



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SKYLAB

COMMAND SERVICE  
MODULE  
SYSTEMS HANDBOOK

CSM 116 - 119

APRIL 20, 1972

PREPARED BY

FLIGHT CONTROL DIVISION

MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS

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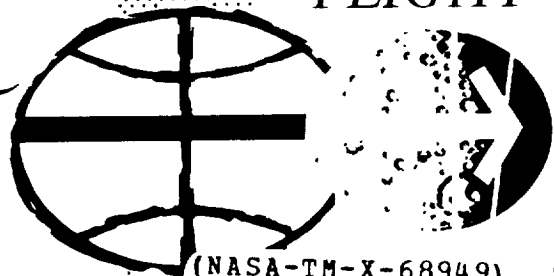
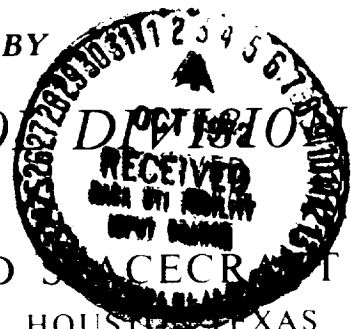
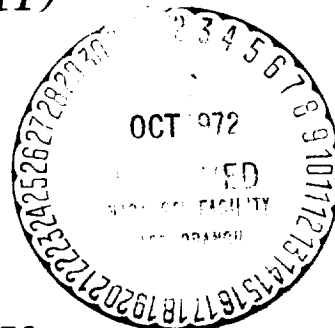
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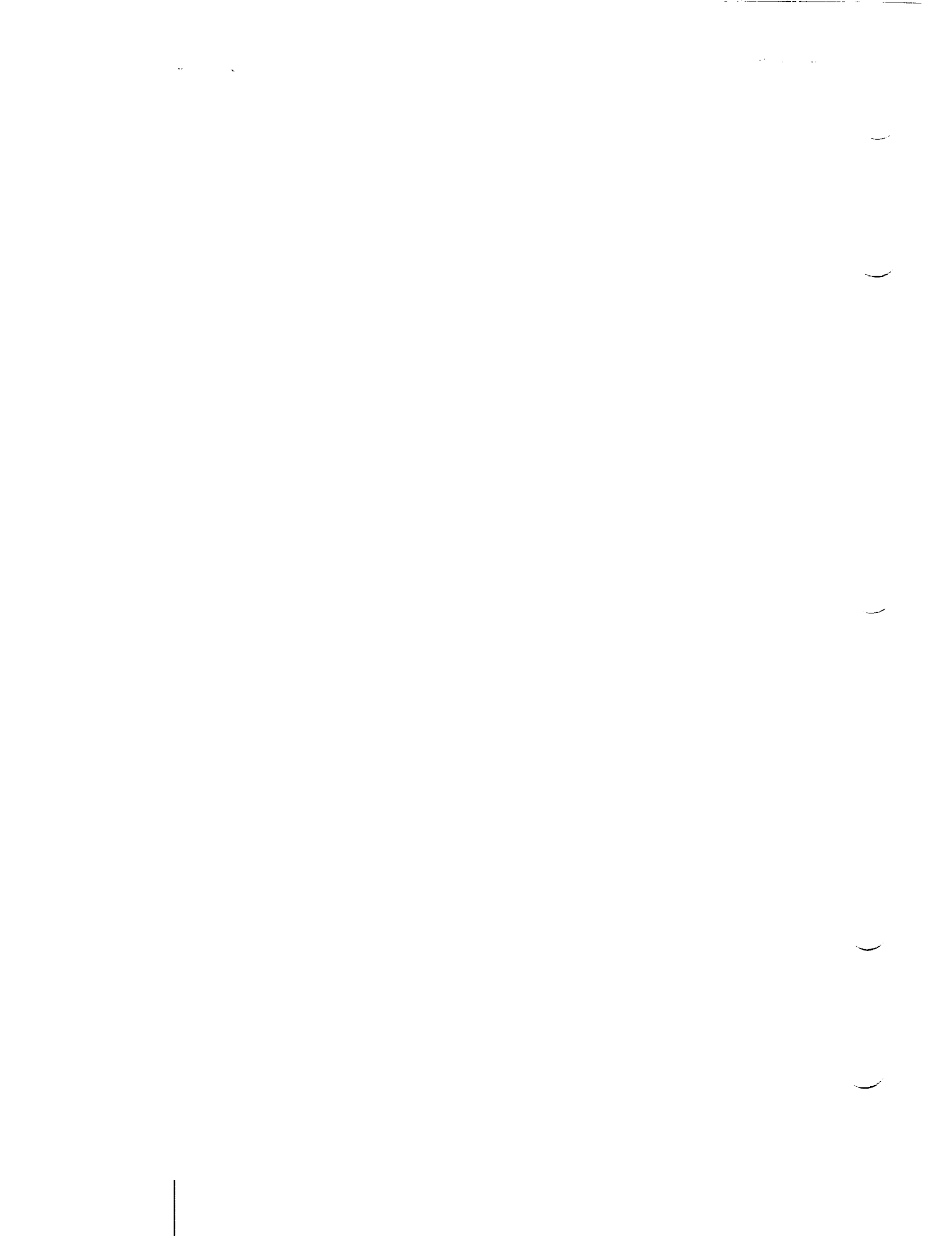
11 MISCELLANEOUS



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# CSM

SYSTEMS HANDBOOK

CSM 116 - 119

APRIL 20, 1972



SKYLAB

COMMAND/SERVICE MODULE SYSTEMS HANDBOOK

CSM 116-119

PREFACE

This document, prepared by the Flight Control Division, NASA, Manned Spacecraft Center, Houston, Texas, with technical support by North American Rockwell (NR) and Service Technology Corporation (STC), reflects the Command/Service Module Systems for S/C 116 through 119 as of April 20, 1972.

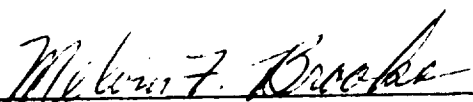
Omitted from this first publication are Sections 5, 7, 8, 9, 10, three figures in Section 3 and one in Section 11. When this material is subsequently published, it will be distributed in document change packages, which may also include revisions to previously published data.

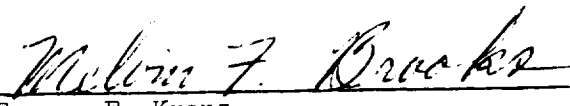
Major emphasis is on material for use by the flight crew and flight controllers during mission operations. Caution should be exercised in using the systems drawings or other information in the handbook for other purposes.

Comments concerning the general contents of this handbook should be directed to FC3/Mr. Fred Whitehead, Jr., NR, Flight Operations Support, 713-483-6206.

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Approved by:

  
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Acting Chief, CSM Systems Branch

  
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Chief, Flight Control Division



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SKYLAB  
 COMMAND/SERVICE MODULE SYSTEMS HANDBOOK  
 CSM 116-119  
 APRIL 20, 1972

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1 STANDARDS

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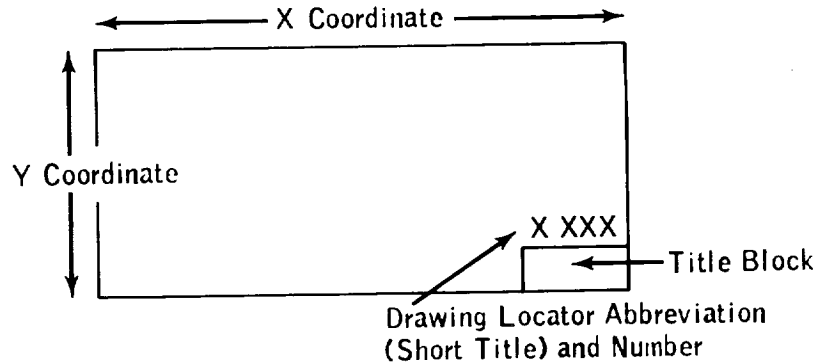
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**SECTION 1**  
**STANDARDS**

CSM  
S/C 116-119

- 1.1 GENERAL DRAWING INFORMATION
- 1.1.1 Cross-indexing
- 1.1.1.1 General drawing configuration

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



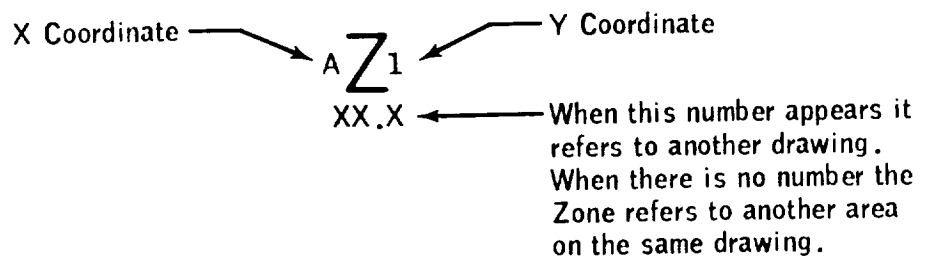
- 1.1.1.2 Component location code

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

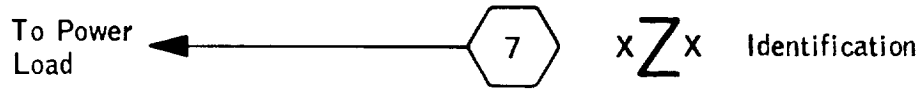


- 3 - Drawing Locator Number for the given detail subsystem drawing
- K - X Coordinate
- 4 - Y Coordinate

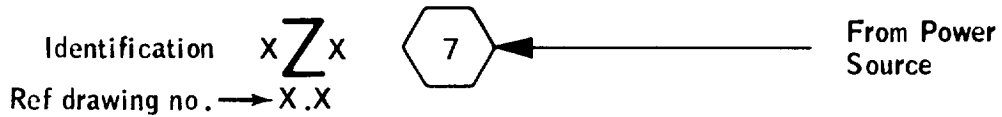
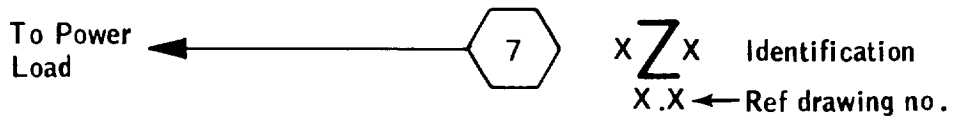
- 1.1.2 Technical Zone References
- 1.1.2.1 Zone reference



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

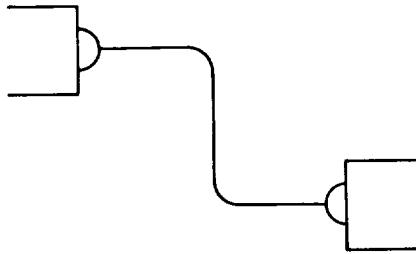


1.1.2.3 Power inter-drawings  
(Drawing to drawing)



1.2 **LINE LEGEND**

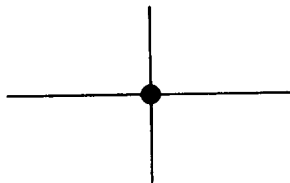
1.2.1 **RF Cable**



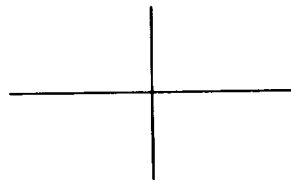
1.2.2 **Electrical Line, Power and control**



1.2.2.1 **Electrical connected**



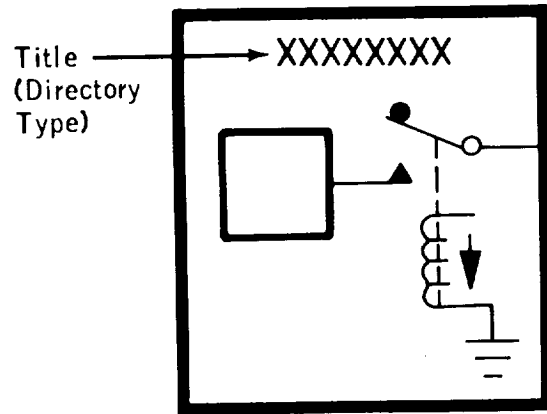
1.2.2.2 **Electrical crossover**



1.2.3 **Directional Flow Arrows**



1.2.4 **Component Enclosures**



1.2.4.1 **Main enclosure**  
1/16-inch solid black line



1.2.4.2 **Sub enclosure**  
1/32-inch solid black line



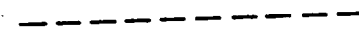
1.2.4.3 **Component enclosure with crew (manual control)**  
1/16-inch dashed black line



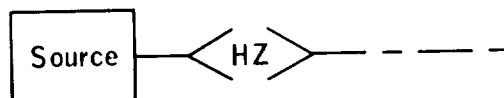
1.2.4.4 **Module interface and systems assembly**  
1/8-inch dashed black line



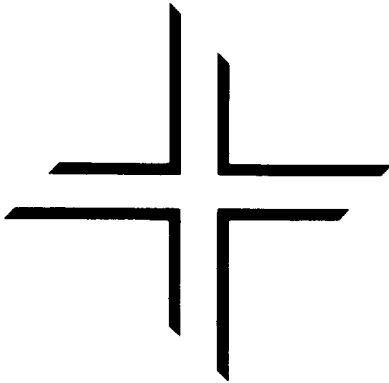
1.2.5 **Mechanical Linkage**



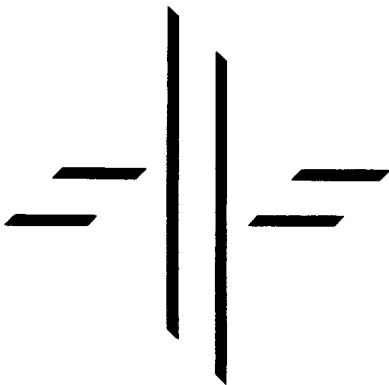
1.2.6 **Timing Pulses**



1.3 PIPE LEGEND  
1.3.1 General  
1.3.1.1 Plumbing connected



1.3.1.2 Plumbing crossover



1.3.2 Line designation

1.3.2.1 Water



1.3.2.2 Oxygen



1.3.2.3 Nitrogen



1.3.2.4 Helium



1.3.2.5 Primary Coolant



1.3.2.6 Secondary Coolant



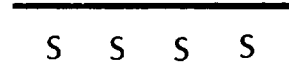
1.3.2.7 Fuel



1.3.2.8 Hydrogen



1.3.2.9 Steam



1.3.2.10 Suit Loop



1.3.2.11 Sense Lines



1.3.2.12 Oxidizer



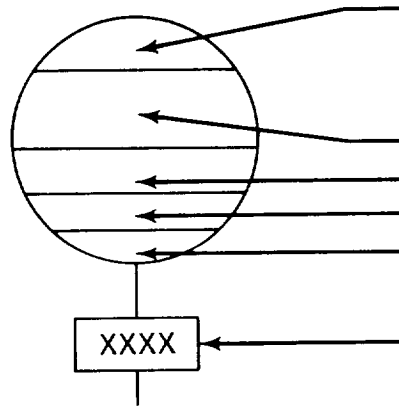
1.3.2.13 Others





1.4  
1.4.1

**TELEMETRY SYMBOLS**  
**Measurements Telemetered**



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

**Measurement Name**

**Measurement Range**

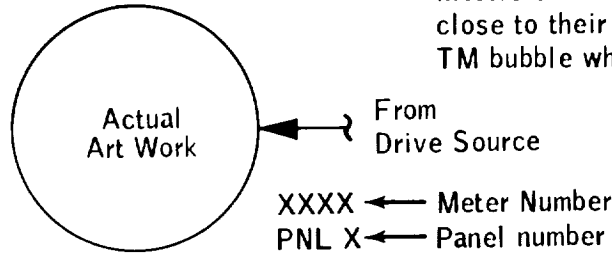
**High Bit Sample Rate**

**Low Bit Sample Rate**

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

1.4.2

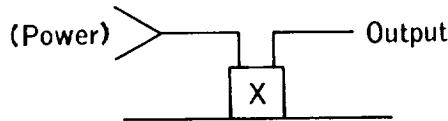
**Onboard Meters**



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

1.4.3  
1.4.3.1

**Sensors**  
**Single source**

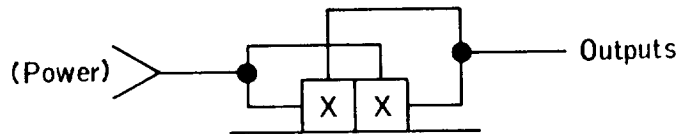


**Example:** Letter indicates the type:

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

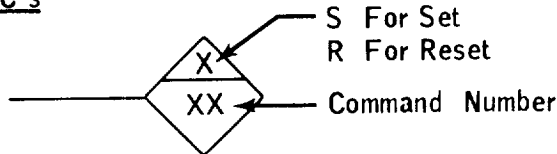
1.4.3.2

**Double source**



1.4.4  
1.4.4.1

**Ground Commands (Contents Optional by Vehicle)**  
**RTC's**



1.5 ELECTRICAL SYMBOLS

1.5.1 Switches

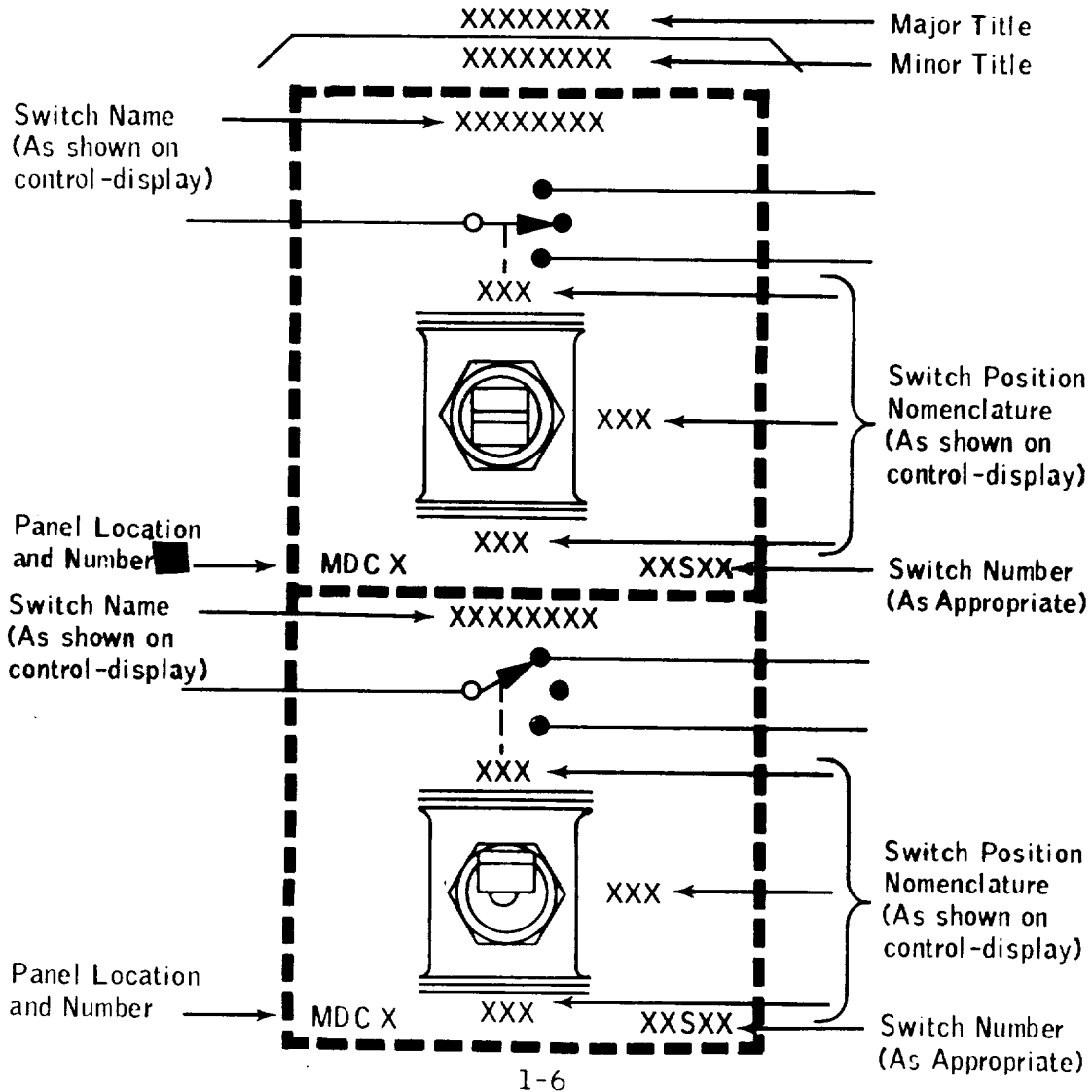
All switches will be shown in the de-energized position (if possible). When a switch has more than one set of contacts, only one set needs to have switch contact nomenclature.

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

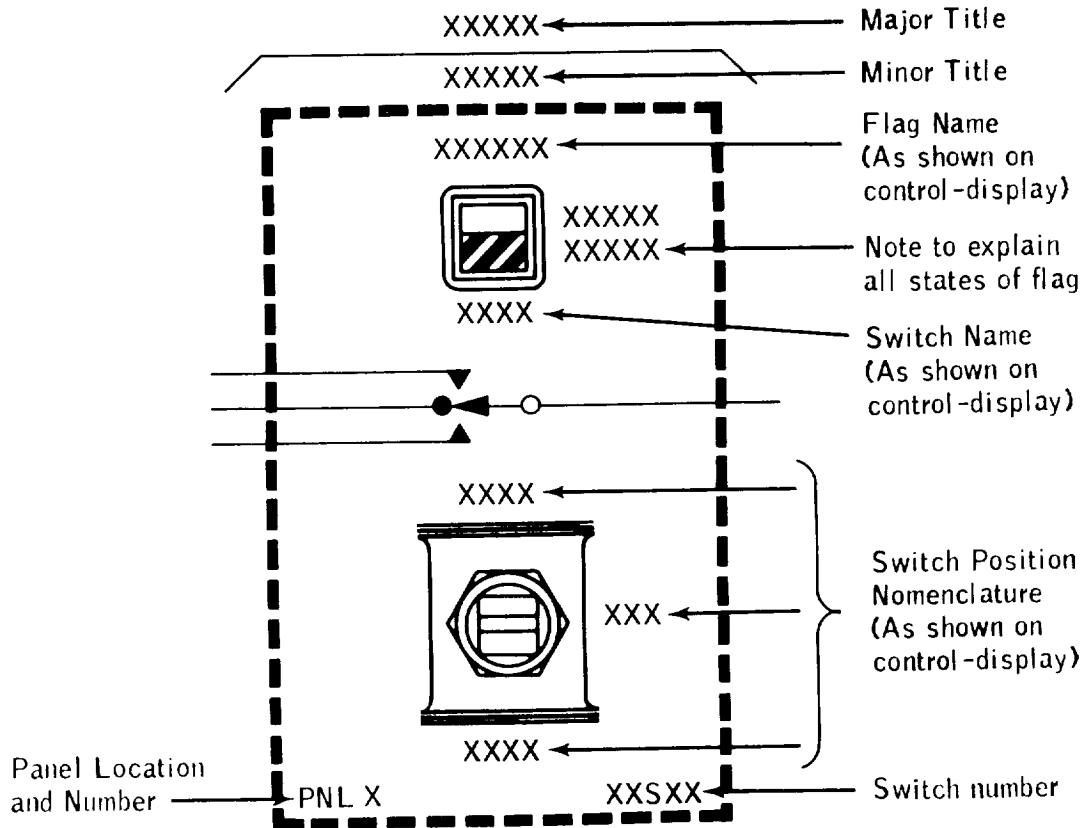
Note: If more than one switch has identical major and minor titles, they may be stacked without repeating these titles.



1.5.1.2

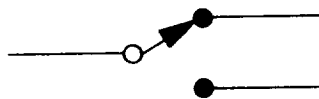
Switch controlled flag

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



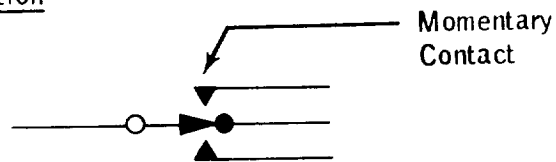
1.5.1.3

Two-position

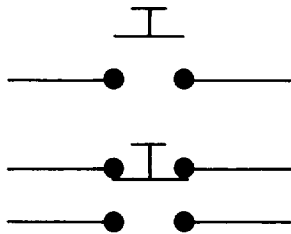


1.5.1.4

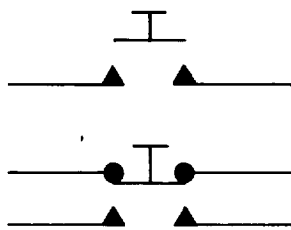
Three-position



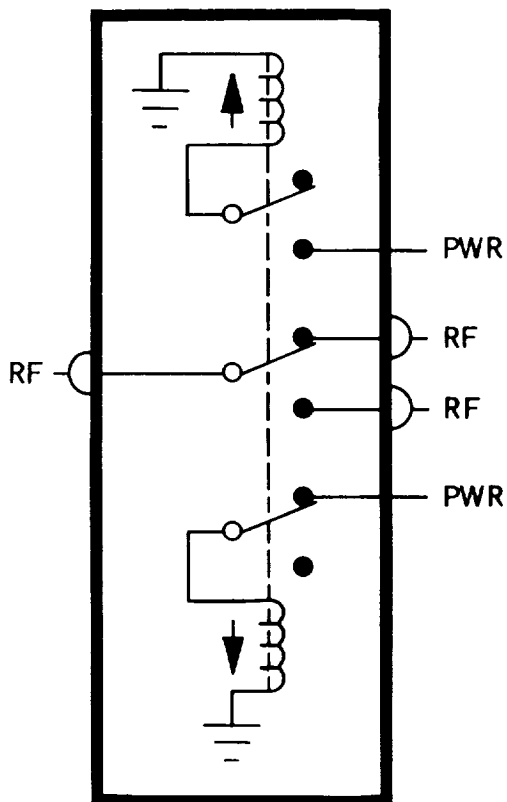
1.5.1.5 Pushbutton  
1.5.1.5.1 Latching



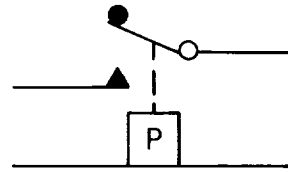
1.5.1.5.2 Momentary



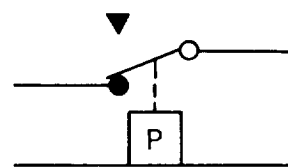
1.5.1.6 Coax



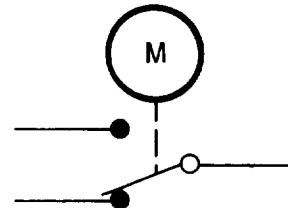
1.5.1.7 Pressure  
1.5.1.7.1 Closed decreased pressure



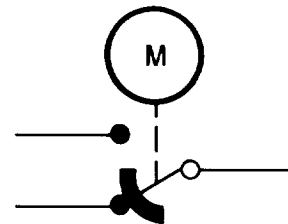
1.5.1.7.2 Closed increased pressure



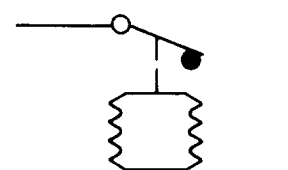
1.5.1.8 Motor  
1.5.1.8.1 Break before make



1.5.1.8.2 Make before break



1.5.1.9 Baro



Close XXX psi or altitude  
Open XXX psi or altitude

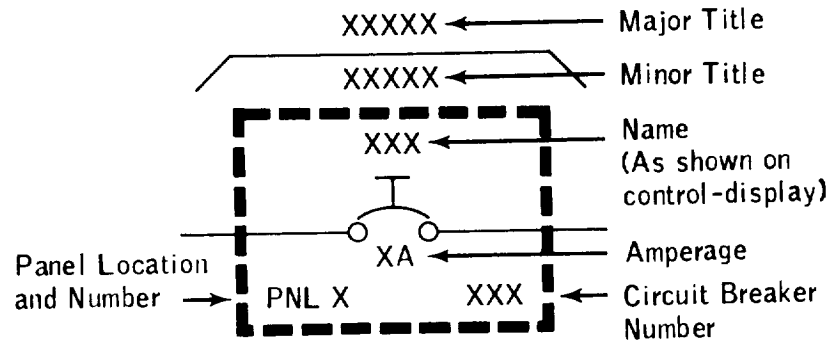
1.5.2

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).

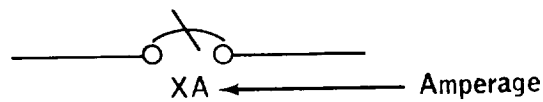
1.5.2.1

Pushbutton



1.5.2.2

Automatic

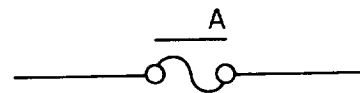


1.5.3

Fuses

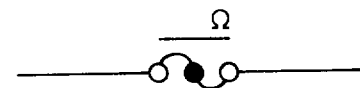
1.5.3.1

General



1.5.3.2

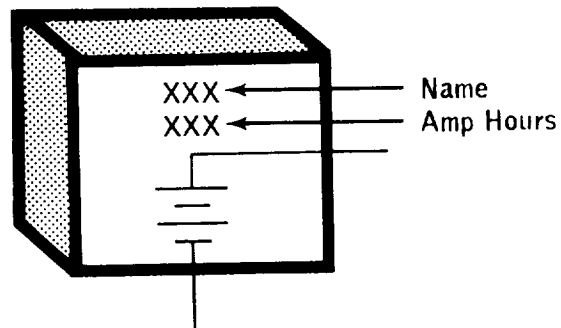
Fusistor



1.5.4

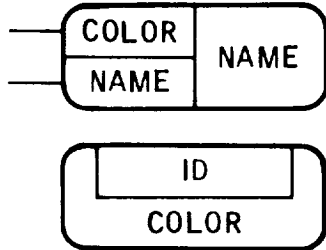
Battery

1/16-inch black tape  
Size varies with number of cells and drawing arrangement.



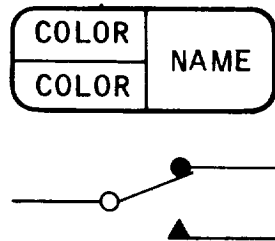
1.5.5  
1.5.5.1

Lights  
Telelights



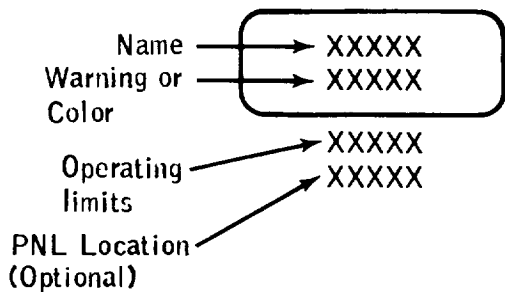
1.5.5.2

Switching



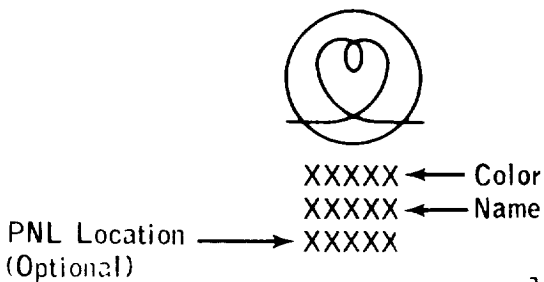
1.5.5.3

Caution and warning



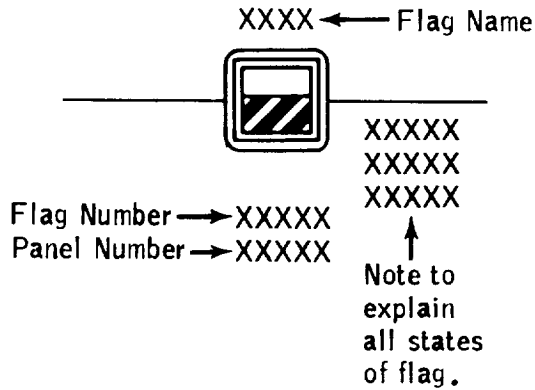
1.5.5.4

Component



1.5.6

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

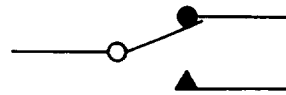


1.5.7

Relays

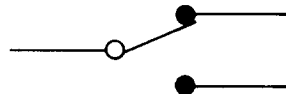
1.5.7.1

Momentary contact



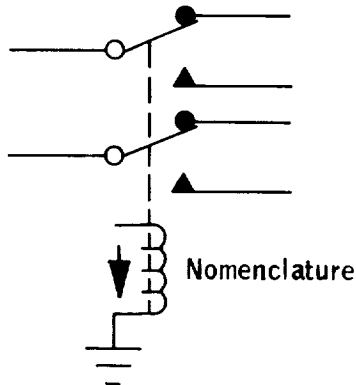
1.5.7.2

Latching contacts

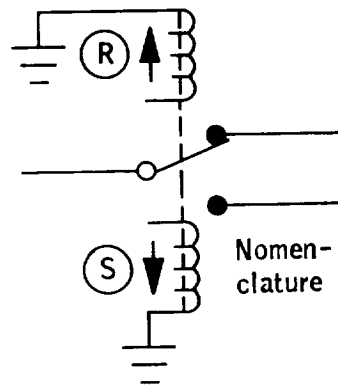


1.5.7.3

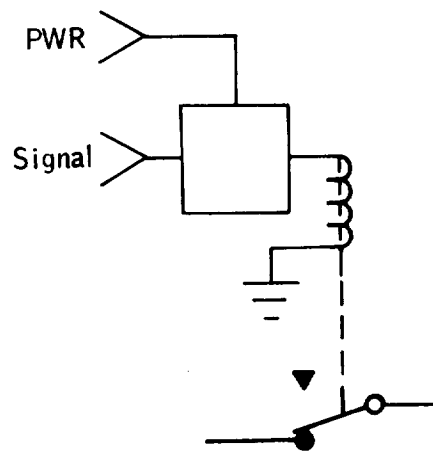
Non-Latching relay



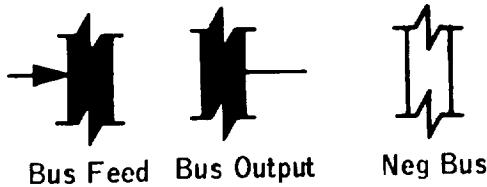
1.5.7.4 Latching relay



1.5.8 Relay or Solenoid Driver



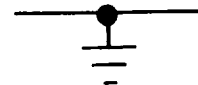
1.5.9  
1.5.9.1 Buses  
Symbol  
Length can vary depending on the bus function on a given drawing.



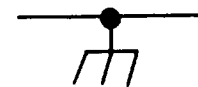
1.5.9.2 Designation  
See bus designation list.



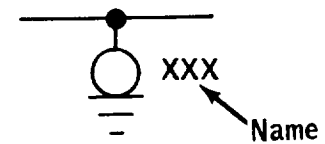
1.5.10  
1.5.10.1 Grounds  
System



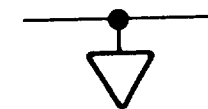
1.5.10.2 Frame



1.5.10.3 Floating or Controlled



1.5.10.4 Signal



1.5.11  
1.5.11.1 Diodes  
General



1.5.11.2 Zener



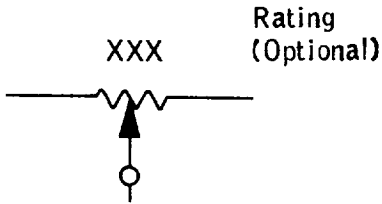
1.5.11.3 Tunnel



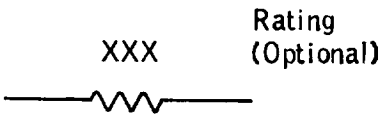
1.5.11.4 Control rectifier (SCR)



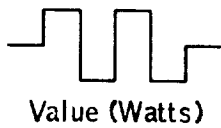
1.5.12 Potentiometer



1.5.13 Fixed Resistor



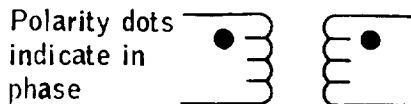
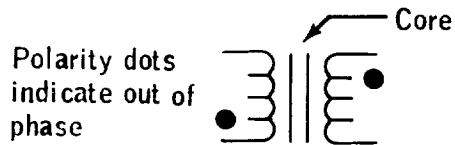
1.5.14 Heater



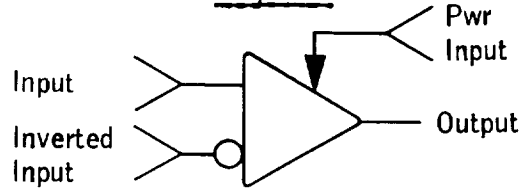
1.5.15 Thermostat



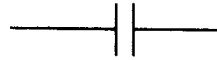
1.5.16 Transformers



1.5.17 Amplifier



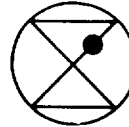
1.5.18 Capacitor



1.5.19 Digital Inverter



1.5.20 Wire Resolver

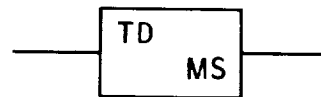


⊗ = Sine Winding

● = Minus Sine

— = Cosine Winding

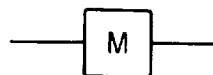
1.5.21 Time Delay



1.5.22 Electrical Filter



1.5.23 Modulator

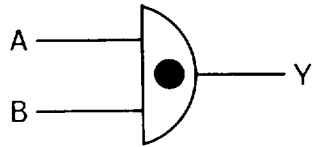




1.5.24 Gates

1.5.24.1

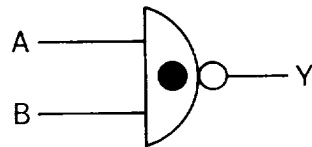
And



A	B	Y
1	1	1
1	0	0
0	1	0
0	0	0

1.5.24.2

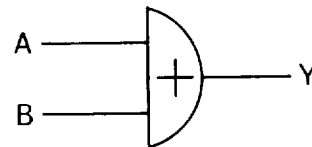
Nand



A	B	Y
1	1	0
1	0	1
0	1	1
0	0	1

1.5.24.3

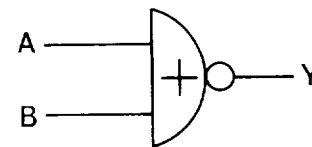
Or



A	B	Y
1	1	1
1	0	1
0	1	1
0	0	0

1.5.24.4

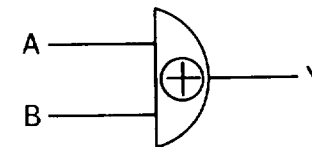
Nor



A	B	Y
1	0	0
0	1	0
1	1	0
0	0	1

1.5.24.5

Exclusive Or

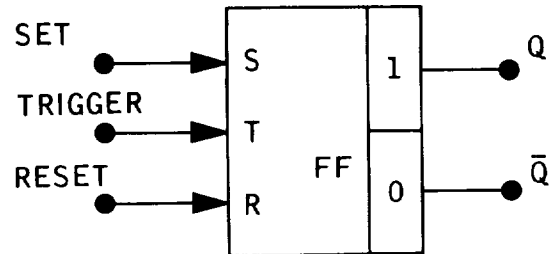


A	B	Y
1	1	0
1	0	1
0	1	1
0	0	0

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

OUTPUT

- S Sets Q to "1"  
Sets  $\bar{Q}$  to "0"
- T Q and  $\bar{Q}$  Change States
- R Resets Q to "0"  
Resets  $\bar{Q}$  to "1"

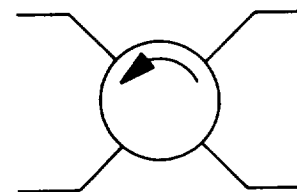
1.5.25

Demodulator

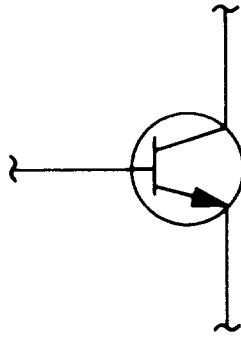


1.5.26

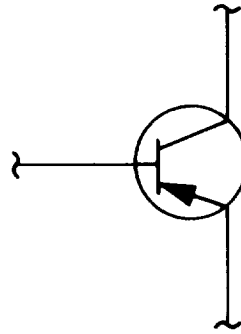
RF Circulator



1.5.27     Transistor  
1.5.27.1   NPN



1.5.27.2     PNP

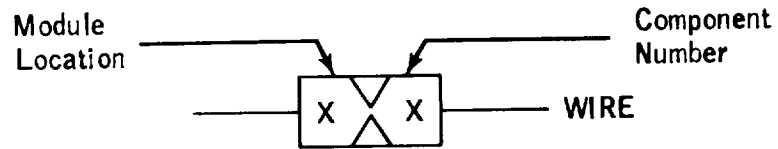


1.5.28     Antenna

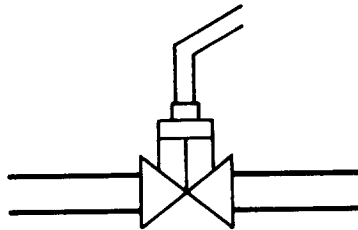
Name  
(Type or Function)



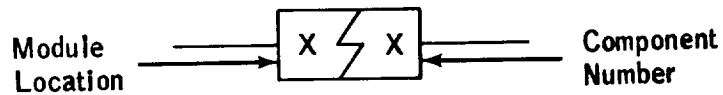
1.6 PYROTECHNIC SYMBOLS  
1.6.1 Pyro Guillotine



1.6.2 Pyro Valve with Single Initiator

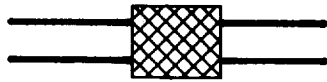


1.6.3 Electrical Circuit Interrupter

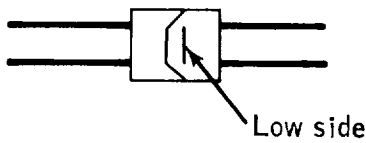


1.7 MECHANICAL SYMBOLS

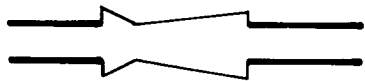
1.7.1 Mechanical Filter



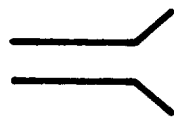
1.7.2 Burst Diaphragm



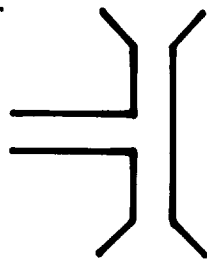
1.7.3 Venturi



1.7.4 Vent



1.7.5 Thrust Neutralized Vent



1.7.6 Disconnects

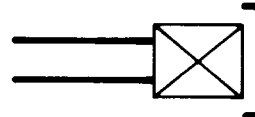
1.7.6.1 Self-sealing



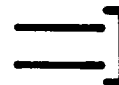
1.7.6.2 Quick



1.7.7 Quick Disconnect Fill and Drain

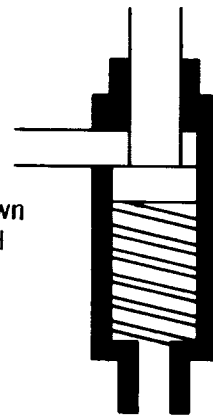


1.7.8 Fill and Drain

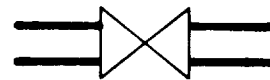


1.7.9 Ball Valve Actuator

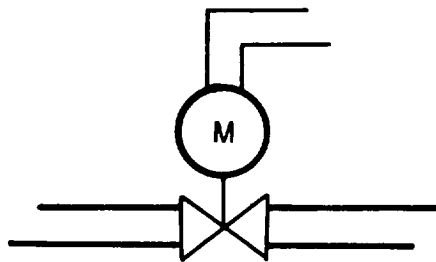
May be shown  
in depressed  
or partially  
depressed  
position



1.7.10 Valves



1.7.10.1 Motor Control



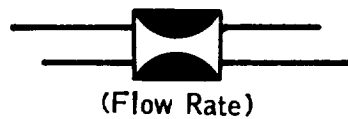
1.7.10.2 Manual Control



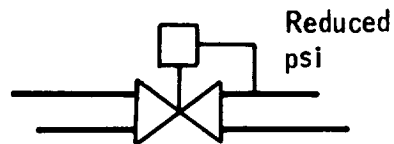
1.7.10.3 Check Valve



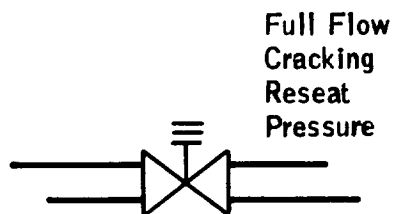
1.7.10.4 Orifice



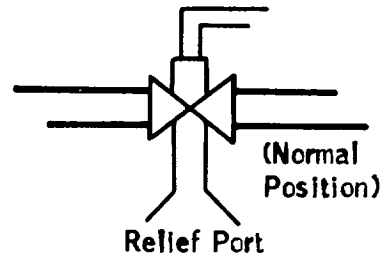
1.7.10.5 Pressure regulator



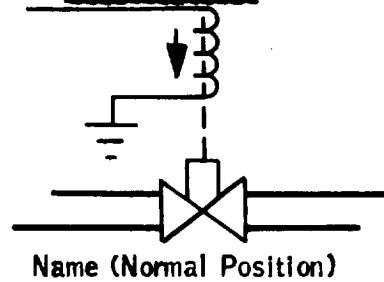
1.7.10.6 Relief Valve



1.7.10.7 Pneumatic controlled valve with line bleed

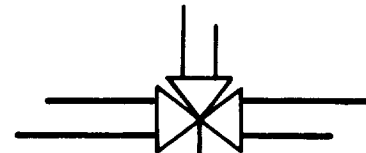


1.7.10.8 Solenoid valve

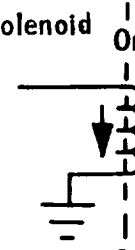


1.7.10.9 Three-way valve

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



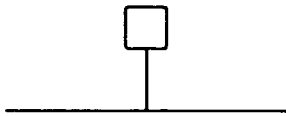
1.8 MISCELLANEOUS SYMBOLS  
1.8.1 Drawing Note Reference



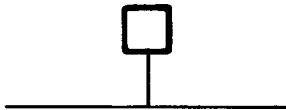
1.8.2 Overview Drawing Instrumentation Legend  
1.8.2.1 Automatic control only



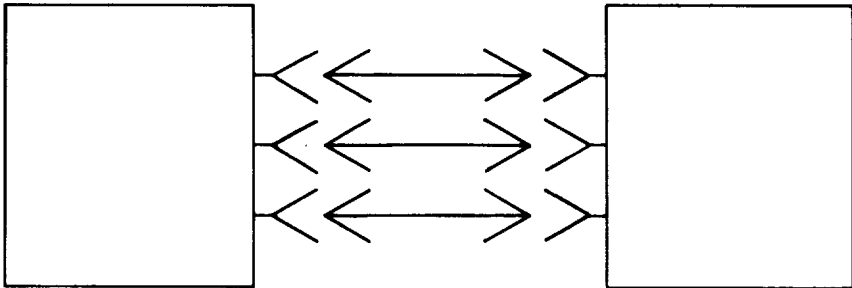
1.8.2.2 PCM only



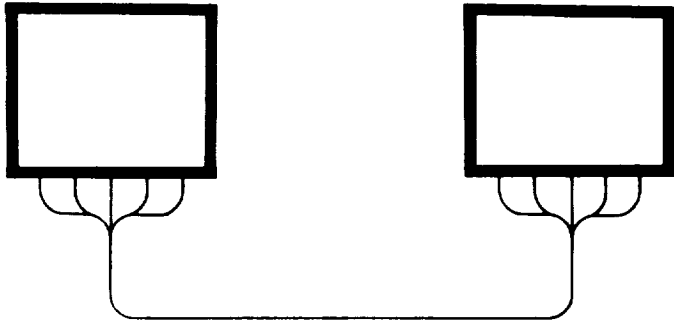
1.8.2.3 PCM and/or onboard display



1.8.3 Two-unit Interface



1.8.4 Two-unit Cable Connection



1.8.5	<u>Buses</u>	
1.8.5.1	<u>Power buses .-</u>	Prime CSH generation <u>dwg No.</u>
	V <sub>MA</sub> - MAIN BUS A	3.2
	V <sub>MB</sub> - MAIN BUS B	3.2
	V <sub>BA</sub> - BATTERY BUS A	3.2
	V <sub>BB</sub> - BATTERY BUS B	3.2
	V <sub>BR</sub> - BATTERY RELAY BUS	3.2
	V <sub>FP</sub> - FLIGHT AND POSTLANDING BUS	3.2
	V <sub>E</sub> - EXPERIMENT BUS	3.2
	V <sub>AC1</sub> - AC BUS 1	3.3
	V <sub>AC2</sub> - AC BUS 2	3.3
	V <sub>F</sub> - FLIGHT BUS	3.2
	V <sub>SMA</sub> - SERVICE MODULE BUS A	3.2
	V <sub>SMB</sub> - SERVICE MODULE BUS B	3.2

1.8.5.2

Sequential buses.-

		<u>Prime CSH generation dwg No.</u>
✓	SQA - SEQUENTIAL PYRO BUS A	2.2
✓	RQA - RCS CONTROLLER PYRO BUS A	2.2
✓	RLA - RCS CONTROLLER LOGIC BUS A	2.2
✓	SLA - SEQUENTIAL LOGIC BUS A	2.2
✓	SAA - SEQUENTIAL ARM BUS A	2.2
✓	ELA - EARTH LANDING BUS A	2.5
✓	SQB - SEQUENTIAL PYRO BUS B	2.2
✓	RQB - RCS CONTROLLER PYRO BUS B	2.2
✓	RLB - RCS CONTROLLER LOGIC BUS B	2.2
✓	SLB - SEQUENTIAL LOGIC BUS B	2.2
✓	SAB - SEQUENTIAL ARM BUS B	2.2
✓	ELB - EARTH LANDING BUS B	2.5
✓	ED 1 - EMERGENCY DETECTION SYSTEM BUS NO 1	2.3
✓	ED 2 - EMERGENCY DETECTION SYSTEM BUS NO 2	2.3



Sequential buses (cont'd) .-

Prime CSH  
generation  
dwg No .

V	ED 3	- EMERGENCY DETECTION SYSTEM BUS NO 3	2.3
V	6D95	- IU ABORT BUS	2.3

1.8.5.3

Instrumentation buses .-

V	1	- CM ESS INST BUS PWR FROM RHEB PNL 276-CB1	7.1
V	2	- CM ESS INST BUS PWR FROM RHEB PNL 276-CB2	7.1
V	3S	- SM ESS INST BUS PWR FROM RHEB PNL 276-CB3	7.1
V	4S	-SM ESS INST BUS PWR FROM RHEB PNL 276-CB4	7.1
V	SC	- SCE PWR REQ'D FOR SIGNAL CONDITIONING (+20, -20, and/or +10Vdc)	7.1 and Page 7-18
V	SC5	- SCE CM +5Vdc PWR	7.1
V	RCS	- SM RCS INDICATOR BUS POWER FROM SM MAIN BUS	10.2
V	RCS	- SM RCS INDICATOR BUS POWER FROM SM MAIN BUS	10.2

1.8.5.4

SCS logic buses .-

✓ LB1 - LOGIC BUS 1

✓ LB2 - LOGIC BUS 2

✓ LB3 - LOGIC BUS 3

✓ LB4 - LOGIC BUS 4

Prime CSH  
generation  
dwg No .

8.2

8.2

8.2

8.2

2 SEQUENTIAL  
EVENTS SYSTEM

1

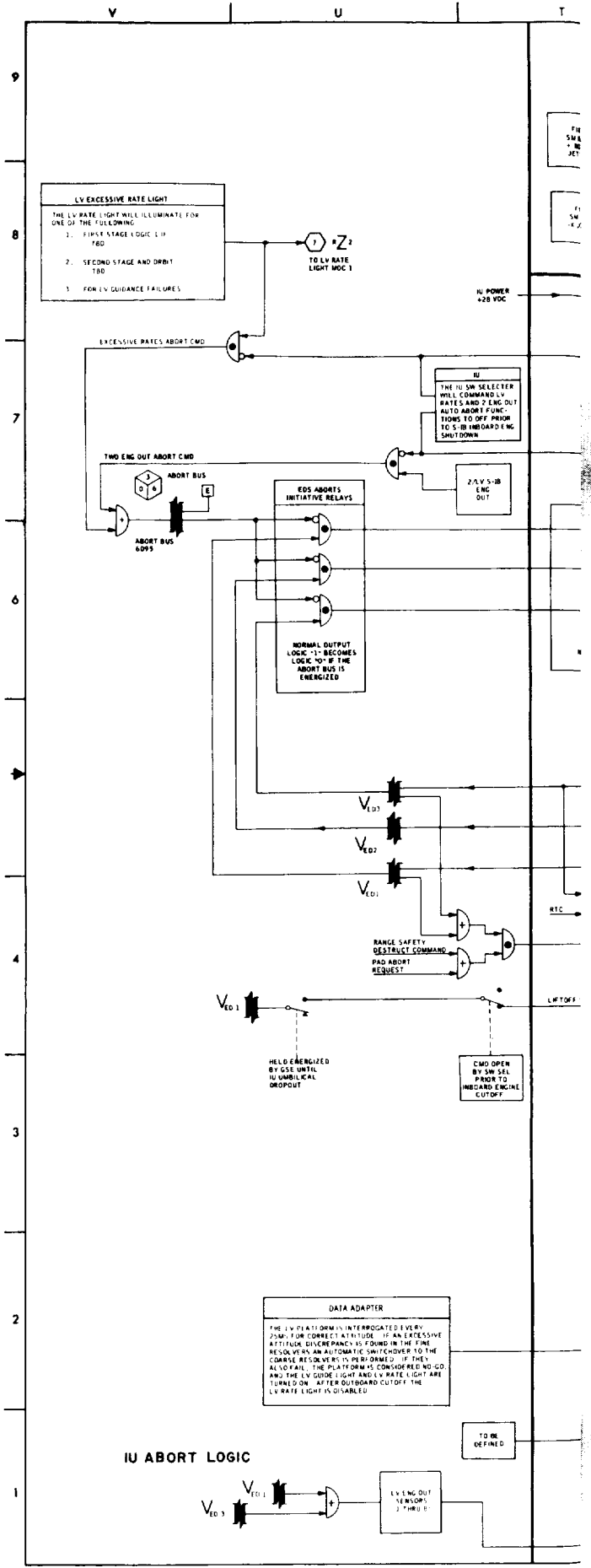
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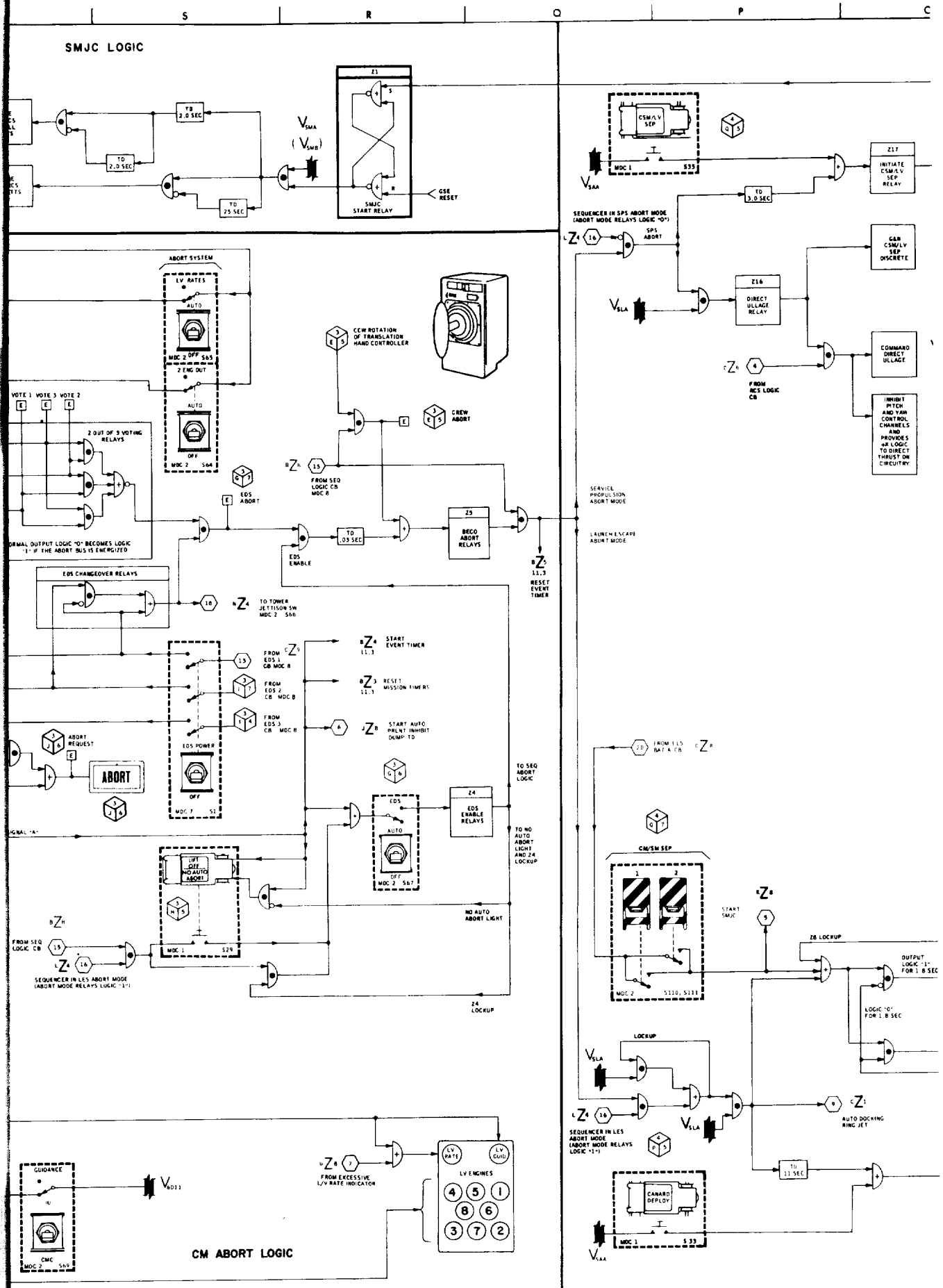
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6



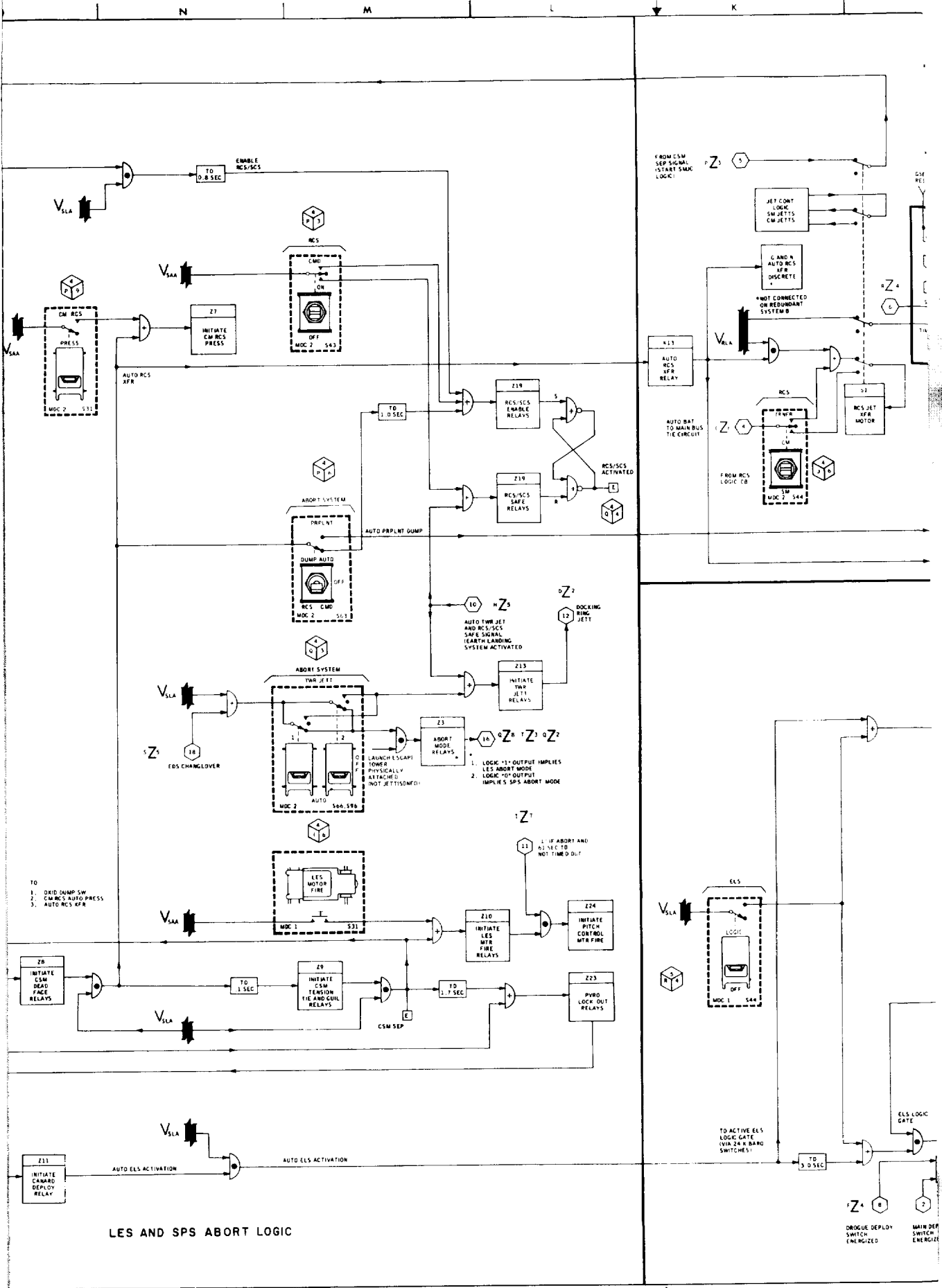
FOLDOUT FRAME











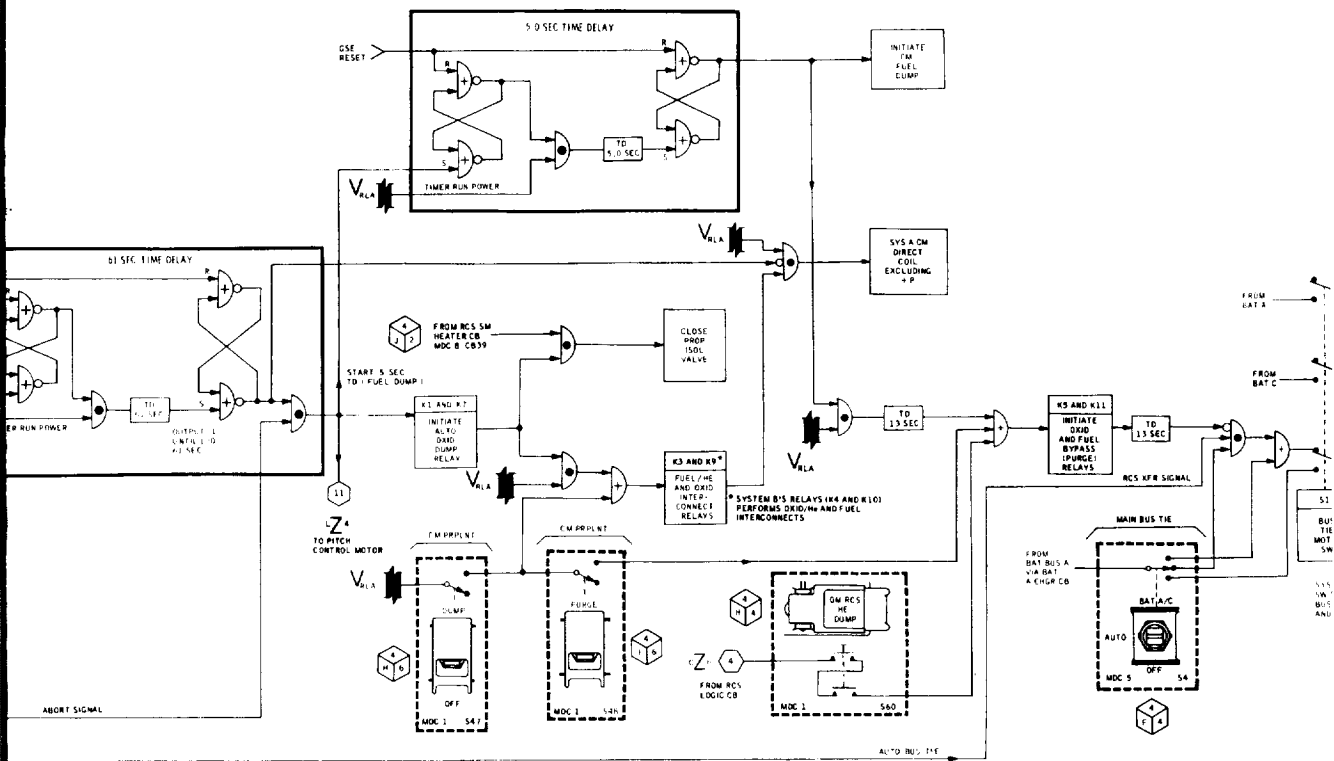
LES AND SPS ABORT LOGIC

TO  
 1. DRD DUMP SW  
 2. CM RCS AUTO PRESS  
 3. AUTO RCS XFR

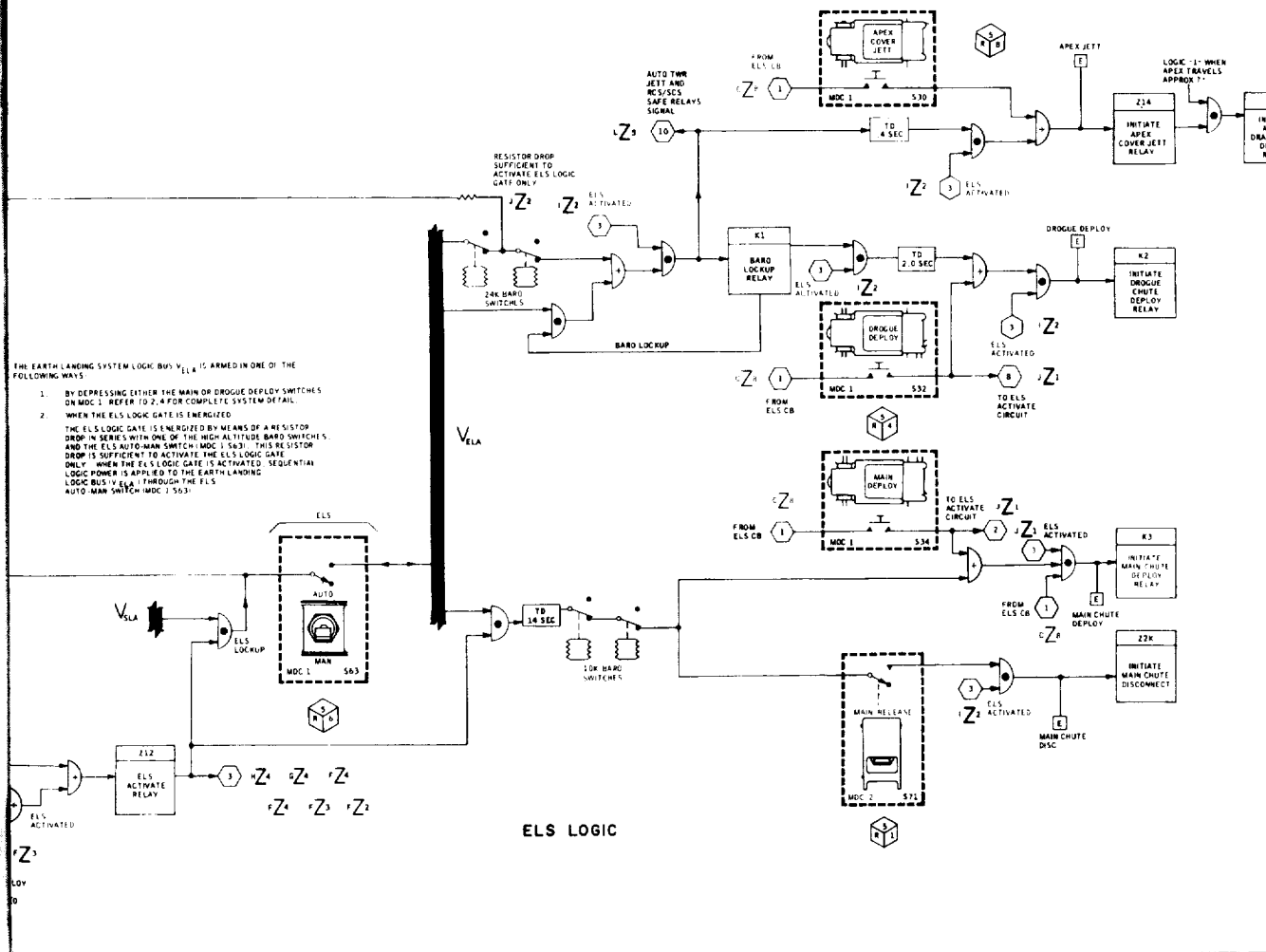
DRUGO DEPLOY SWITCH ENERGIZED  
 MAIN DEP SWITCH ENERGIZED



RCSC LOGIC



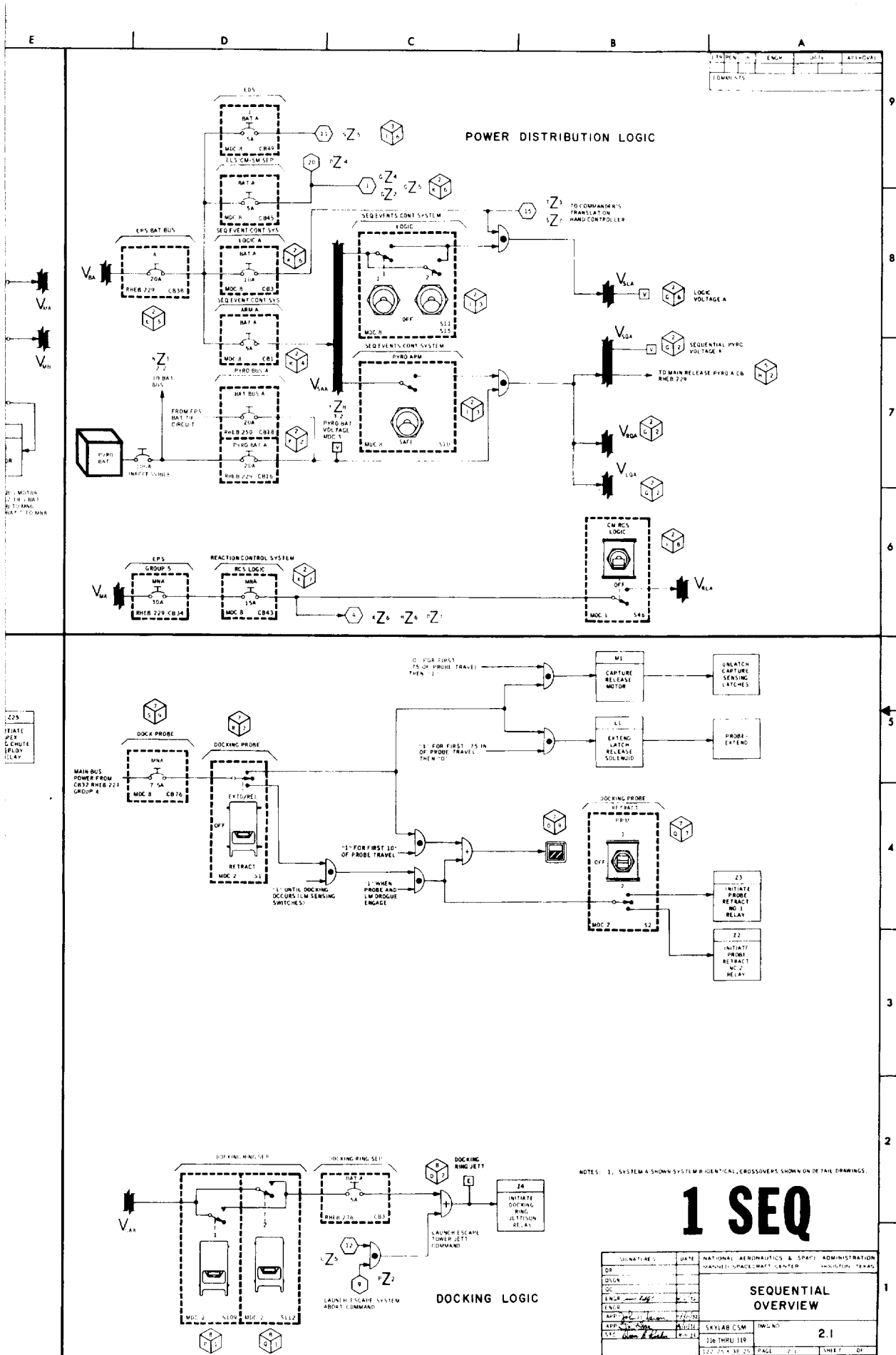
ELS LOGIC



THE EARTH LANDING SYSTEM LOGIC BUS  $V_{ELA}$  IS ARMED IN ONE OF THE FOLLOWING WAYS:

1. BY DEPRESSING EITHER THE MAIN OR DROGUE DEPLOY SWITCHES ON MDC 3. REFER TO 2.4 FOR COMPLETE SYSTEM DETAIL.
2. WHEN THE ELS LOGIC GATE IS ENERGIZED THE ELS LOGIC GATE IS ENERGIZED BY MEANS OF A RESISTOR DROP IN SERIES WITH ONE OF THE HIGH ALTITUDE BARO SWITCHES AND THE ELS AUTO MAIN SWITCH (MDC 1 S63). THIS SYSTEM DROP IS SUFFICIENT TO ACTIVATE THE ELS LOGIC GATE ONLY WHEN THE ELS LOGIC GATE IS ACTIVATED. SEQUENTIAL LOGIC POWER IS APPLIED TO THE EARTH LANDING LOGIC BUS  $V_{ELA}$  THROUGH THE ELS AUTO MAIN SWITCH (MDC 1 S63).





# 1 SEQ

SIGNATURE	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION
DR		MARSHALL SPACEFLIGHT CENTER HOUSTON, TEXAS
DC		
ENGR		
APP		
ESC		
SKYLAB CSM		FWG NO
110 THRU 119		2.1
110 THRU 119	PAGE 2	SHEET 04

1. 2019年12月31日

2. 2020年1月1日

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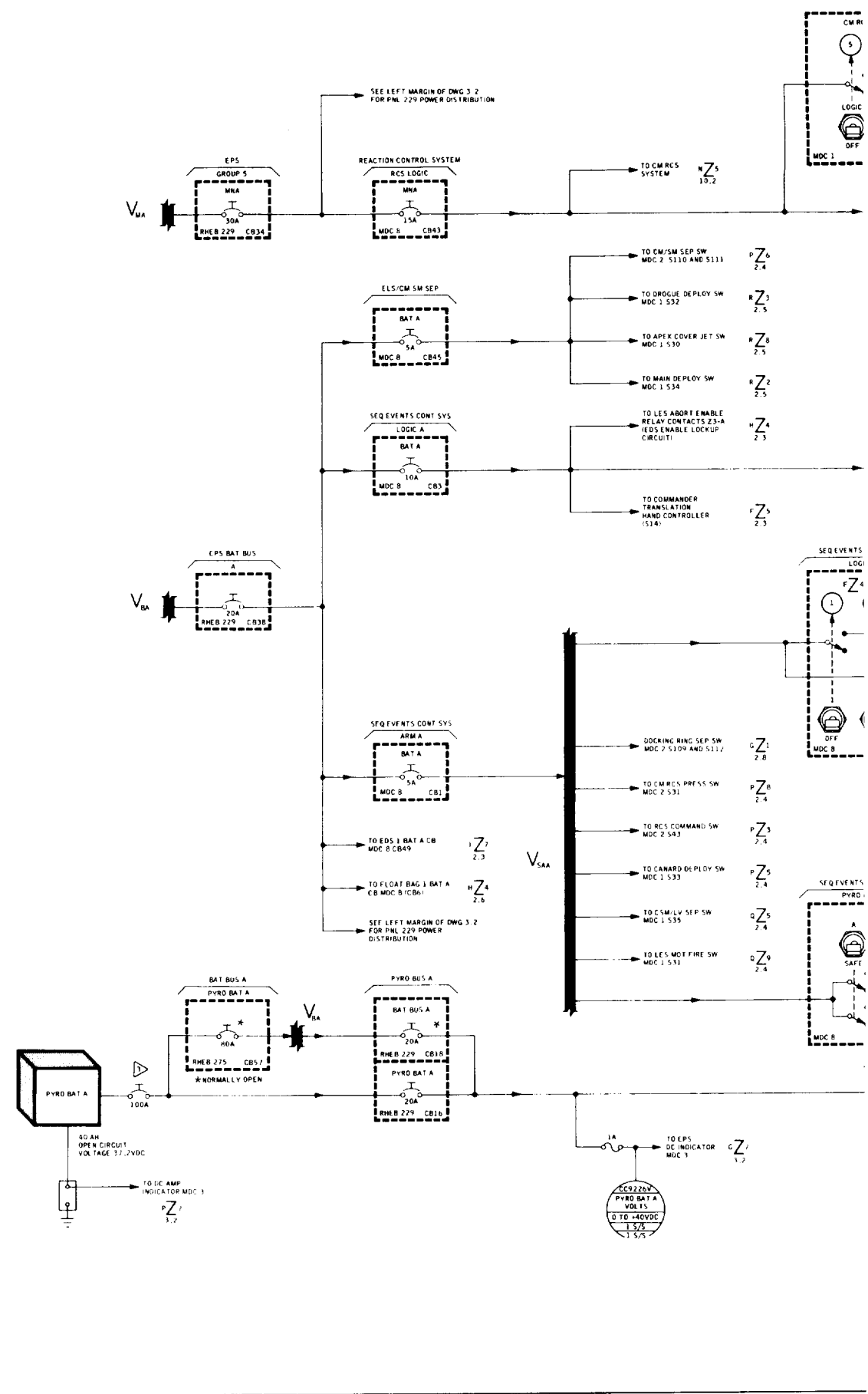
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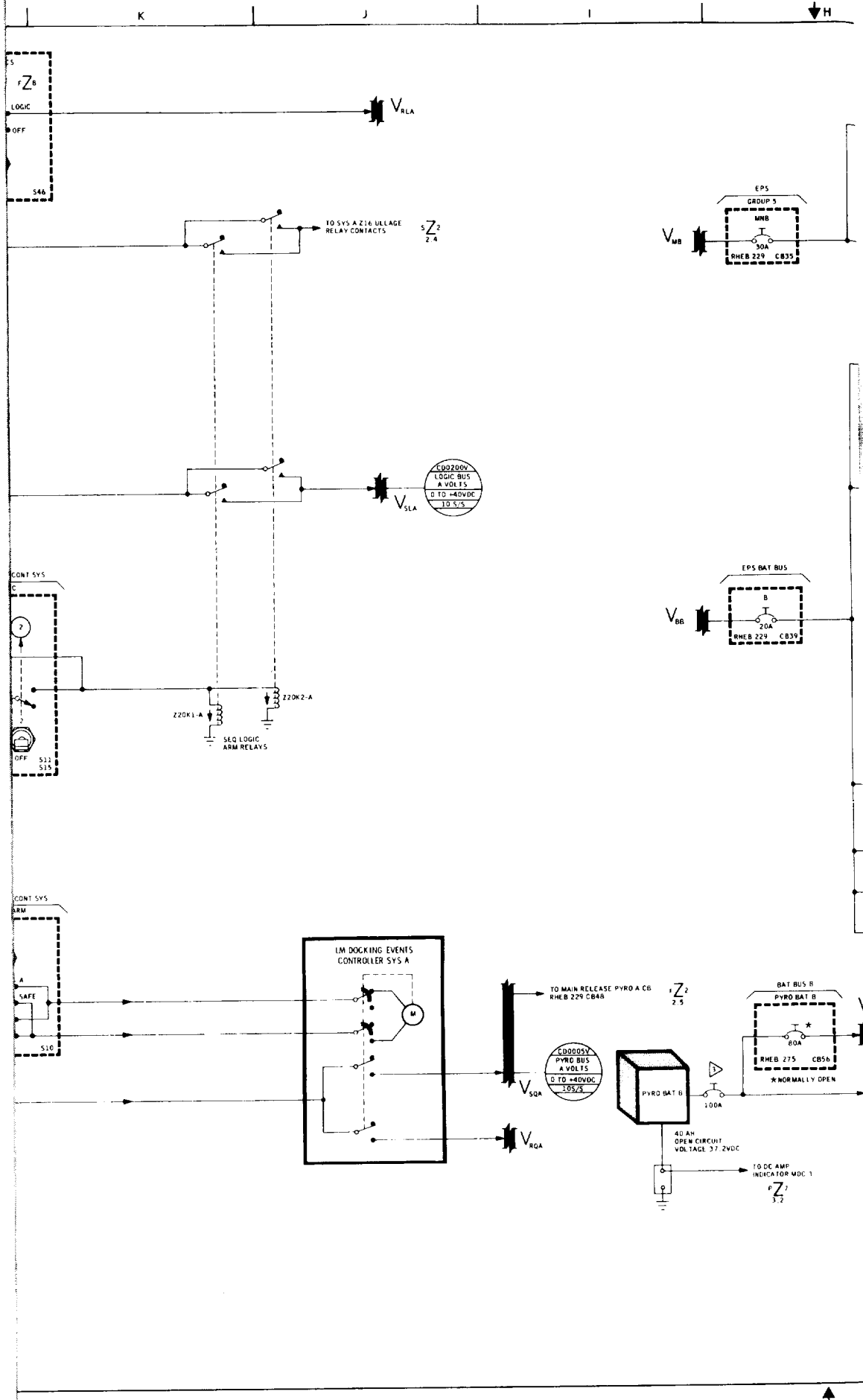
**FOLDOUT FRAME |**

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FOLDOUT FRAME 3

4000

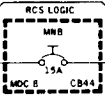
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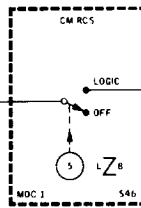
E

SEE LEFT MARGIN OF DWG 3.2 FOR PNL 229 POWER DISTRIBUTION

REACTION CONTROL SYSTEM

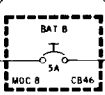


TO CM RCS SYSTEM  
N Z 4  
10.2



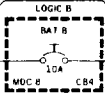
TO S REL.

EIS/CM SW SEP



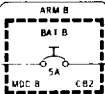
- TO CM/SM SEP SW MDC 2 5110 AND 5111 P Z 6 2.4
- TO DROGUE DEPLOY SW MDC 1 532
- TO APEX COVER JET SW MDC 1 530
- TO MAIN DEPLOY SW MDC 1 534

SEQ EVENTS CONT SYS

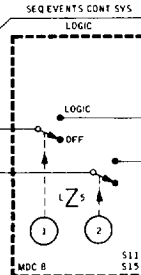


- TO LES ABORT ENABLE RELAY CONTACTS 23-B (EDS ENABLE LOCKUP CIRCUIT)
- TO COMMANDER TRANSLATION HAND CONTROLLER (5151) E Z 5 2.3

SEQ EVENTS CONT SYS

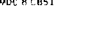


- DOCKING RING SEP SW MDC 2 5109 AND 5112 N Z 1 2.7
- TO RCS COMMAND SW MDC 2 143 P Z 3 2.4
- TO CM RCS PRESS SW MDC 2 531 P Z 9 2.4
- TO CANARD DEPLOY SW MDC 1 533 P Z 5 2.4
- TO OSM/LV SEP SW MDC 1 535 Q Z 5 2.4
- TO LES MOT FIRE SW MDC 531 Q Z 9 2.4



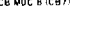
V<sub>SAB</sub>

TO LHS BAT B CH



I Z 3 2.3

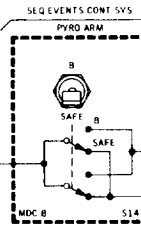
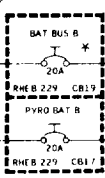
TO FLOAT BAG 2 BAT B



H Z 6 2.6

SEE LEFT MARGIN OF DWG 3.2 FOR PNL 229 POWER DISTRIBUTION

PYRO BUS B

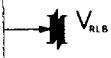


TO EPS DC INDICATOR MDC 3 G Z 6 3.2

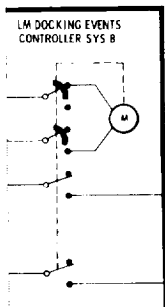
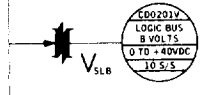


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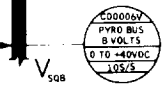
LTN	PCR	DR	ENGR	DATE	APPROVAL
COMMENTS					



YS B 216 ULLAGE  
BY CONTACTS



TO MAIN RELEASE PYRO R CB  
RHEB 229 CB49 (SYS B NOT SHOWN)



▷ INACCESSIBLE CIRCUIT BREAKERS

- V\_ELA EARTH LANDING BUS A
- V\_ELB EARTH LANDING BUS B
- V\_RQA REACTION CONTROL SYSTEM CONTROLLER PYRO BUS A
- V\_RQB REACTION CONTROL SYSTEM CONTROLLER PYRO BUS B
- V\_LLA REACTION CONTROL SYSTEM CONTROLLER LOGIC BUS A
- V\_RLB REACTION CONTROL SYSTEM CONTROLLER LOGIC BUS B
- V\_SLA SEQUENTIAL LOGIC BUS A
- V\_SLB SEQUENTIAL LOGIC BUS B
- V\_SAA SEQUENTIAL ARM BUS A
- V\_SAB SEQUENTIAL ARM BUS B

NOTES: 1. 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.

# 2 SEQ PWR

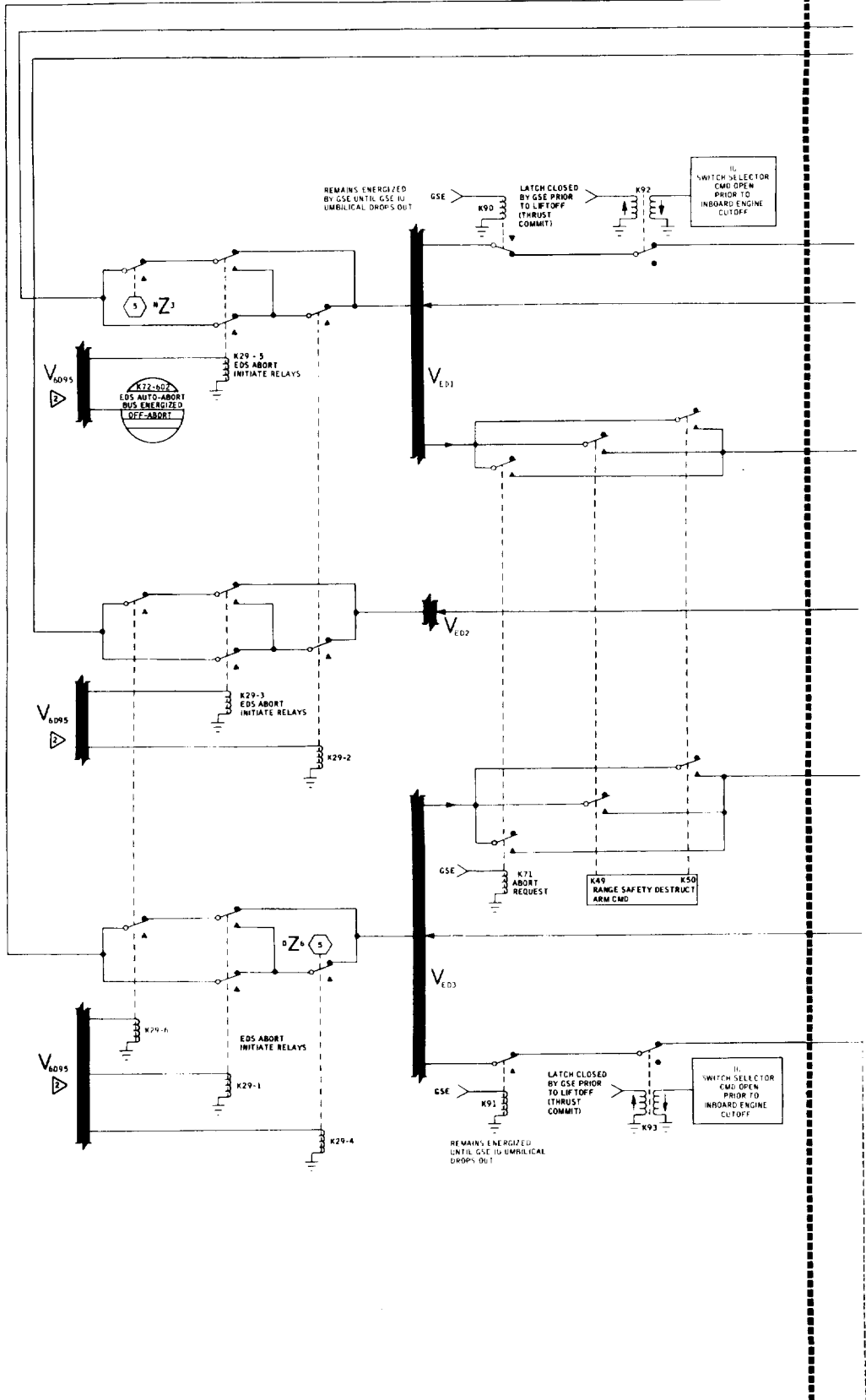
SIGNATURES	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS	
DR <i>Ronald J. ...</i>	1/17/71	<b>SEQUENTIAL POWER DISTRIBUTION</b>	
DSGR			
QC			
ENGR <i>James ...</i>	1/17/71		
ENGR		SKYLAB CSM 116 THRU 119 82.5 X 34	
APP <i>John ...</i>	1/17/71		
APP <i>J.E. ...</i>	1/17/71		
STC <i>John ...</i>	1/17/71	2.2	
		PAGE 2-2	SHEET 1 OF 1



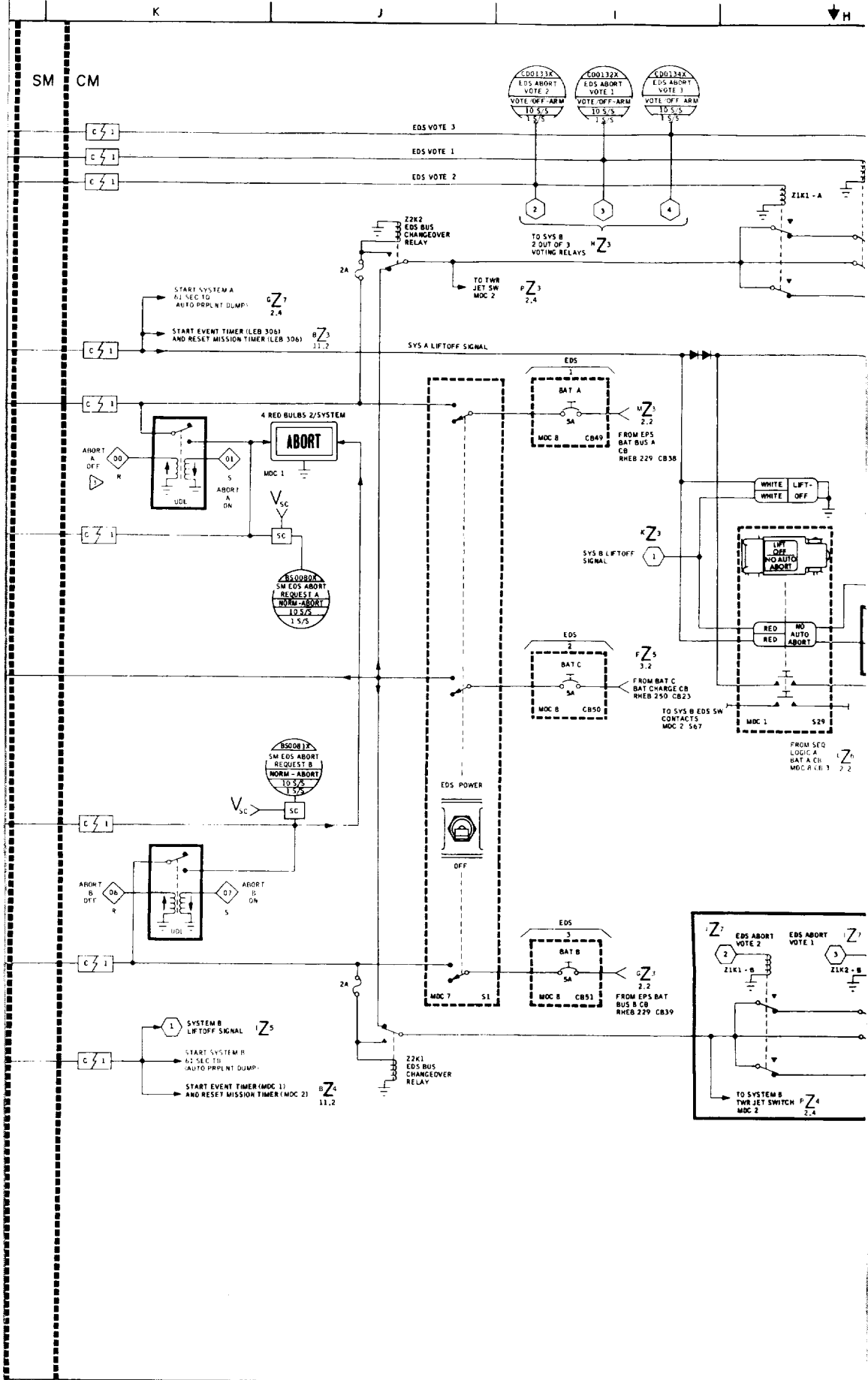


EOLDOUT FRAME /







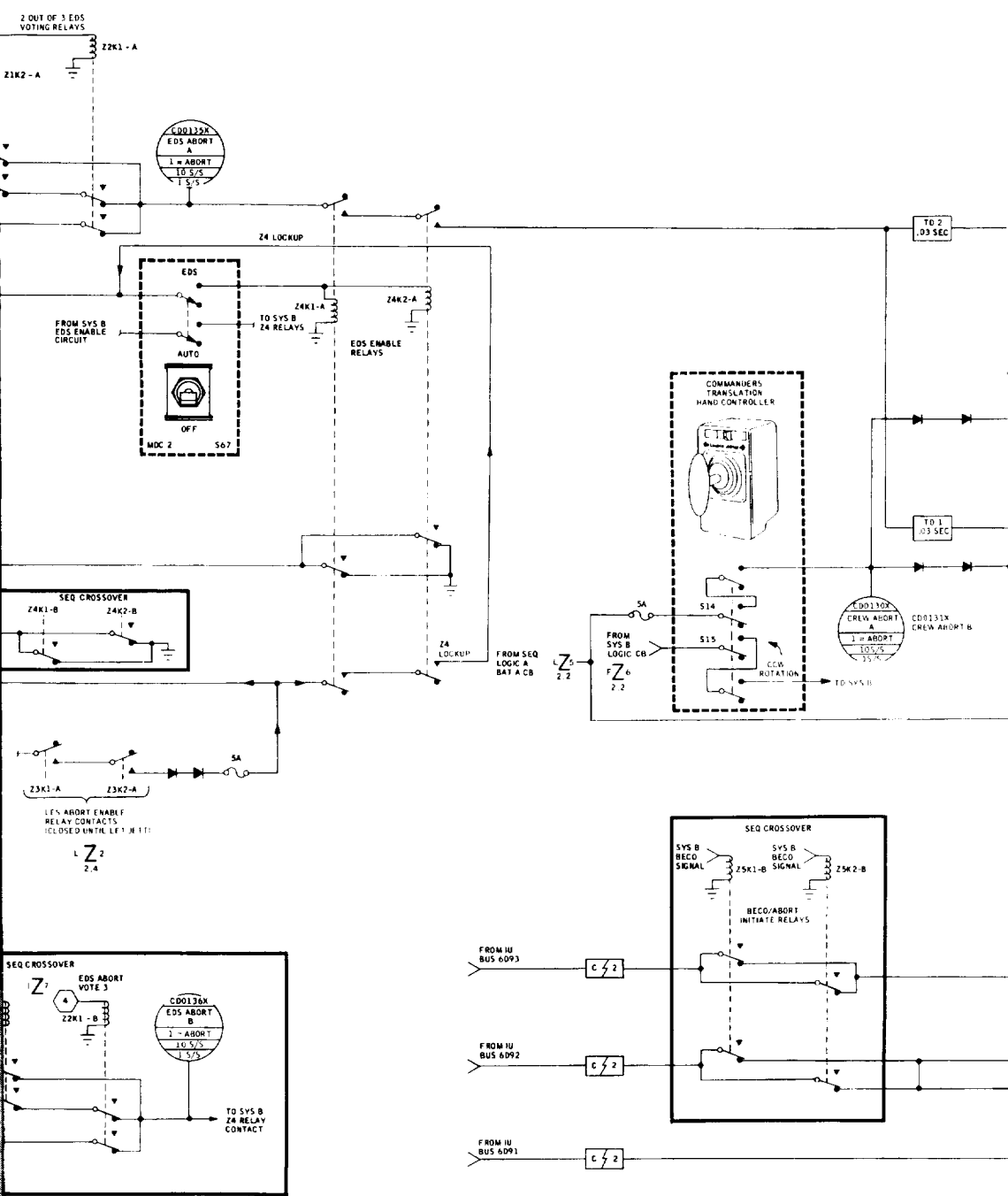


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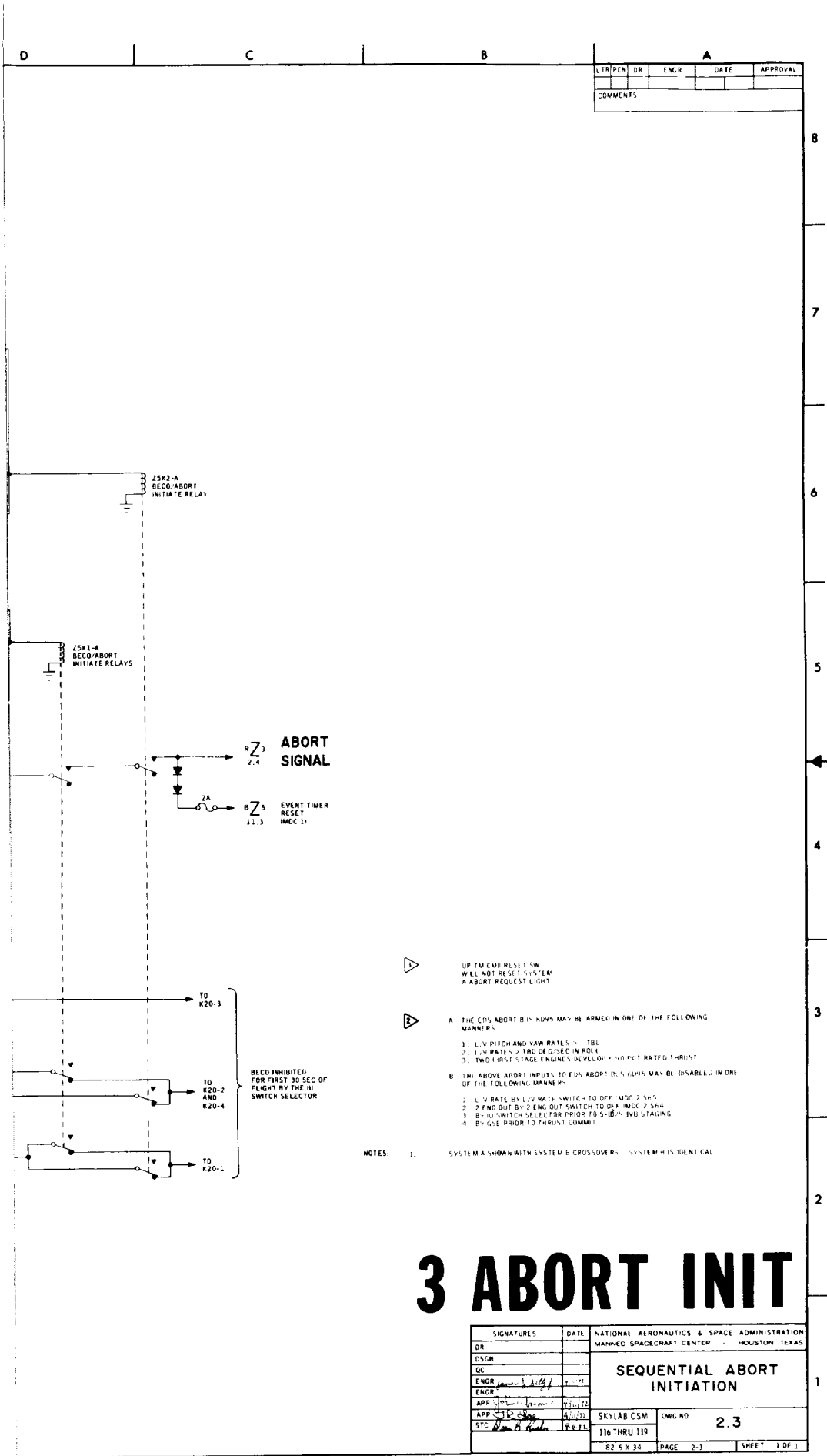
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LTR/PCN	DR	ENGR	DATE	APPROVAL

COMMENTS

- ▽ UP TM ENR RESET SW WILL NOT RESET SYSTEM A ABORT REQUEST LIGHT
- ▽ A THE CIV ABORT BUS ADSRS MAY BE ARMED IN ONE OF THE FOLLOWING MANNERS:
  1. L/V PITCH AND YAW RATES > TBU
  2. L/V RATES > TBU DEG/SEC IN ROL
  3. TWO FIRST STAGE ENGINE'S DEVELOP > 400 PCT RATED THRUST
- B THE ABOVE ABORT INPUTS TO CIV ABORT BUS ADSRS MAY BE DISABLED IN ONE OF THE FOLLOWING MANNERS:
  1. L/V RATE BY L/V RATE SWITCH TO OFF (MDC 2 565)
  2. 2 ENG OUT BY 2 ENG OUT SWITCH TO DEF (MDC 2 565)
  3. BY IU SWITCH SELEC FOR PRIOR TO S-IB/4 IWB STAGING
  4. BY USE PRIOR TO THRUST COMMT

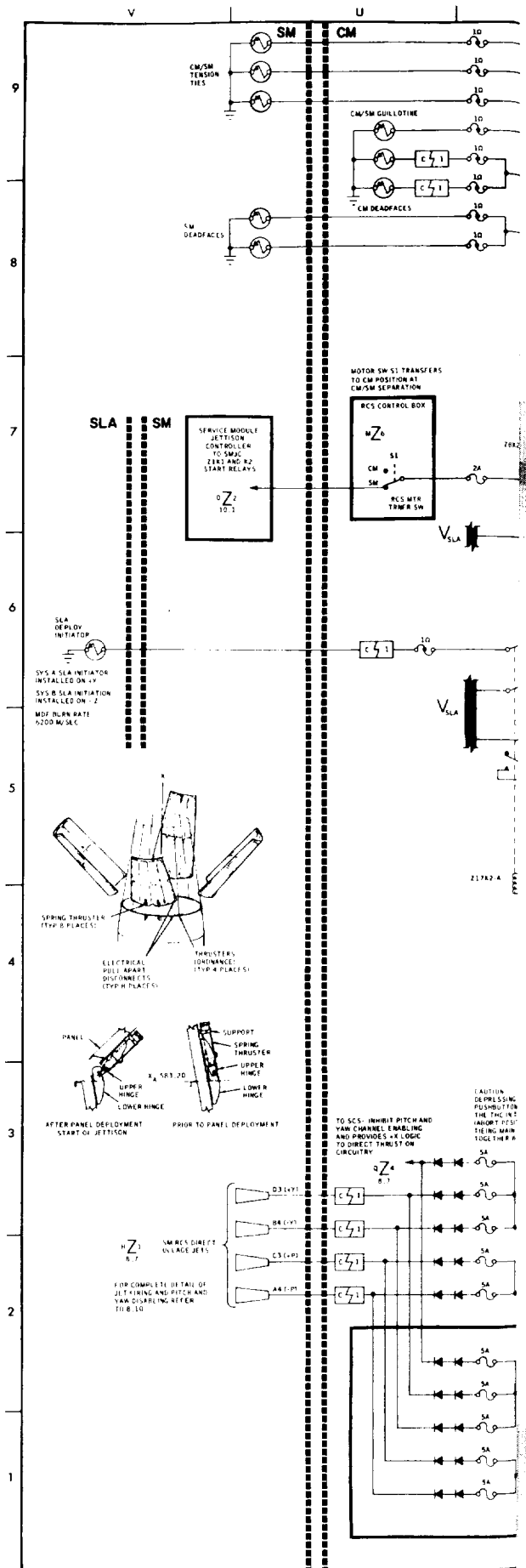
NOTES: 1. SYSTEM A SHOWN WITH SYSTEM B CROSSOVERS. SYSTEM B IS IDENTICAL

# 3 ABORT INIT

SIGNATURES	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
DR		<b>SEQUENTIAL ABORT INITIATION</b>	
DSGN			
DC			
ENGR			
ENGR			
APP		SKYLAB CSM 116 THRU 119	OWC NO <b>2.3</b>
APP			
STC		PAGE 2-3 SHEET 3 OF 1	

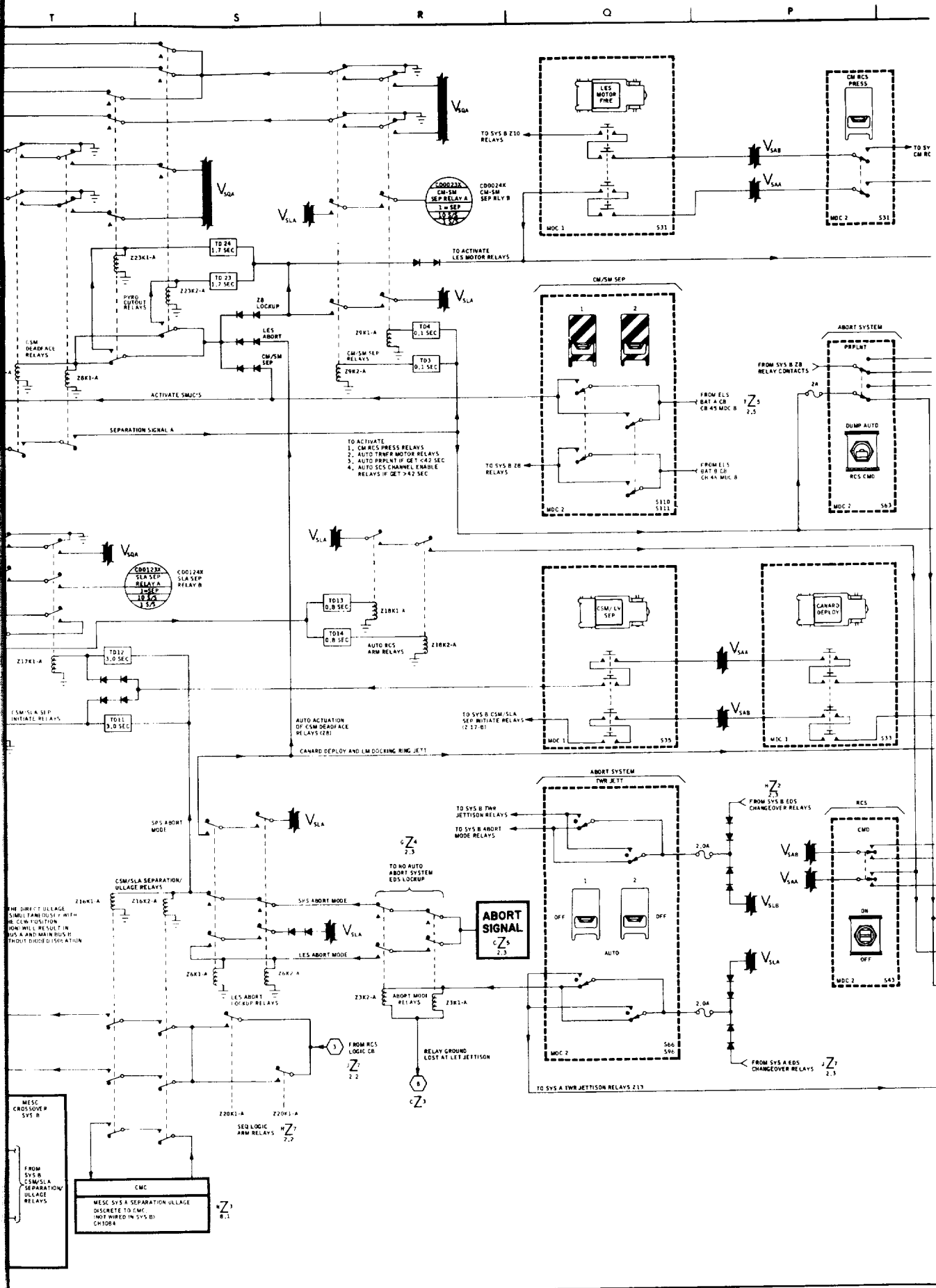
**FOLDOUT FRAME 5**





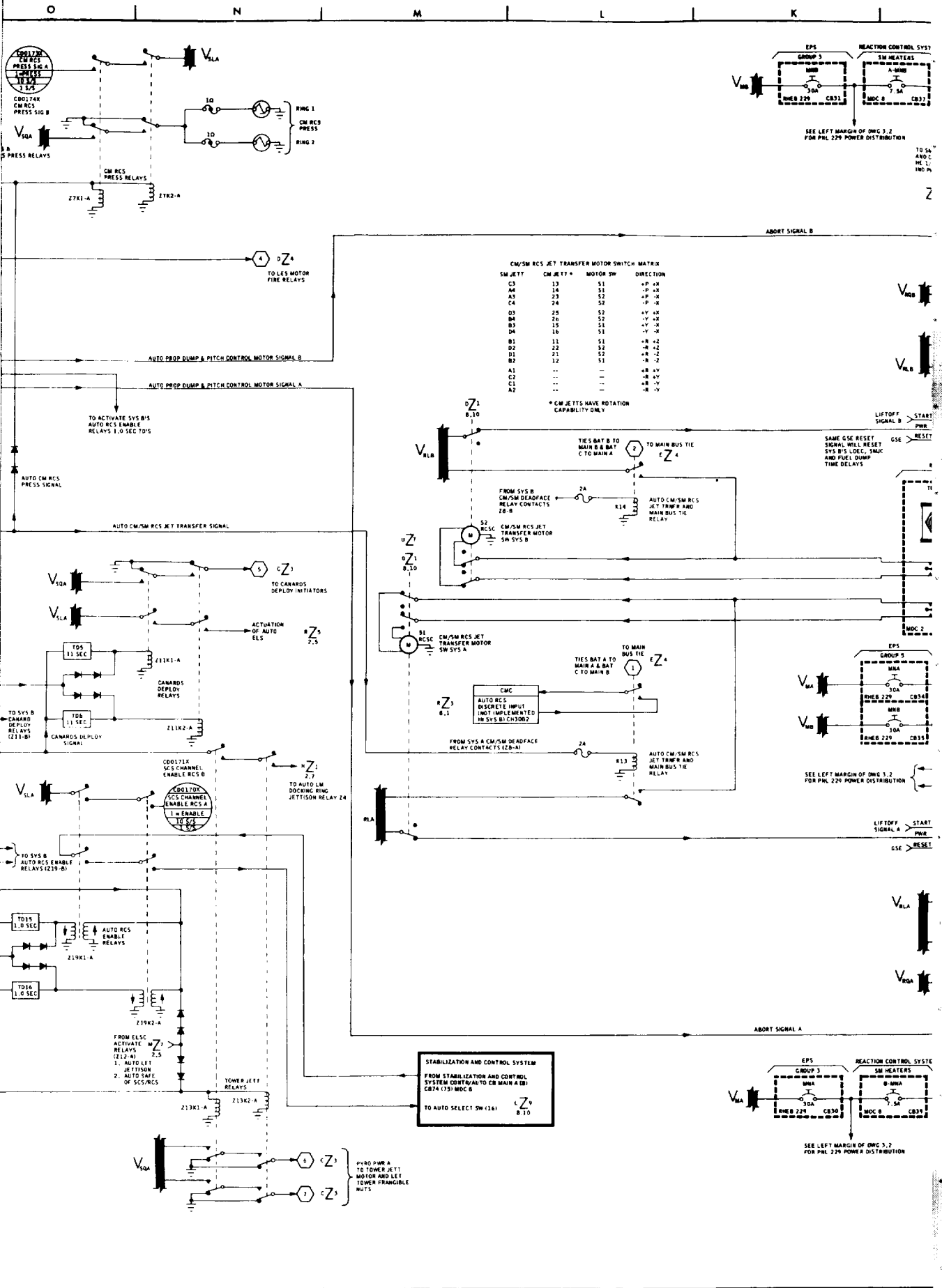
**FOLDOUT FRAME 1**





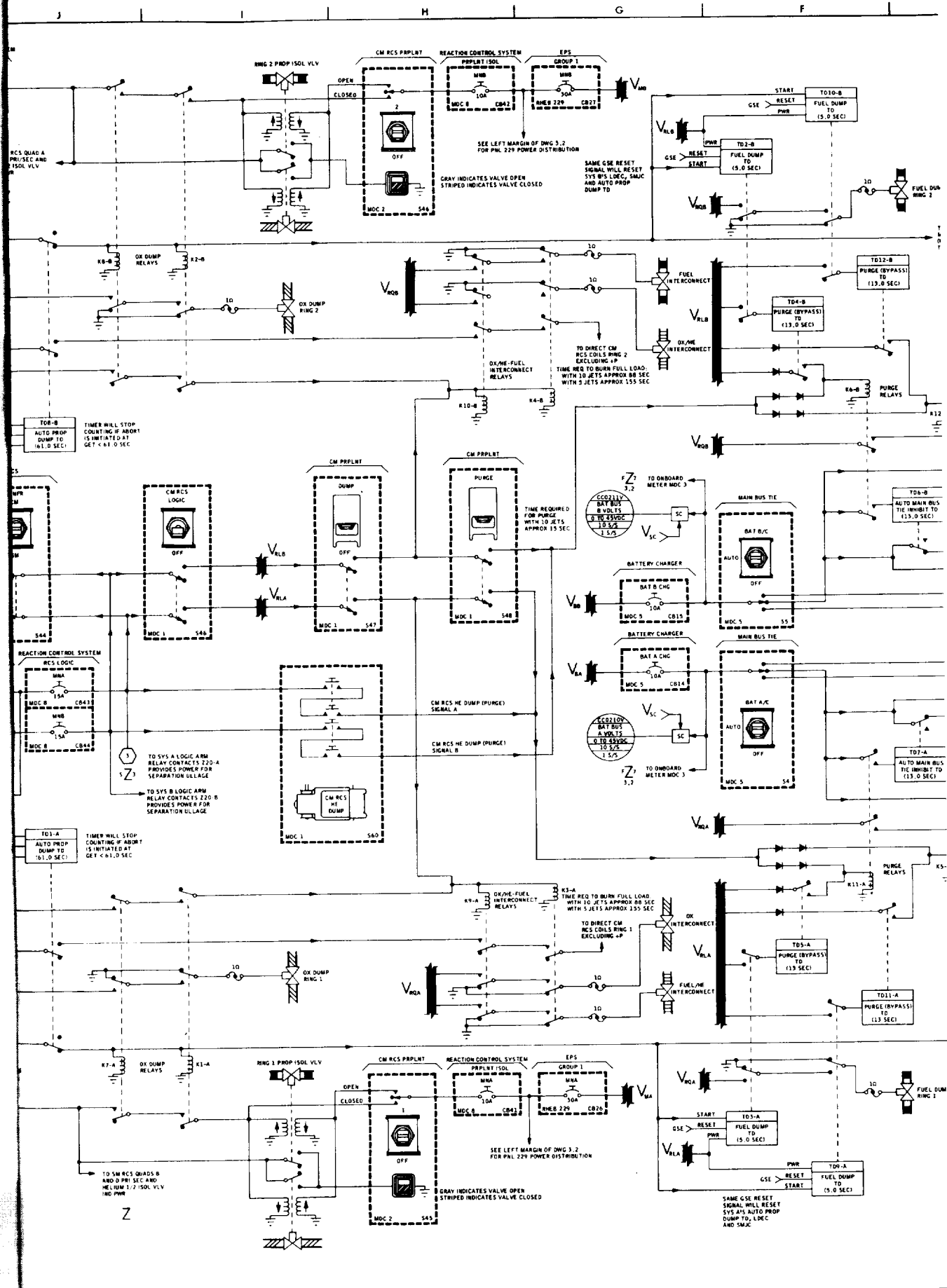
FOLDOUT FRAME 2





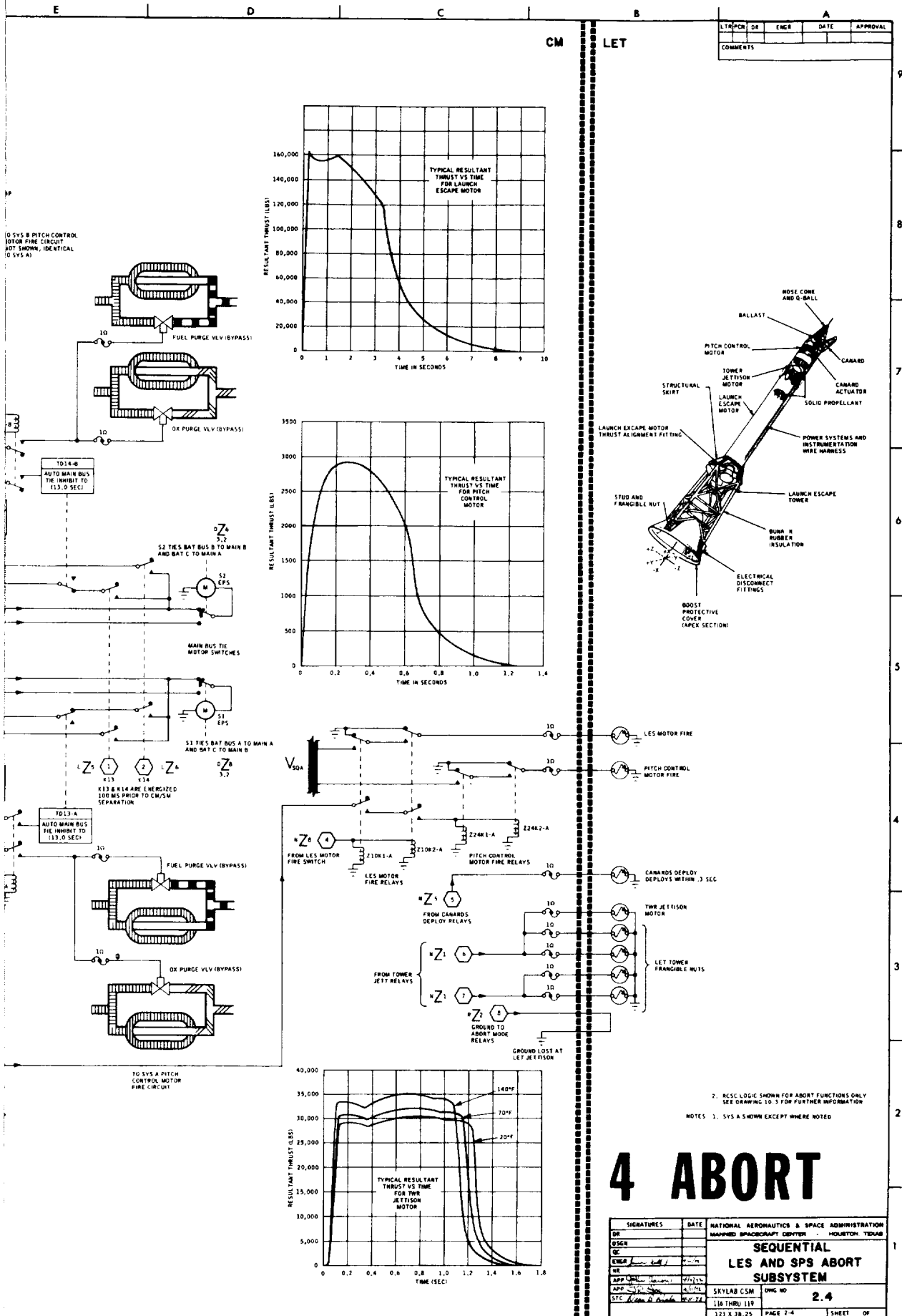
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FOLDOUT FRAME 4





LT#	FOR	OR	EMCR	DATE	APPROVAL

COMMENTS

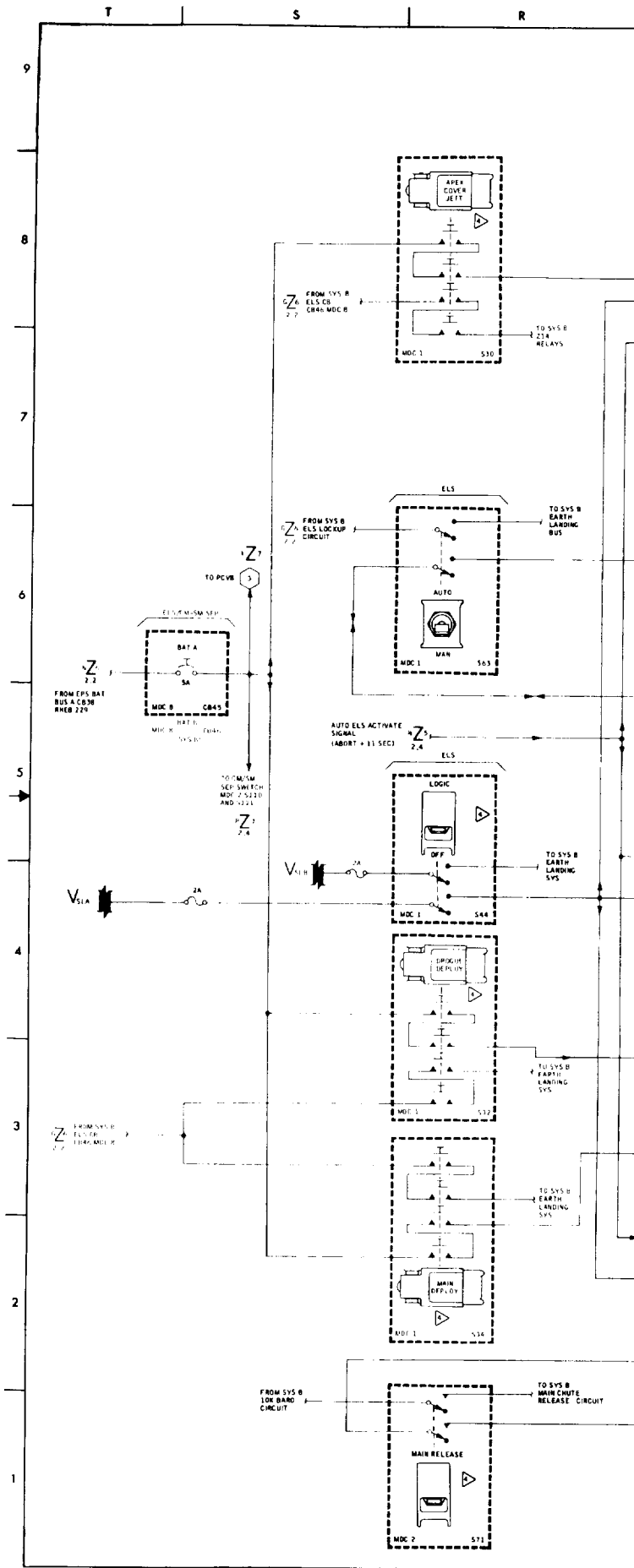
2. RECL LOGIC SHOWN FOR ABORT FUNCTIONS ONLY SEE DRAWING 10-3 FOR FURTHER INFORMATION

NOTES 1. SYS A SHOWN EXCEPT WHERE NOTED

# 4 ABORT

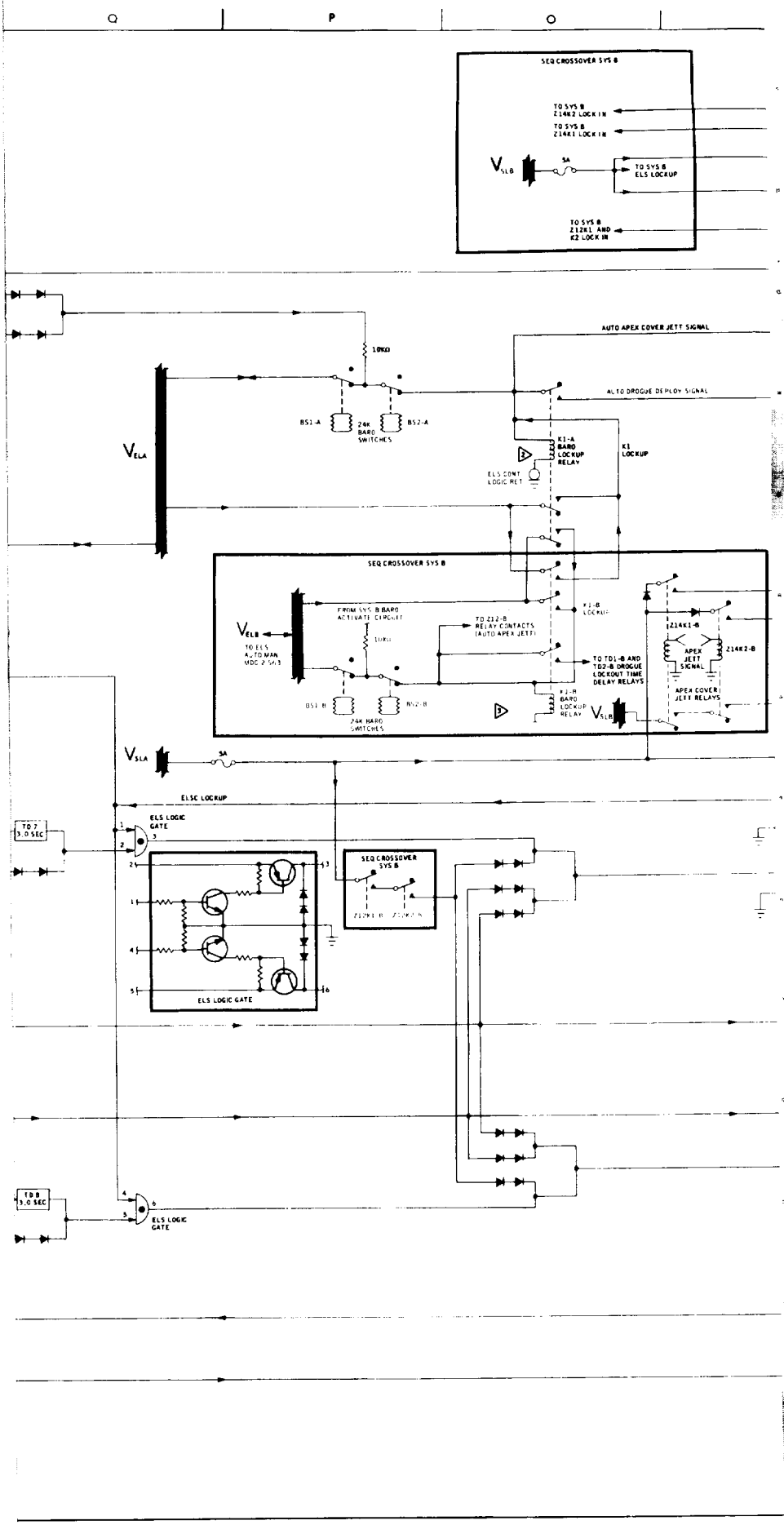
SIGNATURES	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION
DR		MANIPULATED SPACECRAFT CENTER HOUSTON TEXAS
EMCR		
SR		
APP		
CHK		
STC		
SKYLAB CSM	116 THRU 119	2.4
121 X 38 25	PAGE 2-4	SHEET OF





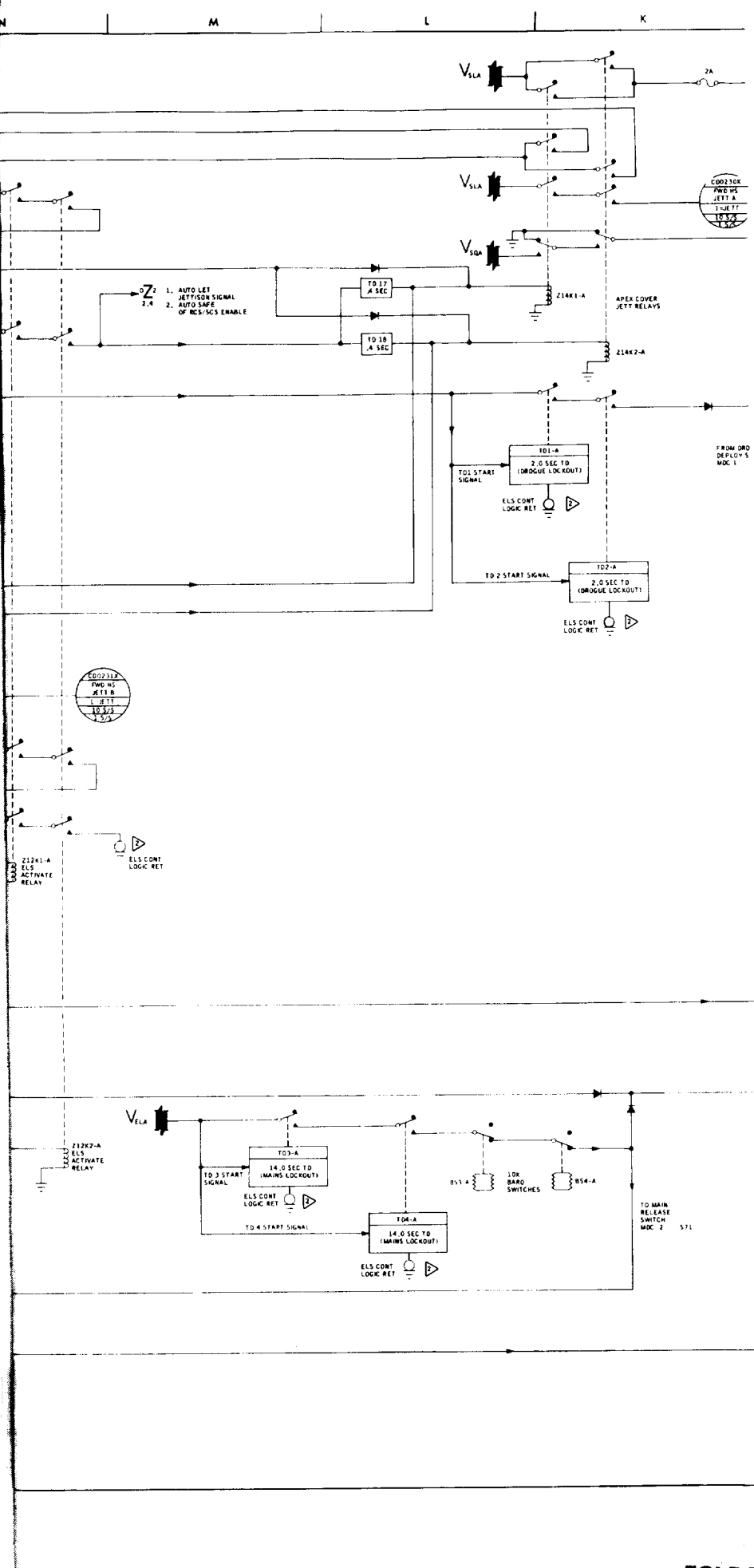
**EQLDOUT FRAME**



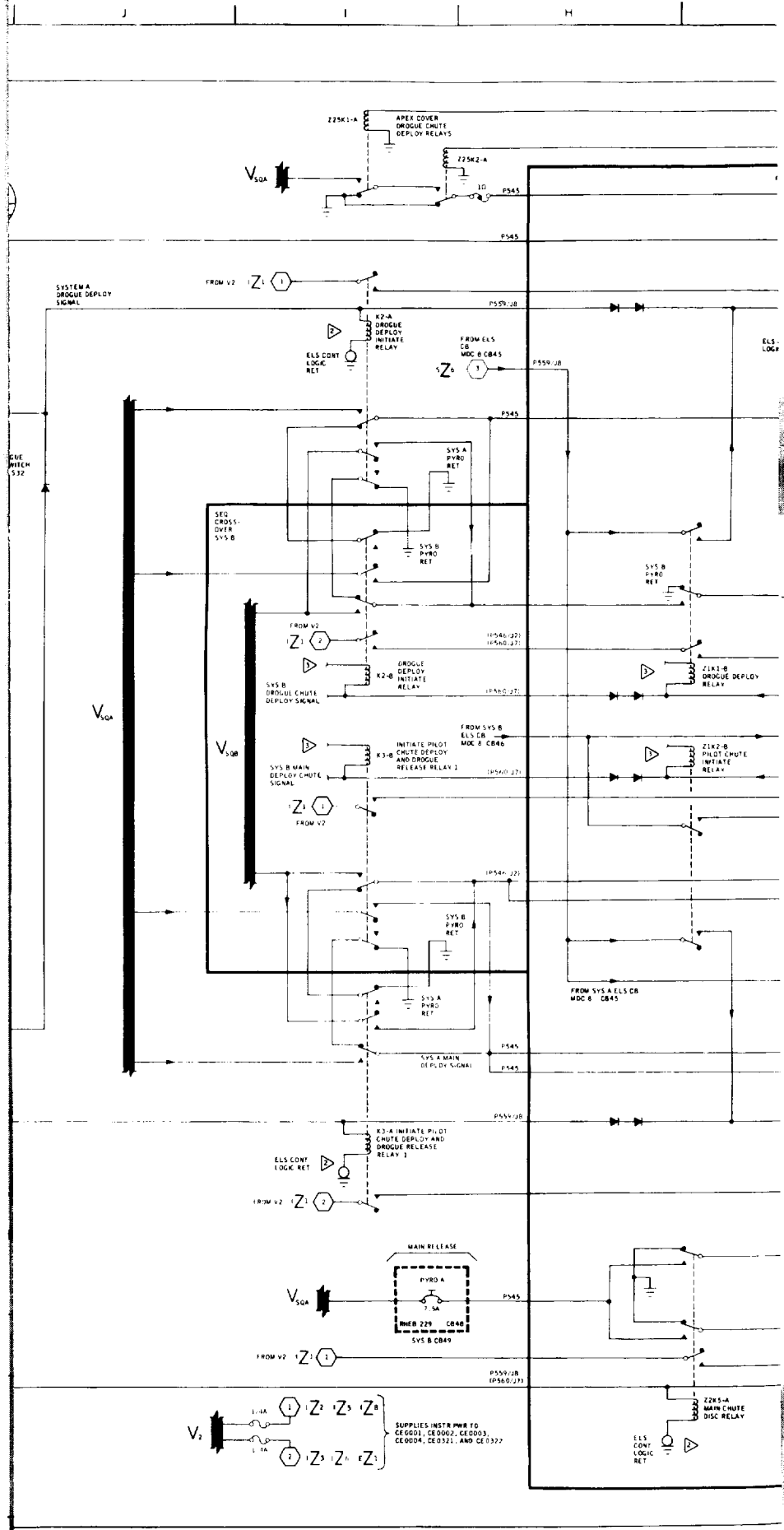








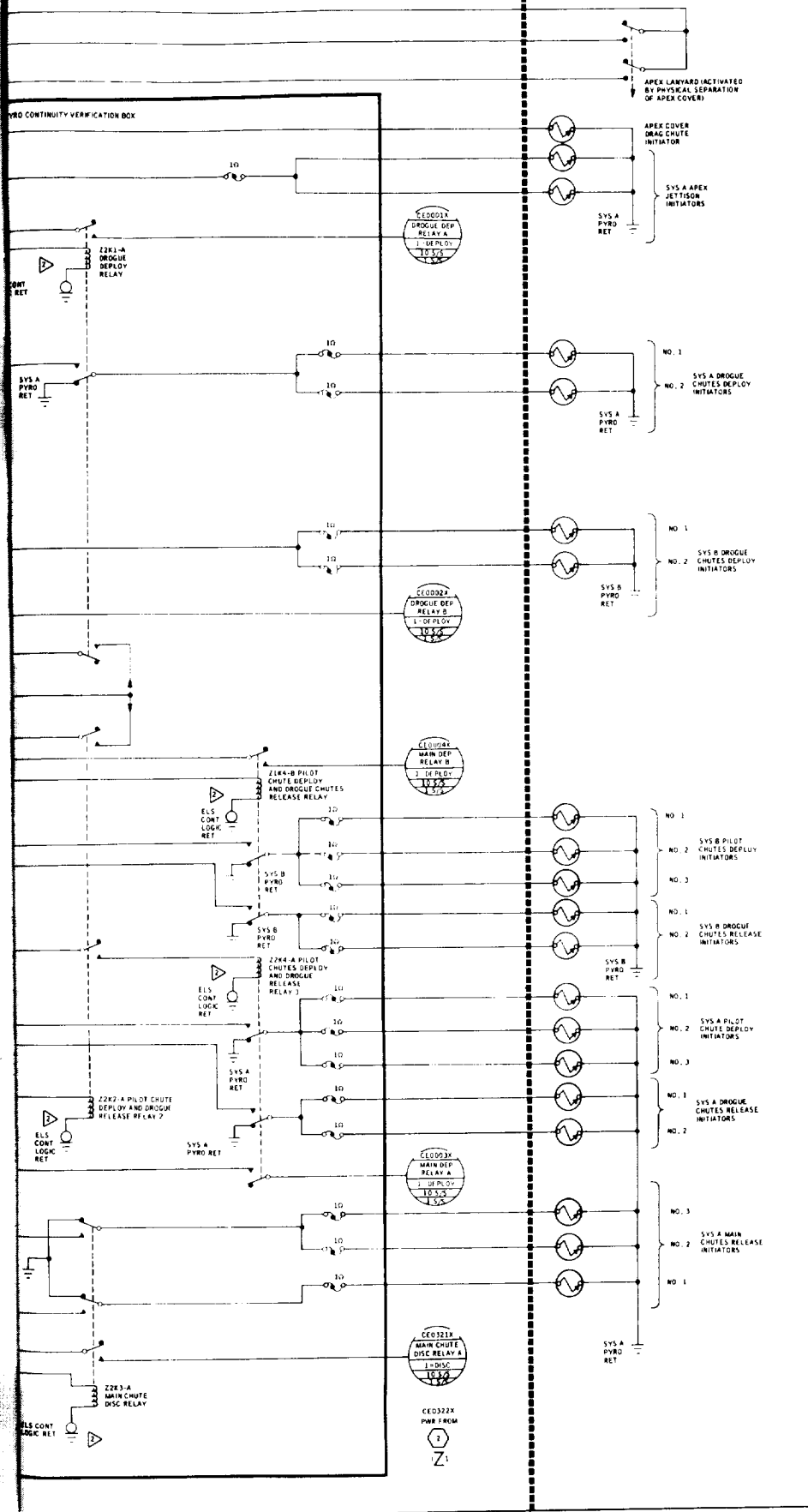
2023年12月



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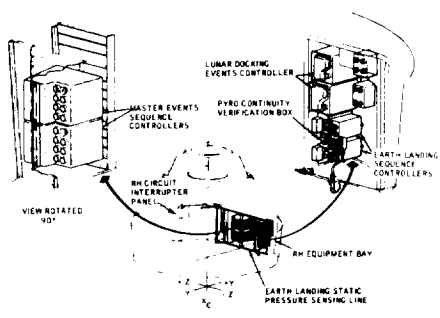
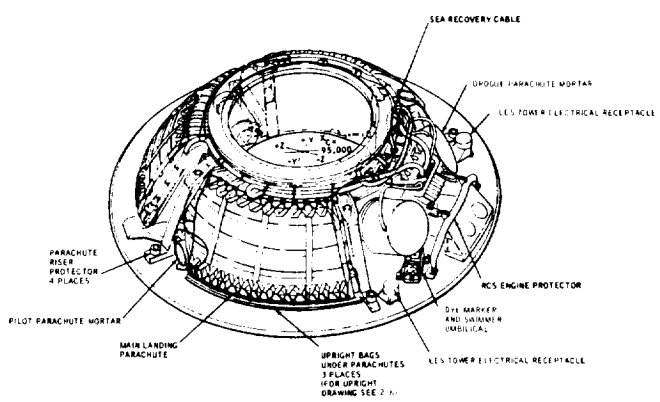


CM FORWARD COMPARTMENT





DATE	OR	ENGR	DATE	APPROVAL
COMMENTS				



- ▷ SWITCH LOCATED UNDER PROTECTIVE COVER
- ▷ RELAYS WILL NOT BE GROUNDED UNTIL ELS ACTIVATED RELAYS 222/5/5/5/1 ARE ENERGIZED
- ▷ RELAYS WILL NOT BE GROUNDED UNTIL THE ELS ACTIVATE RELAYS 222/5/5/5/1 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	
DSGR		<b>SEQUENTIAL EARTH LANDING SUBSYSTEM</b>	
QC			
ENGR			
INC			
APP			
STC		SKYLAR CSM	DATE: <b>2.5</b>
		116 THRU 119	
		210 X 38 75	PAGE 2-5 SHEET 1 OF 1

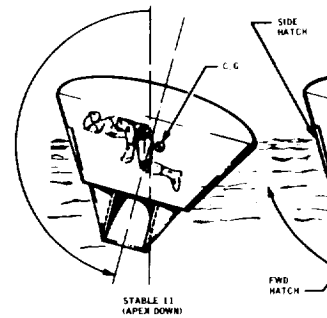
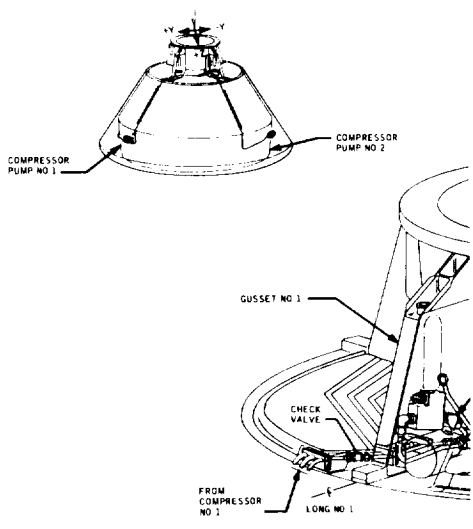
FOLDOUT FRAME 6





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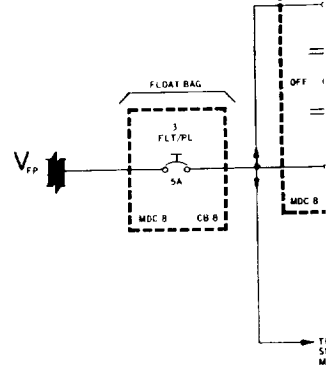
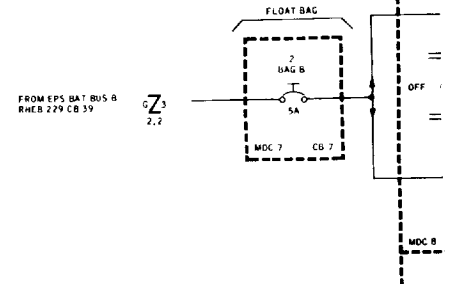
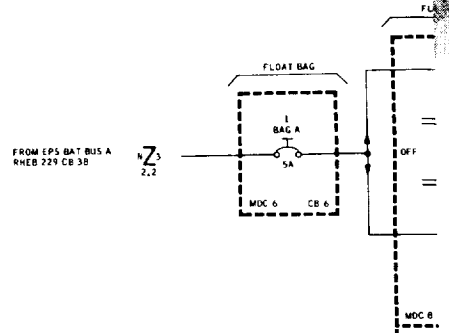
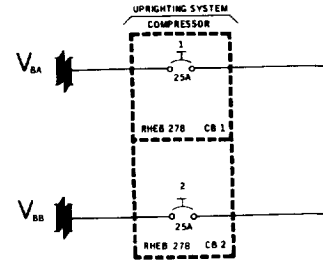
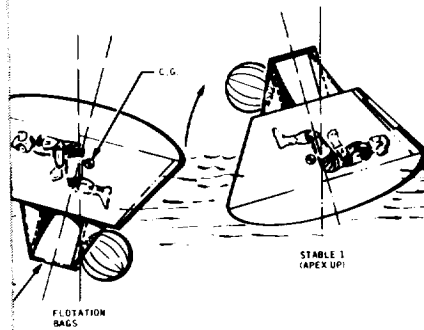
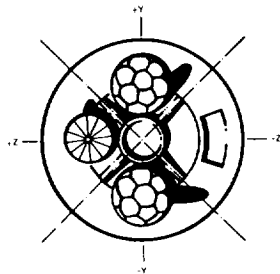
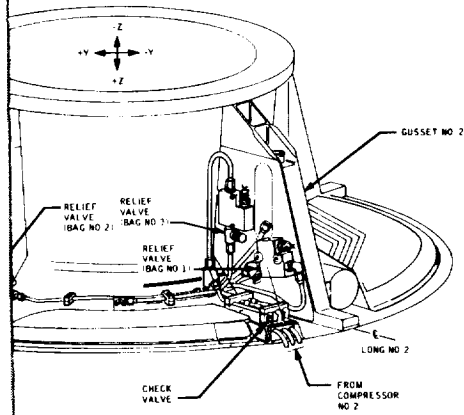


**FOLDOUT FRAME**

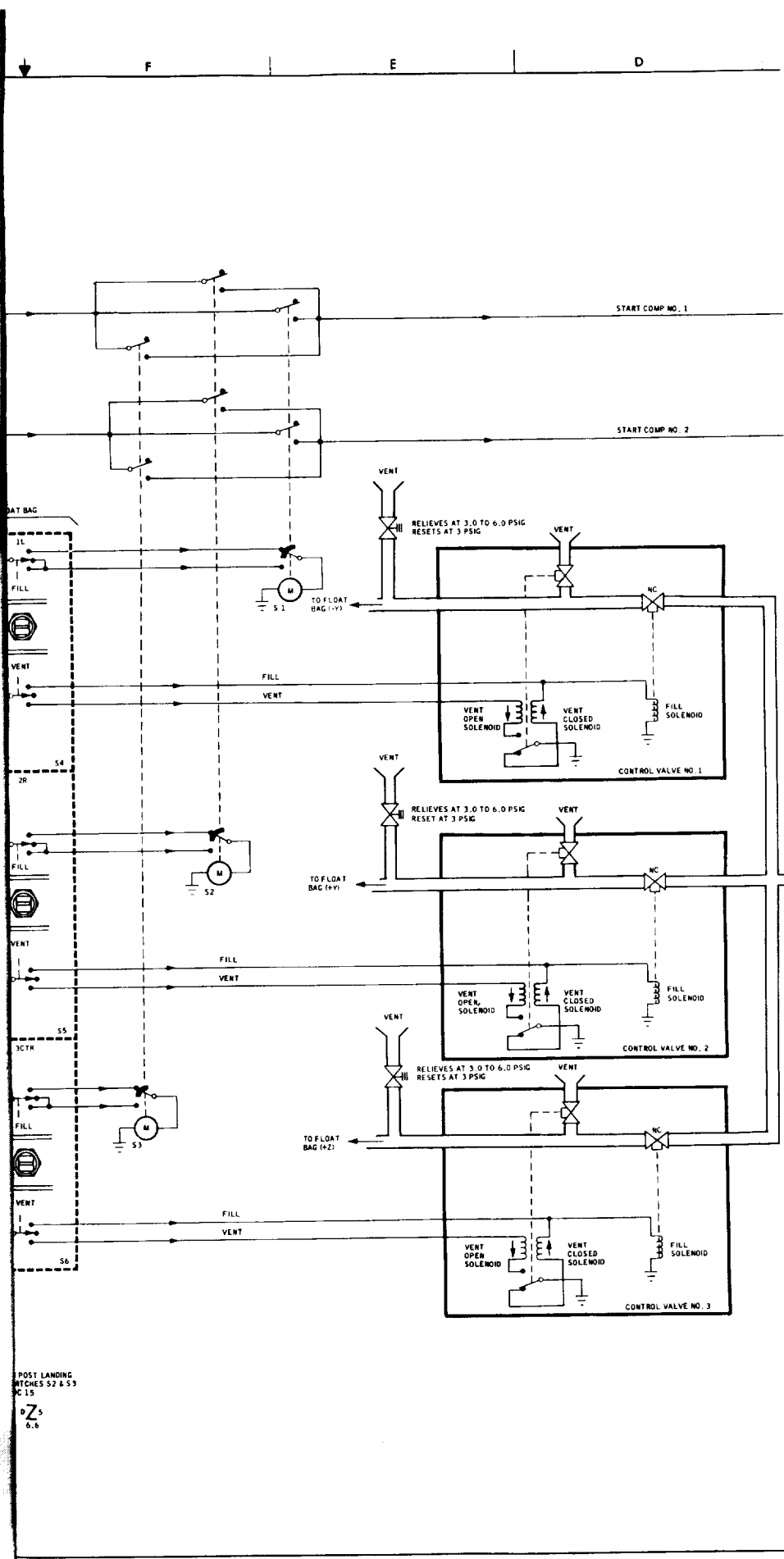
10/10/10

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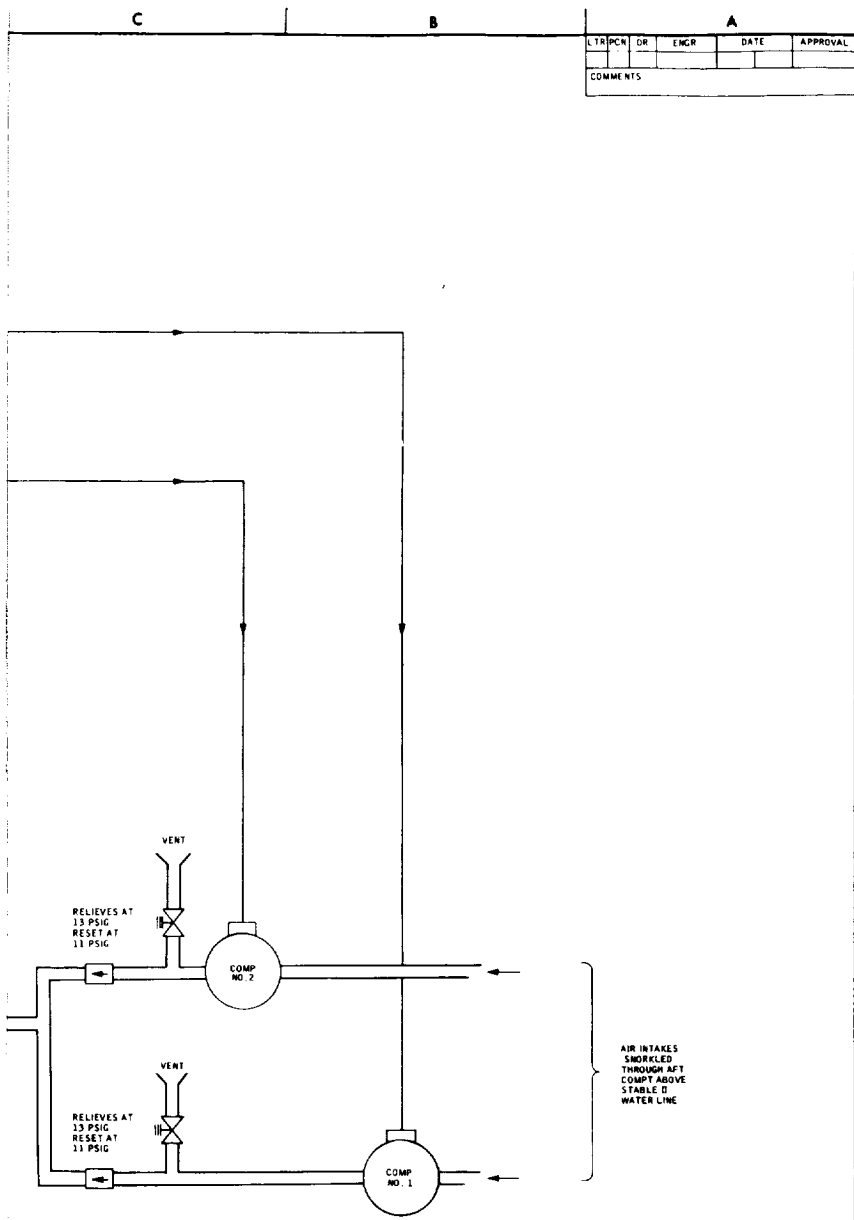






FOLDOUT FRAME 3





3. APPROXIMATE TIME TO UPRIGHT
  - 1 COMPRESSOR, 3 BAGS - 12 MINUTES
  - 2 COMPRESSOR, 3 BAGS - 5 MINUTES
  - 2 COMPRESSOR, 2 BAGS - 10 MINUTES
2. BAG CAPACITY
  - Y 43 IN DIA @ 24 CUBIC FEET
  - Y 43 IN DIA @ 24 CUBIC FEET
  - Z 34 IN DIA @ 12 CUBIC FEET

NOTES: 1. THIS DRAWING SHOWS BOTH SYSTEM A AND SYSTEM B OF THE COMMAND MODULE UPRIGHTING SYSTEM

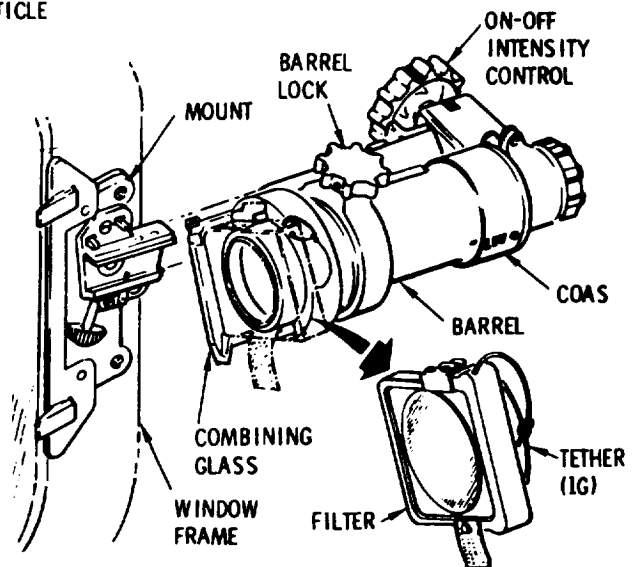
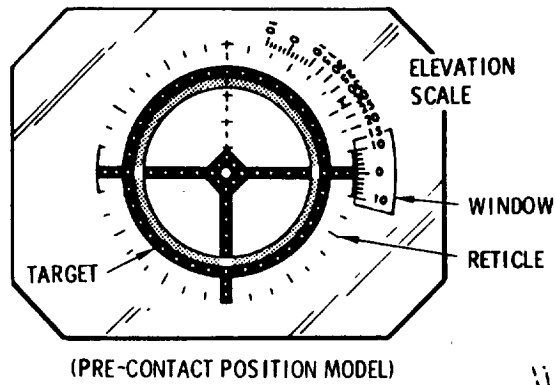
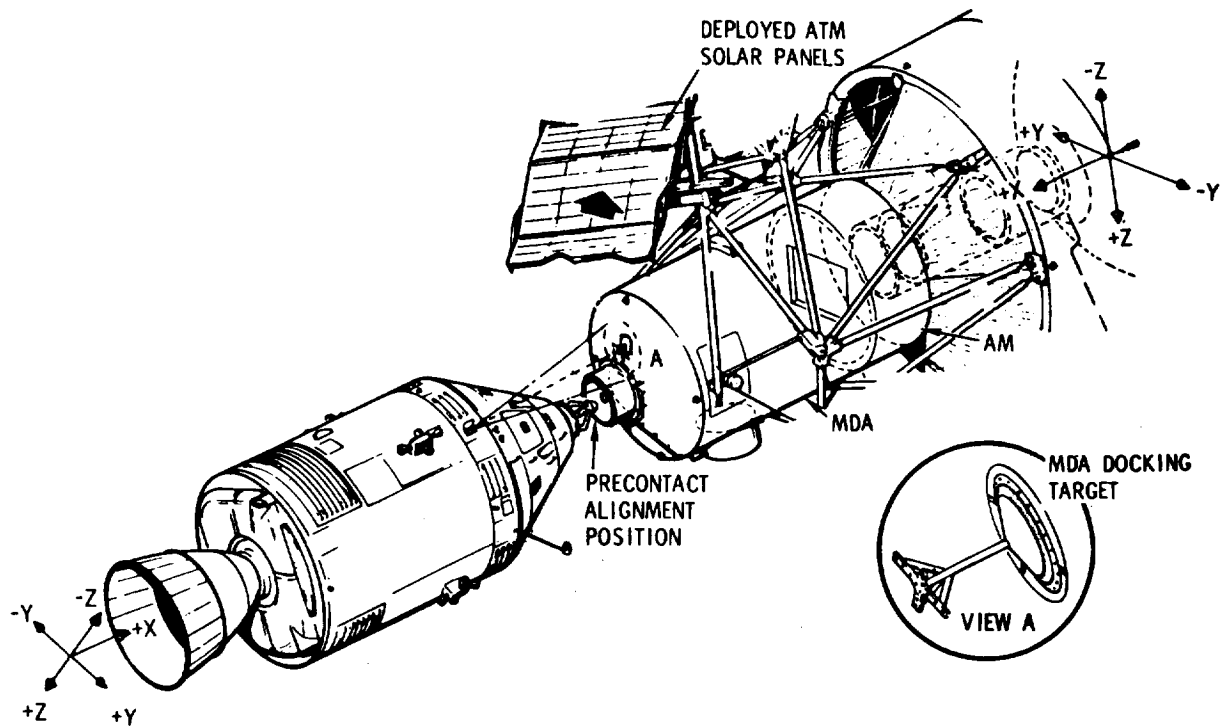
# 6 UPRIGHTING

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION	
DR	<i>[Signature]</i>	12-2-73	MANNED SPACECRAFT CENTER - HOUSTON TEXAS	
DSCR				
DC				
ENGR	<i>[Signature]</i>	12/1/73	<b>SEQUENTIAL UPRIGHTING SYSTEM</b>	
APP	<i>[Signature]</i>	12/1/73		
APR	<i>[Signature]</i>	12/1/73		
STC	<i>[Signature]</i>	12-1-73		
			SKYLAB CSM	OWC NO
			116 THRU 119	2.6
			34 X 66	PAGE 2-6 SHEET 1 OF 1

FOLDOUT FRAME 4

2025-01-15  
10:00 AM  
10:00 AM

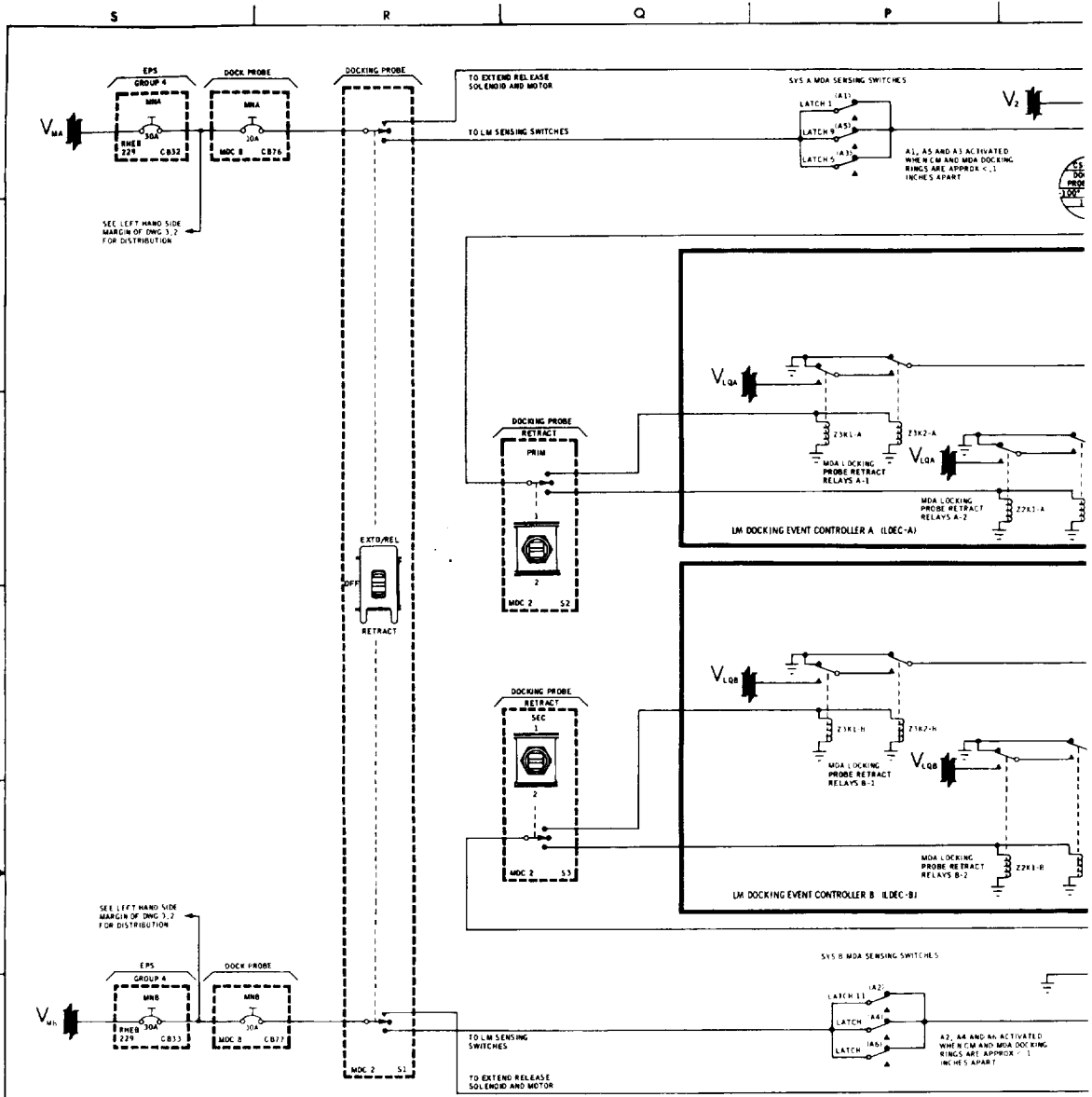




CREWMAN OPTICAL ALIGNMENT SIGHT SYSTEM  
APRON ITEM DWG NO 2.7

**EXPLODED FRAME**



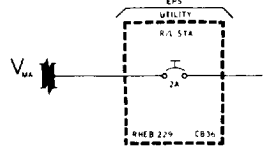


	DOCKING PROBE EXT/REL-RET SWITCH POSITION	NORMAL EXTENSION FROM >10 INCHES	PROBE < 3/4 IN	PROBE > 3/4 IN < 10 IN	NO PROBE POWER	PROBE > 10 IN BUT CAPTURE LATCHES NOT CLOSED
EXTENSION	EXTD					
	OFF					
	RET					
	SHOCK	YES	NO	NO	NO	YES

	DOCKING PROBE EXT/REL-RET SWITCH POSITION	NORMAL PRIOR TO CAPTURE	NORMAL AT CAPTURE
CAPTURE	EXTD		
	OFF		
	RET		
	SHOCK	NO	YES

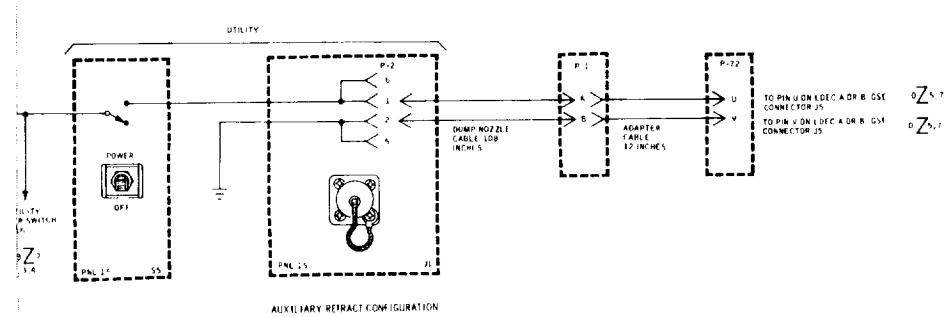
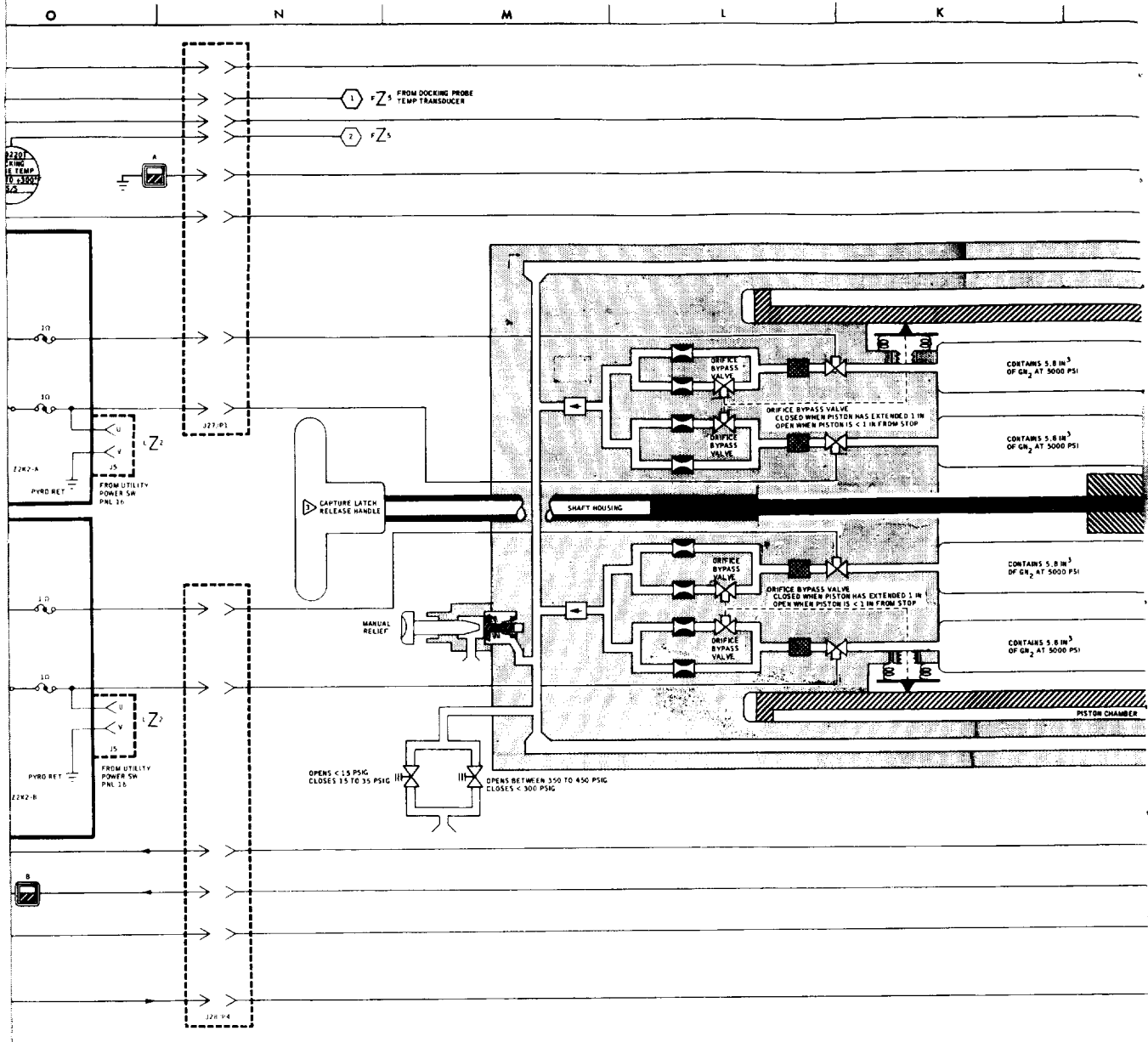
	DOCKING PROBE EXT/REL-RET SWITCH POSITION	NORMAL RE TRACTION (MDC OFF ELM)
RETRACTION	EXTD	
	OFF	
	RET	
	SHOCK	YES

\* DO NOT PLACE SWITCH IN THIS POSITION

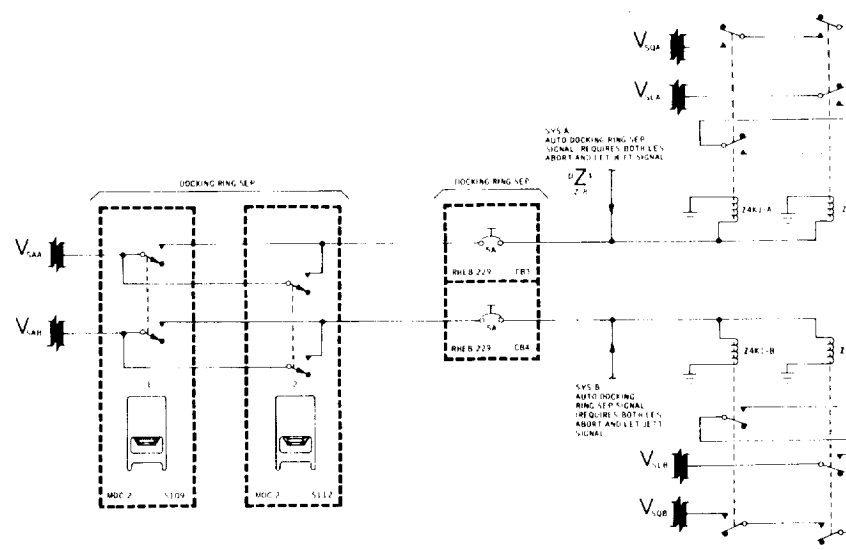
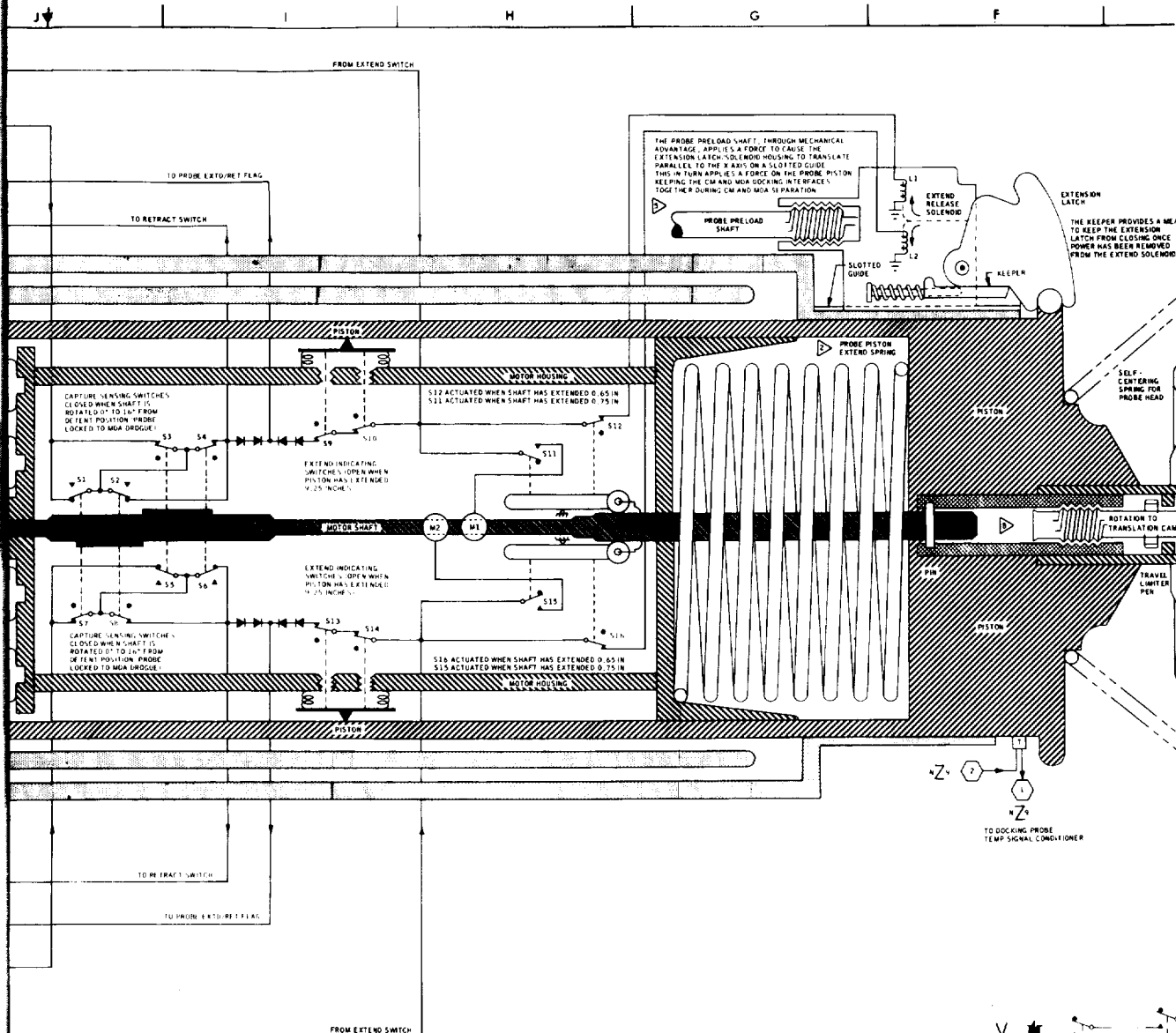


TO UT POWER PNL







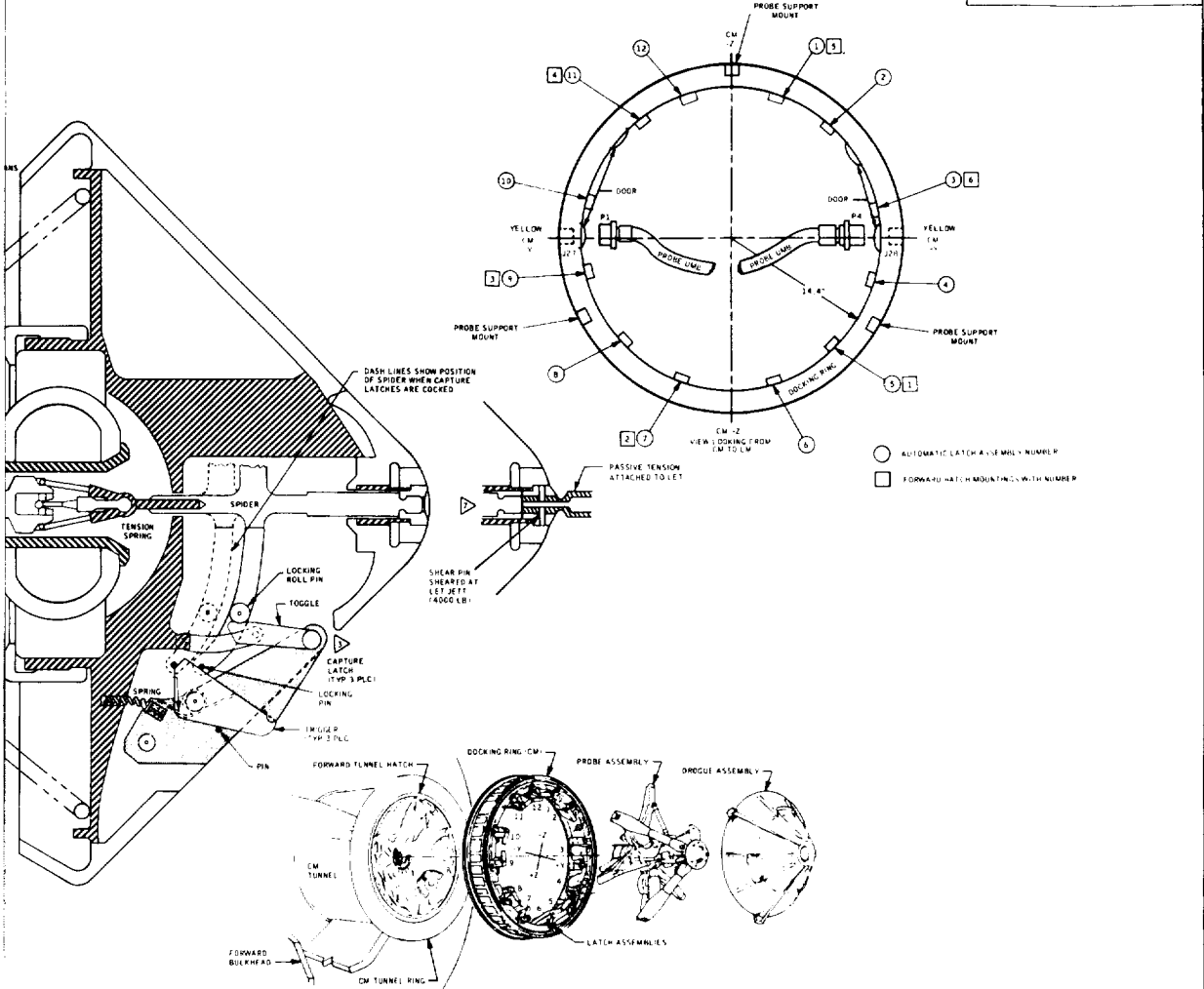


FOLDOUT FRAME 4





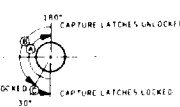
CTR	PCN	OR	ENGR	DATE	APPROVAL
COMMENTS					



- ▶ THE CAPTURE LATCHES ARE LOCKED PRIOR TO OFF-LOAD INSTALLATION OF THE PASSIVE TENSION PIN.
- A. FOR LOCATION AND ELECTRIC CONTROL OF LIGHT AND TARGET SEE DRAWING W SECTION 11.
- ▶ CSM/LM SEPARATION IS ACCOMPLISHED BY THE CREW APPLYING A PRELOAD ON THE EXTENSION SHAFT BY MEANS OF A PERMANENTLY INSTALLED TORQUE PRELOAD HANDLE. WHEN A PRELOAD HAS BEEN APPLIED AT THE INTERFACE, THE CREW WILL MANUALLY RELEASE AND COCK THE 12 AUTOMATIC DOCKING LATCHES. AFTER THE FORWARD FUNNEL HATCH HAS BEEN INSTALLED, THE CREW WILL PLACE THE EXTEND/RETRACT SWITCH MODE 2 TO THE EXTEND POSITION TO EFFECT CSM/LM DODGING.
- A. DRIFF BYPASS VALVE
- ▶ DURING THE LAST ONE INCH OF THE RETRACT CYCLE, THE DRIFF BYPASS VALVE WILL BE OPEN ALLOWING THE PRESSURE CHAMBER TO BUILD UP TO 250 PSIG.
- ▶ CAPTURE LATCHES MOTOR SHAFT
- A. THE CAPTURE LATCHES ARE UNLOCKED BY THE MOTOR ROTATING THE MOTOR SHAFT FROM 0° TO 180° CLOCKWISE WHEN THE EXTEND/RETRACT SWITCH(S) MODE 2 IS PLACED IN THE EXTEND POSITION AND PROBE HAS TRAVELED 3/4 INCH.
  - 1) THE MOTOR SHAFT APPLIES A TORQUING MOMENT TO THE ROTATION TO TRANSLATION CAM. THE ADDITION 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 TRIGGER (COCKS THE CAPTURE LATCHES).
  - 2) THE MOTOR SHAFT IS KEPT IN A COCKED POSITION BY THE LOCKING PIN. PREVENTS THE TENSION SPRING FROM ROTATING THE SHAFT COUNTerclockwise UNTIL THE PROBE HEAD AND LM/DROGUE MAKE PHYSICAL CONTACT CAPTURE.
  - 3) AN INDICATION THAT THIS HAS OCCURRED IS THAT THE PROBE EXTEND A AND B PEGS ON MODE 2 WILL CHANGE FROM GRAY TO BARBER.
- 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, ALLOWING THE TENSION SPRING TO DRIVE THE SHAFT BACK TO 0°.
  - 1) AN INDICATION THAT THIS HAS OCCURRED IS THE PROBE EXTEND A AND B PEGS ON MODE 2 CHANGE FROM GRAY TO BARBER POLE.
  - 2) IF THE EXTEND/RETRACT SWITCH(S) MODE 2 HAS PREVIOUSLY BEEN PLACED IN THE RETRACT POSITION, AN AUTOMATIC GAS RETRACTION WILL OCCUR IF THE DOCKING PROBE RETRACT PRIM OR SEC SWITCH(S) MODE 2 IS AND IS HAVE BEEN PLACED TO AN UNUSED BOTTLE POSITION.
- C. THE SHAFT RETURNS TO 180° FROM DETENT WHEN THE CREW ROTATES THE CAPTURE LATCH RELEASE HANDLE CLOCKWISE TO REMOVE THE PROBE UNDOCKS THE CAPTURE LATCHES.
- ▶ THE PROBE PISTON SPRING ACTS AS A PRELOAD TO EXTEND THE PROBE ONCE THE PROBE EXTEND LATCH RELEASE SOLENOID HAS BEEN ENERGIZED. THE PROBE EXTENSION LATCH IS ENERGIZED BY PLACING THE EXTEND/RETRACT SWITCH (MODE 2) TO THE EXTEND POSITION. IN THE RETRACTED POSITION, THE PROBE PISTON EXERTS A FORCE OF 130 LBS ON THE PROBE ASSEMBLY AND 700 LBS WHEN EXTENDED TENCHES.

NOTES: 1. SYSTEM A AND B OF THE DOCKING PROBE AND RELATED ELECTRONIC COMPONENT'S SHOWN.

- 9. MID RADIAL LOCKING POINT IDENTICAL TO AXIAL EXCEPT IT DOES NOT HAVE POWER TRANSFER CAPABILITY.
- ▶ TRANSLATION TO ROTATION CAM DESCRIPTION
- A. THE MOTOR SHAFT TURNS THE CAM 180° FROM 0° TO UNLOCK THE CAPTURE LATCHES, PULLING THE TENSION SPRING UP.
- B. WHEN FORCE IS RELEASED FROM THE MOTOR, A TORSION SPRING PULLS THE CAM BACK TO 10° FROM 0° (COCKING THE CAPTURE LATCHES).
- C. WHEN THE THREE TRIGGERS ARE DEPRESSSED AT DROGUE CAPTURE, THE TORSION SPRING DRIVES THE CAM BACK TO 0°.



# 7 DOCKING

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION	
DESIGN		02/27/70	MANNED SPACECRAFT CENTER - HOUSTON, TEXAS	
ENGR				
APP				
CHK				
			<b>DOCKING PROBE</b>	
			SKYLAB 5M	27
			110 THRU 119	
			004 N.Y. 30.25	PAGE 2-7 SHEET 1 OF 1



3 ELECTRICAL  
SYSTEM

1

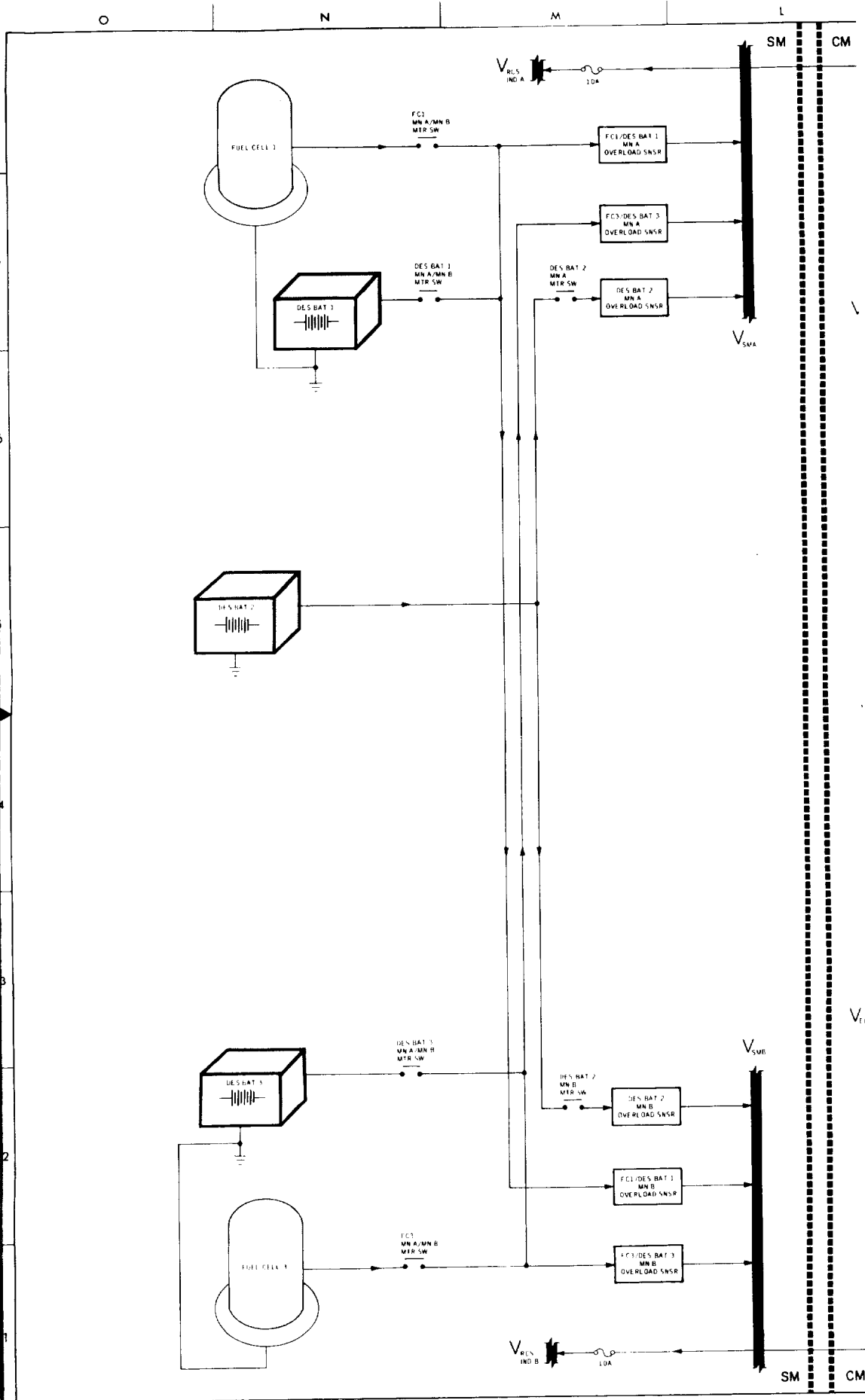
2

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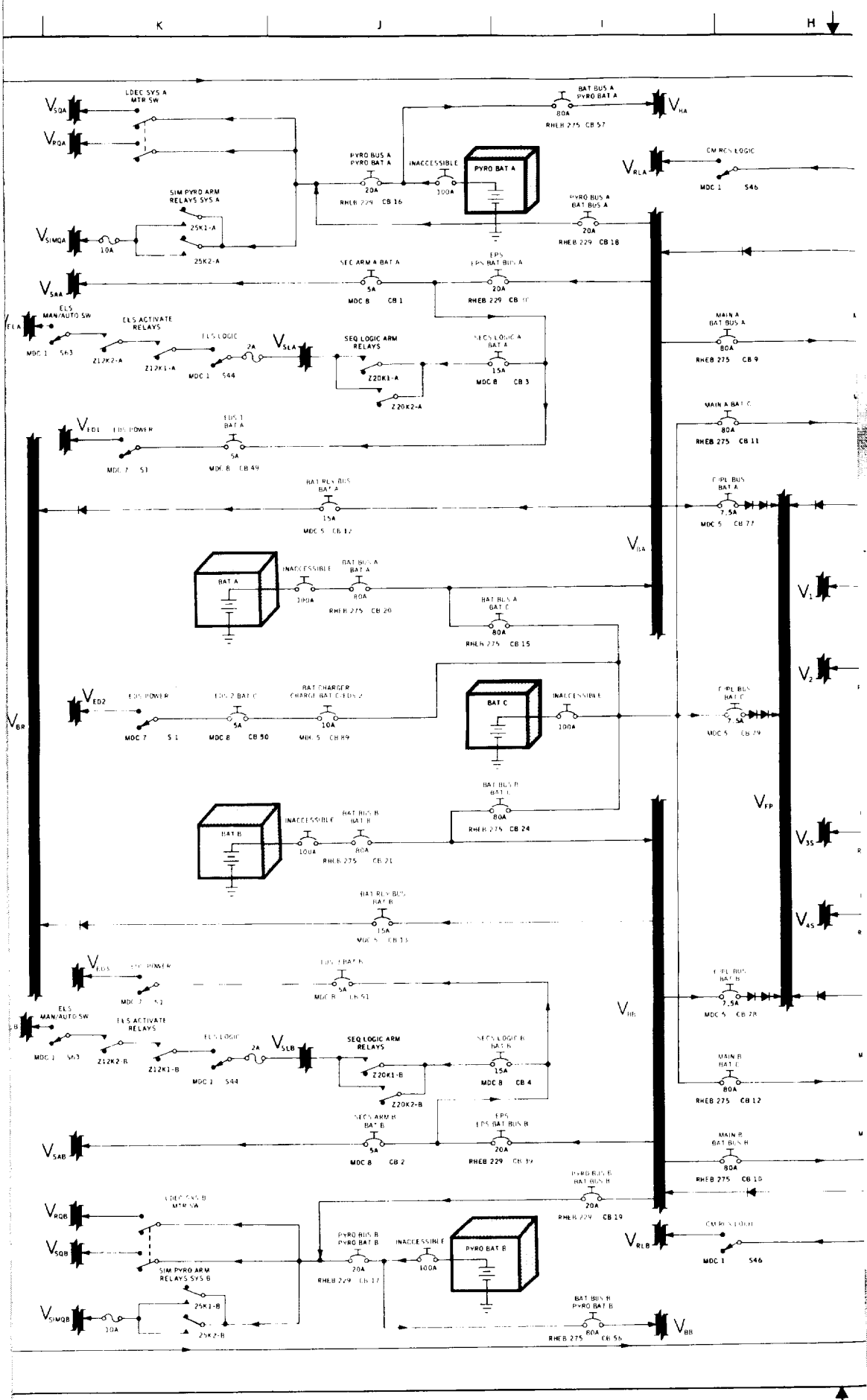
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6



**FOLDOUT FRAME**

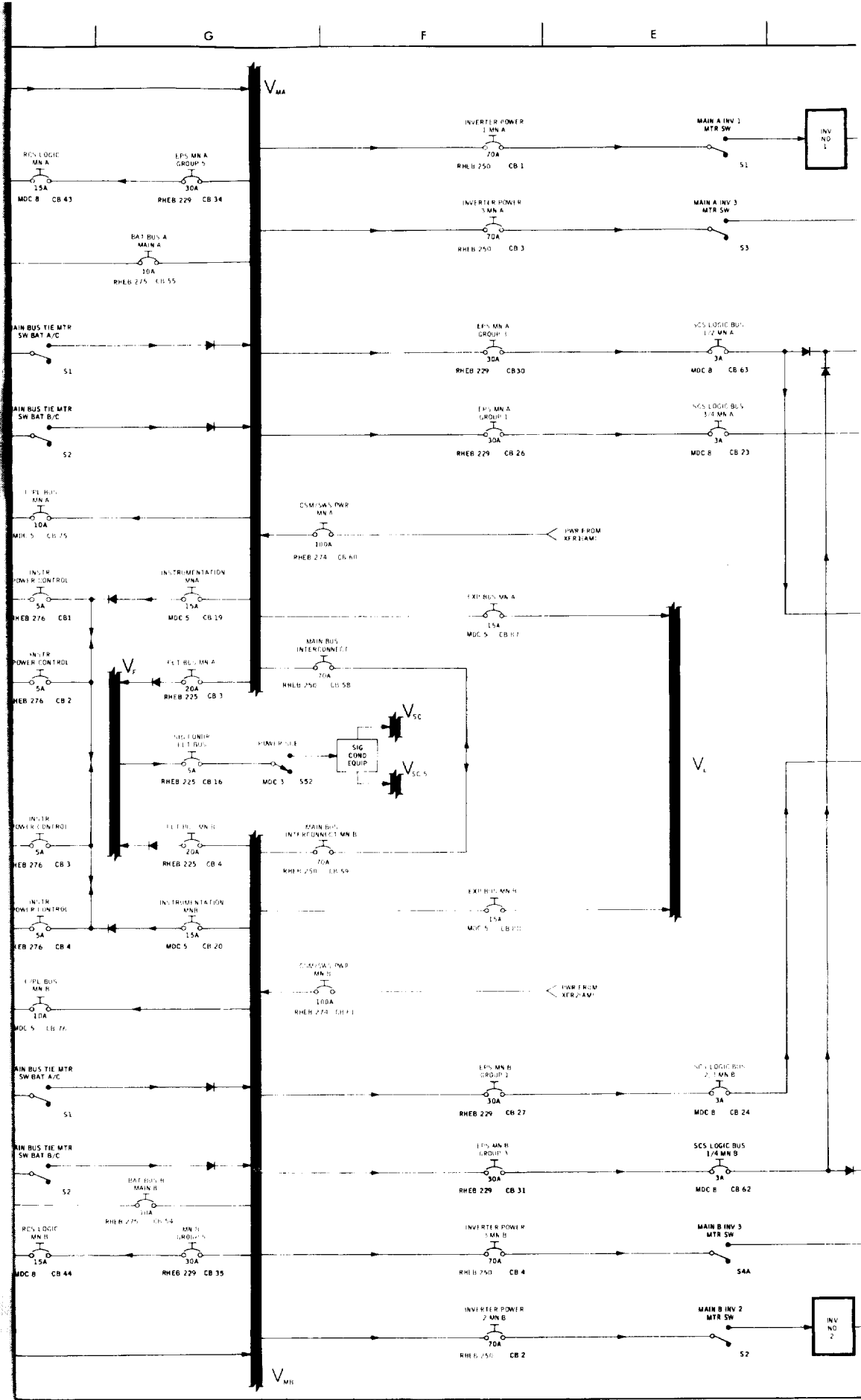
10/10/2020



FOLDOUT FRAME 2

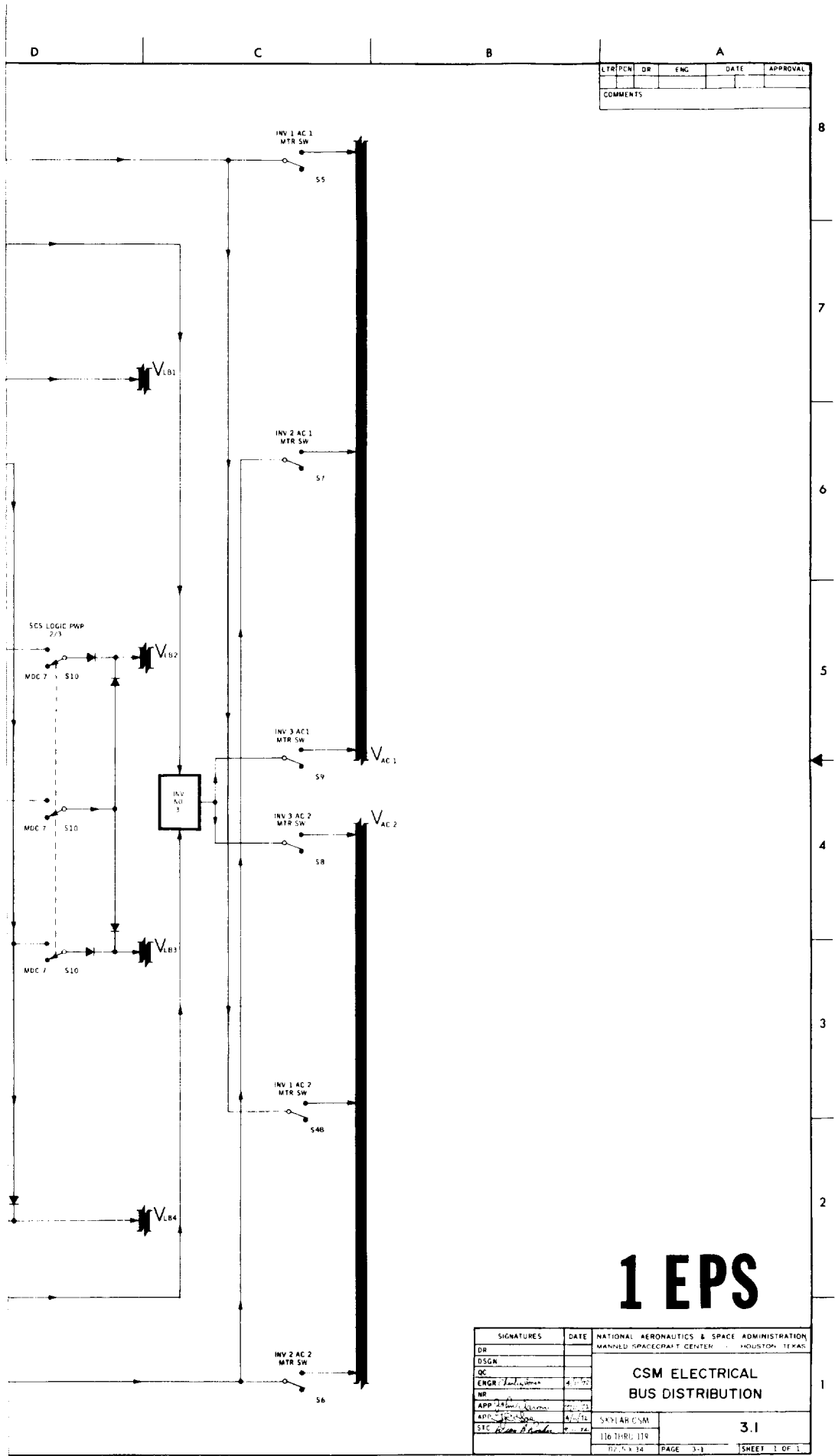






**FOLDOUT FRAME 3**





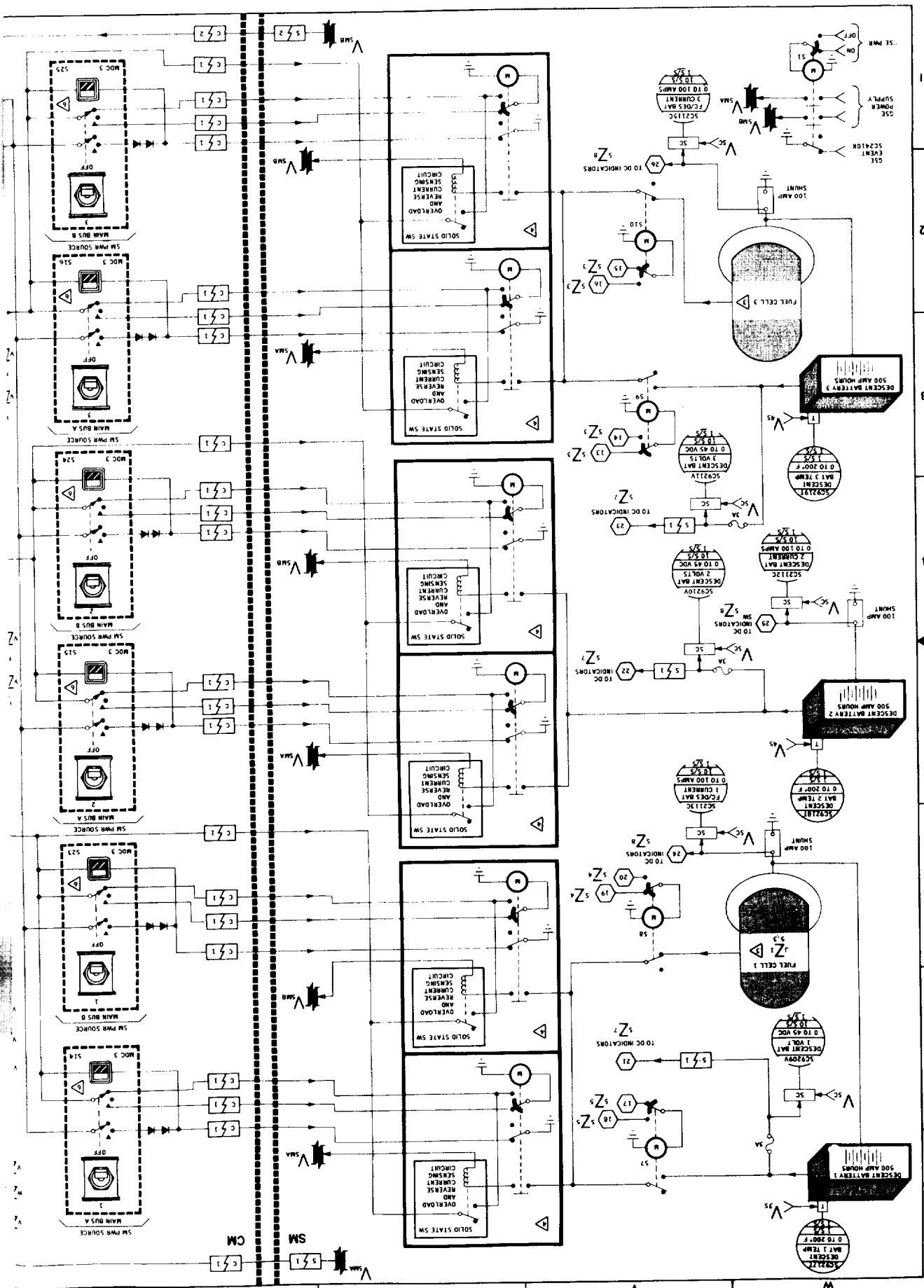
LT/PCW	DR	ENG	DATE	APPROVAL
COMMENTS				

# 1 EPS

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
DR			<b>CSM ELECTRICAL BUS DISTRIBUTION</b>  3.1	
DSGN				
QC				
ENGR	<i>[Signature]</i>	4/1/72		
NR				
APP	<i>[Signature]</i>	7/20/73	SAXLAR CSM	
APPC	<i>[Signature]</i>	8/2/73	110-3181-119	
STC	<i>[Signature]</i>	6/2/72		
			PAGE 3-1	SHEET 1 OF 1

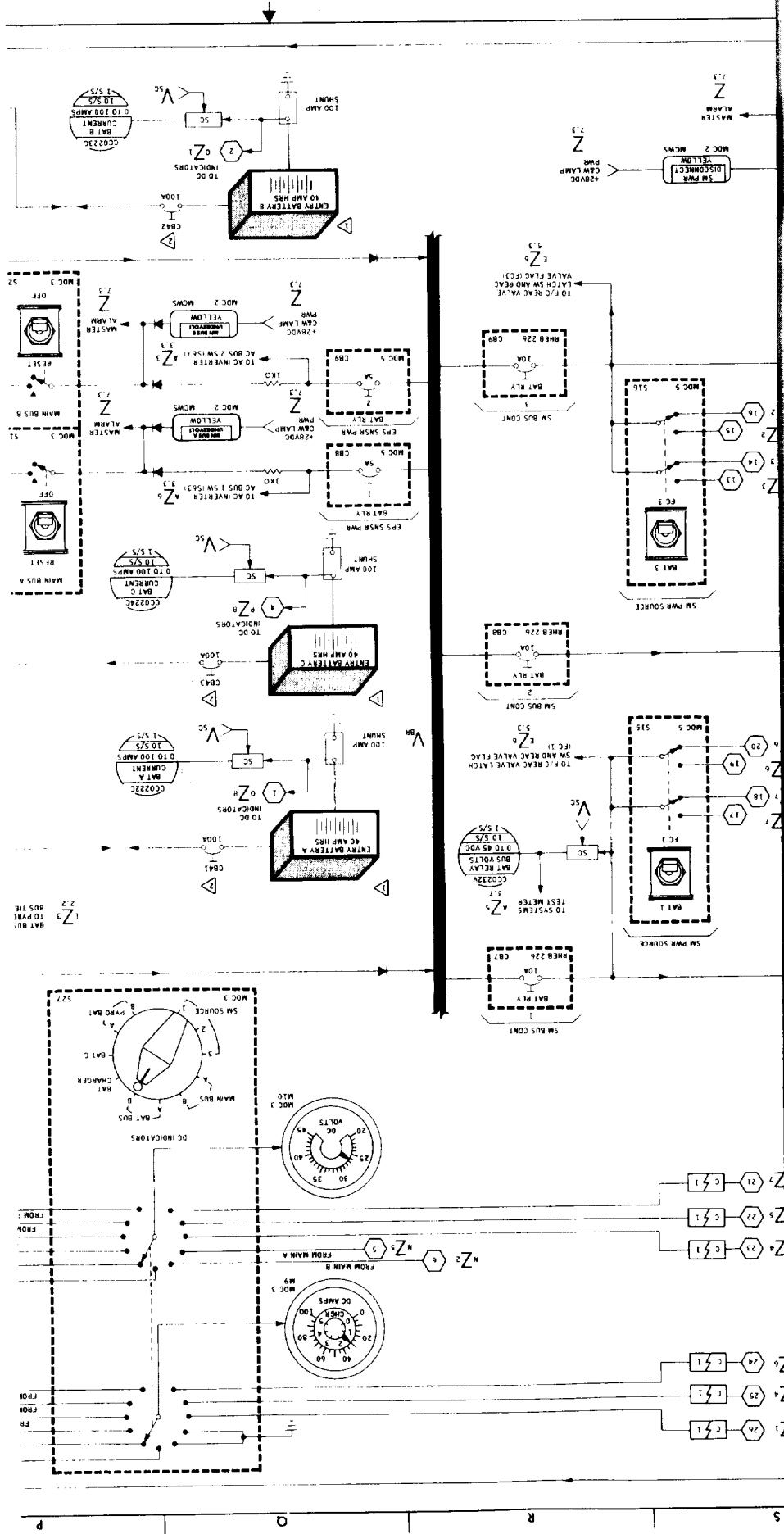
FOLDOUT FRAME 4





FOLDOUT FRAME

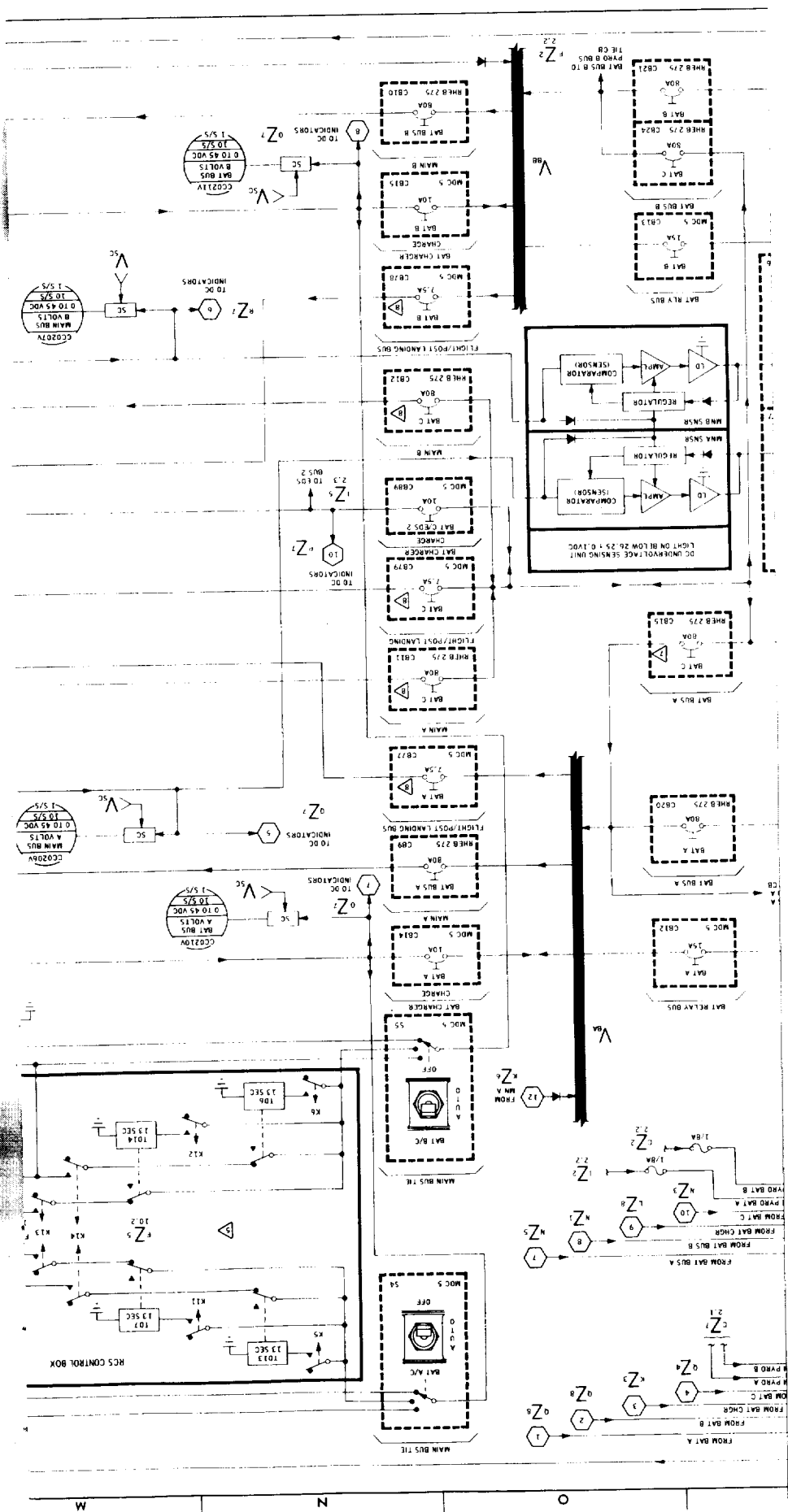




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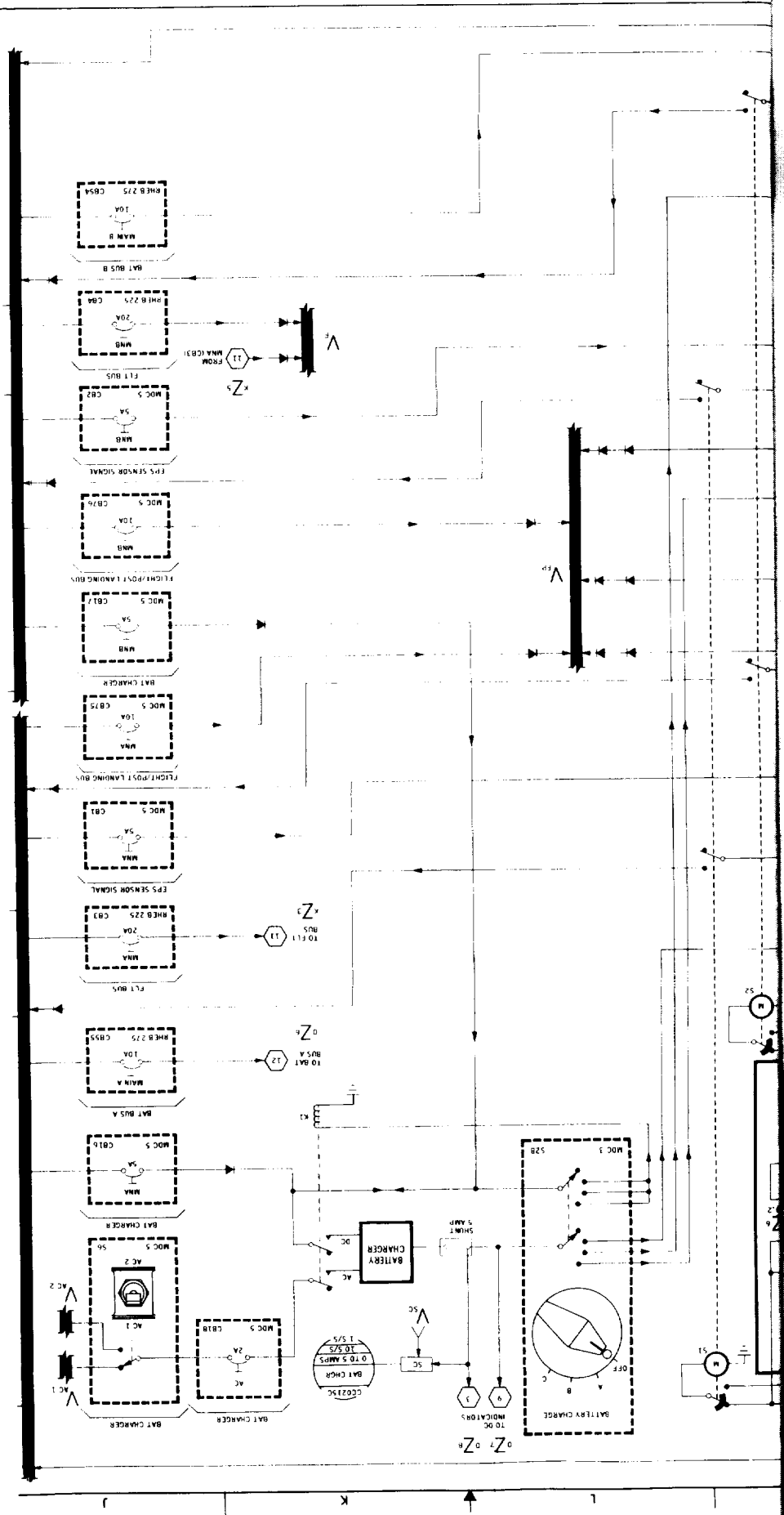






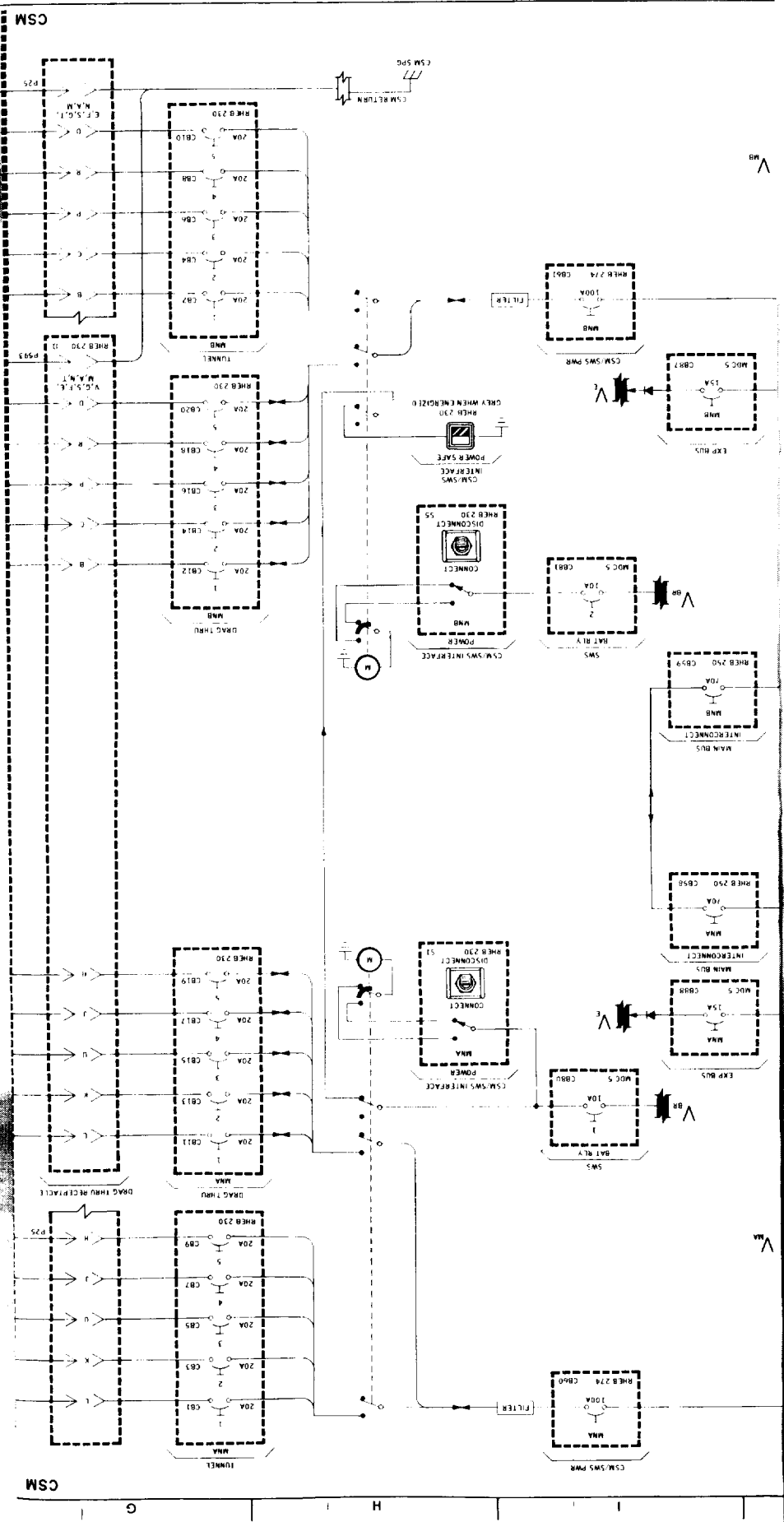
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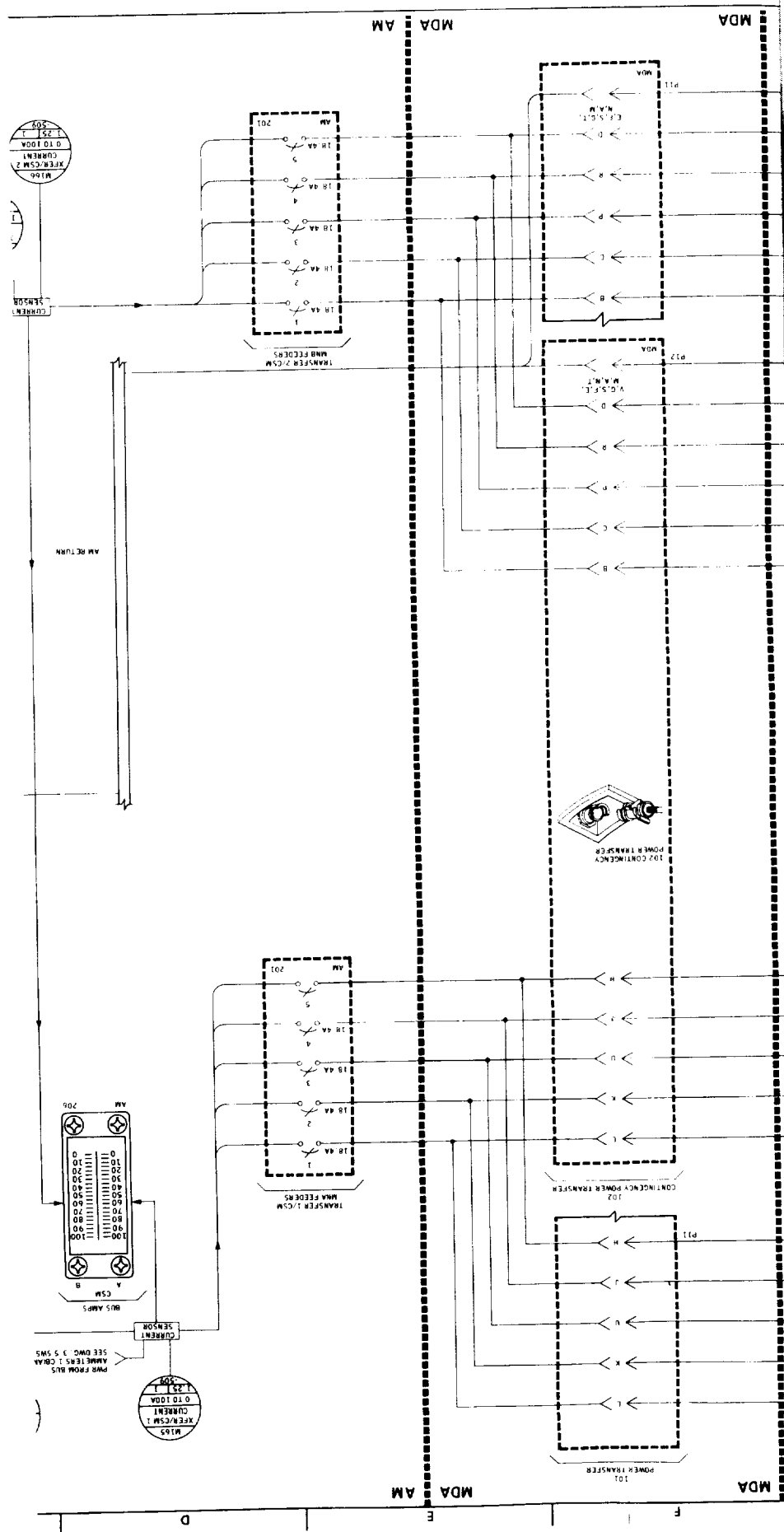
FOLDOUT FRAME 4





FOLDOUT FRAME 5





FOLDOUT FRAME 6

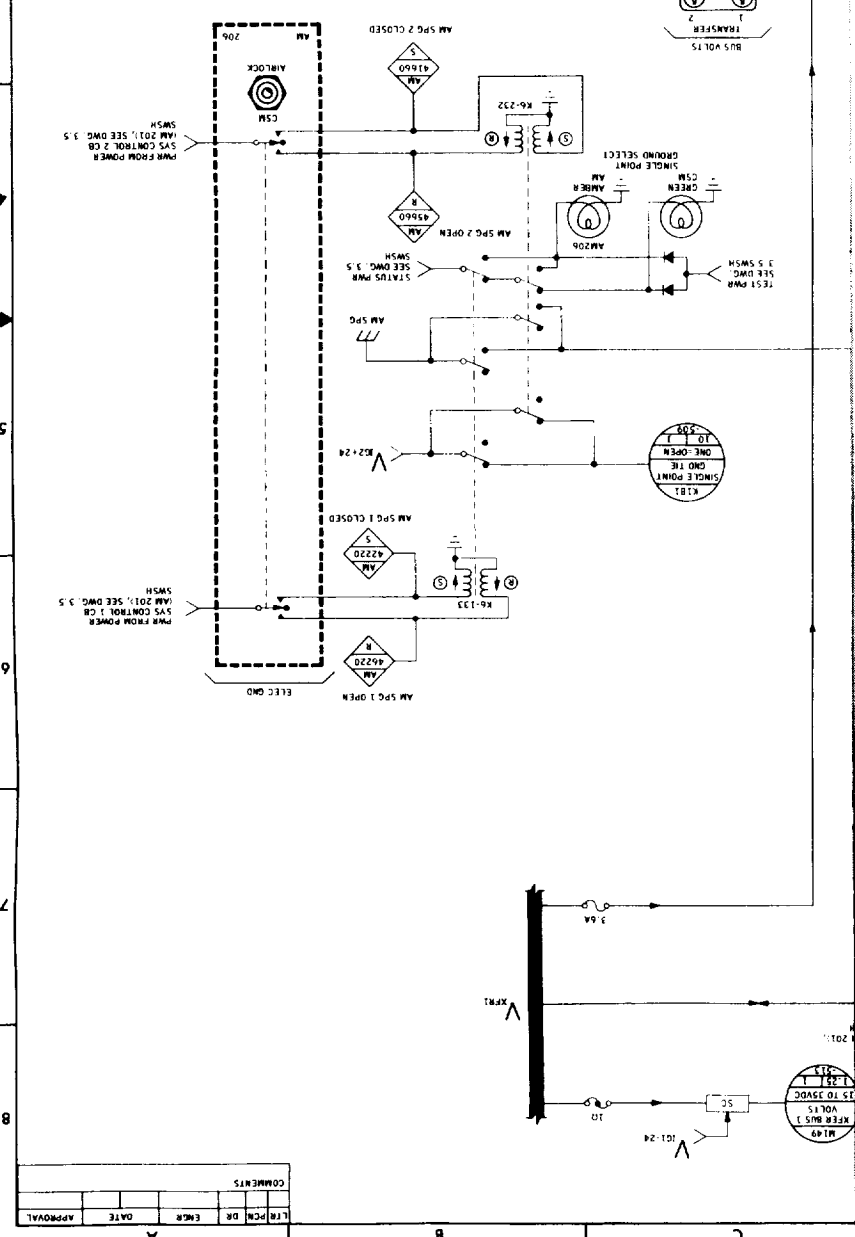




DATE	2-7-72	DR	M. J. ...
DESIGN	2-7-72	DR	M. J. ...
TECH	...	...	...
APP	...	...	...
CHK	...	...	...
SFC	...	...	...
160 THRU 119	...	...	...
126, 5, X 3A	...	...	...
WGT	3-2	...	...
SHEET 1	OF 1	...	...

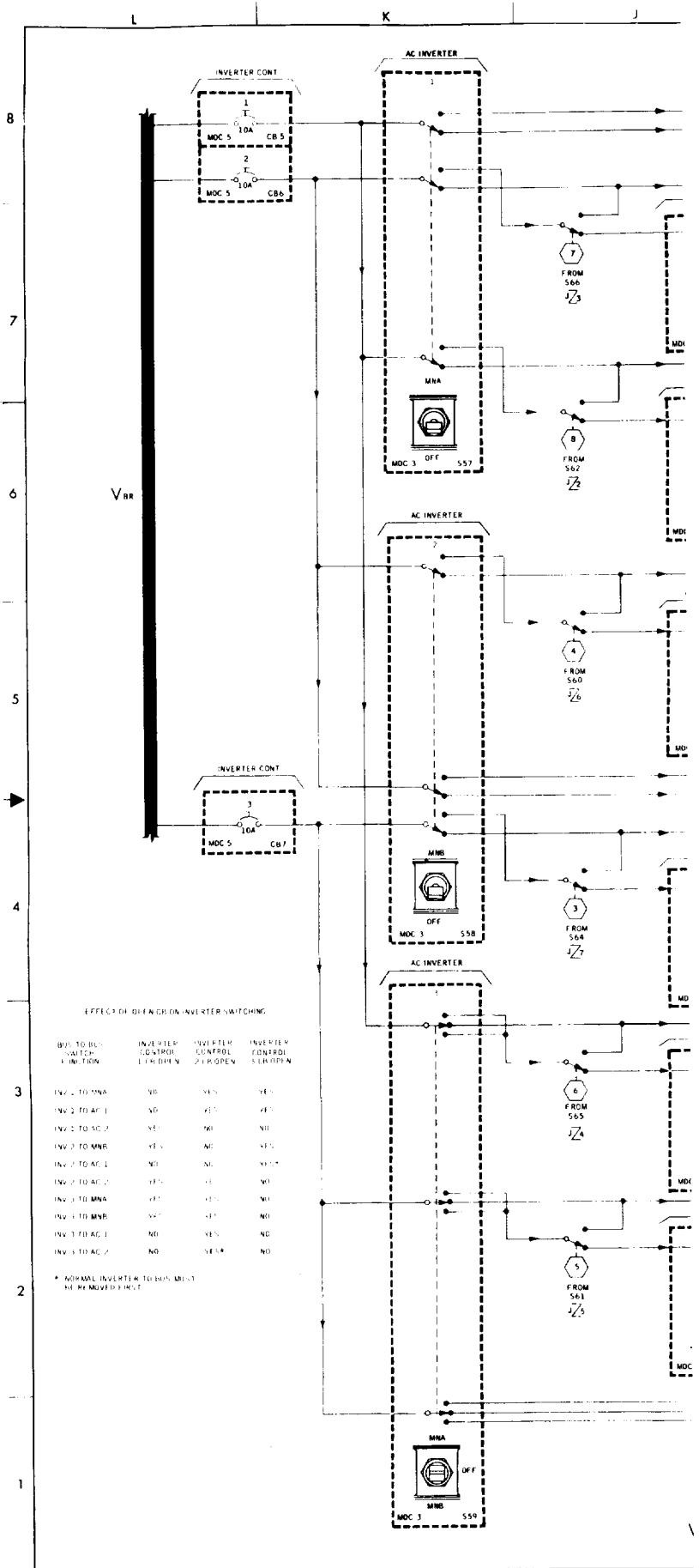
**ELECTRICAL DIRECT CURRENT DISTRIBUTION AND CONTROL SYSTEM**

- NOTES**
- ▷ NORMALLY OPEN UNIT
  - ▷ NORMALLY OPEN UNLESS INDICATED OTHERWISE
  - ▷ BATTERY MALFUNCTION
  - ▷ BATTERY VENT PRESS. ON BUS
  - ▷ CELL DEF. BUS, WHITE (GRAY)
  - ▷ INDICATES FUEL CELL ON BUS
  - ▷ RELAYS AND KIDS AND KID CLOSE AT CM/SM DEP. SEE 10.3
  - ▷ FUEL CELL DISCONNECT
  - ▷ FUEL CELL DISCONNECT > 4 AMPS
  - ▷ REVERSE CURRENT > 4 AMPS
  - ▷ FROM TAILS OF FUEL CELL
  - ▷ SEE DMC 5.3
  - ▷ CM/SM DEP. AND CR43 ARE INACCESSIBLE
  - ▷ BATTERY VENT PRESS. ONBOARD
  - ▷ READOUT SHOWN ON 4.5



APPROVAL	DATE	EMGR	DR	TECH





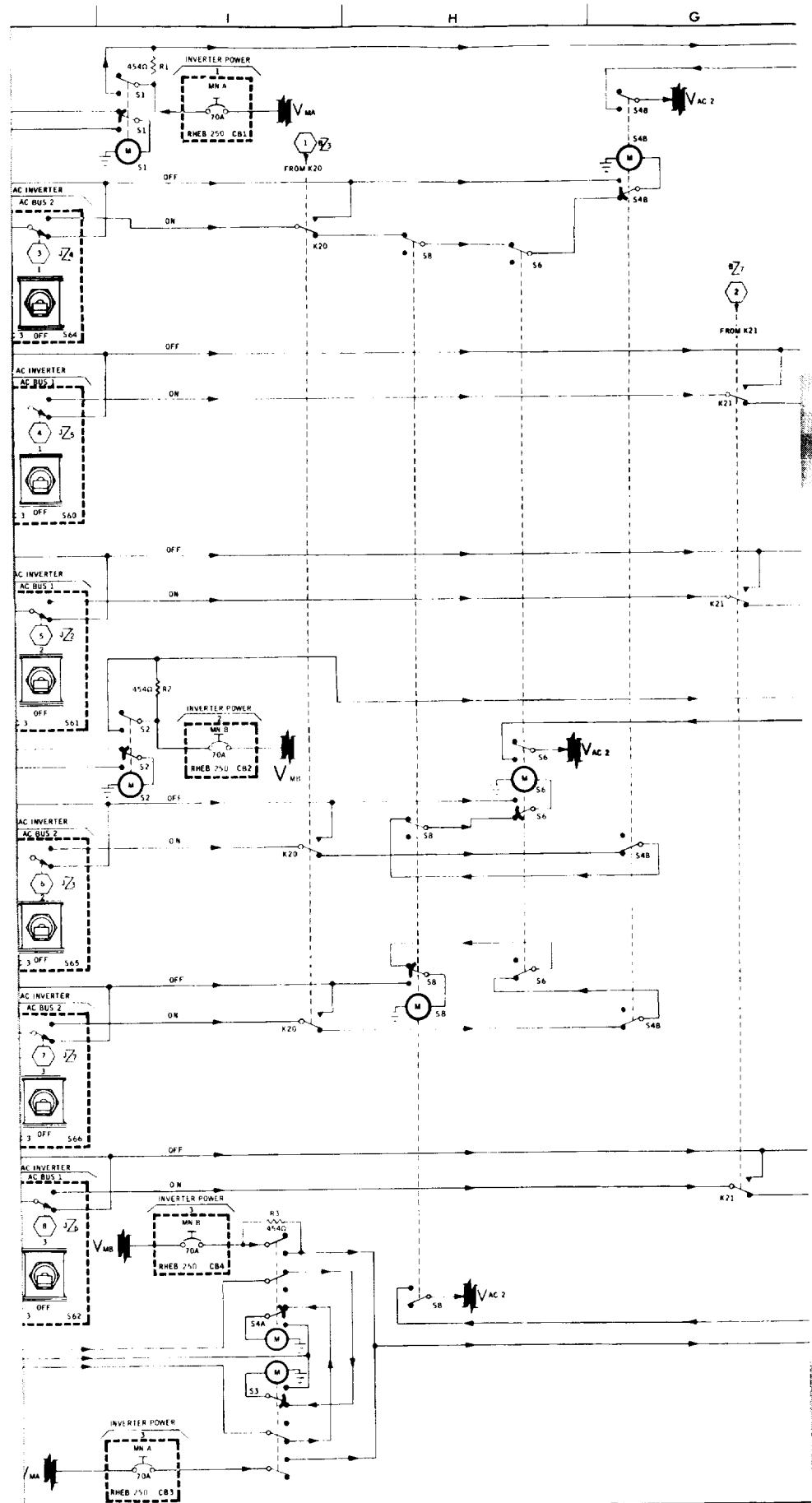
EFFECT OF OFF POSITION ON INVERTER SWITCHING

BUSS TO BUS SWITCH POSITION	INVERTER CONTROL 1 POSITION	INVERTER CONTROL 2 POSITION	INVERTER CONTROL 3 POSITION
INV 1 TO MNA	NO	YES	YES
INV 2 TO AC 1	NO	YES	YES
INV 2 TO AC 2	YES	NO	NO
INV 2 TO MNB	YES	NO	YES
INV 2 TO AC 1	NO	NO	YES
INV 2 TO AC 2	YES	YES	NO
INV 3 TO MNA	YES	YES	YES
INV 3 TO MNB	YES	YES	NO
INV 3 TO AC 1	NO	YES	NO
INV 3 TO AC 2	NO	YES	NO

\* NORMAL INVERTER TO BUS MUST BE RE-MANUALLY RESET

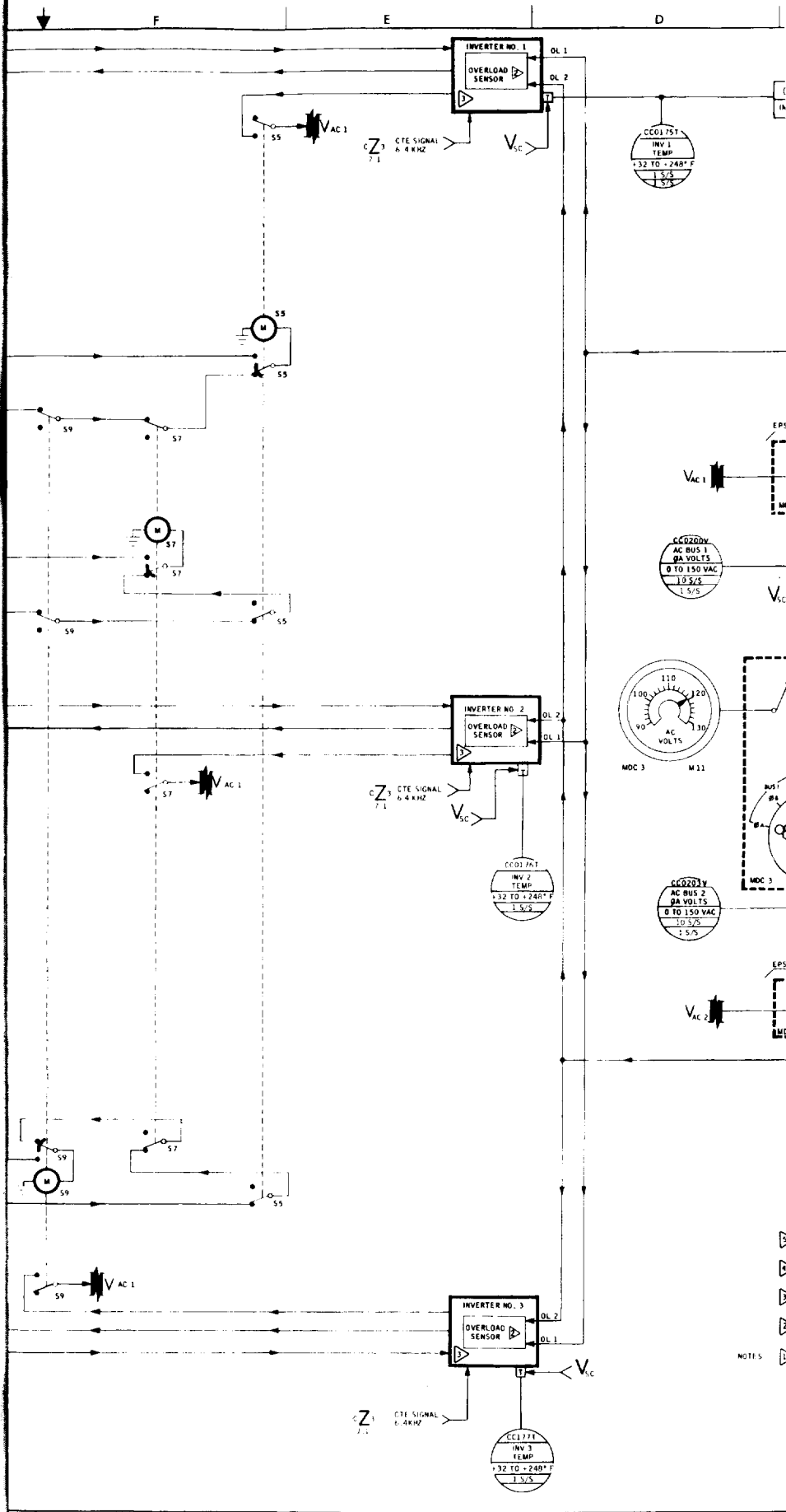
FOLDOUT FRAME





FOLDOUT FRAME 2

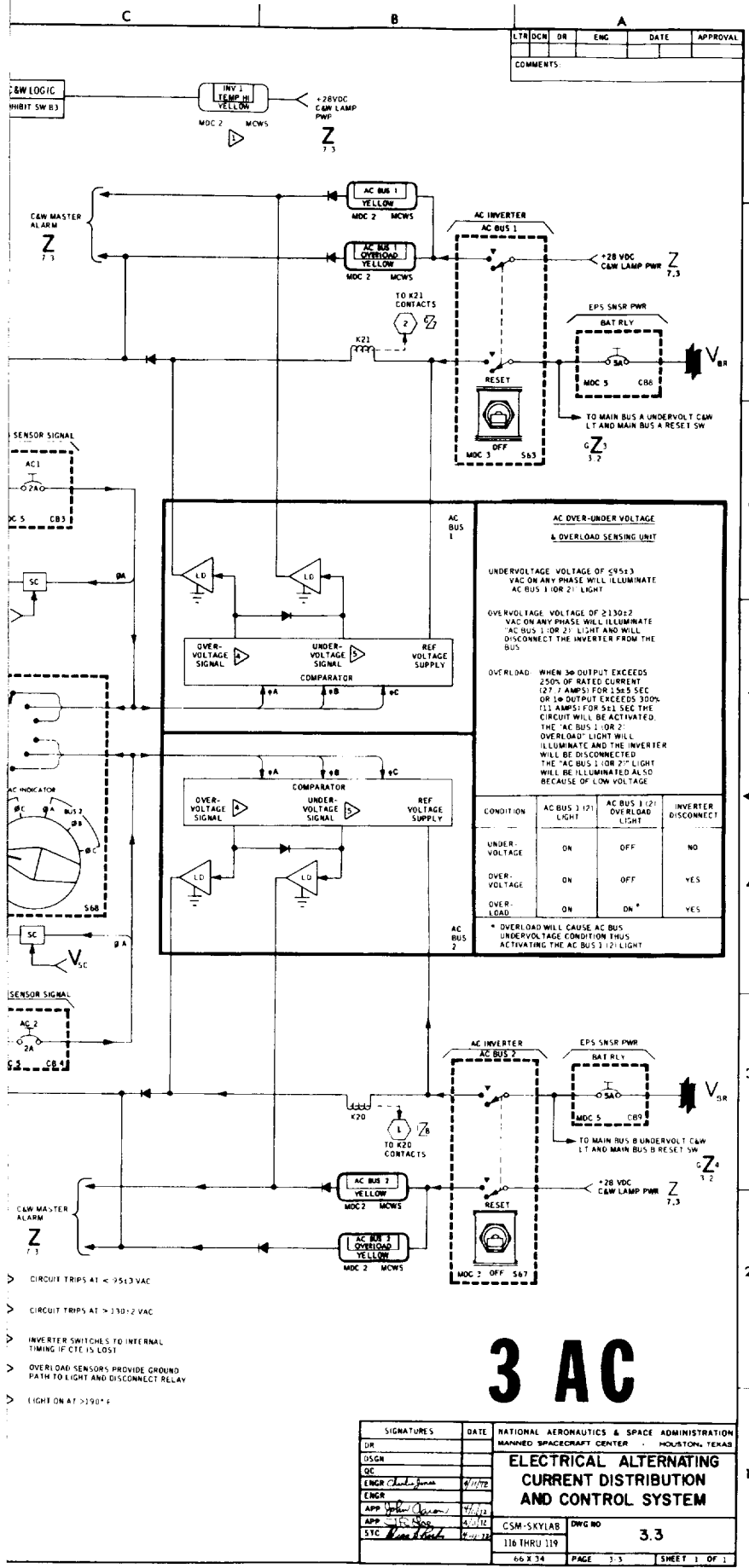




NOTES







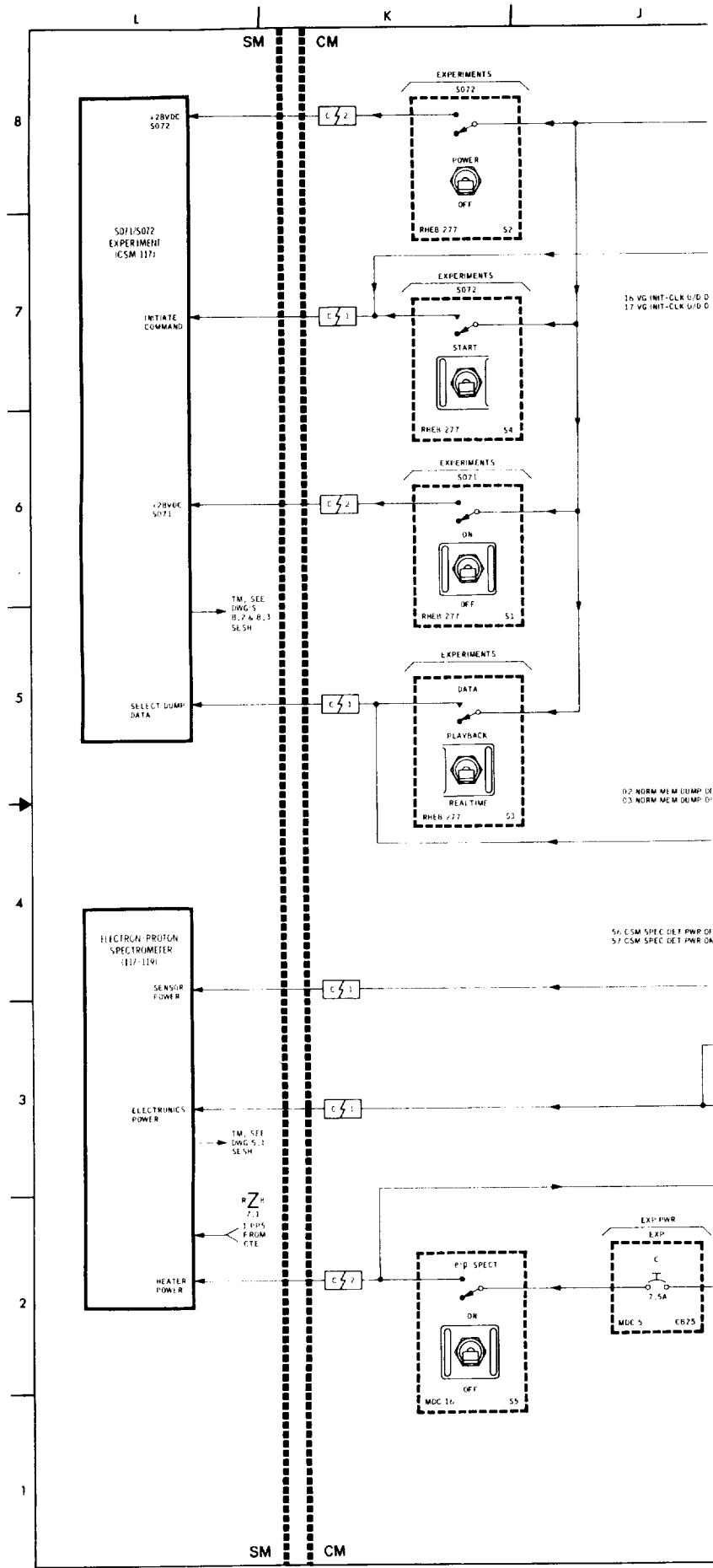
- > CIRCUIT TRIPS AT  $< 95 \pm 3$  VAC
- > CIRCUIT TRIPS AT  $> 130 \pm 2$  VAC
- > INVERTER SWITCHES TO INTERNAL TIMING IF CTE IS LOST
- > OVERLOAD SENSORS PROVIDE GROUND PATH TO LIGHT AND DISCONNECT RELAY
- > LIGHT ON AT  $> 190^\circ \text{F}$

# 3 AC

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION	
DR			MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
OSGN			<b>ELECTRICAL ALTERNATING CURRENT DISTRIBUTION AND CONTROL SYSTEM</b>	
QC				
ENGR	<i>Charles Jones</i>	9/11/72	CSM-SKYLAB DWG NO	
APP	<i>John Jones</i>	9/11/72	116 THRU 119	
APP	<i>JES</i>	9/11/72	3.3	
SYC	<i>John Jones</i>	9/11/72	66 X 34 PAGE 3-3 SHEET 1 OF 1	

FOLDOUT FRAME 4

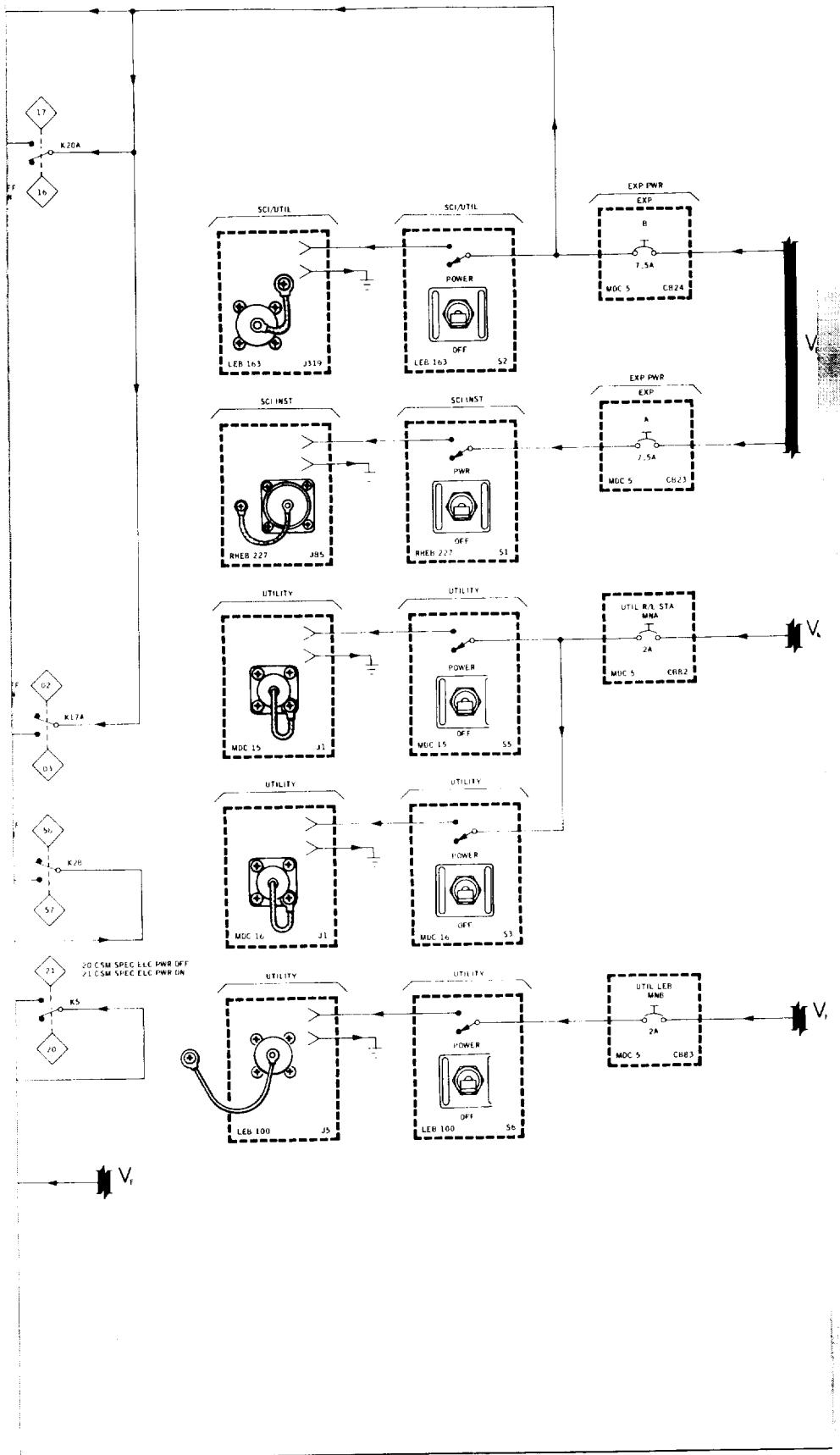




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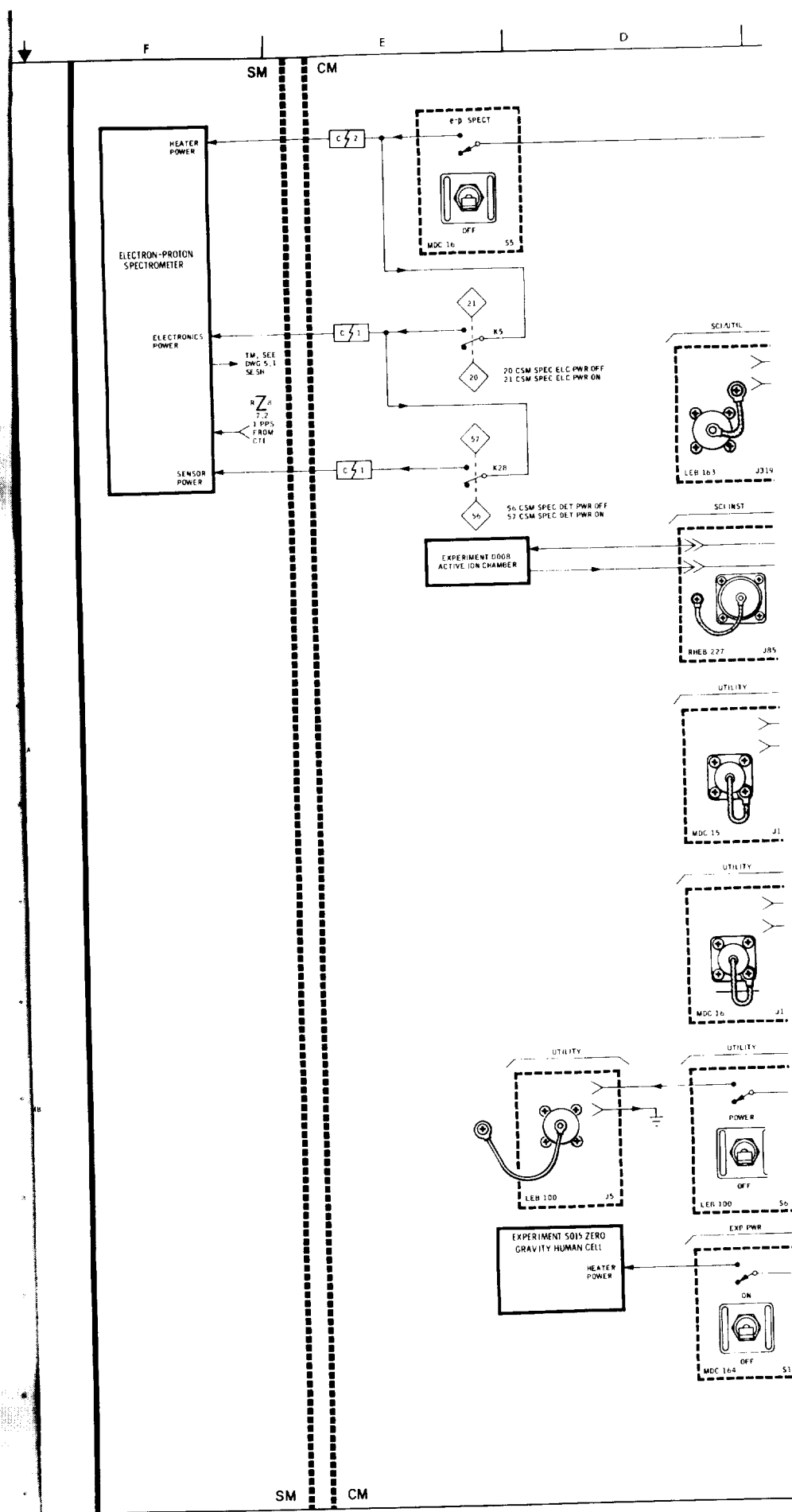


CSM 117, 118 & 119



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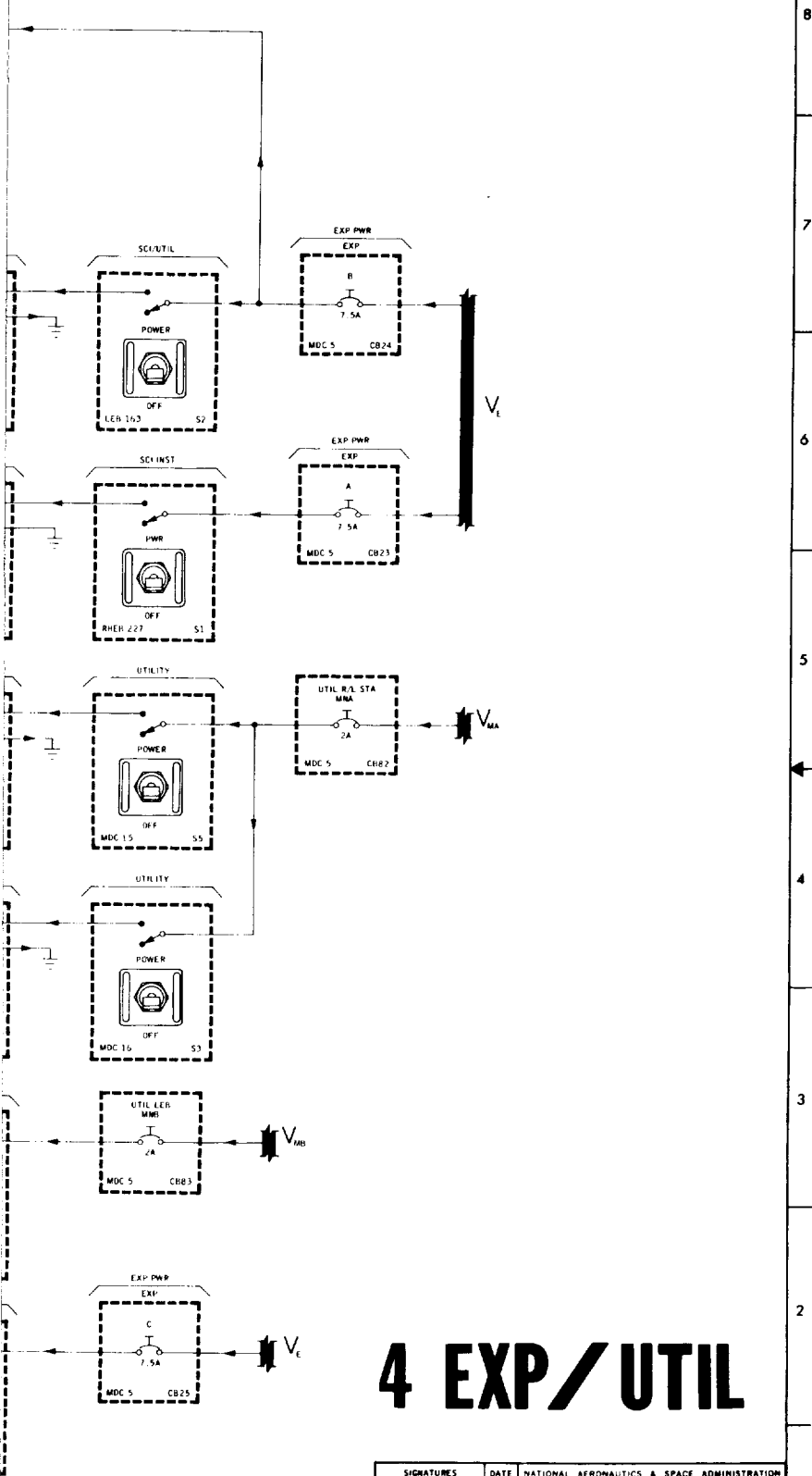








CSM 116

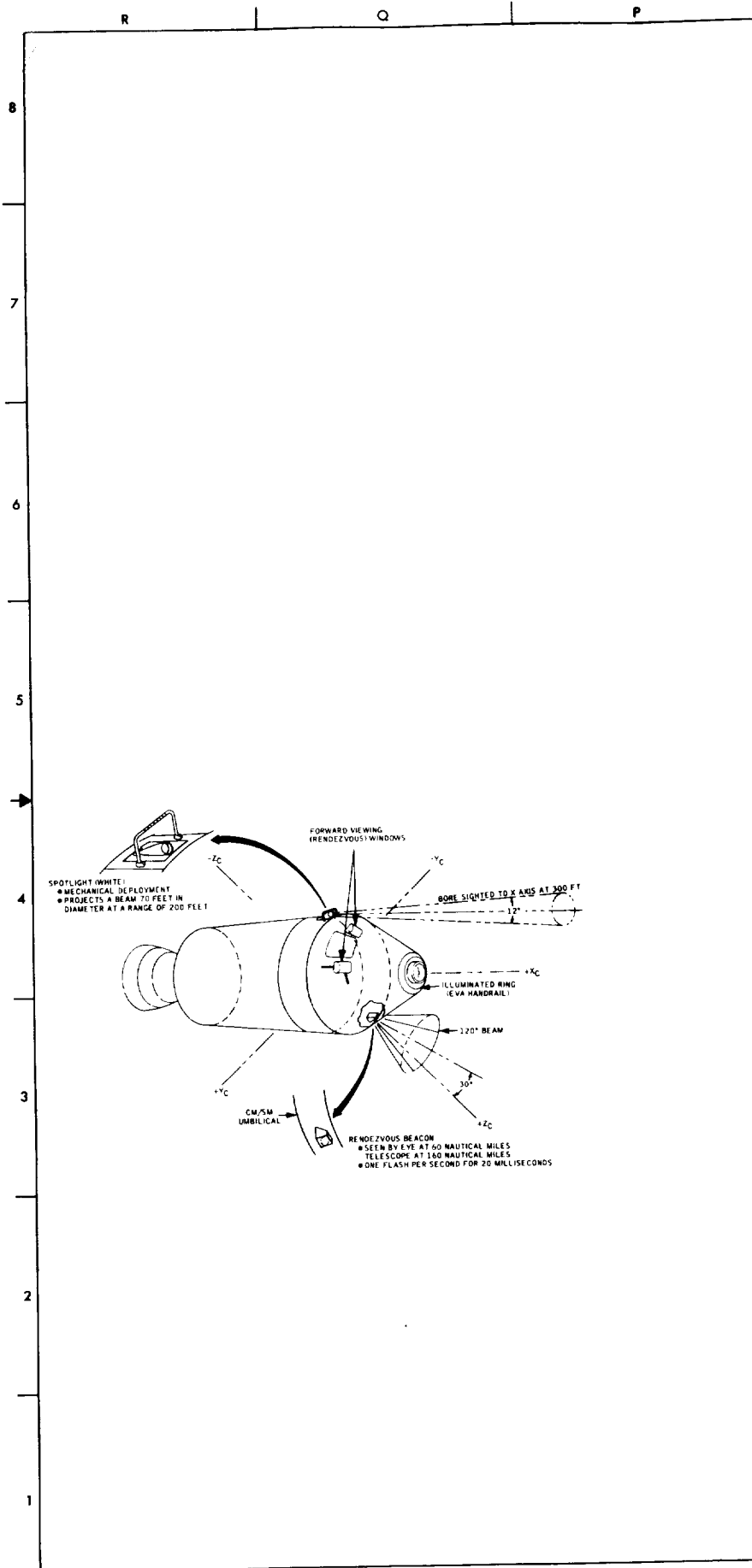


# 4 EXP/UTIL

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION	
DR <i>[Signature]</i>		4/17/72	MANNED SPACECRAFT CENTER - HOUSTON, TEXAS	
DCSN <i>[Signature]</i>				
QC				
ENGR <i>[Signature]</i>		4/17/72	<b>EXPERIMENT/UTILITY POWER</b>	
APP <i>[Signature]</i>		4/17/72		
STC <i>[Signature]</i>		4/17/72		
			SKYLAB CSM	DWG NO
			116 THRU 119	<b>3.4</b>
			66-X 34	PAGE 3-4 SHEET 1 OF 1

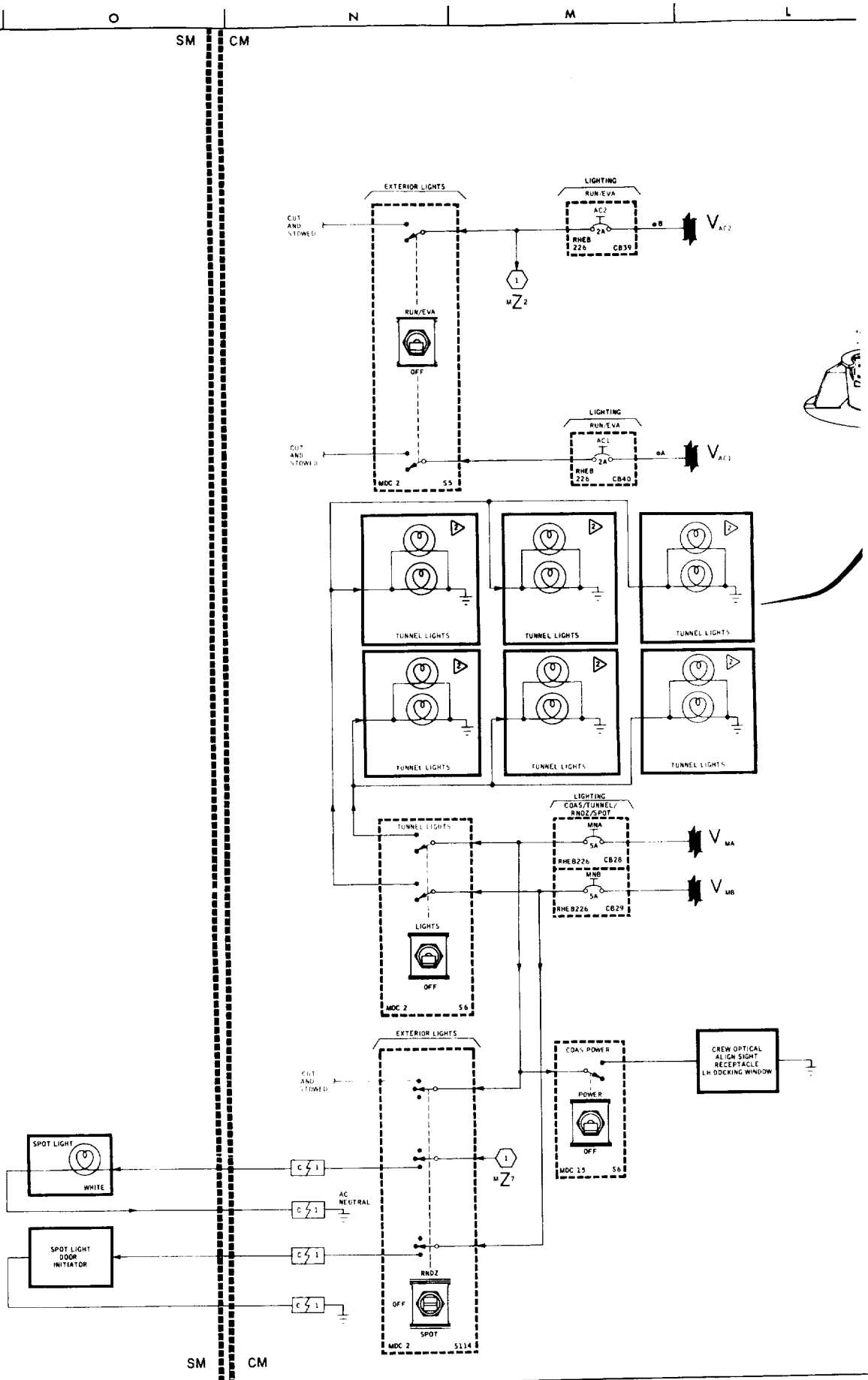
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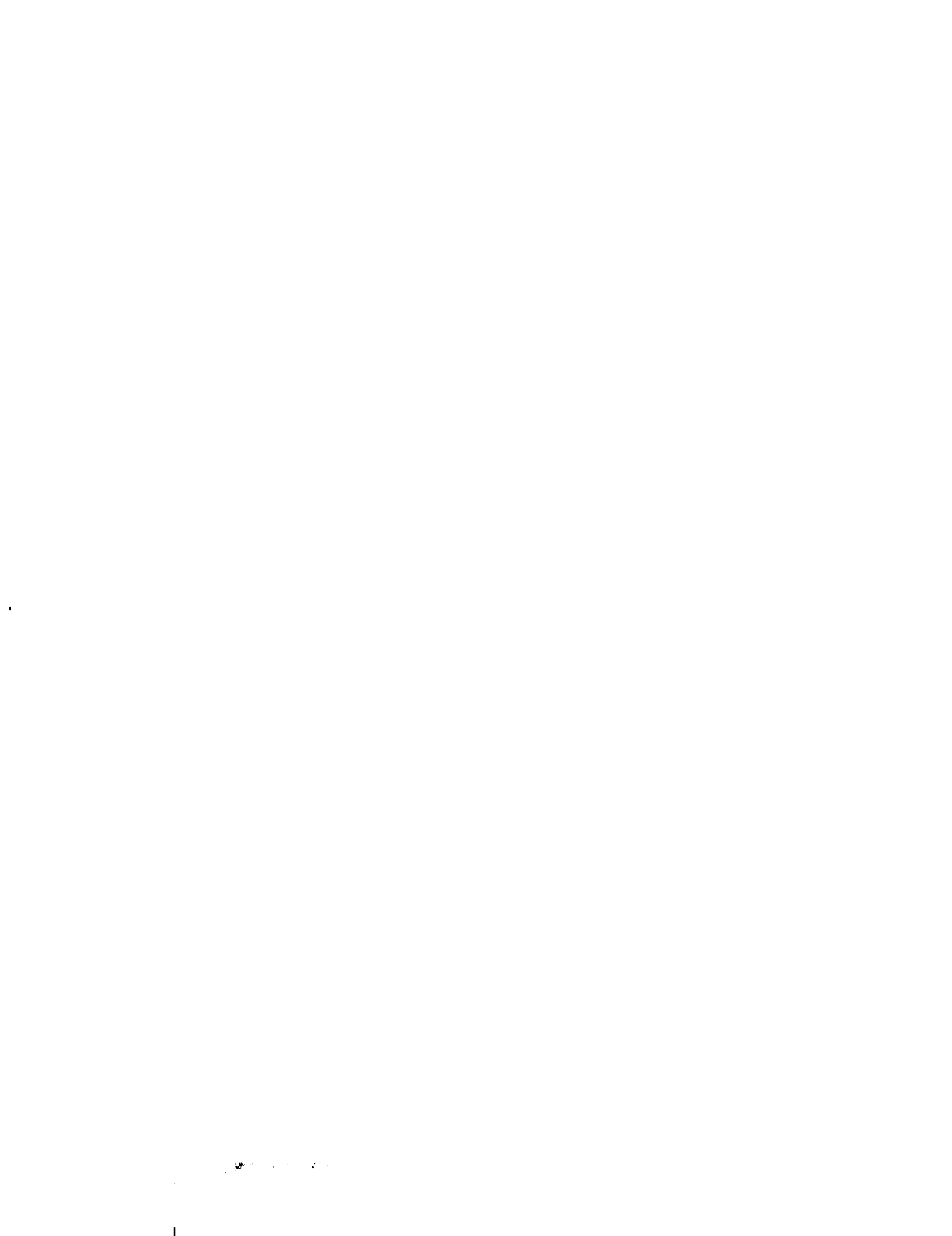


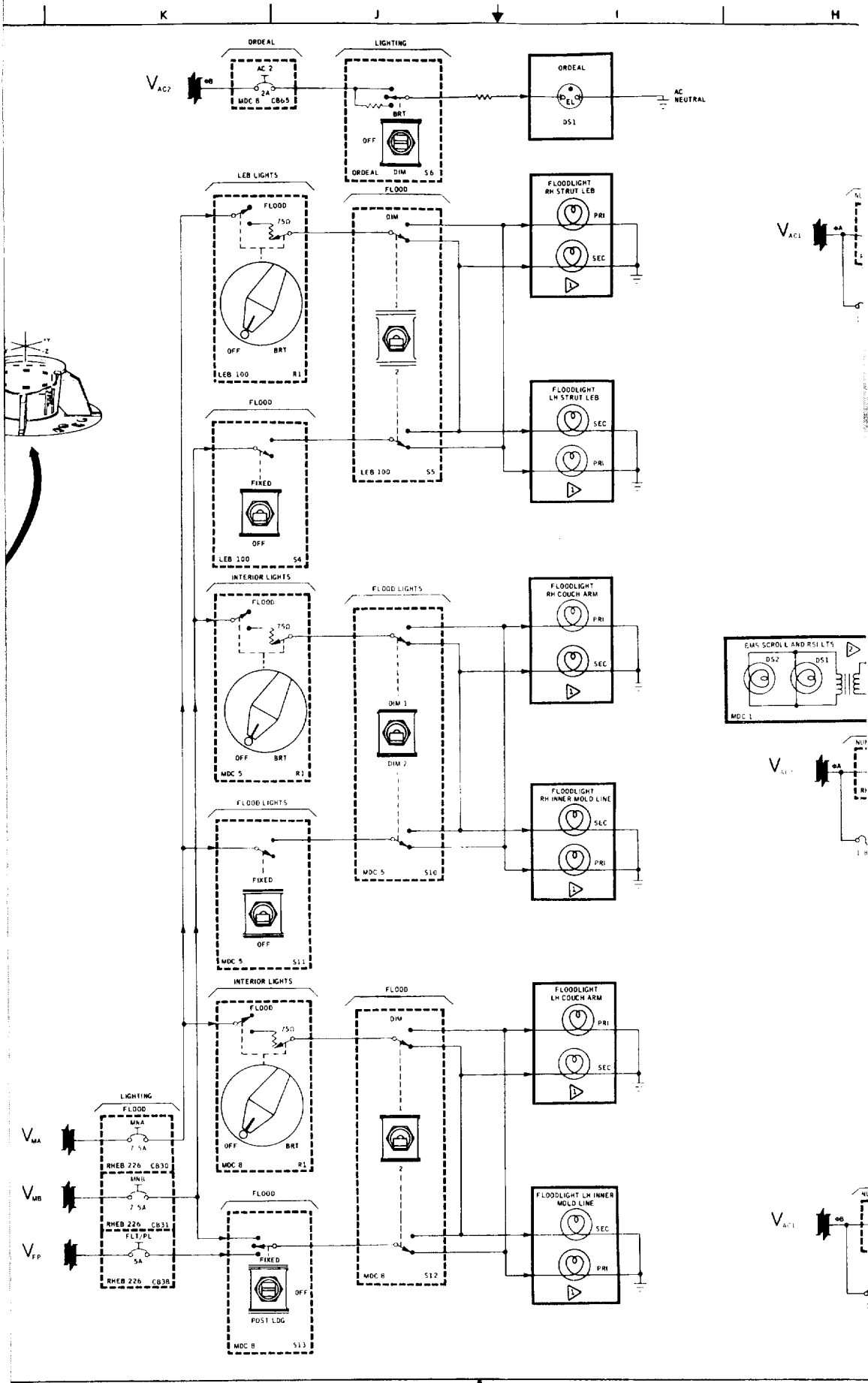


FOLDOUT FRAME 1





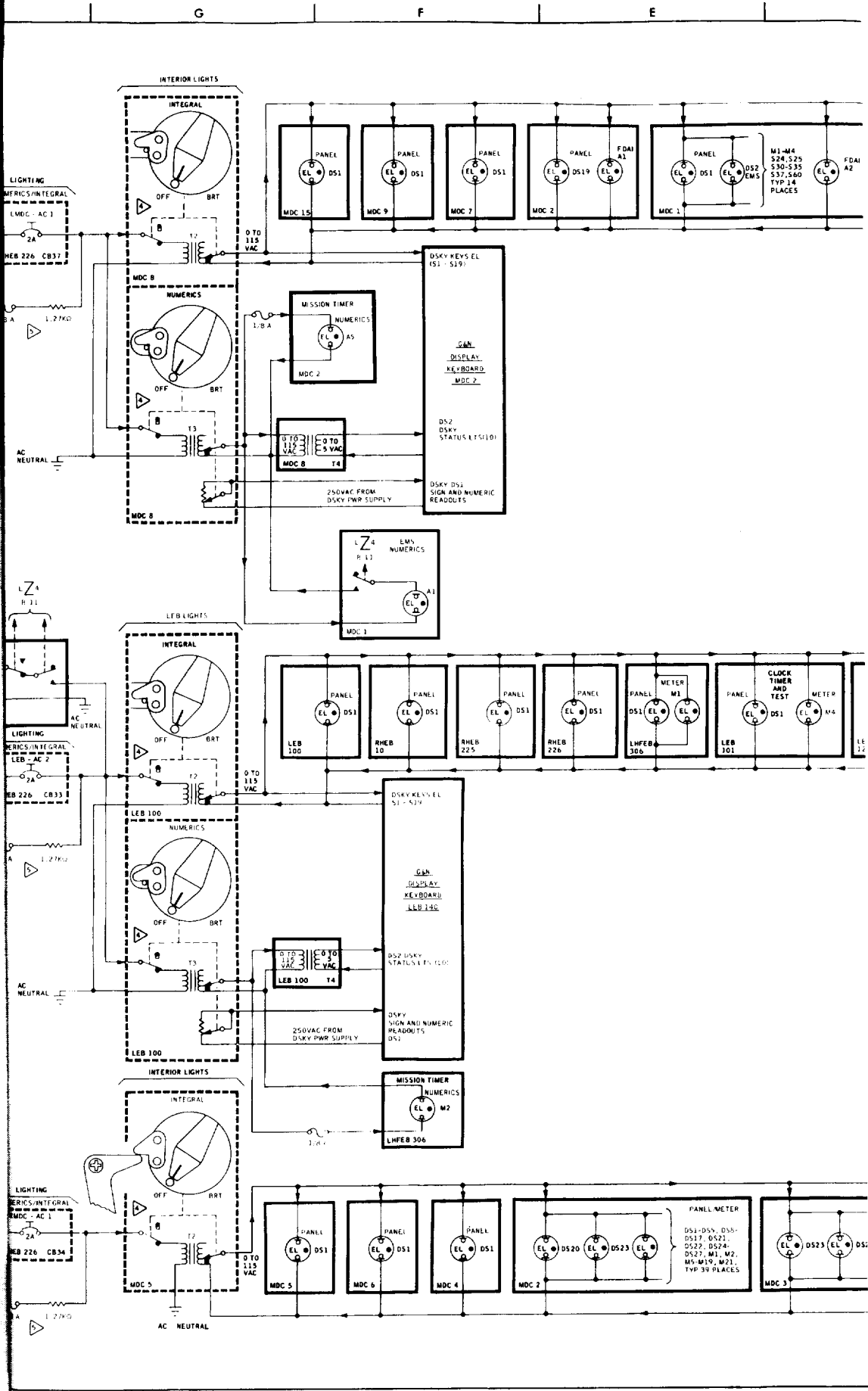




FOLDOUT FRAME 3

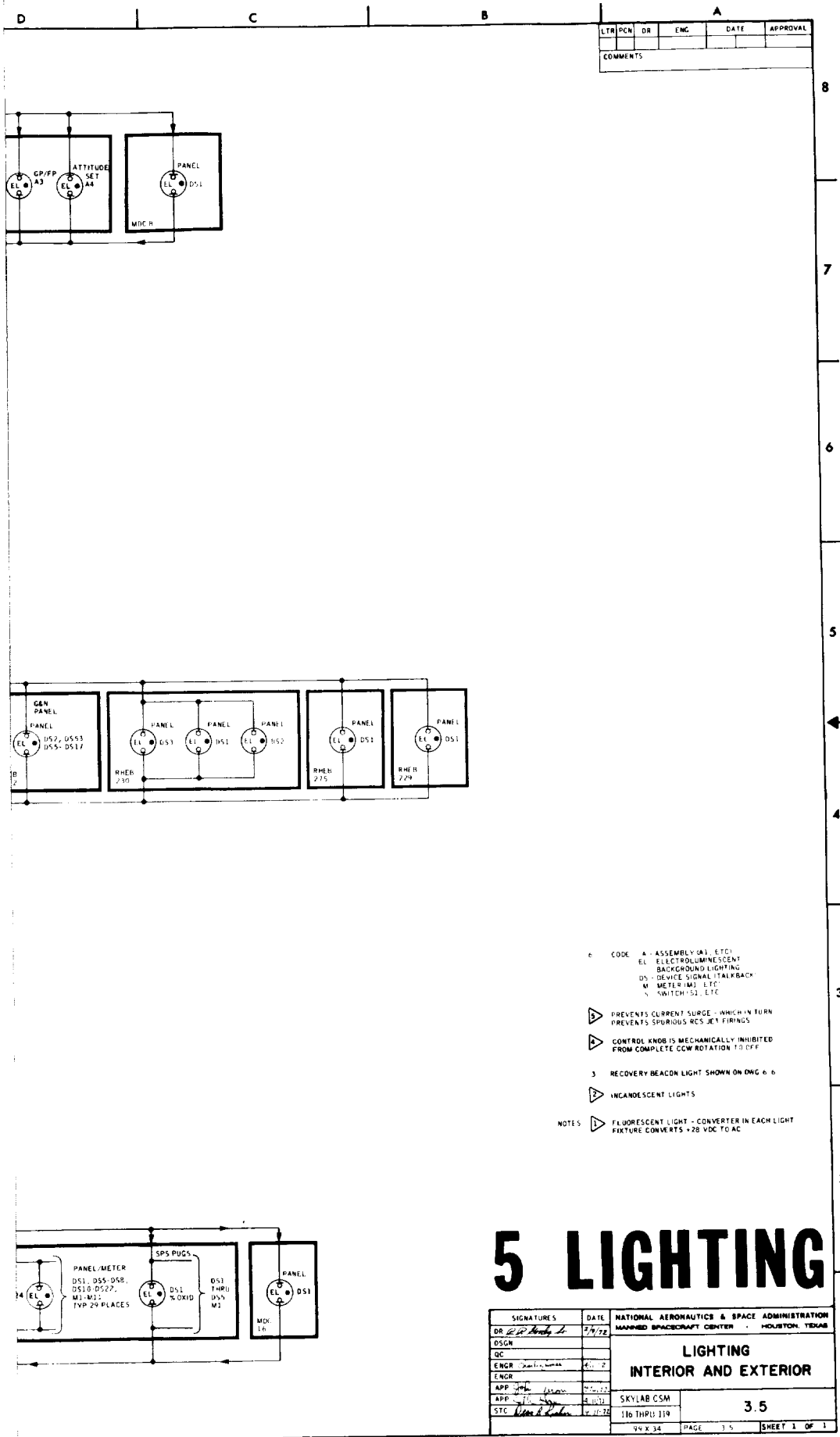






FOLDOUT FRAME 4





LTR	PKR	DR	ENG	DATE	APPROVAL
COMMENTS					

- 6 CODE A - ASSEMBLY (A1, ETC.)
  - EL ELECTROLUMINESCENT
  - BACKGROUND LIGHTING
  - DS - DEVICE SIGNAL (TALKBACK)
  - M - METER (A1) ETC.
  - S - SWITCH (S1) ETC.
- ▷ PREVENTS CURRENT SURGE - WHICH IN TURN PREVENTS SPURIOUS RCS JET FIRINGS
  - ▷ CONTROL KNOB IS MECHANICALLY INHIBITED FROM COMPLETE CCW ROTATION TO OFF
  - 3 RECOVERY BEACON LIGHT SHOWN ON DNG 6 6
  - ▷ INCANDESCENT LIGHTS
  - NOTES ▷ FLUORESCENT LIGHT - CONVERTER IN EACH LIGHT FIXTURE CONVERTS +28 VDC TO AC

# 5 LIGHTING

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION	
DR	<i>[Signature]</i>	7/1/72	MANNED SPACECRAFT CENTER - HOUSTON, TEXAS	
DSCN				
QC				
ENGR	<i>[Signature]</i>	6/21/72		
ENGR	<i>[Signature]</i>	7/1/72		
APP	<i>[Signature]</i>	7/1/72		
APP	<i>[Signature]</i>	7/1/72	SKYLAB CSM	3 5
STC	<i>[Signature]</i>	7/1/72	116 THRU 119	
			44 X 34	PAGE 1 5 SHEET 1 OF 1

FOLDOUT FRAME 5



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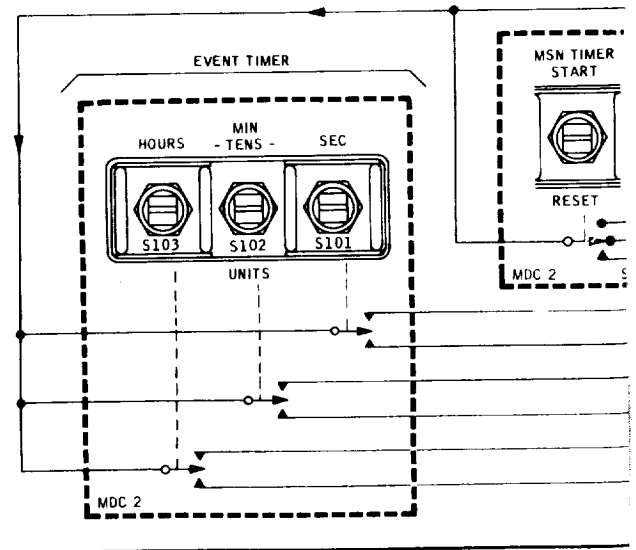
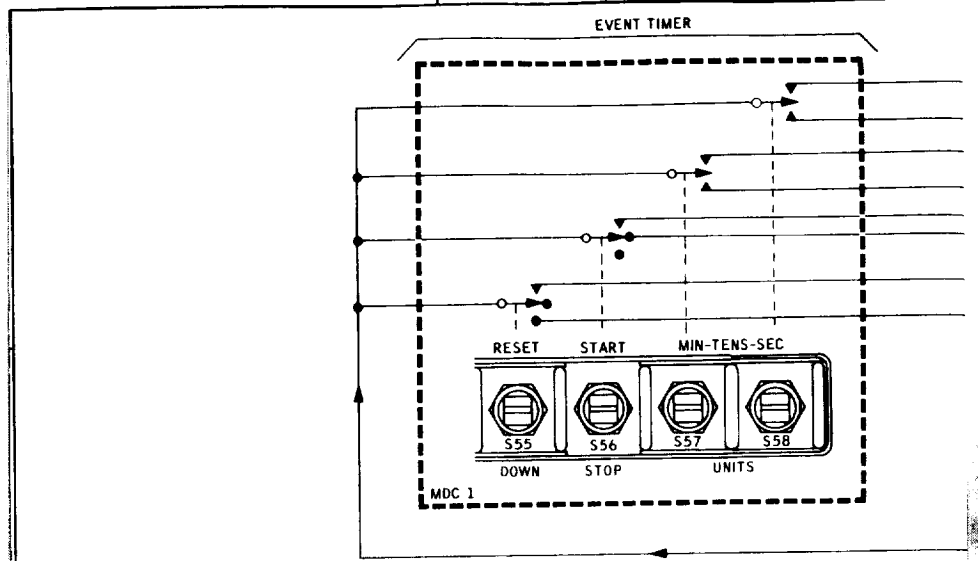
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**FOLDOUT FRAME** |

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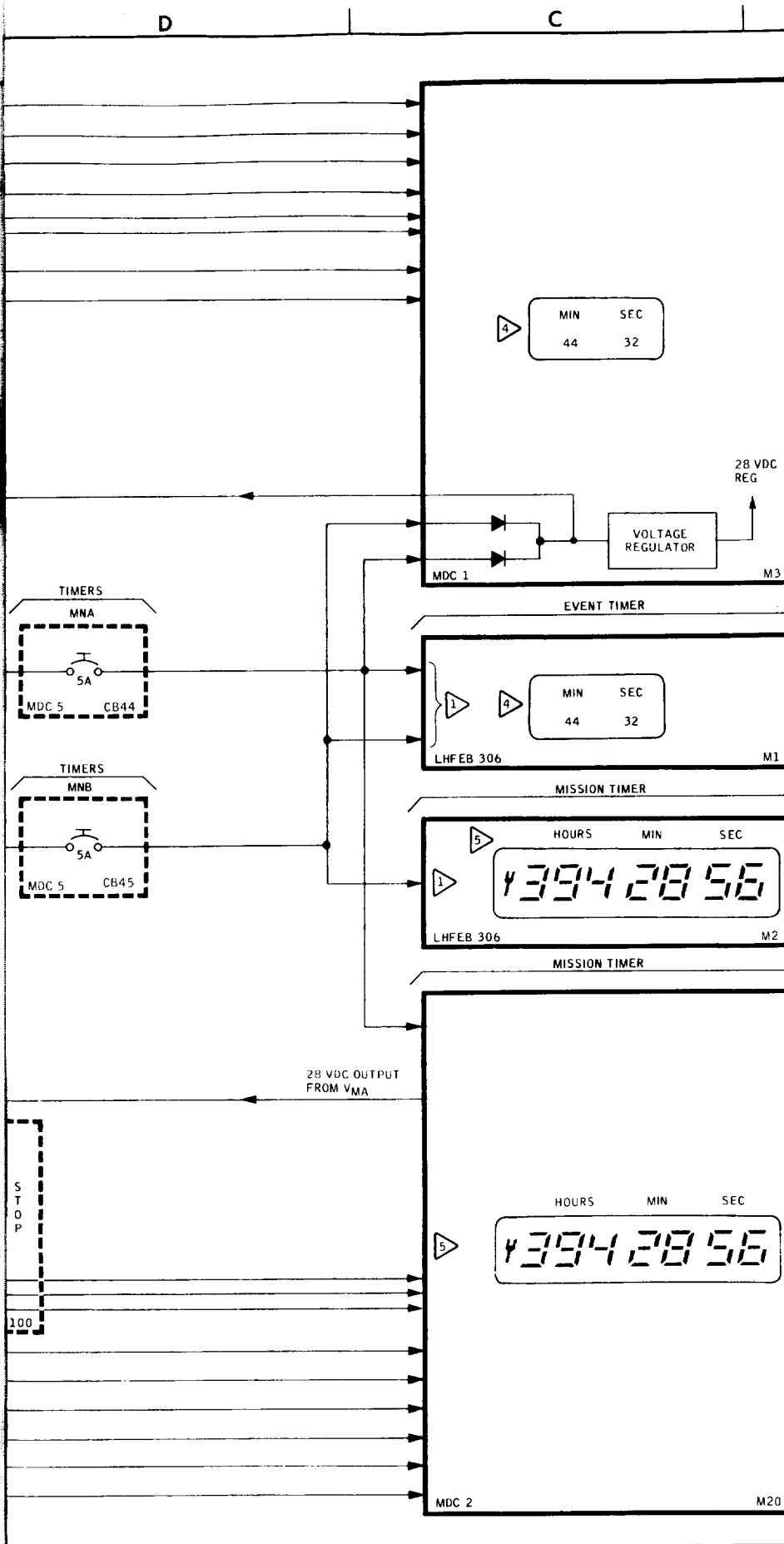
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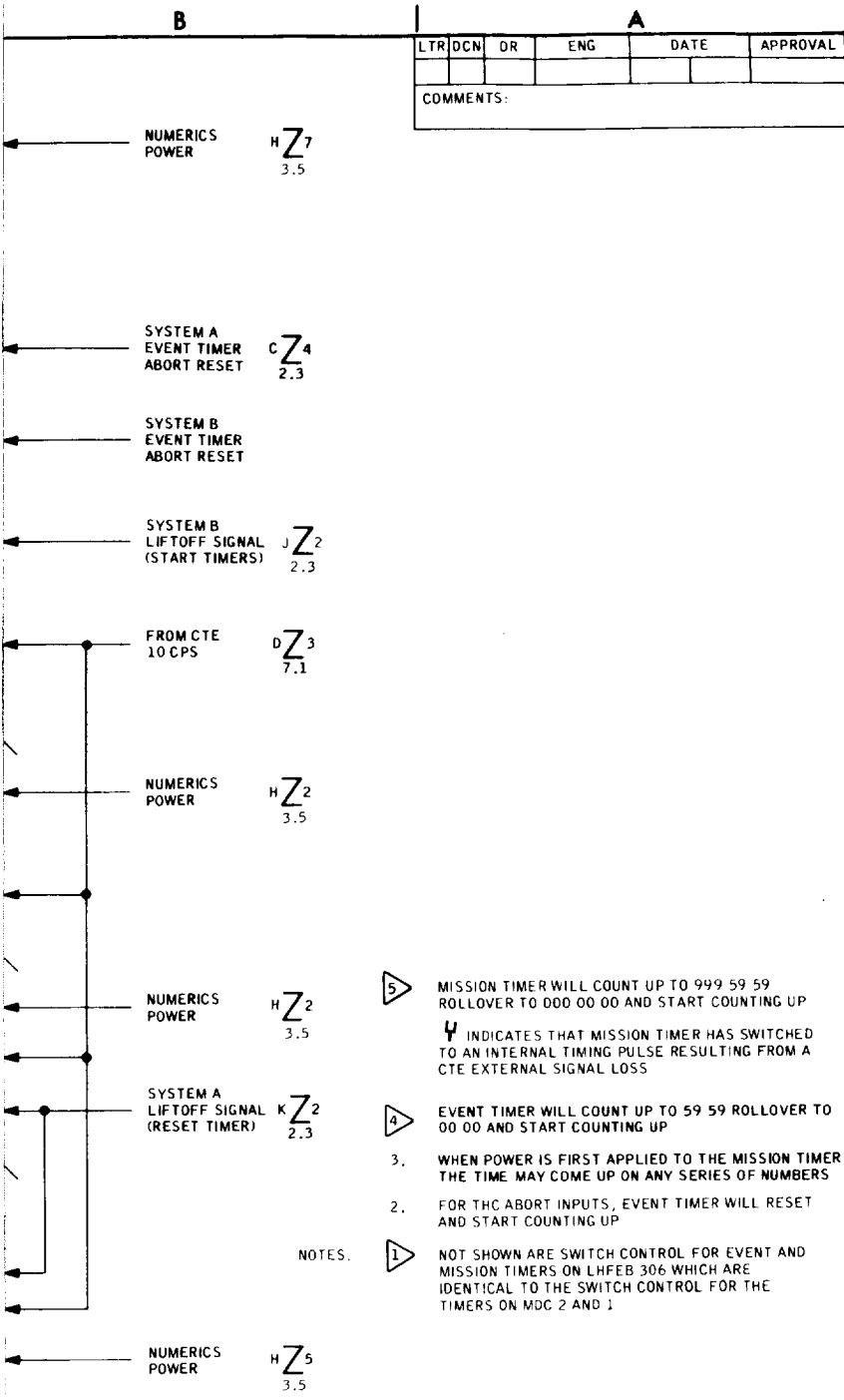
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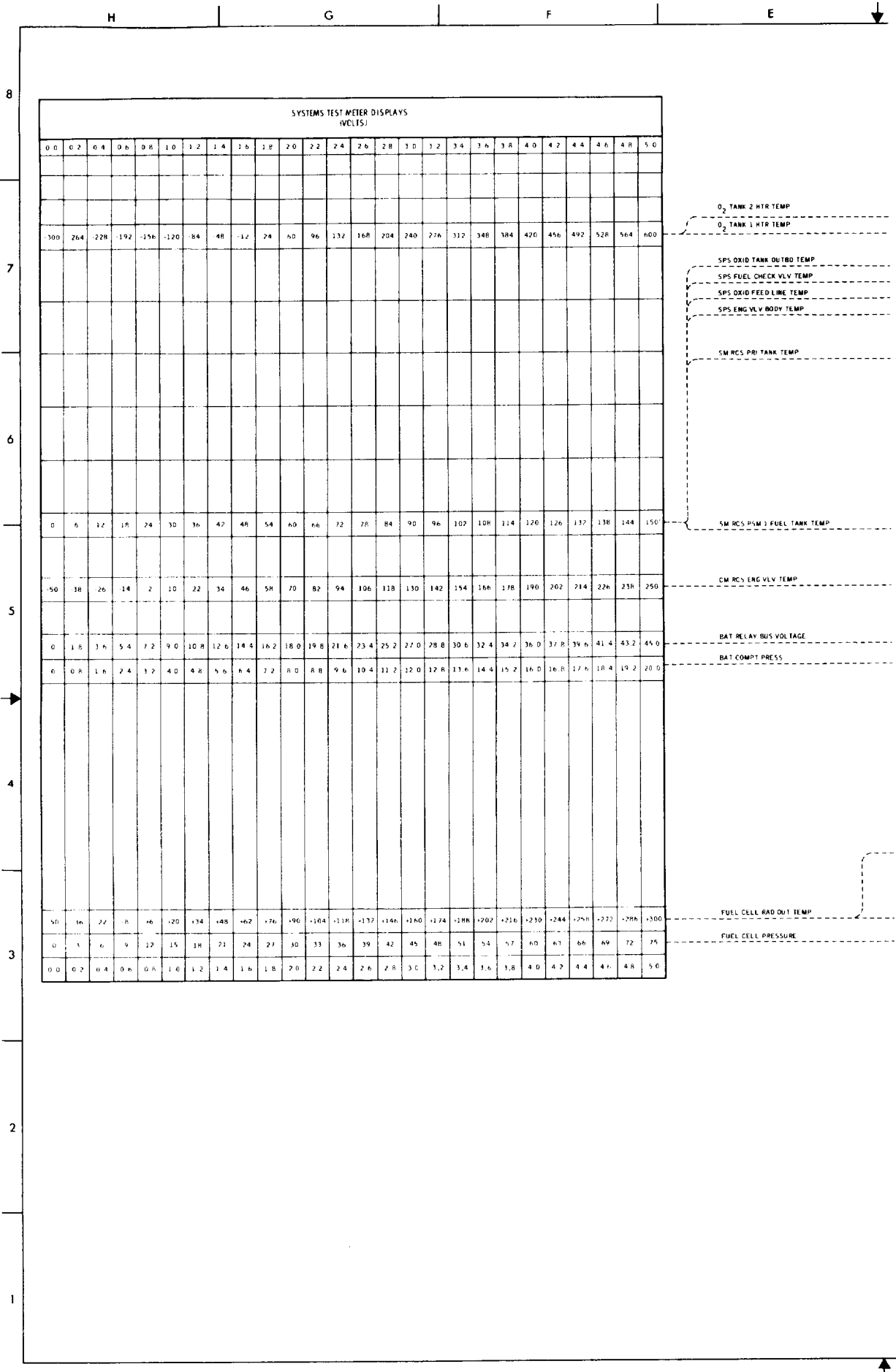


# 6 TIMER

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER · HOUSTON, TEXAS		
DR			<b>TIMER CONTROL</b>		
DSGN					
QC					
ENGR	<i>Charlie Jones</i>	4/11/72			
ENGR					
APP	<i>John Canon</i>	4/11/72	SKYLAB CSM	DWG NO	<b>3.6</b>
APP	<i>JR Spivey</i>	4/11/72			
STC	<i>Don A. Kueber</i>	4-11-72			
			116 THRU 119		
			34 X 22	PAGE 3-6	SHEET 1 OF 1

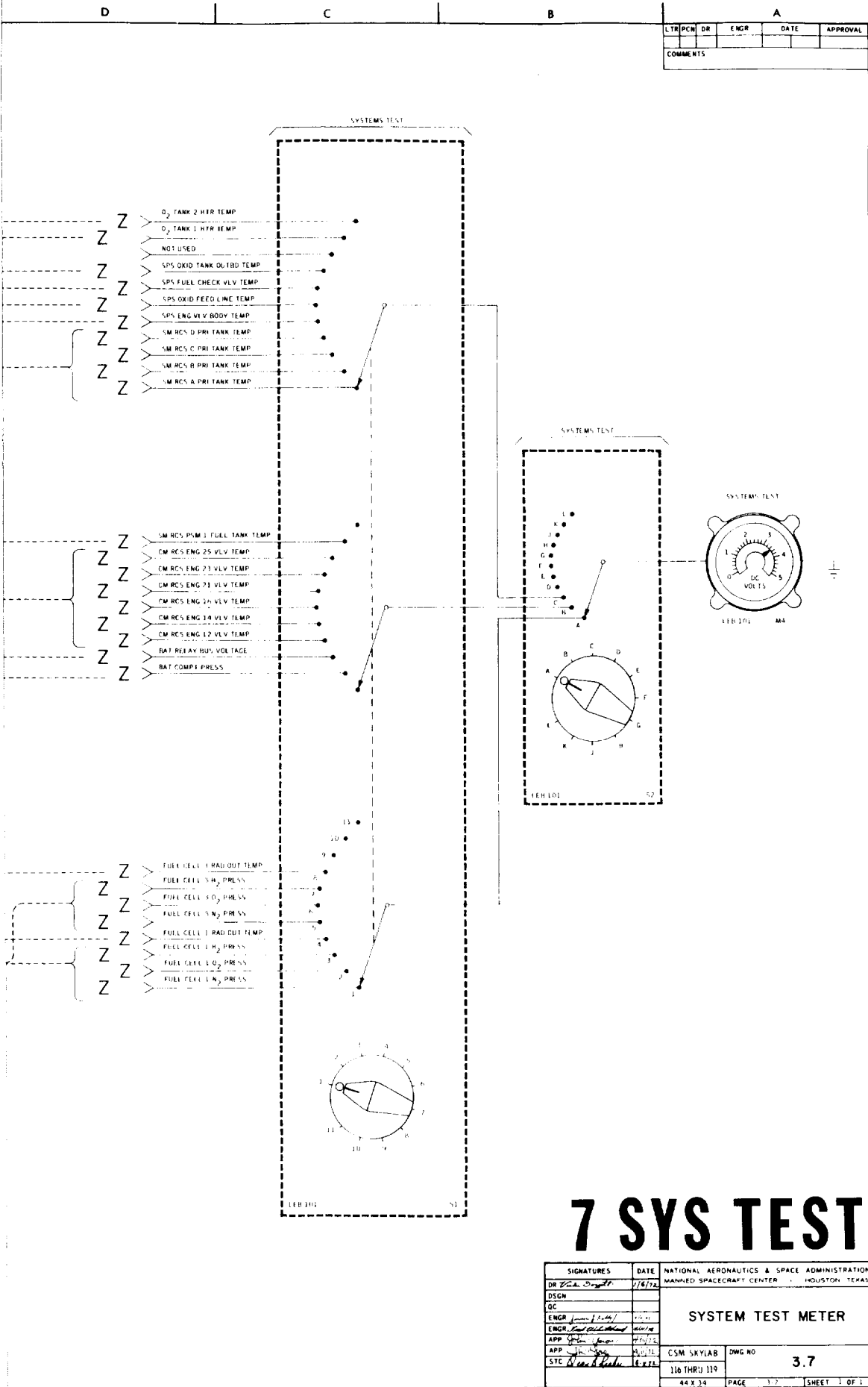
FOLDOUT FRAME 4

10/10/2020



**FOLDOUT FRAME**





# 7 SYS TEST

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON TEXAS	
DR	<i>[Signature]</i>	1/16/72	SYSTEM TEST METER	
DSGN				
QC				
ENGR	<i>[Signature]</i>	1/16/72		
APP	<i>[Signature]</i>	1/16/72		
STC	<i>[Signature]</i>	1/16/72	CSM SKYLAB	DWG NO <b>3.7</b>
			116 THRU 119	
			44 X 34	PAGE 3.7 SHEET 1 OF 1

EOLDOUT FRAME *[Signature]*





4 ENVIRONMENTAL  
CONTROL SYS

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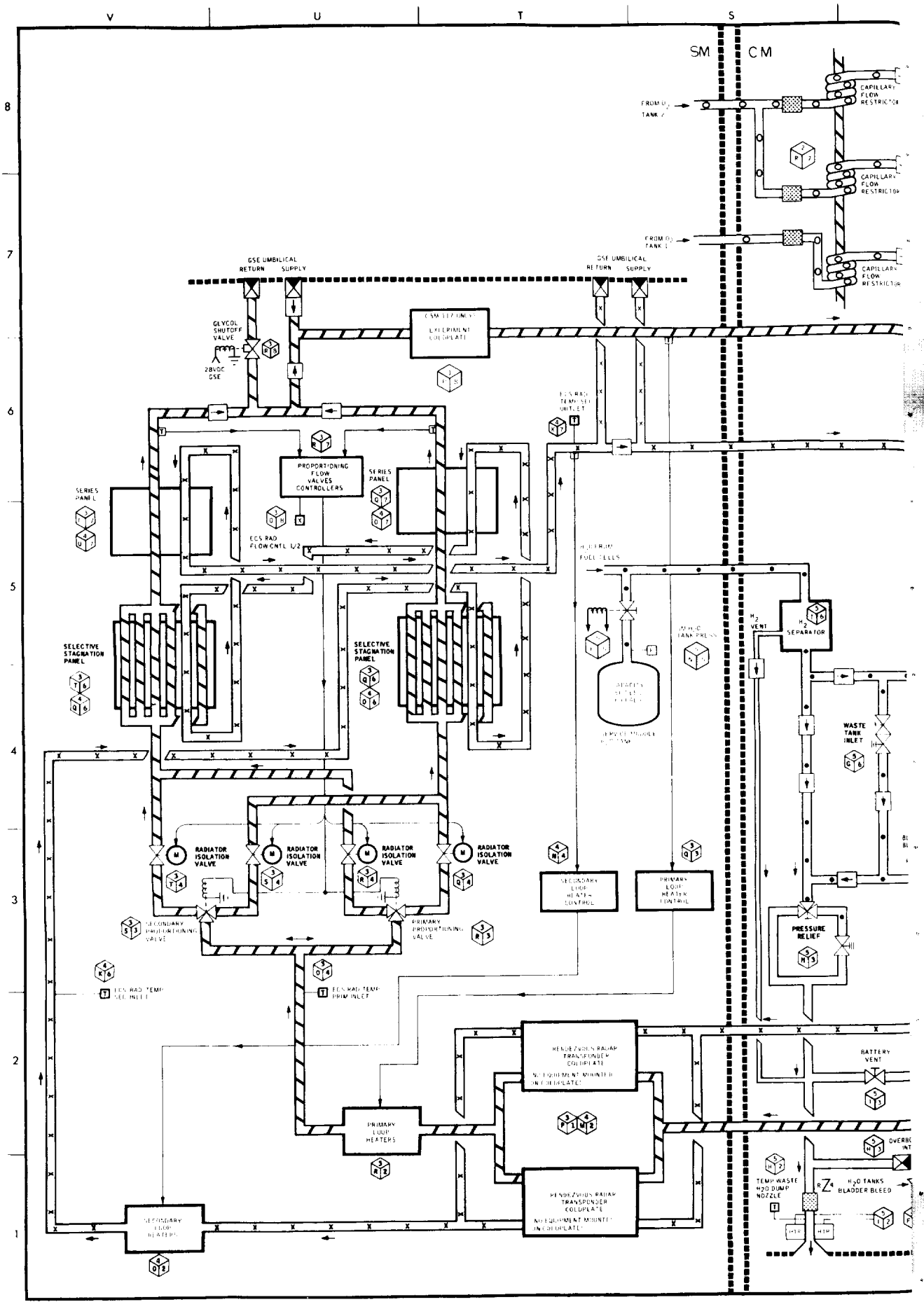
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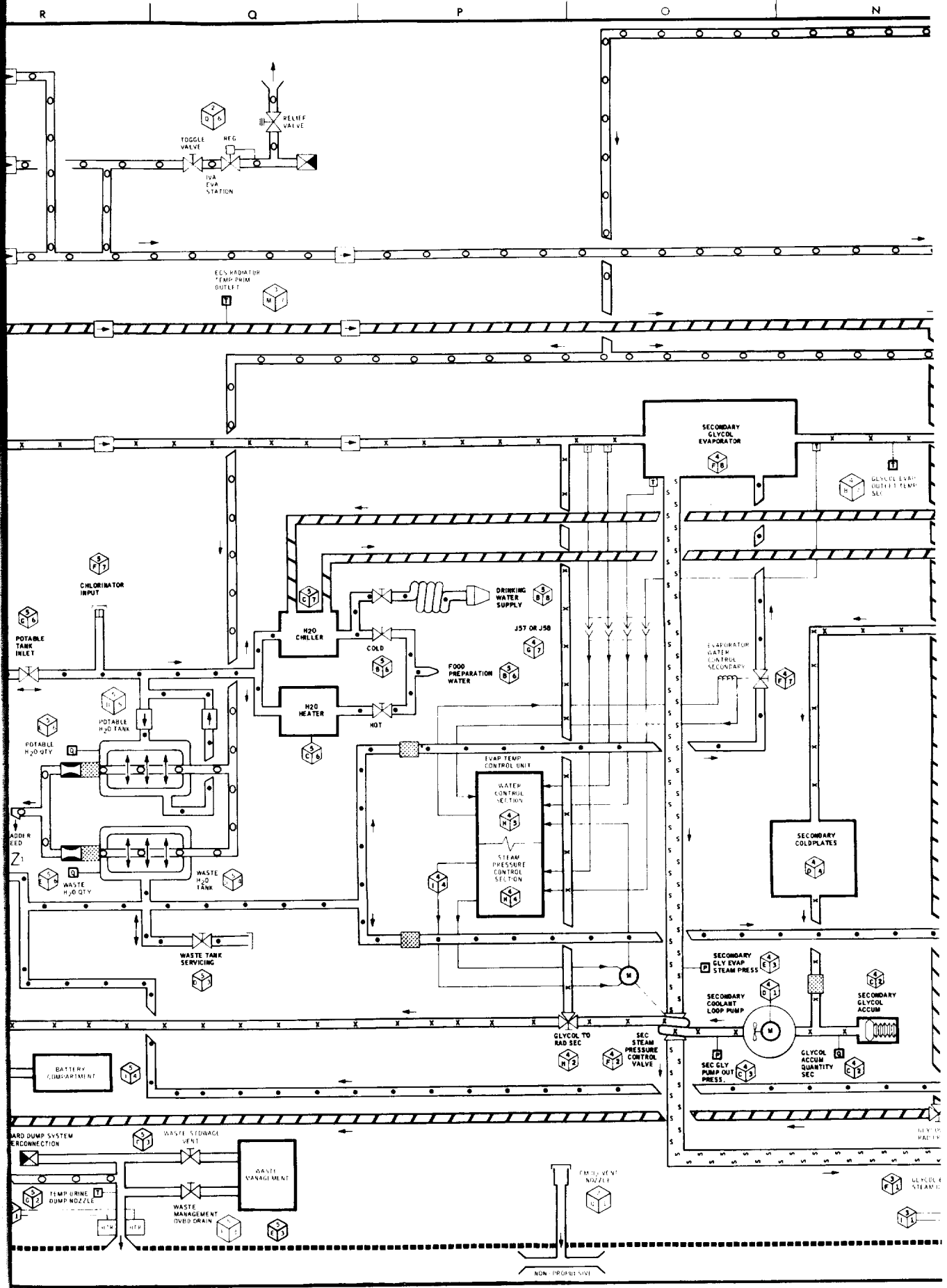
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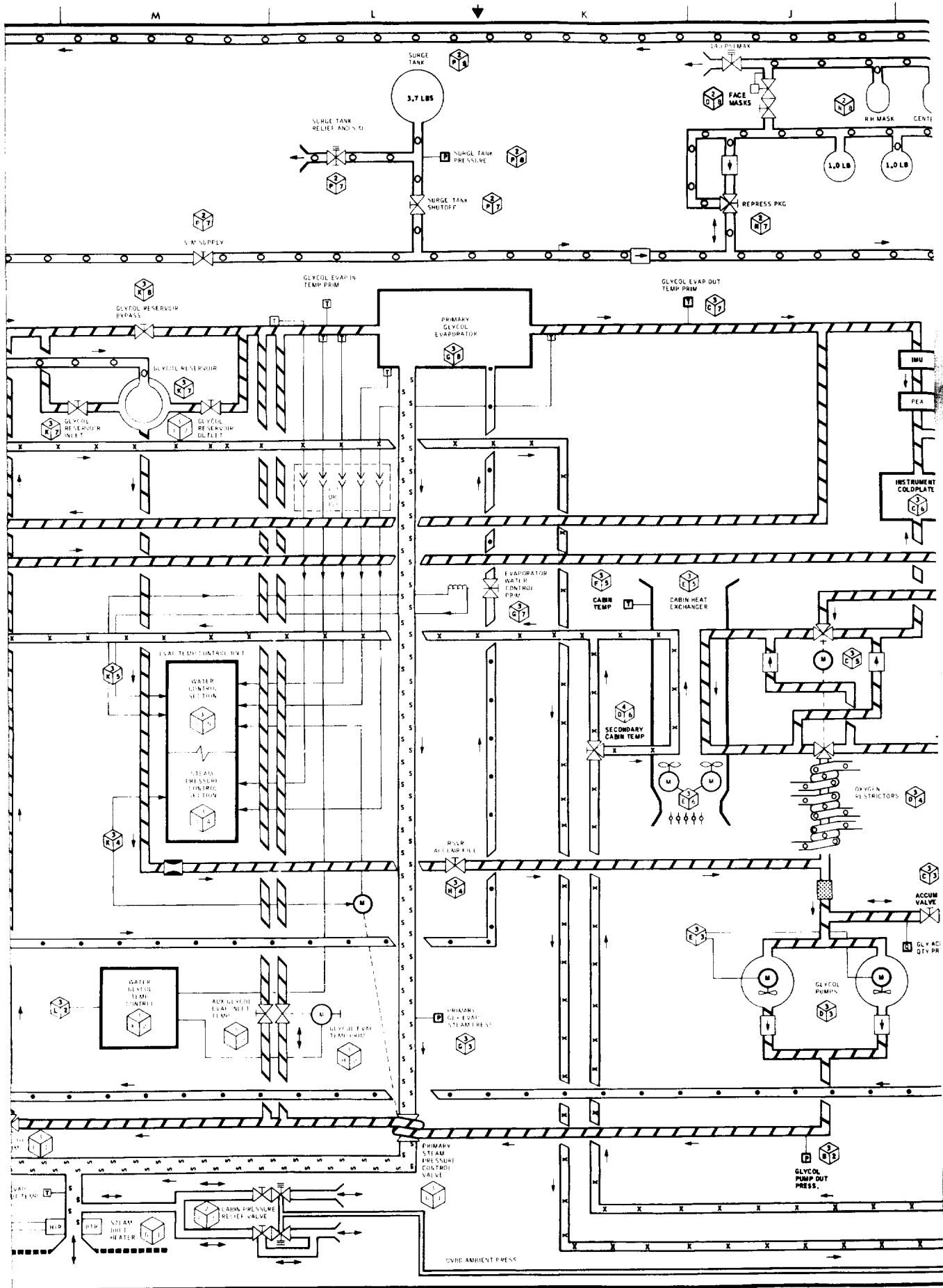
**FOLDOUT FRAME 1**





FOLDOUT FRAME 2

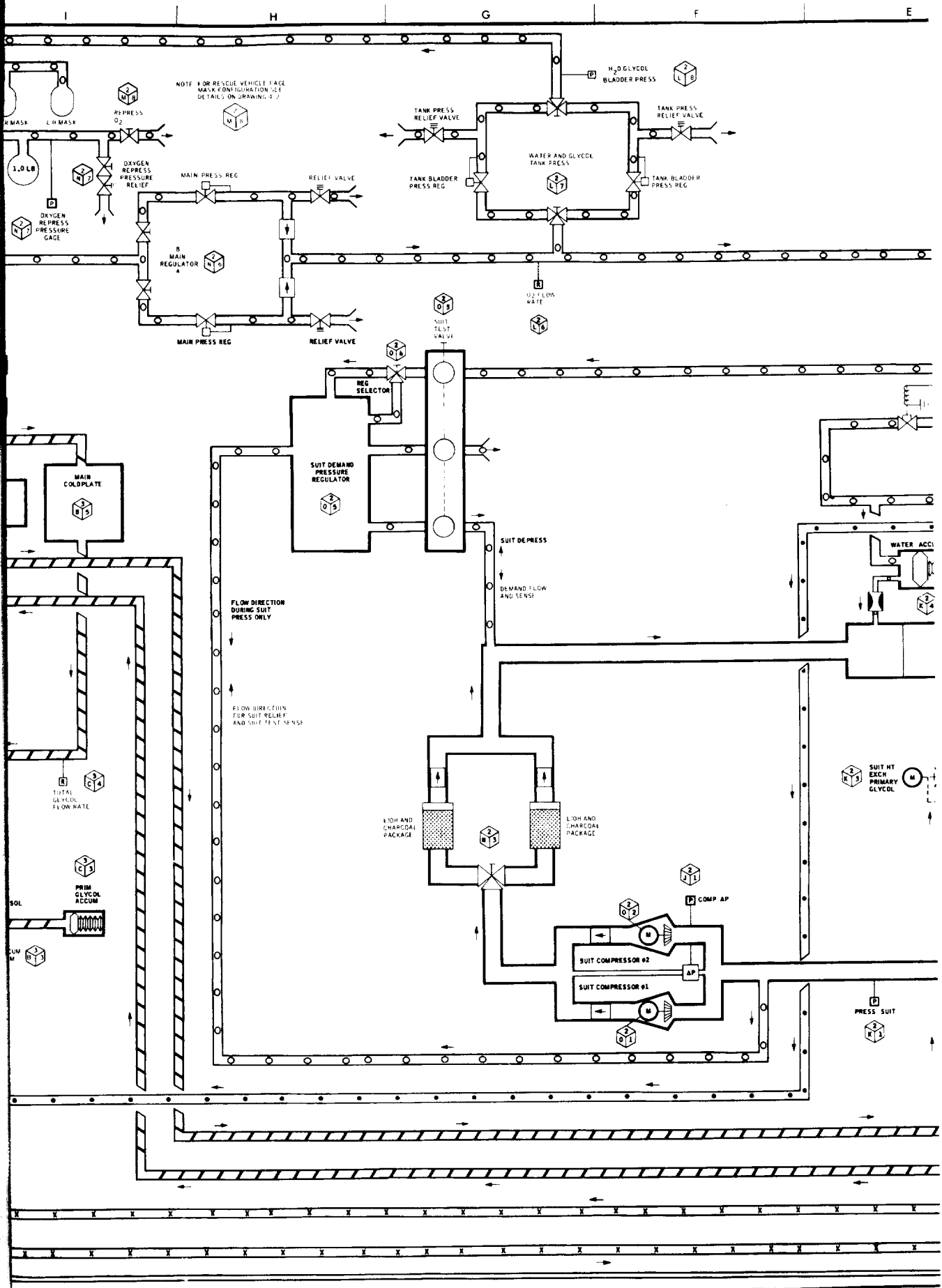




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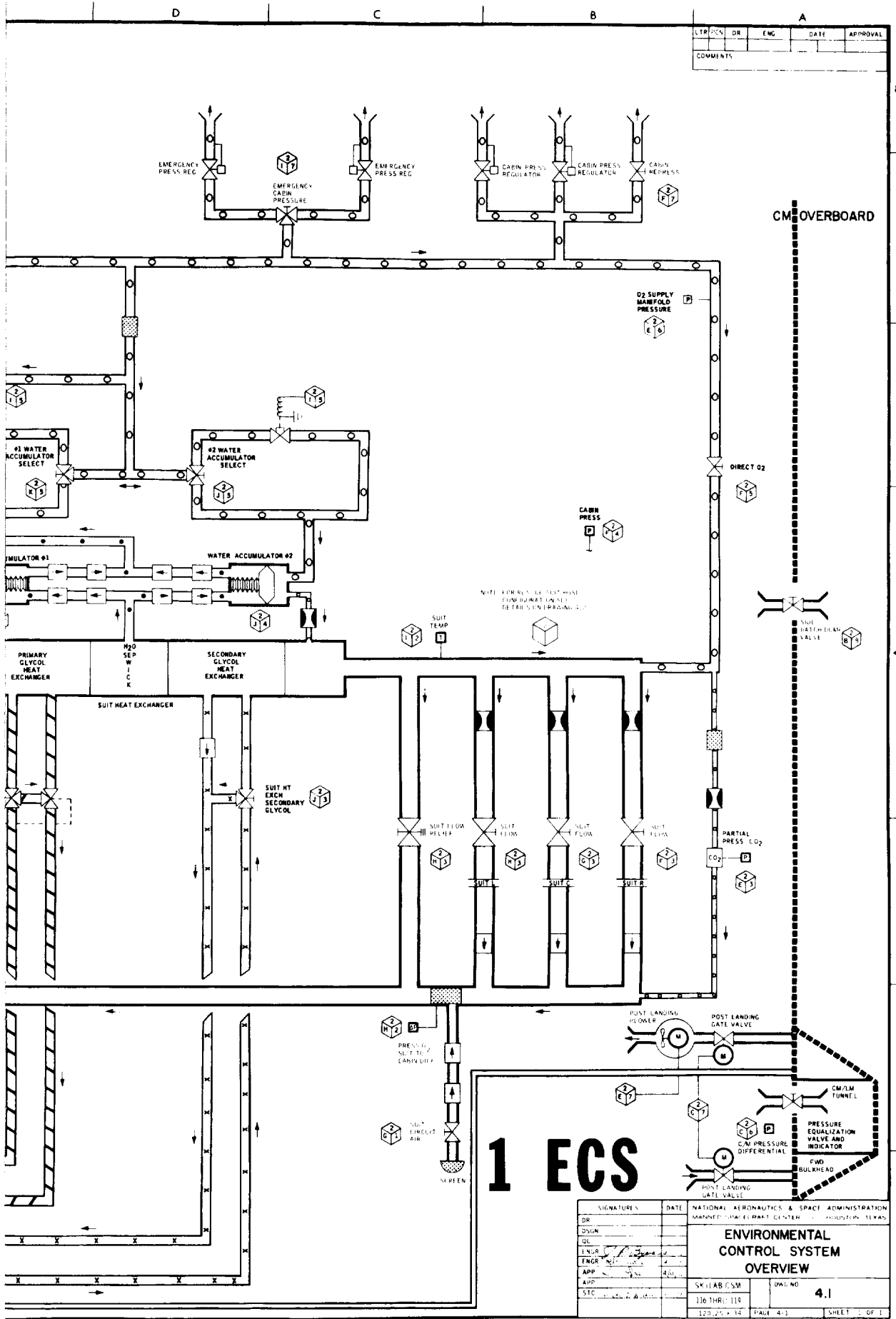






FOLDOUT FRAME 4





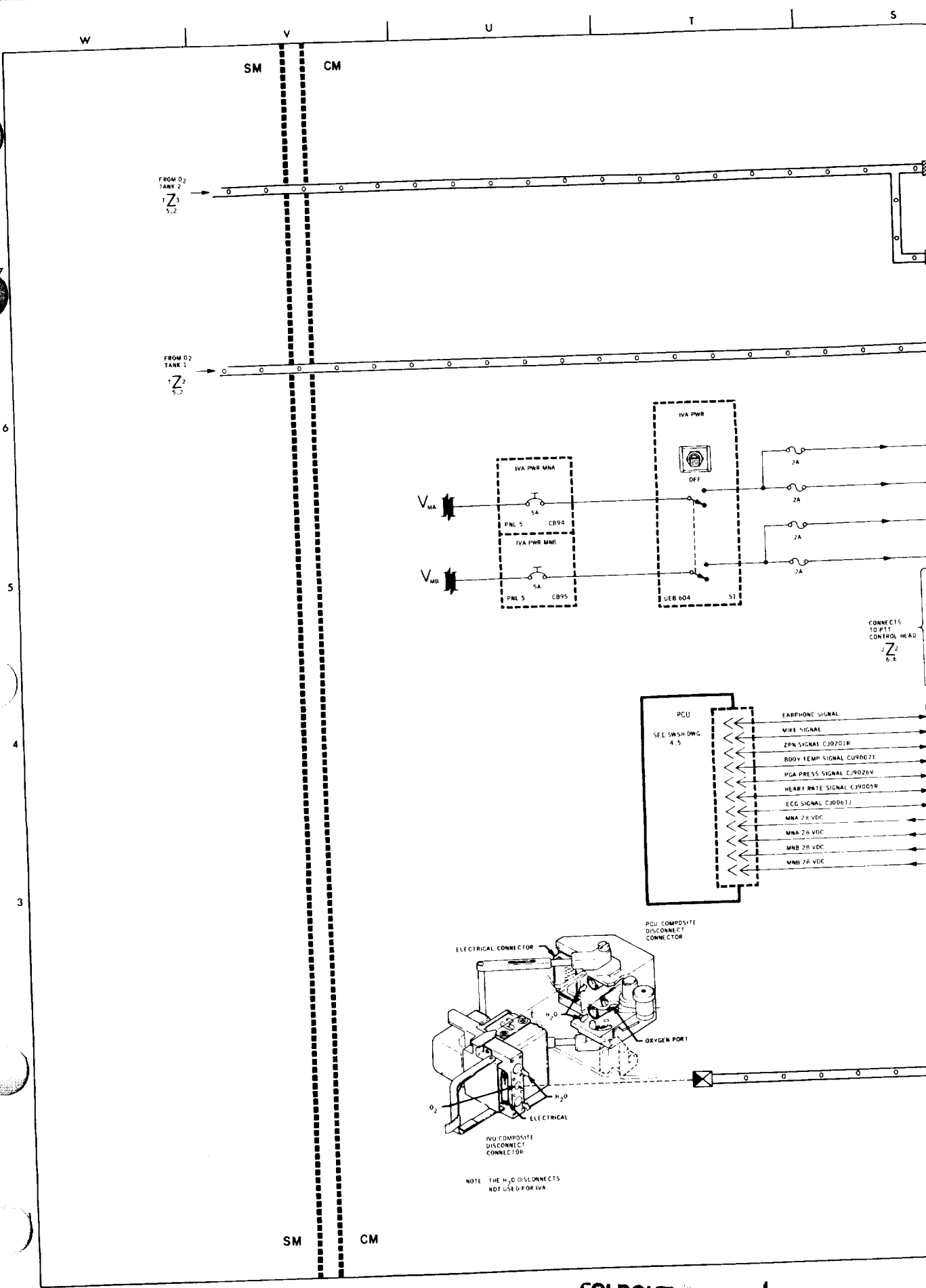
LT/PCN	DR	ENG	DATE	APPROVAL
COMMENTS				

# 1 ECS

SIGNATURES	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION	
DR		MARSHALL SPACE FLIGHT CENTER	
ENGR		HOUSTON, TEXAS	
APP		4.1	
STC		SKYLAB/CSM	UPL NO
		116 THR: 118	4.1
		120, 25 x 142	PAGE 4-1
			SHEET 1 OF 1

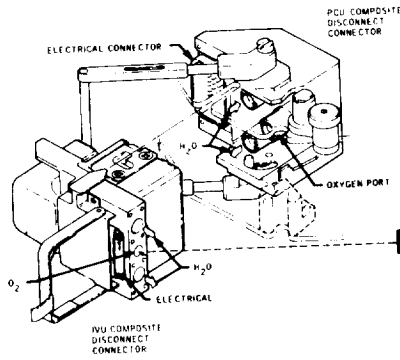
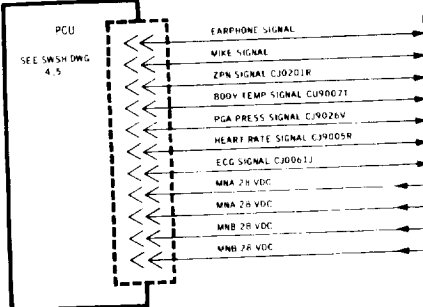
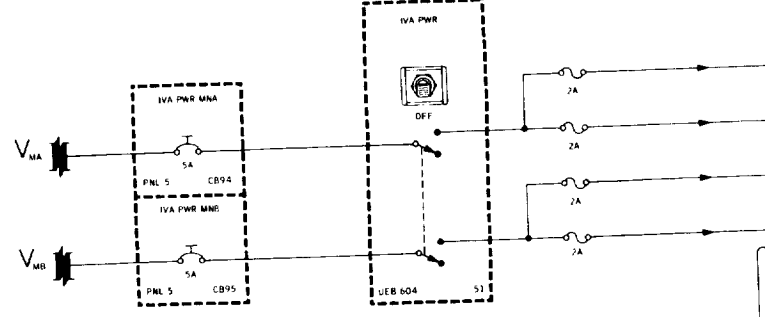
FOLDOUT FRAME 5





FROM O<sub>2</sub>  
TANK 2  
Z 3  
5.2

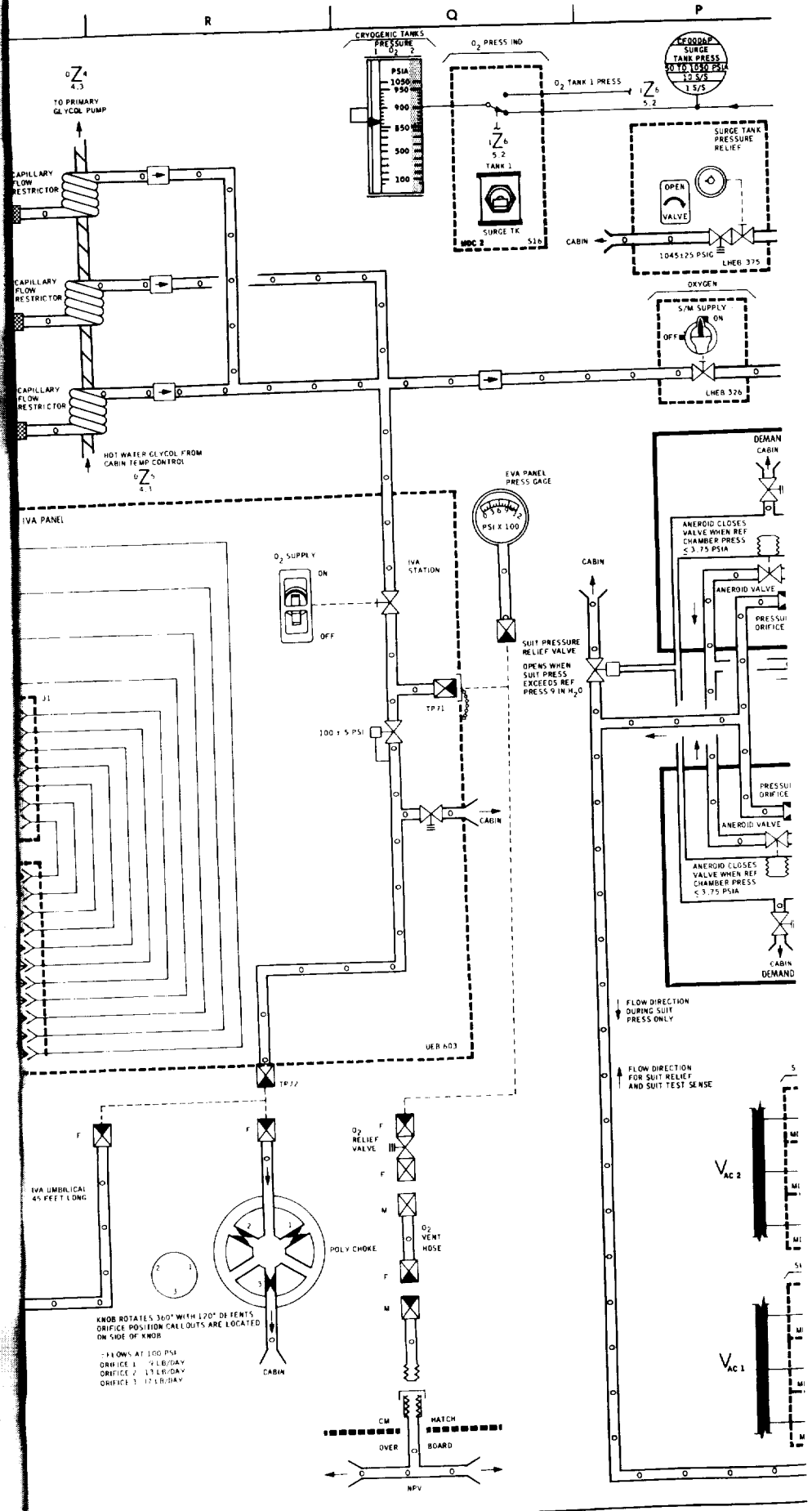
FROM O<sub>2</sub>  
TANK 1  
Z 2  
5.2



NOTE THE H<sub>2</sub>O DISCONNECTS  
NOT USED FOR IVA

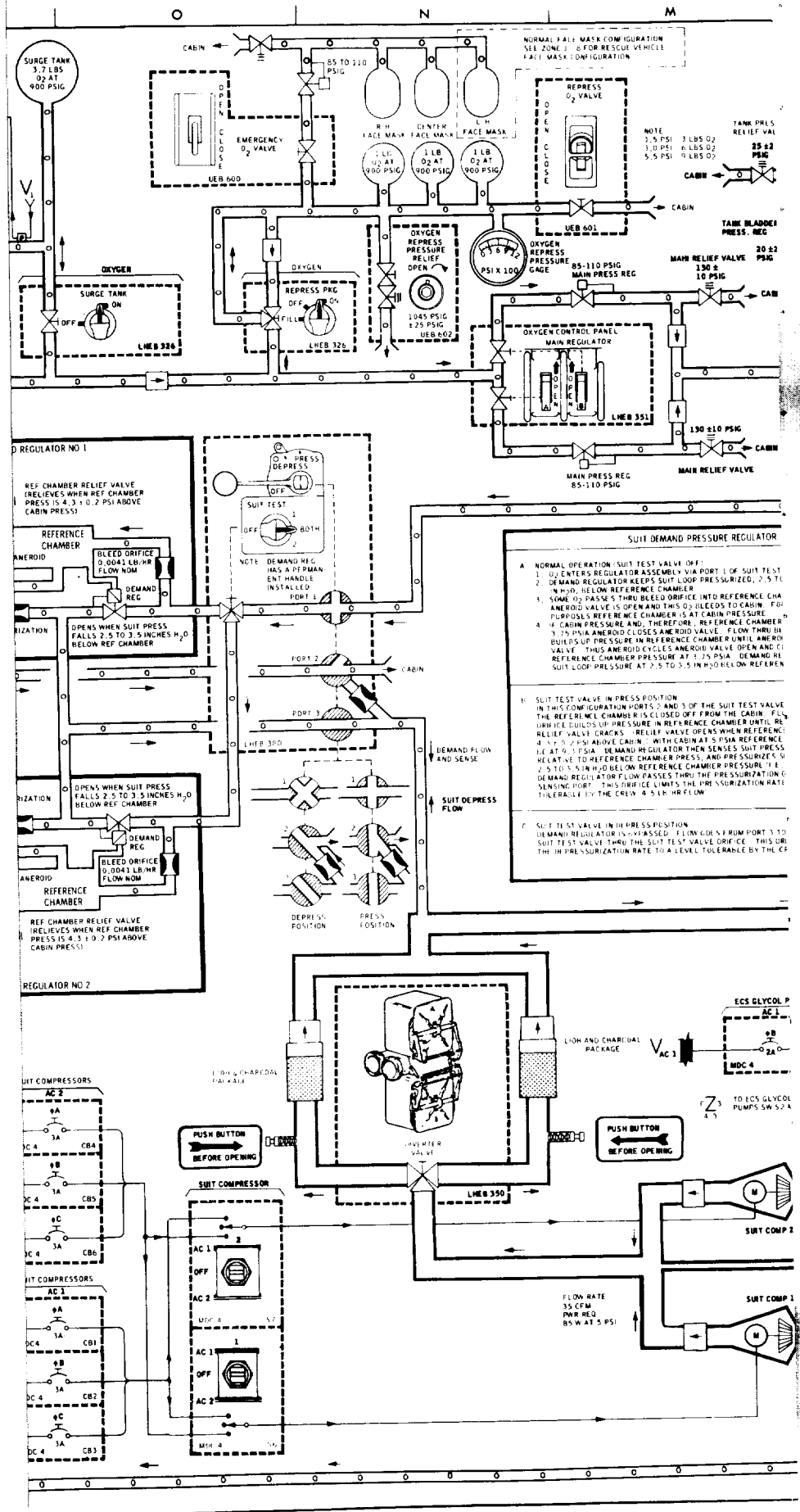
**FOLDOUT FRAME**











NORMAL FULL MASK CONFIGURATION  
SEE ZONE 1 & 8 FOR RESCUE VEHICLE  
FACE MASK CONFIGURATION

NOTE  
3.5 PSI 3 LBS O<sub>2</sub>  
3.0 PSI 6 LBS O<sub>2</sub>  
5.5 PSI 9 LBS O<sub>2</sub>

TANK PRESS  
RELIEF VAL  
25 ± 2  
PSIG

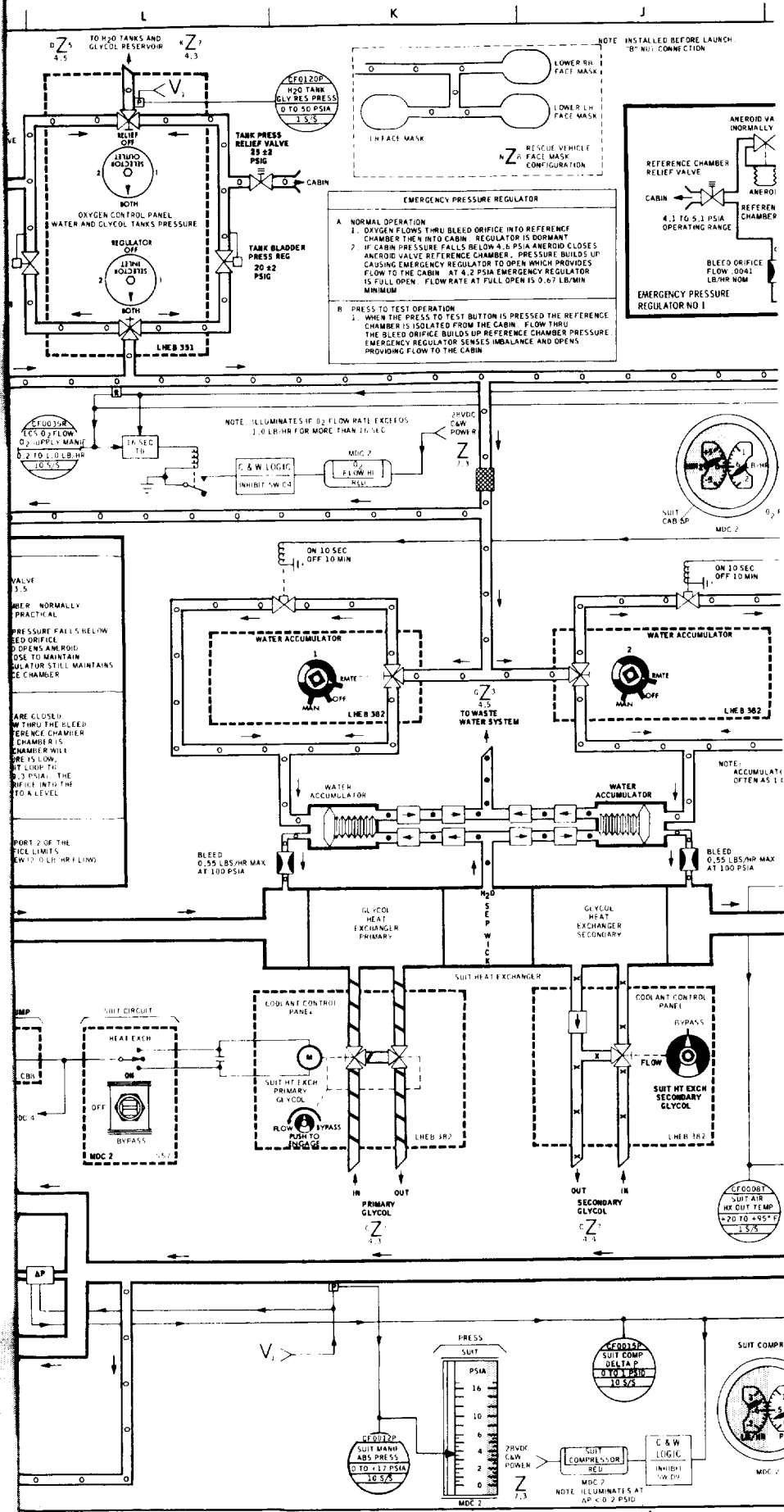
**SUIT DEMAND PRESSURE REGULATOR**

A. NORMAL OPERATION: SUIT TEST VALVE OFF  
 1. O<sub>2</sub> ENTERS REGULATOR ASSEMBLY VIA PORT 1 OF SUIT TEST VALVE  
 2. DEMAND REGULATOR KEEPS SUIT LOOP PRESSURIZED, 2.5 TO 3.5 IN H<sub>2</sub>O, BELOW REFERENCE CHAMBER  
 3. SUIT O<sub>2</sub> PASSES THRU BLEED ORIFICE INTO REFERENCE CHAMBER. ANEROID VALVE IS OPEN AND THIS O<sub>2</sub> BLEEDS TO CABIN. FOR PURPOSES REFERENCE CHAMBER IS AT CABIN PRESSURE.  
 4. IF CABIN PRESSURE AND THEREFORE, REFERENCE CHAMBER PRESSURE, FALLS TO 1.75 PSIA ANEROID CLOSURES ANEROID VALVE. FLOW THRU SUIT LOOP BUILDS UP PRESSURE IN REFERENCE CHAMBER UNTIL ANEROID VALVE THIS ANEROID CYCLES ANEROID VALVE OPEN AND O<sub>2</sub> REFERENCE CHAMBER PRESSURE AT 1.75 PSIA. DEMAND REGULATOR SUIT LOOP PRESSURE AT 2.5 TO 3.5 IN H<sub>2</sub>O BELOW REFERENCE CHAMBER

B. SUIT TEST VALVE IN PRESS POSITION  
 IN THIS CONFIGURATION PORTS 2 AND 3 OF THE SUIT TEST VALVE THE REFERENCE CHAMBER IS CLOSED OFF FROM THE CABIN. FLOW THRU BLEED ORIFICE OF PRESSURE IN REFERENCE CHAMBER UNTIL RELIEF VALVE CRACKS. RELIEF VALVE OPENS WHEN REFERENCE CHAMBER PRESSURE IS 1.75 PSIA ABOVE CABIN. WITH CABIN AT 5.5 PSIA REFERENCE CHAMBER PRESSURE AT 7.25 PSIA. DEMAND REGULATOR THEN SENSES SUIT PRESSURE RELATIVE TO REFERENCE CHAMBER PRESSURE AND PRESSURIZES SUIT LOOP TO 2.5 TO 3.5 IN H<sub>2</sub>O BELOW REFERENCE CHAMBER PRESSURE. THE DEMAND REGULATOR FLOW PASSES THRU THE PRESSURIZATION ORIFICE SENSING PORT. THIS ORIFICE LIMITS THE PRESSURIZATION RATE TO A LEVEL TOLERABLE BY THE CREW (4.5 LB/HR FLOW)

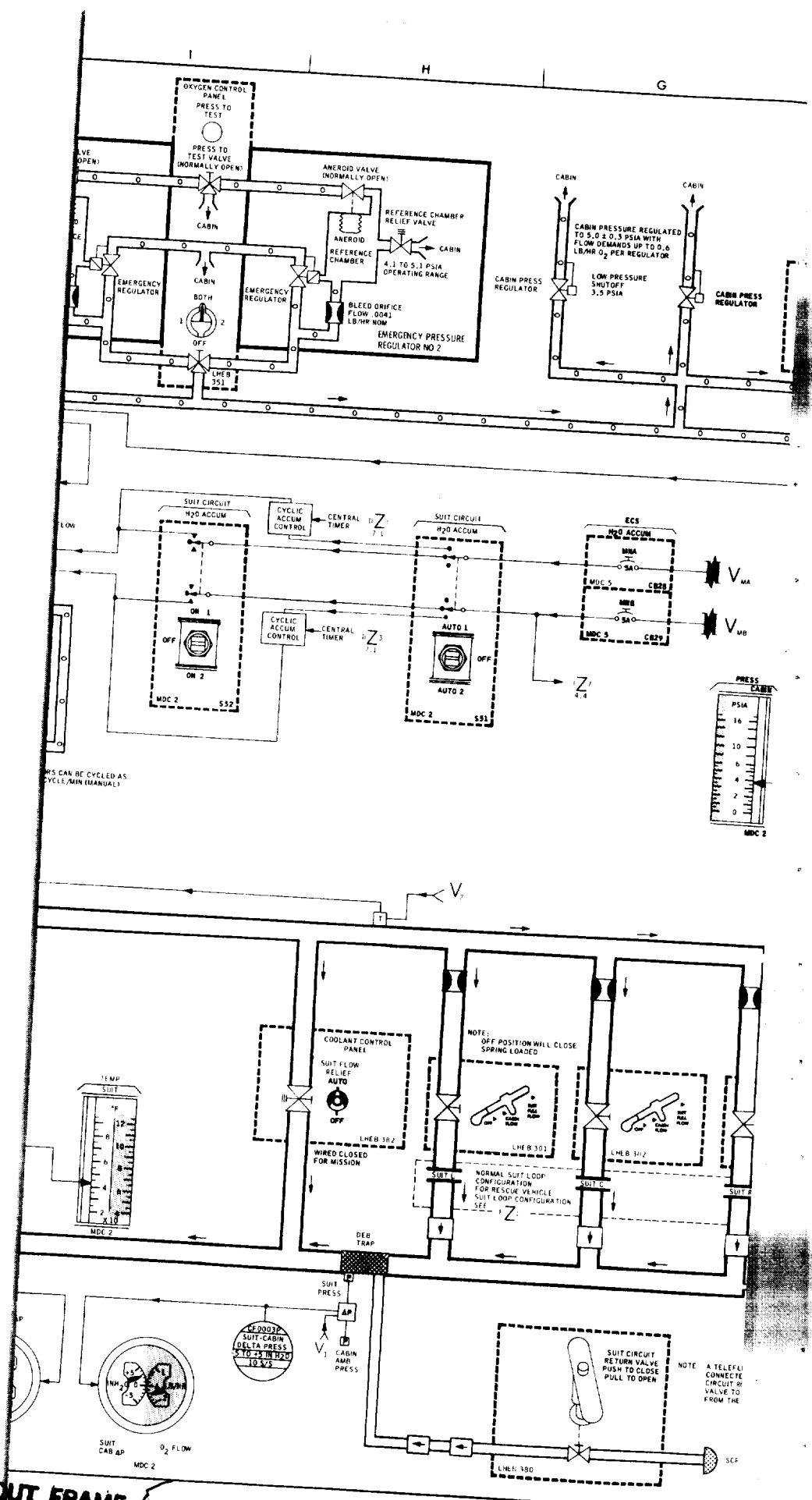
C. SUIT TEST VALVE IN PRESS POSITION  
 DEMAND REGULATOR IS BY-PASSED. FLOW GOES FROM PORT 3 TO SUIT TEST VALVE THRU THE SUIT TEST VALVE ORIFICE. THIS ORIFICE LIMITS THE PRESSURIZATION RATE TO A LEVEL TOLERABLE BY THE CREW (4.5 LB/HR FLOW)





FOLDOUT FRAME 4

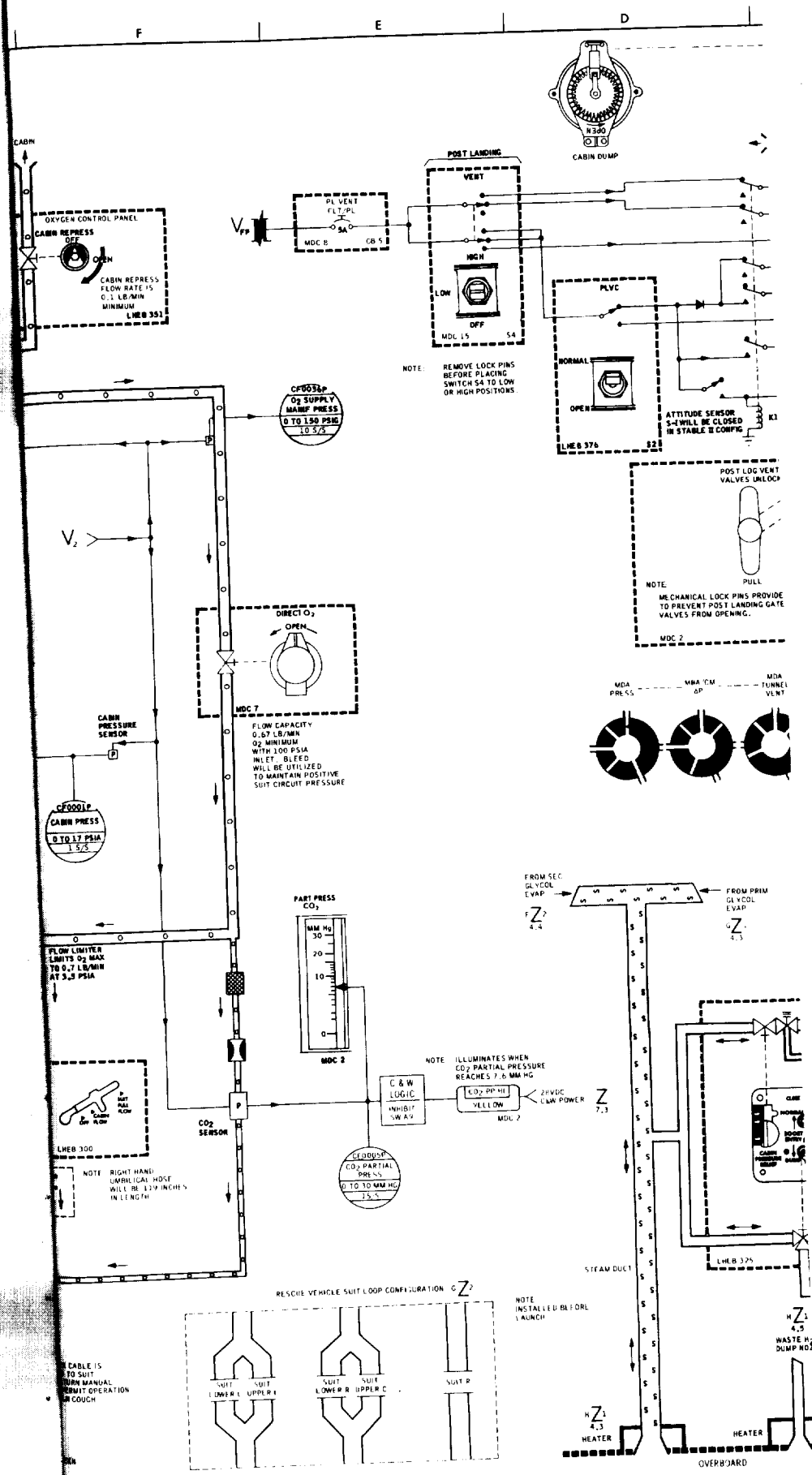




MDCS CAN BE CYCLED AS  
CYCLE/MIN (MANUAL)

FOLDOUT FRAME 5

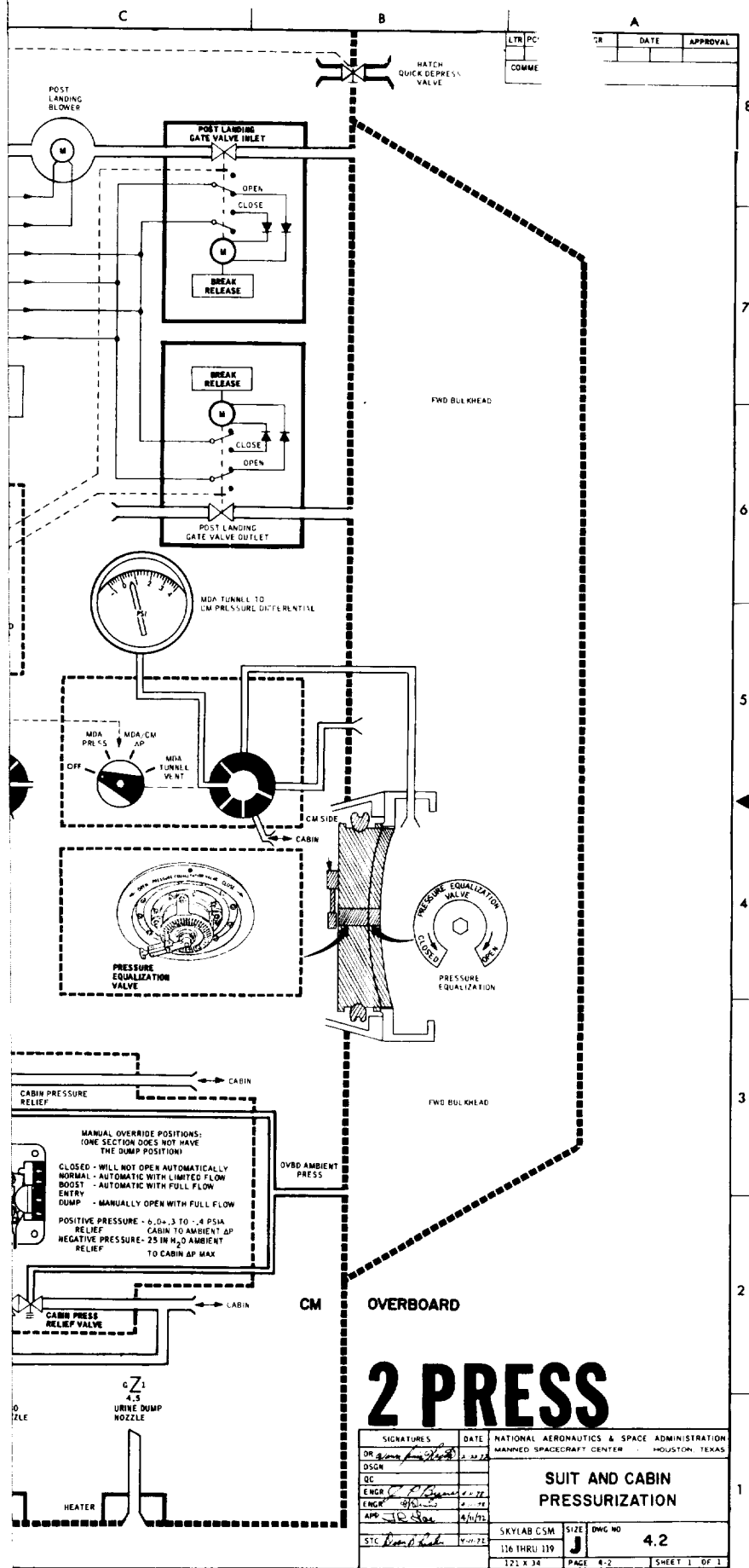




EQLODOUT FRAME 6





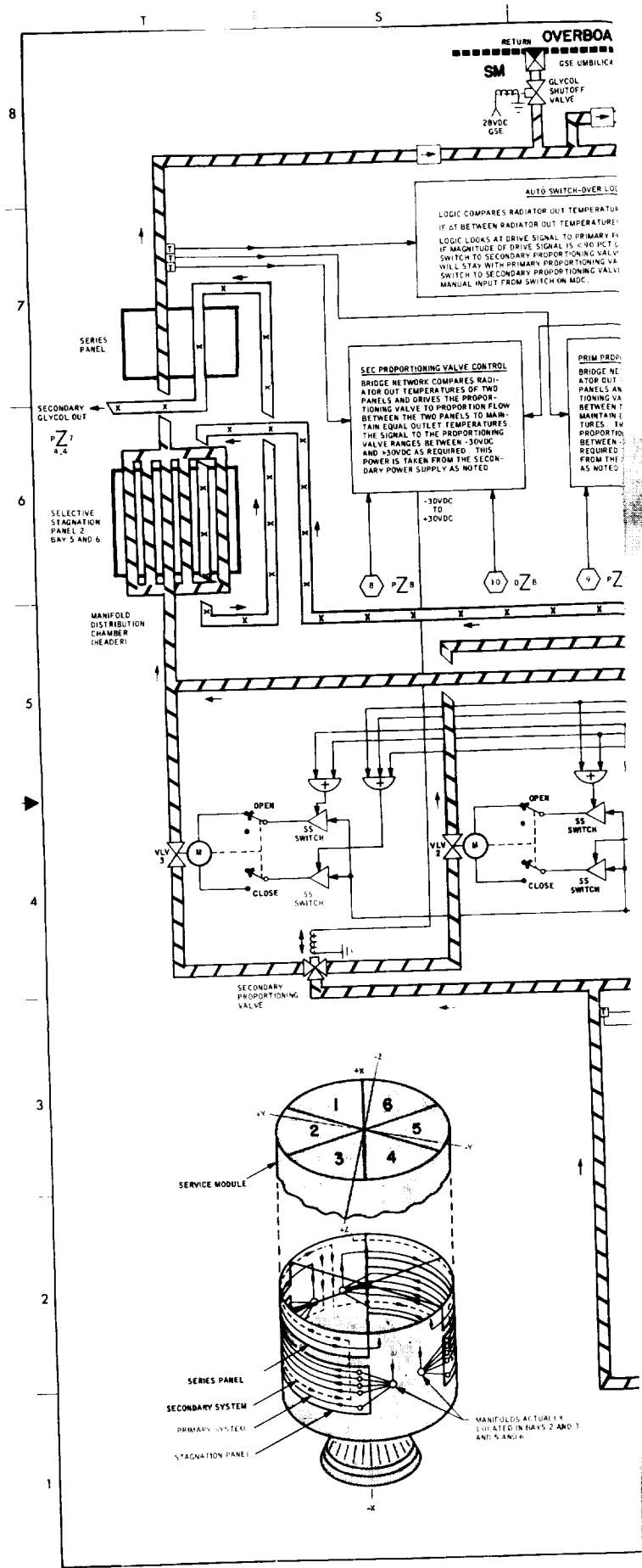


# 2 PRESS

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS			
DR	<i>[Signature]</i>	2-22-72	<b>SUIT AND CABIN PRESSURIZATION</b>			
DSCR						
QC						
ENGR	<i>[Signature]</i>	2-22-72				
APP	<i>[Signature]</i>	2/22/72				
STC	<i>[Signature]</i>	2-22-72	SKYLAB CSM	SIZE	DWG NO	4.2
			116 THRU 119	J		
			121 X 34	PAGE 4-2		SHEET 1 OF 1

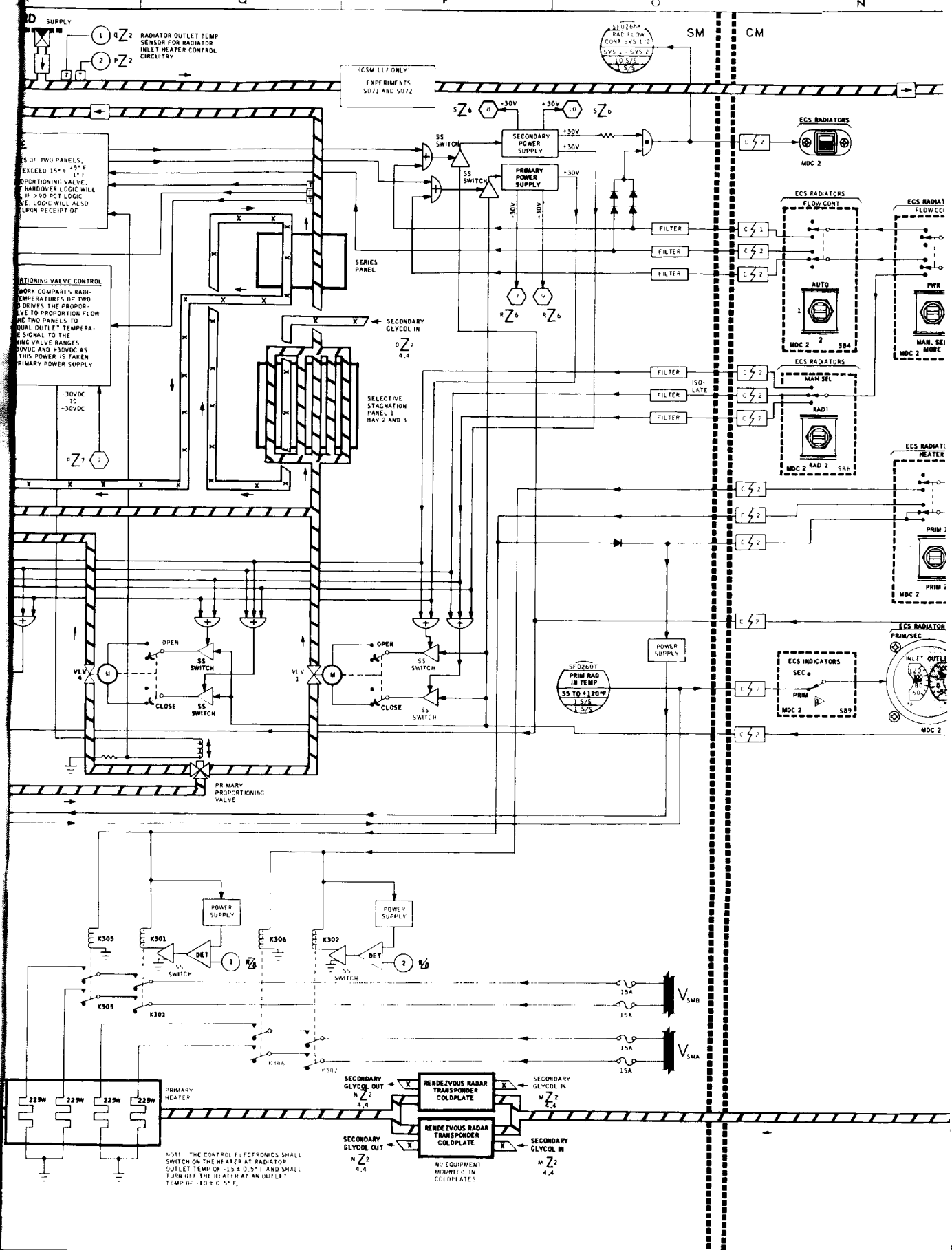
FOLDOUT FRAME 7





EOLDOUT FRAME

1000



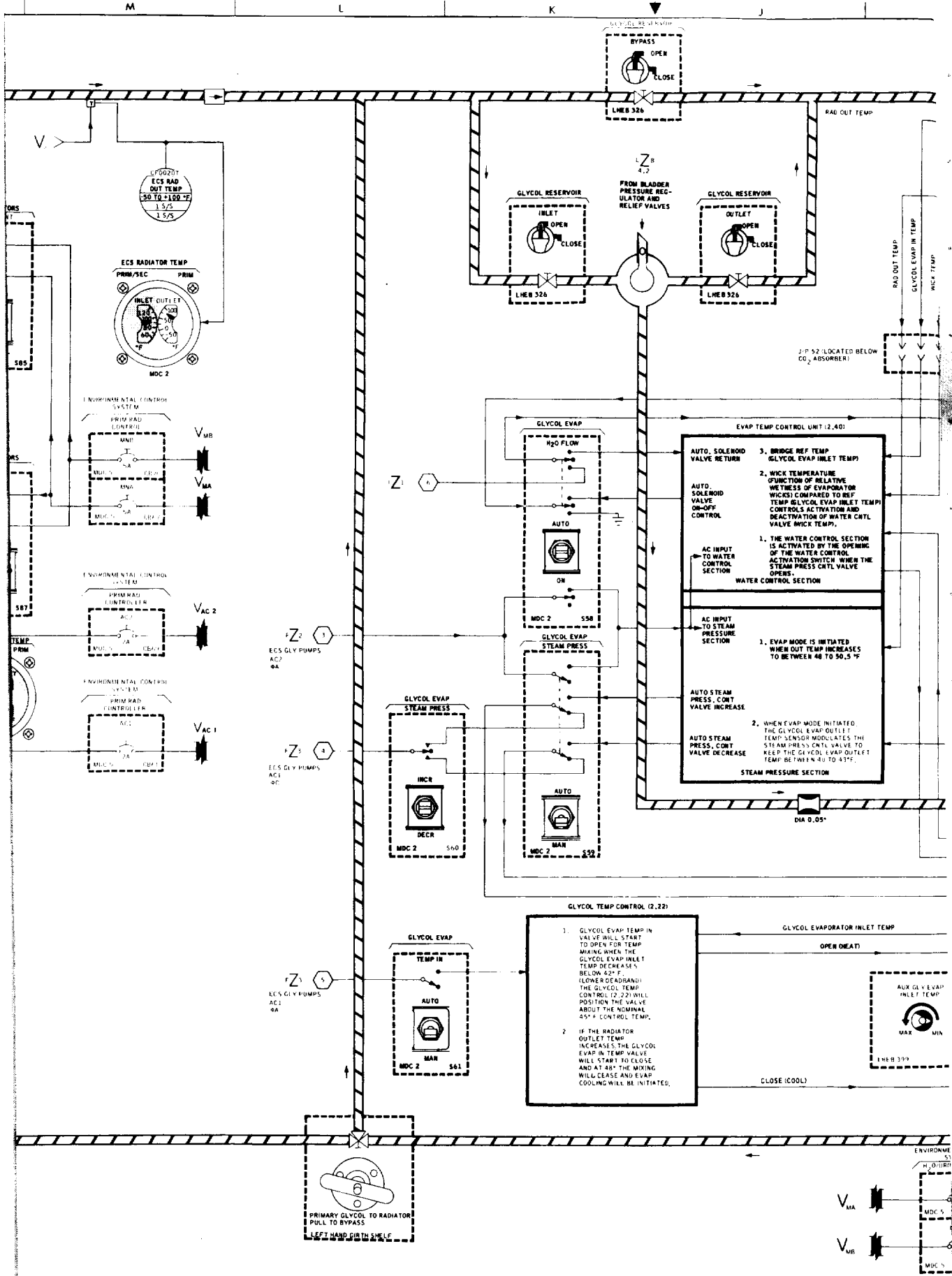
IF TWO PANELS EXCEED 15 ± 0.5°F DIFFERENCE IN TEMPERATURE, THE PROPORTIONING VALVE HARDOVER LOGIC WILL DIVERT FLOW TO THE PANEL WITH THE HIGHER TEMPERATURE. LOGIC WILL ALSO DIVERT FLOW UPON RECEIPT OF

PROPORTIONING VALVE CONTROL LOGIC COMPARES TEMPERATURES OF TWO PANELS TO DETERMINE THE PROPORTION OF FLOW TO BE DIVERTED TO EACH PANEL TO MAINTAIN TEMPERATURES WITHIN 15 ± 0.5°F. LOGIC WILL ALSO DIVERT FLOW UPON RECEIPT OF

NOTE: THE CONTROL ELECTRONICS SHALL SWITCH ON THE HEATER AT RADIATOR OUTLET TEMP OF 15 ± 0.5°F AND SHALL TURN OFF THE HEATER AT AN OUTLET TEMP OF 10 ± 0.5°F.

FOLDOUT FRAME 2





FOLDOUT FRAME 3

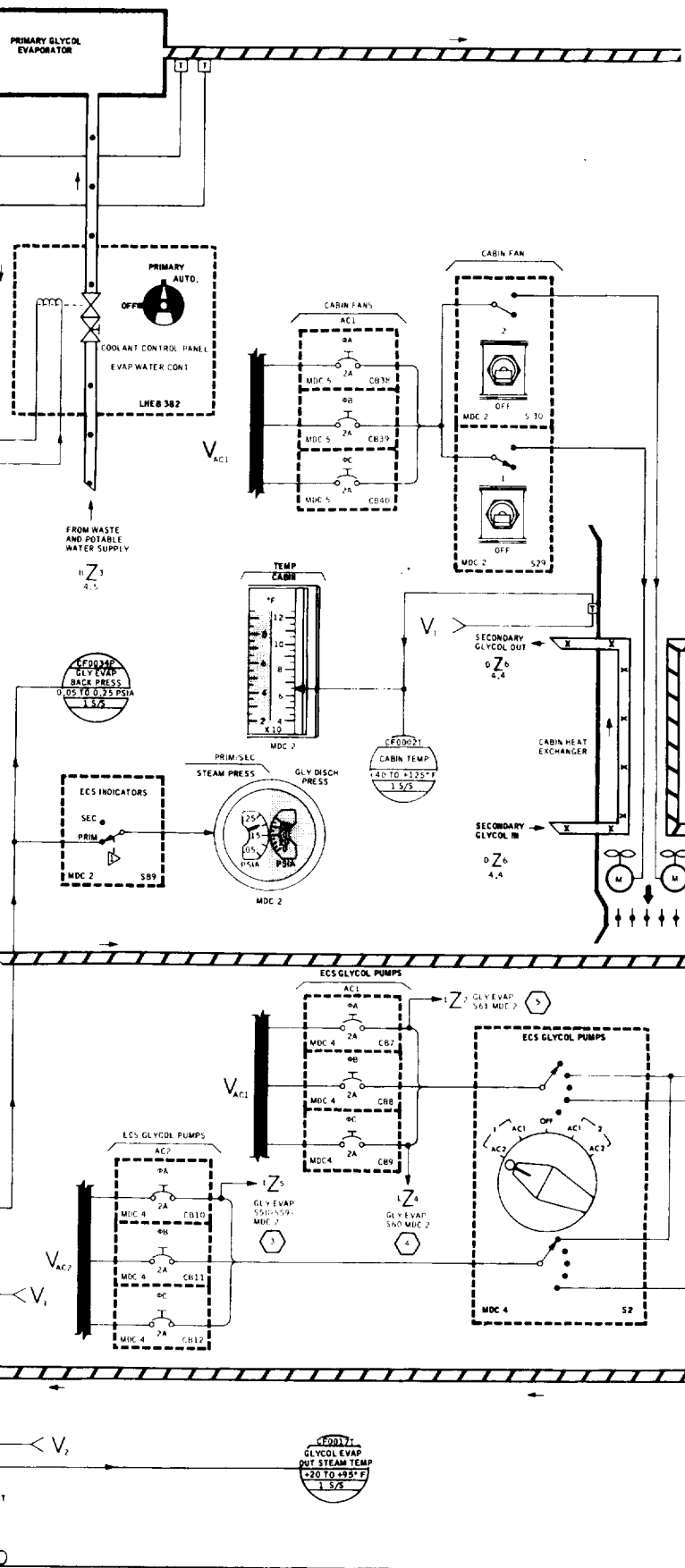
*Imaging*



CF0181  
 PRIM EVAP  
 INLET TEMP  
 175 TO 180°  
 1.5/2

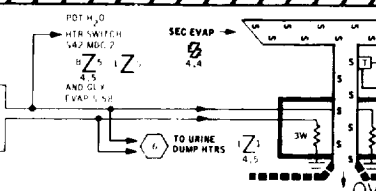
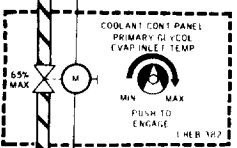
NOTE: IN THE EVENT ONE OF THE SENSORS SHOULD FAIL, A REDUNDANT SET CAN BE SELECTED BY RECONNECTING PLUG FROM J52 TO J53. BE SURE POWER IS REMOVED FROM EVAP TEMP CONTROL UNITS 17, 22 AND 2401 ANYTIME PLUG IS REMOVED. SET GLYCOL EVAP W20 FLOW SWITCH, 558 MDC 2, TO OFF (CENTER). GLYCOL EVAP STEAM PRESS SWITCH, 559 MDC 2, TO MAN. AND GLYCOL EVAP TEMP IN SWITCH 5A3 MDC 2 TO MAN.

JIP 53 (LOCATED BELOW CO<sub>2</sub> ABSORBER)



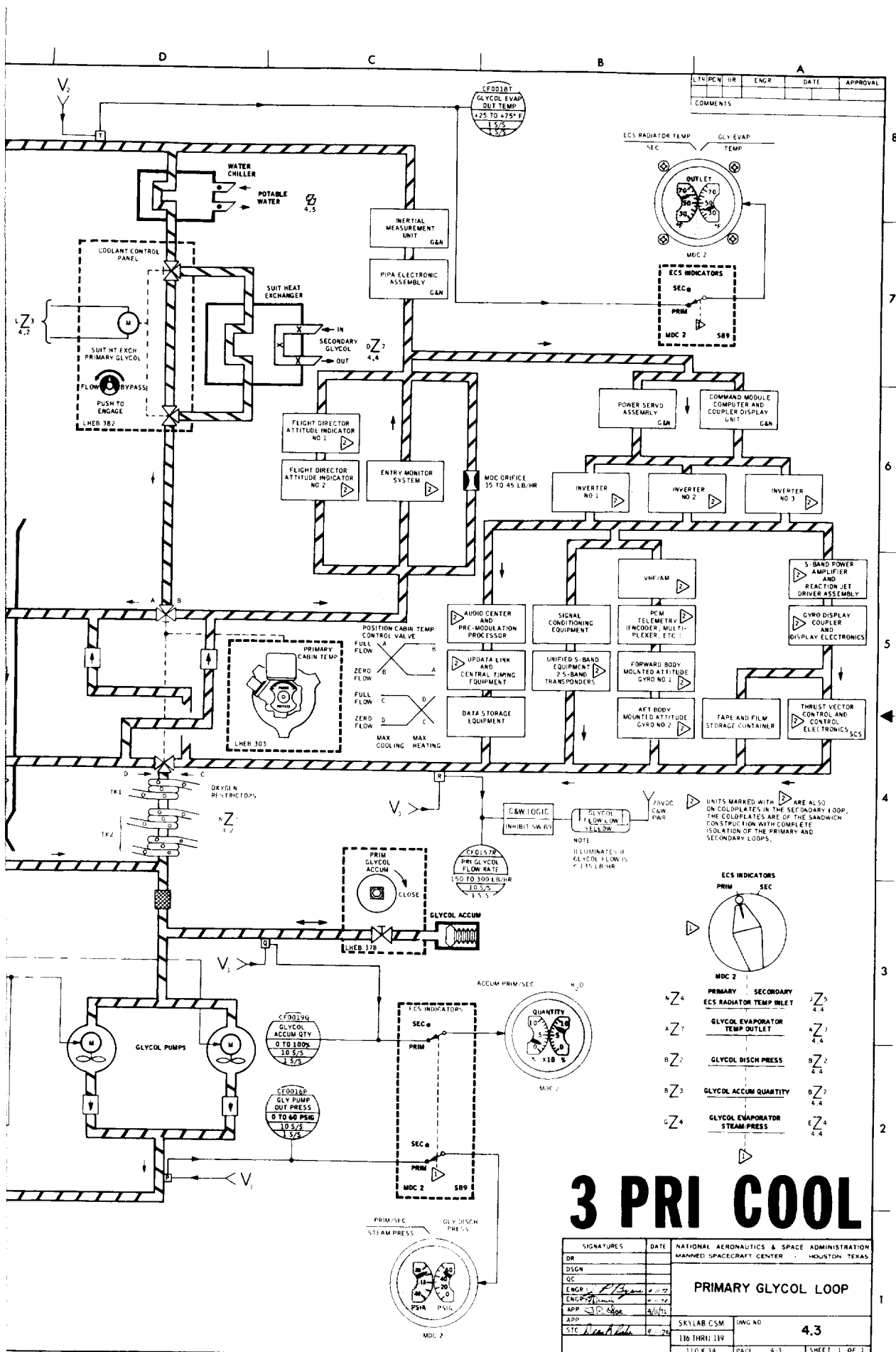
WATER CONTROL ACTIVATION SWITCH OPENS WHEN STEAM PRESSURE CONTROL VALVE OPENS TO ALLOW OPERATION OF THE WATER CONTROL SECTION. SWITCH CLOSURES WHEN STEAM PRESSURE CONTROL VALVE CLOSURES TO PREVENT WATER CONTROL SECTION OPERATION.

MOTOR TAKES APPROX 50 SEC FROM FULL OPEN TO FULL CLOSE.



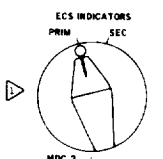
FOLDOUT FRAME 4





LT	PCN	HR	ENGR	DATE	APPROVAL

COMMENTS



- NZ4 PRIM/SEC ECS RADIATOR TEMP INLET 4.4
- NZ7 GLYCOL EVAPORATOR TEMP OUTLET 4.4
- BZ2 GLYCOL DISCH PRESS 4.4
- BZ3 GLYCOL ACCUM QUANTITY 4.4
- CZ4 GLYCOL ENAPORATOR STEAM PRESS 4.4

# 3 PRI COOL

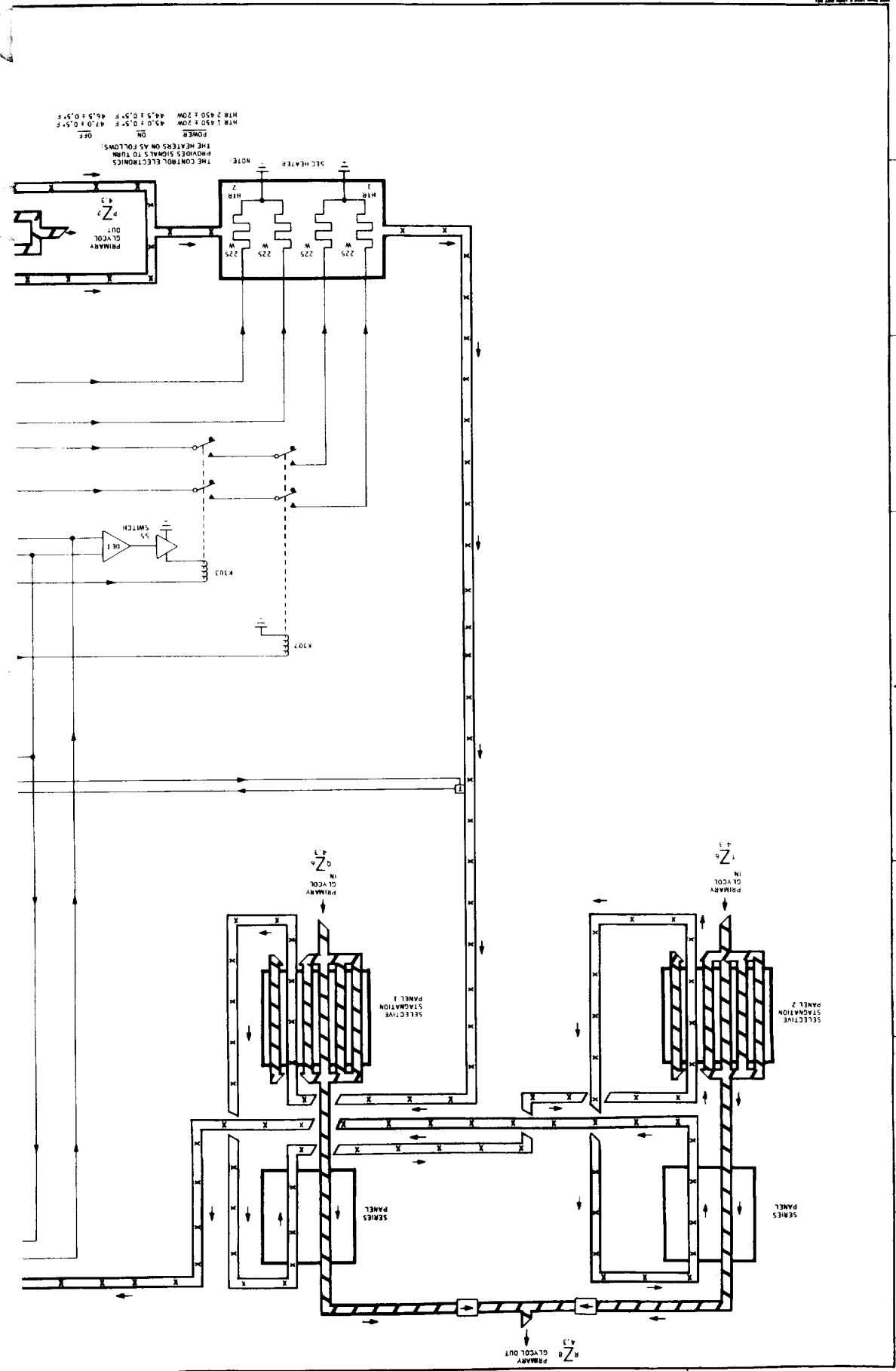
SIGNATURES	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION
DR		MANNED SPACECRAFT CENTER HOUSTON TEXAS
DSEN		
QC		
ENGR		
ENGR		
APP		
APP		
STC		

## PRIMARY GLYCOL LOOP

SKYLAB CSM	WING NO	4.3
116 THRU 119		
310 K 34	PAGE	4-3
	SHEET	1 OF 3

FOLDOUT FRAME 5



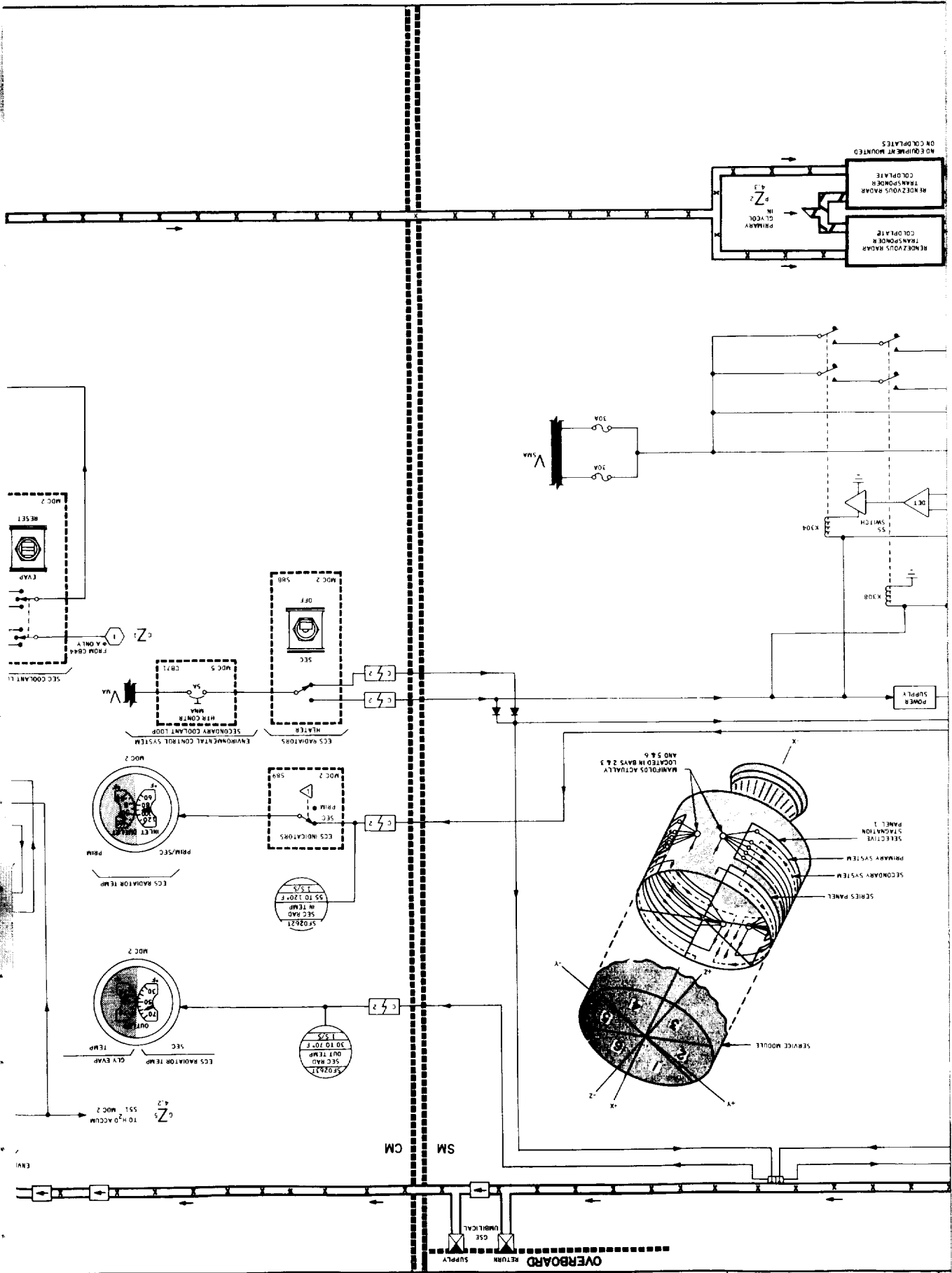


HIR 2 450 F 20W 44.5 F 0.5 F 46.5 F 0.5 F  
 HIR 1 450 F 20W 45.0 F 0.5 F 47.0 F 0.5 F  
 POWER ON  
 THE CONTROL ELECTRONICS  
 PROVIDES SIGNALS TO TURN  
 THE HEATERS ON AS FOLLOWS:  
 OFF

NOTE: SECHEATER

FOLDOUT FRAME





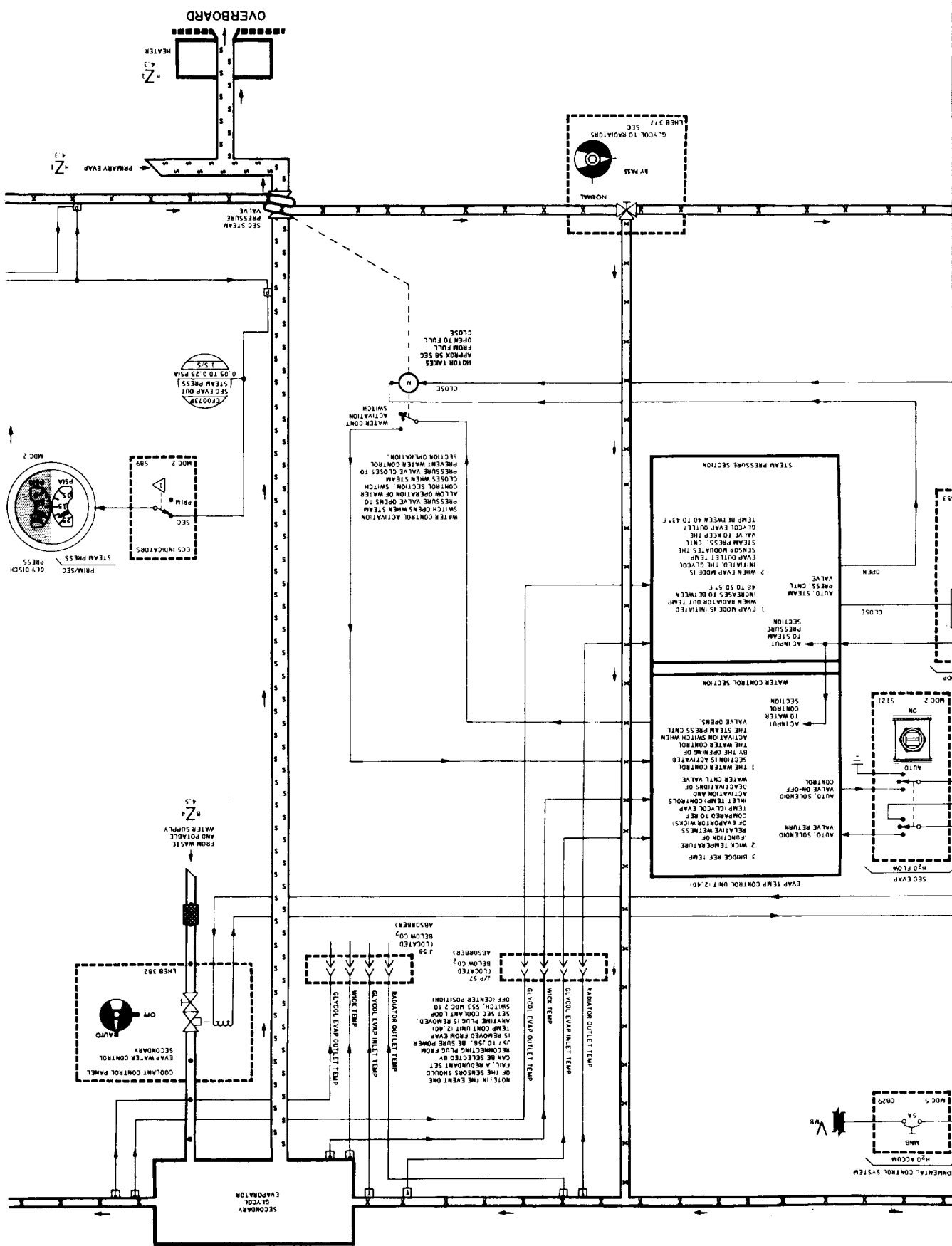
FOLDOUT FRAME 2

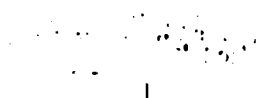
1000

1000

1

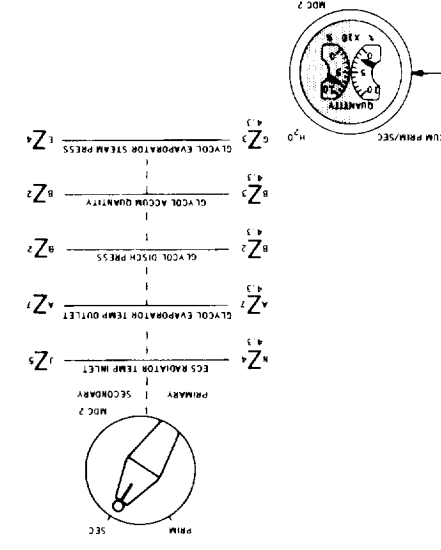






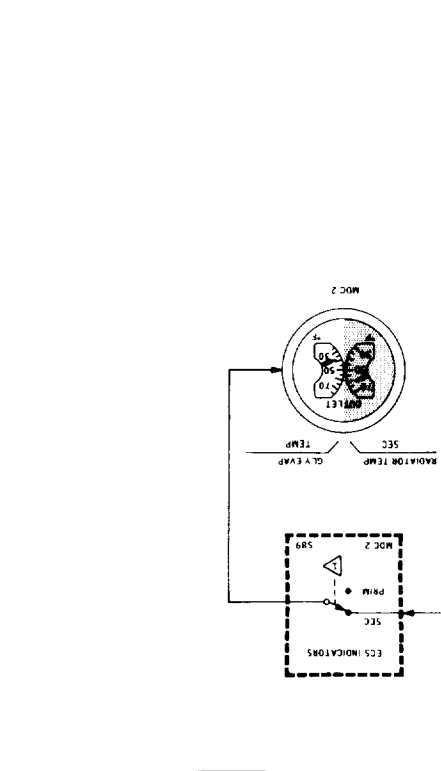
DATE	DESIGNER	APP. NO.	SIZE	SCALE	SHEET
11/18/70	J. J. ...	118 THRU 119	44	4-4	1 OF 1

# 4 SEC COOL

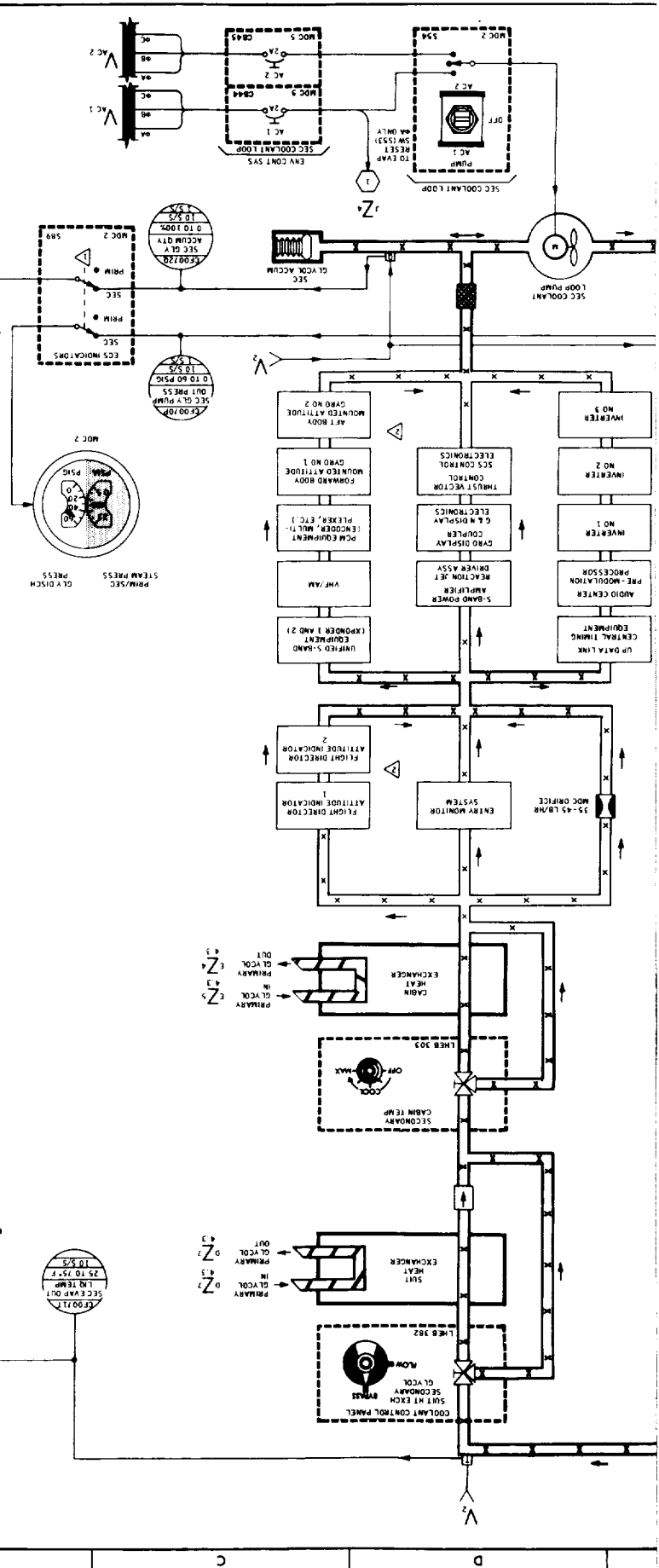


NOTES:
 

- △ ECS INDICATORS
- △ ALL UNITS SHOWN ON SECONDARY COOLANT ARE ALSO ON PRIMARY COOLANT. THE COOLANT ISOLATION OF THE PRIMARY AND SECONDARY GLYCOL LOOPS, SEE ECS DRAWING 4-3 FOR PRIMARY GLYCOL LOOP.



TR	DR	ENG	DATE	APPROVAL



EOLDOUT FRAME 4

1000

8

7

6

5

4

3

2

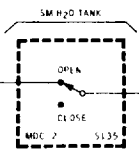
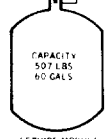
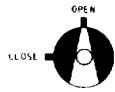
1

**FOLDOUT FRAME**

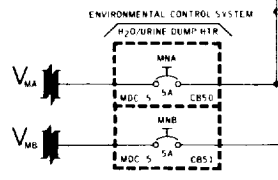
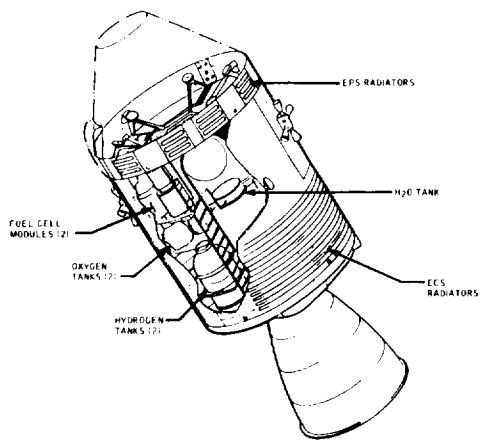


H<sub>2</sub>O FROM FUEL CELLS  
AT APPROX 61.5 PSIG

GZ  
4.7

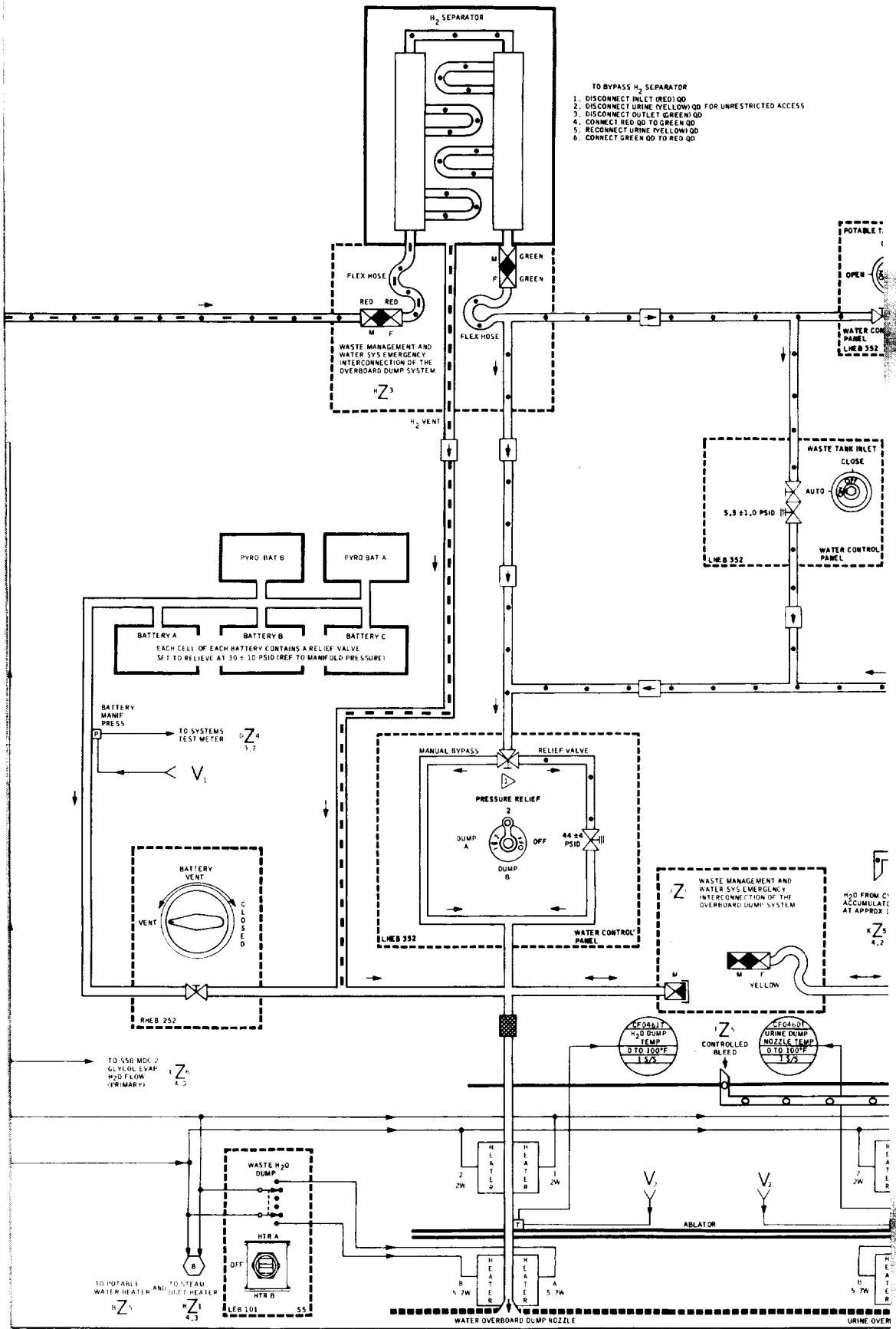


CS 1





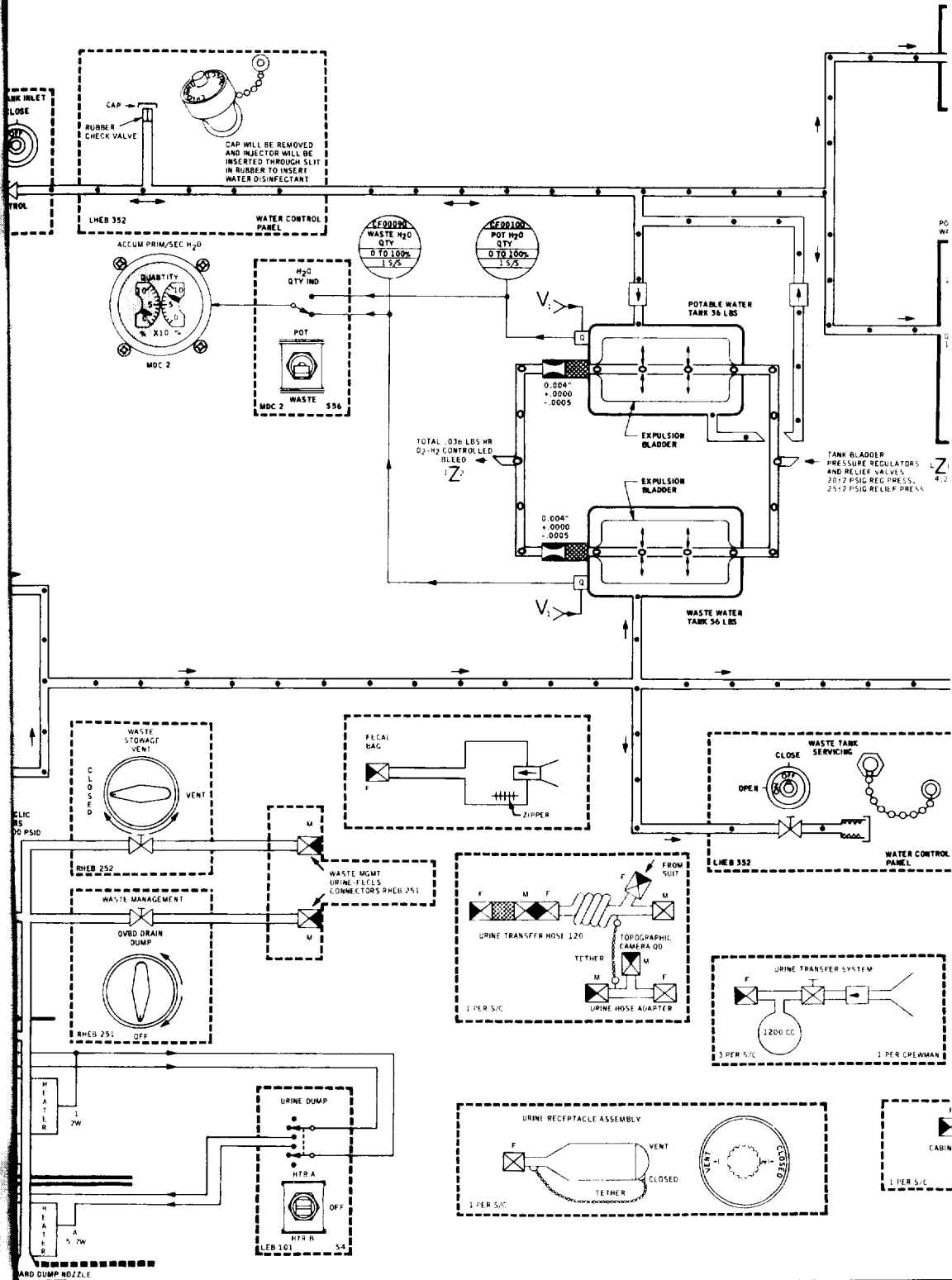




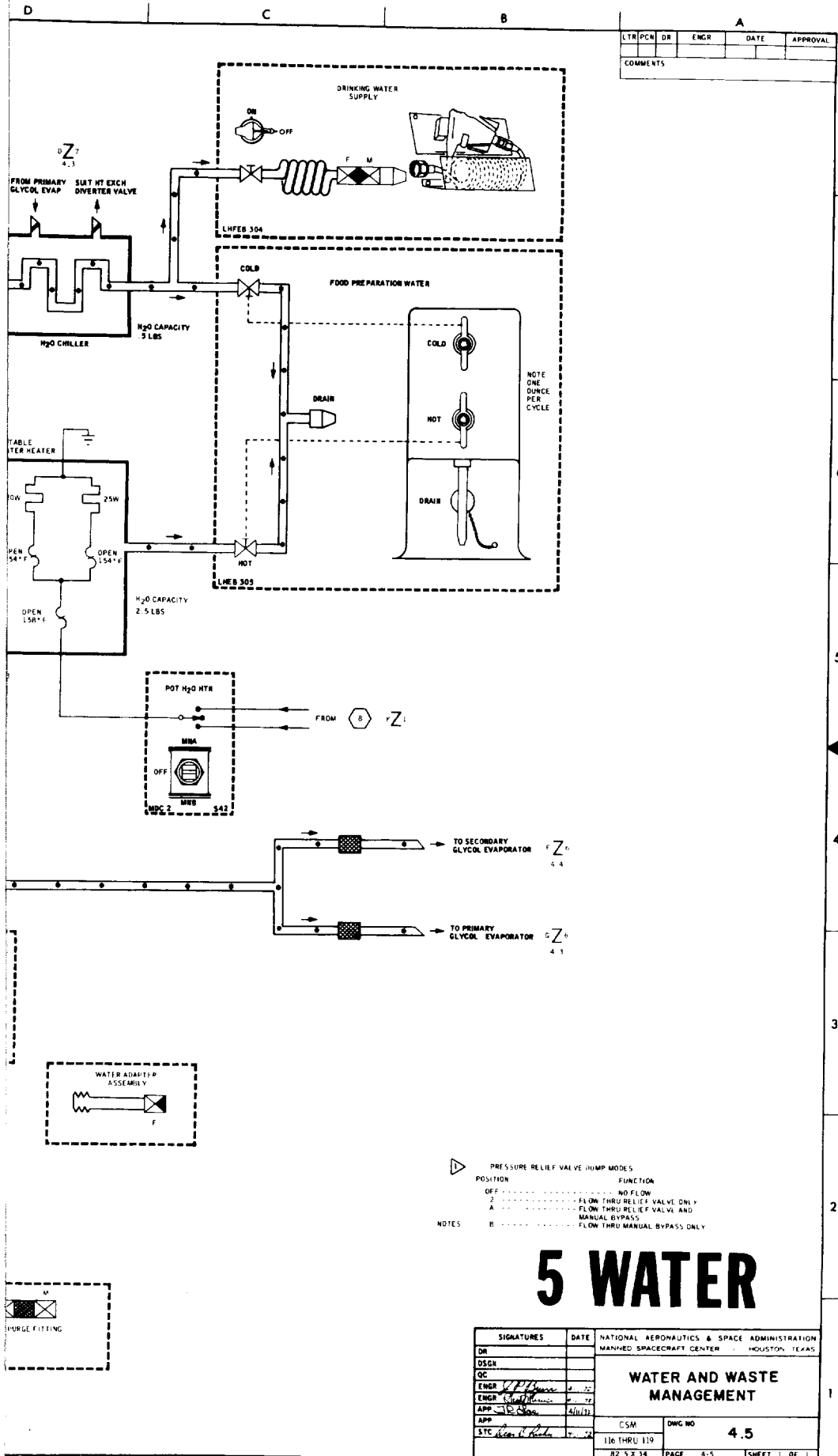
- TO BYPASS H<sub>2</sub> SEPARATOR
1. DISCONNECT INLET (RED) QD
  2. DISCONNECT URINE (YELLOW) QD FOR UNRESTRICTED ACCESS
  3. DISCONNECT OUTLET (GREEN) QD
  4. CONNECT RED QD TO GREEN QD
  5. RECONNECT URINE (YELLOW) QD
  6. CONNECT GREEN QD TO RED QD

**FOLDOUT FRAME 3**









A			
LTR/PCN	DR	ENGR	DATE
COMMENTS			

# 5 WATER

SIGNATURES	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
DR		<b>WATER AND WASTE MANAGEMENT</b> CSM      DWG NO. <b>4.5</b> 116 THRU 119 PAGE 4-5      SHEET 1 OF 1	
DSGX			
QC			
ENGR			
APP			
DTC			

FOLODOUT FRAME 5



5 FUEL CELL/  
CRYOGENICS  
SYSTEM

)

)

)

)

)

|



6 COMMUNI-  
CATIONS  
SYSTEM

)

)

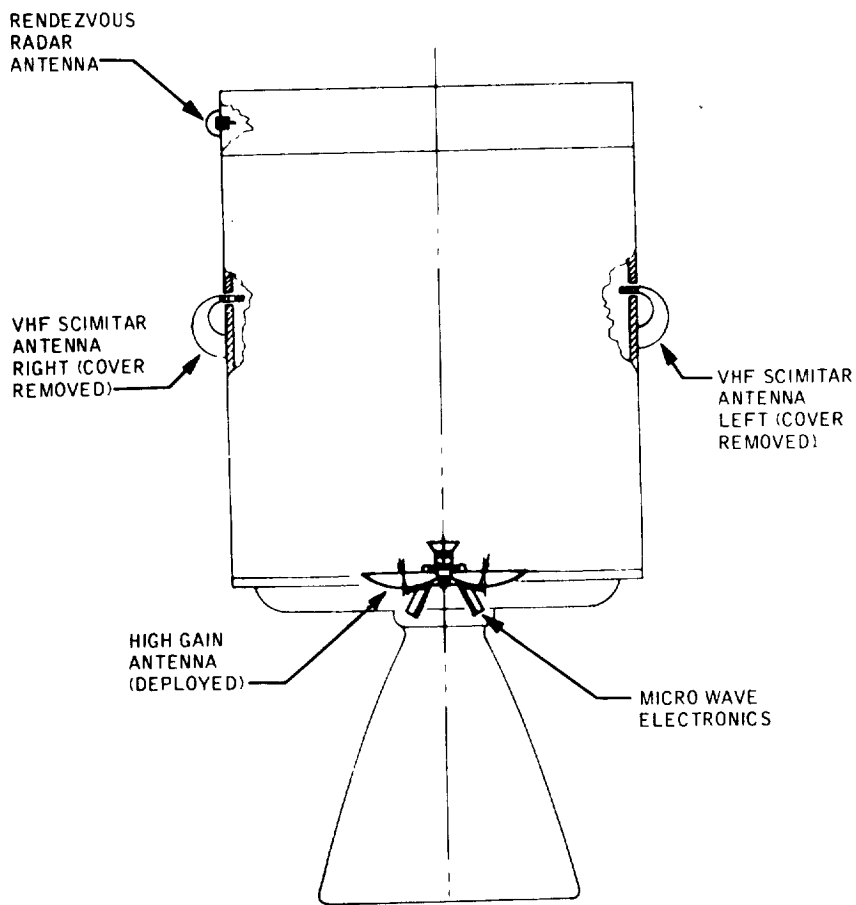
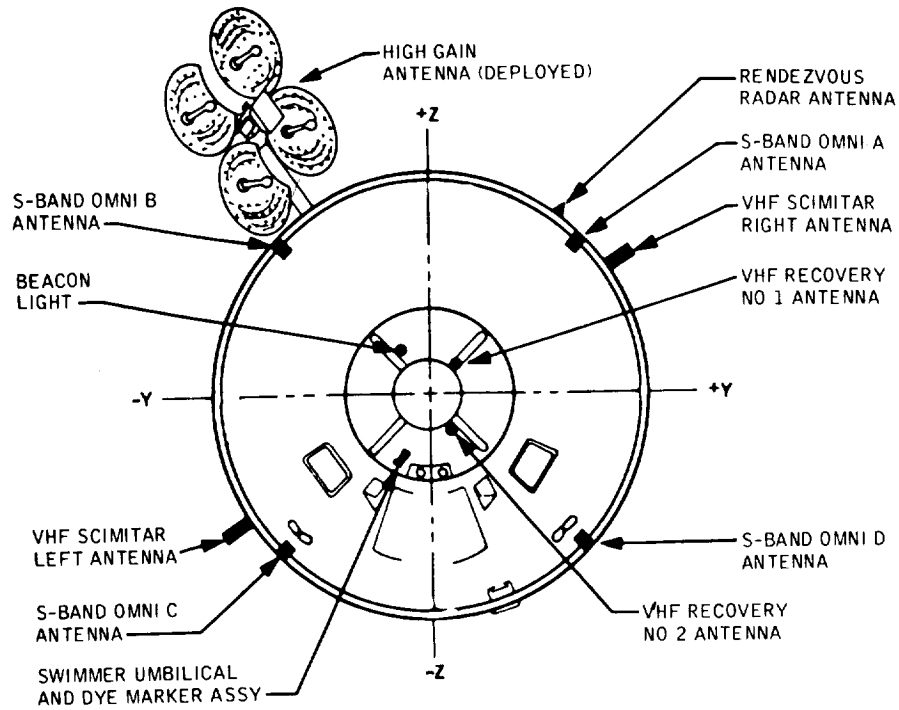
)

)

)

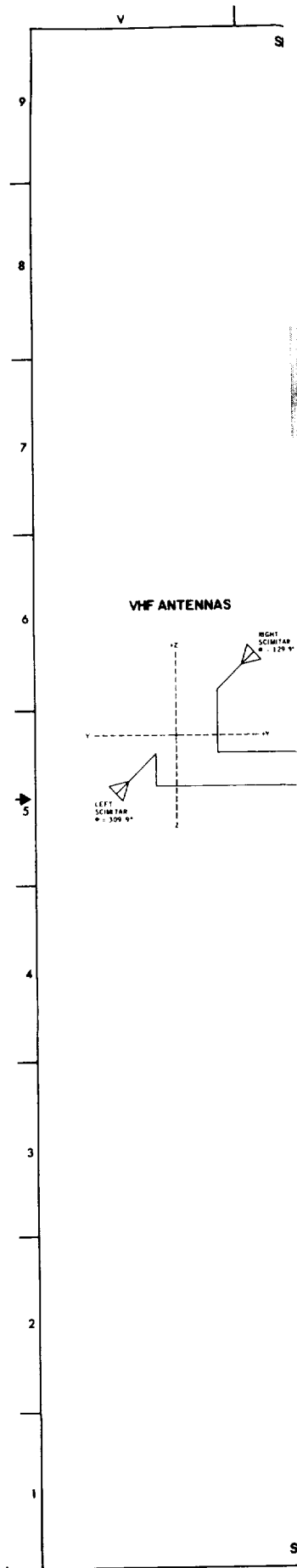
10/10/10

|

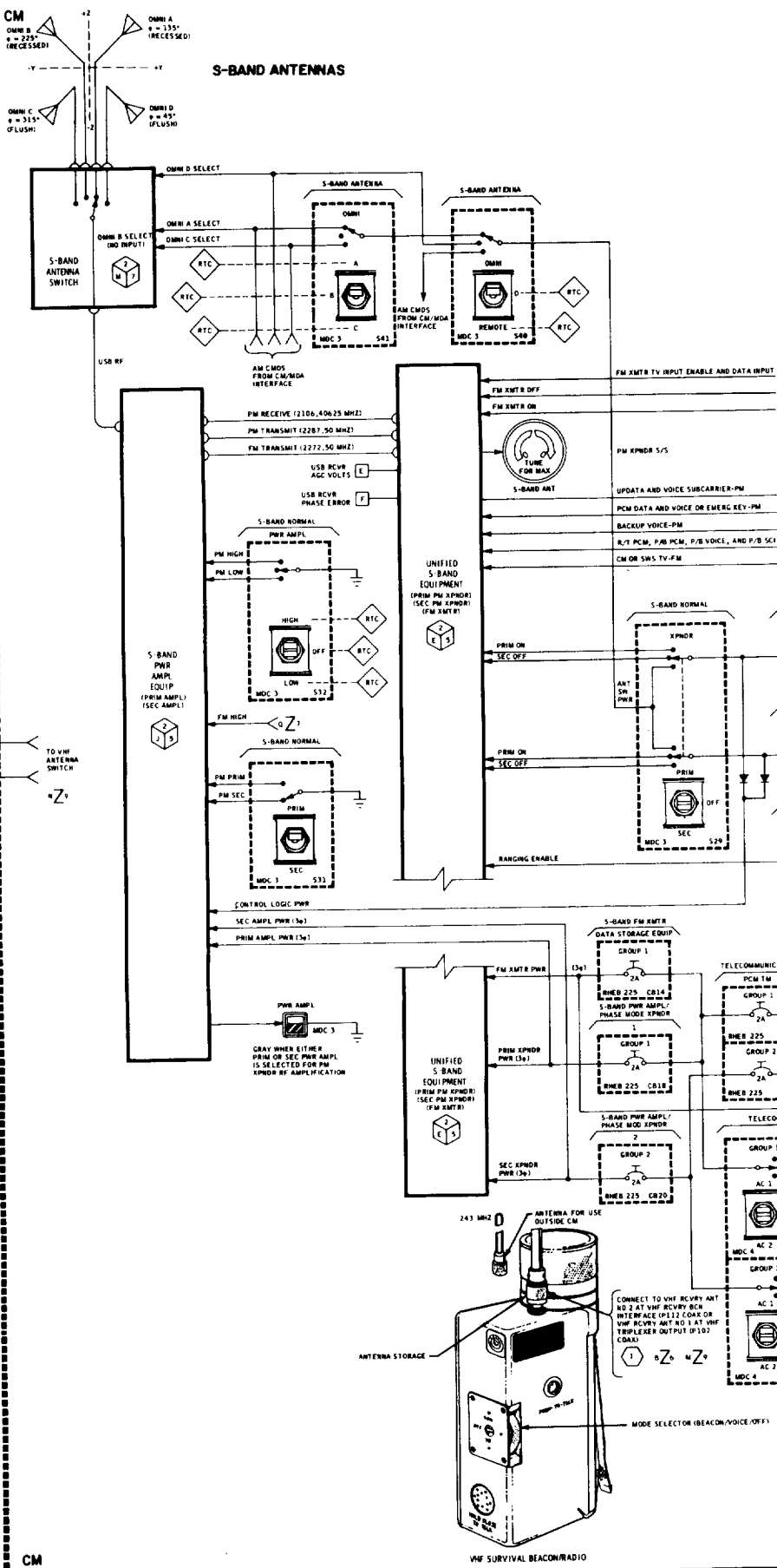


APRON ITEM 6.1

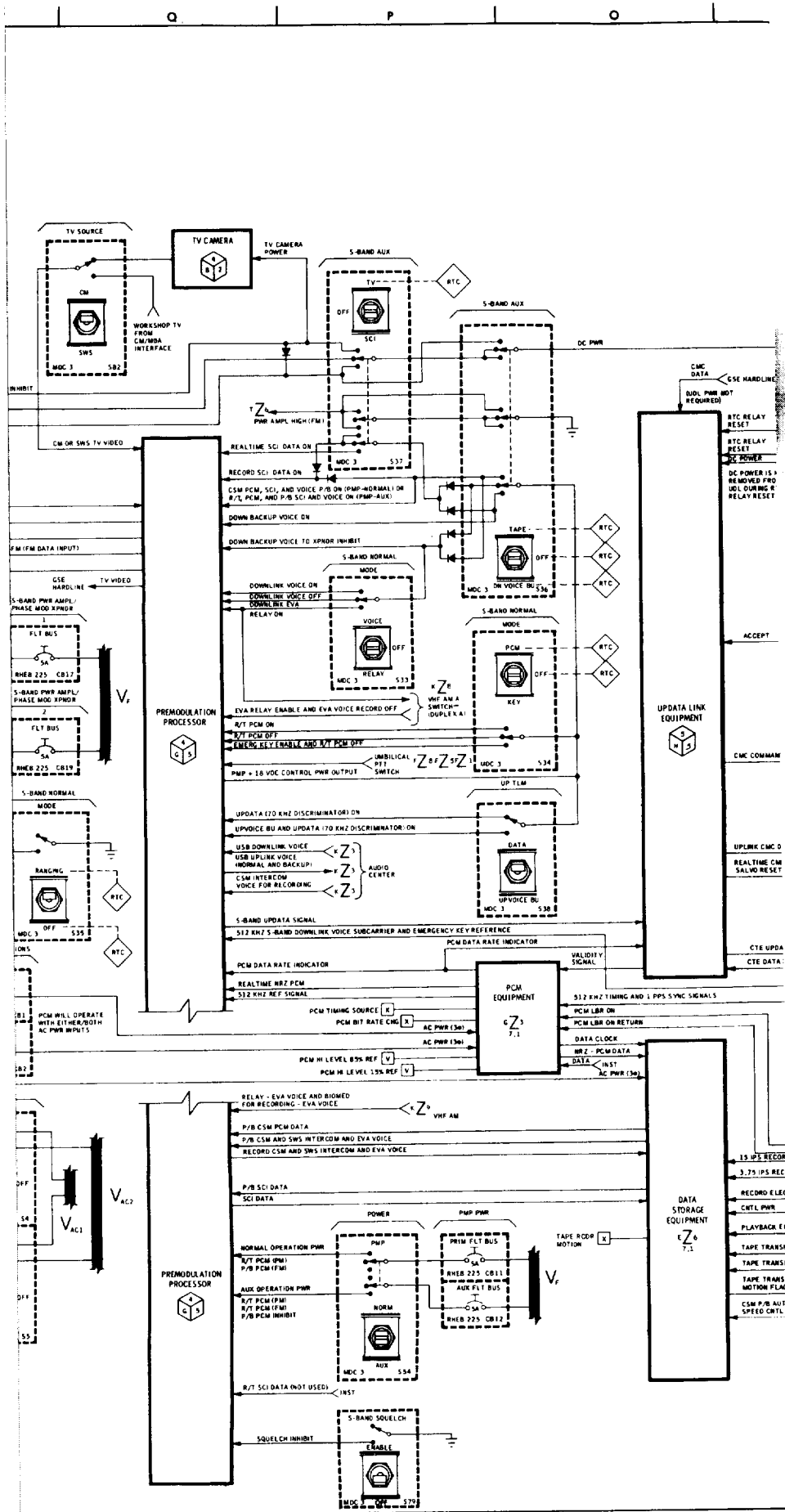
**EOLDOUT FRAME**





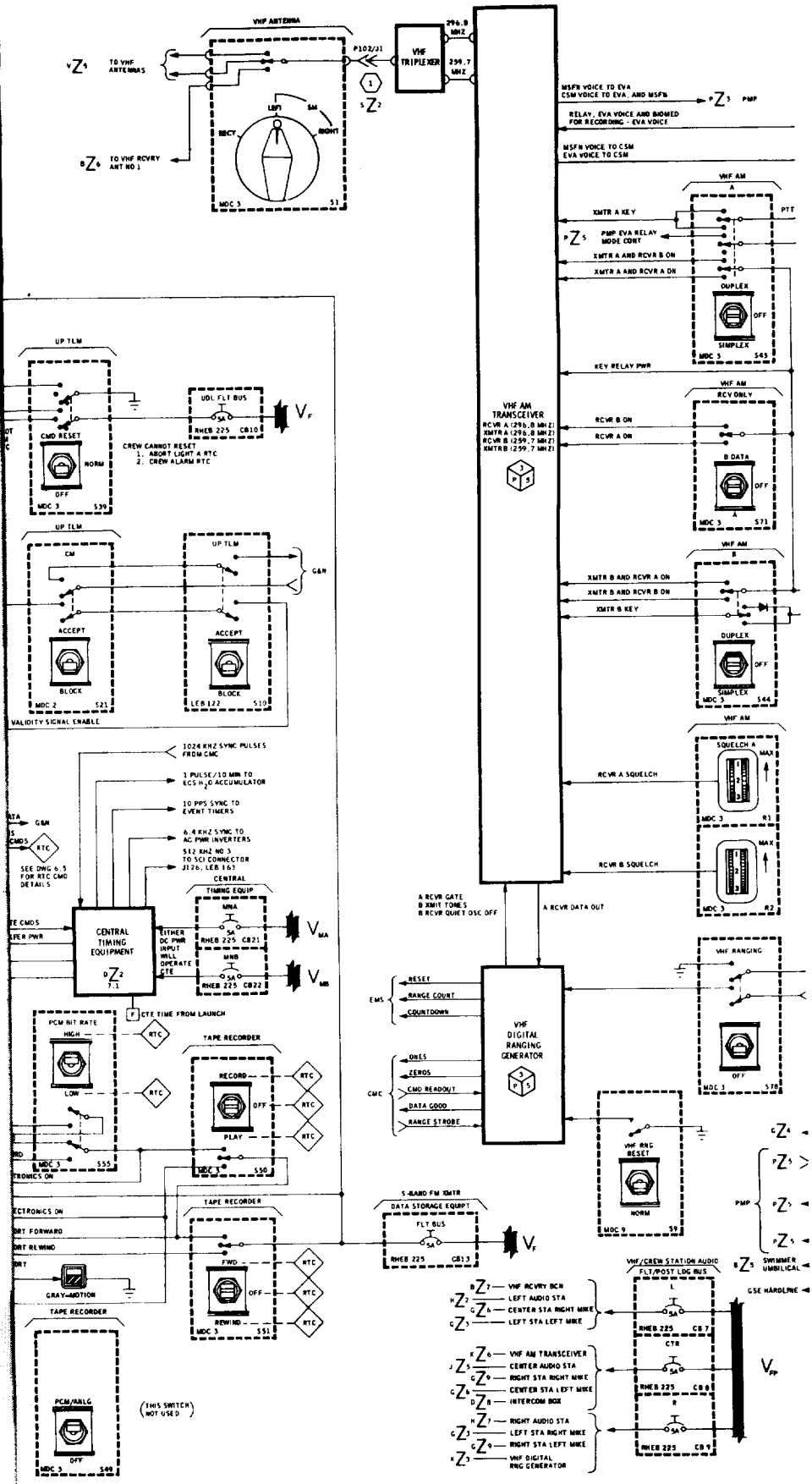






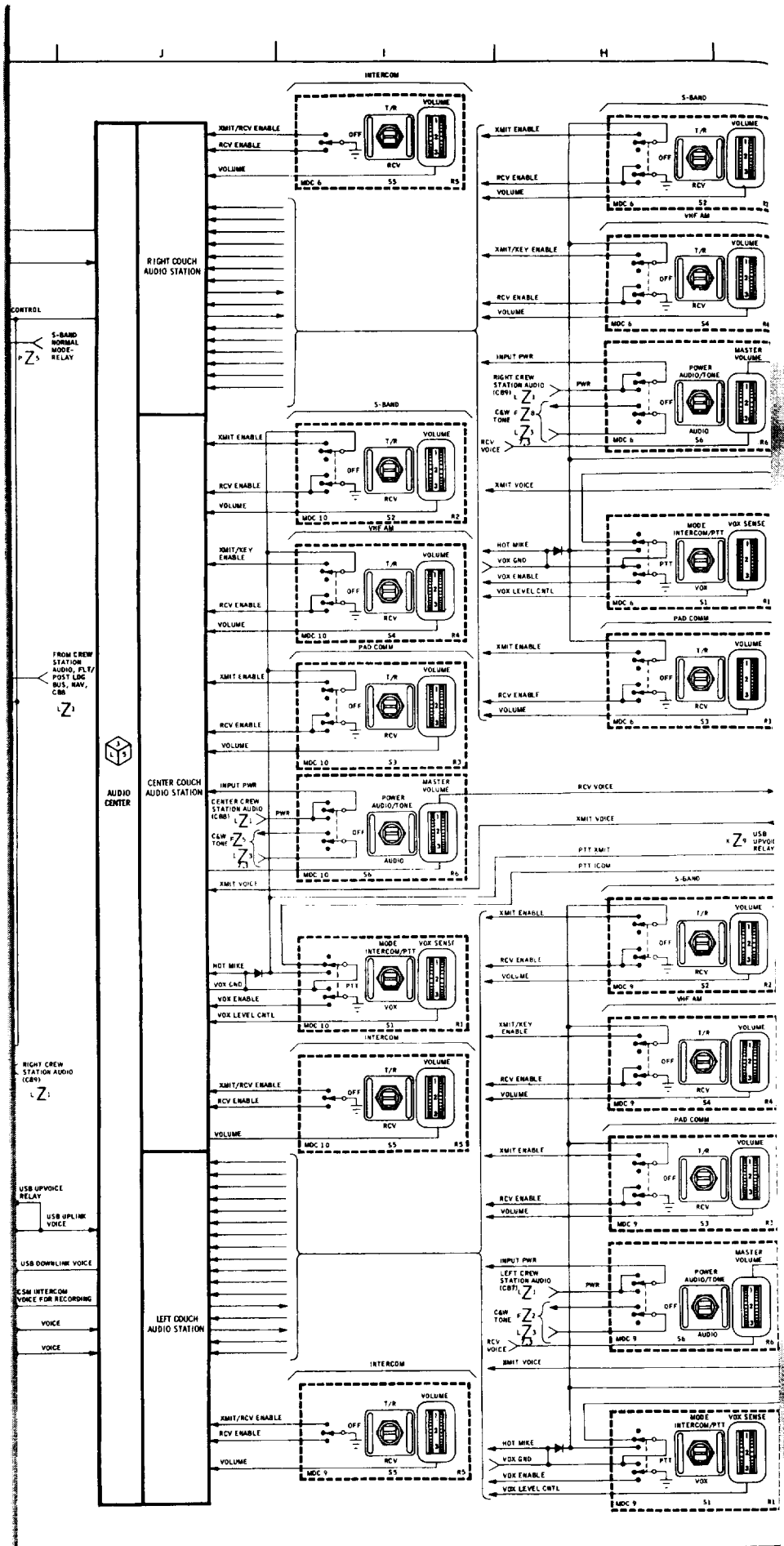






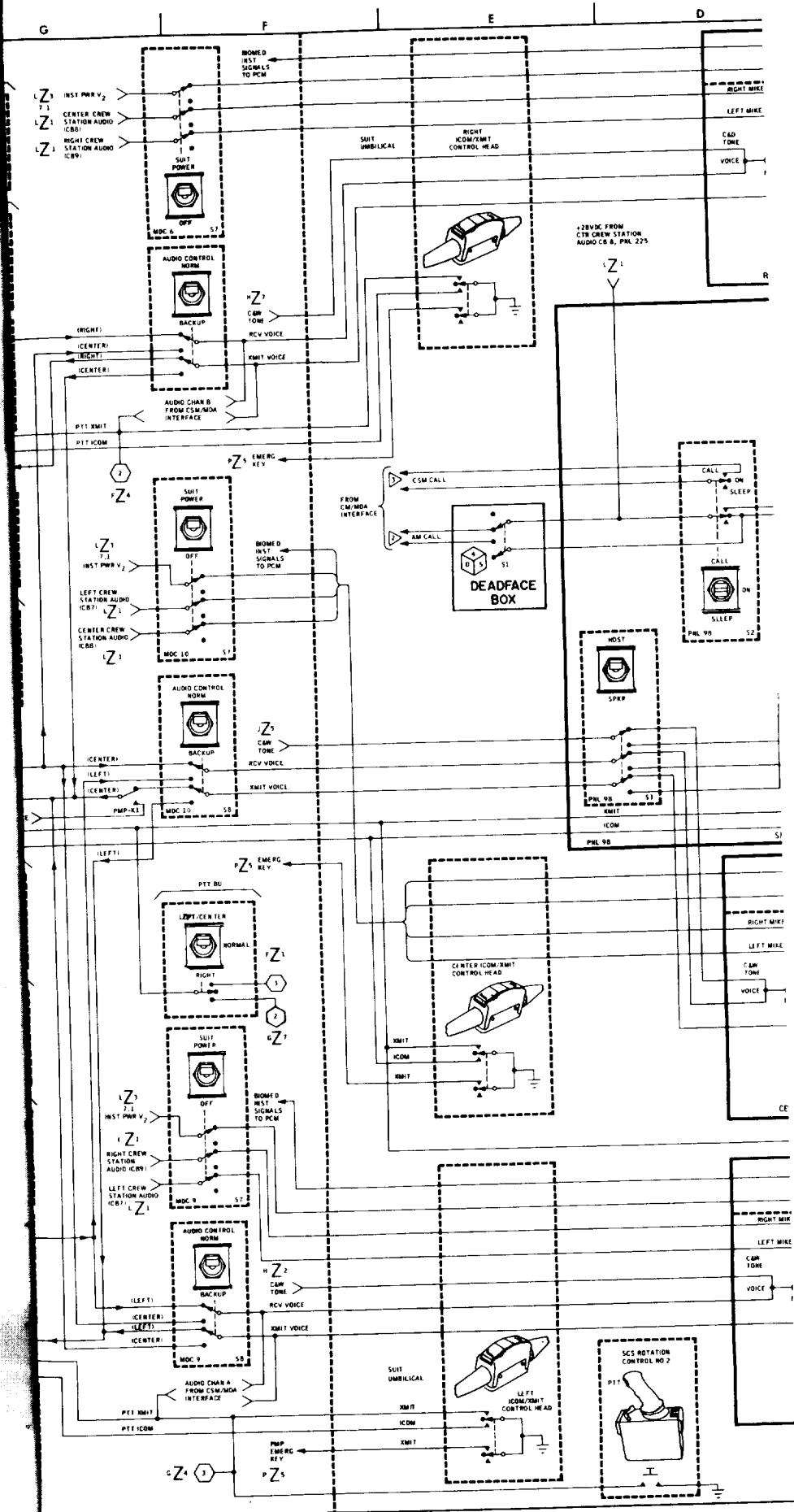
EOLDOUT FRAME 4





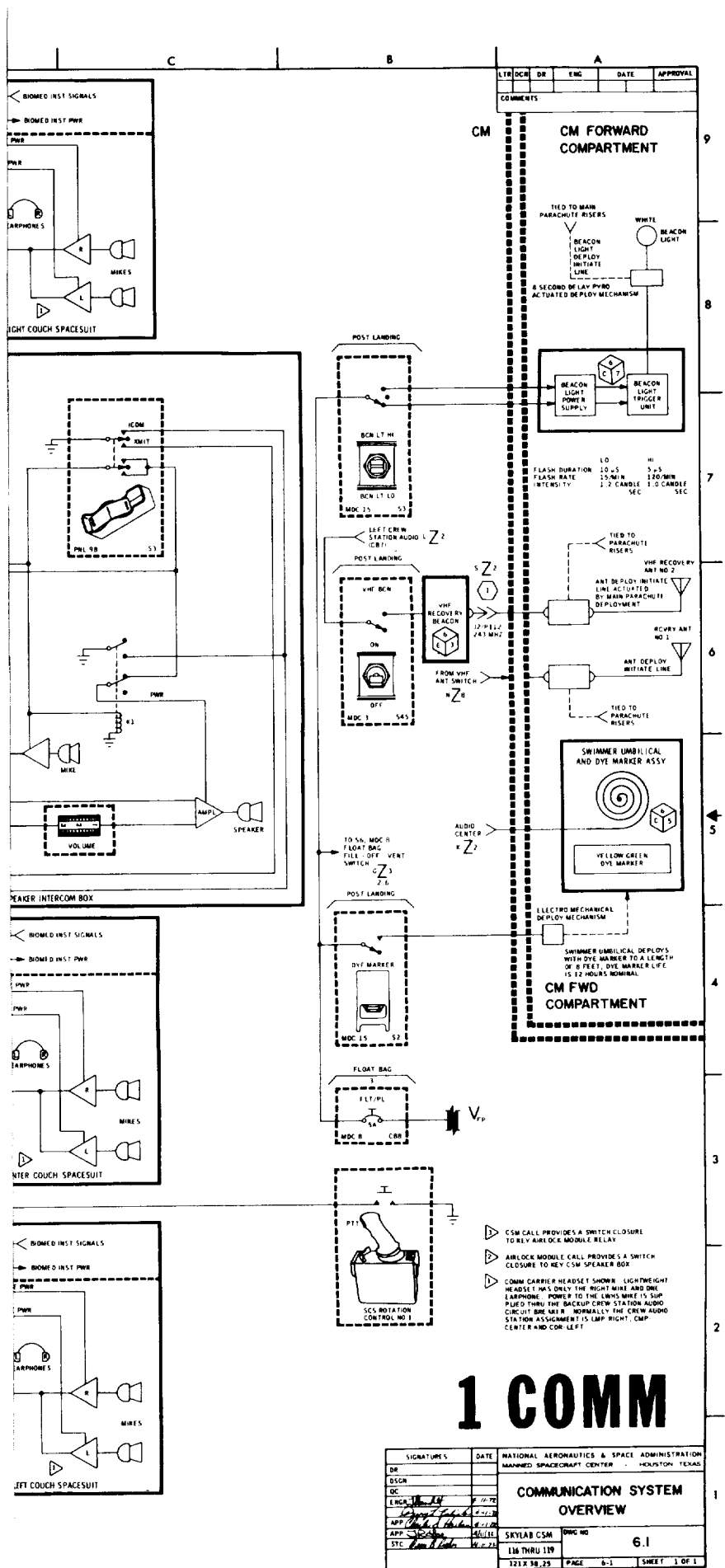
FOLDOUT FRAME 5





FOLDOUT FRAME 6





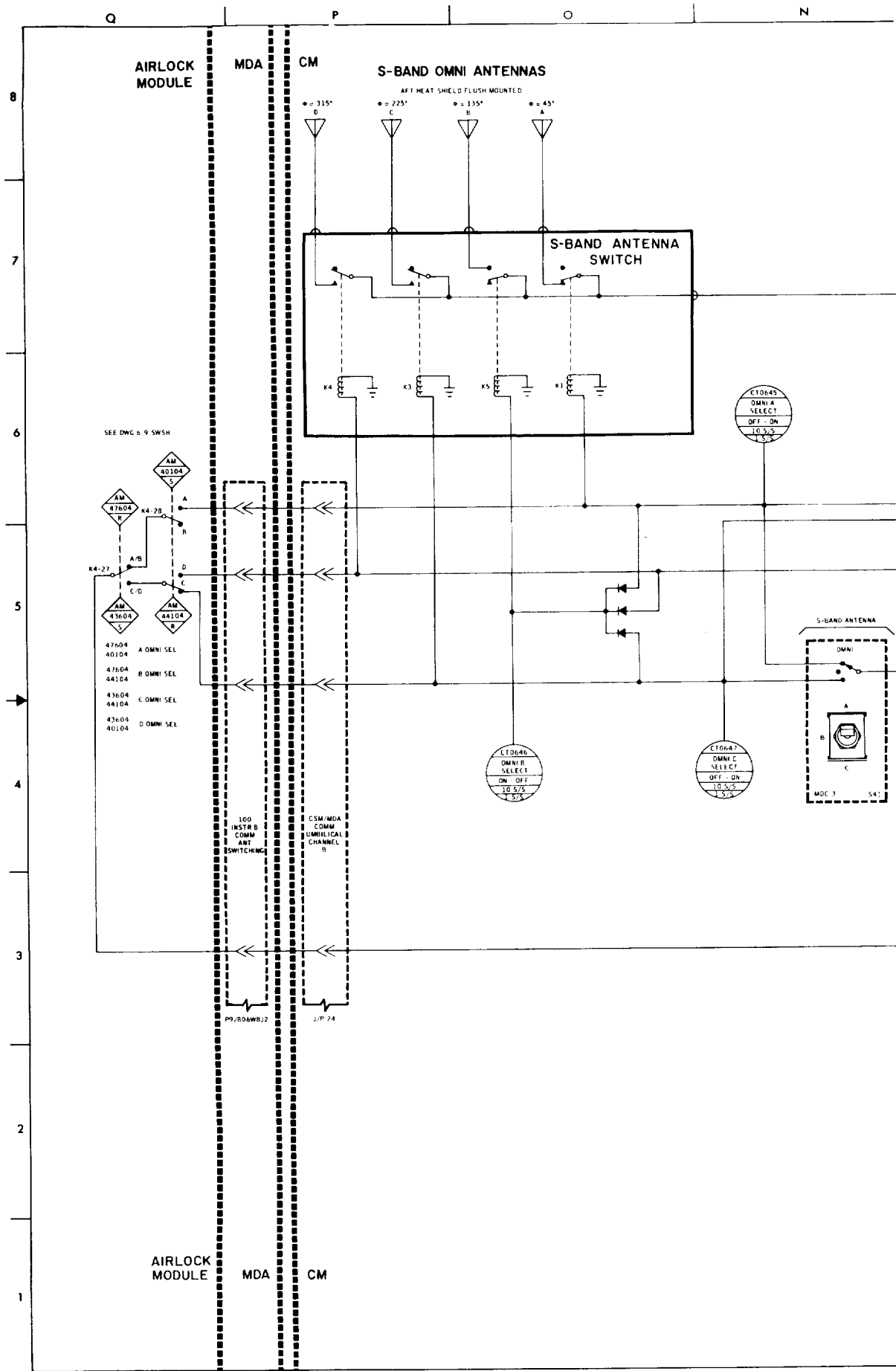
# 1 COMM

SIGNATURES	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION
DR		MANHATTAN SPACECRAFT CENTER HOUSTON TEXAS
ESC		
ENGR	8/11/72	
APP	8/11/72	
STC	8/11/72	
		SKYLAB CSM
		116 THRU 119
		121X 58, 25
		PAGE 6-1
		SHEET 1 OF 1

FOLDOUT FRAME 7

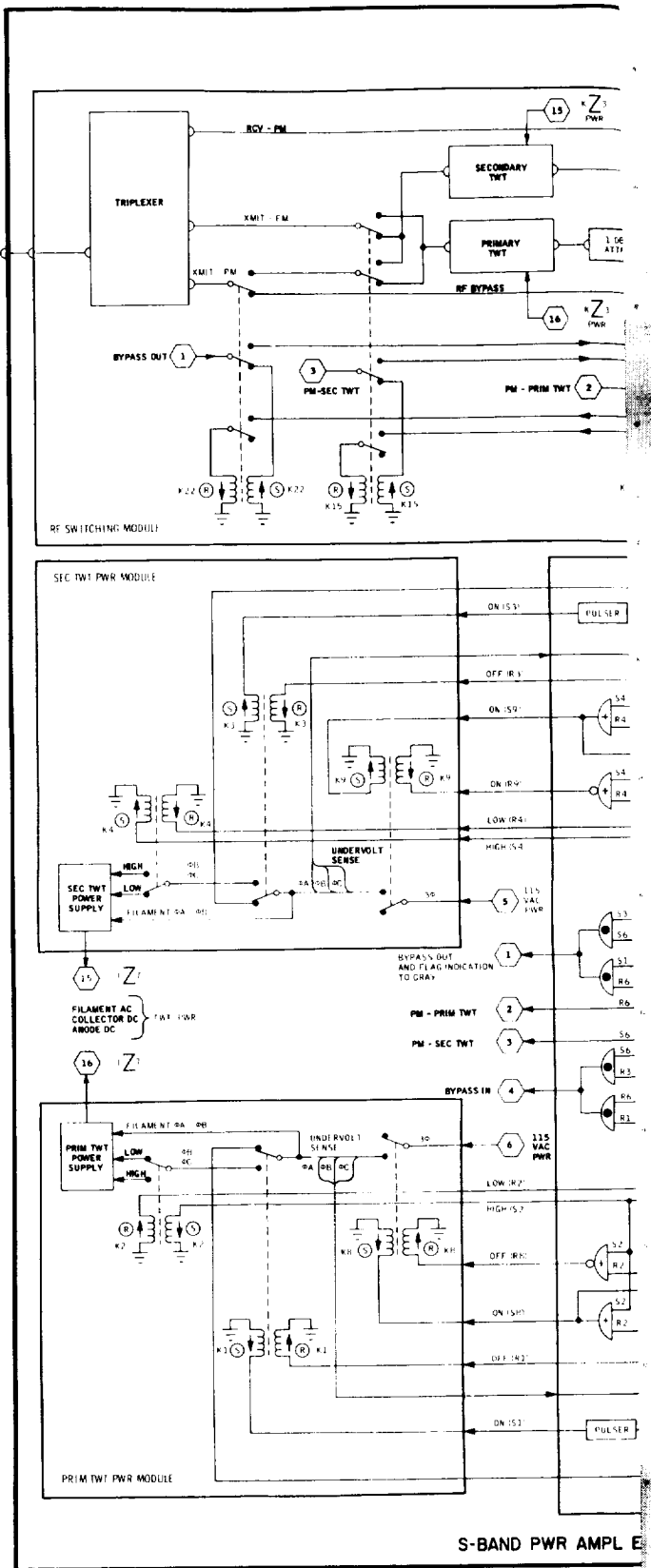
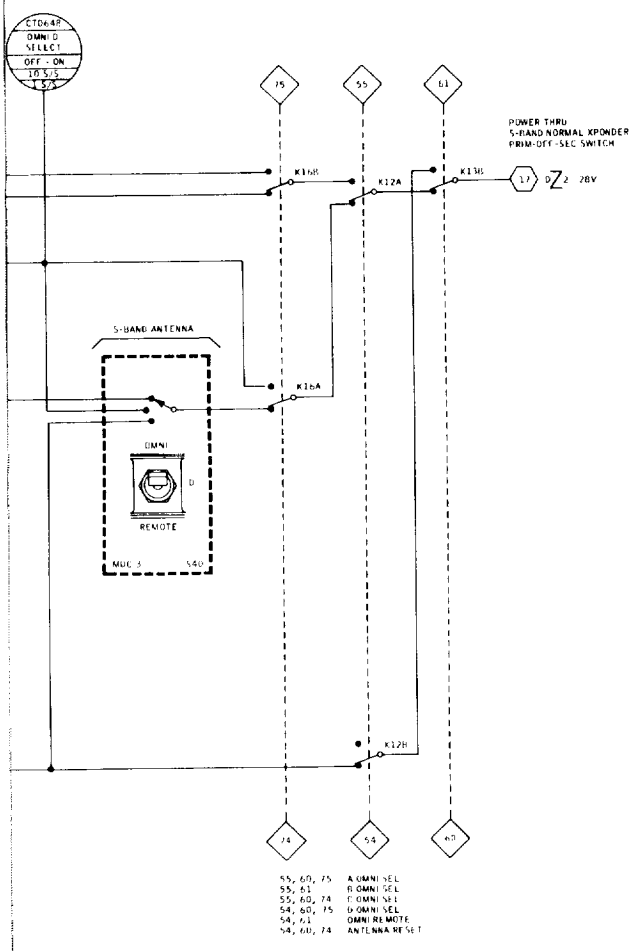




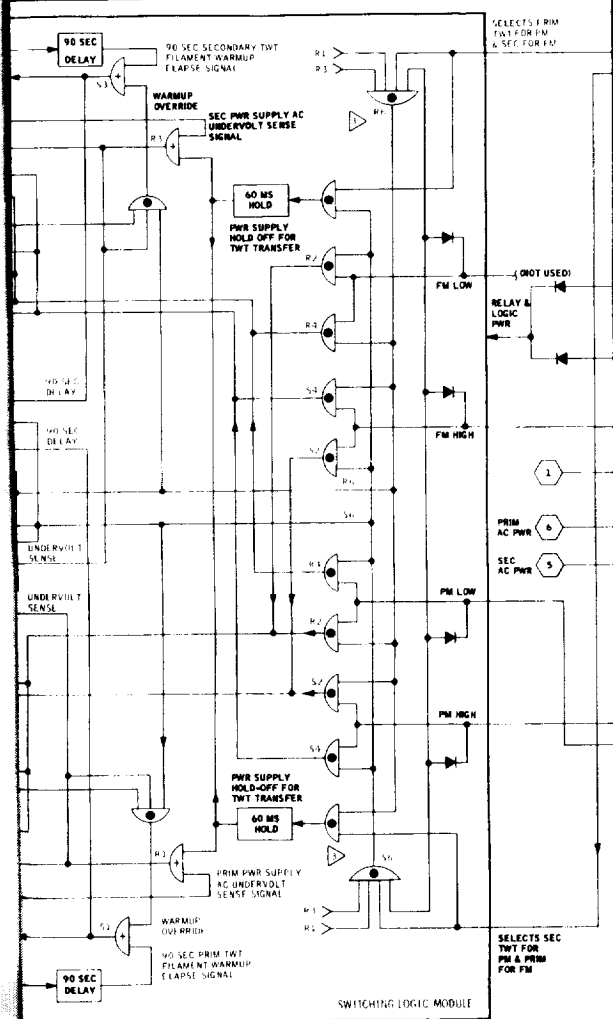
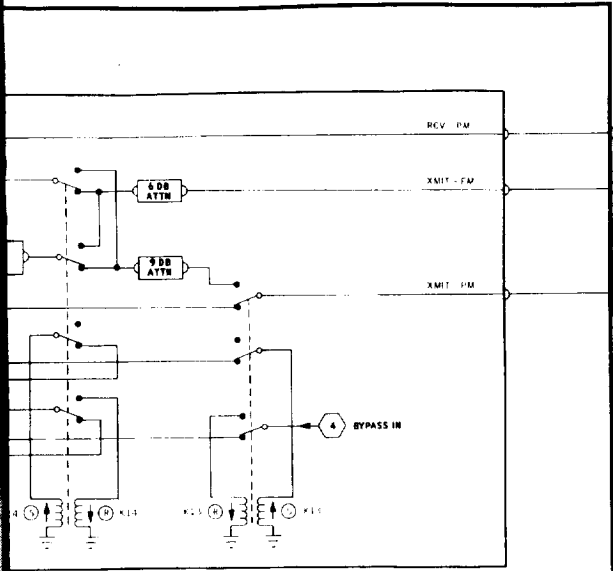


**FOLDOUT FRAME**

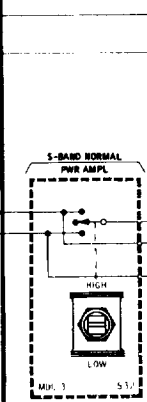
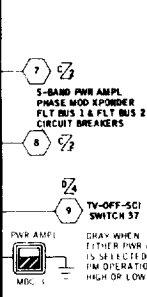
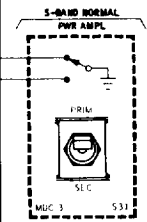
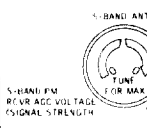




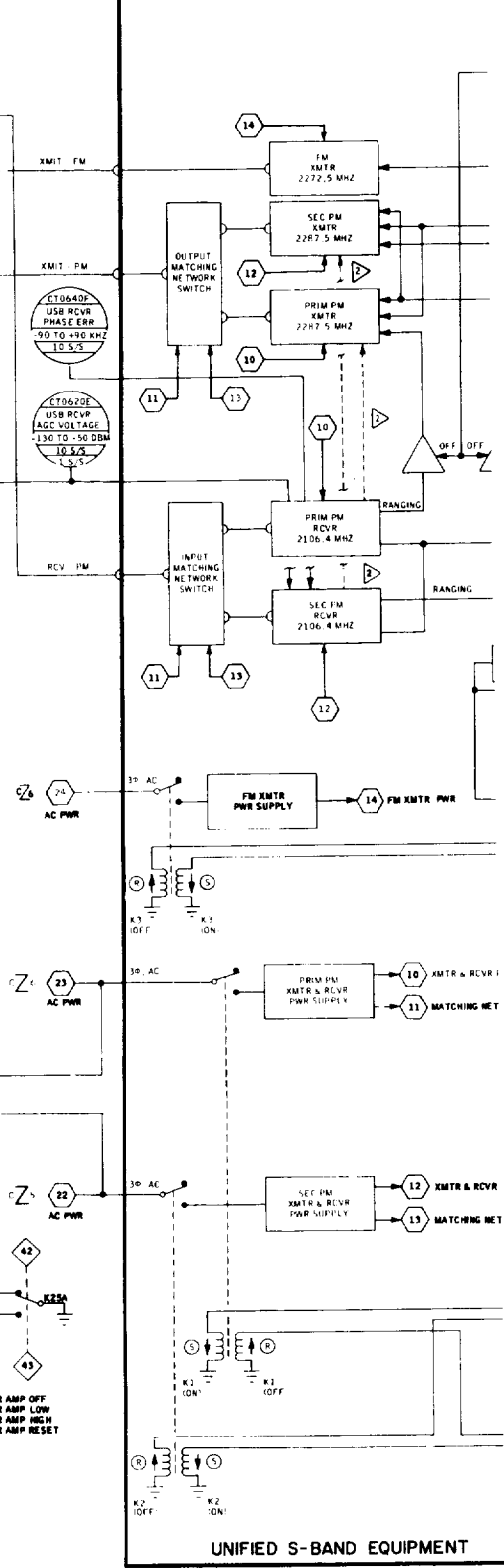




EQUIPMENT

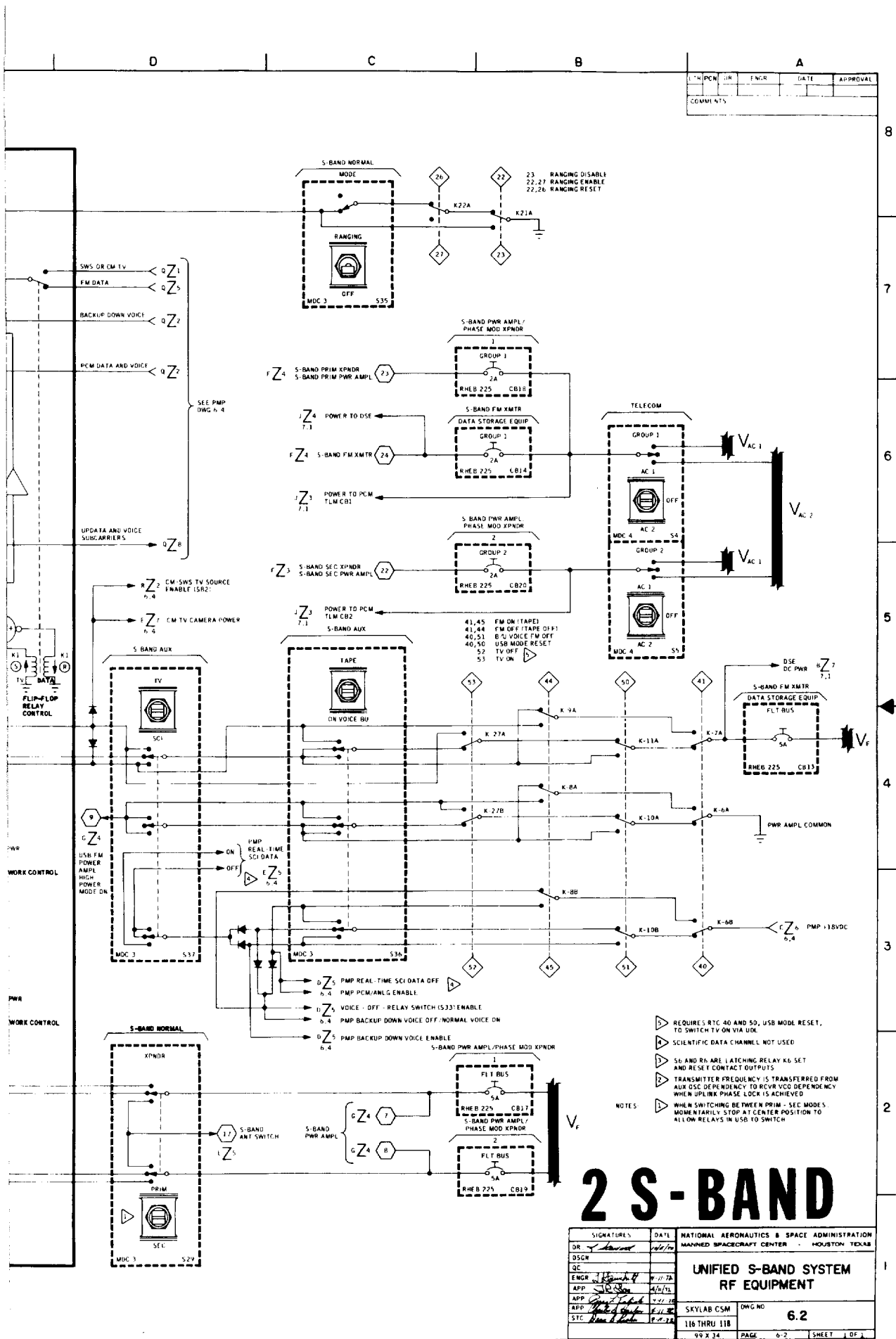


45,46 POWER AMP OFF  
 43,47 POWER AMP LOW  
 42,47 POWER AMP HIGH  
 42,46 POWER AMP RESET



UNIFIED S-BAND EQUIPMENT





DATE	ENGR	DATE	APPROVAL

COMMENTS

- ▷ REQUIRES RTC 40 AND 50, USB MODE RESET, TO SWITCH TV ON VIA UDC
- ▷ SCIENTIFIC DATA CHANNEL NOT USED
- ▷ S6 AND 8N ARE LATCHING RELAY KE SET AND RESET CONTACT OUTPUTS
- ▷ TRANSMITTER FREQUENCY IS TRANSFERRED FROM AUX OSC DEPENDENCY TO RCVR VCO DEPENDENCY WHEN USLIRK PHASE LOCK IS ACHIEVED
- ▷ WHEN SWITCHING BETWEEN PRIM - SEC MODES, MOMENTARILY STOP AT CENTER POSITION TO ALLOW RELAYS IN USB TO SWITCH

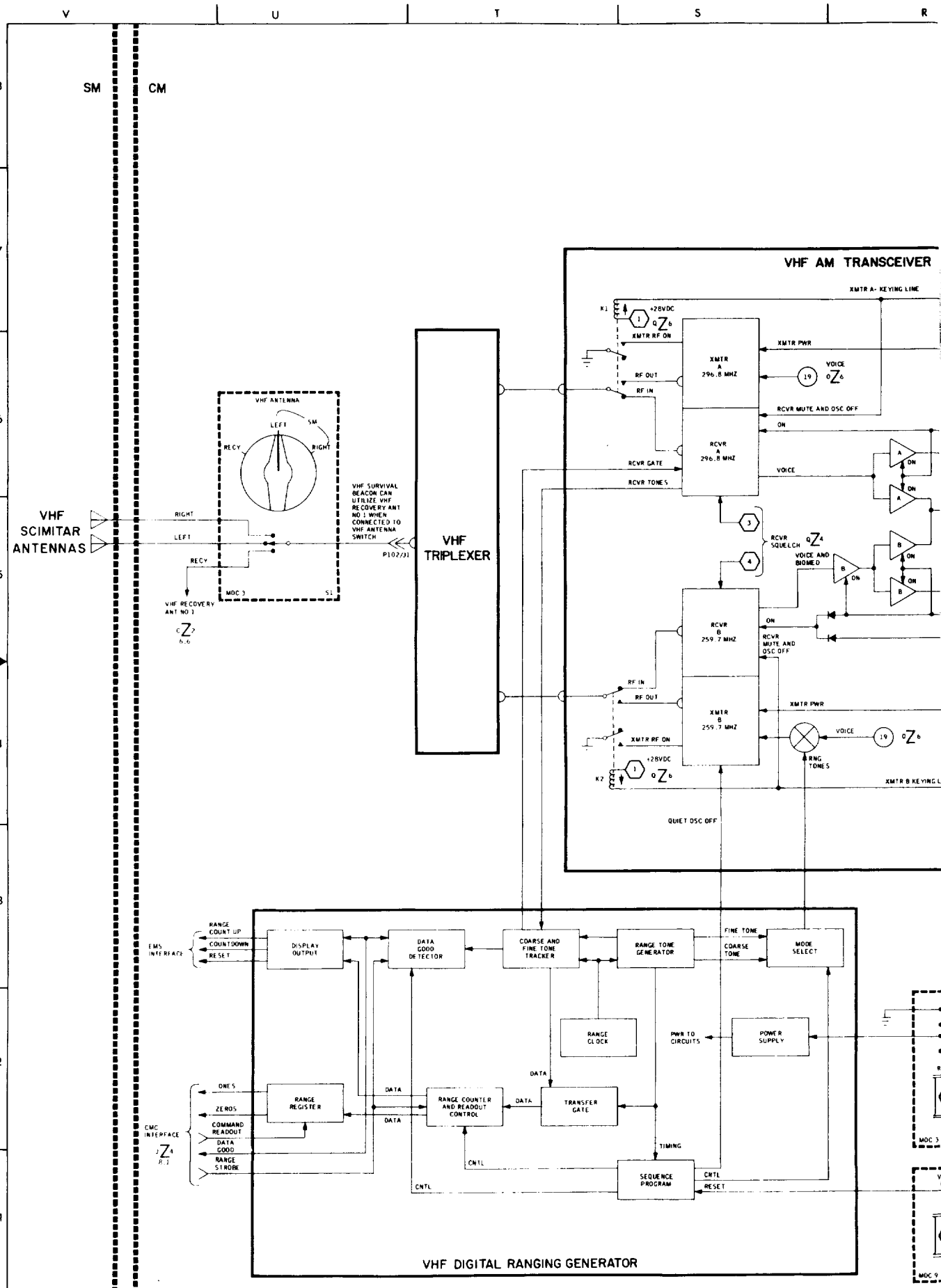
# 2 S-BAND

SIGNATURES	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION
DR		MANNED SPACECRAFT CENTER - HOUSTON TEXAS
OSGN		
QC		
ENGR	7-11-73	
APP	7/11/73	
APP	7/11/73	
APP	7/11/73	
STC	7/11/73	
<b>UNIFIED S-BAND SYSTEM RF EQUIPMENT</b>		
SKYLAB CSM		DWG NO
116 THRU 118		<b>6.2</b>
99 X 34		PAGE 6-2 SHEET 1 OF 1

FOLDOUT FRAME 4

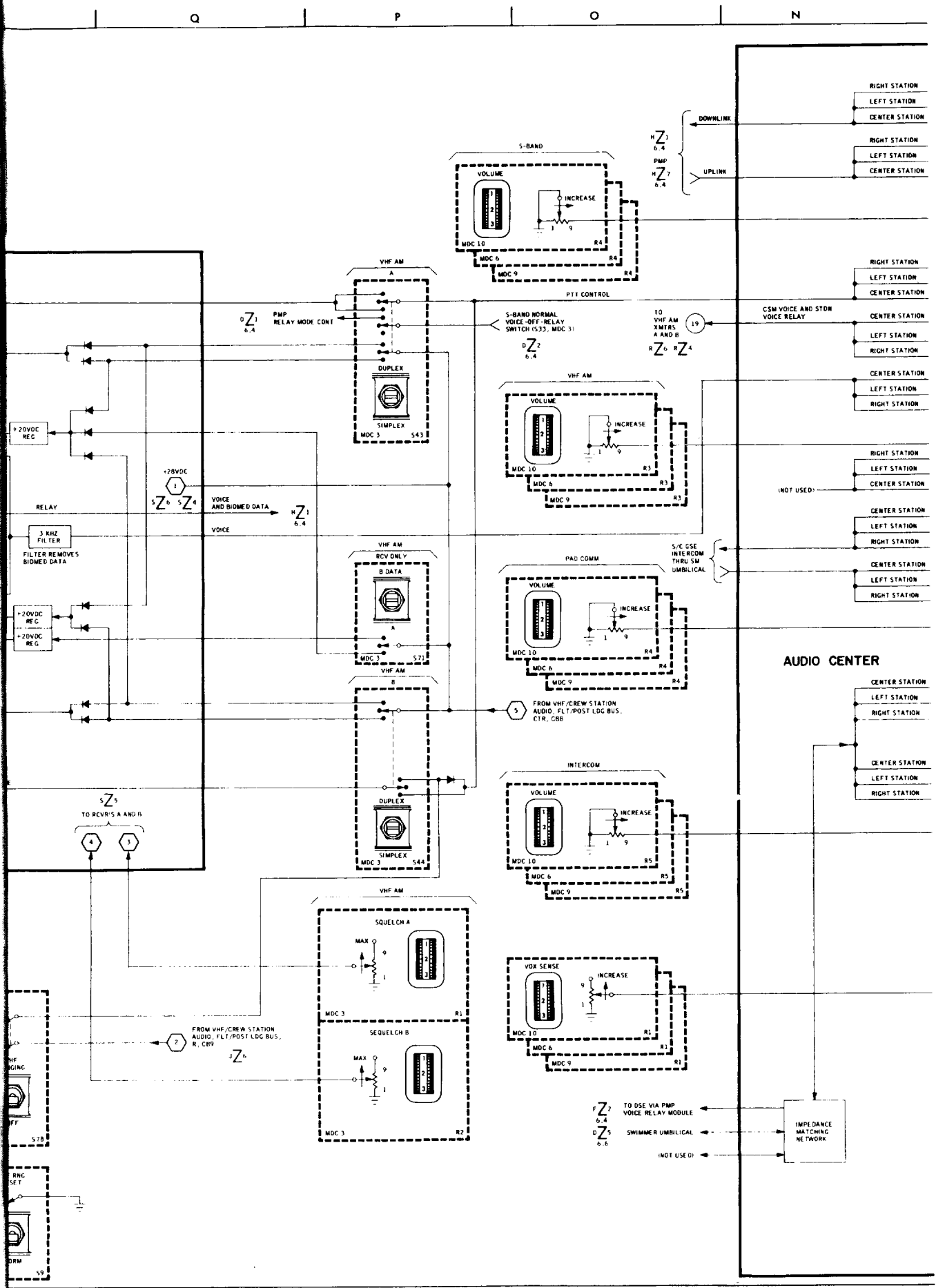






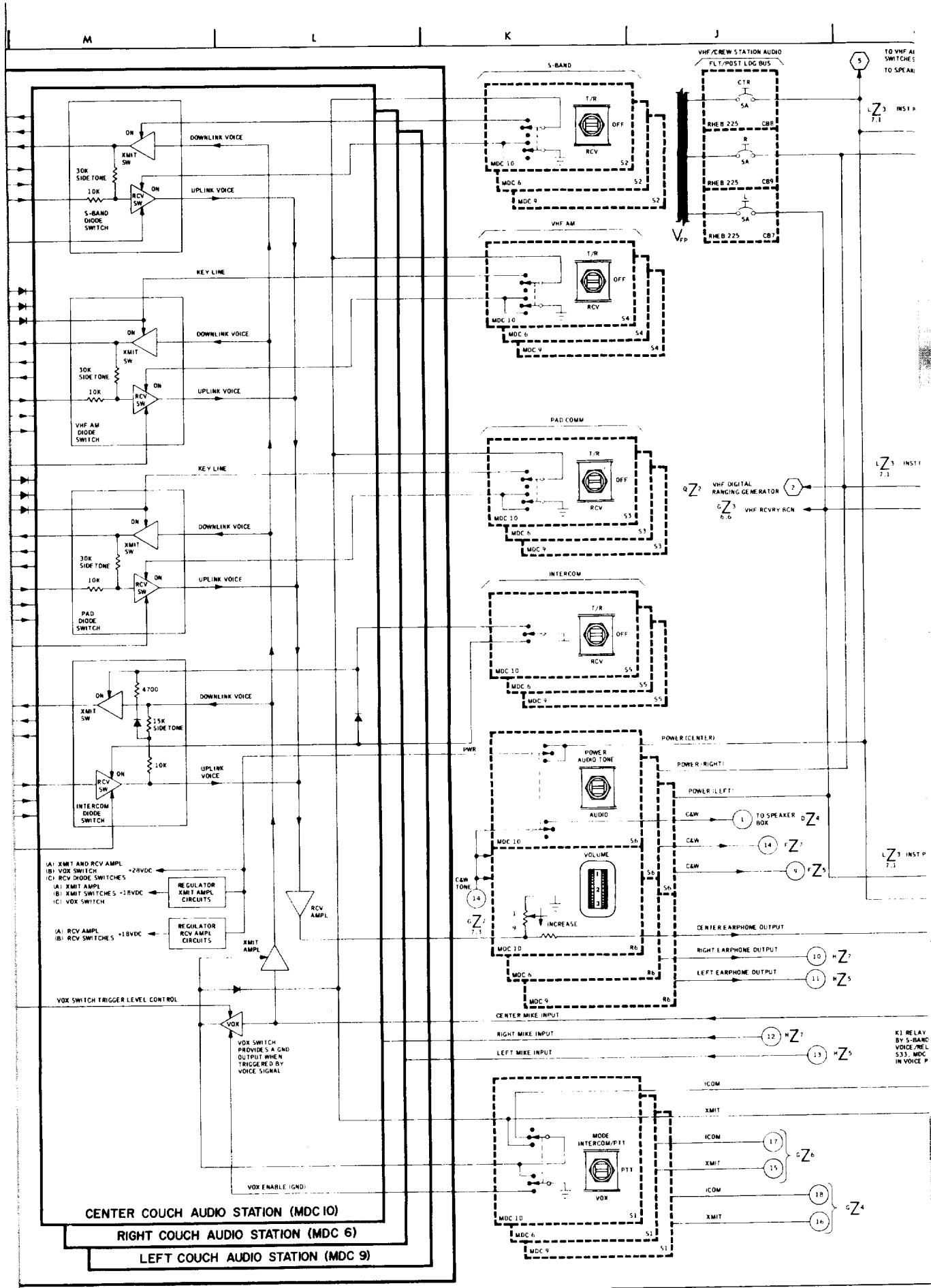
FOLDOUT FRAME





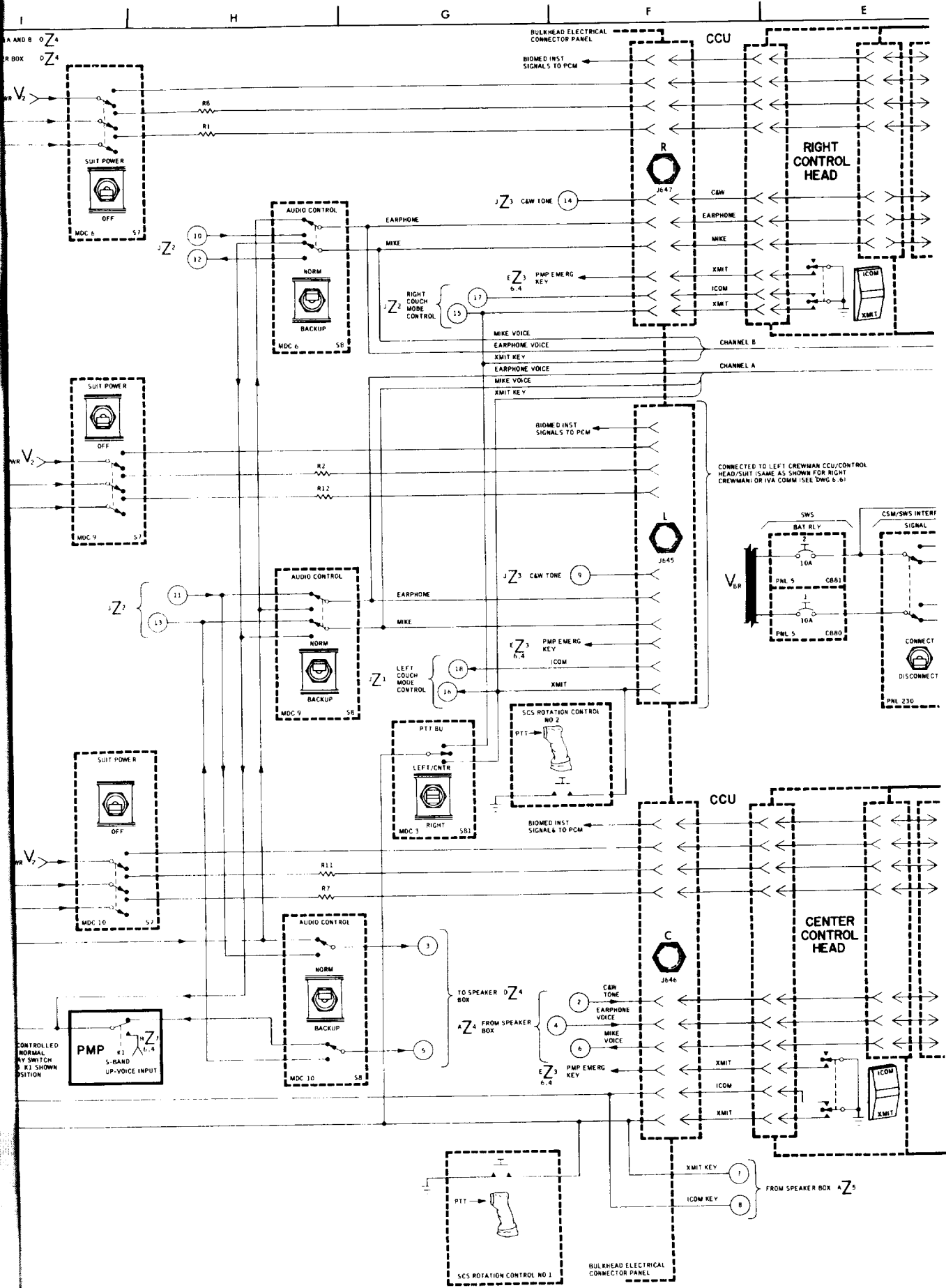
FOLDOUT FRAME 2





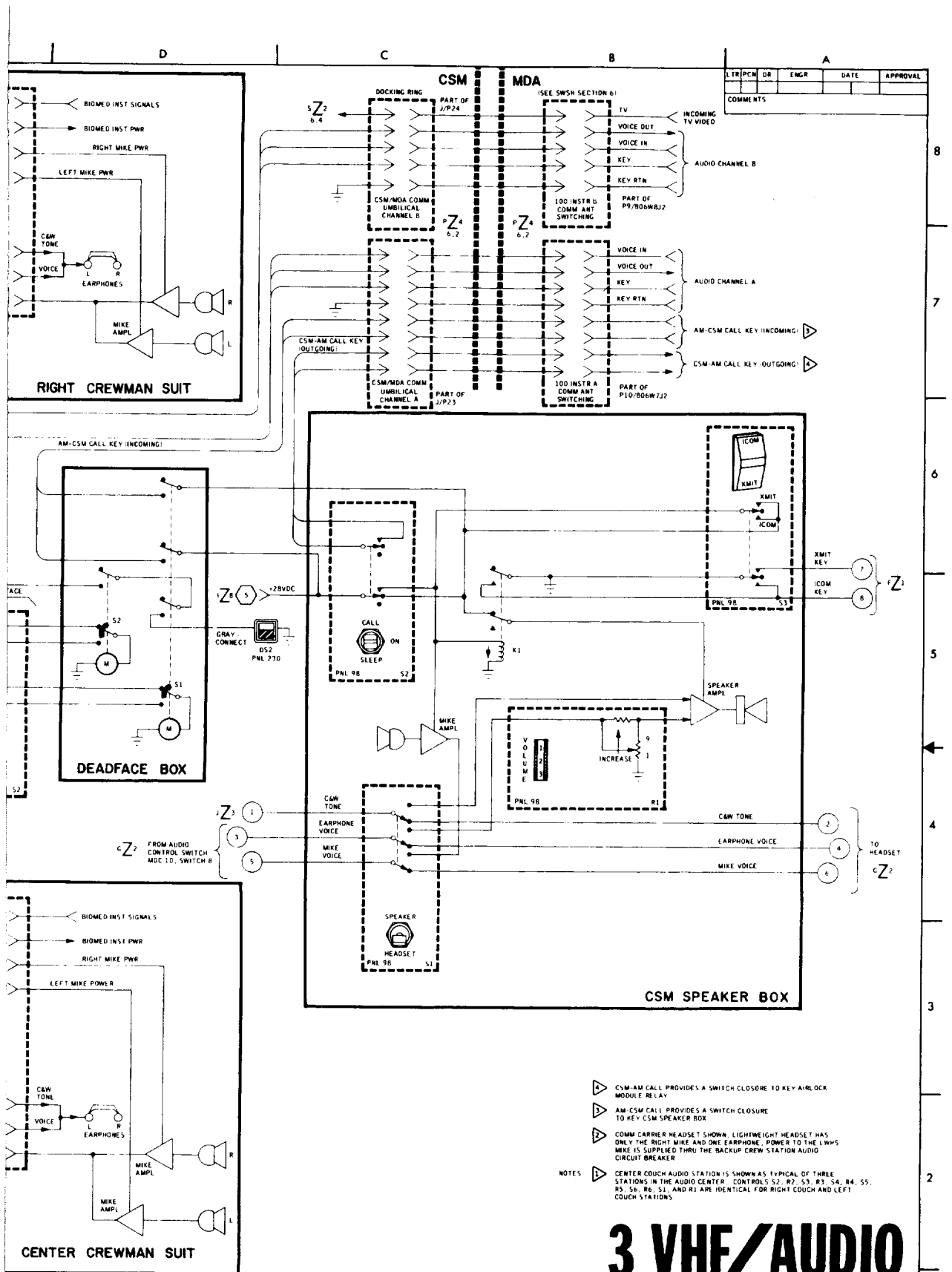
**FOLDOUT FRAME 3**











- NOTES
- ▷ CSM-AM CALL PROVIDES A SWITCH CLOSURE TO KEY AIRBLOCK MODULE RELAY
  - ▷ AM CSM CALL PROVIDES A SWITCH CLOSURE TO KEY CSM SPEAKER BOX
  - ▷ COMM CARRIER HEADSET SHOWN. LIGHTWEIGHT HEADSET HAS ONLY THE RIGHT MIKE AND ONE EARPHONE. POWER TO THE LHM'S MIKE IS SUPPLIED THRU THE BACKUP CREW STATION AUDIO CIRCUIT BREAKER
  - ▷ CENTER COUCH AUDIO STATION IS SHOWN AS TYPICAL OF THREE STATIONS IN THE AUDIO CENTER. CONTROLS S2, R2, S3, R3, S4, R4, S5, S6, R6, S1, AND R1 ARE IDENTICAL FOR RIGHT COUCH AND LEFT COUCH STATIONS

# 3 VHF/AUDIO

SIGNATURES	DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS
DR <i>[Signature]</i>	5/1/72	<b>SKYLAB CSM VHF AM TRANSCIVERS AND AUDIO EQUIPMENT</b>
DSGN		
QC		
ENGR <i>[Signature]</i>	4-11-72	
APP <i>[Signature]</i>	4/11/72	
STC <i>[Signature]</i>	4-11-72	
SKYLAB CSM	DWG NO	118 THRU 119
		6.3
121 K 14	PAGE 6-3	SHEET 1 OF 1

EQLDOUT FRAME 5

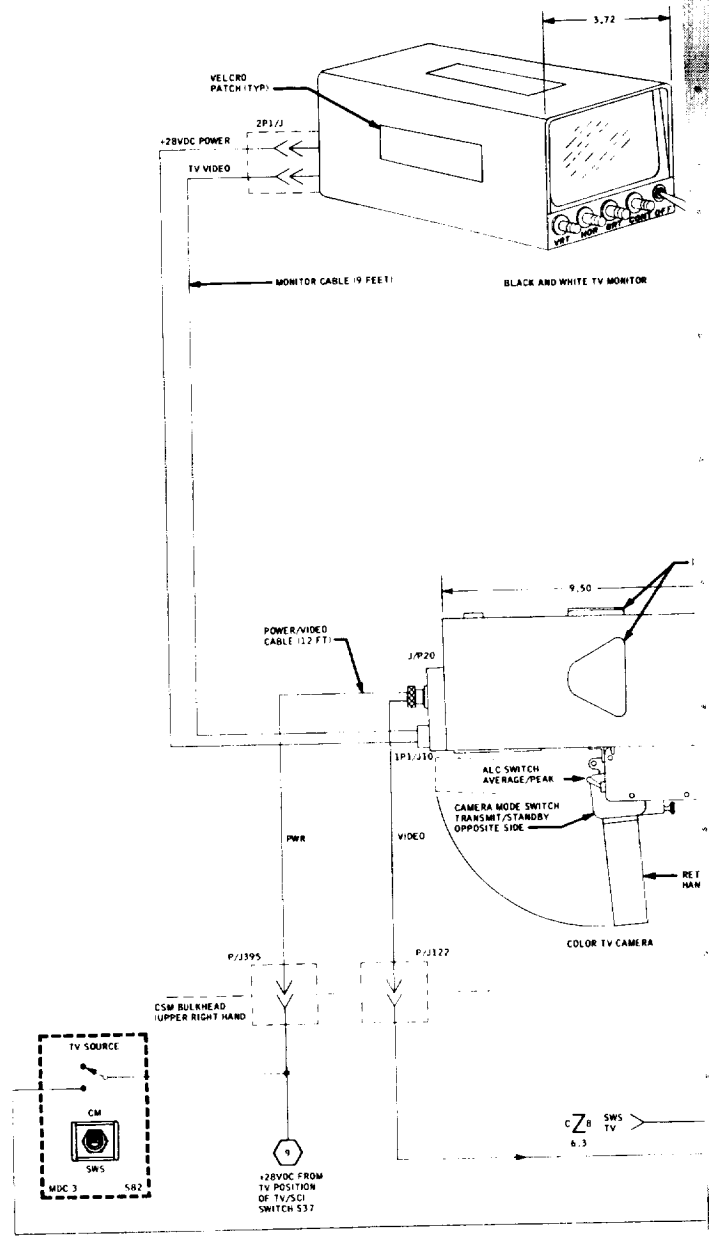
2023

2023

1

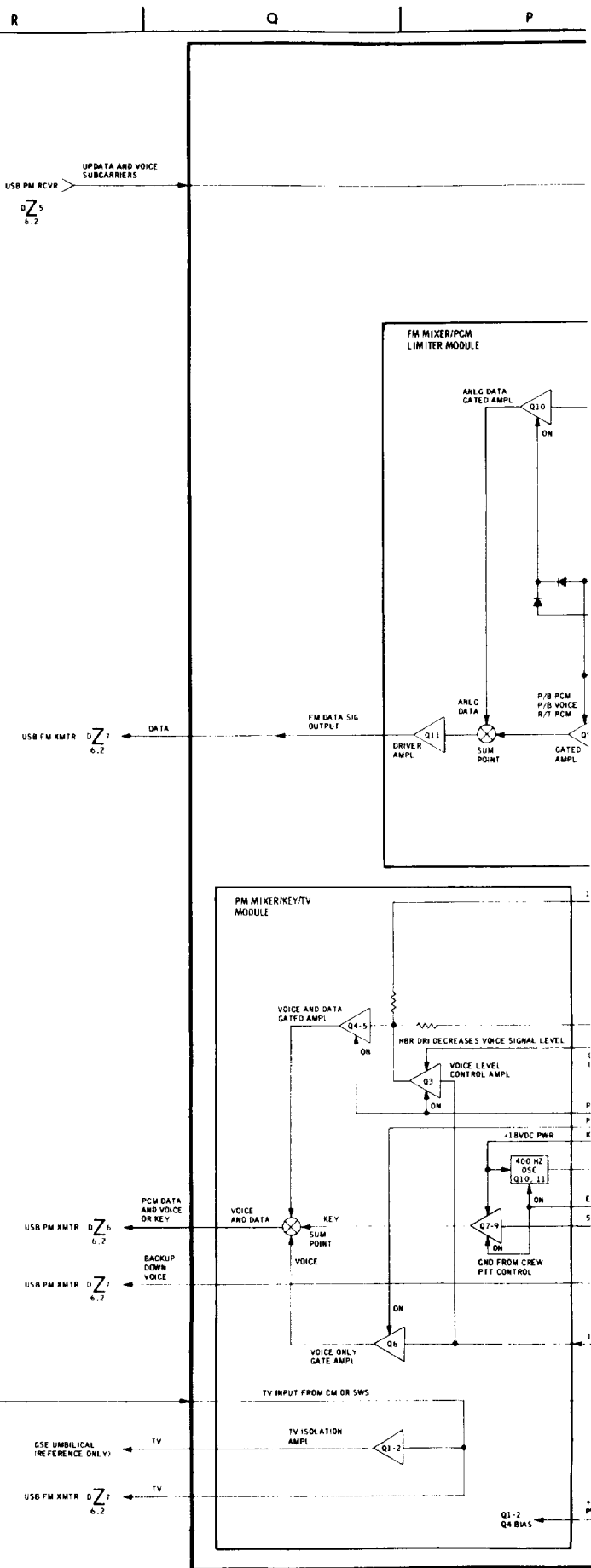
V U T S

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FOLDOUT FRAME





WT-29LBS

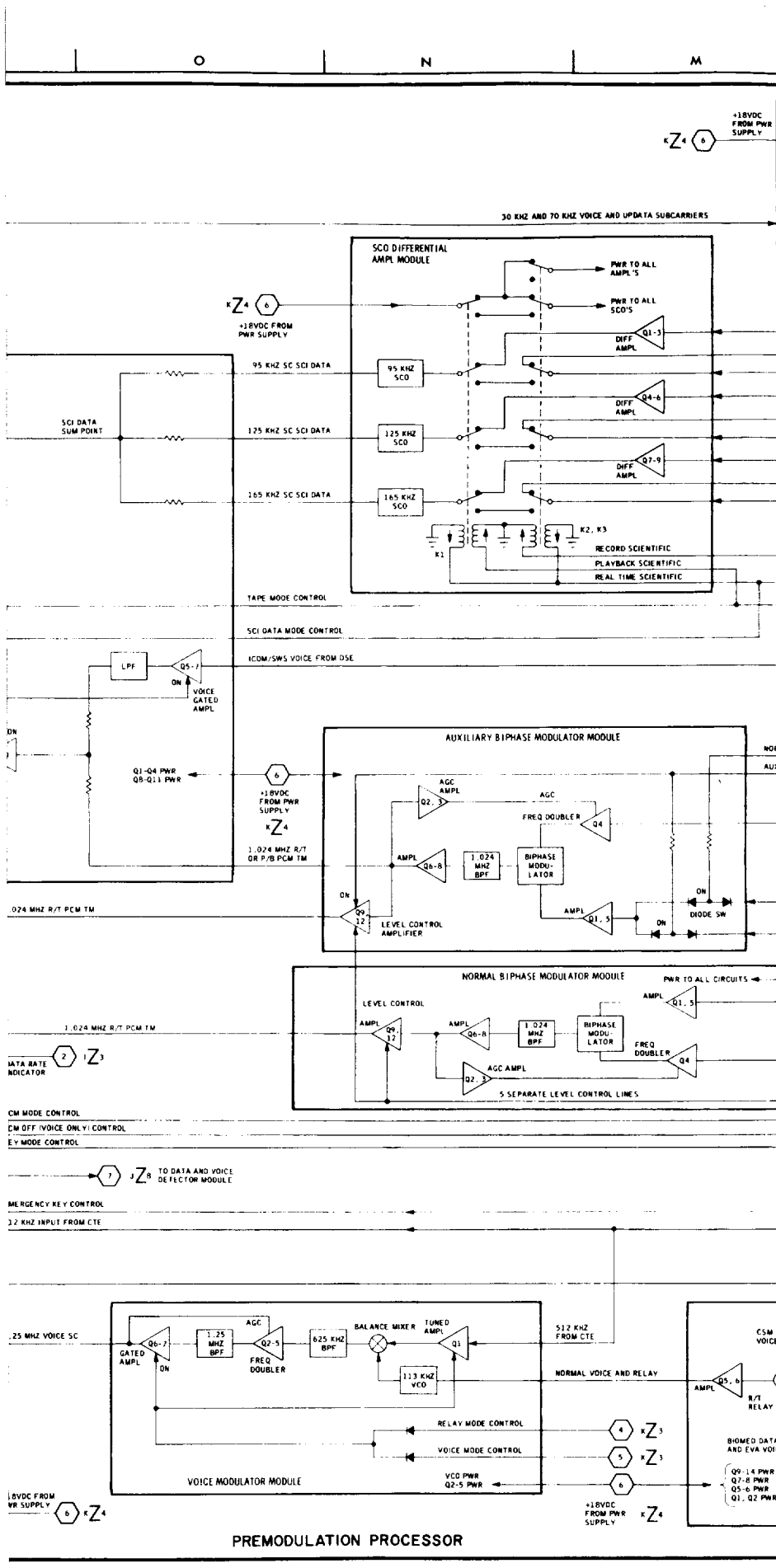
OVETAIL MOUNT

WT-13.7 LBS

METABLE ALL

FOLDOUT FRAME 2

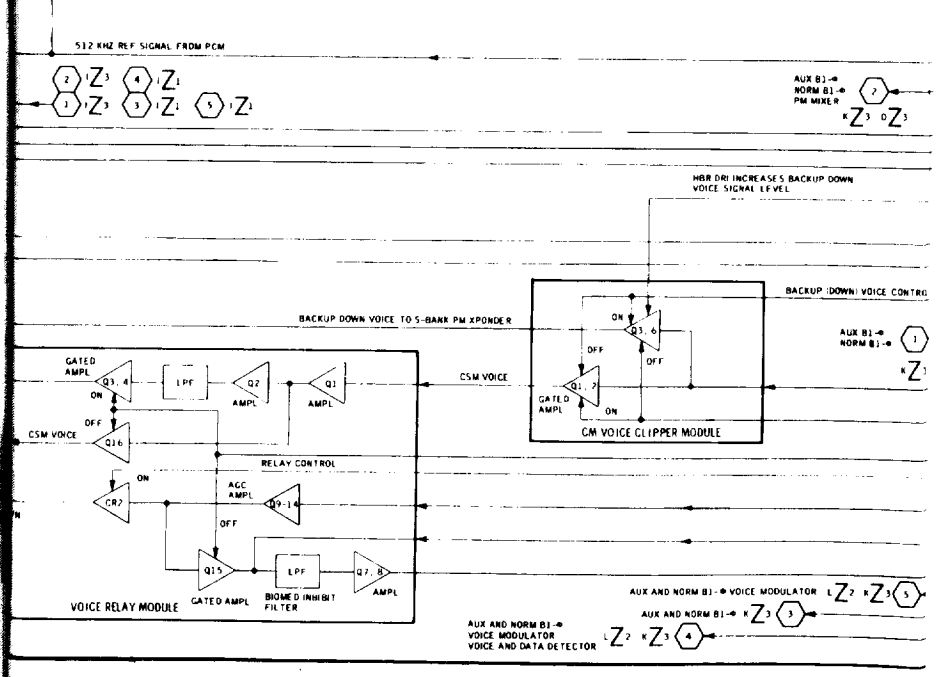
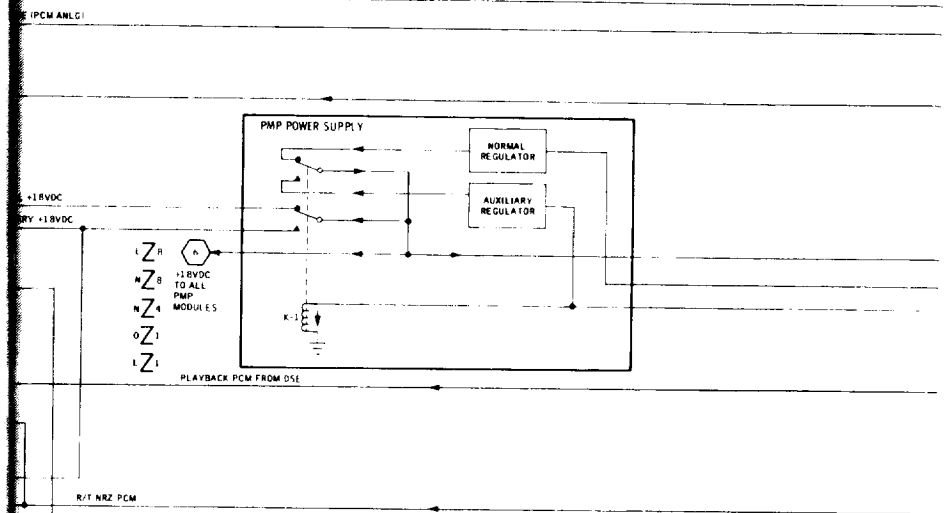
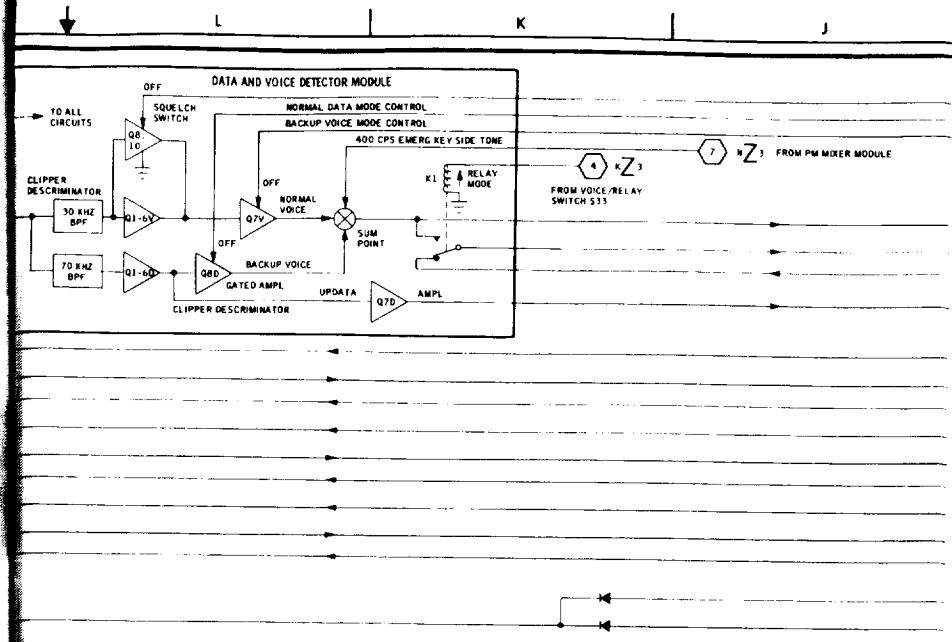




PREMODULATION PROCESSOR

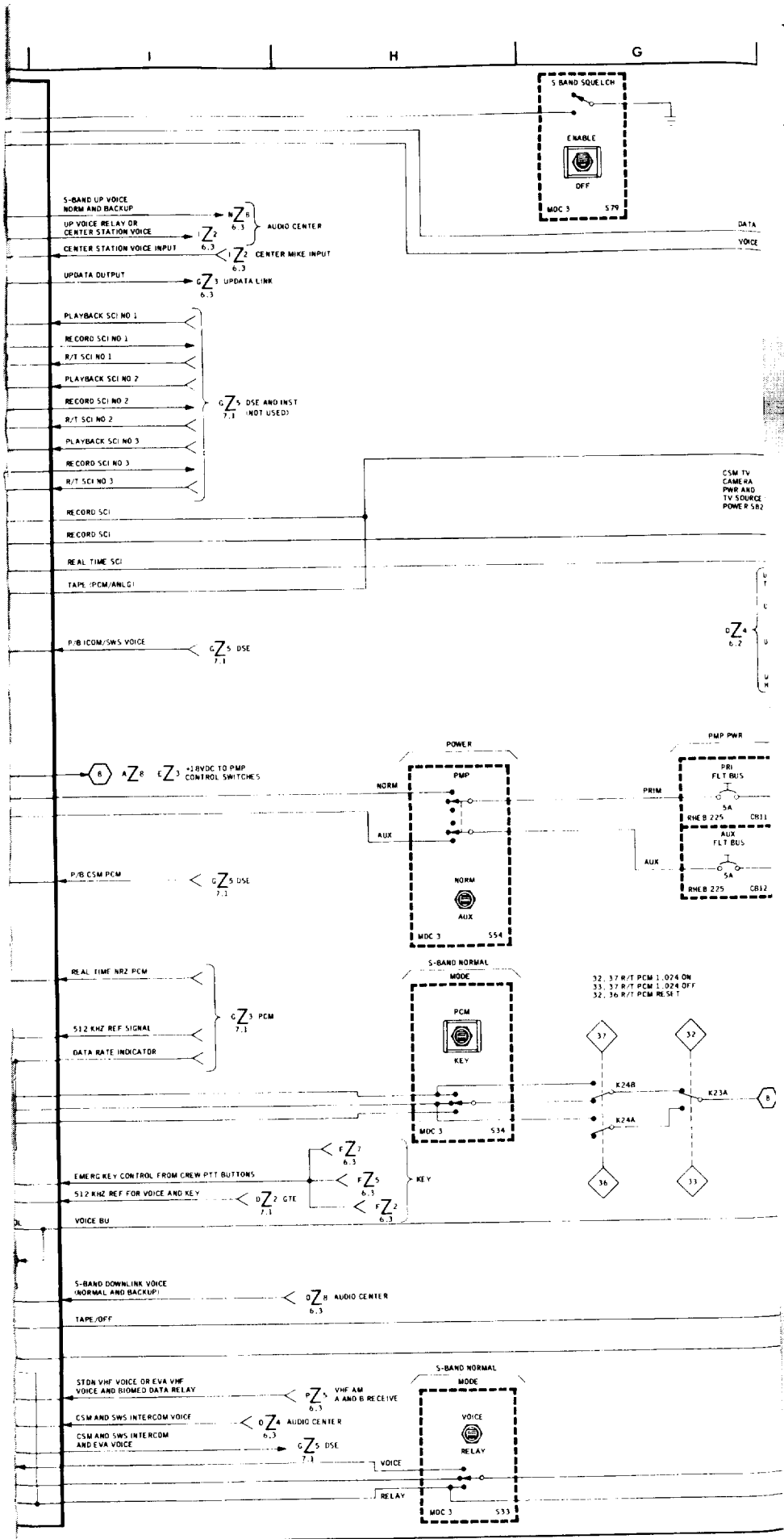






**EQLDOUT FRAME 4**





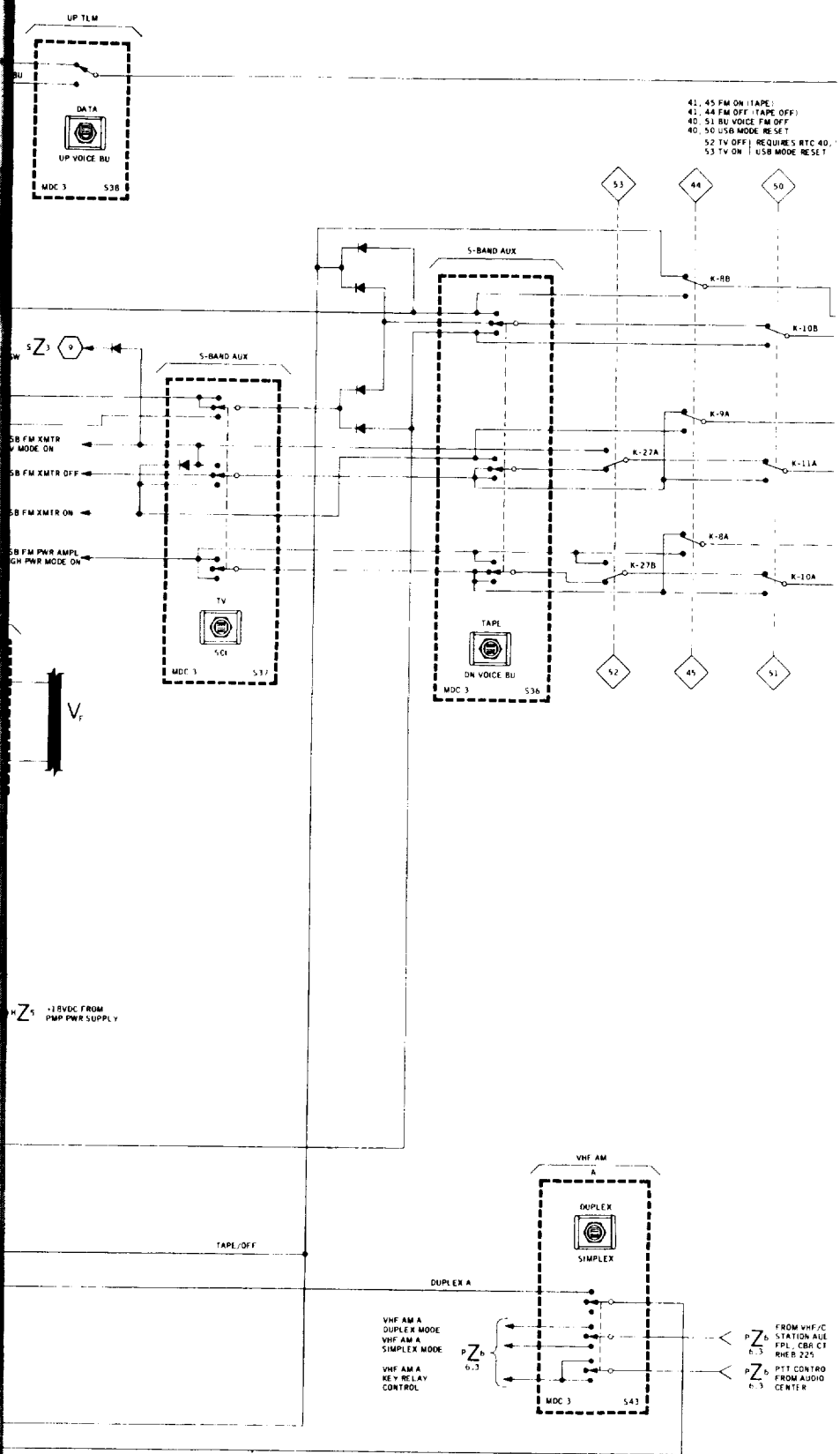
FOLDOUT FRAME 5



F

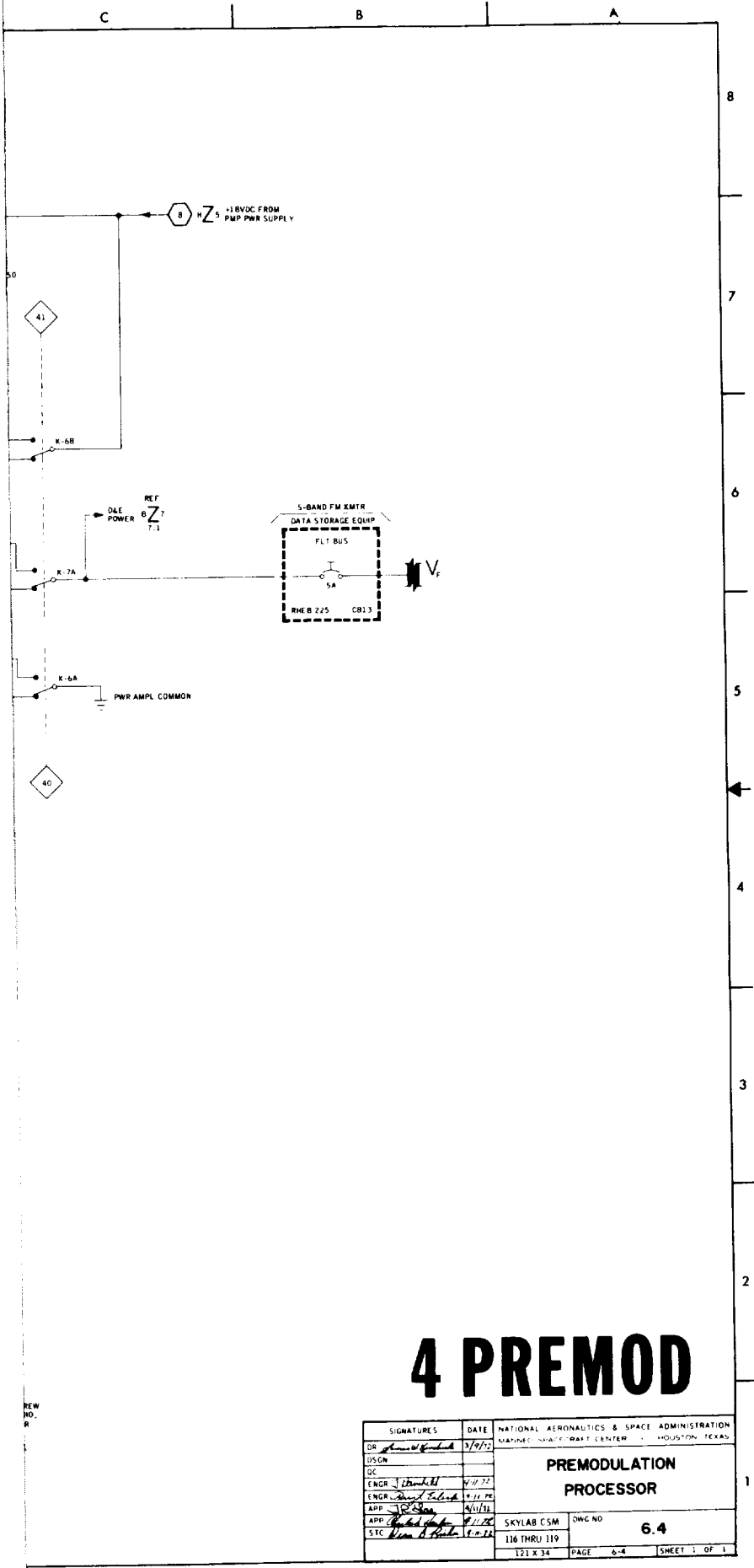
E

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FOLDOUT FRAME 6





# 4 PREMOD

REV  
NO.  
R

SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION	
DR	<i>[Signature]</i>	3/9/72	MARINEC SPACECRAFT CENTER HOUSTON, TEXAS	
DSCN			<b>PREMODULATION PROCESSOR</b>	
DC				
ENGR	<i>[Signature]</i>	4/1/72		
ENGR	<i>[Signature]</i>	4/11/72		
APP	<i>[Signature]</i>	4/1/72	SKYLAB CSM DWC NO.	
STC	<i>[Signature]</i>	4/1/72	<b>6.4</b>	
			116 THRU 119	
			121 X 34	PAGE 6-4 SHEET 1 OF 1

**FOLDOUT FRAME 7**





SALVO REALTIME COMMAND LIST		UDL RELAY MODL REALTIME COMMA	
SALVO RESET (OCTAL) (4XXX)	SALVO FUNCTION	RTC (OCTAL) (46XX)	COMMAND NAME
SALVO RESET 1: RESETS FOLLOWING RTC'S 46XX			
30	00 ABORT LIGHT A OFF 06 CREW ALARM OFF 10 ACE CMC ZERO DISABLE 14 ACE CMC ONE DISABLE 20 CSM SPEC ELC PWR OFF	00	ABORT LIGHT A OFF
12	02 NORM MEM DUMP OFF 08 ABORT LIGHT B OFF 12 (SPARE) 16 VG INIT-CLK U/D OFF 22, 26 RANGING RESET 32, 36 R/T PCM RESET	01	ABORT LIGHT A ON
SALVO RESET 2: RESETS FOLLOWING RTC'S 46XX			
70	40, 50 USB MODE RESET 44 NG EQUIPMENT AFFECTED 54, 60, 74 ANTENNA SELECT RESET 64, 70 BIT RATE RESET	02	NORM MEM DUMP OF
72	42, 46 POWER AMP RESET 52 TV OFF 56 CSM SPEC DET PWR OFF 62, 66 DSE EJECT RESET 72, 76 TAPE CTRL RESET	03	NORM MEM DUMP DN
SALVO COMMAND (OCTAL) (45XX)      RTC INITIATED			
10	00, 04, 10, 14	04	CREW ALARM OFF
11	01, 05, 11, 15	05	CREW ALARM DN
13	03, 07, 13, 17	06	ABORT LIGHT B OFF
14	04, 14	07	ABORT LIGHT B ON
15	05, 15	12	(SPARE)
16	06, 16	13	(SPARE)
17	07, 17	10	ACE CMC ZERO DSA
20	00, 04, 10, 14, 20	11	ACE CMC ZERO ENAB
31	01, 05, 11, 15, 21	14	ACE CMC ONE DISAB
32	02, 06, 12, 18, 22, 26, 32, 36	15	ACE CMC ONE ENAB
33	03, 07, 13, 17, 23, 27, 33, 37	16	VG INIT-CLK U/D OFF
34	04, 14	17	VG INIT-CLK U/D ON
35	05, 15	20	CSM SPEC ELC PWR
36	06, 16, 26, 36	21	CSM SPEC ELC PWR
37	07, 17, 27, 37	22, 26	RANGING RESET
40	40, 44, 50, 54	23, 27	RANGING ENABLE
51	41, 45, 51, 55	23	RANGING DISABLE
52	42, 46, 52, 56	24	(NOT USABLE)
53	43, 47, 53, 57	25	(NOT USABLE)
54	44, 54	30	(NOT USABLE)
55	45, 55	31	(NOT USABLE)
56	46, 56	32, 36	R/T PCM RESET
57	47, 57	32, 37	R/T PCM I, O24 ON
10	40, 44, 50, 54, 60, 64, 70, 76	33, 37	R/T PCM OFF
11	41, 45, 51, 55, 61, 65, 71, 75	34	(NOT USABLE)
12	42, 46, 52, 56, 62, 66, 72, 76	35	(NOT USABLE)
13	43, 47, 53, 57, 63, 67, 73, 77	40, 50	USB MODE RESET
14	44, 54, 64, 74	40, 51	B/V VOICE FM OFF
15	45, 55, 65, 75	41, 44	FM OFF (TAPE OFF)
16	46, 56, 66, 76	41, 45	FM ON (TAPE ON)
17	47, 57, 67, 77	42, 46	POWER AMP RESET
		42, 47	POWER AMP HIGH
		43, 46	POWER AMP OFF
		43, 47	POWER AMP LOW
		52	TV OFF
		53	TV ON
		54, 60, 74	ANTENNA SEL
		54, 60, 75	D OMNI SELEC
		54, 61	RE MOTR
		55, 60, 74	C OMNI SELEC
		55, 60, 75	R OMNI SELEC
		55, 61	B OMNI SELEC
		56	CSM SPEC DET PWR
		57	CSM SPEC DET PWR
		62, 66	DSE EJECT RESET
		62, 67	DSE EJECT RECORD
		63, 66	DSE EJECT OFF
		63, 67	DSE EJECT PLAYBACK
		64, 70	BIT RATE RESET
		64, 71	BIT RATE HIGH
		65	BIT RATE LOW
		72, 76	TAPE CTRL RESET
		72, 77	DSE TAPE FORWARD
		73, 76	DSE TAPE STOP
		73, 77	DSE TAPE REWIND

**SALVO REALTIME COMMAND LIST**

SALVO RESET (OCTAL) (45XX)      SALVO FUNCTION

SALVO RESET 1: RESETS FOLLOWING RTC'S 46XX

30 00 ABORT LIGHT A OFF  
06 CREW ALARM OFF  
10 ACE CMC ZERO DISABLE  
14 ACE CMC ONE DISABLE  
20 CSM SPEC ELC PWR OFF

12 02 NORM MEM DUMP OFF  
08 ABORT LIGHT B OFF  
12 (SPARE)  
16 VG INIT-CLK U/D OFF  
22, 26 RANGING RESET  
32, 36 R/T PCM RESET

SALVO RESET 2: RESETS FOLLOWING RTC'S 46XX

70 40, 50 USB MODE RESET  
44 NG EQUIPMENT AFFECTED  
54, 60, 74 ANTENNA SELECT RESET  
64, 70 BIT RATE RESET

72 42, 46 POWER AMP RESET  
52 TV OFF  
56 CSM SPEC DET PWR OFF  
62, 66 DSE EJECT RESET  
72, 76 TAPE CTRL RESET

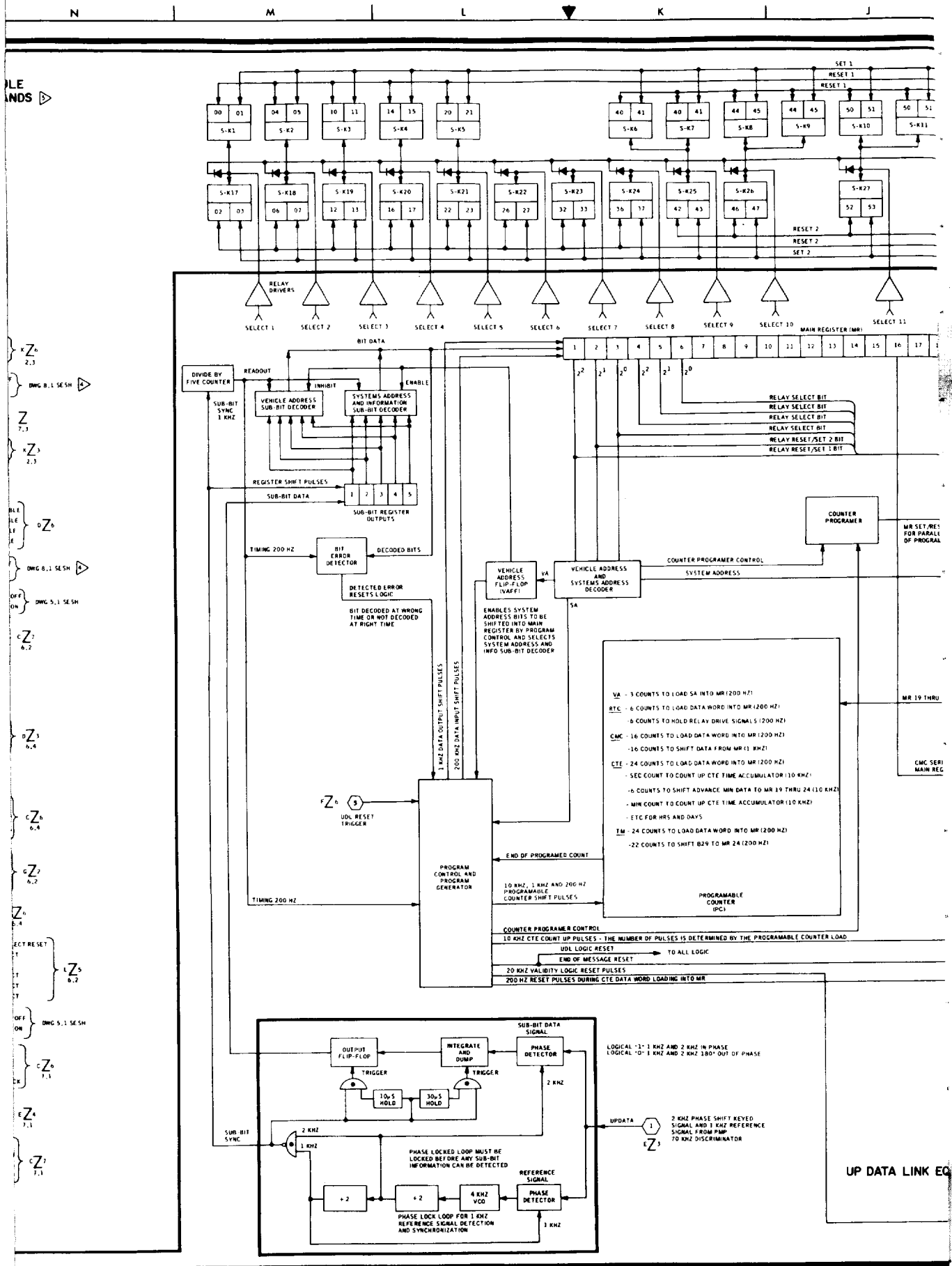
SALVO COMMAND (OCTAL) (45XX)      RTC INITIATED

10 00, 04, 10, 14  
11 01, 05, 11, 15  
13 03, 07, 13, 17  
14 04, 14  
15 05, 15  
16 06, 16  
17 07, 17  
20 00, 04, 10, 14, 20  
31 01, 05, 11, 15, 21  
32 02, 06, 12, 18, 22, 26, 32, 36  
33 03, 07, 13, 17, 23, 27, 33, 37  
34 04, 14  
35 05, 15  
36 06, 16, 26, 36  
37 07, 17, 27, 37  
40 40, 44, 50, 54  
51 41, 45, 51, 55  
52 42, 46, 52, 56  
53 43, 47, 53, 57  
54 44, 54  
55 45, 55  
56 46, 56  
57 47, 57  
10 40, 44, 50, 54, 60, 64, 70, 76  
11 41, 45, 51, 55, 61, 65, 71, 75  
12 42, 46, 52, 56, 62, 66, 72, 76  
13 43, 47, 53, 57, 63, 67, 73, 77  
14 44, 54, 64, 74  
15 45, 55, 65, 75  
16 46, 56, 66, 76  
17 47, 57, 67, 77

\* THESE SALVO'S NOT USED

**FOLDOUT FRAME**

3-11-2011



FILE ENDS

Z<sub>2.3</sub>

DWG B.1.1 SE SH

Z<sub>2.3</sub>

XZ<sub>2.3</sub>

DZ<sub>2.3</sub>

DWG B.1.1 SE SH

DZ<sub>2.3</sub>

DWG S.1.1 SE SH

CZ<sub>6.2</sub>

DZ<sub>6.4</sub>

CZ<sub>6.2</sub>

Z<sub>6.4</sub>

CZ<sub>6.2</sub>

Z<sub>6.4</sub>

ECT RESET

Z<sub>6.7</sub>

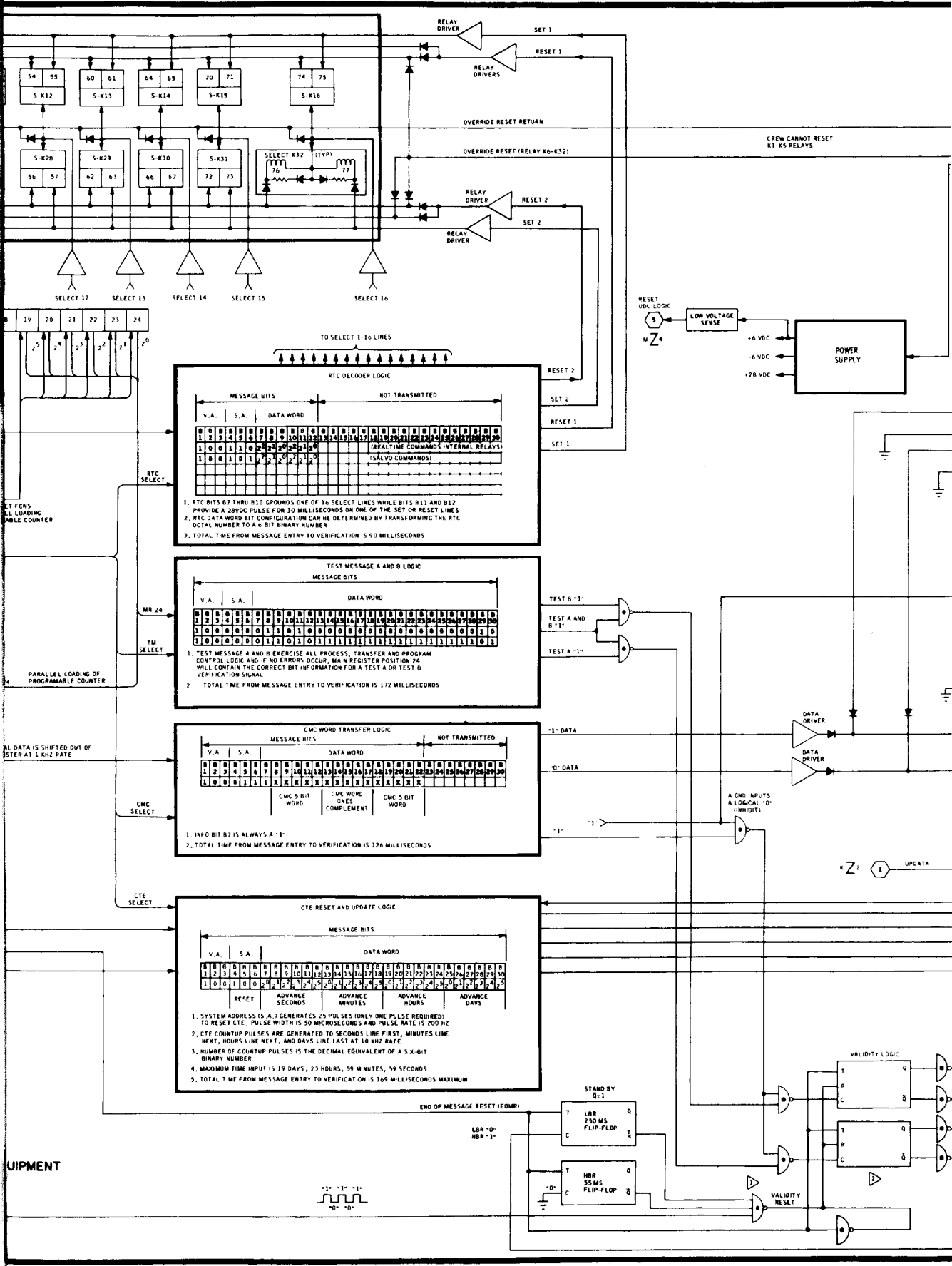
DWG S.1.1 SE SH

CZ<sub>7.1</sub>

CZ<sub>7.1</sub>

CZ<sub>7.1</sub>



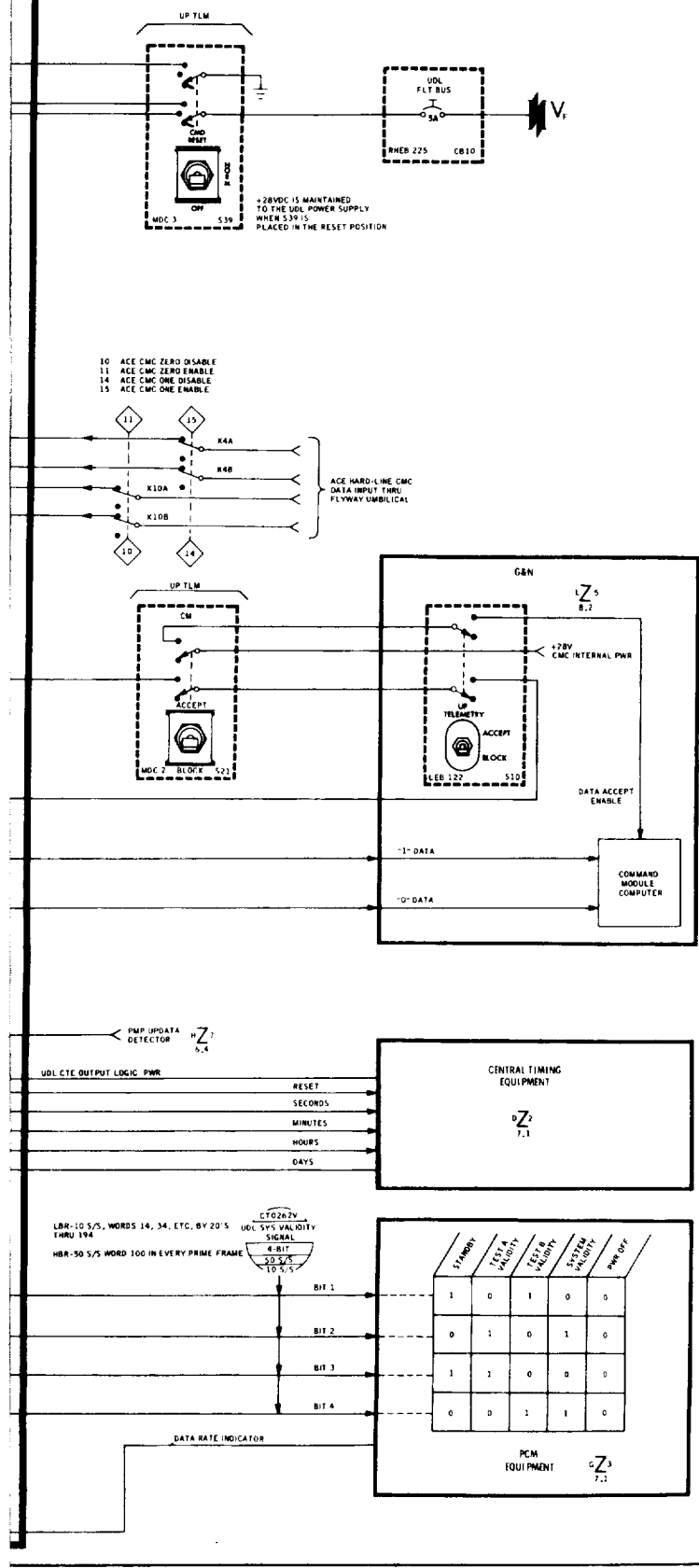


FOLDOUT FRAME 3



LT/DCN	DR	ENG	DATE	APPROVAL

COMMENTS:



- ▶ UDL RELAY CONTACTS ARE SHOWN ON INDIVIDUAL USER DRAWINGS AS REFERENCED IN COMMAND 1.57
  - ▶ THESE COMMANDS ARE UTILIZED IN THIS CONFIGURATION ONLY IN CSM 117 FOR SD71/72
  - ▶ NO SCIENTIFIC DATA IN THIS SPACECRAFT USING SUBCARRIER OSCILLATORS
  - ▶ IF C = '0' THEN Q = '0' AND IF C = '1' THEN Q = '1' WHEN FOUR TRIGGERS 1 INPUT IF Q = '0' THEN Q = '1' AND IF Q = '1' THEN Q = '0'
- NOTES
- ▶ 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

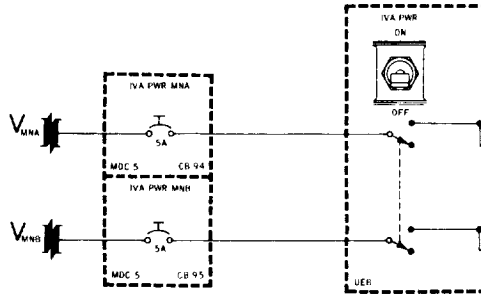
SIGNATURES		DATE	NATIONAL AERONAUTICS & SPACE ADMINISTRATION	
DR <i>P.A. Dwyer</i>		<i>9/16</i>	MANNED SPACECRAFT CENTER - HOUSTON, TEXAS	
DC			<b>UPDATA LINK</b>	
ENGR <i>A. H. ...</i>		<i>9-17-72</i>		
APP <i>...</i>		<i>9-17-72</i>		
STC <i>...</i>		<i>9-17-72</i>		
SKYLAB CSM		DWG NO	<b>6.5</b>	
118 THRU 119				
95.3 X 34		PAGE 6-5	SHEET 1 OF 1	

FOLDOUT FRAME 4

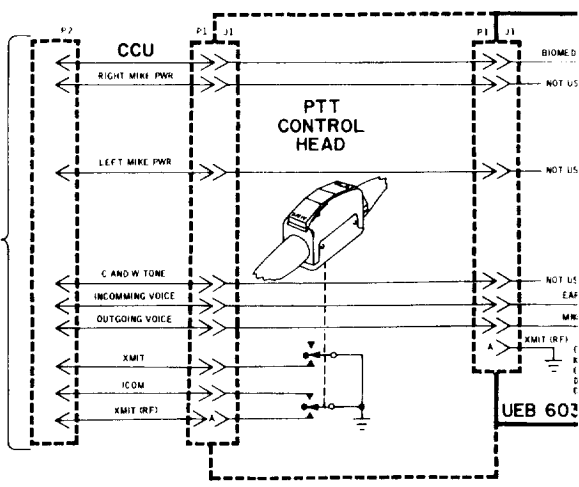




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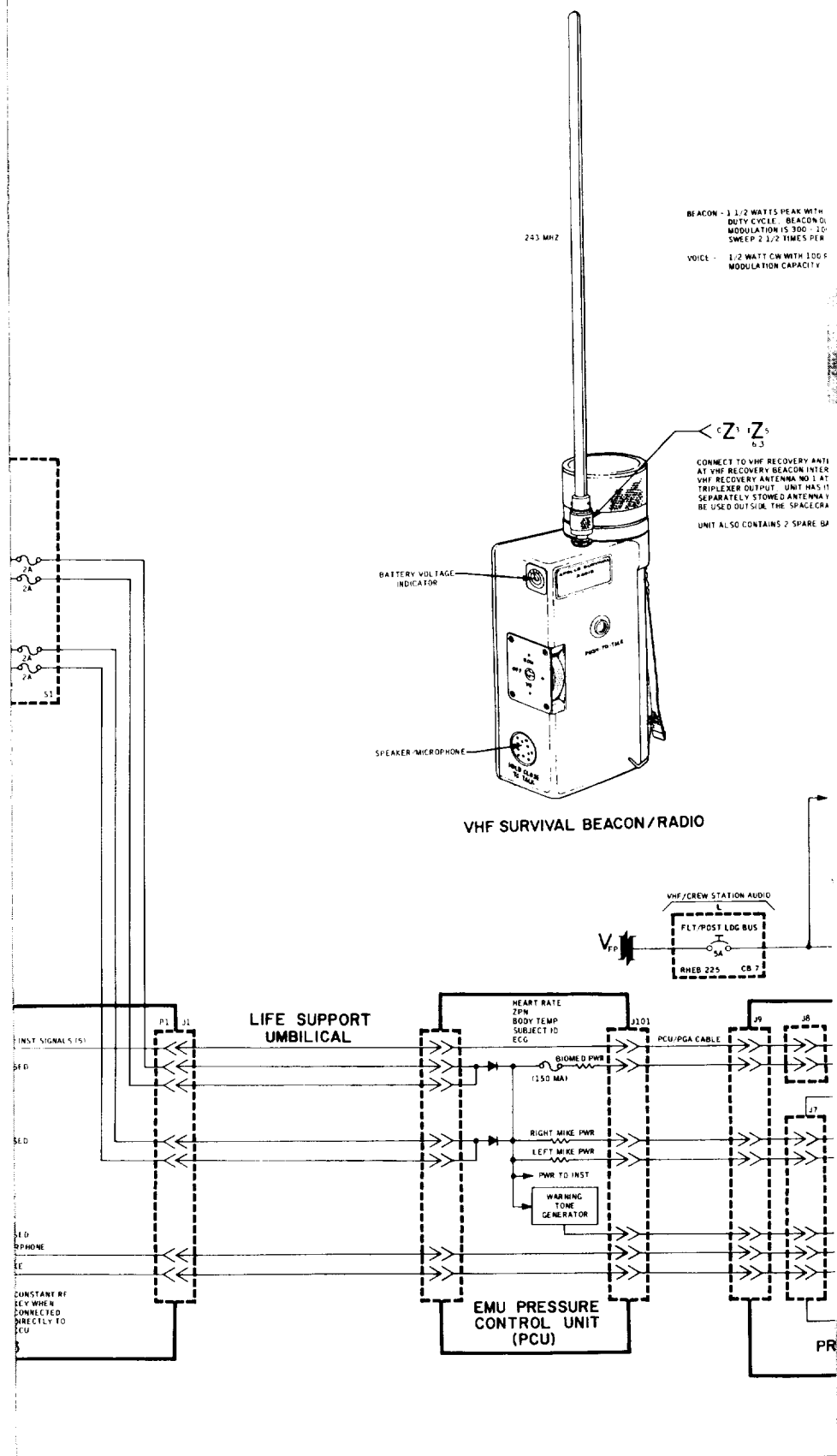


$\sum_{i=1}^n$   
 0.3  
 CONNECT TO  
 AUDIO CENTER  
 INTERFACE CONNECTOR  
 J645 LEFT AUDIO CENTER  
 J646 CENTER AUDIO CENTER  
 OR  
 J647 RIGHT AUDIO CENTER

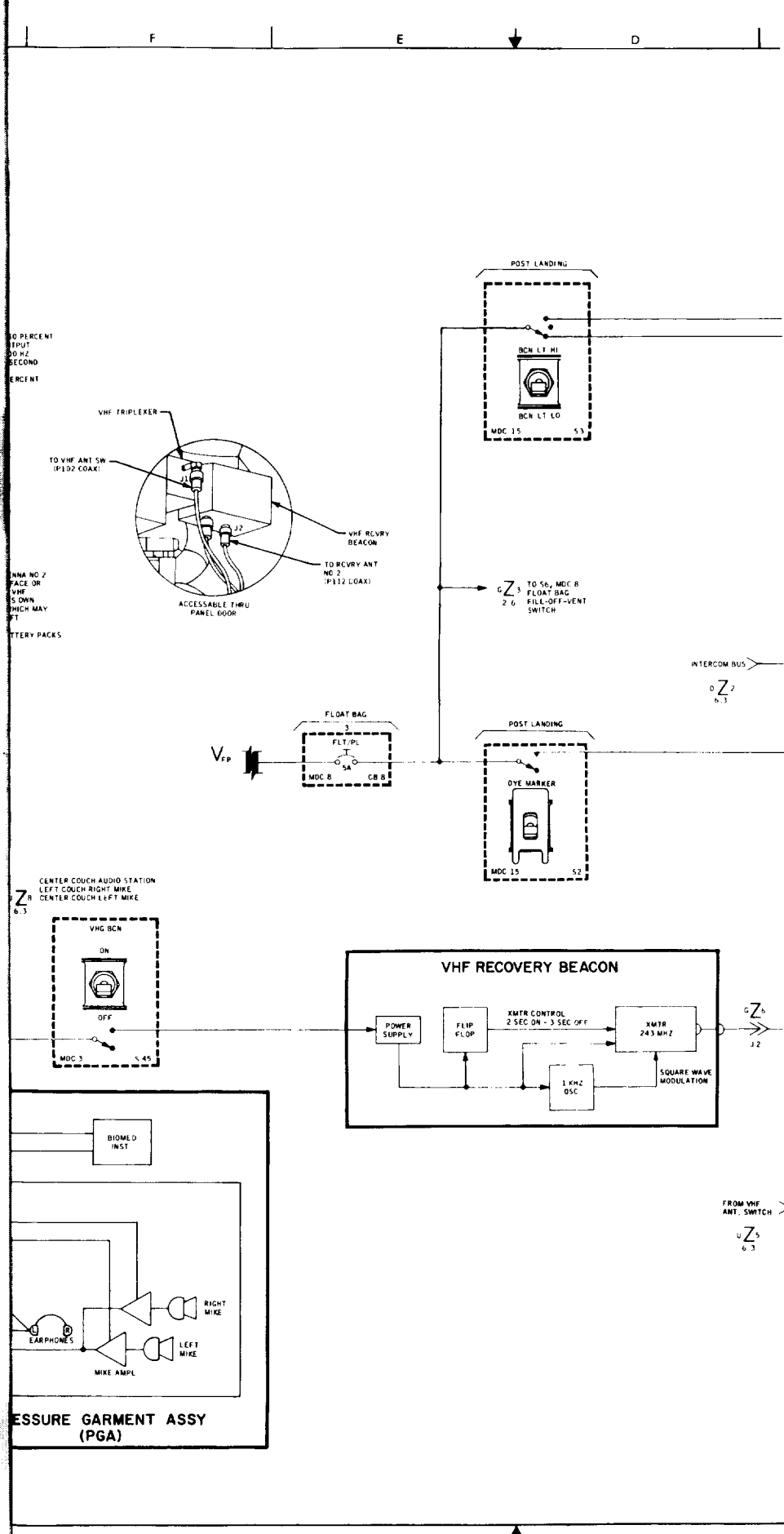


**EOLDOUT FRAME 1**

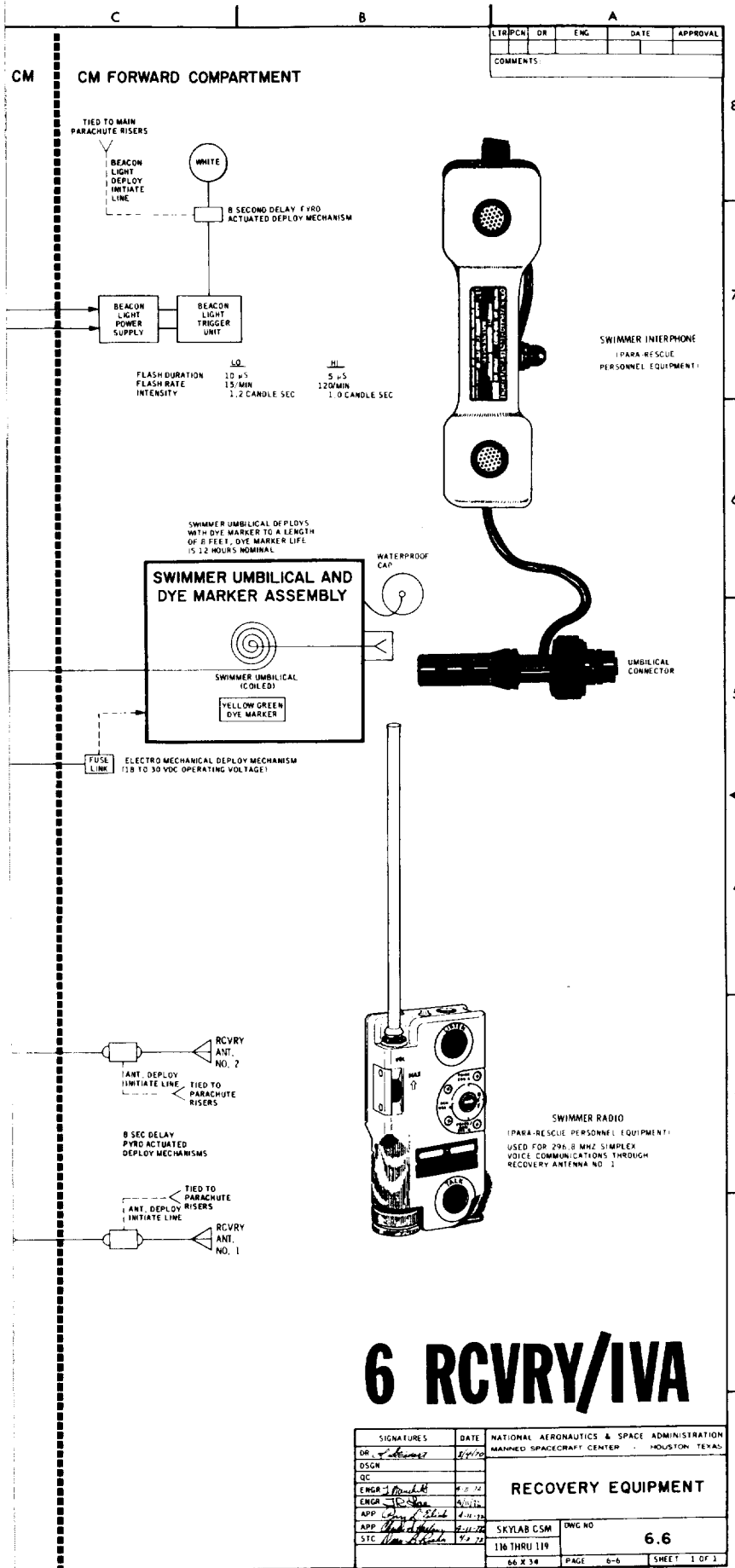




1000



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FOLDOUT FRAME 4





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 16.5 watts dc (Prim or Sec)
(2) FM Transmitter	1.5 watts dc 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 the level of unmodulated CW signal below which lock cannot be maintained for a period of at least one minute with 90 percent probability.

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

ITEM	FUNCTION and/or PARAMETERS
(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 receiver).
e. Automatic Gain Control (AGC)	
(1) Attack Time	TBD
(2) Decay	3 seconds (-51 dBm to -127 dBm)
f. Ranging Channel	
(1) Modulation	PM on Carrier
(2) Bandwidth	10 kHz to 1.5 MHz (3 dB)
(3) PRN Bit Rate	992.834 kbs
(4) PRN Clock	992.834 kbs (496.417 kHz square wave)
(5) PRN Code Length	5,456,682 bits (lunar code)
g. High-Gain Antenna Track Channel	
(1) Pointing Error Signal	50 Hz amplitude modulated signal derived from the coherent AGC detector.
(2) Earth Presence Signal	DC signal superimpose on pointing error signal when RCVR is locked to incoming RF signal.
h. Outputs	(See Table 6-IV Modes)
6. PM Transmitter (Prim/Sec)	
a. Type	PM, S-band
b. Frequency	2287.5 MHz (Aux OSC Mode) or 240/221 times RCVR frequency when RCVR is phase locked to uplink RF signal. (See Auto OSC Control).
c. RF Output Power	301 to 374 milliwatts (Test Data)
d. Auto OSC Control	XMTR frequency is derived from XMTR Aux OSC prior to acquisition and RCVR VCO after acquisition. Switching is controlled using RCVR AGC signal.

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

ITEM	FUNCTION and/or PARAMETERS
<ul style="list-style-type: none"> <li>(1) Aux OSC to RCVR VCO Switching Time</li> </ul>	Less than 0.25 seconds
<ul style="list-style-type: none"> <li>(2) RCVR VCO to Aux OSC Switching Time</li> </ul>	Less than 6 seconds (3 Seconds Nominal at -51 dBm)
<ul style="list-style-type: none"> <li>(3) Switching Threshold</li> </ul>	-127 dBm
<ul style="list-style-type: none"> <li>e. Inputs</li> </ul>	(See Table 6-III Modes)
7. FM Transmitter	
<ul style="list-style-type: none"> <li>a. Type</li> </ul>	FM, S-band
<ul style="list-style-type: none"> <li>b. Frequency</li> </ul>	2272.5 MHz $\pm$ 455 kHz
<ul style="list-style-type: none"> <li>c. Frequency Deviation</li> </ul>	$\pm$ 3 MHz maximum
<ul style="list-style-type: none"> <li>d. RF Output</li> </ul>	111 to 138 milliwatts (Test Data)
<ul style="list-style-type: none"> <li>e. Inputs</li> </ul>	(See Table 6-III Modes)
<ul style="list-style-type: none"> <li>(1) TV (dc coupled)</li> </ul>	$f_o$ at +1.3 Vdc Input $\Delta f/V = 1$ MHz/V Response dc to 500 kHz
<ul style="list-style-type: none"> <li>(2) Wideband (ac coupled)</li> </ul>	$\Delta f/V =$ MHz/V Response 200 Hz to 300 kHz
8. Special Operating Instructions	When switching between primary and secondary transponders, momentarily stop at the OFF (Center) position to allow control relays to operate.

TABLE 6-II.- S-BAND POWER AMPLIFIER

ITEM	FUNCTION and/or PARAMETERS
1. Weight	32 pounds maximum
2. Cooling	ECS Primary and/or Secondary Glycol Loop
3. Electrical Power	
a. Input Voltage	28 ± 4 Vdc control 115 Vac, 400 Hz, 3Ø
b. Input Power	
(1) Control Power	5 watts maximum steady state and 350 watts during switching for 0.5 seconds maximum.
(2) Ac Power	High Pwr Ampl Mode           81 watts Low Pwr Ampl Mode           32 watts Off/Bypass                    0 watts
	Sum ac power values to obtain simultaneous power level operation of Prim and Sec power amplifiers.
4. Power Amplification Activation Time	No RF amplification until 90 second nominal filament warm-up period complete.
	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 ampli- fier is operating at the time of transfer.
5. RF Output	
a. PM Output - Prim or Sec Power Amplifier	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

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

ITEM	FUNCTION and/or PARAMETERS
6. RF Input a. PM b. FM	275 to 400 milliwatts  100 to 145 milliwatts (For rated output)
7. Under Voltage Protection	Under-voltage protection circuit will remove ac pwr from power amplifier TWT if any phase of the ac input voltage falls below 95 Vac for 15 milliseconds or more. If this condition exists for 1 second or more, a 90 second filament warm-up delay will occur when ac voltage is restored.
8. Special Operating Instructions	Dc power should be applied before ac power and removed after ac power removal to prevent possible damage.



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

PM DOWNLINK MODES AVAILABLE	MODE NUMBER	1	2	3	4	5	6	7	8	9
	Carrier Voice <sup>(a)</sup>	Carrier <sup>(a)</sup> Voice <sup>(a)</sup>	Carrier <sup>(a)</sup> Voice <sup>(a)</sup>	Carrier <sup>(a)</sup> Voice <sup>(a)</sup>	Carrier <sup>(a)</sup> Voice <sup>(a)</sup>	Carrier <sup>(a)</sup> Voice <sup>(a)</sup>	Carrier	Carrier	Carrier	Carrier
Channels Included	51.2-kbps TM	51.2-kbps TM	1.6-kbps TM	1.6-kbps TM	1.6-kbps TM	1.6-kbps TM	--	--	1.6-kbps TM	1.6-kbps TM
	--	PRN	PRN	--	--	--	--	PRN	--	PRN
	--	---	--	--	--	--	KEY	--	--	--
PM DOWNLINK MODULATION PROCESS	Modulation Schemes; Subcarrier Character- istics	PRN : PM directly on carrier (2287.5 MHz) Backup Voice : PM directly on carrier (2287.5 MHz) Normal Voice <sup>(a)</sup> : FM/PM; 1.25-MHz subcarrier deviated ±7.5 kHz peak (±9 kHz peak for voice and biomed) <sup>(c)</sup> TM : PCM/PSK/FM; 1.024 MHz subcarrier bi-phase modulated ±90° Key : AM/PM; 512 kHz, 100 percent AM								
	Peak Carrier Deviation- Radians (Δθ)	PRN : <sup>(c)</sup> Normal Voice <sup>(a)</sup> : 0.7 for Modes 1, 2 1.2 for Modes 3, 4, 11, 12 Backup Voice : 0.7 for Modes 8, 14 1.2 for Modes 10, 16 TM <sup>(c)</sup> : 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	6	7	8	
	Channels Included	1:1 Playback of Recorded Voice, Re- corded CSM 51.2-kbps TM and Scien- tific Data <sup>(d)</sup>	32:1 Playback of Recorded Voice, Re- corded CSM 1.6-kbps TM and Scien- tific Data <sup>(d)</sup>	32:1 Playback of (CSM - Re- corded) LM 1.6-kbps TM	TV	Real-time Scientific <sup>(d)</sup>	Real-time 51.2-kbps TM <sup>(e)</sup> Real-time Scientific <sup>(d)</sup>	Real-time 1.6-kbps TM <sup>(e)</sup> Real-time Scientific <sup>(d)</sup>	1:1/32:1 back of tific Da Real-tim 51.2-kbps	
FM DOWNLINK MODULATION PROCESS	Modulation Schemes; Subcarrier Character- istics	TV : FM Directly on carrier (2272.5 MHz) Playback LM TM : PCM/FM Playback Voice : FM Directly on carrier (2272.5 MHz) Playback CSM TM <sup>(e)</sup> : PCM/PSK/FM; 1.024 MHz Scientific Data <sup>(d)</sup> : FM/FM (3 subcarriers) 95 kHz 125 kHz 165 kHz bi-phase modulated ±								
	Peak Carrier Deviation (Δf)	Playback Voice : 100 kHz +20 percent -40 percent Playback CSM TM <sup>(e)</sup> : 600 kHz ±15 percent Playback LM TM : 200 kHz +25 percent -50 percent TV : 1 MHz ±10 percent, f <sub>c</sub> at 1.3 Vdc within 0 to +455 kHz Scientific Data <sup>(d)</sup> : FM/FM (Real-time) 75 kHz ±15 percent 108 kHz ±15 percent 168 kHz ±15 percent								

(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.

(f) For Mode 10 Backup Voice Mod Index, place TLM bit rate switch to HIGH. Use LOW for Mode 14 Mod Index.

(g) HBR Mod Index of 1.2 and 1.6 are actually 0.96 and 1.2 respectively due to HBR suppression of 1.024 MHz subcarrier.

FOLDOUT FRAME





	10	11	12	13	14	15	16	0
r	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	
s	Backup Voice (f)	Voice	Voice	--	Backup Voice (f)	--	Backup Voice	No Carrier
	--	--	--	51.2-kbps TM	--	51.2-kbps TM	51.2-kbps TM	
	--	PRN	--	--	--	PRN	--	
	--	--	--	--	--	--	--	

	9	10	0
Play-Scienta and e s TM	1:1/32:1 Playback of Scientific Data and Real-time 1.6-kbps TM	8.1 Playback if (CSM-Recorded) LM 1.6-kbps TM	No Carrier

z subcarrier  
90°

(95 kHz SC)  
(125 kHz SC)  
(165 kHz SC)



\*

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

\*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 <sub>o</sub>
	5.4 kHz ± 5% f <sub>o</sub>
	6.8 kHz ± 5% f <sub>o</sub>
	8.2 kHz ± 5% f <sub>o</sub>
	9.6 kHz ± 4% f <sub>o</sub>
	11.0 kHz ± 3% f <sub>o</sub>
	12.4 kHz ± 3% f <sub>o</sub>
7. Tape Recorder Output - LM & CSM Voice	LM and CSM intercom voice are mixed and output to DSE for recording.
a. Response	300 to 2300 Hz flat within 2 dB.
8. LM PCM Output Channel	LM PCM (1.6 kbs) is limited and output to DSE for recording.
a. Response	600 to 2800 Hz flat within 1 dB.

TABLE 6-V.- PREMODULATION PROCESSOR - Continued

ITEM	FUNCTION and/or PARAMETERS
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% $f_o$ 2     125 kHz +7.5% $f_o$ 3     165 kHz +7.5% $f_o$
11. Scientific Data Channel (Playback) a. Response	Flat within 2 dB  <u>Channel</u> <u>32:1 Playback</u> <u>1:1 Playback</u> 1     12.5 to 89 Hz   50 to 2850 Hz 2     12.5 to 117 Hz   50 to 3750 Hz 3     12.5 to 154 Hz   50 to 4950 Hz
(Recorded data bandwidths)  12. Tape Recorder Input - LM PCM Channel a. Response	15 to 90 kHz flat within 1 dB.
13. Uplink Subcarrier Detectors a. Up Voice  b. Updata 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 and 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.										
17. Uplink Voice Squelch (30 kHz Discriminator Output) a. Operation	Transistor switch actuated by voice subcarrier threshold detector. Switch grounds input to voice output amplifier.										
b. Threshold	<table border="1"> <thead> <tr> <th data-bbox="808 1182 946 1209"><u>Mode</u></th> <th data-bbox="946 1182 1328 1209"><u>Received Carrier Power</u></th> </tr> </thead> <tbody> <tr> <td data-bbox="808 1220 841 1247">2</td> <td data-bbox="1027 1220 1149 1247">-119 dBm</td> </tr> <tr> <td data-bbox="808 1262 841 1289">4</td> <td data-bbox="1027 1262 1149 1289">-111 dBm</td> </tr> <tr> <td data-bbox="808 1304 841 1331">6</td> <td data-bbox="1027 1304 1149 1331">-108 dBm</td> </tr> <tr> <td data-bbox="808 1346 841 1373">7</td> <td data-bbox="1027 1346 1149 1373">-109 dBm</td> </tr> </tbody> </table>	<u>Mode</u>	<u>Received Carrier Power</u>	2	-119 dBm	4	-111 dBm	6	-108 dBm	7	-109 dBm
<u>Mode</u>	<u>Received Carrier Power</u>										
2	-119 dBm										
4	-111 dBm										
6	-108 dBm										
7	-109 dBm										
c. Squelch Level	Greater than 35 dB squelch of audio output when threshold is reached.										

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	28 ± 4 Vdc
a. Input Voltage	Duplex A (Key OFF) 4.2 watts
b. Input Power	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.
	20 milliseconds maximum to reach full transmit power from PTT (Key ON)
b. RF Output	5 dBW (average) minimum
c. Transmitter Frequency	XMTR A 296.8 MHz ± 8.90 kHz
	XMTR B 259.7 MHz ± 7.79 kHz
d. Modulation	Modulated by clipped speech between 300 and 2000 Hz combined with a 30 kHz signal such that the ON-OFF duty cycle of the RF carrier (50 ± 5 percent) is speech signal dependent and the ON-OFF period is 30 kHz. When XMTR is keyed ON with no speech input the average RF Output is 5 dBW minimum.

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

ITEM	FUNCTION and/or PARAMETERS
<p>5. Receiver (A or B)</p> <p>a. Activation Time</p> <p>b. RCVR RF Input</p> <p>c. A&amp;B Output Response</p> <p>(1) Output to Audio Center (Voice)</p> <p>(2) Output to PMP (Voice and Biomed Data)</p> <p>d. RCVR B LM PCM Output</p> <p>e. RCVR Squelch</p>	<p>500 milliseconds maximum to reach full receive operation from turn-on.</p> <p>100 milliseconds maximum to reach full receive operation from PTT release (Key OFF)</p> <p>2 to 625,000 microvolts</p> <p>300 to 3000 Hz, + 2 dB - 3 dB maximum variation, down 12 dB minimum at 5000 Hz.</p> <p>300 to 13,000 (2 dB).</p> <p>300 to 13,000 Hz (2 dB).</p> <p>Adjustable by MDC 2 controls for between 0 and 10 to 25 microvolts. 9 on squelch control is maximum squelch (10 to 25 microvolt level)</p>
<p>6. VHF Digital Ranging Generator Interface</p> <p>a. RCVR A Gate Input</p> <p>b. RCVR A Tone Output</p> <p>c. XMTR B Tone Input</p> <p>d. XMTR B Quieting (SC Inhibit)</p>	<p>5.266 kHz early-late gate signal to gate fine tone error signal through RCVR IF AMPLS.</p> <p>RCVR A detected IF amplifier output to digital ranging generator.</p> <p>Coarse and module 2 sum of coarse and medium tone input during acquisition and fine tone input during range tracking.</p> <p>Inhibit to XMTR 30 kHz quieting OSC during fine tone transmissions.</p>



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

TABLE 6-VII.- AUDIO CENTER EQUIPMENT - Concluded

ITEM	FUNCTION and/or PARAMETERS
7. Voice Operated Relay (VOX) a. VOX Sensitivity b. VOX Attack c. VOX Release	Adjustable for input from -10 dBm to +10 dBm Less than 50 milliseconds 2 ± 0.7 seconds
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 station's 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 consist 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.

TABLE 6-VIII.- UPDATA LINK EQUIPMENT - Continued

ITEM	FUNCTION and/or PARAMETERS
(2) System Address	<ol style="list-style-type: none"> <li>1. Command Module Computer</li> <li>2. Real-Time Command (Internal relays)</li> <li>3. Real-Time Command (External relays) (not used)</li> <li>4. Central Timing Equipment</li> <li>5. Salvo RTC reset</li> <li>6. Test message A &amp; B</li> <li>7. Auxiliary decoder (not used)</li> </ol>
(3) Data Word	(See Drawing 6.5.)
6. Sub-bit Detector	The 1 kHz and 2 kHz PSK signals are separated to provide synchronization and sub-bit data.
a. Sub-bit Sync	Recovered by phase lock techniques. Three 5 sub-bit sequences must precede a command message to synchronize the UDL.
b. Sub-bit Data	Detected at a 1 kHz rate.
7. Decoder Operation	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.
	Vehicle address recognition disables access bit decoding and enables the decoding of the remaining message.
	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.

TABLE 6-VIII.- UPDATA LINK EQUIPMENT - Concluded

ITEM	FUNCTION and/or PARAMETERS																																		
<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" data-bbox="885 657 1365 846"> <thead> <tr> <th>PCM BIT</th> <th>B1</th> <th>B2</th> <th>B3</th> <th>B4</th> </tr> </thead> <tbody> <tr> <td>UDL OFF</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>*TEST A</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>*TEST B</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>*SYS VAL</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>UDL STANDBY (ON)</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> </tr> </tbody> </table> <p>*Verification signal is presented to the PCM as follows:</p> <table border="1" data-bbox="943 936 1333 993"> <tbody> <tr> <td>PCM HBR</td> <td>55 milliseconds</td> </tr> <tr> <td>PCM LBR</td> <td>250 milliseconds</td> </tr> </tbody> </table>	PCM BIT	B1	B2	B3	B4	UDL OFF	0	0	0	0	*TEST A	0	1	1	0	*TEST B	1	0	0	1	*SYS VAL	0	1	0	1	UDL STANDBY (ON)	1	0	1	0	PCM HBR	55 milliseconds	PCM LBR	250 milliseconds
PCM BIT	B1	B2	B3	B4																															
UDL OFF	0	0	0	0																															
*TEST A	0	1	1	0																															
*TEST B	1	0	0	1																															
*SYS VAL	0	1	0	1																															
UDL STANDBY (ON)	1	0	1	0																															
PCM HBR	55 milliseconds																																		
PCM LBR	250 milliseconds																																		
<p>9. Internal Relays</p> <p>a. Type</p> <p>b. Rating</p> <p>c. Actuation Time</p> <p>d. Dc current</p> <p>e. Latch-in Current</p>	<p>32 double-pole double-throw relays, magnetic latching</p> <p>2 ampere, minimum, contact rating</p> <p>Opening or closure less than 5 milliseconds.</p> <p>18.7 milliamperes per relay</p> <p>7.1 milliamperes per relay</p>																																		

TABLE 6-IX.- VHF RECOVERY BEACON

ITEM	FUNCTION and/or PARAMETERS
1. Weight	2.7 pounds maximum
2. Cooling	Not required
3. Electrical Power	
a. Input Voltage	28 ± 4 Vdc
b. Input Power	6.9 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 ± 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-X.- 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	16.2 Vdc from self-contained battery
b. Power	Battery pack life 24 hours in 100% beacon operation
4. Activation Time	No appreciable warm-up period
5. Receiver	
a. Type	Portable, VHF AM Beacon - transceiver with integral microphone, speaker, PTT pushbutton battery, antenna, and test meter
b. Frequency	243 MHz
Sensitivity ( $\frac{S + N}{N} = 10 \text{ dB}$ )	-97 dBm minimum
6. Transmitter	
a. Frequency	243 MHz
b. RF Output	
(1) Beacon	1.25 watts (peak)
(2) Voice	0.5 watts minimum (unmodulated)
c. Modulation	
(1) Beacon	ON-OFF key by a swept square wave, which varies in frequency from 1000 Hz to 300 Hz at a sweep rate of 2.5 Hz
(2) Voice	
7. Antenna	1/4 wavelength flexible whip

TABLE 6-XI.- 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-XII.- 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-XIII.- ANTENNA, S-BAND OMNI

ITEM	FUNCTION and/or PARAMETERS								
1. Type	Helix in loaded cavity								
2. Frequency	2100 MHz to 2300 MHz								
3. Gain	Greater than -3 dB relative to isotropic source between $\theta > 45^\circ$ and $\theta > 145^\circ$ (See Item 5 below.)								
4. Polarization	Right-hand circular								
5. Coverage	The following coverage is applicable with sequential selection of the four antennas:								
	<table border="0"> <thead> <tr> <th data-bbox="802 793 878 821"><u>*GAIN</u></th> <th data-bbox="1003 793 1170 821"><u>SOLID ANGLE</u></th> </tr> </thead> <tbody> <tr> <td data-bbox="802 835 878 863"><math>\geq -3</math> dB</td> <td data-bbox="889 835 1284 863">between <math>\theta = 45^\circ</math> and <math>145^\circ</math></td> </tr> <tr> <td data-bbox="802 863 878 890"><math>\geq -20</math> dB</td> <td data-bbox="889 863 1284 890">between <math>\theta = 15^\circ</math> and <math>165^\circ</math></td> </tr> <tr> <td data-bbox="802 890 878 917"><math>\geq -24</math> dB</td> <td data-bbox="889 890 1284 917">between <math>\theta = 10^\circ</math> and <math>170^\circ</math></td> </tr> </tbody> </table>	<u>*GAIN</u>	<u>SOLID ANGLE</u>	$\geq -3$ dB	between $\theta = 45^\circ$ and $145^\circ$	$\geq -20$ dB	between $\theta = 15^\circ$ and $165^\circ$	$\geq -24$ dB	between $\theta = 10^\circ$ and $170^\circ$
<u>*GAIN</u>	<u>SOLID ANGLE</u>								
$\geq -3$ dB	between $\theta = 45^\circ$ and $145^\circ$								
$\geq -20$ dB	between $\theta = 15^\circ$ and $165^\circ$								
$\geq -24$ dB	between $\theta = 10^\circ$ and $170^\circ$								
	GAIN WILL BE LESS THAN -24 dB for cones, with solid angles of 20 degrees at the spacecraft nose and SPS nozzle.								
	*Applicable for $\phi = 0^\circ$ to $360^\circ$								
6. Power Rating	15 watts of CW RF								

TABLE 6-XIV.- 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-XV.- VHF RECOVERY

ITEM	FUNCTION and/or PARAMETERS
1. Type	10-inch erectible tape with ground-plane whiskers
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 degree azimuth
6. Power Rating	50 watts continuous

TABLE 6-XVI.- VHF DIGITAL RANGING GENERATOR

ITEM	FUNCTION and/or PARAMETERS
1. Weight	7 pounds maximum
2. Cooling	ECS Primary and/or Secondary Glycol Loop
3. Electrical Power	
a. Input Voltage	28 ± 4 Vdc
b. Input Power	10 watts maximum
4. Ranging Accuracy	±450 feet maximum error at 500 feet for ranging system: ±180 ft random ±270 ft bias
5. Range Tones	247 Hz (coarse), 3.9 kHz (medium), 31.6 kHz (fine)
6. EMS Interface	
a. Range Data Signal	Serial pulse train output to count up EMS range display to desired range in 0.01 n.mi. (60.761 feet) increments.
b. Maximum Unambiguous Range	327.68 n.mi. for intial range display.
c. Countdown Command Signal	When range is decreasing, a countdown command precedes each range data pulse.
d. Reset Pulse Signal	Resets EMS range display to zero when: <ul style="list-style-type: none"> <li>a. Data good test fails</li> <li>b. Reacquisition sequence is initiated.</li> <li>c. Range rate is greater than 1,800 feet/second.</li> </ul>
7. CMC Interface	
a. Range Data Signal	15-bit serial word with the "1" and "0" bits provided as pulse outputs on separate lines, most significant bit first.
b. Command Readout Input	3.2 kilobit/second Pulse train from CMC to clock out the range data signal
c. Range Strobe Input	3.2 kilobit/second pulse train from CMC to provide internal timing for loading range data into range data register.

TABLE 6-XVI.- VHF DIGITAL RANGING GENERATOR - Concluded

ITEM	FUNCTION and/or PARAMETERS
<p>d. Data Good Signal</p> <p>8. Data Good Test</p>	<p>A data good test is initiated by the range strobe input just prior to loading the range data register and prior to permitting the output register to be clocked out to the CMC. Absence of the data good signal for two successive tests will result in a CMC alarm.</p> <p>Data good test is performed only during the following periods:</p> <ul style="list-style-type: none"> <li>a. Range reacquisition sequence (initiated by VHF ranging reset switch)</li> <li>b. CMC range strobe sequence</li> </ul> <p>Data good test will fail under the following conditions:</p> <ul style="list-style-type: none"> <li>a. Fine tracker loses lock during fine tone tracking.</li> <li>b. Range rate of greater than 1800 feet/second</li> <li>c. Coarse tone tracker is locked to an ambiguous null. This condition is corrected by the internal logic which forces the tracker to reacquire during acquisition.</li> </ul>

TABLE 6-XVII.- COLOR TELEVISION CAMERA

ITEM	FUNCTION and/or PARAMETERS
1. Weight	Camera 11.0 pounds Lens 1.3 pounds
2. Cooling	Not required
3. Electrical Power	
a. Input Voltage	28 Vdc
b. Input Power	23 watts (camera) 2.5 watts (monitor)
4. Activation time	Instant on
5. Resolution	200 TV lines-per-picture height
6. Scanning rate	
a. Lines	525 scan lines per frame (2:1 interlace)
b. Frames	30 frames per second
7. Video Bandwidth	2 MHz
8. Illumination Levels	5 to 12,000 foot-candles by using f-stops. (20 watt flourescent lamp $\approx$ 4870 foot-candles.)
9. Aspect Ratio	4:3
10. Optics	<u>Field of View</u> <u>Near Object Distance</u>
a. Zoom Lens (6:1)	7 degrees      Focused 24 in. to $\infty$ 43 degrees      Focused 20 in. to $\infty$
b. f-stops	4.4 to 44 continuously variable
c. Focal Length	25 to 150 mm
11. Video Output	3.5 volts peak-to-peak, dark negative, bandpass 4.5 MHz
12. Connectors	One video, one power
13. Automatic Light Control Switch	
a. Peak	(Bright object in scene)
b. Average	(Uniform scene lighting) 1000:1 light range with AGC
14. Monitor	The monitor provides crew viewing of actual camera picture transmitted so that f-stop, light level, zoom position and focus can be properly accomplished.
15. Video Control Switch	
a. Transmit	Normal video output
b. Standby	Picture content of video is inhibited

TABLE 6-XVIII.- DATA STORAGE EQUIPMENT (DSE)

ITEM	FUNCTION and/or PARAMETERS
1. Weight	42.5 pounds
2. Cooling	ECS primary glycol loop
3. Electrical	
a. DC Voltage	28 ± 4 Vdc
b. AC Voltage	115 Vac, 400 Hz, 3-phase
c. Total Power Consumption	50 watts
4. Operational Stability	
a. Record Speed	3 seconds (max) from activation
b. Playback Speed	5 seconds (max) from activation
c. Tape Speed	±0.5% of specification with a 400 Hz absolute power frequency
d. Wow and Flutter	
(1) 15 ips Record and Playback	3% peak-to-peak (max) with no vibration present; flutter bandwidth is from 0.1 to 5,000 Hz
(2) 3.75 ips Record and 120 ips Playback	1.5% peak-to-peak (max) with no vibration present; flutter bandwidth is from 0.1 to 5,000 Hz
5. Record/Playback Tracks	14 tracks (total)
a. CM PCM Data	4 tracks
b. CM PCM Data Timing	1 track
c. LM PCM Data	1 track (not used)
d. CM-VHF Received Voice	1 track
e. Analog Data	7 tracks (not used)
6. CM PCM Data Channel	
a. Data	1.6 or 51.2 kbps NRZ
b. Timing Signal	1.6 or 51.2 kHz symmetrical squarewave
c. Playback Speed	
(1) 1.6 kbps Data	120 ips (51.2 kbps)
(2) 51.2 kbps Data	15 ips (51.2 kbps)



TABLE 6-XVIII.- DATA STORAGE EQUIPMENT (DSE) - Continued

ITEM	FUNCTION and/or PARAMETERS
d. Record Speed (1) 1.6 kbps Data (2) 51.2 kbps Data	3.75 ips 15 ips
7. LM PCM Data Channel a. Data b. Record/Playback Speed	1.6 kbps Manchester Code Determined automatically by CM PCM data record/playback speed
8. CM-VHF Received Voice Channel a. Signal b. Record/Playback Speed	300 to 2,500 Hz Determined automatically by CM PCM data record/playback speed
9. Analog Channels a. Frequency Response (1) 15 ips Record and 15 ips Playback (2) 3.75 ips Record and 120 ips Playback b. Harmonic Distortion c. Signal-to-Noise ratio (Input-to-Output) d. Crosstalk	4 dB (50 Hz to 10,000 Hz) 6 dB (50 Hz to 25,000 Hz) 4 dB (12.5 Hz to 2,500 Hz) 6 dB (12.5 Hz to 6.250 Hz) Less than 2 percent 35 dB (min) at 1,000 Hz 30 dB (min) at 32,000 Hz Down 32 dB (min) at 1,000 Hz for 15 ips playback Down 23 dB (min) at 32,000 Hz for 120 ips playback
10. Tape Motion Sensor	Indicates tape motion forward or backward
11. Tape Speed Sensor	Senses playback bit rate and automatically switches transport to proper speed. Playback speed is 120 ips if sensor fails.  Sensor is overridden if in LM PCM playback mode or playback electronics is off. Speed will be 120 ips forward or backward.

TABLE 6-XVIII.- DATA STORAGE EQUIPMENT (DSE) - Concluded

ITEM		FUNCTION and/or PARAMETERS				
12. Tape Recorder Mode:						
Data Source	Record			Playback		
	Speed	Control	Data <sup>②</sup>	Speed	Control	Data <sup>②</sup>
CSM	3.75 ips	Bit Rate Select Switch	Voice 1.6 kbps Analog data	120 ips (32:1)	Auto Speed Select	Voice 51.2 kbps Analog data
	----- 15 ips		Voice 51.2 kbps Analog data	----- 15 ips (1:1)		Voice 51.2 kbps Analog data
IM <sup>①</sup> (VHF)	3.75 ips	Bit Rate Select Switch	1.6 kbps	120 ips	(Disconnected)	51.2 kbps
	----- 15 ips					12.8 kbps

NOTES: ① Not used on Skylab CSM  
② Analog data channels not used

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8 GUIDANCE AND  
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9 SERVICE  
PROPULSION  
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10 REACTION  
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11 MISCELLANEOUS

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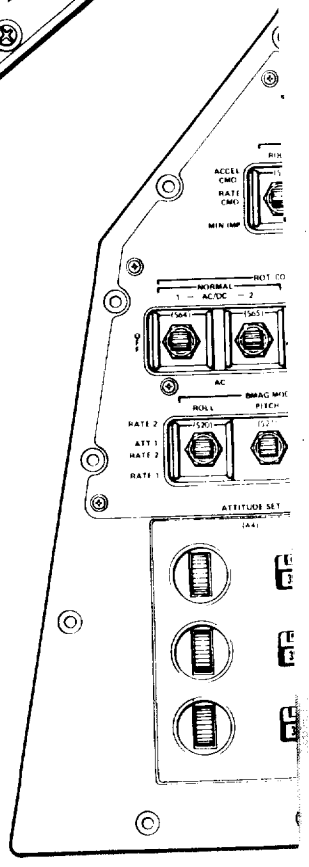
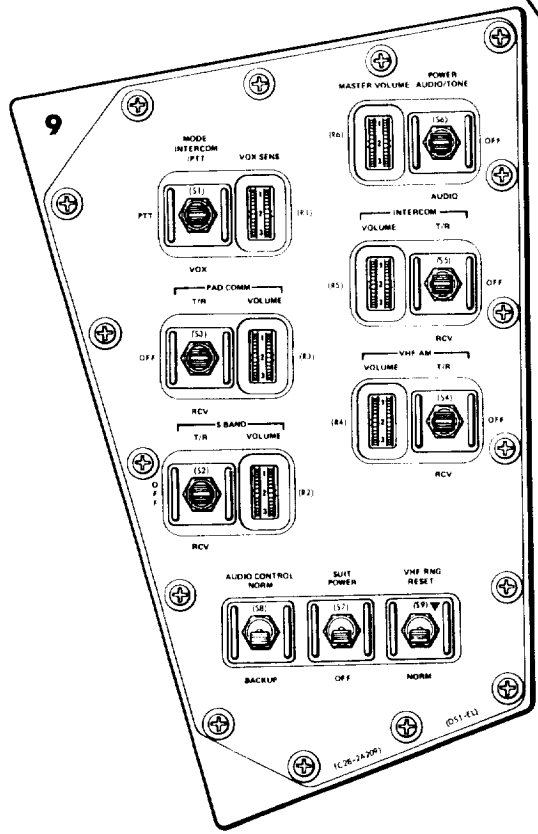
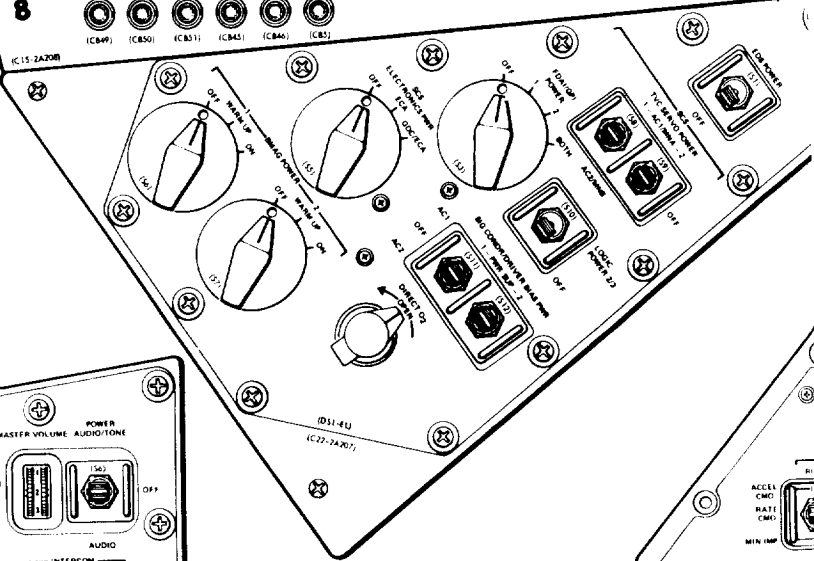
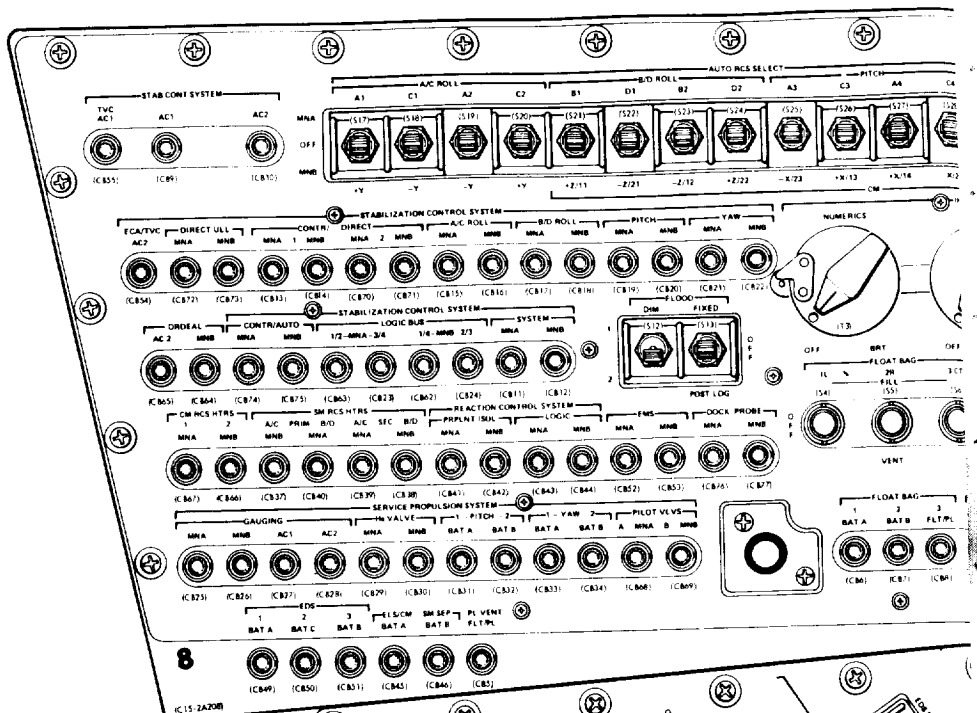
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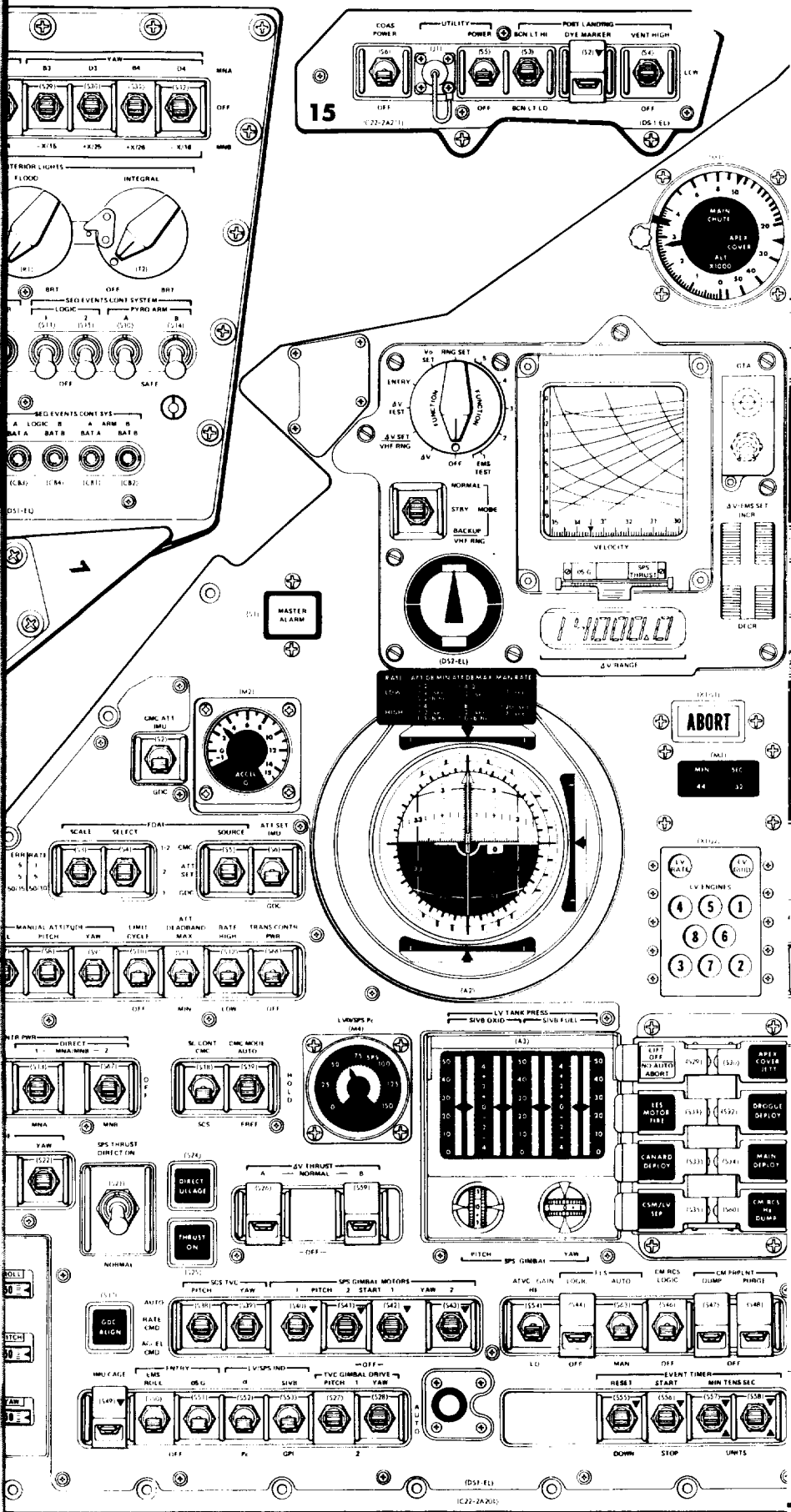
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**FOLDOUT FRAME**

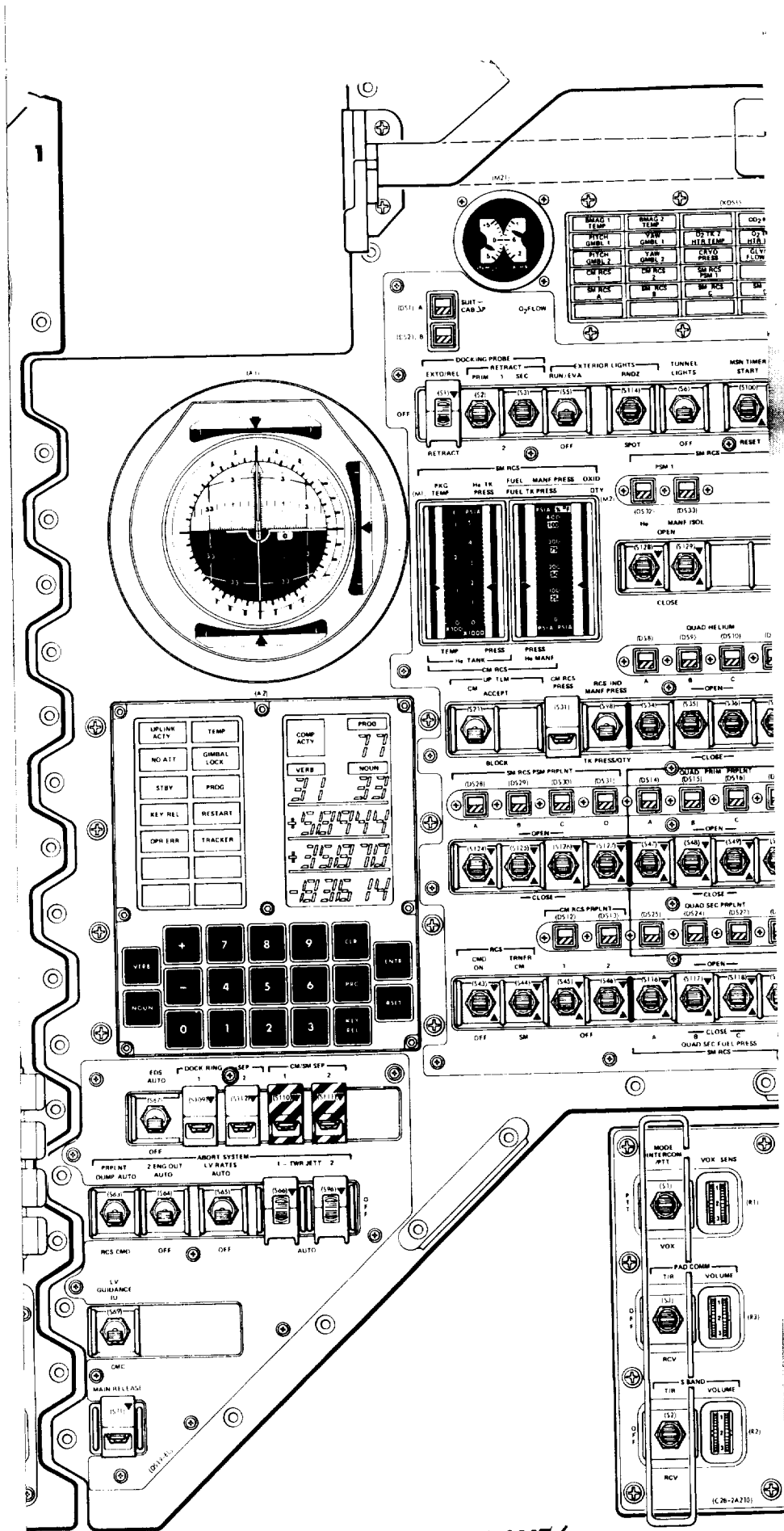




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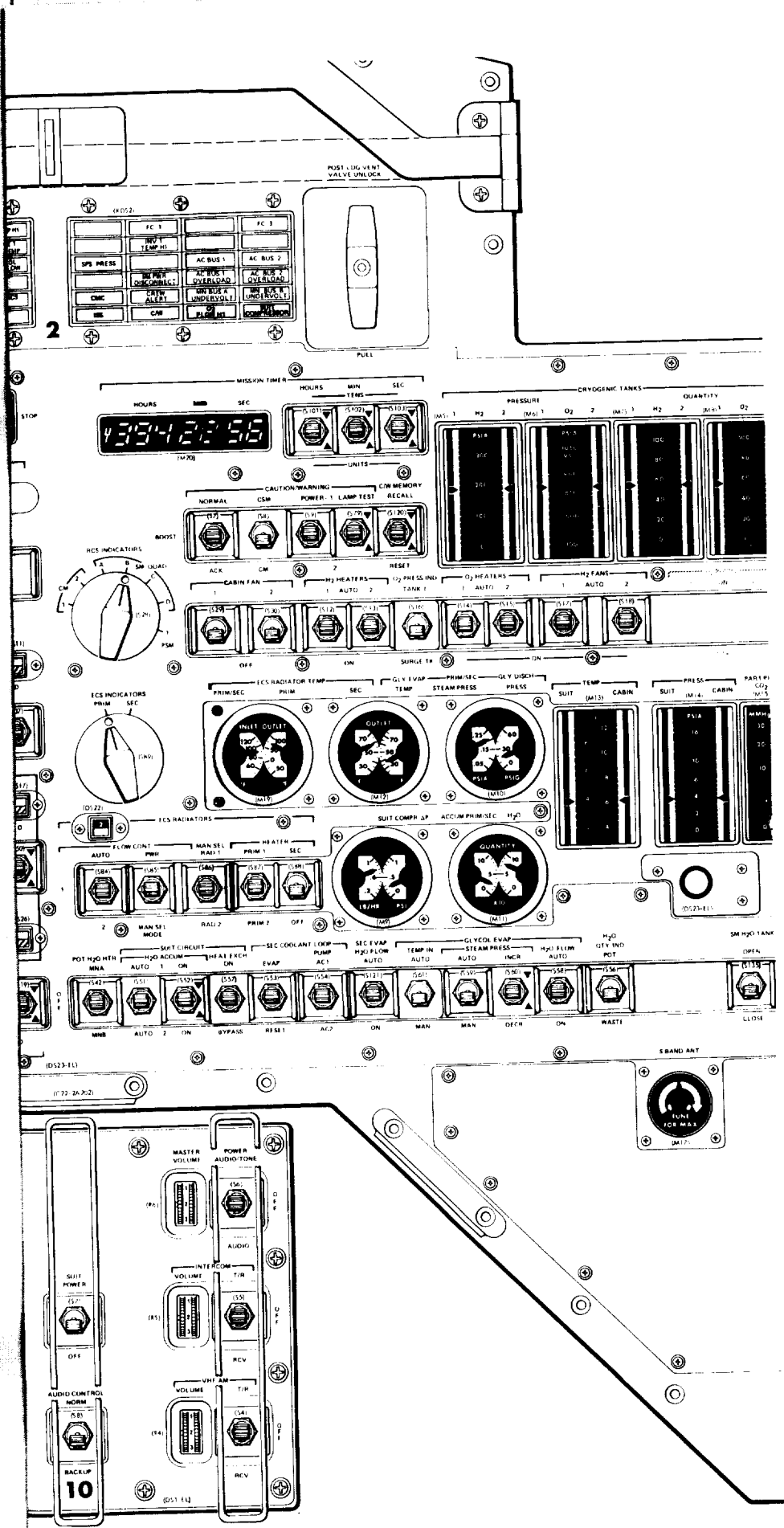






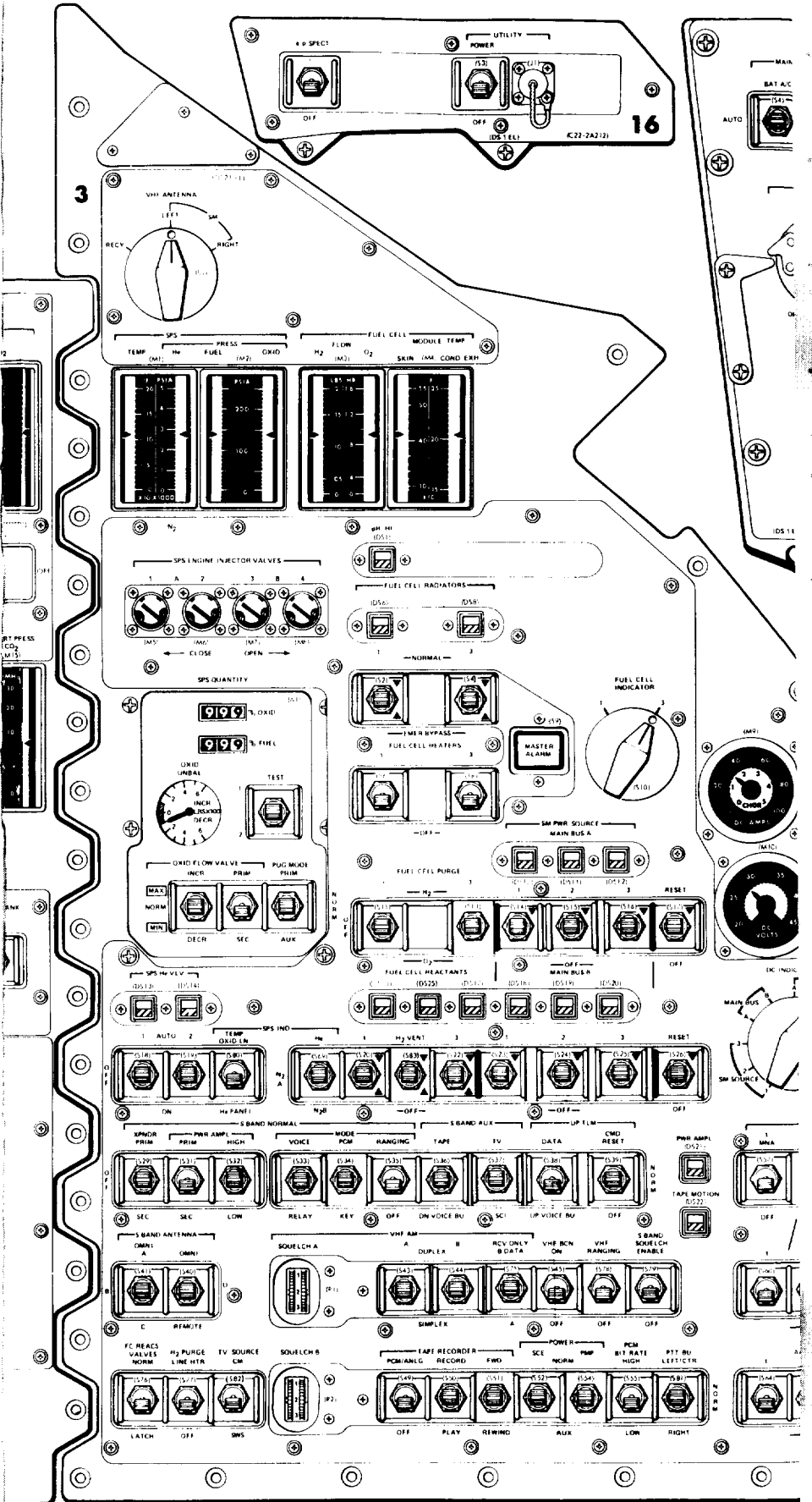
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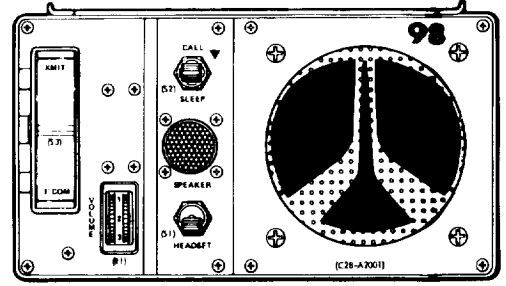
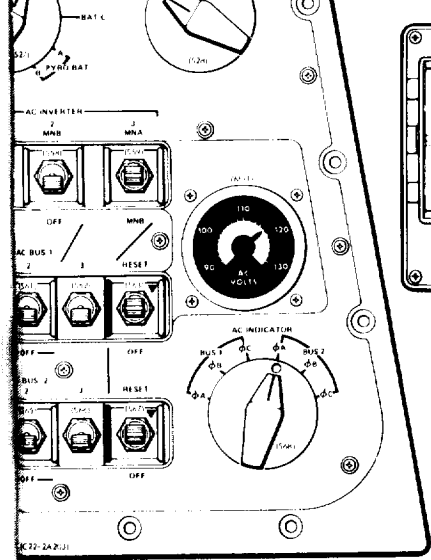
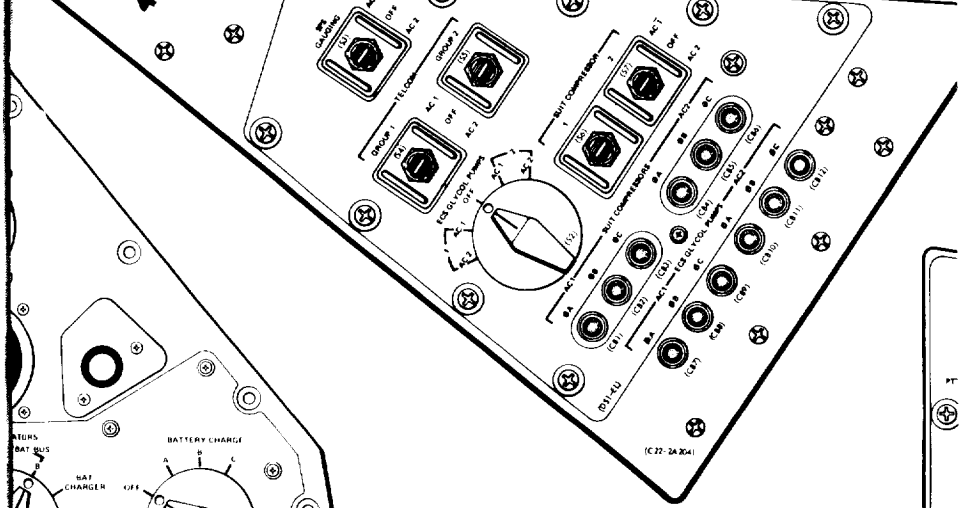
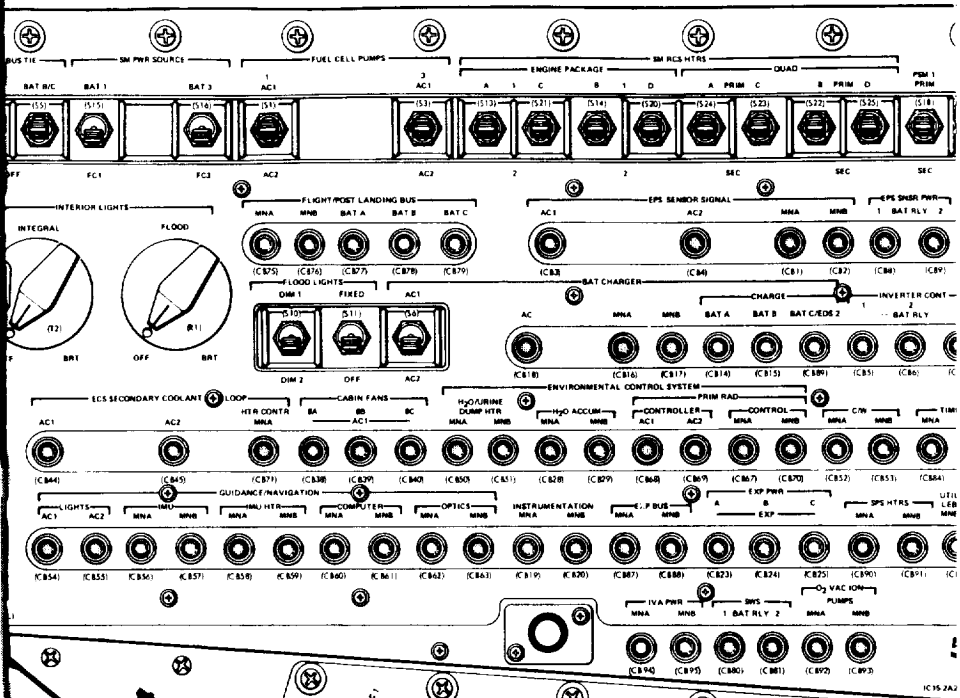
EOLDOUT FRAME 4





EOLDOUT FRAME 5





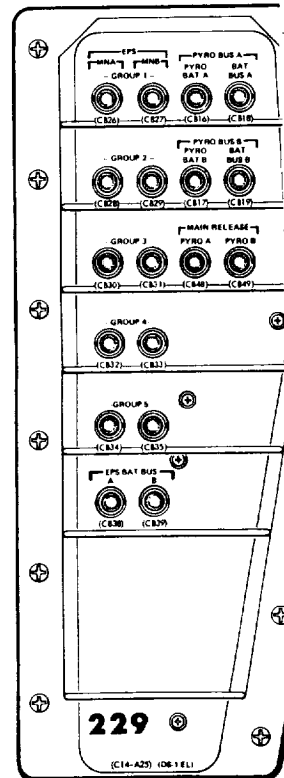
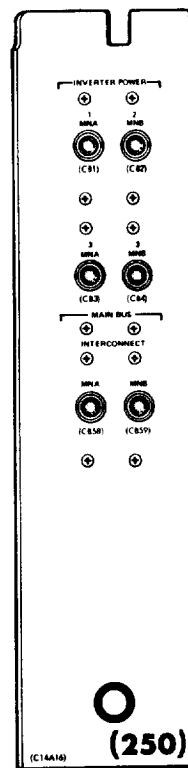
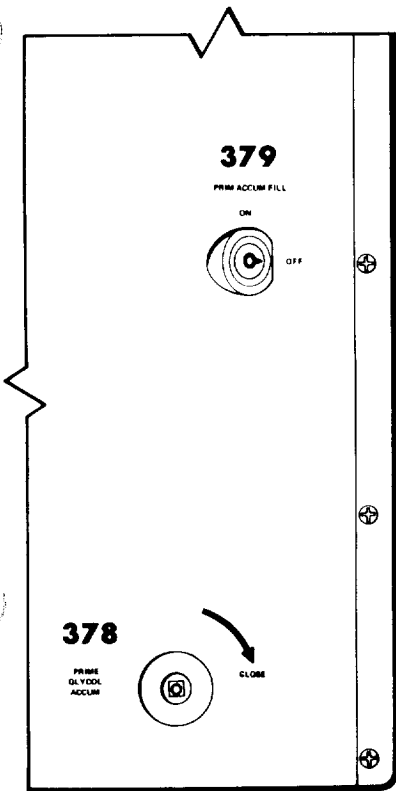
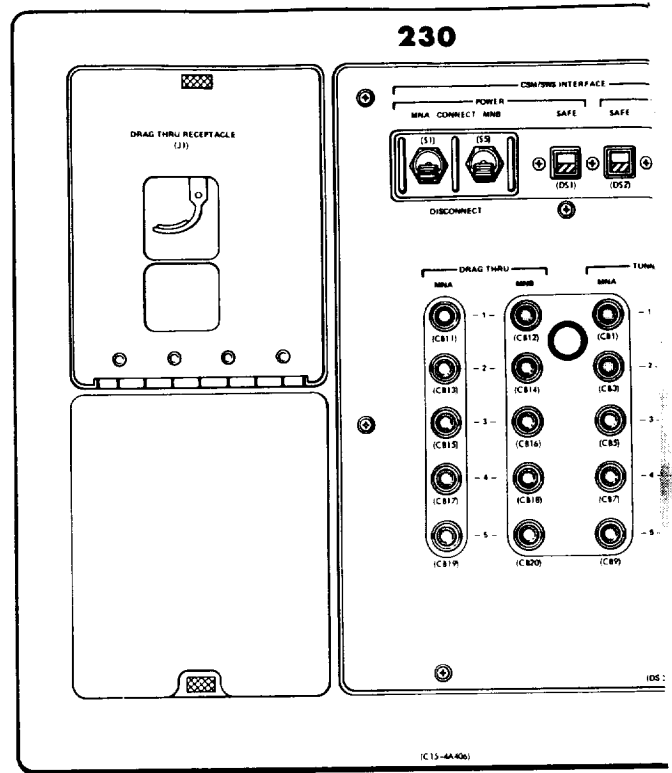
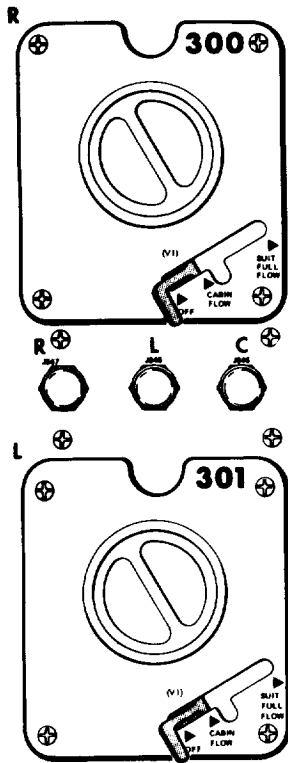
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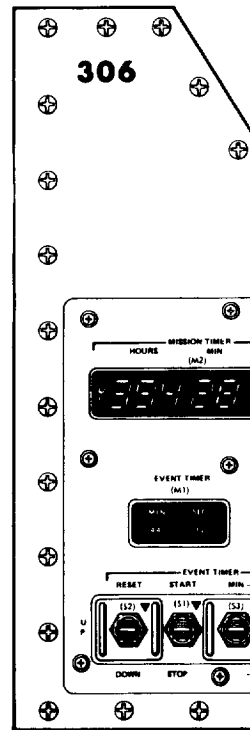
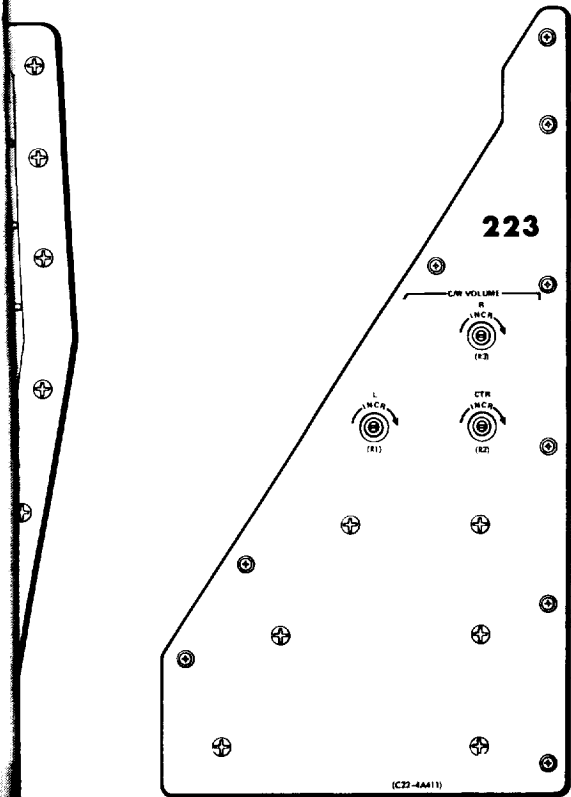
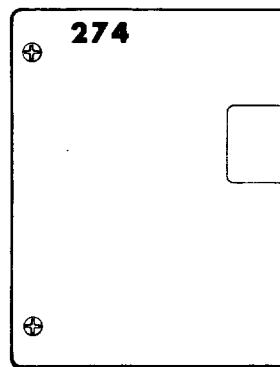
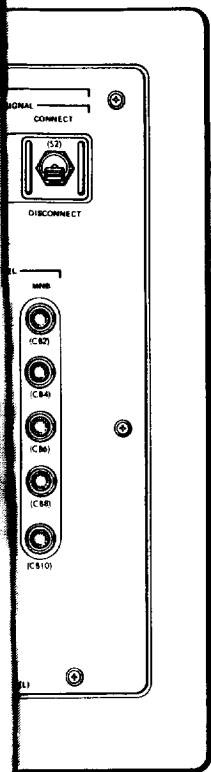






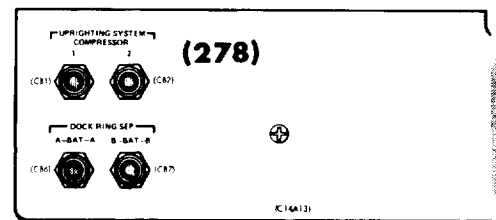
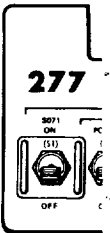
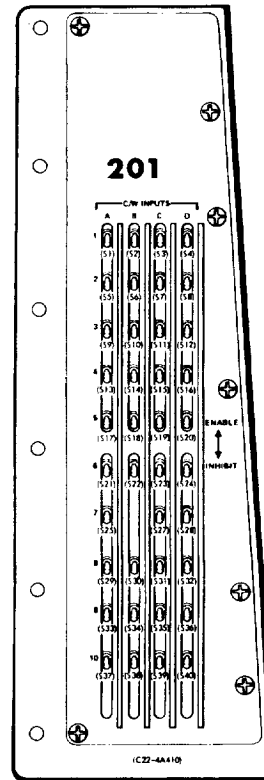
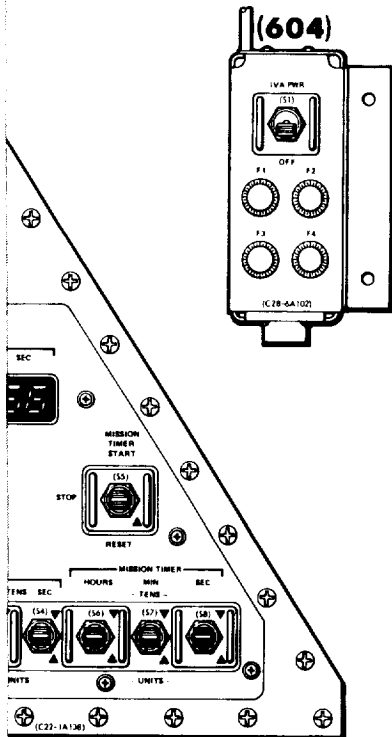
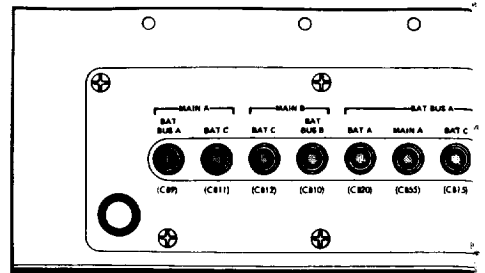
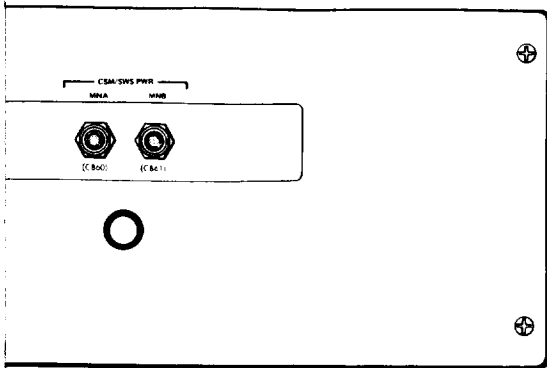
FOLDOUT FRAME

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FOLDOUT FRAME 2

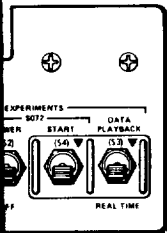
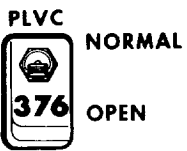
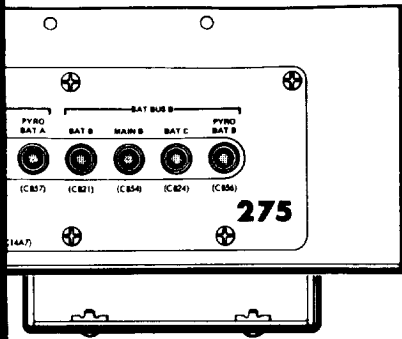




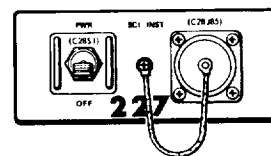
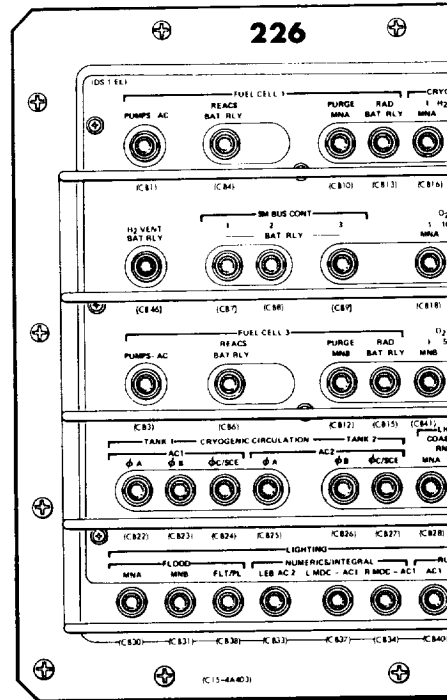
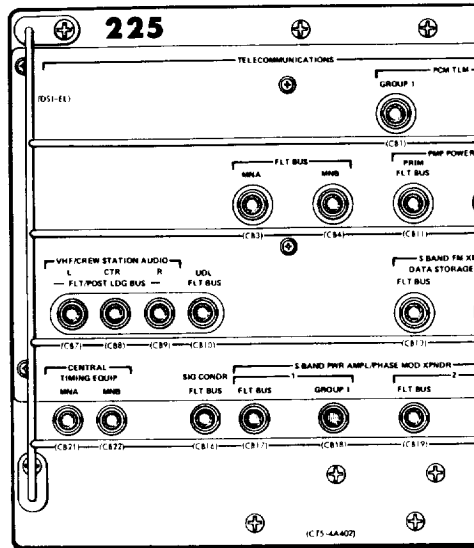
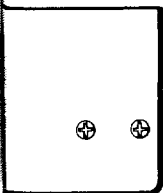
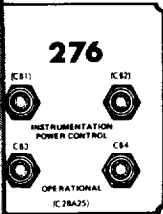
FOLDOUT FRAME 3







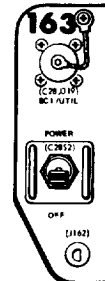
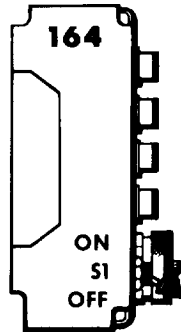
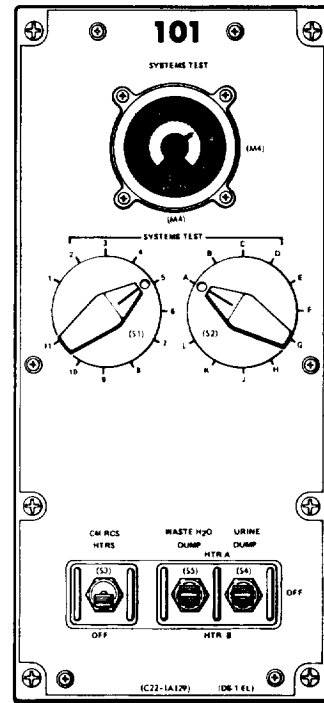
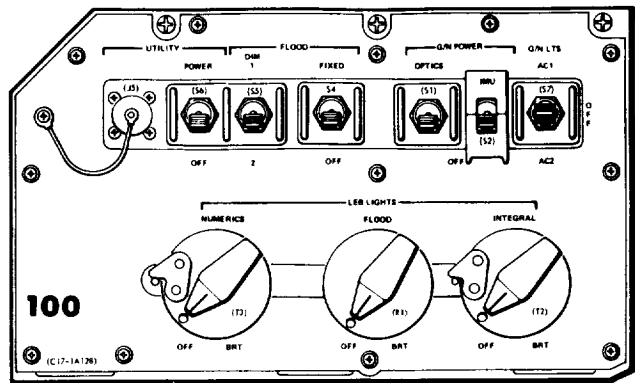
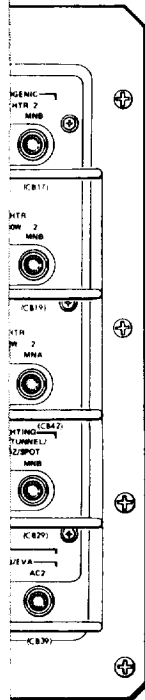
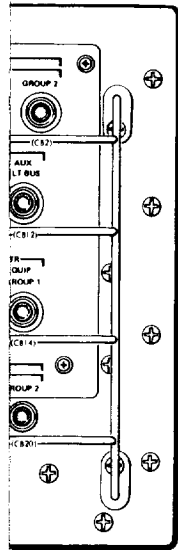
CM 117 ONLY)



FOLDOUT FRAME 4



LTR	PCB	OR	ENGR	DATE	APPROVAL
COMMENTS:					



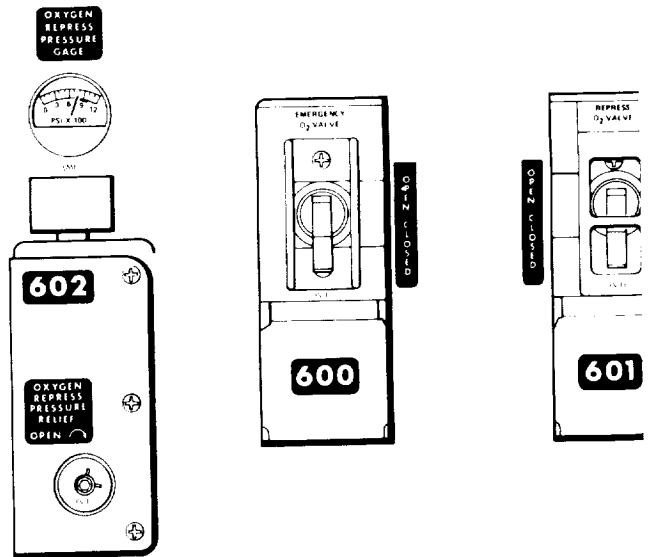
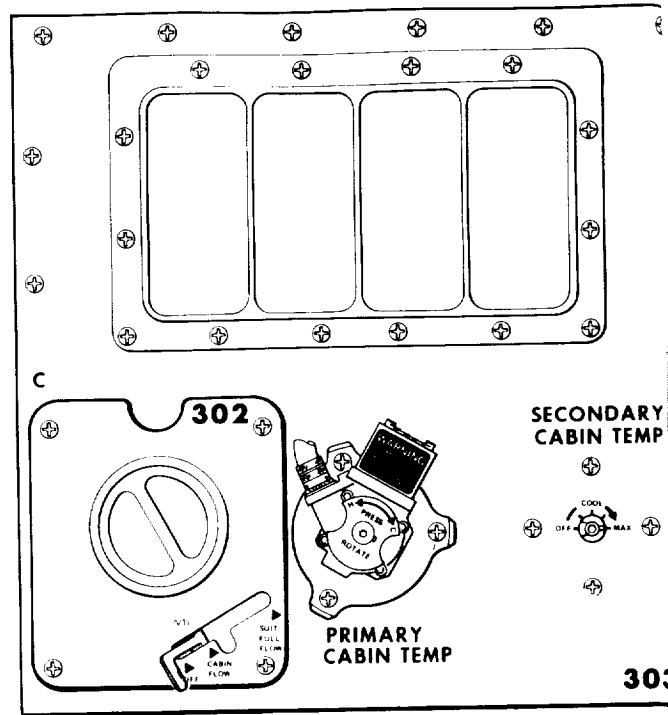
NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS			
DESIGN LAYOUT - MAIN DISPLAY CONSOLE CSM 116 BASELINE DRAWING			
DWG NO.		FIGURE 11-1	
52 X 17	PAGE 11-2	SHEET 2 OF 3	

EQLDOUT FRAME 5

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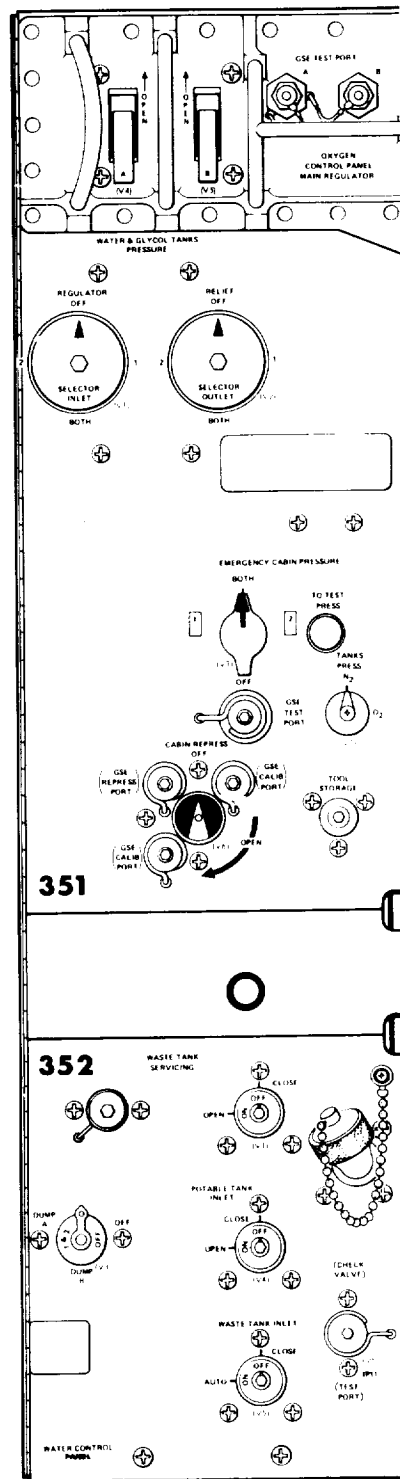
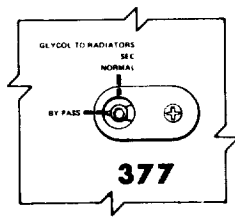
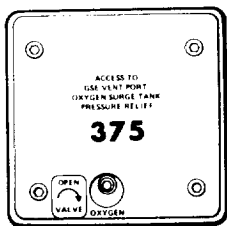
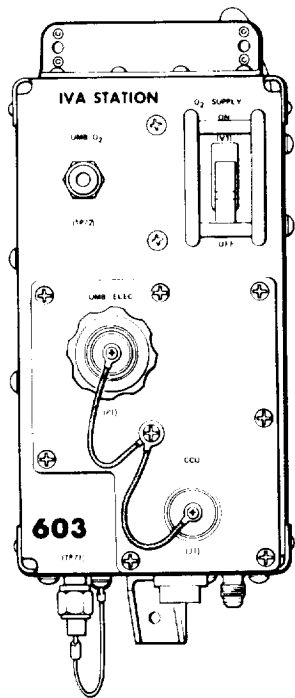
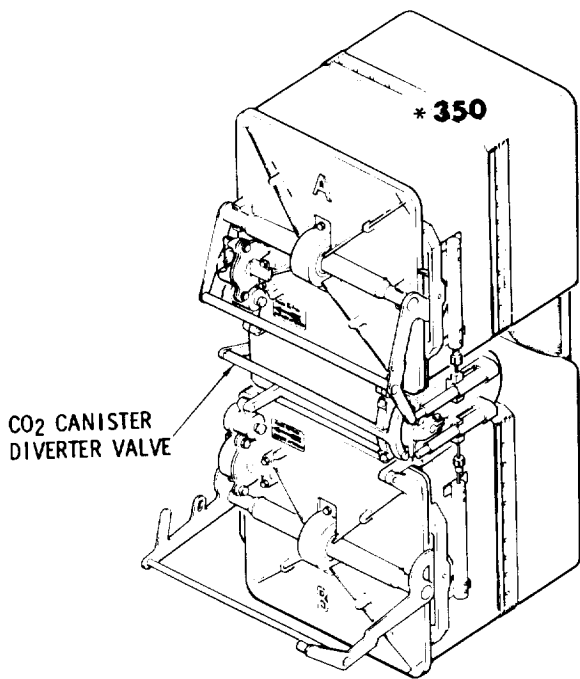
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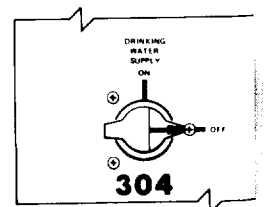
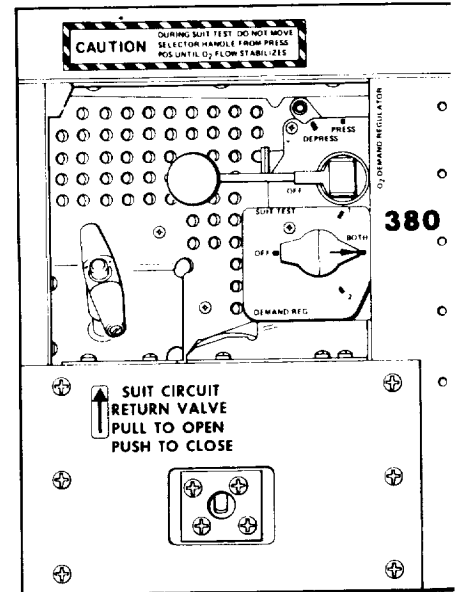
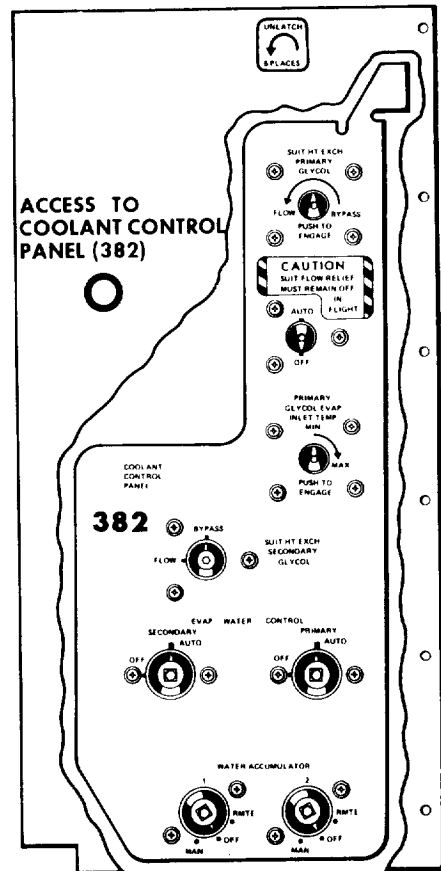
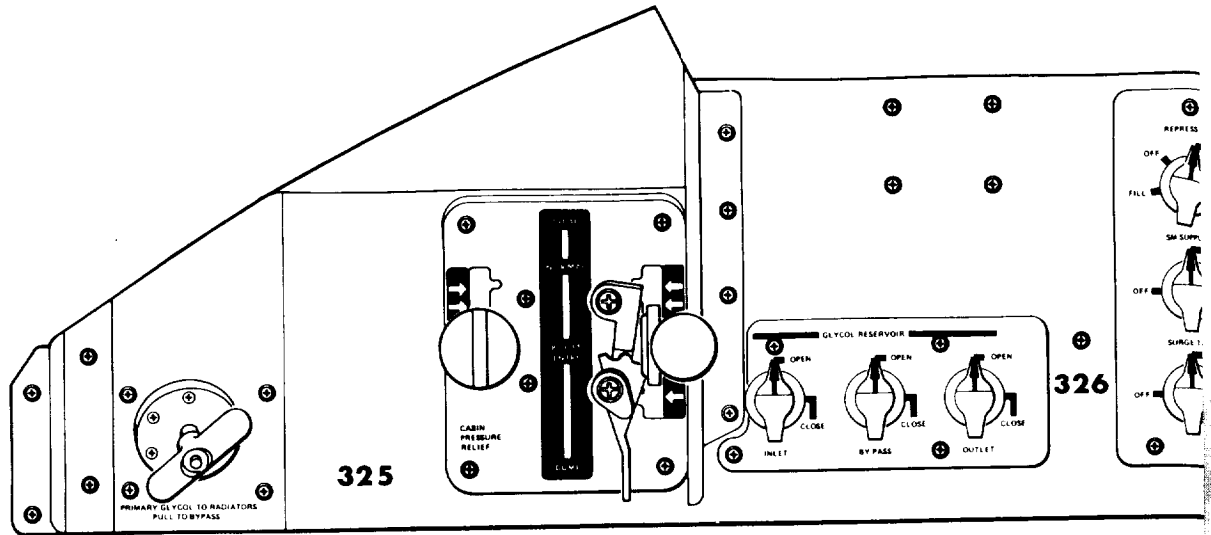
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2023/10/27

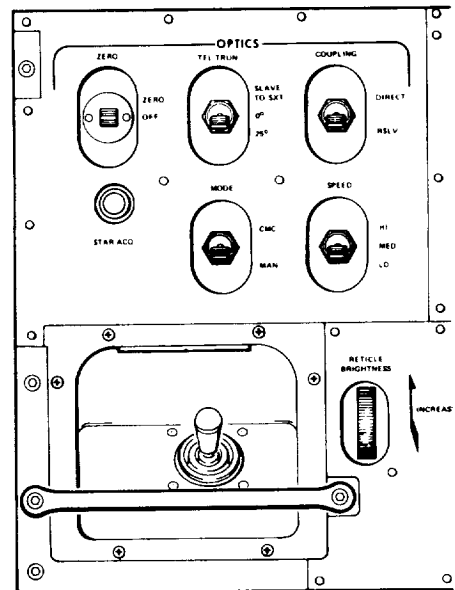
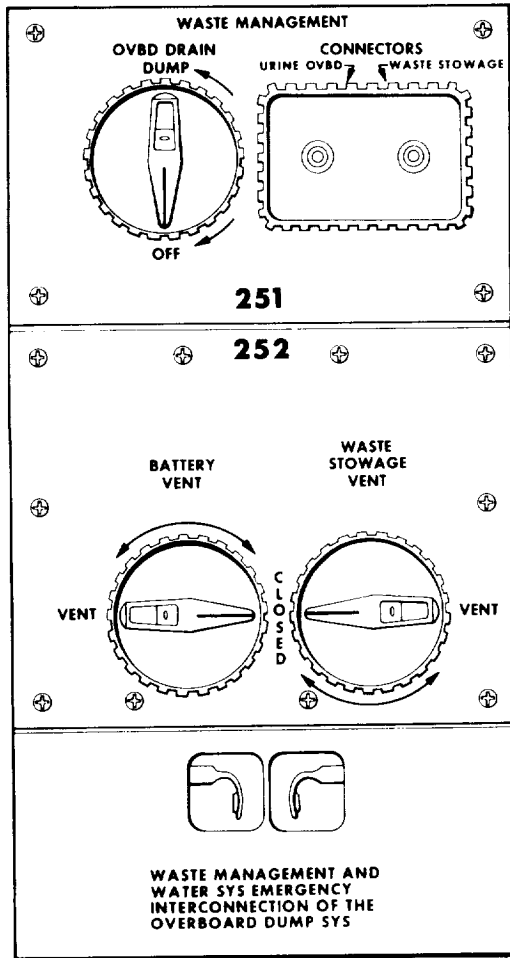
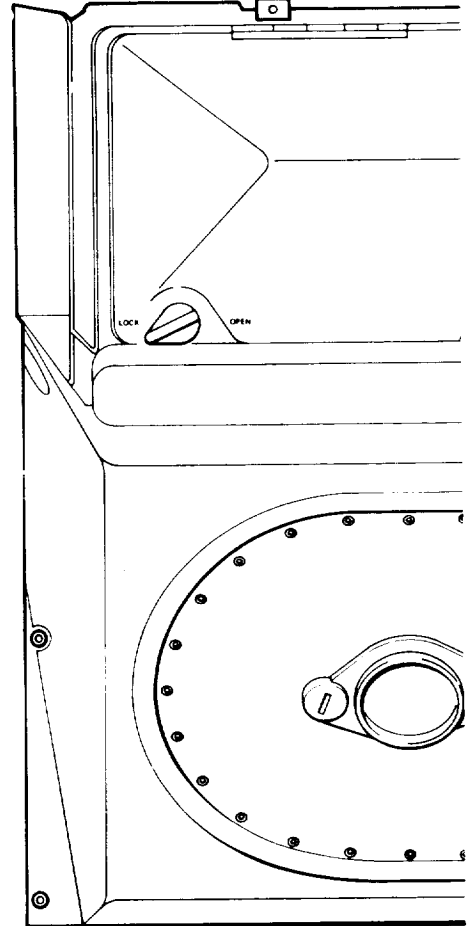
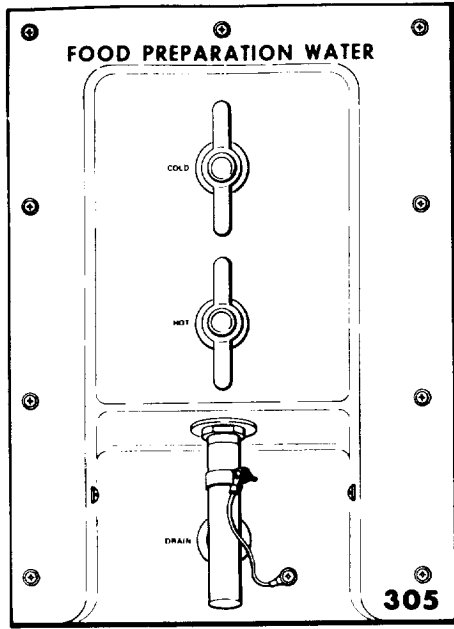
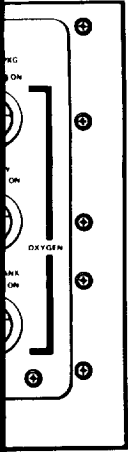






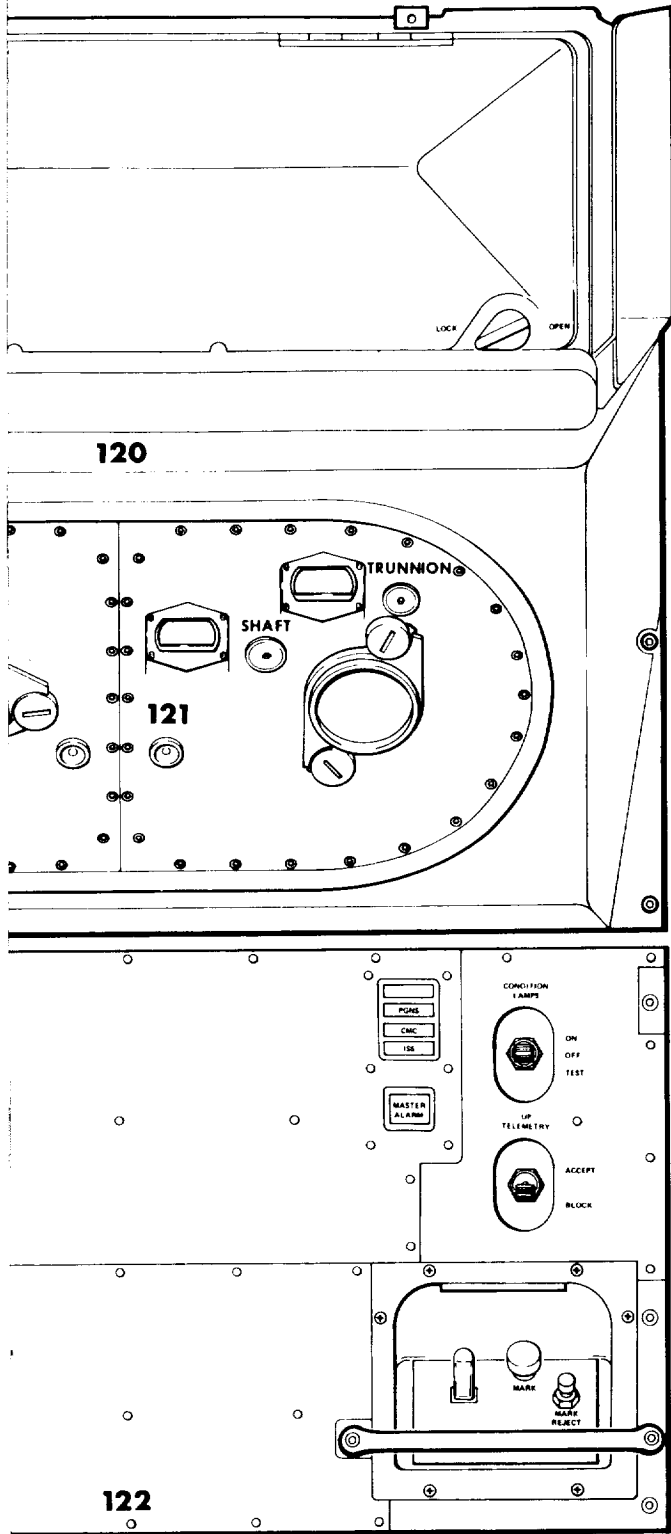




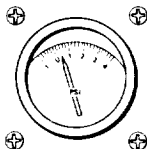
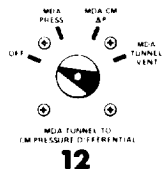
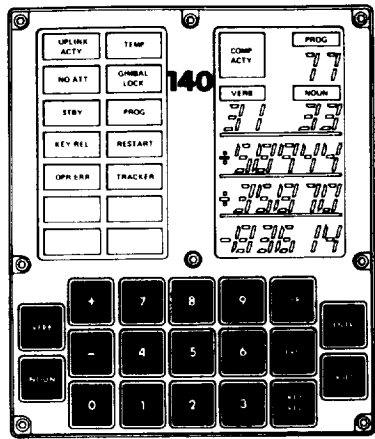


FOLDOUT FRAME 4





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REV	DESCRIPTION	DATE	APPROVED



DR BY		NORTH AMERICAN AVIATION, INC. REPAIR AND INFORMATION SYSTEMS DIVISION 1874 LAKWOOD BLVD. DOWNY, CALIFORNIA	
CHK BY		DESIGN LAYOUT MAIN DISPLAY CONSOLE CSM 116 BASELINE DRAWING	
APPROVED BY		CODE IDENT NO	SIZE
		03953	J
			FIGURE 11-1
			SHEET 3 OF 3

EQLDOUT FRAME 5

10/10/10

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CANARD IN OPEN POSITION

PITCH CONTROL MOTOR  
ME-467-0005-1001 (REF)  
ROCKET MOTOR SET  
V5-410001 (REF)

LOWER CANARD HINGE  
SEE V15-300801 (REF)  
V15-300800 (REF)

LAUNCH ESCAPE SYSTEM  
MARKING DRAWING  
V35-000010 (REF)

TOWER ASSY LAUNCH ESCAPE SYS.  
V18-300100 (REF)  
BODY GROUP ASSY LAUNCH ESCAPE SYS.  
V35-300001 (REF)  
LAUNCH ESCAPE SYS, FIELD SITE INSTL.  
F01-100078 (REF)  
GENERAL ASSY LAUNCH ESCAPE SYS.  
V35-000002 (REF)

WIRE HARNESS INSTL  
V35-441011 (REF)  
ELECTRICAL INSTL  
LAUNCH ESCAPE S  
V35-440001 (REF)  
ELEC FIELD SITE INSTL  
F01-445001 (REF)

PANEL MEGA  
V36-321101

UNIFIED CRT  
WATCH INSTL  
REF

REINDEERING R  
V36-321520

SERVICE MODULE

REACTION  
CONTROL  
SYSTEM  
(CONT'D)

MEAS	SHT - ZONE	SHT - ZONE	SHT - ZONE
SR5015T	12-269	12-270	
SR5016T	12-277	12-277	
SR5729P	12-266	12-266	
SR5716P	12-274		
SR5817P	12-265	12-266	
SR5830P	12-274		
SR5733P	12-267	12-270	
SR5780P	12-276	12-278	12-279
SR5820P	12-267	12-270	
SR5821P	12-276	12-277	
SR5737P	12-271		
SR5784P	12-280		
SR5822P	12-270		
SR5823P	12-279	12-279	
SR9715T	12-269		
SR9716T	12-276		
SR9415T	12-269		
SR9515T	12-275		
SR9740P		13-291	13-299
SR9741P		13-291	13-299
SR9802T	13-290	13-294	
SR9902T	13-291		
SR9904P	13-295	13-295	
SR9904P	13-294		
SR9906P	13-294	13-295	
SR9904P	13-294		
SR9907P	13-294	13-296	
SR9907P	13-295		
SR9908T	13-291	13-295	
SR9908T	13-290		

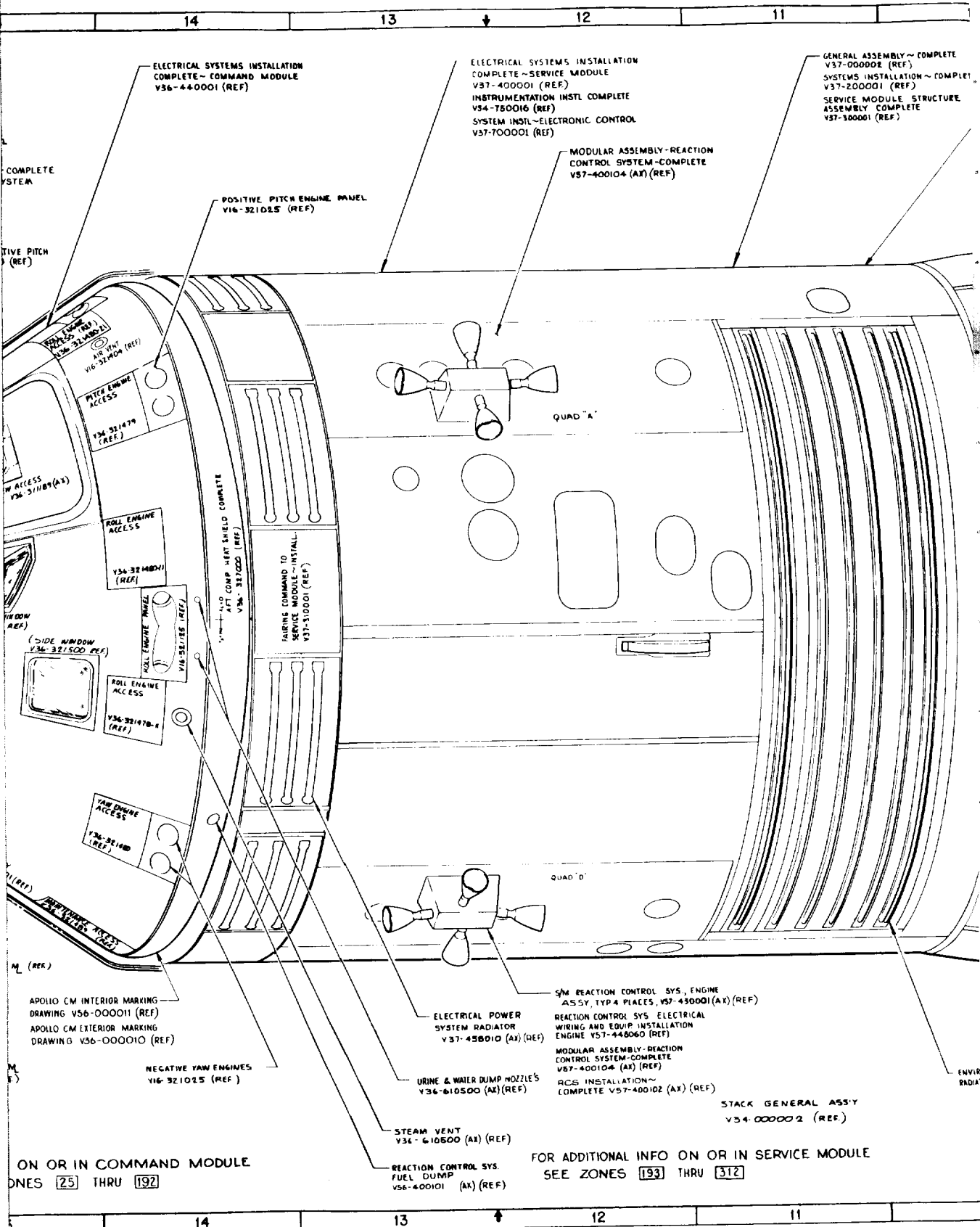
REACTION  
CONTROL  
SYSTEM  
(CONT'D)

MEAS	SHT - ZONE	SHT - ZONE
SR9809T	13-295	13-296
SR9909T	13-294	

C/M HEATSHIELD ASSY  
COMPLETE V36-321001  
C/M OUTER  
ABLATIVE OUTER M  
MD-716-16-D-6 (REF)  
BOOST PROTECTIVE COVER, OUTER  
V35-300680 AND F01-100057 (REF)  
ABLATIVE CORK, OUTER M (REF)

FOR ADDITIONAL INFO  
SEE ZC

11/11/2023



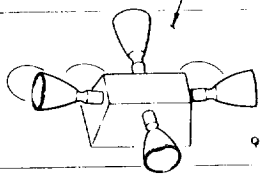
ELECTRICAL SYSTEMS INSTALLATION COMPLETE - COMMAND MODULE V36-440001 (REF)

ELECTRICAL SYSTEMS INSTALLATION COMPLETE - SERVICE MODULE V37-400001 (REF) INSTRUMENTATION INSTL COMPLETE V54-750016 (REF) SYSTEM INSTL - ELECTRONIC CONTROL V57-700001 (REF)

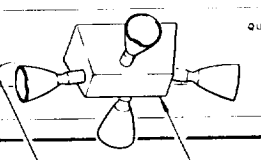
GENERAL ASSEMBLY ~ COMPLETE V37-000002 (REF) SYSTEMS INSTALLATION ~ COMPLETE V37-200001 (REF) SERVICE MODULE STRUCTURE ASSEMBLY COMPLETE V37-300001 (REF)

POSITIVE PITCH ENGINE PANEL V16-321025 (REF)

MODULAR ASSEMBLY - REACTION CONTROL SYSTEM - COMPLETE V57-400104 (AX) (REF)



QUAD "A"



QUAD "D"

POSITIVE COMP HEAT SHIELD COMPLETE V16-321000 (REF)

SERVICE COMMAND TO SERVICE MODULE - INSTALL V37-310001 (REF)

COMPLETE SYSTEM

POSITIVE PITCH (REF)

WINDOW (REF)

M (REF)

ON OR IN COMMAND MODULE ZONES 25 THRU 192

APOLLO CM INTERIOR MARKING DRAWING V56-000011 (REF) APOLLO CM EXTERIOR MARKING DRAWING V36-000010 (REF)

NEGATIVE YAW ENGINES V16-321025 (REF)

ELECTRICAL POWER SYSTEM RADIATOR V37-450010 (AX) (REF)

URINE & WATER DUMP NOZZLES V36-610500 (AX) (REF)

STEAM VENT V36-610500 (AX) (REF)

REACTION CONTROL SYS. FUEL DUMP V56-400101 (AX) (REF)

SM REACTION CONTROL SYS., ENGINE ASSY, TYP 4 PLACES, V57-430001 (AX) (REF)

REACTION CONTROL SYS ELECTRICAL WIRING AND EQUIP INSTALLATION ENGINE V57-440060 (REF)

MODULAR ASSEMBLY - REACTION CONTROL SYSTEM - COMPLETE V57-400104 (AX) (REF)

RCS INSTALLATION ~ COMPLETE V57-400102 (AX) (REF)

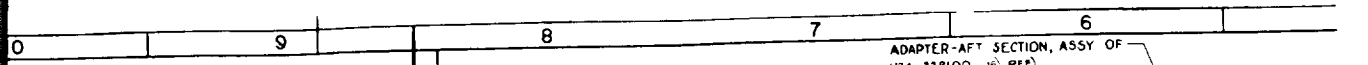
STACK GENERAL ASSY V54-000002 (REF)

ENVIR RADIA

FOR ADDITIONAL INFO ON OR IN SERVICE MODULE SEE ZONES 193 THRU 312

EOLDOUT FRAME 3

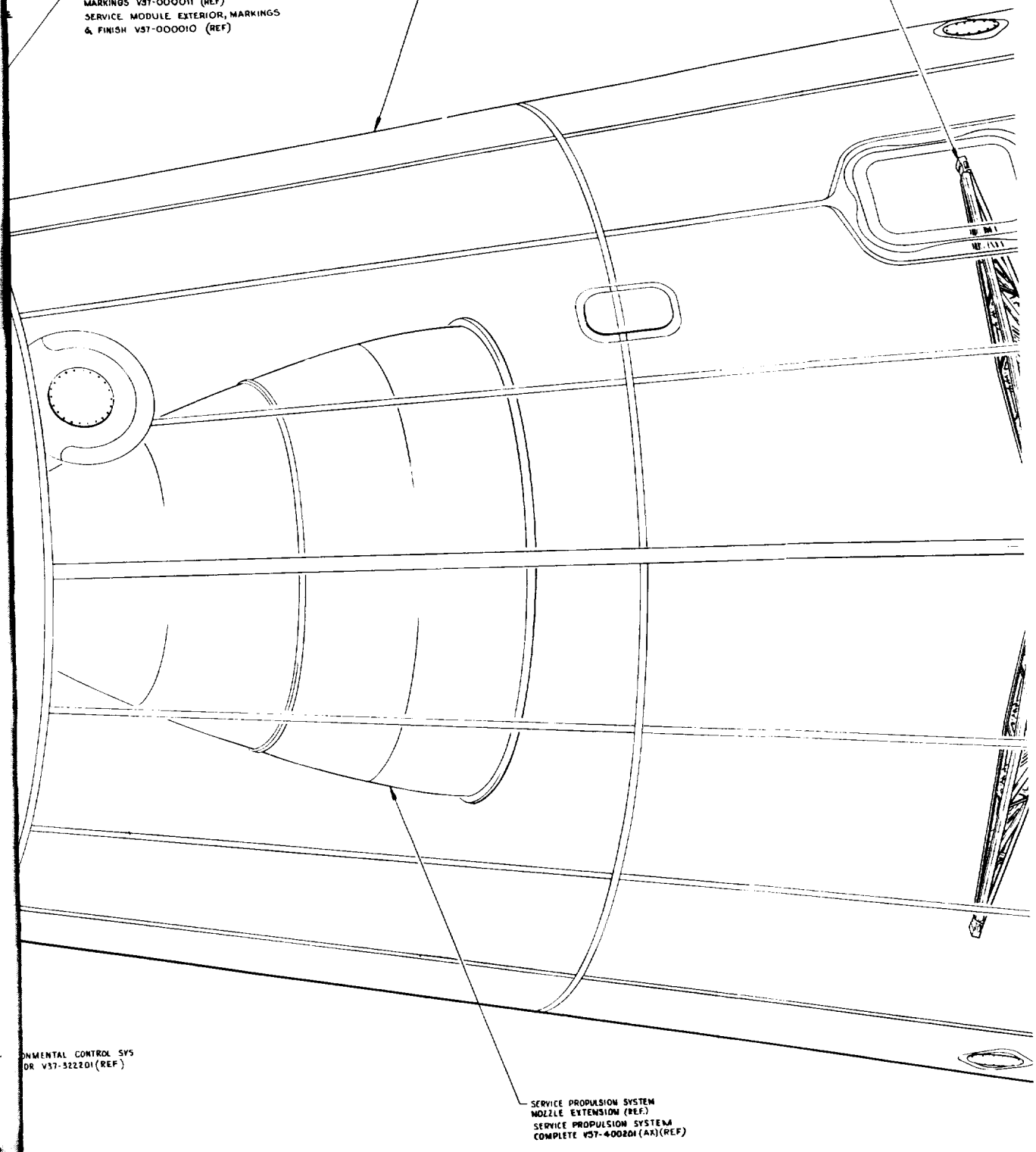
1000



SERVICE MODULE INTERIOR  
MARKINGS V37-000011 (REF)  
SERVICE MODULE EXTERIOR, MARKINGS  
& FINISH V37-000010 (REF)

FIELD SITE INSTALLATION,  
DRDANCE-COMLETE  
FDI-100406 (AR) (REF)

ADAPTER-AFT SECTION, ASSY OF  
V24-328100 (REF)  
STABILIZING DEVICE ASSEMBLY-  
STRUCTURE V24-328171 (REF)



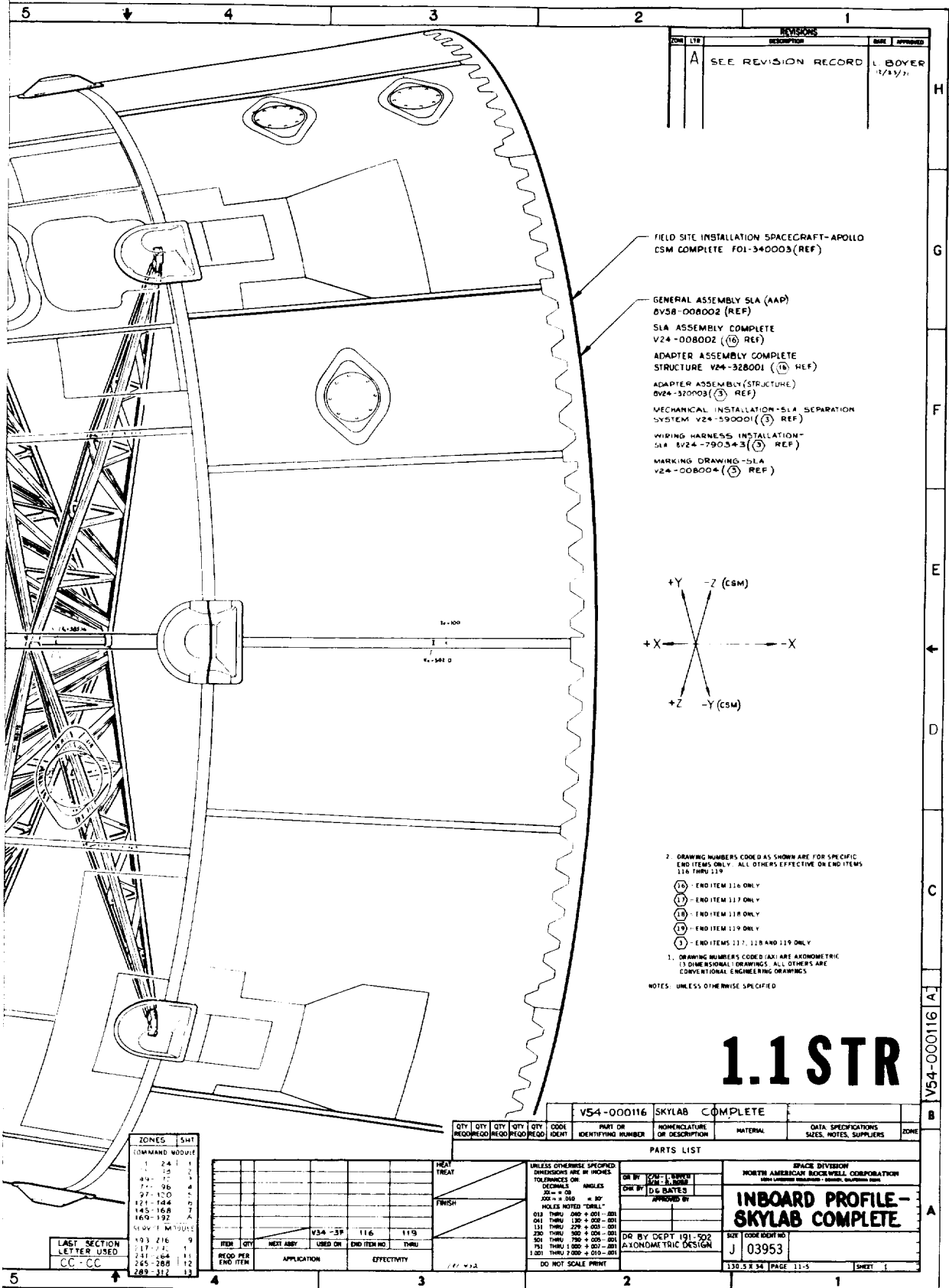
ONMENTAL CONTROL SYS  
DR V37-322201 (REF)

SERVICE PROPULSION SYSTEM  
NOZZLE EXTENSION (REF.)  
SERVICE PROPULSION SYSTEM  
COMPLETE V37-400201 (AR) (REF)

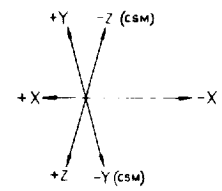


FOLDOUT FRAME 4





- FIELD SITE INSTALLATION SPACECRAFT-APOLLO CSM COMPLETE F01-340003 (REF)
- GENERAL ASSEMBLY SLA (AAP) 0V5B-008002 (REF)
- SLA ASSEMBLY COMPLETE V24-008002 ((16) REF)
- ADAPTER ASSEMBLY COMPLETE STRUCTURE V24-328001 ((16) REF)
- ADAPTER ASSEMBLY (STRUCTURE) 0V24-320003 ((3) REF)
- MECHANICAL INSTALLATION-SLA SEPARATION SYSTEM V24-590001 ((3) REF)
- WIRING HARNESS INSTALLATION-SLA 0V24-790343 ((3) REF)
- MARKING DRAWING-SLA V24-008004 ((3) REF)



2. DRAWING NUMBERS CODED AS SHOWN ARE FOR SPECIFIC END ITEMS ONLY. ALL OTHERS EFFECTIVE ON END ITEMS 116 THRU 119

- (16) - END ITEM 116 ONLY
- (17) - END ITEM 117 ONLY
- (18) - END ITEM 118 ONLY
- (19) - END ITEM 119 ONLY
- (3) - END ITEMS 117, 118 AND 119 ONLY

1. DRAWING NUMBERS CODED (AX) ARE AXONOMETRIC (3) DIMENSIONAL DRAWINGS. ALL OTHERS ARE CONVENTIONAL ENGINEERING DRAWINGS.

NOTES: UNLESS OTHERWISE SPECIFIED

# 1.1 STR

V54-000116	SKYLAB COMPLETE			
------------	-----------------	--	--	--

ZONES	SMT
COMMAND MODULE	
1-24	1
25-32	2
33-40	3
41-48	4
49-56	5
57-64	6
65-72	7
73-80	8
81-88	9
89-96	10
97-104	11
105-112	12
113-120	13

ITEM	QTY	NEXT ABBY	USED ON	END ITEM NO	THRU
			V34-59	116	119

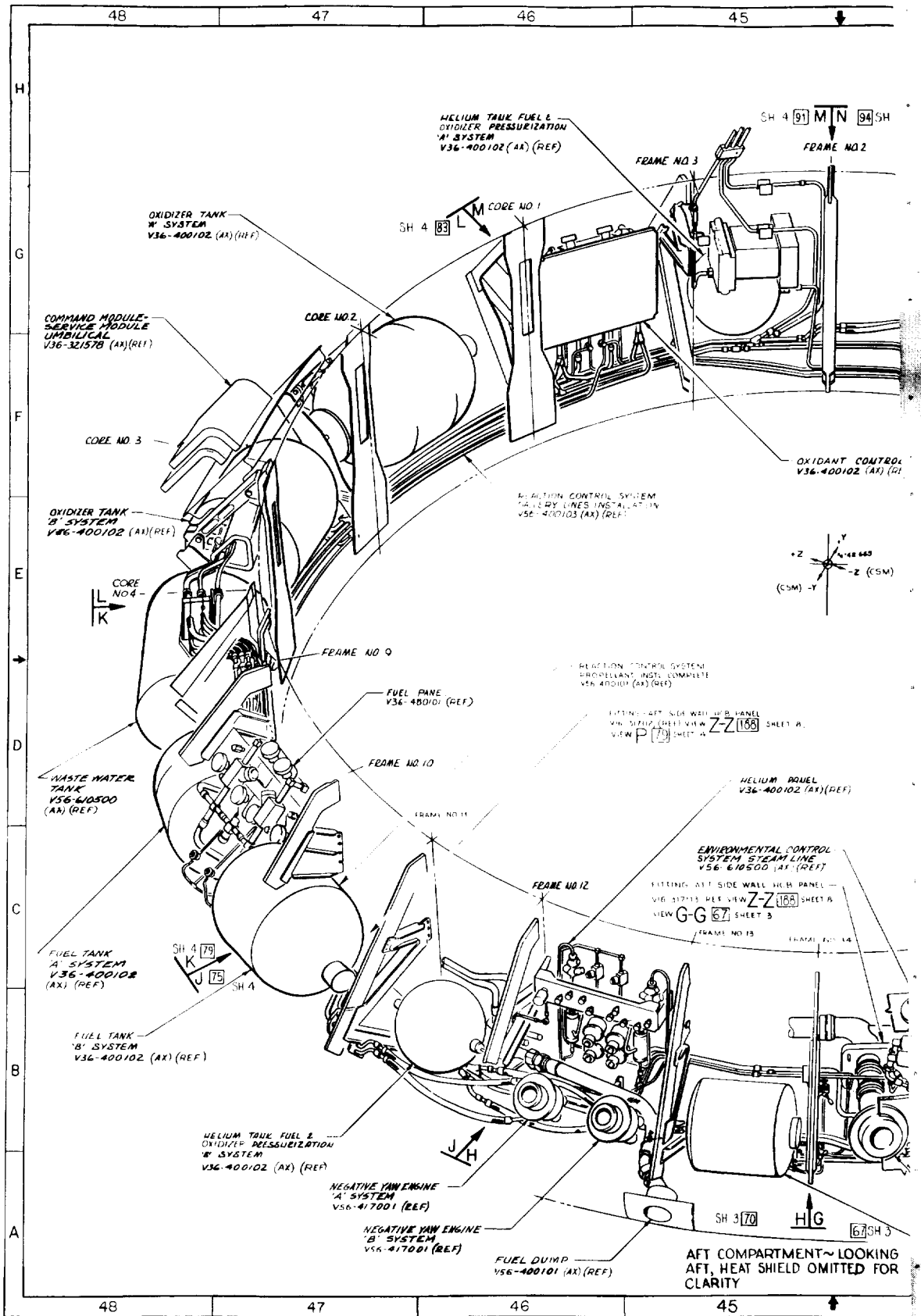
QTY	QTY	QTY	QTY	QTY	CODE	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA SPECIFICATIONS SALES, NOTES, SUPPLIERS	ZONE
RECD	REQD	REQD	REQD	REQD	IDENT					

PARTS LIST		SPACE DIVISION NORTH AMERICAN ROCKWELL CORPORATION	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:	OR BY:	DATE:	APPROVED BY:
ORIGINALS .005 = .00	DR BY:	191-592	
HOLES NOTED "ORL"	CHK BY:	03953	
013 THRU 040 = 001 = 001	APPROVED BY:		
041 THRU 130 = 002 = 001			
131 THRU 229 = 003 = 001			
230 THRU 300 = 004 = 001			
301 THRU 390 = 005 = 001			
391 THRU 400 = 006 = 001			
401 THRU 7000 = 010 = 001			

LAST SECTION LETTER USED  
CC-CC





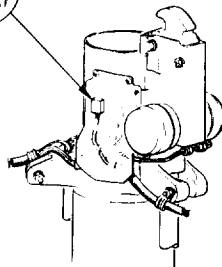


**FOLDOUT FRAME**



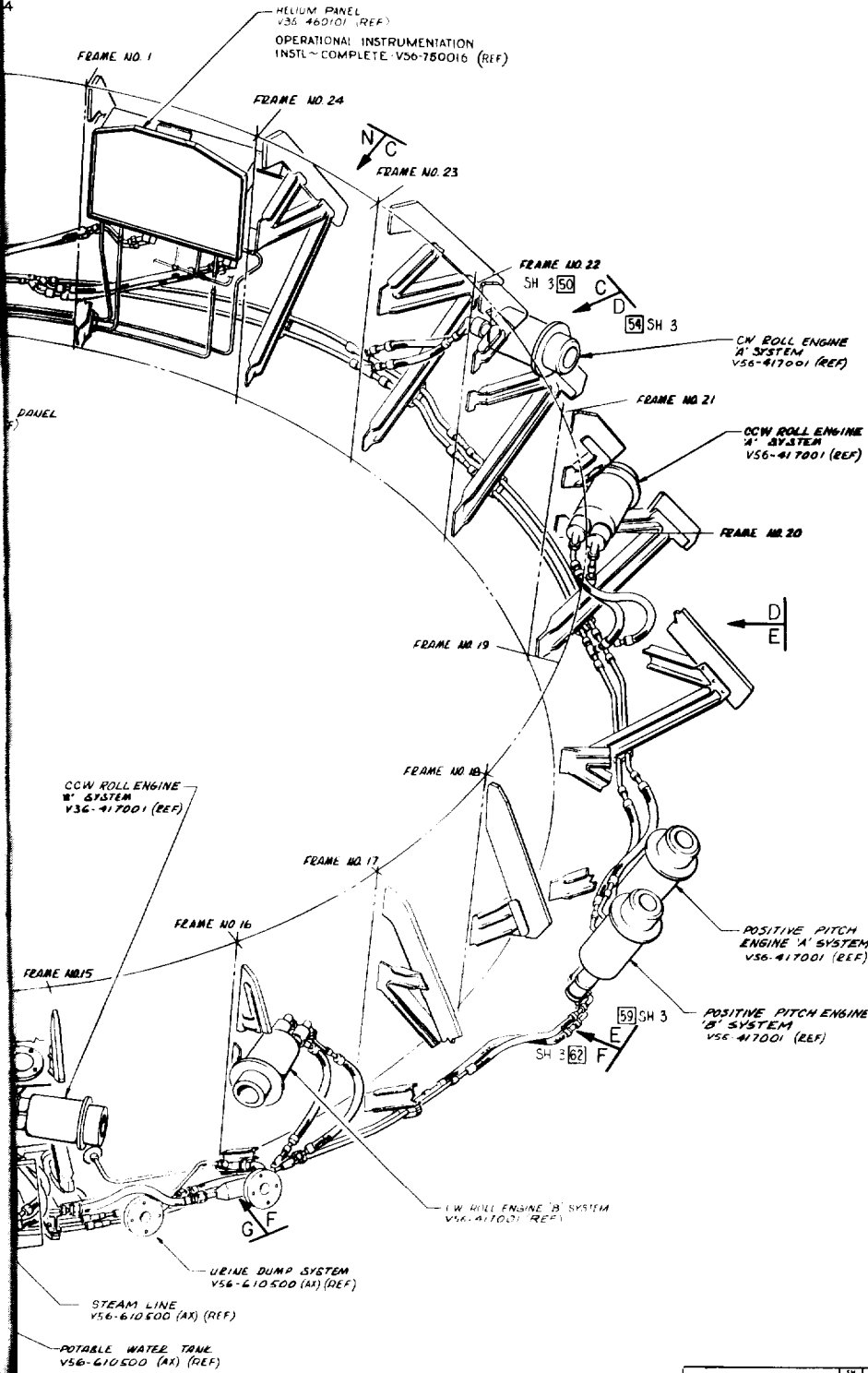
V36-751521 (REF)

CS02207  
TEMP LOCKING  
PROBE CYLINDER  
V0010-770DECT



VIEW B [37]  
ROTATED 135° CCW

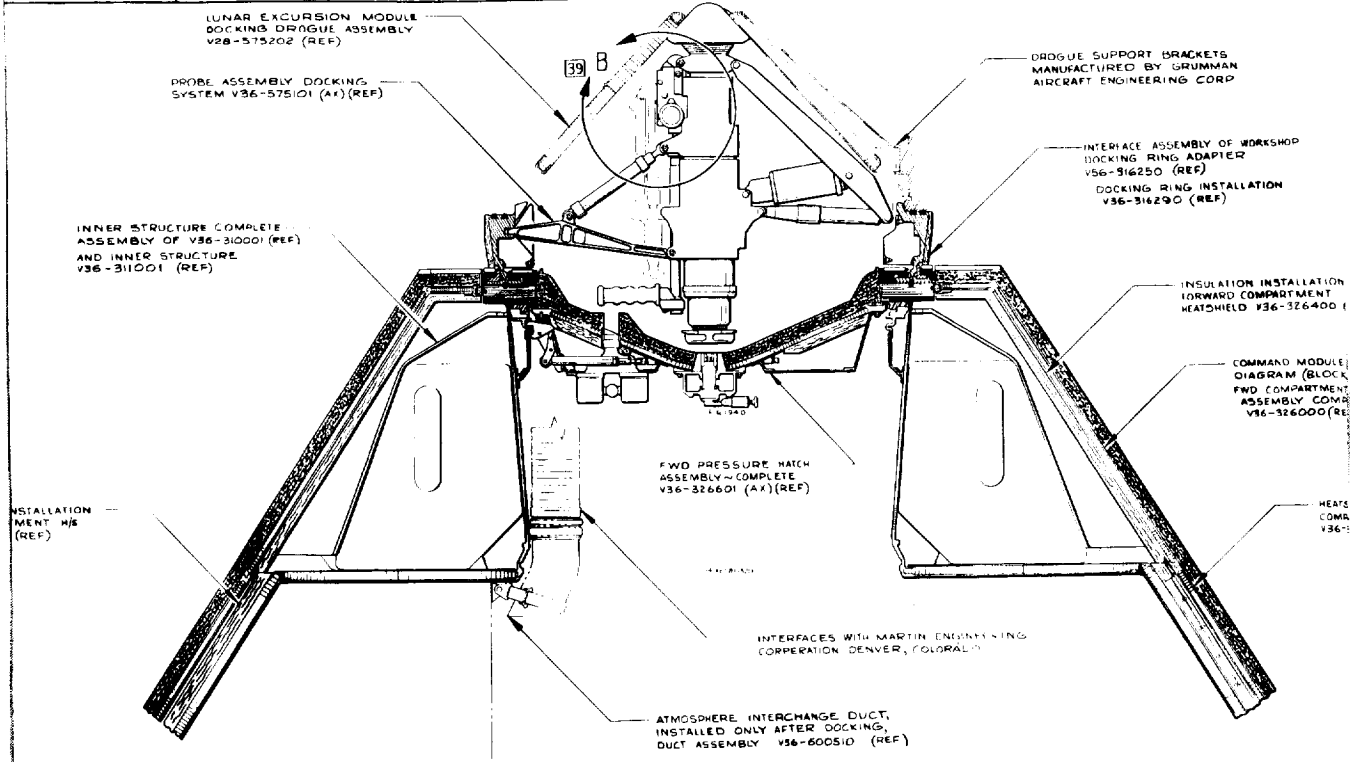
INSULATION II  
CREW COMPART  
V56-321400



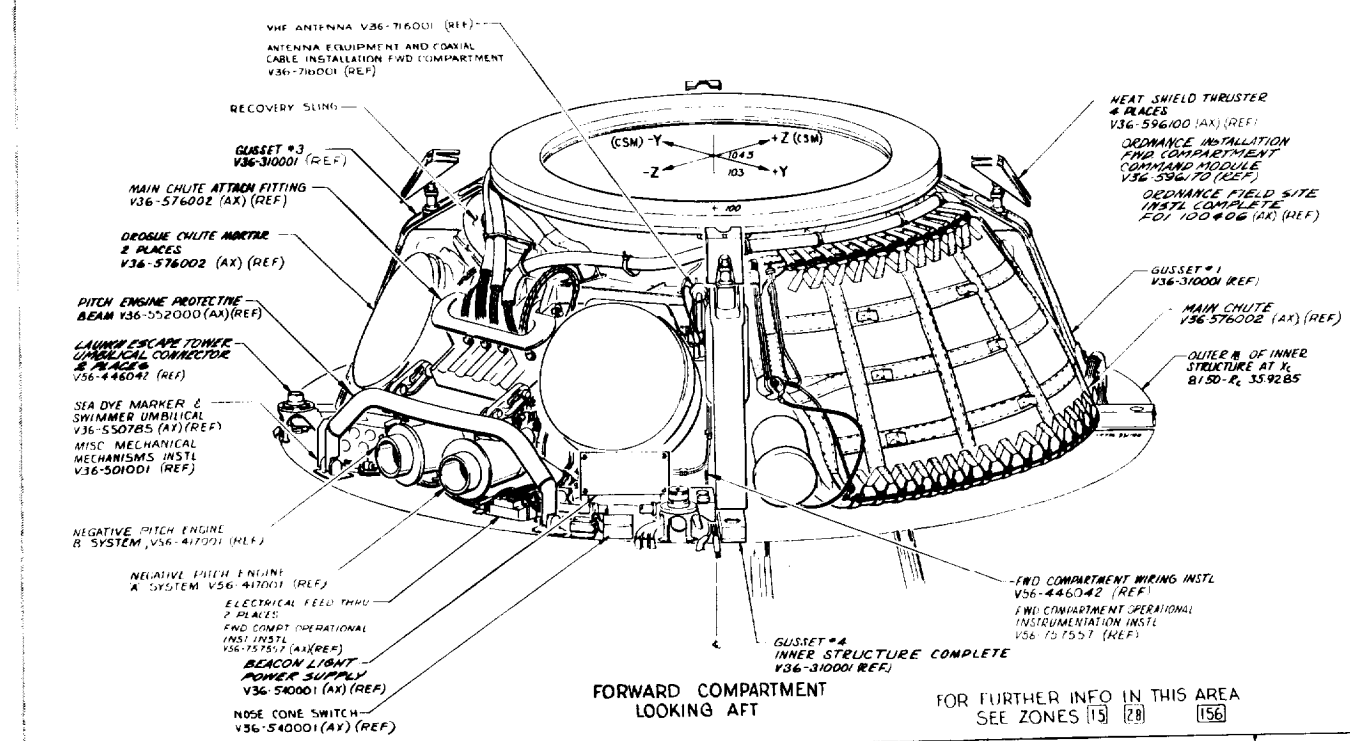
SH	REV
2	A

# FOLDOUT FRAME 2





SCHEMATIC CROSS SECTION OF TUNNEL AREA COMMAND MODULE

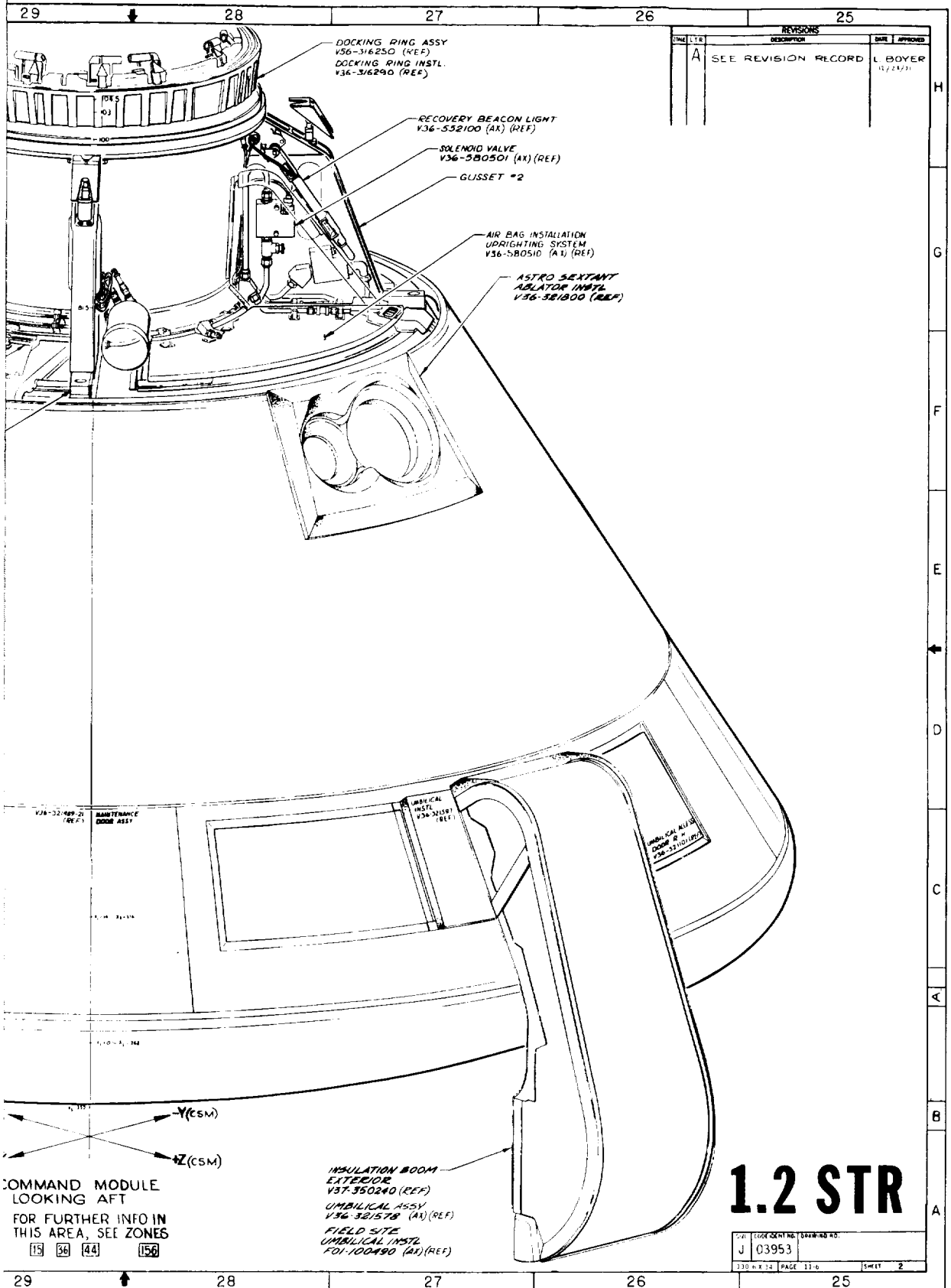












REVISIONS		
NO.	DESCRIPTION	DATE   APPROVED
A	SEE REVISION RECORD	L. BOYER 11/2/57

COMMAND MODULE  
LOOKING AFT  
FOR FURTHER INFO IN  
THIS AREA, SEE ZONES  
13 36 44 156

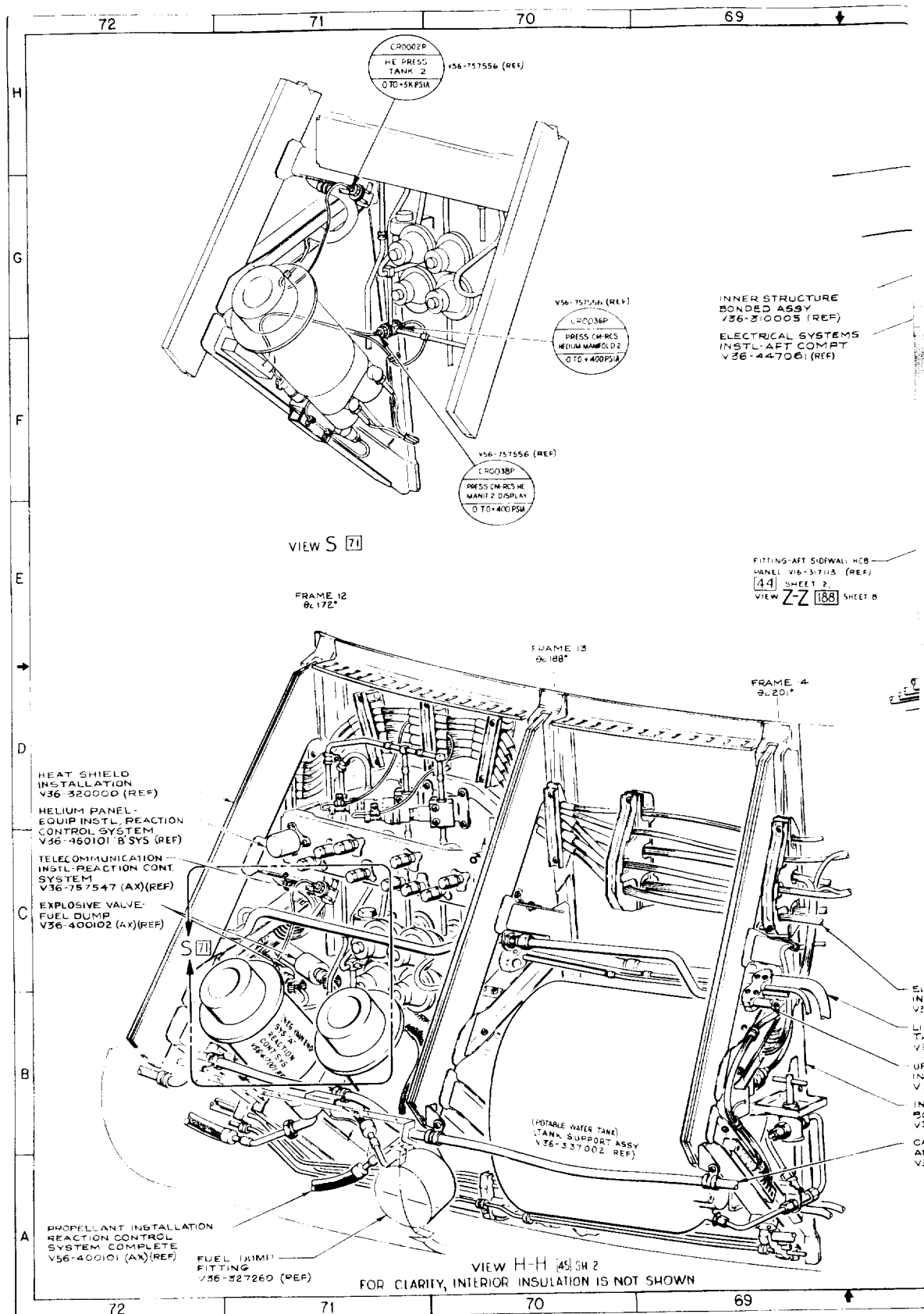
INSULATION BOOM  
EXTENSION  
V37-350240 (REF)  
UMBILICAL ASSY  
V36-351578 (AX) (REF)  
FIELD SITE  
UMBILICAL INSTL  
FDI-100480 (AX) (REF)

**1.2 STR**

DATE	CODE IDENT NO.	DRAWING NO.
J	03953	
330-X-12 PAGE 11-6		SHEET 2

FOLDOUT FRAME 5





**FOLDOUT FRAME**



68

67

66

65

64

CONTINUED ON FWD  
COMPT DWG  
V56-446042

FRAME 16  
Ø. 231'30"

FRAME 15  
Ø. 214"

FRAME 14  
Ø. 201"

HEAT SHIELD  
INSTALLATION  
V36-320000 (REF)  
CW ROLL ENGINE INSTL  
SYSTEM 'B' REACTION  
CONTROL SYSTEM  
V56-417001 (REF)  
REACTION CONTROL  
SYS COMPLETE  
V56-400101 (AX)(REF)  
UPRIGHTING EQUIP  
INSTALLATION  
V36-580501  
(AX)(REF)

INSTRUMENTATION  
AFT COMPARTMENT  
V36-757556 (AX) (REF)

V36-757542 (REF)

Ø. 04611  
TEMP WASTE WATER  
DUMP NOZZLE  
Ø. 1000066

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

V36-757562 (REF)

Ø. 04611  
TEMP WASTE  
DUMP NOZZLE  
Ø. 1000066

PAD 4  
AFT HEAT SHIELD  
V36-327000 (REF)  
LINES INSTL-REACTION  
CONTROL SYSTEM  
V56-400103 (AX)(REF)

URINE DUMP NOZZLE  
STEAM VENT  
LINES, DUCT & WATER  
TANK INSTL-AFT COMPT  
V36-610500 (AX)(REF)

FRAME 16  
Ø. 231'30"

VIEW G-G ~~44~~ SH 2  
FOR CLARITY, INTERIOR  
INSULATION IS NOT SHOWN

ELECTRICAL SYSTEMS  
INSTL-AFT COMPT  
V36-447061 (REF)  
LINES, DUCT & WATER  
TANK INSTL-AFT COMPT  
V36-610500 (AX)(REF)  
UPRIGHTING EQUIPMENT  
INSTALLATION  
V36-580501 (AX) (REF)  
INNER STRUCTURE  
BONDED ASSY  
V36-310005 (REF)  
V-BAND ANTENNA  
INSTALLATION  
ANTENNA EQUIP  
V36-717001 (AX)(REF)

ELECTRICAL SYS  
INSTL-AFT COMPT  
V36-447061 (REF)  
CW ROLL ENGINE INSTL  
SYSTEM 'B' REACTION  
CONTROL SYSTEM  
V56-417001 (REF)  
INSTRUMENTATION INSTL  
AFT COMPT  
V36-757556 (AX) (REF)  
UPRIGHTING EQUIP  
INSTALLATION  
V36-580501 (AX) (REF)  
INNER STRUCTURE  
BONDED ASSY  
V36-310005 (REF)

68

67

66

65

64

EXPLODED FRAME 2



63

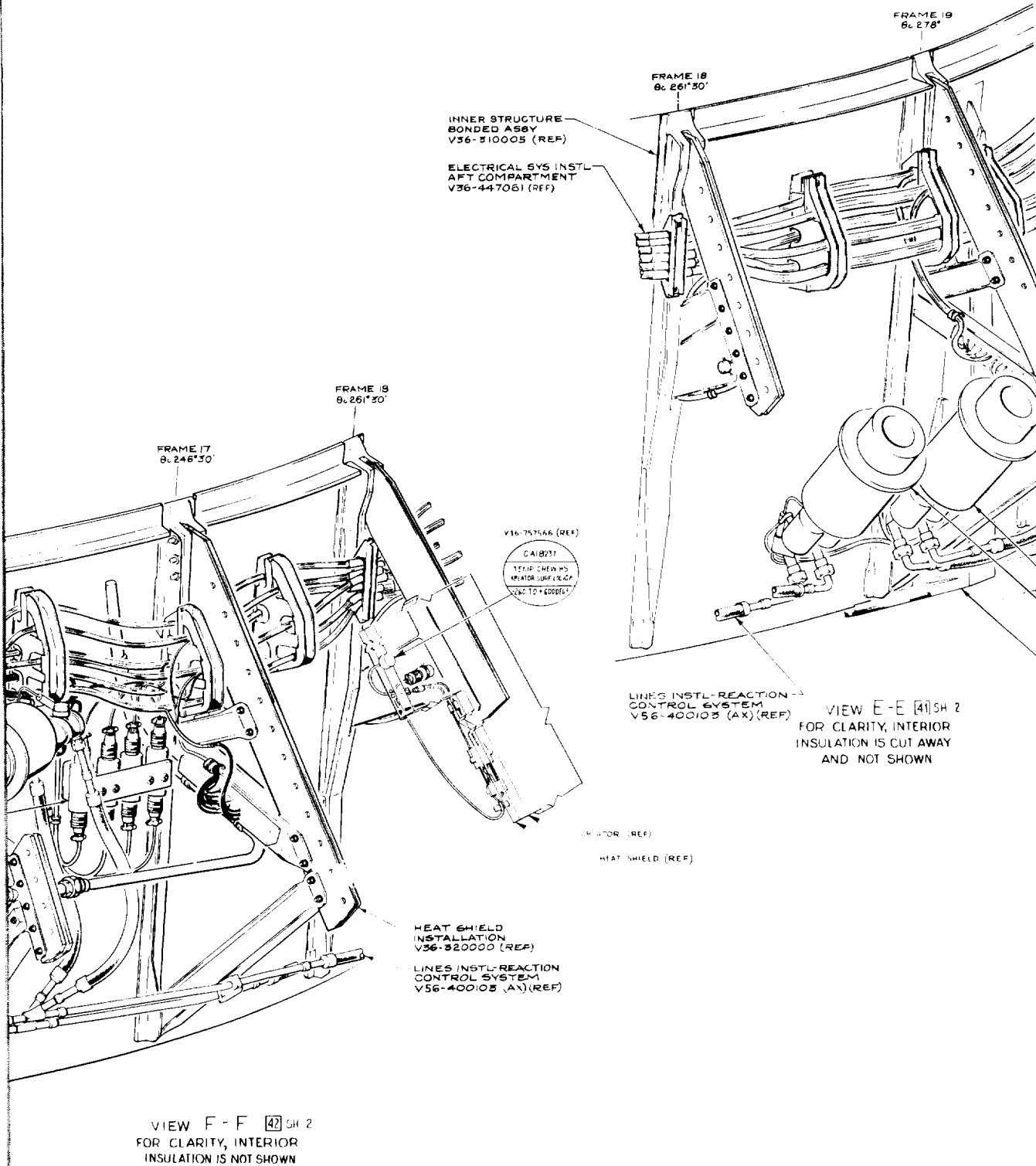
62

61

60

59

FR  
0c



63

62

61

60

59

FOLDOUT FRAME 3





58

57

56

55

54

ME 20  
Ø 294"

INSULATION  
INSTALLATION  
V36-321400 (REF)

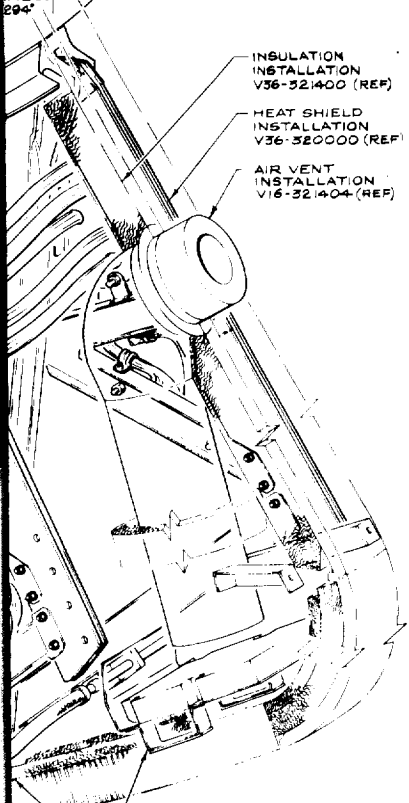
HEAT SHIELD  
INSTALLATION  
V36-320000 (REF)

AIR VENT  
INSTALLATION  
V16-321404 (REF)

INNER STRUC:  
BONDED ASSY  
V36-310005

ELECTRICAL S  
AFT COMPART  
V36-447061 (I)

INSTRUMENT  
AFT COMPAR  
V36-757556



CONTINUED ON FWD COMPT  
DWG V56-446042

FRAME 22  
Ø 326"

ELECTRICAL SYS INSTL  
AFT COMPARTMENT  
V36-447061 (REF)

FRAME 21  
Ø 308"30

FRAME 20  
Ø 294"

HEAT SINK ASSY  
V36-327253 (REF)

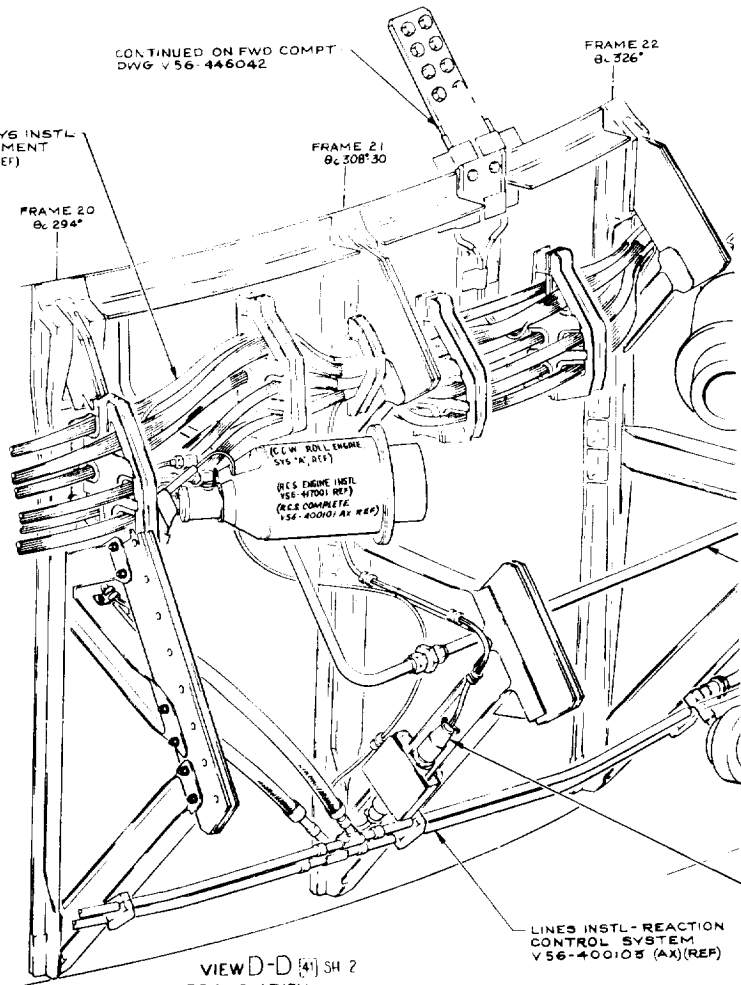
INSULATION INSTL  
V16-327402 (REF)

POS. PITCH ENG  
SYSTEM "A"

POS. PITCH ENG  
SYSTEM "B"

REACTION CONTROL  
SYSTEM COMPLETE  
V56-400101 (AX) (REF)

TENSION TIE 3



VIEW D-D (4) SH 2  
FOR CLARITY,  
INTERIOR INSULATION  
IS NOT SHOWN

LINES INSTL- REACTION  
CONTROL SYSTEM  
V56-400105 (AX) (REF)

58

57

56

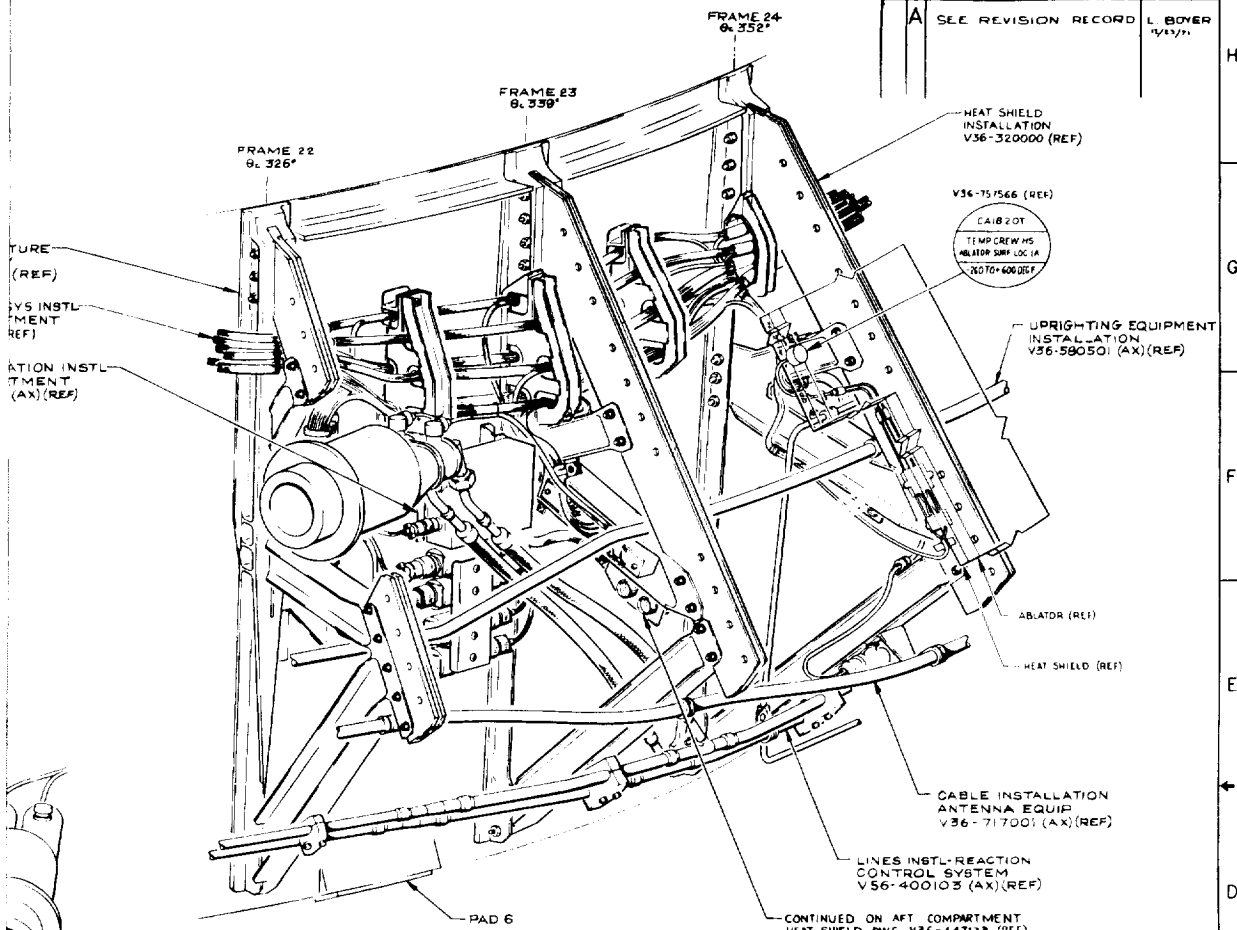
55

54

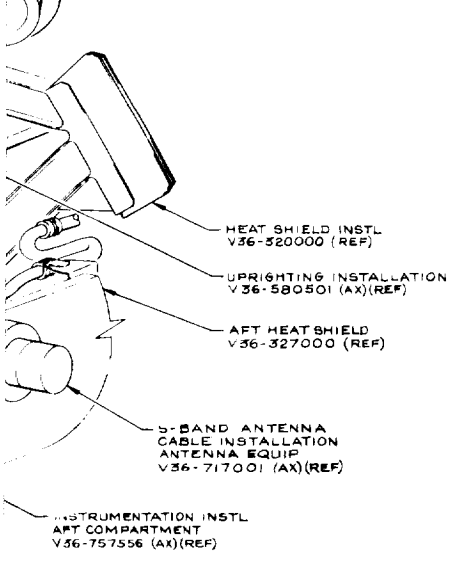
**FOLDOUT FRAME 4**



REVISONS		DATE	APPROVED
A	SEE REVISION RECORD		L. BOYER 1/15/71



VIEW C-C <sup>42</sup> SH 2  
FOR CLARITY,  
INTERIOR INSULATION  
IS NOT SHOWN



**1.3 STR**

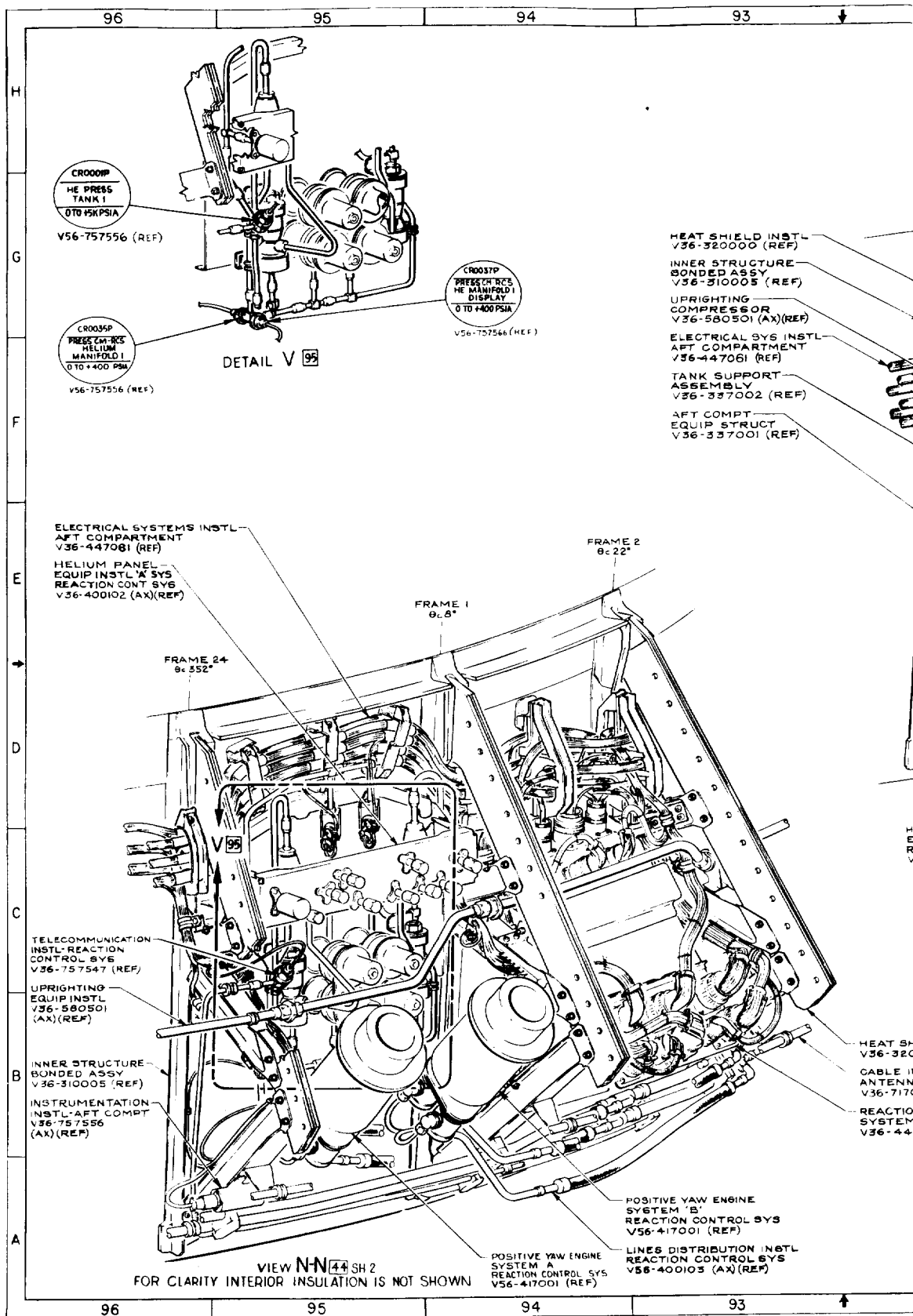
SIZE	CODE	CONT NO	DRAWING NO
J	03953		
130 X 34	PAGE	11-7	DWG

**EQLDOUT FRAME 5**

H  
G  
F  
E  
D  
C  
B  
A

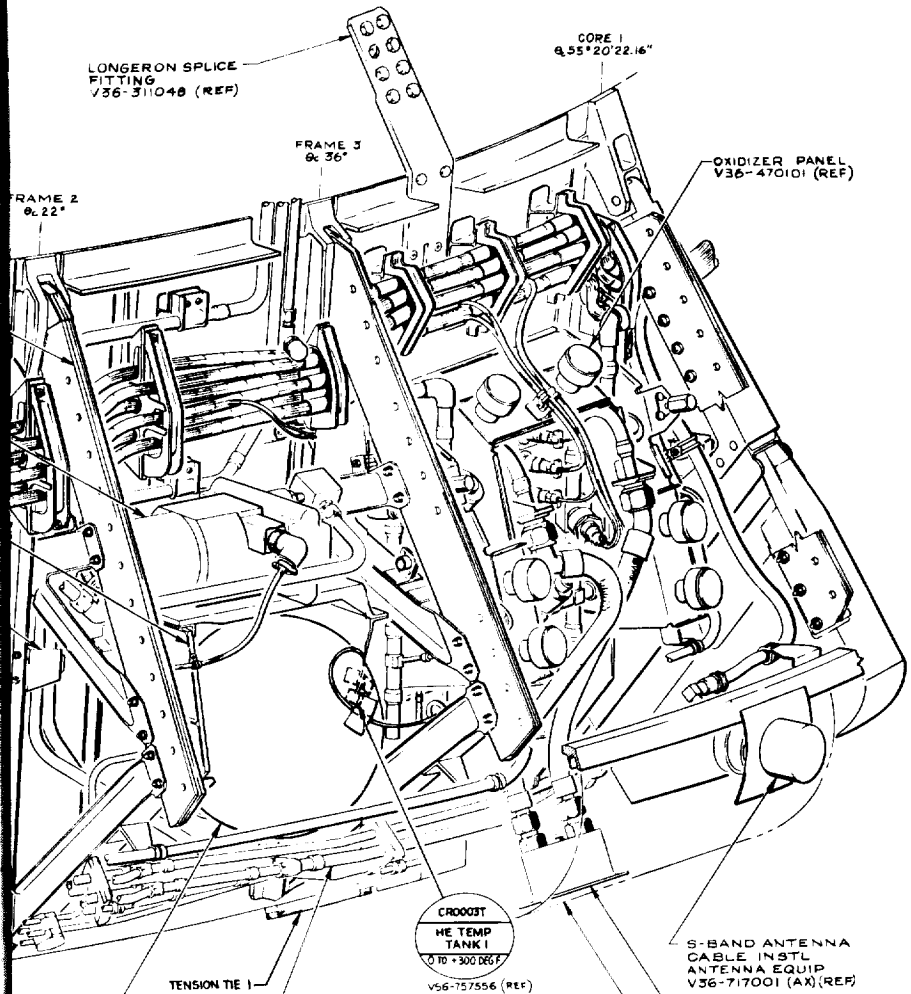
V54-000116



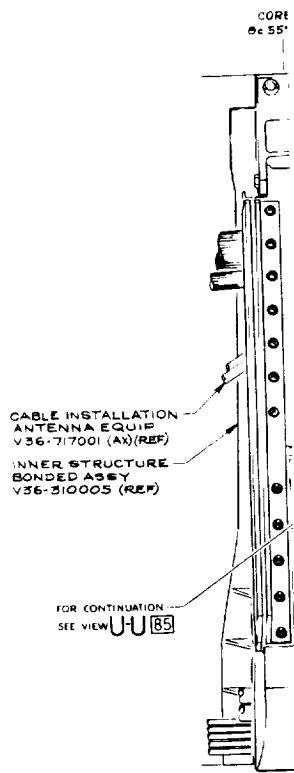


**FOLDOUT FRAME 1**





VIEW M-M 3 SH 2 FOR CLARITY, INTERIOR INSULATION IS NOT SHOWN



LD INSTL DO (REF)

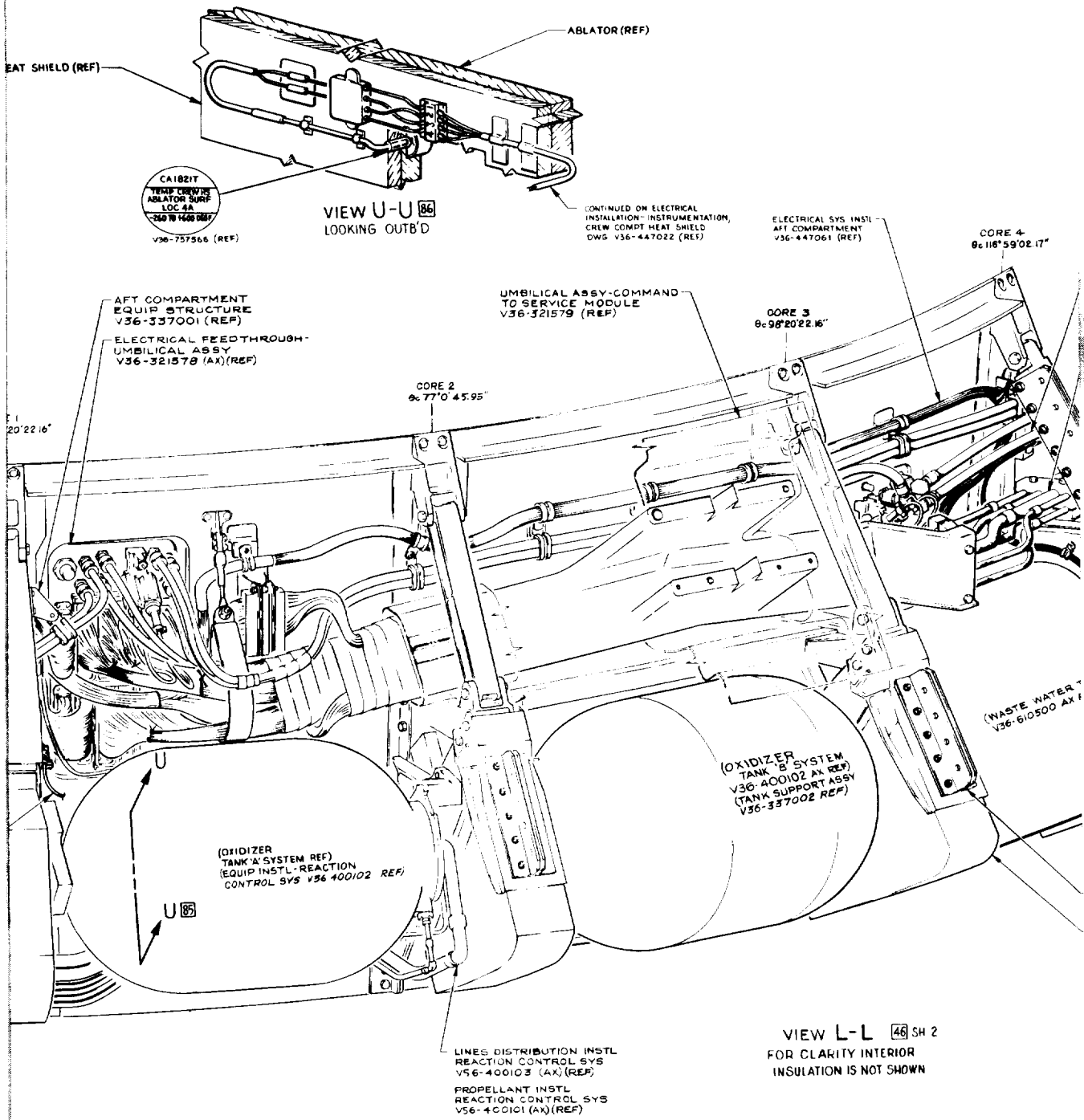
INSTALLATION EQUIP (AX)(REF)

CONTROL OX 80 (REF)

EXPLODED FRAME 2

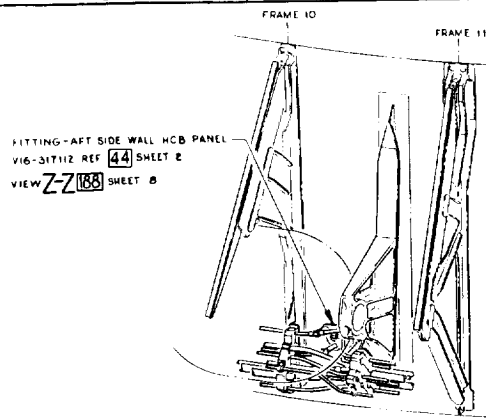




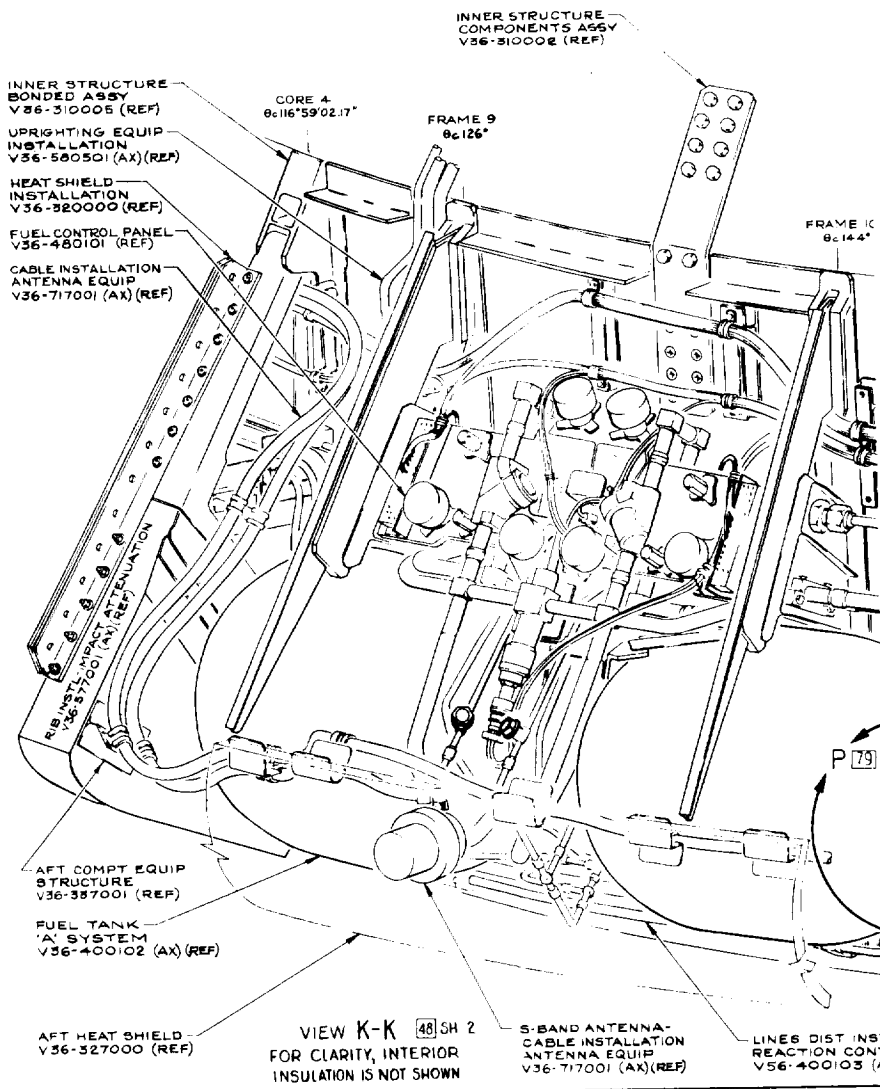


**FOLDOUT FRAME 3**





VIEW P 77  
FOR CLARITY RCS LINES  
ARE NOT SHOWN



CABLE INSTALLATION  
ANTENNA EQUIP  
V36-71700I (AX) (REF)

LINES DUCT WATER  
TANK INSTL AFT COMPT  
V36-610500 (AX) (REF)

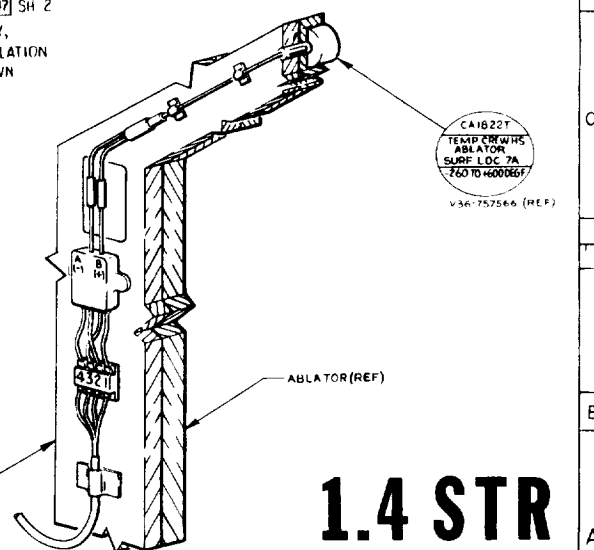
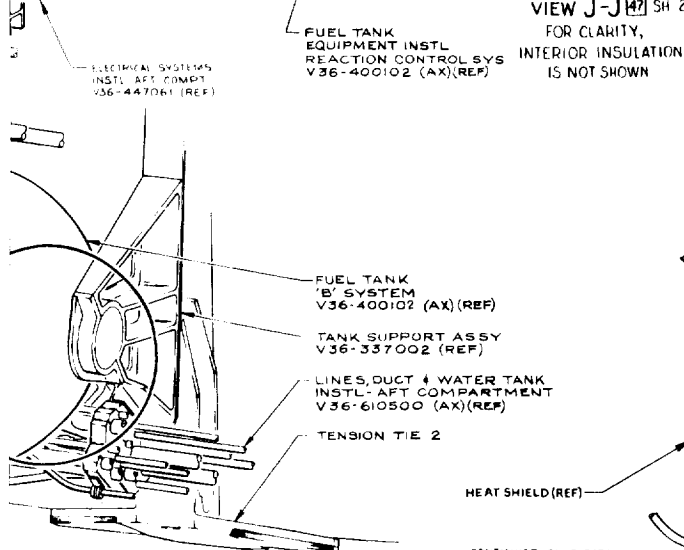
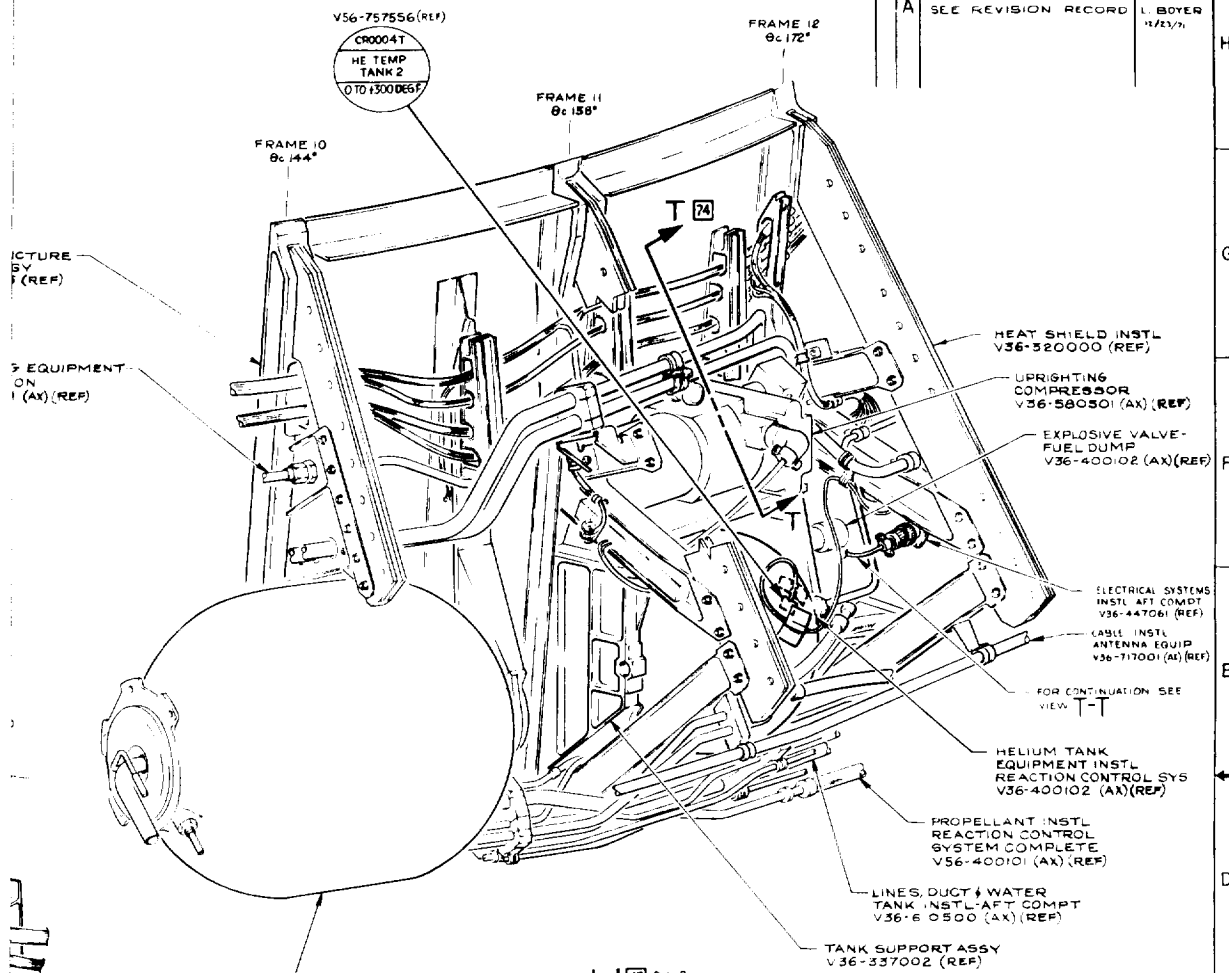
HEAT SHIELD  
INSTALLATION  
V36-320000 (REF)

RIB INSTALLATION  
IMPACT ATTENUATION  
V36-57700I (AX) (REF)

FOLDOUT FRAME 4



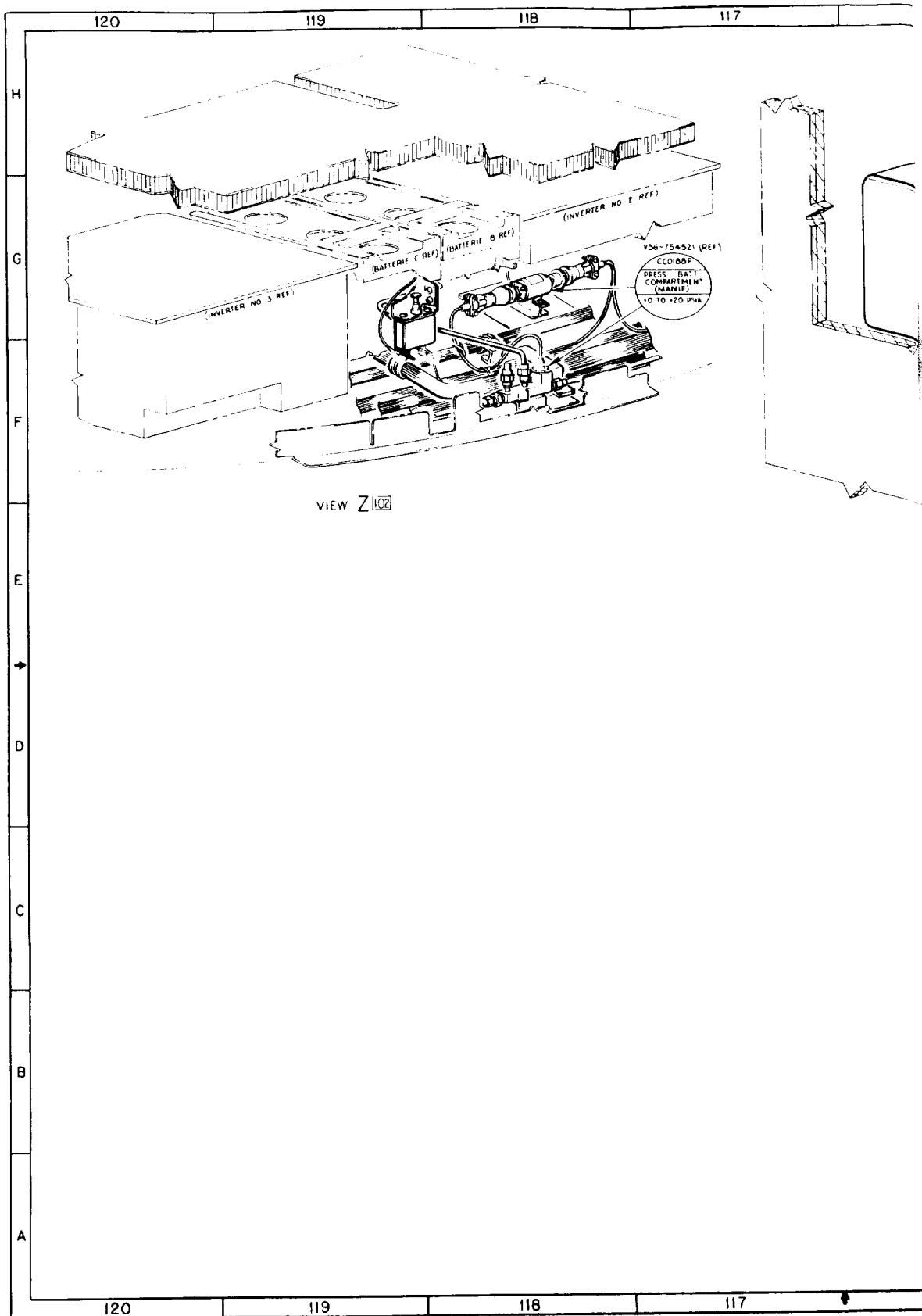
REVISONS		DATE	APPROVED
REV	DESCRIPTION		
A	SEE REVISION RECORD	11/21/74	L. BOYER



**1.4 STR**

FOLDOUT FRAME 5



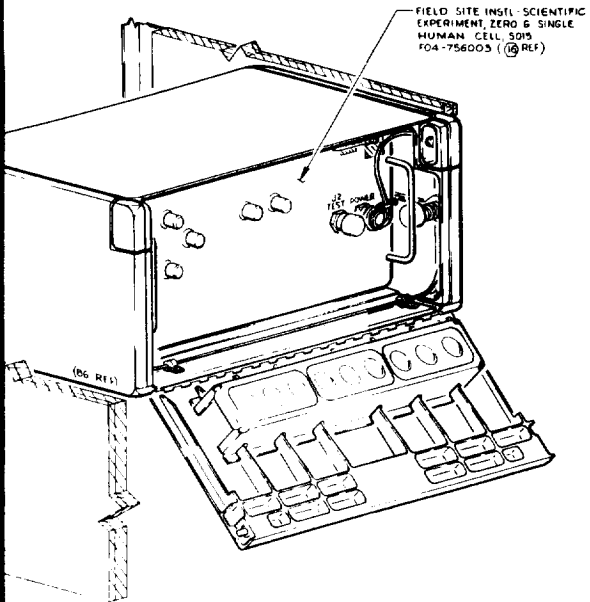


VIEW Z 102

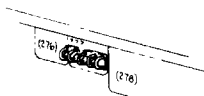
FOLDOUT FRAME /





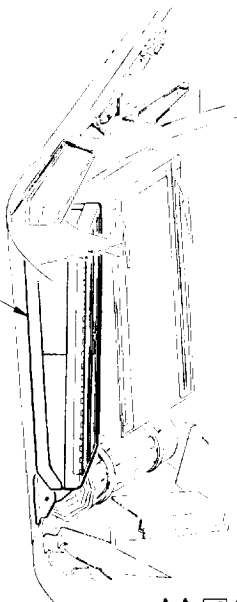


VIEW Y (101)



DETAIL W (10) REF  
THIS DETAIL TYPICAL FOR ALL R.H.E.B. VIEWS SEE ZONES 99 (107) (139)

CONTAINER (104) 6 H. TOWERS 104-111540 (10) (10) (10) REF SEE DRAWING 104-111540 ZONE 10, H



VIEW AA (127) (17) (18) (19)  
SH 6

LOWER EQUIP BAY, D+C INSTALLATION V56-764000 (REF)

GUIDANCE AND NAVIGATION EQUIP INSTL LOWER EQUIP BAY V36-72400T (REF)

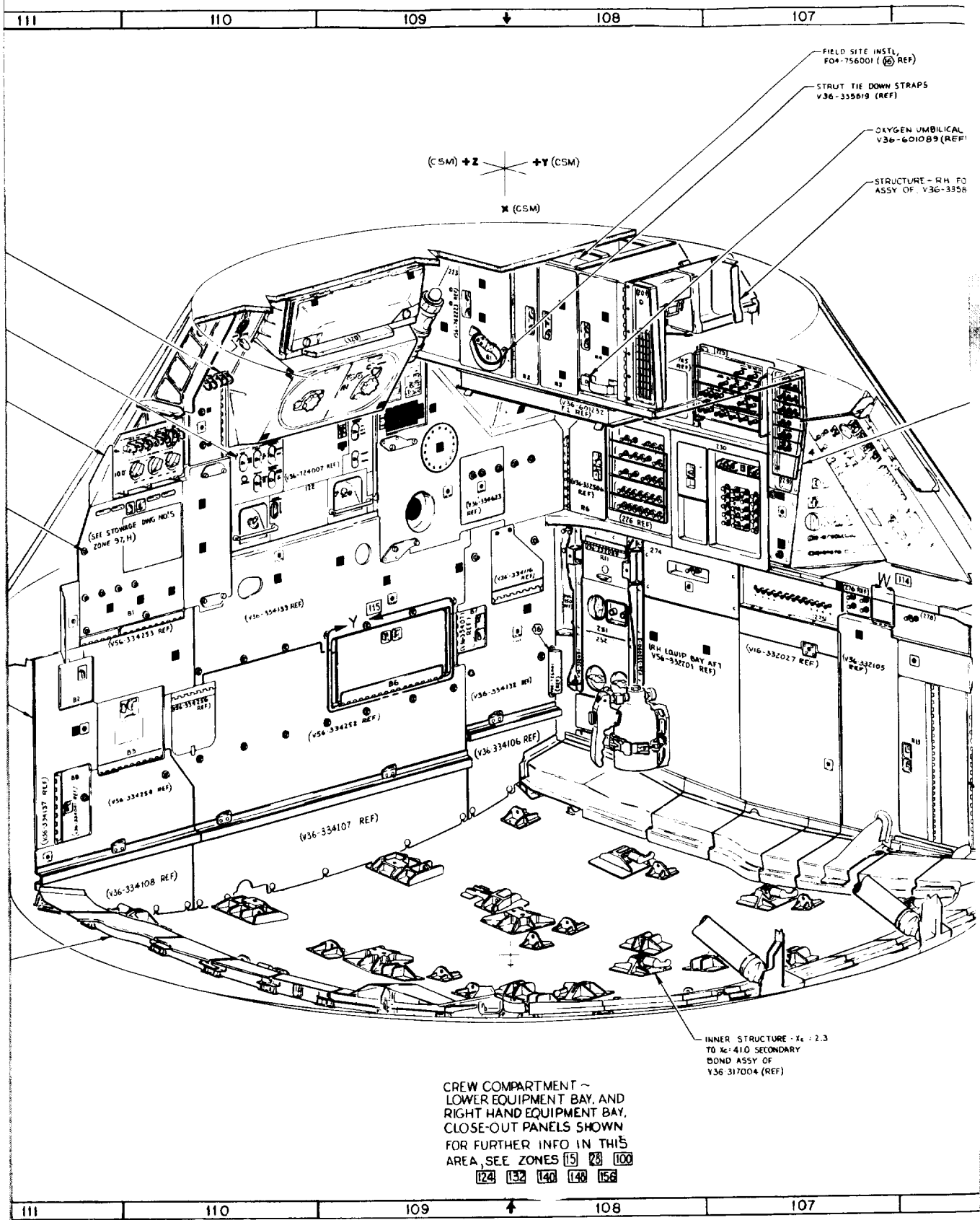
STRUCTURE-LOWER EQUIPMENT BAY Xc-42.645 TO Xc-80.75 V36-334501 (REF)

RETAINERS-EQUIPMENT, CREW COMPARTMENT INTERIOR, INSTALLATION OF (SEE RETAINER DWG NO'S ZONE 97,G)

STRUCTURE-LOWER EQUIPMENT BAY Xc-19.125 TO Xc-42.665, ASSY OF V36-334001 (REF)

WIREWAY INSTL-AFT BULKHEAD-CENTRAL CREW COMPARTMENT, V56-441800 (REF)



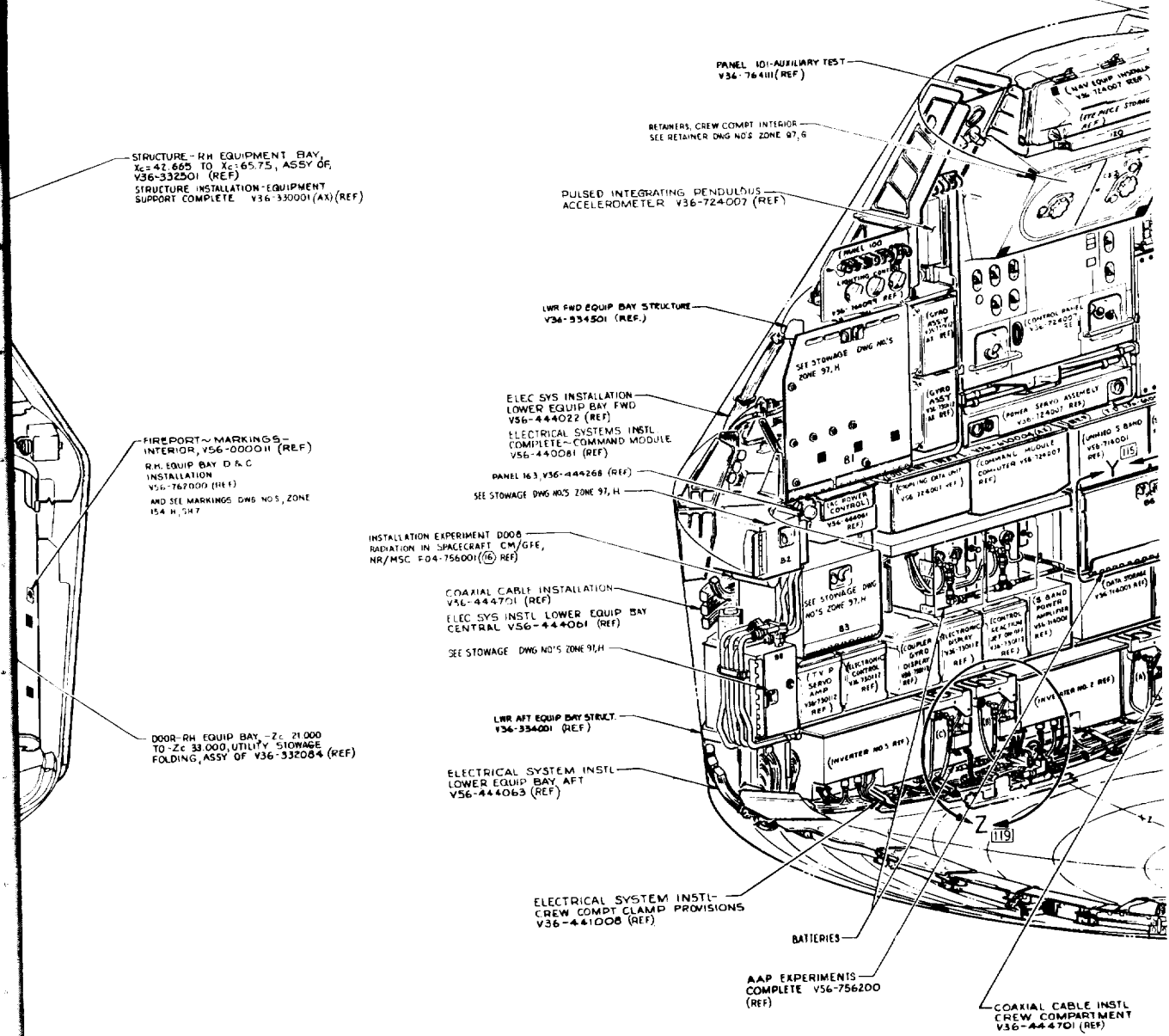


FOLDOUT FRAME 3

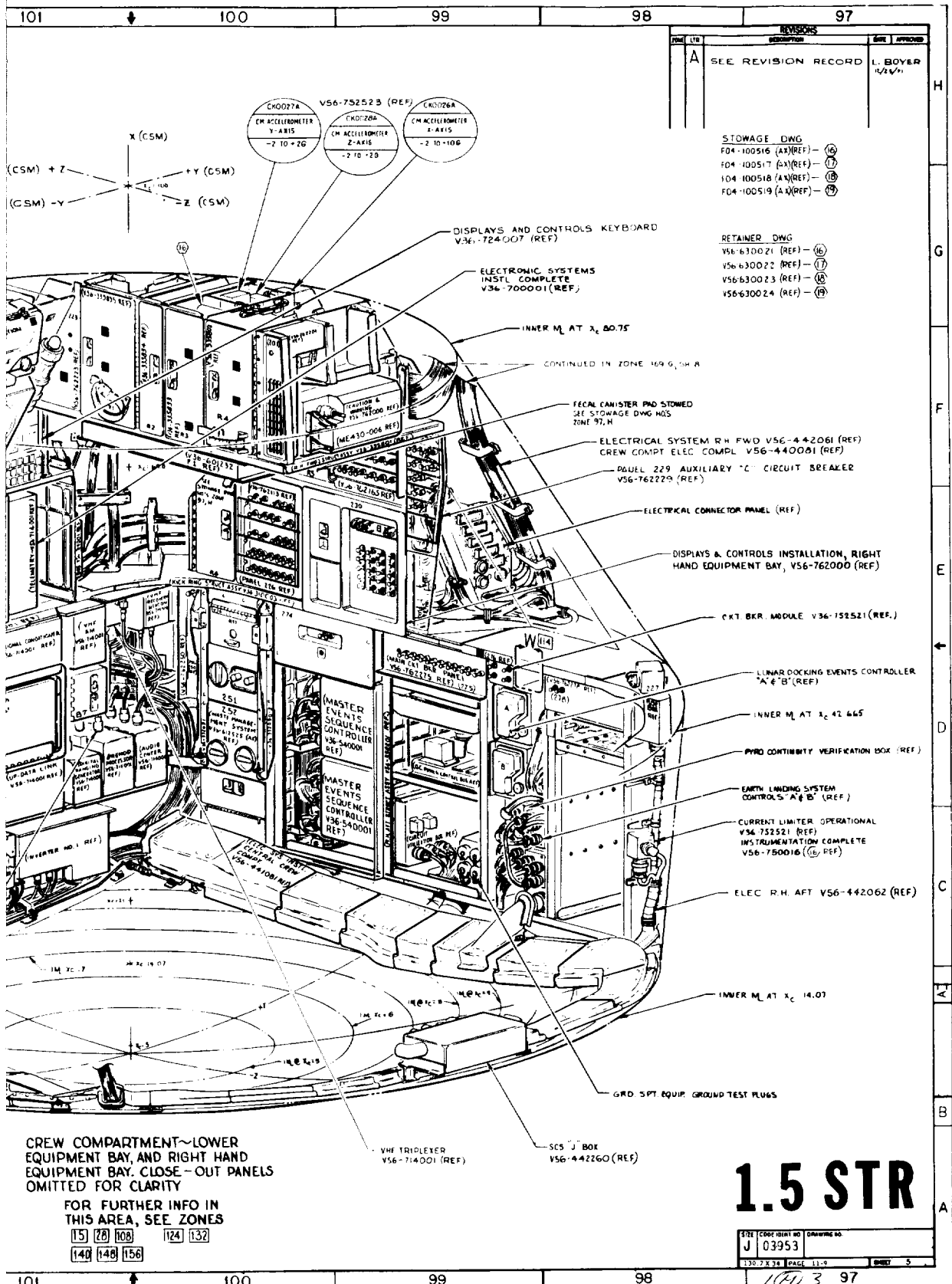


STRAP INSTL.

FORWARD EQUIPMENT BAY,  
D1 (REF)

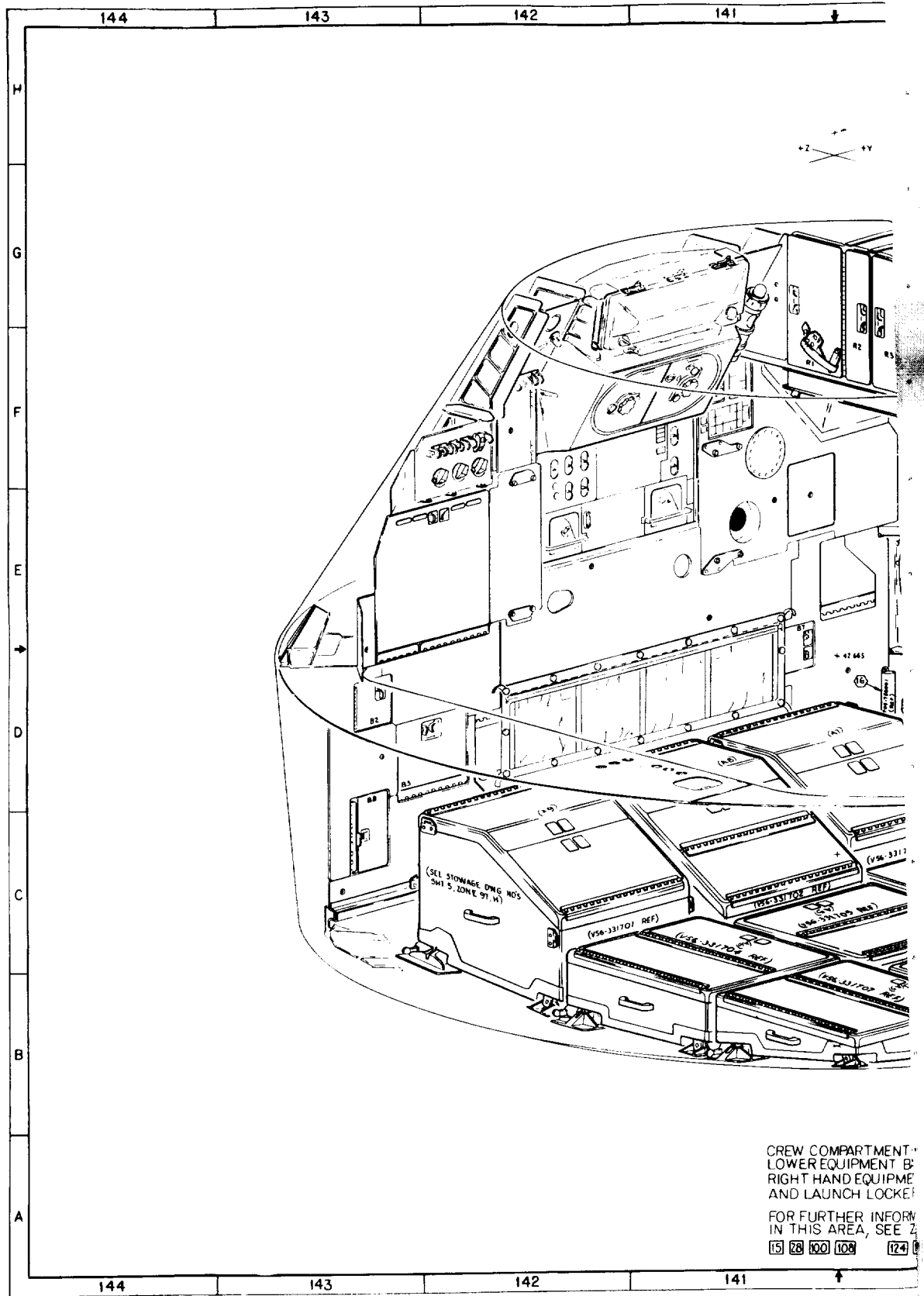






1. The first part of the document is a list of names and titles, including "The Hon. Mr. Justice" and "The Hon. Mr. Justice".





FOLDOUT FRAME 1



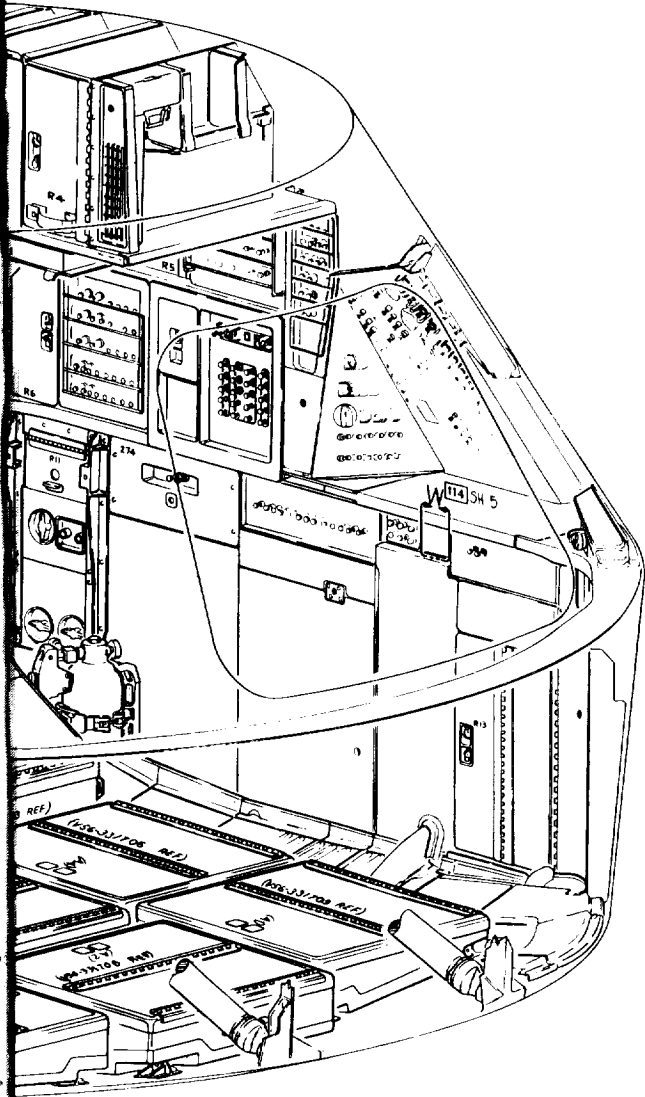
140

139

138

137

136



DESIGN LAYOUT INTERIOR  
 CONFIGURATION AND  
 MARKINGS, SEE MARKINGS  
 DWG. NOS. ZONE 154, H, SH 7

Y, AND  
 NT BAY  
 S SHOWN

ATION  
 ONES

32

140

139

138

137

SH	REV
6	A

323

136

FOLDOUT, FRAME 2

3

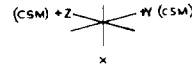
135

134

133

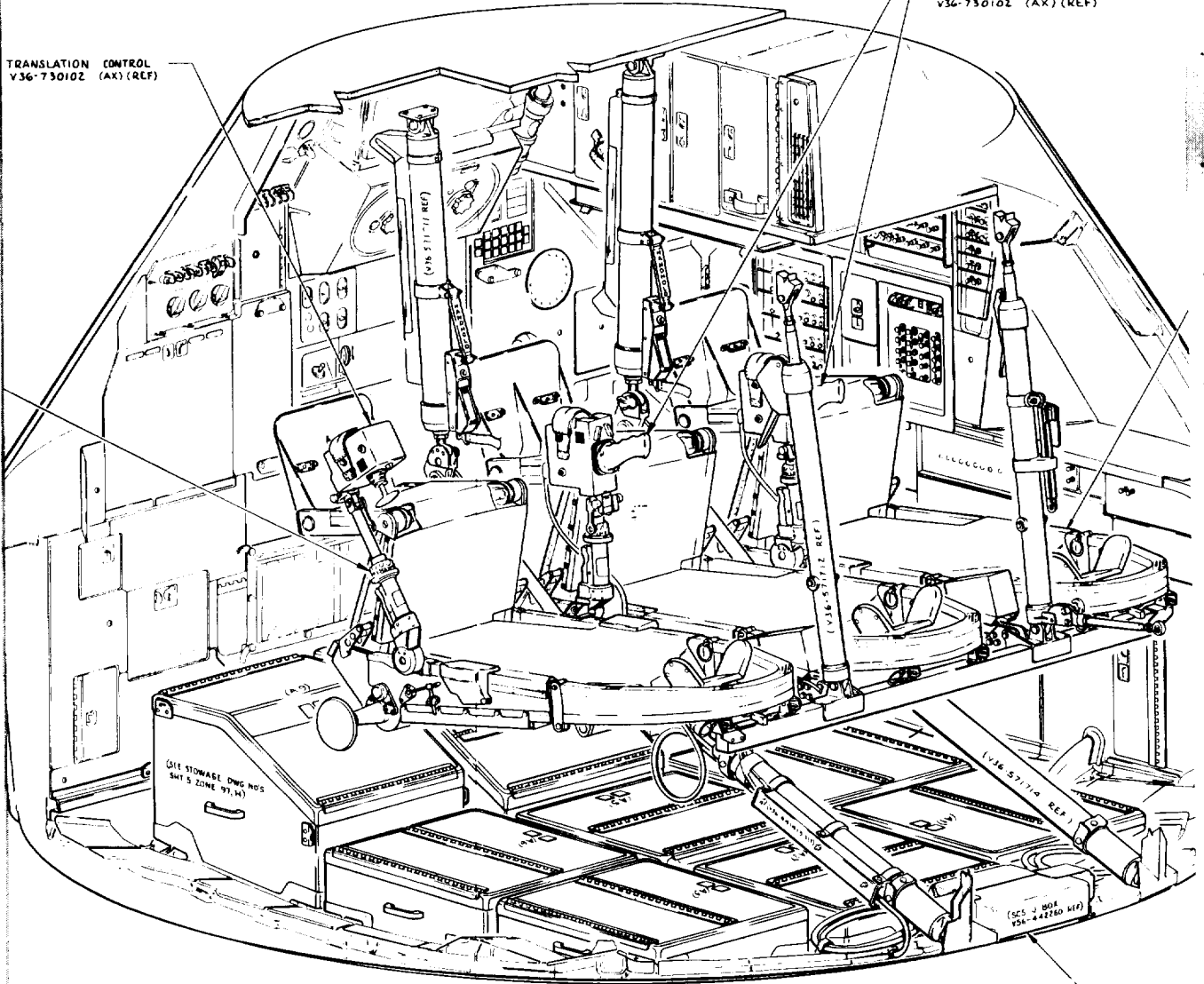
132

131



TRANSLATION CONTROL  
V36-730102 (AX) (REF)

ELECTRONIC SYSTEM INSTL COMPLETE  
V56-700001 (REF)  
EQUIP INSTL STABILIZATION &  
CONTROL SYS  
V36-730102 (AX) (REF)



CREW COMPARTMENT~  
VIEW LOOKING DOWN AND INBOARD  
FOLDABLE CREW COUCHES  
FOR FURTHER INFO IN  
THIS AREA, SEE ZONES  
15 20 100 108  
124 140

ELECTRICAL SYS1  
CENTRAL CREW C  
V56-441081 (REF)

135

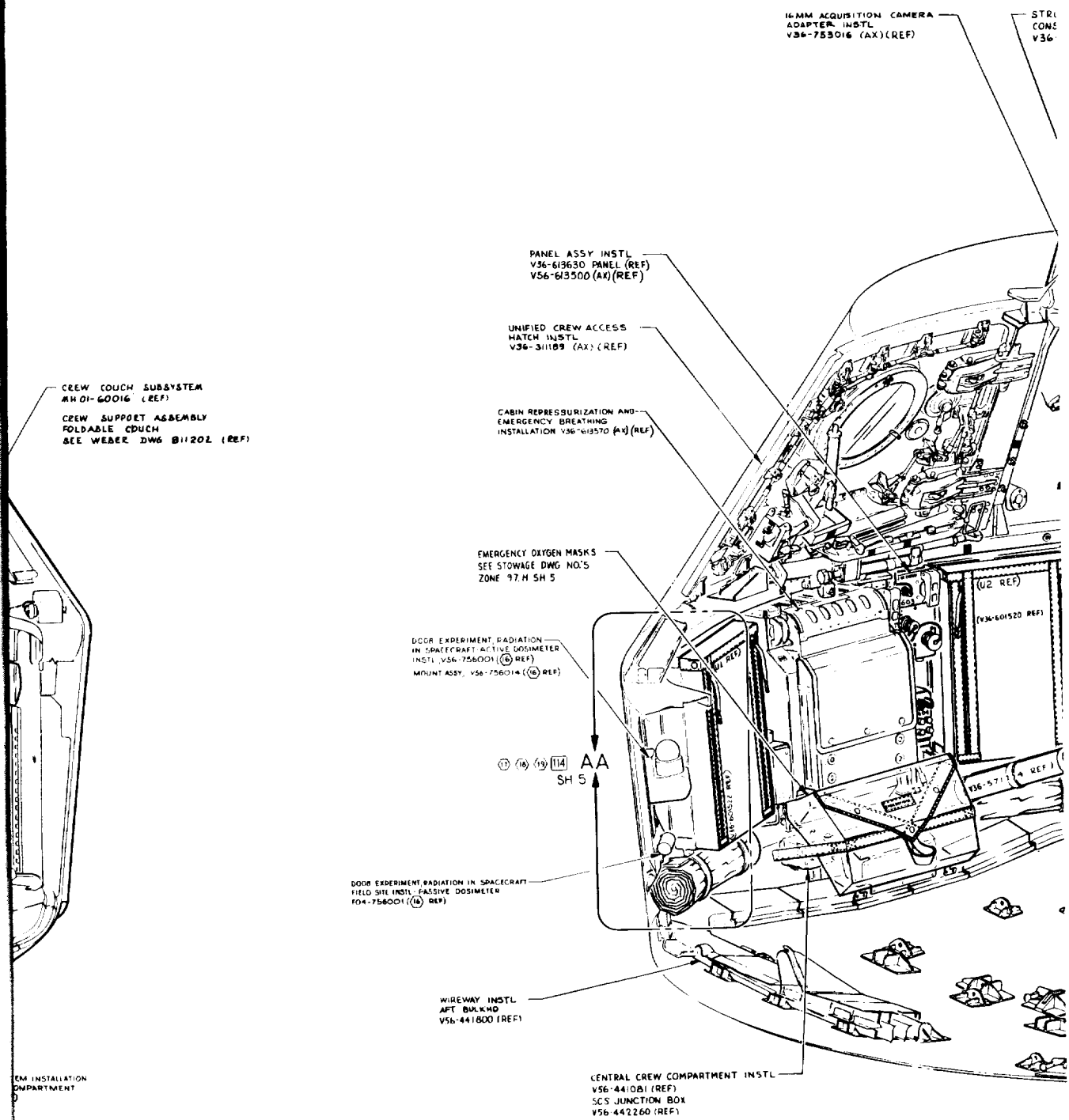
134

133

132

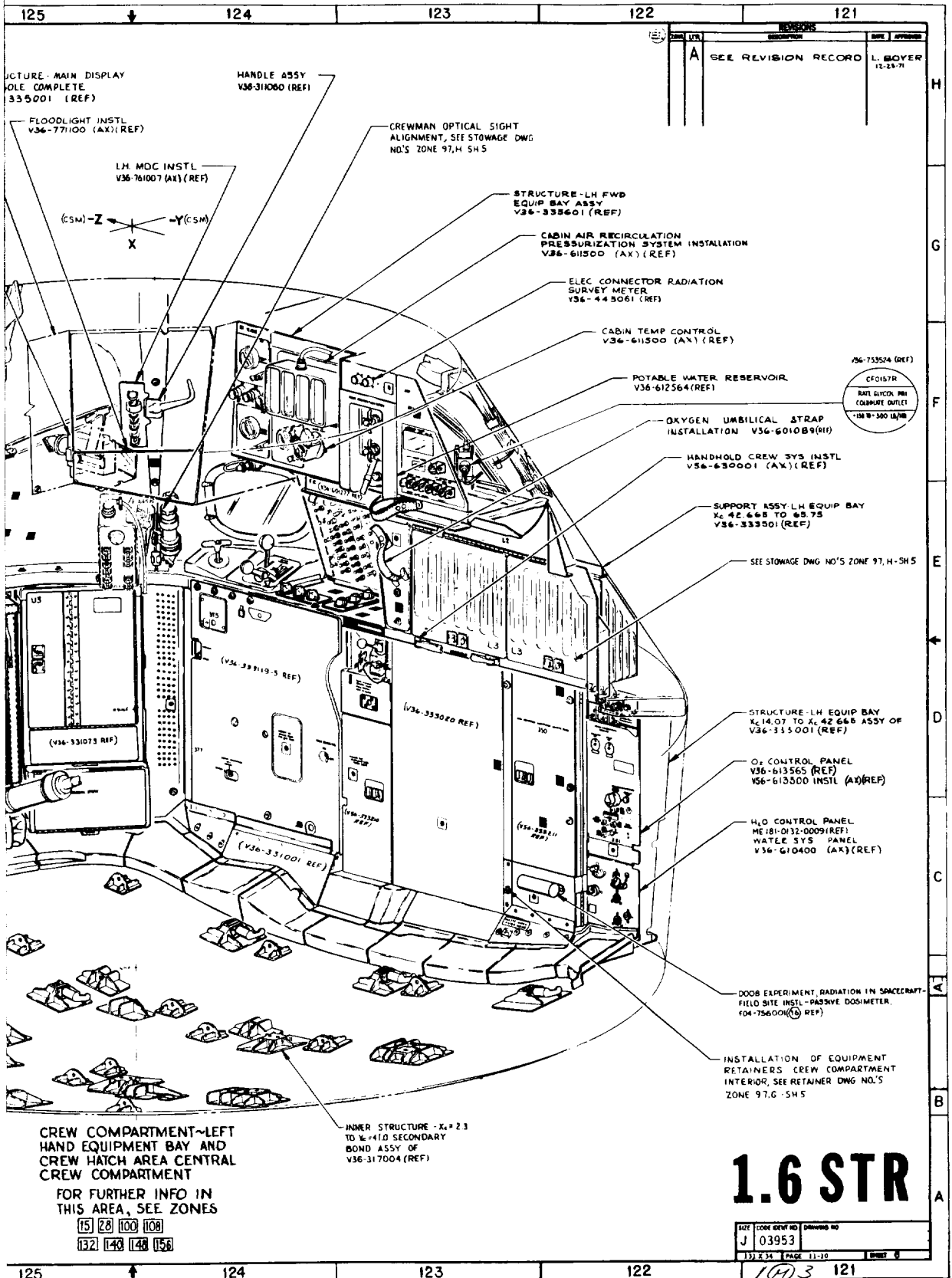
131



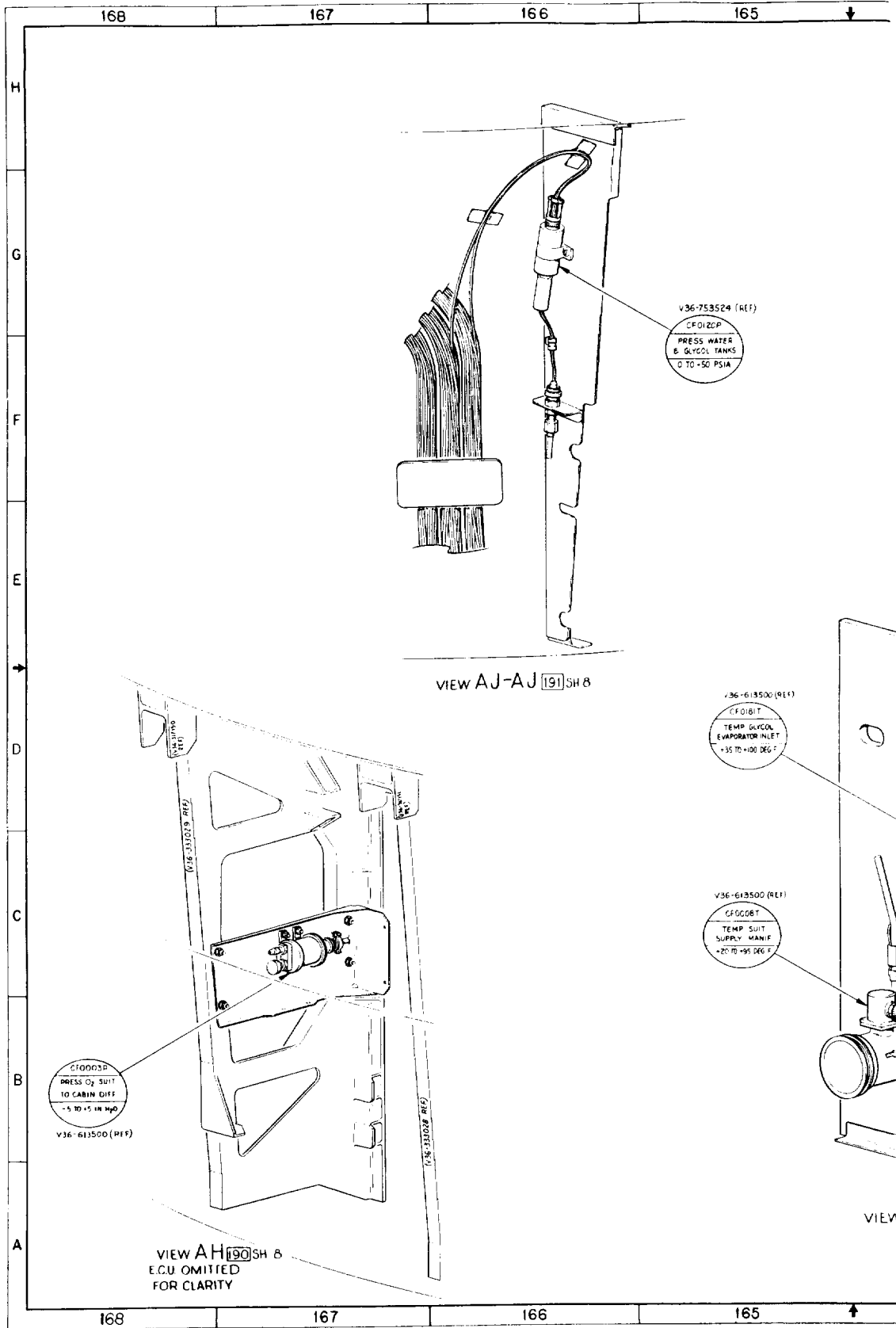












EOLDOUT FRAME |

10/10/2020

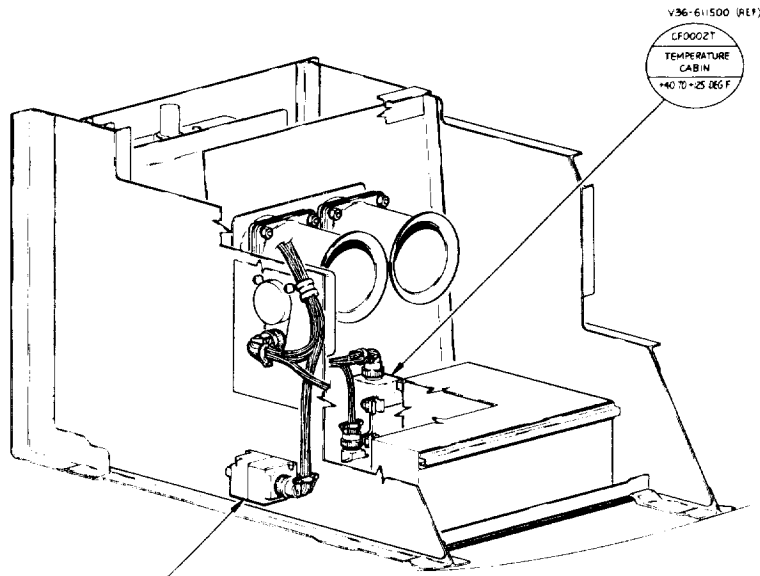
164

163

162

161

160



STOWAGE ASSY-FWD  
V36-601232 (REF)

AE

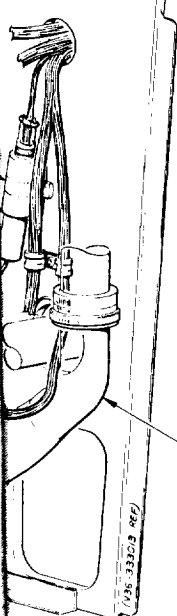
VIEW AF-AF 182 SH 8

- STRUCTURE, MAIN DISPLAY CONSOLE Y36-335001 (REF)
- COMPLETE DISPLAYS AND CONTROLS INSTL Y56-761101 (AX) (R)
- MAIN DISPLAY CONSOLE INSTL V56-761000 (REF)
- DESIGN LAYOUT, INSTRUMENT FACES, MAIN DISPLAY CONSOLE V56-976001 (REF)
- ELECTRICAL SYS INSTL, MAIN DISPLAY CONSOLE V56-445061 (REF)
- ENVIRONMENTAL CONTROL SYS INSTL COMPLETE V36-610001(A4) (REF)

PANEL ASSY NO.16 R.H. LL  
SIDE DISPLAY CONSOLE  
V36-761096 (REF)

UNIFIED CREW AI  
INSTL V36-311099

DUCT - SUIT CIRCUIT TO ENVIRONMENTAL CONTROL UNIT SUPPLY  
V36-615814 (REF)



G-AG 189 SH 8

164

163

162

3 (A) 3 161

160



159

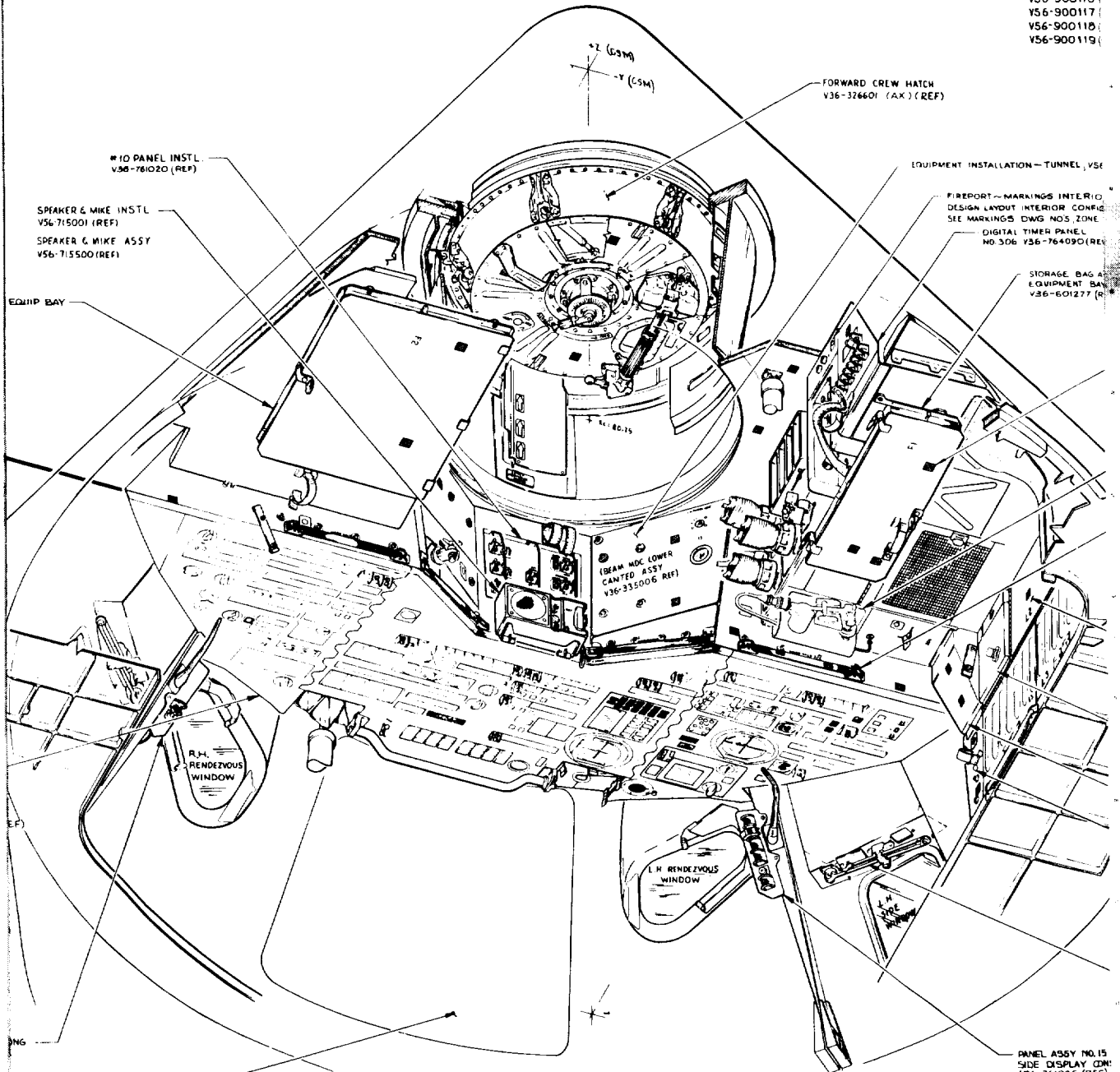
158

157

156

155

MARKINGS D:  
 V56-900116:  
 V56-900117:  
 V56-900118:  
 V56-900119:



#10 PANEL INSTL  
 V36-761020 (REF)

SPEAKER & MIKE INSTL  
 V56-715001 (REF)

SPEAKER & MIKE ASSY  
 V56-715500 (REF)

EQUIP BAY

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

EQUIPMENT INSTALLATION—TUNNEL, V56

FIREPORT—MARKINGS INTERIOR  
 DESIGN LAYOUT INTERIOR CONFIG  
 SEE MARKINGS DWG NOS. ZONE  
 DIGITAL TIMER PANEL  
 NO. 306 V56-764090 (REF)

STORAGE BAG &  
 EQUIPMENT BAG  
 V36-601277 (REF)

(BEAM MDC LOWER  
 CANTEDED ASSY  
 V36-335006 REF)

R.H. RENDEZVOUS  
 WINDOW

L.H. RENDEZVOUS  
 WINDOW

PANEL ASSY NO.15  
 SIDE DISPLAY CONSOLE  
 V36-761095 (REF)

ACCESS HATCH  
 (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

FOR FURTHER INFO IN THIS AREA  
 SEE ZONES 15 28 100 108  
 124 132 140 148

159

158

157

156

155

FOLDOUT FRAME 3

10/10/10



VG  
 AX) (REF) ⑤  
 AX) (REF) ⑥  
 AX) (REF) ⑦  
 AX) (REF) ⑧

-616500 (REF)  
 R V56-000011 (REF)  
 URATION AND MARKINGS  
 54.H  
 )  
 SSY FWD  
 (EF)

RETAINERS-EQUIPMENT (CREW COMPARTMENT  
 INTERIOR, INSTALLATION OF SEE RETAINER  
 DWG NO'S ZONE 97, G, SH 5

WATER DISPENSER ASSY  
 V16-601521 (REF)

HANDHOLD CREW SYS INSTL  
 V56-630001 (AX) (REF)

DOOR-L.H. INTERMEDIATE BAY  
 STOWAGE COMPARTMENT  
 V36-333513 (REF)  
 L.H. INTERMEDIATE STRUCTURE  
 V36-333601 (REF)

COVER-ELECTRICAL CONNECTOR  
 SUPPORT L.H. EQUIP BAY  
 V36-443236 (REF)

PANEL CLOSEOUT  
 V36-333614 (REF)

OXYGEN UMBILICAL STRAP  
 INSTALLATION V16-601089 (REF)

AE ⑩ SH 8

MIRROR ASSY-INTERNAL  
 VIEWING V16-601471 (REF)

L.H. LONG  
 TUBE

R.H. MAIN CONNECTOR, SUIT NO. 1  
 V36-613800 (AX) (REF)  
 SEE STOWAGE DWG NO'S ZONE 97, H, SH 5  
 (3) ELEC CONNECTORS CREWMAN  
 SUIT UMBILICALS  
 L.H. MAIN CONNECTOR, SUIT NO. 3  
 V36-613800 (AX) (REF)  
 SEE STOWAGE DWG NO'S ZONE 97, H, SH 5  
 ELEC SYS INSTL L.H. FWD COMPT  
 V36-443061 (REF)  
 ELEC SYS-CREW COMPT COMPART  
 V36-440081 (REF)  
 SUPPORT ASSY-LH EQUIP BAY  
 Xc 42 665 TO Xc 65 75 ~  
 V36-333501 (REF)

CAR  
 V36

CENTER MAIN CONN  
 V36-613800 (AX)  
 SEE STOWAGE DWG

STRUC  
 EQUIP

ELEC CONNECTOR SUPPORT  
 V36-333501 (REF)

RETAINERS-EQUIPMENT, COLDW  
 COMPARTMENT INTERIOR,  
 INSTALLATION OF  
 SEE RETAINER DWG NO'S ZONE  
 97, G, SH 5

OXYGEN OUTLET  
 V36-613800 (AX) (REF)

DUAL CHECK VALVE  
 V56-613500 (AX) (REF)

AC ⑩ SH 8

SURGE TANK PRESS  
 RELIEF VALVE  
 V56-613500 (AX) (REF)  
 V56-613600 (AX) (REF)

AD ⑩ SH 8

STRUCTURE ASSY-LH EQUIP BAY  
 Xc 14 07 TO Xc 42 665 ~  
 V36-333000 (REF)

ELEC SYS INSTL LH AFT  
 EQUIP BAY V36-443042  
 (REF)

GLYCOL PUMP PACKAGE  
 V36-610004 (AX) (REF)

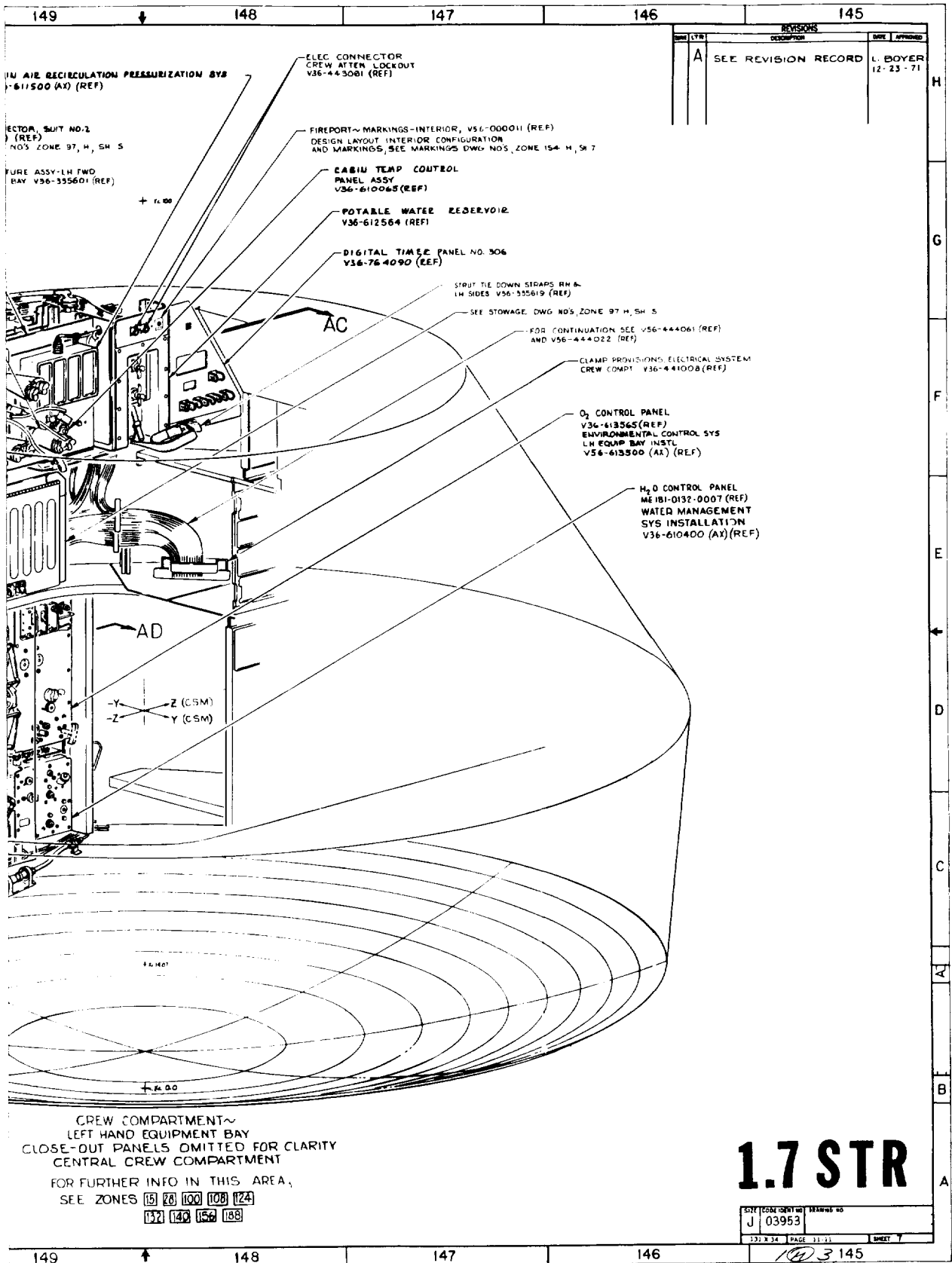
WATER GLYCOL CONTROL

ENVIRONMENTAL CONTROL UNIT  
 ME 501-0737 (REF)  
 ENVIRONMENTAL CONTROL SYS INSTL  
 L.H. EQUIP BAY  
 V36-613600 (AX) (REF)  
 ENVIRONMENTAL CONTROL SYS INSTL COMP  
 V36-610001 (REF)

SH	REV
7	A

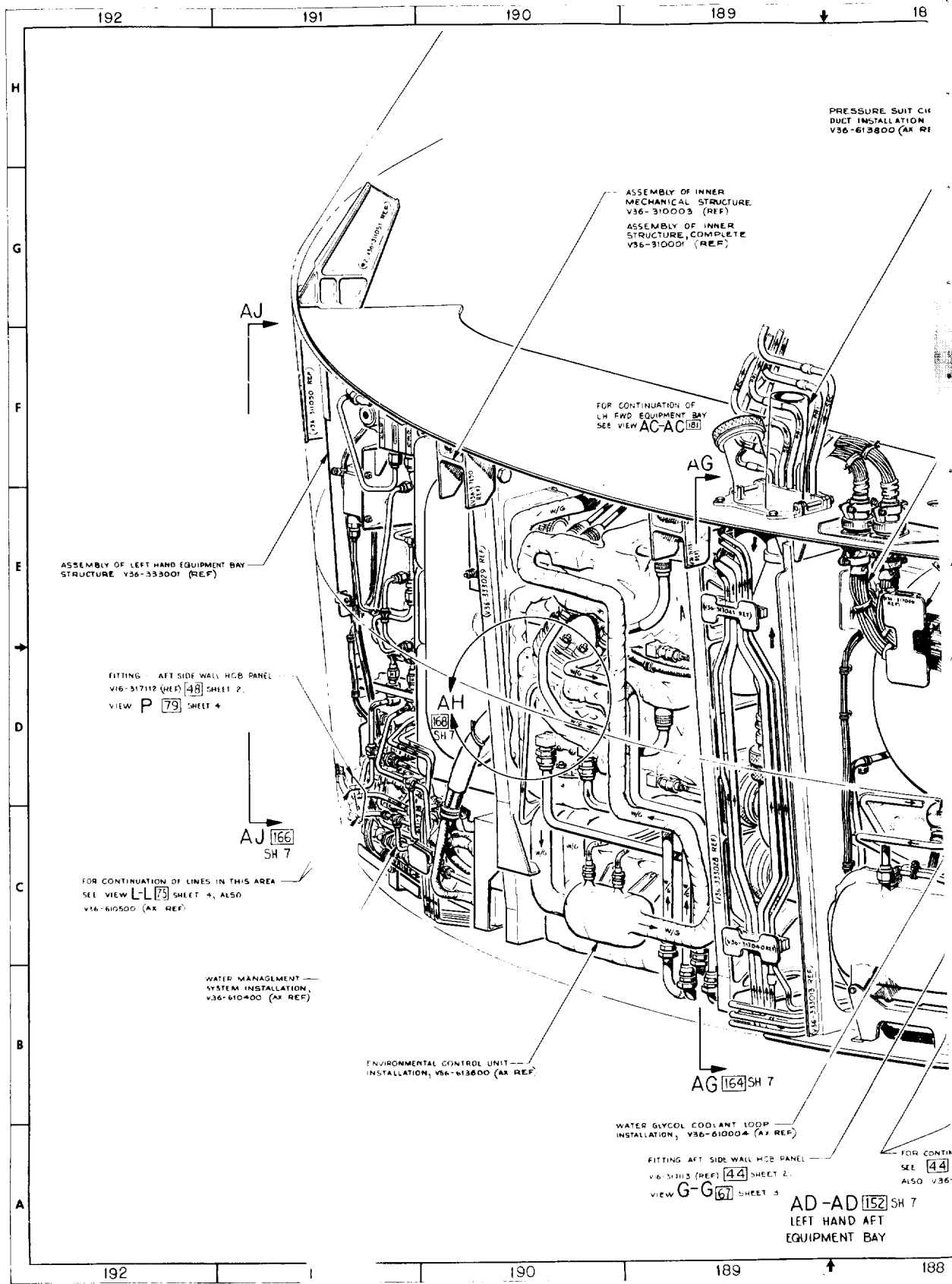
FOLDOUT FRAME 4

10/10/10



FOLDOUT FRAME 5





PRESSURE SUIT CH  
DUCT INSTALLATION  
V36-613800 (AX REF)

ASSEMBLY OF INNER  
MECHANICAL STRUCTURE  
V36-310003 (REF)  
ASSEMBLY OF INNER  
STRUCTURE, COMPLETE  
V36-310001 (REF)

FOR CONTINUATION OF  
LH FWD EQUIPMENT BAY  
SEE VIEW AC-AC 181

ASSEMBLY OF LEFT HAND EQUIPMENT BAY  
STRUCTURE V36-333001 (REF)

FITTING - AFT SIDE WALL HCB PANEL  
V16-317112 (REF) 48 SHEET 2,  
VIEW P 79 SHEET 4

FOR CONTINUATION OF LINES IN THIS AREA  
SEE VIEW L-L 75 SHEET 4, ALSO  
V16-610500 (AX REF)

WATER MANAGEMENT  
SYSTEM INSTALLATION,  
V36-610400 (AX REF)

ENVIRONMENTAL CONTROL UNIT  
INSTALLATION, V36-613800 (AX REF)

WATER GLYCOL COOLANT LOOP  
INSTALLATION, V36-610004 (AX REF)

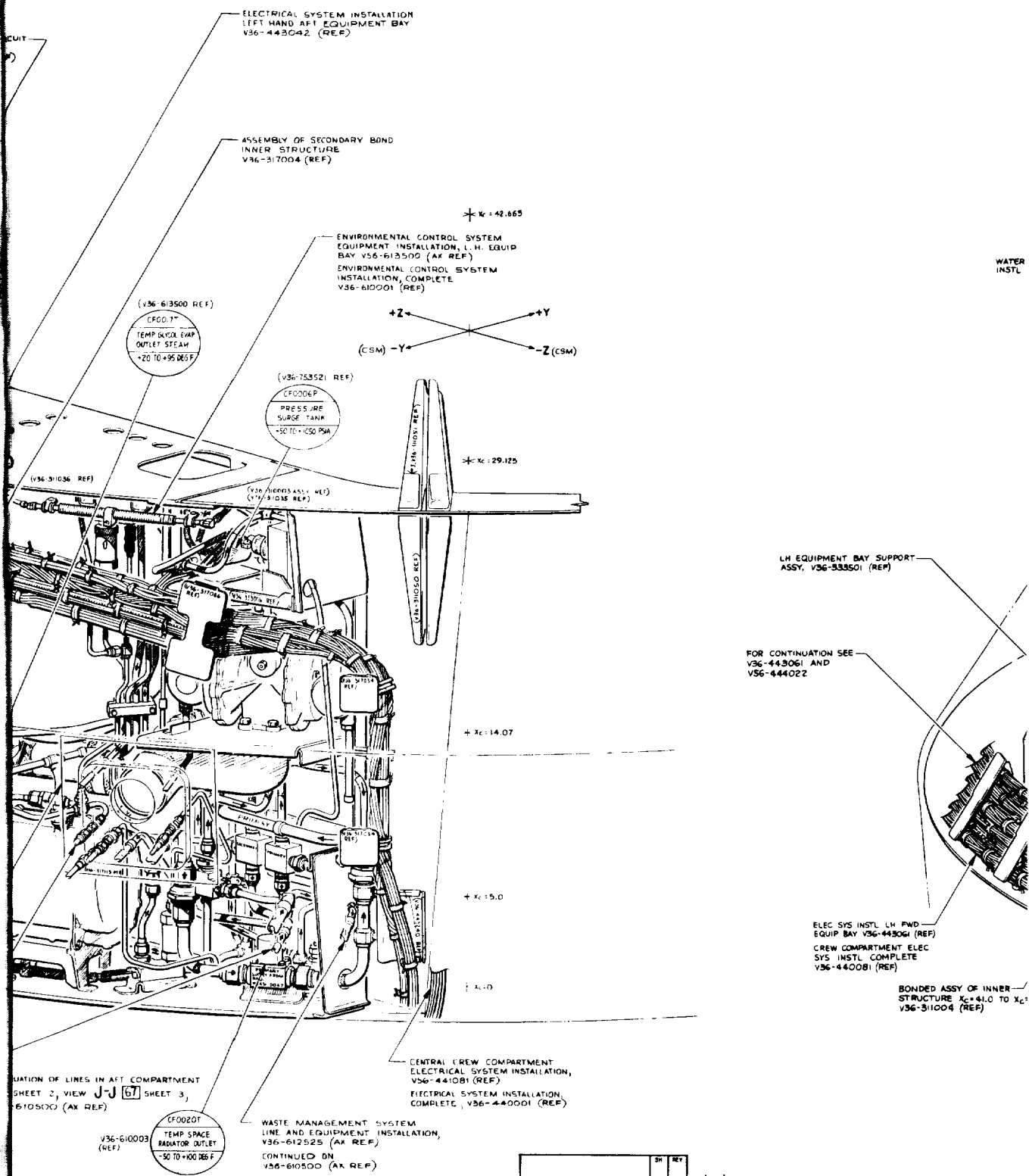
FITTING AFT SIDE WALL HCB PANEL  
V16-313113 (REF) 44 SHEET 2,  
VIEW G-G 67 SHEET 3

FOR CONTIN  
SEE 44  
ALSO V36

AD-AD 152 SH 7  
LEFT HAND AFT  
EQUIPMENT BAY

**FOLDOUT FRAME**

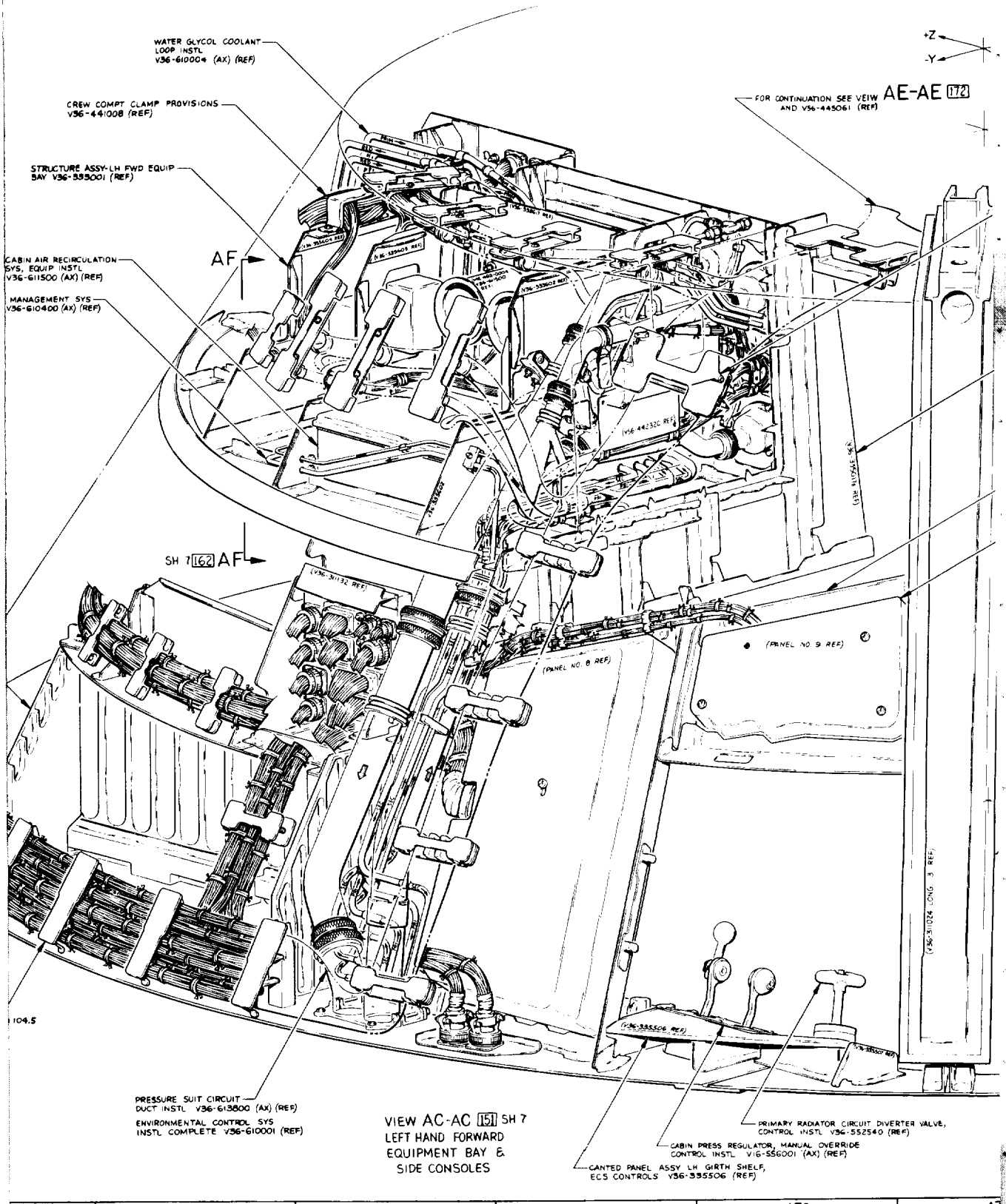
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FOLDOUT FRAME 2







1000

+Y (CSM)  
-Z (CSM)

X: 82.13  
CF0005P  
PRESS CO<sub>2</sub>  
PARTIAL  
0 TO +30 mm Hg  
V36-613800 (REF)

CONTINUED IN VIEW AC-AC (B) AND V36-443061 (REF)

CLAMP PROVISIONS, CREW COMPARTMENT  
ELECTRICAL SYS INSTL V36-44100B (REF)

MAIN DISPLAY  
STRUC COMP  
V36-3350C  
+Z  
+Y

M. D. C. ELECTRICAL  
V36-445061 (REF)

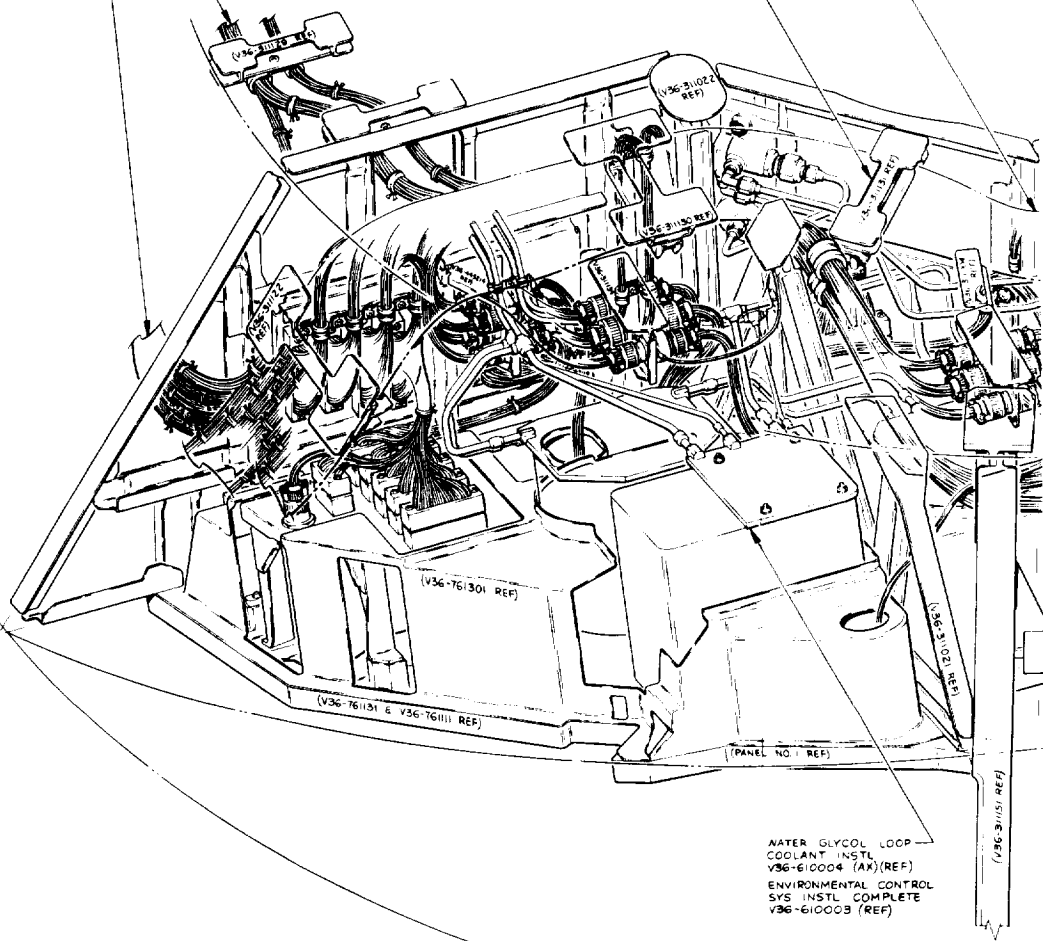
MAIN DISPLAY CONSOLE  
STRUC COMPLETE  
V36-335001 (REF)

SIDE CONSOLE STRUC COMPLETE  
V36-335501 (REF)

DISPLAY PANEL INSTL  
PANELS 7, 8, 9, & 15  
V36-761007 (REF)

(V36-761035 PANEL #15 REF)

X: 42.665  
INNER STRUC HCO<sub>2</sub>B PANEL  
ASSY V36-31002 (REF)



(V36-761301 REF)

(V36-761101 & V36-761111 REF)

(PANEL NO. REF)

(V36-31115 REF)

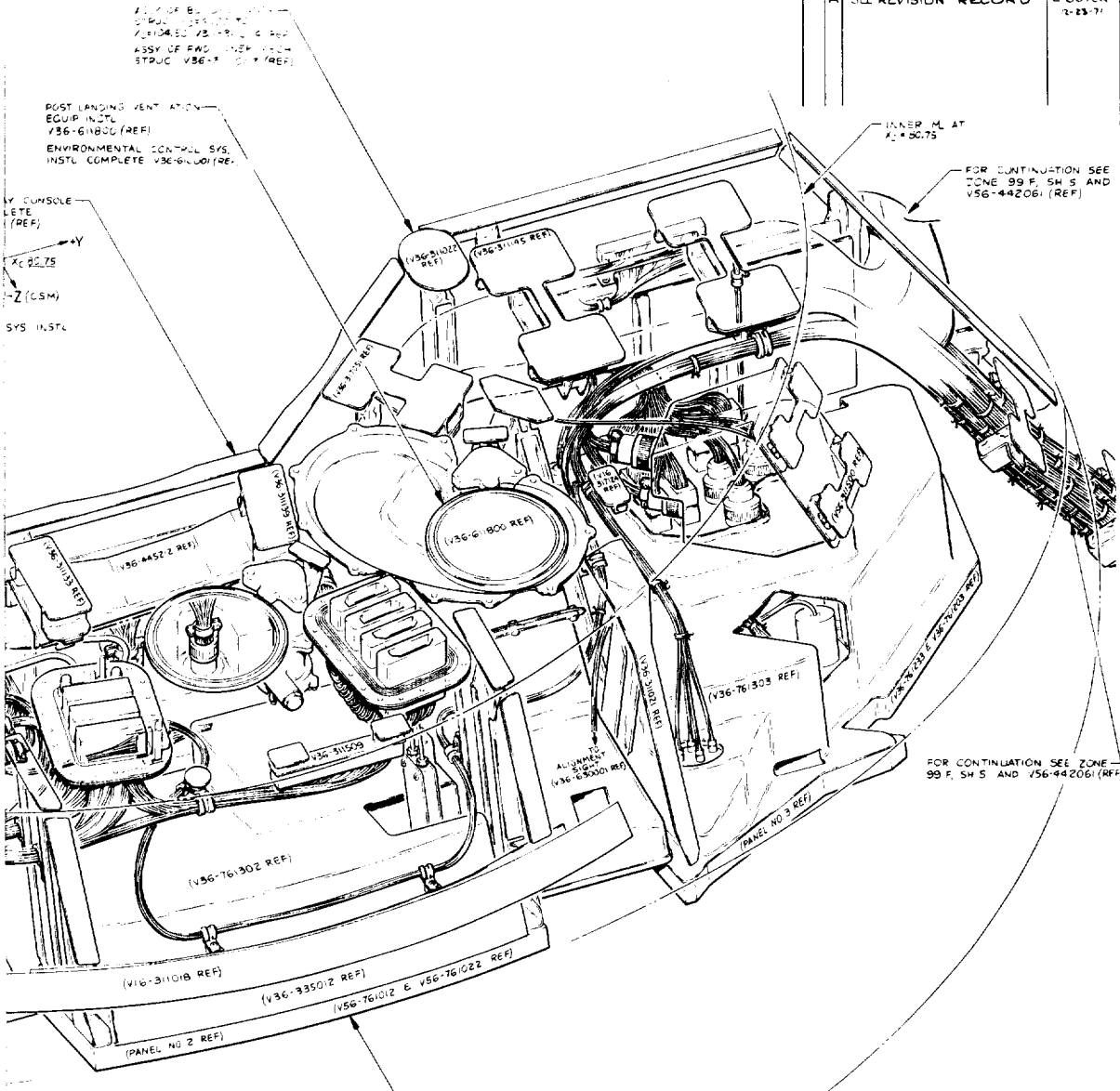
WATER GLYCOL LOOP  
COOLANT INSTL  
V36-610004 (AK) (REF)  
ENVIRONMENTAL CONTROL  
SYS INSTL COMPLETE  
V36-610003 (REF)

FWD S

1



| REVISIONS |                     | DATE | APPROVED            |
|-----------|---------------------|------|---------------------|
| A         | SEE REVISION RECORD |      | L. BOYER<br>2-23-71 |



COMPLETE DISPLAYS AND CONTROLS INSTL  
 V36-76110 (AX) (REF)  
 DESIGN LAYOUT INSTRUMENT FACES MDC C/M  
 V36-976001 (REF)  
 MAIN DISPLAY CONSOLE INSTL V36-761000 (REF)

INNER M.L. AT Xc = 60.75

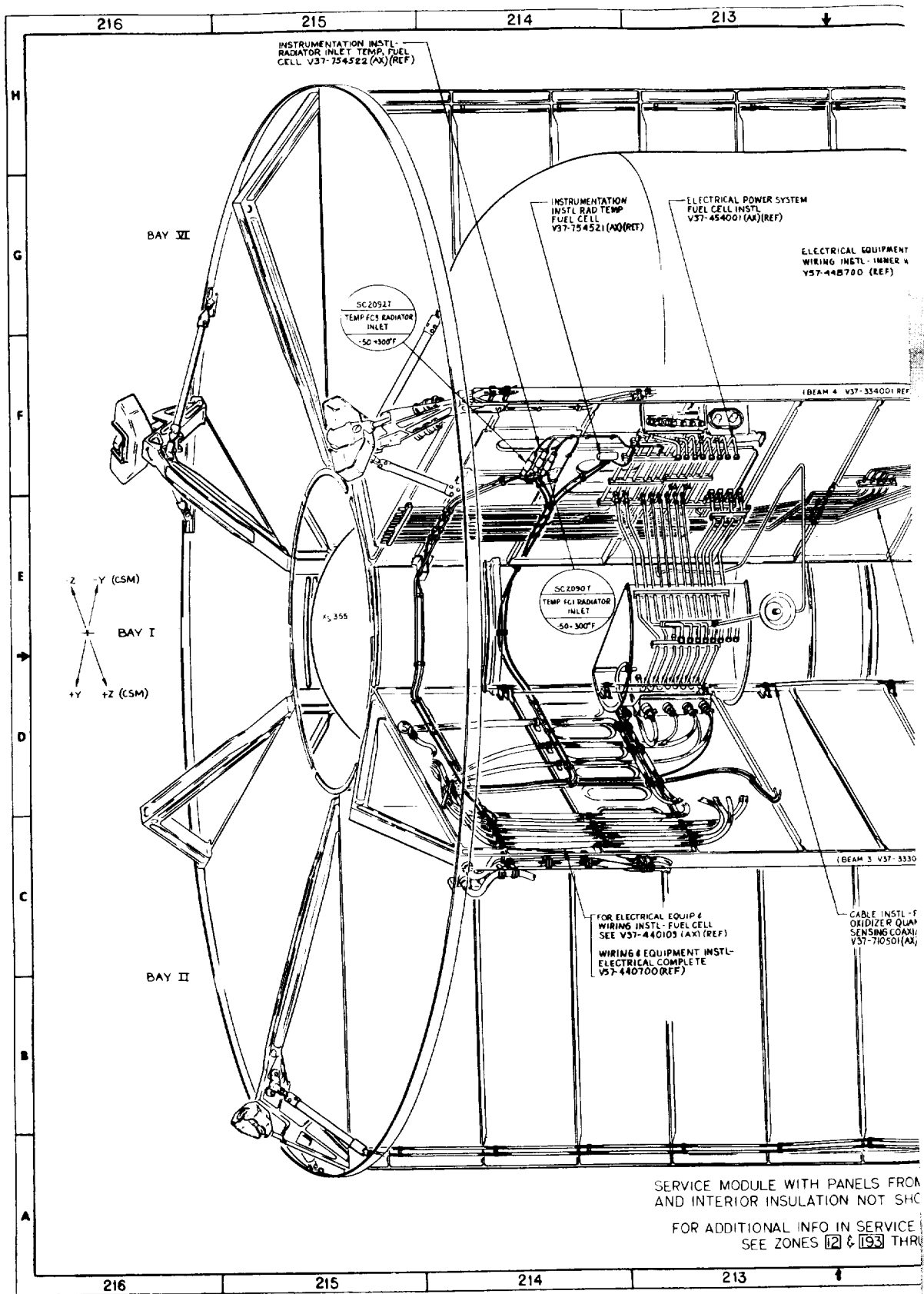
AE-AE 156 SH 7  
 SIDE OF MAIN DISPLAY CONSOLE

**1.8 STR**

|          |               |            |
|----------|---------------|------------|
| SIZE     | CODE IDENT NO |            |
| J        | 03953         | V54-000116 |
| 131 X 34 | PAGE 11-12    | SHEET 6    |

FOLDOUT FRAME 5

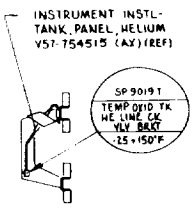
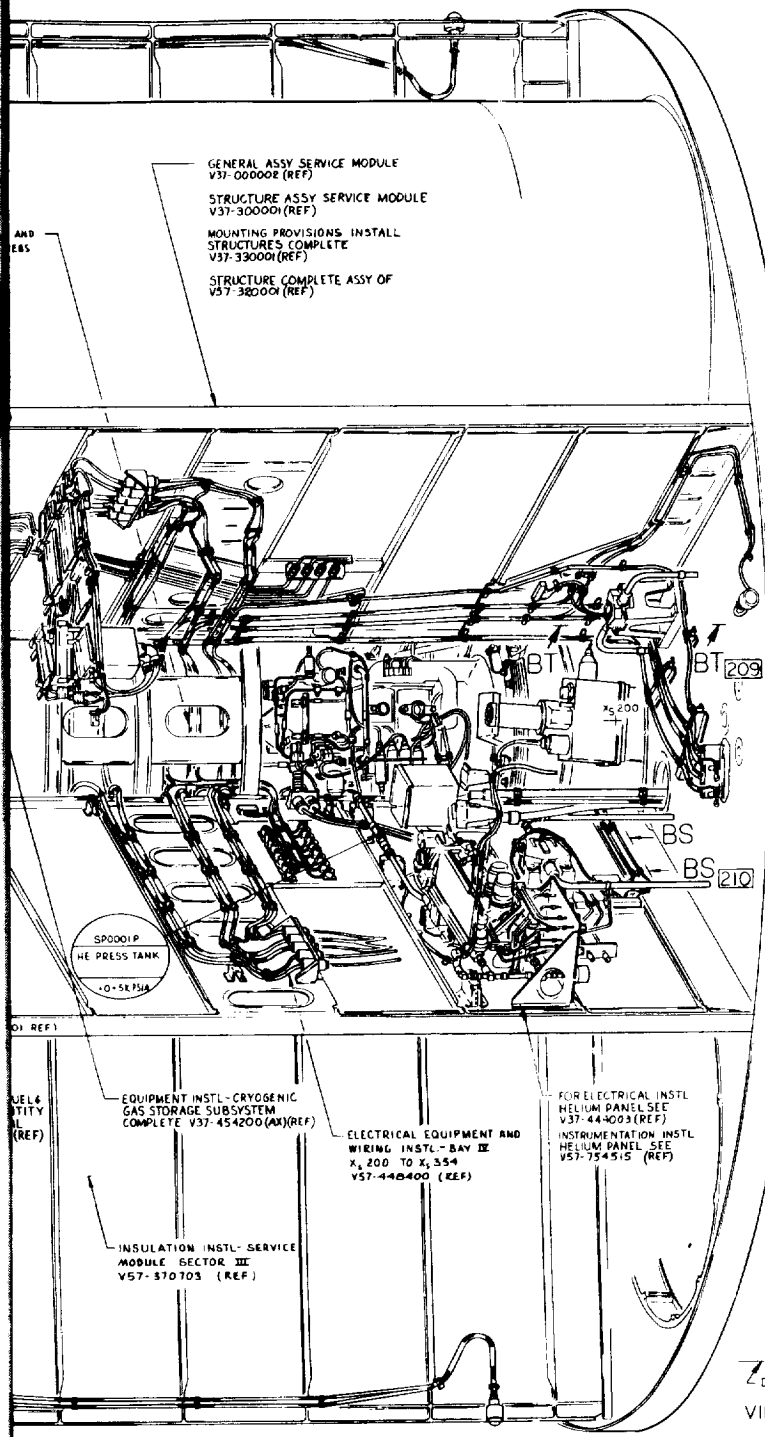
1000



**EOLDOUT FRAME /**

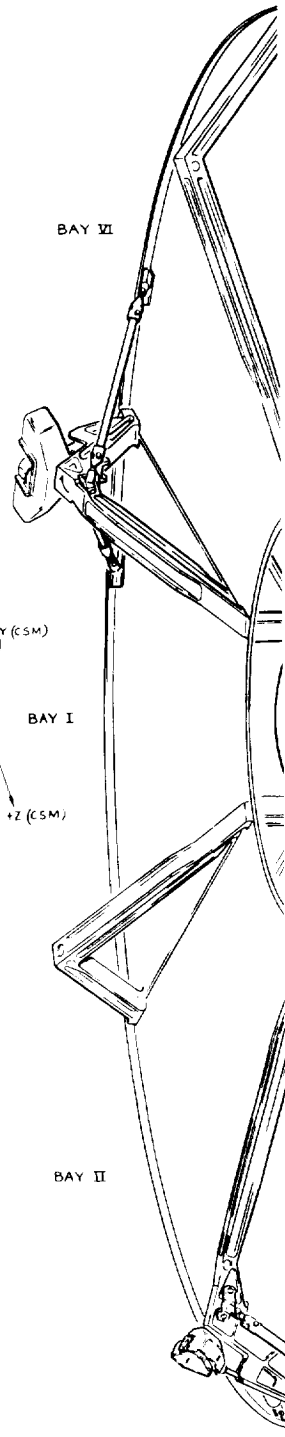
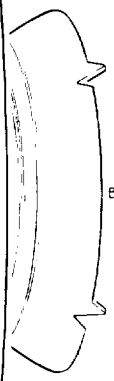
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.



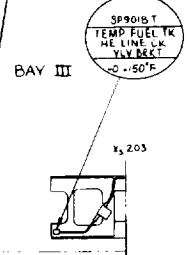


VIEW BS-BS 210

BAY V



V57-754515 (REF)



DATUM PLANE OF BEAM NO. 4

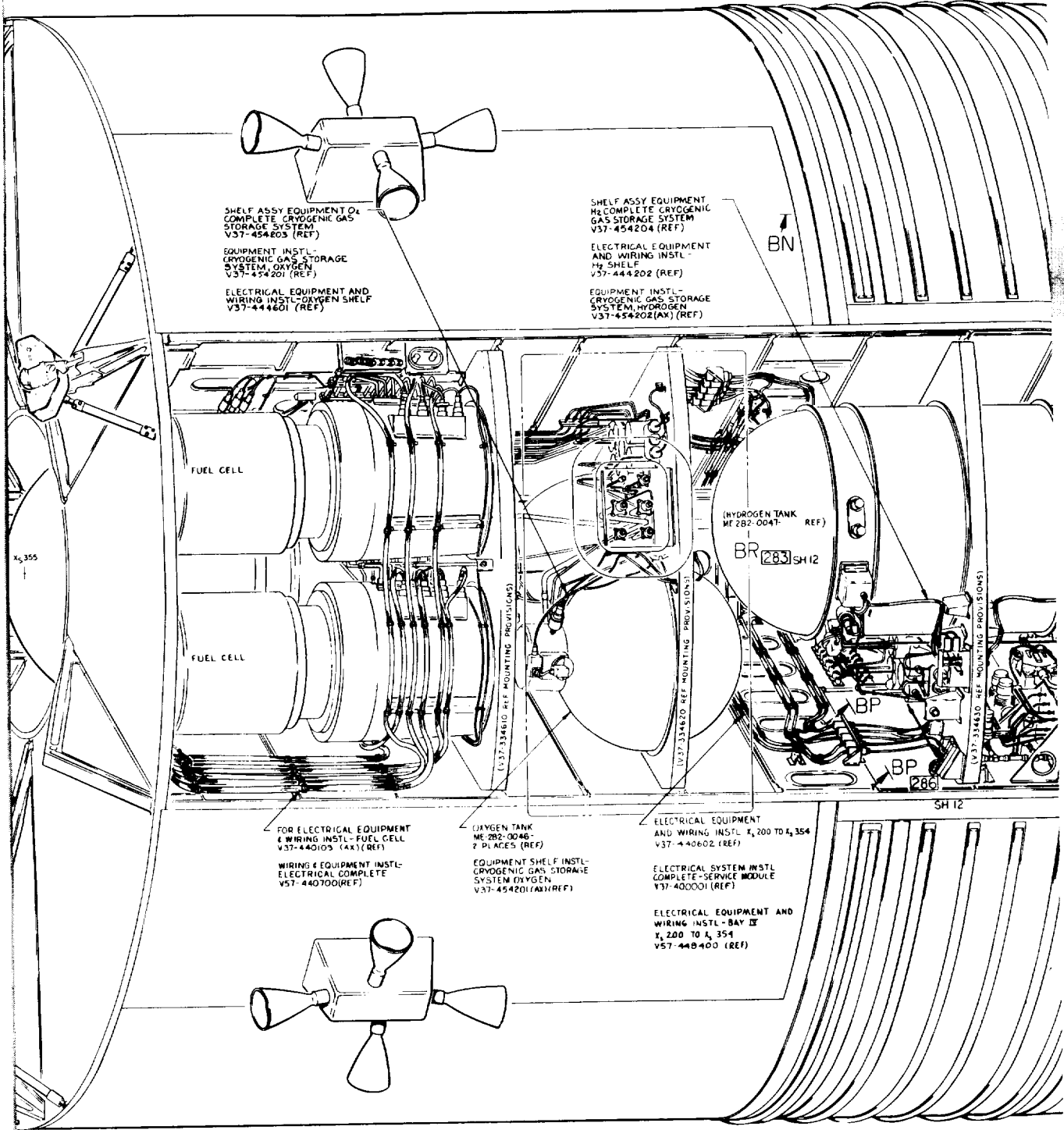
VIEW BT-BT 210

CHECK VALVE REMOVED  
FOR CLARITY

BAYS III, IV, V  
OWN FOR CLARITY

MODULE AREA  
304

2023-2024



SHELF ASSY EQUIPMENT O<sub>2</sub> COMPLETE CRYOGENIC GAS STORAGE SYSTEM V37-454203 (REF)  
 EQUIPMENT INSTL - CRYOGENIC GAS STORAGE SYSTEM, OXYGEN V37-454201 (REF)  
 ELECTRICAL EQUIPMENT AND WIRING INSTL - OXYGEN SHELF V37-444601 (REF)

SHELF ASSY EQUIPMENT H<sub>2</sub> COMPLETE CRYOGENIC GAS STORAGE SYSTEM V37-454204 (REF)  
 ELECTRICAL EQUIPMENT AND WIRING INSTL - H<sub>2</sub> SHELF V37-444202 (REF)  
 EQUIPMENT INSTL - CRYOGENIC GAS STORAGE SYSTEM, HYDROGEN V37-454202 (AX) (REF)

FUEL CELL

FUEL CELL

(HYDROGEN TANK ME 282-0047- REF)  
 BR 283 SH 12

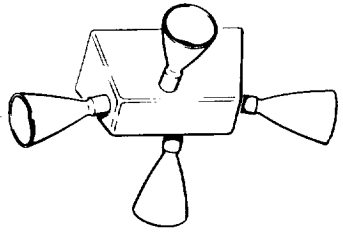
FOR ELECTRICAL EQUIPMENT & WIRING INSTL - FUEL CELL V37-440103 (AX) (REF)  
 WIRING & EQUIPMENT INSTL - ELECTRICAL COMPLETE V37-440700 (REF)

(O<sub>2</sub> TANK ME 282-0046- P IN ACES) (REF)  
 EQUIPMENT SHELF INSTL - CRYOGENIC GAS STORAGE SYSTEM OXYGEN V37-454201 (AX) (REF)

ELECTRICAL EQUIPMENT AND WIRING INSTL X, 200 TO X, 354 V37-440602 (REF)

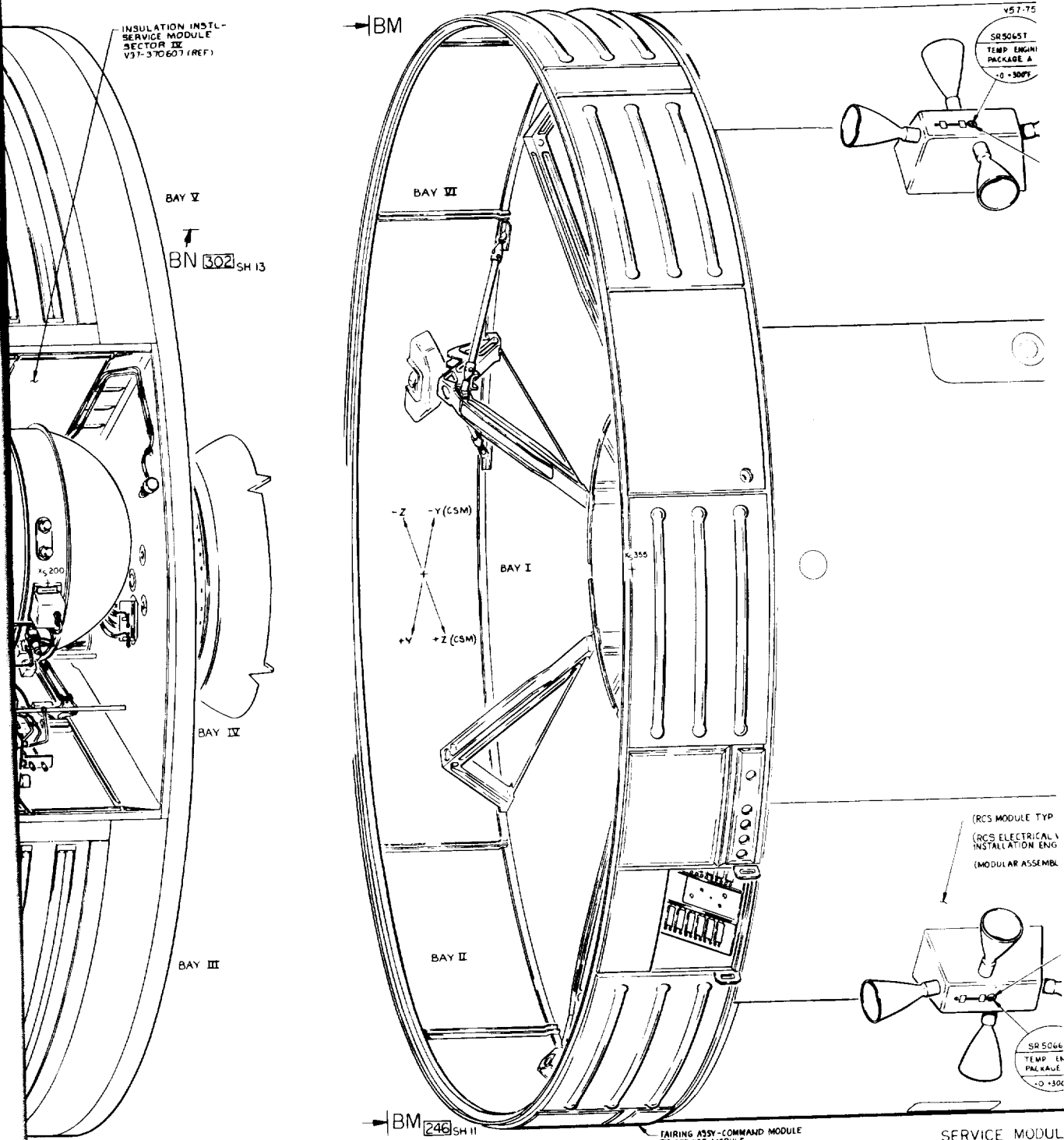
ELECTRICAL SYSTEM INSTL COMPLETE - SERVICE MODULE V37-400001 (REF)

ELECTRICAL EQUIPMENT AND WIRING INSTL - BAY IV X, 200 TO X, 354 V37-440400 (REF)



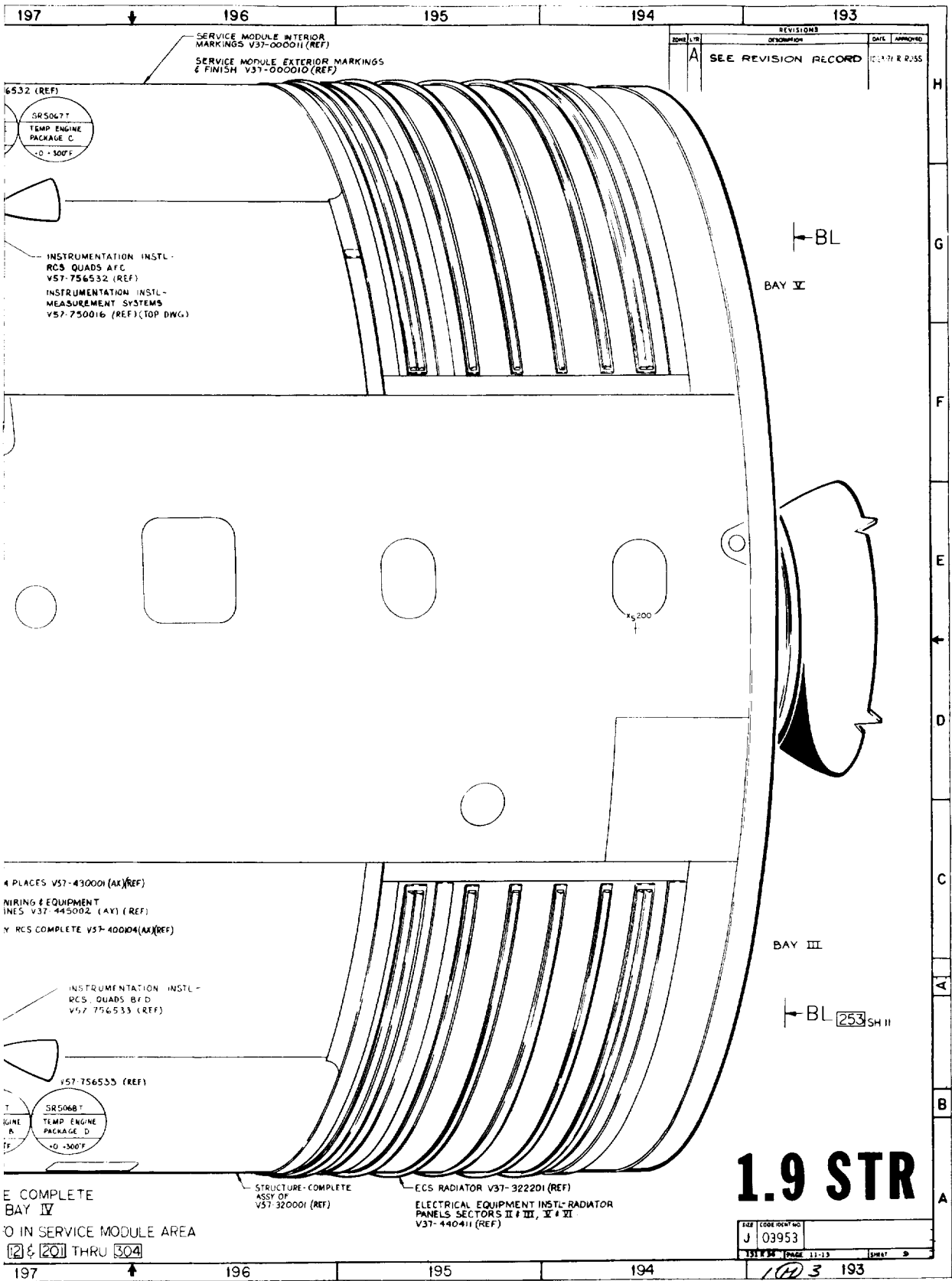
SERVICE MODULE WITH BAY IV PANEL AND INTERIOR INSULATION NOT SHOWN FOR CLARITY  
 FOR ADDITIONAL INFO IN SERVICE MODULE AREA SEE ZONES 2 & 193 THRU 304

2023



FOLDOUT FRAME 4



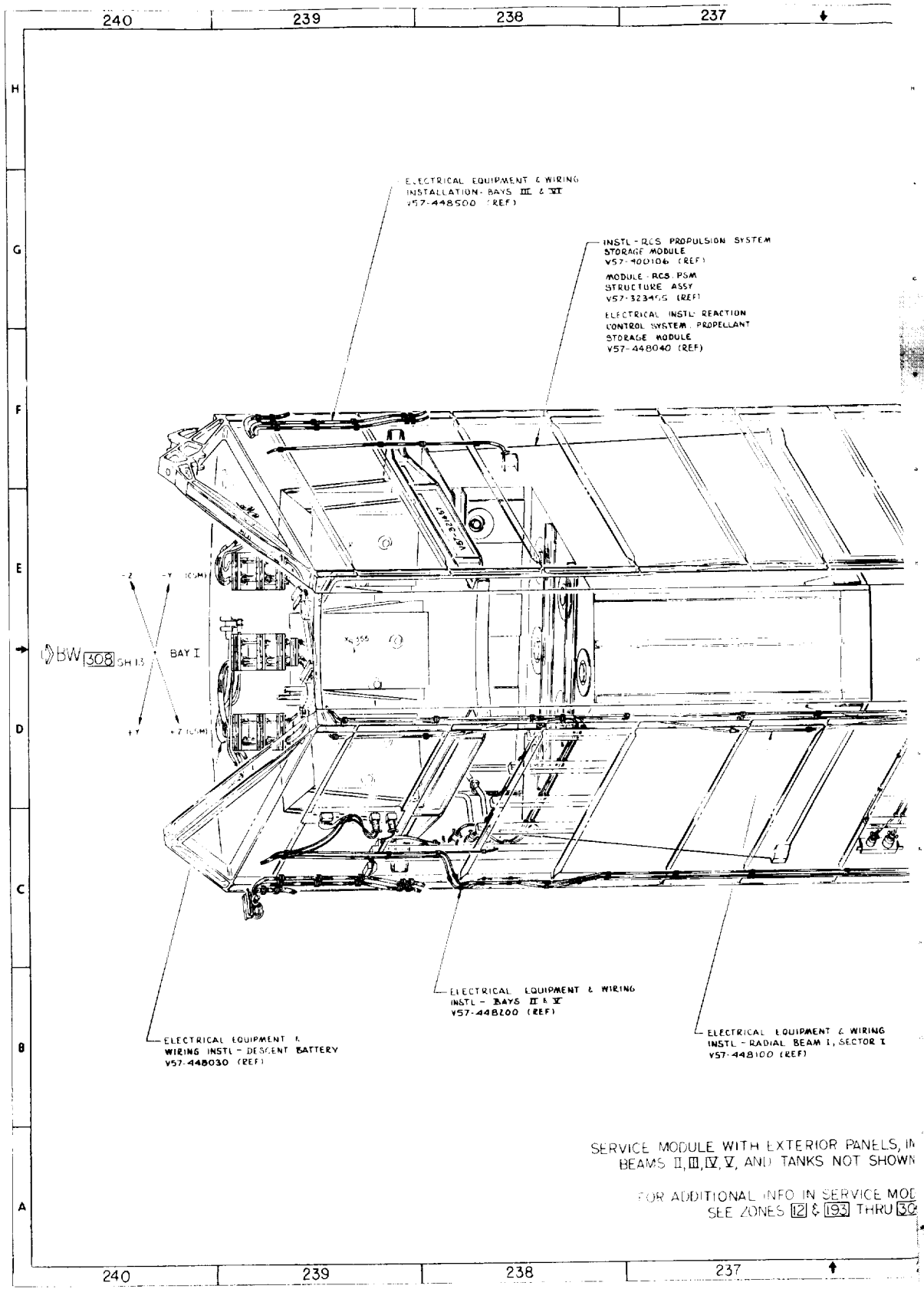


EQLDOUT FRAME 5

1. The first part of the document is a list of names and titles, including "The Hon. Mr. Justice" and "The Hon. Mr. Justice".

2. The second part of the document is a list of names and titles, including "The Hon. Mr. Justice" and "The Hon. Mr. Justice".





**EOLDOUT FRAME /**

• 2019年12月31日

PROPELLANT SYSTEM ASSEMBLY  
REACTION CONTROL SYSTEM  
QUADRA AEC  
V57-400111 (REF)

ELECTRICAL EQUIPMENT &  
WIRING INSTL - BAYS III  
& IV V57-448500 (REF)

FIELD SITE INSTL - SCIENTIFIC  
EXPERIMENTS, S071/5072  
FO4-756002 (REF)  
  
INSTL - EXPERIMENT S071/5072  
CIRCADIAN RHYTHM, POCKET MICE,  
VINEGAR GNAT, CSM/GFE, NR/MSE,  
MH 04 02045-134 (REF) (117 ONLY)

INSULATION INSTL - SERVICE  
MODULE SECTOR 1  
V57-370701 (REF)

INTERIOR INSULATION  
FOR CLARITY  
  
MODULE AREA

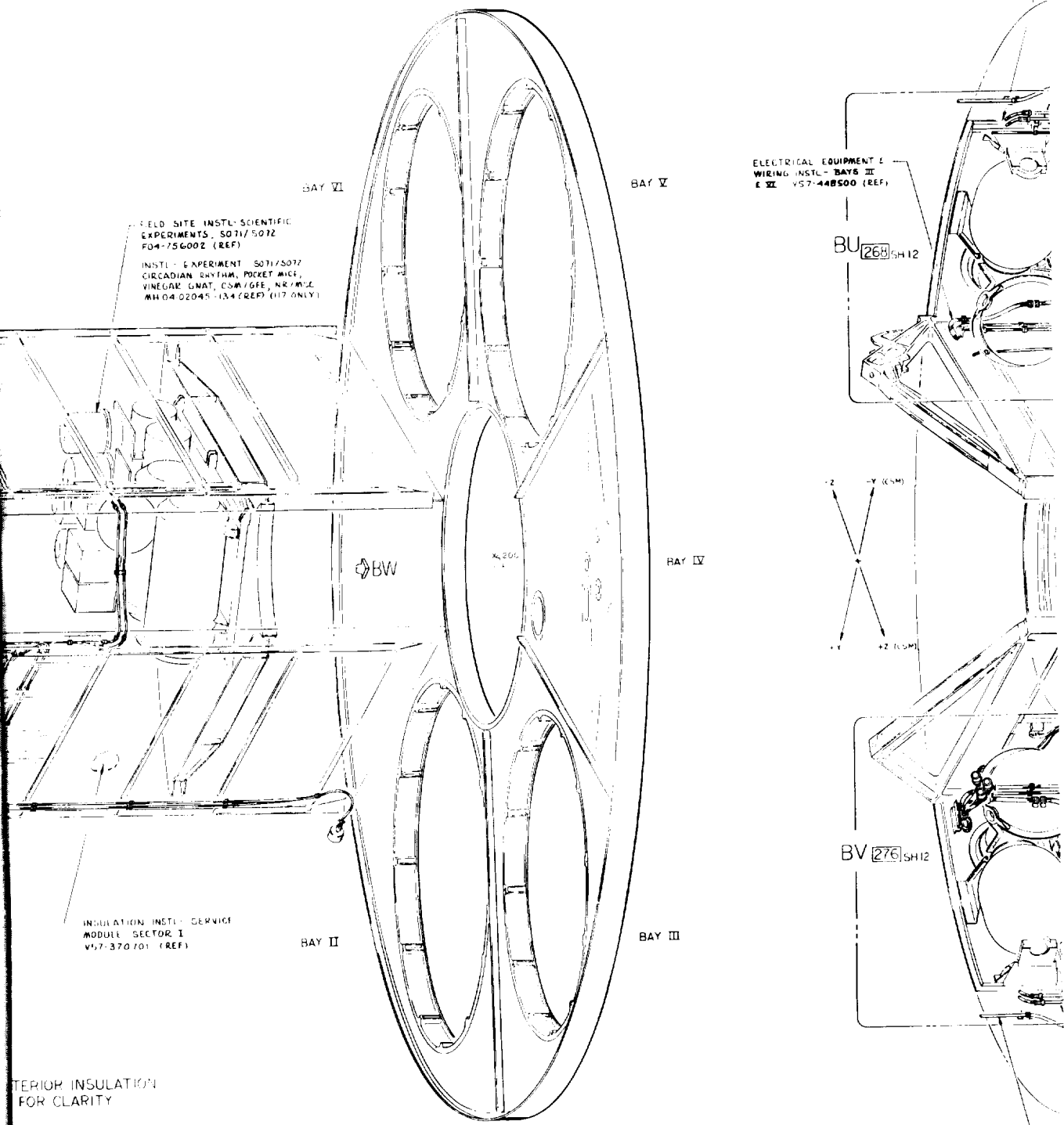
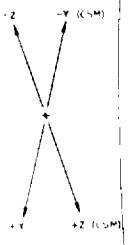
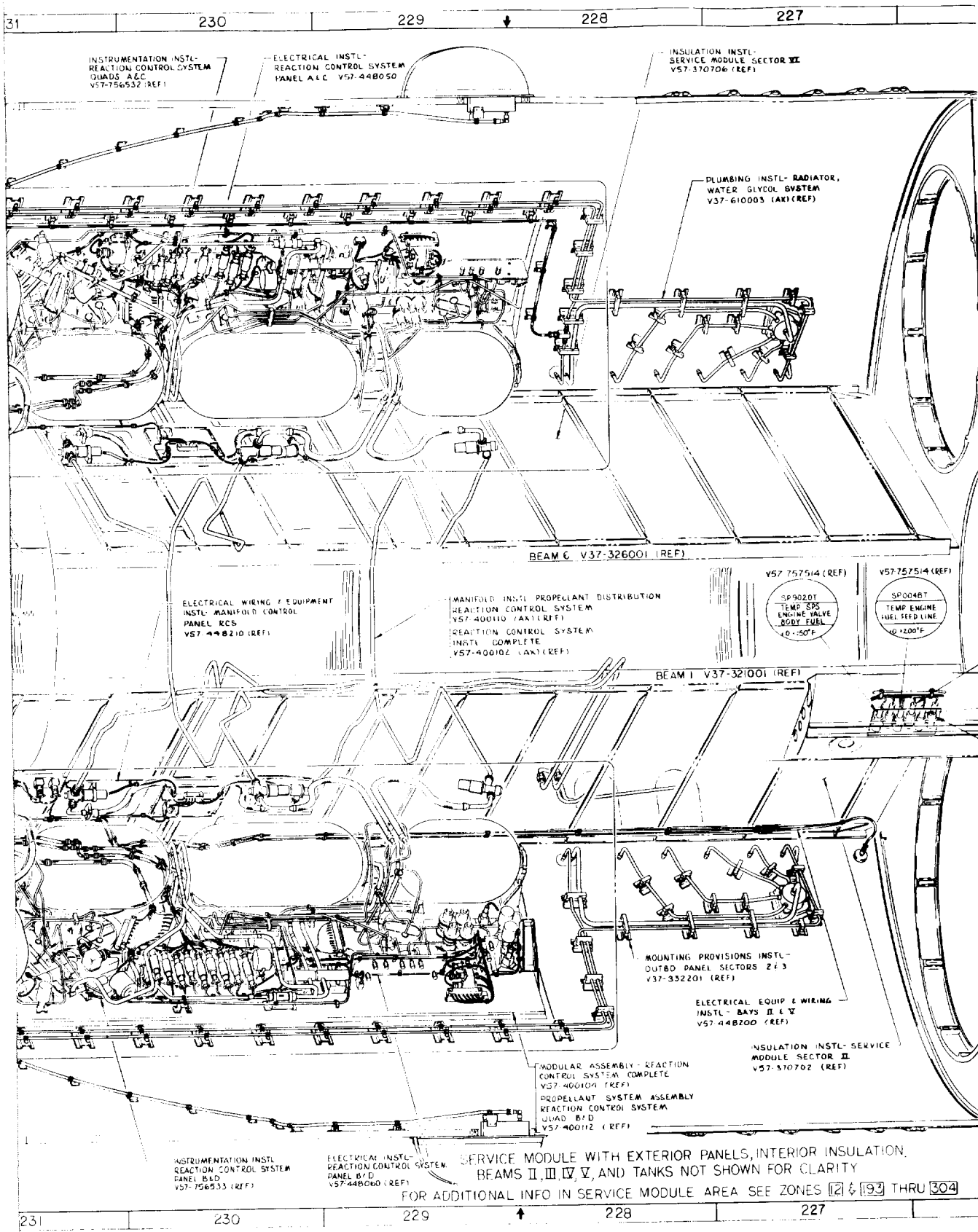


TABLE INSTL - VHF OMNI  
DIRECTIONAL ANTENNA AND  
COAXIAL - V57-71060103 (REF)

REV  
10 A

FOLDOUT FRAME 2





FOLDOUT FRAME 3

10/10/10

226

225

224

223

222

INSULATION INSTALLATION SERVICE  
MODULE SECTOR I  
V57-370705 (REF)

BEAM  
V57-32

BAY V

BAY VI

WATER STOR  
V57-338790

V57-757514 (REF)

SP0049T  
TEMP ENGINE  
OILIZER  
FEED LINE  
50-100°F

V57-754515 (REF)

SP9021T  
TEMP SPS  
HE TANK  
UPPER SURFACE  
100-100°F

BAY IV



V57-757514 (REF)

SP9101T  
TEMP ENGINE  
INJECTOR  
OIL FEED MANIF  
50-150°F

V57-347108 (REF)

HELIUM TANK INSTL

V57-757514 (REF)

SP9102T  
TEMP ENGINE  
INJECTOR  
FUEL MANIF  
50-150°F

BAY III

BAY II

STRUCTURE COMPLETE  
ASSY V57-320001 (REF)

SERVICE  
INSULAT

FOR A

226

225

224

223

222

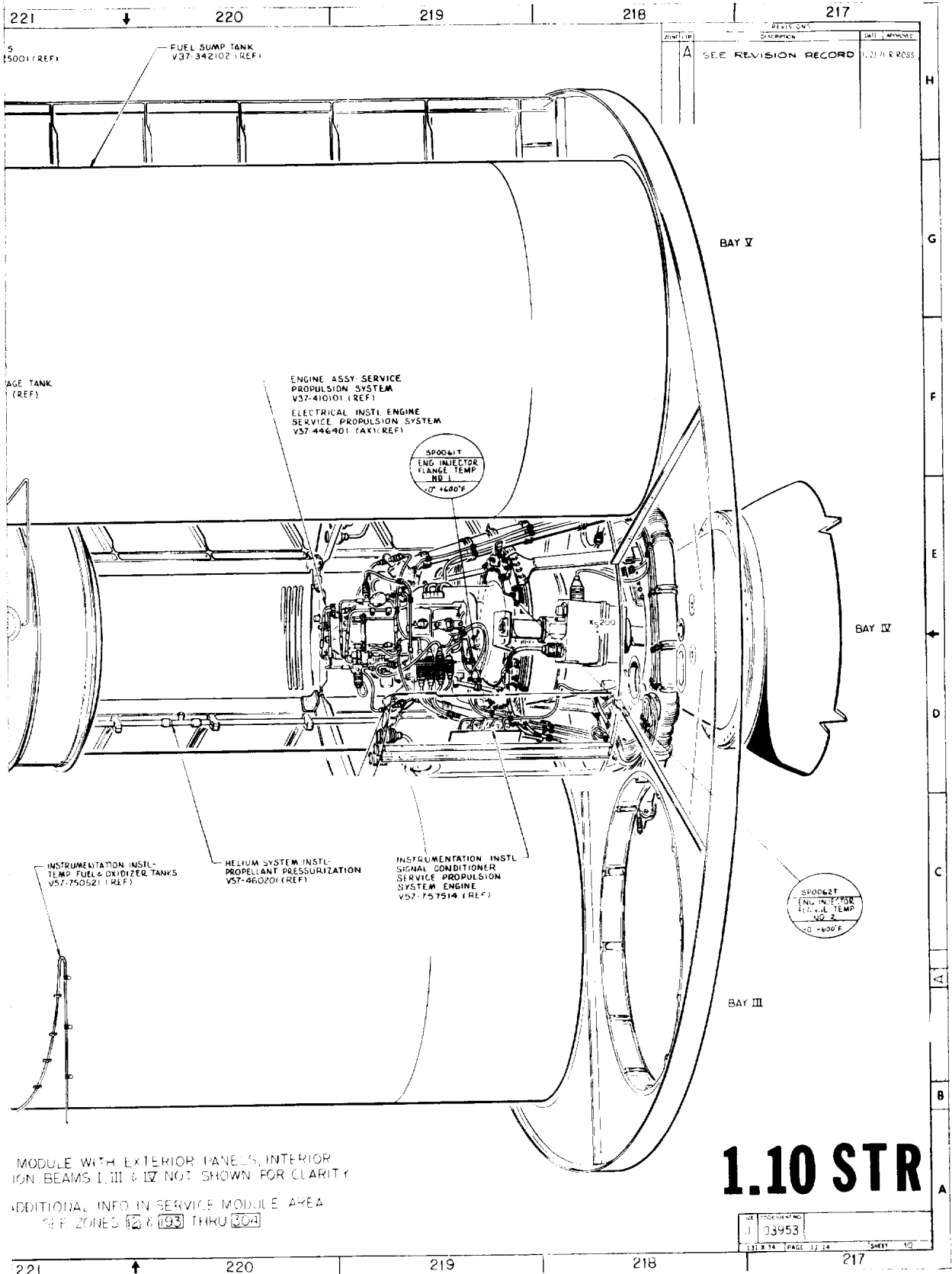
221

REV 10 A

FOLDOUT FRAME 4







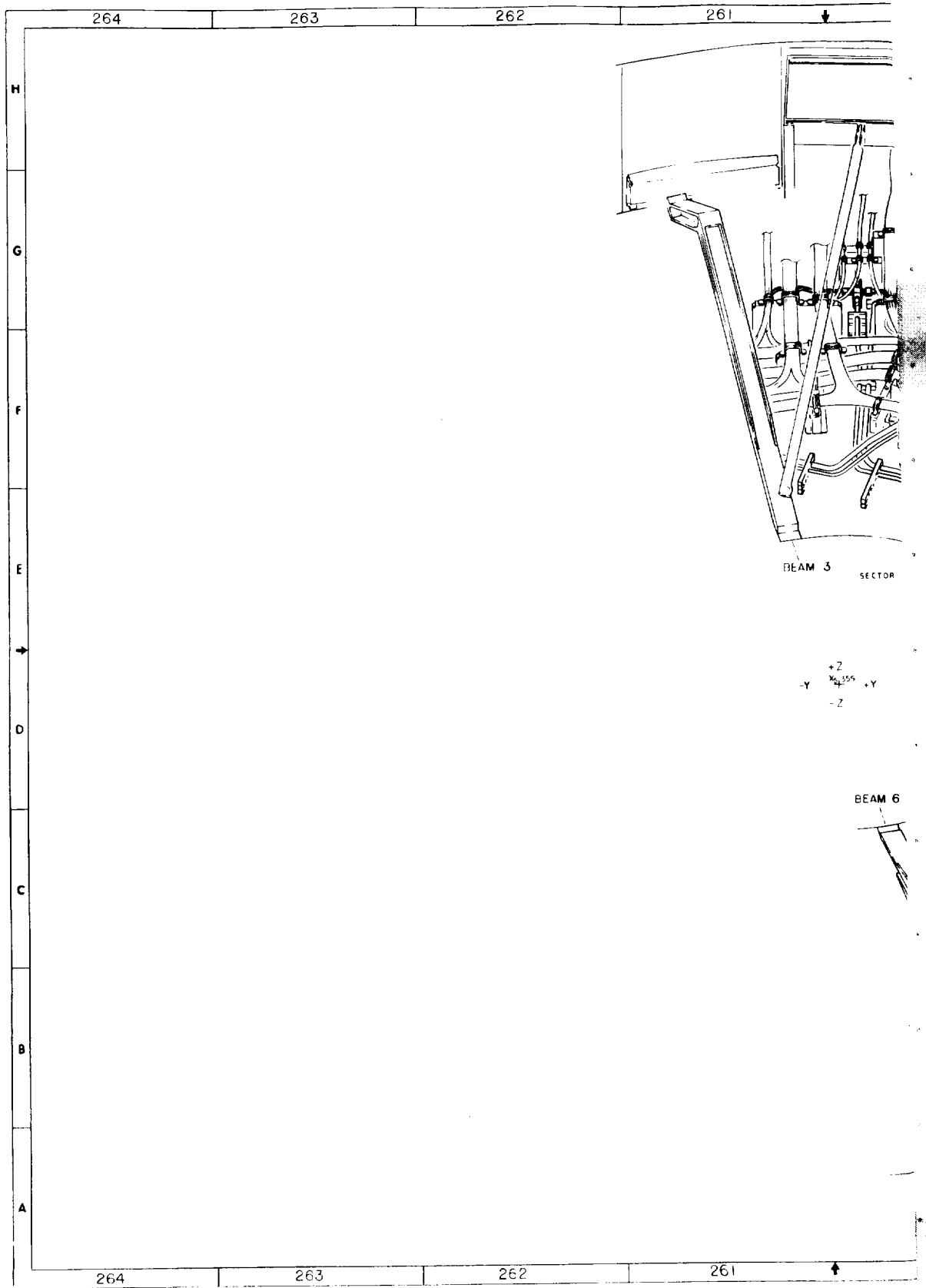
MODULE WITH EXTERIOR PANELS, INTERIOR  
 ION BEAMS I, III & IV NOT SHOWN FOR CLARITY  
 ADDITIONAL INFO IN SERVICE MODULE AREA  
 SEE ZONES 192 & 193 THRU 204

**1.10 STR**

|          |            |
|----------|------------|
| 24       | 33953      |
| 131 X 34 | PAGE 12 14 |
| SHEW     | NO         |

FOLDOUT FRAME 5

2000  
2001  
2002  
2003  
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2030



**FOLDOUT FRAME** /

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259

258

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EQUIPMENT INSTL WATER BYCOL SYSTEM, FWD SHD  
V57-61020 (AX) (REF) SC 117 ONLY

CHANNEL 4

CHANNEL 3

CHANNEL 2

CHANNEL 1

BEAM 2

SECTOR 2

BEAM 1

SECTOR 1

CHANNEL 17

CHANNEL 16

CHANNEL 15

V57-759515 (REF)

SP 9016 T  
TEMP MID  
FEED LINE  
+0 -150°F

SERVICE PROPULSION  
SYSTEM COMPLETE  
V57-400201 (AX) (REF)

OXIDIZER DISTRIBUTION  
SYSTEM INSTL  
V57-470201 (AX) (REF)

FUEL AND OXIDIZER INSTRUMENTATION  
INSTL DISTRIBUTION SYS SPS  
V57-759515 (REF)

VIEW BY-BY 243 117 ONLY

260

259

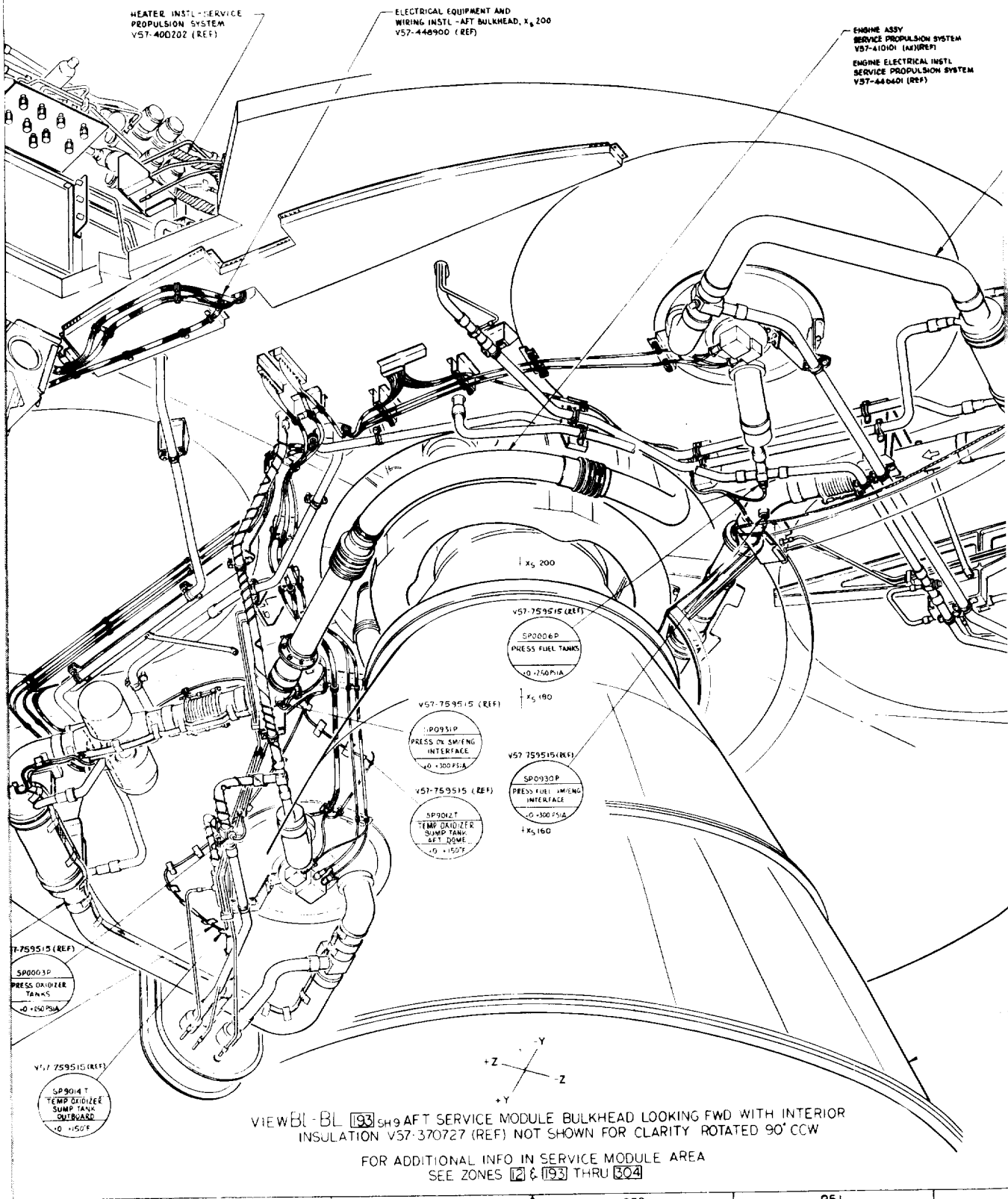
258

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256

FOLDOUT FRAME 2





10/10/2020



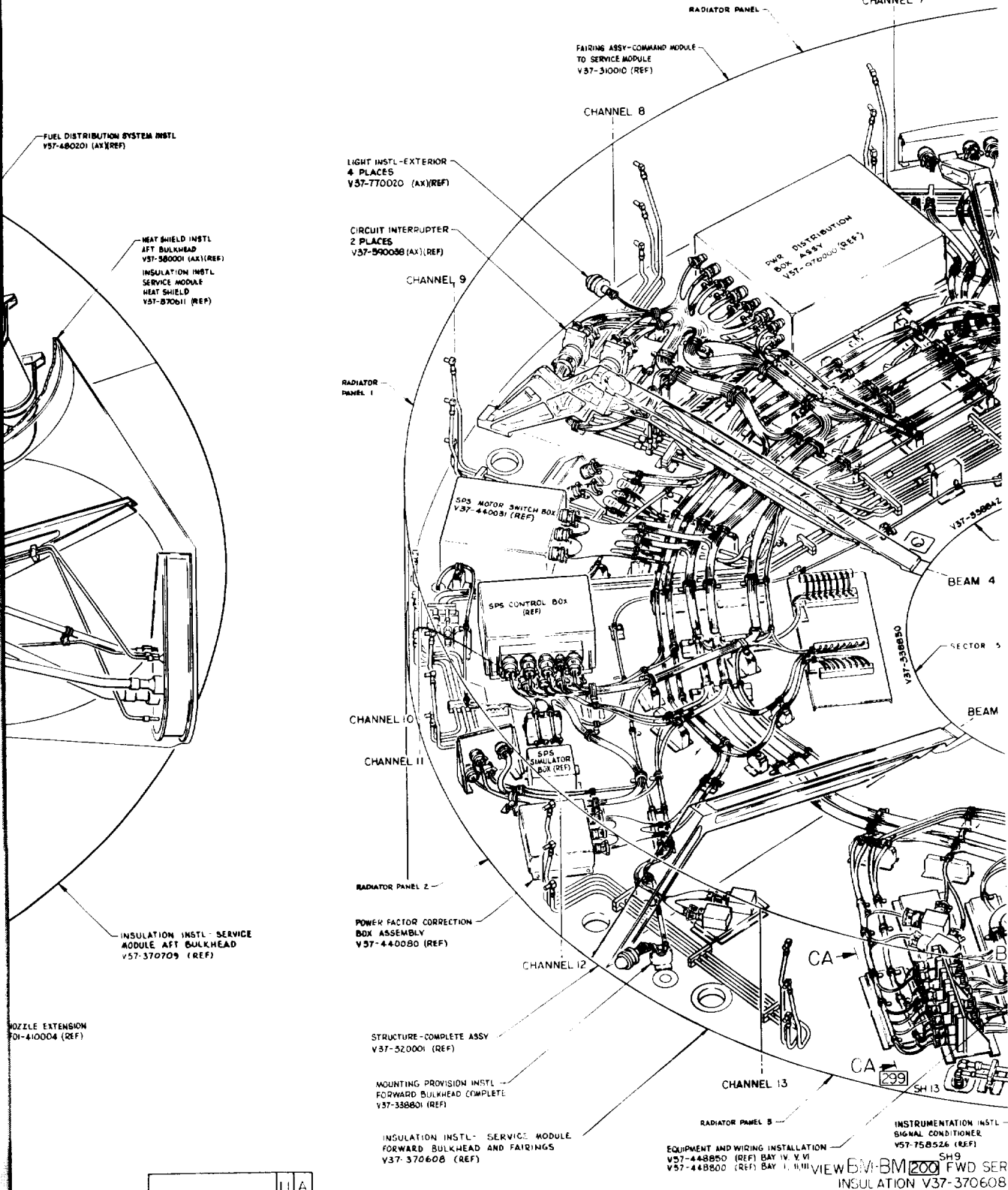
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249

248

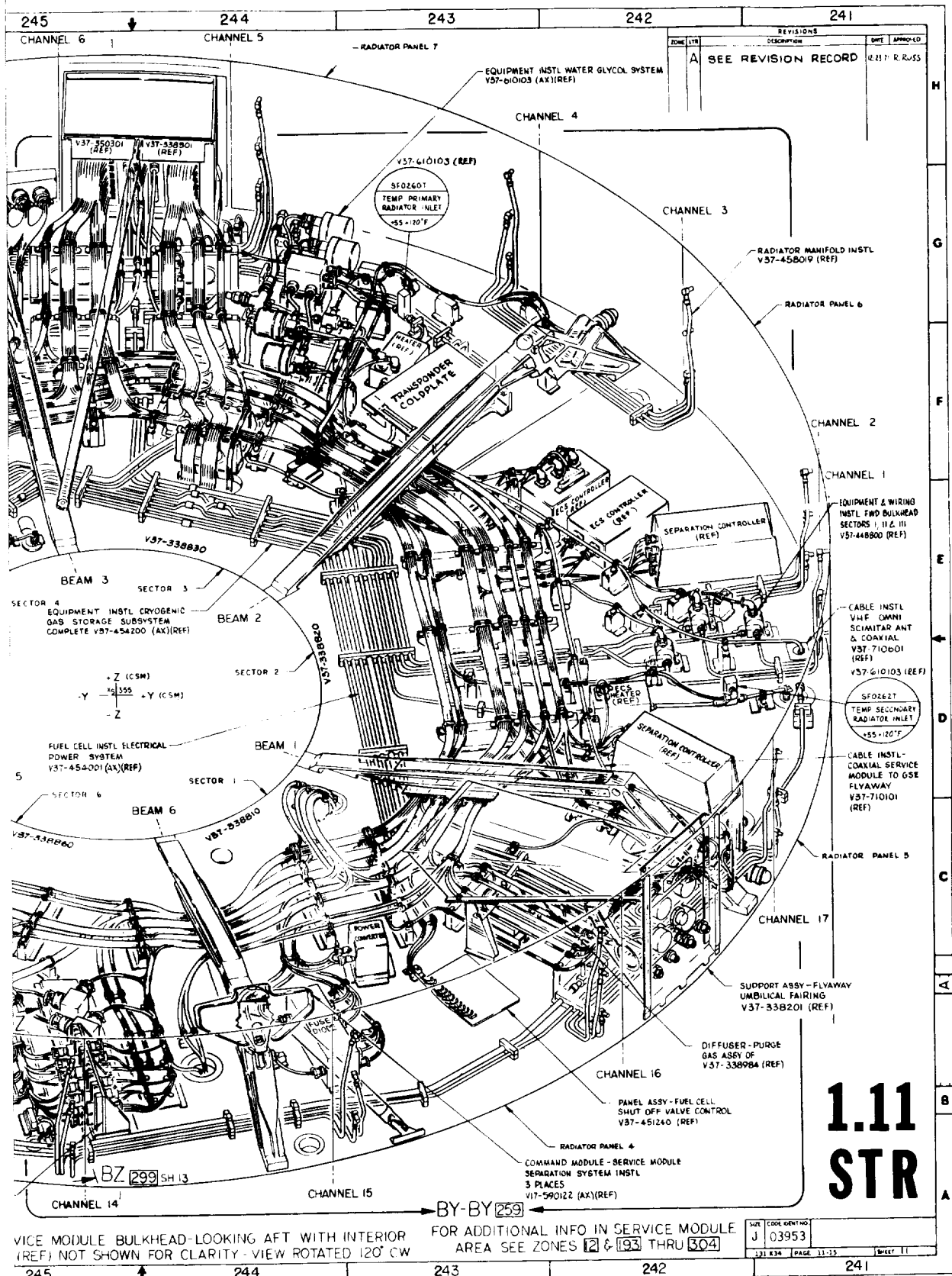
247

246



FOLDOUT FRAME 4





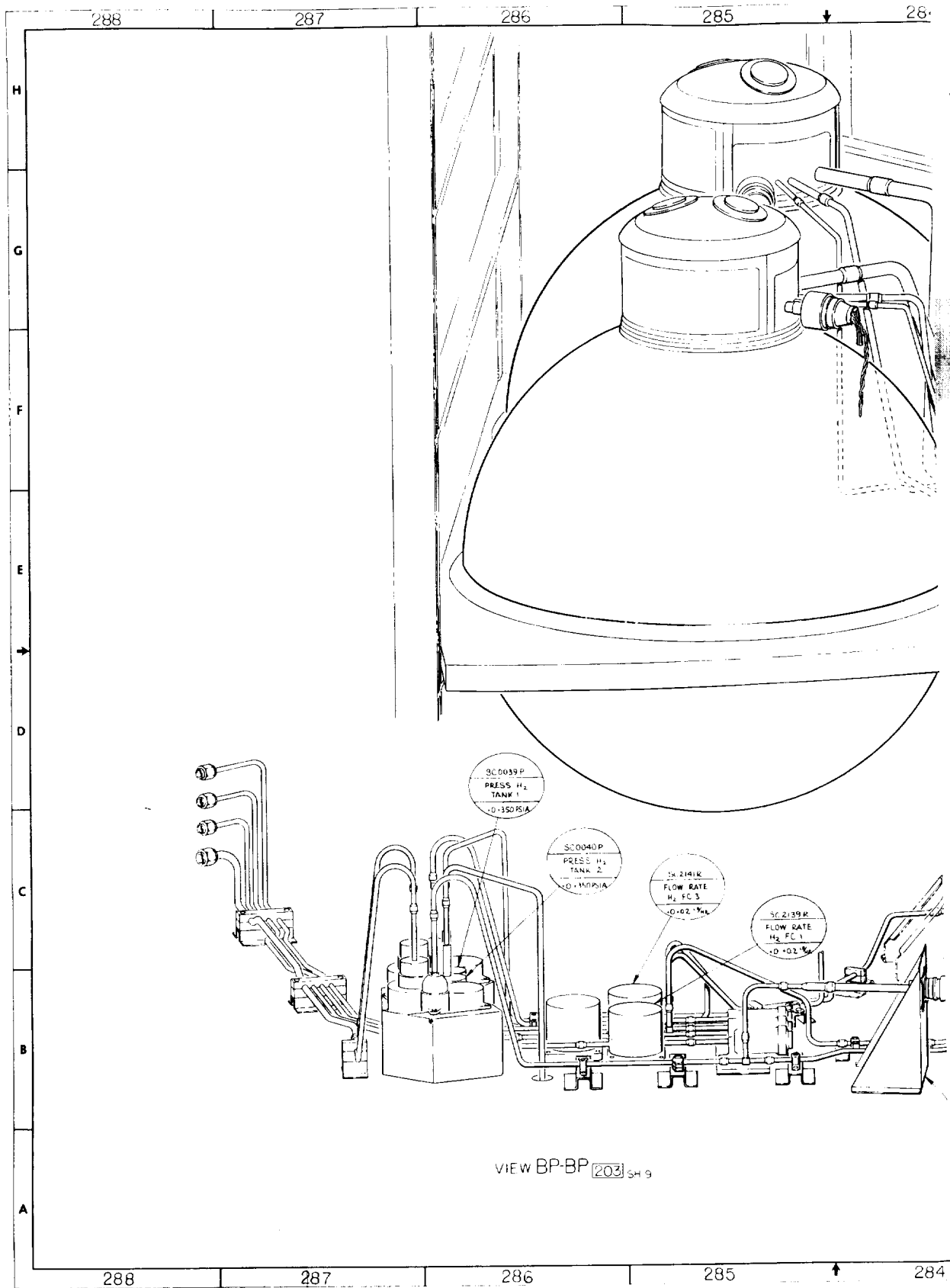
VICE MODULE BULKHEAD-LOOKING AFT WITH INTERIOR (REF) NOT SHOWN FOR CLARITY - VIEW ROTATED 120° CW

FOR ADDITIONAL INFO IN SERVICE MODULE AREA SEE ZONES 12 & 193 THRU 304

|         |      |       |       |
|---------|------|-------|-------|
| REV     | CODE | DATE  | NO    |
| J       |      | 03953 |       |
| 321 834 |      | PAGE  | 11-15 |
| 245     |      | 241   |       |

FOLDOUT FRAME 5

Small, faint, illegible markings or text at the bottom left corner of the page.



VIEW BP-BP 203 SH 9

**FOLDOUT FRAME /**

1. 2. 3.

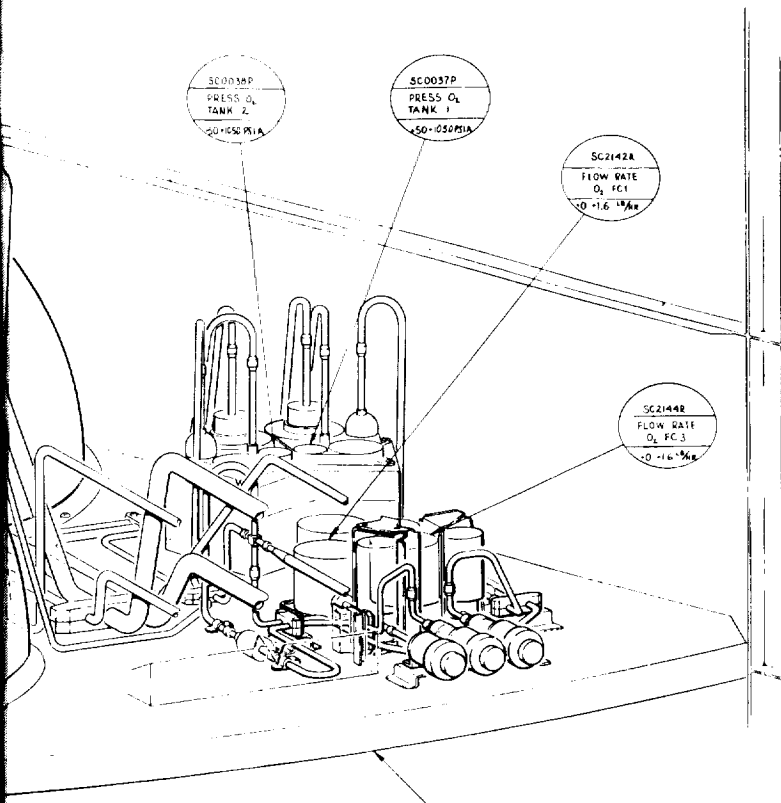
283

282

281

280

279

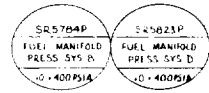
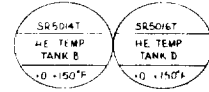


VIEW BR-BR [204] SH9

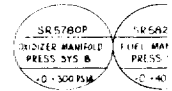
ROTATED 90° CLOCKWISE

EQUIPMENT SHELF INSTL -  
CRYOGENIC GAS STORAGE  
SYS OXYGEN  
V37-454201 (AX) (REF)

EQUIPMENT SHELF INSTL -  
CRYOGENIC GAS STORAGE  
SYSTEM HYDROGEN  
V37-454202



INSTRUMENTATION INSTL -  
REACTION CONTROL SYSTEM  
PANEL B&D  
V57-756533 (REF)



283

282

303 281

280

279

FOLDOUT FRAME 2



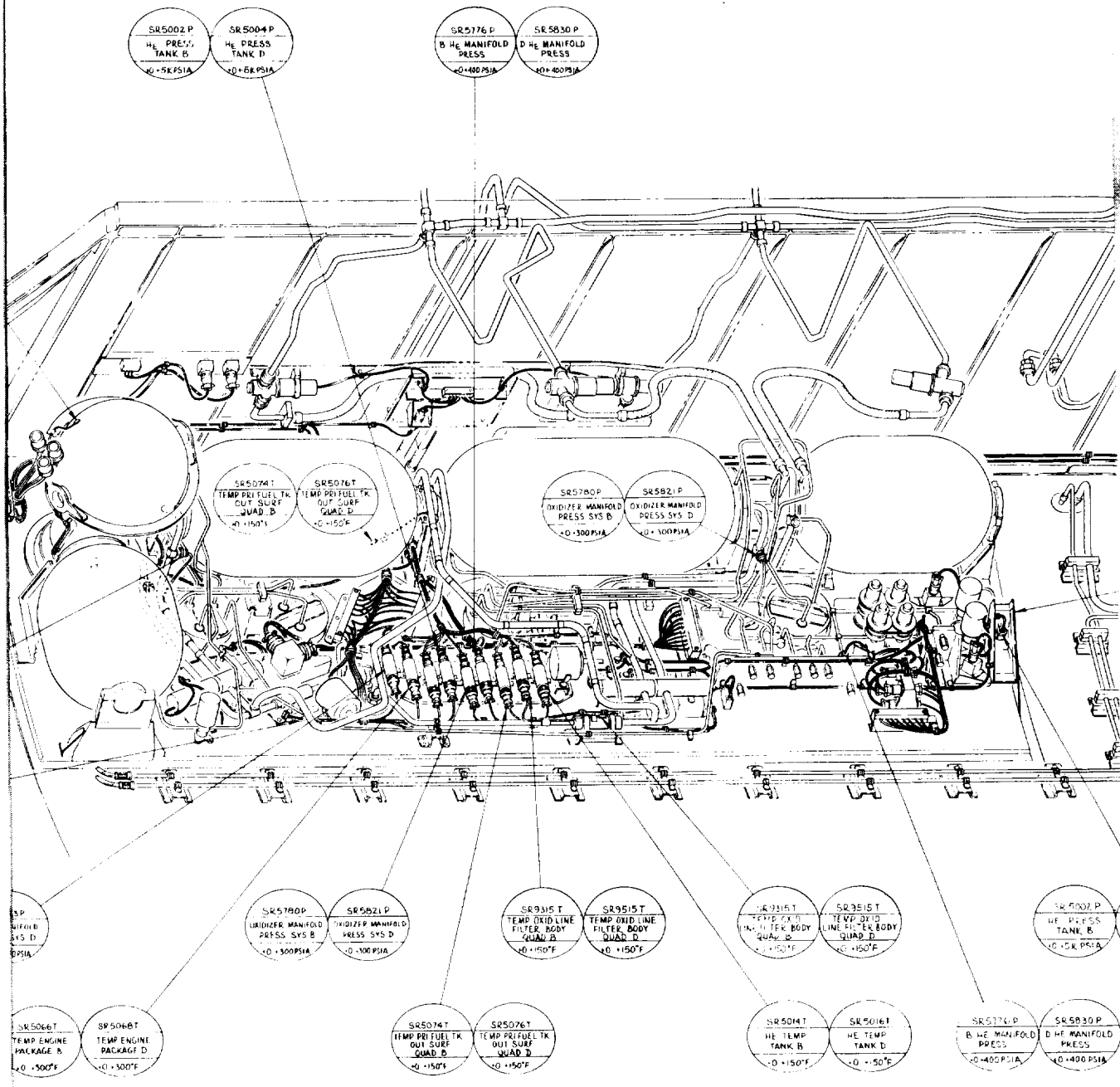


278

277

276

275



VIEW BV 232 SH 10

278

277

276

275

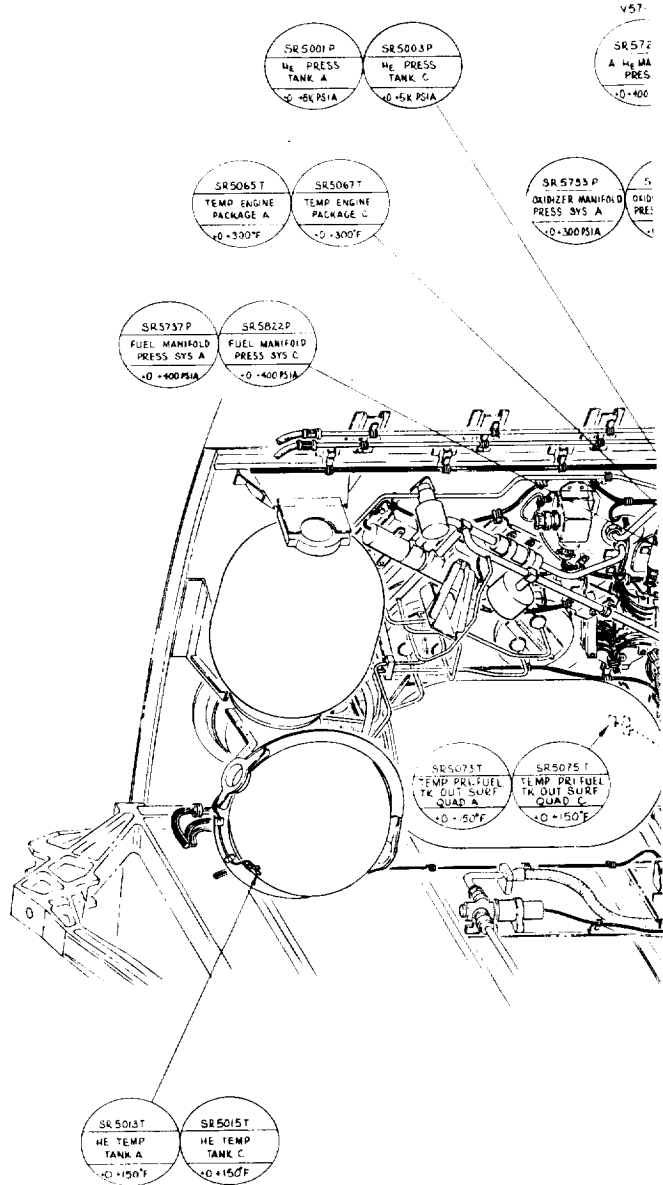
27

FOLDOUT FRAME 3

1000



HEATER INSTL- REACTION  
CONTROL SYSTEM QUADS B&D  
V57-400171 (REF)  
(HEATER, NOT SHOWN FOR CLARITY)



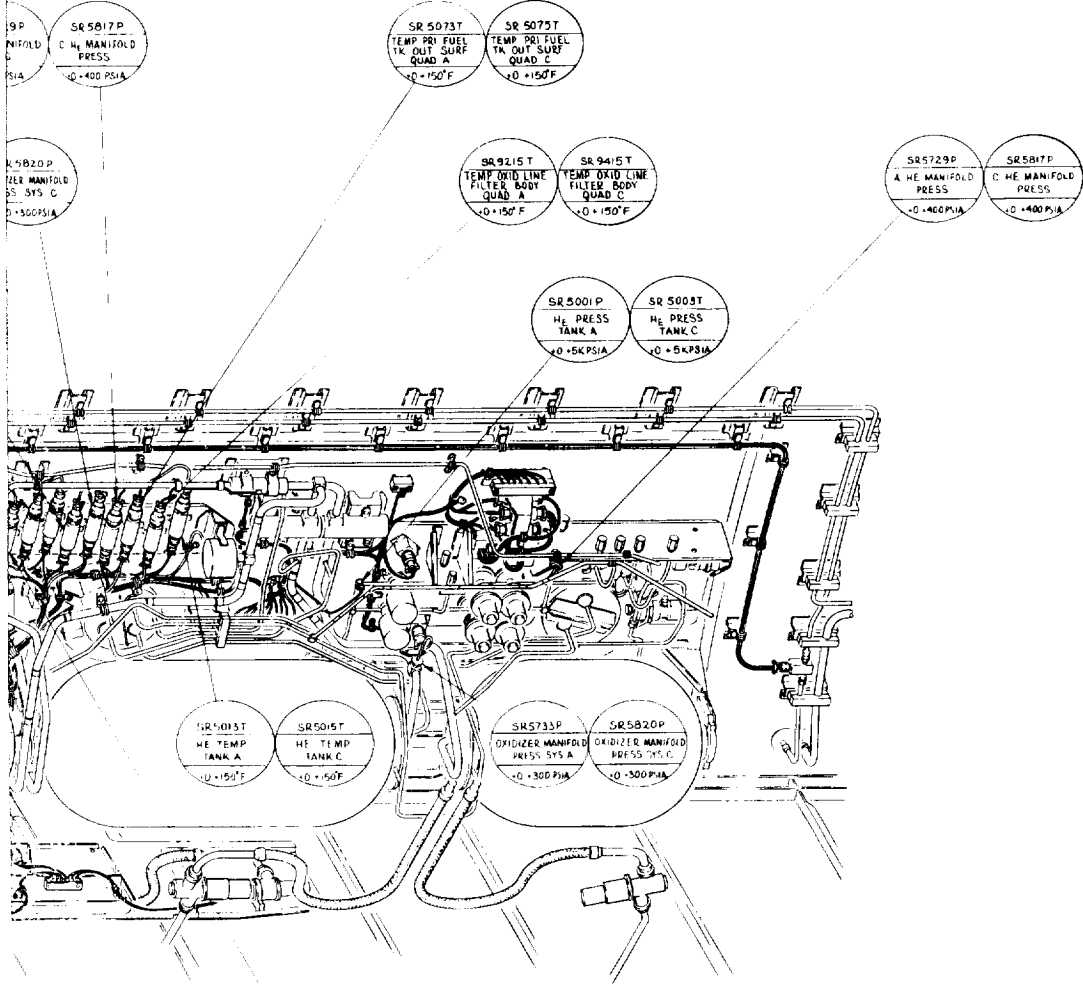
SR5004P  
He PRESS  
TANK D  
(-0 -5KPSIA)

FOLDOUT FRAME 4



| REVISIONS           |    | DATE | APPROVED |
|---------------------|----|------|----------|
| ZONE                | TR |      |          |
| DESCRIPTION         |    |      |          |
| SEE REVISION RECORD |    |      |          |

756532 (TYPICAL REF)



INSTRUMENTATION INSTL  
REACTION CONTROL SYSTEM  
QUADS A/C  
V57 756532 (REF)

VIEW BU [232] SH 10

# 1.12 STR

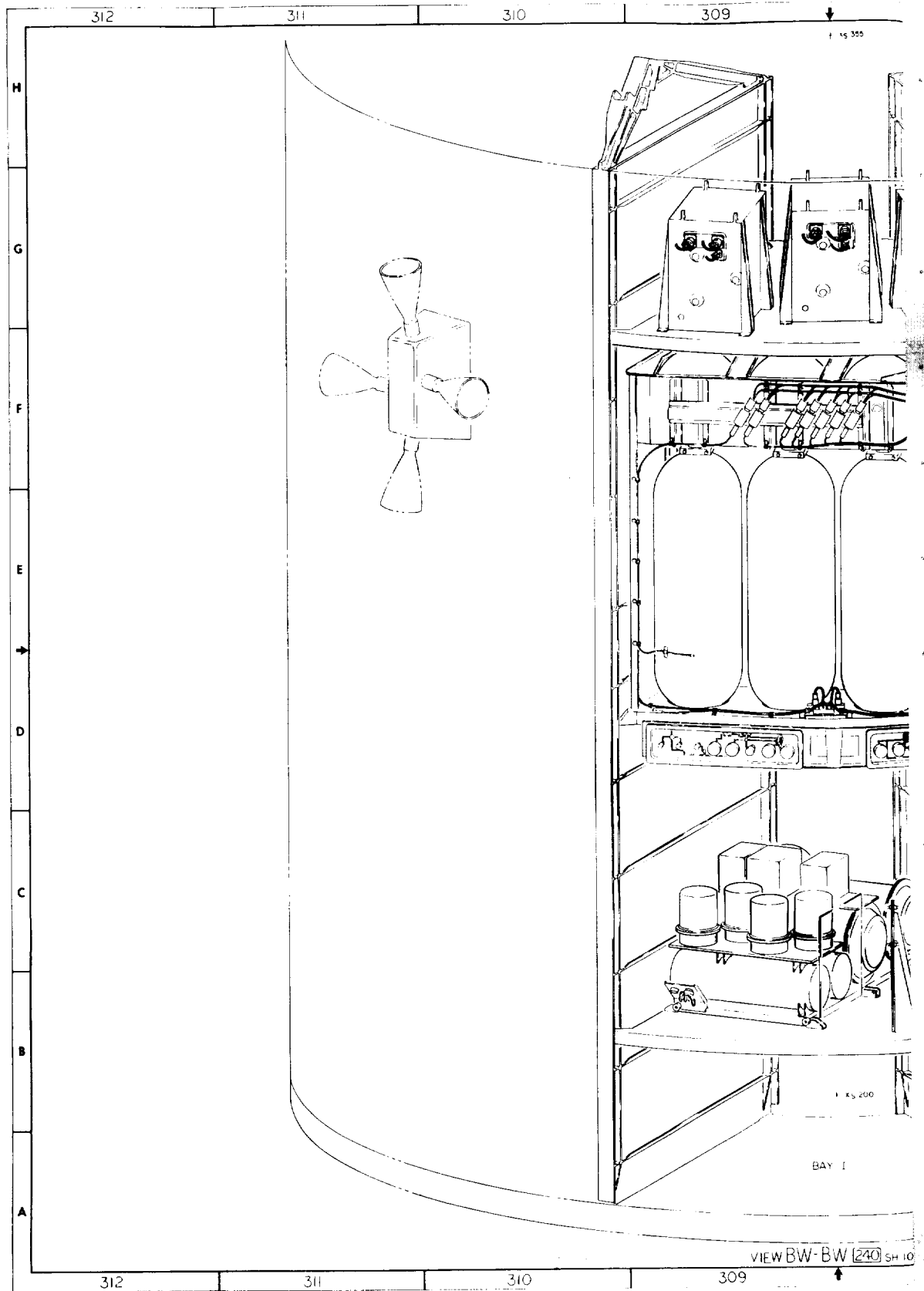
|          |                 |
|----------|-----------------|
| DATE     | 0004 08 11 1963 |
| J        | 03953           |
| 131 X 34 | PAGE 11-16      |
|          | SHEET 12        |

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent data collection procedures and the use of advanced analytical techniques to derive meaningful insights from the data.

3. The third part of the document focuses on the role of technology in data management and analysis. It discusses how modern software solutions can streamline data collection, storage, and analysis processes, thereby improving efficiency and accuracy.

4. The final part of the document provides a summary of the key findings and recommendations. It stresses the importance of regular data audits and the implementation of robust data governance policies to ensure the integrity and security of the organization's data assets.



**FOLDOUT FRAME |**

1000



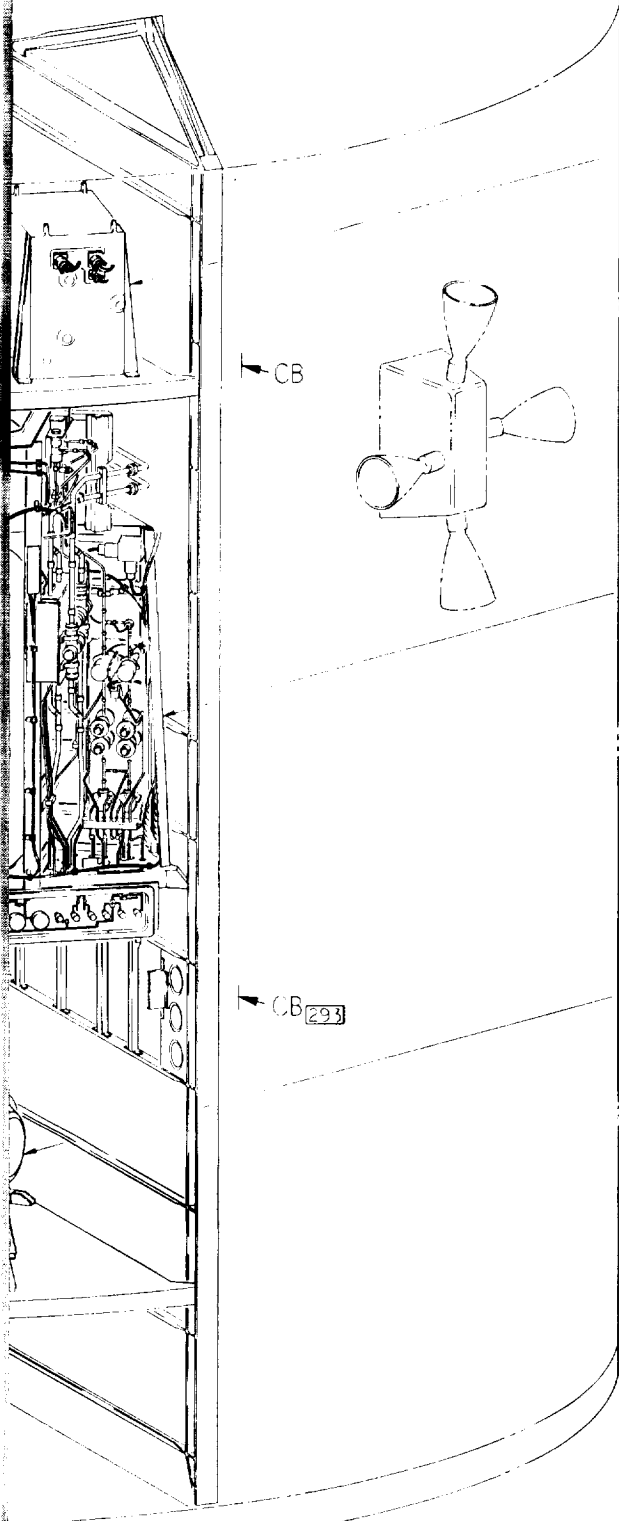
308

307

306

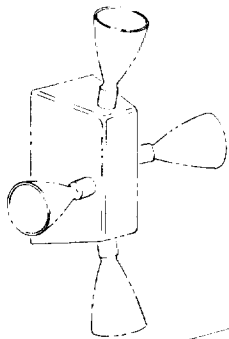
305

304



INSTALLATION PROVISIONS  
 BATTERY BAY 1  
 V57-331454 (REF)  
 BATTERY, STORAGE, SILVER  
 OXIDE-ZINC, 29 VOLT  
 ST 4610009 ME

CB

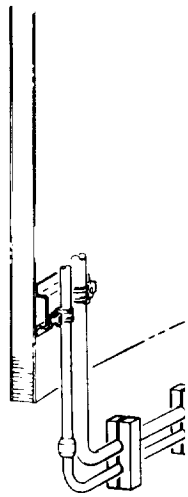


INSTL RCS PROPULSION SYSTEM  
 STORAGE MODULE  
 V57-400106 (REF)  
 MODULE - RCS, PSM  
 STRUCTURE ASSY  
 V57-323455 (REF)  
 ELECTRICAL INSTL - RCS  
 PROPELLANT STORAGE MODULE  
 V57-448040 (REF)

CB 293

FIELD SITE INSTL - SCIENTIFIC  
 EXPERIMENTS, S071/S072  
 F04-756002 (REF)  
 INSTL - EXPERIMENT S071/S072,  
 CIRCADIAN RHYTHM, POCKET MICE,  
 VINEGAR GNAT, CSM/GFE, NR/MSC  
 MH 04-02045-134 (REF) (17 ONLY)

PLUMBING INSTL - RADIATOR  
 WATER GLYCOL SYS  
 V57-610008 (REF)



308

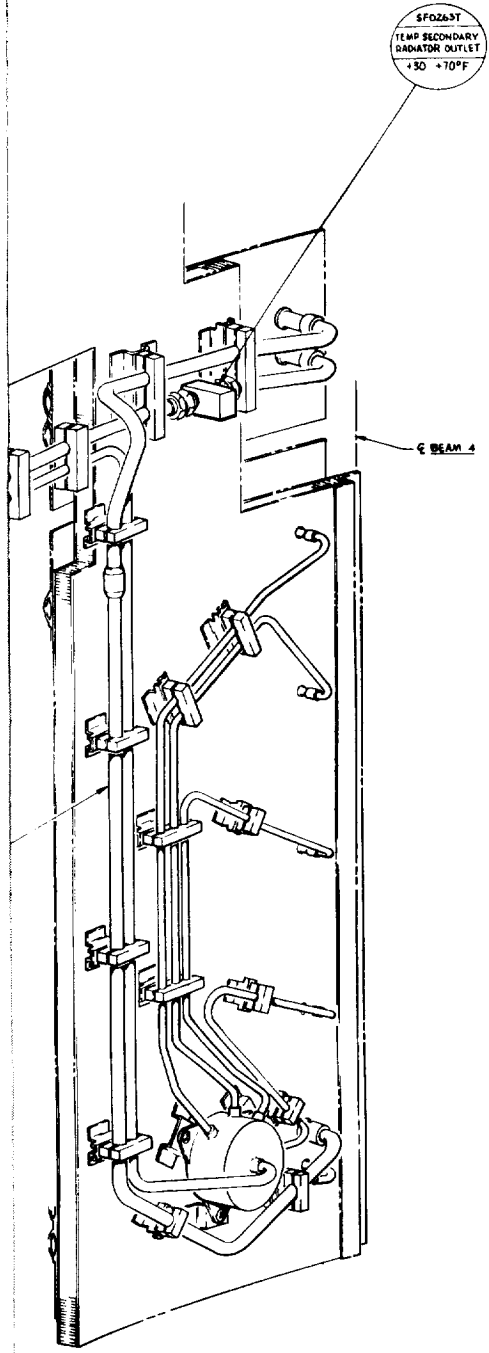
307

306

305

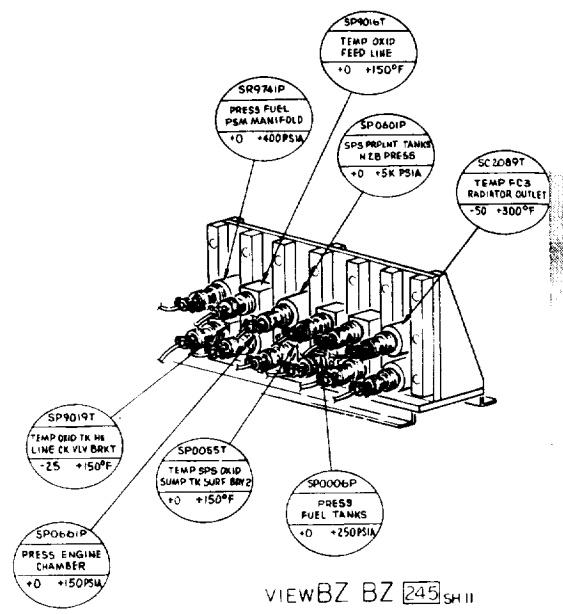
304

1000 1000

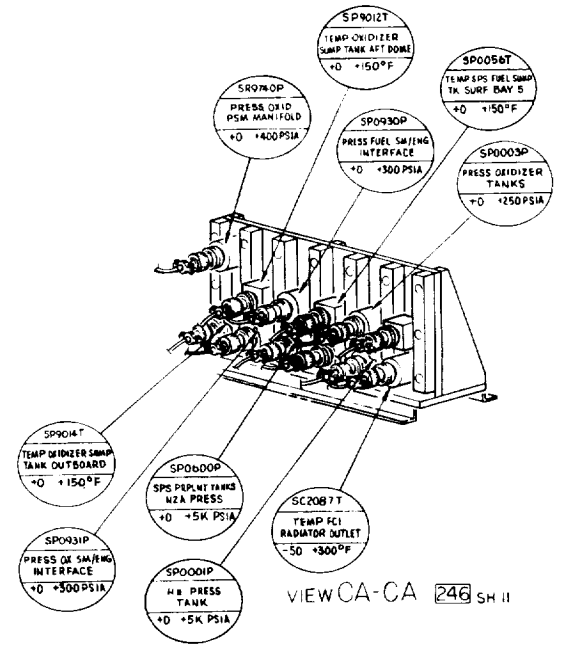


VIEW BN-BN 202 SH 9

SFO263T  
TEMP SECONDARY  
RADIATOR OUTLET  
+50 +70°F



VIEW BZ BZ 245 SH II



VIEW CA-CA 246 SH II

SFO263T  
TEMP OXID  
FEED LINE  
+0 +150°F

SR9761P  
PRESS FUEL  
PSM MANIFOLD  
+0 +400PSIA

SPO601P  
SPS PRELINT TANKS  
N2A PRESS  
+0 +5K PSIA

SC2089T  
TEMP FC3  
RADIATOR OUTLET  
-50 +300°F

SPO191T  
TEMP OXID TK IN  
LINE CK VLV BRK2  
-25 +150°F

SPO055T  
TEMP SPS OXID  
SUMP TK SURF BRK2  
+0 +150°F

SPO006P  
PRESS  
FUEL TANKS  
+0 +250PSIA

SPO661P  
PRESS ENGINE  
CHAMBER  
+0 +150PSIA

SPO101T  
TEMP OXIDIZER  
SUMP TANK AFT BOME  
+0 +150°F

SPO056T  
TEMP SPS FUEL SUMP  
TK SURF BAY 5  
+0 +150°F

SPO700P  
PRESS OXID  
PSM MANIFOLD  
+0 +400PSIA

SPO930P  
PRESS FUEL SW/ING  
INTERFACE  
+0 +300PSIA

SPO003P  
PRESS OXIDIZER  
TANKS  
+0 +250PSIA

SPO141T  
TEMP OXIDIZER SUMP  
TANK OUTBOARD  
+0 +150°F

SPO060P  
SPS PRELINT TANKS  
N2A PRESS  
+0 +5K PSIA

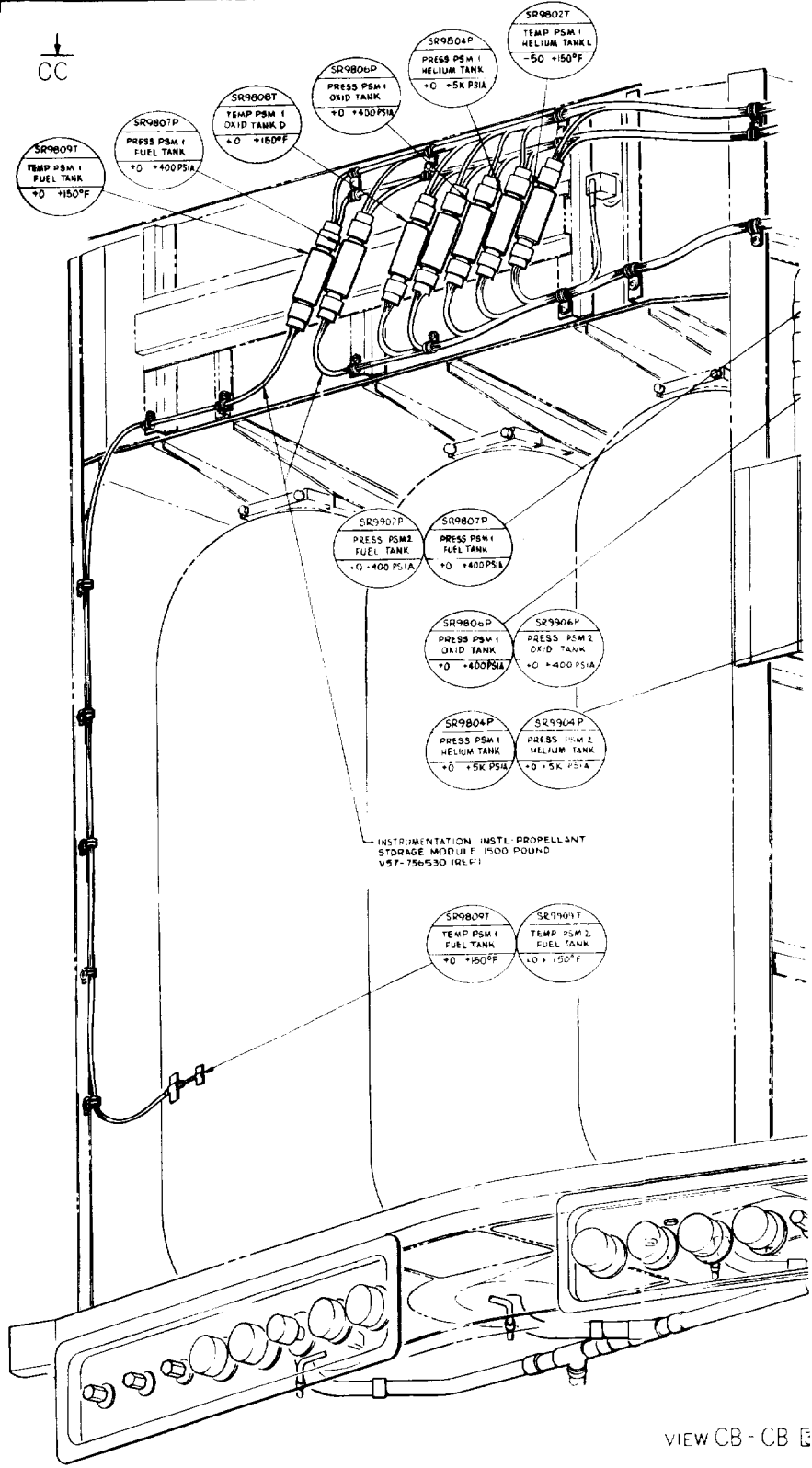
SC2087T  
TEMP FC1  
RADIATOR OUTLET  
-50 +300°F

SPO931P  
PRESS OF SW/ING  
INTERFACE  
+0 +300PSIA

SPO001P  
N2 PRESS  
TANK  
+0 +5K PSIA



CC

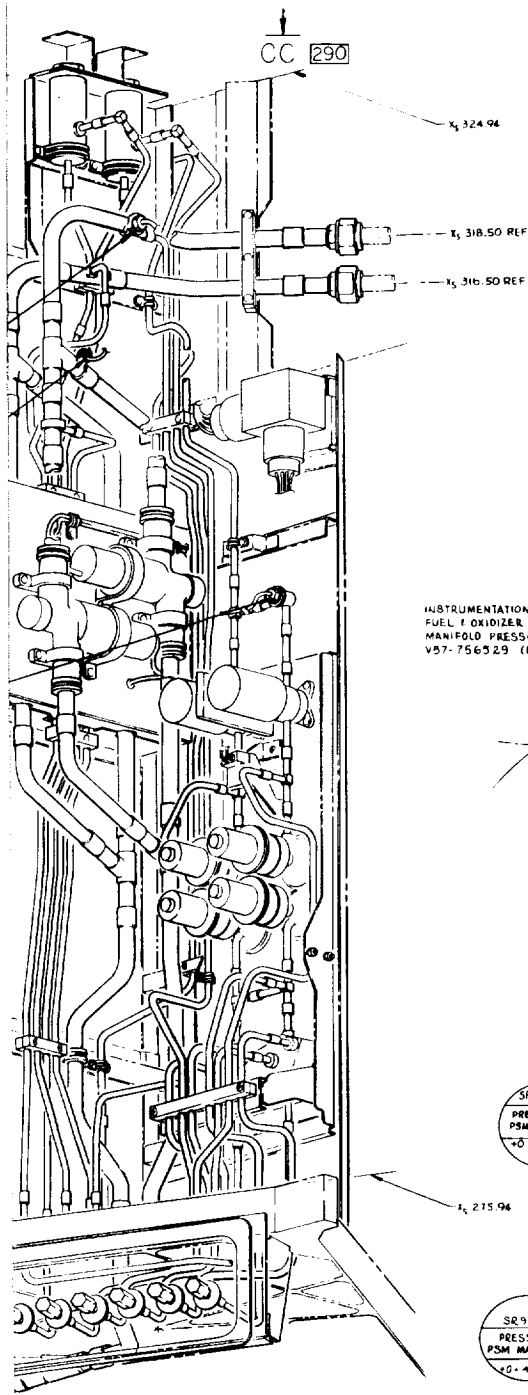


VIEW CB - CB E

FOLDOUT FRAME 4



| REVISIONS |    |                     |                 |
|-----------|----|---------------------|-----------------|
| ZONE      | TR | DESCRIPTION         | DATE APPROVED   |
| A         |    | SEE REVISION RECORD | 12/25/71 R ROSS |



INSTRUMENTATION INSTL  
FUEL / OXIDIZER  
MANIFOLD PRESSURE  
V57-756529 (REF)

SR9902T      SR9802T  
TEMP PSM 2      TEMP PSM 1  
HELIUM TANK L      HELIUM TANK L  
-50 +150°F      -50 +150°F

SR9740P      SR9808T      SR9908T  
PRESS OXID      TEMP PSM 1      TEMP PSM 2  
PSM MANIFOLD      OXID TANK D      OXID TANK D  
+0 +400PSIA      +0 +150°F      +0 +150°F

SR9741P  
PRESS FUEL  
PSM MANIFOLD  
+0 +400PSIA

VIEW CC-CC 292  
ROTATED CW 45°  
LOOKING AFT

# 1.13 STR

