

W.P.S. P. F. Sennewald

~~FC007~~

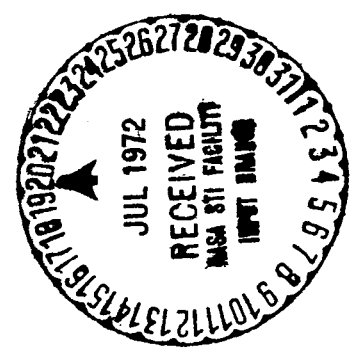
FC007  
1/16/67



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

# COMMAND SERVICE MODULE SYSTEM HANDBOOK

## CSM 101



APRIL 7, 1967

PREPARED BY

### FLIGHT CONTROL DIVISION

MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS



REPRODUCED BY  
NATIONAL TECHNICAL  
INFORMATION SERVICE  
U. S. DEPARTMENT OF COMMERCE  
SPRINGFIELD, VA. 22161

APOLLO

\*

COMMAND/SERVICE MODULE SYSTEMS HANDBOOK

CSM 101

REV A

PCN-2

PCN REVISION INSTRUCTION SHEET

Update this document in accordance with the following instructions:

Remove and replace the following pages:

iiia	3-5	3-12	3-19	3-26	3-33	3-40	6-14	6-21	6-28
iii	3-6	3-13	3-20	3-27	3-34	6-8	6-15	6-22	6-29
iv	3-7	3-14	3-21	3-28	3-35	6-9	6-16	6-23	6-30
v	3-8	3-15	3-22	3-29	3-36	6-10	6-17	6-24	6-31
vi	3-9	3-16	3-23	3-30	3-37	6-11	6-18	6-25	6-32
vii	3-10	3-17	3-24	3-31	3-38	6-12	6-19	6-26	6-33
viii	3-11	3-18	3-25	3-32	3-39	6-13	6-20	6-27	6-34
									6-35

Remove and replace the following drawings and figures:

Dwg 2.1	Dwg 3.3	Dwg 6.2	Dwg 8.4
Dwg 2.2	Dwg 4.3	Dwg 6.3	Dwg 8.6
Dwg 2.3	Dwg 4.5	Dwg 6.4	Dwg 8.7
Dwg 2.4	Dwg 5.2	Dwg 6.5	Dwg 8.9
Dwg 2.5	Dwg 5.3	Dwg 6.6	Dwg 9.1
Dwg 2.6	Fig 6.1	Dwg 8.2	Dwg 10.1
Dwg 3.1	Fig 6.1A	Dwg 8.3	Dwg 11.2
Dwg 3.2	Dwg 6.1		

Add the following new pages:

ib  
3-10A  
3-15A

Delete:

MDC-229 Power Distributions Notes in front of Dwg 3.2

Make pen and ink changes to drawings as follows:

NOTE: Each drawing to be updated by pen and ink changes is listed below. IS and WAS change instruction pages are collated in this PCN in the same sequence that the drawings appear in the basic Rev A document. Changes to each drawing are shown by zones. Corrections should be made on the drawings themselves. When this is done, the pen and ink change instruction pages may be removed from this handbook.

Dwg 8.5 (1 page of change instructions)  
Dwg 8.8A (1 page of change instructions)  
Dwg 8.10 (1 page of change instructions)

FC007  
11/22/67

COMMAND/SERVICE MODULE SYSTEMS HANDBOOK

CSM 101

REV A

OCTOBER 27, 1967

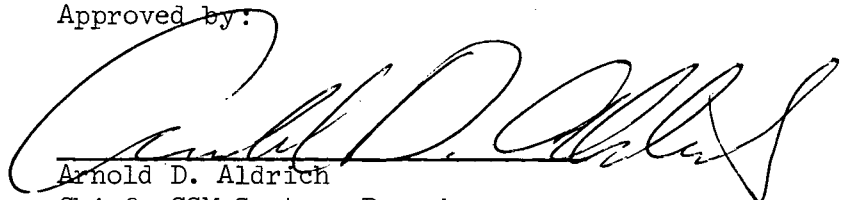
PREFACE

Revision A to the CSM 101 Systems Handbook, prepared by the Flight Control Division, NASA - Manned Spacecraft Center, Houston, Texas, with technical support by North American Rockwell Corporation (NAR), reflects spacecraft systems with major emphasis on material for use by Flight Crew and Flight Controllers during mission operations. Caution should be exercised in using these systems drawings for other purposes.

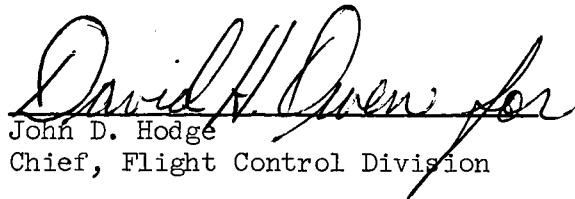
Comments concerning the contents of this document should be directed to FC36/Hubert V. Gregan, NAR, Flight Operations Support, HU3-5805.

This Handbook is not to be reproduced without the written approval of the Chief, Flight Control Division, NASA - Manned Spacecraft Center, Houston, Texas.

Approved by:



Arnold D. Aldrich  
Chief, CSM Systems Branch



John D. Hodge  
Chief, Flight Control Division

# **CSM 101**

REV A, PCN-2

❖

COMMAND/SERVICE MODULE SYSTEMS HANDBOOK

CSM 101

REV A  
PCN-2

SEPTEMBER 6, 1968

PUBLICATION CONTROL AND EFFECTIVE PAGE SHEET

FIGURE, DRAWING OR PAGE NUMBER	TITLE	REVISION	SIGNOFF DATE
<u>SECTION 1 STANDARDS</u>			
<u>SECTION 2 SEQUENTIAL EVENTS SYSTEM</u>			
FIGURE 2.1	CONTROL-DISPLAY FIGURE	A	2/20/68
DRAWING 2.1	SEQUENTIAL OVERVIEW	A/PCN-2	9/6/68
DRAWING 2.2	SEQUENTIAL POWER DISTRIBUTION	A/PCN-2	9/6/68
DRAWING 2.3	SEQUENTIAL ABORT INITIATION	A/PCN-2	9/6/68
DRAWING 2.4	SEQUENTIAL LES AND SPS ABORT SUBSYSTEM	A/PCN-2	9/6/68
DRAWING 2.5	SEQUENTIAL EARTH LANDING SUBSYSTEM	A/PCN-2	9/6/68
DRAWING 2.6	SEQUENTIAL UPRIGHTING SYSTEM	A/PCN-2	2/20/68
DRAWING 2.7	SEQUENTIAL LM SEPARATION AND DOCKING*	BASIC	4/14/67
<u>SECTION 3 ELECTRICAL SYSTEM</u>			
FIGURE 3.1	EPS CONTROL-DISPLAY FIGURE	A	10/31/67
DRAWING 3.1	EPS OVERVIEW	A/PCN-2	9/6/68
DRAWING 3.2	ELECTRICAL DC DISTRIBUTION AND CONTROL SYSTEM AND RHEB 229 POWER DISTRIBUTION NOTES	A/PCN-2	9/6/68
DRAWING 3.3	ELECTRICAL AC DISTRIBUTION AND CONTROL SYSTEM	A/PCN-2	9/6/68
PARAGRAPH 3.4	BUS SUMMARY TABLE		
PAGE 3-6	MAIN BUS A	A/PCN-2	9/6/68
PAGE 3-11	MAIN BUS B	A/PCN-2	9/6/68

\*APPLICABLE TO 103 AND SUBSEQUENT S/C.

\*\* PUBLICATION CONTROL AND EFFECTIVE PAGE SHEET 9/6/68 (CONT'D)

FIGURE, DRAWING OR PAGE NUMBER	TITLE	REVISION	SIGNOFF DATE
PAGE 3-16	BATTERY BUS A	A/PCN-2	9/6/68
PAGE 3-18	BATTERY BUS B	A/PCN-2	9/6/68
PAGE 3-20	BATTERY RELAY BUS	A/PCN-2	9/6/68
PAGE 3-23	FLIGHT AND POSTLANDING BUS	A/PCN-2	9/6/68
PAGE 3-25	BATTERY C	A/PCN-2	9/6/68
PAGE 3-26	BATTERY C PWR, POSTLANDING AND ENTRY CIRCUIT BREAKER (CB22)	A/PCN-2	9/6/68
PAGE 3-27	NON-ESSENTIAL BUS 1	A/PCN-2	9/6/68
PAGE 3-28	NON-ESSENTIAL BUS 2	A/PCN-2	9/6/68
PAGE 3-29	PYRO BUS A	A/PCN-2	9/6/68
PAGE 3-30	PYRO BUS B	A/PCN-2	9/6/68
PAGE 3-31	AC BUS 1	A/PCN-2	9/6/68
PAGE 3-35	AC BUS 2	A/PCN-2	9/6/68
PAGE 3-38	MISCELLANEOUS CIRCUIT BREAKERS	A/PCN-2	9/6/68
<u>SECTION 4 ENVIRONMENTAL CONTROL SYSTEM</u>			
FIGURE 4.1	ECS CONTROL-DISPLAY FIGURE	A	3/20/68
DRAWING 4.1	ECS OVERVIEW	A	3/18/68
DRAWING 4.2	SUIT AND CABIN PRESSURIZATION	A/PCN-1	7/15/68
DRAWING 4.3	PRIMARY GLYCOL LOOP	A/PCN-2	9/6/68
DRAWING 4.4	SECONDARY GLYCOL LOOP	A	3/20/68
DRAWING 4.5	WATER AND WASTE MANAGEMENT	A/PCN-2	9/6/68
<u>SECTION 5 FUEL CELL/CRYOGENIC SYSTEM</u>			
FIGURE 5.1	FUEL CELL/CRYOGENIC CONTROL- DISPLAY FIGURE	A	11/17/67
DRAWING 5.1	FUEL CELL/CRYOGENIC OVERVIEW	A	11/17/67
DRAWING 5.2	CRYOGENIC GAS STORAGE SYSTEM	A/PCN-2	9/6/68:
DRAWING 5.3	FUEL CELL	A/PCN-2	9/6/68

22

PUBLICATION CONTROL AND EFFECTIVE PAGE SHEET 9/6/68 (CONT'D)

FIGURE, DRAWING OR PAGE NUMBER	TITLE	REVISION	SIGNOFF DATE
<u>SECTION 6 COMMUNICATIONS SYSTEM</u>			
FIGURE 6.1	COMMUNICATIONS CONTROL-DISPLAY FIGURE	A/PCN-2	9/6/68
DRAWING 6.1A	AUDIO STATION AND RF EQUIPMENT MODES AND CONTROL CHARTS	A/PCN-2	9/6/68
DRAWING 6.1	COMMUNICATIONS OVERVIEW	A/PCN-2	9/6/68
DRAWING 6.2	UNIFIED S-BAND RF EQUIPMENT	A/PCN-2	9/6/68
DRAWING 6.3	VHF AM TRANSCEIVERS AND AUDIO EQUIPMENT	A/PCN-2	9/6/68
DRAWING 6.4	PREMODULATION PROCESSOR	A/PCN-2	9/6/68
DRAWING 6.5	UPDATA LINK	A/PCN-2	9/6/68
DRAWING 6.6	RENDEZVOUS TRANSPONDER AND RECOVERY EQUIPMENT	A/PCN-2	9/6/68
TABLE 6-I	UNIFIED S-BAND TRANSPONDER	A/PCN-2	9/6/68
TABLE 6-II	S-BAND POWER AMPLIFIER	A/PCN-2	9/6/68
TABLE 6-III	S-BAND DOWNLINK MODES AND MODULATION PROCESS	A/PCN-2	9/6/68
TABLE 6-IV	S-BAND UPLINK MODES AND MODULATION PROCESS	A/PCN-2	9/6/68
TABLE 6-V	PREMODULATION PROCESSOR	A/PCN-2	9/6/68
TABLE 6-VI	VHF AM TRANSCEIVER EQUIPMENT	A/PCN-2	9/6/68
TABLE 6-VII	AUDIO CENTER EQUIPMENT	A/PCN-2	9/6/68
TABLE 6-VIII	UPDATA LINK EQUIPMENT	A/PCN-2	9/6/68
TABLE 6-IX	TELEVISION CAMERA, SLOW SCAN	A/PCN-2	9/6/68
TABLE 6-X	RENDEZVOUS RADAR TRANSPONDER AND ANTENNA	A/PCN-2	9/6/68
TABLE 6-XI	VHF RECOVERY BEACON	A/PCN-2	9/6/68
TABLE 6-XII	VHF SURVIVAL BEACON-TRANSCEIVER	A/PCN-2	9/6/68
TABLE 6-XIII	ANTENNA SWITCH, S-BAND	A/PCN-2	9/6/68
TABLE 6-XIV	ANTENNA SWITCH, VHF	A/PCN-2	9/6/68
TABLE 6-XV	ANTENNE, S-BAND OMNI	A/PCN-2	9/6/68

\*\*

## PUBLICATION CONTROL AND EFFECTIVE PAGE SHEET 9/6/68 (CONT'D)

FIGURE, DRAWING OR PAGE NUMBER	TITLE	REVISION	SIGNOFF DATE
TABLE 6 XVI	ANTENNA, VHF SCIMITAR	A/PCN-2	9/6/68
TABLE 6-XVII	ANTENNA, VHF RECOVERY	A/PCN-2	9/6/68
TABLE 6-XVIII	ANTENNA, RENDEZVOUS RADAR TRANSPONDER	A/PCN-2	9/6/68
<u>SECTION 7 INSTRUMENTATION</u>			
FIGURE 7.1	INSTRUMENTATION CONTROL-DISPLAY FIGURE	A	10/16/67
DRAWING 7.1	INSTRUMENTATION POWER AND CONTROL	A/PCN-1	7/15/68
DRAWING 7.2	INSTRUMENTATION PCM SIGNAL FLOW	A/PCN-1	7/15/68
DRAWING 7.3	CAUTION AND WARNING SYSTEM	A/PCN-1	7/15/68
NOTES 7.4	INSTRUMENTATION SYSTEM NOTES, PP 7-5 THROUGH 7-11	A/PCN-1	7/15/68
TABLE 7-I	PCM TELEMETRY-STRUCTURES	A/PCN-1	7/15/68
TABLE 7-II	PCM TELEMETRY-ELECTRICAL POWER SYSTEM	A/PCN-1	7/15/68
TABLE 7-III	PCM TELEMETRY-LAUNCH ESCAPE SYSTEM	A/PCN-1	7/15/68
TABLE 7-IV	PCM TELEMETRY-EARTH LANDING SEQUENCE CONTROLLER	A/PCN-1	7/15/68
TABLE 7-V	PCM TELEMETRY-ENVIRONMENTAL CONTROL SYSTEM	A/PCN-1	7/15/68
TABLE 7-VI	PCM TELEMETRY-GUIDANCE AND NAVIGATION SYSTEM	A/PCN-1	7/15/68
TABLE 7-VII	PCM TELEMETRY-STABILIZATION AND CONTROL SYSTEM	A/PCN-1	7/15/68
TABLE 7-VIII	PCM TELEMETRY-LIFE SYSTEM	A/PCN-1	7/15/68
TABLE 7-IX	PCM TELEMETRY-FLIGHT TECHNOLOGY	A/PCN-1	7/15/68
TABLE 7-X	PCM TELEMETRY-SCIENTIFIC EQUIPMENT	A/PCN-1	7/15/68
TABLE 7-XI	PCM TELEMETRY-SERVICE PROPULSION SYSTEM	A/PCN-1	7/15/68



\* PUBLICATION CONTROL AND EFFECTIVE PAGE SHEET 9/6/68 (CONT'D)

FIGURE, DRAWING OR PAGE NUMBER	TITLE	REVISION	SIGNOFF DATE
TABLE 7-XII	PCM TELEMETRY-REACTION CONTROL SYSTEM	A/PCN-1	7/15/68
TABLE 7-XIII	PCM TELEMETRY-CREW SAFETY SYSTEM	A/PCN-1	7/15/68
TABLE 7-XIV	PCM TELEMETRY-COMMUNICATION AND INSTRUMENTATION	A/PCN-1	7/15/68
<u>SECTION 8 GUIDANCE AND CONTROL SYSTEM</u>			
FIGURE 8.1	GUIDANCE AND CONTROL SYSTEM CONTROL-DISPLAY FIGURE	A	2/1/68
DRAWING 8.1	GUIDANCE AND CONTROL SYSTEM OVERVIEW	A	2/1/68
DRAWING 8.2	GUIDANCE AND NAVIGATION OVERVIEW	A/PCN-2	9/6/68
PAGE 8-3	POWER CODE (REF DWG 8.3 ZONE B/6)	A	2/1/68
DRAWING 8.3	STABILIZATION/CONTROL SYSTEM	A/PCN-2	9/6/68
PAGE 8-5	INPUT/OUTPUT CHANNELS ON TELEMETRY	A	5/31/68
PAGE 8-6	ALARM CODES	A	5/31/68
PAGE 8-10	DOWNLISTS		
PAGE 8-10	COAST AND ALIGN	A	5/31/68
PAGE 8-24	RENDEZVOUS AND PRETHRUST	A	5/31/68
PAGE 8-38	POWERED	A	5/31/68
PAGE 8-52	ENTRY AND UPDATE	A	5/31/68
DRAWING 8.4	G&N POWER DISTRIBUTION	A/PCN-2	9/6/68
DRAWING 8.5	INERTIAL SUBSYSTEM (PEN AND INK CHANGES - 1 PAGE)	A/PCN-2	9/6/68
DRAWING 8.6	OPTICS SUBSYSTEM	A/PCN-2	9/6/68
DRAWING 8.7	SCS POWER DISTRIBUTION	A/PCN-2	9/6/68
DRAWING 8.8	ATTITUDE REFERENCE SUBSYSTEM	A	2/3/68
DRAWING 8.8A	ATTITUDE REFERENCE LOGIC (PEN AND INK CHANGES - 1 PAGE)	A/PCN-2	9/6/68

\* PUBLICATION CONTROL AND EFFECTIVE PAGE SHEET 9/6/68 (CONCL'D)

FIGURE, DRAWING OR PAGE NUMBER	TITLE	REVISION	SIGNOFF DATE
DRAWING 8.9	CONTROL ELECTRONICS (ECA/ TVC/GYROS)	A/PCN-2	9/6/68
DRAWING 8.9A	CONTROL ELECTRONICS LOGIC	A	2/3/68
DRAWING 8.10	AUTO/MANUAL RCS (PEN AND INK CHANGES - 1 PAGE)	A/PCN-2	9/6/68
<u>SECTION 9 SERVICE PROPULSION SYSTEM</u>			
FIGURE 9.1	SPS CONTROL-DISPLAY FIGURE	A	12/20/67
DRAWING 9.1	SERVICE PROPULSION SYSTEM	A/PCN-2	9/6/68
DRAWING 9.2	SPS PROPELLANT GAUGING SYSTEM	A/PCN-1	7/15/68
DRAWING 9.3	SPS PROPELLANT UTILIZATION VALVE CONTROL	A	12/20/67
<u>SECTION 10 REACTION CONTROL SYSTEM</u>			
FIGURE 10.1	RCS CONTROL-DISPLAY FIGURE	A	12/20/67
DRAWING 10.1	SERVICE MODULE REACTION CONTROL SYSTEM (PEN AND INK CHANGES - 3 PAGES)	A/PCN-2	9/6/68
DRAWING 10.2	COMMAND MODULE REACTION CONTROL SYSTEM	A/PCN-1	7/15/68
<u>SECTION 11 MISCELLANEOUS</u>			
FIGURE 11.1	CONTROL-DISPLAY FIGURE	N/A**	7/4/67
DRAWING 11.1.1 THROUGH DRAWING 11.1.9	NR INBOARD PROFILE DRAWINGS	N/A-B**	5/15/68
DRAWING 11.2	LIGHTING	A/PCN-2	9/6/68
DRAWING 11.3	TIMER	A	4/9/68
DRAWING 11.4	SYSTEMS TESTMETER	A	5/7/68

\*\*NR DRAWINGS, NOT OFFICIAL FCD DRAWINGS

\*

## FOREWORD

Revision A of the Command/Service Module Systems Handbook (CSM 101), published by sections, was completed with the issuance of Section 8 notes and Section 11 drawings on June 11, 1968.

No further major revision to the handbook is contemplated. Small revisions to individual drawings, tables, and notes, of which this is the first, will be published as page change notices (PCN's) as required.

The publication control and effective page sheet immediately following this foreword will continue to be updated and published with each PCN to show the latest effectivity of each drawing. Additionally, each drawing or figure changed by a PCN will be prominently labeled in large type on its outside margin so that it can be readily identified.

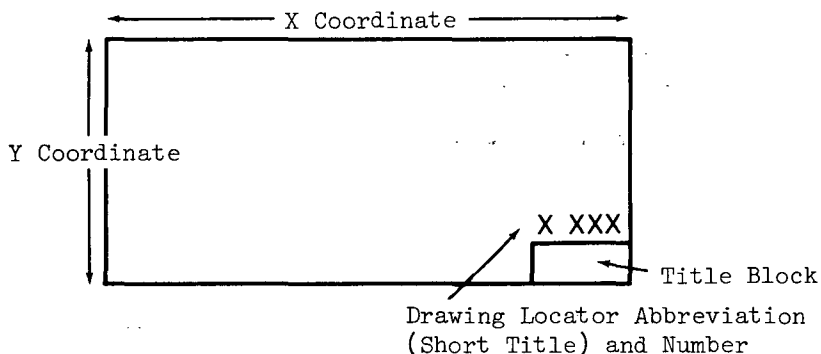
SECTION 1  
STANDARDS

1.1 GENERAL DRAWING INFORMATION

1.1.1 Cross-indexing

1.1.1.1 General drawing configuration

The X coordinate zones are marked alphabetically from the right-hand edge of the sheet (including the 1/2 inch margin). The Y coordinate zones are marked numerically from the bottom right-hand and left-hand corners of the sheet.



1.1.1.2 Component location code

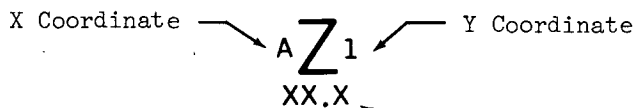
The component location code is used to reference controls (on the control-display figure) and components (on the overview drawing) into the detail system drawings.



- 3 - Drawing Locator Number for the given detail subsystem drawing
- K - X Coordinate
- 4 - Y Coordinate

1.2.1 Technical Zone References

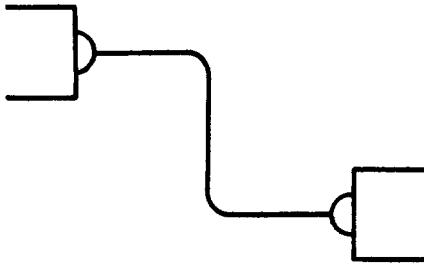
1.2.1.1 Zone reference



When this number appears it refers to another drawing. When there is no number the zone refers to another area on the same drawing.

1.2 LINE LEGEND

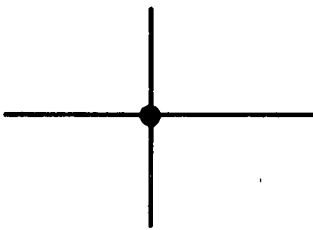
1.2.1 RF Cable



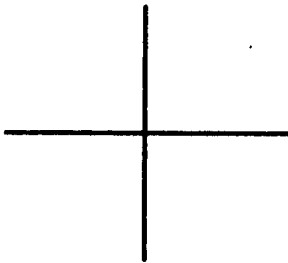
1.2.2 Electrical Line, Power and control



1.2.2.1 Electrical connected



1.2.2.2 Electrical crossover

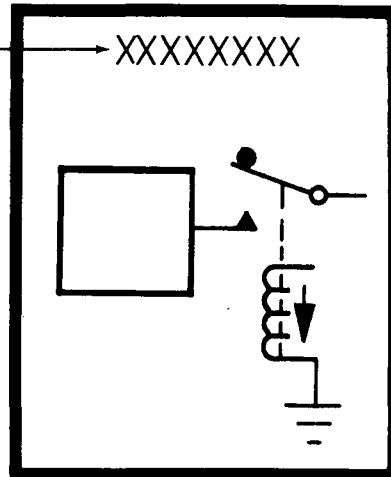


1.2.3 Directional Flow Arrows



1.2.4 Component Enclosures

Title (Directory Type)



1.2.4.1 Main enclosure  
1/16-inch solid black line



1.2.4.2 Sub enclosure  
1/32-inch solid black line



1.2.4.3 Component enclosure with crew (manual control)  
1/16-inch dashed black line



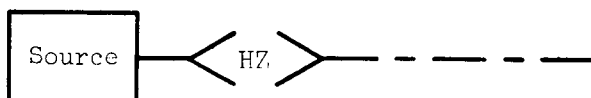
1.2.4.4 Module interface and systems assembly  
1/8-inch dashed black line

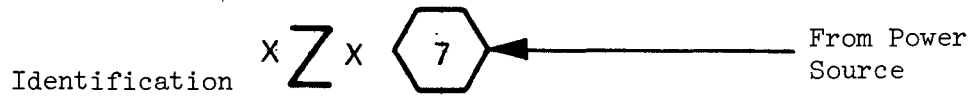
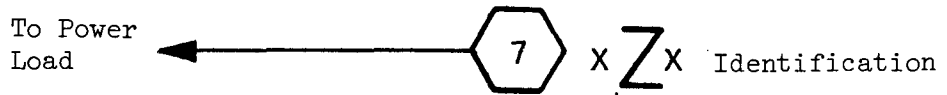


1.2.5 Mechanical Linkage

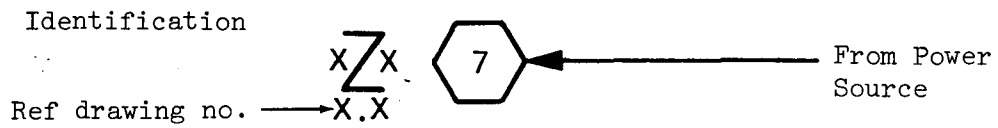
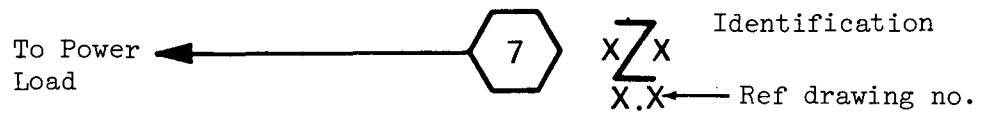


1.2.6 Timing Pulses

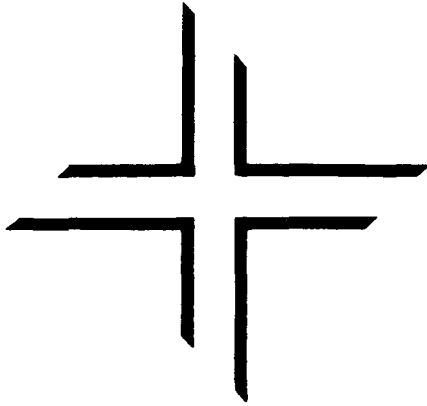




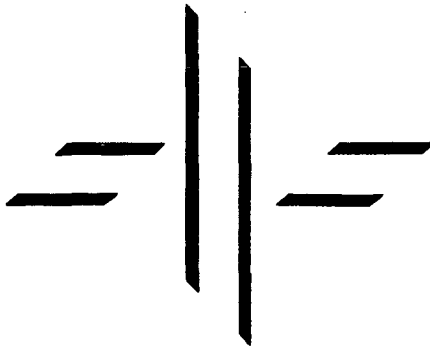
1.2.1.3 Power inter-drawings  
(Drawing to drawing)



1.3 PIPE LEGEND  
 1.3.1 General  
 1.3.1.1 Plumbing connected



1.3.1.2 Plumbing crossover



1.3.2 Line Designation

1.3.2.1 Water



1.3.2.2 Oxygen



1.3.2.3 Nitrogen



1.3.2.4 Helium



1.3.2.5 Primary Coolant



1.3.2.6 Secondary Coolant



1.3.2.7 Fuel



1.3.2.8 Hydrogen



1.3.2.9 Steam



1.3.2.10 Suit Loop



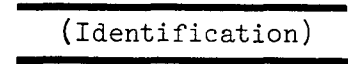
1.3.2.11 Sense Lines



1.3.2.12 Oxidizer

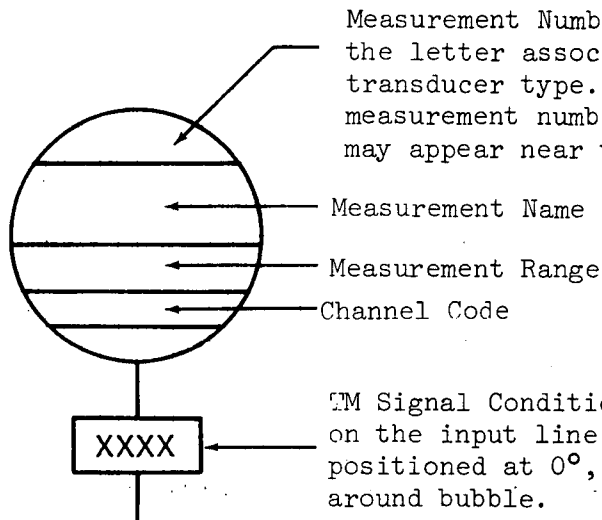


1.3.2.13 Others



1.4  
1.4.1

TELEMETRY SYMBOLS  
Measurements Telemetered



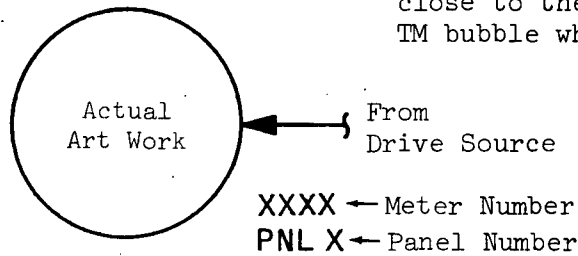
Measurement Number: Should include the letter associating it with the transducer type. Alternate system measurement numbers and PCM codes may appear near the TM bubble.

Measurement Name  
Measurement Range  
Channel Code

TM Signal Conditioner: To be located on the input line next to TM bubble, positioned at 0°, 90°, 180° and 270° around bubble.

1.4.2

Onboard Meters



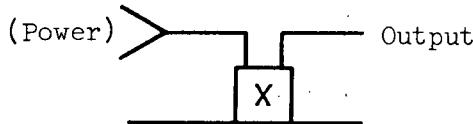
Meters should be placed close to their associated TM bubble wherever possible.

From Drive Source

XXXX ← Meter Number  
PNL X ← Panel Number

1.4.3  
1.4.3.1

Sensors  
Single source

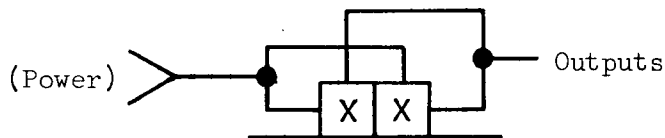


Example: Letter indicates the type:

- P - Pressure
- T - Temperature
- Q - Quantity
- W - Wetness
- R - Rate

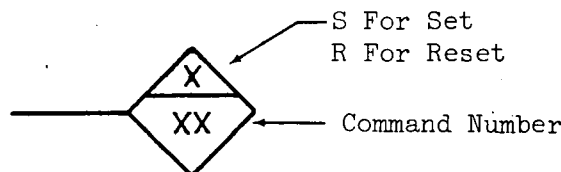
1.4.3.2

Double source



1.4.4  
1.4.4.1

Ground Commands (Contents Optional by Vehicle)  
RTC's





1.5 ELECTRICAL SYMBOLS

1.5.1 Switches

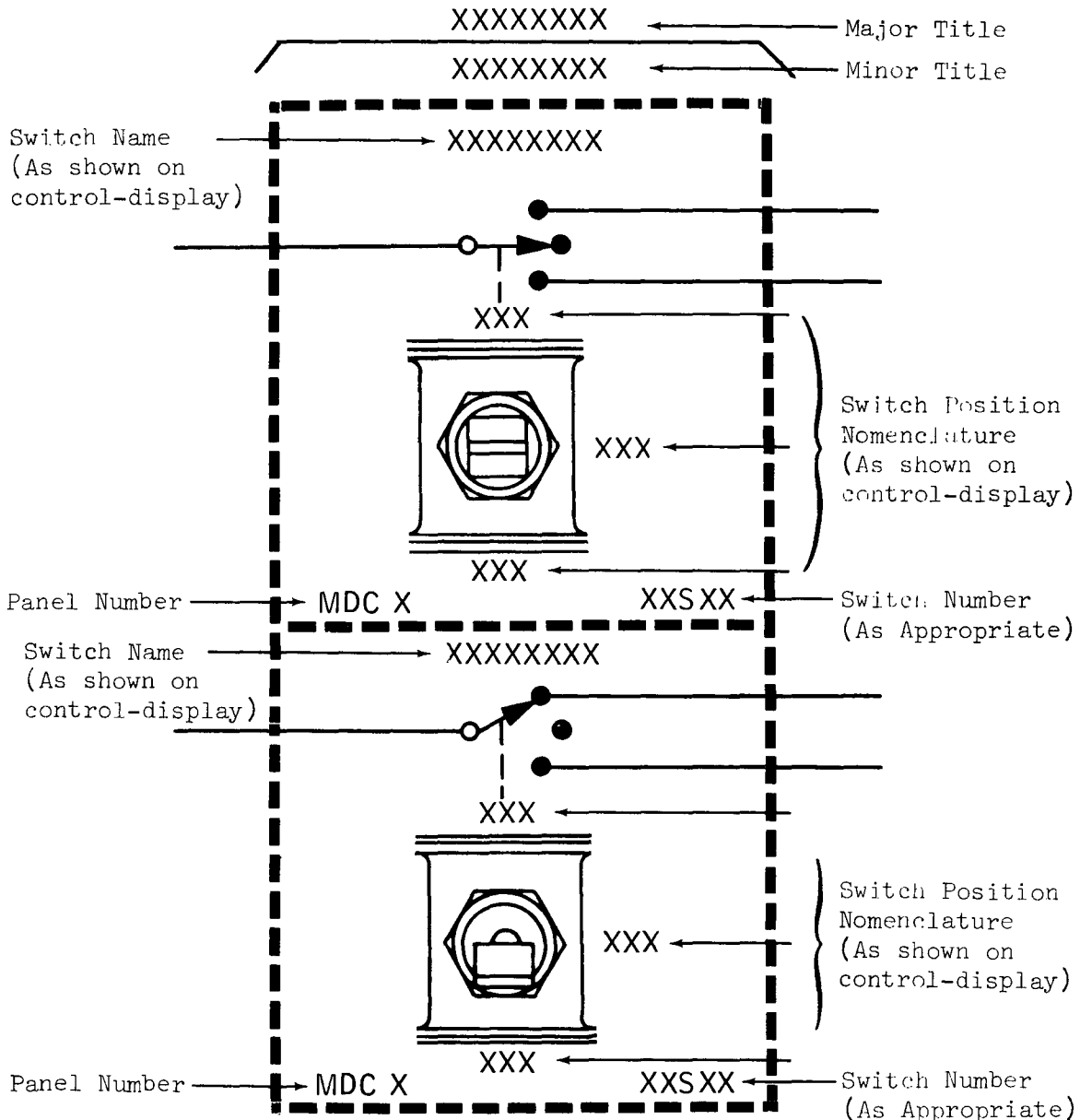
All switches will be shown in the deenergized position (if possible). When a switch has more than one set of contacts, only one set needs to have switch contact nomenclature.

1.5.1.1 Switch nomenclature

Major Title: The title given to a group of switches on the panel.

Minor Title: The title given to a sub-group of switches

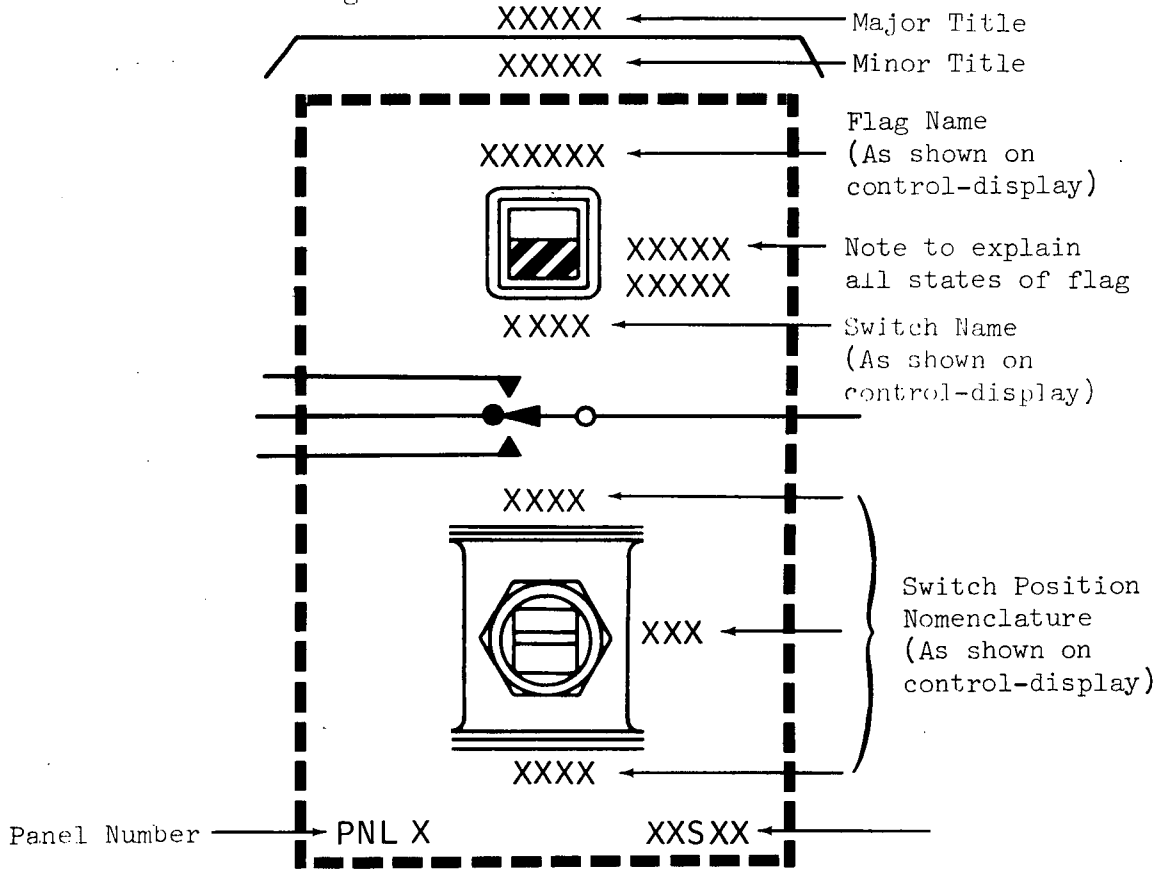
NOTE: If more than one switch has identical major and minor titles, they may be stacked without repeating these titles.



1.5.1.2

Switch controlled flag

If a flag is directly controlled by a switch, it may be shown in the following manner:



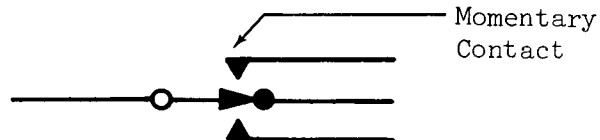
1.5.1.3

Two-position

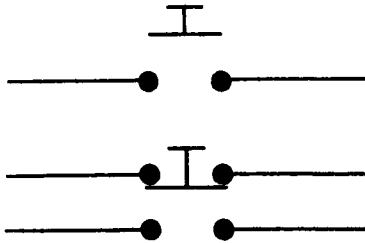


1.5.1.4

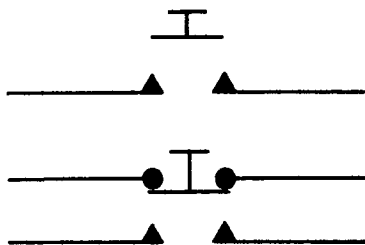
Three-position



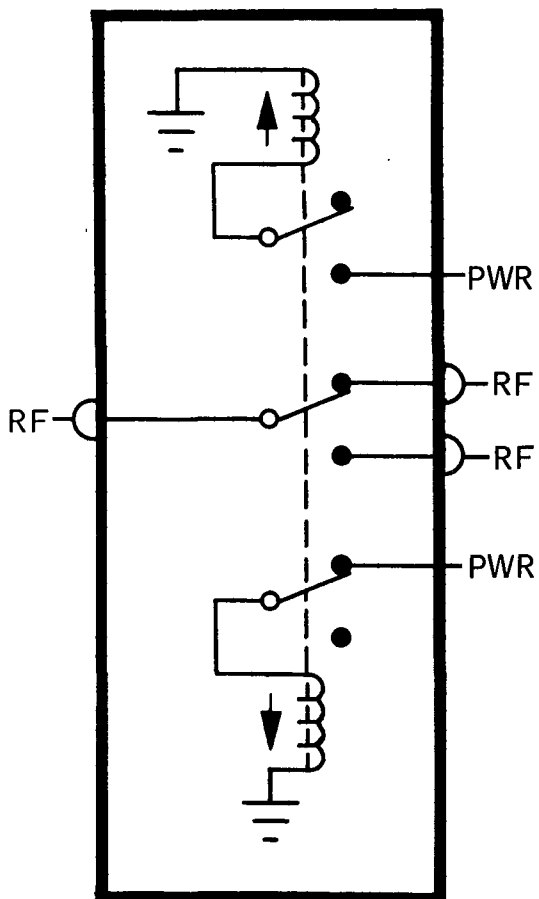
1.5.1.5 Pushbutton  
 1.5.1.5.1 Latching



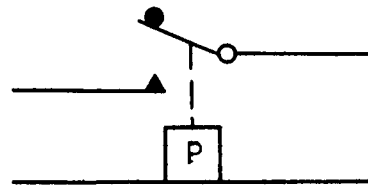
1.5.1.5.2 Momentary



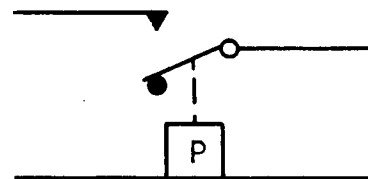
1.5.1.6 Coax



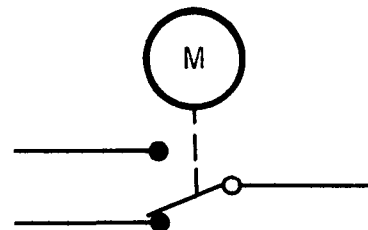
1.5.1.7 Pressure  
 1.5.1.7.1 Closed decreased pressure



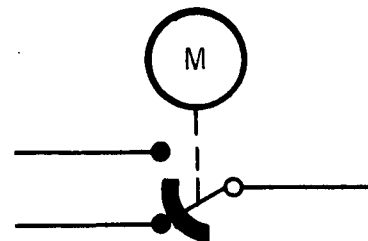
1.5.1.7.2 Closed increased pressure



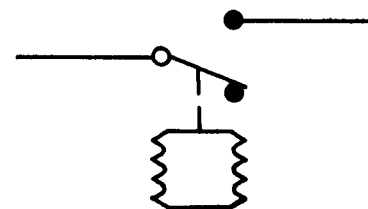
1.5.1.8 Motor  
 1.5.1.8.1 Break before make



1.5.1.8.2 Made before break



1.5.1.9 Baro

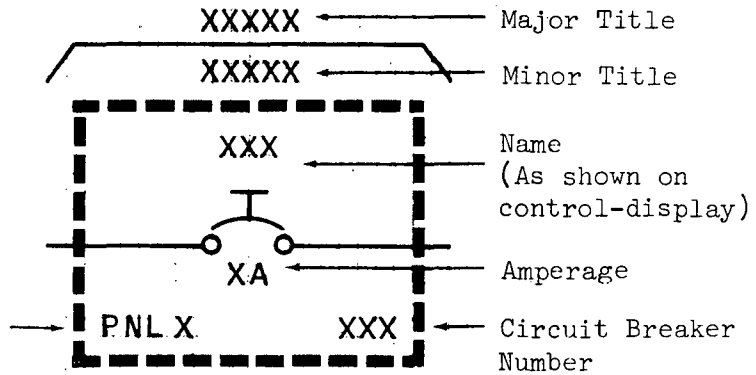


Close XXX psi or altitude  
 Open XXX psi or altitude

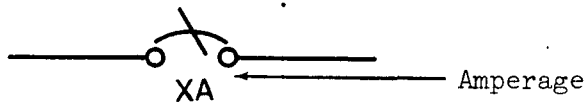
1.5.2 Circuit Breakers

The circuit breaker should be placed near the associated bus whenever possible. For the difference between major and minor titles see remark under switches (1.5.1.1).

1.5.2.1 Pushbutton

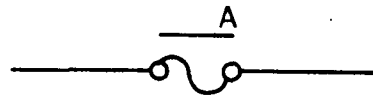


1.5.2.2 Automatic

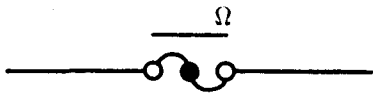


1.5.3 Fuses

1.5.3.1 General



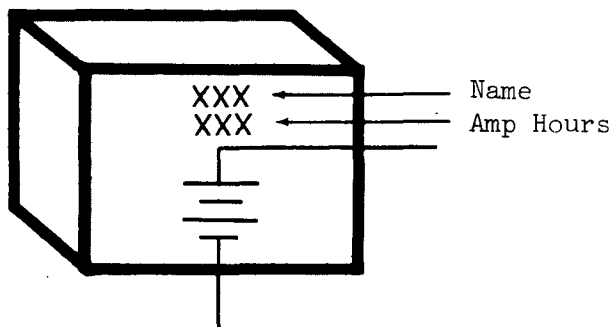
1.5.3.2 Fusistor



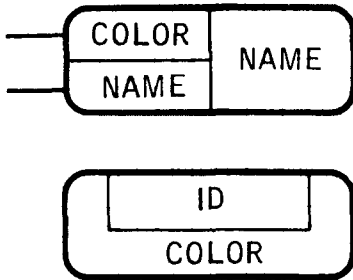
1.5.4 Battery

1/16-inch black tape

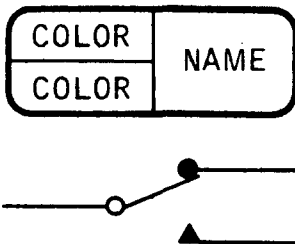
Size varies with number of cells and drawing arrangement.



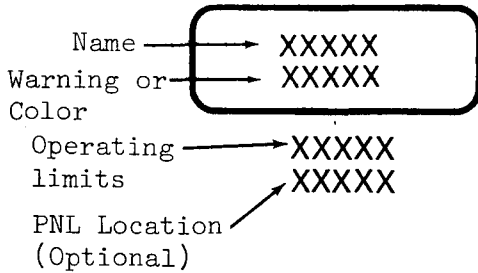
1.5.5 Lights  
 1.5.5.1 Telelights



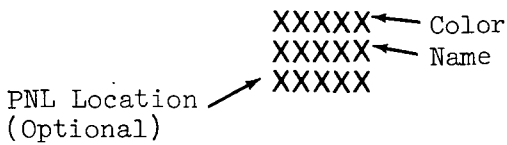
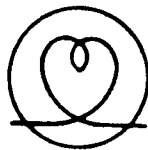
1.5.5.2 Switching



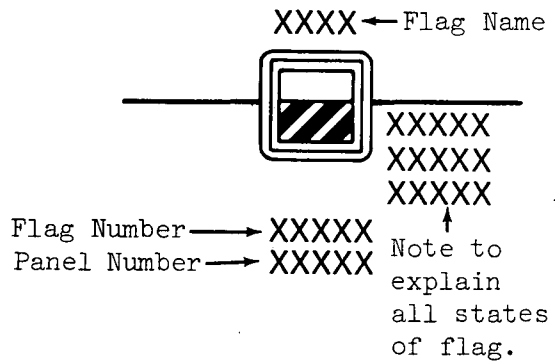
1.5.5.3 Caution and warning



1.5.5.4 Component



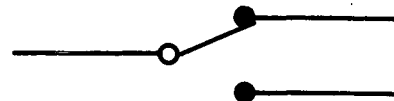
1.5.6 Annunciator Flag  
 Flag symbol will not reflect switch position of the associated switch.



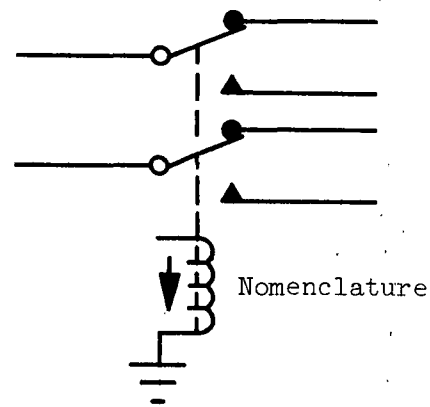
1.5.7 Relays  
 1.5.7.1 Momentary contact



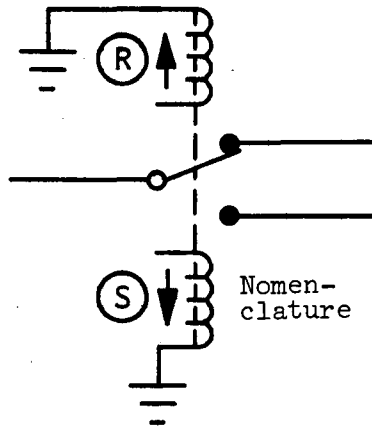
1.5.7.2 Latching contacts



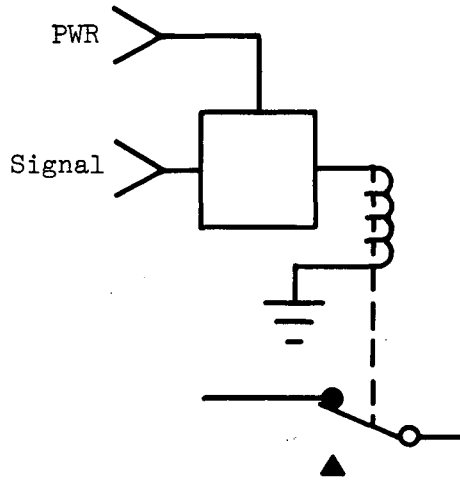
1.5.7.3 Non-latching relay



1.5.7.4 Latching relay



1.5.8 Relay or Solenoid Driver



1.5.9 Buses  
1.5.9.1 Symbol

Length can vary depending on the bus function on a given drawing.



Bus Feed



Bus Output



Neg Bus

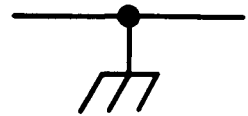
1.5.9.2 Designation  
See bus designation list.



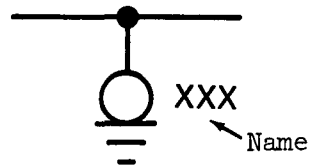
1.5.10 Grounds  
1.5.10.1 System



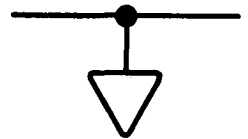
1.5.10 Frame



1.5.10.3 Floating or Controlled



1.5.10.4 Signal



1.5.11 Diodes  
1.5.11.1 General



1.5.11.2 Zener



1.5.11.3 Tunnel



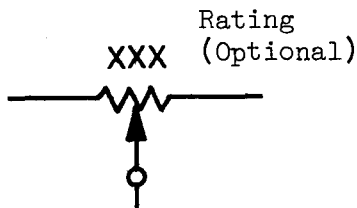
1.5.11.4

Control rectifier  
(SCR)



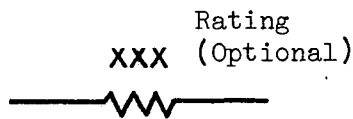
1.5.12

Potentiometer



1.5.13

Fixed Resistor



1.5.14

Heater



1.5.15

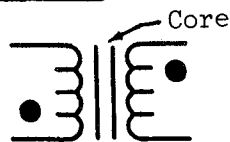
Thermostat



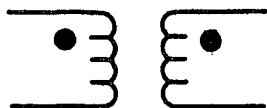
1.5.16

Transformers

Polarity dots indicate out phase

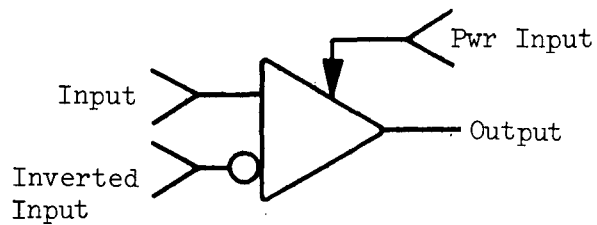


Polarity dots indicate in phase



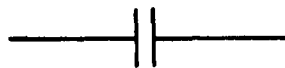
1.5.17

Amplifier



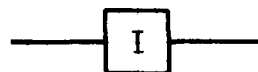
1.5.18

Capacitor



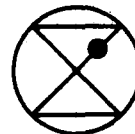
1.5.19

Digital Inverter



1.5.20

Wire Resolver



X = Sine Winding

● = Minus Sine

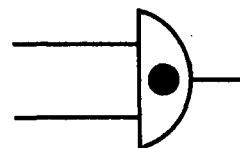
— = Cosine Winding

1.5.21

Gates

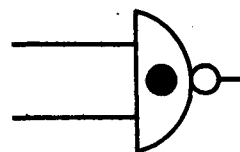
1.5.21.1

And

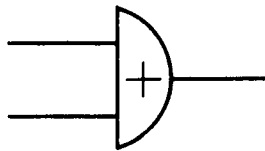


1.5.21.2

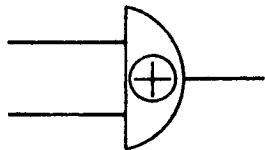
Nand



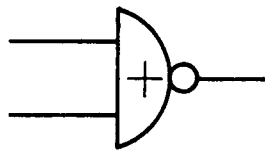
1.5.21.3 Or



1.5.21.4 Nor

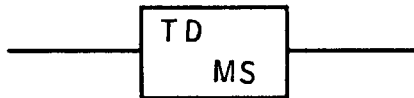


1.5.21.6 Exclusive Or



Open circle means it is an inverter and may appear on any of the lines on the gate.

1.5.22 Time Delay



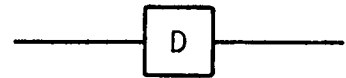
1.5.23 Electrical Filter



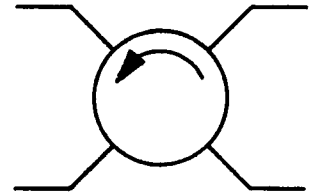
1.5.24 Modulator



1.5.25 Demodulator

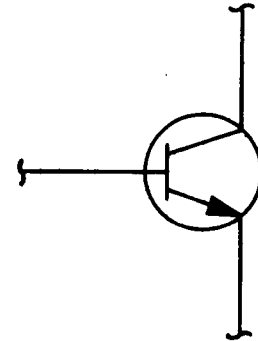


1.5.26 RF Circulator

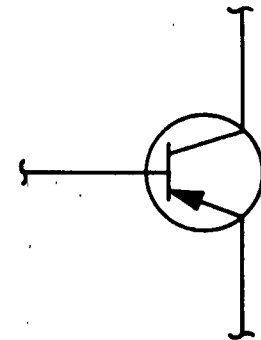


1.5.27 Transistor

1.5.27.1 NPN



1.5.27.2 PNP



1.5.28 Antenna

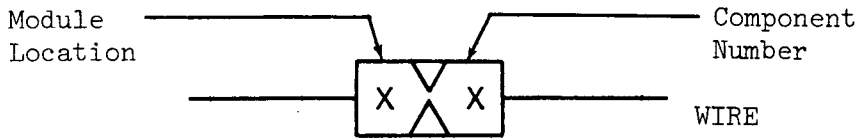
Name  
(Type or Function)





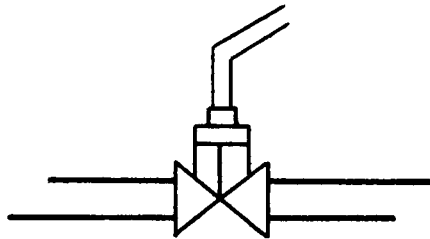
1.6  
1.6.1

PYROTECHNIC SYMBOLS  
Pyro Guillotine



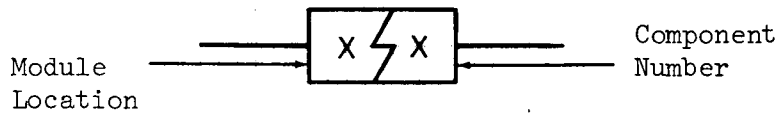
1.6.2

Pyro Valve with Single Initiator



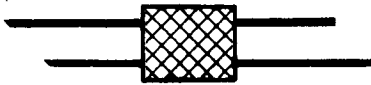
1.6.3

Electrical Circuit Interrupter



1.7 MECHANICAL SYMBOLS

1.7.1 Mechanical Filter



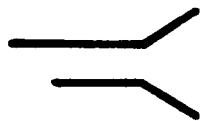
1.7.2 Burst Diaphragm



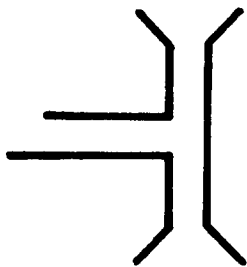
1.7.3 Venturi



1.7.4 Vent



1.7.5 Thrust Neutralized Vent



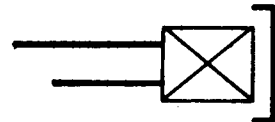
1.7.6 Disconnects  
1.7.6.1 Self-sealing



1.7.6.2 Quick



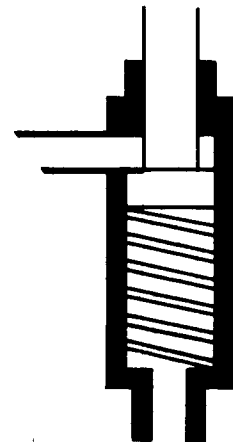
1.7.7 Quick Disconnect Fill and Drain



1.7.8 Fill and Drain



1.7.9 Ball Valve Actuator



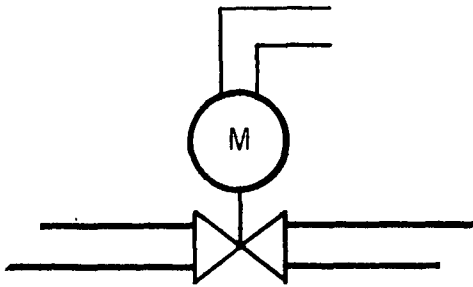
May be shown  
in depressed  
or partially  
depressed  
position

1.7.10 Valves



Open

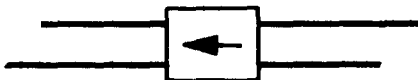
1.7.10.1 Motor control



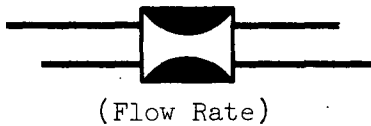
1.7.10.2 Manual control



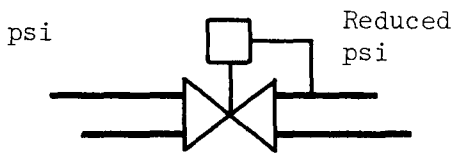
1.7.10.3 Check valve



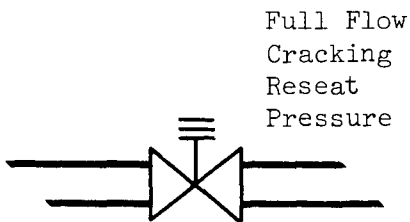
1.7.10.4 Orifice



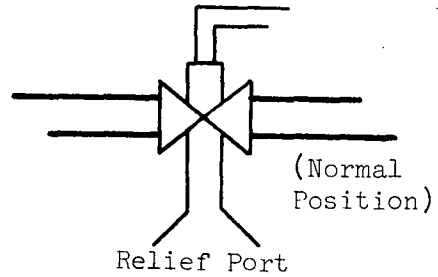
1.7.10.5 Pressure regulator



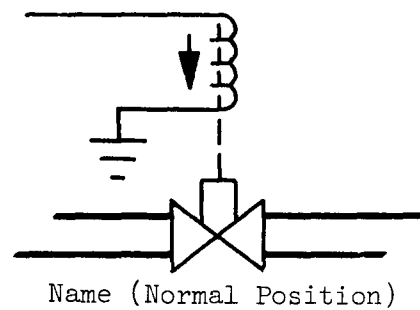
1.7.10.6 Relief valve



1.7.10.7 Pneumatic controlled valve with line bleed

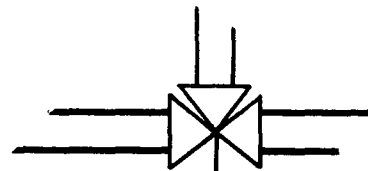


1.7.10.8 Solenoid valve

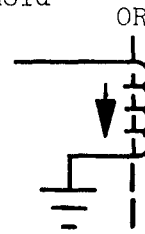


1.7.10.9 Three-way valve

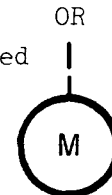
1.7.10.9.1 Manual



1.7.10.9.2 Solenoid



1.7.10.9.3 Motor controlled



1.7.10.10 Ball valve



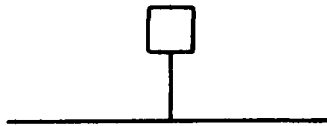
1.8 MISCELLANEOUS SYMBOLS  
1.8.1 Drawing Note Reference



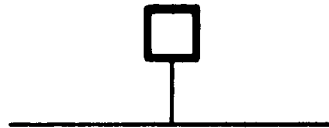
1.8.2 Overview Drawing Instrumentation Legend  
1.8.2.1 Automatic control only



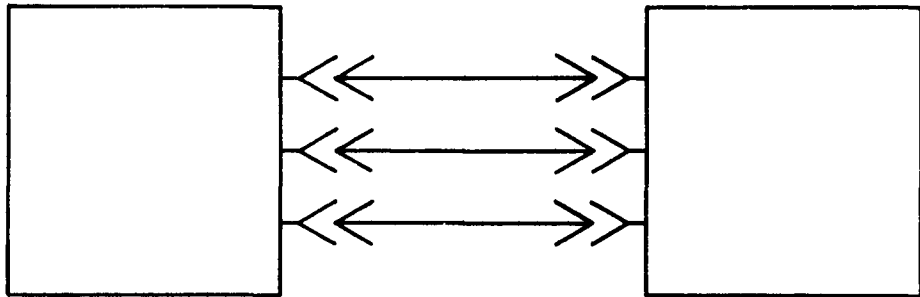
1.8.2.2 PCM only



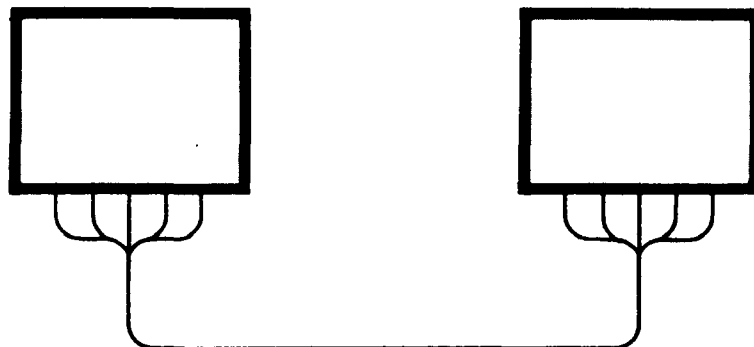
1.8.2.3 PCM and/or onboard display



1.8.3 Two-unit Interface



1.8.4 Two-unit Cable Connection





Page intentionally left blank

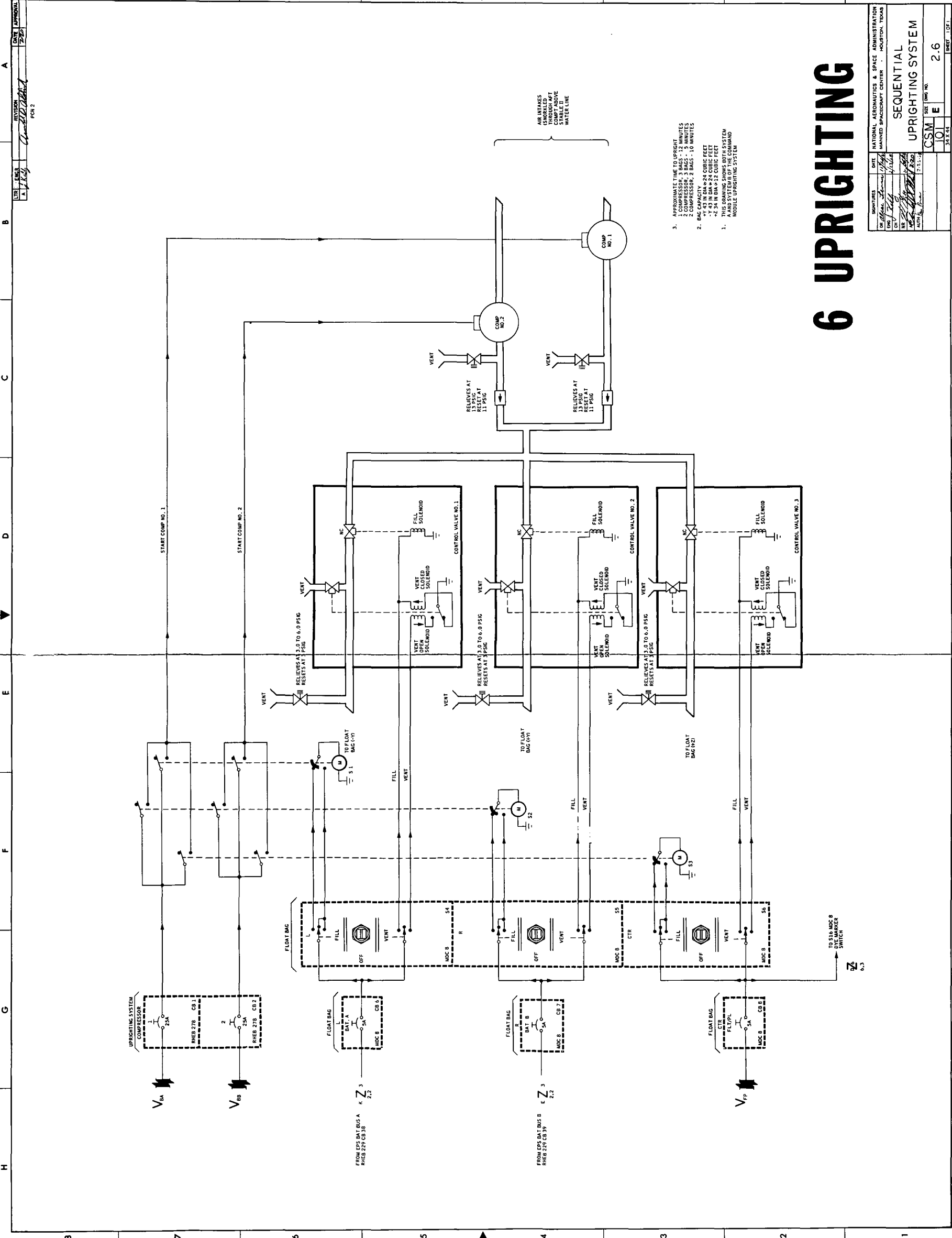
Page intentionally left blank

Page intentionally left blank



Page intentionally left blank

Page intentionally left blank



# 6 UPRIGHTING

3. APPROXIMATE TIME TO UPRIGHT
1. COMPRESSOR, 3 BAGS - 12 MINUTES
  2. COMPRESSOR, 2 BAGS - 10 MINUTES
  3. COMPRESSOR, 1 BAG - 8 MINUTES
2. BAG CAPACITY
- 1. 45 IN DIA - 24 CUBIC FEET
  - 2. 36 IN DIA - 12 CUBIC FEET
  - 3. 24 IN DIA - 6 CUBIC FEET
1. THIS DRAWING SHOWS BOTH SYSTEM A AND SYSTEM B OF THE COMMAND MODULE UPRIGHTING SYSTEM

AIR INTAKES (SHORLIFT) CONTROL VALVE COMPRT ABOVE WATER LINE

DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION
MANAGED SPACECRAFT CENTER	HOUSTON, TEXAS
DATE	11/14/64
BY	J. J. ...
CHKD	...
INSTR	...
APPROVAL	...
CSM	TOI E
SIZE	10 1/2 X 14 1/2
SHEET NO.	2-6
SHEET TOTAL	10

REV 5 A. P C N 2

Page intentionally left blank

Page intentionally left blank

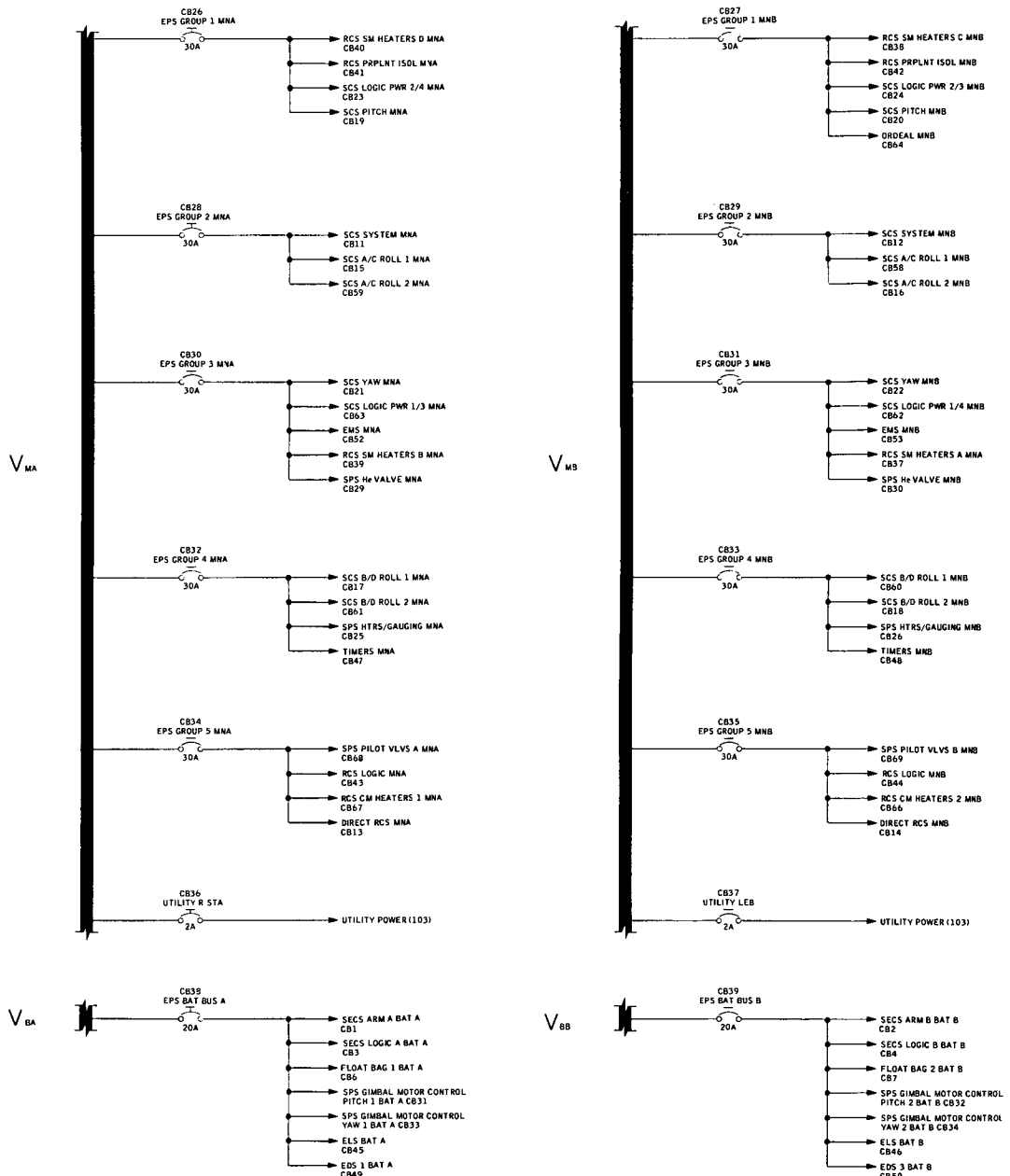
Page intentionally left blank

SPECIAL REVISION INSTRUCTIONS

Please insert this page into your handbook immediately in front of  
EPS Drawing 3.2.

MDC-229 POWER DISTRIBUTION

NOTE: THESE CIRCUIT BREAKERS WERE INSTALLED TO  
PROTECT LONG WIRE LEADS



\*  
3.4 BUS SUMMARY TABLE

The following table is a listing of spacecraft buses subdivided into the circuit breakers each bus feeds. In turn each circuit breaker is subdivided to list all the components it feeds. A miscellaneous list includes circuit breakers fed by other circuit breakers and circuit breakers installed to protect long wire leads.

- A. Main Bus A
- B. Main Bus B
- C. Battery Bus A
- D. Battery Bus B
- E. Battery Relay Bus
- F. Flight Bus
- G. Flight and Postlanding Bus
- H. Battery C
- I. CB22 (Battery C Pwr, Postlanding and Entry)
- J. Non-essential Bus 1
- K. Non-essential Bus 2
- L. Pyro Bus A
- M. Pyro Bus B
- N. AC Bus 1
- O. AC Bus 2
- P. Miscellaneous Circuit Breakers.



A. MAIN BUS A

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
EPS CB1/EPS SENSOR SIGNAL MN A	MDC-5	DC UNDERVOLTAGE SENSOR	0.25	5 AMP	
CB1/INVERTER POWER 1 MAIN A	RHEB-275	INVERTER 1	SEE EFFICIENCY CURVES	70 AMP	MOTOR SW ISOLATED, IDLES AT 112.0 WATTS DC
CB3/INVERTER POWER 3 MAIN A	RHEB-275	INVERTER 3	SEE EFFICIENCY CURVES	70 AMP	MOTOR SW ISOLATED, IDLES AT 112.0 WATTS DC
CB5/FLIGHT & POSTLANDING MAIN A	RHEB-275	POSTLDG BUS	VARIABLE	10 AMP	DIODE (1) ISOLATED
CB10/FUEL CELL 1 PURGE	RHEB-226	1. H <sub>2</sub> PURGE VALVE 2. O <sub>2</sub> PURGE VALVE 3. H <sub>2</sub> PURGE HEATER	1. 17.5 2. 17.5 3. 4.0	5 AMP	DIODE (1) ISOLATED SW ISOLATED, SHARED BY MAIN BUS B THROUGH A FUSE (F1)
CB16/BATTERY CHARGER MN A	MDC-5	BATTERY CHARGER	19.0 (AVG)	5 AMP	1. DIODE (1) ISOLATED, MTR. SW. ISOLATED 2. DRAWS 21.0 WAC (AVG) 3. SHARED BY MAIN BUS B THROUGH CB17
CB30/LIGHTING FLOOD MN A	RHEB-226	FLOOD LTS 1. LEB 2. RH 3. LH	1. 7.0 2. 7.0 3. 7.0	15 AMP	1. QTY - 2 2. QTY - 2 3. QTY - 2

A. MAIN BUS A (CONTINUED) -

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>SEQUENTIAL</u> CB28/DOCKING SYSTEM MN A	RHEB-226	1. TUNNEL FLOOD- LIGHTS 2. OPTICAL ALIGN SIGHT 3. RH DOCKING WINDOW	1. 3.0 2. 8.4	5 AMP	1. QTY - 2
CB47/TIMERS MN A	MDC-8	1. DIGITAL EVENT TIMER 2. MISSION TIMER 3. CM RCS HE DUMP BUTTON	1.A. 5.0 B. 1.0 2. 11.2	5 AMP	1.A. OPERATE } QTY - 2 B. STANBY } 2. QTY - 2
<u>CRYO</u> CB16/CRYOGENIC H <sub>2</sub> HTR 1 MN A	RHEB-226	H <sub>2</sub> TANK HEATER	20.0	5 AMP	QTY - 2
CB18/CRYOGENIC O <sub>2</sub> HTR 1 MN A	RHEB-226	O <sub>2</sub> TANK HEATER	155.0	15 AMP	QTY - 2
<u>ECS</u> CB26/ECS POT H <sub>2</sub> O HTR MN A	MDC-5	1. POT H <sub>2</sub> O HTR 2. GLYCOL EVAP CNTL VALVE	1. 45.0 2. 6.0	5 AMP	DIODE COUPLED TO MN B.
CB28/ECS H <sub>2</sub> O ACCUM MN A	MDC-5	1. CYCLIC ACCUMU- LATOR VALVE 2. SENSOR ELECT	1. 2.6	5 AMP	
CB30/ECS TRANSDUCER WASTE POT H <sub>2</sub> O MN A	MDC-5	POTABLE & WASTE WATER QTY XDUCERS	2.24 (TOTAL)	5 AMP	
CB32/ECS TRANSDUCER PRESS. GROUPS 1 MN A	MDC-5	TRANSDUCERS (GLY ACCUM, GLY PMP, SUIT COMP ΔP, SUIT PRESS.)	4.34 (TOTAL)	5 AMP	

A. MAIN BUS A (CONTINUED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>ECS (CONTINUED)</u> CB34/ECS TRANSDUCER PRESS. GROUPS 2 MN A	MDC-5	TRANSDUCERS (CABIN P, EVAP BACK P, O <sub>2</sub> MANIF P, CO <sub>2</sub> P P, O <sub>2</sub> FLOW)	8.68 (TOTAL)	5 AMP	
CB36/ECS TRANSDUCER TEMP MN A	MDC-5	CABIN T XDUCER TEMP XDUCER PWR SUPPLY	11.65 (TOTAL)	5 AMP	
CB46/ECS SECONDARY COOLANT LOOP XDUCERS MN A	MDC-5	SEC LOOP TRANSDUCERS	2.52 (TOTAL)	5 AMP	
CB50/ECS STEAM URINE DUCT HTR MN A	MDC-5	1. STEAM DUCT HTR 2. URINE DUMP HTR	1. 3.0 2. 5.7	5 AMP	
CB67/ECS RADIATORS CONT HTRS MN A	MDC-5	PRIMARY RADIATOR HTR CNTL ELEC-TRONICS	11.48 (MAX.)	5 AMP	
CB71/ECS SECONDARY COOLANT LOOP RAD HTR MN A	MDC-5	SECONDARY RADIATOR HTR CNTL ELECTRONICS	14.84 (MAX.)	5 AMP	
CB72/ECS RADIATORS HTRS OVLD MN A	MDC-5	PRIMARY OVERLD CIRCUIT FOR HTRS	SEE REMARKS	10 AMP	8.7 AMPS FOR 0.085 SEC.
<u>COM 1 &amp; INST</u> CB33/TELECOM FLT BUS MN A	RHEB-225	FLT BUS	VARIABLE	20 AMP	
CB19/INSTRUMENTS ESS MN A	MDC-5	INSTRUMENTS PWR CONTROL CIRCUIT BREAKER	124.1	15 AMP	FEEDS CB1, CB2, CB3, CB4, (SEE MISC. LIST), DIODE COUPLED TO MN B FROM CB20
CB21 TELECOM CENTRAL TIMING EQUIP MN A	RHEB-225	CTE PWR SUPPLY NO. 1	8.7	5 AMP	
CB52/C&W MN A	MDC-5	C&W LIGHTS AND DETECTOR	3.75	10 AMP	DIODE COUPLED TO MN B FROM CB53

A. MAIN BUS A (CONTINUED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>G&amp;N</u> CB56/G&N IMU MN A	MDC-5	1. NBA STBY IMU 2. PSA IMU STBY 3. SIG COND C	1. 25.5 2. 13.0 3. 2.1	25 AMP	DIODE ISOLATED WITH MN B
CB58/G&N IMU HTR MN A	MDC-5	1. NBA OPER IMU 2. CDU IMU ON 3. PSA IMU OPER 4. PIPA ELECT 5. SIGNAL COND A	1. 78.6 2. 33.0 3. 64.0 4. 25.6 5. 8.7	7.5 AMP	DIODE ISOLATED WITH MN B
CB60/G&N COMPUTER MN A	MDC-5	G&N COMPUTER (CMC)	1. 70.0 2. 15.0	10 AMP	1. OPERATE } DIODE ISOLATED 2. STANDBY } WITH MN B
CB62/G&N OPTICS MN A	MDC-5	1. NBA OBA ON 2. CDU OBA ON 3. PSA OBA ON 4. SIGNAL COND B 5. SIGNAL COND D	1. 27.3 2. 19.3 3. 40.4 4. 10.8 5. 2.2	10 AMP	DIODE ISOLATED WITH MN B
<u>SCS</u> CB11/SCS SYSTEM MN A	MDC-8	1. GYRO ASS'Y NO. 1 2. ELECT CNTL ASS'Y 3. ELECT DSPY ASS'Y	1. 60.0 2. 8.4 3. 46.0	15 AMP	1. DRAWS 34.6 WAC 2. DRAWS 9.5 WAC 3. DRAWS 27.0 WAC
CB13/SCS DIRECT RCS MN A	MDC-8	SCS DIRECT RCS	112	15 AMP	FED BY CB34 (MDC-229)
CB15/SCS AC ROLL 1 MN A	MDC-8	SCS AC ROLL 1	216	15 AMP	FED BY CB28 (MDC-229)
CB17/SCS BD ROLL 1 MN A	MDC-8	SCS BD ROLL 1	216	15 AMP	FED BY CB32 (MDC-229)
CB19/SCS PITCH MN A	MDC-8	SCS PITCH	216	15 AMP	FED BY CB26 (MDC-229)
CB21/SCS YAW MN A	MDC-8	SCS YAW	216	15 AMP	FED BY CB30 (MDC-229)
CB23/LOGIC PWR 1 MN A	MDC-8	SCS LOGIC PWR 1	44	5 AMP	FED BY CB26 (MDC-229)

A. MAIN BUS A (CONTINUED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>SCS (CONTINUED)</u>					
CB52/EMS MN A	MDC-8	EMS	70	5 AMP	
CB59/SCS AC ROLL 2 MN A	MDC-8	SCS AC ROLL 2	216	15 AMP	FED BY CB28 (MDC-229)
CB61/SCS BD ROLL 2 MN A	MDC-8	SCS BD ROLL 2	216	15 AMP	FED BY CB32 (MDC-229)
CB63/SCS LOGIC PWR 2 MN A	MDC-8	SCS LOGIC PWR	5.4	15 AMP	FED BY CB32 (MDC-229)
<u>SPS</u>					
CB25/SPS HTRS GAUGING MN A	MDC-8	1. PUGS (PRIMARY) 2. SPS LINE HTRS	1. 12.4 2. 2.0	5 AMP	1. DRAWS 49.5 WAG 2. QTY - 12
CB29/SPS HE VALVE MN A	MDC-8	HELIUM ISOLATION VALVE A	55.0	7.5 AMP	
CB68/SPS PILOT VLVS MN A	MDC-8	SPS PILOT VALVES	23.0	10 AMP	
<u>RCS</u>					
CB39/RCS SM HEATERS B MN A	MDC-8	1. QUAD B HTRS 2. CM RCS HTR CIR- CUITRY	1. 36.0	7.5 AMP	1. QTY - 2
CB40/RCS SM HEATERS D MN A	MDC-8	QUAD D HTRS	36.0	7.5 AMP	QTY - 2
CB41/RCS PRPLNT ISOL MN A	MDC-8	1. QUAD B PROP ISOL VALVES 2. QUAD D PROP ISOL VALVES 3. QUAD B HELIUM ISOL VALVES 4. QUAD D HELIUM ISOL VALVES	49.0 49.0 54.0 54.0	10 AMP	1. QTY - 2 2. QTY - 2 3. QTY - 2 4. QTY - 2

35 A

CSM 101  
 REV A  
 PCN-2  
 NEW PAGE

A. MAIN BUS A (CONCLUDED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>RCS (CONTINUED)</u> CB43/RCS RCS LOGIC MN A	MDC-8	1. RCS TRANS SW 2. DIRECT ULLAGE PUSH BUTTON 3. CM PROP JETT SM 4. CM PROP JETT LOGIC SW 5. CM PROP PURGE SW 6. CM RCS HELIUM DUMP PUSH BUTTON	SEE REMARKS	15 AMP	9.7 AMPS FOR 0.01 SEC.
CB66/RCS CM HEATERS 1 MN A	MDC-8	RCS CM HEATERS	302.4 (336 MAX.)	20 AMP	

B. MAIN BUS B

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>EPS</u> CB2/ EPS SENSOR SIGNAL MN B	MDC-5	DC UNDERVOLTAGE SENSOR	0.25	5 AMP	
CB2/INVERTER POWER 2 MAIN B	RHEB-275	INVERTER 2	SEE EFFICIENCY	70 AMP	MOTOR SW ISOLATED, IDLES AT 112.0 WATTS DC
CB4/INVERTER POWER 3 MAIN B	RHEB-275	INVERTER 3	SEE EFFICIENCY CURVES	70 AMP	MOTOR SW ISOLATED, IDLES AT 112.0 WATTS DC
CB6/FLIGHT & POSTLANDING MAIN B	RHEB-275	POSTLDG BUS	VARIABLE	10 AMP	DIODE (1) ISOLATED
CB11/FUEL CELL 2 PURGE	RHEB-226	1. H <sub>2</sub> PURGE VLV 2. O <sub>2</sub> PURGE VLV 3. H <sub>2</sub> PURGE HTR	1. 17.5 2. 17.5 3. 4.0	5 AMP	DIODE (1) ISOLATED SW ISOLATED, SHARED BY MAIN BUS A THROUGH A FUSE (F2)
CB12/FUEL CELL 3 PURGE	RHEB-226	1. H <sub>2</sub> PURGE VLV 2. O <sub>2</sub> PURGE VLV	1. 17.5 2. 17.5	5 AMP	DIODE (1) ISOLATED SW ISOLATED, SHARED BY MAIN BUS A THROUGH A FUSE (F3)
CB17/BATTERY CHARGER MN B	MDC-5	BATTERY CHARGER	19.0	5 AMP	1. DIODE (1) ISOLATED, RELAY ISOLATED 2. DRAWS 21.0 WAC 3. SHARED BY MAIN BUS A THROUGH CB16
CB31/LIGHTING FLOOD MN B	RHEB-226	FLOOD LTS A. LEB B. RH C. LH	7.0 7.0 7.0	15 AMP	A. QTY - 2 B. QTY - 2 C. QTY - 2

B. MAIN BUS B (CONTINUED)

CSM 101  
REV A  
PCN-2

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>SEQUENTIAL</u> CB29/DOCKING SYSTEM MN B	RHEB-226	1. TUNNEL FLOOD-LIGHTS 2. OPTICAL ALIGN SIGHT 3. RH DOCKING WINDOW	1. 3.0 2. 8.4	5 AMP	QTY - 2
CB48/TIMERS MN B	MDC-8	1. DIGITAL EVENT TIMER 2. MISSION TIMER	1.A. 2.0 B. 1.0 2. 11.2	5 AMP	1.A. OPERATE { B. STANDBY } QTY - 2 2. QTY - 2
<u>CRYO</u> CB17/CRYOGENIC H <sub>2</sub> HTR 2 MN B CB19/CRYOGENIC O <sub>2</sub> HTR 2 MN B	RHEB-226 RHEB-226	H <sub>2</sub> TANK HTR O <sub>2</sub> TANK HTR	20.0 155.0	5 AMP 15 AMP	QTY - 2 QTY - 2
<u>ECS</u> CB27/ECS POT H <sub>2</sub> O HTR MN B	MDC-5	1. POT H <sub>2</sub> O HTR 2. GLYCOL EVAP CNTL VALVE	1. 45.0 2. 6.0	5 AMP	DIODE COUPLED TO MN A
CB29/ECS H <sub>2</sub> O ACCUM MN B	MDC-5	CYCLIC ACCUMULATOR VALVE AND SENSOR ELECT	3.05 (TOTAL) (MAX.)	5 AMP	
CB31/ECS TRANSDUCER WASTE POT H <sub>2</sub> O MN B	MDC-5	POTABLE & WASTE WATER QTY XDUCERS	2.24 (TOTAL)	5 AMP	
CB33/ECS TRANSDUCER PRESS. GROUPS 1 MN B	MDC-5	XDUCERS (GLY ACCUM, GLY PUMP, SUIT COMP ΔP, SUIT P)	4.34 (TOTAL)	5 AMP	
CB35/ECS TRANSDUCER PRESS. GROUPS 2 MN B	MDC-5	XDUCERS (CABIN P, EVAP BACK P, O <sub>2</sub> MANIF P, CO <sub>2</sub> P P, O <sub>2</sub> FLOW)	8.12 (TOTAL)	5 AMP	

88A



B. MAIN BUS B (CONTINUED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC (@28 VDC)	CB RATING	REMARKS
<u>ECS (CONTINUED)</u>					
CB37/ECS TRANSDUCER TEMP MN B	MDC-5	CABIN T XDUCER	11.65	5 AMP	
CB47/ECS SECONDARY COOLANT LOOP XDUCERS MN B	MDC-5	SECONDARY LOOP XDUCERS	2.52 (TOTAL)	15 AMP	
CB51/ECS STEAM URINE DUCT HTR MN A	MDC-5	1. STEAM DUCT HTR 2. URINE DUMP HTR	1. 3.0 2.. 5.7	5 AMP	
CB70/ECS RADIATORS CONT HTRS MNRB	MDC-5	PRIMARY RADIATOR HTR CNTL ELECTRONICS	11.48	5 AMP	
CB73/ECS RADIATORS HTRS OVLD MN B	MDC-5	PRIMARY OVERLD CIR- CUIT FOR HTRS	SEE REMARKS	10 AMP	8.7 AMPS FOR 0.085 SEC.
<u>COMM &amp; INST</u>					
CB4/TELECOM FLT BUS MN B	RHEB-225	FLIGHT BUS.	VARIABLE	20 AMP	
CB20/INSTRUMENTS ESS MN B	MDC-5	INSTRUMENTS PWR CONTROL CIRCUIT BREAKER BOX	124.1	15 AMP	FEED CB1, CB2, CB3, CB4 (SEE MISC. LIST), DIODE COUPLED TO MN A FROM CB19
CB22/TELECOM CENTRAL TIMING EQUIP MN B	RHEB-225	CTE PWR SUPPLY NO. 2	8.7	5 AMP	
CB53/C&W MN B	MDC-5	C&W LIGHTS AND DE- TECTOR	3.75	10 AMP	DIODE COUPLED TO MN B FROM CB52
<u>G&amp;N</u>					
CB57/G&N IMU MN B	MDC-5	1. NBA STBY IMU 2. PSA IMU STBY 3. SIGNAL COND C	1. 25.5 2. 13.0 3. 2.1	25 AMP	
CB59/G&N IMU HTR MN B	MDC-5	1. NBA OPER ON 2. CDU IMU ON 3. PSA IMU OPER 4. PIPA ELECT 5. SIGNAL COND A	1. 78.6 2. 33.0 3. 64.0 4. 25.6 5. 8.7	7.5 AMP	

B. MAIN BUS B (CONTINUED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>G&amp;N (CONTINUED)</u>					
CB61/G&N COMPUTER MN B	MDC-5	CMC	1. 70 2. 15	10 AMP	1. OPERATE } DIODE ISOLATED 2. STANDBY } WITH MN A
CB63/G&N OPTICS MN B	MDC-5	1. NBA OBA ON 2. CDU OBA ON 3. PSA OBA ON 4. SIGNAL COND B 5. SIGNAL COND D	1. 27.3 2. 19.3 3. 40.4 4. 10.8 5. 2.2	10 AMP	
CB64/ORDEAL MN B	MDC-8	ORDEAL	4.0	5 AMP	DRAWS 4.0 WAC
<u>SCS</u>					
CB12/SCS SYSTEM MN B	MDC-8	1. GYRO ASS'Y NO. 2 2. ELECT CNTL ASS'Y 3. ELECT DSPY ASS'Y 4. GYRO DSPY CULPR	1. 60.0 2. 8.4 3. 46.2 4. 61.8	15 AMP	1. DRAWS 34.6 WAC 2. DRAWS 9.5 WAC } COMPONENTS 3. DRAWS 27.0 WAC } FED BY AC 4. DRAWS 60.2 WAC } AND DC PWR
CB14/SCS DIRECT RCS MN B	MDC-8	SCS DIRECT RCS	112	15 AMP	DC PWR FED BY CB29 (MDC-229)
CB16/SCS AC ROLL 2 MN B	MDC-8	SCS AC ROLL 2	216	15 AMP	FED BY CB35 (MDC-229)
CB18/SCS BD ROLL 2 MN B	MDC-8	SCS BD ROLL 2	216	15 AMP	FED BY CB29 (MDC-229)
CB20/SCS PITCH MN B	MDC-8	SCS PITCH	216	15 AMP	FED BY CB33 (MDC-229)
CB22/SCS YAW MN B	MDC-8	SCS YAW	216	15 AMP	FED BY CB27 (MDC-229)
CB24/SCS LOGIC PWR 1 MN B	MDC-8	SCS LOGIC PWR 1	43	5 AMP	FED BY CB31 (MDC-229)
CB53/EMS MN B	MDC-8	EMS	61	5 AMP	FED BY CB27 (MDC-229)
CB58/SCS AC ROLL 1 MN B	MDC-8	SCS AC ROLL 1	216	15 AMP	FED BY CB29 (MDC-229)
CB60/SCS BD ROLL 1 MN B	MDC-8	SCS BD ROLL 1	216	15 AMP	FED BY CB33 (MDC-229)

B. MAIN BUS B (CONTINUED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>SCS (CONTINUED)</u>					
CB62/SPS LOGIC PWR 2 MN B	MDC-8	SCS LOGIC PWR 2	21	15 AMP	FED BY CB31 (MDC-229)
<u>SPS</u>					
CB26/SPS HTRS GAUGING MN B	MDC-8	1. PUGS (AUXILIARY) 2. SPS LINE HTRS	1. 12.4 2. 2.0	5 AMP	2. QTY - 12
CB30/SPS HE VALVE MN B	MDC-8	HELIUM ISOLATION VALVE B	55.0	7.5 AMP	
<u>RCS</u>					
CB37/RCS SM HEATERS A MN B	MDC-8	1. QUAD A HTRS 2. CM RCS HTR CIR-CUITRY	1. 36.0	7.5 AMP	1. QTY - 2
CB38/RCS SM HEATERS C MN B	MDC-8	QUAD A HTRS	36.0	7.5 AMP	QTY - 2
CB42/RCS PRPLNT ISOL MFI B	MDC-8	1. QUAD A PROP ISOL VALVES 2. QUAD C PROP ISOL VALVES 3. QUAD A HELIUM ISOL VALVES 4. QUAD C HELIUM ISOL VALVES	49.0 49.0 54.0 54.0	10 AMP	1. QTY - 2 2. QTY - 2 3. QTY - 2 4. QTY - 2
CB69/SPS PILOT VLVS MN B	MDC-8	SPS PILOT VALVES		10 AMP	
CB44/RCS RCS LOGIC MN B	MDC-8	1. RCS TRANS SW 2. DIRECT ULLAGE PUSH BUTTON 3. CM PROP JETT SW 4. CM PROP JETT LOGIC SW 5. CM PROP PURGE SW 6. CM RCS HELIUM DUMP PUSHBUTTON	SEE REMARKS	15 AMP	9.7 AMPS FOR 0.01 SEC

CSM 101  
 REV A  
 PCN-2  
 NEW PAGE

B. MAIN BUS B (CONCLUDED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>RCS (CONTINUED)</u> CB67/RCS CM HEATERS 2 MN B	MDC-8		302.4 (336 MAX.)	20 AMP	

C. BATTERY BUS A

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>EPS</u>					
CB7/FLIGHT & POSTLANDING BAT BUS A	RHEB-275	FLIGHT & POSTLDG BUS	VARIABLE	25 AMP	DIODE ISOLATED
CB9/MAIN A BAT BUS A	RHEB-275	MAIN BUS A	VARIABLE	80 AMP	DIODE ISOLATED
CB12/BAT RLY BUS BAT A	MDC-5	BATTERY RELAY BUS	VARIABLE	15 AMP	BAT RLY BUS ALSO POWERED THROUGH CB13 FROM BAT BUS B, DIODE ISOLATED
CB14/BATTERY CHARGER BAT A CHG	MDC-5	1. BATTERY CHARGER 2. BUS TIE SW BAT A/C 3. DC METER	1. N/A 2. 150.0	10 AMP	1. CHARGER FEEDS BAT BUS A 2. AVERAGE FOR 50 MICROSECONDS
CB20/BAT A PWR ENTRY & POST- LANDING	RHEB-250	BATTERY A	N/A	80 AMP	BAT BUS A FED BY BAT A THROUGH CB20
<u>SEQUENTIAL</u>					
CB1/SEQ EVENTS CONT SYS ARM A BAT A	MDC-8	SEQ SW LOGIC BUS	9.08	5 AMP	
CB1/UPRIGHTING SYSTEM COMPRES- SOR NO. 1	RHEB-278	PUMP NO. 1	560.0	25 AMP	
CB3/SEQ EVENTS CONT SYS LOGIC A BAT A	MDC-8	SEQ LOGIC BUS	66.9	15 AMP	
CB6/FLOAT BAG 1 BAT A	MDC-8	BAG CONTROL VALVE	30.0	5 AMP	
CB45/ELS BAT A	MDC-8	EARTH LANDING SYSTEM	12.6	5 AMP	1. APEX JETT 2. DROGUE DEPLOY 3. MAIN DEPLOY
CB49/EDS 1 BAT A	MDC-8	EDS PWR SW	36.96 (49.0 MAX.)	5 AMP	

C. BATTERY BUS A (CONCLUDED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>SPS</u> CB31/SPS GIMBAL MOTOR CONTROL PITCH 1 BAT A	MDC-8	GIMBAL MOTOR NO. 1	6.0	15 AMP	
CB33/SPS GIMBAL MOTOR CONTROL YAW 1 BAT A	MDC-8	GIMBAL MOTOR NO. 1	6.0	15 AMP	

D. BATTERY BUS B

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>EPS</u> CB8/FLIGHT & POSTLANDING BAT BUS B	RHEB-275	FLIGHT & POSTLDG BUS (V <sub>FL</sub> )	VARIABLE	25 AMP	DIODE ISOLATED
CB10/MAIN B BAT BUS B	RHEB-275	MAIN BUS B	VARIABLE	80 AMP	DIODE ISOLATED
CB13/BAT RLY BUS BAT B	MDC-5	BATTERY RELAY BUS	VARIABLE	15 AMP	BAT RLY BUS ALSO POWERED THROUGH CB12 FROM BAT BUS A, DIODE ISO-LATED
CB15/BATTERY CHARGER BAT B CHG	MDC-5	1. BATTERY CHARGER 2. BUS TIE SW BAT B/C 3. DC METER	1. N/A 2. 150.0	10 AMP	1. CHARGER FEEDS BAT BUS B 2. AVERAGE FOR 50 MICROSECONDS
CB21/BAT B PWR ENTRY & POST-LANDING	RHEB-250	BATTERY B	N/A	80 AMP	BAT BUS A FED BY BAT A THROUGH CB21
<u>SEQUENTIAL</u> CB2/SEQ EVENTS CONT SYS ARM B BAT B	MDC-8	SEQ SW LOGIC PWR	9.08	5 AMP	
CB2/UPRIGHTING SYSTEM COMPRESSOR NO. 2	RHEB-278	PUMP NO. 2	560.0	25 AMP	
CB4/SEQ EVENTS CONT SYS LOGIC B BAT B	MDC-8	SEQ LOGIC BUS	66.9	15 AMP	
CB7/FLOAT BAG 2 BAT B	MDC-8	BAT CONTROL VLAVE	30.0	5 AMP	
CB46/ELS BAT B	MDC-8	EARTH LANDING SYSTEM	12.6	5 AMP	1. APEX JETT 2. DRAGGUE DEPLOY 3. MAIN DEPLOY
CB51/EDS 3 BAT B	MDC-8	EDS PWR SW	37.8 (49.84 MAX.)	5 AMP	

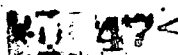
D. BATTERY BUS B (CONCLUDED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>SPS</u> CB32/SPS GIMBAL MOTOR CONTROL PITCH 2 BAT B CB34/SPS GIMBAL MOTOR CONTROL YAW 2 BAT B	MDC-8  MDC-8	GIMBAL MOTOR NO. 2  GIMBAL MOTOR NO. 2	1.4  1.4	15 AMP  15 AMP	



E. BATTERY RELAY BUS

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
EPS CB4/FUEL CELL 1 REACS	RHEB-226	1. O <sub>2</sub> REACTANT VALVE 2. H <sub>2</sub> REACTANT VALVE	140 (BOTH) 347.2 (MAX. FOR BOTH)	10 AMP	MAX. TIME TO THROW IS 10 SEC., ONLY USED TO SHUT DOWN A MALFUNCTIONED F/C
CB5/FUEL CELL 2 REACS	RHEB-226	1. O <sub>2</sub> REACTANT VALVE 2. H <sub>2</sub> REACTANT VALVE	140 (BOTH) 347.2 (MAX. FOR BOTH)	10 AMP	MAX. TIME TO THROW IS 10 SEC., ONLY USED TO SHUT DOWN A MALFUNCTIONED F/C
CB5/INVERTER CONTROL 1	MDC-5	INVERTER NO. 1	SEE REMARKS	10 AMPS	COLDPLATED, 560 WATT TRANSIENT FOR 85 M.S. (MAX.)
CB6/FUEL CELL 3 REACS	RHEB-226	1. O <sub>2</sub> REACTANT VALVE 2. H <sub>2</sub> REACTANT VALVE	140 (BOTH) 347.2 (MAX. FOR BOTH)	10 AMP	MAX. TIME TO THROW IS 10 SEC., ONLY USED TO SHUT DOWN A MALFUNCTIONED F/C
CB6/INVERTER CONTROL 2	MDC-5	INVERTER NO. 2	SEE REMARKS	10 AMP	COLDPLATED, 560 WATT TRANSIENT FOR 85 M.S. (MAX.)
CB7/INVERTER CONTROL 3	MDC-5	INVERTER NO. 3	SEE REMARKS	10 AMP	COLDPLATED, 560 WATT TRANSIENT FOR 85 M.S. (MAX.)
CB7/FUEL CELL 1 BUS CONT	RHEB-226	1. F/C 1 MN A DISCONNECT CIRCUIT 2. F/C 1 MN B DISCONNECT CIRCUIT 3. F/C 1&2 REAC VLV HLD CRKT	1. 1.12 (FLAG) 2. 1.12 (FLAG) 3. 12.1	10 AMP	FLAG DRAWS 40 MA WHEN F/C IS OFF BUS, HOLDING CIRCUIT (ITEM 3) DISABLED AFTER ORBIT INSERTION
CB8/FUEL CELL 2 BUS CONT	RHEB-226	1. F/C 2 MN A DISCONNECT 2. F/C 2 MN B DISCONNECT CIRCUIT	1. 1.12 (FLAG) 2. 1.12 (FLAG)	10 AMP	FLAG DRAWS 40 MA WHEN F/C IS OFF BUS



E. BATTERY RELAY BUS (CONCLUDED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>EPS (CONTINUED)</u>					
CB8/EPS SENSOR UNIT DC BUS A	MDC-5	DC UNDERVOLTAGE SENSOR UNIT MN A	28.0	5 AMP	MOMENTARY POWER TO ACTIVATE C&W LIGHT
CB9/FUEL CELL 3 BUS CONT	RHEB-226	1. F/C 3 MN A DISCONNECT CIRCUIT 2. F/C 3 MN B DISCONNECT CIRCUIT 3. F/C 3 REAC VLV HD CRKT	1. 1.12 (FLAG) 2. 1.12 (FLAG) 3. 12.1	10 AMP	FLAG DRAWS 40 MA WHEN F/C IS OFF BUS, HOLDING CIRCUIT (ITEM 3) DISABLED AFTER ORBIT INSERTION
CB9/EPS SENSOR UNIT DC BUS B	MDC-5	DC UNDERVOLTAGE SENSOR UNIT (MN B)	28.0	5 AMP	MOMENTARY POWER TO ACTIVATE C&W LIGHT
CB10/EPS SENSOR UNIT AC BUS 1	MDC-5	AC BUS 1 OVER/UNDER VOLTAGE SENSOR UNIT	0.63	5 AMP	
CB11/EPS SENSOR UNIT AC BUS 2	MDC-5	AC BUS 2 OVER/UNDER VOLTAGE SENSOR UNIT	0.63	5 AMP	
CB13/FUEL CELL 1 RAD	RHEB-226	F/C 1 RADIATOR VALVE	SEE REMARKS	5 AMP	37.24 WDC (1 TO 2 SEC.) TO OPEN OR CLOSE VLV, 1.12 WDC FOR FLAG IN BYPASS POSITION
CB14/FUEL CELL 2 RAD	RHEB-226	F/C 2 RADIATOR VALVE		5 AMP	
CB15/FUEL CELL 3 RAD	RHEB-226	F/C 3 RADIATOR VALVE		5 AMP	

F. FLIGHT BUS

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>COMMUNICATIONS</u>					
CB10/TELECOM UDL FLT BUS	RHEB-225	UPDATA LINK	8.9	5 AMP	
CB11/TELECOM PMP POWER PRIM FLT BUS	RHEB-225	PRE MOD PROCESSOR	2.9	5 AMP	
CB12/TELECOM PMP POWER AUX FLT BUS	RHEB-225	PRE MOD PROCESSOR	2.9	5 AMP	
CB13/TELECOM S-BAND FM XMTR DATA STORAGE EQUIP FLT BUS	RHEB-225	1. DATA STORAGE 2. TV CAMERA 3. S-BAND FM XMTR	1. 2.8 2. 5.75 3. 1.46	5 AMP	1. DRAWS 32.0 WAC
CB15/TELECOM RNDZ XPNDR FLT BUS	RHEB-225	RENDEZVOUS TRANSPONDER	1. 70.5 2. 14.0	10 AMP	1. OPERATE 2. HEATER (ONLY)
CB16/TELECOM SIG COND FLT BUS	RHEB-225	SIGNAL CONDITIONING EQUIPMENT	22.0	5 AMP	
CB17/TELECOM S-BAND PWR AMPL PHASE MOD XPNDR 1 FLT BUS	RHEB-225	1. S-BAND PRIM PA 2. S-BAND PRIM XPNDR	1. 5.0 2. 1.05	5 AMP	
CB19/TELECOM S-BAND PWR AMPL PHASE MOD XPNDR 2 FLT BUS	RHEB-225	1. S-BAND SEC PA 2. S-BAND SEC XPNDR	1. 5.0 2. 1.05	5 AMP	

G. FLIGHT AND POSTLANDING BUS

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>EPS</u> CB38/LIGHTING FLOOD FLT PL	RHEB-226	FLOODLIGHTS	7.0	5 AMP	LH INTERIOR FLOODLIGHTS QTY - 2 BULBS
<u>COMMUNICATIONS</u> CB7/TELECOM CREW STATION AUDIO L FLT POSTLDG BUS	RHEB-225	<ol style="list-style-type: none"> <li>CSM PILOT RIGHT MIKE</li> <li>CMDR LEFT MIKE</li> <li>CMDR AUDIO STATION</li> </ol>	28.84 (MAX) (TOTAL)	5 AMP	
CB8/TELECOM CREW STATION AUDIO CTR FLT POSTLDG BUS	RHEB-225	<ol style="list-style-type: none"> <li>CSM PILOT LEFT MIKE</li> <li>LM PILOT RIGHT MIKE</li> <li>CSM PILOT AUDIO STA</li> <li>VHF AM TRANS-CEIVER</li> </ol>	76.16 (MAX) (TOTAL)	5 AMP	
CB9/TELECOM CREW STATION AUDIO R FLT POSTLDG BUS	RHEB-225	<ol style="list-style-type: none"> <li>LM PILOT LEFT MIKE</li> <li>CMDR RIGHT MIKE</li> <li>LM PILOT AUDIO STATION</li> <li>VHF BCN</li> </ol>	68.88 (MAX) (TOTAL)	5 AMP	
<u>SEQUENTIAL</u> CB5/PL VENT FLT PL	MDC-8	<ol style="list-style-type: none"> <li>PLV FAN</li> <li>PLV GATE VALVE</li> </ol>	1.A. 17.0 (HI) B. 8.0 (LO) 2. 50.4	5 AMP	

G. FLIGHT AND POSTLANDING BUS (CONCLUDED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>SEQUENTIAL (CONCLUDED)</u> CB8/FLOAT BAG 3 FLT PL	MDC-8	1. SEA DYE MARKER 2. BAG CONTROL VALVE	1. 140.0 2. 30.0	5 AMP	

H. BATTERY C

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>EPS</u> CB22/BAT C PWR ENTRY & POST-LANDING	RHEB-250	FLIGHT & POSTLDG BUS	VARIABLE	80 AMP	SEE NEXT PAGE, CB22 FEEDS SIX EPS CIRCUIT BREAKERS

I. BATTERY C PWR, POSTLANDING AND ENTRY CIRCUIT BREAKER (CB22)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>EPS</u> CB11/MAIN A BAT C CB12/MAIN B BAT C CB13/FLIGHT & POSTLANDING BAT C	RHEB-275 RHEB-275 RHEB-275	MAIN BUS A MAIN BUS B FLIGHT & POSTLDG BUS	VARIABLE VARIABLE VARIABLE	80 AMP 80 AMP 25 AMP	
CB23/BAT CHGR BAT C CB15/BAT C TO BAT BUS A	RHEB-250 RHEB-250	BATTERY CHARGER BAT BUS A	N/A VARIABLE	5 AMP 80 AMP	
CB24/BAT C TO BAT BUS-B	RHEB-250	BAT BUS B	VARIABLE	80 AMP	

CSM 101  
 REV A  
 PCN-2

J. NON-ESSENTIAL BUS 1

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
CB22/INSTRUMENTS NONESS	MDC-5	INSTRUMENTS POWER CONTROL CIRCUIT BREAKER BOX - FLIGHT QUAL	195.2 (TOTAL)	30 AMP	FEEDS CB5, CB6, CB7, CB8, CB9, CB10 (SEE MISCELLANEOUS CIRCUIT BREAKER LIST)



CSM 101  
 REV A  
 PCN-2

K. NON-ESSENTIAL BUS 2

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>EXPERIMENTS</u> CB23/INSTRUMENTS SCIEN EQUIP .SEB 1	MDC-5		70	5 AMP	GSE MEASUREMENT

L. PYRO BUS A

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>SEQUENTIAL</u> CB16/PYRO A SEQ A	RHEB-250	1. VLQA 2. VMQA 3. VRQA MAIN CHUTE RELEASE INITIATORS	SEE REMARKS	20 AMPS	96 AMPS FOR 0.04 SEC.
CB44/MAIN RELEASE PYRO A  <u>RCS</u>	RHEB-229	1. VLQA 2. VMQA 3. VRQA	SEE REMARKS	7.5 AMP	30 AMPS FOR 0.01 SEC.
CB18/PYRO A BAT BUS A TO PYRO BUS TIE	RHEB-250	1. VLQA 2. VMQA 3. VRQA	SEE REMARKS	20 AMP	USED ONLY IF PYRO BAT A FAILS, 96 AMPS FOR 0.04 SEC.

M. PYRO BUS B

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
<u>SEQUENTIAL</u> CB17/PYRO B SEQ B	RHEB-250	1. VLOB 2. VMOB 3. VRQB MAIN CHUTE RELEASE INITIATORS	SEE REMARKS	20 AMP	96 AMPS FOR 0.04 SEC.
<u>RCS</u> CB45/MAIN RELEASE PYRO B	RHEB-229		SEE REMARKS	7.5 AMP	30 AMPS FOR 0.01 SEC.
CB19/PYRO B BAT B TO PYRO BUS TIE	RHEB-250	1. VLOB 2. VMOB 3. VRQB	SEE REMARKS	20 AMP	USED ONLY IF PYRO BAT B FAILS; 96 AMPS FOR 0.04 SEC.

N. AC BUS 1

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS AC @115 VAC	CB RATING	REMARKS
<u>EPS</u> CB1/FUEL CELL 1 PUMPS - AC	RHEB-226	1. H <sub>2</sub> PUMP 2. GLYCOL PUMP 3. pH SENSOR (φA) 4. PF CORRECTION BOX	1. 80 (HI) 65 (LO) 2. 80 (HI) 65 (LO) 3. 2.0 4. 5.0	2 AMP	PUMP PWR VARIES WITH FUEL CELL TEMP, CAN BE SWITCHED TO AC2 (3φ EXCEPT pH)
CB2/FUEL CELL 2 PUMPS - AC	RHEB-226	1. H <sub>2</sub> PUMP 2. GLYCOL PUMP 3. pH SENSOR (φA)	1. 80 (HI) 65 (LO) 2. 80 (HI) 65 (LO) 3. 2.0	2 AMP	PUMP PWR VARIES WITH FUEL CELL TEMP, CAN BE SWITCHED TO AC2 (3φ EXCEPT pH)
CB3/FUEL CELL 3 PUMPS - AC	RHEB-226	1. H <sub>2</sub> PUMP 2. GLYCOL PUMP 3. pH SENSOR (φA) 4. PF CORRECTION BOX	1. 80 (HI) 65 (LO) 2. 80 (HI) 65 (LO) 3. 2.0 4. 5.0	2 AMP	PUMP PWR VARIES WITH FUEL CELL TEMP, CAN BE SWITCHED TO AC2 (3φ EXCEPT pH)
CB3/EPS SENSOR SIGNAL AC 1	MDC-5	AC BUS 1 OVER/UNDER VOLTAGE SENSOR	0	2 AMP	SENSOR DRAWS CONTINUOUS POWER FROM BAT RLY BUS (3φ)
CB18/BATTERY CHARGER AC PWR	MDC-5	BATTERY CHARGER	21.0 (AVG)	2 AMP	CAN BE SWITCHED TO AC2, DRAWS 19 WDC (AVG) (3φ)
CB34/LIGHTING NUMERICS INTEGRAL RMDC-AC 1	RHEB-226	STATION 2 PANEL LIGHTS	20.5 (TOTAL)	2 AMP	MDC PANELS 2, 3, 4, 5, & 6 (φB USED)
CB39/LIGHTING RUN TARGET AC 1	RHEB-226	RUNNING LIGHTS & TRANSFORMER	12.6 (TOTAL)	2 AMP	QTY - 22 BULBS (φA USED)
CB37/LIGHTING NUMERICS INTEGRAL LMDC-AC 1	RHEB-226	NUMERICS LIGHTING	8.5 (TOTAL)	2 AMP	φA USED

N. AC BUS 1 (CONTINUED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS AC @115 VAC	CB RATING	REMARKS
<u>CRYO</u> CB22/CRYOGENIC FAN MOTORS TANK 1 AC 1 $\phi$ A	RHEB-226			2 AMP	0.8 PF
CB23/CRYOGENIC FAN MOTORS TANK 1 AC 1 $\phi$ B	RHEB-226	1. O <sub>2</sub> TANK 1 FAN 2. H <sub>2</sub> TANK 1 FAN	1. 20.5 2. 3.5	2 AMP	1. QTY - 2 2. QTY - 2
CB24/CRYOGENIC FAN MOTORS TANK 1 AC 1 $\phi$ C	RHEB-226			2 AMP	$\phi$ C USED
CB20/CRYOGENIC QTY AMPL 1 AC 1	RHEB-226	1. O <sub>2</sub> TANK 1 SIG COND 2. H <sub>2</sub> TANK 1 SIG COND	1. 3.7 2. 3.1	2 AMP	
<u>ECS</u> CB1/SUIT COMPRESSORS AC 1 $\phi$ A	MDC-4			2 AMP	
CB2/SUIT COMPRESSORS AC 1 $\phi$ B	MDC-4	SUIT COMPRESSOR	79.7 (ORBIT) 195.0 (GRND)	2 AMP	0.8 - PF QTY - 2 EITHER UNIT CAN BE POWERED FROM EITHER AC BUS
CB3/SUIT COMPRESSORS AC 1 $\phi$ C	MDC-4			2 AMP	
CB7/ECS GLYCOL PUMPS AC 1 $\phi$ A	MDC-4			2 AMP	0.8 - PF QTY - 2 EITHER UNIT CAN BE POWERED FROM EITHER AC BUS
CB8/ECS GLYCOL PUMPS AC 1 $\phi$ B	MDC-4	GLYCOL PUMP	50.0	2 AMP	
CB9/ECS GLYCOL PUMPS AC 1 $\phi$ C	MDC-4			2 AMP	
CB38/ECS CABIN FAN 1 AC 1 $\phi$ A	MDC-5	CABIN FAN		2 AMP	

N. AC BUS 1 (CONTINUED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS AC @115 VAC	CB RATING	REMARKS
<u>ECS</u> (CONTINUED)					
CB39/ECS CABIN FAN 1 AC 1 φB	MDC-5	CABIN FAN	19.0 (ORBIT) 30.0 (GRND)	2 AMP	0.8 - PF
CB40/ECS CABIN FAN 1 AC 1 φC	MDC-5	1. SECONDARY GLYCOL PUMP 2. EVAP TEMP CNTL UNIT	1. 50.0 2. 23.8	2 AMP	
CB44/ECS SECONDARY COOLANT LOOP AC 1	MDC-5	RAD PROP VLV CONTROL	43.7	2 AMP	φC USED
CB68/ECS RADIATORS CONTROLLER AC 1	MDC-5				
<u>G&amp;N</u>					
CB54/G&N POWER AC 1	MDC-5	1. C&W LIGHTS 2. SIGNAL COND	69 (TOTAL)	2 AMP	φB USED
<u>SCS</u>					
CB9/SCS AC 1	MDC-8	1. ELECT DSPY ASS'Y 2. GYRO ASS'Y NO. 1 3. FDAI NO. 1	1. 27.0 2. 34.6 3. 6.6	2 AMP	1. DRAWS 46.2 WDC } 2. DRAWS 60.0 WDC } 3φ
CB55/SCS TVC AC 1	MDC-8	SERVO AMPL ASS'Y TV	21.9	2 AMP	DRAWS 12.7 WDC
<u>SPS</u>					
CB27/SPS GAUGING AC 1	MDC-8	PUG SYSTEM	49.5	2 AMP	DRAWS 12.4 WDC, φC USED, CAN BE SWITCHED TO AC2

N. AC BUS 1 (CONCLUDED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS AC @ 115 V.A.C	CB RATING	REMARKS
<u>COMMUNICATIONS</u> CB1/TELECOM PCM TM GROUP 1 CB2/TELECOM PCM TM GROUP 2 CB14/TELECOM S-BAND FM XMTR DATA STORAGE EQUIP GROUP 1 CB18/TELECOM S-BAND PWR AMPL PHASE MOD XPNDR 1 GROUP 1 CB20/TELECOM S-BAND PWR AMPL PHASE MOD XPNDR 2 GROUP 2 CB24/TELECOM FLT QUAL RCDR GROUP 1	RHEB-225 RHEB-225 RHEB-225 RHEB-225 RHEB-225 RHEB-225	PCM EQUIP PCM EQUIP 1. DATA STORAGE 2. S-BAND FM XMTR 1. S-BAND PRIM PWR AMPL 2. S-BAND PRIM XPNDR 1. S-BAND SEC PWR AMPL 2. S-BAND SEC XPNDR FLT QUAL RCDR	18.9 18.9 1. 33.0 2. 6.7 1. HI 90.0 LO 40.0 2. 16.5 1. HI 90.0 LO 40.0 2. 16.5 14.4	2 AMP 2 AMP 2 AMP 2 AMP 2 AMP 2 AMP	CAN BE SWITCHED TO AC2 (3φ) CAN BE SWITCHED TO AC2 (3φ) DSE DRAWS 6.0 WDC, CAN BE SWITCHED TO AC2 (3φ) CAN BE SWITCHED TO AC2 (3φ) CAN BE SWITCHED TO AC2 (3φ) CAN BE SWITCHED TO AC2 (3φ)

O. AC BUS 2

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS AC @115 VAC	CB RATING	REMARKS
<u>EPS</u> CB1/FUEL CELL 1 PUMPS - AC	RHEB-226	1. H <sub>2</sub> PUMP 2. GLYCOL PUMP 3. pH SENSOR (φA) 4. PF CORRECTION BOX	1. 80(HI)65(LO) 2. 80(HI)65(LO) 3. 2.0 4. 5.0	2 AMP	PUMP PWR VARIES WITH FUEL CELL TEMP, CAN BE SWITCHED TO AC1 (3φ EXCEPT pH)
CB2/FUEL CELL 2 PUMPS - AC	RHEB-226	1. H <sub>2</sub> PUMP 2. GLYCOL PUMP 3. pH SENSOR (φA)	1. 80(HI)65(LO) 2. 80(HI)65(LO) 3. 2.0	2 AMP	PUMP PWR VARIES WITH FUEL CELL TEMP, CAN BE SWITCHED TO AC1 (3φ EXCEPT pH)
CB3/FUEL CELL 3 PUMPS - AC	RHEB-226	1. H <sub>2</sub> PUMP 2. GLYCOL PUMP 3. pH SENSOR (φA) 4. PF CORRECTION BOX	1. 80(HI)65(LO) 2. 80(HI)65(LO) 3. 2.0 4. 5.0	2 AMP	PUMP PWR VARIES WITH FUEL CELL TEMP, CAN BE SWITCHED AT AC1 (3φ EXCEPT pH)
CB4/EPS SENSOR SIGNAL AC 2	MDC-5	AC BUS 2 OVER/UNDER VOLTAGE SENSOR	0	2 AMP	SENSOR DRAWS CONTINUOUS POWER FROM BAT RLY BUS (3φ)
CB18/BATTERY CHARGER AC PWR	MDC-5	BATTERY CHARGER	21.0 (AVG)	2 AMP	CAN BE SWITCHED TO AC 1, DRAWS 19 WDC (AVG) (3φ)
CB33/LIGHTING NUMERICS INTEGRAL LEB - AC 2	RHEB-226	STATION 3 PANEL LIGHTS	5.0 (TOTAL)	2 AMP	LEB PANELS (φA USED)
CB40/LIGHTING RUN TARGET AC 2	RHEB-226	RUNNING LIGHTS & TRANSFORMER	12.6 (TOTAL)	2 AMP	QTY - 22 BULBS (φB USED)



0. AC BUS 2 (CONTINUED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS AC @115 VAC	CB RATING	REMARKS
<u>CRYO</u> CB21/CRYOGENIC QTY AMPL 2 AC 2	RHEB-226	1. O <sub>2</sub> TANK 2 SIG COND 2. H <sub>2</sub> TANK 2 SIG COND	1. 3.7 2. 3.1	2 AMP	φC USED
CB25/CRYOGENIC FAN MOTORS TANK 2 AC 2 φA	RHEB-226			2 AMP	0.8 - PF
CB26/CRYOGENIC FAN MOTORS TANK 2 AC 2 φB	RHEB-226	1. O <sub>2</sub> TANK 2 FAN 2. H <sub>2</sub> TANK 2 FAN	1. 14.5 2. 3.5	2 AMP	1. QTY - 2 2. QTY - 2
CB27/CRYOGENIC FAN MOTORS TANK 2 AC 2 φC	RHEB-226			2 AMP	
<u>ECS</u> CB4/SUIT COMPRESSORS AC 2 φA	MDC-4			2 AMP	
CB5/SUIT COMPRESSORS AC 2 φB	MDC-4	SUIT COMPRESSOR	79.7 (ORBIT)	2 AMP	0.8 - PF
CB6/SUIT COMPRESSORS AC 2 φC	MDC-4		195.0 (GRND)	2 AMP	QTY-2 EITHER UNIT CAN BE POWERED FROM EITHER BUS
CB10/ECS GLYCOL PUMP AC 2 φA	MDC-4			2 AMP	0.8 - PF
CB11/ECS GLYCOL PUMP AC 2 φB	MDC-4	GLYCOL PUMP	50.0	2 AMP	QTY - 2 EITHER UNIT CAN BE POWERED FROM EITHER BUS
CB12/ECS GLYCOL PUMP AC 2 φC	MDC-4			2 AMP	
CB41/ECS CABIN FAN 2 AC 2 φA	MDC-5			2 AMP	
CB42/ECS CABIN FAN 2 AC 2 φB	MDC-5	CABIN FAN	19.0	2 AMP	0.8 PF
CB43/ECS CABIN FAN 2 AC 2 φC	MDC-5			2 AMP	
CB45/ECS SECONDARY COOLANT AC 2	MDC-5	SECONDARY GLYCOL PUMP	50.0	2 AMP	3φ
CB69/ECS RADIATORS CONTROLLER AC 2	MDC-5	RAD PROP VLV CONTROL	43.7	2 AMP	φC USED

O. AC BUS 2 (CONCLUDED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS AC @115 VAC	CB RATING	REMARKS
<u>G&amp;N</u> CB55/G&N POWER AC 2	MDC-5	G&N SYS PWR	69 (TOTAL)	2 AMP	φB USED
<u>SCS</u> CB10/SCS AC 2	MDC-8	1. ELECT DSPY ASS'Y 2. GYRO ASS'Y NO. 2 3. FDAI NO. 2	1. 27.0 2. 34.6 3. 6.6	2 AMP	1. DRAWS 46.2 WDC } 2. DRAWS 60.0 WDC } 3φ
<u>SPS</u> CB28/SPS GAUGING AC 2 <u>COMMUNICATIONS</u>	MDC-8	PUG SYSTEM	49.5	2 AMP	DRAWS 12.4 WDC, φC USED, CAN BE SWITCHED TO AC1
CB17/TELECOM PCM TM GROUP 1	RHEB-225	PCM EQUIP	18.9	2 AMP	CAN BE SWITCHED TO AC 1 (3φ)
CB27/TELECOM PCM TM GROUP 2	RHEB-225	PCM EQUIP	18.9	2 AMP	CAN BE SWITCHED TO AC 1 (3φ)
CB14/TELECOM S-BAND FM XMTR DATA STORAGE EQUIP GROUP 1	RHEB-225	1. DATA STORAGE 2. S-BAND FM XMTR	1. 33.0 2. 6.7	2 AMP	DSE DRAWS 6.0 WDC, CAN BE SWITCHED TO AC 1 (3φ)
CB18/TELECOM S-BAND PWR AMPL PHASE MOD XPNDR 1 GROUP 1	RHEB-225	1. S-BAND PRIM PWR AMPL 2. S-BAND PRIM XPNDR	1. HI 90.0 LO 40.0 2. 16.5	2 AMP	CAN BE SWITCHED TO AC 1 (3φ)
CB20/TELECOM S-BAND PWR AMPL PHASE MOD XPNDR 2 GROUP 2	RHEB-225	1. S-BAND SEC PWR AMPL 2. S-BAND SEC XPNDR	1. HI 90.0 LO 40.0 2. 16.5	2 AMP	CAN BE SWITCHED TO AC 1 (3φ)
CB24/TELECOM FLT QUAL RCDR GROUP 1	RHEB-225	FLT QUAL RCDR	14.4	2 AMP	CAN BE SWITCHED TO AC 1 (3φ)

P. MISCELLANEOUS CIRCUIT BREAKERS

CB NO./NOMENCLATURE	PANEL I.D.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
CB36/EP5 UTILITY R STA	MDC-229	PORTABLE FLOODLIGHT	14.0	2 AMP	FED BY V <sub>MA</sub>
CB37/EP5 UTILITY LEB	MDC-229	1. SEQ CAMERA 2. PORTABLE FLOOD-LIGHT	17.0 (TOTAL)	2 AMP	FED BY V <sub>ME</sub>
CB41/BATTERY A (NO NOMENCLATURE)	ON BAT A	BAT BUS A	VARIABLE	100 AMP	INACCESSIBLE TO PILOTS
CB42/BATTERY B (NO NOMENCLATURE)	ON BAT B	BAT BUS B	VARIABLE	100 AMP	INACCESSIBLE TO PILOTS
CB43/BATTERY C (NO NOMENCLATURE)	ON BAT C	CB22 (PHEB-250)	VARIABLE	100 AMP	INACCESSIBLE TO PILOTS
<u>SEQUENTIAL</u>					
CB38/EP5 BAT BUS A	MDC-229	SEQUENTIAL AND SPS CIRCUIT BREAKERS		20 AMP	FEEDS CB1, CB3, CB6, CB31, CB33, CB45, CB49. (MDC-8)
CB39/EP5 BAT BUS B	MDC-229	SEQUENTIAL AND SPS CIRCUIT BREAKERS		20 AMP	FEEDS CB2, CB4, CB7, CB32, CB34, CB46, AND CB51 (MDC-8)
CB50/EDS 2 BAT C	MDC-8	EDS PWR SW	30.0	5 AMP	FED BY CB23 (BAT CHGR BAT C CIRCUIT BREAKER)
<u>SCS-RCS-SPS</u>					
CB26/EP5 MN A GROUP 1	MDC-229	SCS AND RCS CIRCUIT BREAKERS		30 AMP	FEEDS CB19, CB23, CB40, AND CB41 (MDC-8)
CB27/EP5 MN B GROUP 1	MDC-229	SCS, ORDEAL AND RCS CIRCUIT BREAKERS		30 AMP	FEEDS CB20, CB24, CB38, CB42, AND AND CB64 (MDC-8)
CB28/EP5 MN A GROUP 2	MDC-229	SCS CIRCUIT BREAKERS		30 AMP	FEEDS CB11, CB15, AND CB59 (MDC-8)
CB29/EP5 MN B GROUP 2	MDC-229	SCS CIRCUIT BREAKERS		30 AMP	FEEDS CB12, CB16, AND CB58 (MDC-8)
CB30/EP5 MN A GROUP 3	MDC-229	SCS, SPS, RCS, AND EMS CIRCUIT BREAKERS		30 AMP	FEEDS CB21, CB29, CB39, CB52, AND CB63

P. MISCELLANEOUS CIRCUIT BREAKERS (CONTINUED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
CB31/EPS MN B GROUP 3	MDC-229	SCS, SPS, RCS AND EMS CIRCUIT BREAKERS		30 AMP	FEEDS CB22, CB30, CB37, CB53, AND CB62 (MDC-8)
CB32/EPS MN A GROUP 4	MDC-229	SPS, SCS AND CLOCK CIRCUIT BREAKERS		30 AMP	FEEDS CB17, CB25, CB47, AND CB61 (MDC-8)
CB33/EPS MN B GROUP 4	MDC-229	SPS, SCS AND CLOCK CIRCUIT BREAKERS		30 AMP	FEEDS CB18, CB26, CB48, AND CB60 (MDC-8)
CB34/EPS MN A GROUP 5	MDC-229	SPS, SCS AND RCS CIRCUIT BREAKERS		30 AMP	FEEDS CB13, CB43, CB67, AND CB68 (MDC-8)
CB35/EPS MN B GROUP 5	MDC-229	SPS, SCS AND RCS CIRCUIT BREAKERS		30 AMP	FEEDS CB14, CB44, CB66, AND CB69 (MDC-8)
<u>INST</u>					
CB1/INSTRUMENTATION POWER CONTROL OPERATIONAL	RHEB-276	V <sub>1</sub>	5.6	5 AMP	FED BY CB19 (MN A) OR CB20 (MN B)
CB2/INSTRUMENTATION POWER CONTROL OPERATIONAL	RHEB-276	V <sub>2</sub>	19.6	5 AMP	FED BY CB19 (MN A) OR CB20 (MN B)
CB3/INSTRUMENTATION POWER CONTROL OPERATIONAL	RHEB-276	V <sub>3S</sub>	56.0	5 AMP	FED BY CB19 (MN A) OR CB20 (MN B)
CB4/INSTRUMENTATION POWER CONTROL OPERATIONAL	RHEB-276	V <sub>4S</sub>	44.8	5 AMP	FED BY CB19 (MN A) OR CB20 (MN B)
CB5/INST POWER CONTROL FLIGHT QUALIFICATION	RHEB-277	V <sub>5</sub>	28.0	5 AMP	FED BY CB22 FROM V <sub>NE1</sub>
CB6/INST POWER CONTROL FLIGHT QUALIFICATION	RHEB-277	V <sub>6</sub>	21.0	5 AMP	FED BY CB22 FROM V <sub>NE1</sub>
CB7/INST POWER CONTROL FLIGHT QUALIFICATION	RHEB-277	NOT WIRED	--	5 AMP	FED BY CB22 FROM V <sub>NE1</sub>
CB8/INST POWER CONTROL FLIGHT QUALIFICATION	RHEB-277	1. V <sub>8</sub> 2. V <sub>8S</sub> 3. PBW MODULATION	70.0	10 AMP	FED BY CB22 FROM V <sub>NE1</sub>

P. MISCELLANEOUS CIRCUIT BREAKERS (CONCLUDED)

CB NO./NOMENCLATURE	PANEL NO.	COMPONENT	POWER WATTS DC @28 VDC	CB RATING	REMARKS
CB9/INST POWER CONTROL FLIGHT QUALIFICATION	RHEB-277	V <sub>9</sub>	44.0	10 AMP	FED BY CB22 FROM V <sub>NE1</sub>
CB10/INST POWER CONTROL FLIGHT QUALIFICATION	RHEB-277	V <sub>10</sub>	33.6	10 AMP	FED BY CB22 FROM V <sub>NE1</sub>

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

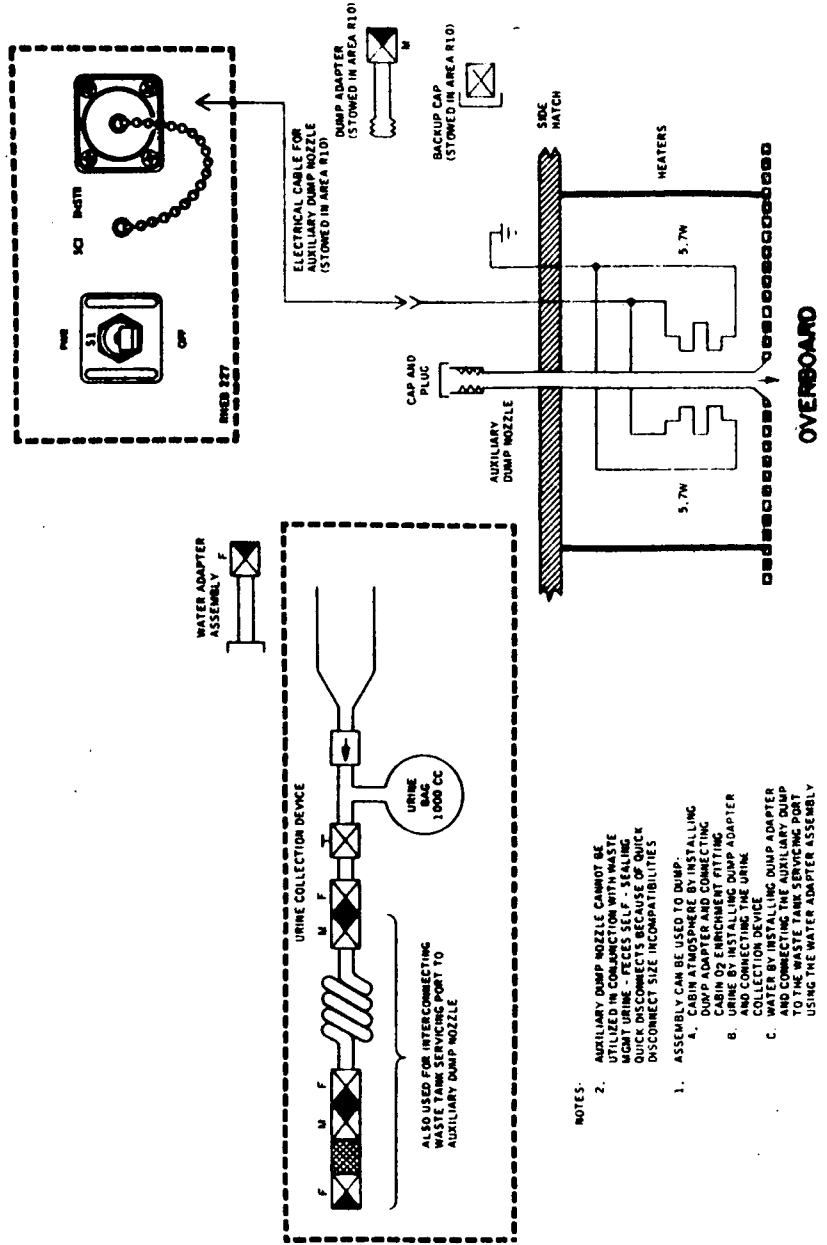
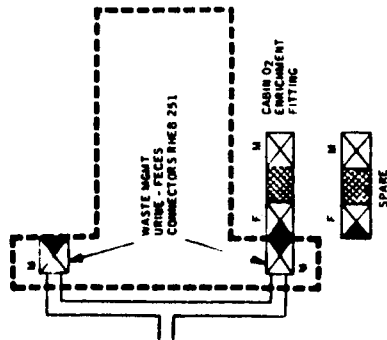


Page intentionally left blank

Page intentionally left blank

# DRAWING 4.5 - B,C,D Z 1 AND 2

DELETE THE FECAL CANISTER AND MODIFY THE URINE COLLECTION SYSTEM TO INCLUDE THE AUXILIARY DUMP ASSEMBLY AS SHOWN BELOW:



- NOTES:
1. ASSEMBLY CAN BE USED TO DUMP.
    - A. CABIN ATMOSPHERE BY INSTALLING DUMP ADAPTER AND CONNECTING CABIN O2 ENRICHMENT FITTING
    - B. URINE BY INSTALLING DUMP ADAPTER AND CONNECTING TO THE URINE COLLECTION DEVICE
    - C. WATER BY INSTALLING DUMP ADAPTER AND CONNECTING THE AUXILIARY DUMP TO THE WASTE TANK SERVICING PORT USING THE WATER ADAPTER ASSEMBLY
  2. AUXILIARY DUMP NOZZLE CANNOT BE UTILIZED IN CONNECTION WITH WASTE MGMT URINE - FECES SELF - SEALING QUICK DISCONNECT BECAUSE OF QUICK DISCONNECT SIZE INCOMPATIBILITIES

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank



Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank



Page intentionally left blank

TABLE 6-I.- UNIFIED S-BAND TRANSPONDER AND FM TRANSMITTER

ITEM	FUNCTION and/or PARAMETERS
1. Weight	32 pounds
2. Cooling	ECS Primary and/or Secondary Glycol Loops
3. Electrical Power	
a. DC Voltage	28 ± 4 Vdc (For control only)
b. AC Voltage	115 Vac, 400 Hz, 3 Phase
c. Power	
(1) PM Transponder	1.05 Watts DC (During ON/OFF Switching)
(2) FM Transmitter	16.5 Watts AC (Prim or Sec)
	1.46 Watt DC (During ON/OFF Switching)
	6.7 Watts AC
4. Activation Time	1 minute maximum - PM Receiver, PM Transmitter, and FM Transmitter
5. PM Receiver (Prim/Sec)	
a. Type	Double Conversion Superheterodyne, Phase Lock Loop
b. Frequency (Center)	2106.40625 MHz
c. Phase Lock Tracking Loop	
(1) In-Lock Range	±90 kHz for RF INPUT greater than -114 dbm and STATIC PHASE ERROR less than 15 degrees peak.
(2) In-Lock Rate	Linear rate of 35 kHz/second or less to ±90 kHz for RF INPUT greater than -114 dbm.
(3) Acquisition Probability	90 percent probability of acquisition on first sweep at above range and rates.
(4) Predetection Noise Bandwidth	16 kHz
(5) Loop Noise Bandwidth (Optimizing Point)	800 Hz (0 db S/N @ -134.5 dbm)
(6) Threshold	-125 dbm, defined as level of unmodulated CW signal below which lock cannot be maintained for period of at least one minute with 90 percent probability.
(7) Phase Error	24 degrees maximum (Offset + Rate Errors)
d. Dynamic Range	-51 dbm to -124 dbm (Normal)
	-37 dbm to -51 dbm (Must maintain lock, and must not damage RCVR.)

P-2

P-2

TABLE 6-I.- UNIFIED S-BAND TRANSPONDER AND FM TRANSMITTER - Continued

ITEM	FUNCTION and/or PARAMETERS
e. Automatic Gain Control (AGC)	
(1) Attack Time	TBD
(2) Decay	TBD
f. Ranging Channel	
(1) Modulation	PM on Carrier
(2) Bandwidth	10 kHz to 1.5 MHz (3 db)
(3) PRN Bit Rate	992.834 kbs
(4) PRN Clock	992.834 kbs (496.417 kHz Squarewave)
(5) PRN Code Length	5,456,682 bits (Lunar Code)
g. High-Gain Antenna Track Channel	
(1) Pointing Error Signal	50 Hz amplitude modulated signal derived from the coherent AGC detector.
(2) Earth Presence Signal	DC signal superimpose on pointing error signal when RCVR is locked to incoming RF signal. (See Table 6-IV Modes)
h. Outputs	
6. PM Transmitter (Prim/Sec)	
a. Type	PM, S-Band
b. Frequency	2287.5 MHz (Aux OSC Mode) or 240/221 times RCVR frequency when RCVR is phase locked to uplink RF signal. (See Auto OSC Control)
c. RF Output Power	301 to 374 milliwatts (Test Data)
d. Auto OSC Control	XMTR frequency is derived from XMTR Aux OSC prior to acquisition and RCVR VCO after acquisition. Switching is controlled using RCVR AGC signal.
(1) Aux OSC to RCVR VCO Switching Time	Less than 0.25 seconds
(2) RCVR VCO to Aux OSC Switching Time	Less than 6 seconds (3 seconds nominal at -51 dbm)

\*

TABLE 6-I.- UNIFIED S-BAND TRANSPONDER AND FM TRANSMITTER - Concluded

ITEM	FUNCTION and/or PARAMETERS
(3) Switching Threshold	-127 dbm
e. Inputs	(See Table 6-III Modes)
7. FM Transmitter	
a. Type	FM, S-Band
b. Frequency	2272.5 MHz
c. RF Output	111 to 138 milliwatts (Test Data)
d. Inputs	(See Table 6-III Modes)
8. Special Operating Instructions	When switching between primary and secondary transponders, momentarily stop at the OFF (Center) position to allow control relays to operate.

TABLE 6-II.- S-BAND POWER AMPLIFIER

ITEM	FUNCTION and/or PARAMETERS						
1. Weight	32 pounds maximum						
2. Cooling	ECS Primary and/or Secondary Glycol Loop						
3. Electrical Power							
a. Input Voltage	28 ± 4 Vdc control 115 Vac, 400 Hz, 3Ø						
b. Input Power							
(1) Control Power	5 Watts maximum steady state and 350 Watts during switching for 0.5 seconds maximum.						
(2) AC Power	<table border="0"> <tr> <td>High Pwr Ampl Mode</td> <td>81 Watts</td> </tr> <tr> <td>LowPwr Ampl Mode</td> <td>32 Watts</td> </tr> <tr> <td>Off/Bypass</td> <td>0 Watts</td> </tr> </table>	High Pwr Ampl Mode	81 Watts	LowPwr Ampl Mode	32 Watts	Off/Bypass	0 Watts
High Pwr Ampl Mode	81 Watts						
LowPwr Ampl Mode	32 Watts						
Off/Bypass	0 Watts						
	Sum ac power values to obtain simultaneous power level operation of Prim and Sec power amplifiers.						
4. Power Amplification Activation Time	<p>No RF amplification until 90 second nominal filament warm-up period complete.</p> <p>RF transfer (PM or FM) from one power amplifier to the other, with a 60 millisecond RF amplification dropout, is possible without an additional 90 second delay (filament warm-up) if the desired power amplifier is operating at the time of transfer.</p>						
5. RF Output							
a. PM Output - Prim or Sec Power Amplifier	<table border="0"> <tr> <td>High Pwr Mode:</td> <td>11.2 Watts min</td> </tr> <tr> <td>Low Pwr Mode:</td> <td>2.8 Watts min</td> </tr> <tr> <td>Bypass Mode:</td> <td>Less than 2.5 db below input</td> </tr> </table>	High Pwr Mode:	11.2 Watts min	Low Pwr Mode:	2.8 Watts min	Bypass Mode:	Less than 2.5 db below input
High Pwr Mode:	11.2 Watts min						
Low Pwr Mode:	2.8 Watts min						
Bypass Mode:	Less than 2.5 db below input						
b. FM Output - Prim or Sec Power Amplifier	High Pwr Mode: 11.2 Watts min						
6. RF Input							
a. PM	275 to 400 milliwatts						
b. FM	100 to 145 milliwatts (For rated output)						

P-2

TABLE 6-II.- S-BAND POWER AMPLIFIER - Concluded

ITEM	FUNCTION and/or PARAMETERS
7. Under Voltage Protection	Under voltage protection circuit will remove ac pwr from power amplifier TWT if any phase of the ac input voltage falls below 95 Vac for 15 milliseconds or more. If this condition exists for 1 second or more a 90 second filament warm-up delay will occur when ac voltage is restored.
8. Special Operating Instructions	DC power should be applied before ac power and removed after ac power removal to prevent possible damage.

TABLE 6-III.- S-BAND DOWNLINK MODES AND MODULATION PROCESS

FM DOWNLINK MODES AVAILABLE	FM MODES																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	0
Channels Included	Carrier Voice <sup>(a)</sup> 51.2-kbps TM	Carrier Voice <sup>(a)</sup> 51.2-kbps TM	Carrier Voice <sup>(a)</sup> 1.6-kbps TM	Carrier Voice <sup>(a)</sup> 1.6-kbps TM	Carrier 1.6-kbps TM	Carrier 1.6-kbps TM	Carrier Backup Voice 1.6-kbps TM	Carrier Backup Voice 1.6-kbps TM	Carrier 1.6-kbps TM	Carrier Backup Voice 1.6-kbps TM	Carrier Voice PRN	Carrier Voice PRN	Carrier 51.2-kbps TM	Carrier Backup Voice 51.2-kbps TM	Carrier 51.2-kbps TM	Carrier Backup Voice 51.2-kbps TM	No Carrier
Modulation Schemes; Subcarrier Characteristics	PRN : FM directly on carrier (2287.5 MHz) Backup Voice : FM directly on carrier (2287.5 MHz) Normal Voice <sup>(a)</sup> : FM/PM; 1.25-MHz subcarrier deviated ±7.5 kHz peak (±9 kHz peak for voice and biomed) <sup>(b)</sup> TM : PCM/PSK/PM; 1.024-MHz subcarrier bi-phase modulated ±90° Key : AM/PM; 512 kHz, 100 percent AM																
Peak Carrier Deviation-Radians (Δf)	PRN : <sup>(c)</sup> Normal Voice <sup>(a)</sup> : 0.7 for modes 1, 2 1.2 for modes 3, 4, 11, 12 Backup Voice : 0.7 for mode 8, 14 1.2 for mode 10, 16 TM : 1.2 for modes 1, 2, 16 (51.2-kbps) and mode 8 (1.6-kbps) 0.7 for modes 3, 4 (1.6-kbps) 1.6 for modes 5, 9 (1.6-kbps) and modes 13, 15 (51.2-kbps) Key : 1.0																
FM DOWNLINK MODES AVAILABLE	FM MODES																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	0
Channels Included	1:1 Playback of Recorded Voice, Recorded CSM 51.2-kbps TM and Scientific Data <sup>(c)</sup>	32:1 Playback of Recorded Voice, Recorded CSM 1.6-kbps TM and Scientific Data <sup>(c)</sup>	32:1 Playback of (CSM - Recorded) LM 1.6-kbps TM	TV	Real-Time Scientific <sup>(d)</sup>	Real-Time 51.2-kbps TM	Real-Time 1.6-kbps TM <sup>(e)</sup>	Real-Time 1.6-kbps TM <sup>(e)</sup>	1:1/32:1 Playback of Scientific Data and Real Time 51.2-kbps TM	1:1/32:1 Playback of Scientific Data and Real Time 51.2-kbps TM	1:1/32:1 Playback of Scientific Data and Real Time 1.6-kbps TM	8:1 Playback of (CSM-Recorded) LM 1.6-kbps TM	Same as Mode 1 Except No Scientific Data	Same as Mode 2 Except No Scientific Data	Same as Mode 2 Except No Scientific Data	No Carrier	
Modulation Schemes; Subcarrier Characteristics	TV : FM Directly on carrier (2272.5 MHz) Playback Voice: FM Directly on carrier (2272.5 MHz) Scientific Data <sup>(c)</sup> : FM/PM (3 subcarriers) 95 kHz 125 kHz 165 kHz Playback LM TM : PCM/PM Playback CSM TM <sup>(e)</sup> : PCM/PSK/PM; 1.024 MHz subcarrier bi-phase modulated ±90° Playback Voice : 100 kHz ±20 percent Playback CSM TM <sup>(e)</sup> : 600 kHz ±15 percent Playback LM TM : 200 kHz ±25 percent TV : 1 MHz ±10 percent Scientific Data <sup>(c)</sup> : FM/PM 75 kHz ±15 percent (95 kHz SC) 108 kHz ±15 percent (125 kHz SC) 168 kHz ±15 percent (165 kHz SC)																
Peak Carrier Deviation (Δf)	Playback Voice : 100 kHz ±20 percent Playback CSM TM <sup>(e)</sup> : 600 kHz ±15 percent Playback LM TM : 200 kHz ±25 percent TV : 1 MHz ±10 percent Scientific Data <sup>(c)</sup> : FM/PM 75 kHz ±15 percent (95 kHz SC) 108 kHz ±15 percent (125 kHz SC) 168 kHz ±15 percent (165 kHz SC)																

<sup>(a)</sup> Or voice and biomed.  
<sup>(b)</sup> In the event of an EVA, the EVA biomed data is relayed via the CSM S-Band link on the voice subcarrier; otherwise the biomed data comes back as PCM telemetry.  
<sup>(c)</sup> Varies with the received uplink.  
<sup>(d)</sup> Scientific data not used on SC-103.  
<sup>(e)</sup> Auxiliary FMP mode will provide real time PCM with same USB-FM characteristics as playback PCM.

TABLE 6-IV.- S-BAND UPLINK MODES AND MODULATION PROCESS

PM UPLINK MODES AVAILABLE	MODE NUMBER	1	2	3	4	5	6	7	8	9	0	
		Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	--
	PRN	--	--	PRN	PRN	PRN	--	--	--	--	--	
	Channels Included	--	Voice	--	Voice	--	Voice	Voice	Backup Voice	--	--	
		--	--	Udata	--	Udata	Udata	Udata	--	--	--	
PM UPLINK MODULATION PROCESS	Modulation Schemes; Subcarrier Character- istics	PRN : FM directly on carrier Voice : FM/PM; 30-kHz subcarrier deviated $\pm 7.5$ kHz (peak) Udata : PSK/FM/PM; 70-kHz subcarrier deviated $\pm 5.0$ kHz (peak) Backup Voice: FM/PM; 70-kHz subcarrier deviated $\pm 5.0$ kHz (peak)										
		MODE NUMBER	1	2	3	4	5	6	7	8	9	0
	Carrier Phase Deviation (Radians- Peak)	PRN	1.34	--	--	0.38	0.38	0.44	--	--		
		Voice	--	1.85	--	1.20	--	1.00	1.10	--	NA	NA
		Udata	--	--	1.85	--	1.20	1.00	1.10	--		
	Backup Voice	--	--	--	--	--	--	--	1.85			

P-2



TABLE 6-V.- PREMODULATION PROCESSOR

ITEM	FUNCTION and/or PARAMETERS
1. Weight	14.5 pounds
2. Cooling	ECS Primary and/or Secondary Glycol Loops.
3. Electrical Power	
a. Input Voltage	28 ± 4 Vdc
b. Input Power	8.5 Watts
4. CM Down Voice Channel (Normal)	
a. Subcarrier	1.25 MHz derived from CTE 512 kHz.
b. Response	300 to 3000 Hz flat within 6 db.
5. CM Down Voice Channel (Backup)	
a. Response	300 to 2300 Hz flat within 6 db.
6. LM/EVA Voice and LM Biomed Relay Channel	
a. Subcarrier	1.25 MHz derived from CTE 512 kHz.
b. Subcarrier Deviation	LM Voice - 8 kHz EVA Voice and Biomed - 9 kHz
c. Response	300 to 13,000 Hz flat within 2 db.
d. LM Input	Voice
e. EVA Input	Voice and/or 7 Biomed Subcarriers
4.0 kHz ± 5% f <sub>o</sub>	
5.4 kHz ± 5% f <sub>o</sub>	
6.8 kHz ± 5% f <sub>o</sub>	
8.2 kHz ± 5% f <sub>o</sub>	
9.6 kHz ± 4% f <sub>o</sub>	
11.0 kHz ± 3% f <sub>o</sub>	
12.4 kHz ± 3% f <sub>o</sub>	
7. Tape Recorder Output - LM & CSM Voice	LM and CSM intercom voice are mixed and output to DSE for recording.
a. Response	300 to 2300 Hz flat within 2 db.

P-2

TABLE 6-V.- PREMODULATION PROCESSOR - Continued

ITEM	FUNCTION and/or PARAMETERS
8. LM PCM Output Channel	LM PCM (1.6 kbs) is limited and output to DSE for recording.
a. Response	600 to 2800 Hz flat within 1 db.
9. CM PCM Data Channel (Real-Time and Playback)	
a. Input	51.2 kbs or 1.6 kbs NRZ PCM data.
b. Subcarrier	1.024 MHz derived from PCM 512 kHz ref signal.
c. Modulation	Bi-phase
10. Scientific Data Channel (Real-Time)	
A. Response	Flat within 2 db
	<u>Channel</u>
	1     0 to 2850 Hz
	2     0 to 3750 Hz
	3     0 to 4950 Hz
b. Frequency and Deviation	<u>Channel</u>
	1     95 kHz +7.5% $f_o$
	2     125 kHz +7.5% $f_o$
	3     165 kHz +7.5% $f_o$
11. Scientific Data Channel (Playback)	
a. Response	Flat within 2 db
	<u>Channel</u> <u>32:1 Playback</u> <u>1:1 Playback</u>
	1     12.5 to 89 Hz    50 to 2850 Hz
	2     12.5 to 117 Hz    50 to 3750 Hz
	3     12.5 to 154 Hz    50 to 4950 Hz
	(Recorded data bandwidths)
12. Tape Recorder Input - LM PCM Channel	
a. Response	15 to 90 kHz flat within 1 db.
13. Uplink Subcarrier Detectors	
a. Up Voice	30 kHz (Normal) 70 kHz (Backup)
b. Udata	70 kHz
c. Response	300 to 4,000 kHz flat within 3 db.

TABLE 6-V.- REMODULATION PROCESSOR - Concluded

ITEM	FUNCTION and/or PARAMETERS
14. Emergency Key Control	512 kHz signal derived from CTE 512 kHz timing signal baseband modulates S-Band PM carrier when key is depressed. A 400 Hz sidetone output to the audio center is provided when key is depressed.
15. Data Rate Indicator Control	DC signal from PCM to control modulation levels to PM & FM modulator modules.  HBR = 5.3 Vdc LBR = 0 Vdc
15. Television Channel a. Direct Output b. Response c. Isolated Output d. Response	To S-Band FM transmitter  DC to 500 kHz flat within 0.5 db.  To GSE hardline  10 to 500,000 Hz flat within 3 db.

TABLE 6-VI.- VHF AM TRANSCEIVER EQUIPMENT

ITEM	FUNCTION and/or PARAMETERS
1. Weight	13 pounds Maximum
2. Cooling	ECS Primary and/or Secondary Glycol Loop
3. Electrical Power	
a. Input Voltage	28 ± 4 Vdc
b. Input Power	Duplex A (Key OFF)                   4.2 Watts
	Duplex A (Key ON)                   28.87 Watts
	Simplex A (Key OFF)                4.1 Watts
	Simplex A (Key ON)                28.87 Watts
	Duplex B (Key OFF)                3.8 Watts
	Duplex B (Key ON)                27.61 Watts
	Simplex B (Key OFF)               3.97 Watts
	Simplex B (Key ON)               27.61 Watts
	RCV A Only                           1.2 Watts
	RCV B Only                           1.2 Watts
	PTT A (Key ON)                    1.23 Watts
	PTT B (Key ON)                    1.29 Watts
4. Transmitter (A or B)	
a. Activation Time	250 milliseconds maximum to reach standby condition.
	20 milliseconds maximum to reach full transmit power from PTT (Key ON)
b. RF Output	5 DBW (average) minimum
c. XMTR Frequency	XMTR A 296.8 MHz ± 8.90 kHz
	XMTR B 259.7 MHz ± 7.79 kHz
d. Modulation	Modulated by clipped speech between 300 and 2000 Hz combined with a 30 kHz signal such that the ON-OFF duty cycle of the RF carrier (50 ± 5 percent) is speech signal dependent and the ON-OFF period is 30 kHz. When XMTR is keyed ON with no speech input the average RF Output is 5 DBW minimum.
5. Receiver (A or B)	
a. Activation Time	500 milliseconds maximum to reach full receive operation from turn-on.
	100 milliseconds maximum to reach full receive operation from PTT release (Key OFF).

P-2

TABLE 6-VI.- VHF AM TRANSCEIVER EQUIPMENT - Concluded

ITEM	FUNCTION and/or PARAMETERS
b. RCVR RF Input	2 to 625,000 Microvolts
c. A&B Output Response	
(1) Output to Audio Center (Voice)	300 to 3000 Hz, + 2db - 3 db maximum variation, down 12 db minimum at 5000 Hz.
(2) Output to PMP (Voice and Biomed Data)	300 to 13,000 (2 db).
d. RCVR B LM PCM Output	300 to 13,000 Hz (2 db).
e. RCVR Squelch	Adjustable by MDC2 controls for between 0 and 10 to 25 microvolts. 9 on squelch control is maximum squelch (10 to 25 microvolt level)

\*

TABLE 6-VII.- AUDIO CENTER EQUIPMENT

ITEM	FUNCTION and/or PARAMETERS
1. Weight	7.9 pounds
2. Cooling	ECS Primary and/or Secondary Glycol Loop
3. Electrical Power	
a. Input Voltage	28 ± 4 Vdc
b. Input Power	14.2 Watts (3 Stations ON)
4. Stations	Left Couch Station Right Couch Station Center Couch Station
5. Microphone Amplifier (1 Each Station)	
a. Input	0 dbm sound pressure level (nominal)
b. Response	300 to 3000 Hz flat within 2 db
c. Automatic Volume Control	
(1) Range	Less Than 4 db change for 20 db input change
(2) Attack Time	50 milliseconds
(3) Release Time	1 to 6 seconds
(4) Threshold	13 ± 3 db (referred to input)
d. Output	0 dbm ± 3 db at threshold
e. Isolation	30 db or greater between modulation output channels
6. Earphone Amplifier (1 Each Station)	
a. Input	Variable over 35 db range of given input signal
b. Output	With 13 db on input attenuator the output is 20 dbm ± 3 dbm
c. Response	300 to 3000 Hz flat within 2 db
d. Isolation	40 db or greater between input channels
7. Voice Operated Relay (VOX)	
a. VOX Sensitivity	Adjustable for input from -10 dbm to +10 dbm
b. VOX Attack	Less than 50 milliseconds
c. VOX Release	2 ± 0.7 seconds

P-2

TABLE 6-VII.- AUDIO CENTER EQUIPMENT - Concluded

ITEM	FUNCTION and/or PARAMETERS
8. Intercom Bus a. GSE Output b. Swimmer Output c. Tape Recorder	Prelaunch voice via hardline For recovery voice to recovery swimmers Output for voice recording on DSE
9. Spacecraft/GSE Facility Hardline Voice Interface	The HF Control Switch and Volume Control are used to operate each audio stations input/output voice links with the checkout and launch facilities.  <p style="text-align: center;"><u>NOTE</u></p> The above capabilities not implemented on SC 101.

TABLE 6-VIII.- UPDATA LINK EQUIPMENT

ITEM	FUNCTION and/or PARAMETERS
1. Weight	21 pounds maximum
2. Cooling	ECS Primary and/or Secondary Glycol Loops
3. Electrical Power	
a. Input Voltage	28 + 2, -4 Vdc
b. Input Power	8.9 Watts maximum
4. Information Signal	
a. Modulation	Phase shift key FM modulation of 70 kHz S-Band uplink subcarrier. Modulation deviation is $\pm 5$ kHz.
b. Sub-bit "ONE"	Sub-bit "one" begins when the positive transition of the 1 kHz information signal cross each other in-phase.
c. Sub-bit "Zero"	Sub-bit "zero" begins when the positive transition of the 1 kHz sync signal crosses the 2 kHz information signal 180 degrees out-of-phase.
d. Sub-bit Period	One millisecond.
e. Sub-bit Rate	1,000 bits per second.
5. Message Structure	
a. Sub-bit Code	5 sub-bits per information bit. Vehicle address sub-bit code is different than system address and data word. Sub-bit coding (See Drawing 6.5)
b. Message Code	Each message contains up to 30 information bits which consists of a vehicle address, system address, and data word. (See Drawing 6.5)
(1) Vehicle Address	Eight possible codes selectable by hard wire on an external connector.
(2) System Address	<ol style="list-style-type: none"> <li>1. Command Module Computer</li> <li>2. Real-Time Command (Internal relays)</li> <li>3. Real-Time Command (External relays) (not used)</li> <li>4. Central Timing Equipment</li> <li>5. Salvo RTC reset</li> <li>6. Test message A &amp; B</li> <li>7. Auxiliary decoder (not used)</li> </ol>
(3) Data Word	(See Drawing 6.5)

P-2



TABLE 6-VIII.- UPDATA LINK EQUIPMENT - Continued

ITEM	FUNCTION and/or PARAMETERS																														
<p>6. Sub-bit Detector</p> <p>a. Sub-bit Sync</p> <p>b. Sub-bit Data</p>	<p>The 1 kHz and 2 kHz PSK signals are separated to provide synchronization and sub-bit data.</p> <p>Recovered by phase lock techniques. Three five sub-bit sequences must precede a command message to synchronize the UDL.</p> <p>Detected at a 1 kHz rate.</p>																														
<p>7. Decoder Operation</p>	<p>The vehicle address decoded as "access" bits are decoded asynchronously (without sync). Message timing in the decoder is not established until after vehicle address is decoded.</p> <p>Vehicle address recognition disables access bit decoding and enables the decoding of the remaining message.</p> <p>The system address determines information for receiving the correct number of info bits and processing a particular data word. After the proper number of bits have been received and temporarily stored in the main register, the program control modifies the operation to enable processing or transfer of the data word.</p>																														
<p>8. Verification Signal</p>	<p>When a complete message is received, processed or transferred without the detection of sub-bit or bit errors and without the occurrence of a logic power deviation the parallel 4-bit verification code to the PCM TM will be as follows:</p> <table border="1"> <thead> <tr> <th>PCM BIT</th> <th>B1</th> <th>B2</th> <th>B3</th> <th>B4</th> </tr> </thead> <tbody> <tr> <td>UDL OFF</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>*TEST A</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>*TEST B</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>*SYS VAL</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>UDL STANDBY (ON)</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> </tr> </tbody> </table> <p>*Verification signal is presented to the PCM as follows:</p> <p>PCM HBR 55 milliseconds            PCM LBR 250 milliseconds</p>	PCM BIT	B1	B2	B3	B4	UDL OFF	0	0	0	0	*TEST A	0	1	1	0	*TEST B	1	0	0	1	*SYS VAL	0	1	0	1	UDL STANDBY (ON)	1	0	1	0
PCM BIT	B1	B2	B3	B4																											
UDL OFF	0	0	0	0																											
*TEST A	0	1	1	0																											
*TEST B	1	0	0	1																											
*SYS VAL	0	1	0	1																											
UDL STANDBY (ON)	1	0	1	0																											

TABLE 6-VII.- UPDATA LINK EQUIPMENT - Concluded

ITEM	FUNCTION and/or PARAMETERS
9. Internal Relays a. Type b. Rating  c. Actuation Time	32 double-pole double-throw relays 2 ampere, minimum, contact rating  Opening or closure less than 10 milliseconds.

TABLE 6-IX.- TELEVISION CAMERA, SLOW SCAN

ITEM	FUNCTION and/or PARAMETERS
1. Weight	6.8 pounds maximum
2. Cooling	Not required
3. Electrical Power	
aa. Input Voltage	24 to 31 Vdc
b. Input Power	5.75 Watts
4. Activation Time	TBD
5. Resolution	250 EIA Test Pattern Lines (Electronic Industries Association)
6. Scanning Rates	
a. Lines	320 Lines-per-Frame
b. Frames	10 Frames-per-Second
7. Video Bandwidth	40 to 400,000 Hz (3 db) 400 kHz to 500 kHz (+3, -12 db) 20 db Roll - Off
8. Gray Scales	5 minimum (Black to white is positive signal)
9. Illumination levels	0.1 to 30 foot candles
10. Automatic Light Control Switch	
a. "ALC" Position	Camera will operate in specification over light levels in Item 8.
b. "OFF" Position	Camera will operate in specification over light levels of 6.3 to 22 foot candles.  (20 Watt flourescent lamp $\approx$ 4870 foot candles)
11. Optics	
a. Fixed Focal Length Lens	80 degrees field of view and 25 to 90 inches depth of view at lens aperature of f2.
b. Variable Focal Length Lens and View Finder	Adjustable from 20 to 80 millimeters with f2.5 minimum aperature.

I-2

TABLE 6-X. RENDEZVOUS RADAR TRANSPONDER AND ANTENNA

ITEM	FUNCTION and/or PARAMETERS
1. Weight	13.63 pounds
2. Cooling	ECS SM Primary and/or Secondary Glycol Loops.
3. Electrical Power	
a. DC Voltage	25 to 31.5 Vdc
b. Power	70.5 Watts (Transponder) 14 Watts (Heater)
4. Activation Time	TBD
5. Receiver	
a. Type	Solid state coherent radar transponder
b. Frequency	9832.8 MHz $\pm$ 30 kHz Offset by doppler $\pm$ 49 kHz with maximum
c. Modulation	3 sinusoidal tones (PM on carrier) 204.8 kHz $\pm$ 0.0015%, 20 $\pm$ 2 degrees 6.4 kHz $\pm$ 0.0015%, 20 $\pm$ 2 degrees 0.2 kHz $\pm$ 0.0015%, 24 $\pm$ 2 degrees
d. Dynamic Range	-123 dbm to -18 dbm at antenna terminals.
e. Acquisition	Acquires rendezvous radar in 1.3 seconds at -123 dbm or greater.
6. Transmitter	
a. Type	Solid state coherent radar transponder
b. Frequency	
(1) Search	9792 MHz $\pm$ 25 kHz and swept $\pm$ 104 kHz minimum.
(2) Transpond	240/241 times receive frequency.
c. RF Output Power	Greater than 240 milliwatts
d. Modulation	Received tones transponded with modulation index same as received except $\pm$ 4 degree tolerance.
7. Mode Operation	
a. Transponder	In operation at all times a signal is being received.
b. Signal Search	In operation when no signal is being received. Transmit frequency is swept $\pm$ 104 kHz with a saw-tooth function at 200 kHz rate.

P-2

TABLE 6-X.- RENDEZVOUS RADAR TRANSPONDER AND ANTENNA  $\odot$  Concluded

ITEM	FUNCTION and/or PARAMETERS
c. Self Test	In operation when selected by systems test switch S1, LEB 101. Test checks receiver operation by inserting 40.8 MHz signal between mixer stage and preamp input to first IF.
8. Display Outputs	
a. AGC Monitor	0 to 5 Vdc
b. Frequency Lockup	0 $\pm$ 0.4 Vdc (Search Mode) 4.5 $\pm$ 0.45 Vdc (Transponder Mode)
c. RF Power	2.5 $\pm$ 0.4 Vdc
9. Range	Between 50 feet and 400 n.mi.
a. Range Accuracy	200 Hz tone $\pm$ 12,044.74 feet 64 kHz tone $\pm$ 425.22 feet 204.8 kHz tone $\pm$ 57.63 feet
b. Range Rate Accuracy	0.25 percent or 1 foot per second (which ever is greater) based on LM Guidance Computer sampling period of 100 milliseconds.

TABLE 6-XI.- VHF RECOVERY BEACON

ITEM	FUNCTION and/or PARAMETERS
1. Weight	2.7 pounds maximum
2. Cooling	Not required
3. Electrical power	
a. Input Voltage	28 ± 4 Vdc
b. Input Power	6.88 Watts maximum averaged over interruption cycle
4. RF Output Power	3 Watts minimum during the ON time of the interruption cycle
5. XMT Frequency	243 ± 0.0126S MHz
6. Modulation	Carrier is amplitude - modulated by 1 kHz square wave, 20 to 40 percent.
7. Interruption Cycle	Modulated carrier is present at the output for 2 seconds and absent for 3 seconds.

P-2

TABLE 6-XII.- VHF SURVIVAL BEACON - TRANSCEIVER

ITEM	FUNCTION and/or PARAMETERS
1. Weight	5 pounds maximum including battery pack.
2. Cooling	Not required
3. Electrical	
a. DC Voltage	-30 Vdc and -20 Vdc from attachable battery pack.
b. Power	Battery pack life is 24 hours in 100% beacon operation with 40% duty cycle.
4. Activation Time	No appreciable warm-up period
5. Receiver	
a. Type	Portable, VHF AM Beacon - transceiver with integral microphone, speaker, PTT pushbutton battery and antenna.
b. Frequency	243 MHz
c. Dynamic Range (Sensitivity)	7.5 microvolts at $\frac{S + N}{N} \geq 10$ db when 30% modulated by 1 kHz.
d. Selectivity	6 db at $f_c \pm 1.5$ MHz, 60 db at $f_c \pm 9$ MHz
e. Audio Output	103 db SPL with 1000 microvolt input
6. Transmitter	
a. Frequency	243 MHz
b. RF Output	(Short circuit protection)
(1) Beacon	2 Watts (0 hrs), 0.9 Watts (24 hrs)
(2) Voice	1.4 Watts minimum (90% modulation)
c. Modulation	
(1) Beacon	1 kHz, tone on carrier. Carrier duty cycle is $2 \pm 0.2$ seconds on and $3 \pm 0.3$ seconds off.
(2) Voice	0 - 90% from 300 to 3000 MHz

\*

TABLE 6-XIII.- ANTENNA SWITCH, S-BAND

ITEM	FUNCTION and/or PARAMETERS
1. Weight	2.5 pounds
2. Cooling	Not required
3. Electrical Power	
a. Input Voltage	23 to 30 Vdc
b. Input Power	12 Watts (For Omni Position)
4. Actuation Time	150 milliseconds maximum
5. Mechanics	Non-latching, 5-position, break-before-make.
6. Isolation	40 db minimum between RF lines

P-2



TABLE 6-XIV ANTENNA SWITCH, VHF

ITEM	FUNCTION and/or PARAMETERS
1. Weight	0.75 pounds maximum
2. Cooling	Not required
3. Electrical Power	
a. Input Voltage	None - Manual Switch
b. Input Power	None - Manual Switch
4. Actuation Time	Not applicable
5. Mechanics	Manual, 3-position, make-before-break
6. Isolation	40 db minimum between RF lines

TABLE 6-XV.- ANTENNA, S-BAND OMNI

ITEM	FUNCTION and/or PARAMETERS								
1. Type	Helix in loaded cavity								
2. Frequency	2100 MHz to 2300 MHz								
3. Gain	Greater than -3 db relative to isotropic source between $\theta > 45^\circ$ and $\theta > 145^\circ$ (See Coverage)								
4. Polarization	Right-hand circular								
5. Coverage	<p>The following coverage is applicable with sequential selection of the four antennas:</p> <table border="0"> <thead> <tr> <th><u>*GAIN</u></th> <th><u>SOLID ANGLE</u></th> </tr> </thead> <tbody> <tr> <td><math>\geq -3</math> db</td> <td>between <math>\theta = 45^\circ</math> and <math>145^\circ</math></td> </tr> <tr> <td><math>\geq -20</math> db</td> <td>between <math>\theta = 15^\circ</math> and <math>165^\circ</math></td> </tr> <tr> <td><math>\geq -24</math> db</td> <td>between <math>\theta = 10^\circ</math> and <math>170^\circ</math></td> </tr> </tbody> </table> <p>GAIN WILL BE LESS THAN -24 db for cones, with solid angles of 20 degrees at the spacecraft nose and SPS nozzle.</p> <p>*Applicable for <math>\phi = 0^\circ</math> to <math>360^\circ</math></p>	<u>*GAIN</u>	<u>SOLID ANGLE</u>	$\geq -3$ db	between $\theta = 45^\circ$ and $145^\circ$	$\geq -20$ db	between $\theta = 15^\circ$ and $165^\circ$	$\geq -24$ db	between $\theta = 10^\circ$ and $170^\circ$
<u>*GAIN</u>	<u>SOLID ANGLE</u>								
$\geq -3$ db	between $\theta = 45^\circ$ and $145^\circ$								
$\geq -20$ db	between $\theta = 15^\circ$ and $165^\circ$								
$\geq -24$ db	between $\theta = 10^\circ$ and $170^\circ$								
6. Power Rating	15 Watts of CW RF								

TABLE 6-XVI.- ANTENNA, VHF SCIMITAR

ITEM	FUNCTION and/or PARAMETERS
1. Type	Scimitar blade - one inch thick cover for thermal protection.
2. Frequency	225 MHz to 450 MHz
3. Gain	Greater than -3 db (On axis) Relative to isotropic source.
4. Polarization	Slant Linear
5. Coverage	Each antenna covers a hemisphere, approximately full coverage obtainable with antenna selection.
6. Power Rating	50 Watts average

TABLE 6-XVII.- ANTENNA, VHF RECOVERY

ITEM	FUNCTION and/or PARAMETERS
1. Type	10 inch erectible tape
2. Frequency	243 MHz tuned
3. Gain	+6 db with respect to isotropic source, -18 db null
4. Polarization	Vertical
5. Coverage	+70 degree elevation 360 degrees azimuth
6. Power Rating	50 Watts continuous

\*

CSM 101  
REV A

TABLE 6-XVIII.- ANTENNA, RENDEZVOUS RADAR TRANSPONDER

ITEM	FUNCTION and/or PARAMETERS
1. Type	Open ended waveguide
2. Frequency	9782 MHz to 9802 MHz (XMT) 9822 MHz to 9842 MHz (RCV)
3. Gain	Greater than 0 db above isotropic source
4. Polarization	Linear
5. Coverage	Gain is maintained over solid angle of 160 degrees (X-axis) by 105 degrees (axis at right angle to X-axis)

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank



※

CSM  
S/C-101  
REV A  
PCN-1

#### 7.4 INSTRUMENTATION SYSTEM NOTES

##### 7.4.1 PCM Signal Capabilities

Each analog and digital input to the PCM equipment is assigned to a channel and given a channel code number. A fixed program is provided for HBR and for LBR sampling. In HBR, all inputs will be sampled at least once during a subframe at sampling rates from 1 s/s to 200 s/s. In LBR, only selected inputs will be sampled during a subframe at a sample rate of 1 s/s (except channel codes 51DS1 [AGC parameters] and 51DP2 [UDL validity], which will be sampled at 10 s/s). The sampling sequence for HBR and for LBR are shown in the HBR format and LBR format respectively.

In the HBR mode the PCM equipment is capable of handling the following input signals:

- A. High Level Analog (0-5 Vdc) - 365 channels (4 at 200 s/s, 16 at 100 s/s, 15 at 50 s/s, 180 at 10 s/s, and 150 at 1 s/s).
- B. Parallel Digital - 1 - 16 bit channel at 200 s/s  
1 - 8 bit channel at 50 s/s  
1 - 32 bit channel at 10 s/s  
  
31 - 8 bit channel at 10 s/s
- C. Serial Digital - 1 - 40 bit channel at 50 s/s

In the LBR mode the PCM equipment is capable of handling the following input signals:

- A. High Level Analog (0-5 Vdc) - 100 channels at 1 s/s (these channels are not necessarily the same as the HBR 1 s/s channels).
- B. Parallel Digital - 1 - 32 bit channel at 1 s/s  
1 - 8 bit channel at 10 s/s  
29 - 8 bit channel at 1 s/s
- C. Serial Digital - 1 - 40 bit channel at 10 s/s

P-1

#### 7.4.2 PCM Telemetry Formats

The HBR format, shown on Drawing 7.2, gives the bit stream word and prime frame location for each channel. The 128 word blocks make up a prime frame. A 200 s/s channel will appear in 4 word blocks, a 100 s/s channel will appear in 2 word blocks and a 50 s/s channel will appear in 1 word block in each prime frame. The 10 s/s channels will appear in every fifth prime frame. The 1 s/s channels will appear in only one prime frame. Prime frame locations are given in the word blocks by the following code:

- A. A - All prime frames
- B. B - Prime frames 1, 6, 11, 16....46
- C. C - Prime frames 2, 7, 12, 17....47
- D. D - Prime frames 3, 8, 13, 18....48
- E. E - Prime frames 4, 9, 14, 19....49
- F. F - Prime frames 5, 10, 15, 20....50
- G. 1, 2, 3,....50 - Prime frames 1, 2, 3....50.

The LBR format gives the word location (1 through 200) of each channel appearing in the LBR bit stream.

#### 7.4.3 Programmer

The programmer maintains primary control of all functioning units of the PCM equipment. It uses CTE or internal clock pulses to generate gating and control signals for sampling and processing data.

#### 7.4.4 Analog Data

Each analog data input is connected to an analog gate. The analog gates are grouped in matrix combinations, basically arranged such that five channel inputs (columns) are provided per row with multiple rows used to form the desired matrices. The five analog gates in each column utilize a common Sequencer Gate (SG). Drawing 7.2 shows the matrix combinations used for analog signals. A row command and a column command must both be present for an analog gate to transfer the data signal via the sequencer gate and high-speed gate to an analog coder.

The selected coder uses a successive approximation technique to code the analog 0 to 5 Vdc signal into an 8-bit binary coded word. This 8-bit word is fed to the digital multiplexer where it is transferred to the output shift register when the coder gate is interrogated.

#### 7.4.5 Parallel Digital Data

Each parallel digital (or event) signal is connected to a gate in the digital multiplexer. When the digital multiplexer gate is interrogated, the output shift register will be loaded with a "1" if the input signal is greater than 3.5 Vdc or if the input is open circuited. The output shift register will remain a zero provided the input signal is less than 0.5 Vdc and the input impedance is less than 5K ohms.

#### 7.4.6 PCM Telemetry Parameters

Tables 7-1 through 7-14 list the PCM telemetry parameters that will be available for real-time analysis. Analog parameters recorded on the flight qualification recorder and the data storage equipment are not listed. Also, onboard display and GSE parameters are not listed. Information on parameters not listed is available in the Apollo Baseline Master Measurements list and/or the Apollo Instrumentation Equipment List for Spacecraft 101.

##### 7.4.6.1 Column Definitions for Tables 7-1 through 7-14

###### A. Column 1 - Meas ID

The Measurement ID consists of seven characters:

Two letters follow by four numbers and one letter.

###### 1. Module Code

The first letter designates the measurement location by module.

- a. A - ADAPTER
- b. B - BOOSTER
- c. C - COMMAND MODULE
- d. L - LAUNCH ESCAPE TOWER
- e. S - SERVICE MODULE

2. Functional Subsystem Code

The second letter denotes the subsystem wherein the measurement originates.

- a. A - STRUCTURES
- b. C - ELECTRICAL POWER
- c. D - MASTER EVENTS SEQUENCE CONTROLLER
- d. E - EARTH LANDING SEQUENCE CONTROLLER
- e. F - ENVIRONMENTAL CONTROL
- f. G - GUIDANCE & NAVIGATION
- g. H - STABILIZATION & CONTROL
- h. J - CREW EQUIPMENT
- i. K - FLIGHT TECHNOLOGY
- j. L - SCIENTIFIC EQUIPMENT
- k. P - SERVICE PROPULSION
- l. R - REACTION CONTROL
- m. S - L/V EMERGENCY DETECTION
- n. T - COMMUNICATIONS & INSTRUMENTATION

3. Discrete Number

Characters three through six are discrete numbers listed sequentially within each subsystem.

B. Column 2 - Meas Description

The measurement description is a brief, definitive title given to each measurement. Standard abbreviations are used, where applicable.

C. Column 3 - TM

The telemetry column contains two characters. The first character indicates the type of signal measured as follows:

- H - High level analog
- E - Event (one bit)
- D - Digital word (more than one bit)
- S - Serial digital word (more than one bit)

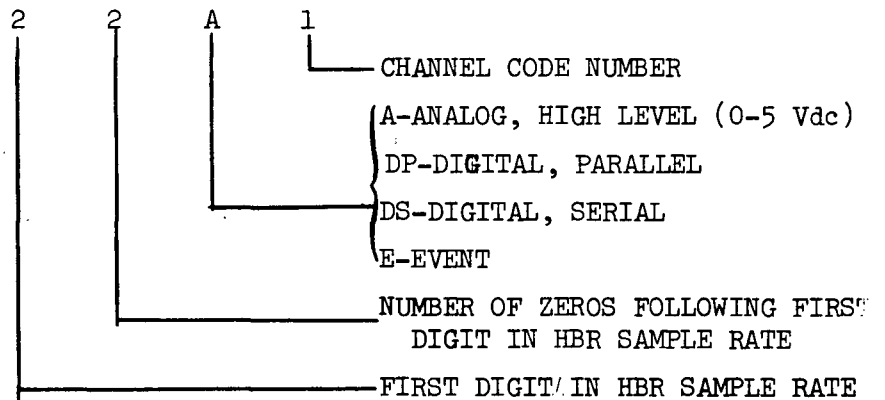
The second character indicates the telemetry format as follows:

- 1 - HBR format only
- 2 - HBR and LBR formats

D. Column 4 - Chan Code

The channel code contains information giving the high bit rate (HBR) sample rate, the type of parameter measurement (analog, digital, etc.), and the channel code number associated with that type of measurement.

EXAMPLE:



E. Column 5 - Data Range

The data range column indicates the total PCM range of the parameter. For bilevel parameters a PCM "one" state will be listed under HIGH and a PCM "zero" state will be listed under LOW.

F. Column 6 - Inst Bus

The instrumentation bus column will indicate the power source for a parameter. Some measurements are sensed and, or signal conditioned within a particular system using that systems' power and will be indicated by EPS, LES, EDS, ECS, G&N, S&C, SPS, C&W, AND C&I.

The instrumentation system distributes +28Vdc power directly to certain sensors and signal conditioners. These instrumentation power buses are shown on Drawing 7.1 and are designated.

- V<sub>1</sub> - CM ESS INST BUS PWR FROM RHEB PNL 276-CB1.
- V<sub>2</sub> - CM ESS INST BUS PWR FROM RHEB PNL 276-CB2.
- V<sub>3S</sub> - SM ESS INST BUS PWR FROM RHEB PNL 276-CB3.
- V<sub>4S</sub> - SM ESS INST BUS PWR FROM RHEB PNL 276-CB4.
- V<sub>5</sub> - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB5.
- V<sub>6</sub> - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB6.
- V<sub>7</sub> - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB7.
- V<sub>8</sub> - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB8.
- V<sub>8S</sub> - SM NON ESS INST BUS PWR FROM RHEB PNL 277-CB8.
- V<sub>9</sub> - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB9.
- V<sub>10</sub> - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB10.
- V<sub>SC</sub> - SCE PWR REQ'D FOR SIGNAL CONDITIONING (+20, -20, and/or +10Vdc).
- V<sub>SC5</sub> - SCE CM +5Vdc PWR.

G. Column 7 - Sig Cond

The signal conditioner column uses the following code to indicate the type of SCE module that is used to condition the signal.

- AA - dc Active Attenuator
- DA - dc Differential Amplifier
- DBA - dc Differential Bridge Amplifier
- AC - ac to dc Converter
- PD - Bi-phase Demodulator
- FD - Frequency Demodulator

H. Column 8 - Pwr Rqmts

The PWR requirement column gives dc power required for signal conditioner and sensor unless otherwise indicated. The power may or may not include onboard display requirements depending on whether the display is driven directly from the sig cond or not.

I. Column 9 - O. B. Displ

The following acronyms and \* indicate the type of onboard display used for parameters that appear both onboard and in the PCM bit stream.

\* - Displayed on C&W System

M - Displayed on Meter

SM - Displayed on Selectable Meter

L - Displayed on Lamp Indicator

TB - Displayed on Talk Back (FLAG)

STB - Displayed on Selectable Talk Back (FLAG)

SMB - Displayed on Selectable Meter and Talk Back

J. Column 10 - Sig Dist

The following acronyms indicate common circuit characteristics of the PCM parameters being displayed to the crew.

CS - Common Signal Drives Display and PCM

SS - Separate Signal Drives Display and PCM

TSC - Common Sensor but PCM is Signal Conditioned

K. Column 11 - DWG CSMSH

This column will reference the CSMSH drawing for system information.

30  
20/6

TABLE 7-1.- PCM TELEMETRY - STRUCTURES  
CSM  
S/C-101  
REV A  
PCN-1

MEAS. I.D.	MEAS. DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	INS CALD	MAX RANGE	C.B. DISPL	SIG DIS	CHN
CA1800T	SIDE HS BOND LOC 1 TEMP	H1	10A65	-260	+600	DEG F	V2	--	120 MA	--	--	--
CA1803T	SIDE HS BOND LOC 4 TEMP	H1	10A70	-260	+600	DEG F	V2	--	TOTAL	--	--	--
CA1806T	SIDE HS BOND LOC 7 TEMP	H1	10A74	-260	+600	DEG F	V2	--		--	--	--
CA1809T	SIDE HS BOND LOC 10 TEMP	H1	10A79	-260	+600	DEG F	V2	--		--	--	--
SA2377T	BAY 2 OX TK SURFACE TEMP	H1	10A142	-100	+200	DEG F	V3S	--	56 MA	--	--	--
SA2378T	BAY 3 OX TK SURFACE TEMP	H1	10A137	-100	+200	DEG F	V4S	--	56 MA	--	--	--
SA2379T	BAY 5 FU TK SURFACE TEMP	H1	10A139	-100	+200	DEG F	V3S	--	56 MA	--	--	--
SA2380T	BAY 6 FU TK SURFACE TEMP	H1	10A140	-100	+200	DEG F	V4S	--	56 MA	--	--	--
SA2400T	OX LINE ENTRY SUMP TK TEMP	H1	10A143	-100	+200	DEG F	V3S	--	56 MA	--	--	--
SA2401T	FU LINE ENTRY SUMP TK TEMP	H1	10A145	-100	+200	DEG F	V4S	--	56 MA	--	--	--
SA4480T	BEAM CAP 1 TEMP	H1	10A32	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4481T	BEAM CAP 2 TEMP	H1	10A34	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4482T	BEAM CAP 3 TEMP	H1	10A35	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4483T	BEAM CAP 4 TEMP	H1	10A23	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4484T	BEAM CAP 5 TEMP	H1	10A38	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4485T	BEAM CAP 6 TEMP	H1	10A40	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4486T	BEAM CAP 1 TEMP	H1	10A41	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4487T	BEAM CAP 2 TEMP	H1	10A43	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4488T	BEAM CAP 3 TEMP	H1	10A46	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4489T	BEAM CAP 4 TEMP	H1	10A50	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4490T	BEAM CAP 5 TEMP	H1	10A52	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4491T	BEAM CAP 6 TEMP	H1	10A53	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4492T	BEAM CAP 1 TEMP	H1	10A68	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4493T	BEAM CAP 4 TEMP	H1	10A71	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4494T	OUT SHELL BAY 4 TEMP	H1	10A73	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4495T	OUT SHELL BAY 4A TEMP	H1	10A76	-200	+250	DEG F	V8S	--	50 MA	--	--	--
SA4496T	SPS HE. TK 1 UP SURF TEMP	H1	10A77	0	+100	DEG F	V8S	--	50 MA	--	--	--
SA4497T	SPS HE. TK 2 LOW SURF TEMP	H1	10A80	0	+100	DEG F	V8S	--	50 MA	--	--	--

REQ TSC - 95 (NOV. 77)



81

TABLE 7-1.- PCM TELEMETRY - STRUCTURES - CONCLUDED

CSM  
S/C-101  
REV A  
PCN-1

MEAS I.D.	MEAS DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST EJS	SIG COND	PWR ROMTS	O. S. DISPL	SIG DIST	DWG CSM SH
SA4498T	RCS OUT OX TK QUAD A TEMP	H1	10A82	0	+120	DEG F	V85	--	50 MA	--	--	10.1
SA4499T	RCS OUT OX TK QUAD B TEMP	H1	10A55	0	+120	DEG F	V85	--	50 MA	--	--	10.1
SA4500T	RCS OUT OX TK QUAD C TEMP	H1	10A56	0	+120	DEG F	V85	--	50 MA	--	--	10.1
SA4501T	RCS OUT OX TK QUAD D TEMP	H1	10A58	0	+120	DEG F	V85	--	50 MA	--	--	10.1
SA4502T	RCS OUT FUEL TK QUAD A TEMP	H1	10A124	0	+120	DEG F	V85	--	50 MA	--	--	10.1
SA4503T	RCS OUT FUEL TK QUAD B TEMP	H1	10A125	0	+120	DEG F	V85	--	50 MA	--	--	10.1
SA4504T	RCS OUT FUEL TK QUAD C TEMP	H1	10A127	0	+120	DEG F	V85	--	50 MA	--	--	10.1
SA4505T	RCS OUT FUEL TK QUAD D TEMP	H1	10A128	0	+120	DEG F	V85	--	50 MA	--	--	10.1

P-1

82

CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-II.- PCM TELEMETRY - ELECTRICAL POWER SYSTEM

MEAS I.D.	MEAS DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RMTS	O. B. DISPL	SIG DIST	DWG CSMISH
SC0030Q	H2 TK 1 QTY	H2	10A141	0	100	PCT	EPS	--	4W AC	M	CS	5.2
SC0031Q	H2 TK 2 QTY	H2	10A144	0	100	PCT	EPS	--	4W AC	M	CS	5.2
SC0032Q	O2 TK 1 QTY	H2	10A147	0	100	PCT	EPS	--	4W AC	M	CS	5.2
SC0033Q	O2 TK 2 QTY	H2	10A42	0	100	PCT	EPS	--	4W AC	M	CS	5.2
SC0037P	O2 TK 1 PRESS	H2	10A150	50	1050	PSIA	V4S	--	25 MA	SM**	CS	5.2
SC0038P	O2 TK 2 PRESS	H2	10A66	50	1050	PSIA	V3S	--	25 MA	M**	CS	5.2
SC0039P	H2 TK 1 PRESS	H2	10A36	0	350	PSIA	V4S	--	25 MA	M**	CS	5.2
SC0040P	H2 TK 2 PRESS	H2	10A39	0	350	PSIA	V3S	--	25 MA	M**	CS	5.2
SC0041T	O2 TK 1 TEMP	H2	10A54	-325	+80	DEG F	EPS	--	SC0032	--	--	5.2
SC0042T	O2 TK 2 TEMP	H2	10A57	-325	+80	DEG F	EPS	--	SC0033	--	--	5.2
SC0043T	H2 TK 1 TEMP	H2	10A60	-425	-200	DEG F	EPS	--	SC0030	--	--	5.2
SC0044T	H2 TK 2 TEMP	H2	10A63	-425	-200	DEG F	EPS	--	SC0031	--	--	5.2
CC0200V	AC BUS 1 $\phi$ A VOLTS	H2	11A147	0	150	VAC	V5C	AC	--	SM**	TSC	3.1,3.3
CC0203V	AC BUS 2 $\phi$ A VOLTS	H2	11A56	0	150	VAC	V5C	AC	--	SM**	TSC	3.1,3.3
CC0206V	MAIN BUS A VOLTS	H2	11A57	0	+45	VDC	V5C	AA	--	SM**	TSC	3.1,3.2
CC0207V	MAIN BUS B VOLTS	H2	11A58	0	+45	VDC	V5C	AA	--	SM**	TSC	3.1,3.2
CC0218V	BAT BUS A VOLTS	H1	11A23	0	+45	VDC	V5C	AA	--	SM	TSC	3.1,3.2
CC0211V	BAT BUS B VOLTS	H1	11A24	0	+45	VDC	V5C	AA	--	SM	TSC	3.1,3.2
CC0215C	BAT CHGR	H2	11A73	0	+5	AMPS	V5C	DA	--	SM	TSC	3.2
CC0222C	BAT A CUR	H2	11A74	0	+100	AMPS	V5C	DA	--	SM	TSC	3.2
CC0223C	BAT B CUR	H1	11A27	0	+100	AMPS	V5C	DA	--	SM	TSC	3.2
CC0224C	BAT C CUR	H1	11A28	0	+100	AMPS	V5C	DA	--	SM	TSC	3.2
CC0232V	BAT RELAY BUS VOLTS	H2	11A75	0	+45	VDC	V5C	AA	--	SM	CS	3.1,3.2
SC2060P	FC 1 N2 PRESS	H1	11A29	0	75	PSIA	V4S	--	--	SM	CS	5.3
SC2061P	FC 2 N2 PRESS	H1	11A30	0	75	PSIA	V3S	--	--	SM	CS	5.3
SC2062P	FC 3 N2 PRESS	H1	11A35	0	75	PSIA	V3S	--	--	SM	CS	5.3
SC2066P	FC 1 O2 PRESS	H1	11A67	0	75	PSIA	V4S	--	--	SM	CS	5.3
SC2067P	FC 2 O2 PRESS	H1	11A68	0	75	PSIA	V3S	--	--	SM	CS	5.3
SC2068P	FC 3 O2 PRESS	H1	11A69	0	75	PSIA	V3S	--	--	SM	CS	5.3

FEC/TSG - 94 (NOV. 67)

83

TABLE 7-11.-- PCM TELEMETRY - ELECTRICAL POWER SYSTEM - CONCLUDED

CSM  
S/C-101  
REV A  
PCN-1

MEAS. I.D.	MEAS. DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RMTS	O. B. DISPL	SIG DIST	DWG CS/ASH
SC2069P	FC 1 H2 PRESS	H1	11A70	0	75	PSIA	V4S	--		SM	CS	5.3
SC2070P	FC 2 H2 PRESS	H1	11A71	0	75	PSIA	V3S	--		SM	CS	5.3
SC2071P	FC 3 H2 PRESS	H1	11A72	0	75	PSIA	V3S	--		SM	CS	5.3
SC2081T	FC 1 COND EXH TEMP	H2	10A51	+145	+250	DEG F	V5C	DE	--	SM*	CS	5.3
SC2082T	FC 2 COND EXH TEMP	H2	10A123	+145	+250	DEG F	V5C	DFA	--	SM*	CS	5.3
SC2083T	FC 3 COND EXH TEMP	H2	10A69	+145	+250	DEG F	V5C	DBA	--	SM*	CS	5.3
SC2084T	FC 1 SKIN TEMP	H2	10A72	+80	+550	DEG F	V5C	DBA	--	SM*	CS	5.3
SC2085T	FC 2 SKIN TEMP	H2	10A75	+80	+550	DEG F	V5C	DBA	--	SM*	CS	5.3
SC2086T	FC 3 SKIN TEMP	H2	10A78	+80	+550	DEG F	V5C	DBA	--	SM*	CS	5.3
SC2087T	FC 1 RAD OUT TEMP	H2	10A126	-50	+300	DEG F	V4S	--	56 MA	SMB**	CS	5.3
SC2088T	FC 2 RAD OUT TEMP	H2	10A129	-50	+300	DEG F	V3S	--	56 MA	SMB**	CS	5.3
SC2089T	FC 3 RAD OUT TEMP	H2	10A132	-50	+300	DEG F	V3S	--	56 MA	SMB**	CS	5.3
SC2090T	FC 1 RAD IN TEMP	H1	10A130	-50	+300	DEG F	V4S	--	56 MA	--	--	5.3
SC2091T	FC 2 RAD IN TEMP	H1	10A131	-50	+300	DEG F	V3S	--	56 MA	--	--	5.3
SC2092T	FC 3 RAD IN TEMP	H1	10A67	-50	+300	DEG F	V3S	--	56 MA	--	--	5.3
SC2113C	FC 1 CUR	H2	11A76	0	+100	AMPS	V5C	DA	--	SM	TSC	5.3
SC2114C	FC 2 CUR	H2	11A84	0	+100	AMPS	V5C	DA	--	SM	TSC	5.3
SC2115C	FC 3 CUR	H2	11A85	0	+100	AMPS	V5C	DA	--	SM	TSC	5.3
SC2139R	FC 1 H2 FLOW	H1	11A77	0	0.2	LB/HR	V4S	--	56 MA	SM*	CS	5.3
SC2140R	FC 2 H2 FLOW	H1	11A78	0	0.2	LB/HR	V3S	--	56 MA	SM*	CS	5.3
SC2141R	FC 3 H2 FLOW	H1	11A79	0	0.2	LB/HR	V3S	--	56 MA	SM*	CS	5.3
SC2142R	FC 1 O2 FLOW	H1	11A80	0	1.6	LB/HR	V4S	--	56 MA	SM*	CS	5.3
SC2143R	FC 2 O2 FLOW	H1	11A81	0	1.6	LB/HR	V3S	--	56 MA	SM*	CS	5.3
SC2144R	FC 3 O2 FLOW	H1	11A82	0	1.6	LB/HR	V3S	--	56 MA	SM*	CS	5.3
SC2160X	FC 1 PH	E2	11E28-1	NORM	HIGH	EVENT	EPS	--		STB*	CS	5.3
SC2161X	FC 2 PH	E2	11E28-2	NORM	HIGH	EVENT	EPS	--		STB*	CS	5.3
SC2162X	FC 3 PH	E2	11E28-3	NORM	HIGH	EVENT	EPS	--		STB*	CS	5.3

FEC/TSG - 94 (NOV. 67)

84

CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-III.- PCM TELEMETRY - LAUNCH ESCAPE SYSTEM

MEAS. I.D.	MEAS. DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RQMTS	O. B. DISPL	SIG DIST	DWG CSM/SH
CD0005V	PYRO BUS A VOLTS	H1	11A9	0	+40	VDC	SEQ	--	1 MA	--	--	2.2
CD0006V	PYRO BUS B VOLTS	H1	11A5	0	+40	VDC	SEQ	--	1 MA	--	--	2.2
CD0023X	CM-SM SEP RELAY A	E2	11E22-1		SEP	EVENT	SEQ	--	1 MA	--	--	2.4
CD0024X	CM-SM SEP RELAY B	E2	11E23-1		SEP	EVENT	SEQ	--	1 MA	--	--	2.4
CD0123X	SLA SEP RELAY A	E2	11E22-5		SEP	EVENT	SEQ	--	1 MA	--	--	2.4
CD0124X	SLA SEP RELAY B	E2	11E23-7		SEP	EVENT	SEQ	--	1 MA	--	--	2.4
CD0130X	CREW ABORT A	E2	11E13-3		ABORT	EVENT	SEQ	--	300 MA	--	--	2.3
CD0131X	CREW ABORT B	E2	11E13-6		ABORT	EVENT	SEQ	--	300 MA	--	--	2.3
CD0132X	EDS ABORT VOTE 1	E2	11E14-1	VOTE/OFF	ARM	EVENT	EDS	--	300 MA	--	--	2.3
CD0133X	EDS ABORT VOTE 2	E2	11E14-2	VOTE/OFF	ARM	EVENT	EDS	--	300 MA	--	--	2.3
CD0134X	EDS ABORT VOTE 3	E2	11E14-4	VOTE/OFF	ARM	EVENT	EDS	--	300 MA	--	--	2.3
CD0135X	EDS ABORT A	E2	11E13-7		ABORT	EVENT	EDS	--	2 MA	--	--	2.3
CD0136X	EDS ABORT B	E2	11E13-4		ABORT	EVENT	EDS	--	2 MA	--	--	2.3
CD0170X	SCS CHANNEL ENABLE RCS A	E2	11E22-3		ENABLE	EVENT	SEQ	--	1 MA	--	--	2.4
CD0171X	SCS CHANNEL ENABLE RCS B	E2	11E23-3		ENABLE	EVENT	SEQ	--	1 MA	--	--	2.4
CD0173X	CM RCS PRESS SIG A	E2	11E22-7		PRESS	EVENT	SEQ	--	1 MA	--	--	2.4
CD0174X	CM RCS PRESS SIG B	E2	11E23-5		PRESS	EVENT	SEQ	--	1 MA	--	--	2.4
CD0200V	LOGIC BUS A VOLTS	H1	11A8	0	+40	VDC	SEQ	--	1 MA	--	--	2.2
CD0201V	LOGIC BUS B VOLTS	H1	11A6	0	+40	VDC	SEQ	--	1 MA	--	--	2.2
CD0230X	FWD HS JET A	E2	11E24-1		JETT	EVENT	SEQ	--	1 MA	--	--	2.5
CD0231X	FWD HS JET B	E2	11E26-5		JETT	EVENT	SEQ	--	1 MA	--	--	2.5

FEC/TSG - 94 (NOV. 57)

85

CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-IV.- PCM TELEMETRY - EARTH LANDING SEQUENCE CONTROLLER

MEAS. I.D.	MEAS. DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RMTS	O. B. DISPL	SIG DIST	DWS CSM/SH
CE0001X	DROGUE DEP RELAY A	E2	11E29-1		DEPLOY	EVENT	V2	--		--	--	2.5
CE0002X	DROGUE DEP RELAY B	E2	11E30-6		DEPLOY	EVENT	V2	--		--	--	2.5
CE0003X	MAIN DEPLOY RELAY A	E2	11E29-8		DEPLOY	EVENT	V2	--		--	--	2.5
CE0004X	MAIN DEPLOY RELAY B	E2	11E30-3		DEPLOY	EVENT	V2	--		--	--	2.5
CE0321X	MAIN CHUTE DISC RELAY A	E2	11E29-5		DISC	EVENT	V2	--		--	--	2.5
CE0322X	MAIN CHUTE DISC RELAY B	E2	11E30-8		DISC	EVENT	V2	--		--	--	2.5

P-1

TABLE 7-V.- PCM TELEMETRY - ENVIRONMENTAL CONTROL SYSTEM

MEAS. I.D.	MEAS. DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR ROPTS	O. B. DISPL	SIG DIST	DXS CSM/SH
CF0001P	CABIN PRESS	H2	10A6	0	17	PSIA	ECS	--	25 MA	M	CS	4.2
CF0002T	CABIN TEMP	H2	10A84	+40	+125	DEG F	ECS	--	80 MA	M	CS	4.3
CF0003P	SUIT-CABIN DELTA PRESS	H1	11A37	0	5	IN H2O	V2	--	10 MA	SM	CS	4.2
CF0005P	CO2 PARTIAL PRESS	H2	10A3	0	30	MM HG	ECS	--	40 MA	M*	CS	4.2
CF0006P	SURGE TANK PRESS	H1	10A2	50	1050	PSIA	V2	--	56 MA	SM	CS	4.2
CF0008T	SUIT AIR HX OUT TEMP	H2	10A45	+20	+95	DEG F	ECS	--	356 MA	M	CS	4.2
CF0009Q	WASTE H2O QTY	H2	10A9	0	100	PCT	ECS	--	40 MA	SM	CS	4.5
CF0010Q	POTABLE H2O QTY	H2	10A81	0	100	PCT	ECS	--	40 MA	SM	CS	4.5
CF0012P	SUIT MANF ABS PRESS	H2	11A1	0	17	PSIA	ECS	--	25 MA	M	CS	4.2
CF0015P	SUIT COMP DELTA P	H2	11A2	0	1	PSID	ECS	--	40 MA	M*	CS	4.2
CF0016P	PRI GLY PUMP OUT PRESS	H2	11A3	0	60	PSIG	ECS	--	25 MA	SM	CS	4.3
CF0017T	GLY EVAP OUT STEAM TEMP	H1	10A133	+20	+95	DEG F	ECS	--	CF0008T	--	--	4.3
CF0018T	GLY EVAP OUT TEMP	H2	10A12	+25	+75	DEG F	ECS	--	CF0008T	SM	CS	4.3
CF0019Q	GLY ACCUM QTY	H1	10A134	0	100	PCT	ECS	--	25 MA	SM	CS	4.3
CF0020T	ECS RAD OUT TEMP	H2	10A15	-50	+100	DEG F	E65	--	CF0008T	M*	CS	4.3
CF0034P	GLY EVAP BACK PRESS	H1	10A4	0.05	0.25	PSIA	ECS	--	40 MA	SM	CS	4.3
CF0035R	ECS O2 FLOW O2 SUPPLY MANF	H2	11A4	0.2	1.0	LB/HR	ECS	--	120 MA	M*	CS	4.2
CF0036P	O2 SUPPLY MANF PRESS	H1	11A14	0	150	PSIG	ECS	--	25 MA	--	--	4.2
CF0070P	SEC GLY PUMP OUT PRESS	H1	11A86	0	60	PSIG	ECS	--	25 MA	SM	CS	4.4
CF0071T	SEC EVAP OUT LIQ TEMP	H1	10A25	+25	+75	DEG F	ECS	--	CF0008T	SM	CS	4.4
CF0072Q	SEC GLY ACCUM QUANTITY	H1	10A64	0	100	PCT	ECS	--	25 MA	SM	CS	4.4
CF0073P	SEC EVAP OUT STEAM PRESS	H1	10A8	0	0.3	PSIA	ECS	--	40 MA	SM	CS	4.4
CF0157R	PRI GLYCOL FLOW RATE	H1	11A87	+150	+500	LB/HP	V2	--	10 MA	--	--	4.3
CF0162T	COLDPLATE NETWORK OUT T	H1	10A86	+50	+150	DEG F	V8	--	31 MA	--	--	4.3
CF0163T	CABIN AIR HX OUTLET T	H1	10A95	+40	+125	DEG F	V8	--	31 MA	--	--	4.3
CF0181T	PRI EVAP INLET TEMP	H1	10A100	+35	+100	DEG F	V2	--	56 MA	--	--	4.3
CF0184T	SUIT AIR HX INLET TEMP	H1	10A88	+90	+200	DEG F	V8	--	31 MA	--	--	4.2
CF0245T	O2 REG INLET TEMP	H1	10A89	-50	+150	DEG F	V8	--	31 MA	--	--	4.2

FEC/TSS - 94 (NOV. 57)

CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-V.- PCM TELEMETRY - ENVIRONMENTAL CONTROL SYSTEM - CONCLUDED

MEAS I.D.	MEAS DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RCMTS	O. B. DISPL	SIG DIST	DWG CS/SH
SF0260T	PRI RAD IN TEMP	H2	10A48	+55	+120	DEG F	ECS	--	25 MA	SM	CS	4.3
SF0262T	SEC RAD IN TEMP	H2	10A87	+55	+120	DEG F	ECS	--	25 MA	SM	CS	4.4
SF0263T	SEC RAD OUT TEMP	H2	10A90	+30	+70	DEG F	ECS	--	25 MA	M	CS	4.4
SF0266X	RAD FLOW CONT SYS 1 OR 2	E2	11E4-8	PRI	SEC	EVENT	V5C	AA	--	TB	TSC	4.3
CF0411T	SUIT HX GLY OUT TEMP	H1	10A92	+35	+100	DEG F	V8	--	31 MA	--	--	4.2, 4.3
CF0460T	H <sub>2</sub> O DUMP TEMP	H2	10A114	0	100	DEG F	V2	--	56 MA	--	--	4.5
CF0545T	INVERTER GLY IN TEMP	H1	10A94	+50	+150	DEG F	V8	--	31 MA	--	--	4.3
SF0815T	RAD PNL 2-3 OUT TEMP	H1	10A97	-60	+100	DEG F	V8S	--	31 MA	--	--	4.3
SF0816T	RAD PNL 5-6 OUT TEMP	H1	10A98	-60	+100	DEG F	V8S	--	31 MA	--	--	4.3

87

48

CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-VI.- PCM TELEMETRY - GUIDANCE AND NAVIGATION SYSTEM

MEAS. I.D.	MEAS. DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RQMTS	C. B. DISPL	SIG DIST	DWG CSMST
CG0001V	CPTR DIG DATA - 40 BITS	S2	51DS1				--	--	--	--	--	8.2
CG1040V	PIPA +120 VDC	H1	10A83	+85	+135	VDC	G8N	--	--	--	--	8.2, 8.5
CG1110V	TM BIAS 2.5 VDC	H2	10A138	0	5	VDC	G8N	--	--	--	--	8.2
CG1201V	IMU 28 VAC 800HZ	H1	10A91	0	31.1	VRMS	G8N	--	--	--	--	8.2
CG1211V	OPTX 28 VAC 800HZ	H1	10A146	0	31.1	VRMS	G8N	--	--	--	--	8.2
CG1331V	3.2 KHZ 28V SUPPLY	H1	10A85	0	31.1	VRMS	G8N	--	--	--	--	8.2, 8.5
CG1513X	IMU HTR +28VDC	E2	11E15-2	OFF	STBY	EVENT	G8N	--	--	--	--	8.2, 8.5
CG1523X	CMC OPERATE +28VDC	E2	11E15-3	OFF	OPR	EVENT	G8N	--	--	--	--	8.2
CG1533X	OPTX OPERATE 28VAC	E2	11E15-4	OFF	OPR	EVENT	G8N	--	--	--	--	8.2
CG2112V	IG 1X RSVR OUT SIN	H1	11A54	-50/+230	+50/+130	DEG	G8N	--	--	--	--	8.2, 8.5
CG2113V	IG 1X RSVR OUT COS	H1	11A59	+130/+230	+50/+310	DEG	G8N	--	--	--	--	8.2, 8.5
CG2117V	IGA SERVO ERR IN PHASE	H1	12A2	-2.5	+2.5	MRAD	G8N	--	--	--	--	8.2, 8.5
CG2142V	MG 1X RSVR OUT SIN	H1	11A60	-50/+230	+50/+130	DEG	G8N	--	--	--	--	8.2, 8.5
CG2143V	MG 1X RSVR OUT COS	H1	11A61	+130/+230	+50/+310	DEG	G8N	--	--	--	--	8.2, 8.5
CG2147V	MGA SERVO ERR IN PHASE	H1	12A1	-2.5	+2.5	MRAD	G8N	--	--	--	--	8.2, 8.5
CG2172V	OG 1X RSVR OUT SIN	H1	11A62	-50/+230	+50/+130	DEG	G8N	--	--	--	--	8.2, 8.5
CG2173V	OG 1X RSVR OUT COS	H1	11A63	+130/+230	+50/+310	DEG	G8N	--	--	--	--	8.2, 8.5
CG2177V	OGA SERVO ERR IN PHASE	H1	12A3	-2.5	+2.5	MRAD	G8N	--	--	--	--	8.2, 8.5
CG2219V	PITCH ATT ERR CDU DAC OUT	H1	11A64	-16.8	+16.8	DEG	G8N	--	--	--	--	8.2, 8.5
CG2249V	YAW ATT ERR CDU DAC OUT	H1	11A65	-16.8	+16.8	DEG	G8N	--	--	--	--	8.2, 8.5
CG2279V	ROLL ATT ERR CDU DAC OUT	H1	11A16	-16.8	+16.8	DEG	G8N	--	--	--	--	8.2, 8.5
CG2300T	PIPA TEMP	H2	10A96	+120	+140	DEG F	G8N	--	--	--	--	8.2, 8.5
CG2301T	IRIG TEMP	H1	10A1	+123	+143	DEG F	G8N	--	--	--	--	8.2, 8.5
CG2302X	IMU HEATER CUR	H1	10A5	ON	OFF	EVENT	G8N	--	--	--	--	8.2, 8.5
CG2303X	IMU BLOWER CUR	H1	10A7	ON	OFF	EVENT	G8N	--	--	--	--	8.2, 8.5

FEC/TSG - 94 (NOV. 67)



CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-VI.- PCM TELEMETRY - GUIDANCE AND NAVIGATION SYSTEM - CONCLUDED

MEAS I.D.	MEAS DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RQMTS	O. B. DISPL	SIG DIST	DWG CSM SH
CG3011V	TRUNNION CDU FINE ERR	H1	11A171	-1.2	+1.2	VRMS	G8N	--	--	--	--	8.2, 8.6
CG3021V	SHAFT CDU FINE ERR	H1	11A180	-8.3	+8.3	ARC-MIN	G8N	--	--	--	--	8.2, 8.6
CG3140V	SXT SHAFT TACH OUT	H1	11A172	-500	+500	RPM	G8N	--	--	--	--	8.2
CG3150V	SXT TRUNNION TACH OUT	H1	11A173	-500	+500	RPM	G8N	--	--	--	--	8.2
CG3160V	SCT SHAFT TACH OUT	H1	10A13	-5000	+5000	RPM	G8N	--	--	--	--	8.2
CG3170V	SCT TRUNNION TACH OUT	H1	10A14	-5000	+5000	RPM	G8N	--	--	--	--	8.2
CG3721V	SHAFT CDU DAC OUT	H1	11A52	-10	+10	VRMS	G8N	--	--	--	--	8.2, 8.6, 8.9
CG3722V	TRUNNION CDU DAC OUT	H1	11A53	-10	+10	VRMS	G8N	--	--	--	--	8.2, 8.6, 8.9
CG5040X	OMC WARNING	E2	11E19-1	WARN		EVENT	G8N	--	--	L:	--	8.2

90

CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-VII.- PCM TELEMETRY - STABILIZATION AND CONTROL SYSTEM

MEAS. I.D.	MEAS DESCRIPTION	TM	CHAN CODE	LOW	HIGH	UNITS	INST BUS	SIG COND	PWR RCPTS	O. 3. DISPL	SIG DIST	ENG CSM/SH
CH3500H	PITCH ATT ERR	H1	51A5	-5/5/15	+5/5/15	DEG	S&C	--	--	M	CS	8.3,8.8
CH3501H	YAW ATT ERR	H1	51A6	-5/5/15	5/5/15	DEG	S&C	--	--	M	CS	8.3,8.8
CH3502H	ROLL ATT ERR	H1	12A4	-5/5/50	5/5/50	DEG	S&C	--	--	M	CS	8.3,8.8
CH3503R	SCS PITCH BODY RATE	H1	12A5	-1/5/10	1/5/10	DEG/S	S&C	--	--	M	CS	8.3,8.8
CH3504R	SCS YAW BODY RATE	H1	12A6	-1/5/10	1/5/10	DEG/S	S&C	--	--	M	CS	8.3,8.8
CH3505R	SCS ROLL BODY RATE	H1	12A7	-1/5/50	1/5/50	DEG/S	S&C	--	--	M	CS	8.3,8.8
CH3517H	PITCH GMBL POS 1 OR 2	H1	12A8	-5.0	+5.0	DEG	S&C	--	--	SM	CS	8.3,8.9
CH3518H	YAW GMBL POS 1 OR 2	H1	12A10	-5.0	+5.0	DEG	S&C	--	--	SM	CS	8.3,8.9
CH3546X	+PITCH/+X JET	E1	22E1-1	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3547X	-PITCH/+X JET	E1	22E2-2	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3548X	+PITCH/-X JET	E1	22E3-3	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3549X	-PITCH/-X JET	E1	22E4-4	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3550X	+YAW/+X JET	E1	22E5-5	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3551X	-YAW/+X JET	E1	22E6-6	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3552X	+YAW/-X JET	E1	22E7-7	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3553X	-YAW/-X JET	E1	22E8-8	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3554X	+ROLL/+Z JET	E1	22E9-1	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3555X	-ROLL/+Z JET	E1	22E13-5	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3556X	+ROLL/-Z JET	E1	22E14-6	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3557X	-ROLL/-Z JET	E1	22E10-2	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3558X	+ROLL/+Y JET	E1	22E15-7	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3559X	-ROLL/+Y JET	E1	22E11-3	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3560X	+ROLL/-Y JET	E1	22E12-4	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3561X	-ROLL/-Y JET	E1	22E16-8	FIRE/OFF	ARM	EVENT	S&C	--	--	--	--	8.3,8.10
CH3588X	ATT DEADBAND MIN	E2	11E8-2	MAX	MIN	EVENT	S&C	--	--	--	--	8.3,8.9
CH3590X	HI RATE LIMIT	E2	11E8-4	LOW	HIGH	EVENT	S&C	--	--	--	--	8.3,8.9
CH3592X	FDAI ERR 5 RATE 5	E2	11E8-5	OFF	ON	EVENT	S&C	--	--	--	--	8.3
CH3593X	FDAI SCALE ERR 50/15	E2	11E8-6	OFF	ON	EVENT	S&C	--	--	--	--	8.3

P-1

R-A

126 A

91

CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-VII.- PCM TELEMETRY - STABILIZATION AND CONTROL SYSTEM - CONCLUDED

MEAS I.D.	MEAS DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RQMTS	O. B. DISPL	SIG DIST	DMG CSM/SH
CH3604X	SPS SOL DRIVER 1	E2	11E4-4	FIRE/OFF	ARM	EVENT	S6C	--	--	--	--	8.3,8.9
CH3605X	SPS SOL DRIVER 2	E2	11E9-4	FIRE/OFF	ARM	EVENT	S6C	--	--	--	--	8.3,8.9
CH3607X	S/C CNTL SCS	E2	11E9-5	CMC	SCS	EVENT	S6C	--	--	--	--	8.3,8.9
CH3623X	GYRO 1 COMB SMRD	E2	11E8-7	LOW	NORM	EVENT	S6C	--	--	--	--	8.3,8.9
CH3624X	GYRO 2 COMB SMRD	E2	11E8-8	LOW	NORM	EVENT	S6C	--	--	--	--	8.3,8.9
CH3635X	BMAG MODE SW-ROLL ATT 1 RT 2	E1	11E33-1	OFF	ON	EVENT	V5C	AA	--	--	--	8.3,8.9
CH3636X	BMAG MODE SW-ROLL RATE 2	E1	11E33-2	OFF	ON	EVENT	V5C	AA	--	--	--	8.3,8.9
CH3638X	BMAG MODE SW-PITCH ATT 1 RT 2	E1	11E33-3	OFF	ON	EVENT	V5C	AA	--	--	--	8.3,8.9
CH3639X	BMAG MODE SW-PITCH RATE 2	E1	11E33-4	OFF	ON	EVENT	V5C	AA	--	--	--	8.3,8.9
CH3641X	BMAG MODE SW-YAW ATT 1 RT 2	E1	11E33-5	OFF	ON	EVENT	V5C	AA	--	--	--	8.3,8.9
CH3642X	BMAG MODE SW-YAW RATE 2	E1	11E33-6	OFF	ON	EVENT	V5C	AA	--	--	--	8.3,8.9

P-1

TABLE 7-VIII.- PCM TELEMETRY - LIFE SYSTEM

MEAS. I.D.	MEAS. DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST. BUS	SIG COND	PWR RQMTS	O. B. DISPL	SIG DIST	DWG CSM SH
CJ0060J	ASTRO 1 EKG AXIS 1	H1	22A3	0.1	5	MV	V2	--	150 MA	--	--	R-A
CJ0061J	ASTRO 2 EKG AXIS 1	H1	22A3	0.1	5	MV	V2	--	CJ0060	--	--	
CJ0062J	ASTRO 3 EKG AXIS 1	H1	22A3	0.1	5	MV	V2	--	CJ0060	--	--	
CJ0200R	ASTRO 1 RESPIR	H1	12A13	-5	+5	OHMS	V2	--	CJ0060	--	--	P-1
CJ0201R	ASTRO 2 RESPIR	H1	12A13	-5	+5	OHMS	V2	--	CJ0060	--	--	
CJ0202R	ASTRO 3 RESPIR	H1	12A13	-5	+5	OHMS	V2	--	CJ0060	--	--	
CJ0210X	ASTRO 1 SEL SW POS	E2	11E14-6	OFF	LH	EVENT	V2	--	6 MA	--	--	R-A
CJ0211X	ASTRO 2 SEL SW POS	E2	11E14-7	OFF	CTR	EVENT	V2	--	6 MA	--	--	
CJ0212X	ASTRO 3 SEL SW POS	E2	11E14-8	OFF	RH	EVENT	V2	--	6 MA	--	--	

92

TABLE 7-1X.- PCM TELEMETRY - FLIGHT TECHNOLOGY

MEAS. I.D.	MEAS. DESCRIPTION	TM	CHAN. CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR. RMTS	O. B. DISPL	SIG DIST	DWG CSM/SH
CK0026A	CM X-AXIS ACCEL	H1	12A9	-2	+10	G	V2	--	50 MA	--	--	
CK0027A	CM Y-AXIS ACCEL	H1	12A11	-2	+2	G	V2	--	45 MA	--	--	
CK0028A	CM Z-AXIS ACCEL	H1	12A12	-2	+2	G	V2	--	45 MA	--	--	

R-A

94

CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-X.- PCM TELEMETRY - SCIENTIFIC EQUIPMENT

MEAS. I. D.	MEAS. DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RMTS	O. B. DISPL	SIG DIST	DWG CSM SH
SL1001U	SCI EXP NO. 1	H2	10A108									
SL1002U	SCI EXP NO. 2	H2	10A111									
SL1003U	SCI EXP NO. 3	H1	10A104									
SL1004U	SCI EXP NO. 4	H1	10A106									
SL1005U	SCI EXP NO. 5	H1	10A107									
SL1006U	SCI EXP NO. 6	H1	10A109									
SL1007U	SCI EXP NO. 7	H1	10A110									
SL1008U	SCI EXP NO. 8	H1	10A112									
SL1009U	SCI EXP NO. 9	H1	10A113									
SL1010U	SCI EXP NO. 10	H1	10A115									
SL1011U	SCI EXP NO. 11	H1	10A116									
SL1012U	SCI EXP NO. 12	H1	10A118									
SL1013U	SCI EXP NO. 13	H1	10A119									
SL1014U	SCI EXP NO. 14	H1	10A121									
SL1015U	SCI EXP NO. 15	H1	10A122									
SL1016U	SCI EXP NO. 16	D2	11D16									
SL1017U	SCI EXP NO. 17	D2	11D3									
SL1018U	SCI EXP NO. 18	D2	11D5									
SL1019U	SCI EXP NO. 19	D2	11D6									
SL1020U	SCI EXP NO. 20	D2	11D7									
SL1021U	SCI EXP NO. 21	D2	11D10									
SL1022U	SCI EXP NO. 22	D2	11D11									
SL1023U	SCI EXP NO. 23	D2	11D12									
SL1024U	SCI EXP NO. 24	D2	11D17									
SL1025U	SCI EXP NO. 25	D2	11D18									

R-A

P-1

R-A

FEC/TSG - 94 (NOV. 67)

CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-XI.- PCM TELEMETRY - SERVICE PROPUSSION SYSTEM

MEAS. I.D.	MEAS. DESCRIPTION	TM	CHAIN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PVR RMTS	O. B. DISPL	SIG DIST	DWG CSM#H
SP0001P	HE TK PRESS	H2	11A10	0	5K	PSIA	V3S	--	56 MA	--	--	9.1
SP0002T	HE TK TEMP	H1	10A16	-100	+200	DEG F	V4S	--	56 MA	--	--	9.1
SP0003P	OX TK PRESS	H2	11A11	0	250	PSIA	V3S	--	56 MA	M*	CS	9.1
SP0006P	FU TK PRESS	H2	11A12	0	250	PSIA	V4S	--	56 MA	M*	CS	9.1
SP0022H	FU/OX VLV 1 POS	H1	11A31	0	90	DEG	V3S	--	--	--	--	9.1
SP0023H	FU/OX VLV 2 POS	H1	11A32	0	90	DEG	V4S	--	--	--	--	9.1
SP0024H	FU/OX VLV 3 POS	H1	11A33	0	90	DEG	V3S	--	--	--	--	9.1
SP0025H	FU/OX VLV 4 POS	H1	11A34	0	90	DEG	V4S	--	--	--	--	9.1
SP0045T	SPS VLV BODY TEMP	H1	10A37	0	+200	DEG F	V4S	--	56 MA	--	--	9.1
SP0048T	SPS FU FEED LINE TEMP	H2	10A117	0	+200	DEG F	V3S	--	56 MA	M	CS	9.1
SP0049T	SPS OX FEED LINE TEMP	H2	10A120	0	+200	DEG F	V4S	--	56 MA	SM	CS	9.1
SP0050T	SPS OUT SKIN 1 NOZ TEMP	H1	11A131	-260	+2500	DEG F	V8S	--	56 MA	--	--	9.1
SP0054T	OX LINE 1 TEMP	H1	10A44	0	+200	DEG F	V3S	--	56 MA	--	--	9.1
SP0057T	FU LINE 1 TEMP	H1	10A59	0	+200	DEG F	V4S	--	56 MA	--	--	9.1
SP0061T	SPS INJECTOR FLANGE TEMP 1	H1	10A47	0	+600	DEG F	V5C	DBA	--	L*	CS	9.1
SP0062T	SPS INJECTOR FLANGE TEMP 2	H1	10A49	0	+600	DEG F	V5C	DBA	--	L*	CS	9.1
SP0600P	SPS VLV ACT PRESS PRI	H1	10A10	0	5K	PSIA	V3S	--	56 MA	SM	CS	9.1
SP0601P	SPS VLV ACT PRESS SEC	H1	10A11	0	5K	PSIA	V4S	--	56 MA	SM	CS	9.1
SP0655Q	OX TK 1 QTY-TOTAL AUX	H1	10A26	0	50	PCT	SPS	--	--	--	--	9.2
SP0656Q	OX TK 2 QTY	H1	10A28	0	60	PCT	SPS	--	--	--	--	9.2
SP0657Q	FU TK 1 QTY-TOTAL AUX	H1	10A29	0	50	PCT	SPS	--	--	--	--	9.2
SP0658Q	FU TK 2 QTY	H1	10A31	0	60	PCT	SPS	--	--	--	--	9.2
SP0661P	ENG CHAMBER PRESS.	H1	12A14	0	150	PSIA	V3S	--	56 MA	SM	CS	9.1
SP0930P	FUEL SW/ENG INTERFACE P	H1	11A152	0	300	PSIA	V3S	--	56 MA	--	--	9.1
SP0931P	OX SW/ENG INTERFACE P	H1	11A161	0	300	PSIA	V4S	--	56 MA	--	--	9.1
SP2012T	HE PRESS PNL TEMP	H1	11A132	-100	+200	DEG F	V8S	--	56 MA	--	--	9.1
SP2055T	P GMBL ACT CASE TEMP	H1	11A133	-100	+200	DEG F	V8S	--	56 MA	--	--	9.1
SP2095T	OX LN ENG INT TEMP	H1	11A134	-100	+200	DEG F	V8S	--	56 MA	--	--	9.1
SP2096T	ENG OX FD LN TEMP	H1	11A135	-100	+200	DEG F	V8S	--	56 MA	--	--	9.1

95

141A

98

CSM  
S/C-101  
REV A  
PCN-1

TABLE XII.- PCM TELEMETRY - REACTION CONTROL SYSTEM

MEAS I.D.	MEAS DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RQMTS	O. B. DISPL	SIG DIST	DMG CS/SH
CR0001P	CM HE TK A PRESS	H2	10A18	0	5K	PSIA	V1	--	56 MA	SM	CS	10.2
CR0002P	CM HE TK B PRESS	H2	10A21	0	5K	PSIA	V2	--	56 MA	SM	CS	10.2
CR0003T	CM HE TK A TEMP	H1	10A103	0	300	DEG F	V1	--	56 MA	SM	CS	10.2
CR0004T	CM HE TK B TEMP	H1	10A148	0	300	DEG F	V2	--	56 MA	SM	CS	10.2
CR0005P	CM FU TK A PRESS	H2	11A13	0	400	PSIA	V1	--	56 MA	SM*	CS	10.2
CR0006P	CM FU TK B PRESS	H2	11A21	0	400	PSIA	V2	--	56 MA	SM*	CS	10.2
CR0011P	CM OX TK A PRESS	H2	11A22	0	400	PSIA	V1	--	56 MA	SM*	CS	10.2
CR0012P	CM OX TK B PRESS	H2	11A55	0	400	PSIA	V2	--	56 MA	SM*	CS	10.2
SR5001P	SM HE TK A PRESS	H2	10A24	0	5K	PSIA	V3S	--	56 MA	SM	CS	10.1
SR5002P	SM HE TK B PRESS	H2	10A27	0	5K	PSIA	V4S	--	56 MA	SM	CS	10.1
SR5003P	SM HE TK C PRESS	H2	10A30	0	5K	PSIA	V3S	--	56 MA	SM	CS	10.1
SR5004P	SM HE TK D PRESS	H2	10A33	0	5K	PSIA	V4S	--	56 MA	SM	CS	10.1
SR5013T	SM HE TK A TEMP	H2	11A163	0	+100	DEG F	V3S	--	56 MA	--	--	10.1
SR5014T	SM HE TK B TEMP	H2	11A164	0	+100	DEG F	V4S	--	56 MA	--	--	10.1
SR5015T	SM HE TK C TEMP	H2	11A165	0	+100	DEG F	V3S	--	56 MA	--	--	10.1
SR5016T	SM HE TK D TEMP	H2	11A166	0	+100	DEG F	V4S	--	56 MA	--	--	10.1
SR5025Q	SM HE PRESS/TEMP RATIO A	H2	10A93	0	100	PCT	V3S	--	56 MA	SM	CS	10.1
SR5026Q	SM HE PRESS/TEMP RATIO B	H2	10A99	0	100	PCT	V4S	--	56 MA	SM	CS	10.1
SR5027Q	SM HE PRESS/TEMP RATIO C	H2	10A102	0	100	PCT	V3S	--	56 MA	SM	CS	10.1
SR5028Q	SM HE PRESS/TEMP RATIO D	H2	10A105	0	100	PCT	V4S	--	56 MA	SM	CS	10.1
SR5065T	SM ENG PACKAGE A TEMP	H1	10A136	0	+300	DEG F	V3S	--	56 MA	SM*	CS	10.1
SR5066T	SM ENG PACKAGE B TEMP	H1	10A17	0	+300	DEG F	V4S	--	56 MA	SM*	CS	10.1
SR5067T	SM ENG PACKAGE C TEMP	H1	10A19	0	+300	DEG F	V3S	--	56 MA	SM*	CS	10.1
SR5068T	SM ENG PACKAGE D TEMP	H1	10A20	0	+300	DEG F	V4S	--	56 MA	SM*	CS	10.1
SR5729P	SM HE MANF A PRESS	H2	11A39	0	400	PSIA	V3S	--	56 MA	SM*	CS	10.1
SR5733P	SM OX MANF A PRESS	H2	11A91	0	300	PSIA	V3S	--	56 MA	--	--	10.1
SR5737P	SM FU MANF A PRESS	H2	11A92	0	300	PSIA	V3S	--	56 MA	--	--	10.1

P-1

R-A

P-1



CSM  
S7C-101  
REV A  
PCN-1

TABLE XII.- PCM TELEMETRY - REACTION CONTROL SYSTEM - CONCLUDED

MEAS. I. D.	MEAS. DESCRIPTION	TM	CHAN. CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RQMTS	O. B. DISPL	SIG DIST	DWG CSM SH
SR5776P	SM HE MANF B PRESS	H2	11A40	0	400	PSIA	V4S	--	56 MA	SM*	CS	10.1
SR5780P	SM OX MANF B PRESS	H2	11A93	0	300	PSIA	V4S	--	56 MA	--	--	10.1
SR5784P	SM FU MANF B PRESS	H2	11A94	0	300	PSIA	V4S	--	56 MA	--	--	10.1
SR5817P	SM HE MANF C PRESS	H2	11A46	0	400	PSIA	V3S	--	56 MA	SM*	CS	10.1
SR5820P	SM OX MANF C PRESS	H2	11A109	0	300	PSIA	V3S	--	56 MA	--	--	10.1
SR5821P	SM OX MANF D PRESS	H2	11A110	0	300	PSIA	V4S	--	56 MA	--	--	10.1
SR5822P	SM FU MANF C PRESS	H2	11A111	0	300	PSIA	V3S	--	56 MA	--	--	10.1
SR5823P	SM FU MANF D PRESS	H2	11A112	0	300	PSIA	V4S	--	56 MA	--	--	10.1
SR5830P	SM HE MANF D PRESS	H2	11A130	0	400	PSIA	V4S	--	56 MA	SM*	CS	10.1

P-1

98

CSM  
S/C-101  
REV A  
PCN-1

TABLE 7-X1111.- PCM TELEMETRY - CREW SAFETY SYSTEM

MEAS I.D.	MEAS DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RQMTS	G. B. DISPL	SIG DIST	DWG CSM SH
B50080X	SM EDS ABORT REQUEST A	E2	11E4-5	NORM	ABORT	EVENT	V5C	AA	--	L	TSC	2.3, 6.6
B50081X	SM EDS ABORT REQUEST B	E2	11E4-3	NORM	ABORT	EVENT	V5C	AA	--	L	TSC	2.3, 6.6
CS0100X	CM/SM SEP A	E2	11E4-2	SEP/OFF	NO SEP	EVENT	V2 & V5C	AA	100 MA	--	--	2.4
SS0140X	SLA/SM SEP A	E2	11E4-7	SEP/OFF	NO SEP	EVENT	V3S & V5C	AA	100 MA	--	--	2.4
CS0150X	MASTER CAUTION WARNING ON	E2	11E4-6	WARN/OFF	NORM	EVENT	V5C	AA	--	L*	TSC	7.3
LS0200H	ANGLE OF ATTACK	H1	11A51	0	+5	VDC	EDS	--	--	SM	CS	

P-1  
R-A  
P-1  
R-A

144

CSM  
S7C-101  
REV A  
PCN-1

TABLE 7-XIV.- PCM TELEMETRY - COMMUNICATION AND INSTRUMENTATION

MEAS. I.D.	MEAS. DESCRIPTION	TM	CHAN CODE	LOW	DATA RANGE HIGH	UNITS	INST BUS	SIG COND	PWR RMTS	O. B. DISPL	SIG DIST	DWG CSMSE
CT0012X	DSE TAPE MOTION	E2	11E14-5		MOTION	EVENT	DSE	--	--	--	--	7.1
CT0015V	SCE POS SUPPLY VOLTS	H2	11A148	0	+30	VDC	SCE	--	--	--	--	7.1
CT0016V	SCE NEG SUPPLY VOLTS	H2	11A154	0	-30	VDC	SCE	--	--	--	--	7.1
CT0017V	SENSOR EXCITATION 5 VOLTS	H2	11A119	0	+9	VDC	SCE	--	--	--	--	7.1
CT0018V	SENSOR EXCITATION 10 VOLTS	H2	11A120	0	+15	VDC	SCE	--	--	--	--	7.1
CT0120X	PCM BIT RATE CHANGE 8-BIT	D2	--				PCM	--	--	--	--	7.1
CT0125V	PCM HI LEVEL 85 PCT REF	H2	11A48	0	+5	VDC	PCM	--	--	--	--	7.1
CT0126V	PCM HI LEVEL 15 PCT REF	H2	11A49	0	+1.0	VDC	PCM	--	--	--	--	7.1
CT0145F	CTE TIME FROM LAUNCH 32-BIT	D2	11D2				CTE	--	--	--	--	7.1
CT0262V	UDL VALIDITY SIG 4-BIT	D2	51D				UDL	--	--	--	--	6.5
CT0340X	PCM SYNC SOURCE EXT OR INT	E1	11E32-8	INT	EXT	EVENT	PCM	--	--	--	--	7.1
CT0620E	USB RCVR AGC VOLTAGE	H2	11A121	-130	-50	DBM	S-BND	--	--	M	SS	6.2
CT0640F	USB RCVR PHASE ERR	H1	11A50	-90K	+90K	HZ	S-BND	--	--	--	--	6.2

R-A

P-1

R-A

P-1

F-A

99

145<

Page intentionally left blank

**Page intentionally left blank**

Page intentionally left blank

Page intentionally left blank

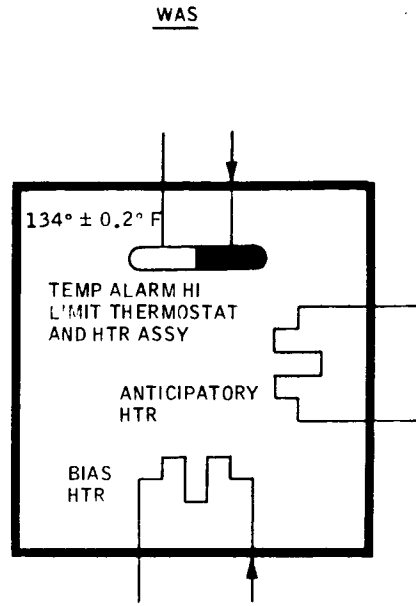
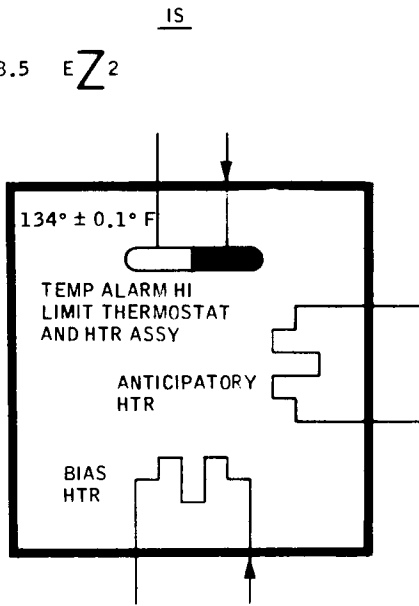
Page intentionally left blank



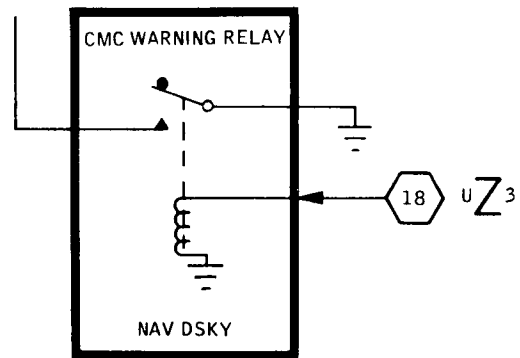
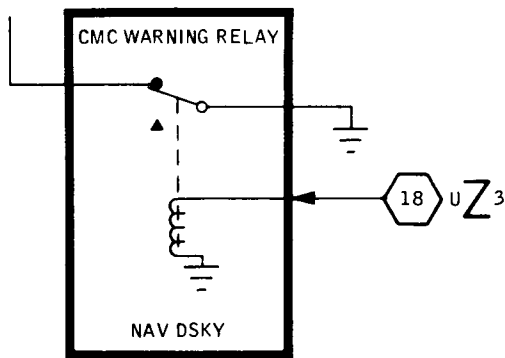
Page intentionally left blank

SECTION 8

3. DWG 8.5 EZ<sup>2</sup>



4. DWG 8.5 JZ<sup>1</sup>

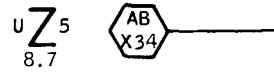
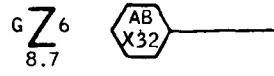
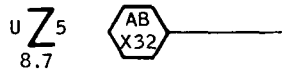
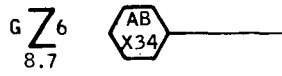


REV A, PCN-2

Page intentionally left blank

Page intentionally left blank

1. DWG 8.8A J Z<sup>IS</sup><sub>5</sub>



Page intentionally left blank

Page intentionally left blank

Page intentionally left blank



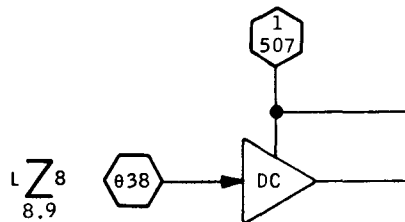
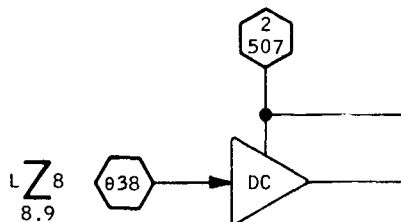
SECTION 8

CSM  
S/C-101  
REV A, PCN 2

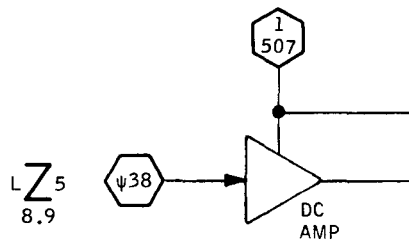
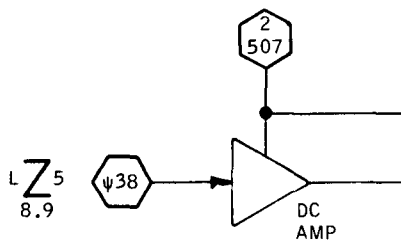
WAS

IS

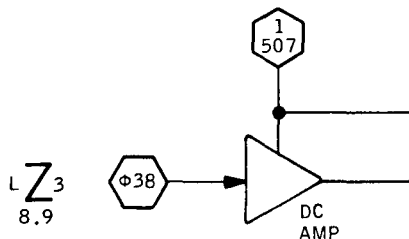
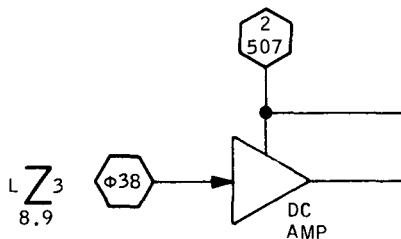
1. DWG 8.10 QZ 6



2. DWG 8.10 QZ 5



3. DWG 8.10 QZ 2



Page intentionally left blank

## SCS SIGNAL AND POWER CODE

REV A

(REF DWG 8.3 ZONE B/6)

<u>CODE</u>	<u>TYPE OF POWER</u>	<u>CODE</u>	<u>TYPE OF POWER</u>
01	27.5 VDC	34	SCS LOGIC BUS 4
02	+20 VDC	35	-4 VDC
03	10 VAC	36	TRANSLATION CONTROL
04	2.2 KHz		CLOCKWISE
05	25 VAC	37	SCS CONTROL MODE
06	+15 VDC	38	RCS ERROR
07	+14.5 VDC	39	GA1 AC RATE OR
08	400 Hz SPIN MOTOR POWER		ATTITUDE ERROR
09	26 VAC 400 Hz REFERENCE	40	GA2 AC RATE
10	14 VDC	41	DC RATE
11	13 VDC	42	ENGINE ON WITH 1
12	-15 VDC		SECOND DELAYED OFF
13	+20 VDC	43	ENGINE ON/OFF 1 SECOND
14	+32 VDC		DELAY
15	28 VDC	44	MODE SELECTED SCS
M	400 Hz 26 V BUS 1 SWITCH 3 OR	45	PITCH GYRO UNCAGE
	800 Hz 0 PHASE IMU	46	YAW GYRO UNCAGE
N	400 Hz 26 VAC BUS 2 SWITCH 3	47	ROLL GYRO UNCAGE
	OR 800 Hz 0 PHASE IMU	48	SIG COND POWER +15.0,
P	400 Hz 26 VAC BUS 2 SWITCH 3		-2.5 AND -10 VDC
	OR 400 Hz 26 VAC BUS 1 SWITCH	49	115 V 400 Hz PHASE A
	6 OR 800 Hz 0 PHASE IMU	50	MODE SELECTED CMC
16	+X TRANSLATION	51	PITCH AUTO CNTL DISABLE
17	-X TRANSLATION	52	YAW AUTO CNTL DISABLE
18	+Y TRANSLATION	53	ROLL AUTO CNTL DISABLE
19	-Y TRANSLATION	54	PITCH ACCEL CMD ENABLE
20	+Z TRANSLATION	55	YAW ACCEL CMD ENABLE
21	-Z TRANSLATION	56	ROLL ACCEL CMD ENABLE
22	PITCH RATE COMMAND	57	DIRECT ULLAGE PITCH JETS
23	YAW RATE COMMAND	58	DIRECT ULLAGE YAW JETS
24	ROLL RATE COMMAND	59	.05g OFF
25	PITCH MIN IMP	60	GDC EULER
26	YAW MIN IMP	61	.05g ON
27	ROLL MIN IMP	R	400/800 CPS OUT PHASE
28	PITCH DIRECT		FDAI #1 RESOLVER SIG DEMOD
29	YAW DIRECT	S	400/800 CPS OUT PHASE
30	ROLL DIRECT		FDAI #2 RESOLVER SIG DEMOD
31	SCS LOGIC BUS 1	T	FDAI 1 & 2 PYR RATE DEMOD
32	SCS LOGIC BUS 2		REF VOLTAGE
33	SCS LOGIC BUS 3	62	115 V 400 Hz

S/C 101 CMC INPUT/OUTPUT CHANNELS ON TELEMETRY

BITS	OUTPUT				INPUT			
	CHANNEL							
	11 WD91a	12 WD91b	13 WD92a	14 WD92b	30 WD93a	31 WD93b	32 WD94a	33 WD94b
1	ISS WARN	OCDU ZERO	X	X	S4 ULLAGE	+P RHC	+P MIC	X
2	COMP ACTV	OPT EC EN	X	X	RCS XFER	-P RHC	-P MIC	X
3	UPL ACTV	X	X	X	SPS READY	+Y RHC	+Y MIC	X
4	TEMP CAUT	COAR ALGN	X	X	S4 SP/ABT	-Y RHC	-Y MIC	X
5	KEY REL	ICDU ZERO	X	X	CMC L/O	+R RHC	+R MIC	X
6	FLASH	IMU EC EN	BL INLINK	GY ENABLE	X	-R RHC	-R MIC	X
7	OPR ERR	X	DN WD ORD	GY SEL B*	OCDU FAIL	+X TRANS	X	X
8	X	TVC ENABLE	X	GY SEL A*	X	-X TRANS	X	X
9	TST CONN	IVB TK/EN	X	GY SIGN- *	IMU OPER	+Y TRANS	X	X
10	CAUT REST	ZERO OPT	TST ALARM	GY ACT	SAT TAKO	-Y TRANS	X	UP TM BLK
11	X	DIS O DAC	EN STBY	DR CDU S	IMU CAGE	+Z TRANS	LM ATTACH	UPL FAST
12	X	X	RST T 31A	DR CDU T	ICDU FAIL	-Z TRANS	X	DNL FAST
13	ENG ON	S-IVB INJ	RST T 31B	DR CDU Z	IMU FAIL	FREE/AUTO	X	PIPA FAIL
14	X	S-IVB CO	RST T 32	DR CDU Y	ISS TN ON	HOLD/AUTO	PROCEED	CMC WARN
15	X	EN T6 RUPT	EN T6 RUPT	DR CDU X	IMU TEMP	A/P CONT	X	OSC ALARM

* GYRO SELECT	
AB	GYRO
00	-
01	X
10	Y
11	Z

\*\*

CSM 101 ALARM CODES

CSM 101  
REV A  
NEW PAGE

<u>ALARM CODE (OCTAL)</u>	<u>PROGRAM ALARM IS ON ACTION REQUIRED FOR DISPLAY</u>	<u>DESCRIPTION</u>
110	V05N09E FOR DISPLAY	MARK REJECT WITH NO EFFECT (NO MARK IS REJECTED, EITHER PREVIOUS MARKS HAVE BEEN ACCEPTED OR NONE RECEIVED).
112	V05N09E FOR DISPLAY	MARK REJECT WITH MARK SYSTEM NOT IS USE.
113	V05N09E FOR DISPLAY	PROGRAM INTERRUPT #6 HAS OCCURRED WITH CHANNEL 16 = 0. CHANNEL 16 MONITORS MARK, MARK REJECT AND NAV DSKY KEYBOARD.
114	V05N09E FOR DISPLAY	OPTICS MARK RECEIVED WITH ALL REQUESTED MARKS ALREADY PROCESSED.
115	V05N09E FOR DISPLAY	OPTICS MODE SWITCH NOT IN COMPUTER POSITION WITH OPTICS DRIVE REQUEST MADE (V41N91E).
116	V05N09E FOR DISPLAY	OPTICS MODE SWITCH MOVED FROM ZERO BEFORE MINIMUM TIME EXPIRES (16.2 SEC).
117	V05N09E FOR DISPLAY	OPTICS NOT AVAILABLE FOR DRIVING WHEN DRIVE REQUEST RECEIVED (V41N91E).
120	V05N09E FOR DISPLAY	OPTICS DRIVE REQUEST (V41N91E) WITH OPTICS NOT PREVIOUSLY ZEROED.
121	V05N09E FOR DISPLAY	IMU CDU CHANGE EXCESSIVE AFTER A MARK.
122	V05N09E FOR DISPLAY	OPTICS MARK RECEIVED WITH MARK SYSTEM NOT IN USE.
205	V05N09E FOR DISPLAY	ACCELEROMETER SATURATED DURING SERVICER ROUTINE MONITOR (6400 PULSES IN 2 SEC).
206	V05N09E FOR DISPLAY	REQUEST FOR IMU CDU ZERO REJECTED SINCE IMU IN COARSE ALIGN DUE TO GIMBAL LOCK.
207	V05N09E FOR DISPLAY	ISS TURN ON REQUEST NOT PRESENT FOR THE REQUIRED 90 SEC PERIOD.
210	V05N09E FOR DISPLAY	IMU NOT OPERATING WHEN IMU CDU ZEROING REQUEST IS RECEIVED.
211	V05N09E FOR DISPLAY	EXCESSIVE ANGLE ERROR BETWEEN DESIRED AND ACTUAL CDU AFTER COARSE ALIGN COMPLETED.
212	V05N09E FOR DISPLAY	PIPA FAIL HAS OCCURRED WITH PIPA'S NOT IN USE.
213	V05N09E FOR DISPLAY	ISS TURN ON REQUESTED WITH IMU OPERATE SIGNAL NOT PRESENT.
214	V05N09E FOR DISPLAY	PROGRAM IS USING THE IMU WHEN THE IMU IS OFF.

::

CSM 101 ALARM CODES - CONTINUED

<u>ALARM CODE (GCTAL)</u>	<u>PROGRAM ALARM IS ON ACTION REQUIRED FOR DISPLAY</u>	<u>DESCRIPTION</u>
215	AUTO DISPLAY V05N09 FLASHING	PREFERRED IMU ORIENTATION SELECTED BUT NOT AVAILABLE.
217	V05N09E FOR DISPLAY	ERROR RETURN FROM ROUTINE GENERALLY "IMUSTALL".
401	V05N09E FOR DISPLAY	COMPUTED MIDDLE GIMBAL ANGLE EXCEEDS 60° OR DESIRED FINAL MIDDLE GIMBAL ANGLE EXCEEDS 59.5° FOR AN ATTITUDE MANEUVER.
404	AUTO DISPLAY V05N09 FLASHING	PRIORITY ALARM. NOT TRACKING LM AND TARGET IS OUTSIDE THE FIELD OF VIEW.
405	AUTO DISPLAY V05N09 FLASHING	TWO STARS ARE NOT AVAILABLE.
406	V05N09E FOR DISPLAY	START OF REND TRACK PROCEDURE (V57E) REJECTED SINCE P20 NOT RUNNING AND/OR FW1 BIT 5 = 0.
407	V05N09E FOR DISPLAY	TARGET OUT OF FIELD OF VIEW SO NO OPTICS TRUNNION DRIVE IS DONE. NOT GENERATED IF ALARM 404 EXISTS.
421	V05N09E FOR DISPLAY	OVERFLOW IN THE ORBITAL INTEGRATION PACKAGE HAS OCCURRED.
607	AUTO DISPLAY V05N09 FLASHING	ERROR RETURN FROM LAMBERT ROUTINE (SATISFACTORY CONVERGENCE NOT ACHIEVED).
607	V05N09E FOR DISPLAY	ERROR RETURN FROM LAMBERT ROUTINE PROGRAMS TRANSFERS TO P00.
611	AUTO DISPLAY V05N09 FLASHING	NO Tig FOR GIVEN ELEVATION ANGLE.
700	V05N09E FOR DISPLAY	STATE VECTOR UPDATE CHANGE EXCEEDS MAXIMUM.
1102	V05N09E FOR DISPLAY	FAILURE IN COMPUTER SELF-CHECK HAS OCCURRED.
1103	RESTART ON V05N09E FOR DISPLAY	ILLEGAL STEP HAS BEEN EXECUTED IN COMPUTER PROGRAM.
1104	RESTART ON V05N09E FOR DISPLAY	TOO MANY JOBS WAITING IN JOB DELAY ROUTINE.
1105	V05N09E FOR DISPLAY	DOWNLINK RATE IS TOO FAST.
1106	V05N09E FOR DISPLAY	UPLINK RATE IS TOO FAST.
1107	V05N09E FOR DISPLAY	RESTART PHASE TABLE ENTRIES DISAGREE.
1110	V05N09E FOR DISPLAY	RESTART WITH NO ACTIVE RESTART GROUPS.

\*\*

CSM 101 ALARM CODES - CONTINUED

<u>ALARM CODE (OCTAL)</u>	<u>PROGRAM ALARM IS ON ACTION REQUIRED FOR DISPLAY</u>	<u>DESCRIPTION</u>
1201	RESTART ON V05N09E FOR DISPLAY	NO VAC AREAS ARE AVAILABLE.
1202	RESTART ON V05N09E FOR DISPLAY	NO JOB REGISTER SETS AVAILABLE.
1203	RESTART ON V05N09E FOR DISPLAY	NEW TASK CANNOT BE SUCCESSFULLY INSERTED INTO WAITLIST.
1206	RESTART ON V05N09E FOR DISPLAY	DISPLAY SYSTEM ADDRESS BUFFERS ARE FULL, HENCE ANOTHER JOB CANNOT BE ACCOMMODATED.
1207	RESTART ON V05N09E FOR DISPLAY	NO VAC AREA AVAILABLE FOR SEXTANT MARKS.
1210	RESTART ON V05N09E FOR DISPLAY	JOB ALREADY WAITING IN A PARTICULAR "STALL" ROUTINE, HENCE ANOTHER JOB CANNOT BE ACCOMMODATED.
1211	RESTART ON V05N09E FOR DISPLAY	OPTICS USE NOT ALLOWED WITH EXTENDED VERB BEING PERFORMED.
1301	RESTART ON V05N09E FOR DISPLAY	ARC COSINE OR ARC SINE ARGUMENT TOO BIG.
1302	RESTART ON V05N09E FOR DISPLAY	SQUARE ROOT ARGUMENT TOO NEGATIVE.
1401	V05N09E FOR DISPLAY	TEST INDEX TOO LARGE IN TEXT PROGRAM (V67).
1402	V05N09E FOR DISPLAY	ILLEGAL QUANTITY LOADED IN JET OR ENGINE TEST PROGRAM (V67).
1403	V05N09E FOR DISPLAY	ILLEGAL QUANTITY LOADED IN SATURN OR SPS STEERING TEST PROGRAM (V67).
1404	V05N09E FOR DISPLAY	ILLEGAL RESPONSE TO REQUEST TO PERFORM CHECKLIST 4018, 4028, 4038 IN TEST PROGRAM (V67).
1405	V05N09E FOR DISPLAY	IMU CDU'S BUSY DURING SATURN STEERING TEST PROGRAM (V67).
1407	V05N09E FOR DISPLAY	Vg'S ARE INCREASING.
1410	V05N09E FOR DISPLAY	THRUST TOO LOW FOR CROSS PRODUCT STEER- ING ( $\Delta V_{NOW}$ MUST BE $\geq .75 \Delta V_{LAST}$ ).
1411	V05N09E FOR DISPLAY	IMPROPER RESULTS FROM GYRO SCALE FACTOR TEST.
1412	V05N09E FOR DISPLAY	BAD DRIVE OF XCDU IN TEST.
1413	V05N09E FOR DISPLAY	BAD DRIVE OF YCDU IN TEST.

\*

CSM 101 ALARM CODES - CONCLUDED

CSM 101  
REV A  
NEW PAGE

<u>ALARM CODE (OCTAL)</u>	<u>PROGRAM ALARM IS ON ACTION REQUIRED FOR DISPLAY</u>	<u>DESCRIPTION</u>
1414	V05N09E FOR DISPLAY	BAD DRIVE OF ZCDU IN TEST.
1426	AUTO DISPLAY V05N09 FLASHING	IMU ORIENTATION UNSATISFACTORY FOR ENTRY (PROGRAM WAITS 10 SEC THEN PROCEEDS).
1427	AUTO DISPLAY V05N09 FLASHING	IMU ORIENTATION REVERSED FOR ENTRY, SO BALL READS 0° IN ROLL FOR LIFT DOWN (PROGRAM WAITS 10 SEC THEN PROCEEDS).
1430	RESTART ON V05N09E FOR DISPLAY	COMPUTED ANGLES YIELD GIMBAL LOCK IN A TEST PROGRAM.
1501	RESTART ON V05N09E FOR DISPLAY	DISPLAY SYSTEM ALARM.
1502	RESTART ON V05N09E FOR DISPLAY	ILLEGAL REQUEST FOR FLASHING DISPLAY.
1520	V05N09E FOR DISPLAY	MAJOR MODE CHANGE (V37) CANNOT BE ACCEPTED.
1600	V05N09E FOR DISPLAY	OVERFLOW DURING COMPUTATION OF GYRO DRIFT HAS OCCURRED (DURING TEST PROGRAM).
1601	V05N09E FOR DISPLAY	ERROR RETURN FROM GYRO TORQUEING, DURING TEST PROGRAM OR DURING PULSE TORQUEING OF AZIMUTH CHANGE (INITIATED BY V78).
1602	V05N09E FOR DISPLAY	ERROR RETURN FROM OPTICS DURING P03.
1703	AUTO DISPLAY V05N09 FLASHING	LESS THAN 45 SEC REMAINING TO IGNITION
1704	V05N09E FOR DISPLAY	GNC AUTO MODE NOT SELECTED DURING REND AND TRACKING PROGRAMS.
1705	V05N09E FOR DISPLAY	RHC IN CONTROL OF CSM-RCS DAP DURING REND AND TRACKING PROGRAMS (FW1 BIT 14 = 1).



::

COAST AND ALIGN

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
1A 1B	COAST AND ALIGN LIST ID SYNC BITS	(00123) <sub>8</sub> INDICATES COAST AND ALIGN LIST BEING XMITTED (77340) <sub>8</sub> INDICATES DATA TO FOLLOW
2A 2B	R <sub>X</sub> X COMPONENT OF VEHICLE POSITION VECTOR	CSM VEHICLE STATE VECTOR AND TIME
3A 3B	R <sub>Y</sub> Y COMPONENT OF VEHICLE POSITION VECTOR	
4A 4B	R <sub>Z</sub> Z COMPONENT OF VEHICLE POSITION VECTOR	
5A 5B	V <sub>X</sub> X COMPONENT OF VEHICLE VELOCITY VECTOR	
6A 6B	V <sub>Y</sub> Y COMPONENT OF VEHICLE VELOCITY VECTOR	
7A 7B	V <sub>Z</sub> Z COMPONENT OF VEHICLE VELOCITY VECTOR	
8A 8B	T <sub>SV</sub> TIME TAG FOR R AND V	
9A	REDOCTR	
9B	THETAD FINAL DESIRED XCDU ANGLE	FINAL DESIRED CDU ANGLES DURING COARSE ALIGN OR ATTITUDE MANEUVERS. PREFERRED ATTITUDE DURING ORBITAL NAVIGATION (P20) AND AUTO OPTICS POSITIONING. INDICATE REORIENTATION ANGLES DURING ENTRY (P62).
10A	THETAD FINAL DESIRED YCDU ANGLE	
10B	THETAD FINAL DESIRED ZCDU ANGLE	
11A 11B	ADOT <sub>X</sub>	MEASURED BODY RATES ABOUT CONTROL AXES ANY TIME RCS DAP IS ON FW6,BIT 15=0, 14=1
12A 12B	ADOT <sub>Y</sub>	
13A 13B	ADOT <sub>Z</sub>	
14A 14B	RSP-RREC	
15A 15B	HAP0	ALTITUDE OF APOGEE (COMPUTED EVERY 2 SEC IN P11 OR ONCE WITH V82E)
16A 16B	HPER	ALTITUDE OF PERIGEE (COMPUTED WITH ALTITUDE OF APOGEE [HAP0])
17A 17B	SPARE	

::

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
18A 18B	MTPER	TIME OF PERIGEE ALTITUDE (COMPUTED WITH ALTITUDE OF PERIGEE)
19A	BESTI	STAR SERIAL NUMBER MULTIPLIED BY 6. IN P51 AND P53 INDICATES FIRST STAR USED. IN P52 AND P54 INDICATES 2ND STAR SELECTED.
19B	BESTJ	STAR SERIAL NUMBER MULTIPLIED BY 6. IN P51 AND P53 INDICATES 2ND STAR USED. IN P52 AND P54 INDICATES 2ND STAR SELECTED.
20A 20B 21A 21B 22A 22B	STARS <sub>AV1</sub> <sub>X</sub> STARS <sub>AV1</sub> <sub>Y</sub> STARS <sub>AV1</sub> <sub>Z</sub>	UNIT STAR VECTOR IN STABLE MEMBER COORDINATES. COORDINATES OF BEST I IN P51 AND P53. COORDINATES OF BEST J IN P52 AND P54. DATA VALID IN P51 THROUGH P54 ONLY.
23A 23B 24A 24B 25A 25B	STARS <sub>AV2</sub> <sub>X</sub> STARS <sub>AV2</sub> <sub>Y</sub> STARS <sub>AV2</sub> <sub>Z</sub>	UNIT STAR VECTOR IN STABLE MEMBER COORDINATES. COORDINATES OF BEST J IN P51 AND P53. COORDINATES OF BEST I IN P52 AND P54. DATA VALID IN P51 THROUGH P54 ONLY.
26A 26B 27A 27B 28A 28B	X <sub>X</sub> X <sub>Y</sub> X <sub>Z</sub>	REFSMMAT
29A 29B 30A 30B 31A 31B	Y <sub>X</sub> Y <sub>Y</sub> Y <sub>Z</sub>	
32A	SPARE	
32B	CADRFLSH	VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED PRIORITY DISPLAY (FW4 BIT 14=1)
33A	CHANTEMP	IF RCS DAP IS ON (FW6 BIT 15=0, BIT 14=1) SET TO -0 (77778) UNTIL MIN IMPULSE CONTROLLER IS USED (CHAN 31 BIT 14=0) THEN = CHAN 32
33B 34A 34B	ERROR <sub>X</sub> ERROR <sub>Y</sub> ERROR <sub>Z</sub>	INTERMEDIATE ATTITUDE ERRORS COMPUTED DURING CSM RCS DAP (DAP FOLLOWING ERRORS). ERRORS IN CONTROL COORDINATES AND ARE LOADED INTO AK'S FOR FDAI NEEDLES WHEN FW0 BIT 9=0 (FRESH START OP. V61E SETS FW0 BIT 9=0).

::

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
35A	OPTMODES	CONTROLS PERFORMANCE OF OPTICS FUNCTIONS  BITS 15-11 - NOT ASSIGNED - SHOULD BE 0 BIT 10=1 - OPTICS HAS BEEN ZEROED SINCE LAST FRESH START OR RESTART. GENERATES ALARM (120) <sub>8</sub> IF OPTICS DRIVE IS ATTEMPTED WITH BIT=0. BIT 9 - SET TO ONE WHEN OPTICS SWITCHED FROM COMPUTER MODE TO SOME OTHER MODE (MANUAL OR ZERO). SET TO ZERO BY FRESH START. BIT 8 - NOT ASSIGNED SHOULD BE 0. BIT 7 - LAST SAMPLED VALUE OF CHANNEL 30 BIT 7 (OPTICS CDU FAIL). GENERATES TRACKER ALARM (DSPTAB 11 BIT 8=1) IF THIS BIT GOES FROM 1 TO 0 PROVIDED BIT 2 OF OPTMODES = 0. SET TO ONE BY FRESH START OR RESTART. BIT 6 - NOT ASSIGNED SHOULD BE 0. BIT 5 - LAST SAMPLED VALUE OF CHANNEL 33 BIT 5 (0 = OPTICS MODE SWITCH IN COMPUTER). BIT 4 - LAST SAMPLED VALUE OF CHANNEL 33 BIT 4 (0 = OPTICS MODE SWITCH IN ZERO) IF BIT 5 AND BIT 4 OF OPTMODES = 1, THE MANUAL MODE IS SELECTED. BIT 3 - SET TO ONE WHEN OPTICS MODE SWITCH SET TO ZERO. REMAINS ONE FOR 16.2 SECONDS (OPTICS ZEROING DELAY). IF MODE SWITCH IS TAKEN OUT OF ZERO DURING 16.2 SECONDS ALARM (116) <sub>8</sub> IS GENERATED. BIT 2 - BIT SET TO ONE TO INHIBIT ANY TRACKER ALARMS DURING OPTICS ZEROING DELAY. BIT 1 = BIT SET TO ONE TO INDICATE OPTICS ZEROING DELAY WILL COMPLETE IN .4 SEC INHIBITS ALARM (116) <sub>8</sub> .
35B	HOLDFLAG	USED TO DETERMINE NATURE OF ATTITUDE HOLD CONTROL IN CSM RCS DAP. IF >+0 PERFORM ATTITUDE HOLD ABOUT ANGLES CONTAINED IN CDU INPUT COUNTERS (PRESENT IMU ANGLES), IF = +0 ATTITUDE HOLD ABOUT EXISTING REFERENCE, IF <+0 AUTOMATIC STEERING TO BE PERFORMED.
36A	CADRFLSH + 1	VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED MARK
36B	CADRFLSH + 2	VALUE OF RETURN ADDRESS INFORMATION FOR LAST NORMAL DISPLAY REQUESTED.
37A	CDUS	OPTICS SHAFT ANGLE, READS SHAFT CDU READ COUNTER
37B	PIPAX	X, Y, AND Z PIPA INPUT COUNTERS. ZEROED AT THE START OF AVEG AND EVERY 2 SEC DURING AVEG.
38A	PIPAY	
38B	PIPAZ	
39A	CDUX	
39B	CDUY	X, Y, AND Z CDU INPUT COUNTERS. READ THE IMU CDU READ COUNTERS, ZEROED DURING ZERO ENCODE MODE (IMODES 33 BIT 5=1).
40A	CDUZ	
40B	CDUT	
		OPTICS TRUNNION ANGLE, READS TRUNNION CDU READ COUNTER

\*\*

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
			SET	RESET
41A	<p>FLAGWORD 0</p> <p>CPHIXCMP J SWITCH</p> <p>COAROFIN NEEDLFLG IMUSE RNDVZFLG R53FLG</p> <p>TRUNFLG FREEFLG</p> <p>ESCAPESW</p>	<p>BIT 15</p> <p>BIT 14</p> <p>BIT 13-11</p> <p>BIT 10</p> <p>BIT 9</p> <p>BIT 8</p> <p>BIT 7</p> <p>BIT 6</p> <p>BIT 5</p> <p>BIT 4</p> <p>BIT 3</p> <p>BIT 2</p> <p>BIT 1</p>	<p>OUTPUT OF CALCGA IS CφX INTEGRATION OF W MATRIX NOT ASSIGNED SHOULD BE ZERO USED IN TEST PROGRAMS SHOULD TOTAL ATTITUDE ERROR DISPLAY IMU IN USE NOT USED IN COAST AND ALIGN REQUEST FOR OPTICS MARK INITIATED V51 FLASHING NOT USED SHOULD REMAIN ZERO DRIVING OF TRUNNION ALLOWED USED TO CONTROL INTERNAL NOT USED SHOULD REMAIN ZERO ORBIT HYPERBOLIC</p>	<p>OUTPUT OF CALCGA IS THETAD INTEGRATION OF STATE VECTOR BE ZERO DAP FOLLOWING ERROR DISPLAY IMU NOT IN USE REQUEST HAS NOT BEEN INITIATED SUBROUTINE PERFORMANCE ORBIT ELLIPTIC</p>
41B	<p>FLAGWORD 1</p> <p>NJETSFLG</p> <p>STIKFLAG</p> <p>ERADFLAG R31FLAG ENG2FLAG TARG1FLAG TARG2FLAG</p> <p>VEHUPFLG</p> <p>UPDATFLG ONFLAG TRACKFLG</p> <p>ITERISW GUESSSW AVEGFLG</p>	<p>BIT 15</p> <p>BIT 14</p> <p>BIT 13</p> <p>BIT 12</p> <p>BIT 11</p> <p>BIT 10</p> <p>BIT 9</p> <p>BIT 8</p> <p>BIT 7</p> <p>BIT 6</p> <p>BIT 5</p> <p>BIT 4</p> <p>BIT 3</p> <p>BIT 2</p> <p>BIT 1</p>	<p>2 JET X TRANSLATION WITH CSM RCS DAP RHC IN CONTROL OF CSM RCS DAP V85 REND PARAM DISPLAY NOT USED IN COAST AND ALIGN NOT USED IN COAST AND ALIGN CSM STATE VECTOR BEING UPDATED NOT USED SHOULD BE 0 NOT USED IN COAST AND ALIGN NOT USED SHOULD BE 0 NOT USED IN COAST AND ALIGN NOT USED IN COAST AND ALIGN NOT USED IN COAST AND ALIGN AVE G 2 SEC RATE TO CONTINUE</p>	<p>4 JET X TRANSLATION WITH CSM RCS DAP CMC IN CONTROL OF CSM RCS DAP CONSTANT EARTH PAD RADIUS USED FOR COORD TRANSFORMATION, V85 REND PARAM DISPLAY. STAR TRACKING REQUIRED P51-P54 LEM STATE VECTOR BEING UPDATED AVE G TO TERMINATE</p>
42A	<p>FLAGWORD 2</p> <p>DRIFTFLG</p> <p>R21MARK</p> <p>STEERSW CYCLESW IMPULSW XDELVFLG ETPIFLG, FIRST FLG, RPEATFLG FINALFIG AVFLAG PFRATFLG</p> <p>CALCMAN3</p>	<p>BIT 15</p> <p>BIT 14</p> <p>BIT 13-12</p> <p>BIT 11</p> <p>BIT 10</p> <p>BIT 9</p> <p>BIT 8</p> <p>BIT 7</p> <p>BIT 6</p> <p>BIT 5</p> <p>BIT 4</p> <p>BIT 3</p>	<p>PLATFORM ALIGNMENT COMPENSA- TED FOR IRIG DRIFT EVERY 82 SEC. NOT USED IN COAST AND ALIGN NOT ASSIGNED SHOULD BE ZERO NOT USED IN COAST AND ALIGN NOT USED IN COAST AND ALIGN NOT USED IN COAST AND ALIGN NOT USED IN COAST AND ALIGN NOT USED IN COAST AND ALIGN NOT USED IN COAST AND ALIGN NOT USED IN COAST AND ALIGN PREFERRED ATTITUDE COMPUTED IN P40, P41 SET TO ONE AT END OF CALCULA- TION OF A LARGE ATTITUDE MA- NEUVER TO INDICATE THAT NO GIMBAL LOCK AVOIDANCE IS REQ.</p>	<p>PREFERRED ATTITUDE NOT COM- PUTED. IF PREFERRED ATTI- TUDE IS SELECTED IN P52 AND P54 WITH BIT = 0 ALARM 2158 WILL OCCUR. GIMBAL LOCK AVOIDANCE IS REQUIRED.</p>

\*\*

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
			SET	RESET
42A	FLAGWORD 2 CALCMAN2	BIT 2	USED IN MANEUVER CALCULATIONS BE NOTED ON TELEMETRY MAJOR MODE CHANGE (V37) TO POO ONLY ALLOWED.	UNLIKELY THAT CHANGES WILL MAJOR MODE CHANGE TO ANY PROGRAM IS ALLOWED.
	NODOFLG	BIT 1		
42B	FLAGWORD 3 AUTMANSW GLOKFAIL	BIT 15 BIT 14	NOT USED IN COAST AND ALIGN BIT SET TO ONE IF GIMBAL ANGLE CALC DETERMINES A MIDDLE GIMBAL ANGLE OF >60° WILL OCCUR. GENE- RATES ALARM 4018. BIT SET TO ONE IF THE REFSMAT IS GOOD.  NOT ASSIGNED SHOULD REMAIN ZERO SET TO ONE IN PO6 (CMC STANDBY) JUST PRIOR TO COMPUTER SHUT- DOWN. SET TO ONE AT BEGINNING OF P52 AND P54 INDICATING TWO STARS NOT YET FOUND. IF IT IS STILL ONE AT END OF STAR TABLE SEARCH ALARM 4058 RESULTS. NOT USED IN COAST AND ALIGN NOT ASSIGNED SHOULD BE ZERO STAR OCCULTED. W MATRIX VALID FOR ORBITAL NAVIGATION. STATE VECTOR TO BE UPDATED.  CONIC INTEGRATION WILL BE PERFORMED. CSM STATE VECTOR TO BE INTEGRATED. W MATRIX INTEGRATION WILL BE 9X9 DIMENSION. W MATRIX WILL BE INTEGRATED.	BIT ZEROED WITH COARSE ALIGN, CAGE, SHUTDOWN AND DURING ALIGNMENT PROGRAMS INDICATING REFSMMAT NOT GOOD AT THIS TIME.  SET TO ZERO 3 SEC AFTER ENTERING PO5 (CMC OPERATE)  SET TO ZERO WHEN A PAIR OF STARS IS FOUND.  STAR NOT OCCULTED. W MATRIX NOT VALID FOR ORBITAL NAVIGATION. STATE VECTOR HAS BEEN UP- DATED OR WILL NOT BE UPDATED. ENCKE (PRECISION) INTEGRA- TION WILL BE PERFORMED. LM STATE VECTOR TO BE INTEGRATED. W MATRIX INTEGRATION WILL BE 6X6 DIMENSION. W MATRIX WILL NOT BE INTEGRATED.
	REFSMFLG	BIT 13		
	STBYFLAG	BIT 12 BIT 11		
	VFLAG	BIT 10		
	ONMONFLAG	BIT 9		
	CULTFLAG	BIT 8		
	ORBIFLAG	BIT 7		
	STATEFLG	BIT 6		
	INTYPFLAG	BIT 5		
	VINTFLAG	BIT 4		
	D60R9FLAG	BIT 3		
DIMOFLAG	BIT 2 BIT 1			
43A	FLAGWORD 4 MRKIDFLG	BIT 15	MARK OR EXTENDED VERB DISPLAY IS WAITING FOR A RESPONSE. PRIORITY DISPLAY IS WAITING FOR A RESPONSE. PRIORITY OR NORMAL DISPLAY IS WAITING FOR A RESPONSE.	NO MARK OR EXTENDED VERB DISPLAY WAITING.  NO PRIORITY DISPLAY WAITING. NEITHER PRIORITY OR NORMAL DISPLAY IS WAITING.
	PRIODFLG	BIT 14		
	ENDIOFLG	BIT 13		

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
			SET	RESET
43A	FLAGWORD 4			
	NRMIDFLG	BIT 12	NORMAL DISPLAY IS WAITING FOR A RESPONSE.	NO NORMAL DISPLAY WAITING.
	MWAITFLG	BIT 11	NOT PRESENTLY PROGRAMED. SHOULD BE ZERO.	
	NWAITFLG	BIT 10	NORMAL DISPLAY IS WAITING TO BE INITIATED.	NO NORMAL DISPLAY WAITING.
	MRKNVFLG	BIT 9	MARK OR EXTENDED VERB DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRO-NAUT OR UPLINK.	
	NRMNVFLG	BIT 8	NORMAL DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.	
	PRONVFLG	BIT 7	PRIORITY DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.	
	PINBRFLG	BIT 6	INTERFERENCE WITH AN INTERNALLY GENERATED DISPLAY HAS OCCURRED OR TERMINATE HAS OCCURRED WITH BIT 13 OF THIS FLAGWORD = 1.	
	MRUPTFLG	BIT 5	BIT SET TO ONE WHEN A MARK OR EXTENDED VERB DISPLAY HAS BEEN INTERRUPTED BY A PRIORITY DISPLAY.	
	NRUPTFLG	BIT 4	BIT SET TO ONE WHEN A NORMAL DISPLAY IS INTERRUPTED BY A MARK OR EXTENDED VERB DISPLAY, OR A PRIORITY DISPLAY.	
MRKOVFLG	BIT 3	BIT SET TO ONE WHEN A MARK OR EXTENDED VERB DISPLAY IS TO INTERRUPT A NORMAL DISPLAY.		
RET1FLG	BIT 2	NOT PROGRAMED. SHOULD BE ZERO.		
		BIT 1	NOT ASSIGNED. SHOULD BE ZERO.	
43B	FLAGWORD 5			
	DSKYFLG	BIT 15	DISPLAYS SENT TO DSKY.	NO DISPLAY SENT.
	INTFLAG2	BIT 14	ORBITAL INTEGRATION PROGRAM PACKAGE IN USE.	ORBITAL INTEGRATION PROGRAM PACKAGE NOT IN USE.
	INTFLAG3	BIT 13	SET IF RESTART PHASE CHANGE OCCURS TO PREVENT RESET OF BIT 14 IF A RESTART OCCURS.	
	V59FLAG	BIT 12	NOT USED IN COAST AND ALIGN	
	INCORFLG	BIT 11	NOT USED IN COAST AND ALIGN	
	DMENFLG	BIT 10	NOT ASSIGNED SHOULD BE ZERO	
	COMPUTER	BIT 9 BIT 8	NOT USED IN COAST AND ALIGN BIT SET TO ONE IN FRESH START INDICATES THAT THE COMPUTER IS A CSM COMPUTER HENCE SHOULD REMAIN 1.	INDICATES LGC
ENGONFLG	BIT 7	NOT USED IN COAST AND ALIGN		
3AXISFLAG	BIT 6	BIT SET TO ONE WHEN ATTITUDE MANEUVER IS SPECIFIED BY 3 ANGLES.	BIT SET TO ZERO WHEN AN ATTITUDE MANEUVER IS SPECIFIED BY SOME OTHER ROUTINE.	

COAST AND ALIGN - Continued  
 TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
			SET	RESET
43B	FLAGWORD 5 GRRBKFLG	BIT 5	BIT SET TO ONE WITH V75E INDICATING BACKUP LIFTOFF SIGNAL HAS BEEN SENT. INITIATES P11 IF CHAN 30 BIT 5 HASN'T ALREADY DONE SO.	
NOSOLNSW AND NOSOFLAG	MGLVFLAG	BIT 4	NOT ASSIGNED SHOULD BE ZERO.	
	RENDWFLG	BIT 3	NOT USED IN COAST AND ALIGN	
		BIT 2	NOT USED IN COAST AND ALIGN	
		BIT 1	W MATRIX IS VALID FOR USE IN REND NAVIGATION.	W MATRIX IS NOT VALID FOR USE IN REND NAVIGATION.
44A	FLAGWORD 6			
	DAP BIT 1	BIT 15	} INDICATE 0 } NO DAP 1 } TVC 0 } CSM 1 } SATURN } DAP STATUS 0 } OR ENTRY 0 } DAP 1 } RCS 1 } DAP	
	DAP BIT 2	BIT 14		
	DLBARFLG AND LEWDSW	BIT 13	NOT USED IN COAST AND ALIGN	
	CMDAPARM	BIT 12	NOT USED IN COAST AND ALIGN	
	GAMDIFSW	BIT 11	NOT USED IN COAST AND ALIGN	
	GONEPAST	BIT 10	NOT USED IN COAST AND ALIGN	
	RELVELSW	BIT 9	NOT USED IN COAST AND ALIGN	
	KNOWNFLG AND EGSW	BIT 8	NOT USED IN COAST AND ALIGN	
	HUNTSW1	BIT 7	NOT USED IN COAST AND ALIGN	
	HIND	BIT 6	NOT USED IN COAST AND ALIGN	
	INRLSW	BIT 5	NOT USED IN COAST AND ALIGN	
	LATSW	BIT 4	NOT USED IN COAST AND ALIGN	
	.05GSW	BIT 3	NOT USED IN COAST AND ALIGN	
	CMDSTBY	BIT 2	NOT USED IN COAST AND ALIGN	
	GYMDIFSW	BIT 1	NOT USED IN COAST AND ALIGN	
44B	FLAGWORD 7			
	TEMIFLAG	BIT 15	NOT USED IN COAST AND ALIGN	
		BIT 14	NOT ASSIGNED SHOULD BE ZERO	
	IGNFLAG	BIT 13	NOT USED IN COAST AND ALIGN	
	ASTNFLAG	BIT 12	NOT USED IN COAST AND ALIGN	
	TIMRFLAG	BIT 11	NOT USED IN COAST AND ALIGN	
	UNNORMSW	BIT 10	NOT USED IN COAST AND ALIGN	
	TTMODESW	BIT 9	EXPECTED TO BE ZERO	NOT USED IN COAST AND ALIGN
	GONEBY	BIT 8	NOT USED IN COAST AND ALIGN	
	IDLEFLAG	BIT 7	INHIBIT ΔV MONITOR. SET TO ONE AT CUTOFF OF EITHER SPS OR SATURN.	AVEG WILL PERFORM ΔV MONITOR FUNCTION.
	V37FLAG	BIT 6	AVERAGE G IS RUNNING.	AVERAGE G COMPUTED STATE VECTOR HAS BEEN UPDATED. (AVE G IS OFF). SHOULD BE ZERO.
		BIT 5	NOT ASSIGNED.	
	UPLOCKFL	BIT 4	NOT USED IN COAST AND ALIGN	
	VERIFLAG	BIT 3	NOT USED IN COAST AND ALIGN	
	ATTCHFLAG	BIT 2	LM ATTACHED INDICATION FOR CSM RCS DAP COMPUTATION.	LM NOT ATTACHED
	TFFSW	BIT 1	CALCULATE TIME OF PERIGEE.	CALCULATE T <sub>FF</sub> . SINCE BIT IS RESET AFTER PERIGEE TIME IS COMPUTED. BIT WILL BE OBSERVED AS ZERO.

\*\*

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
45A 45B 46A 46B 47A 47B 48A 48B 49A 49B 50A 50B	DSPTAB + 0 DSPTAB + 1 DSPTAB + 2 DSPTAB + 3 DSPTAB + 4 DSPTAB + 5 DSPTAB + 6 DSPTAB + 7 DSPTAB + 8 DSPTAB + 9 DSPTAB + 10 DSPTAB + 11	DISPLAY TABLE CODES FOR GENERATION DSKY NUMERIC.  USED TO INDICATE VERB-NOUN, MAJOR MODE AND R <sub>1</sub> R <sub>2</sub> R <sub>3</sub> DISPLAYS.
		DISPLAY TABLE TO DSKY STATUS LIGHTS. 60400g = PROGRAM CAUTION, 60200g = TRACKER WARNING 60020g = NO ATTITUDE, 60040g = GIMBAL LOCK
51A 51B	T <sub>Now</sub>	COMPUTER CLOCK INDICATING TIME SINCE LIFTOFF. UPDATED BY V55E OR V73E.
52A 52B 53A 53B 54A 54B 55A 55B 56A 56B 57A 57B	R <sub>X</sub> X COMPONENT OF "OTHER" VEHICLE POSITION R <sub>Y</sub> Y COMPONENT OF "OTHER" VEHICLE POSITION R <sub>Z</sub> Z COMPONENT OF "OTHER" VEHICLE POSITION V <sub>X</sub> X COMPONENT OF "OTHER" VEHICLE VELOCITY V <sub>Y</sub> Y COMPONENT OF "OTHER" VEHICLE VELOCITY V <sub>Z</sub> Z COMPONENT OF "OTHER" VEHICLE VELOCITY	LM ("OTHER") STATE VECTOR
58A 58B	TETLM	TIME TAG FOR LM (OTHER) STATE VECTOR
59A 59B 60A 60B 61A 61B 62A 62B 63A 63B	REDOCTR THETAD THETAD THETAD ADOTX ADOTY ADOTZ	SAME AS 9A SAME AS 9B SAME AS 10A SAME AS 10B SAME AS 11A, 11B SAME AS 12A, 12B SAME AS 13A, 13B
64A 64B	TFF	TIME FROM INTERFACE ALTITUDE 300,000 FT ABOVE PAD RADIUS.
65A 65B 66A 66B 67A 67B	OGC IGC MGC	REQUIRED OUTER GIMBAL GYRO TORQUE ANGLE REQUIRED INNER GIMBAL GYRO TORQUE ANGLE REQUIRED MIDDLE GIMBAL GYRO TORQUE ANGLE



::

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
68A 68B 69A 69B 70A 70B	VGX VGY VGZ	NOT USED IN COAST AND ALIGN
71A 71B	FAILREG + 0 FAILREG + 1	CONTAINS ALARM PATTERN OF FIRST ALARM RECEIVED CONTAINS ALARM PATTERN OF SECOND ALARM RECEIVED
72A 72B	PIPTIME 1	VALUE OF TIME WHEN THE PIPAS WERE LAST READ
73A 73B	FAILREG + 2 ALMCADR + 0	CONTAINS ALARM PATTERN OF MOST RECENT ALARM (3RD IF 0XXXX8, >3 IF 4XXXX8) CONTAINS REGISTER PORTION OF 1ST ADDRESS FOLLOWING MOST RECENT ALARM.
74A 74B 75A 75B	INTVECY INTVECZ	VALUE OF COMPENSATED PIPA PULSES ABOUT THE PRELAUNCH Y AXIS. VALUE OF COMPENSATED PIPA PULSES ABOUT THE PRELAUNCH Z AXIS.
76A 76B 77A 77B 78A 78B	DELVX DELVY DELVZ	X, Y, Z COMPENSATED PIPA COUNT FOR 2 SECOND INCREMENT DURING AVERAGE G. THEREFORE ONLY APPLIES DURING P11 IN COAST AND ALIGN LIST TRANSMISSION.
79A 79B	TEVENT	VALUE OF COMPUTER CLOCK WHEN LIFTOFF OCCURRED, WHEN SPS ENGINE CAME ON, OR WHEN SPS ENGINE WENT OFF.
80A 80B 81A 81B 82A 82B	SPARES	
83A 83B 84A	AK0 (ROLL ATTITUDE ERROR) AK1 (PITCH ATTITUDE ERROR) AK2 (YAW ATTITUDE ERROR)	VEHICLE ATTITUDE ERRORS SENT TO FDAI NEEDLES THRU ECDU. DURING P11 ACTUAL VALUE DIVIDED BY FOUR SO THAT MAX ERROR IS (4x16-2/3)°. DURING RCS DAP EITHER TOTAL ATTITUDE ERROR OR DAP FOLLOWING ERROR IS DISPLAYED. (DETERMINED BY FWOBIT 9).
84B	OGARATE	NOT USED IN COAST AND ALIGN

\*\*

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
85A	DAPDATAR1 LOADED WITH V48N46E	15	NOT USED SHOULD BE ZERO	
		14	0 } NO DAP 1 } LM-ON	0 } LM-OFF 1 } SATURN
			OR	
		13	0 } ENTRY 0 } RCS DAP	1 } RCS DAP 1 } DAP
		12-11	NOT USED SHOULD BE ZERO	
		10	USE A/C QUAD (RCS JETS)	IF BIT 7=0 USE A/C AND B/D
		9-8	NOT USED SHOULD BE ZERO	
		7	USE B/D QUAD (RCS JETS)	IF BIT 10=0 USE A/C AND B/D
		6-5	NOT USED SHOULD BE ZERO	
		4	5° DEADBAND	0.5° DEADBAND
		3	NOT USED SHOULD BE ZERO	
		2	( SPECIFY ) 0 } .05°	0 } 0.2° 1 } .5° 1 } 4°
		1	( MANEUVER RATE ) 0 } / SEC	1 } / SEC 0 } / SEC 1 } / SEC
85B	DAPDATAR2 LOADED WITH V48N46E	15-14	NOT USED SHOULD BE ZERO	
		13	USE A/C QUAD FOR ROLL	USE B/D QUAD FOR ROLL
		12-11	NOT USED SHOULD BE ZERO	
		10	USE OF A QUAD ALLOWED	USE OF A QUAD NOT ALLOWED
		9-8	NOT USED SHOULD BE ZERO	
		7	USE OF B QUAD ALLOWED	USE OF B QUAD NOT ALLOWED
		6-5	NOT USED SHOULD BE ZERO	
		4	USE OF C QUAD ALLOWED	USE OF C QUAD NOT ALLOWED
		3-2	NOT USED SHOULD BE ZERO	
1	USE OF D QUAD ALLOWED	USE OF D QUAD NOT ALLOWED		
86A	RSBBQ	VALUE OF BBANK AND Q REGISTERS AT THE TIME OF A RESTART. USED TO DETERMINE LOCATION OF RESTART OCCURRENCE.		
87A	ALARMCADR + 0	SAME AS 73B		
87B	ALARMCADR + 1	BBANK PORTION OF THE 1ST ADDRESS FOLLOWING MOST RECENT ALARM		
88A	IMODES 30 BITS 15 THROUGH 9 ARE LAST SAMPLED VALUE OF CHANNEL 30 EXCEPT FOR BIT 10 WHICH IS LAST SAMPLED VALUE OF CHAN 33 BIT 13.	15	IMU TEMP OUT OF LIMITS. (CHANNEL 11 BIT 4 IS SET TO AGREE WITH THIS BIT).	IMU TEMP WITHIN LIMITS.
		14	NO ISS TURN ON REQUEST	ISS TURN ON REQUEST HAS OCCURRED.
		13	NO IMU FAIL	IMU FAIL HAS OCCURRED. IF BIT 4 OF THIS WORD IS ALSO ZERO SETS CHAN 11 BIT 1=1.
		12	NO ECDU FAIL	ECDU FAIL HAS OCCURRED. IF BIT 3 OF THIS WORD IS ALSO ZERO, SET CHAN 11 BIT 1=1.
		11	NO IMU CAGE COMMAND	IMU CAGE COMMANDED
		10		PIPA FAIL HAS OCCURRED. IF BIT 1 OF THIS WORD IS ALSO ZERO SET CHAN 11 BIT 1=1.
		9	IMU NOT OPERATING	IMU OPERATING
		8	BIT USED IN IMU TURN-ON SEQUENCING. SET FOR .48 SEC WILL MOST LIKELY BE ZERO.	
		7	BIT USED IN IMU TURN-ON SEQUENCING. SET FOR .48 SEC WILL MOST LIKELY BE ZERO.	
		6	IMU INITIALIZATION BEING ACCOMPLISHED (CAGE CMD, IMU ZEROING, TURN-ON DELAY ALL SET THIS BIT).	IMU NOT IN INITIALIZATION.

\*\*

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
88A	IMODES 30	5	INHIBIT ALARM 2128 IF PIPA FAIL OCCURS DURING TURN-ON SEQUENCING.	
		4	INHIBIT ISS WARNING BASED ON IMU FAIL (OCCURS DURING TURN-ON DELAY AND COARSE ALIGN).	ISS WARNING NOT INHIBITED.
		3	INHIBIT ISS WARNING BASED ON ECDU FAIL (OCCURS DURING TURN-ON DELAY AND IMU ZERO).	ISS WARNING NOT INHIBITED.
		2	INDICATES TURN-ON DELAY FAILURE ALONG WITH ALARM 2078.	NO TURN-ON DELAY FAILURE.
		1	INHIBIT ISS WARNING BASED ON PIPA FAIL. (BIT IS ONE UNLESS AVERAGE "G" IS RUNNING).	ISS WARNING NOT INHIBITED (AVERAGE G IS RUNNING).
88B	IMODES 33	15	NOT ASSIGNED SHOULD REMAIN ZERO	
		14	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 30 BIT 14.	SET TO ZERO WHEN STANDBY BUTTON ON DSKY IS PRESSED (CONTROLS PROCEED FUNCTION THE SAME AS V33E.)
		13	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 13.	SET TO ZERO IF PIPA FAIL HAS OCCURRED.
		12	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 12.	SET TO ZERO IF TELEMETRY DOWNLINK IS TOO FAST.
		11	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 11.	SET TO ZERO IF UPLINK IS TOO FAST.
		10-7	NOT ASSIGNED SHOULD REMAIN ZERO	
		6	IMU USE FOR VEHICLE ATTITUDE SHOULD NOT BE ATTEMPTED. SET TO ONE IN COARSE ALIGN AND IMU ZEROING.	SET OF ZERO AFTER FINE ALIGN ROUTINE.
		5	SET TO ONE DURING IMU ZEROING ROUTINE (V40N20E).	NOT EXPECTED TO BE USED IN FLIGHT.
		4-3	NOT ASSIGNED SHOULD BE ZERO	
		2	USED IN GROUND TESTING ONLY	
1	SET TO ONE WITH V35E (LAMP TEST) FOR 5 SEC.			
89A	CDUX	SAME AS 39A		
89B	CDUY	SAME AS 39B		
90A	CDUZ	SAME AS 40A		
90B	CDUT	SAME AS 40B		
91A	CHANNEL 11	BIT 15-14	NOT ASSIGNED SHOULD BE ZERO.	
		13	SET TO ONE FOR SPS ENGINE ON NOT USED IN COAST AND ALIGN.	
		12-11	NOT ASSIGNED SHOULD BE ZERO.	
		10	SET 1 WHEN ERROR RESET KEYCODE FROM UPLINK OR DSKY IS RECEIVED.	
		9	TEST CONNECTOR OUTPUT SET TO ONE 2 SECONDS AFTER AVE G STARTS AND REMAINS 1 UNTIL AVE G END.	
		8	NOT ASSIGNED SHOULD BE ZERO.	
		7	SET TO ONE WHEN OPERATOR ERROR HAS OCCURRED. RESET WITH ERROR RESET VIA DSKY OR UPLINK.	
		6	SET TO 1 WHEN OPERATOR ACTION IS REQUIRED (DSKY IS FLASHING).	

\*\*

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION		REAL-TIME SIGNIFICANCE
91A	CHANNEL 11	BIT 5 4 3 2 1	SET TO 1 WITH KEY RELEASE LIGHT INDICATING PROGRAM DESIRES USE OF DSKY DISPLAYS. SET TO ONE WHEN THE IMU TEMP IS OUT OF LIMITS. SET TO 1 WHEN UPLINK INTERRUPT OCCURS INDICATING UPLINK ACTIVITY. SET TO 1 WHEN COMPUTER IS WORKING ON AN ACTIVE JOB. GENERATES COMPUTER ACTIVITY LIGHT. SET TO 1 WITH ISS WARNING. SETS ISS WARNING LIGHT.
91B	CHANNEL 12	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	SET TO ONE 4 SECONDS AT THE END OF THE ISS 90 SEC. TURN-ON DELAY INDICATING TURN-ON DELAY COMPLETE. S-IVB CUTOFF COMMAND. NOT EXPECTED TO BE USED DURING FLIGHT. S-IVB INJECTION SEQUENCING START NOT EXPECTED TO BE USED DURING FLIGHT. NOT ASSIGNED SHOULD BE ZERO. DISENGAGE OPTICS DAC NOT EXPECTED TO BE USED. ZERO OPTICS COMMAND NOT EXPECTED TO BE USED. SET TO ONE WITH V46E IF BITS 14-13 OF DAPDATARI = 1 SETS S-IVB TAKEOVER ENABLE. SET TO ONE IN P40 IF TVC DAP IS GOING TO BE USED. SETS TVC DAP ENABLE. NOT ASSIGNED SHOULD BE ZERO. IMU CDU ERROR COUNTER ENABLE SET TO ONE DURING COARSE ALIGN, S-IVB TAKEOVER AND ATTITUDE ERRORS TO FDAI. IMU CDU ZERO COMMAND. SET TO ONE ANYTIME IMU CDU READ COUNTERS ARE TO BE ZEROED. IMU COARSE ALIGN ENABLE. SET TO ONE ANYTIME IMU IS TO BE COARSE ALIGNED. NOT USED OPTICS CDU ERROR COUNTER ENABLE. SET TO ONE DURING OPTICS COARSE ALIGN OR TVC DAP ENABLE. ZERO OPTICS CDU. SET TO ONE FOR 0.2 SEC AT THE END OF OPTICS ZEROING SEQUENCE. BECAUSE OF SHORT SET TIME IT SHOULD BE ZERO.
92A	CHANNEL 13	15 14 13 12 11 10 9 8 7 6 5 4-1	T6RUPRT ENABLE. ONE ENABLES THE TIME 6 COUNTER TO START COUNTING DOWN FOR RCS JET ON TIME. USED IN CSM-RCS DAP AND TVC ROLL DAP. NOT EXPECTED TO BE USED SHOULD BE ZERO. NOT EXPECTED TO BE USED SHOULD BE ZERO. NOT EXPECTED TO BE USED SHOULD BE ZERO. SET TO ONE AT THE END OF P06 TO ENABLE STANDBY BUTTON TO DOWNMODE THE COMPUTER TO STANDBY. SET TO 1 BY V35E (LAMP TEST). REMAINS 1 FOR 5 SEC. NOT ASSIGNED SHOULD BE ZERO. NOT USED SHOULD BE ZERO. WORD ORDER CODE BIT 1 EXCEPT FOR WORDS 1 AND 51. BLOCK UPLINK NOT SET BY PROGRAM NOT USED SHOULD BE ZERO. NOT ASSIGNED SHOULD BE ZERO.
92B	CHANNEL 14	15 14 13	XCDU DRIVE ENABLE. ENABLES PULSES TO BE SENT FROM COMPUTER TO XCDU ERROR COUNTER. YCDU DRIVE ENABLE ZCDU DRIVE ENABLE

⌘

COAST AND ALIGN - Continued

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
92B	CHANNEL 14	12	TRUNNION CDU DRIVE ENABLE. ENABLES PULSES TO BE SENT TO TRUNNION CDU ERROR COUNTER FOR EITHER OPTICS COARSE ALIGN OR TVC YAW AXIS COMMAND. SHAFT CDU DRIVE ENABLE. ALSO TVC PITCH AXIS COMMAND. ENABLE GYRO TORQUEING. ENABLES PULSES TO BE SENT FROM COMPUTER TO GYRO PULSE TORQUE ELECTRONICS. BIT SET TO ONE TO INDICATE NEGATIVE GYRO TORQUE. 0 } NO 0 } TORQUE 1 } TORQUE 1 } TORQUE 0 } AXIS 1 } X-AXIS GYRO 0 } Y-AXIS GYRO 1 } Z-AXIS GYRO SET TO ONE TO ENABLE GYRO PULSE TORQUE POWER SUPPLY. 5 NOT USED 4-2 NOT ASSIGNED 1 NOT USED
		11	
		10	
		9	
		8	
		7	
		6	
		5	
		4-2	
		1	
		1	
93A	CHANNEL 30	15	
		14	
		13	
		12	
		11	
		10	
		9	
		8	
		7	
		6	
		5	
		4	
		3	
		2	
		1	
93B	CHANNEL 31	15	SET TO ZERO IF COMPUTER IS IN CONTROL OF THE SPACECRAFT. SET TO ONE BY G&N AUTOPILOT CONTROL SWITCH OFF OR IMU OFF. ZERO IF RCS DAP FREE MODE IS SELECTED. ZERO IF RCS DAP HOLD MODE IS SELECTED. IF BITS 14 AND 13 = 112 AUTOMATIC MODE SELECTED. ZERO IF -Z TRANSLATION COMMANDED. ZERO IF +Z TRANSLATION COMMANDED. ZERO IF -Y TRANSLATION COMMANDED. ZERO IF +Y TRANSLATION COMMANDED. ZERO IF -X TRANSLATION COMMANDED. ZERO IF +X TRANSLATION COMMANDED. ZERO IF -ROLL COMMANDED. ZERO IF +ROLL COMMANDED. ZERO IF -YAW COMMANDED. ZERO IF +YAW COMMANDED. ZERO IF -PITCH COMMANDED. ZERO IF +PITCH COMMANDED.
		14	
		13	
		12	
	THC INPUTS	11	
		10	
		9	
		8	
		7	
		6	
		5	
		4	
	RHC INPUTS	3	
		2	
		1	
		1	

\*\*

COAST AND ALIGN - Concluded

TRANSMITTED IN PROGRAMS 00,01,02,03,05,06,07,11,51,52,53,54

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
94A	CHANNEL 32         MINIMUM IMPULSE CONTROLLER INPUTS	15 14  13-12 11 10-7 6 5 4 3 2 1	NOT ASSIGNED SHOULD BE ZERO. ZERO IF PROCEED KEY (FORMERLY STANDBY) ON DSKY IS PRESSED. NOT ASSIGNED SHOULD BE ZERO. NOT USED IN S/C 101. NOT ASSIGNED SHOULD BE ZERO. ZERO IF -ROLL COMMANDED. ZERO IF +ROLL COMMANDED. ZERO IF -YAW COMMANDED ZERO IF +YAW COMMANDED ZERO IF -PITCH COMMANDED ZERO IF +PITCH COMMANDED
94B	CHANNEL 33	15 14 13 12 11 10  9-8 7 6 5 4 3-1	ZERO IF COMPUTER OSCILLATOR HAS STOPPED. ZERO IF CMC WARNING HAS OCCURRED. ZERO IF PIPA FAIL HAS OCCURRED. ZERO IF TELEMETRY DOWNLINK IS TOO FAST. ZERO IF UPLINK TOO FAST. ZERO IF BLOCK UPLINK SWITCH IN SPACECRAFT IS SET TO BLOCK. NOT ASSIGNED SHOULD BE ZERO. NOT USED NOT USED ZERO IF CMC CONTROL OF OPTICS IS SET. ZERO IF ZERO OPTICS IS SET. NOT ASSIGNED SHOULD BE ZERO.
95A 95B 96A 96B 97A 97B 98A 98B 99A 99B 100A 100B	DSPTAB + 0 DSPTAB + 1 DSPTAB + 2 DSPTAB + 3 DSPTAB + 4 DSPTAB + 5 DSPTAB + 6 DSPTAB + 7 DSPTAB + 8 DSPTAB + 9 DSPTAB + 10 DSPTAB + 11	SAME AS 45A TO 50B	

::

RENDEZVOUS AND PRETHRUST

TRANSMITTED IN PROGRAMS 20, 21, 22, 23, 30, 34, 35, 74, 75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
1A 1B	RENDEZVOUS AND PRETHRUST LIST ID SYNC BITS	(00367) <sub>8</sub> INDICATES REND AND PRETHRUST BEING SENT. (77034) <sub>8</sub> INDICATES DATA TO FOLLOW
2A 2B	R <sub>X</sub> X COMPONENT OF VEHICLE POSITION VECTOR	CSM VEHICLE STATE VECTOR AND TIME
3A 3B	R <sub>Y</sub> Y COMPONENT OF VEHICLE POSITION VECTOR	
4A 4B	R <sub>Z</sub> Z COMPONENT OF VEHICLE POSITION VECTOR	
5A 5B	V <sub>X</sub> X COMPONENT OF VEHICLE VELOCITY VECTOR	
6A 6B	V <sub>Y</sub> Y COMPONENT OF VEHICLE VELOCITY VECTOR	
7A 7B	V <sub>Z</sub> Z COMPONENT OF VEHICLE VELOCITY VECTOR	
8A 8B	T <sub>SV</sub> TIME TAG FOR R AND V	
9A	REDOCTR	
9B	THETAD FINAL DESIRED XCDU ANGLE	FINAL DESIRED CDU ANGLES DURING COARSE ALIGN OR ATTITUDE MANEUVERS. PERFERRED ATTITUDE DURING OR- BITAL NAVIGATION (P20) AND AUTO OPTICS POSITIONING. INDICATE REORIENTATION ANGLES DURING ENTRY (P62).
10A	THETAD FINAL DESIRED YCDU ANGLE	
10B	THETAD FINAL DESIRED ZCDU ANGLE	
11A 11B	ADOT <sub>X</sub>	MEASURED BODY RATES ABOUT CONTROL AXES ANY TIME RCS DAP IS ON FW6, BIT 15=0, 14=1
12A 12B	ADOT <sub>Y</sub>	
13A 13B	ADOT <sub>Z</sub>	
14A 14B	LAT	
15A 15B	LONG	VALUE OF LONGITUDE DISPLAYED BY NOUNS 43 AND 67.
16A 16B	ALT	VALUE OF ALTITUDE. (IF FW1 BIT 13=1, ALT BASED ON FISCHER ELLIPSE. IF FW1 BIT 13=0, ALTITUDE ABOVE LAUNCH PAD RADIUS). DISPLAYED BY NOUN 43.
17A 17B	FAILREG + 0 FAILREG + 1	CONTAINS ALARM PATTERN OF FIRST ALARM RECEIVED. CONTAINS ALARM PATTERN OF SECOND ALARM RECEIVED.
18A 18B	FAILREG + 2 ALMCADR + 0	CONTAINS ALARM PATTERN OF MOST RECENT ALARM (3RD IF 0XXXX <sub>8</sub> > 3 IF 4XXXX <sub>8</sub> ). CONTAINS REGISTER PORTION OF 1ST ADDRESS FOLLOWING MOST RECENT ALARM.

::

RENDEZVOUS AND PRETHRUST - Continued  
TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
19A 19B	SPARES	
20A 20B	RANGE	CALCULATED RANGE TO OTHER VEHICLE DISPLAYED BY NOUNS 53 AND 54. VALID WITH V83E OR V85E ONLY.
21A 21B	RRATE	CALCULATED RANGE RATE TO OTHER VEHICLE DISPLAYED BY NOUNS 53 AND 54. VALID WITH V83E OR V85E ONLY.
22A 22B	RTHETA	VALUE OF ANGLE BETWEEN LOCAL HORIZONTAL AND +X AXIS (NOUN 54) OR STAR LINE OF SIGHT (NOUN 53). VALID WITH V83E OR V85E ONLY.
23A 23B	WBODY 0	DESIRED BODY ROLL RATE ABOUT CONTROL AXIS DETERMINED IN CSM-RCS DAP.
24A 24B	WBODY 1	DESIRED BODY PITCH RATE ABOUT CONTROL AXIS DETERMINED IN CSM-RCS DAP.
25A 25B	WBODY 2	DESIRED BODY YAW RATE ABOUT CONTROL AXIS DETERMINED IN CSM-RCS DAP.
26A	CHANTEMP	IF RCS DAP IS ON (FW6 BIT 15=0, BIT 14=1) SET TO -0 (7777 <sub>8</sub> ) UNTIL MIN IMPULSE CONTROLLER IS USED (CHAN 31 BIT 14=0) THEN = CHAN 32.
26B 27A 27B	ERRORX ERRORY ERRORZ	INTERMEDIATE ATTITUDE ERRORS COMPUTED DURING CSM-RCS DAP (DAP FOLLOWING ERRORS). ERRORS IN CONTROL COORDINATES AND ARE LOADED INTO AK'S FOR FDAI NEEDLES WHEN FW0 BIT 9=0 (FRESH START OR V61E SETS FW0 BIT 9=0.)
28A 28B	MARKDOWN + 0 MARKDOWN + 1	VALUE OF COMPUTER CLOCK AT TIME OF OPTICS MARK IN PROGRAMS OTHER THAN P51-P54.
29A 29B	MARKDOWN + 2 MARKDOWN + 3	VALUE OF IMU CDUY AT TIME OF MARK. VALUE OF OPTICS CDUS AT TIME OF MARK.
30A 30B	MARKDOWN + 4 MARKDOWN + 5	VALUE OF IMU CDUZ AT TIME OF MARK. VALUE OF OPTICS CDUT AT TIME OF MARK.
31A	MARKDOWN + 6	VALUE OF IMU CDUX AT TIME OF MARK.
31B	NOT USED	
32A 32B	DELVEET3X	X, Y, AND Z COMPONENTS OF VELOCITY INCREMENT REQUIRED TO COMPLETE A MANEUVER. COMPUTED IN P34, P35, P74, P75.
33A 33B	DELVEET3Y	
34A 34B	DELVEET3Z	
35A	OPTMODES	



\*\*

RENDEZVOUS AND PRETHRUST - Continued  
TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE																											
35A	OPTMODES	<p>BIT 8 - NOT ASSIGNED, SHOULD BE 0.</p> <p>7 - LAST SAMPLED VALUE OF CHANNEL 30 BIT 7 (OPTICS CDU FAIL). GENERATES TRACKER ALARM (DSPTAB 11 BIT 8=1) IF THIS BIT GOES FROM 1 TO 0 PROVIDED BIT 2 OF OPTMODES = 0. SET TO ONE BY FRESH START OR RESTART.</p> <p>6 - NOT ASSIGNED, SHOULD BE 0.</p> <p>5 - LAST SAMPLED VALUE OF CHANNEL 33 BIT 5 (0 = OPTICS MODE SWITCH IN COMPUTER).</p> <p>4 - LAST SAMPLED VALUE OF CHANNEL 33 BIT 4 (0 = OPTICS MODE SWITCH IN ZERO). IF BIT 5 AND BIT 4 OF OPTMODES = 1, THE MANUAL MODE IS SELECTED.</p> <p>3 - SET TO ONE WHEN OPTICS MODE SWITCH SET TO ZERO. REMAINS ONE FOR 16.2 SECONDS (OPTICS ZEROING DELAY). IF MODE SWITCH IS TAKEN OUT OF ZERO DURING 16.2 SECONDS ALARM (116)<sub>8</sub> IS GENERATED.</p> <p>2 - BIT SET TO ONE TO INHIBIT ANY TRACKER ALARMS DURING OPTICS ZEROING DELAY.</p> <p>1 - BIT SET TO ONE TO INDICATE OPTICS ZEROING DELAY WILL COMPLETE IN .4 SEC INHIBITS ALARM (116)<sub>8</sub>.</p>																											
35B	HOLDFLAG	USED TO DETERMINE NATURE OF ATTITUDE HOLD CONTROL IN CSM-PCS DAP. IF >+0 PERFORM ATTITUDE HOLD ABOUT ANGLES CONTAINED IN CDU INPUT COUNTERS (PRESENT IMU ANGLES), IF = +0 ATTITUDE HOLD ABOUT EXISTING REFERENCE, IF <+0 AUTOMATIC STEERING TO BE PERFORMED.																											
36A	CADRFLSH + 1	VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED MARK.																											
36B	CADRFLSH + 2	VALUE OF RETURN ADDRESS INFORMATION FOR LAST NORMAL DISPLAY REQUESTED.																											
37A	CDUS	OPTICS SHAFT ANGLE, READS SHAFT CDU READ COUNTER.																											
37B	PIPAX	X, Y, AND Z PIPA INPUT COUNTERS ZEROED AT THE START OF AVE G AND EVERY 2 SEC DURING AVE G.																											
38A	PIPAY																												
38B	PIPAZ																												
39A	CDUX		X, Y, AND Z CDU INPUT COUNTERS. READ THE IMU CDU READ COUNTERS, ZEROED DURING ZERO ENCODE MODE (IMODES 33 BIT 5=1).																										
39B	CDUY																												
40A	CDUZ																												
40B	CDUT	OPTICS TRUNNION ANGLE, READS TRUNNION CDU READ COUNTER																											
41A	FLAGWORD 0	<table border="1"> <thead> <tr> <th>BIT</th> <th>SET</th> <th>RESET</th> </tr> </thead> <tbody> <tr> <td>15</td> <td>OUTPUT OF CALCGA IS CφX.</td> <td>OUTPUT OF CALCGA IS THETAD.</td> </tr> <tr> <td>14</td> <td>INTEGRATION OF W MATRIX.</td> <td>INTEGRATION OF STATE VECTOR.</td> </tr> <tr> <td>13-11</td> <td>NOT ASSIGNED, SHOULD BE ZERO.</td> <td></td> </tr> <tr> <td>10</td> <td>USED IN TEST PROGRAMS, SHOULD BE ZERO.</td> <td></td> </tr> <tr> <td>9</td> <td>TOTAL ATTITUDE ERROR DISPLAY.</td> <td>DAP FOLLOWING ERROR DISPLAY.</td> </tr> <tr> <td>8</td> <td>IMU IN USE.</td> <td>IMU NOT IN USE.</td> </tr> <tr> <td>7</td> <td>PROGRAM 20 IS RUNNING.</td> <td></td> </tr> <tr> <td>6</td> <td>REQUEST FOR OPTICS MARK INITIATED VERB 51 FLASHING.</td> <td></td> </tr> </tbody> </table>	BIT	SET	RESET	15	OUTPUT OF CALCGA IS CφX.	OUTPUT OF CALCGA IS THETAD.	14	INTEGRATION OF W MATRIX.	INTEGRATION OF STATE VECTOR.	13-11	NOT ASSIGNED, SHOULD BE ZERO.		10	USED IN TEST PROGRAMS, SHOULD BE ZERO.		9	TOTAL ATTITUDE ERROR DISPLAY.	DAP FOLLOWING ERROR DISPLAY.	8	IMU IN USE.	IMU NOT IN USE.	7	PROGRAM 20 IS RUNNING.		6	REQUEST FOR OPTICS MARK INITIATED VERB 51 FLASHING.	
BIT	SET	RESET																											
15	OUTPUT OF CALCGA IS CφX.	OUTPUT OF CALCGA IS THETAD.																											
14	INTEGRATION OF W MATRIX.	INTEGRATION OF STATE VECTOR.																											
13-11	NOT ASSIGNED, SHOULD BE ZERO.																												
10	USED IN TEST PROGRAMS, SHOULD BE ZERO.																												
9	TOTAL ATTITUDE ERROR DISPLAY.	DAP FOLLOWING ERROR DISPLAY.																											
8	IMU IN USE.	IMU NOT IN USE.																											
7	PROGRAM 20 IS RUNNING.																												
6	REQUEST FOR OPTICS MARK INITIATED VERB 51 FLASHING.																												
	CPH1XCMP J SWITCH																												
	COAROFIN NEEDFLG																												
	IMUSE RNDVZFLG R53FLG																												

RENDEZVOUS AND PRETHRUST - Continued  
TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
41A	FLAGWORD 0			
	TRUNFLG	5	NOT ASSIGNED, SHOULD REMAIN ZERO.	
	FREEFLG	4	DRIVING OF OPTICS TRUNNION IS ALLOWED.	
		3	USED TO CONTROL INTERNAL SUBROUTINE PERFORMANCE.	
	ESCAPESW	1	ORBIT HYPERBOLIC.	ORBIT ELLIPTIC
41B	FLAGWORD 1			
	NJETSFLAG	15	2 JET X-TRANSLATION WITH CSM-RCS DAP.	4 JET X-TRANSLATION WITH CSM-RCS DAP.
	ST1KFLAG	14	RHC IN CONTROL OF CSM-RCS DAP.	CMC IN CONTROL CSM-RCS DAP.
	ERADFLAG	13	USE FISCHER ELLIPSOID FOR EARTHS RADIUS (P22).	USE CONSTANT EARTH PAD RADIUS.
	R31FLAG	12	V83 REND PARAM DISPLAY.	V85 REND PARAM DISPLAY.
	ENG2FLAG	11	NOT USED IN REND AND PRETHRUST LIST.	
	TARG1FLAG	10	INDICATES THAT TRACKING OF THE LM AS A TRAGET REQUIRED IN P20.	
	TARG2FLAG	9	INDICATES TRACKING OF LANDMARK REQUIRED IN P22.	
	VEHUPFLG	8	CSM STATE VECTOR BEING UPDATED.	LM STATE VECTOR BEING UPDATED.
	UPDATFLG	7	INDICATES	
	ONFLAG	6	NOT USED, SHOULD BE ZERO.	
	TRACKFLG	5	INDICATES P20 IS ALLOWED.	
	ITER1SW	3	USED TO SELECT ITERATOR ROUTINE IN LAMBERT COMPUTATION.	
	GUESSSW	2	SET TO ONE TO INDICATE INITIAL VALUE FOR ITERATION IN LAMBERT ROUTINE IS AVAILABLE.	
	AVEGFLAG	1	NOT USED IN REND AND PRETHRUST LIST.	
42A	FLAGWORD 2			
	DRIFTFLG	15	PLATFORM ALIGNMENT COMPENSATED FOR IRIG DRIFT EVERY 82 SEC.	
	R21MARK	14	INDICATES TO OPTICS MARK RECEPTION ROUTINE THAT DIFFERENT PROCESSING UPON MARK RECEPTION IS REQUIRED. (P20).	
		3-12	NOT ASSIGNED, SHOULD BE ZERO.	
	STEERSW	11	NOT USED IN REND AND PRETHRUST LIST.	
	CYCLESW	10	NOT USED IN REND AND PRETHRUST LIST.	
	IMPULSW	9	NOT USED IN REND AND PRETHRUST LIST.	
	XDELVFLG	8	EXTERNAL ΔV BURN.	LAMBERT BURN.
	ETPIFLG	7	ELEVATION INFORMATION WAS INPUT IN P34/P74.	TPI TIME WAS INPUT IN P34/P74.
	RPEATFLG	7	LANDMARK COORDINATES ARE STORED (P22).	
FINALFLG	6	FINAL ELEVATION TO BE DONE REQUIRING PROCEED RESPONSE TO V16N45 IN P34/P74.		

\*\*

RENDEZVOUS AND PRETHRUST - Continued  
TRANSMITTED IN PROGRAMS 20, 21, 22, 23, 30, 34, 35, 74, 75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
42A	FLAGWORD 2 AVFLAG  PFRATFLG CALCMAN3  CALCMAN2  NODOFLAG	5	IN P74/P75 INDICATES LM IS ACTIVE VEHICLE IN P30 SET TO CAUSE MIDDLE GIMBAL ANGLE TO BE COMPUTED FOR NOUN 45.	IN P34/P35 INDICATES CSM IS ACTIVE VEHICLE.
		4	NOT USED IN REND AND PRETHRUST LIST.	
		3	SET TO ONE AT THE END OF CALCULATION OF A LARGE ATTITUDE MANEUVER TO INDICATE THAT NO GIMBAL LOCK AVOIDANCE IS REQUIRED.	
		2	USED IN MANEUVER CALCULATIONS. UNLIKELY THAT CHANGES WILL BE NOTED ON TELEMETRY.	
		1	MAJOR MODE CHANGE TO POO ONLY ALLOWED.	MAJOR MODE CHANGE TO ANY PROGRAM ALLOWED.
42B	FLAGWORD 3 AUTMANSW GLOKFAIL  REFSMFLG  STBYFLAG VFLAG ONMONFLAG  CULTFLAG ORBWFLAG  STATEFLG  INTYPFLAG  VINTFLAG  D60R9FLG  DIMOFLAG	15	MANUAL MANEUVER DESIRED.	AUTOMATIC MANEUVER DESIRED.
		14	GIMBAL ANGLE CALCULATION DETERMINES MIDDLE GIMBAL ANGLE OF >60° WILL OCCUR. GENERATES ALARM 4018.	
		13	REFSMAT IS GOOD.	ZEROED WITH COARSE ALIGN, GAGE, SHUTDOWN AND DURING ALIGNMENT PROGRAMS INDICATING REFSMAT NO GOOD AT THIS TIME.
		12	NOT ASSIGNED, SHOULD BE ZERO.	
		11	NOT USED IN REND AND PRETHRUST LIST.	
		10	NOT USED IN REND AND PRETHRUST LIST.	
		9	NOT USED IN REND AND PRETHRUST LIST.	
		8	NOT ASSIGNED, SHOULD BE ZERO.	
		7	NOT USED IN REND AND PRETHRUST LIST.	
		6	W MATRIX VALID FOR ORBITAL RENDEZVOUS NAVIGATION.	
		5	STATE VECTOR TO BE UPDATED.	STATE VECTOR HAS BEEN UPDATED OR WILL NOT BE UPDATED.
		4	CONIC INTEGRATION WILL BE PERFORMED.	ENCKE (PRECISION) INTEGRATION WILL BE PERFORMED.
		3	CSM STATE VECTOR TO BE INTEGRATED.	LM STATE VECTOR TO BE INTEGRATED.
		2	W MATRIX INTEGRATION WILL BE 9X9 DIMENSION.	W MATRIX INTEGRATION WILL BE 6X6 DIMENSION.
		1	W MATRIX WILL BE INTEGRATED.	

RENDEZVOUS AND PRETHRUST - Continued  
TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
43A	FLAGWORD 4 MRKIDFLG	15	MARK OR EXTENDED VERB DISPLAY IS WAITING FOR A RESPONSE.	NO MARK OR EXTENDED VERB DISPLAY WAITING.
	PRIODFLG	14	PRIORITY DISPLAY IS WAITING FOR A RESPONSE.	NO PRIORITY DISPLAY WAITING.
	ENDIOFLG	13	PRIORITY OR NORMAL DISPLAY IS WAITING FOR A RESPONSE.	NEITHER PRIORITY OR NORMAL DISPLAY IS WAITING.
	NRMIDFLG	12	NORMAL DISPLAY IS WAITING FOR A RESPONSE.	NO NORMAL DISPLAY WAITING.
	MWAITFLG	11	NOT PRESENTLY PROGRAMED.	SHOULD BE ZERO.
	NWAITFLG	10	NORMAL DISPLAY IS WAITING TO BE INITIATED.	NO NORMAL DISPLAY WAITING.
	MRKNVFLG	9	MARK OR EXTENDED VERB DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.	
	NRMNVFLG	8	NORMAL DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.	
	PRONVFLG	7	PRIORITY DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.	
	PINBRFLG	6	INTERFERENCE WITH AN INTERNALLY GENERATED DISPLAY HAS OCCURRED OR TERMINATE HAS OCCURRED WITH BIT 13 OF THIS FLAGWORD = 1.	
	MRUPTFLG	5	BIT SET TO ONE WHEN A MARK OR EXTENDED VERB DISPLAY HAS BEEN INTERRUPTED BY A PRIORITY DISPLAY.	
	NRUPTFLG	4	BIT SET TO ONE WHEN A NORMAL DISPLAY IS INTERRUPTED BY A MARK OR EXTENDED VERB DISPLAY, OR A PRIORITY DISPLAY.	
	MRKOVFLG	3	BIT SET TO ONE WHEN A MARK OR EXTENDED VERB DISPLAY IS TO INTERRUPT A NORMAL DISPLAY.	
RET1FLG	2	NOT PROGRAMED. SHOULD BE ZERO.		
		1	NOT ASSIGNED. SHOULD BE ZERO.	
43B	FLAGWORD 5 DSKYFLG	15	DISPLAY SENT TO DSKY.	
	INTFLAG2	14	ORBITAL INTEGRATION PACKAGE IN USE.	
	INTFLAG3	13	SET IF RESTART PHASE CHANGE OCCURS TO PREVENT RESET OF BIT 14 IF RESTART OCCURS.	
	V59FLAG	12	DISPLAY CALIBRATION INFORMATION WITH V59 IN P23.	SET TO ZERO IF A PROCEED RESPONSE OR MARK IS MADE WITH V59 IN P23.
	INCORFLG	11	FIRST INCORPORATION OF OBSERVATION DATA FROM MARK IS BEING MADE.	
			10	NOT ASSIGNED. SHOULD BE ZERO.

RENDEZVOUS AND PRETHRUST - Continued  
TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
43B	FLAGWORD 5 DMENFLG	9	INDICATES THAT MEASURE- MENT INCORPORATION ROUTINE SHOULD CONSIDER THE W MATRIX AS HAVING 9X9 DIMENSION FOR UPDATING BASED ON OPTICS MARK IN P22.	INDICATES W MATRIX MUST BE INITIALIZED IN P22.
	COMPUTER	8	INDICATES COMPUTER IS CSM COMPUTER.	INDICATES COMPUTER IS LGC.
	ENGNFLG 3AXISFLG	7 6	NOT USED IN REND AND PRETHRUST LIST. INDICATES AN ATTITUDE MANEUVER IS SPECIFIED BY 3 ANGLES.	ATTITUDE MANEUVER IS SPECIFIED BY OTHER MEANS.
	GRRBFLG NOSOLNSW	5 4	NOT USED IN REND AND PRETHRUST LIST. INDICATES LAMBERT PACK- AGE HAS FAILED TO DE- LIVER A SOLUTION. GENERATED ALARM 6078.	
	MGLVFLAG	2	VELOCITY CHANGE IN LOCAL VERTICAL COORDINATES HAS BEEN COMPUTED (P40,P41, P74,P75).	MIDDLE GIMBAL ANGLE AT IGNITION HAS BEEN COM- PUTED (P30,P34,P35).
	RENDWFLAG	1	W MATRIX IS VALID FOR RENDEZVOUS NAVIGATION (P20).	
44A	FLAGWORD 6	BIT	SET	RESET
	DAP BIT 1	15	INDICATE 0{ NO DAP 1{TVC 0{ CSM 1{SATURN	
	DAP BIT 2	14	DAP STATUS 0{OR ENTRY 0{DAP 1{RCS 1{ DAP	
	DLBARFLG AND LEWDSW	13	NOT USED IN COAST AND ALIGN.	
	CMDAPARM	12	NOT USED IN COAST AND ALIGN.	
	GAMDIFSW	11	NOT USED IN COAST AND ALIGN.	
	GONEPAST	10	NOT USED IN COAST AND ALIGN.	
	RELVELSW	9	NOT USED IN COAST AND ALIGN.	
	KNOWNFLG AND EGSW	8	NOT USED IN COAST AND ALIGN.	
	HUNTSW1	7	NOT USED IN COAST AND ALIGN.	
	HIND	6	NOT USED IN COAST AND ALIGN.	
	INRLSW	5	NOT USED IN COAST AND ALIGN.	
	LATSW	4	NOT USED IN COAST AND ALIGN.	
	.05GSW	3	NOT USED IN COAST AND ALIGN.	
CMDSTBY	2	NOT USED IN COAST AND ALIGN.		
GYMDIFSW	1	NOT USED IN COAST AND ALIGN.		
44B	FLAGWORD 7 TERMIFLAG	BIT	SET	RESET
		15	INDICATES COMPUTATIONS IN ROUTINE 22 OF P20 TO BE HALTED.	
		14	NOT ASSIGNED, SHOULD BE ZERO.	
	IGNFLAG	13	NOT USED IN REND AND PRETHRUST LIST.	
	ASTNFLAG	12	NOT USED IN REND AND PRETHRUST LIST.	
	TIMRFLAG	11	NOT USED IN REND AND PRETHRUST LIST.	
	UNNORMSW	10	NOT USED IN REND AND PRETHRUST LIST.	
	TIMODESW	9	NOT PROGRAMED, SHOULD REMAIN ZERO.	
	GONEBY	8	NOT USED IN REND AND PRETHRUST LIST.	
	IDLEFLAG	7	NOT USED IN REND AND PRETHRUST LIST.	
V37FLAG	6	NOT USED IN REND AND PRETHRUST LIST.		
	5	NOT ASSIGNED, SHOULD BE ZERO.		
UPLOCKFL	4	NOT USED IN REND AND PRETHRUST LIST.		
VERIFLAG	3	NOT USED IN REND AND PRETHRUST LIST.		

RENDEZVOUS AND PRETHRUST - Continued  
TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
44B	FLAGWORD 7 ATTCHFLAG	2	LM ATTACHED FOR CSM-RCS DAP COMPUTATION.	LM NOT ATTACHED.
	TFFSW	1	NOT USED IN REND AND PRETHRUST LIST.	
45A 45B 46A 46B 47A 47B 48A 48B 49A 49B 50A	DSPTAB + 0 DSPTAB + 1 DSPTAB + 2 DSPTAB + 3 DSPTAB + 4 DSPTAB + 5 DSPTAB + 6 DSPTAB + 7 DSPTAB + 8 DSPTAB + 9 DSPTAB + 10	DISPLAY TABLE CODES FOR GENERATION DSKY NUMERICS.  USED TO INDICATE VERB-NOUN, MAJOR MODE AND R <sub>1</sub> R <sub>2</sub> R <sub>3</sub> DISPLAYS.		
50B	DSPTAB + 11	DISPLAY TABLE TO DSKY STATUS LIGHTS. 60400g = PROGRAM CAUTION, 60200g = TRACKER WARNING 60020g = NO ATTITUDE, 60040g = GIMBAL LOCK		
51A 51B	TNOW	COMPUTER CLOCK INDICATING TIME SINCE LIFTOFF. UPDATED BY V55E OR V73E.		
52A 52B 53A 53B 54A 54B	R <sub>X</sub> X COMPONENT OF "OTHER" VEHICLE POSITION R <sub>Y</sub> Y COMPONENT OF "OTHER" VEHICLE POSITION R <sub>Z</sub> Z COMPONENT OF "OTHER" VEHICLE POSITION	LM ("OTHER") STATE VECTOR		
55A 55B 56A 56B 57A 57B	V <sub>X</sub> X COMPONENT OF "OTHER" VEHICLE VELOCITY V <sub>Y</sub> Y COMPONENT OF "OTHER" VEHICLE VELOCITY V <sub>Z</sub> Z COMPONENT OF "OTHER" VEHICLE VELOCITY			
58A 58B	TETLM	TIME TAG FOR LM (OTHER) STATE VECTOR		
59A 59B 60A 60B 61A 61B 62A 62B 63A 63B	REDOCTR THETAD THETAD THETAD ADOTX ADOTY ADOTZ	SAME AS 9A SAME AS 9B SAME AS 10A SAME AS 10B SAME AS 11A, 11B SAME AS 12A, 12B SAME AS 13A, 13B		
64A	SPARE			
64B	CADRFLSH	VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED PRIORITY DISPLAY (FW4 BIT 14=1).		
65A 65B	TPI	TIME OF TRANSFER PHASE INITIATION SET IN P34/P74 TO ONE HOUR FROM NOW. IT CAN ALSO BE LOADED BY NOUN 37.		

RENDEZVOUS AND PRETHRUST - Continued  
 TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
66A 66B	TPASS4	TIME OF INTERCEPT COMPUTED AS SUM OF TPI AND (T3 TO T4) IN P34/P74.
67A 67B 68A 68B 69A 69B	DELVEET <sub>4X</sub>  DELVEET <sub>4Y</sub>  DELVEET <sub>4Z</sub>	X, Y, AND Z COMPONENT OF VELOCITY VECTOR INCREMENT REQUIRED AT INTERCEPT. (DIFFERENCE BETWEEN VELOCITY VECTOR OF PASSIVE VEHICLE AND PREDICTED VELOCITY OF ACTIVE VEHICLE AT THIS TIME) COMPUTED IN P34/P74 AND P35/P75.
70A 70B	SPARES	
71A 71B 72A 72B	AK0 (ROLL ATTITUDE ERROR) AK1 (PITCH ATTITUDE ERROR) AK2 (YAW ATTITUDE ERROR) NOT USED IN REND AND PRETHRUST LIST.	VEHICLE ATTITUDE ERRORS SENT TO FDAI NEEDLES THRU ECDU. DURING P11 ACTUAL VALUE DIVIDED BY FOUR SO THAT MAX ERROR IS (4X16-2/3)°. DURING RCS DAP EITHER TOTAL ATTITUDE ERROR OR DAP FOLLOWING ERROR (DETERMINED BY FW0 BIT 9) IS DISPLAYED.
73A 73B 74A 74B 75A 75B	RTARGX  RTARGY  RTARGZ	X, Y, AND Z COMPONENTS OF TARGET POSITION VECTOR FOR LAMBERT GUIDANCE COMPUTED IN P34/P74 AND P35/P75.
76A 76B 77A	THETADX THETADY THETADZ	X, Y, AND Z INTERMEDIATE DESIRED CDU ANGLES COMPUTED IN CSM-RCS DAP ONLY.
77B	DELCDUXSP	MOST SIGNIFICANT HALF OF THETADX
78A 78B 79A 79B 80A 80B 81A 81B		SAME AS WORDS 28A THROUGH 31B
82A 82B	ELEV	VALUE OF THE ELEVATION ANGLE (R2 OF NOUN 55 DISPLAY)
83A 83B	TIG	VALUE OF IGNITION TIME DISPLAYED BY NOUN 33
84A 84B	T3 TO T4	SPECIFIED VALUE OF TRANSFER TIME COMPUTED ONLY IN P34.

RENDEZVOUS AND PRETHRUST - Continued  
TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
85A	DAPDATAR1 LOADED WITH V48N46E	BIT	SET	RESET
		15	NOT USED, SHOULD BE ZERO.	
		14	0 } NO DAP 1 } LM-ON	0 } LM-OFF 1 } SATURN
			OR	
		13	0 } ENTRY 0 } RCS DAP 1 } RCS DAP 1 } DAP	
		12-11	NOT USED, SHOULD BE ZERO.	
		10	USE A/C QUAD (RCS JETS).	IF BIT 7=0 USE A/C AND B/D.
		9-8	NOT USED, SHOULD BE ZERO.	
		7	USE B/D QUAD (RCS JETS).	IF BIT 10=0 USE A/C AND B/D.
		6-5	NOT USED, SHOULD BE ZERO.	
		4	5° DEADBAND.	0.5° DEADBAND.
		3	NOT USED, SHOULD BE ZERO.	
		2	SPECIFY 0 } .05° 0 } .02° 1 } .5° 1 } 4°	
1	MANEUVER RATE 0 } / 1 } / 0 } / 1 } /			
85B	DAPDATAR2 LOADED WITH V48N46E	BIT	SET	RESET
		15-14	NOT USED, SHOULD BE ZERO.	
		13	USE A/C QUAD FOR ROLL.	USE B/D QUAD FOR ROLL.
		12-11	NOT USED SHOULD BE ZERO.	
		10	USE OF A QUAD ALLOWED.	USE OF A QUAD NOT ALLOWED.
		9-8	NOT USED, SHOULD BE ZERO.	
		7	USE OF B QUAD ALLOWED.	USE OF B QUAD NOT ALLOWED.
		6-5	NOT USED, SHOULD BE ZERO.	
		4	USE OF C QUAD ALLOWED.	USE OF C QUAD NOT ALLOWED.
		3-2	NOT USED, SHOULD BE ZERO.	
1	USE OF D QUAD ALLOWED.	USE OF D QUAD NOT ALLOWED.		
86A 86B	RSBBQ	VALUE OF BBANK AND Q REGISTERS AT THE TIME OF A RESTART. USED TO DETERMINE LOCATION OF RESTART OCCURRENCE.		
87A	ALRMCADR + 0	CONTAINS REGISTER PORTION OF 1ST ADDRESS FOLLOWING MOST RECENT ALARM.		
87B	ALRMCADR + 1	BBANK PORTION OF THE 1ST ADDRESS FOLLOWING MOST RECENT ALARM.		
88A	IMODES 30 BITS 15 THROUGH 9 ARE LAST SAMPLED VALUE OF CHANNEL 30 EXCEPT FOR BIT 10 WHICH IS LAST SAMPLED VALUE OF CHAN 33 BIT 13.	BIT	SET	RESET
		15	IMU TEMP OUT OF LIMITS. (CHANNEL 11 BIT 4 IS SET	IMU TEMP WITHIN LIMITS. TO AGREE WITH THIS BIT).
		14	NO ISS TURN-ON REQUEST.	ISS TURN-ON REQUEST HAS OCCURRED.
		13	NO IMU FAIL.	IMU FAIL HAS OCCURRED. IF BIT 4 OF THIS WORD IS ALSO ZERO, SET CHAN 11 BIT 1=1.
		12	NO ECDU FAIL	ECDU FAIL HAS OCCURRED. IF BIT 3 OF THIS WORD IS ALSO ZERO, SET CHAN 11 BIT 1=1.
		11	NO IMU CAGE COMMAND	IMU CAGE COMMANDED.
		10		PIPA FAIL HAS OCCURRED. IF BIT 1 OF THIS WORD IS ALSO ZERO, SET CHAN 11 BIT 1=1.
		9	IMU NOT OPERATING.	IMU OPERATING.
		8	BIT USED IN IMU TURN-ON SEQUENCING. SET FOR .48 SEC WILL MOST LIKELY BE ZERO.	
		7	BIT USED IN IMU TURN-ON SEQUENCING. SET FOR .48 SEC WILL MOST LIKELY BE ZERO.	



RENDEZVOUS AND PRETHRUST - Continued  
 TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
88A	IMODES 30	6	IMU INITIALIZATION BEING ACCOMPLISHED (CAGE CMD, IMU ZEROING, TURN-ON DELAY ALL SET THIS BIT).	IMU NOT IN INITIALIZATION.
		5	INHIBIT ALARM 2128 IF PIPA FAIL OCCURS DURING TURN-ON SEQUENCING.	
		4	INHIBIT ISS WARNING BASED ON IMU FAIL (OCCURS DURING TURN-ON DELAY AND COARSE ALIGN).	ISS WARNING NOT INHIBITED.
		3	INHIBIT ISS WARNING BASED ON ECDU FAIL (OCCURS DURING TURN-ON DELAY AND IMU ZERO).	ISS WARNING NOT INHIBITED.
		2	INDICATES TURN-ON DELAY FAILURE ALONG WITH ALARM 2078.	NO TURN-ON DELAY FAILURE.
		1	INHIBIT ISS WARNING BASED ON PIPA FAIL. (BIT IS ONE UNLESS AVERAGE "G" IS RUNNING.	ISS WARNING NOT INHIBITED (AVERAGE G IS RUNNING).
88B	IMODES 33	15	NOT ASSIGNED, SHOULD REMAIN ZERO.	
		14	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 30 BIT 14.	SET TO ZERO WHEN STANDBY BUTTON ON DSKY IS PRESSED (CONTROLS PROCEED FUNCTION THE SAME AS V33E).
		13	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 13.	SET TO ZERO IF PIPA FAIL HAS OCCURRED.
		12	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 12.	SET TO ZERO IF TELEMETRY DOWNLINK IS TOO FAST.
		11	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 11.	SET TO ZERO IF UPLINK IS TOO FAST.
		10-7	NOT ASSIGNED, SHOULD REMAIN ZERO.	
		6	IMU USE FOR VEHICLE ATTITUDE SHOULD NOT BE ATTEMPTED. SET TO ONE IN COARSE ALIGN AND IMU ZEROING.	SET OF ZERO AFTER FINE ALIGN ROUTINE.
		5	SET TO ONE DURING IMU ZEROING ROUTINE (V40N20E).	NOT EXPECTED TO BE USED IN FLIGHT.
		4-3	NOT ASSIGNED, SHOULD BE ZERO.	
		2	USED IN GROUND TESTING ONLY.	
		1	SET TO ONE WITH V35E (LAMP TEST) FOR 5 SEC.	
89A	CDUX	SAME AS 39A		
89B	CDUY	SAME AS 39B		
90A	CDUZ	SAME AS 40A		
90B	CDUT	SAME AS 40B		

RENDEZVOUS AND PRETHRUST - Continued  
 TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
91A	CHANNEL 11	BIT 15-14 13	NOT ASSIGNED, SHOULD BE ZERO. SET TO ONE FOR SPS ENGINE ON, NOT USED IN COAST AND ALIGN.
		12-11 10	NOT ASSIGNED, SHOULD BE ZERO. SET 1 WHEN ERROR RESET KEYCODE FROM UPLINK OR DSKY IS RECEIVED.
		9	TEST CONNECTOR OUTPUT SET TO ONE 2 SECONDS AFTER AVE G STARTS AND REMAINS 1 UNTIL AVE G END.
		8	NOT ASSIGNED, SHOULD BE ZERO.
		7	SET TO ONE WHEN OPERATOR ERROR HAS OCCURRED. RESET WITH ERROR RESET VIA DSKY OR UPLINK.
		6	SET TO 1 WHEN OPERATOR ACTION IS REQUIRED (DSKY IS FLASHING).
		5	SET TO 1 WITH KEY RELEASE LIGHT INDICATING PROGRAM DESIRES USE OF DSKY DISPLAYS.
		4	SET TO ONE WHEN THE IMU TEMP IS OUT OF LIMITS.
		3	SET TO 1 WHEN UPLINK INTERRUPT OCCURS INDICATING UPLINK ACTIVITY.
		2	SET TO 1 WHEN COMPUTER IS WORKING ON AN ACTIVE JOB. GENERATES COMPUTER ACTIVITY LIGHT.
		1	SET TO 1 WITH ISS WARNING. SETS ISS WARNING LIGHT.
91B	CHANNEL 12	BIT 15	SET TO ONE 4 SECONDS AT THE END OF THE ISS 90 SEC TURN-ON DELAY INDICATING TURN-ON DELAY COMPLETE.
		14	S-IVB CUTOFF COMMAND. NOT EXPECTED TO BE USED DURING FLIGHT.
		13	S-IVB INJECTION SEQUENCING START NOT EXPECTED TO BE USED DURING FLIGHT.
		12	NOT ASSIGNED, SHOULD BE ZERO.
		11	DISENGAGE OPTICS DAC NOT EXPECTED TO BE USED.
		10	ZERO OPTICS COMMAND NOT EXPECTED TO BE USED.
		9	SET TO ONE WITH V46E IF BITS 14-13 OF DAPDATARI = 1 SETS S-IVB TAKEOVER ENABLE.
		8	SET TO ONE IN P40 IF TVC DAP IS GOING TO BE USED. SETS TVC DAP ENABLE.
		7	NOT ASSIGNED, SHOULD BE ZERO.
		6	IMU CDU ERROR COUNTER ENABLE SET TO ONE DURING COARSE ALIGN, S-IVB TAKEOVER AND ATTITUDE ERRORS TO FDAI.
		5	IMU CDU ZERO COMMAND. SET TO ONE ANYTIME IMU CDU READ COUNTERS ARE TO BE ZEROED.
		4	IMU COARSE ALIGN ENABLE. SET TO ONE ANYTIME IMU IS TO BE COARSE ALIGNED.
		3	NOT USED.
		2	OPTICS CDU ERROR COUNTER ENABLE. SET TO ONE DURING OPTICS COARSE ALIGN OR TVC DAP ENABLE.
		1	ZERO OPTICS CDU. SET TO ONE FOR 0.2 SEC AT THE END OF OPTICS ZEROING SEQUENCE. BECAUSE OF SHORT SET TIME IT SHOULD BE ZERO.

RENDEZVOUS AND PRETHRUST - Continued  
TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
92A	CHANNEL 13	BIT 15	T6RUPRT ENABLE. ONE ENABLES THE TIME 6 COUNTER TO START COUNTING DOWN FOR RCS JET ON TIME. USED IN CSM-RCS DAP AND TVC ROLL DAP.
		14	NOT EXPECTED TO BE USED, SHOULD BE ZERO.
		13	NOT EXPECTED TO BE USED, SHOULD BE ZERO.
		12	NOT EXPECTED TO BE USED, SHOULD BE ZERO.
		11	SET TO ONE AT THE END OF P06 TO ENABLE STANDBY BUTTON TO DOWNMODE THE COMPUTER TO STANDBY.
		10	SET TO 1 BY V35E (LAMP TEST). REMAINS 1 FOR 5 SEC.
		9	NOT ASSIGNED, SHOULD BE ZERO.
		8	NOT USED, SHOULD BE ZERO.
		7	WORD ORDER CODE BIT 1, EXCEPT FOR WORDS 1 AND 51.
		6	BLOCK UPLINK NOT SET BY PROGRAM.
		5	NOT USED, SHOULD BE ZERO.
		4-1	NOT ASSIGNED, SHOULD BE ZERO.
92B	CHANNEL 14	BIT 15	XCDU DRIVE ENABLE. ENABLES PULSES TO BE SENT FROM COMPUTER TO XCDU ERROR COUNTER.
		14	YCDU DRIVE ENABLE.
		13	ZCDU DRIVE ENABLE.
		12	TRUNNION CDU DRIVE ENABLE. ENABLES PULSES TO BE SENT TO TRUNNION CDU ERROR COUNTER FOR EITHER OPTICS COARSE ALIGN OR TVC YAW AXIS COMMAND.
		11	SHAFT CDU DRIVE ENABLE. ALSO TVC PITCH AXIS COMMAND.
		10	ENABLE GYRO TORQUEING. ENABLES PULSES TO BE SENT FROM COMPUTER TO GYRO PULSE TORQUE ELECTRONICS.
		9	BIT SET TO ONE TO INDICATE NEGATIVE GYRO TORQUE.
		8	0{ NO TORQUE 1{ TORQUE 1{ TORQUE 1{ TORQUE
		7	0{ X-AXIS GYRO 1{ X-AXIS GYRO 0{ Y-AXIS GYRO 1{ Y-AXIS GYRO
		6	SET TO ONE TO ENABLE GYRO PULSE TORQUE POWER SUPPLY.
		5	NOT USED.
		4-2	NOT ASSIGNED.
		1	NOT USED.
93A	CHANNEL 30	BIT 15	ZERO IF IMU TEMP WITHIN LIMITS.
		14	ZERO IF ISS IS ON OR COMMANDED ON.
		13	ZERO IF IMU FAIL HAS OCCURRED.
		12	ZERO IF IMU CDU FAIL HAS OCCURRED.
		11	ZERO IF IMU CAGE HAS BEEN COMMANDED.
		10	ZERO IF LV GUIDANCE SW IN CMC POSITION. S/C CONTROL OF SATURN.
		9	ZERO IF IMU OPERATING WITH NO MALFUNCTIONS.
		8	NOT ASSIGNED, SHOULD BE ZERO.
		7	ZERO IF OPTICS CDU FAIL HAS OCCURRED.
		6	ZERO IF GUIDANCE REFERENCE RELEASE HAS OCCURRED.
		5	ZERO IF LIFTOFF HAS OCCURRED CAUSES CHANGE FROM P02 TO P11.
		4	ZERO IF S-IVB SEPARATION OR ABORT HAS OCCURRED.
		3	ZERO WHEN SPS ENGINE BURN PREPARATIONS ARE COMPLETE.
		2	ZERO IF CM/SM SEPARATION HAS OCCURRED.
		1	ZERO IF ULLAGE THRUST FROM S-IVB PRESENT.

RENDEZVOUS AND PRETHRUST - Concluded

TRANSMITTED IN PROGRAMS 20,21,22,23,30,34,35,74,75

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
93B	CHANNEL 31  THC INPUTS }  RHC INPUTS }	BIT 15  14 13  12 11 10 9 8 7 6 5 4 3 2 1	SET TO ZERO IF COMPUTER IS IN CONTROL OF THE SPACECRAFT. SET TO ONE BY G&N AUTOPILOT CONTROL SWITCH OFF OR IMU OFF. ZERO IF RCS DAP FREE MODE IS SELECTED. ZERO IF RCS DAP HOLD MODE IS SELECTED. IF BITS 14 AND 13 = 112 AUTOMATIC MODE SELECTED. ZERO IF -Z TRANSLATION COMMANDED. ZERO IF +Z TRANSLATION COMMANDED. ZERO IF -Y TRANSLATION COMMANDED. ZERO IF +Y TRANSLATION COMMANDED. ZERO IF -X TRANSLATION COMMANDED. ZERO IF +X TRANSLATION COMMANDED. ZERO IF -ROLL COMMANDED. ZERO IF +ROLL COMMANDED. ZERO IF -YAW COMMANDED. ZERO IF +YAW COMMANDED. ZERO IF -PITCH COMMANDED. ZERO IF +PITCH COMMANDED.
94A	CHANNEL 32  MINIMUM IMPULSE CONTROLLER INPUTS }	BIT 15 14  13-12 11 10-7 6 5 4 3 2 1	NOT ASSIGNED, SHOULD BE ZERO. ZERO IF PROCEED KEY (FORMERLY STANDBY) ON DSKY IS PRESSED. NOT ASSIGNED, SHOULD BE ZERO. NOT USED IN S/C 101. NOT ASSIGNED, SHOULD BE ZERO. ZERO IF -ROLL COMMANDED. ZERO IF +ROLL COMMANDED. ZERO IF -YAW COMMANDED. ZERO IF +YAW COMMANDED. ZERO IF -PITCH COMMANDED. ZERO IF +PITCH COMMANDED.
94B	CHANNEL 33	BIT 15 14 13 12 11 10  9-8 7 6 5 4 3-1	ZERO IF COMPUTER OSCILLATOR HAS STOPPED. ZERO IF CMC WARNING HAS OCCURRED. ZERO IF PIPA FAIL HAS OCCURRED. ZERO IF TELEMETRY DOWNLINK IS TOO FAST. ZERO IF UPLINK TOO FAST. ZERO IF BLOCK UPLINK SWITCH IN SPACECRAFT IS SET TO BLOCK. NOT ASSIGNED, SHOULD BE ZERO. NOT USED. NOT USED. ZERO IF CMC CONTROL OF OPTICS IS SET. ZERO IF ZERO OPTICS IS SET. NOT ASSIGNED, SHOULD BE ZERO.
95A 95B 96A 96B 97A 97B 98A 98B 99A 99B 100A 100B	DSPTAB + 0 DSPTAB + 1 DSPTAB + 2 DSPTAB + 3 DSPTAB + 4 DSPTAB + 5 DSPTAB + 6 DSPTAB + 7 DSPTAB + 8 DSPTAB + 9 DSPTAB + 10 DSPTAB + 11	SAME AS 45A TO 50B	

POWERED

\*\*

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
1A 1B	POWERED LIST ID SYNC BITS	(00245)8 INDICATES POWERED LIST BEING SENT. (77340)8 INDICATES DATA TO FOLLOW.	
2A 2B	R <sub>X</sub> X COMPONENT OF VEHICLE POSITION VECTOR	CSM VEHICLE STATE VECTOR AND TIME	
3A 3B	R <sub>Y</sub> Y COMPONENT OF VEHICLE POSITION VECTOR		
4A 4B	R <sub>Z</sub> Z COMPONENT OF VEHICLE POSITION VECTOR		
5A 5B	V <sub>X</sub> X COMPONENT OF VEHICLE VELOCITY VECTOR		
6A 6B	V <sub>Y</sub> Y COMPONENT OF VEHICLE VELOCITY VECTOR		
7A 7B	V <sub>Z</sub> Z COMPONENT OF VEHICLE VELOCITY VECTOR		
8A 8B	T <sub>SV</sub> TIME TAG FOR R AND V		
9A	REDOCTR	INDICATES THE NUMBER OF RESTARTS THAT HAVE OCCURRED SINCE THE LAST FRESH START (V36E)	
9B	THETAD FINAL DESIRED XCDU ANGLE	FINAL DESIRED CDU ANGLES DURING COARSE ALIGN OR ATTITUDE MANEUVERS. PREFERRED ATTITUDE DURING ORBITAL NAVIGATION (P20) AND AUTO OPTICS POSITIONING. INDICATE REORIENTATION ANGLES DURING ENTRY (P62).	
10A	THETAD FINAL DESIRED YCDU ANGLE		
10B	THETAD FINAL DESIRED ZCDU ANGLE		
11A 11B	CSM-RCS DAP ON TVC DAP ON ADOTX YERRB	MEASURED BODY RATES ABOUT CONTROL AXES ANY TIME CSM-RCS DAP IS ON FW6, BIT 15=0, 14=1	TVC DAP ON
12A 12B	ADOTY DELPBAR		YAW ATTITUDE ERROR COMPUTED AS INTEGRAL OF YAW RATE ERROR. PITCH ACTUATOR OFFSET W.R.T. ELECTRICAL NULL. INITIALLY SET TO PACTOFF THEN UPDATED EVERY DAP CYCLE.
13A 13B	ADOTZ DELYBAR		YAW ACTUATOR OFFSET W.R.T. ELECTRICAL NULL. INITIALLY SET TO YACTOFF THEN UPDATED EVERY DAP CYCLE.
14A 14B	VIPRIMEX	X, Y, AND Z COMPONENTS OF VELOCITY VECTOR REQUIRED AT IGNITION TIME FOR LAMBERT BURN.	
15A 15B	VIPRIMEY		
16A 16B	VIPRIMEZ		

POWERED - Continued

::

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION		REAL-TIME SIGNIFICANCE	
17A 17B 18A 18B 19A 19B	BDT <sub>X</sub>  BDT <sub>Y</sub>  BDT <sub>Z</sub>		X, Y, AND Z COMPONENTS OF THE EFFECT RATE OF CHANGE OF VELOCITY AND GRAVITY UPON VELOCITY TO BE GAINED. MEASURED IN REFERENCE COORDINATES. USED ONLY IF A LAMBERT BURN IS SPECIFIED. CELLS REMAIN 0 IN AN EXTERNAL ΔV BURN.	
20A	PACTOFF		VALUE OF PITCH C.G. OFFSET (PITCH TRIM ANGLE) FOR SPS ENGINE TVC DAP.	
20B	YACTOFF		VALUE OF YAW C.G. OFFSET (YAW TRIM ANGLE) FOR SPS ENGINE TVC DAP.	
21A  21B	CSM-RCS DAP	TVC DAP	CSM-RCS DAP	TVC DAP
	DRH02	PCMD  YCMD	MEASURED YAW ATTITUDE RATE IN CONTROL AXIS COORDINATE UPDATED EVERY 1 SEC.	VALUE SENT TO ECDC FOR SPS PITCH GIMBAL TRIM.  VALUE SENT TO ECDC FOR YAW GIMBAL TRIM.
22A	SPARE			
22B	CADRFLSH		VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED PRIORITY DISPLAY (FW4 BIT 14=1)	
23A 23B	CSM-RCS DAP	TVC DAP	CSM-RCS DAP	TVC DAP
	WBODY <sub>0</sub>	OMEGAXC	DESIRED BODY ROLL RATE ABOUT CONTROL AXIS.	NOT ACTIVELY USED IN TVC DAP.
24A 24B	WBODY <sub>1</sub>	OMEGAYC	DESIRED BODY PITCH RATE ABOUT CONTROL AXIS.	DESIRED PITCH ATTITUDE CHANGE ABOUT BODY AXIS PER DAP CYCLE.
25A 25B	WBODY <sub>2</sub>	OMEGAZC	DESIRED BODY YAW RATE ABOUT CONTROL AXIS.	DESIRED YAW ATTITUDE CHANGE ABOUT BODY AXIS PER DAP CYCLE.
26A 26B 27A 27B 28A 28B	X <sub>X</sub> UNIT VECTOR OF X STABLE MEMBER IN REFERENCE COORDINATES	REFSMAT		
29A 29B 30A 30B 31A 31B	Y <sub>X</sub> UNIT VECTOR OF Y STABLE MEMBER IN REFERENCE COORDINATES			
32A 32B	AK <sub>1</sub> (PITCH ATTITUDE ERROR) AK <sub>2</sub> (YAW ATTITUDE ERROR)	CSM-RCS DAP	TVC DAP	
		ATTITUDE ERROR TO FDAI NEEDLES. IF FW0 BIT 9=0 DAP FOLLOWING ERROR IS DISPLAYED. IF FW0 BIT 9=1 TOTAL ATTITUDE ERROR IS DISPLAYED.	BODY AXIS ATTITUDE ERRORS DETERMINED BY DAP.	

0701

POWERED - Continued

::

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION		REAL-TIME SIGNIFICANCE	
	CSM-RCS DAP	TVC DAP	CSM-RCS DAP	TVC DAP
33A	CHANTEMP	ROLLWORD	SET TO ZERO IN RCS DAP UNTIL MINIMUM IMPULSE IS USED THEN = CHAN 31	USES ONLY BITS 1 AND 2 OF WORD. 0 } NO ROLL 0 } -ROLL 1 } +ROLL 0 } JETSON 1 } COMMAND 0 } COMMAND
33B	ERROR <sub>X</sub>	TEMREG	INTERMEDIATE ATTITUDE ERRORS IN CONTROL CO-ORDINATES (SENT TO AK'S IF FWO BIT 9=0)	ROLL JET ON TIME (-0 FOR NO JETS TO FIRE).
34A	ERROR <sub>Y</sub>	STROKER		USED TO CONTROL STROKING TEST CHANGES WILL PROBABLY NOT BE SEEN.
34B	ERROR <sub>Z</sub>	PASTDELV		CONTAINS THE MOST SIGNIFICANT HALF OF PREVIOUS ACCEL OUTPUT USED TO CHECK FOR LOW THRUST (75%) FOR CROSS-PRODUCT STEERING.
35A	OPTMODES		CONTROLS PERFORMANCE OF OPTICS FUNCTIONS BITS 15-11 - NOT ASSIGNED - SHOULD BE 0. BIT 10=1 - OPTICS HAS BEEN ZEROED SINCE LAST FRESH START OR RESTART. GENERATES ALARM (120) <sub>8</sub> IF OPTICS DRIVE IS ATTEMPTED WITH BIT=0. BIT 9 - SET TO ONE WHEN OPTICS SWITCHED FROM COMPUTER MODE TO SOME OTHER MODE (MANUAL OR ZERO). SET TO ZERO BY FRESH START. BIT 8 - NOT ASSIGNED SHOULD BE 0. BIT 7 - LAST SAMPLED VALUE OF CHANNEL 30 BIT 7 (OPTICS CDU FAIL). GENERATES TRACKER ALARM (DSPTAB 11 BIT 8=1) IF THIS BIT GOES FROM 1 TO 0 PROVIDED BIT 2 OF OPTMODES = 0. SET TO ONE BY FRESH START OR RESTART. BIT 6 - NOT ASSIGNED SHOULD BE 0. BIT 5 - LAST SAMPLED VALUE OF CHANNEL 33 BIT 5 (0 = OPTICS MODE SWITCH IN COMPUTER). BIT 4 - LAST SAMPLED VALUE OF CHANNEL 33 BIT 4 (0 = OPTICS MODE SWITCH IN ZERO) IF BIT 5 AND BIT 4 OF OPTMODES = 1 THE MANUAL MODE IS SELECTED. BIT 3 - SET TO ONE WHEN OPTICS MODE SWITCH SET TO ZERO. REMAINS ONE FOR 16.2 SECONDS (OPTICS ZEROING DELAY). IF MODE SWITCH IS TAKEN OUT OF ZERO DURING 16.2 SECONDS ALARM (116) <sub>8</sub> IS GENERATED. BIT 2 - BIT SET TO ONE TO INHIBIT ANY TRACKER ALARMS DURING OPTICS ZEROING DELAY. BIT 1 - BIT SET TO ONE TO INDICATE DELAY WILL COMPLETE IN .4 SEC. INHIBITS ALARM (116) <sub>8</sub> .	
35B	HOLDFLAG		USED TO DETERMINE NATURE OF ATTITUDE HOLD CONTROL IN CSM-RCS DAP. IF >+0 PERFORM ATTITUDE HOLD ABOUT ANGLES CONTAINED IN CDU INPUT COUNTERS (PRESENT IMU ANGLES), IF = +0 ATTITUDE HOLD ABOUT EXISTING REFERENCE, IF <+0 AUTOMATIC STEERING TO BE PERFORMED.	
36A	CADRFLSH + 1		VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED MARK.	
36B	CADRFLSH + 2		VALUE OF RETURN ADDRESS INFORMATION FOR LAST NORMAL DISPLAY REQUESTED.	

POWERED - Continued

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
37A	CDUS	OPTICS SHAFT ANGLE, READS SHAFT CDU READ COUNTER		
37B	PIPAX	X, Y, AND Z PIPA INPUT COUNTERS ZEROED AT THE START OF AVE G AND ENTRY 2 SEC DURING AVE G.		
38A	PIPAY			
38B	PIPAZ			
39A	CDUX	X, Y, AND Z CDU INPUT COUNTERS. READ THE IMU CDU READ COUNTERS ZEROED DURING ZERO ENCODE MODE (IMODES 33 BIT 5=1).		
39B	CDUY			
40A	CDUZ			
40B	CDUT	OPTICS TRUNNION ANGLE, READS TRUNNION CDU READ COUNTER		
		BIT	SET	RESET
41A	FLAGWORD 0			
	CPHIXMP	15	OUTPUT OF CALCGA IS CφX	OUTPUT OF CALCGA THETAD
	JSWITCH	14	INTEGRATION W MATRIX	INTEGRATION OF STATE VECTOR
		13-11	NOT ASSIGNED SHOULD BE ZERO	
	COAROFIN	10	USED IN TEST PROGRAMS	SHOULD BE ZERO
	NEEDFLG	9	TOTAL ATTITUDE ERROR DISPLAYED	DAP FOLLOWING ERROR DISPLAYED
	IMUSE	8	IMU IN USE	IMU NOT IN USE
	RNDVZFLG	7	NOT USED IN POWERED LIST	
	R53FLG	6	NOT USED IN POWERED LIST	
		5	NOT ASSIGNED SHOULD BE ZERO	
TRUNFLG	4	NOT USED IN POWERED LIST		
FREEFLG	3	NOT USED IN POWERED LIST		
	2	NOT ASSIGNED SHOULD BE ZERO		
ESCAPESW	1	ORBIT HYPERBOLIC	ORBIT ELLIPTIC	
		BIT	SET	RESET
41B	FLAGWORD 1			
	NJETSFLG	15	2-JET XTRANSLATION WITH CSM-RCS DAP.	4-JET XTRANSLATION WITH CSM-RCS DAP.
	STIKFLAG	14	RHC IN CONTROL OF CSM-RCS DAP	CMC IN CONTROL OF CSM-RCS DAP
	ERADFLAG	13	NOT USED IN POWERED LIST	
	R31FLAG	12	V83 REND PARAMETER DISPLAY	V85 REND PARAMETER DISPLAY
	ENG2FLAG	11	RCS BURN CALLED (P41)	SPS BURN CALLED (P40)
	TARG1FLAG	10	NOT USED IN POWERED LIST	
	TARG2FLAG	9	NOT USED IN POWERED LIST	
	VEHUPFLG	8	CSM STATE VECTOR BEING UPDATED	LM STATE VECTOR BEING UPDATED
	UPDATFLG	7	NOT USED IN POWERED LIST	
	ONFLAG	6	NOT PROGRAMED, THEREFORE SHOULD REMAIN ZERO	
	TRACKFLG	5	NOT USED IN POWERED LIST	
		4	NOT ASSIGNED SHOULD BE ZERO	
ITER1SW	3	SET TO ONE AT START OF LAMBERT ROUTINE	SET TO ZERO AFTER FIRST LAMBERT ITERATION IF A 2ND IS REQUIRED.	
GUESSW	2	SET TO ONE TO INDICATE STARTING VALUE FOR ITERATION AVAILABLE		
AVEGFLG	1	AVE G 2-SEC RATE TO CONTINUE	AVE G TO TERMINATE	
		BIT	SET	RESET
42A	FLAGWORD 2			
	DRIFTFLG	15	PLATFORM ALIGNMENT COMPENSATED EVERY 82 SEC FOR DRIFT	NO DRIFT COMPENSATION SCHEDULED
	R21MARK	14	NOT USED IN POWERED LIST	
		13-12	NOT ASSIGNED SHOULD BE ZERO	
	STEERSW	11	CROSS-PRODUCT STEERING COMPUTATIONS ARE TO BE DONE	NO CROSS-PRODUCT STEERING
	CYCLESW	10	USED TO CONTROL INITIATION OF LAMBERT COMPUTATION IN P40 AND P41	
IMPULSW	9	INITIATE SPS ENGINE CUTOFF		
XDELVFLG	8	PERFORM EXTERNAL ΔV BURN	PERFORM LAMBERT BURN	



POWERED - Continued  
TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE					
		BIT	SET	RESET			
42A	FLAGWORD 2	7	NOT THE FIRST LAMBERT COMPUTATION CYCLE.	FIRST COMPUTATION CYCLE.			
	FIRSTFLAG						
	FINALFLG						
	AVFLAG						
	PFRATFLAG						
	CALCMAN3				3	SET TO ONE AT THE END OF THE CALCULATIONS FOR A LARGE ATTITUDE MANEUVER TO INDICATE NO GIMBAL LOCK AVOIDANCE IS REQUIRED.	PREFERRED ATTITUDE NOT COMPUTED. GIMBAL LOCK AVOIDANCE IS REQUIRED.
	CALCMAN2				2	USED IN MANEUVER CALCULATIONS	UNLIKELY THAT CHANGES WILL BE NOTED ON TELEMETRY.
NODOFLAG	1	MAJOR MODE CHANGE TO P00 ONLY IS ALLOWED.	MAJOR MODE CHANGE TO ANY PROGRAM IS ALLOWED.				
		BIT	SET	RESET			
42B	FLAGWORD 3	15	MANUAL MANEUVER DESIRED	AUTOMATIC MANEUVER DESIRED			
	AUTMANSW						
	GLOKFAIL	14	BIT SET TO ONE IF GIMBAL ANGLE CALC DETECTS A MIDDLE GIMBAL ANGLE OF $>60^\circ$ WILL OCCUR. GENERATES ALM4018.	NO GIMBAL LOCK WILL OCCUR			
	REFSMFLG	13	REFSMAT IS GOOD.	REFSMAT NO GOOD (SET IN COARSE ALIGN, CAGE, DURING ALIGNMENT PROGRAMS).			
	STBYFLG	12	NOT ASSIGNED, SHOULD BE ZERO.	ZEROED DURING AVE G.			
	VFLAG	11	NOT USED IN POWERED LIST.				
	ONMONFLAG	10	NOT USED IN POWERED LIST.				
	CULTFLAG	9	ACCEL MONITORED AT INTERMEDIATE TIMES IN P61 AND P62.	STATE VECTOR HAS BEEN OR WILL NOT BE UPDATED. ENCKE (PRECISION) INTEGRATION WILL BE PERFORMED. LM STATE VECTOR TO BE INTEGRATED. W MATRIX INTEGRATION WILL BE 6X6 DIMENSION. W MATRIX WILL NOT BE INTEGRATED.			
	ORBWFLAG	8	NOT ASSIGNED, SHOULD BE ZERO.				
	STATEFLAG	7	NOT USED IN POWERED LIST.				
	INTYPFLAG	6	NOT USED IN POWERED LIST.				
	VINTFLAG	5	STATE VECTOR TO BE UPDATED.				
	D60R9FLAG	4	CONIC INTEGRATION WILL BE PERFORMED.				
DIMOFLAG	3	CSM STATE VECTOR TO BE INTEGRATED.					
	2	W MATRIX INTEGRATION WILL BE 9X9 DIMENSION.					
	1	W MATRIX WILL BE INTEGRATED.					
		BIT	SET	RESET			
43A	FLAGWORD 4	15	MARK OR EXTENDED VERB DISPLAY IS WAITING FOR A RESPONSE.	NO MARK OR EXTENDED VERB DISPLAY WAITING.			
	MRKIDFLG						
	PRIODFLG				14	PRIORITY DISPLAY IS WAITING FOR A RESPONSE.	NO PRIORITY DISPLAY WAITING.
	ENDIOFLG				13	PRIORITY OR NORMAL DISPLAY IS WAITING FOR A RESPONSE.	NEITHER PRIORITY OR NORMAL DISPLAY IS WAITING.
	NRMIDFLG				12	NORMAL DISPLAY IS WAITING FOR A RESPONSE.	NO NORMAL DISPLAY WAITING.
	MWAITFLG				11	NOT PRESENTLY PROGRAMED. SHOULD BE ZERO.	NO NORMAL DISPLAY WAITING.
	NWAITFLG				10	NORMAL DISPLAY IS WAITING TO BE INITIATED.	
MRKNVFLG	9	MARK OR EXTENDED VERB DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.					

POWERED - Continued

::

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
43A	FLAGWORD 4			
	NRMNVFLG	8	NORMAL DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.	
	PRONVFLG	7	PRIORITY DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.	
	PINBRFLG	6	INTERFERENCE WITH AN INTERNALLY GENERATED DISPLAY HAS OCCURRED OR TERMINATE HAS OCCURRED WITH BIT 13 OF THIS FLAGWORD = 1.	
	MRUPTFLG	5	BIT SET TO ONE WHEN A MARK OR EXTENDED VERB DISPLAY HAS BEEN INTERRUPTED BY A PRIORITY DISPLAY.	
	NPUPTFLG	4	BIT SET TO ONE WHEN A NORMAL DISPLAY IS INTERRUPTED BY A MARK OR EXTENDED VERB DISPLAY OR A PRIORITY DISPLAY.	
	MRKOVFLG	3	BIT SET TO ONE WHEN A MARK OR EXTENDED VERB DISPLAY IS TO INTERRUPT A NORMAL DISPLAY.	
	RET1FLG	2	NOT PROGRAMED. SHOULD BE ZERO.	
		1	NOT ASSIGNED. SHOULD BE ZERO.	
		BIT	SET	RESET
43B	FLAGWORD 5			
	DSKYFLG	15	DISPLAYS SENT TO DSKY.	NO DISPLAYS SENT.
	INTFLAG2	14	ORBITAL INTEGRATION PACKAGE IN USE.	ORBITAL INTEGRATION PACKAGE NOT IN USE.
	INTFLAG3	13	SET IF RESTART PHASE CHANGE OCCURS TO PREVENT RESET OF BIT 14 IF RESTART OCCURS.	
	V59FLAG	12	NOT USED IN POWERED LIST.	
	INCORFLAG	11	NOT USED IN POWERED LIST.	
	DMENFLG	10	NOT ASSIGNED SHOULD BE ZERO.	
	COMPUTER	9	NOT USED IN POWERED LIST.	
	ENGONFLG	8	SET TO ONE IN FRESH START TO INDICATE COMPUTER IS A CMC.	LGC COMPUTER.
	3AXISFLAG	7	SPS ENGINE ON (P40).	SPS ENGINE OFF.
		6	BIT SET WHEN ATTITUDE MANEUVER IS SPECIFIED BY 3 ANGLES. SET PRIOR TO PERFORMING MANEUVER TO SEPARATION ATTITUDE IN P61.	ZERO WHEN ATTITUDE IS SPECIFIED BY SOME OTHER ROUTINE.
	GRRBKFLG	5	NOT USED IN POWERED LIST.	
NOSOLNSW AND NOSOFLAG	4	NOT ASSIGNED SHOULD BE ZERO.		
	3	SET TO ONE IF LAMBERT PACKAGE FAILS TO DELIVER A SOLUTION. GENERATES ALARM 6078.		
MGLVFLG	2	VELOCITY CHANGE IN LOCAL VERTICAL COORDINATES HAS TO BE COMPUTED.	MIDDLE GIMBAL ANGLE AT IGNITION HAS BEEN COMPUTED.	
RENDWFLAG	1	NOT USED IN POWERED LIST.		

POWERED - Continued

::

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
44A	FLAGWORD 6			
	DAPBIT1	15	DAP STATUS	0 } NO DAP 0 } CSM 1 } TVC 1 } SATURN RCS
	DAPBIT2	14		0 } OR ENTRY 1 } DAP 0 } DAP 1 } DAP
	OFSETUP	13	LENGTH SPS BURN LONG ENOUGH TO PERMIT UPDATE OF PITCH AND YAW OFFSETS TO BE MADE AT END OF BURN.	ZERO AT START OF TVC DAP AND REMAINS ZERO IF BURN LESS THAN 10 SEC.
	CMDAPARM	12	NOT USED IN POWERED LIST.	
	GAMDIFSW	11	NOT USED IN POWERED LIST.	
	GONEPAST	10	NOT USED IN POWERED LIST.	
	RELVELSW	9	NOT USED IN POWERED LIST.	
	KNOWNFLG AND EGSW	8	NOT USED IN POWERED LIST.	
	HUNTSW1	7	NOT USED IN POWERED LIST.	
	HIND	6	NOT USED IN POWERED LIST.	
	INRLSW	5	NOT USED IN POWERED LIST.	
	LATSW	4	NOT USED IN POWERED LIST.	
	05GSW	3	NOT USED IN POWERED LIST.	
CM/DSTB4	2	NOT USED IN POWERED LIST.		
GMDIFSW	1	NOT USED IN POWERED LIST.		
		BIT	SET	RESET
44B	FLAGWORD 7			
	TERMIFLG	15	NOT USED IN POWERED LIST.	
	IGNFLAG	14	NOT ASSIGNED SHOULD BE ZERO.	
	ASTNFLAG	13	NOMINAL SPS IGNITION TIME HAS ARRIVED (P40).	
	TIMRFLAG	12	CREW HAS AUTHORIZED SPS IGNITION (P40)	
	UNNORMSW	11	SETS TGO TO BE DISPLAYED IN NOUNS 35,40,45,59.	TGO = TIME TO IGNITION OR TIME TO CUTOFF.
	TTMODESW	10	SHOULD REMAIN ZERO FOR FLIGHT.	
	GONEBY	9	SHOULD REMAIN ZERO FOR FLIGHT.	
	IDLEFLAG	8	NOT USED IN POWERED LIST.	
	V37FLAG	7	INHIBIT ΔV MONITOR SET TO ONE AT CUTOFF.	ENABLE AVE G ROUTINE TO PERFORM ΔV MONITOR FUNCTION. AVE G STATE VECTOR HAS BEEN UPDATED. AVE G IS OFF.
		6	AVE G IS RUNNING.	
	5	NOT ASSIGNED. SHOULD BE ZERO.		
UPLOCKFL	4	NOT USED IN POWERED LIST.		
VERIFLAG	3	NOT USED IN POWERED LIST.		
ATTCHFLAG	2	LM ATTACHED FOR CSM-RCS DAP COMPUTATION.	LM NOT ATTACHED.	
TFFSW	1	CALCULATE TIME OF PERIGEE.	CALCULATE TFF. SINCE BIT IS RESET AFTER PERIGEE IS COMPUTED IT WILL BE OBSERVED AS ZERO.	
45A	DSPTAB + 0	DISPLAY TABLE CODES FOR GENERATION DSKY NUMERICS.  USED TO INDICATE VERB-NOUN, MAJOR MODE AND R <sub>1</sub> , R <sub>2</sub> , R <sub>3</sub> DISPLAYS.		
45B	DSPTAB + 1			
46A	DSPTAB + 2			
46B	DSPTAB + 3			
47A	DSPTAB + 4			
47B	DSPTAB + 5			
48A	DSPTAB + 6			
48B	DSPTAB + 7			
49A	DSPTAB + 8			
49B	DSPTAB + 9			
50A	DSPTAB + 10			

POWERED - Continued  
TRANSMITTED IN PROGRAMS 40, 41, 47, 61

\*\*

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
50B	DSPTAB + 11	DISPLAY TABLE TO DSKY STATUS LIGHTS. 604008 = PROGRAM CAUTION, 602008 = TRACKER WARNING 600208 = NO ATTITUDE, 600408 = GIMBAL LOCK	
51A 51B	TNOW	COMPUTER CLOCK INDICATING TIME SINCE LIFTOFF. UPDATED BY V55E OR V73E.	
52A 52B 53A 53B 54A 54B	RX X COMPONENT OF "OTHER" VEHICLE POSITION RY Y COMPONENT OF "OTHER" VEHICLE POSITION RZ Z COMPONENT OF "OTHER" VEHICLE POSITION	LM ("OTHER") STATE VECTOR	
55A 55B 56A 56B 57A 57B	VX X COMPONENT OF "OTHER" VEHICLE VELOCITY VY Y COMPONENT OF "OTHER" VEHICLE VELOCITY VZ Z COMPONENT OF "OTHER" VEHICLE VELOCITY		
58A 58B	TETLM		TIME TAG FOR LM (OTHER) STATE VECTOR
59A 59B 60A 60B 61A 61B 62A 62B 63A 63B	REDOCTR THETAD THETAD THETAD ADOTX ADOTY ADOTZ		SAME AS 9A SAME AS 9B SAME AS 10A SAME AS 10B SAME AS 11, 11B SAME AS 12A, 12B SAME AS 13A, 13B
64A 64B 65A	TFF 1/CONACC		TIME FROM INTERFACE ALTITUDE 300,000 FT ABOVE PAD RADIUS. RECIPROCAL OF ROLL AXIS ACCELERATION (ROLL DAP GAIN) COMPUTED IN TVC DAP.
65B	VARX		VALUE OF TVC PITCH/YAW GAIN
66A 66B	MASS	VALUE OF CURRENT VEHICLE MASS	
67A 67B	ELEV	VALUE OF THE ELEVATION ANGLE (R2 OF NOUN 55)	
68A 68B 69A 69B 70A 70B	VGX VGY VGZ	X, Y, AND Z COMPONENTS OF VELOCITY TO BE GAINED UPDATED EVERY 2 SECS DURING AVE G IN P40 AND P41.	

POWERED - Continued  
TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION		REAL-TIME SIGNIFICANCE	
71A 71B	PCMD YCMD		SAME AS 21A SAME AS 21B	
72A 72B	PIPTIME 1		VALUE OF TIME WHEN THE PIPAS WERE LAST READ	
73A 73B	DELV <sub>X</sub>		X, Y AND Z COMPENSATED PIPA COUNT FOR 2-SECOND INCREMENT. UPDATED DURING AVE G ROUTINE.	
74A 74B	DELV <sub>Y</sub>			
75A 75B	DELV <sub>Z</sub>			
76A 76B 77A	THETAD <sub>X</sub> THETAD <sub>Y</sub> THETAD <sub>Z</sub>		X, Y AND Z INTERMEDIATE DESIRED CDU ANGLES COMPUTED IN CSM-RCS DAP ONLY.	
77B	DELCDU <sub>XSP</sub>		MOST SIGNIFICANT HALF OF THETAD <sub>X</sub>	
78A 78B	FAILREG +0 FAILREG +1		CONTAINS ALARM PATTERN OF FIRST ALARM RECEIVED CONTAINS ALARM PATTERN OF SECOND ALARM RECEIVED	
79A 79B	T <sub>EVENT</sub>		VALUE OF COMPUTER CLOCK WHEN LIFTOFF OCCURRED, WHEN SPS ENGINE CAME ON, OR WHEN SPS ENGINE WENT OFF.	
80A 80B	T <sub>GO</sub>		TIME TO GO TO ENGINE CUTOFF	
	CSM-RCS DAP	RVC DAP	CSM-RCS DAP	TVC DAP
81A	AK <sub>0</sub>	PAXERR	ROLL ATTITUDE ERROR TO FDAI NEEDLES. IF FW0 BIT 9=1 TOTAL ATTITUDE ERROR DIS- PLAYED, IF FW0 BIT 9=0 DAP FOLLOWING ERROR DISPLAYED.	CONTAINS DIFFERENCE BE- TWEEN DESIRED AND PRE- SENT CDUX UPDATED EVERY 0.5 SECONDS.
81B	AK <sub>1</sub>	AK <sub>1</sub>	PITCH ATTITUDE ERROR TO FDAI NEEDLES. IF FW0 BIT 9=1 TOTAL ATTITUDE ERROR DISPLAYED. IF FW0 BIT 9=0 DAP FOLLOWING ERROR DISPLAYED.	PITCH ERROR SIGNAL (INTEGRAL OF COMMANDED PITCH RATE + PITCH RATE ERROR MINUS ACTUAL PITCH RATE) UPDATED EVERY 0.5 SECONDS.
82A	AK <sub>2</sub>	AK <sub>2</sub>	YAW ATTITUDE ERROR TO FDAI NEEDLES. IF FW0 BIT 9=1 TOTAL ATTITUDE ERROR DIS- PLAYED. IF FW0 BIT 9=0 DAP FOLLOWING ERROR DISPLAYED.	YAW ERROR SIGNAL (INTEGRAL OF COMMANDED YAW RATE + YAW RATE ERROR MINUS ACTUAL YAW RATE) UPDATED EVERY 0.5 SECONDS.
82B	OGARATE		RATE OF CHANGE OF CDU <sub>X</sub> USED BY TVC DAP FOR ROLL ATTITUDE CONTROL.	
83A 83B	T <sub>IG</sub>		VALUE OF IGNITION TIME DISPLAYED BY NOUN 33	

POWERED - Continued

\*\*

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
84A 84B	T3 TO T4	SPECIFIED VALUE OF TRANSFER TIME COMPUTED ONLY IN P34.		
85A	DAPDatar1 LOADED WITH V48N46E	BIT	SET	RESET
		15	NOT USED SHOULD BE ZERO	
		14	0 } NO DAP 1 } LM-ON OR	0 } LM-OFF 1 } SATURN
		13	0 } ENTRY 0 } RCS DAP	1 } RCS DAP 1 } DAP
		12-11	NOT USED SHOULD BE ZERO	
		10	USE A/C QUAD (RCS JETS)	IF BIT 7=0 USE A/C AND B/D
		9-8	NOT USED SHOULD BE ZERO	
		7	USE B/D QUAD (RCS JETS)	IF BIT 10=0 USE A/C AND B/D
		6-5	NOT USED SHOULD BE ZERO	
		4	5° DEADBAND	0.5° DEADBAND
		3	NOT USED SHOULD BE ZERO	
		2	( SPECIFY ) 0 } .05° 0 } .2° 1 } .5° 1 } 4°	
		1	( MANEUVER RATE ) 0 } / SEC 1 } / SEC 0 } / SEC 1 } / SEC	
85B	DAPDatar2 LOADED WITH V48N46E	BIT	SET	RESET
		15-14	NOT USED SHOULD BE ZERO	
		13	USE A/C QUAD FOR ROLL	USE B/D QUAD FOR ROLL
		12-11	NOT USED SHOULD BE ZERO	
		10	USE OF A QUAD ALLOWED	USE OF A QUAD NOT ALLOWED
		9-8	NOT USED SHOULD BE ZERO	
		7	USE OF B QUAD ALLOWED	USE OF B QUAD NOT ALLOWED
		6-5	NOT USED SHOULD BE ZERO	
		4	USE OF C QUAD ALLOWED	USE OF C QUAD NOT ALLOWED
		3-2	NOT USED SHOULD BE ZERO	
		1	USE OF D QUAD ALLOWED	USE OF D QUAD NOT ALLOWED
86A 86B	RSBBQ	VALUE OF BBANK AND Q REGISTERS AT THE TIME OF A RESTART. USED TO DETERMINE LOCATION OF RESTART OCCURRENCE.		
87A 87B	ALARMCADR +0 ALARMCADR +1	CONTAINS REGISTER PORTION OF 1ST ADDRESS FOLLOWING MOST RECENT ALARM. BBANK PORTION OF THE 1ST ADDRESS FOLLOWING MOST RECENT ALARM.		
88A	IMODES 30 BITS 15 THROUGH 9 ARE LAST SAMPLED VALUE OF CHANNEL 30 EXCEPT FOR BIT 10 WHICH IS LAST SAMPLED VALUE OF CHAN 33 BIT 13.	BIT	SET	RESET
		15	IMU TEMP OUT OF LIMITS. (CHANNEL 11 BIT 4 IS SET TO AGREE WITH THIS BIT).	IMU TEMP WITHIN LIMITS. AGREE WITH THIS BIT).
		14	NO ISS TURN-ON REQUEST	ISS TURN-ON REQUEST HAS OCCURRED.
		13	NO IMU FAIL	IMU FAIL HAS OCCURRED. IF BIT 4 OF THIS WORD IS ALSO ZERO SET CHAN 11 BIT 1=1.
		12	NO ECDU FAIL	ECDU FAIL HAS OCCURRED. IF BIT 3 OF THIS WORD IS ALSO ZERO, SET CHAN 11 BIT 1=1.
		11	NO IMU CAGE COMMAND	IMU CAGE COMMANDED
		10		PIPA FAIL HAS OCCURRED. IF BIT 1 OF THIS WORD IS ALSO ZERO SET CHAN 11 BIT 1=1.

POWERED - Continued

\*\*

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
88A	IMODES 30	9	IMU NOT OPERATING.	IMU OPERATING.
		8	BIT USED IN IMU TURN-ON SEQUENCING. SET FOR .48 SEC WILL MOST LIKELY BE ZERO.	
		7	BIT USED IN IMU TURN-ON SEQUENCING. SET FOR .48 SEC WILL MOST LIKELY BE ZERO.	
		6	IMU INITIALIZATION BEING ACCOMPLISHED (CAGE CMD, IMU ZEROING, TURN-ON DELAY ALL SET THIS BIT).	IMU NOT IN INITIALIZATION.
		5	INHIBIT ALARM 2128 IF PIPA FAIL OCCURS DURING TURN-ON SEQUENCING.	
		4	INHIBIT ISS WARNING BASED ON IMU FAIL (OCCURS DURING TURN-ON DELAY AND COARSE ALIGN).	ISS WARNING NOT INHIBITED.
		3	INHIBIT ISS WARNING BASED ON ECDU FAIL (OCCURS DURING TURN-ON DELAY AND IMU ZERO)	ISS WARNING NOT INHIBITED.
		2	INDICATES TURN-ON DELAY FAILURE ALONG WITH ALARM 2078.	NO TURN-ON DELAY FAILURE.
		1	INHIBIT ISS WARNING BASED ON PIPA FAIL. (BIT IS ONE UNLESS AVERAGE "G" IS RUNNING).	ISS WARNING NOT INHIBITED (AVERAGE G IS RUNNING).
88B	IMODES 33	15	NOT ASSIGNED SHOULD REMAIN ZERO.	
		14	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 30 BIT 14.	SET TO ZERO WHEN STANDBY BUTTON ON DSKY IS PRESSED (CONTROLS PROCEED FUNCTION THE SAME AS V33E).
		13	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 13.	SET TO ZERO IF PIPA FAIL HAS OCCURRED.
		12	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 12.	SET TO ZERO IF TELEMETRY DOWNLINK IS TOO FAST.
		11	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 11.	SET TO ZERO IF UPLINK IS TOO FAST.
		10-7	NOT ASSIGNED SHOULD REMAIN ZERO.	
		6	IMU USE FOR VEHICLE ATTITUDE SHOULD NOT BE ATTEMPTED. SET TO ONE IN COARSE ALIGN AND IMU ZEROING.	SET OF ZERO AFTER FINE ALIGN ROUTINE.
		5	SET TO ONE DURING IMU ZEROING ROUTINE (V40N20E).	NOT EXPECTED TO BE USED IN FLIGHT.
		4-3	NOT ASSIGNED SHOULD BE ZERO	
		2	USED IN GROUND TESTING ONLY	
1	SET TO ONE WITH V35E (LAMP TEST) FOR 5 SEC.			
89A	CDUX	SAME AS 39A		
89B	CDUY	SAME AS 39B		
90A	CDUZ	SAME AS 40A		
90B	CDUT	SAME AS 40B		
91A	CHANNEL 11	BIT 15-14	NOT ASSIGNED SHOULD BE ZERO.	
		13	SET TO ONE FOR SPS ENGINE ON NOT USED IN COAST AND ALIGN.	
		12-11	NOT ASSIGNED SHOULD BE ZERO.	

POWERED - Continued

::

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
91A	CHANNEL 11	BIT 9 8 7 6 5 4 3 2 1	TEST CONNECTOR OUTPUT SET TO ONE 2 SECONDS AFTER AVE G STARTS AND REMAINS 1 UNTIL AVE G END. NOT ASSIGNED SHOULD BE ZERO. SET TO ONE WHEN OPERATOR ERROR HAS OCCURRED. RESET WITH ERROR RESET VIA DSKY OR UPLINK. SET TO 1 WHEN OPERATOR ACTION IS REQUIRED (DSKY IS FLASHING). SET TO 1 WITH KEY RELEASE LIGHT INDICATING PROGRAM DESIRES USE OF DSKY DISPLAYS. SET TO ONE WHEN THE IMU TEMP IS OUT OF LIMITS. SET TO 1 WHEN UPLINK INTERRUPT OCCURS INDICATING UPLINK ACTIVITY. SET TO 1 WHEN COMPUTER IS WORKING ON AN ACTIVE JOB. GENERATES COMPUTER ACTIVITY LIGHT. SET TO 1 WITH ISS WARNING. SETS ISS WARNING LIGHT.
91B	CHANNEL 12	BIT 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	SET TO ONE 4 SECONDS AT THE END OF THE ISS 90-SEC. TURN-ON DELAY INDICATING TURN-ON DELAY COMPLETE. S-IVB CUTOFF COMMAND. NOT EXPECTED TO BE USED DURING FLIGHT. S-IVB INJECTION SEQUENCING START NOT EXPECTED TO BE USED DURING FLIGHT. NOT ASSIGNED SHOULD BE ZERO. DISENGAGE OPTICS DAC NOT EXPECTED TO BE USED. ZERO OPTICS COMMAND NOT EXPECTED TO BE USED. SET TO ONE WITH V46E IF BITS 14-13 OF DAPDATARI = 1 SETS S-IVB TAKEOVER ENABLE. SET TO ONE IN P40 IF TVC DAP IS GOING TO BE USED. SETS TVC DAP ENABLE. NOT ASSIGNED SHOULD BE ZERO. IMU CDU ERROR COUNTER ENABLE SET TO ONE DURING COARSE ALIGN, S-IVB TAKEOVER AND ATTITUDE ERRORS TO FDAI. IMU CDU ZERO COMMAND. SET TO ONE ANYTIME IMU CDU READ COUNTERS ARE TO BE ZEROED. IMU COARSE ALIGN ENABLE. SET TO ONE ANYTIME IMU IS TO BE COARSE ALIGNED. NOT USED. OPTICS CDU ERROR COUNTER ENABLE. SET TO ONE DURING OPTICS COARSE ALIGN OR TVC DAP ENABLE. ZERO OPTICS CDU. SET TO ONE FOR 0.2 SEC AT THE END OF OPTICS ZEROING SEQUENCE. BECAUSE OF SHORT SET TIME IT SHOULD BE ZERO.
92A	CHANNEL 13	BIT 15 14 13 12 11 10 9 8 7 6 5 4-1	T6RUPNT ENABLE. ONE ENABLES THE TIME 6 COUNTER TO START COUNTING DOWN FOR RCS JET ON TIME. USED IN CSM-RCS DAP AND TVC ROLL DAP. NOT EXPECTED TO BE USED SHOULD BE ZERO. NOT EXPECTED TO BE USED SHOULD BE ZERO. NOT EXPECTED TO BE USED SHOULD BE ZERO. SET TO ONE AT THE END OF P06 TO ENABLE STANDBY BUTTON TO DOWNMODE THE COMPUTER TO STANDBY. SET TO 1 BY V35E (LAMP TEST). REMAINS 1 FOR 5 SEC. NOT ASSIGNED SHOULD BE ZERO. NOT USED SHOULD BE ZERO. WORD ORDER CODE BIT 1, EXCEPT FOR WORDS 1 AND 51. BLOCK UPLINK NOT SET BY PROGRAM. NOT USED SHOULD BE ZERO. NOT ASSIGNED SHOULD BE ZERO.



POWERED - Continued

※

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
92B	CHANNEL 14	BIT 15	XCDU DRIVE ENABLE. ENABLES PULSES TO BE SENT FROM COMPUTER TO XCDU ERROR COUNTER.
		14	YCDU DRIVE ENABLE.
		13	ZCDU DRIVE ENABLE.
		12	TRUNNION CDU DRIVE ENABLE. ENABLES PULSES TO BE SENT TO TRUNNION CDU ERROR COUNTER FOR EITHER OPTICS COARSE ALIGN OR TVC YAW AXIS COMMAND.
		11	SHAFT CDU DRIVE ENABLE. ALSO TVC PITCH AXIS COMMAND.
		10	ENABLE GYRO TORQUEING. ENABLES PULSES TO BE SENT FROM COMPUTER TO GYRO PULSE TORQUE ELECTRONICS.
		9	BIT SET TO ONE TO INDICATE NEGATIVE GYRO TORQUE.
		8	0 } NO 0 } TORQUE 1 } TORQUE 1 } TORQUE
		7	0 } AXIS 1 } X-AXIS GYRO 0 } Y-AXIS GYRO 1 } Z-AXIS GYRO
		6	SET TO ONE TO ENABLE GYRO PULSE TORQUE POWER SUPPLY.
		5	NOT USED.
		4-2	NOT ASSIGNED SHOULD BE ZERO.
		1	NOT USED.
93A	CHANNEL 30	BIT 15	ZERO IF IMU TEMP WITHIN LIMITS.
		14	ZERO IF ISS IS ON OR COMMANDED ON.
		13	ZERO IF IMU FAIL HAS OCCURRED.
		12	ZERO IF IMU CDU FAIL HAS OCCURRED.
		11	ZERO IF IMU CAGE HAS BEEN COMMANDED.
		10	ZERO IF LV GUIDANCE SW IN CMC POSITION. S/C CONTROL OF SATURN.
		9	ZERO IF IMU OPERATING WITH NO MALFUNCTIONS.
		8	NOT ASSIGNED SHOULD BE ZERO.
		7	ZERO IF OPTICS CDU FAIL HAS OCCURRED.
		6	ZERO IF GUIDANCE REFERENCE RELEASE HAS OCCURRED.
		5	ZERO IF LIFTOFF HAS OCCURRED. CAUSES CHANGE FROM P02 TO P11.
		4	ZERO IF S-IVB SEPARATION OR ABORT HAS OCCURRED.
		3	ZERO WHEN SPS ENGINE BURN PREPARATIONS ARE COMPLETE.
		2	ZERO IF CM/SM SEPARATION HAS OCCURRED.
		1	ZERO IF ULLAGE THRUST FROM S-IVB PRESENT.
93B	CHANNEL 31	BIT 15	SET TO ZERO IF COMPUTER IS IN CONTROL OF THE SPACECRAFT. SET TO ONE BY G&N AUTOPILOT CONTROL SWITCH OFF OR IMU OFF.
		14	ZERO IF RCS DAP FREE MODE IS SELECTED.
		13	ZERO IF RCS DAP HOLD MODE IS SELECTED.
			IF BITS 14 AND 13 = 112 AUTOMATIC MODE SELECTED
		12	ZERO IF -Z TRANSLATION COMMANDED.
		11	ZERO IF +Z TRANSLATION COMMANDED.
		10	ZERO IF -Y TRANSLATION COMMANDED.
		9	ZERO IF +Y TRANSLATION COMMANDED.
		8	ZERO IF -X TRANSLATION COMMANDED.
		7	ZERO IF +X TRANSLATION COMMANDED.
		6	ZERO IF -ROLL COMMANDED.
		5	ZERO IF +ROLL COMMANDED.
		4	ZERO IF -YAW COMMANDED.
		3	ZERO IF +YAW COMMANDED.
		2	ZERO IF -PITCH COMMANDED.
		1	ZERO IF +PITCH COMMANDED.

POWERED - Concluded

::

TRANSMITTED IN PROGRAMS 40, 41, 47, 61

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
94A	CHANNEL 32       MINIMUM IMPULSE CONTROLLER INPUTS	BIT 15 14  13-12 11 10-7 6 5 4 3 2 1	NOT ASSIGNED SHOULD BE ZERO. ZERO IF PROCEED KEY (FORMERLY STANDBY) ON DSKY IS PRESSED. NOT ASSIGNED SHOULD BE ZERO. NOT USED IN S/C 101. NOT ASSIGNED SHOULD BE ZERO. ZERO IF -ROLL COMMANDED. ZERO IF +ROLL COMMANDED. ZERO IF -YAW COMMANDED. ZERO IF +YAW COMMANDED. ZERO IF -PITCH COMMANDED ZERO IF +PITCH COMMANDED
94B	CHANNEL 33	BAT 15 14 13 12 11 10  9-8 7 6 5 4 3-1	ZERO IF COMPUTER OSCILLATOR HAS STOPPED. ZERO IS CMC WARNING HAS OCCURRED. ZERO IF PIPA FAIL HAS OCCURRED. ZERO IF TELEMETRY DOWNLINK IS TOO FAST. ZERO IF UPLINK TOO FAST. ZERO IF BLOCK UPLINK SWITCH IN SPACECRAFT IS SET TO BLOCK. NOT ASSIGNED SHOULD BE ZERO. NOT USED. NOT USED ZERO IF CMC CONTROL OF OPTICS IS SET. ZERO IF ZERO OPTICS IS SET. NOT ASSIGNED SHOULD BE ZERO.
95A 95B 96A 96B 97A 97B 98A 98B 99A 99B 100A 100B	DSPTAB + 0 DSPTAB + 1 DSPTAB + 2 DSPTAB + 3 DSPTAB + 4 DSPTAB + 5 DSPTAB + 6 DSPTAB + 7 DSPTAB + 8 DSPTAB + 9 DSPTAB + 10 DSPTAB + 11	SAME AS 45A TO 50B	

ENTRY AND UPDATE

\*\*

TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
1A	ENTRY AND UPDATE LIST ID	(00001) <sub>8</sub> INDICATES ENTRY AND UPDATE LIST BEING TRANSMITTED.	
1B	SYNC BITS	(77340) <sub>8</sub> INDICATES DATA TO FOLLOW.	
2A 2B	R <sub>X</sub> X COMPONENT OF VEHICLE POSITION VECTOR	CSM VEHICLE STATE VECTOR AND TIME	
3A 3B	R <sub>Y</sub> Y COMPONENT OF VEHICLE POSITION VECTOR		
4A 4B	R <sub>Z</sub> Z COMPONENT OF VEHICLE POSITION VECTOR		
5A 5B	V <sub>X</sub> X COMPONENT OF VEHICLE VELOCITY VECTOR		
6A 6B	V <sub>Y</sub> Y COMPONENT OF VEHICLE VELOCITY VECTOR		
7A 7B	V <sub>Z</sub> Z COMPONENT OF VEHICLE VELOCITY VECTOR		
8A 8B	T <sub>SV</sub> TIME TAG FOR R AND V		
9A	REDOCTR		INDICATES THE NUMBER OF RESTARTS THAT HAVE OCCURRED SINCE THE LAST FRESH START (V36E)
9B	THETAD FINAL DESIRED XCDU ANGLE		FINAL DESIRED CDU ANGLES DURING COARSE ALIGN OR ATTITUDE MANEUVERS. PREFERRED ATTITUDE DURING ORBITAL NAVIGATION (P20) AND AUTO OPTICS POSITIONING. INDICATE REORIENTATION ANGLES DURING ENTRY (P62).
10A	THETAD FINAL DESIRED YCDU ANGLE		
10B	THETAD FINAL DESIRED ZCDU ANGLE		
11A 11B 12A	QREL PITCH BODY RATE RREL YAW BODY RATE PREL ROLL BODY RATE	BODY RATES COMPUTED BY ENTRY DAP	
12B	QREL PITCH BODY RATE	SAME AS WORD 11A	
13A	CMDAPMOD ENTRY DAP MODE CONTROL	USED TO CONTROL BRANCHING IN ENTRY DAP	
13B	MVTD180E VALUE OF PREL	VALUE OF PREL (WORD 12A) COMPLEMENTED AND RESCALED	
14A 14B	LATANG LATERAL RANGE	INITIALLY LOADED IN P61 AND SUBSEQUENTLY UPDATED EVERY 2 SECONDS AFTER START OF P63	
15A 15B 16A 16B 17A 17B	RT + 0 RT + 1 RT + 2 RT + 3 RT + 4 RT + 5	VALUE OF ENTRY UNIT TARGET VECTOR IN REFERENCE COORDINATES. LOADED AT THE START OF P61.	

ENTRY AND UPDATE - Continued

::

TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
18A	PAXERR1 (ROLL ERROR)	VALUE OF ROLL ERROR FOR ENTRY DAP
18B	ROLLTM (ROLL ANGLE)	VALUE OF ROLL ANGLE USED BY ENTRY DAP
19A	OAXERR (PITCH ATTITUDE ERROR)	VALUE OF PITCH ATTITUDE ERROR COMPUTED IN ENTRY DAP
19B	RAXERR (YAW ATTITUDE ERROR)	VALUE OF YAW ATTITUDE ERROR COMPUTED IN ENTRY DAP
20A	COMPNUMB	IN P27, THE TOTAL NUMBER OF UPLINK WORDS TO BE RECEIVED. WHEN UPCOUNT (WD 21B) EQUALS THIS QUANTITY THE REQUEST FOR VERIFICATION OF UPLINK IS INITIATED.
20B	UPOLDMOD	IN P27, CONTAINS THE NUMBER OF THE PROGRAM THAT WAS INTERRUPTED BY ENTRANCE TO P27 TO PERMIT RESTORATION AFTER PERFORMANCE OF UPDATE.
21A	UPVERB	IN P27, CONTAINS INFORMATION ON THE UPLINK VERB THAT INITIATED THE PROGRAM TO PERMIT PROPER PROGRAM PERFORMANCE AFTER COMPLETION OF UPLINK SEQUENCE. THE VALUE IS 0, 1, 2, AND 3 RESPECTIVELY FOR V70, V71, V72, V73.
21B	UPCOUNT	IN P27, CONTAINS SERIAL NUMBER OF THE UPLINK WORD EXPECTED NEXT (INITIAL CONDITION IS 1). WHEN THE WORD HAS BEEN COMPLETED, IT IS LOADED INTO "UPBUFF" + UPCOUNT -1. WHEN UPCOUNT IS EQUAL TO COMPNUMB (WD 20A), IT IS CONCLUDED THAT THE UPLINK SEQUENCE IS COMPLETED. THE LINE-BY-LINE CORRECTION MODE DOES NOT CHANGE THIS VALUE, THEREFORE THE V21 N02 FLASH IS REPEATED AFTER EACH WORD.
22A 22B 23A 23B 24A 24B 25A 25B 26A 26B 27A 27B 28A 28B 29A 29B 30A 30B 31A 31B	UPBUFF + 0 UPBUFF + 1 UPBUFF + 2 UPBUFF + 3 UPBUFF + 4 UPBUFF + 5 UPBUFF + 6 UPBUFF + 7 UPBUFF + 8 UPBUFF + 9 UPBUFF + 10 UPBUFF + 11 UPBUFF + 12 UPBUFF + 13 UPBUFF + 14 UPBUFF + 15 UPBUFF + 16 UPBUFF + 17 UPBUFF + 18 UPBUFF + 19	A 20-CELL BUFFER USED TO CONTAIN UPLINKED WORDS AS THEY ARE COMPLETED DURING P27.

ENTRY AND UPDATE - Continued

\*\*

TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
32A 32B	TTE	TIME FROM ARRIVAL AT EMS INTERFACE ALTITUDE COMPUTED AT START OF P61 AND DISPLAYED IN R3 OF N63.
33A 33B	THETAH	VALUE OF "DESIRED RANGE" (ANGLE BETWEEN PRESENT POSITION VECTOR AND APPROPRIATELY ROTATED TARGET VECTOR) DURING ENTRY. INITIALLY LOADED IN P61 AND SUBSEQUENTLY COMPUTED EVERY 2 SECONDS AFTER START OF P63.
34A 34B	RDOT	VALUE OF ALTITUDE RATE (NEG IF DECENDING). QUANTITY COMPUTED AT START OF P61 AND SUBSEQUENTLY EVERY 2 SECONDS AFTER START OF P63.
35A	OPTMODES	<p>CONTROLS PERFORMANCE OF OPTICAL FUNCTIONS</p> <p>BITS 15-11 NOT ASSIGNED - SHOULD BE 0</p> <p>BITS 10-1 OPTICS HAS BEEN ZEROED SINCE LAST FRESH START OF RESTART. GENERATES ALARM (120)<sub>8</sub> IF OPTICS DRIVE IS ATTEMPTED WITH BIT=0.</p> <p>BIT 9 SET TO ONE WHEN OPTICS SWITCHED FROM COMPUTED MODE TO SOME OTHER MODE (MANUAL OR ZERO). SET TO ZERO BY FRESH START.</p> <p>BIT 8 NOT ASSIGNED, SHOULD BE 0.</p> <p>BIT 7 LAST SAMPLED VALUE OF CHANNEL 30 BIT 7 (OPTICS CDU FAIL). GENERATES TRACKER ALARM (DSPTAB 11 BIT 8=1) IF BIT GOES FROM 1 TO 0 PROVIDED BIT 2 OF OPTMODES = 0. SET TO ONE BY FRESH START OR RESTART.</p> <p>BIT 6 NOT ASSIGNED, SHOULD BE 0.</p> <p>BIT 5 LAST SAMPLED VALUE OF CHANNEL 33 BIT 5 (0 = OPTICS MODE SWITCH IN COMPUTER).</p> <p>BIT 4 LAST SAMPLED VALUE OF CHANNEL 33 BIT 4 (0 = OPTICS MODE SWITCH IN ZERO) IF BIT 5 AND BIT 4 OF OPTMODES = 1 THE MANUAL MODE IS SELECTED.</p> <p>BIT 3 SET TO ONE WHEN OPTICS MODE SWITCH SET TO ZERO. REMAINS ONE FOR 16.2 SECONDS (OPTICS ZEROING DELAY). IF MODE SWITCH IS TAKEN OUT OF ZERO DURING 16.2 SECONDS, ALARM (116)<sub>8</sub> IS GENERATED.</p> <p>BIT 2 BIT SET TO ONE TO INHIBIT ANY TRACKER ALARMS DURING OPTICS ZEROING DELAY.</p> <p>BIT 1 BIT SET TO ONE TO INDICATE OPTICS ZEROING DELAY COMPLETE IN .4 SEC INHIBITS ALARM (116)<sub>8</sub>.</p>
35B	HOLDFLAG	USED TO DETERMINE NATURE OF ATTITUDE HOLD CONTROL IN CSM RCS DAP. IF > +0 PERFORM ATTITUDE HOLD ABOUT ANGLES CONTAINED IN CDU INPUT COUNTERS (PRESENT IMU ANGLES). IF = +0 ATTITUDE HOLD ABOUT EXISTING REFERENCE. IF < +0 AUTOMATIC STEERING TO BE PERFORMED.

ENTRY AND UPDATE - Continued

::

TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
36A	CADRFLSH + 1	VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED MARK.		
36B	CADRFLSH + 2	VALUE OF RETURN ADDRESS INFORMATION FOR LAST NORMAL DISPLAY REQUESTED		
37A	CDUS	OPTICS SHAFT ANGLE, READS SHAFT CDU READ COUNTER		
37B	PIPAX	X, Y, AND Z PIPA INPUT COUNTERS ZEROED AT THE START OF AVE G AND EVERY 2 SEC DURING AVE G.		
38A	PIPAY			
38B	PIPAZ			
39A	CDUX			
39B	CDUY	X, Y, AND Z CDU INPUT COUNTERS. READ THE IMU CDU READ COUNTERS ZEROED DURING ZERO ENCODE MODE (IMODES 33 BIT 5=1).		
40A	CDUZ			
40B	CDUT	OPTICS TRUNNION ANGLE, READS TRUNNION CDU READ COUNTER		
41A	FLAGWORD 0	BIT	SET	RESET
	CPHIXCMP	15	OUTPUT OF CALGA IS CφX.	OUTPUT OF CALGA IS THETAD.
	JSWITCH	14	INTEGRATION OF W MATRIX.	INTEGRATION OF STATE VECTOR.
		13	NOT ASSIGNED, SHOULD BE ZERO	
		12	NOT ASSIGNED, SHOULD BE ZERO	
		11	NOT ASSIGNED, SHOULD BE ZERO	
	COAROFIN	10	USED IN TEST PROGRAMS, SHOULD BE ZERO	
	NEEDLFLG	9	TOTAL ATTITUDE ERROR DISPLAYED.	DAP FOLLOWING ERROR DISPLAYED.
	IMUSE	8	IMU IN USE.	IMU NOT IN USE.
	RNDVZFLG	7	NOT USED IN ENTRY AND UPDATE LIST.	
	R53FLG	6	NOT USED IN ENTRY AND UPDATE LIST.	
	TRUNFLG	5	NOT USED, SHOULD REMAIN ZERO.	
	FREEFLG	4	NOT USED IN ENTRY AND UPDATE LIST	
		3	USED TO CONTROL INTERNAL SUBROUTINE PERFORMANCE.	
		2	NOT USED, SHOULD BE ZERO.	
	ESCAPESW	1	NOT USED IN ENTRY AND UPDATE LIST.	
41B	FLAGWORD 1	BIT	SET	RESET
	NJETSFLG	15	NOT USED IN ENTRY AND UPDATE LIST.	
	STIKFLG	14	RHC IN CONTROL OF CSM- RCS DAP.	CMC IN CONTROL OF CSM- RCS DAP.
	ERADFLAG	13	NOT USED IN ENTRY AND UPDATE LIST.	
	R31FLAG	12	NOT USED IN ENTRY AND UPDATE LIST.	
	ENG2FLAG	11	NOT USED IN ENTRY AND UPDATE LIST.	
	TARG1FLAG	10	NOT USED IN ENTRY AND UPDATE LIST.	
	TARG2FLAG	9	NOT USED IN ENTRY AND UPDATE LIST.	
	VEHUPFLG	8	CSM STATE VECTOR BEING UPDATED.	LM STATE VECTOR BEING UPDATED.
	UPDATFLG	7	NOT USED IN ENTRY AND UPDATE LIST.	
	ONFLAG	6	NOT PROGRAMED, SHOULD BE ZERO.	
	TRACKFLAG	5	NOT USED IN ENTRY AND UPDATE LIST.	
		4	NOT USED, SHOULD BE ZERO.	
	ITER1SW	3	NOT USED IN ENTRY AND UPDATE LIST.	
	GUESSSW	2	NOT USED IN ENTRY AND UPDATE LIST.	
	AVEGFLAG	1	NOT USED IN ENTRY AND UPDATE LIST.	

::

ENTRY AND UPDATE - Continued  
TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
42A	FLAGWORD 2			
	DRIFTFLG	15	NOT USED IN ENTRY AND UPDATE LIST.	
	R21MARK	14	NOT USED IN ENTRY AND UPDATE LIST.	
		13-12	NOT ASSIGNED, SHOULD BE ZERO.	
	STEERSW	11	NOT USED IN ENTRY AND UPDATE LIST.	
	CYCLESW	10	NOT USED IN ENTRY AND UPDATE LIST.	
	IMPULSW	9	NOT USED IN ENTRY AND UPDATE LIST.	
	XDELVFLG	8	NOT USED IN ENTRY AND UPDATE LIST.	
	ETPIFLG, FIRSTFLG, RPEATFLG	7	NOT USED IN ENTRY AND UPDATE LIST.	
	FINALFLG	6	NOT USED IN ENTRY AND UPDATE LIST.	
	AVFLAG	5	NOT USED IN ENTRY AND UPDATE LIST.	
	PFRATFLG	4	NOT USED IN ENTRY AND UPDATE LIST.	
	CALCMAN 3	3	NOT USED IN ENTRY AND UPDATE LIST.	
	CALCMAN 2	2	NOT USED IN ENTRY AND UPDATE LIST.	
NODOFLG	1	MAJOR MODE CHANGE TO POO ONLY ALLOWED.	MAJOR MODE CHANGE TO ANY PROGRAM ALLOWED.	
		BIT	SET	RESET
42B	FLAGWORD 3			
	AUTMANSW	15	NOT USED IN ENTRY AND UPDATE LIST.	
	GLOKFAIL	14	NOT USED IN ENTRY AND UPDATE LIST.	
	REFSMFLG	13	NOT USED IN ENTRY AND UPDATE LIST.	
		12	NOT ASSIGNED, SHOULD REMAIN ZERO.	
	STBYFLAG	11	NOT USED IN ENTRY AND UPDATE LIST.	
	VFLAG	10	NOT USED IN ENTRY AND UPDATE LIST.	
	ONMONFLAG	9	SET TO ONE AT BEGINNING OF P61 AND P62 IN ORDER TO ENABLE SAMPLING OF ACCELEROMETER REGISTERS AT INTERMEDIATE TIMES.	SET TO ZERO WHEN AVE G COMPUTATIONS ARE TERMINATED.
		8	NOT ASSIGNED, SHOULD BE ZERO.	
	CULTFLAG	7	NOT USED IN ENTRY AND UPDATE LIST.	
	ORBWFLAG	6	NOT USED IN ENTRY AND UPDATE LIST.	
	STATEFLG	5	NOT USED IN ENTRY AND UPDATE LIST.	
	INTYPFLG	4	NOT USED IN ENTRY AND UPDATE LIST.	
	VINTFLAG	3	NOT USED IN ENTRY AND UPDATE LIST.	
D6OR9FLAG	2	NOT USED IN ENTRY AND UPDATE LIST.		
DIMOFFLAG	1	NOT USED IN ENTRY AND UPDATE LIST.		
		BIT	SET	RESET
43A	FLAGWORD 4			
	MRKIDFLG	15	MARK OR EXTENDED VERB DISPLAY IS WAITING FOR A RESPONSE.	NO MARK OR EXTENDED VERB DISPLAY WAITING.
	PRIDFLG	14	PRIORITY DISPLAY IS WAITING FOR A RESPONSE.	NO PRIORITY DISPLAY WAITING.
	ENDIOFLG	13	PRIORITY OR NORMAL DISPLAY IS WAITING FOR A RESPONSE.	NEITHER PRIORITY OR NORMAL DISPLAY IS WAITING.
	NRMIDFLG	12	NORMAL DISPLAY IS WAITING FOR A RESPONSE.	NO NORMAL DISPLAY WAITING.
	MWAITFLG	11	NOT PRESENTLY PROGRAMED.	SHOULD BE ZERO.
	NWAITFLG	10	NORMAL DISPLAY IS WAITING TO BE INITIATED.	NO NORMAL DISPLAY WAITING.
	MRKNVFLG	9	MARK OR EXTENDED VERB. DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.	
NRMNVFLG	8	NORMAL DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.		
PRONVFLG	7	PRIORITY DISPLAY FOUND DISPLAY SYSTEM IN USE BY ASTRONAUT OR UPLINK.		

ENTRY AND UPDATE - Continued  
 TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

::

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
43A	FLAGWORD 4 PINBRFLG	6	INTERFERENCE WITH AN INTERNALLY GENERATED DISPLAY HAS OCCURRED OR TERMINATE HAS OCCURRED WITH BIT 13 OF THIS FLAGWORD = 1.	
	MRUPTFLG	5	BIT SET TO ONE WHEN A MARK OR EXTENDED VERB DISPLAY HAS BEEN INTERRUPTED BY A PRIORITY DISPLAY.	
	NPUPTFLG	4	BIT SET TO ONE WHEN A NORMAL DISPLAY IS INTERRUPTED BY A MARK OR EXTENDED VERB DISPLAY OR A PRIORITY DISPLAY.	
	MRKOVFLG	3	BIT SET TO ONE WHEN A MARK OR EXTENDED VERB DISPLAY IS TO INTERRUPT A NORMAL DISPLAY.	
	RET1FLG	2 1	NOT PROGRAMED. SHOULD BE ZERO. NOT ASSIGNED. SHOULD BE ZERO.	
		BIT	SET	RESET
43B	FLAGWORD 5 DSKYFLG	15	DISPLAYS SENT TO DSKY.	NO DISPLAY SENT.
	INTFLAG2	14	INHIBITS USE OF ORBITAL INTEGRATION PACKAGE DURING P27.	
	INTFLAG3	13	NOT USED IN ENTRY AND UPDATE LIST.	
	V59FLAG	12	NOT USED IN ENTRY AND UPDATE LIST.	
	INCORFLG	11	NOT USED IN ENTRY AND UPDATE LIST.	
		10	NOT ASSIGNED SHOULD BE ZERO.	
	DMENFLG	9	NOT USED IN ENTRY AND UPDATE LIST.	
	COMPUTER	8		
	ENGONFLG	7	NOT USED IN ENTRY AND UPDATE LIST.	
	3AXISFLAG	6	NOT USED IN ENTRY AND UPDATE LIST.	
	GRRBKFLG	5	NOT USED IN ENTRY AND UPDATE LIST.	
NOSOLNSW, NOSOFLAG	4	NOT ASSIGNED, SHOULD BE ZERO.		
MGLVFLAG	3	NOT USED IN ENTRY AND UPDATE LIST.		
RENDWFLG	2 1	NOT USED IN ENTRY AND UPDATE LIST. W MATRIX IS VALID FOR REND NAVIGATION.		
		BIT	SET	RESET
44A	FLAGWORD 6 DAPBIT 1	15	INDICATE 0 } NO DAP DAP STATUS 0 } OR ENTRY	1 } TVC 0 } CSM 0 } DAP 1 } RCS 1 } SATURN DAP 1 } DAP
	DAPBIT 2	14		
	LEWDSW	13	INITIALLY A ZERO NEAR START OF P63 AND SET TO ONE IF ON 1ST CYCLE FOR WHICH THE SENSED DRAG IS .05G OR MORE.	
	CMDAPARM	12	"ARM" ENTRY DAP	SET TO ZERO IN P62 SHORTLY BEFORE START OF (00041)8 CHECKLIST DISPLAY.



ENTRY AND UPDATE - Continued

::

TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
44A	FLAGWORD 6 GAMDIFSW	11	PERMIT INITIALIZATION OF ENTRY DAP COMPUTATIONS TO PROCEED AND TO PERMIT AN ENTRY DAP QUANTITY TO BE COMPUTED AS THE FIRST DIFFERENCE OF THE PRESENT AND PREVIOUS VALUES OF A CELL.	SET TO ZERO IN P62 SHORTLY BEFORE START OF (00041) <sub>8</sub> CHECKLIST DISPLAY.
	GONEPAST	10	SET TO ONE IF IN P67 BIT 8 (GONEBYTG OF FLAGWRD 7 IS SENSED AS ONE.	INITIALIZED TO ZERO NEAR START OF P63.
	RELVELSW	9	SET TO ONE IF BIT 8 OF THIS WORD IS ONE AND OUTPUT OF AVE G EQUATIONS INDICATES A VELOCITY OF LESS THAN ABOUT 12883.1 FPS.	INITIALIZED TO ZERO NEAR START OF P63.
	EGSW	8	EGSW - SET WHEN P67 IS STARTED.	INITIALIZED TO ZERO NEAR START OF P67 AND START OF P61.
	HUNTSW1	7	SET WHEN "DRAG LEVEL INITIALIZED FOR CONSTANT DRAG."	INITIALIZED TO ZERO NEAR START OF P63.
	HIND	6	SET WHEN SOME ENTRY ITERATION CALCULATIONS ARE TO BE PERFORMED.	INITIALIZED TO ZERO NEAR START OF P63.
	INRLSW	5	SET WHEN THE FIRST TIME THE SENSED DRAG IS .05G OR MORE (A LATCHED VERSION OF BIT 3 OF THIS WORD).	INITIALIZED TO ZERO NEAR START OF P63.
	LATSW	4	SET SHORTLY BEFORE START OF (00041) <sub>8</sub> CHECKLIST DISPLAY, AND ALSO NEAR START OF P63.	RESET TO ZERO BY ENTRY GUIDANCE COMPUTATIONS TO ENFORCE A ROLL "OVER THE TOP" BY THE ENTRY DAP. BIT NOT EXPECTED TO BE RESET IN THIS FLIGHT SINCE COMPUTATIONS NOT ENTERED.
	05GSW	3	WHEN .05G OR MORE IS SENSED.	INITIALIZED TO ZERO IN P62 BEFORE START OF (00041) <sub>8</sub> CHECKLIST DISPLAY AND ALSO NEAR START OF P63. SET TO ZERO WHEN SENSED DRAG IN P64 IS LESS THAN .05G.
	CMDSTBY	2	INDICATES THAT ENTRY DAP NOT TO BE IN STANDBY (IS ACTIVATED). INITIALIZED TO ONE IN P62 SHORTLY BEFORE START OF (00041) <sub>8</sub> CHECKLIST DISPLAY.	RESET TO ZERO IN P67 AFTER RESPONSE TO THE V16N67 DISPLAY WHEN VELOCITY HAS BECOME LESS THAN 1000 FPS.
	GYMDIFSW	1	SET TO ONE IN ENTRY DAP IF IT IS ZERO AND BIT 2 OF THIS WORD IS ONE AND BIT 6 OF IMODES 33 IS ZERO. MEANS THAT CDU DIFFERENCES AND BODY RATES CAN BE COMPUTED.	INITIALIZED TO ZERO IN P62 SHORTLY BEFORE START OF (00041) <sub>8</sub> .

ENTRY AND UPDATE - Continued

\*\*

TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
44B	FLAGWORD 7 TERMIFLAG  IGNFLAG ASTNFLAG TIMRFLAG UNNORMSW TTMODESW GONEBY  IDLEFLAG  V37FLAG  UPLCKFL  VERIFLAG  ATTCHFLAG  TFFSW	15 14 13 12 11 10 9 8  7  6  5 4  3  2  1	NOT USED IN ENTRY AND UPDATE. NOT ASSIGNED, SHOULD BE ZERO. NOT USED IN ENTRY AND UPDATE. NOT USED IN ENTRY AND UPDATE. NOT USED IN ENTRY AND UPDATE. NOT USED IN ENTRY AND UPDATE. EXPECTED TO BE ZERO THIS FLIGHT SET IF IT IS CONCLUDED THAT THE VEHICLE HAS PASSED THE TARGET. INHIBITS THE ΔV MONITOR.  AVE G IS RUNNING.  NOT ASSIGNED, SHOULD BE ZERO. SET IF A FAILURE OF THE KKK DATA CHECK IS DETECTED IN PROCESSING AN INPUT FROM THE UPLINK RECEIVER. WHILE BIT IS A ONE, ALL UPLINK INFORMATION EXCEPT AN ERROR RESET CODE IS REJECTED BY THE PROGRAM. BIT WHOSE VALUE IS COMPLEMENTED WHEN THE FINAL PROCEED ENTRY IS RECEIVED IN P27 INDICATING THAT THE UPLINK INFORMATION IS TO BE USED. LM ATTACHED INDICATION FOR CSM-RCS DAP COMPUTATION. CALCULATION TIME OF PERIGEE.	RESET TO ZERO EACH TIME THROUGH THE ENTRY "TARGETING" ROUTINE. ENABLES AVEG ROUTINE TO PERFORM ΔV MONITOR FUNCTION. AVE G STATE VECTOR HAS BEEN UPDATED (AVE G IS OFF).  RESET TO ZERO BY SENDING AN ERROR RESET CODE VIA THE UPLINK. THE DSKY ERROR RESET KEY DOES NOT RESET THE BIT.  LM NOT ATTACHED.  CALCULATE TFF. SINCE BIT IS RESET AFTER PERIGEE TIME IS COMPUTED BIT WILL BE OBSERVED AS ZERO.
45A 45B 46A 46B 47A 47B 48A 48B 49A 49B 50A	DSPTAB + 0 DSPTAB + 1 DSPTAB + 2 DSPTAB + 3 DSPTAB + 4 DSPTAB + 5 DSPTAB + 6 DSPTAB + 7 DSPTAB + 8 DSPTAB + 9 DSPTAB + 10		DISPLAY TABLE CODES FOR GENERATION OF DSKY NUMERICS.  USED TO INDICATE VERB-NOUN, MAJOR MODE AND R1 R2 R3 DISPLAYS.	
50B	DSPTAB + 11		DISPLAY TABLE TO DSKY STATUS LIGHTS. 60400g = PROGRAM CAUTION, 60200g = TRACKER WARNING. 60020g = NO ATTITUDE, 60040g = GIMBAL LOCK.	
51A 51B	TNOW		COMPUTER CLOCK INDICATING TIME SINCE LIFTOFF. UPDATED BY V55E OR V73E.	

ENTRY AND UPDATE - Continued

::

TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL TIME SIGNIFICANCE
52A 52B 53A 53B 54A 54B	DELVX  DELVY  DELVZ	X, Y, AND Z COMPENSATED PIPA COUNT, FOR 2 SEC INCREMENT DURING AVERAGE G. APPLIES DURING P62, P63, P64, AND P67 IN ENTRY AND UPDATE LIST TRANSMISSION.
55A 55B 56A 56B 57A 57B	VREL VREL + 1 VREL + 2 VREL + 3 VREL + 4 VREL + 5	VELOCITY MEASURED RELATIVE TO THE ATMOSPHERE DURING ENTRY.
58A 58B	PIPTIME 1	VALUE OF TIME WHEN THE PIPAS WERE LAST READ.
59A	REDOCTR	SAME AS 9A
59B 60A 60B	THETAD FINAL DESIRED XCDU ANGLE THETAD FINAL DESIRED YCDU ANGLE THETAD FINAL DESIRED ZCDU ANGLE	SAME AS 9B, 10A, 10B
61A 61B 62A	QREL (PITCH BODY RATE) PREL (YAW BODY RATE) PREL (ROLL BODY RATE)	SAME AS 11A, 11B, 12A
62B	QREL (PITCH BODY RATE)	SAME AS 12B
63A	CMDAPMOD (ENTRY DAP MODE CONTROL)	SAME AS 13A
63B	MVTD180E (VALUE OF PREL)	SAME AS 13B
64A 64B	LATSPL (LATITUDE OF TARGET)	VALUE OF INPUT DATA ON TARGET LATITUDE. A POSITIVE LATITUDE IS NORTH. CAN BE LOADED IN R1 BY N61 (AND IS DISPLAYED IN P61 JUST AFTER SEP ACKNOWLEDGE) FOR USE IN DEFINING ENTRY TARGET.
65A 65B	LNGSPL (LONGITUDE OF TARGET)	VALUE OF INPUT DATA ON TARGET LONGITUDE. A POSITIVE LONG IS EAST. CAN BE LOADED IN R2 BY N61.
66A 66B	GAMMAEI (GAMMA ENTRY INTERFACE)	VALUE OF FLIGHT PATH ANGLE AT 400,000 FEET ABOVE FISCHER RADIUS COMPUTED AT START OF P61 (ONCE ONLY) AND DIS- PLAYED IN R3 OF N60. IT IS NEGATIVE AND IS THE "ANGLE HORIZONTAL" AT THIS ALTITUDE.

ENTRY AND UPDATE - Continued

\*

TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
67A 67B	VPRED (VELOCITY ENTRY INTERFACE)	VALUE OF PREDICTED VELOCITY AT AN ALTITUDE OF 400,000 FEET ABOVE FISCHER RADIUS COMPUTED AT START OF P61 (ONCE ONLY) AND DISPLAYED IN R2 N60. IF BIT 3 OF FLAGWORD 6 = 1 (.05GSW) CELL CONTAINS L/D CALC WHICH IS A CALCULATED VALUE OF LIFT TO DRAG.
68A	ROLLTM (ROLL ANGLE)	SAME AS 18B
68B	ROLLCSP (ROLL COMMAND)	VALUE OF MOST SIGNIFICANT HALF OF ROLL COMMAND GENERATED BY ENTRY EQUATIONS. IT IS INITIALIZED TO 180° IF HEADSUP (R3 OF N61) IS POSITIVE NON-ZERO, AND TO 0° IF HEADSUP = 0 IN P62 AFTER SEP ACKNOWLEDGED.
69A	QAXERR (PITCH ATTITUDE ERROR)	SAME AS 19A
69B	RAXERR (YAW ATTITUDE ERROR)	SAME AS 19B
70A	COMPNUMB	SAME AS 20A
70B	UPOLDMOD	SAME AS 20B
71A	UPVERB	SAME AS 21A
71B	UPCOUNT	SAME AS 21B
72A 72B 73A 73B 74A 74B 75A 75B 76A 76B 77A 77B 78A 78B 79A 79B 80A 80B 81A 81B	UPBUFF + 0 UPBUFF + 1 UPBUFF + 2 UPBUFF + 3 UPBUFF + 4 UPBUFF + 5 UPBUFF + 6 UPBUFF + 7 UPBUFF + 8 UPBUFF + 9 UPBUFF + 10 UPBUFF + 11 UPBUFF + 12 UPBUFF + 13 UPBUFF + 14 UPBUFF + 15 UPBUFF + 16 UPBUFF + 17 UPBUFF + 18 UPBUFF + 19	SAME AS 22A THROUGH 31B
82A 82B	LDD1 (L/D)	VALUE OF DESIRED LIFT TO DRAG RATIO USED IN ENTRY PROGRAM TO COMPUTE DESIRED ROLL COMMAND. UPDATED EVERY 2 SECONDS DURING ENTRY PORTION OF FLIGHT STARTING SHORTLY AFTER P63.

ENTRY AND UPDATE - Continued

TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
83A	RTGO + 1	LEAST SIGNIFICANT HALF OF RTGO. MOST SIGNIFICANT HALF OF RTGO IN UPBUFF + 19 WHEN IN P61.		
83B	CADRFLSH	VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED PRIORITY DISPLAY FROM DISPLAY INTERFACE ROUTINES.		
84A 84B	V10	VALUE OF PREDICTED VELOCITY AT ENTRY MONITORING SYSTEM (EMS) ALTITUDE COMPUTED AT START OF P61 (ONCE ONLY) AND DISPLAYED IN R2 OF N63.		
85A	DAPDAR1 LOADED WITH V48N46E	BIT	SET	RESET
		15	NOT USED SHOULD BE ZERO	
		14	0 } NO DAP 1 } LM-ON 0 } LM-OFF 1 } SATURN	
			OR	
		13	0 } ENTRY 0 } RCS DAP 1 } RCS DAP 1 } DAP	
		12-11	NOT USED, SHOULD BE ZERO.	
		10	USE A/C QUAD (RCS JETS).	IF BIT 7=0 USE A/C AND B/D.
		9-8	NOT USED, SHOULD BE ZERO.	
		7	USE B/D QUAD (RCS JETS).	IF BIT 10=0 USE A/C AND B/D.
		6-5	NOT USED SHOULD BE ZERO.	
		4	5° DEADBAND	0.5° DEADBAND
		3	NOT USED, SHOULD BE ZERO.	
		2	( SPECIFY ) 0 } .05° 0 } 0.2° 1 } .5° 1 } 4°	
			( MANEUVER RATE ) / / / /	
		1	0 } SEC 1 } SEC 0 } SEC 1 } SEC	
85B	DAPDAR2 LOADED WITH V48N46E	BIT	SET	RESET
		15-14	NOT USED, SHOULD BE ZERO.	
		13	USE A/C QUAD FOR ROLL.	USE B/D QUAD FOR ROLL.
		12-11	NOT USED, SHOULD BE ZERO.	
		10	USE OF A QUAD ALLOWED.	USE OF A QUAD NOT ALLOWED.
		9-8	NOT USED, SHOULD BE ZERO.	
		7	USE OF B QUAD ALLOWED.	USE OF B QUAD NOT ALLOWED.
		6-5	NOT USED, SHOULD BE ZERO.	
		4	USE OF C QUAD ALLOWED.	USE OF C QUAD NOT ALLOWED.
		3-2	NOT USED, SHOULD BE ZERO.	
		1	USE OF D QUAD ALLOWED.	USE OF D QUAD NOT ALLOWED.
86A 86B	RSBQ	VALUE OF BBANK AND Q REGISTERS AT THE TIME OF A RESTART. USED TO DETERMINE LOCATION OF RESTART OCCURRENCE.		
87A	ALARMCADR + 0	CONTAINS S REGISTER PORTION OF 1ST ADDRESS FOLLOWING MOST RECENT ALARM.		
87B	ALARMCADR + 1	SAME AS 73B		

ENTRY AND UPDATE - Continued  
TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE		
		BIT	SET	RESET
88A	IMODES 30 BITS 15 THROUGH 9 ARE LAST SAMPLED VALUE OF CHANNEL 30 EXCEPT FOR BIT 10 WHICH IS LAST SAMPLED VALUE OF CHAN 33 BIT 13.	15	IMU TEMP OUT OF LIMITS. (CHANNEL 11 BIT 4 IS SET TO	IMU TEMP WITHIN LIMITS. AGREE WITH THIS BIT).
		14	NO ISS TURN ON REQUEST.	ISS TURN ON REQUEST HAS OCCURRED.
		13	NO IMU FAIL	IMU FAIL HAS OCCURRED. IF BIT 4 OF THIS WORD IS ALSO ZERO SETS CHAN 11 BIT 1=1.
		12	NO ECDU FAIL	ECDU FAIL HAS OCCURRED. IF BIT 3 OF THIS WORD IS ALSO ZERO, SET CHAN 11 BIT 1=1.
		11	NO IMU CAGE COMMAND	IMU CAGE COMMANDED
		10		PIPA FAIL HAS OCCURRED. IF BIT 1 OF THIS WORD IS ALSO ZERO SET CHAN 11 BIT 1=1.
		9	IMU NOT OPERATING	IMU OPERATING
		8	BIT USED IN IMU TURN-ON SEQUENCING. SET FOR .48 SEC WILL MOST LIKELY BE ZERO.	
		7	BIT USED IN IMU TURN-ON SEQUENCING. SET FOR .48 SEC WILL MOST LIKELY BE ZERO.	
		6	IMU INITIALIZATION BEING ACCOMPLISHED (CAGE CMD, IMU ZEROING, TURN-ON DELAY ALL SET THIS BIT).	IMU NOT IN INITIALIZATION.
		5	INHIBIT ALARM 2128 IF PIPA FAIL OCCURS DURING TURN-ON SEQUENCING.	
		4	INHIBIT ISS WARNING BASED ON IMU FAIL (OCCURS DURING TURN-ON DELAY AND COARSE ALIGN).	ISS WARNING NOT INHIBITED.
		3	INHIBIT ISS WARNING BASED ON ECDU FAIL (OCCURS DURING TURN-ON DELAY AND IMU ZERO).	ISS WARNING NOT INHIBITED.
		2	INDICATES TURN-ON DELAY FAILURE ALONG WITH ALARM 2078.	NO TURN-ON DELAY FAILURE.
		1	INHIBIT ISS WARNING BASED ON PIPA FAIL. (BIT IS ONE UNLESS AVERAGE "G" IS RUNNING.	ISS WARNING NOT INHIBITED (AVERAGE G IS RUNNING).
		88B	IMODES 33	15
14	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 30 BIT 14.			SET TO ZERO WHEN STANDBY BUTTON ON DSKY IS PRESSED (CONTROLS PROCEED FUNCTION THE SAME AS V33E.)
13	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 13.			SET TO ZERO IF PIPA FAIL HAS OCCURRED.
12	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 12.			SET TO ZERO IF TELEMETRY DOWNLINK IS TOO FAST.
11	MONITORS THE LAST SAMPLED VALUE OF CHANNEL 33 BIT 11.			SET TO ZERO IF UPLINK IS TOO FAST.
10-7	NOT ASSIGNED, SHOULD REMAIN			ZERO.
6	IMU USE FOR VEHICLE ATTI- TUDE SHOULD NOT BE ATTEMPTED. SET TO ONE IN COARSE ALIGN AND IMU ZEROING.			SET OF ZERO AFTER FINE ALIGN ROUTINE.

ENTRY AND UPDATE - Continued  
 TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE					
		BIT	SET	RESET			
88B	IMODES 33	5	SET TO ONE DURING IMU ZEROING ROUTINE (V40N20E).	NOT EXPECTED TO BE USED IN FLIGHT.			
		4-3	NOT ASSIGNED, SHOULD BE ZERO.				
		2	USED IN GROUND TESTING ONLY				
		1	SET TO ONE WITH V35E (LAMP TEST) FOR 5 SEC.				
89A	CDUX	SAME AS 39A					
89B	CDUY	SAME AS 39B					
90A	CDUZ	SAME AS 40A					
90B	CDUT	SAME AS 40B					
91A	CHANNEL 11	15-14	NOT ASSIGNED, SHOULD BE ZERO.				
		13	SET TO ONE FOR SPS ENGINE ON NOT USED IN COAST AND ALIGN.				
		12-11	NOT ASSIGNED, SHOULD BE ZERO.				
		10	SET 1 WHEN ERROR RESET KEYCODE FROM UPLINK OR DSKY IS RECEIVED.				
		9	TEST CONNECTOR OUTPUT SET TO ONE 2 SECONDS AFTER AVE G STARTS AND REMAINS 1 UNTIL AVE G END.				
		8	NOT ASSIGNED, SHOULD BE ZERO.				
		7	SET TO ONE WHEN OPERATOR ERROR HAS OCCURRED.				
		6	SET TO 1 WHEN OPERATOR ACTION IS REQUIRED (DSKY IS FLASHING).				
		5	SET TO 1 WITH KEY RELEASE LIGHT INDICATING PROGRAM DESIRES USE OF DSKY DISPLAYS.				
		4	SET TO ONE WHEN THE IMU TEMP IS OUT OF LIMITS.				
		3	SET TO 1 WHEN UPLINK INTERRUPT OCCURS INDICATING UPLINK ACTIVITY.				
		2	SET TO 1 WHEN COMPUTER IS WORKING ON AN ACTIVE JOB. GENERATES COMPUTER ACTIVITY LIGHT.				
		1	SET TO 1 WITH ISS WARNING. SETS ISS WARNING LIGHT.				
		91B	CHANNEL 12		15	SET TO ONE 4 SECONDS AT THE END OF THE ISS 90 SEC. TURN-ON DELAY INDICATING TURN-ON DELAY COMPLETE.	
					14	S-IVB CUTOFF COMMAND. NOT EXPECTED TO BE USED DURING FLIGHT.	
13	S-IVB INJECTION SEQUENCING START NOT EXPECTED TO BE USED DURING FLIGHT.						
12	NOT ASSIGNED, SHOULD BE ZERO.						
11	DISENGAGE OPTICS DAC NOT EXPECTED TO BE USED.						
10	ZERO OPTICS COMMAND NOT EXPECTED TO BE USED.						
9	SET TO ONE WITH V46E IF BITS 14-13 OF DAPDATABIT = 1 SETS S-IVB TAKEOVER ENABLE.						
8	SET TO ONE IN P40 IF TVC DAP IS GOING TO BE USED. SETS TVC DAP ENABLE.						
7	NOT ASSIGNED, SHOULD BE ZERO.						
6	IMU CDU ERROR COUNTER ENABLE SET TO ONE DURING COARSE ALIGN, S-IVB TAKEOVER AND ATTITUDE ERRORS TO FDAI.						
5	IMU CDU ZERO COMMAND. SET TO ONE ANYTIME IMU CDU READ COUNTERS ARE TO BE ZEROED.						
4	IMU COARSE ALIGN ENABLE. SET TO ONE ANYTIME IMU IS TO BE COARSE ALIGNED.						
3	NOT USED.						

ENTRY AND UPDATE - Continued  
TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
91B	CHANNEL 12	BIT 2 1	OPTICS CDU ERROR COUNTER ENABLE. SET TO ONE DURING OPTICS COARSE ALIGN OR TVC DAP ENABLE. ZERO OPTICS CDU. SET TO ONE FOR 0.2 SEC AT THE END OF OPTICS ZEROING SEQUENCE. BECAUSE OF SHORT SET TIME, IT SHOULD BE ZERO.
92A	CHANNEL 13	BIT 15 14 13 12 11 10 9 8 7 6 5 4-1	T6RUPT ENABLE. ONE ENABLES THE TIME 6 COUNTER TO START COUNTING DOWN FOR RCS JET ON TIME. USED IN CSM-RCS DAP AND TVC ROLL DAP. NOT EXPECTED TO BE USED, SHOULD BE ZERO. NOT EXPECTED TO BE USED, SHOULD BE ZERO. NOT EXPECTED TO BE USED, SHOULD BE ZERO. SET TO ONE AT THE END OF P06 TO ENABLE STANDBY BUTTON TO DOWNMODE THE COMPUTER TO STANDBY. SET TO 1 BY V35E (LAMP TEST). REMAINS 1 FOR 5 SEC. NOT ASSIGNED, SHOULD BE ZERO. NOT USED, SHOULD BE ZERO. WORD ORDER CODE BIT 1, EXCEPT FOR WORDS 1 AND 51. BLOCK UPLINK NOT SET BY PROGRAM. NOT USED, SHOULD BE ZERO. NOT ASSIGNED, SHOULD BE ZERO.
92B	CHANNEL 14	BIT 15 14 13 12 11 10 9 8 7 6 5 4-2 1	XCDU DRIVE ENABLE. ENABLES PULSES TO BE SENT FROM COMPUTER TO XCDU ERROR COUNTER. YCDU DRIVE ENABLE. ZCDU DRIVE ENABLE. TRUNNION CDU DRIVE ENABLE. ENABLES PULSES TO BE SENT TO TRUNNION CDU ERROR COUNTER FOR EITHER OPTICS COARSE ALIGN OR TVC YAW AXIS COMMAND. SHAFT CDU DRIVE ENABLE. ALSO TVC PITCH AXIS COMMAND. ENABLE GYRO TORQUEING. ENABLES PULSES TO BE SENT FROM COMPUTER TO GYRO PULSE TORQUE ELECTRONICS. BIT SET TO ONE TO INDICATE NEGATIVE GYRO TORQUE. 0{ NO 0{ TORQUE 1{ TORQUE 1{TORQUE 0{AXIS 1{X-AXIS GYRO 0{Y-AXIS GYRO 1{Z-AXIS GYRO 6 SET TO ONE TO ENABLE GYRO PULSE TORQUE POWER SUPPLY. 5 NOT USED. 4-2 NOT ASSIGNED. 1 NOT USED.
93A	CHANNEL 30	BIT 15 14 13 12 11 10 9 8	ZERO IF IMU TEMP WITHIN LIMITS. ZERO IF ISS IS ON OR COMMANDED ON. ZERO IF IMU FAIL HAS OCCURRED. ZERO IF IMU CDU FAIL HAS OCCURRED. ZERO IF IMU CAGE HAS BEEN COMMANDED. ZERO IF LV GUIDANCE SW IN CMC POSITION. (S/C CONTROL OF SATURN). ZERO IF IMU OPERATING WITH NO MALFUNCTIONS. NOT ASSIGNED, SHOULD BE ZERO.



ENTRY AND UPDATE - Continued  
 TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE	
93A	CHANNEL 30	BIT 7 6 5 4 3 2 1	ZERO IF OPTICS CDU FAIL HAS OCCURRED. ZERO IF GUIDANCE REFERENCE RELEASE HAS OCCURRED. ZERO IF LIFTOFF HAS OCCURRED CAUSES CHANGE FROM P02 TO P11. ZERO IF S-IVB SEPARATION OR ABORT HAS OCCURRED. ZERO WHEN SPS ENGINE BURN PREPARATIONS ARE COMPLETE. ZERO IF CM/SM SEPARATION HAS OCCURRED. ZERO IF ULLAGE THRUST FROM S-IVB PRESENT.
93B	CHANNEL 31  THC INPUTS  RHC INPUTS	BIT 15  14 13 12 11 10 9 8 7 6 5 4 3 2 1	SET TO ZERO IF COMPUTER IS IN CONTROL OF THE SPACECRAFT. SET TO ONE BY G&N AUTOPILOT CONTROL SWITCH OFF OR IMJ OFF. ZERO IF RCS DAP FREE MODE IS SELECTED. ZERO IF RCS DAP HOLD MODE IS SELECTED. IF BITS 14 AND 13 = 112 AUTOMATIC MODE SELECTED. ZERO IF -Z TRANSLATION COMMANDED. ZERO IF +Z TRANSLATION COMMANDED. ZERO IF -Y TRANSLATION COMMANDED. ZERO IF +Y TRANSLATION COMMANDED. ZERO IF -X TRANSLATION COMMANDED. ZERO IF +X TRANSLATION COMMANDED. ZERO IF -ROLL COMMANDED. ZERO IF +ROLL COMMANDED. ZERO IF -YAW COMMANDED. ZERO IF +YAW COMMANDED. ZERO IF -PITCH COMMANDED. ZERO IF +PITCH COMMANDED.
94A	CHANNEL 32  MINIMUM IMPULSE CONTROLLER INPUTS	BIT 15 14  13-12 11 10-7 6 5 4 3 2 1	NOT ASSIGNED, SHOULD BE ZERO. ZERO IF PROCEED KEY (FORMERLY STANDBY) ON DSKY IS PRESSED. NOT ASSIGNED, SHOULD BE ZERO. NOT USED IN S/C 101. NOT ASSIGNED, SHOULD BE ZERO. ZERO IF -ROLL COMMANDED. ZERO IF +ROLL COMMANDED. ZERO IF -YAW COMMANDED. ZERO IF +YAW COMMANDED. ZERO IF -PITCH COMMANDED. ZERO IF +PITCH COMMANDED.
94B	CHANNEL 33	BIT 15 14 13 12 11 10  9-8 7 6 5 4 3-1	ZERO IF COMPUTER OSCILLATOR HAS STOPPED. ZERO IF CMC WARNING HAS OCCURRED. ZERO IF PIPA FAIL HAS OCCURRED. ZERO IF TELEMETRY DOWNLINK IS TOO FAST. ZERO IF UPLINK TOO FAST. ZERO IF BLOCK UPLINK SWITCH IN SPACECRAFT IS SET TO BLOCK. NOT ASSIGNED, SHOULD BE ZERO. NOT USED. NOT USED. ZERO IF CMC CONTROL OF OPTICS IS SET. ZERO IF ZERO OPTICS IS SET. NOT ASSIGNED, SHOULD BE ZERO.

ENTRY AND UPDATE - Concluded  
TRANSMITTED IN PROGRAMS 27, 62, 63, 64 AND 67

WORD NO.	DESCRIPTION	REAL-TIME SIGNIFICANCE
95A	DSPTAB + 0	SAME AS 45A
95B	DSPTAB + 1	SAME AS 45B
96A	DSPTAB + 2	SAME AS 46A THROUGH 50B
96B	DSPTAB + 3	
97A	DSPTAB + 4	
97B	DSPTAB + 5	
98A	DSPTAB + 6	
98B	DSPTAB + 7	
99A	DSPTAB + 8	
99B	DSPTAB + 9	
100A	DSPTAB + 10	
100B	DSPTAB + 11	

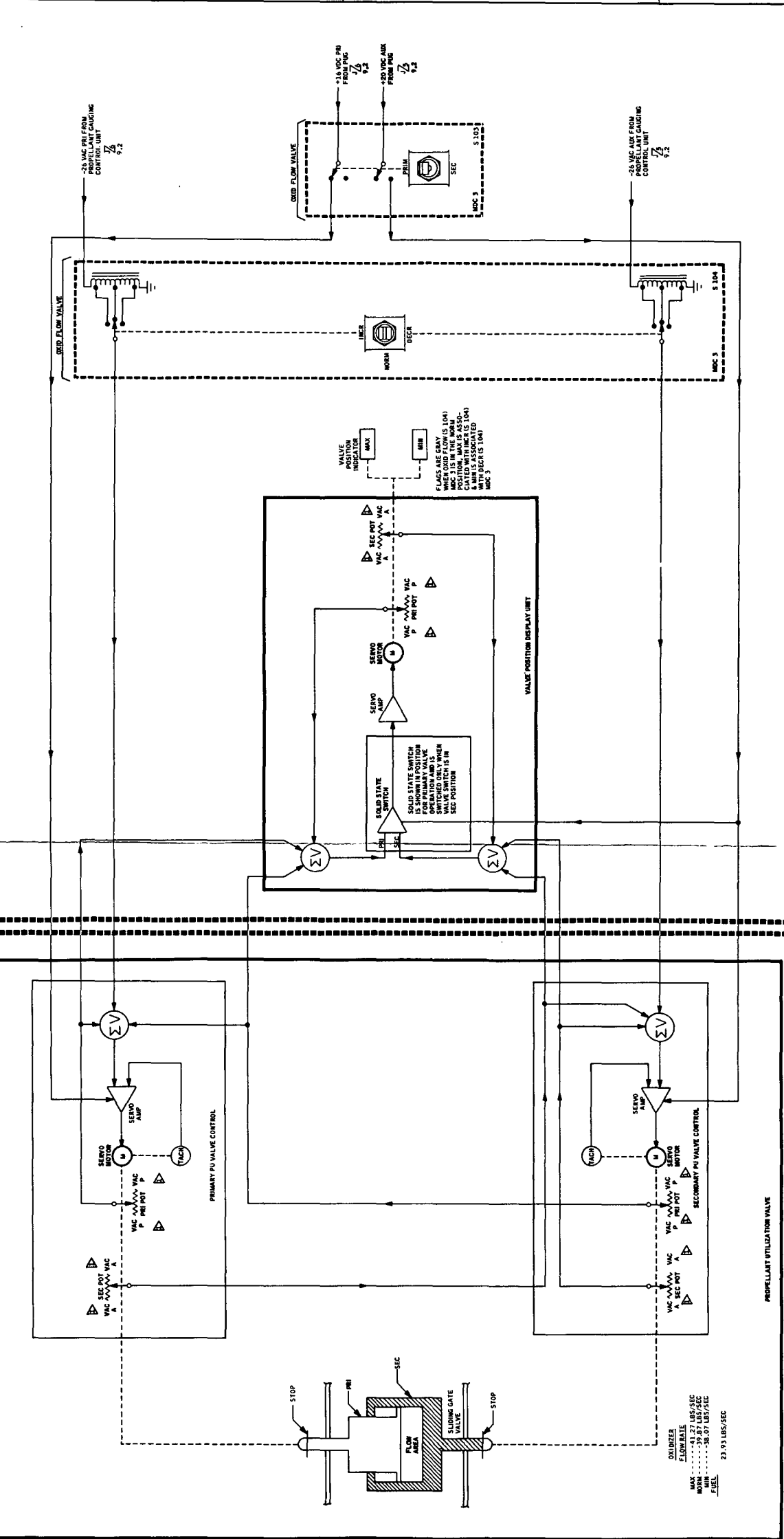
Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

8  
7  
6  
5  
4  
3  
2  
1  
A B C D E F G H

REVISIONS  
DATE  
BY



A-1 IS POWER FROM AUX POWER SUPPLY  
P-1 IS POWER FROM PRI POWER SUPPLY

# SPS 3

NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
DATE 10-1-72	BY E. J. ...
REV 10-2-72	BY ...
DRWING NO. 10-2-72	SCALE E
CSM 101	SHEET NO. 93
SCALE E	SHEET 93

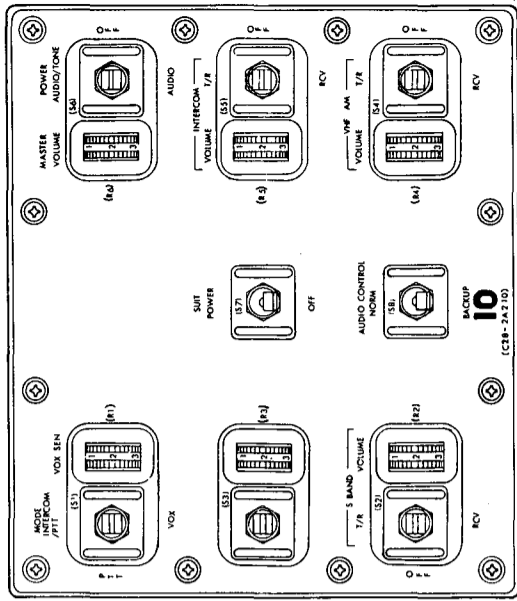
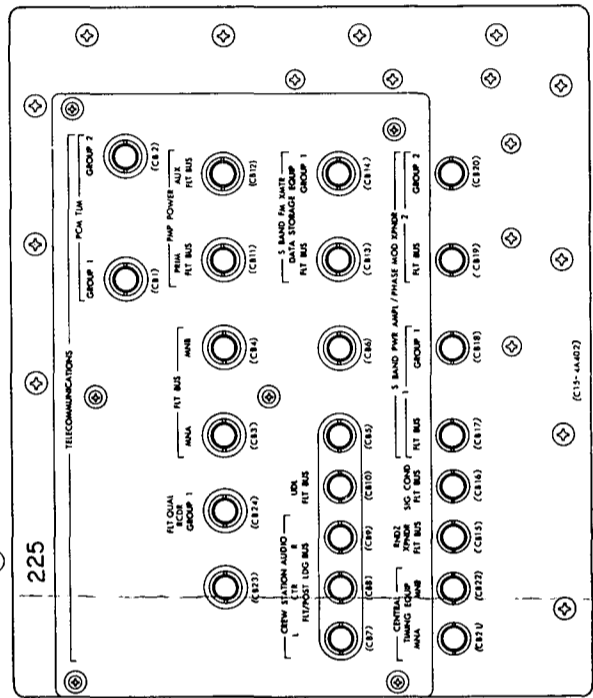
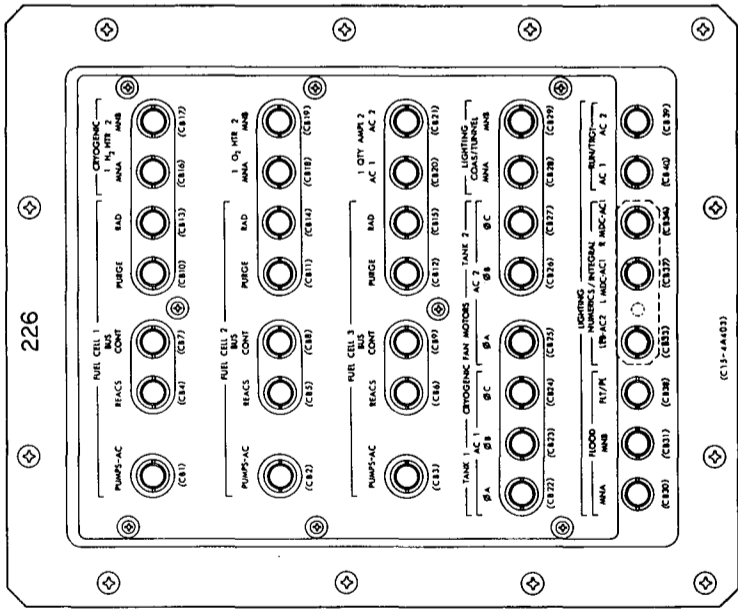
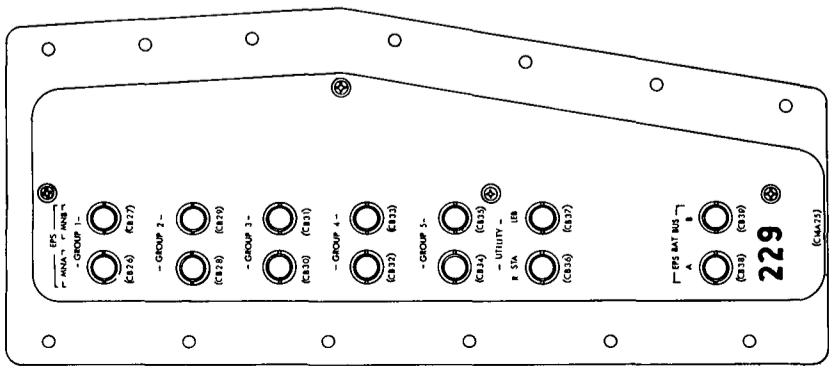
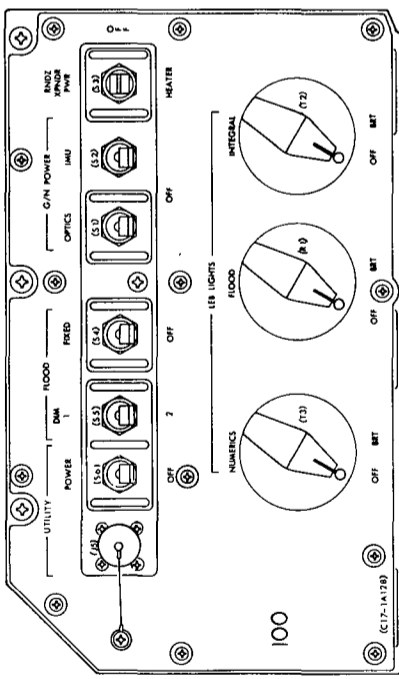
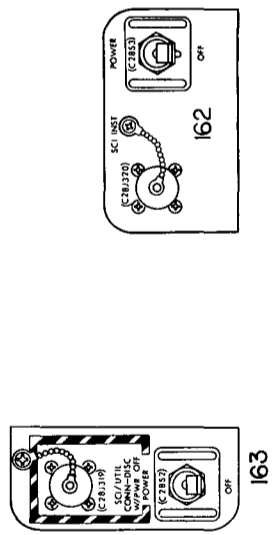
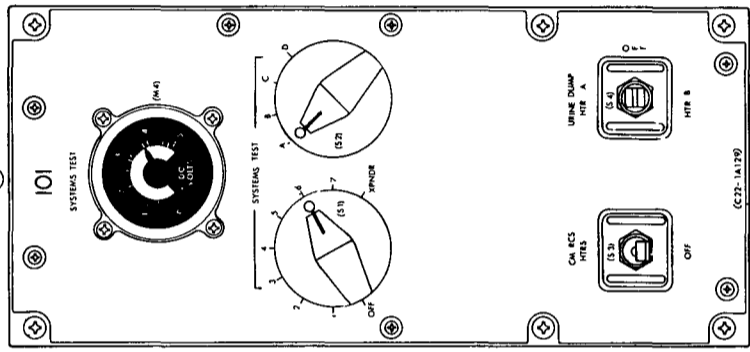
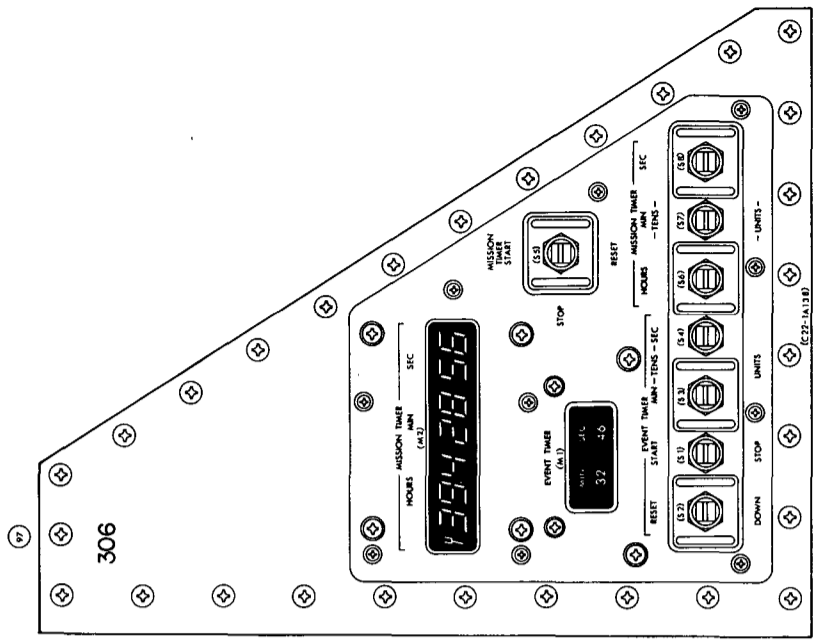
228

Page intentionally left blank

Page intentionally left blank



Page intentionally left blank



NATIONAL AERONAUTICS & SPACE ADMINISTRATION  
MANNED SPACECRAFT CENTER HOUSTON, TEXAS

**CONTROL DISPLAY FIGURE**

FIG. NO.	SIZE	SCALE
11.1A		
SHEET	OF	PAGE

V36-976018

232<

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

Page intentionally left blank



Page intentionally left blank

Page intentionally left blank

Page intentionally left blank

97

98

99

100

REVISIONS		DATE	APPROVED
1	WAS REWORKED		
2	RECORD CHANGE		
3	REWORKED		
4	REWORKED		
5	REWORKED		
SEE REVISION RECORD			
SEE REVISION RECORD			

INSTRUMENTATION INSTL  
REACTION CONTROL SYS  
QUADS A & C SHOWN  
V37-756522 (REF)  
QUADS B & D REFER TO  
V37-756523 (REF)

FUEL SUPPLY

OXIDIZER SUPPLY

MODULAR ASSY, REACTION  
CONTROL SYS COMPLETE  
V37-40010 (REF)  
PROPELLANT SYS ASSY,  
REACTION CONTROL SYS,  
QUADS A & C SHOWN  
V37-40011 (REF)  
QUADS B & D REFER TO  
DWG V37-40012  
REACTION CONTROL SYS,  
ENGINE ASSY  
V17-43001 (REF)  
REACTION CONTROL SYS ELEC  
WIRING AND EQUIP INSTL  
ENGINE V37-445002 (REF)  
STRUCTURAL PANEL  
ASSY V37-350300 (REF)

HELIUM PRESSURIZATION  
ASSY, V37-460105 (REF)

(AUXILIARY FUEL)

(PRIMARY FUEL)

(PRIMARY OXIDIZER)

(AUXILIARY OXIDIZER)

(HELIUM BOTTLE)

ELECTRICAL INSTL  
REACTION CONTROL SYS  
QUADS A & C SHOWN  
V37-440143 (REF)  
QUADS B & D REFER TO  
V37-440142 (REF)

VIEW U-U  
ROTATED 75° CW  
TYPICAL OF QUADS A & C

# 1.9STR

NORTH AMERICAN AVIATION, INC.  
1874 LAKESIDE BLVD., DONNER, CALIFORNIA  
CODE BODY NO. SIZE  
03953 J  
SCALE NONE  
SHEET 9

97

98

99

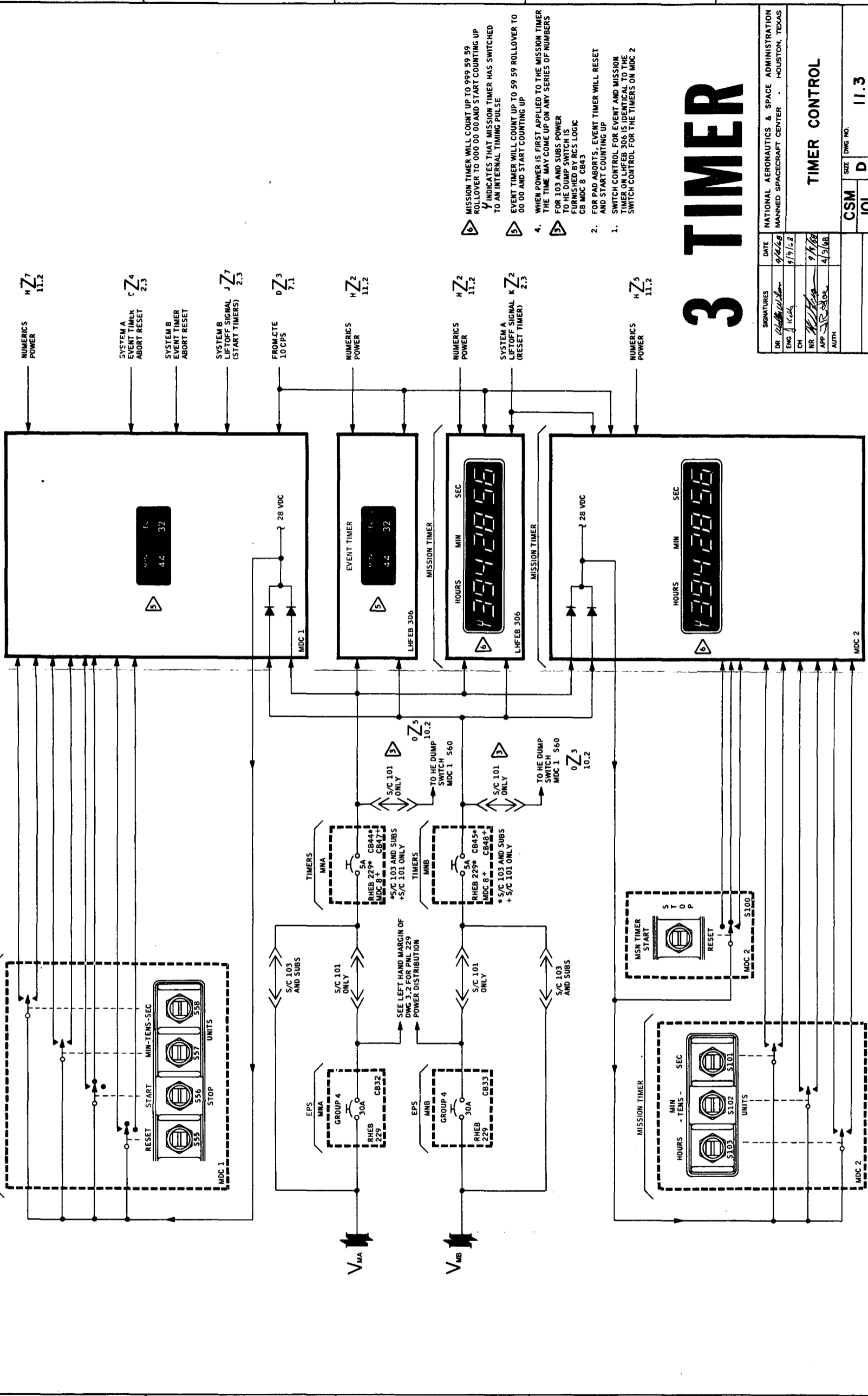
100

242<

Page intentionally left blank

Page intentionally left blank

LTR	ENGR	DATE	APPROVAL
A	A	1/11/68	[Signature]

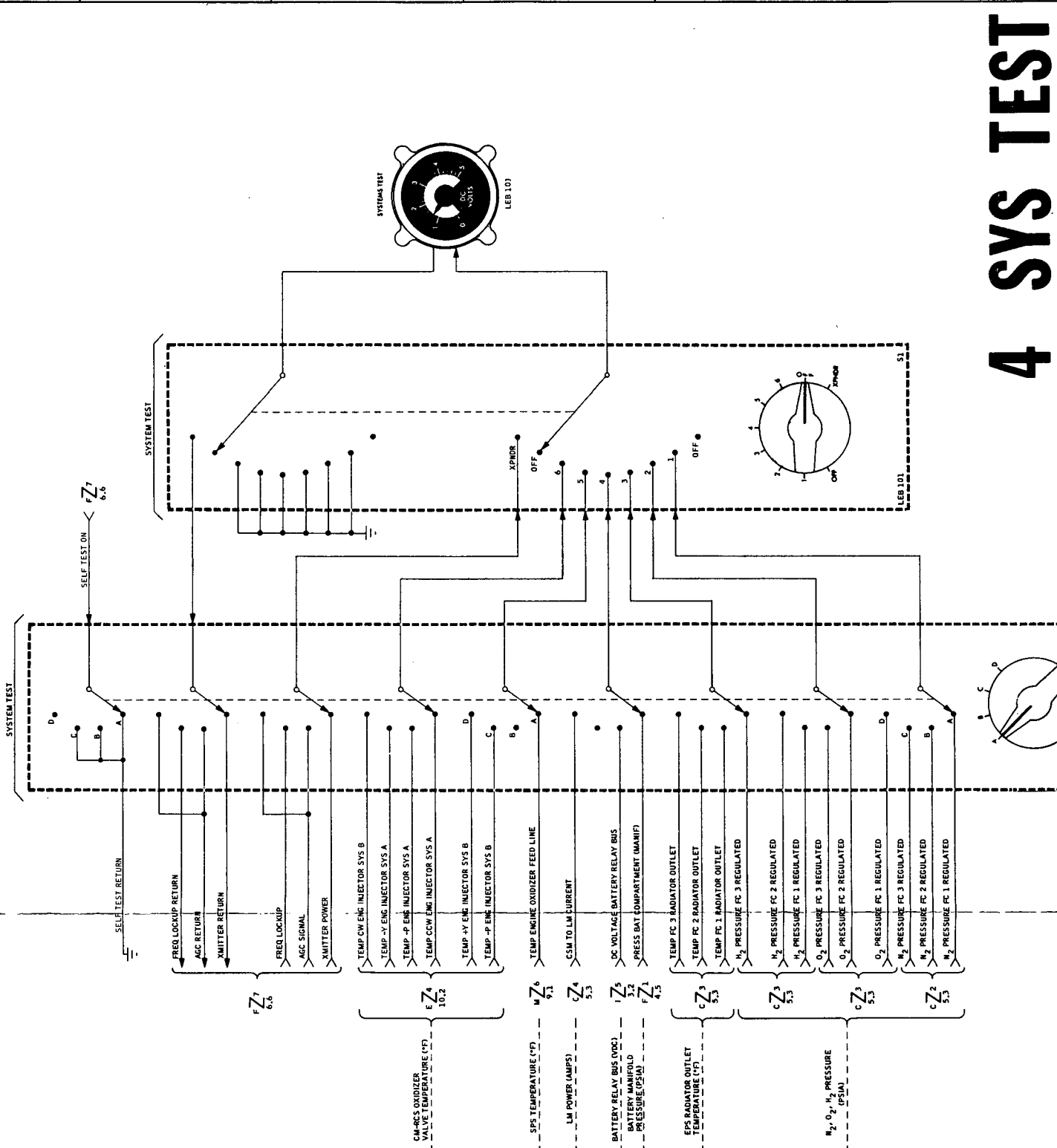


1. MISSION TIMER WILL COUNT UP TO 999 59 59 ROLLOVER TO 000 00 00 AND START COUNTING UP TO AN INTERNAL TIMING PULSE
2. EVENT TIMER WILL COUNT UP TO 59 ROLLOVER TO 00 00 AND START COUNTING UP
3. WHEN POWER IS FIRST APPLIED TO THE MISSION TIMER FOR 103 AND SUBS POWER TO HE DUMP SWITCH IS FURNISHED BY RCS LOGIC CB MDC 8 CB43
4. FOR PAD ABORTS, EVENT TIMER WILL RESET AND START COUNTING UP
5. SWITCH CONTROL FOR EVENT AND MISSION TIMER ON LFEB 306 IS IDENTICAL TO THE SWITCH CONTROL FOR THE TIMERS ON MDC 2

# 3 TIMER

SIGNATURES	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS
DR [Signature]	9/4/68	
ENGR [Signature]	9/9/68	
CH		
MR [Signature]	9/5/68	
APP [Signature]	4/5/68	
AUTH		
<b>TIMER CONTROL</b>		
CSM	SIZE	DWG NO.
101	D	11.3
22 X 34 SHEET		

REV	ENG	DATE	APPROVAL
A			



SYSTEMS TEST METER DISPLAY (VOLTS)																									
0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0
-5.0	-4.6	-4.2	-3.8	-3.4	-3.0	-2.6	-2.2	-1.8	-1.4	-1.0	-0.6	-0.4	0	+4	+10	+14	+18	+22	+26	+30	+34	+38	+42	+46	+50
0	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192	200
0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4	6.8	7.2	7.6	8.0	8.4	8.8	9.2	9.6	10.0
0	1.8	3.6	5.4	7.2	9.0	10.8	12.6	14.4	16.2	18.0	19.8	21.6	23.4	25.2	27.0	28.8	30.6	32.4	34.2	36.0	37.8	39.6	41.4	43.2	45.0
0.00	0.72	1.44	2.16	2.88	3.60	4.32	5.04	5.76	6.48	7.20	7.92	8.64	9.36	10.08	10.80	11.52	12.24	12.96	13.68	14.40	15.12	15.84	16.56	17.28	18.00
-50	-36	-22	-8	+6	+20	+34	+48	+62	+76	+90	+104	+118	+132	+146	+160	+174	+188	+202	+216	+230	+244	+258	+272	+286	+300
0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75
0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0

# 4 SYS TEST

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION
DR	F. C. [Signature]	7/72	MANNEDED SPACECRAFT CENTER HOUSTON, TEXAS
DC	[Signature]		
ENGR	[Signature]		
APP	[Signature]		
FEC	[Signature]		
AUTH	[Signature]		
SYSTEM TEST METER		CSM	SIZE DWG NO.
		101	J 11.4
		44 X 29 1/2	PAGE
			SHEET OF