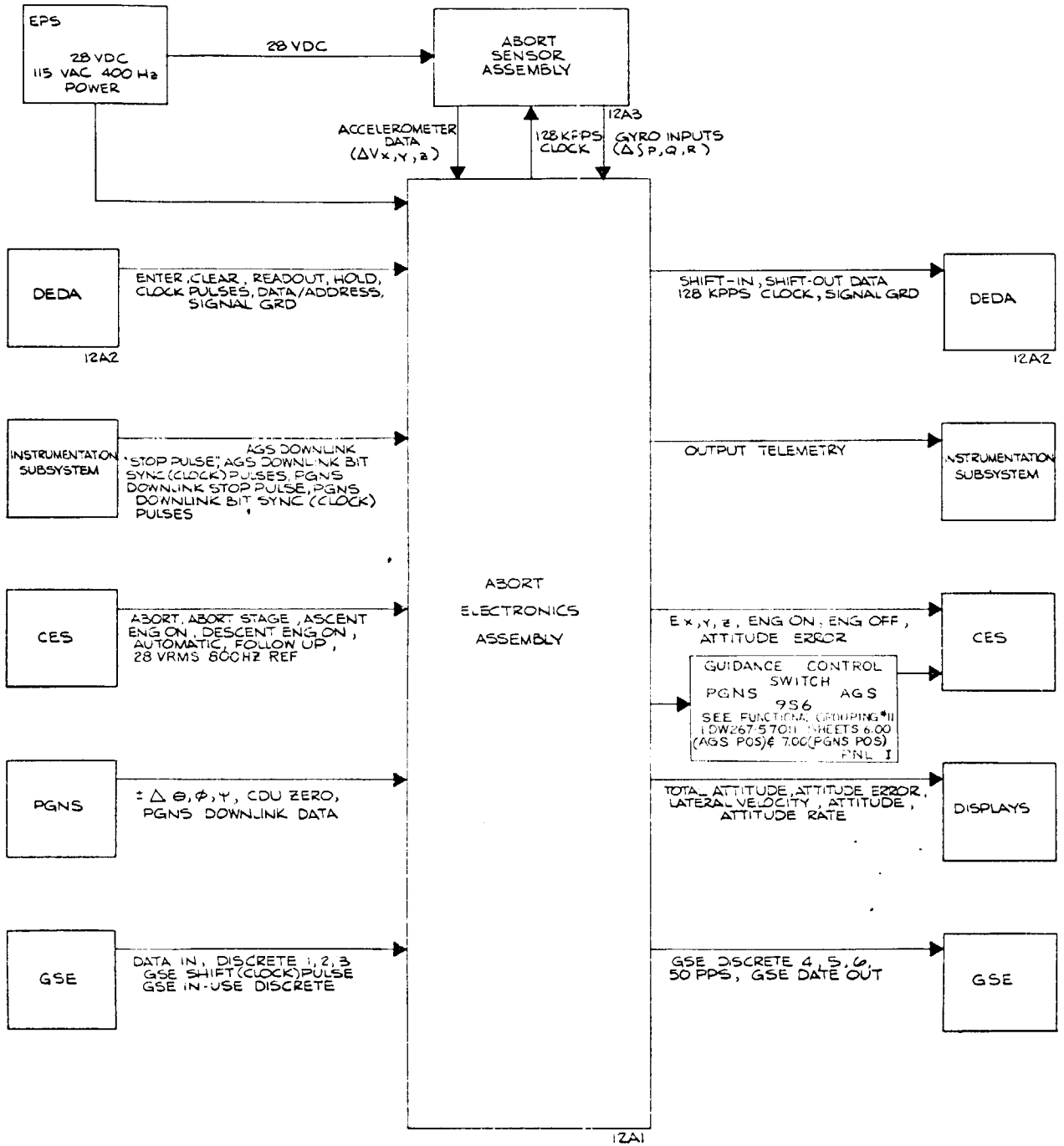
SUBSYSTEM: ABORT GUIDANCE (DEDA) (FUNCTIONAL GROUPING 12)

Code	Control/Indicator	Function
12S1 to 12S12	KEYBOARD SWITCHES MOMENTARY PUSHBUTTONS	Numerical keys 0 thru 9 (pushbuttons switches 12S1 thru 12S10) and the algebraic sign keys + and - (pushbuttons switches 12S11 and 12S12) perform the following when depressed; the first three numerical keys enter the address codes and are displayed on the Address Indicator 12M1, the fourth is the algebraic sign (+ or -) of data to be inserted, and the remaining five numerical keys represent the data in decimal or octal form and are displayed on the Data Indicator 12M2. All 12 keys are used to control the AGS mode of operation manually. Typical examples of these modes are: Attitude hold submode, Guidance steering submode, IMU alignment (PGNS to AGS) alignment submode, Lunar alignment submode, In-flight calibration submode, Reinitiate in-flight AGS self test and Initialize LM or CSM via DEDA.
12S13	CLEAR SWITCH MOMENTARY PUSHBUTTON	This pushbutton erases all numerals displayed on Address Indicator 12M1 and Data Indicator 12M2 and cancels effect of hold switch 12S16. When pressed this switch extinguishes OPR ERR indicator lamp. This switch must be pressed before any DEDA entry.
12S14	ENTER SWITCH MOMENTARY PUSHBUTTON	This pushbutton enables the crew to enter data which has been set up on the Data Indicator (12M2) into the computer address set up on the Address Indicator (12M1). The indicators are now clear, prior to any further operations the clear (12S13 button must be depressed.
12S15	READOUT SWITCH MOMENTARY PUSHBUTTON	This pushbutton enables the crew to call up AEA computer data. The contents of the Memory Location called out on 12M1 will be displayed as data on 12M2, and will be updated every 1/2 second. It will also cancel the effect of 12S16.
12S16	HOLD SWITCH MOMENTARY PUSHBUTTON	This pushbutton enables the crew to interrupt the updating of any continuously changing data displayed on 12M2. The data will remain unchanged until the readout or clear pushbutton is depressed. Depression of the readout pushbutton enables display of the present value of the data and continuance of updating. Depression of

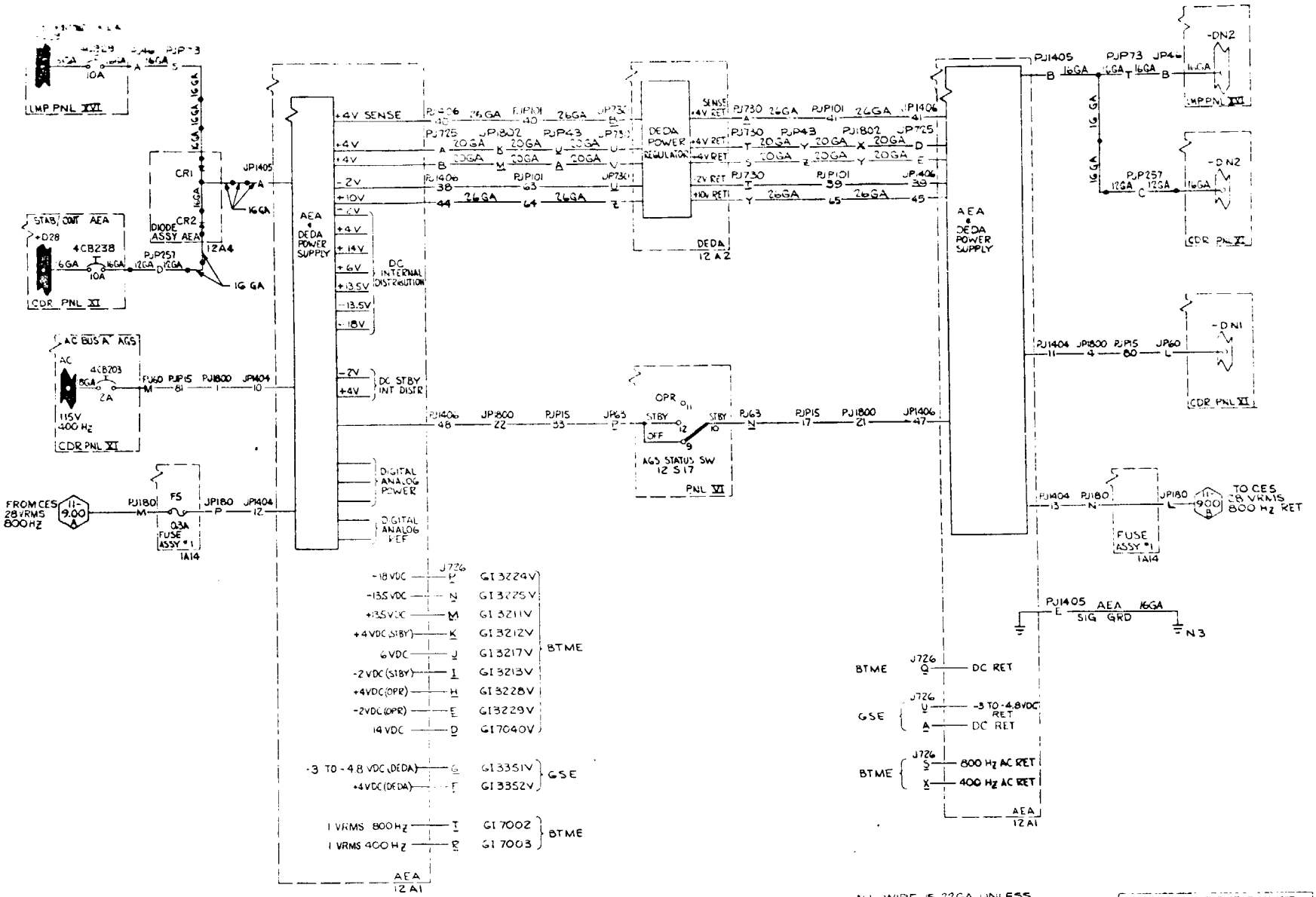
SUBSYSTEM: ABORT GUIDANCE (DEDA) (FUNCTIONAL GROUPING 12)

Code	Control/Indicator	Function
12S16 (Cont.)		the CLR pushbutton (12S13) causes resetting of the HOLD condition as well as clearing of the display. A new display with updating, can then be commanded.
12S17	AGS STATUS SWITCH 3-POSITION TOGGLE LOCK-LOCK-LOCK	This three-position toggle (OPERATE-STANDBY-OFF) enables the crew to place the AGS in any one of three states. In the OFF position, all AGS activity is inhibited except for the Abort Sensor Assembly (ASA) heaters. In STANDBY, full activity is enabled in the ASA, and the Abort Electronics Assembly (AEA) is placed in its STANDBY mode. In OPERATE, full activity is enabled to both the ASA and AEA. Twenty five minutes of standby operation is required or ten minutes in EMERGENCY WARM-UP mode before OPERATE can be selected. In addition, the AEA DC circuit breaker must also be activated to provide power both for the heaters and for all AGS activity.
12M1	ADDRESS INDICATOR	This three digit indicator displays the Abort Electronics Assembly computer address selected by the crew via the keyboard, following the depression of the clear (12S13) pushbutton. Three octal digits must be set up on this indicator by means of the keyboard prior to each ENTR or READOUT pushbutton depression.
12M2	DATA INDICATOR	This sign (+ or -) and five digit indicator, displays data to be entered into, or read out from, the AEA computer address displayed on 12M1. Data to be entered is selected by the crew via the keyboard and entered by depressing 12S14. Data selected for readout by the AEA computer address identified on 12M1 is displayed if 12S15 is depressed. The display updating rate of any changing data selected for readout is limited to two times per second.
12DS1	OPERATOR ERROR STATUS LIGHT (WHITE)	This (OPR ERR) status light is illuminated if the crew depresses an incorrect number or sequence of pushbuttons for the operation

Code	Control/Indicator	Function
12DS1 (Cont.)		being performed. If too few pushbuttons have been pushed the indicator illuminates after the ENTR or READOUT buttons have been depressed. The indicator is also illuminated if the plus or minus keys are not pressed first in entering data and if an eight or nine or sign is used in entering an address (which is limited to octal digits). If too many depressions of the buttons have been made the OPR ERR indicator will illuminate before the ENTR or READOUT buttons are depressed.

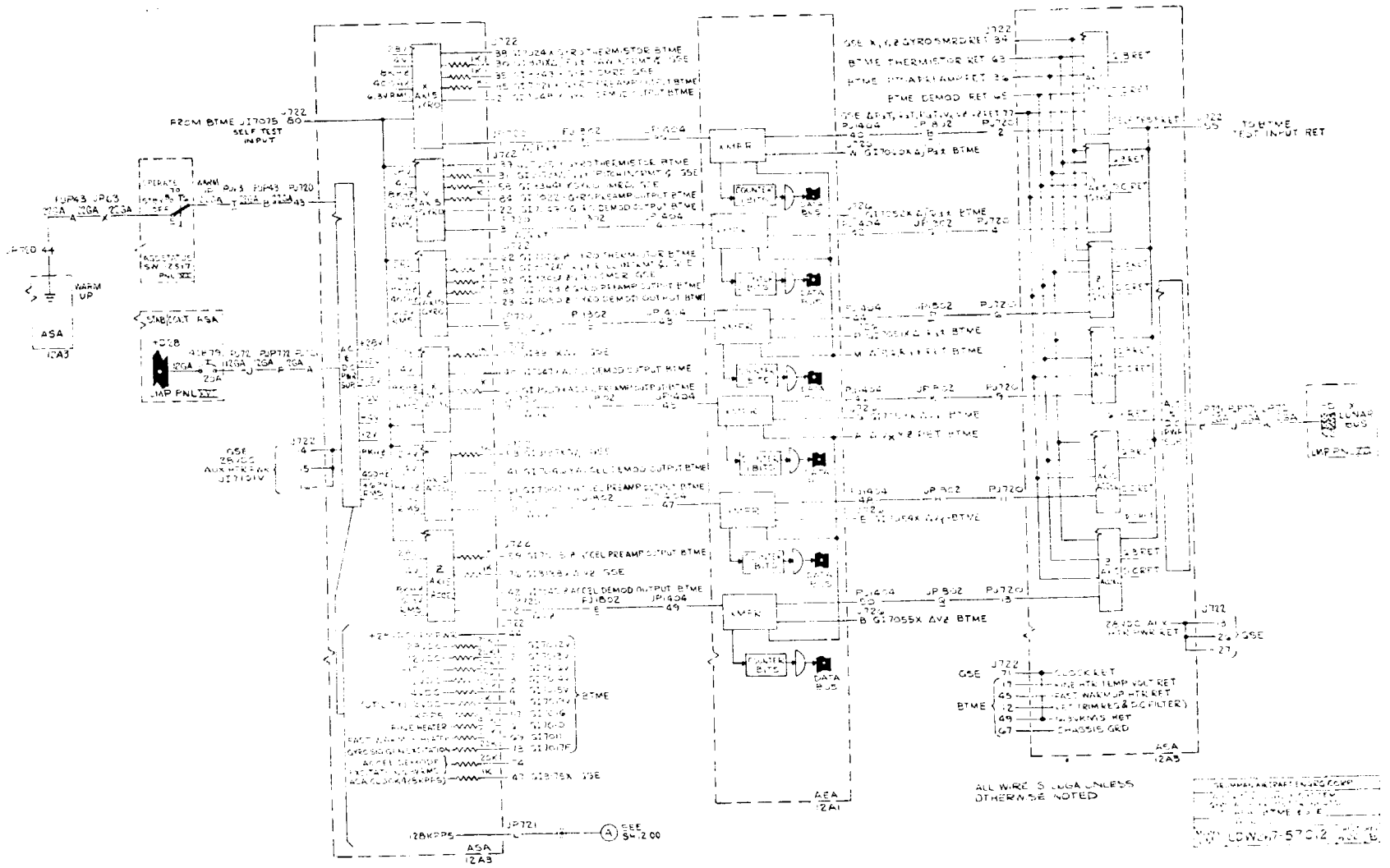


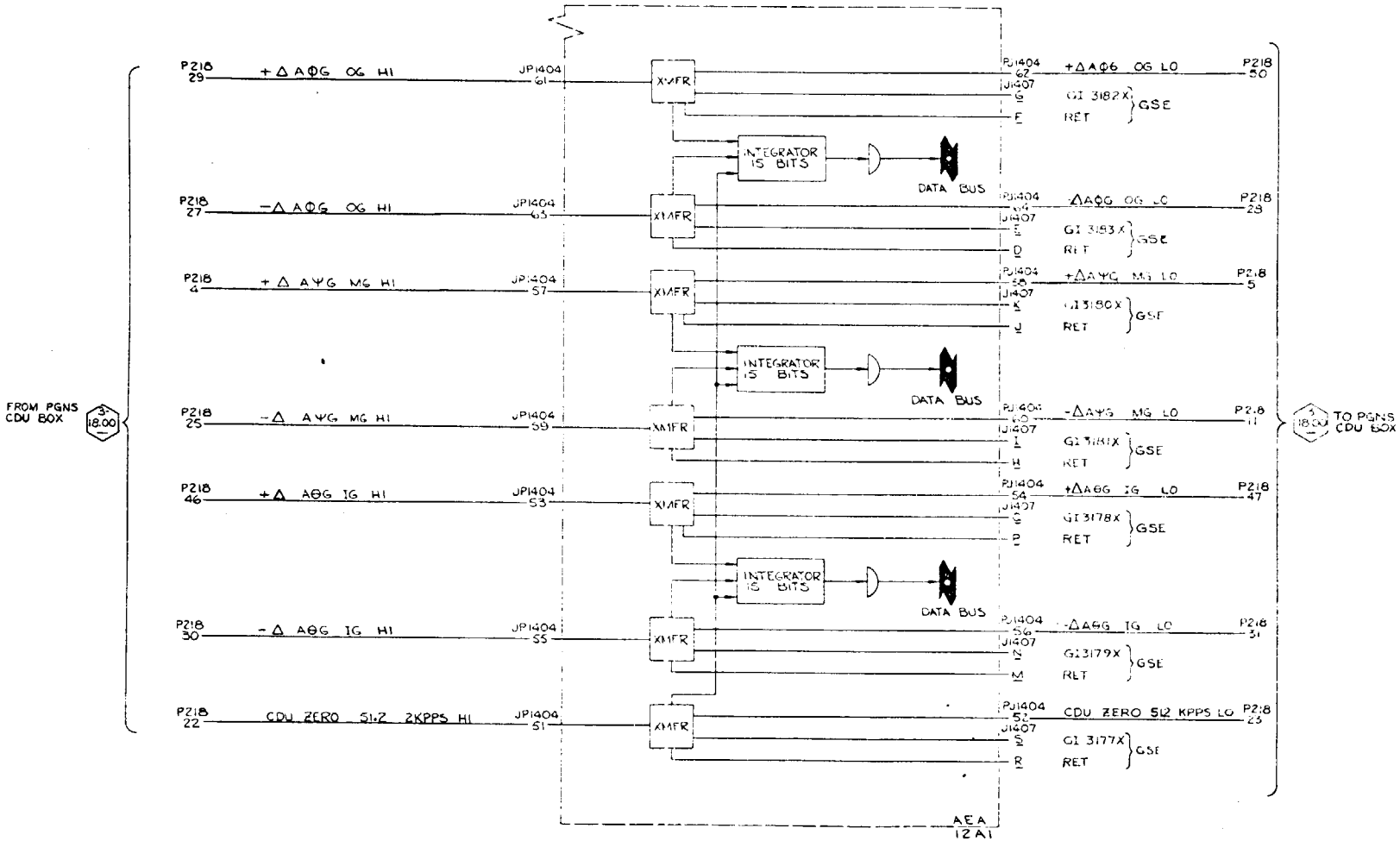
GRUMMAN AIRCRAFT ENGINEERING CORP
ABORT GUIDANCE SYSTEM
BLOCK DIAGRAM



ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

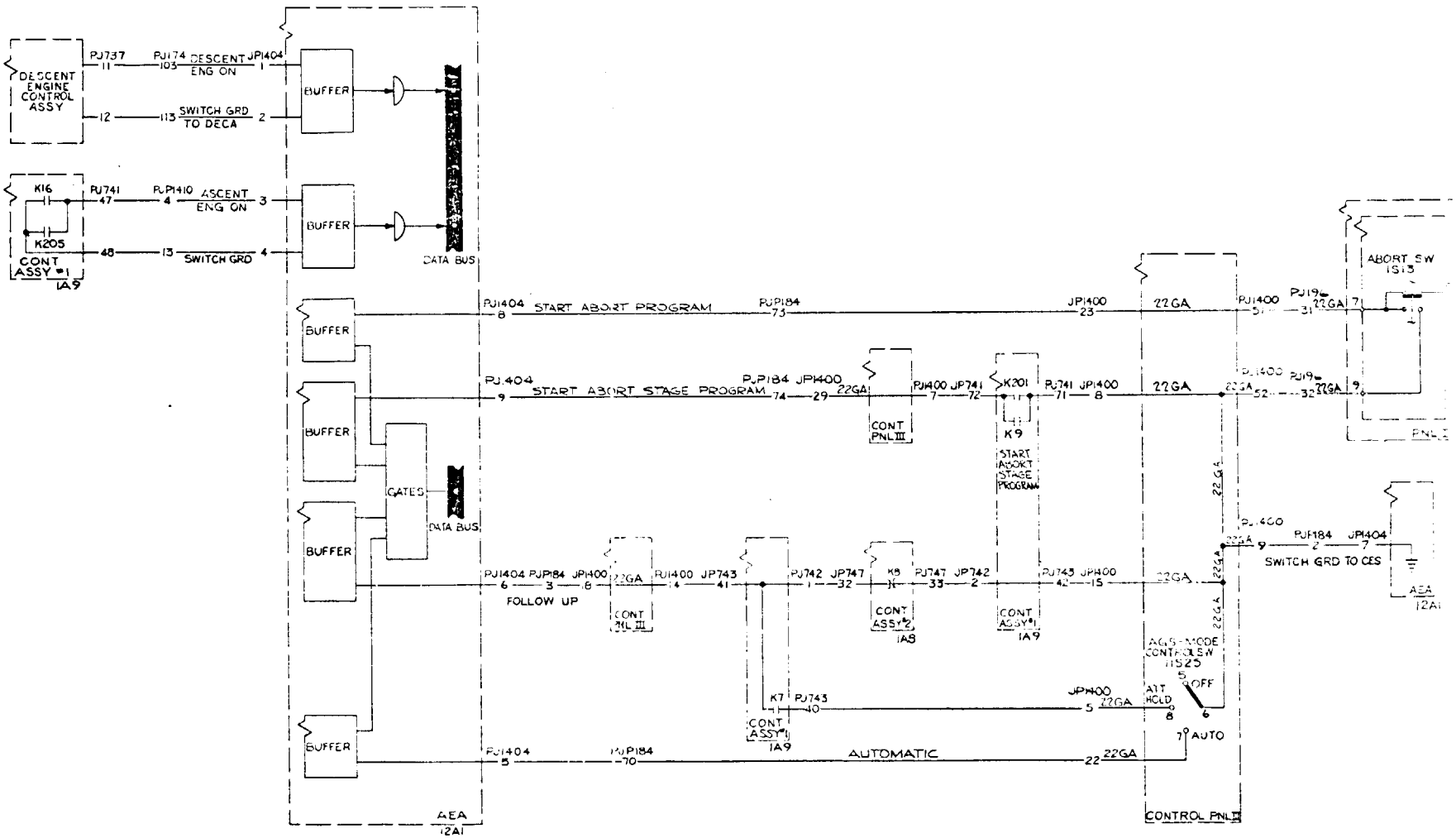
GRUMMAN AEROSPACE CORP
ABORT GUIDANCE SYSTEM
POWER DISTRIBUTION (AEA)
SIZE CODE IDENT NO. SHEET
LM LDW2677012 1.00 B


FROM BTME J17075
SELF TEST INPUT
J722
X AXIS GYRO
Y AXIS GYRO
Z AXIS ACCEL
AMPR
MUX
DATA BUS
POWER SUPPLY
WARM UP
ASA
12A3
AEA
12A1
ALL WIRE 5 UGA UNLESS OTHERWISE NOTED
TO BTME TEST INPUT RET
GSE
BTME



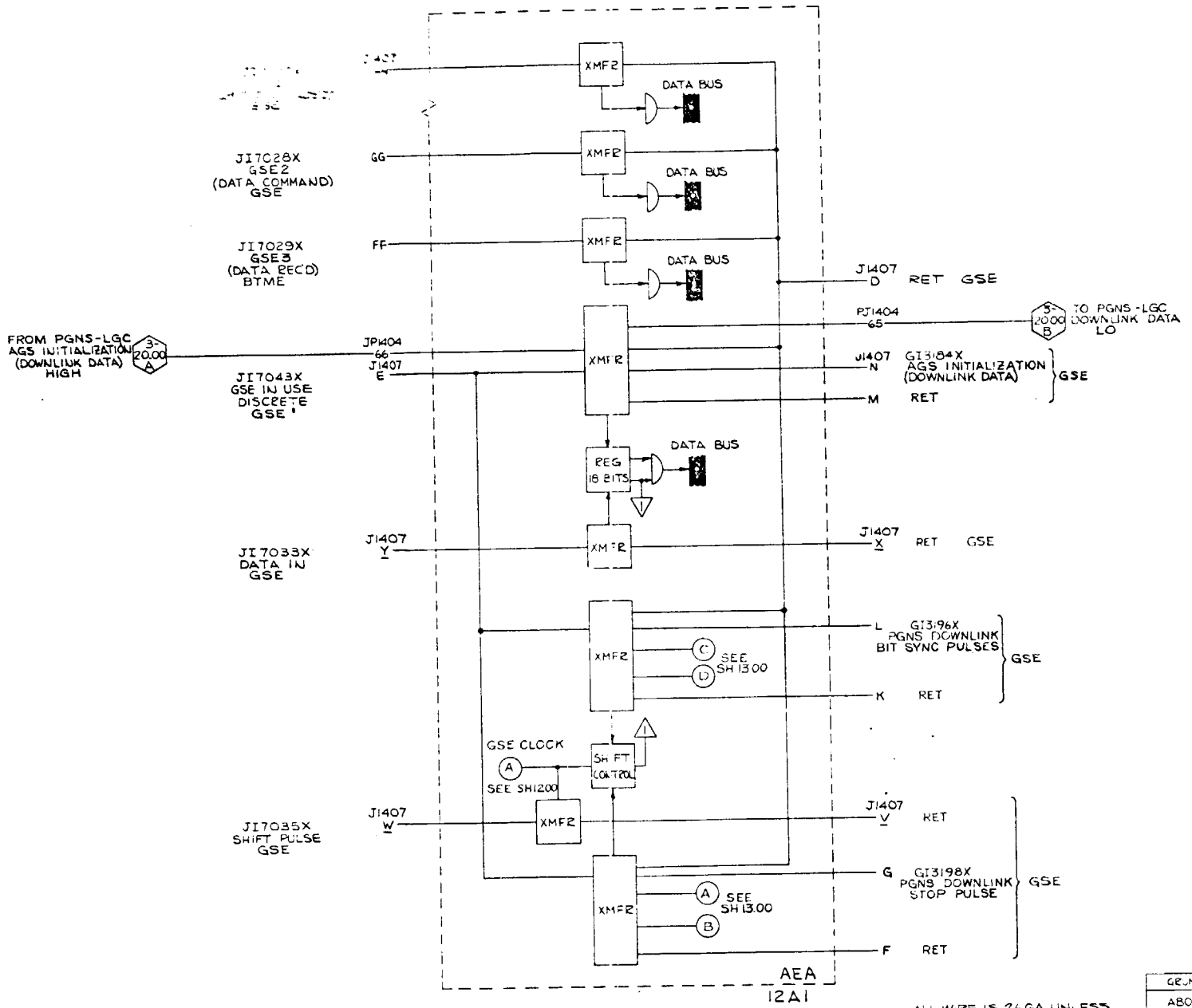
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.

SIZE LM	LDW267-57012



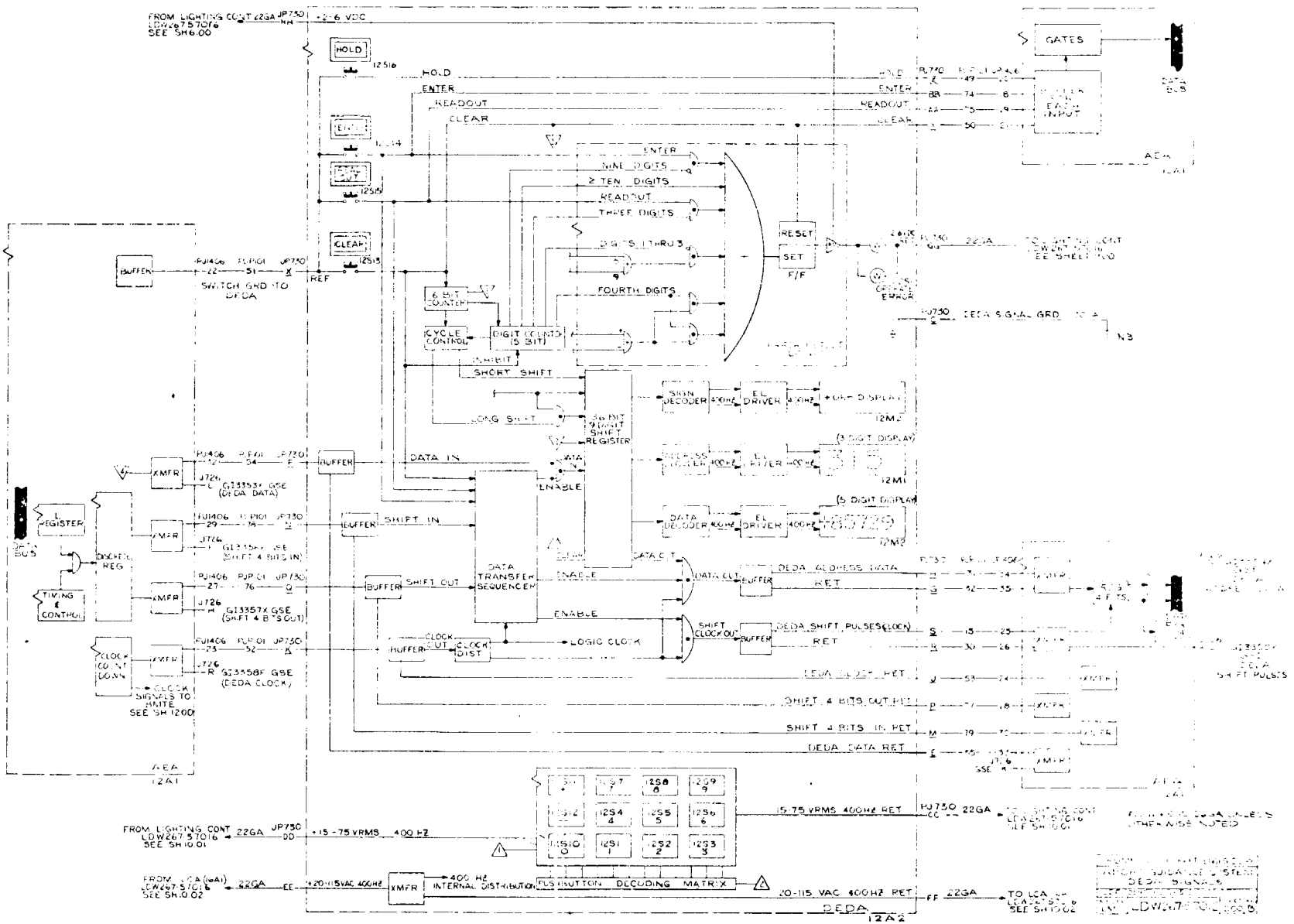
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED

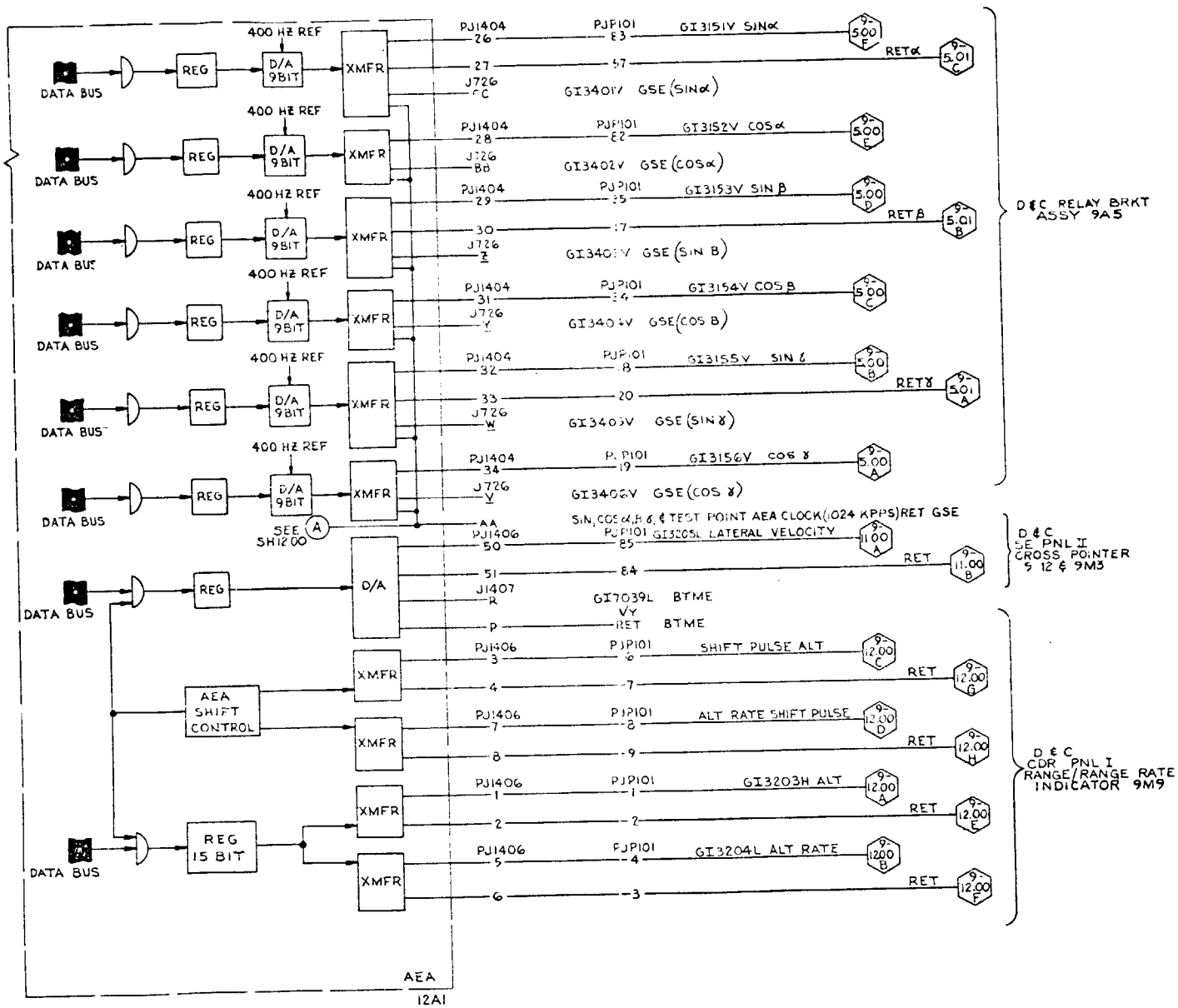
GRUMMAN AIRCRAFT ENG. CORP.
ABORT GUIDANCE SYSTEM
CES TO AEA SIGNALS



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGR CORP			
ABOZT GUIDANCE SYSTEM GSE DATA INPUTS			
CODE IDENT NO	SIZE		
MODEL LM	LDW267-57012	SHEET 900	REV

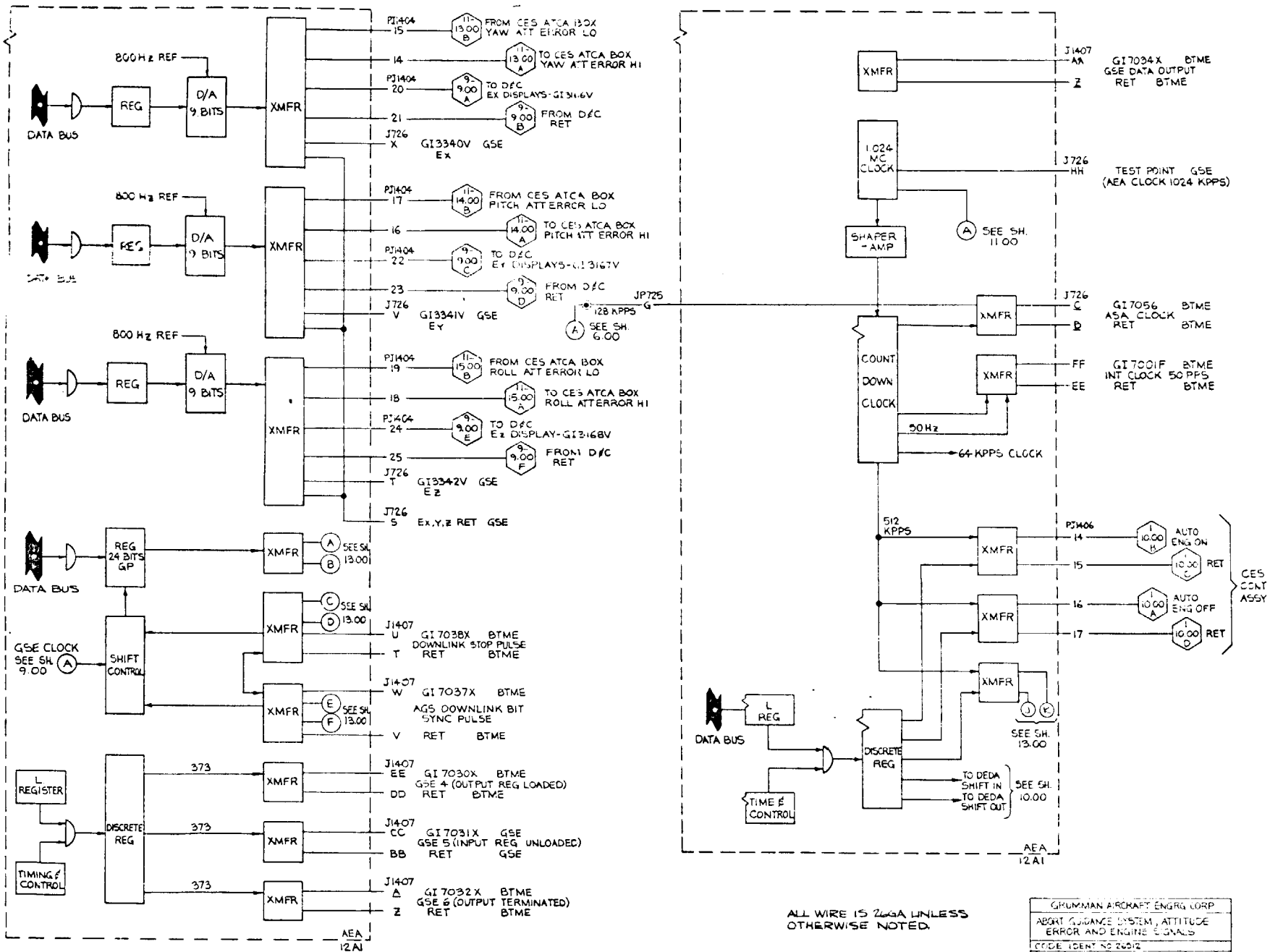

HOLD
ENTER
READOUT
CLEAR
ENTER NINE DIGITS
≥ TEN DIGITS
READOUT
THREE DIGITS
DIGITS 1 THRU 3
FOURTH DIGITS
RESET
SET
F/F
6 BIT COUNTER
CYCLE CONTROL
DIGIT COUNTS (5 BIT)
EXHIBIT
SHORT SHIFT
LONG SHIFT
36 BIT 9 DIGIT SHIFT REGISTER
SIGN DECODER
EL DRIVER
DATA IN
ENABLE
SHIFT IN
SHIFT OUT
DATA TRANSFER SEQUENCER
DATA OUT
DATA DECODER
L REGISTER
DISCRETE REG
TIMING CONTROL
CLOCK COUNT DOWN
CLOCK SIGNALS TO AMTE SEE SH 12001
BUFFER
XMFR
CLOCK OUT
CLOCK DIST
LOGIC CLOCK
SHIFT CLOCK OUT
GATES
DATA BUS
AEA 12A1
DEDA 12A2
FROM LIGHTING CONT 22GA JP730 LDW267 57016 SEE SH 6.00
+2.6 VDC
SWITCH GRD TO DEDA
REF
DEDA SIGNAL GRD
DEDA ADDRESS DATA
DEDA SHIFT PULSES (CLOCK)
SHIFT 4 BITS OUT RET
SHIFT 4 BITS IN RET
DEDA DATA RET
15.75 VRMS 400HZ RET
20-115 VAC 400HZ RET
FROM LIGHTING CONT 22GA JP730 LDW267 57016 SEE SH 10.01
+15-75 VRMS 400 HZ
FROM LCA (eaA) LDW267 57016 SEE SH 10.02
+20-115 VAC 400HZ
400 HZ INTERNAL DISTRIBUTION
PUSHBUTTON DECODING MATRIX
TO LCA SEE SH 10.02
UNLESS OTHERWISE NOTED



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.

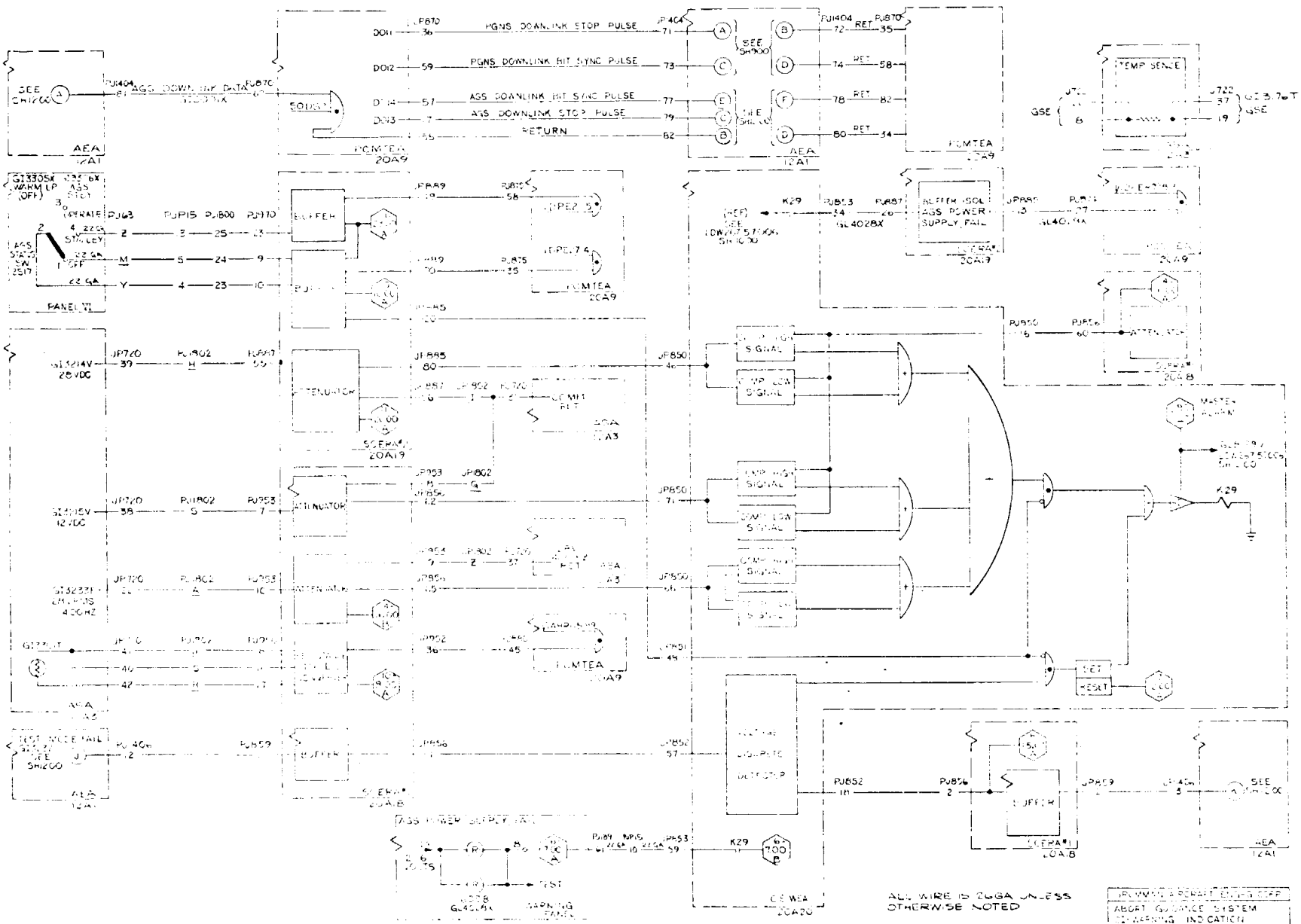
GRUMMAN AIRCRAFT ENGRG CORP

ABORT GUIDANCE SYSTEM DATA OUTPUT TO DISPLAY



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGRG CORP	
ABORT GUIDANCE SYSTEM, ATTITUDE ERROR AND ENGINE SIGNALS	
CODE IDENT NO 26512	
MODEL LM	LDW267-57012
SHEET 17.00	REV


PGNS DOWNLINK STOP PULSE
PGNS DOWNLINK BIT SYNC PULSE
AGS DOWNLINK BIT SYNC PULSE
AGS DOWNLINK STOP PULSE
RETURN
AGS DOWN LINK DATA
AGS POWER SUPPLY FAIL
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED
ABORT GUIDANCE SYSTEM
WARNING INDICATION

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 13)

COMMUNICATIONS

(REF LDW267-60013 A)

1. Applicable Documents

Level Three Drawings

ITEM NAME	DWG. NO.	REV.	E.O.'s
Communications	LDW380-56000	H	

2. Table of Contents

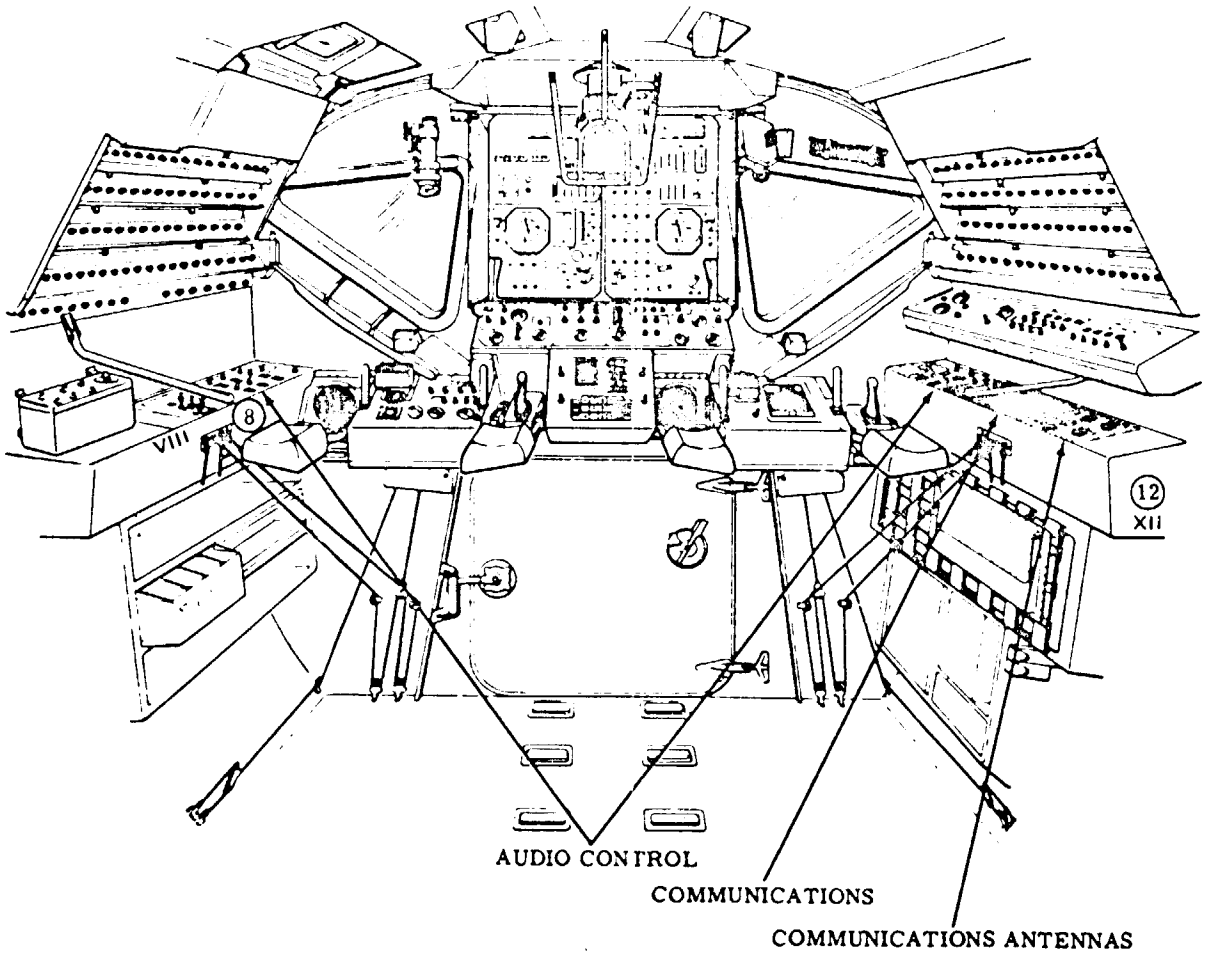
ITEM NAME		DWG. NO.
a)	Cover Sheet	13-1001
b)	Application Documents, Table of Contents, Notes, and Revisions	13-1002, 1002.1
c)	Cabin Location of Communications Controls and Indicators	13-1003
d)	S-Band Antenna Controls and Indicators Layout	13-1004
e)	VHF & S-Band Communications Controls and Indicators Layout	13-1004.1
f)	Audio Control and Indicators Layout	13-1004.2
g)	Controls and Indicators - Functional Description	13-1005 thru 1005.10
h)	Signal Flow Block Diagram	LDW267-60013 SH 4.00A
i)	Power Flow Block Diagram	LDW267-60013 SH 4.01
j)	TV and Signal Processor Power Distribution	LDW267-60013 SH 5.00
k)	S-Band Steerable Antenna Power Distribution	LDW267-60013 SH 6.00A
l)	S-Band Transceiver, Diplexer and Amplifier Power Supplies	LDW267-60013 SH 6.01
m)	S-Band Antennas, Input and Output	LDW267-60013 SH 7.00
n)	S-Band Steerable Antenna	LDW267-60013 SH 8.00
o)	S-Band Transceiver, Receiver Section	LDW267-60013 SH 9.00
p)	Pre-Modulation Processor Audio Section	LDW267-60013 SH 10.00
q)	SPA Audio Centers	LDW267-60013 SH 11.00
r)	Tape Recorder Power and Control	LDW267-60013 SH 12.00
s)	Communication Umbilical Assembly and Space Suit Headset	LDW267-60013 SH 13.00
t)	Communications Space Suit Interface	LDW267-60013 SH 13.01

2. Table of Contents (Continued)

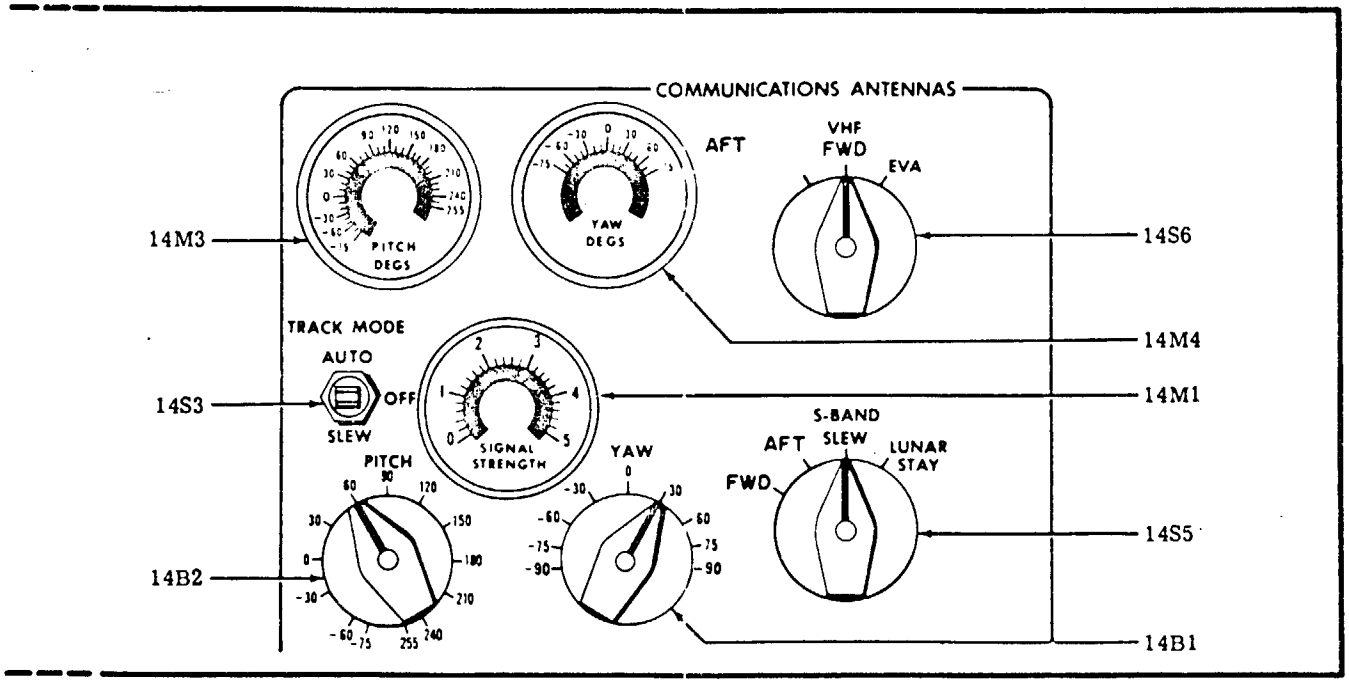
ITEM NAME		DWG. NO.
u)	Digital Uplink Assembly, Power, Range Indication and BU Voice	LDW267-60013 SH 14.00
v)	Signal Processor Assembly PMP Data Section	LDW267-60013 SH 15.00
w)	S-Band Transceiver Transmit Section	LDW267-60013 SH 16.00
x)	VHF Antennas and PLSS System	LDW267-60013 SH 17.00
y)	VHF Transceivers	LDW267-60013 SH 18.00
z)	Ranging Tone Transfer Assy	LDW267-60013 SH 19.00

3. Applicable Revisions

Rev	Sheet No.	LCD	Description
A	13-1004.1 13-1005.3	5157F	Addition of Circuit Breaker guards on panels 11 and 16

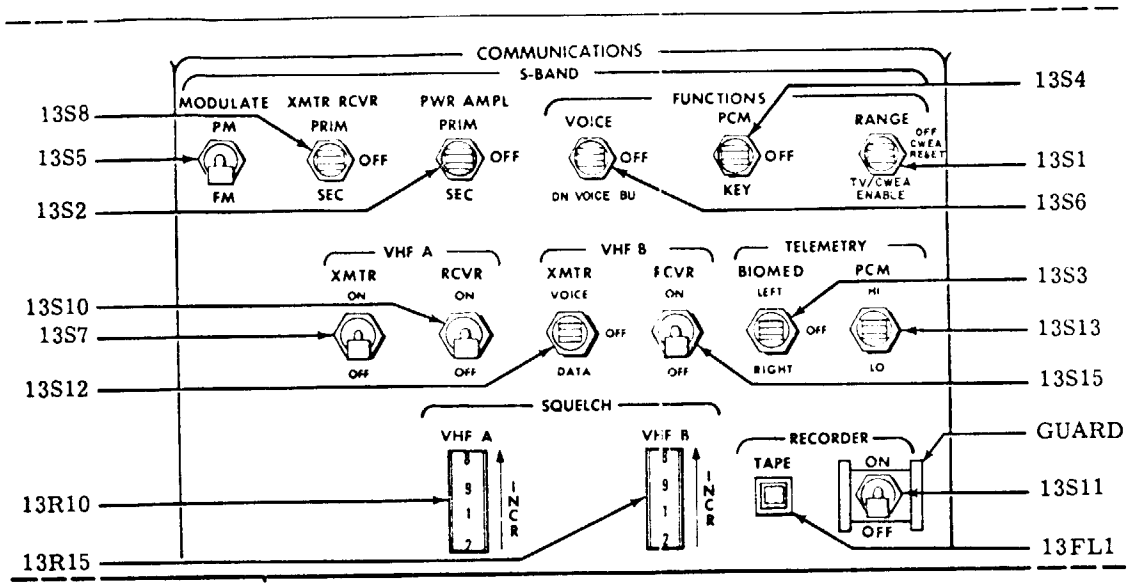


Cabin Location of Communications Controls and Indicators

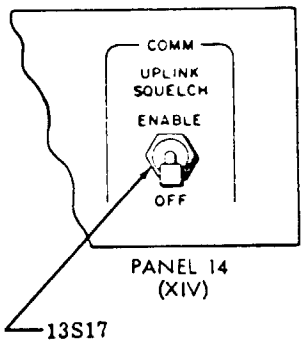


PANEL 12
(XII)

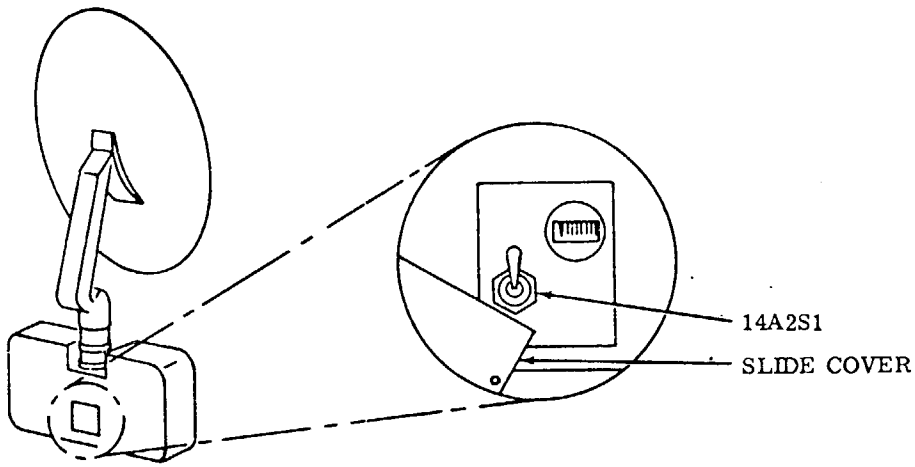
S-Band Antenna Controls and Indicators Layout



PANEL 12
(XII)



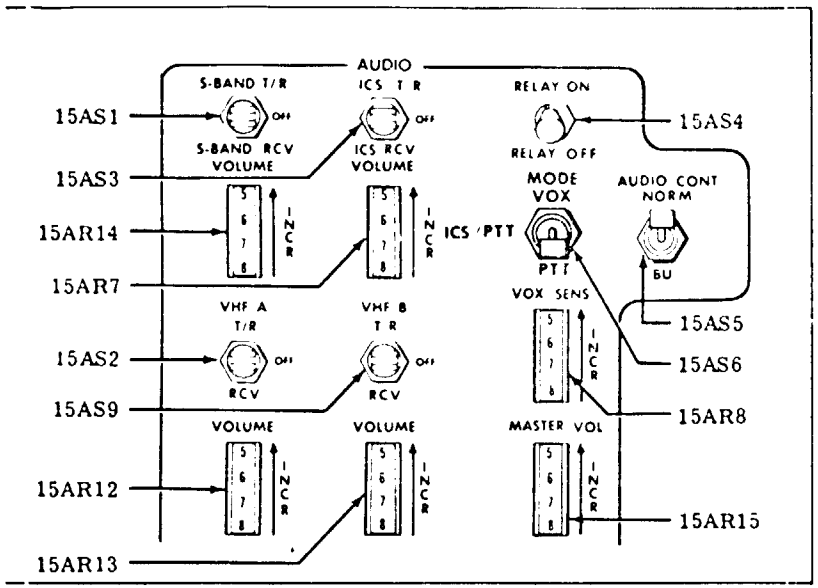
PANEL 14
(XIV)



S-BAND STEERABLE ANTENNA

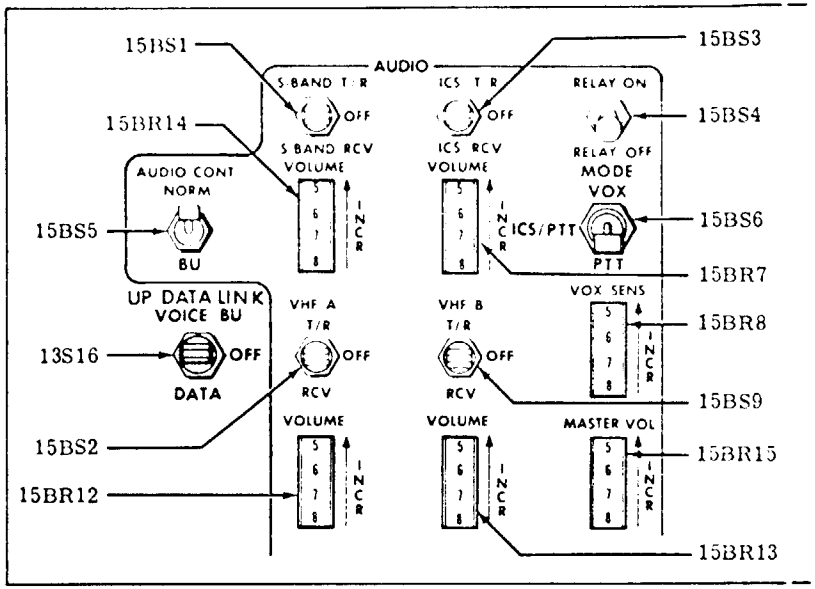
VHF and S-Band Communications Control and Indicators Layout

COMMANDER

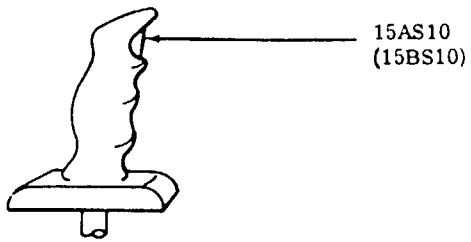


PANEL 8
(VIII)

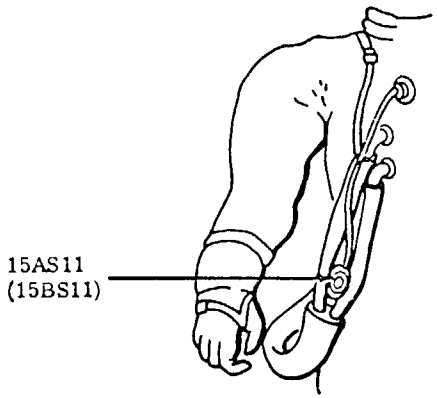
LM PILOT



PANEL 12
(XII)



ATTITUDE CONTROLLER ASSY (ACA)



SUIT UMBILICAL

Audio Control and Indicators Layout

SUBSYSTEM: COMMUNICATIONS (FUNCTIONAL GROUPING 13)

Code	Control/Indicator	Function
13S1	RANGE FUNCTION SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This switch (RANGE-OFF/RESET-TV/CWEA ENABLE) permits the selection of the ranging function for transmission via the S-Band equipment. In the RANGE position, the received ranging signal is re-transmitted back to earth via the phase modulated S-Band transmitter (13S5 in PM position). The TV CWEA ENABLE position enables the CWEA logic which feeds the annunciator light S-BD RCVR (6DS40). This light and the Master Alarm light and warning tone will be activated, if for any reason, the received signal is interrupted. This position disables the range gate, thereby interrupting the re-transmission of the ranging signal to earth. This position is not wired into the TV circuitry. If 13S1 is in the OFF/RESET position, the range gate is disabled. This position also provides a reset to the CWEA logic which feeds the annunciator light S-BD RCVR (6DS40). A reset will extinguish the light, if on, or inhibit from illuminating if not on.
13S2	POWER AMPLIFIER SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This switch (PRIM-OFF-SEC) permits the selection of either of two redundant power amplifiers for use with the S-Band equipment. When activated, the amplifier requires a 72 watt power input; however during certain phases of the lunar stay, S-Band transmissions are possible in a low power mode, with the power amplifier turned off. This switch is enabled only if 13S8 is in the PRIM or SEC position, thus preventing operation of either power amplifier without a driving signal.
13S3	BIOMEDICAL SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This switch (LEFT-OFF-RIGHT) selects which crew station hardline biomedical data will be sent to earth via the S-Band. In the LEFT or RIGHT positions, inputs are fed from the Commander's

Code	Control/Indicator	Function
13S3 (Cont.)		or LM pilot's stations respectively. With this switch in the OFF position, and with 13S6 in the DN VOICE BU position, the transmission of hardline biomed and EMU data is interrupted, and additional speech processing of the voice signal transmitted to earth is accomplished.
13S4	PCM/KEY FUNCTION SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This switch (PCM-OFF-KEY) permits the selection of either the telemetry or the emergency keying function for transmission via the S-Band equipment. In the PCM position, telemetry data is routed to the PMP for transmission to earth via the S-Band. (This function is used in conjunction with 13S13). In the OFF position no data is transmitted, nor is the subcarrier transmitted. In the KEY position all other selected S-Band functions (13S1, 13S3, 13S5, and 13S6) are interrupted and the PM section of the selected S-Band transmitter is enabled; DC power is applied to the PMP emergency key gating circuitry, and the PTT/Keyer switches (15AS10, 15BS10, 15AS11 and 15BS11) located on the ACA's and ECS suit umbilicals, are enabled to serve as Morse code keyers for emergency transmissions.
13S5	MODULATE SWITCH 2-POSITION TOGGLE MAIN-MAIN	This switch (PM-FM) permits selection of either the PM or the FM mode of transmission for the S-band transmitter. All S-band transmission modes are normally PM, except for television transmissions during lunar stay, which require the FM mode. In addition, transmission of television data requires that 13S2 and 13S8 be in the PRIM or SEC positions.

Code	Control/Indicator	Function
13S6	VOICE FUNCTION SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This switch (VOICE-OFF-DN VOICE BU) permits the selection of either normal voice or backup voice for transmission via the S-band equipment. In the VOICE position, the voice output is modulated onto a 1.25 MHz subcarrier within the PMP and routed to the S-band PM transmitter for transmission to earth. If the FM transmitter is selected, and 13S1 is in the OFF/Reset position, the voice is routed to the FM transmitter for modulation directly on the carrier (used during lunar stay). In the VOICE BU position, the PM section of the S-band transmitter is automatically selected (regardless of the position of 13S5) to transmit voice directly on the carrier, bypassing the PMP. In this position the system is permitted to transmit low bit rate PCM data on a 1.024 MHz subcarrier if the PCM position is selected on 13S4 and either of the hardline biomeds are selected on 13S3. (Additionally, in the DN VOICE BU position, the ranging or television function of 13S1 is interrupted if either has been selected). In the OFF position, all S-band voice transmission capability is interrupted.
13S7	RANGE/VOICE SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This switch (VOICE/RNG-OFF-VOICE) enables simultaneous voice transmission & range capability via the VHF A XMTR when in the VOICE/RNG position. In the VOICE position it enables voice transmission only. All power from the VHF A XMTR is removed in the OFF position.
13S8	TRANSMITTER/RECEIVER SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This switch (PRIM-OFF-SEC) selects either of two redundant S-Band transmitter/receiver combinations. The redundant components involved are: power supplies, receivers, PM modulators and transmitter chains. In the OFF position power to this S-band equipment is interrupted.

SUBSYSTEM: COMMUNICATIONS (FUNCTIONAL GROUPING 13)

Code	Control/Indicator	Function
13S10 13S15	VHF A RECEIVER SWITCH VHF B RECEIVER SWITCH TWO 2-POSITION TOGGLES MAIN-MAIN	These switches (ON-OFF) control primary power to the VHF A receiver (296.8 MHz) and VHF B receiver (259.7 MHz) respectively. In the ON position, electrical power is applied to the A or B receiver assembly and in the OFF position power to the assembly is interrupted.
13S11	TAPE RECORDER SWITCH 2-POSITION TOGGLE MAIN-MAIN	This guarded switch (ON-OFF) is used in conjunction with the VOX circuit for controlling tape recording. In the ON position the tape transport equipment is capable of being turned on and off automatically under the control of the VOX trigger signal. In the OFF position the VOX trigger signal to the recorder is interrupted. The recorder unit includes a ten-hour tape supply. End of tape sensing provides automatic turn-off and termination of tape movement.
13S12	VHF B TRANSMITTER SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This switch (VOICE-OFF-DATA) provides primary power of the VHF B transmitter (259.7 MHz) for either of two modes of operation. In the VOICE position the transmitter can be used for voice transmissions to the CSM and/or EVA and in the DATA position this equipment can be used to transmit PCM Telemetry data to the CSM. However, in the DATA position, 13S13 must be in the LO position. In the OFF position power to the assembly is interrupted.
13S13	PCM RATE SWITCH 2-POSITION TOGGLE MAIN-MAIN	This switch (HI-LO) selects the high or low bit rate telemetry to be transmitted via PCM to earth on S-band. Some information is sent in high bit rate telemetry only, including AGS and PGNS downlink, and AGS State Vector update via PGNS downlink. Additionally, with this switch in the LO position, and with switch 13S12 in the DATA

SUBSYSTEM: COMMUNICATIONS (FUNCTIONAL GROUPING 13)

Code	Control/Indicator	Function
13S13 (Cont.)		position, PCM telemetry data is transmitted to the CSM and recorded there for eventual re-transmission to earth. (Used when LM is behind the moon and when CSM is in LOS.)
13S16	UPDATA LINK SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This switch (VOICE BU-OFF-DATA) in the VOICE BU position, enables the voice circuitry of the digital uplink assembly (DUA) and inhibits the data circuitry. In the DATA position it enables the DATA circuitry of the DUA and inhibit the voice circuitry. In the OFF position all power is removed from the DUA.
13S17	UPLINK SQUELCH SWITCH 2-POSITION TOGGLE MAIN-MAIN	This switch (ENABLE-OFF) in the ENABLE position prevents the voice output of the S-Band transceiver from being received or retransmitted via the signal processor assembly (SPA) whenever there is a loss of the 30 KHz subcarrier. In the OFF position all power is removed.
13R10 13R15	VHF A SQUELCH CONTROL THUMBWHEEL VHF B SQUELCH CONTROL THUMBWHEEL	These thumbwheels (↑INCR) permit continuous adjustment of the threshold of the VHF A and VHF B receiver squelch circuits, i. e. : they adjust the level which the incoming signal must exceed in order for it to be heard, and thereby serve to eliminate the noise level in the VHF A or VHF B receiver during periods when no voice signal is present.
13FL1	TAPE STATUS 2-POSITION FLAG	This flag (GREY-BARBERPOLE) indicates, in the grey position, that the tape is moving and that voice recording is taking place. Conversely, the barberpole position indicates that the tape is not moving and that voice recording is not taking place.

SUBSYSTEM: COMMUNICATIONS ANTENNAS (FUNCTIONAL GROUPING 13)

Code	Control/Indicator	Function
14S3	TRACK MODE SELECT SWITCH 3 POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (AUTO-OFF-SLEW) selects the control mode by which the S-band steerable antenna is positioned. In the OFF position, power to the antenna drive motors is interrupted. In the SLEW position the steerable antenna is positioned by using 14B1 and 14B2 to peak 14M1. In the AUTO position, the earth sensor is activated, which will automatically keep the antenna pointed at earth, provided the antenna is oriented to within ±12 degrees of the earth.
14S5	S-BAND ANTENNA SELECT SWITCH 4-POSITION ROTARY	This four-position rotary (FWD-AFT-SLEW-LUNAR STAY) provides selection of any of the four S-band antennas for communication with earth. The FWD and AFT positions select #1 and #2 omni-directional antennas respectively, for use in the event of S-band steerable antenna failure. The SLEW position selects the steerable antenna, and the LUNAR STAY position selects the S-band erectable antenna for use during lunar stay. A lock mechanism is incorporated in this rotary knob to prevent inadvertent selection of the LUNAR STAY position in the absence of and antenna load at the connector.
14S6	VHF ANTENNA SELECT SWITCH 3-POSITION ROTARY (SEE EFD13-504)	This rotary (AFT-FWD-EVA) provides selection of any of three VHF antennas for communication with (a) command module or (b) the extra-vehicular astronaut. The AFT position is used for checking out the Portable Life Support System Communications. Positions AFT and FWD are used for communication with the CM. The EVA position is provided for LM/EVA communications during lunar stay. A lock mechanism is incorporated in this rotary

SUBSYSTEM: COMMUNICATIONS ANTENNAS (FUNCTIONAL GROUPING 13)

Code	Control/Indicator	Function
14S6 (Cont.)		knob to prevent inadvertent selection of the EVA position in the absence of an antenna load at the connector.
14M1	SIGNAL STRENGTH INDICATOR	This indicator displays the intensity of S-band signals received from the earth. It is utilized in conjunction with 14B1 and 14B2 to manually establish signal contact with the earth. When peaked, it indicates that the S-band steerable antenna is pointing at the earth. It can be used as an indication of the pointing accuracy of the steerable antenna or erectable antenna, or it can indicate which of the two in-flight antennas is providing the best link to earth.
14M3 14M4	ANTENNA PITCH INDICATOR ANTENNA YAW INDICATOR	These indicators display the pitch (14M3) and yaw (14M4) angles of the S-band dish antenna. The antenna pitch limits are 255^{o} above and 75^{o} below a plane parallel to the vehicle Y-Z plane. The antenna yaw limits are 90^{o} to the left and 90^{o} to the right of a plane parallel to the vehicle X-Y plane. The antenna is positioned to the desired pitch and yaw angles by using 14B1 and 14B2, and by reference to the antenna pitch and yaw indicators.
14B1 14B2	PITCH SLEW CONTROL YAW SLEW CONTROL (TWO CONTINUOUS ROTARY CONTROLS WITH POSITIVE STOPS)	Each of these rotary controls actuates a synchro transmitter which generates position command signals to the antenna drive assembly in the pitch and yaw axes, when 14S3 is in the SLEW position. Positioning these controls transmits corresponding position commands to the antenna drive assembly in two axes, and position signals from the antenna assembly drive and panel indicators (14M3 and 14M4).

Code	Control/Indicator	Function
14A2S1	STOW LATCH ARMING SWITCH MAIN - MAIN (NOT A FLIGHT SWITCH)	This 2 position switch (safe-armed) operates the stow latch mechanism which restricts the steerable antenna gimbal (pitch and yaw axis) movement. By placing 14S3 (Track-Mode Switch) in either "auto" or "track" mode the stow-latch mechanism automatically releases the antenna permitting normal gimbal functions. The stow-latch arming switch is mounted on the steerable antenna and must be preset before flight (to "armed") in order to complete the electrical path to the stow-latch mechanism. In the event of an electrical failure, manual mechanical latches can be utilized to release the stow latch mechanism. These latches are mounted on the antenna and to release them requires an EVA.

Note: The Commander's Audio controls (15A) and the LM Pilot's Audio controls (15B) have identical components. Therefore, this listing and description of controls applies to both functional groupings.

Code	Control/Indicator	Function
15AS1 (15BS1)	S-BAND SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (S-BAND T/R-OFF-S-BAND RCV), in the S-BAND T/R position, routes received S-band voice to the headset, and mike amplifier outputs to the PMP for transmission via S-band equipment. In the OFF position, neither the S-band receiver nor transmitter output is routed through the Audio Center. In the S-Band RCV position, the audio center is enabled to accept received S-Band voice.
15AS2 15AS9 (15BS2) (15BS9)	VHF A SWITCH VHF B SWITCH TWO 3-POSITION TOGGLES MAIN-MAIN-MAIN	These three-position toggles (T/R-OFF-RCV), in the T/R positions, route received VHF voice signals to the headsets, and mike amplifier outputs to the PMP for transmission via the VHF equipment. In the T/R position, the VOX or PTT keying voltages are routed to the VHF transmitter. In the OFF position the respective microphone and headset amplifiers are disconnected from the VHF transceivers. In the RCV position, the audio center is enabled to accept received VHF voice. 15AS2 and 15BS2 enable these control capabilities with the VHF A equipment. 15AS9 and 15BS9 enable these control capabilities with the VHF B equipment.
15AS3 (15BS3)	INTERCOM SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (ICS T/R-OFF-ICS RCV), in the ICS T/R position, routes mike amplifier outputs to the ICS bus and from there to the headset. In the OFF position the intercom capability is disabled. In the ICS RCV position voice signals on the ICS bus are routed to the headsets.

SUBSYSTEM: AUDIO CONTROL (FUNCTIONAL GROUPING 13)

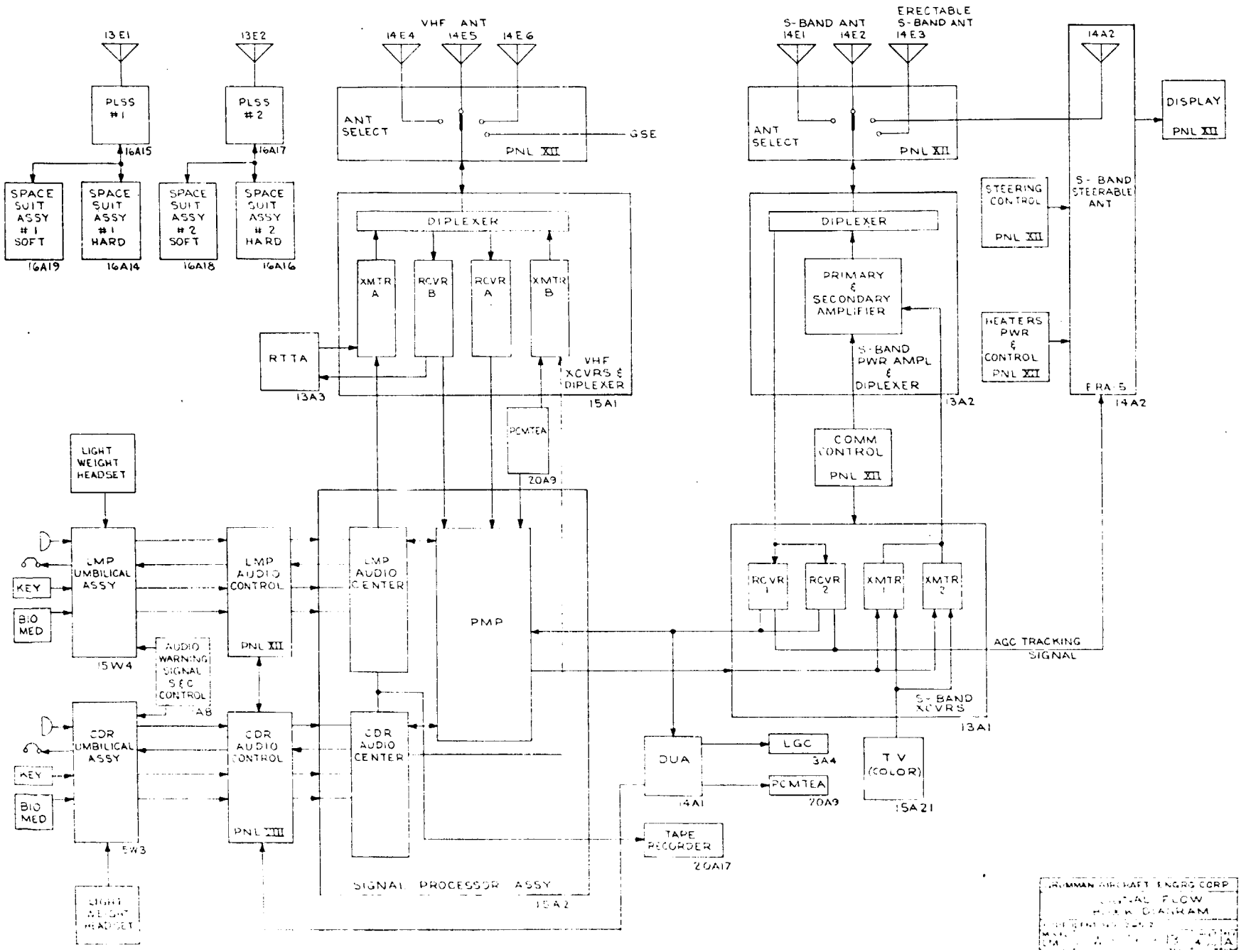
Code	Control/Indicator	Function
15AS4 (15BS4)	RELAY SWITCH 2-POSITION TOGGLE LOCK-LOCK	This two-position toggle (RELAY ON-RELAY OFF) in the RELAY ON position, establishes a voice conference capability among the Earth, LM and the Extra-Vehicular Astronaut, and relays received Extra-Vehicular Astronaut biomed data to Earth. Additionally, in the event of failure of the CSM-earth S-band link, received VHF from CSM can be relayed to earth via the LM S-band transmitter. In the RELAY OFF position these capabilities are not enabled. Only one relay switch must be "ON" at a time. Appropriate switch positions on both audio control panels must be selected to establish the desired relay link.
15AS5 (15BS5)	AUDIO CONTROL SWITCH 2-POSITION TOGGLE MAIN-MAIN	This two-position toggle (NORM-BU) selects the audio center and microphone circuit which is to be utilized. In the NORM [illegible] the crewman is using his own audio center and microphone [illegible] In the BU position he is utilizing the other crewman's [illegible] assembly.
15AS6 (15BS6)	MODE SWITCH 3-POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (VOX-ICS PTT-PTT) selects the manner in which the various equipments are keyed. In the VOX position the VOX control circuitry in the audio center is enabled to key both the intercom and selected transmitter(s). In the ICS position, the intercom is always "hot" (e.g., an open line continually exists between the astronauts; selected transmitters are keyed only by the push-to-talk (PTT) switches (15S10 and 15S11). In the PTT position the VOX circuit is disabled and both the intercom and selected transmitters can be keyed only by the PTT switches.

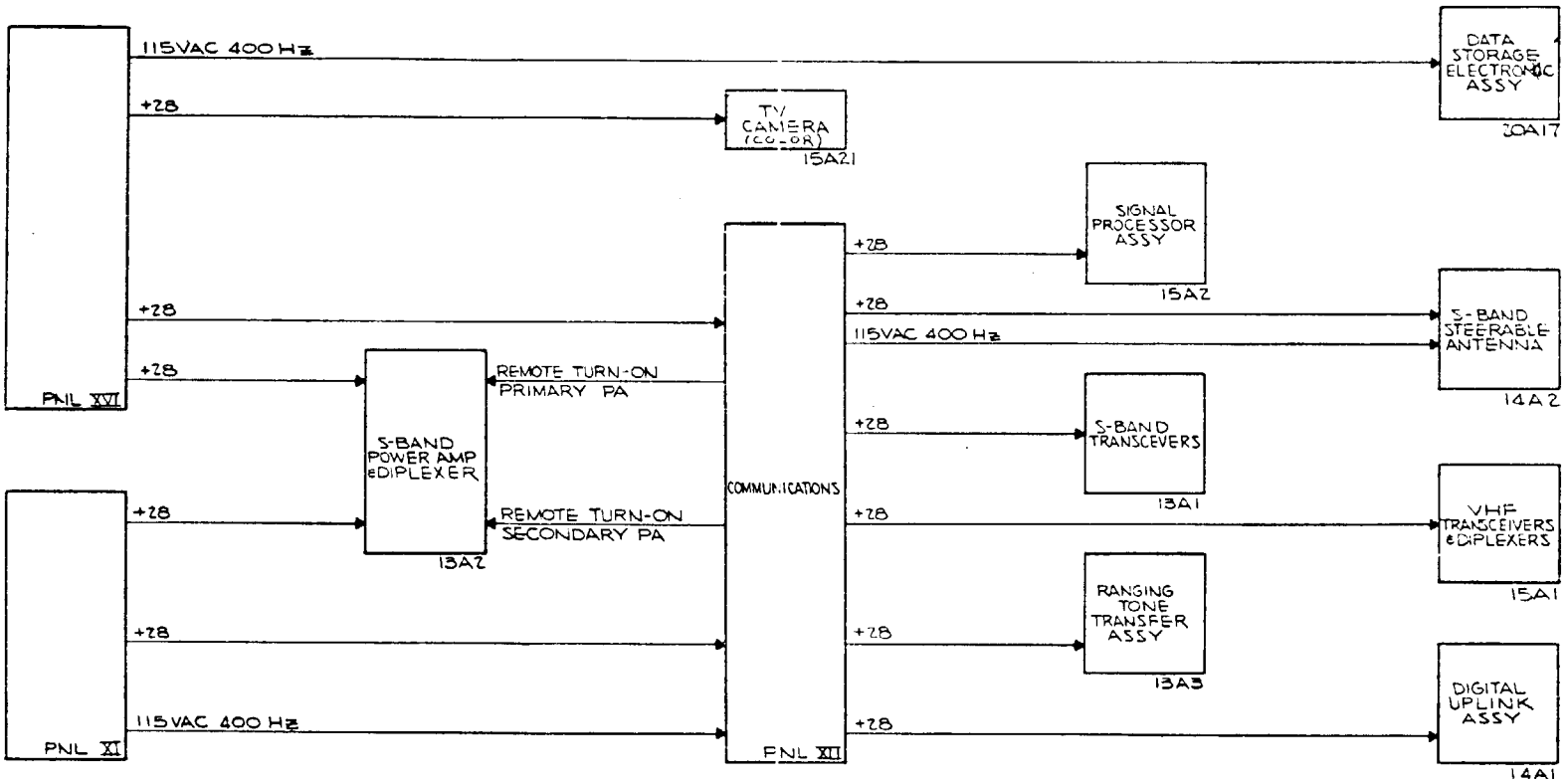
SUBSYSTEM: AUDIO CONTROL (FUNCTIONAL GROUPING 13)

Code	Control/Indicator	Function
15AR7 (15BR7)	ICS VOLUME CONTROL THUMBWHEEL	This thumbwheel (↑INCR) permits continuous adjustment of the level of the audio input of the ICS to the headset. Movement of the thumbwheel in an upward direction increases the volume; a downward movement decreases it.
15AR8 (15BR8)	VOX SENSITIVITY THUMBWHEEL	This thumbwheel (↑INCR) permits continuous adjustment of the threshold of the VOX control circuit in the audio center. Movement of the thumbwheel in an upward direction increases VOX sensitivity, a downward movement decreases it.
15AS10 (15BS10)	PTT SWITCH MOMENTARY PUSHBUTTON	This momentary pushbutton, located on the astronaut's attitude controller, is used to key the intercom and/or selected transmitter(s).
15AS11 (15BS11)	PTT/KEYER SWITCH MOMENTARY PUSHBUTTON	This momentary pushbutton, located on the astronaut's LM Communications umbilical, is used to key the intercom and/or selected transmitter(s). Additionally, in the event of a voice communication failure, the S-band Function switch 13S4 can be placed in the KEY position, thus enabling this PTT switch to serve as a Morse code keyer. (In this mode, the PM section of the S-band transmitter is automatically utilized to transmit Morse code.)
15AR12 15AR13 (15BR12) (15BR13)	VHF A VOLUME CONTROL VHF B VOLUME CONTROL TWO THUMBWHEELS	These thumbwheels (↑INCR) permit continuous adjustment of the audio level of the VHF A and VHF B receiver signals to the headset amplifier.

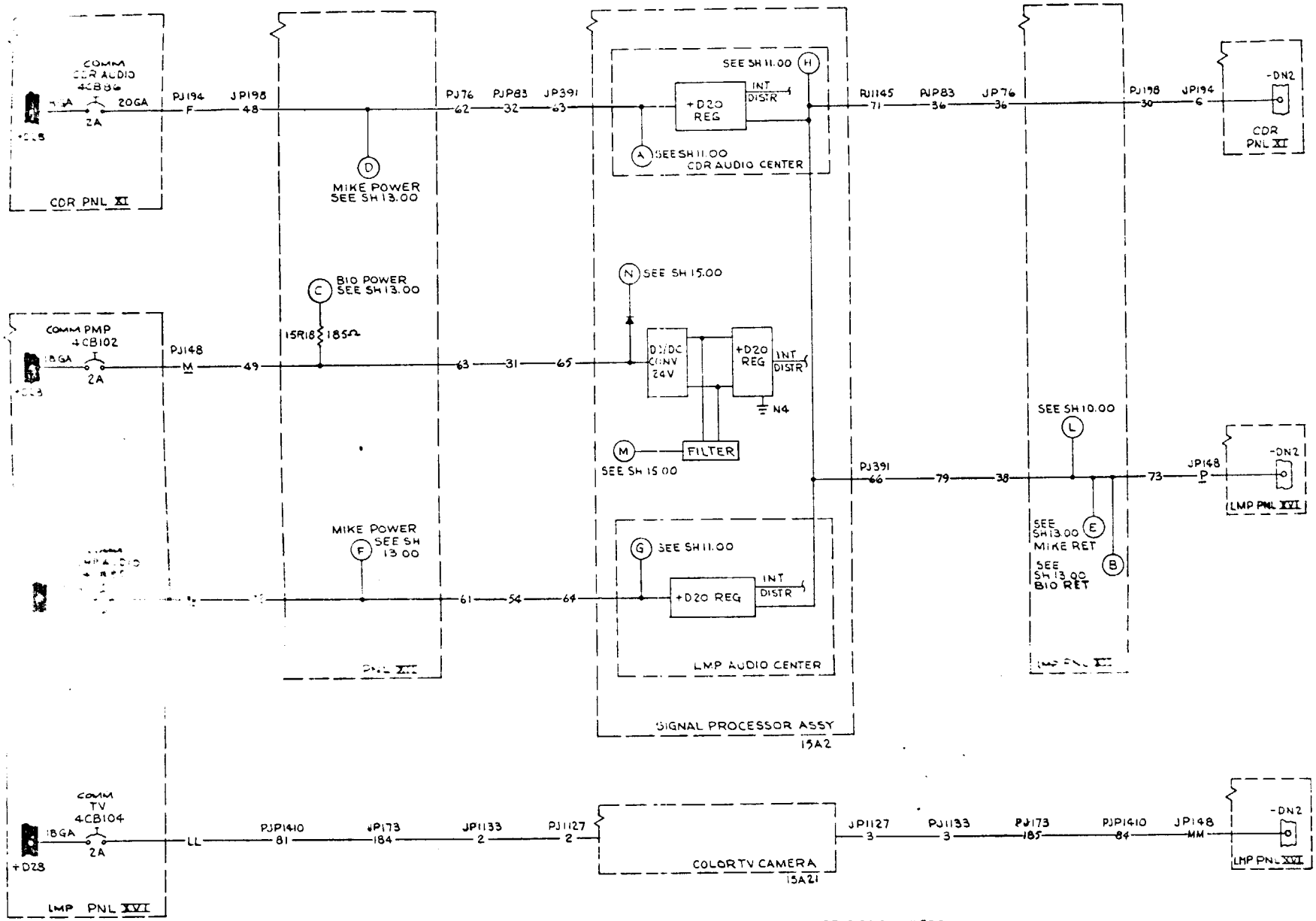
SUBSYSTEM: AUDIO CONTROL (FUNCTIONAL GROUPING 13)

Code	Control/Indicator	Function
15AR14 (15BR14)	S-BAND VOLUME CONTROL THUMBWHEEL	This thumbwheel (▲ INCR) permits continuous adjustment of the audio level of the S-band receiver signal to the headset amplifier.
15AR15 (15BR15)	MASTER VOLUME CONTROL THUMBWHEEL	This thumbwheel (▲ INCR) permits continuous adjustment of the level of all audio outputs (received VHF A and B, ICS and S-band) from the headset amplifier simultaneously. Thus, individual input levels would be set by using the respective volume control thumbwheels, and the overall level would be adjusted with this thumbwheel.


13E1
13E2
VHF ANT
14E4
14E5
14E6
S-BAND ANT
14E1
14E2
ERECTABLE
S-BAND ANT
14E3
14A2
PLSS #1
PLSS #2
16A15
16A17
ANT SELECT
PNL XII
GSE
DISPLAY
PNL XII
SPACE SUIT ASSY #1 SOFT
16A19
SPACE SUIT ASSY #1 HARD
16A14
SPACE SUIT ASSY #2 SOFT
16A18
SPACE SUIT ASSY #2 HARD
16A16
DIPLEXER
XMTR A
RCVR B
RCVR A
XMTR B
RTTA
13A3
VHF XCVRS & DIPLEXER
15A1
PCMTEA
20A9
PRIMARY & SECONDARY AMPLIFIER
S-BAND PWR AMPL & DIPLEXER
13A2
STEERING CONTROL
PNL XII
S-BAND STEERABLE ANT
HEATERS PWR & CONTROL
PNL XII
FRA-5
14A2
COMM CONTROL
PNL XII
LIGHT WEIGHT HEADSET
LMP UMBILICAL ASSY
KEY
BIO MED
15W4
LMP AUDIO CONTROL
PNL XII
LMP AUDIO CENTER
PMP
AUDIO WARNING SIGNAL S&C CONTROL
4A8
RCVR 1
RCVR 2
XMTR 1
XMTR 2
AGC TRACKING SIGNAL
S-BAND XCVRS
13A1
CDR UMBILICAL ASSY
KEY
BIO MED
5W3
CDR AUDIO CONTROL
PNL XIII
CDR AUDIO CENTER
DUA
14A1
LGC
3A4
PCMTEA
20A9
T V (COLOR)
15A21
TAPE RECORDER
20A17
SIGNAL PROCESSOR ASSY
15A2
LIGHT WEIGHT HEADSET
GRUMMAN AIRCRAFT ENGRG CORP
SIGNAL FLOW
BLOCK DIAGRAM
A

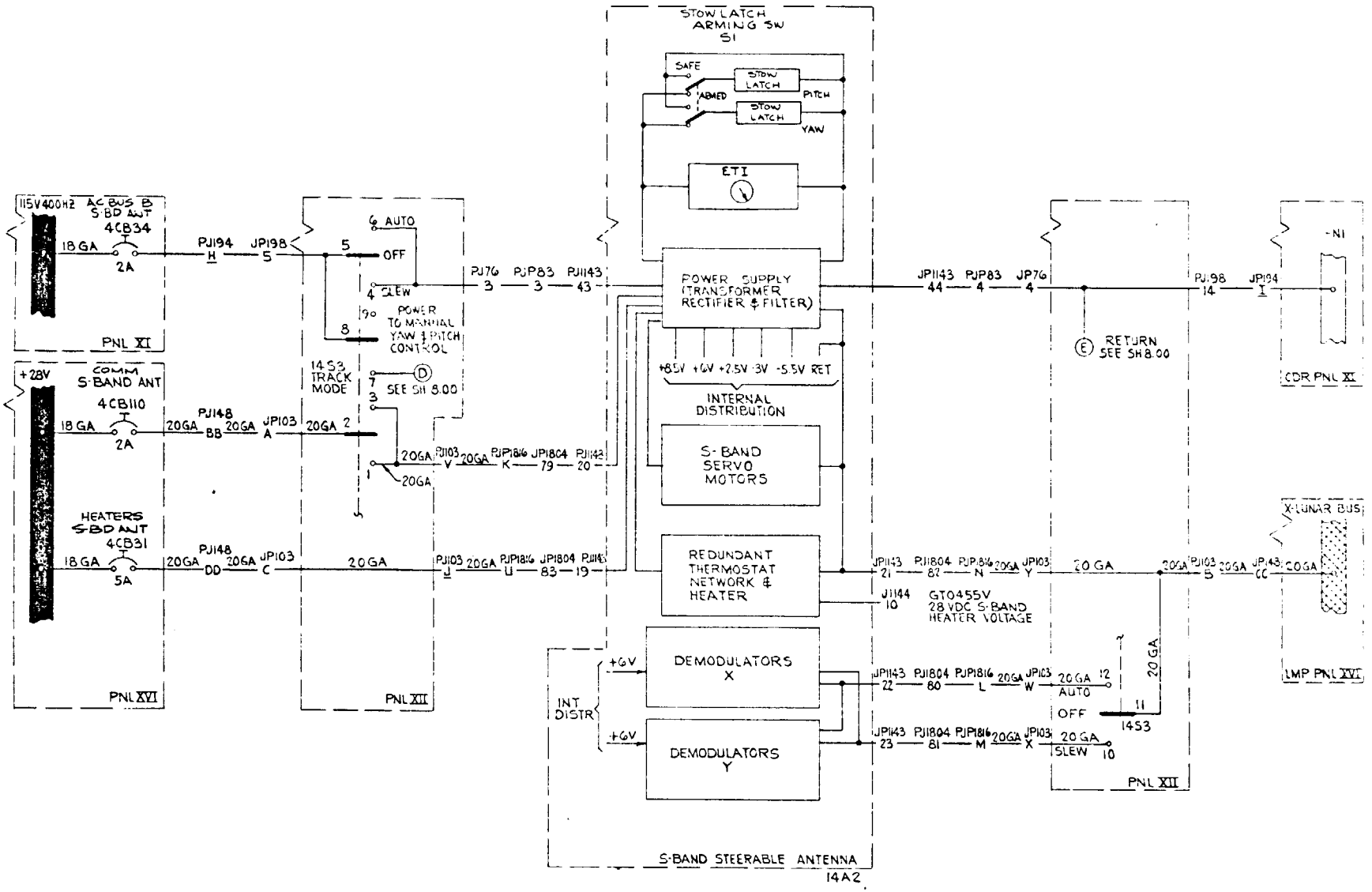


GENERAL DYNAMICS CORP
POWER FLOW BLOCK DIAGRAM
SIZE LM
LDV 367-60013
SHEET 401
REV



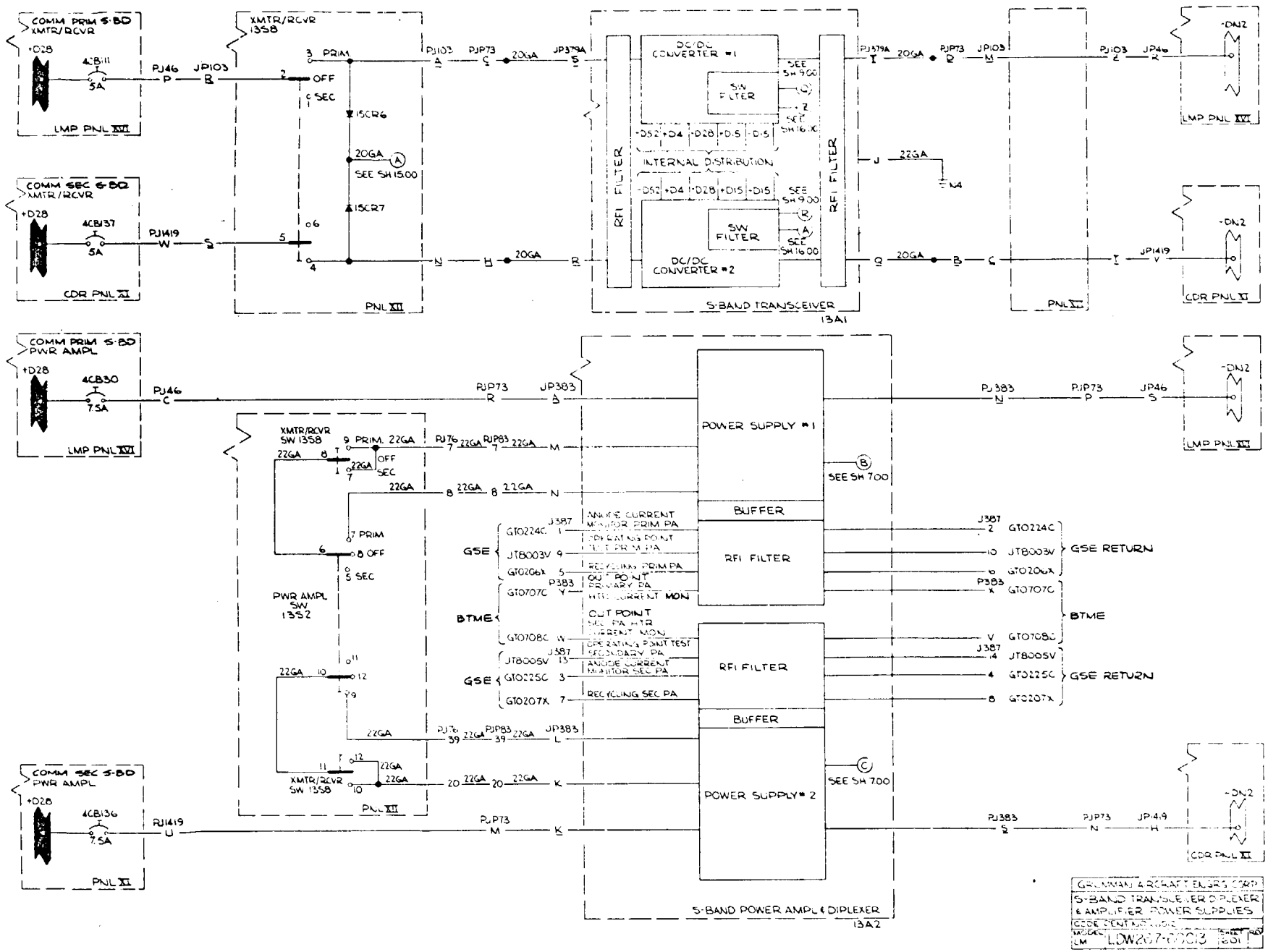
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.

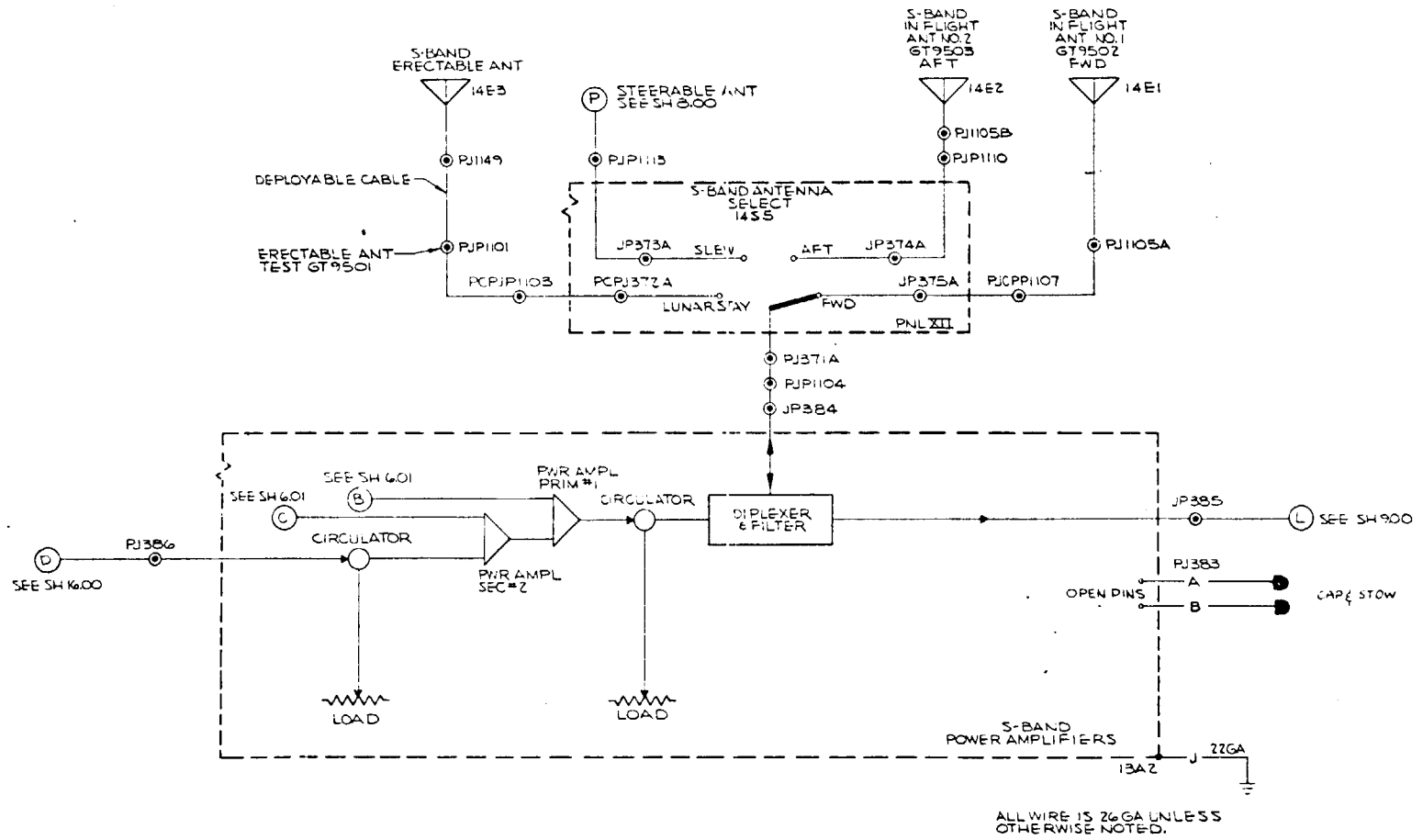
GRUMMAN AIRCRAFT ENGRG CORP			
TV & SIGNAL PROCESSOR POWER DISTRIBUTION			
CODE IDENT NO. 26512			
MODEL LM	LDW267-60013	SHEET 500	REV



ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

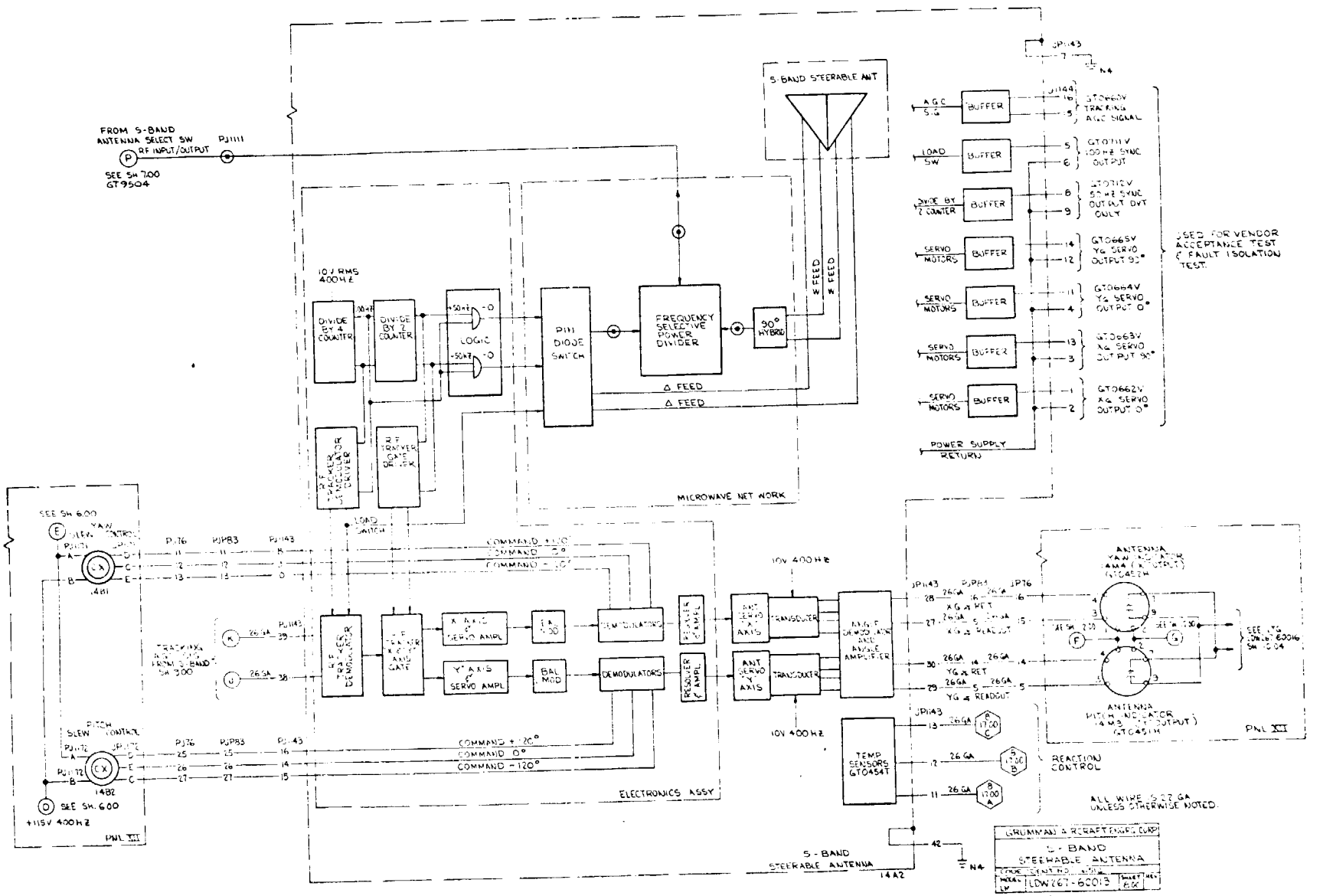
GRUMMAN AEROSPACE CORP
S BAND STEERABLE ANTENNA POWER DISTRIBUTION
DASC7-60013

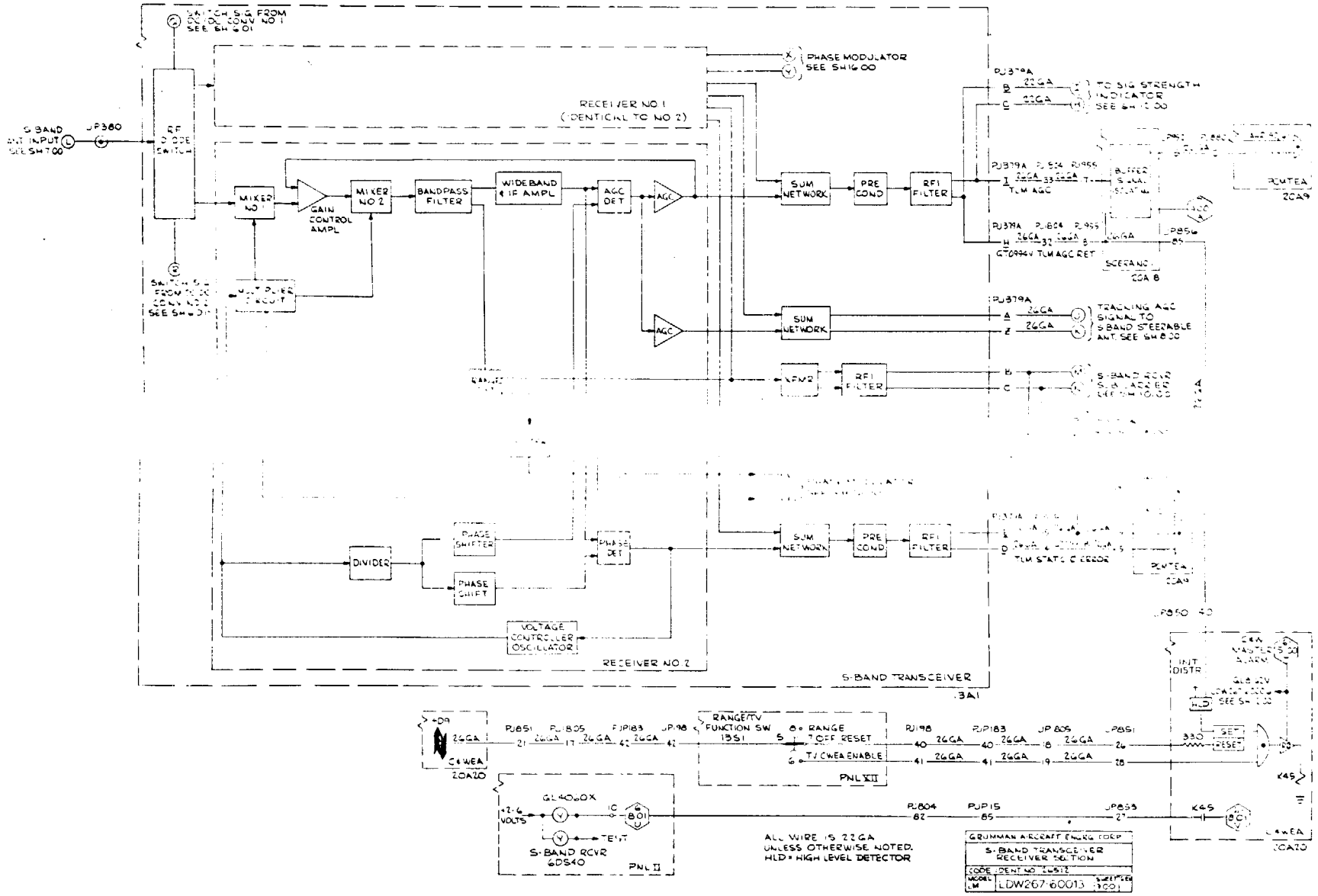

COMM PRIM S-BD XMTR/RCVR
+D28
4CB111
5A
LMP PNL XVI
PJ46 P
JP103 B
XMTR/RCVR 1358
3 PRIM
2 OFF
1 SEC
15CR6
20GA
A
SEE SH 1500
15CR7
PJ103 A
PJP73 S
20GA
JP3794 S
COMM SEC S-BD XMTR/RCVR
+D28
4CB137
5A
CDR PNL XI
PJ1419 W
5
6
4
N
H
20GA
R
PNL XII
RFI FILTER
DC/DC CONVERTER #1
SEE SH 900
S/W FILTER
Q
Z
SEE SH 1600
+DS2 +D4 +D28 +D5 -D5
INTERNAL DISTRIBUTION
DC/DC CONVERTER #2
SW FILTER
R
A
S-BAND TRANSCEIVER 13A1
PJ379A I
20GA
PJP73 R
JP103 M
J
22GA
N4
PNL XV
PJ103 L
JP46 R
-DN2
LMP PNL XVI
JP1419 V
CDR PNL XI
COMM PRIM S-BD PWR AMPL
+D28
4CB130
7.5A
LMP PNL XVI
PJ46 C
PJP73 R
JP383 A
POWER SUPPLY #1
SEE SH 700
BUFFER
RFI FILTER
PJ383 N
PJP73 P
JP46 S
-DN2
LMP PNL XVI
XMTR/RCVR SW 1358
9 PRIM 22GA
8 22GA
7 OFF
SEC
22GA
7 PRIM
6
8 OFF
5 SEC
PWR AMPL SW 1352
11
10 22GA
12
9
PJ76 7 22GA
PJP83 7 22GA
M
8 22GA
8 22GA
N
PJ76 39 22GA
PJP83 39 22GA
JP383 L
20 22GA
20 22GA
K
PNL XII
GSE
BTME
GTO224C 1
JT8003V 9
GTO206X 5
GTO707C Y
GTO708C W
JT8005V 13
GTO225C 3
GTO207X 7
ANODE CURRENT MONITOR PRIM PA
OPERATING POINT TEST PRIM PA
RECYCLING PRIM PA
OUT POINT PRIMARY PA
MTR CURRENT MON
OUT POINT SEC PA MTR CURRENT MON
OPERATING POINT TEST SECONDARY PA
ANODE CURRENT MONITOR SEC PA
RECYCLING SEC PA
J387 1
P383 Y
J387 13
RFI FILTER
BUFFER
POWER SUPPLY #2
SEE SH 700
J387 2 GTO224C
10 JT8003V
6 GTO206X
GSE RETURN
P383 X GTO707C
V GTO708C
BTME
J387 4 JT8005V
4 GTO225C
8 GTO207X
GSE RETURN
5-BAND POWER AMPL & DIPLEXER 13A2
COMM SEC S-BD PWR AMPL
+D28
4CB136
7.5A
PNL XI
PJ1419 U
PJP73 M
K
PJ383 S
PJP73 N
JP1419 H
-DN2
CDR PNL XI
GRUMMAN AIRCRAFT ENGR'G CORP
S-BAND TRANSCEIVER DIPLEXER & AMPLIFIER POWER SUPPLIES
CODE IDENT NO. 80878
LDW267-00013
SHEET 160

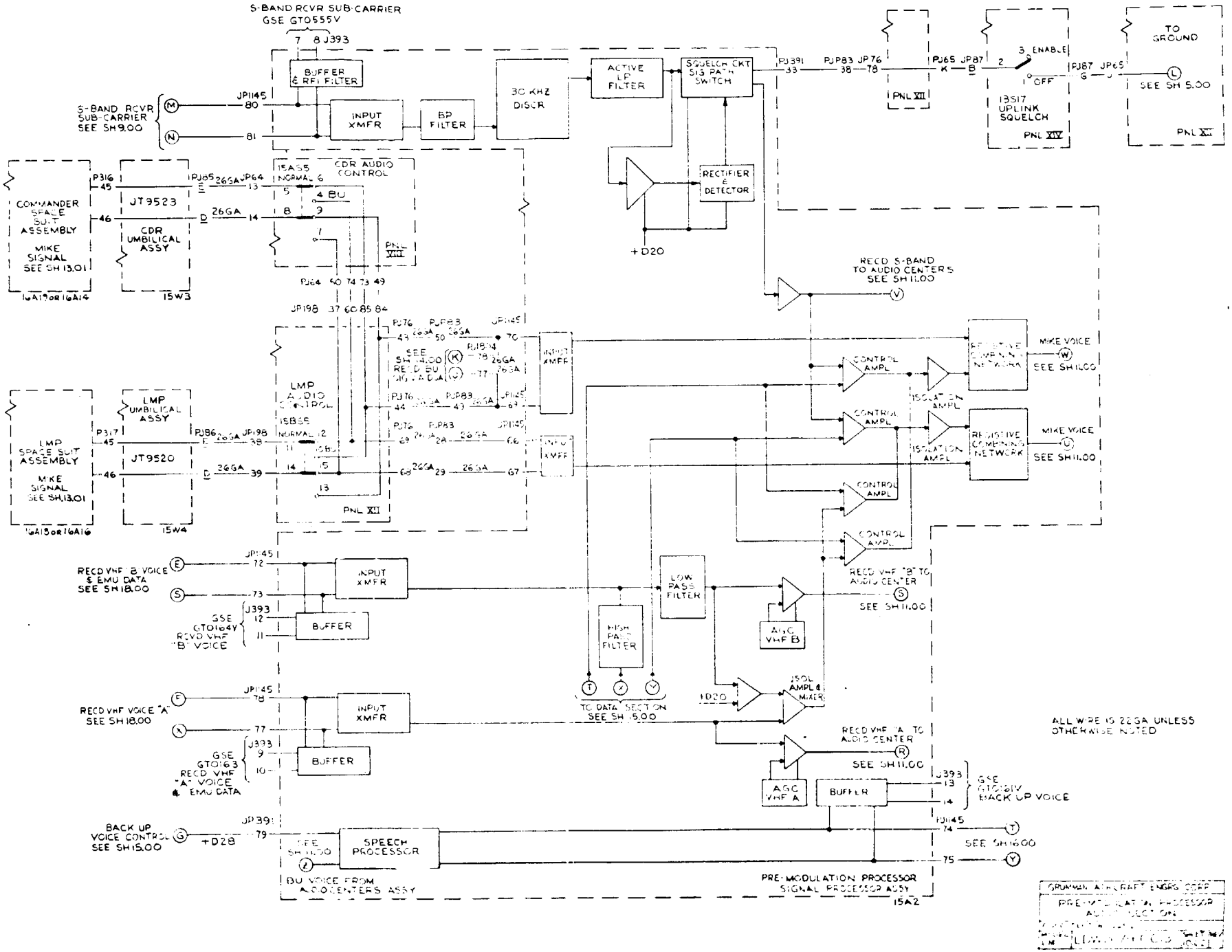


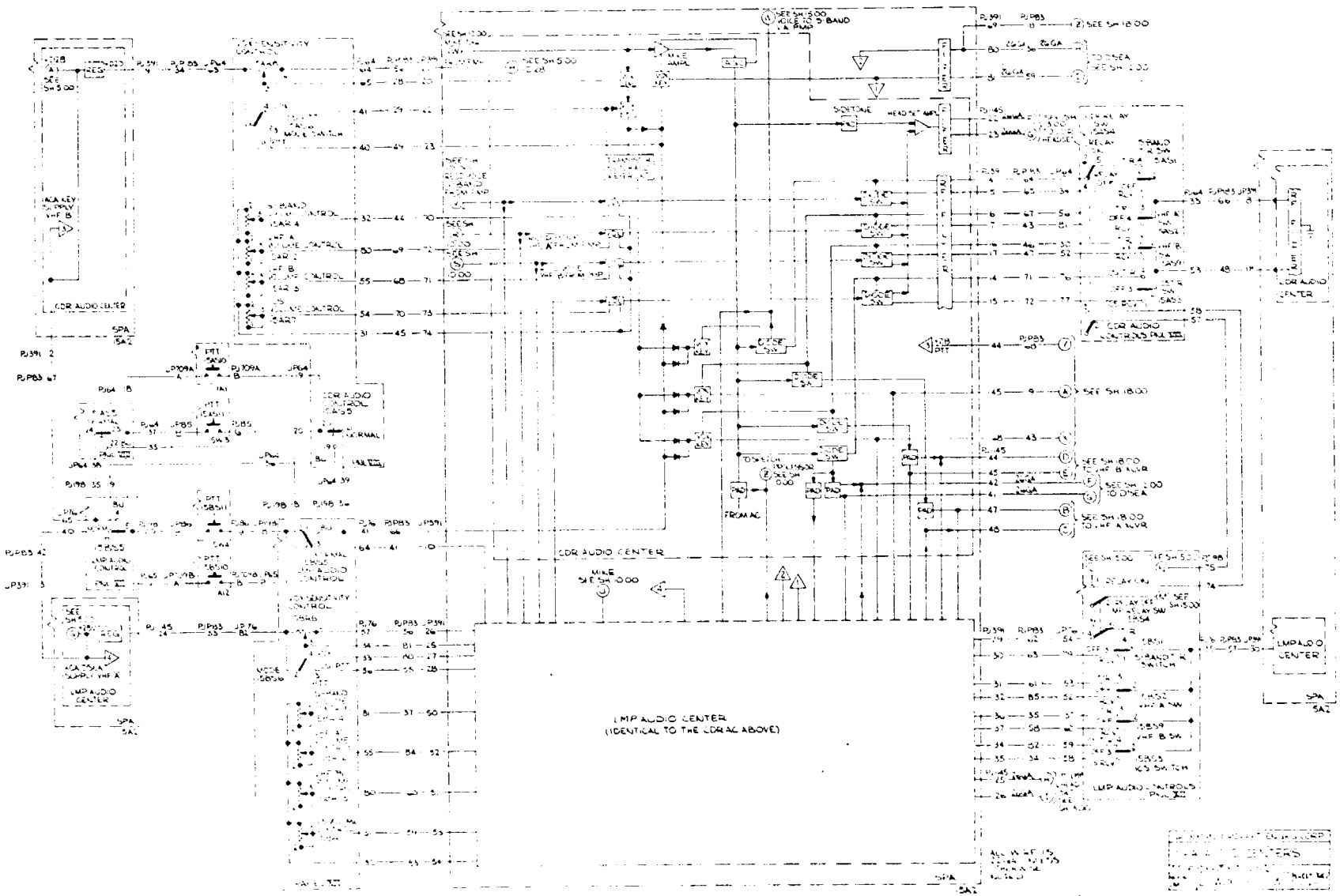
ALL WIRE IS 26 GA UNLESS OTHERWISE NOTED.

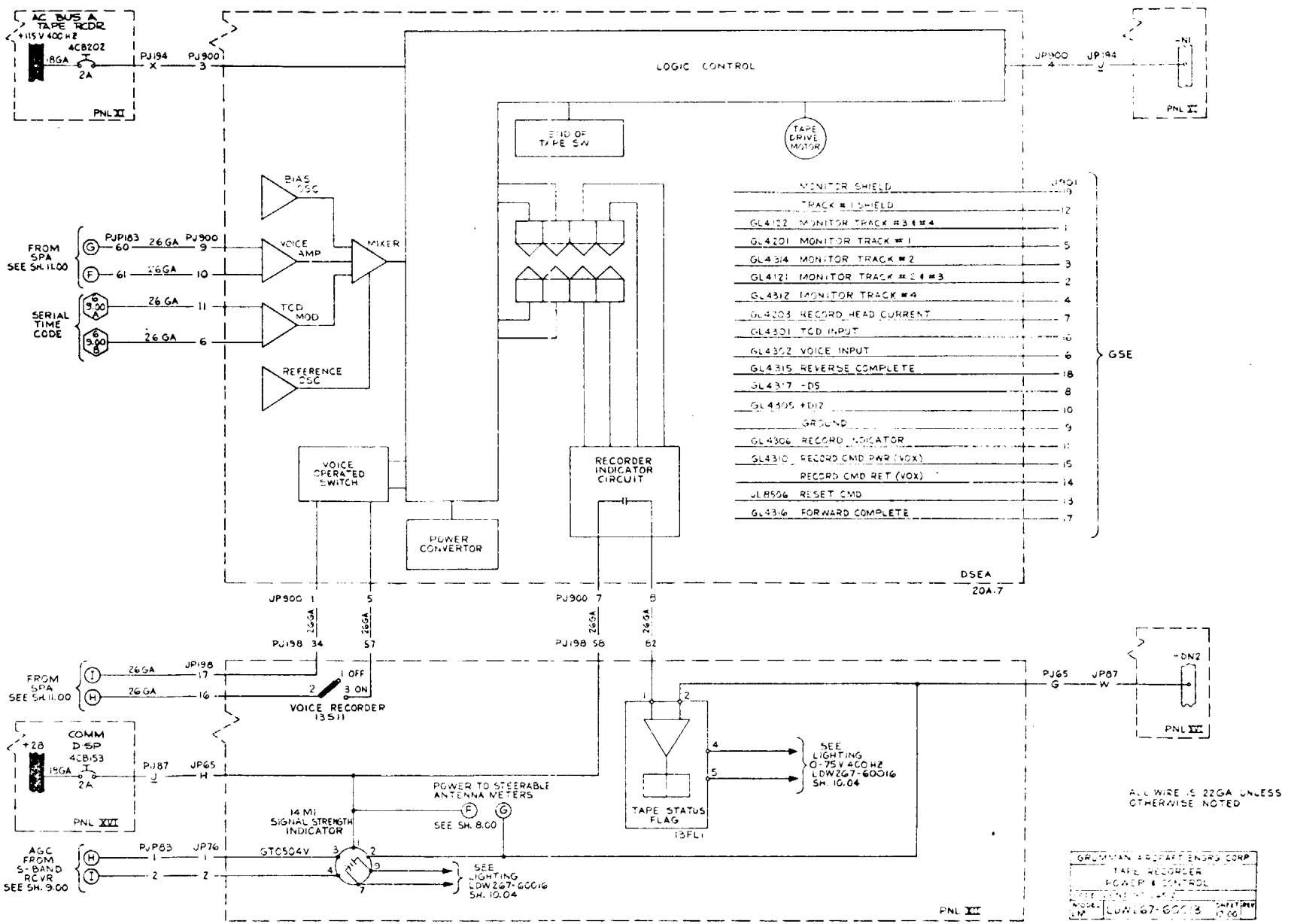
GRUMMAN AIRCRAFT ENGR CORP	
S-BAND ANTENNAS INPUT & OUTPUT	
CODE IDENT NO 76812	
MODEL LM	LDW267-60013


5-BAND STEERABLE ANT
FROM S-BAND ANTENNA SELECT SW RF INPUT/OUTPUT PJ1111
SEE SH 700 GT9504
10V RMS 400Hz
DIVIDE BY X COUNTER
DIVIDE BY Y COUNTER
LOGIC
PIN DIODE SWITCH
FREQUENCY SELECTIVE POWER DIVIDER
90° HYBRID
Σ FEED
Δ FEED
MICROWAVE NET WORK
JP1143
AGC S/G BUFFER
LOAD SW BUFFER
DIVIDE BY 2 COUNTER BUFFER
SERVO MOTORS BUFFER
GT0660V TRACKING AGC SIGNAL
GT0711V 100Hz SYNC OUTPUT
GT0712V 50Hz SYNC OUTPUT DVT ONLY
GT0665V Yg SERVO OUTPUT 90°
GT0664V Yg SERVO OUTPUT 0°
GT0663V Xg SERVO OUTPUT 90°
GT0662V Xg SERVO OUTPUT 0°
USED FOR VENDOR ACCEPTANCE TEST & FAULT ISOLATION TEST.
POWER SUPPLY RETURN
SEE SH 600
YAW SLEW CONTROL
PITCH SLEW CONTROL
+115V 400Hz
COMMAND +120°
COMMAND 0°
COMMAND -120°
TRACKING ANTENNA SIGNAL FROM S-BAND SW 300
R.F. TRANSFER GATE DEMODULATOR
R.F. TRANSFER GATE AXIS GATE
X AXIS SERVO AMPL
Y AXIS SERVO AMPL
BAL MOD
DEMODULATORS
RESOLVER EXCITER AMPL
ANT SERVO X AXIS
ANT SERVO Y AXIS
TRANSDUCER
Xg & Yg DEMOD AMP AND ANGLE AMPLIFIER
10V 400Hz
TEMP SENSORS GT0454T
ANTENNA YAW INDICATOR (14M3 OUTPUT) GT0452M
ANTENNA PITCH INDICATOR (14M3 OUTPUT) GT0451M
REACTION CONTROL
PNL XII
PNL XII
ELECTRONICS ASSY
ALL WIRE 22 GA UNLESS OTHERWISE NOTED.
5-BAND STEERABLE ANTENNA
14A2
GRUMMAN AEROSPACE CORP
S-BAND STEERABLE ANTENNA
LDW267-60013


S BAND ANT INPUT SEE SH 700
J P380
RF DIODE SWITCH
MIXER NO 1
GAIN CONTROL AMPL
MIXER NO 2
BANDPASS FILTER
WIDEBAND IF AMPL
AGC DET
AGC
SUM NETWORK
PRE COND
RFI FILTER
RECEIVER NO 1 (IDENTICAL TO NO 2)
PHASE MODULATOR SEE SH 1600
TO SIG STRENGTH INDICATOR SEE SH 1200
TLM AGC
TLM AGC RET
TRACKING AGC SIGNAL TO S-BAND STEERABLE ANT SEE SH 8100
S-BAND RCVR S.A. ASSY SEE SH 10100
LPM2
DIVIDER
PHASE SHIFTER
PHASE SHIFT
PHASE DET
VOLTAGE CONTROLLER OSCILLATOR
RECEIVER NO 2
TLM STATS C ERROR
S-BAND TRANSCEIVER
3A1
RANGE/TV FUNCTION SW 1351
RANGE
TV CMEA ENABLE
PNL XII
INT DISTR
CMEA MASTER ALARM
SET
RESET
K45
S-BAND RCVR 6DS40
PNL II
+2.6 VOLTS
TEST
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.
HLD = HIGH LEVEL DETECTOR
GRUMMAN AIRCRAFT ENERG CORP
S-BAND TRANSCEIVER RECEIVER SECTION
CODE IDENT NO 71511
LDW267-60013

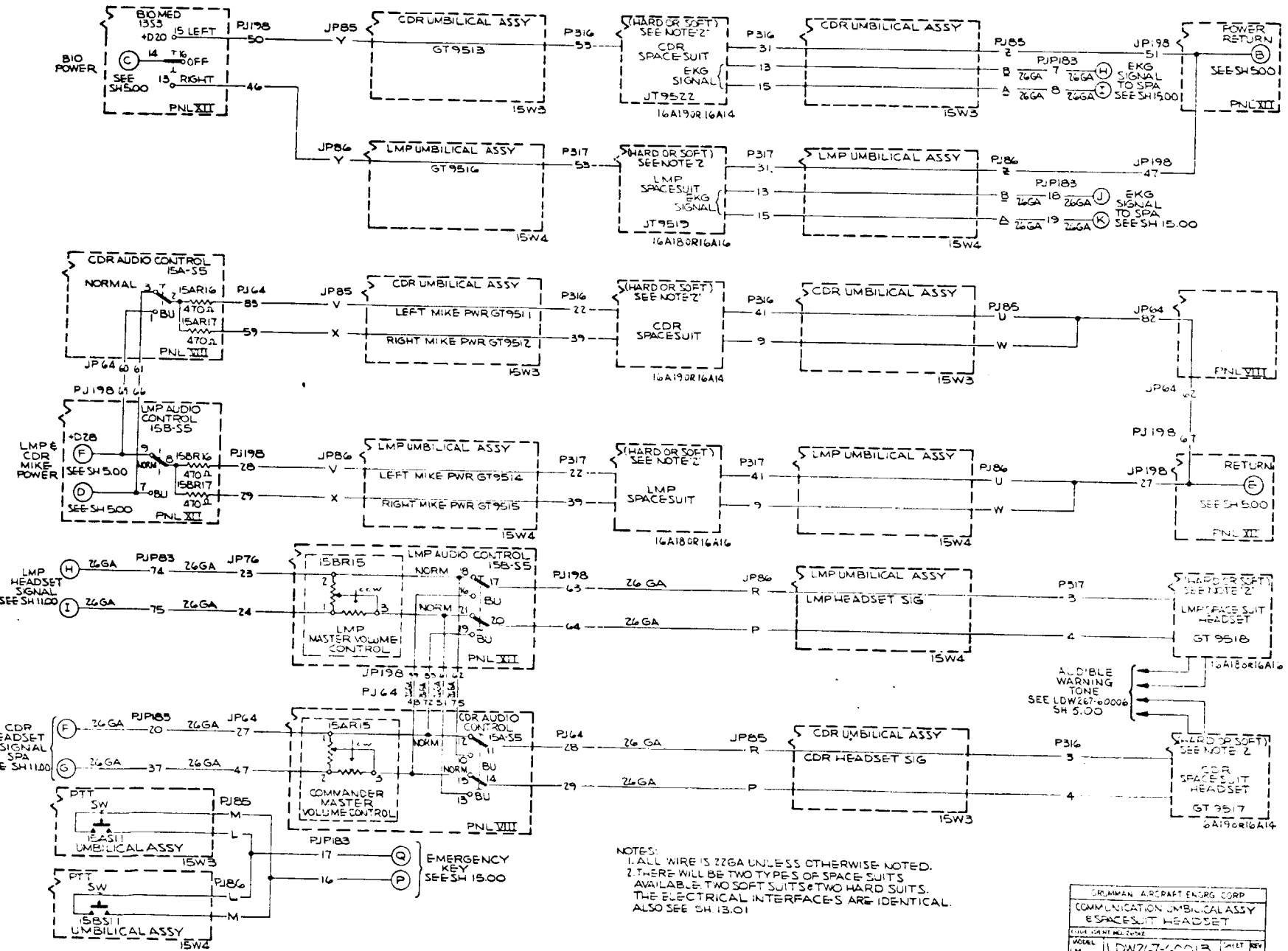

S-BAND RCVR SUB-CARRIER
GSE GT0555V
J393
BUFFER & RFI FILTER
S-BAND RCVR SUB-CARRIER SEE SH 9.00
INPUT XMFR
BP FILTER
30 KHZ DISCR
ACTIVE LP FILTER
SQUELCH CKT SIG PATH SWITCH
RECTIFIER & DETECTOR
+D20
PNL XII
PNL XIV
13S17 UPLINK SQUELCH
ENABLE
OFF
TO GROUND
SEE SH 5.00
PNL XV
CDR AUDIO CONTROL
15A55
COMMANDER SPACE SUIT ASSEMBLY
MIKE SIGNAL SEE SH 13.01
JT9523
CDR UMBILICAL ASSY
15W3
PNL XIII
RECD S-BAND TO AUDIO CENTERS SEE SH 11.00
LMP AUDIO CONTROL
15B55
LMP SPACE SUIT ASSEMBLY
LMP UMBILICAL ASSY
JT9520
15W4
CONTROL AMPL
ISOLATION AMPL
REGENERATIVE COMBINING NETWORK
MIKE VOICE
SEE SH 11.00
RECD VHF 'B' VOICE & EMU DATA SEE SH 18.00
RECD VHF 'B' VOICE
LOW PASS FILTER
HIGH PASS FILTER
AGC VHF B
RECD VHF 'B' TO AUDIO CENTER
RECD VHF VOICE 'A' SEE SH 18.00
RECD VHF 'A' VOICE & EMU DATA
TO DATA SECTION SEE SH 5.00
ISOL AMPL & MIXER
AGC VHF A
RECD VHF 'A' TO AUDIO CENTER
BACK UP VOICE CONTROL SEE SH 15.00
+D28
SPEECH PROCESSOR
BU VOICE FROM AUDIO CENTERS ASSY
PRE-MODULATION PROCESSOR SIGNAL PROCESSOR ASSY
15A2
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
PRE-MODULATION PROCESSOR AUDIO SECTION


CDR AUDIO CENTER
LMP AUDIO CENTER
(IDENTICAL TO THE CDR AC ABOVE)
MIKE
SEE SH 5.00
FROM AC
SPA
SA1
SA2



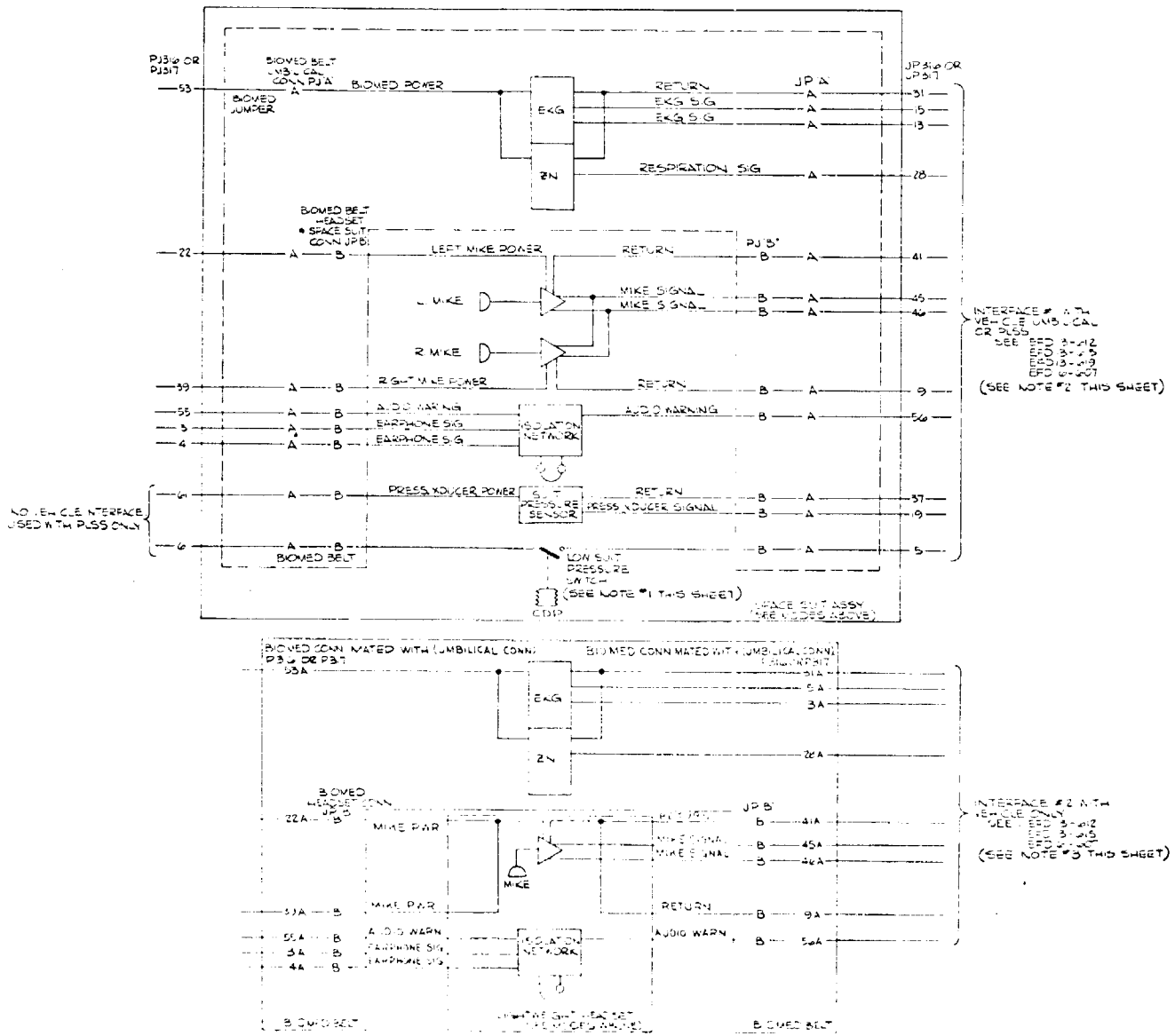
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

GRUMMAN AEROSPACE CORP
TAPE RECORDER
POWER & CONTROL
SIZE LDW267-60018 SHEET 17.00



NOTES:
1. ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.
2. THERE WILL BE TWO TYPES OF SPACE SUITS AVAILABLE TWO SOFT SUITS & TWO HARD SUITS. THE ELECTRICAL INTERFACES ARE IDENTICAL. ALSO SEE SH 13.01

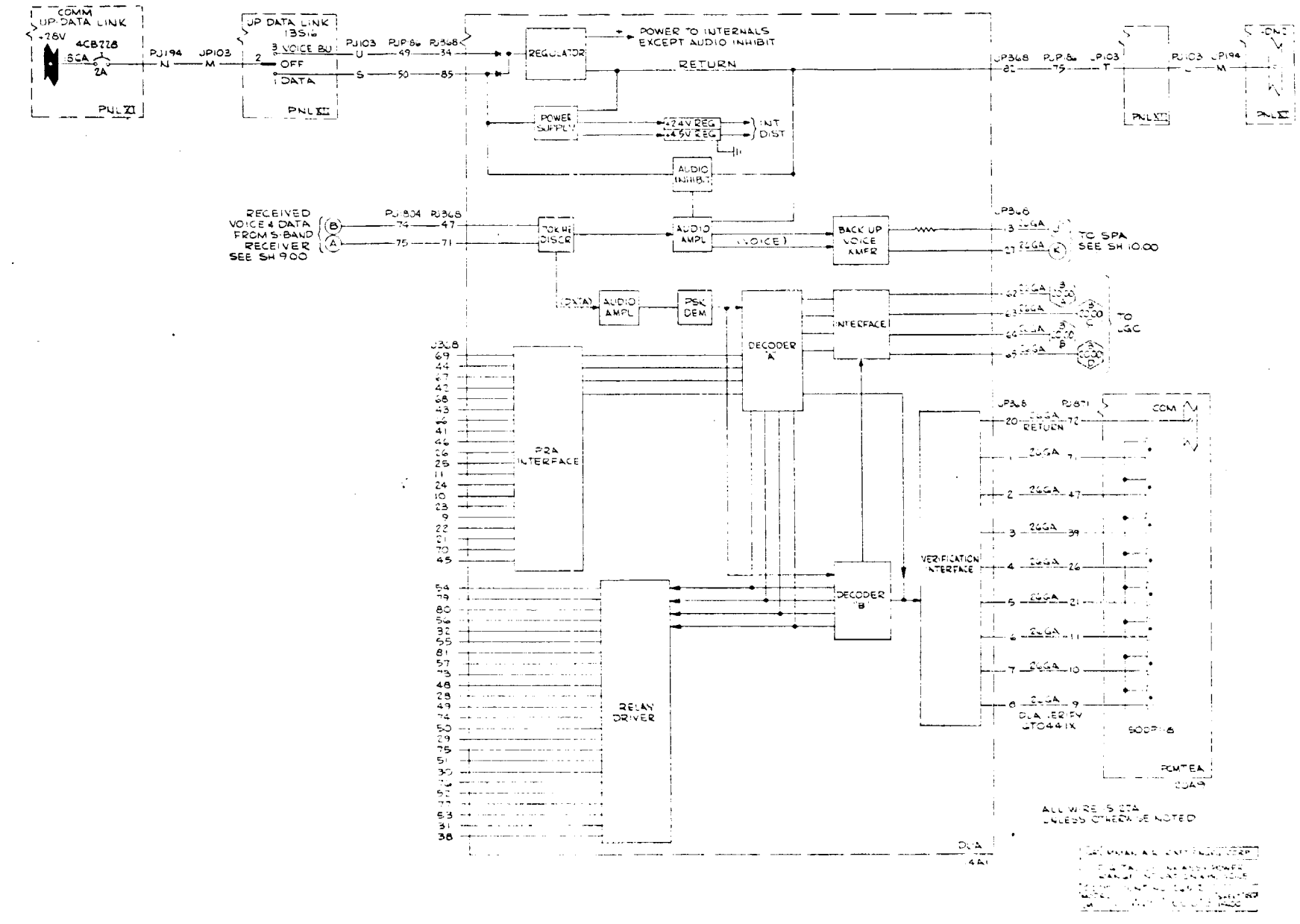
GRUMMAN AIRCRAFT ENGRG CORP			
COMMUNICATION UMBILICAL ASSY ESPACESUIT HEADSET			
YOUR IDENT NO. HERE			
MODEL LM	LDW267-60013	SHEET 3 OF 3	REV

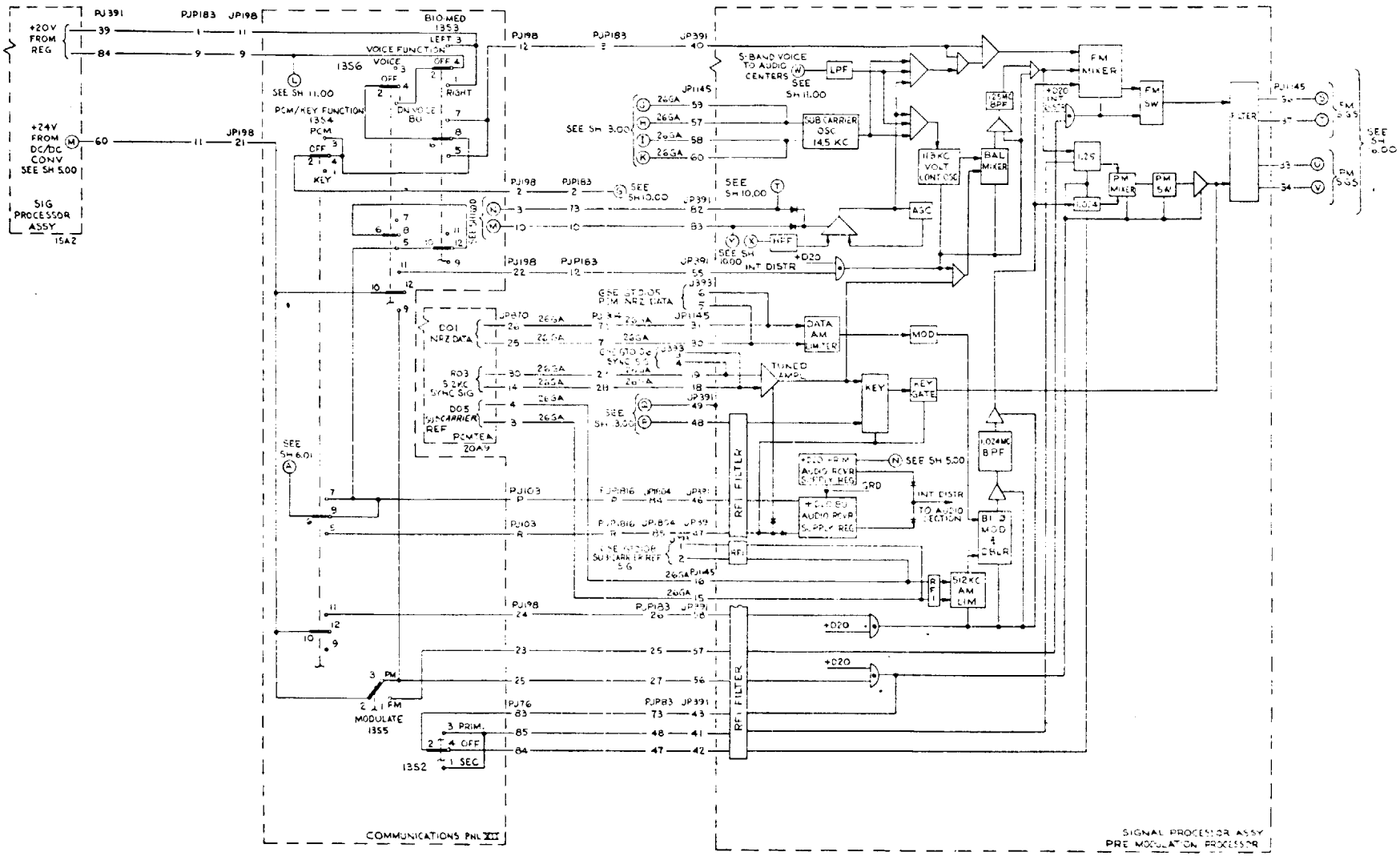


SPACE SUIT MODES (NORMAL)				
MODE	ENVIRONMENT	REF	INTERFACE	QUANTITY
1	ALSS (HARD SUIT) (SEE NOTE #4 THIS SH)	MIL-C-26482 (USAF)	#1	2
2	ALSS (SOFT SUIT) (SEE NOTE #4 THIS SH)	MIL-C-26482 (USAF)	#1	2
3	SPACE SUIT ASSY (LIGHTWEIGHT HEADSET)	MIL-C-26482 (USAF)	#2	2

NOTES

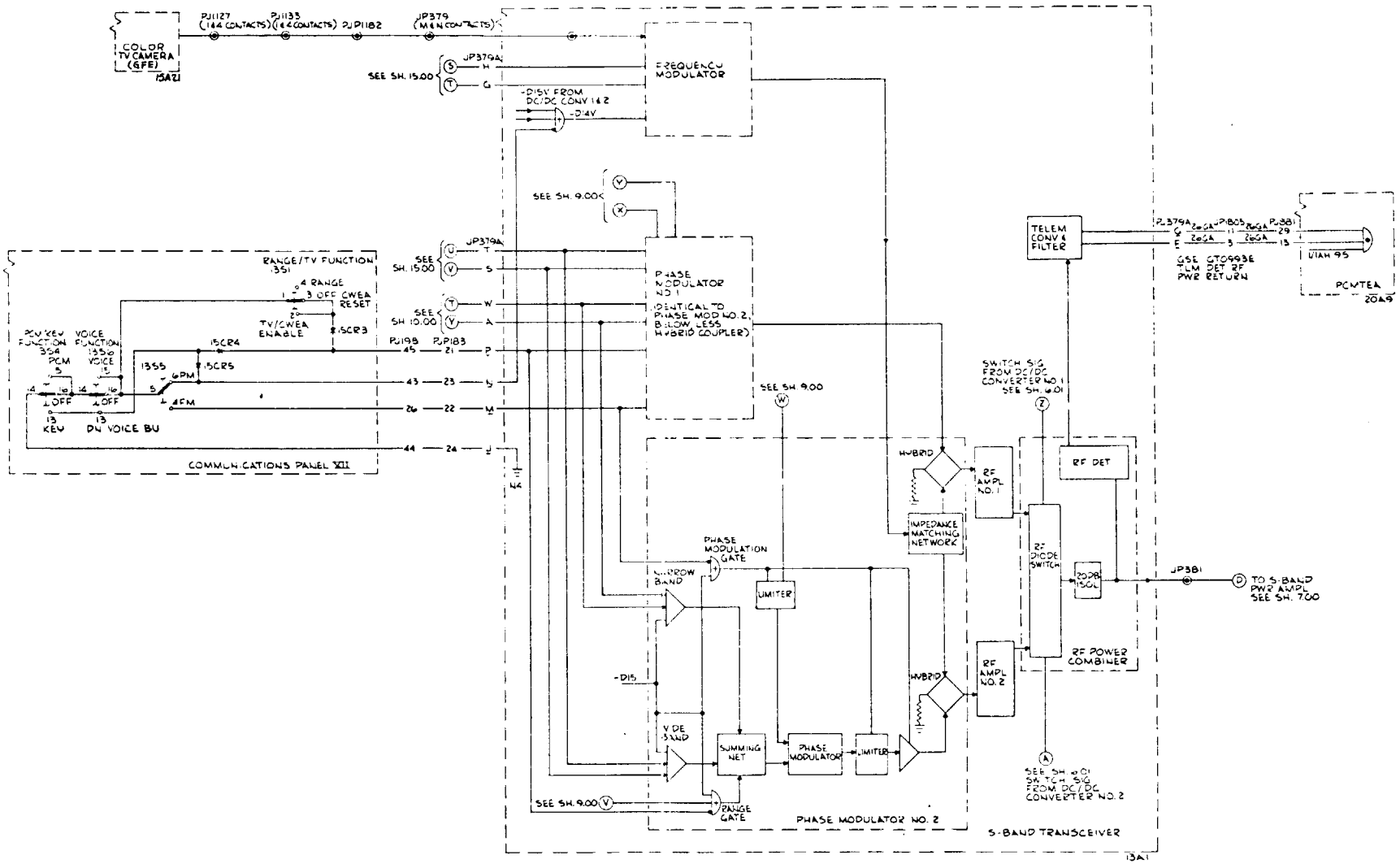
1. DURING MODES #1 AND #2 USE DUAL CONNECTOR & LOW PRESSURE SWITCH ARE UNUSED AND CLOSED IN OPERATION.
2. DURING MODE #2 A/B UMBILICAL CONNECTS THE UMBILICAL CONNECTOR (P316 OR P317) TO THE BIOMED CONNECTOR (JP A).
3. DURING MODE #3 THE UMBILICAL PLUG MATES DIRECTLY TO THE BIOMED CONNECTOR (JP A). THE LOW WEIGHT HEADSET CONNECTS DIRECTLY TO THE BIOMED CONNECTOR PJ B.
4. WITH SPACE SUIT ASSEMBLY RESTRICTED TO THE VEHICLE AT EACH END, THE REQUIREMENTS FOR ALSS MODES AND DATE AND IN MODES ARE TO BE ENFORCED.


COMM UP DATA LINK
+28V
4CB228
5A
2A
PNL XI
PJ194
N
JP103
M
UP DATA LINK TBS16
3 VOICE BU
2
OFF
1 DATA
PNL XII
PJ103
U
S
PJP8a
49
50
PJ368
34
85
REGULATOR
POWER TO INTERNALS EXCEPT AUDIO INHIBIT
RETURN
POWER SUPPLY
+24V REG
+4.5V REG
INT DIST
AUDIO INHIBIT
JP368
82
75
JP103
T
PJ103
L
JP194
M
PNL XII
PNL XI
RECEIVED VOICE & DATA FROM S-BAND RECEIVER SEE SH 900
PJ804
74
75
PJ368
47
71
70K HI DISCR
AUDIO AMPL
(VOICE)
BACK UP VOICE AMPR
JP368
3
27
TO SPA SEE SH 10.00
(DATA)
AUDIO AMPL
PSK DEM
DECODER A
INTERFACE
TO LGC
J368
69
44
47
42
68
43
66
41
46
26
25
11
24
10
23
9
22
21
70
45
P2A INTERFACE
54
79
80
56
32
55
81
57
73
48
28
49
74
50
29
75
51
30
53
31
38
RELAY DRIVER
DECODER B
VERIFICATION INTERFACE
JP368
PJ871
COM
20
RETURN
72
1
7
2
47
3
39
4
26
5
21
6
11
7
10
8
9
DLA VERIFY LTO441X
SOCP16
PCMTEA
20A9
DLA
4A1
ALL WIRE 5 STA
UNLESS OTHERWISE NOTED



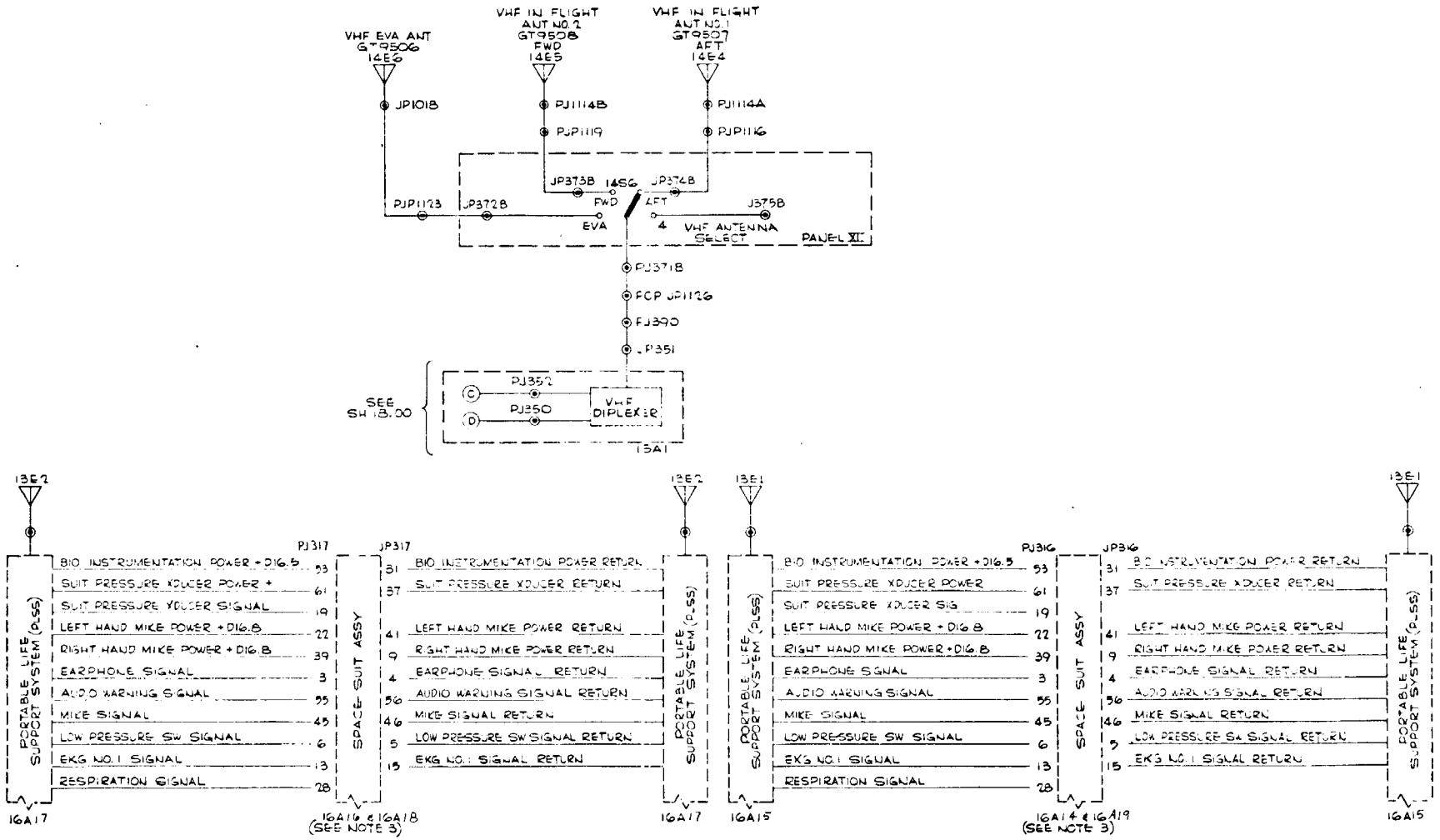
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP
SIGNAL PROCESSOR ASSY PRE MODULATION PROCESSOR



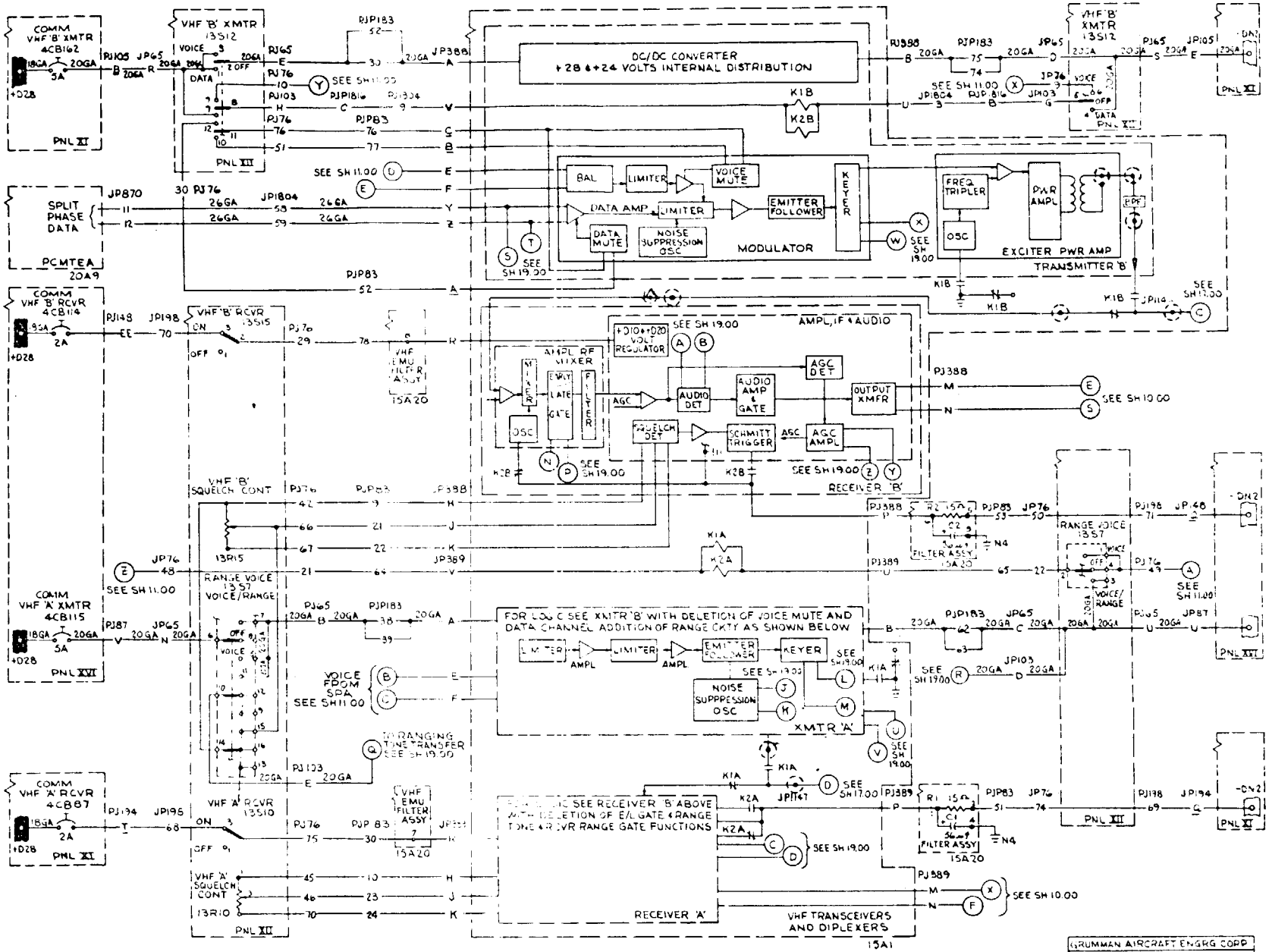
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

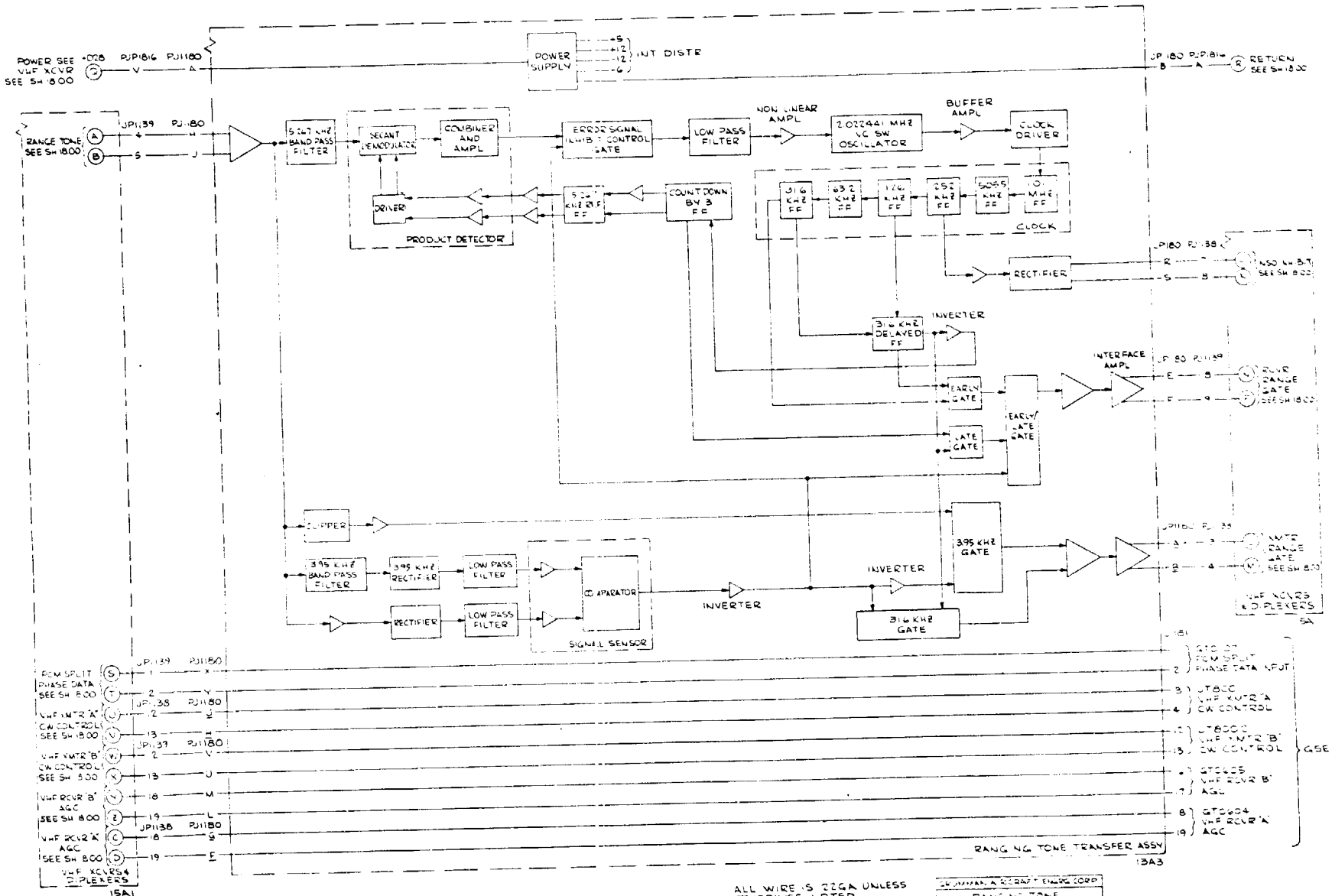
GRUMMAN AIRCRAFT ENGRG CORP	
S-BAND TRANSCEIVER TRANSMIT SECTION	
CODE IDENT NO. 24931	
MODEL LM	LDW267.60013



NOTES:
1. THE PLSS IS PLUGGED INTO THE ASTRONAUT'S UMBILICAL ASSY AS SHOWN FOR THE LUNAR STAY INVESTIGATION. WHEN IN THE SPACE CRAFT THE PLSS IS REPLACED BY THE COMMUNICATIONS SYSTEM.
2. LEGEND "AFT" WILL BE USED FOR PLSS TEST POSITION. A PERMANENT LOCKOUT ON PANEL PREVENTS TURNING TO THE FOURTH POSITION.
3. THERE ARE TWO TYPES OF SPACE SUITS; A7L AND A6L. THE ELECTRONIC INTERFACES ARE IDENTICAL.

GRUMMAN AIRCRAFT ENGRG CORP	
VHF ANTENNAS AND PLSS SYSTEM	
CONTRACT NO. NAS 9-1	
MODEL LM	LDW-207-60018


COMM VHF 'B' XMTR 4CB162
VHF 'B' XMTR 13S12
DC/DC CONVERTER +28 & +24 VOLTS INTERNAL DISTRIBUTION
BAL
LIMITER
VOICE MUTE
DATA AMP
LIMITER
DATA MUTE
NOISE SUPPRESSION OSC
MODULATOR
EMITTER FOLLOWER
KEYER
FREQ TRIPLER
PWR AMPL
OSC
EXCITER PWR AMP
TRANSMITTER 'B'
SPLIT PHASE DATA
PCMTEA 20A9
COMM VHF 'B' RCVR 4CB114
VHF 'B' RCVR 13S15
AMPL, IF & AUDIO
+10 & +20 VOLT REGULATOR
AMPL RF MIXER
AUDIO DET
AUDIO AMP & GATE
AGC DET
OUTPUT XMFR
SQUELCH DET
SCHMITT TRIGGER
AGC AMPL
RECEIVER 'B'
VHF 'B' SQUELCH CONT
RANGE VOICE 13S7 VOICE/RANGE
COMM VHF 'A' XMTR 4CB115
FOR LOGIC SEE XMTR 'B' WITH DELETION OF VOICE MUTE AND DATA CHANNEL ADDITION OF RANGE CKT AS SHOWN BELOW
NOISE SUPPRESSION OSC
XMTR 'A'
VOICE FROM SPA SEE SH 11.00
TO RANGING TONE TRANSFER SEE SH 19.00
COMM VHF 'A' RCVR 4CB87
VHF 'A' RCVR 13S10
VHF 'A' SQUELCH CONT
FOR LOGIC SEE RECEIVER 'B' ABOVE WITH DELETION OF E/L GATE & RANGE TONE & RCVR RANGE GATE FUNCTIONS
RECEIVER 'A'
VHF TRANSCEIVERS AND DIPLEXERS
15A1
VHF EMU FILTER ASSY 15A20
PNL XI
PNL XII
PNL XIII
PNL XVI
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
GRUMMAN AIRCRAFT ENGRG CORP
VHF TRANSCEIVERS
LDW267-600:3


POWER SEE VHF XCVR SEE SH 18.00
+28
PJP1816
PJ1180
POWER SUPPLY
+5
+12
-12
-6
INT DISTR
JP 180 PJP1816
RETURN SEE SH 18.00
RANGE TONE SEE SH 18.00
JP1139
PJ1180
5267 KHZ BAND PASS FILTER
SECANT DEMODULATOR
COMBINER AND AMPL
ERROR SIGNAL INHIBIT CONTROL GATE
LOW PASS FILTER
NON LINEAR AMPL
2.022441 MHZ VC SW OSCILLATOR
BUFFER AMPL
CLOCK DRIVER
DRIVER
5267 KHZ R-F FF
COUNT DOWN BY 3 FF
PRODUCT DETECTOR
316 KHZ FF
632 KHZ FF
1.26 MHZ FF
2.52 MHZ FF
5.045 MHZ FF
10 MHZ FF
CLOCK
RECTIFIER
JP180 PJ1838
NSD LW B/T SEE SH 8.00
316 KHZ DELAYED FF
INVERTER
EARLY GATE
LATE GATE
EARLY/LATE GATE
INTERFACE AMPL
JP 80 PJ1139
RCVR RANGE GATE SEE SH 18.00
CLIPPER
395 KHZ BAND PASS FILTER
395 KHZ RECTIFIER
LOW PASS FILTER
RECTIFIER
LOW PASS FILTER
COMPARATOR
SIGNAL SENSOR
INVERTER
395 KHZ GATE
INVERTER
316 KHZ GATE
JP1181
XMTR RANGE GATE SEE SH 8.00
VHF XCVRS & DIPLEXERS
5A
PCM SPLIT PHASE DATA SEE SH 8.00
VHF XMTR 'A' CW CONTROL SEE SH 18.00
VHF XMTR 'B' CW CONTROL SEE SH 8.00
VHF RCVR 'B' AGC SEE SH 8.00
VHF RCVR 'A' AGC SEE SH 8.00
JP1139
JP1138
PJ1180
PJ1138
GTD 07 PCM SPLIT PHASE DATA INPUT
GTD 06 VHF XMTR 'A' CW CONTROL
GTD 05 VHF XMTR 'B' CW CONTROL
GTD 03 VHF RCVR 'B' AGC
GTD 04 VHF RCVR 'A' AGC
GSE
VHF XCVRS & DIPLEXERS
5A1
RANGING TONE TRANSFER ASSY
5A3
ALL WIRES 22GA UNLESS OTHERWISE NOTED
SPERRY GYROSCOPE CORP
RANGING TONE TRANSFER ASSY
LDW267-0013

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 16)

CREW PROVISIONS & LIGHTING CONTROLS

(REF LDW267-60016 A)

1. Applicable Documents

Level Three Drawings

ITEM NAME	DWG. NO.	REV.	E.O.'s
Crew Provisions	LDW340-60999	A	B1

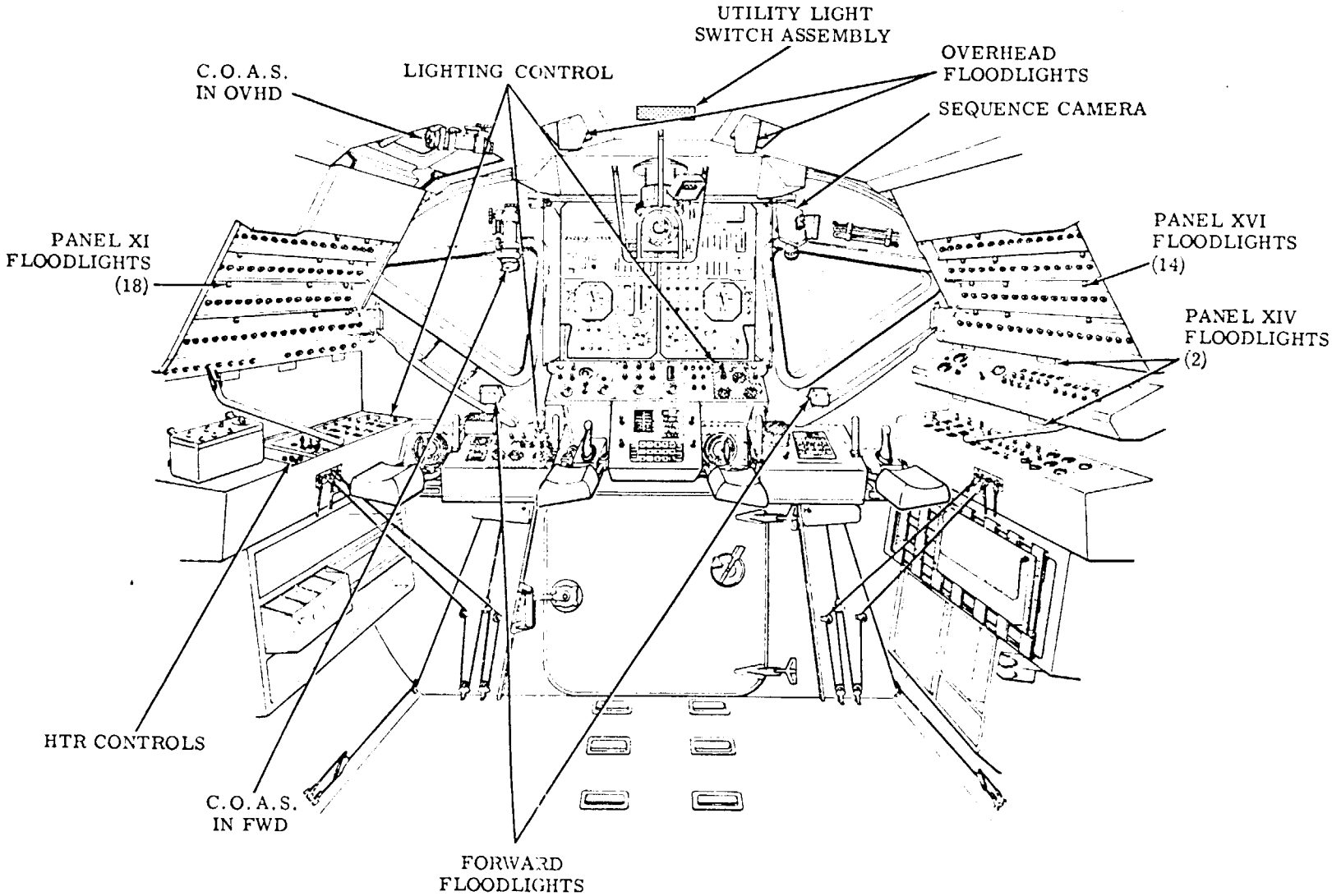
2. Table of Contents

ITEM NAME

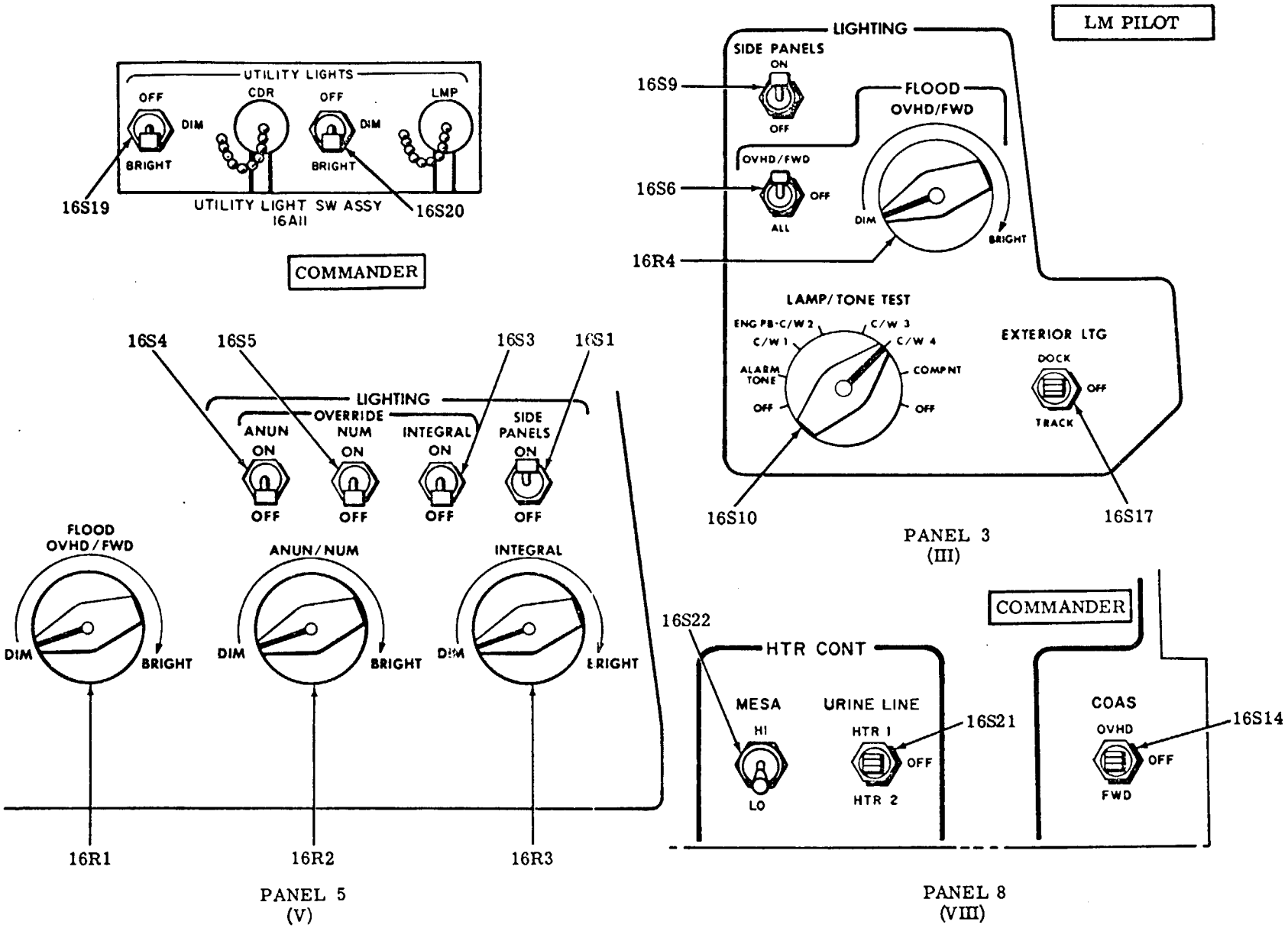
a)	Sheet Cover	16-1001
b)	Applicable Documents, Table of Contents and Notes & Revisions	16-1002 & 16-1002.1
c)	Cabin Location of Crew Prov Lighting & Heater Controls and Indicators	16-1003
d)	Crew Provisions - Lighting & Heater Controls and Indicators Layout	16-1004
e)	Location of Floodlights PNL XI	16-1004.1
f)	Location of Floodlights PNL XIV & XVI	16-1004.2
g)	Crew Optical Alignment Sight (System Configuration)	16-1004.3
h)	Crew Provisions - Lighting Controls, Functional Description	16-1005 thru 1005.5
i)	Crew Provisions - Lighting Block Diagram	LDW267-60016 SH 4.00
j)	Crew Provisions - Schematic Diagram LCA Distribution	LDW267-60016 SH 4.01A
k)	Crew Provisions - Lighting Floodlights	LDW267-60016 SH 5.00
l)	Crew Provisions - Power Distribution Engine Start and Stop	LDW267-60016 SH 6.00
m)	Crew Provisions - Tracking and Docking Lights	LDW267-60016 SH 7.00
n)	Crew Provisions - Power Failure Relay Indicators	LDW267-60016 SH 8.00
o)	Crew Provisions - Common Return to Lighting	LDW267-60016 SH 9.00
p)	Crew Provisions - Integral Lighting for PNLS III & V (EL Illumination	LDW267-60016 SH 10.00
q)	Crew Provisions - Integral Lighting for PNLS I, II, IV & VI (EL Illumination)	LDW267-60016 SH 10.01
r)	Crew Provisions - Lighting Numerics (EL Illumination)	LDW267-60016 SH 10.02
s)	Crew Provisions - Integral Lighting for PNLS VIII & XI (EL Illumination)	LDW267-60016 SH 10.03
t)	Crew Provisions - Integral Lighting for PNLS XII, XIV, & XVI (EL Illumination)	LDW267-60016 SH 10.04
u)	Crew Provisions - Sequence Camera & Crewman Optical Alignment Sight	LDW267-60016 SH 11.00
v)	Crew Provisions - Urine Line and Mesa Heaters	LDW267-60016 SH 12.00A

3. Applicable Revisions

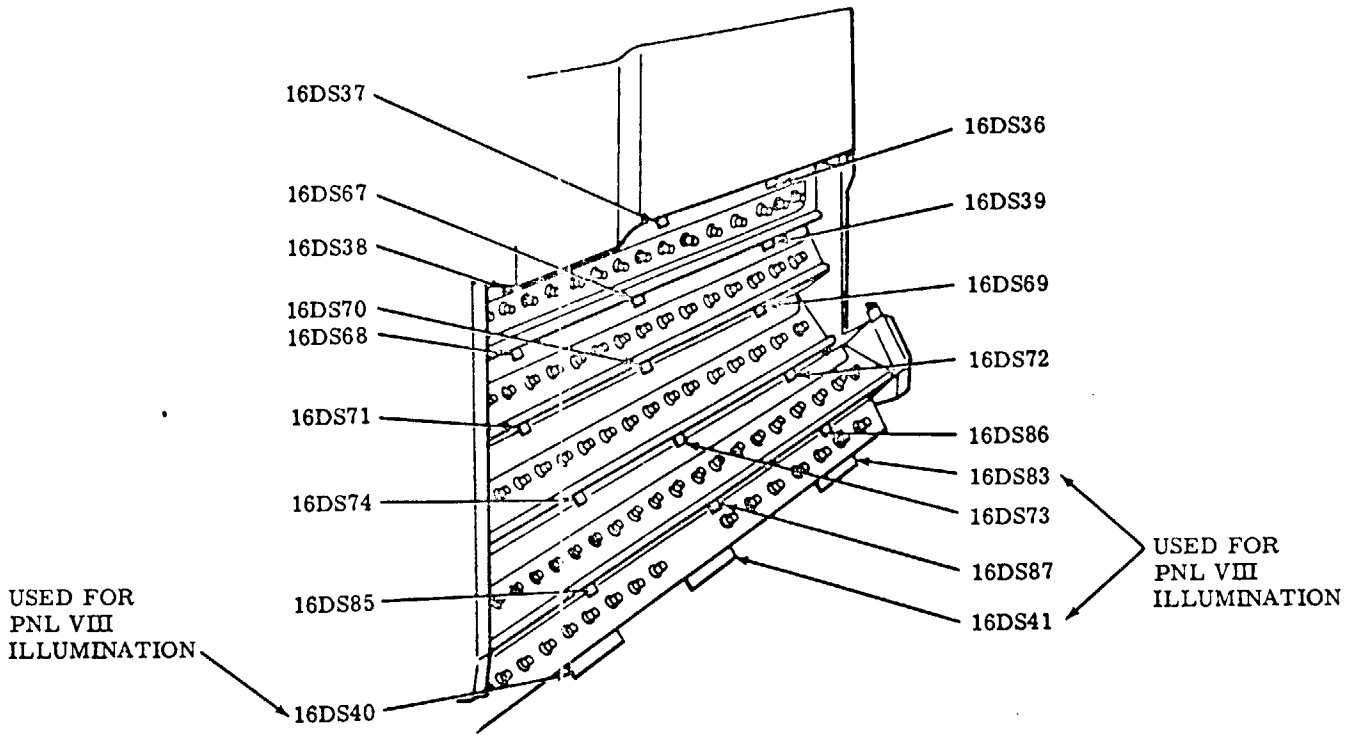
Rev	Sheet No.	LCD	Description
A	16-12.00	3994L	LM Modification program
	16-4.01	5374A	Replacement of the water quantity measuring device (WQMD) with an absolute pressure transducer
	16-12.00	5502	Transducer installation for APS helium pressure and H_2O line temperature



Cabin Location of Crew Provisions Lighting & Heater Controls and Indicators

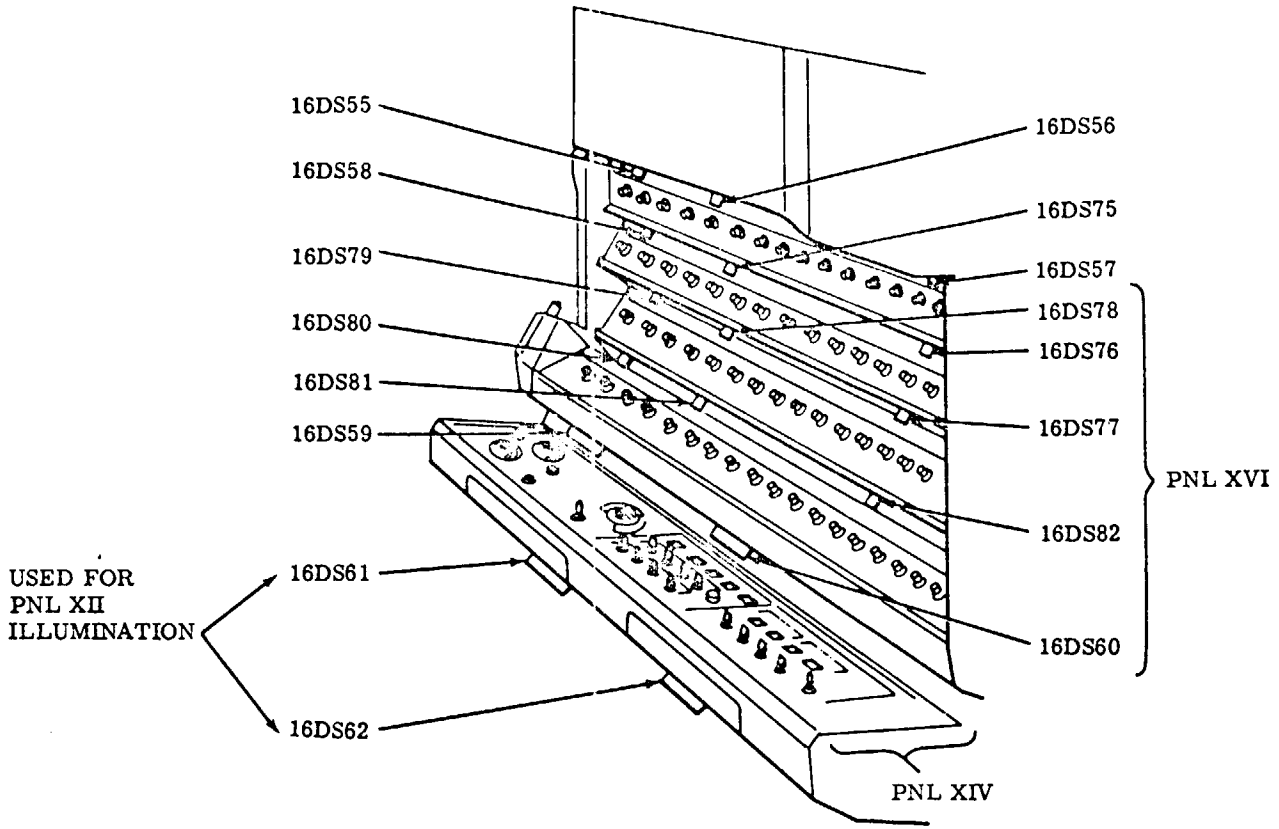


Lighting Crew Provisions Lighting and Heater Controls and Indicators Layout



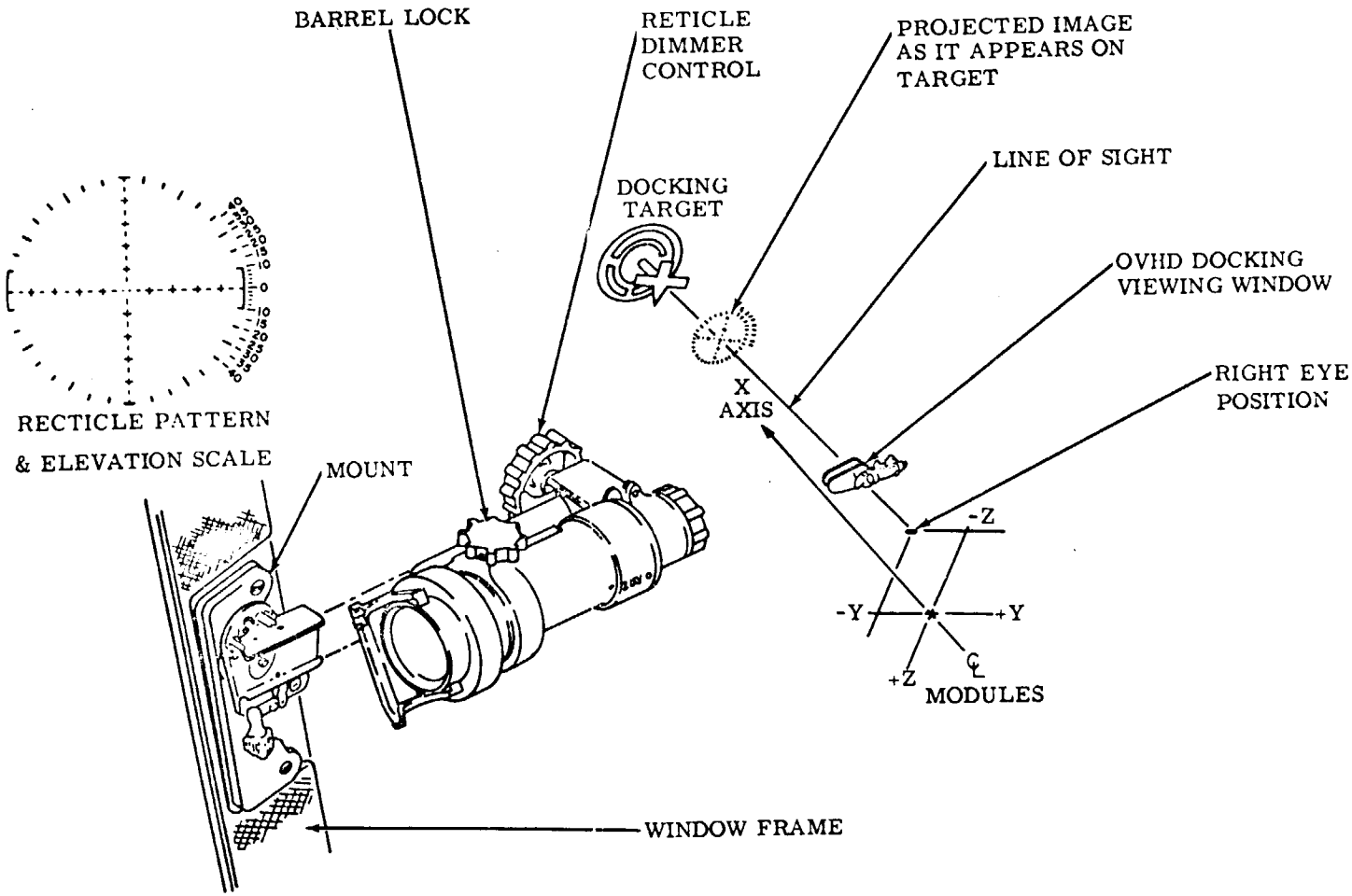
PNL XI

Location of Floodlights (Side Panel Illumination)



PNL XIV & XVI

Location of Floodlights (Side Panel Illumination)



Crewman Optical Alignment Sight (System Configuration)

SUBSYSTEM: CREW PROVISIONS & LIGHTING CONTROL (FUNCTIONAL GROUPING 16)

Code	Control/Indicator	Function
16R1	FLOOD LIGHTING CONTROL OVHD/FWD CONTINUOUS ROTARY	This continuous rotary (DIM-BRIGHT) controls the brightness of the 28V incandescent overhead and forward flood lights on the Commander's side of the cockpit from DIM to BRIGHT. It is operable only when 16S6 is in either the OVHD/FWD or ALL position when the OVHD hatch is closed. If the hatch is open, the dimmer adjusts the intensity level regardless of the position of 16S6.
16R2	ANUN/NUM CONTROL	This continuous rotary (DIM-BRIGHT) controls the brightness of the annunciators (except the C/W PWR annunciator), some of the component caution lights, incandescently illuminated pushbuttons, the electroluminescent numeric displays and time-shared displays (i.e., temporary legends or multipliers). An override switch (16S4) is provided for the annunciators, component caution lights and pushbuttons, and a second override switch (16S5) for the EL numeric and time-shared displays in the event that either of these two portions of the ANUN/NUM control fails. A third portion of this control varies DSKY numeric lights. It has no override switch.
16R3	INTEGRAL LIGHTING CONTROL CONTINUOUS ROTARY	This continuous rotary (DIM-BRIGHT) controls the brightness of the low level EL integrally illuminated markings and displays from DIM to BRIGHT. Should this control fail, it may be bypassed by 16S3, which will increase the maximum operating voltage from 75V to 115V.
16R4	FLOOD LIGHTING CONTROL OVHD/FWD CONTINUOUS ROTARY	This continuous rotary (DIM-BRIGHT) controls the brightness of the 28V incandescent overhead and forward flood lights on the LM Pilot's side of the cockpit from DIM to BRIGHT.

SUBSYSTEM: CREW PROVISIONS & LIGHTING CONTROL (FUNCTIONAL GROUPING 16)

Code	Control/Indicator	Function
16R4 (Cont.)		It is operable only when 16S6 is in either the OVHD/FWD or ALL position when the OVHD hatch is closed. If the hatch is open the dimmer adjusts the intensity level regardless of the position of 16S6.
16S1 16S9	SIDE PANELS SWITCH (CDR) SIDE PANELS SWITCH (LMP) TWO 2-POSITION TOGGLES MAIN-MAIN	These two-position toggles (ON-OFF) provide ON/OFF control of the CDR's and LMP's side panel EL illumination. In the ON position these switches connect the integral lights located on the CDR's and/or LMP's side panels to 16R3 and 16S3. In the OFF position, the side panels are not connected to 16R3 and 16S3 and are therefore not EL illuminated.
16S2	EXTERIOR LIGHTING CONTROL 3-POSITION TOGGLE MAIN-MAIN-MAIN	This 3-position toggle switch (DOCK-OFF-TRACK) controls the docking and tracking lights. In the DOCK position the docking lights are turned on. In the TRACK position, the tracking light is turned on. The OFF position interrupts power to both docking and tracking lights.
16S3	INTEGRAL OVERRIDE SWITCH 2-POSITION TOGGLE MAIN-MAIN	This two-position toggle (ON-OFF) permits 16R3 to be by-passed if the dimmer circuit becomes inoperative. In the OFF position, the intensity of the markings and displays are controlled by 16R3. In the ON position, 16R3 is bypassed and 115 V 400 Hz is applied directly to the EL markings and displays. This switch should only be used in an emergency as full line voltage is detrimental to lamp life.

SUBSYSTEM: CREW PROVISIONS & LIGHTING CONTROL (FUNCTIONAL GROUPING 16)

Code	Control/Indicator	Function
16S4	ANUN OVERRIDE SWITCH 2-POSITION TOGGLE MAIN-MAIN	This two-position toggle (ON-OFF) provides a full voltage bypass of the brightness control of the ANUN portion of the ANUN/NUM control. In the OFF position some of the annunciators, component caution lights and incandescent pushbutton intensities are controlled by 16R2. In the ON position that control is bypassed and 5V DC is amplified directly to the annunciators, component caution lights and incandescently illuminated pushbuttons.
16S5	NUM OVERRIDE SWITCH 2-POSITION TOGGLE MAIN-MAIN	This two-position toggle (ON-OFF) provides a full voltage override to the brightness control of the NUM portion of the ANUN/NUM control. In the OFF position, the electroluminescent numerics (except DSKY numerics) and the time-shared displays are controlled by 16R2. In the ON position that control is bypassed and 115V 400 Hz is supplied directly to the numerics and displays.
16S6	FLOODLIGHT CONTROL 3-POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (OVHD/FWD-OFF-ALL) in the OVHD/FWD position, turns on the two forward floodlights and the two overhead floodlights (fitted with reflectors which can be rotated). In the OFF position, all floodlights will be turned off. The two overhead lights and forward lights can also be turned on by opening the overhead hatch. This overrides all positions of 16S6. The ALL position turns on all cockpit flood lights; overhead, forward and side panels.
16S10	LAMP/TONE TEST SWITCH 8-POSITION ROTARY	This eight-position rotary (OFF-ALARM/TONE-C/W 1 - ENG PB and C/W 2 - C/W 3 - C/W 4 - COMPNT-OFF) is used to perform the following test functions. In the ALARM/TONE position, it tests the lamps in the Master Alarm buttons (6S2 and 6S3) and the Audible Tone (6T1). In the C/W 1 position it tests the lamps in one bank of the Caution/Warning annunciators 6DS1 through 6DS10).

SUBSYSTEM: CREW PROVISIONS & LIGHTING CONTROL (FUNCTIONAL GROUPING 16)

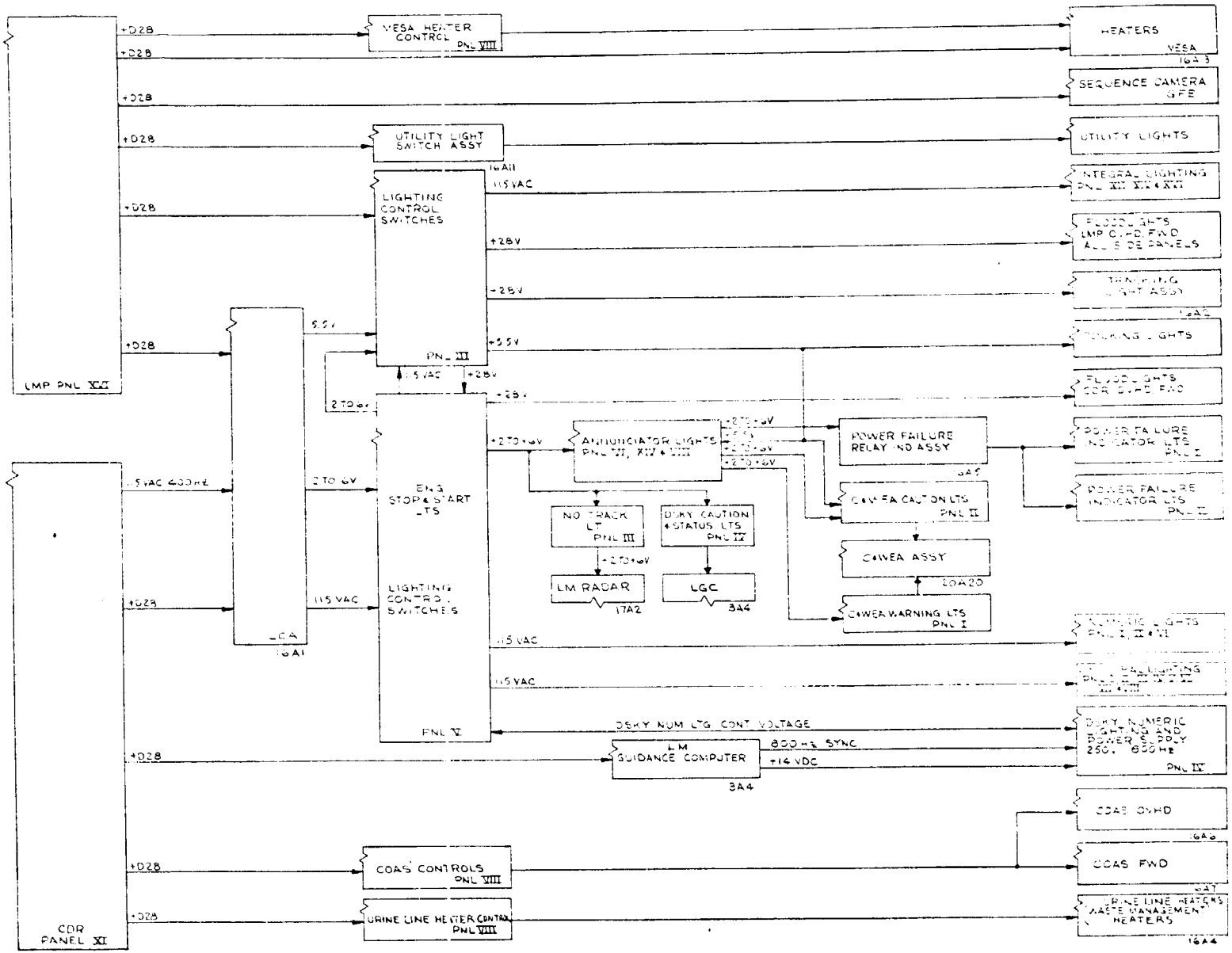
Code	Control/Indicator	Function
16S10 (Cont.)		The ENG and C/W 2 position tests the lamps in the Engine Start (1S2) and Stop (1S3 and 1S4) buttons as well as the second bank of C/W annunciators (6DS11 through 6DS20). In the C/W 3 and C/W 4 positions the lamps in the remaining two banks of C/W annunciators (6DS21 through 6DS30 and 6DS31 through 6DS40) are tested. In the COMPNT position the lamps in the Component Caution lights and lunar contact lights are tested. OFF positions are located at each end of the switching sequence. This will permit the switch to be placed in an OFF position, without recycling through all of the test positions.
16S14	COAS 3-POSITION TOGGLE MAIN-MAIN-MAIN	This three-position toggle (OVHD-OFF-FWD) provides ON/OFF control reticle lighting for the crewman's optical alignment sight, (COAS) when it is used in either of the two mounts provided.
16S19 16S20	PORTABLE UTILITY LIGHTS CONTROL MAIN-MAIN-MAIN	Each switch controls an overhead outlet on either side of the vehicle that will accept a portable utility light. Each switch is a 3-position toggle (OFF-DIM-BRIGHT). The dim and bright light intensities of the utility light when connected to the CDR's outlet are brighter than the respective LMP dim and bright intensities.
16DS90	PROPULSION PRESS INDICATOR (10M3) POWER FAILURE LIGHT	This red incandescent light will illuminate when there is a 28 VDC power interruption to this display.
16DS91	CDR CROSS POINTER INDICATOR (9M2) POWER FAILURE LIGHT	This red incandescent light will illuminate when there is a 28 VDC power interruption to this display.

SUBSYSTEM: CREW PROVISIONS & LIGHTING CONTROL (FUNCTIONAL GROUPING 16)

Code	Control/Indicator	Function
16DS92	THRUST INDICATOR (9M7) POWER FAILURE LIGHT	This red incandescent light will illuminate when there is a 28 VDC power interruption to this display.
16DS93	SUIT/CABIN PRESS IND (7M2) POWER FAILURE LIGHT	This red incandescent light will illuminate when there is a 28 VDC power interruption to this display.
16DS94	O_2/H_2O QUANTITY IND (7M4) POWER FAILURE LIGHT	This red incandescent light will illuminate when there is a 28 VDC power interruption to this display.
16DS95	GLYCOL TEMP/PRESS IND (7M5) POWER FAILURE LIGHT	This red incandescent light will illuminate when there is a 28 VDC power interruption to this display.
16DS96	RCS PRESS IND (8M1) POWER FAILURE LIGHT	This red incandescent light will illuminate when there is a 28 VDC power interruption to this display.
16DS97	LMP CROSS POINTER IND (9M3) POWER FAILURE LIGHT	This red incandescent light will illuminate when there is a 28 VDC power interruption to this display.
16DS98	RCS QUANTITY IND (8M4) POWER FAILURE LIGHT	This red incandescent light will illuminate when there is a 28 VDC power interruption to this display.

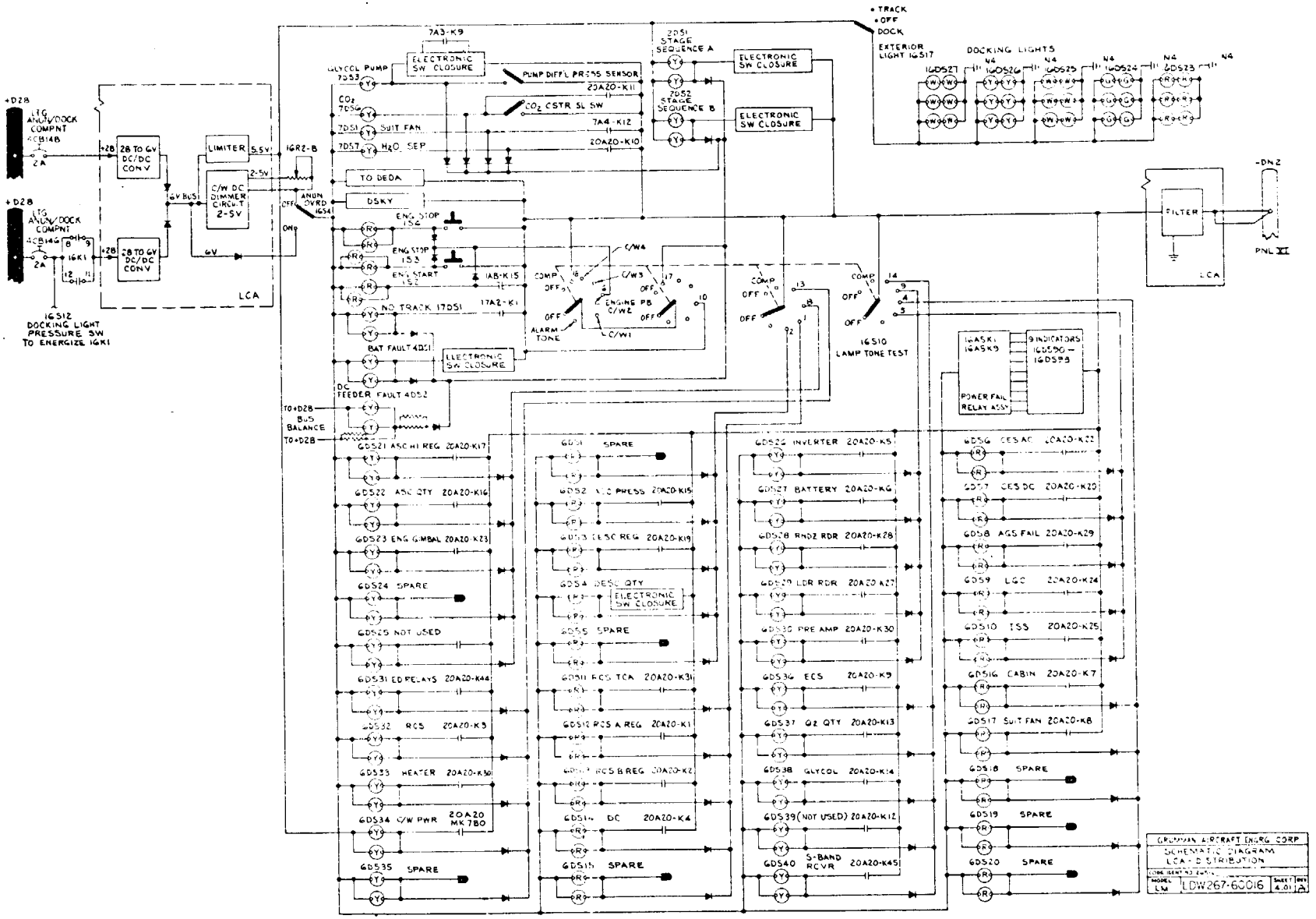
SUBSYSTEM: CREW PROVISIONS & LIGHTING CONTROL (FUNCTIONAL GROUPING 16)

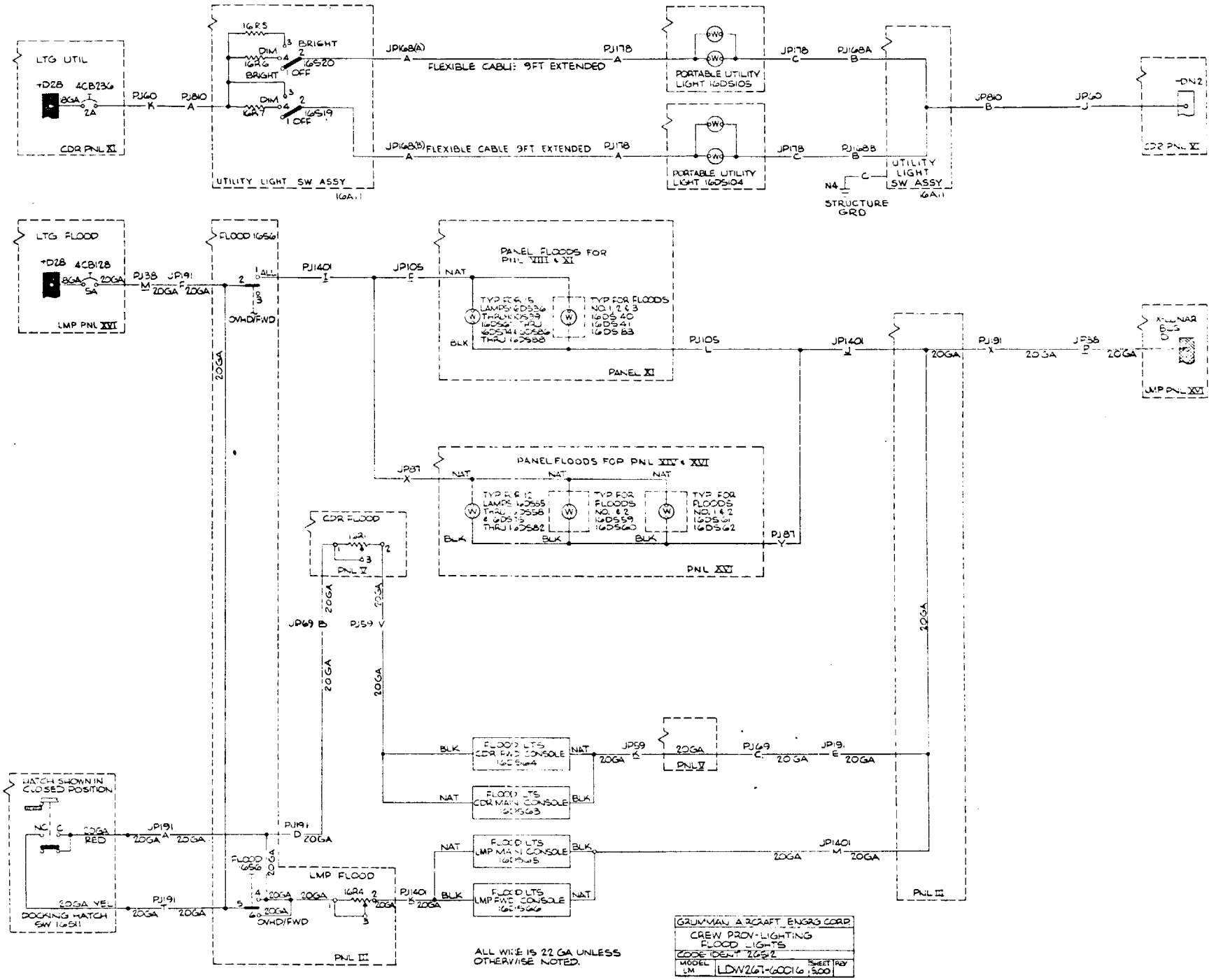
Code	Control/Indicator	Function
16S21	HEATER CONTROL URINE LINE 3-POSITION TOGGLE MAIN-MAIN-MAIN	The SW in heater 1 position will supply 15 watts of heater power to waste management system during the periods of translunar coast and lunar stay. Heater 2 position is a backup provision. Functional operation is identical.
16S22	HEATER CONTROL MESA 2-POSITION TOGGLE MAIN-MAIN	The SW in LO position provides the MESA with 50 watts maximum of heater power. SW in HIGH position adds 100 watts (maximum) more of heater power. There are six (6) 25 watts heaters controlled by (3) heater control circuits. The temperature is monitored by PCM telemetry.

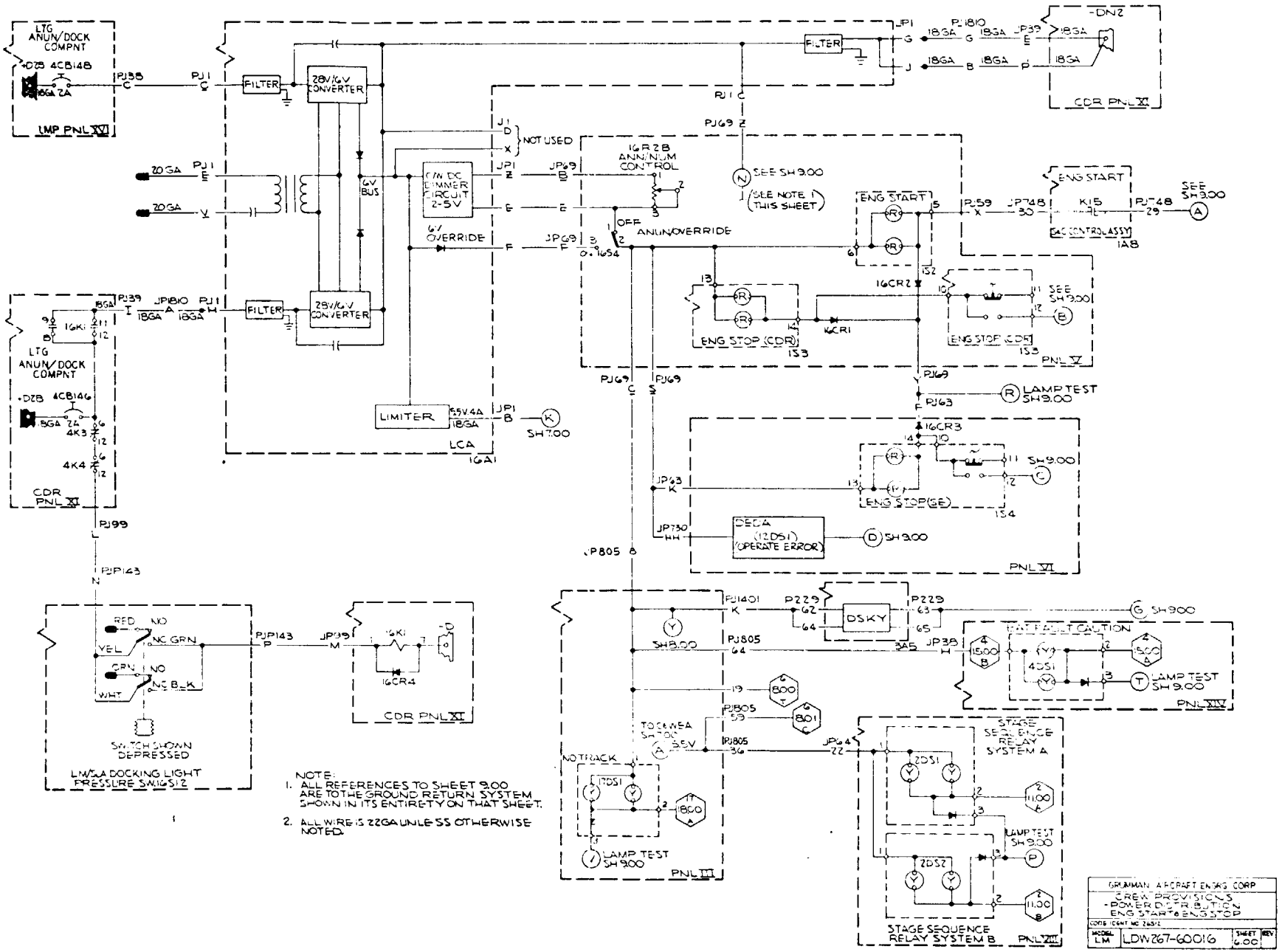


GRUMMAN AIRCRAFT ENGRG CORP

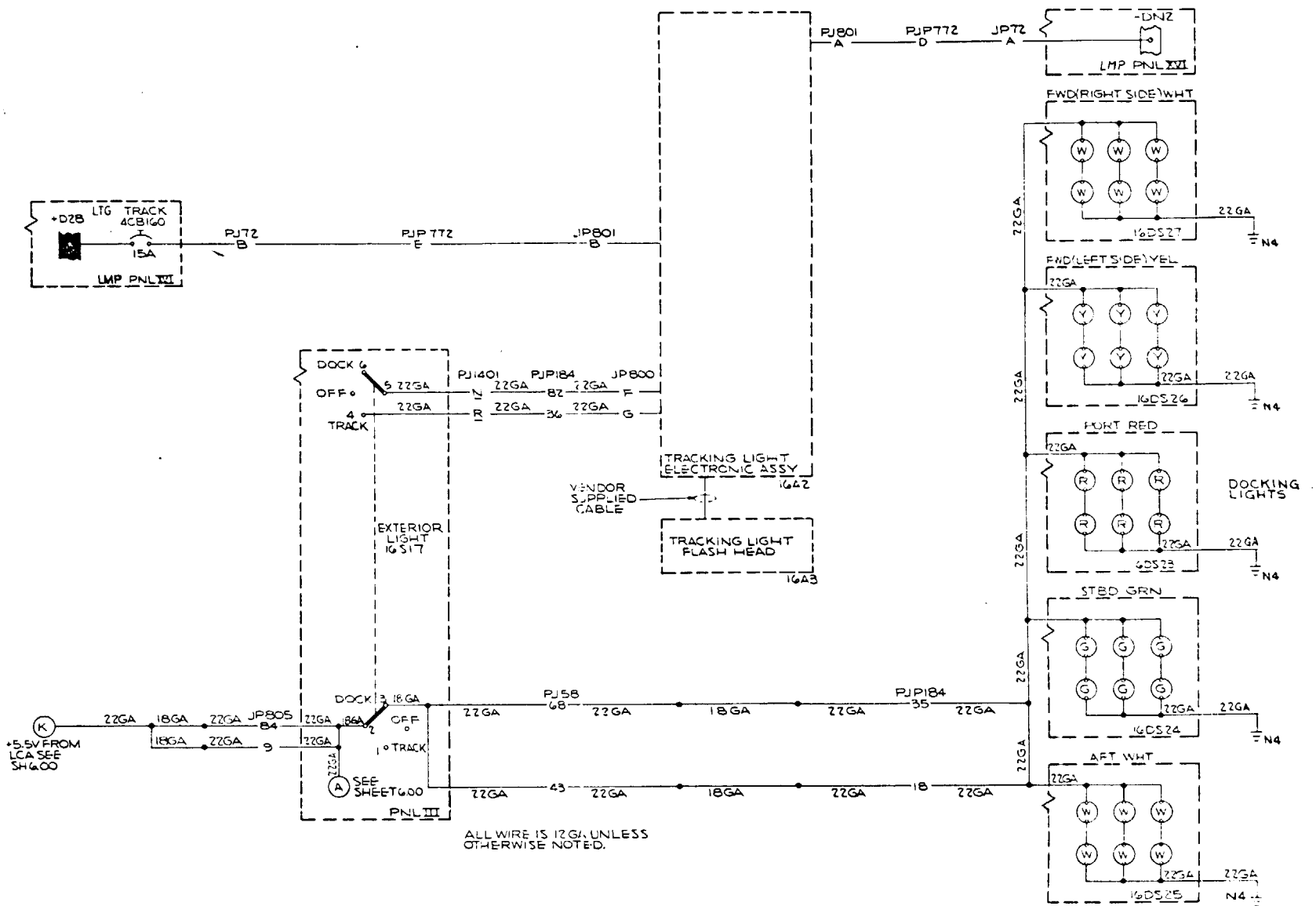
PLA PROX LIGHTING BLOCK DIAGRAM


+D28
LTG ANUN/DOCK COMPNT
4CB148
2A
+28
28 TO 6V DC/DC CONV
LIMITER
5.5V
2.5V
C/W DC DIMMER CIRCUIT 2-5V
6V BUS
IGR2-B
ANUN DVRD IGS4
OFF
ON
6V
LCA
IGS12 DOCKING LIGHT PRESSURE SW TO ENERGIZE IGK1
7A3-K9
ELECTRONIC SW CLOSURE
GLYCOL PUMP 7DS3
PUMP DIFF'L PRESS SENSOR
20AZ0-K11
CO2 7DS6
CO2 CSTR SL SW
7DS1 SUIT FAN
7A4-K12
7DS7 H2O SEP
20AZ0-K10
TO DEDA
DSKY
ENG STOP IS2
ENG STOP IS3
ENG START IS1
IAB-K15
NO TRACK 17DS1
17A2-K1
BAT FAULT 4DS1
DC FEEDER FAULT 4DS2
TO+D28 BUS BALANCE
TO+D28
7DS1 STAGE SEQUENCE A
7DS2 STAGE SEQUENCE B
C/W4
C/W3
C/W2
C/W1
ENGINE PB
ALARM TONE
COMP
OFF
IGS10 LAMP TONE TEST
+TRACK
•OFF
DOCK
EXTERIOR LIGHT IGS17
DOCKING LIGHTS
IGDS27
IGDS26
GDS25
GDS24
GDS23
N4
FILTER
-DN2
PNL XI
IGASK1
IGASK9
POWER FAIL RELAY ASSY
9 INDICATORS IGDS90 – IGDS98
GDS21 ASC HI REG 20AZ0-K17
GDS22 ASC QTY 20AZ0-K16
GDS23 ENG GIMBAL 20AZ0-K23
GDS24 SPARE
GDS25 NOT USED
GDS31 ED RELAYS 20AZ0-K44
GDS32 RCS 20AZ0-K3
GDS33 HEATER 20AZ0-K50
GDS34 C/W PWR 20AZ0 MK780
GDS35 SPARE
GDS1 SPARE
GDS2 ASC PRESS 20AZ0-K15
GDS3 CES REG 20AZ0-K19
GDS4 DES QTY
ELECTRONIC SW CLOSURE
GDS5 SPARE
GDS11 RCS TCA 20AZ0-K31
GDS12 RCS A REG 20AZ0-K1
GDS14 RCS B REG 20AZ0-K2
GDS15 DC 20AZ0-K4
GDS16 SPARE
GDS24 INVERTER 20AZ0-K5
GDS27 BATTERY 20AZ0-K6
GDS28 RNDZ RDR 20AZ0-K28
GDS29 LDR RDR 20AZ0-K27
GDS30 PRE AMP 20AZ0-K30
GDS36 ECS 20AZ0-K9
GDS37 O2 QTY 20AZ0-K13
GDS38 GLYCOL 20AZ0-K14
GDS39 (NOT USED) 20AZ0-K12
GDS40 S-BAND RCVR 20AZ0-K45
GDS6 CES AC 20AZ0-K22
GDS7 CES DC 20AZ0-K20
GDS8 AGS FAIL 20AZ0-K29
GDS9 LGC 20AZ0-K24
GDS10 ISS 20AZ0-K25
GDS16 CABIN 20AZ0-K7
GDS17 SUIT FAN 20AZ0-K8
GDS18 SPARE
GDS19 SPARE
GDS20 SPARE
GRUMMAN AIRCRAFT ENGRG CORP
SCHEMATIC DIAGRAM
LCA-D STRIBUTION
MODEL LM
LDW267-60016
SHEET 1
REV 4.01A

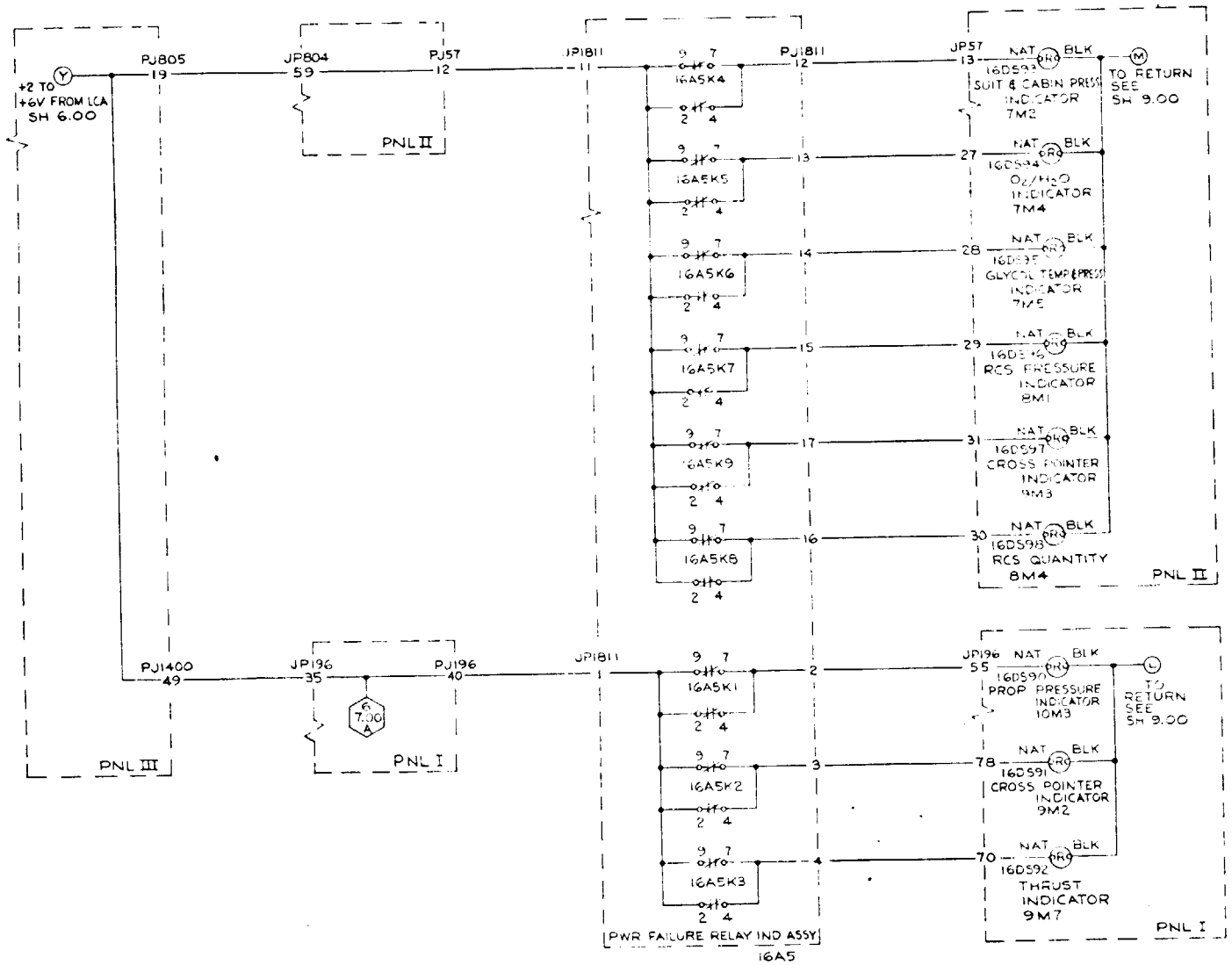

LTG UTIL
+D28
4CB236
8GA
2A
CDR PNL XI
PJ60
K
PJ810
A
16R5
DIM
16R6
BRIGHT
16S20
OFF
16R7
16S19
UTILITY LIGHT SW ASSY
16A11
JP168(A)
A
FLEXIBLE CABLE 9FT EXTENDED
PJ178
A
PORTABLE UTILITY LIGHT 16DS105
JP178
C
PJ168A
B
JP168(B)
PORTABLE UTILITY LIGHT 16DS104
PJ168B
N4
STRUCTURE GRD
UTILITY LIGHT SW ASSY
JP810
B
JP60
J
+DN2
CDR PNL X
LTG FLOOD
+D28
4CB128
8GA
5A
20GA
LMP PNL XVI
PJ38
M
JP191
F
FLOOD 16S6
1 ALL
2
3
OVHD/FWD
PJ1401
I
JP105
E
PANEL FLOODS FOR PNLS VIII & XI
TYP FOR 15 LAMPS 16DS36 THRU 16DS39 16DS60 THRU 16DS141 16DS86 THRU 16DS88
TYP FOR FLOODS NO. 1 & 3 16DS 80 16DS 81 16DS 83
NAT
BLK
PANEL XI
PJ105
L
JP1401
J
PJ191
X
JP38
P
JP87
X
PANEL FLOODS FOR PNL XIV & XVI
TYP FOR 15 LAMPS 16DS55 THRU 16DS58 & 16DS78 THRU 16DS82
TYP FOR FLOODS NO. 1 & 2 16DS59 16DS60
TYP FOR FLOODS NO. 1 & 4 16DS61 16DS62
PJ87
Y
PNL XVI
CDR FLOOD
16R2
PNL V
JP69 B
PJ59 V
20GA
HATCH SHOWN IN CLOSED POSITION
NC
C
RED
DOCKING HATCH SW 16S11
20GA YEL
PJ191
A
D
T
S
FLOOD 16S6
LMP FLOOD
16R4
OVHD/FWD
PJ1401
K
PNL III
FLOOD LTS CDR FWD CONSOLE 16DS64
FLOOD LTS CDR MAIN CONSOLE 16DS63
FLOOD LTS LMP MAIN CONSOLE 16DS65
FLOOD LTS LMP FWD CONSOLE 16DS66
JP59
K
PJ69
C
JP191
E
JP1401
M
PNL V
PNL III
BLK
NAT
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.
GRUMMAN AIRCRAFT ENGRG CORP
CREW PROV-LIGHTING
FLOOD LIGHTS
CODE IDENT 26512
MODEL LM
LDW267-60016
SHEET REV
300



NOTE:
1. ALL REFERENCES TO SHEET 9.00 ARE TO THE GROUND RETURN SYSTEM SHOWN IN ITS ENTIRETY ON THAT SHEET.
2. ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

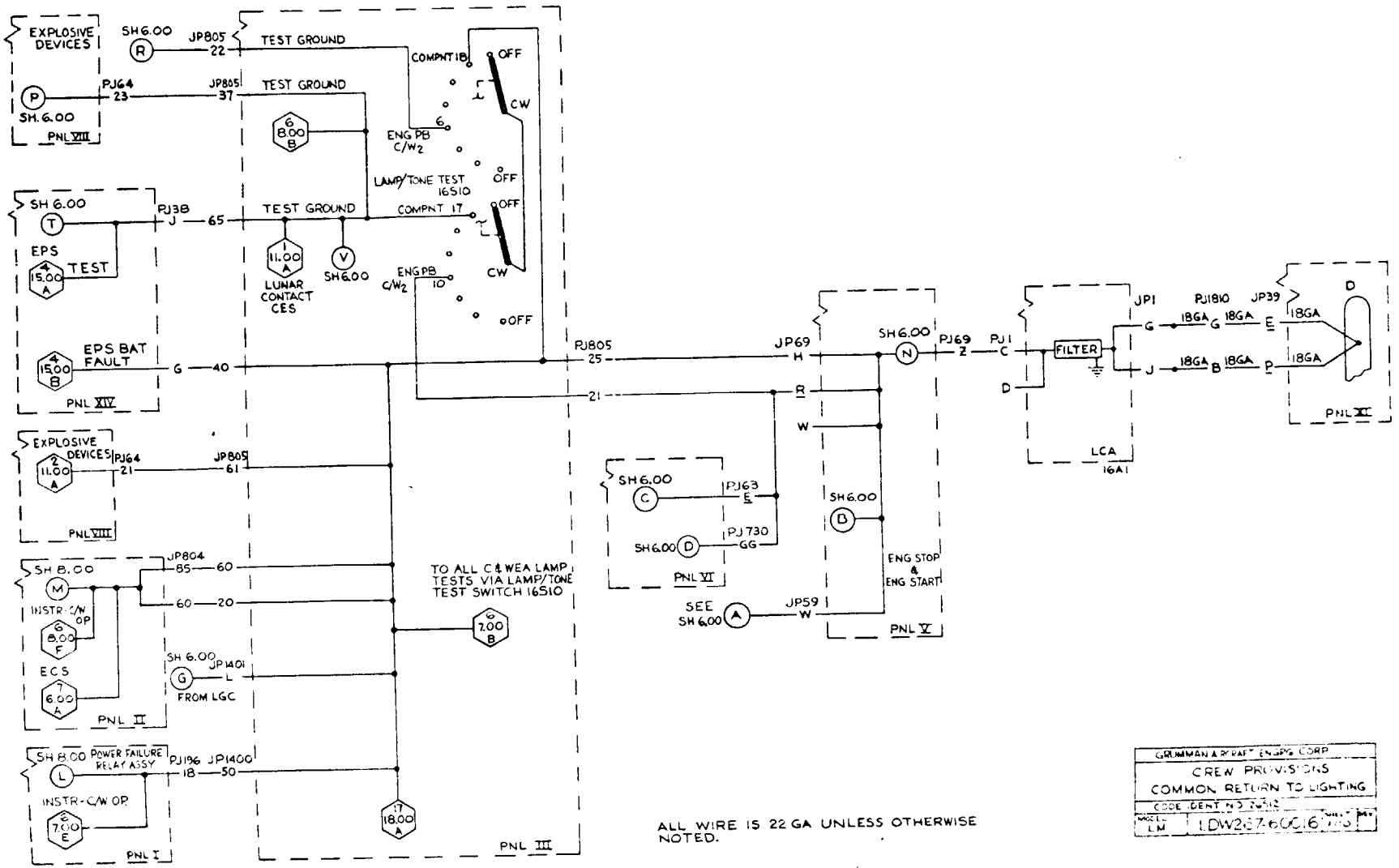


	LDW267-60016



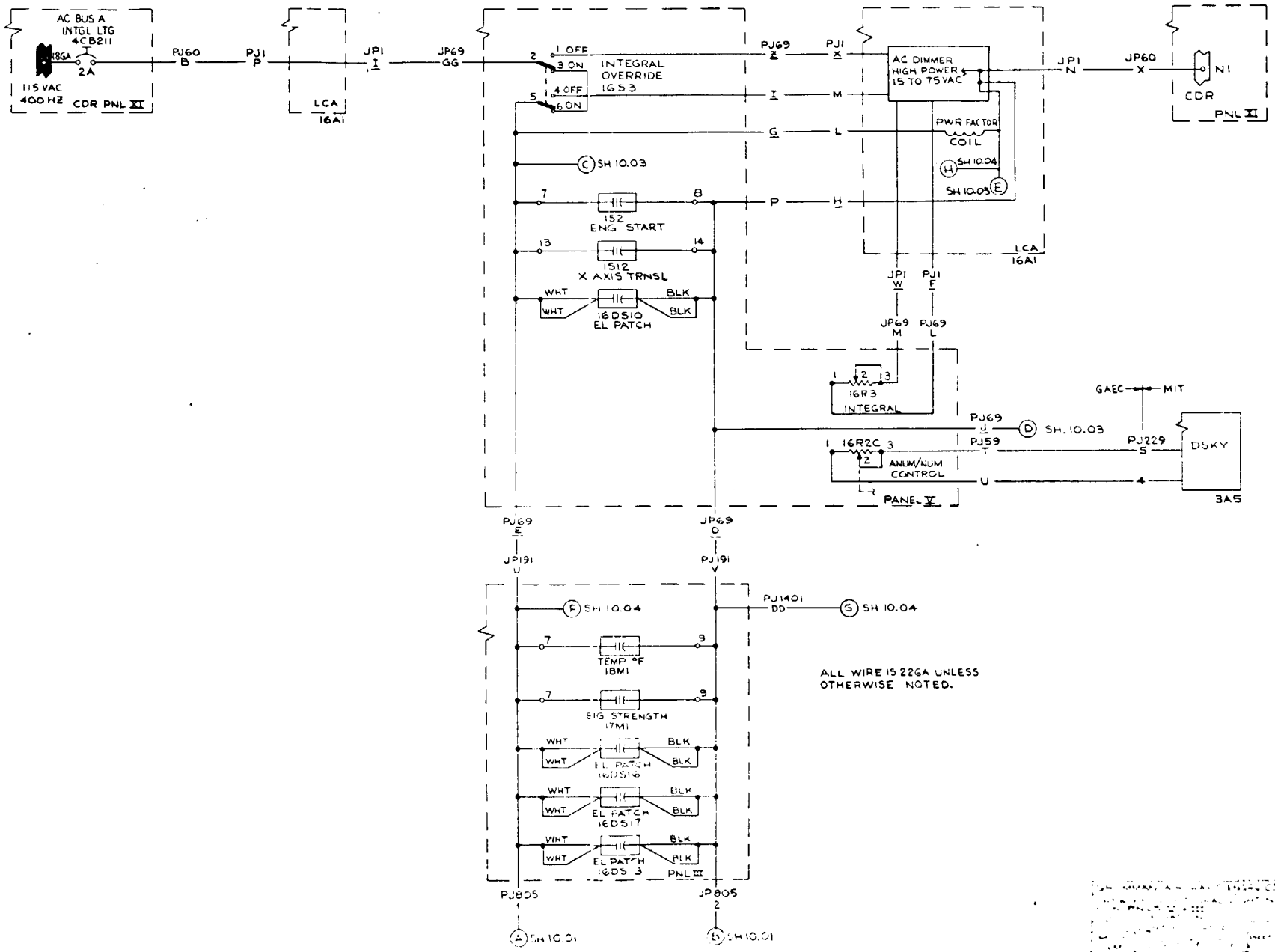
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

GRUMMAN AIRCRAFT ENGRG CORP
CREW PROVISIONS POWER FAILURE RELAY INDICATORS
SCALE NONE NO 26512
MODEL LM LSW267-60018 SHEET 8.00 REV

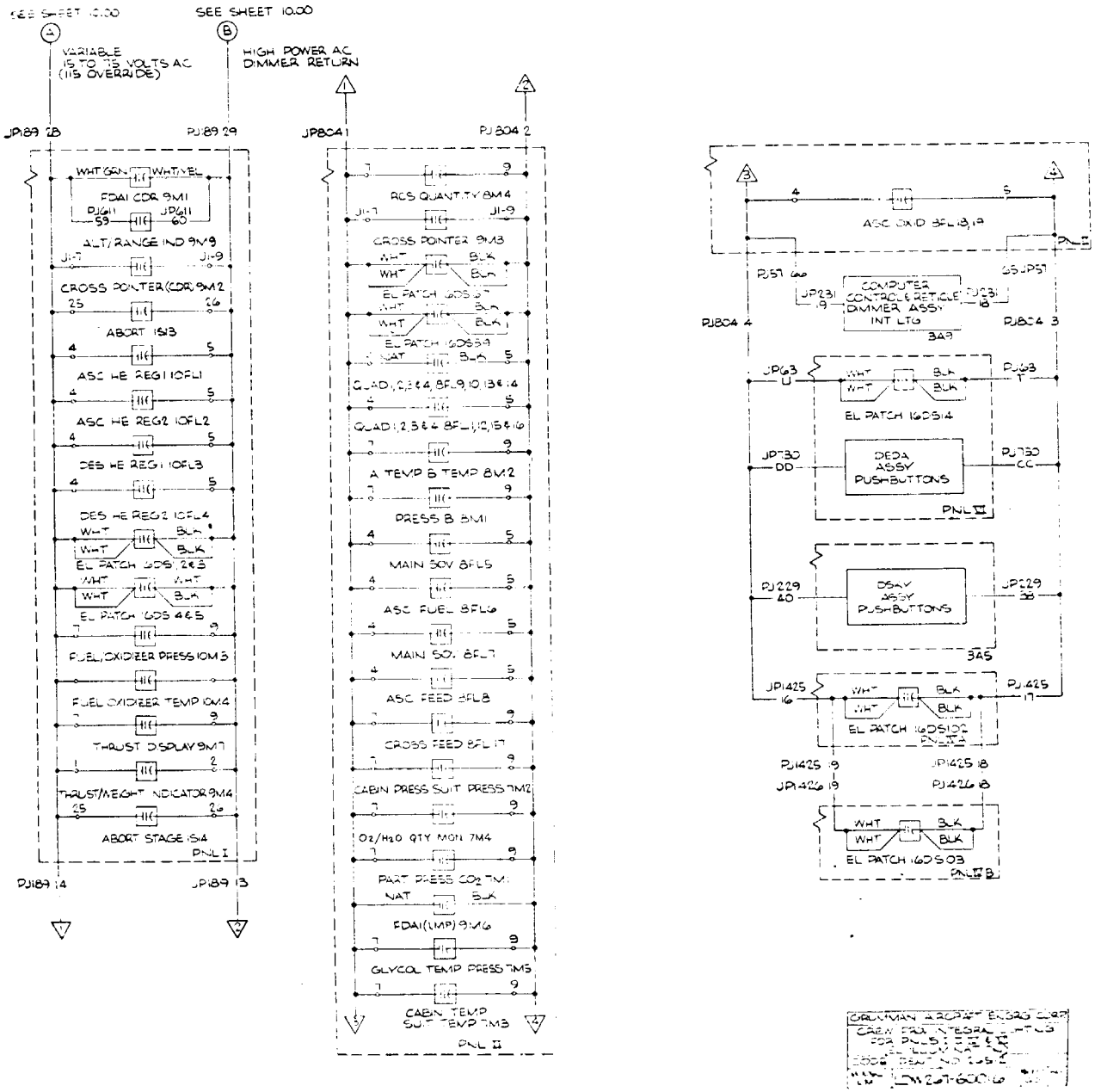


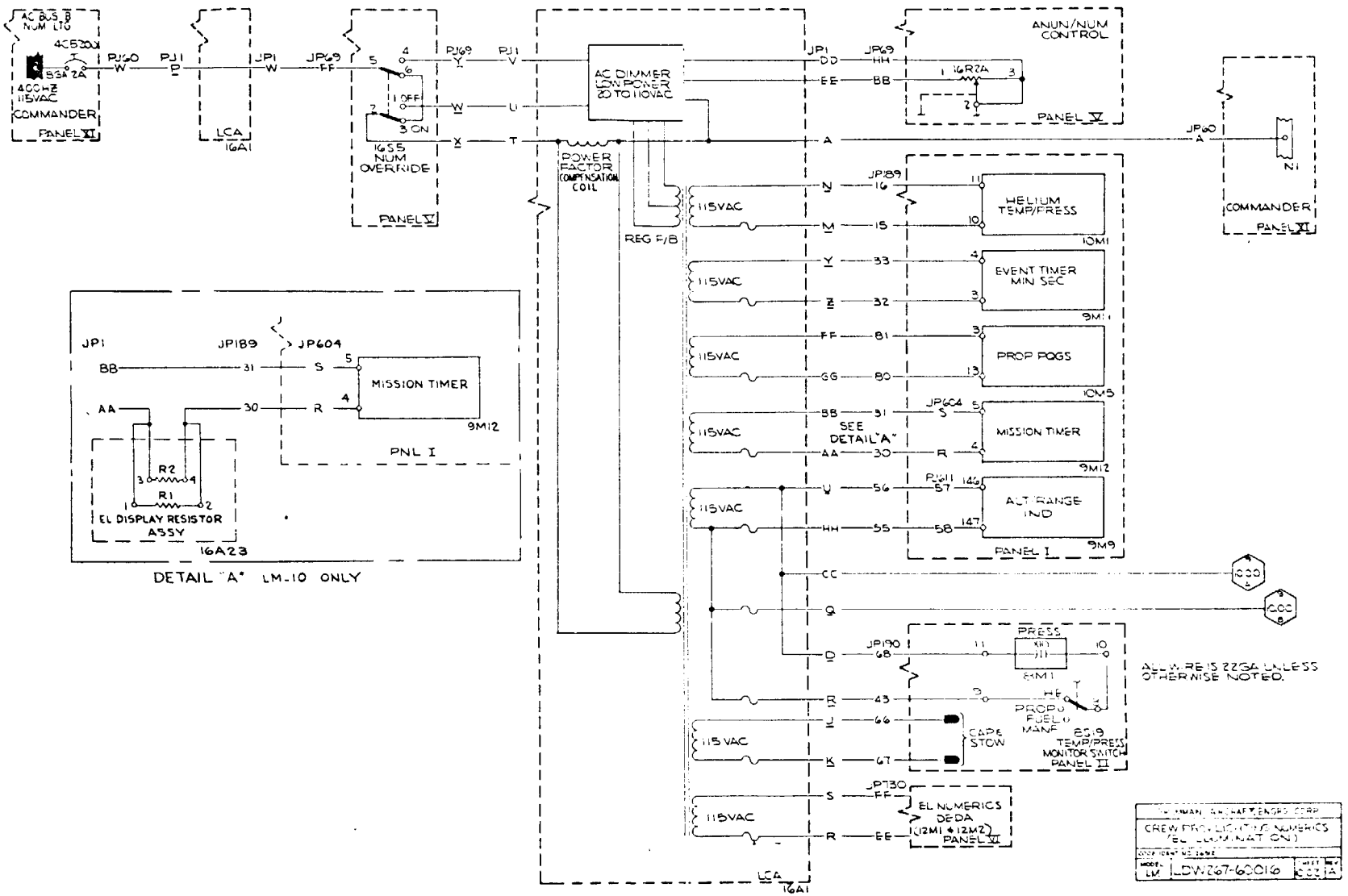
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.

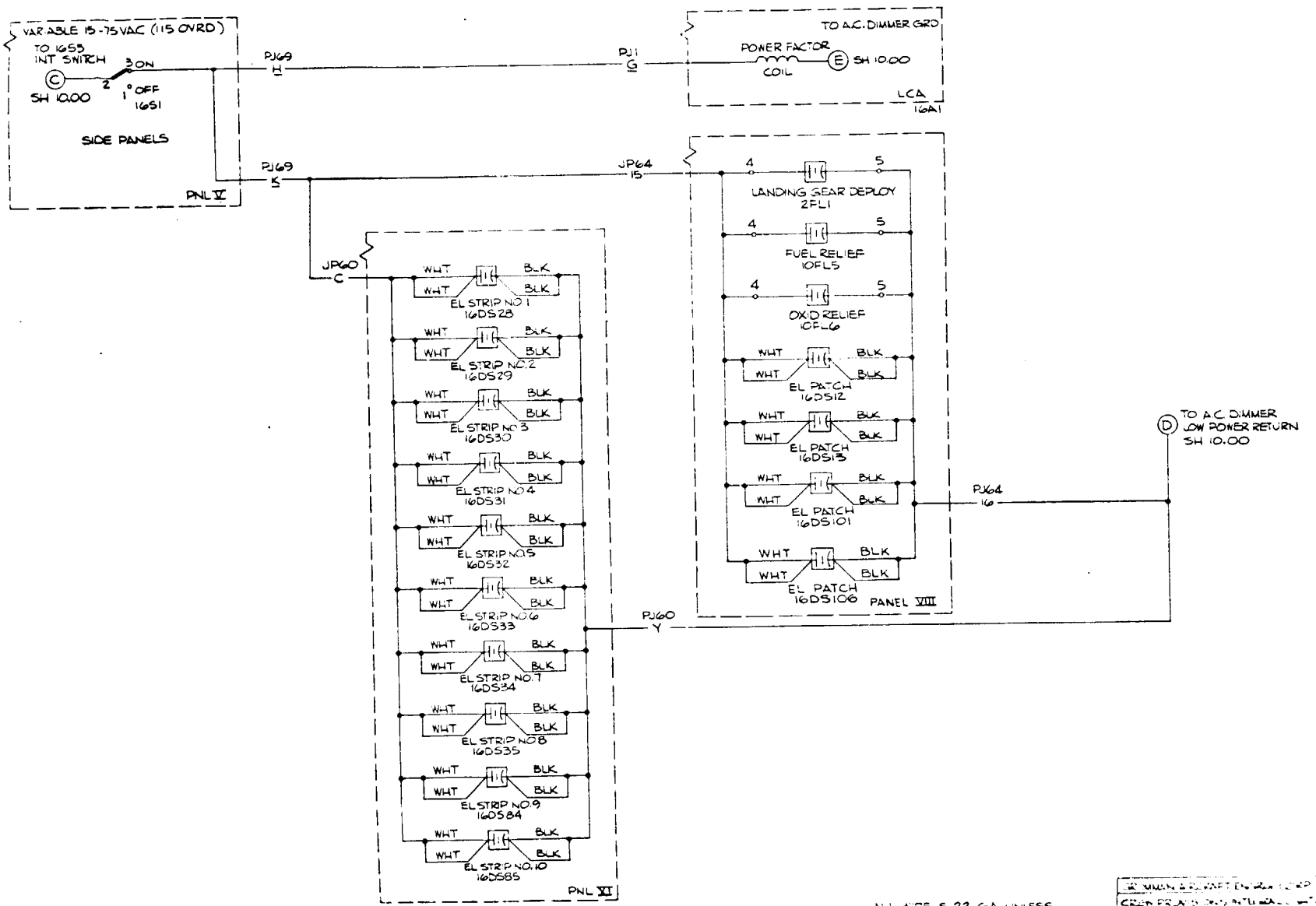
GRUMMAN AIRCRAFT ENGRG CORP	
CREW PROVISIONS	
COMMON RETURN TO LIGHTING	
CODE IDENT NO 71268	
MODEL LM	LDW2-37-0001-6



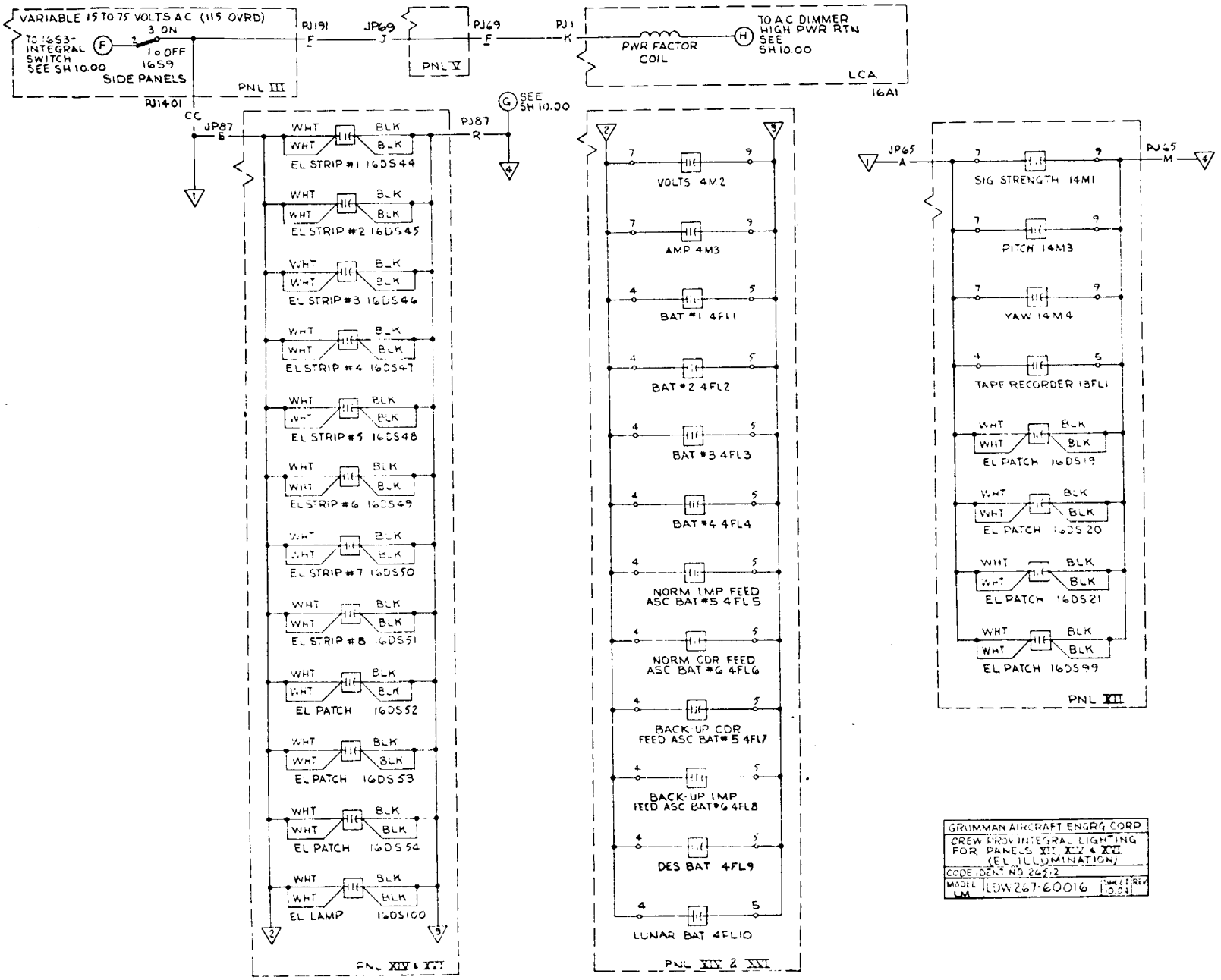
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.


SEE SHEET 10.00
SEE SHEET 10.00
VARIABLE 15 TO 75 VOLTS AC (115 OVERRIDE)
HIGH POWER AC DIMMER RETURN
JP189 28
PJ189 29
JP804 1
PJ 804 2
WHT/GRN
WHT/YEL
FDAI CDR 9M1
PJ611 59
JP611 60
ALT/RANGE IND 9M9
CROSS POINTER (CDR) 9M2
ABORT 1S13
ASC HE REG1 10FL1
ASC HE REG2 10FL2
DES HE REG1 10FL3
DES HE REG2 10FL4
EL PATCH 6DS1,2&3
EL PATCH 6DS 4&5
FUEL/OXIDIZER PRESS 10M3
FUEL OXIDIZER TEMP 10M4
THRUST DISPLAY 9M7
THRUST/WEIGHT INDICATOR 9M4
ABORT STAGE 1S14
PNL I
PJ189 14
JP189 13
RCS QUANTITY 8M4
CROSS POINTER 9M3
EL PATCH 6DS 6,7
EL PATCH 6DS8,9
QUAD 1,2,3&4 8FL9,10,13&14
QUAD 1,2,3&4 8FL11,12,15&16
A TEMP B TEMP 8M2
PRESS B 8M1
MAIN SOV 8FL5
ASC FUEL 8FL6
MAIN SOV 8FL7
ASC FEED 8FL8
CROSS FEED 8FL17
CABIN PRESS SUIT PRESS 7M2
O2/H2O QTY MON 7M4
PART PRESS CO2 7M1
FDAI(LMP) 9M6
GLYCOL TEMP PRESS 7M3
CABIN TEMP SUIT TEMP 7M3
PNL II
ASC OXID 8FL18,19
PNL I
PJ57 60
65 JP57
COMPUTER CONTROL & RETICLE DIMMER ASSY INT LTG
JP231 19
PJ231 18
3A9
PJ804 4
PJ804 3
JP63 U
PJ63 T
EL PATCH 16DS14
JPT30 DD
DEDA ASSY PUSHBUTTONS
PJT30 CC
PNL II
PJ229 40
DSKY ASSY PUSHBUTTONS
JP229 38
3A5
JP1425 16
PJ1425 17
EL PATCH 16DS10
PNL II
PJ1425 9
JP1425 8
JP1426 19
PJ1426 8
EL PATCH 16DS03
PNL II B
GRUMMAN AIRCRAFT ENGRG CORP
CABIN FAN INTEGRAL LIGHTING
FOR PNLS
LM 2GT-600016


AC BUS B NUM LTG
4C5320X
S3A 2A
400HZ 115VAC
COMMANDER
PANEL VI
PJ60 W
PJ1 P
LCA 16A1
JP1 W
JP69 FF
16S5 NUM OVERRIDE
PANEL V
PJ69 Y
PJ1 V
1 OFF
3 ON
W U
X T
AC DIMMER LOW POWER 80 TO 110VAC
POWER FACTOR COMPENSATION COIL
REG F/B
JP1 DD
JP69 HH
EE BB
ANUN/NUM CONTROL
16R2A
PANEL V
JP60 A
COMMANDER
PANEL VI
A
115VAC
N
M
JP189 16
HELIUM TEMP/PRESS
10M1
Y
Z
33
32
EVENT TIMER MIN SEC
9M11
FF
GG
81
80
PROP PQGS
10M5
BB
AA
31
30
SEE DETAIL "A"
JP604 S
R
MISSION TIMER
9M12
U
HH
56
55
PJ11 146
147
ACT RANGE IND
9M9
PANEL I
CC
Q
D
JP190 68
PRESS
8M11
R
43
HE
PROPU FUEL U MANF
8S19
TEMP/PRESS MONITOR SWITCH
PANEL II
J
K
66
67
CAPE STOW
115 VAC
S
R
JP730 FF
EE
EL NUMERICS DEDA (12M1 + 12M2)
PANEL VI
LCA 16A1
JP1
JP189
JP604
BB
AA
31
30
S
R
5
4
MISSION TIMER
9M12
PNL I
R2
R1
EL DISPLAY RESISTOR ASSY
16A23
DETAIL "A" LM-10 ONLY
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.
GRUMMAN AIRCRAFT ENGRG CORP
CREW PROCEDURES NUMERICS (EL ILLUMINATION)
LDW267-60016
SHEET 1 OF 2
REV A

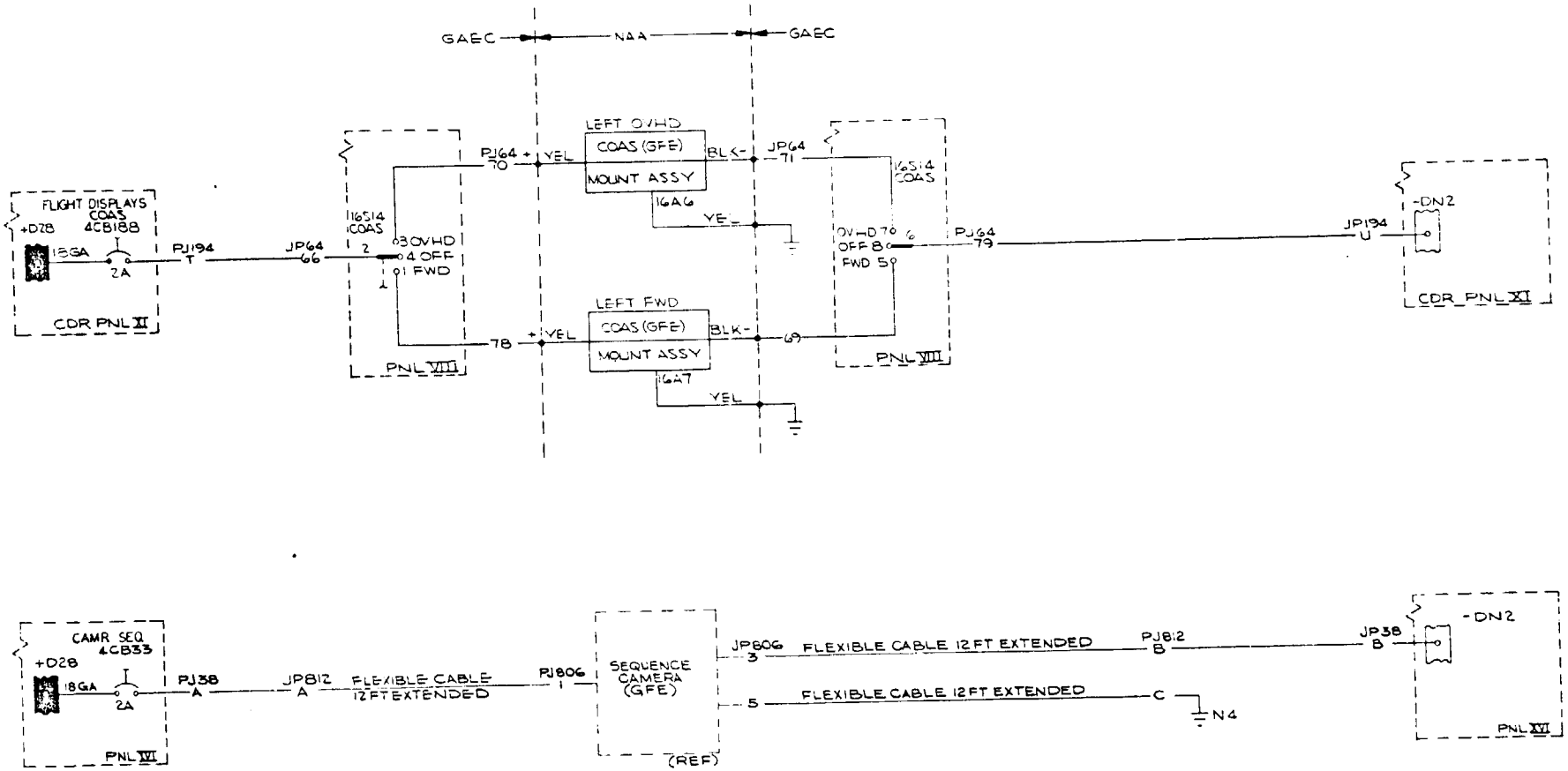


ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED



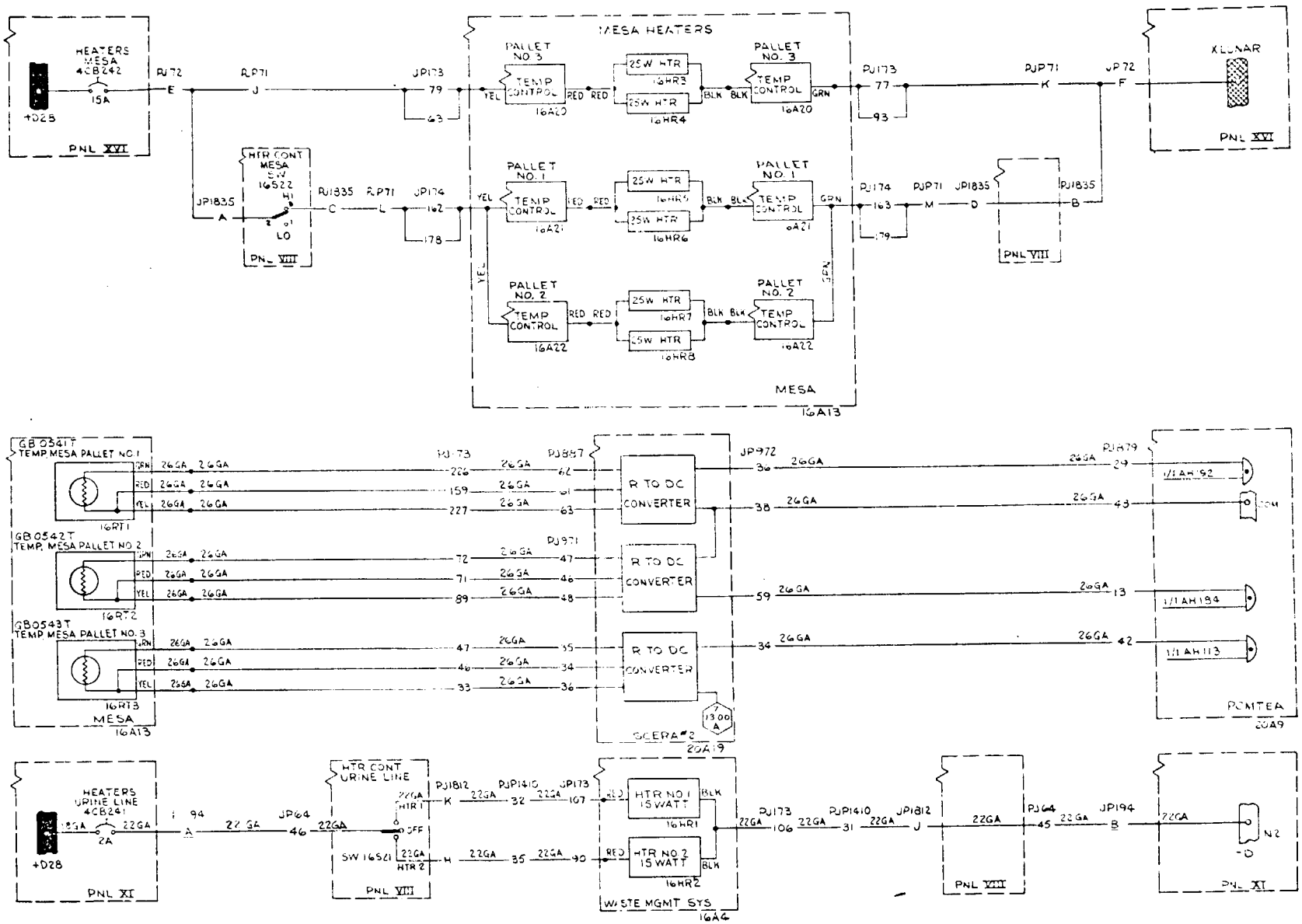
ALL WIRE IS 22 GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGRG CORP	
CREW PROV INTEGRAL LIGHTING FOR PANELS XII XIV & XV (EL ILLUMINATION)	
CODE IDENT NO 26512	
MODEL LM	LDW 267-60016 SHEET REV 10.04



ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENGRG CORP	
CREW STATION REFERENCE CAMERA AND CREW OPTICAL ALIGNMENT SET	
CODE IDENT NO. 24161	
MODEL LM	LDW267-60016 SHEET 50 REV



ALL WIRE IS 16GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENG. CORP.
CREW PROVISIONS PORTABLE UNIT AND MESA INSTALLATION
LDW267-60016
REV A

LM ELEMENTARY FUNCTIONAL

DIAGRAM

(Functional Grouping No. 17)

RADAR

SUBSYSTEM

(REF LDW267-57017 C)

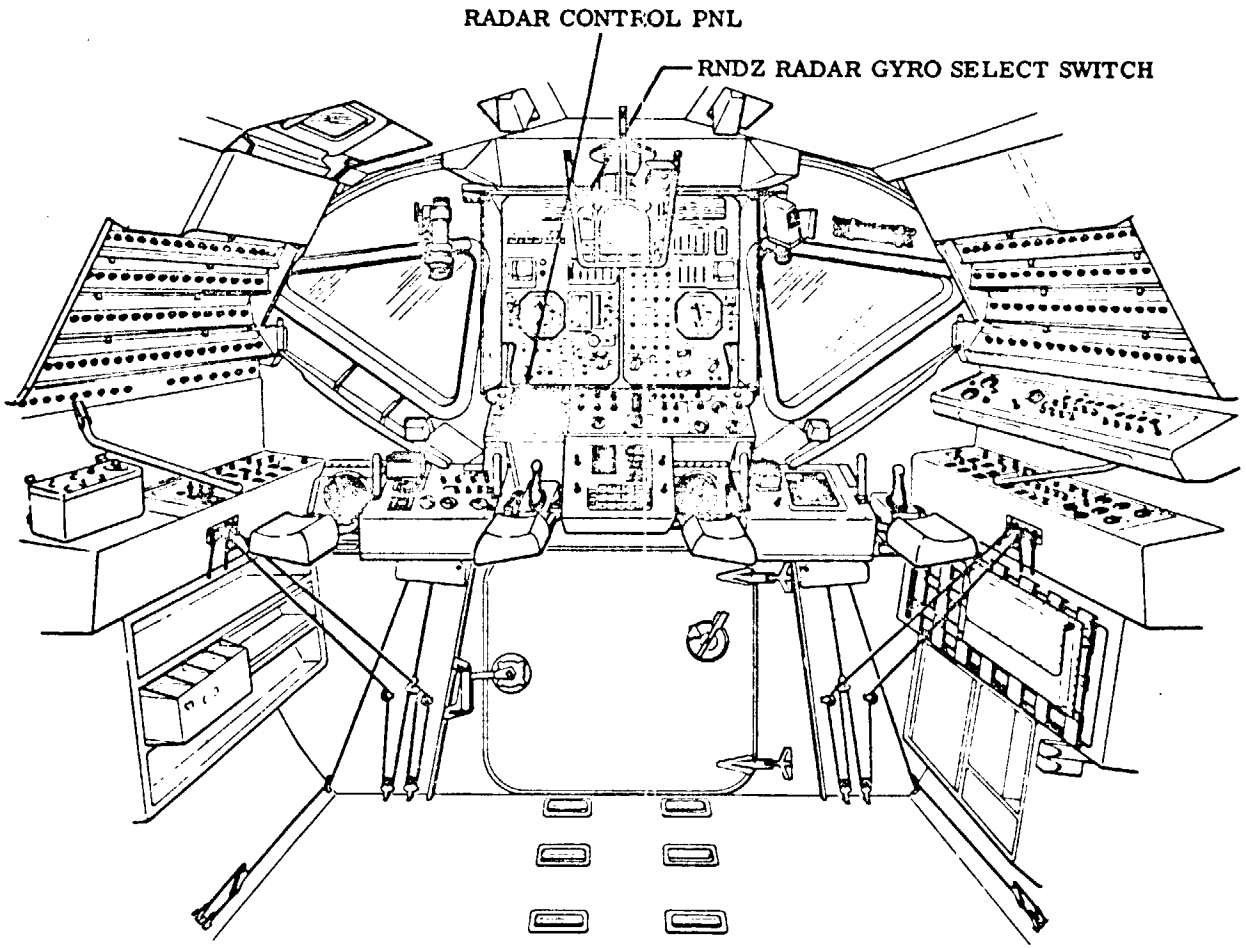
1. Applicable Documents

Level Three Drawings

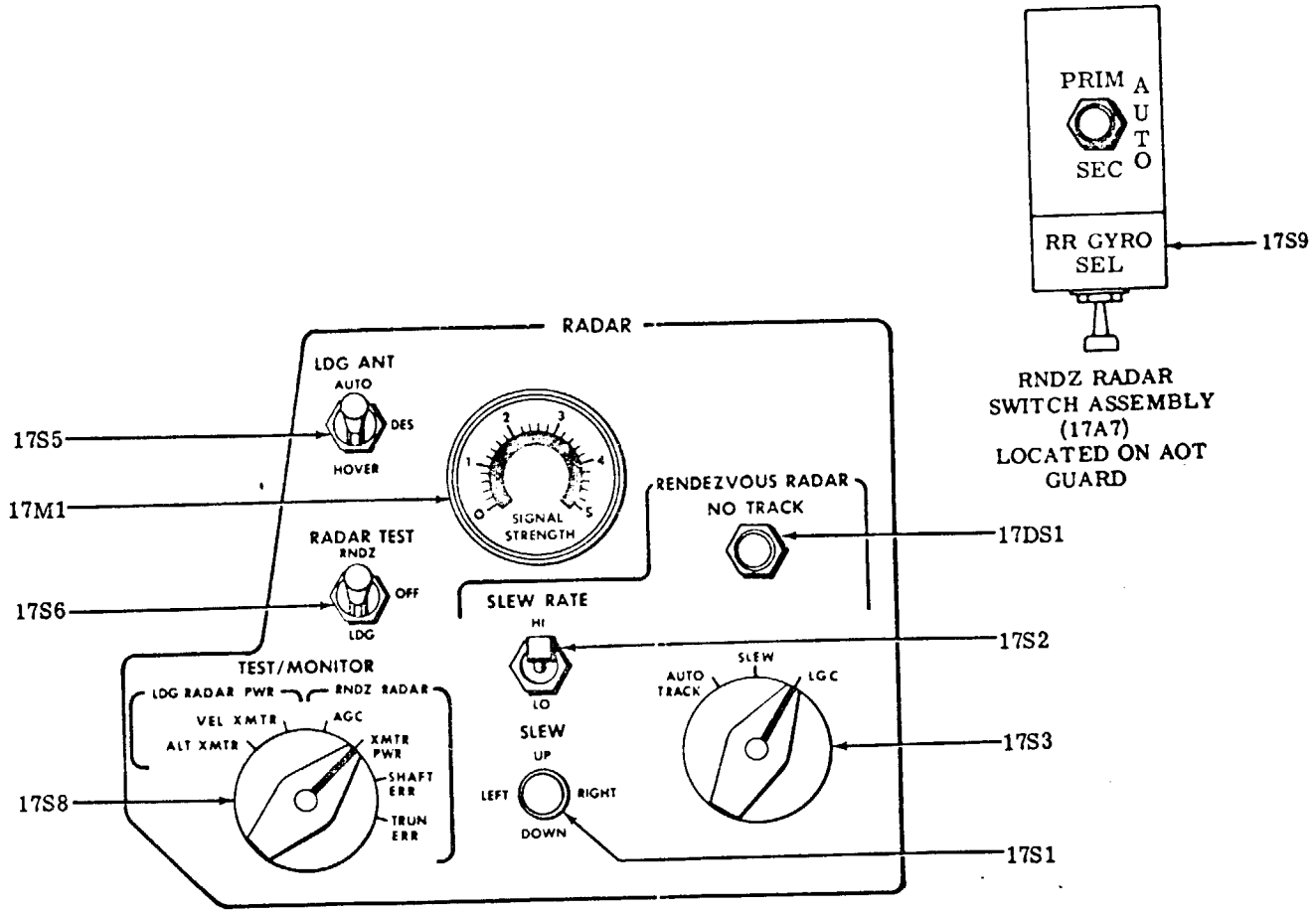
ITEM NAME	DWG. NO.	REV.	E.O.'s
Radar Subsystem	LDW370-54000	N	

2. Table of Contents

ITEM NAME	DWG. NO.
a) Cover Sheet	17-1001
b) Applicable Documents Table of Contents, & Notes	17-1002
c) Cabin Location of Radar Controls and Indicators	17-1003
d) Radar Controls and Indicators Layout	17-1004
e) Radar Controls and Indicators Functional Description	17-1005 thru 17-1005.2
f) Rendezvous Radar - Block Diagram	LDW267-57017 SH 4.00B
g) Landing Radar - Block Diagram	LDW267-57017 SH 4.01A
h) Rendezvous Radar - Prime and Heater Power, 28VDC and 115VAC	LDW267-57017 SH 5.00C
i) RR Antenna Assembly and Transponder Mode Tracker and Self Test Interface	LDW267-57017 SH 6.00A
j) RR Angle Tracker Outputs to Signal Strength Meter	LDW267-57017 SH 7.00B
k) RR Computer Interface Unit Inputs	LDW267-57017 SH 8.00C
l) RR Computer Interface Unit to LGC and Outputs to Alt and Range Rate Meter	LDW267-57017 SH 9.00C
m) RR Inputs to Servo Amplifier Assembly	LDW267-57017 SH 10.00A
n) RR 800 Hz Inputs to Servo AMP Assembly	LDW267-57017 SH 10.01B
o) RR Servo Amplifier Output to RRAA, Resolvers, and Gyros	LDW267-57017 SH 11.00B
p) RR Antenna Assembly and Electronics Assembly Outputs	LDW267-57017 SH 12.00A
q) Landing Radar Prime Power and Heater Distribution	LDW267-57017 SH 13.00C
r) Landing Radar MIT/LGC Interface	LDW267-57017 SH 14.00B
s) Landing Radar Antenna Position and Indication	LDW267-57017 SH 15.00B
t) Landing Radar Self Test Signal to Freq. Tracker	LDW267-57017 SH 16.00C
u) Landing Radar Range and Velocity Signals	LDW267-57017 SH 17.00B
v) Landing and Rendezvous Radar Antenna Temperature and Caution Lights	LDW267-57017 SH 18.00C



Cabin Location of Radar Controls and Indicators



PANEL 3
(III)

Radar Controls and Indicators Layout

SUBSYSTEM: RADAR GUIDANCE NAVIGATION AND CONTROL SUBSYSTEM (FUNCTIONAL GROUPING 17)

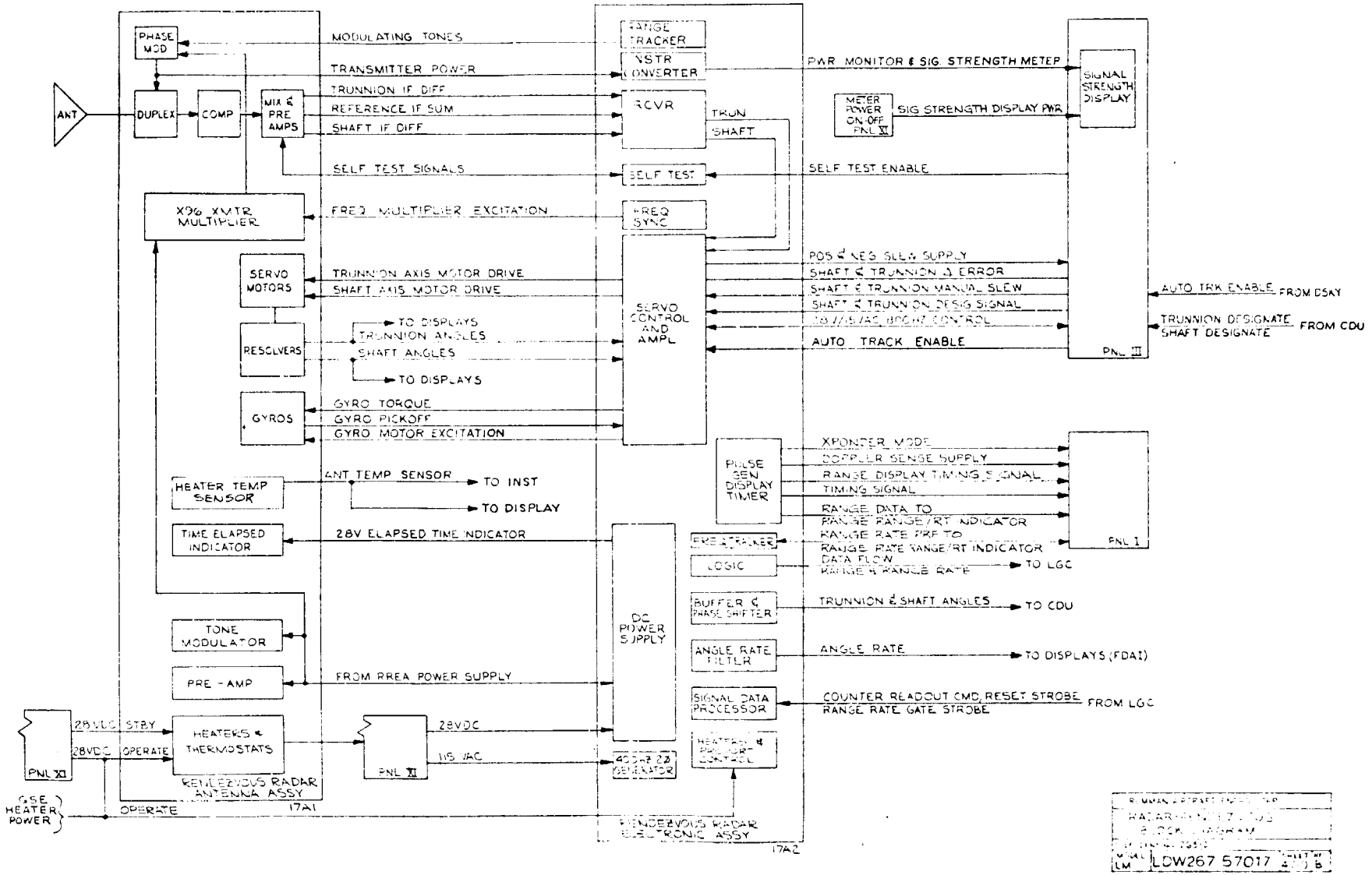
Code	Control/Indicator	Function
17S1	MANUAL SLEW SWITCH SPRING LOADED 4-WAY CENTER OFF TOGGLE	This four-way toggle (UP-RIGHT-DOWN-LEFT) is used when 17S3 is in the SLEW position to slew the trunnion and/or shaft servos. This in turn will position the Rendezvous Radar antenna for manual acquisition of the target. Two antenna slew rates are available through 17S2. When the target (CSM) has been acquired, as noted on 17M1, it may be tracked automatically by placing 17S3 in the AUTO TRACK position. The position of the Rendezvous Radar antenna (shaft and trunnion) can be determined from either the Commander's or LM Pilot's FDAI (9M1 or 9M6) pitch and yaw error needles when the Rate/Error Monitor switches (9S2 and 9S7) are positioned to RNDZ RADAR.
17S2	SLEW RATE SWITCH 2-POSITION TOGGLE MAIN-MAIN	This two-position toggle (HI-LO) provides two rates for manually slewing the Rendezvous Radar antenna. The HI slew rate is 7^{o}/sec. and the LO slew rate is $1\text{-}1/3^{o}$/sec. The HI slew rate is used for quick, coarse adjustments to guide the antenna in the direction of the target. The LO slew rate is used for slow, fine adjustments to drive the antenna toward maximum signal strength as monitored on 17M1 thus enabling the subsequent initiation of auto track through 17S3.
17S3	RNDZ RADAR MODE SWITCH 3-POSITION ROTARY	This three-position rotary (AUTO TRACK-SLEW-LGC) enables control of the Rendezvous Radar antenna drive. In the AUTO TRACK position, tracking is maintained by comparing the received radar signals from the shaft and trunnion channels; with the sum channel signal in the Rendezvous Radar angle error detection circuitry; the resultant error signals are used to drive the antenna servos thus maintaining track. In the SLEW position

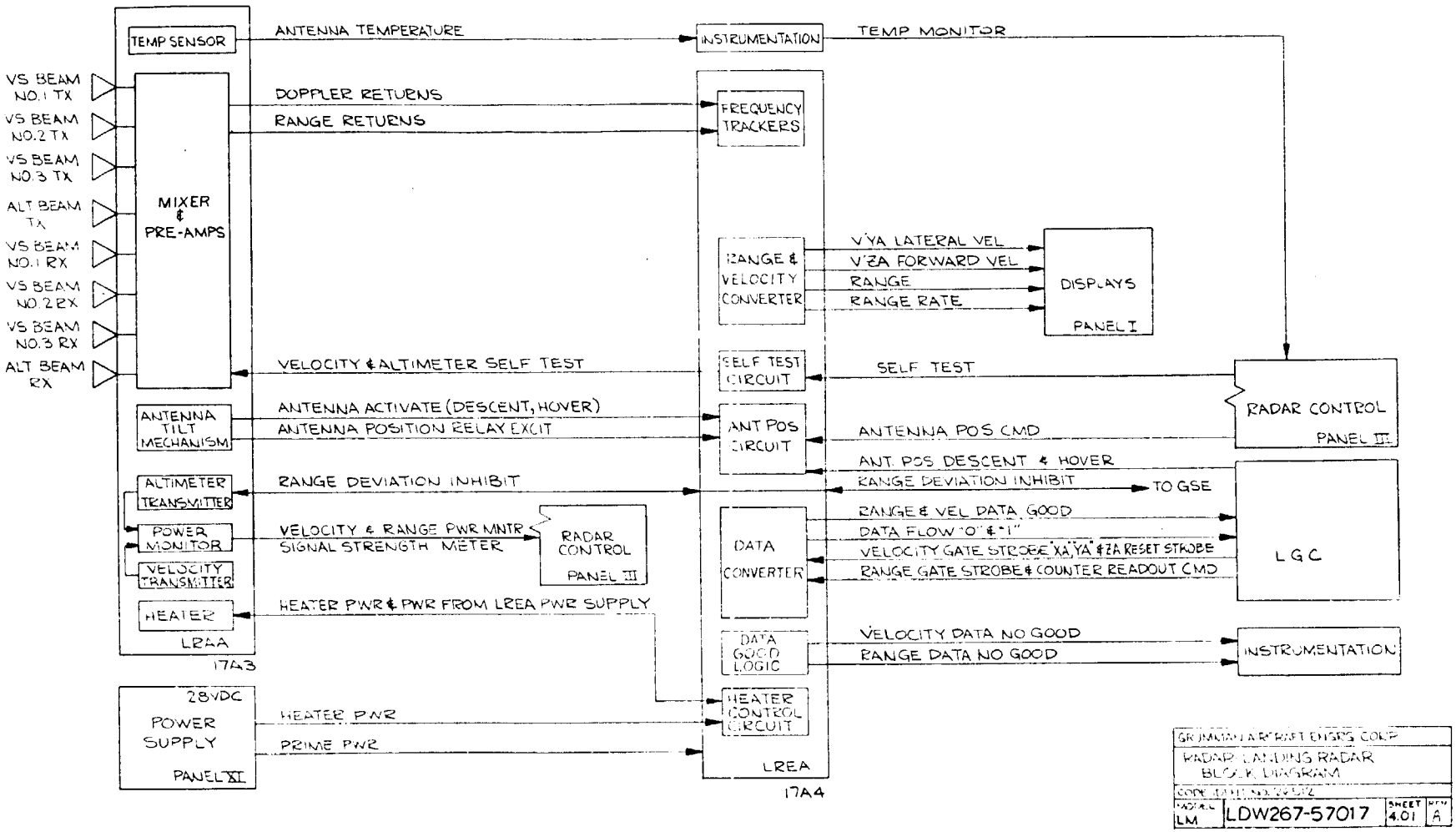
SUBSYSTEM: RADAR GUIDANCE NAVIGATION AND CONTROL SUBSYSTEM (FUNCTIONAL GROUPING 17)

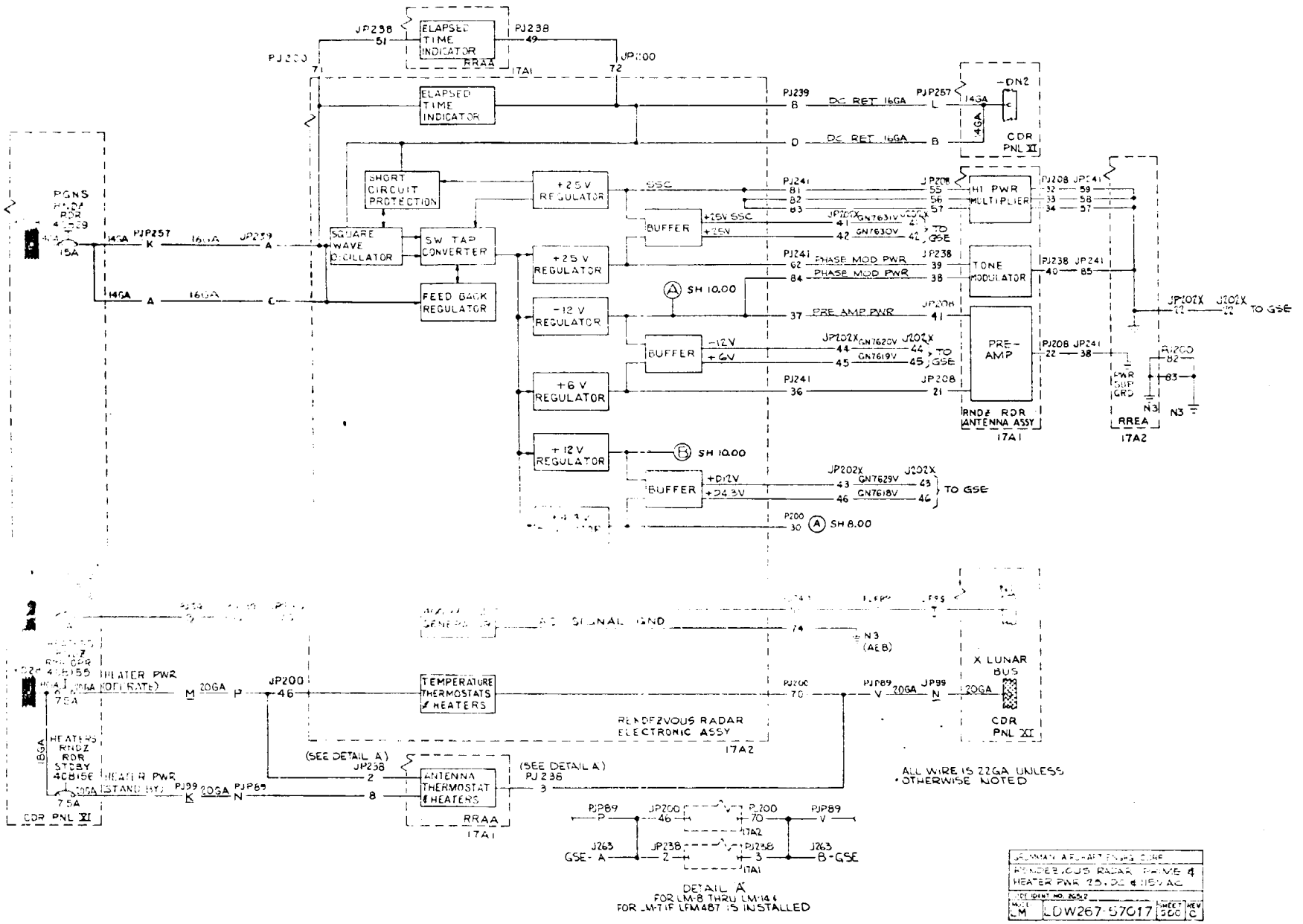
Code	Control/Indicator	Function
17S3 (Cont.)		the Rendezvous Radar antenna drive is controlled manually from 17S1. In the LGC position the computer automatically drives the antenna towards the target. Once the target is acquired the Radar will automatically maintain track and the No-Track component caution light (17-DS-1) will extinguish.
17S5	LDG ANT SWITCH 3-POSITION TOGGLE LOCK-LOCK-LOCK	This three position toggle (AUTO-DES-HOVER) in the AUTO position enables the LGC to position the Landing Radar antenna appropriate to a particular mission phase. The DES and HOVER positions provide an override of the antenna position drive signal in case of LGC/Antenna interface failure. The DES position is also used to reposition the antenna after testing.
17S6	RADAR TEST SWITCH 3-POSITION TOGGLE MAIN-LOCK-MAIN	This three-position toggle (RNDZ-OFF-LDG) provides signals to the Rendezvous and Landing Radar's test circuitry. In the RNDZ or LDG position, test circuitry is enabled and Rendzvous Radar or Landing Radar performance is determined by monitoring 17M1, the Altitude/Range meter (9M9), and the X-Pointers (9M2 and 9M3) after the appropriate positioning of the following switches: a) Radar Test Switch (17S8) b) Mode Sel. Switch (9S9) c) Rate/Err Mon. Switches (9S2 and 9S7) d) RNG/ALT Mon Switch (9S4).
17S8	TEST/MONITOR SWITCH 6-POSITION ROTARY	This six-position rotary (LDG RADAR PWR: ALT XMTR-VEL XMTR; RNDZ RADAR: AGC-XMTR PWR-SHAFT ERR-TRUN ERR) selects either Landing or Rendezvous Radar test data or flight performance data for monitoring on meter 17M1. In the ALT XMTR position, the landing radar altitude transmitter power output is displayed on 17M1 during testing and flight operations. In the VEL

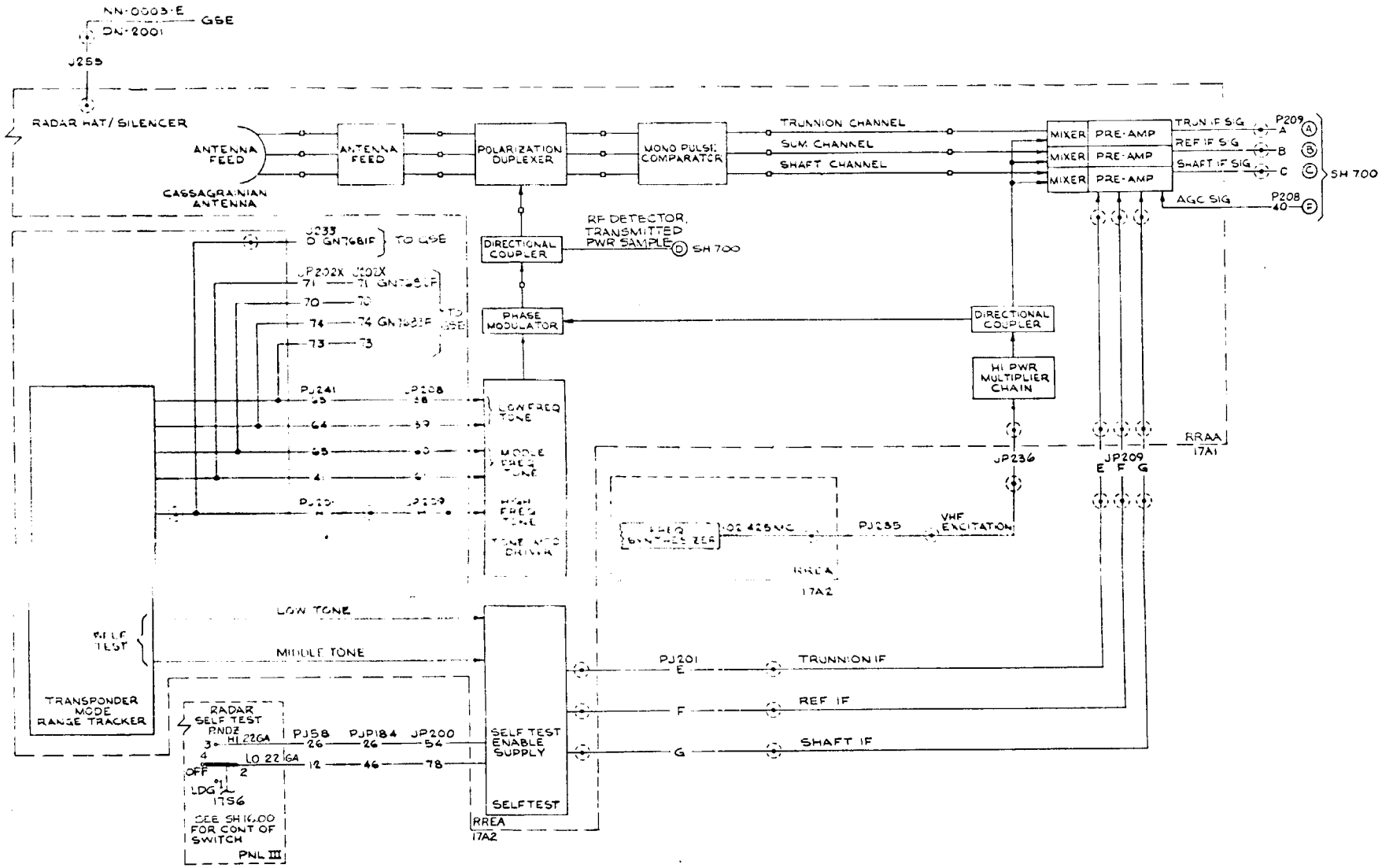
SUBSYSTEM: RADAR GUIDANCE NAVIGATION AND CONTROL SUBSYSTEM (FUNCTIONAL GROUPING 17)

Code	Control/Indicator	Function
17S8 (Cont.)		XMTR position, the landing radar velocity transmitter power output is displayed on 17M1 during testing and flight operations. In the AGC position, during testing, a specific value of Rendezvous Radar receiver signal strength will be displayed on 17M1; however, during flight operations the signal will vary. In the XMTR PWR position, a specific value of Rendezvous Radar transmitter output power is displayed on 17M1. In the SHAFT ERR and/or TRUN ERR positions, during testing Rendezvous Radar angle error signals will be displayed as needle fluctuations with equal amplitude on 17M1. During flight operations these error signals will be displayed as needle fluctuations which represent the smoothness of servo tracking, and will usually be unequal in amplitude.
17S9	RNDZ RADAR GYRO SELECT SWITCH 3-POSITION TOGGLE MAIN-LOCK-MAIN	This three-position toggle (PRIM-AUTO-SEC) provides the means to override the automatic gyro voting logic circuit in the Rendezvous Radar Electronic Assembly by selecting either the primary or secondary pair of Rendezvous Radar gyros.
17DS1	NO TRACK LIGHT COMPONENT CAUTION LIGHT	The illumination of this light indicates that the Rendezvous Radar has broken track (data not good).
17M1	SIGNAL STRENGTH METER	The Signal Strength meter displays Landing Radar and Rendezvous Radar data as selected by 17S8 for test and flight operations.


PHASE MOD
MODULATING TONES
TRANSMITTER POWER
TRUNNION IF DIFF
REFERENCE IF SUM
SHAFT IF DIFF
ANT
DUPLEX
COMP
MIX & PRE AMPS
RANGE TRACKER
XSTR CONVERTER
RCVR
TRUN
SHAFT
PWR MONITOR & SIG. STRENGTH METER
METER POWER ON-OFF PNL XI
SIG STRENGTH DISPLAY PWR
SIGNAL STRENGTH DISPLAY
SELF TEST SIGNALS
SELF TEST
SELF TEST ENABLE
X96 XMTR MULTIPLIER
FREQ MULTIPLIER EXCITATION
FREQ SYNC
SERVO MOTORS
TRUNNION AXIS MOTOR DRIVE
SHAFT AXIS MOTOR DRIVE
SERVO CONTROL AND AMPL
POS & NEG SLEW SUPPLY
SHAFT & TRUNNION Δ ERROR
SHAFT & TRUNNION MANUAL SLEW
SHAFT & TRUNNION DESIG SIGNAL
AUTO TRACK ENABLE
AUTO TRK ENABLE FROM DSKY
TRUNNION DESIGNATE
SHAFT DESIGNATE FROM CDU
PNL III
RESOLVERS
TO DISPLAYS
TRUNNION ANGLES
SHAFT ANGLES
TO DISPLAYS
GYROS
GYRO TORQUE
GYRO PICKOFF
GYRO MOTOR EXCITATION
PULSE GEN DISPLAY TIMER
XPONDER MODE
DOPPLER SENSE SUPPLY
RANGE DISPLAY TIMING SIGNAL
TIMING SIGNAL
RANGE DATA TO RANGE RANGE/RT INDICATOR
RANGE RATE PRF TO RANGE RATE RANGE/RT INDICATOR
DATA FLOW RANGE & RANGE RATE
TO LGC
PNL I
HEATER TEMP SENSOR
ANT TEMP SENSOR
TO INST
TO DISPLAY
TIME ELAPSED INDICATOR
28V ELAPSED TIME INDICATOR
RREA TRACKER
LOGIC
BUFFER & PHASE SHIFTER
TRUNNION & SHAFT ANGLES
TO CDU
TONE MODULATOR
PRE - AMP
FROM RREA POWER SUPPLY
DC POWER SUPPLY
ANGLE RATE FILTER
ANGLE RATE
TO DISPLAYS (FDAI)
SIGNAL DATA PROCESSOR
COUNTER READOUT CMD, RESET STROBE
RANGE RATE GATE STROBE
FROM LGC
28VDC STBY
28VDC OPERATE
HEATERS & THERMOSTATS
PNL XI
PNL XI
28VDC
115 VAC
400 HZ 2Ø GENERATOR
HEATER & PROPORT CONTROL
RENDEZVOUS RADAR ANTENNA ASSY
17A1
GSE HEATER POWER
OPERATE
RENDEZVOUS RADAR ELECTRONIC ASSY
17A2
LDW267 57017

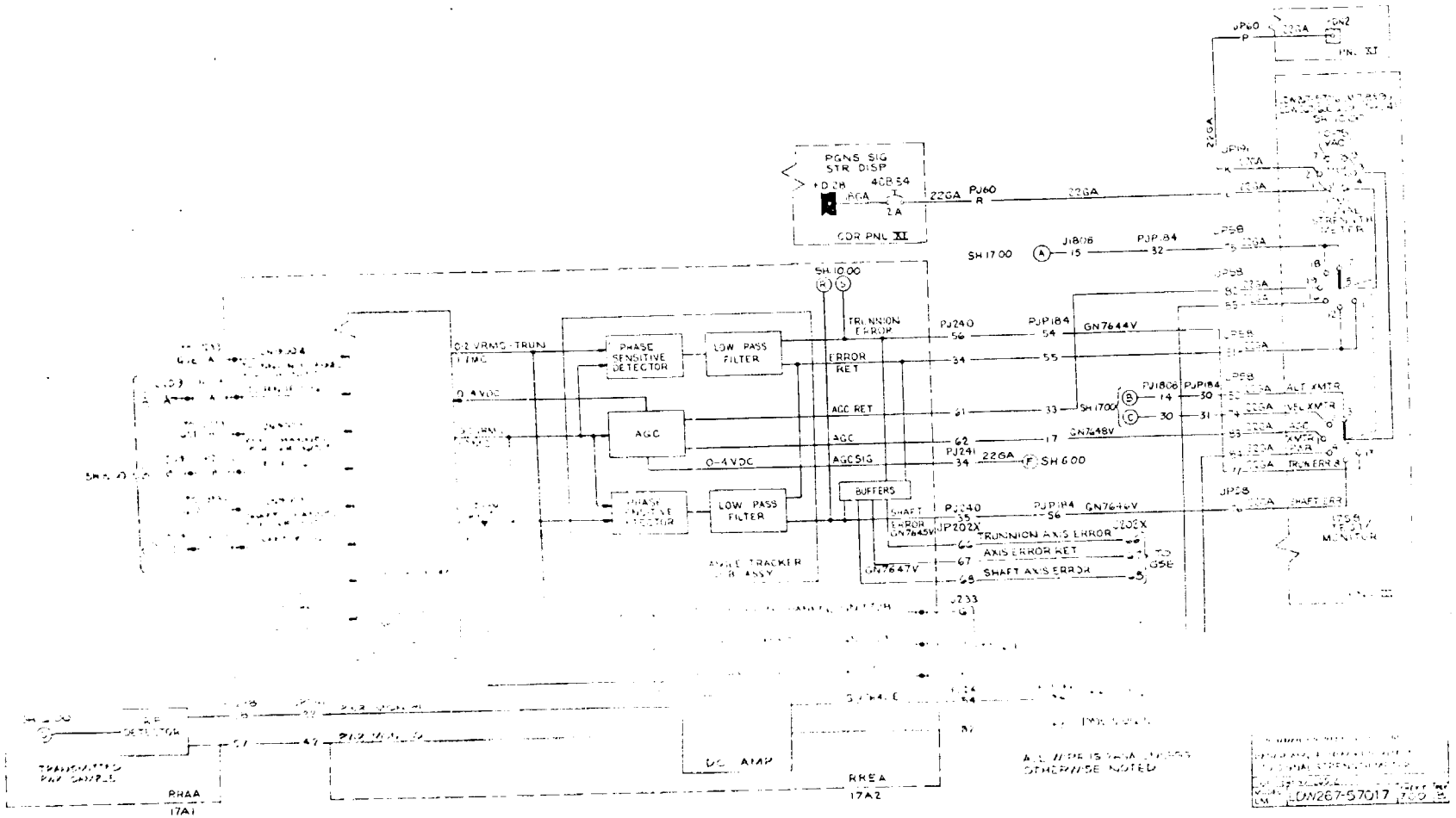

TEMP SENSOR
ANTENNA TEMPERATURE
INSTRUMENTATION
TEMP MONITOR
VS BEAM NO.1 TX
VS BEAM NO.2 TX
VS BEAM NO.3 TX
ALT BEAM TX
VS BEAM NO.1 RX
VS BEAM NO.2 RX
VS BEAM NO.3 RX
ALT BEAM RX
MIXER & PRE-AMPS
DOPPLER RETURNS
RANGE RETURNS
FREQUENCY TRACKERS
RANGE & VELOCITY CONVERTER
V'YA LATERAL VEL
V'ZA FORWARD VEL
RANGE
RANGE RATE
DISPLAYS PANEL I
VELOCITY & ALTIMETER SELF TEST
SELF TEST CIRCUIT
SELF TEST
RADAR CONTROL PANEL II
ANTENNA TILT MECHANISM
ANTENNA ACTIVATE (DESCENT, HOVER)
ANTENNA POSITION RELAY EXCIT
ANT POS CIRCUIT
ANTENNA POS CMD
ANT. POS DESCENT & HOVER
ALTIMETER TRANSMITTER
RANGE DEVIATION INHIBIT
RANGE DEVIATION INHIBIT
TO GSE
POWER MONITOR
VELOCITY TRANSMITTER
VELOCITY & RANGE PWR MNTR
SIGNAL STRENGTH METER
RADAR CONTROL PANEL III
DATA CONVERTER
RANGE & VEL DATA GOOD
DATA FLOW "0" & "1"
VELOCITY GATE STROBE XA, YA & ZA RESET STROBE
RANGE GATE STROBE & COUNTER READOUT CMD
LGC
HEATER
HEATER PWR & PWR FROM LREA PWR SUPPLY
LRAA
17A3
DATA GOOD LOGIC
VELOCITY DATA NO GOOD
RANGE DATA NO GOOD
INSTRUMENTATION
28VDC POWER SUPPLY PANEL XI
HEATER PWR
PRIME PWR
HEATER CONTROL CIRCUIT
LREA
17A4
GRUMMAN AIRCRAFT ENGRG CORP
RADAR LANDING RADAR BLOCK DIAGRAM
CODE IDENT NO. 70082
MATERIAL LM
LDW267-57017
SHEET 4.01
REV A

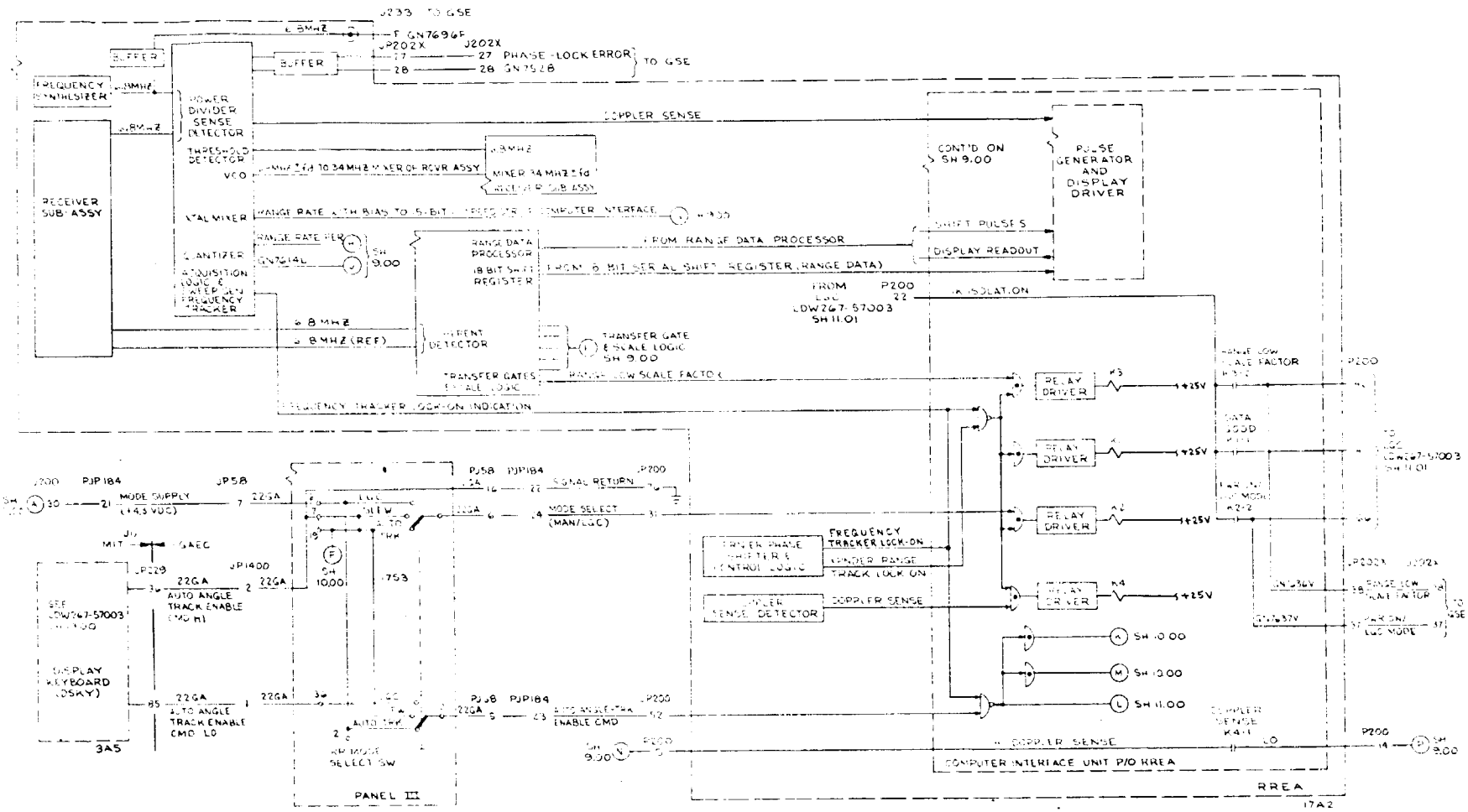

ELAPSED TIME INDICATOR
RRAA
17A1
JP238
51
PJ238
49
PJ200
71
JP200
72
ELAPSED TIME INDICATOR
PJ239
B
DC RET 16GA
PJP257
L
-DN2
14GA
CDR PNL XI
D
DC RET 16GA
B
SHORT CIRCUIT PROTECTION
+25 V REGULATOR
SSC
PJ241
81
82
83
JP208
55
56
57
HI PWR MULTIPLIER
PJ208 JP241
32 59
33 58
34 57
PGNS
RNDZ RDR
4 C359
14GA
PJP257
K
16GA
JP239
A
15A
SQUARE WAVE OSCILLATOR
SW TAP CONVERTER
BUFFER
+15V SSC
+15V
JP202X GN7631V J202X
41 41
42 GN7630V 42
TO GSE
FEED BACK REGULATOR
+25 V REGULATOR
PJ241
62
84
PHASE MOD PWR
PHASE MOD PWR
JP238
39
38
TONE MODULATOR
PJ238 JP241
40 85
14GA
A
16GA
C
A SH 10.00
-12 V REGULATOR
37
PRE AMP PWR
JP208
41
PRE-AMP
BUFFER
-12V
+6V
JP202X GN7620V J202X
44 44
45 GN7619V 45
TO GSE
PJ208 JP241
22 38
+6 V REGULATOR
PJ241
36
JP208
21
RNDZ RDR ANTENNA ASSY
17A1
PWR SUP GRD
N3
RREA
17A2
JP202X J202X
12 12
TO GSE
+12 V REGULATOR
B SH 10.00
BUFFER
+12V
+24.3V
JP202X GN7629V J202X
43 43
46 GN7618V 46
TO GSE
P200
30
A SH 8.00
SIGNAL GND
74
N3
(AEB)
X LUNAR BUS
20GA
CDR PNL XI
HEATER PWR
(OPERATE)
M
20GA
P
JP200
46
TEMPERATURE THERMOSTATS & HEATERS
PJ200
70
PJP89
V
20GA
JP99
N
RENDEZVOUS RADAR ELECTRONIC ASSY
17A2
HEATERS RNDZ RDR STBY 40B155
HEATER PWR
(STAND BY)
PJ99
K
20GA
PJP89
N
JP238
2
8
ANTENNA THERMOSTAT & HEATERS
RRAA
17A1
(SEE DETAIL A)
JP238
2
(SEE DETAIL A)
PJ238
3
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
CDR PNL XI
PJP89
P
JP200
46
P200
70
PJP89
V
J263
GSE-A
JP238
2
PJ238
3
J263
B-GSE
17A2
17A1
DETAIL A
FOR LM-8 THRU LM-14 &
FOR LM-TF LEM 487 IS INSTALLED
GRUMMAN AEROSPACE CORP.
RENDEZVOUS RADAR PRIME 4
HEATER PWR 28 DC & 115 V AC
SEE PRINT NO. 8552
MOD LM
LDW267-57017
SHEET 300
REV C



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.

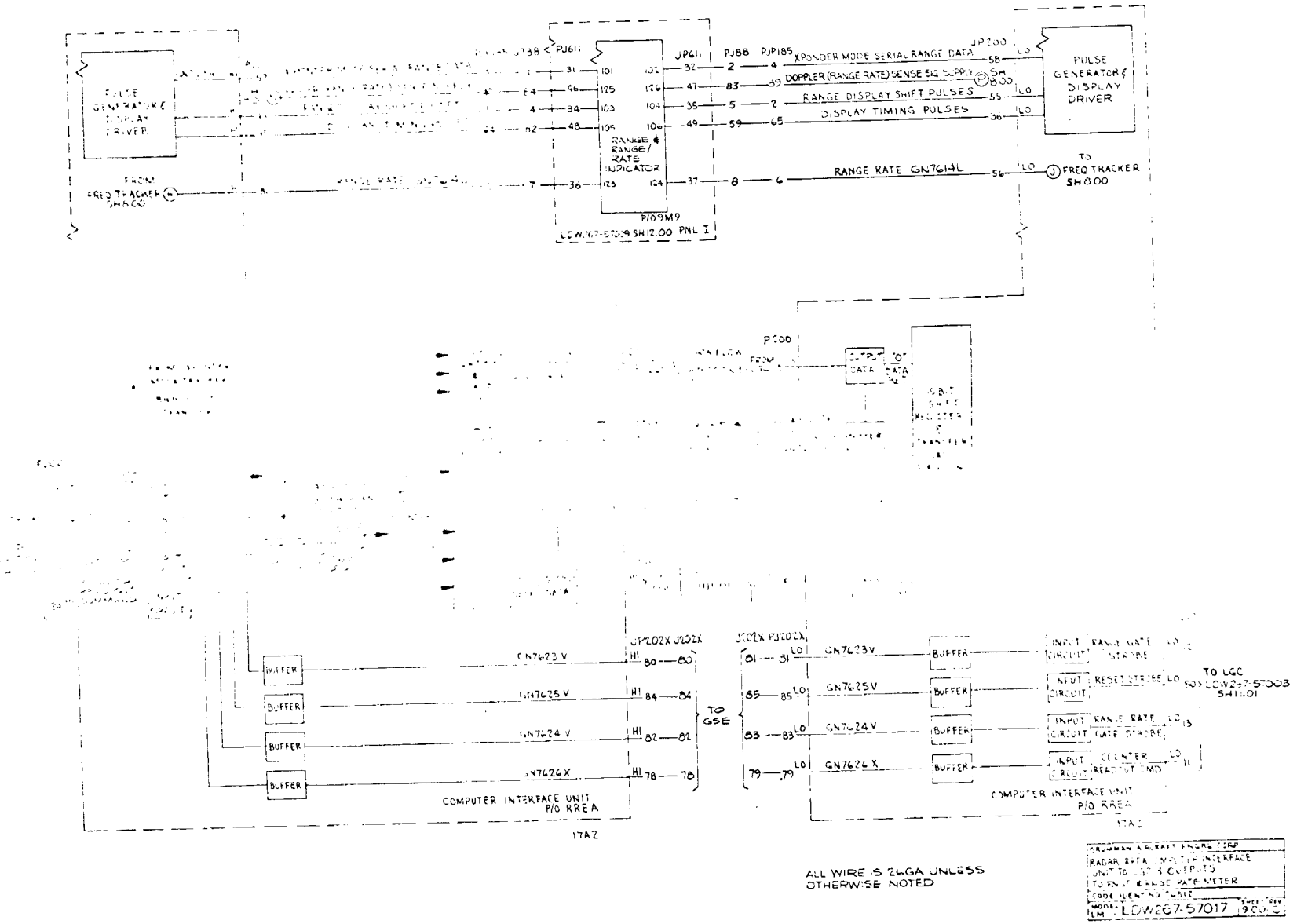
GRUMMAN AIRCRAFT ENGRG CORP			
RADAR RR ANTENNA ASSY, TRANSPONDER MODE TRACKER & SELF TEST INTERFACE			
CODE IDENT NO. 20812			
MODEL LM	LDW267-57017	SHEET 600	REV A

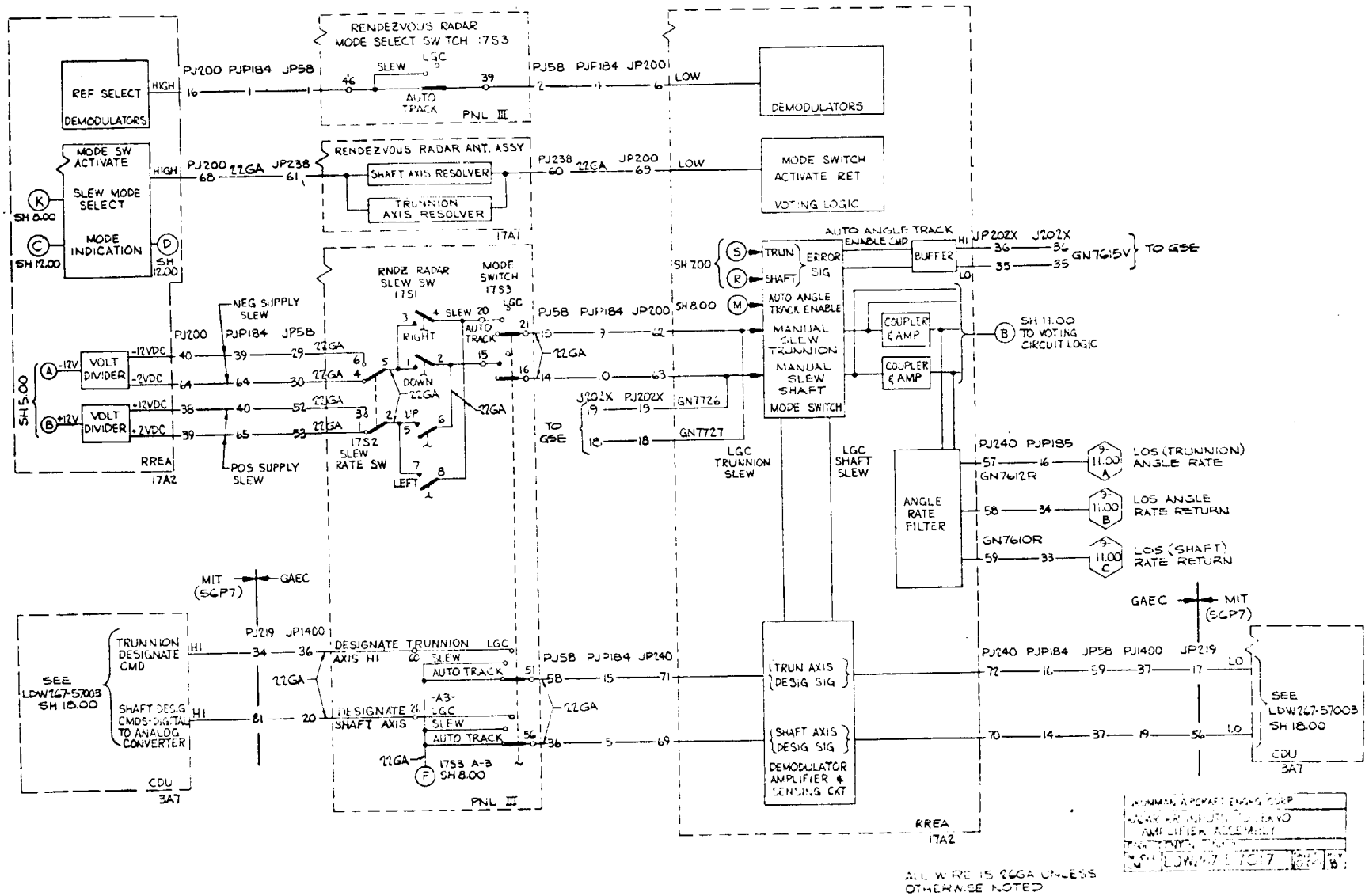

PGNS SIG STR DISP
CDR PNL XI
PHASE SENSITIVE DETECTOR
LOW PASS FILTER
AGC
BUFFERS
TRUNNION ERROR
ERROR RET
AGC RET
AGC
AGCSIG
SHAFT ERROR
TRUNNION AXIS ERROR
AXIS ERROR RET
SHAFT AXIS ERROR
0-4 VDC
PJ240
PJP184
PJ241
PJ202X
J202X
J233
GN7644V
GN7648V
GN7645V
GN7647V
GN7646V
22GA
SH 17.00
SH 6.00
SH 10.00
RRAA
17A1
RRBA
17A2
LDN267-57017

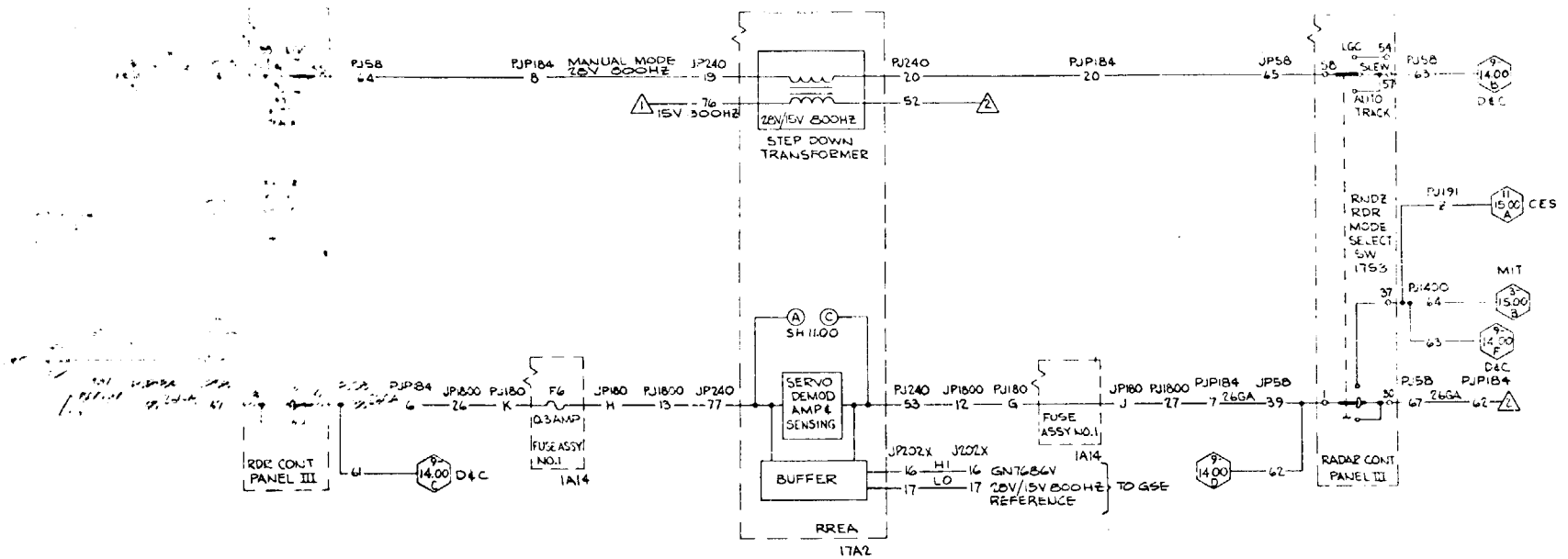


ALL WIRE 12 26GA UNLESS OTHERWISE NOTED

	HALAR COMPUTER INTERFACE UNIT INPUTS
SIZE	LDW267-57017


PULSE GENERATOR & DISPLAY DRIVER
PJ611
JP611
PJ88
PJP185
XPONDER MODE SERIAL RANGE DATA
DOPPLER (RANGE RATE) SENSE SIG
RANGE DISPLAY SHIFT PULSES
DISPLAY TIMING PULSES
RANGE RATE GN7614L
RANGE & RANGE/RATE INDICATOR
P109M9
LOW267-57009 SH12.00 PNL I
FROM FREQ TRACKER SH4.00
TO FREQ TRACKER SH8.00
PULSE GENERATOR & DISPLAY DRIVER
JP200
P300
SHIFT REGISTER & TRANSFER
BUFFER
GN7623V
GN7625V
GN7624V
GN7626X
JP202X J202X
J202X PJ202X
TO GSE
INPUT CIRCUIT
RANGE RATE GATE SIGNAL
RESET STROBE
COUNTER READOUT CMD
TO LGC
LOW267-57003 SH11.01
COMPUTER INTERFACE UNIT P/O RREA
17A2
ALL WIRES 26GA UNLESS OTHERWISE NOTED
GRUMMAN AEROSPACE CORP
RADAR RREA INTERFACE UNIT TO LGC & OUTPUTS TO PNL & RANGE RATE METER
CODE IDENT NO 71612
SIZE
LDW267-57017
REV C

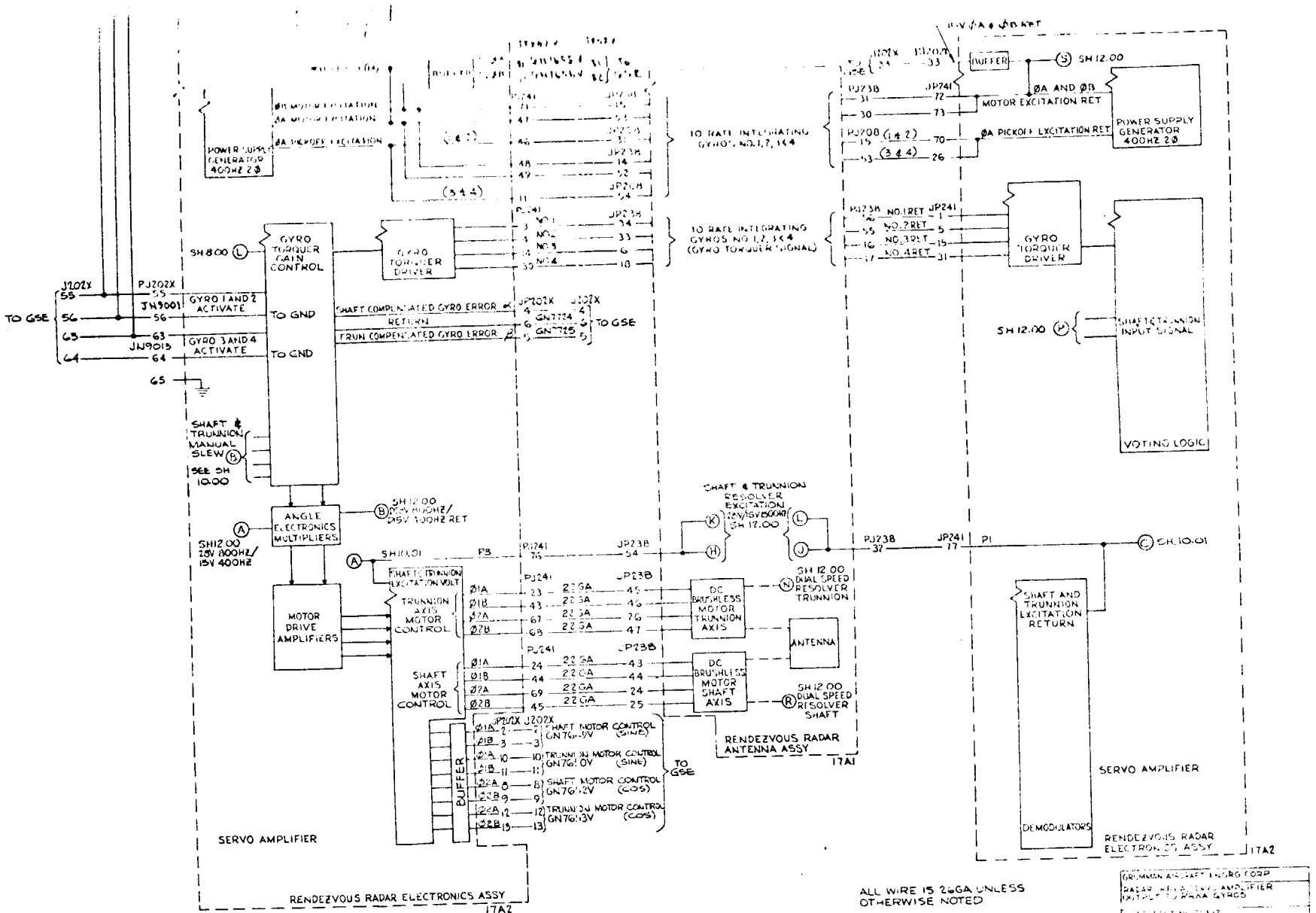

RENDEZVOUS RADAR MODE SELECT SWITCH 17S3
REF SELECT DEMODULATORS
HIGH
PJ200 PJP184 JP58
SLEW
LGC
AUTO TRACK
PNL III
PJ58 PJP184 JP200
LOW
DEMODULATORS
MODE SW ACTIVATE
SLEW MODE SELECT
MODE INDICATION
RENDEZVOUS RADAR ANT. ASSY
SHAFT AXIS RESOLVER
TRUNNION AXIS RESOLVER
PJ200 22GA JP238
PJ238 22GA JP200
MODE SWITCH ACTIVATE RET
VOTING LOGIC
17A1
SH 8.00
SH 12.00
RNDZ RADAR SLEW SW 17S1
MODE SWITCH 17S3
NEG SUPPLY SLEW
POS SUPPLY SLEW
-12VDC
-2VDC
+12VDC
+2VDC
VOLT DIVIDER
RIGHT
DOWN
UP
LEFT
17S2 SLEW RATE SW
RREA 17A2
SH 5.00
SH 7.00
TRUN
SHAFT
ERROR SIG
AUTO ANGLE TRACK ENABLE CMD
BUFFER
HI
LO
JP202X J202X
GN7615V
TO GSE
AUTO ANGLE TRACK ENABLE
MANUAL SLEW TRUNNION
MANUAL SLEW SHAFT
MODE SWITCH
COUPLER & AMP
SH 11.00 TO VOTING CIRCUIT LOGIC
J202X PJ202X GN7726
GN7727
TO GSE
LGC TRUNNION SLEW
LGC SHAFT SLEW
ANGLE RATE FILTER
PJ240 PJP185
GN7612R
LOS (TRUNNION) ANGLE RATE
GN7610R
LOS ANGLE RATE RETURN
LOS (SHAFT) RATE RETURN
MIT (SGP7)
GAEC
PJ219 JP1400
SEE LDW267-57003 SH 18.00
TRUNNION DESIGNATE CMD
SHAFT DESIG CMDS-DIGITAL TO ANALOG CONVERTER
CDU 3A7
DESIGNATE TRUNNION AXIS HI
DESIGNATE SHAFT AXIS
A3-LGC
17S3 A-3 SH 8.00
PJ58 PJP184 JP240
PJ240 PJP184 JP58 PJ1400 JP219
TRUN AXIS DESIG SIG
SHAFT AXIS DESIG SIG
DEMODULATOR AMPLIFIER & SENSING CKT
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

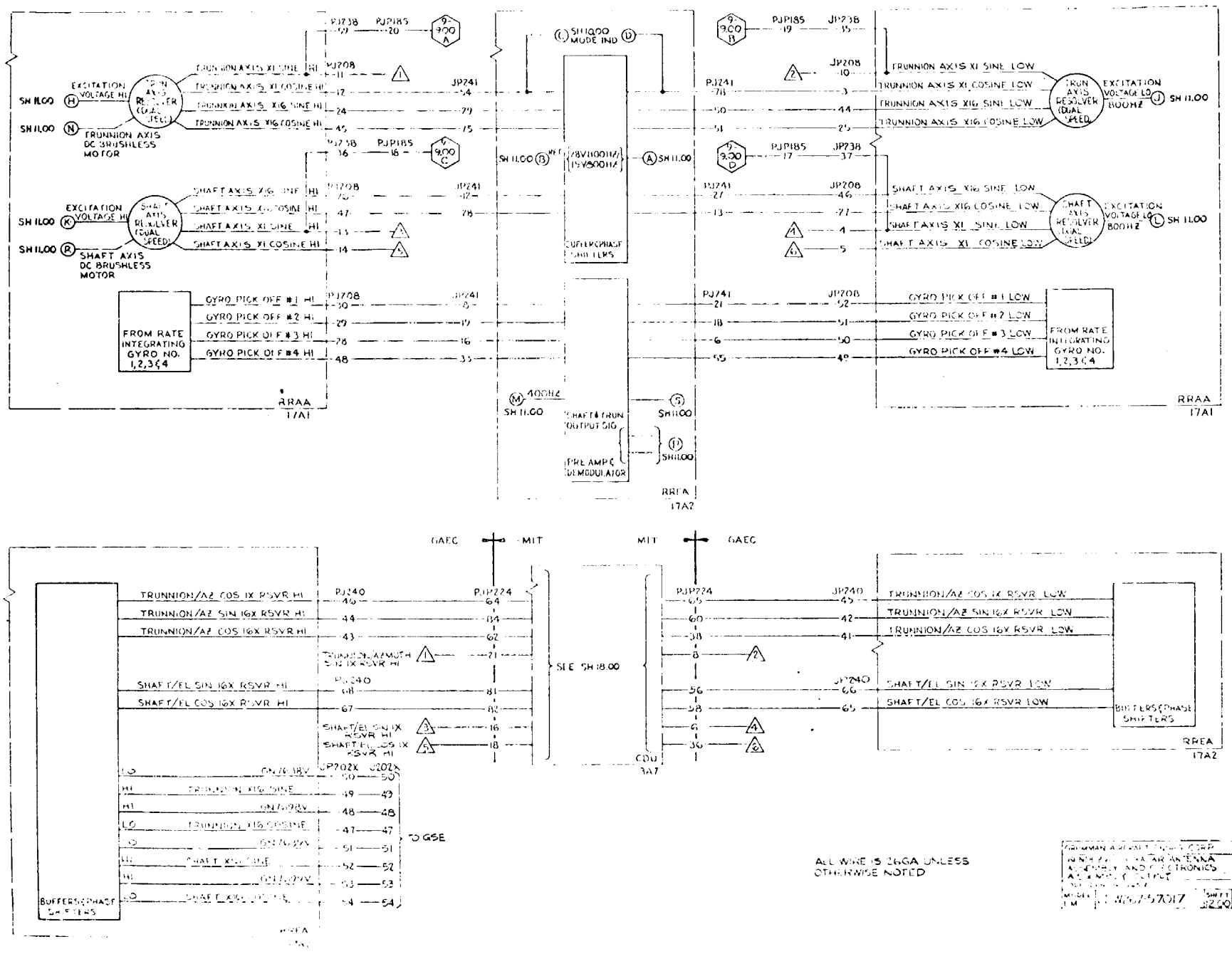


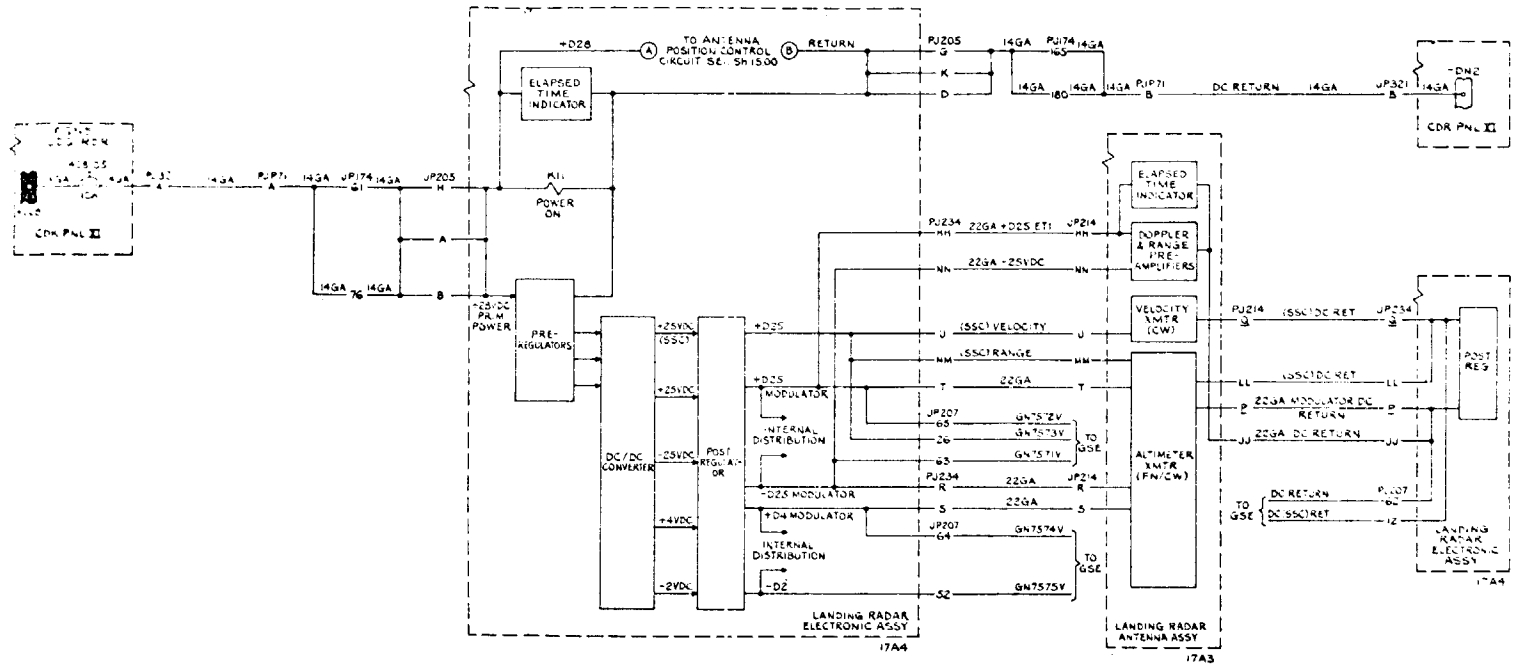
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED.

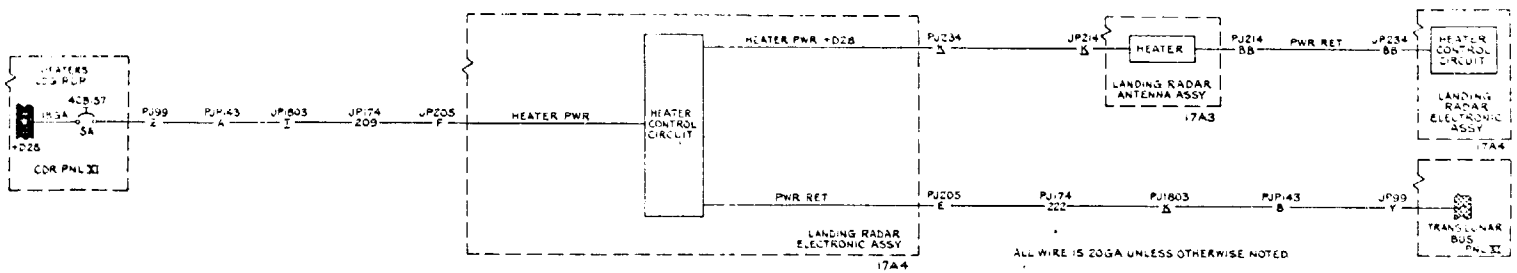
RADAR RR 800HZ INPUT TO SERVO AMPLIFIER ASSY

MODEL		SHEET	REV
LEM	LDW267-57017	10.01	B

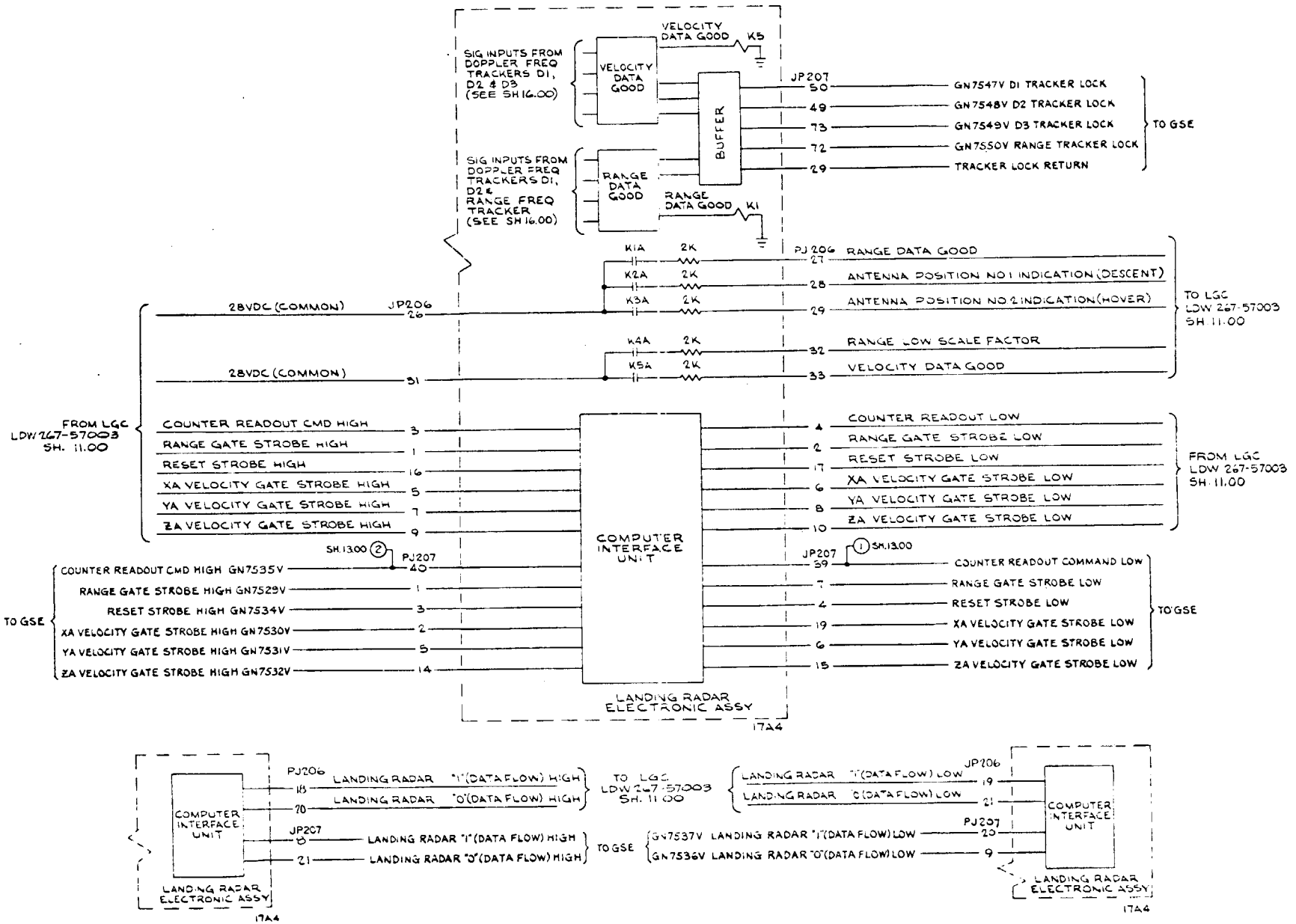

GYRO TORQUER GAIN CONTROL
GYRO TORQUER DRIVER
GYRO TORQUER DRIVER
GYRO 1 AND 2 ACTIVATE
GYRO 3 AND 4 ACTIVATE
TO GND
SHAFT COMPENSATED GYRO ERROR RETURN
TRUN COMPENSATED GYRO ERROR
TO GSE
SHAFT & TRUNNION MANUAL SLEW
ANGLE ELECTRONICS MULTIPLIERS
MOTOR DRIVE AMPLIFIERS
TRUNNION AXIS MOTOR CONTROL
SHAFT AXIS MOTOR CONTROL
BUFFER
SHAFT MOTOR CONTROL (SINE)
TRUNNION MOTOR CONTROL (SINE)
SHAFT MOTOR CONTROL (COS)
TRUNNION MOTOR CONTROL (COS)
SERVO AMPLIFIER
RENDEZVOUS RADAR ELECTRONICS ASSY
17A2
10 RATE INTEGRATING GYROS NO.1,2,3&4
10 RATE INTEGRATING GYROS NO 1,2,3&4 (GYRO TORQUER SIGNAL)
POWER SUPPLY GENERATOR 400HZ 2Ø
ØA AND ØB MOTOR EXCITATION RET
ØA PICKOFF EXCITATION RET
BUFFER
GYRO TORQUER DRIVER
VOTING LOGIC
SHAFT&TRUNNION INPUT SIGNAL
SHAFT & TRUNNION RESOLVER EXCITATION
DC BRUSHLESS MOTOR TRUNNION AXIS
DC BRUSHLESS MOTOR SHAFT AXIS
ANTENNA
DUAL SPEED RESOLVER TRUNNION
DUAL SPEED RESOLVER SHAFT
SHAFT AND TRUNNION EXCITATION RETURN
DEMODULATORS
SERVO AMPLIFIER
RENDEZVOUS RADAR ELECTRONICS ASSY
17A2
RENDEZVOUS RADAR ANTENNA ASSY
17A1
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.
GRUMMAN AIRCRAFT ENGR CORP
RADAR FREQ. DEV. AMPLIFIER (OUTPUT TO RADAR GYROS)
CAGE JOINT NO. 25512
MODEL LM
CONTRACT NAS 9-7017
SHEET REV 11.00 B


TRUNNION AXIS RESOLVER (DUAL SPEED)
TRUNNION AXIS DC BRUSHLESS MOTOR
SHAFT AXIS RESOLVER (DUAL SPEED)
SHAFT AXIS DC BRUSHLESS MOTOR
EXCITATION VOLTAGE HI
TRUNNION AXIS XI SINE HI
TRUNNION AXIS XI COSINE HI
TRUNNION AXIS X16 SINE HI
TRUNNION AXIS X16 COSINE HI
SHAFT AXIS X16 SINE HI
SHAFT AXIS X16 COSINE HI
SHAFT AXIS XI SINE HI
SHAFT AXIS XI COSINE HI
TRUNNION AXIS XI SINE LOW
TRUNNION AXIS XI COSINE LOW
TRUNNION AXIS X16 SINE LOW
TRUNNION AXIS X16 COSINE LOW
SHAFT AXIS X16 SINE LOW
SHAFT AXIS X16 COSINE LOW
SHAFT AXIS XI SINE LOW
SHAFT AXIS XI COSINE LOW
EXCITATION VOLTAGE LO 800HZ
GYRO PICK OFF #1 HI
GYRO PICK OFF #2 HI
GYRO PICK OFF #3 HI
GYRO PICK OFF #4 HI
GYRO PICK OFF #1 LOW
GYRO PICK OFF #2 LOW
GYRO PICK OFF #3 LOW
GYRO PICK OFF #4 LOW
FROM RATE INTEGRATING GYRO NO. 1,2,3&4
BUFFERS&PHASE SHIFTERS
SHAFT&TRUN OUTPUT SIG
PRE AMPS DEMODULATOR
400HZ
SH11.00
SH11.00 MODE IND
RRAA 17A1
RRBA 17A2
RRBA
GAEC
MIT
SEE SH18.00
CDU 3A7
TRUNNION/AZ COS IX RSVR HI
TRUNNION/AZ SIN 16X RSVR HI
TRUNNION/AZ COS 16X RSVR HI
TRUNNION/AZIMUTH SIN IX RSVR HI
SHAFT/EL SIN 16X RSVR HI
SHAFT/EL COS 16X RSVR HI
SHAFT/EL SIN IX RSVR HI
SHAFT/EL COS IX RSVR HI
TRUNNION/AZ COS IX RSVR LOW
TRUNNION/AZ SIN 16X RSVR LOW
TRUNNION/AZ COS 16X RSVR LOW
SHAFT/EL SIN 16X RSVR LOW
SHAFT/EL COS 16X RSVR LOW
TO GSE
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED



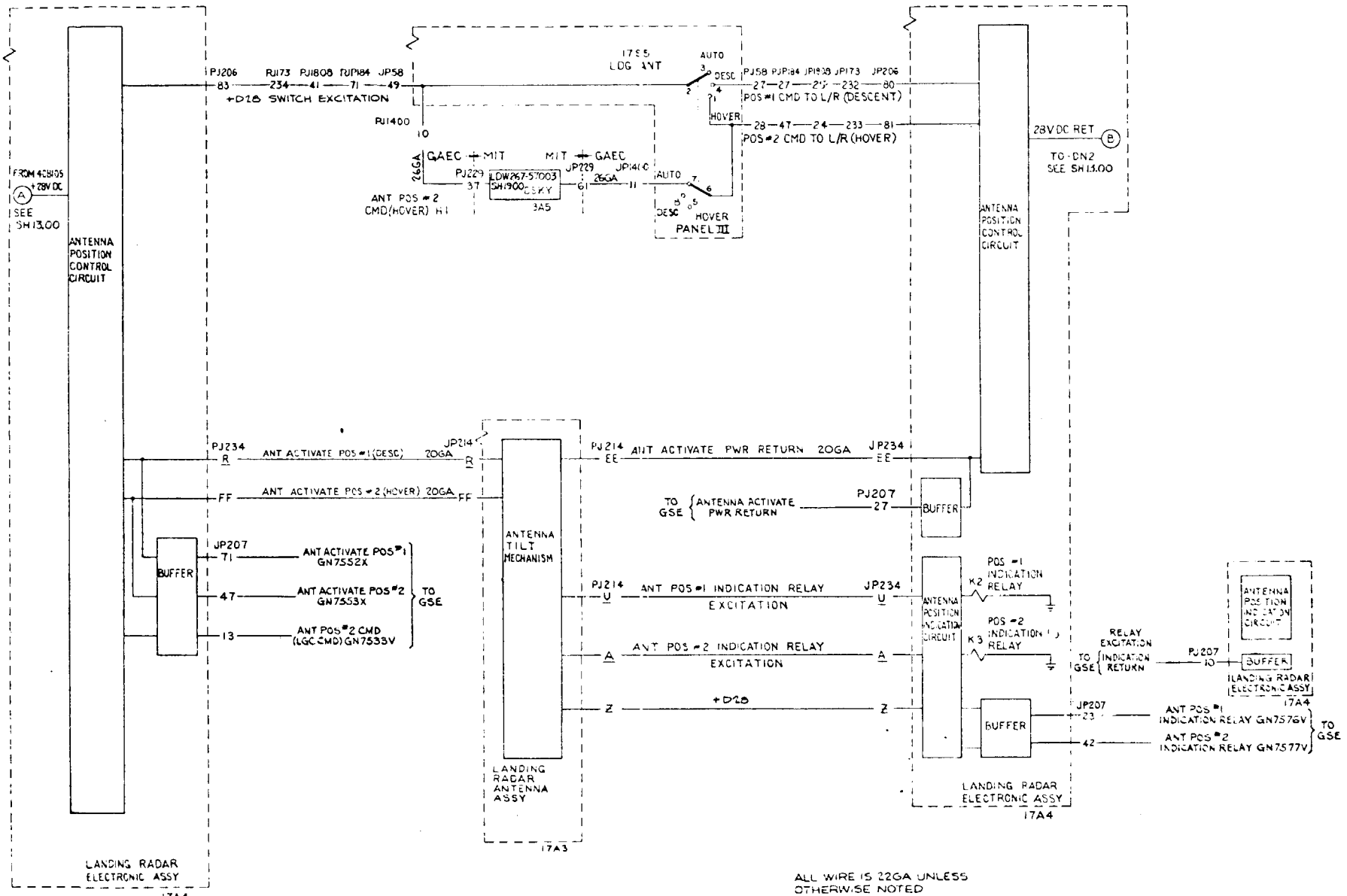


GRUMMAN AEROSPACE CORP	
LANDING RADAR PRIME POWER & HEATER DISTRIBUTION	
CAGE IDENT NO. 14934	
MODEL LM	LDW2617-570.7



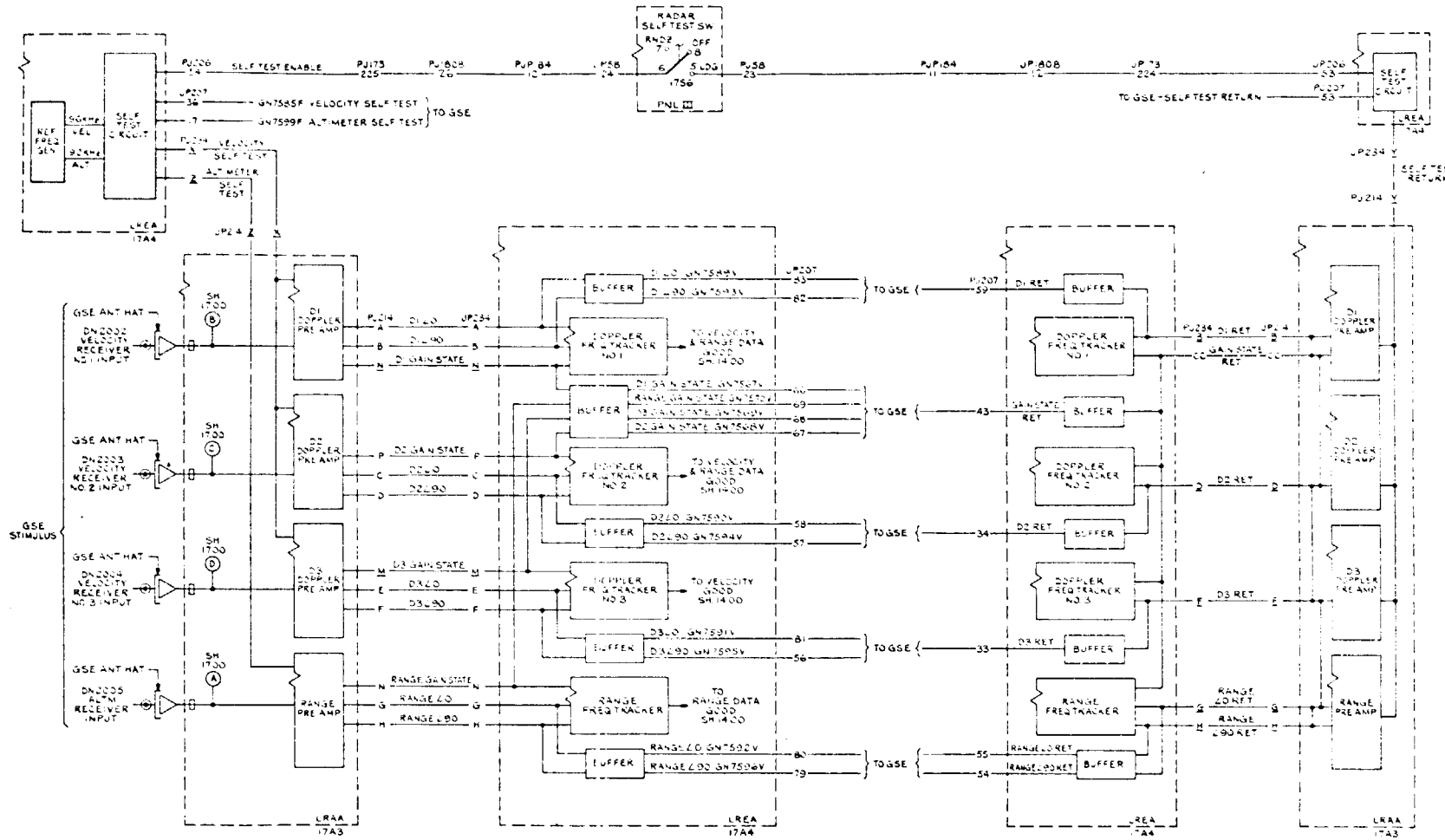
ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.

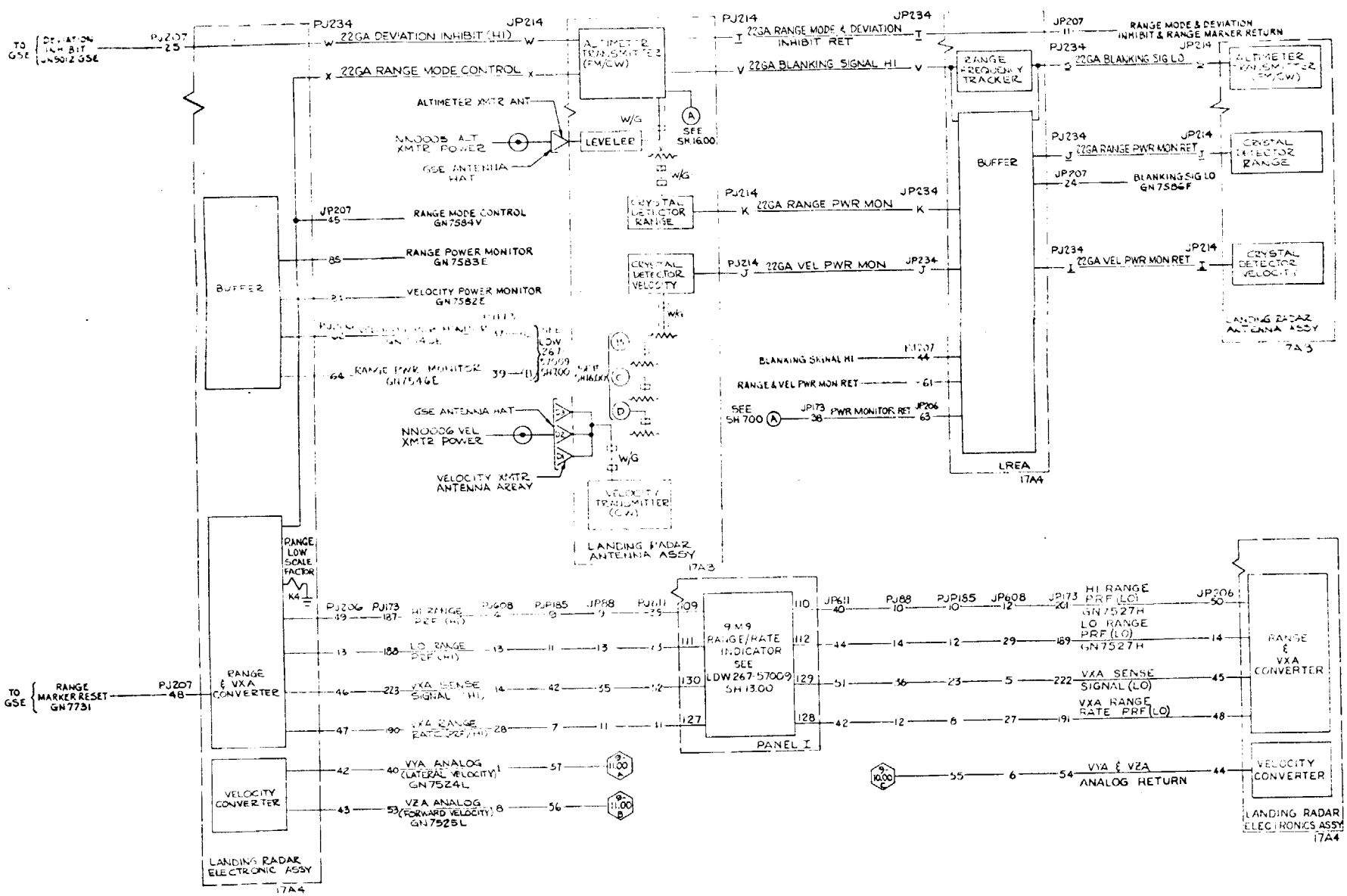
GRUMMAN AIRCRAFT ENGRG CORP
RADAR-LANDING RADAR
M.T.-LGC INTERFACE
SIZE | DWG NO | REV
M | LDW267-57007 | E



ALL WIRE IS 22GA UNLESS OTHERWISE NOTED

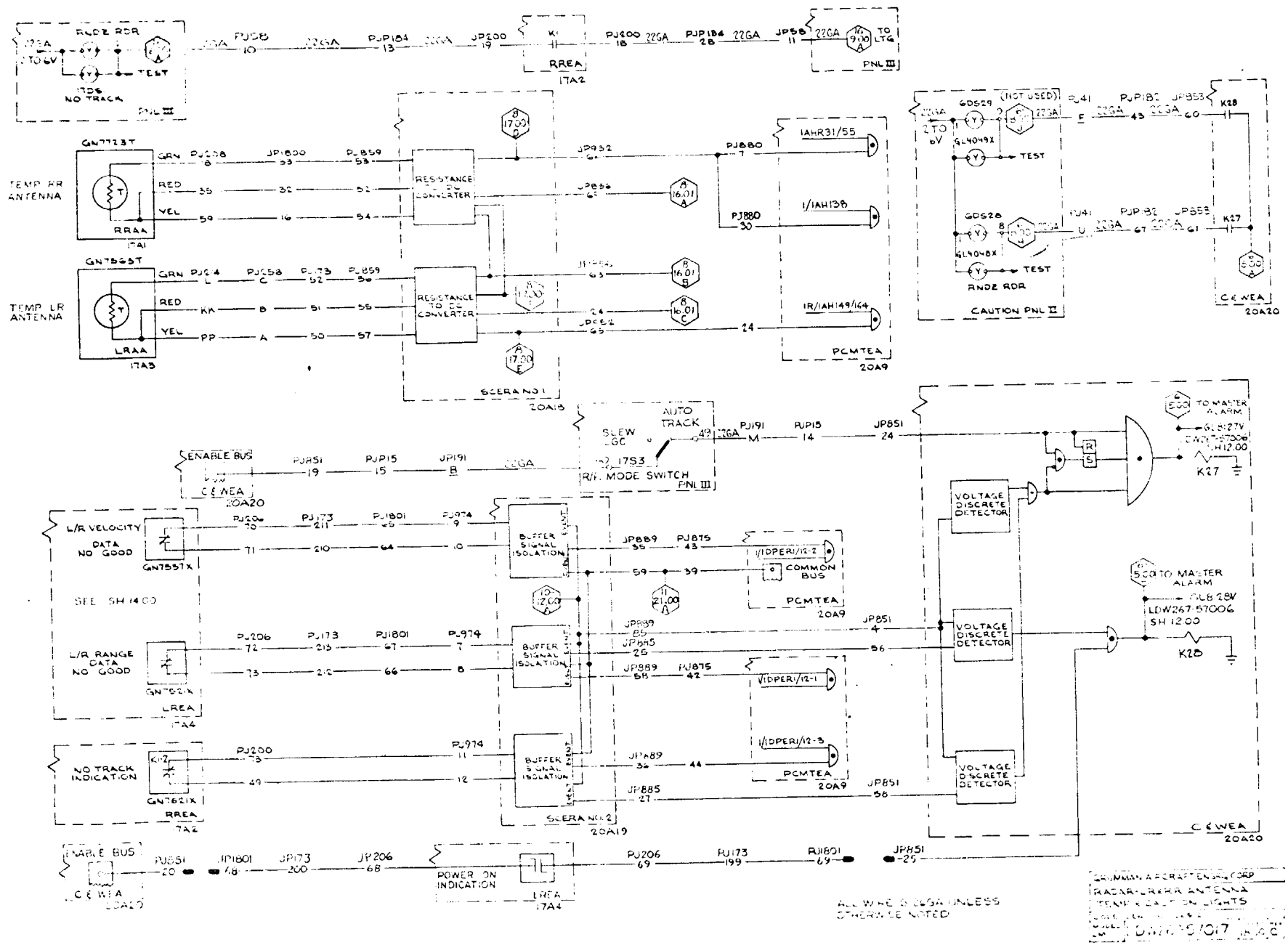
GRUMMAN AIRCRAFT ENGG. CORP.
LANDING RADAR-POSITION & INDICATION CIRCUITS
LM LDW267-57011


RADAR SELF TEST SW
RNDZ
OFF
PNL III
SELF TEST ENABLE
TO GSE
GN7585F VELOCITY SELF TEST
GN7599F ALTIMETER SELF TEST
TO GSE - SELF TEST RETURN
REF FREQ GEN
SELF TEST CIRCUIT
LREA 17A4
GSE STIMULUS
GSE ANT HAT
DN2002 VELOCITY RECEIVER NO 1 INPUT
DN2003 VELOCITY RECEIVER NO 2 INPUT
DN2004 VELOCITY RECEIVER NO 3 INPUT
DN2005 ALTM RECEIVER INPUT
SM 1700
D1 DOPPLER PRE AMP
D2 DOPPLER PRE AMP
D3 DOPPLER PRE AMP
RANGE PRE AMP
LRAA 17A3
BUFFER
DOPPLER FREQ TRACKER NO 1
DOPPLER FREQ TRACKER NO 2
DOPPLER FREQ TRACKER NO 3
RANGE FREQ TRACKER
TO VELOCITY & RANGE DATA GOOD SM 1400
TO VELOCITY GOOD SM 1400
TO RANGE DATA GOOD SM 1400
TO GSE
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED



ALL WIRE IS 26GA UNLESS OTHERWISE NOTED.

GRUMMAN AIRCRAFT ENG. CORP.
RADAR-LANDING RANGE & VELOCITY SYSTEM
DRAWING NO.
SCALE
DATE


RNDZ RDR
TO 6V
TEST
NO TRACK
PNL III
RRREA
17A2
PNL III
TEMP RR ANTENNA
RRAA
17A1
TEMP LR ANTENNA
LRAA
17A3
RESISTANCE TO DC CONVERTER
SCERA NO 1
20A18
1AHR31/55
1/1AH138
1R/1AH149/164
PCMTEA
20A9
(NOT USED)
GL4049X
GL4048X
TEST
RNDZ RDR
CAUTION PNL II
C&WEA
20A20
ENABLE BUS
C&WEA
20A20
AUTO TRACK
SLEW LOC
R/T MODE SWITCH
PNL III
17S3
TO MASTER ALARM
K27
K28
L/R VELOCITY DATA NO GOOD
GN7557X
SEE SH 14 00
L/R RANGE DATA NO GOOD
GN7562X
LREA
17A4
NO TRACK INDICATION
GN7621X
RREA
17A2
BUFFER SIGNAL ISOLATION
1/1DPER1/12-2
1/1DPER1/12-1
1/1DPER1/12-3
COMMON BUS
PCMTEA
20A9
VOLTAGE DISCRETE DETECTOR
SCERA NO 2
20A19
ENABLE BUS
C&WEA
20A20
POWER ON INDICATION
LREA
17A4
C&WEA
20A20
ALL WIRE IS 22GA UNLESS OTHERWISE NOTED
GRUMMAN AEROSPACE CORP
RADAR-LR-RR ANTENNA
TEMP & CAUTION LIGHTS