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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

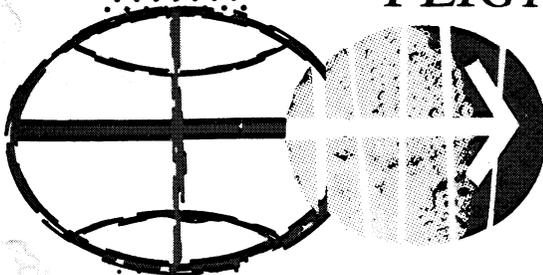
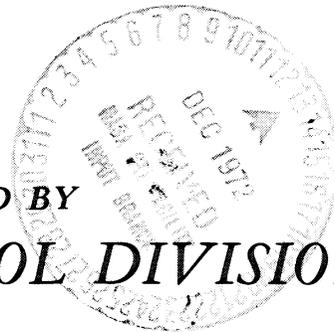
COMMAND/SERVICE MODULE SYSTEMS HANDBOOK

CSM 104

NOVEMBER 1, 1968

PREPARED BY

FLIGHT CONTROL DIVISION



MANNED SPACECRAFT CENTER
HOUSTON, TEXAS



1 STANDARDS

2 SEQUENTIAL
EVENTS SYSTEM

3 ELECTRICAL
SYSTEM

4 ENVIRONMENTA
CONTROL SYS

5 FUEL CELL/
CRYOGENICS
SYSTEM

6 COMMUNI-
CATIONS
SYSTEM

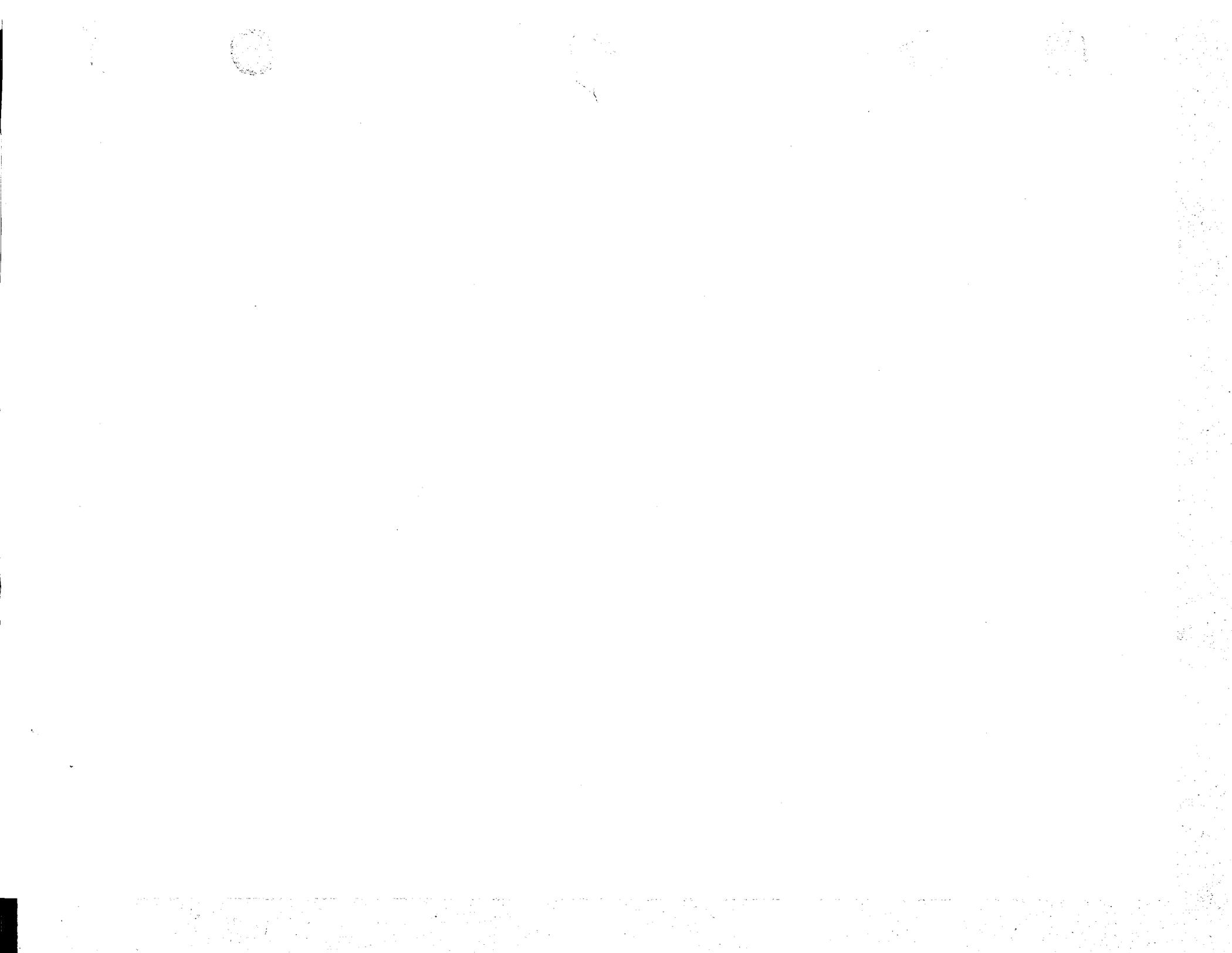
7 INSTRU-
MENTATION

8 GUIDANCE AND
CONTROL
SYSTEM

9 SERVICE
PROPULSION
SYSTEM

10 REACTION
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SYSTEM

11 MISCELLANEOU



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COMMAND/SERVICE MODULE SYSTEMS HANDBOOK

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PREFACE

This handbook, prepared by the Flight Control Division, NASA, Manned Spacecraft Center, Houston, Texas with technical support by North American Rockwell Corporation (NR), reflects the Command/Service Module (CSM 104) Spacecraft Systems as of November 1, 1968.

Major emphasis is on material for use by Flight Crew and Flight Controllers during mission operations. Caution should be exercised in using the systems drawings or other information in the handbook for any other purposes.

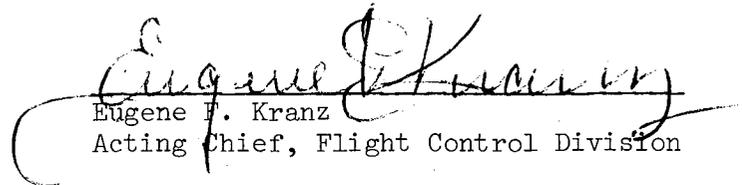
Comments concerning the contents of this handbook should be directed to FC36/Mr. Hubert V. Gregan, NR, Flight Operations Support, HU3-5805.

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Approved by:



Arnold D. Aldrich
Chief, CSM Systems Branch



Eugene F. Kranz
Acting Chief, Flight Control Division

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FOREWORD

The basic Command/Service Module Systems Handbook (CSM) is being published and will be distributed in several installments.

The publication control and effective page sheet immediately following this foreword will serve as a table of contents. It lists by sections all figures, drawings, tables and pages that will be in the handbook whether they are included in this issue or not.

The publication control and effective page sheet, which is continuously updated each time additional material is issued, give a chronological history of the document and will show for which the information in each section is valid.

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PCN REVISION INSTRUCTION SHEET

Update this document in accordance with the following instructions:

Remove and replace the following pages:

| | | | |
|------|------|------|------|
| iiia | vi | 7-13 | 7-22 |
| iiib | vii | 7-19 | |
| iv | viii | 7-20 | |
| v | 6-14 | 7-21 | |

Add the following new pages:

iib
ix

Make pen and ink changes to drawings and figures as follows:

NOTE: Each drawing and figure to be updated by pen and ink changes is listed below. Corrections to figures are indicated sequentially on their respective change instruction sheets and are referenced to the appropriate buses and circuit breakers. Drawing changes are indicated on IS and WAS sheets, and all change instruction sheets are collated in this PCN in the same sequence that the drawings and figures appear in the basic handbook. Changes to each drawing are shown by zones. Shading over portions of the IS drawings makes possible a rapid identification of items to be changed. Corrections need be made only where there is no shading. When the drawings and figures have been carefully updated, the pen and ink change instruction pages may be removed from this handbook.

| | | | |
|---------|--------------------------------|----------|--------------------------------|
| Dwg 2.3 | 1 page of change instructions | Dwg 8.1 | 3 pages of change instructions |
| Dwg 2.7 | 3 pages of change instructions | Dwg 8.3 | 4 pages of change instructions |
| Dwg 3.1 | 1 page of change instructions | Dwg 8.4 | 1 page of change instructions |
| Fig 3.2 | 4 pages of change instructions | Dwg 8.5 | 4 pages of change instructions |
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| Dwg 4.5 | 2 pages of change instructions | Dwg 9.1 | 4 pages of change instructions |
| Dwg 6.1 | 1 page of change instructions | Dwg 9.2 | 1 page of change instructions |
| Dwg 6.3 | 1 page of change instructions | Dwg 10.1 | 1 page of change instructions |
| Dwg 6.6 | 1 page of change instructions | Dwg 10.2 | 1 page of change instructions |
| Dwg 7.2 | 1 page of change instructions | Dwg 11.3 | 1 page of change instructions |
| Dwg 7.3 | 1 page of change instructions | | |

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PUBLICATION CONTROL AND EFFECTIVE PAGE SHEET

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| DRAWING 2.2 | SEQUENTIAL POWER DISTRIBUTION | BASIC | 10/30/68 |
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| DRAWING 2.6 | SEQUENTIAL UPRIGHTING SYSTEM | BASIC | 10/30/68 |
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| DRAWING 6.3 | VHF AM TRANSCEIVERS AND AUDIO EQUIPMENT | BASIC | 10/10/68 |
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| TABLE 6-II | S-BAND POWER AMPLIFIER | BASIC | 11/1/68 |
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| FIGURE, DRAWING OR PAGE NUMBER | TITLE | REVISION | SIGNOFF DATE |
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| FIGURE, DRAWING OR PAGE NUMBER | TITLE | REVISION | SIGNOFF DATE |
|--|---|----------|-----------------|
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| DRAWING 8.5 | INERTIAL SUBSYSTEM (PEN AND INK CHANGES - 4 PAGES) | PCN-1 | 1/24/69 |
| DRAWING 8.6 | OPTICS SUBSYSTEM (PEN AND INK CHANGES - 2 PAGES) | PCN-1 | 1/24/69 |
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| FIGURE, DRAWING OR PAGE NUMBER | TITLE | REVISION | SIGNOFF DATE |
|-----------------------------------|---|----------|-----------------|
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| DRAWING 11.4 | SYSTEMS TESTMETER | BASIC | 11/1/68 |

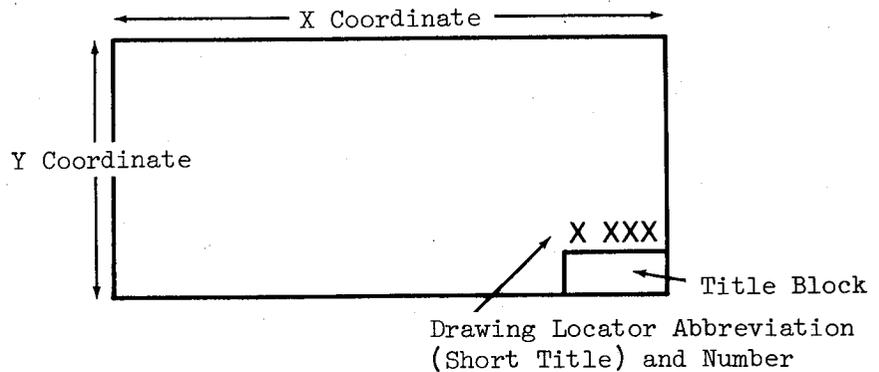
*NR DRAWINGS, NOT OFFICIAL FCD DRAWINGS.

STANDARDS

1.1 GENERAL DRAWING INFORMATION

1.1.1 Cross-indexing1.1.1.1 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.

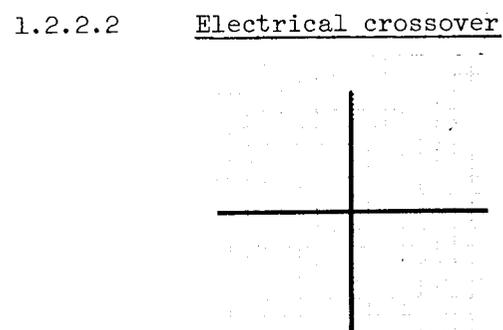
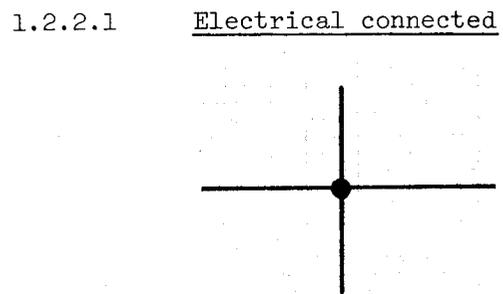
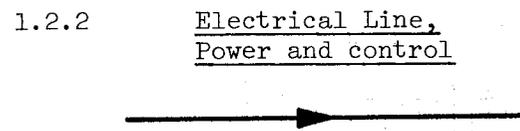
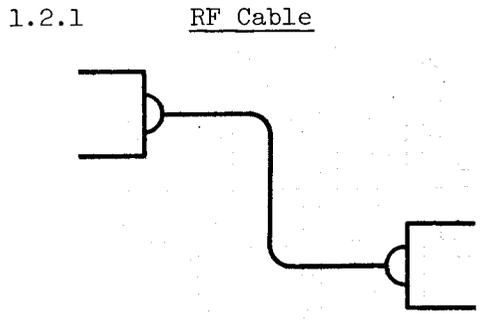


3 - Drawing Locator Number for the given detail subsystem drawing
 K - X Coordinate
 4 - Y Coordinate

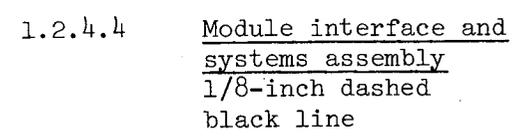
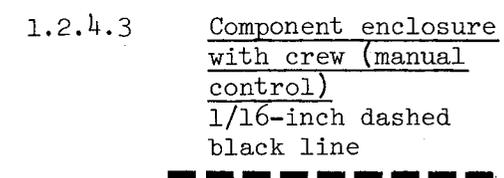
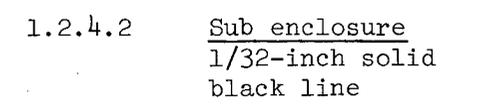
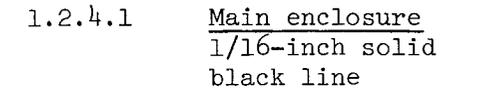
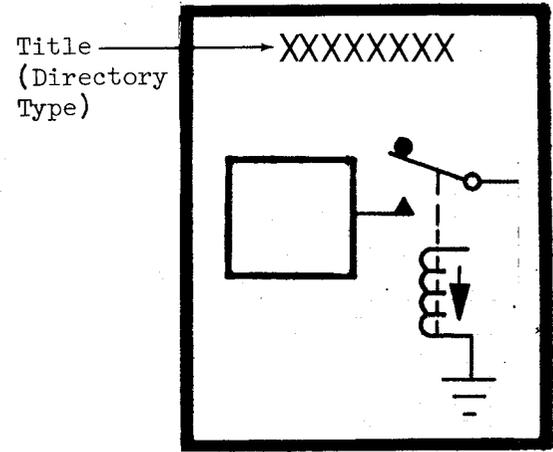
1.2.1 Technical Zone References1.2.1.1 Zone reference

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

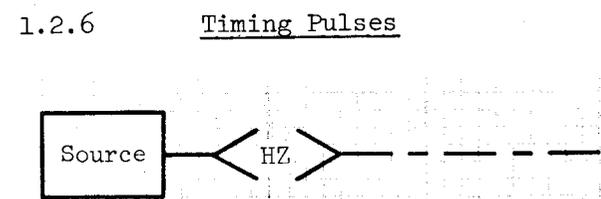
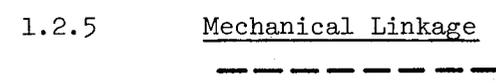
1.2 LINE LEGEND



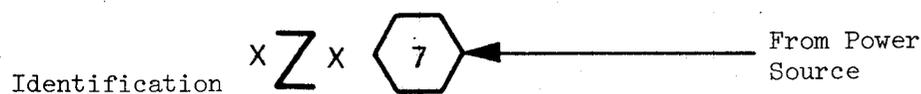
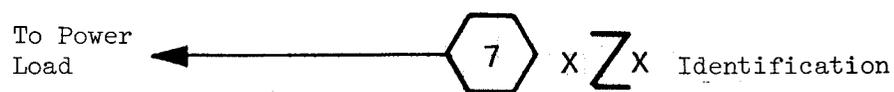
1.2.4 Component Enclosures



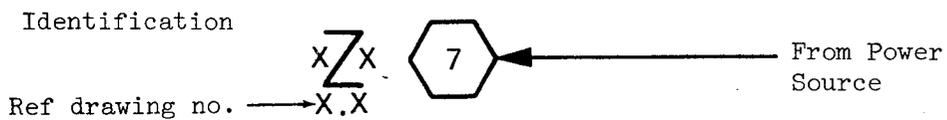
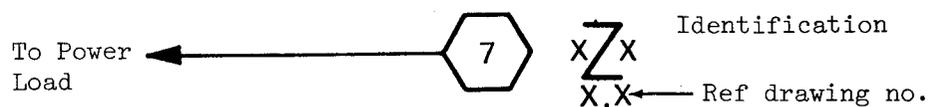
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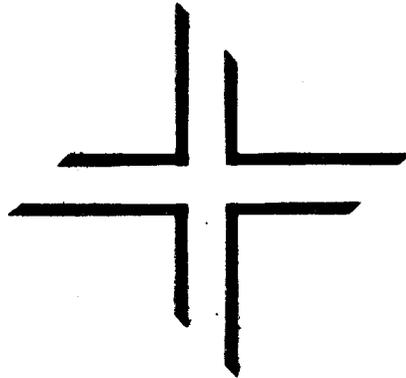
1.2.1.2 Power intra-drawing
(Section to section within the same drawing)



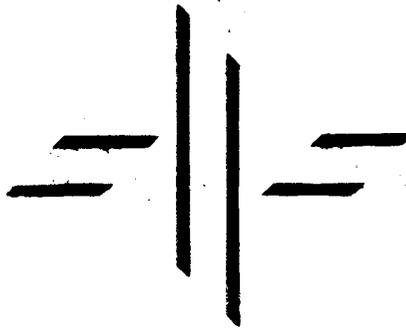
1.2.1.3 Power inter-drawings
(Drawing to drawing)



1.3 PIPE LEGEND
 1.3.1 General
 1.3.1.1 Plumbing connected

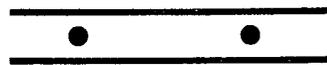


1.3.1.2 Plumbing crossover

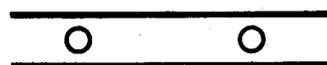


1.3.2 Line Designation

1.3.2.1 Water



1.3.2.2 Oxygen



1.3.2.3 Nitrogen



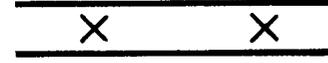
1.3.2.4 Helium



1.3.2.5 Primary Coolant



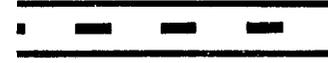
1.3.2.6 Secondary Coolant



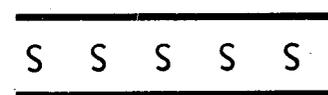
1.3.2.7 Fuel



1.3.2.8 Hydrogen



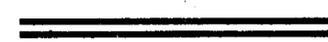
1.3.2.9 Steam



1.3.2.10 Suit Loop



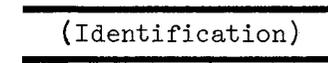
1.3.2.11 Sense Lines



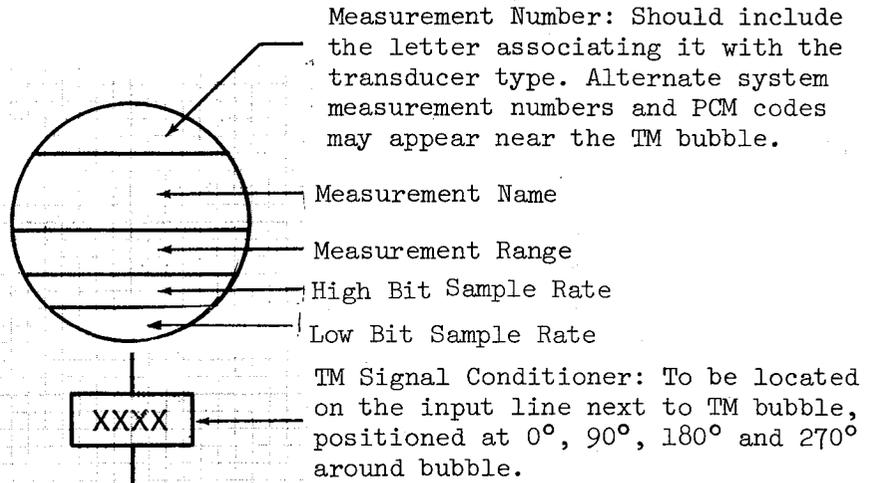
1.3.2.12 Oxidizer



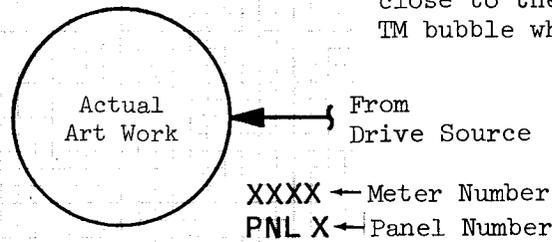
1.3.2.13 Others



1.4 TELEMETRY SYMBOLS
 1.4.1 Measurements Telemetered

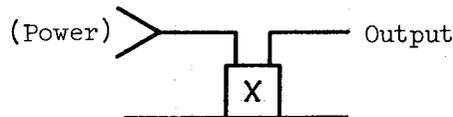


1.4.2 Onboard Meters



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

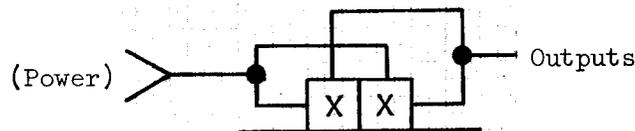
1.4.3 Sensors
 1.4.3.1 Single source



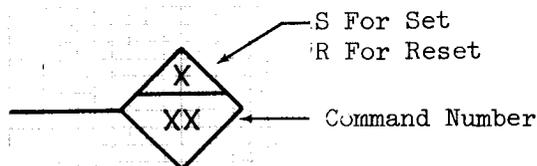
Example: Letter indicates the type:

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

1.4.3.2 Double source



1.4.4 Ground Commands (Contents Optional by Vehicle)
 1.4.4.1 RTC's



1.5 ELECTRICAL SYMBOLS

1.5.1 Switches

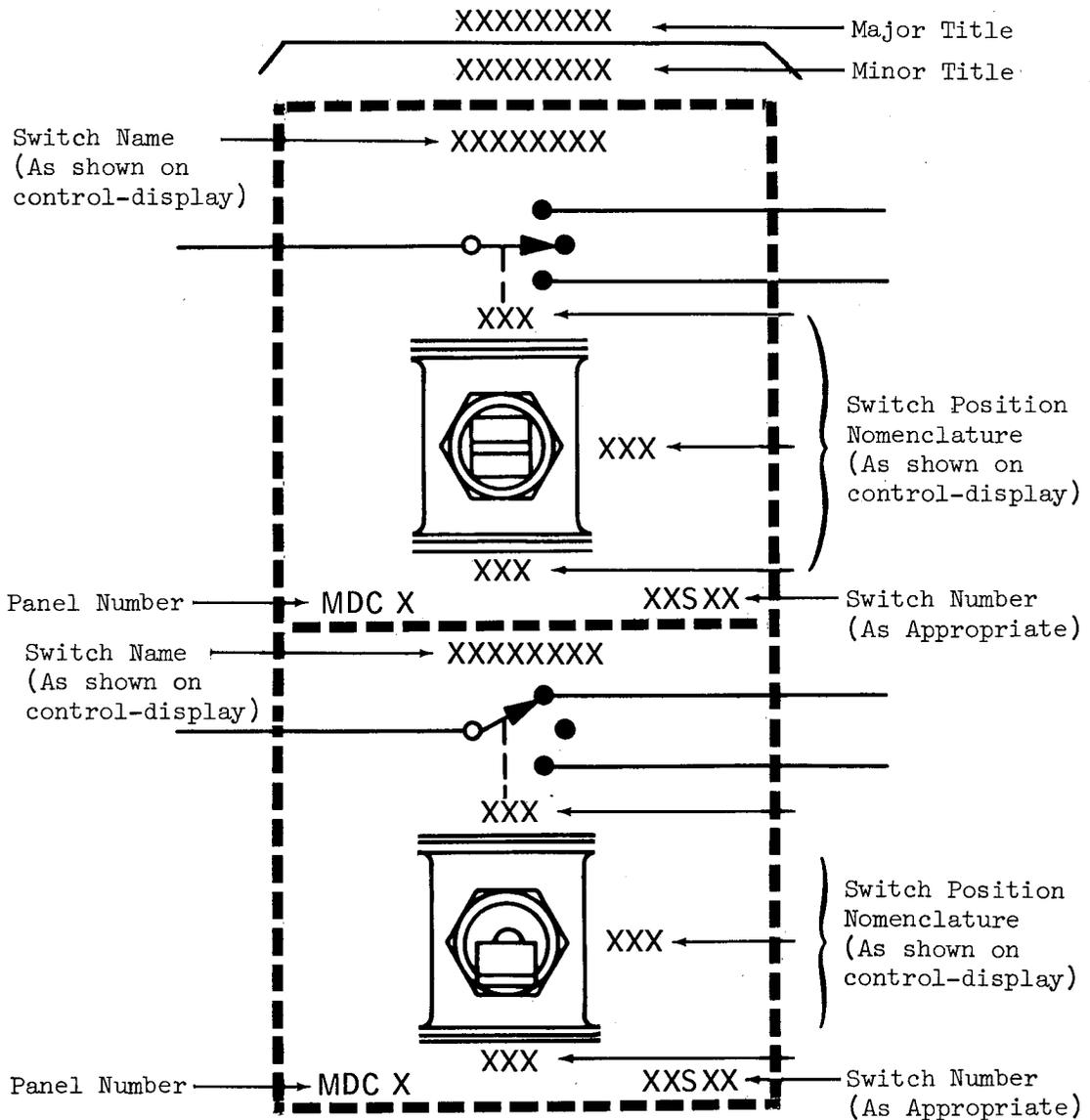
All switches will be shown in the deenergized position (if possible). When a switch has more than one set of contacts, only one set needs to have switch contact nomenclature.

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

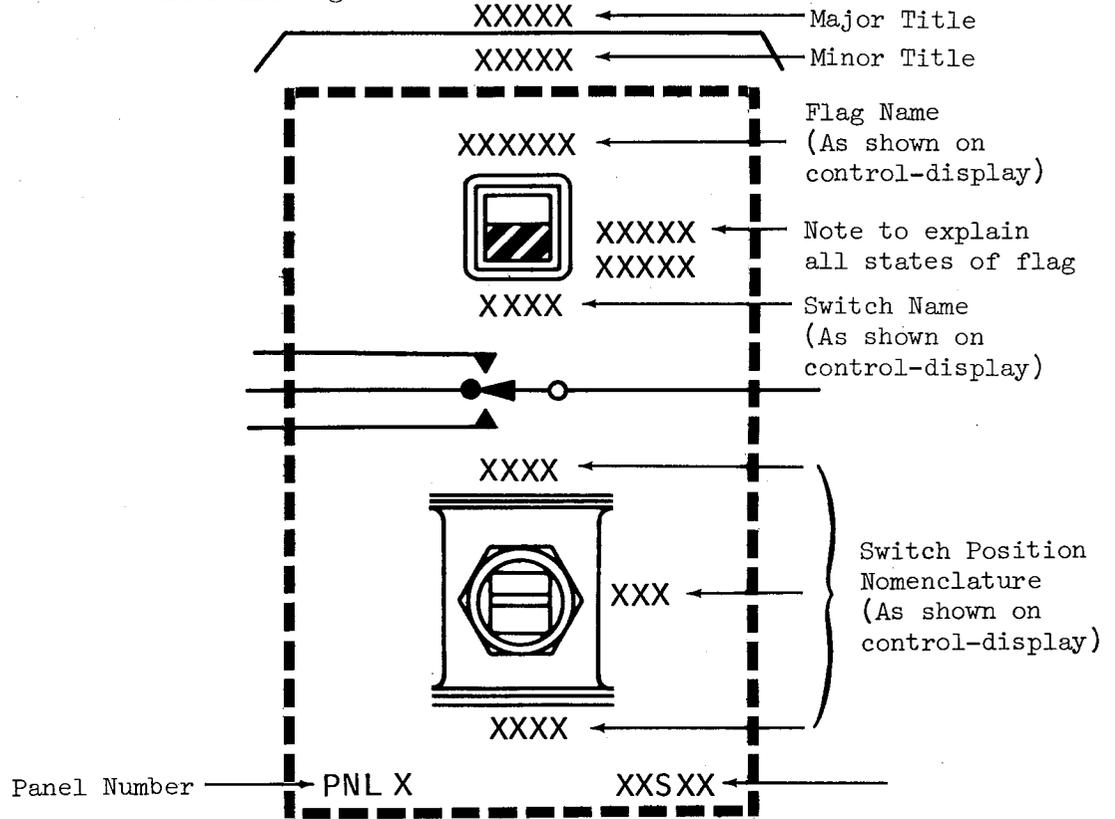
NOTE: If more than one switch has identical major and minor titles, they may be stacked without repeating these titles.



1.5.1.2

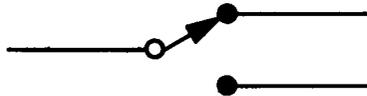
Switch controlled flag

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



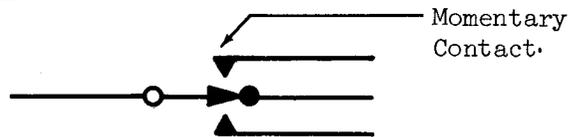
1.5.1.3

Two-position

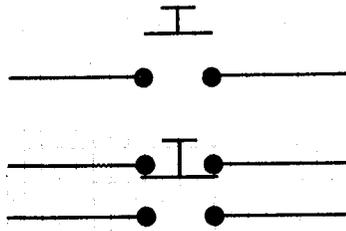


1.5.1.4

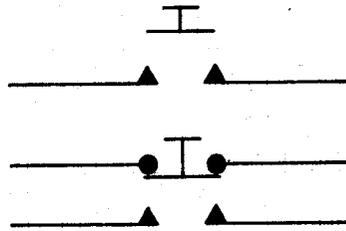
Three-position



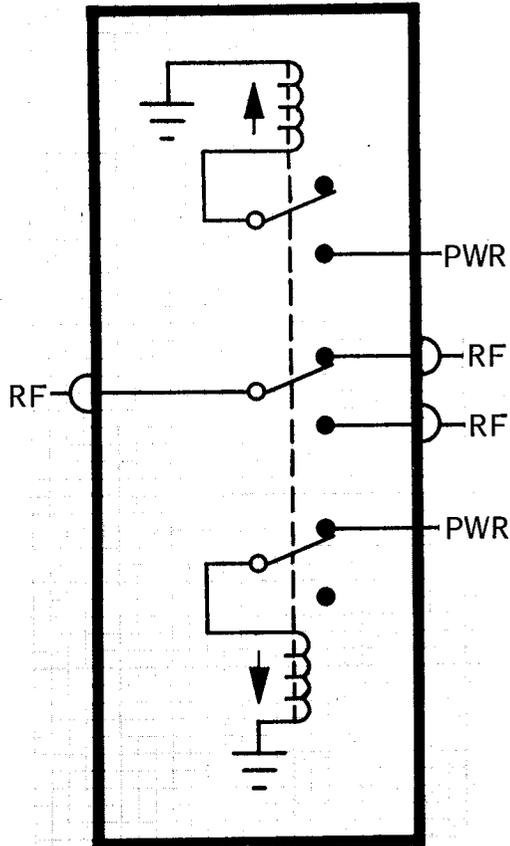
1.5.1.5 Pushbutton
 1.5.1.5.1 Latching



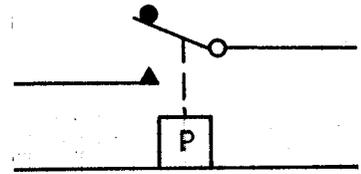
1.5.1.5.2 Momentary



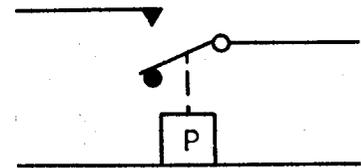
1.5.1.6 Coax



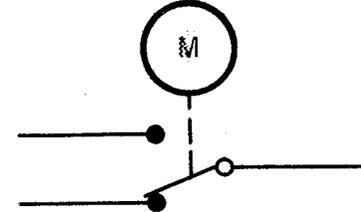
1.5.1.7 Pressure
 1.5.1.7.1 Closed decreased pressure



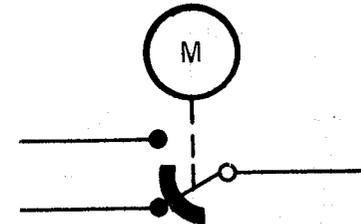
1.5.1.7.2 Closed increased pressure



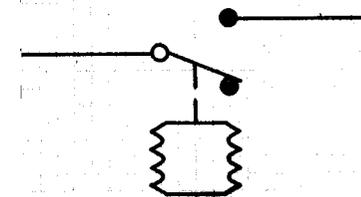
1.5.1.8 Motor
 1.5.1.8.1 Break before make



1.5.1.8.2 Made before break



1.5.1.9 Baro

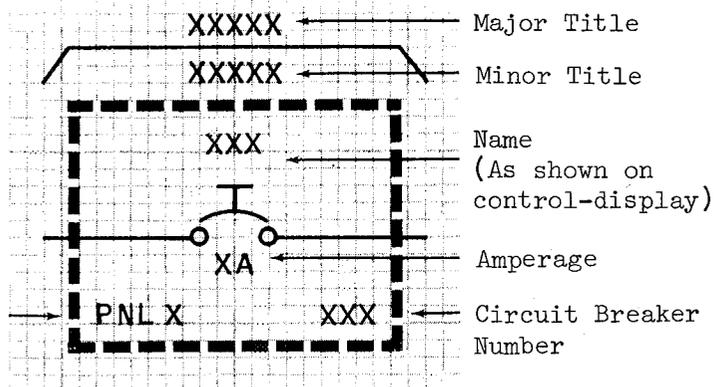


Close XXX psi or altitude
 Open XXX psi or altitude

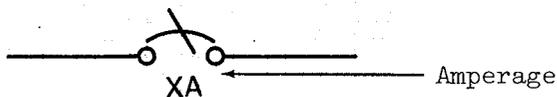
1.5.2 Circuit Breakers

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

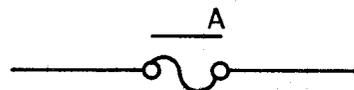


1.5.2.2 Automatic

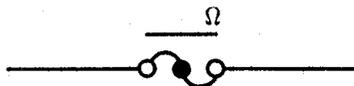


1.5.3 Fuses

1.5.3.1 General



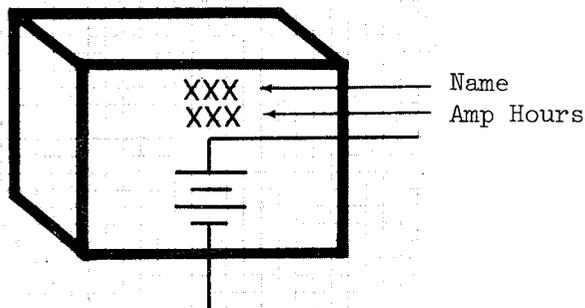
1.5.3.2 Fusistor



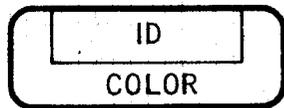
1.5.4 Battery

1/16-inch black tape

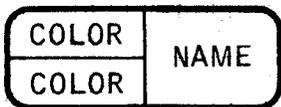
Size varies with number of cells and drawing arrangement.



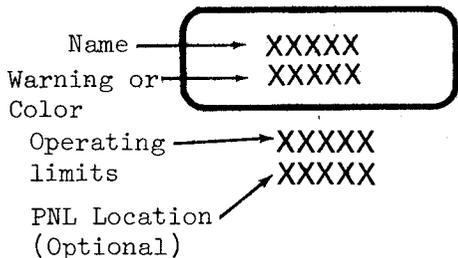
1.5.5 Lights
 1.5.5.1 Telelights



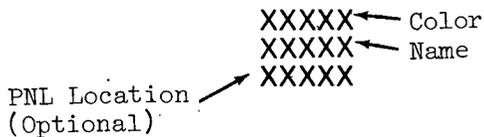
1.5.5.2 Switching



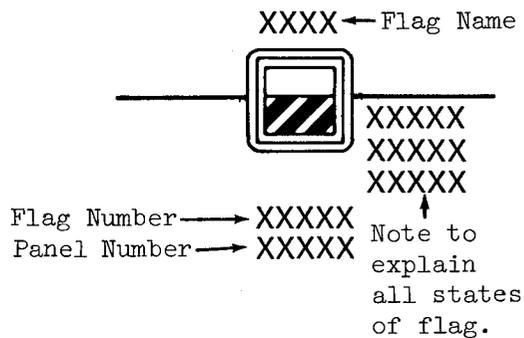
1.5.5.3 Caution and warning



1.5.5.4 Component



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



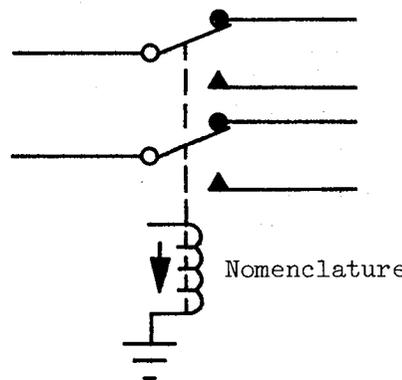
1.5.7 Relays
 1.5.7.1 Momentary contact



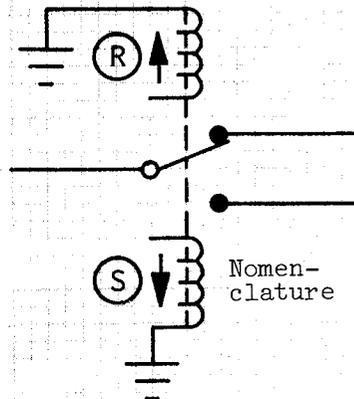
1.5.7.2 Latching contacts



1.5.7.3 Non-latching relay

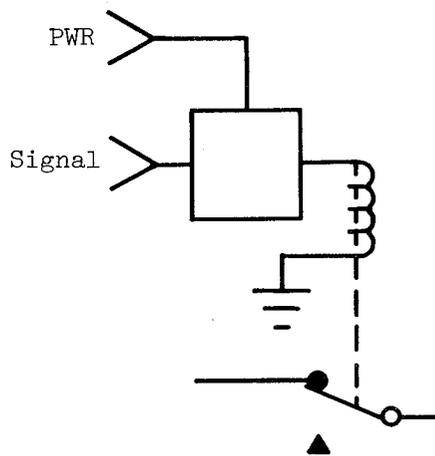


1.5.7.4 Latching relay



Nomen-
clature

1.5.8 Relay or Solenoid Driver

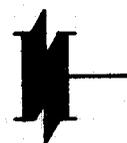


1.5.9 Buses
1.5.9.1 Symbol

Length can vary depend-
ing on the bus function
on a given drawing.



Bus Feed



Bus Output

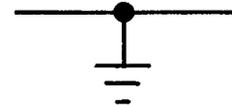


Neg Bus

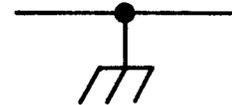
1.5.9.2 Designation
See bus designation list.



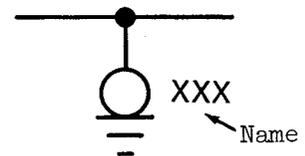
1.5.10 Grounds
1.5.10.1 System



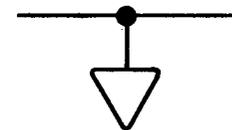
1.5.10 Frame



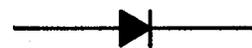
1.5.10.3 Floating or Controlled



1.5.10.4 Signal



1.5.11 Diodes
1.5.11.1 General



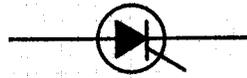
1.5.11.2 Zener



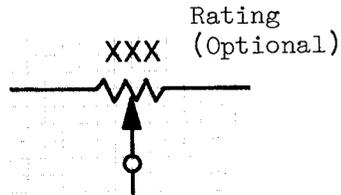
1.5.11.3 Tunnel



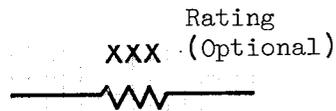
1.5.11.4 Control rectifier (SCR)



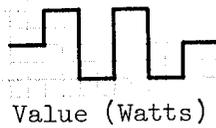
1.5.12 Potentiometer



1.5.13 Fixed Resistor



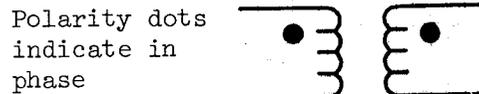
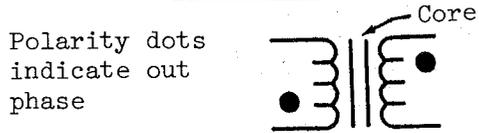
1.5.14 Heater



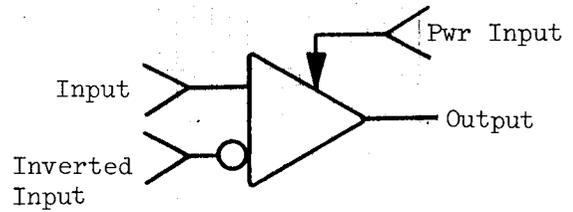
1.5.15 Thermostat



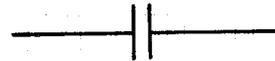
1.5.16 Transformers



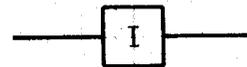
1.5.17 Amplifier



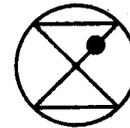
1.5.18 Capacitor



1.5.19 Digital Inverter

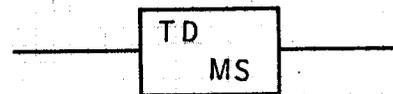


1.5.20 Wire Resolver



- ✕ = Sine Winding
- = Minus Sine
- = Cosine Winding

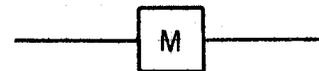
1.5.21 Time Delay



1.5.22 Electrical Filter

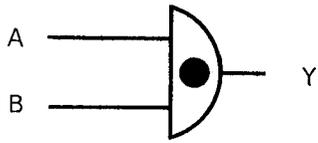


1.5.23 Modulator



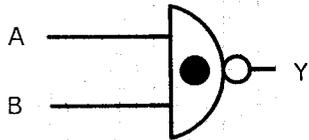
1.5.24 Gates

1.5.24.1 And



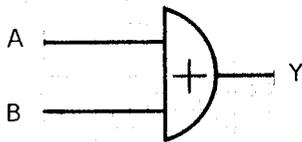
| A | B | Y |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 0 | 0 | 0 |

1.5.24.2 Nand



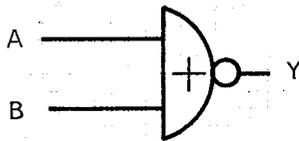
| | | |
|---|---|---|
| 1 | 1 | 0 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 0 | 0 | 1 |

1.5.24.3 Or



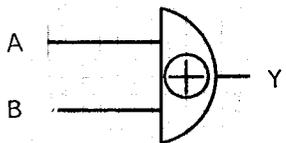
| | | |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 0 | 0 | 0 |

1.5.24.4 Nor



| | | |
|---|---|---|
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 1 | 0 |
| 0 | 0 | 1 |

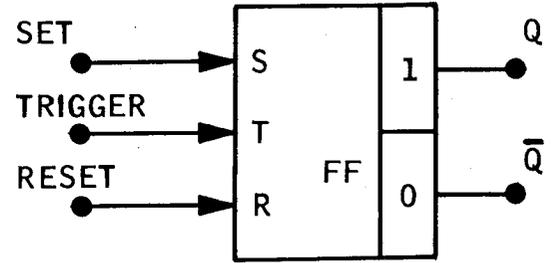
1.5.24.5 Exclusive Or



| | | |
|---|---|---|
| 1 | 1 | 0 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 0 | 0 | 0 |

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

1.5.24.6 SRT Flip-Flop



INPUT

S

OUTPUT

Sets \bar{Q} to A "1"
Sets \bar{Q} to A "0"

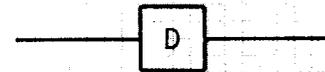
T

Q and \bar{Q} Change States

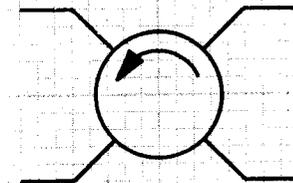
R

Resets \bar{Q} to A "0"
Resets \bar{Q} to A "1"

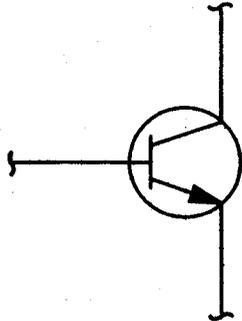
1.5.25 Demodulator



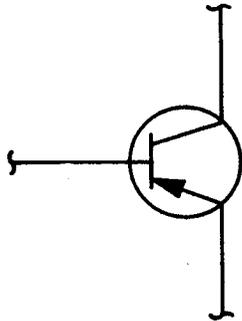
1.5.26 RF Circulator



1.5.27 Transistor
1.5.27.1 NPN



1.5.27.2 PNP

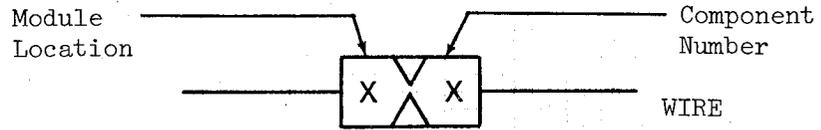


1.5.28 Antenna

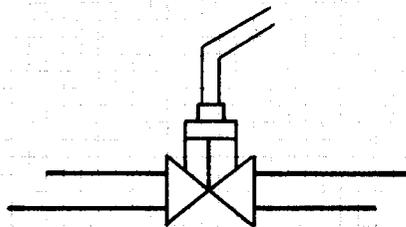
Name
(Type or Function)



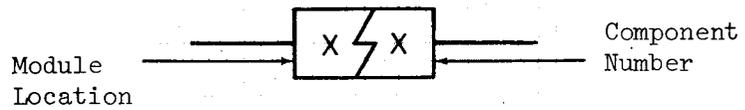
1.6 PYROTECHNIC SYMBOLS
1.6.1 Pyro Guillotine



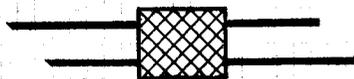
1.6.2 Pyro Valve with Single Initiator



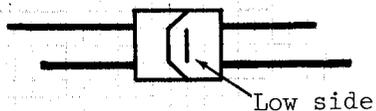
1.6.3 Electrical Circuit Interrupter



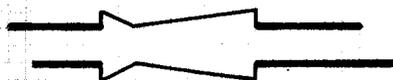
1.7 MECHANICAL SYMBOLS
1.7.1 Mechanical Filter



1.7.2 Burst Diaphragm



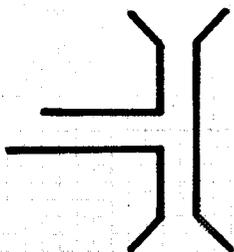
1.7.3 Venturi



1.7.4 Vent



1.7.5 Thrust Neutralized Vent



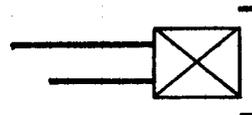
1.7.6 Disconnects
1.7.6.1 Self-sealing



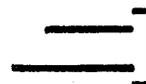
1.7.6.2 Quick



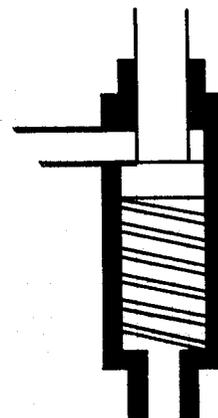
1.7.7 Quick Disconnect Fill and Drain



1.7.8 Fill and Drain



1.7.9 Ball Valve Actuator

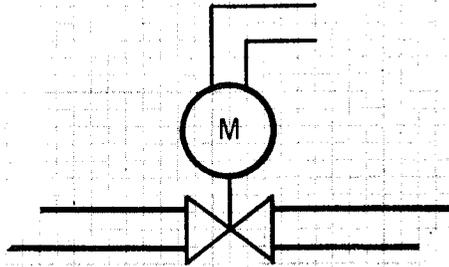


May be shown in depressed or partially depressed position

1.7.10 Valves



1.7.10.1 Motor control



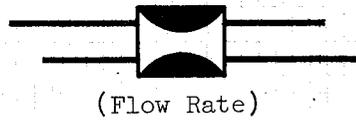
1.7.10.2 Manual control



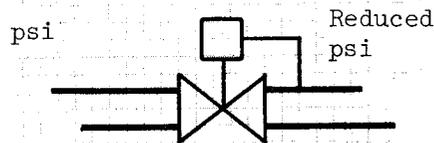
1.7.10.3 Check valve



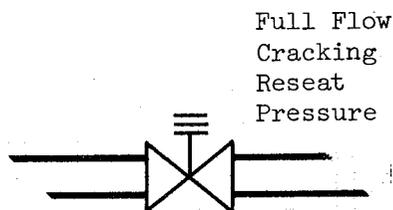
1.7.10.4 Orifice



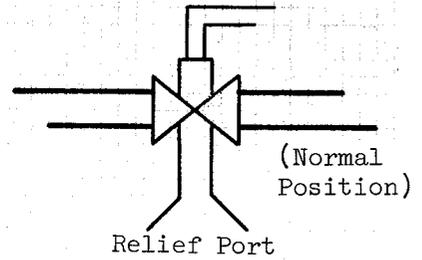
1.7.10.5 Pressure regulator



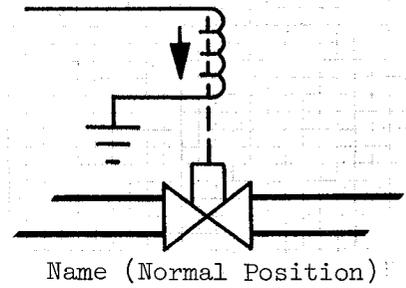
1.7.10.6 Relief valve



1.7.10.7 Pneumatic controlled valve with line bleed

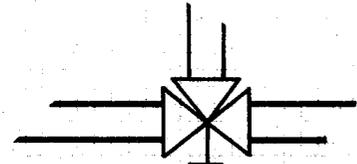


1.7.10.8 Solenoid valve

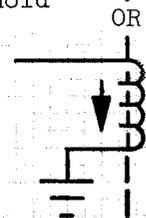


1.7.10.9 Three-way valve

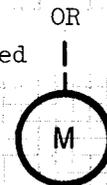
1.7.10.9.1 Manual



1.7.10.9.2 Solenoid



1.7.10.9.3 Motor controlled



1.7.10.10 Ball valve



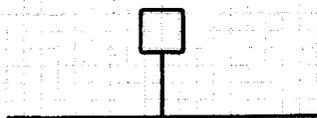
1.8 MISCELLANEOUS SYMBOLS
 1.8.1 Drawing Note Reference



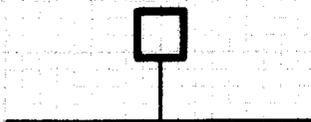
1.8.2 Overview Drawing Instrumentation Legend
 1.8.2.1 Automatic control only



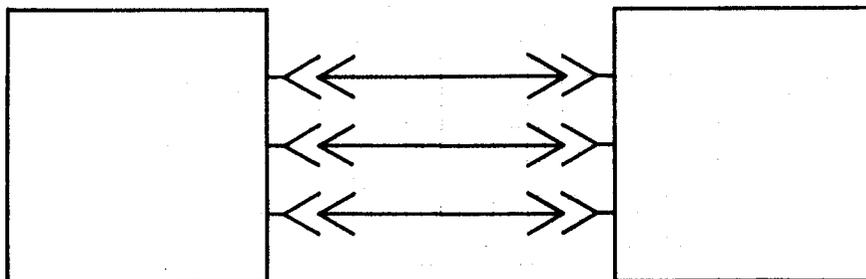
1.8.2.2 PCM only



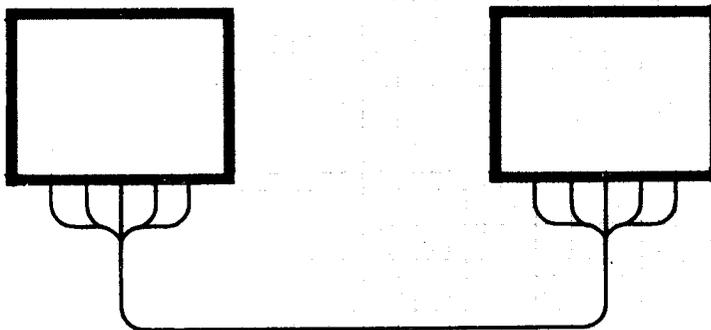
1.8.2.3 PCM and/or onboard display



1.8.3 Two-unit Interface



1.8.4 Two-unit Cable Connection



1.8.5 BUSSES1.8.5.1 POWER BUSSES

| | | |
|---|-----|------------------------------|
| ✓ | MA | - MAIN BUS A |
| ✓ | MB | - MAIN BUS B |
| ✓ | BA | - BATTERY BUS A |
| ✓ | BB | - BATTERY BUS B |
| ✓ | BR | - BATTERY RELAY BUS |
| ✓ | FP | - FLIGHT AND POSTLANDING BUS |
| ✓ | NE1 | - NON-ESSENTIAL BUS 1 |
| ✓ | NE2 | - NON-ESSENTIAL BUS 2 |
| ✓ | AC1 | - AC BUS 1 |
| ✓ | AC2 | - AC BUS 2 |
| ✓ | F | - FLIGHT BUS |
| ✓ | SMA | - SERVICE MODULE BUS A |
| ✓ | SMB | - SERVICE MODULE BUS B |

1.8.5.2

SEQUENTIAL BUSES

| | | |
|---|-----|------------------------------|
| ✓ | SQA | - SEQUENTIAL PYRO BUS A |
| ✓ | RQA | - RCS CONTROLLER PYRO BUS A |
| ✓ | RLA | - RCS CONTROLLER LOGIC BUS A |
| ✓ | LQA | - IM DOCKING BUS A |
| ✓ | SLA | - SEQUENTIAL LOGIC BUS A |
| ✓ | SAA | - SEQUENTIAL ARM BUS A |
| ✓ | ELA | - EARTH LANDING BUS A |
| ✓ | SQB | - SEQUENTIAL PYRO BUS B |
| ✓ | RQB | - RCS CONTROLLER PYRO BUS B |
| ✓ | RLB | - RCS CONTROLLER LOGIC BUS B |
| ✓ | LQB | - IM DOCKING BUS B |
| ✓ | SLB | - SEQUENTIAL LOGIC BUS B |
| ✓ | SAB | - SEQUENTIAL ARM BUS B |
| ✓ | ELB | - EARTH LANDING BUS B |

SEQUENTIAL BUSSES (cont'd)

- ✓ ED1 - EMERGENCY DETECTION SYSTEM BUS NO. 1
- ✓ ED2 - EMERGENCY DETECTION SYSTEM BUS NO. 2
- ✓ ED3 - EMERGENCY DETECTION SYSTEM BUS NO. 3
- ✓ 6D95 - IU ABORT BUS

1.8.5.3

INSTRUMENTATION BUSSES

- ✓ 1 - CM ESS INST BUS PWR FROM RHEB PNL 276-CB1
- ✓ 2 - CM ESS INST BUS PWR FROM RHEB PNL 276-CB2
- ✓ 3S - SM ESS INST BUS PWR FROM RHEB PNL 276-CB3
- ✓ 4S - SM ESS INST BUS PWR FROM RHEB PNL 276-CB4
- ✓ 5 - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB5
- ✓ 6 - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB6
- ✓ 7 - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB7
- ✓ 8 - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB8
- ✓ 8S - SM NON ESS INST BUS PWR FROM RHEB PNL 277-CB8

INSTRUMENTATION BUSES (Cont'd)

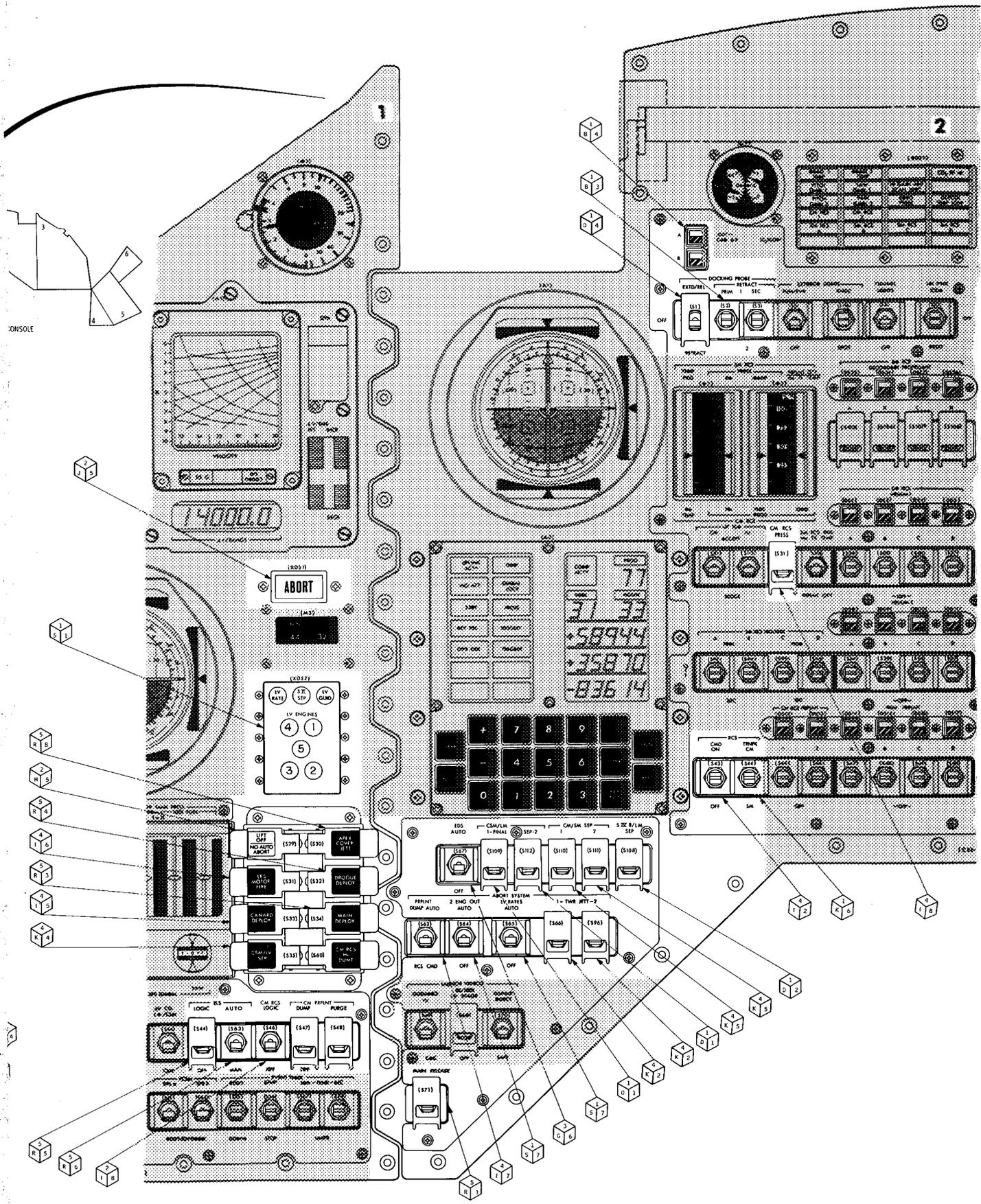
- V₉ - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB9
- V₁₀ - CM NON ESS INST BUS PWR FROM RHEB PNL 277-CB10
- V_{SC} - SCE PWR REQ'D FOR SIGNAL CONDITIONING
(+20, -20, and/or +10Vdc)
- V_{SC5} - SCE CM +5Vdc PWR

1.8.5.4

SCS LOGIC BUSES

- V_{LB1} - LOGIC BUS 1
- V_{LB2} - LOGIC BUS 2
- V_{LB3} - LOGIC BUS 3
- V_{LB4} - LOGIC BUS 4

2 SEQUENTIAL
EVENTS SYSTEM



CONSOLE

1

2

ABORT

TV ENGINES
4 1
5 2
3

77
31 33
58944
75870
83614

ECS AUTO CM/SM SEP-2 CM/SM SEP 3 SEV BY/LM SEP
(S109) (S112) (S110) (S111) (S108)

PRINT DUMP AUTO 2 ENG OUT IV BATES AUTO 1- FIVE INT-2
(S103) (S104) (S105) (S106) (S107)

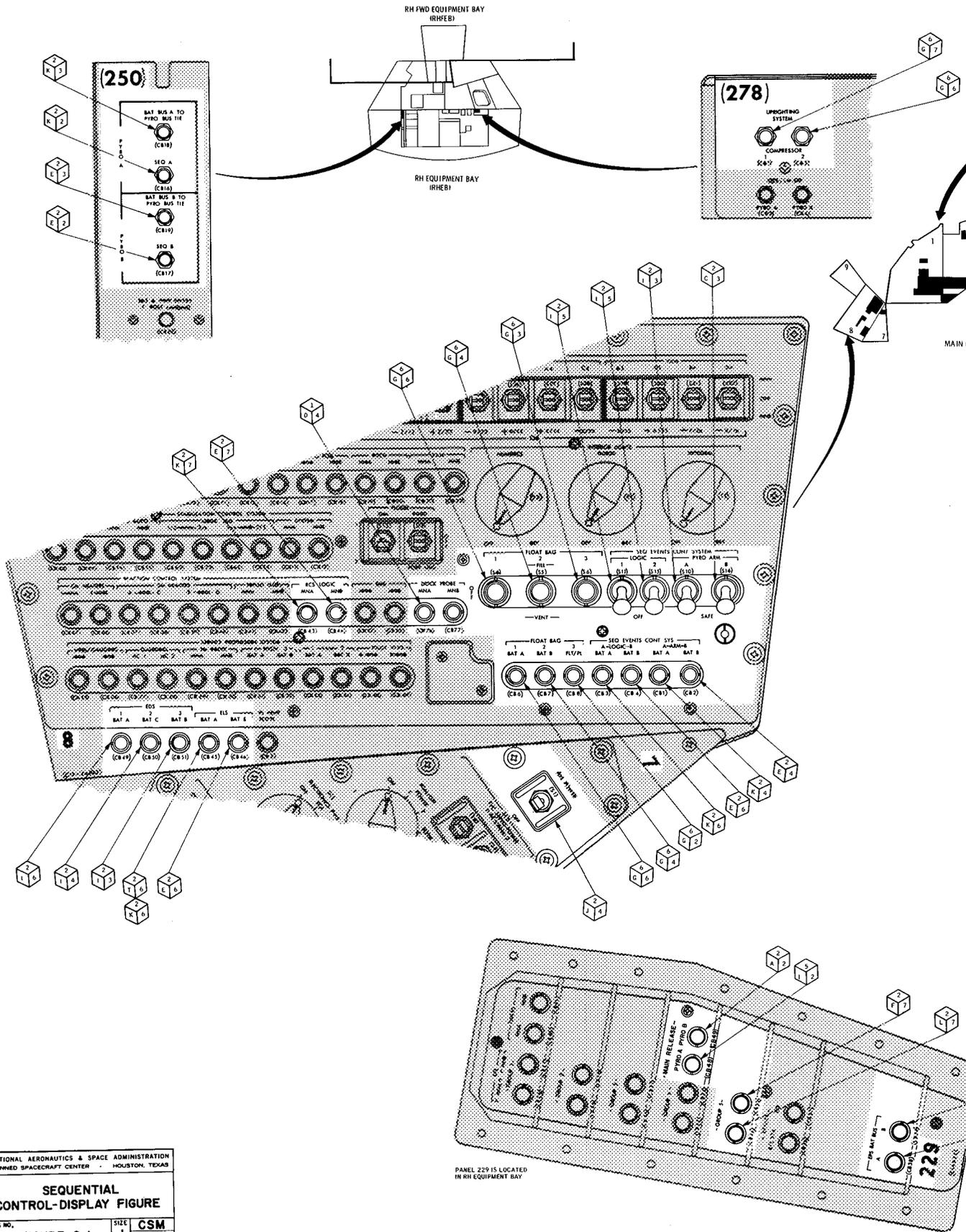
RCS CMD OFF OFF OFF
(S101) (S102) (S103)

LOGIC BS AUTO CM RCS LOGIC CM PPINT PURGE
(S44) (S43) (S42) (S41) (S40)

STOP STOP STOP STOP STOP
(S39) (S38) (S37) (S36) (S35)

MAIN RELEASE (S71)

- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
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- 30
- 31



NATIONAL AERONAUTICS & SPACE ADMINISTRATION
 MANNED SPACECRAFT CENTER - HOUSTON, TEXAS

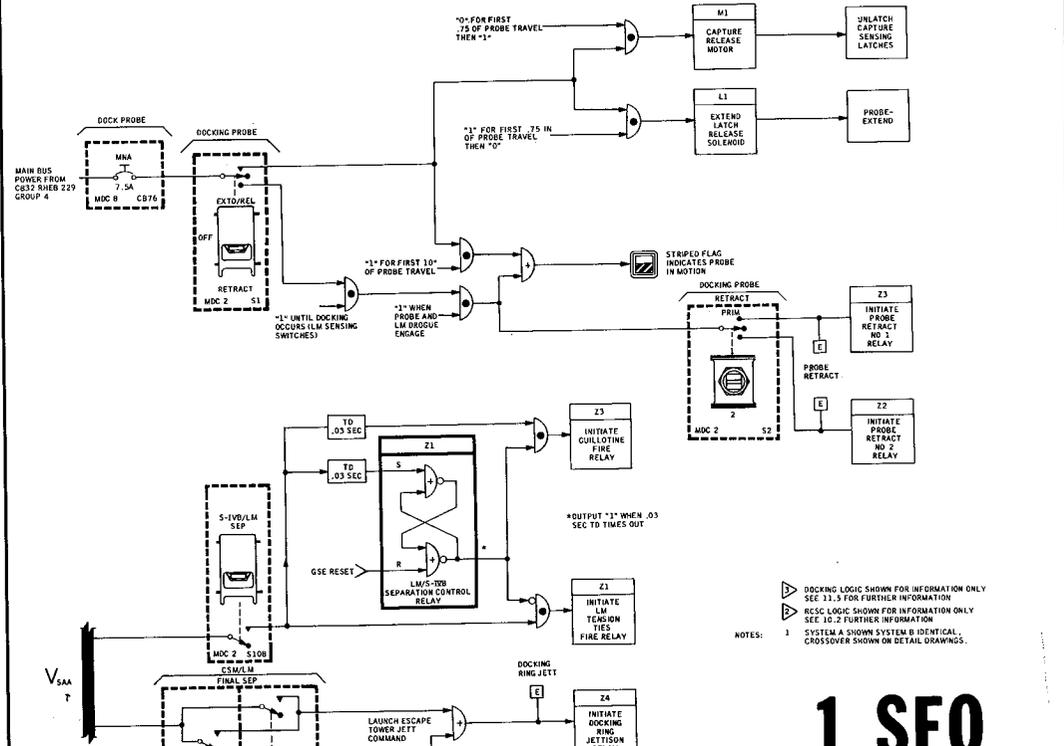
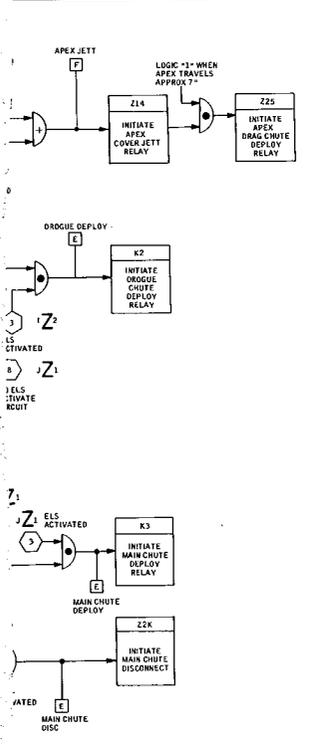
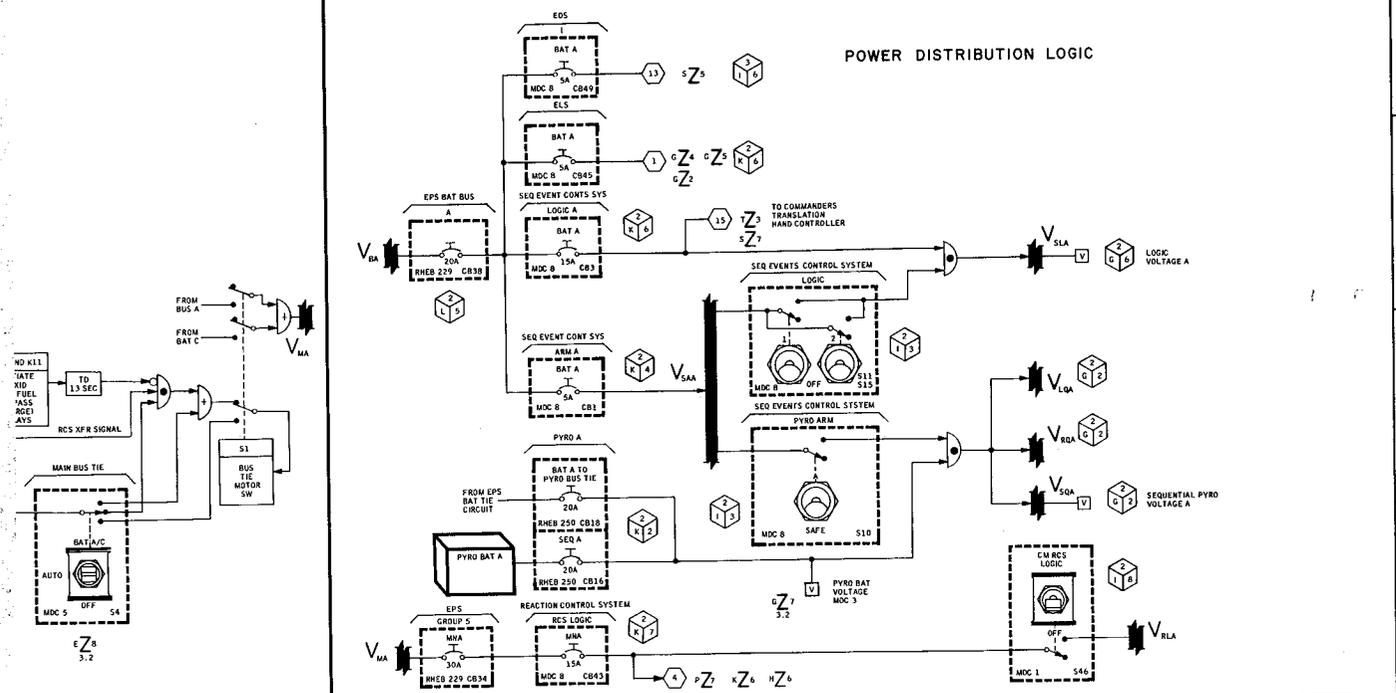
SEQUENTIAL CONTROL-DISPLAY FIGURE

DWG NO. **FIGURE 2.1** SIZE **J** **CSM**
104

SHEET OF PAGE 57.025 X 36

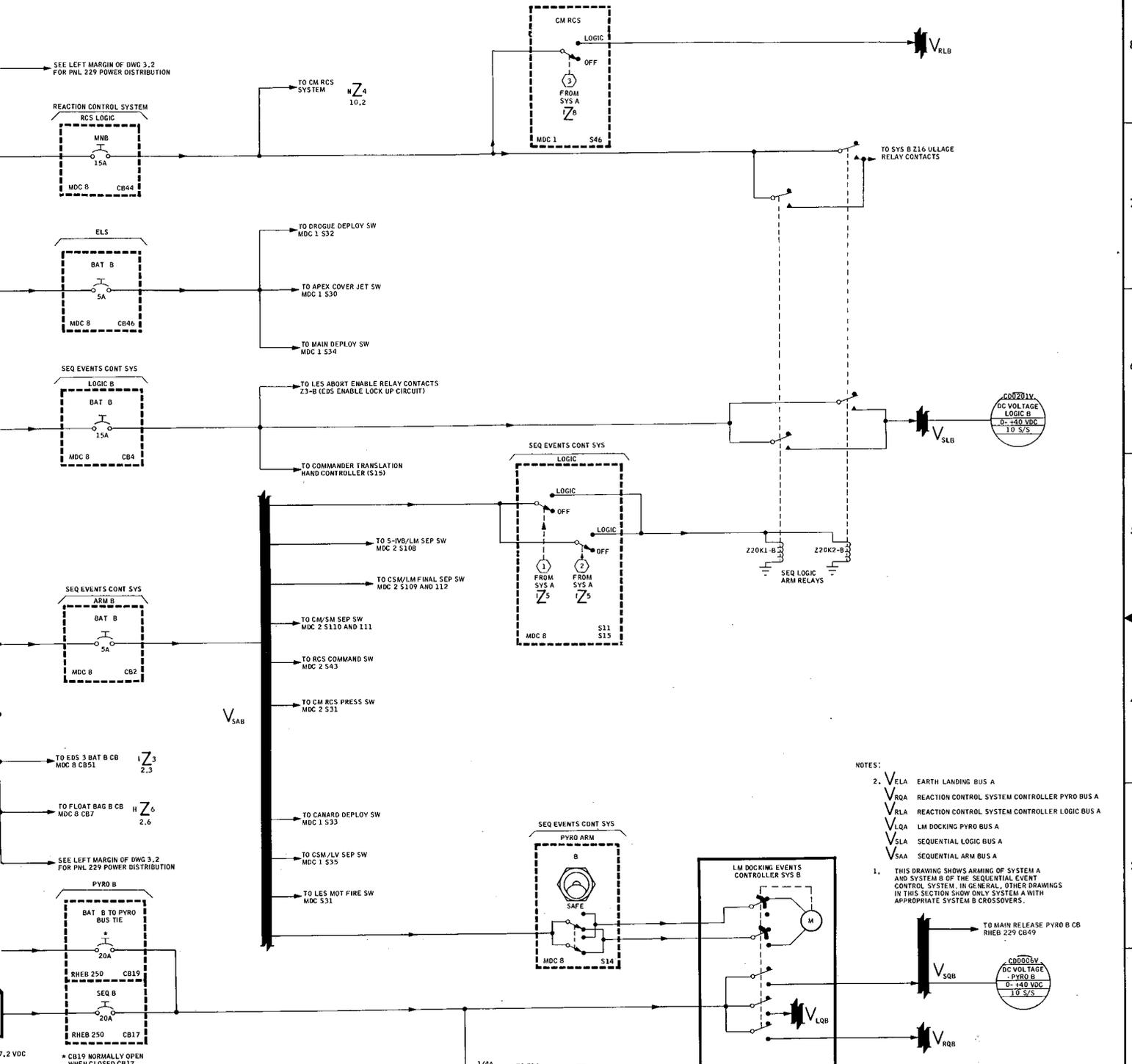
PANEL 229 IS LOCATED IN RH EQUIPMENT BAY

POWER DISTRIBUTION LOGIC



1 SEQ

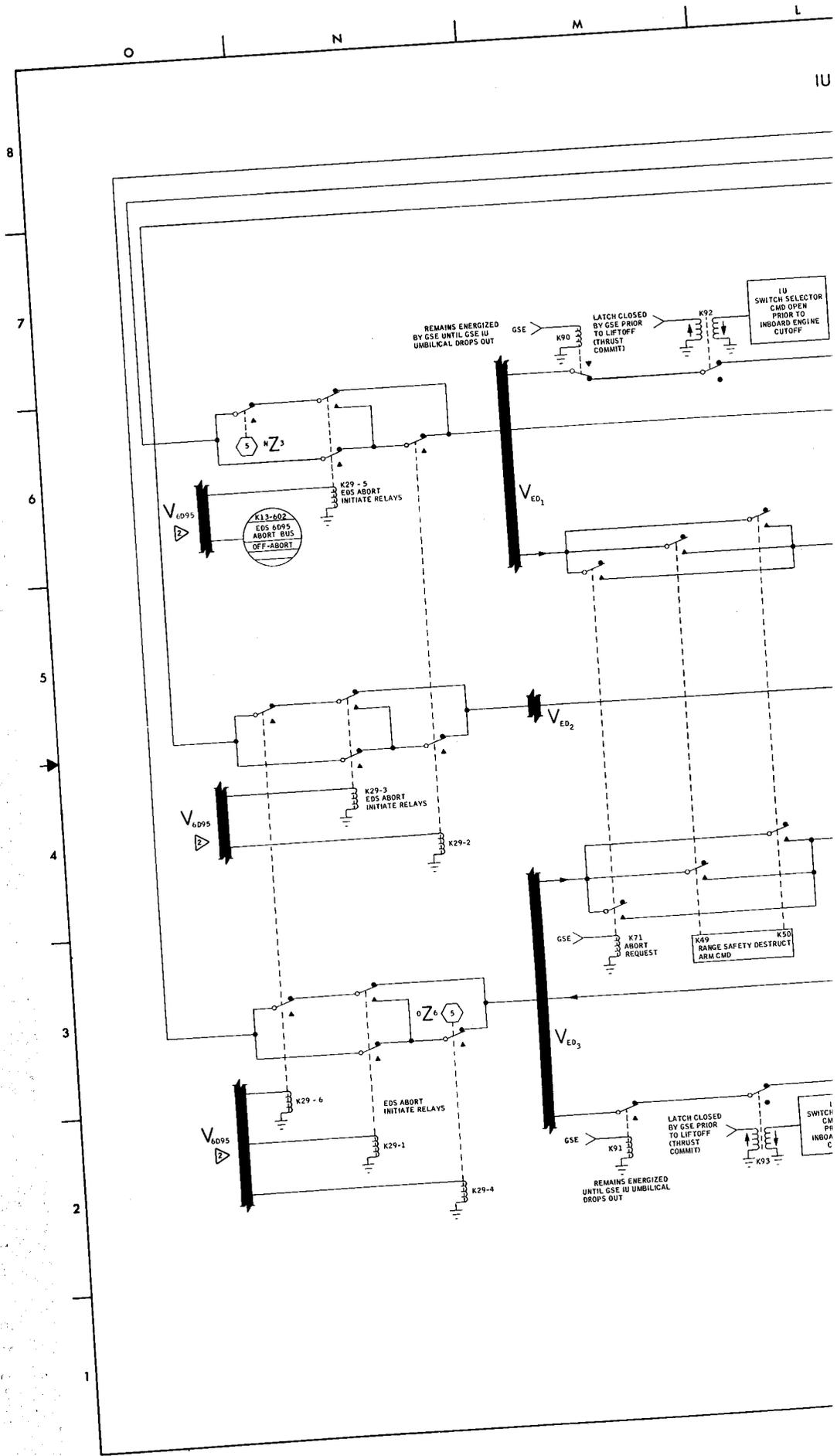
| | | | | |
|-----------------|----|--------------|---|--|
| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION | |
| DR | DR | | MANNED SPACECRAFT CENTER HOUSTON, TEXAS | |
| DC | | | | |
| NR | | | | |
| ENGR | | | | |
| APR | | | | |
| FEC | | | | |
| AUTH | | | | |
| CSM 104 J | | SIZE DWG NO. | 2.1 | |
| 35 1/4 x 12 1/2 | | PAGE | INSET | |



- NOTES:
- THIS DRAWING SHOWS ARMING OF SYSTEM A AND SYSTEM B OF THE SEQUENTIAL EVENT CONTROL SYSTEM. IN GENERAL, OTHER DRAWINGS IN THIS SECTION SHOW ONLY SYSTEM A WITH APPROPRIATE SYSTEM B CROSSOVERS.
 - V_{5ELA} EARTH LANDING BUS A
 - V_{5RQA} REACTION CONTROL SYSTEM CONTROLLER PYRO BUS A
 - V_{5RLA} REACTION CONTROL SYSTEM CONTROLLER LOGIC BUS A
 - V_{5LQA} LM DOKKING PYRO BUS A
 - V_{5SLA} SEQUENTIAL LOGIC BUS A
 - V_{5SAA} SEQUENTIAL ARM BUS A

2 SEQ PWR

| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | |
|------------|--------------------|----------|--|--|
| DR | <i>[Signature]</i> | | <p style="text-align: center;">SEQUENTIAL POWER DISTRIBUTION</p> <p>CSM SIZE DWG NO. 104 J 2.2</p> <p>88-234 PAGE SHEET 1 OF 1</p> | |
| DSCH | <i>[Signature]</i> | | | |
| DC | <i>[Signature]</i> | 11/26/68 | | |
| ENGR | <i>[Signature]</i> | 11/26/68 | | |
| NR | <i>[Signature]</i> | 11/26/68 | | |
| AMP | <i>[Signature]</i> | 11/26/68 | | |
| FEC | <i>[Signature]</i> | 11/26/68 | | |
| AUTH | <i>[Signature]</i> | 11/26/68 | | |



O

Z

M

L

IU

8

7

6

5

4

3

2

1

REMAINS ENERGIZED BY GSE UNTIL GSE IU UMBILICAL DROPS OUT

LATCH CLOSED BY GSE PRIOR TO LIFTOFF (THRUST COMMIT)

IU SWITCH SELECTOR CMD OVER PRIOR TO INBOARD ENGINE CUTOFF

K13-002
EDS 6095
ABORT BUS
OFF-ABORT

K29-5
EDS ABORT
INITIATE RELAYS

V_{ED1}

V₆₀₉₅

K29-3
EDS ABORT
INITIATE RELAYS

V_{ED2}

GSE

K71
ABORT
REQUEST

K49
RANGE SAFETY DESTRUCT
ARM CMD

K50

V₆₀₉₅

K29-6
EDS ABORT
INITIATE RELAYS

K29-1

K29-4

V_{ED3}

GSE

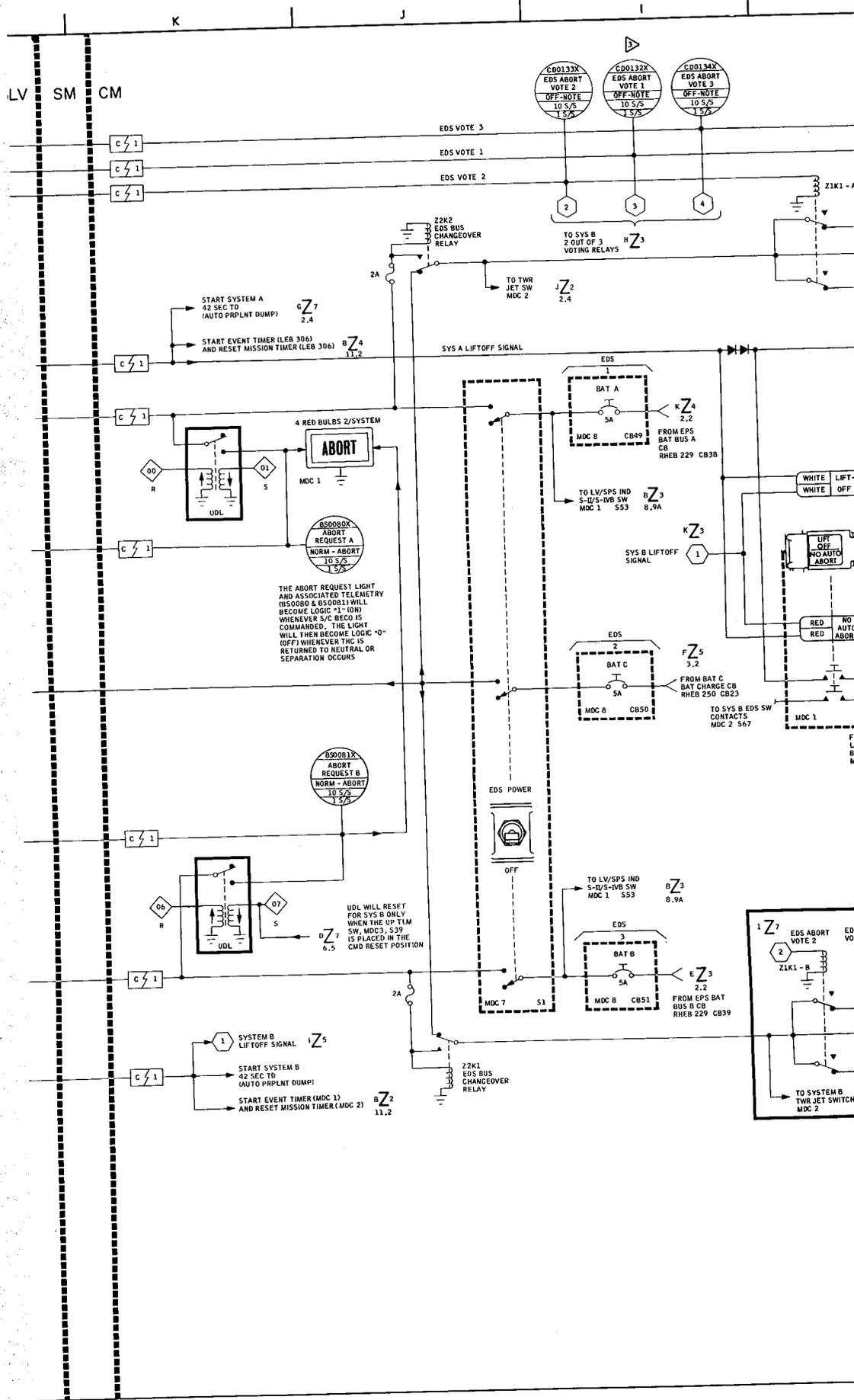
K91

LATCH CLOSED BY GSE PRIOR TO LIFTOFF (THRUST COMMIT)

K93

SWITCH
CM
PR
INBOA
C

REMAINS ENERGIZED UNTIL GSE IU UMBILICAL DROPS OUT



LV SM CM

EDS VOTE 3

EDS VOTE 1

EDS VOTE 2

CB0133X
EDS ABORT
VOTE 2
OFF-NOTE
10 S/S
1 S/A

CB0133Z
EDS ABORT
VOTE 1
OFF-NOTE
10 S/S
1 S/A

CB0134X
EDS ABORT
VOTE 3
OFF-NOTE
10 S/S
1 S/A

Z1K1 - A

Z2K2
EDS BUS
CHANGEOVER
RELAY

TO SYS B
2 OUT OF 3
VOTING RELAYS

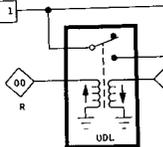
Z2
2.4

START SYSTEM A
42 SEC TO
(AUTO PRPLNT DUMP) Z7
2.4

START EVENT TIMER (LEB 306)
AND RESET MISSION TIMER (LEB 306) Z4
11.2

SYS A LIFTOFF SIGNAL

EDS
1
BAT A
MDC B
5A
CB49
FROM EPS
BAT BUS A
CB
RHEB 229 CB38



4 RED BULBS 2/SYSTEM

ABORT

MDC 1

850080X
ABORT
REQUEST A
NORM - ABORT
10 S/S
1 S/A

THE ABORT REQUEST LIGHT
AND ASSOCIATED TELEMTRY
(850080 & 850081) WILL
BECOME LOGIC "1" (ON)
WHENEVER S/C BECO IS
COMMANDED. THE LIGHT
WILL THEN BECOME LOGIC "0"
(OFF) WHENEVER THIC IS
RETURNED TO NEUTRAL OR
SEPARATION OCCURS

Z4
2.2

Z3
8.9A

WHITE LIFT-
WHITE OFF

LIFT
OFF
NO AUTO
ABORT

RED
RED
NO
AUTO
ABORT

Z3
1

EDS
2
BAT C
MDC B
5A
CB50
FROM BAT C
BAT CHARGE CB
RHEB 250 CB23

TO SYS B EDS SW
CONTACTS
MDC 2 567

850081X
ABORT
REQUEST B
NORM - ABORT
10 S/S
1 S/A

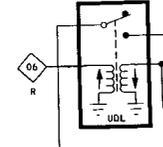
EDS POWER

OFF

Z3
8.9A

Z3
3.2

EDS
3
BAT B
MDC B
5A
CB51
FROM EPS BAT
BUS B CB
RHEB 229 CB39



UDL WILL RESET
FOR SYS B ONLY
WHEN THE UP TLM
SW, MDC3, 539
IS PLACED IN THE
CMD RESET POSITION

Z7
6.5

SYSTEM B
LIFTOFF SIGNAL Z5

START SYSTEM B
42 SEC TO
(AUTO PRPLNT DUMP)

START EVENT TIMER (MDC 1)
AND RESET MISSION TIMER (MDC 2) Z2
11.2

Z2K1
EDS BUS
CHANGEOVER
RELAY

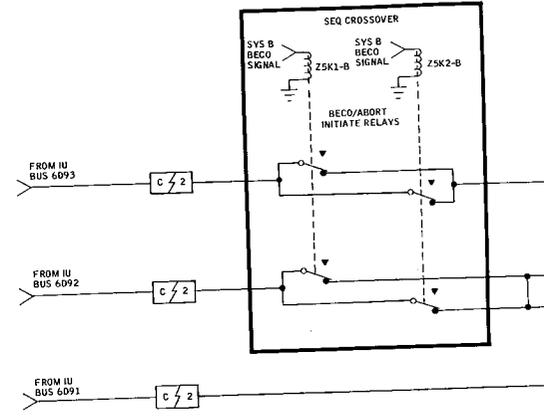
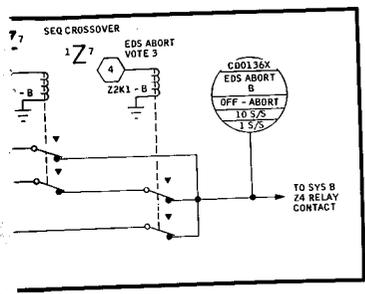
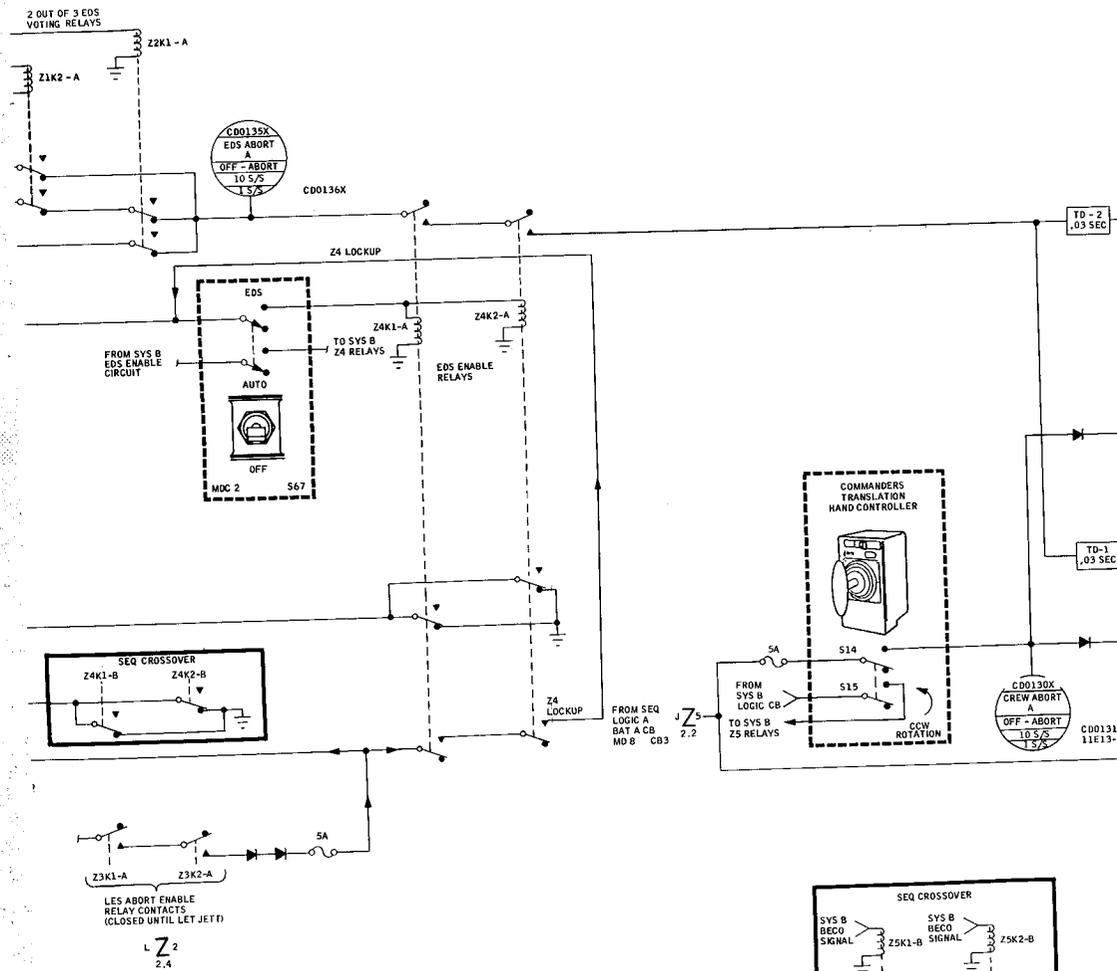
Z7
EDS ABORT
VOTE 2

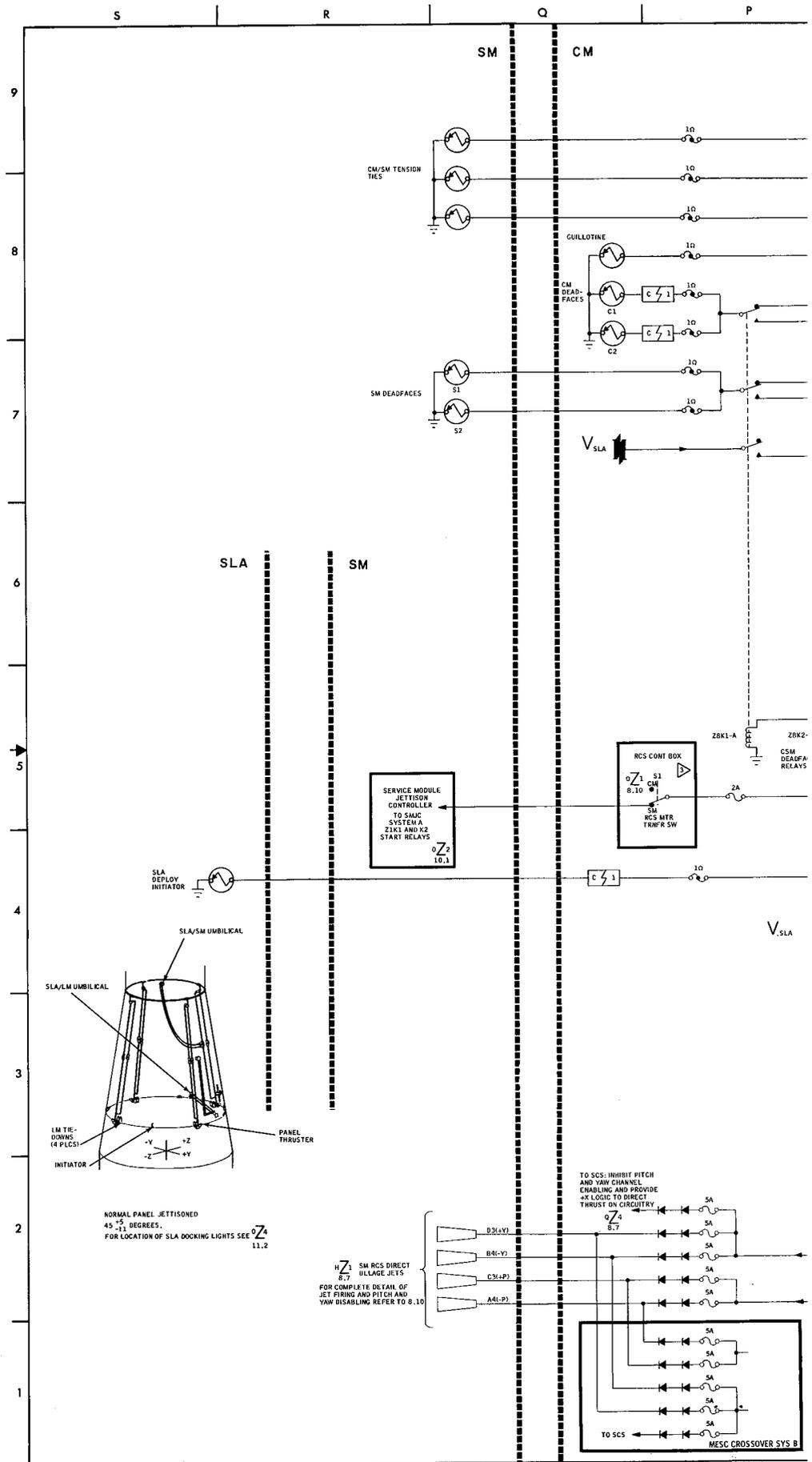


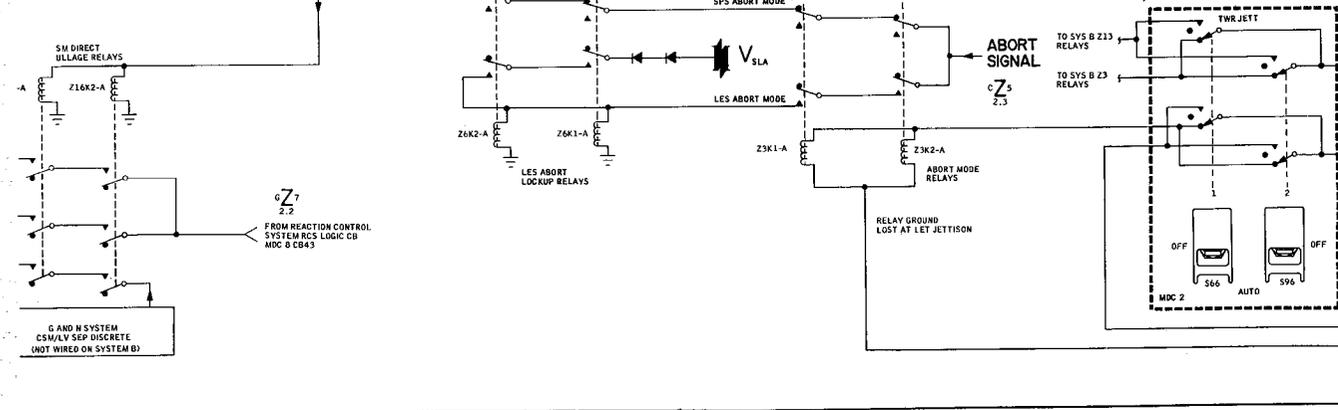
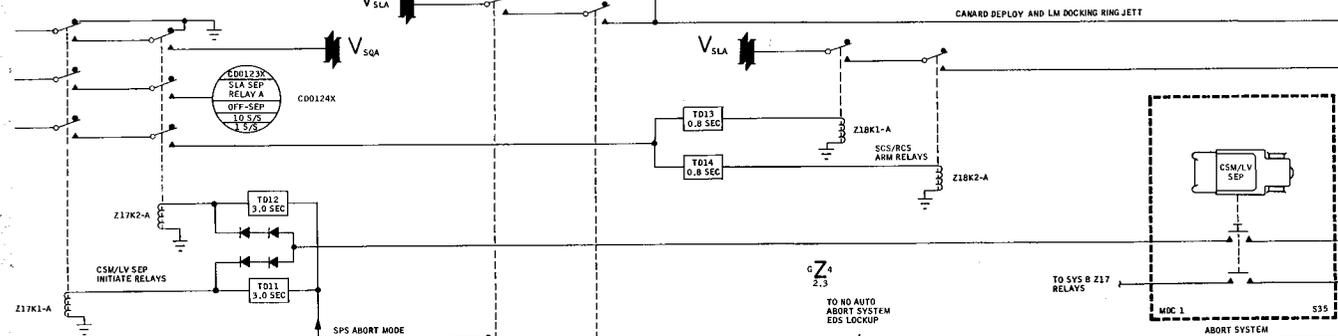
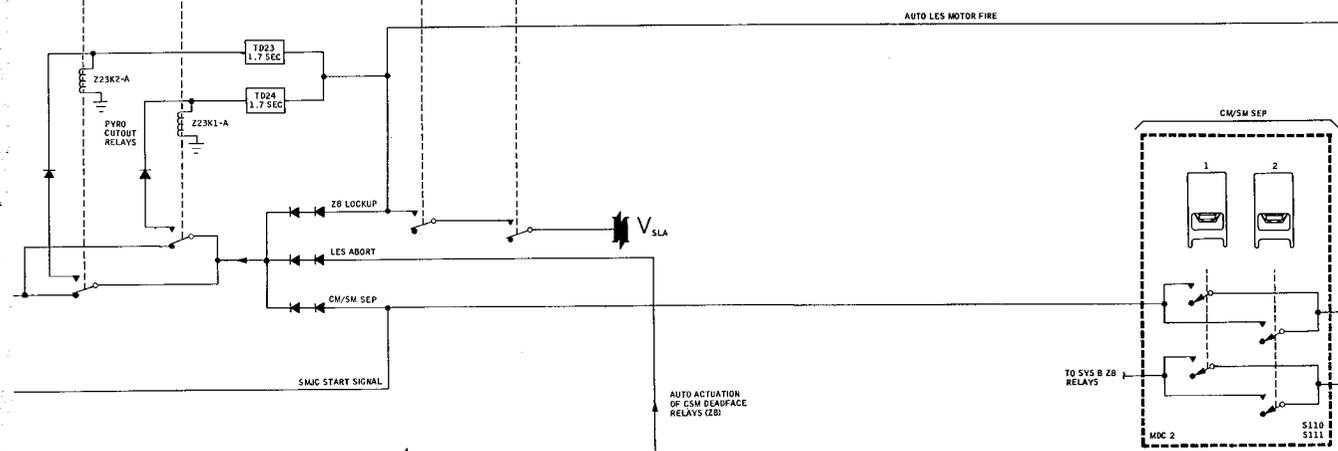
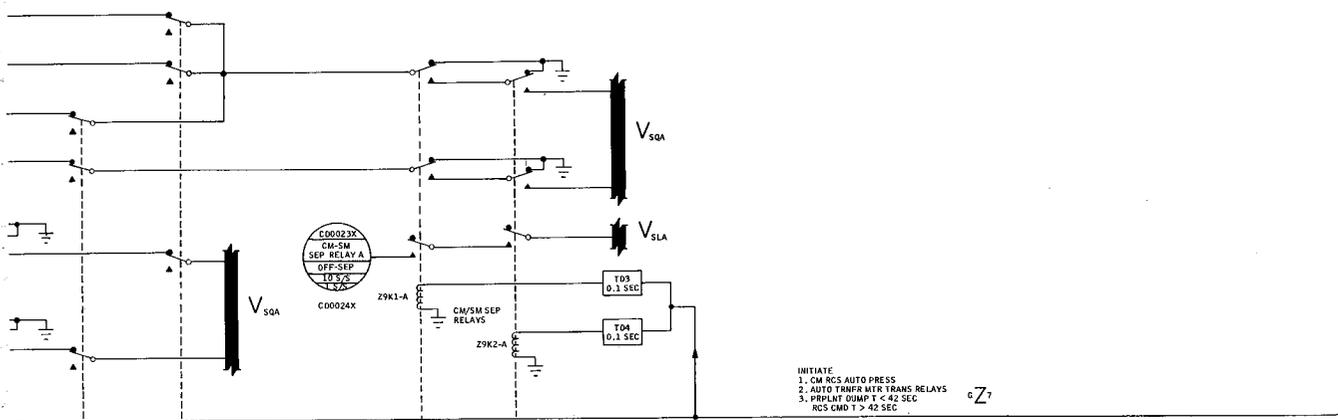
Z1K1 - B

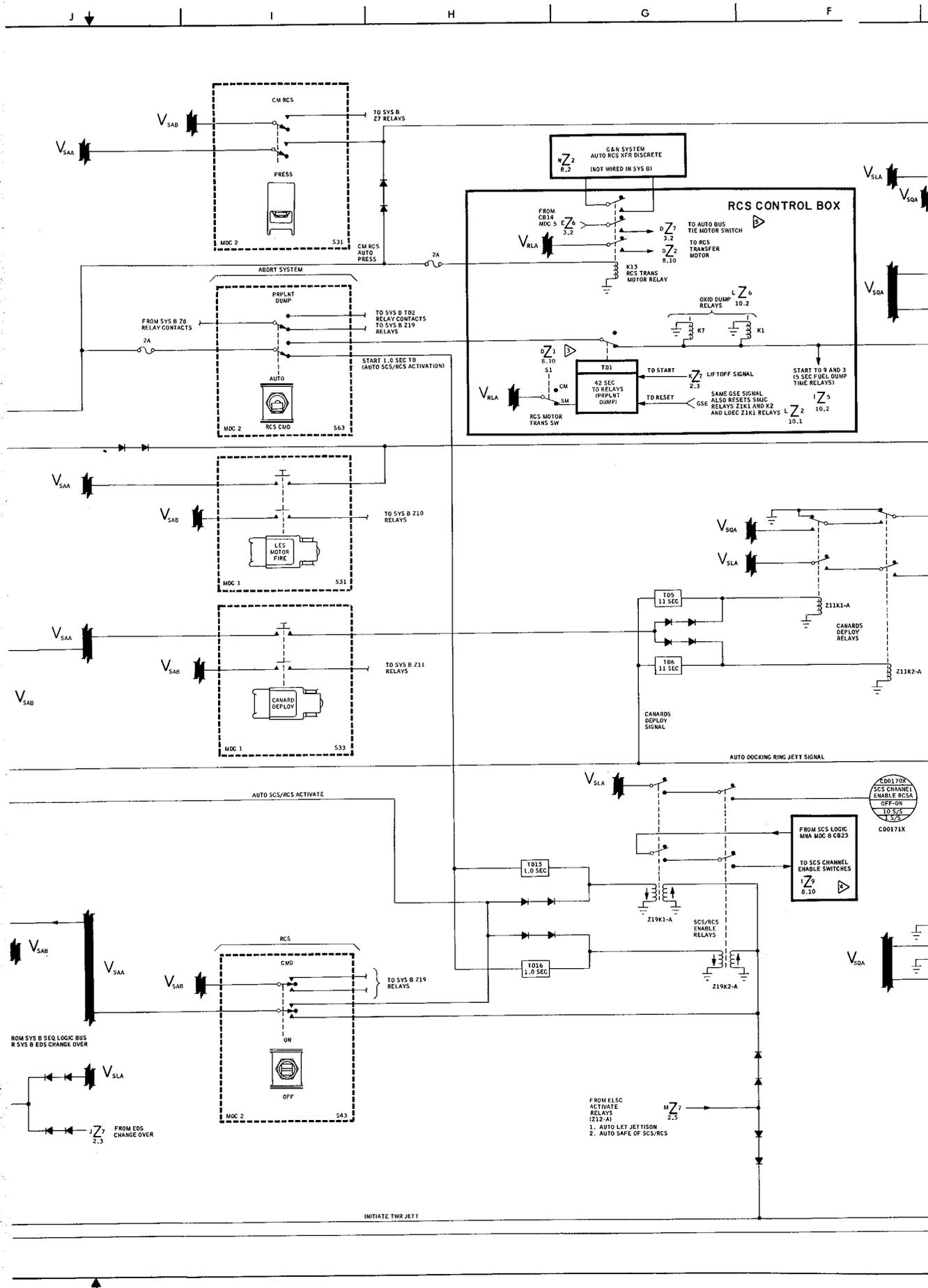
TO SYSTEM B
TWR JET SWITCH
MDC 2

F
L
B
M









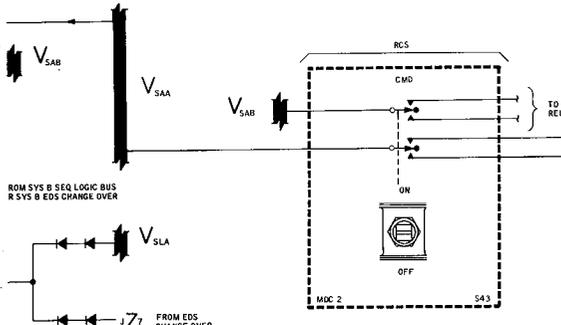
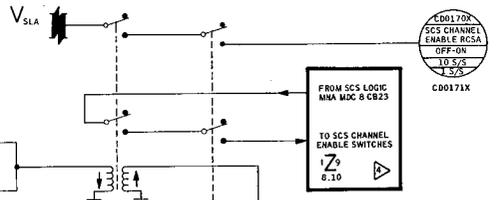
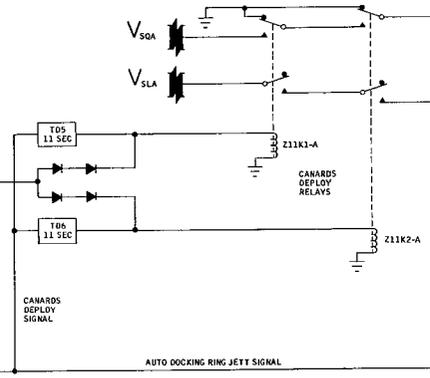
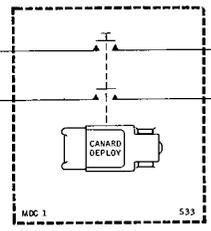
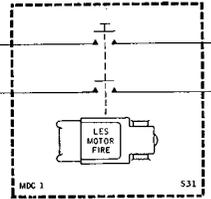
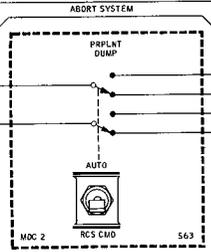
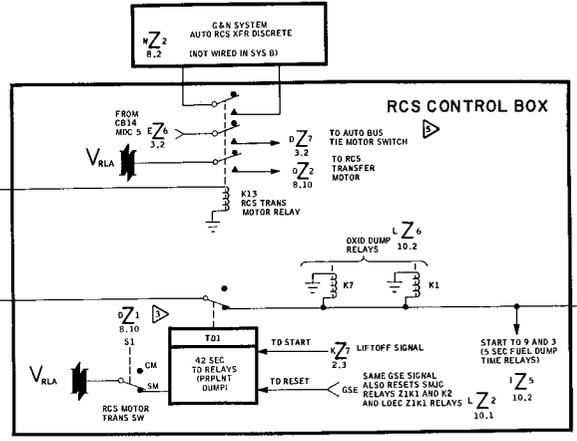
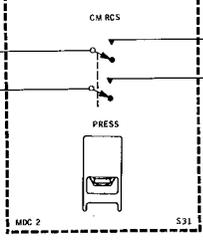
J

I

H

G

F



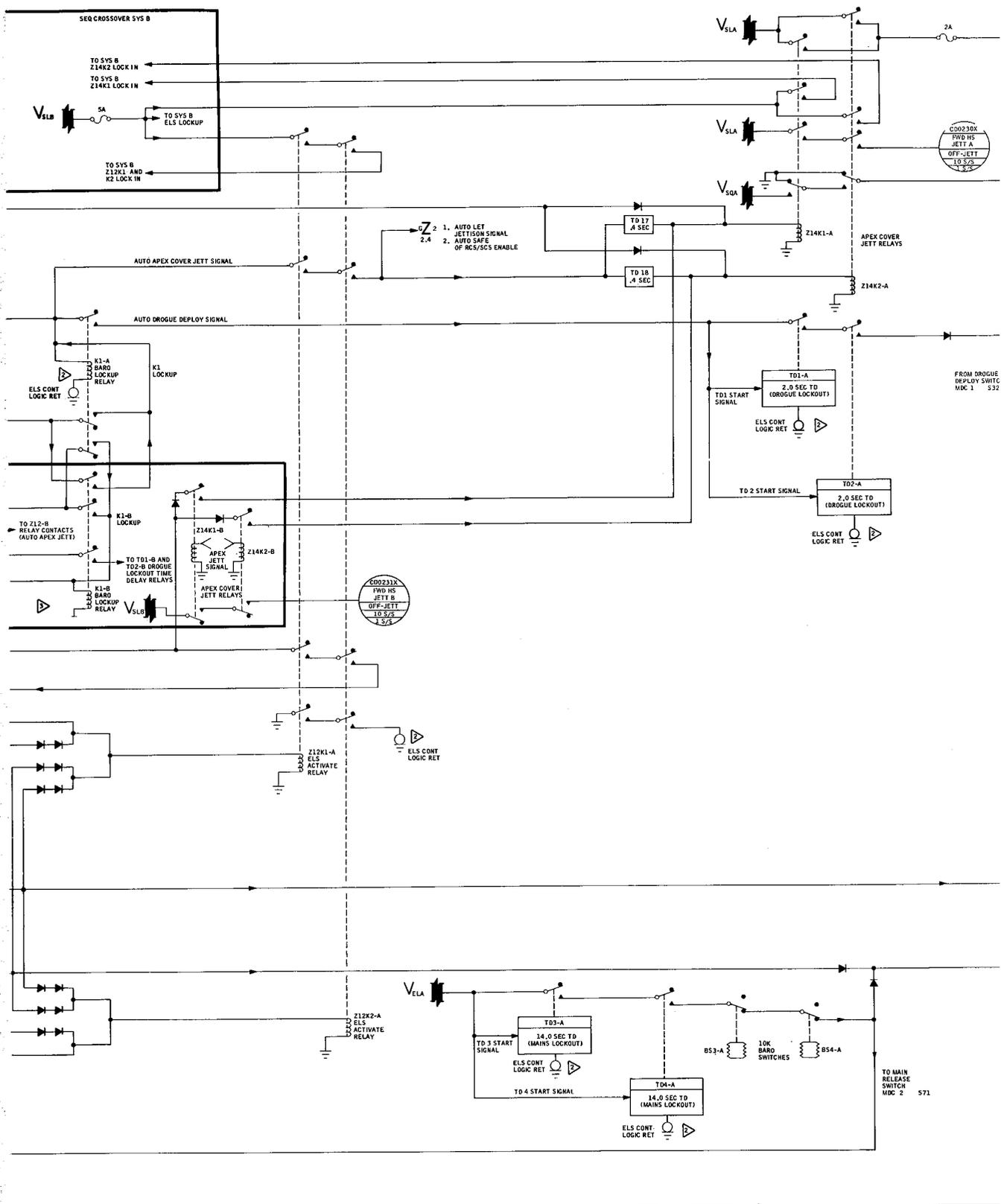
FROM E1 SC ACTIVATE RELAYS (Z12-A)

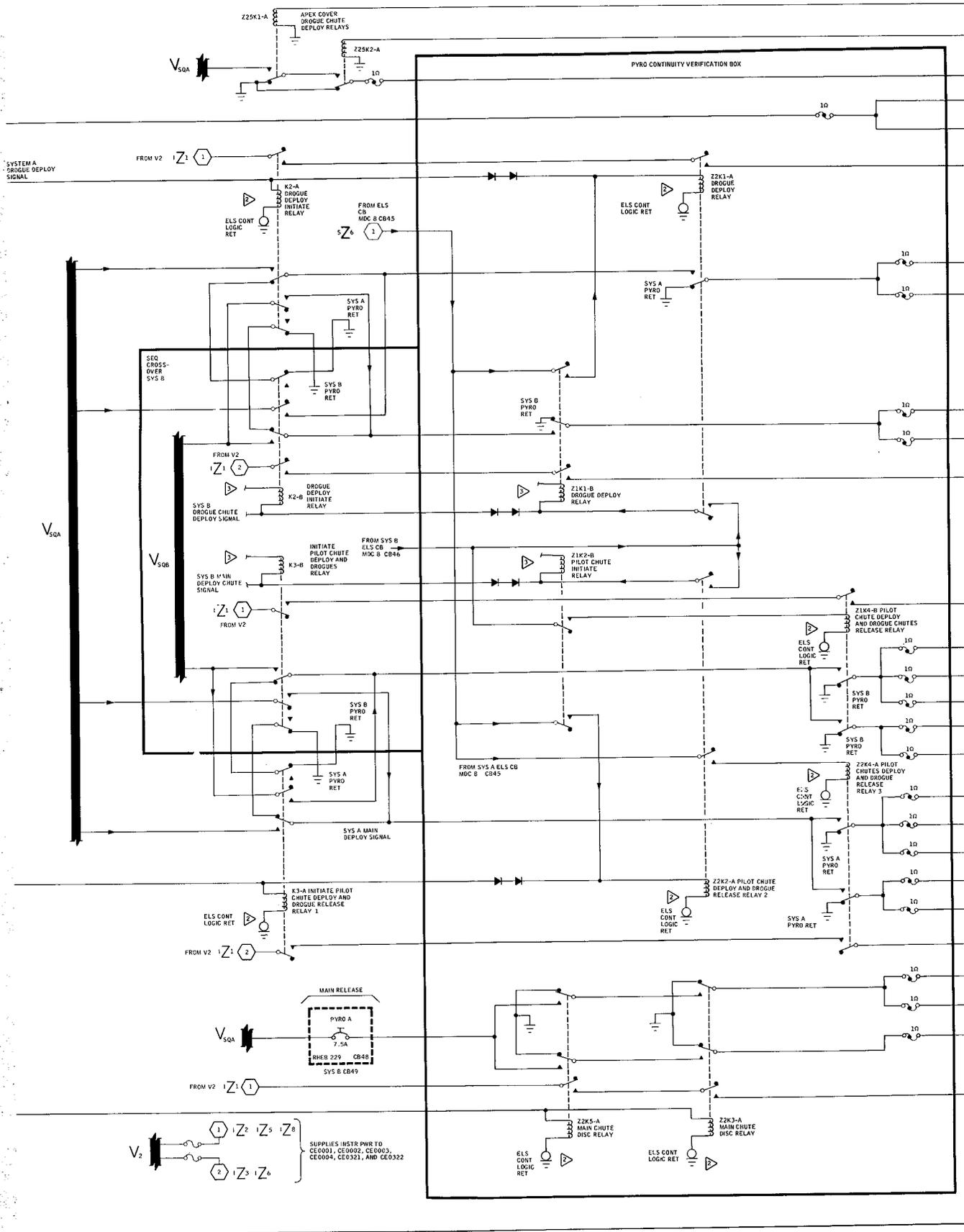
1. AUTO LET JETTISON

2. AUTO SAFE OF SCS/RCS

Z 7 2.5

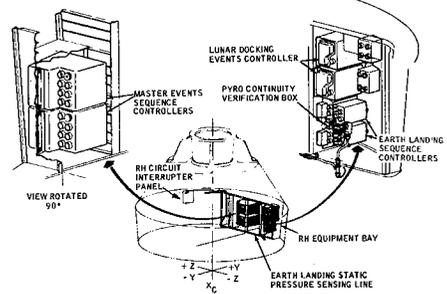
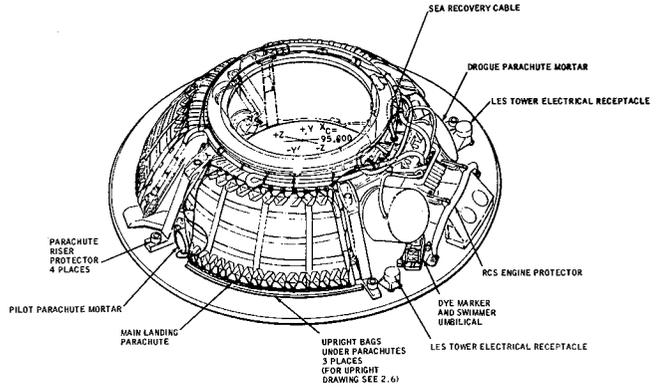
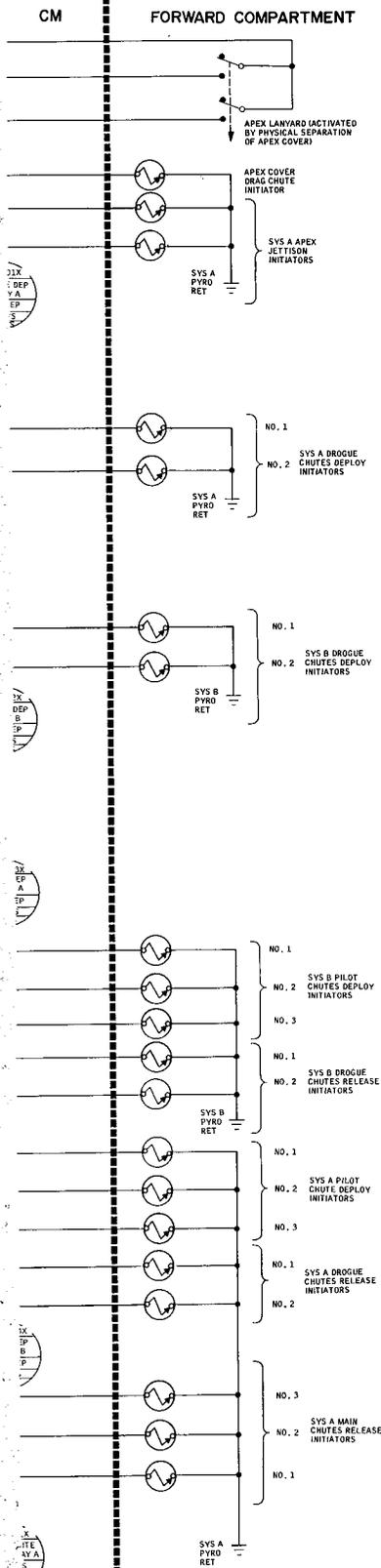
INITIATE TWR JETT





SUPPLIES INSTR PWR TO
CE0001, CE0002, CE0003,
CE0004, CE0321, AND CE0322

| LTG | DR | ENGR | DATE | APPROVAL |
|-----|----|------|------|----------|
| | | | | |

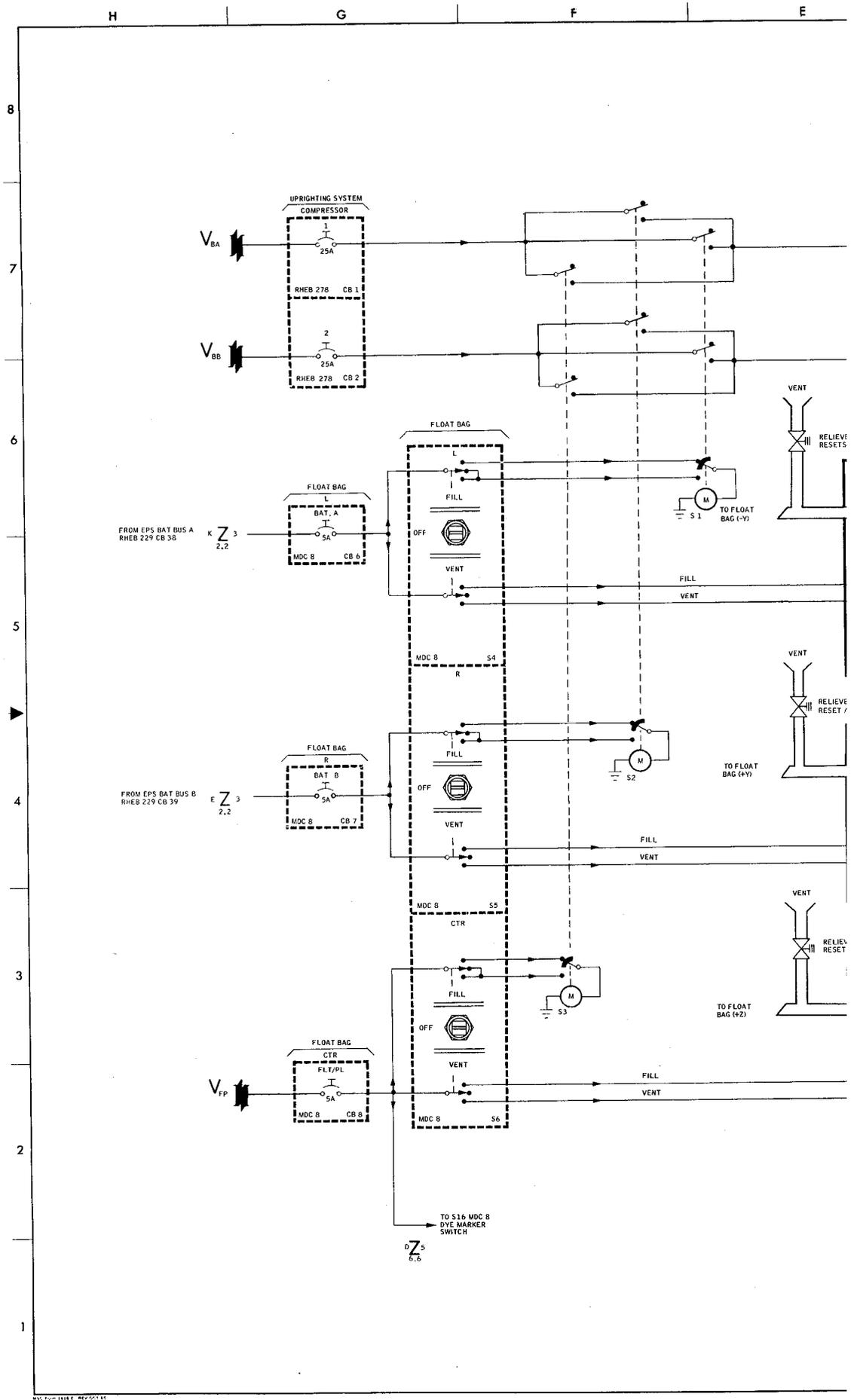


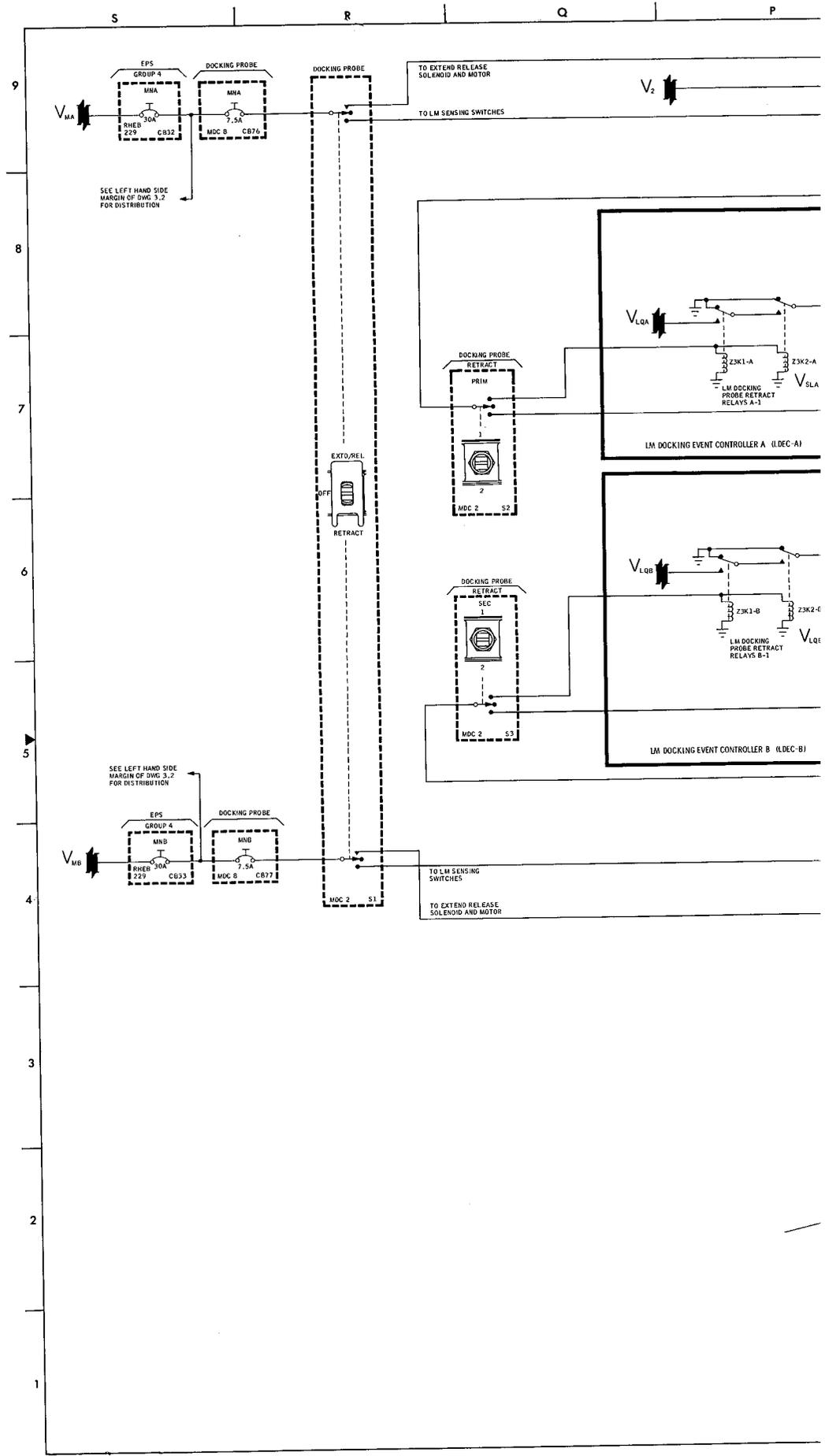
- ▽ SWITCH LOCATED UNDER PROTECTIVE COVER
- ▽ RELAYS WILL NOT BE GROUNDED UNTIL ELS ACTIVATED RELAYS 212(SYS B) ARE ENERGIZED
- ▽ RELAYS WILL NOT BE GROUNDED UNTIL THE ELS ACTIVATE RELAYS 212(SYS A) ARE ENERGIZED

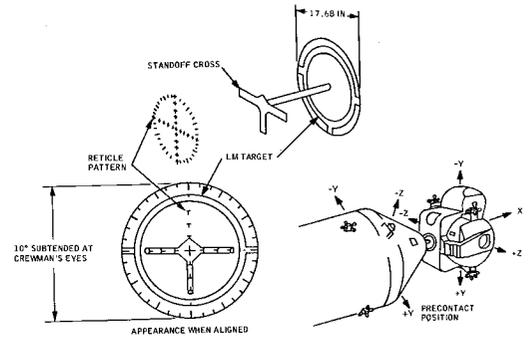
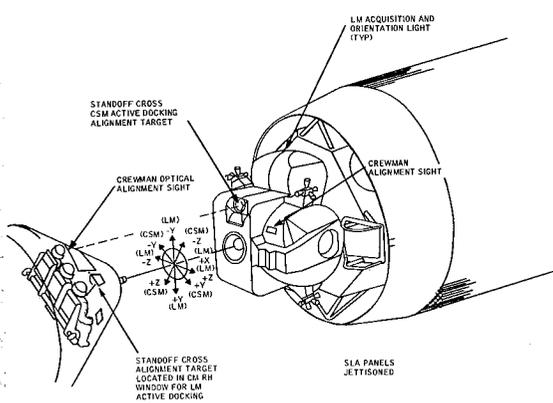
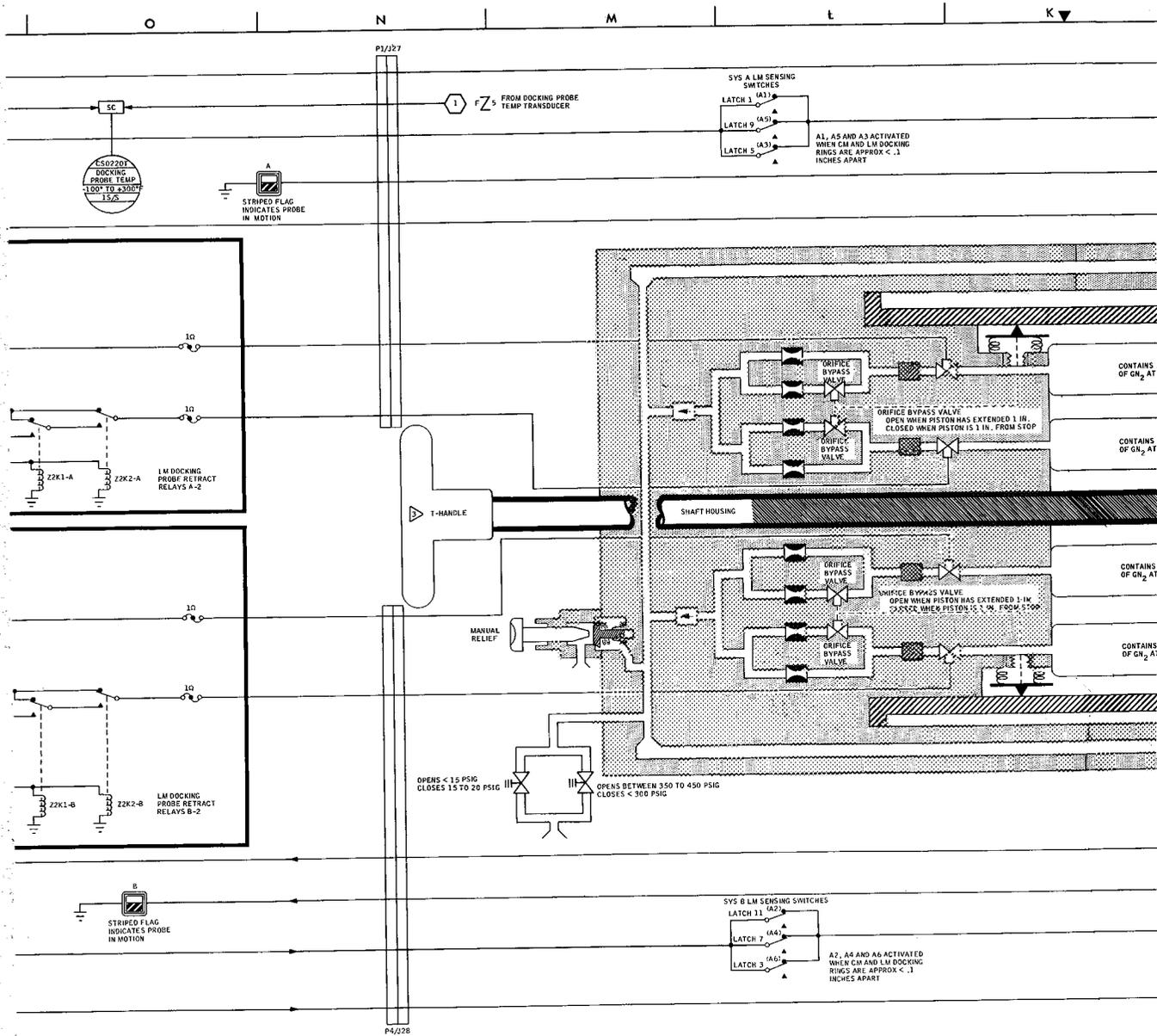
NOTES: 1 SYSTEM A SHOWN EXCEPT WHERE NOTED. PYRO VERIFICATION BOX SHOWN WITH SYSTEM A FUNCTIONS AND SYSTEM B CROSSOVERS. SYSTEM B MAIN CHUTE RELEASE IDENTICAL TO SYSTEM A.

5 EARTH LDG

| | | |
|-------------------------|---------------|--|
| SIGNATURES | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER • HOUSTON, TEXAS |
| DR. <i>[Signature]</i> | <i>[Date]</i> | SEQUENTIAL EARTH LANDING SUBSYSTEM |
| DSCR | | |
| QC <i>[Signature]</i> | <i>[Date]</i> | |
| ENGR | | |
| NR <i>[Signature]</i> | <i>[Date]</i> | |
| AWP <i>[Signature]</i> | <i>[Date]</i> | |
| FEC <i>[Signature]</i> | <i>[Date]</i> | |
| AUTH <i>[Signature]</i> | <i>[Date]</i> | |
| CSM 104 | SIZE J | OWN NO. 2.5 |
| 110X38.25 | PAGE | SHEET |







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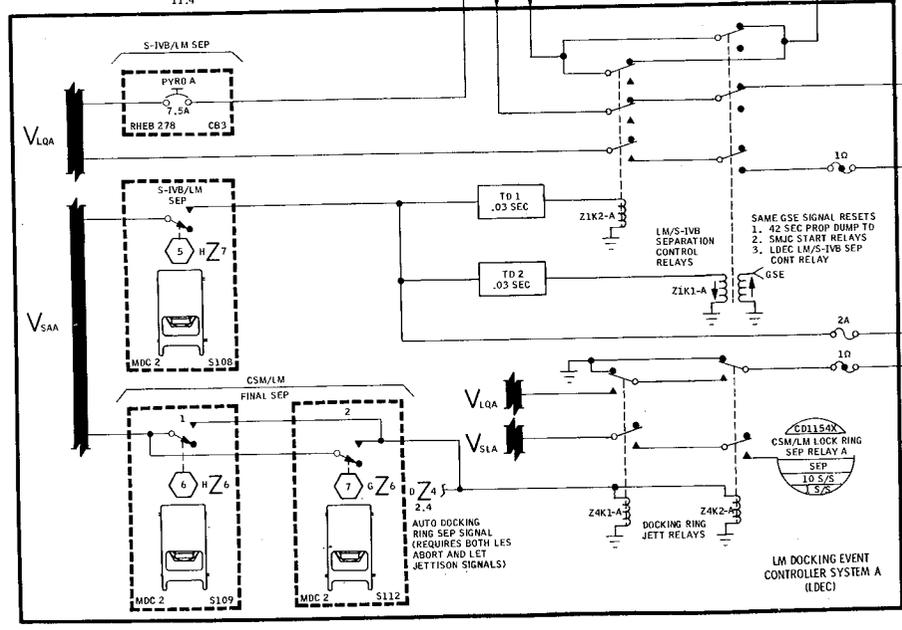
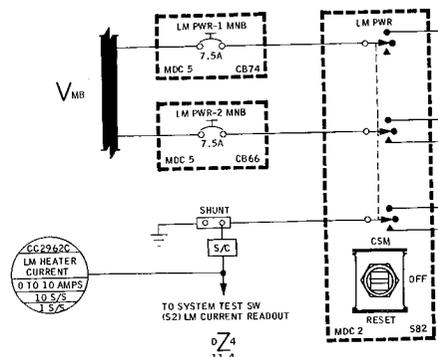
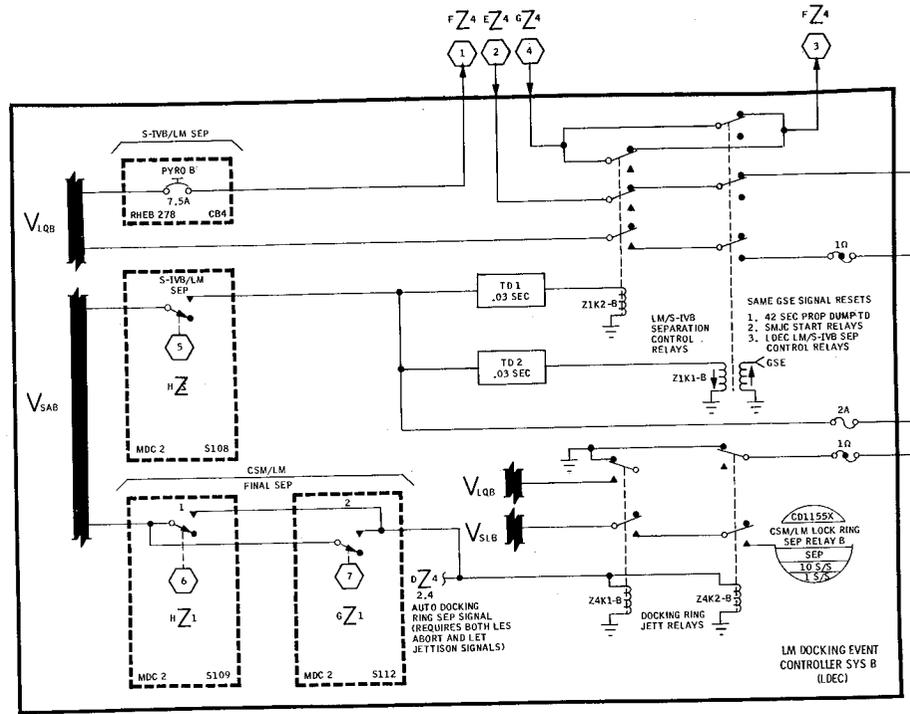
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LM

SLA

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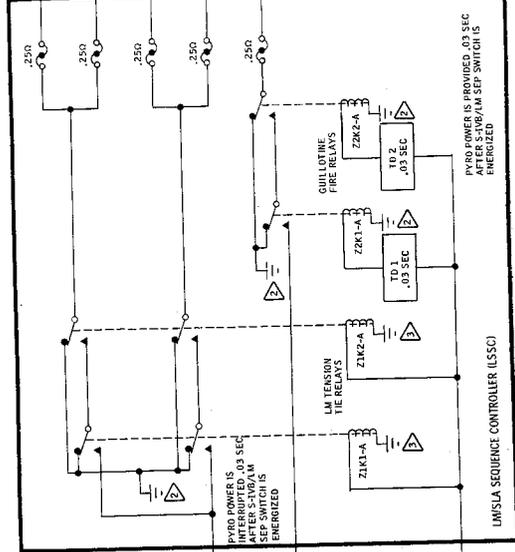
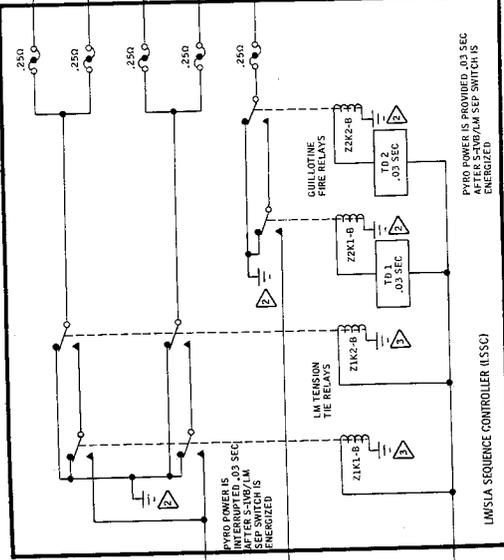
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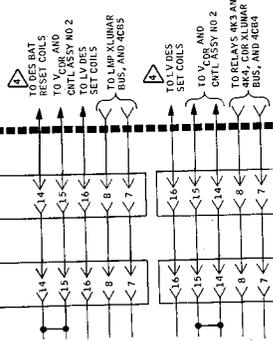
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2

1



- NOTES:
- SEE DWG 2, LV SYSTEMS
 - REG RETURN THRU PIN 6
 - PHS 2, 4, 10 & 13
 - PYRO PWR THRU REDUNDANT PHS 7 & 12



8 LM INTER

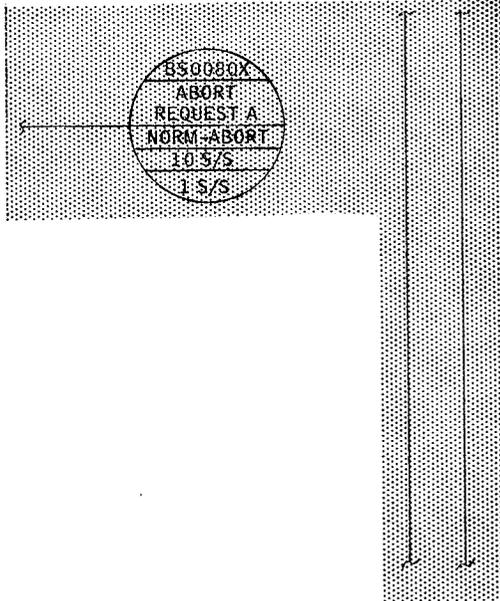
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|------------------|----------------|--|
| SIGNATURES | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS |
| DR: JFC | VALUES | |
| ENG: CM | | |
| CHK: [Signature] | | |
| APP: [Signature] | | |
| DATE: 11-7-68 | SIZE: DWG NO.: | CSM 104 E 2.8 |
| BY: [Signature] | DATE: 11-7-68 | 34 X 41 |
| SHEET | | |

SECTION 2

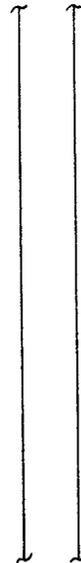
IS

WAS

1. DWG 2.3 JZ⁵



THE ABORT REQUEST LIGHT
AND ASSOCIATED TELEMETRY
(BS0080 & BS0081) WILL
BECOME LOGIC "1" (ON)
WHENEVER S/C BECO IS
COMMANDED. THE LIGHT
WILL THEN BECOME LOGIC "0"
(OFF) WHENEVER THC IS
RETURNED TO NEUTRAL OR
SEPARATION OCCURS



SECTION 2

IS

1. DWG 2.7 B,AZ4,3

- 3 CAPTURE LATCHES/MOTOR SHAFT
- A. THE CAPTURE LATCHES ARE UNLOCKED BY THE MOTOR ROTATING THE MOTOR SHAFT 180° CLOCKWISE WHEN THE EXTD/REL RETRACT SWITCH (S1 MDC 2) IS PLACED IN THE EXTD/REL POSITION.
- (1) THE MOTOR SHAFT APPLIES A TORQUING MOMENT TO THE ROTATION TO TRANSLATION CAM. THE ROTATION TO TRANSLATION CAM IN TURN APPLIES A TENSION FORCE TO THE TENSION SPRING, PULLING THE SPIDER DOWN AND ALLOWING THE LOCKING PIN TO ENGAGE THE TOGGLE.
 - (2) THE MOTOR SHAFT IS KEPT FROM ROTATING BACK TO 0° BY THE LOCKING PIN, UNTIL THE PROBE HEAD AND LM DROGUE MAKE PHYSICAL CONTACT (CAPTURE).
 - (3) AN INDICATION THAT THIS HAS OCCURRED IS THE PROBE EXTD/RET A AND B FLAGS ON MDC 2 WILL CHANGE FROM GRAY TO BARBER AND THEN BACK TO GRAY WHEN THE PROBE HAS EXTENDED TEN INCHES.
- B. WHEN THE PROBE HEAD AND LM DROGUE MAKE CONTACT, THE THREE CAPTURE LATCHES, THROUGH MECHANICAL ACTION, RELEASE THE LOCKING PIN WHICH IS HOLDING THE SPIDER DOWN, AND ALLOWS THE TENSION SPRING TO DRIVE THE SHAFT BACK TO 0°.

WAS

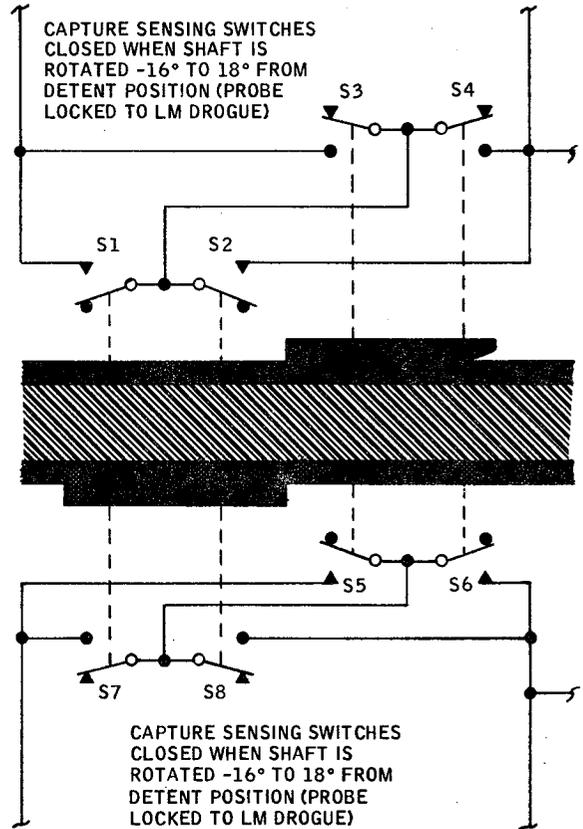
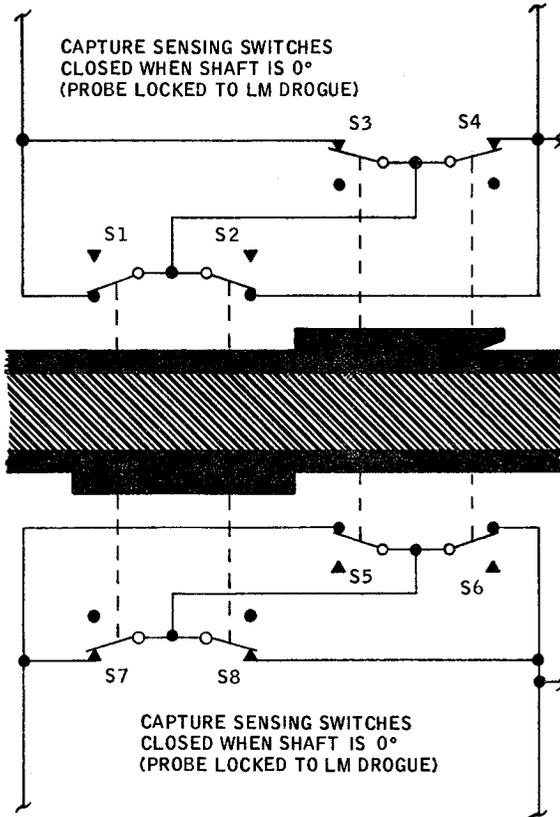
- 3 CAPTURE LATCHES/MOTOR SHAFT
- A. THE CAPTURE LATCHES ARE UNLOCKED BY THE MOTOR ROTATING THE MOTOR SHAFT 150° CLOCKWISE WHEN THE EXTD/REL RETRACT SWITCH (S1 MDC 2) IS PLACED IN THE EXTD/REL POSITION.
- (1) THE MOTOR SHAFT APPLIES A TORQUING MOMENT TO THE ROTATION TO TRANSLATION CAM. THE ROTATION TO TRANSLATION CAM IN TURN APPLIES A TENSION FORCE TO THE TENSION SPRING, PULLING THE SPIDER DOWN AND ALLOWING THE LOCKING PIN TO ENGAGE THE TOGGLE.
 - (2) THE MOTOR SHAFT IS LOCKED IN THIS POSITION (150° CLOCKWISE) BY THE LOCKING PIN (PREVENTS THE TENSION SPRING FROM ROTATING THE SHAFT COUNTERCLOCKWISE), UNTIL THE PROBE HEAD AND LM DROGUE MAKE PHYSICAL CONTACT
 - (3) AN INDICATION THAT THIS HAS OCCURRED IS THE PROBE EXTD/RET A AND B FLAGS ON MDC 2 WILL CHANGE FROM GRAY TO BARBER AND THEN BACK TO GRAY WHEN THE PROBE HAS EXTENDED TEN INCHES
- B. WHEN THE PROBE HEAD AND LM DROGUE MAKE CONTACT, THE THREE CAPTURE LATCHES, THROUGH MECHANICAL ACTION, RELEASE THE LOCKING PIN WHICH IS HOLDING THE SPIDER DOWN, AND ALLOWS THE TENSION SPRING TO DRIVE THE SHAFT APPROXIMATELY 165° COUNTERCLOCKWISE.

SECTION 2

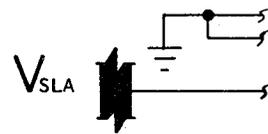
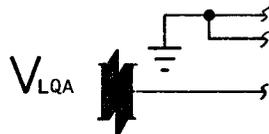
IS

WAS

2. DWG 2.7 J,1 Z 7,6



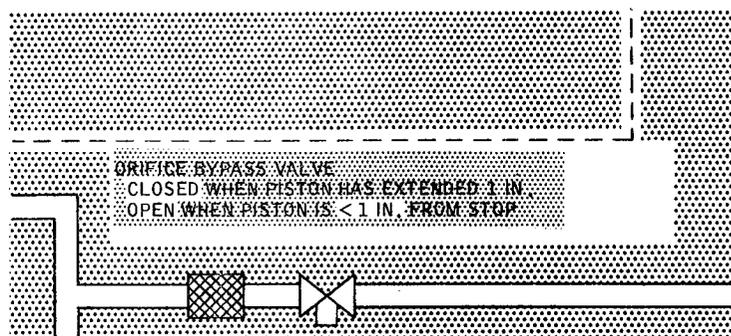
3. DWG 2.7 P Z 7



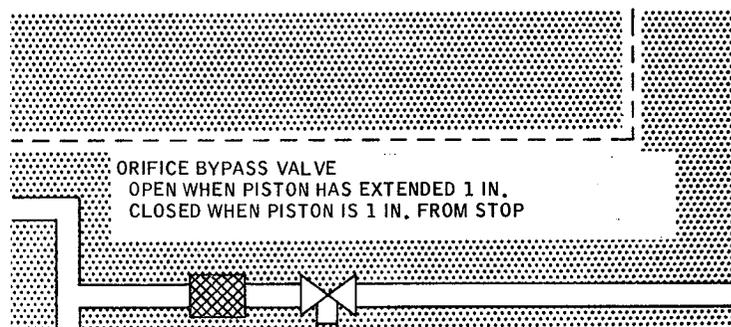
SECTION 2

IS

4. DWG 2.7 L,KZ 7

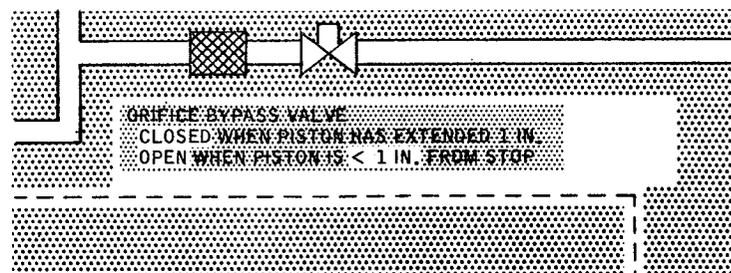


WAS

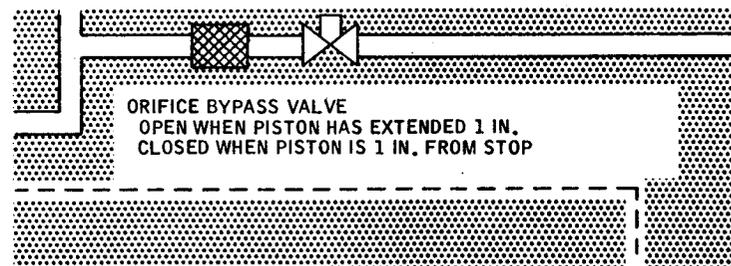


5. DWG 2.7 L,KZ 6

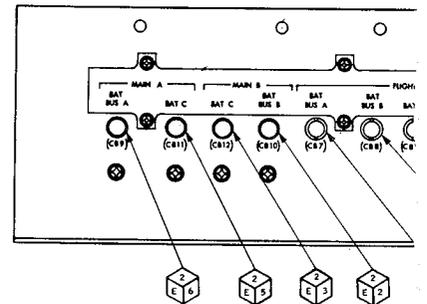
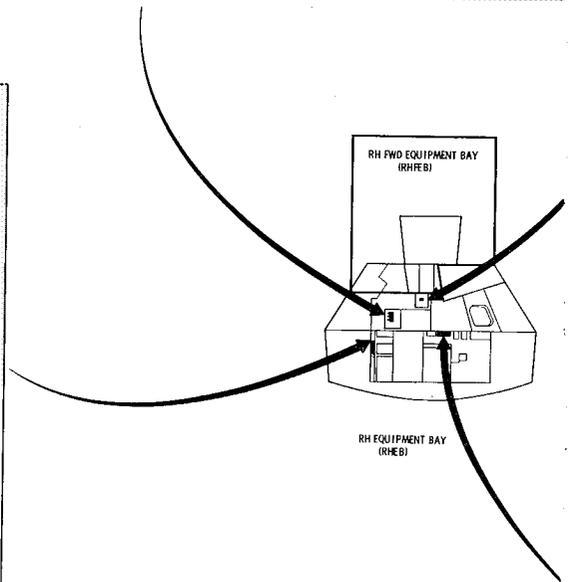
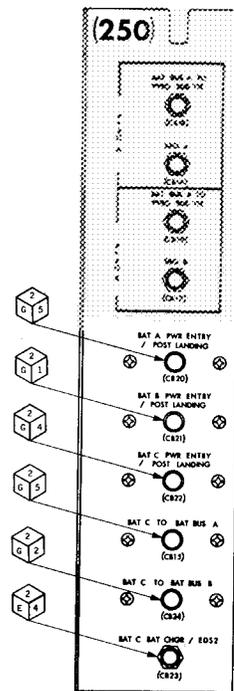
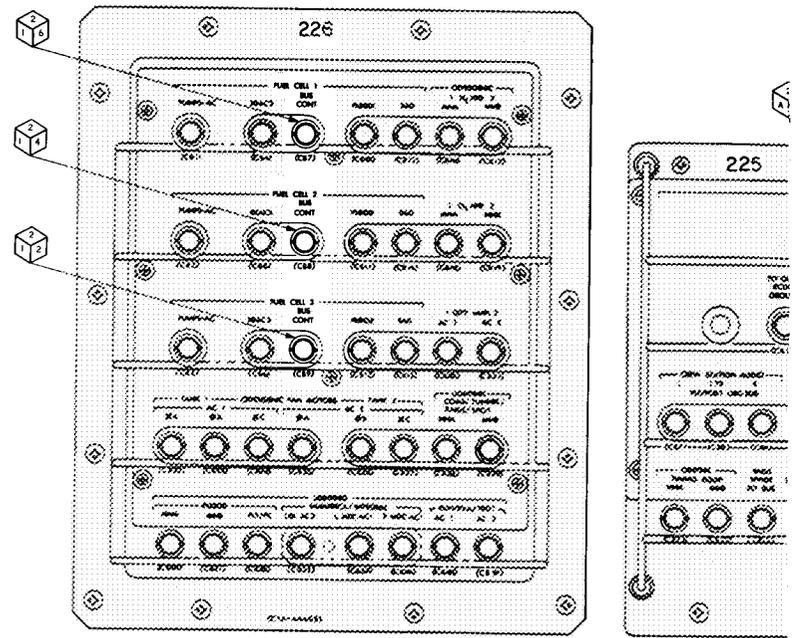
IS



WAS



3 ELECTRICAL
SYSTEM

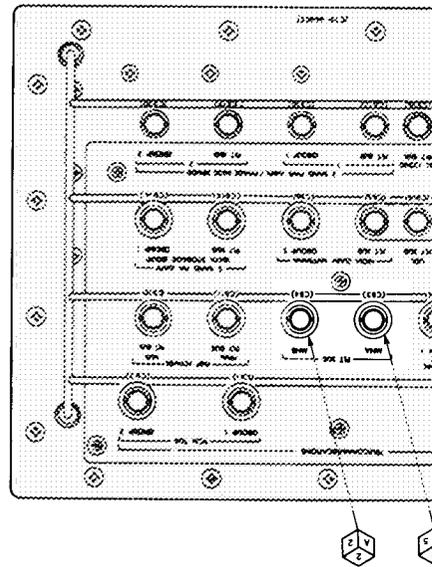
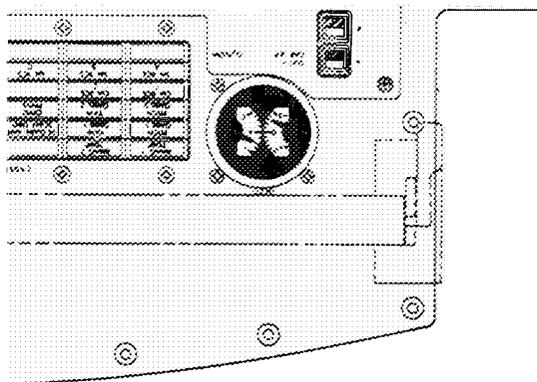
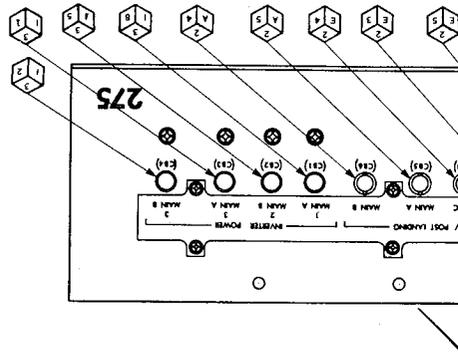
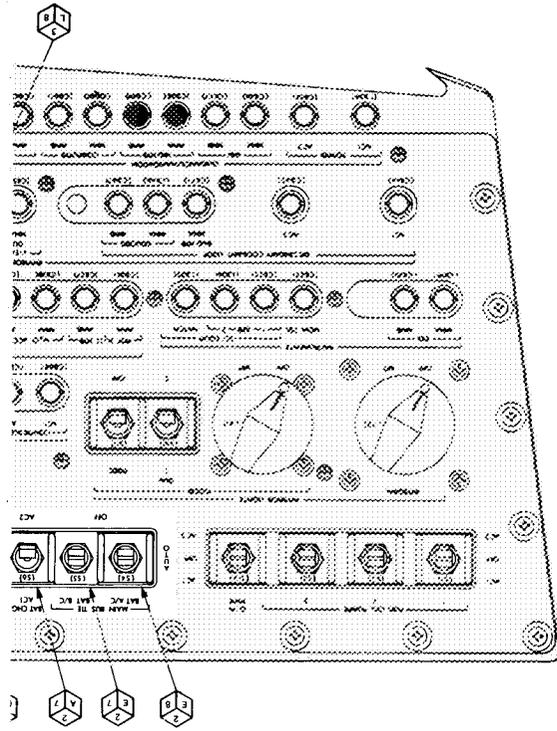


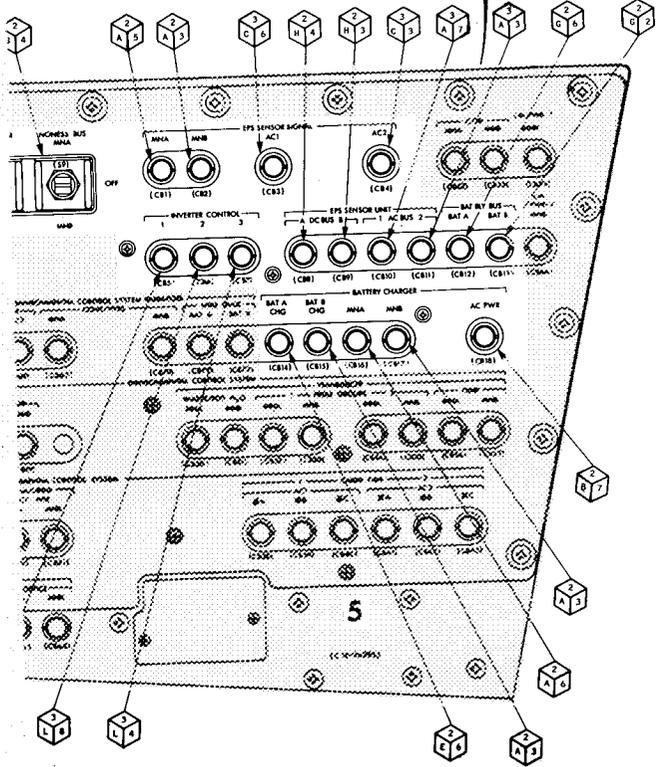
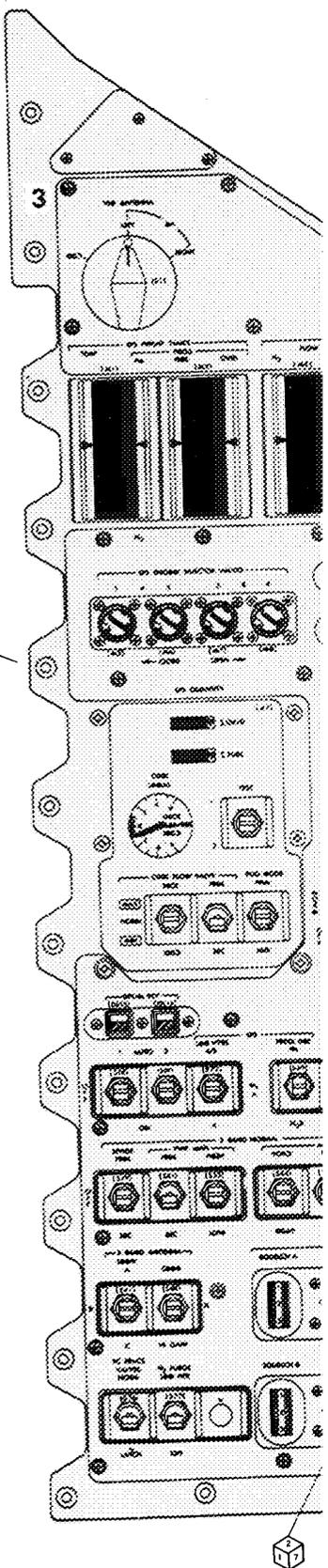
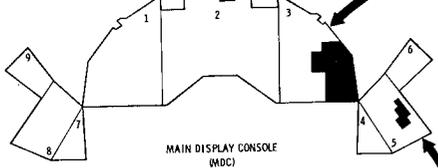
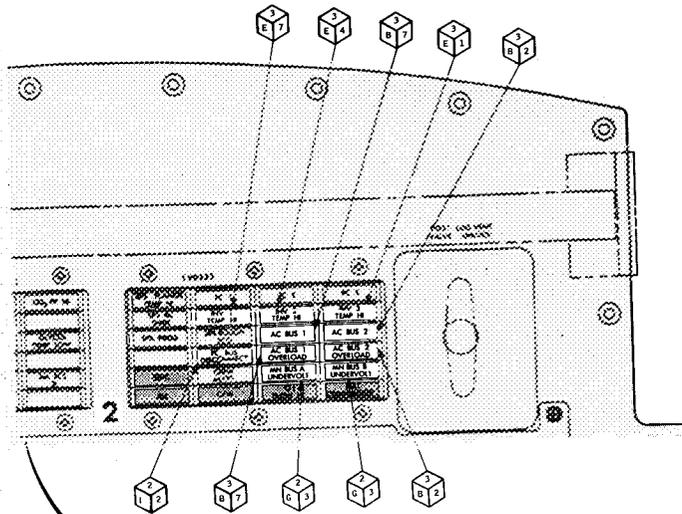
NATIONAL AERONAUTICS & SPACE ADMINISTRATION
 MANNEED SPACECRAFT CENTER HOUSTON, TEXAS

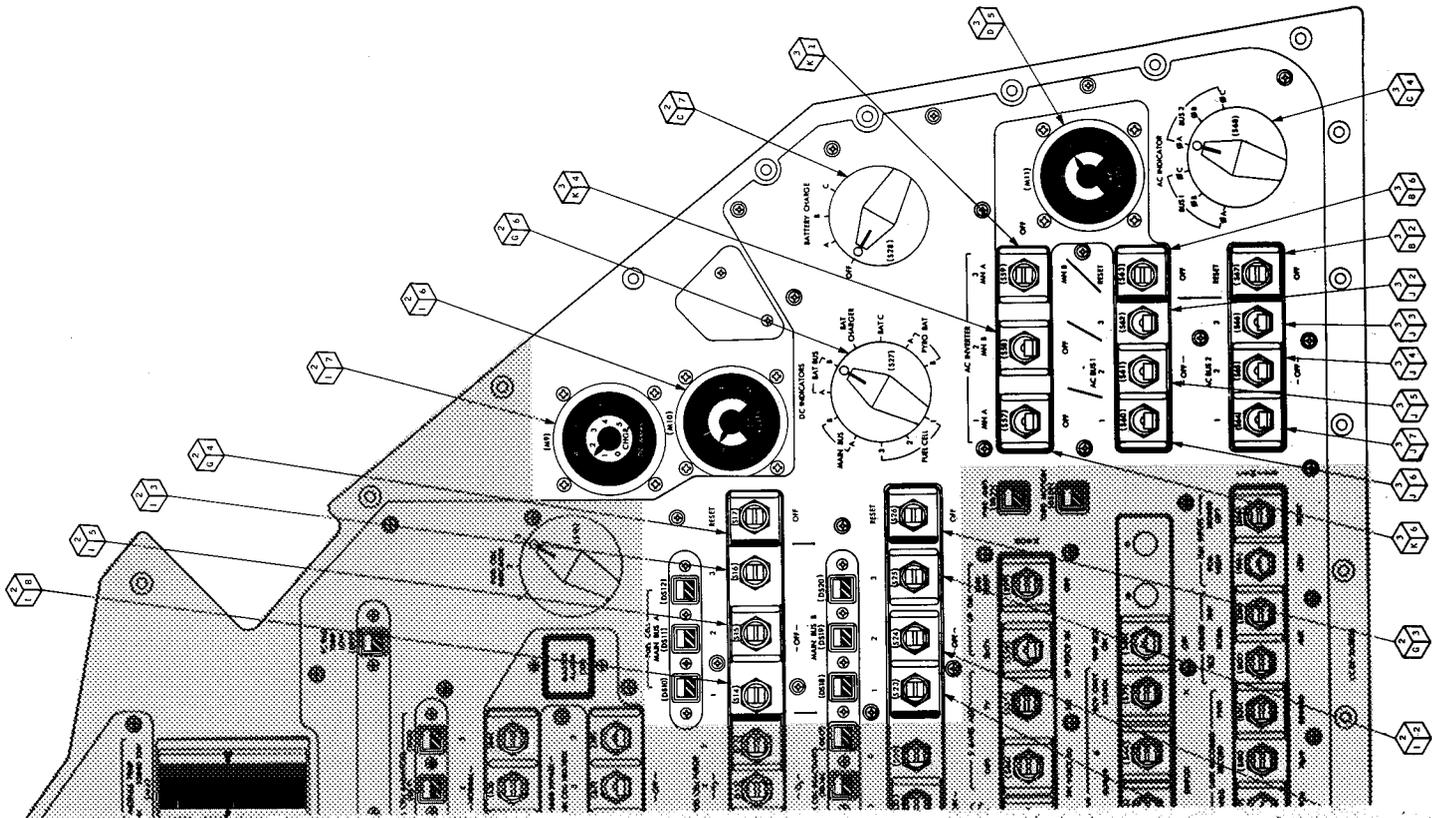
**ELECTRICAL POWER SYSTEM
 CONTROL-DISPLAY FIGURE**

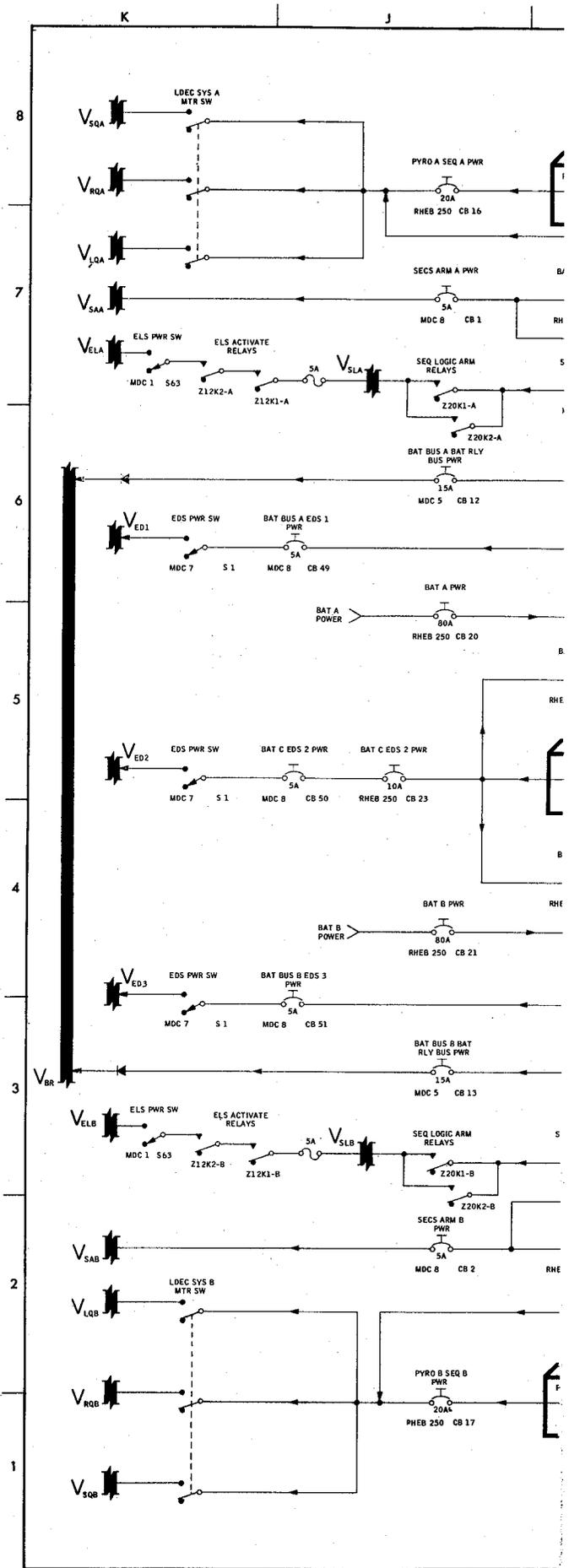
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104

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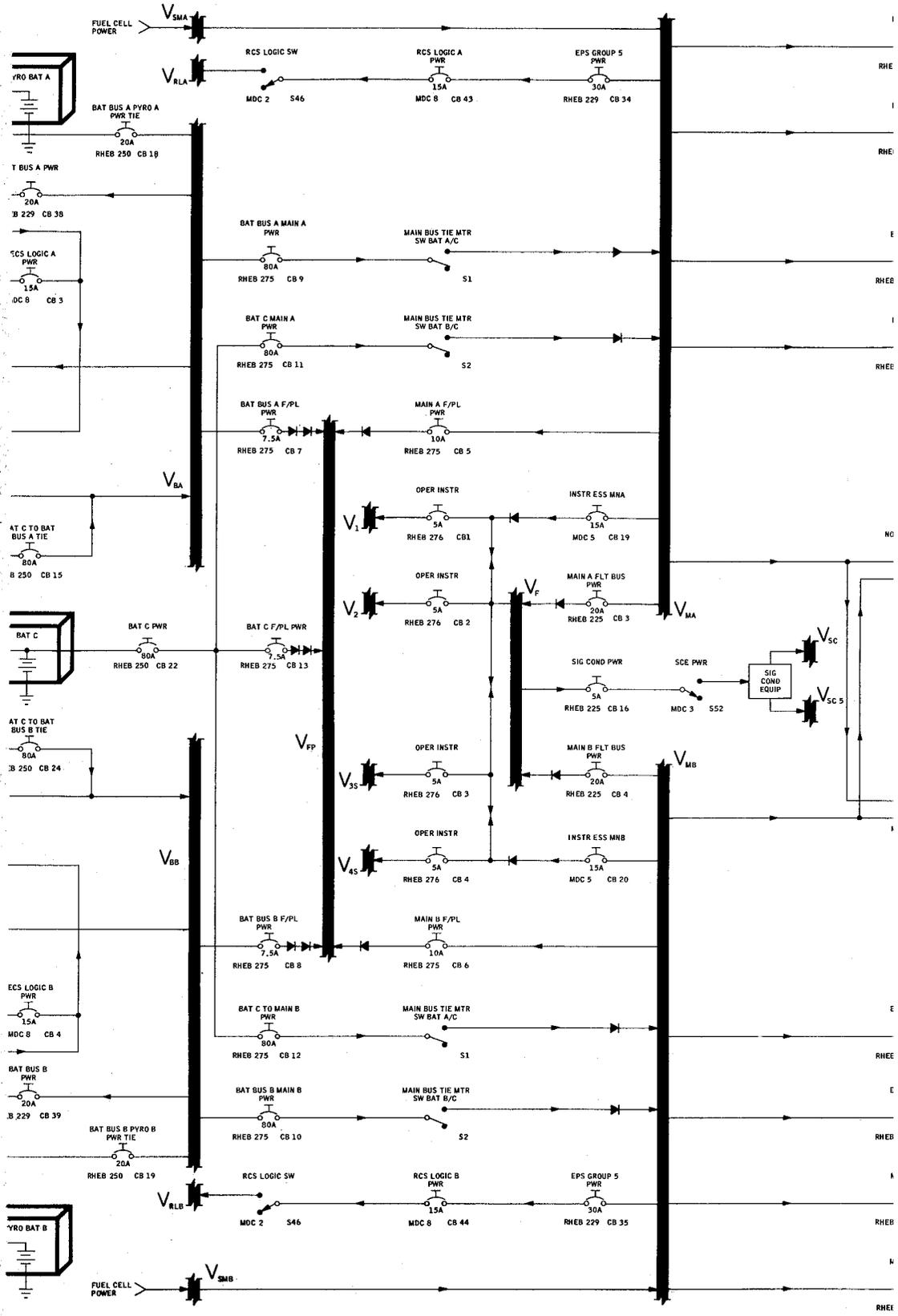






CSM ELECTRICAL BUS DISTRIBUTION

NOTE: SEE SYSTEM DRAWINGS FOR FURTHER DETAILS



E

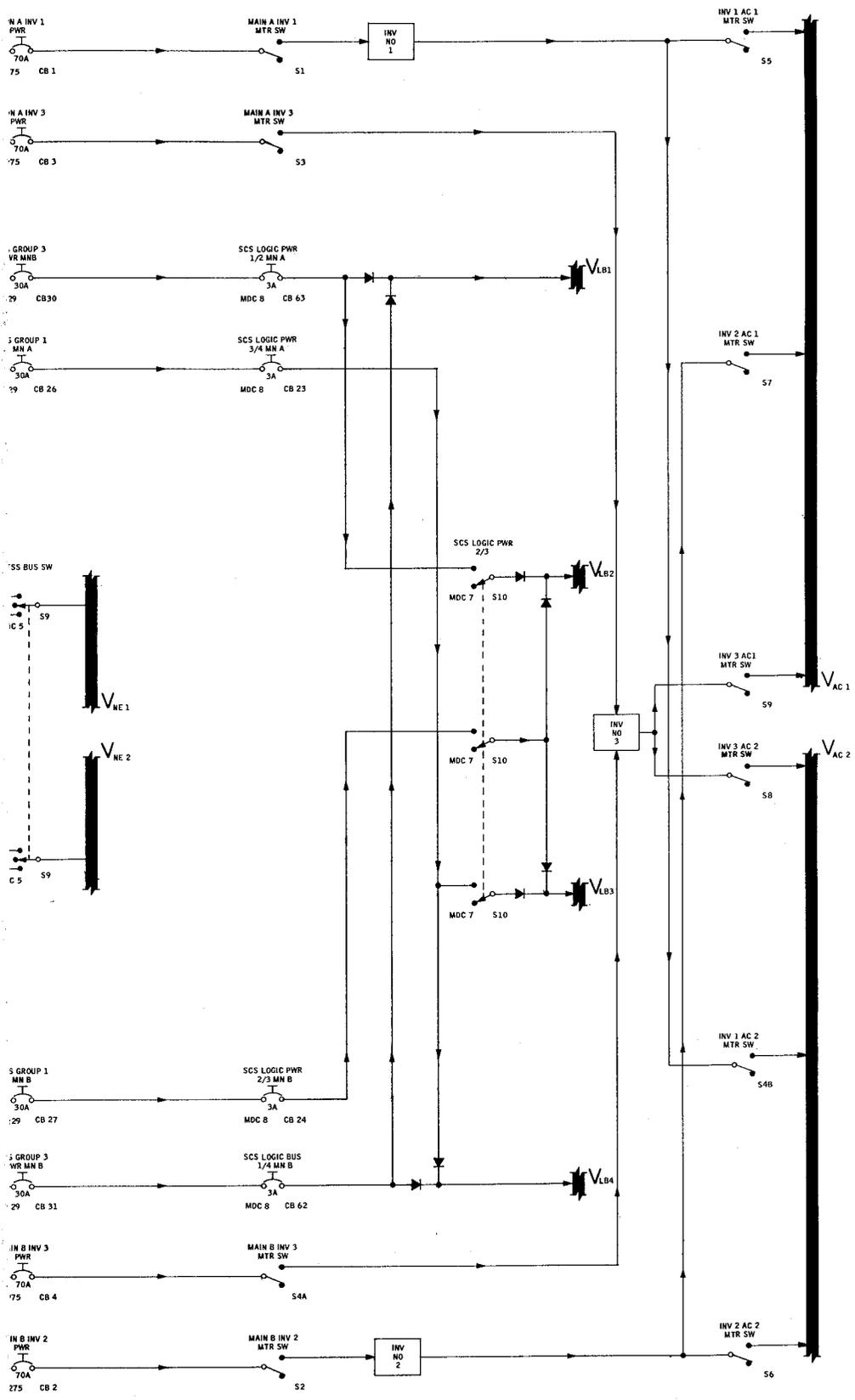
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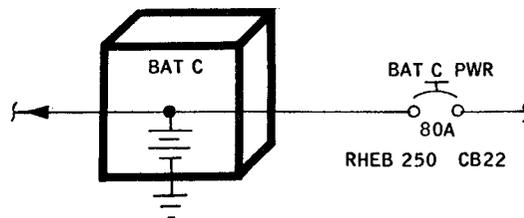
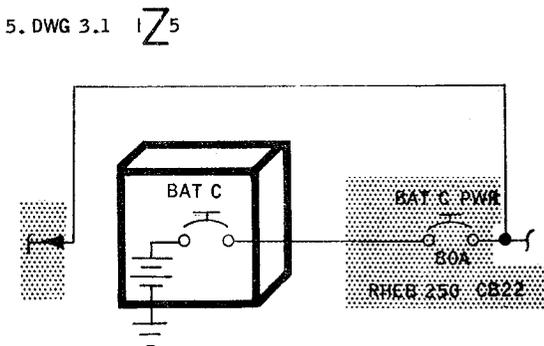
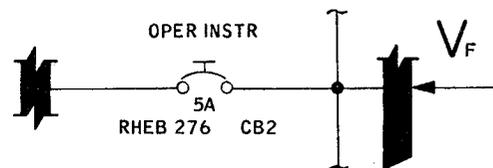
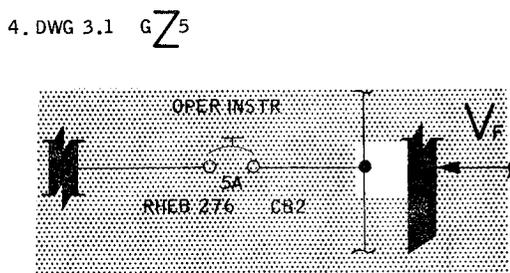
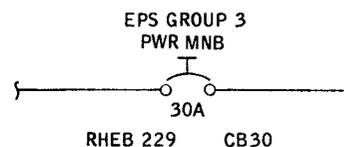
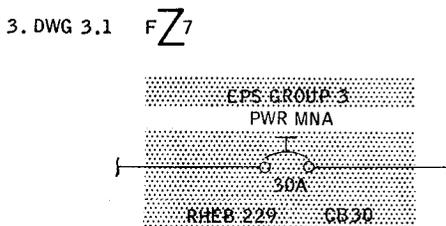
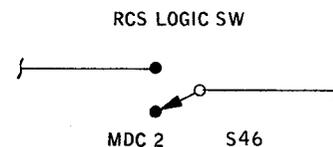
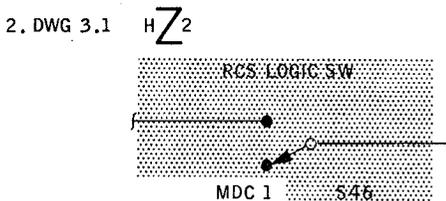
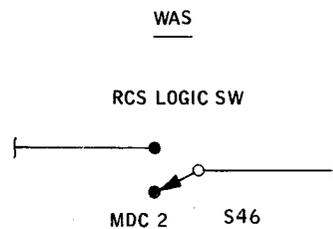
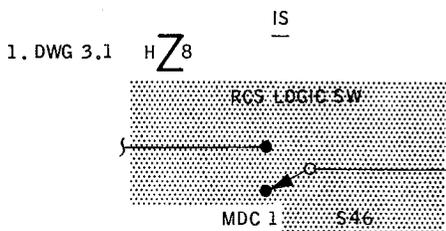
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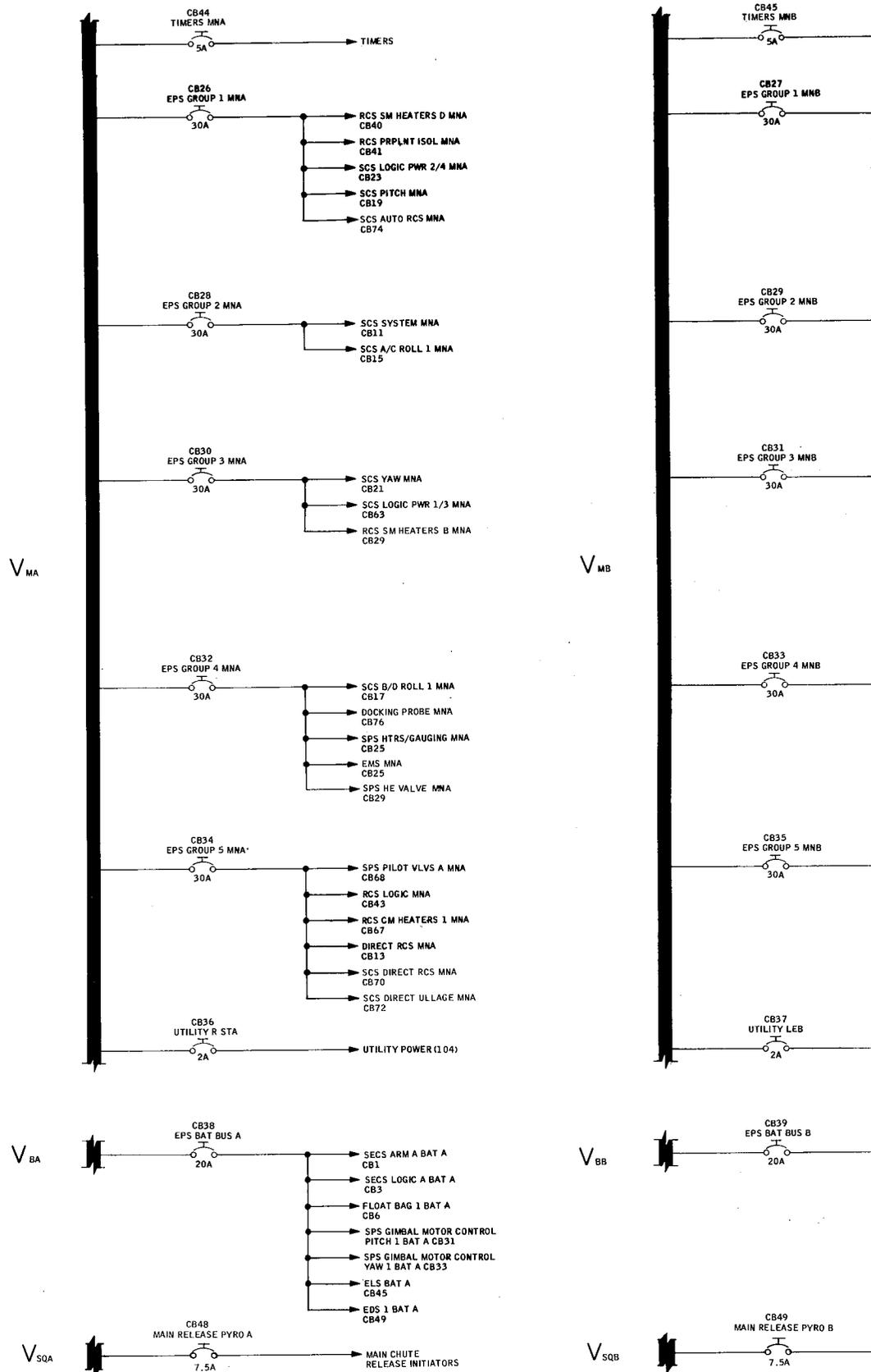
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| DR | | | | |
| DSGN | | | | |
| QC | | | | |
| ENGR | C. M. Jones | 12/10/63 | | |
| NR | | | | |
| APP | | | | |
| FEC | | | CSM | DWG NO |
| AUTH | | | 104 | 3.1 |
| | | | 35.5 X 62 | PAGE SHEET OF |

SECTION 3



RHEB-229 POWER DISTRIBUTION

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



→ TIMERS

- RCS SM HEATERS C MNB CB38
- RCS PRPLNT ISOL MNB CB42
- SCS LOGIC PWR 2/3 MNB CB24
- SCS PITCH MNB CB20
- SCS AUTO RCS MNB CB75

- SCS SYSTEM MNB CB12
- SCS A/C ROLL 2 MNB CB16

- SCS YAW MNB CB22
- SCS LOGIC PWR 1/4 MNB CB62
- ORDEAL MNB CB64
- RCS SM HEATERS A MNB CB37

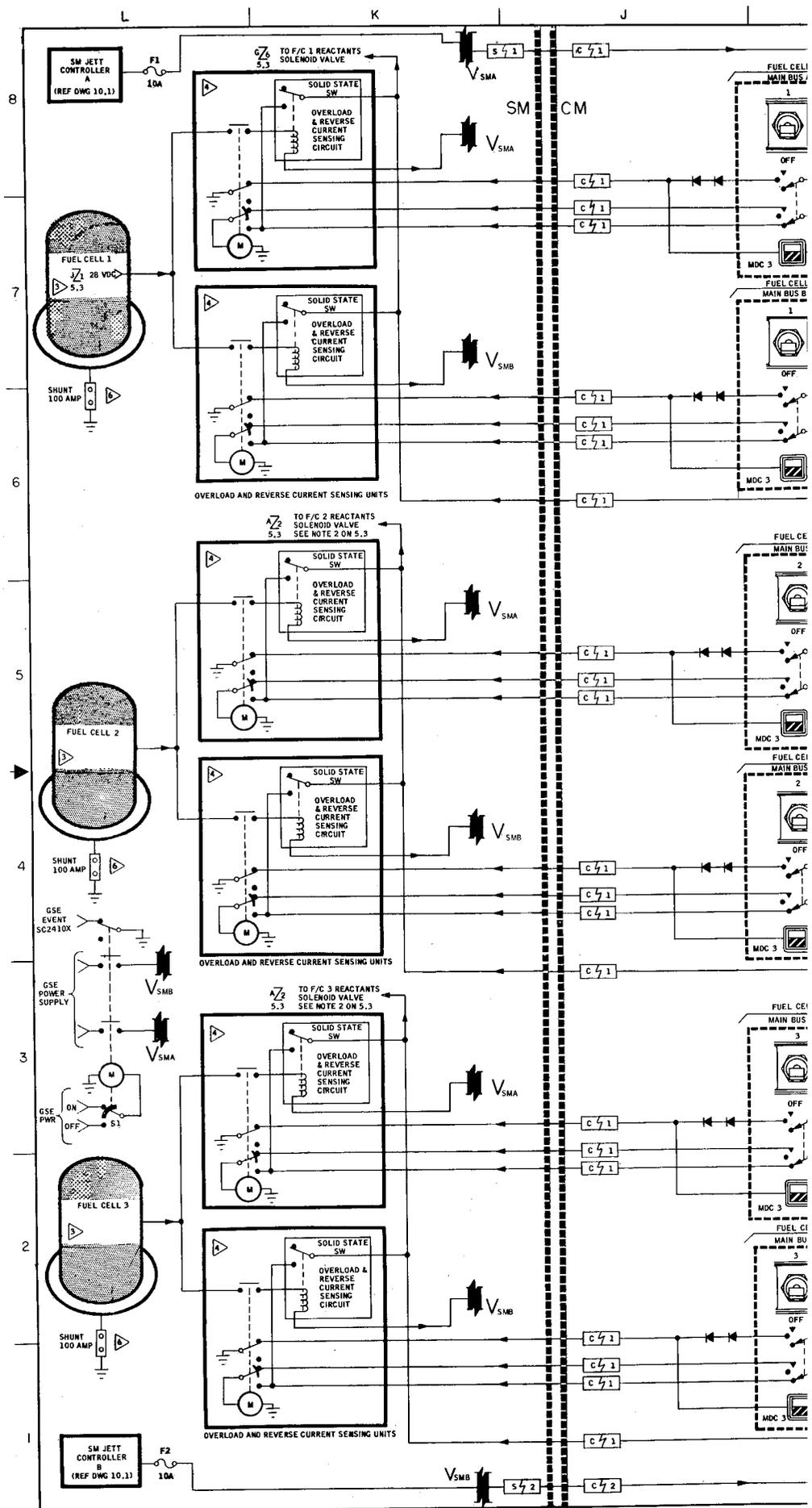
- DOCKING PROBE MNB CB77
- SCS B/D ROLL 2 MNB CB18
- SPS HTRS/GAUGING MNB CB26
- EMS MNB CB53
- SPS HE VALVE MNB CB30

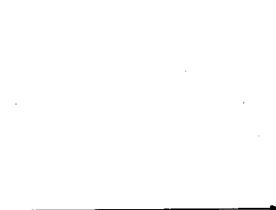
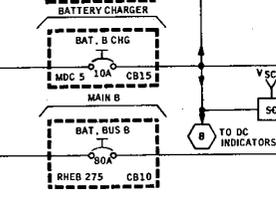
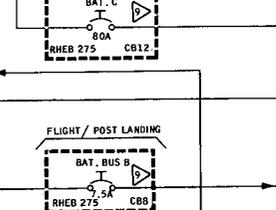
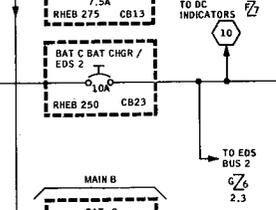
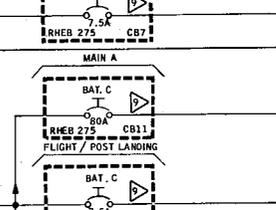
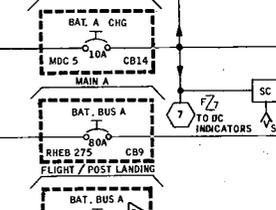
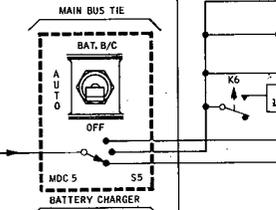
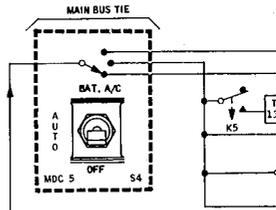
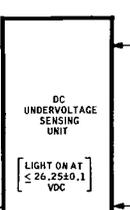
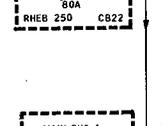
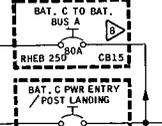
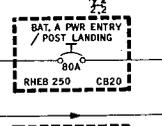
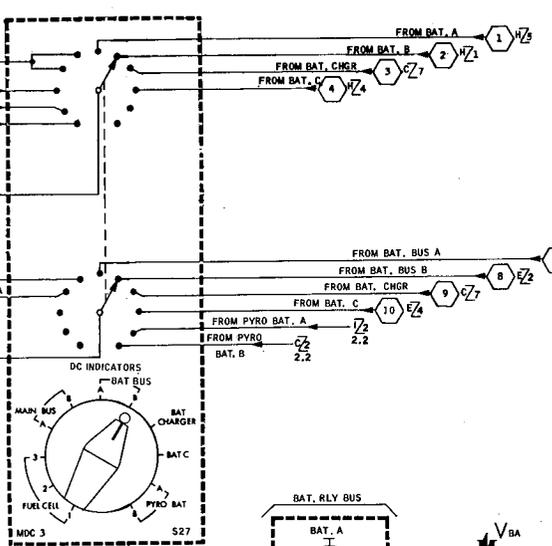
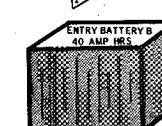
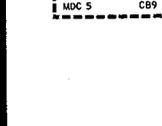
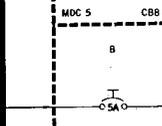
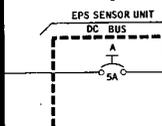
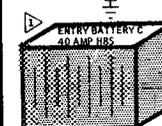
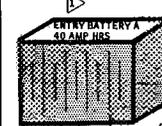
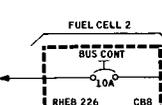
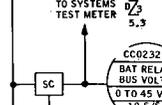
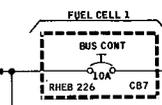
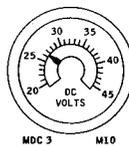
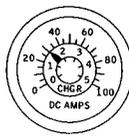
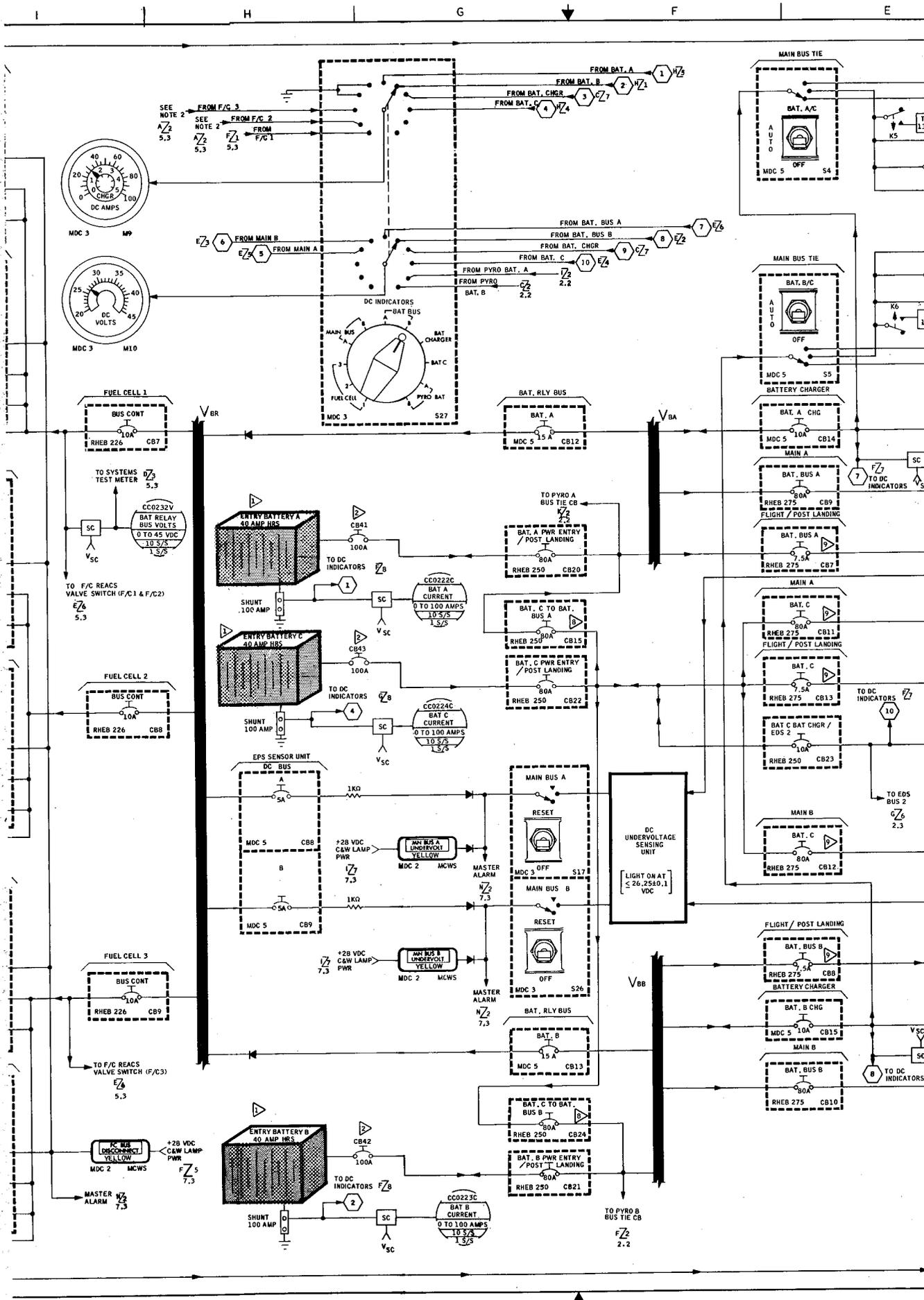
- SPS PILOT VLVS B MNB CB69
- RCS LOGIC MNB CB44
- RCS CM HEATERS 2 MNB CB66
- DIRECT RCS MNB CB14
- SCS DIRECT RCS MNB CB71
- SCS DIRECT ULLAGE MNB CB73

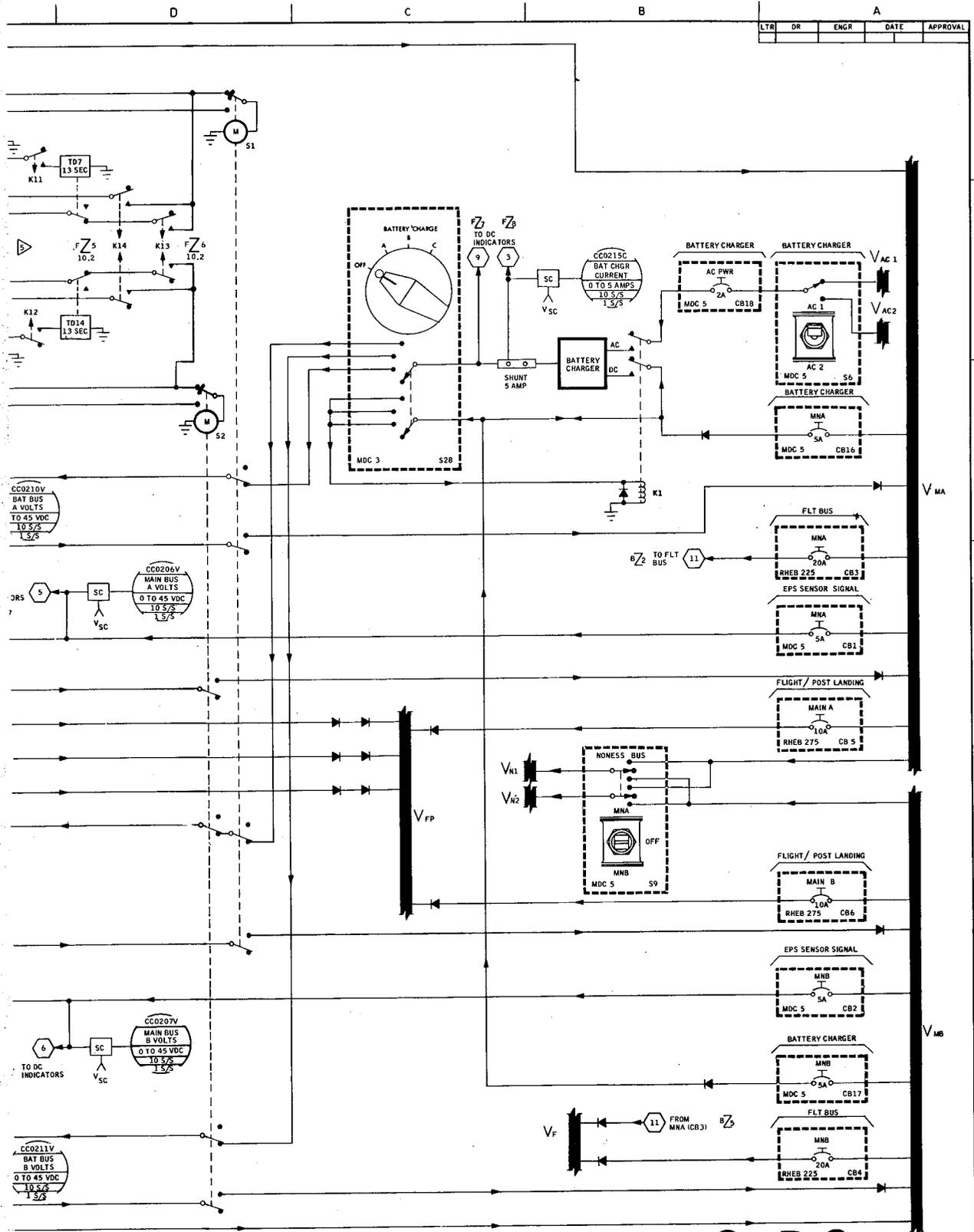
→ UTILITY POWER (104)

- SECS ARM B BAT B CB2
- SECS LOGIC B BAT B CB4
- FLOAT BAG 2 BAT B CB7
- SPS GIMBAL MOTOR CONTROL PITCH 2 BAT B CB32
- SPS GIMBAL MOTOR CONTROL YAW 2 BAT B CB34
- ELS BAT B CB46
- EDS 3 BAT B CB51

→ MAIN CHUTE RELEASE INITIATORS







NORMALLY OPEN UNLESS BATTERY MALFUNCTION
 NORMALLY OPEN UNTIL ENTRY

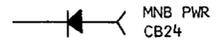
- NOTES:
- ▲ BATTERY VENT PRESS ONBOARD READOUT SHOWN ON 4.5
 - ▲ CB41, CB42 AND CB43 ARE INACCESSIBLE
 - ▲ FOR DETAILS OF FUEL CELL SEE DWG 5.3
 - ▲ FUEL CELL DISCONNECT FOR:
 - A. OVERLOAD > 7.5 AMPS
 - B. REVERSE CURRENT > 4 AMPS
 - ▲ RELAYS K5, K6, K11 AND K12 CLOSE:
 - A. 18 SEC AFTER PAD ABORT
 - B. AFTER CSM PROP JETT PURGE
 - C. AFTER HE DUMP
 - ▲ FUEL CELL CURRENT (TM & ONBOARD) SHOWN ON 5.3
 - ▲ STRIPED INDICATES FUEL CELL OFF BUS
 - ▲ WHITE (GRAY) INDICATES FUEL CELL ON BUS

2 DC

| SIGNATURES | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION |
|------------------------------|----------|---|
| DR <i>[Signature]</i> | 7-30-68 | MANNED SPACECRAFT CENTER HOUSTON, TEXAS |
| DSGN | | |
| QC <i>[Signature]</i> | 7-6-68 | |
| ENGR C.M. <i>[Signature]</i> | 12/12/68 | |
| NR <i>[Signature]</i> | 12-9-68 | |
| APP <i>[Signature]</i> | | |
| FEC | | |
| AUTH | | |
| CSM | SIZE J | DWG NO. 3.2 |
| 104 | 66 x 34 | PAGE |
| | | SHEET 1 OF 1 |

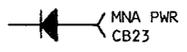
CORRECTIONS TO FIGURE 3.2, POWER DISTRIBUTION MATRIX, MAIN BUSES

| V (MAIN BUS A OR B) | RHEB | MDC | CHANGE | |
|--------------------------|------|------------------|--|---|
| V_{MA} | | MDC-5 CB32 | SECOND ITEM SHOULD READ: <u>SUIT COMP</u> <u>DIFF-PRESS SENSOR</u> <u>DIODE SHARED</u> | |
| | | CB34 | FOURTH ITEM - DELETE THE MNB, CB35 INPUT AND SHOULD READ: <u>CO₂ PARTIAL</u> <u>PRESSURE SENSOR</u> | |
| | | CB36 | FIRST ITEM ADD: SUIT HEAT EXCHANGER OUT TEMP | |
| | | CB46 | THIRD ITEM SHOULD READ: <u>SEC EVAP OUT STEAM</u> <u>PRESSURE SENSOR</u> <u>DIODE SHARED</u> | |
| | | CB50 | ADD AS A THIRD ITEM: <u>WASTE H₂O LINE STRIP HTR 1</u> <u>URINE LINE STRIP HTR 1</u> LOSS OF BOTH HTRS | |
| | | RHEB 229 CB26 | MDC-8 CB23 | FIRST ITEM SHOULD READ: <u>LOGIC POWER 2/3</u> <u>SW (S10-MDC 7)</u> LOGIC BUS 3 DIODE SHARED |
| | | CB26 | CB41 | SECOND ITEM SHOULD READ: <u>SM RCS SYS B & D</u> <u>PRPLNT ISOL SWITCHES</u> <u>S48, S50, S117, S119</u> <u>MDC 2 (PRIM AND SEC)</u> LOSS OF SM BANK B AND D RCS PROP ISOL VALVES |
| | | CB28 | CB11 | THIRD ITEM: S8 NOT S9 |
| | | CB28 | CB15 | CB15 TITLE: A/C NOT AC |
| | | CB30 | CB63 | FIRST ITEM SHOULD READ: <u>LOGIC POWER 2/3</u> <u>SW (S10-MDC 7)</u> LOGIC BUS 2 DIODE SHARED |



CORRECTIONS TO FIGURE 3.2, POWER DISTRIBUTION MATRIX, MAIN BUSES - Continued

| <u>V</u> (MAIN BUS A OR B) | <u>RHEB</u> | <u>MDC</u> | <u>CHANGE</u> | |
|-------------------------------|-------------|--------------|--|---|
| <u>V</u> MB | | <u>MDC-5</u> | | |
| | | CB35 | DELETE THE FOURTH ITEM | |
| | | CB37 | FIRST ITEM ADD: SUIT HEAT EXCHANGER OUT TEMP | |
| | | CB47 | THIRD ITEM SHOULD READ: <u>SEC EVAP OUT STEAM</u> <u>PRESSOR SENSOR</u> <u>DIODE SHARED</u> | |
| | | CB51 | FIRST ITEM SHOULD READ: <u>URINE DUMP HTR SW</u> <u>(S4 LEB 101) LOSS</u> <u>OF SYS B URINE DUMP</u> <u>HTR AND SYS B WASTE</u> <u>H₂O DUMP HTR.</u> | |
| | | CB51 | ADD FOLLOWING AS THIRD ITEM: <u>(0.14A)</u> <u>WASTE H₂O LINE STRIP HTR 2</u> <u>URINE LINE STRIP HTR 2</u> <u>LOSS OF BOTH STRIP HTRS</u> | |
| | | RHEB 229 | <u>MDC-8</u> | |
| | | CB27 | CB24 | SECOND ITEM SHOULD READ: <u>LOGIC PWR 2/3</u> <u>SW (S10-MDC 7)</u> <u>LOGIC BUSES 2 AND 3</u> <u>DIODE SHARED</u> |
| | | CB27 | CB42 | SECOND ITEM SHOULD READ: <u>SM RCS SYS A & C</u> <u>PRPLNT ISOL SWITCHES</u> <u>(S47, S49, S116, S118 - MDC 2)</u> <u>LOSS OF SM BANK A AND C</u> <u>RCS PRPLNT CONTROL VALVES</u> |
| | | CB31 | | ADD ORDEAL MNB CB64, 5 AMP (AS A NEW CB) TO READ: <u>(0.143A)</u> <u>ORDEAL</u> <u>LOSS OF ORDEAL</u> <u>USE BACKUP</u> <u>PROCEDURES</u> |
| | CB33 | CB18 | CB18 TITLE: B/D NOT BD | |

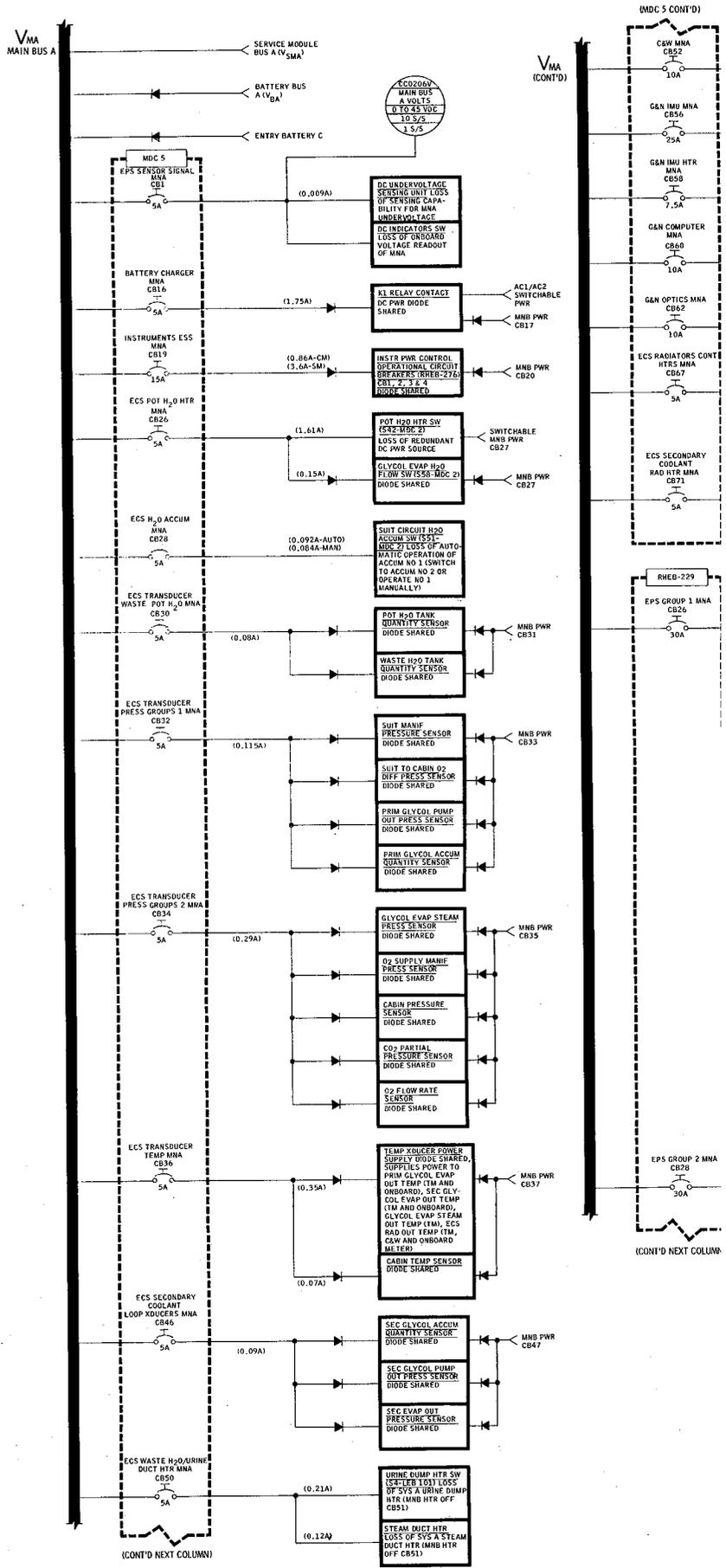


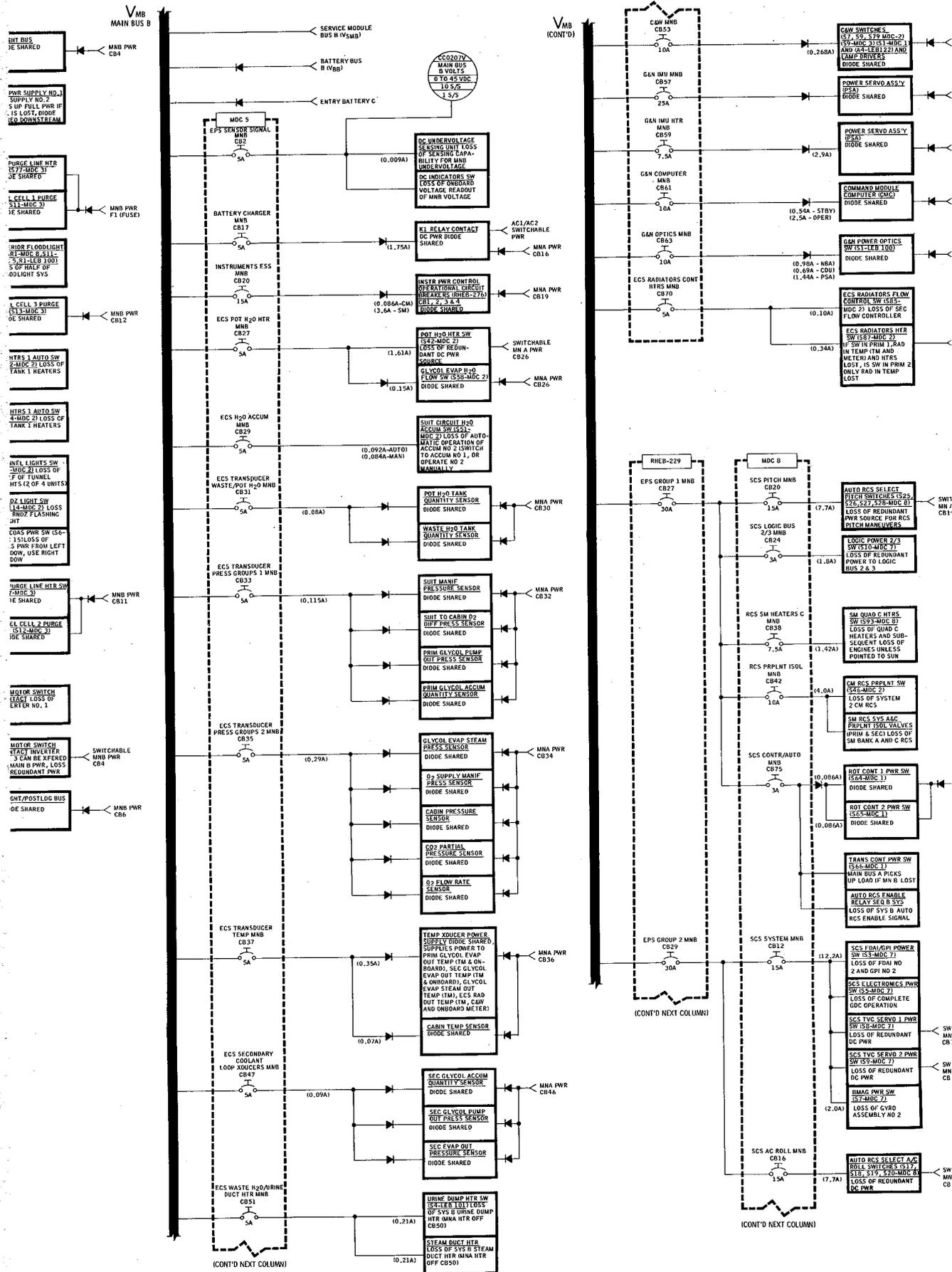
CORRECTIONS TO FIGURE 3.2, POWER DISTRIBUTION MATRIX, MAIN BUSES - Continued

| <u>V</u> (MAIN BUS A OR B) | <u>RHEB</u> | <u>MDC</u> | <u>CHANGE</u> |
|-------------------------------|------------------|---------------|---|
| <u>V</u> _{MA} | RHEB 229 CB32 | MDC-8 CB17 | CB17 TITLE: B/D NOT BD |
| | CB32 | CB25 | FIRST ITEM SHOULD READ: <u>SPS LINE HTRS A/B</u> <u>SW (S75-MDC 3) LOSS</u> OF SYS A HEATERS |
| | CB34 | CB13 | SHOULD READ: <u>ROT CONT PWR DIRECT</u> <u>1 SW (S13-MDC 1) LOSS</u> OF HALF OF DIRECT CONTROL IF SW IN A/B POSITION; ALL, IF IN A POS |
| | CB34 | CB70 | SHOULD READ: <u>ROT CONT PWR DIRECT</u> <u>2 SW (S67-MDC 1)</u> LOSS OF HALF OF DIRECT CONTROL IF SW IN A/B OR B POS |
| | CB34 | CB68 | SHOULD READ: <u>ΔV THRUST A SW (S26-MDC 1)</u> LOSS OF PRPLNT CONTROL PILOT VALVE SOLENOID A |
| | CB34 | CB72 | SHOULD READ: <u>DIRECT ULLAGE PUSH</u> <u>BUTTON (S24-MDC 1)</u> LOSS OF QUADS B4 AND D3 (OR LOSS OF A JET ULLAGE CAPABILITY). |
| | CB34 | CB43 | DELETE THIRD ITEM AND ADD FOLLOWING AS NEW THIRD ITEM: <u>CSM RCS LOGIC</u> <u>SW (S46-MDC 1)</u> LOSS OF RCS LOGIC BUS |
| | CB44 | | FIRST ITEM - DELETE DIODES AND MNB PWR CB45, THEN CORRECT TO READ: <u>MISSION TIMERS (MDC 2)</u> LOSS OF TIMER |
| <u>V</u> _{MB} | | MDC-5 CB33 | SECOND ITEM SHOULD READ: <u>SUIT COMP</u> <u>DIFF-PRESS SENSOR</u> DIODE SHARED |

CORRECTIONS TO FIGURE 3.2, POWER DISTRIBUTION MATRIX, MAIN BUSES - Concluded

| <u>V</u> (MAIN BUS A OR B) | <u>RHEB</u> | <u>MDC</u> | <u>CHANGE</u> |
|-------------------------------|-------------|---|--|
| <u>V</u> MB | RHEB 229 | MDC-8 | |
| | CB33 | CB26 | FIRST ITEM SHOULD READ: <u>SPS LINE HTRS A/B</u> <u>SW (S75-MDC 3)</u> LOSS OF SYS B HEATERS |
| | CB35 | CB14 | SHOULD READ: <u>ROT CONT PWR DIRECT</u> <u>1 SW (S13-MDC 1)</u> LOSS OF HALF OF DIRECT CONTROL IF SW IS IN A/B OR A POSITION |
| | CB35 | CB70 | CORRECT CB NUMBERED CB70 TO CB71, WHICH SHOULD NOW READ AS FOLLOWS: <u>ROT CONT PWR DIRECT</u> <u>2 SW (S67-MDC 1)</u> LOSS OF HALF OF DIRECT CONTROL IF SW IN A/B POSITION; ALL, IF IN B POS. |
| | CB35 | CB69 | SHOULD READ: <u>AV THRUST B SW</u> <u>(S59-MDC 1)</u> LOSS OF PILOT VALVE SOLENOID B |
| | RHEB 229 | MDC-8 | |
| | CB35 | CB73 | SHOULD READ: <u>DIRECT ULLAGE PUSH</u> <u>BUTTON (S24-MDC 1)</u> LOSS OF QUADS A4 AND C3 OR LOSS OF 4 JET ULLAGE CAPABILITY. |
| | CB35 | CB67 | CORRECT CB NUMBERED CB67 TO CB66 |
| | CB35 | CB44 | DELETE THIRD ITEM AND SUBSTITUTE THE FOLLOWING: <u>CM RCS LOGIC</u> <u>SW (S46-MDC 1)</u> LOSS OF RCS LOGIC BUS |
| | CB37 | | ADD AS A SECOND ITEM: <u>UTILITY POWER SW</u> <u>(S6-MDC 16)</u> SIDE HATCH AUX DUMP HTR |
| | CB64 | DELETE THIS BREAKER, WHICH WAS MOVED TO TIE IN WITH RHEB 229, CB31 | |

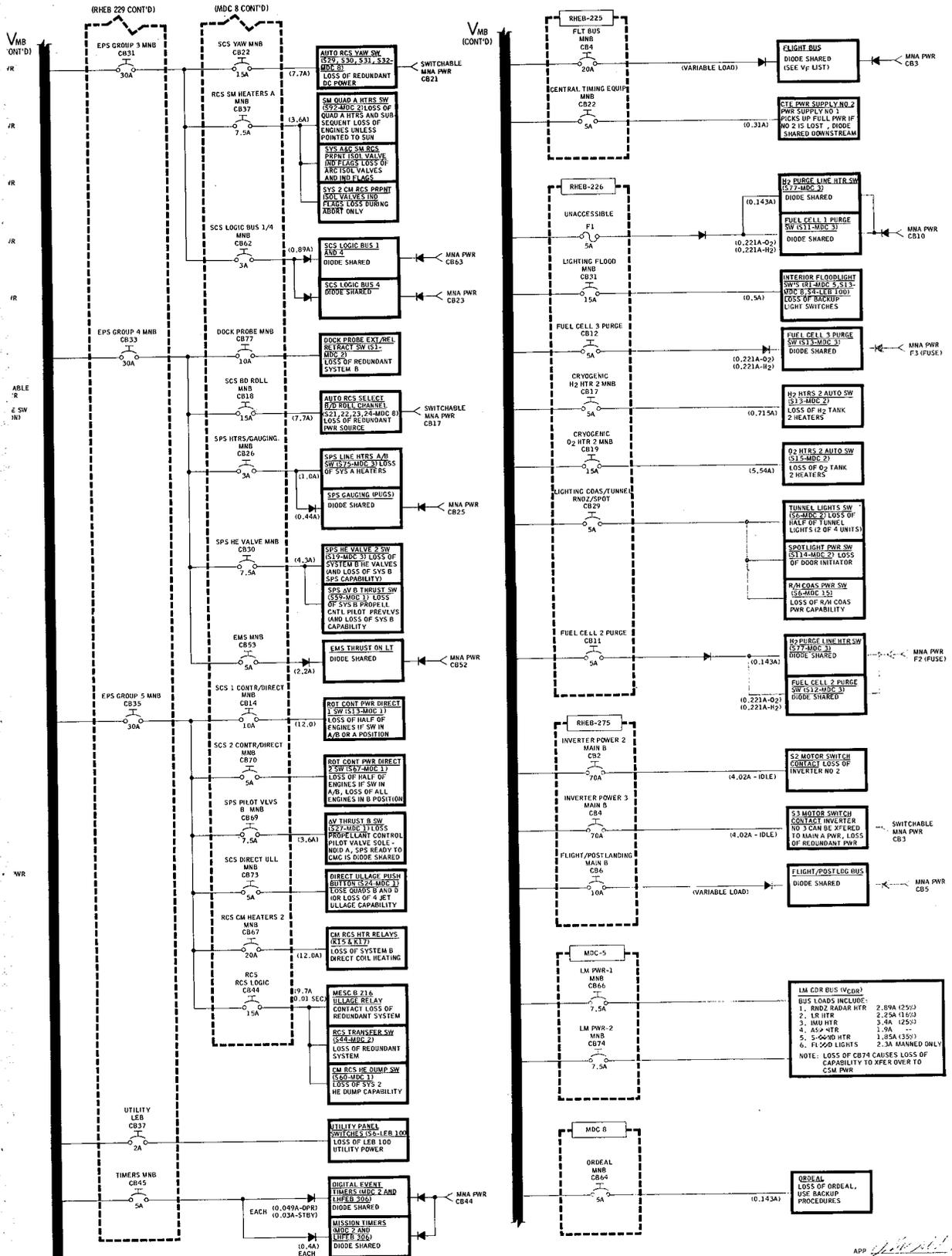




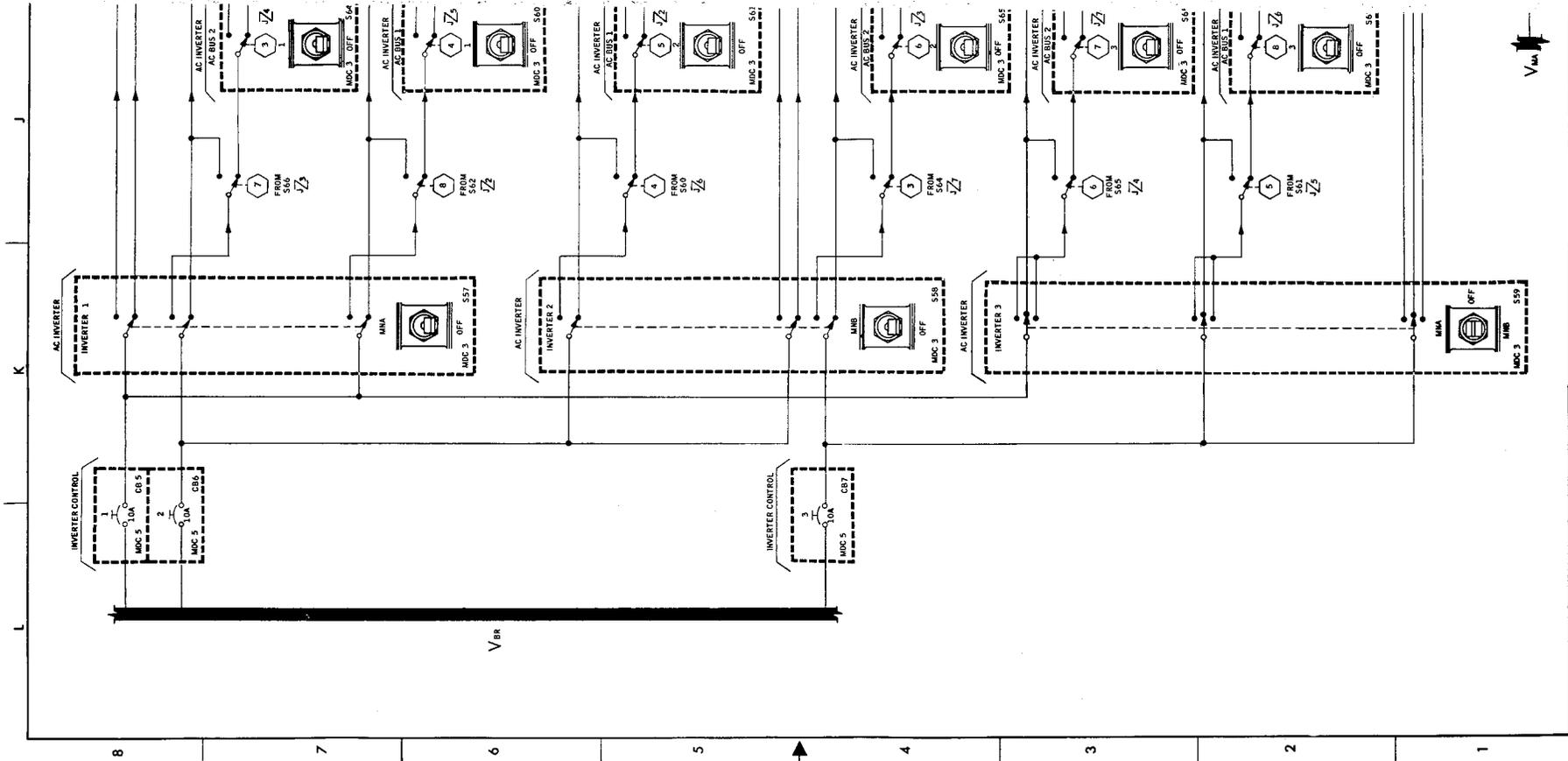
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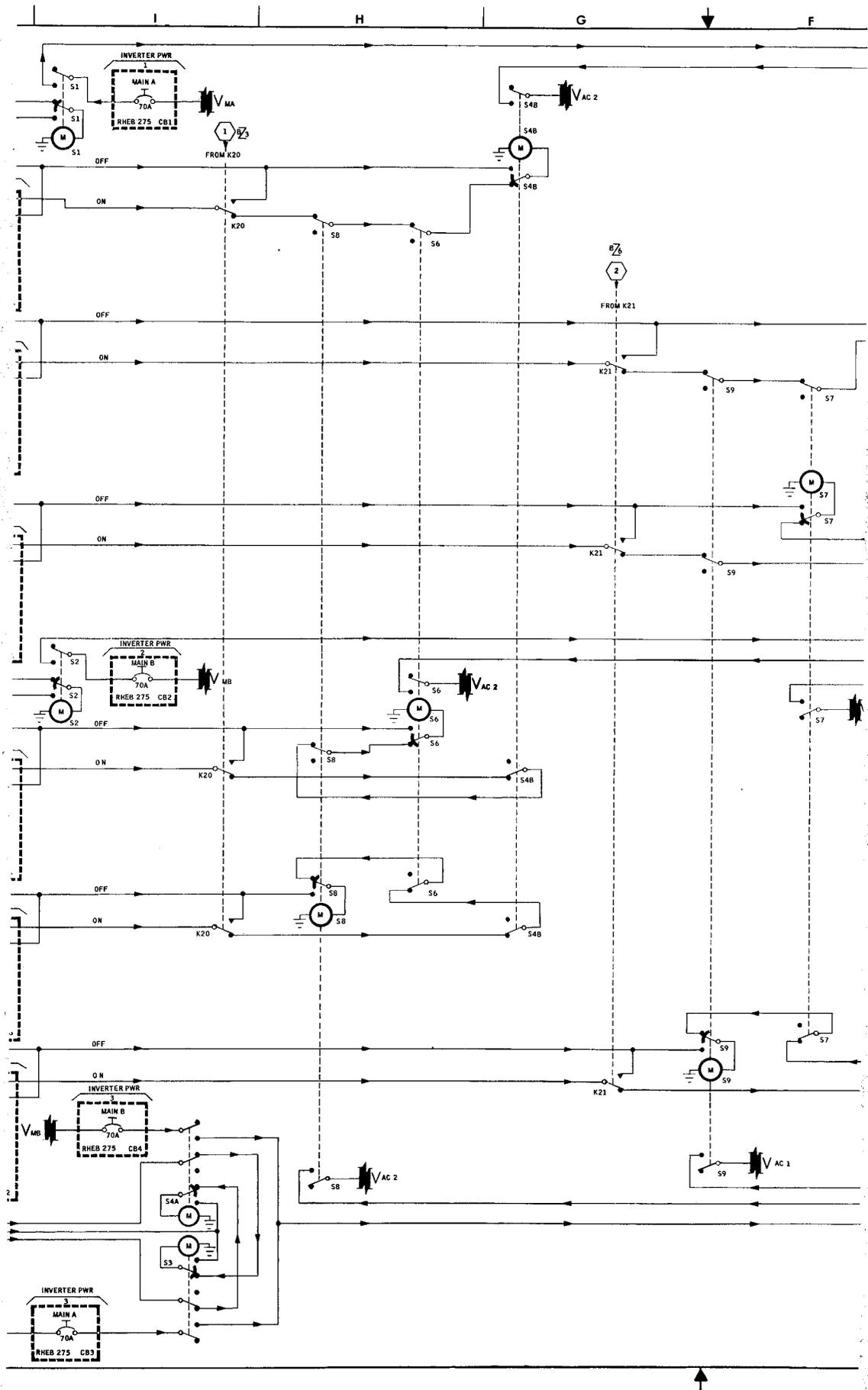
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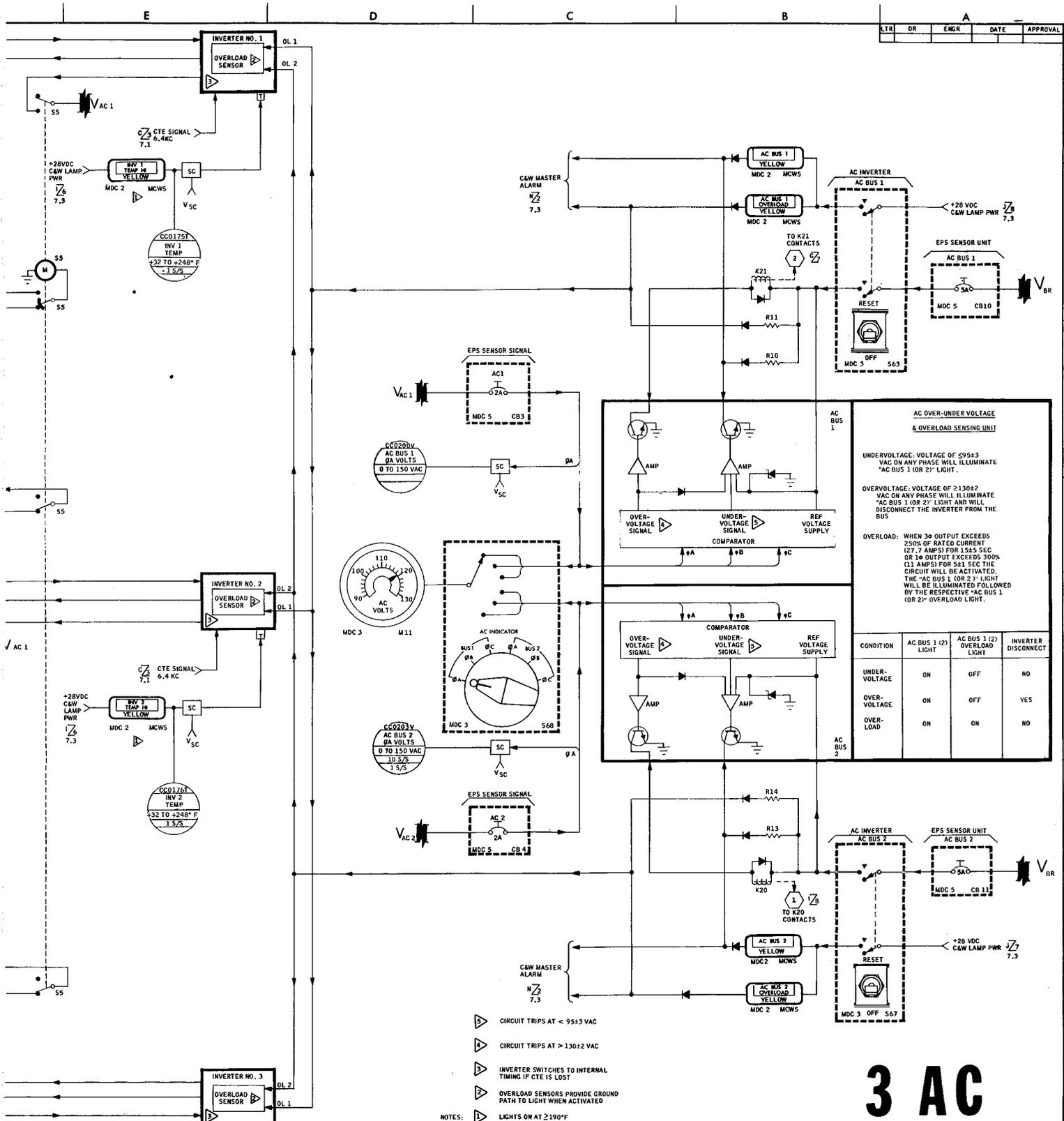
(CONT'D NEXT COLUMN)



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 ENG: [Signature]







| TR | OR | ENGR | DATE | APPROVAL |
|----|----|------|------|----------|
|----|----|------|------|----------|

AC OVER-UNDER VOLTAGE & OVERLOAD SENSING UNIT

UNDERVOLTAGE: VOLTAGE OF $\geq 95\pm 3$ VAC ON ANY PHASE WILL ILLUMINATE "AC BUS 1 (OR 2)" LIGHT.

OVERVOLTAGE: VOLTAGE OF $\geq 130\pm 2$ VAC ON ANY PHASE WILL ILLUMINATE "AC BUS 1 (OR 2)" LIGHT AND WILL DISCONNECT THE INVERTER FROM THE BUS.

OVERLOAD: WHEN 3 ϕ OUTPUT EXCEEDS 250% OF RATED CURRENT (27.7 AMPS FOR 1.5 \pm SEC OR 1 ϕ OUTPUT EXCEEDS 300% (11 AMPS) FOR 5 \pm SEC THE CIRCUIT WILL BE ACTIVATED. THE "AC BUS 1 (OR 2)" LIGHT WILL BE ILLUMINATED FOLLOWED BY THE RESPECTIVE "AC BUS 1 (OR 2)" OVERLOAD LIGHT.

| CONDITION | AC BUS 1 (2) LIGHT | AC BUS 1 (2) OVERLOAD LIGHT | INVERTER DISCONNECT |
|---------------|--------------------|-----------------------------|---------------------|
| UNDER-VOLTAGE | ON | OFF | NO |
| OVER-VOLTAGE | ON | OFF | YES |
| OVER-LOAD | ON | ON | NO |

- ▷ CIRCUIT TRIPS AT $< 95\pm 3$ VAC
 - ▷ CIRCUIT TRIPS AT $> 130\pm 2$ VAC
 - ▷ INVERTER SWITCHES TO INTERNAL TIMING IF CTE IS LOST
 - ▷ OVERLOAD SENSORS PROVIDE ROUND PATH TO LIGHT WHEN ACTIVATED
- NOTES: ▷ LIGHTS ON AT $\geq 190^\circ\text{F}$

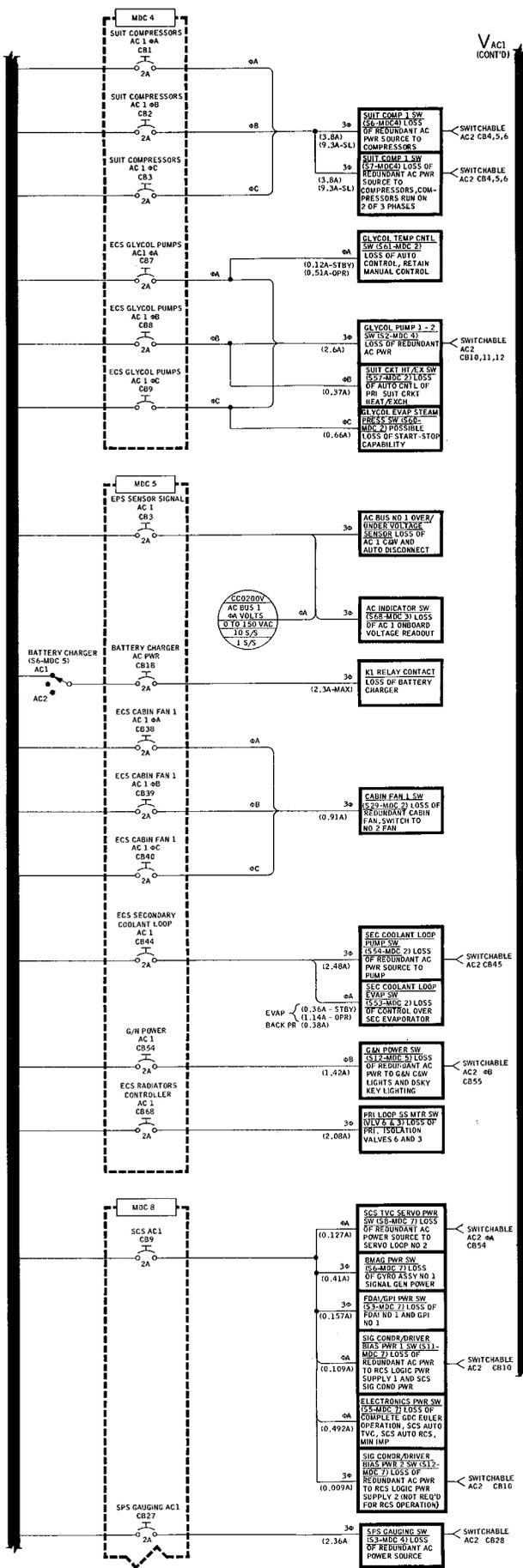
3 AC

| | | | |
|--------------------------------|--|---------|--|
| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION |
| DR. <i>[Signature]</i> | | 7-30-71 | MANNED SPACECRAFT CENTER - HOUSTON, TEXAS |
| DSM | | | ELECTRICAL ALTERNATING CURRENT DISTRIBUTION & CONTROL SYS |
| QC <i>[Signature]</i> | | 8-1-72 | |
| ENGR. C. M. <i>[Signature]</i> | | 12-2-73 | |
| MR. <i>[Signature]</i> | | 12-2-73 | |
| APP. <i>[Signature]</i> | | 12-2-73 | |
| FEC | | CSM | SIZE DWG NO |
| AUTH | | 104 | J 33 |
| | | 66 X 34 | PAGE SHEET OF |

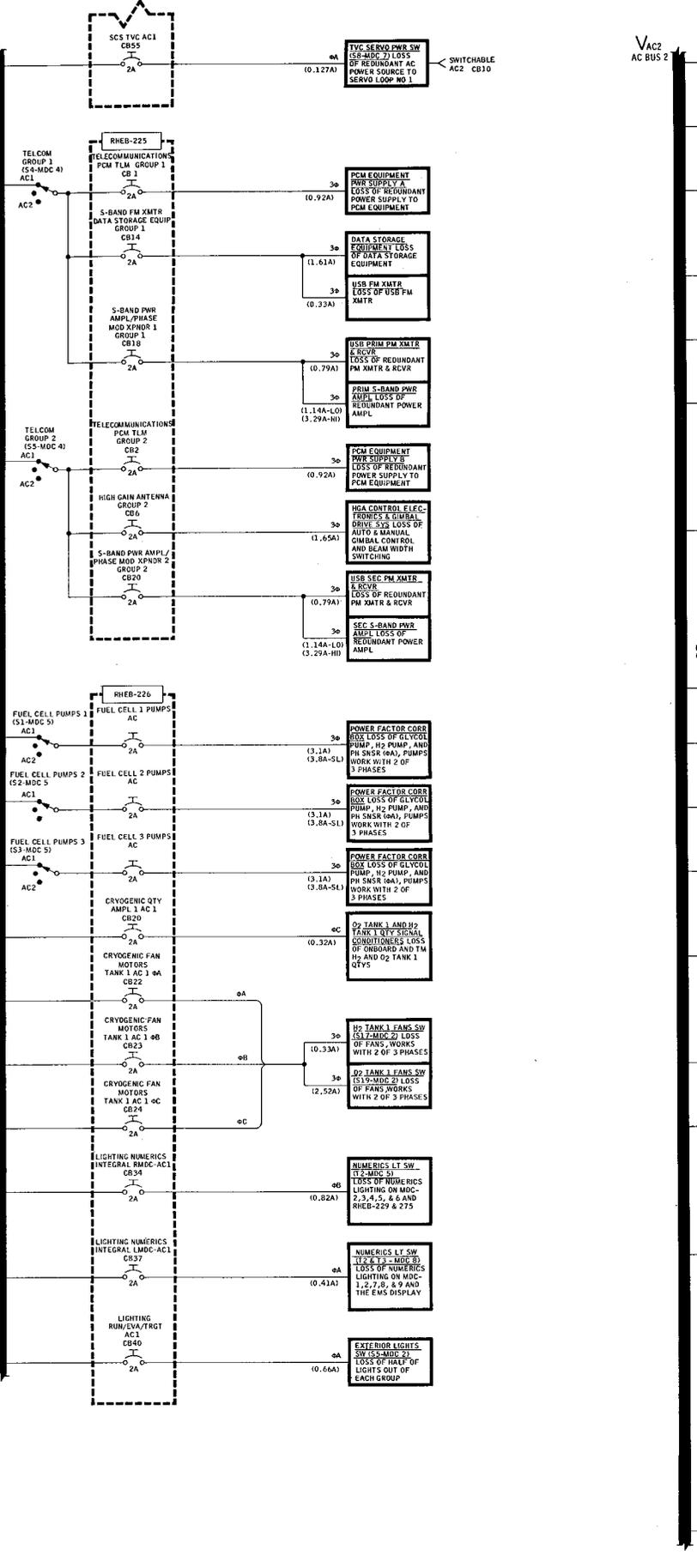
V AC1
AC BUS 1

V AC1
(CONT'D)

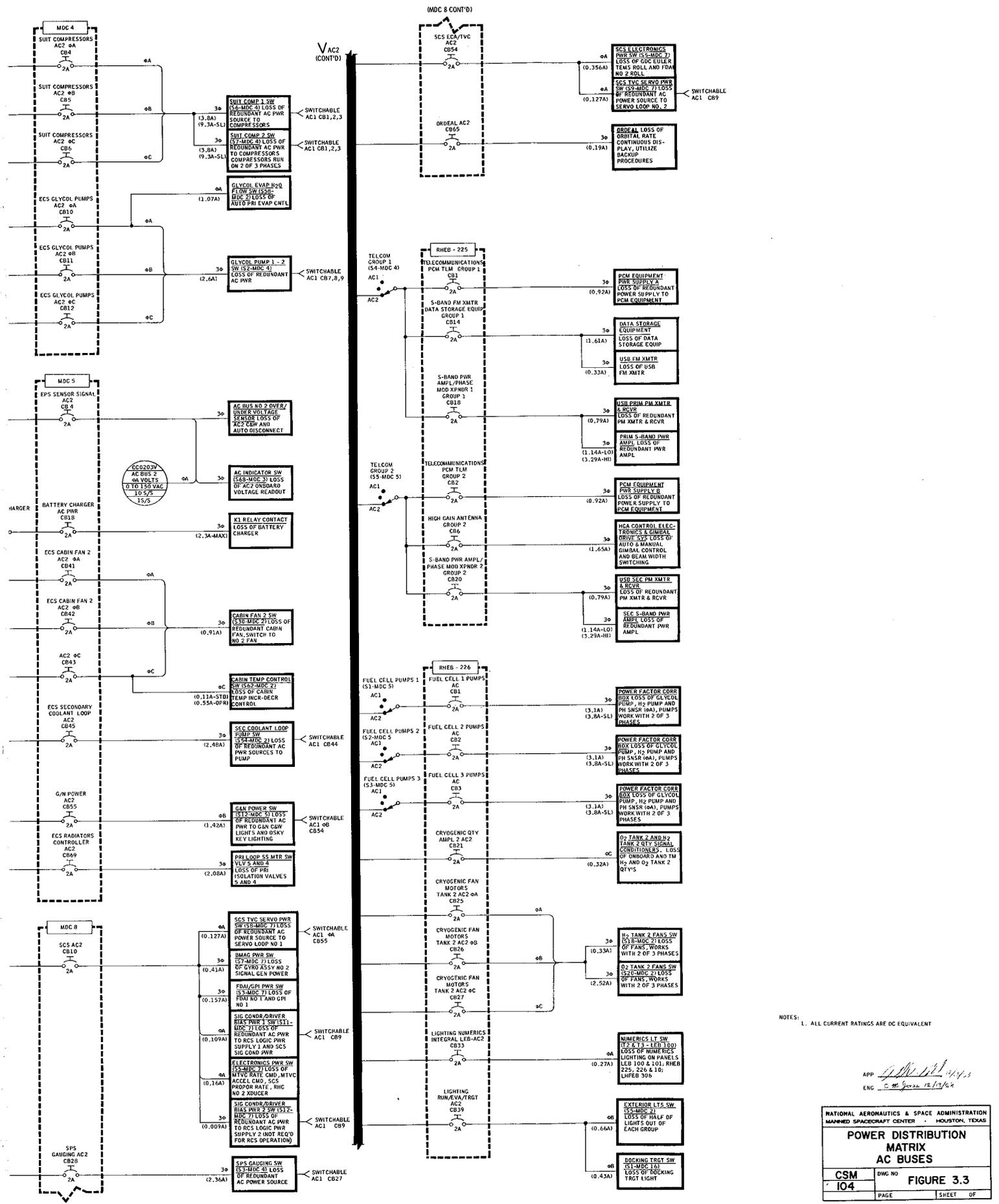
V AC2
AC BUS 2



(MDC 8 CONT'D)



BA 15C



NOTES: 1. ALL CURRENT RATINGS ARE DC EQUIVALENT

APP: *[Signature]*
 ENG: *[Signature]* 12/13/02

NATIONAL AERONAUTICS & SPACE ADMINISTRATION
 MANNED SPACECRAFT CENTER - HOUSTON, TEXAS

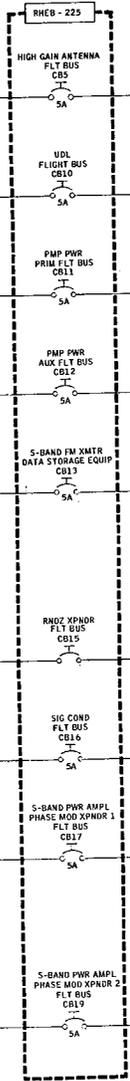
POWER DISTRIBUTION MATRIX AC BUSES

| | |
|------------|----------------------|
| CSM 104 | DWG NO FIGURE 3.3 |
| PAGE | SHEET OF |

V_F
FLIGHT BUS

MAIN BUS A
POWER (CB3-RHEB 225)

MAIN BUS B
POWER (CB4-RHEB 225)



(0.59A) HIGH GAIN ANTENNA POWER SW (S2-MDC 2)
LOSS OF HIGH GAIN ANTENNA TRACKING AND MANUAL POSITION CNTL ANTENNA WILL OPERATE IN WIDE BEAM XMT/RCV

(0.5A) UP TLM CMD RESET SW (S3-MDC 3)
LOSS OF UPDATA LINK EQUIPMENT AND CMD RESET CAPABILITY

(0.32A) POWER PMP SW (S5-MDC 3)
LOSS OF PMP PRIMARY PWR SUPPLY AND DSE DUMP CAPABILITY (SEC PWR SUPPLY AVAILABLE)

(0.32A) POWER PMP SW (S5-MDC 3)
LOSS OF PMP SEC PWR SUPPLY (PRIMARY PWR SUPPLY AVAILABLE)

(TV 0.24A) S-BAND AUX SW (S3-MDC 3)
LOSS OF FM XMTDR ON/OFF CONTROL, LOSS OF TV

(0.21A) DATA STORAGE EQUIP
DSE LOST

(2.47A OPERATE) RNOZ XPNDR POWER SW (S1-LEB 100)
LOSS OF RNOZ RADAR XPNDR

(1.25A MAX) SEC POWER SW (S22-MDC 3)
LOSS OF SIGNAL CONDITIONING EQUIPMENT

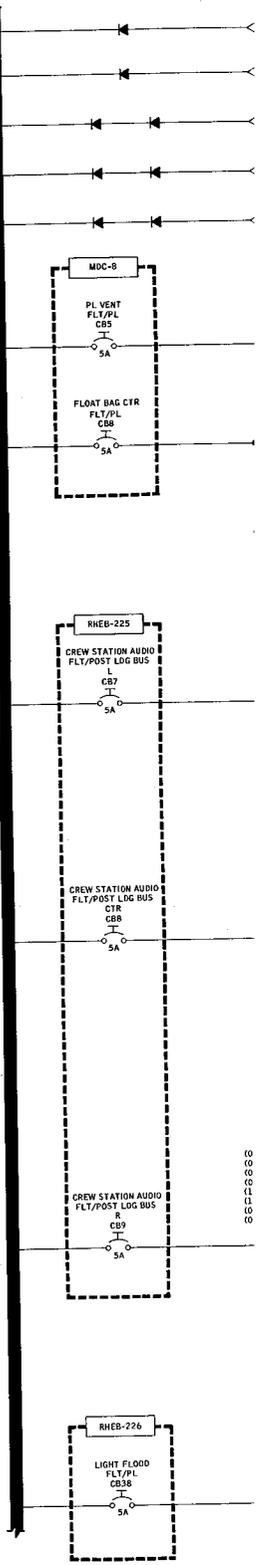
(0.74A) S-BAND NORMAL XPNDR SW (S29-MDC 3)
LOSS OF PRIM PM XPNDR ON CNTL & SEC PM XPNDR OFF CNTL AND LOSS OF OMNI ANT SELECTION IN SEC XPNDR SW POSITION

(0.18A-H/L0) S-BAND PWR AMPL EQUIP MODE CNTL ELECTRONICS, DIODE SHARED

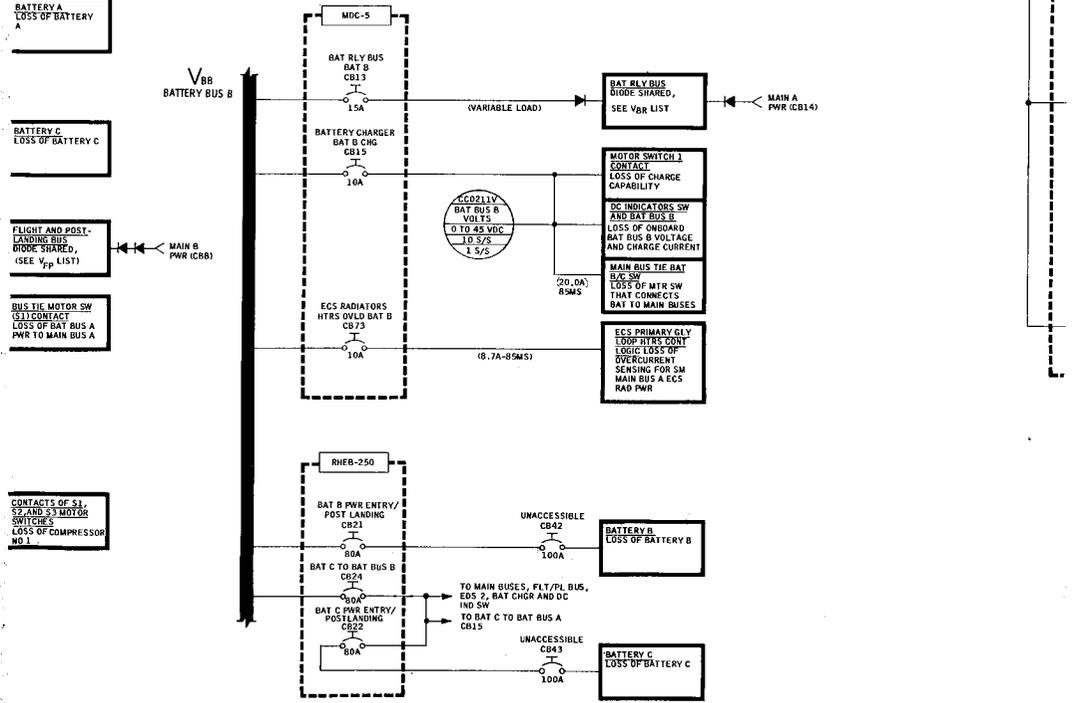
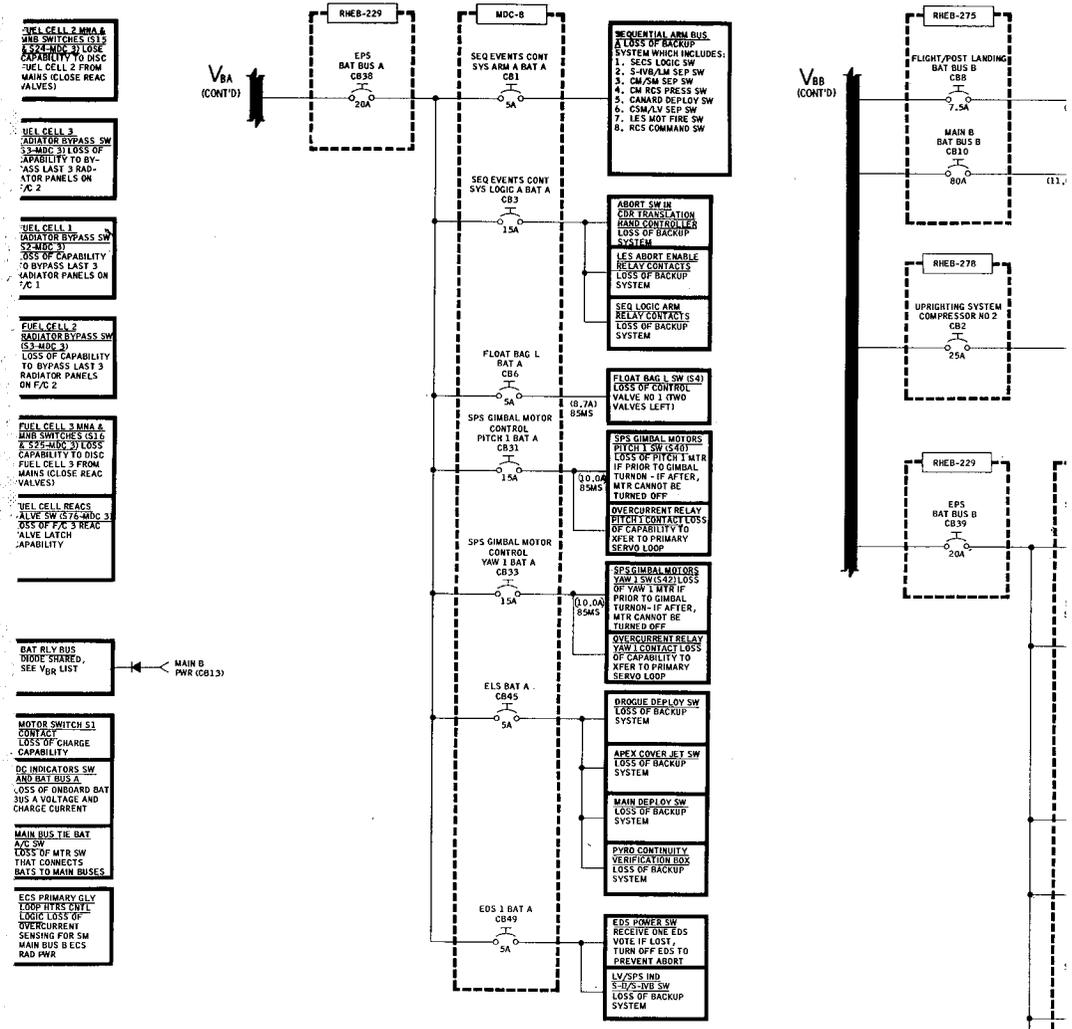
(0.74A) S-BAND NORMAL XPNDR SW (S29-MDC 3)
LOSS OF SEC PM XPNDR ON CNTL & PRIM PM XPNDR OFF CNTL & LOSS OF OMNI ANT SELECTION IN PRIM XPNDR SW POSITION

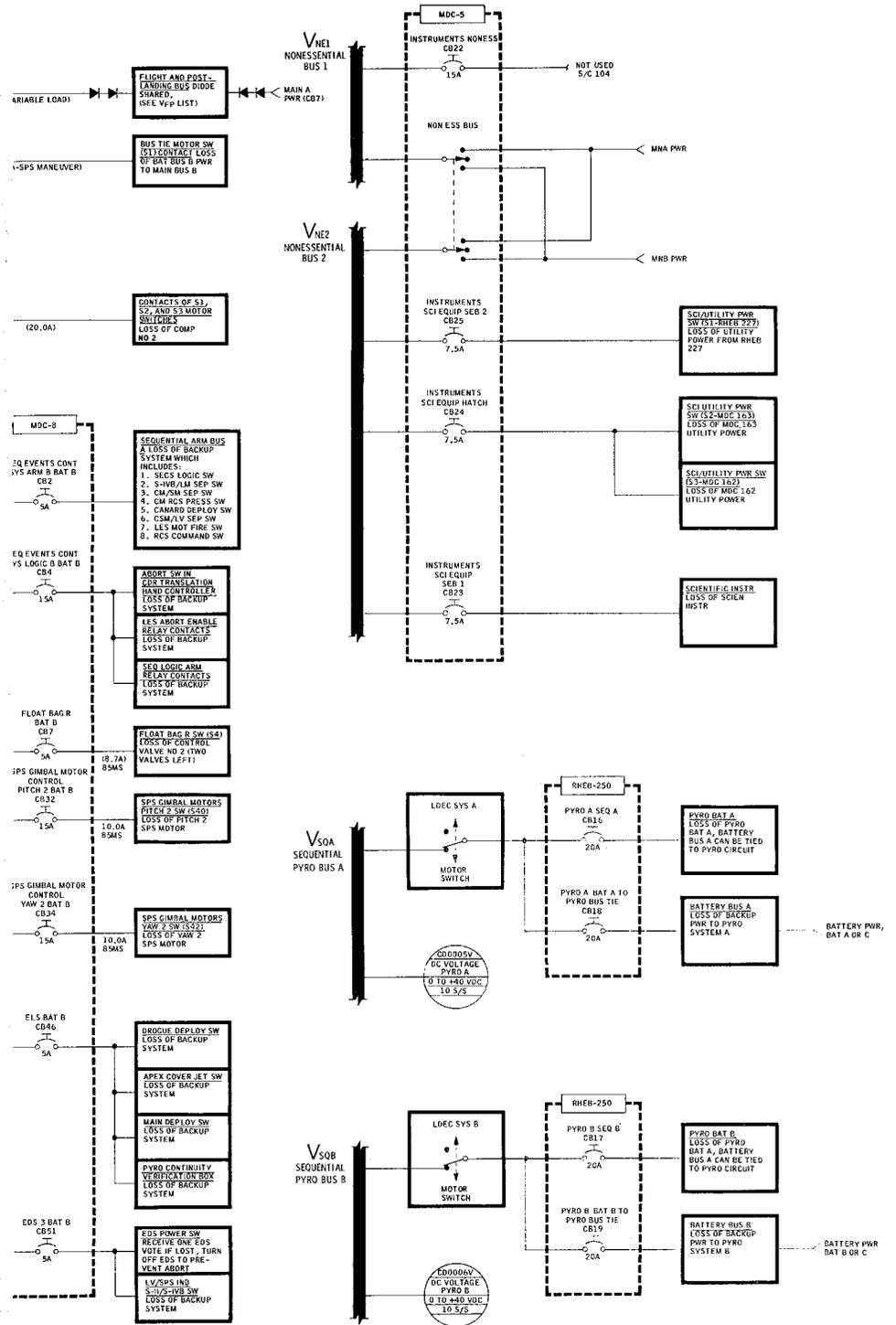
(0.18A-H/L0) S-BAND PWR AMPL EQUIP MODE CNTL ELECTRONICS, DIODE SHARED

V_F
FLIGHT/POST LANDING BUS



10
10
10
10
10





APP *[Signature]*
 ENG *[Signature]*

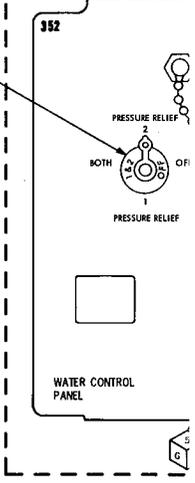
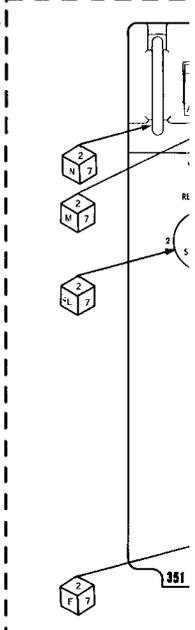
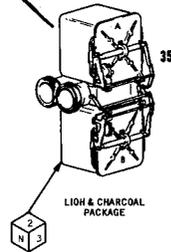
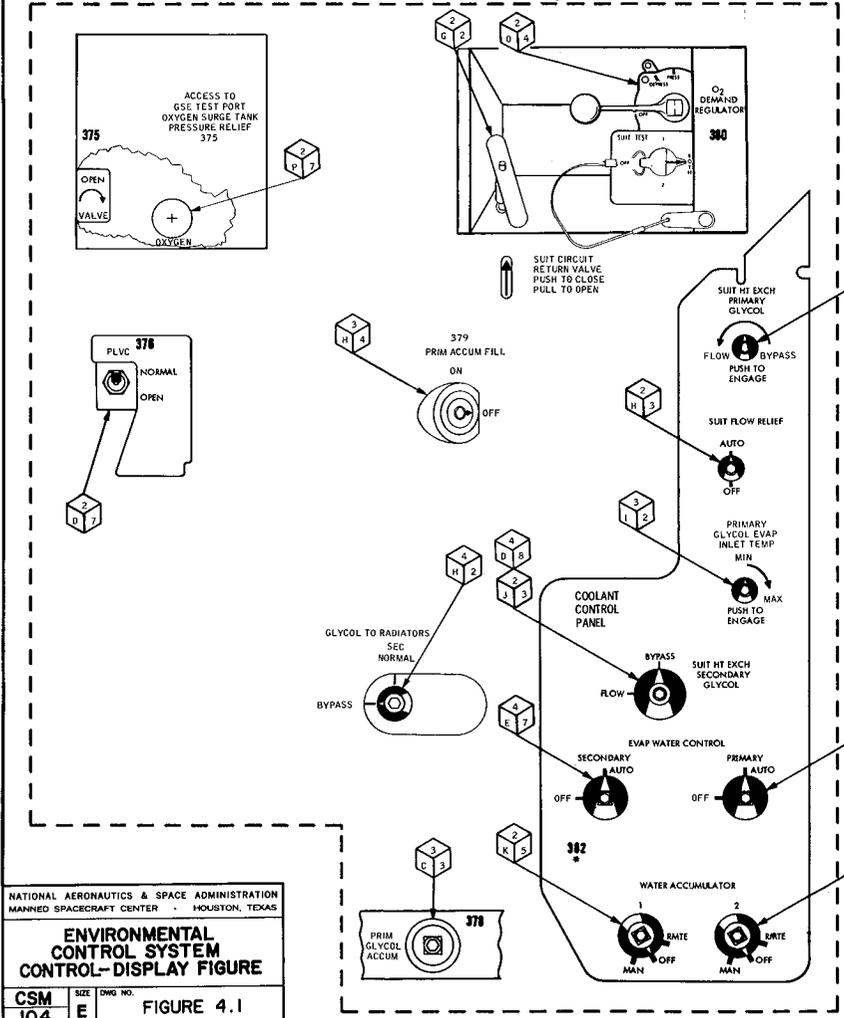
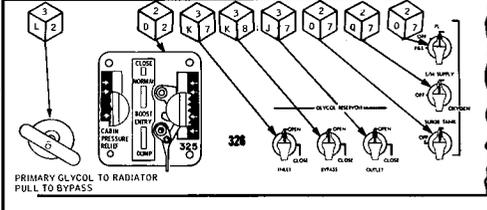
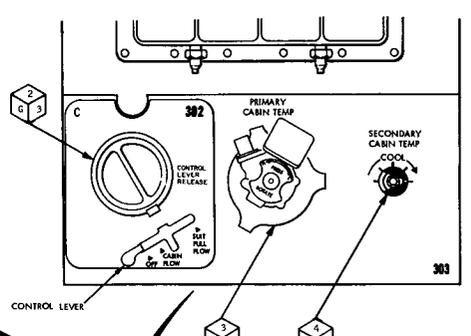
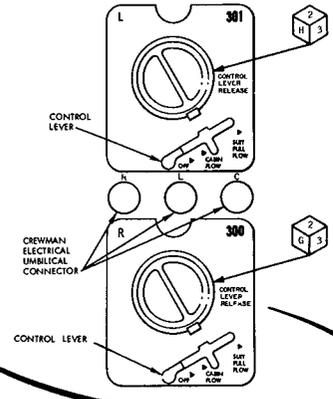
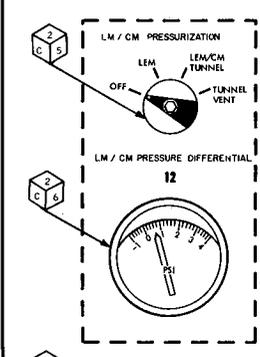
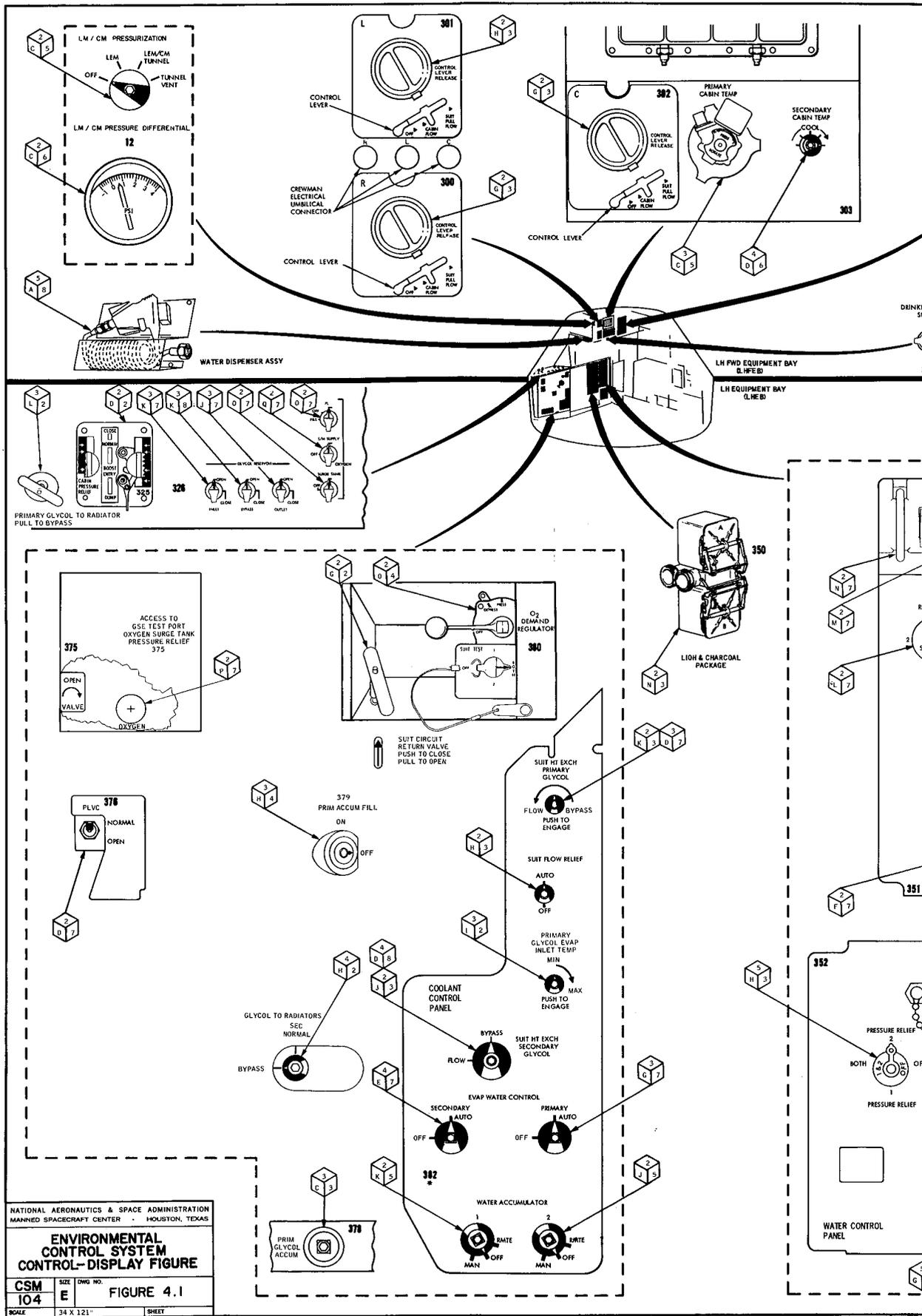
NATIONAL AERONAUTICS & SPACE ADMINISTRATION
 MANNED SPACECRAFT CENTER HOUSTON, TEXAS

POWER DISTRIBUTION MATRIX MISCELLANEOUS BUSES

| | | |
|---------|--------|------------|
| CSM 104 | DWG NO | FIGURE 3.4 |
| | PAGE | SHEET OF |

CORRECTIONS TO FIGURE 3.4, POWER DISTRIBUTION MATRIX, MISCELLANEOUS BUSES

| <u>V</u> (MISC. BUSES) | <u>RHEB</u> | <u>MDC</u> | <u>CHANGE</u> |
|---------------------------|------------------|---------------|---|
| V _{BR} | | MDC-5 CB8 | SHOULD READ: <u>MAIN BUS A RESET</u> <u>SW (S17-MDC 3)</u> LOSS OF MAIN BUS A UNDERVOLTAGE LIGHT IF SW S17-MDC 2 IS IN THE ACK POSITION |
| | | CB9 | SHOULD READ: <u>MAIN BUS B RESET</u> <u>SW (S26-MDC 3)</u> LOSS OF MAIN BUS B UNDERVOLTAGE LIGHT IF SW S17-MDC 2 IS IN THE ACK POSITION |
| V _{BA} | | MDC-5 CB12 | THE SHARED POWER INPUT SHOULD BE FROM V _{BB} , NOT MAIN B. |
| V _{BB} | | CB13 | THE SHARED POWER INPUT SHOULD BE FROM V _{BA} , CB12, NOT MAIN A CB14 |
| V _{NE2} | | MDC-5 CB25 | CORRECT CB TITLE TO READ: INSTRUMENTS SCI EQUIP HATCH |
| | | CB24 | CORRECT CB TITLE TO READ: INSTRUMENTS SCI EQUIP SEB 2 |
| V _{SQA} | | | TM - CORRECT THE TM NOMENCLATURE TO READ: PYRO BUS A VOLTS |
| V _{SQB} | RHEB 250 CB17 | | ADD RHEB 229 MAIN RELEASE CB48, 5 AMP, WHICH SHOULD READ AS FOLLOWS: <u>MAIN CHUTE</u> <u>DISC RELAY</u> LOSS OF SYS A |
| | | | SHOULD READ: <u>PYRO BAT B</u> LOSS OF PYRO BAT B, BATTERY BUS A CAN BE RETIED TO PYRO CIRCUIT |
| | | | TM - CORRECT THE TM NOMENCLATURE TO READ: PYRO BUS B VOLTS |
| | | | ADD RHEB 229 MAIN RELEASE CB49, 7.5 AMP, WHICH SHOULD READ AS FOLLOWS: <u>MAIN CHUTE</u> <u>DISC RELAY</u> LOSS OF SYS B |

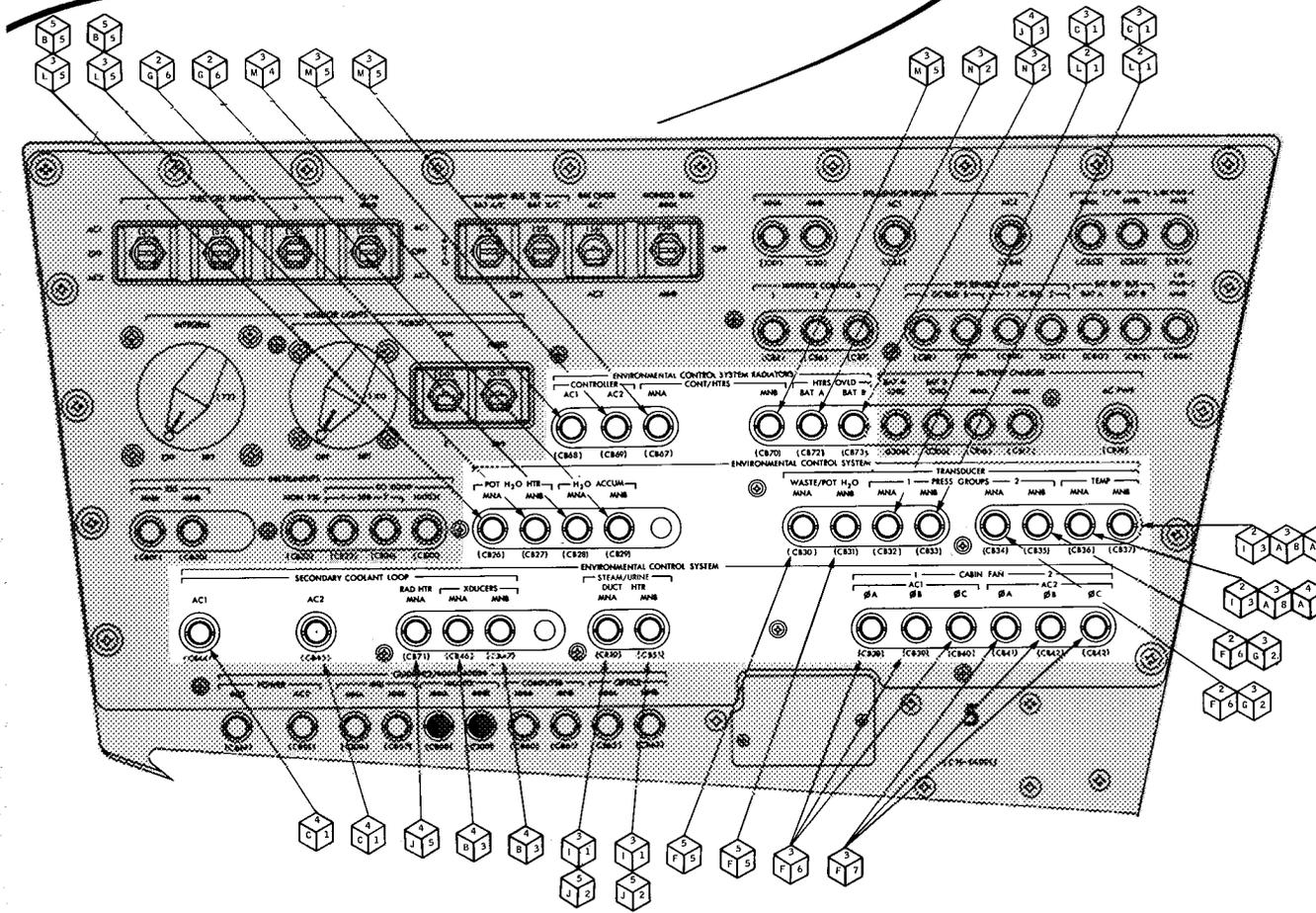
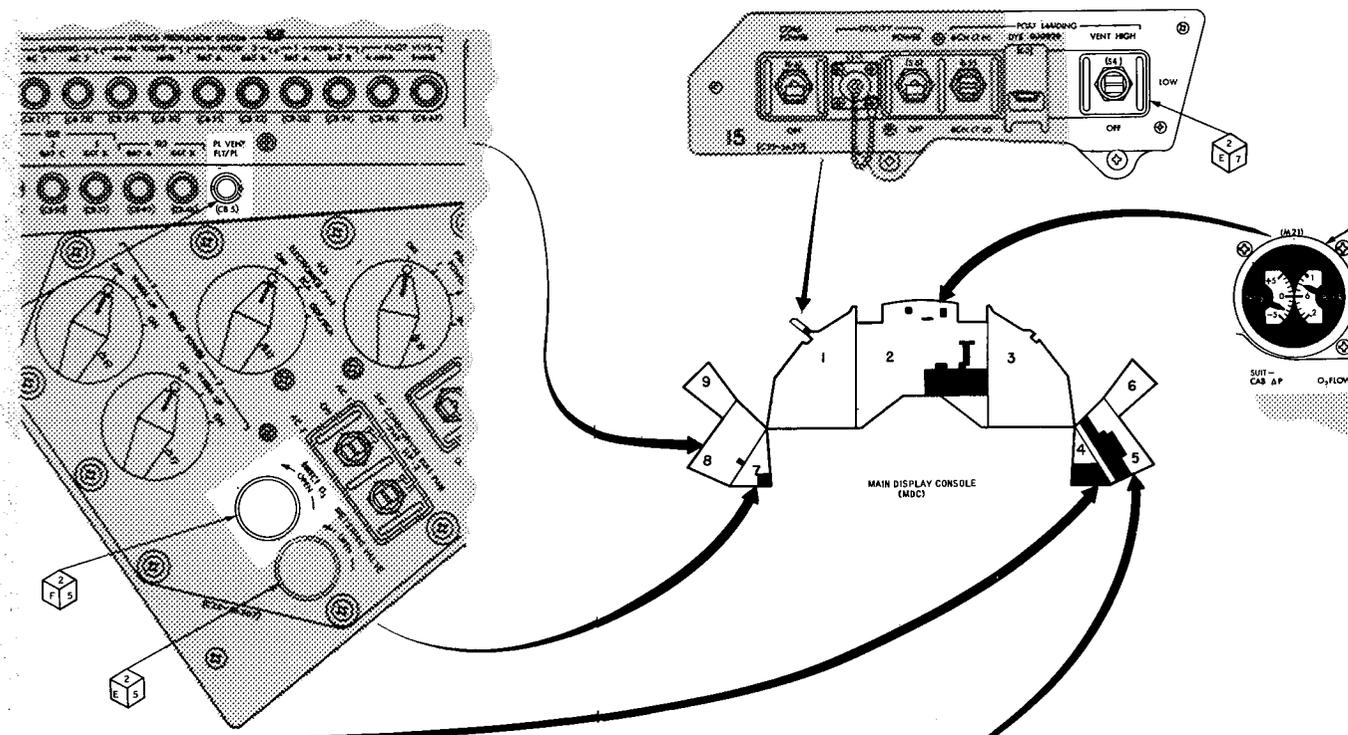


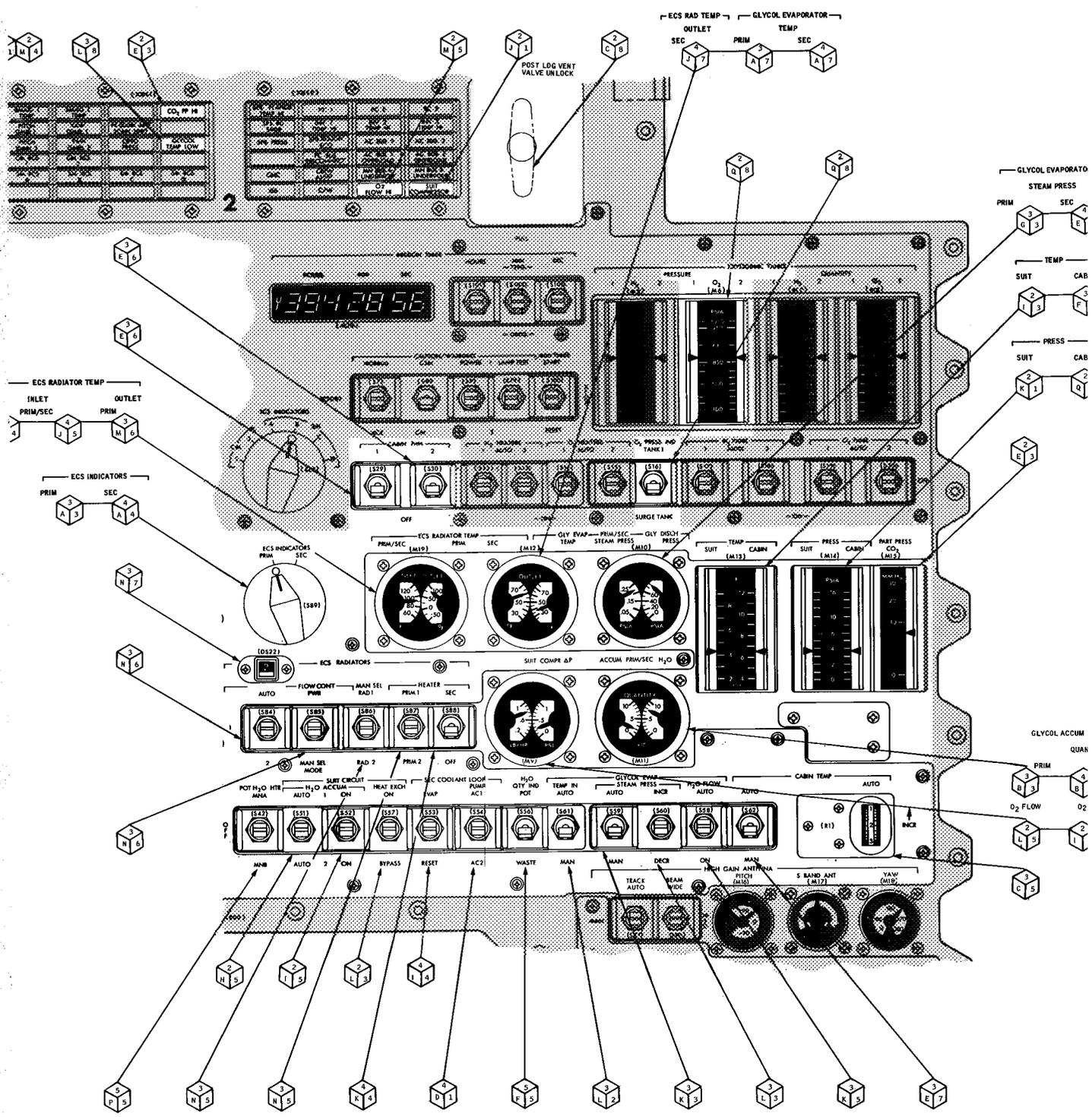
NATIONAL AERONAUTICS & SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER HOUSTON, TEXAS

ENVIRONMENTAL CONTROL SYSTEM CONTROL-DISPLAY FIGURE

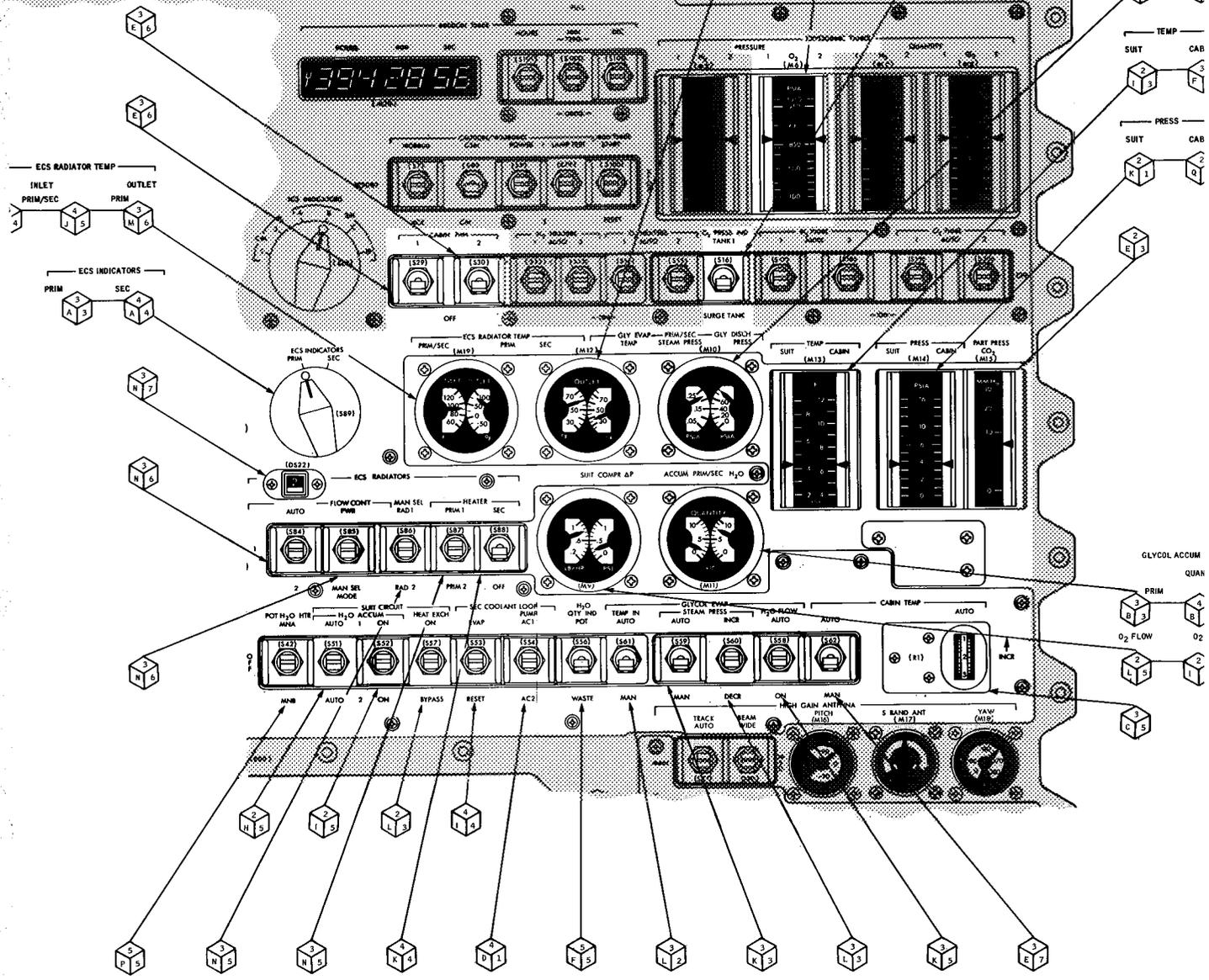
CSM SIZE DWG NO. FIGURE 4.1
104 E

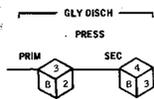
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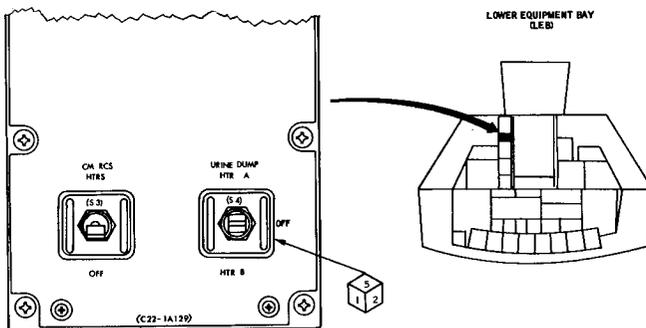
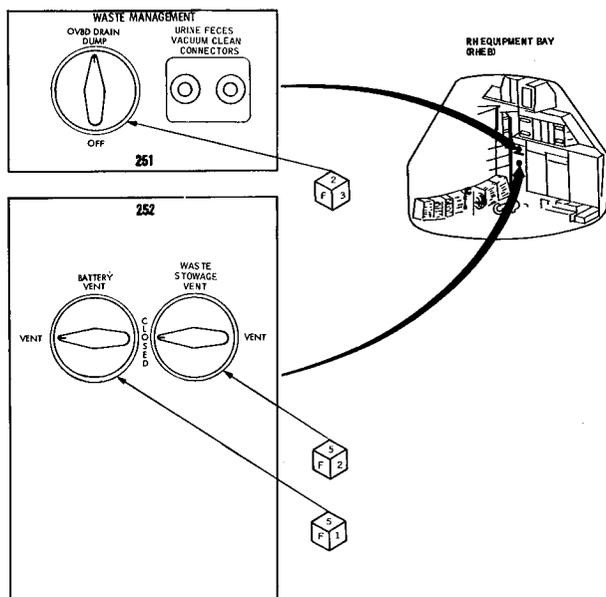
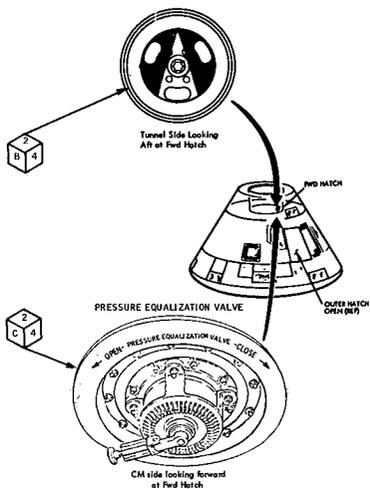


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|-----|-----------------------|------|--------|-----------|
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| 2 | CO ₂ PP 14 | PPM | 0-1000 | 2 |
| 3 | CO ₂ PP 14 | PPM | 0-1000 | 3 |
| 4 | CO ₂ PP 14 | PPM | 0-1000 | 4 |
| 5 | CO ₂ PP 14 | PPM | 0-1000 | 5 |
| 6 | CO ₂ PP 14 | PPM | 0-1000 | 6 |
| 7 | CO ₂ PP 14 | PPM | 0-1000 | 7 |
| 8 | CO ₂ PP 14 | PPM | 0-1000 | 8 |
| 9 | CO ₂ PP 14 | PPM | 0-1000 | 9 |
| 10 | CO ₂ PP 14 | PPM | 0-1000 | 10 |
| 11 | CO ₂ PP 14 | PPM | 0-1000 | 11 |
| 12 | CO ₂ PP 14 | PPM | 0-1000 | 12 |
| 13 | CO ₂ PP 14 | PPM | 0-1000 | 13 |
| 14 | CO ₂ PP 14 | PPM | 0-1000 | 14 |
| 15 | CO ₂ PP 14 | PPM | 0-1000 | 15 |
| 16 | CO ₂ PP 14 | PPM | 0-1000 | 16 |
| 17 | CO ₂ PP 14 | PPM | 0-1000 | 17 |
| 18 | CO ₂ PP 14 | PPM | 0-1000 | 18 |
| 19 | CO ₂ PP 14 | PPM | 0-1000 | 19 |
| 20 | CO ₂ PP 14 | PPM | 0-1000 | 20 |
| 21 | CO ₂ PP 14 | PPM | 0-1000 | 21 |
| 22 | CO ₂ PP 14 | PPM | 0-1000 | 22 |
| 23 | CO ₂ PP 14 | PPM | 0-1000 | 23 |
| 24 | CO ₂ PP 14 | PPM | 0-1000 | 24 |
| 25 | CO ₂ PP 14 | PPM | 0-1000 | 25 |
| 26 | CO ₂ PP 14 | PPM | 0-1000 | 26 |
| 27 | CO ₂ PP 14 | PPM | 0-1000 | 27 |
| 28 | CO ₂ PP 14 | PPM | 0-1000 | 28 |
| 29 | CO ₂ PP 14 | PPM | 0-1000 | 29 |
| 30 | CO ₂ PP 14 | PPM | 0-1000 | 30 |
| 31 | CO ₂ PP 14 | PPM | 0-1000 | 31 |
| 32 | CO ₂ PP 14 | PPM | 0-1000 | 32 |
| 33 | CO ₂ PP 14 | PPM | 0-1000 | 33 |
| 34 | CO ₂ PP 14 | PPM | 0-1000 | 34 |
| 35 | CO ₂ PP 14 | PPM | 0-1000 | 35 |
| 36 | CO ₂ PP 14 | PPM | 0-1000 | 36 |
| 37 | CO ₂ PP 14 | PPM | 0-1000 | 37 |
| 38 | CO ₂ PP 14 | PPM | 0-1000 | 38 |
| 39 | CO ₂ PP 14 | PPM | 0-1000 | 39 |
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| 41 | CO ₂ PP 14 | PPM | 0-1000 | 41 |
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| 45 | CO ₂ PP 14 | PPM | 0-1000 | 45 |
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| 47 | CO ₂ PP 14 | PPM | 0-1000 | 47 |
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| 88 | CO ₂ PP 14 | PPM | 0-1000 | 88 |
| 89 | CO ₂ PP 14 | PPM | 0-1000 | 89 |
| 90 | CO ₂ PP 14 | PPM | 0-1000 | 90 |
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| 92 | CO ₂ PP 14 | PPM | 0-1000 | 92 |
| 93 | CO ₂ PP 14 | PPM | 0-1000 | 93 |
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| 95 | CO ₂ PP 14 | PPM | 0-1000 | 95 |
| 96 | CO ₂ PP 14 | PPM | 0-1000 | 96 |
| 97 | CO ₂ PP 14 | PPM | 0-1000 | 97 |
| 98 | CO ₂ PP 14 | PPM | 0-1000 | 98 |
| 99 | CO ₂ PP 14 | PPM | 0-1000 | 99 |
| 100 | CO ₂ PP 14 | PPM | 0-1000 | 100 |





PRESSURE EQUALIZATION VALVE



8

FROM O₂
TANK 1

7

FROM O₂
TANK 2

6

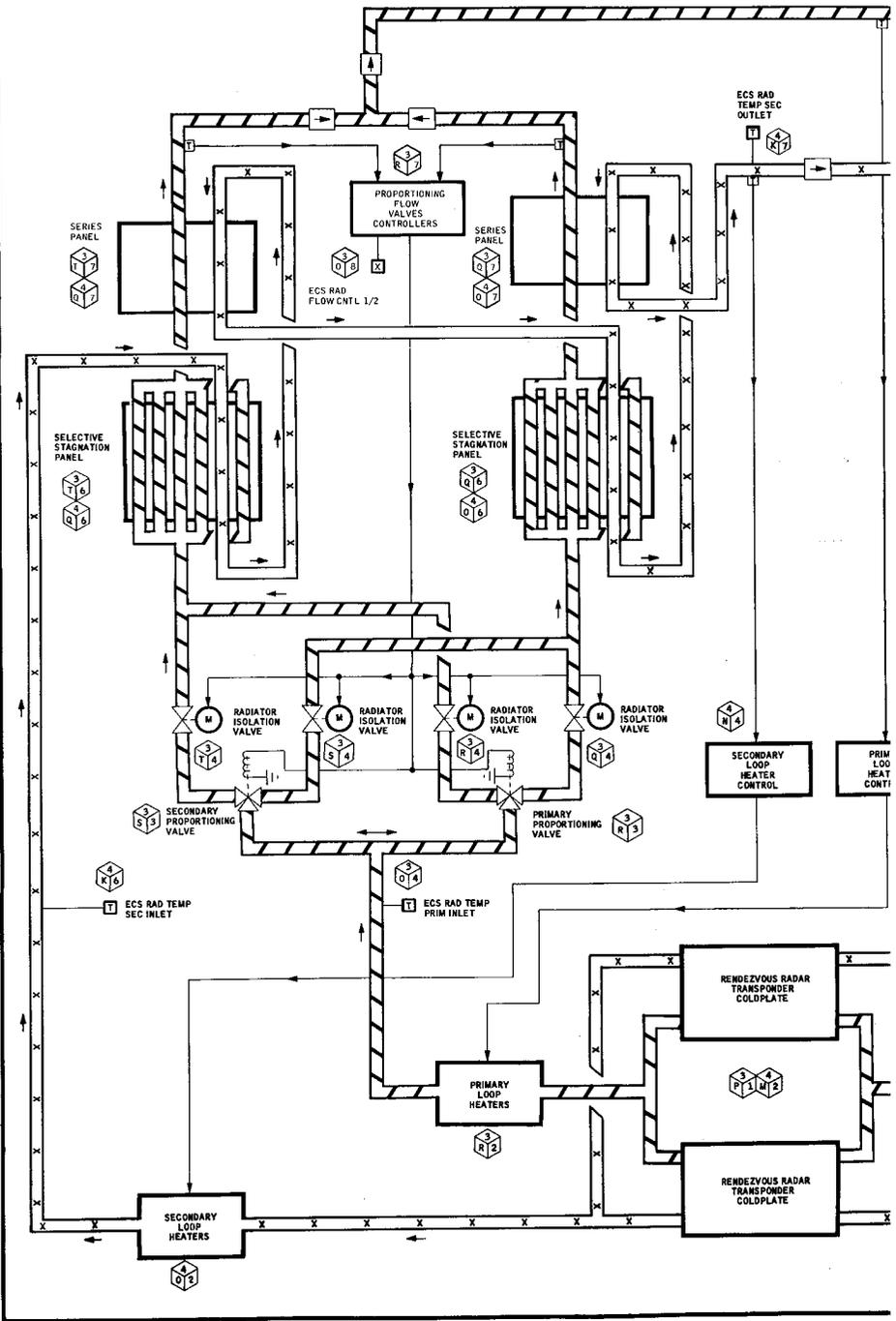
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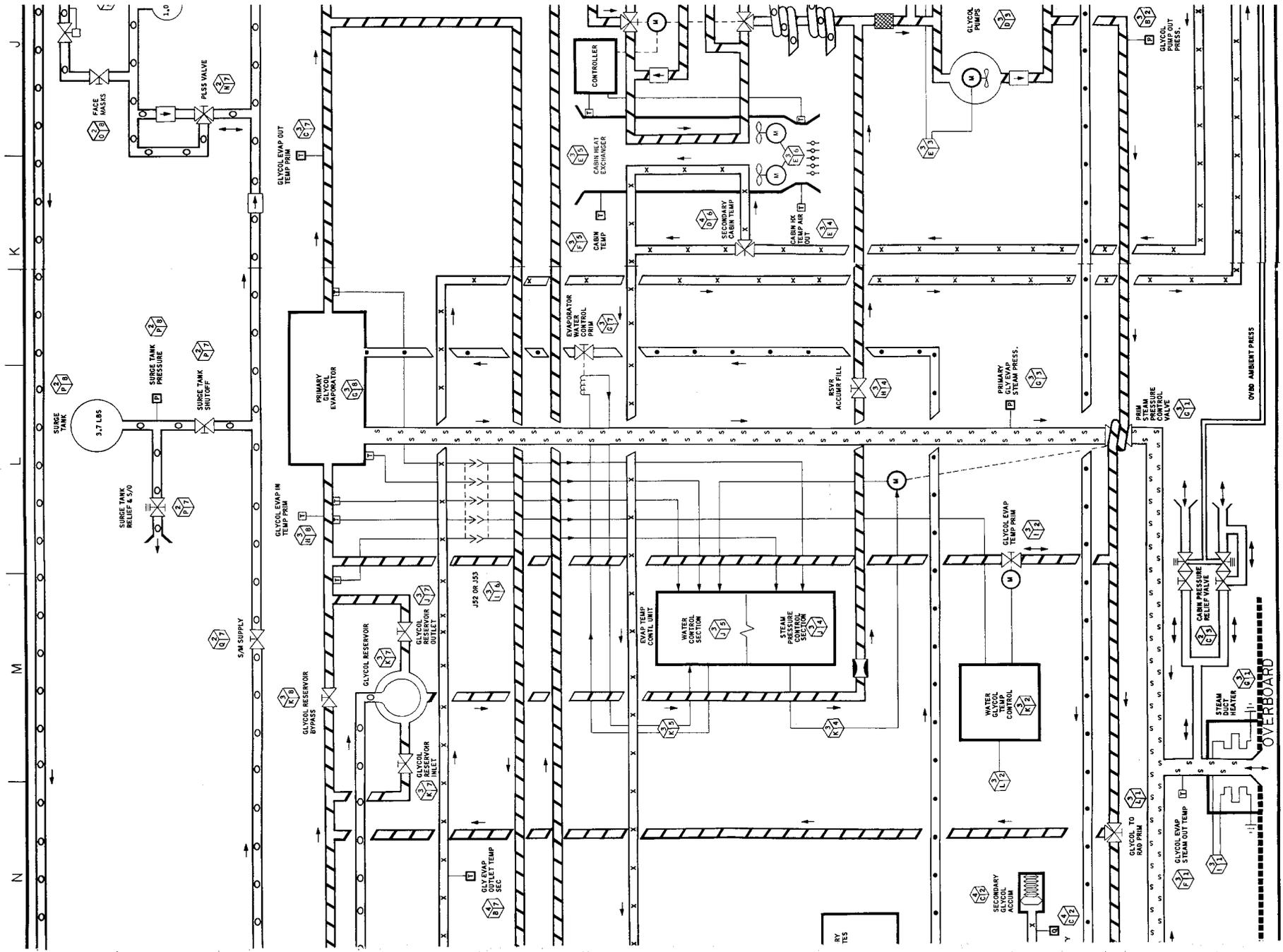
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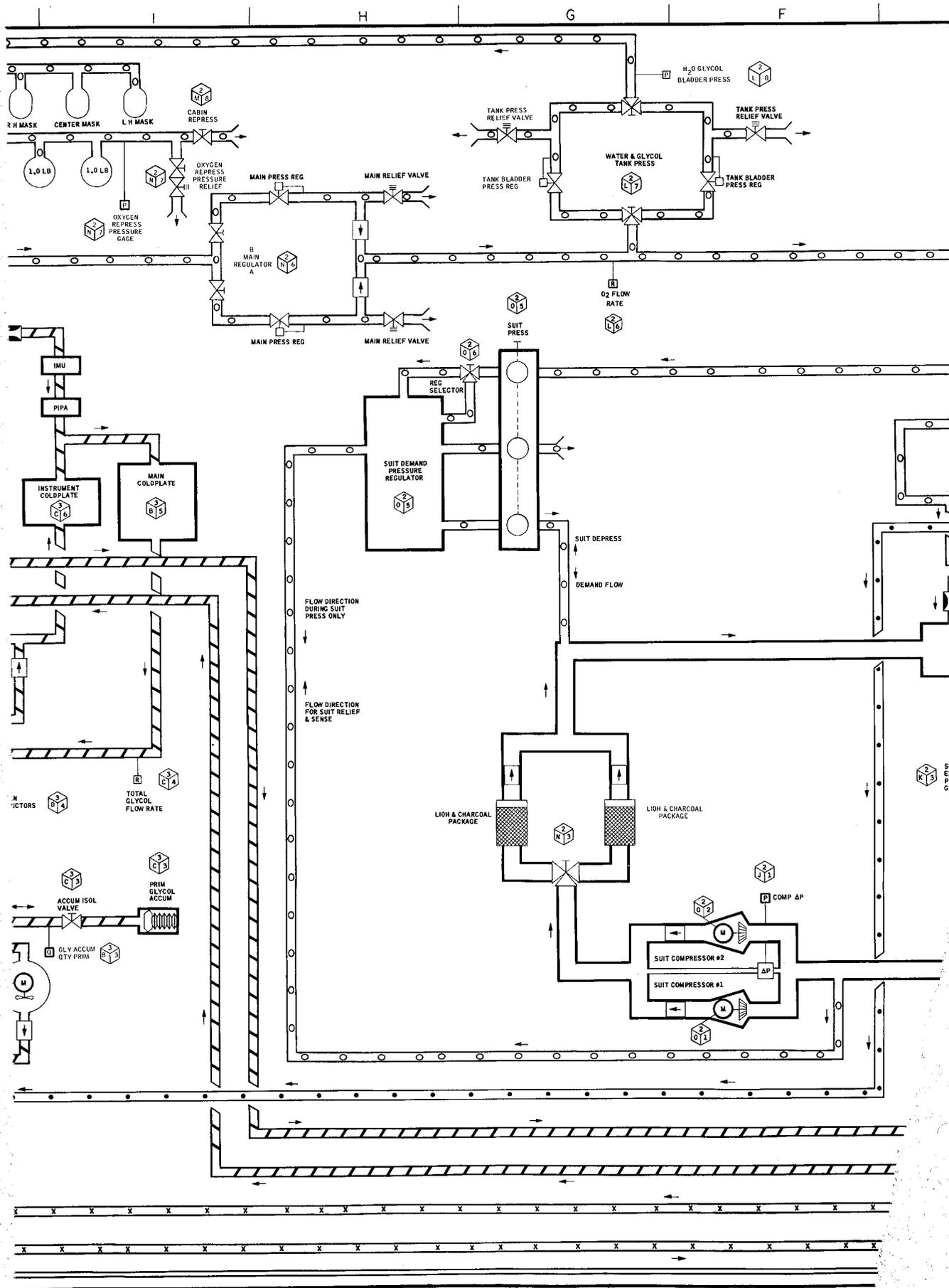
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2

1







CM COVERBOARD

8

7

6

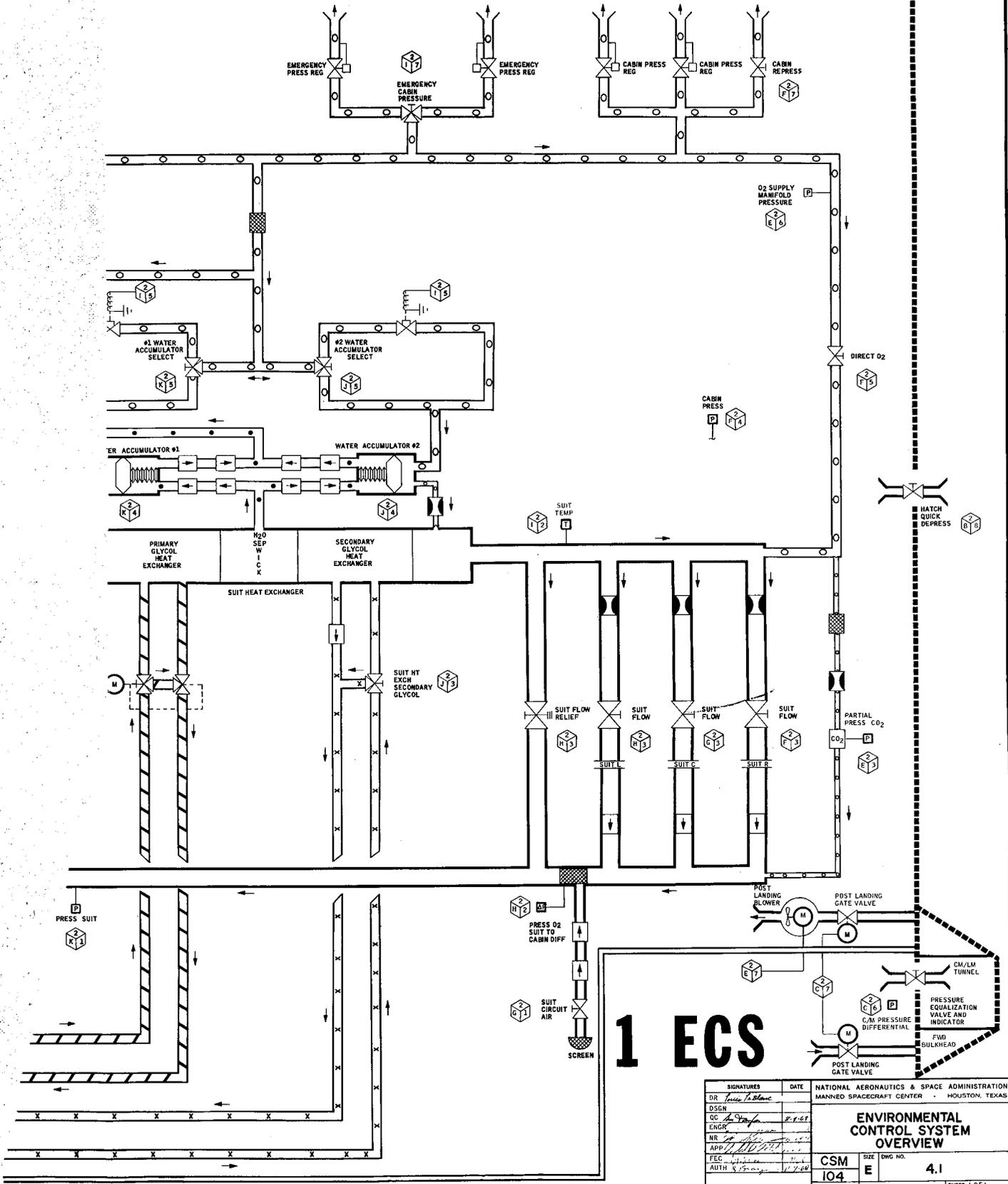
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4

3

2

1



1 ECS

| | | | | |
|------------|-----------------------|---------|---|--|
| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION | |
| DR | <i>James H. Blane</i> | | MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | |
| DSCN | | | | |
| QC | <i>A. G. ...</i> | 2.1.67 | | |
| ENGR | | | | |
| NR | | | | |
| APP | | | | |
| FEC | | | | |
| AUTH | | | | |
| CSM | SIZE | DWG NO. | | |
| 104 | E | 4.1 | | |
| 121 X 34 | | | SHEET 1 OF 1 | |

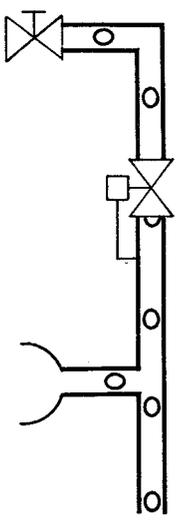
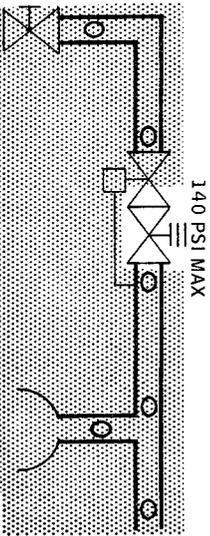
SECTION 4

WAS

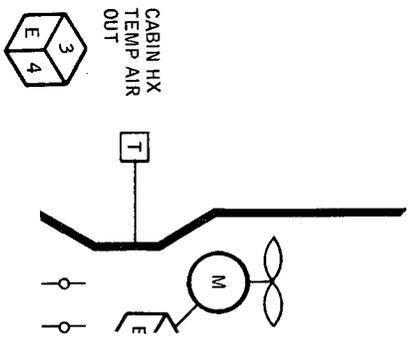
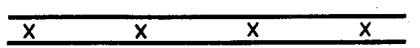
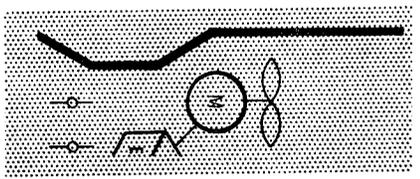
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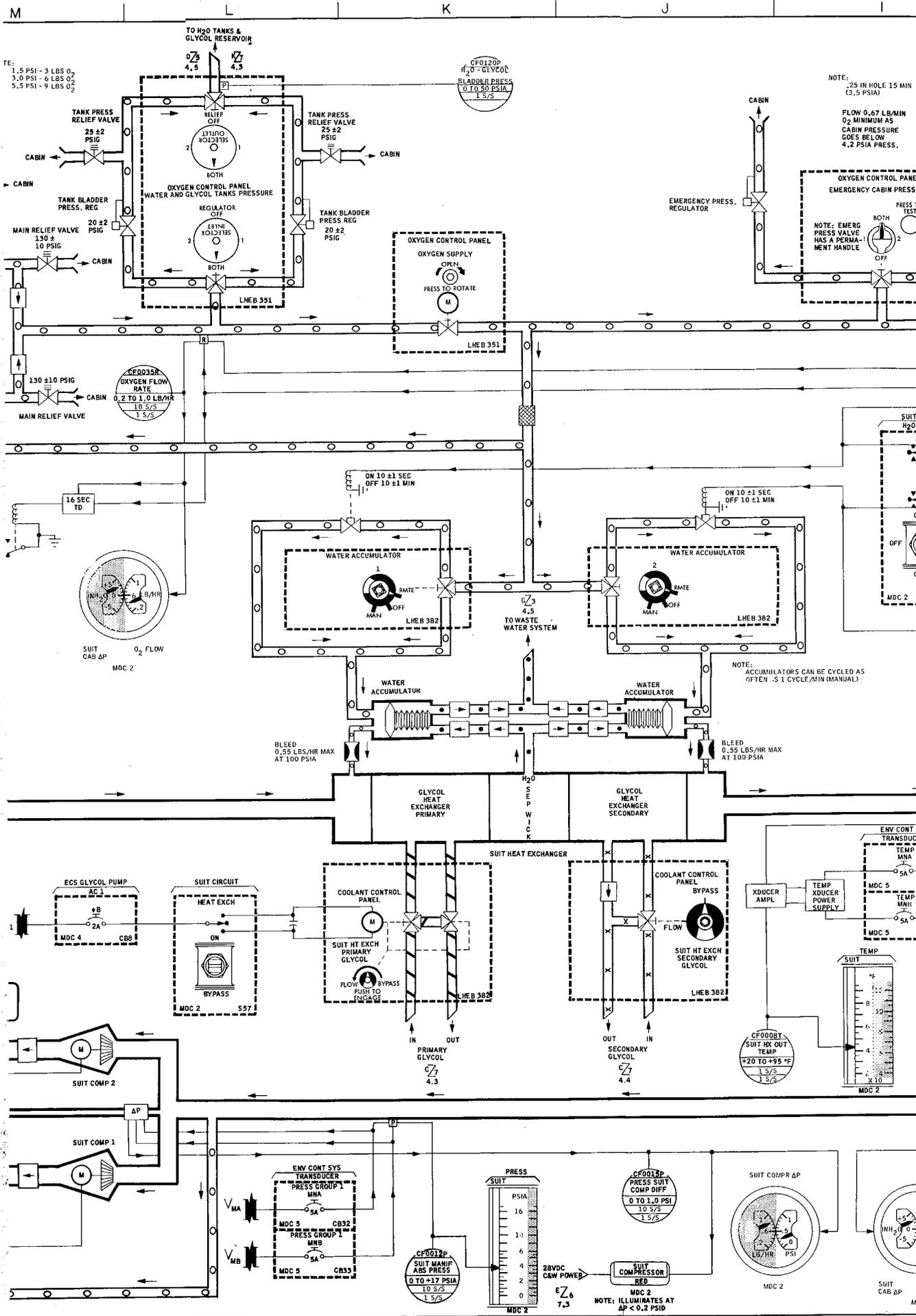
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JS

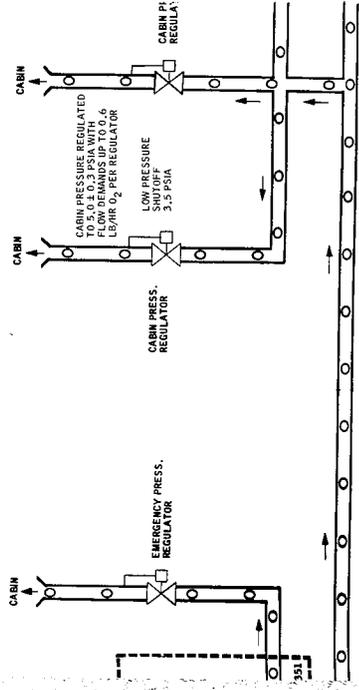


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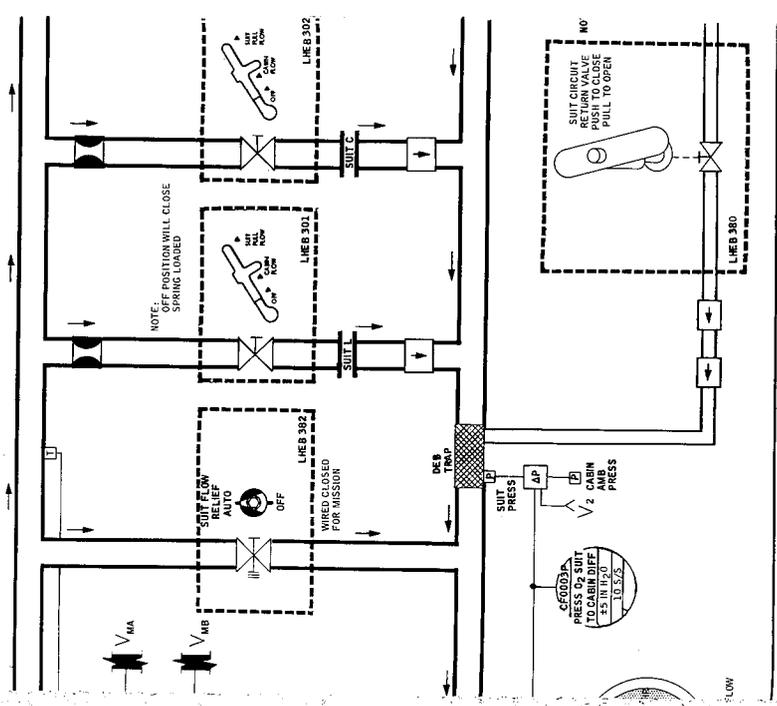
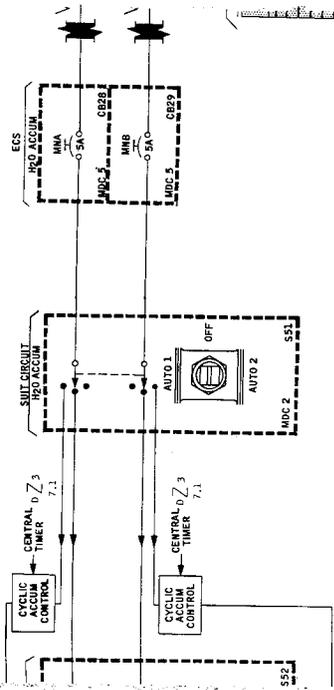


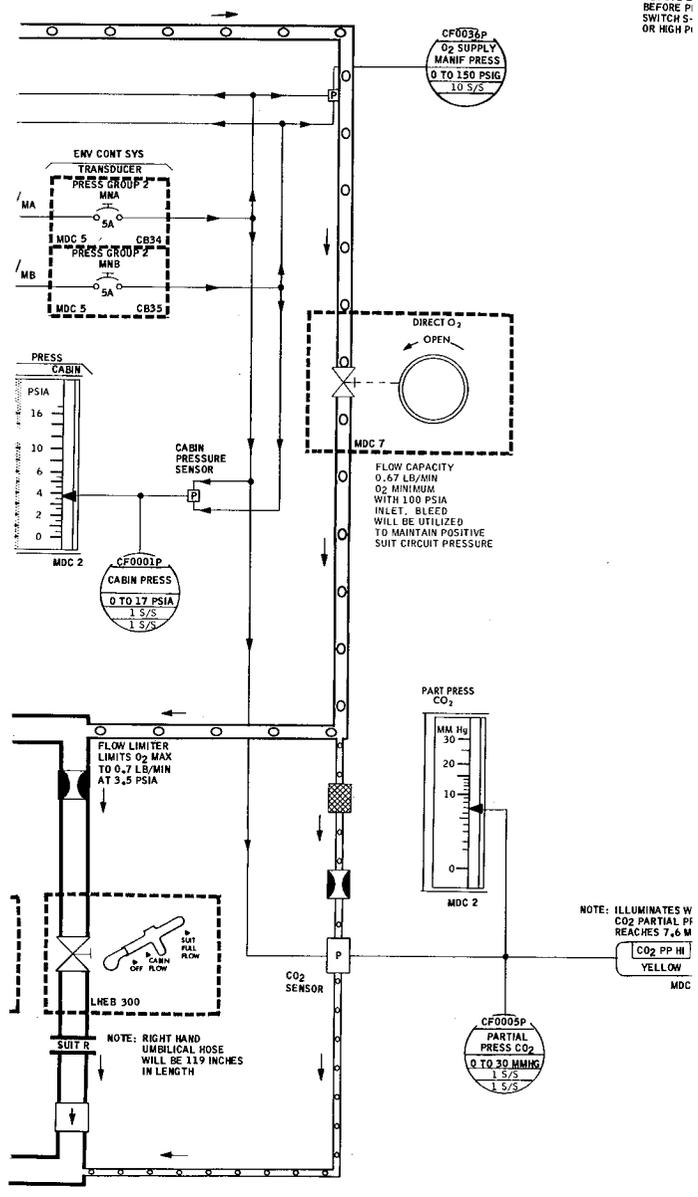
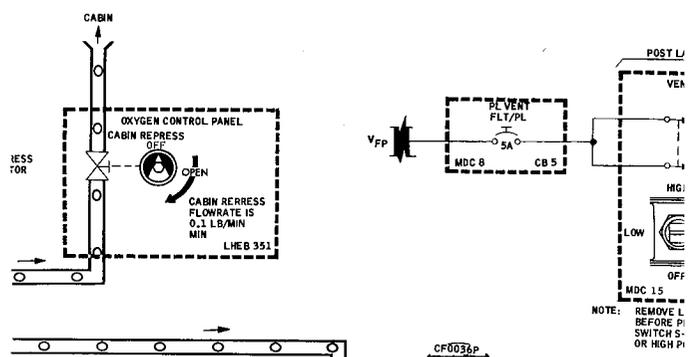


G



H





NOTE: A TELEFLEX CABLE IS CONNECTED TO SUIT CIRCUIT RETURN MANUAL VALVE TO PERMIT OPERATION FROM THE L.H. COUCH



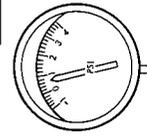
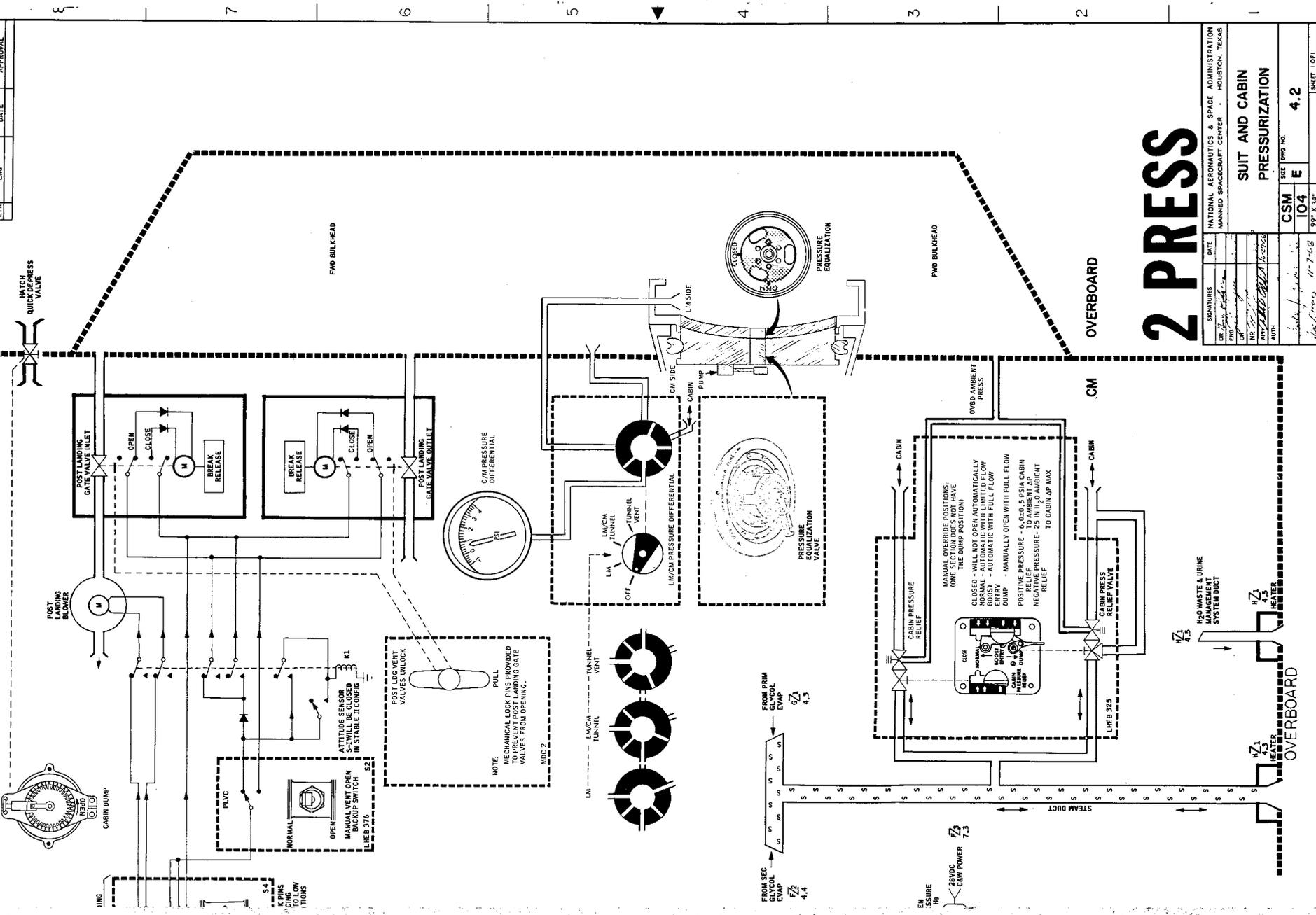
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| TR | ENC | DATE | APPROVAL |
| | | | |

C

D

B

A



C/M PRESSURE DIFFERENTIAL

NOTE:
 MECHANICAL LOCK PINS PROVIDED TO PREVENT POST LANDING GATE VALVES FROM OPENING.

PLVC

ATTITUDE SENSOR S-1 WILL BE CLOSED IN STABLE II CONFIG

MANUAL VENT OPEN BACKUP SWITCH LINE B 376

POST LANDING GATE VALVES UNLOCK

PULL TO PREVENT POST LANDING GATE VALVES FROM OPENING.

NOG 2

MANUAL AIRBORNE PROTECTION VALVE SECTION DOES NOT HAVE THE DUMP POSITION

CLOSED - WILL NOT OPEN AUTOMATICALLY

NORMAL - AUTOMATIC WITH LIMITED FLOW

ENTRY - AUTOMATIC WITH FULL FLOW

DUMP - MANUALLY OPEN WITH FULL FLOW

POSITIVE PRESSURE - 6.0 ± 0.5 PSIA CABIN RELIEF TO AMBIENT AIR

NEGATIVE PRESSURE: 25 IN H₂O AMBIENT RELIEF TO CABIN, JP MAX

CABIN PRESSURE RELIEF

OVRD AMBIENT PRESS

OVERBOARD

OVERBOARD

28VDC CAV POWER

FROM SEC GLYCOL EVAP 4.4

FROM PRIM GLYCOL EVAP 4.3

H₂O WASTE & URINE MANAGEMENT SYSTEM DUCT

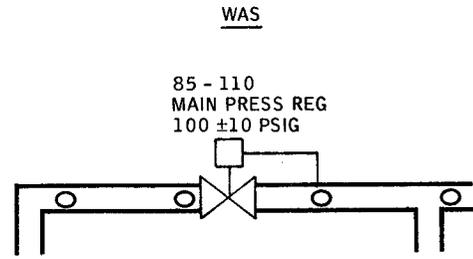
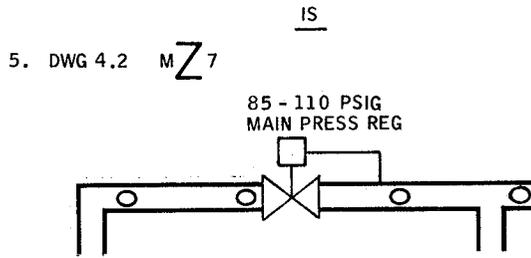
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HEATER

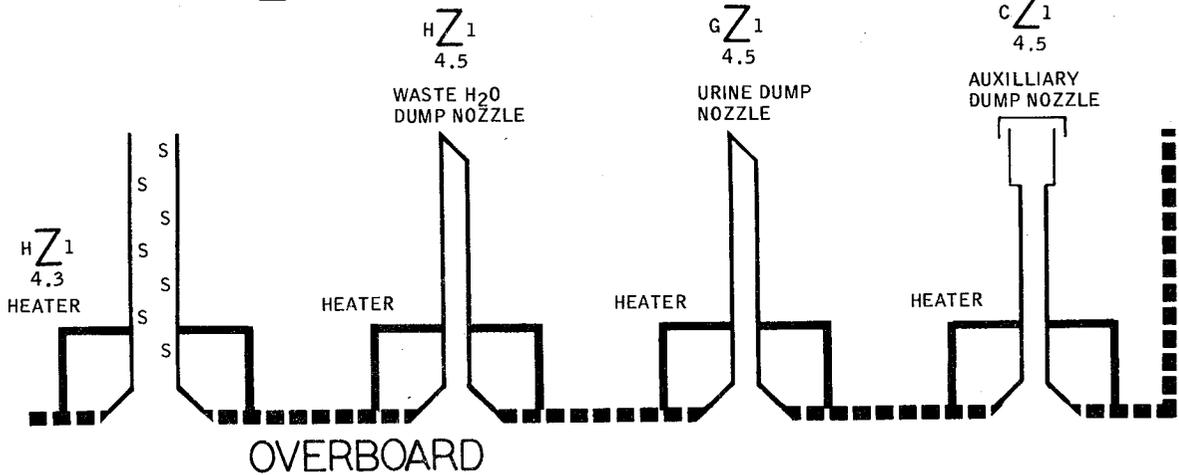
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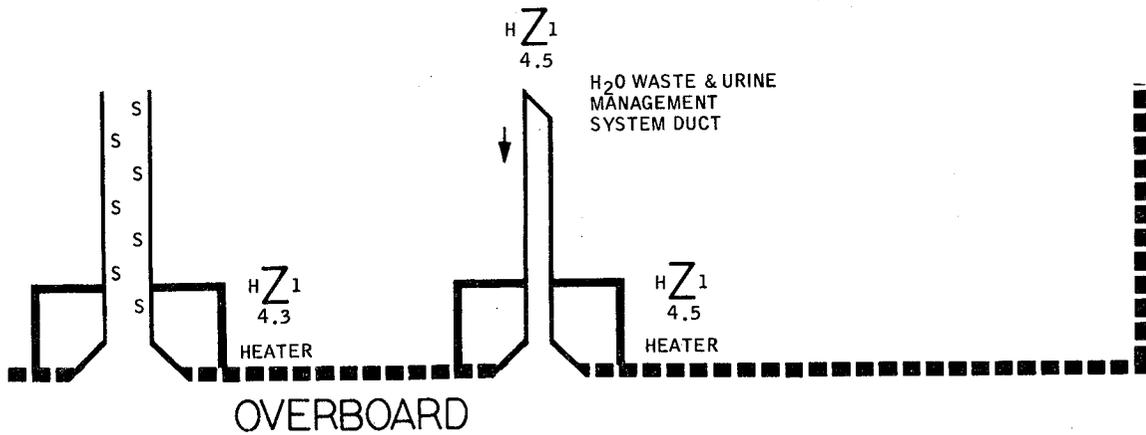
SECTION 4

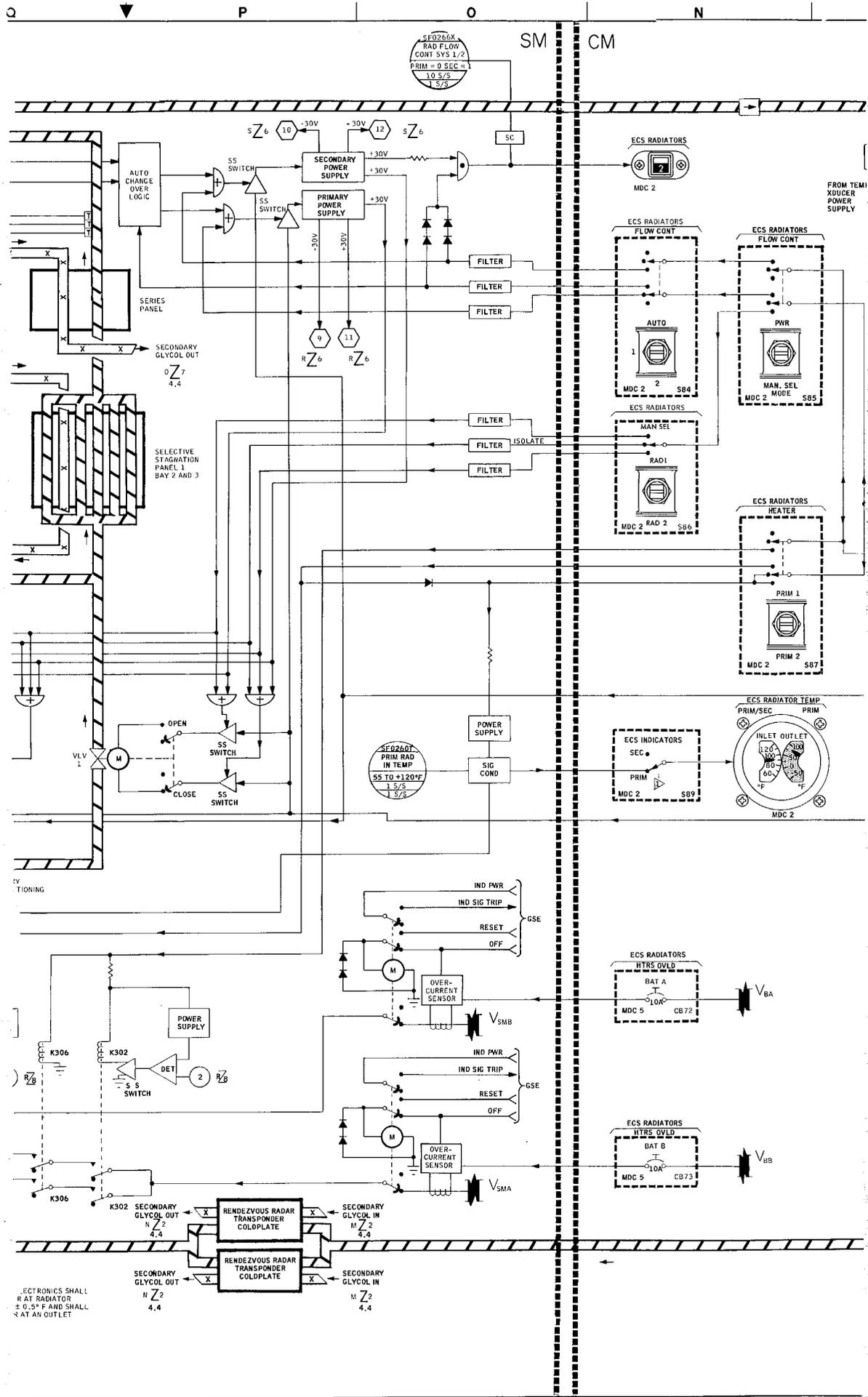


6. DWG 4.2 D,C,BZ1



WAS

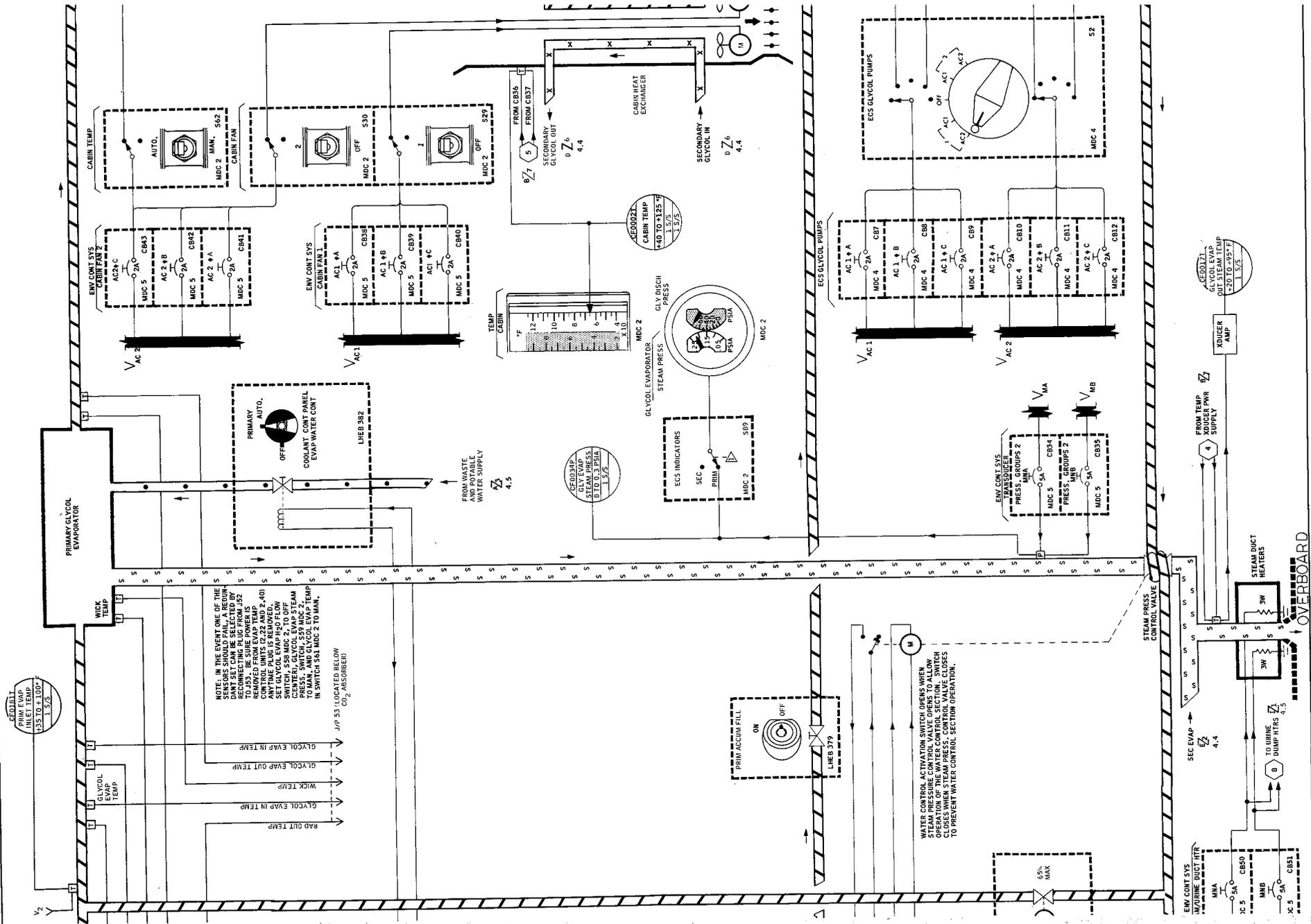




SE0260X
RAD FLOW
CONT SYS 1/2
PRIM = 0 SEC = 1
10 S/S
1 S/S

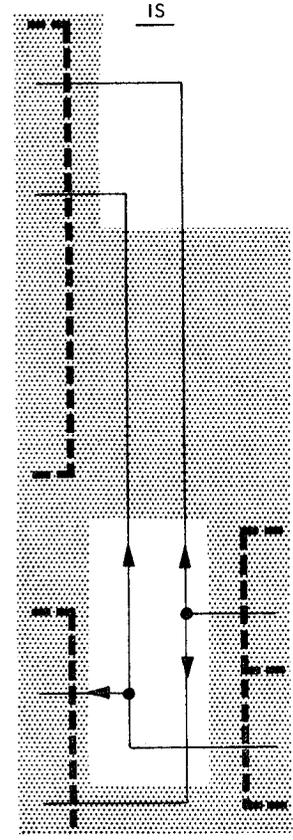
SE0260T
PRIM RAD
IN TEMP
55 TO +120°F
1 S/S
1 S/S

ELECTRONICS SHALL
R AT RADIATOR
± 0.5° F AND SHALL
AT AN OUTLET

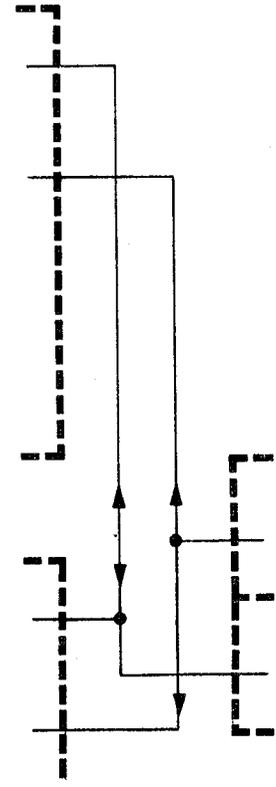


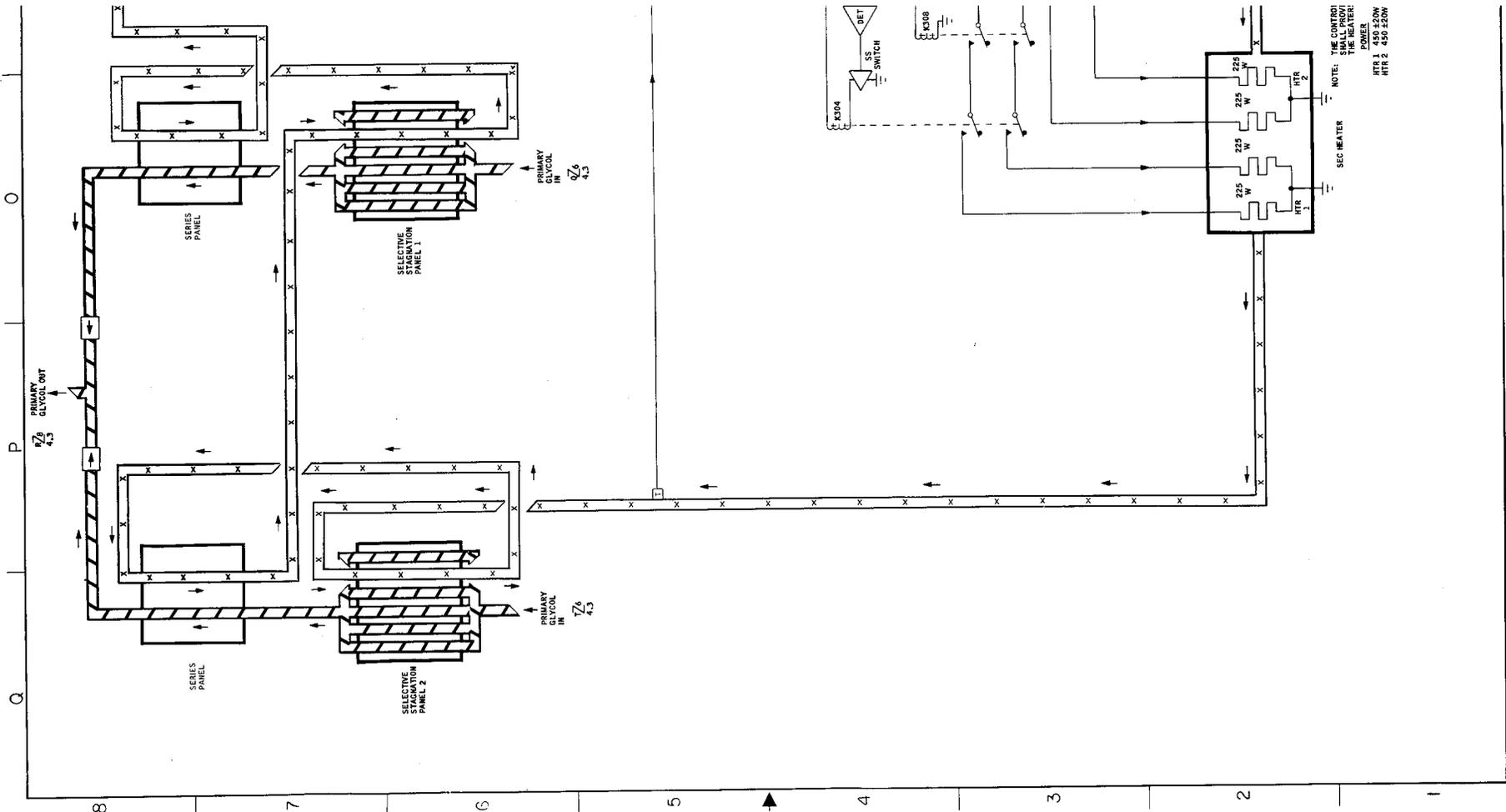
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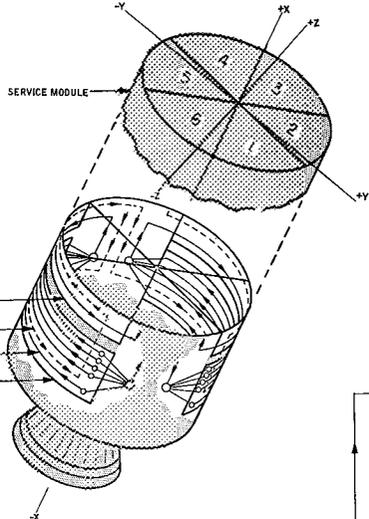
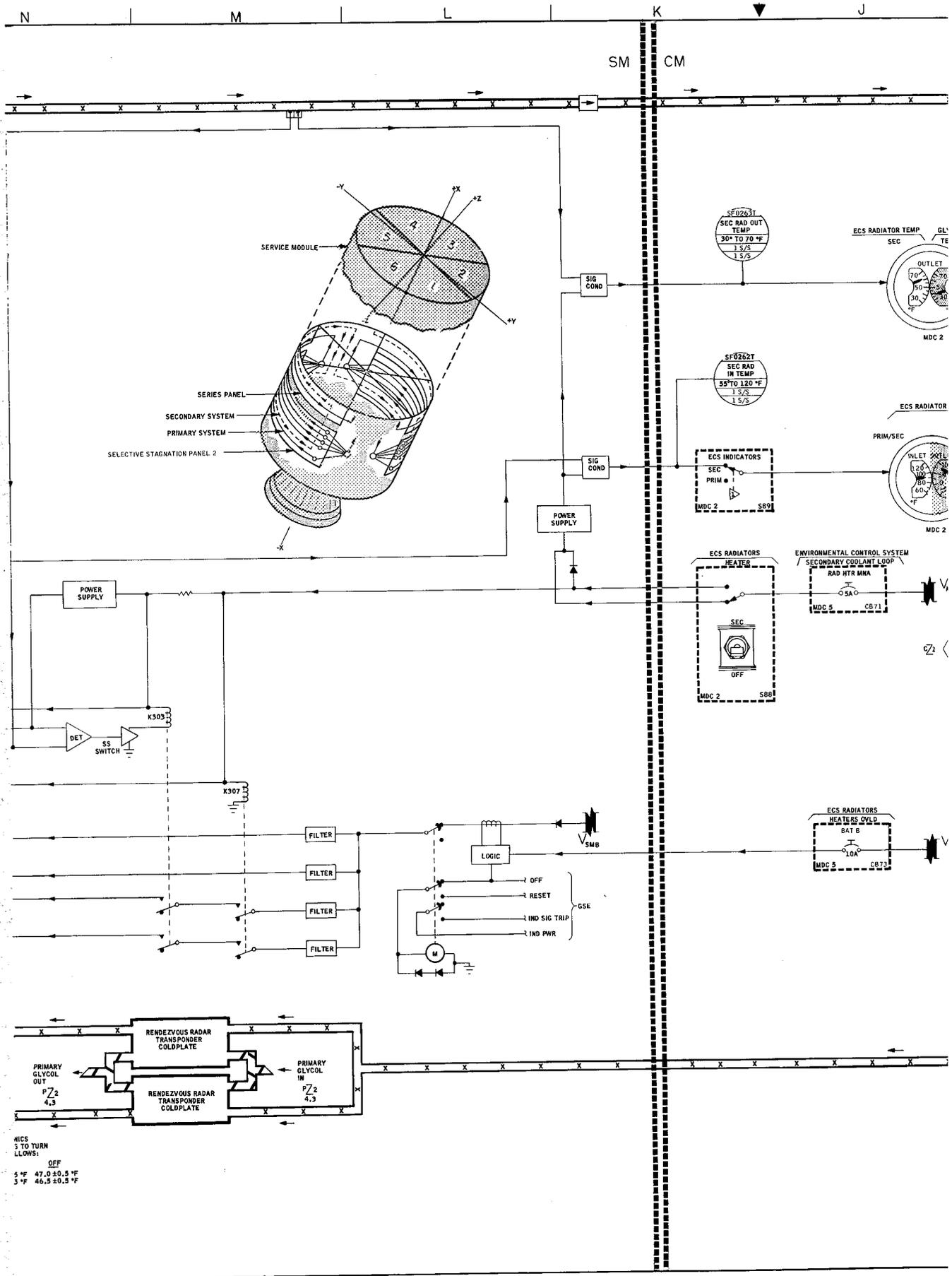
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WAS







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SEC RAD OUT
TEMP
30° TO 70° F
1 5/8
1 5/8

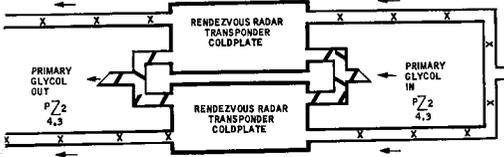
SF0242T
SEC RAD
IN TEMP
33° TO 120° F
1 5/8
1 5/8

ECS INDICATORS
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PRIM
MDC 2
SF02

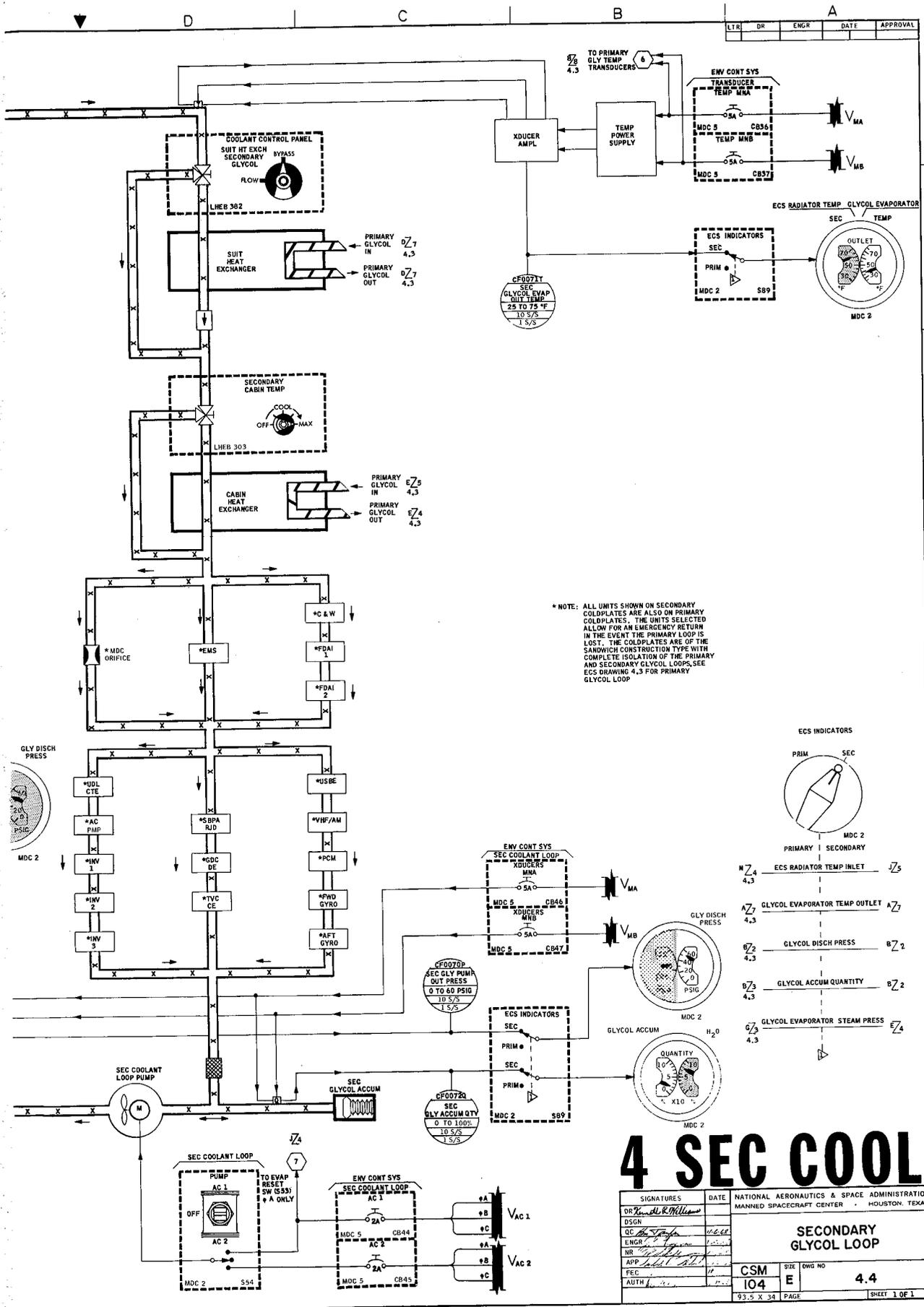
ECS RADIATORS
HEATERS
SEC
OFF
MDC 2
588

ENVIRONMENTAL CONTROL SYSTEM
SECONDARY COOLANT LOOP
RAD HTR MMA
10A
CB71

ECS RADIATORS
HEATERS OVLDR
BAT B
10A
CB73



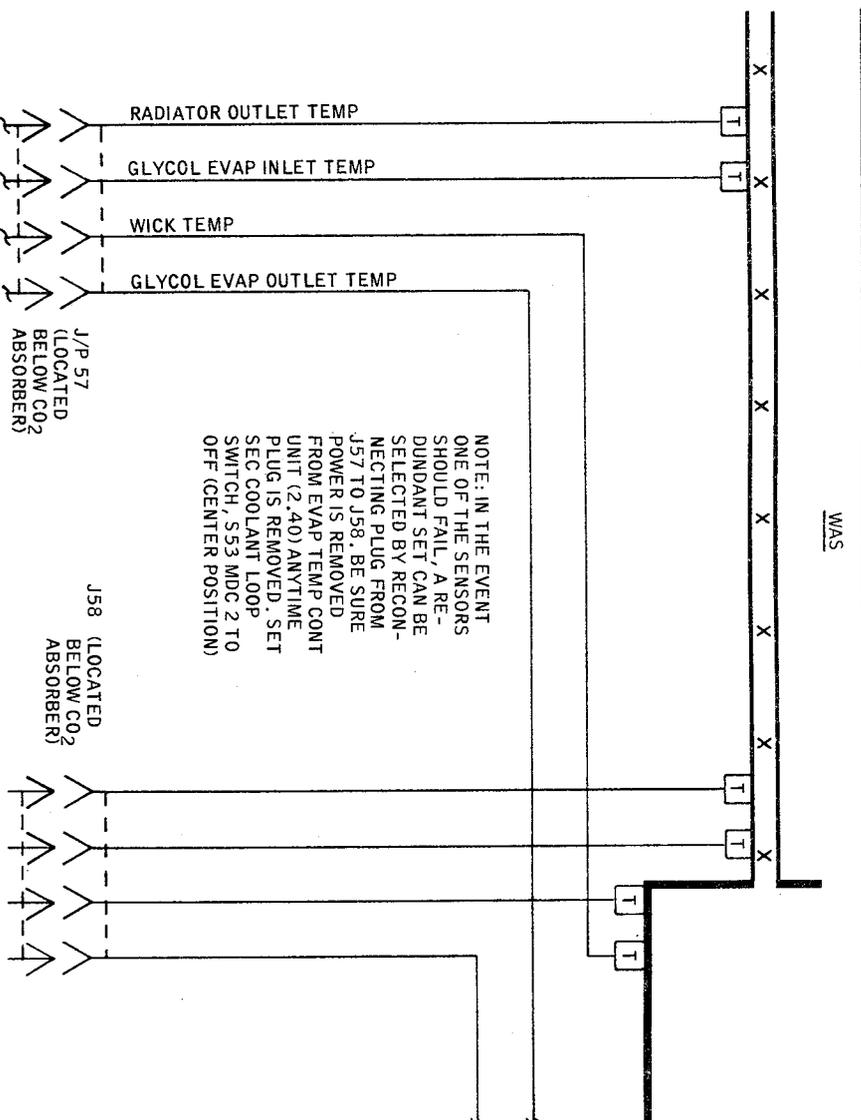
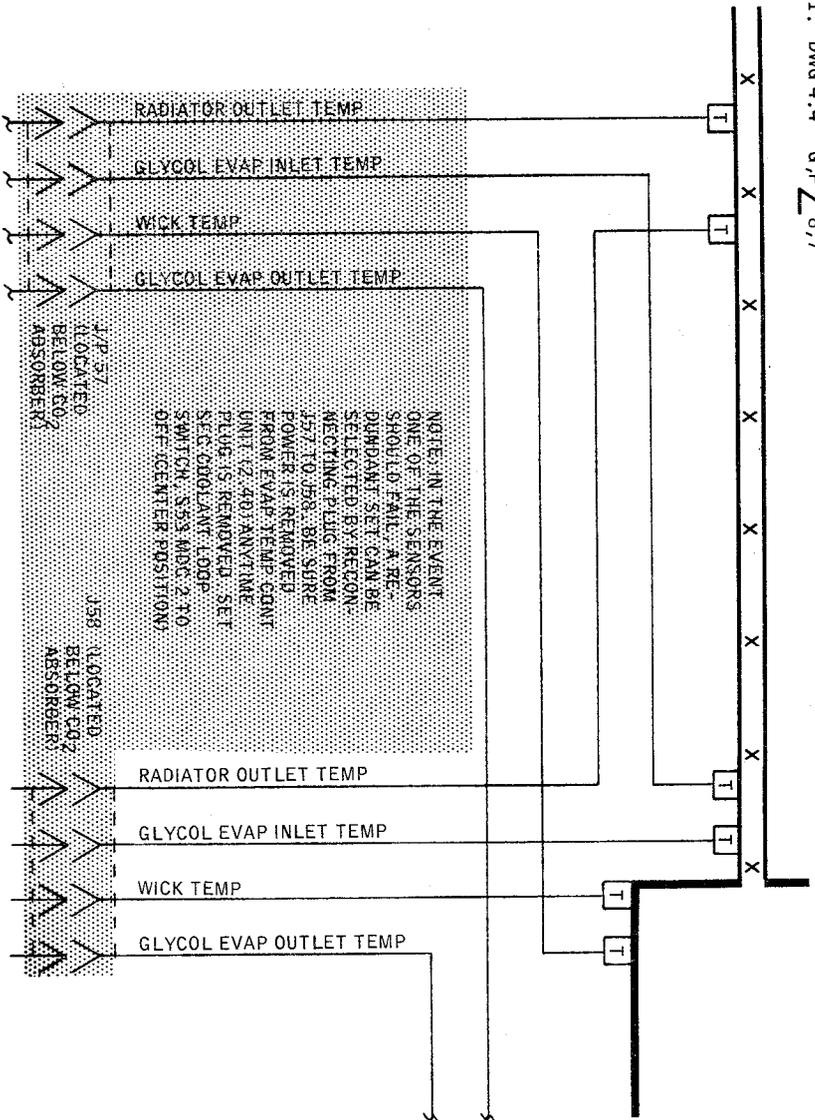
HICS
5 TO TURN
LLOWS:
OFF
5°F 47.0 ± 0.5 °F
5°F 46.5 ± 0.5 °F



* NOTE: ALL UNITS SHOWN ON SECONDARY COLDPLATES ARE ALSO ON PRIMARY COLDPLATES. THE UNITS SELECTED ALLOW FOR AN EMERGENCY RETURN IN THE EVENT THE PRIMARY LOOP IS LOST. THE COLDPLATES ARE OF THE SANDWICH CONSTRUCTION TYPE WITH COMPLETE ISOLATION OF THE PRIMARY AND SECONDARY GLYCOL LOOPS, SEE ECS DRAWING 4.3 FOR PRIMARY GLYCOL LOOP

4 SEC COOL

| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | |
|------------|--------------------|------|--|-----|
| DR | <i>R. Williams</i> | | SECONDARY GLYCOL LOOP | |
| DSGN | | | | |
| QC | <i>R. Williams</i> | | | |
| ENGR | | | | |
| APP | | | | |
| FEC | | | | |
| AUTH | | | | |
| | | | | |
| CSM | 104 | SIZE | ENG NO | 4.4 |
| 93.5 X 34 | | PAGE | SHEET 1 OF 1 | |

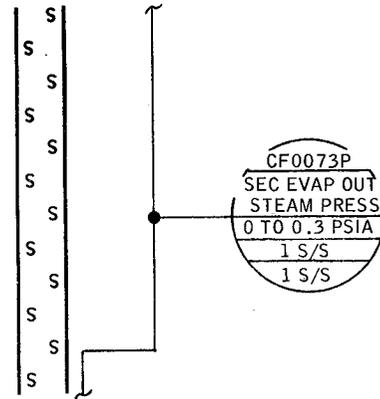
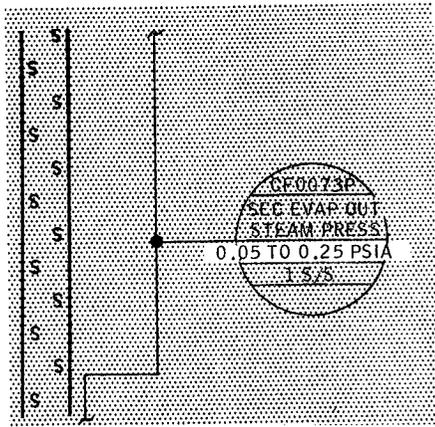


SECTION 4

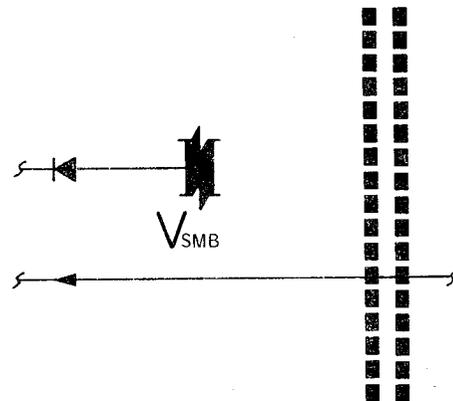
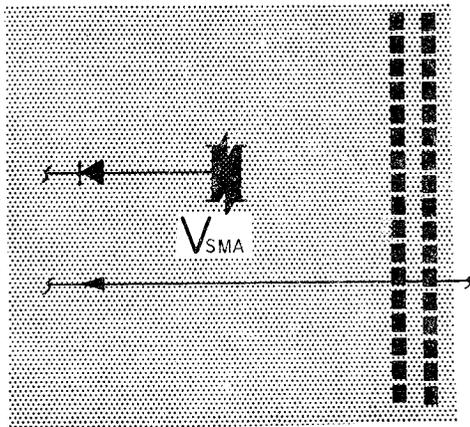
IS

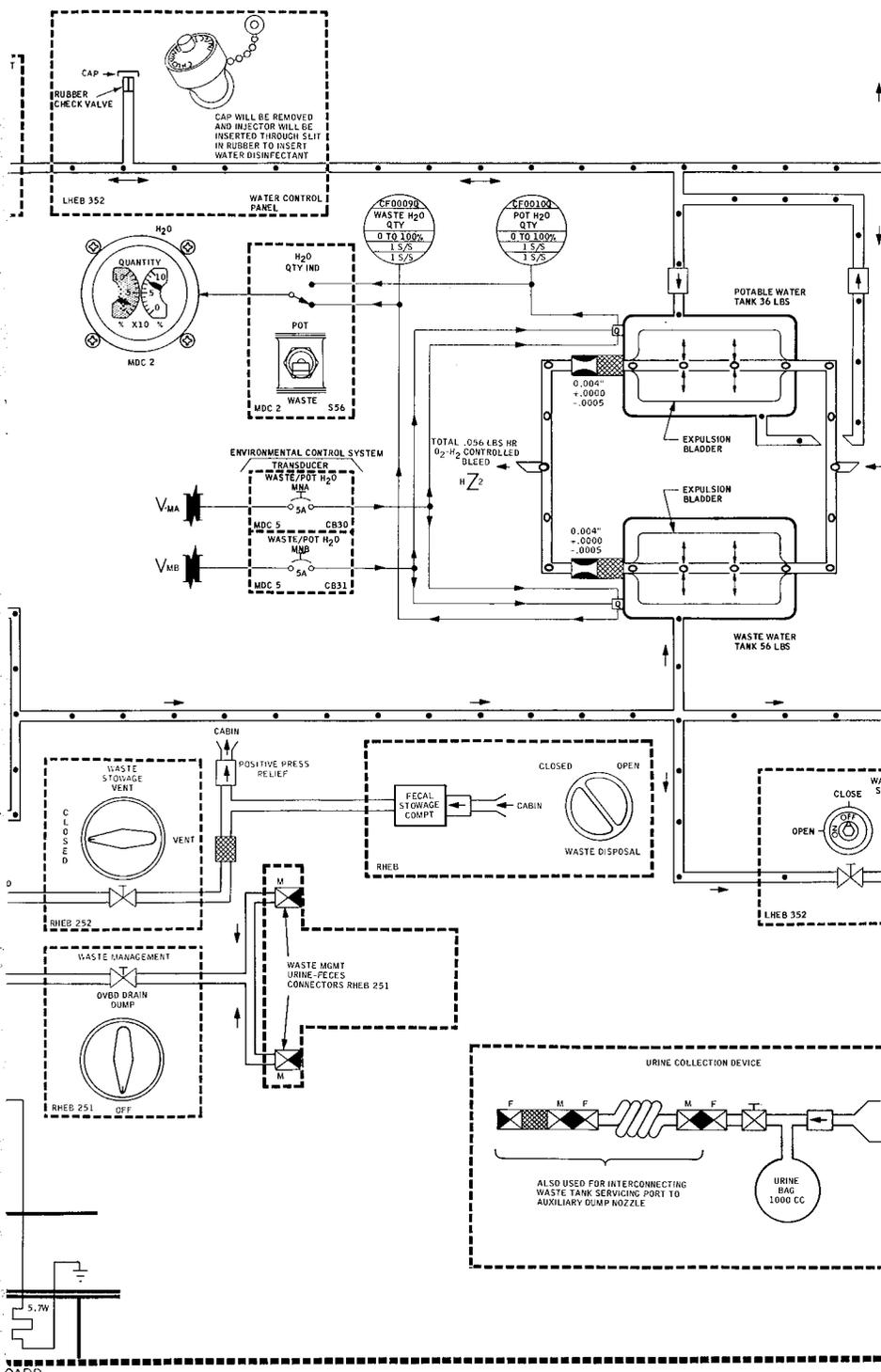
WAS

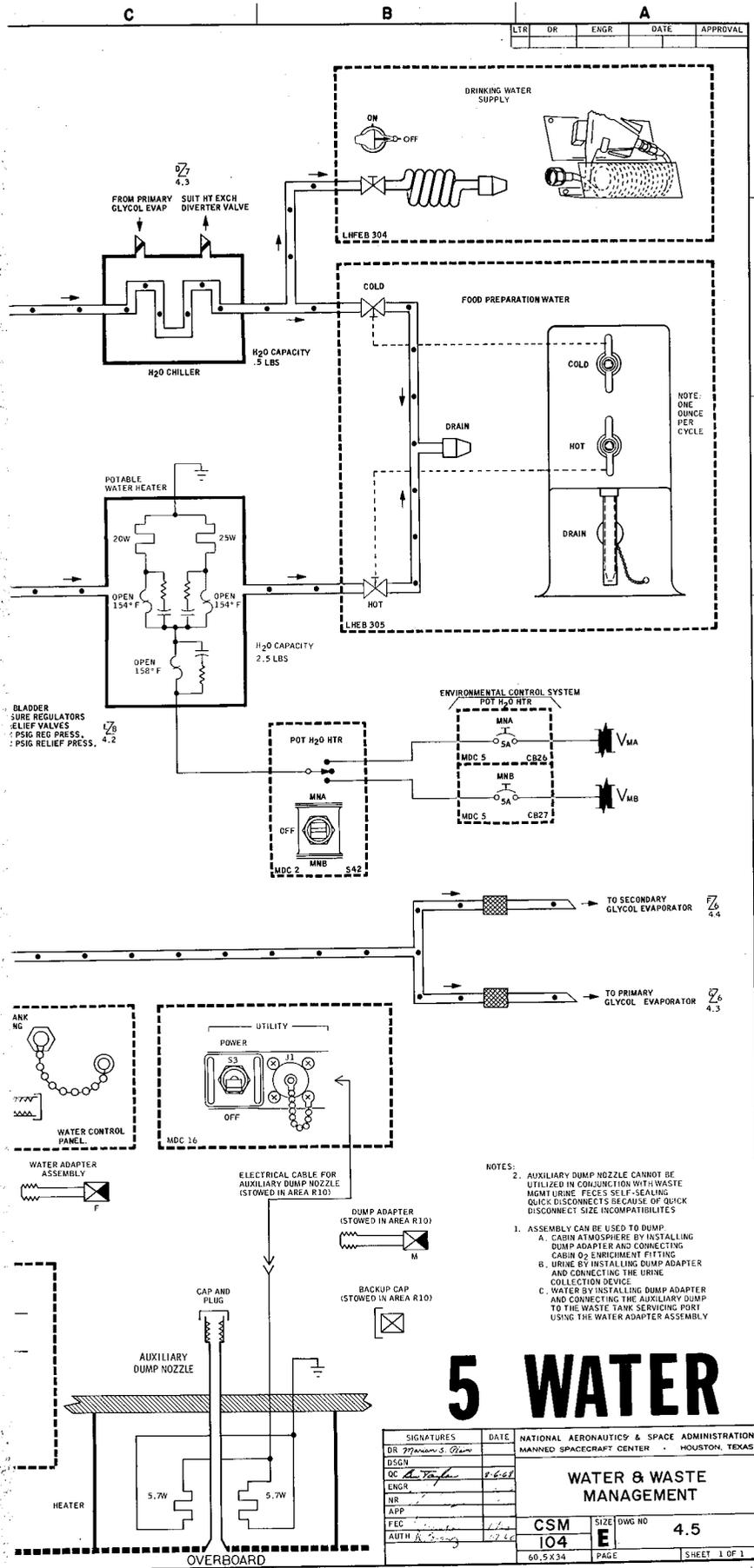
2. DWG 4.4 FZ₃



3. DWG 4.4 KZ₃







BLADDER
SURE REGULATORS
RELIEF VALVES
PSIG REG PRESS.
PSIG RELIEF PRESS.

4.2

ANK
NC

WATER CONTROL
PANEL

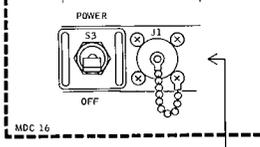
WATER ADAPTER
ASSEMBLY

HEATER

5.7W

5.7W

OVERBOARD



UTILITY
POWER

MDC 16

OFF

OFF

OFF

OFF

OFF

OFF

OFF

OFF

OFF

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

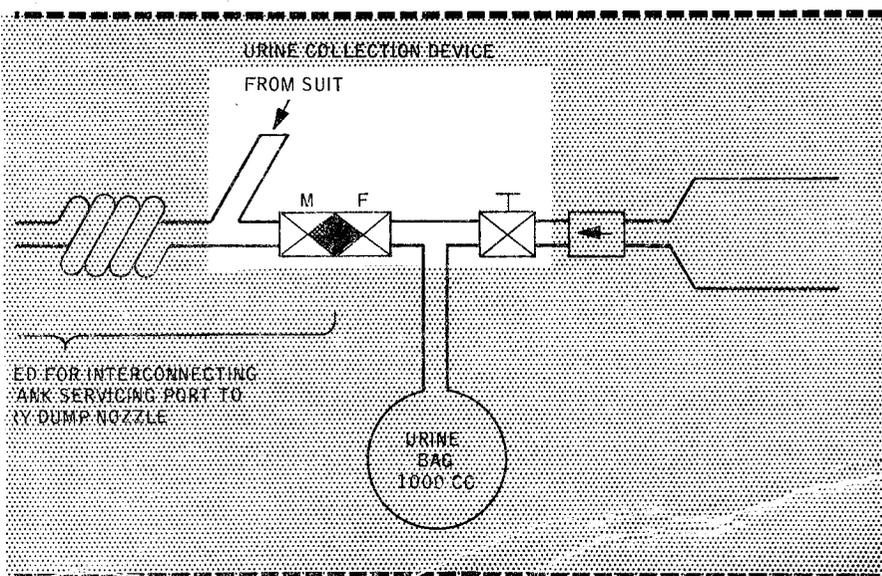
5 WATER

| SIGNATURES | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | |
|-------------------------|--------|--|-------------------|
| DR <i>Manan S. Chaw</i> | | | |
| DSGN | | | |
| QC <i>De Taylor</i> | 8/6/68 | | |
| ENGR | | | |
| NR | | | |
| APP | | | |
| FEC | | | |
| AUTH <i>R. S. Boney</i> | 12/60 | | |
| | | CSM | SIZE DWG NO 4.5 |
| | | 104 | E |
| | | 60-5X34 | PAGE SHEET 1 OF 1 |

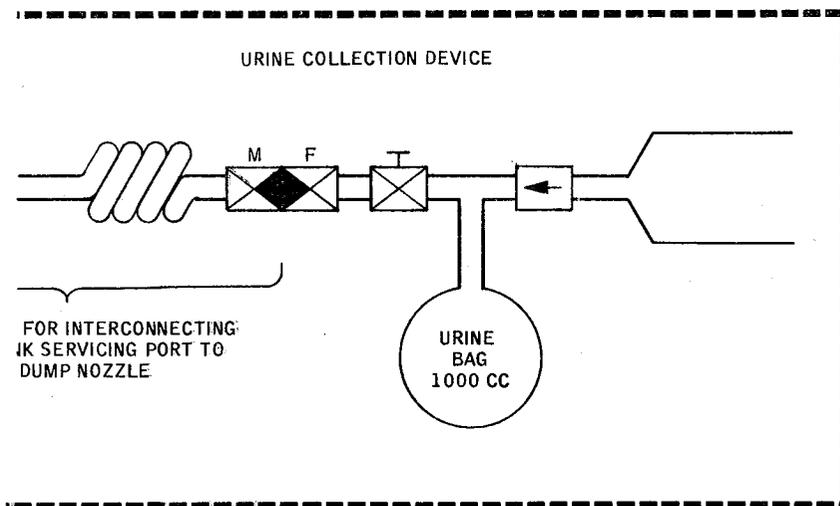
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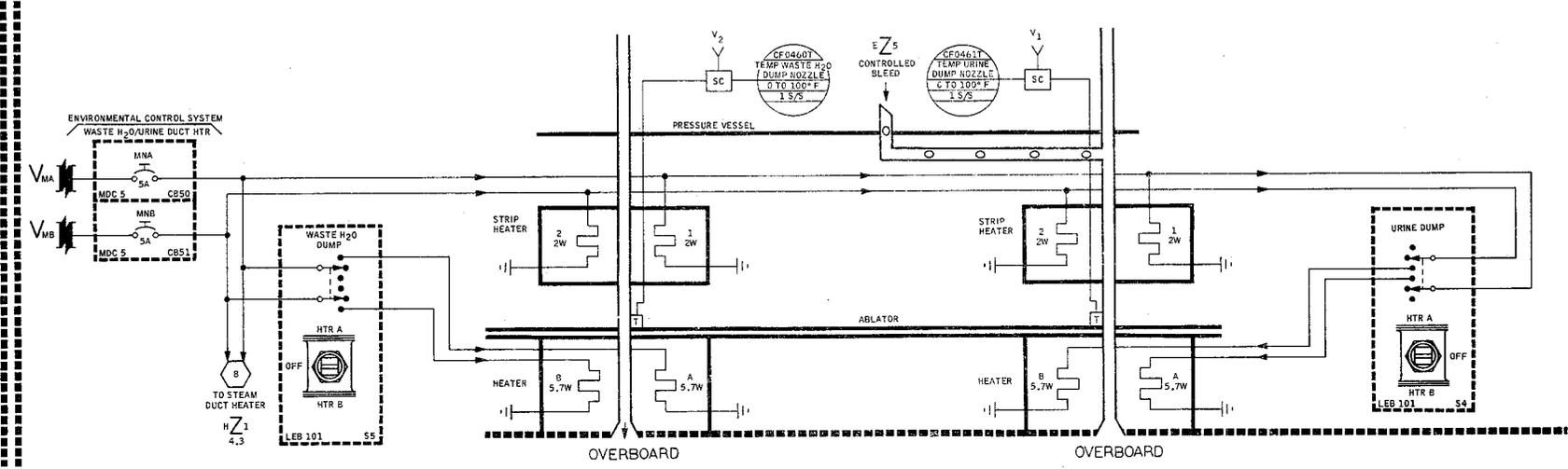
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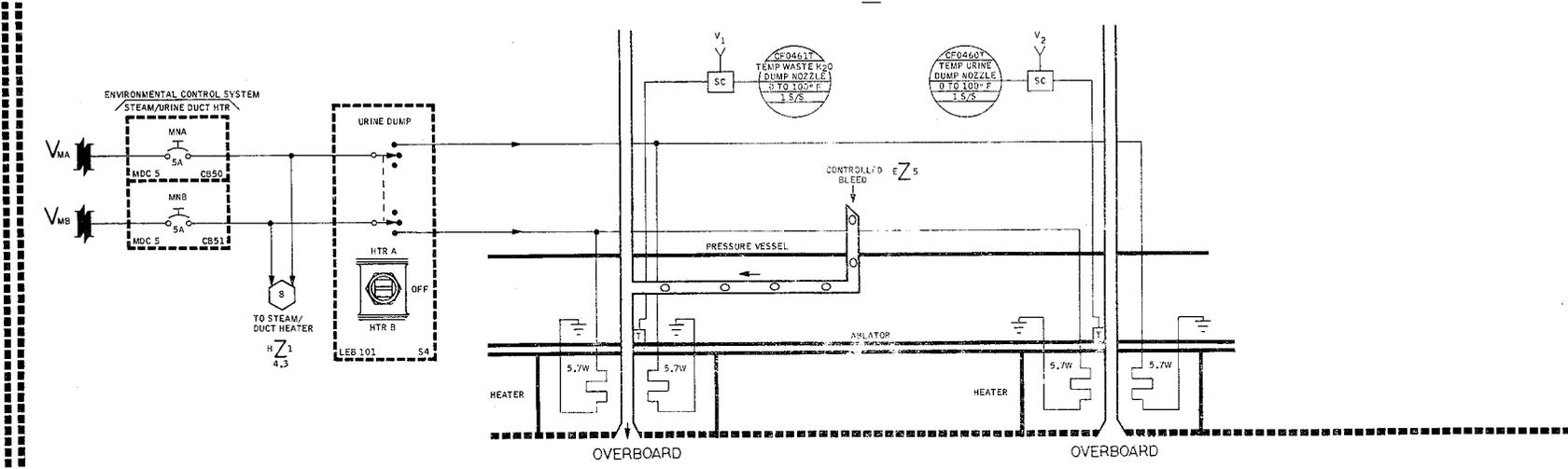


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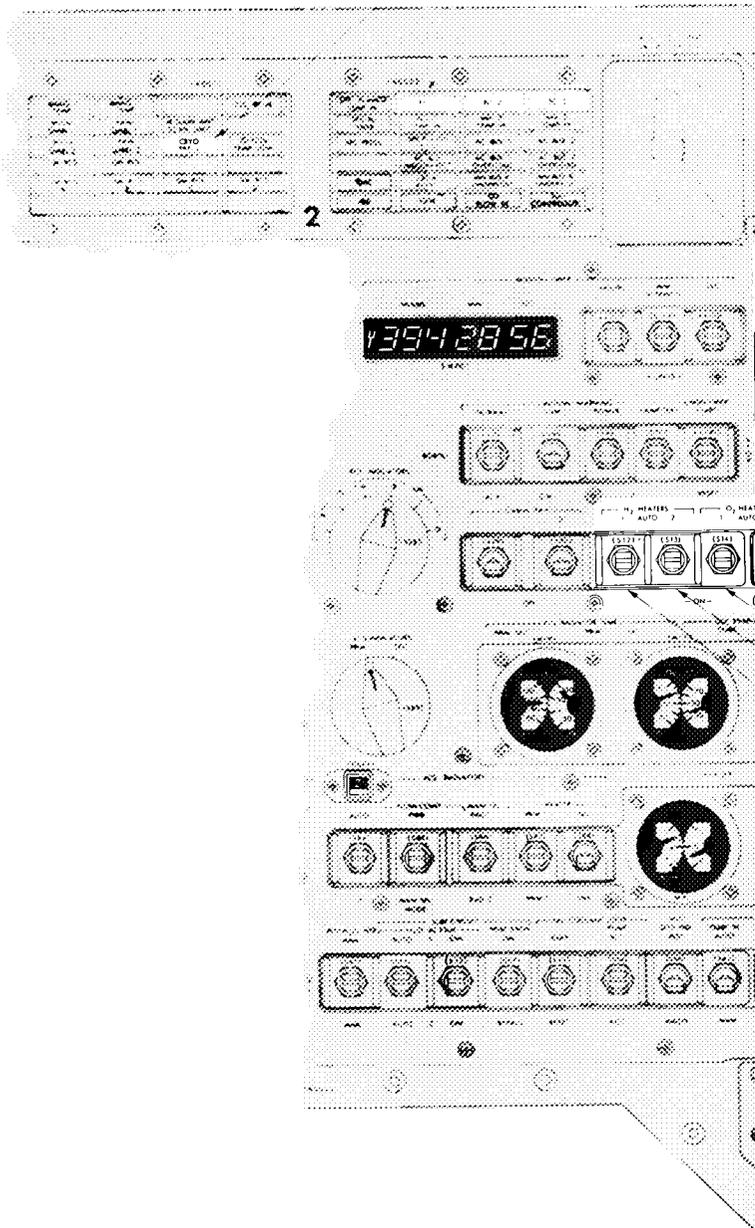




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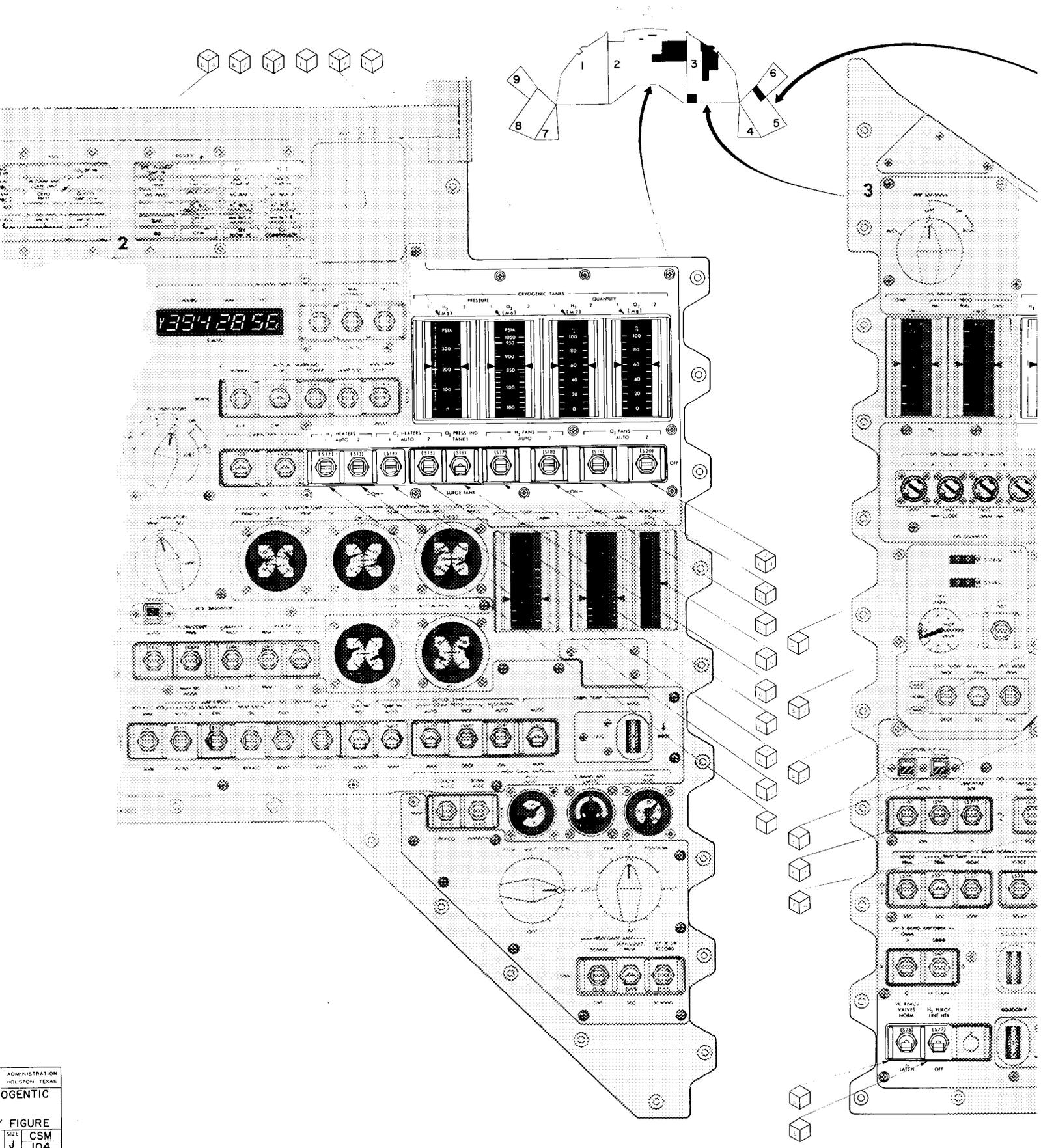
5 FUEL CELL/
CRYOGENICS
SYSTEM



NATIONAL AERONAUTICS & SPACE ADMINISTRATION
MANNING SPACEFLIGHT CENTER HOUSTON, TEXAS

**FUEL CELL / CRYOGENIC
SYSTEM
CONTROL-DISPLAY FIGURE**

| | | | | |
|----------|---------|------|---|-------|
| DRW. NO. | FIG 5.1 | SIZE | J | CSM |
| SHEET | OF | PAGE | | SCALE |

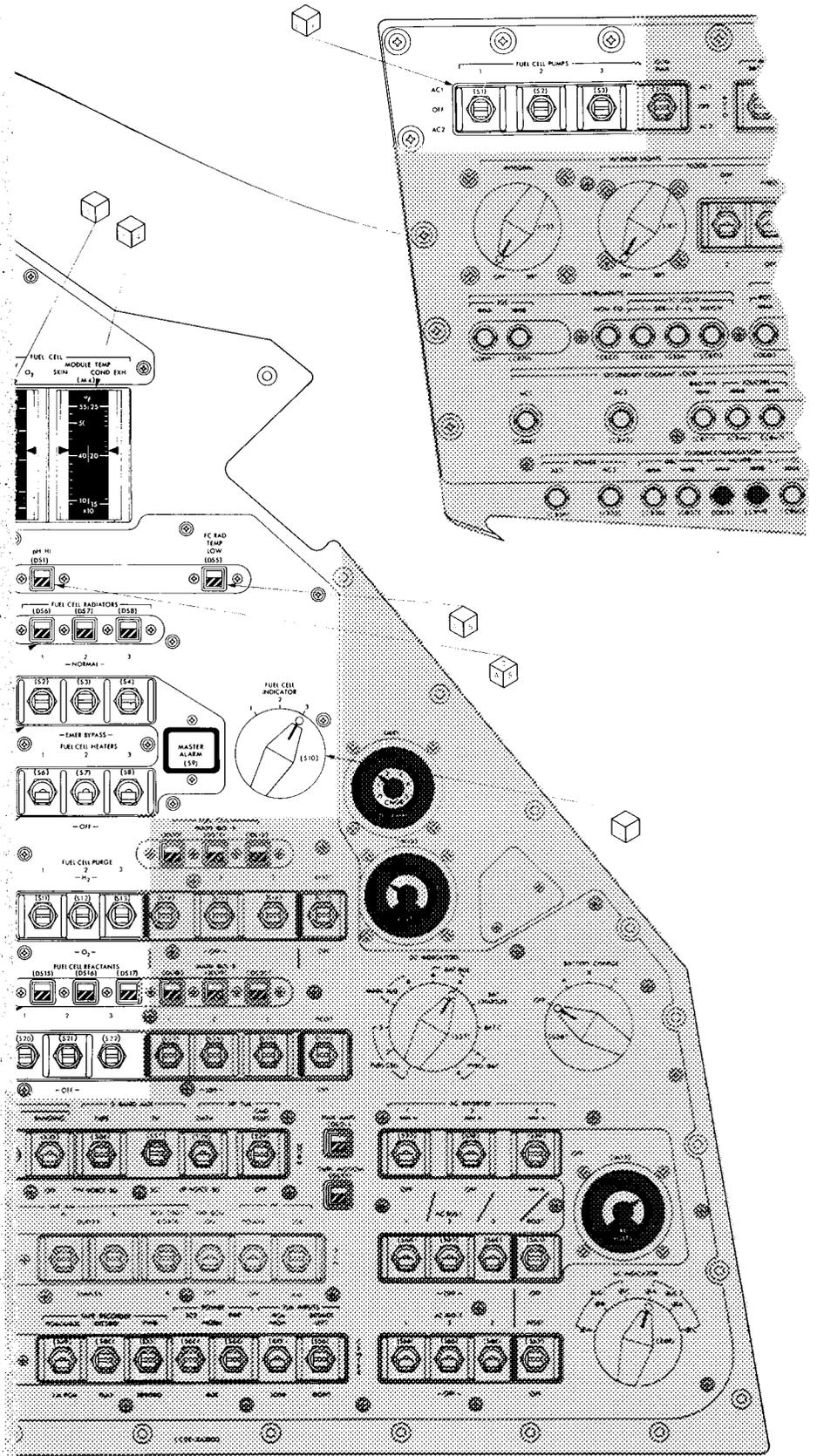


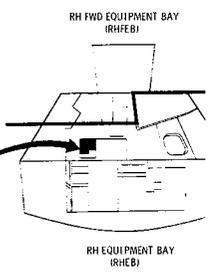
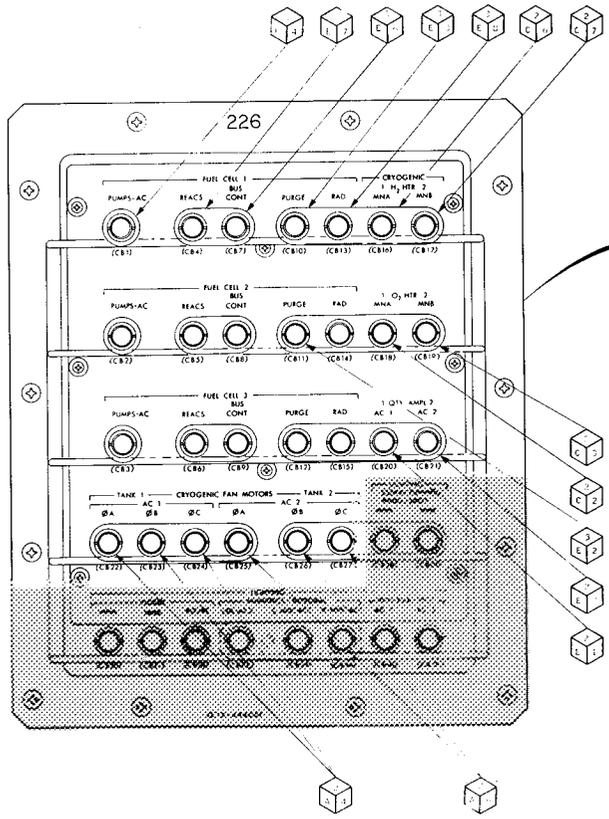
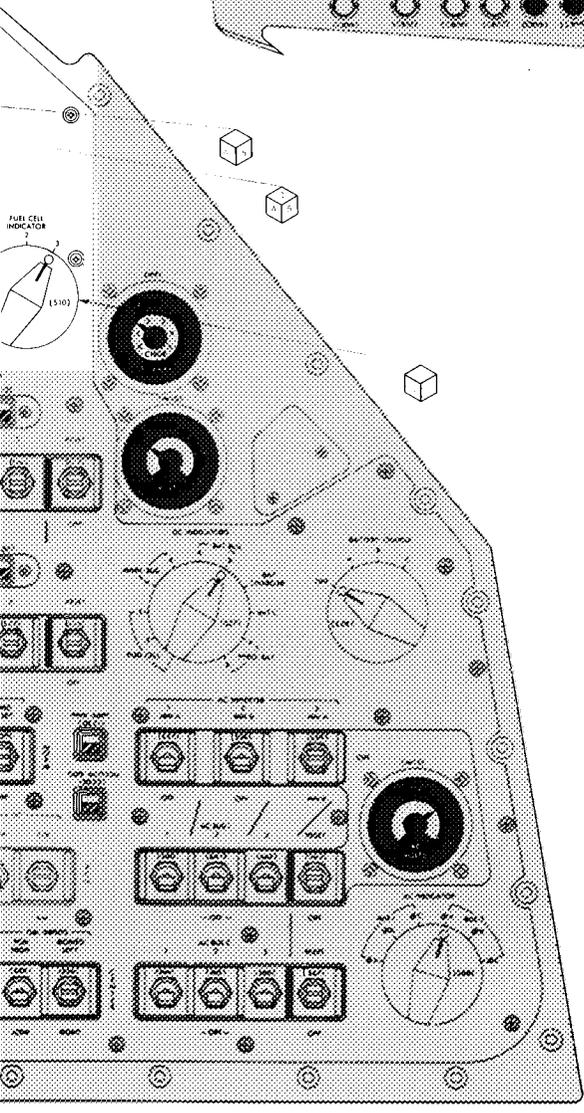
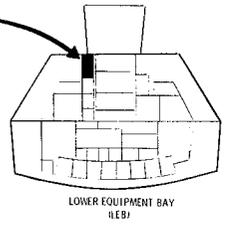
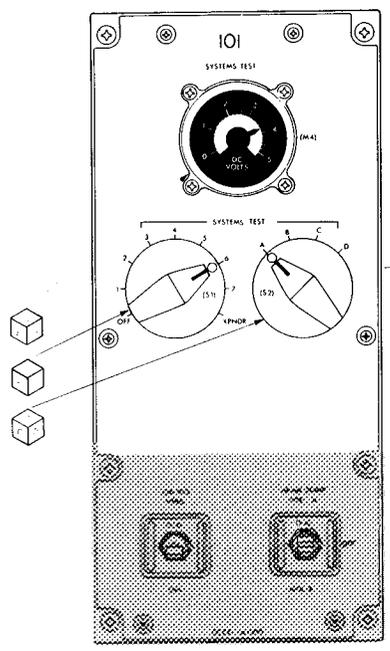
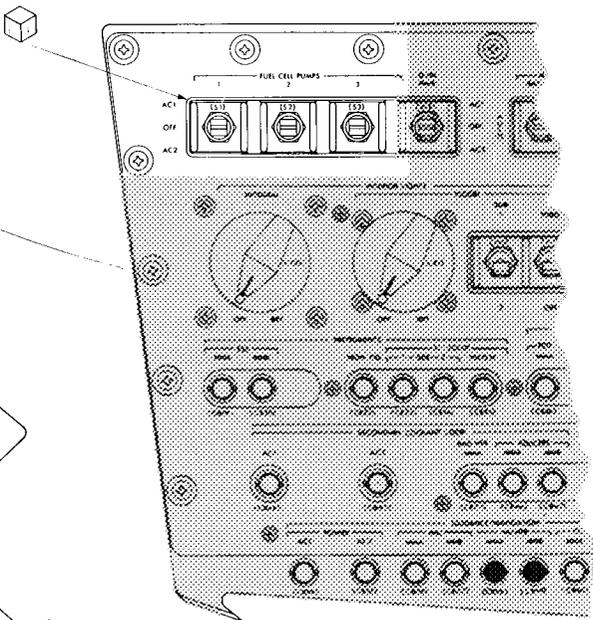
ADMINISTRATION
HOUSTON TEXAS

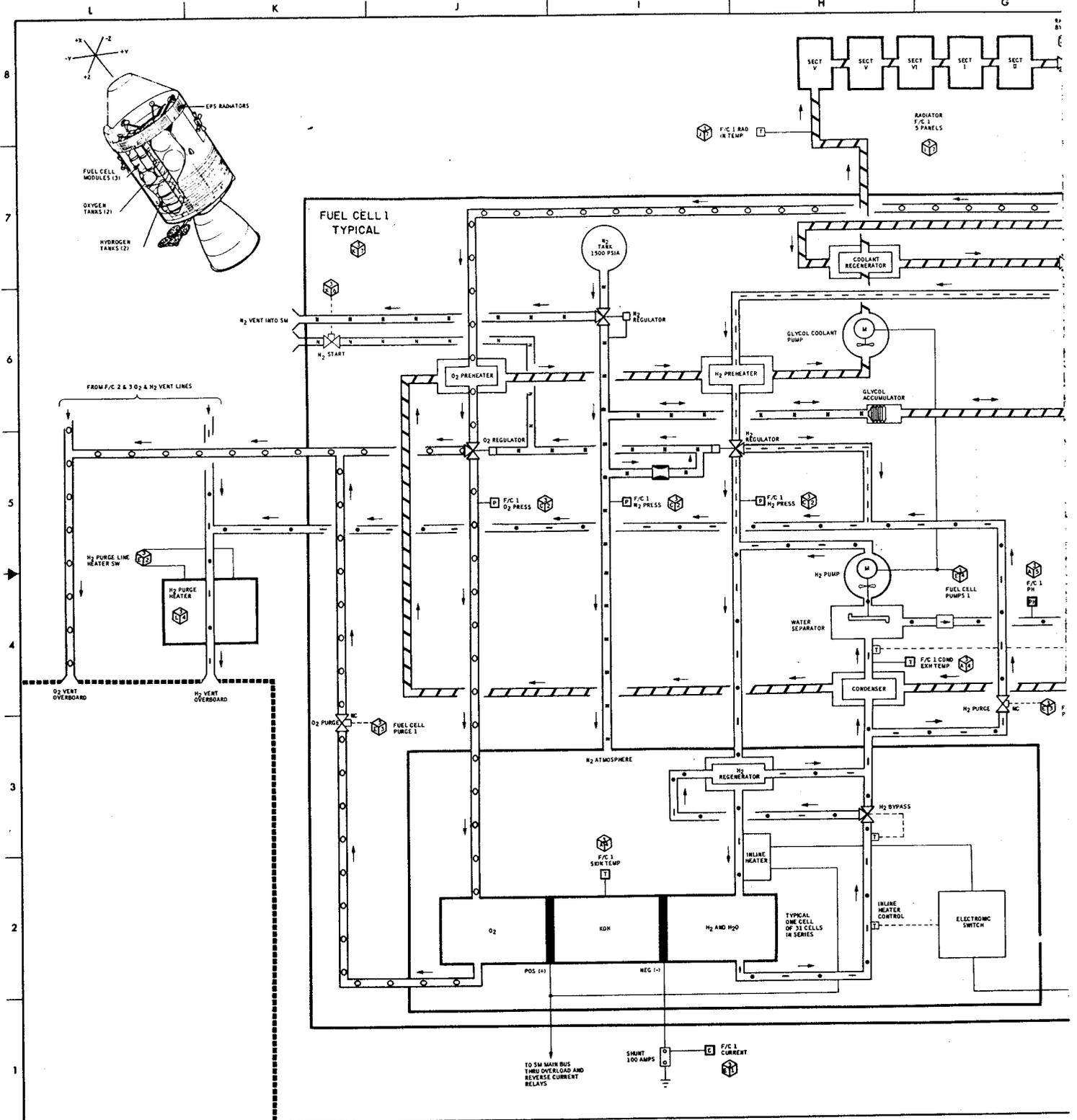
OGENTIC

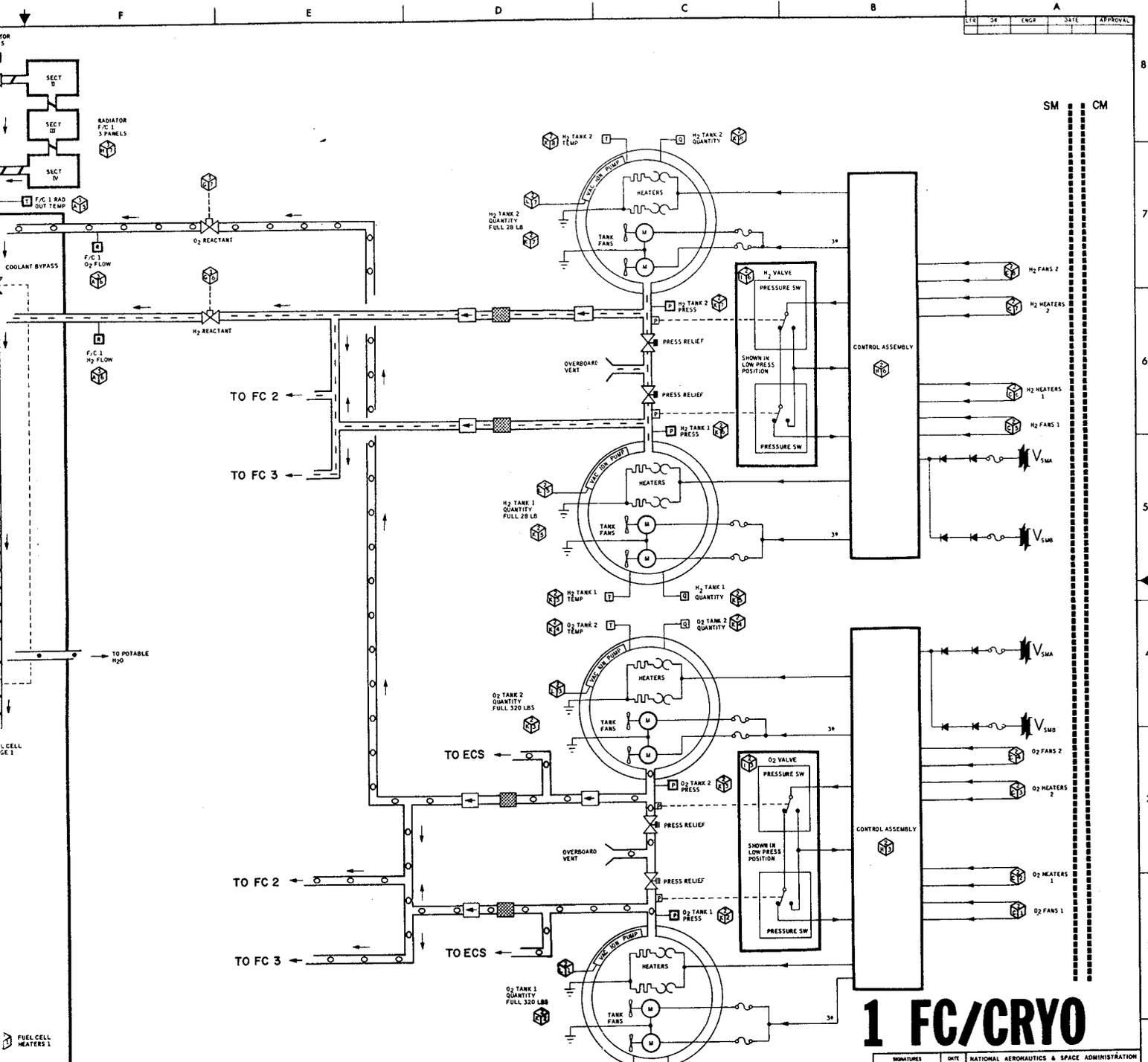
FIGURE

| | |
|-------|-----|
| SIZE | CSM |
| J | 104 |
| SCALE | |



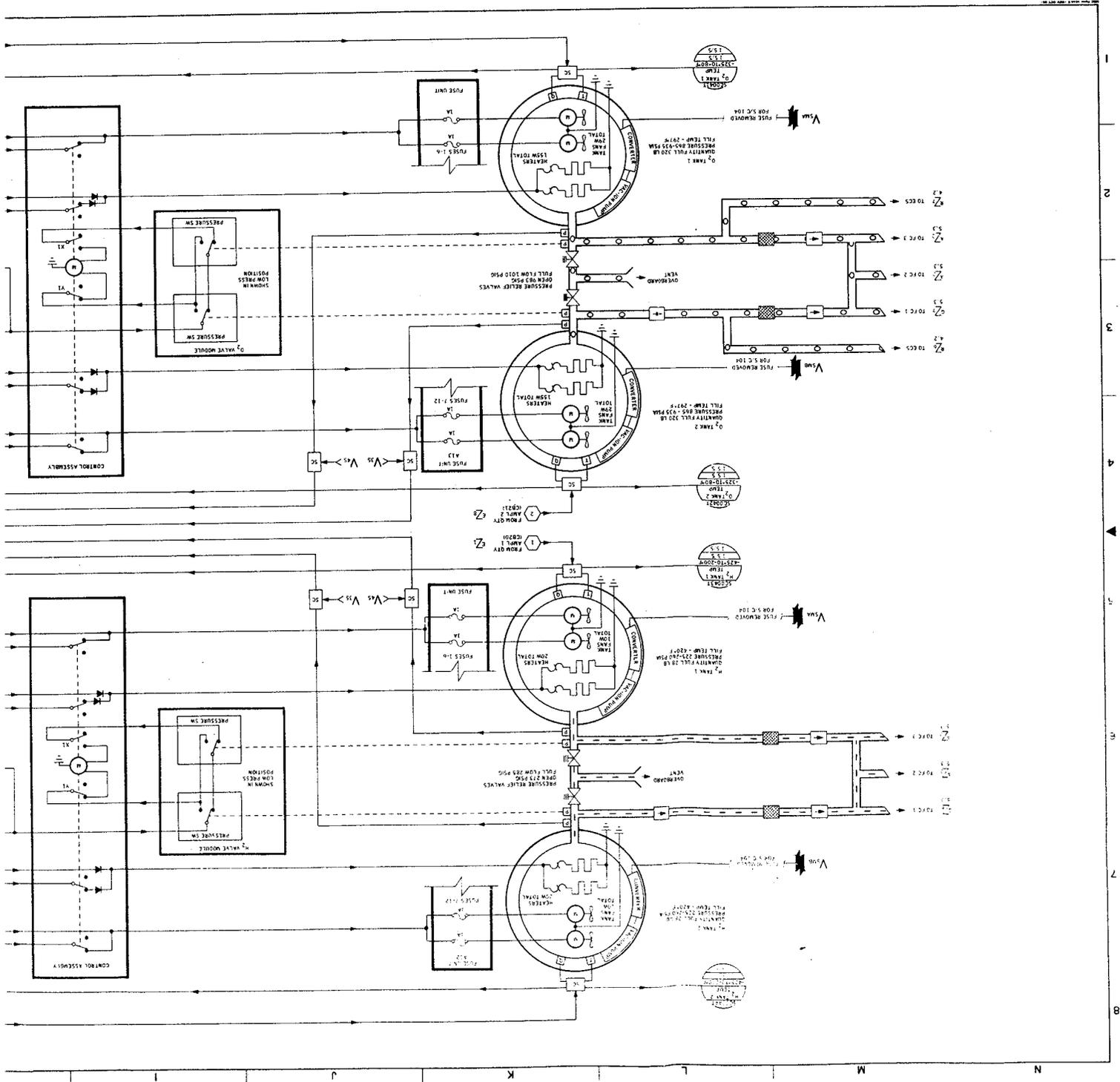




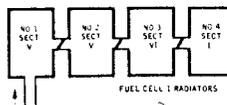
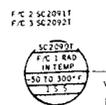
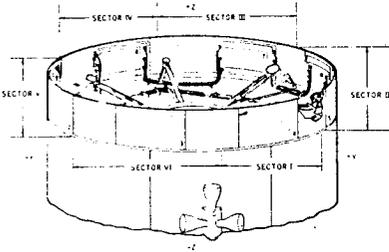


1 FC/CRYO

| | | | | | |
|-------------------------|--|------|--|---|--------------|
| SIGNATURES | | DATE | | NATIONAL AERONAUTICS & SPACE ADMINISTRATION | |
| DR <i>J. J. Daley</i> | | | | MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | |
| DCR | | | | FUEL CELL/CRYOGENIC OVERVIEW | |
| ENGR <i>[Signature]</i> | | | | | |
| SR <i>[Signature]</i> | | | | | |
| APP <i>[Signature]</i> | | | | | |
| FEC <i>[Signature]</i> | | | | | |
| AUTH <i>[Signature]</i> | | | | CSM | DRG NO. |
| | | | | 104 | J |
| | | | | 5.1 | |
| | | | | 34 X 66 | PAGE |
| | | | | | SHEET 1 OF 1 |

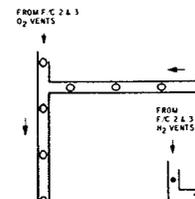
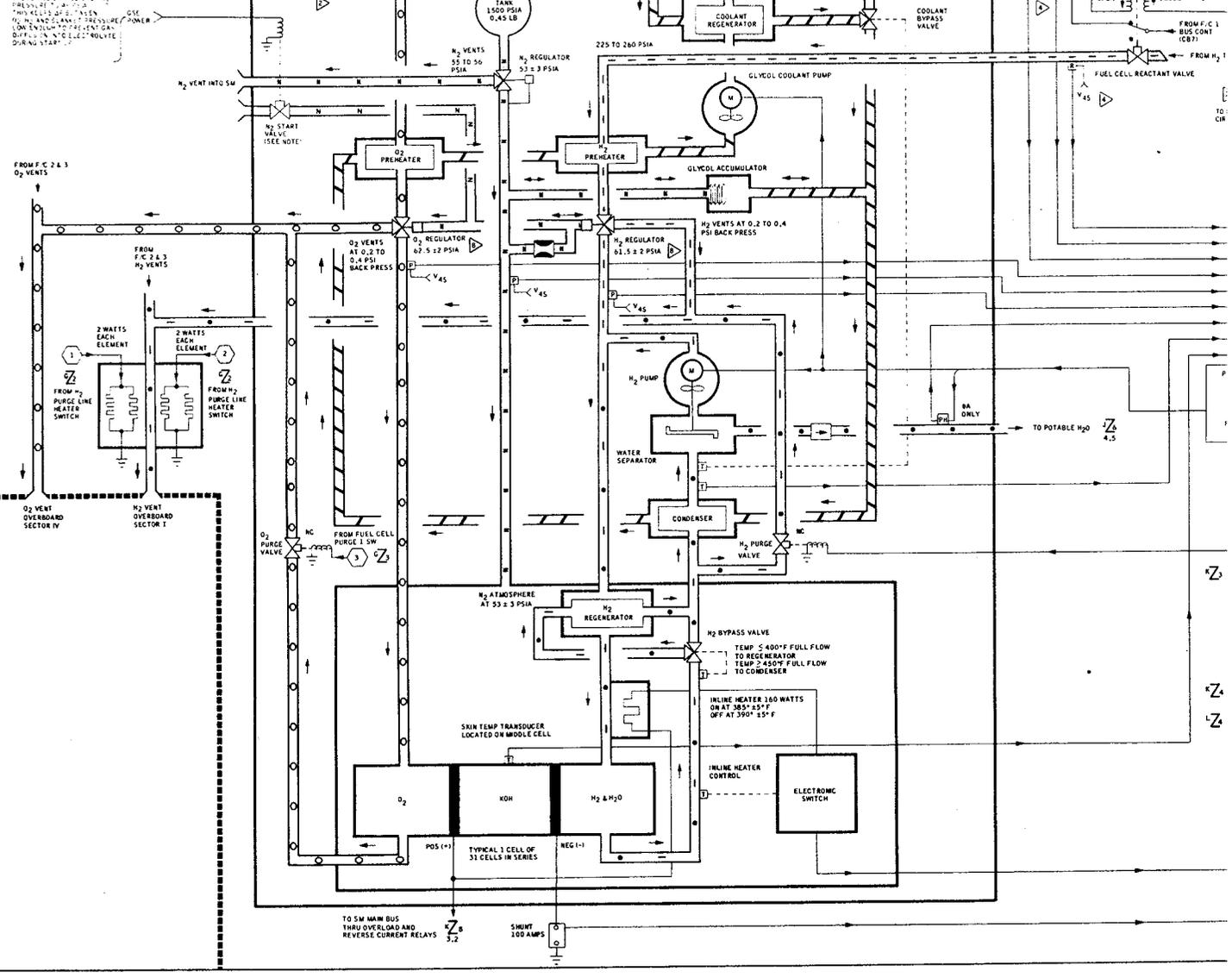


EPS RADIATOR LOCATION



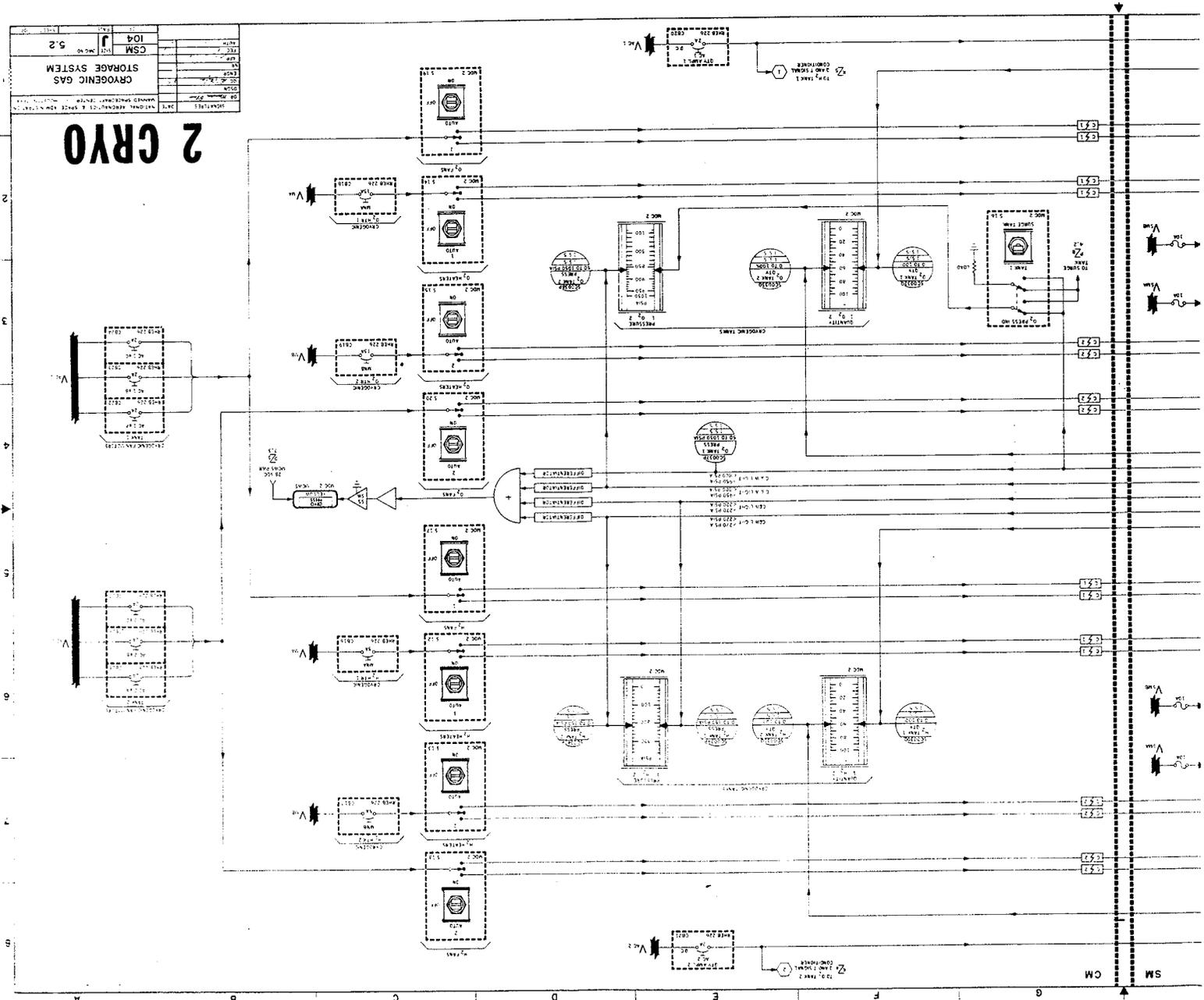
N₂ START VALVE: VALVE ANYTIME TO STOP N₂ PRESSURE IN FUEL CELL. TWO RELEASES ARE PROVIDED. N₂ NO. 1 AND 2 ARE PRESSURE RELEASES. N₂ NO. 3 IS TO PREVENT GAS DIFFUSION IN TO CELL DURING STARTUP.

FUEL CELL 1 TYPICAL

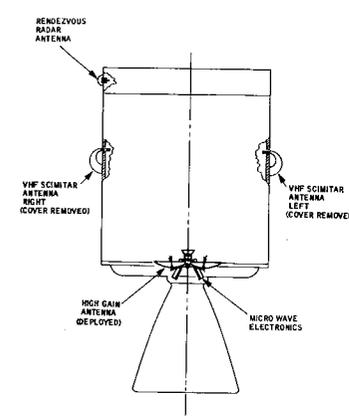
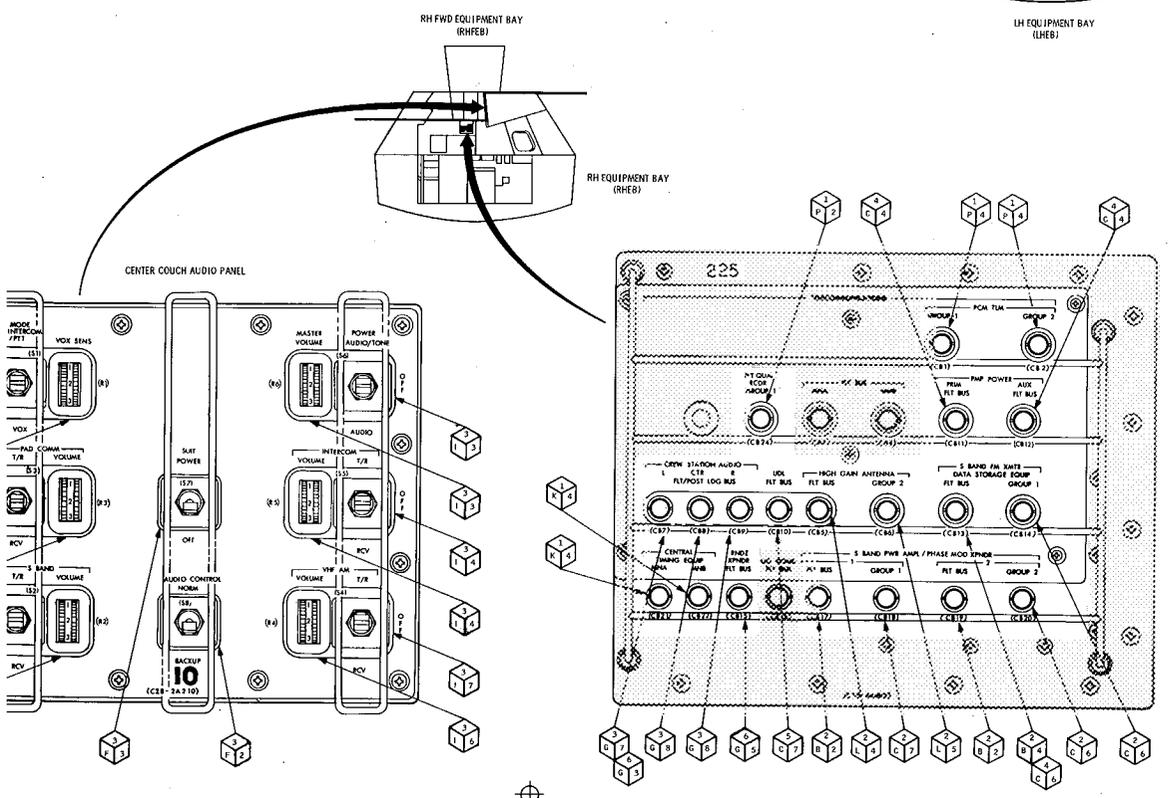
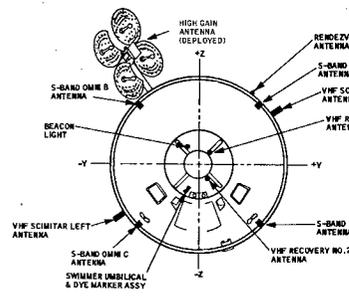
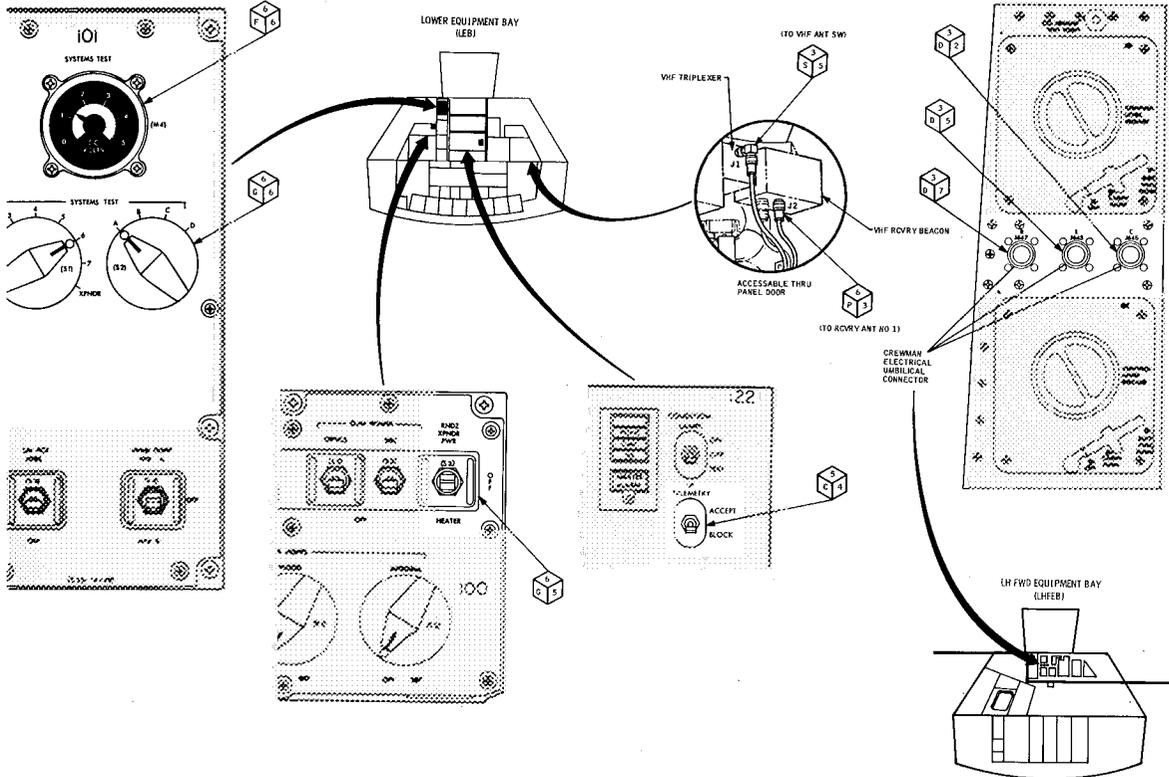


| | | |
|----------|----------------|----------------|
| DATE | APPROVED | DESIGNED |
| 10/15/52 | [Signature] | [Signature] |
| PROJECT | STORAGE SYSTEM | STORAGE SYSTEM |
| REV. | 104 | 5.2 |
| BY | | |
| CHECKED | | |
| APPROVED | | |
| DATE | | |

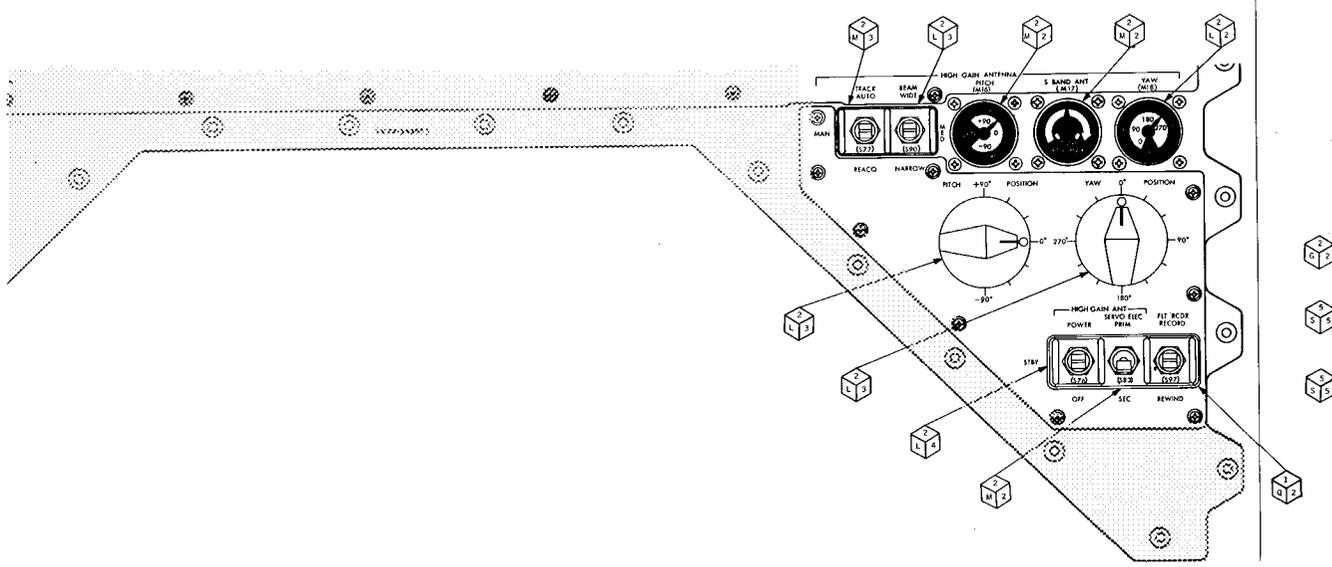
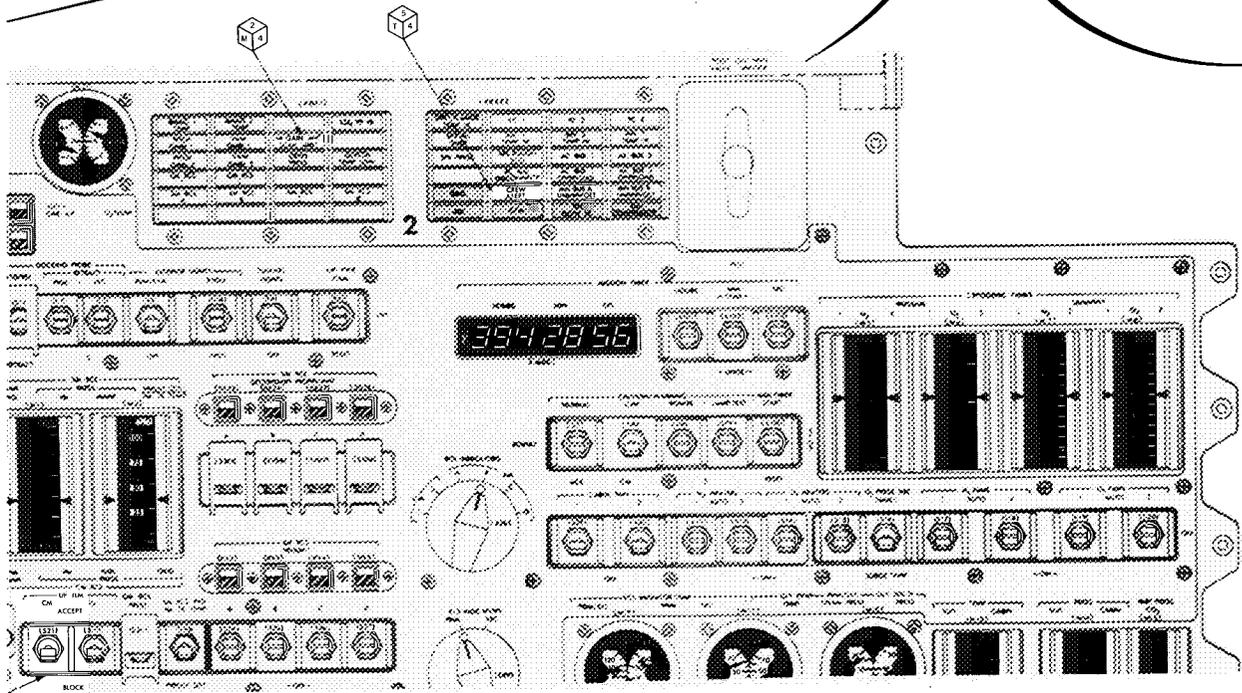
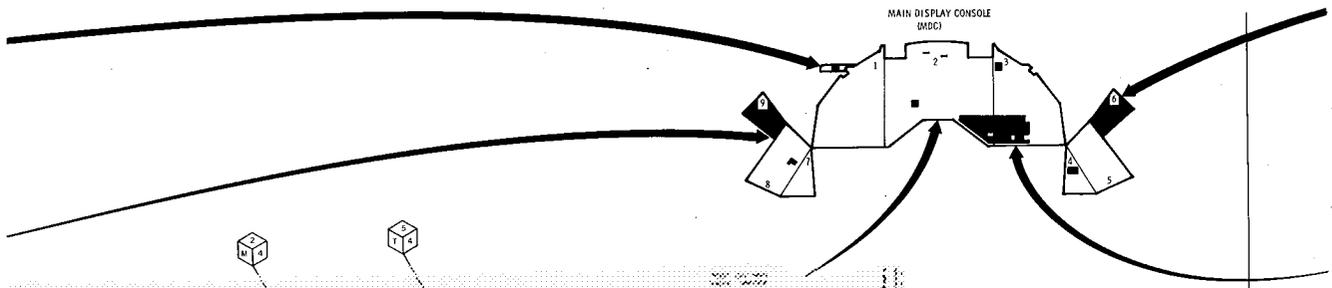
2 CRYO

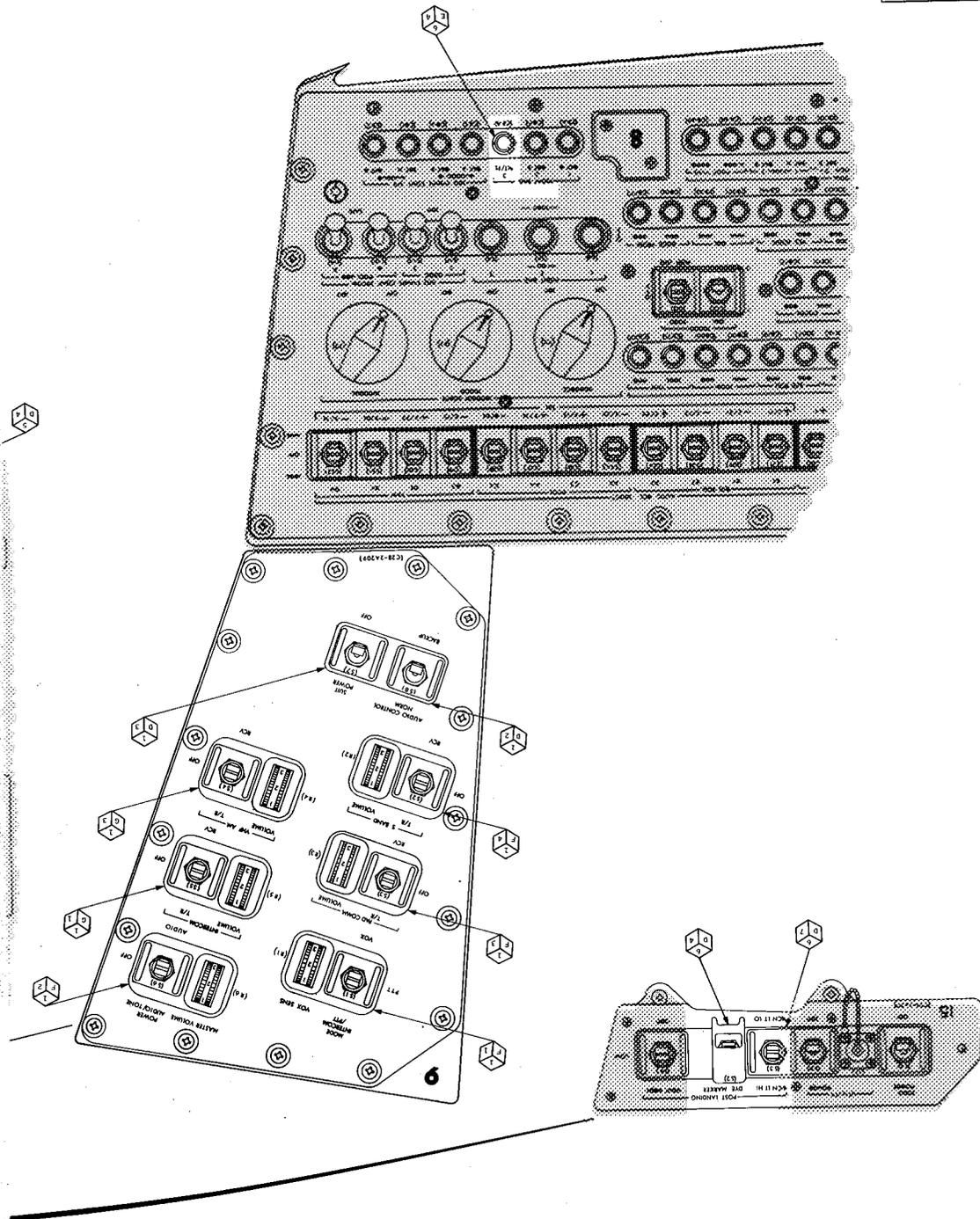


6 COMMUNI-
CATIONS
SYSTEM



MAIN DISPLAY CONSOLE (MDC)



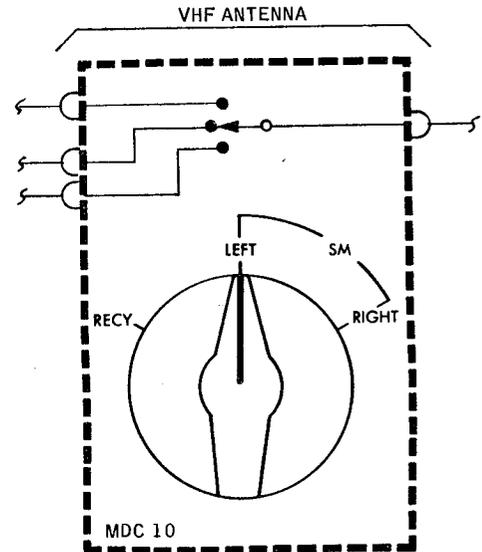
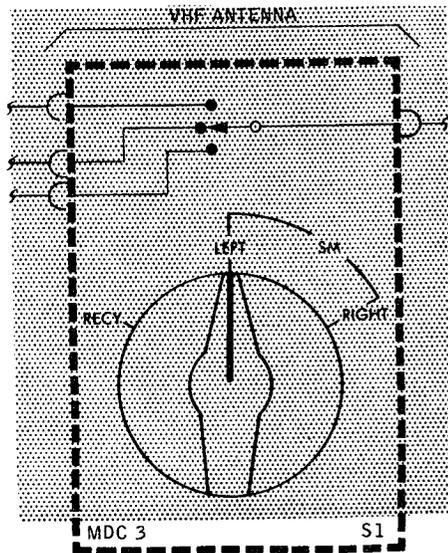


SECTION 6

IS

WAS

1. DWG 6.1 KZ^{9,8}



2. DWG 6.1 T,SZ¹



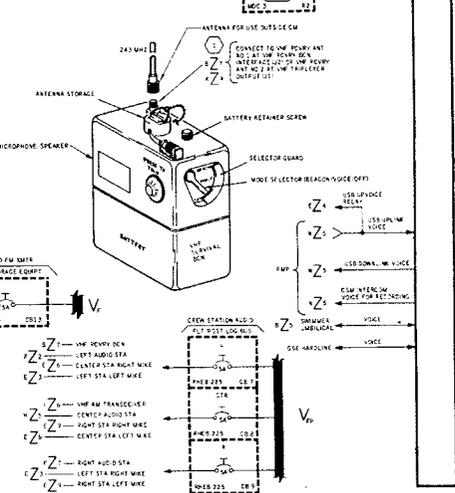
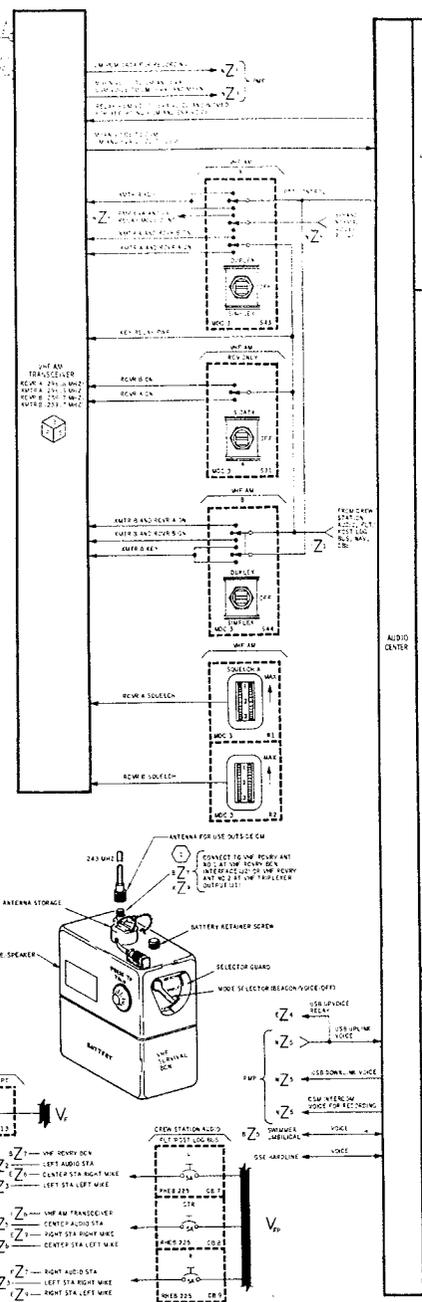
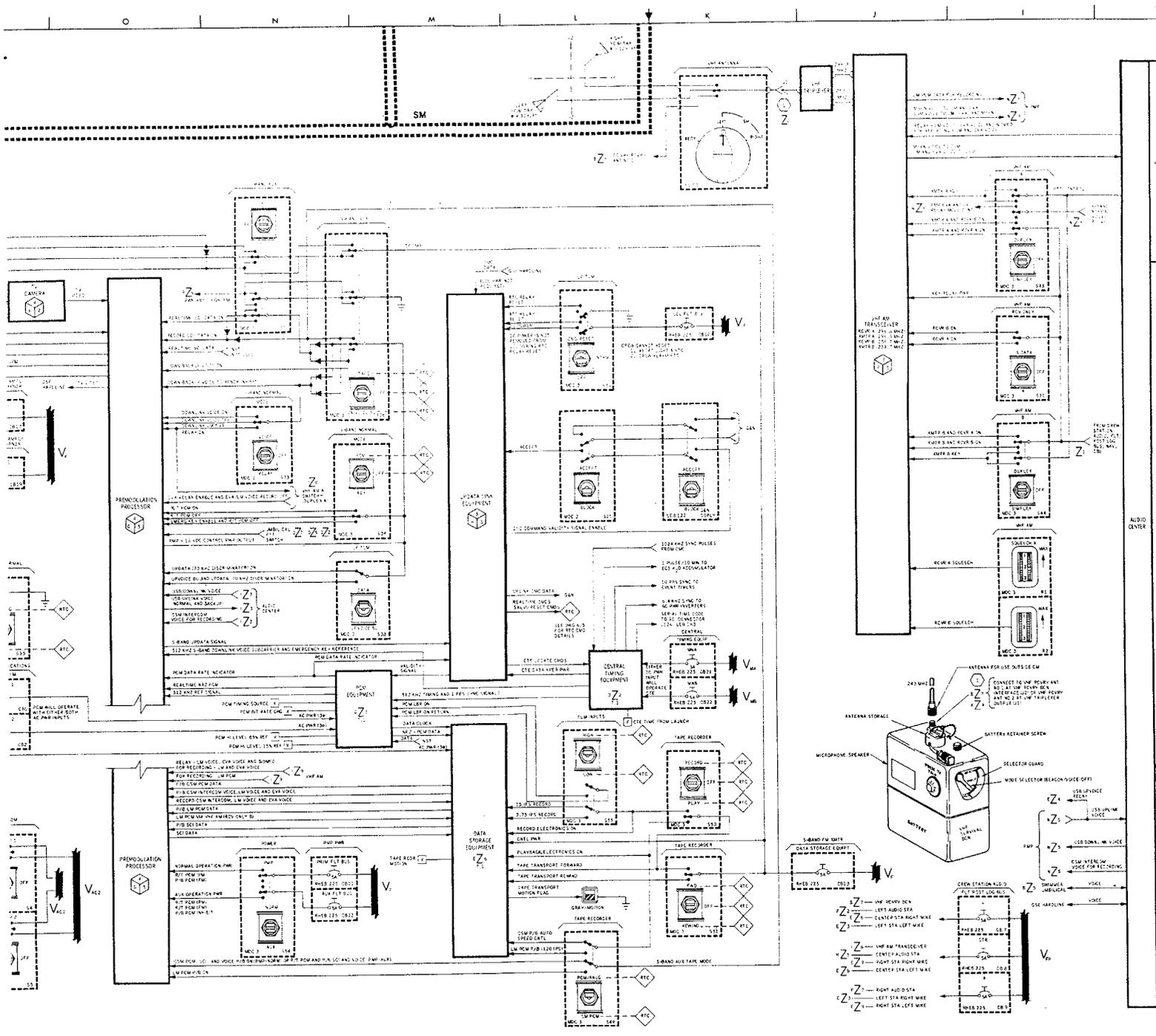
- A - (2.1 TO 5 VDC)
- B - RCVR AGC (0 TO 4.5 VDC)
- C - FREQ LOCK (4 TO 5 VDC, OPERATE MODE & LOCKED)

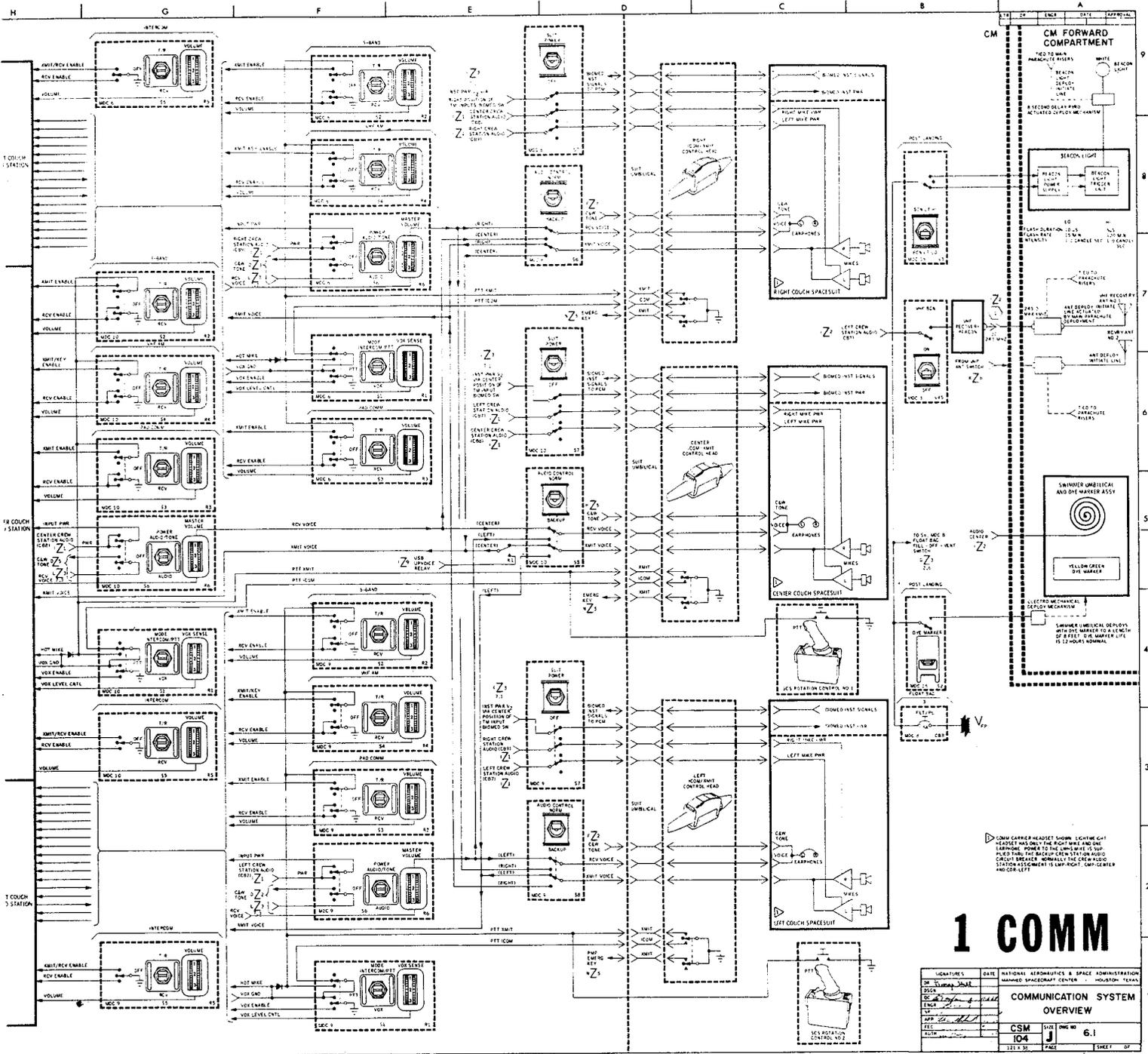


- A - (2.5 TO 5 VDC)
- B - RCVR AGC (0 TO 4.5 VDC)
- C - FREQ LOCK (4.5 VDC)
- D - RCVR AGC (0 TO 4.5 VDC)

NOTE

B READOUT IS TEST AGC
AND D READOUT IS RECEIVED
AGC VIA ANTENNA





1 COMM

| SIGNATURE | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION |
|--------------------------------------|------|---|
| Dr. William S. ... | | MANNED SPACECRAFT CENTER - HOUSTON, TEXAS |
| COMMUNICATION SYSTEM OVERVIEW | | |
| CSM | 104 | 6.1 |
| 118 x 31 | PAGE | SHEET OF |

AUDIO STATION MODE

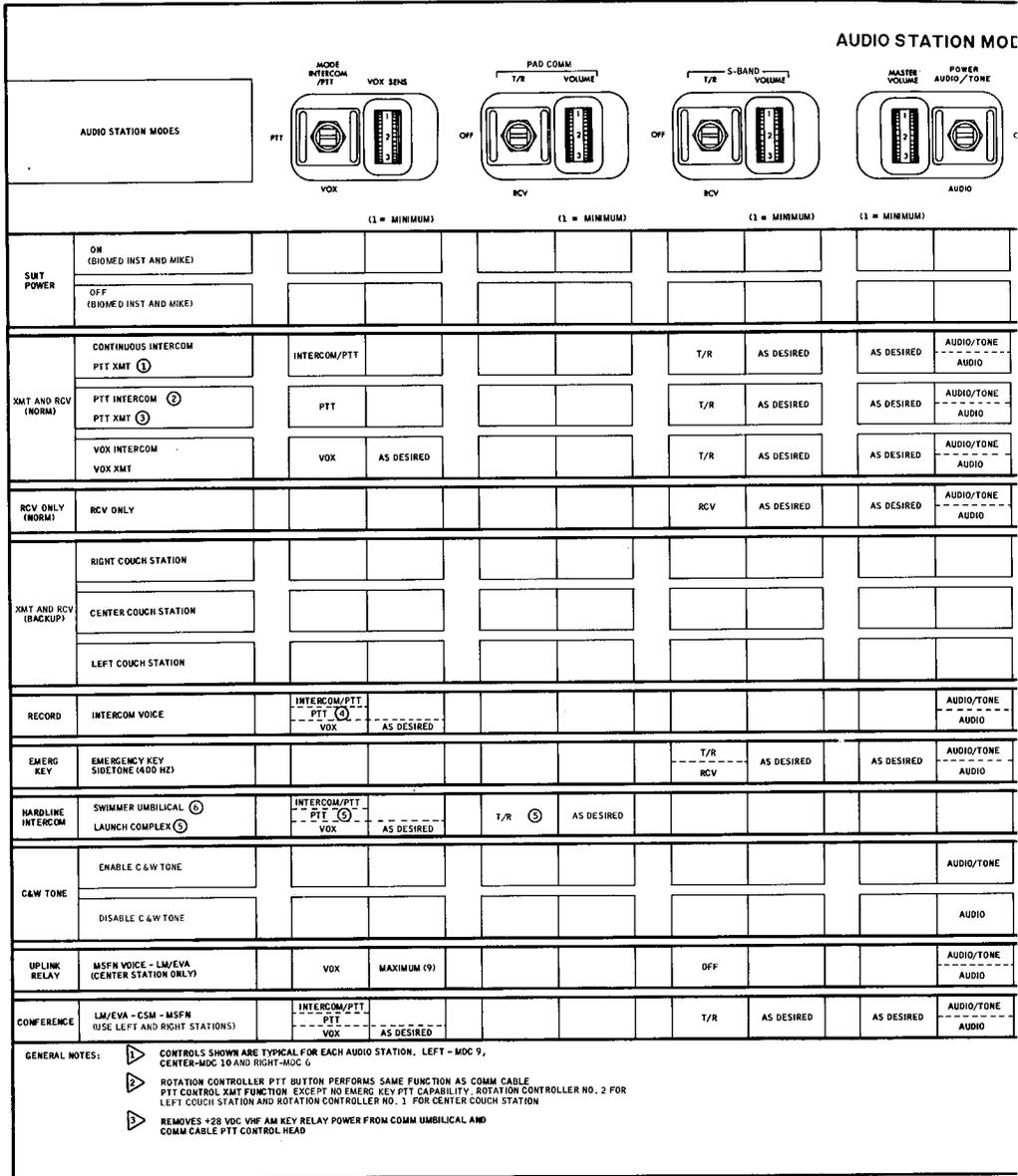
| AUDIO STATION MODES | | MODE INTERCOM / PTT VOX SENS | | PAD COMM T/R VOLUME | | S-BAND T/R VOLUME | | MASTER VOLUME | | POWER AUDIO/TONE | |
|----------------------|---|------------------------------|-------------|---------------------|-------|-------------------|------------|---------------|------------|------------------|------------------|
| | | PTT | VOX | OFF | RCV | OFF | RCV | | | | AUDIO |
| | | (1 = MINIMUM) | | (1 = MINIMUM) | | (1 = MINIMUM) | | (1 = MINIMUM) | | | |
| SUIT POWER | ON (BIDMED INST AND MIKE) | | | | | | | | | | |
| | OFF (BIDMED INST AND MIKE) | | | | | | | | | | |
| XMT AND RCV (NORM) | CONTINUOUS INTERCOM PTT XMT ① | INTERCOM/PTT | | | | T/R | AS DESIRED | | AS DESIRED | AS DESIRED | AUDIO/TONE AUDIO |
| | PTT INTERCOM ② PTT XMT ③ | PTT | | | | T/R | AS DESIRED | | AS DESIRED | AS DESIRED | AUDIO/TONE AUDIO |
| | VOX INTERCOM VOX XMT | VOX AS DESIRED | | | | T/R | AS DESIRED | | AS DESIRED | AS DESIRED | AUDIO/TONE AUDIO |
| RCV ONLY (NORM) | RCV ONLY | | | | | RCV | AS DESIRED | | AS DESIRED | AS DESIRED | AUDIO/TONE AUDIO |
| XMT AND RCV (BACKUP) | RIGHT COUCH STATION | | | | | | | | | | |
| | CENTER COUCH STATION | | | | | | | | | | |
| | LEFT COUCH STATION | | | | | | | | | | |
| RECORD | INTERCOM VOICE | INTERCOM/PTT PTT ④ VOX | | AS DESIRED | | | | | | | AUDIO/TONE AUDIO |
| EMERG KEY | EMERGENCY KEY SIDETONE (400 HZ) | | | | | T/R RCV | AS DESIRED | | AS DESIRED | AS DESIRED | AUDIO/TONE AUDIO |
| HARDLINE INTERCOM | SWIMMER UMBILICAL ⑤ LAUNCH COMPLEX ⑥ | INTERCOM/PTT PTT ⑤ VOX | | AS DESIRED | T/R ⑤ | AS DESIRED | | | | | |
| C&W TONE | ENABLE C&W TONE | | | | | | | | | | AUDIO/TONE |
| | DISABLE C&W TONE | | | | | | | | | | AUDIO |
| UPLINK RELAY | MSFN VOICE - LM/EVA (CENTER STATION ONLY) | VOX | MAXIMUM (9) | | | OFF | | | | | AUDIO/TONE AUDIO |
| CONFERENCE | LM/EVA - CSM - MSFN (USE LEFT AND RIGHT STATIONS) | INTERCOM/PTT PTT VOX | | AS DESIRED | | T/R | AS DESIRED | | AS DESIRED | AS DESIRED | AUDIO/TONE AUDIO |

GENERAL NOTES:

- ▶ CONTROLS SHOWN ARE TYPICAL FOR EACH AUDIO STATION. LEFT - MDC 9, CENTER-MDC 10 AND RIGHT-MDC 6
- ▶ ROTATION CONTROLLER PTT BUTTON PERFORMS SAME FUNCTION AS COMM CABLE PTT CONTROL. XMT FUNCTION EXCEPT NO EMERG KEY PTT CAPABILITY. ROTATION CONTROLLER NO. 2 FOR LEFT COUCH STATION AND ROTATION CONTROLLER NO. 1 FOR CENTER COUCH STATION
- ▶ REMOVES +28 VDC VHF AM KEY RELAY POWER FROM COMM UMBILICAL AND COMM CABLE PTT CONTROL HEAD

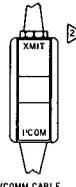
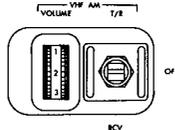
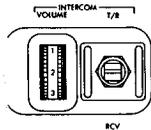
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|--|------|------------|--------------------|-------|
| NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS | | SIGNATURES | | DATE |
| AUDIO STATION AND RF EQUIPMENT MODES AND CONTROL CHARTS | | DR | | |
| | | DSGN | | |
| | | QC | <i>[Signature]</i> | 11/14 |
| | | ENGR | <i>[Signature]</i> | 10-08 |
| | | NR | <i>[Signature]</i> | 10-08 |
| OWC NO | 6.1A | SIZE | CSM | |
| | | J | 104 | |
| SHEET | OF | PAGE | | |
| | | | | |

AUDIO STATION MDC



| | | | | |
|--|------|------------|--------------------|----------|
| NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS | | SIGNATURES | | DATE |
| AUDIO STATION AND RF EQUIPMENT MODES AND CONTROL CHARTS | | DR | | |
| | | DSGH | | |
| | | DC | <i>[Signature]</i> | 11-16 |
| | | ENG | <i>[Signature]</i> | 10-28-68 |
| | | NR | <i>[Signature]</i> | 11-29 |
| | | AP | <i>[Signature]</i> | 12-24-68 |
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| SHEET | OF | PAGE | | |

8 CONTROLS

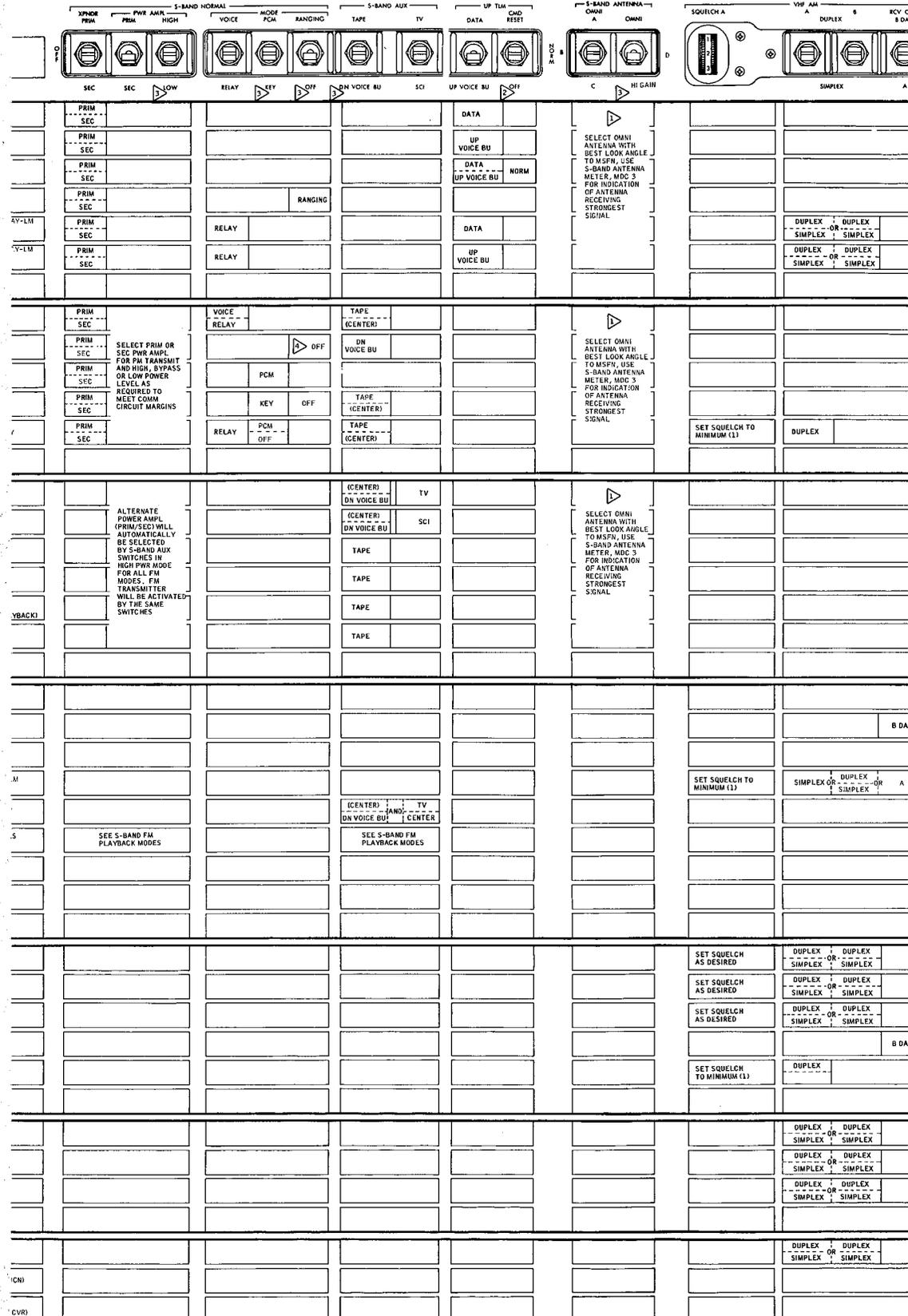


SPECIAL INSTRUCTIONS AND NOTES:

| | | | | | | | |
|-------------|------------|---------------|-----|----------------|----------------|--------------|--|
| 1 = MINIMUM | | (1 = MINIMUM) | | | SUIT POWER | | SUIT POWER NOT REQUIRED FOR EARPHONES |
| | | | | | | | |
| | | OFF | | | OFF | | SUIT POWER NOT REQUIRED FOR EARPHONES |
| AS DESIRED | T/R | AS DESIRED | T/R | NORM | SUIT POWER | XMT | USE S-BAND, INTERCOM, AND/OR VHF AM T/R CONTROLS AS REQUIRED FOR COMM LINK DESIRED |
| AS DESIRED | T/R | AS DESIRED | T/R | NORM | SUIT POWER | I'COM XMT | USE S-BAND, INTERCOM, AND/OR VHF AM T/R CONTROLS AS REQUIRED FOR COMM LINK DESIRED |
| AS DESIRED | T/R | AS DESIRED | T/R | NORM | SUIT POWER | | USE S-BAND INTERCOM AND/OR VHF AM T/R CONTROLS AS REQUIRED FOR COMM LINK DESIRED |
| AS DESIRED | RCV | AS DESIRED | RCV | NORM | SUIT POWER OFF | | SUIT POWER NOT REQUIRED FOR EARPHONES |
| | | | | BACKUP | SUIT POWER | | USE CENTER COUCH STATION CONTROLS AND CONFIGURE FOR DESIRED MODE |
| | | | | BACKUP | SUIT POWER | | USE LEFT COUCH STATION CONTROLS AND CONFIGURE FOR DESIRED MODE. NOTE: DURING RELAY OPERATIONS THE CENTER COUCH ASTRONAUT SHOULD GO BACK UP MODE SINCE UPLINK VOICE REQUIRES HIS MIKE LINK. |
| | | | | BACKUP | SUIT POWER | | USE RIGHT COUCH STATION CONTROLS AND CONFIGURE FOR DESIRED MODE |
| | T/R | | | NORM BACKUP | SUIT POWER | I'COM | SEE DSE - CSM VOICE RECORD MODE FOR DSE SWITCH POSITIONS |
| | | | | | | XMT | |
| AS DESIRED | T/R | | | NORM BACKUP | SUIT POWER | XMT I'COM | VOX MODE WILL OPERATE RF XMITERS IF VHF AM AND/OR S-BAND IS IN T/R MODE |
| | | | | | | | |
| | | | T/R | | | | UPLINK VOICE RELAY FROM MSFN USES CENTER COUCH STATION MIKE INPUT. CENTER COUCH ASTRONAUT SHOULD GO TO BACKUP MODE AND USE LEFT STATION CONTROLS |
| | AS DESIRED | T/R | | NORM BACKUP | SUIT POWER | | SEE XMT AND RCV - BACKUP MODE IF AUDIO CONTROL "BACKUP" SWITCH POSITION IS USED. CENTER COUCH STATION IS USED FOR UPLINK RELAY AND HAS NO TALK CAPABILITY. ONLY MONITOR |

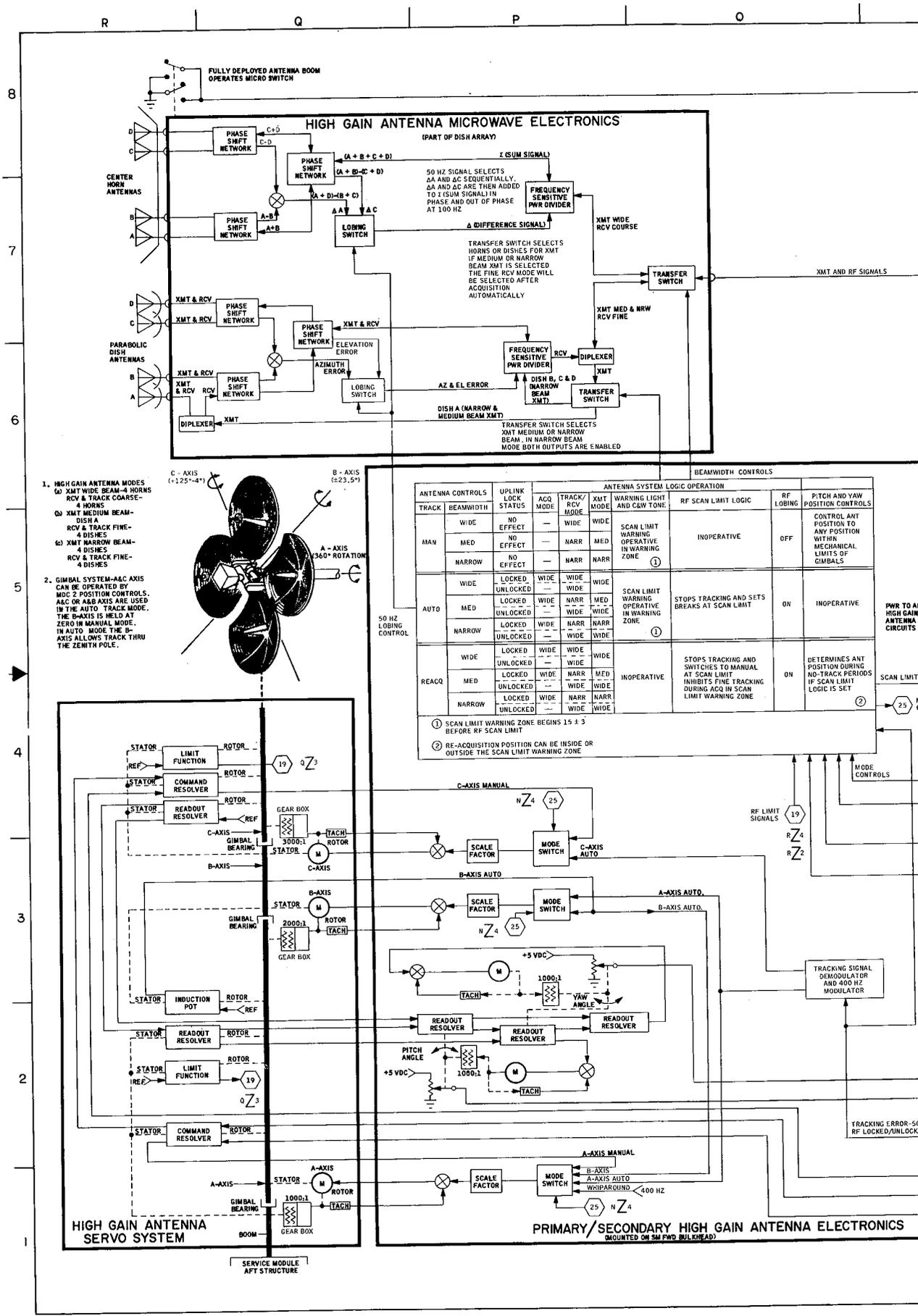
| | |
|------------------------|-------------------------------|
| COMMUNICATION M | |
| S-BAND FM - RECEIVE | VOICE (NORMAL) |
| | VOICE (BACK - U) |
| | UP - DAT |
| | RANGING |
| S-BAND FM - TRANSMIT | MSFN VOI AND/OR E (NORMAL) |
| | MSFN VOI AND/OR E (BACKUP) |
| | VOICE (NORMAL) |
| | VOICE (BACK-UP) |
| S-BAND FM TRANSMIT | CSM PCM |
| | EMERGES |
| | LM VOICE (EVA VOIC BIONMED E) |
| | TELEVISI |
| S-BAND FM TRANSMIT | ANALOG (REAL TH) |
| | ANALOG (PLAYBAK) |
| | CSM PCM (REAL TH) |
| | CSM PCM (PLAYBAK) |
| S-BAND FM TRANSMIT | CSM VOI (EVA VOIC) |
| | LM PCM (PLAYBAK) |
| | CSM PCM (RECORD) |
| | LM PCM (RECORD) |
| DATA STORAGE EQUIPMENT | CSM VOI (RECORD) |
| | CSM VOI (EVA VOIC) |
| | SCIENTIF (RECORD) |
| | PLAYBAK (PLAYBAK) |
| VHF - AM RECEIVE | REWIND |
| | FAST FO |
| | MSFN VO |
| | LM VOIC |
| VHF - AM TRANSMIT | EVA VOIC |
| | LM PCM |
| | EVA BIOD |
| | VOICE - 1 |
| RECOVERY | VOICE - |
| | VOICE - |
| | VOICE - |
| | VOICE IV (TWO-W) |
| NOTE: | BCN REC |
| | BCN OR V (VHF SRV) |
| | |
| | |

RF EQUIPMENT MODES &

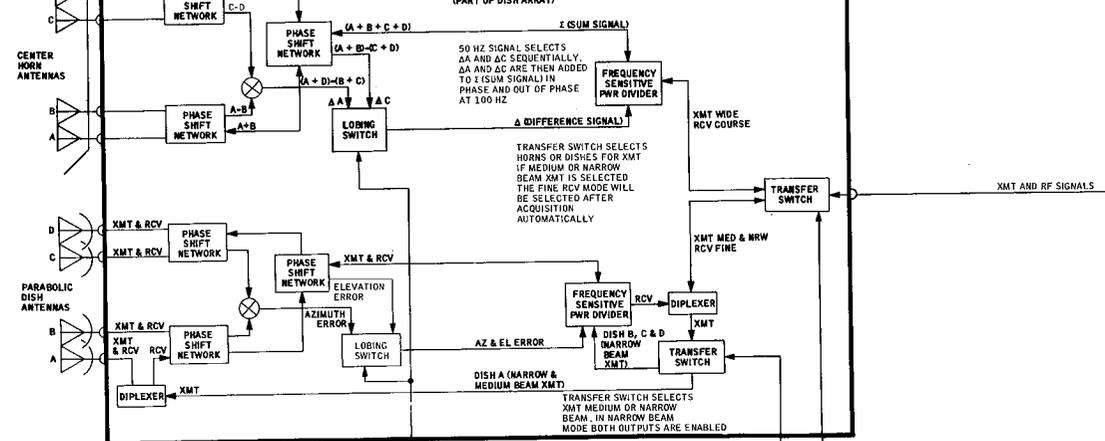


E HI GAIN ANTENNA PER FLIGHT PLAN AND MISSION PROCEDURES
 AD RESET POSITION RESETS ALL REALTIME COMMANDS AFFECTING COMMUNICATION
 NTROLS. RESET RETURNS CONTROL TO MDC 3 SWITCHES
 V TROL LABLE BY REALTIME COMMANDS (SEE DWG 6,3 FOR CMD LIST)
 NGING INTERFERES WITH DN VOICE BU

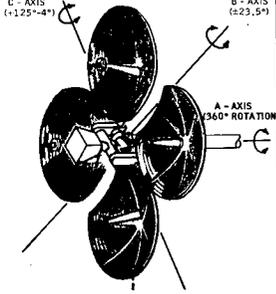
▷ SWITCH NOT REQUIRED FOR COM MODES



HIGH GAIN ANTENNA MICROWAVE ELECTRONICS (PART OF DISH ARRAY)

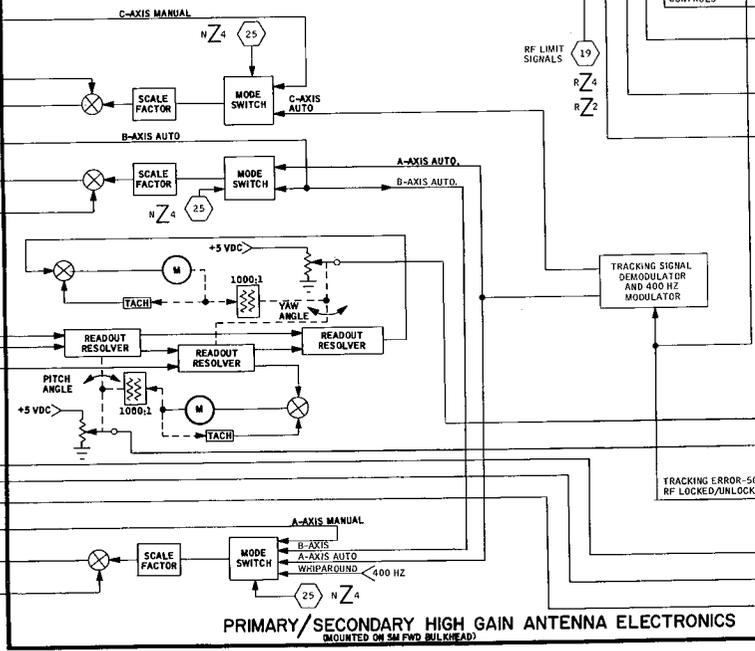
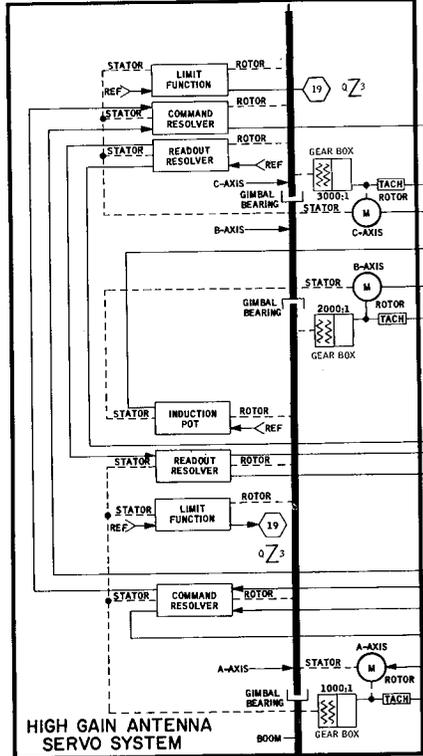


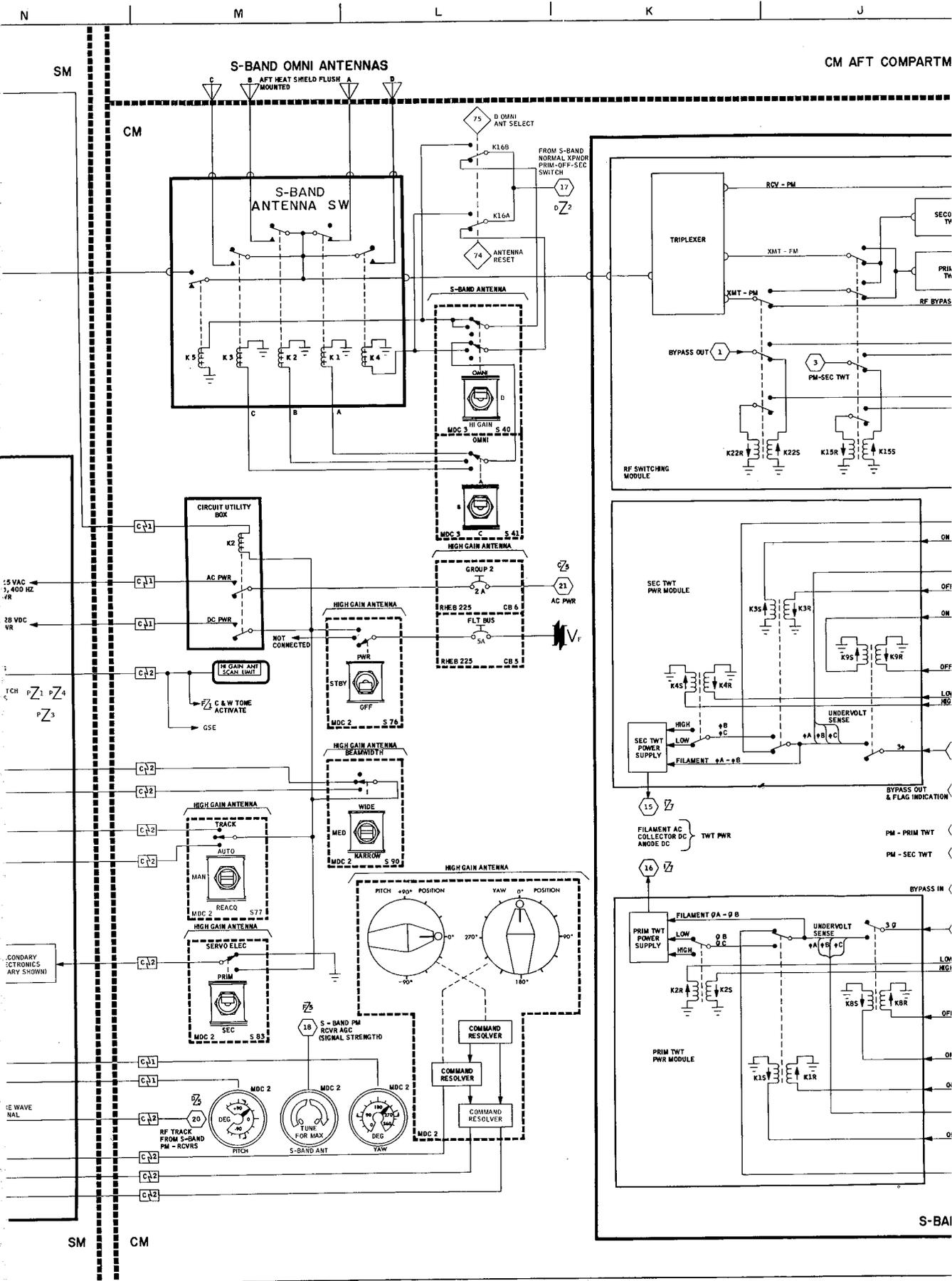
- HIGH GAIN ANTENNA MODES
 - XMT WIDE BEAM-4 HORNS RCV & TRACK COME-4 HORNS
 - XMT MEDIUM BEAM-DISH A RCV & TRACK FINE-4 DISHES
 - XMT NARROW BEAM-4 DISHES RCV & TRACK FINE-4 DISHES
- GIMBAL SYSTEM-ACC AXIS CAN BE OPERATED BY MDC 2 POSITION CONTROLS. ACC OR ASS AXIS ARE USED IN THE AUTO TRACK MODE. THE B-AXIS IS HELD AT ZERO IN MANUAL MODE. IN AUTO MODE THE B-AXIS ALLOWS TRACK THRU THE ZENITH POLE.

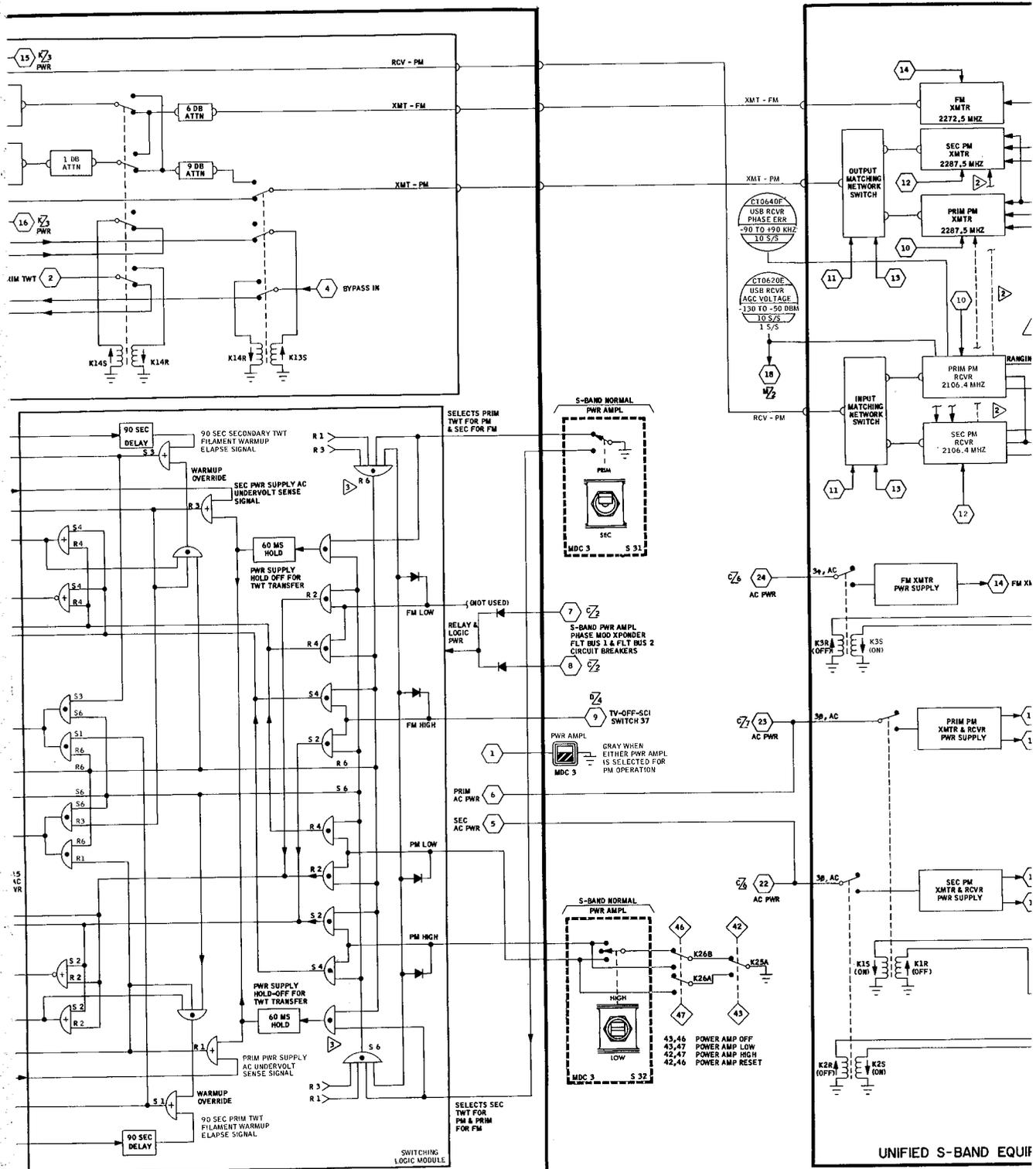


| ANTENNA CONTROLS | | ANTENNA SYSTEM LOGIC OPERATION | | | | BEAMWIDTH CONTROLS | | |
|------------------|-----------|--------------------------------|----------|----------------|----------|--|---------------------|--|
| TRACK | BEAMWIDTH | UPLINK LOCK STATUS | ACQ MODE | TRACK/RCV MODE | XMT MODE | WARNING LIGHT AND C&W TONE | RF SCAN LIMIT LOGIC | PITCH AND YAW POSITION CONTROLS |
| MAN | WIDE | NO EFFECT | --- | WIDE | WIDE | SCAN LIMIT WARNING OPERATIVE IN WARNING ZONE ① | INOPERATIVE | CONTROL ANT POSITION TO ANY POSITION WITHIN MECHANICAL LIMITS OF GIMBALS |
| | MED | NO EFFECT | --- | NARR | MED | SCAN LIMIT WARNING OPERATIVE IN WARNING ZONE ① | INOPERATIVE | CONTROL ANT POSITION TO ANY POSITION WITHIN MECHANICAL LIMITS OF GIMBALS |
| | NARROW | NO EFFECT | --- | NARR | NARR | SCAN LIMIT WARNING OPERATIVE IN WARNING ZONE ① | INOPERATIVE | CONTROL ANT POSITION TO ANY POSITION WITHIN MECHANICAL LIMITS OF GIMBALS |
| AUTO | WIDE | LOCKED | --- | WIDE | WIDE | SCAN LIMIT WARNING OPERATIVE IN WARNING ZONE ① | ON | INOPERATIVE |
| | MED | UNLOCKED | --- | WIDE | MED | SCAN LIMIT WARNING OPERATIVE IN WARNING ZONE ① | ON | INOPERATIVE |
| | NARROW | UNLOCKED | --- | WIDE | NARR | SCAN LIMIT WARNING OPERATIVE IN WARNING ZONE ① | ON | INOPERATIVE |
| REQQ | WIDE | LOCKED | --- | WIDE | WIDE | INOPERATIVE | ON | DETERMINES ANT POSITION DURING NO-TRACK PERIODS IF SCAN LIMIT LOGIC IS SET ② |
| | MED | UNLOCKED | --- | WIDE | MED | INOPERATIVE | ON | DETERMINES ANT POSITION DURING NO-TRACK PERIODS IF SCAN LIMIT LOGIC IS SET ② |
| | NARROW | UNLOCKED | --- | WIDE | NARR | INOPERATIVE | ON | DETERMINES ANT POSITION DURING NO-TRACK PERIODS IF SCAN LIMIT LOGIC IS SET ② |

① SCAN LIMIT WARNING ZONE BEGINS 15 ± 3 BEFORE RF SCAN LIMIT
② RE-ACQUISITION POSITION CAN BE INSIDE OR OUTSIDE THE SCAN LIMIT WARNING ZONE

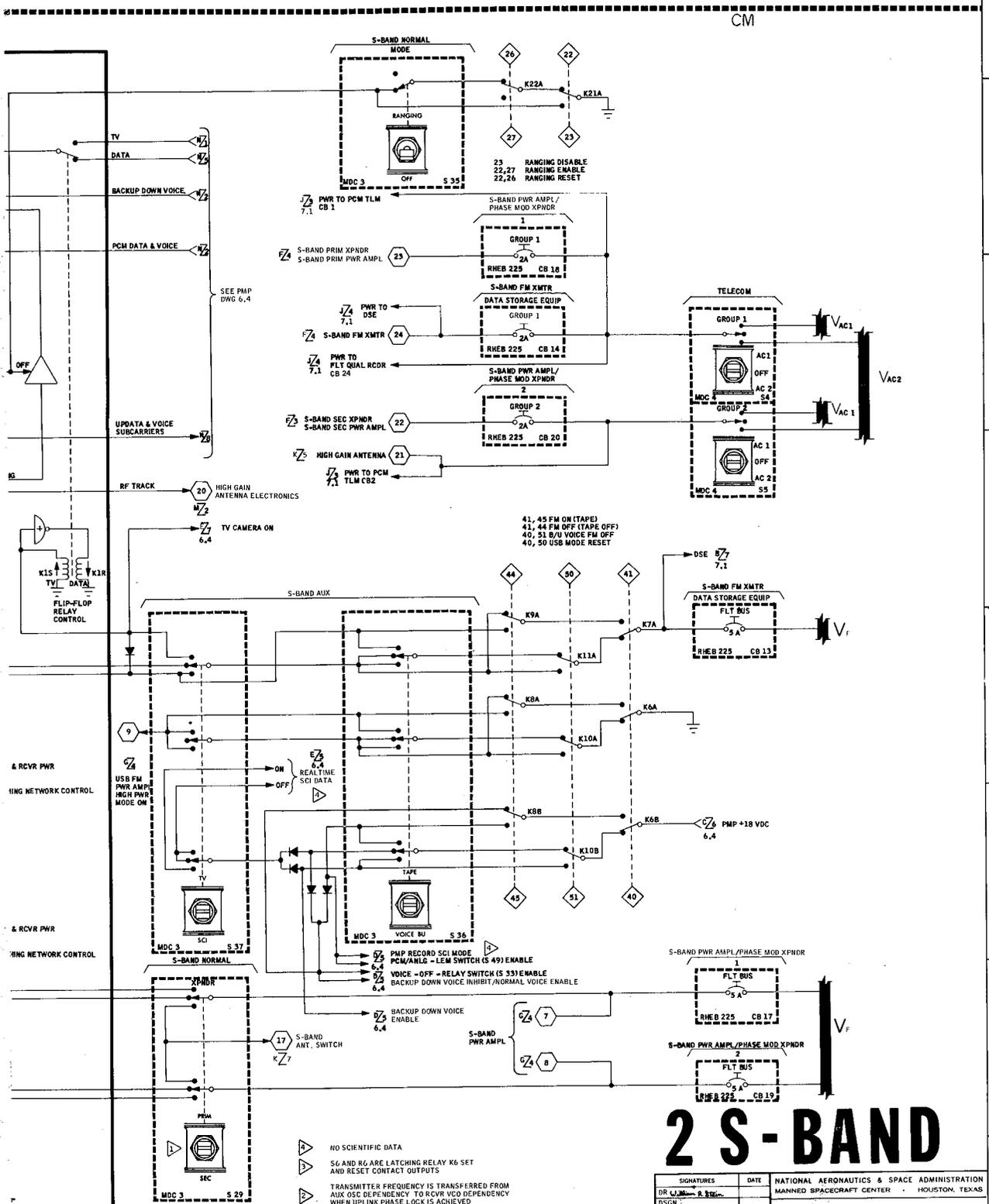






WR AMPL EQUIPMENT

UNIFIED S-BAND EQUIP



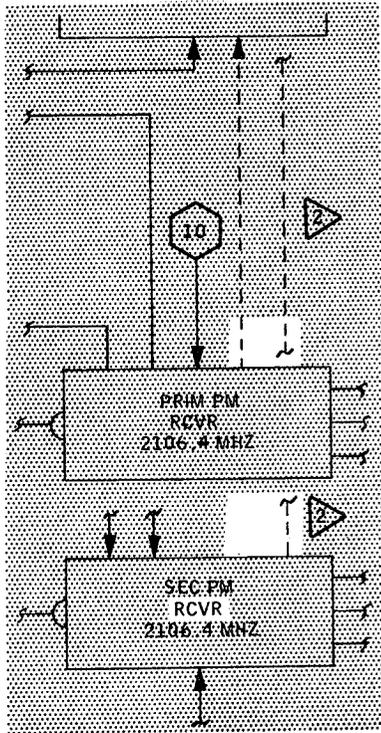
2 S-BAND

- NOTES:
- ▷ NO SCIENTIFIC DATA
 - ▷ S6 AND R6 ARE LATCHING RELAY K6 SET AND RESET CONTACT OUTPUTS
 - ▷ TRANSMITTER FREQUENCY IS TRANSFERRED FROM AUX OSD DEPENDENCY TO RCVR VCO DEPENDENCY WHEN UPLINK PHASE LOCK IS ACHIEVED
 - ▷ WHEN SWITCHING BETWEEN PRIM - SEC MODES, MOMENTARILY STOP AT CENTER POSITION TO ALLOW RELAYS IN USB TO SWITCH

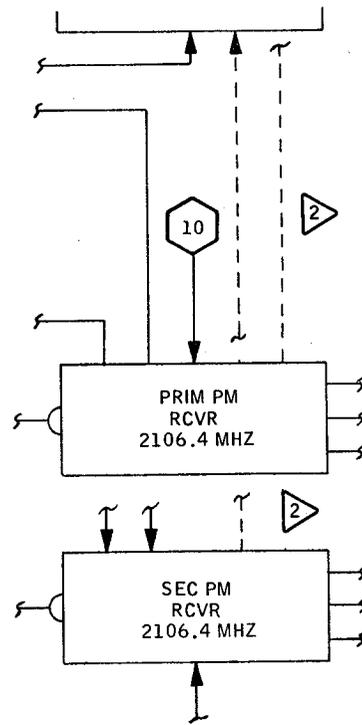
| | | | | |
|-------------------------|--|----------------|--|--|
| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER · HOUSTON, TEXAS | |
| DR <i>[Signature]</i> | | <i>9-26-61</i> | UNIFIED S-BAND SYSTEM RF EQUIPMENT | |
| DSGN | | | | |
| QC <i>[Signature]</i> | | <i>9-26-61</i> | | |
| ENGR <i>[Signature]</i> | | <i>9-26-61</i> | | |
| NR <i>[Signature]</i> | | <i>9-26-61</i> | | |
| APP <i>[Signature]</i> | | <i>9-26-61</i> | CSM | |
| FEC | | | SITE DWG NO. 6.2 | |
| AUTH <i>[Signature]</i> | | <i>9-26-61</i> | 104 J | |
| | | | 99 X 34 PAGE SHEET 1 of 1 | |

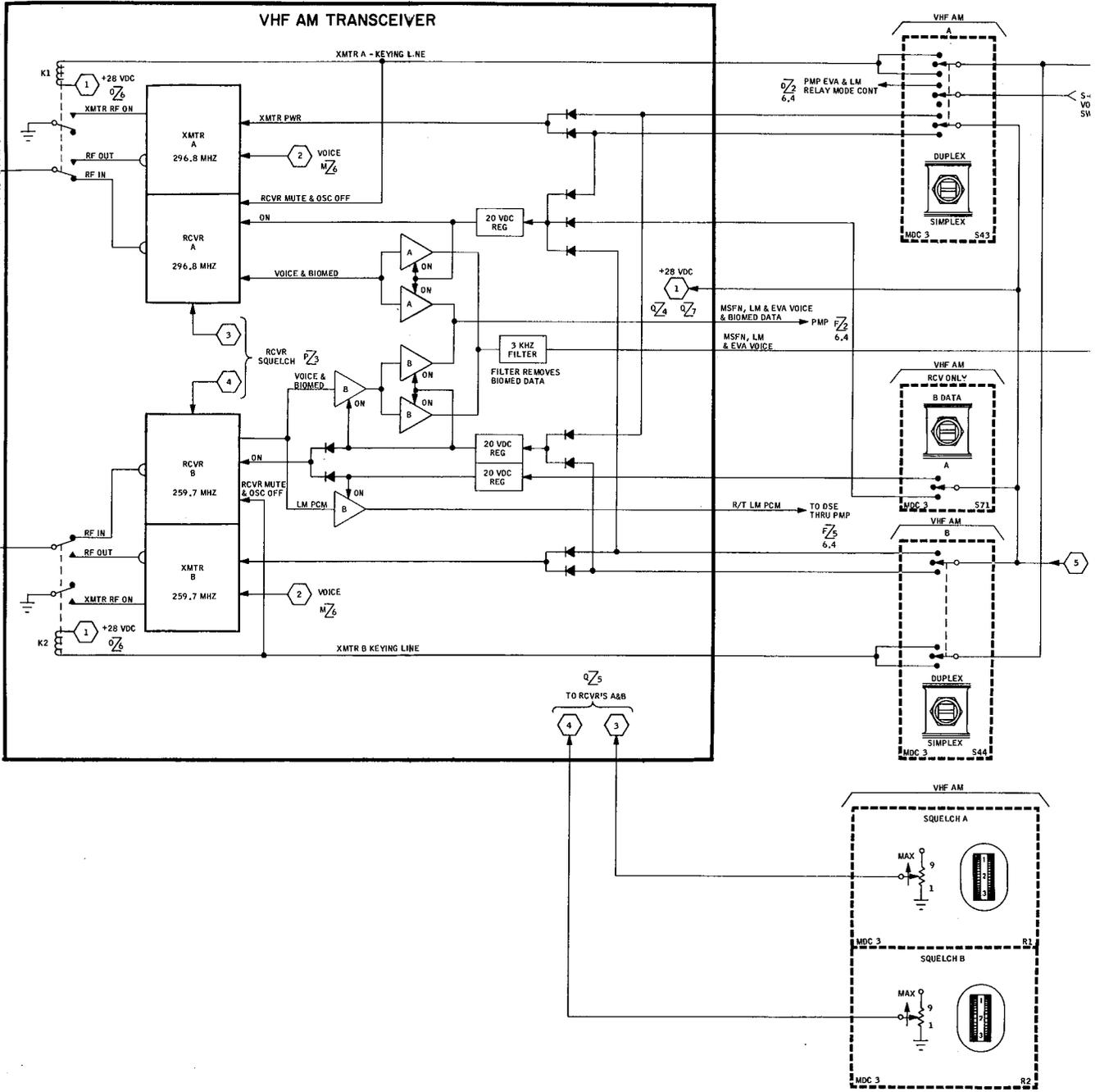
SECTION 6

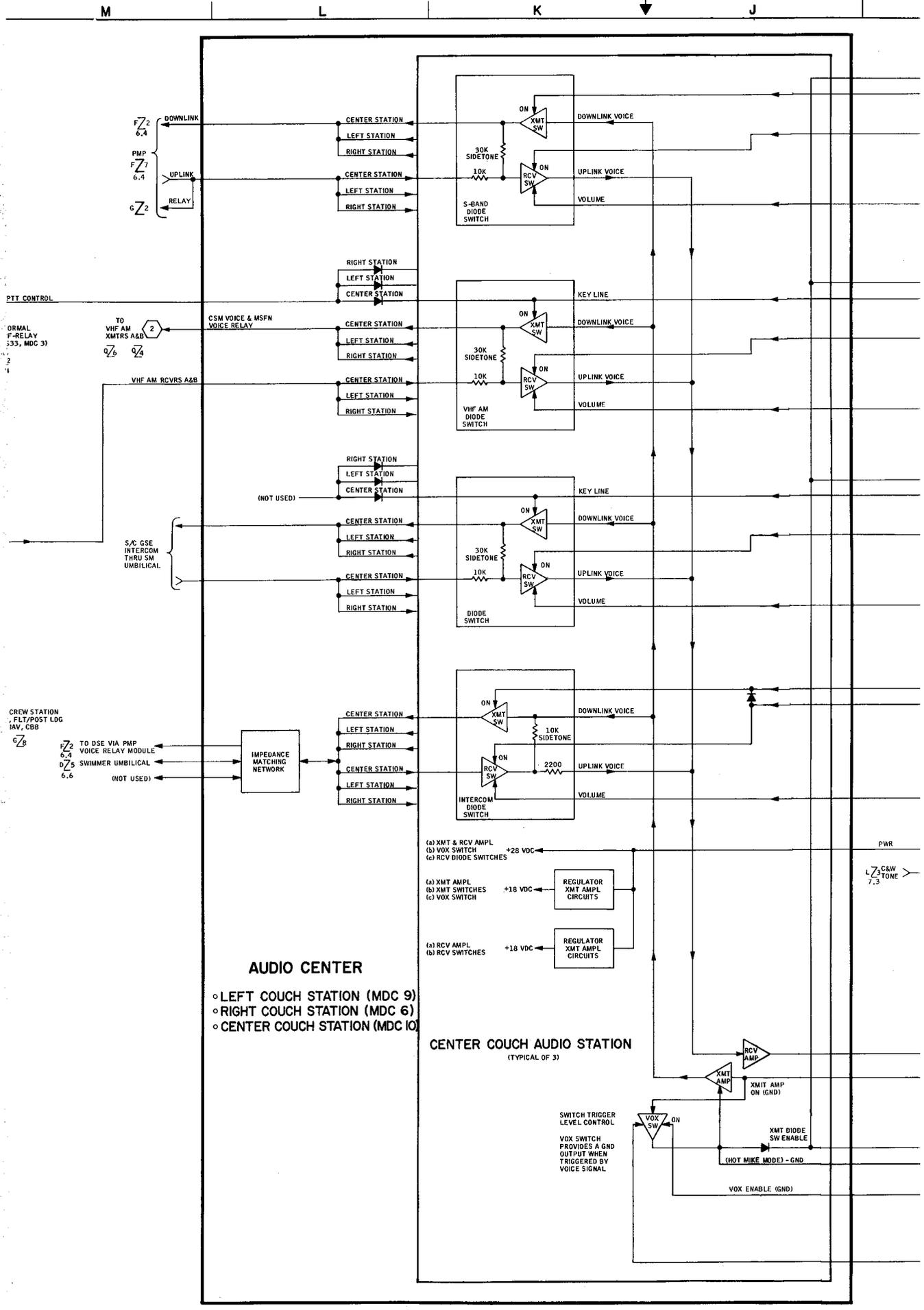
1. DWG 6.2 E Z7,6,5 IS



WAS







FZ2
6.4
PMP
FZ7
6.4
GZ2
RELAY

PTT CONTROL
NORMAL
F-RELAY
333, MDC 31
2
1

TO
VHF AM
XMTRS A&B
QZ6 QZ4

VHF AM RCVRs A&B

S/C GSE
INTERCOM
THRU SW
UMBILICAL

CREW STATION
FLT/POST LOG
IAV, CBB
QZ8

TO DSE VIA PMP
VOICE RELAY MODULE
QZ2 QZ4
SWIMMER UMBILICAL
QZ5 QZ6
(NOT USED)

AUDIO CENTER

- LEFT COUCH STATION (MDC 9)
- RIGHT COUCH STATION (MDC 6)
- CENTER COUCH STATION (MDC 10)

CENTER COUCH AUDIO STATION
(TYPICAL OF 3)

(a) XMT & RCV AMPL
(b) VOX SWITCH
(c) RCV DIODE SWITCHES
+28 VDC

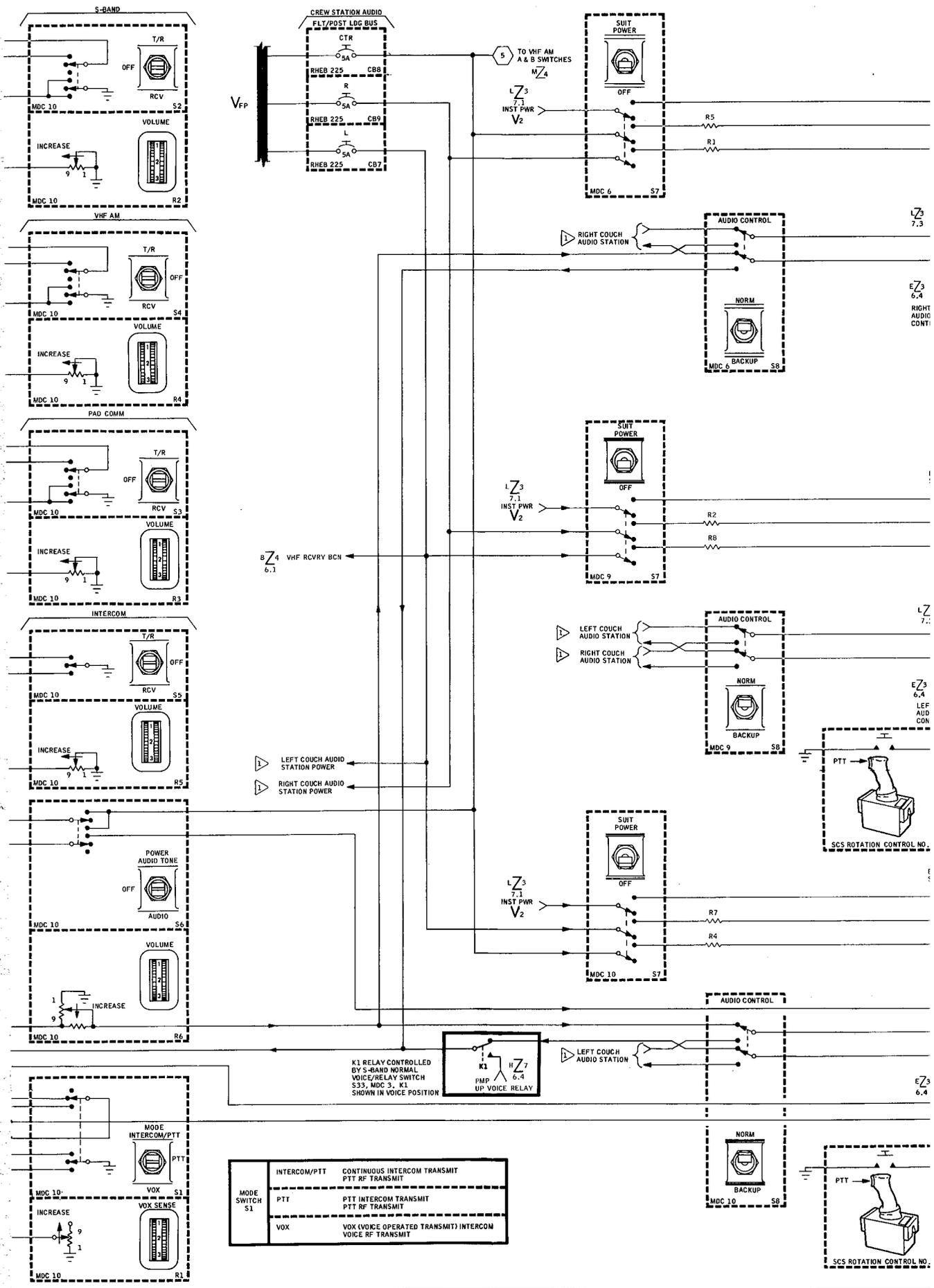
(a) XMT AMPL
(b) XMT SWITCHES
(c) VOX SWITCH
+18 VDC

(a) RCV AMPL
(b) RCV SWITCHES
+18 VDC

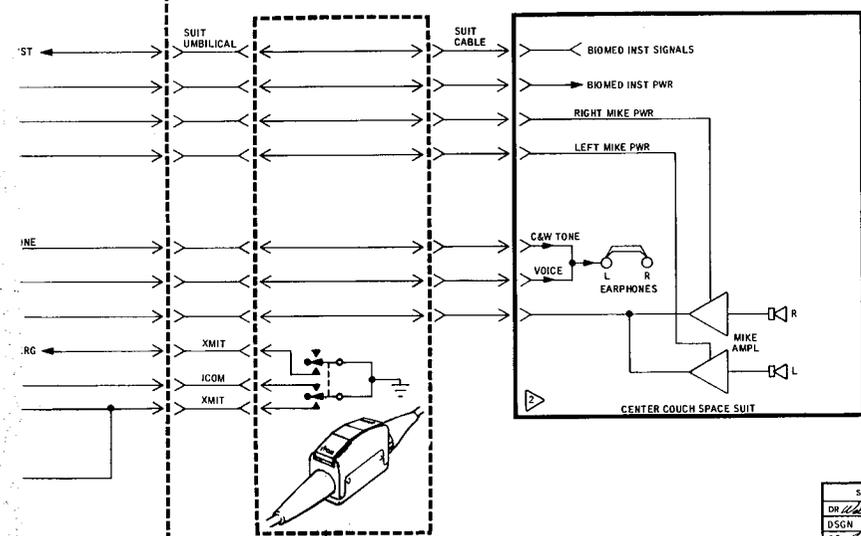
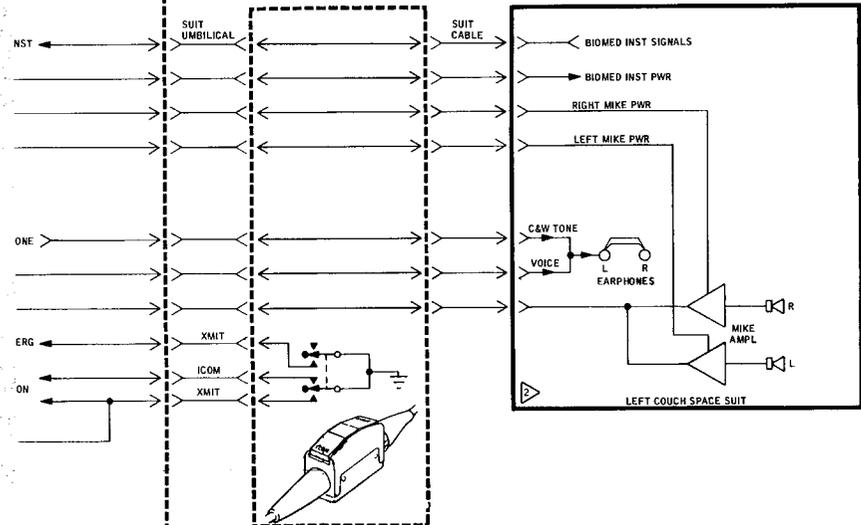
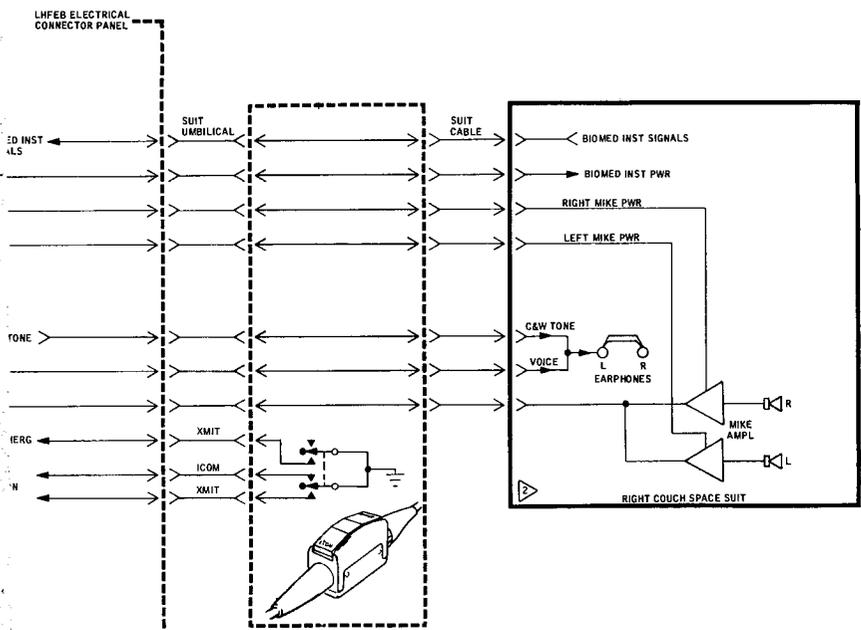
PWR
L23 C&W
TONE
7.3

SWITCH TRIGGER
LEVEL CONTROL
VOX SWITCH PROVIDES A GND
OUTPUT WHEN
TRIGGERED BY
VOICE SIGNAL

VOX ENABLE (GND)



| | | |
|----------------|--------------|---|
| MODE SWITCH S1 | INTERCOM/PTT | CONTINUOUS INTERCOM TRANSMIT PTT RF TRANSMIT |
| | PTT | PTT INTERCOM TRANSMIT PTT RF TRANSMIT |
| | VOX | VOX (VOICE OPERATED TRANSMIT) INTERCOM VOICE RF TRANSMIT |



▷ COMM CARRIER HEADSET SHOWN, LIGHTWEIGHT HEADSET HAS ONLY THE RIGHT MIKE AND ONE EARPHONE. POWER TO THE LEFT MIKE IS SUPPLIED THRU THE BACKUP CREW STATION AUDIO CIRCUIT BREAKER. NORMALLY THE CREW AUDIO STATION ASSIGNMENT IS LMP-RIGHT, CMP-CENTER AND COR-LEFT

▷ CENTER COUCH AUDIO STATION IS SHOWN AS TYPICAL OF THREE STATIONS IN THE AUDIO CENTER. CONTROLS S2, R2, S4, R4, S3, R3, S5, R5, S6, R6, S1 & R1 ARE IDENTICAL FOR RIGHT COUCH AND LEFT COUCH AUDIO STATIONS.

3 VHF/ AUDIO

| | | | | | |
|----------------------------------|--------------------|---------|--|--------|----------------|
| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | | |
| DR | <i>[Signature]</i> | | | | |
| DC | | | | | |
| ENGR | <i>[Signature]</i> | 2-20-63 | VHF AM TRANSCIVERS & AUDIO EQUIPMENT | | |
| NR | <i>[Signature]</i> | 2-20-63 | | | |
| APP | <i>[Signature]</i> | 1-10-63 | | | |
| FEC | <i>[Signature]</i> | 11-1-62 | | | |
| AUTH | <i>[Signature]</i> | 11-2-66 | CSM 104 | SIZE J | ENG NO. 6.3 |
| LHFEB ELECTRICAL CONNECTOR PANEL | | | 34 X 110 | | SHEET 1 OF 1 |

8

7

6

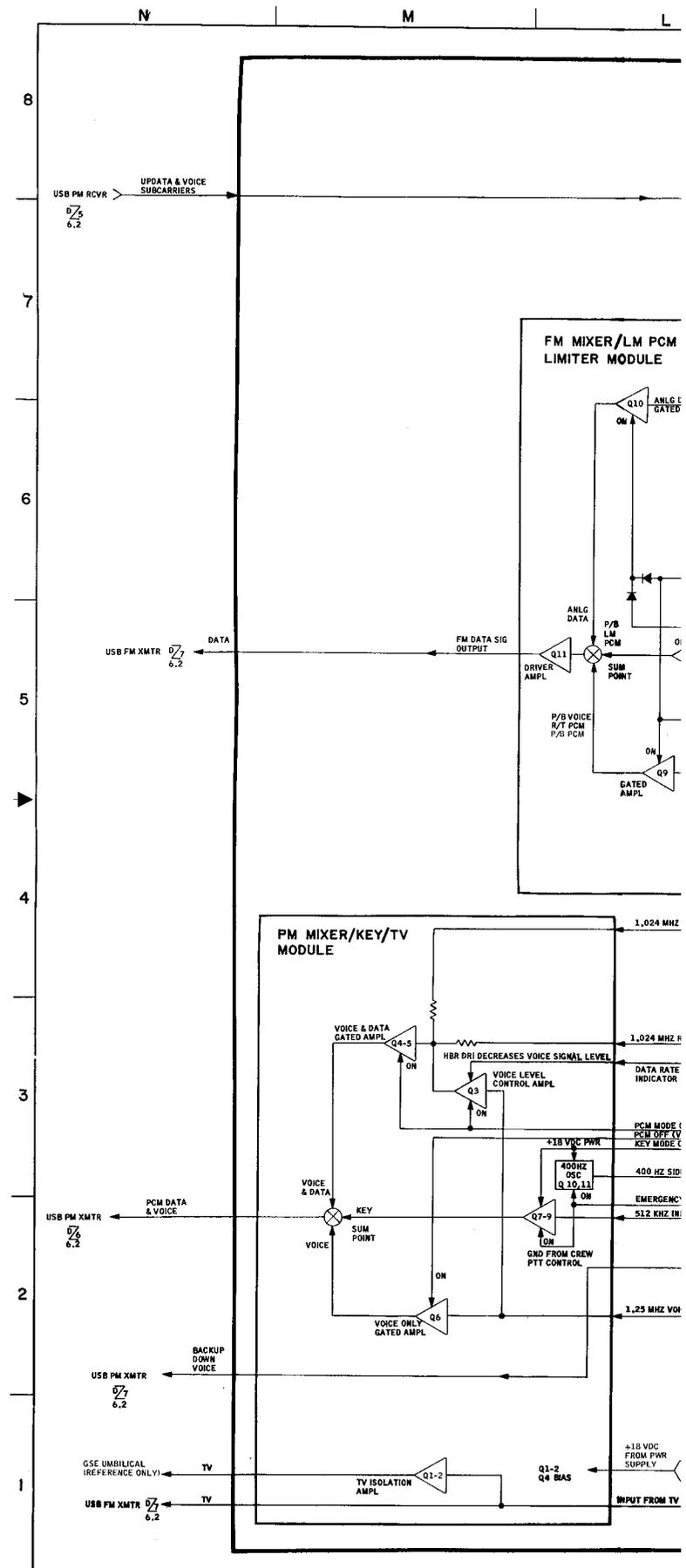
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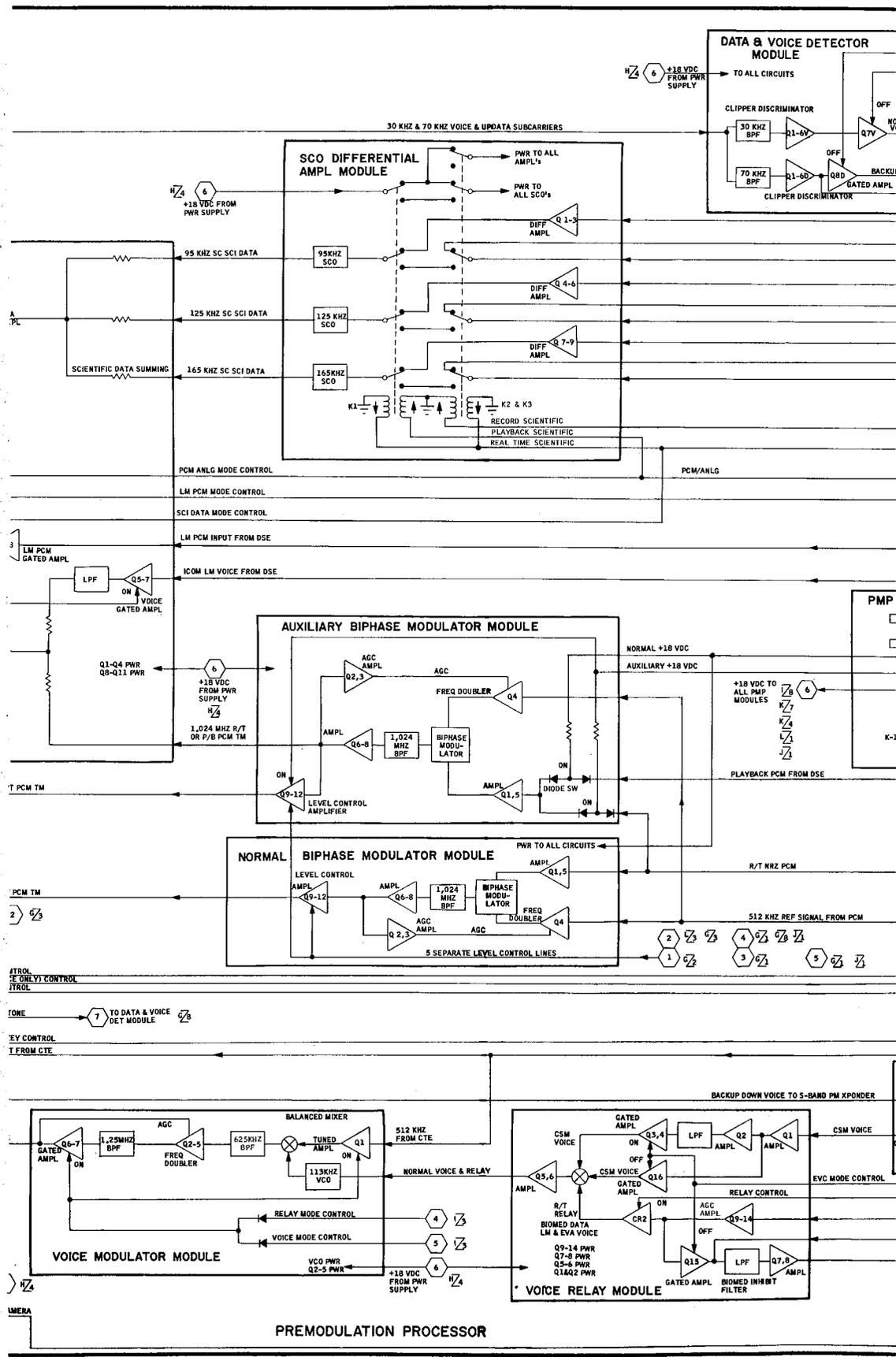
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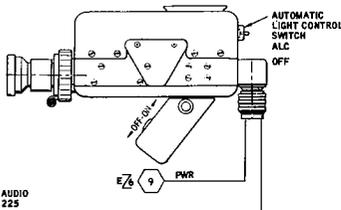
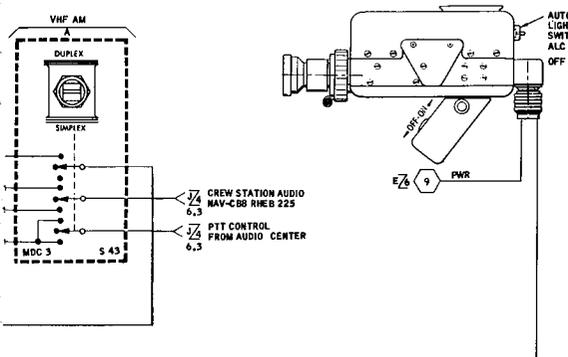
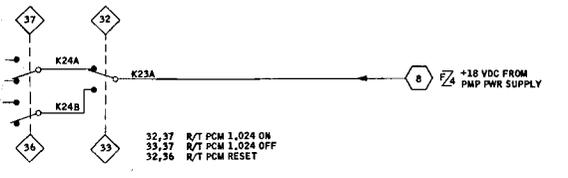
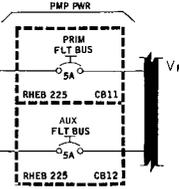
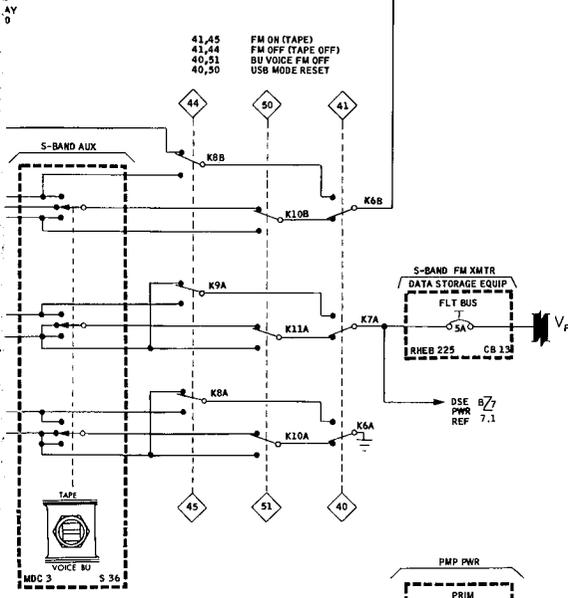
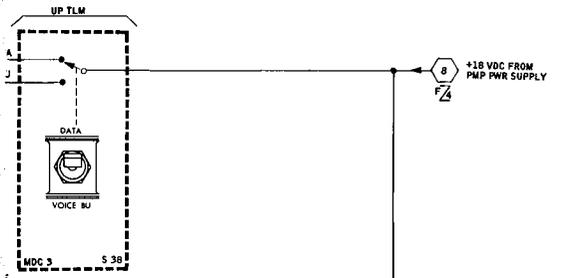
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PREMODULATION PROCESSOR

| LTG | DR | ENGR | DATE | APPROVAL |
|-----|----|------|------|----------|
|-----|----|------|------|----------|



4 PREMOD

| | | | | |
|------------|--------------------|------|--|-----------------------|
| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS | |
| DR | <i>[Signature]</i> | | PREMODULATION PROCESSOR | |
| DSEN | | | | |
| QC | <i>[Signature]</i> | | | |
| ENGR | | | | |
| NR | | | | |
| APP | | | CSM 104 | SIZE DWG NO. J 6.4 |
| FEC | | | 34 X 77 | SHEET 1 OF 1 |
| AUTH | <i>[Signature]</i> | | | |

CSM
S/C 104
PCN 1

SECTION 6

IS

1. DWG 6.4 C,BZ²

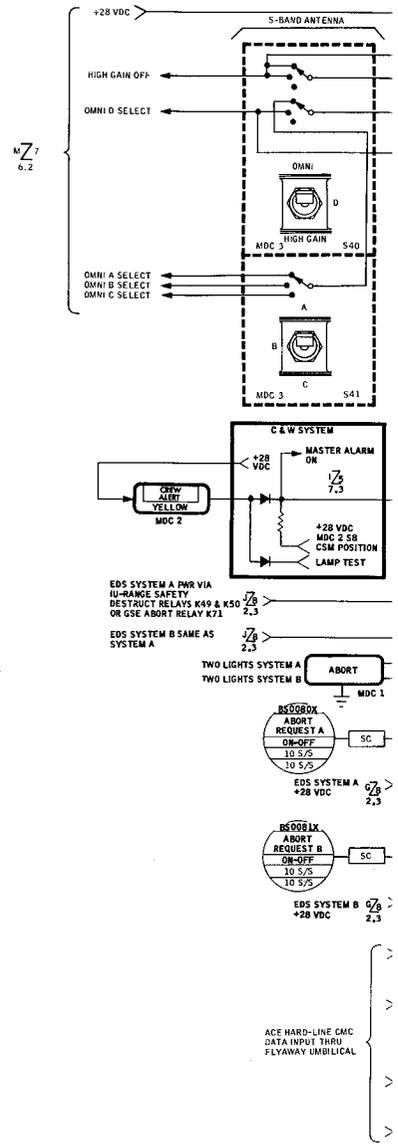
NO TV CAMERA ON CSM 104
(TV CAMERA LOCATED IN LM)

REALTIME COMMAND LIST

| RTC (OCTAL) (48XX) | COMMAND FUNCTION | |
|-----------------------|----------------------|--|
| 00 | ABORT LIGHT A OFF | } $\frac{5}{2}$ 6,5 |
| 01 | ABORT LIGHT A ON | |
| 02 | (SPARE) | |
| 03 | (SPARE) | |
| 04 | CREW ALARM OFF | } $\frac{5}{2}$ 6,5 |
| 05 | CREW ALARM ON | |
| 06 | ABORT LIGHT B OFF | } $\frac{5}{2}$ 6,5 |
| 07 | ABORT LIGHT B ON | |
| 10 | ACE CMC ZERO DISABLE | |
| 11 | ACE CMC ZERO ENABLE | |
| 12 | (SPARE) | |
| 13 | (SPARE) | |
| 14 | ACE CMC ONE DISABLE | |
| 15 | ACE CMC ONE ENABLE | |
| 16 | (SPARE) | |
| 17 | (SPARE) | |
| 20 | (SPARE) | |
| 21 | (SPARE) | |
| 22,26 | RANGING RESET | } $\frac{0}{2}$ $\frac{0}{2}$ 6,5 6,2 |
| 22,27 | RANGING ENABLE | |
| 23 | RANGING DISABLE | |
| 24 | NOT USABLE. | |
| 25 | NOT USABLE. | |
| 30 | NOT USABLE. | |
| 31 | NOT USABLE. | |
| 32,36 | R/T PCM RESET | } $\frac{0}{2}$ $\frac{0}{2}$ 6,5 6,4 |
| 32,37 | R/T PCM 1, 024 ON | |
| 33,37 | R/T PCM OFF | |
| 34 | NOT USABLE. | |
| 35 | NOT USABLE. | |
| 40,50 | USB MODE RESET | } $\frac{0}{2}$ $\frac{0}{2}$ 6,5 6,4 |
| 40,51 | B/U VOICE FM OFF | |
| 41,44 | FM OFF (TAPE OFF) | |
| 41,45 | FM ON (TAPE) | |
| 42,46 | POWER AMP RESET | } $\frac{0}{2}$ $\frac{0}{2}$ 6,5 6,2 |
| 42,47 | POWER AMP HIGH | |
| 43,46 | POWER AMP OFF | |
| 43,47 | POWER AMP LOW | |
| 52,56 | P/B MODE RESET | } $\frac{0}{2}$ $\frac{0}{2}$ $\frac{0}{2}$ 6,5 6,4 7,1 |
| 52,57 | SELECT CSM P/B DATA | |
| 53 | SELECT LM P/B DATA | |
| 54 | (SPARE) | |
| 55 | (SPARE) | |
| 60 | (SPARE) | |
| 61 | (SPARE) | |
| 62,66 | DSE ELECT RESET | } $\frac{0}{2}$ $\frac{0}{2}$ 6,5 7,1 |
| 62,67 | DSE ELECT RECORD | |
| 63,66 | DSE ELECT OFF | |
| 63,67 | DSE ELECT PLAYBACK | |
| 64,70 | BIT RATE RESET | } $\frac{0}{2}$ $\frac{0}{2}$ 6,5 7,1 |
| 64,71 | BIT RATE HIGH | |
| 65 | BIT RATE LOW | |
| 72,76 | TAPE CNTL RESET | } $\frac{0}{2}$ $\frac{0}{2}$ 6,5 7,1 |
| 72,77 | DSE TAPE FORWARD | |
| 73,76 | DSE TAPE STOP | |
| 73,77 | DSE TAPE REWIND | |
| 74 | ANTENNA RESET | |
| 75 | O OMNI ANT SELECT | |

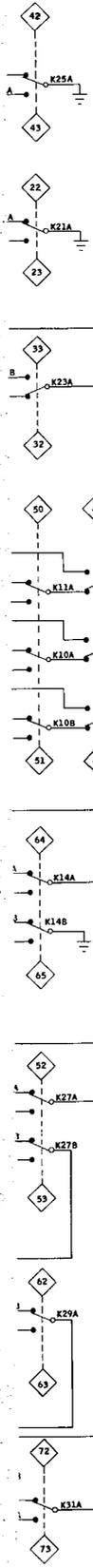
REALTIME COMMAND LIST

| SALVO RESET (OCTAL) (452X) | SALVO FUNCTION |
|-------------------------------|--|
| 30,32 | SALVO RESET 1 (RESETS FOLLOWING RTC'S) |
| 00 | ABORT LIGHT A OFF |
| 04 | CREW ALARM OFF |
| 20 | (NOT USED) |
| 10 | ACE CMC ZERO DISABLE |
| 14 | ACE CMC ONE DISABLE |
| 02,16 | (NOT USED) |
| 06 | ABORT LIGHT B OFF |
| 12 | (NOT USED) |
| 22,26 | RANGING RESET |
| 32,36 | R/T PCM RESET |
| 70,72 | SALVO RESET 2 (RESETS FOLLOWING RTC'S) |
| 40,50 | USB MODE RESET |
| 44,54,60 | (NOT USED) |
| 64,70 | BIT RATE RESET |
| 74 | ANTENNA RESET |
| 42,46 | POWER AMP RESET |
| 52,56 | P/B MODE RESET |
| 62,66 | DSE ELECT RESET |
| 72,76 | TAPE CNTL RESET |

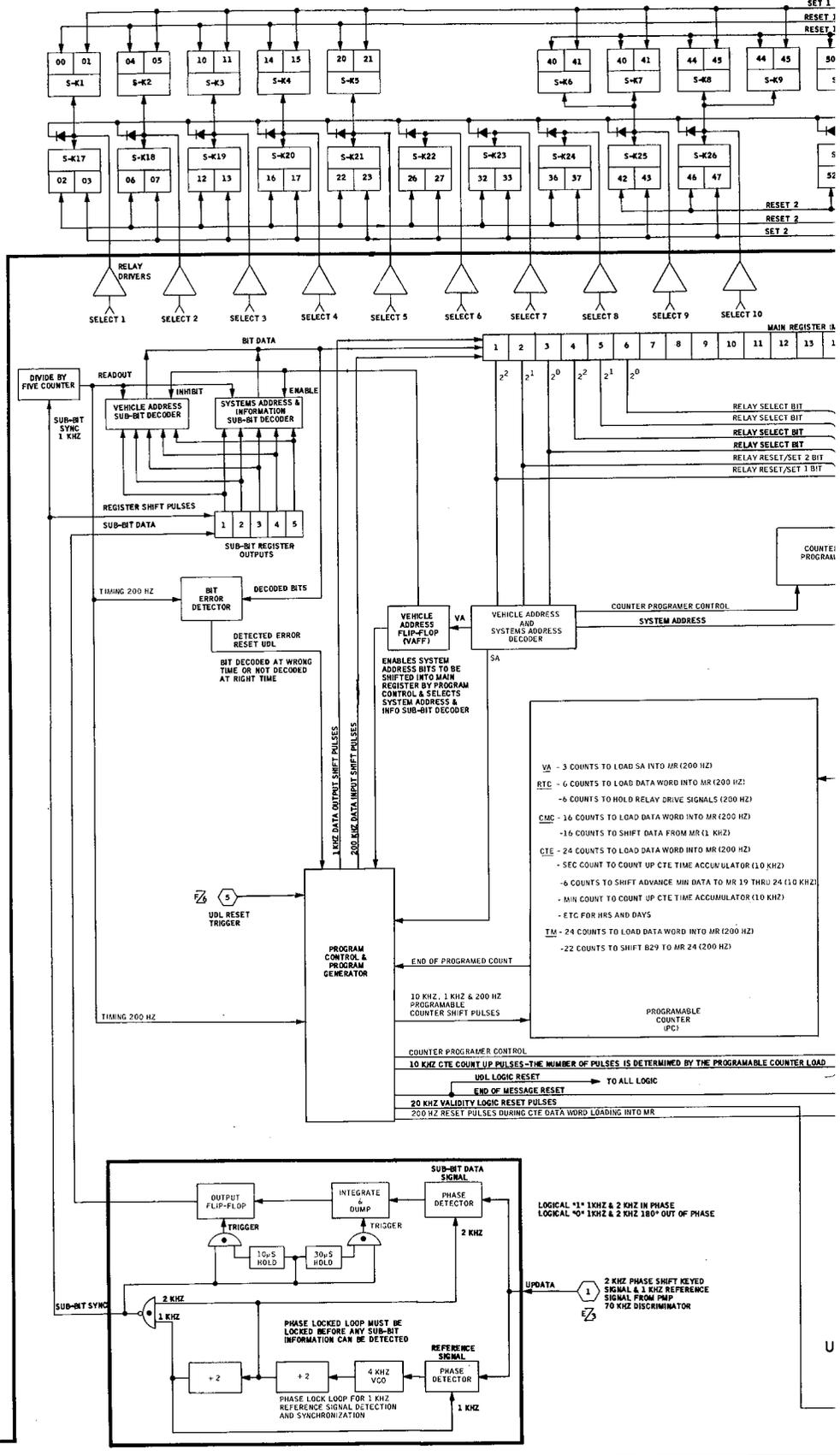


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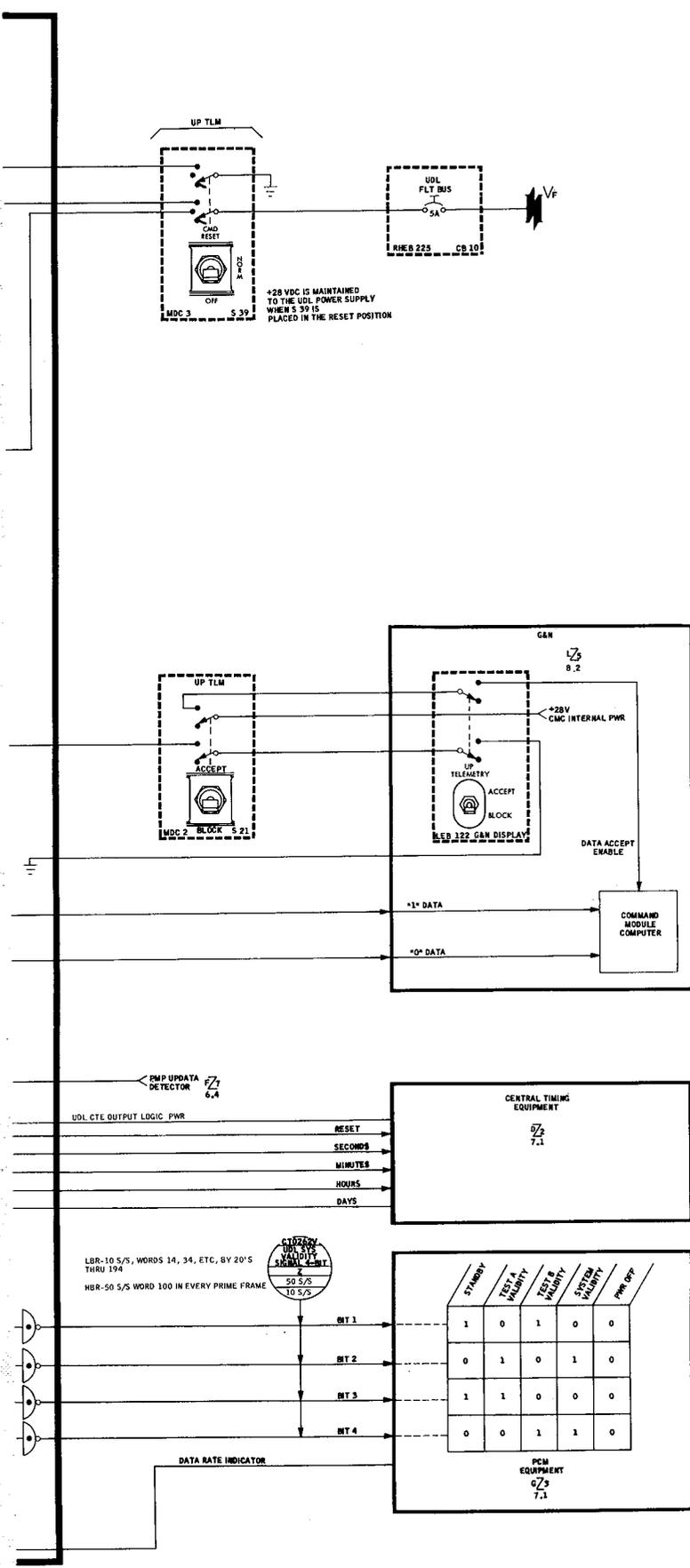
UDL RELAY MODULE



- 41,46 POWER AMP OFF
- 43,47 POWER AMP LOW
- 42,47 POWER AMP HIGH
- 42,46 POWER AMP RESET
- 23 RANGING DISABLE
- 22,27 RANGING ENABLE
- 22,26 RANGING RESET
- 32,37 R/T PCM 1,024 ON
- 33,37 R/T PCM OFF
- 32,36 R/T PCM RESET
- 41,45 FM ON (TAPE)
- 41,44 FM OFF (TAPE OFF)
- 40,51 B/D VOICE FM OFF
- 40,50 USB MODE RESET
- 64,71 BIT RATE HIGH
- 65 BIT RATE LOW
- 64,70 BIT RATE RESET
- 52,57 SELECT CSM P/B DATA
- 53 SELECT LM P/B DATA
- 52,56 P/B MODE RESET
- 62,67 DSE ELECT RECORD
- 63,66 DSE ELECT OFF
- 63,67 DSE ELECT PLAYBACK
- 62,66 DSE ELECT RESET
- 72,77 DSE TAPE FORWARD
- 73,76 DSE TAPE STOP
- 73,77 DSE TAPE REWIND
- 72,76 TAPE CNTL RESET



| LTR | DR | ENGR | DATE | APPROVAL |
|-----|----|------|------|----------|
| | | | | |



NOTES:

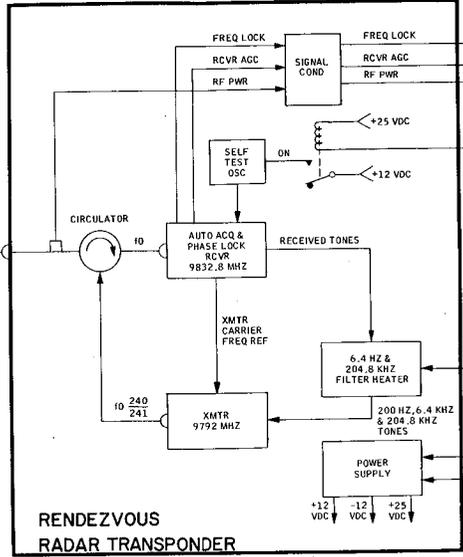
- IF C = "0" THEN Q = "0" AND IF C = "1" THEN Q = "1" WHEN EDNR TRIGGERS I INPUT IF Q = "0" THEN Q = "1" AND IF Q = "1" THEN Q = "0"
- IN STANDBY Q = "1" ON BOTH FLIP-FLOPS AND VALIDITY LOGIC RESET SIGNAL CONTINUALLY RESETS VALIDITY LOGIC WITH EACH "0" TO "1" TRANSITION. DURING VALIDITY PERIOD WHEN EITHER Q = "0" THE RESET FUNCTION IS INHIBITED UNTIL THE FLIP-FLOP TIMES OUT.

5 UPDATA

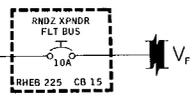
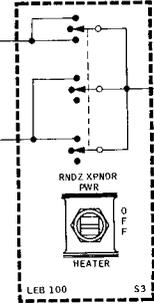
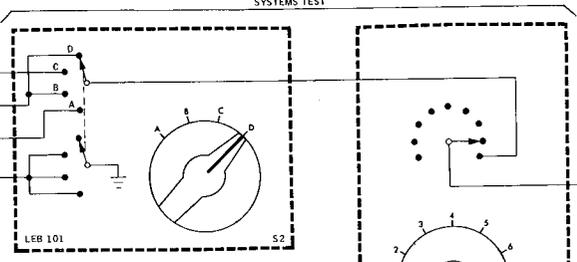
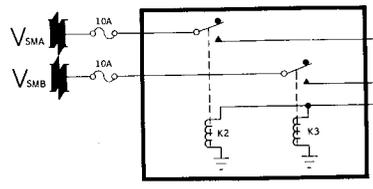
| | | | | | |
|------------|------|---------|--------------|---|--|
| SIGNATURES | | DATE | | NATIONAL AERONAUTICS & SPACE ADMINISTRATION | |
| DR | | | | MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | |
| DSGN | | | | | |
| QC | | | | | |
| ENGR | | | | | |
| WR | | | | | |
| APP | | | | | |
| FEC | | | | | |
| AUTH | | | | | |
| CSM | SIZE | DWG NO. | | | |
| 104 | J | 6.5 | | | |
| 34 X 121 | | | SHEET 1 OF 1 | | |

SM CM

RENDEZVOUS
RADAR XPNDR
ANTENNA



RENDEZVOUS
RADAR TRANSPONDER

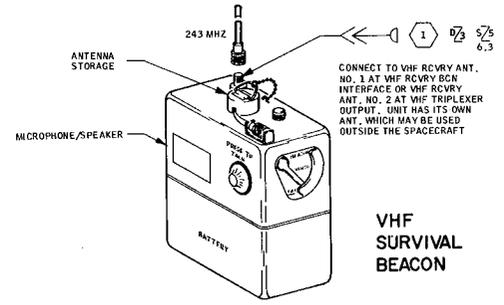
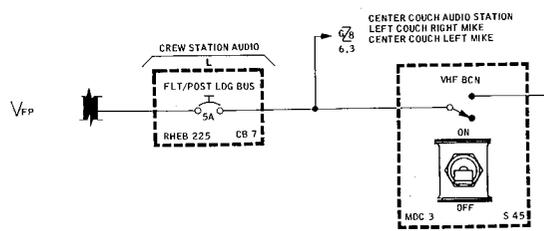


A - (2,5 TO
B - RCVR AGC
C - FREQ LO
D - RCVR AGC

B READOUT 1
AND D READ
AGC VIA ANT



V_{FP}]



VHF
SURVIVAL
BEACON

SECTION 6

IS

WAS

1. DWG 6.6 F,E Z⁷

A - (2.1 TO 5 VDC)
B - RCVR AGC (0 TO 4.5 VDC)
C - FREQ LOCK (4 TO 5 VDC, OPERATE MODE & LOCKED)

A - (2.5 TO 5 VDC)
B - RCVR AGC (0 TO 4.5 VDC)
C - FREQ LOCK (4.5 VDC)
D - RCVR AGC (0 TO 4.5 VDC)

NOTE

B READOUT IS TEST AGC
AND D READOUT IS RECEIVED
AGC VIA ANTENNA



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 | 1.0 Watts DC (During ON/OFF Switching) 16.5 Watts AC (Prim or Sec) |
| (2) FM Transmitter | 1.5 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) -35 dbm to -51 dbm (Must Maintain Lock and Must Not Damage Rcvr) |

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

| ITEM | FUNCTION and/or PARAMETERS |
|---|--|
| e. Automatic Gain Control (AGC) (1) Attack Time (2) Decay | TBD TBD |
| f. Ranging Channel (1) Modulation (2) Bandwidth (3) PRN Bit Rate (4) PRN Clock (5) PRN Code Length | PM on Carrier 10 kHz to 1.5 MHz (3 db) 992.834 kbs 992.834 kbs (496.417 kHz Squarewave) 5,456,682 bits (Lunar Code) |
| g. High-Gain Antenna Track Channel (1) Pointing Error Signal (2) Earth Presence Signal | 50 Hz amplitude modulated signal derived from the coherent AGC detector. DC signal superimpose on pointing error signal when RCVR is locked to incoming RF signal. (See Table 6-IV Modes) |
| h. Outputs | (See Table 6-IV Modes) |
| 6. PM Transmitter (Prim/Sec) | PM, S-Band |
| 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 (1) Aux OSC to RCVR VCO Switching Time (2) RCVR VCO to Aux OSC Switching Time | XMTR frequency is derived from XMTR Aux OSC prior to acquisition and RCVR VCO after acquisition. Switching is controlled using RCVR AGC signal. Less than 0.25 seconds 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 \pm 4 Vdc control 115 Vac, 400 Hz, 3 ϕ | | | | | | |
| 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>Low Pwr 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 | Low Pwr Ampl Mode | 32 Watts | Off/Bypass | 0 Watts |
| High Pwr Ampl Mode | 81 Watts | | | | | | |
| Low Pwr Ampl Mode | 32 Watts | | | | | | |
| Off/Bypass | 0 Watts | | | | | | |
| 4. Power Amplification Activation Time | <p>Sum ac power values to obtain simultaneous power level operation of Prim and Sec power amplifiers.</p> <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) | | | | | | |

*

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 DOW

| PM DOWNLINK MODES AVAILABLE | MODE NUMBER | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|--|--|--|--|------------------------------|-------------------------------------|------------|---------|
| | Carrier Voice ^(a) | Carrier Voice ^(a) | Carrier Voice ^(a) | Carrier Voice ^(a) | Carrier Voice ^(a) | Carrier Voice ^(a) | Carrier | Carrier |
| Channels Included | 51.2-kbps TM | 51.2-kbps TM | 1.6-kbps TM | 1.6-kbps TM | 1.6-kbps TM | -- | -- | -- |
| | -- | PRN | PRN | -- | -- | -- | -- | PRN |
| | -- | -- | -- | -- | -- | -- | Key | -- |
| PM DOWNLINK MODULATION PROCESS | Modulation Schemes; Subcarrier Characteristics | PRN : PM directly on carrier (2287.5 MHz) Backup Voice : PM directly on carrier (2287.5 MHz) Normal Voice ^(a) : FM/PM; 1.25-MHz subcarrier deviated ±7.5 kHz peak (±9 kHz peak) TM : PCM/PSK/PM; 1.024-MHz subcarrier bi-phase modulated ±90° Key : AM/PM; 512 kHz, 100 percent AM | | | | | | |
| | Peak Carrier Deviation-Radians (Δθ) | PRN : ^(c) Normal Voice ^(a) : 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 | MODE NUMBER | 1 | 2 | 3 | 4 | 5 | | |
| | Channels Included | 1:1 Playback of Recorded Voice, Recorded CSM 51.2-kbps TM and Scientific Data ^(d) | 32:1 Playback of Recorded Voice, Recorded CSM 1.6-kbps TM and Scientific Data ^(d) | 32:1 Playback of (CSM - Recorded) LM 1.6-kbps TM | TV | Real-Time Scientific ^(d) | Real-51.2- | |
| FM DOWNLINK MODULATION PROCESS | Modulation Schemes; Subcarrier Characteristics | TV : FM Directly on carrier (2272.5 MHz) Playback Voice: FM Directly on carrier (2272.5 MHz) Scientific Data ^(d) : FM/FM (3 subcarriers) 95 kHz 125 kHz 165 kHz Playback LM TM : PCM/FM Playback CSM TM ^(e) : PCM/PSK/FM; 1.024 MHz subcarrier bi-phase modulated ±90° | | | | | | |
| | Peak Carrier Deviation (Δf) | Playback Voice : 100 kHz +20 percent -40 percent Playback CSM TM ^(e) : 600 kHz ±15 percent Playback LM TM : 200 kHz +25 percent -50 percent TV : 1 MHz ±10 percent Scientific Data ^(d) (Real-Time) : FM/FM 75 kHz ±15 percent (95 kHz SC) 108 kHz ±15 percent (125 kHz SC) 168 kHz ±15 percent (165 kHz SC) | | | | | | |

- ^(a) Or voice and biomed.
- ^(b) 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.
- ^(c) Varies with the received uplink.
- ^(d) Scientific data not used
- ^(e) Auxiliary PMP mode will provide real time PCM with same USB-FM characteristics as playback PCM.

NK MODES AND MODULATION PROCESS

| FM MODES | | | | | | | | | |
|----------|----------|--------------|---------|---------|-----------|--------------|-----------|--------------|------------|
| 5 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 0 |
| Carrier | Carrier | Carrier | Carrier | Carrier | Carrier | Carrier | Carrier | Carrier | No Carrier |
| voice | -- | Backup Voice | Voice | Voice | -- | Backup Voice | -- | Backup Voice | |
| -kbps | 1.6-kbps | -- | -- | -- | 51.2-kbps | -- | 51.2-kbps | 51.2-kbps | |
| TM | TM | | | | TM | | TM | TM | |
| -- | PRN | -- | PRN | -- | -- | -- | PRN | -- | |
| -- | -- | -- | -- | -- | -- | -- | -- | -- | |

for voice and biomed)ⓑ

| FM MODES | | | | | | | |
|----------|-------------------------------|---|--|--|---|---|------------|
| | 7 | 8 | 9 | 10 | 11 | 12 | 0 |
| TM | Real-Time 1.6-kbps TM ⓐ | 1:1/32:1 Play- back of Scien- tific Data and Real Time 51.2-kbps TM | 1:1/32:1 Play- back of Scien- tific Data and Real Time 1.6-kbps TM | 8:1 Playback of (CSM-Re- corded) LM 1.6-kbps TM | Same as Mode 1 Except No Scientific Data | Same as Mode 2 Except No Scientific Data | No Carrier |

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 | |
|---------------------------------------|--|---|------------------------------|------------------------------|------------------------------|-------------------------------|--------------------------------|-----------------------------------|----------------------------------|---|---------------------------|---------------------------|
| | Channels Included | Carrier PRN -- -- | Carrier -- Voice -- | Carrier -- Voice -- | Carrier -- Voice -- | Carrier PRN Voice -- | Carrier PRN -- Update | Carrier PRN Voice Update | Carrier -- Voice Update | Carrier PRN Backup Voice -- | Carrier -- -- -- | Carrier -- -- -- |
| PM UPLINK MODULATION PROCESS | Modulation Schemes; Subcarrier Character- istics | PRN : PM directly on carrier Voice : FM/PM; 30-kHz subcarrier deviated ± 7.5 kHz (peak) Update : PSK/FM/PM; 70-kHz subcarrier deviated ± 5.0 kHz (peak) Backup Voice: FM/PM; 70-kHz subcarrier deviated ± 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 | -- | 0.38 | | |
| | | Voice | -- | 1.85 | -- | 1.20 | -- | 1.00 | 1.10 | -- | NA | NA |
| | Update | -- | -- | 1.85 | -- | 1.20 | 1.00 | 1.10 | -- | | | |
| | Backup Voice | -- | -- | -- | -- | -- | -- | -- | 1.20 | | | |

*All phase deviations have $\pm 10\%$ tolerance.

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 _o |
| | 5.4 kHz ± 5% f _o |
| | 6.8 kHz ± 5% f _o |
| | 8.2 kHz ± 5% f _o |
| | 9.6 kHz ± 4% f _o |
| | 11.0 kHz ± 3% f _o |
| | 12.4 kHz ± 3% f _o |
| 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. |

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TABLE 6-V.- PREMODULATION PROCESSOR - Continued

| ITEM | FUNCTION and/or PARAMETERS |
|---|---|
| 8. LM PCM Output Channel a. Response | LM PCM (1.6 kbs) is limited and output to DSE for recording. 600 to 2800 Hz flat within 1 db. |
| 9. CM PCM Data Channel (Real-Time and Playback) a. Input b. Subcarrier c. Modulation | 51.2 kbs or 1.6 kbs NRZ PCM data. 1.024 MHz derived from PCM 512 kHz ref signal. Bi-phase |
| 10. Scientific Data Channel (Real-Time) a. Response b. Frequency and Deviation | Flat within 2 db <u>Channel</u> 1 0 to 2850 Hz 2 0 to 3750 Hz 3 0 to 4950 Hz <u>Channel</u> 1 95 kHz +7.5% f_0 2 125 kHz +7.5% f_0 3 165 kHz +7.5% f_0 |
| 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 b. Udata c. Response | 30 kHz (Normal) 70 kHz (Backup) 70 kHz 300 to 4,000 kHz flat within 3 db. |

TABLE 6-V.- PREMODULATION 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 |
| 16. 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-V.- PREMODULATION 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 |
| 16. 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-V.- PREMODULATION 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 |
| 16. 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 | <table border="0"> <tr> <td>Duplex A (Key OFF)</td> <td>4.2 Watts</td> </tr> <tr> <td>Duplex A (Key ON)</td> <td>28.8 Watts</td> </tr> <tr> <td>Simplex A (Key OFF)</td> <td>4.1 Watts</td> </tr> <tr> <td>Simplex A (Key ON)</td> <td>28.8 Watts</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td>Duplex B (Key OFF)</td> <td>3.8 Watts</td> </tr> <tr> <td>Duplex B (Key ON)</td> <td>27.6 Watts</td> </tr> <tr> <td>Simplex B (Key OFF)</td> <td>4.0 Watts</td> </tr> <tr> <td>Simplex B (Key ON)</td> <td>27.6 Watts</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td>RCV A Only</td> <td>1.2 Watts</td> </tr> <tr> <td>RCV B Only</td> <td>1.2 Watts</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td>PTT (Key ON)</td> <td>1.3 Watts</td> </tr> </table> | Duplex A (Key OFF) | 4.2 Watts | Duplex A (Key ON) | 28.8 Watts | Simplex A (Key OFF) | 4.1 Watts | Simplex A (Key ON) | 28.8 Watts | | | Duplex B (Key OFF) | 3.8 Watts | Duplex B (Key ON) | 27.6 Watts | Simplex B (Key OFF) | 4.0 Watts | Simplex B (Key ON) | 27.6 Watts | | | RCV A Only | 1.2 Watts | RCV B Only | 1.2 Watts | | | PTT (Key ON) | 1.3 Watts |
| Duplex A (Key OFF) | 4.2 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Duplex A (Key ON) | 28.8 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Simplex A (Key OFF) | 4.1 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Simplex A (Key ON) | 28.8 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Duplex B (Key OFF) | 3.8 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Duplex B (Key ON) | 27.6 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Simplex B (Key OFF) | 4.0 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Simplex B (Key ON) | 27.6 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RCV A Only | 1.2 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RCV B Only | 1.2 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PTT (Key ON) | 1.3 Watts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Transmitter (A or B) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| a. Activation Time | 250 milliseconds maximum to reach standby condition. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b. RF Output | 20 milliseconds maximum to reach full transmit power from PTT (Key ON) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| c. XMTR Frequency | 5 DBW (average) minimum 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). | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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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-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 |

TABLE 6-VII.- AUDIO CENTER EQUIPMENT - Concluded

| ITEM | FUNCTION and/or PARAMETERS |
|---|--|
| 8. Intercom Bus a. GSE Output b. Swimmer Output c. Tape Recorder | (Not Used) For recovery voice to recovery swimmers Output for voice recording on DSE |
| 9. Spacecraft/GSE Facility Hardline Voice Interface | The Pad COMM Switch and Volume Control are used to operate each audio stations input/output voice links with the checkout and launch facilities. |

*

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 ± 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"> 1. Command Module Computer 2. Real-Time Command (Internal relays) 3. Real-Time Command (External relays) (not used) 4. Central Timing Equipment 5. Salvo RTC reset 6. Test message A & B 7. Auxiliary decoder (not used) |
| (3) Data Word | (See Drawing 6.5) |

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><u>PCM BIT</u></th> <th><u>B1</u></th> <th><u>B2</u></th> <th><u>B3</u></th> <th><u>B4</u></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> | <u>PCM BIT</u> | <u>B1</u> | <u>B2</u> | <u>B3</u> | <u>B4</u> | 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 |
| <u>PCM BIT</u> | <u>B1</u> | <u>B2</u> | <u>B3</u> | <u>B4</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 |
|--|--|
| <p>9. Internal Relays</p> <p>a. Type</p> <p>b. Rating</p> <p>c. Actuation Time</p> | <p>32 double-pole double-throw relays, magnetic latching</p> <p>2 ampere, minimum, contact rating</p> <p>Opening or closure less than 10 milliseconds.</p> |

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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 | |
| a. Input Voltage | 24 to 31 Vdc |
| b. Input Power | 6.75 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 | Adjustable from 20 to 80 millimeters |
| and View Finder | with f2.5 minimum aperature. |

TABLE 6-X.- RENDEZVOUS RADAR TRANSPONDER

| 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. |

TABLE 6-X.- RENDEZVOUS RADAR TRANSPONDER - 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 \pm 4 Vdc |
| b. Input Power | 6.9 Watts maximum average over interruption cycle |
| 4. RF Output Power | 3 Watts minimum during the ON time of the interruption cycle |
| 5. XMT Frequency | 243 \pm 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. |

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 ± 0.2 seconds on and 3 ± 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 |

*

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 $\theta \geq 45^\circ$ and $\theta \geq 145^\circ$ (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>≥ -3 db</td> <td>between $\theta = 45^\circ$ and 145°</td> </tr> <tr> <td>≥ -20 db</td> <td>between $\theta = 15^\circ$ and 165°</td> </tr> <tr> <td>≥ -24 db</td> <td>between $\theta = 10^\circ$ and 170°</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 $\phi = 0^\circ$ to 360°</p> | <u>*GAIN</u> | <u>SOLID ANGLE</u> | ≥ -3 db | between $\theta = 45^\circ$ and 145° | ≥ -20 db | between $\theta = 15^\circ$ and 165° | ≥ -24 db | between $\theta = 10^\circ$ and 170° |
| <u>*GAIN</u> | <u>SOLID ANGLE</u> | | | | | | | | |
| ≥ -3 db | between $\theta = 45^\circ$ and 145° | | | | | | | | |
| ≥ -20 db | between $\theta = 15^\circ$ and 165° | | | | | | | | |
| ≥ -24 db | between $\theta = 10^\circ$ and 170° | | | | | | | | |
| 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 with ground plane wiskers |
| 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 |

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) |

TABLE 6-XIX.- ANTENNA, HIGH-GAIN

CSM 104

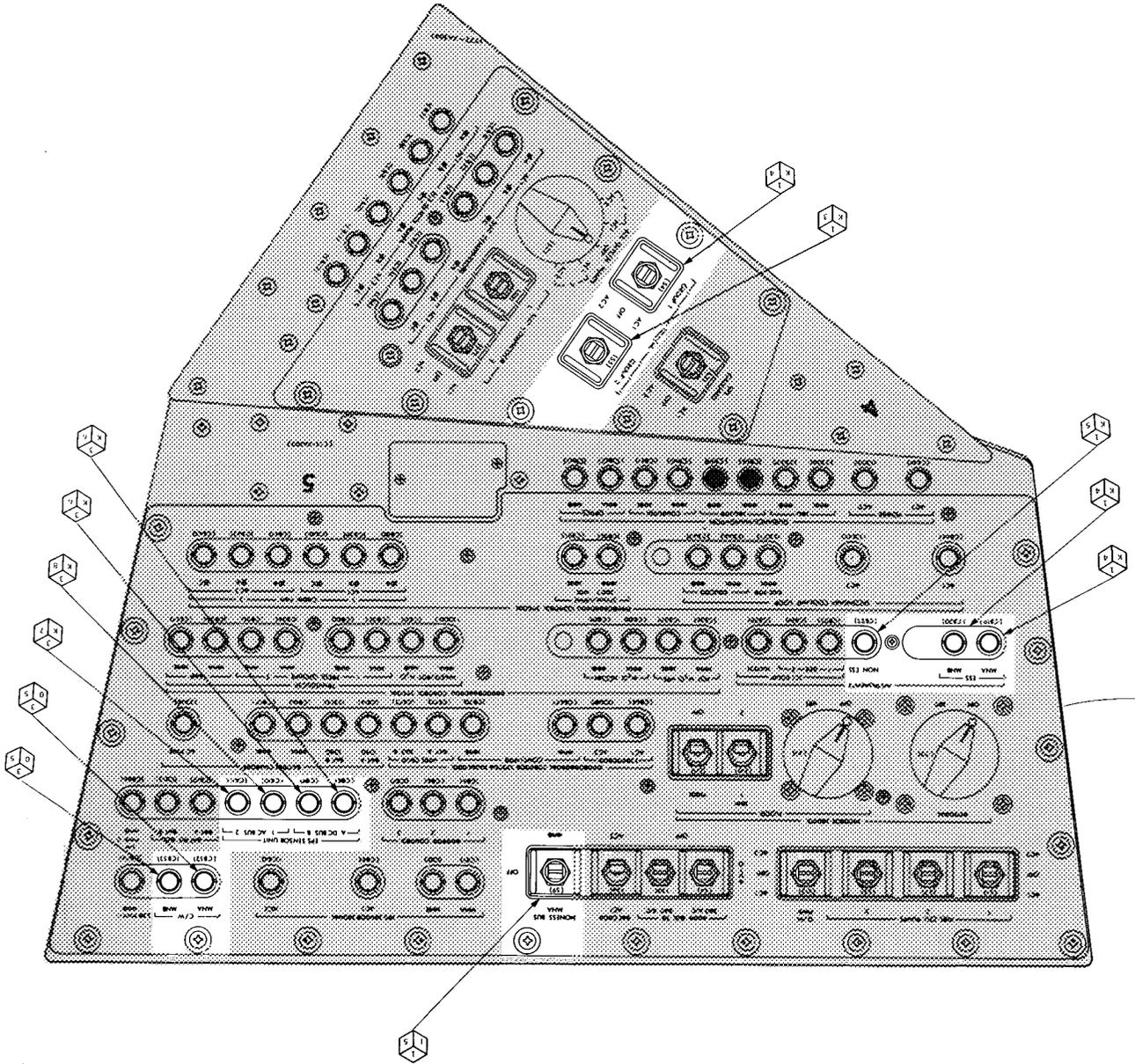
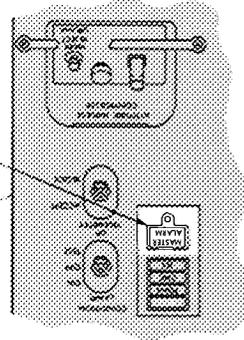
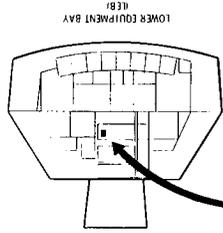
| ITEM | FUNCTION and/or PARAMETERS | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|------------------|-------------|------------------|------|--------|-------|--------|---------|------|---------|---------|------|-----------------|-------------|------------------|------|--------|-------|---------|---------|------|---------|---------|------|
| 1. Type | Multi-mode, variable gain, beamwidth, steerable antenna, consisting of four parabolas, a central horn, three-axis gimbal system and control logic. | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Frequency | Transmit: 2272.5 + 2.5 MHz 2287.5 + 2.5 MHz Receive: 2106.4 + 2 MHz | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Gain (On Axis) and Beamwidth (3 db) for XDV-5 Antenna and Electronics Box | <table border="1"> <thead> <tr> <th><u>XMT MODE</u></th> <th><u>GAIN</u></th> <th><u>BEAMWIDTH</u></th> </tr> </thead> <tbody> <tr> <td>Wide</td> <td>8.0 db</td> <td>40.0°</td> </tr> <tr> <td>Medium</td> <td>19.6 db</td> <td>7.9°</td> </tr> <tr> <td>ΔNarrow</td> <td>25.9 db</td> <td>3.9°</td> </tr> <tr> <th><u>RCV MODE</u></th> <th><u>GAIN</u></th> <th><u>BEAMWIDTH</u></th> </tr> <tr> <td>Wide</td> <td>3.8 db</td> <td>40.0°</td> </tr> <tr> <td>*Narrow</td> <td>22.8 db</td> <td>3.9°</td> </tr> <tr> <td>ΔNarrow</td> <td>23.3 db</td> <td>3.9°</td> </tr> </tbody> </table> | <u>XMT MODE</u> | <u>GAIN</u> | <u>BEAMWIDTH</u> | Wide | 8.0 db | 40.0° | Medium | 19.6 db | 7.9° | ΔNarrow | 25.9 db | 3.9° | <u>RCV MODE</u> | <u>GAIN</u> | <u>BEAMWIDTH</u> | Wide | 3.8 db | 40.0° | *Narrow | 22.8 db | 3.9° | ΔNarrow | 23.3 db | 3.9° |
| <u>XMT MODE</u> | <u>GAIN</u> | <u>BEAMWIDTH</u> | | | | | | | | | | | | | | | | | | | | | | | |
| Wide | 8.0 db | 40.0° | | | | | | | | | | | | | | | | | | | | | | | |
| Medium | 19.6 db | 7.9° | | | | | | | | | | | | | | | | | | | | | | | |
| ΔNarrow | 25.9 db | 3.9° | | | | | | | | | | | | | | | | | | | | | | | |
| <u>RCV MODE</u> | <u>GAIN</u> | <u>BEAMWIDTH</u> | | | | | | | | | | | | | | | | | | | | | | | |
| Wide | 3.8 db | 40.0° | | | | | | | | | | | | | | | | | | | | | | | |
| *Narrow | 22.8 db | 3.9° | | | | | | | | | | | | | | | | | | | | | | | |
| ΔNarrow | 23.3 db | 3.9° | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Polarization | Right-Hand Circular | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Coverage | Spherical except for pointing angles where the MSFN to the high gain antenna (HGA) line of site is shadowed by the CSM. Shadow area covers approximately 40 percent of sphere. | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. RF Power Rating | 15 Watts Continuous | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. Electrical Power | a. DC Voltage 28 + 2, - 4 Vdc b. AC Voltage 115/200 Vac, 400 Hz, 3-Phase c. DC Power (Watts) 16.45 (PRIM), 22.84 (SEC) d. AC Power (Watts RMS) 34.5 (PRIM), 34.5 (SEC) | | | | | | | | | | | | | | | | | | | | | | | | |
| 8. Weight | 94 Pounds maximum | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. Acquisition Range | 60 degrees or less from boresight axis when line of sight is outside RF Scan Limits. | | | | | | | | | | | | | | | | | | | | | | | | |
| 10. Track Mode Transfer | Wide track to narrow track switching occurs for tracking errors less than 1 degree. HGA will switch back to wide track if the tracking errors increase to greater than 3 degrees. | | | | | | | | | | | | | | | | | | | | | | | | |
| 11. RF Scan Limit | Electronic limit set to correspond to CSM RF shadow profile. | | | | | | | | | | | | | | | | | | | | | | | | |

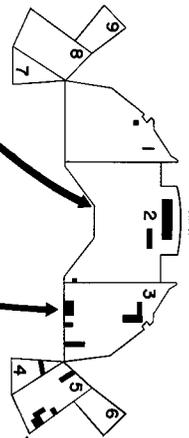
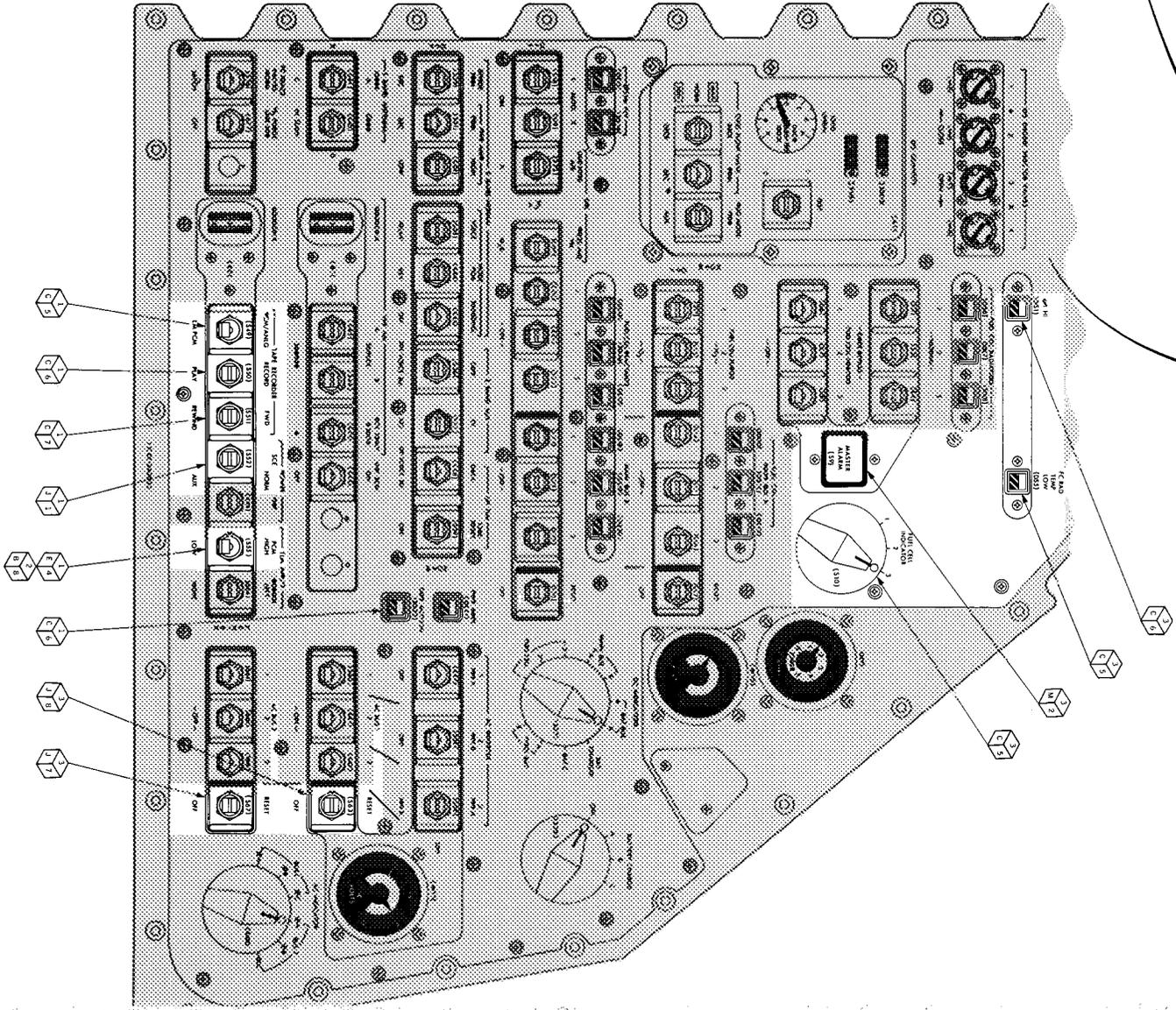
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TABLE 6-XIX.- ANTENNA, HIGH-GAIN - Concluded

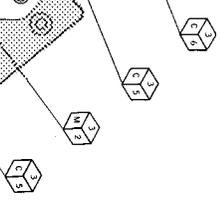
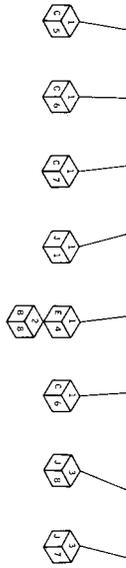
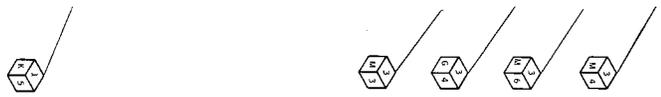
CSM 104

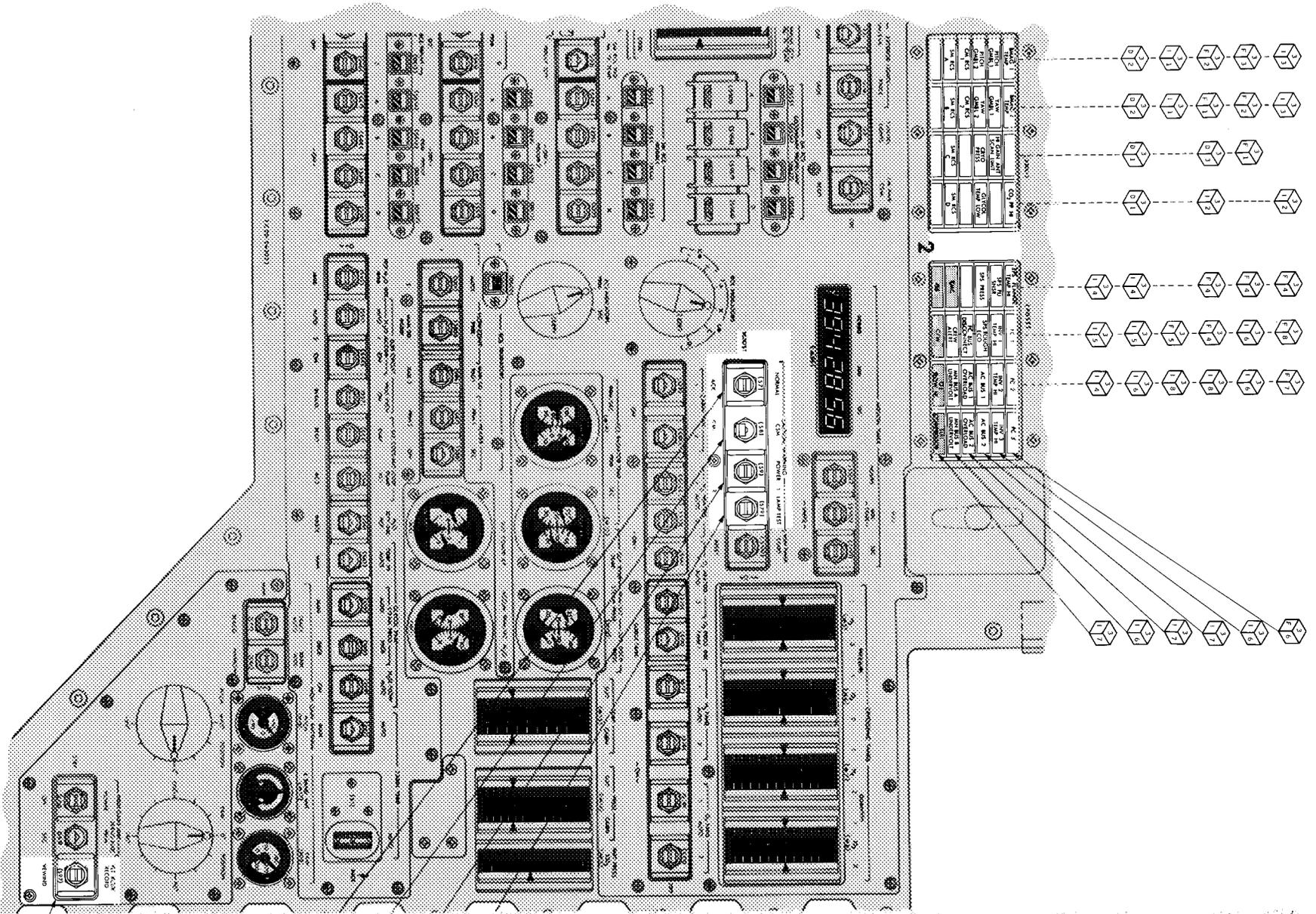
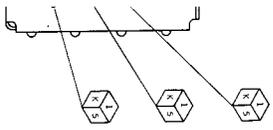
| ITEM | FUNCTION and/or PARAMETERS |
|---|--|
| 12. Gimbal Limits A-axis B-axis C-axis | 360° Rotation ±23.5° +125°, -4 A-, B-, and C-axis are at 0 degrees when B-axis is parallel to CSM X-axis and C-axis forms a right angle with A-axis. When onboard pitch and yaw indicators read 0 degrees. A-axis equals 0 degrees, B-axis equals 0 degrees, and C-axis equals + 90 degrees. |
| 13. Scan Warning Light | Warning limit is set 15 ± 3 degrees outside RF Scan Limit. |
| 14. Deployment | Deployment is initiated by SLA Panel Deployment. The HGA boom is pivoted in the deployment mechanism by spring-loaded push arms. Deployment period is nominally 10 seconds. |

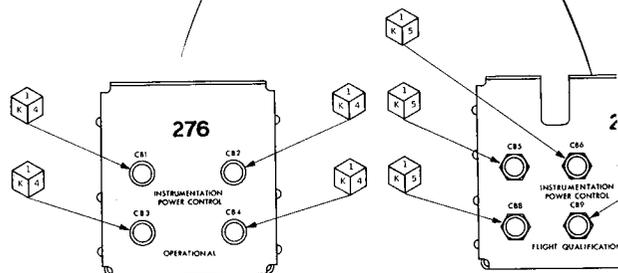
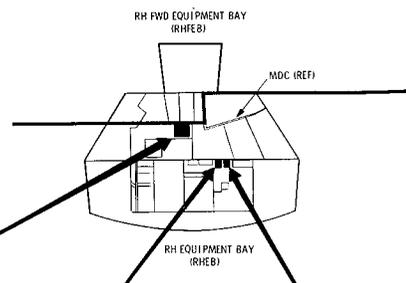
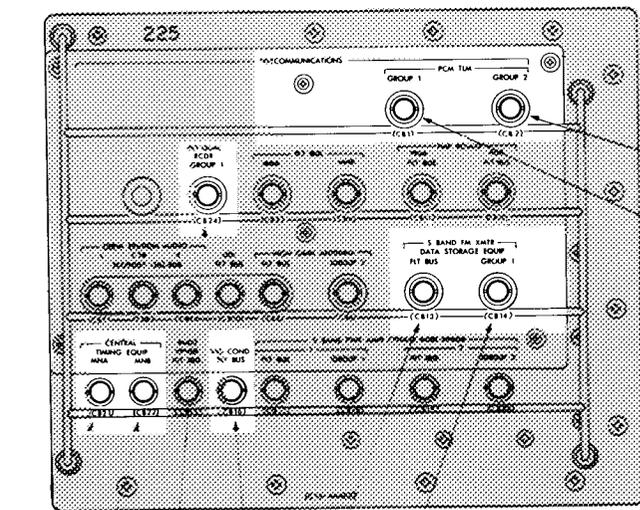
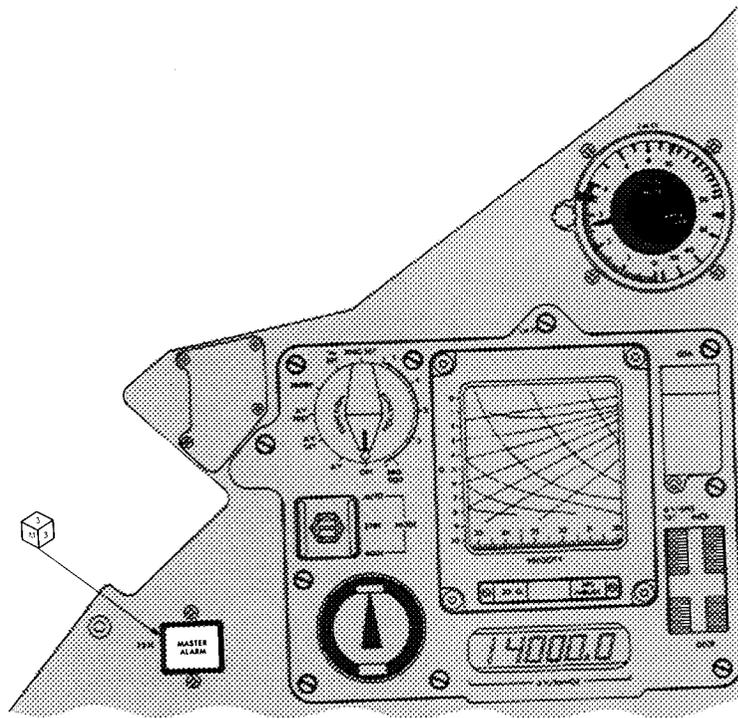




MAIN DISPLAY CONSOLE (MDC)





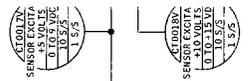
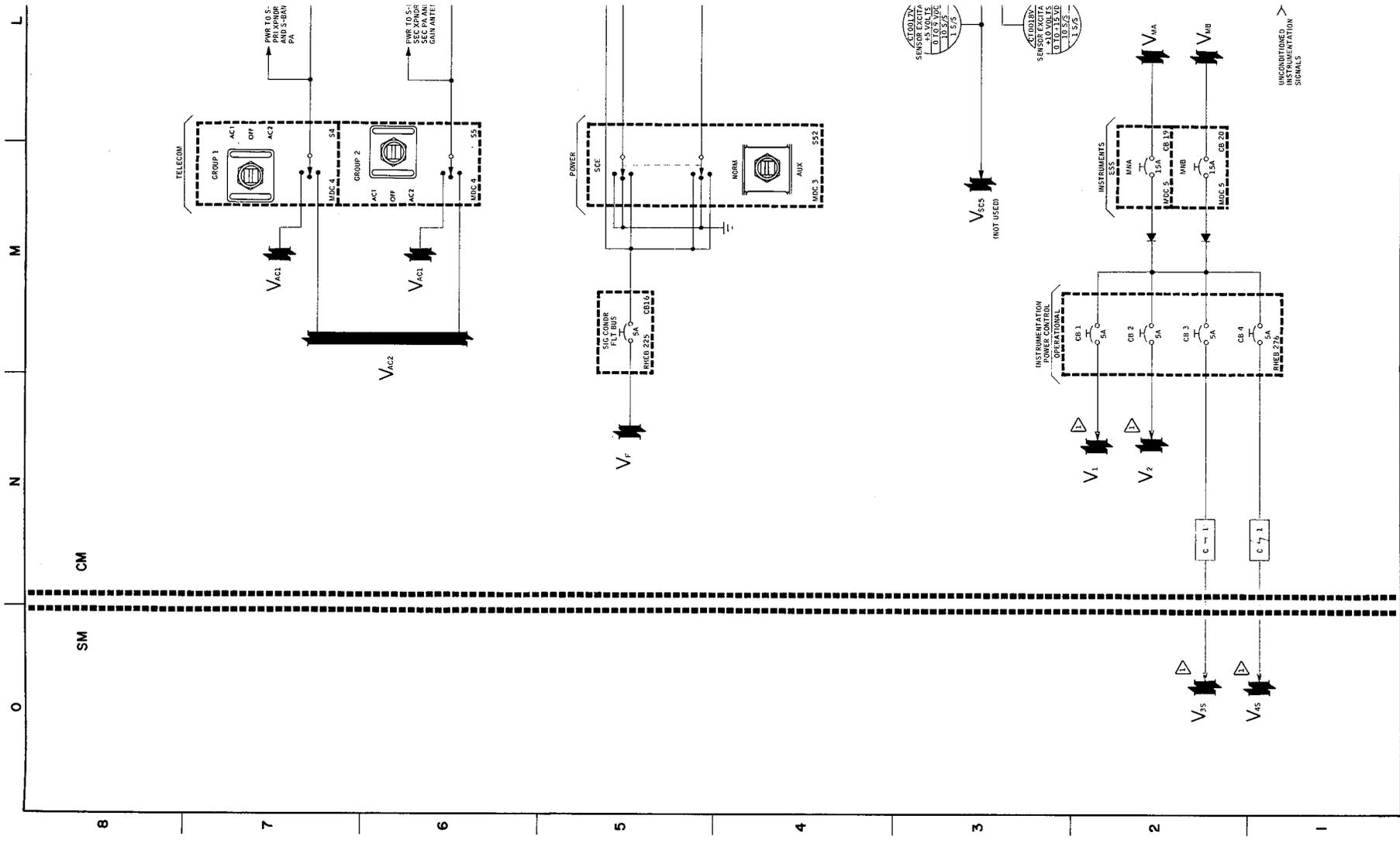


NATIONAL AERONAUTICS & SPACE ADMINISTRATION
 MANNED SPACECRAFT CENTER HOUSTON, TEXAS

**INSTRUMENTATION
 CONTROL-DISPLAY FIGURE**

DWG NO. **FIGURE 7.1** SIZE **J** CSM **104**

SHEET OF PAGE 36 X 11.1



INSTRUMENTATION
INSTRUMENTATION
SIGNALS

K

J

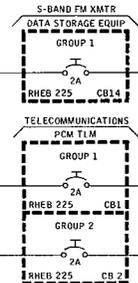
SCIENTIFIC EXPERIMENT JUNCTION BOX
C28-A66

K2 AND K3 SCI RECORD RELAY

B Z₆
6,2

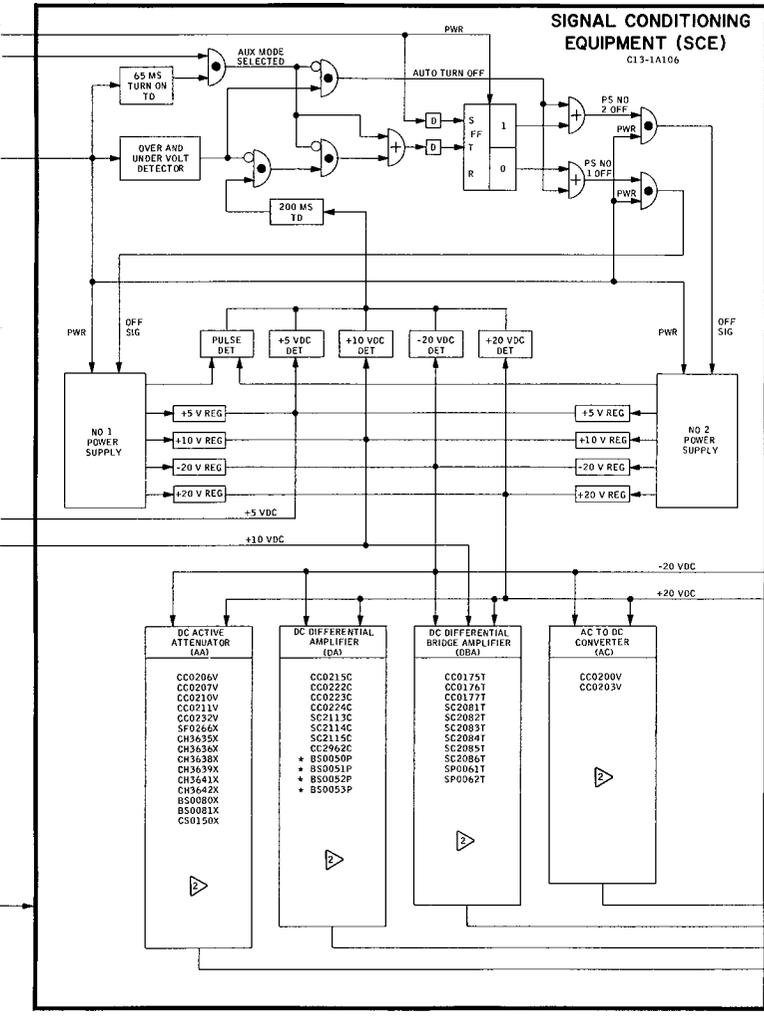
PWR TO USBE FM XMTR
C Z₆
6,2

AND B Z₅
6,2



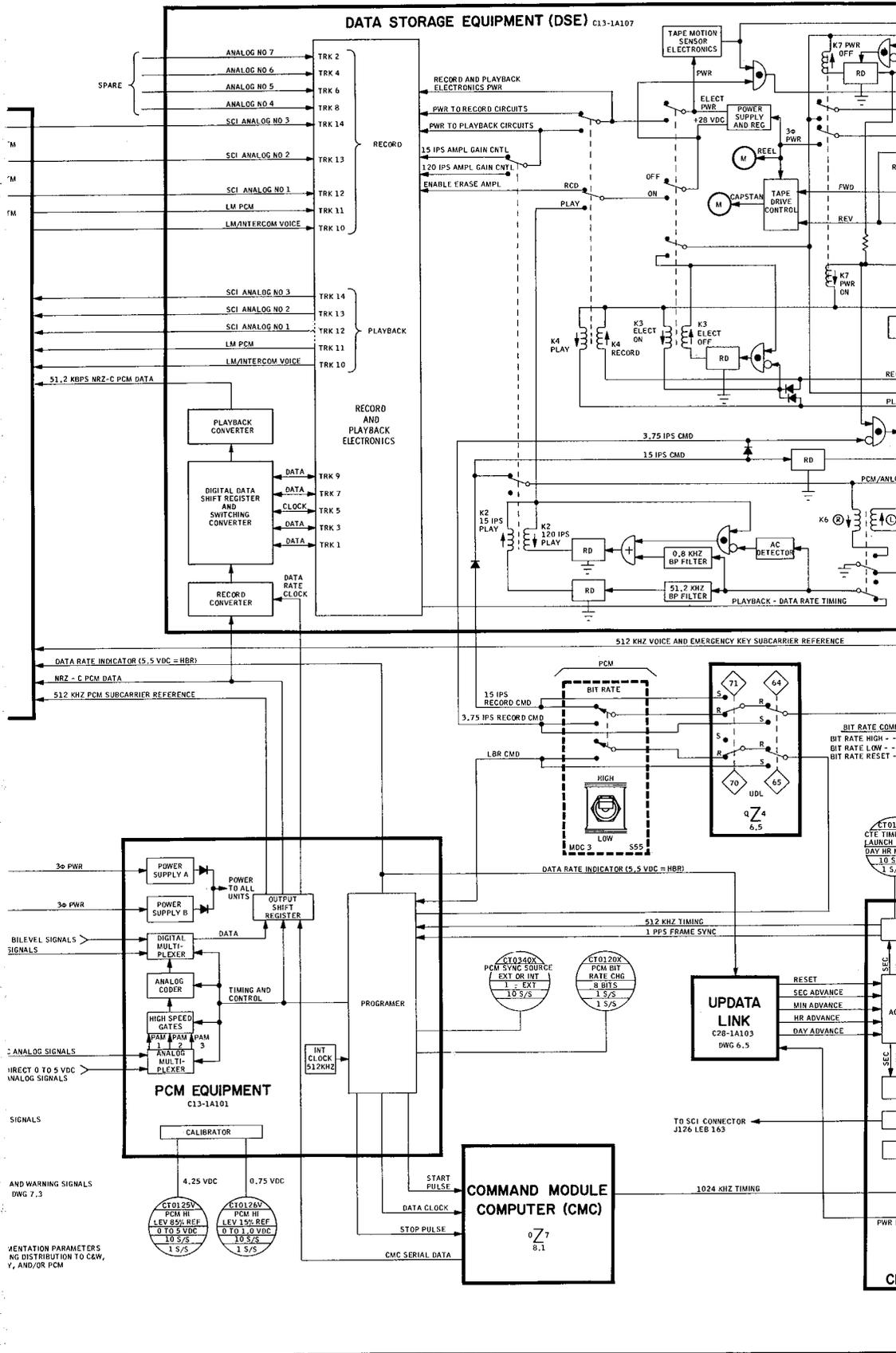
PMF
C28-1A)
F Z₆
6,4

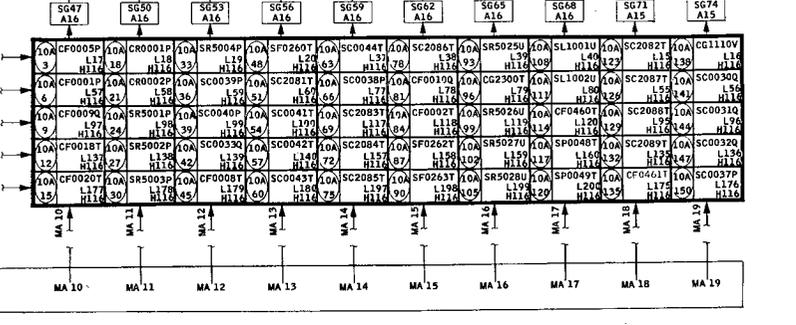
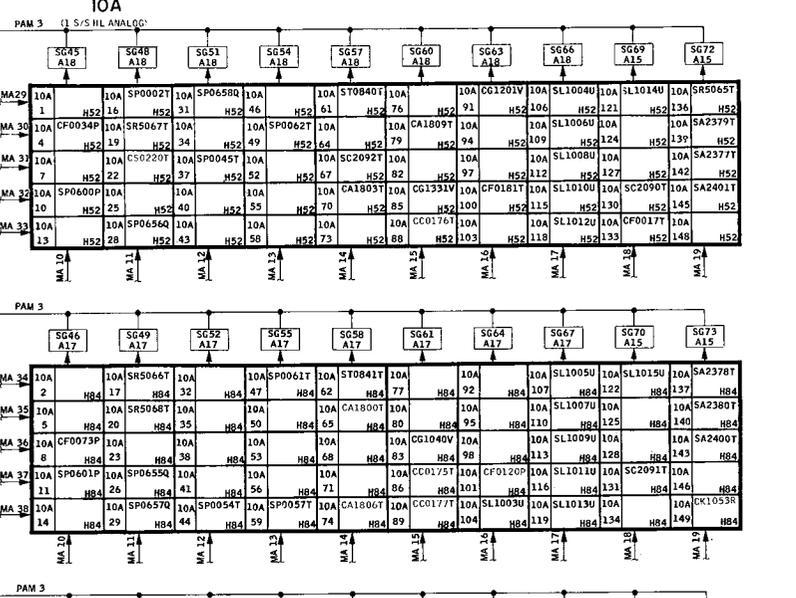
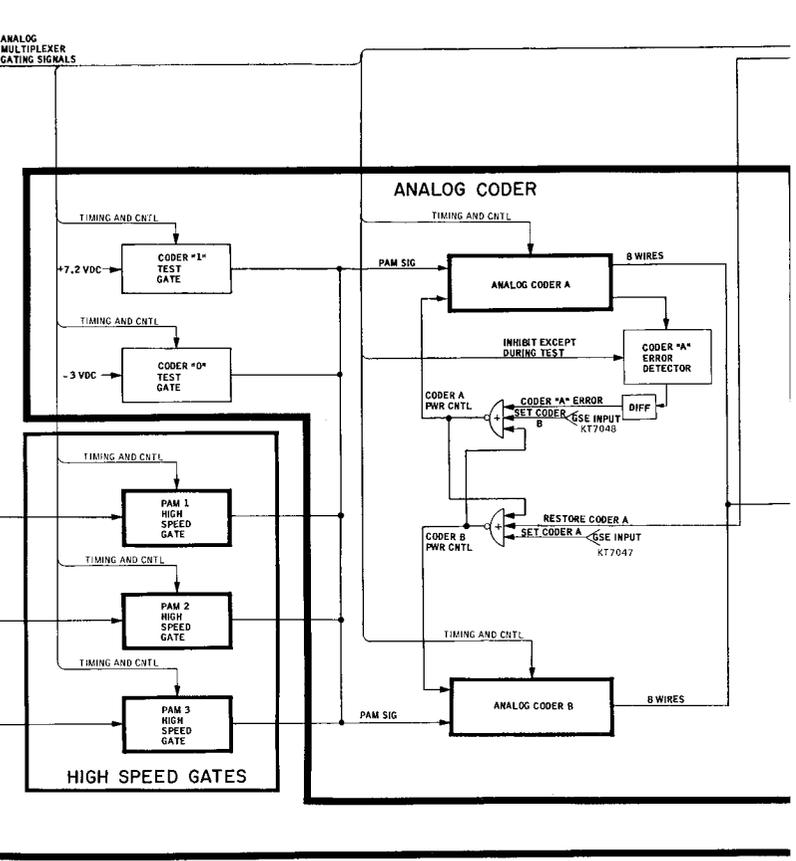
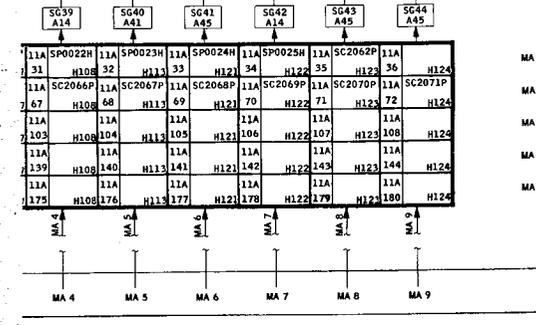
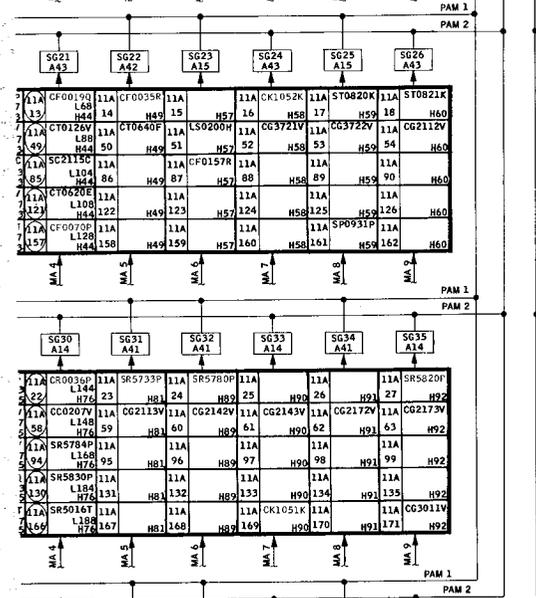
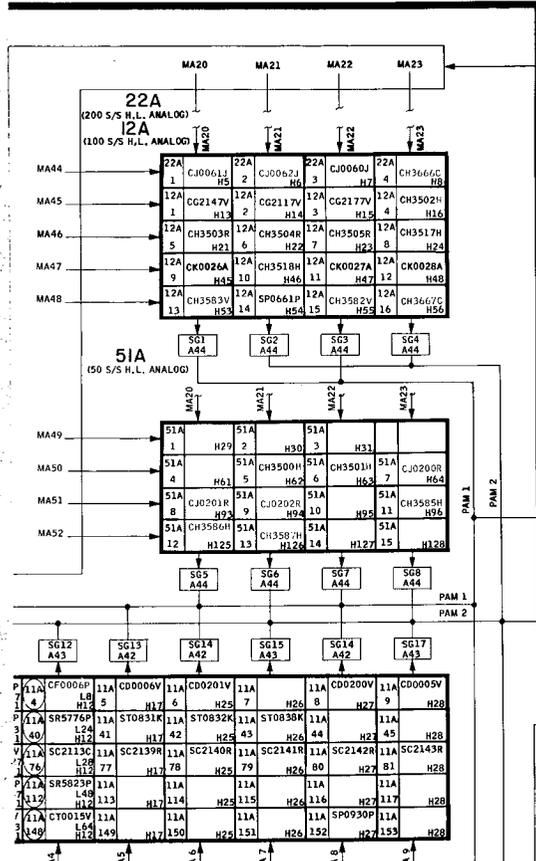
SIGNAL CONDITIONING EQUIPMENT (SCE)
C13-1A106



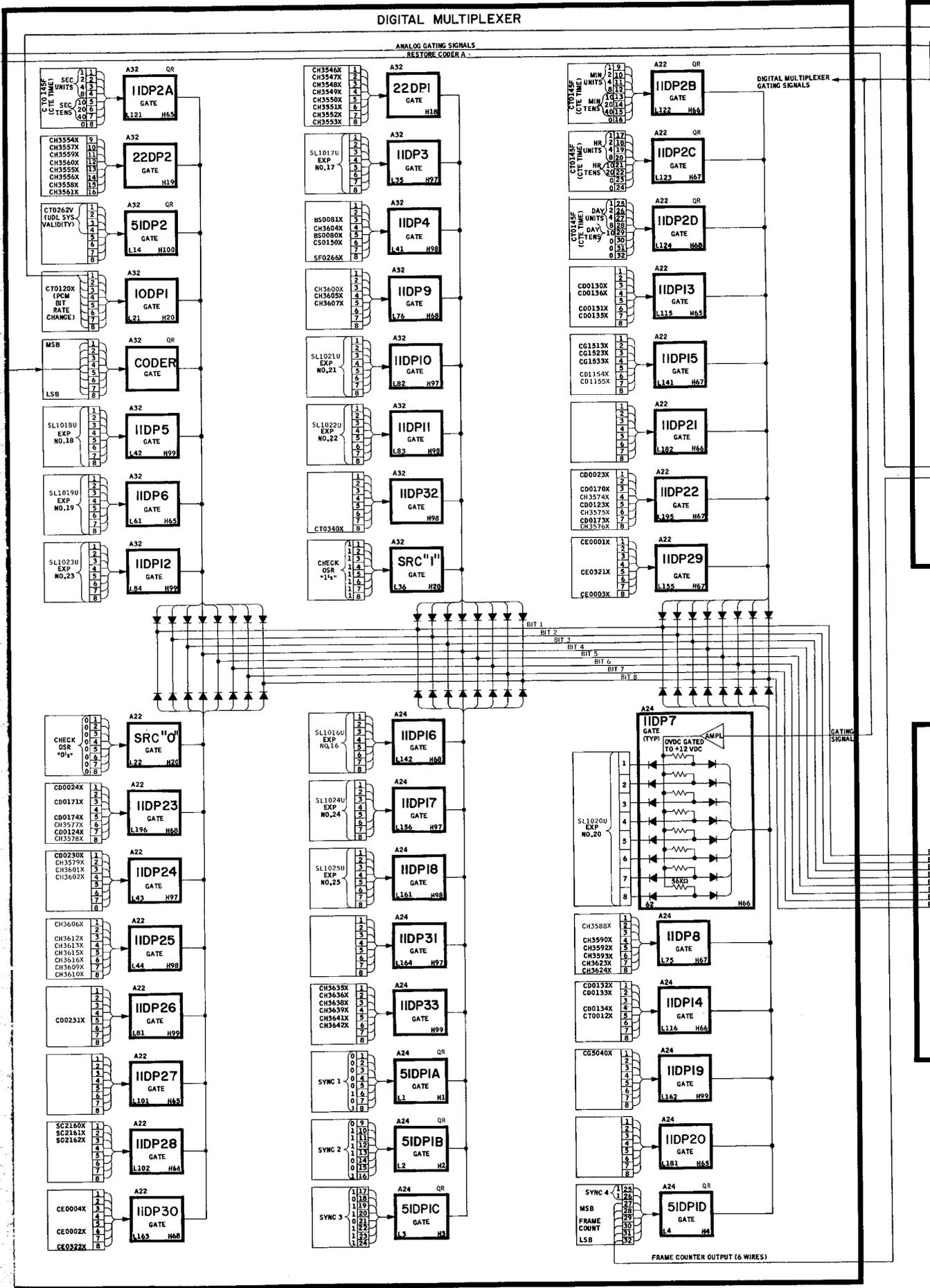
CT0016V
SCE REG
SUPPLY VOLTS
0 TO +30 VDC
10 S/S
1 S/S

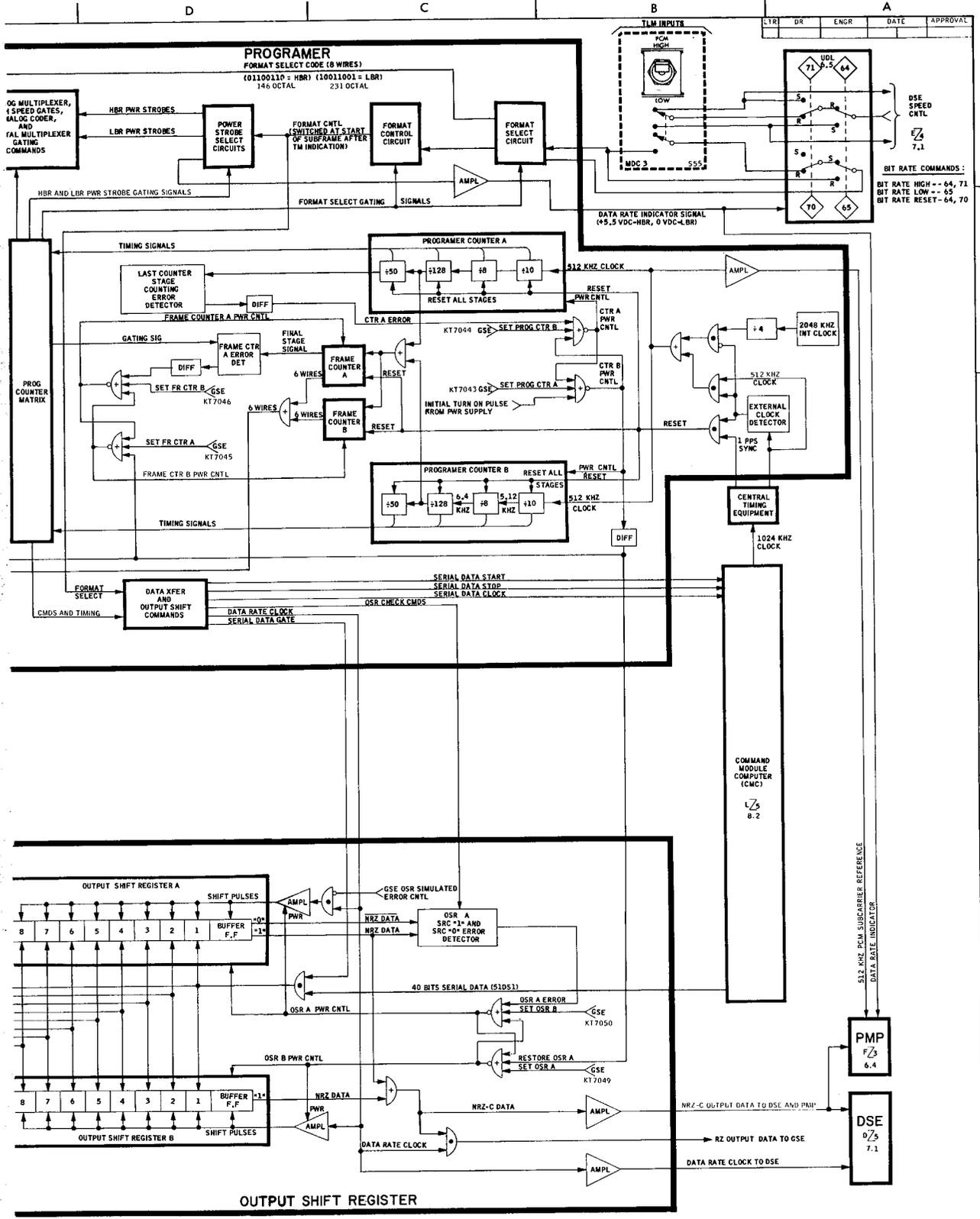
CT0015V
SCE POS
SUPPLY VOLTS
0 TO +30 VDC
10 S/S
1 S/S





DIGITAL MULTIPLEXER





OUTPUT SHIFT REGISTER

- ▷ SRC "0" WILL APPEAR IN WORD 20 PRIME FRAMES 2, 7, 12, 17, ..., 47 AND SRC "1" WILL APPEAR IN WORD 20 PRIME FRAMES 3, 8, 13, 18, ..., 48
- 6. ENCIRCLED CHANNEL CODE NUMBERS INDICATE ANALOG CHANNELS APPEARING IN LBR FORMAT
- 5. EVENT PARAMETERS DESIGNATED XXEXX-XX WILL BE GATED BY CORRESPONDING XXDPXX GATE
- 4. AXX DESIGNATES PRINTED CIRCUIT MODULE LOCATION INTERNAL TO PCM
- 3. S0XX DESIGNATES SEQUENCER GATE NUMBER
- 2. S00X DESIGNATES HBR WORD NUMBER
- NOTES: 1. LXXX DESIGNATES LBR WORD NUMBER

2 PCM

| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | | |
|------------|--------------------|------|--|------------------|--------------|
| DR | <i>[Signature]</i> | | INSTRUMENTATION PCM SIGNAL FLOW | | |
| DSGN | | | | | |
| QC | | | | | |
| ENGR | | | | | |
| APP | <i>[Signature]</i> | | | | |
| FCC | | | CSM 104 | SIZE DWG NO J | 7.2 |
| AUTH | | | 9/9 X 34 | | SHEET 1 OF 1 |

SECTION 7

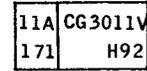
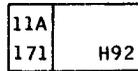
IS

WAS

1. DWG 7.2 MZ₆



2. DWG 7.2 MZ₃



3. DWG 7.2 JZ₂

SR5025Q

SR5025U

SR5026Q

SR5026U

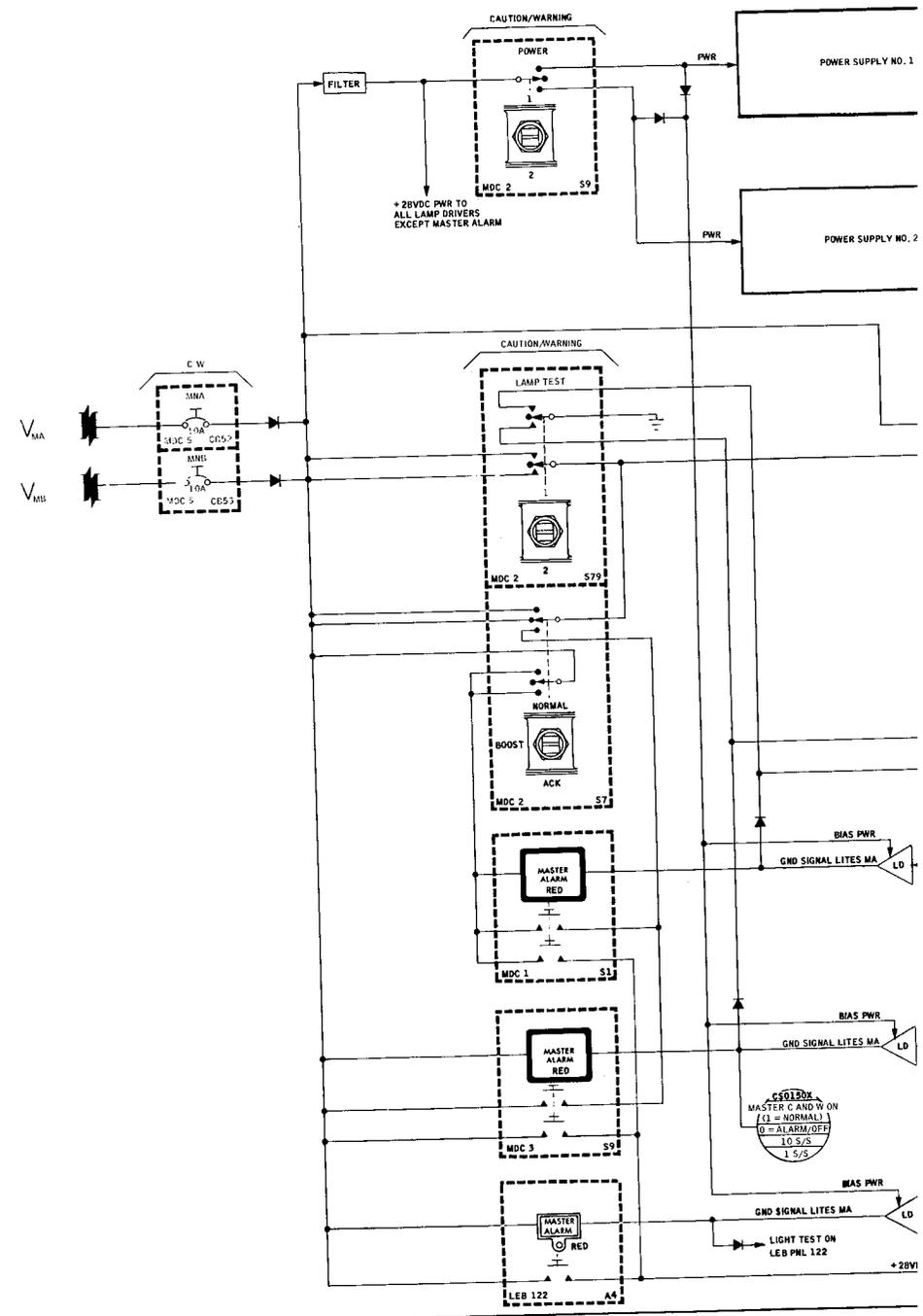
SR5027Q

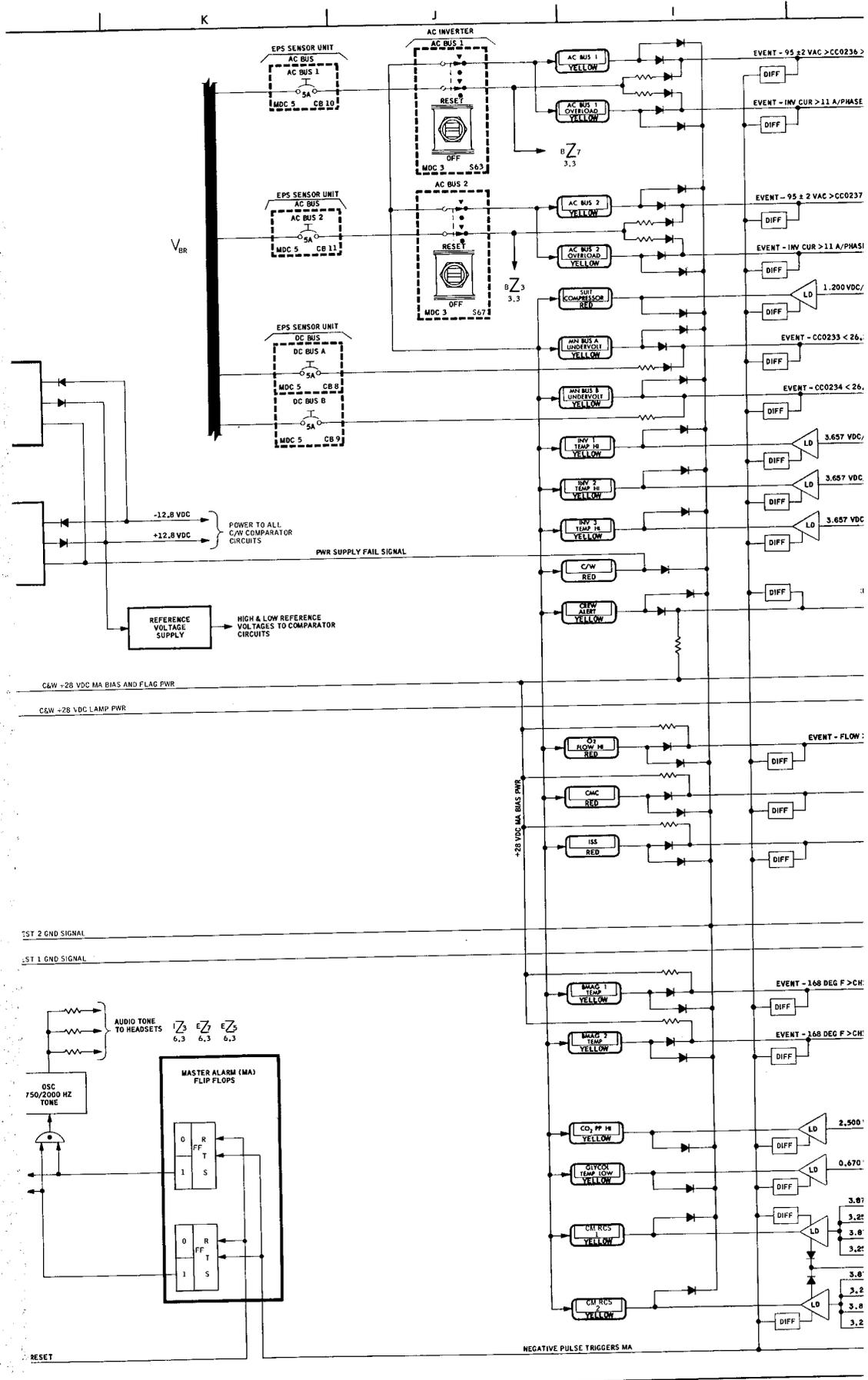
SR5027U

SR5028Q

SR5028U

8
7
6
5
4
3
2
1





K J I

V_{BR}

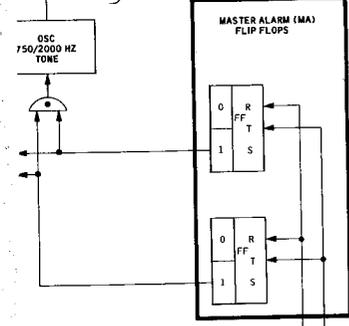
C&W +28 VDC MA BIAS AND FLAG PWR

C&W +28 VDC LAMP PWR

TST 2 GND SIGNAL

TST 1 GND SIGNAL

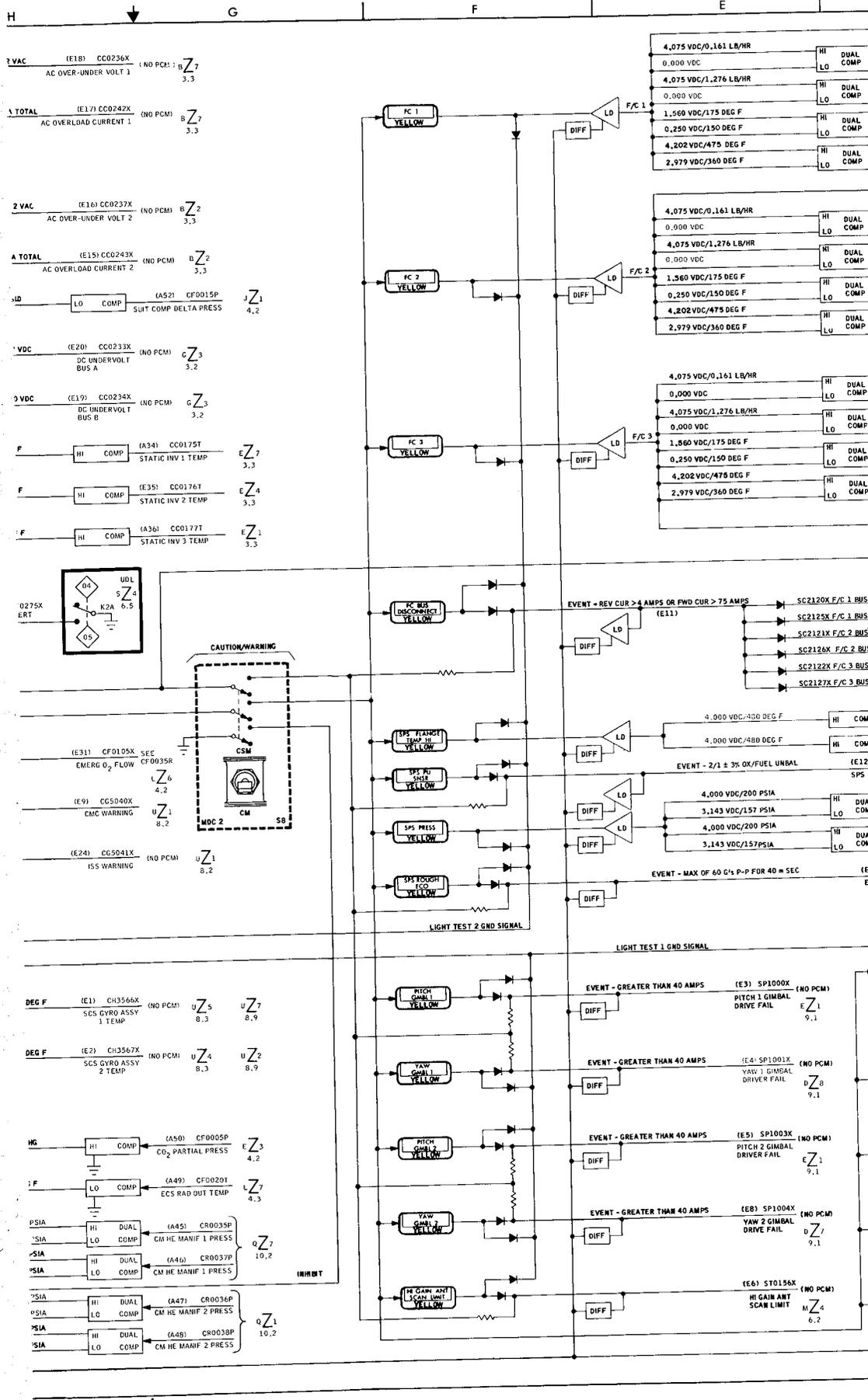
AUDIO TONE TO HEADSETS
 I_{Z3} E_{Z1} E_{Z3}
 6,3 6,3 6,3

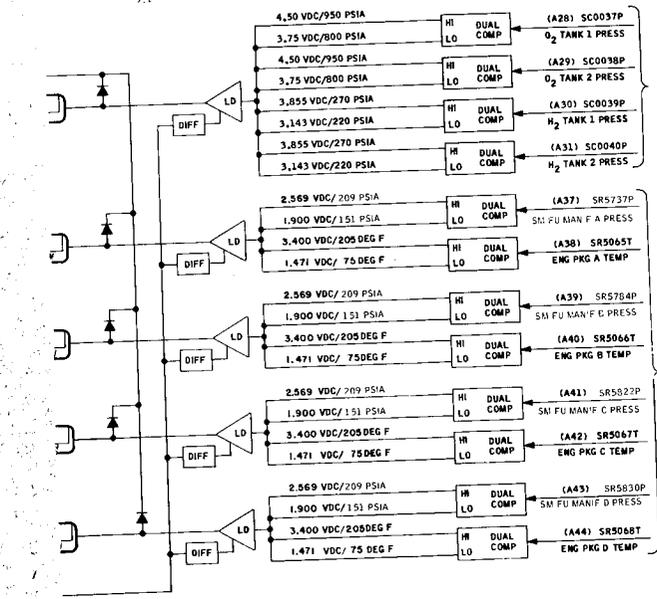
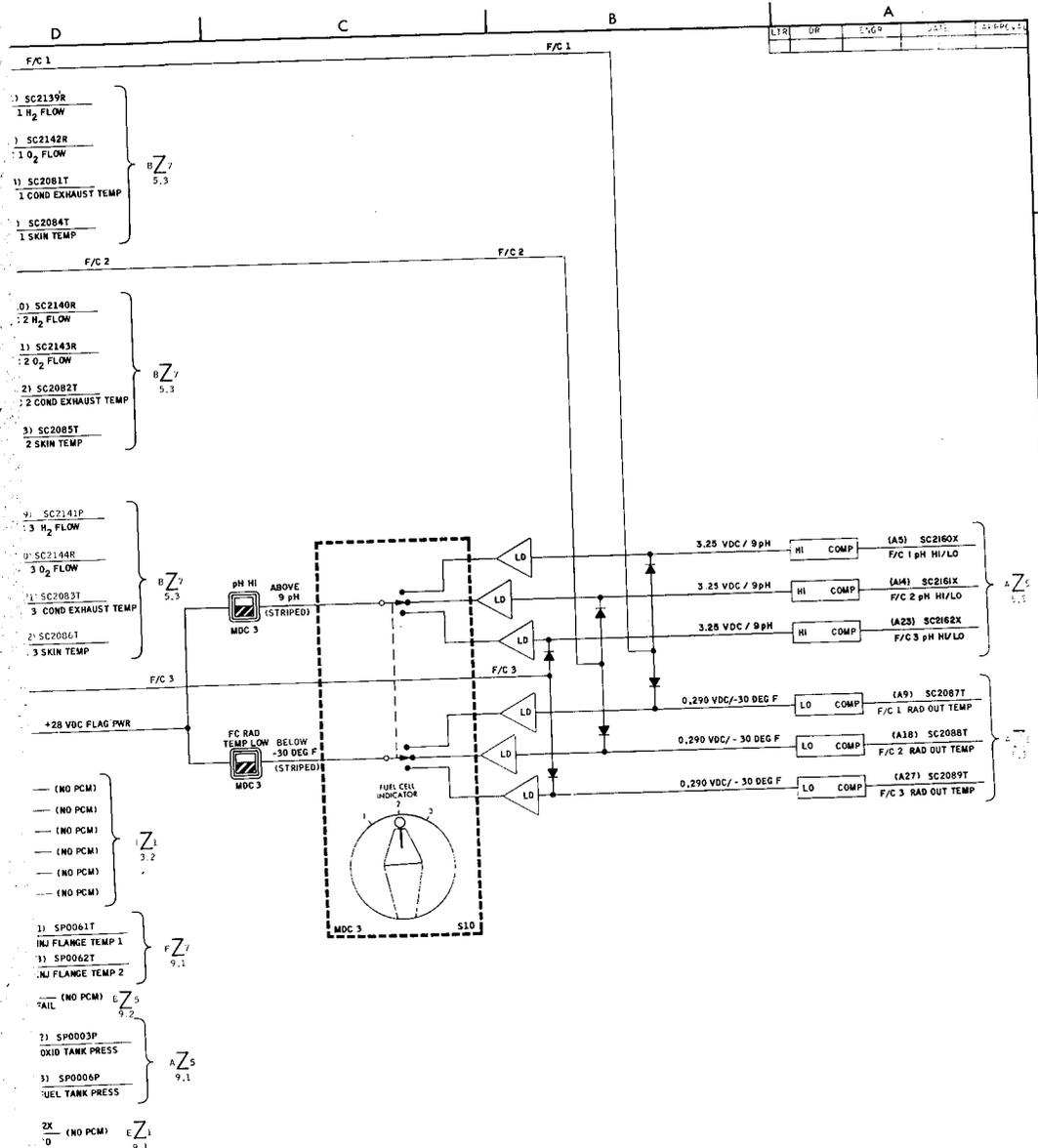


RESET

NEGATIVE PULSE TRIGGERS MA

- EVENT - 95 ± 2 VAC > CC0236 >
- EVENT - INV CUR > 11 A/PHASE
- EVENT - 95 ± 2 VAC > CC0237
- EVENT - INV CUR > 11 A/PHASE
- 1.200 VDC/
- EVENT - CC0235 < 26.
- EVENT - CC0234 < 26.
- 3.657 VDC/
- 3.657 VDC/
- 3.657 VDC/
- EVENT - FLOW :
- EVENT - 168 DEG F > CH
- EVENT - 168 DEG F > CH
- 2.500
- 0.670
- 3.07
- 3.05
- 3.0
- 3.2
- 3.8
- 3.2
- 3.8
- 3.2





- NOTES. 1. THE FOLLOWING NON-STANDARD ABBREVIATIONS ARE USED:
 MA - MASTER ALARM
 LD - ELECTRONIC LAMP DRIVER
 COMP - ELECTRONIC COMPARATOR
 DIFF - ELECTRONIC DIFFERENTIATOR
2. VOLTAGE COMPARATOR WILL OUTPUT A GROUND SIGNAL AT INDICATED VOLTAGE LEVEL. ENGINEERING UNITS ARE FOR REFERENCE ONLY. LATEST CALIBRATION CURVE SHOULD BE USED FOR ACTUAL OPERATING POINT
3. UNLESS OTHERWISE SPECIFIED, ALL CAUTION AND WARNING INDICATORS ARE LOCATED ON MDC 2

3 C&W

| SIGNATURES | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | | |
|----------------------|----------------|--|-------------|--------------|
| DR <i>Rich Spake</i> | | CAUTION AND WARNING SYSTEM | | |
| DESIGN | | | | |
| QC <i>W. J. ...</i> | <i>9-11-67</i> | | | |
| ENGR | | | | |
| NR | | | | |
| APP <i>...</i> | | CSM | SIZE DWG NO | 7.3 |
| FEC | | 104 | J | |
| AUTH | | 82.5 X 34 | | SHEET 1 OF 1 |

SECTION 7

IS

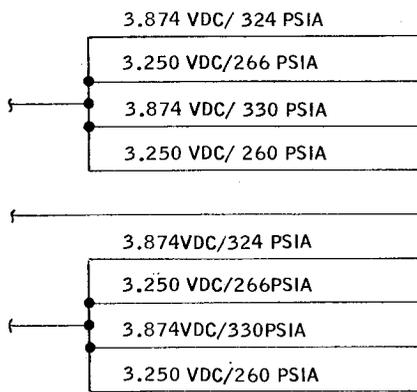
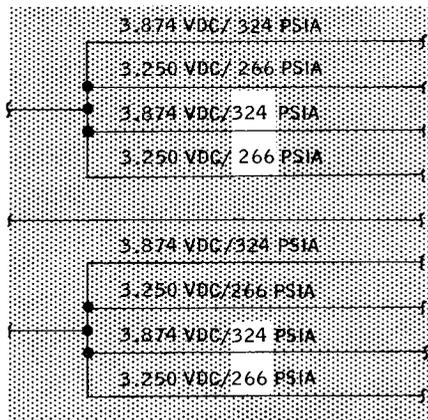
WAS

1. DWG 7.3 BZ1

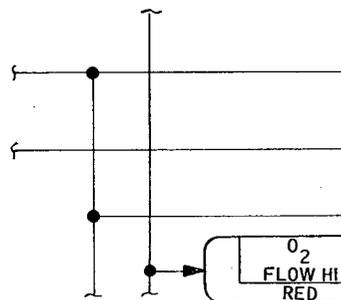
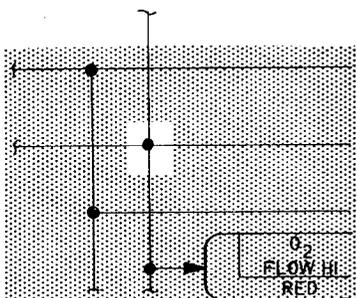
SR5823P

SR5830P

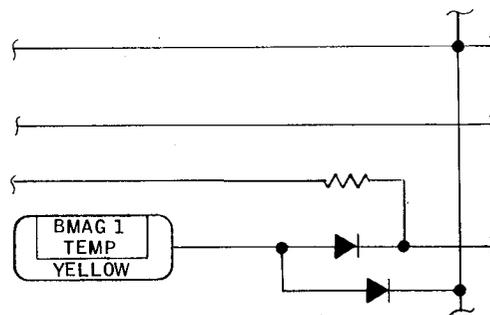
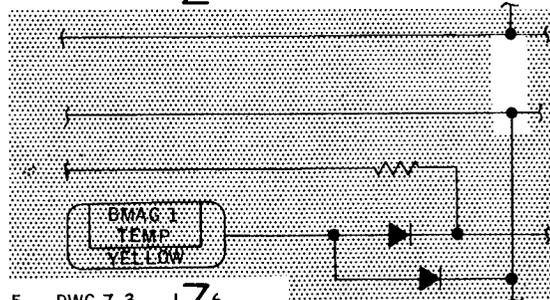
2. DWG 7.3 HZ1



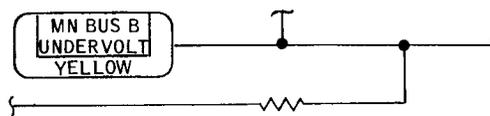
3. DWG 7.3 IZ4



4. DWG 7.3 IZ3



5. DWG 7.3 IZ6



*

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 [CMC 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

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 - All prime frames
- B - Prime Frames 1, 6, 11, 16...46
- C - Prime Frames 2, 7, 12, 17...47
- D - Prime Frames 3, 8, 13, 18...48
- E - Prime Frames 4, 9, 14, 19...49
- F - Prime Frames 5, 10, 15, 20...50
- 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 in such a manner 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. 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 104.

*

7.4.6.1 Column definitions for tables 7-I through 7-XIV.-

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 - ADAPTER
- B - BOOSTER
- C - COMMAND MODULE
- L - LAUNCH ESCAPE TOWER
- S - SERVICE MODULE

2. Functional Subsystem Code

The second letter denotes the subsystem wherein the measurement originates.

- A - STRUCTURES
- C - ELECTRICAL POWER
- D - MASTER EVENTS SEQUENCE CONTROLLER
- E - EARTH LANDING SEQUENCE CONTROLLER
- F - ENVIRONMENTAL CONTROL
- G - GUIDANCE & NAVIGATION
- H - STABILIZATION & CONTROL
- J - CREW EQUIPMENT
- K - FLIGHT TECHNOLOGY
- L - SCIENTIFIC EQUIPMENT
- P - SERVICE PROPULSION
- R - REACTION CONTROL
- S - L/V EMERGENCY DETECTION
- T - COMMUNICATIONS AND 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:

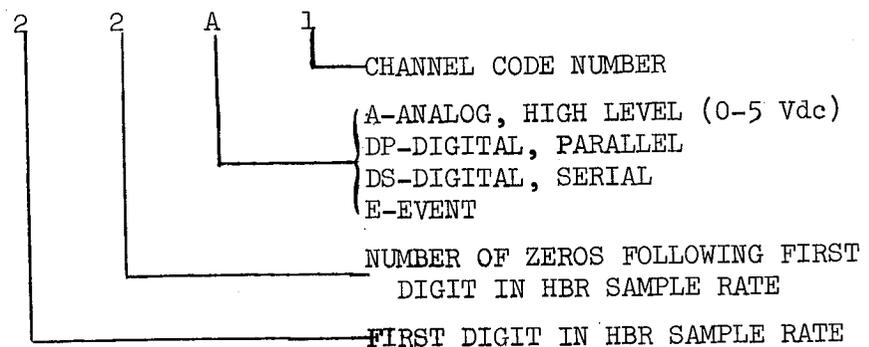
1 - HBR format only

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

V₁ - CM ESS INST BUS PWR FROM RHEB PNL 276-CB1
V₂ - CM ESS INST BUS PWR FROM RHEB PNL 276-CB2
V_{3S} - SM ESS INST BUS PWR FROM RHEB PNL 276-CB3
V_{4S} - SM ESS INST BUS PWR FROM RHEB PNL 276-CB4

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

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.

*

CSM
S/C 104

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.

TABLE 7-I.- PCM TELEMETRY - STRUCTURES

CSM
S/C 104

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|----------------------------|----|-----------|------------|------|-------|----------|----------|---------------------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| CA1800T | SIDE HS BOND LOC 1 TEMP | H1 | 10A65 | -260 | +600 | DEG F | V2 | -- | } 120 MA TOTAL } | -- | -- | -- |
| CA1803T | SIDE HS BOND LOC 4 TEMP | H1 | 10A70 | -260 | +600 | DEG F | V2 | -- | | -- | -- | -- |
| 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 | -- | -- | -- |

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|---------------------------|----|-----------|------------|------|-------|-----------------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| SC0030Q | H ₂ TK 1 QTY | H2 | 10A141 | 0 | 100 | PCT | EPS | -- | 4W AC | M | CS | 5.2 |
| SC0031Q | H ₂ TK 2 QTY | H2 | 10A144 | 0 | 100 | PCT | EPS | -- | 4W AC | M | CS | 5.2 |
| SC0032Q | O ₂ TK 1 QTY | H2 | 10A147 | 0 | 100 | PCT | EPS | -- | 4W AC | M | CS | 5.2 |
| SC0033Q | O ₂ TK 2 QTY | H2 | 10A42 | 0 | 100 | PCT | EPS | -- | 4W AC | M | CS | 5.2 |
| SC0037P | O ₂ TK 1 PRESS | H2 | 10A150 | 50 | 1050 | PSIA | V _{4S} | -- | 25 MA | SM** | CS | 5.2 |
| SC0038P | O ₂ TK 2 PRESS | H2 | 10A66 | 50 | 1050 | PSIA | V _{3S} | -- | 25 MA | M** | CS | 5.2 |
| SC0039P | H ₂ TK 1 PRESS | H2 | 10A36 | 0 | 350 | PSIA | V _{4S} | -- | 25 MA | M** | CS | 5.2 |
| SC0040P | H ₂ TK 2 PRESS | H2 | 10A39 | 0 | 350 | PSIA | V _{3S} | -- | 25 MA | M** | CS | 5.2 |
| SC0041T | O ₂ TK 1 TEMP | H2 | 10A54 | -325 | +80 | DEG F | EPS | -- | SC0032 | -- | -- | 5.2 |
| SC0042T | O ₂ TK 2 TEMP | H2 | 10A57 | -325 | +80 | DEG F | EPS | -- | SC0033 | -- | -- | 5.2 |
| SC0043T | H ₂ TK 1 TEMP | H2 | 10A60 | -425 | -200 | DEG F | EPS | -- | SC0030 | -- | -- | 5.2 |
| SC0044T | H ₂ TK 2 TEMP | H2 | 10A63 | -425 | -200 | DEG F | EPS | -- | SC0031 | -- | -- | 5.2 |
| CC0175T | INVERTER 1 TEMP | H1 | 10A86 | +32 | +248 | DEG F | V _{SC} | DBA | -- | L** | CS | 3.3 |
| CC0176T | INVERTER 2 TEMP | H1 | 10A88 | +32 | +248 | DEG F | V _{SC} | DBA | -- | L** | CS | 3.3 |
| CC0177T | INVERTER 3 TEMP | H1 | 10A89 | +32 | +248 | DEG F | V _{SC} | DBA | -- | L** | CS | 3.3 |
| CC0200V | AC BUS 1 ϕ A VOLTS | H2 | 11A147 | 0 | 150 | VAC | V _{SC} | AC | -- | SM** | TSC | 3.3 |
| CC0203V | AC BUS 2 ϕ A VOLTS | H2 | 11A56 | 0 | 150 | VAC | V _{SC} | AC | -- | SM** | TSC | 3.3 |
| CC0206V | MAIN BUS A VOLTS | H2 | 11A57 | 0 | +45 | VDC | V _{SC} | AA | -- | SM** | TSC | 3.2 |
| CC0207V | MAIN BUS B VOLTS | H2 | 11A58 | 0 | +45 | VDC | V _{SC} | AA | -- | SM** | TSC | 3.2 |
| CC0210V | BAT BUS A VOLTS | H2 | 11A91 | 0 | +45 | VDC | V _{SC} | AA | -- | SM | TSC | 3.2 |
| CC0211V | BAT BUS B VOLTS | H2 | 11A93 | 0 | +45 | VDC | V _{SC} | AA | -- | SM | TSC | 3.2 |
| CC0215C | BAT CHGR | H2 | 11A73 | 0 | +5 | AMPS | V _{SC} | DA | -- | SM | TSC | 3.2 |
| CC0222C | BAT A CUR | H2 | 11A74 | 0 | +100 | AMPS | V _{SC} | DA | -- | SM | TSC | 3.2 |
| CC0223C | BAT B CUR | H2 | 11A109 | 0 | +100 | AMPS | V _{SC} | DA | -- | SM | TSC | 3.2 |
| CC0224C | BAT C CUR | H2 | 11A110 | 0 | +100 | AMPS | V _{SC} | DA | -- | SM | TSC | 3.2 |
| CC0232V | BAT RELAY BUS VOLTS | H2 | 11A75 | 0 | +45 | VDC | V _{SC} | AA | -- | SM | CS | 3.2 |
| SC2060P | FC 1 N ₂ PRESS | H1 | 11A29 | 0 | 75 | PSIA | V _{4S} | -- | -- | SM | CS | 5.3 |
| SC2061P | FC 2 N ₂ PRESS | H1 | 11A30 | 0 | 75 | PSIA | V _{3S} | -- | -- | SM | CS | 5.3 |
| SC2062P | FC 3 N ₂ PRESS | H1 | 11A35 | 0 | 75 | PSIA | V _{3S} | -- | -- | SM | CS | 5.3 |

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|---------------------------|----|-----------|------------|------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| SC2066P | FC 1 O ₂ PRESS | H1 | 11A67 | 0 | 75 | PSIA | V4S | --- | | SM | CS | 5.3 |
| SC2067P | FC 2 O ₂ PRESS | H1 | 11A68 | 0 | 75 | PSIA | V3S | --- | | SM | CS | 5.3 |
| SC2068P | FC 3 O ₂ PRESS | H1 | 11A69 | 0 | 75 | PSIA | V3S | --- | | SM | CS | 5.3 |
| SC2069P | FC 1 H ₂ PRESS | H1 | 11A70 | 0 | 75 | PSIA | V4S | --- | | SM | CS | 5.3 |
| SC2070P | FC 2 H ₂ PRESS | H1 | 11A71 | 0 | 75 | PSIA | V3S | --- | | SM | CS | 5.3 |
| SC2071P | FC 3 H ₂ PRESS | H1 | 11A72 | 0 | 75 | PSIA | V3S | --- | | SM | CS | 5.3 |
| SC2081T | FC 1 COND EXH TEMP | H2 | 10A51 | +145 | +250 | DEG F | V5C | DBA | --- | SM** | CS | 5.3 |
| SC2082T | FC 2 COND EXH TEMP | H2 | 10A123 | +145 | +250 | DEG F | V5C | DBA | --- | 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 H ₂ FLOW | H1 | 11A77 | 0 | 0.2 | LB/HR | V4S | --- | 56 MA | SM** | CS | 5.3 |
| SC2140R | FC 2 H ₂ FLOW | H1 | 11A78 | 0 | 0.2 | LB/HR | V3S | --- | 56 MA | SM** | CS | 5.3 |
| SC2141R | FC 3 H ₂ FLOW | H1 | 11A79 | 0 | 0.2 | LB/HR | V3S | --- | 56 MA | SM** | CS | 5.3 |
| SC2142R | FC 1 O ₂ FLOW | H1 | 11A80 | 0 | 1.6 | LB/HR | V4S | --- | 56 MA | SM** | CS | 5.3 |
| SC2143R | FC 2 O ₂ FLOW | H1 | 11A81 | 0 | 1.6 | LB/HR | V3S | --- | 56 MA | SM** | CS | 5.3 |
| SC2144R | FC 3 O ₂ FLOW | H1 | 11A82 | 0 | 1.6 | LB/HR | V3S | --- | 56 MA | SM** | CS | 5.3 |

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|-------------------|----|-----------|------------|------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| 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 |
| CC2962C | LM HEATER CURRENT | H2 | 11A47 | 0 | +10 | AMPS | VSC | DA | | SM | CS | 5.3 |

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|------------------------------|----|-----------|------------|--------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| 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 |
| CD1154X | CSM-LM LOCK RING SEP RELAY A | E2 | 11E15-6 | | SEP | EVENT | SEQ | -- | 1 MA | -- | -- | 2.7 |
| CD1155X | CSM-LM LOCK RING SEP RELAY B | E2 | 11E15-7 | | SEP | EVENT | SEQ | -- | 1 MA | -- | -- | 2.7 |

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|-------------------------|----|-----------|------------|--------|-------|----------------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| CE0001X | DROGUE DEP. RELAY A | E2 | 11E29-1 | | DEPLOY | EVENT | V ₂ | -- | 1 MA | -- | -- | 2.5 |
| CE0002X | DROGUE DEP RELAY B | E2 | 11E30-6 | | DEPLOY | EVENT | V ₂ | -- | 1 MA | -- | -- | 2.5 |
| CE0003X | MAIN DEPLOY RELAY A | E2 | 11E29-8 | | DEPLOY | EVENT | V ₂ | -- | 1 MA | -- | -- | 2.5 |
| CE0004X | MAIN DEPLOY RELAY B | E2 | 11E30-3 | | DEPLOY | EVENT | V ₂ | -- | 1 MA | -- | -- | 2.5 |
| CE0321X | MAIN CHUTE DISC RELAY A | E2 | 11E29-5 | | DISC | EVENT | V ₂ | -- | 1 MA | -- | -- | 2.5 |
| CE0322X | MAIN CHUTE DISC RELAY B | E2 | 11E30-8 | | DISC | EVENT | V ₂ | -- | 1 MA | -- | -- | 2.5 |

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|--|----|-----------|------------|-------|---------------------|----------------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| 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 | -5 | +5 | IN H ₂ O | V ₂ | -- | 10 MA | M | CS | 4.2 |
| CF0005P | CO ₂ PARTIAL PRESS | H2 | 10A3 | 0 | 30 | MM HG | ECS | -- | 40 MA | M* | SS | 4.2 |
| CF0006P | SURGE TANK PRESS | H2 | 11A4 | 50 | 1050 | PSIA | V ₂ | -- | 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 H ₂ O QTY | H2 | 10A9 | 0 | 100 | PCT | ECS | -- | 40 MA | SM | CS | 4.5 |
| CF0010Q | POTABLE H ₂ O 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 | 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 | H2 | 11A13 | 0 | 100 | PCT | ECS | -- | 25 MA | SM | CS | 4.3 |
| CF0020T | ECS RAD OUT TEMP | H2 | 10A15 | -50 | +100 | DEG F | ECS | -- | 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 O ₂ FLOW O ₂ SUPPLY MANF | H1 | 11A14 | 0.2 | 1.0 | LB/HR | ECS | -- | 120 MA | M* | CS | 4.2 |
| CF0036P | O ₂ SUPPLY MANF PRESS | H2 | 11A55 | 0 | 150 | PSIG | ECS | -- | 25 MA | -- | -- | 4.2 |
| CF0070P | SEC GLY PUMP OUT PRESS | H2 | 11A157 | 0 | 60 | PSIG | ECS | -- | 25 MA | SM | CS | 4.4 |
| CF0071T | SEC EVAP OUT LIQ TEMP | H2 | 11A118 | +25 | +75 | DEG F | ECS | -- | CF0008T | SM | CS | 4.4 |
| CF0072Q | SEC GLY ACCUM QUANTITY | H2 | 11A129 | 0 | 100 | PCT | ECS | -- | 25 MA | SM | CS | 4.4 |
| CF0073P | SEC EVAP OUT STEAM PRESS | H1 | 10A8 | 0.05 | 0.25 | PSIA | ECS | -- | 40 MA | SM | CS | 4.4 |
| CF0120P | H ₂ O TANK - GLY RES PRESS | H1 | 10A101 | 0 | 50 | PSIA | V ₂ | -- | 10 MA | -- | -- | 4.2 |
| CF0157R | PRI GLYCOL FLOW RATE | H1 | 11A87 | +150 | +300 | LB/HR | V ₂ | -- | 10 MA | -- | -- | 4.3 |
| CF0181T | PRI EVAP INLET TEMP | H1 | 10A100 | +35 | +100 | DEG F | V ₂ | -- | 56 MA | -- | -- | 4.3 |
| 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 |

CSM
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PCN-1

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|----------------------------|----|-----------|------------|-------|-------|-----------------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| SF0266X | RAD FLOW CONT SYS 1 OR 2 | E2 | 11E4-8 | SYS 1 | SYS 2 | EVENT | V _{SC} | AA | -- | TB | TSC | 4.3 |
| CF0460T | H ₂ O DUMP TEMP | H2 | 10A114 | 0 | +100 | DEG F | V ₂ | -- | 56 MA | -- | -- | 4.5 |
| CF0461T | URINE DUMP NOZZLE TEMP | H2 | 10A135 | 0 | +100 | DEG F | V ₁ | -- | 56 MA | -- | -- | 4.5 |

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|-------------------------|----|-----------|------------|----------|-------|----------|----------|-----------|-------------|----------|------------------|
| | | | | LOW | HIGH | | | | | | | |
| CG0001V | CPTR DIG DATA - 40 BITS | S2 | 51DS1 | | | | -- | -- | -- | -- | -- | 8.1 |
| CG1040V | PIPA + 120 VDC | H1 | 10A83 | +85 | +135 | VDC | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG1110V | TM BIAS 2.5 VDC | H2 | 10A138 | 0 | 5 | VDC | G&N | -- | -- | -- | -- | 8.1, 8.4 |
| CG1201V | IMU 28 VAC 800HZ | H1 | 10A91 | 0 | 31.1 | VRMS | G&N | -- | -- | -- | -- | 8.1, 8.4 |
| CG1331V | 3.2 KHZ 28V SUPPLY | H1 | 10A85 | 0 | 31.1 | VRMS | G&N | -- | -- | -- | -- | 8.1 8.5 |
| CG1513X | IMU HTR +28 VDC | E2 | 11E15-2 | OFF | STBY | EVENT | G&N | -- | -- | -- | -- | 8.1 8.5 |
| CG1523X | CMC OPERATE +28 VDC | E2 | 11E15-3 | OFF | OPR | EVENT | G&N | -- | -- | -- | -- | 8.1, 8.4 |
| CG1533X | OPTX OPERATE 28 VAC | E2 | 11E15-4 | OFF | OPR | EVENT | G&N | -- | -- | -- | -- | 8.1, 8.4 |
| CG2112V | IG 1X RSVR OUT SIN | H1 | 11A54 | -50/+230 | +50/+130 | DEG | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG2113V | IG 1X RSVR OUT COS | H1 | 11A59 | +130/+230 | +50/+310 | DEG | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG2117V | IGA SERVO ERR IN PHASE | H1 | 12A2 | -2.5 | +2.5 | MRAD | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG2142V | MG 1X RSVR OUT SIN | H1 | 11A60 | -50/+230 | +50/+130 | DEG | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG2143V | MG 1X RSVR OUT COS | H1 | 11A61 | +130/+230 | +50/+310 | DEG | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG2147V | MGA SERVO ERR IN PHASE | H1 | 12A1 | -2.5 | +2.5 | MRAD | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG2172V | OG 1X RSVR OUT SIN | H1 | 11A62 | -50/+230 | +50/+130 | DEG | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG2173V | OG 1X RSVR OUT COS | H1 | 11A63 | +130/+230 | +50/+310 | DEG | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG2177V | OGA SERVO ERR IN PHASE | H1 | 12A3 | -2.5 | +2.5 | MRAD | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG2300T | PIPA TEMP | H2 | 10A96 | +120 | +140 | DEG F | G&N | -- | -- | -- | -- | 8.1, 8.5 |
| CG3721V | SHAFT CDU DAC OUT | H1 | 11A52 | -10 | +10 | VRMS | G&N | -- | -- | -- | -- | 8.1, 8.6, 8.9 |
| CG3722V | TRUNNION CDU OUT | H1 | 11A53 | -10 | +10 | VRMS | G&N | -- | -- | -- | -- | 8.1, 8.6, 8.9 |
| CG5040X | CMC WARNING | E2 | 11E19-1 | | WARN | EVENT | G&N | -- | -- | L* | -- | 8.1 |

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|-----------------------|----|-----------|------------|---------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| CH3500H | PITCH ATT ERR | H1 | 51A5 | -5/5/15 | +5/5/15 | DEG | S&C | -- | -- | M | TSC | 8.3,8.8 |
| CH3501H | YAW ATT ERR | H1 | 51A6 | -5/5/15 | +5/5/15 | DEG | S&C | -- | -- | M | TSC | 8.3,8.8 |
| CH3502H | ROLL ATT ERR | H1 | 12A4 | -5/5/50 | +5/5/50 | DEG | S&C | -- | -- | M | TSC | 8.3,8.8 |
| CH3503R | SCS PITCH BODY RATE | H1 | 12A5 | -1/5/10 | +1/5/10 | DEG/S | S&C | -- | -- | M | TSC | 8.3,8.8 |
| CH3504R | SCS YAW BODY RATE | H1 | 12A6 | -1/5/10 | +1/5/10 | DEG/S | S&C | -- | -- | M | TSC | 8.3,8.8 |
| CH3505R | SCS ROLL BODY RATE | H1 | 12A7 | -1/5/50 | +1/5/50 | DEG/S | S&C | -- | -- | M | TSC | 8.3,8.8 |
| CH3517H | PITCH GMBL POS 1 OR 2 | H1 | 12A8 | -5.0 | +5.0 | DEG | S&C | -- | -- | SM | TSC | 8.3,8.9 |
| CH3518H | YAW GMBL POS 1 OR 2 | H1 | 12A10 | -5.0 | +5.0 | DEG | S&C | -- | -- | SM | TSC | 8.3,8.9 |
| CH3546X | +PITCH/+X ENG | E1 | 22E1-1 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3547X | -PITCH/+X ENG | E1 | 22E2-2 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3548X | +PITCH/-X ENG | E1 | 22E3-3 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3549X | -PITCH/-X ENG | E1 | 22E4-4 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3550X | +YAW/+X ENG | E1 | 22E5-5 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3551X | -YAW/+X ENG | E1 | 22E6-6 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3552X | +YAW/-X ENG | E1 | 22E7-7 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3553X | -YAW/-X ENG | E1 | 22E8-8 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3554X | +ROLL/+Z ENG | E1 | 22E9-1 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3555X | -ROLL/+Z ENG | E1 | 22E13-5 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3556X | +ROLL/-Z ENG | E1 | 22E14-6 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3557X | -ROLL/-Z ENG | E1 | 22E10-2 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3558X | +ROLL/+Y ENG | E1 | 22E15-7 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3559X | -ROLL/+Y ENG | E1 | 22E11-3 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3560X | +ROLL/-Y ENG | E1 | 22E12-4 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3561X | -ROLL/-Y ENG | E1 | 22E16-8 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3,8.10 |
| CH3574X | TRANS CNTL +X CMD | E2 | 11E22-4 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.10 |
| CH3575X | TRANS CNTL -X CMD | E2 | 11E22-6 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.10 |
| CH3576X | TRANS CNTL +Y CMD | E2 | 11E22-8 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.10 |
| CH3577X | TRANS CNTL -Y CMD | E2 | 11E23-6 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.10 |

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

CSM
S/C 104
PCN-1

| 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 |
|-----------|------------------------------|----|-----------|----------|-----------------|-------|----------|----------|-----------|-------------|----------|-------------------|
| CH3578X | TRANS CNTL +Z CMD | E2 | 11E23-8 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.10 |
| CH3579X | TRANS CNTL -Z CMD | E2 | 11E24-2 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.10 |
| CH3582V | SCS TVC PITCH AUTO CMD | H1 | 12A15 | -10 | +10 | VDC | S&C | -- | -- | -- | -- | 8.9 |
| CH3583V | SCS TVC YAW AUTO CMD | H1 | 12A13 | -10 | +10 | VDC | S&C | -- | -- | -- | -- | 8.9 |
| CH3585H | MTVC PITCH CMD | H1 | 51A11 | -11.5 | +11.5 | DEG | S&C | -- | -- | -- | -- | 8.9 |
| CH3586H | MTVC YAW CMD | H1 | 51A12 | -11.5 | +11.5 | DEG | S&C | -- | -- | -- | -- | 8.9 |
| CH3587H | ROT ROLL CMD | H1 | 51A13 | -11.5 | +11.5 | DEG | S&C | -- | -- | -- | -- | 8.9 |
| CH3588X | ATT DEADBAND MIN | E2 | 11E8-2 | MAX | MIN | EVENT | S&C | -- | -- | -- | -- | 8.3, 8.9A |
| CH3590X | HI RATE LIMIT | E2 | 11E8-4 | LOW | HIGH | EVENT | S&C | -- | -- | -- | -- | 8.3, 8.9A |
| 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 |
| CH3600X | ΔV CG LM/CSM | E2 | 11E9-3 | CSM | LM/CSM | EVENT | S&C | -- | -- | -- | -- | 8.9A |
| CH3601X | DIRECT RCS NO. 1 | E2 | 11E24-3 | OFF | ENABLE | EVENT | S&C | -- | -- | -- | -- | 8.7 |
| CH3602X | DIRECT RCS NO. 2 | E2 | 11E24-4 | OFF | ENABLE | EVENT | S&C | -- | -- | -- | -- | 8.7 |
| CH3604X | SPS SOL DRIVER 1 | E2 | 11E4-4 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3, 8.9 |
| CH3605X | SPS SOL DRIVER 2 | E2 | 11E9-4 | FIRE/OFF | ARM | EVENT | S&C | -- | -- | -- | -- | 8.3, 8.9 |
| CH3606X | LIMIT CYCLE SWITCH | E2 | 11E25-1 | ON | OFF | EVENT | S&C | -- | -- | -- | -- | 8.3, 8.9A |
| CH3607X | S/C CNTL SCS | E2 | 11E9-5 | CMC | SCS | EVENT | S&C | -- | -- | -- | -- | 8.3, 8.9A, 8.9 |
| CH3609X | MANUAL ATT ROLL ACCEL CMD | E2 | 11E25-7 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.9A |
| CH3610X | MANUAL ATT ROLL MIN IMP CMD | E2 | 11E25-8 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.9A |
| CH3612X | MANUAL ATT PITCH ACCEL CMD | E2 | 11E25-3 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.9A |
| CH3613X | MANUAL ATT PITCH MIN IMP CMD | E2 | 11E25-4 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.9A |
| CH3615X | MANUAL ATT YAW ACCEL CMD | E2 | 11E25-5 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.9A |
| CH3616X | MANUAL ATT YAW MIN IMP CMD | E2 | 11E25-6 | OFF | ON | EVENT | S&C | -- | -- | -- | -- | 8.9A |
| CH3623X | GYRO 1 COMB SMRD | E2 | 11E8-7 | LOW | NORM | EVENT | S&C | -- | -- | -- | -- | 8.2, 8.9 |
| CH3624X | GYRO 2 COMB SMRD | E2 | 11E8-8 | LOW | NORM | EVENT | S&C | -- | -- | -- | -- | 8.2, 8.9 |
| CH3635X | BMAG MODE SW-ROLL ATT 1 RT 2 | E1 | 11E33-1 | OFF | ON | EVENT | VSC | AA | -- | -- | -- | 8.3, 8.9A |
| CH3636X | BMAG MODE SW-ROLL RATE 2 | E1 | 11E33-2 | OFF | ON | EVENT | VSC | AA | -- | -- | -- | 8.3, 8.9A |

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|-------------------------------|----|-----------|------------|--------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | UNITS | | | | | | |
| CH3638X | BMAG MODE SW-PITCH ATT 1 RT 2 | E1 | 11E33-3 | OFF | ON | EVENT | VSC | AA | -- | -- | -- | 8.3,8.9A |
| CH3639X | BMAG MODE SW-PITCH RATE 2 | E1 | 11E33-4 | OFF | ON | EVENT | VSC | AA | -- | -- | -- | 8.3,8.9A |
| CH3641X | BMAG MODE SW-YAW-ATT 1 RT 2 | E1 | 11E33-5 | OFF | ON | EVENT | VSC | AA | -- | -- | -- | 8.3,8.9A |
| CH3642X | BMAG MODE SW-YAW RATE 2 | E1 | 11E33-6 | OFF | ON | EVENT | VSC | AA | -- | -- | -- | 8.3,8.9A |
| CH3666C | PITCH DIFF CLUTCH CURRENT | H1 | 22A4 | -0.807 | +0.807 | AMP | S&C | -- | -- | -- | -- | 8.9 |
| CH3667C | YAW DIFF CLUTCH CURRENT | H1 | 12A16 | -0.807 | +0.807 | AMP | S&C | -- | -- | -- | -- | 8.9 |

TABLE 7-VIII.- PCM TELEMETRY - LIFE SYSTEM

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|--------------------|----|-----------|------------|------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| CJ0060J | ASTRO 1 EKG AXIS 1 | H1 | 22A3 | 0.1 | 5 | MV | V2 | -- | 150 MA | -- | -- | |
| CJ0061J | ASTRO 2 EKG AXIS 1 | H1 | 22A1 | 0.1 | 5 | MV | V2 | -- | 150 MA | -- | -- | |
| CJ0062J | ASTRO 3 EKG AXIS-1 | H1 | 22A2 | 0.1 | 5 | MV | V2 | -- | 150 MA | -- | -- | |
| CJ0200R | ASTRO 1 RESPIR | H1 | 51A7 | -5 | +5 | OHMS | V2 | -- | CJ0060 | -- | -- | |
| CJ0201R | ASTRO 2 RESPIR | H1 | 51A8 | -5 | +5 | OHMS | V2 | -- | CJ0061 | -- | -- | |
| CJ0202R | ASTRO 3 RESPIR | H1 | 51A9 | -5 | +5 | OHMS | V2 | -- | CJ0062 | -- | -- | |

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TABLE 7-IX.- PCM TELEMETRY - FLIGHT TECHNOLOGY

| 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 |
|-----------|-----------------------|----|-----------|-----|-----------------|-------|----------|----------|-----------|-------------|----------|------------|
| 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 | -- | -- | |
| CK1051K | DOSIMETER 1 RADIATION | H1 | 11A169 | 0 | 1K | RAD/H | V2 | -- | | -- | -- | |
| CK1052K | DOSIMETER 2 RADIATION | H1 | 11A16 | 0 | 1K | RAD/H | V2 | -- | | -- | -- | |
| CK1053R | DOSIMETER RATE | H1 | 10A149 | 0 | 5 | VDC | V2 | -- | | -- | -- | |

TABLE 7-X.- PCM TELEMETRY - SCIENTIFIC EQUIPMENT

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|------------------|----|-----------|------------|------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| 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 | | | | | | | | | |

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

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | Dwg CSM SH |
|-----------|----------------------------|----|-----------|------------|------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | UNITS | | | | | | |
| SP0001P | HE TK PRESS | H2 | 11A10 | 0 | 5K | PSIA | V3S | 56 MA | -- | -- | -- | 9.1 |
| SP0002T | HE TK PRESS | 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 |
| 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 SM/ENG INTERFACE P | H1 | 11A152 | 0 | 300 | PSIA | V3S | 56 MA | -- | -- | -- | 9.1 |
| SP0931P | OX SM/ENG INTERFACE P | H1 | 11A161 | 0 | 300 | PSIA | V4S | 56 MA | -- | -- | -- | 9.1 |

7-27

TABLE 7-XII.- PCM TELEMETRY - REACTION CONTROL SYSTEM

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|--------------------------|----|-----------|------------|------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | UNITS | | | | | | |
| 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 | H2 | 11A155 | 0 | 300 | DEG F | V1 | -- | 56 MA | SM | CS | 10.2 |
| CR0004T | CM HE TK B TEMP | H2 | 11A156 | 0 | 300 | DEG F | V2 | -- | 56 MA | SM | CS | 10.2 |
| CR0035P | CM HE MANIF 1 PRESS | H2 | 11A21 | 0 | 400 | PSIA | V1 | -- | 56 MA | L* | CS | 10.2 |
| CR0036P | CM HE MANIF 2 PRESS | H2 | 11A22 | 0 | 400 | PSIA | V2 | -- | 56 MA | L* | 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 | SM | CS | 10.1 |
| SR5014T | SM HE TK B TEMP | H2 | 11A164 | 0 | +100 | DEG F | V4S | -- | 56 MA | SM | CS | 10.1 |
| SR5015T | SM HE TK C TEMP | H2 | 11A165 | 0 | +100 | DEG F | V3S | -- | 56 MA | SM | CS | 10.1 |
| SR5016T | SM HE TK D TEMP | H2 | 11A166 | 0 | +100 | DEG F | V4S | -- | 56 MA | SM | CS | 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 | -- | -- | 10.1 |
| SR5733P | SM OX MANF A PRESS | H1 | 11A23 | 0 | 300 | PSIA | V3S | -- | 56 MA | -- | -- | 10.1 |
| SR5737P | SM FU MANF A PRESS | H2 | 11A92 | 0 | 400 | PSIA | V3S | -- | 56 MA | SM** | CS | 10.1 |

TABLE 7-XII.- PCM TELEMETRY - REACTION CONTROL SYSTEM - CONCLUDED

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|--------------------|----|-----------|------------|------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| SR5776P | SM HE MANF B PRESS | H2 | 11A40 | 0 | 400 | PSIA | V4S | -- | 56 MA | -- | -- | 10.1 |
| SR5780P | SM OX MANF B PRESS | H1 | 11A24 | 0 | 300 | PSIA | V4S | -- | 56 MA | -- | -- | 10.1 |
| SR5784P | SM FU MANF B PRESS | H2 | 11A94 | 0 | 400 | PSIA | V4S | -- | 56 MA | SM** | CS | 10.1 |
| SR5817P | SM HE MANF C PRESS | H2 | 11A46 | 0 | 400 | PSIA | V3S | -- | 56 MA | -- | -- | 10.1 |
| SR5820P | SM OX MANF C PRESS | H1 | 11A27 | 0 | 300 | PSIA | V3S | -- | 56 MA | -- | -- | 10.1 |
| SR5821P | SM OX MANF D PRESS | H1 | 11A28 | 0 | 300 | PSIA | V4S | -- | 56 MA | -- | -- | 10.1 |
| SR5822P | SM FU MANF C PRESS | H2 | 11A111 | 0 | 400 | PSIA | V3S | -- | 56 MA | SM** | CS | 10.1 |
| SR5823P | SM FU MANF D PRESS | H2 | 11A112 | 0 | 400 | PSIA | V4S | -- | 56 MA | SM** | CS | 10.1 |
| SR5830P | SM HE MANF D PRESS | H2 | 11A130 | 0 | 400 | PSIA | V4S | -- | 56 MA | -- | -- | 10.1 |

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

CSM
S/C

| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|---------------------------|----|-----------|------------|-------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| BS0080X | SM EDS ABORT REQUEST A | E2 | 11E4-5 | NORM | ABORT | EVENT | VSC | AA | -- | L | TSC | 2.3,6.6 |
| BS0081X | SM EDS ABORT REQUEST B | E2 | 11E4-3 | NORM | ABORT | EVENT | VSC | AA | -- | L | TSC | 2.3,6.6 |
| CS0150X | MASTER CAUTION WARNING ON | E2 | 11E4-6 | WARN/OFF | NORM | EVENT | VSC | AA | -- | L* | TSC | 7.3 |
| LS0200H | ANGLE OF ATTACK | H1 | 11A51 | 0 | +5 | VDC | EDS | -- | -- | SM | CS | |
| CS0220T | DOCKING PROBE TEMP | H1 | 10A22 | -100 | +300 | DEG F | V2 | -- | 56 MA | -- | -- | |

T-30

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

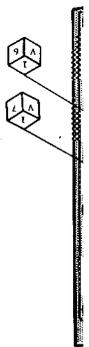
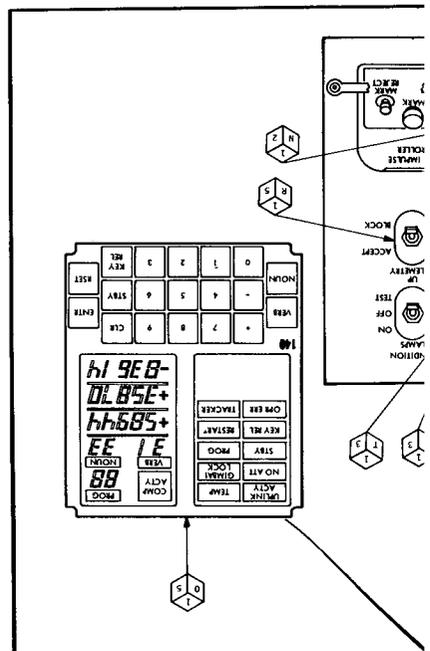
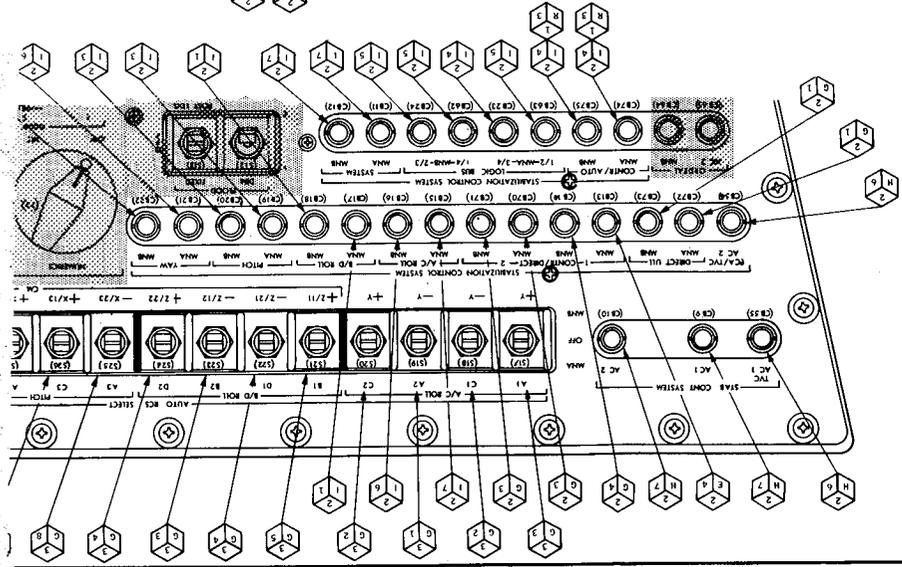
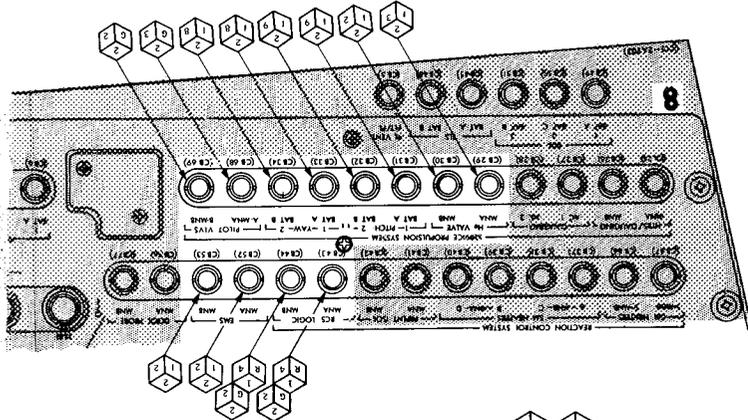
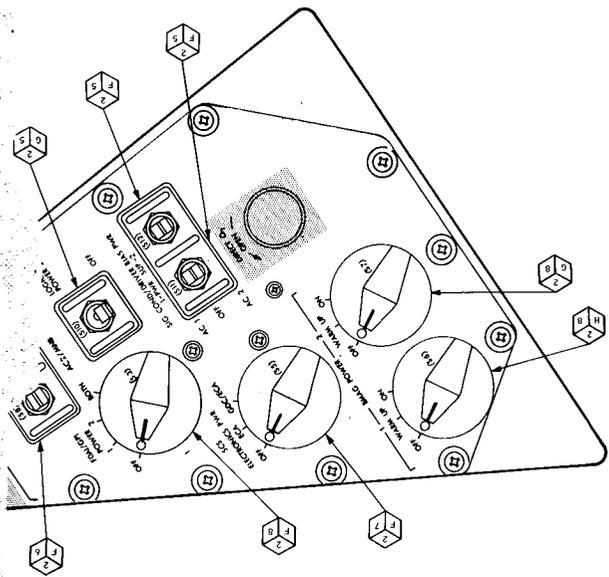
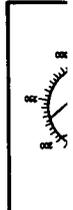
| MEAS I.D. | MEAS DESCRIPTION | TM | CHAN CODE | DATA RANGE | | UNITS | INST BUS | SIG COND | PWR RQMTS | O. B. DISPL | SIG DIST | DWG CSM SH |
|-----------|-----------------------------|----|-----------|------------|--------|-------|----------|----------|-----------|-------------|----------|------------|
| | | | | LOW | HIGH | | | | | | | |
| CT0012X | DSE TAPE MOTION | E2 | 11E14-5 | OFF | 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 |
| ST0820K | PROTON CT RATE CHAN 1 | H1 | 11A17 | 1 | 100K | C/S | V3S | -- | -- | -- | -- | |
| ST0821K | PROTON CT RATE CHAN 2 | H1 | 11A18 | 0.1 | 10K | C/S | V3S | -- | -- | -- | -- | |
| ST0822K | PROTON CT RATE CHAN 3 | H1 | 11A19 | 0.1 | 10K | C/S | V3S | -- | -- | -- | -- | |
| ST0823K | PROTON CT RATE CHAN 4 | H1 | 11A20 | 0.1 | 10K | C/S | V3S | -- | -- | -- | -- | |
| ST0830K | ALPHA CT RATE CHAN 1 | H1 | 11A38 | 0.1 | 10K | C/S | V3S | -- | -- | -- | -- | |
| ST0831K | ALPHA CT RATE CHAN 2 | H1 | 11A41 | 0.1 | 10K | C/S | V3S | -- | -- | -- | -- | |
| ST0832K | ALPHA CT RATE CHAN 3 | H1 | 11A42 | 0.1 | 10K | C/S | V3S | -- | -- | -- | -- | |
| ST0838K | PROTON INTEG CT RATE | H1 | 11A43 | 1 | 100K | C/S | V3S | -- | -- | -- | -- | |
| ST0840T | NUCLEAR PARTICLE DET TEMP | H1 | 10A61 | -109 | +140 | DEG F | V4S | -- | -- | -- | -- | |
| ST0841T | NUCLEAR PARTICLE ANAL TEMP | H1 | 10A62 | -109 | +140 | DEG F | V4S | -- | -- | -- | -- | |

7-31



8 GUIDANCE AND
CONTROL
SYSTEM

STOWED WHEN NOT
IN USE. MOUNTED
IN USE.

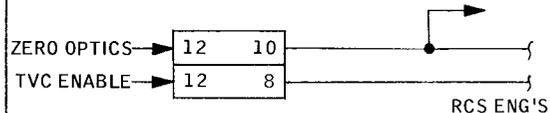
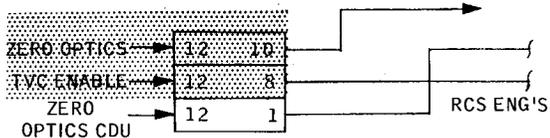


SECTION 8

IS

WAS

1. DWG 8.1 JZ3

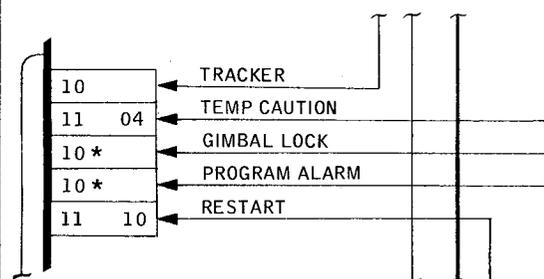
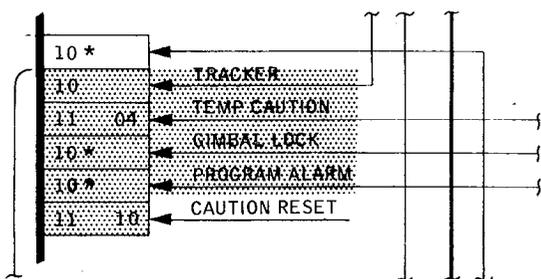


2. DWG 8.1 MZ6

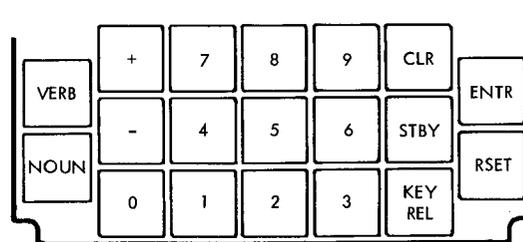
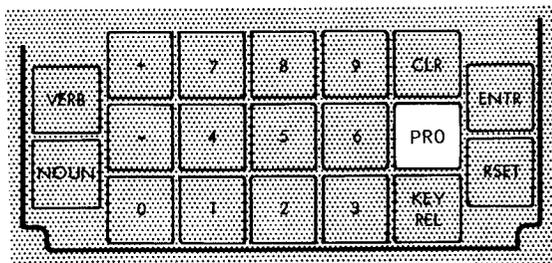
T4 RUPT ROUTINE

T4 RUFT ROUTINE

3. DWG 8.1 MZ5



4. DWG 8.1 OZ4

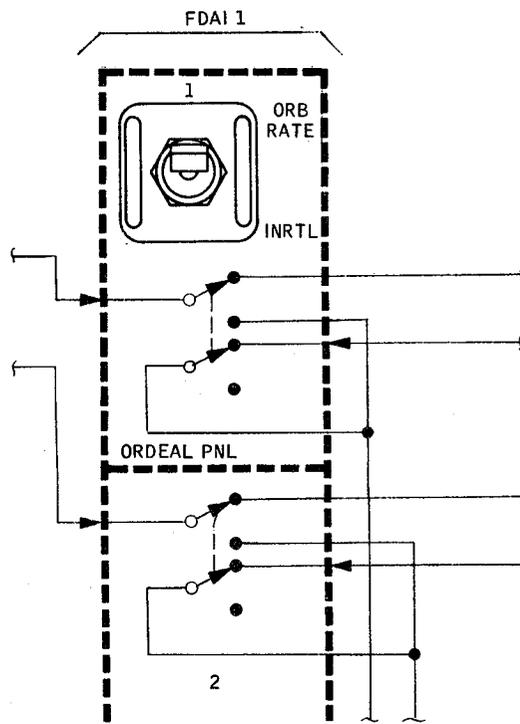
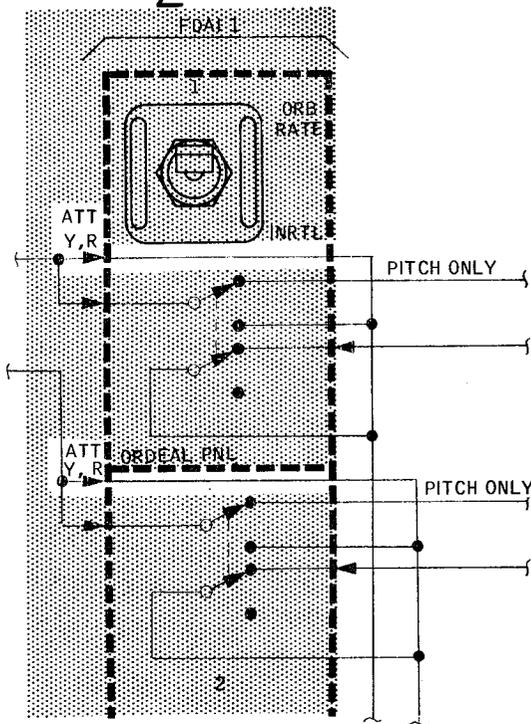


SECTION 8

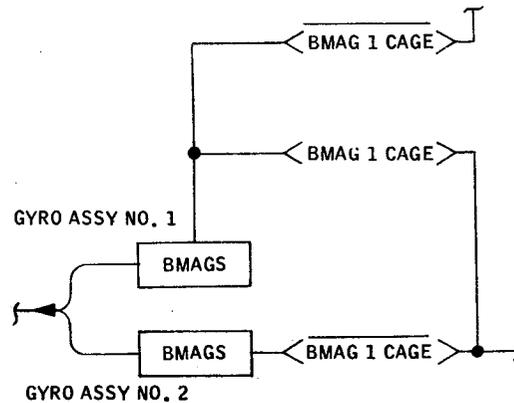
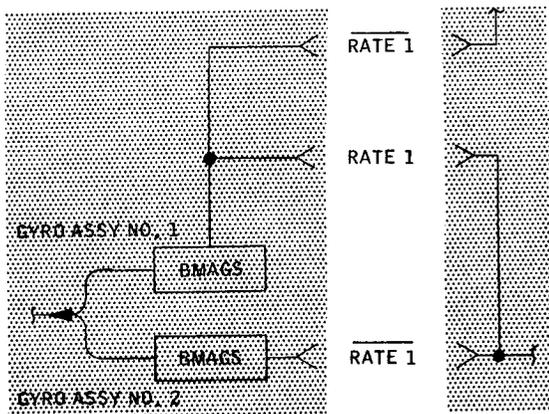
IS

WAS

5. DWG 8.1 BZ⁹



6. DWG 8.1 DZ⁷



7. DWG 8.1 IZ⁹

126°F < PLATFORM TEMP < 134°F

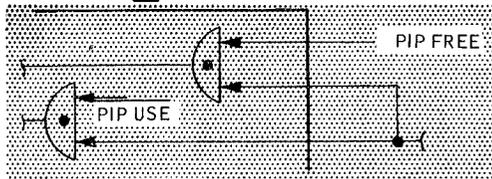
126°F > PLATFORM TEMP > 134°F

SECTION 8

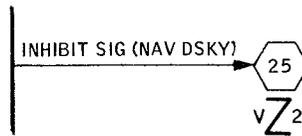
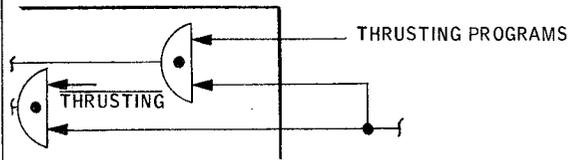
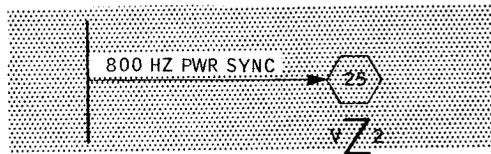
IS

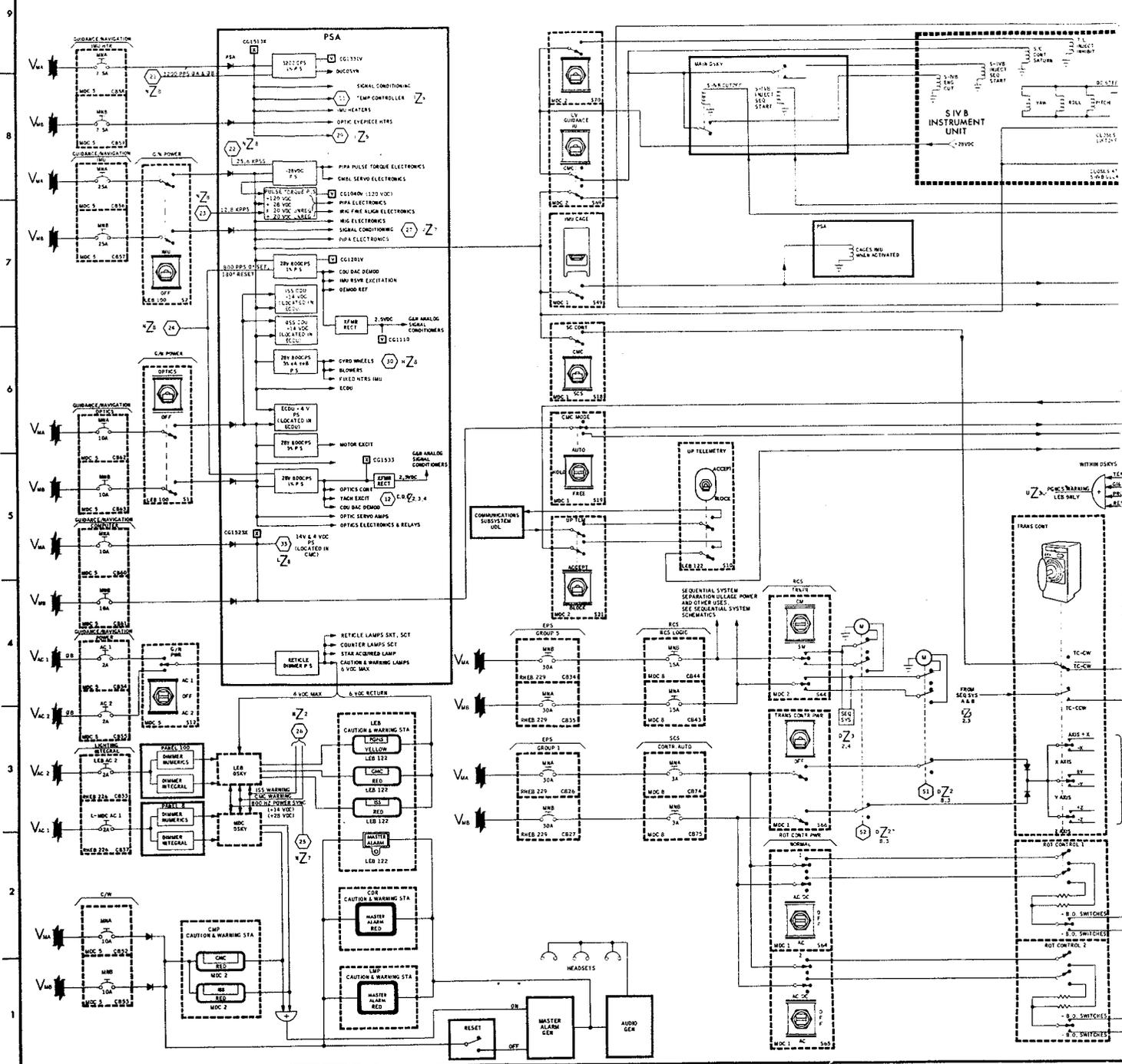
WAS

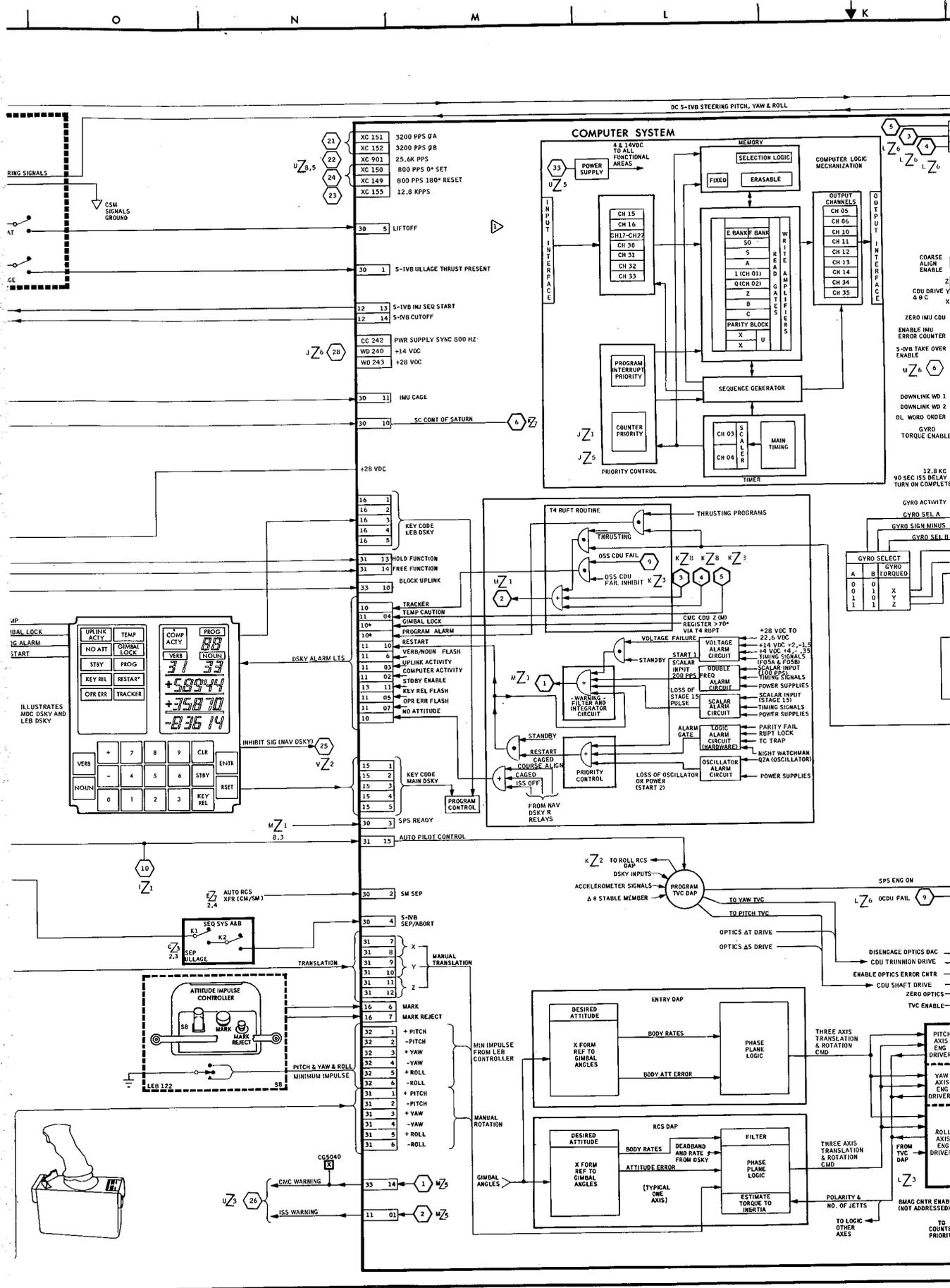
8. DWG 8.1 LZ 6



9. DWG 8.1 NZ 4







DC 5-IVB STEERING PITCH, YAW & ROLL

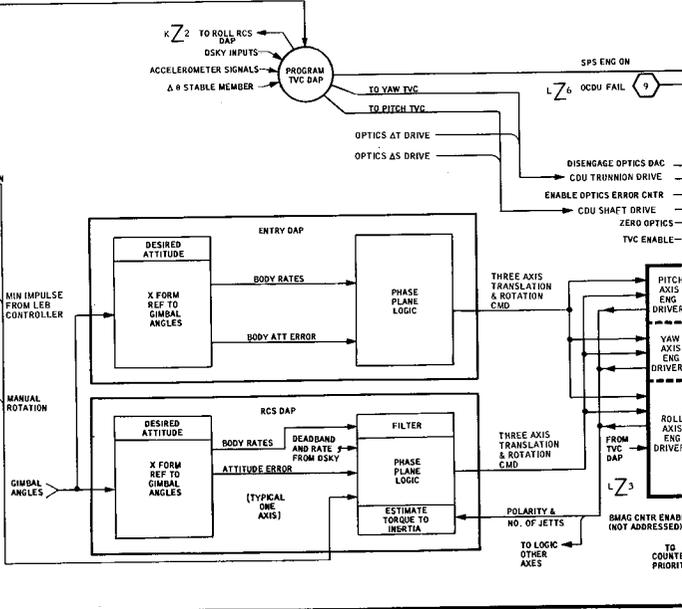
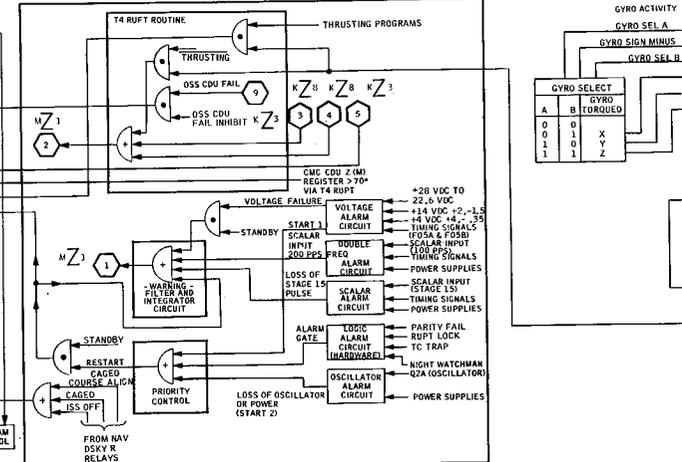
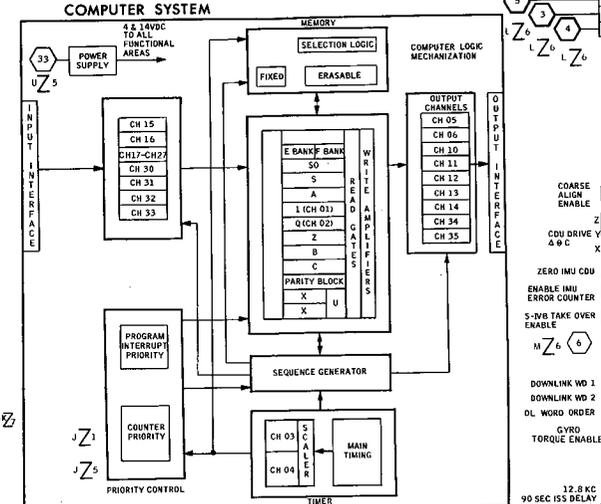
COMPUTER SYSTEM

- 21 XC 151 3200 PPS #A
- 22 XC 152 3200 PPS #B
- 23 XC 901 25.6K PPS
- 24 XC 150 800 PPS 0° SET
- 25 XC 149 800 PPS 180° RESET
- 26 XC 155 12.8 KPPS

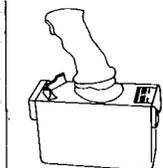
- 30 5 LIFTOFF
- 30 1 5-IVB ULLAGE THRUST PRESENT
- 12 13 5-IVB IMU SEQ START
- 12 14 5-IVB CUTOFF
- CC 242 PWR SUPPLY SYNC 600 HZ
- WD 240 +14 VDC
- WD 243 +28 VDC
- 30 11 IMU CAGE
- 30 10 SC CONF OF SATURN

- 16 1
- 16 2
- 16 3
- 16 4
- 16 5
- 31 13 HOLD FUNCTION
- 31 14 FREE FUNCTION
- 33 10 BLOCK UPLINK
- 10 TRACKER
- 11 04 TEMP CAUTION
- 10+ GIMBAL LOCK
- 10+ PROGRAM ALARM
- 11 10 VERT/NOIN FLASH
- 11 03 UPLINK ACTIVITY
- 11 02 COMPUTER ACTIVITY
- 13 11 STBY ENABLE
- 11 05 KEY REL FLASH
- 11 07 OPR ERR FLASH
- 10 NO ATTITUDE

- 15 1 KEY CODE MAIN DSKY
- 15 2
- 15 3
- 15 4
- 15 5
- 30 3 SPS READY
- 31 15 AUTO PILOT CONTROL
- 10
- 10 AUTO RCS XFR (CM/SM)
- 30 2 SM SEP
- 30 4 5-IVB SEP/ABORT
- 31 7
- 31 8
- 31 9
- 31 10
- 31 11
- 31 12
- 16 6 MARK
- 16 7 MARK REJECT
- 32 1 + PITCH
- 32 2 - PITCH
- 32 3 + YAW
- 32 4 - YAW
- 32 5 + ROLL
- 32 6 - ROLL
- 31 1 + PITCH
- 31 2 - PITCH
- 31 3 + YAW
- 31 4 - YAW
- 31 5 + ROLL
- 31 6 - ROLL
- 33 14 1
- 11 01 2



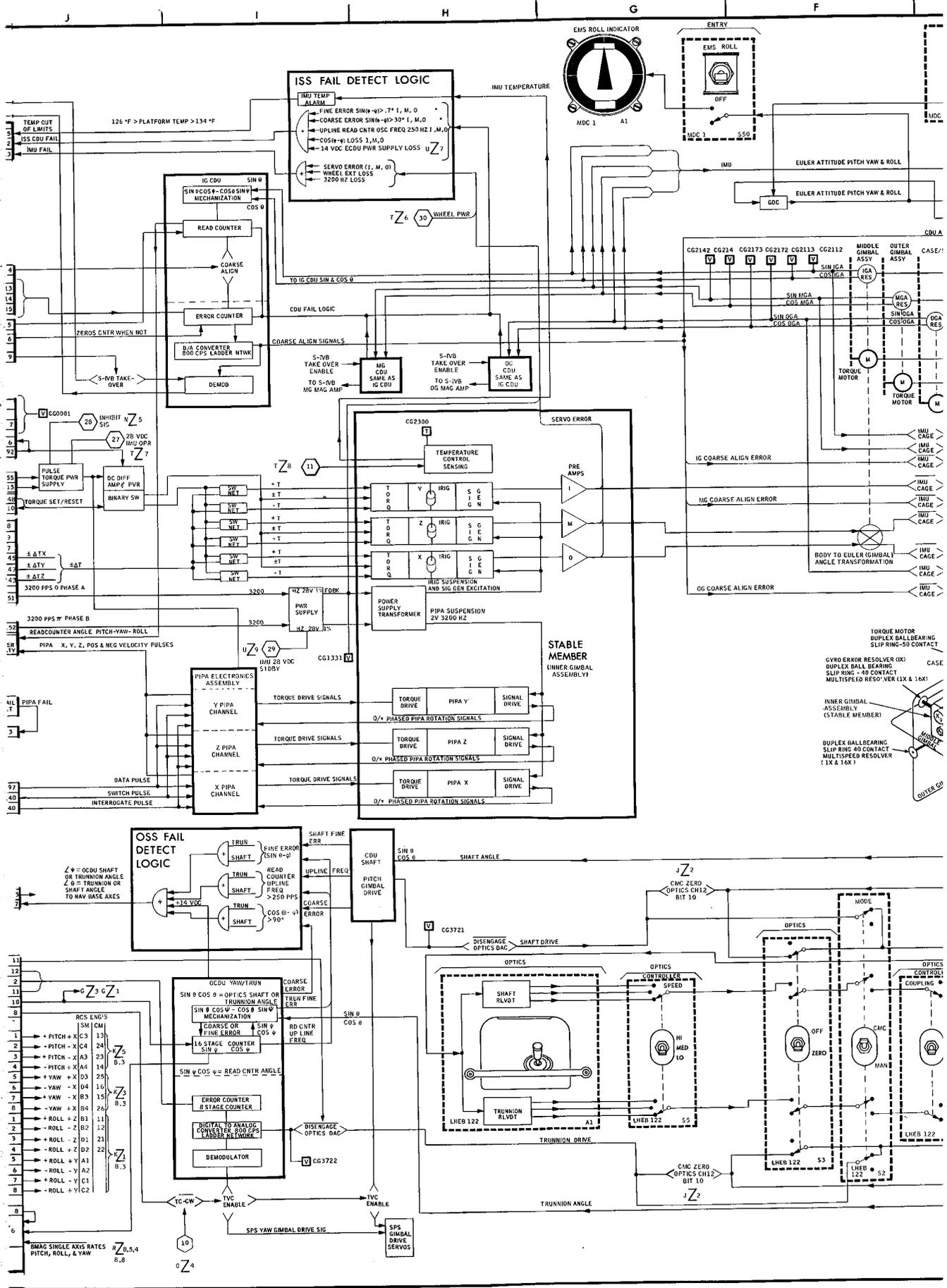
ILLUSTRATES MDC DSKY AND LEB DSKY

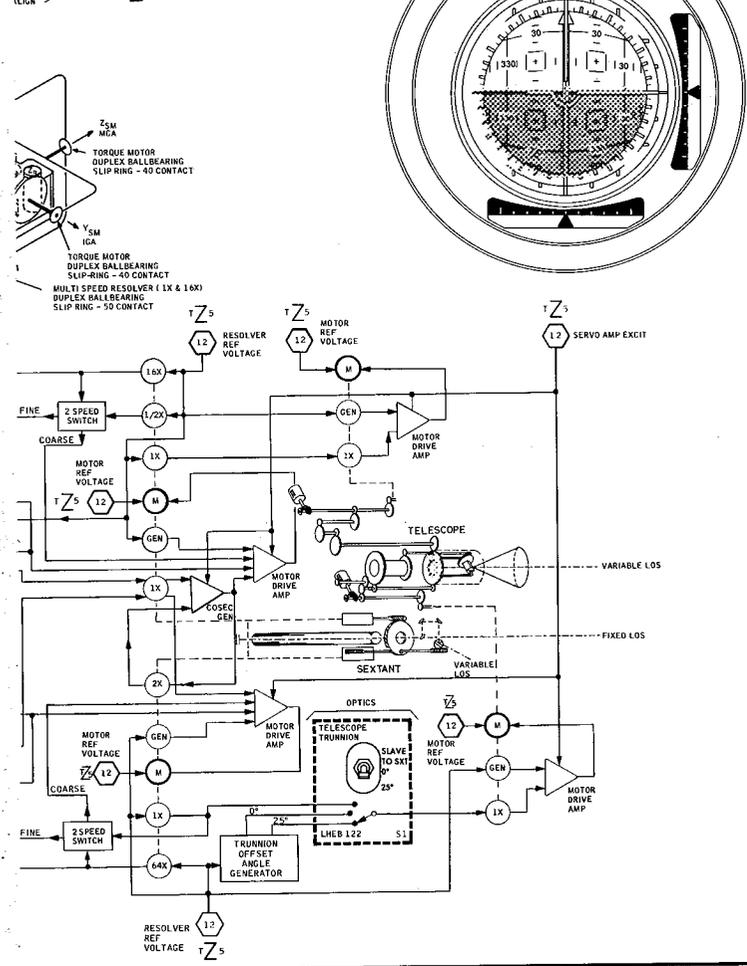
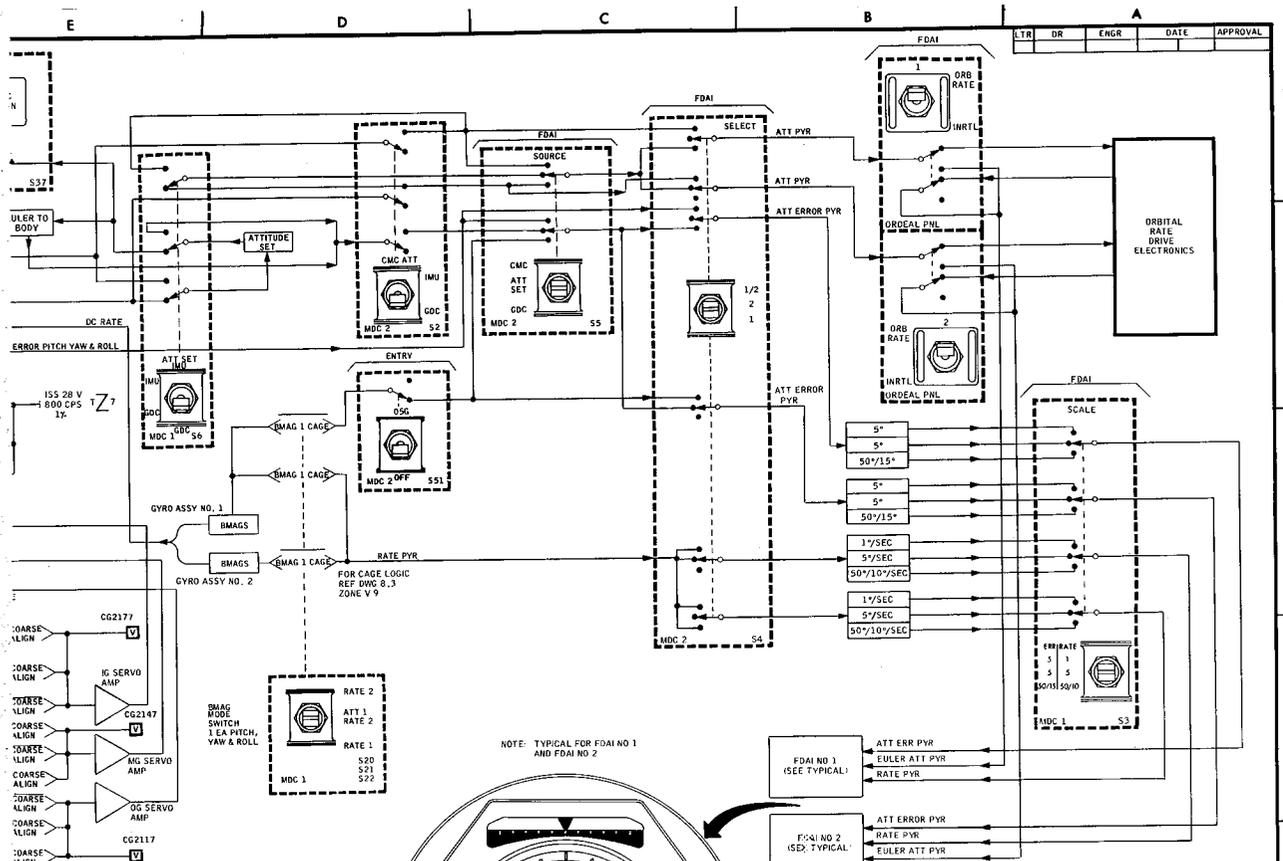


- COARSE ALIGN ENABLE
- CDU DRIVE Y Δθ C
- ZERO IMU CDU
- ENABLE IMU ERROR COUNTER
- 5-IVB TAKE OVER ENABLE
- DOWNLINK WD 1
- DOWNLINK WD 2
- DL WORD ORDER
- GYRO TORQUE ENABLE
- 12.8 KC
- 90 SEC ISS DELAY
- TURN ON COMPLETE

- GYRO ACTIVITY
- GYRO SEL A
- GYRO SIGN MINUS
- GYRO SEL B

| | |
|-------------|--------------|
| GYRO SELECT | GYRO TORQUED |
| A | B |
| 0 | 0 |
| 0 | 1 |
| 1 | 0 |
| 1 | 1 |





NOTE: TYPICAL FOR FDAI NO 1 AND FDAI NO 2

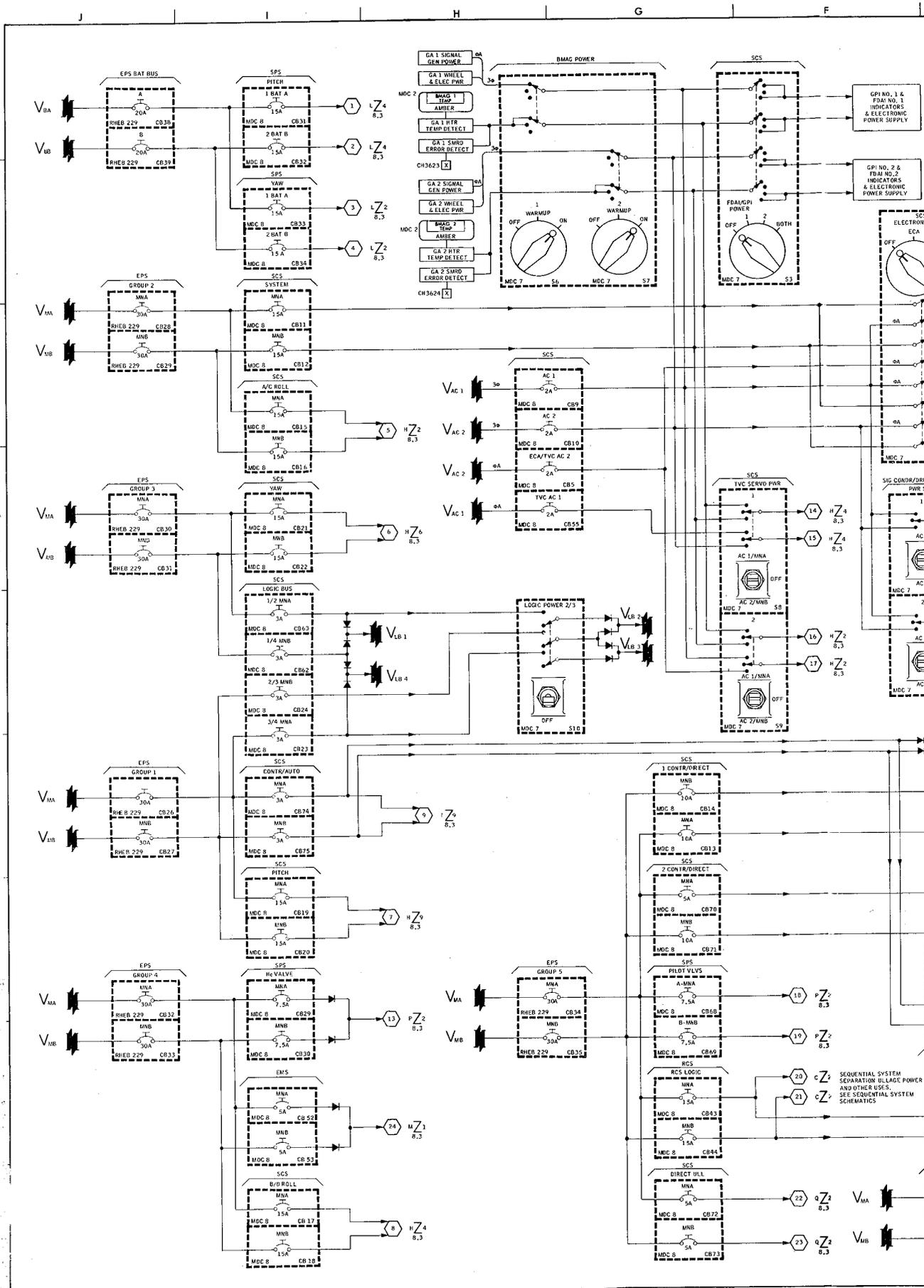
G&C 2 PROVIDES AN OVERALL PRESENTATION OF SYSTEM FUNCTIONAL CAPABILITIES. CAUTION: MDC PANEL SWITCHES, MOST SIGNAL FLOW PATHS, AND BOOLEAN FUNCTIONS PRESENTED ON THIS DRAWING REPRESENT THE SYSTEM LOGICAL FLOW RATHER THAN ACTUAL HARDWARE CONFIGURATIONS. DETAILED PRESENTATIONS OF THIS LOGIC ARE FOUND IN SUBSEQUENT DRAWINGS OF SECTION 8.

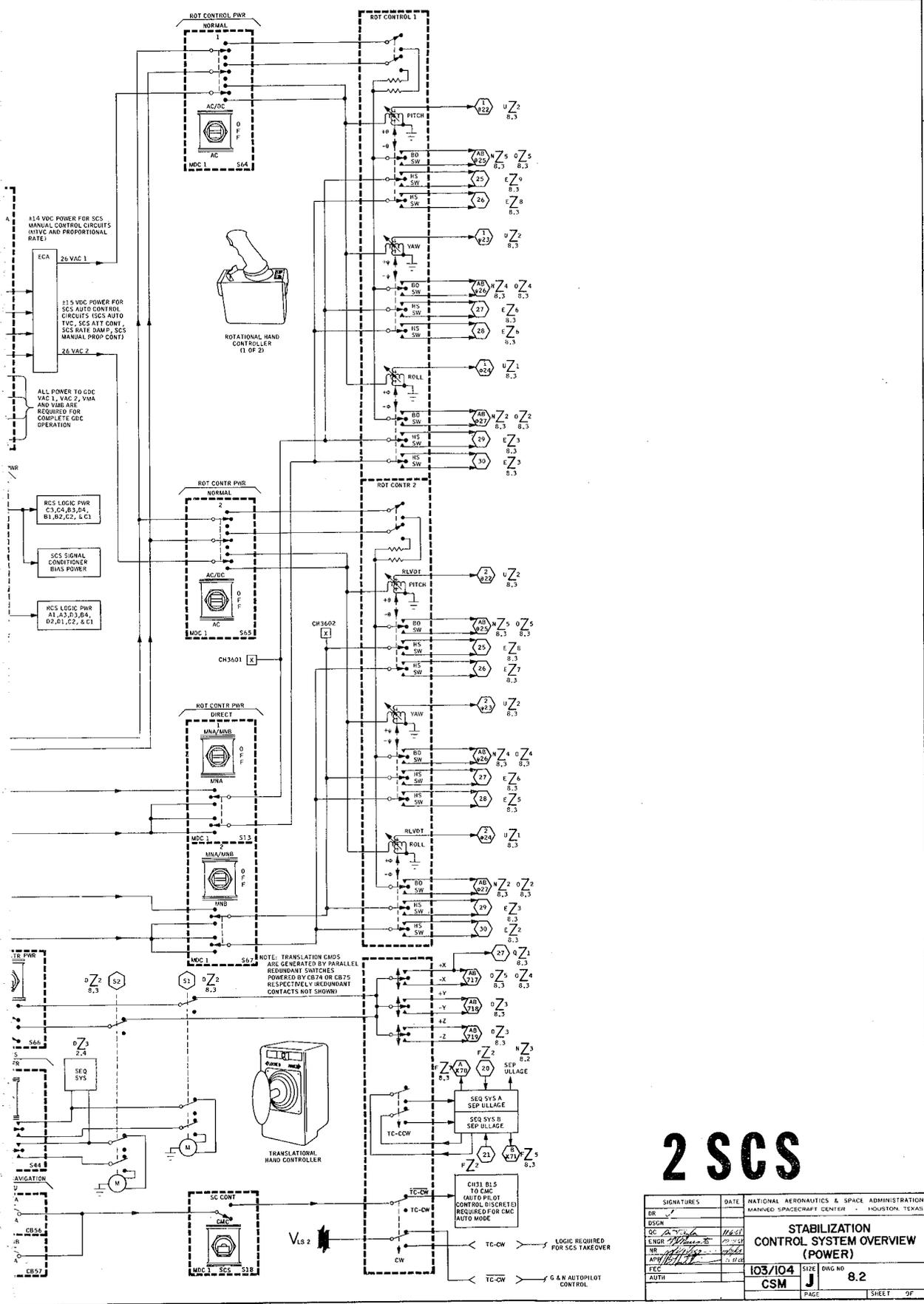
| MEAS ID | MEASUREMENT DESCRIPTION | TM BIAS SOURCE |
|---------|---------------------------------------|------------------|
| C00001V | COMPUTER DIGITAL DATA - REF DOWN LIST | |
| C01040V | PIPA +120 VDC | IMU POWER SWITCH |
| C01110V | TM BIAS 2.5 VDC | |
| C01201V | IMU 28 V AC 800 HZ | |
| C01331V | 3.2 K 28 V SUPPLY | |
| C01513X | IMU HTR +28 VDC | |
| C01523X | CMC OPERATE +28 VDC | |
| C01533X | OPTX OPERATE +28 VAC | |
| C02112V | IG 1X RSVR OUT SIN | IMU POWER SWITCH |
| C02113V | IG 1X RSVR OUT COS | |
| C02117V | IGA SERVO ERR IN PHASE | |
| C02142V | MG 1X RSVR OUT SIN | |
| C02143V | MG 1X RSVR OUT COS | |
| C02147V | MGA SERVO ERR IN PHASE | |
| C02172V | OG 1X RSVR OUT SIN | |
| C02173V | OG 1X RSVR OUT COS | |
| C02177V | OGA SERVO ERR IN PHASE | |
| C02300T | PIPA TEMP | |
| C03721V | SHAFT CDU DAC OUT | |
| C03722V | TRUNNION CDU DAC OUT | |
| C05040X | CMC WARNING | |

ALL OF THE INPUT SIGNALS IN CHANNELS 30-33 ARE INVERTED, ZERO INDICATES THAT THE SIGNAL IS PRESENT.

1 G&N

| | | |
|---|----------|--|
| SIGNATURES | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS |
| DR | 01/14/72 | |
| ENGR | | |
| APP | | |
| AUTH | | |
| GUIDANCE AND NAVIGATION OVERVIEW | | |
| CSM | DATE | DWG NO. |
| 103/104 | J | 8.1 |
| 114 X 30 | | SHEET 1 OF 1 |



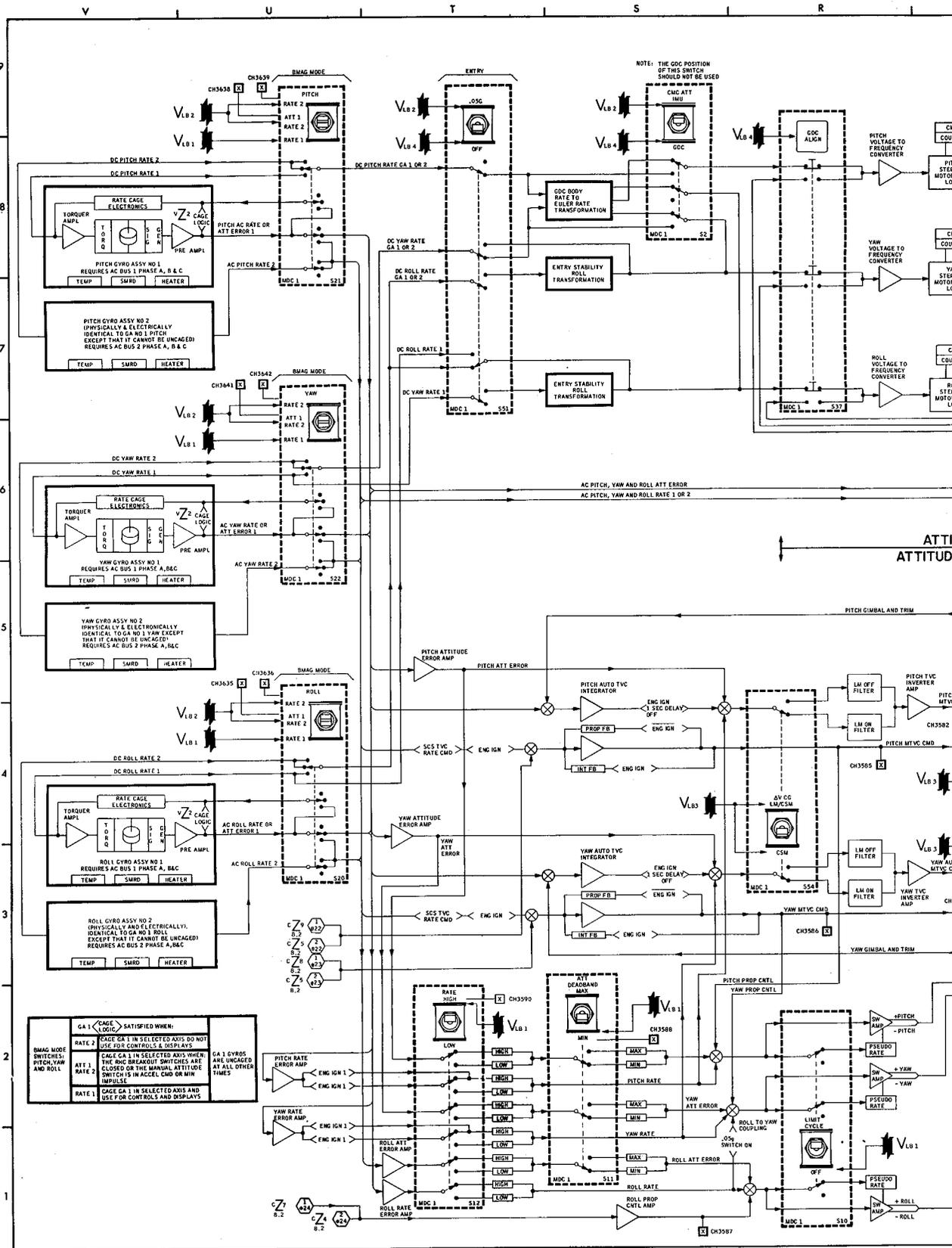


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| DR | | | MANNE SPACECRAFT CENTER HOUSTON, TEXAS |
| DC | <i>[Signature]</i> | 1/8/61 | |
| ENGR | <i>[Signature]</i> | 1/8/61 | |
| WB | <i>[Signature]</i> | 1/8/61 | |
| FEC | | | |
| AUTH | | | |
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| PAGE | | SHEET | 09 |

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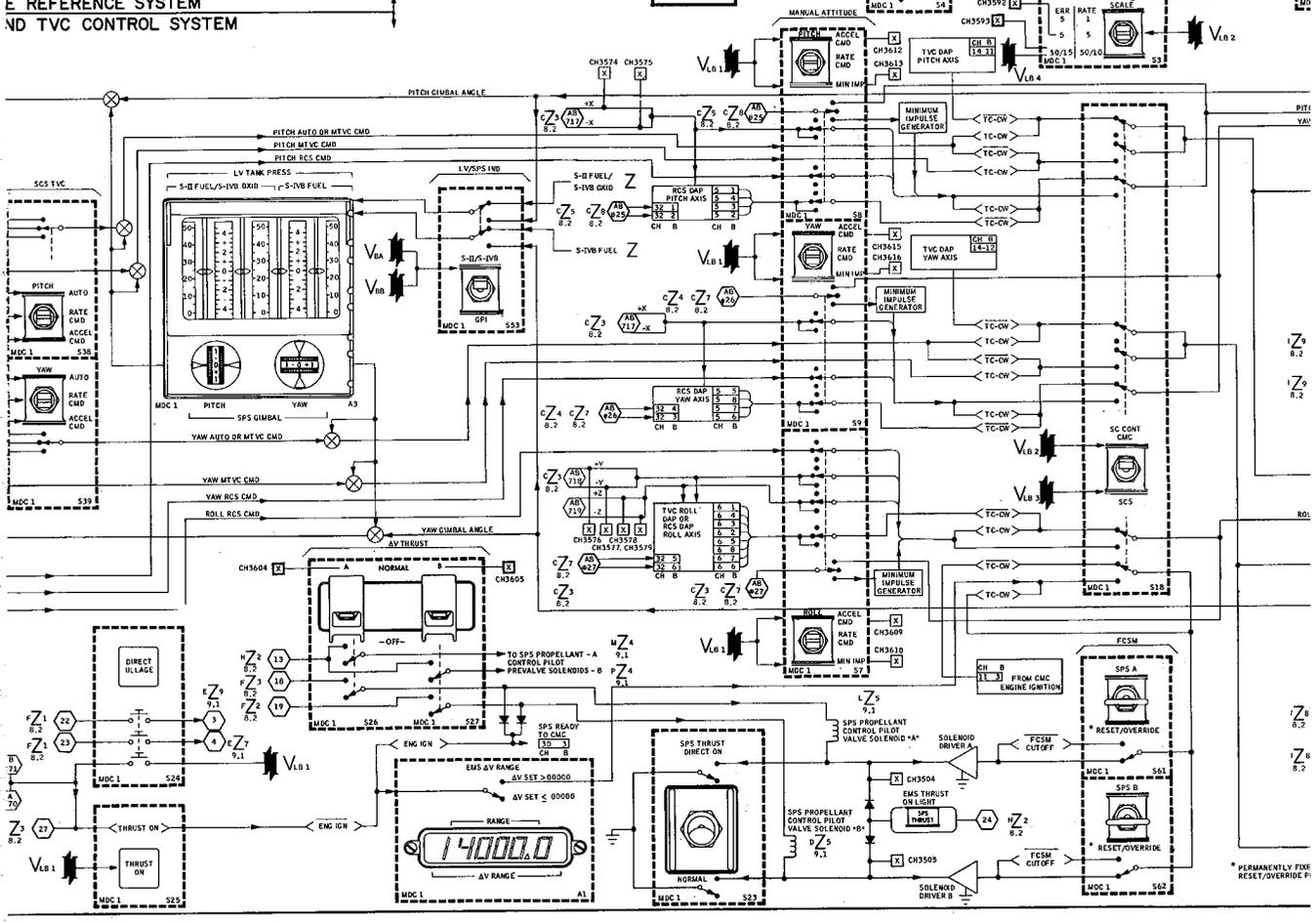
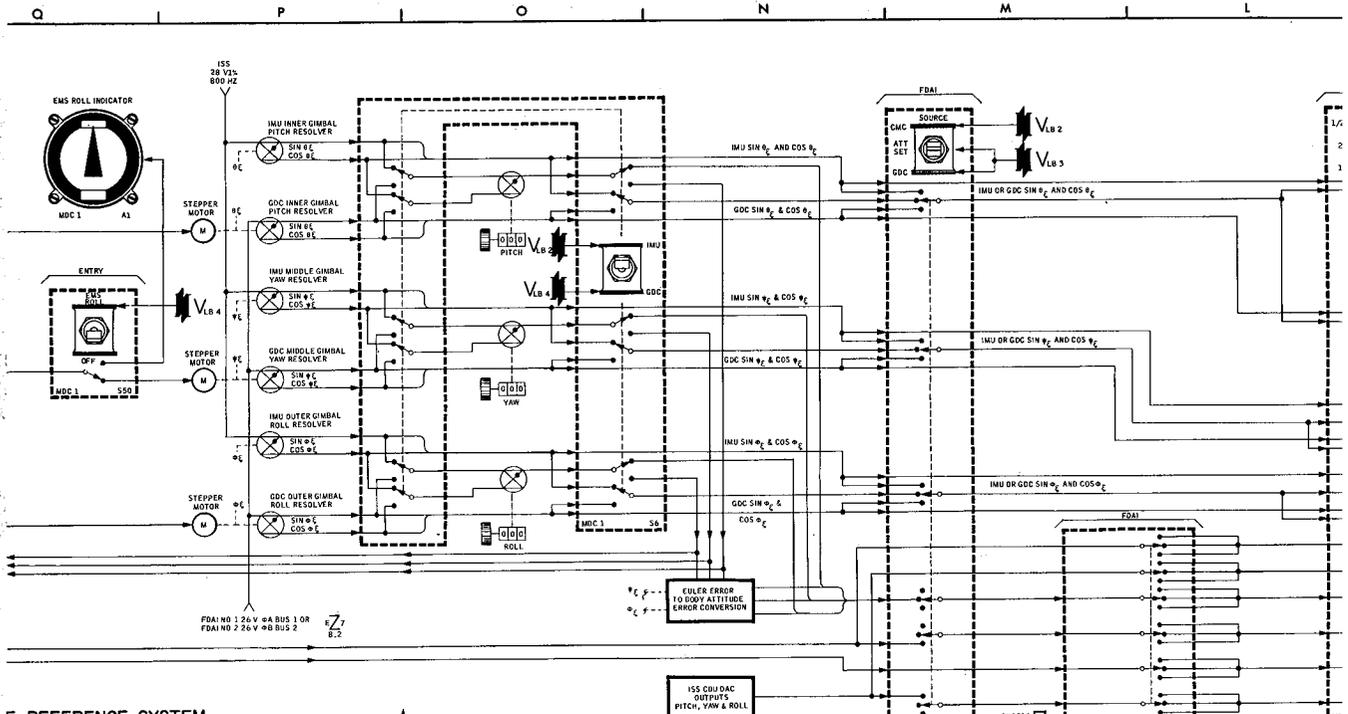
SCS SIGNAL AND POWER CODE

| <u>CODE</u> | <u>TYPE OF POWER</u> | <u>CODE</u> | <u>TYPE OF POWER</u> |
|-------------|--|-------------|--|
| 01 | 27.5 VDC | 37 | SCS CONTROL MODE |
| 02 | +20 VDC | 38 | RCS ERROR |
| 03 | 10 VAC | 39 | GA1 AC RATE OR ATTITUDE ERROR |
| 04 | 2.2 KHz | 40 | GA2 AC RATE |
| 05 | 25 VAC | 41 | DC RATE |
| 06 | +15 VDC | 42 | ENGINE ON WITH 1 SECOND DELAYED OFF |
| 07 | +14.5 VDC | 43 | ENGINE ON/OFF 1 SECOND DELAY |
| 08 | 400 Hz SPIN MOTOR POWER | 44 | MODE SELECTED SCS |
| 09 | 26 VAC 400 Hz REFERENCE | 45 | PITCH GYRO UNCAGE |
| 10 | 14 VDC | 46 | YAW GYRO UNCAGE |
| 11 | 13 VDC | 47 | ROLL GYRO UNCAGE |
| 12 | -15 VDC | 48 | SIG COND POWER +15.0, -2.5 & -10 VDC |
| 13 | +20 VDC | 49 | 115 V 400 Hz PHASE A |
| 14 | +32 VDC | 50 | MODE SELECTED CMC |
| 15 | 28 VDC | 51 | PITCH AUTO CNTL DISABLE |
| M | 400 Hz 26 V BUS 1 SWITCH 3 OR 800 Hz 0 PHASE IMU | 52 | YAW AUTO CNTL DISABLE |
| N | 400 Hz 26 VAC BUS 2 SWITCH 3 OR 800 Hz 0 PHASE IMU | 53 | ROLL AUTO CNTL DISABLE |
| P | 400 Hz 26 VAC BUS 2 SWITCH 3 OR 400 Hz 26 VAC BUS 1 SWITCH 6 OR 800 Hz 0 PHASE IMU | 54 | PITCH ACCEL CMD ENABLE |
| 16 | +X TRANSLATION | 55 | YAW ACCEL CMD ENABLE |
| 17 | -X TRANSLATION | 56 | ROLL ACCEL CMD ENABLE |
| 18 | +Y TRANSLATION | 57 | DIRECT ULLAGE PITCH JETS |
| 19 | -Y TRANSLATION | 58 | DIRECT ULLAGE YAW JETS |
| 20 | +Z TRANSLATION | 59 | .05g OFF |
| 21 | -Z TRANSLATION | 60 | GDC EULER |
| 22 | PITCH RATE COMMAND | 61 | .05g ON |
| 23 | YAW RATE COMMAND | R | 400/800 CPS OUT PHASE FDAI #1 RESOL- VER SIG DEMOD |
| 24 | ROLL RATE COMMAND | S | 400/800 CPS OUT PHASE FDAI #2 RESOL- VER SIG DEMOD |
| 25 | PITCH MIN IMP | T | FDAI 1 & 2 PYR RATE DEMOD REF VOLTAGE |
| 26 | YAW MIN IMP | 62 | 115 V 400 Hz |
| 27 | ROLL MIN IMP | 63 | 26 VAC <90°, 400 Hz REACTION |
| 28 | PITCH DIRECT | 64 | A/C ROLL ENGINE POWER CB15 & CB16 MDC 8 |
| 29 | YAW DIRECT | 65 | B/D ROLL REACTION ENGINE POWER CB17 & CB18 MDC 8 |
| 30 | ROLL DIRECT | 66 | PITCH REACTION ENGINE POWER CB19 & CB20 MDC 8 |
| 31 | SCS LOGIC BUS 1 | 67 | YAW REACTION ENGINE POWER CB21 & CB22 MDC 8 |
| 32 | SCS LOGIC BUS 2 | 68 | REACTION ENGINE SOLENOID DRIVER ENABLE POWER CB74 & CB75 MDC 8 (AUTO RCS) |
| 33 | SCS LOGIC BUS 3 | 69 | RCS LOGIC POWER FROM CB34 & CB35 PNL 229 |
| 34 | SCS LOGIC BUS 4 | 70 | SEQ A SPS THRUST ON LOGIC ENABLE AND SEP ULLAGE |
| 35 | -4 VDC | 71 | SEQ B SPS THRUST ON LOGIC ENABLE AND SEP ULLAGE |
| 36 | TRANSLATION CONTROL CLOCKWISE | | |

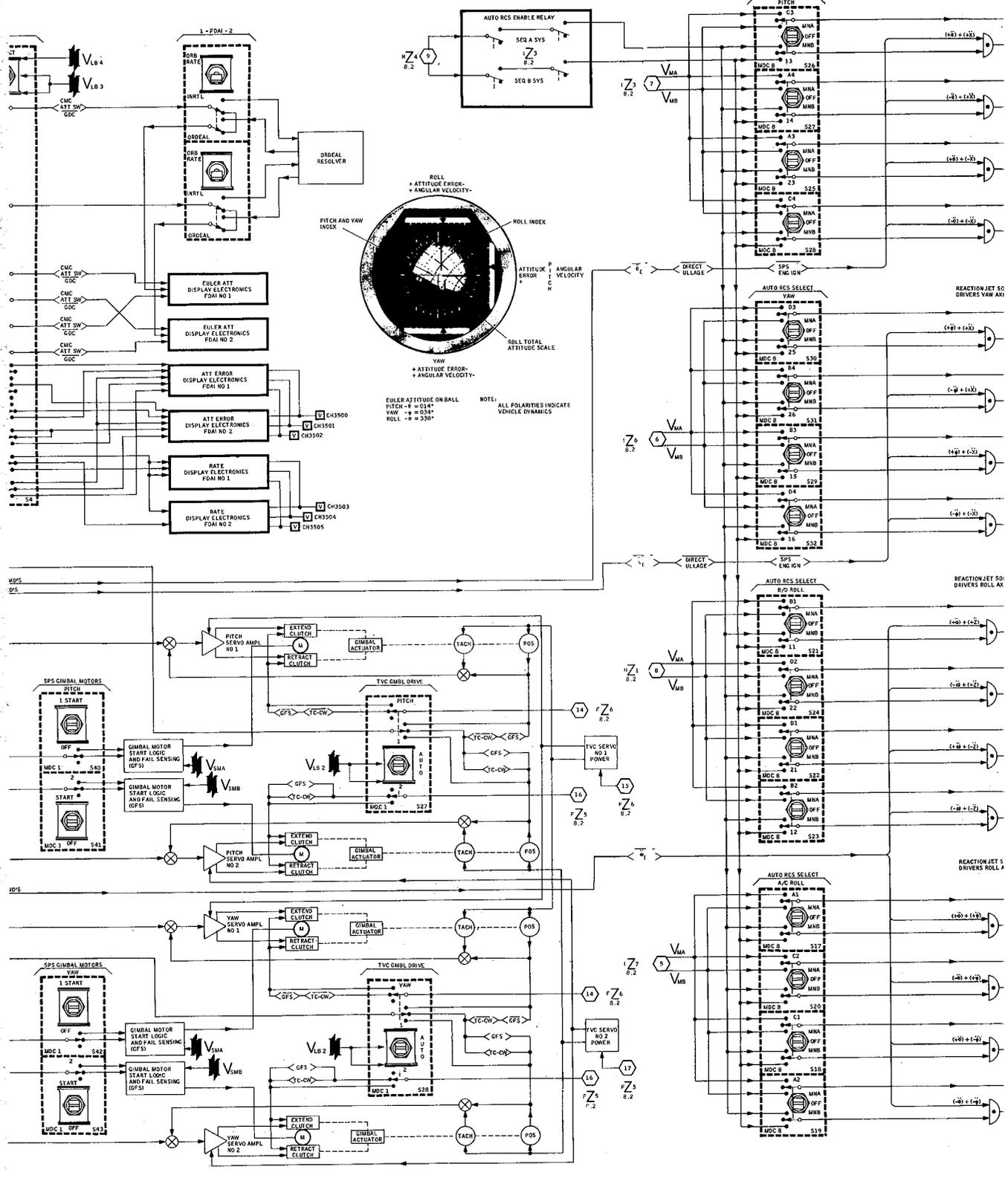


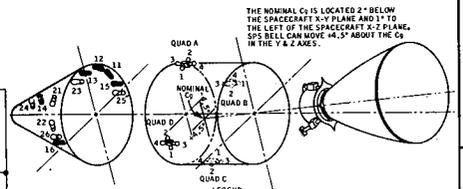
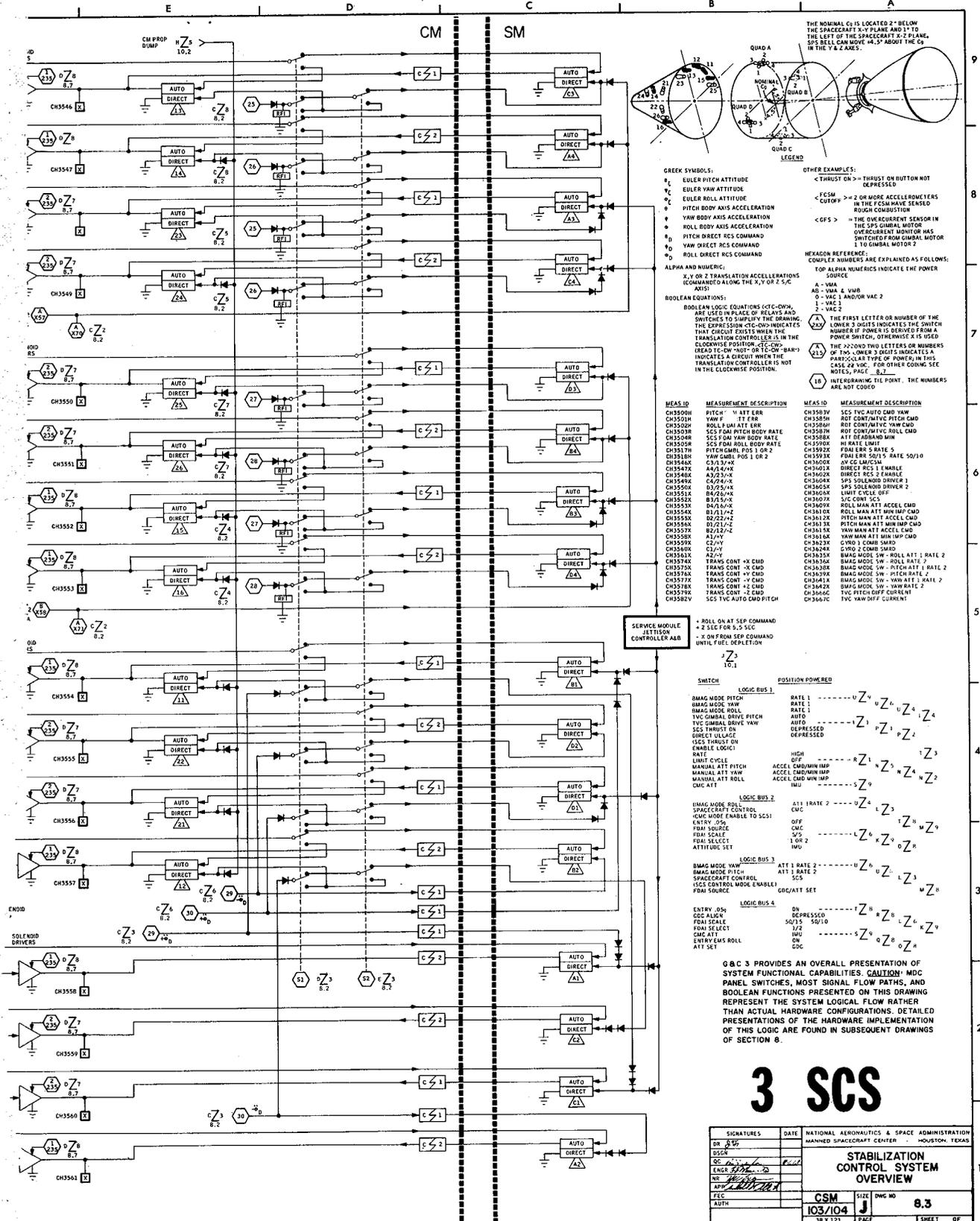
ATTI
ATTITUD

NOTE: THE GDC POSITION OF THIS SWITCH SHOULD NOT BE USED



* PERMANENTLY FIXED RESET/OVERRIDE P





GREEK SYMBOLS:
 # ELDER YAW ATTITUDE
 # ELDER YAW ATTITUDE
 # ELDER ROLL ATTITUDE
 # PITCH BODY AXIS ACCELERATION
 # YAW BODY AXIS ACCELERATION
 # ROLL BODY AXIS ACCELERATION
 # PITCH DIRECT RCS COMMAND
 # YAW DIRECT RCS COMMAND
 # ROLL DIRECT RCS COMMAND

OTHER EXAMPLES:
 <THRUST ON> = THRUST ON BUTTON NOT DEPRESSED
 <FCSM GYROFF> = 2 OR MORE ACCELEROMETERS ROUGH COMBUSTION
 <GFS> = THE OVERCURRENT SENSOR IN THE SPS GIMBAL MOTOR OVERCURRENT MONITOR HAS SWITCHED FROM GIMBAL MOTOR 1 TO GIMBAL MOTOR 2

HEXAGON REFERENCE:
 COMPLEX NUMBERS ARE EXPANDED AS FOLLOWS:
 TOP ALPHA NUMBERS INDICATE THE POWER SOURCE
 A - VMA
 AB - VMA & VMB
 0 - VAC 1 AND/OR VAC 2
 1 - VAC 1
 2 - VAC 2

ALPHA AND NUMERIC:
 X, Y, OR Z TRANSLATION ACCELERATIONS (COMMANDS) ALONG THE X, Y, OR Z S/C AXIS)

BOOLEAN EQUATIONS:
 BOOLEAN LOGIC EQUATIONS (<C-C-OWM, ARE USED IN PLACE OF RELAYS AND SWITCHES TO SIMPLIFY THE DRAWING. THE EXPRESSION C-C-OWM INDICATES THAT CIRCUIT EXISTS WHEN THE TRANSLATION CONTROLLER IS IN THE CLOCKWISE POSITION. <C-C-OWM (READ TC-DW *NOT* OR TC-DW *BAR*) INDICATES A CIRCUIT WHEN THE TRANSLATION CONTROLLER IS NOT IN THE CLOCKWISE POSITION.

| MEAS ID | MEASUREMENT DESCRIPTION | MEAS ID | MEASUREMENT DESCRIPTION |
|---------|-------------------------|---------|-----------------------------|
| CH3500H | PITCH - M ATT ERR | CH3583V | SCS TVC AUTO CMD YAW |
| CH3500M | YAW F TT ERR | CH3583H | ROT CONTINUOUS PITCH CMD |
| CH3500N | ROLL 1 MAN ATT ERR | CH3583B | ROT CONTINUOUS YAW CMD |
| CH3500R | SCS FDI PITCH BODY RATE | CH3583M | ROT CONTINUOUS ROLL CMD |
| CH3500S | SCS FDI YAW BODY RATE | CH3583K | ATT DEGRAND MIN |
| CH3500T | PITCH GIMBAL POS 1 OR 2 | CH3590X | HI RATE LIMIT |
| CH3510H | YAW GIMBAL POS 1 OR 2 | CH3590C | FCM LAMP ON |
| CH3547E | A4/4+X | CH3601X | DIRECT RCS 1 ENABLE |
| CH3547F | A4/4+Y | CH3602X | DIRECT RCS 2 ENABLE |
| CH3549E | C4/4+X | CH3604X | SPS SOLLEND DRIVER 1 |
| CH3549F | C4/4+Y | CH3605X | SPS SOLLEND DRIVER 2 |
| CH3551E | B4/2+X | CH3606X | LIMIT CYCLE OFF |
| CH3551F | B4/2+Y | CH3607X | S/C CONT SW |
| CH3553E | B4/6+X | CH3609X | ROLL MAN ATT ACCEL CMD |
| CH3553F | B4/6+Y | CH3610X | PITCH MAN ATT ACCEL CMD |
| CH3555E | D2/2+Z | CH3611X | PITCH MAN ATT MIN IMP CMD |
| CH3555F | D2/2+Z | CH3612X | YAW MAN ATT ACCEL CMD |
| CH3557E | B2/12+Z | CH3613X | YAW MAN ATT MIN IMP CMD |
| CH3558E | C2/4 | CH3614X | YAW MAN ATT MIN IMP CMD |
| CH3559E | C2/4 | CH3615X | GYRO 1 COMB SMO |
| CH3560E | C2/4 | CH3616X | GYRO 2 COMB SMO |
| CH3574E | TRANS CONT -X CMD | CH3633X | BMAG MODE SW - ROLL RATE 1 |
| CH3574F | TRANS CONT -Y CMD | CH3634X | BMAG MODE SW - ROLL RATE 2 |
| CH3576E | TRANS CONT -X CMD | CH3635X | BMAG MODE SW - PITCH RATE 1 |
| CH3576F | TRANS CONT -Y CMD | CH3636X | BMAG MODE SW - PITCH RATE 2 |
| CH3578E | TRANS CONT -X CMD | CH3637X | BMAG MODE SW - YAW RATE 1 |
| CH3578F | TRANS CONT -Y CMD | CH3638X | BMAG MODE SW - YAW RATE 2 |
| CH3579E | TRANS CONT -X CMD | CH3640X | TVC PITCH OFF CURRENT |
| CH3582V | SCS TVC AUTO CMD PITCH | CH3642X | TVC YAW OFF CURRENT |

SERVICE MODULE JETTISON CONTROLLER ASB

- ROLL ON AT SEP COMMAND + S SET FOR 0.5 SEC
- X ON FROM SEP COMMAND UNTIL FUEL DEPLETION

| SWITCH | LOGIC BUS 1 | POSITION POWERED |
|------------------------------|-------------------|--|
| BMAG MODE PITCH | RATE 1 | U ² Z ⁴ U ² Z ⁴ Z ⁴ |
| BMAG MODE YAW | RATE 1 | U ² Z ⁴ U ² Z ⁴ Z ⁴ |
| BMAG MODE ROLL | RATE 1 | U ² Z ⁴ U ² Z ⁴ Z ⁴ |
| TVC GIMBAL DRIVE PITCH | AUTO | U ² Z ⁴ U ² Z ⁴ Z ⁴ |
| TVC GIMBAL DRIVE YAW | DEPRESSED | U ² Z ⁴ U ² Z ⁴ Z ⁴ |
| SCS THRUST ON DIRECT ISOLATE | DEPRESSED | U ² Z ⁴ U ² Z ⁴ Z ⁴ |
| USCS THRUST ON ENABLE LOGIC | DEPRESSED | U ² Z ⁴ U ² Z ⁴ Z ⁴ |
| RATE LIMIT CYCLE | HIGH | Z ⁴ |
| MANUAL ATT PITCH | OFF | Z ⁴ |
| MANUAL ATT YAW | ACCEL CMD/MIN IMP | Z ⁴ |
| MANUAL ATT ROLL | ACCEL CMD/MIN IMP | Z ⁴ |
| CNC ATT | IMU | Z ⁴ |

G & C 3 PROVIDES AN OVERALL PRESENTATION OF SYSTEM FUNCTIONAL CAPABILITIES. CAUTION: MDC PANEL SWITCHES, MOST SIGNAL FLOW PATHS, AND BOOLEAN FUNCTIONS PRESENTED ON THIS DRAWING REPRESENT THE SYSTEM LOGICAL FLOW RATHER THAN ACTUAL HARDWARE CONFIGURATIONS. DETAILED PRESENTATIONS OF THE HARDWARE IMPLEMENTATION OF THIS LOGIC ARE FOUND IN SUBSEQUENT DRAWINGS OF SECTION 8.

3 SCS

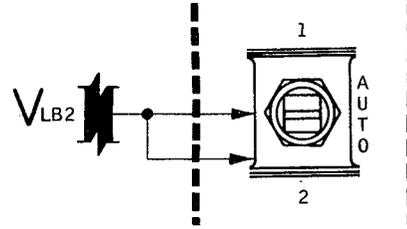
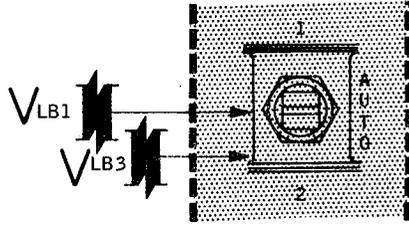
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| DR | ENG | | | |
| DESIGN | ENGR | | | |
| NO | REV | | | |
| SEC | AUTH | | | |
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| 38 X 121 | | PAGE | SHEET OF | |

SECTION 8

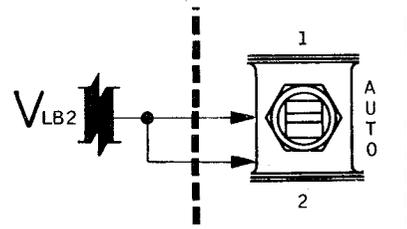
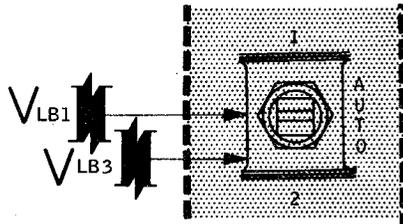
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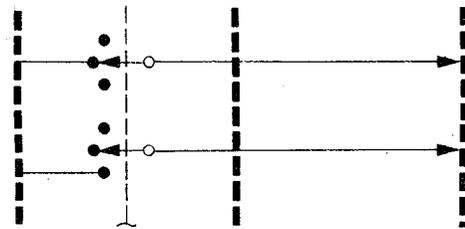
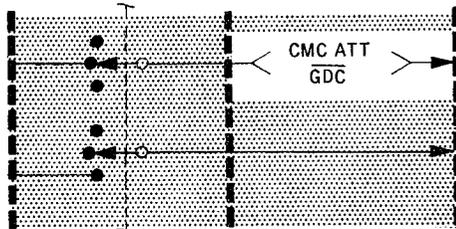
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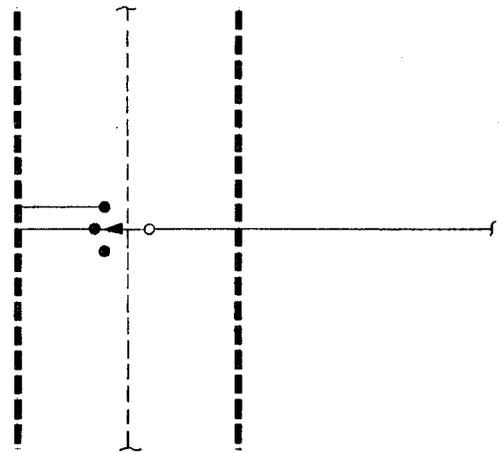
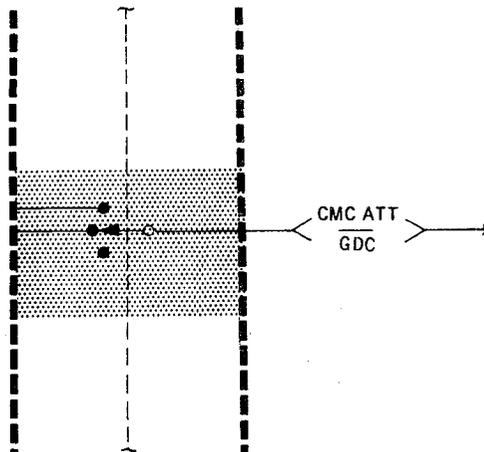
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3. DWG 8.3 MZ6



4. DWG 8.3 KZ8

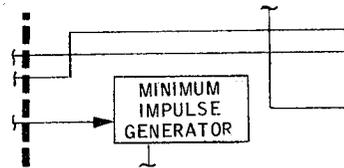
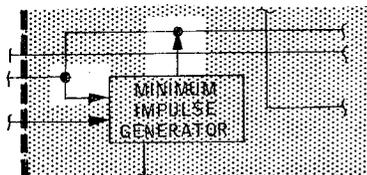


SECTION 8

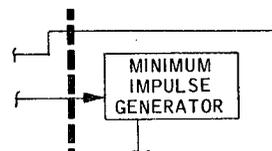
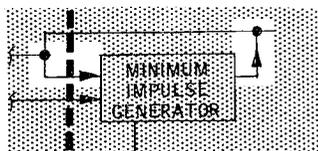
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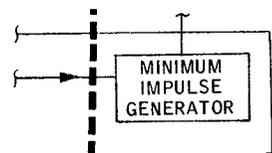
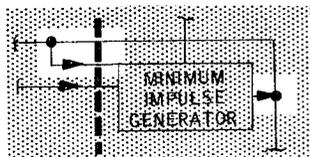
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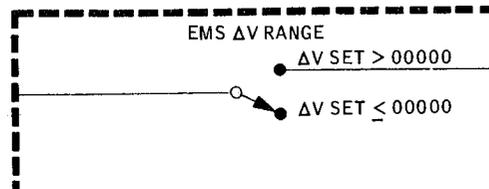
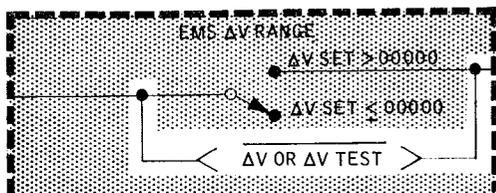
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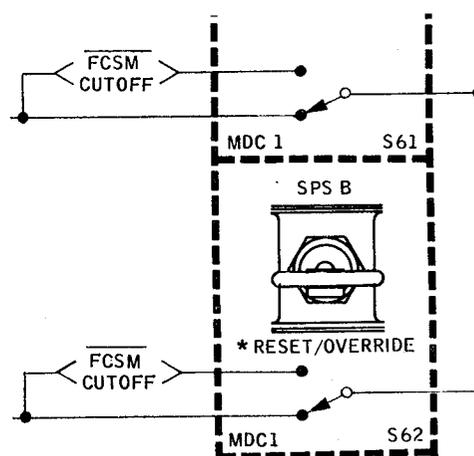
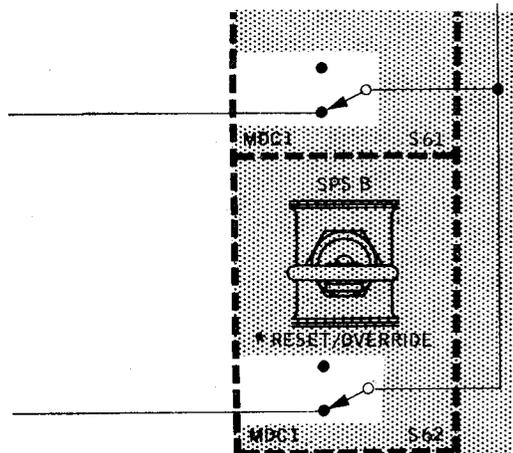
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8. DWG 8.3 OZ1



9. DWG 8.3 LZ1

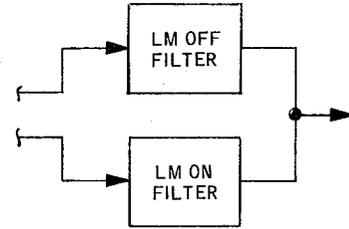
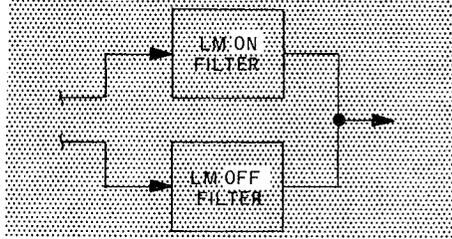


SECTION 8

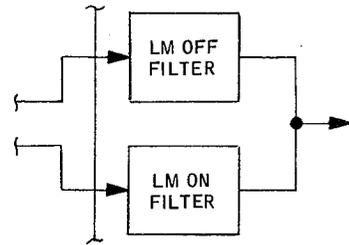
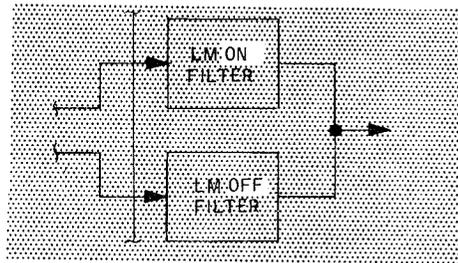
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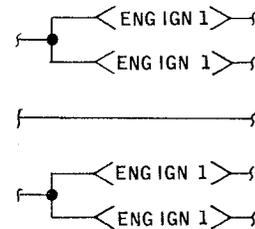
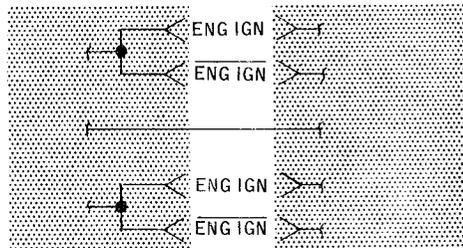
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11. DWG 8.3 RZ3



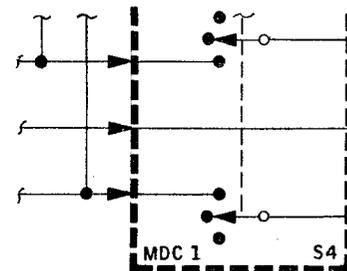
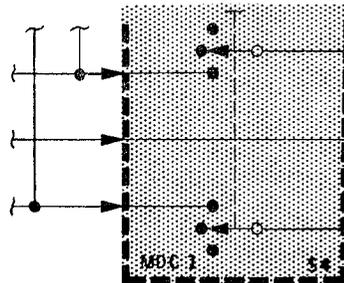
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13. DWG 8.3 SZ9



14. DWG 8.3 NZ6

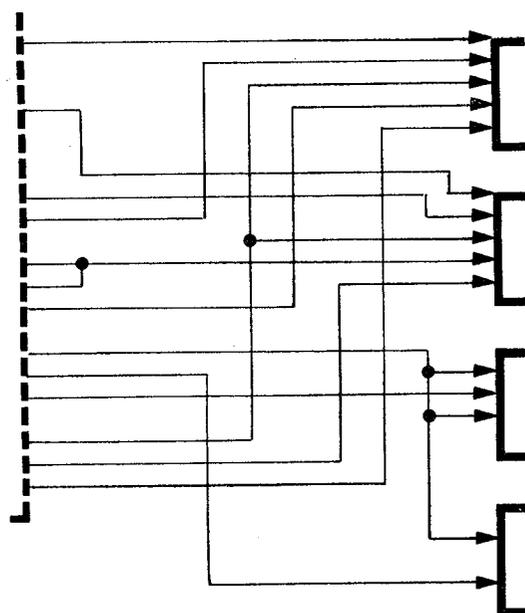
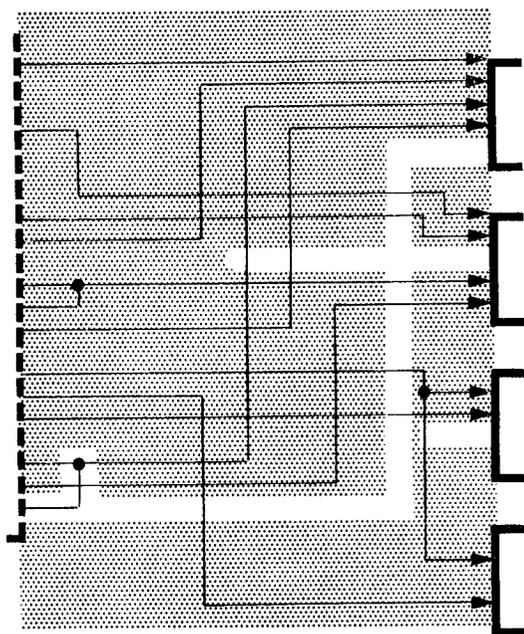


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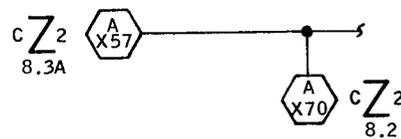
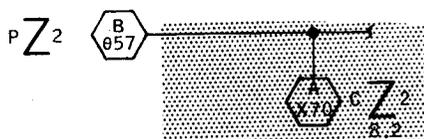
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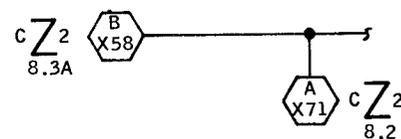
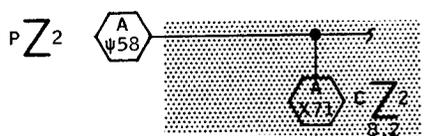
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16. DWG 8.3 FZ₇



17. DWG 8.3 FZ₅



18. DWG 8.3 QZ₂

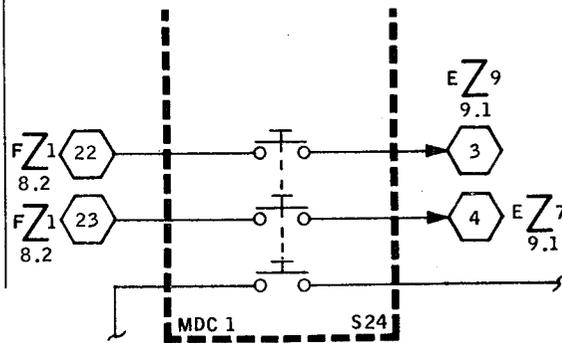
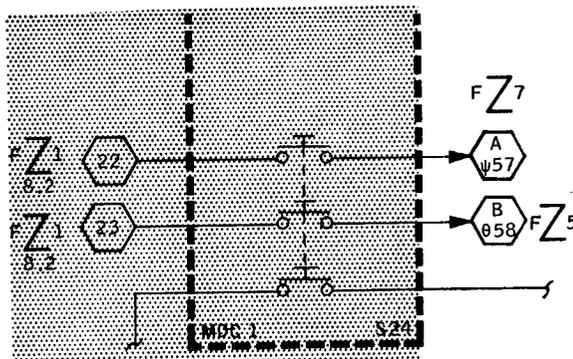


TABLE 8-I. - S/C 103 CMC INPUT/OUTPUT CHANNELS ON TELEMETRY

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

* GYRO SELECT

| AB | GYRO |
|----|------|
| 00 | - |
| 01 | X |
| 10 | Y |
| 11 | Z |

TABLE 8-II.- CSM 103 ALARM CODES

CSM 104

| <u>ALARM CODE (OCTAL)</u> | <u>PROGRAM ALARM IS ON ACTION REQUIRED FOR DISPLAY</u> | <u>DESCRIPTION</u> |
|-------------------------------|--|--|
| 110 | V05N09 FOR DISPLAY | MARK REJECT WITH NO EFFECT (NO MARK IS REJECTED, EITHER PREVIOUS MARKS HAVE BEEN ACCEPTED OR NONE RECEIVED). |
| 112 | V05N09 FOR DISPLAY | MARK NOT BEING ACCEPTED. |
| 113 | V05N09 FOR DISPLAY | PROGRAM INTERRUPT #6 HAS OCCURRED WITH CHANNEL 16 = 0. (CHANNEL 16 MONITORS MARK, MARK REJECT AND NAV DSKY.) |
| 114 | V05N09 FOR DISPLAY | OPTICS MARK RECEIVED WITH ALL REQUESTED MARKS ALREADY PROCESSED. |
| 115 | V05N09 FOR DISPLAY | OPTICS MODE SWITCH NOT IN COMPUTER POSITION WITH OPTICS DRIVE REQUEST MADE. OPERATOR ERROR LAMP ON. |
| 116 | V05N09 FOR DISPLAY | OPTICS SWITCH ALTERED BEFORE 15 SEC ZERO TIME ELAPSED. |
| 117 | V05N09 FOR DISPLAY | OPTICS NOT AVAILABLE FOR DRIVING WHEN DRIVE REQUEST RECEIVED. |
| 120 | V05N09 FOR DISPLAY | OPTICS DRIVE REQUEST WITH OPTICS NOT PREVIOUSLY ZEROED. |
| 121 | V05N09 FOR DISPLAY | IMU CDU CHANGE EXCESSIVE AFTER A MARK. |
| 122 | V05N09 FOR DISPLAY | OPTICS MARK RECEIVED WITH MARK SYSTEM NOT IN USE. |
| 124 | AUTO DISPLAY V05N09 FLASHING | PROGRAM 17 TPI SEARCH - NO SAFE PERICENTER IN THIS SECTOR. |
| 205 | V05N09 FOR DISPLAY | ACCELEROMETER SATURATED DURING SERVICER ROUTINE MONITOR (6400 PULSES IN 2 SEC). |
| 206 | V05N09 FOR DISPLAY | REQUEST FOR IMU CDU ZERO REJECTED SINCE IMU IN COARSE ALIGN DUE TO GIMBAL LOCK. |
| 207 | V05N09 FOR DISPLAY | ISS TURN ON REQUEST NOT PRESENT FOR THE REQUIRED 90 SEC PERIOD. |
| 210 | V05N09 FOR DISPLAY | IMU NOT OPERATING. |
| 211 | V05N09 FOR DISPLAY | EXCESSIVE ANGLE ERROR BETWEEN DESIRED AND ACTUAL CDU AFTER COARSE ALIGN COMPLETED (ERROR > 2°). |
| 212 | V05N09 FOR DISPLAY | PIPA FAIL HAS OCCURRED WITH PIPA'S NOT IN USE. |
| 213 | V05N09 FOR DISPLAY | ISS TURN ON REQUESTED WITH IMU OPERATE SIGNAL NOT PRESENT. |

| <u>ALARM CODE (OCTAL)</u> | <u>PROGRAM ALARM IS ON ACTION REQUIRED FOR DISPLAY</u> | <u>DESCRIPTION</u> |
|-------------------------------|--|---|
| 214 | V05N09 FOR DISPLAY | PROGRAM IS USING THE IMU WHEN THE IMU IS OFF. |
| 215 | AUTO DISPLAY V05N09 FLASHING | PREFERRED IMU ORIENTATION SELECTED BUT NOT AVAILABLE. |
| 217 | V05N09 FOR DISPLAY | ERROR RETURN FROM STALL ROUTINES. |
| 220 | V05N09 FOR DISPLAY | REFSMAT (REFERENCE STABLE MEMBER MATRIX) IS BAD. |
| 401 | V05N09 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 | NOT TRACKING LM AND TARGET IS OUTSIDE THE FIELD OF VIEW (TRUNNION ANGLE > 90°). |
| 405 | AUTO DISPLAY V05N09 FLASHING | TWO STARS NOT AVAILABLE. |
| 406 | V05N09 FOR DISPLAY | REND NAVIGATION NOT OPERATING. |
| 407 | V05N09 FOR DISPLAY | AUTO OPTICS REQUEST TRUNNION ANGLE > 50°. |
| 421 | V05N09 FOR DISPLAY | OVERFLOW IN THE ORBITAL INTEGRATION PACKAGE (W-MATRIX) HAS OCCURRED. |
| 605 | AUTO DISPLAY V05N09 FLASHING | NUMBER OF ITERATIONS EXCEEDS LOOP MAXIMUM. |
| 611 | AUTO DISPLAY V05N09 FLASHING | NO T _{IG} FOR GIVEN ELEVATION ANGLE. |
| 612 | AUTO DISPLAY V05N09 FLASHING | STATE VECTOR IN WRONG SPHERE OF INFLUENCE. |
| 613 | AUTO DISPLAY V05N09 FLASHING | REENTRY ANGLE OUT OF LIMITS. |
| 1102 | V05N09 FOR DISPLAY | FAILURE IN COMPUTER SELF TEST. |
| 1103 | RESTART ON V05N09 FOR DISPLAY | ILLEGAL STEP (UNUSED CCS BRANCH) HAS BEEN EXECUTED IN COMPUTER PROGRAM. |
| 1104 | RESTART ON V05N09 FOR DISPLAY | ANOTHER JOB USING THE JOB DELAY ROUTINE. |
| 1105 | V05N09 FOR DISPLAY | DOWNLINK RATE IS TOO FAST. |
| 1106 | V05N09 FOR DISPLAY | UPLINK RATE IS TOO FAST. |
| 1107 | V05N09 FOR DISPLAY | RESTART PHASE TABLE ENTRIES DISAGREE. ASSUME ERASABLE MEMORY IS DESTROYED. |

| <u>ALARM CODE (OCTAL)</u> | <u>PROGRAM ALARM IS ON ACTION REQUIRED FOR DISPLAY</u> | <u>DESCRIPTION</u> |
|-------------------------------|--|---|
| 1201 | RESTART ON V05N09 FOR DISPLAY | EXECUTIVE OVERFLOW - NO VAC AREAS AVAILABLE. |
| 1202 | RESTART ON V05N09 FOR DISPLAY | EXECUTIVE OVERFLOW - NO CORE SETS AVAILABLE. |
| 1203 | RESTART ON V05N09 | NEW TASK CANNOT BE SUCCESSFULLY INSERTED INTO WAITLIST. |
| 1206 | RESTART ON V05N09 | DISPLAY SYSTEM ADDRESS BUFFERS ARE FULL, HENCE ANOTHER JOB CANNOT BE ACCOMPLISHED. |
| 1207 | RESTART ON V05N09 | NO VAC AREAS AVAILABLE FOR SEXTANT MARKS. |
| 1210 | RESTART ON V05N09 | TWO PROGRAMS TRYING TO USE A PARTICULAR 'STALL' ROUTINE AT THE SAME TIME. |
| 1211 | RESTART ON V05N09 | OPTICS USE NOT ALLOWED WITH EXTENDED VERB BEING PERFORMED. |
| 1301 | RESTART ON V05N09 | ARC SINE OR ARC COSINE ARGUMENT TOO BIG. |
| 1302 | RESTART ON V05N09 | SQUARE ROOT CALLED WITH NEGATIVE ARGUMENT. |
| 1407 | V05N09 FOR DISPLAY | VG INCREASING - THRUST POINTING IN WRONG DIRECTION. |
| 1410 | V05N09 FOR DISPLAY | THRUST TOO LOW FOR CROSS PRODUCT STEERING. |
| 1426 | AUTO DISPLAY V05N09 FLASHING | IMU ORIENTATION UNSATISFACTORY FOR ENTRY. |
| 1427 | AUTO DISPLAY V05N09 FLASHING | IMU ORIENTATION REVERSED FOR ENTRY. |
| 1501 | RESTART ON V05N09 FOR DISPLAY | DISPLAY SYSTEM ALARM. |
| 1502 | RESTART ON V05N09 FOR DISPLAY | ILLEGAL REQUEST FOR FLASHING DISPLAY. |
| 1520 | V05N09 FOR DISPLAY | MAJOR MODE CHANGE (V37) CANNOT BE ACCEPTED. |
| 1600 | V05N09 FOR DISPLAY | OVERFLOW DURING COMPUTATION OF GYRO DRIFT HAS OCCURRED. |
| 1601 | V05N09 FOR DISPLAY | BAD IMU TORQUE. |
| 1602 | V05N09 FOR DISPLAY | BAD OPTICS DURING OPTICAL VERIFICATION. |
| 1703 | V05N09 FOR DISPLAY | INSUFFICIENT TIME FOR INTEGRATION TIG WAS SLIPPED. |

COAST AND ALIGN

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | | | | | | | | | | | | | | | | |
|----------|---|--|-----|-----|-------|----|----------|--|----|-----------------------------|-------------------------|----|----------------------------|--|----|-----------------------------|--|----|---------------------------|--|
| 1A | LIST ID | (77777) ₈ INDICATED COAST AND ALIGN LIST BEING TRANSMITTED | | | | | | | | | | | | | | | | | | |
| 1B | SYNC BITS | (77340) ₈ INDICATES DATA TO FOLLOW | | | | | | | | | | | | | | | | | | |
| 2A | R _X X COMPONENT OF VEHICLE POSITION VECTOR | CSM VEHICLE STATE VECTOR AND TIME | | | | | | | | | | | | | | | | | | |
| 2B | | | | | | | | | | | | | | | | | | | | |
| 3A | | | | | | | | | | | | | | | | | | | | |
| 3B | | | | | | | | | | | | | | | | | | | | |
| 4A | R _Z Z COMPONENT OF VEHICLE POSITION VECTOR | | | | | | | | | | | | | | | | | | | |
| 4B | | | | | | | | | | | | | | | | | | | | |
| 5A | V _X X COMPONENT OF VEHICLE VELOCITY VECTOR | | | | | | | | | | | | | | | | | | | |
| 5B | | | | | | | | | | | | | | | | | | | | |
| 6A | V _Y Y COMPONENT OF VEHICLE VELOCITY VECTOR | | | | | | | | | | | | | | | | | | | |
| 6B | | | | | | | | | | | | | | | | | | | | |
| 7A | V _Z Z COMPONENT OF VEHICLE VELOCITY VECTOR | | | | | | | | | | | | | | | | | | | |
| 7B | | | | | | | | | | | | | | | | | | | | |
| 8A | T _{SV} TIME TAG FOR R AND V | | | | | | | | | | | | | | | | | | | |
| 8B | | | | | | | | | | | | | | | | | | | | |
| 9A | CDUX | X, Y, AND Z CDU INPUT COUNTERS. READ THE IMU COUNTERS ZEROED DURING ZERO ENCODE MODE (IMODES 33 BIT 5 = 1) | | | | | | | | | | | | | | | | | | |
| 9B | | | | | | | | | | | | | | | | | | | | |
| 10A | | | | | | | | | | | | | | | | | | | | |
| 10B | CDUT | TRUNNION CDU INPUT COUNTER | | | | | | | | | | | | | | | | | | |
| 11A | ADOT _X | MEASURED BODY RATES ABOUT THE X, Y, AND Z CONTROL AXES ANY TIME THE RCS DAP IS ON | | | | | | | | | | | | | | | | | | |
| 11B | | | | | | | | | | | | | | | | | | | | |
| 12A | | | | | | | | | | | | | | | | | | | | |
| 12B | | | | | | | | | | | | | | | | | | | | |
| 13A | ADOT _Z | | | | | | | | | | | | | | | | | | | |
| 13B | | | | | | | | | | | | | | | | | | | | |
| 14A | AK AK1 AK2 | VEHICLE ATTITUDE ERRORS (RPY) SENT TO FDAI. DURING P11, THE VALUE IS DIVIDED BY 4 SO THAT MAXIMUM ERROR IS 4 X 16-2/3 DEG. DURING RCS DAP OPERATION EITHER TOTAL ATTITUDE OR DAP FOLLOWING ERROR IS DISPLAYED (DETERMINED BY FLAGWORD 0 BIT 9). | | | | | | | | | | | | | | | | | | |
| 14B | | | | | | | | | | | | | | | | | | | | |
| 15A | | | | | | | | | | | | | | | | | | | | |
| 15B | RCSFLAGS | <table border="1"> <thead> <tr> <th>BIT</th> <th>SET</th> <th>RESET</th> </tr> </thead> <tbody> <tr> <td>15</td> <td>NOT USED</td> <td></td> </tr> <tr> <td>14</td> <td>RATE FILTER NOT INITIALIZED</td> <td>RATE FILTER INITIALIZED</td> </tr> <tr> <td>13</td> <td>ROLL RATE DAMPING REQUIRED</td> <td></td> </tr> <tr> <td>12</td> <td>PITCH RATE DAMPING REQUIRED</td> <td></td> </tr> <tr> <td>11</td> <td>YAW RATE DAMPING REQUIRED</td> <td></td> </tr> </tbody> </table> | BIT | SET | RESET | 15 | NOT USED | | 14 | RATE FILTER NOT INITIALIZED | RATE FILTER INITIALIZED | 13 | ROLL RATE DAMPING REQUIRED | | 12 | PITCH RATE DAMPING REQUIRED | | 11 | YAW RATE DAMPING REQUIRED | |
| BIT | SET | RESET | | | | | | | | | | | | | | | | | | |
| 15 | NOT USED | | | | | | | | | | | | | | | | | | | |
| 14 | RATE FILTER NOT INITIALIZED | RATE FILTER INITIALIZED | | | | | | | | | | | | | | | | | | |
| 13 | ROLL RATE DAMPING REQUIRED | | | | | | | | | | | | | | | | | | | |
| 12 | PITCH RATE DAMPING REQUIRED | | | | | | | | | | | | | | | | | | | |
| 11 | YAW RATE DAMPING REQUIRED | | | | | | | | | | | | | | | | | | | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|----------|---------------------|--|-----------------------------------|---------------------------------|----------------------------|
| | | BIT | SET | RESET | |
| 15B | RCSFLAGS | | | | |
| | | 10 | -ROLL RHC INPUT | | |
| | | 9 | +ROLL RHC INPUT | | |
| | | 8 | -YAW RHC INPUT | | |
| | | 7 | +YAW RHC INPUT | | |
| | | 6 | -PITCH RHC INPUT | | |
| | | 5 | +PITCH RHC INPUT | | |
| | | 4 | COMPUTE AK'S (ATTITUDE ERRORS) | PERFORM NEEDLER TO DISPLAY AK'S | |
| | | 3 | 0 } 3RD PASS } THRU | 0 } 2ND PASS } THRU | 1 } INITIAL PASS } THRU |
| | | 2 | 0 } NEEDLER | 1 } NEEDLER | 1 } NEEDLER |
| 1 | | | INITIALIZE T ₆ PROGRAM | | |
| 16A | THETAD _X | X, Y, AND Z REFERENCE CDU ANGLES FOR THE ATTITUDE HOLD ROUTINE. INTERMEDIATE DESIRED CDU ANGLES FOR AUTO MANEUVER ROUTINE. | | | |
| 16B | THETAD _Y | | | | |
| 17A | THETAD _Z | | | | |
| 17B | DELCDU _X | MOST SIGNIFICANT HALF OF X INCREMENTAL GIMBAL ANGLE USED IN AUTOMATIC MANEUVERS | | | |
| 18A | TIG | TIME OF IGNITION | | | |
| 18B | | | | | |
| 19A | BESTI | FIRST STAR NUMBER MULTIPLIED BY 6 | | | |
| 19B | BESTJ | SECOND STAR NUMBER MULTIPLIED BY 6 | | | |
| 20A | MARKDOWN (TIME2) | MARK DATA FOR THE FIRST MARK | | | |
| 20B | MARKDOWN+1 (TIME1) | | | | |
| 21A | MARKDOWN+2 (CDUY) | | | | |
| 21B | MARKDOWN+3 (CDUS) | | | | |
| 22A | MARKDOWN+4 (CDUZ) | | | | |
| 22B | MARKDOWN+5 (CDUT) | | | | |
| 23A | MARKDOWN+6 (CDUX) | | | | |
| 23B | BDT | EFFECT OF RATE OF CHANGE OF REQUIRED VELOCITY AND GRAVITY DURING DT UPON VELOCITY-TO-BE GAINED | | | |
| 24A | MARK2DWN (TIME2) | MARK DATA FOR THE SECOND MARK | | | |
| 24B | MARK2DWN+1 (TIME1) | | | | |
| 25A | MARK2DWN+2 (CDUY) | | | | |
| 25B | MARK2DWN+3 (CDUS) | | | | |
| 26A | MARK2DWN+4 (CDUZ) | | | | |
| 26B | MARK2DWN+5 (CDUT) | | | | |
| 27A | MARK2DWN+6 (CDUX) | | | | |
| 27B | UNITV+2 | MOST SIGNIFICANT HALF OF THE Y COMPONENT OF A UNITIZED VELOCITY USED DURING REENTRY | | | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|------------|---------------------|--|---|---|
| 28A 28B | HAP0 | ALTITUDE OF APOGEE | | |
| 29A 29B | HPER | ALTITUDE OF PERIGEE | | |
| 30A 30B | RSP-RREC | DOWNRANGE RECOVERY RANGE ERROR | | |
| 31A 31B | VGTI _G X | X, Y, AND Z COMPONENTS OF VELOCITY TO BE GAINED. NOT USED IN COAST AND ALIGN PROGRAMS | | |
| 32A 32B | VGTI _G Y | | | |
| 33A 33B | VGTI _G Z | | | |
| 34A 34B | X _X | REFSMAT | | |
| 35A 35B | X _Y | | | |
| 36A 36B | X _Z | | | |
| 37A 37B | Y _X | | | |
| 38A 38B | Y _Y | | | |
| 39A 39B | Y _Z | | | |
| 40A | FLAGWORD 0 | | | |
| | CPHIFLAG | 15 | OUTPUT OF CALCGA IS CPHIX | OUTPUT OF CALCGA IS THETAD |
| | JSWITCH | 14 | INTEGRATION OF W MATRIX | INTEGRATION OF STATE VECTOR |
| | MIDFLAG | 13 | INTEGRATION WITH SOLAR PERTURBATIONS | INTEGRATION WITHOUT SOLAR PERTURBATIONS |
| | MOONFLAG | 12 | MOON IS SPHERE OF INFLUENCE | EARTH IS SPHERE OF INFLUENCE |
| | NORFHOR | 11 | NOT USED IN COAST AND ALIGN LIST | |
| | ZMEASURE | 10 | NOT USED IN COAST AND ALIGN LIST | |
| | NEEDLFLG | 9 | TOTAL ALTITUDE ERROR DISPLAYED | A/P FOLLOWING ERROR DISPLAYED |
| | IMUSE | 8 | IMU IN USE | IMU NOT IN USE |
| | RNDVZFLG | 7 | NOT USED IN COAST AND ALIGN LIST | |
| | R53FLAG | 6 | V51 INITIATED | V51 NOT INITIATED |
| | F2RTE | 5 | NOT USED IN COAST AND ALIGN LIST | |
| | TRUNFLAG | 4 | DRIVING OF TRUNNION ALLOWED | DRIVING OF TRUNNION NOT ALLOWED |
| | FREEFLAG | 3 | USED TO CONTROL INTERNAL SUBROUTINE PERFORMANCE | |
| | B29FLAG | 2 | NOT USED | |
| | KFLAG | 1 | NOT USED IN COAST AND ALIGN LIST | |
| 40B | FLAGWORD 1 | BIT | SET | RESET |
| | NJETSFLG | 15 | TWO JET RCS BURN | FOUR JET RCS BURN |
| | STIKFLAG | 14 | RHC CONTROL OF RCS | CMC CONTROL OF RCS |

COAST AND ALIGN - Continued

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---------------------------|-------------------------------------|--|--|
| | | BIT | SET | RESET |
| 40B | FLAGWORD 1 | | | |
| | ERADFLAG | 13 | COMPUTE REARTH FISCHER ELLIPSOID | USE CONSTANT REARTH PAD RADIUS |
| | | 12 | NOT USED | |
| | ENG2FLAG | 11 | NOT USED IN COAST AND ALIGN LIST | |
| | TARG1FLG | 10 | NOT USED IN COAST AND ALIGN LIST | |
| | R23FLG | 9 | NOT USED IN COAST AND ALIGN LIST | |
| | VEHUPFLG | 8 | CMS STATE VECTOR BEING UPDATED | LM STATE VECTOR BEING UPDATED |
| | UPDATFLG | 7 | NOT USED IN COAST AND ALIGN LIST | |
| | IDLEFAIL | 6 | NOT USED IN COAST AND ALIGN LIST | |
| | TRACKFLG | 5 | NOT USED IN COAST AND ALIGN LIST | |
| | | 4 | NOT USED | |
| | SLOPESW | 3 | NOT USED IN COAST AND ALIGN LIST | |
| | AVEGFLAG | 2 | NOT USED IN COAST AND ALIGN LIST | |
| | 1 | AVERAGE G (SERVICER) TO CONTINUE | AVERAGE G (SERVICER) TO CEASE | |
| 41A | FLAGWORD 2 | | | |
| | DRIFTFLG | 15 | T3RUPT CALLS GYRO COMPENSATION | T3RUPT DOES NO GYRO COMPENSATION |
| | R21MARK | 14 | NOT USED IN COAST AND ALIGN LIST | |
| | 22DSPFLG | 13 | NOT USED IN COAST AND ALIGN LIST | |
| | | 12 | NOT USED | |
| | STERRSW | 11 | NOT USED IN COAST AND ALIGN LIST | |
| | CYCLESW | 10 | NOT USED IN COAST AND ALIGN LIST | |
| | IMPULSW | 9 | NOT USED IN COAST AND ALIGN LIST | |
| | XDELVFLG | 8 | NOT USED IN COAST AND ALIGN LIST | |
| | ETPIFLAG, FIRSTFLG OPTNSW | 7 | NOT USED IN COAST AND ALIGN LIST | |
| | FINALFLG | 6 | NOT USED IN COAST AND ALIGN LIST | |
| | AVFLAG | 5 | NOT USED IN COAST AND ALIGN LIST | |
| | PFPRATFLG | 4 | PREFERRED ATTITUDE COMPUTED | PREFERRED ATTITUDE NOT COMPUTED |
| CALCMAN3 | 3 | NO GIMBAL LOCK AVOIDANCE REQUIRED | GIMBAL LOCK AVOIDANCE REQUIRED | |
| CALCMAN2 | 2 | PERFORM MANEUVER STARTING PROCEDURE | BYPASS STARTING PROCEDURE | |
| NODOFLAG | 1 | V37 NOT PERMITTED | V37 PERMITTED | |
| 41B | FLAGWORD 3 | | | |
| | | 15 | NOT USED | |
| | GLOKFAIL | 14 | GIMBAL LOCK HAS OCCURRED | NOT IN GIMBAL LOCK |
| | REFSMFLG | 13 | REFSMAT GOOD | REFSMAT NO GOOD |
| | LUNAFLAG | 12 | LUNAR LAT-LONG | EARTH LAT-LONG |
| | P22MKFLG | 11 | NOT USED IN COAST AND ALIGN LIST | |
| | VFLAG | 10 | LESS THAN TWO STARS IN FIELD OF VIEW | TWO STARS IN FIELD OF VIEW |
| | ONMONFLG | 9 | NOT USED IN COAST AND ALIGN LIST | |
| | PRECIFLG | 8 | CSMPREC OR LEMPREC CALLED | INTEGRV OR INTEGRVS CALLED |
| | CULTFLAG | 7 | STAR OCCULTED | STAR NOT OCCULTED |
| | ORBWFLAG | 6 | W MATRIX VALID FOR ORBITAL INTEGRATION | W MATRIX INVALID FOR ORBITAL INTEGRATION |
| | STATEFLG | 5 | PERMANENT STATE VECTOR UPDATED | PERMANENT STATE VECTOR NOT UPDATED |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------|------------------------|---|--|
| | | BIT | SET | RESET |
| 41B | FLAGWORD 3 | | | |
| | INTYPFLG | 4 | CONIC INTEGRATION | ENCKE INTEGRATION |
| | VINTFLAG | 3 | CSM STATE VECTOR BEING INTEGRATED | LM STATE VECTOR BEING INTEGRATED |
| | D60R9FLG | 2 | DIMENSION OF W IS 9 FOR INTEGRATION | DIMENSION OF W IS 6 FOR INTEGRATION |
| | DIMOFFLAG | 1 | W MATRIX IS TO BE USED | W MATRIX IS NOT TO USED |
| 42A | FLAGWORD 4 | | | |
| | MRKIDFLG | 15 | MARK DISPLAY IN ENDIDLE | NO MARK DISPLAY IN ENDIDLE |
| | PRIODFLG | 14 | PRIORITY DISPLAY IN ENDIDLE | NO PRIORITY DISPLAY IN ENDIDLE |
| | NEMIDFLG | 13 | NORMAL DISPLAY IN ENDIDLE | NO NORMAL DISPLAY IN ENDIDLE |
| | PDSPFLAG | 12 | CAN NOT INTERRUPT PRIORITY DISPLAY | |
| | MWAITFLG | 11 | HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED |
| | NWAITFLG | 10 | HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED |
| | MRKNVFLG | 9 | ASTRONAUT USING KEYBOARD WHEN MARK DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN MARK DISPLAY INITIATED |
| | NRMNVFLG | 8 | ASTRONAUT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED |
| | PRONVFLG | 7 | ASTRONAUT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED |
| | PINBRFLG | 6 | ASTRONAUT HAS INTERFERED WITH EXISTING DISPLAY | ASTRONAUT HAS NOT INTERFERED WITH EXISTING DISPLAY |
| | MRUPTFLG | 5 | MARK DISPLAY INTERRUPTED BY PRIORITY DISPLAY | MARK DISPLAY NOT INTERRUPTED BY PRIORITY DISPLAY |
| | NRUPTFLG | 4 | NORMAL DISPLAY INTERRUPTED BY PRIORITY OR MARK DISPLAY | NORMAL DISPLAY NOT INTERRUPTED BY PRIORITY OR MARK DISPLAY |
| | MKOVFLAG | 3 | MARK DISPLAY OVER NORMAL | NO MARK DISPLAY OVER NORMAL |
| | | 2 | NOT USED | |
| | | 1 | MARK DISPLAY NOT TO BE INTERRUPTED | |
| | 42B | FLAGWORD 5 | | |
| DSKYFLAG | | 15 | DISPLAYS SENT TO DSKY | NO DISPLAYS TO DSKY |
| | | 14 | NOT USED | |
| | | 13 | NOT USED | |
| V59FLAG | | 12 | NOT USED IN COAST AND ALIGN LIST | |
| INCORFLG | | 11 | NOT USED IN COAST AND ALIGN LIST | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | | |
|----------|---|------------------------|---|---------------------------------------|-------------------------------|-------------------------------|
| | | BIT | SET | RESET | | |
| 42B | FLAGWORD 5 PRFTRKAT DMENFLG COMPUTER ENGONFLG 3AXISFLG GRRBKFLG R60FLAG SOLNSW MGLVFLAG RENDWFLG | 10 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 9 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 8 | COMPUTER IS CMC | COMPUTER IS LGC | | |
| | | 7 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 6 | MANEUVER SPECIFIED BY THREE AXES | MANEUVER SPECIFIED BY ONE AXIS | | |
| | | 5 | BACKUP GRR RECEIVED | BACKUP GRR NOT RECEIVED | | |
| | | 4 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 3 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 2 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 1 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 43A | FLAGWORD 6 DAPBIT1, DAPBIT2 ENTRYDSP CMDAPARM GAMDIFSW GONEPAST RELVELSW KNOWNFLG FIRSTPAS HINK INRLSW LATSW .05GSW CM/DSTBY GYMDIFSW | 15 | 0 } NO DAP OR 0 } ENTRY | 0 } CSM 1 } RCS 1 } DAP |
| 14 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 13 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 12 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 11 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 10 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 9 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 8 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 7 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 6 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 5 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 4 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 3 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 2 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 1 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 43B | FLAGWORD 7 TERMIFLG ITSWICH IGNFLAG ASTNFLAG TIMRFLAG NORMSW RVSW GONEBY IDLEFLAG V37FLAG NOUPFLAG, R32FLAG UPLOCKFL VERIFLAG ATTCHFLG TFFSW | 15 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 14 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 13 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 12 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 11 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 10 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 9 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 8 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 7 | NO DV MONITOR | CONNECT DV MONITOR | | |
| | | 6 | AVERAGE G (SERVICER) RUNNING | AVERAGE G (SERVICER) OFF | | |
| | | 5 | NEITHER CSM NOR LM STATE VECTOR MAY BE UPDATED | EITHER STATE VECTOR MAY BE UPDATED | | |
| | | 4 | K-K-K FAIL | NO K-K-K FAIL | | |
| | | 3 | NOT USED IN COAST AND ALIGN LIST | | | |
| | | 2 | LM, CM ATTACHED | LM, CM NOT ATTACHED | | |
| 1 | NOT USED IN COAST AND ALIGN LIST | | | | | |
| 44A | FLAGWORD 8 RPQFLAG NEWIFLG | 15 | RPQ NOT COMPUTED | RPQ COMPUTED | | |
| | | 14 | NOT USED | | | |
| | | 13 | FIRST PASS THROUGH INTEGRATION | SUCCESSING INTEGRATION OF INTEGRATION | | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------|---|---|---|
| | | BIT | SET | RESET |
| 44A | FLAGWORD 8 | | | |
| | CMOONFLG | 12 | PERMANENT CSM STATE IN LUNAR SPHERE | PERMANENT CSM STATE IN EARTH SPHERE |
| | LMOONFLG | 11 | PERMANENT LM STATE IN LUNAR SPHERE | PERMANENT LM STATE IN EARTH SPHERE |
| | ADVTRK | 10 | ADVANCE GROUND TRACK SIGHTING WANTED | NOT ADVANCED GROUND TRACK |
| | P39/79SW | 9 | NOT USED IN COAST AND ALIGN LIST | |
| | SURFFLAG | 8 | NOT USED IN COAST AND ALIGN LIST | |
| | INFINFLG | 7 | NOT USED IN COAST AND ALIGN LIST | |
| | ORDERSW | 6 | 1ST ORDER ITERATOR | 2ND ORDER ITERATOR |
| | APSESW | 5 | NOT USED IN COAST AND ALIGN LIST | |
| | COGAFLAG | 4 | NOT USED IN COAST AND ALIGN LIST | |
| | | 3 | NOT USED | |
| | | 2 | NOT USED | |
| | 360SW | 1 | NOT USED IN COAST AND ALIGN LIST | |
| 44B | FLAGWORD 9 | | | |
| | SWTOVER | 15 | NOT USED IN COAST AND ALIGN LIST | |
| | V67FLAG | 14 | NOT USED IN COAST AND ALIGN LIST | |
| | V82EMFLG | 13 | NOT USED IN COAST AND ALIGN LIST | |
| | MAXDBFLG | 12 | MAX DB SELECTED | MAX DB NOT SELECTED |
| | V94FLAG | 11 | NOT USED IN COAST AND ALIGN LIST | |
| | SAVECFLG | 10 | NOT USED IN COAST AND ALIGN LIST | |
| | VHFRFLAG | 9 | NOT USED IN COAST AND ALIGN LIST | |
| | SOURCFLG | 8 | NOT USED IN COAST AND ALIGN LIST | |
| | | 7 | NOT USED | |
| | N22ORN17 | 6 | COMPUTE TOTAL ATTITUDE ERRORS WRT N22 (V62) | COMPUTE TOTAL ATTITUDE ERRORS WRT N17 (V63) |
| | QUITFLAG | 5 | CAUSE INTEGRATION TO EXIST AT NEXT TIME STOP | ALLOW INTEGRATION TO CONTINUE |
| | R31FLAG | 4 | NOT USED IN COAST AND ALIGN LIST | |
| | MID1FLAG | 3 | INTEGRATE TO TDEC | INTEGRATE TO THE THEN-PRESENT TIME |
| | MIDAVFLG | 2 | INTEGRATION ENTERED FROM ONE OF MIDTOAV PORTALS | INTEGRATION WAS NOT ENTERED VIA MIDTOAV |
| AVEMIDSW | 1 | AVETOMID CALLING FOR W MATRIX INTEGER DON'T WRITE OVER RN, VN, PIPTIME | NO AVETOMID W INTEGER ALLOW SET UP OF RN, VN, PIPTIME | |
| 45A | DSPTAB | DISPLAY TABLE CODES FOR GENERATION OF DSKY NUMERICS | | |
| 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 | USED TO INDICATE VERB-NOUN MAJOR MODE AND R ₁ , R ₂ , AND R ₃ DISPLAYS | | |
| 50B | DSPTAB + 11 | DISPLAY TABLE OF DSKY STATUS LIGHTS 60400g = PROGRAM CAUTION, 60200g = TRACKER WARNING 60020g = NO ATTITUDE, 60040g = GIMBAL LOCK | | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE |
|-------------------|---|--|
| 51A 51B | TIME2, TIME1 | COMPUTER CLOCK INDICATING ELAPSED TIME SINCE LIFTOFF |
| 52A 52B | R _X X COMPONENT OF "OTHER" VEHICLE POSITION | "OTHER" VEHICLE STATE VECTOR |
| 53A 53B | R _Y Y COMPONENT OF "OTHER" VEHICLE POSITION | |
| 54A 54B | R _Z Z COMPONENT OF "OTHER" VEHICLE POSITION | |
| 55A 55B | V _X X COMPONENT OF "OTHER" VEHICLE VELOCITY | |
| 56A 56B | V _Y Y COMPONENT OF "OTHER" VEHICLE VELOCITY | |
| 57A 57B | V _Z Z COMPONENT OF "OTHER" VEHICLE VELOCITY | |
| 58A 58B | T _{OTHER} TIME TAG FOR "OTHER" STATE VECTOR | |
| 59A 59B 60A | CDUX CDUY CDUZ | SAME AS 9A SAME AS 9B SAME AS 10A |
| 60B | CDUT | SAME AS 10B |
| 61A 61B | ADOT _X | SAME AS 11A, 11B |
| 62A 62B | ADOT _Y | SAME AS 12A, 12B |
| 63A 63B | ADOT _Z | SAME AS 13A, 13B |
| 64A 64B 65A | AK AK1 AK2 | SAME AS 14A SAME AS 14B SAME AS 15A |
| 65B | RCSFLAGS | SAME AS 15B |
| 66A 66B 67A | THETAD _X THETAD _Y THETAD _Z | SAME AS 16A SAME AS 16B SAME AS 17A |
| 67B | DELCDUX | SAME AS 17B |
| 68A 68B | RSBBQ, +1 | VALUE OF BBANK AND Q REGISTERS AT THE TIME OF A RESTART |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|----------|-------------|---|-------------------------------------|---|--|
| 69A | CADRFLSH | VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED PRIORITY DISPLAY | | | |
| 69B | CADRFLSH+1 | VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED MARK | | | |
| 70A | CADRFLSH+2 | VALUE OF RETURN ADDRESS INFORMATION FOR LAST NORMAL DISPLAY REQUESTED | | | |
| 70B | FAILREG | CONTAINS ALARM CODE OF FIRST ALARM RECEIVED | | | |
| 71A | FAILREG+1 | CONTAINS ALARM CODE OF SECOND ALARM RECEIVED | | | |
| 71B | FAILREG+2 | CONTAINS ALARM CODE OF THIRD ALARM RECEIVED | | | |
| 72A | CDUS | SHAFT CDU INPUT COUNTER | | | |
| 72B | PIPAX | X, Y, AND Z PIPA INPUT COUNTERS. ZEROED AT THE START OF AVERAGE G, READ EVERY 2 SEC DURING AVERAGE G ROUTINE. | | | |
| 73A | PIPAY | | | | |
| 73B | PIPAZ | | | | |
| 74A | OGC | X GYRO TORQUE ANGLE. | | | |
| 74B | | | | | |
| 75A | IGC | Y GYRO TORQUE ANGLE. | | | |
| 75B | | | | | |
| 76A | MGC | Z GYRO TORQUE ANGLE. | | | |
| 76B | | | | | |
| 77A | FLAGWORD 10 | BIT | SET | RESET | |
| | | 15 | NOT USED | | |
| | | 14 | INTEGRATION IN PROGRESS | INTEGRATION NOT IN PROGRESS | |
| | | 13 | NOT USED | | |
| | | 12 | NOT USED | | |
| | | 11 | NOT USED | | |
| | | 10 | NOT USED | | |
| | | 9 | NOT USED | | |
| | | 8 | NOT USED | | |
| | | 7 | INTEGRATION ROUTINE TO BE RESTARTED | INTEGRATION ROUTINE NOT TO BE RESTARTED | |
| | | 6 | NOT USED | | |
| | | 5 | NOT USED | | |
| | | 4 | NOT USED | | |
| | | 3 | NOT USED | | |
| | | 2 | NOT USED | | |
| | | 1 | NOT USED | | |
| 77B | FLAGWORD 11 | NOT USED | | | |
| 78A | TEVENT | VALUE OF COMPUTER CLOCK WHEN LIFTOFF OCCURRED, | | | |
| 78B | | WHEN SPS ENGINE CAME ON OR WHEN SPS ENGINE SHUT OFF | | | |
| 79A | LAUNCHAZ | LAUNCH AZIMUTH ANGLE (ANGLE FROM NORTH TO | | | |
| 79B | | X STABLE MEMBER) | | | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|----------|---------------------------------|--|--|--|--|
| | | BIT | SET | RESET | |
| 80A | OPTMODES | 15 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 13 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 11 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 10 | INDICATES OPTICS HAS BEEN ZEROED SINCE LAST FRESH START | ALARM 1208 WILL BE GENERATED IF ATTEMPT IS MADE TO ZERO OPTICS | |
| | | 9 | OPTICS MODE SWITCH IN COMPUTER POSITION | RESET BY FRESH START OR MODE OTHER THAN CMC | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 7 | OPTICS CDU FAIL PRESENTLY | NO OPTICS CDU FAIL PRESENTLY | |
| | | 6 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 5 | OPTICS MODE SWITCH NOT IN CMC POSITION | OPTICS MODE SWITCH IN CMC POSITION | |
| | | 4 | OPTICS ZERO SWITCH NOT IN ZERO POSITION | OPTICS ZERO SWITCH IN ZERO POSITION (BITS 4, 5 = 1'S OPTICS IN MANUAL MODE) | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 1 | NOT ASSIGNED - SHOULD BE ZERO | | |
| 80B | 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, PERFORM ATTITUDE HOLD ABOUT EXISTING REFERENCE. IF <+0, AUTOMATIC STEERING IS TO BE PERFORMED. | | | |
| 81A | LEMMASS | MASS OF THE LM | | | |
| 81B | CSMMASS | MASS OF THE CSM | | | |
| 82A | DAPDATR1 LOADED WITH V48N46E | BITS | | | |
| | | 15 | NOT USED - SHOULD BE ZERO | | |
| | | 14 | 0 } NO } LM } 1 } LM ON } 1 } SATURN | | |
| | | 13 | 0 } DAP } 1 } OFF } RCS DAP } 0 } DAP } 1 } DAP | | |
| | | 12 | NOT USED - SHOULD BE ZERO | | |
| | | 11 | NOT USED - SHOULD BE ZERO | | |
| | | 10 | X TRANSLATIONS 0 1 } USE 0 1 } USE 1 } USE | | |
| | | 7 | 0 1 } AC&BD } AC } BD | | |
| | | 7 | 0 1 } QUADS 1 } QUADS 0 } QUADS | | |
| | | 9 | NOT USED - SHOULD BE ZERO | | |
| | | 8 | NOT USED - SHOULD BE ZERO | | |
| | | 6 | NOT USED - SHOULD BE ZERO | | |
| | | 5 | NOT USED - SHOULD BE ZERO | | |
| | | 4 | ANGULAR DEADBAND FOR ATTITUDE HOLD AND AUTOMATIC MANEUVERS 0 - ±0.5° DEADBAND 1 - ±5.0° DEADBAND | | |
| | | 3 | NOT USED - SHOULD BE ZERO | | |
| | | 2 | SPECIFY 0 } .05° 0 } .2° 1 } .5° 1 } .5° 4 | | |
| | | 1 | MANEUVER 0 } / } / } / } / | | |
| | | 1 | RATE 0 } SEC 1 } SEC 0 } SEC 1 } SEC | | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | | | |
|----------|--------------------------------|--|--|--|---------------------------------|-----------------------|------------------|
| | | BIT | SET | RESET | | | |
| 80A | OPTMODES | 15 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 13 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 11 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 10 | INDICATES OPTICS HAS BEEN ZEROED SINCE LAST FRESH START | ALARM 1208 WILL BE GENERATED IF ATTEMPT IS MADE TO ZERO OPTICS | | | |
| | | 9 | OPTICS MODE SWITCH IN COMPUTER POSITION | RESET BY FRESH START OR MODE OTHER THAN CMC | | | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 7 | OPTICS CDU FAIL PRESENTLY | NO OPTICS CDU FAIL PRESENTLY | | | |
| | | 6 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 5 | OPTICS MODE SWITCH NOT IN CMC POSITION | OPTICS MODE SWITCH IN CMC POSITION | | | |
| | | 4 | OPTICS ZERO SWITCH NOT IN ZERO POSITION (BITS 4, 5 = 1'S OPTICS IN MANUAL MODE) | OPTICS ZERO SWITCH IN ZERO POSITION | | | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 1 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| 80B | 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, PERFORM ATTITUDE HOLD ABOUT EXISTING REFERENCE. IF <+0, AUTOMATIC STEERING IS TO BE PERFORMED. | | | | | |
| 81A | LEMMASS | MASS OF THE LM | | | | | |
| 81B | CSMMASS | MASS OF THE CSM | | | | | |
| 82A | DAPDTRI LOADED WITH V48N46E | 15 | NOT USED - SHOULD BE ZERO | | | | |
| | | 14 | 0 } NO 1 } DAP | 0 } LM 1 } OFF | 1 } LM ON 0 } RCS 1 } DAP | 1 } SATURN 0 } DAP | |
| | | 13 | NOT USED - SHOULD BE ZERO | | | | |
| | | 12 | NOT USED - SHOULD BE ZERO | | | | |
| | | 11 | NOT USED - SHOULD BE ZERO | | | | |
| | | 10 | X TRANSLATIONS | 0 } USE 1 } AC&BD | 0 } USE 1 } AC | 1 } USE 0 } BD | |
| | | 7 | USES | 0 } QUADS 1 } QUADS | 1 } QUADS | 0 } QUADS | |
| | | 9 | NOT USED - SHOULD BE ZERO | | | | |
| | | 8 | NOT USED - SHOULD BE ZERO | | | | |
| | | 6 | NOT USED - SHOULD BE ZERO | | | | |
| | | 5 | NOT USED - SHOULD BE ZERO | | | | |
| | | 4 | ANGULAR DEADBAND FOR ATTITUDE HOLD AND AUTOMATIC MANEUVERS 0 - ±0.5° DEADBAND 1 - ±5.0° DEADBAND | | | | |
| | | 3 | NOT USED - SHOULD BE ZERO | | | | |
| | | 2 | SPECIFY MANEUVER RATE | 0 } .05° 1 } / | 0 } .2° 1 } / | 1 } .5° 1 } / | 4 } .5° 1 } / |
| | | 1 | 0 } SEC 1 } SEC | | | | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | | | |
|----------|---------------------------------|--|--|--|--|-----------------------|---------|
| | | BIT | SET | RESET | | | |
| 80A | OPTMODES | 15 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 13 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 11 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 10 | INDICATES OPTICS HAS BEEN ZEROED SINCE LAST FRESH START | ALARM 1208 WILL BE GENERATED IF ATTEMPT IS MADE TO ZERO OPTICS | | | |
| | | 9 | OPTICS MODE SWITCH IN COMPUTER POSITION | RESET BY FRESH START OR MODE OTHER THAN CMC | | | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 7 | OPTICS CDU FAIL PRESENTLY | NO OPTICS CDU FAIL PRESENTLY | | | |
| | | 6 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 5 | OPTICS MODE SWITCH NOT IN CMC POSITION | OPTICS MODE SWITCH IN CMC POSITION | | | |
| | | 4 | OPTICS ZERO SWITCH NOT IN ZERO POSITION | OPTICS ZERO SWITCH IN ZERO POSITION (BITS 4, 5 = 1'S OPTICS IN MANUAL MODE) | | | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| | | 1 | NOT ASSIGNED - SHOULD BE ZERO | | | | |
| 80B | 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, PERFORM ATTITUDE HOLD ABOUT EXISTING REFERENCE. IF <+0, AUTOMATIC STEERING IS TO BE PERFORMED. | | | | | |
| 81A | LEMMASS | MASS OF THE LM | | | | | |
| 81B | CSMMASS | MASS OF THE CSM | | | | | |
| 82A | DAPDATR1 LOADED WITH V48N46E | BITS | | | | | |
| | | 15 | NOT USED - SHOULD BE ZERO | | | | |
| | | 14 | 0 } NO 0 } DAP | 0 } LM 1 } OFF 1 } RCS DAP | 1 } LM ON 0 } RCS 1 } DAP | 1 } SATURN 1 } DAP | |
| | | 13 | NOT USED - SHOULD BE ZERO | | | | |
| | | 12 | NOT USED - SHOULD BE ZERO | | | | |
| | | 11 | NOT USED - SHOULD BE ZERO | | | | |
| | | 10 | X TRANSLATIONS 0 1 | USE 0 1 | OR AC&BD 0 1 | USE AC 1 | BD 1 |
| | | 7 | USES 0 1 | QUADS 1 | QUADS 0 | QUADS 0 | QUADS 4 |
| | | 9 | NOT USED - SHOULD BE ZERO | | | | |
| | | 8 | NOT USED - SHOULD BE ZERO | | | | |
| | | 6 | NOT USED - SHOULD BE ZERO | | | | |
| | | 5 | NOT USED - SHOULD BE ZERO | | | | |
| | | 4 | ANGULAR DEADBAND FOR ATTITUDE HOLD AND AUTOMATIC MANEUVERS 0 - ±0.5° DEADBAND 1 - ±5.0° DEADBAND | | | | |
| | | 3 | NOT USED - SHOULD BE ZERO | | | | |
| | | 2 | SPECIFY MANEUVER RATE | 0 } .05° / SEC 0 } .2° / SEC 1 } .5° / SEC 1 } .5° / SEC | 0 } .2° / SEC 1 } .5° / SEC 0 } .5° / SEC 1 } .5° / SEC | 4 | |
| | | 1 | NOT USED - SHOULD BE ZERO | | | | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|----------|---------------------------------|--|--|--|--|
| | | BIT | SET | RESET | |
| 80A | OPTMODES | 15 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 13 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 11 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 10 | INDICATES OPTICS HAS BEEN ZEROED SINCE LAST FRESH START | ALARM 1208 WILL BE GENERATED IF ATTEMPT IS MADE TO ZERO OPTICS | |
| | | 9 | OPTICS MODE SWITCH IN COMPUTER POSITION | RESET BY FRESH START OR MODE OTHER THAN CMC | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 7 | OPTICS CDU FAIL PRESENTLY | NO OPTICS CDU FAIL PRESENTLY | |
| | | 6 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 5 | OPTICS MODE SWITCH NOT IN CMC POSITION | OPTICS MODE SWITCH IN CMC POSITION | |
| | | 4 | OPTICS ZERO SWITCH NOT IN ZERO POSITION | OPTICS ZERO SWITCH IN ZERO POSITION (BITS 4, 5 = 1'S OPTICS IN MANUAL MODE) | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 1 | NOT ASSIGNED - SHOULD BE ZERO | | |
| 80B | 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, PERFORM ATTITUDE HOLD ABOUT EXISTING REFERENCE. IF <+0, AUTOMATIC STEERING IS TO BE PERFORMED. | | | |
| 81A | LEMMASS | MASS OF THE LM | | | |
| 81B | CSMMASS | MASS OF THE CSM | | | |
| 82A | DAPDATR1 LOADED WITH V48N46E | BITS | | | |
| | | 15 | NOT USED - SHOULD BE ZERO | | |
| | | 14 | 0 } NO LM 1 } DAP | 0 } LM OFF 1 } RCS DAP | 1 } LM ON 0 } RCS DAP 1 } SATURN DAP |
| | | 12 | NOT USED - SHOULD BE ZERO | | |
| | | 11 | NOT USED - SHOULD BE ZERO | | |
| | | 10 | X TRANSLATIONS 0 1 | USE 0 } AC&BD 1 } AC BD | 0 } USE 1 } BD |
| | | 7 | USES 0 1 | QUADS 1 } QUADS 0 | QUADS |
| | | 9 | NOT USED - SHOULD BE ZERO | | |
| | | 8 | NOT USED - SHOULD BE ZERO | | |
| | | 6 | NOT USED - SHOULD BE ZERO | | |
| | | 5 | NOT USED - SHOULD BE ZERO | | |
| | | 4 | ANGULAR DEADBAND FOR ATTITUDE HOLD AND AUTOMATIC MANEUVERS 0 - ±0.5° DEADBAND 1 - ±5.0° DEADBAND | | |
| | | 3 | NOT USED - SHOULD BE ZERO | | |
| | | 2 | SPECIFY MANEUVER RATE | 0 } .05° / SEC 1 } .2° / SEC | 0 } .5° / SEC 1 } .5° / SEC |
| | | 1 | NOT USED - SHOULD BE ZERO | | |

COAST AND ALIGN - Continued

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|-------------------|--|--|--|-------------------------------|
| | | BITS | | |
| 82B | DAPDATR2 | 15 | NOT USED - SHOULD BE ZERO | |
| | | 14 | NOT USED - SHOULD BE ZERO | |
| | | 13 | ROLL JET SELECTION 0 - USE QUAD AC FOR ROLL MANEUVERS 1 - USE QUAD BD FOR ROLL MANEUVERS | |
| | | 12 | NOT USED - SHOULD BE ZERO | |
| | | 11 | NOT USED - SHOULD BE ZERO | |
| | | 10 | A QUAD FAIL 0 - QUAD A IS OK 1 - QUAD A FAILED | |
| | | 9 | NOT USED - SHOULD BE ZERO | |
| | | 8 | NOT USED - SHOULD BE ZERO | |
| | | 7 | B QUAD FAIL 0 - QUAD B IS OK 1 - QUAD B FAILED | |
| | | 6 | NOT USED - SHOULD BE ZERO | |
| | | 5 | NOT USED - SHOULD BE ZERO | |
| | | 4 | C QUAD FAIL 0 - QUAD C IS OK 1 - QUAD C FAILED | |
| | | 3 | NOT USED - SHOULD BE ZERO | |
| | | 2 | NOT USED - SHOULD BE ZERO | |
| 1 | D QUAD FAIL 0 - QUAD D IS OK 1 - QUAD D FAILED | | | |
| 83A 83B 84A | 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 DISPLAY WHEN FWD0 BIT 9 = 0 | | |
| 84B | THETADX | SAME AS 16A | | |
| 85A 85B | WBODY | DESIRED BODY ROLL RATE ABOUT CONTROL AXIS | | |
| 86A 86B | WBODY1 | DESIRED BODY PITCH RATE ABOUT CONTROL AXIS | | |
| 87A 87B | WBODY2 | DESIRED BODY YAW RATE ABOUT CONTROL AXIS | | |
| 88A | REDOCTR | INDICATES THE NUMBER OF RESTARTS WHICH HAVE OCCURRED SINCE LAST FRESH START | | |
| 88B 89A 89B | THETAD THETAD+1 THETAD+2 | FINAL DESIRED X CDU ANGLE FINAL DESIRED Y CDU ANGLE FINAL DESIRED Z CDU ANGLE | | |
| 90A | IMODES30 | BIT | SET | RESET |
| | | 15 | IMU TEMPERATURE OUT OF LIMITS | IMU TEMPERATURE WITHIN LIMITS |
| | | 14 | NO ISS TURN ON REQUEST PRESENT | ISS TURN ON REQUEST PRESENT |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|--|---|--|---|
| | | BIT | SET | RESET |
| 90A | IMODES30 | | | |
| | | 13 | NO IMU FAIL | IMU FAIL HAS OCCURRED |
| | | 12 | NO ICDU FAIL | ICDU FAIL HAS OCCURRED |
| | | 11 | NO IMU CAGE COMMANDED | IMU CAGE HAS BEEN COMMANDED |
| | | 10 | NO PIPA FAIL | PIPA FAIL HAS OCCURRED |
| | | 9 | IMU NOT OPERATING | IMU OPERATING |
| | | 8 | USED IN IMU TURN-ON SEQUENCING MOST LIKELY BE ZERO | |
| | | 7 | SAME AS BIT 8 | |
| | | 6 | IMU INITIALIZATION BEING ACCOMPLISHED | IMU NOT IN INITIALIZATION |
| | | 5 | INHIBIT ALARM 212g IF PIPA FAIL OCCURS | DO NOT INHIBIT ALARM 212g IF PIPA FAIL OCCURS |
| | | 4 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF IMU FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF IMU FAIL OCCURS |
| | | 3 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF ICDU FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF ICDU FAIL OCCURS |
| | | 2 | TURN-ON DELAY FAIL- URE (ALARM 207g) | NO TURN-ON DELAY FAILURE |
| 1 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF A PIPA FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF A PIPA FAIL OCCURS | | |
| 90B | IMODES33 | | | |
| | | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | | PROCEED DEPRESSED |
| | | 13 | PIPA FAIL HAS NOT OCCURRED | PIPA FAIL HAS OCCURRED |
| | | 12 | TELEMETRY DOWNLINK OK | TELEMETRY DOWNLINK IS TOO FAST |
| | | 11 | UPLINK IS OK | UPLINK IS TOO FAST |
| | | 10 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | IMU IN COARSE ALIGN OR ZEROING MODE | IMU NOT IN COARSE ALIGN OR ZEROING MODE |
| | | 5 | IMU IN ZEROING ROUTINE | IMU NOT IN ZEROING ROUTINE |
| | | 4 | NOT ASSIGNED - SHOULD BE ZERO | |
| 3 | NOT ASSIGNED - SHOULD BE ZERO | | | |
| 2 | NOT USED | | | |
| 1 | LAMP TEST IN PROGRESS (V35) | LAMP TEST NOT IN PROGRESS | | |
| 91A | CHANNEL 11 | | | |
| | | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 13 | SPS ENGINE ON COMMAND | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|----------------------------------|------------------------|--|------------------------------------|
| | | BIT | SET | RESET |
| 91A | CHANNEL 11 | 11 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 10 | ERROR RESET KEYCODE RECEIVED FROM UPLINK OR DSKY | |
| | | 9 | INDICATES AVERAGE G. ROUTINE IS RUNNING | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | OPERATOR ERROR HAS OCCURRED | |
| | | 6 | VERB-NOUN FLAHSER ON | |
| | | 5 | KEY RELEASE LAMP ON | |
| | | 4 | IMU TEMPERATURE IS OUT OF LIMITS | |
| | | 3 | UPLINK ACTIVITY LAMP ON | |
| | | 2 | COMPUTER ACTIVITY LAMP ON | |
| | | 1 | ISS WARNING LAMP ON | |
| 91B | CHANNEL 12 | 15 | TURN ON DELAY - COMPLETE | |
| | | 14 | S-IVB CUTOFF COMMAND | |
| | | 13 | S-IVB INJECTION SEQUENCING START | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | DISENGAGE OPTICS DAC | |
| | | 10 | ZERO OPTICS COMMAND | |
| | | 9 | S-IVB TAKEOVER ENABLE | |
| | | 8 | TVC ENABLE | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | IMU CDU ERROR COUNTER ENABLE | |
| | | 5 | IMU CDU ZERO COMMAND | |
| | | 4 | IMU COARSE ALIGN ENABLE | |
| | | 3 | STAR TRACKERS ON | |
| | | 2 | OPTICS CDU ERROR COUNTER ENABLE | |
| | | 1 | OPTICS CDU ZERO COMMAND | |
| 92A | CHANNEL 13 | 15 | T6RUPT ENABLE | |
| | | 14 | RESET TRAP 32 | |
| | | 13 | RESET TRAP 31-B | |
| | | 12 | RESET TRAP 31-A | |
| | | 11 | ENABLE STANDBY BUTTON | |
| | | 10 | LAMP TEST BEING PERFORMED | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | BMAG OUTPUT ENABLE | |
| | | 7 | WORD ORDER CODE FOR WORDS 2-50, 52-100 | WORD ORDER CODE FOR WORDS 1 AND 51 |
| | | 6 | BLOCK UPLINK | |
| 5 | INHIBIT UPLINK, ENABLE CROSSLINK | | | |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------------------------------|----------------------------------|---|--|
| | | BIT | SET | RESET |
| 92A | CHANNEL 13 | | | |
| | | 4 | RANGE UNIT ACTIVITY | |
| | | 3 | RANGE UNIT SELECT A | |
| | | 2 | RANGE UNIT SELECT B | |
| | | 1 | RANGE UNIT SELECT C | |
| 92B | CHANNEL 14 | | | |
| | | 15 | XCDU DRIVE ENABLE | |
| | | 14 | YCDU DRIVE ENABLE | |
| | | 13 | ZCDU DRIVE ENABLE | |
| | | 12 | TRUNNION CDU DRIVE ENABLE | |
| | | 11 | SHAFT CDU DRIVE ENABLE | |
| | | 10 | GYRO TORQUING ENABLE | |
| | | 9 | NEGATIVE GYRO TORQUE | POSITIVE GYRO TORQUE |
| | | 8 | GYRO 0 } NO 0 } X 1 } Y 1 } Z | |
| | | 7 | SELECT 0 } GYRO 1 } GYRO 0 } GYRO 1 } GYRO | |
| | | 6 | GYRO PULSE TORQUE POWER SUPPLY ENABLED | |
| | | 5 | NOT USED - SHOULD BE ZERO | |
| | | 4 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | |
| 1 | NOT USED - SHOULD BE ZERO | | | |
| 93A | CHANNEL 30 | | | |
| | | 15 | IMU TEMPERATURE OUT OF LIMITS | IMU TEMPERATURE WITHIN LIMITS |
| | | 14 | ISS OFF | ISS ON OR COMMANDED ON |
| | | 13 | NO IMU FAIL | IMU FAILURE |
| | | 12 | NO ICDU FAIL | ICDU FAILURE |
| | | 11 | NO IMU CAGE COMMANDED | IMU CAGE COMMANDED |
| | | 10 | | LAUNCH VEHICLE GUIDANCE SWITCH IN CMC POSITION |
| | | 9 | IMU NOT OPERATING | IMU OPERATING |
| | | 8 | NOT ASSIGNED - SHOULD BE SET | |
| | | 7 | NO OCDU FAIL | OCDU FAILURE |
| | | 6 | NOT USED | |
| | | 5 | LIFTOFF HAS NOT OCCURRED | LIFTOFF HAS OCCURRED |
| | | 4 | S-IVB ATTACHED | S-IVB SEPARATED |
| | | 3 | SPS NOT READY | SPS READY |
| | | 2 | CM/SM ATTACHED | CM/SM SEPARATED |
| 1 | ULLAGE THRUST NOT PRESENT FOR S-IVB | ULLAGE THRUST PRESENT FROM S-IVB | | |
| 93B | CHANNEL 31 | | | |
| | | 15 | COMPUTER NOT IN CONTROL OF SPACECRAFT | COMPUTER IN CONTROL OF SPACECRAFT |
| | | 14 | CSM RCS 0 } ILLEGAL 0 } FREE 1 } HOLD 1 } AUTO | |
| | | 13 | DAP MODE 0 } ILLEGAL 1 } MODE 0 } MODE 1 } MODE | |

COAST AND ALIGN - Continued

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|--|------------------------|---|--|
| | | BIT | SET | RESET |
| 93B | CHANNEL 31 THC INPUTS | 12 | | -Z TRANSLATION COMMANDED |
| | | 11 | | +Z TRANSLATION COMMANDED |
| | | 10 | | -Y TRANSLATION COMMANDED |
| | | 9 | | +Y TRANSLATION COMMANDED |
| | | 8 | | -X TRANSLATION COMMANDED |
| | | 7 | | +X TRANSLATION COMMANDED |
| | RHC INPUTS | 6 | | -ROLL COMMANDED |
| | | 5 | | +ROLL COMMANDED |
| | | 4 | | -YAW COMMANDED |
| | | 3 | | +YAW COMMANDED |
| | | 2 | | -PITCH COMMANDED |
| | | 1 | | +PITCH COMMANDED |
| | | | | |
| 94A | CHANNEL 32 MINIMUM IMPULSE CONTROLLER INPUTS | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | | PROCEED KEY IS DEPRESSED |
| | | 13 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | | LM ATTACHED |
| | | 10 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | | -ROLL COMMANDED |
| | | 5 | | +ROLL COMMANDED |
| | | 4 | | -YAW COMMANDED |
| | | 3 | | +YAW COMMANDED |
| | | 2 | | -PITCH COMMANDED |
| | | 1 | | +PITCH COMMANDED |
| | | | | |
| 94B | CHANNEL 33 | 15 | | COMPUTER OSCILLATOR HAS FAILED |
| | | 14 | | CMC WARNING HAS OCCURRED |
| | | 13 | | PIPA FAIL HAS OCCURRED |
| | | 12 | | TELEMETRY DOWNLINK IS TOO FAST |
| | | 11 | | UPLINK IS TOO FAST |
| | | 10 | BLOCK UPLINK SWITCH IN NORMAL POSITION | BLOCK UPLINK SWITCH IN BLOCK POSITION |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 5 | OPTICS MODE SWITCH IN MANUAL POSITION | OPTICS MODE SWITCH IN COMPUTER POSITION |
| | | 4 | OPTICS ZERO SWITCH IN NORMAL POSITION | OPTICS ZERO SWITCH IN ZERO POSITION |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | RANGE UNIT DATA NO GOOD | RANGE UNIT DATA GOOD |
| | | 1 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | | | |

COAST AND ALIGN - Concluded

CSM 104

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

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE |
|----------|-------------|-------------------------|
| 95A | DSPTAB | |
| 95B | DSPTAB + 1 | |
| 96A | DSPTAB + 2 | |
| 96B | DSPTAB + 3 | |
| 97A | DSPTAB + 4 | |
| 97B | DSPTAB + 5 | |
| 98A | DSPTAB + 6 | SAME AS 49A THROUGH 50B |
| 98B | DSPTAB + 7 | |
| 99A | DSPTAB + 8 | |
| 99B | DSPTAB + 9 | |
| 100A | DSPTAB + 10 | |
| 100B | DSPTAB + 11 | |

RENDEZVOUS AND PRETHRUST

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|-------------------|---|--|---|-------------------------|--|
| 1A | LIST ID | (77775) ₈ INDICATES RENDEZVOUS AND PRETHRUST LIST BEING TRANSMITTED. | | | |
| 1B | SYNC BITS | (77340) ₈ INDICATES DATA TO FOLLOW. | | | |
| 2A 2B | R _X X COMPONENT OF VEHICLE POSITION VECTOR | CSM VEHICLE STATE VECTOR AND TIME | | | |
| 3A 3B | R _Y Y COMPONENT OF VEHICLE POSITION VECTOR | | | | |
| 4A 4B | R _Z Z COMPONENT OF VEHICLE POSITION VECTOR | | | | |
| 5A 5B | V _X X COMPONENT OF VEHICLE VELOCITY VECTOR | | | | |
| 6A 6B | V _Y Y COMPONENT OF VEHICLE VELOCITY VECTOR | | | | |
| 7A 7B | V _Z Z COMPONENT OF VEHICLE VELOCITY VECTOR | | | | |
| 8A 8B | T _{SV} TIME TAG FOR R AND V | | | | |
| 9A 9B 10A | CDUX CDUY CDUZ | | X, Y, AND Z CDU INPUT COUNTERS. READ THE IMU COUNTERS ZEROED DURING ZERO ENCODE MODE (IMODES 33 BIT 5=1). | | |
| 10B | CDUT | | TRUNNION CDU INPUT COUNTER | | |
| 11A 11B | ADOT _X | | MEASURED BODY RATES ABOUT THE X, Y, AND Z CONTROL AXES ANY TIME THE RCS DAP IS ON. | | |
| 12A 12B | ADOT _Y | | | | |
| 13A 13B | ADOT _Z | | | | |
| 14A 14B 15A | AK AK1 AK2 | VEHICLE ATTITUDE ERRORS SENT TO FDAI. DURING P11 THE ROLL (AK) VALUE IS DIVIDED BY 4 SO THAT MAX ERROR DISPLAY IS 4 X 16-2/3°. DURING RCS DAP OPERATION EITHER TOTAL ATTITUDE OR DAP FOLLOWING ERROR IS DISPLAYED (DET. BY FW0 BIT 9). | | | |
| 15B | RCSFLAGS | BIT | SET | RESET | |
| | | 15 | NOT USED - SHOULD BE ZERO | | |
| | | 14 | RATE FILTER NOT INITIALIZED | RATE FILTER INITIALIZED | |
| | | 13 | ROLL RATE DAMPING REQUIRED | | |
| | | 12 | PITCH RATE DAMPING REQUIRED | | |
| | | 11 | YAW RATE DAMPING REQUIRED | | |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17, 20, 21, 23, 30, 31, 34, 35, 37, 38, 39, 74, 75, 77, 78, 79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|---|---|--|--------------------------------|----------------------------------|----------------------------------|
| | | BIT | SET | RESET | |
| 15B | RCSFLAGS | 10 | -ROLL RHC INPUT | | |
| | | 9 | +ROLL RHC INPUT | | |
| | | 8 | -YAW RHC INPUT | | |
| | | 7 | +YAW RHC INPUT | | |
| | | 6 | -PITCH RHC INPUT | | |
| | | 5 | +PITCH RHC INPUT | | |
| | | 4 | COMPUTE AK'S (ATTITUDE ERRORS) | PERFORM NEEDLER TO DISPLAY AK'S. | |
| | | 3 | 0 } 3RD PASS THROUGH NEEDLER | 0 } 2ND PASS THROUGH NEEDLER | 1 } INITIAL PASS THROUGH NEEDLER |
| | | 2 | 0 } NEEDLER | 1 } NEEDLER | 1 } NEEDLER |
| | | 1 | | | INITIALIZE T6 PROGRAM |
| 16A 16B 17A | THETAD _X THETAD _Y THETAD _Z | X, Y, AND Z REFERENCE CDU ANGLES FOR THE ATTITUDE HOLD ROUTINE. INTERMEDIATE DESIRED CDU ANGLES FOR AUTO MANEUVER ROUTINE. | | | |
| 17B | DELCDU _X | MOST SIGNIFICANT HALF OF X INCREMENTAL GIMBAL ANGLE USED IN AUTOMATIC MANEUVERS. | | | |
| 18A 18B | TIG | TIME OF IGNITION | | | |
| 19A 19B | DELLT4 | TIME REMAINING UNTIL ARRIVAL AT AIMPOINT | | | |
| 20A 20B 21A 21B 22A 22B | RTARG _X RTARG _Y RTARG _Z | X, Y, AND Z COMPONENTS OF TARGET POSITION VECTOR | | | |
| 23A 23B | VHFTIME | TIME OF MOST RECENT READING OF RADAR | | | |
| 24A 24B 25A 25B 26A 26B 27A | MARKDOWN (TIME2) MARKDOWN+1 (TIME1) MARKDOWN+2 (CDUY) MARKDOWN+3 (CDUS) MARKDOWN+4 (CDUZ) MARKDOWN+5 (CDUT) MARKDOWN+6 (CDUX) | MARK DATA | | | |
| 27B | RM | RANGE FROM CSM TO LM | | | |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|--|--|---|---|--|
| 28A 28B | VHFCNT TRKMCNT | NUMBER OF RENDEZVOUS VHF RANGE MARKS TAKEN NUMBER OF RENDEZVOUS TRACKING MARKS TAKEN | | |
| 29A 29B | TTP1 | TIME OF TRANSFER PHASE INITIATION | | |
| 30A | ECSTEER | CROSS PRODUCT STEERING CONSTANT | | |
| 30B | LSAT | NOT USED | | |
| 31A 31B | DELVTPF | MAGNITUDE OF DELTA V AT INTERCEPT TIME | | |
| 32A 32B 33A 33B | SPARES | | | |
| 34A 34B | TPASS4 | TIME OF ARRIVAL AT AIMPOINT | | |
| 35A 35B 36A 36B 37A 37B | DELVSLVx DELVSLVy DELVSLVz | SPECIFIED DELTA V IN LOCAL VERTICAL COORDINATES OF ACTIVE VEHICLE AT TIME OF IGNITION | | |
| 38A 38B | RANGE | CALCULATED RANGE TO "OTHER" VEHICLE | | |
| 39A 39B | RRATE | CALCULATED RANGE RATE TO "OTHER" VEHICLE | | |
| 40A | FLAGWORD 0 | BIT | SET | RESET |
| | CPHIFLAG | 15 | OUTPUT OF CALCGA IS CPHIX | OUTPUT OF CALCGA IS THETAD |
| | JSWITCH | 14 | INTEGRATION OF W MATRIX | INTEGRATION OF STATE VECTOR |
| | MIDFLAG | 13 | INTEGRATION WITH SOLAR PERTURBATIONS | INTEGRATION WITHOUT SOLAR PERTURBATIONS |
| | MOONFLAG | 12 | MOON IS SPHERE OF INFLUENCE | EARTH IS SPHERE OF INFLUENCE |
| | NORFHOR ZMEASURE | 11 | FAR HORIZON | NEAR HORIZON |
| | NEEDLFLG | 10 | MEASUREMENT PLANET AND PRIMARY PLANET DIFFERENT | MEASUREMENT PLANET AND PRIMARY PLANET SAME |
| | IMUSE | 9 | TOTAL ATTITUDE ERROR DISPLAYED | A/P FOLLOWING ERROR DISPLAYED |
| | RNDVZFLG | 8 | IMU IN USE | IMU NOT IN USE |
| | | 7 | P20 RUNNING (RADAR IN USE) | P20 NOT RUNNING (RADAR NOT IN USE) |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|------------------|---|--|---|
| 40A | FLAGWORD | BIT | SET | RESET |
| | R53FLAG | 6 | V51 INITIATED | V51 NOT INITIATED |
| | F2RTE | 5 | IN TIME CRITICAL MODE | NOT IN TIME CRITICAL MODE |
| | TRUNFLAG | 4 | DRIVING OF TRUNNION ALLOWED | DRIVING OF TRUNNION NOT ALLOWED |
| | FREEFLAG | 3 | USED TO CONTROL INTERNAL SUBROUTINE PERFORMANCE | |
| | B29FLAG | 2 | NOT USED | |
| | KFLAG | 1 | SEARCH SECTOR MORE THAN 180 DEGREES | SEARCH SECTOR LESS THAN 180 DEGREES |
| 40B | FLAGWORD 1 | BIT | SET | RESET |
| | NJETSFLG | 15 | TWO JET RCS BURN | FOUR JET RCS BURN |
| | STIKFLAG | 14 | RHC CONTROL OF RCS | CMC CONTROL OF RCS |
| | ERADFLAG | 13 | COMPUTE REARTH FISCHER ELLIPSOID | USE CONSTANT REARTH PAD RADIUS |
| | | 12 | NOT USED | |
| | ENG2FLAG | 11 | RCS BURN | SPS BURN |
| | TARG1FLG | 10 | SIGHTING LM | NOT SIGHTING LM |
| | TARG2FLG, R23FLG | 9 | SIGHTING LANDMARK R23 MARKING | SIGHTING STAR R21 MARKING |
| | VEHUPFLG | 8 | CSM STATE VECTOR BEING UPDATED | LM STATE VECTOR BEING UPDATED |
| | UPDATFLG | 7 | UPDATING BY MARKS ALLOWED | UPDATING BY MARKS NOT ALLOWED |
| | IDLEFAIL | 6 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | TRACKFLG | 5 | TRACKING ALLOWED | TRACKING NOT ALLOWED |
| | | 4 | NOT USED | |
| | SLOPESW | 3 | ITERATE WITH REGULAR FALSI METHOD | ITERATE WITH BIAS METHOD |
| GUESSW | 2 | NO STARTING VALUE FOR ITERATION EXISTS | STARTING VALUE FOR ITERATION EXISTS | |
| AVEGFLAG | 1 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| 41A | FLAGWORD 2 | BIT | SET | RESET |
| | DRIFTFLG | 15 | T3RUPT CALLS GYRO COMPENSATION | T3RUPT DOES NO GYRO COMPENSATION |
| | R21MARK | 14 | OPTION ONE FOR MARKRUPT | OPTION TWO FOR MARKRUPT |
| | 22DSPFLG | 13 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 12 | NOT USED | |
| | STERRSW | 11 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | CYCLESW | 10 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | IMPULSW | 9 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | XDELVFLG | 8 | EXTERNAL DELTAV VG COMPUTATION | LAMBERT (AIMPOINT) VB COMPUTATION |
| | ETPIFLAG, OPTNSW | 7 | ELEVATING ANGLE SUPPLIED FOR P34, 74. SOI PHASE P38/P78. | TPI TIME SPECIFIED FOR P34, 74. SOR PHASE OF P38/P78. |
| | FINALFLG | 6 | LAST PASS THROUGH RENDEZVOUS PROGRAM COMPUTATIONS | INTERIM PASS THROUGH RENDEZVOUS PROGRAM COMPUTATIONS |
| | AVFLAG | 5 | LM VEHICLE IS ACTIVE | CSM VEHICLE IS ACTIVE |
| | PFRAFPLG | 4 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | CALCMAN3 | 3 | NO FINAL ROLL | FINAL ROLL IS NECESSARY |
| | CALCMAN2 | 2 | PERFORM MANEUVER STARTING PROCEDURE | BYPASS STARTING PROCEDURE |
| NODOFLAG | 1 | V37 NOT PERMITTED | V37 PERMITTED | |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---|----------------------------|---|--|
| | | BIT | SET | RESET |
| 41B | FLAGWORD 3 GLOKFAIL REFSMFLG LUNAFLAG P22MKFLG VFLAG ONMONFLG PRECIFLG CULTFLAG ORBWFLAG STATEFLG INTYPFLG VINTFLAG D6OR9FLG DIMØFLAG | | | |
| | | 15 | NOT USED | |
| | | 14 | GIMBAL LOCK HAS OCCURRED | NOT IN GIMBAL LOCK |
| | | 13 | REFSMMAT GOOD | REFSMMAT NO GOOD |
| | | 12 | LUNAR LAT-LONG | EARTH LAT-LONG |
| | | 11 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 10 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 9 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 8 | CSMPREC OR LEMPREC CALLED INTEGRATION INITIALIZATION | INTEGRV OR INTEGRVS CALLED INTEGRATION INITIALIZATION |
| | | 7 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 6 | W MATRIX VALID FOR ORBITAL INTEGRATION | W MATRIX INVALID FOR ORBITAL INTEGRATION |
| | | 5 | PERMANENT STATE VECTOR UPDATED | PERMANENT STATE VECTOR NOT UPDATED |
| | | 4 | CONIC INTEGRATION | ENCKE INTEGRATION |
| | | 3 | CSM STATE VECTOR BEING INTEGRATED | LM STATE VECTOR BEING INTEGRATED |
| | | 2 | DIMENSION OF W IS 9 FOR INTEGRATION | DIMENSION OF W IS 6 FOR INTEGRATION |
| 1 | W MATRIX IS TO BE USED | W MATRIX IS NOT TO BE USED | | |
| 42A | FLAGWORD 4 MRKIDFLG PRIODFLG NRMIDFLG PDSPFLAG MWAITFLG NWAITFLG MRKNVFLG NRMNVFLG PRONVFLG PINBRFLG MRUPTFLG NRUPTFLG | | | |
| | | 15 | MARK DISPLAY IN ENDIDLE | NO MARK DISPLAY IN ENDIDLE |
| | | 14 | PRIORITY DISPLAY IN ENDIDLE | NO PRIORITY DISPLAY IN ENDIDLE |
| | | 13 | NORMAL DISPLAY IN ENDIDLE | NO NORMAL DISPLAY IN ENDIDLE |
| | | 12 | CAN NOT INTERRUPT PRIORITY DISPLAY | |
| | | 11 | HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED |
| | | 10 | HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED |
| | | 9 | ASTRONAUT USING KEYBOARD WHEN MARK DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN MARK DISPLAY INITIATED |
| | | 8 | ASTRONAUT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED |
| | | 7 | ASTRONAUT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED |
| | | 6 | ASTRONAUT HAS INTERFERED WITH EXISTING DISPLAY | ASTRONAUT HAS NOT INTERFERED WITH EXISTING DISPLAY |
| | | 5 | MARK DISPLAY INTERRUPTED BY PRIORITY DISPLAY | MARK DISPLAY NOT INTERRUPTED BY PRIORITY DISPLAY |
| | | 4 | NORMAL DISPLAY INTERRUPTED BY PRIORITY OR MARK DISPLAY | NORMAL DISPLAY NOT INTERRUPTED BY PRIORITY OR MARK DISPLAY |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|----------|--|------------------------|---|--|----------------------------|
| | | BIT | SET | RESET | |
| 42A | FLAGWORD 4 MKOVFLAG XDSPFLAG | 3 | MARK DISPLAY OVER NORMAL | NO MARK DISPLAY OVER NORMAL | |
| | | 2 | NOT USED | | |
| | | 1 | MARK DISPLAY NOT TO BE INTERRUPTED | | |
| 42B | FLAGWORD 5 DSKYFLAG V59FLAG INCORFLG PRFTRKAT DMENFLG COMPUTER ENGONFLG 3AXISFLG GRRBKFLG R60FLAG SOLNSW MGLVFLAG RENDWFLG | 15 | DISPLAYS SENT TO DSKY | NO DISPLAYS TO DSKY | |
| | | 14 | NOT USED | | |
| | | 13 | NOT USED | | |
| | | 12 | CALIBRATING FOR P23 | NORMAL MARKING FOR P23 | |
| | | 11 | FIRST INCORPORATION | SECOND INCORPORATION | |
| | | 10 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 9 | DIMENSION OF W IS 9 FOR INCORPORATION | DIMENSION OF W IS 6 FOR INCORPORATION | |
| | | 8 | COMPUTER IS CMC | COMPUTER IS LGC | |
| | | 7 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 6 | MANEUVER SPECIFIED BY THREE AXES | MANEUVER SPECIFIED BY ONE AXIS | |
| | | 5 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 4 | R61 MUST USE R60 | NORMAL R61 | |
| | | 3 | LAMBERT CONVERGES | LAMBERT DOES NOT CONVERGE | |
| | | 2 | LOCAL VERTICAL COORDINATES COMPUTED | MIDDLE GIMBAL ANGLE COMPUTED | |
| | | 1 | W MATRIX VALID FOR RENDEZVOUS NAVIGATION | W MATRIX INVALID FOR RENDEZVOUS NAVIGATION | |
| 43A | FLAGWORD 6 DAPBIT1, DAPBIT2 ENTRYDSP CMDAPARM GAMDIFSW GONEPAST RELVELSW EGSW R57FLAG FIRSTPAS HIND INRLSW LATSW NTARGFLG CM/DSTBY GYMDIFSW | 15 | 0 } NO DAP OR 0 } ENTRY | 0 } CSM RCS 1 } DAP | 1 } TVC DAP 1 } SATURN DAP |
| | | 14 | 0 } ENTRY | 1 } DAP | 0 } DAP 1 } DAP |
| | | 13 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 12 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 11 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 10 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 9 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 8 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 8 | DO NOT DO R57, TRUNNION BIAS HAS OBTAINED | DO R57, TRUNNION BIAS NEEDED | |
| | | 7 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 6 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 5 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 4 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| | | 3 | ASTRONAUT DID OVERWRITE DELTA | ASTRONAUT DID NOT OVERWRITE DELTA | |
| | | 2 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | |
| 1 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | | | |
| 43B | FLAGWORD 7 TERMIFLG ITSWICH | 15 | TERMINATE R21, R22 | DO NOT TERMINATE R21, R22 | |
| | | 14 | ACCEPT NEXT LAMBERT TPI SEARCH SOLUTION | TEST LAMBERT ANSWER AGAINST LIMITS | |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17, 20, 21, 23, 30, 31, 34, 35, 37, 38, 39, 74, 75, 77, 78, 79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---|--|---|---------------------------------------|
| | | BIT | SET | RESET |
| 42A | FLAGWORD 4 MKOVFLAG | 3 | MARK DISPLAY OVER NORMAL | NO MARK DISPLAY OVER NORMAL |
| | | 2 | NOT USED | |
| | XDSPFLAG | 1 | MARK DISPLAY NOT TO BE INTERRUPTED | |
| 42B | FLAGWORD 5 DSKYFLAG V59FLAG INCORFLAG PRFTRKAT DMENFLAG COMPUTER ENCONFLAG 3AXISFLAG GRRBKFLAG R60FLAG SOLNSW MGLVFLAG RENDWFLAG | 15 | DISPLAYS SENT TO DSKY | NO DISPLAYS TO DSKY |
| | | 14 | NOT USED | |
| | | 13 | NOT USED | |
| | | 12 | CALIBRATING FOR P23 | NORMAL MARKING FOR P23 |
| | | 11 | FIRST INCORPORATION | SECOND INCORPORATION |
| | | 10 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 9 | DIMENSION OF W IS 9 FOR INCORPORATION | DIMENSION OF W IS 6 FOR INCORPORATION |
| | | 8 | COMPUTER IS CMC | COMPUTER IS LGC |
| | | 7 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 6 | MANEUVER SPECIFIED BY THREE AXES | MANEUVER SPECIFIED BY ONE AXIS |
| | | 5 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 4 | R61 MUST USE R60 | NORMAL R61 |
| | | 3 | LAMBERT CONVERGES | LAMBERT DOES NOT CONVERGE |
| | | 2 | LOCAL VERTICAL COORDINATES COMPUTED | MIDDLE GIMBAL ANGLE COMPUTED |
| 1 | W MATRIX VALID FOR RENDEZVOUS NAVIGATION | W MATRIX INVALID FOR RENDEZVOUS NAVIGATION | | |
| 43A | FLAGWORD 6 DAPBIT1, DAPBIT2 ENTRYDSP CMDAPARM GAMDIFSW GONEPAST RELVELSW EGSW R57FLAG FIRSTPAS HIND INRLSW LATSW NTARGFLAG CM/DSTBY GYMDIFSW | 15 | 0 } NO DAP 0 } CSM 1 } TVC 1 } SATURN OR RCS DAP DAP | |
| | | 14 | 0 } ENTRY 1 } DAP 0 } DAP 1 } DAP | |
| | | 13 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 12 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 11 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 10 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 9 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 8 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 8 | DO NOT DO R57, TRUNNION BIAS HAS OBTAINED | DO R57, TRUNNION BIAS NEEDED |
| | | 7 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 6 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 5 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 4 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 3 | ASTRONAUT DID OVERWRITE DELTA | ASTRONAUT DID NOT OVERWRITE DELTA |
| | | 2 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| 1 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | | |
| 43B | FLAGWORD 7 TERMIFLG ITSWICH | 15 | TERMINATE R21, R22 | DO NOT TERMINATE R21, R22 |
| | | 14 | ACCEPT NEXT LAMBERT TPI SEARCH SOLUTION | TEST LAMBERT ANSWER AGAINST LIMITS |

RENDEZVOUS AND PRETHRUST - Continued

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|--|-------------------------------------|--|--|
| | | BIT | SET | RESET |
| 43B | FLAGWORD 7 IGFLAG ASTFLAG TIMRFLAG NORMSW RVSW GONEBY IDLEFLAG V37FLAG NOUPFLAG ULOCKFL VERIFLAG ATTCHFLG TFFSW | 13 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 12 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 11 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 10 | UNIT NORMAL COMPUTED | UNIT NORMAL NOT COMPUTED |
| | | 9 | COMPUTE STATE VECTOR DURING TIME - THETA | DO NOT COMPUTE STATE VECTOR |
| | | 8 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 7 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 6 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 5 | NEITHER CSM NOR LM STATE VECTOR MAY BE UPDATED | EITHER STATE VECTOR MAY BE UPDATED |
| | | 4 | K-K-K FAIL | NO K-K-K FAIL |
| | | 3 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 2 | LM, CM ATTACHED | LM, CM NOT ATTACHED |
| | | 1 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 44A | FLAGWORD 8 RPQFLAG NEWIFLG CMOONFLG LMOONFLG ADVTRK P37/79SW SURFFLAG INFINFLG ORDERSW APSESW COGAFLAG 360SW | 15 |
| 14 | NOT USED | | | |
| 13 | FIRST PASS THROUGH INTEGRATION | | | SUCCEEDING ITERATION OF INTEGRATION |
| 12 | PERMANENT CSM STATE IN LUNAR SPHERE | | | PERMANENT CSM STATE IN EARTH SPHERE |
| 11 | PERMANENT LM STATE IN LUNAR SPHERE | | | PERMANENT LM STATE IN EARTH SPHERE |
| 10 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | | | |
| 9 | P37/79 OPERATING | | | P38/78 OPERATING |
| 8 | LM ON LUNAR SURFACE | | | LM NOT ON LUNAR SURFACE |
| 7 | TIMETHET SOLUTION EXISTS | | | TIMETHET SOLUTION DOES NOT EXIST |
| 6 | 1ST ORDER ITERATOR | | | 2ND ORDER ITERATOR |
| 5 | NOMINAL TIMERAD SOLUTION | | | OFF-NOMINAL TIMERAD SOLUTION |
| 4 | TIMETHET SOLUTION EXISTS | | | NO TIMETHET SOLUTION EXISTS |
| 3 | NOT USED | | | |
| 2 | NOT USED | | | |
| 1 | TRANSFER ANGLE NEAR 360 DEGREES | TRANSFER ANGLE NOT NEAR 360 DEGREES | | |
| 44B | FLAGWORD 9 SWTOVER V67FLAG V82EMFLG MAXDBFLG V94FLAG SAVECFLG VHFRFLAG SOURCFLG | 15 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 14 | NOT USED IN RENDEZVOUS AND PRETHRUST LIST | |
| | | 13 | MOON VICINITY | EARTH VICINITY |
| | | 12 | MAX DB SELECTED | MAX DB NOT SELECTED |
| | | 11 | V94 ALLOWED DURING P23 | V94 NOT ALLOWED |
| | | 10 | P23 DISPLAY AND DATA STORAGE AFTER MARK IS DONE | P23 DISPLAY AND DATA STORAGE BEFORE MARK IS DONE |
| | | 9 | ALLOW R22 TO ACCEPT RANGE DATA | STOP ACCEPTANCE OF RANGE DATA |
| | | 8 | SOURCE OF INPUT DATA IS FROM VHF RADAR | SOURCE OF DATA IS FROM OPTICS MARK |
| | | 7 | NOT USED | |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---|--|---|---|
| | | BIT | SET | RESET |
| 44B | FLAGWORD 9 | | | |
| | N220RN17 | 6 | COMPUTE TOTAL ATTITUDE ERRORS WRT N22 (V62) | COMPUTE TOTAL ATTITUDE ERRORS WRT N17 (V63) |
| | QUITFLAG | 5 | CAUSE INTEGRATION TO EXIT AT NEXT TIME STEP | ALLOW INTEGRATION TO CONTINUE |
| | R31FLAG | 4 | R31 SELECTED (V83) | R34 SELECTED (V85) |
| | MID1FLAG | 3 | INTEGRATE TO TDEC | INTEGRATE TO THE THEN-PRESENT TIME |
| | MIDAVFLG | 2 | INTEGRATION ENTERED FROM ONE OF MIDTOAV PORTALS | INTEGRATION WAS NOT ENTERED VIA MIDTOAV |
| | AVEMIDSW | 1 | AVETOMID CALLING FOR W MATRIX INTEGER DO NOT WRITE OVER RN, VN, PIPTIME | NO AVETOMID W INTEGER ALLOW SET UP OF RN, VN, PIPTIME |
| 45A | DSPTAB | DISPLAY TABLE CODES FOR GENERATION OF DSKY NUMERICS USED TO INDICATE VERB-NOUN, MAJOR MODE AND R ₁ R ₂ R ₃ 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 | | | |
| 50B | DSPTAB + 11 | DISPLAY TABLE OF DSKY STATUS LIMITS 60400g = PROGRAM CAUTION, 60200g = TRACKER WARNING 60020g = NO ATTITUDE, 60040g = GIMBAL LOCK | | |
| 51A | TIME2, TIME1 | COMPUTER CLOCK INDICATING ELAPSED TIME SINCE LIFTOFF | | |
| 51B | | | | |
| 52A | R _X X COMPONENT OF "OTHER" VEHICLE POSITION R _Y Y COMPONENT OF "OTHER" VEHICLE POSITION R _Z Z COMPONENT OF "OTHER" VEHICLE POSITION | "OTHER" VEHICLE STATE VECTOR | | |
| 52B | | | | |
| 53A | | | | |
| 53B | | | | |
| 54A | V _X X COMPONENT OF "OTHER" VEHICLE VELOCITY V _Y Y COMPONENT OF "OTHER" VEHICLE VELOCITY V _Z Z COMPONENT OF "OTHER" VEHICLE VELOCITY | | | |
| 54B | | | | |
| 55A | | | | |
| 55B | | | | |
| 56A | TIME TAG FOR "OTHER" | | | |
| 56B | | | | |
| 57A | T _{OTHER} STATE VECTOR | | | |
| 57B | | | | |
| 58A | | | | |
| 58B | | | | |
| 59A | CDUX | SAME AS 9A | | |
| 59B | CDUY | SAME AS 9B | | |
| 60A | CDUZ | SAME AS 10A | | |
| 60B | CDUT | SAME AS 10B | | |
| 61A | ADOTX | SAME AS 11A, 11B | | |
| 61B | | | | |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE |
|--------------------------|---|--|
| 62A 62B 63A 63B | ADOT _Y ADOT _Z | SAME AS 12A, 12B SAME AS 13A, 13B |
| 64A 64B 65A | AK AK1 AK2 | SAME AS 14A SAME AS 14B SAME AS 15A |
| 65B | RCSFLAGS | SAME AS 15B |
| 66A 66B 67A | THETAD _X THETAD _Y THETAD _Z | SAME AS 16A SAME AS 16B SAME AS 17A |
| 67B | DELCDU _X | SAME AS 17B |
| 68A 68B | RSBBQ + 1 | VALUE OF BBANK AND Q REGISTERS AT THE TIME OF A RESTART |
| 69A | CADRFLSH | VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED PRIORITY DISPLAY |
| 69B | CADRFLSH + 1 | VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED MARK |
| 70A | CADRFLSH + 2 | VALUE OF RETURN ADDRESS INFORMATION FOR LAST NORMAL DISPLAY REQUESTED |
| 70B 71A 71B | FAILREG FAILREG + 1 FAILREG + 2 | CONTAINS ALARM CODE OF FIRST ALARM RECEIVED CONTAINS ALARM CODE OF SECOND ALARM RECEIVED CONTAINS ALARM CODE OF THIRD ALARM RECEIVED |
| 72A | CDUS | SHAFT CDU INPUT COUNTER |
| 72B 73A 73B | PIPAX PIPAY PIPAZ | X, Y, AND Z PIPA INPUT COUNTERS. ZEROED AT THE START OF AVERAGE G READ EVERY 2 SEC DURING AVERAGE G ROUTINE |
| 74A 74B | ELEV | DESIRED LOS ANGLE AT TPI |
| 75A 75B | CENTANG | ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE DURING TRANSFER FROM TPI TO TIME OF INTERCEPT |
| 76A 76B | DELTAR | THE DESIRED SEPARATION OF THE TWO VEHICLES SPECIFIED AS A DISTANCE ALONG THE PASSIVE VEHICLE ORBIT |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | |
|-------------------|--|--|--|
| 82A | DAPDATR1 | BITS | |
| | | 6 | NOT USED - SHOULD BE ZERO |
| | | 5 | NOT USED - SHOULD BE ZERO |
| | | 4 | ANGULAR DEADBAND FOR ATTITUDE HOLD AND AUTOMATIC MANEUVERS 0 - ±0.5° DEADBAND 1 - ±5.0° DEADBAND |
| | | 3 | NOT USED - SHOULD BE ZERO |
| | | 2 | SPECIFY 0 } .05° 0 } .2° 1 } .5° 1 } 4.0° MANEUVER / / / / RATE 0 } SEC 1 } SEC 0 } SEC 1 } SEC |
| | | 1 | |
| 82B | DAPDATR2 | BITS | |
| | | 15-14 | NOT USED - SHOULD BE ZERO |
| | | 13 | ROLL JET SELECTION 0 - USE QUAD AC FOR ROLL MANEUVERS 1 - USE QUAD BD FOR ROLL MANEUVERS |
| | | 12-11 | NOT USED - SHOULD BE ZERO |
| | | 10 | A QUAD FAIL 0 - QUAD A IS OK 1 - QUAD A FAILED |
| | | 9-8 | NOT USED - SHOULD BE ZERO |
| | | 7 | B QUAD FAIL 0 - QUAD B IS OK 1 - QUAD B FAILED |
| | | 6-5 | NOT USED - SHOULD BE ZERO |
| | | 4 | C QUAD FAIL 0 - QUAD C IS OK 1 - QUAD C FAILED |
| | | 3-2 | NOT USED - SHOULD BE ZERO |
| 1 | D QUAD FAIL 0 - QUAD D IS OK 1 - QUAD D FAILED | | |
| 83A 83B 84A | ERROR _X ERROR _Y ERROR _Z | INTERMEDIATE ATTITUDE ERRORS COMPUTED DURING CSM RCS (DAP FOLLOWING ERRORS). ERRORS IN CONTROL COORDINATES AND ARE LOADED INTO AK'S FOR FDAI DISPLAY WHEN FW0 BIT 9 = 0. | |
| 84B | THETADX | SAME AS 16A | |
| 85A 85B | WBODY | DESIRED BODY ROLL RATE ABOUT CONTROL AXIS | |
| 86A 86B | WBODY1 | DESIRED BODY PITCH RATE ABOUT CONTROL AXIS | |
| 87A 87B | WBODY2 | DESIRED BODY YAW RATE ABOUT CONTROL AXIS | |
| 88A | REDOCTR | INDICATES THE NUMBER OF RESTARTS WHICH HAVE OCCURRED SINCE LAST FRESH START | |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------|---------------------------|---|--|
| 88B | THETAD | FINAL DESIRED X CDU ANGLE | | |
| 89A | THETAD + 1 | FINAL DESIRED Y CDU ANGLE | | |
| 89B | THETAD + 2 | FINAL DESIRED Z CDU ANGLE | | |
| 90A | IMODES30 | BIT | SET | RESET |
| | | 15 | IMU TEMPERATURE OUT OF LIMITS | IMU TEMPERATURE WITHIN LIMITS |
| | | 14 | NO ISS TURN ON REQUEST PRESENT | ISS TURN ON REQUEST PRESENT |
| | | 13 | NO IMU FAIL | IMU FAIL HAS OCCURRED |
| | | 12 | NO ICDU FAIL | ICDU FAIL HAS OCCURRED |
| | | 11 | NO IMU CAGE COMMANDED | IMU CAGE HAS BEEN COMMANDED |
| | | 10 | NO PIPA FAIL | PIPA FAIL HAS OCCURRED |
| | | 9 | IMU NOT OPERATING | IMU OPERATING |
| | | 8 | USED IN IMU TURN-ON | SEQUENCING MOST LIKELY ZERO |
| | | 7 | SAME AS BIT 8 | |
| | | 6 | IMU INITIALIZATION BEING ACCOMPLISHED | IMU NOT IN INITIALIZATION |
| | | 5 | INHIBIT ALARM 2128 IF PIPA FAIL OCCURS | DO NOT INHIBIT ALARM 2128 IF PIPA FAIL OCCURS |
| | | 4 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF IMU FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF IMU FAIL OCCURS |
| | | 3 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF ICDU FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF ICDU FAIL OCCURS |
| | | 2 | TURN-ON DELAY FAILURE (ALARM 2078) | NO TURN-ON DELAY FAILURE |
| | | 1 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF A PIPA FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF A PIPA FAIL OCCURS |
| 90B | IMODES33 | BIT | SET | RESET |
| | | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 13 | PIPA FAIL HAS NOT OCCURRED | PIPA FAIL HAS OCCURRED |
| | | 12 | TELEMETRY DOWNLINK OK | TELEMETRY DOWNLINK IS TOO FAST |
| | | 11 | UPLINK IS OK | UPLINK IS TOO FAST |
| | | 10 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | IMU IN COARSE ALIGN OR ZEROING MODE | IMU NOT IN COARSE ALIGN OR ZEROING MODE |
| | | 5 | IMU IN ZEROING ROUTINE | IMU NOT IN ZEROING ROUTINE |
| | | 4 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | NOT USED | |
| | | 1 | LAMP TEST IN PROGRESS (V35) | LAMP TEST NOT IN PROGRESS |

RENDEZVOUS AND PRETHRUST - Continued

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------------------|------------------------|--|------------------------------------|
| | | BIT | SET | RESET |
| 91A | CHANNEL 11 | | | |
| | | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 13 | SPS ENGINE ON COMMAND | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 10 | ERROR RESET KEYCODE RECEIVED FROM UPLINK ON DSKY | |
| | | 9 | INDICATES AVERAGE G ROUTINE IS RUNNING | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | OPERATOR ERROR HAS OCCURRED | |
| | | 6 | VERB-NOUN FLASHER ON | |
| | | 5 | KEY RELEASE LAMP ON | |
| | | 4 | IMU TEMPERATURE IS OUT OF LIMITS | |
| | | 3 | UPLINK ACTIVITY LAMP ON | |
| | | 2 | COMPUTER ACTIVITY LAMP ON | |
| 1 | ISS WARNING LAMP ON | | | |
| 91B | CHANNEL 12 | | | |
| | | 15 | TURN ON DELAY - COMPLETE | |
| | | 14 | S-IVB CUTOFF COMMAND | |
| | | 13 | S-IVB INJECTION SEQUENCING START | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | DISENGAGE OPTICS DAC | |
| | | 10 | ZERO OPTICS COMMAND | |
| | | 9 | S-IVB TAKEOVER ENABLE | |
| | | 8 | TVC ENABLE | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | IMU CDU ERROR COUNTER ENABLE | |
| | | 5 | IMU CDU ZERO COMMAND | |
| | | 4 | IMU COARSE ALIGN ENABLE | |
| | | 3 | STAR TRACKERS ON | |
| | | 2 | OPTICS CDU ERROR COUNTER ENABLE | |
| 1 | OPTICS CDU ZERO COMMAND | | | |
| 92A | CHANNEL 13 | | | |
| | | 15 | T6RUPT ENABLE | |
| | | 14 | RESET TRAP 32 | |
| | | 13 | RESET TRAP 31-B | |
| | | 12 | RESET TRAP 31-A | |
| | | 11 | ENABLE STANDBY BUTTON | |
| | | 10 | LAMP TEST BEING PERFORMED | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | BMAG OUTPUT ENABLE | |
| | | 7 | WORD ORDER CODE FOR WORDS 2-50, 52-100 | WORD ORDER CODE FOR WORDS 1 AND 51 |

RENDEZVOUS AND PRETHRUST - Continued

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------------------------------|---------------------------------|---|--|
| 92A | CHANNEL 13 | BIT | SET | RESET |
| | | 6 | BLOCK UPLINK | |
| | | 5 | INHIBIT UPLINK | ENABLE CROSSLINK |
| | | 4 | RANGE UNIT ACTIVITY | |
| | | 3 | RANGE UNIT SELECT a | |
| | | 2 | RANGE UNIT SELECT b | |
| | | 1 | RANGE UNIT SELECT c | |
| 92B | CHANNEL 14 | BIT | SET | RESET |
| | | 15 | XCDU DRIVE ENABLE | |
| | | 14 | YCDU DRIVE ENABLE | |
| | | 13 | ZCDU DRIVE ENABLE | |
| | | 12 | TRUNNION CDU DRIVE ENABLE | |
| | | 11 | SHAFT CDU DRIVE ENABLE | |
| | | 10 | GYRO TORQUING ENABLE | |
| | | 9 | NEGATIVE GYRO TORQUE | POSITIVE GYRO TORQUE |
| | | 8 | GYRO 0 } NO 0 } X 1 } Y 1 } Z | |
| | | 7 | SELECT 0 } GYRO 1 } GYRO 0 } GYRO 1 } GYRO | |
| | | 6 | GYRO PULSE TORQUE POWER SUPPLY ENABLED | |
| | | 5 | NOT USED - SHOULD BE ZERO | |
| | | 4 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 1 | NOT USED - SHOULD BE ZERO | |
| | | 93A | CHANNEL 30 | BIT |
| 15 | IMU TEMPERATURE OUT OF LIMITS | | | IMU TEMPERATURE WITHIN LIMITS |
| 14 | ISS OFF | | | ISS ON OR COMMANDED ON |
| 13 | NO IMU FAIL | | | IMU FAILURE |
| 12 | NO ICDU FAIL | | | ICDU FAILURE |
| 11 | NO IMU CAGE COMMANDED | | | IMU CAGE COMMANDED |
| 10 | | | | LAUNCH VEHICLE GUIDANCE SWITCH IN CMC POSITION |
| 9 | IMU NOT OPERATING | | | IMU OPERATING |
| 8 | NOT ASSIGNED - SHOULD BE ZERO | | | |
| 7 | NO OCDU FAIL | | | OCDU FAILURE |
| 6 | NOT USED | | | |
| 5 | LIFTOFF HAS NOT OCCURRED | | | LIFTOFF HAS OCCURRED |
| 4 | S-IVB ATTACHED | | | S-IVB SEPARATED |
| 3 | SPS NOT READY | | | SPS READY |
| 2 | CM/SM ATTACHED | | | CM/SM SEPARATED |
| 1 | ULLAGE THRUST NOT PRESENT FOR S-IVB | ULLAGE THRUST PRESENT FOR S-IVB | | |
| 93B | CHANNEL 31 | BIT | SET | RESET |
| | | 15 | COMPUTER NOT IN CONTROL OF SPACECRAFT | COMPUTER IN CONTROL OF SPACECRAFT |
| | | 14 | CSM RCS DAP 0 } ILLEGAL 0 } FREE 1 } HOLD 1 } AUTO MODE 0 } MODE 1 } MODE | |

RENDEZVOUS AND PRETHRUST - Continued
 TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|--|------------------------|--|---|
| | | BIT | SET | RESET |
| 93B | CHANNEL 31 THC INPUTS RHC INPUTS | 12 | | -Z TRANSLATION COMMANDED |
| | | 11 | | +Z TRANSLATION COMMANDED |
| | | 10 | | -Y TRANSLATION COMMANDED |
| | | 9 | | +Y TRANSLATION COMMANDED |
| | | 8 | | -X TRANSLATION COMMANDED |
| | | 7 | | +X TRANSLATION COMMANDED |
| | | 6 | | -ROLL COMMANDED |
| | | 5 | | +ROLL COMMANDED |
| | | 4 | | -YAW COMMANDED |
| | | 3 | | +YAW COMMANDED |
| | | 2 | | -PITCH COMMANDED |
| | | 1 | | +PITCH COMMANDED |
| | | 94A | CHANNEL 32 MINIMUM IMPULSE CONTROLLER INPUTS | 15 |
| 14 | | | | PROCEED KEY IS DEPRESSED |
| 13 | NOT ASSIGNED - SHOULD BE ZERO | | | |
| 12 | NOT ASSIGNED - SHOULD BE ZERO | | | |
| 11 | | | | LM ATTACHED |
| 10 | NOT ASSIGNED - SHOULD BE ZERO | | | |
| 9 | NOT ASSIGNED - SHOULD BE ZERO | | | |
| 8 | NOT ASSIGNED - SHOULD BE ZERO | | | |
| 7 | NOT ASSIGNED - SHOULD BE ZERO | | | |
| 6 | | | | -ROLL COMMANDED |
| 5 | | | | +ROLL COMMANDED |
| 4 | | | | -YAW COMMANDED |
| 3 | | | | +YAW COMMANDED |
| 2 | | -PITCH COMMANDED | | |
| 1 | | +PITCH COMMANDED | | |
| 94B | CHANNEL 33 | 15 | | COMPUTER OSCILLATOR HAS FAILED |
| | | 14 | | CMC WARNING HAS OCCURRED |
| | | 13 | | PIPA FAIL HAS OCCURRED |
| | | 12 | | TELEMETRY DOWNLINK IS TOO FAST |
| | | 11 | | UPLINK IS TOO FAST |
| | | 10 | BLOCK UPLINK SWITCH IN NORMAL POSITION | BLOCK UPLINK SWITCH IN BLOCK POSITION |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 5 | OPTICS MODE SWITCH IN MANUAL POSITION | OPTICS MODE SWITCH IN COMPUTER POSITION |
| | | 4 | OPTICS ZERO SWITCH IN NORMAL POSITION | OPTICS ZERO SWITCH IN ZERO POSITION |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| 2 | RANGE UNIT DATA NOT GOOD | RANGE UNIT DATA GOOD | | |
| 1 | NOT ASSIGNED - SHOULD BE ZERO | | | |

RENDEZVOUS AND PRETHRUST - Concluded

CSM 104

TRANSMITTED IN PROGRAMS 17,20,21,23,30,31,34,35,37,38,39,74,75,77,78,79

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|------------|---|---|--|--|
| 95A 95B | RTHETA | ANGLE BETWEEN LOCAL HORIZONTAL AND +X AXIS (NOUN 54) OR STAR LINE OF SIGHT (NOUN 53) | | |
| 96A 96B | LAT (SPL) | LATITUDE OF THE SPLASHDOWN SITE | | |
| 97A 97B | LNG (SPL) | LONGITUDE OF THE SPLASHDOWN SITE | | |
| 98A 98B | VPRED | PREDICTED VELOCITY AT ALTITUDE OF 400,000 FEET ABOVE FISCHER RADIUS | | |
| 99A 99B | GAMMAEI | VALUE OF FLIGHT PATH ANGLE AT 400,000 FEET ABOVE FISCHER RADIUS | | |
| 100A | FLAGWORD 10 INTFLBIT REINTFLG. REINTBIT | BIT | SET | RESET |
| | | 15 | NOT USED | |
| | | 14 | INTEGRATION IN PROGRESS | INTEGRATION NOT IN PROGRESS |
| | | 13 | NOT USED | |
| | | 12 | NOT USED | |
| | | 11 | NOT USED | |
| | | 10 | NOT USED | |
| | | 9 | NOT USED | |
| | | 8 | NOT USED | |
| | | 7 | INTEGRATION ROUTINE TO BE RESTARTED | INTEGRATION ROUTINE NOT TO BE RESTARTED |
| | | 6 | NOT USED | |
| | | 5 | NOT USED | |
| | | 4 | NOT USED | |
| | | 3 | NOT USED | |
| | | 2 | NOT USED | |
| 1 | NOT USED | | | |
| 100B | FLAGWORD 11 | BIT | SET | RESET |
| | | NOT USED | | |

POWERED LIST
 TRANSMITTED IN PROGRAMS 40,41,47,61

CSM 104

| WORD NO. | DESCRIPTION | | REAL-TIME SIGNIFICANCE | | | |
|-------------------|--|---|--|---|--|------------|
| 1A 1B | LIST ID SYNC BITS | | (77774) ₈ INDICATES POWERED LIST BEING TRANSMITTED (77340) ₈ INDICATES DATA TO FOLLOW | | | |
| 2A 2B | RX | X COMPONENT OF VEHICLE POSITION VECTOR | CSM VEHICLE STATE VECTOR AND TIME | | | |
| 3A 3B | RY | Y COMPONENT OF VEHICLE POSITION VECTOR | | | | |
| 4A 4B | RZ | Z COMPONENT OF VEHICLE POSITION VECTOR | | | | |
| 5A 5B | VX | X COMPONENT OF VEHICLE VELOCITY VECTOR | | | | |
| 6A 6B | VY | Y COMPONENT OF VEHICLE VELOCITY VECTOR | | | | |
| 7A 7B | VZ | Z COMPONENT OF VEHICLE VELOCITY VECTOR | | | | |
| 8A 8B | TSV TIME TAG FOR \bar{R} AND \bar{V} | | | | | |
| 9A 9B 10A | CDUX CDUY CDUZ | | | | X, Y, AND Z CDU INPUT COUNTERS. READ THE IMU COUNTERS ZEROED DURING ZERO ENCODE MODE (IMODES 33 BIT 5 = 1) | |
| 10B | CDUT | | | | TRUNNION CDU INPUT COUNTER | |
| 11A 11B | CSM-RCS DAP ON | TVC DAP ON | | | CSM-RCS DAP ON | TVC DAP ON |
| | ADOTX | OGARATE | BODY RATE ABOUT X AXIS | OUTER GIMBAL ANGLE RATE | | |
| | ADOTY | OMEGAYB | BODY RATE ABOUT Y AXIS | BODY AXIS PITCH RATE | | |
| | ADOTZ | OMEGAZB | BODY RATE ABOUT Z AXIS | BODY AXIS ROLL RATE | | |
| 14A 14B 15A | CSM-RCS DAP ON | TVC DAP ON | CSM-RCS DAP ON | TVC DAP ON | | |
| | AK AK2 AK3 | PAXERR | VEHICLE ATTITUDE ERRORS (RPY) SENT TO FDAI. DUR- ING RCS DAP OPERATION EITHER TOTAL ATTITUDE OR DAP FOLLOWING ERROR IS DISPLAYED (DET BY FLAGWORD 0 BIT 9) | DIFFERENCE BETWEEN DE- SIRED AND PRESENT CDU X PITCH ERROR SIGNAL COM- PUTED IN TVC DAP. YAW ERROR SIGNAL COMPUTED IN TVC DAP. | | |
| | | | | | | |
| 15B | RCSFLAGS | | BIT | SET | RESET | |
| | | | 15 | NOT USED - SHOULD BE ZERO | | |
| | | | 14 | RATE FILTER NOT INITIALIZED | RATE FILTER INITIALIZED | |
| | | | 13 | ROLL RATE DAMPING REQUIRED | | |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|--|---|--|--|------------------------------------|
| | | BIT | SET | RESET |
| 15B | RCSFLAGS | 12 | PITCH RATE DAMPING REQUIRED | |
| | | 11 | YAW RATE DAMPING REQUIRED | |
| | | 10 | -ROLL RHC INPUT | |
| | | 9 | +ROLL RHC INPUT | |
| | | 8 | -YAW RHC INPUT | |
| | | 7 | +YAW RHC INPUT | |
| | | 6 | -PITCH RHC INPUT | |
| | | 5 | +PITCH RHC INPUT | |
| | | 4 | COMPUTE AK'S (ATTITUDE ERRORS) | PERFORM NEEDLER TO DISPLAY AK'S |
| | | 3 | 0 } 3RD PASS 0 } 2ND PASS 1 } INITIAL PASS } THROUGH } THROUGH } THROUGH } NEEDLER } NEEDLER } NEEDLER | |
| | | 2 | 0 } NEEDLER 1 } NEEDLER 1 } NEEDLER | |
| 1 | | INITIALIZE T6 PROGRAM | | |
| 16A 16B 17A | THETAD _X THETAD _Y THETAD _Z | X, Y, AND Z REFERENCE CDU ANGLES FOR THE ATTITUDE HOLD ROUTINE. INTERMEDIATE DESIRED CDU ANGLES FOR AUTO MANEUVER ROUTINE. | | |
| 17B | DELCDU _X | MOST SIGNIFICANT HALF OF X INCREMENTAL GIMBAL ANGLE USED IN AUTOMATIC MANEUVERS | | |
| 18A 18B | TIG | TIME OF IGNITION | | |
| 19A 19B | DELLT4 | TIME REMAINING UNTIL ARRIVAL AT AIMPOINT | | |
| 20A 20B | RTARG _X | X COMPONENT OF TARGET POSITION VECTOR | | |
| 21A 21B | RTARG _Y | Y COMPONENT OF TARGET POSITION VECTOR | | |
| 22A 22B | RTARG _Z | Z COMPONENT OF TARGET POSITION VECTOR | | |
| 23A 23B | TGO | TIME TO GO TO ENGINE CUTOFF | | |
| 24A 24B | PIPTIME1 | THE TIME AT WHICH PIPA'S WERE LAST READ | | |
| 25A 25B 26A 26B 27A 27B | DELV _X DELV _Y DELV _Z | X, Y, AND Z PIPA VALUES AT LAST READING CORRECTED FOR SCALE FACTOR ERROR AND BIAS. DURING AVERAGE G ROUTINE THEY ARE READ EVERY 2 SECONDS. | | |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|--|--|---|--------------------------------|-------------------------------|
| 28A | PACTOFF | VALUE OF PITCH TRIM ANGLE FOR SPS ENGINE DURING TVC DAP | | |
| 28B | YACTOFF | VALUE OF YAW TRIM ANGLE FOR SPS ENGINE DURING TVC DAP | | |
| 29A | PCMD | VALUE SENT TO OCDU FOR SPS PITCH GIMBAL TRIM DURING TVC DAP | | |
| 29B | YCMD | VALUE SENT TO OCDU FOR SPS YAW GIMBAL TRIM DURING TVC DAP | | |
| 30A | CSTEER | CROSS PRODUCT STEERING CONSTANT | | |
| 30B | ALP | UPCONTROL CONSTANT | | |
| 31A 31B 32A 32B 33A 33B | SPARES | | | |
| 34A 34B 35A 35B 36A 36B | XX XY XZ | REFSMAT | | |
| 37A 37B 38A 38B 39A 39B | YX YY YZ | | | |
| 40A | FLAGWORD 0 CPHIFLAG JSWITCH MIDFLAG MOONFLAG NORFHOR ZMEASURE NEEDLFLG IMUSE RNDVZFLG R53FLAG F2RTE TRUNFLAG FREEFLAG B29FLAG KFLAG | BIT | SET | RESET |
| | | 15 | OUTPUT OF CALCGA IS CPHIX | OUTPUT OF CALCGA IS THETAD |
| | | 14 | NOT USED IN POWERED LIST | |
| | | 13 | NOT USED IN POWERED LIST | |
| | | 12 | NOT USED IN POWERED LIST | |
| | | 11 | NOT USED IN POWERED LIST | |
| | | 10 | NOT USED IN POWERED LIST | |
| | | 9 | TOTAL ALTITUDE ERROR DISPLAYED | A/P FOLLOWING ERROR DISPLAYED |
| | | 8 | IMU IN USE | IMU NOT IN USE |
| | | 7 | NOT USED IN POWERED LIST | |
| | | 6 | NOT USED IN POWERED LIST | |
| | | 5 | NOT USED IN POWERED LIST | |
| | | 4 | NOT USED IN POWERED LIST | |
| | | 3 | NOT USED IN POWERED LIST | |
| | | 2 | NOT USED | |
| | | 1 | NOT USED IN POWERED LIST | |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------|------------------------|--|--|
| 40B | FLAGWORD 1 | BIT | SET | RESET |
| | NJETSFLG | 15 | TWO JET RCS BURN | FOUR JET RCS BURN |
| | STIKFLAG | 14 | RHC CONTROL OF RCS | CMC CONTROL OF RCS |
| | ERADFLAG | 13 | NOT USED IN POWERED LIST | |
| | | 12 | NOT USED | |
| | ENG2FLAG | 11 | RCS BURN | SPS BURN |
| | TARG1FLG | 10 | NOT USED IN POWERED LIST | |
| | TARG2FLG | 9 | NOT USED IN POWERED LIST | |
| | R23FLG | 9 | NOT USED IN POWERED LIST | |
| | VEHUPFLG | 8 | NOT USED IN POWERED LIST | |
| | UPDATFLG | 7 | NOT USED IN POWERED LIST | |
| | IDLEFAIL | 6 | INHIBIT R41 | ENABLE R41 (ENGFALL) THRUST NOT DETECTED |
| | TRACKFLG | 5 | NOT USED IN POWERED LIST | |
| | | 4 | NOT USED | |
| | SLOPESW | 3 | NOT USED IN POWERED LIST | |
| | GUESSW | 2 | NOT USED IN POWERED LIST | |
| | AVEGFLAG | 1 | AVERAGE G (SERVICER) TO CONTINUE | AVERAGE G (SERVICER) TO CEASE |
| 41A | FLAGWORD 2 | BIT | SET | RESET |
| | DRIFTFLG | 15 | T3RUPT CALLS GYRO COMPENSATION | T3RUPT DOES NO GYRO COMPENSATION |
| | R21MARK | 14 | NOT USED IN POWERED LIST | |
| | 22DSPFLG | 13 | NOT USED IN POWERED LIST | |
| | | 12 | NOT USED | |
| | STERRSW | 11 | STEERING TO BE DONE | STEERING OMITTED |
| | CYCLESW | 10 | VG CALCULATION TO BE DONE | VG CALCULATION OMITTED |
| | IMPULSW | 9 | MINIMUM IMPULSE BURN (CUTOFF TIME SPECIFIED) | STEERING BURN (NO CUTOFF TIME YET AVAILABLE) |
| | XDELVFLG | 8 | EXTERNAL DELTAV VG COMPUTATION | LAMBERT (AIMPOINT) VG COMPUTATION |
| | FIRSTFLG | 7 | SUCCESSING PASS THRU S40.9 | FIRST PASS THRU S40.9 |
| | FINALFLG | 6 | NOT USED IN POWERED LIST | |
| | AVFLAG | 5 | LM VEHICLE IS ACTIVE | CSM VEHICLE IS ACTIVE |
| | PFRAFPLG | 4 | PREFERRED ATTITUDE COMPUTED | PREFERRED ATTITUDE NOT COMPUTED |
| | CALCMAN3 | 3 | NO FINAL ROLL | FINAL ROLL IS NECESSARY |
| | CALCMAN2 | 2 | PERFORM MANEUVER STARTING PROCEDURE | BYPASS STARTING PROCEDURE |
| | NODOFLAG | 1 | V37 NOT PERMITTED | V37 PERMITTED |
| | 41B | FLAGWORD 3 | BIT | SET |
| GLOKFAIL | | 15 | NOT USED | |
| | | 14 | GIMBAL LOCK HAS OCCURRED | NOT IN GIMBAL LOCK |
| REFSMFLG | | 13 | REFSMMAT GOOD | REFSMMAT NO GOOD |
| LUNAFLAG | | 12 | NOT USED IN POWERED LIST | |
| P22MKFLG | | 11 | NOT USED IN POWERED LIST | |
| VFLAG | | 10 | NOT USED IN POWERED LIST | |
| ONMONFLG | | 9 | ON MONITOR ENABLED | ON MONITOR DISABLED |
| PRECIFLG | | 8 | NOT USED IN POWERED LIST | |
| CULTFLAG | | 7 | NOT USED IN POWERED LIST | |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|----------|-------------|------------------------|---|--|--|
| | | BIT | SET | RESET | |
| 41B | FLAGWORD 3 | | | | |
| | ORBWFLAG | 6 | NOT USED IN POWERED LIST | | |
| | STATEFLG | 5 | PERMANENT STATE VECTOR UPDATED | PERMANENT STATE VECTOR NOT UPDATED | |
| | INTYPFLG | 4 | CONIC INTEGRATION | ENCKE INTEGRATION | |
| | VINTFLAG | 3 | CSM STATE VECTOR BEING INTEGRATED | LM STATE VECTOR BEING INTEGRATED | |
| | D60R9FLG | 2 | DIMENSION OF W IS 9 FOR INTEGRATION | DIMENSION OF W IS 6 FOR INTEGRATION | |
| | DIMOFFLAG | 1 | W MATRIX IS TO BE USED | W MATRIX IS NOT TO BE USED | |
| 42A | FLAGWORD 4 | | | | |
| | MRKIDFLG | 15 | MARK DISPLAY IN ENDIDLE | NO MARK DISPLAY IN ENDIDLE | |
| | PRIODFLG | 14 | PRIORITY DISPLAY IN ENDIDLE | NO PRIORITY DISPLAY IN ENDIDLE | |
| | NRMIDFLG | 13 | NORMAL DISPLAY IN ENDIDLE | NO NORMAL DISPLAY IN ENDIDLE | |
| | PDSPFLAG | 12 | CAN NOT INTERRUPT PRIORITY DISPLAY | | |
| | MWAITFLG | 11 | HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED | |
| | MWAITFLG | 10 | HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED | |
| | NWAITFLG | 10 | HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED | |
| | MRKNVFLG | 9 | ASTRONAUT USING KEYBOARD WHEN MARK DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN MARK DISPLAY INITIATED | |
| | NRMNVFLG | 8 | ASTRONAUT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED | |
| | PRONVFLG | 7 | ASTRONAUT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED | |
| | PINBRFLG | 6 | ASTRONAUT HAS INTERFERED WITH EXISTING DISPLAY | ASTRONAUT HAS NOT INTERFERED WITH EXISTING DISPLAY | |
| | MRUPTFLG | 5 | MARK DISPLAY INTERRUPTED BY PRIORITY DISPLAY | MARK DISPLAY NOT INTERRUPTED BY PRIORITY DISPLAY | |
| | NRUPTFLG | 4 | NORMAL DISPLAY INTERRUPTED BY PRIORITY OR MARK DISPLAY | NORMAL DISPLAY NOT INTERRUPTED BY PRIORITY OR MARK DISPLAY | |
| | MKOVFLAG | 3 | MARK DISPLAY OVER NORMAL | NO MARK DISPLAY OVER NORMAL | |
| | XDSPFLAG | | 2 | NOT USED | |
| | | | 1 | MARK DISPLAY NOT TO BE INTERRUPTED | |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | | |
|----------|---|------------------------|---|------------------------------------|--------------------------|----------------------------|
| | | BIT | SET | RESET | | |
| 42B | FLAGWORD 5 DSKYFLAG V59FLAG INCORFLG PRFTRKAT DMENFLG COMPUTER ENGNFLG 3AXISFLG GRRBKFLG R60FLAG SOLNSW MGLVFLAG RENDWFLG | 15 | DISPLAYS SENT TO DSKY | NO DISPLAYS TO DSKY | | |
| | | 14 | NOT USED | | | |
| | | 13 | NOT USED | | | |
| | | 12 | NOT USED IN POWERED LIST | | | |
| | | 11 | NOT USED IN POWERED LIST | | | |
| | | 10 | NOT USED IN POWERED LIST | | | |
| | | 9 | NOT USED IN POWERED LIST | | | |
| | | 8 | COMPUTER IS CMC | COMPUTER IS LGC | | |
| | | 7 | ENGINE TURNED ON | ENGINE TURNED OFF | | |
| | | 6 | MANEUVER SPECIFIED BY THREE AXES | MANEUVER SPECIFIED BY ONE AXIS | | |
| | | 5 | NOT USED IN POWERED LIST | | | |
| | | 4 | NOT USED IN POWERED LIST | | | |
| | | 3 | NOT USED IN POWERED LIST | | | |
| | | 2 | LOCAL VERTICAL COORDINATES COMPUTED | MIDDLE GIMBAL ANGLE COMPUTED | | |
| | | 1 | NOT USED IN POWERED LIST | | | |
| | | 43A | FLAGWORD 6 DAPBIT1, DAPBIT2 ENTRYDSP CMDAPARM GAMDIFSW GONEPAST RELVELSW EGSW FIRSTPAS HIND INRLSW LATSW .05GSW CM/DSTBY GYMDIFSW | 15 | 0}NO DAP | 0}CSM RCS 1} TVC 1} SATURN |
| | | | | 14 | 0}OR ENTRY | 1} DAP 0} DAP 1} DAP |
| 13 | NOT USED IN POWERED LIST | | | | | |
| 12 | NOT USED IN POWERED LIST | | | | | |
| 11 | NOT USED IN POWERED LIST | | | | | |
| 10 | NOT USED IN POWERED LIST | | | | | |
| 9 | NOT USED IN POWERED LIST | | | | | |
| 8 | NOT USED IN POWERED LIST | | | | | |
| 7 | NOT USED IN POWERED LIST | | | | | |
| 6 | NOT USED IN POWERED LIST | | | | | |
| 5 | NOT USED IN POWERED LIST | | | | | |
| 4 | NOT USED IN POWERED LIST | | | | | |
| 3 | NOT USED IN POWERED LIST | | | | | |
| 2 | NOT USED IN POWERED LIST | | | | | |
| 1 | NOT USED IN POWERED LIST | | | | | |
| 43B | FLAGWORD 7 TERMIFLG ITSWICH IGNFLAG ASTNFLAG TIMRFLAG NORMSW RVSW GONEBY IDLEFLAG V37FLAG NOUPFLAG, R32FLAG UPLOCKFL VERIFLAG ATTCHFLG TFFSW | | | 15 | NOT USED IN POWERED LIST | |
| | | | | 14 | NOT USED IN POWERED LIST | |
| | | 13 | TIG HAS ARRIVED | TIG HAS NOT ARRIVED | | |
| | | 12 | ASTRONAUT HAS OKAYED IGNITION | ASTRONAUT HAS NOT OKAYED IGNITION | | |
| | | 11 | CLOKTAK OPERATING | CLOKTAK INOPERATIVE | | |
| | | 10 | UNIT NORMAL COMPUTED | UNIT NORMAL NOT COMPUTED | | |
| | | 9 | NOT USED IN POWERED LIST | | | |
| | | 8 | NOT USED IN POWERED LIST | | | |
| | | 7 | NO DV MONITOR | CONNECT DV MONITOR | | |
| | | 6 | AVERAGE G (SERVICER) RUNNING | AVERAGE G (SERVICER) OFF | | |
| | | 5 | NEITHER CSM NOR LM STATE VECTOR MAY BE UPDATED | EITHER STATE VECTOR MAY BE UPDATED | | |
| | | 4 | K-K-K FAIL | NO K-K-K FAIL | | |
| | | 3 | NOT USED IN POWERED LIST | | | |
| | | 2 | LM, CM ATTACHED | LM, CM NOT ATTACHED | | |
| | | 1 | NOT USED IN POWERED LIST | | | |

POWERED LIST - Continued
 TRANSMITTED IN PROGRAMS 40,41,37,61

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|---|--|---|---|---|
| | | BIT | SET | RESET |
| 44A | FLAGWORD 8 RPQFLAG NEWIFLG DMOONFLG LMOONFLG ADVTRK P39/79SW SURFFLAG INFINFLG ORDERSW APSESW COGAFLAG 360SW | 15 | NOT USED IN POWERED LIST | |
| | | 14 | NOT USED | |
| | | 13 | NOT USED IN POWERED LIST | |
| | | 12 | NOT USED IN POWERED LIST | |
| | | 11 | NOT USED IN POWERED LIST | |
| | | 10 | NOT USED IN POWERED LIST | |
| | | 9 | NOT USED IN POWERED LIST | |
| | | 8 | NOT USED IN POWERED LIST | |
| | | 7 | NOT USED IN POWERED LIST | |
| | | 6 | NOT USED IN POWERED LIST | |
| | | 5 | NOT USED IN POWERED LIST | |
| | | 4 | NOT USED IN POWERED LIST | |
| | | 3 | NOT USED | |
| | | 2 | NOT USED | |
| 1 | NOT USED IN POWERED LIST | | | |
| 44B | FLAGWORD 9 SWTOVER V67FLAG V82EMFLG MAXDBFLG V94FLAG SAVECFLG VHFRFLAG SOURCFLG N22ORN17 QUITFLAG R31FLAG MID1FLAG MIDAVFLG AVEMIDSW | 15 | SWITCHOVER HAS OCCURRED | NO SWITCHOVER YET |
| | | 14 | NOT USED IN POWERED LIST | |
| | | 13 | NOT USED IN POWERED LIST | |
| | | 12 | MAX DB SELECTED | MAX DB NOT SELECTED |
| | | 11 | NOT USED IN POWERED LIST | |
| | | 10 | NOT USED IN POWERED LIST | |
| | | 9 | NOT USED IN POWERED LIST | |
| | | 8 | NOT USED IN POWERED LIST | |
| | | 7 | NOT USED | |
| | | 6 | COMPUTE TOTAL ATTITUDE ERRORS WRT N22 (V62) | COMPUTE TOTAL ATTITUDE ERRORS WRT N17 (V63) |
| | | 5 | CAUSE INTEGRATION TO EXIT AT NEXT TIME STOP | ALLOW INTEGRATION TO CONTINUE |
| | | 4 | NOT USED IN POWERED LIST | |
| | | 3 | INTEGRATE TO TDEC | INTEGRATE TO THE THEN-PRESENT TIME |
| | | 2 | INTEGRATION ENTERED FROM ONE OF MIDTOAV PORTALS | INTEGRATION WAS NOT ENTERED VIA MIDTOAV |
| 1 | AVETOMID CALLING FOR W MATRIX INTEGER DO NOT WRITE OVER RN, VN, PIPTIME | NO AVETOMID W INTEGER ALLOW SET UP OF RN, VN, PIPTIME | | |
| 45A 45B 46A 46B 47A 47B 48A 48B 49A 49B 50A | DSPTAB 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, AND R3 DISPLAYS | | |
| 50B | DSPTAB+11 | DISPLAY TABLE OF DSKY STATUS LIGHTS 60400g = PROGRAM CAUTION, 60200g = TRACKER WARNING 60020g = NO ATTITUDE, 60040g = GIMBAL LOCK | | |

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

CSM 104

| WORD NO. | DESCRIPTION | | REAL-TIME SIGNIFICANCE |
|-------------------|---|--|--|
| 51A 51B | TIME2, TIME1 | | COMPUTER CLOCK INDICATING ELAPSED TIME SINCE LIFTOFF SINCE LIFTOFF |
| 52A 52B | R _X | X COMPONENT OF "OTHER" VEHICLE POSITION | "OTHER" VEHICLE STATE VECTOR |
| 53A 53B | R _Y | Y COMPONENT OF "OTHER" VEHICLE POSITION | |
| 54A 54B | R _Z | Z COMPONENT OF "OTHER" VEHICLE POSITION | |
| 55A 55B | V _X | X COMPONENT OF "OTHER" VEHICLE VELOCITY | |
| 56A 56B | V _Y | Y COMPONENT OF "OTHER" VEHICLE VELOCITY | |
| 57A 57B | V _Z | Z COMPONENT OF "OTHER" VEHICLE VELOCITY | |
| 58A 58B | T _{OTHER} | TIME TAG FOR "OTHER" STATE VECTOR | |
| 59A 59B 60A | CDUX CDUY CDUZ | | SAME AS 9A SAME AS 9B SAME AS 10A |
| 60B | CDUT | | SAME AS 10B |
| 61A 61B | CSM-RCS DAP ADOT _X | TVC DAP OGARATE | SAME AS 11A, 11B SAME AS 12A, 12B SAME AS 13A, 13B |
| 62A 62B | ADOT _Y | OMEGAYB | |
| 63A 63B | ADOT _Z | OMEGAZB | |
| 64A 64B 65A | AK AK1 AK2 | | SAME AS 14A SAME AS 14B SAME AS 15A |
| 65B | RCSFLAGS | | SAME AS 15B |
| 66A 66B 67A | THETAD _X THETAD _Y THETAD _Z | | SAME AS 16A SAME AS 16B SAME AS 17A |
| 67B | DELCDUX | | SAME AS 17B |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|------------|------------------|---|-----------------------------|---------------------------------|
| 68A 68B | RSBBQ RSBBQ+1 | VALUE OF BBANK AND Q REGISTERS AT THE TIME OF A RESTART | | |
| 69A | CADRFLSH | VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED PRIORITY DISPLAY | | |
| 69B | CADRFLSH+1 | VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED MARK | | |
| 70A | CADRFLSH+2 | VALUE OF RETURN ADDRESS INFORMATION FOR LAST NORMAL DISPLAY REQUESTED | | |
| 70B | FAILREG | CONTAINS ALARM CODE OF FIRST ALARM RECEIVED | | |
| 71A | FAILREG+1 | CONTAINS ALARM CODE OF SECOND ALARM RECEIVED | | |
| 71B | FAILREG+2 | CONTAINS ALARM CODE OF THIRD ALARM RECEIVED | | |
| 72A | CDUS | SHAFT CDU INPUT COUNTER | | |
| 72B | PIPAX | X, Y, AND Z PIPA INPUT COUNTERS ZEROED AT THE START OF AVERAGE G AND EVERY 2 SEC DURING AVERAGE G ROUTINE | | |
| 73A | PIPAY | | | |
| 73B | PIPAZ | | | |
| 74A 74B | ELEV | DESIRED LOS ANGLE AT TPI | | |
| 75A 75B | CENTANG | ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE DURING TRANSFER FROM TPI TO TIME OF INTERCEPT | | |
| 76A 76B | DELTAR | THE DESIRED SEPARATION OF THE TWO VEHICLES SPECIFIED AS A DISTANCE ALONG THE PASSIVE VEHICLE ORBIT | | |
| 77A | FLAGWORD 10 | BIT | SET | RESET |
| | | 15 | NOT USED | |
| | | 14 | INTEGRATION IN PROGRESS | INTEGRATION NOT IN PROGRESS |
| | | 13 | NOT USED | |
| | | 12 | NOT USED | |
| | | 11 | NOT USED | |
| | | 10 | NOT USED | |
| | | 9 | NOT USED | |
| | | 8 | NOT USED | |
| | | 7 | INTEGRATION TO BE RESTARTED | INTEGRATION NOT TO BE RESTARTED |
| | | 6 | NOT USED | |
| | | 5 | NOT USED | |
| | | 4 | NOT USED | |
| | | 3 | NOT USED | |
| 2 | NOT USED | | | |
| 1 | NOT USED | | | |
| 77B | FLAGWORD 11 | NOT USED | | |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|------------|---------------------------------|--|---|---|
| 78A 78B | TEVENT | VALUE OF COMPUTER CLOCK WHEN LIFTOFF OCCURRED, WHEN SPS ENGINE CAME ON OR WHEN SPS ENGINE SHUT OFF | | |
| 79A 79B | PCMD YCMD | SAME AS 29A SAME AS 29B | | |
| 80A | OPTMODES | BIT | SET | RESET |
| | | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 13 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 10 | INDICATES OPTICS HAS BEEN ZEROED SINCE LAST FRESH START | ALARM 120g WILL BE GENERATED IF ATTEMPT IS MADE TO ZERO OPTICS |
| | | 9 | OPTICS MODE SWITCH IN COMPUTER POSITION | RESET BY FRESH START OR MODE OTHER THAN CMC |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | OPTICS CDU FAIL PRESENTLY | NO OPTICS CDU FAIL PRESENTLY |
| | | 6 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 5 | OPTICS MODE SWITCH NOT IN CMC POSITION | OPTICS MODE SWITCH IN CMC POSITION |
| | | 4 | OPTICS ZERO SWITCH NOT IN ZERO POSITION | OPTICS ZERO SWITCH IN ZERO POSITION (BITS 4, 5 = 1'S OPTICS IN MANUAL MODE) |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 1 | NOT ASSIGNED - SHOULD BE ZERO | |
| 80B | 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 PERFORM ATTITUDE HOLD ABOUT EXISTING REFERENCE. IF <+0 AUTOMATIC STEERING IS TO BE PERFORMED. | | |
| 81A | LEMASS | MASS OF THE LM | | |
| 81B | CSMASS | MASS OF THE CSM | | |
| 82A | DAPDATR1 LOADED WITH V48N46E | BITS | | |
| | | 15 | VEHICLE 0 } NO 0 } LM 1 } LM 1 } SATURN | |
| | | 14 | CONFIGURATION 0 } DAP 1 } OFF 0 } ON 1 } DAP | |
| | | 13 | NOT USED - SHOULD BE ZERO | |
| | | 12 | NOT USED - SHOULD BE ZERO | |
| | | 11 | NOT USED - SHOULD BE ZERO | |
| | | 9 | NOT USED - SHOULD BE ZERO | |
| | | 8 | NOT USED - SHOULD BE ZERO | |
| | | 10 | X TRANSLATION 0 OR 1 } USE AC 0 } USE 1 } USE | |
| | | 7 | USES 0 OR 1 } & BD 1 } AC 0 } BD | |
| | | 6 | NOT USED - SHOULD BE ZERO | |
| | | 5 | NOT USED - SHOULD BE ZERO | |

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

CSM 104

| WORD NO. | DESCRIPTION | | REAL-TIME SIGNIFICANCE | |
|-------------------|--|--|--|--|
| 82A | DAPDATR1 | | BITS | |
| | | | 4 | ANGULAR DEADBAND FOR ATTITUDE HOLD AND AUTOMATIC MANEUVERS 0 - ±0.5° DEADBAND 1 - ±5.0° DEADBAND |
| | | | 3 | NOT USED - SHOULD BE ZERO |
| | | | 2 | SPECIFY MANEUVER RATE } .05° / SEC } .2° / SEC } .5° / SEC } 4.0° / SEC |
| | | | 1 | |
| 82B | DAPDATR2 | | BITS | |
| | | | 15 | NOT USED - SHOULD BE ZERO |
| | | | 14 | NOT USED - SHOULD BE ZERO |
| | | | 13 | ROLL JET SELECTION 0 - USE QUAD AC FOR ROLL MANEUVERS 1 - USE QUAD BD FOR ROLL MANEUVERS |
| | | | 12 | NOT USED - SHOULD BE ZERO |
| | | | 11 | NOT USED - SHOULD BE ZERO |
| | | | 10 | A QUAD FAIL 0 - QUAD A IS OK 1 - QUAD A FAILED |
| | | | 9 | NOT USED - SHOULD BE ZERO |
| | | | 8 | NOT USED - SHOULD BE ZERO |
| | | | 7 | B QUAD FAIL 0 - QUAD B IS OK 1 - QUAD B FAILED |
| | | | 6 | NOT USED - SHOULD BE ZERO |
| | | | 5 | NOT USED - SHOULD BE ZERO |
| | | | 4 | C QUAD FAIL 0 - QUAD C IS OK 1 - QUAD C FAILED |
| | | | 3 | NOT USED - SHOULD BE ZERO |
| | | | 2 | NOT USED - SHOULD BE ZERO |
| 1 | D QUAD FAIL 0 - QUAD D IS OK 1 - QUAD D FAILED | | | |
| 83A 83B 84A | 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 DISPLAY WHEN FLAGWORD 0 BIT 9 = 0 | | |
| 84B | THETADX | SAME AS 16A | | |
| 85A 85B | RCS-CSM DAP | TVC DAP | RCS-CSM DAP | TVC DAP |
| | WBODY | OMEGAXC | DESIRED BODY ROLL RATE ABOUT CONTROL AXIS | ROLL BODY AXIS RATE COMMAND FROM CROSS PRODUCT STEERING |
| 86A 86B | WBODY1 | OMEGAYC | DESIRED BODY PITCH RATE ABOUT CONTROL AXIS | PITCH BODY AXIS RATE COMMAND FROM CROSS PRODUCT STEERING |
| | WBODY2 | OMEGAZC | DESIRED BODY YAW RATE ABOUT CONTROL AXIS | YAW BODY AXIS RATE COMMAND FROM CROSS PRODUCT STEERING |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|-------------------|--------------------------------|---|---|--|
| 88A | REDOCTR | INDICATES THE NUMBER OF RESTARTS WHICH HAVE OCCURRED SINCE LAST FRESH START | | |
| 88B 89A 89B | THETAD THETAD+1 THETAD+2 | FINAL DESIRED X CDU ANGLE FINAL DESIRED Y CDU ANGLE FINAL DESIRED Z CDU ANGLE | | |
| 90A | IMODES30 | BIT | SET | RESET |
| | | 15 | IMU TEMPERATURE OUT OF LIMITS | IMU TEMPERATURE WITHIN LIMITS |
| | | 14 | NO ISS TURN ON REQUEST PRESENT | ISS TURN ON REQUEST PRESENT |
| | | 13 | NO IMU FAIL | IMU FAIL HAS OCCURRED |
| | | 12 | NO ICDU FAIL | ICDU FAIL HAS OCCURRED |
| | | 11 | NO IMU CAGE COMMANDED | IMU CAGE HAS BEEN COMMANDED |
| | | 10 | NO PIPA FAIL | PIPA FAIL HAS OCCURRED |
| | | 9 | IMU NOT OPERATING | IMU OPERATING |
| | | 8 | USED IN IMU TURN-ON SEQUENCING MOST LIKELY ZERO | |
| | | 7 | SAME AS BIT 8 | |
| | | 6 | IMU INITIALIZATION BEING ACCOMPLISHED | IMU NOT IN INITIALIZATION |
| | | 5 | INHIBIT ALARM 2128 IF PIPA FAIL OCCURS | DO NOT INHIBIT ALARM 2128 IF PIPA FAIL OCCURS |
| | | 4 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF IMU FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF IMU FAIL OCCURS |
| | | 3 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF ICDU FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF ICDU FAIL OCCURS |
| | | 2 | TURN-ON DELAY FAILURE (ALARM 2078) | NO TURN-ON DELAY FAILURE |
| | | 1 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF A PIPA FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF A PIPA FAIL OCCURS |
| 90B | IMODES33 | BIT | SET | RESET |
| | | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | | PROCEED DEPRESSED |
| | | 13 | PIPA FAIL HAS NOT OCCURRED | PIPA FAIL HAS OCCURRED |
| | | 12 | TELEMETRY DOWNLINK OK | TELEMETRY DOWNLINK IS TOO FAST |
| | | 11 | UPLINK IS OK | UPLINK IS TOO FAST |
| | | 10 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | IMU IN COARSE ALIGN OR ZEROING MODE | IMU NOT IN COARSE ALIGN OR ZEROING MODE |
| | | 5 | IMU IN ZEROING ROUTINE | IMU NOT IN ZEROING ROUTINE |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---------------------------------|------------------------|--|---------------------------|
| | | BIT | SET | RESET |
| 90B | IMODES33 | | | |
| | | 4 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | NOT USED | |
| | | 1 | LAMP TEST IN PROGRESS (V35) | LAMP TEST NOT IN PROGRESS |
| 91A | CHANNEL 11 | | | |
| | | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 13 | SPS ENGINE ON COMMAND | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 10 | ERROR RESET KEYCODE RECEIVED FROM UPLINK OR DSKY | |
| | | 9 | INDICATES AVERAGE G ROUTINE IS RUNNING | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | OPERATOR ERROR HAS OCCURRED | |
| | | 6 | VERB-NOUN FLASHER ON | |
| | | 5 | KEY RELEASE LAMP ON | |
| | | 4 | IMU TEMPERATURE IS OUT OF LIMITS | |
| | | 3 | UPLINK ACTIVITY LAMP ON | |
| | | 2 | COMPUTER ACTIVITY LAMP ON | |
| 1 | ISS WARNING LAMP ON | | | |
| 91B | CHANNEL 12 | | | |
| | | 15 | TURN ON DELAY - COMPLETE | |
| | | 14 | S-IVB CUTOFF COMMAND | |
| | | 13 | S-IVB INJECTION SEQUENCING START | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | DISENGAGE OPTICS DAC | |
| | | 10 | ZERO OPTICS COMMAND | |
| | | 9 | S-IVB TAKEOVER ENABLE | |
| | | 8 | TVC ENABLE | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | IMU CDU ERROR COUNTER ENABLE | |
| | | 5 | IMU CDU ZERO COMMAND | |
| | | 4 | IMU COARSE ALIGN ENABLE | |
| 3 | STAR TRACKERS ON | | | |
| 2 | OPTICS CDU ERROR COUNTER ENABLE | | | |
| 1 | OPTICS CDU ZERO COMMAND | | | |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---------------------------|------------------------|--|--|
| 92A | CHANNEL 13 | BIT | SET | RESET |
| | | 15 | T6RUPT ENABLE | |
| | | 14 | RESET TRAP 32 | |
| | | 13 | RESET TRAP 31-B | |
| | | 12 | RESET TRAP 31-A | |
| | | 11 | ENABLE STANDBY BUTTON | |
| | | 10 | LAMP TEST BEING PERFORMED | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | BMAG OUTPUT ENABLE | |
| | | 7 | WORD ORDER CODE FOR WORDS 2-50, 52-100 | WORD ORDER CODE FOR WORDS 1 AND 51 |
| | | 6 | BLOCK UPLINK | |
| | | 5 | INHIBIT UPLINK, ENABLE CROSSLINK | |
| | | 4 | RANGE UNIT ACTIVITY | |
| | | 3 | RANGE UNIT SELECT a | |
| | | 2 | RANGE UNIT SELECT b | |
| 1 | RANGE UNIT SELECT c | | | |
| 92B | CHANNEL 14 | BIT | SET | RESET |
| | | 15 | XCDU DRIVE ENABLE | |
| | | 14 | YCDU DRIVE ENABLE | |
| | | 13 | ZCDU DRIVE ENABLE | |
| | | 12 | TRUNNION CDU DRIVE ENABLE | |
| | | 11 | SHAFT CDU DRIVE ENABLE | |
| | | 10 | GYRO TORQUING ENABLE | |
| | | 9 | NEGATIVE GYRO TORQUE | POSITIVE GYRO TORQUE |
| | | 8 | GYRO 0 NO 0 X 1 Y 1 Z | |
| | | 7 | SELECT 0 GYRO 1 GYRO 0 GYRO 1 GYRO | |
| | | 6 | GYRO PULSE TORQUE POWER SUPPLY ENABLED | |
| | | 5 | NOT USED - SHOULD BE ZERO | |
| | | 4 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | |
| 1 | NOT USED - SHOULD BE ZERO | | | |
| 93A | CHANNEL 30 | BIT | SET | RESET |
| | | 15 | IMU TEMPERATURE OUT OF LIMITS | IMU TEMPERATURE WITHIN LIMITS |
| | | 14 | ISS OFF | ISS ON OR COMMANDED ON |
| | | 13 | NO IMU FAIL | IMU FAILURE |
| | | 12 | NO ICDU FAIL | ICDU FAILURE |
| | | 11 | NO IMU CAGE COMMANDED | IMU CAGE COMMANDED |
| | | 10 | | LAUNCH VEHICLE GUIDANCE SWITCH IN CMC POSITION |
| | | 9 | IMU NOT OPERATING | IMU OPERATING |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NO OCDU FAIL | OCDU FAILURE |
| | | 6 | NOT USED | |
| | | 5 | LIFTOFF HAS NOT OCCURRED | LIFTOFF HAS OCCURRED |
| 4 | S-IVB ATTACHED | S-IVB SEPARATED | | |

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

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------|------------------------|---------------------------------------|-----------------------------------|
| | | BIT | SET | RESET |
| 93A | CHANNEL 30 | 3 | SPS NOT READY | SPS READY |
| | | 2 | CM/SM ATTACHED | CM/SM SEPARATED |
| | | 1 | ULLAGE THRUST NOT PRESENT FOR S-IVB | ULLAGE THRUST PRESENT FROM S-IVB |
| | | | | |
| 93B | CHANNEL 31 | 15 | COMPUTER NOT IN CONTROL OF SPACECRAFT | COMPUTER IN CONTROL OF SPACECRAFT |
| | | 14 | CSM RCS 0 } ILLEGAL DAP MODE 0 } | 0 } FREE 1 } HOLD 1 } AUTO |
| | | 13 | | 1 } MODE 0 } MODE 1 } MODE |
| | | 12 | | -Z TRANSLATION COMMANDED |
| | | 11 | | +Z TRANSLATION COMMANDED |
| | | 10 | | -Y TRANSLATION COMMANDED |
| | | 9 | | +Y TRANSLATION COMMANDED |
| | | 8 | | -X TRANSLATION COMMANDED |
| | | 7 | | +X TRANSLATION COMMANDED |
| | | 6 | | -ROLL COMMANDED |
| | | 5 | | +ROLL COMMANDED |
| | | 4 | | -YAW COMMANDED |
| | | 3 | | +YAW COMMANDED |
| | | 2 | | -PITCH COMMANDED |
| | | 1 | | +PITCH COMMANDED |
| 94A | CHANNEL 32 | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | | PROCEED KEY IS DEPRESSED |
| | | 13 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | | LM ATTACHED |
| | | 10 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | | -ROLL COMMANDED |
| | | 5 | | +ROLL COMMANDED |
| | | 4 | | -YAW COMMANDED |
| | | 3 | | +YAW COMMANDED |
| | | 2 | | -PITCH COMMANDED |
| | | 1 | | +PITCH COMMANDED |
| 94B | CHANNEL 33 | 15 | | COMPUTER OSCILLATOR HAS FAILED |
| | | 14 | | CMC WARNING HAS OCCURRED |
| | | 13 | | PIPA FAIL HAS OCCURRED |
| | | | | |

POWERED LIST - Concluded
 TRANSMITTED IN PROGRAMS 40,41,47,61

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|--|-------------|--|--|---|
| | | BIT | SET | RESET |
| 94B | CHANNEL 33 | 12 | | TELEMETRY DOWNLINK IS TOO FAST |
| | | 11 | | UPLINK IS TOO FAST |
| | | 10 | BLOCK UPLINK SWITCH IN NORMAL POSITION | BLOCK UPLINK SWITCH IN BLOCK POSITION |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 5 | OPTICS MODE SWITCH IN MANUAL POSITION | OPTICS MODE SWITCH IN COMPUTER POSITION |
| | | 4 | OPTICS ZERO SWITCH IN NORMAL POSITION | OPTICS ZERO SWITCH IN ZERO POSITION |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | RANGE UNIT DATA NO GOOD | RANGE UNIT DATA GOOD |
| | | 1 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 95A 95B 96A 96B 97A 97B | VTIGX VTIGY VTIGZ | X, Y, AND Z COMPONENTS OF VELOCITY TO BE GAINED |
| 98A 98B 99A 99B 100A 100B | SPARES | | | |

ORBITAL NAVIGATION
TRANSMITTED IN PROGRAM 22

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---|--|-----------------------------|-------------------------|
| 1A | LIST ID | (77773)8 INDICATES PROGRAM 22 POWERED LIST BEING TRANSMITTED. | | |
| 1B | SYNC BITS | (77340)8 INDICATES DATA TO FOLLOW. | | |
| 2A | R _X X COMPONENT OF VEHICLE POSITION VECTOR | CSM VEHICLE STATE VECTOR AND TIME | | |
| 2B | | | | |
| 3A | R _Y Y COMPONENT OF VEHICLE POSITION VECTOR | | | |
| 3B | | | | |
| 4A | R _Z Z COMPONENT OF VEHICLE POSITION VECTOR | | | |
| 4B | | | | |
| 5A | V _X X COMPONENT OF VEHICLE VELOCITY VECTOR | | | |
| 5B | | | | |
| 6A | V _Y Y COMPONENT OF VEHICLE VELOCITY VECTOR | | | |
| 6B | | | | |
| 7A | V _Z Z COMPONENT OF VEHICLE VELOCITY VECTOR | | | |
| 7B | | | | |
| 8A | T _{SV} TIME TAG FOR \vec{R} AND \vec{V} | | | |
| 8B | | | | |
| 9A | CDUX | X, Y, AND Z CDU INPUT COUNTERS. READ THE IMU COUNTERS ZEROED DURING ZERO ENCODE MODE (IMODES33 BIT 5 = 1) | | |
| 9B | | | | |
| 10A | | | | |
| 10B | CDUT | TRUNNION CDU INPUT COUNTER | | |
| 11A | ADOT _X | CMC BODY RATE ABOUT THE X, Y, AND Z AXIS | | |
| 11B | | | | |
| 12A | ADOT _Y | | | |
| 12B | | | | |
| 13A | ADOT _Z | | | |
| 13B | | | | |
| 14A | AK | VEHICLE ATTITUDE ERRORS SENT TO FDAI. DURING P11 THE ROLL VALVE IS 4 X 16-2/3 DEG DURING RCS DAP OPERATION EITHER TOTAL ATTITUDE OR DAP FOLLOWING ERROR IS DISPLAYED (DET BY FLAGWORD 0 BIT 9) | | |
| 14B | | | | |
| 15A | | | | |
| 15B | RCSFLAGS | BIT | SET | RESET |
| | | 15 | NOT USED - SHOULD BE ZERO | |
| | | 14 | RATE FILTER NOT INITIALIZED | RATE FILTER INITIALIZED |
| | | 13 | ROLL RATE DAMPING REQUIRED | |
| | | 12 | PITCH RATE DAMPING REQUIRED | |
| | | 11 | YAW RATE DAMPING REQUIRED | |
| | | 10 | -ROLL RHC INPUT | |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|----------|-------------|---|--------------------------------|---------------------------------|----------------------------|
| | | BIT | SET | RESET | |
| 15B | RCSFLAGS | 9 | +ROLL RHC INPUT | | |
| | | 8 | -YAW RHC INPUT | | |
| | | 7 | +YAW RHC INPUT | | |
| | | 6 | -PITCH RHC INPUT | | |
| | | 5 | +PITCH RHC INPUT | | |
| | | 4 | COMPUTE AK'S (ATTITUDE ERRORS) | PERFORM NEEDLER TO DISPLAY AK'S | |
| | | 3 | 0 } 3RD PASS } THRU | 0 } 2ND PASS } THRU | 1 } INITIAL } PASS THRU |
| | | 2 | 0 } NEEDLER | 1 } NEEDLER | 1 } NEEDLER |
| | | 1 | | | INITIALIZE T6 PROGRAM |
| 16A | THETADX | X, Y, AND Z REFERENCE CDU ANGLES FOR THE ATTITUDE HOLD ROUTINE. INTERMEDIATE DESIRED CDU ANGLES FOR AUTO MANEUVER ROUTINE. | | | |
| 16B | THETADY | | | | |
| 17A | THETADZ | | | | |
| 17B | DELCDUX | MOST SIGNIFICANT HALF OF X INCREMENTAL GIMBAL ANGLE USED IN AUTOMATIC MANEUVERS | | | |
| 18A | SVMRKDAT | 5 SETS OF LANDMARK TRACKING DATA STORED AS FOLLOWS: TIME (DP) - TIME OF MARK CDUY - INNER GIMBAL ANGLE CDUS - OPTICS SHAFT ANGLE CDUZ - MIDDLE GIMBAL ANGLE CDUT - OPTICS TRUNNION ANGLE CDUX - OUTER GIMBAL ANGLE (REPEATED 4 ADDITIONAL TIMES) | | | |
| 18B | SVMRKDAT+1 | | | | |
| 19A | SVMRKDAT+2 | | | | |
| 19B | SVMRKDAT+3 | | | | |
| 20A | SVMRKDAT+4 | | | | |
| 20B | SVMRKDAT+5 | | | | |
| 21A | SVMRKDAT+6 | | | | |
| 21B | SVMRKDAT+7 | | | | |
| 22A | SVMRKDAT+8 | | | | |
| 22B | SVMRKDAT+9 | | | | |
| 23A | SVMRKDAT+10 | | | | |
| 23B | SVMRKDAT+11 | | | | |
| 24A | SVMRKDAT+12 | | | | |
| 24B | SVMRKDAT+13 | | | | |
| 25A | SVMRKDAT+14 | | | | |
| 25B | SVMRKDAT+15 | | | | |
| 26A | SVMRKDAT+16 | | | | |
| 26B | SVMRKDAT+17 | | | | |
| 27A | SVMRKDAT+18 | | | | |
| 27B | SVMRKDAT+19 | | | | |
| 28A | SVMRKDAT+20 | | | | |
| 28B | SVMRKDAT+21 | | | | |
| 29A | SVMRKDAT+22 | | | | |
| 29B | SVMRKDAT+23 | | | | |
| 30A | SVMRKDAT+24 | | | | |
| 30B | SVMRKDAT+25 | | | | |
| 31A | SVMRKDAT+26 | | | | |
| 31B | SVMRKDAT+27 | | | | |
| 32A | SVMRKDAT+28 | | | | |
| 32B | SVMRKDAT+29 | | | | |
| 33A | SVMRKDAT+30 | | | | |
| 33B | SVMRKDAT+31 | | | | |
| 34A | SVMRKDAT+32 | | | | |
| 34B | SVMRKDAT+33 | | | | |
| 35A | SVMRKDAT+34 | | | | |
| 35B | SVMRKDAT+35 | NOT USED | | | |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|--|--|---|---|---|
| 36A | LANDMARK | BITS | | |
| | | 15-13 | 18 - LANDMARK KNOWN 28 - LANDMARK UNKNOWN | |
| | | 12-10 | INDEX OF OFFSET DESIGNATOR | |
| | | 9-7 | NOT USED | |
| | | 6-1 | 008 - LANDMARK COORDINATES ARE NOT STORED IN CMC MEMORY 018 - LANDING SITE DESIGNATION 028 - 268 - INDEX NUMBER FOR LANDMARK WHOSE COORDINATES ARE STORED IN CMC MEMORY | |
| 36B | ECC | MOST SIGNIFICANT HALF OF ECCENTRICITY OF CONIC TRAJECTORY | | |
| 37A 37B 38A 38B 39A 39B | SPARES | | | |
| 40A | FLAGWORD 0 CPHIFLAG JSWITCH MIDFLAG MOONFLAG NORFHOR ZMEASURE NEEDLFLG IMUSE RNDVZFLG R53FLAG F2RTE TRUNFLAG FREEFLAG B29FLAG KFLAG | BIT | SET | RESET |
| | | 15 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 14 | INTEGRATION OF W MATRIX | INTEGRATION OF STATE VECTOR |
| | | 13 | INTEGRATION WITH SOLAR PERTURBATIONS | INTEGRATION WITHOUT SOLAR PERTURBATIONS |
| | | 12 | MOON IS SPHERE OF INFLUENCE | EARTH IS SPHERE OF INFLUENCE |
| | | 11 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 10 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 9 | TOTAL ATTITUDE ERROR DISPLAYED | A/P FOLLOWING ERROR DISPLAYED |
| | | 8 | IMU IN USE | IMU NOT IN USE |
| | | 7 | P20 RUNNING (RADAR IN USE) | P20 NOT RUNNING (RADAR NOT IN USE) |
| | | 6 | V51 INITIATED | V51 NOT INITIATED |
| | | 5 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 4 | DRIVING OF TRUNNION ALLOWED | DRIVING OF TRUNNION NOT ALLOWED |
| | | 3 | NOT USED IN ORBITAL NAVIGATION LIST | |
| 2 | NOT USED | | | |
| 1 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 40B | FLAGWORD 1 NJETSFLG STIKFLAG ERADFLAG ENG2FLAG TARG1FLG TARG2FLG | BIT | SET | RESET |
| | | 15 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 14 | RHC CONTROL OF RCS | CMC CONTROL OF RCS |
| | | 13 | COMPUTE REARTH FISCHER ELLIPSOID | USE CONSTANT REARTH PAD RADIUS |
| | | 12 | NOT USED | |
| | | 11 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 10 | SIGHTING LM | NOT SIGHTING LM |
| | | 9 | SIGHTING LANDMARK | SIGHTING STAR |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---|------------------------|--|--|
| | | BIT | SET | RESET |
| 40B | FLAGWORD 1 R23FLG VEHUPFLG UPDATFLG IDLEFAIL TRACKFLG SLOPSW GUESSW AVEGFLAG | 9 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 8 | CSM STATE VECTOR BEING UPDATED | LM STATE VECTOR BEING UPDATED |
| | | 7 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 6 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 5 | TRACKING ALLOWED | TRACKING NOT ALLOWED |
| | | 4 | NOT USED | |
| | | 3 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 2 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 1 | AVERAGE G (SERVICER) TO CONTINUE | AVERAGE G (SERVICER) TO CEASE |
| | | 41A | FLAGWORD 2 DRIFTFLG R21MARK 22DSPFLG STERRSW CYCLESW IMPULSW XDELVFLG ETPIFLAG, OPTNSW FINALFLG AVFLAG PFRATFLG CALCMAN3 CALCMAN2 NODOFLAG | 15 |
| 14 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 13 | DISPLAY DR, DV | | | DO NOT DISPLAY DR, DV |
| 12 | NOT USED | | | |
| 11 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 10 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 9 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 8 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 7 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 6 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 5 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 4 | PREFERRED ATTITUDE COMPUTED | | | PREFERRED ATTITUDE NOT COMPUTED |
| 3 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 2 | NOT USED IN ORBITAL NAVIGATION LIST | | | |
| 1 | V37 NOT PERMITTED | | | V37 PERMITTED |
| 41B | FLAGWORD 3 GLOKFAIL REFSMFLG LUNAFLAG P22MKFLG VFLAG ONMONFLG PRECIFLG CULTFLAG ORBWFLAG STATEFLG INTYPFLG VINTFLAG D60R9FLG DIMOFLAG | 15 | NOT USED | |
| | | 14 | GIMBAL LOCK HAS OCCURRED | NOT IN GIMBAL LOCK |
| | | 13 | REFSMAT GOOD | REFSMAT NO GOOD |
| | | 12 | LUNAR LAT-LONG | EARTH LAT-LONG |
| | | 11 | P22 DOWNLINKED MARK DATA WAS JUST TAKEN | P22 DOWNLINKED MARK DATA NOT JUST TAKEN |
| | | 10 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 9 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 8 | CSMPREC OR LEMPREC CALLED | INTEGRV OR INTEGRVS CALLED |
| | | 7 | STAR OCCULTED | STAR NOT OCCULTED |
| | | 6 | W MATRIX VALID FOR ORBITAL INTEGRATION | W MATRIX INVALID FOR ORBITAL INTEGRATION |
| | | 5 | PERMANENT STATE VECTOR UPDATED | PERMANENT STATE VECTOR NOT UPDATED |
| | | 4 | CONIC INTEGRATION | ENCKE INTEGRATION |
| | | 3 | CSM STATE VECTOR BEING INTEGRATED | LM STATE VECTOR BEING INTEGRATED |
| | | 2 | DIMENSION OF W IS 9 FOR INTEGRATION | DIMENSION OF W IS 6 FOR INTEGRATION |
| | | 1 | W MATRIX IS TO BE USED | W MATRIX IS NOT TO BE USED |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------|------------------------|---|--|
| | | BIT | SET | RESET |
| 42A | FLAGWORD 4 | | | |
| | MRKIDFLG | 15 | MARK DISPLAY IN ENDIDLE | NO MARK DISPLAY IN ENDIDLE |
| | PRIODFLG | 14 | PRIORITY DISPLAY IN ENDIDLE | NO PRIORITY DISPLAY IN ENDIDLE |
| | NRMIDFLG | 13 | NORMAL DISPLAY IN ENDIDLE | NO NORMAL DISPLAY IN ENDIDLE |
| | PDSPFLAG | 12 | CAN NOT INTERRUPT PRIORITY DISPLAY | |
| | MWAITFLG | 11 | HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED |
| | NWAITFLG | 10 | HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED |
| | MRKNVFLG | 9 | ASTRONAUT USING KEYBOARD WHEN MARK DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN MARK DISPLAY INITIATED |
| | NRMNVFLG | 8 | ASTRONAUT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED |
| | PRONVFLG | 7 | ASTRONAUT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED |
| | PINBRFLG | 6 | ASTRONAUT HAS INTERFERED WITH EXISTING DISPLAY | ASTRONAUT HAS NOT INTERFERED WITH EXISTING DISPLAY |
| | MRUPTFLG | 5 | MARK DISPLAY INTERRUPTED BY PRIORITY DISPLAY | MARK DISPLAY NOT INTERRUPTED BY PRIORITY DISPLAY |
| | NRUPTFLG | 4 | NORMAL DISPLAY INTERRUPTED BY PRIORITY OR MARK DISPLAY | NORMAL DISPLAY NOT INTERRUPTED BY PRIORITY OR MARK DISPLAY |
| | MKOVFLAG | 3 | MARK DISPLAY OVER NORMAL | NO MARK DISPLAY OVER NORMAL |
| | | | 2 | NOT USED - SHOULD BE ZERO |
| | | 1 | MARK DISPLAY NOT TO BE INTERRUPTED | |
| 42B | FLAGWORD 5 | | | |
| | DSKYFLAG | 15 | DISPLAYS SENT TO DSKY | NO DISPLAYS TO DSKY |
| | | 14 | NOT USED | |
| | | 13 | NOT USED | |
| | V59FLAG | 12 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | INCORFLG | 11 | FIRST INCORPORATION | SECOND INCORPORATION |
| | PRFTRKAT | 10 | PREFERRED TRACKING ATTITUDE | +X AXIS TRACKING ATTITUDE |
| | DMENFLG | 9 | DIMENSION OF W IS 9 FOR INCORPORATION | DIMENSION OF W IS 6 FOR INCORPORATION |
| | COMPUTER | 8 | COMPUTER IS CMC | COMPUTER IS LGC |
| | ENGONFLG | 7 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | 3AXISFLG | 6 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | GRRBKFLG | 5 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | R60FLAG | 4 | R61 MUST USE R60 | NORMAL R61 |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|----------|--|-------------------------|--|--|-------------------------------------|
| 42B | FLAGWORD 5 SOLNSW MGLVFLAG RENDWFLG | BIT | SET | RESET | |
| | | 3 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 2 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 1 | W MATRIX VALID FOR RENDEZVOUS NAVIGATION | W MATRIX INVALID FOR RENDEZVOUS NAVIGATION | |
| 43A | FLAGWORD 6 DAPBIT1 ENTRYDSP CMDAPARM GAMDIFSW GONEPAST RELVELSW KNOWNFLG FIRSTPAS HIND INRLSW LATSW .05GSW CM/DSTBY GYMDIFSW | BIT | SET | RESET | |
| | | 15 | 0 } NO DAP OR 0 } ENTRY | 0 } CSM RCS 1 } DAP | 1 } TVC DAP 1 } SATURN DAP |
| | | 14 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 13 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 12 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 11 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 10 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 9 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 8 | LANDMARK KNOWN | LANDMARK UNKNOWN | |
| | | 7 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 6 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 5 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 4 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 3 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 2 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| 1 | NOT USED IN ORBITAL NAVIGATION LIST | | | | |
| 43B | FLAGWORD 7 TERMIFLG ITSWICH IGNFLAG ASTNFLAG TIMRFLAG NORMSW RVSW GONEBY IDLEFLAG V37FLAG NOUPFLAG UPLOCKFL VERIFLAG ATTCHFLG TFFSW | BIT | SET | RESET | |
| | | 15 | TERMINATE R21, R22 | | |
| | | 14 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 13 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 12 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 11 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 10 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 9 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 8 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 7 | NO DV MONITOR | CONNECT DV MONITOR | |
| | | 6 | AVERAGE G (SERVICER RUNNING) | AVERAGE G (SERVICER OFF) | |
| | | 5 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| | | 4 | K-KBAR-K FAIL | NO K-KBAR-K FAIL | |
| | | 3 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| 2 | NOT USED IN ORBITAL NAVIGATION LIST | | | | |
| 1 | NOT USED IN ORBITAL NAVIGATION LIST | | | | |
| 44A | FLAGWORD 8 RPQFLAG NEWIFLG CMOONFLG LMOONFLG ADVTRK P39/79 SW SURFFLAG | BIT | SET | RESET | |
| | | 15 | RPQ NOT COMPUTED | RPQ COMPUTED | |
| | | 14 | NOT USED | | |
| | | 13 | FIRST PASS THROUGH INTEGRATION | SUCCEEDING INTEGRATION OF INTEGRATION | |
| | | 12 | PERMANENT CSM STATE IN LUNAR SPHERE | PERMANENT CSM STATE IN EARTH SPHERE | |
| | | 11 | PERMANENT LM STATE IN LUNAR SPHERE | PERMANENT LM STATE IN EARTH SPHERE | |
| | | 10 | ADVANCE GROUND TRACK SIGHTING WANTED | NOT ADVANCED GROUND TRACK | |
| | | 9 | NOT USED IN ORBITAL NAVIGATION LIST | | |
| 8 | LM ON LUNAR SURFACE | LM NOT ON LUNAR SURFACE | | | |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|---|--|--|---|---|
| | | BIT | SET | RESET |
| 44A | FLAGWORD 8 INFINFLG ORDERSW APSESW COGAFLAG 360SW | 7 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 6 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 5 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 4 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 3 | NOT USED | |
| | | 2 | NOT USED | |
| | | 1 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | | | |
| 44B | FLAGWORD 9 SWTOVER V67FLAG V82EMFLG MAXDBFLG V94FLAG SAVECFLG VHFRFLAG SOURCFLG R22CAFLG N22ORN17 QUITFLAG R31FLAG MID1FLAG MIDAVFLG AVEMIDSW | 15 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 14 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 13 | MOON VICINITY | EARTH VICINITY |
| | | 12 | MAX DB SELECTED | MAX DB NOT SELECTED |
| | | 11 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 10 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 9 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 8 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 7 | NOT USED | |
| | | 6 | COMPUTE TOTAL ATTITUDE ERRORS WRT N22 (V62) | COMPUTE TOTAL ATTITUDE ERRORS WRT N17 (V63) |
| | | 5 | CAUSE INTEGRATION TO EXIT AT NEXT TIME STEP | ALLOW INTEGRATION TO CONTINUE |
| | | 4 | NOT USED IN ORBITAL NAVIGATION LIST | |
| | | 3 | INTEGRATE TO TDEC | INTEGRATE TO THE THEN-PRESENT TIME |
| | | 2 | INTEGRATION ENTERED FROM ONE OF MIDTOAV PORTALS | INTEGRATION WAS NOT ENTERED VIA MIDTOAV |
| | | 1 | AVETOMID CALLING FOR W MATRIX INTEGER DO NOT WRITE OVER RN, VN, PIPTIME | NO AVETOMID W INTEGER ALLOW SET UP OF RN, VN, PIPTIME |
| 45A 45B 46A 46B 47A 47B 48A 48B 49A 49B 50A | DSPTAB 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 R ₁ , R ₂ , AND R ₃ DISPLAYS | | |
| 50B | DSPTAB +11 | DISPLAY TABLE TO DSKY STATUS LIGHTS 60400g = PROGRAM CAUTION, 60200g = TRACKER WARNING 60020g = NO ATTITUDE, 60040g = GIMBAL LOCK | | |
| | | | | |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE |
|--|-------------------------------|---|
| 51A 51B | TIME2, TIME1 | COMPUTER CLOCK INDICATING ELAPSED TIME SINCE LIFTOFF |
| 52A 52B | LAT | LATITUDE OF LANDMARK |
| 53A 53B | LONG | LONGITUDE OF LANDMARK |
| 54A 54B | ALT | ALTITUDE OF LANDMARK |
| 55A 55B 56A 56B 57A 57B 58A 58B | SPARES | |
| 59A 59B 60A | CDUX CDUY CDUZ | SAME AS 9A SAME AS 9B SAME AS 10A |
| 60B | CDUT | SAME AS 10B |
| 61A 61B | ADOTX | SAME AS 11A, 11B |
| 62A 62B | ADOTY | SAME AS 12A, 12B |
| 63A 63B | ADOTZ | SAME AS 13A, 13B |
| 64A 64B 65A | AK AK1 AK2 | SAME AS 14A SAME AS 14B SAME AS 15A |
| 65B | RCSFLAGS | SAME AS 15B |
| 66A 66B 67A | THETADx THETADy THETADz | SAME AS 16A SAME AS 16B SAME AS 17A |
| 67B | DELCDUx | SAME AS 17B |
| 68A 68B | RSBBQ, +1 | VALUE OF BBANK AND Q REGISTERS AT THE TIME OF A RESTART |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---|--|-------------------------------------|---|
| 69A | CADRFLSH | VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED PRIORITY DISPLAY | | |
| 69B | CADRFLSH+1 | VALUE OF RETURN ADDRESS INFORMATION LAST REQUESTED MARK | | |
| 70A | CADRFLSH+2 | VALUE OF RETURN ADDRESS INFORMATION FOR LAST NORMAL DISPLAY REQUESTED | | |
| 70B | FAILREG | CONTAINS ALARM CODE OF FIRST ALARM RECEIVED | | |
| 71A | FAILREG+1 | CONTAINS ALARM CODE OF SECOND ALARM RECEIVED | | |
| 71B | FAILREG+2 | CONTAINS ALARM CODE OF THIRD ALARM RECEIVED | | |
| 72A | CDUS | SHAFT CDU INPUT COUNTER | | |
| 72B | PIPAX | X, Y, AND Z INPUT COUNTERS ZEROED AT THE START OF AVERAGE G AND ENTRY ROUTINES READ EVERY 2 SEC DURING AVERAGE G ROUTINE | | |
| 73A | PIPAY | | | |
| 73B | PIPAZ | | | |
| 74A | 8NN | NUMBER OF MARKS | | |
| 74B | S22LOC | ADDRESS OF MARK DATA REGISTER | | |
| 75A | FLAGWORD 10 INTFLBIT REINTFLG, REINTBIT | BIT | SET | RESET |
| | | 15 | NOT USED | |
| | | 14 | INTEGRATION IN PROGRESS | INTEGRATION IN PROGRESS |
| | | 13 | NOT USED | |
| | | 12 | NOT USED | |
| | | 11 | NOT USED | |
| | | 10 | NOT USED | |
| | | 9 | NOT USED | |
| | | 8 | NOT USED | |
| | | 7 | INTEGRATION ROUTINE TO BE RESTARTED | INTEGRATION ROUTINE NOT TO BE RESTARTED |
| | | 6 | NOT USED | |
| | | 5 | NOT USED | |
| | | 4 | NOT USED | |
| | | 3 | NOT USED | |
| | | 2 | NOT USED | |
| 1 | NOT USED | | | |
| 75B | FLAGWORD 11 | NOT USED | | |
| 76A | RLSx | X, Y, AND Z OF LUNAR LANDING SITE VECTOR | | |
| 76B | | | | |
| 77A | RLSy | | | |
| 77B | | | | |
| 78A | RLSz | | | |
| 78B | | | | |
| 79A | SPARES | | | |
| 79B | | | | |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | | | | | | | | | | | | | | | |
|----------|--|---|--|--|---------------------|-----------------|-----|----|--------------|-----|---|--------------|---|-----|---|------|---|----|---|
| | | BIT | SET | RESET | | | | | | | | | | | | | | | |
| 80A | OPTMODES | 15 | NOT ASSIGNED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 13 | NOT ASSIGNED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 11 | NOT ASSIGNED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 10 | INDICATES OPTICS HAS BEEN ZEROED SINCE LAST FRESH START | ALARM 1208 WILL BE GENERATED IF ATTEMPT IS MADE TO ZERO OPTICS | | | | | | | | | | | | | | | |
| | | 9 | OPTICS MODE SWITCH IN COMPUTER POSITION | RESET BY FRESH START OR MODE OTHER THAN CMC | | | | | | | | | | | | | | | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 7 | OPTICS CDU FAIL PRESENTLY | NO OPTICS CDU FAIL PRESENTLY | | | | | | | | | | | | | | | |
| | | 6 | NOT ASSIGNED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 5 | OPTICS MODE SWITCH NOT IN CMC POSITION | OPTICS MODE SWITCH IN CMC POSITION | | | | | | | | | | | | | | | |
| | | 4 | OPTICS ZERO SWITCH NOT IN ZERO POSITION (BIT 4 AND 5 = 1'S OPTICS IN MANUAL MODE) | OPTICS ZERO SWITCH IN ZERO POSITION | | | | | | | | | | | | | | | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 1 | NOT ASSIGNED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| 80B | 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 PERFORM ATTITUDE HOLD ABOUT EXISTING REFERENCE. IF <+0 AUTOMATIC STEERING IS TO BE PERFORMED. | | | | | | | | | | | | | | | | | |
| 81A | LEMMASS | MASS OF THE LM | | | | | | | | | | | | | | | | | |
| 81B | CSMMASS | MASS OF THE CSM | | | | | | | | | | | | | | | | | |
| 82A | DAPDATR1 LOADED WITH V48N46E | 15 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 14 | VEHICLE CONFIGURATION | | | | | | | | | | | | | | | | |
| | | 13 | <table style="display: inline-table; border: none;"> <tr> <td style="padding: 0 5px;">0</td><td style="padding: 0 5px;">NO</td><td style="padding: 0 5px;">0</td><td style="padding: 0 5px;">CM</td><td style="padding: 0 5px;">1</td><td style="padding: 0 5px;">CSM</td><td style="padding: 0 5px;">1</td><td rowspan="2" style="padding: 0 5px;">} SATURN DAP</td> </tr> <tr> <td style="padding: 0 5px;">0</td><td style="padding: 0 5px;">DAP</td><td style="padding: 0 5px;">1</td><td style="padding: 0 5px;">ONLY</td><td style="padding: 0 5px;">0</td><td style="padding: 0 5px;">LM</td><td style="padding: 0 5px;">1</td> </tr> </table> | | 0 | NO | 0 | CM | 1 | CSM | 1 | } SATURN DAP | 0 | DAP | 1 | ONLY | 0 | LM | 1 |
| | | 0 | NO | 0 | CM | 1 | CSM | 1 | } SATURN DAP | | | | | | | | | | |
| | | 0 | DAP | 1 | ONLY | 0 | LM | 1 | | | | | | | | | | | |
| | | 12 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 11 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 10 | X TRANSLATION USES | | 0 1 } USE AC AND BD | 0 1 } USE AC BD | | | | | | | | | | | | | |
| | | 9 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 8 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 6 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| | | 5 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | |
| 4 | ANGULAR DEADBAND FOR ATTITUDE HOLD AND AUTOMATIC MANEUVERS 0 - ±0.5° DEADBAND 1 - ±5.0° DEADBAND | | | | | | | | | | | | | | | | | | |
| 3 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | | | |
| 2 | SPECIFY MANEUVER RATE | | 0 } .05° / SEC | 0 } .2° / SEC | | | | | | | | | | | | | | | |
| 1 | | | 1 } .5° / SEC | 1 } 4.0° / SEC | | | | | | | | | | | | | | | |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | |
|-------------------|--|---|--|
| 82B | DAPDATR2 | BITS | |
| | | 15 | NOT USED - SHOULD BE ZERO |
| | | 14 | NOT USED - SHOULD BE ZERO |
| | | 13 | ROLL JET SELECTION 0 - USE QUAD AC FOR ROLL MANEUVERS 1 - USE QUAD BD FOR ROLL MANEUVERS |
| | | 12 | NOT USED - SHOULD BE ZERO |
| | | 11 | NOT USED - SHOULD BE ZERO |
| | | 10 | A QUAD FAIL 0 - QUAD A IS OK 1 - QUAD A FAILED |
| | | 9 | NOT USED - SHOULD BE ZERO |
| | | 8 | NOT USED - SHOULD BE ZERO |
| | | 7 | B QUAD FAIL 0 - QUAD B IS OK 1 - QUAD B FAILED |
| | | 6 | NOT USED - SHOULD BE ZERO |
| | | 5 | NOT USED - SHOULD BE ZERO |
| | | 4 | C QUAD FAIL 0 - QUAD C IS OK 1 - QUAD C FAILED |
| | | 3 | NOT USED - SHOULD BE ZERO |
| | | 2 | NOT USED - SHOULD BE ZERO |
| 1 | D QUAD FAIL 0 - QUAD D IS OK 1 - QUAD D FAILED | | |
| 83A 83B 84A | ERROR _X ERROR _Y ERROR _Z | INTERMEDIATE ATTITUDE ERRORS COMPUTED DURING CSM RCS DAP (DAP FOLLOWING ERRORS). ERRORS IN CONTROL COORDINATES AND ARE LOADED INTO AK'S FOR FDAI DISPLAY WHEN FWD0 BIT 9=0. | |
| 84B | THETAD _X | SAME AS 16A | |
| 85A 85B | WBODY | DESIRED BODY ROLL RATE ABOUT CONTROL AXIS | |
| 86A 86B | WBODY1 | DESIRED BODY PITCH RATE ABOUT CONTROL AXIS | |
| 87A 87B | WBODY2 | DESIRED BODY YAW RATE ABOUT CONTROL AXIS | |
| 88A | REDOCTR | INDICATES THE NUMBER OF RESTARTS WHICH HAVE OCCURRED SINCE LAST FRESH START | |
| 88B 89A 89B | THETAD THETAD+1 THETAD+2 | FINAL DESIRED X CDU ANGLE FINAL DESIRED Y CDU ANGLE FINAL DESIRED Z CDU ANGLE | |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------|------------------------|---|--|
| | | BIT | SET | RESET |
| 90A | IMODES30 | 15 | IMU TEMPERATURE OUT OF LIMITS | IMU TEMPERATURE WITHIN LIMITS |
| | | 14 | NO ISS TURN ON REQUEST PRESENT | ISS TURN ON REQUEST PRESENT |
| | | 13 | NO IMU FAIL | IMU FAIL HAS OCCURRED |
| | | 12 | NO ICDU FAIL | ICDU FAIL HAS OCCURRED |
| | | 11 | NO IMU CAGE COMMANDED | IMU CAGE HAS BEEN COMMANDED |
| | | 10 | NO PIPA FAIL | PIPA FAIL HAS OCCURRED |
| | | 9 | IMU NOT OPERATING | IMU OPERATING |
| | | 8 | USED IN IMU TURN-ON SEQUENCING MOST LIKELY ZERO | |
| | | 7 | SAME AS BIT 8 | |
| | | 6 | IMU INITIALIZATION BEING ACCOMPLISHED | IMU NOT IN INITIALIZATION |
| | | 5 | INHIBIT ALARM 212g IF PIPA FAIL OCCURS | DO NOT INHIBIT ALARM 212g IF PIPA FAIL OCCURS |
| | | 4 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF IMU FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF IMU FAIL OCCURS |
| | | 3 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF ICDU FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF ICDU FAIL OCCURS |
| | | 2 | TURN-ON DELAY FAILURE (ALARM 207g) | NO TURN-ON DELAY FAILURE |
| | | 1 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF A PIPA FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF A PIPA FAIL OCCURS |
| 90B | IMODES33 | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | | |
| | | 13 | PIPA FAIL HAS NOT OCCURRED | PIPA FAIL HAS OCCURRED |
| | | 12 | TELEMETRY DOWNLINK OK | TELEMETRY DOWNLINK IS TOO FAST |
| | | 11 | UPLINK IS OK | UPLINK IS TOO FAST |
| | | 10 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | IMU IN COARSE ALIGN OR ZEROING MODE | IMU NOT IN COARSE ALIGN OR ZEROING MODE |
| | | 5 | IMU IN ZEROING ROUTINE | IMU NOT IN ZEROING ROUTINE |
| | | 4 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | NOT USED | |
| | | 1 | LAMP TEST IN PROGRESS (V35) | LAMP TEST NOT IN PROGRESS |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------------------|------------------------|--|-------|
| | | BIT | SET | RESET |
| 91A | CHANNEL 11 | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 13 | SPS ENGINE ON COMMAND | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 10 | ERROR RESET KEYCODE RECEIVED FROM UPLINK OR DSKY | |
| | | 9 | INDICATES AVERAGE G ROUTINE IS RUNNING | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | OPERATOR ERROR HAS OCCURRED | |
| | | 6 | VERB-NOUN FLASHER ON | |
| | | 5 | KEY RELEASE LAMP ON | |
| | | 4 | IMU TEMPERATURE IS OUT OF LIMITS | |
| | | 3 | UPLINK ACTIVITY LAMP ON | |
| | | 2 | COMPUTER ACTIVITY LAMP ON | |
| 1 | ISS WARNING LAMP ON | | | |
| 91B | CHANNEL 12 | 15 | TURN-ON DELAY - COMPLETE | |
| | | 14 | S-IVB CUTOFF COMMAND | |
| | | 13 | S-IVB INJECTION SEQUENCING START | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | DISENGAGE OPTICS DAC | |
| | | 10 | ZERO OPTICS COMMAND | |
| | | 9 | S-IVB TAKEOVER ENABLE | |
| | | 8 | TVC ENABLE | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | IMU CDU ERROR COUNTER ENABLE | |
| | | 5 | IMU CDU ZERO COMMAND | |
| | | 4 | IMU COARSE ALIGN ENABLE | |
| | | 3 | STAR TRACKERS ON | |
| | | 2 | OPTICS CDU ERROR COUNTER ENABLE | |
| 1 | OPTICS CDU ZERO COMMAND | | | |
| 92A | CHANNEL 13 | 15 | T6RUPT ENABLE | |
| | | 14 | RESET TRAP 32 | |
| | | 13 | RESET TRAP 31-B | |
| | | 12 | RESET TRAP 31-A | |
| | | 11 | ENABLE STANDBY BUTTON | |
| | | 10 | LAMP TEST BEING PERFORMED | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |

ORBITAL NAVIGATION - Continued

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------------------------------|----------------------------------|--|--|
| | | BIT | SET | RESET |
| 92A | CHANNEL 13 | | | |
| | | 8 | BMAG OUTPUT ENABLE | |
| | | 7 | WORD ORDER CODE FOR WORDS 2-50, 52-100 | WORD ORDER CODE FOR WORDS 1 AND 51 |
| | | 6 | BLOCK UPLINK | |
| | | 5 | INHIBIT UPLINK, ENABLE CROSSLINK | |
| | | 4 | RANGE UNIT ACTIVITY | |
| | | 3 | RANGE UNIT SELECT a | |
| | | 2 | RANGE UNIT SELECT b | |
| | | 1 | RANGE UNIT SELECT c | |
| 92B | CHANNEL 14 | | | |
| | | 15 | XCDU DRIVE ENABLE | |
| | | 14 | YCDU DRIVE ENABLE | |
| | | 13 | ZCDU DRIVE ENABLE | |
| | | 12 | TRUNNION CDU DRIVE ENABLE | |
| | | 11 | SHAFT CDU DRIVE ENABLE | |
| | | 10 | GYRO TORQUING ENABLE | |
| | | 9 | NEGATIVE GYRO TORQUE | POSITIVE GYRO TORQUE |
| | | 8 | GYRO 0 } NO 0 } X 1 } Y 1 } Z | |
| | | 7 | SELECT 0 } GYRO 1 } GYRO 0 } GYRO 1 } GYRO | |
| | | 6 | GYRO PULSE TORQUE POWER SUPPLY ENABLED | |
| | | 5 | NOT USED - SHOULD BE ZERO | |
| | | 4 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | |
| 1 | NOT USED - SHOULD BE ZERO | | | |
| 93A | CHANNEL 30 | | | |
| | | 15 | IMU TEMPERATURE OUT OF LIMITS | IMU TEMPERATURE WITHIN LIMITS |
| | | 14 | ISS OFF | ISS ON OR COMMANDED ON |
| | | 13 | NO IMU FAIL | IMU FAILURE |
| | | 12 | NO ICDU FAIL | ICDU FAILURE |
| | | 11 | NO IMU CAGE COMMANDED | IMU CAGE COMMANDED |
| | | 10 | | LAUNCH VEHICLE GUIDANCE SWITCH IN CMC POSITION |
| | | 9 | IMU NOT OPERATING | IMU OPERATING |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NO OCDU FAIL | OCDU FAILURE |
| | | 6 | NOT USED | |
| | | 5 | LIFTOFF HAS NOT OCCURRED | LIFTOFF HAS OCCURRED |
| | | 4 | S-IVB ATTACHED | S-IVB SEPARATED |
| | | 3 | SPS NOT READY | SPS READY |
| | | 2 | CM/SM ATTACHED | CM/SM SEPARATED |
| 1 | ULLAGE THRUST NOT PRESENT FOR S-IVB | ULLAGE THRUST PRESENT FROM S-IVB | | |

ORBITAL NAVIGATION - Concluded

CSM 104

TRANSMITTED IN PROGRAM 22

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE |
|--|-------------|------------------------|
| 95A 95B 96A 96B 97A 97B 98A 98B 99A 99B 100A 100B | SPARES | |

ENTRY AND UPDATE

CSM 104

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|---|--|-----|-----|-------|----|---------------------------|--|----|-----------------------------|-------------------------|----|----------------------------|--|----|-----------------------------|--|----|---------------------------|--|----|-----------------|--|---|-----------------|--|
| 1A | LIST ID | (77776) ₈ INDICATES ENTRY AND UPDATE LIST BEING TRANSMITTED. | | | | | | | | | | | | | | | | | | | | | | | | |
| 1B | SYNC BITS | (77340) ₈ INDICATES DATA TO FOLLOW | | | | | | | | | | | | | | | | | | | | | | | | |
| 2A | R _X X COMPONENT OF VEHICLE POSITION VECTOR | CSM VEHICLE STATE VECTOR AND TIME | | | | | | | | | | | | | | | | | | | | | | | | |
| 2B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3A | R _Y Y COMPONENT OF VEHICLE POSITION VECTOR | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4A | R _Z Z COMPONENT OF VEHICLE POSITION VECTOR | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5A | V _X X COMPONENT OF VEHICLE VELOCITY VECTOR | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6A | V _Y Y COMPONENT OF VEHICLE VELOCITY VECTOR | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7A | V _Z Z COMPONENT OF VEHICLE VELOCITY VECTOR | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8A | T _{SV} TIME TAG FOR \bar{R} AND \bar{V} | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9A | CDUX | X, Y, AND Z CDU INPUT COUNTERS. READ THE IMU COUNTERS ZEROED DURING ZERO ENCODE MODE (IMODES 33 BIT 5 = 1) | | | | | | | | | | | | | | | | | | | | | | | | |
| 9B | CDUY | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10A | CDUZ | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10B | CDUT | TRUNNION CDU INPUT COUNTER | | | | | | | | | | | | | | | | | | | | | | | | |
| 11A | ADOTX | MEASURED BODY RATES ABOUT THE X, Y, AND Z CONTROL AXES ANY TIME THE RCS DAP IS ON | | | | | | | | | | | | | | | | | | | | | | | | |
| 11B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12A | ADOTY | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13A | ADOTZ | VEHICLE ATTITUDE ERRORS (RPY) SENT TO FDAI. DURING RCS DAP OPERATION EITHER TOTAL ATTITUDE OR DAP FOLLOWING ERROR IS DISPLAYED. (DET BY FLAGWORD 0 BIT 9) | | | | | | | | | | | | | | | | | | | | | | | | |
| 13B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14A | AK | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14B | AK2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15A | AK3 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15B | RCSFLAGS | <table border="1"> <thead> <tr> <th>BIT</th> <th>SET</th> <th>RESET</th> </tr> </thead> <tbody> <tr> <td>15</td> <td colspan="2">NOT USED - SHOULD BE ZERO</td> </tr> <tr> <td>14</td> <td>RATE FILTER NOT INITIALIZED</td> <td>RATE FILTER INITIALIZED</td> </tr> <tr> <td>13</td> <td>ROLL RATE DAMPING REQUIRED</td> <td></td> </tr> <tr> <td>12</td> <td>PITCH RATE DAMPING REQUIRED</td> <td></td> </tr> <tr> <td>11</td> <td>YAW RATE DAMPING REQUIRED</td> <td></td> </tr> <tr> <td>10</td> <td>-ROLL RHC INPUT</td> <td></td> </tr> <tr> <td>9</td> <td>+ROLL RHC INPUT</td> <td></td> </tr> </tbody> </table> | BIT | SET | RESET | 15 | NOT USED - SHOULD BE ZERO | | 14 | RATE FILTER NOT INITIALIZED | RATE FILTER INITIALIZED | 13 | ROLL RATE DAMPING REQUIRED | | 12 | PITCH RATE DAMPING REQUIRED | | 11 | YAW RATE DAMPING REQUIRED | | 10 | -ROLL RHC INPUT | | 9 | +ROLL RHC INPUT | |
| BIT | SET | RESET | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | RATE FILTER NOT INITIALIZED | RATE FILTER INITIALIZED | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | ROLL RATE DAMPING REQUIRED | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | PITCH RATE DAMPING REQUIRED | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | YAW RATE DAMPING REQUIRED | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | -ROLL RHC INPUT | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | +ROLL RHC INPUT | | | | | | | | | | | | | | | | | | | | | | | | | |

ENTRY AND UPDATE - Continued

CSM 104

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|--|--|--|---|------------------------------------|
| | | BIT | SET | RESET |
| 15B | RCSFLAGS | | | |
| | | 8 | -YAW RHC INPUT | |
| | | 7 | +YAW RHC INPUT | |
| | | 6 | -PITCH RHC INPUT | |
| | | 5 | +PITCH RHC INPUT | |
| | | 4 | COMPUTE AK'S (ATTITUDE ERRORS) | PERFORM NEEDLER TO DISPLAY AK'S |
| | | 3 | 0 } 3RD PASS 0 } 2ND PASS 1 } INITIAL PASS } THROUGH } THROUGH } THROUGH | |
| | | 2 | 0 } NEEDLER 1 } NEEDLER 1 } NEEDLER | |
| 1 | | INITIALIZE T6 PROGRAM | | |
| 16A 16B 17A | THETADX THETADY THETADZ | X, Y, AND Z REFERENCE CDU ANGLES FOR THE ATTITUDE HOLD ROUTINE. INTERMEDIATE DESIRED CDU ANGLES FOR AUTO MANEUVER ROUTINE. | | |
| 17B | DELCDUX | MOST SIGNIFICANT HALF OF X INCREMENTAL GIMBAL ANGLE USED IN AUTOMATIC MANEUVERS | | |
| 18A | CMDAPMOD | ENTRY DAP MODE CONTROL USED TO CONTROL BRANCHING IN ENTRY DAP | | |
| 18B | PREL | ROLL ANGULAR BODY RATE DURING ENTRY | | |
| 19A | QREL | PITCH ANGULAR BODY RATE DURING ENTRY | | |
| 19B | RREL | YAW ANGULAR BODY RATE DURING ENTRY | | |
| 20A 20B | L/D1 | DESIRED LIFT TO DRAG RATIO | | |
| 21A 21B 22A 22B 23A 23B 24A 24B 25A 25B 26A 26B 27A 27B 28A 28B 29A 29B 30A 30B | UPBUFF 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 LOCATION BUFFER USED TO CONTAIN UPLINKED WORDS AS THEY ARE COMPLETED DURING P27 | | |
| 31A | COMPNUMB | USED IN P27 TO INDICATE THE TOTAL NUMBER OF UPLINK WORDS TO BE RECEIVED | | |

ENTRY AND UPDATE - Continued

CSM 104

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|------------|-------------|---|---|---|
| 31B | UPOLDMOD | INDICATES THE MAJOR MODE INTERRUPTED BY P27 | | |
| 32A | UPVERB | CONTAINS INFORMATION WHICH INDICATES WHICH VERB INITIATED P27 | | |
| 32B | UPCOUNT | INDICATES THE TOTAL NUMBER OF WORDS RECEIVED BY P27 | | |
| 33A | PAXERRI | ROLL ERROR FOR ENTRY DAP | | |
| 33B | ROLLTM | VALUE OF ROLL ANGLE FOR ENTRY DAP | | |
| 34A 34B | LATANG | LATERAL RANGE | | |
| 35A 35B | RDOT | ATTITUDE RATE | | |
| 36A 36B | THETAH | DESIRED RANGE | | |
| 37A 37B | LAT(SPL) | LATITUDE OF THE SPLASHDOWN SITE | | |
| 38A 38B | LNG(SPL) | LONGITUDE OF THE SPLASHDOWN SITE | | |
| 39A | ALFA/180 | PITCH ATTITUDE ANGLE | | |
| 39B | BETA/180 | YAW ATTITUDE ANGLE | | |
| 40A | FLAGWORD 0 | BIT | SET | RESET |
| | CPHIFLAG | 15 | OUTPUT OF CALCGA IS CPHIX | OUTPUT OF CALCGA IS THETAH |
| | JSWITCH | 14 | INTEGRATION OF W MATRIX | INTEGRATION OF STATE VECTOR |
| | MIDFLAG | 13 | INTEGRATION WITH SOLAR PERTURBATIONS | INTEGRATION WITHOUT SOLAR PERTURBATIONS |
| | MOONFLAG | 12 | MOON IS SPHERE OF INFLUENCE | EARTH IS SPHERE OF INFLUENCE |
| | NORFHOR | 11 | NOT USED IN ENTRY AND UPDATE LIST | |
| | ZMEASURE | 10 | NOT USED IN ENTRY AND UPDATE LIST | |
| | NEEDLFLG | 9 | TOTAL ATTITUDE ERROR DISPLAYED | A/P FOLLOWING ERROR DISPLAYED |
| | IMUSE | 8 | IMU IN USE | IMU NOT IN USE |
| | RNDVZFLG | 7 | NOT USED IN ENTRY AND UPDATE LIST | |
| | R53FLAG | 6 | NOT USED IN ENTRY AND UPDATE LIST | |
| | F2RTE | 5 | NOT USED IN ENTRY AND UPDATE LIST | |
| | TRUNFLAG | 4 | NOT USED IN ENTRY AND UPDATE LIST | |
| | FREEFLAG | 3 | USED TO CONTROL INTERNAL SUBROUTINE PERFORMANCE | |
| | B29FLAG | 2 | NOT USED | |
| | KFLAG | 1 | NOT USED IN ENTRY AND UPDATE LIST | |

ENTRY AND UPDATE - Continued

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---|------------------------|--|--|
| | | BIT | SET | RESET |
| 40B | FLAGWORD 1 NJETSFLG STIKFLAG ERADFLAG ENG2FLAG TARG1FLG TARG2FLG R23FLG VEHUPFLG UPDATFLG IDLEFAIL TRACKFLG SLOPESW GUESSW AVEGFLAG | 15 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 14 | RHC CONTROL OF RCS | CMC CONTROL OF RCS |
| | | 13 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 12 | NOT USED | |
| | | 11 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 10 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 9 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 9 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 8 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 7 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 6 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 5 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 4 | NOT USED | |
| | | 3 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 2 | NOT USED IN ENTRY AND UPDATE LIST | |
| 1 | NOT USED IN ENTRY AND UPDATE LIST | | | |
| 41A | FLAGWORD 2 DRIFTFLG R21MARK 22DSPFLG STERRSW CYCLESW IMPULSW XDELVFLG ETPIFLAG OPTNSW FINALFLG AVFLAG PFRATFLG CALCMAN3 CALCMAN2 NODOFLAG | 15 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 14 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 13 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 12 | NOT USED | |
| | | 11 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 10 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 9 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 8 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 7 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 7 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 6 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 5 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 4 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 3 | NOT USED | |
| | | 2 | NOT USED IN ENTRY AND UPDATE LIST | |
| 1 | V37 NOT PERMITTED | V37 PERMITTED | | |
| 41B | FLAGWORD 3 GLOKFAIL REFSMFLG LUNAFLAG P22MKFLG VFLAG ONMONFLG PRECIFLG CULTFLAG ORBWFLAG STATEFLG INTYPFLG VINTFLAG D6OR9FLG DIMOFLAG | 15 | NOT USED | |
| | | 14 | GIMBAL LOCK HAS OCCURRED | NOT IN GIMBAL LOCK |
| | | 13 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 12 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 11 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 10 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 9 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 8 | CSMPREC OR LEMPREC CALLED | INTEGRV OR INTEGRVS CALLED |
| | | 7 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 6 | W MATRIX VALID FOR ORBITAL INTEGRATION | W MATRIX INVALID FOR ORBITAL INTEGRATION |
| | | 5 | PERMANENT STATE VECTOR UPDATED | PERMANENT STATE VECTOR NOT UPDATED |
| | | 4 | CONIC INTEGRATION | ENCKE INTEGRATION |
| | | 3 | CSM STATE VECTOR BEING INTEGRATED | LM STATE VECTOR BEING INTEGRATED |
| | | 2 | DIMENSION OF W IS 9 FOR INTEGRATION | DIMENSION OF W IS 6 FOR INTEGRATION |
| | | 1 | W MATRIX IS TO BE USED | W MATRIX IS NOT TO BE USED |

ENTRY AND UPDATE - Continued

CSM 104

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------|-----------------------------------|---|--|
| | | BIT | SET | RESET |
| 42A | FLAGWORD 4 | | | |
| | MRKIDFLG | 15 | MARK DISPLAY IN ENDIDLE | NO MARK DISPLAY IN ENDIDLE |
| | PRIODFLG | 14 | PRIORITY DISPLAY IN ENDIDLE | NO PRIORITY DISPLAY IN ENDIDLE |
| | NRMIDFLG | 13 | NORMAL DISPLAY IN ENDIDLE | NO NORMAL DISPLAY IN ENDIDLE |
| | PDSPFLAG | 12 | CAN NOT INTERRUPT PRIORITY DISPLAY | |
| | MWAITFLG | 11 | HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED |
| | NWAITFLG | 10 | HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED | NO HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED |
| | MRKNVFLG | 9 | ASTRONAUT USING KEYBOARD WHEN MARK DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN MARK DISPLAY INITIATED |
| | NRMNVFLG | 8 | ASTRONAUT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED |
| | PRONVFLG | 7 | ASTRONAUT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED | ASTRONAUT NOT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED |
| | PINBRFLG | 6 | ASTRONAUT HAS INTERFERED WITH EXISTING DISPLAY | ASTRONAUT HAS NOT INTERFERED WITH EXISTING DISPLAY |
| | MRUPTFLG | 5 | MARK DISPLAY INTERRUPTED BY PRIORITY DISPLAY | MARK DISPLAY NOT INTERRUPTED BY PRIORITY DISPLAY |
| | NRUPTFLG | 4 | NORMAL DISPLAY INTERRUPTED BY PRIORITY OR MARK DISPLAY | NORMAL DISPLAY NOT INTERRUPTED BY PRIORITY OR MARK DISPLAY |
| | MKOVFLAG | 3 | MARK DISPLAY OVER NORMAL | NO MARK DISPLAY OVER NORMAL |
| | | | 2 | NOT USED |
| | | 1 | MARK DISPLAY NOT TO BE INTERRUPTED | |
| 42B | FLAGWORD 5 | | | |
| | DSKYFLAG | 15 | DISPLAYS SENT TO DSKY | NO DISPLAYS TO DSKY |
| | | 14 | NOT USED | |
| | | 13 | NOT USED | |
| | V59FLAG | 12 | NOT USED IN ENTRY AND UPDATE LIST | |
| | INCORFLG | 11 | NOT USED IN ENTRY AND UPDATE LIST | |
| | PRFTRKAT | 10 | NOT USED IN ENTRY AND UPDATE LIST | |
| | DMENFLG | 9 | NOT USED IN ENTRY AND UPDATE LIST | |
| | COMPUTER | 8 | COMPUTER IS CMC | COMPUTER IS LGC |
| | ENGONFLG | 7 | NOT USED IN ENTRY AND UPDATE LIST | |
| | 3AXISFLG | 6 | NOT USED IN ENTRY AND UPDATE LIST | |
| | GRRBKFLG | 5 | NOT USED IN ENTRY AND UPDATE LIST | |
| | R60FLAG | 4 | NOT USED IN ENTRY AND UPDATE LIST | |
| | SOLNSW | 3 | NOT USED IN ENTRY AND UPDATE LIST | |
| | MGLVFLAG | 2 | NOT USED IN ENTRY AND UPDATE LIST | |
| RENDWFLG | 1 | NOT USED IN ENTRY AND UPDATE LIST | | |

ENTRY AND UPDATE - Continued

CSM 104

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|--------------------|--|---|---|
| | | BIT | SET | RESET |
| 43A | FLAGWORD 6 | | | |
| | DAPBIT1 | 15 | 0 } NO DAP 0 } CSM OR RCS | 1 } TVC 1 } SATURN DAP 1 } DAP |
| | | 14 | 0 } ENTRY 1 } DAP | |
| | STRULLSW | 13 | DO STEERULL | DO ULLAGE ONLY |
| | ENTRYDSP | 13 | DO ENTRY DISPLAY VIA ENTRYVN | OMIT ENTRY DISPLAY |
| | CMDAPARM | 12 | ALLOW ENTRY FIRINGS AND CALCULATIONS | INHIBIT ENTRY FIRINGS AND CONTROL FUNCTIONS |
| | GAMDIFSW | 11 | CALCULATE GAMDOT | GAMDOT NOT TO BE CALCULATED |
| | GONEPAST | 10 | LATERAL CONTROL CALCULATIONS TO BE OMITTED | LATERAL CONTROL CALCULATIONS TO BE DONE |
| | RELVELSW | 9 | TARGETING USES EARTH VELOCITY | TARGETING USES INERTIAL VELOCITY |
| | EGSW | 8 | IN FINAL PHASE | NOT IN FINAL PHASE |
| | FIRSTPAS | 7 | NOT FIRST TIME IN HUNTEST | FIRST TIME IN HUNTEST |
| | HIND | 6 | INTEGRATING HUNTEST CALCULATIONS TO BE DONE AFTER RANGE PREDICTION | INTEGRATING OF HUNTEST CALCULATIONS TO BE OMITTED AFTER RANGE PREDICTION |
| | INRLSW | 5 | INITIAL ROLL V (LV) ATTITUDE NOT HELD | INITIAL ROLL V (LV) ATTITUDE HELD |
| | LATSW | 4 | DOWNLIFT NOT INHIBITED | DOWNLIFT INHIBITED |
| | .05GSW CM/DSTBY | 3 | DRAG OVER .05G | DRAG LESS THAN .05G |
| | | 2 | ENTRY DAP ACTIVATED | ENTRY DAP NOT ACTIVATED |
| GYMDIFSW | 1 | CDU DIFFERENCES AND BODY RATES COMPUTED | CDU DIFFERENCES AND BODY RATES NOT COMPUTED | |
| | | | | |
| 43B | FLAGWORD 7 | | | |
| | TERMIFLG | 15 | NOT USED IN ENTRY AND UPDATE LIST | |
| | ITSWICH | 14 | NOT USED IN ENTRY AND UPDATE LIST | |
| | IGNFLAG | 13 | NOT USED IN ENTRY AND UPDATE LIST | |
| | ASTNFLAG | 12 | NOT USED IN ENTRY AND UPDATE LIST | |
| | TIMRFLAG | 11 | NOT USED IN ENTRY AND UPDATE LIST | |
| | NORMSW | 10 | UNIT NORMAL COMPUTED | UNIT NORMAL NOT COMPUTED |
| | RVSW | 9 | NOT USED IN ENTRY AND UPDATE LIST | |
| | GONEBY | 8 | PASSED TARGET | APPROACHING TARGET |
| | IDLEFLAG | 7 | NO DV MONITOR | CONNECT DV MONITOR |
| | V37FLAG | 6 | AVERAGE G (SERVICER) RUNNING | AVERAGE G (SERVICER) OFF |
| | NOUPFLAG | 5 | NOT USED IN ENTRY AND UPDATE LIST | |
| | UPLOCKFL | 4 | K-KBAR-K FAIL | NO K-KBAR-K FAIL |
| | VERIFLAG | 3 | CHANGED WHEN VERB 33 OCCURS AT END OF P27 | |
| | ATTCHFLG | 2 | NOT USED IN ENTRY AND UPDATE LIST | |
| | TFFSW | 1 | CALCULATE TPERIGEE | CALCULATE TFF |

ENTRY AND UPDATE - Continued

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|--|---|---|---|
| | | BIT | SET | RESET |
| 44A | FLAGWORD 8 RPQFLAG NEWIFLG CMOONFLG LMOONFLG ADVTRK P39/79 SW SURFFLAG INFINFLG ORDERSW APSESW COGAFLAG 360SW | 15 | RPQ NOT COMPUTED | RPQ COMPUTED |
| | | 14 | NOT USED | |
| | | 13 | FIRST PASS THROUGH INTEGRATION | SUCCESSING INTEGRATION OF INTEGRATION |
| | | 12 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 11 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 10 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 9 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 8 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 7 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 6 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 5 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 4 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 3 | NOT USED | |
| | | 2 | NOT USED | |
| 1 | NOT USED IN ENTRY AND UPDATE LIST | | | |
| 44B | FLAGWORD 9 SWTOVER V67FLAG V82EMFLG MAXDBFLG V94FLAG SAVECFLG VHFRFLAG SOURCFLG R22CAFLG N22ORN17 QUITFLAG R31FLAG MID1FLAG MIDAVFLG AVEMIDSW | 15 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 14 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 13 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 12 | MAX DB SELECTED | MAX DB NOT SELECTED |
| | | 11 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 10 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 9 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 8 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 7 | NOT USED | |
| | | 6 | COMPUTE TOTAL ATTITUDE ERRORS WRT N22 (V62) | COMPUTE TOTAL ATTITUDE ERRORS WRT N17 (V63) |
| | | 5 | CAUSE INTEGRATION TO EXIT AT NEXT TIME STEP | ALLOW INTEGRATION TO CONTINUE |
| | | 4 | NOT USED IN ENTRY AND UPDATE LIST | |
| | | 3 | INTEGRATE TO TDEC | INTEGRATE TO THE THEN-PRESENT TIME |
| | | 2 | INTEGRATION ENTERED FROM ONE OF MIDTOAV PORTALS | INTEGRATION WAS NOT ENTERED VIA MIDTOAV |
| 1 | AVETOMID CALLING FOR W MATRIX INTEGER DO NOT WRITE OVER RN, VN, PIPTIME | NO AVETOMID W INTEGER ALLOW SET UP OF RN, VN, PIPTIME | | |
| 45A | DSPTAB | DISPLAY TABLE CODES FOR GENERATION OF DSKY NUMBERS | | |
| 45B | DSPTAB+1 | USED TO INDICATE VERB-NOUN MAJOR MODE AND R1, R2, AND R3 DSIPLAYS | | |
| 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 | | | |
| 50B | DSPTAB+11 | DISPLAY TABLE OF DSKY STATUS LIGHTS 60400g = PROGRAM CAUTION, 60200g = TRACKER WARNING 60020g = NO ATTITUDE, 60040g = GIMBAL LOCK | | |

ENTRY AND UPDATE - Continued
 TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE |
|-------------------|----------------------------|--|
| 51A 51B | TIME2, TIME1 | COMPUTER CLOCK INDICATING ELAPSED TIME SINCE LIFTOFF |
| 52A 52B | PIPTIME | THE TIME AT WHICH PIPA'S WERE LAST READ |
| 53A 53B | DELVX | X, Y, AND Z PIPA 2 SECOND VALUES CORRECTED FOR SCALE FACTOR ERROR AND BIAS. UPDATED EVERY 2 SEC DURING AVERAGE G ROUTINE. |
| 54A 54B | DELVY | |
| 55A 55B | DELVZ | |
| 56A 56B | TTE | TIME TO ARRIVAL AT EMS INTERFACE ALTITUDE |
| 57A 57B | VIO | PREDICTED VELOCITY AT EMS INTERFACE ALTITUDE |
| 58A 58B | VPRED | PREDICTED VELOCITY AT ALTITUDE OF 400,000 FEET ABOVE FISCHER RADIUS |
| 59A 59B 60A | CDUX CDUY CDUZ | SAME AS 9A SAME AS 9B SAME AS 10A |
| 60B | CDUT | SAME AS 10B |
| 61A 61B | ADOTX | SAME AS 11A, 11B SAME AS 12A, 12B SAME AS 13A, 13B |
| 62A 62B | ADOTY | |
| 63A 63B | ADOTZ | |
| 64A 64B 65A | AK AK1 AK2 | SAME AS 14A SAME AS 14B SAME AS 15A |
| 65B | RCSFLAGS | SAME AS 15B |
| 66A 66B 67A | 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 DISPLAY WHEN FWO BIT 9=0. |

ENTRY AND UPDATE - Continued

CSM 104

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|------|--|----|---------------------------|----|--|----|---------------------------------------|----|---------------------------|----|---------------------------|----|--|---|---------------------------|---|---------------------------|---|--|---|---------------------------|---|---------------------------|---|---|
| 67B 68A 68B | THETADX THETADY THETADZ | SAME AS 16A SAME AS 16B SAME AS 17A | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 69A | CMDAPMOD | SAME AS 18A | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 69B 70A 70B | PREL QREL RREL | SAME AS 18B SAME AS 19A SAME AS 19B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71A 71B 72A 72B 73A 73B 74A 74B 75A 75B 76A 76B 77A 77B 78A 78B 79A 79B 80A 80B | UPBUFF 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 21A THROUGH 30B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 81A 81B | LEMMASS CSMASS | MASS OF THE LM MASS OF THE CSM | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 82A | DAPDTR1 LOADED WITH V48N46E | <table border="1"> <thead> <tr> <th colspan="2">BITS</th> </tr> </thead> <tbody> <tr> <td>15</td> <td>NOT USED - SHOULD BE ZERO</td> </tr> <tr> <td>14</td> <td>0\NO 0\LM 1\LM 1\SATURN</td> </tr> <tr> <td>13</td> <td>0\DAP 1\OFF 0\ON 1\DAP</td> </tr> <tr> <td>12</td> <td>NOT USED - SHOULD BE ZERO</td> </tr> <tr> <td>11</td> <td>NOT USED - SHOULD BE ZERO</td> </tr> <tr> <td>10</td> <td>X TRANSLATIONS USING QUADS AC 0 - DO NOT USE QUADS AC 1 - USE QUADS AC</td> </tr> <tr> <td>9</td> <td>NOT USED - SHOULD BE ZERO</td> </tr> <tr> <td>8</td> <td>NOT USED - SHOULD BE ZERO</td> </tr> <tr> <td>7</td> <td>X TRANSLATIONS USING QUADS BD 0 - DO NOT USE QUADS BD 1 - USE QUADS BD</td> </tr> <tr> <td>6</td> <td>NOT USED - SHOULD BE ZERO</td> </tr> <tr> <td>5</td> <td>NOT USED - SHOULD BE ZERO</td> </tr> <tr> <td>4</td> <td>ANGULAR DEADBAND FOR ATTITUDE HOLD AND AUTOMATIC MANEUVERS 0 - ±0.5° DEADBAND 1 - ±5.0° DEADBAND</td> </tr> </tbody> </table> | BITS | | 15 | NOT USED - SHOULD BE ZERO | 14 | 0\NO 0\LM 1\LM 1\SATURN | 13 | 0\DAP 1\OFF 0\ON 1\DAP | 12 | NOT USED - SHOULD BE ZERO | 11 | NOT USED - SHOULD BE ZERO | 10 | X TRANSLATIONS USING QUADS AC 0 - DO NOT USE QUADS AC 1 - USE QUADS AC | 9 | NOT USED - SHOULD BE ZERO | 8 | NOT USED - SHOULD BE ZERO | 7 | X TRANSLATIONS USING QUADS BD 0 - DO NOT USE QUADS BD 1 - USE QUADS BD | 6 | NOT USED - SHOULD BE ZERO | 5 | NOT USED - SHOULD BE ZERO | 4 | ANGULAR DEADBAND FOR ATTITUDE HOLD AND AUTOMATIC MANEUVERS 0 - ±0.5° DEADBAND 1 - ±5.0° DEADBAND |
| BITS | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | 0\NO 0\LM 1\LM 1\SATURN | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | 0\DAP 1\OFF 0\ON 1\DAP | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | X TRANSLATIONS USING QUADS AC 0 - DO NOT USE QUADS AC 1 - USE QUADS AC | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | X TRANSLATIONS USING QUADS BD 0 - DO NOT USE QUADS BD 1 - USE QUADS BD | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | NOT USED - SHOULD BE ZERO | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | ANGULAR DEADBAND FOR ATTITUDE HOLD AND AUTOMATIC MANEUVERS 0 - ±0.5° DEADBAND 1 - ±5.0° DEADBAND | | | | | | | | | | | | | | | | | | | | | | | | | | | |

ENTRY AND UPDATE - Continued

CSM 104

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | | |
|-------------------|--------------------------------|---|---|--|--|
| | | BIT | SET | RESET | |
| 84A | OPTMODES | 3 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | | |
| | | 1 | NOT ASSIGNED - SHOULD BE ZERO | | |
| 84B | 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 PERFORM ATTITUDE HOLD ABOUT EXISTING REFERENCE. IF <+0 AUTOMATIC STEERING IS TO BE PERFORMED. | | | |
| 85A 85B | WBODY | DESIRED BODY ROLL RATE ABOUT CONTROL AXIS | | | |
| 86A 86B | WBODY1 | DESIRED BODY PITCH RATE ABOUT CONTROL AXIS | | | |
| 87A 87B | WBODY2 | DESIRED BODY YAW RATE ABOUT CONTROL AXIS | | | |
| 88A | REDOCTR | INDICATES THE NUMBER OF RESTARTS WHICH HAVE OCCURRED SINCE LAST FRESH START | | | |
| 88B 89A 89B | THETAD THETAD+1 THETAD+2 | FINAL DESIRED X CDU ANGLE FINAL DESIRED Y CDU ANGLE FINAL DESIRED Z CDU ANGLE | | | |
| 90A | IMODES30 | 15 | IMU TEMPERATURE OUT OF LIMITS | IMU TEMPERATURE WITHIN LIMITS | |
| | | 14 | NO ISS TURN ON REQUEST PRESENT | ISS TURN ON REQUEST PRESENT | |
| | | 13 | NO IMU FAIL | IMU FAIL HAS OCCURRED | |
| | | 12 | NO ICPU FAIL | ICPU FAIL HAS OCCURRED | |
| | | 11 | NO IMU CAGE COMMANDED | IMU CAGE HAS BEEN COMMANDED | |
| | | 10 | NO PIPA FAIL | PIPA FAIL HAS OCCURRED | |
| | | 9 | IMU NOT OPERATING | IMU OPERATING | |
| | | 8 | USED IN IMU TURN-ON SEQUENCING MOST LIKELY ZERO | | |
| | | 7 | SAME AS BIT 8 | | |
| | | 6 | IMU INITIALIZATION BEING ACCOMPLISHED | IMU NOT IN INITIALIZATION | |
| | | 5 | INHIBIT ALARM 2128 IF PIPA FAIL OCCURS | DO NOT INHIBIT ALARM 2128 IF PIPA FAIL OCCURS | |
| | | 4 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF IMU FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF IMU FAIL OCCURS | |
| | | 3 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF ICPU FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF ICPU FAIL OCCURS | |

ENTRY AND UPDATE - Continued

CSM 104

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-----------------------------|---------------------------|---|--|
| 90A | IMODES30 | BIT | SET | RESET |
| | | 2 | TURN-ON DELAY FAILURE (ALARM 2078) | NO TURN-ON DELAY FAILURE |
| | | 1 | INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF A PIPA FAIL OCCURS | DO NOT INHIBIT ISS WARNING LAMP FROM BEING TURNED ON IF A PIPA FAIL OCCURS |
| 90B | IMODES33 | BIT | SET | RESET |
| | | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 13 | PIPA FAIL HAS NOT OCCURRED | PIPA FAIL HAS OCCURRED |
| | | 12 | TELEMETRY DOWNLINK OK | TELEMETRY DOWNLINK IS TOO FAST |
| | | 11 | UPLINK IS OK | UPLINK IS TOO FAST |
| | | 10 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | IMU IN COARSE ALIGN OR ZEROING MODE | IMU NOT IN COARSE ALIGN OR ZEROING MODE |
| | | 5 | IMU IN ZEROING ROUTINE | IMU NOT IN ZEROING ROUTINE |
| | | 4 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| 2 | NOT USED | | | |
| 1 | LAMP TEST IN PROGRESS (V35) | LAMP TEST NOT IN PROGRESS | | |
| 91A | CHANNEL 11 | BIT | SET | RESET |
| | | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 13 | SPS ENGINE ON COMMAND | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 10 | ERROR RESET KEYCODE RECEIVED FROM UPLINK OR DSKY | |
| | | 9 | INDICATES AVERAGE G ROUTINE IS RUNNING | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | OPERATOR ERROR HAS OCCURRED | |
| | | 6 | VERB-NOUN FLASHER ON | |
| | | 5 | KEY RELEASE LAMP ON | |
| | | 4 | IMU TEMPERATURE IS OUT OF LIMITS | |
| 3 | UPLINK ACTIVITY LAMP ON | | | |
| 2 | COMPUTER ACTIVITY LAMP ON | | | |
| 1 | ISS WARNING LAMP ON | | | |

ENTRY AND UPDATE - Continued

CSM 104

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|---------------------|------------------------|--|------------------------------------|
| | | BIT | SET | RESET |
| 91B | CHANNEL 12 | | | |
| | | 15 | TURN-ON DELAY - COMPLETE | |
| | | 14 | S-IVB CUTOFF COMMAND | |
| | | 13 | S-IVB INJECTION SEQUENCING START | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | DISENGAGE OPTICS DAC | |
| | | 10 | ZERO OPTICS COMMAND | |
| | | 9 | S-IVB TAKEOVER ENABLE | |
| | | 8 | TVC ENABLE | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | IMU CDU ERROR COUNTER ENABLE | |
| | | 5 | IMU CDU ZERO COMMAND | |
| | | 4 | IMU COARSE ALIGN ENABLE | |
| | | 3 | STAR TRACKERS ON | |
| | | 2 | OPTICS CDU ERROR COUNTER ENABLE | |
| | | 1 | OPTICS CDU ZERO COMMAND | |
| 92A | CHANNEL 13 | | | |
| | | 15 | T6RUPT ENABLE | |
| | | 14 | RESET TRAP 32 | |
| | | 13 | RESET TRAP 31-B | |
| | | 12 | RESET TRAP 31-A | |
| | | 11 | ENABLE STANDBY BUTTON | |
| | | 10 | LAMP TEST BEING PERFORMED | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | BMAG OUTPUT ENABLE | |
| | | 7 | WORD ORDER CODE FOR WORDS 2-50, 52-100 | WORD ORDER CODE FOR WORDS 1 AND 51 |
| | | 6 | BLOCK UPLINK | |
| | | 5 | INHIBIT UPLINK, ENABLE CROSSLINK | |
| | | 4 | RANGE UNIT ACTIVITY | |
| | | 3 | RANGE UNIT SELECT a | |
| 2 | RANGE UNIT SELECT b | | | |
| 1 | RANGE UNIT SELECT c | | | |
| 92B | CHANNEL 14 | | | |
| | | 15 | XCDU DRIVE ENABLE | |
| | | 14 | YCDU DRIVE ENABLE | |
| | | 13 | ZCDU DRIVE ENABLE | |
| | | 12 | TRUNNION CDU DRIVE ENABLE | |
| | | 11 | SHAFT CDU DRIVE ENABLE | |
| | | 10 | GYRO TORQUING ENABLE | |
| | | 9 | NEGATIVE GYRO TORQUE | POSITIVE GYRO TORQUE |
| | | 8 | GYRO 0 NO 0 X 1 Y 1 Z | |
| | | 7 | SELECT 0 GYRO 1 GYRO 0 GYRO 1 GYRO | |
| | | 6 | GYRO PULSE TORQUE POWER SUPPLY ENABLED | |

ENTRY AND UPDATE - Continued

CSM 104

TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|-------------|------------------------|---------------------------------------|---|
| | | BIT | SET | RESET |
| 92B | CHANNEL 14 | 5 | NOT USED - SHOULD BE ZERO | |
| | | 4 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 1 | NOT USED - SHOULD BE ZERO | |
| | | | | |
| 93A | CHANNEL 30 | 15 | IMU TEMPERATURE OUT OF LIMITS | IMU TEMPERATURE WITHIN LIMITS |
| | | 14 | ISS OFF | ISS ON OR COMMANDED ON |
| | | 13 | NO IMU FAIL | IMU FAILURE |
| | | 12 | NO ICDU FAIL | ICDU FAILURE |
| | | 11 | NO IMU CAGE COMMANDED | IMU CAGE COMMANDED |
| | | 10 | | LAUNCH VEHICLE GUIDANCE SWITCH IN CMC POSITION |
| | | 9 | IMU NOT OPERATING | IMU OPERATING |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NO OCDU FAIL | OCDU FAILURE |
| | | 6 | NOT USED | |
| | | 5 | LIFTOFF HAS NOT OCCURRED | LIFTOFF HAS OCCURRED |
| | | 4 | S-IVB ATTACHED | S-IVB SEPARATED |
| | | 3 | SPS NOT READY | SPS READY |
| | | 2 | CM/SM ATTACHED | CM/SM SEPARATED |
| | | 1 | ULLAGE THRUST NOT PRESENT FOR S-IVB | ULLAGE THRUST PRESENT FROM S-IVB |
| 93B | CHANNEL 31 | 15 | COMPUTER NOT IN CONTROL OF SPACECRAFT | COMPUTER IN CONTROL OF SPACECRAFT |
| | | 14 | CSM RCS 0 } ILLEGAL 0 | FREE 1 } HOLD 1 } AUTO 1 } MODE 0 } MODE 1 } MODE |
| | | 13 | DAP MODE 0 } ILLEGAL 0 | FREE 1 } HOLD 1 } AUTO 1 } MODE 0 } MODE 1 } MODE |
| | | 12 | | -Z TRANSLATION COMMANDED |
| | | 11 | | +Z TRANSLATION COMMANDED |
| | | 10 | | -Y TRANSLATION COMMANDED |
| | | 9 | | +Y TRANSLATION COMMANDED |
| | | 8 | | -X TRANSLATION COMMANDED |
| | | 7 | | +X TRANSLATION COMMANDED |
| | | 6 | | -ROLL COMMANDED |
| | | 5 | | +ROLL COMMANDED |
| | | 4 | | -YAW COMMANDED |
| | | 3 | | +YAW COMMANDED |
| | | 2 | | -PITCH COMMANDED |
| | | 1 | | +PITCH COMMANDED |

ENTRY AND UPDATE - Continued

CSM 104

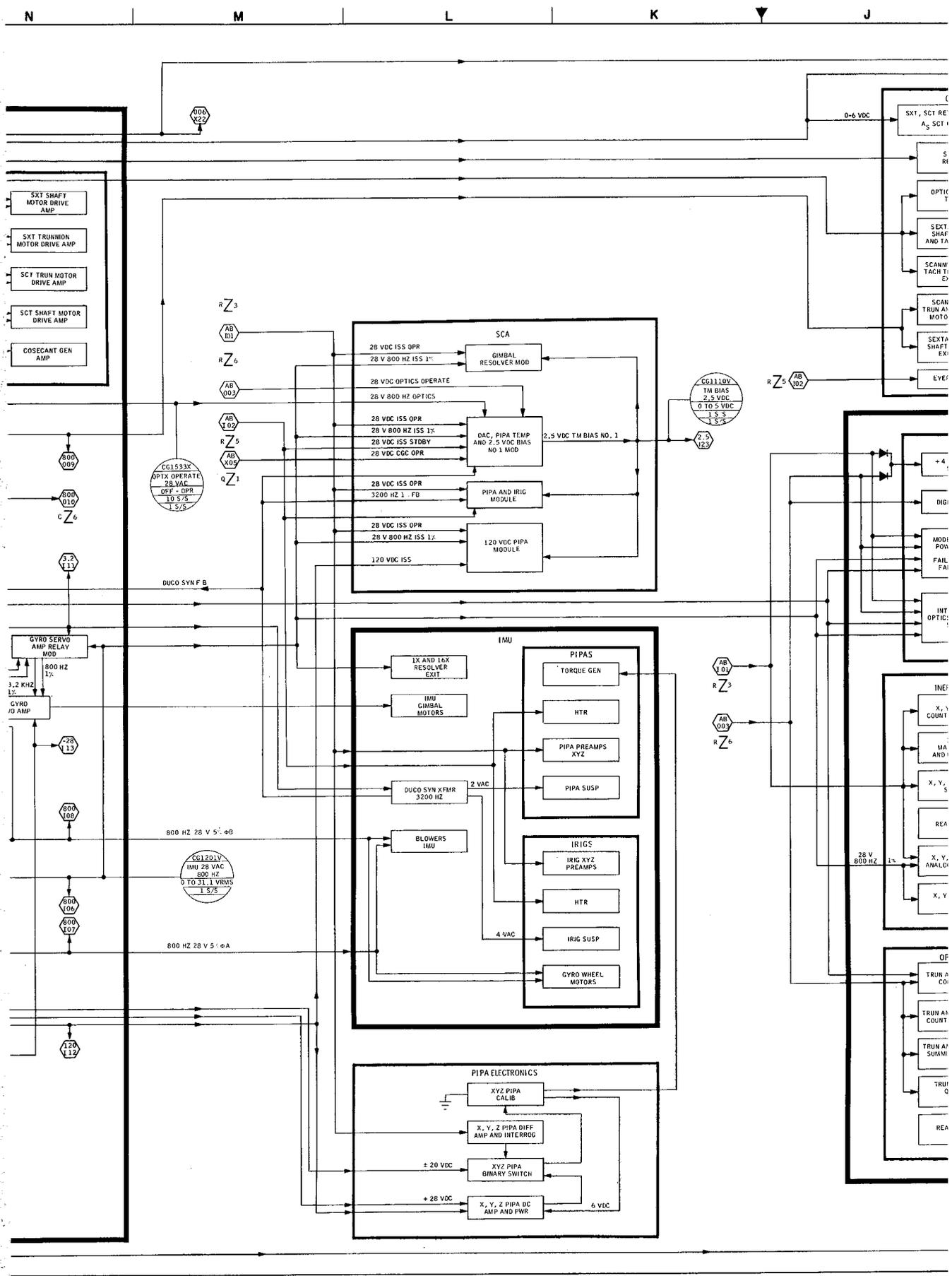
TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

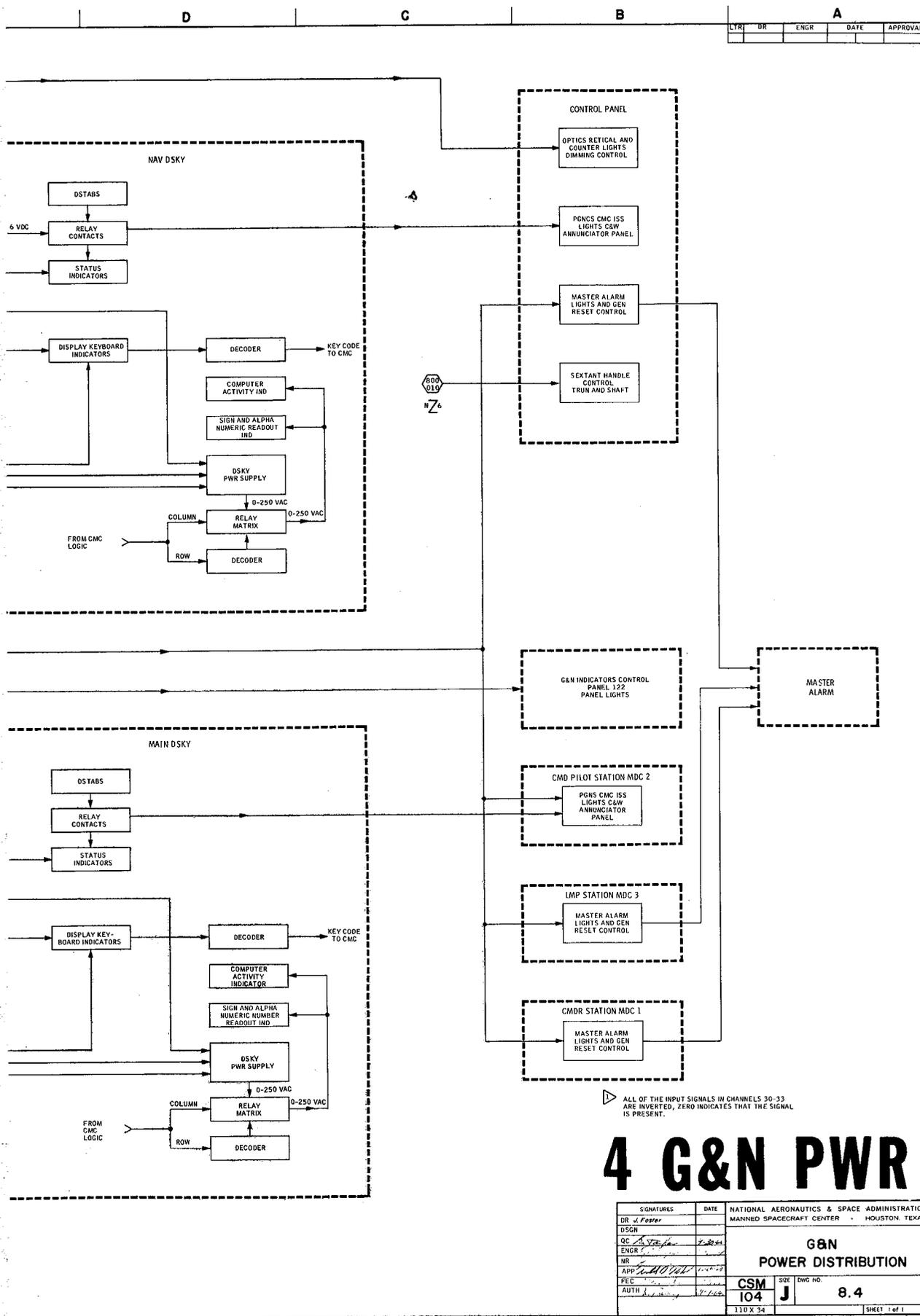
| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|------------|--|--|---|--|
| 94A | CHANNEL 32 MINIMUM IMPULSE CONTROLLER INPUTS | BIT | SET | RESET |
| | | 15 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 14 | | PROCEED KEY IS DEPRESSED |
| | | 13 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 12 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 11 | | LM ATTACHED |
| | | 10 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | | -ROLL COMMANDED |
| | | 5 | | +ROLL COMMANDED |
| | | 4 | | -YAW COMMANDED |
| | | 3 | | +YAW COMMANDED |
| | | 2 | | -PITCH COMMANDED |
| 1 | | +PITCH COMMANDED | | |
| 94B | CHANNEL 33 | BIT | SET | RESET |
| | | 15 | | COMPUTER OSCILLATOR HAS FAILED |
| | | 14 | | CMC WARNING HAS OCCURRED |
| | | 13 | | PIPA FAIL HAS OCCURRED |
| | | 12 | | TELEMETRY DOWNLINK IS TOO FAST |
| | | 11 | | UPLINK IS TOO FAST |
| | | 10 | BLOCK UPLINK SWITCH IN NORMAL POSITION | BLOCK UPLINK SWITCH IN BLOCK POSITION |
| | | 9 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 8 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 7 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 6 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 5 | OPTICS MODE SWITCH IN MANUAL POSITION | OPTICS MODE SWITCH IN COMPUTER POSITION |
| | | 4 | OPTICS ZERO SWITCH IN NORMAL POSITION | OPTICS ZERO SWITCH IN ZERO POSITION |
| | | 3 | NOT ASSIGNED - SHOULD BE ZERO | |
| | | 2 | RANGE UNIT DATA NO GOOD | RANGE UNIT DATA GOOD |
| 1 | NOT ASSIGNED - SHOULD BE ZERO | | | |
| 95A 95B | RSBBQ | VALUE OF BBANK AND Q REGISTERS AT THE TIME OF A RESTART | | |
| 96A | CADRFLSH | VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED PRIORITY DISPLAY | | |
| 96B | CADRFLSH+1 | VALUE OF RETURN ADDRESS INFORMATION FOR LAST REQUESTED MARK | | |
| 97A | CADRFLSH+2 | VALUE OF RETURN ADDRESS INFORMATION FOR LAST NORMAL DISPLAY REQUESTED | | |

ENTRY AND UPDATE - Concluded
 TRANSMITTED IN PROGRAMS 27,62,63,64,65,66,67

CSM 104

| WORD NO. | DESCRIPTION | REAL-TIME SIGNIFICANCE | | |
|----------|--------------------|---|-------------------------------------|---|
| 97B | FAILREG | CONTAINS ALARM CODE OF FIRST ALARM RECEIVED | | |
| 98A | FAILREG+1 | CONTAINS ALARM CODE OF SECOND ALARM RECEIVED | | |
| 98B | FAILREG+2 | CONTAINS ALARM CODE OF THIRD ALARM RECEIVED | | |
| 99A | FLAGWORD 10 | BIT | SET | RESET |
| | INTFLBIT | 15 | NOT USED | |
| | | 14 | INTEGRATION IN PROGRESS | INTEGRATION NOT IN PROGRESS |
| | | 13 | NOT USED | |
| | | 12 | NOT USED | |
| | | 11 | NOT USED | |
| | | 10 | NOT USED | |
| | | 9 | NOT USED | |
| | | 8 | NOT USED | |
| | REINTFLG, REINTBIT | 7 | INTEGRATION ROUTINE TO BE RESTARTED | INTEGRATION ROUTINE NOT TO BE RESTARTED |
| | | 6 | NOT USED | |
| | | 5 | NOT USED | |
| | | 4 | NOT USED | |
| | | 3 | NOT USED | |
| | | 2 | NOT USED | |
| | | 1 | NOT USED | |
| 99B | FLAGWORD 11 | NOT USED | | |
| 100A | GAMMAEI | VALUE OF FLIGHT PATH ANGLE AT 400,000 FEET ABOVE FISCHER RADIUS | | |
| 100B | RTGO | RANGE ANGLE TO SPLASH FROM EMS INTERFACE ALTITUDE | | |





4 G&N PWR

| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER · HOUSTON, TEXAS | | | |
|------------|-----------|------|--|---|----------|--------------|
| DR | J. Foster | | G&N POWER DISTRIBUTION | | | |
| DSGN | | | | | | |
| QC | | | | | | |
| ENGR | | | | | | |
| NR | | | | | | |
| APP | | | | | | |
| REC | | | CSM 104 | | | |
| AUTH | | | | | | |
| | | | | | | |
| | | | SIZE | J | ENG. NO. | 8.4 |
| | | | 110 X 34 | | | SHEET 1 of 1 |

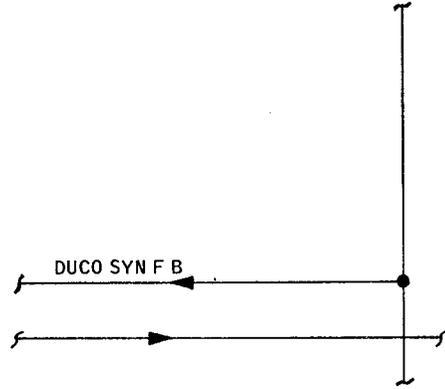
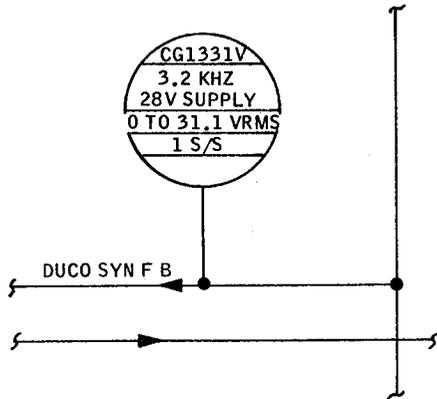
SECTION 8

CSM
S/C 104
PCN 1

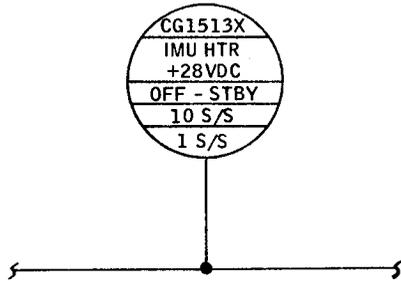
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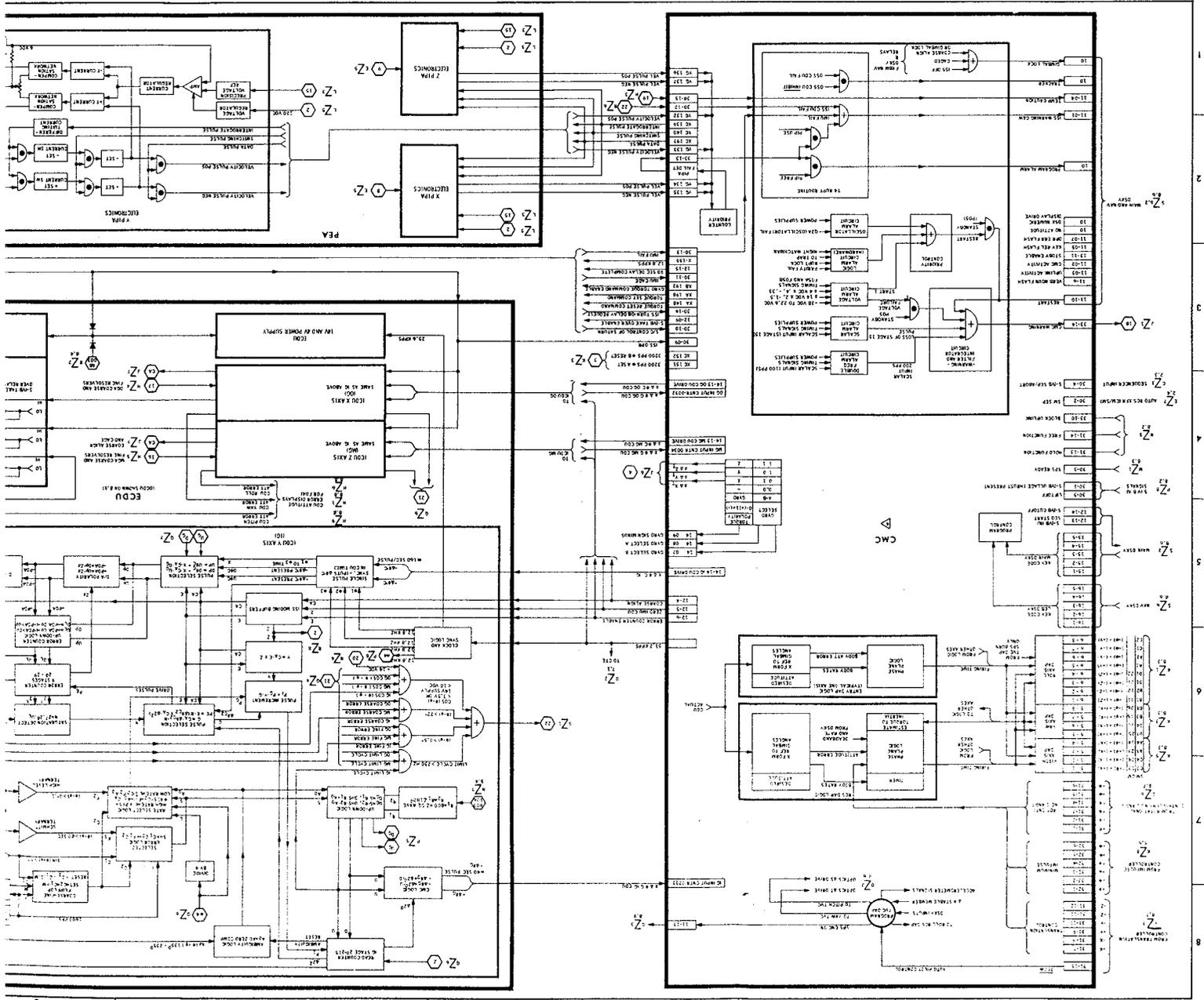
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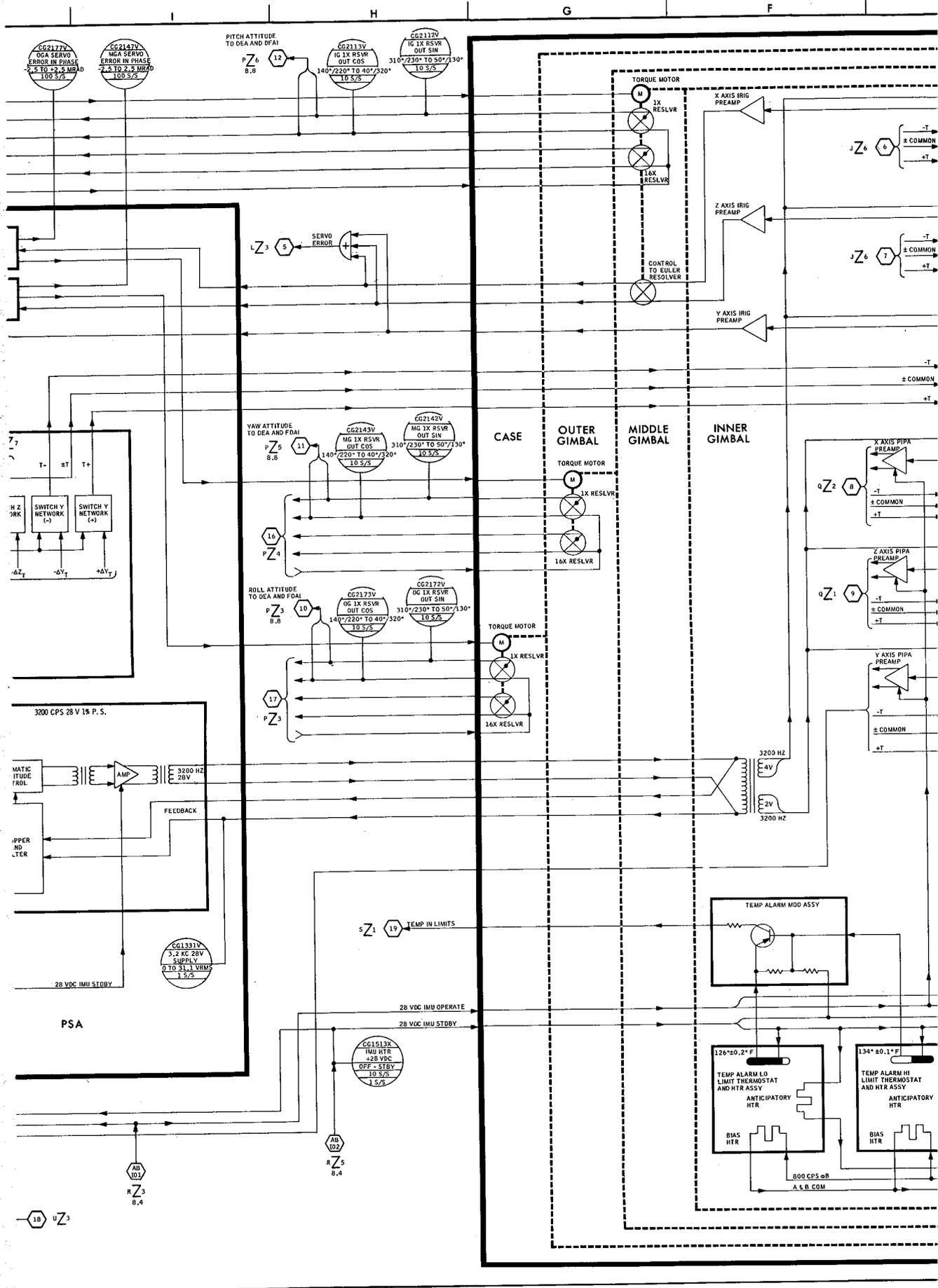
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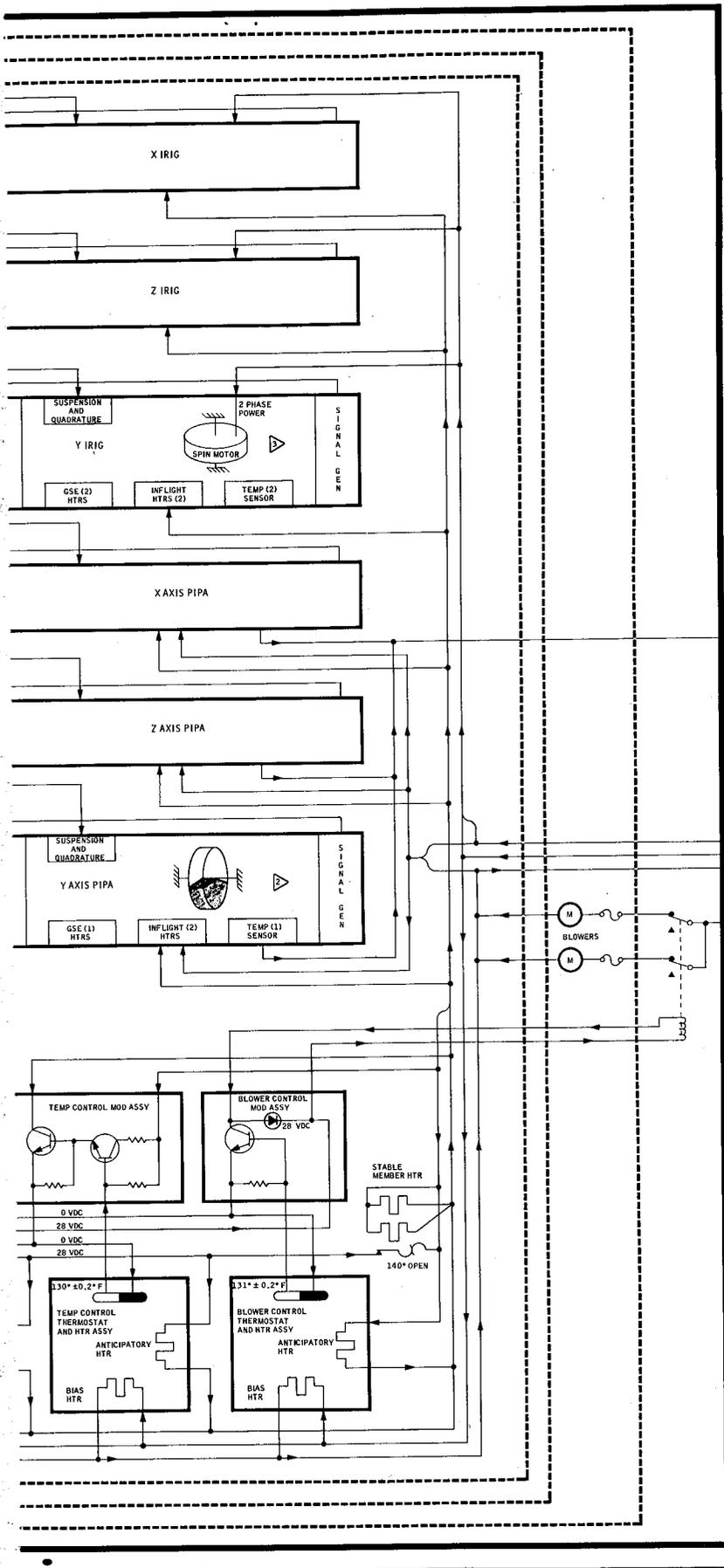


2. DWG 8.4 RZ5



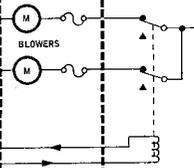






CG23001
PIPA TEMP
+120 TO +140°
1 S/S

800 CPS QA 28 V 5%
800 CPS QB 28 VDC 5%
A AND B COM



- NOTES:
- ▷ ALL OF THE INPUT SIGNALS IN CHANNELS 30-33 ARE INVERTED, ZERO INDICATES THAT THE SIGNAL IS PRESENT.
 - ▷ X, Y, Z IRIGS EACH HAVE TWO TEMP INDICATING SENSORS. ALL SIX ARE CONNECTED IN SERIES. X, Y, Z IRIGS EACH HAVE AN END MOUNT HTR AND A TAPERED MOUNT HTR. ALL SIX ARE IN PARALLEL TO THE IMU STBY PWR
 - ▷ X, Y, Z PIPA EACH CONTAINS ONE TEMP SENSOR AND THEY ARE CONNECTED IN SERIES. X, Y, Z PIPA EACH HAVE A FIXED HTR AND A VARIABLE HTR. THE THREE FIXED HTRS ARE IN PARALLEL TO THE WHEEL POWER. THE THREE VARIABLE HTRS ARE IN PARALLEL TO THE IMU STBY PWR
- 1 800 CPS TM SIGNALS CONDITIONED BY
28 VDC ISS SEE N 7 6 CG2219 FOR EXAMPLES
2.5 V TM BIAS
3200 CPS TM SIGNALS CONDITIONED BY
28 VDC ISS
2.5 V TM BIAS
DC TM SIGNALS DIVIDED BY FACTOR WHICH PROVIDES A MAX OF 5 VDC

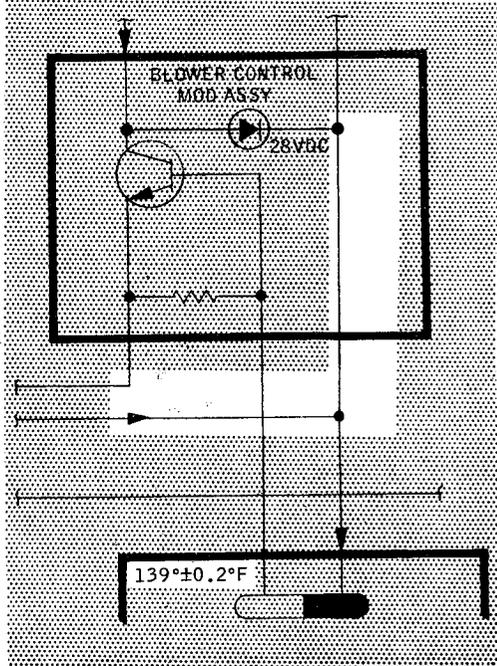
5 ISS

| | | | | |
|------------|--------------------|---------|---|--|
| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION | |
| DR | <i>[Signature]</i> | | MANNED SPACECRAFT CENTER HOUSTON, TEXAS | |
| DSGN | | | | |
| QC | <i>[Signature]</i> | 9/7/68 | | |
| ENGR | <i>[Signature]</i> | 12/1/68 | | |
| WR | <i>[Signature]</i> | 12/1/68 | | |
| APP | <i>[Signature]</i> | 12/1/68 | | |
| FEC | <i>[Signature]</i> | 12/1/68 | | |
| AUTH | <i>[Signature]</i> | 12/1/68 | | |
| CSM | | SIZE | DWG NO. | |
| 03/104 J | | | 8.5 | |
| 36X121 | | PAGE | SHEET OF | |

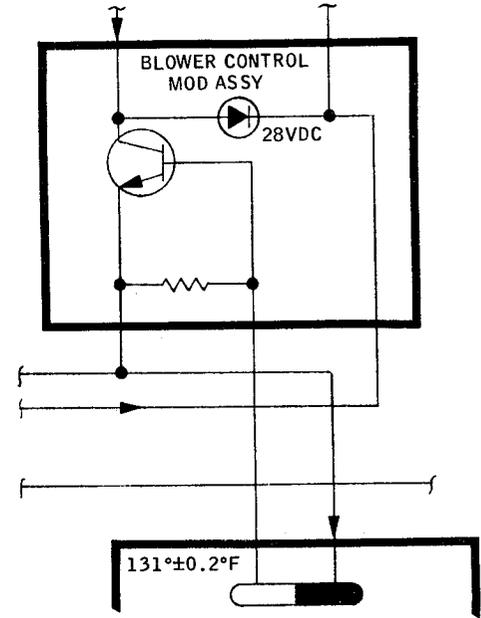
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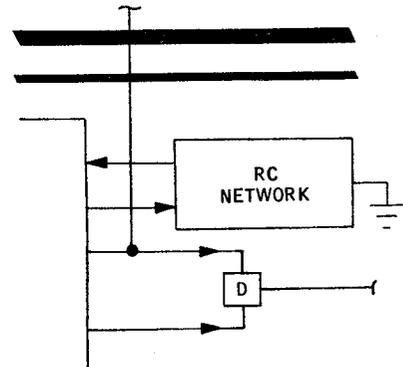
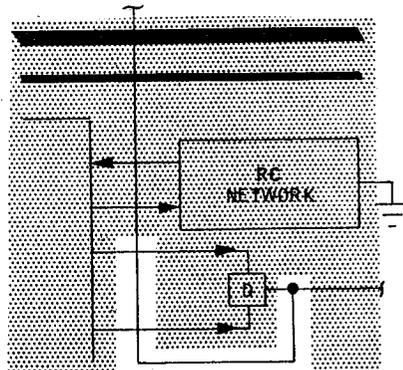
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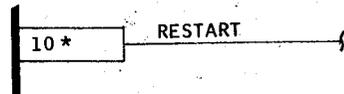
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2. DWG 8.5 LZ7



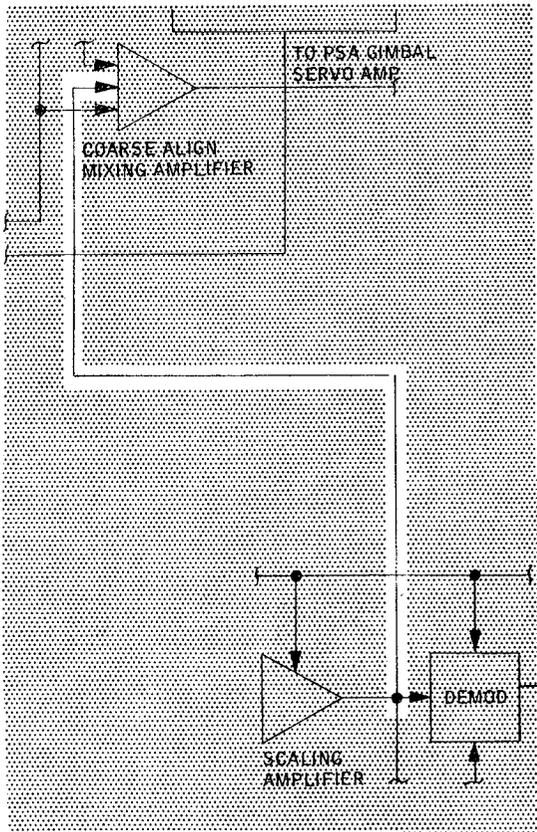
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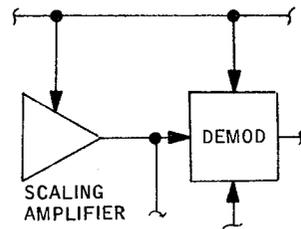
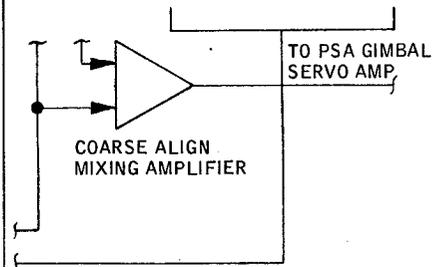
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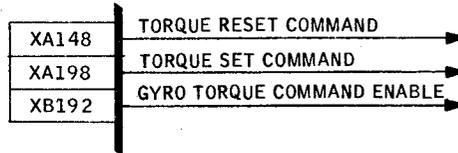
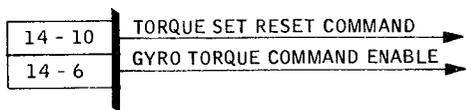
4. DWG 8.5 NZ6



WAS



5. DWG 8.5 SZ3

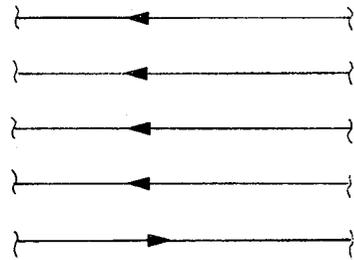
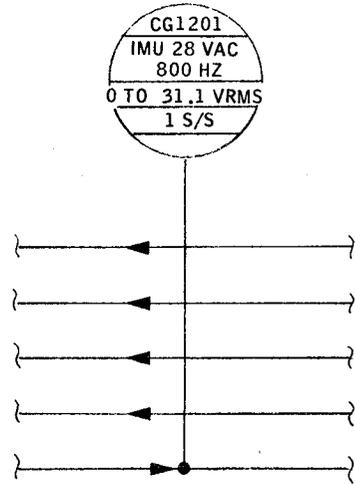


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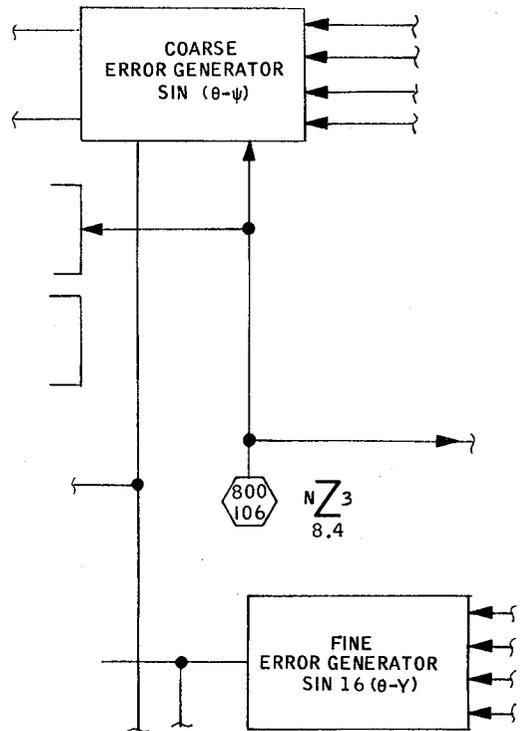
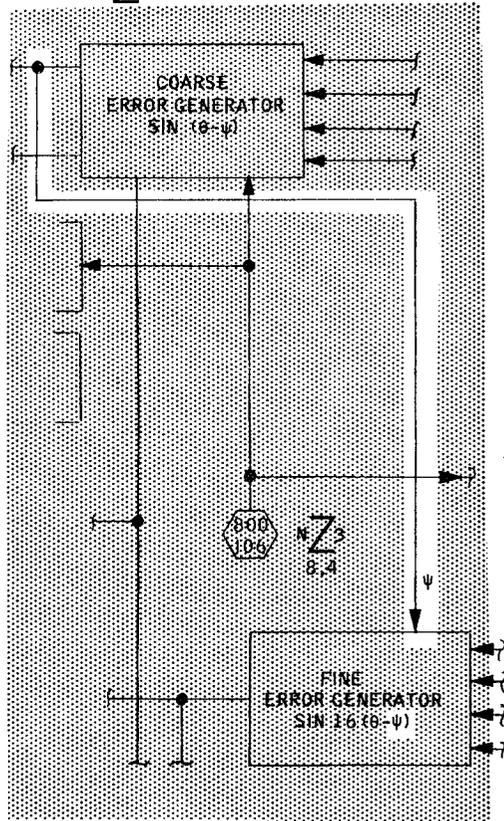
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6. DWG 8.5 KZ7



7. DWG 8.5 NZ6



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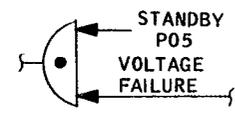
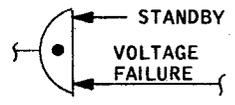
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8. DWG 8.5 TZ₃

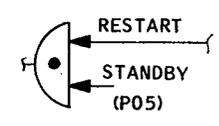
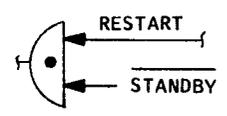
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TO TRAP

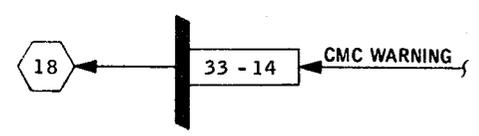
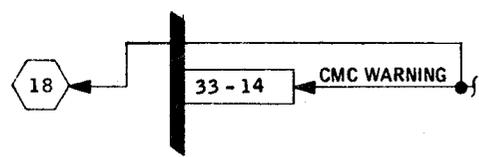
9. DWG 8.5 TZ₃



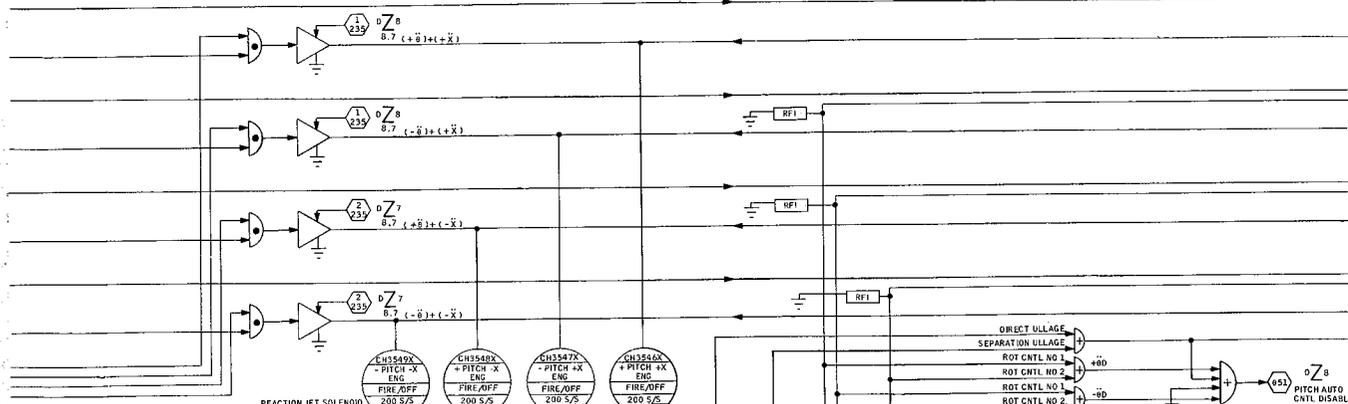
10. DWG 8.5 UZ₂



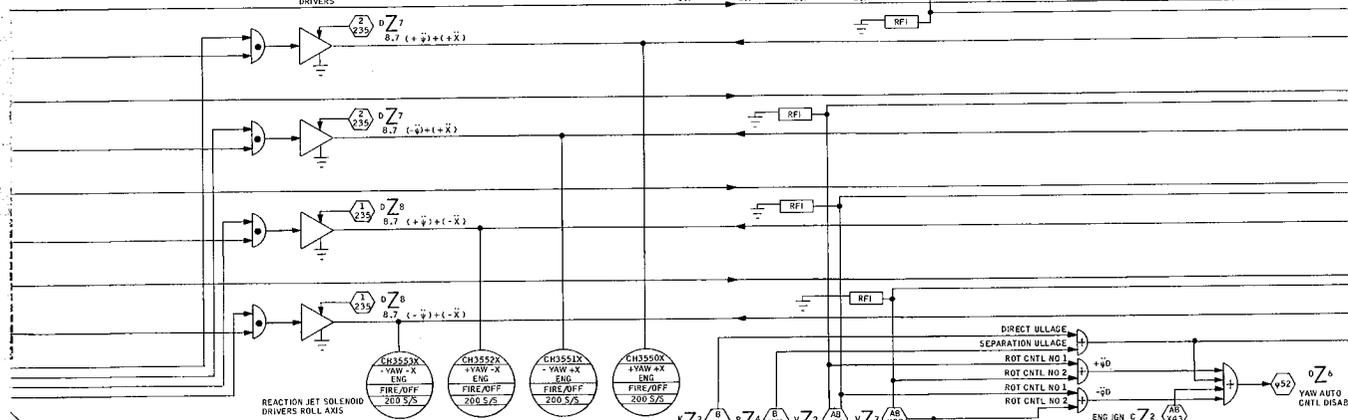
11. DWG 8.5 vZ₃



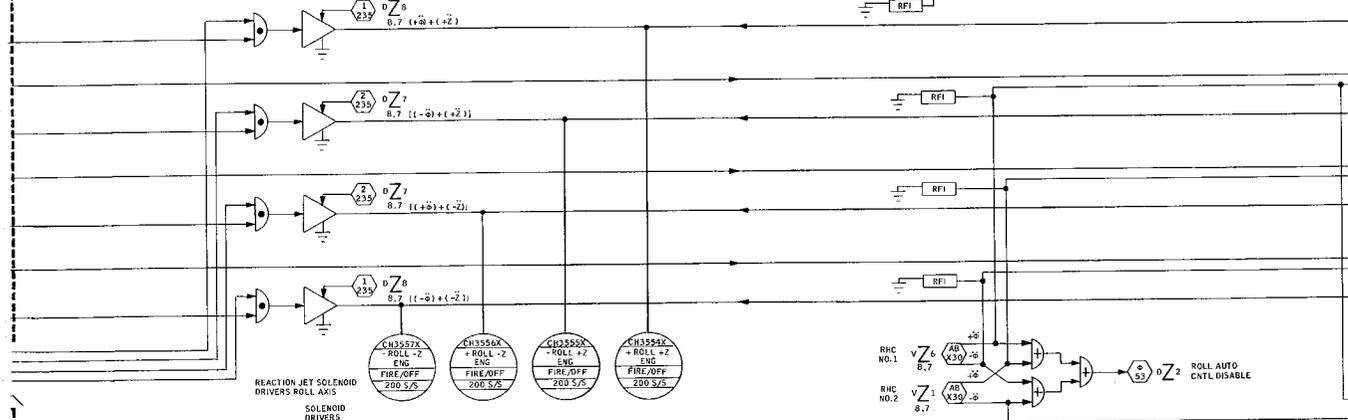
REACTION JET SOLENOID DRIVERS PITCH AXIS SOLENOID DRIVERS



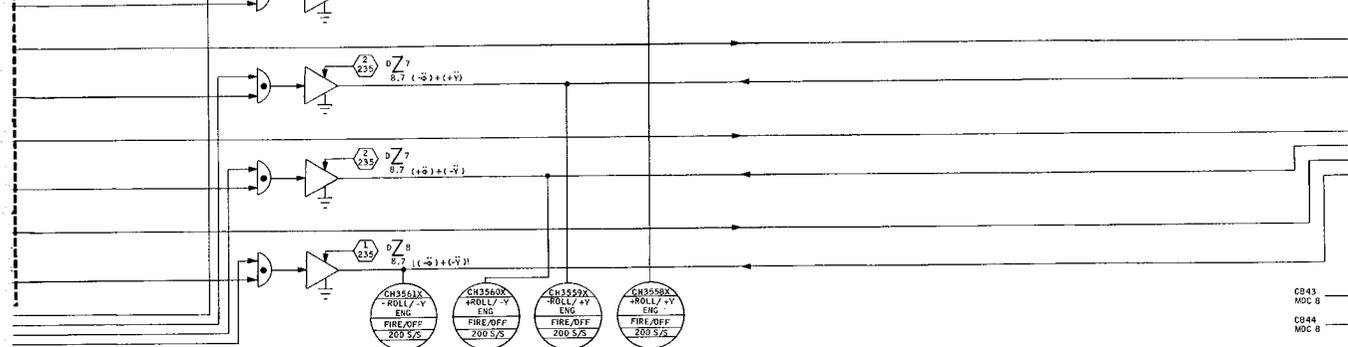
REACTION JET SOLENOID DRIVERS YAW AXIS SOLENOID DRIVERS



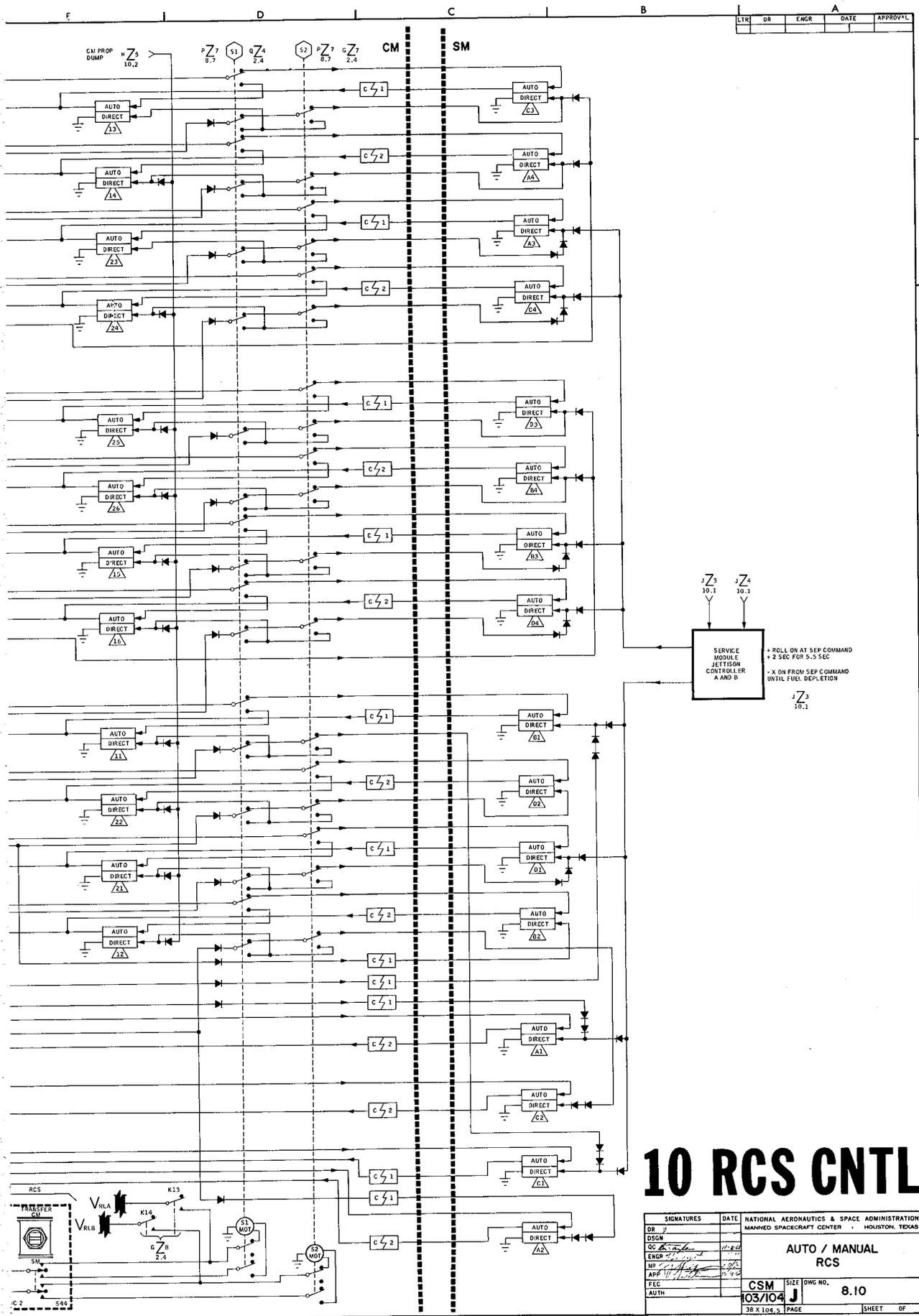
REACTION JET SOLENOID DRIVERS ROLL AXIS SOLENOID DRIVERS



REACTION JET SOLENOID DRIVERS ROLL AXIS SOLENOID DRIVERS



CB43 MOC 3
CB44 MOC 8



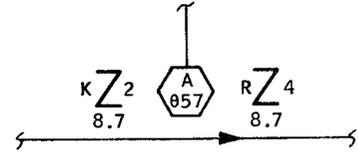
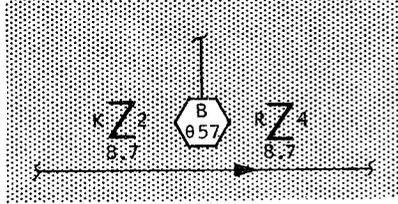
10 RCS CNTL

| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | |
|------------|---|------|--|--------------|
| DR | J | | AUTO / MANUAL RCS | |
| DSCN | | | | |
| QC | | | | |
| ENGR | | | | |
| APP | | | | |
| FEC | | | CSM | SIZE DWG NO. |
| AUTH | | | 103/104 J | 8.10 |
| | | | 38 X 104.5 | PAGE |
| | | | SHEET OF | |

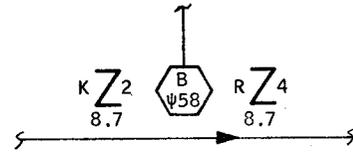
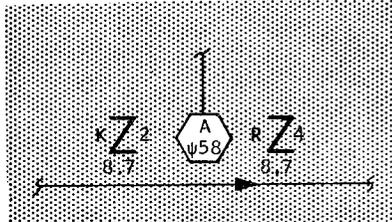
IS

WAS

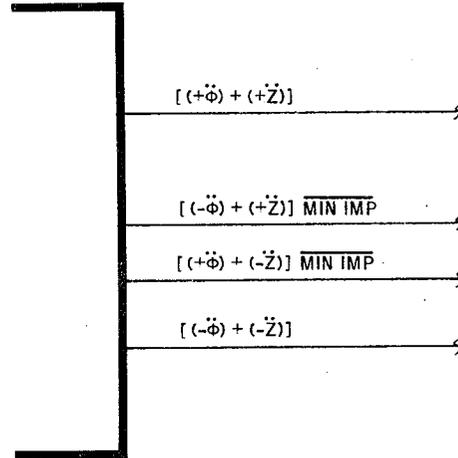
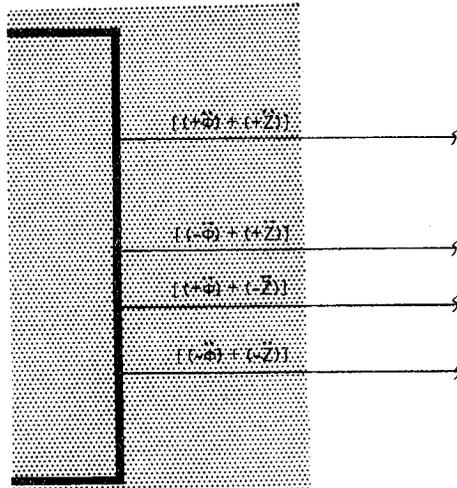
1. DWG 8.10 HZ7



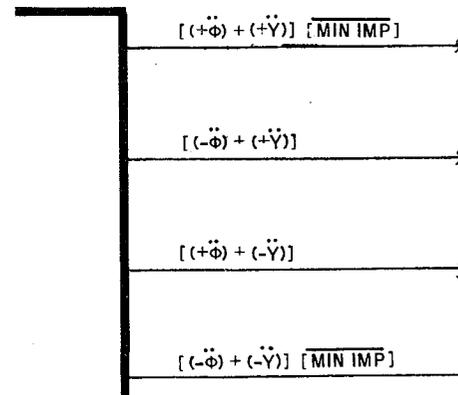
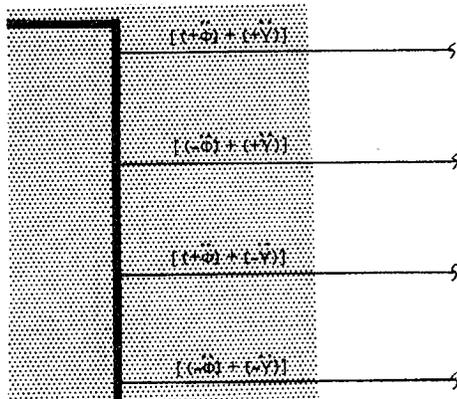
2. DWG 8.10 HZ5



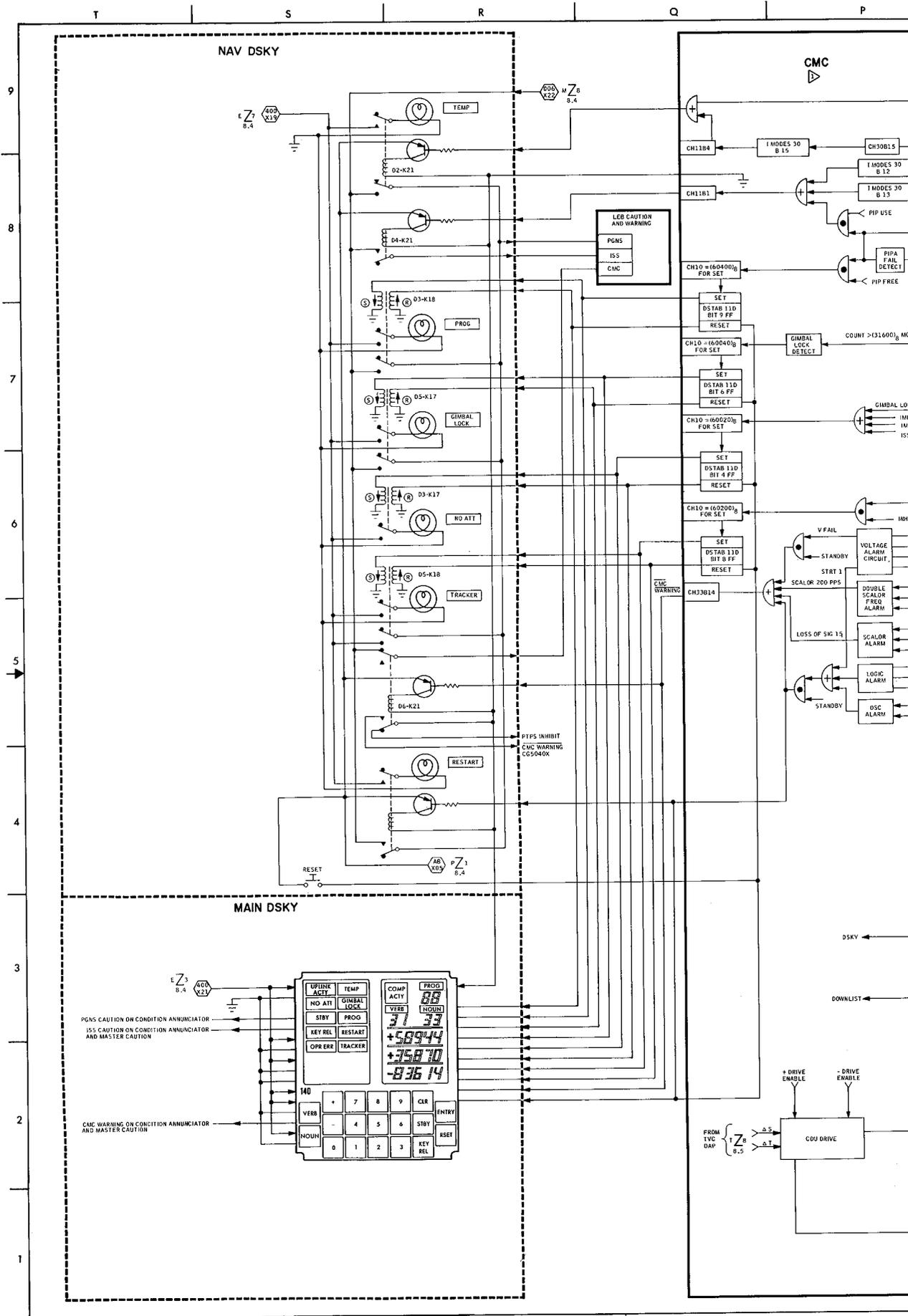
3. DWG 8.10 LZ3



4. DWG 8.10 LZ2,1



9 SERVICE
PROPULSION
SYSTEM



NAV DSKY

CMC

MAIN DSKY

PGNS CAUTION ON CONDITION ANNUNCIATOR
ISS CAUTION ON CONDITION ANNUNCIATOR
AND MASTER CAUTION

CMC WARNING ON CONDITION ANNUNCIATOR
AND MASTER CAUTION

| | | | |
|-----------------|-----------------|--------------|------|
| UP/LINK ACTY | TEMP | COMP ACTY | PROG |
| NO ATT | GIMBAL LOCK | VERB | NOUN |
| STBY | PROG | 31 | 33 |
| KEY REL | RESTART | +58944 | |
| OPR ERR | TRACKER | +35870 | |
| | | -83614 | |
| 140 | | | |
| VERB | + 7 8 9 CLR | ENTRY | |
| NOUN | - 4 5 6 STBY | RSET | |
| | 0 1 2 3 KEY REL | | |

FROM TVO DAP

$\begin{matrix} \delta.S \\ \delta.T \end{matrix}$

$\begin{matrix} \delta.S \\ \delta.T \end{matrix}$

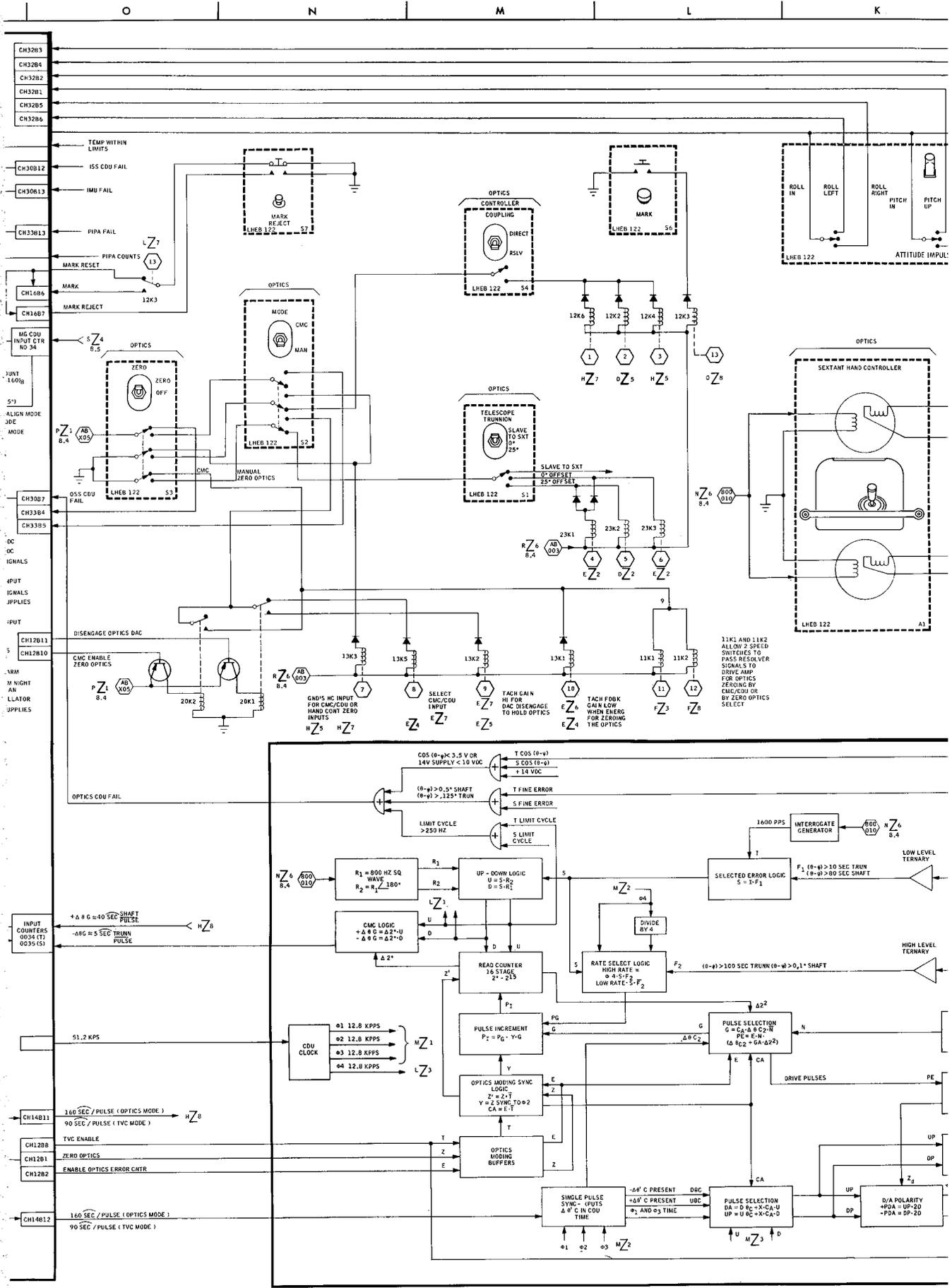
CDU DRIVE

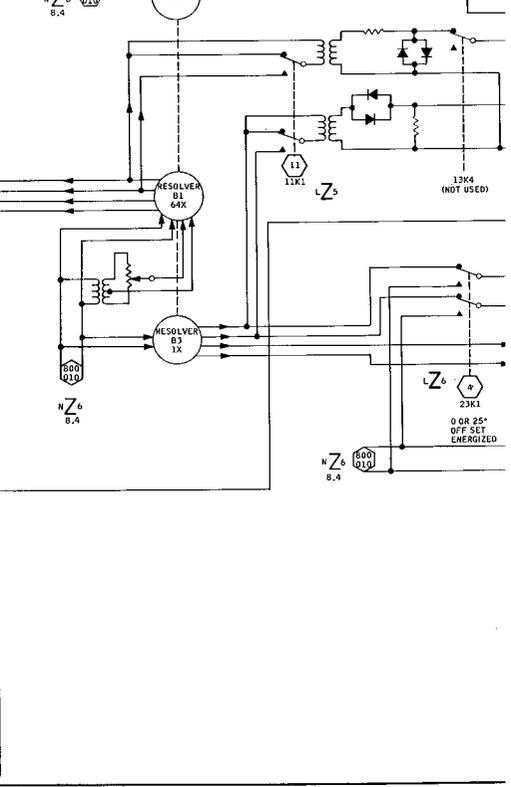
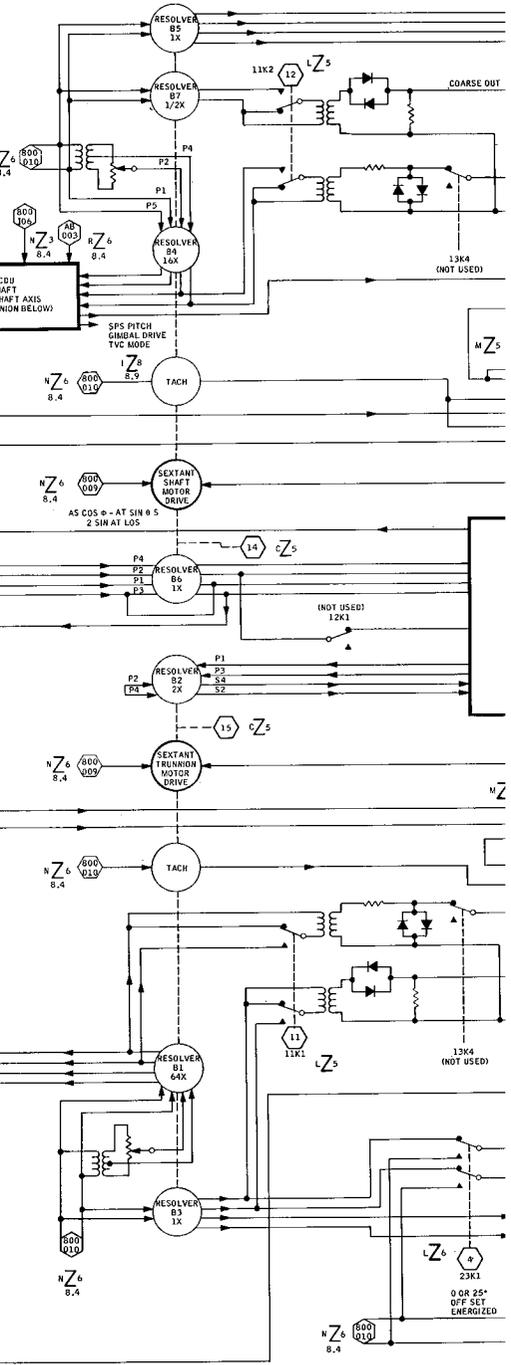
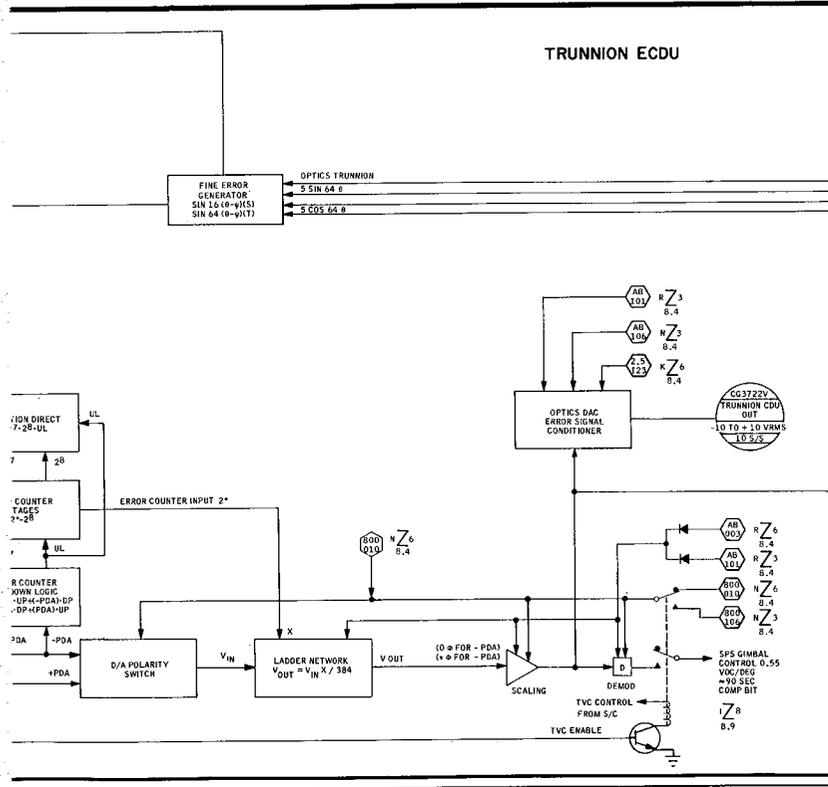
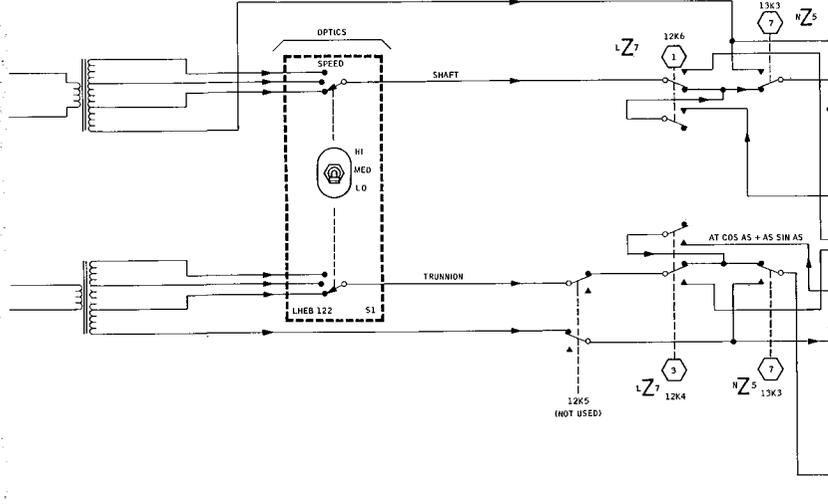
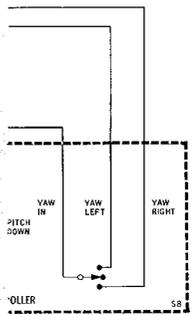
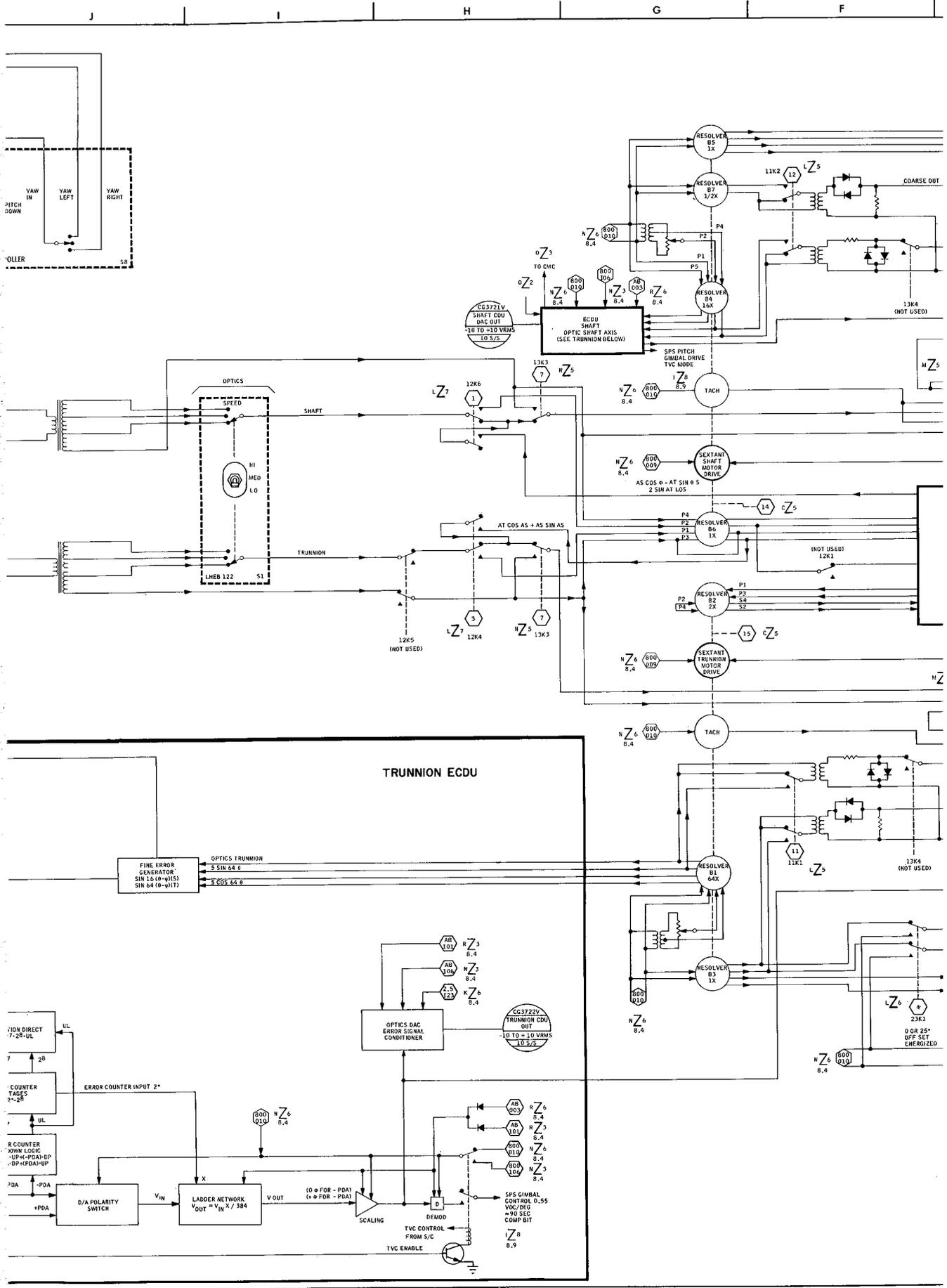
+ DRIVE ENABLE

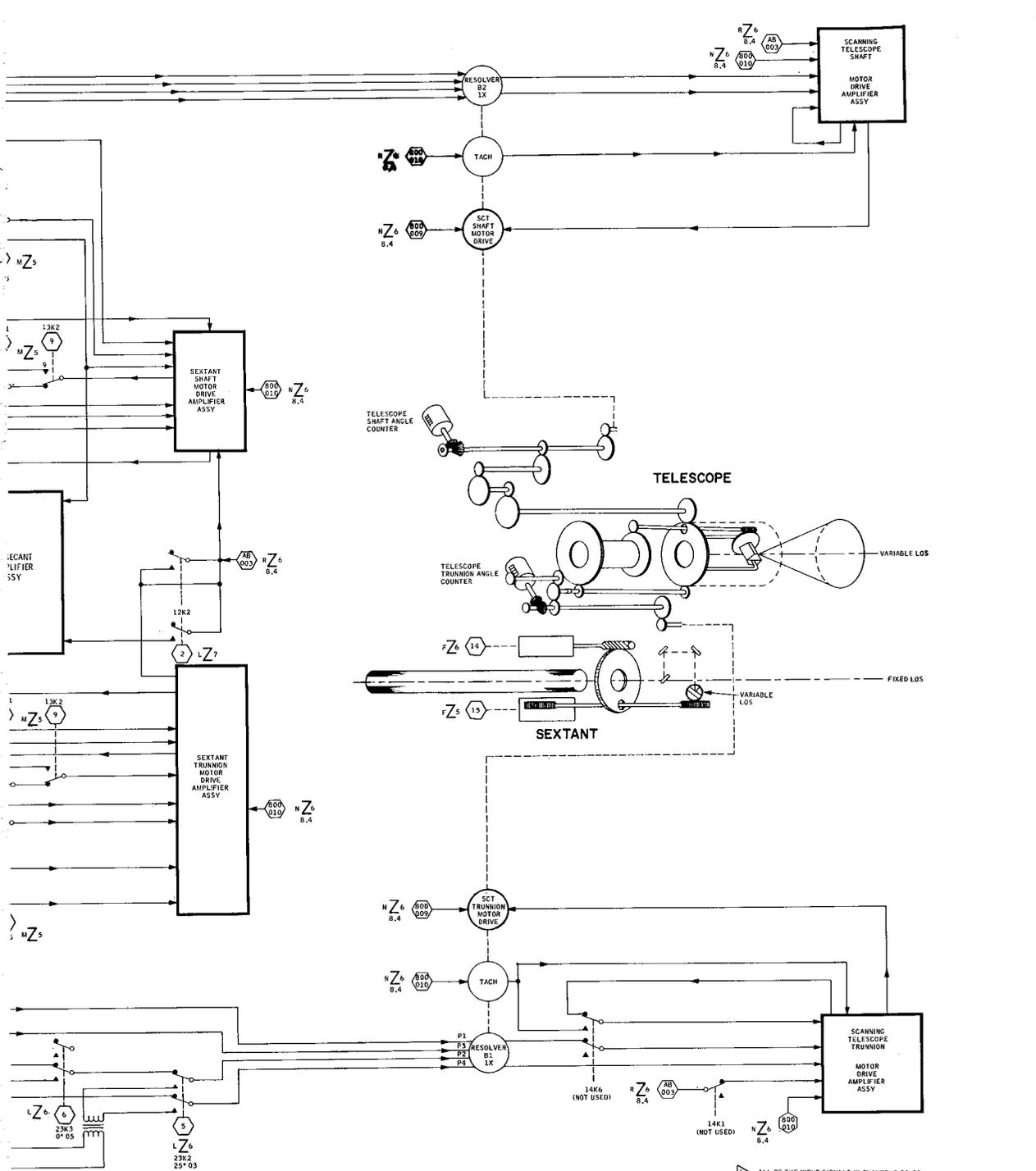
- DRIVE ENABLE

DSKY

DOWNLIST







6 OPTICS

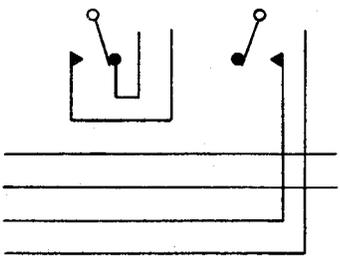
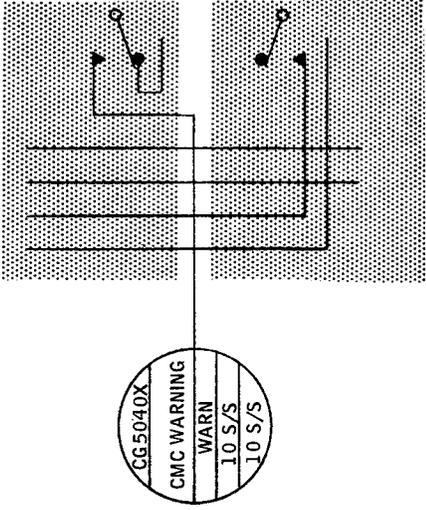
| | | |
|-------------|------|---|
| SIGNATURES | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION |
| DR | | MANNED SPACECRAFT CENTER - HOUSTON, TEXAS |
| DSGN | | |
| QC | | |
| ENGR | | |
| WR | | |
| APP | | |
| FEC | | |
| AUTH | | |
| CSM | | SIZE DWG NO |
| 03/104 | | 8.6 |
| 110 X 34.25 | | SHEET 1 OF 1 |

SECTION 8

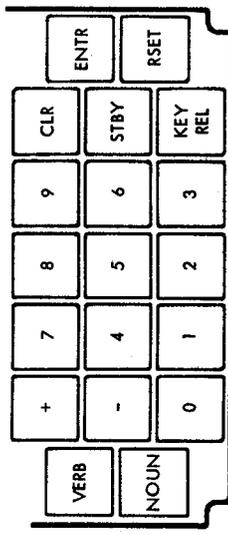
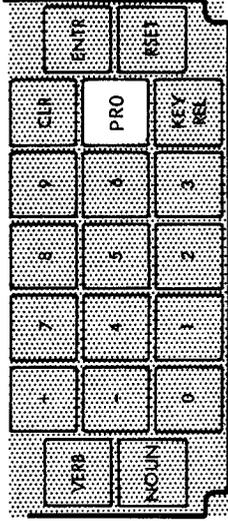
IS

WAS

1. DWG 8.6 SZ 5,4



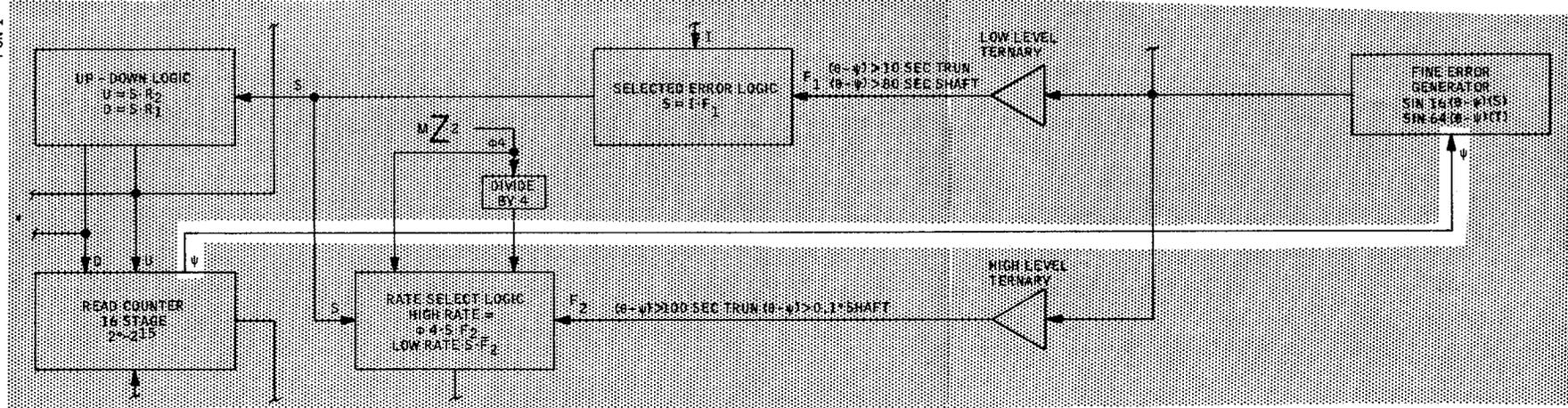
2. DWG 8.6 S,RZ 2



CSM
S/C 104
PCN 1

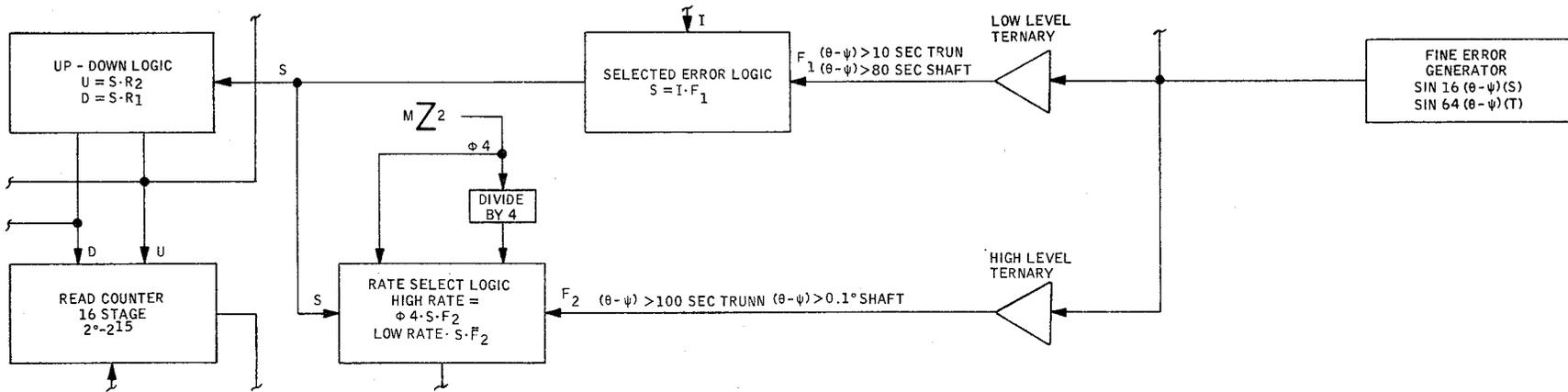
IS

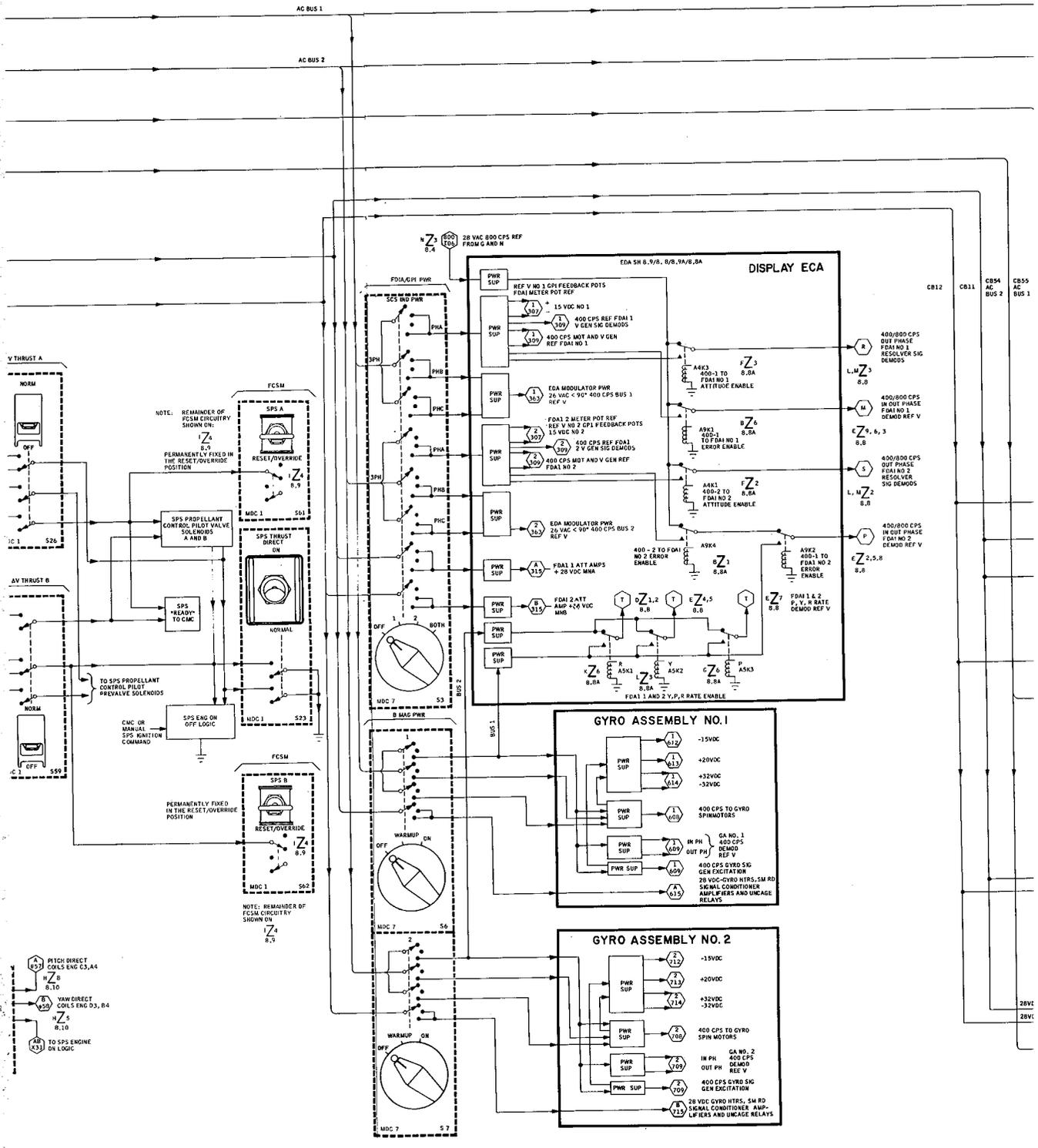
SECTION 8



WAS

3. DWG 8.6 M.L.K.J Z 4,3





NOTE: REMAINDER OF FCSM CIRCUITRY SHOWN ON 8.9 PERMANENTLY FIXED IN THE RESET/OVERRIDE POSITION

NOTE: REMAINDER OF FCSM CIRCUITRY SHOWN ON 8.9 PERMANENTLY FIXED IN THE RESET/OVERRIDE POSITION

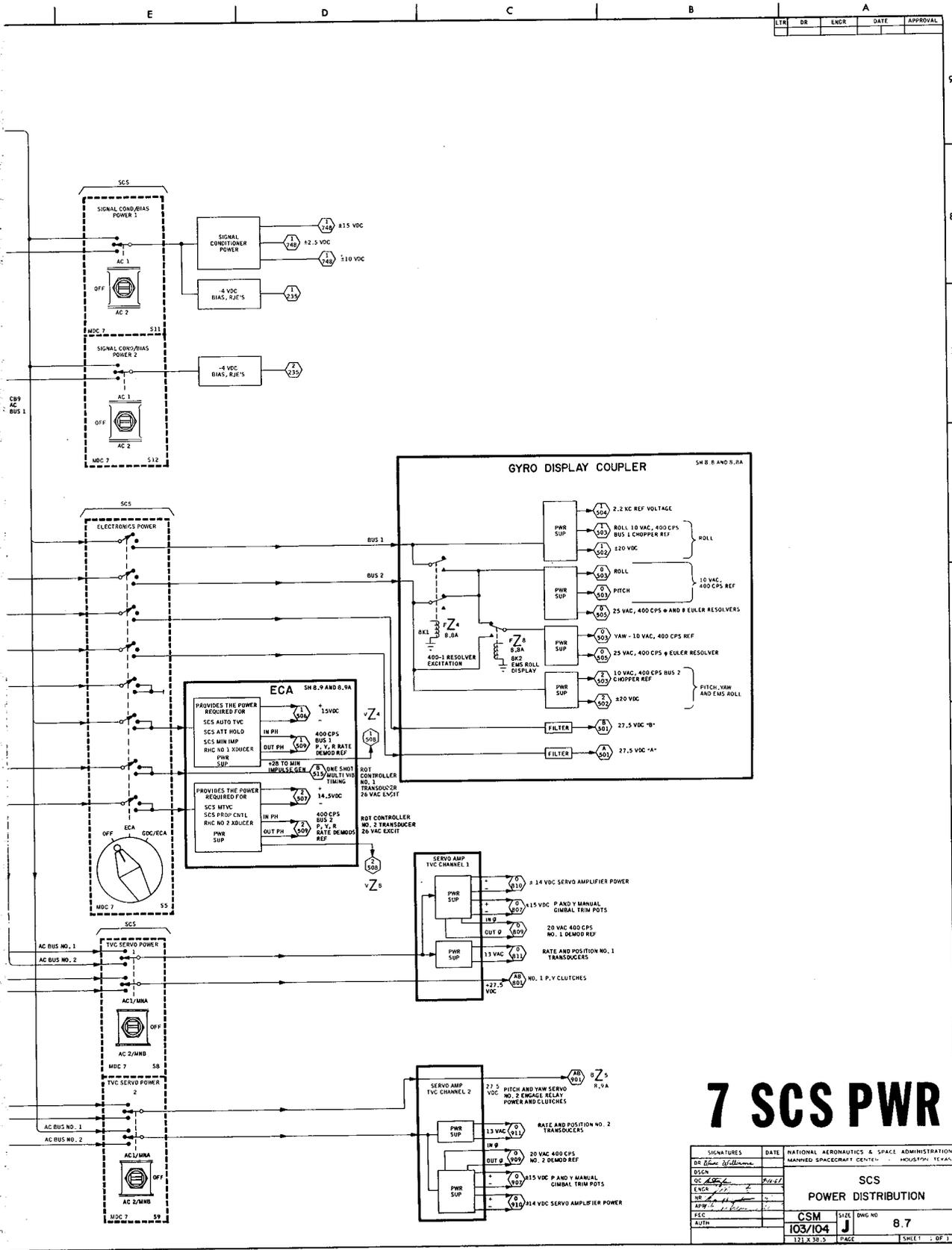
DISPLAY ECA

GYRO ASSEMBLY NO. 1

GYRO ASSEMBLY NO. 2

- A 8.3 PITCH DIRECT COILS ENG C3, A4
- B 8.10 YAW DIRECT COILS ENG D3, B4
- C 8.10 TO SPS ENGINE ON LOGIC

28VDC
28VDC



7 SCS PWR

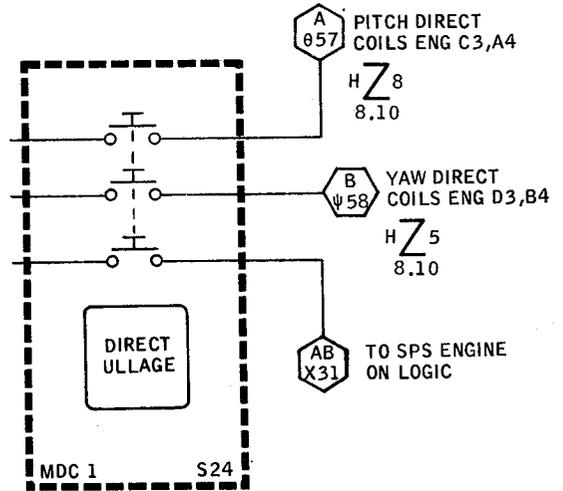
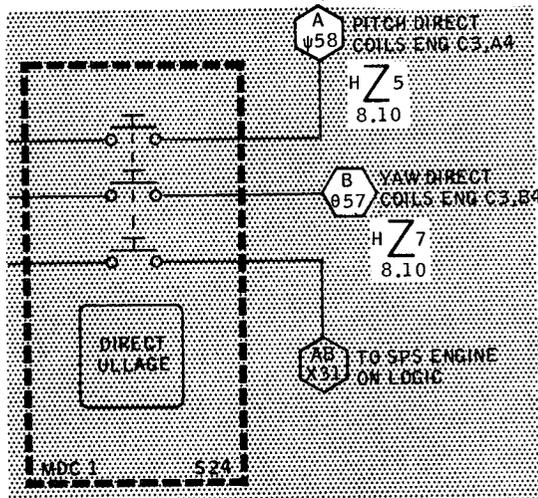
| SIGNATURES | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION |
|---------------------------|-------------|---|
| DR <i>Don Williams</i> | | MANNEF SPACECRAFT CENTER HOUSTON TEXAS |
| SCS | | |
| POWER DISTRIBUTION | | |
| CSM | SIZE DWG NO | 8.7 |
| 103/104 | J | |
| 131 X 38.5 | PAGE | SHEET 1 OF 1 |

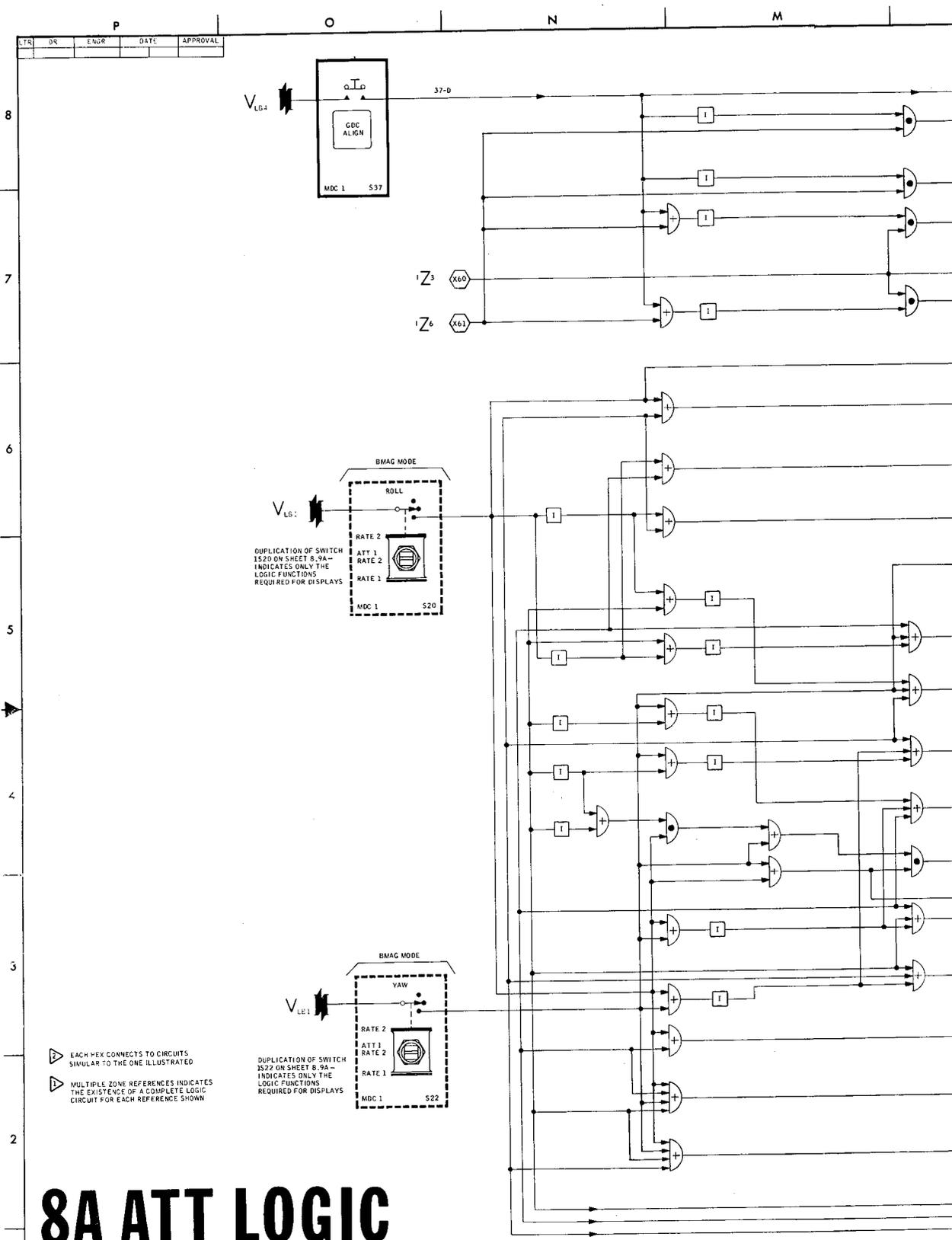
SECTION 8

IS

WAS

1. DWG 8.7 L,KZ2



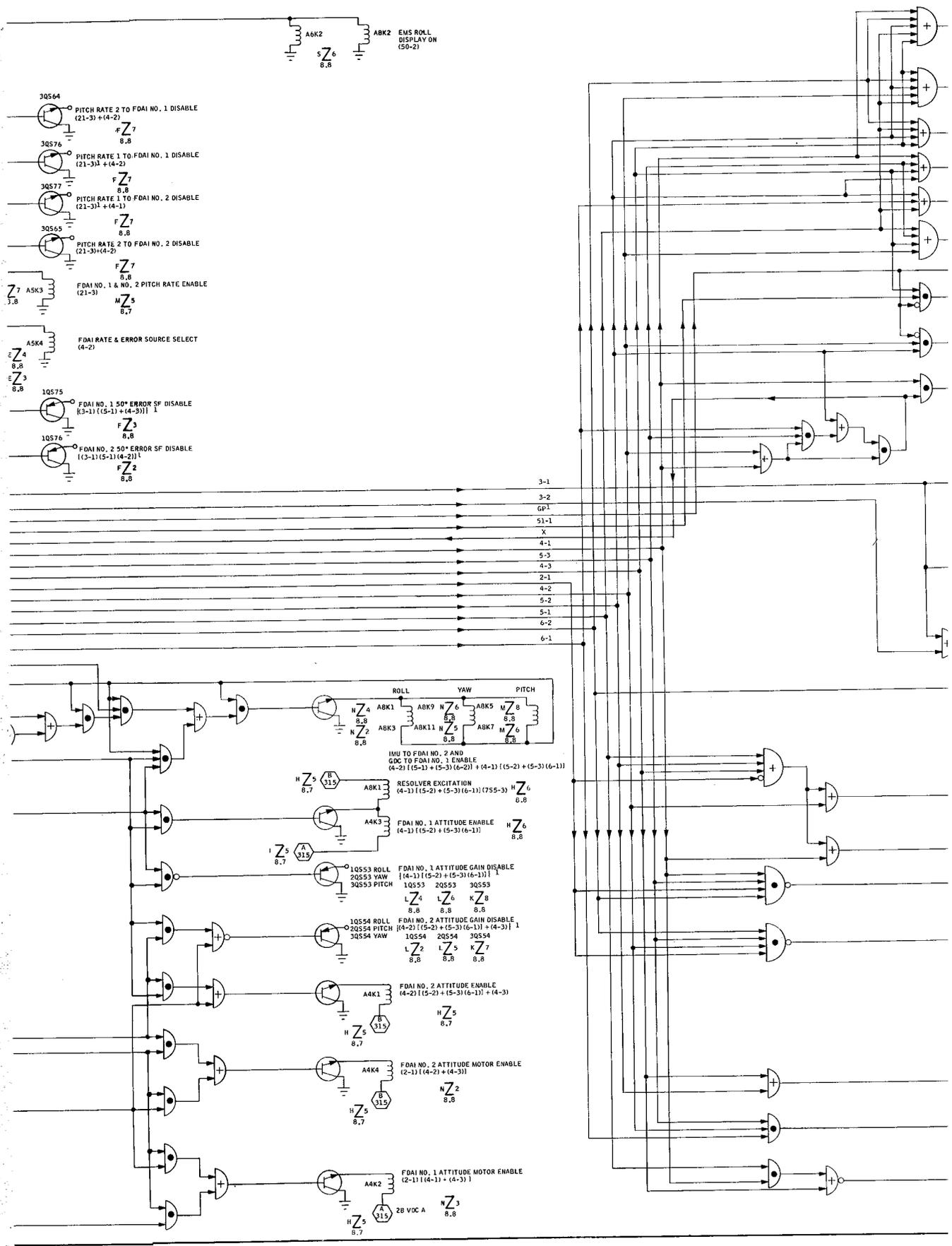


▷ EACH HEX CONNECTS TO CIRCUITS SIMILAR TO THE ONE ILLUSTRATED
 ▷ MULTIPLE ZONE REFERENCES INDICATES THE EXISTENCE OF A COMPLETE LOGIC CIRCUIT FOR EACH REFERENCE SHOWN

DUPLICATION OF SWITCH 1522 ON SHEET 8.9A - INDICATES ONLY THE LOGIC FUNCTIONS REQUIRED FOR DISPLAYS

8A ATT LOGIC

| | | | | |
|--|---------|------------|--------------------|--------|
| NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | | SIGNATURES | | DATE |
| SCS ATTITUDE REFERENCE LOGIC | | DR | <i>[Signature]</i> | |
| DWG NO. 8.8A | | DSGN | <i>[Signature]</i> | 8.2.62 |
| SIZE J | CSM 104 | ENGR | | |
| SHEET 1 OF 1 PAGE | | APP | | |
| | | FEC | | |
| | | AUTH | | |



3Q564 PITCH RATE 2 TO FDAl NO. 1 DISABLE
 (21-3) + (4-2)
 $F Z 7$
 8,8

3Q576 PITCH RATE 1 TO FDAl NO. 1 DISABLE
 (21-3) + (4-2)
 $F Z 7$
 8,8

3Q577 PITCH RATE 1 TO FDAl NO. 2 DISABLE
 (21-3) + (4-1)
 $F Z 7$
 8,8

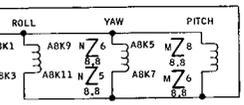
3Q565 PITCH RATE 2 TO FDAl NO. 2 DISABLE
 (21-3) + (4-2)
 $F Z 7$
 8,8

$Z 7$ A5K3 FDAl NO. 1 & NO. 2 PITCH RATE ENABLE
 (21-3)
 $M Z 5$
 8,7

$Z 4$ A5K4 FDAl RATE & ERROR SOURCE SELECT
 (4-2)
 $Z 3$
 8,8

1Q575 FDAl NO. 1 50° ERROR SF DISABLE
 [(3-1) (5-1) + (4-3)] 1
 $F Z 3$
 8,8

1Q576 FDAl NO. 2 50° ERROR SF DISABLE
 [(3-1) (5-1) + (4-2)] 1
 $F Z 2$
 8,8



IMU TO FDAl NO. 2 AND
 GDC TO FDAl NO. 1 ENABLE
 (4-2) [(5-1) + (5-3) (6-2)] + (4-1) [(5-2) + (5-3) (6-1)]

RESOLVER EXCITATION
 (4-1) [(5-2) + (5-3) (6-1)] (755-3) H Z 6
 8,8

A4K3 FDAl NO. 1 ATTITUDE ENABLE
 (4-3) [(5-2) + (5-3) (6-1)] H Z 6
 8,8

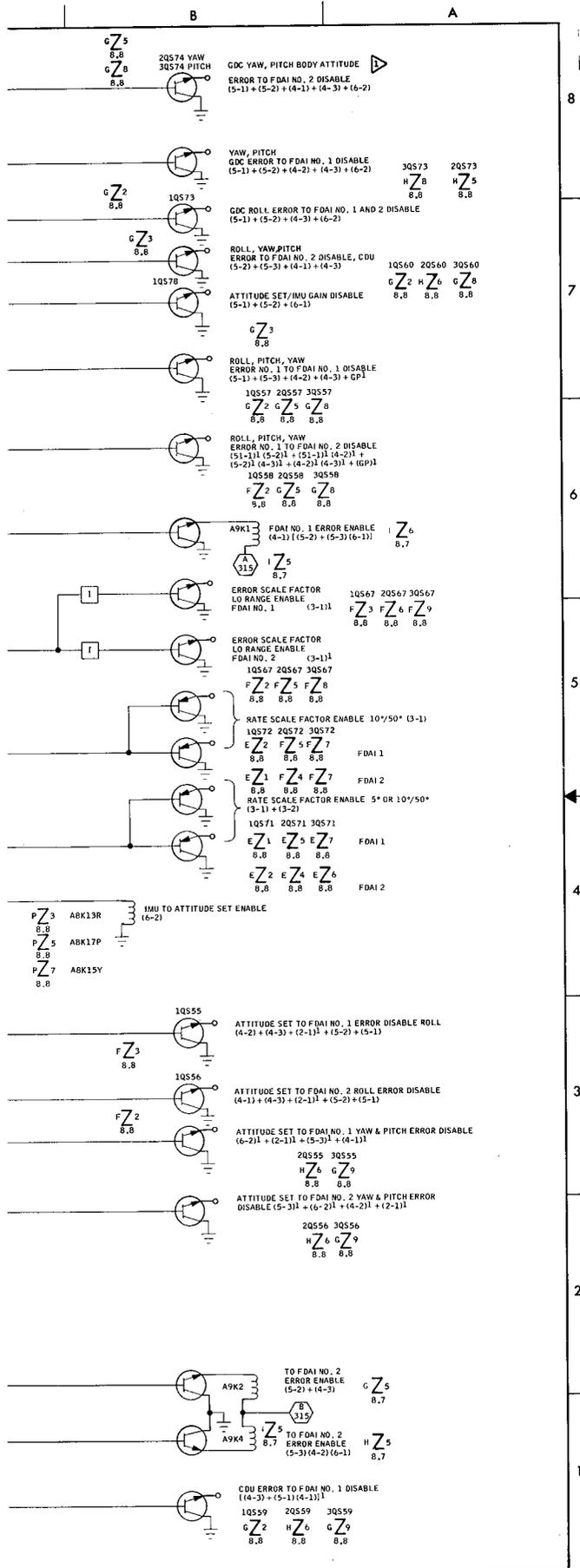
1Q553 ROLL FDAl NO. 1 ATTITUDE GAIN DISABLE
 [(4-1) (5-2) + (5-3) (6-1)] 1
 1Q553 2Q553 3Q553
 $L Z 4$ $L Z 5$ $K Z 8$
 8,8 8,8 8,8

1Q554 ROLL FDAl NO. 2 ATTITUDE GAIN DISABLE
 [(4-2) (5-2) + (5-3) (6-1) + (4-3)] 1
 1Q554 2Q554 3Q554
 $L Z 2$ $L Z 5$ $K Z 7$
 8,8 8,8 8,8

A4K1 FDAl NO. 2 ATTITUDE ENABLE
 (4-2) [(5-2) + (5-3) (6-1)] + (4-3) H Z 5
 8,7

A4K4 FDAl NO. 2 ATTITUDE MOTOR ENABLE
 (2-1) [(4-2) + (4-3)] N Z 2
 8,8

A4K2 FDAl NO. 1 ATTITUDE MOTOR ENABLE
 (2-1) [(4-1) + (4-3)] N Z 3
 8,8



SECTION 8

IS

WAS

1. DWG 8.8A JZ⁵



2. DWG 8.8A JZ⁵

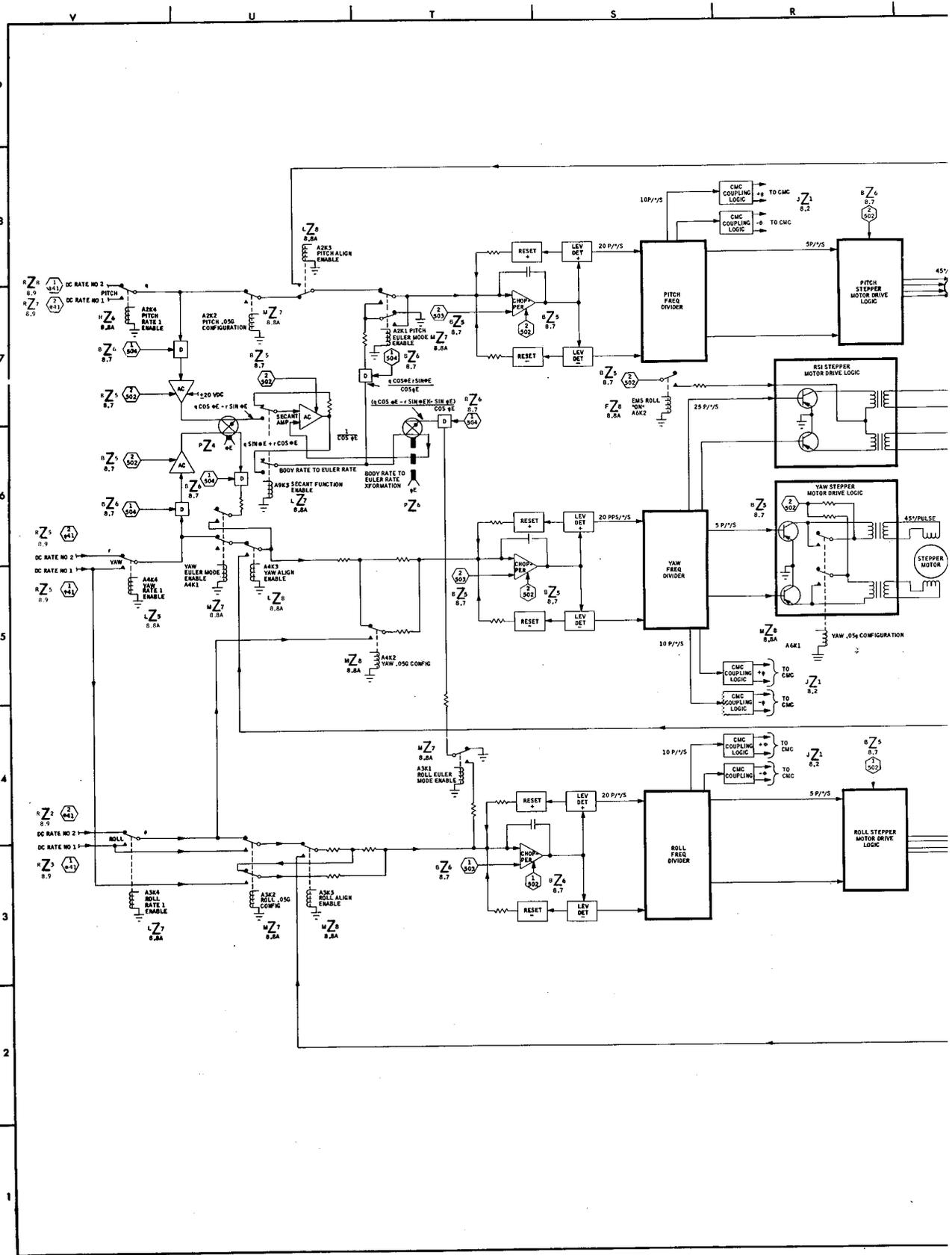


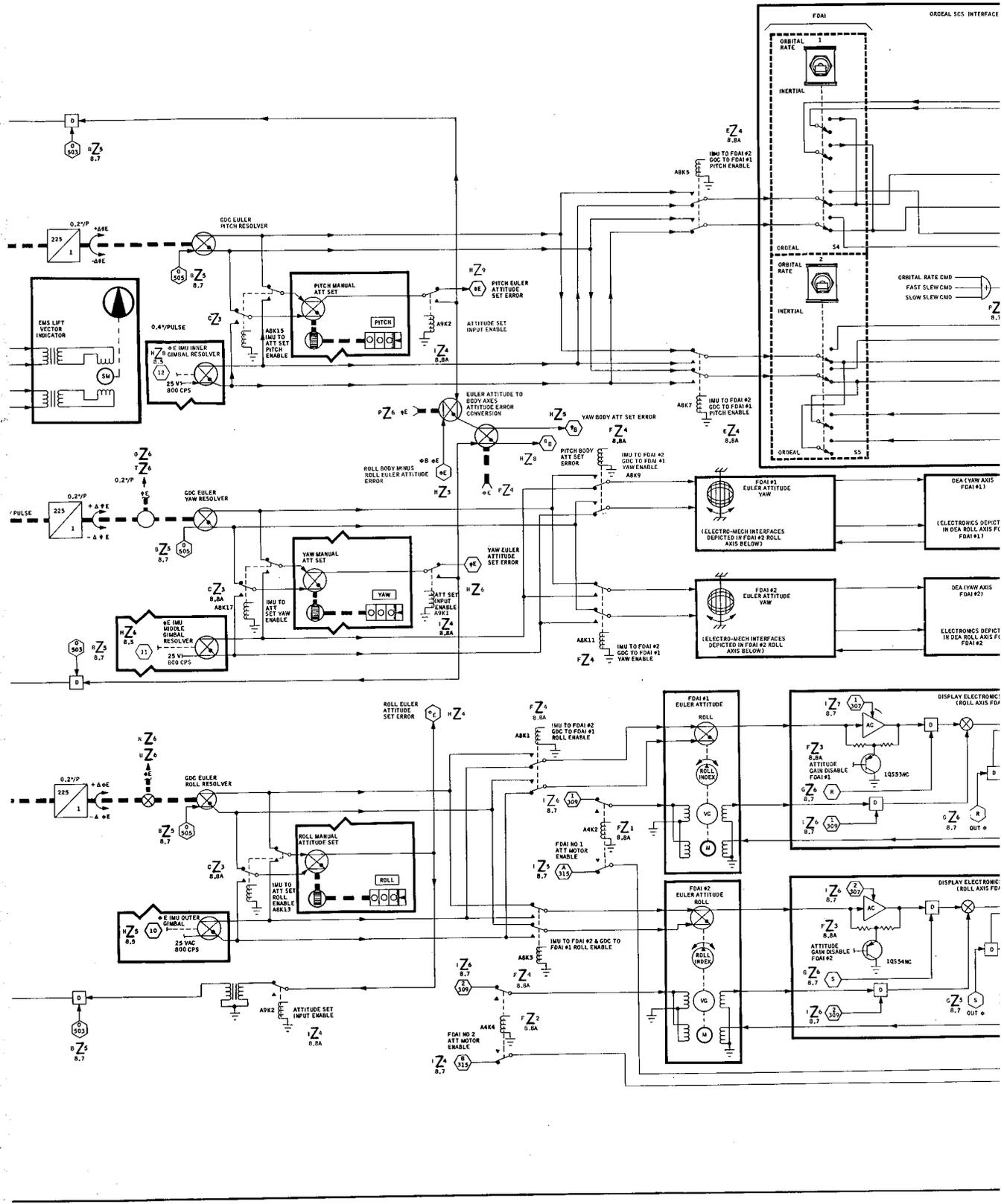
3. DWG 8.8A KZ⁴

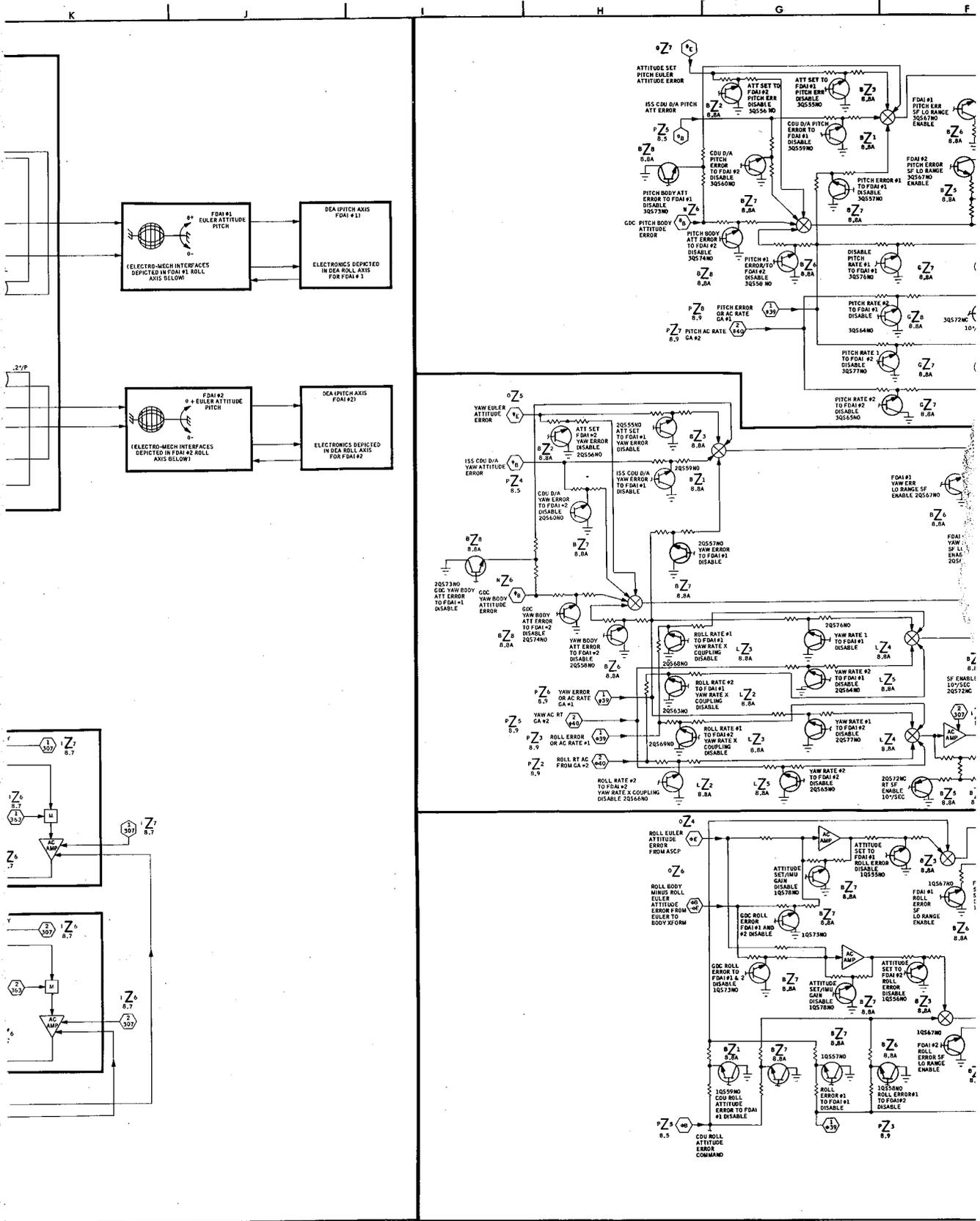


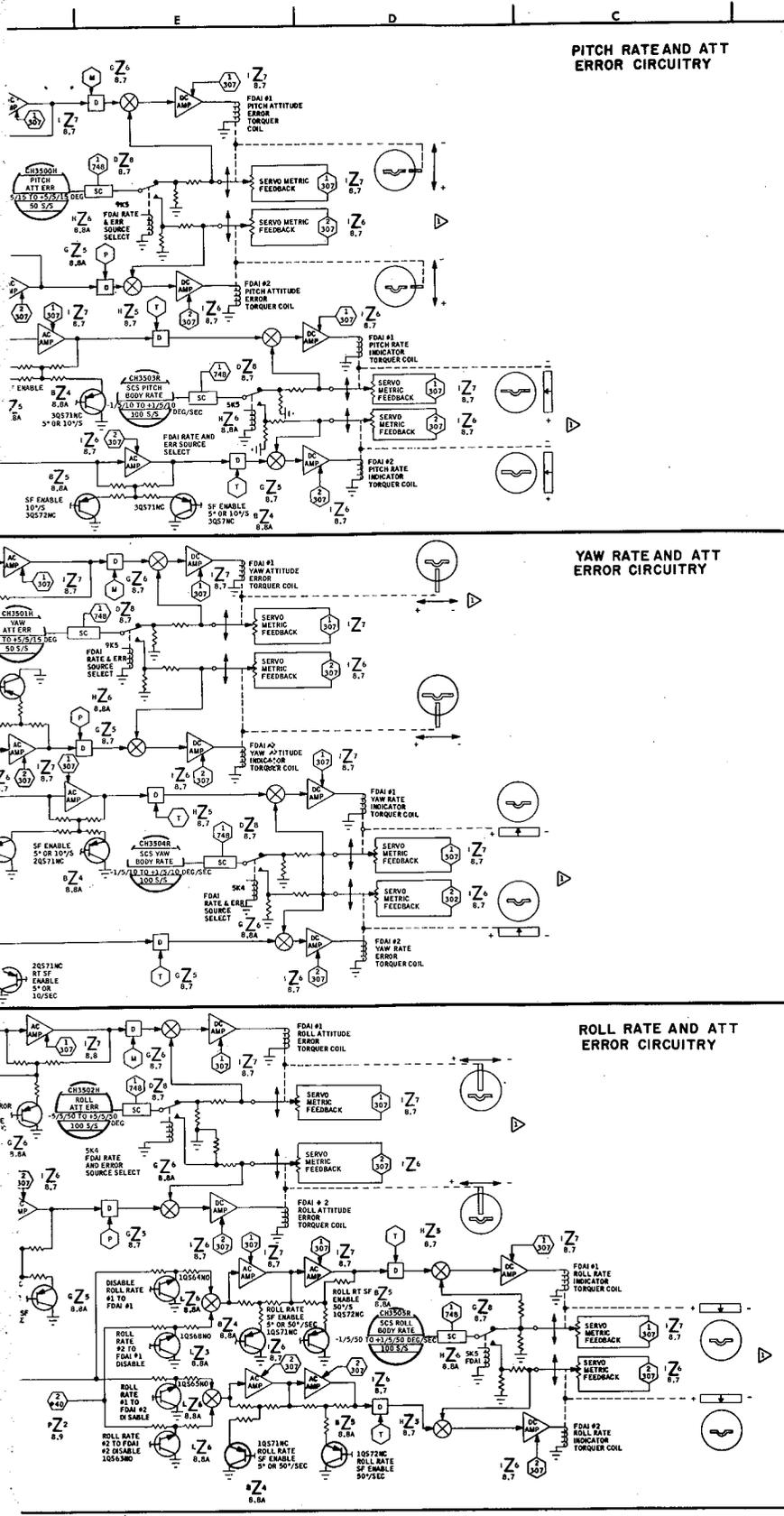
4. DWG 8.8A KZ⁴



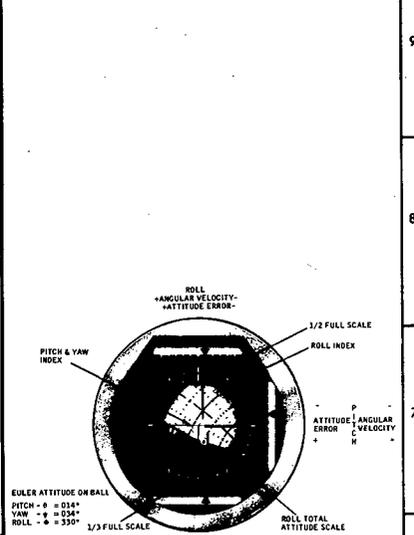








| LET | DR | ENGR | DATE | APPROVAL |
|-----|----|------|------|----------|
| | | | | |



NOTE: ALL POLARITIES INDICATE VEHICLE DYNAMICS AND CMD INPUT REQUIRED TO NULL THE ERROR.

NOTE: RATE AND ATTITUDE INDICATORS PROVIDE "FLY TO" INFORMATION. THUS A NEGATIVE READING REQUIRES A POSITIVE INPUT COMMAND

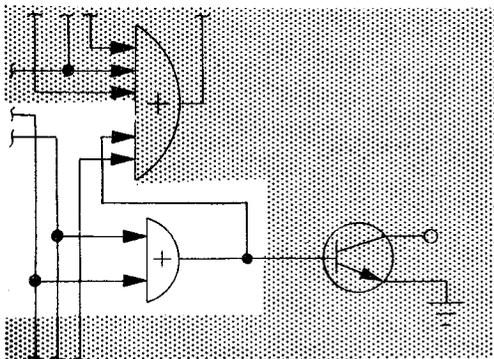
8 ATT REF

| | | |
|-------------------------|------|--|
| SIGNATURES | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION |
| DR <i>R. Davis</i> | | MANHATTAN SPACECRAFT CENTER - HOUSTON, TEXAS |
| DC <i>[Signature]</i> | | |
| ENGR <i>[Signature]</i> | | |
| IN <i>[Signature]</i> | | |
| APP' <i>[Signature]</i> | | |
| REC <i>[Signature]</i> | | |
| AUTH <i>[Signature]</i> | | |
| CSM | | |
| 104 | | |
| J | | |
| 8.8 | | |
| 121 X 35.5 | | |
| PAGE | | |
| (REV. 1-65) | | |

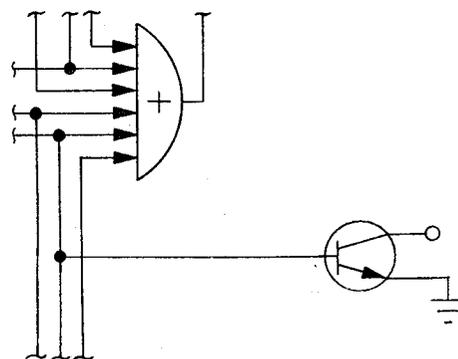
SECTION 8

IS

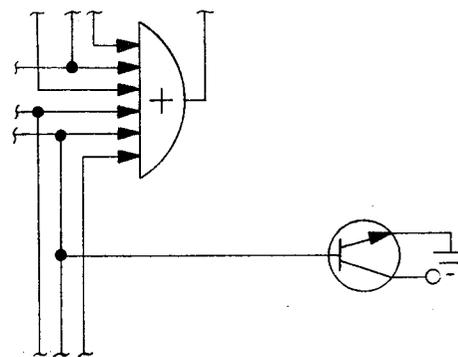
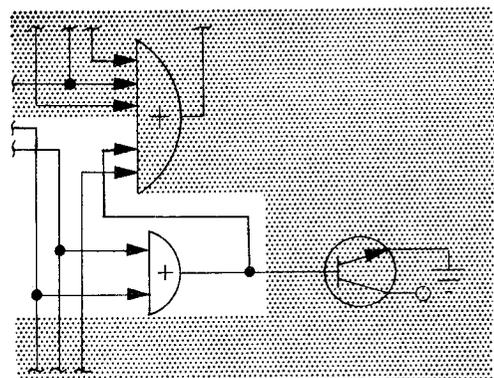
1. DWG 8.9A CZ₂



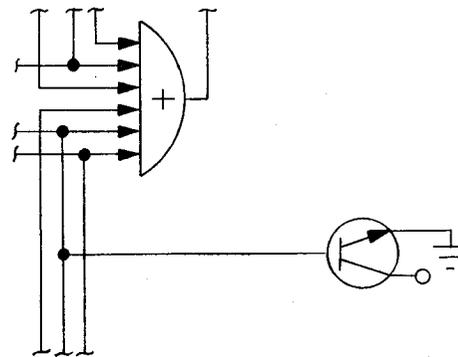
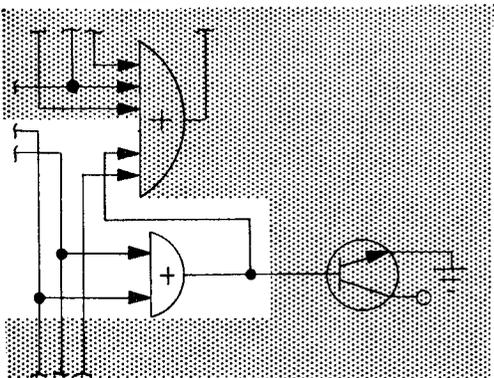
WAS



2. DWG 8.9A EZ₂



3. DWG 8.9A FZ₂



SECTION 8

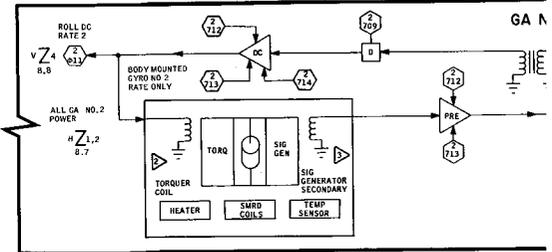
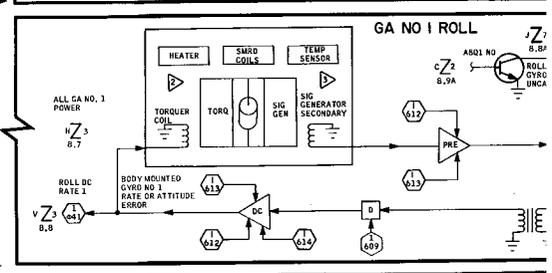
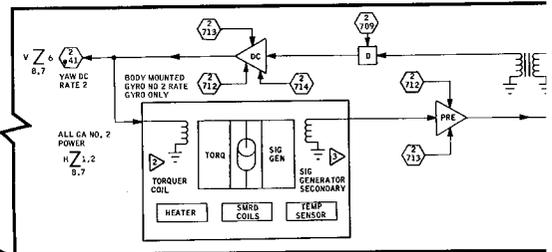
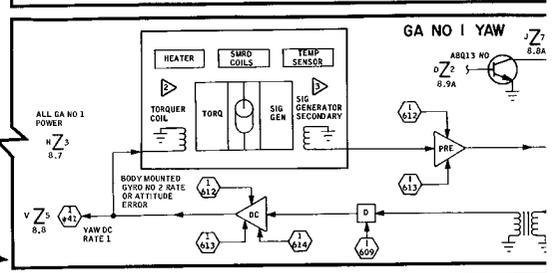
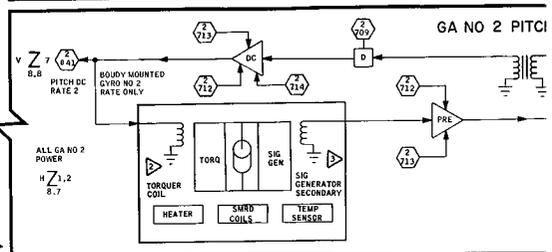
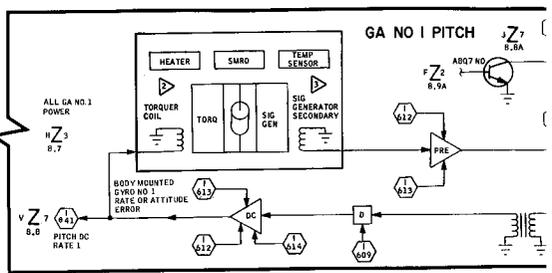
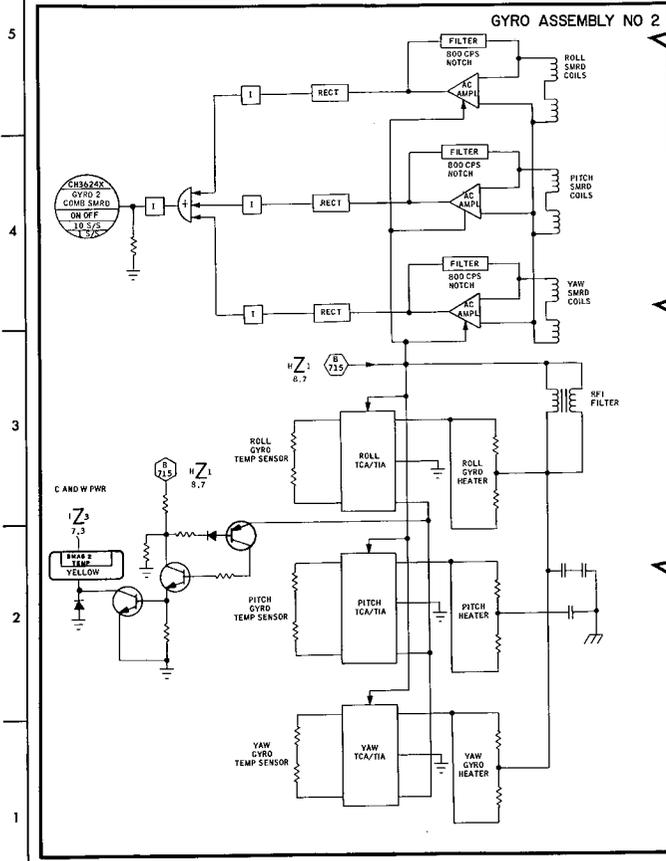
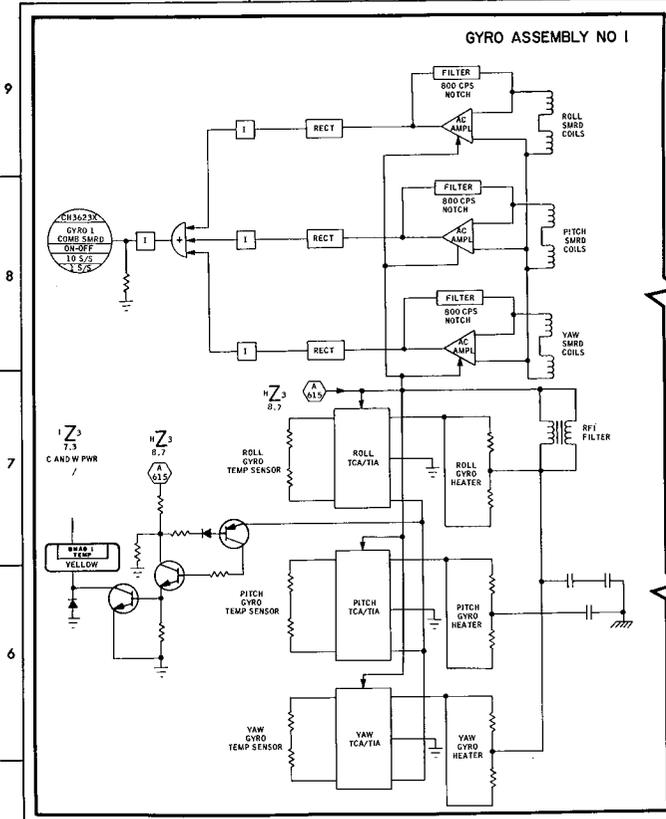
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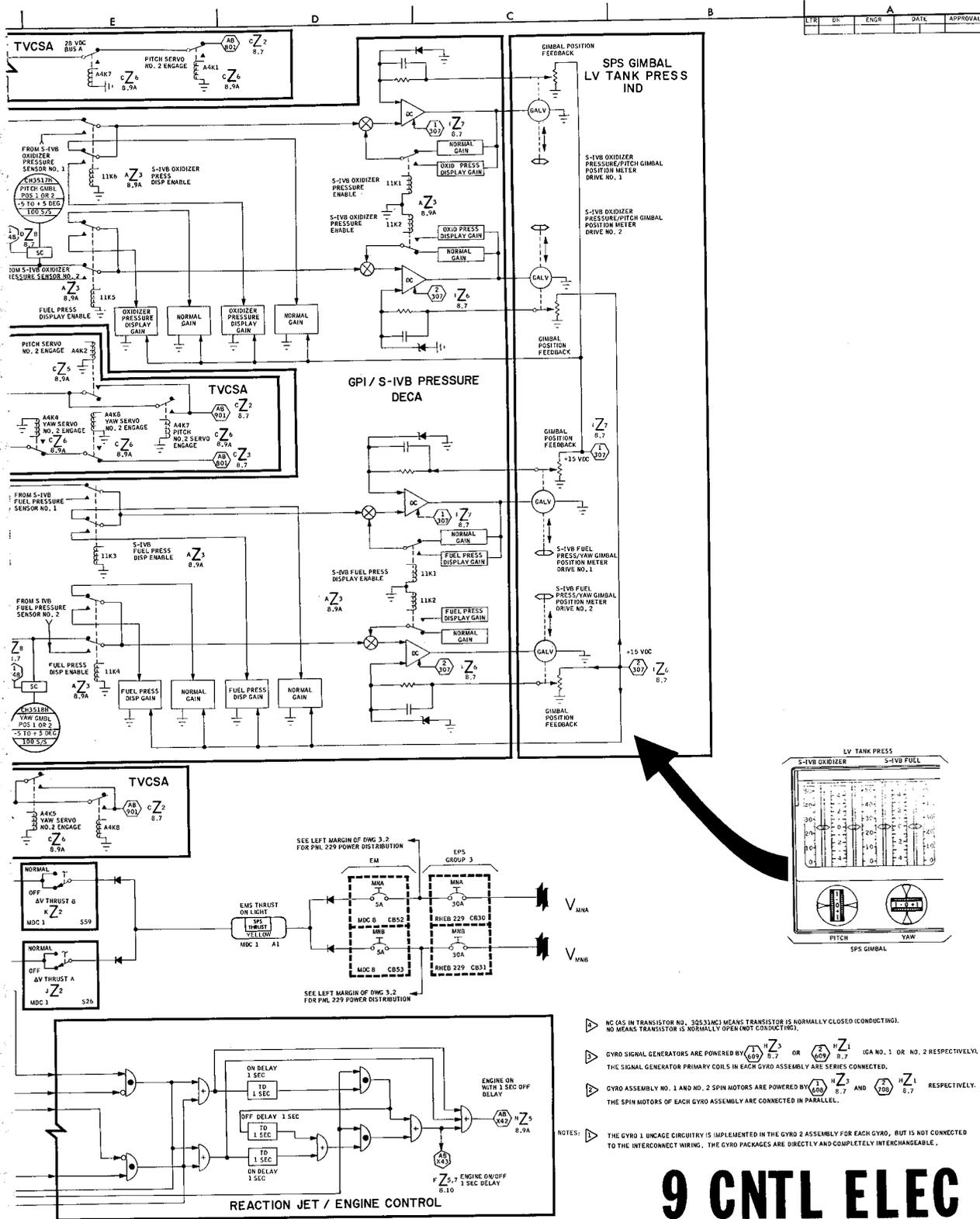
4. DWG 8.9A HZ⁸

V_{LB2} 

WAS

V_{LB3} 





| REV | BY | ENGR | DATE | APPROVAL |
|-----|----|------|------|----------|
| | | | | |

- NOTES:
- ▷ NC (AS IN TRANSISTOR NO. 3Q533MC) MEANS TRANSISTOR IS NORMALLY CLOSED (CONDUCTING). NO MEANS TRANSISTOR IS NORMALLY OPEN (NOT CONDUCTING).
 - ▷ GYRO SIGNAL GENERATORS ARE POWERED BY $\frac{1}{100} \frac{Z}{8.7}$ OR $\frac{5}{100} \frac{Z}{8.7}$ (GA NO. 1 OR NO. 2 RESPECTIVELY). THE SIGNAL GENERATOR PRIMARY COILS IN EACH GYRO ASSEMBLY ARE SERIES CONNECTED.
 - ▷ GYRO ASSEMBLY NO. 1 AND NO. 2 SPIN MOTORS ARE POWERED BY $\frac{1}{100} \frac{Z}{8.7}$ AND $\frac{2}{100} \frac{Z}{8.7}$ RESPECTIVELY. THE SPIN MOTORS OF EACH GYRO ASSEMBLY ARE CONNECTED IN PARALLEL.
 - ▷ THE GYRO 1 UNLOAD CIRCUITRY IS IMPLEMENTED IN THE GYRO 2 ASSEMBLY FOR EACH GYRO, BUT IS NOT CONNECTED TO THE INTERCONNECT WIRING. THE GYRO PACKAGES ARE DIRECTLY AND COMPLETELY INTERCHANGEABLE.

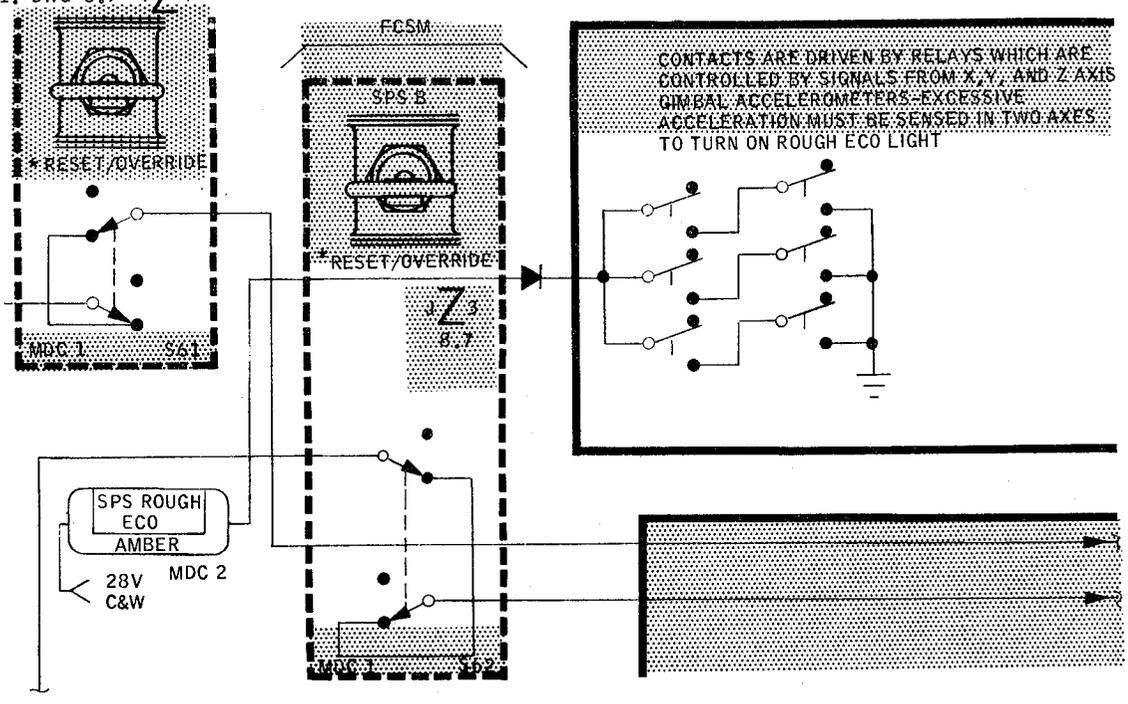
9 CNTL ELEC

| REVISIONS | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS |
|-----------|--------|--|
| DESIGN | 12/68 | SCS CONTROL ELECTRONICS (ECA/TVG/GYROS) CSM 104 J SIZE DWG NO. 8.9 115.5X35.25 PART SHEET 1 OF 3 |
| QC | 1/1/69 | |
| ENGR | 1/1/69 | |
| YR | 1/1/69 | |
| APP | 1/1/69 | |
| AUTH | 1/1/69 | |

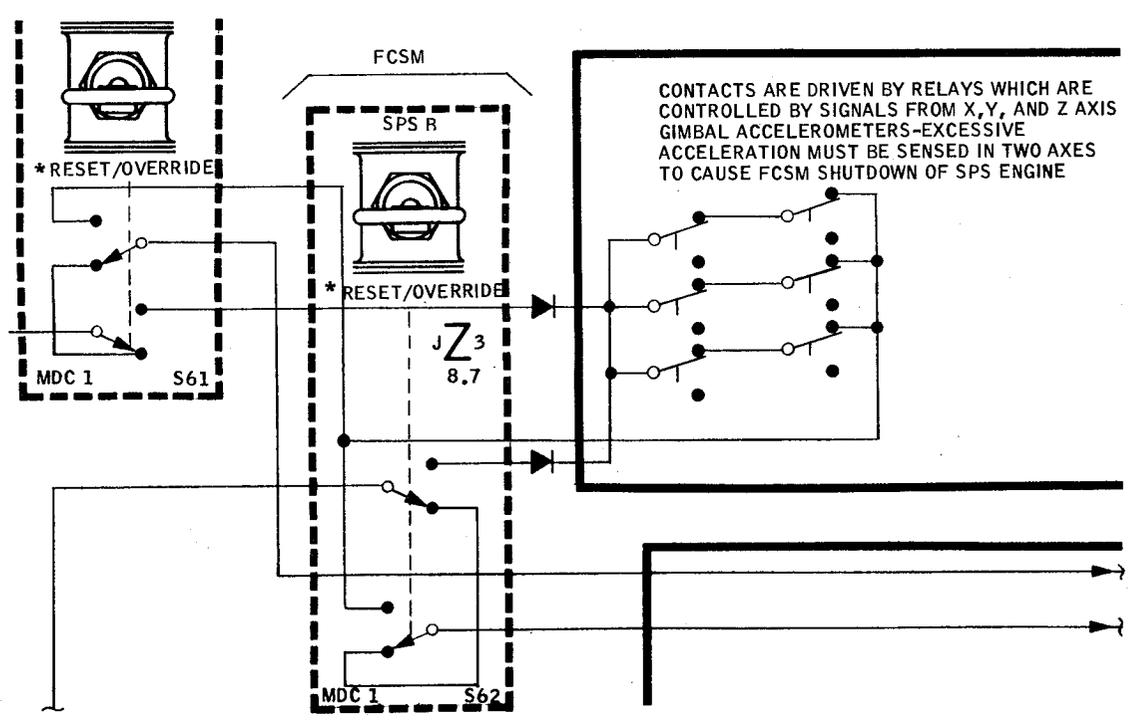
SECTION 8

IS

1. DWG 8.9 1Z4



WAS



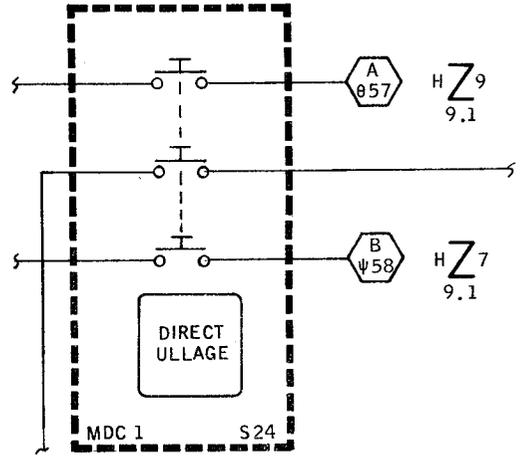
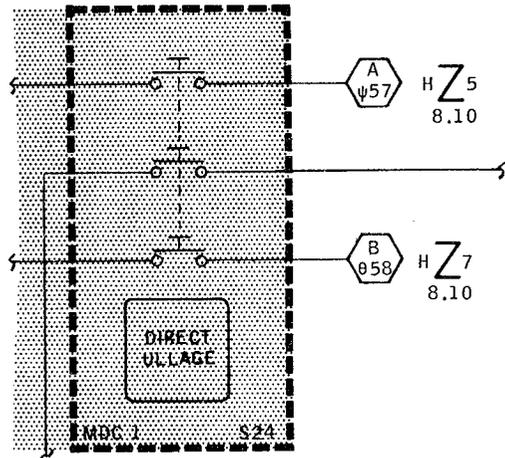
SECTION 8

CSM
S/C 104
PCN 1

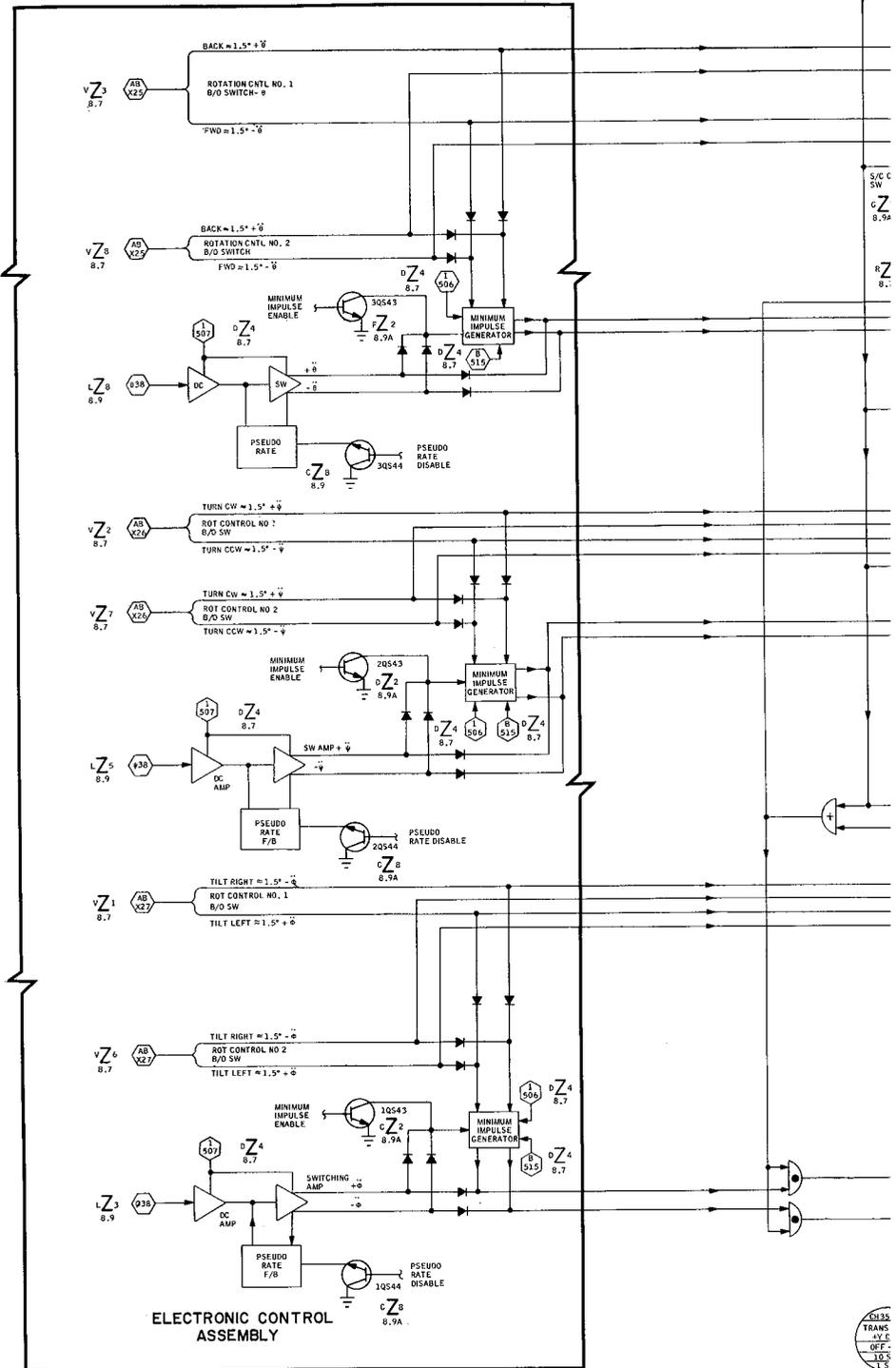
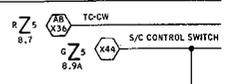
IS

WAS

2. DWG 8.9 | Z 2



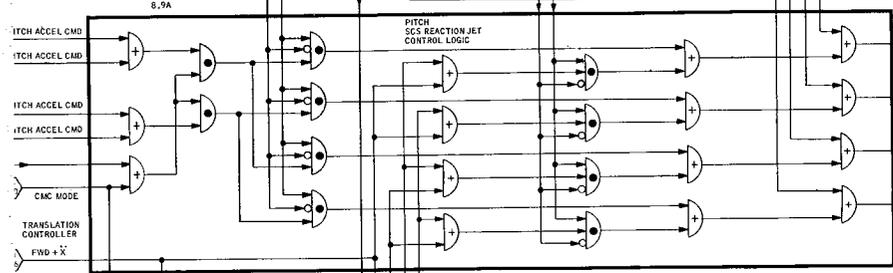
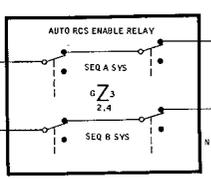
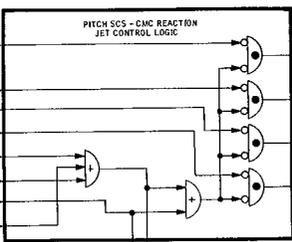
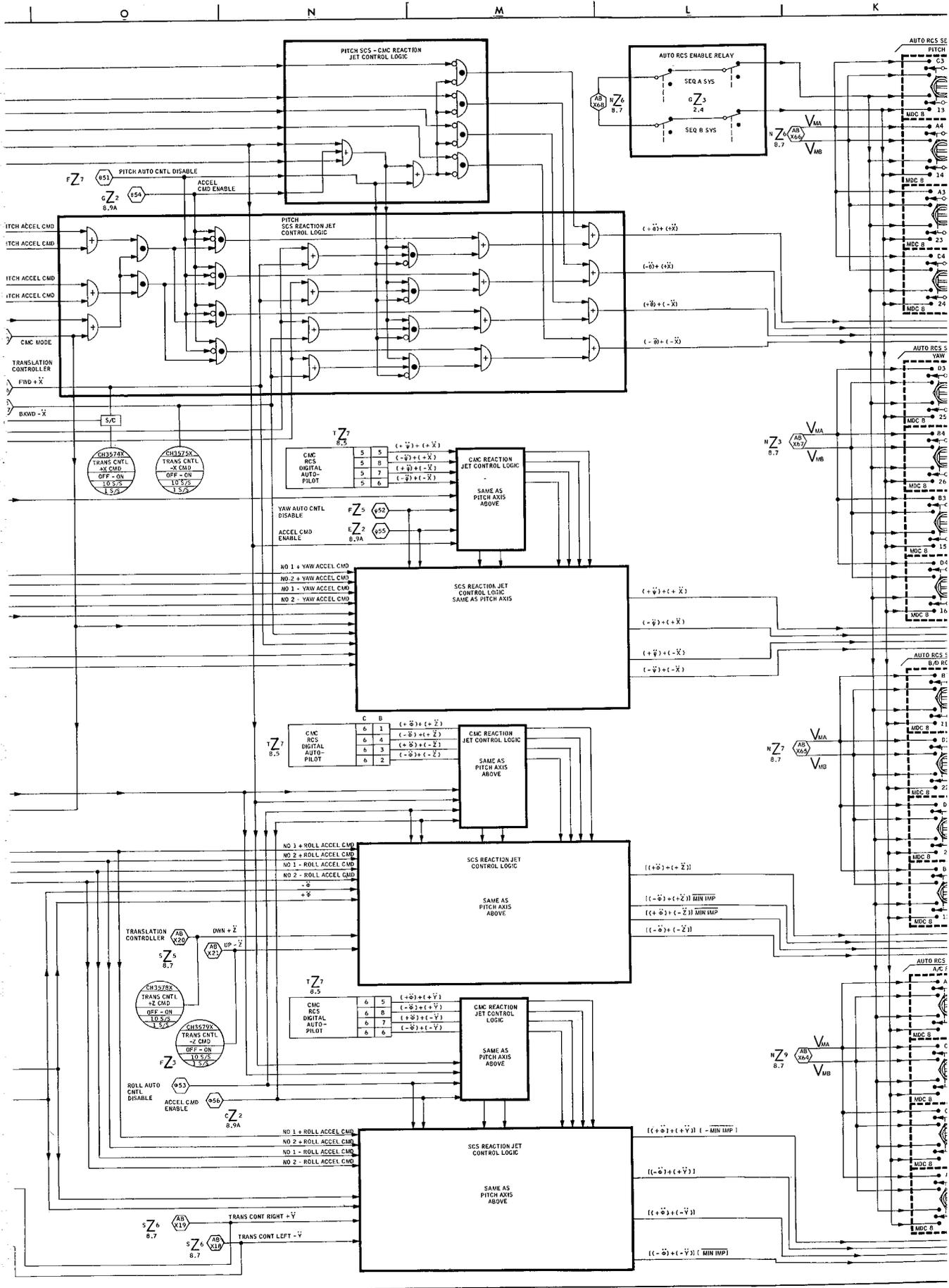
| | CH | B | |
|------------|----|---|-------------|
| 1Z7 8.5 | 5 | 1 | (+θ) + (+X) |
| CMC | 5 | 4 | (-θ) + (+X) |
| RCS | 5 | 3 | (+θ) + (-X) |
| DAP | 5 | 2 | (-θ) + (-X) |



ELECTRONIC CONTROL ASSEMBLY

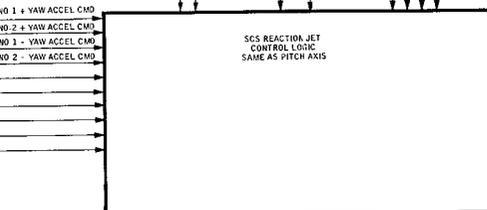
5035
TRANS
-V-
OFF
10
-2.5

5035
TRANS
-V-
OFF
10
-2.5



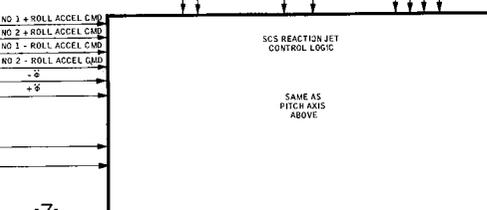
CMC RCS DIGITAL AUTO-PILOT

| | | |
|---|---|-------------|
| 5 | 5 | (+Y) + (+X) |
| 5 | 8 | (-Y) + (+X) |
| 5 | 7 | (+Y) + (-X) |
| 5 | 6 | (-Y) + (-X) |



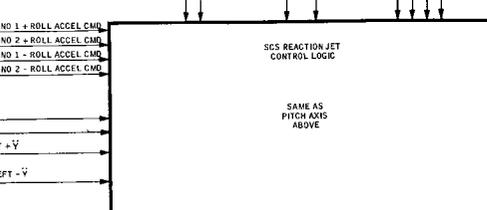
CMC RCS DIGITAL AUTO-PILOT

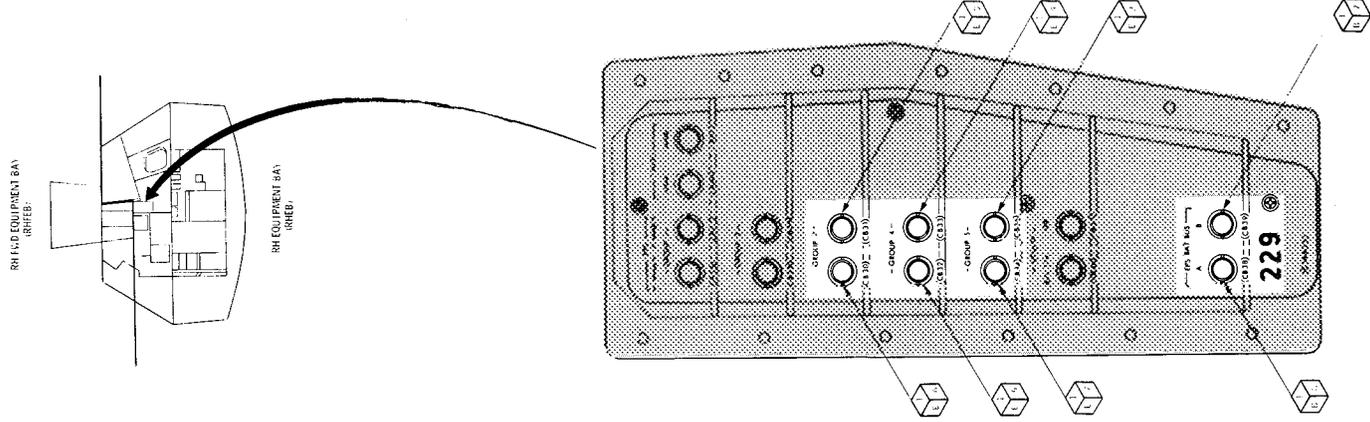
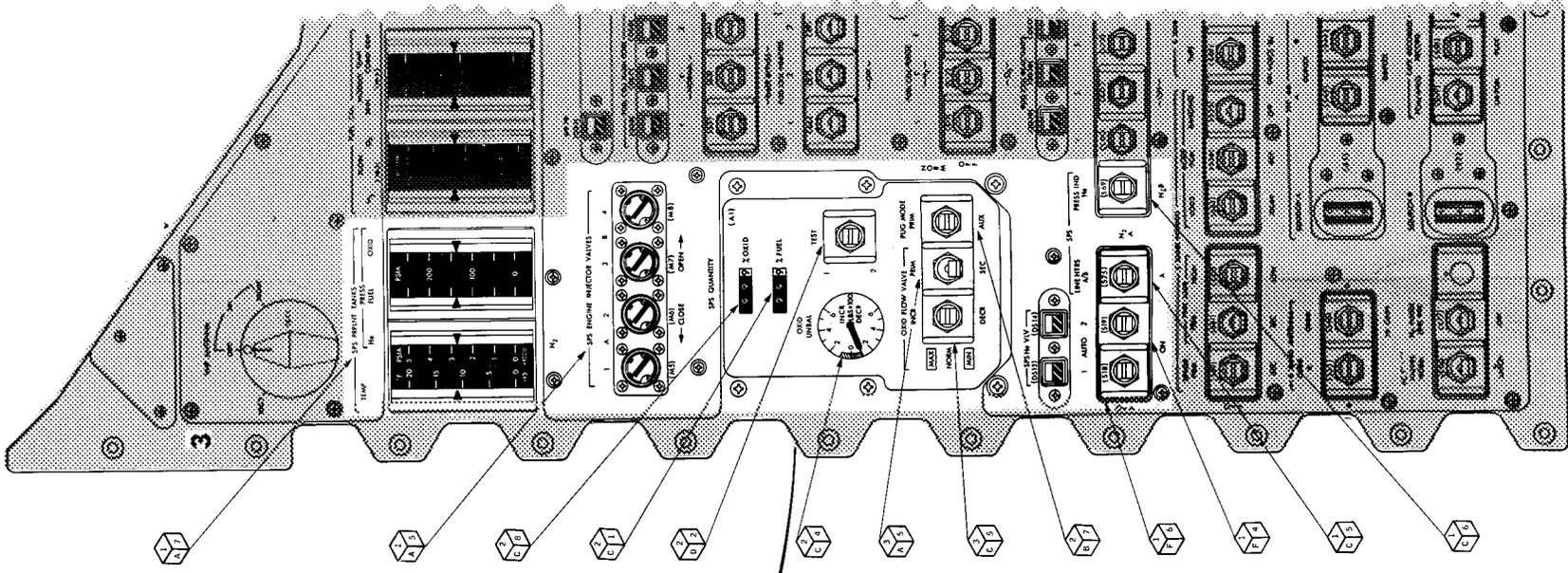
| | | |
|---|---|-------------|
| 6 | 1 | (+Y) + (+Z) |
| 6 | 4 | (-Y) + (+Z) |
| 6 | 3 | (+Y) + (-Z) |
| 6 | 2 | (-Y) + (-Z) |

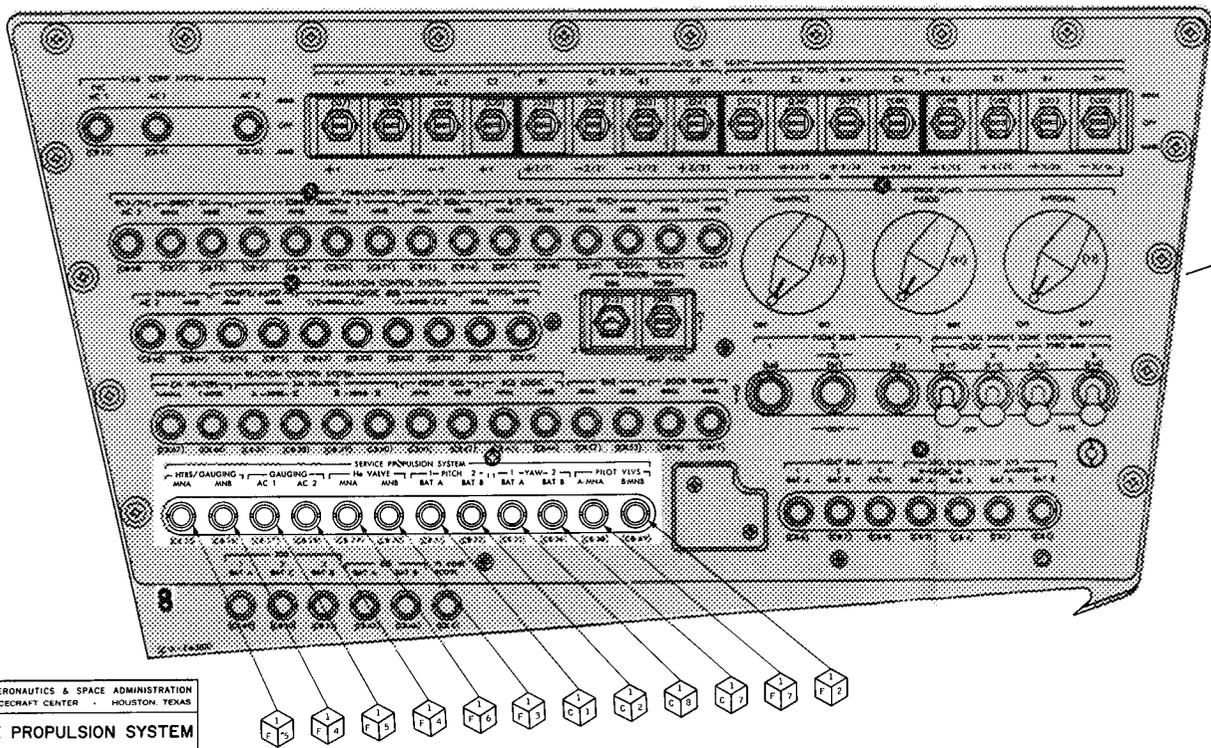
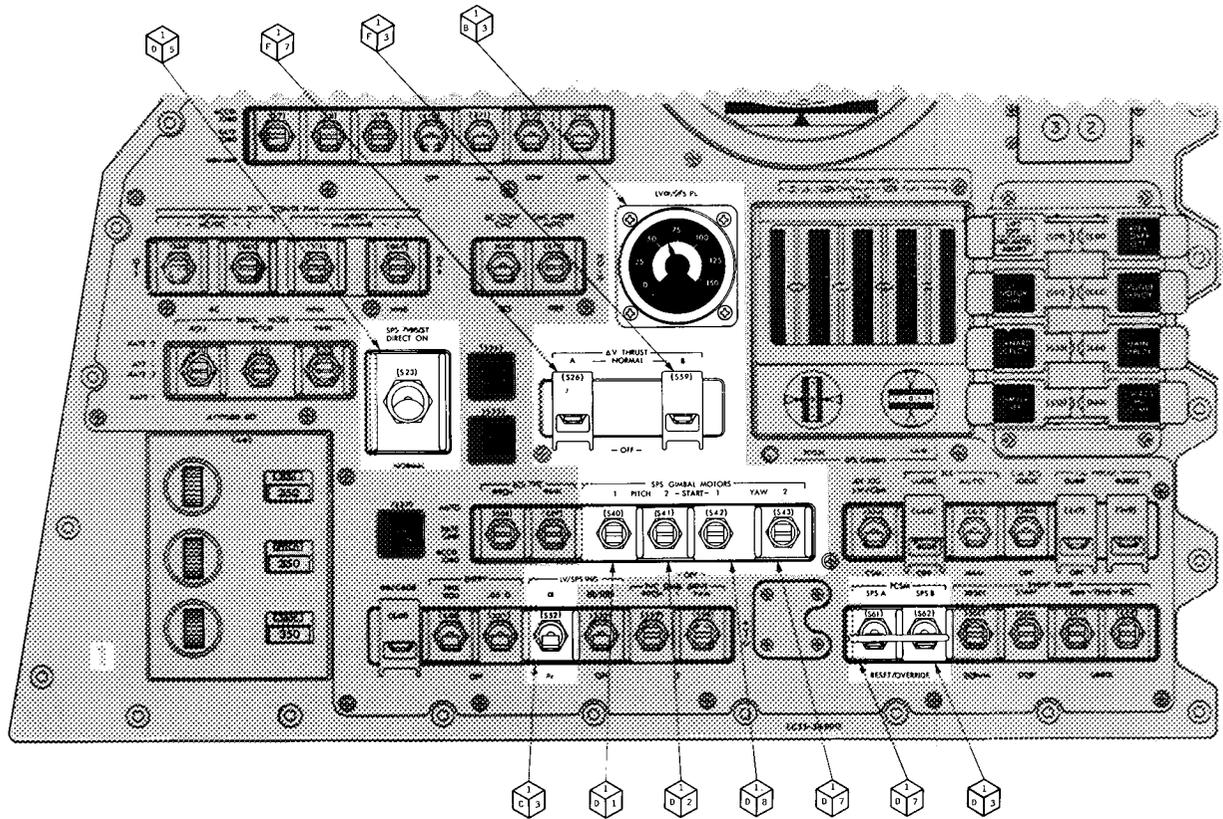


CMC RCS DIGITAL AUTO-PILOT

| | | |
|---|---|-------------|
| 6 | 5 | (+Y) + (+Z) |
| 6 | 8 | (-Y) + (+Z) |
| 6 | 7 | (+Y) + (-Z) |
| 6 | 6 | (-Y) + (-Z) |







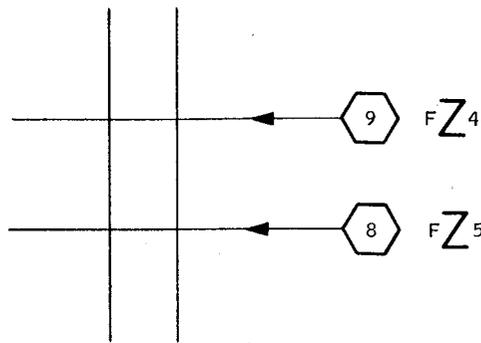
NATIONAL AERONAUTICS & SPACE ADMINISTRATION
 MANNED SPACECRAFT CENTER - HOUSTON, TEXAS

**SERVICE PROPULSION SYSTEM
 CONTROL-DISPLAY FIGURE**

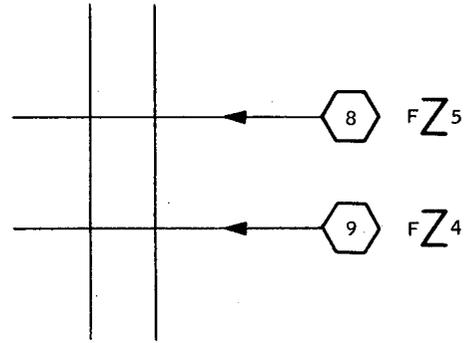
| | | |
|------------|------|------------|
| DWG NO. | SIZE | CSM |
| FIGURE 9.1 | J | 104 |
| SHEET OF | PAGE | 70, 5 X 30 |

SECTION 9

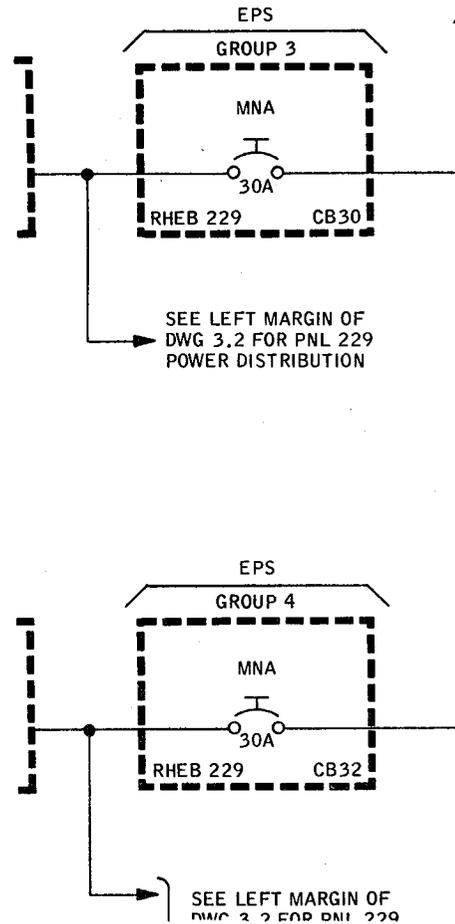
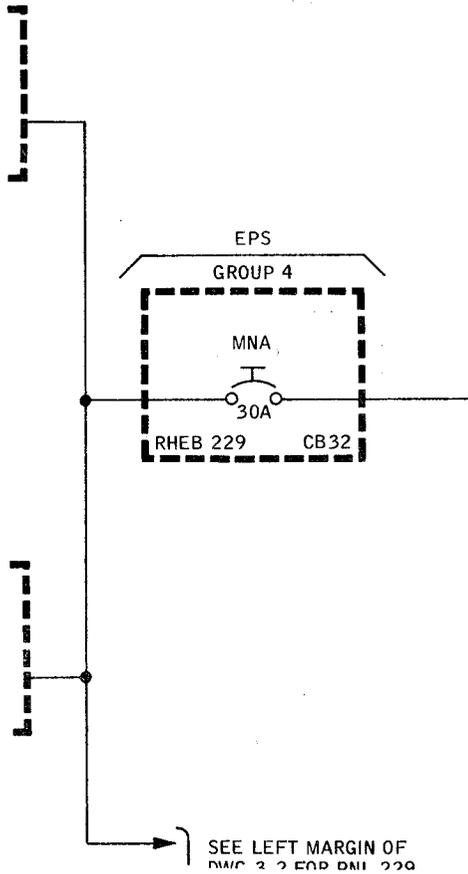
1. DWG 9.1 C,BZ5 IS



WAS



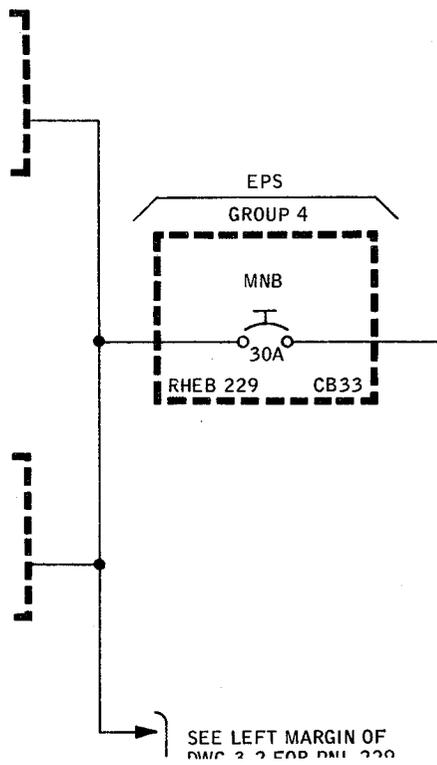
2. DWG 9.1 EZ6,5



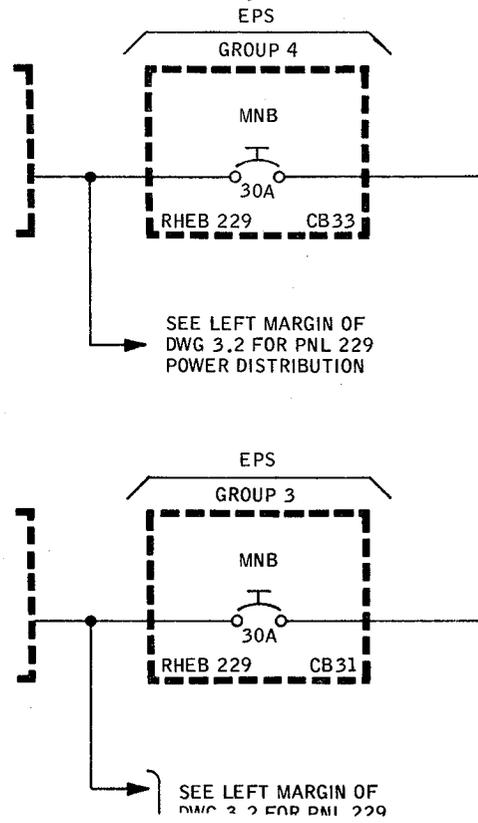
SECTION 9

IS

3. DWG 9.1 E Z_{3,2}



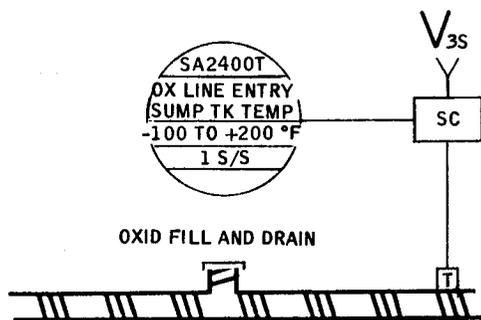
WAS



4. DWG 9.1 A Z₃

THRUST 20,500±205 LBS DOUBLE BANK
20,000±200 LBS SINGLE BANK

5. DWG 9.1 J Z₆



THRUST 20,000±200 LBS

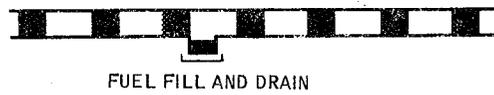
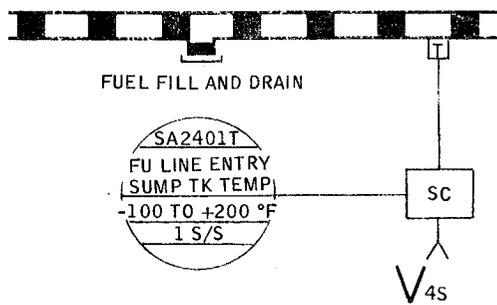


SECTION 9

IS

WAS

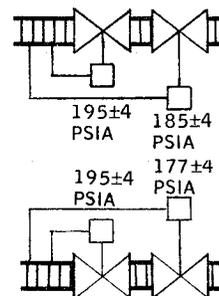
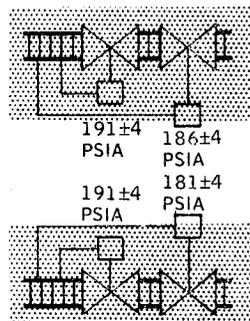
6. DWG 9.1 JZ₃



7. DWG 9.1 LZ₆



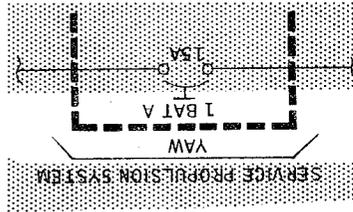
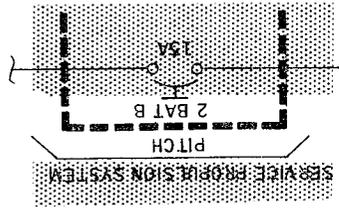
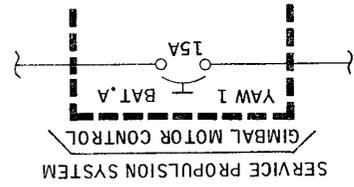
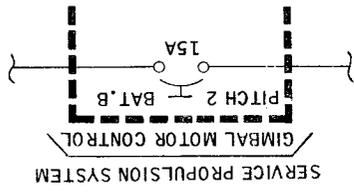
8. DWG 9.1 LZ₄



9. DWG 9.1 LZ₃



SECTION 9



13. DWG 9.1 C 2

12. DWG 9.1 C 8

11. DWG 9.1 S 7

10. DWG 9.1 S 8

WAS

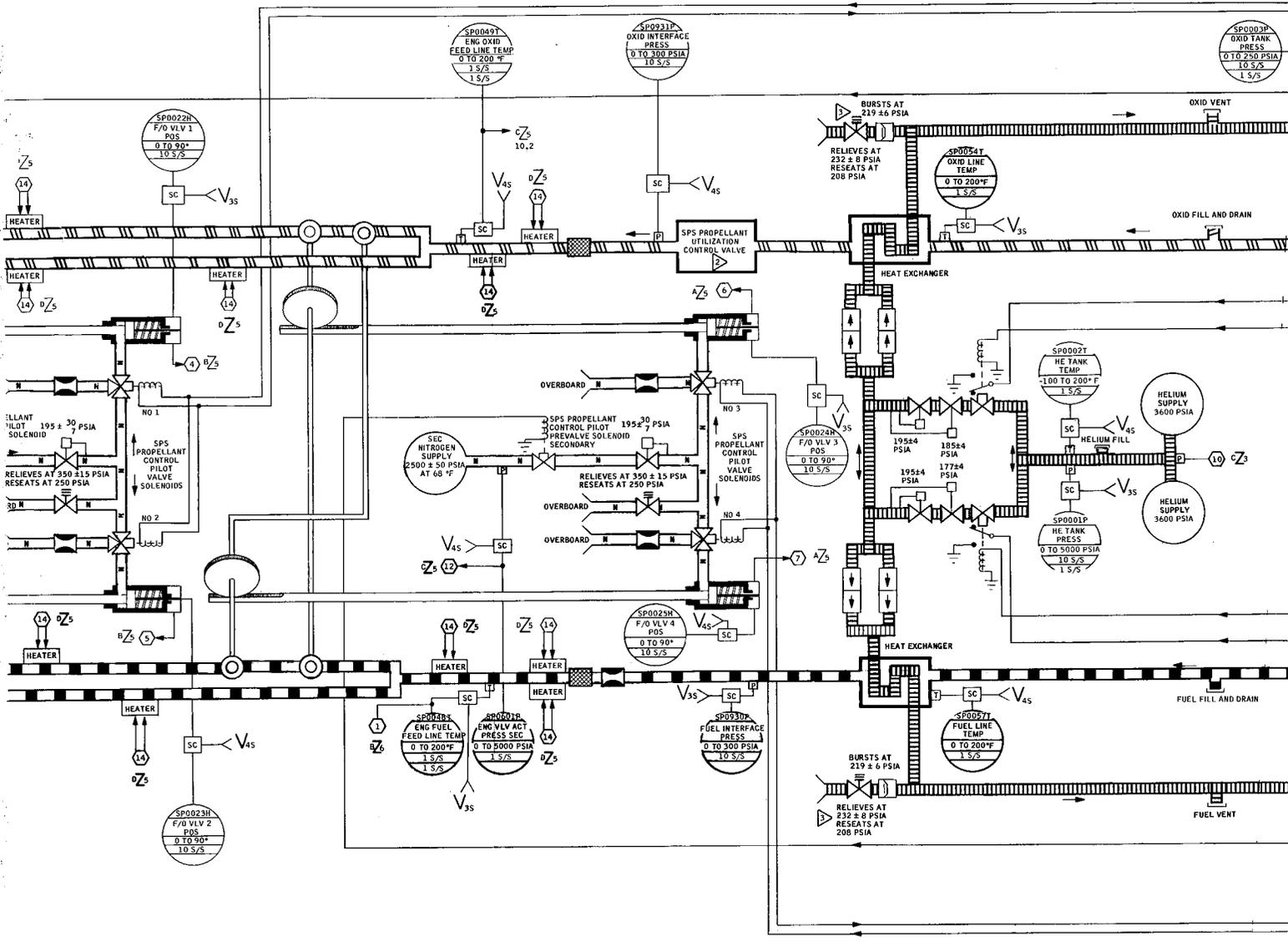
IS

YAW GIMBAL 1

YAW GIMBAL 1 C&W LITE
YAW GIMBAL 2 C&W LITE

YAW GIMBAL 2

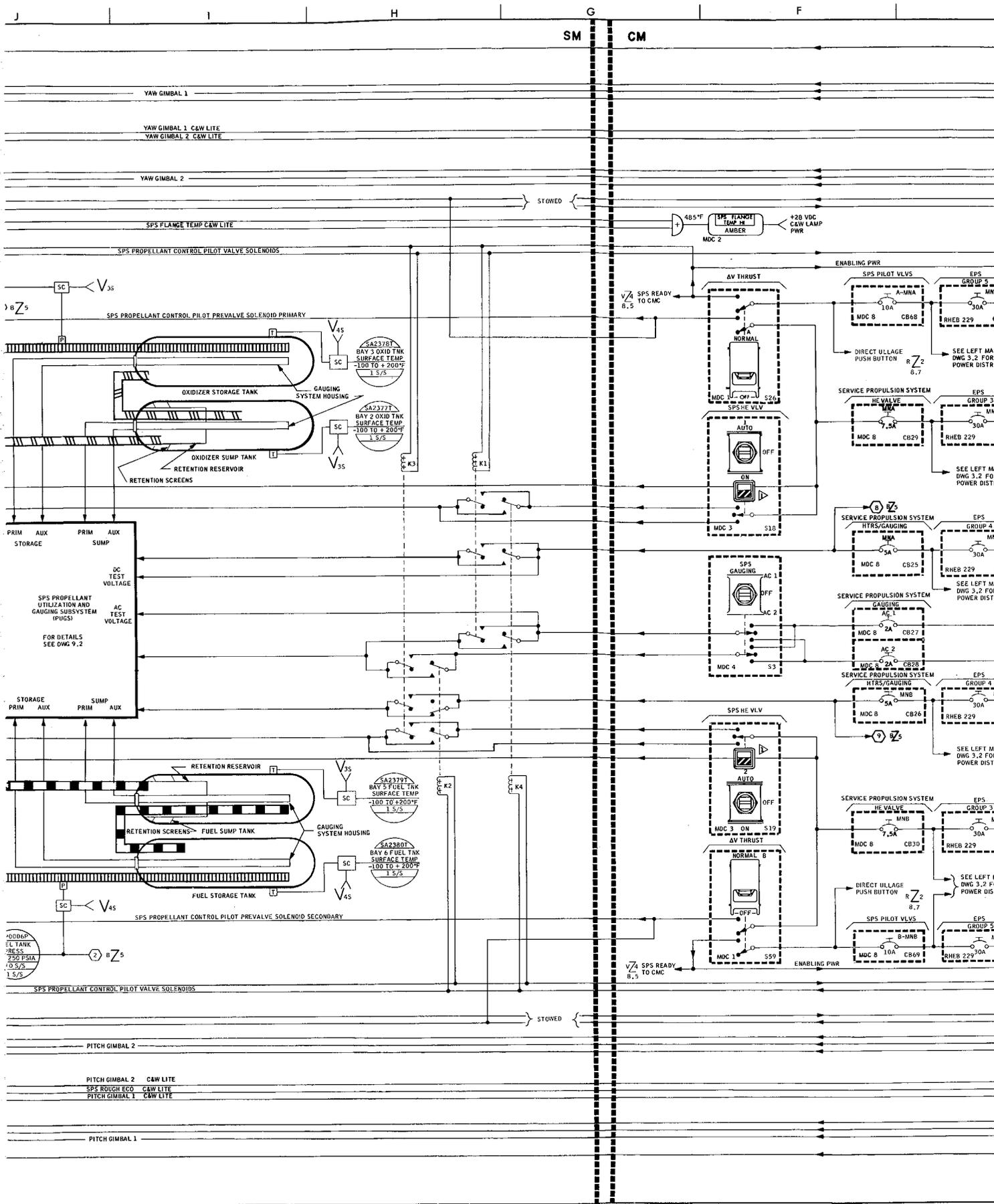
SPS FLANGE TEMP - C&W LITE



PITCH GIMBAL 2

PITCH GIMBAL 2 C&W LITE
SPS ROUGH ECD C&W LITE
PITCH GIMBAL 1 C&W LITE

PITCH GIMBAL 1



YAW GIMBAL 1

YAW GIMBAL 1 C&W LITE
YAW GIMBAL 2 C&W LITE

YAW GIMBAL 2

SPS FLANGE TEMP C&W LITE

SPS PROPELLANT CONTROL PILOT VALVE SOLENOIDS

SPS PROPELLANT CONTROL PILOT PREVALVE SOLENOID PRIMARY

OXIDIZER STORAGE TANK

OXIDIZER SUMP TANK

RETENTION RESERVOIR

RETENTION SCREENS

PRIM STORAGE

AUX STORAGE

PRIM SUMP

AUX SUMP

SPS PROPELLANT UTILIZATION AND GAUGING SUBSYSTEM (PUGS)

FOR DETAILS SEE DWG 9.2

STORAGE

PRIM STORAGE

AUX STORAGE

PRIM SUMP

AUX SUMP

RETENTION RESERVOIR

RETENTION SCREENS

FUEL SUMP TANK

FUEL STORAGE TANK

SPS PROPELLANT CONTROL PILOT PREVALVE SOLENOID SECONDARY

SPS PROPELLANT CONTROL PILOT VALVE SOLENOIDS

PITCH GIMBAL 2

PITCH GIMBAL 2 C&W LITE

SPS ROUGH ECO C&W LITE

PITCH GIMBAL 1 C&W LITE

PITCH GIMBAL 1

SM CM

STOWED

485°F

SPS FLANGE TEMP

AMBER

MDC 2

+28 VDC

C&W LAMP

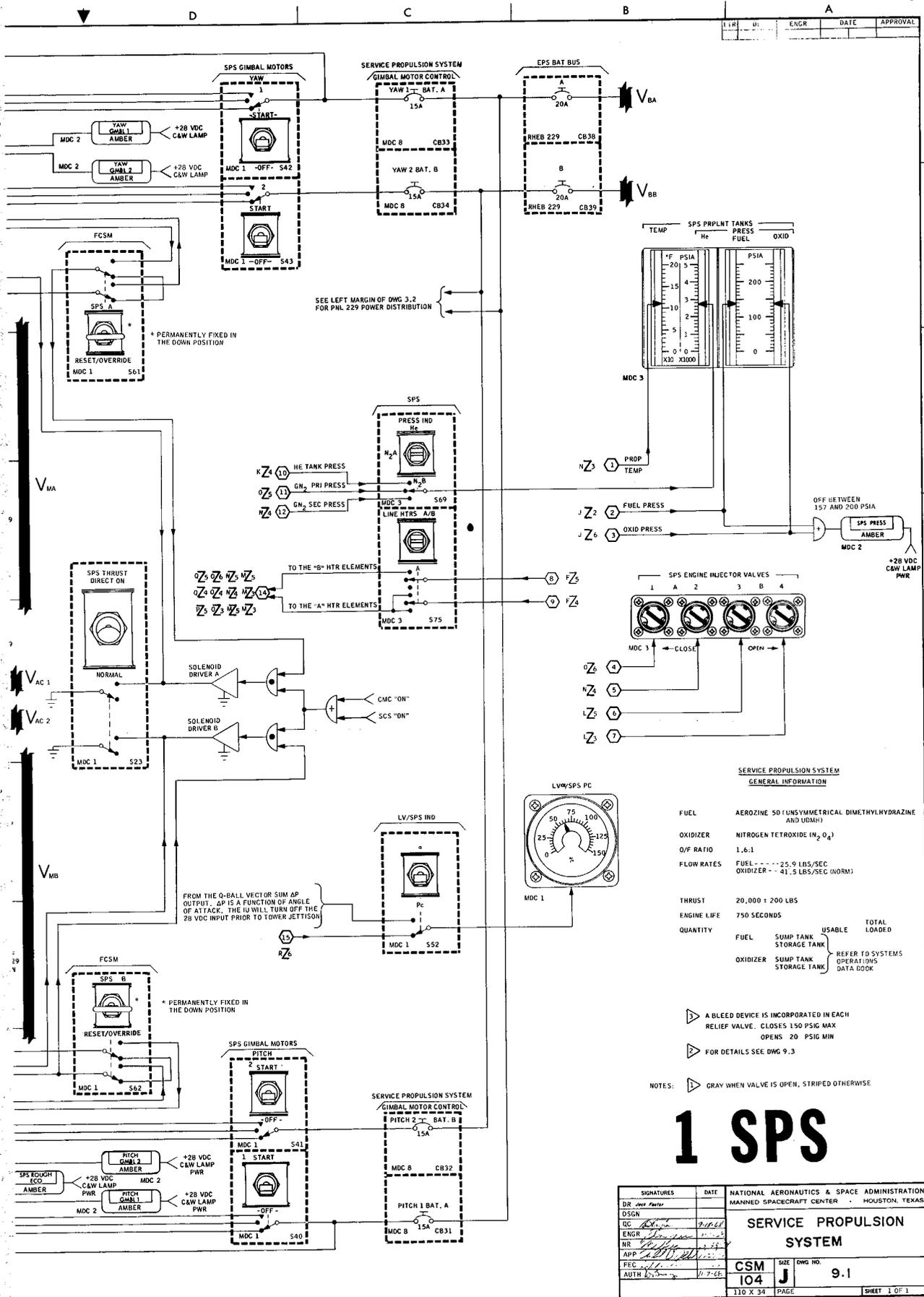
PWR

ENABLING PWR

AV THRUST

SPS PILOT VLVs

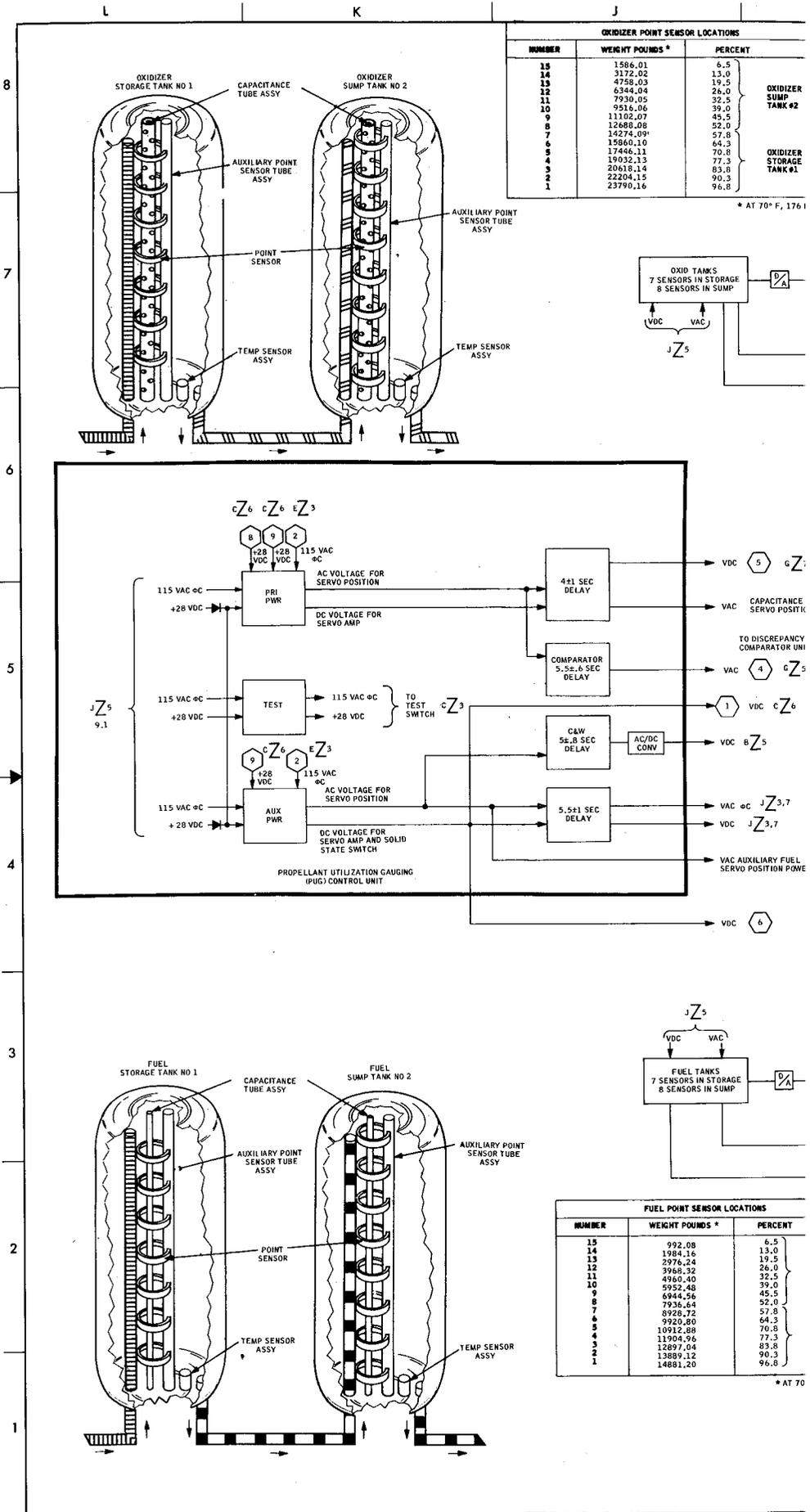
SPS HE VLV



1 SPS

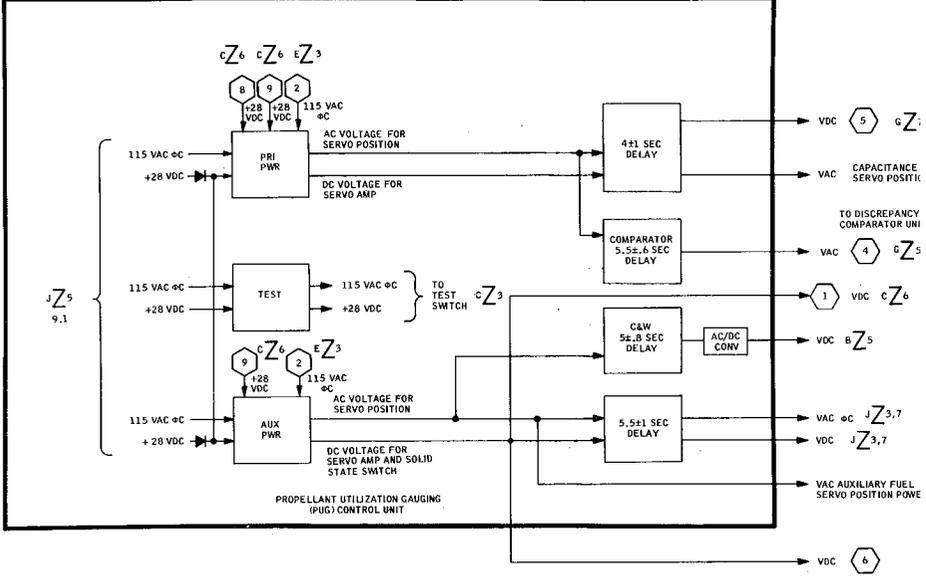
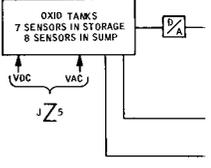
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|-------------------------|------|--|
| DR. <i>[Signature]</i> | | |
| DCM | | |
| QC <i>[Signature]</i> | | |
| ENGR <i>[Signature]</i> | | |
| NR <i>[Signature]</i> | | |
| APP <i>[Signature]</i> | | |
| FEC <i>[Signature]</i> | | |
| AUTH <i>[Signature]</i> | | |

| | |
|----------------------------------|--------------|
| SERVICE PROPUSSION SYSTEM | |
| CMS 104 | SIZE 9.1 |
| J | PAGE 1 |
| 110 X 34 | SHEET 1 OF 1 |



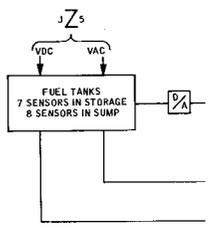
| OXIDIZER POINT SENSOR LOCATIONS | | |
|---------------------------------|-----------------|---------|
| NUMBER | WEIGHT POUNDS * | PERCENT |
| 15 | 1586.01 | 6.5 |
| 14 | 3272.02 | 13.0 |
| 13 | 4758.03 | 19.5 |
| 12 | 6344.04 | 26.0 |
| 11 | 7930.05 | 32.5 |
| 10 | 9516.06 | 39.0 |
| 9 | 11102.07 | 45.5 |
| 8 | 12688.08 | 52.0 |
| 7 | 14274.09 | 57.8 |
| 6 | 15860.10 | 64.3 |
| 5 | 17446.11 | 70.8 |
| 4 | 19032.13 | 77.3 |
| 3 | 20618.14 | 83.8 |
| 2 | 22204.15 | 90.3 |
| 1 | 23790.16 | 96.8 |

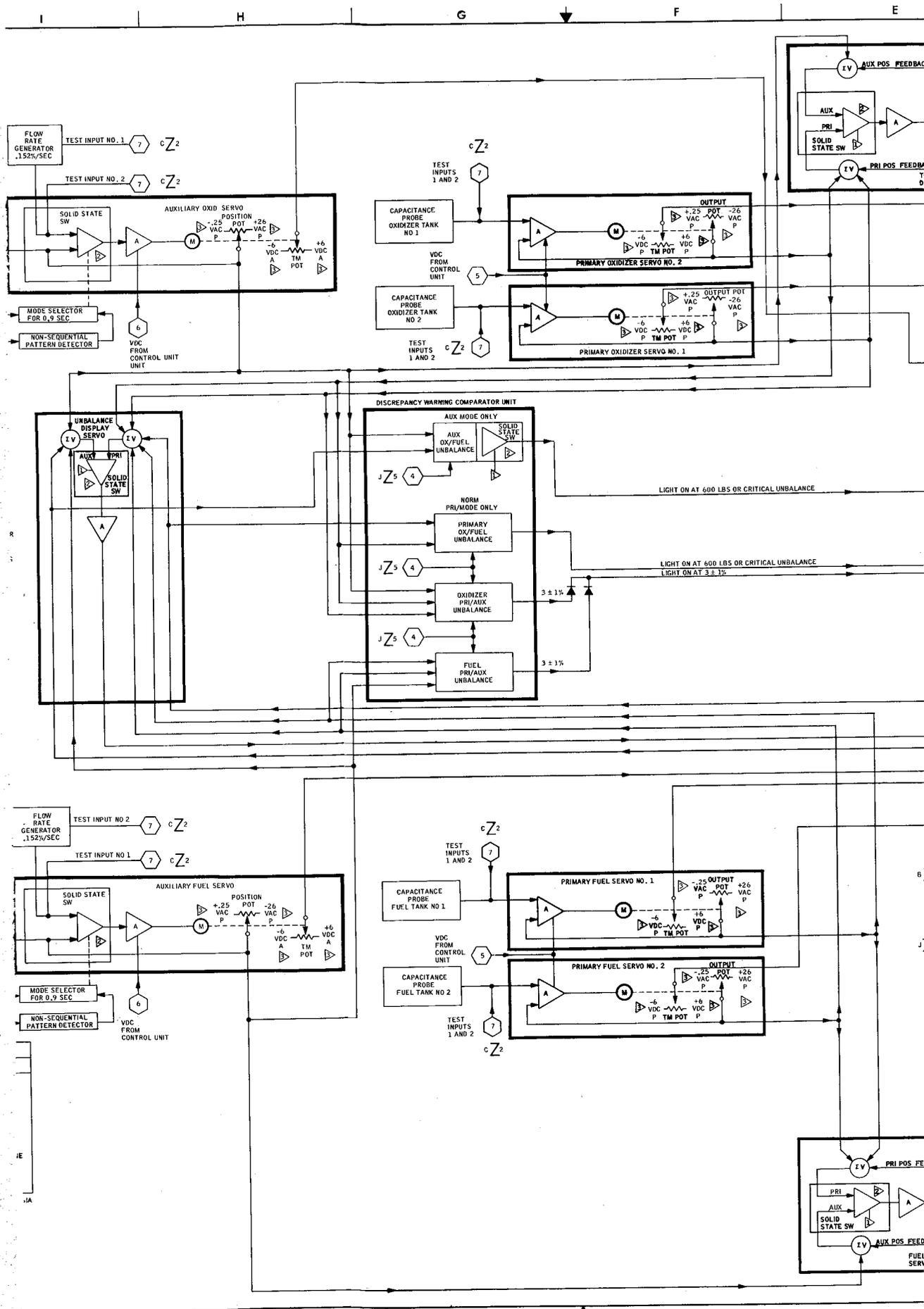
* AT 70° F, 176 l

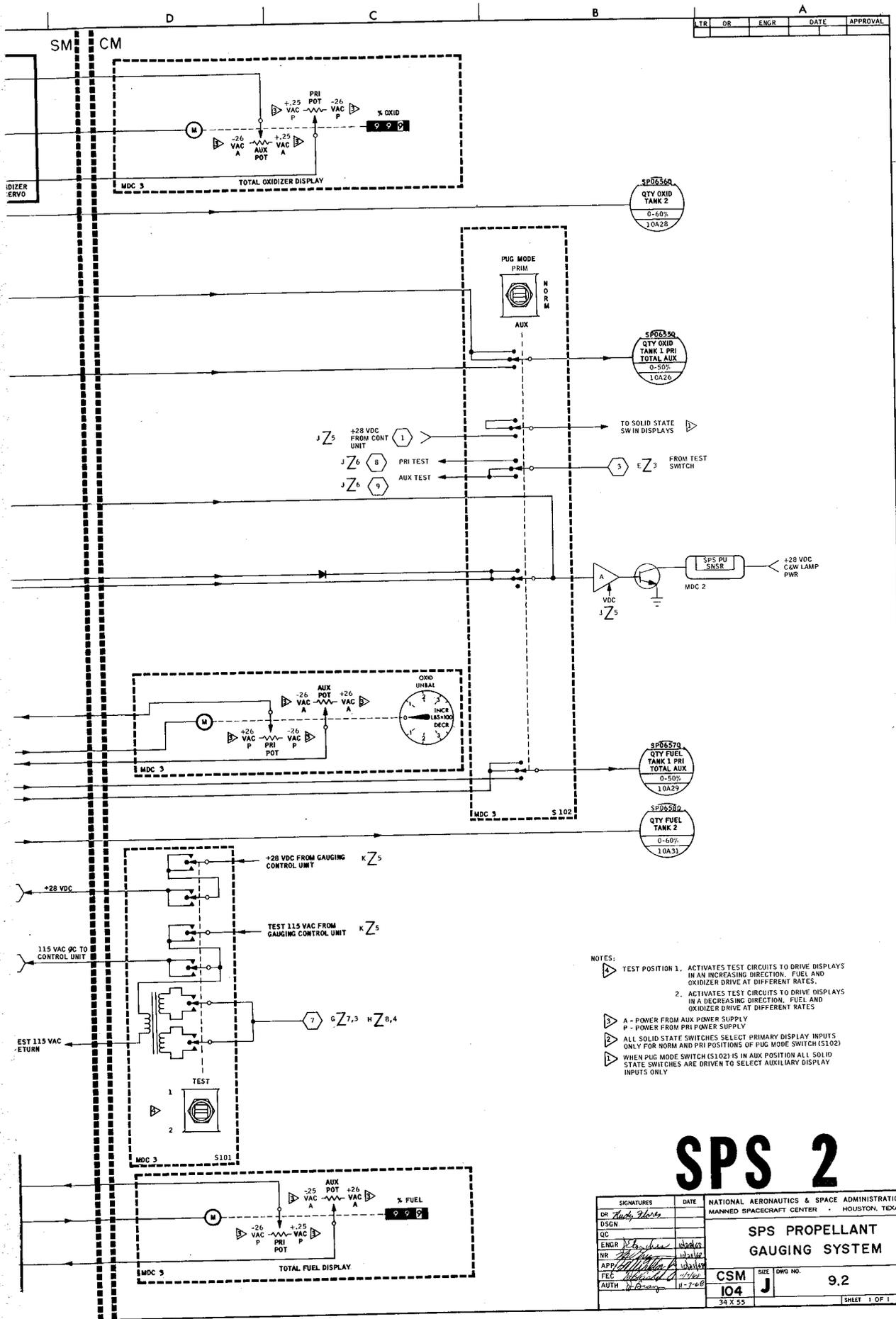


| FUEL POINT SENSOR LOCATIONS | | |
|-----------------------------|-----------------|---------|
| NUMBER | WEIGHT POUNDS * | PERCENT |
| 15 | 992.08 | 6.5 |
| 14 | 1984.16 | 13.0 |
| 13 | 2976.24 | 19.5 |
| 12 | 3968.32 | 26.0 |
| 11 | 4960.40 | 32.5 |
| 10 | 5952.48 | 39.0 |
| 9 | 6944.56 | 45.5 |
| 8 | 7936.64 | 52.0 |
| 7 | 8928.72 | 57.8 |
| 6 | 9920.80 | 64.3 |
| 5 | 10912.88 | 70.8 |
| 4 | 11904.96 | 77.3 |
| 3 | 12897.04 | 83.8 |
| 2 | 13889.12 | 90.3 |
| 1 | 14881.20 | 96.8 |

* AT 70







- NOTES:
- ▽ TEST POSITION 1. ACTIVATES TEST CIRCUITS TO DRIVE DISPLAYS IN AN INCREASING DIRECTION. FUEL AND OXIDIZER DRIVE AT DIFFERENT RATES.
 - ▽ TEST POSITION 2. ACTIVATES TEST CIRCUITS TO DRIVE DISPLAYS IN A DECREASING DIRECTION. FUEL AND OXIDIZER DRIVE AT DIFFERENT RATES.
 - ▽ A - POWER FROM AUX POWER SUPPLY
P - POWER FROM PRI POWER SUPPLY
 - ▽ ALL SOLID STATE SWITCHES SELECT PRIMARY DISPLAY INPUTS ONLY FOR NORM AND PRI POSITIONS OF PUG MODE SWITCH (S102)
 - ▽ WHEN PUG MODE SWITCH (S102) IS IN AUX POSITION ALL SOLID STATE SWITCHES ARE DRIVEN TO SELECT AUXILIARY DISPLAY INPUTS ONLY

SPS 2

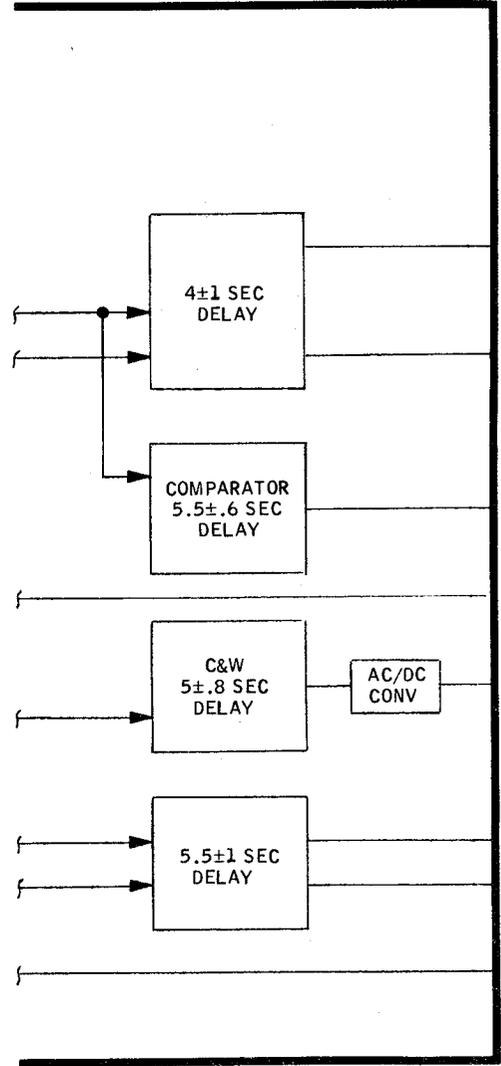
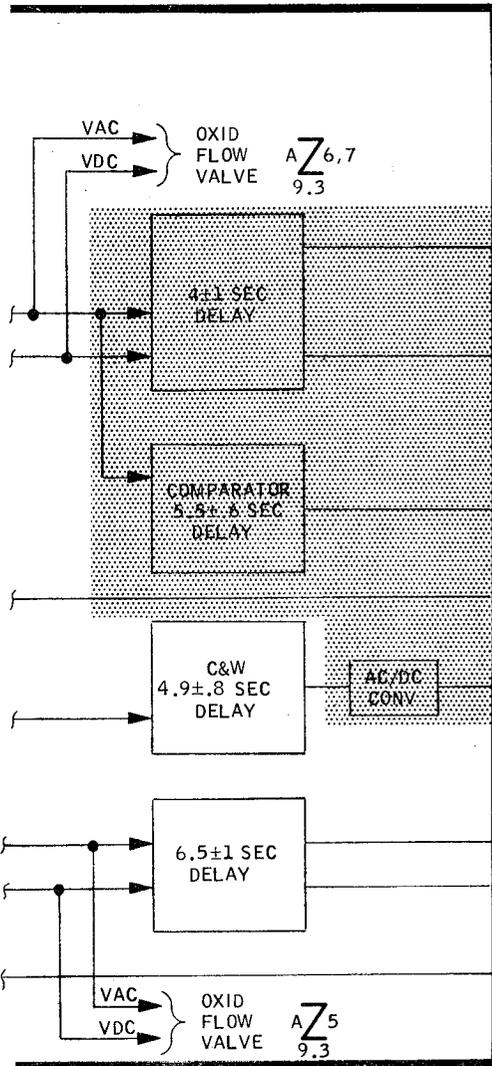
| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS | |
|------------|--------------------|----------|--|---------|
| DR | <i>Andy Harris</i> | | SPS PROPELLANT GAUGING SYSTEM | |
| DSGN | | | | |
| ICG | | | | |
| ENGR | <i>John Jones</i> | 10/26/68 | | |
| MR | <i>John Jones</i> | 10/26/68 | | |
| APP | <i>John Jones</i> | 10/26/68 | | |
| FEC | <i>John Jones</i> | 11-7-68 | CSM | DWG NO. |
| AUTH | <i>John Jones</i> | 11-7-68 | 104 | J |
| | | | 34 X 55 | 9.2 |
| | | | SHEET 1 OF 1 | |

SECTION 9

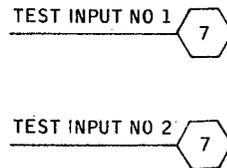
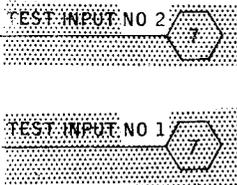
IS

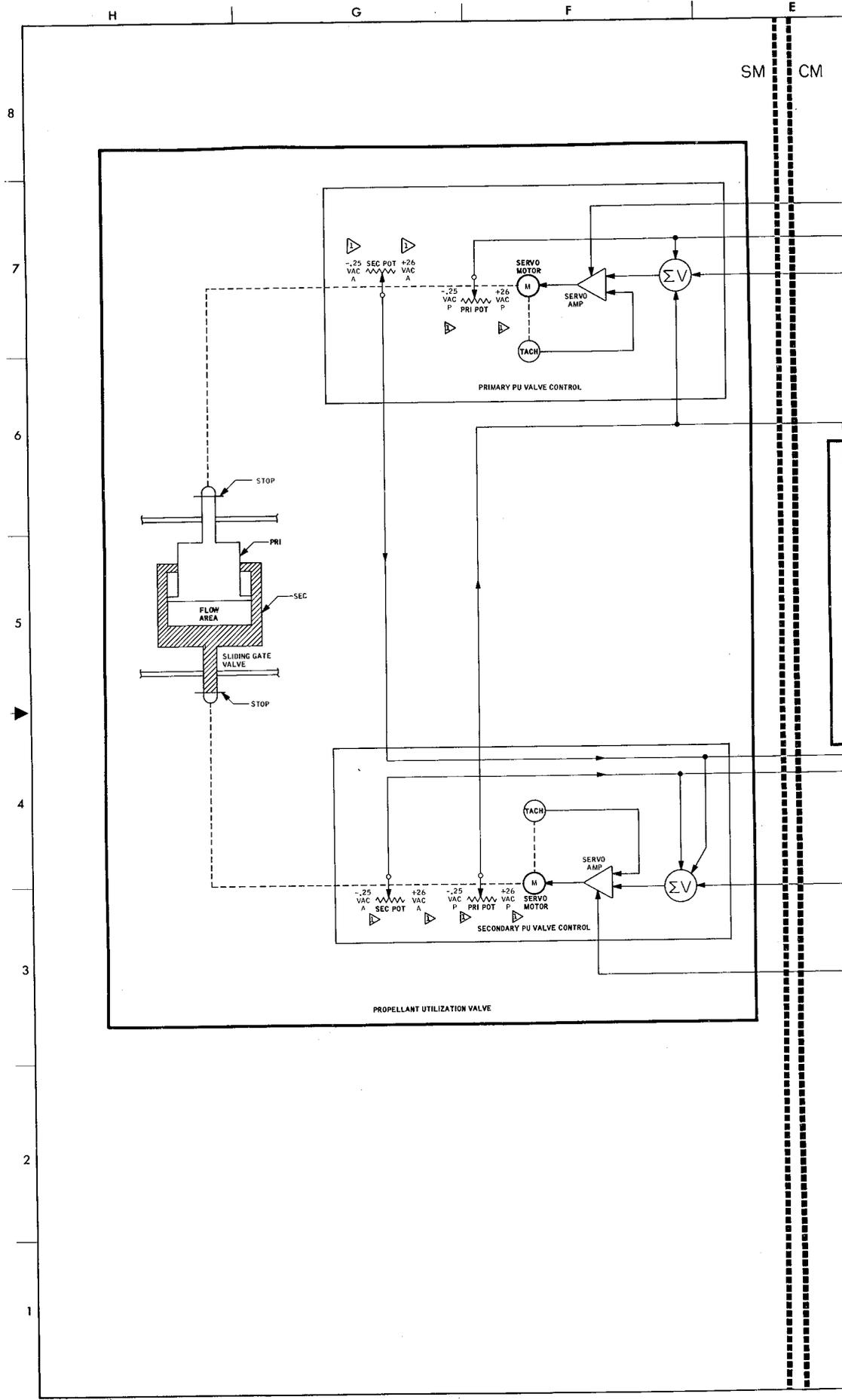
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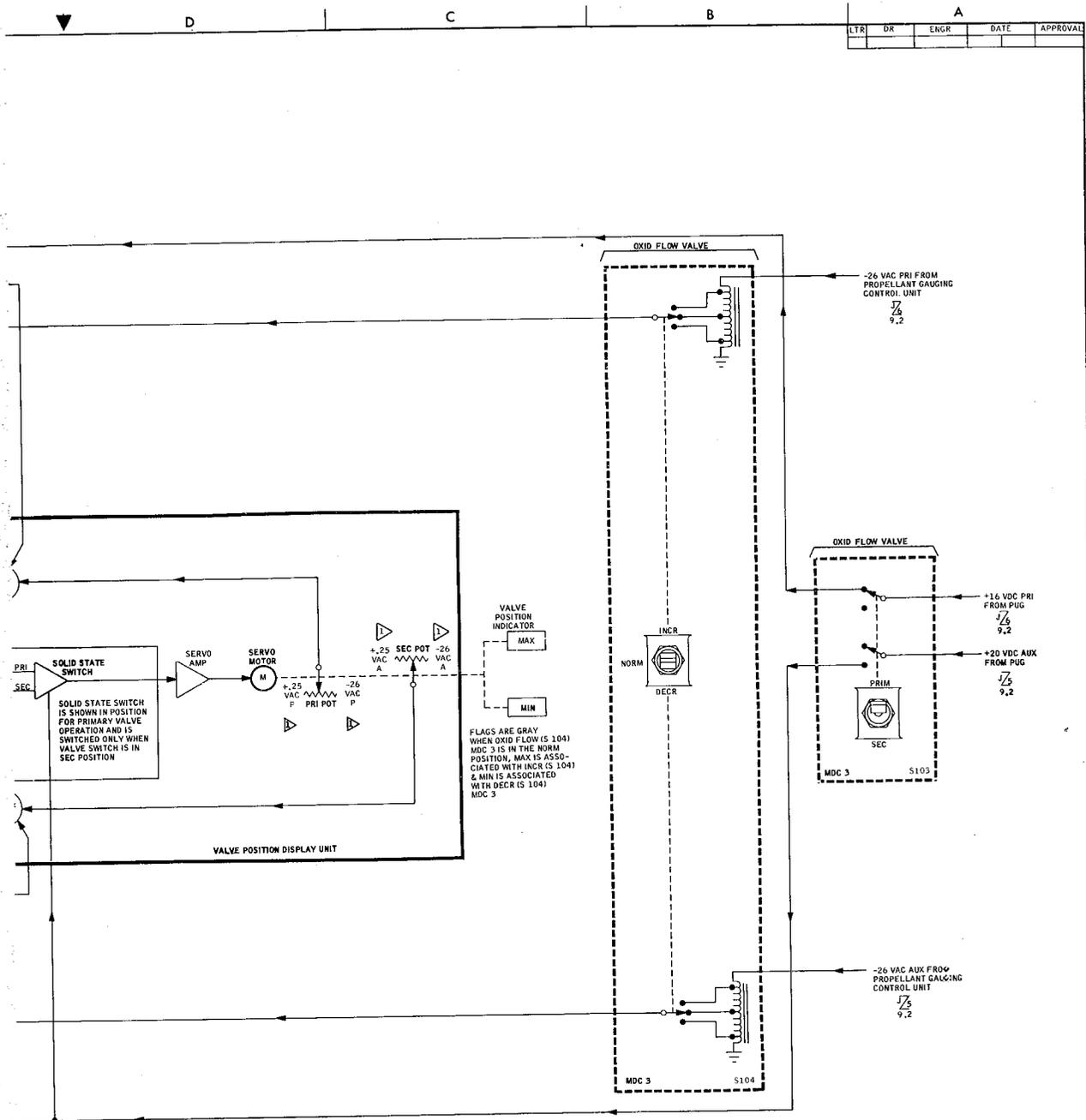
1. DWG 9.2 JZ5



2. DWG 9.2 IZ8





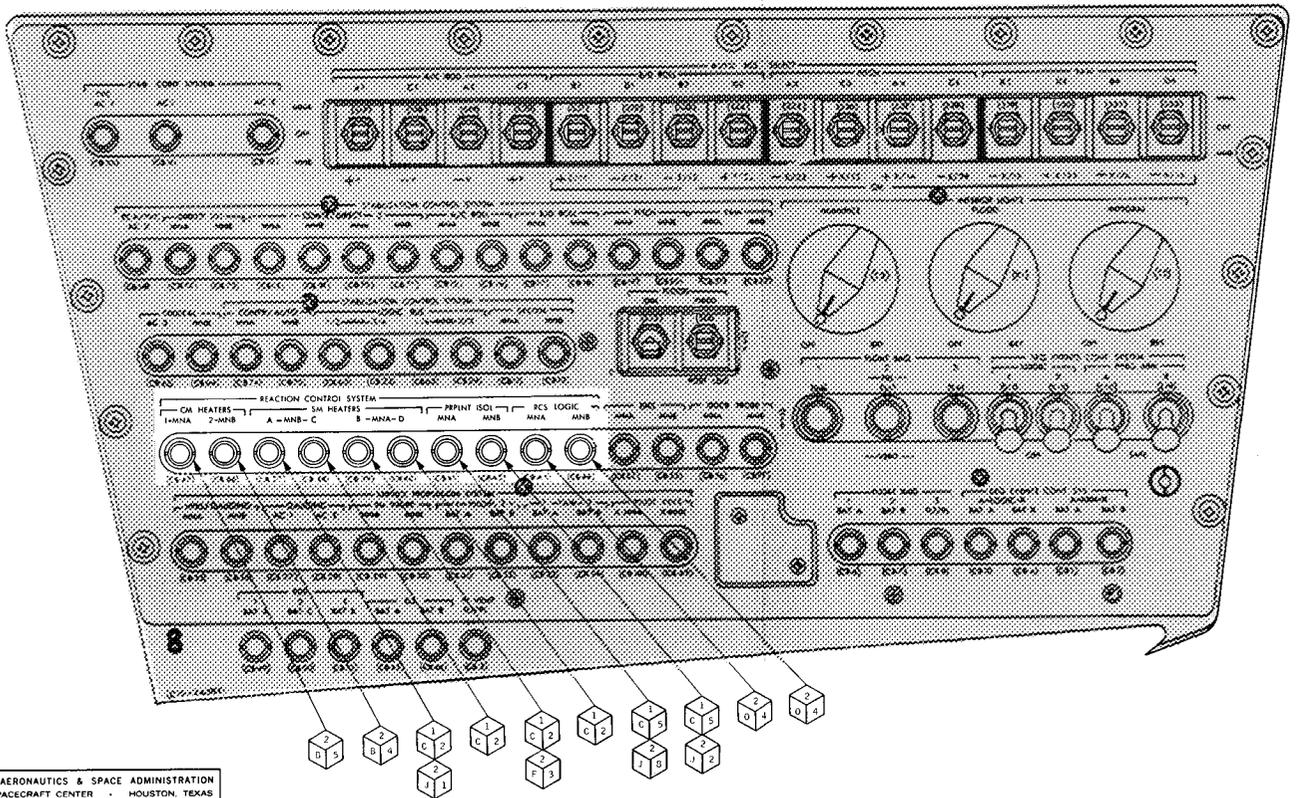
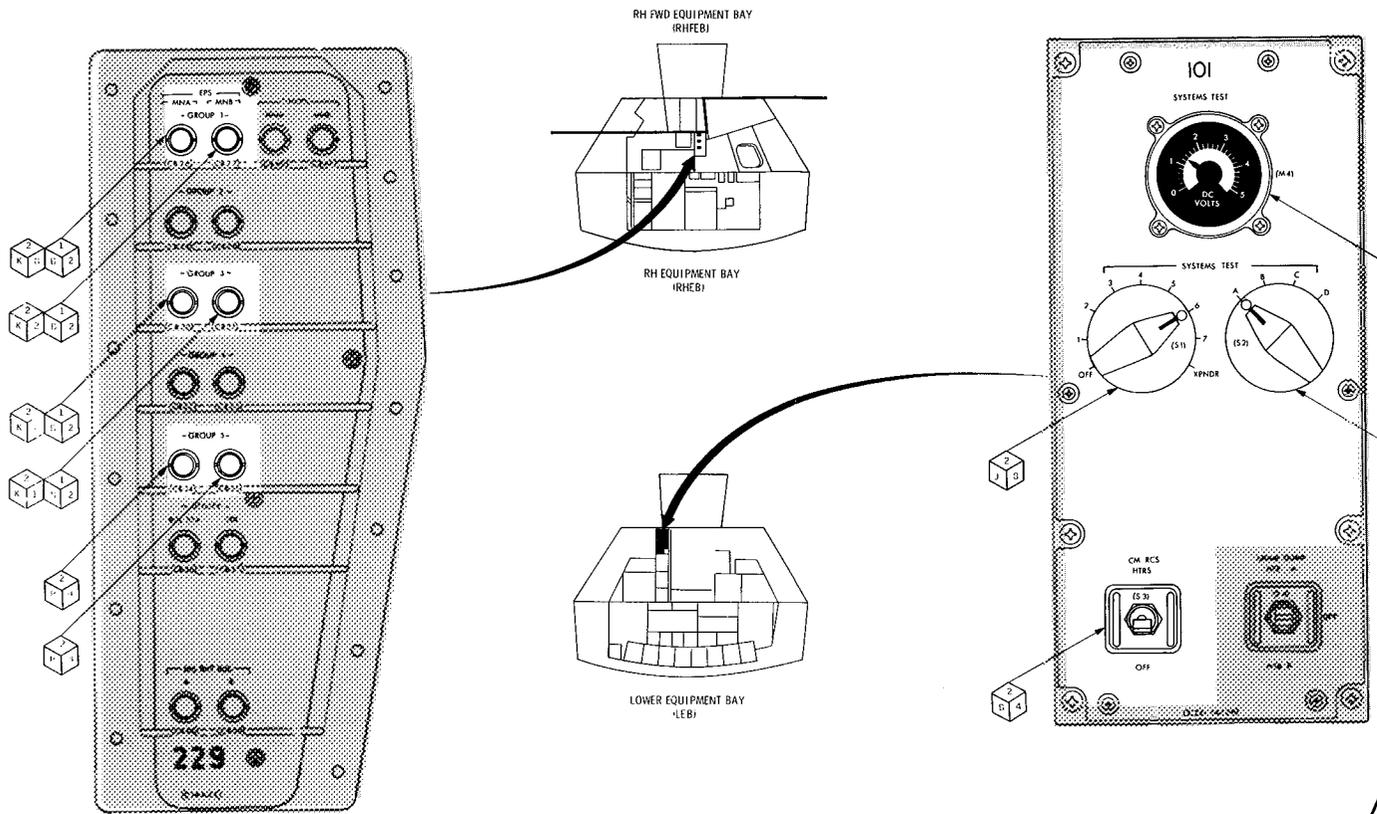


NOTE: ∇ A - IS POWER FROM AUX POWER SUPPLY
P - IS POWER FROM PRI POWER SUPPLY

3 PRPLNT CNTL

| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER • HOUSTON, TEXAS | | |
|------------|-------------------|---------|--|--------------|---------|
| DR | <i>Tom R. ...</i> | 9-18-69 | SPS PROPELLANT UTILIZATION VALVE CONTROL | | |
| DSGN | | | | | |
| QC | | | | | |
| ENGR | | | | | |
| NR | | | | | |
| ARB | | | | | |
| FEC | | | | | |
| AUTH | | | | | |
| | | | CSM | SIZE | OWG NO. |
| | | | 104 | E | 9.3 |
| | | | 44 X 34 | SHEET 1 OF 1 | |

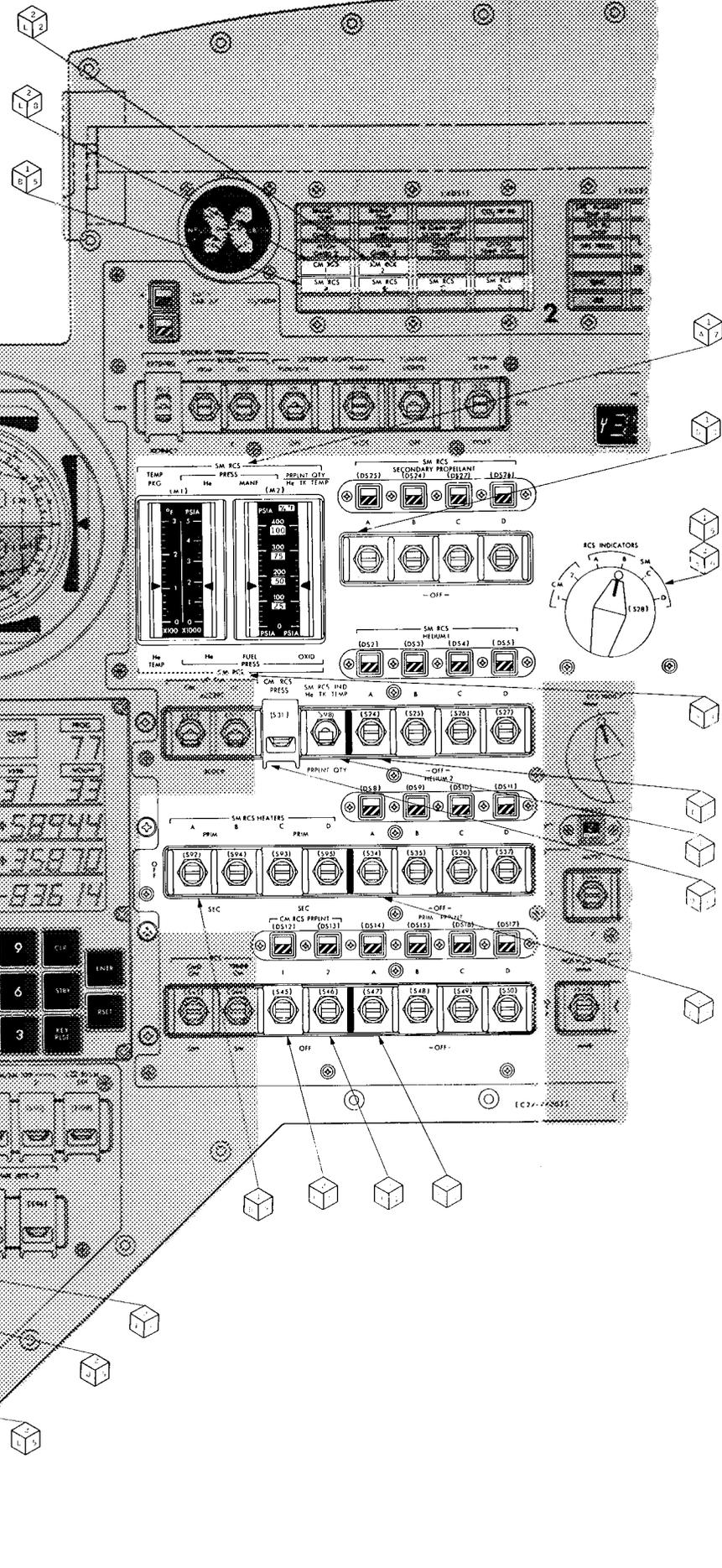
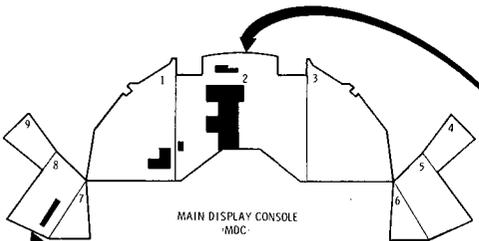
10 REACTION
CONTROL
SYSTEM



NATIONAL AERONAUTICS & SPACE ADMINISTRATION
 MANNED SPACECRAFT CENTER HOUSTON, TEXAS

**REACTION CONTROL SYSTEM
 CONTROL-DISPLAY FIGURE**

| | | | | |
|----------|-------------|------|---|-----------|
| DWG NO. | FIGURE 10.1 | SIZE | J | CSM |
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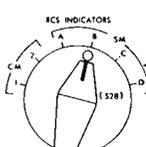


ABORT

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| 4 | 5 | 6 | DEL |
| 0 | 1 | 2 | 3 |

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| 37 |
| 33 |
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| +35870 |
| 83614 |



EC27-12655

SECTION 10

IS

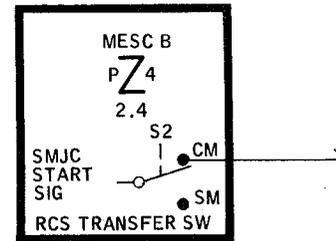
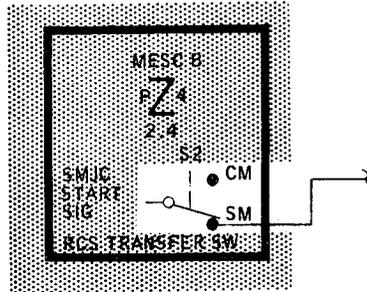
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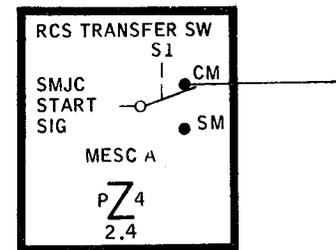
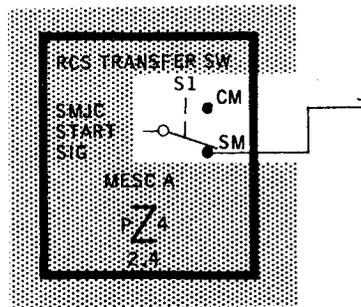
ENGINE LIFE 1000 SECONDS MIXED MODES
750 SECONDS CONTINUOUS CAPABILITY

ENGINE LIFE 1000 SECONDS MIXED MODES
500 SECONDS CONTINUOUS CAPABILITY

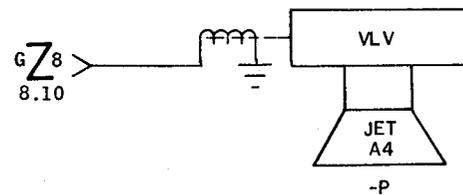
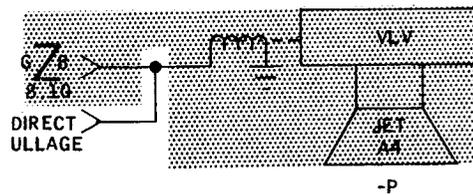
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3. DWG 10.1 0 Z₂



4. DWG 10.1 1 Z₂

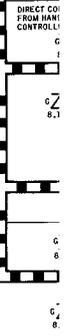
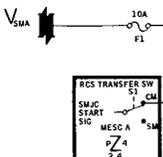
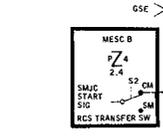
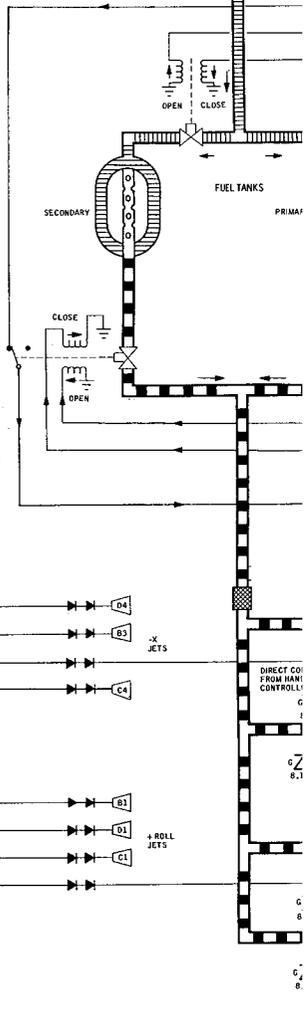
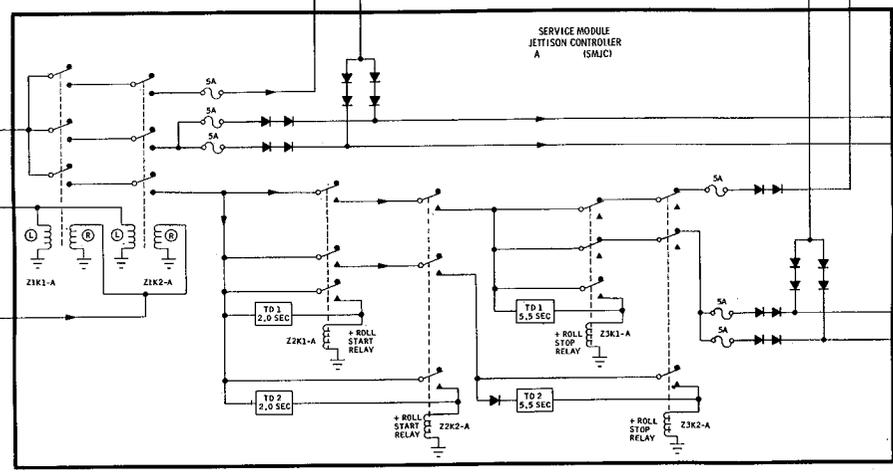
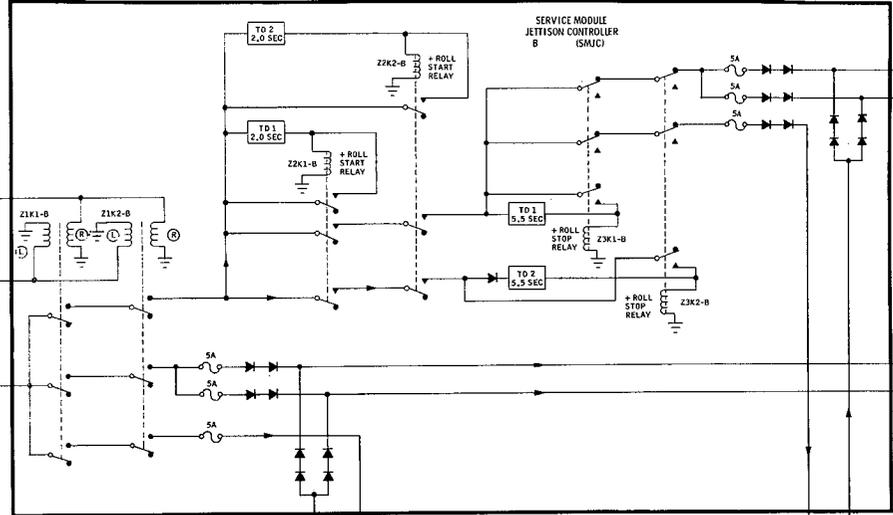
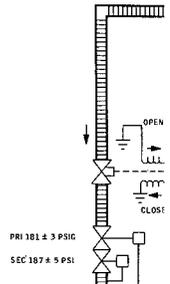
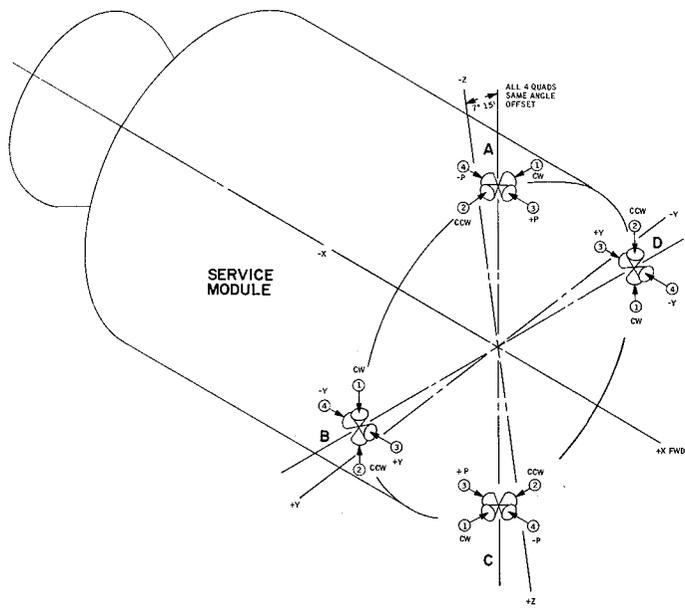


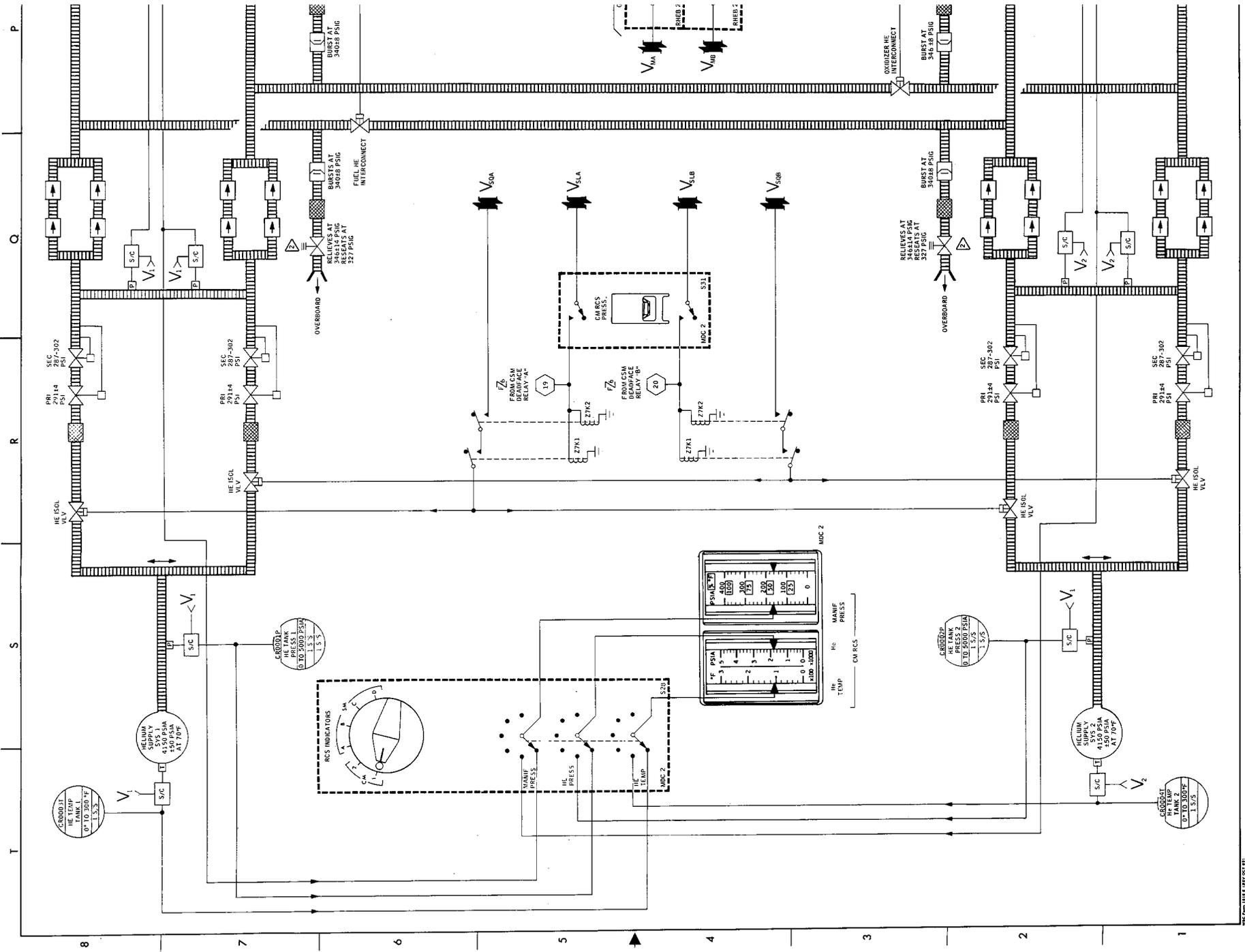
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8.10
DIRECT
ULLAGE

GZ 8
8.10

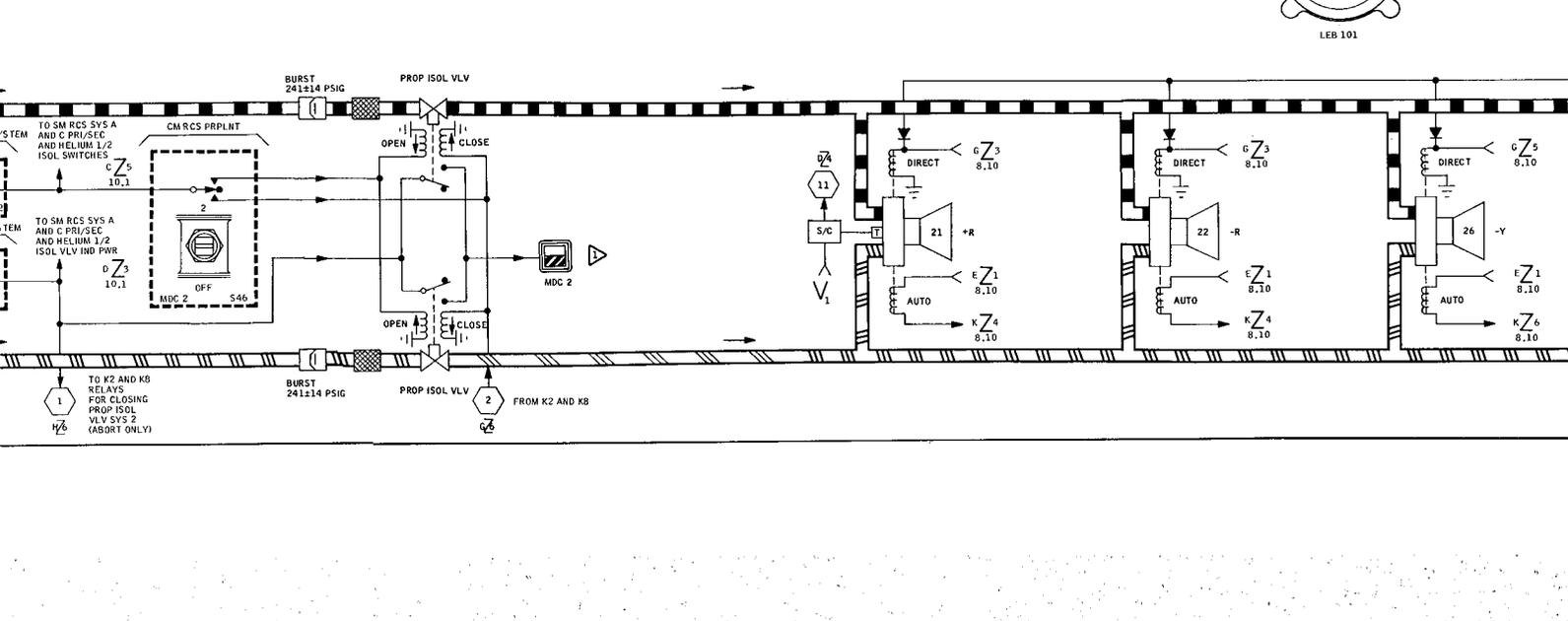
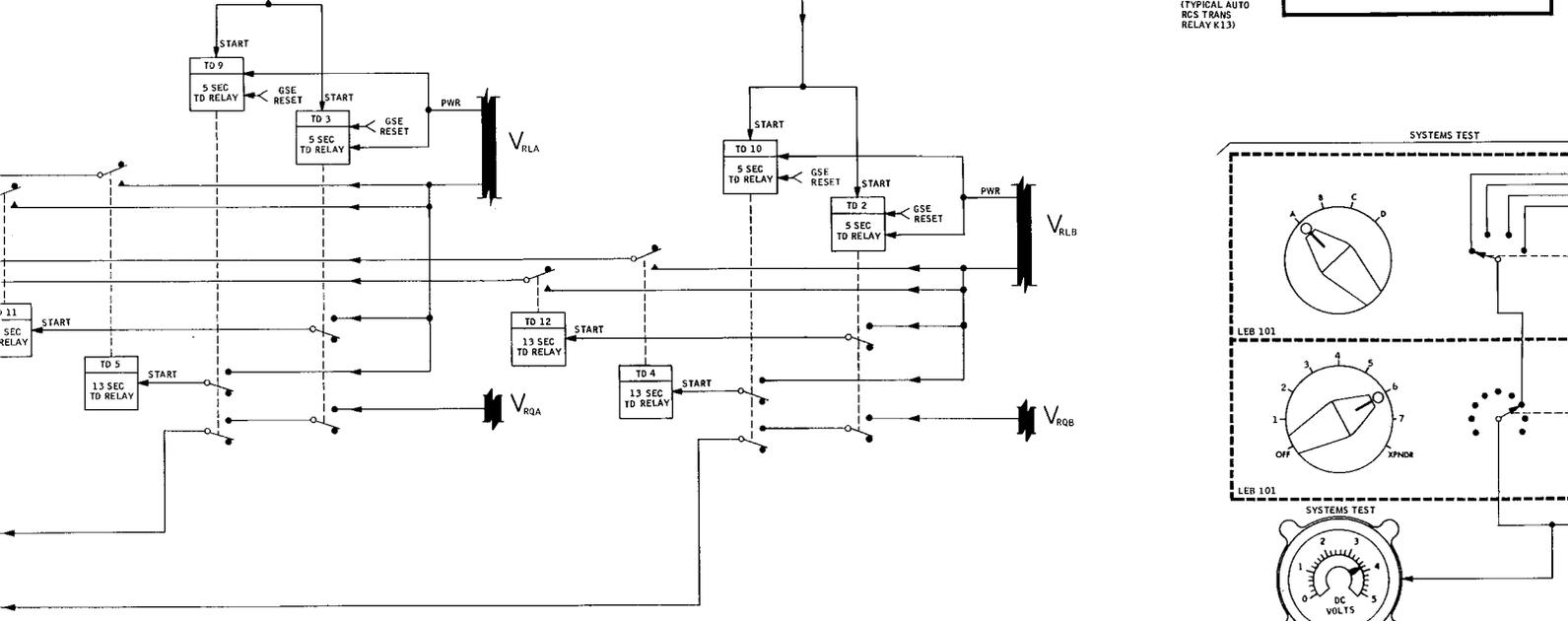
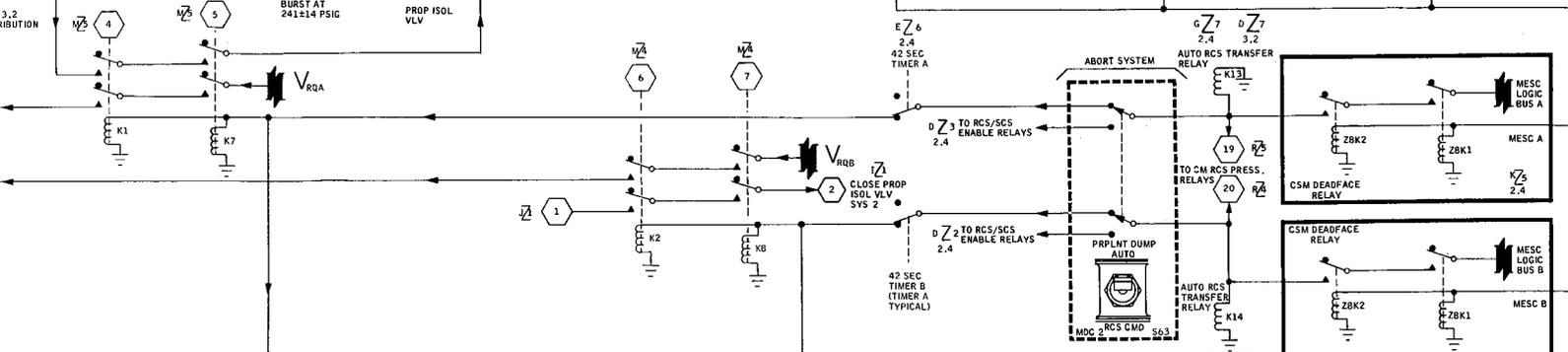
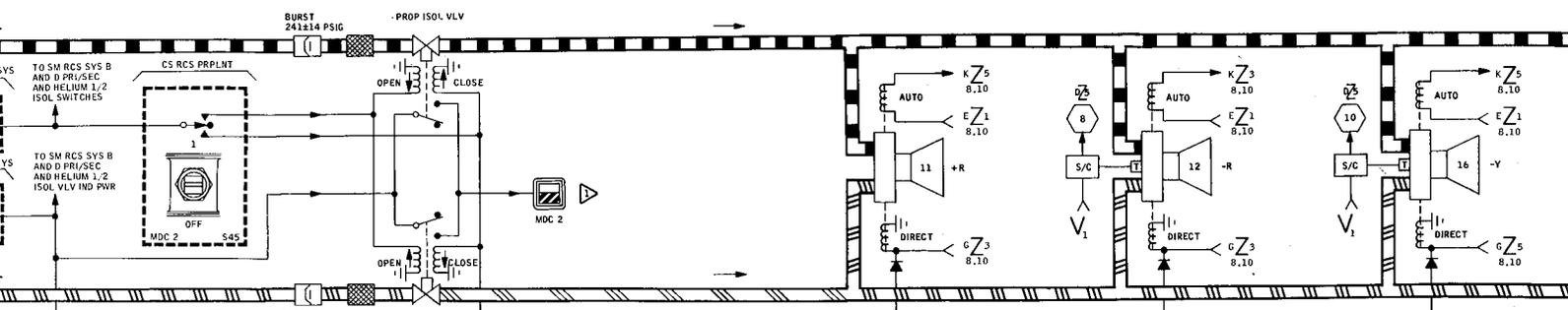
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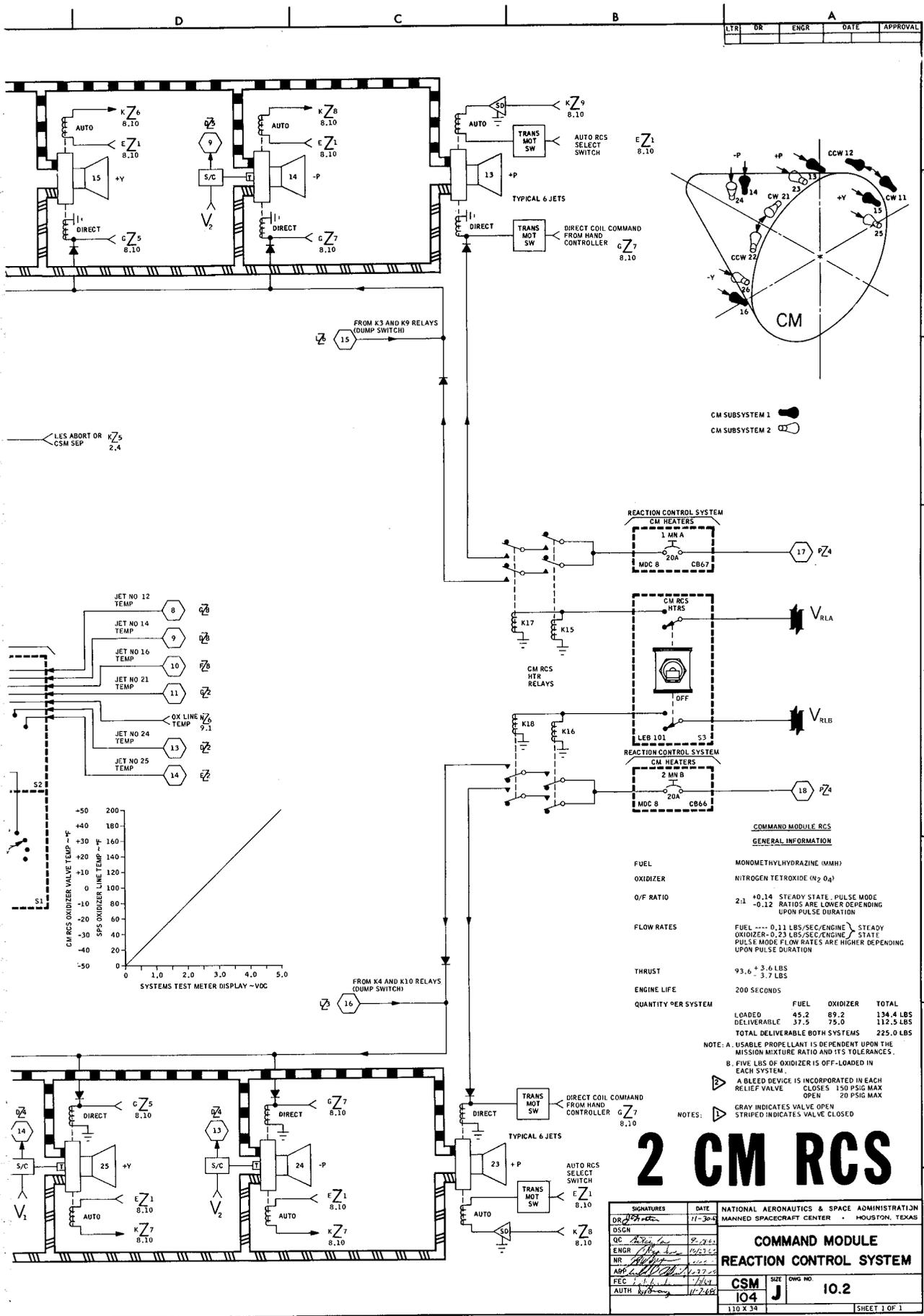
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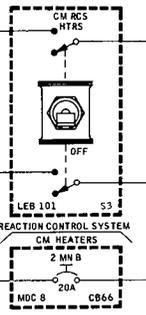
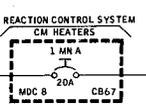
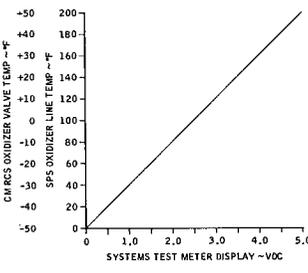
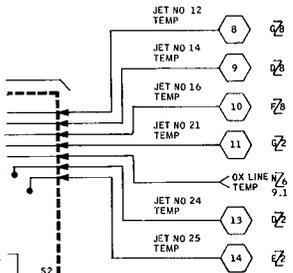


HELIUM SUPPLY TANK 2





LES ABORT OR CSM SEP
K Z5
2.4



COMMAND MODULE RCS
GENERAL INFORMATION

FUEL: MONOMETHYLHYDRAZINE (MMH)
 OXIDIZER: NITROGEN TETROXIDE (N₂O₄)
 O/F RATIO: 2:1 ±0.14 STEADY STATE, PULSE MODE
 -0.12 RATIOS ARE LOWER DEPENDING UPON PULSE DURATION

FLOW RATES: FUEL ---- 0.11 LBS/SEC/ENGINE STEADY
 OXIDIZER - 0.23 LBS/SEC/ENGINE STATE
 PULSE MODE FLOW RATES ARE HIGHER DEPENDING UPON PULSE DURATION

THRUST: 93.6 + 3.6 LBS
 ENGINE LIFE: 200 SECONDS

| QUANTITY PER SYSTEM | FUEL | OXIDIZER | TOTAL |
|--------------------------------|------|----------|-----------|
| LOADED | 45.2 | 89.2 | 134.4 LBS |
| DELIVERABLE | 37.5 | 75.0 | 112.5 LBS |
| TOTAL DELIVERABLE BOTH SYSTEMS | | | 225.0 LBS |

NOTE: A: USABLE PROPELLANT IS DEPENDENT UPON THE MISSION MIXTURE RATIO AND ITS TOLERANCES.
 B: FIVE LBS OF OXIDIZER IS OFF-LOADED IN EACH SYSTEM.
 C: A BLEED DEVICE IS INCORPORATED IN EACH RELIEF VALVE CLOSURE 150 PSIG MAX OPEN 20 PSIG MAX

NOTES: ▷ A BLEED DEVICE IS INCORPORATED IN EACH RELIEF VALVE CLOSURE 150 PSIG MAX OPEN 20 PSIG MAX
 ▷ GRAY INDICATES VALVE OPEN STRIPED INDICATES VALVE CLOSED

2 CM RCS

| SIGNATURES | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS |
|-------------------|----------|--|
| DR: [Signature] | 11-30-61 | |
| DSCN | | |
| QC: [Signature] | 11-27-61 | |
| ENGR: [Signature] | 11-27-61 | |
| NR: [Signature] | 11-27-61 | |
| APP: [Signature] | 11-27-61 | |
| REC: [Signature] | 11-27-61 | |
| AUTH: [Signature] | 11-27-61 | |

COMMAND MODULE REACTION CONTROL SYSTEM

CSM 104
 SITE J
 OWS NO. 10.2

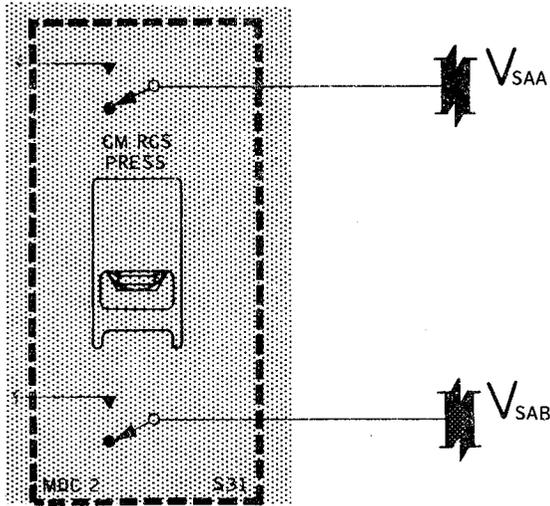
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SECTION 10

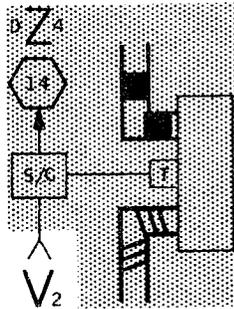
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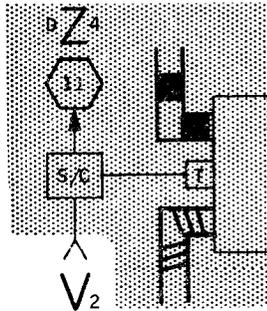
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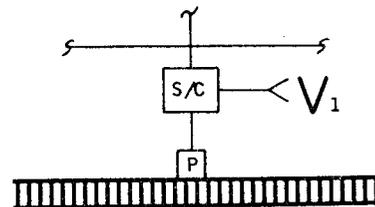
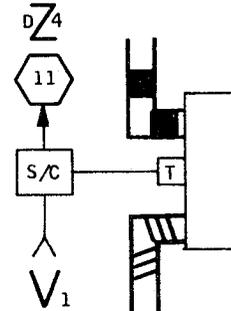
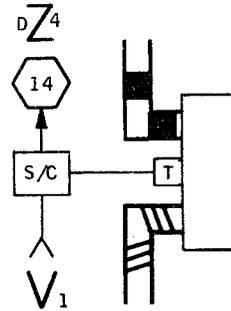
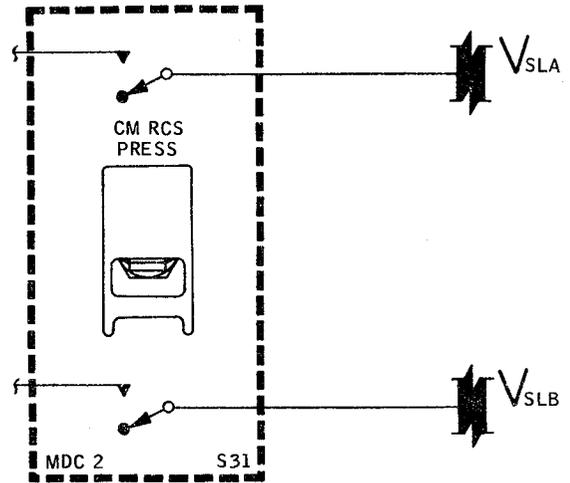
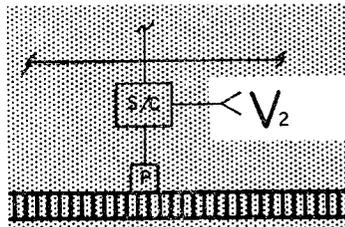
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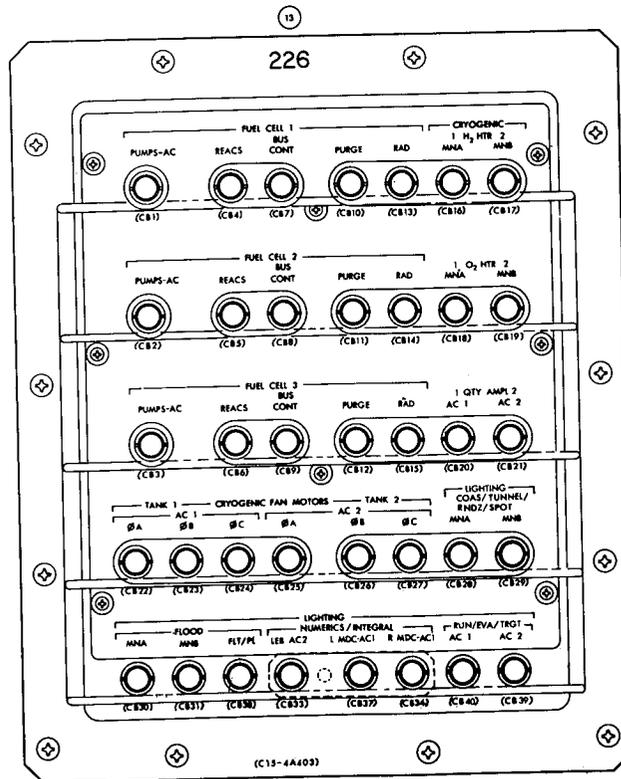
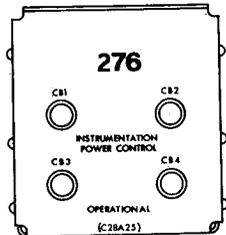
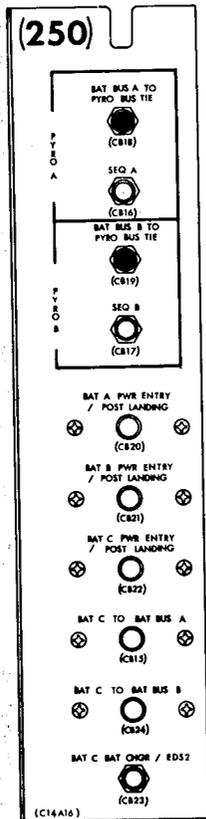
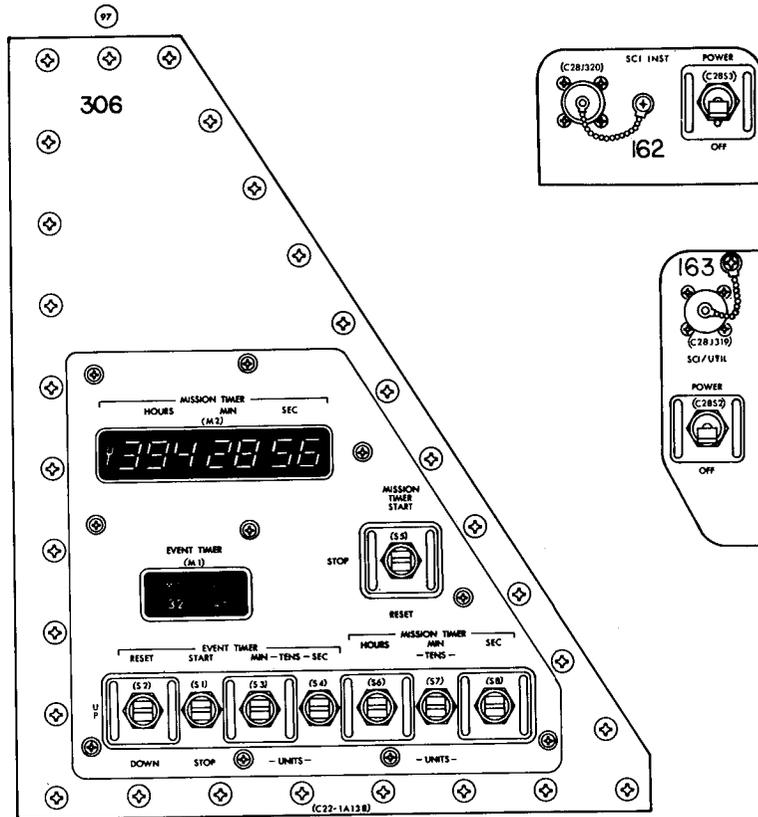
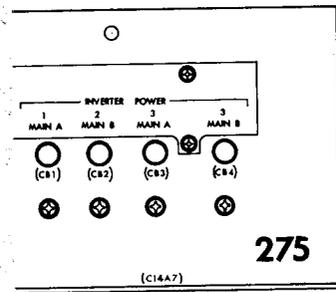
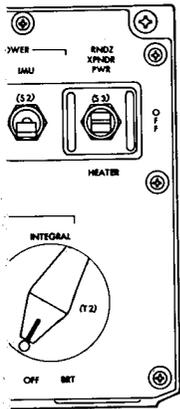


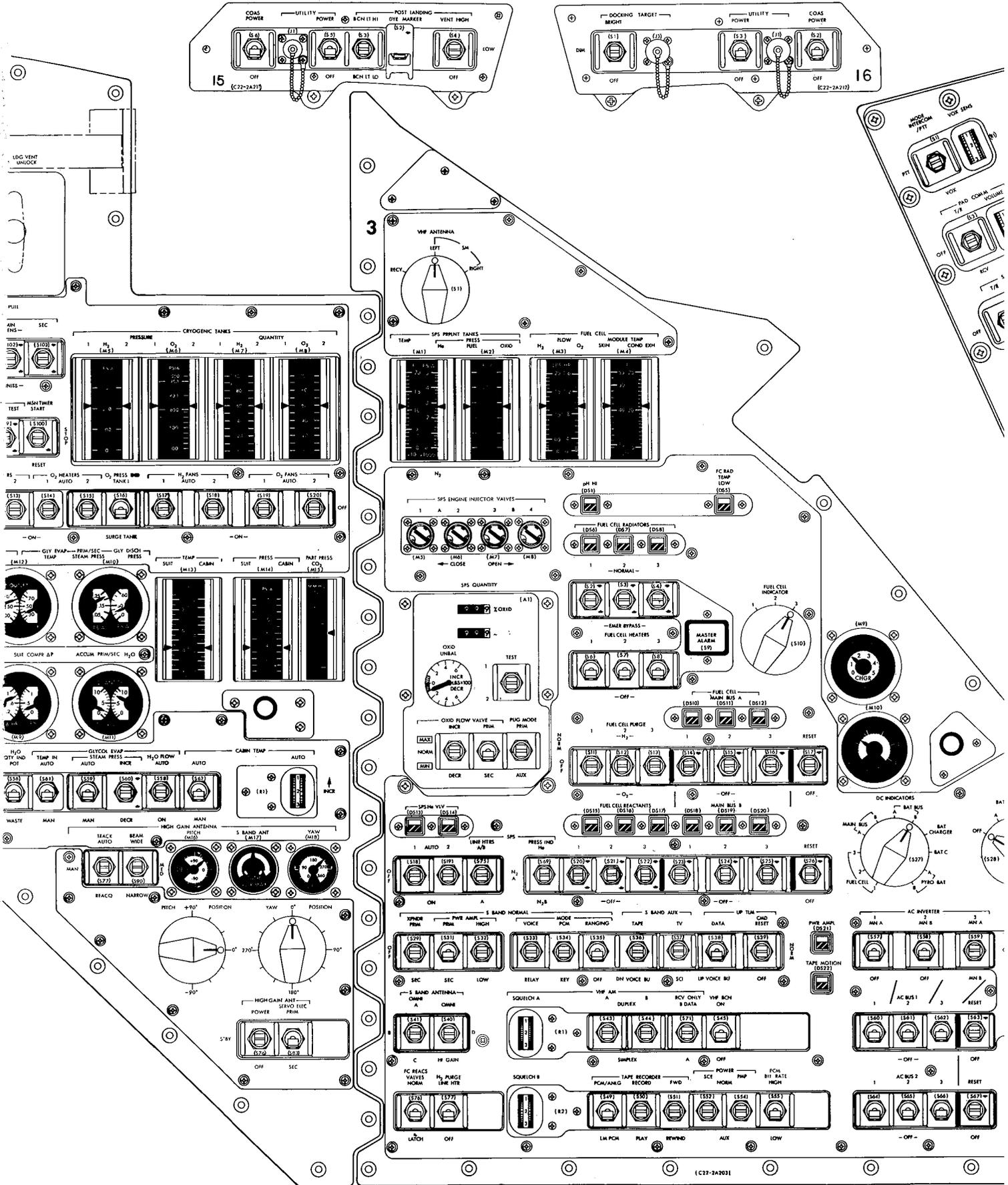
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4. DWG 10.2 SZ₂

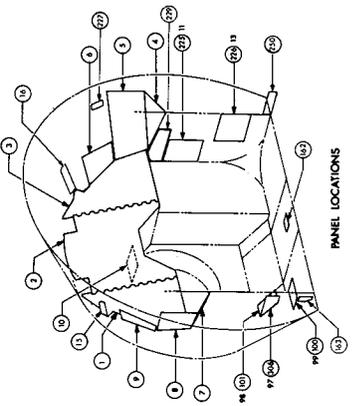




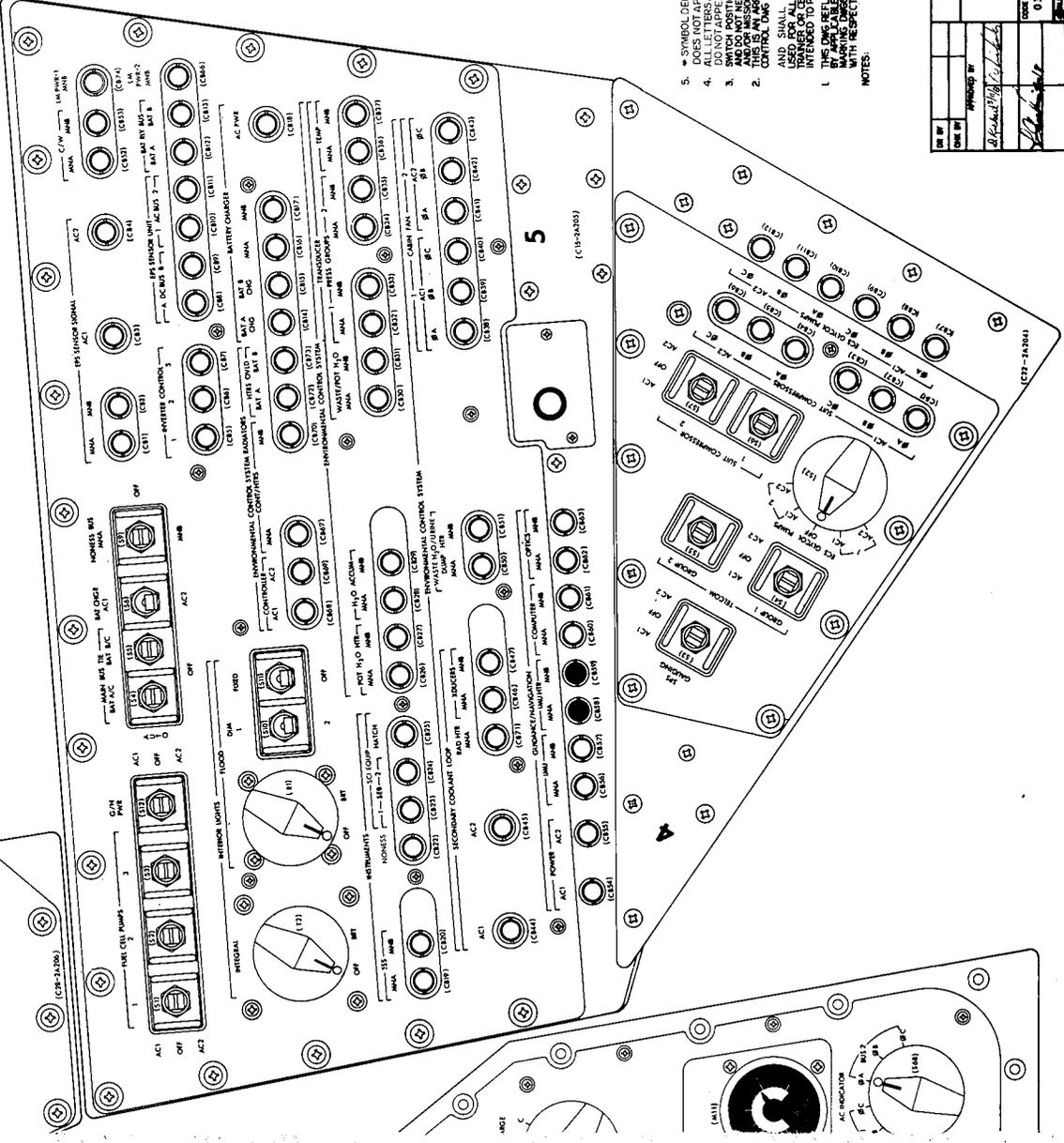
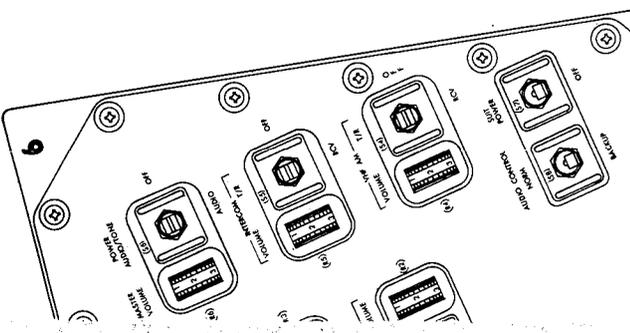
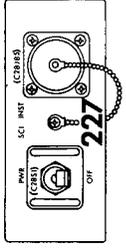


(C22-2A201)

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| 2 | 10/1/68 | REVISIONS TO DRAWING |
| 3 | 10/1/68 | REVISIONS TO DRAWING |
| 4 | 10/1/68 | REVISIONS TO DRAWING |
| 5 | 10/1/68 | REVISIONS TO DRAWING |



PANEL LOCATIONS



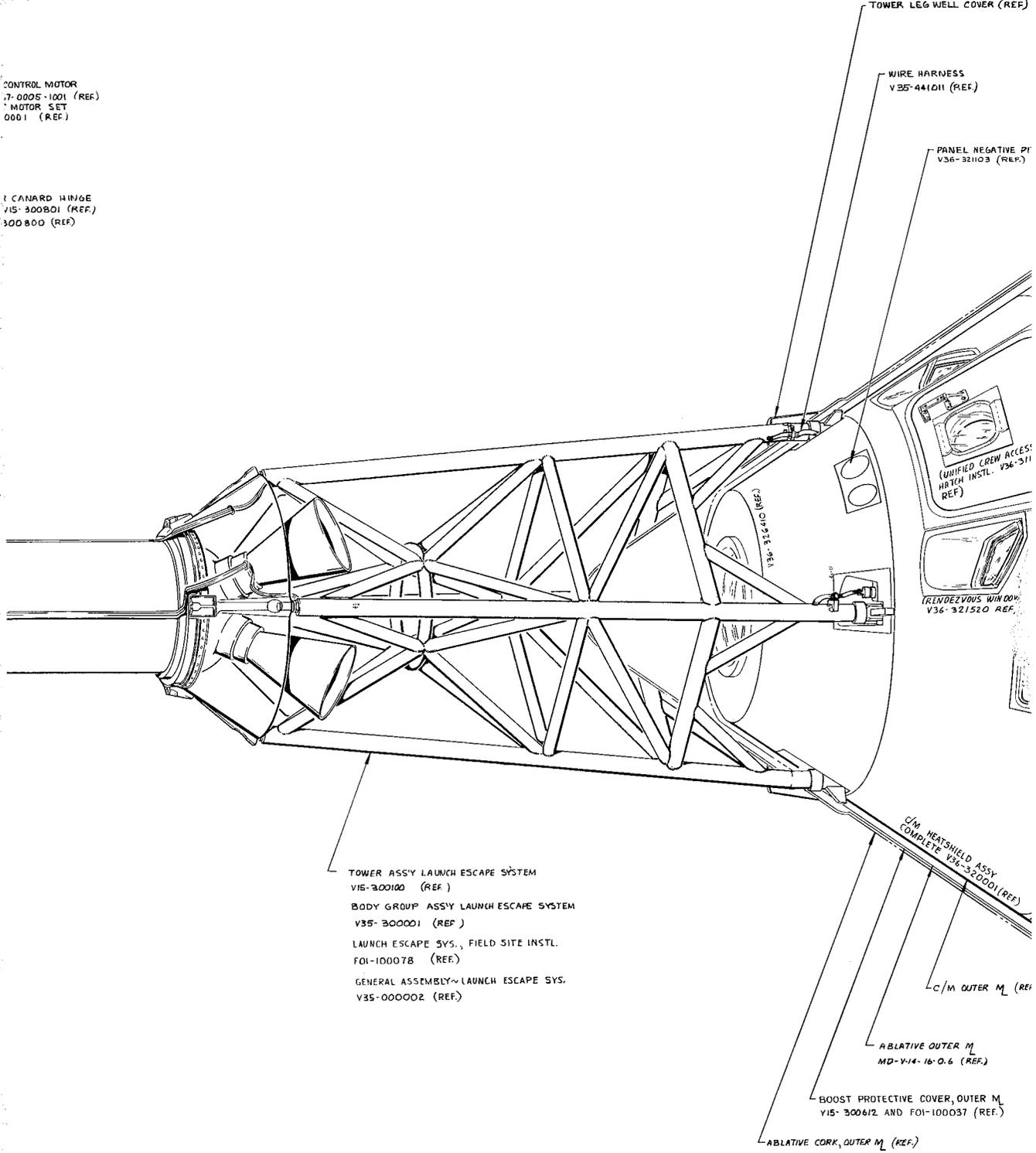
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4. * THIS DRAWING IS A WORKUP FOR CONVENIENCE ONLY AND DOES NOT APPEAR ON PANEL.
3. SWITCH POSITIONS ARE SHOWN FOR CONVENIENCE ONLY AND FOR MESSAGE PURPOSES. THE ACTUAL POSITION OF THE SWITCH IS TO BE DETERMINED BY THE INSTRUMENTATION CONTROLS FOR INSPECTION PURPOSES.
2. * THIS DRAWING IS A WORKUP FOR CONVENIENCE ONLY AND DOES NOT APPEAR ON PANEL.
1. THIS DRAWING REFLECTS A CONFIGURATION AS DEFINED BY AVAILABLE SCHEMATIC DRAWINGS AND INTENDED TO REFLECT CURRENT DESIGN WITH RESPECT TO THE AFFECTED VEHICLES.

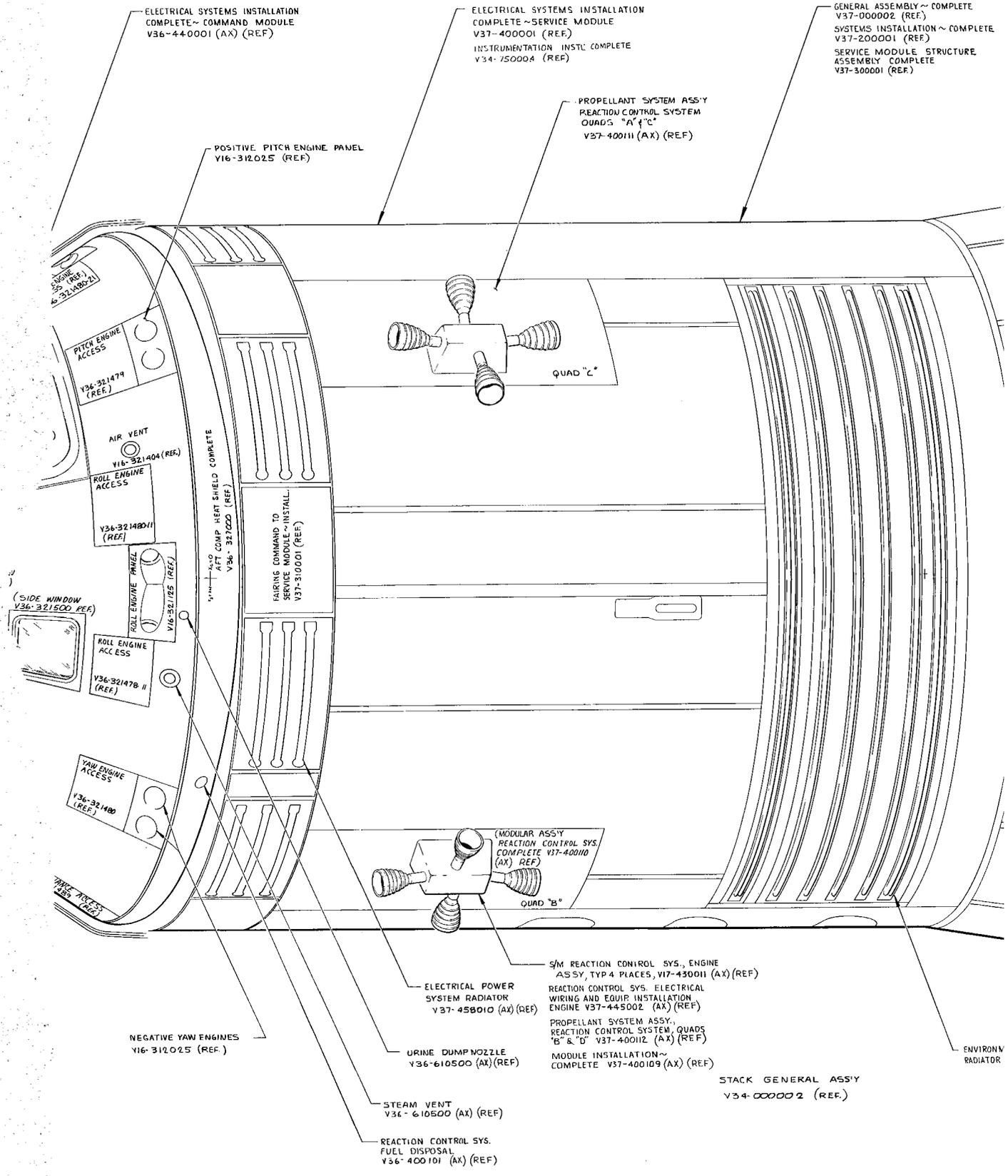
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| NORTH AMERICAN AIRWORKS, INC. 10000 W. 10TH AVENUE, DENVER, CO. 80202 | |
| DESIGNED BY | 03953 J |
| APPROVED BY | |
| DATE | 11.1 |
| REV | 03953 J |

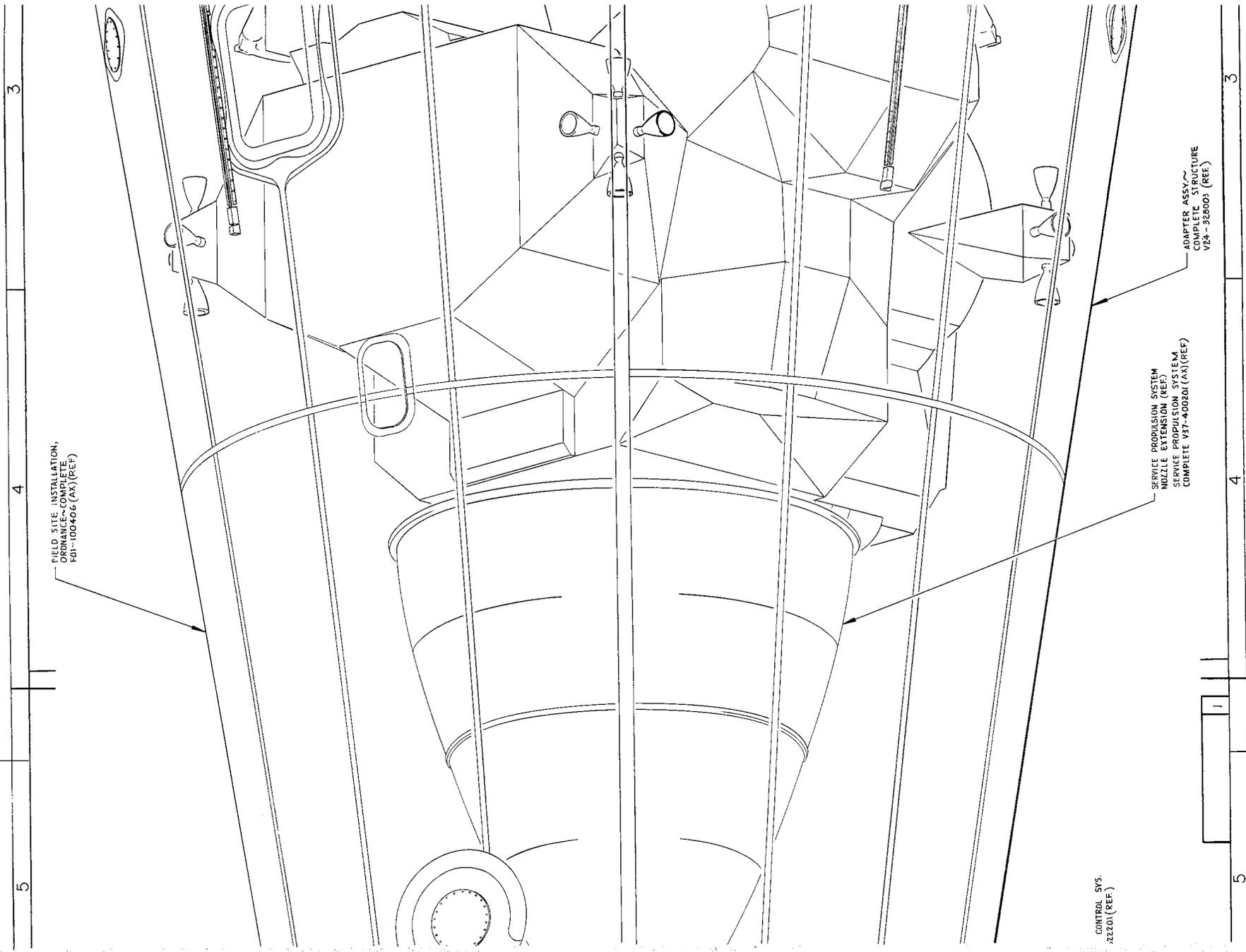
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CONTROL MOTOR
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MOTOR SET
0001 (REF)

CANARD HINGE
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300800 (REF)







FIELD SITE INSTALLATION,
ORDNANCE-COMPLETE
F01-100406 (AX) (REF)

SERVICE PROPUSSION SYSTEM
NOZZLE EXTENSION (REF)
SERVICE PROPUSSION SYSTEM
COMPLETE V37-400201 (AX) (REF)

ADAPTER ASSY,
COMPLETE STRUCTURE
V24-328003 (REF)

CONTROL SYS.
22201 (REF)

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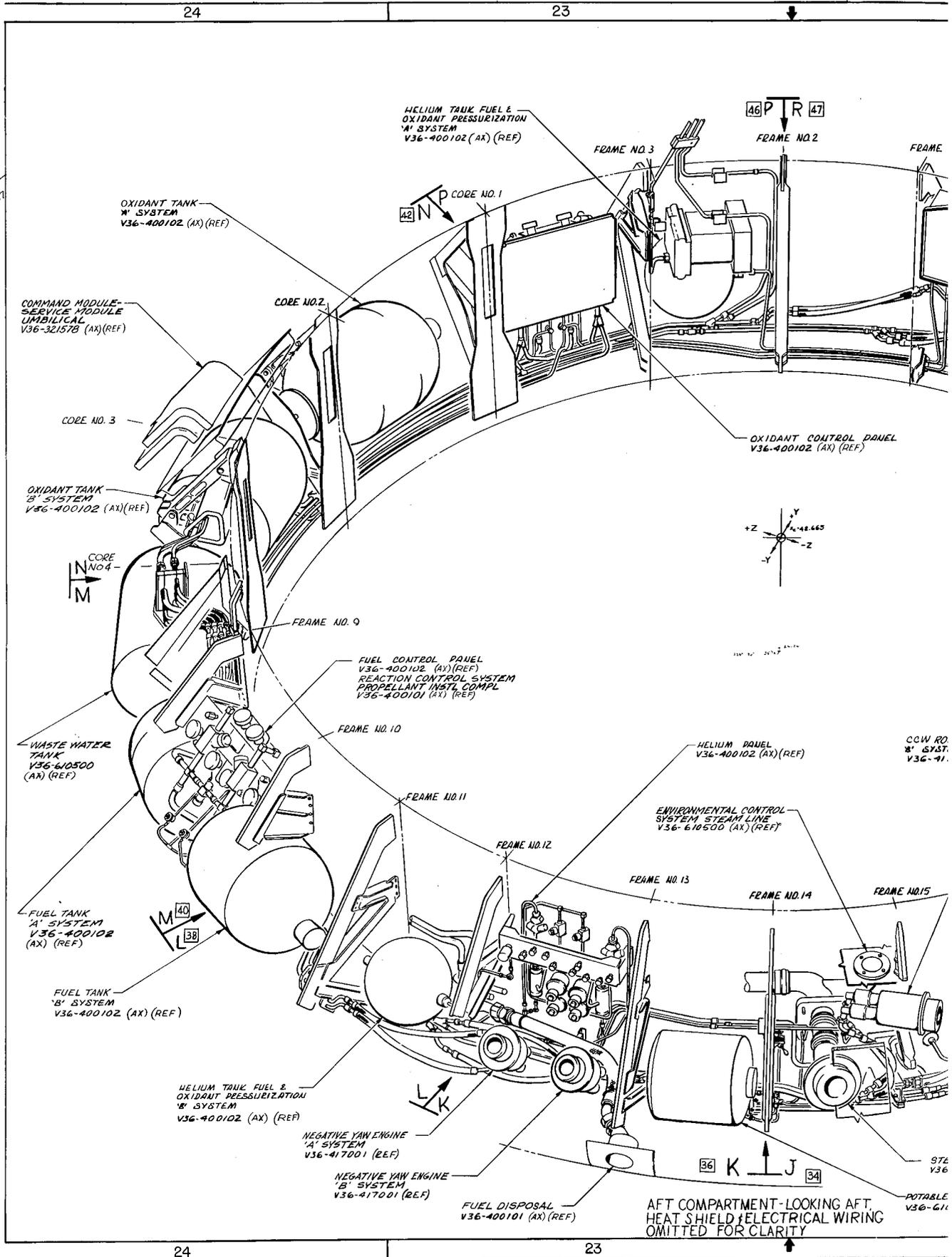
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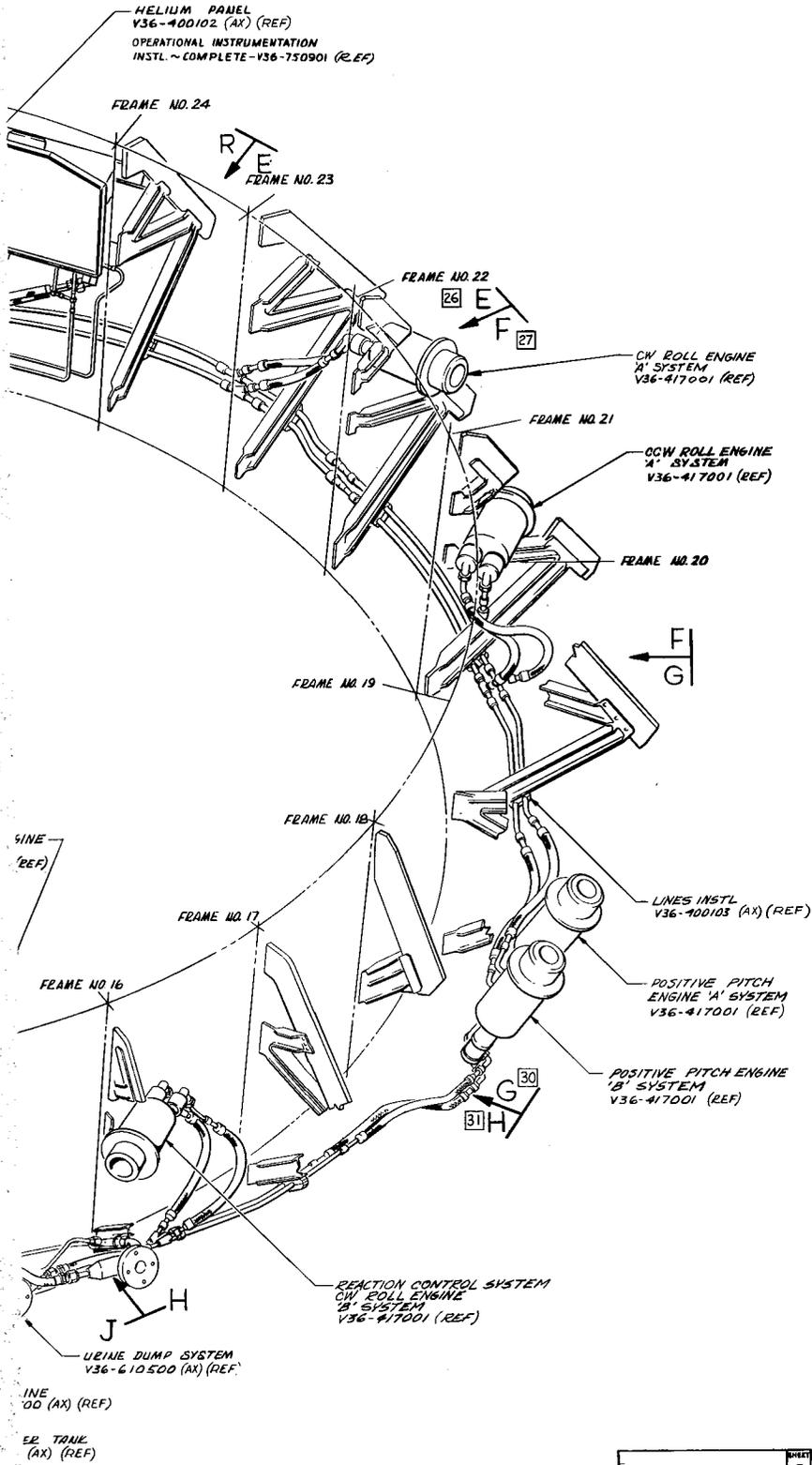
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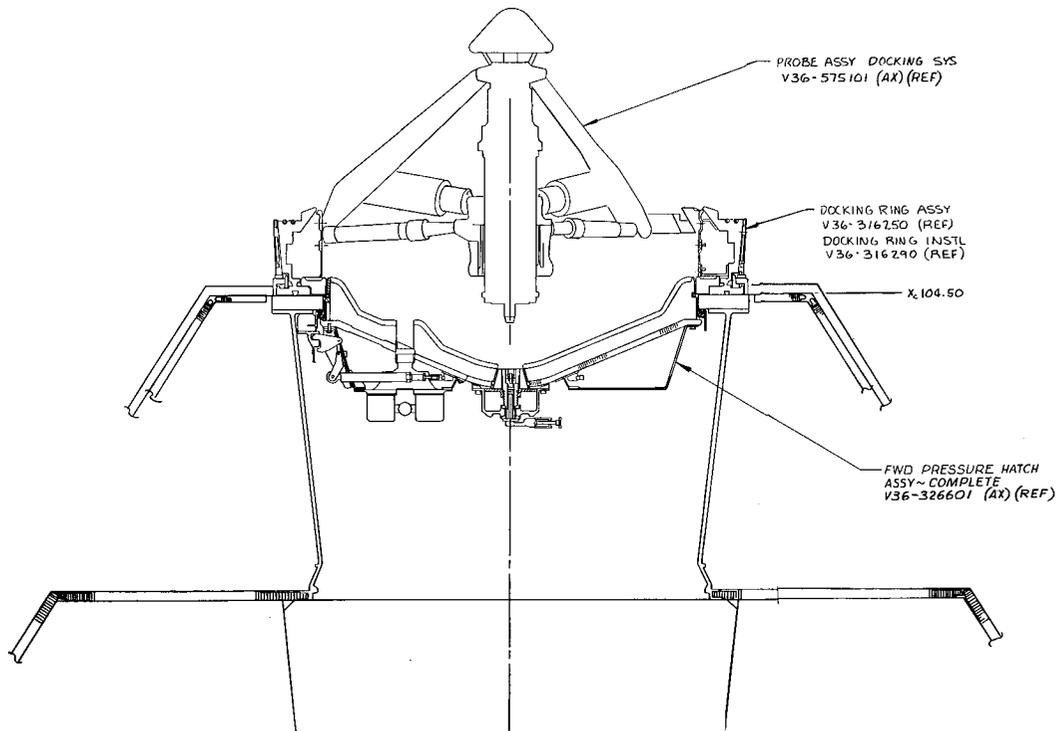
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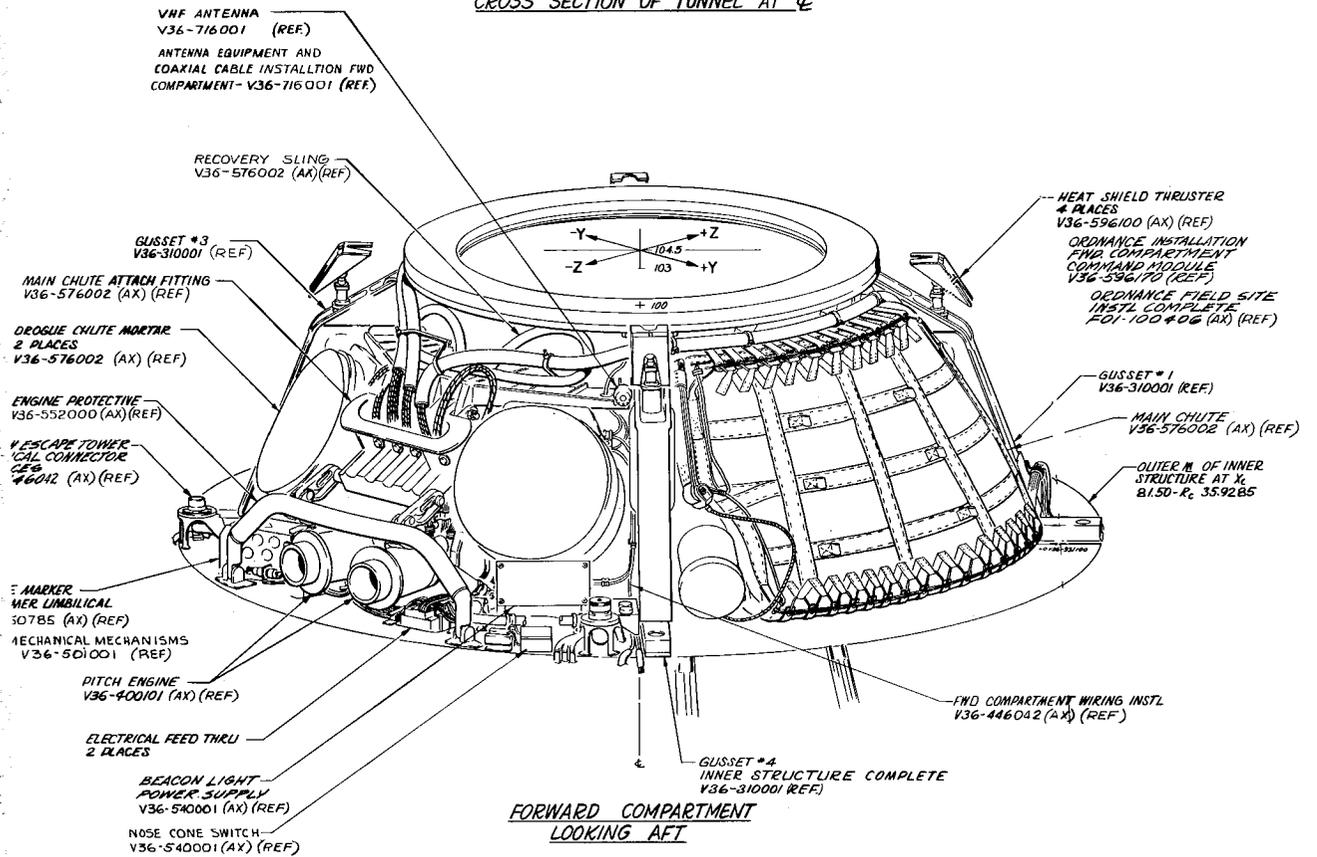
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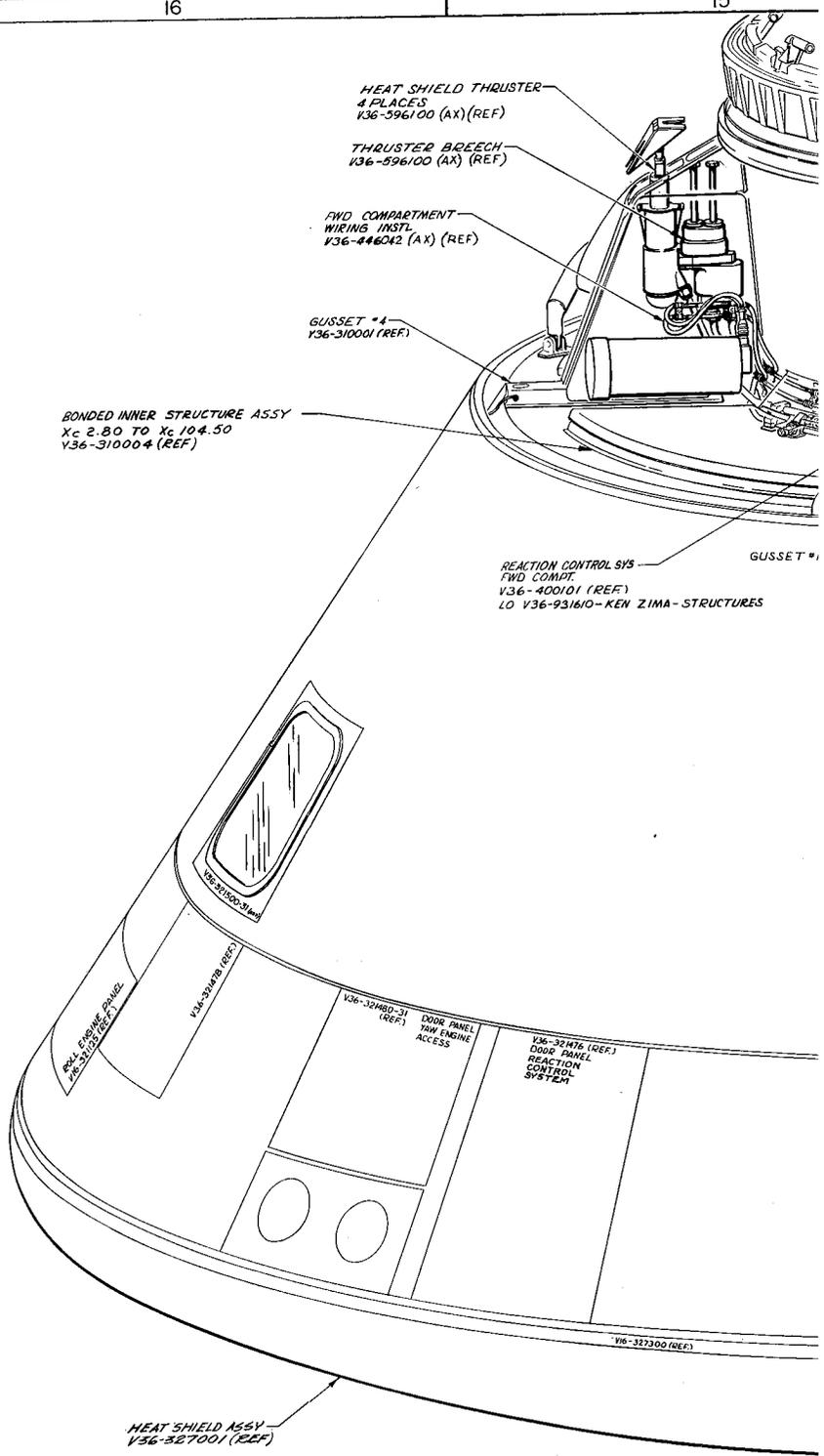


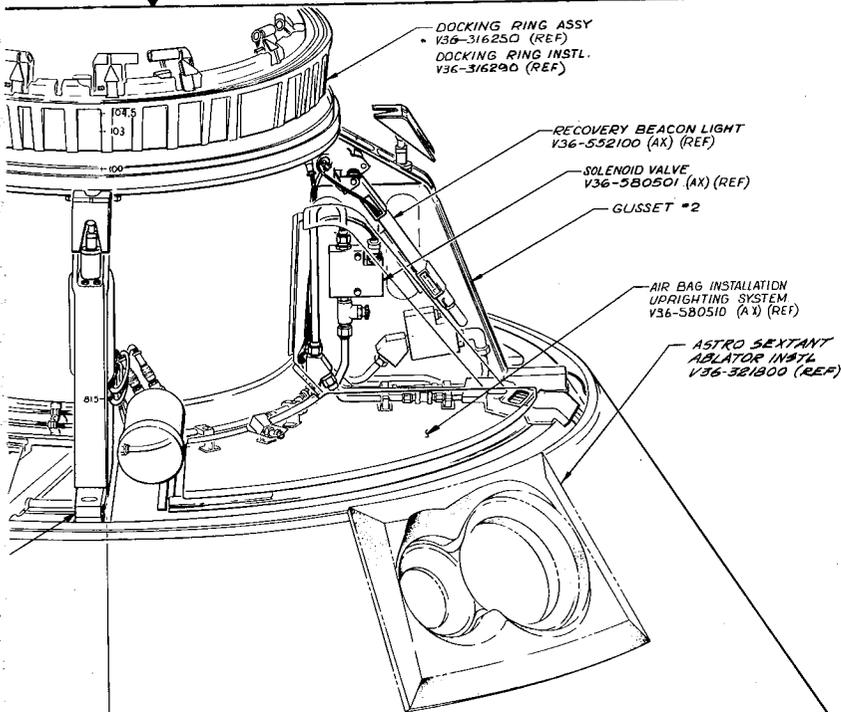


CROSS SECTION OF TUNNEL AT ϕ



FORWARD COMPARTMENT
LOOKING AFT





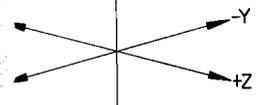
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| 1 | | MAY BE REMOVED | | |
| 2 | | CANNOT BE REMOVED | | |
| 3 | | RECORD CHANGE | | |
| 4 | | HOW SHIP PRACTICE | | |
| 5 | | PARTS MADE OK | | |

V36-321489-21
REF. 1
MAINTENANCE
DOOR ASSY

X₁ = 14 ~ X₂ = 316

X₁ = 10 ~ X₂ = 312

X₂ = 335



COMMAND MODULE
LOOKING AFT

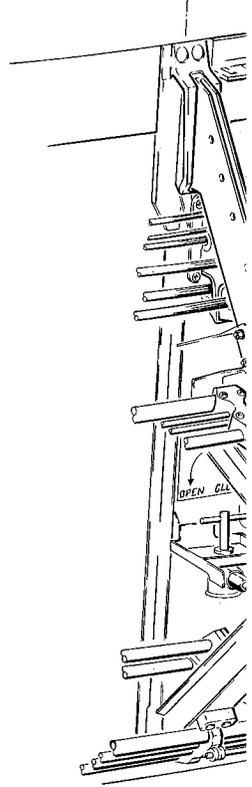
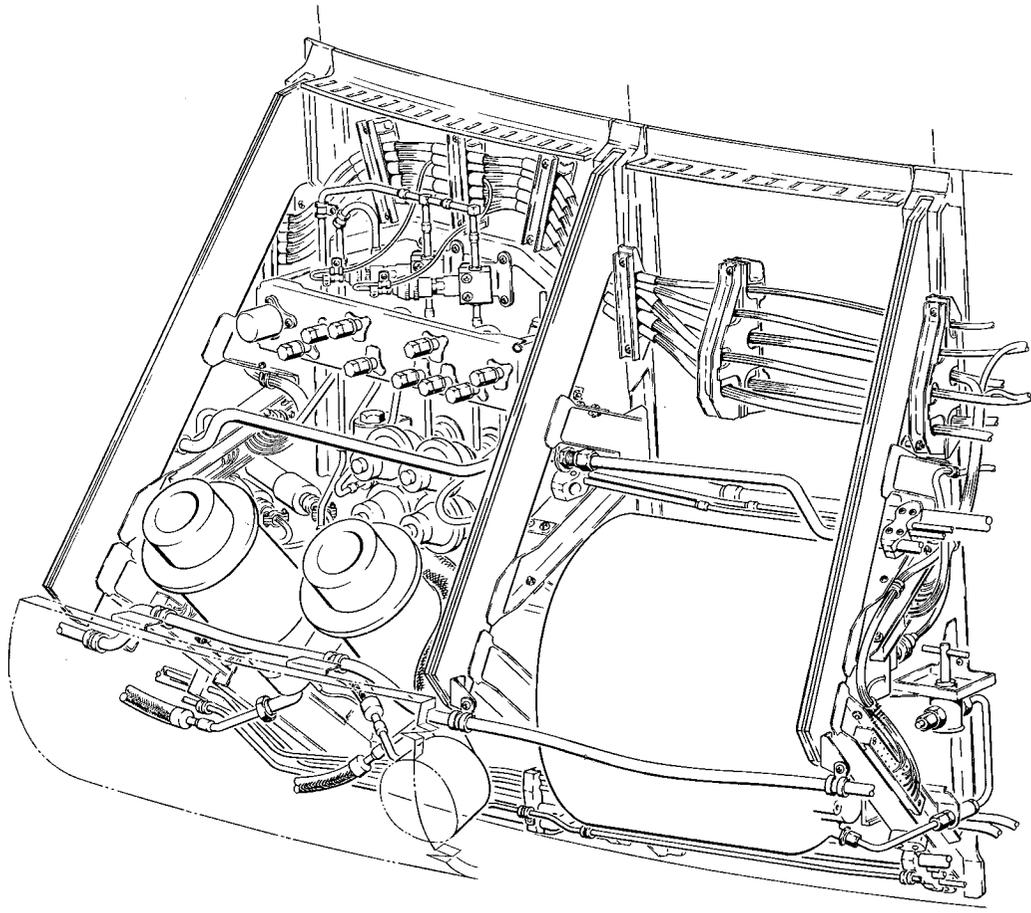
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EXTERIOR
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V36-321578 (AX) (REF)
FIELD SITE
UMBILICAL INSTL.
FOI-100490 (AX) (REF)

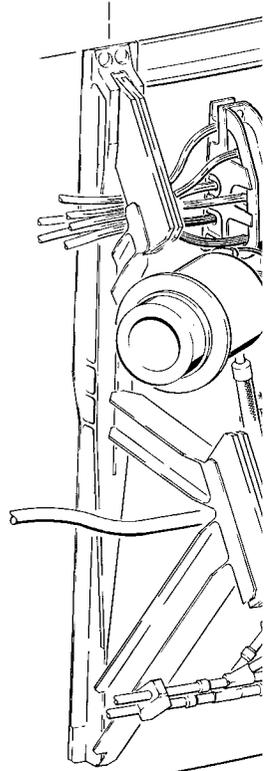
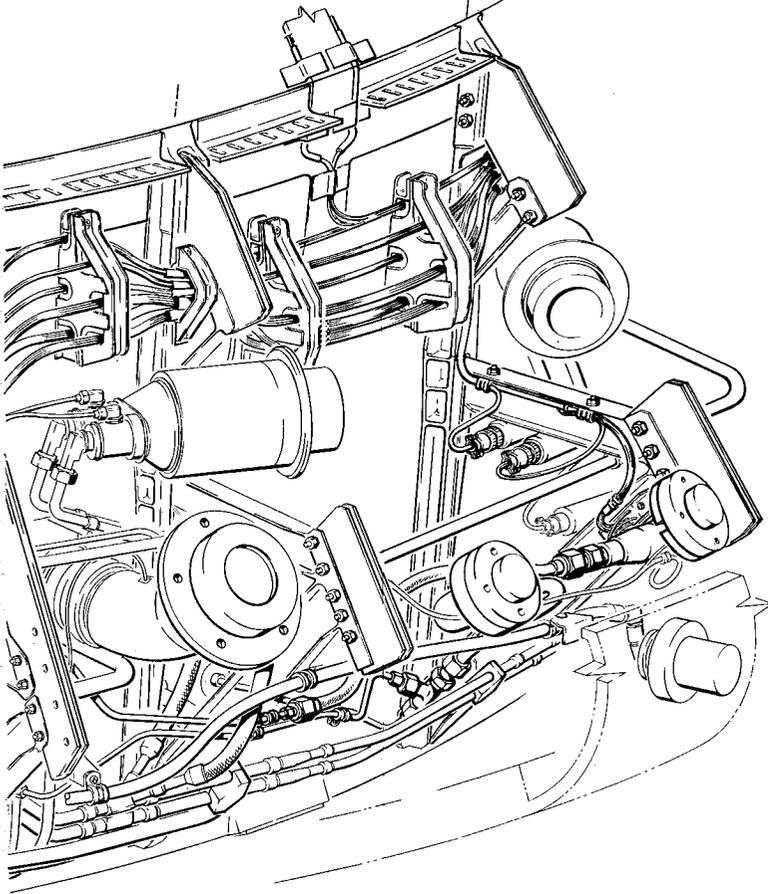
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INSTL.
V36-321597
(REF.)

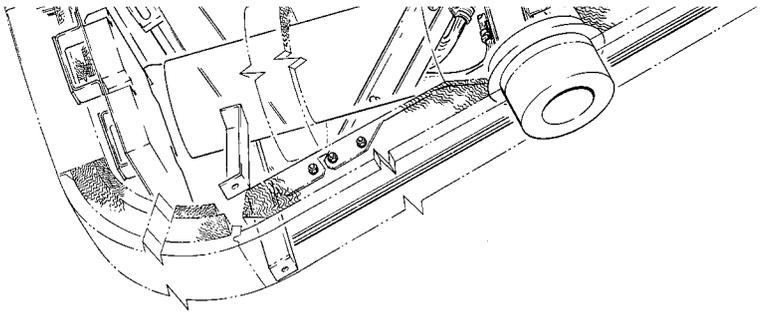
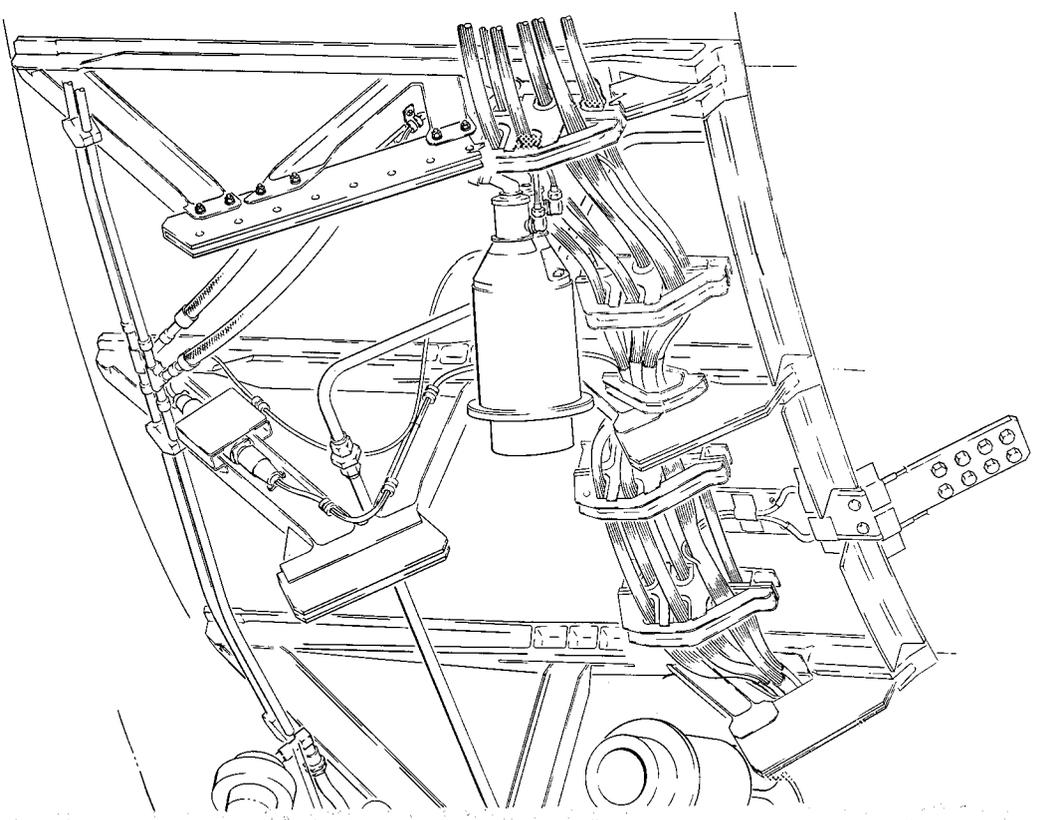
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DOOR R.H.
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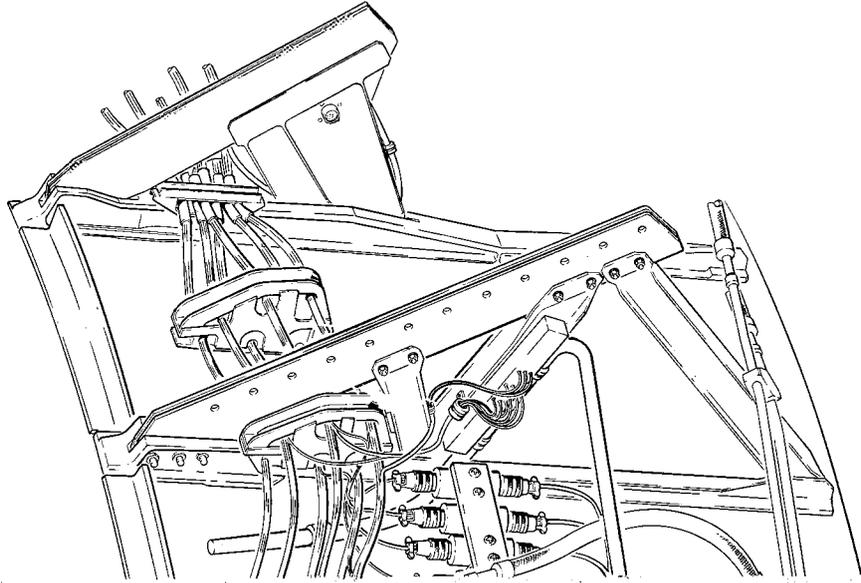
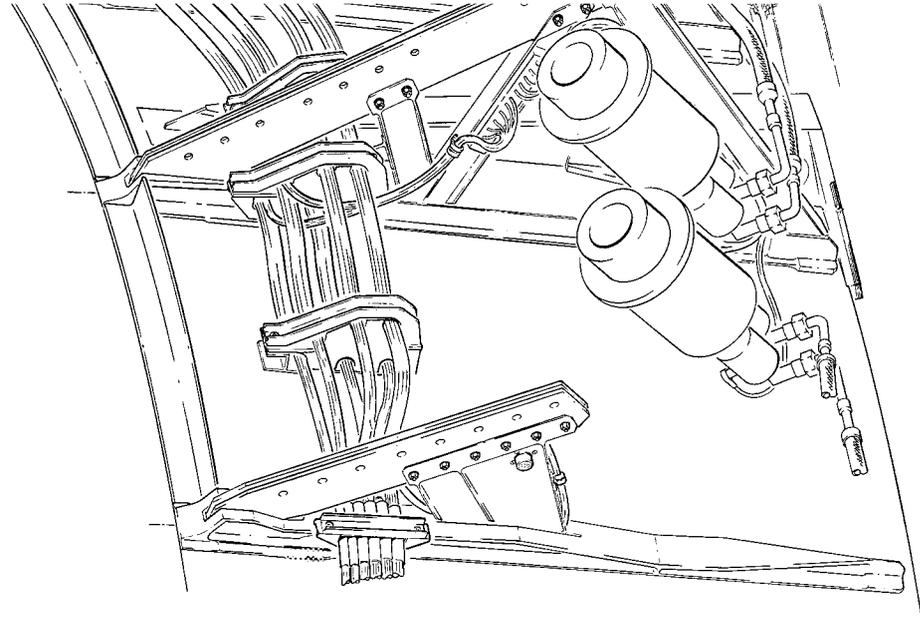
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| 03953 | J | | |
| SCALE NONE | SHEET | | 2 |





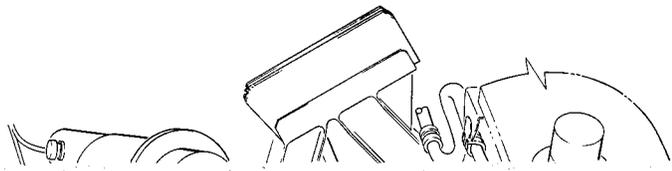
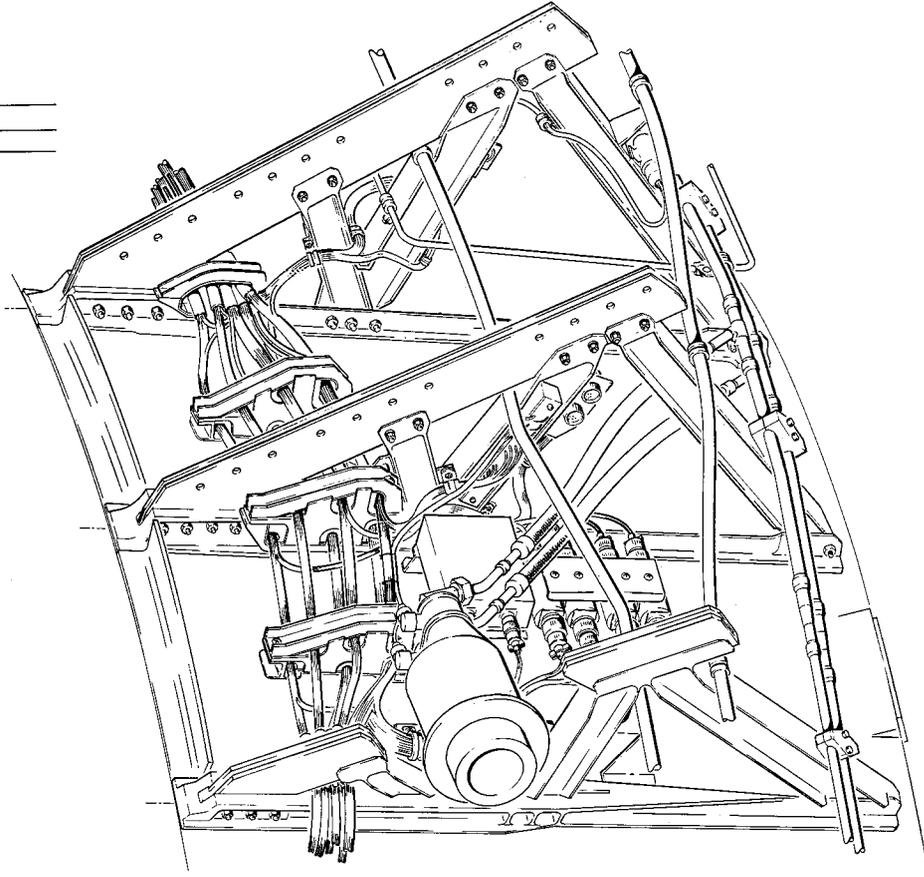




25

26

| SYN | ZONE | REVISIONS | DATE | APPROVED |
|-----|------|-----------------------|------|----------|
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| | | 2. CANNOT BE REWORKED | | |
| | | 3. RECORD CHANGE | | |
| | | 4. NO SHOP PRACTICE | | |
| | | 5. PARTS MADE OK | | |

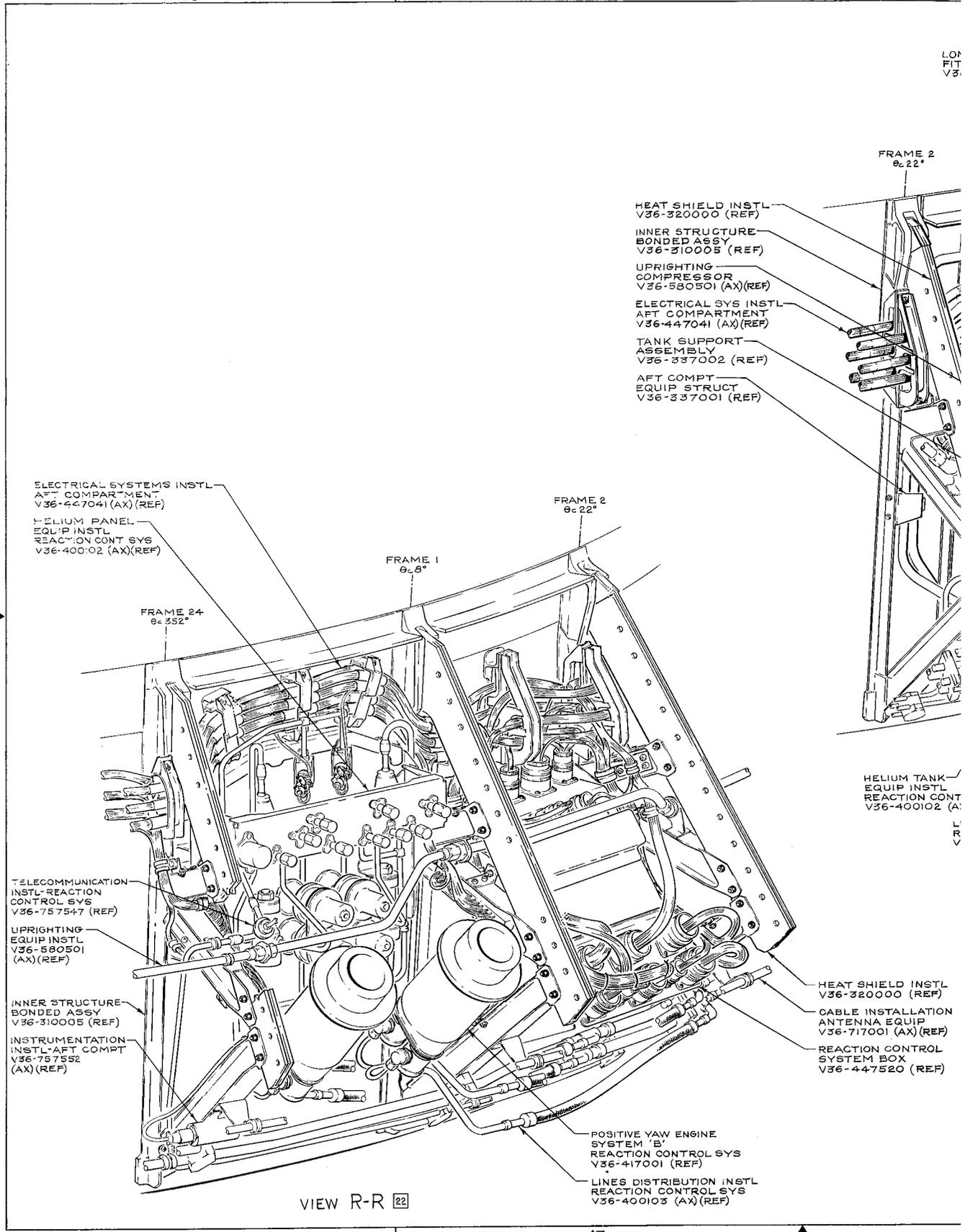


1.3 STR

| | |
|--|-------|
| NORTH AMERICAN AVIATION, INC. ENGINE AND INFORMATION SERVICES DIVISION 10000 WILSON AVENUE MONTICELLO, CALIFORNIA 95936 | |
| CODE | 03953 |
| SIZE | J |
| SCALE | NONE |
| SHEET 3 | |

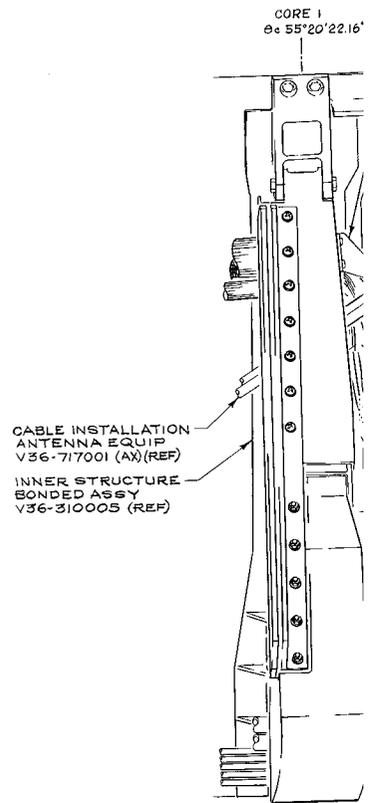
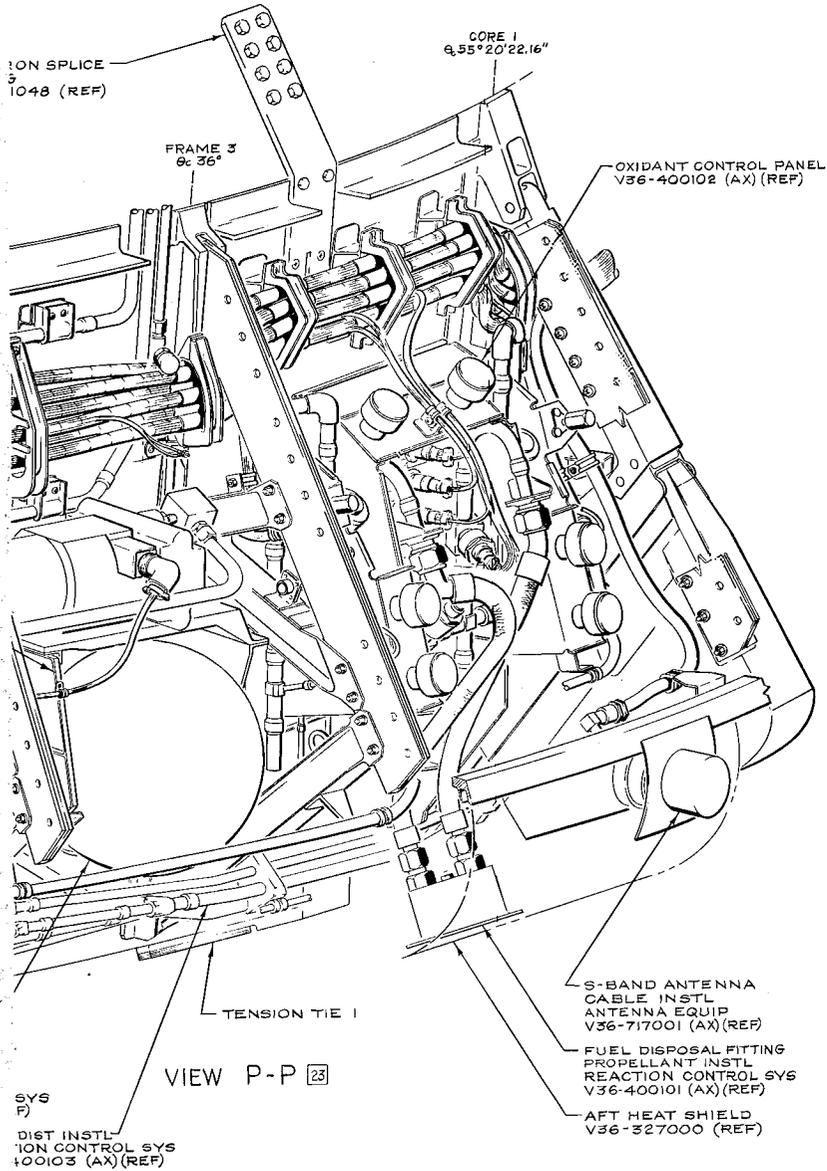
25

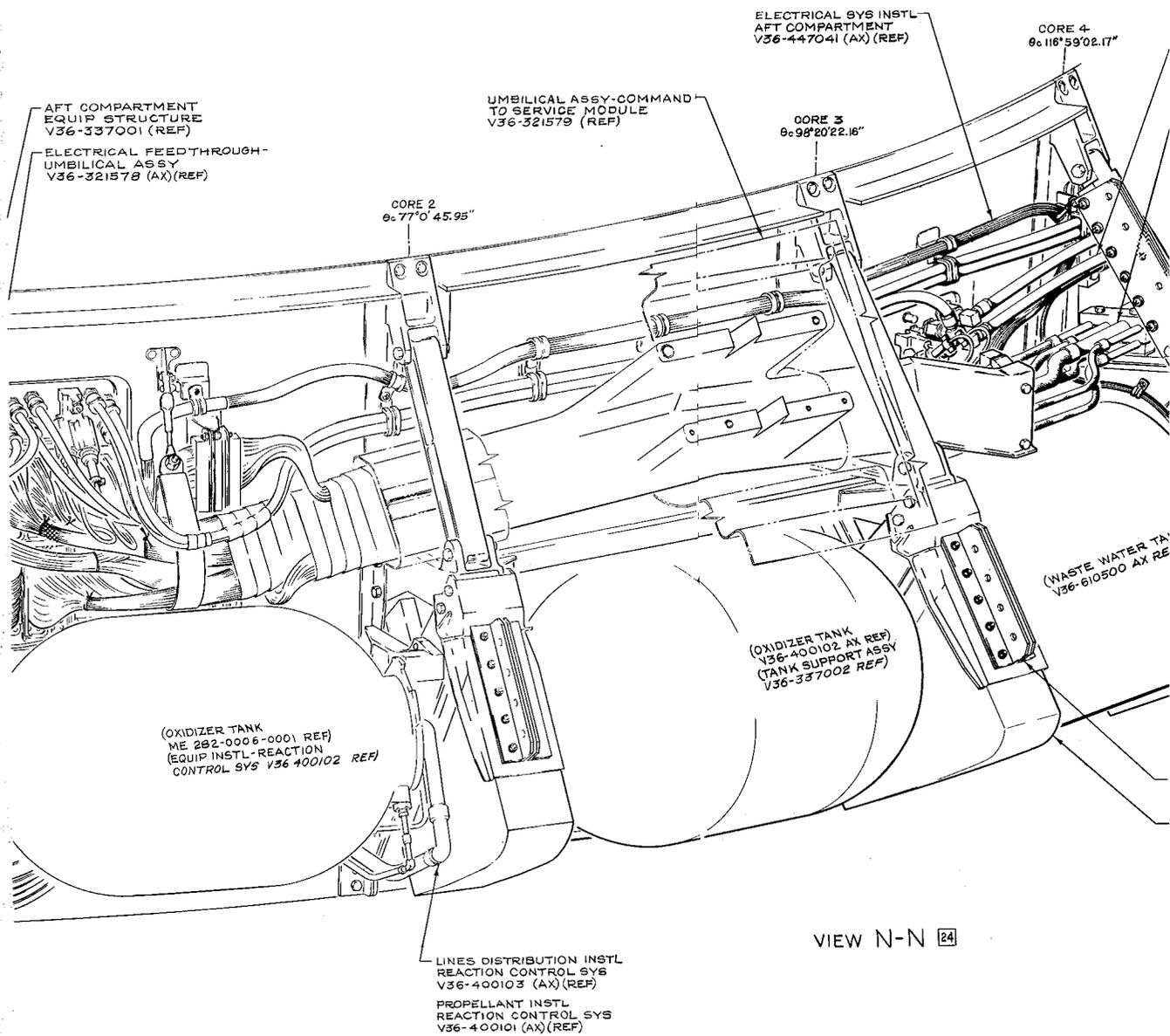
26



VIEW R-R 22







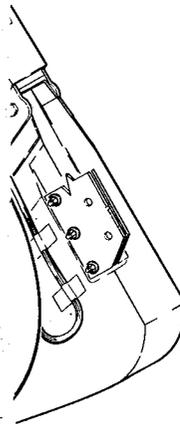
CABLE INSTALLATION
ANTENNA EQUIP
V36-717001 (AX) (REF)

WATER DUCT & WATER
PUMP INSTL: AFT COMPT
V36-610500 (AX) (REF)

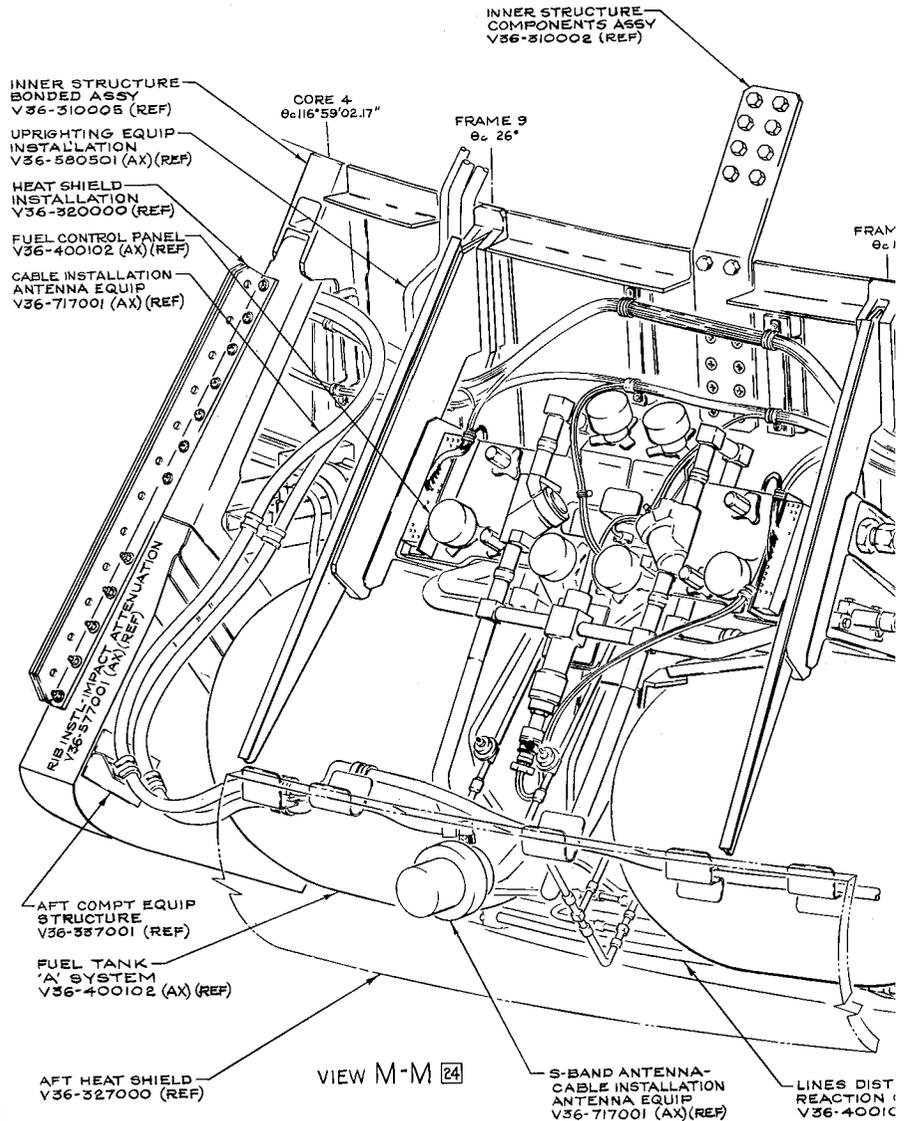
INNER ST
BONDED
V36-310005

ELECTRICAL
INSTL: A
V36-447

UPRIGHT
INSTALL
V36-58C

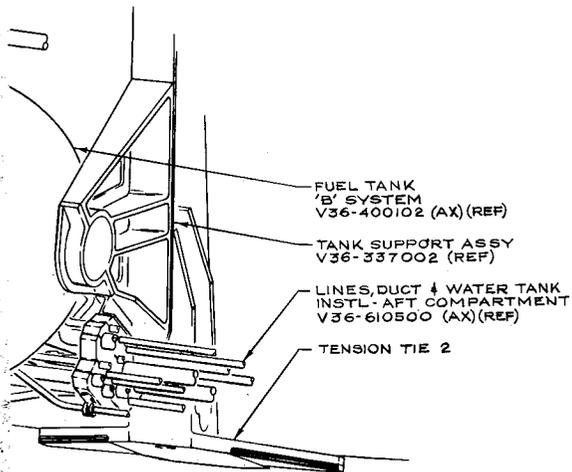
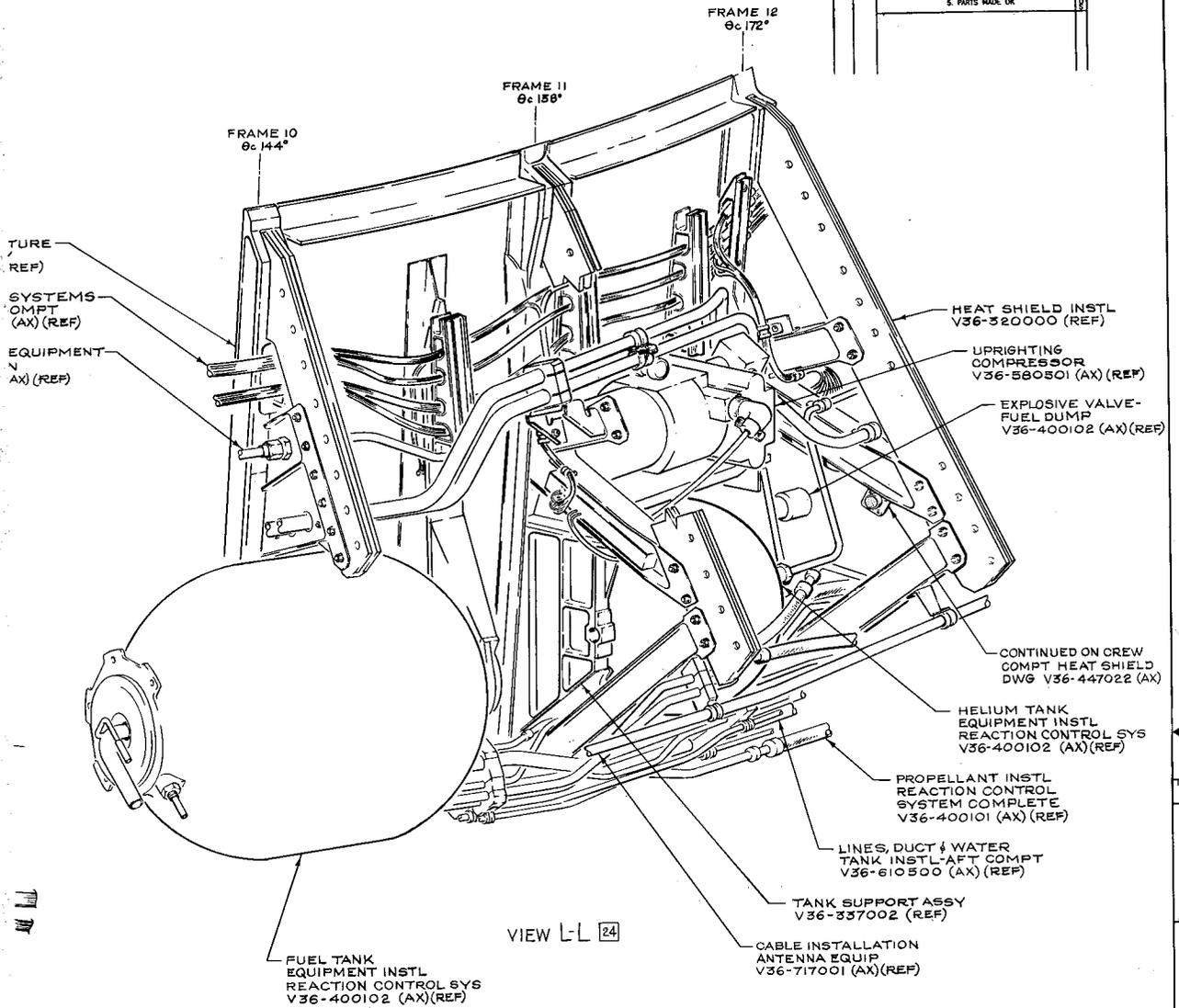


HEAT SHIELD
INSTALLATION
V36-320000 (REF)
CABLE INSTALLATION
ATTENUATION
EQUIP
V36-577001 (AX) (REF)



4

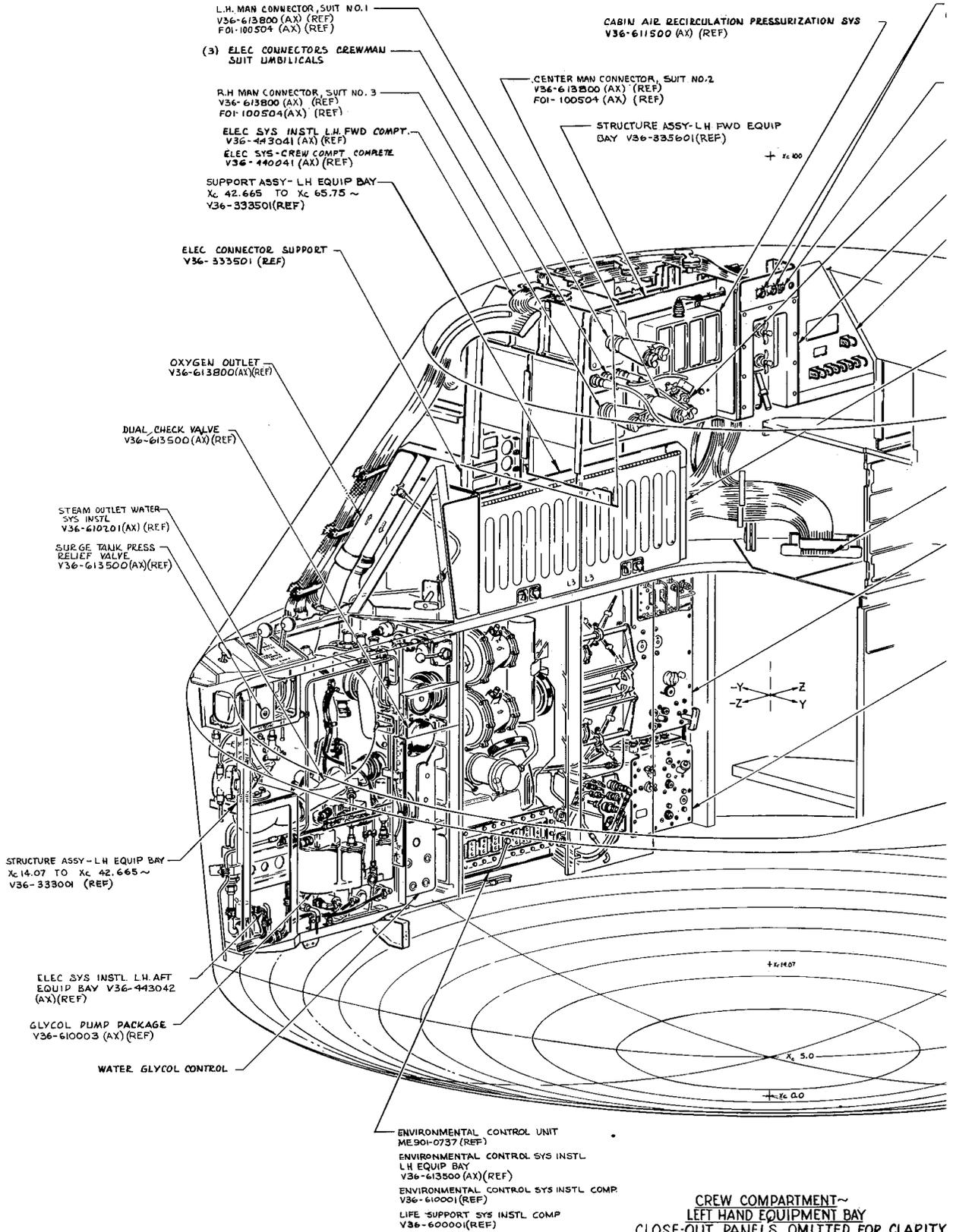
| REVISIONS | | DATE | APPROVED |
|-----------|--------------------|------|-------------------|
| 1. | MAY BE REWORKED | 5. | RECORD CHANGE |
| 2. | CANNOT BE REWORKED | 4. | HOW SHOP PRACTICE |
| 3. | | 5. | PARTS MADE OK |



OL SYS (REF)

1.4 STR

| | |
|---|---------|
| NORTH AMERICAN AVIATION, INC. SPACE and INFORMATION SYSTEMS DIVISION 3700 LAKEWOOD BLVD. DOWNEY, CALIFORNIA | |
| CODE IDENT NO | SIZE |
| 03953 | J |
| SCALE NONE | SHEET 4 |



CONNECTOR
ATTEN LOCKOUT
443041 (AX) (REF)

CONNECTOR, RADIATION SURVEY METER
443041 (AX) (REF)

CABIN TEMP CONTROL
PANEL ASSY
V36-610065 (REF)

POTABLE WATER RESERVOIR
AIRSEARCH 812940 (REF)

DIGITAL TIMER PANEL NO. 306
V36-764090 (REF)

FOOD STORAGE
FOI-100504 (AX) (REF)

FOR CONTINUATION SEE V36-444201 (AX) (REF)
AND V36-444202 (AX) (REF)

O₂ CONTROL PANEL
V36-613565 (REF)
ENVIRONMENTAL CONTROL SYS.
LH EQUIP BAY INSTL
V36-613500 (AX) (REF)

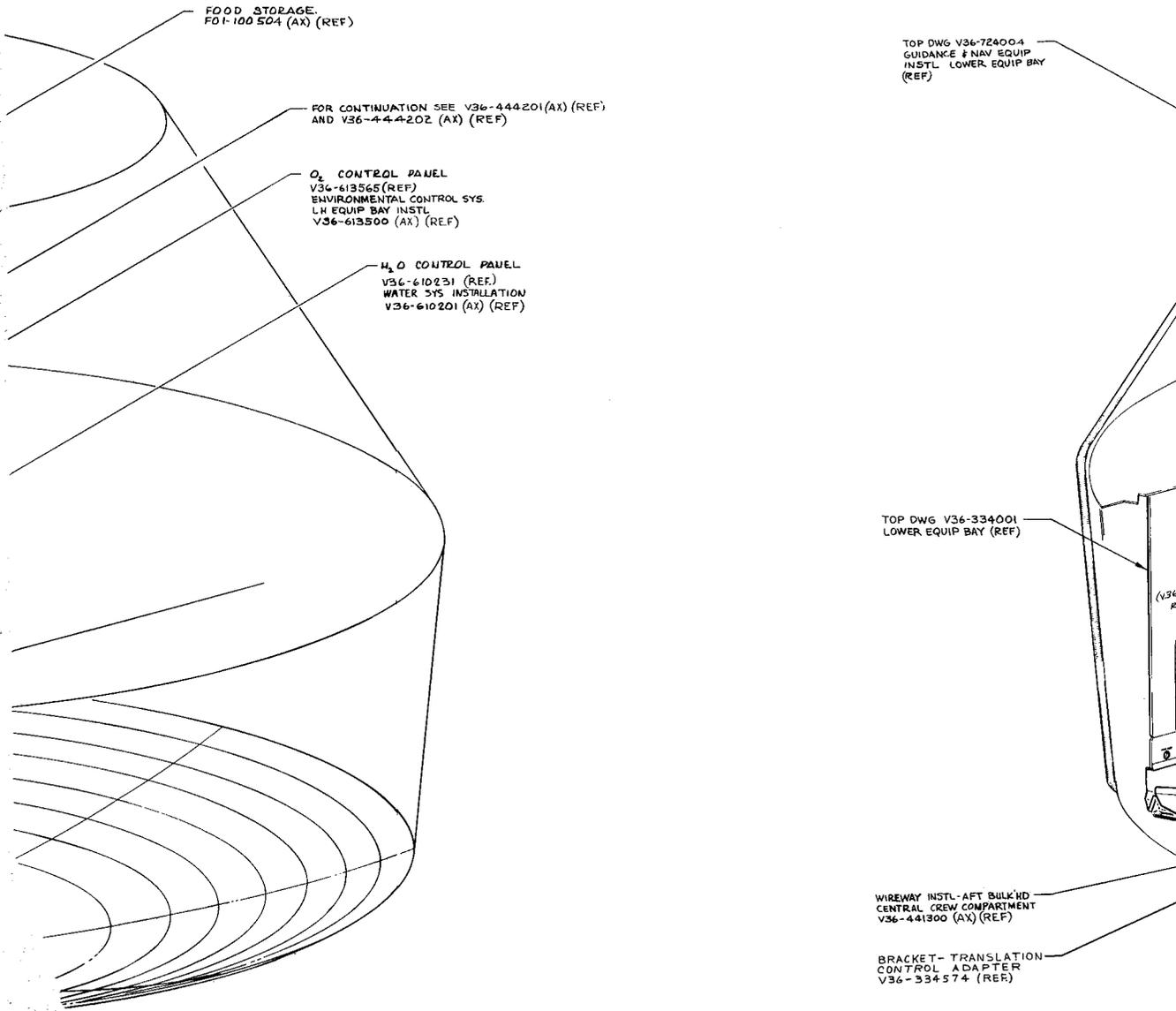
H₂O CONTROL PANEL
V36-610231 (REF)
WATER SYS INSTALLATION
V36-610201 (AX) (REF)

TOP DWG V36-724004
GUIDANCE & NAV EQUIP
INSTL LOWER EQUIP BAY
(REF)

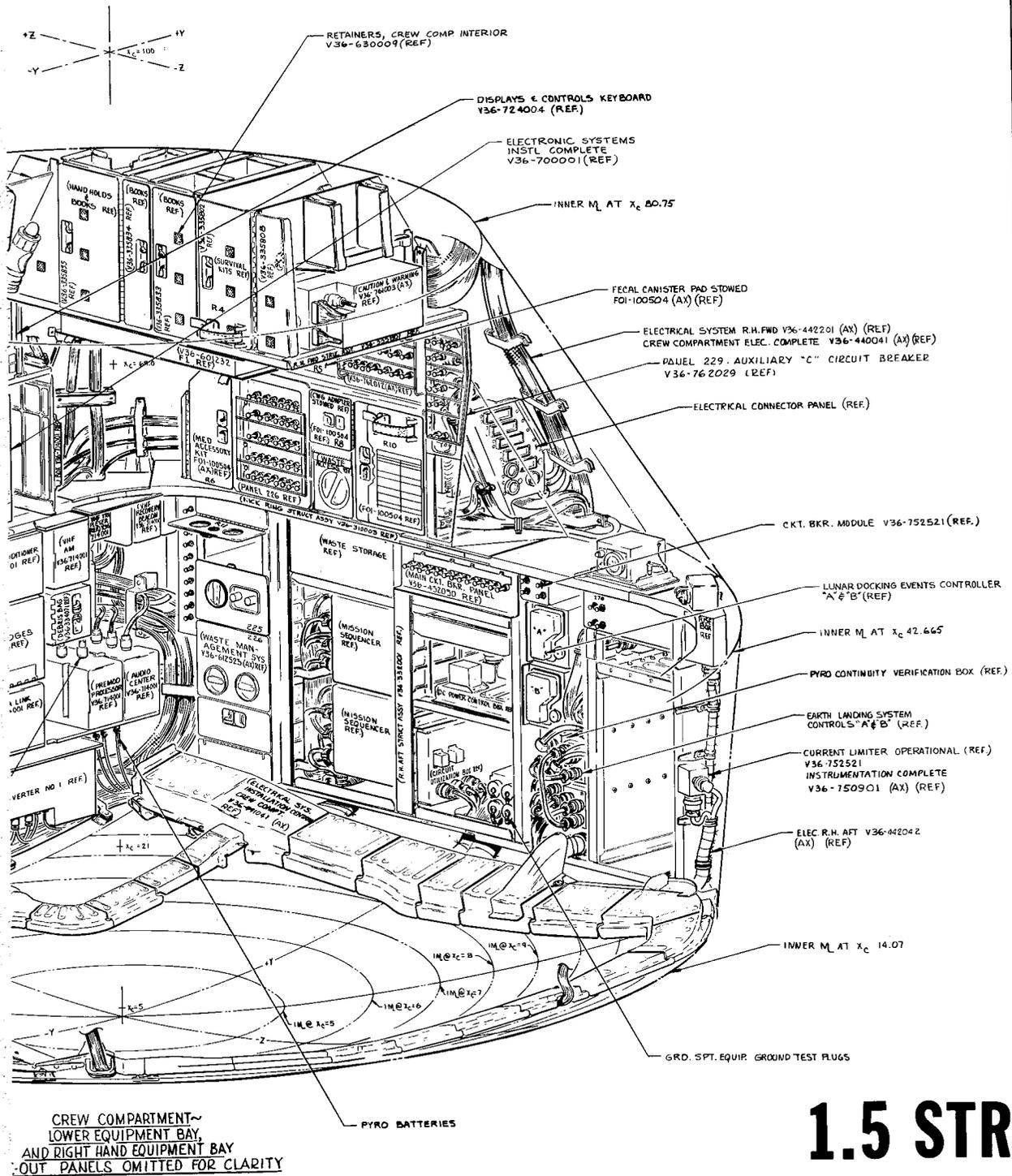
TOP DWG V36-334001
LOWER EQUIP BAY (REF)

WIREWAY INSTL-AFT BULKHD
CENTRAL CREW COMPARTMENT
V36-441300 (AX) (REF)

BRACKET- TRANSLATION
CONTROL ADAPTER
V36-334574 (REF)



| REVISONS | | DATE | APPROVED |
|----------|------|---|----------|
| SYM | ZONE | DESCRIPTION | |
| | | 1. MAY BE REMOVED 2. CANNOT BE REMOVED 3. RECORD CHANGE 4. HOW SHOP PRACTICE 5. PARTS MAKE OR | |



1.5 STR

| | |
|--|---------|
| NORTH AMERICAN AVIATION, INC. REPAIR AND INFORMATION SYSTEMS DIVISION 18214 LAKESIDE BLVD., DOWNEY, CALIFORNIA | |
| CODE IDENT NO. | SIZE |
| 03953 | J |
| SCALE NONE | SHEET 5 |

STORAGE ASSY
 FWD EQUIP BAY
 V36-601232 (REF)

STRUCTURE, MAIN DISPLAY
 CONSOLE Y36-335001 (REF)

COMPLETE DISPLAYS AND
 CONTROLS INSTL. V36-761101 (AX) (REF)

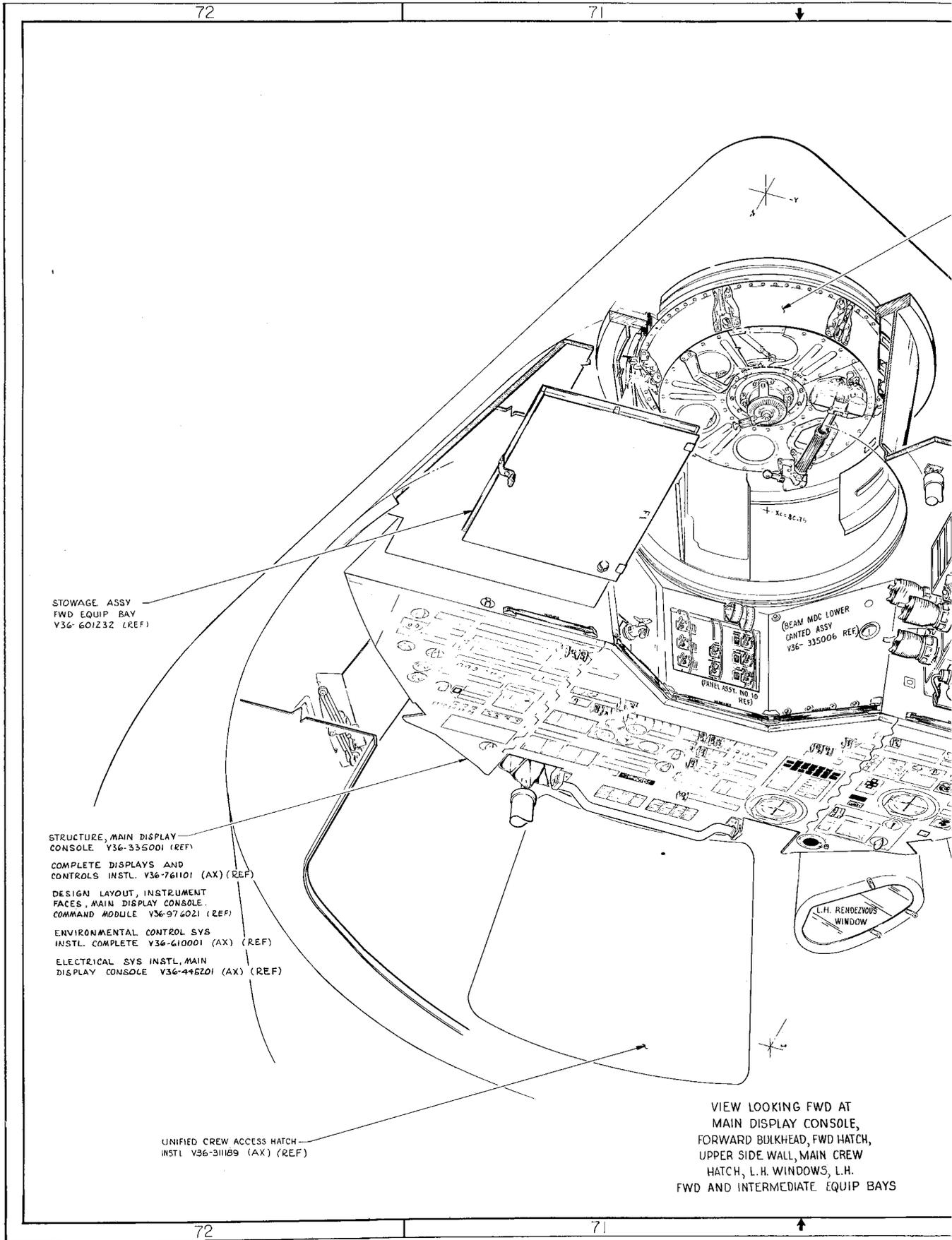
DESIGN LAYOUT, INSTRUMENT
 FACES, MAIN DISPLAY CONSOLE.
 COMMAND MODULE V36-976021 (REF)

ENVIRONMENTAL CONTROL SYS
 INSTL. COMPLETE V36-610001 (AX) (REF)

ELECTRICAL SYS INSTL. MAIN
 DISPLAY CONSOLE V36-446201 (AX) (REF)

UNIFIED CREW ACCESS HATCH
 INSTL V36-311189 (AX) (REF)

VIEW LOOKING FWD AT
 MAIN DISPLAY CONSOLE,
 FORWARD BULKHEAD, FWD HATCH,
 UPPER SIDE WALL, MAIN CREW
 HATCH, L. H. WINDOWS, L. H.
 FWD AND INTERMEDIATE EQUIP BAYS



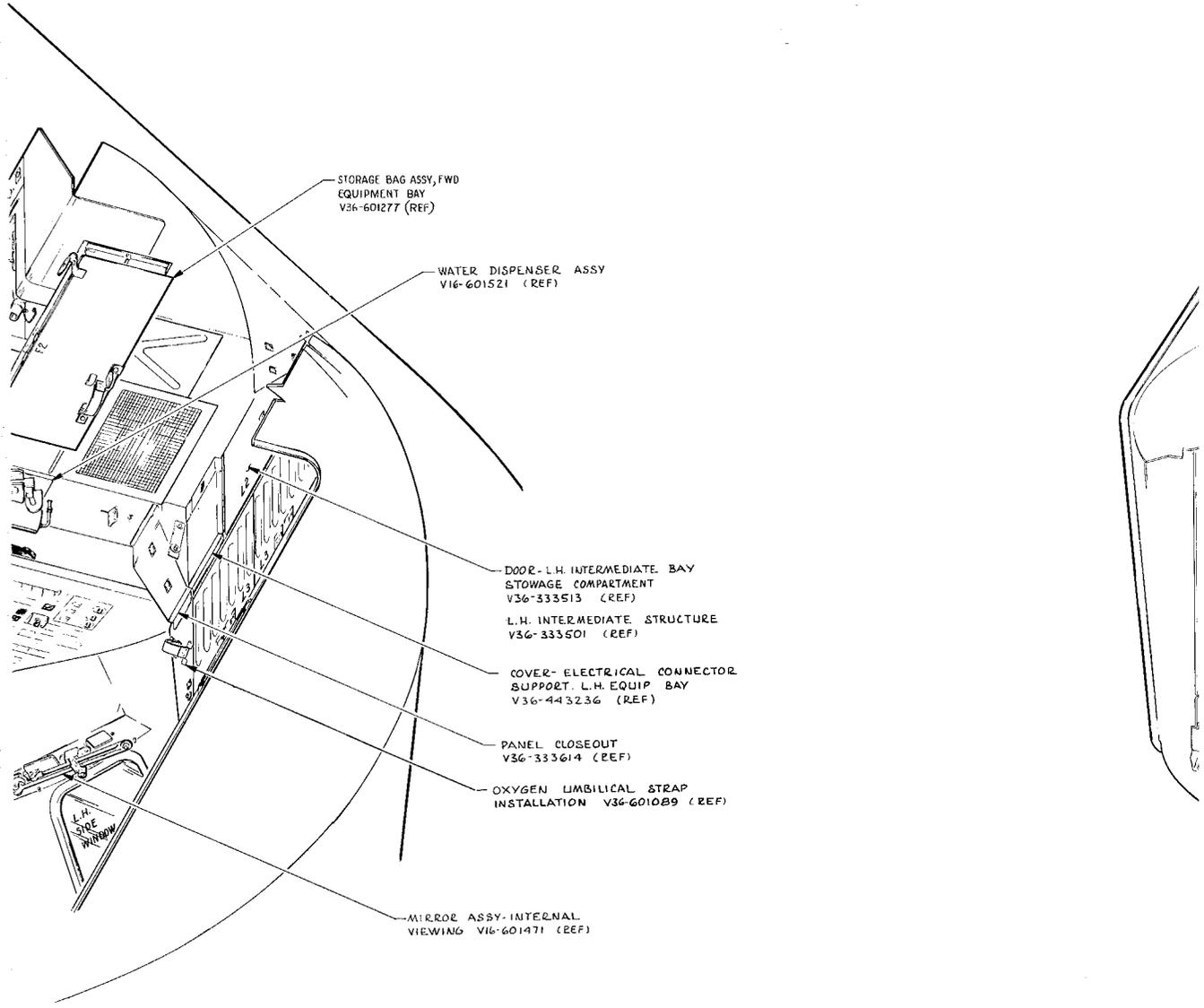
70

69

68

FORWARD CREW HATCH
V36-326601 (AX) (REF)

TRANSL
V36-73

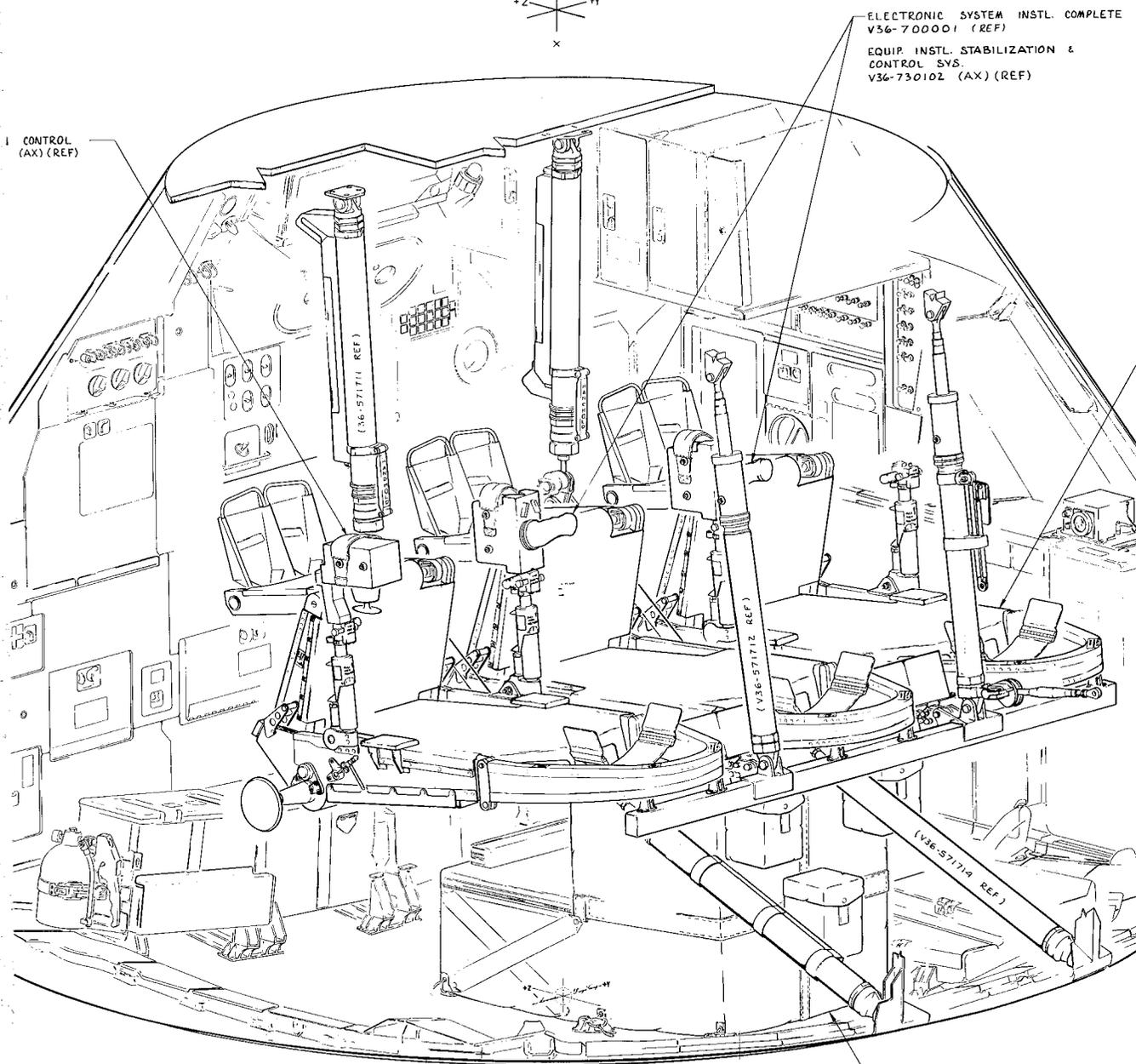
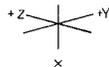


70

69

SHEET
6

68

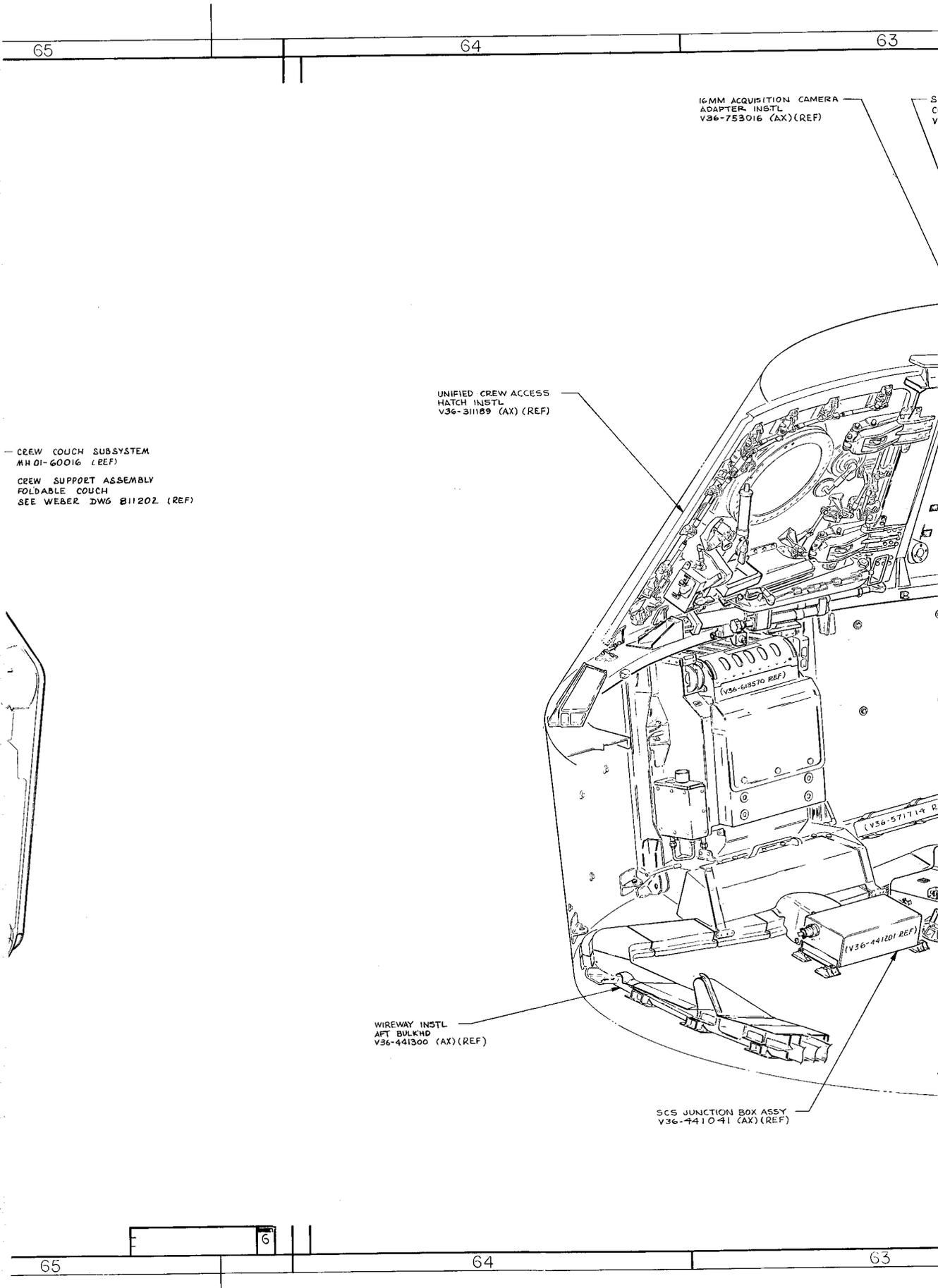


CONTROL
(AX) (REF)

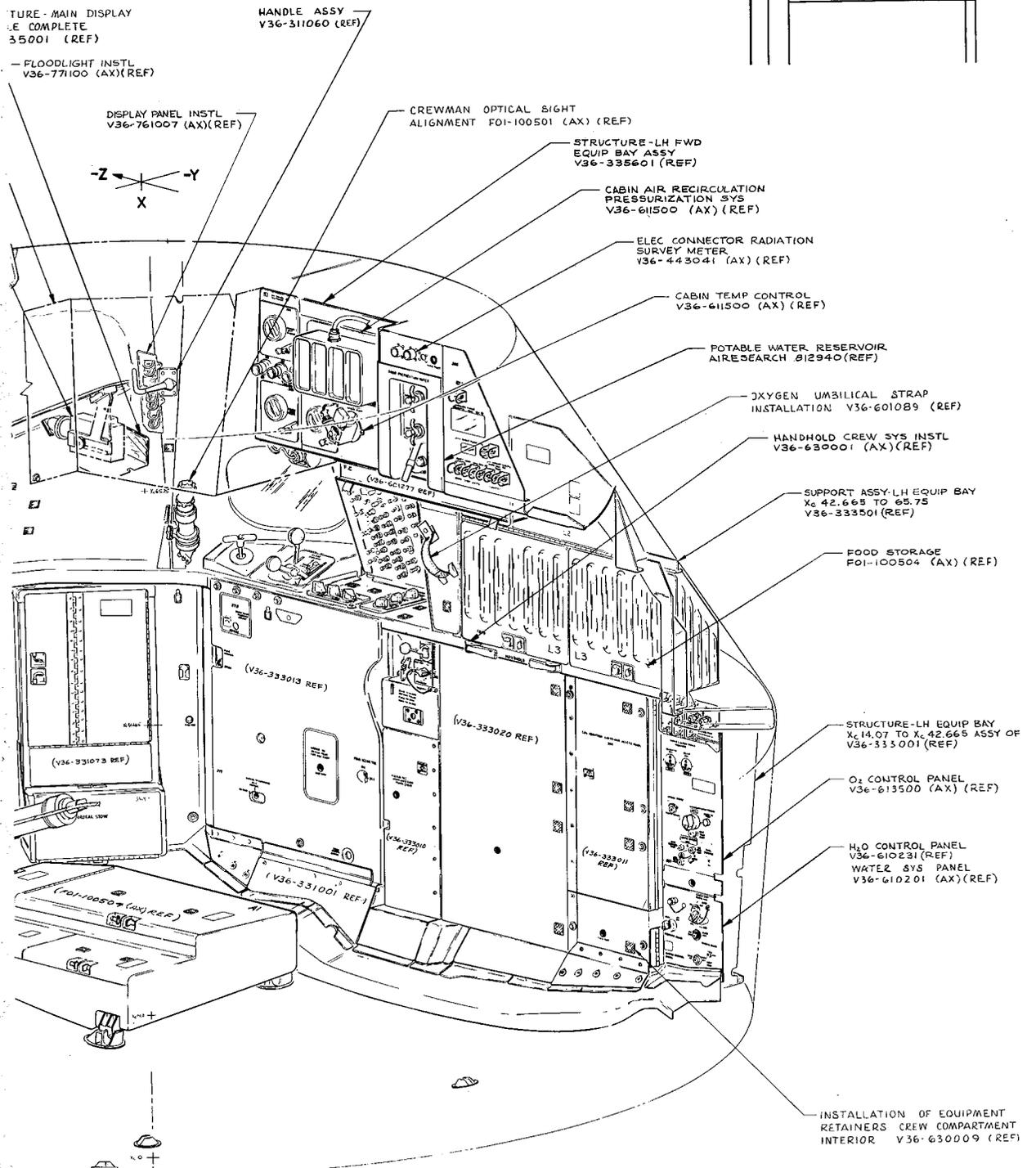
ELECTRONIC SYSTEM INSTL. COMPLETE
V36-700001 (REF)
EQUIP INSTL. STABILIZATION &
CONTROL SYS.
V36-730102 (AX) (REF)

PGA BAG
V36-601010 (REF)

VIEW LOOKING DOWN & INBOARD
FOLDABLE CREW COUCHES



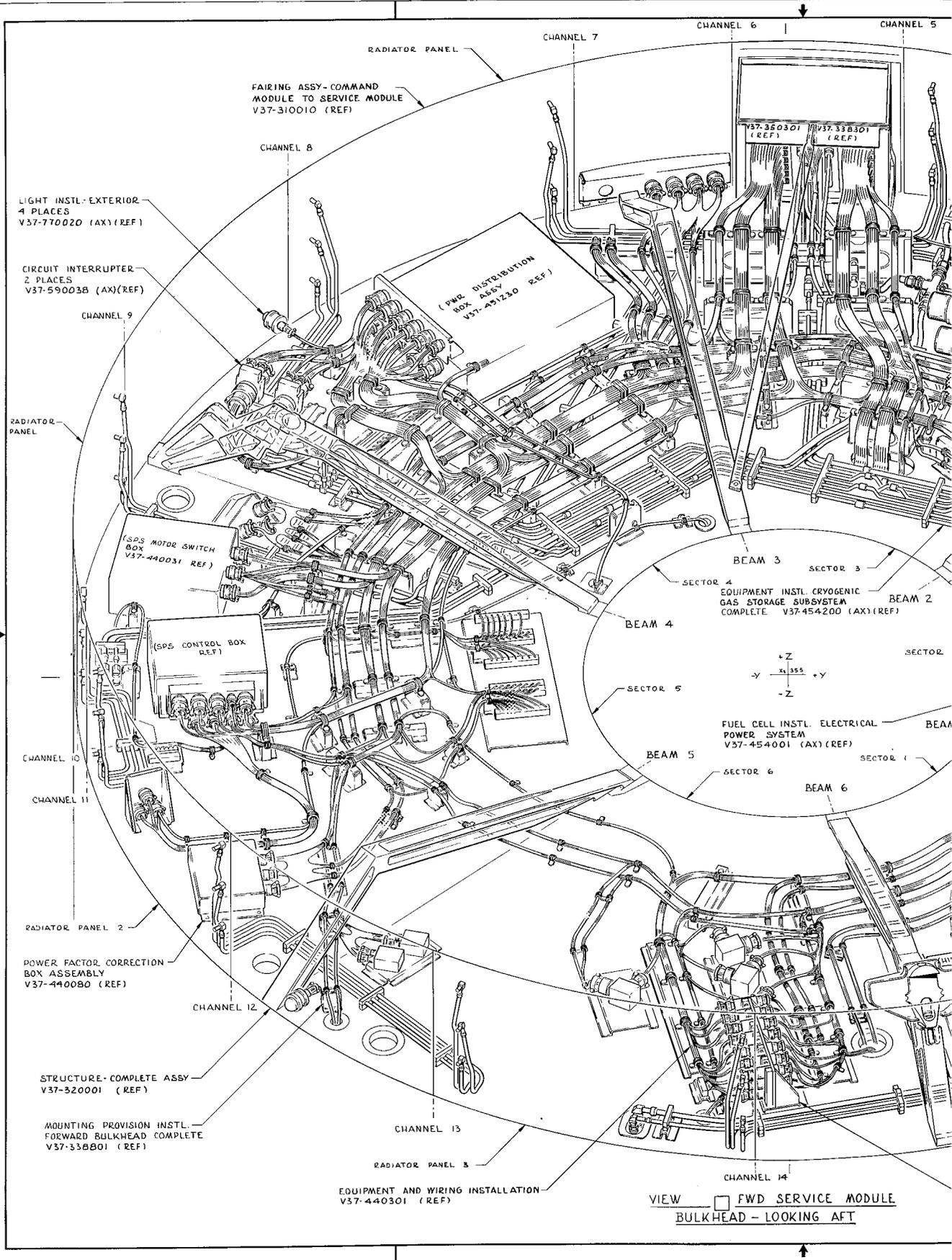
| REVISIONS | | | DATE | APPROVED |
|-----------|------|-------------------|------|----------|
| SYM | ZONE | DESCRIPTION | | |
| 1. | | MAY BE REMOVED | | |
| 2. | | CANNOT BE REMOVED | | |
| 3. | | RECORD CHANGE | | |
| 4. | | HOW SHOP PRACTICE | | |
| 5. | | PARTS MADE OK | | |

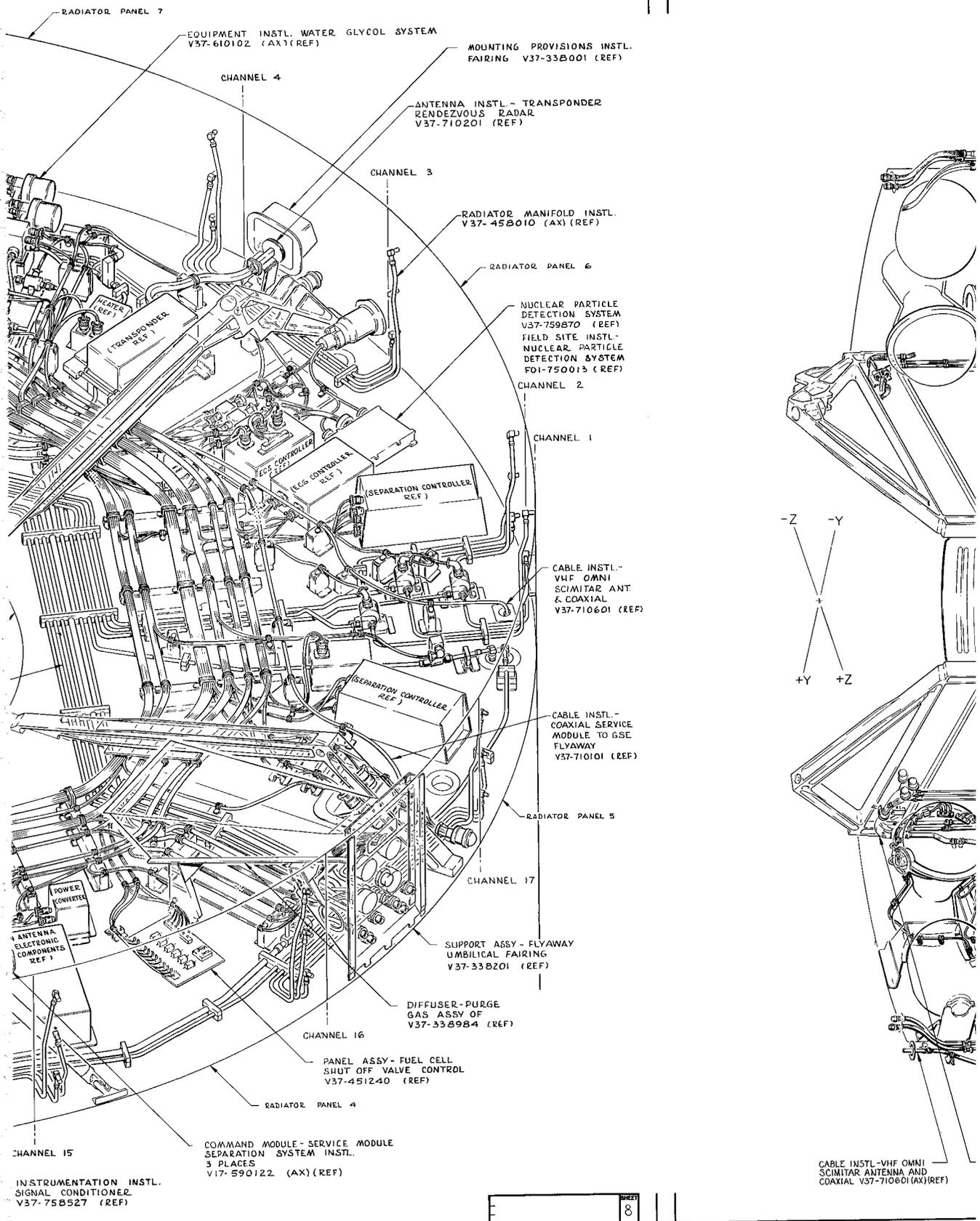


CREW COMPARTMENT
LEFT HAND EQUIPMENT BAY
AND CREW HATCH AREA
CENTRAL CREW COMPARTMENT

1.6 STR

| | |
|--|---------|
| NORTH AMERICAN AVIATION, INC. | |
| OFFICE AND INFORMATION SERVICES DIVISION | |
| 1814 LAKWOOD BLVD., GOWHEY, CALIFORNIA | |
| CODE IDENT NO. | SIZE |
| 03953 | J |
| SCALE: NONE | SHEET 6 |





INSTRUMENTATION INSTL-
REACTION CONTROL SYSTEM
V37-756524 (REF)
ELECTRICAL INSTL-
REACTION CONTROL SYSTEM
PANEL A1C
V37-445203 (REF)

ELECTRICAL EQUIPMENT INSTL-
REACTOR CONTROL SYSTEM
SECTORS II, III & IV
V37-44011 (REF)

PLUMBING INSTL-
RADIATOR WATER GLYCOL SYSTEM
V37-60002 (AXI) (REF)

(BEAM B V37-32000)

5

+
K27925

(BEAM A V37-32000)

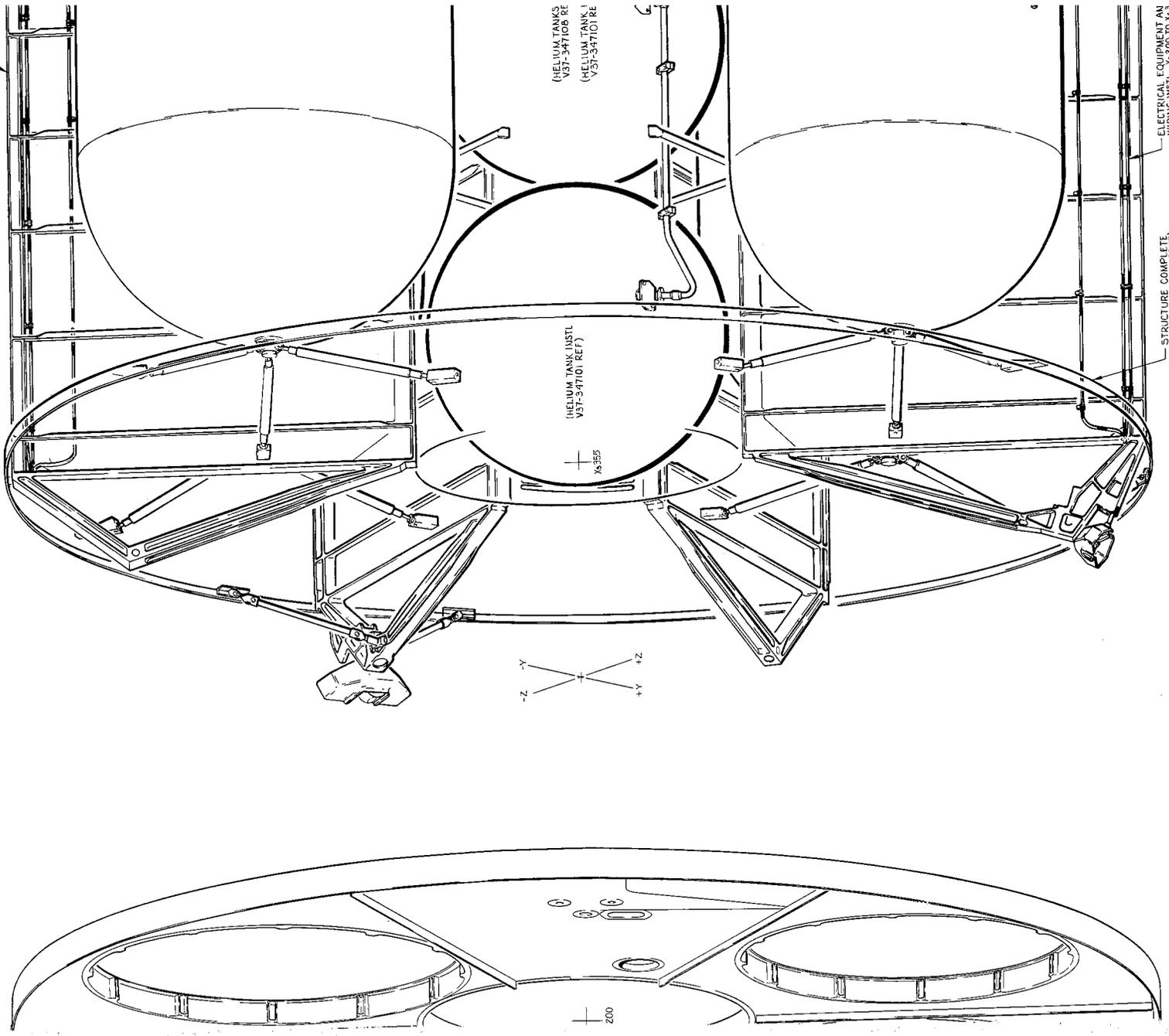
ELECTRICAL EQUIPMENT INSTL-
RING INSTL-
TO K27925
V37-756525 (REF)

INSTRUMENTATION INSTL-
REACTION CONTROL SYSTEM
V37-756525 (REF)

ELECTRICAL INSTL-
REACTOR CONTROL SYSTEM
PANEL B1C
V37-445202 (REF)

SERVICE MODULE WITH EXTERIOR
PANELS, BEAMS 2, 3, 4, 5 AND TANKS
REMOVED FOR CLARITY

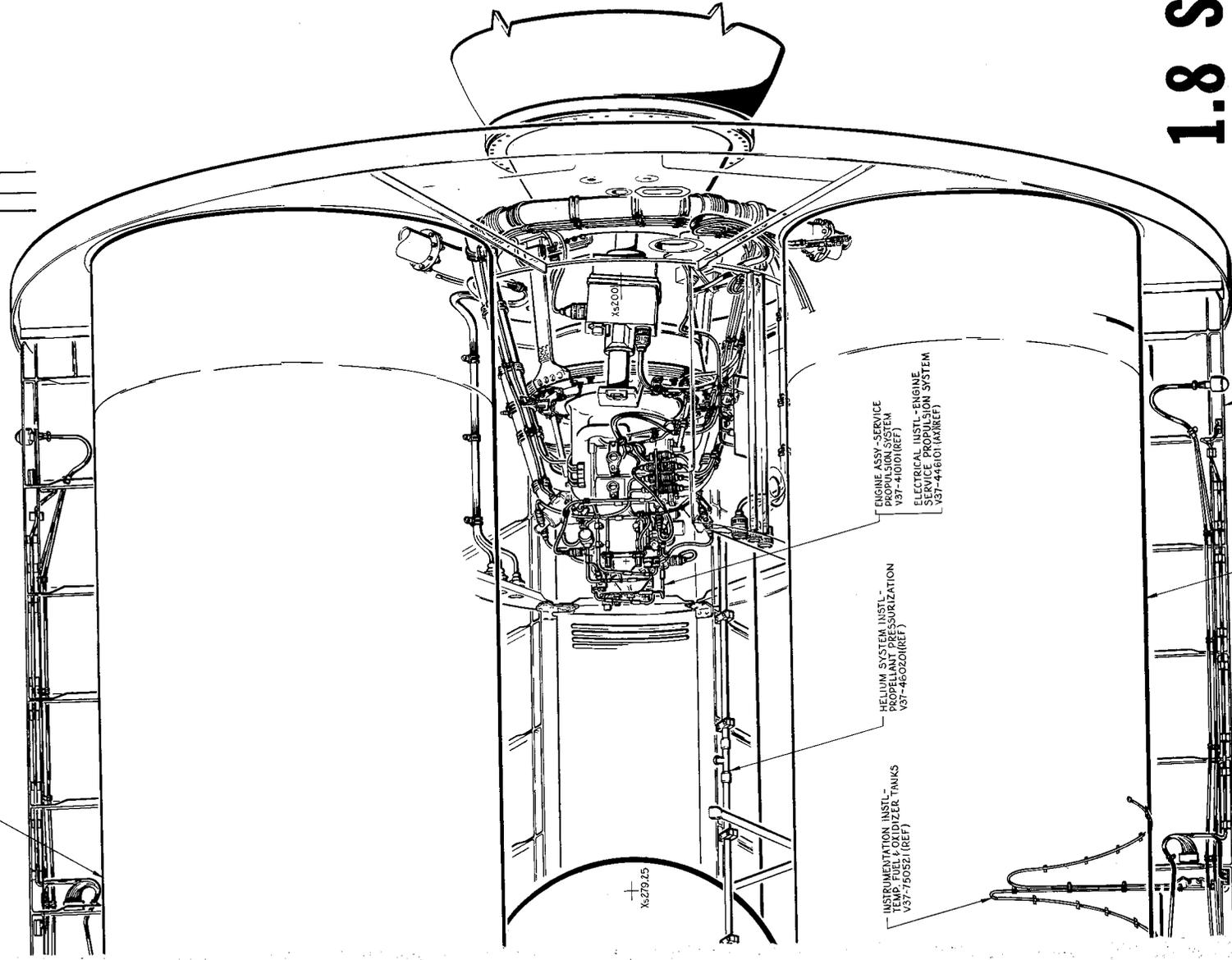
PLUMBING INSTL- RADIATOR,
WATER GLYCOL SYSTEM
V37-60002 (AXI) (REF)



| REV | DATE | APPROVED |
|-----|------|----------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

001 (REF)

FUEL SUMP TANK
V37-342101 (REF)



ELECTRICAL INSTL - ENGINE SERVICE PROPULSION SYSTEM
V37-4446101 (A) (REF)

HELIUM SYSTEM INSTL -
PROPELLANT PRESSURIZATION
V37-460201 (REF)

INSTRUMENTATION INSTL -
TEMP. FUEL/OXIDIZER TANKS
V37-780521 (REF)

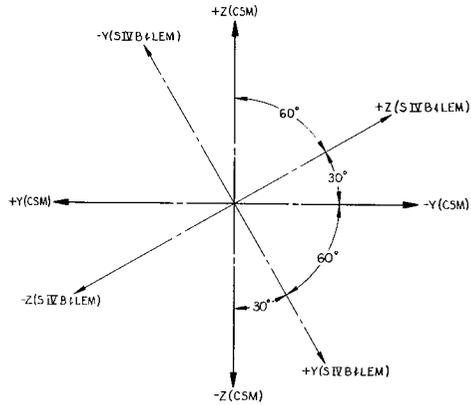
BEAM 2
V37-322101 (REF)

OXIDIZER STORAGE TANK
V37-343102 (REF)
MAIN PROPELLANT TANK
INSTL V37-340101 (REF)

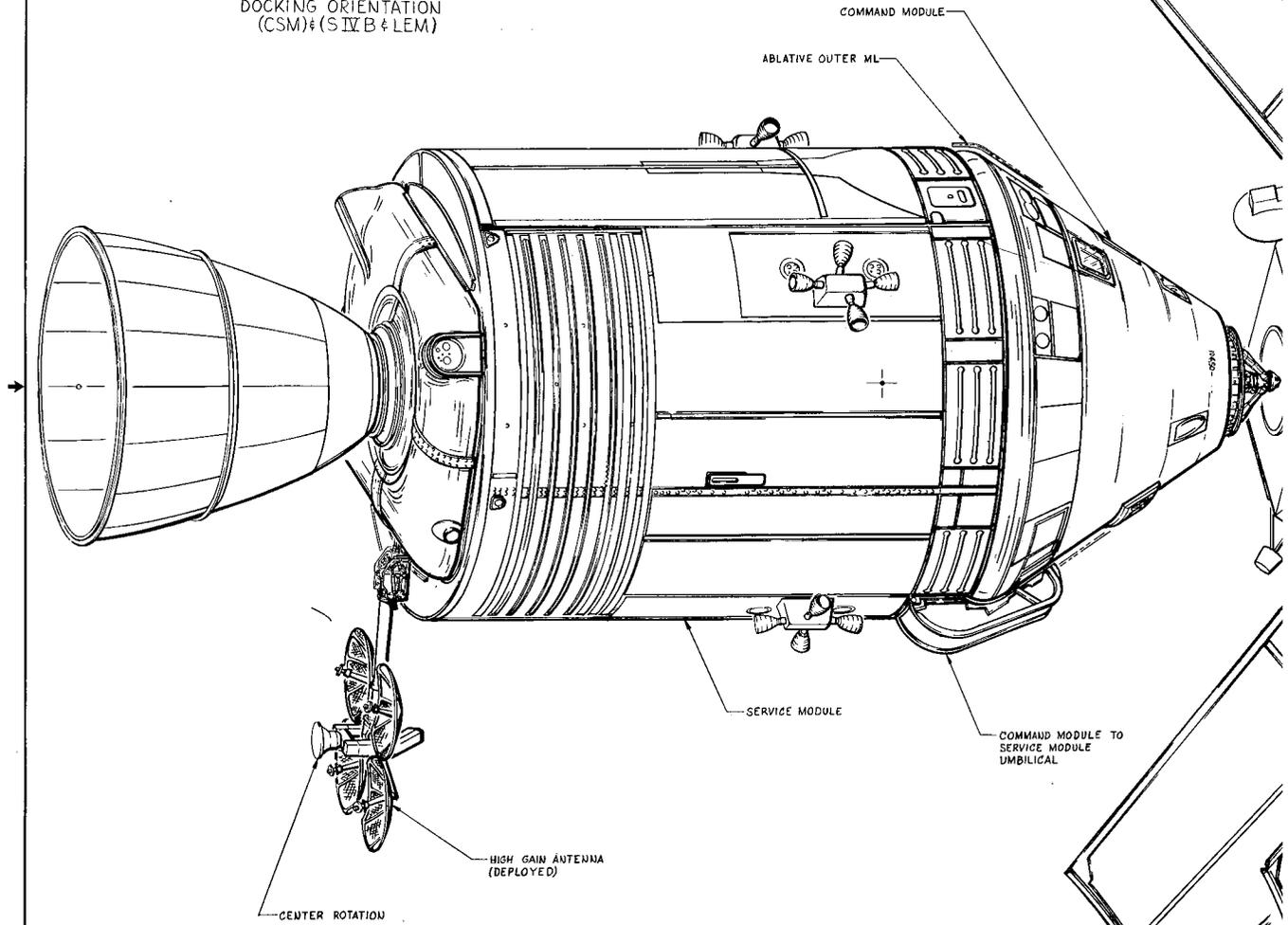
SERVICE MODULE WITH EXTERIOR
PANELS AND BEAMS 3 AND 4
REMOVED FOR CLARITY

1.8 STR

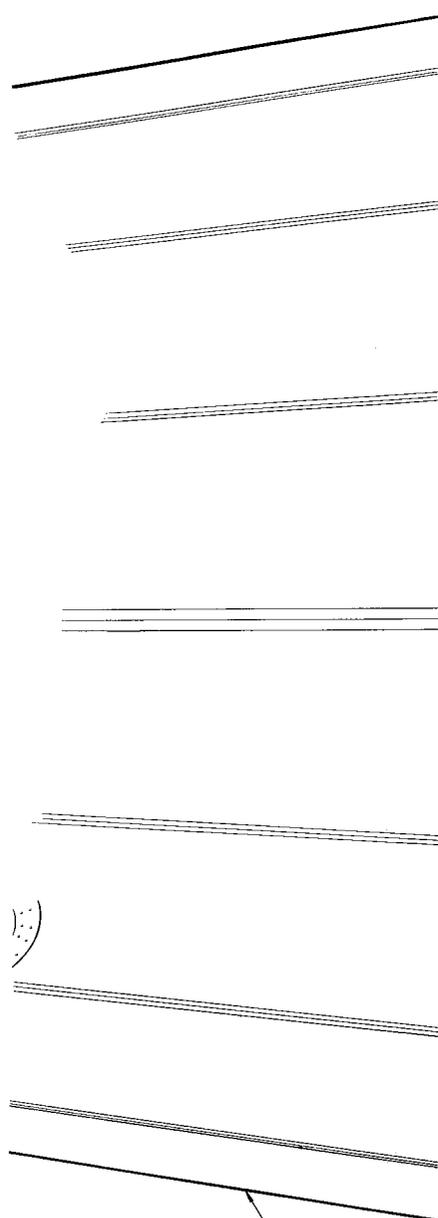
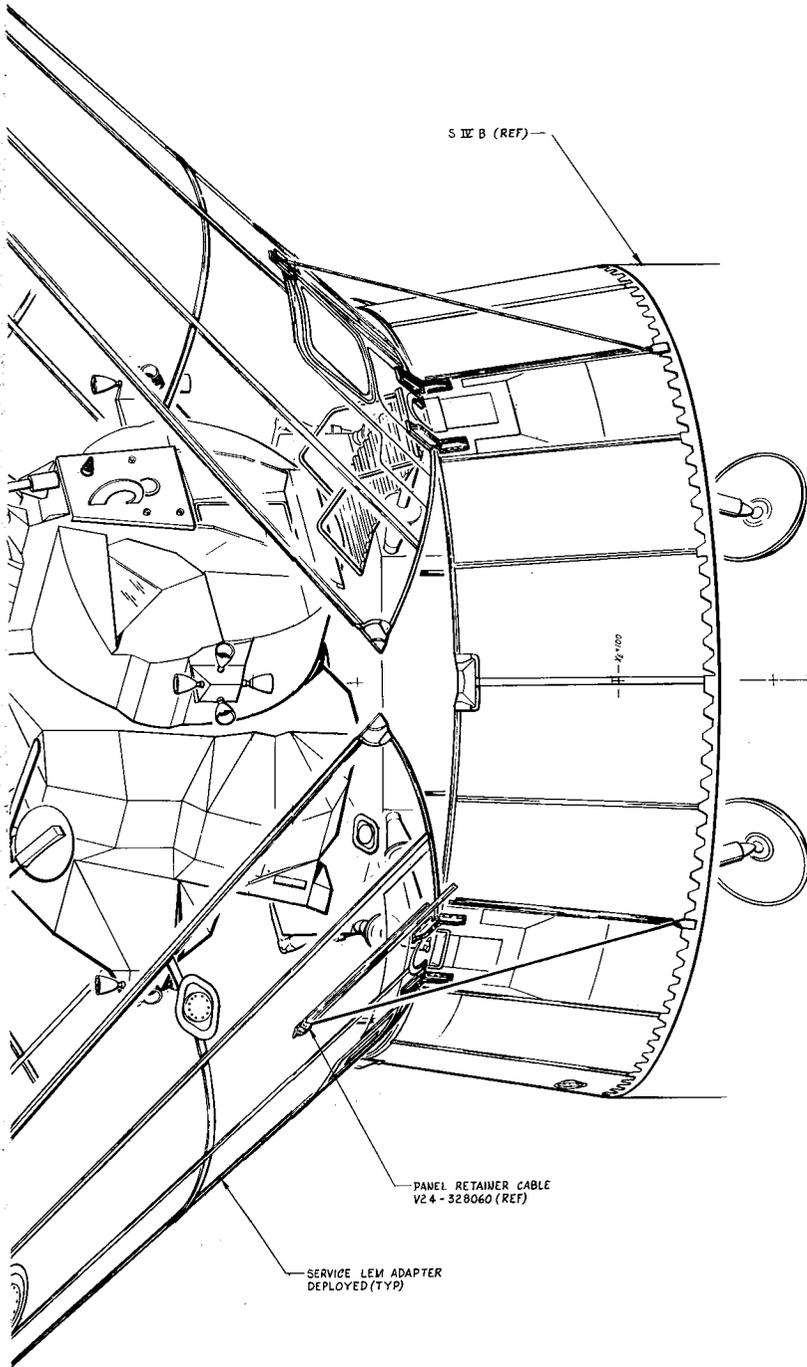
| | |
|---|---------------------|
| NORTH AMERICAN AVIATION, INC. ENGINE AND PROPULSION DIVISION 10000 WILLOW CREEK DRIVE DALLAS, TEXAS 75243-5000 | |
| CODE (DDT) NO. | 03953 |
| SIZE | J |
| SCALE NOTE | FOR BY: J.M. KELLAS |
| | SHEET 8 |



DOCKING ORIENTATION
(CSM) & (SIVB & LEM)



ELECTRICAL SYSTEM SUPPORT
 BV24-323001 (REF)
 WIRE BUNDLE INSTL
 BV24-790064 (REF)

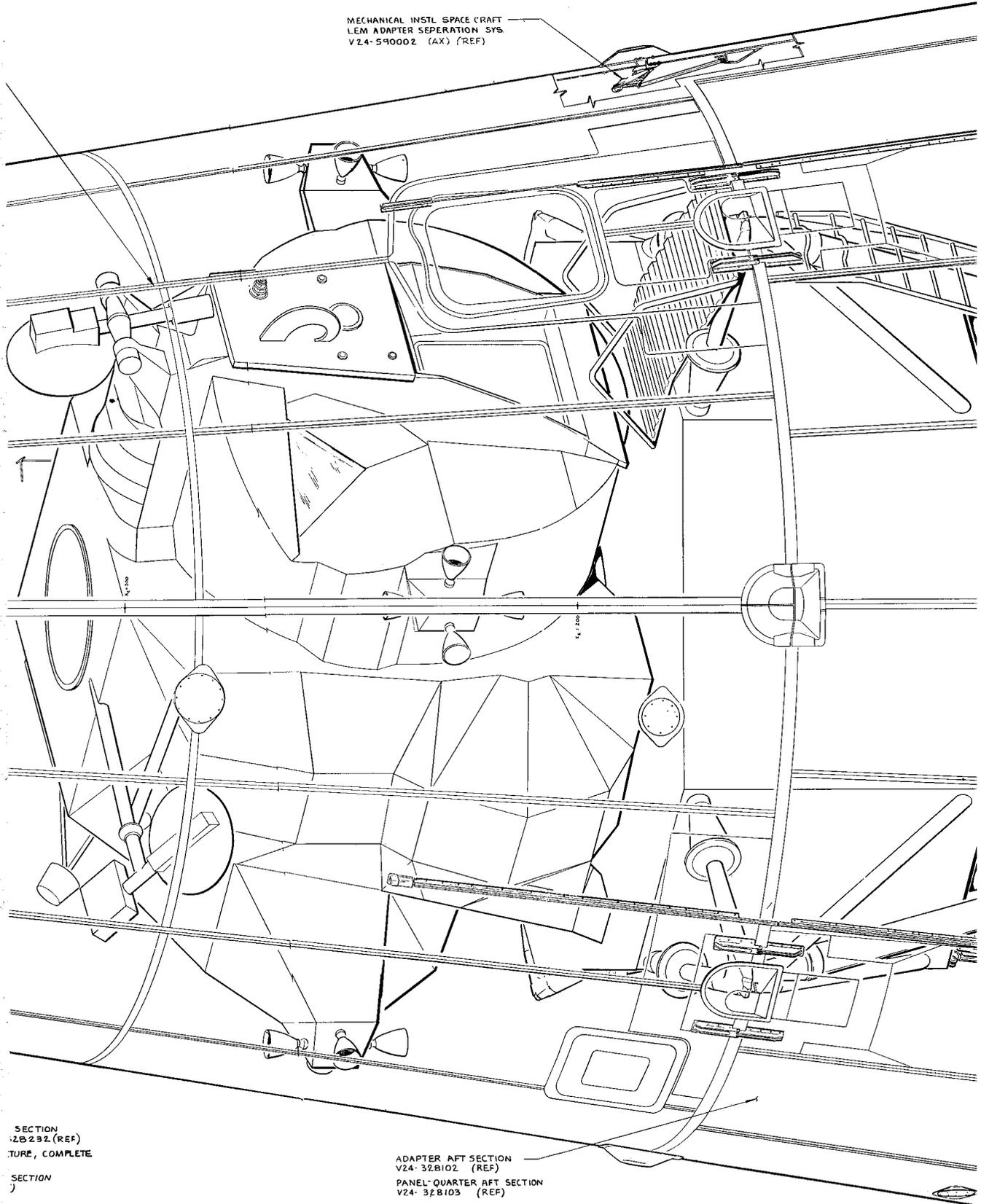


GENERAL ASSY
 V24-008002 (P)
 PANEL QUARTER
 V24-328231,
 ADAPTER ASSY
 V24-328003
 ADAPTER ASSY
 V24-328238

103

102

MECHANICAL INSTL SPACE CRAFT
LEM ADAPTER SEPERATION SYS
V24-590002 (AX) (REF)



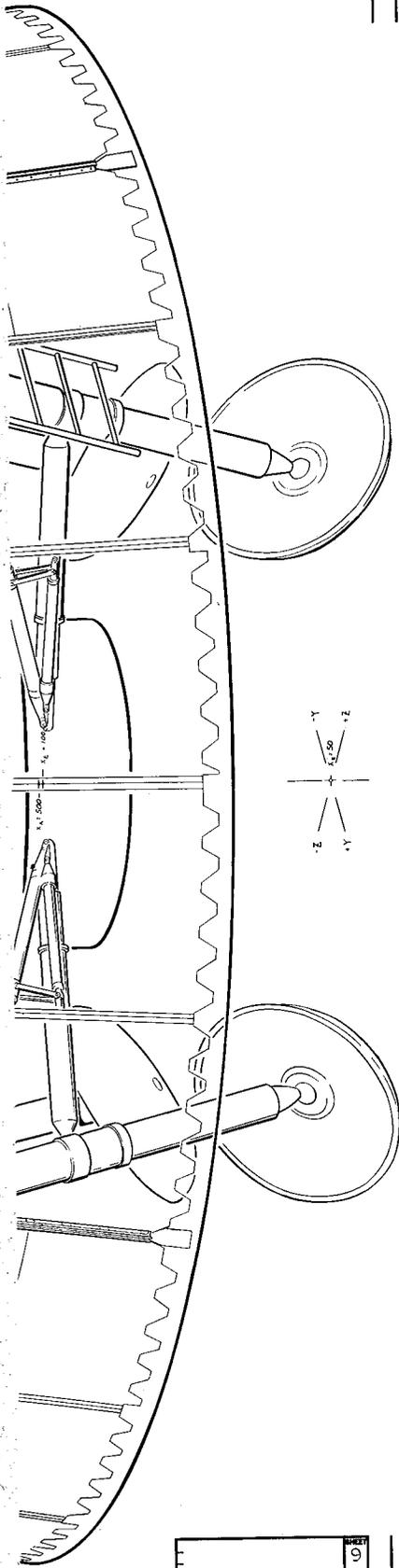
SECTION
2B232 (REF)
TURE, COMPLETE

SECTION
)

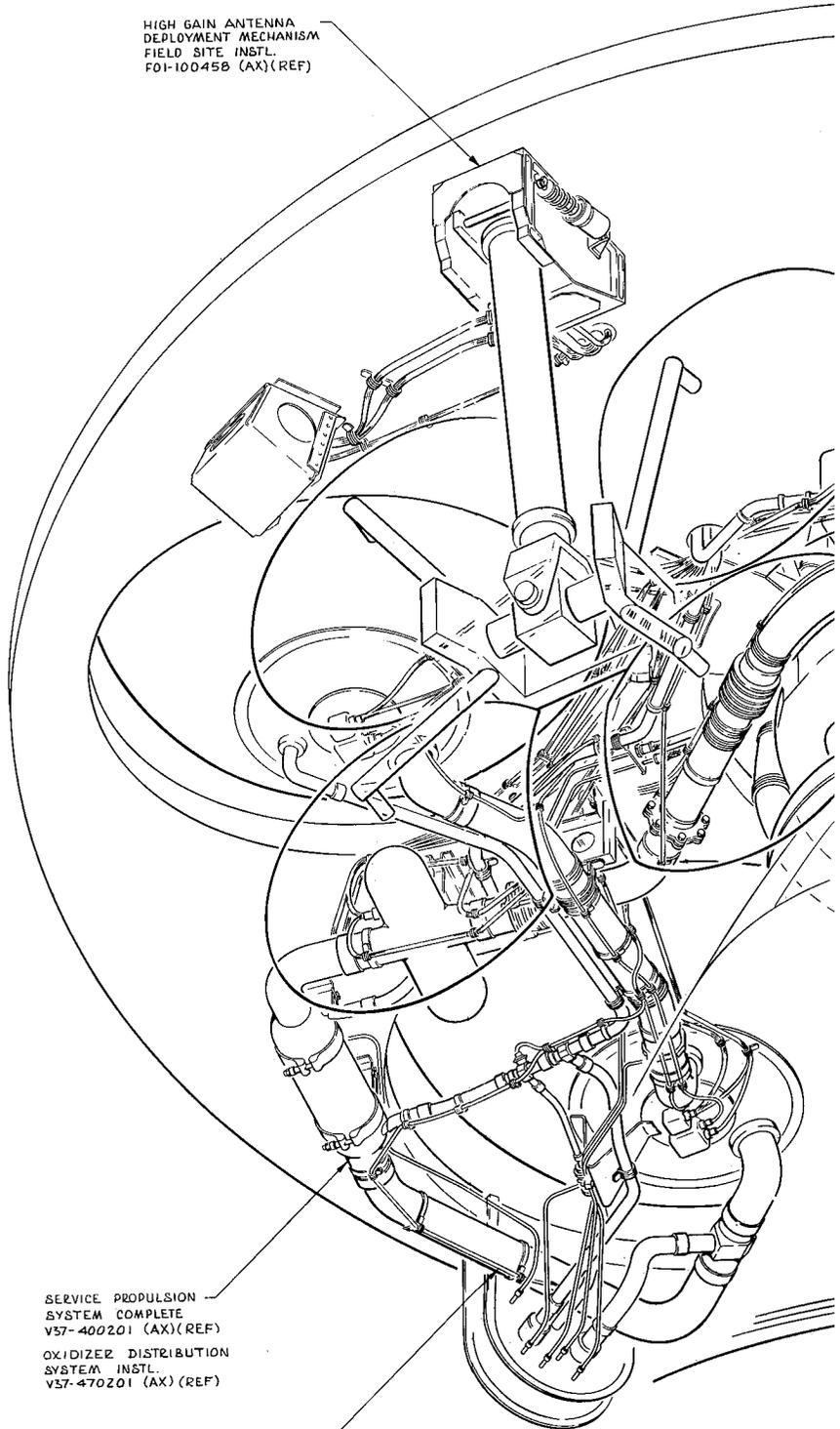
ADAPTER AFT SECTION
V24-328102 (REF)
PANEL-QUARTER AFT SECTION
V24-328103 (REF)

103

102



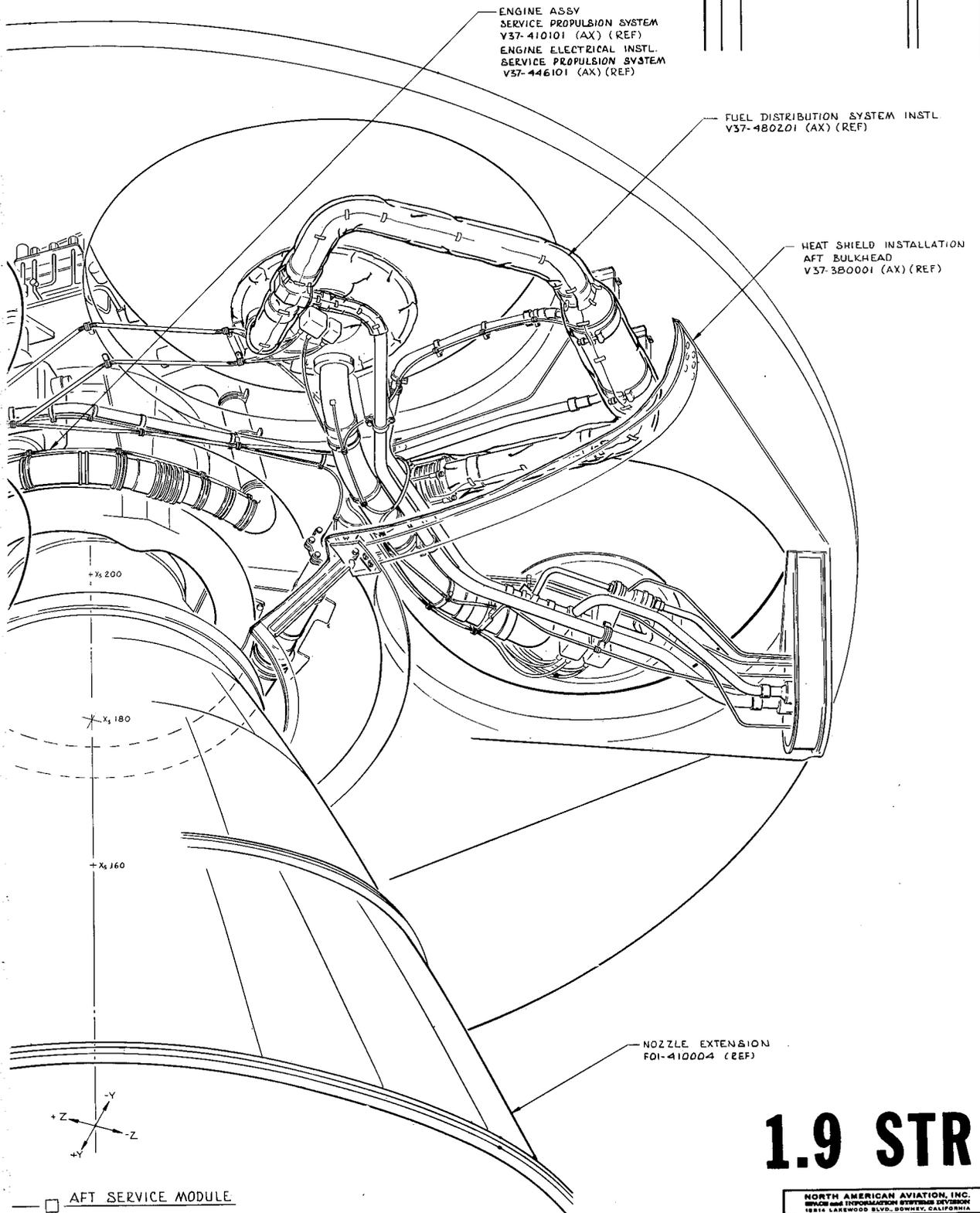
HIGH GAIN ANTENNA
DEPLOYMENT MECHANISM
FIELD SITE INSTL.
FDI-100458 (AX)(REF)



SERVICE PROPULSION
SYSTEM COMPLETE
V37-400201 (AX)(REF)
OXIDIZER DISTRIBUTION
SYSTEM INSTL.
V37-470201 (AX)(REF)

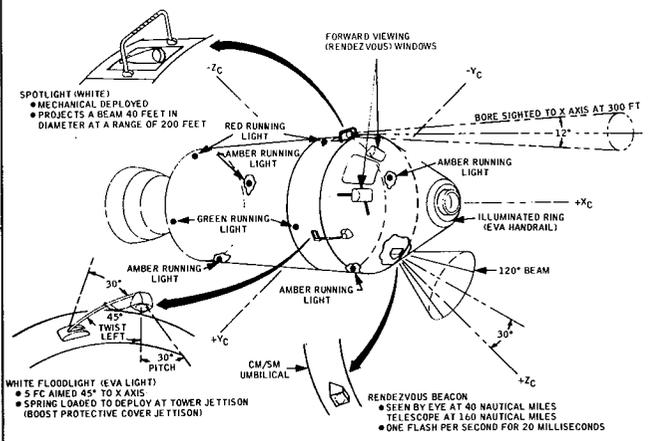
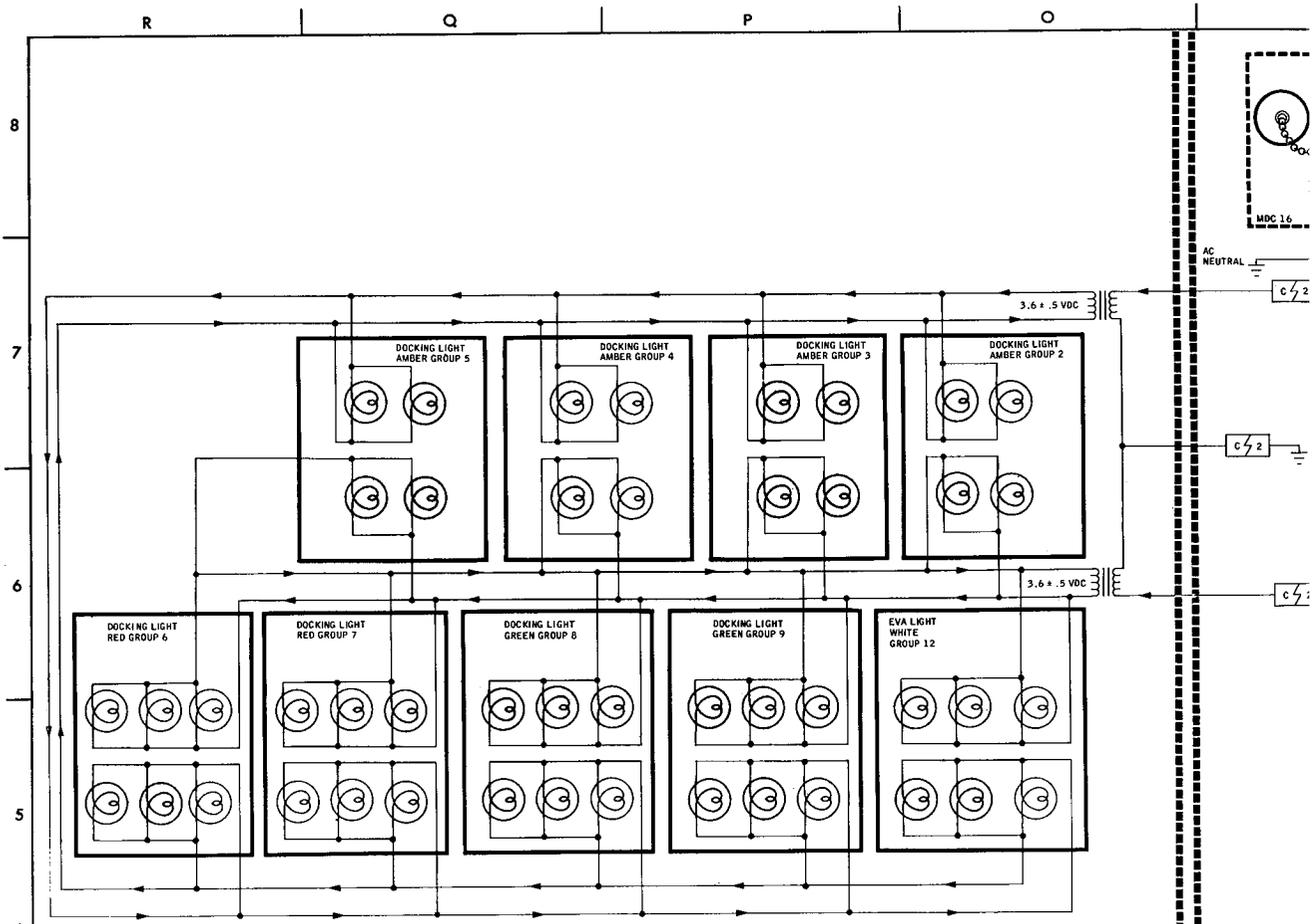
FUEL AND OXIDIZER INSTRUMENTATION
INSTL. DISTRIBUTION SYS.
V37-759515 (REF)

| REVISEMENTS | | DATE | APPROVED |
|-------------|------|----------------------|----------------------|
| SYN | ZONE | DESCRIPTION | |
| | | 1. MAY BE REMOVED | 3. RECORD CHANGE |
| | | 2. CANNOT BE REMOVED | 4. NEW SHOP PRACTICE |
| | | | 5. PARTS MADE OK |



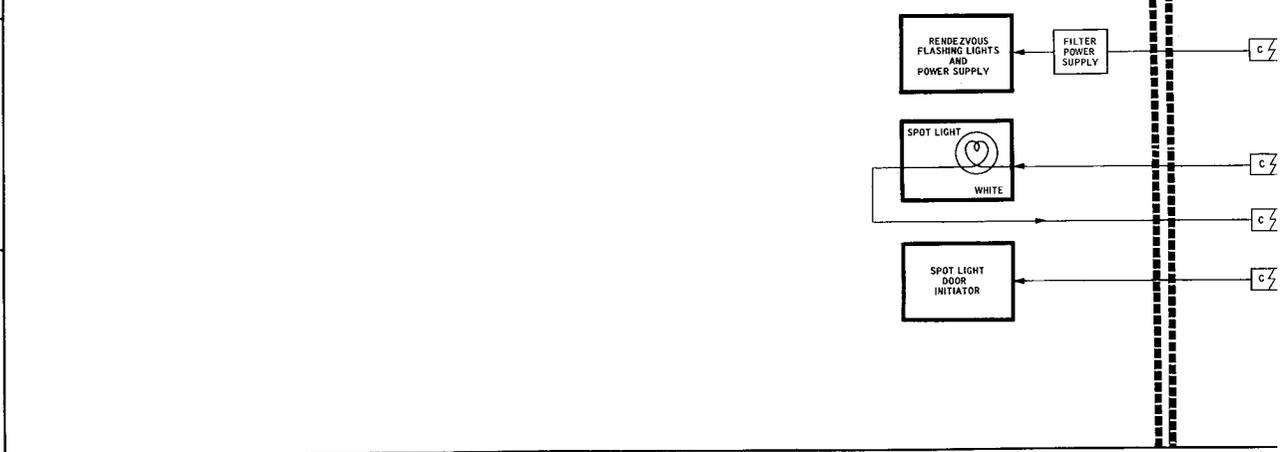
1.9 STR

| | |
|--|-----------|
| NORTH AMERICAN AVIATION, INC. DIVISION OF INTERNATIONAL ELECTRONICS SYSTEMS 18214 LAKEWOOD BLVD., DOWNEY, CALIFORNIA | |
| CODE IDENT NO. 03953 | SIZE J |
| SCALE NONE | SHEET 5 |



SM EXTERIOR LIGHTS LOCATION

| GROUP | COLOR | SM AXIS +X LOCATION | LOCATION REFERENCE TO +Z AXIS |
|-------|-------|---------------------|-------------------------------|
| 2 | AMBER | 358.10 | 44° |
| 3 | AMBER | 206.22 | 44° |
| 4 | AMBER | 358.10 | 313° |
| 5 | AMBER | 206.22 | 313° |
| 6 | RED | 358.10 | 244° |
| 7 | RED | 206.22 | 244° |
| 8 | GREEN | 358.10 | 103° 3 MIN |
| 9 | GREEN | 206.22 | 103° 3 MIN |
| 12 | WHITE | | |



AC NEUTRAL

c/2

c/2

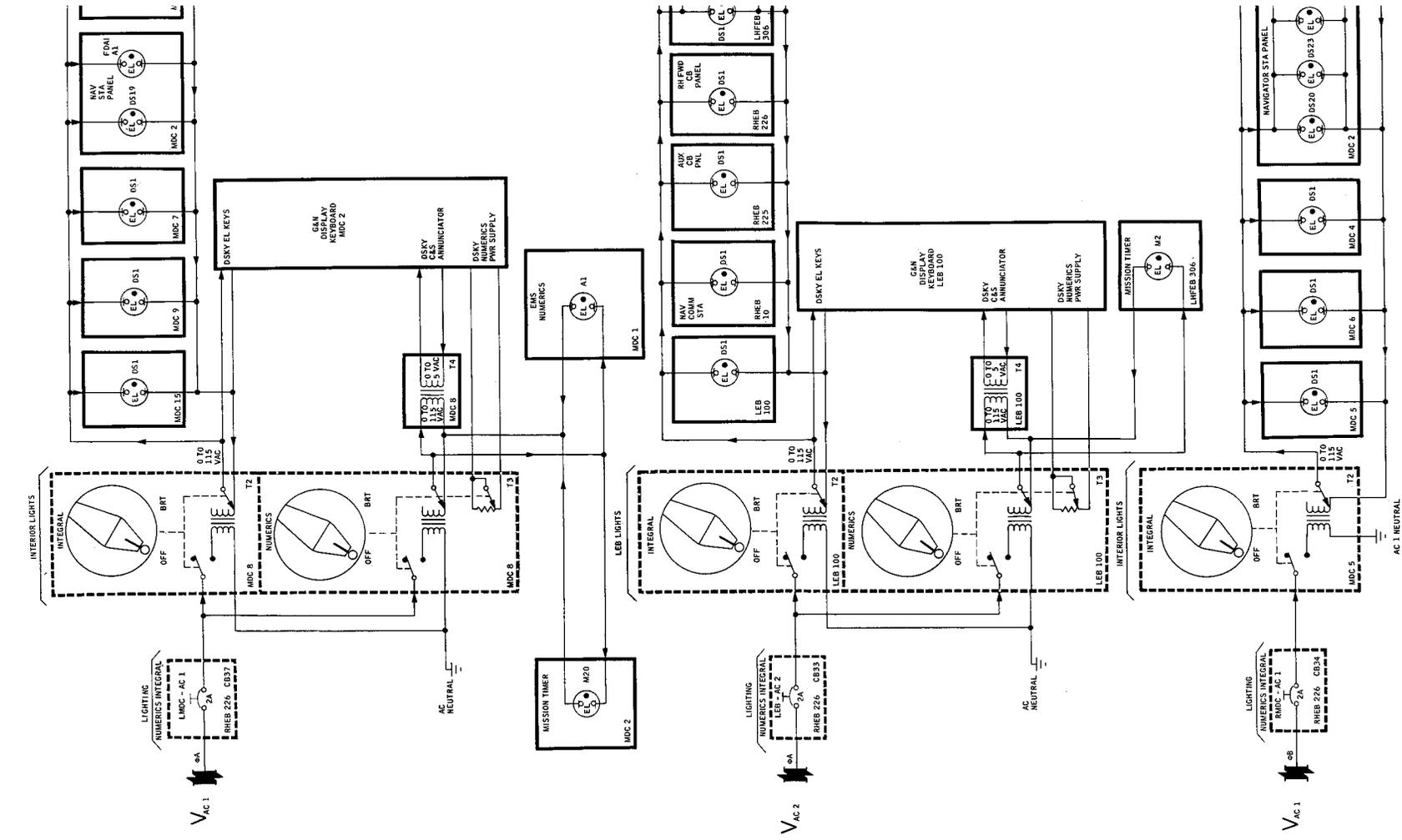
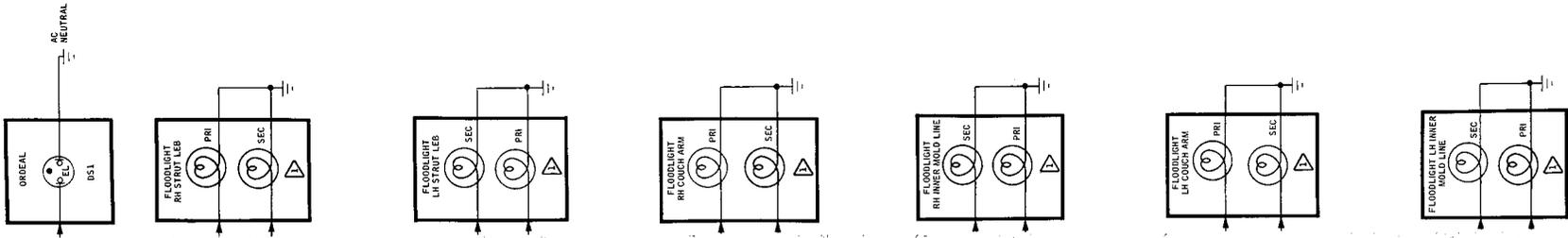
c/2

c/2

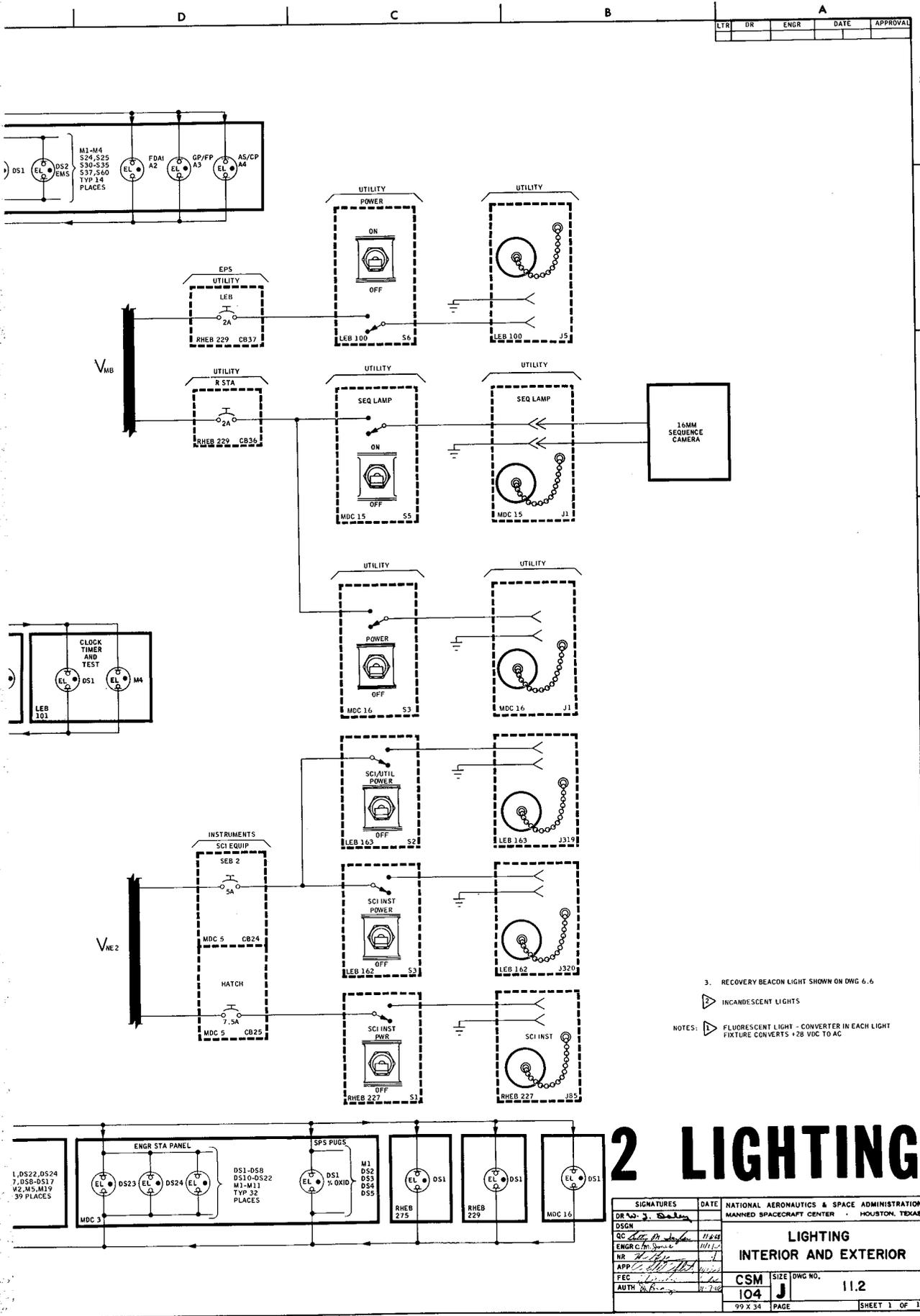
c/2

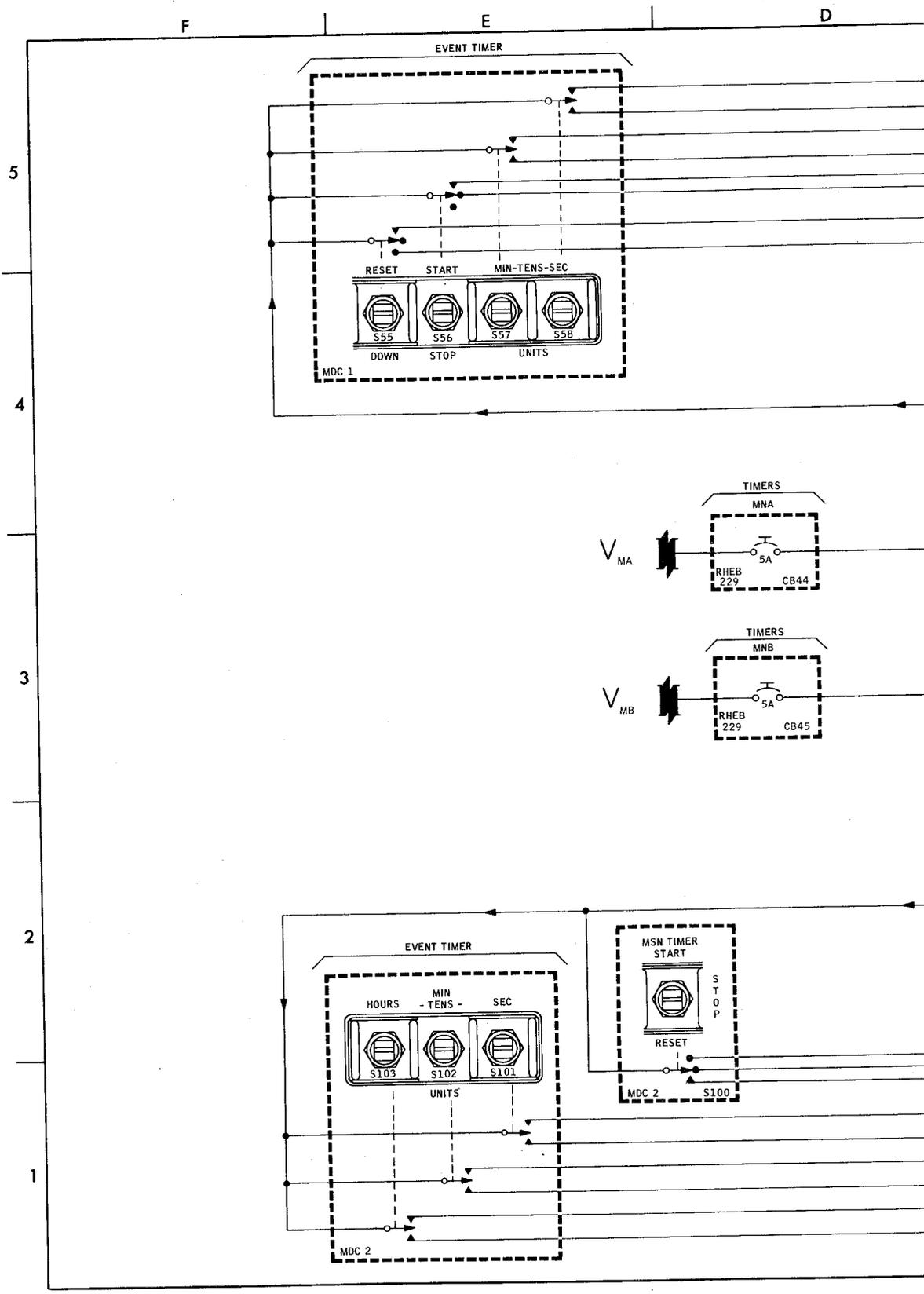
c/2

c/2

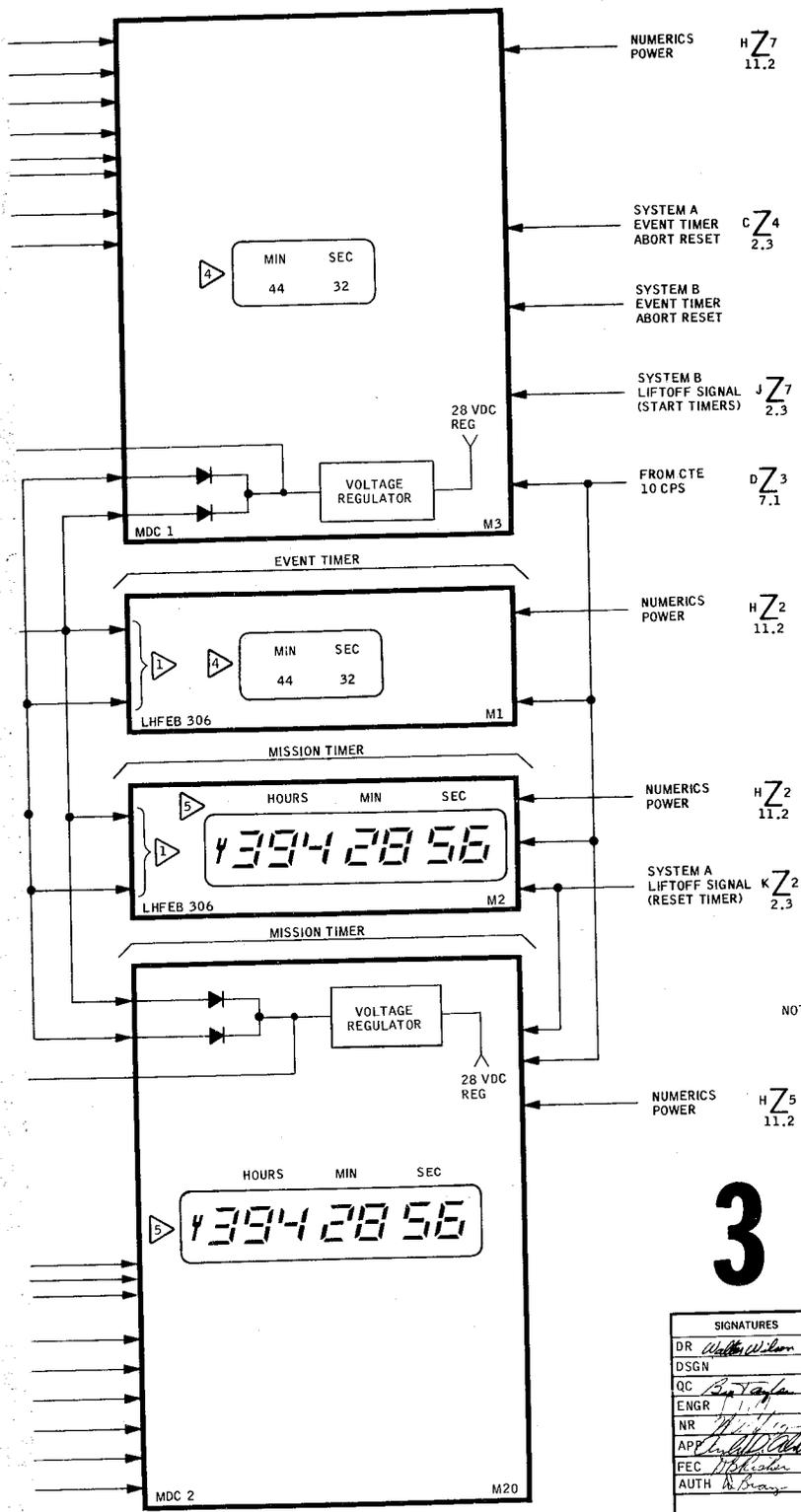


AC 1 NEUTRAL





| | | | |
|-----|------|------|----------|
| LTR | ENGR | DATE | APPROVAL |
| | | | |



- NUMERICS POWER H Z 7
11.2
- SYSTEM A EVENT TIMER ABORT RESET C Z 4
2.3
- SYSTEM B EVENT TIMER ABORT RESET
- SYSTEM B LIFTOFF SIGNAL (START TIMERS) J Z 7
2.3
- FROM CTE 10 CPS D Z 3
7.1
- NUMERICS POWER H Z 2
11.2
- NUMERICS POWER H Z 2
11.2
- SYSTEM A LIFTOFF SIGNAL (RESET TIMER) K Z 2
2.3
- NUMERICS POWER H Z 5
11.2

5. MISSION TIMER WILL COUNT UP TO 999 59 59 ROLLOVER TO 000 00 00 AND START COUNTING UP
- Y INDICATES THAT MISSION TIMER HAS SWITCHED TO AN INTERNAL TIMING PULSE RESULTING FROM A CTE EXTERNAL SIGNAL LOSS
4. EVENT TIMER WILL COUNT UP TO 59 59 ROLLOVER TO 00 00 AND START COUNTING UP
3. WHEN POWER IS FIRST APPLIED TO THE MISSION TIMER THE TIME MAY COME UP ON ANY SERIES OF NUMBERS
2. FOR PAD ABORTS, EVENT TIMER WILL RESET AND START COUNTING UP
- NOTES: 1. SWITCH CONTROL FOR EVENT AND MISSION TIMER ON LHFEB 306 IS IDENTICAL TO THE SWITCH CONTROL FOR THE TIMERS ON MDC 2

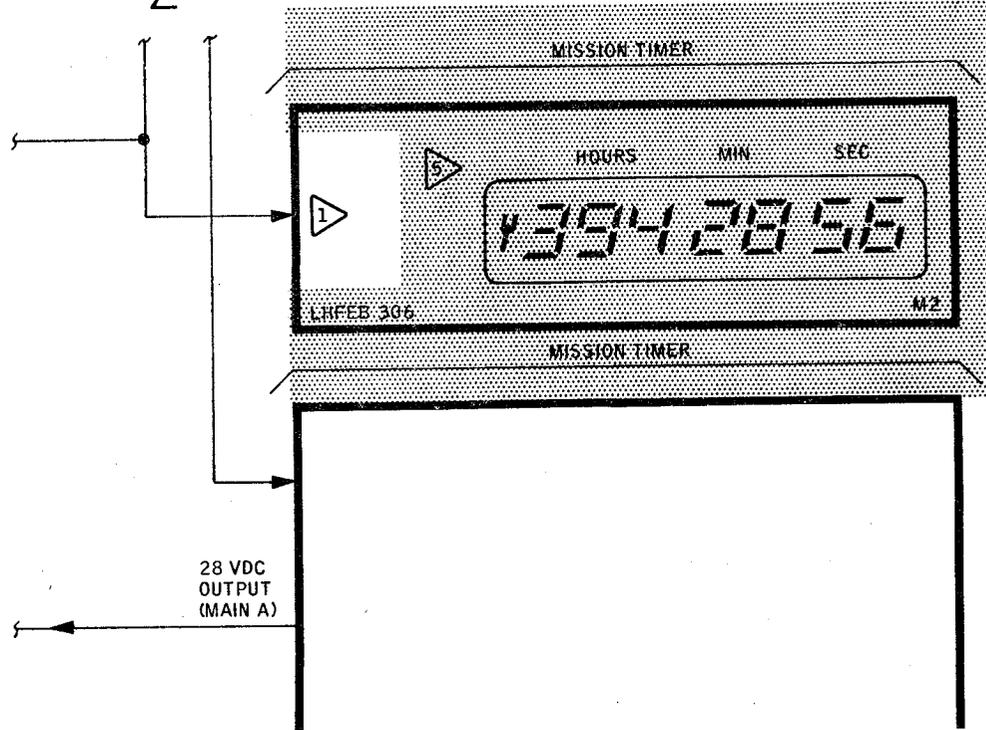
3 TIMER

| | | | | | |
|------------|------------------|---------|--|-----------|-----------------|
| SIGNATURES | | DATE | NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS | | |
| DR | <i>W. Wilson</i> | | TIMER CONTROL | | |
| DSGN | | | | | |
| QC | <i>B. Taylor</i> | 9-5-68 | | | |
| ENGR | <i>J. H. ...</i> | 11/1 | | | |
| NR | <i>...</i> | 11/1 | | | |
| APP | <i>...</i> | 10/2/68 | | | |
| FEC | <i>...</i> | 11/1/68 | CSM 104 | SIZE D | DWG NO. 11.3 |
| AUTH | <i>...</i> | 11-7-68 | 34 X 22 | SHEET | |

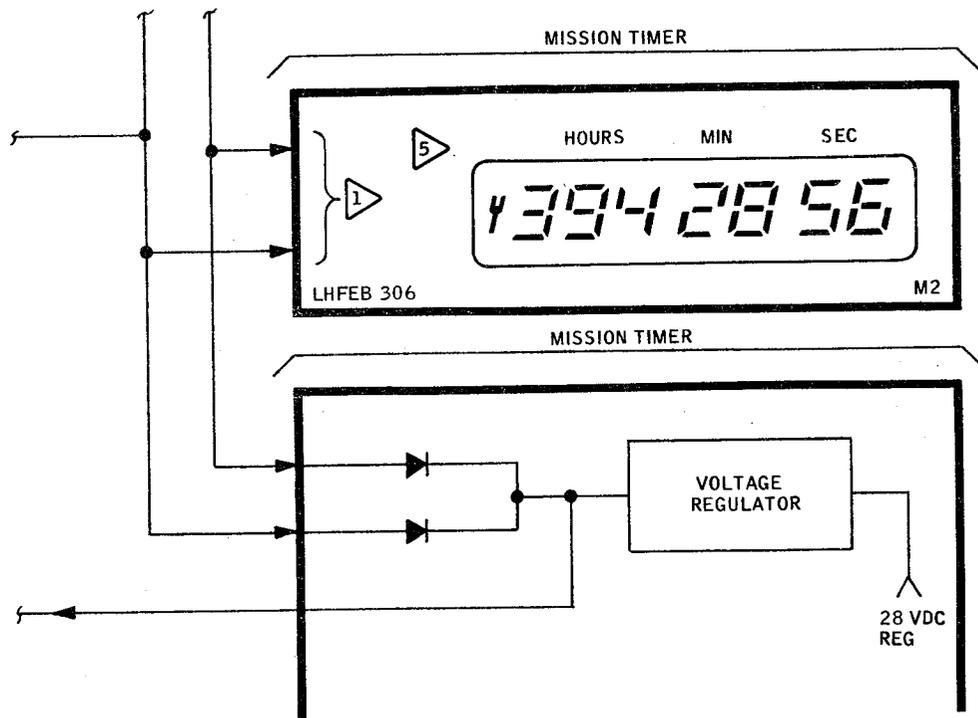
SECTION 11

IS

1. DWG 11.3 C,BZ_{3,2}



WAS



H

G

F

E

7

6

5

4

3

2

1

RENDEZVOUS
RADAR
TRANSPONDER

| 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 | |
| -50 | -46 | -42 | -38 | -34 | -30 | -26 | -22 | -18 | -14 | -10 | -6 | -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 | |
| 0.00 | 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 | |

CM-RCS OXIDIZER
VALVE TEMPERATURE (°F)

SPS TEMPERATURE (°F)

LM POWER (AMPS)

BATTERY RELAY BUS (VDC)

BATTERY MANIFOLD
PRESSURE (PSIA)

EPS RADIATOR OUTLET
TEMPERATURE (°F)

N₂, O₂, H₂ PRESSURE
(PSIA)

