

QUESTIONS RELATIVE TO THE CONTENTS OF THIS

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ELECTRICAL POWER SUBSYSTEM

A. POWER GENERATION

1. DC SYSTEM

(a) FUEL CELL POWER PLANTS (3)

(b) CRYOGENIC STORAGE SYSTEM

**(c) ENTRY & POST LANDING
BATTERIES (A, B, & C)**

2. AC SYSTEM

SOLID STATE INVERTERS (3)

ELECTRICAL POWER SUBSYSTEM

B. POWER DISTRIBUTION & CONTROLS

1. DC DISTRIBUTION

(a) BUS SYSTEM

(b) UNDERVOLTAGE SENSING

(c) FUEL CELL CONTROLS

(1) DC BUS CONNECTION

(2) OVERLOAD/REVERSE CURRENT SENSING

2. AC DISTRIBUTION

(a) BUS SYSTEM

(b) INVERTER CONTROL CIRCUITS

(1) AC BUS CONNECTION

(2) OVERLOAD SENSING

(3) OVER/UNDER VOLTAGE SENSING

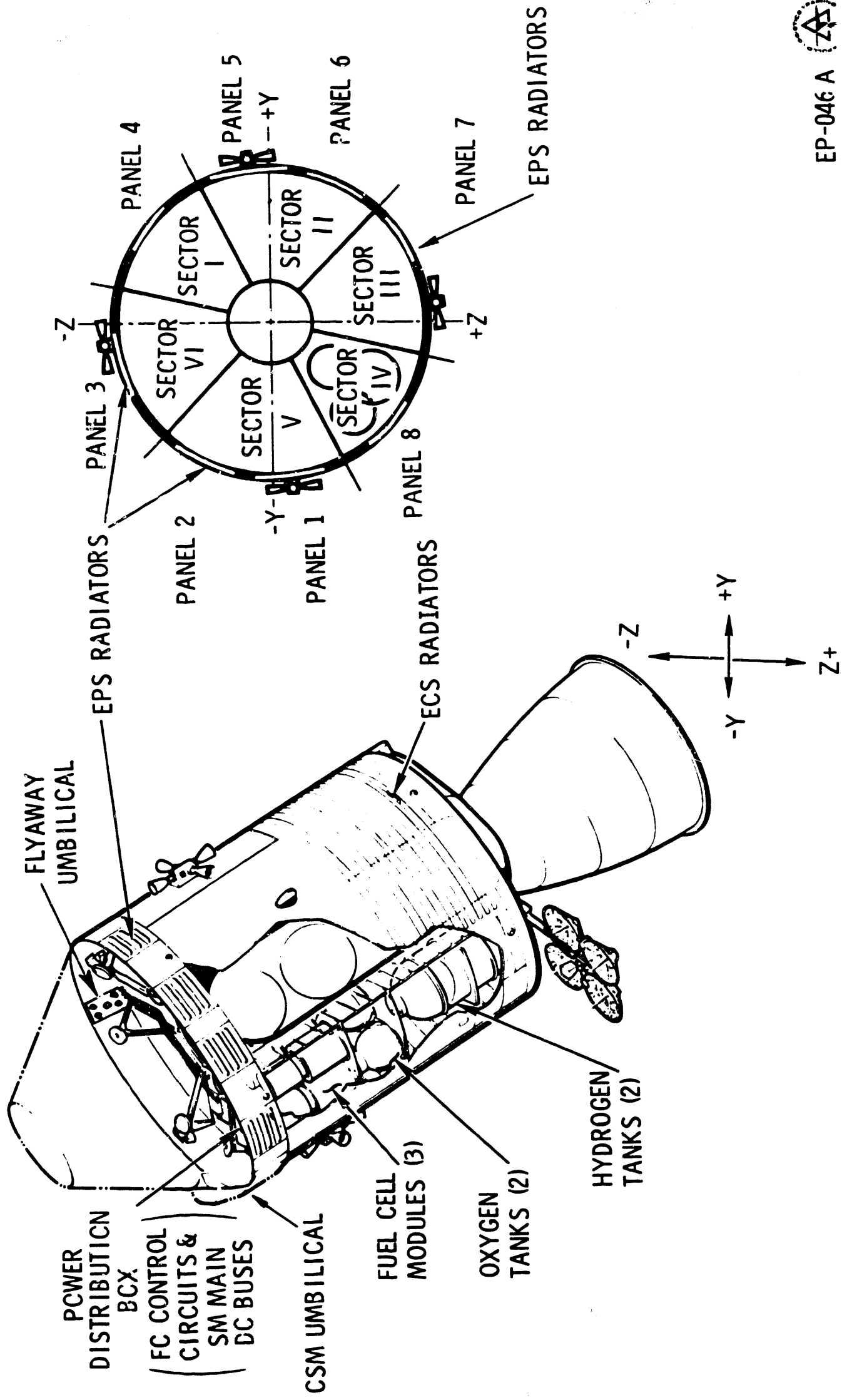


ELECTRICAL POWER SUBSYSTEM

C. SPECIAL CIRCUITS

- 1. BATTERY CHARGER (1)**
- 2. PYROTECHNIC BATTERIES (2)**

ELECTRICAL POWER SYSTEM

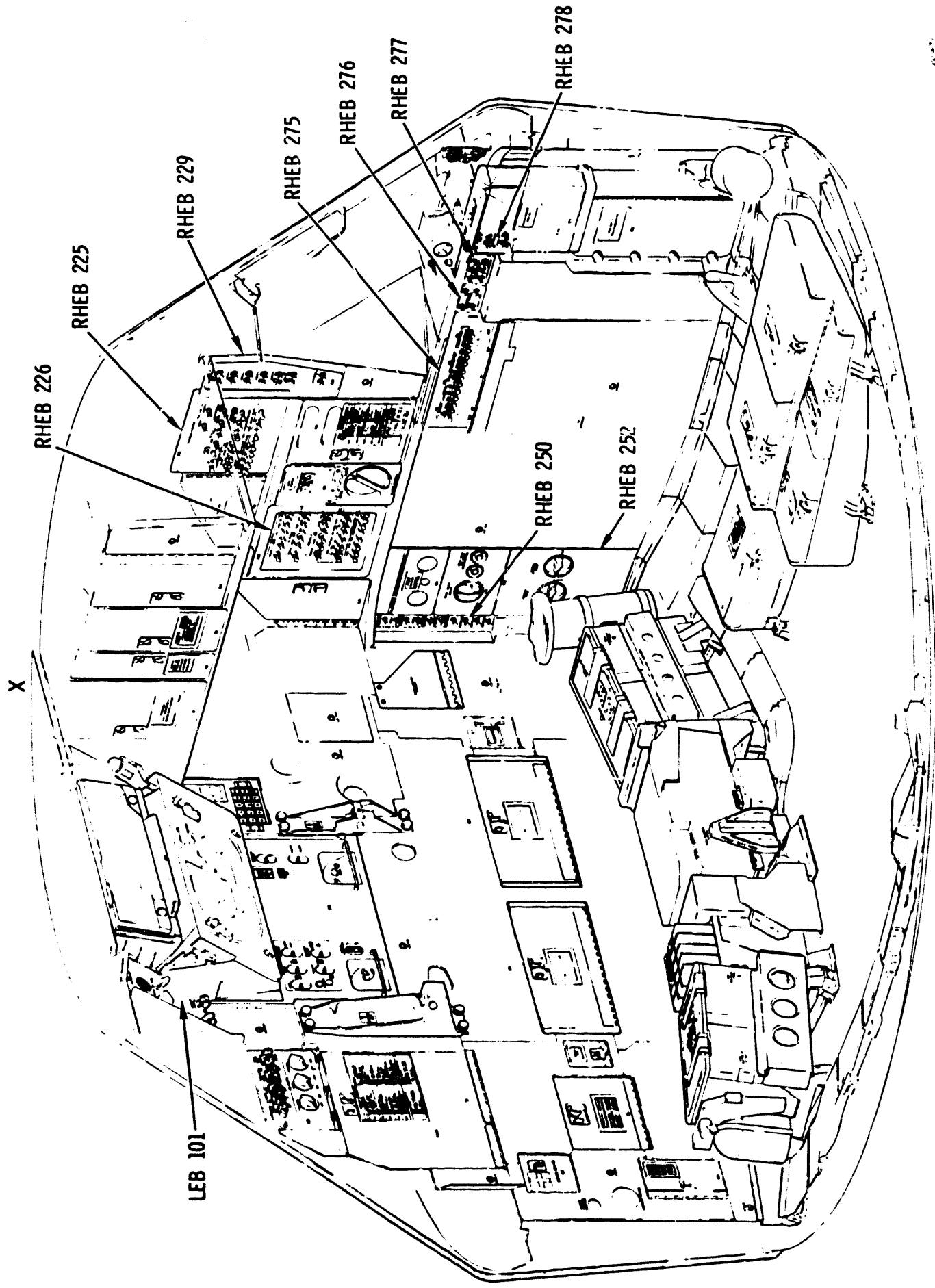


EP-046 A (A)

APOLLO CM INTERIOR CONFIGURATION

LEB, RHEB, RHFB, & RIGHT AB

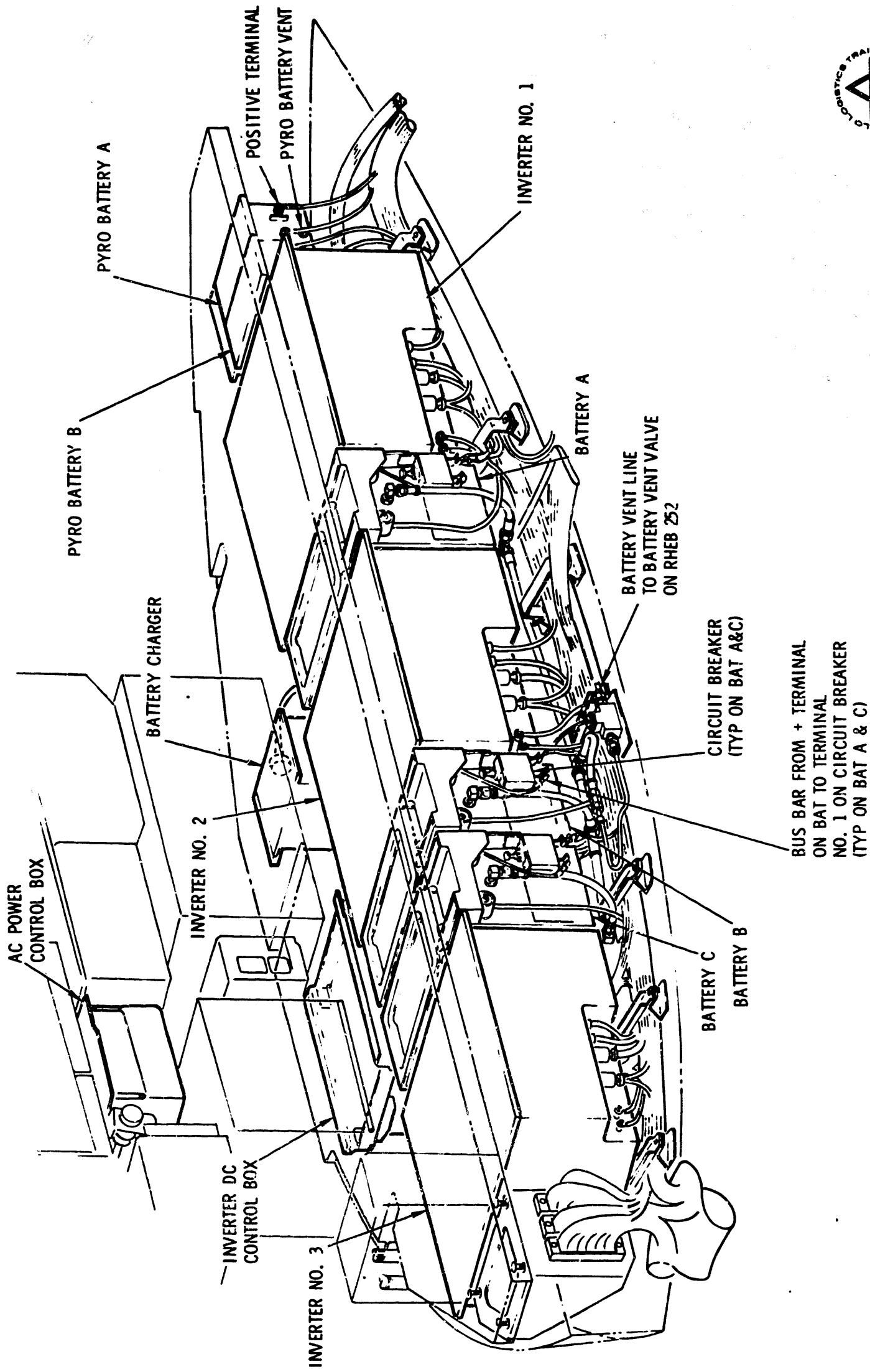
+Z +Y



VIEW-LOOKING DOWN & OUTBOARD
AFT BLKHD, L.E.B. & RH EQUIP BAY

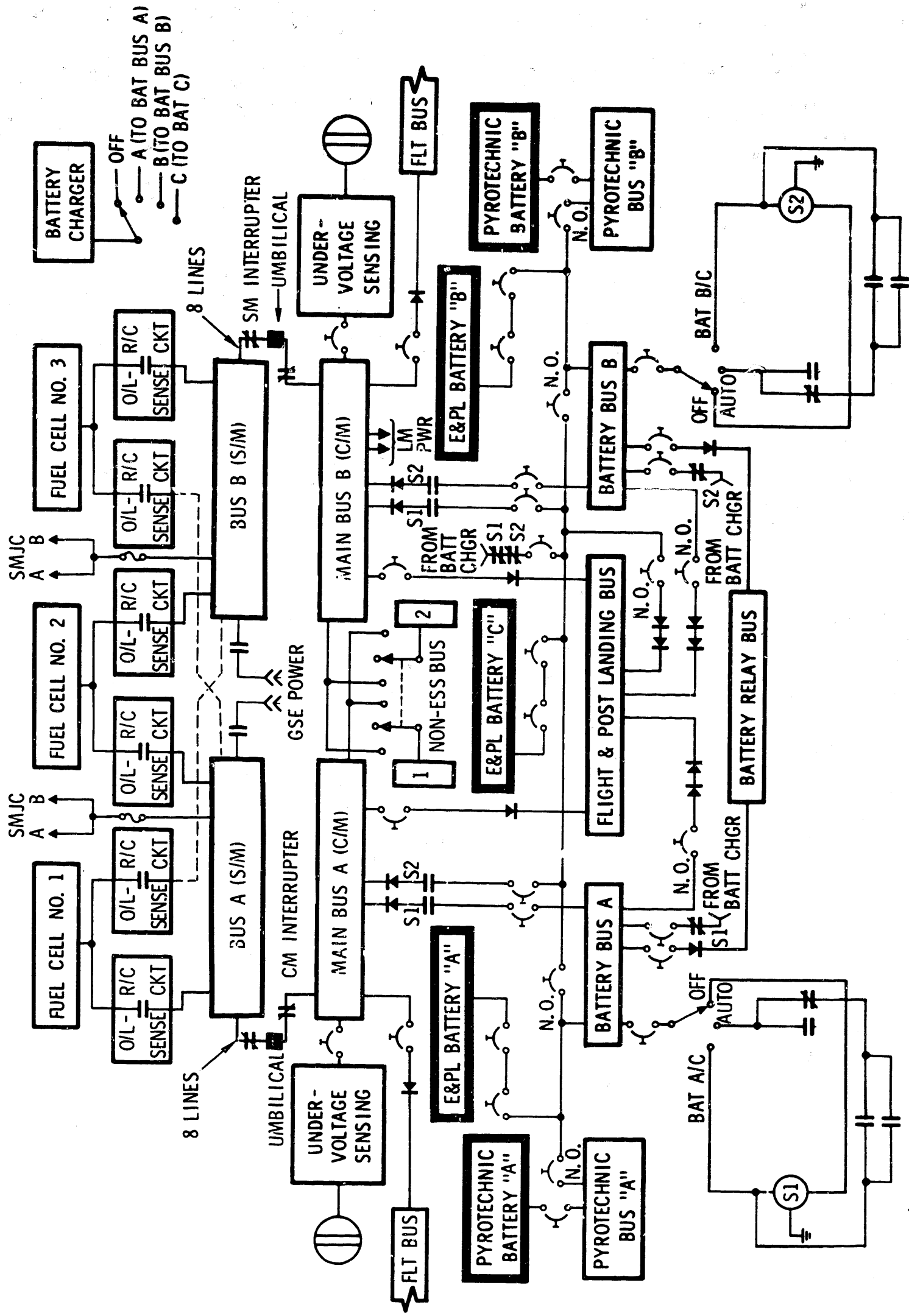


EPS COMPONENTS LOWER EQUIPMENT BAY (BLOCK II)



DC POWER DISTRIBUTION

SIMPLIFIED SCHEMATIC DIAGRAM



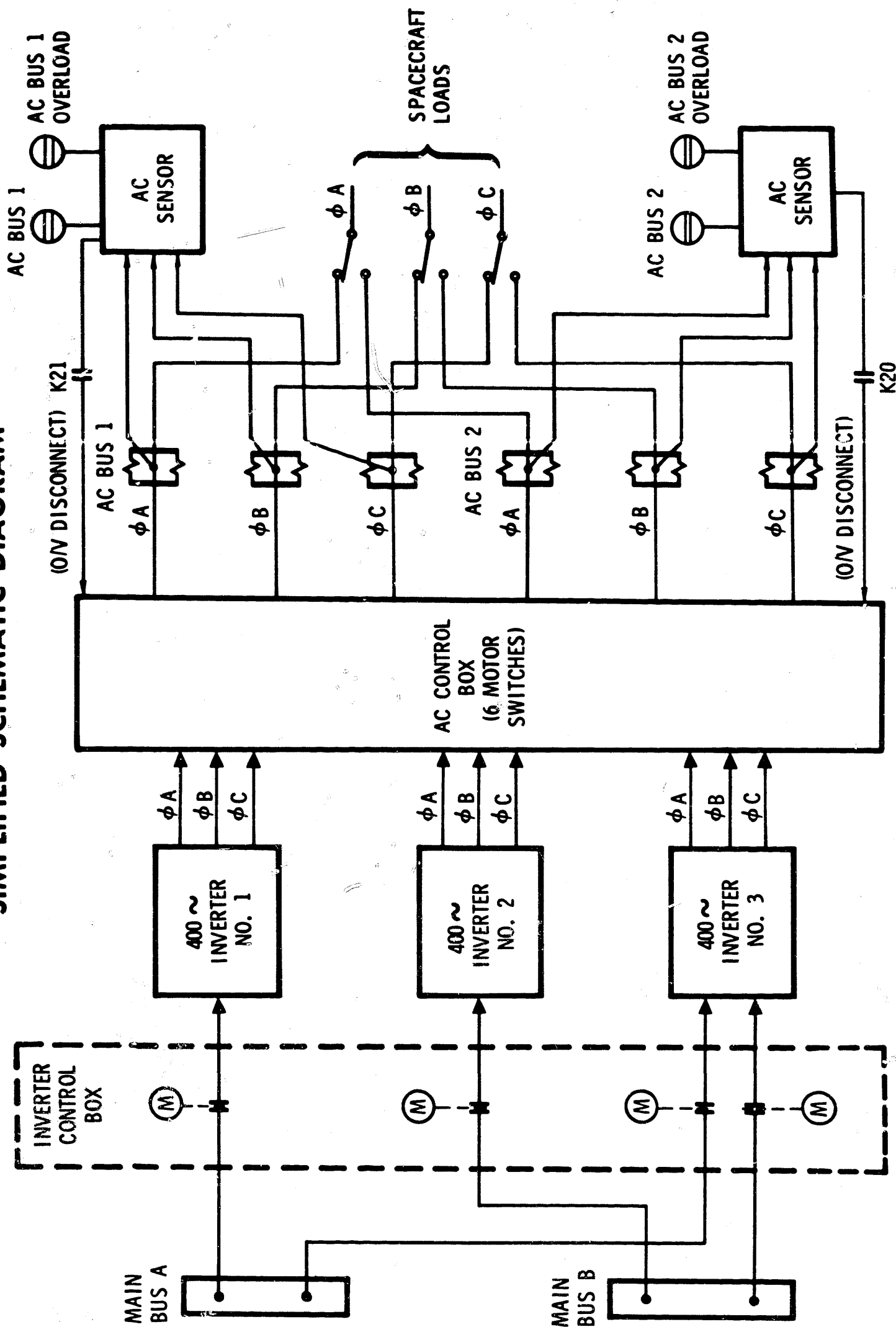
AUTO RCS TRANSFER RELAYS

AUTO RCS TRANSFER RELAYS

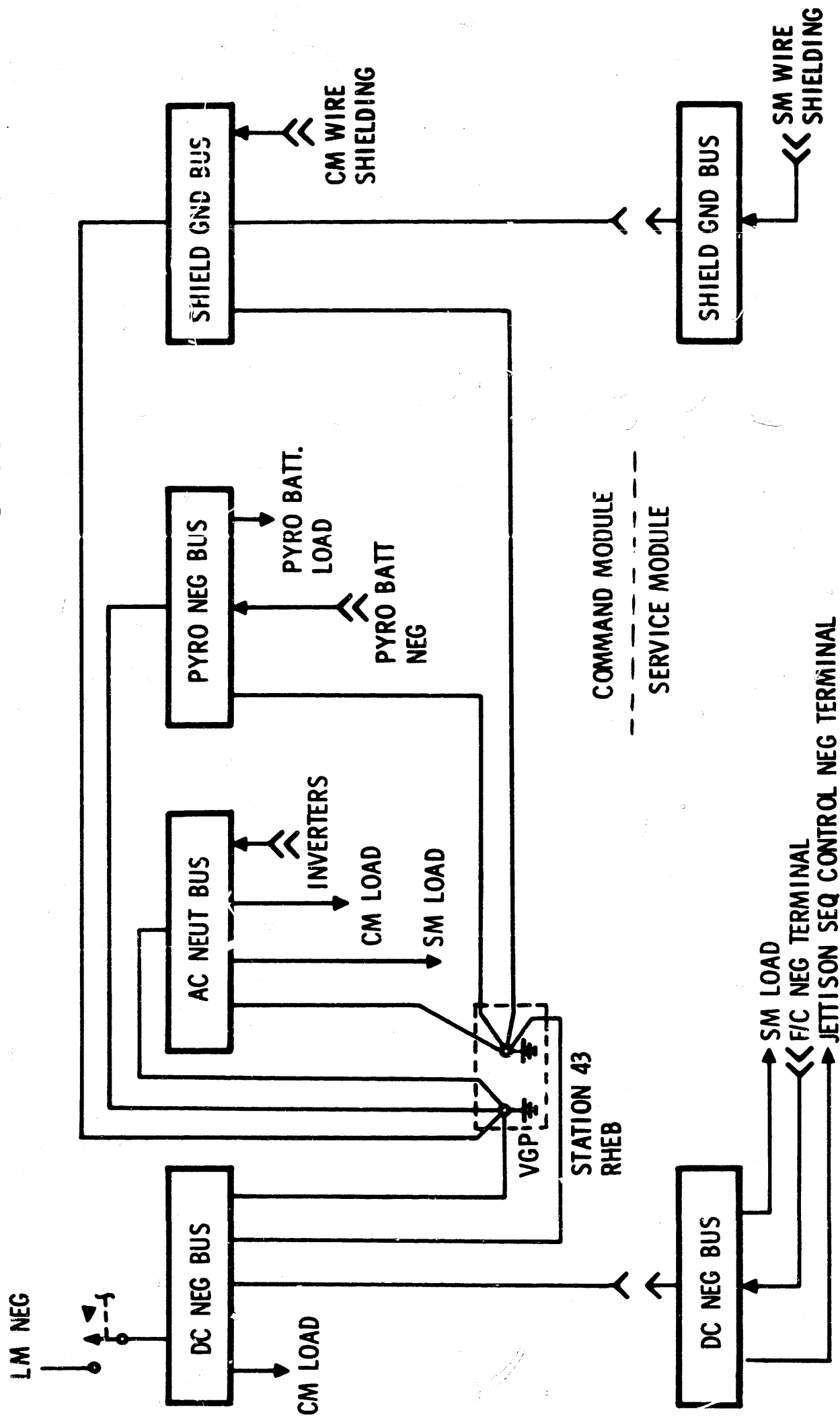
EP-606K

AC POWER DISTRIBUTION

SIMPLIFIED SCHEMATIC DIAGRAM

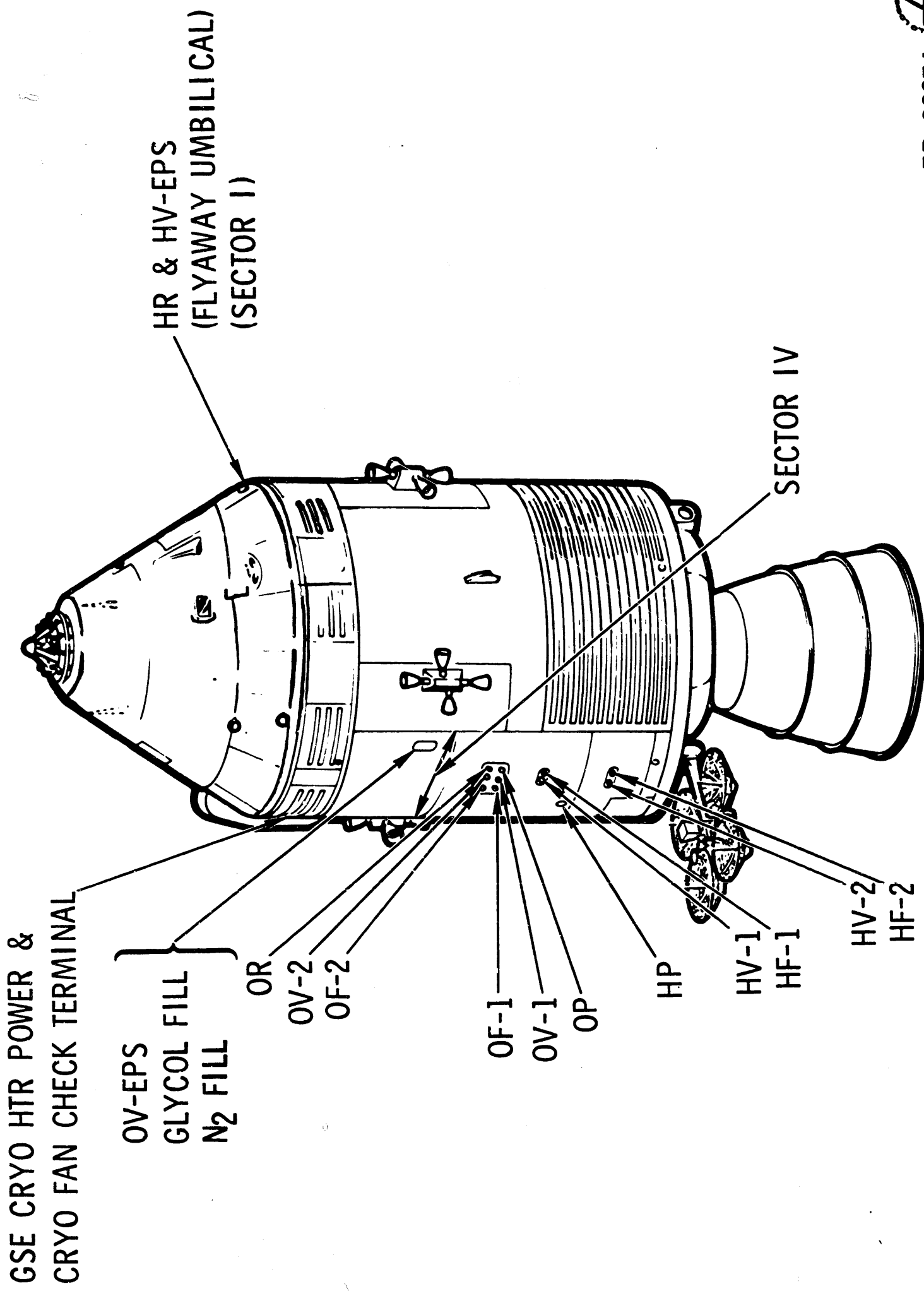


VEHICLE GROUND POINT



EP-038C (A)

SM CRYOGENIC SYSTEM INTERFACE (EXTERNAL)



CRYOGENIC STORAGE SYSTEM

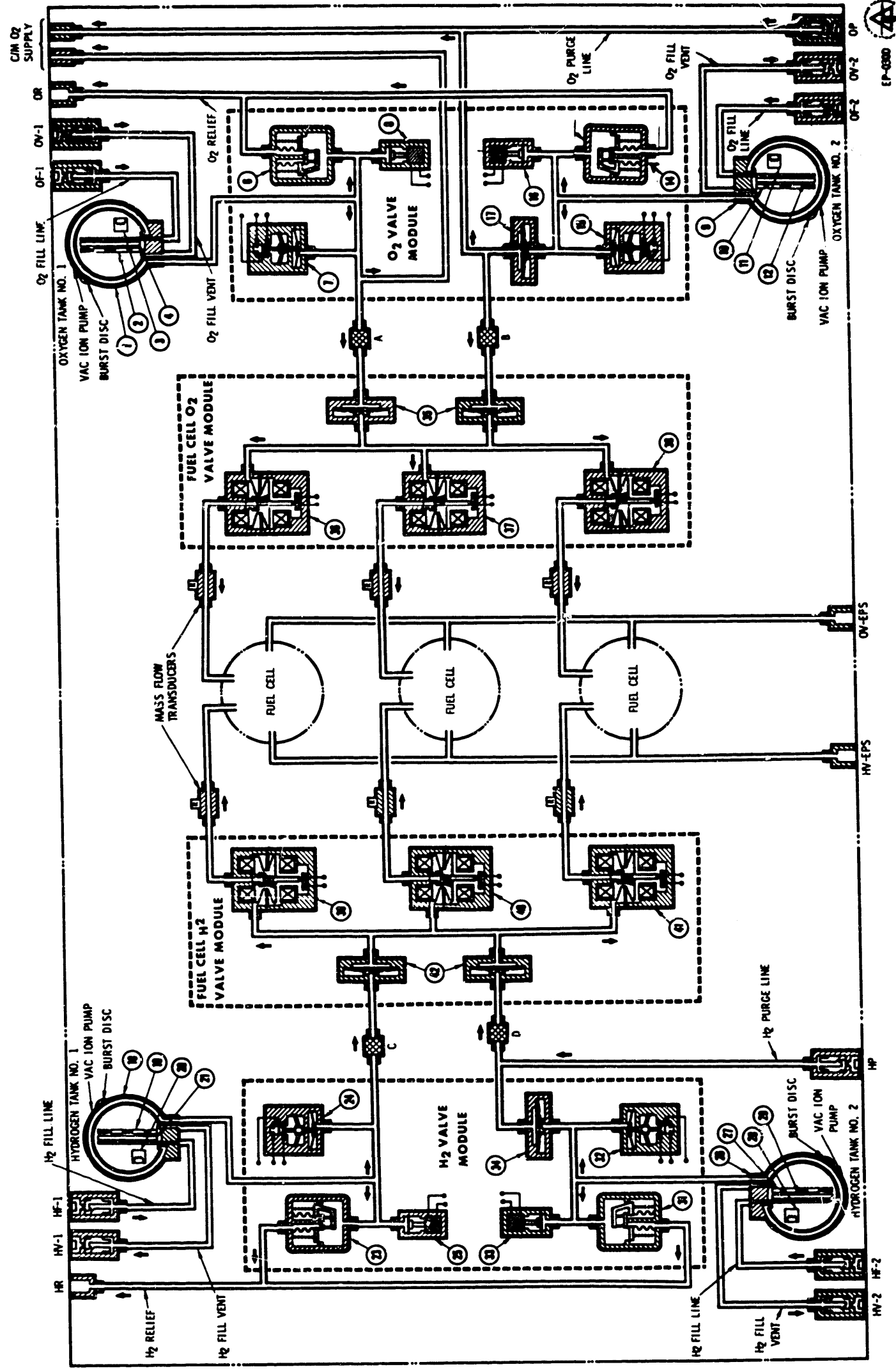
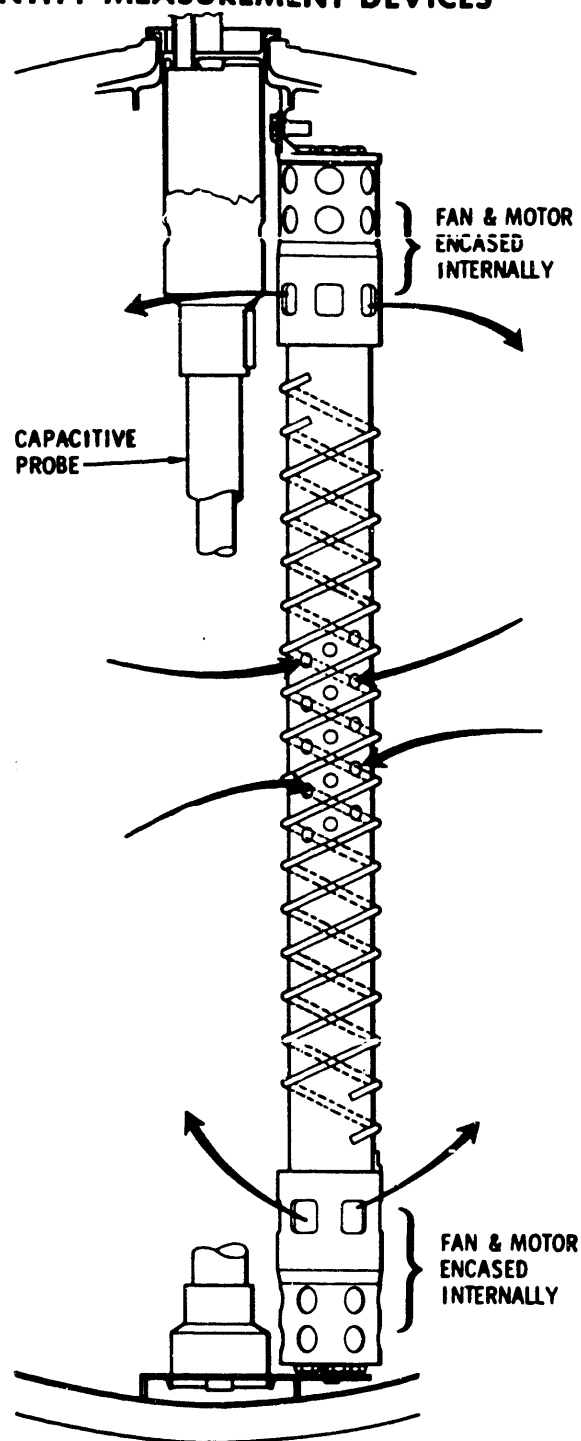


TABLE 2-2		ITEM NO.	
DESCRIPTION		DESCRIPTION	
1	O2 TANK 1	31	H2 TANK 2 PRESSURE RELIEF VALVE
2	HEATER ELEMENT & FAN MOTORS	32	H2 TANK 2 PRESSURE SWITCH
3	TEMPERATURE SENSOR PROBE	33	H2 TANK 2 PRESSURE TRANSDUCER
4	DENSITY SENSOR PROBE	34	H2 TANK 2 CHECK VALVE
5	(DELETED)	C	H2 FILTER, TANK 1
6	O2 TANK 1 PRESSURE RELIEF VALVE	D	H2 FILTER, TANK 2
7	O2 TANK 1 PRESSURE SWITCH	35	FUEL CELL #2 CHECK VALVE (2)
8	O2 TANK 1 PRESSURE TRANSDUCER	36	FUEL CELL #1 O2 SHUT OFF VALVE
9	O2 TANK 2	37	FUEL CELL #2 O2 SHUT OFF VALVE
10	HEATER ELEMENT AND FAN MOTORS	38	FUEL CELL #3 O2 SHUT OFF VALVE
11	TEMPERATURE SENSOR PROBE	39	FUEL CELL #1 H2 SHUT OFF VALVE
12	DENSITY SENSOR PROBE	40	FUEL CELL #2 H2 SHUT OFF VALVE
13	(DELETED)	41	FUEL CELL #3 H2 SHUT OFF VALVE
14	O2 TANK 2 PRESSURE RELIEF VALVE	42	FUEL CELL H2 CHECK VALVE
15	O2 TANK 2 PRESSURE SWITCH	DISCONNECT KEY	
16	O2 TANK 2 PRESSURE TRANSDUCER	DESCRIPTION	
17	O2 TANK 2 CHECK VALVE	OR	OXYGEN RELIEF
A	O2 FILTER, TANK 1	OV-1	OXYGEN VENT, TANK 1
B	O2 FILTER, TANK 2	OF-1	OXYGEN FILL, TANK 1
18	H2 TANK 1	OP	OXYGEN PURGE
19	HEATER ELEMENT & FAN MOTORS	OV-2	OXYGEN VENT, TANK 2
20	TEMPERATURE SENSOR PROBE	OF-2	OXYGEN FILL, TANK 2
21	DENSITY SENSOR PROBE	OV-EPS	OXYGEN VENT, FUEL CELLS
22	(DELETED)	HR	HYDROGEN RELIEF
23	H2 TANK 1 PRESSURE RELIEF VALVE	HV-1	HYDROGEN VENT, TANK 1
24	H2 TANK 1 PRESSURE SWITCH	HF-1	HYDROGEN FILL, TANK 1
25	H2 TANK 1 PRESSURE TRANSDUCER	HV-2	HYDROGEN VENT, TANK 2
26	H2 TANK 2	HF-2	HYDROGEN FILL, TANK 2
27	HEATER ELEMENT & FAN MOTORS	HP	HYDROGEN PURGE
28	TEMPERATURE SENSOR PROBE	HV-EPS	HYDROGEN VENT, FUEL CELLS
29	DENSITY SENSOR PROBE		
30	(DELETED)		

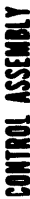
CRYOGENIC PRESSURIZATION & QUANTITY MEASUREMENT DEVICES



EP-086B



CONCRETE



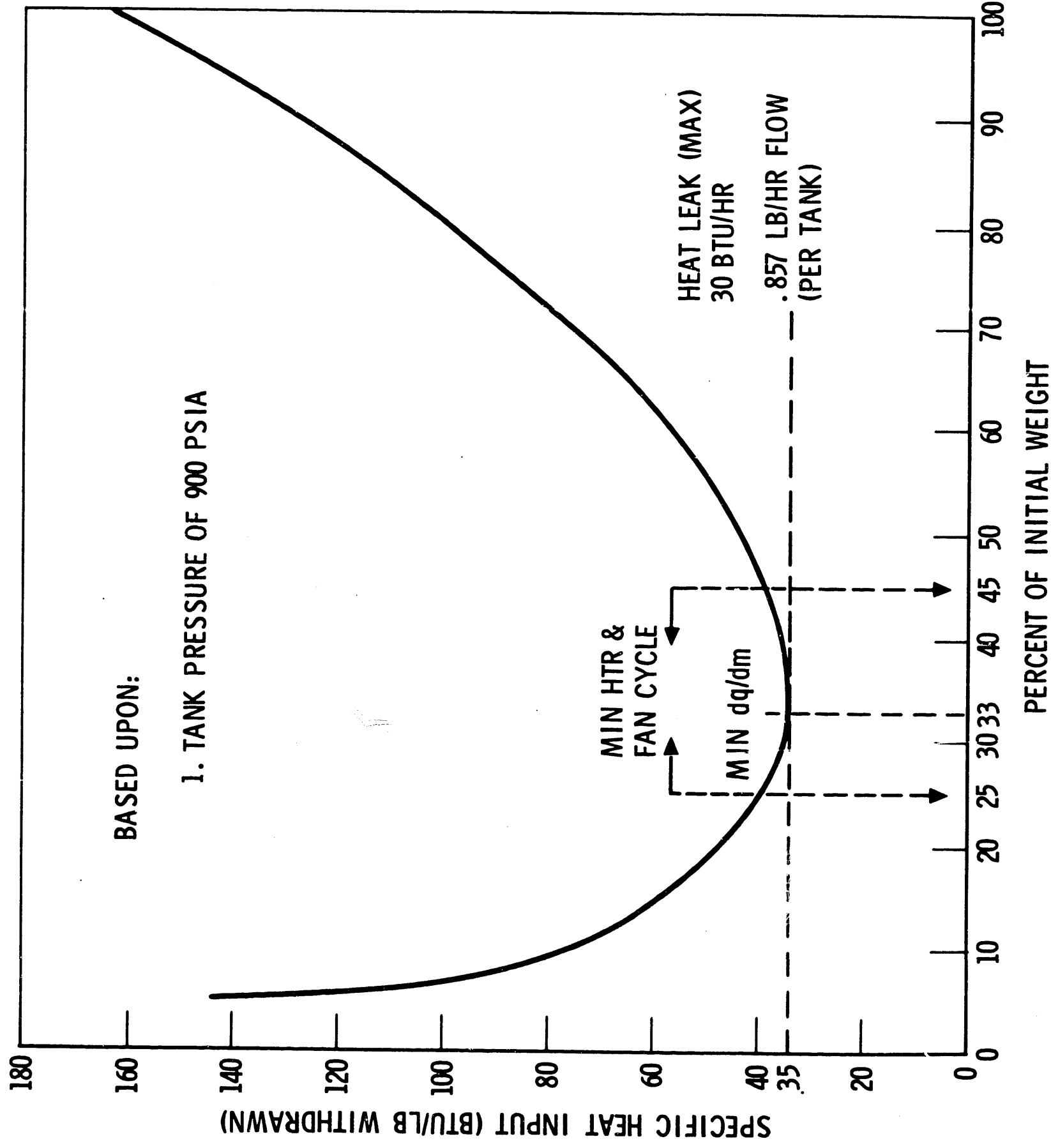
① FAN MOTOR FUSES ON SC 102, 103, 104, 106 & SUBS

② VAC 10W PUMP FUSES ON SC 103 & 104

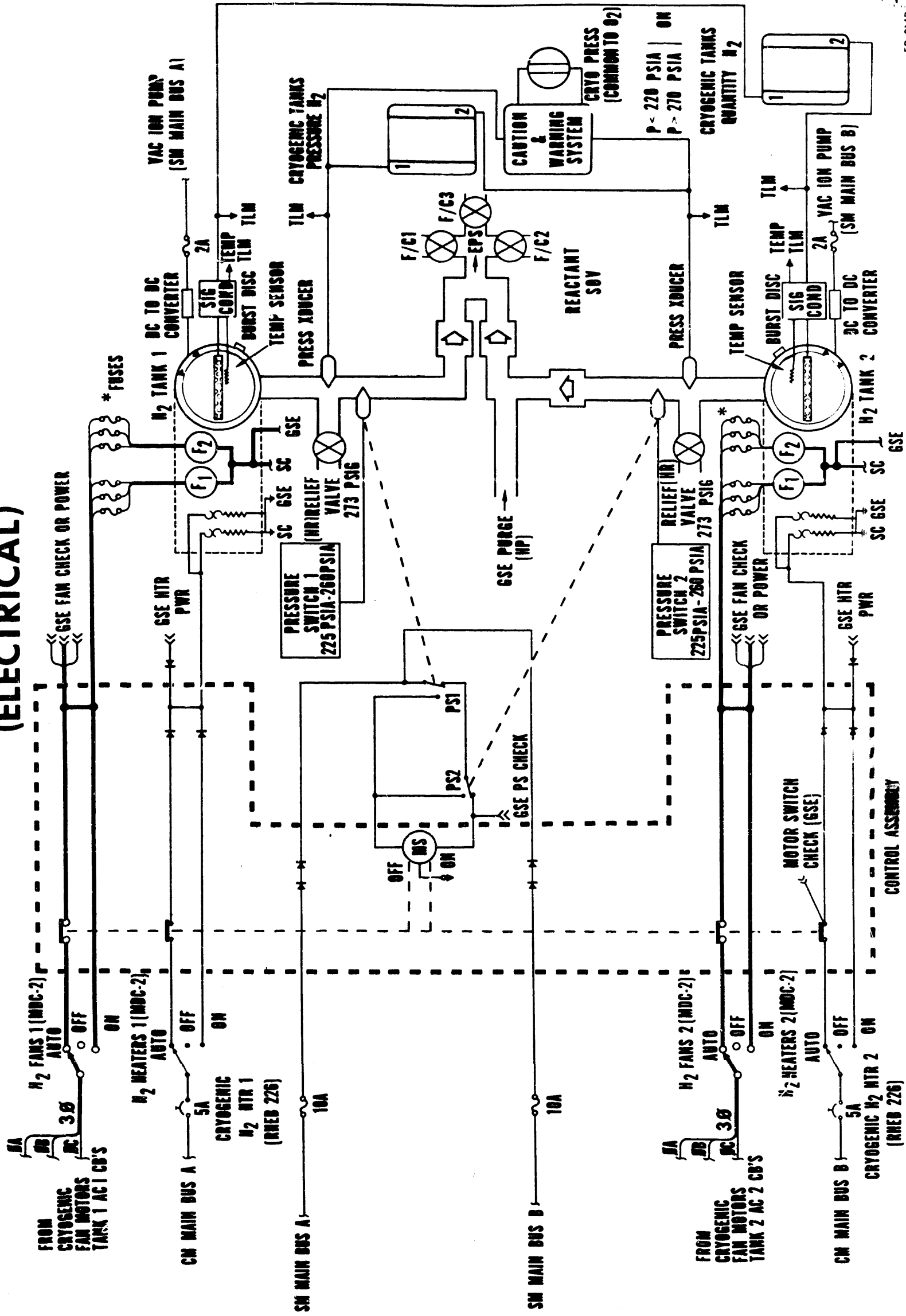
O₂ VACUUM PUMPS CO'S ON SC 102, 106 & SUBS



OXYGEN SPECIFIC HEAT INPUT

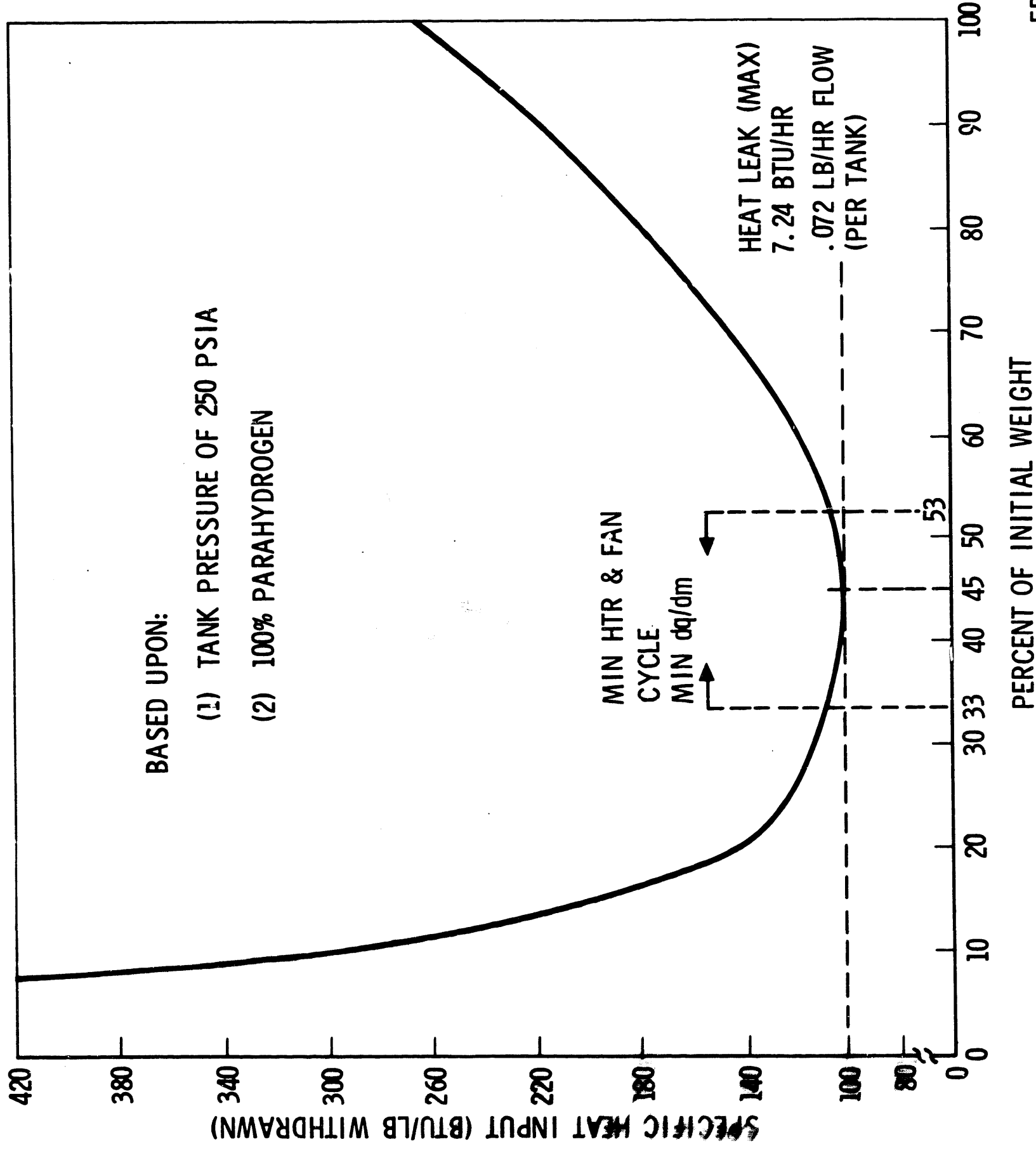


HYDROGEN STORAGE SYSTEM (ELECTRICAL)



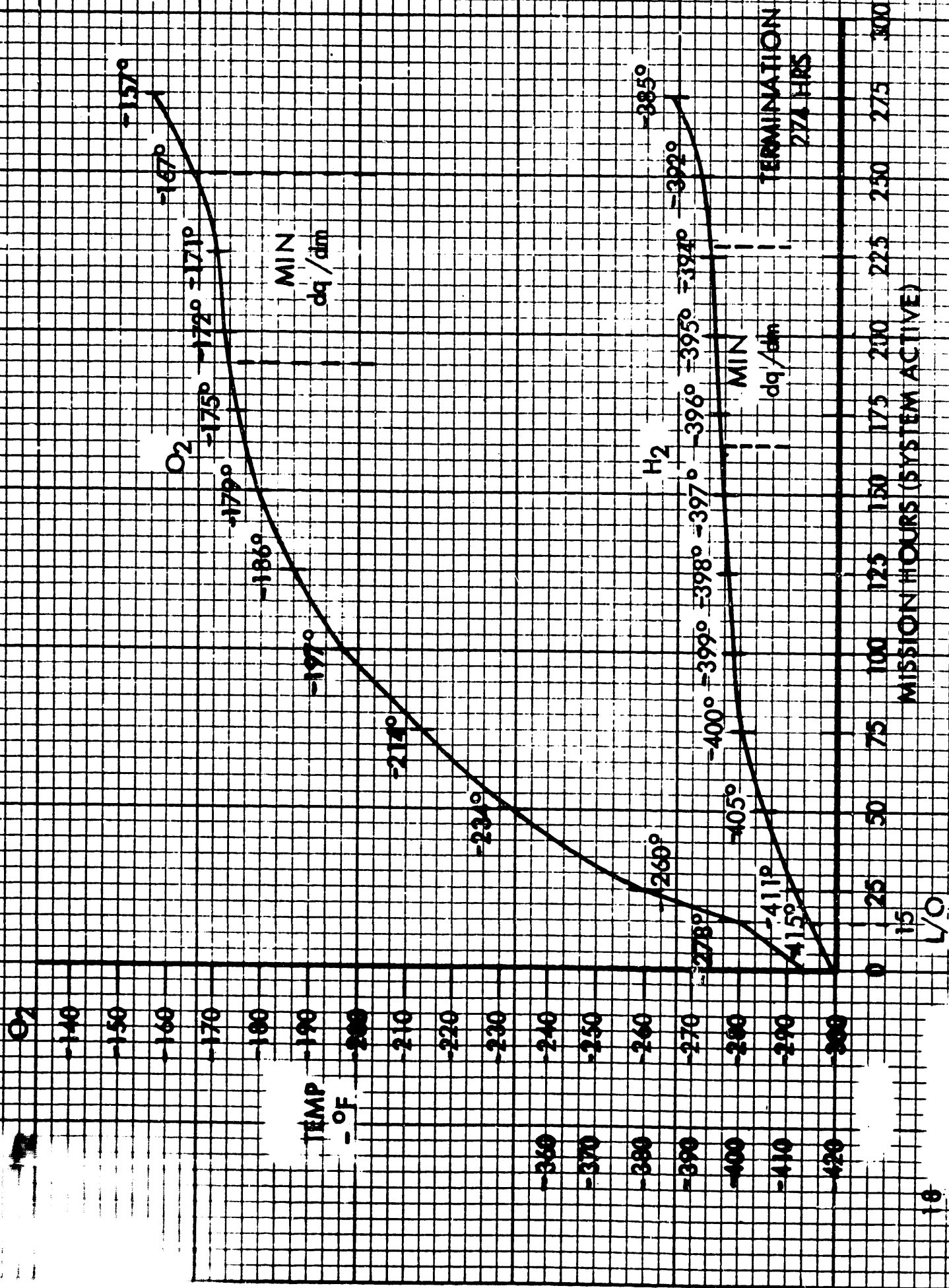
* FUSES ON SC 102, 103, 104, 105 & 106

HYDROGEN SPECIFIC HEAT INPUT



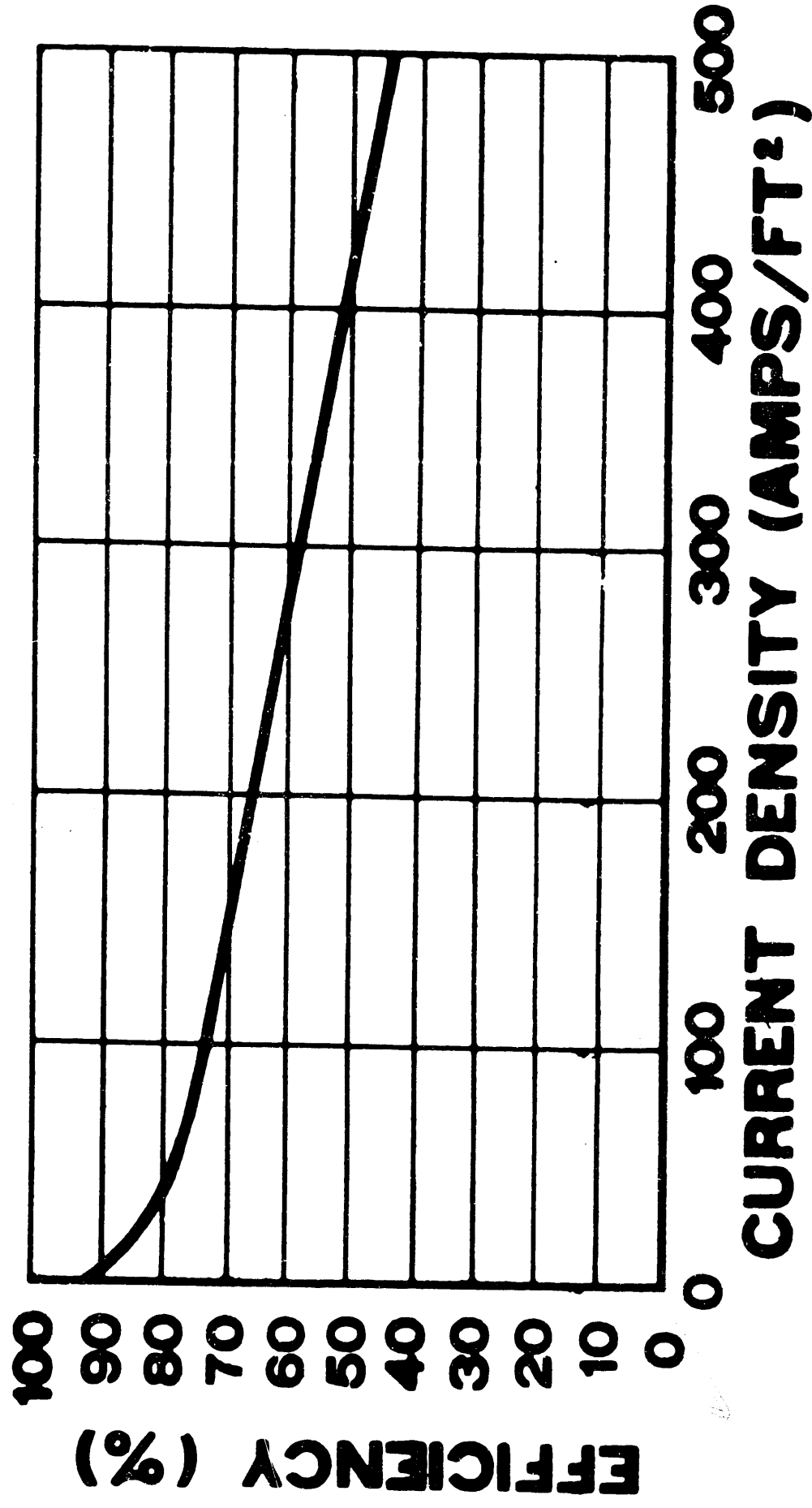
CRYOGENIC TEMPERATURES VS MISSION TIME

SC 101

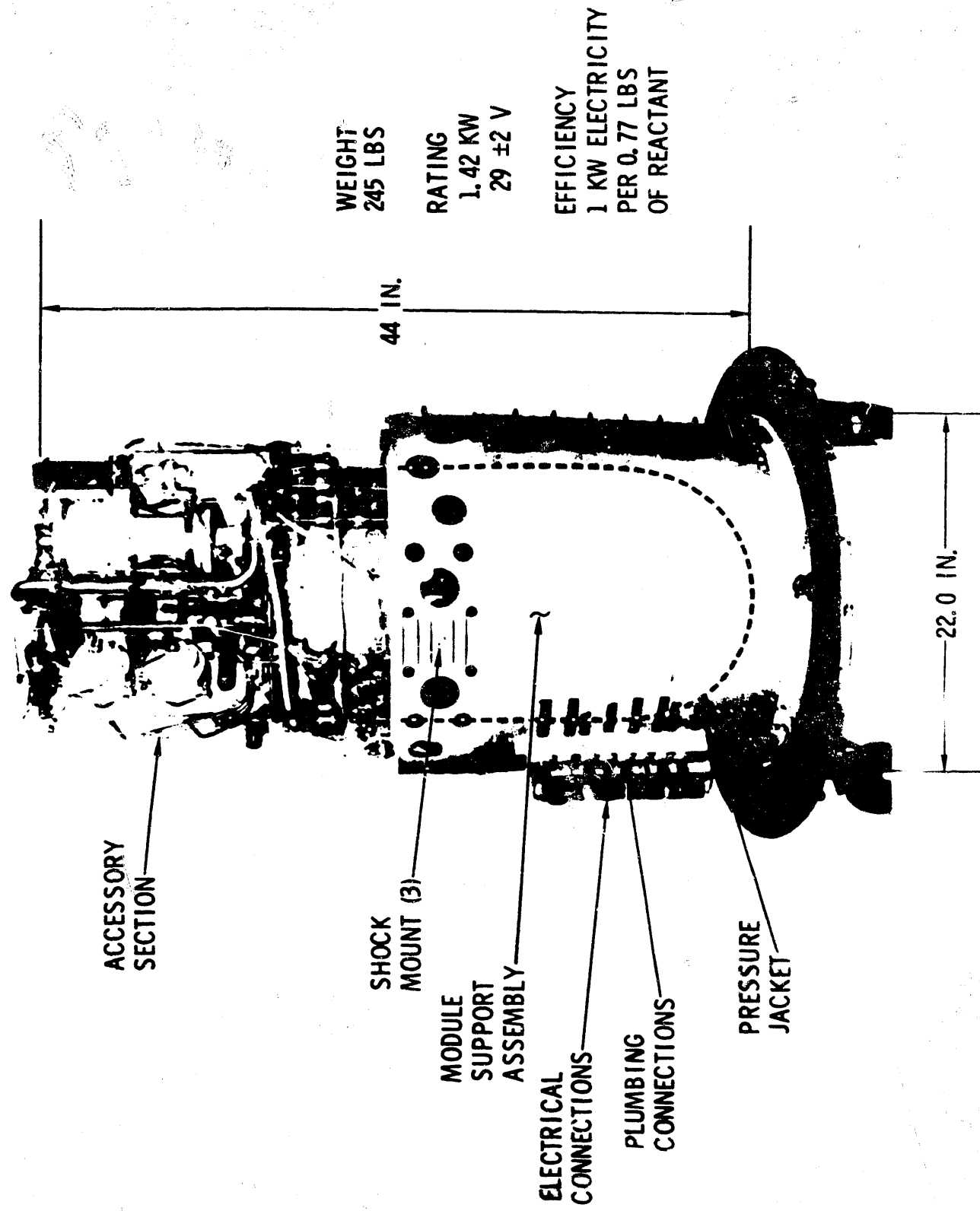


EP-019C

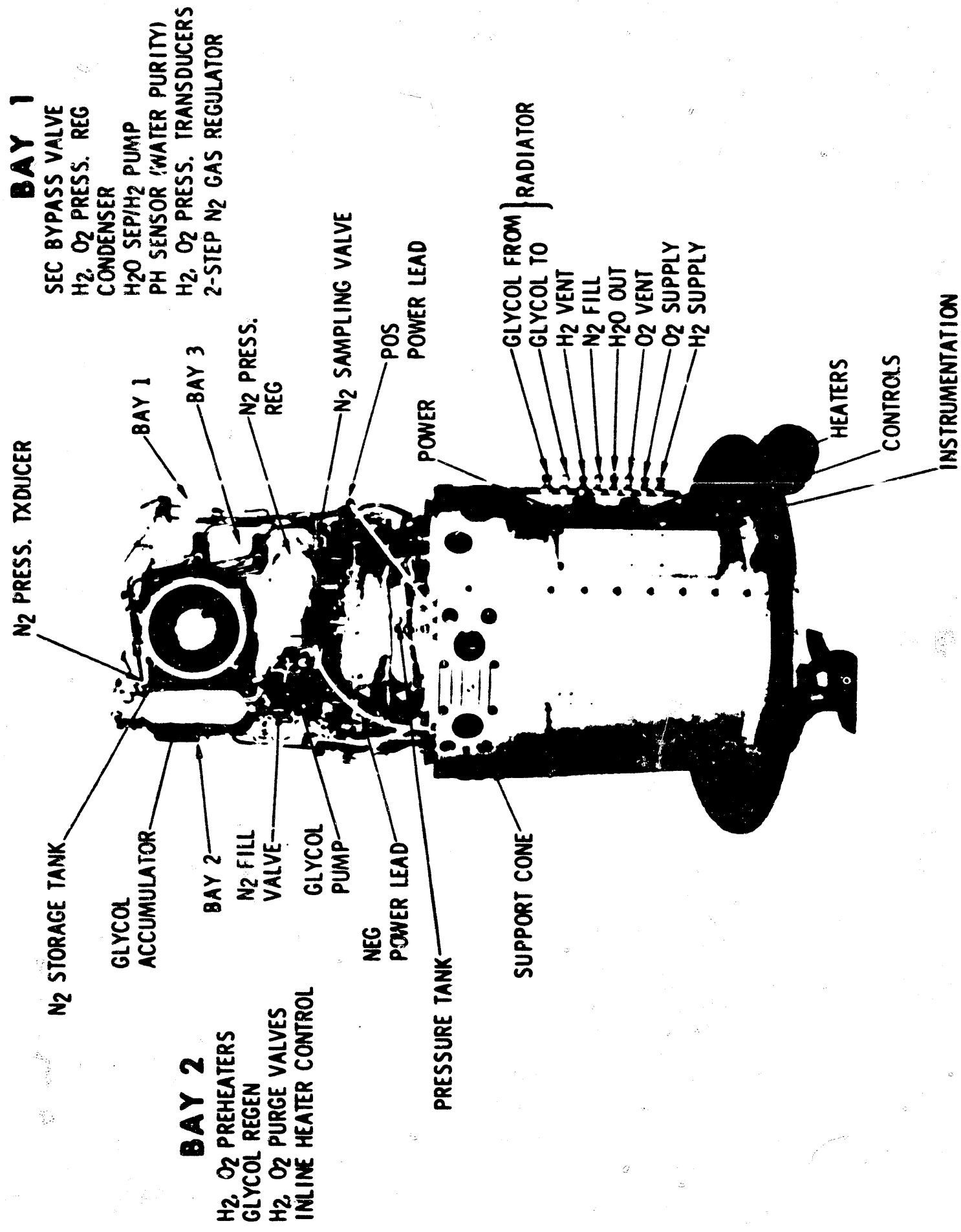
CELL EFFICIENCY



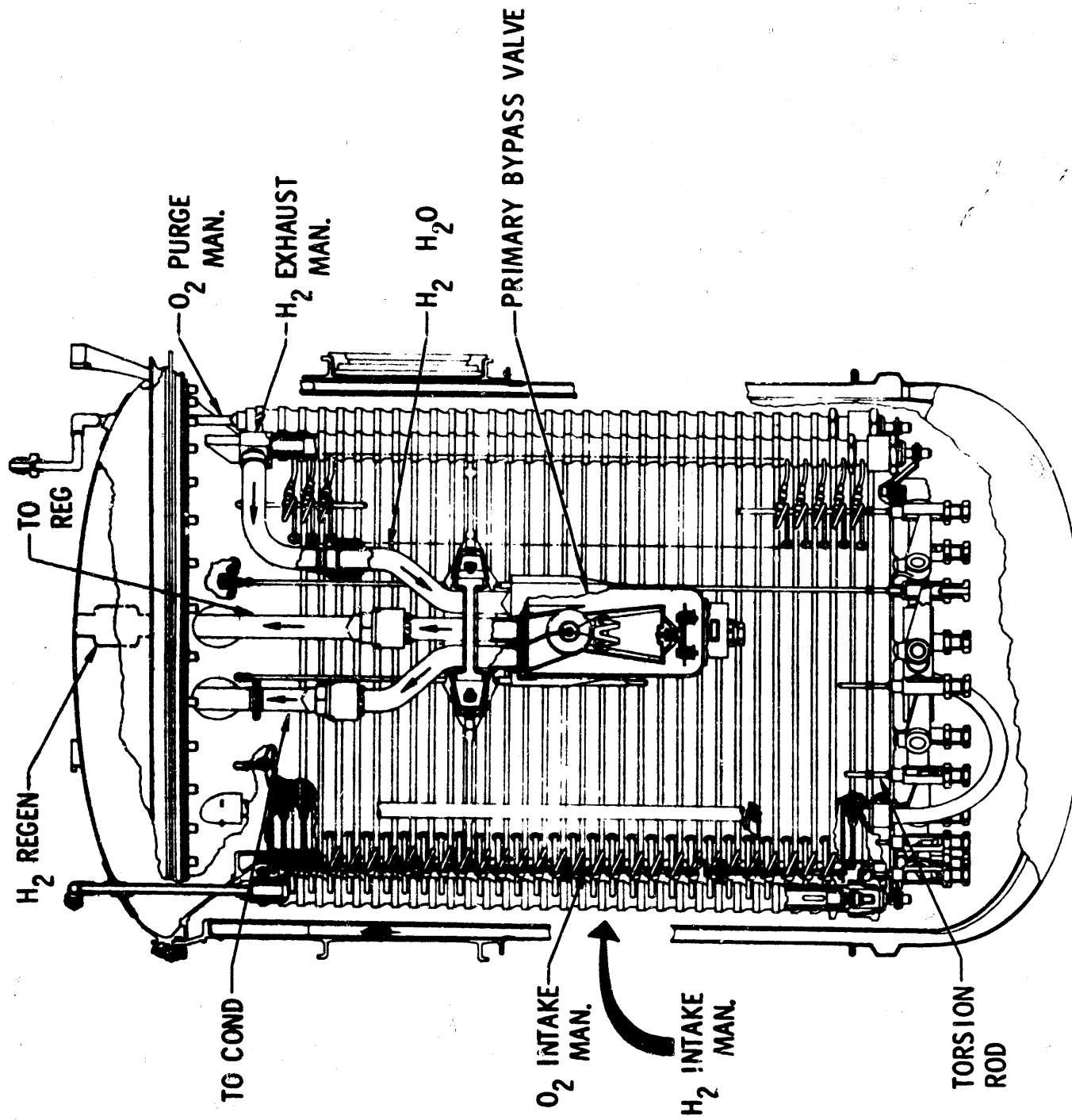
FUEL CELL POWER PLANT



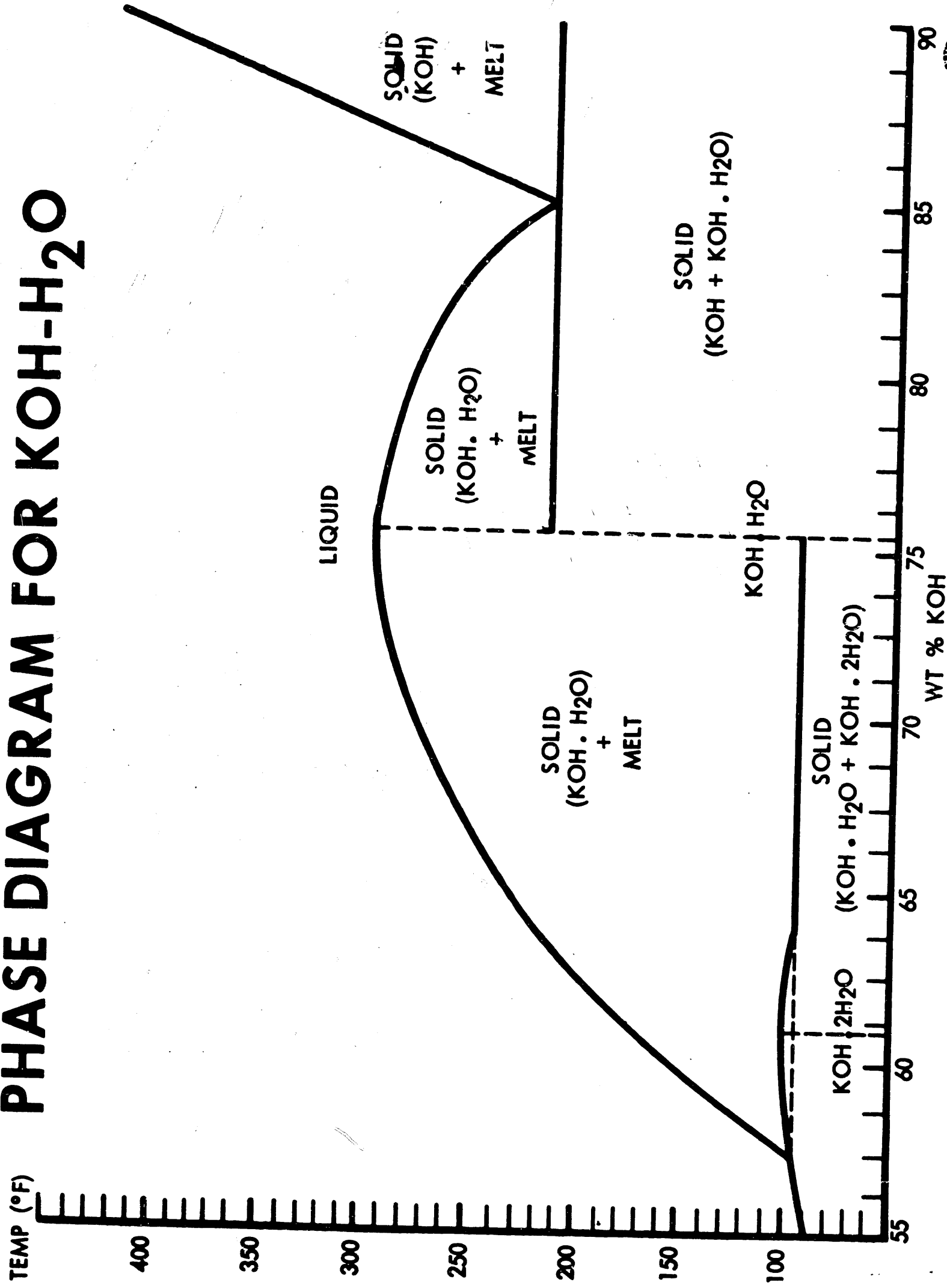
FUEL CELL MODULE ACCESSORIES



FUEL CELL MODULE

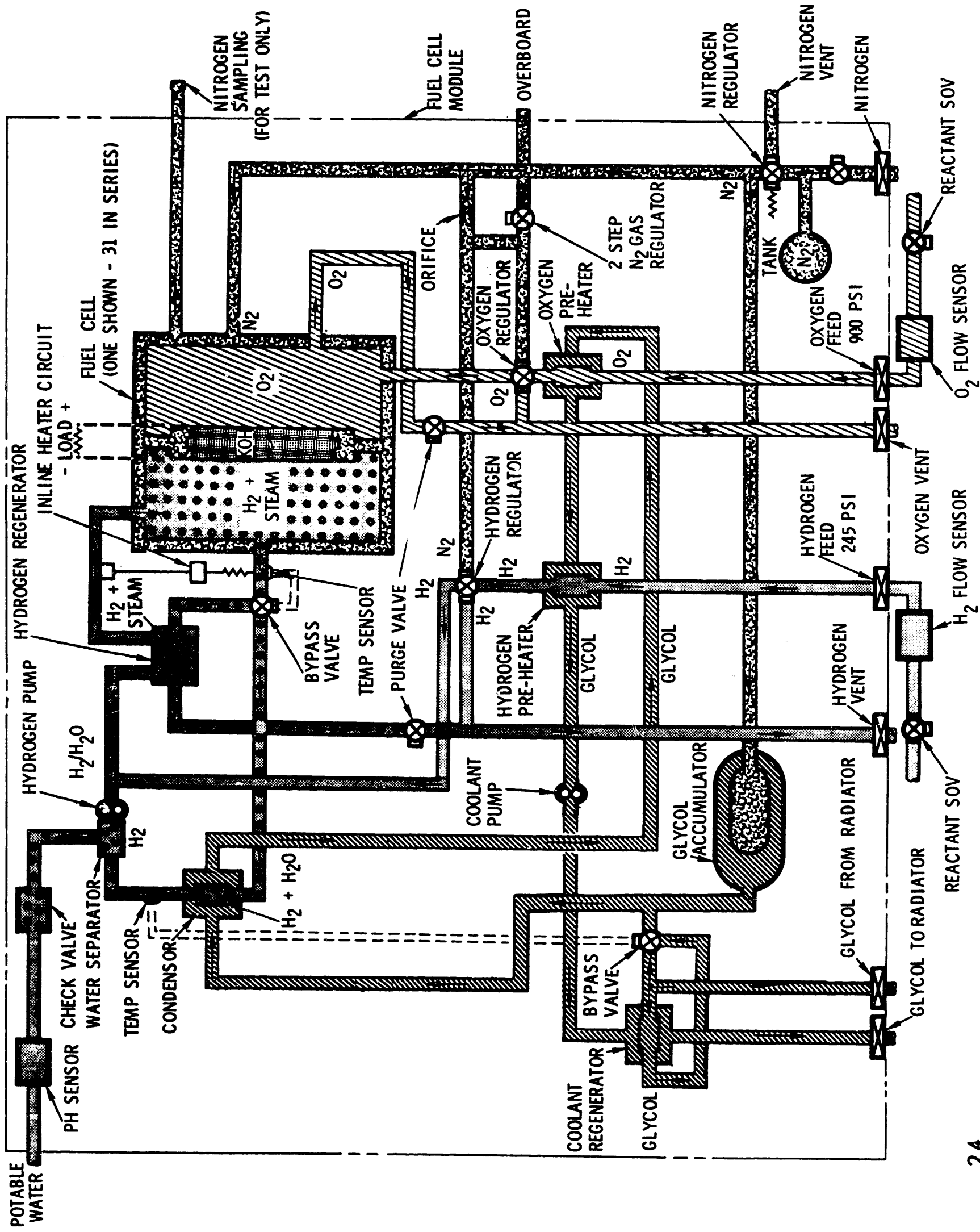


PHASE DIAGRAM FOR KOH-H₂O



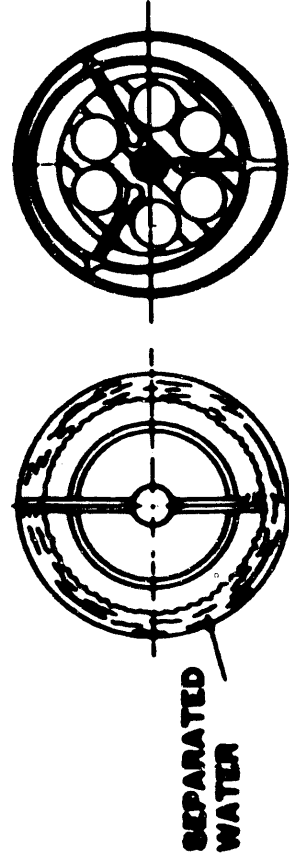
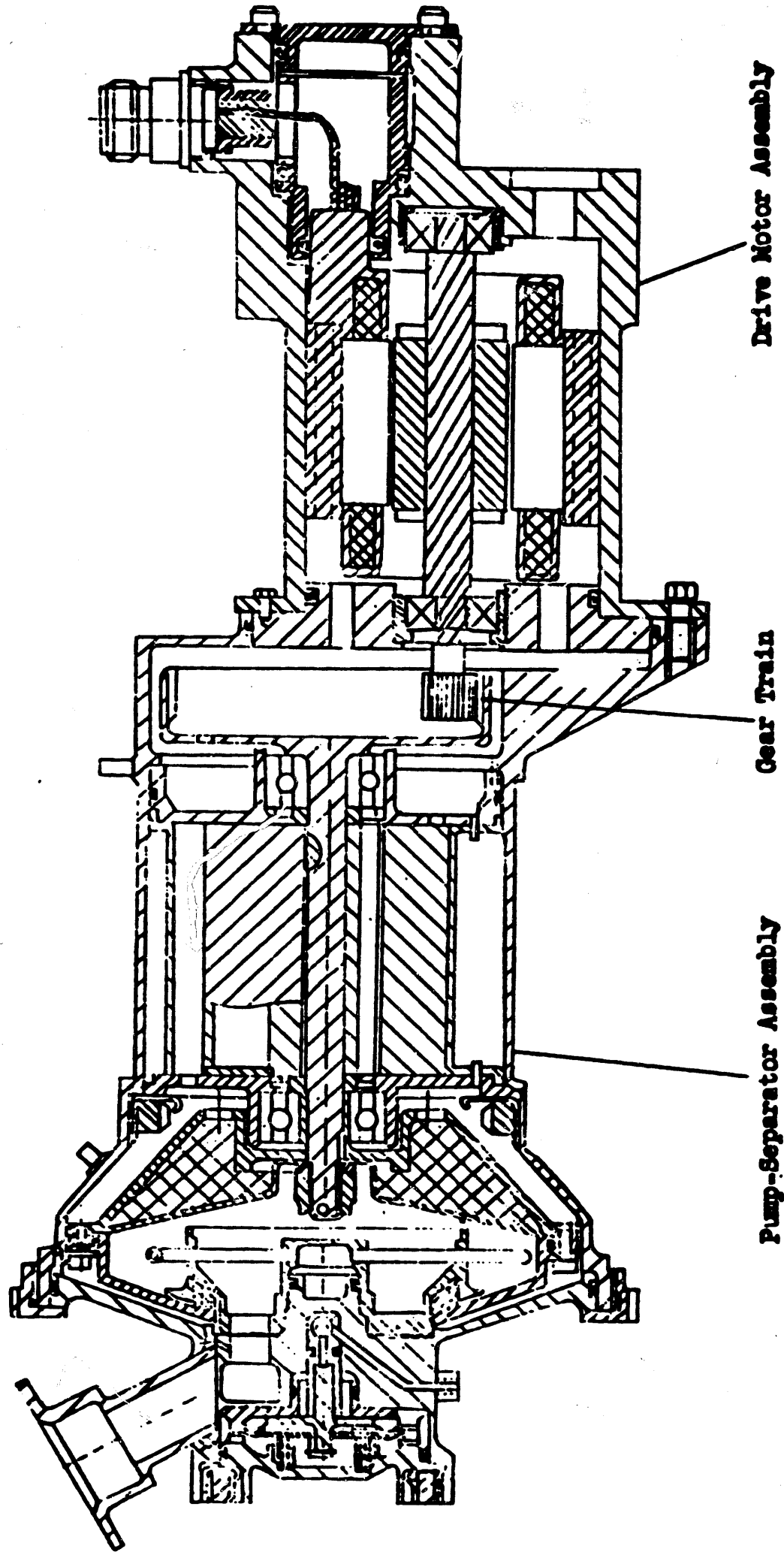
EP-007

FUEL CELL MODULE SCHEMATIC DIAGRAM

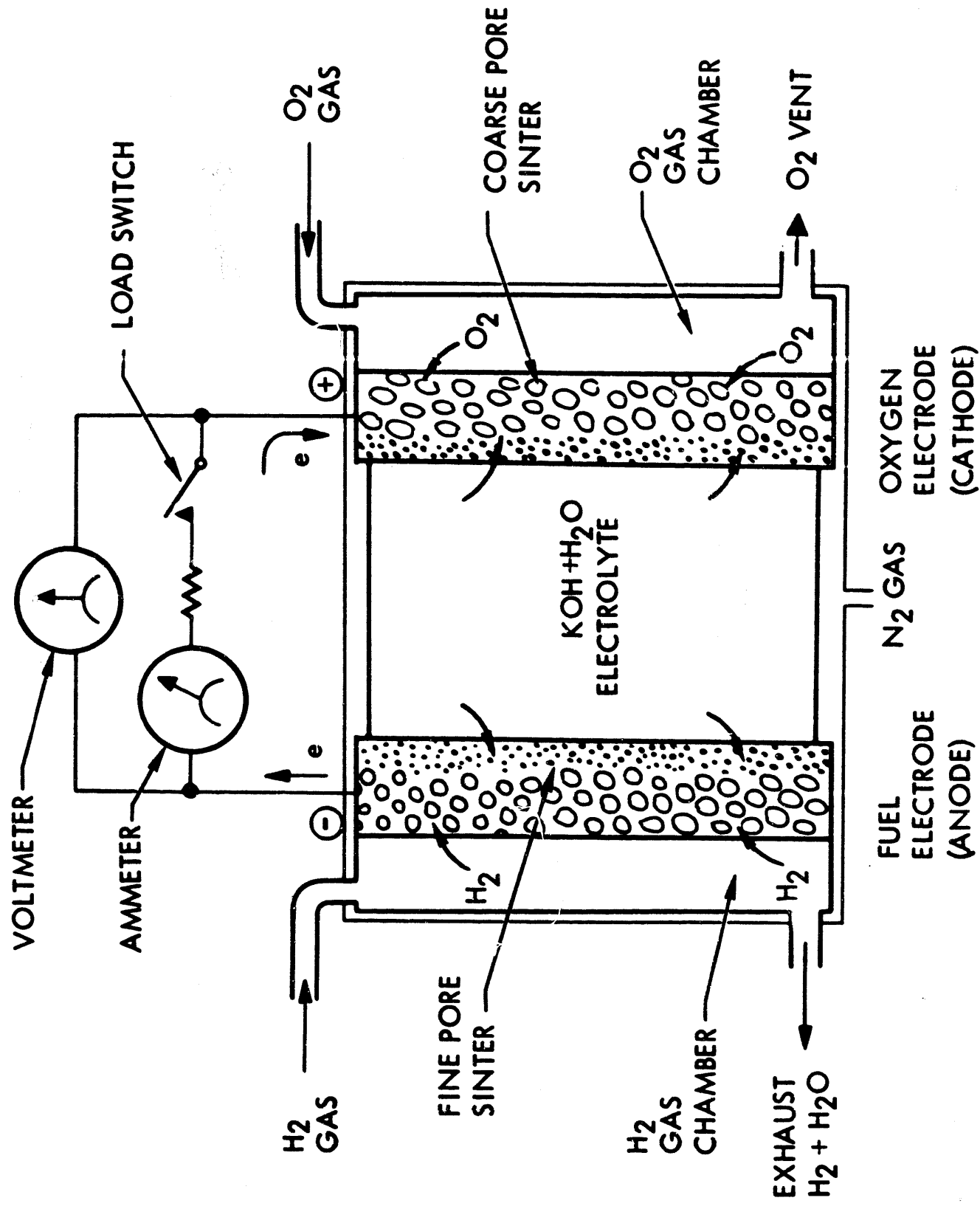


H₂ PUMP-SEPARATOR

BLOCK II

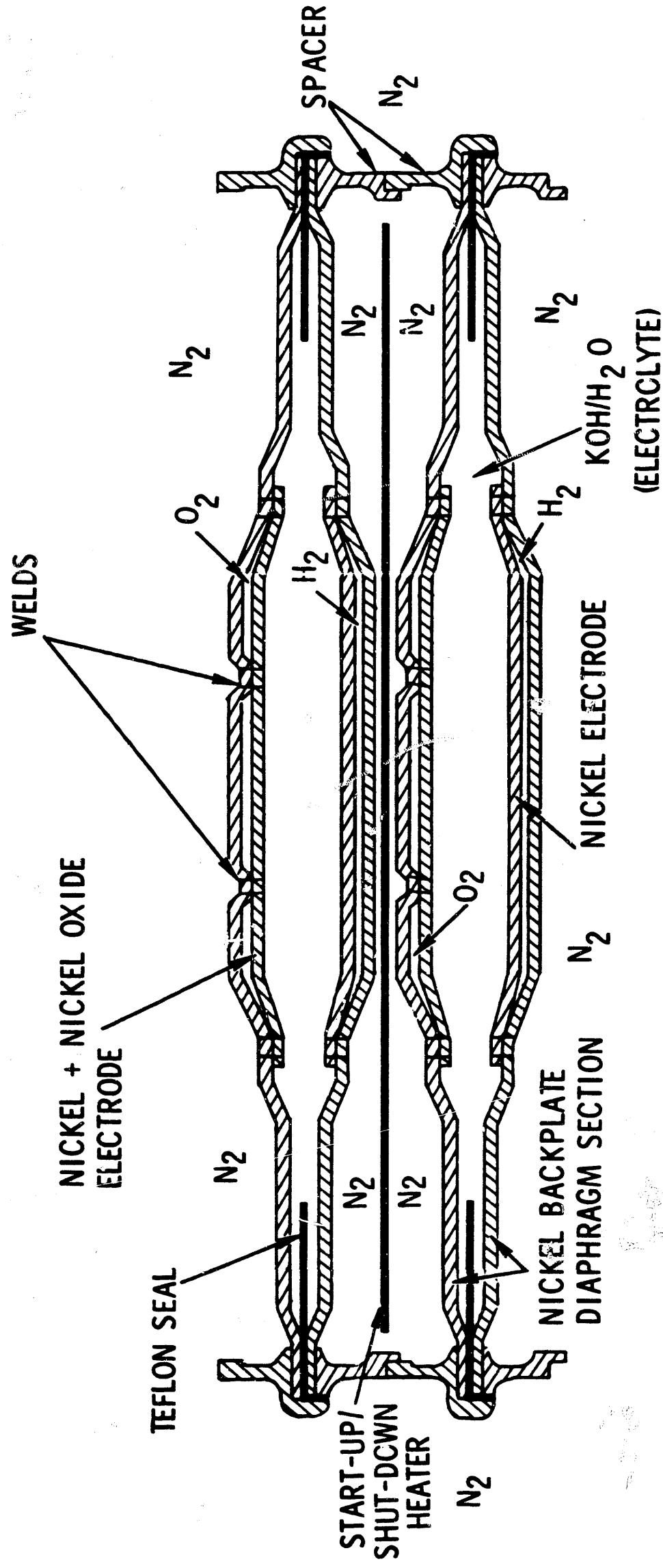


FUEL CELL ELECTROCHEMICAL FLOW SCHEMATIC



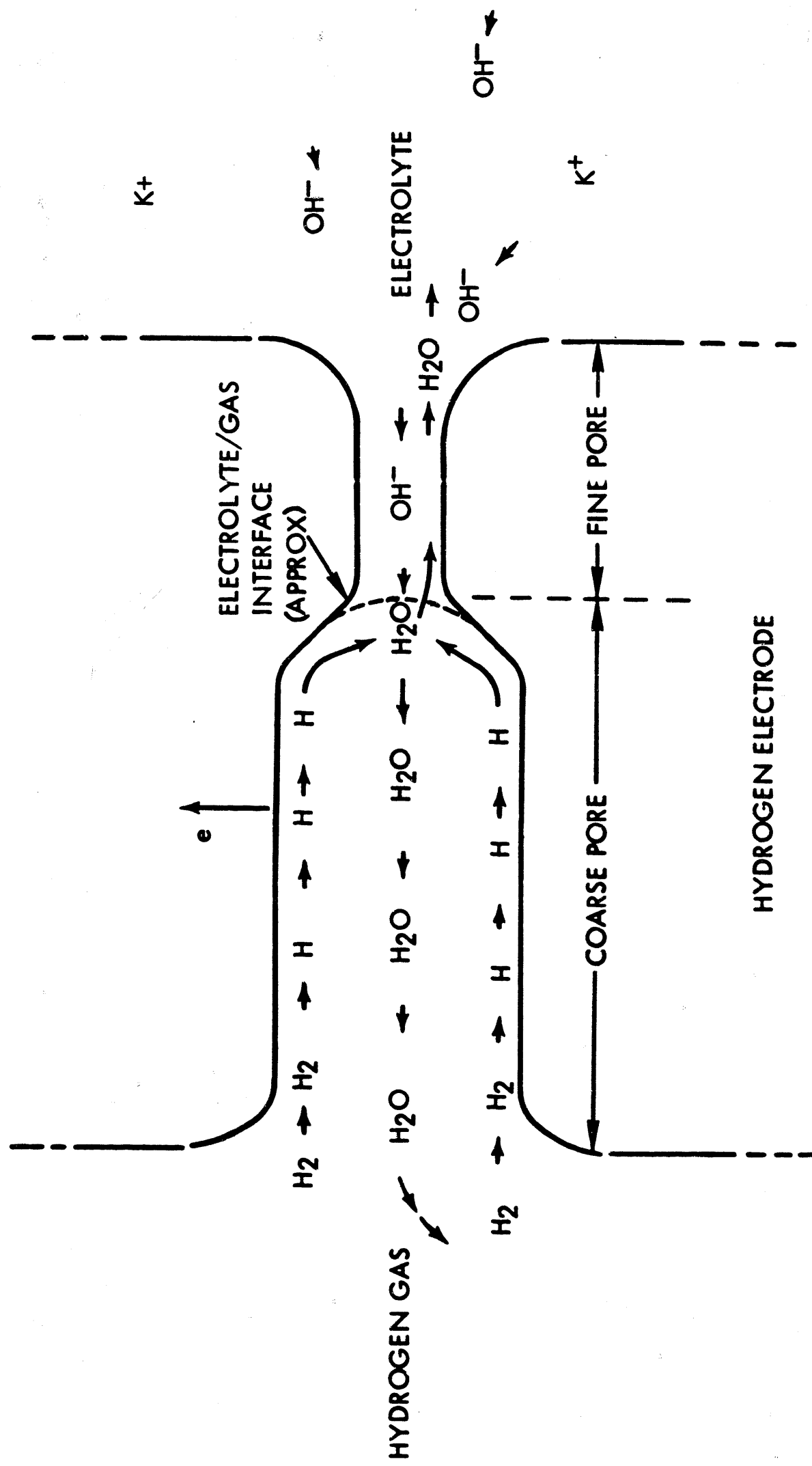
EP-003C

CELL CUTAWAY AND MOUNTING CONFIGURATION

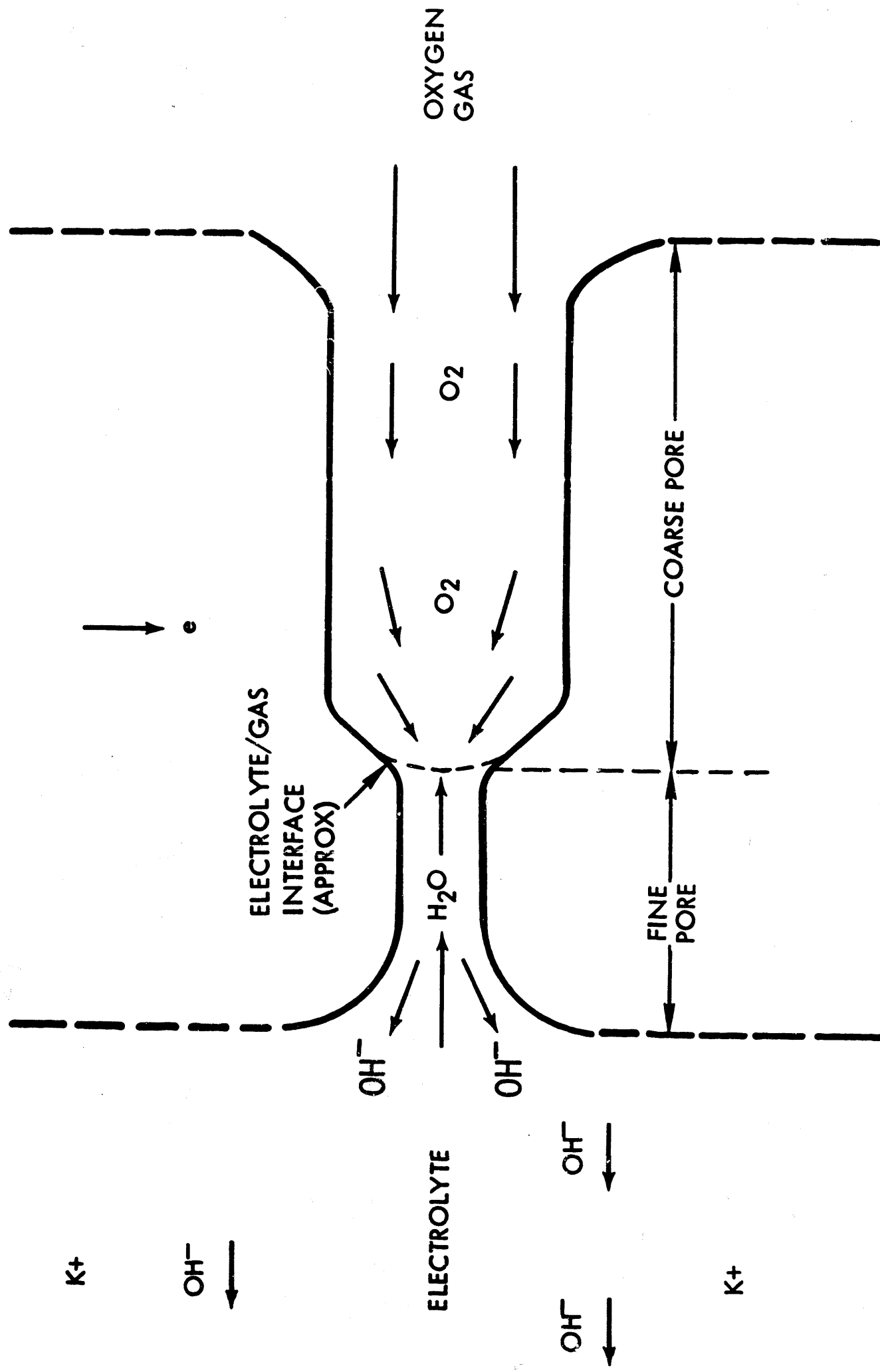


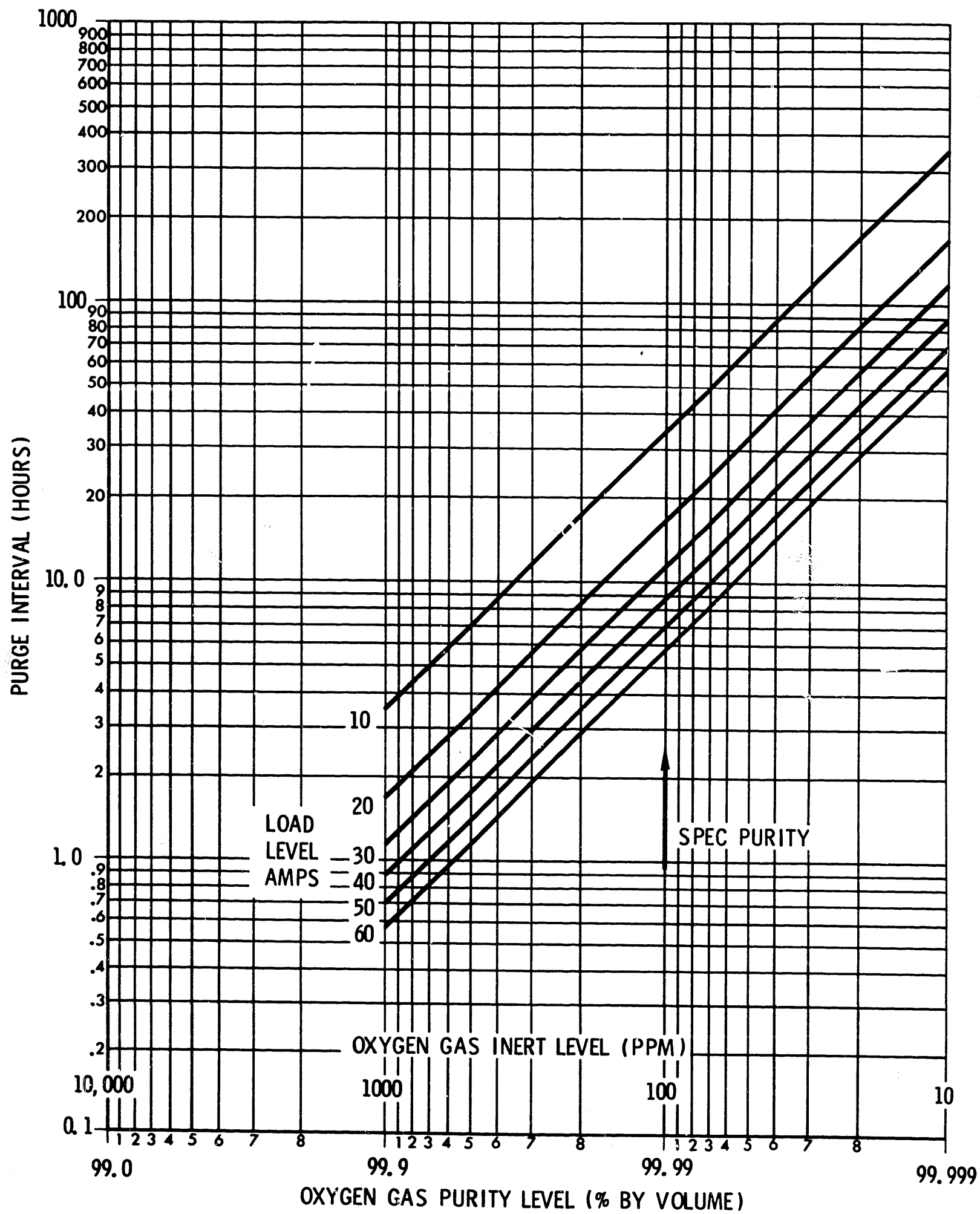
EP-039B (A)

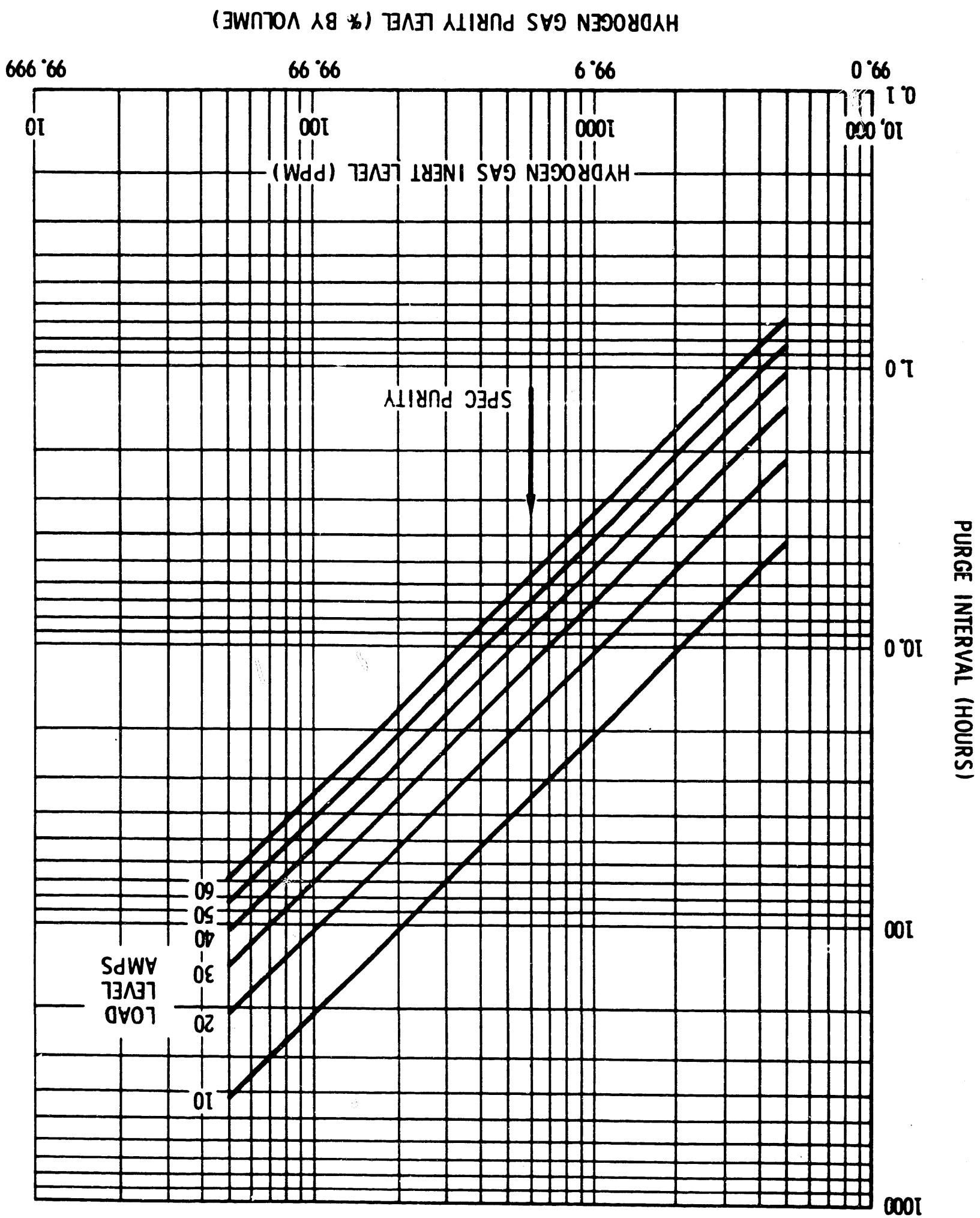
HYDROGEN ELECTRODE REACTION

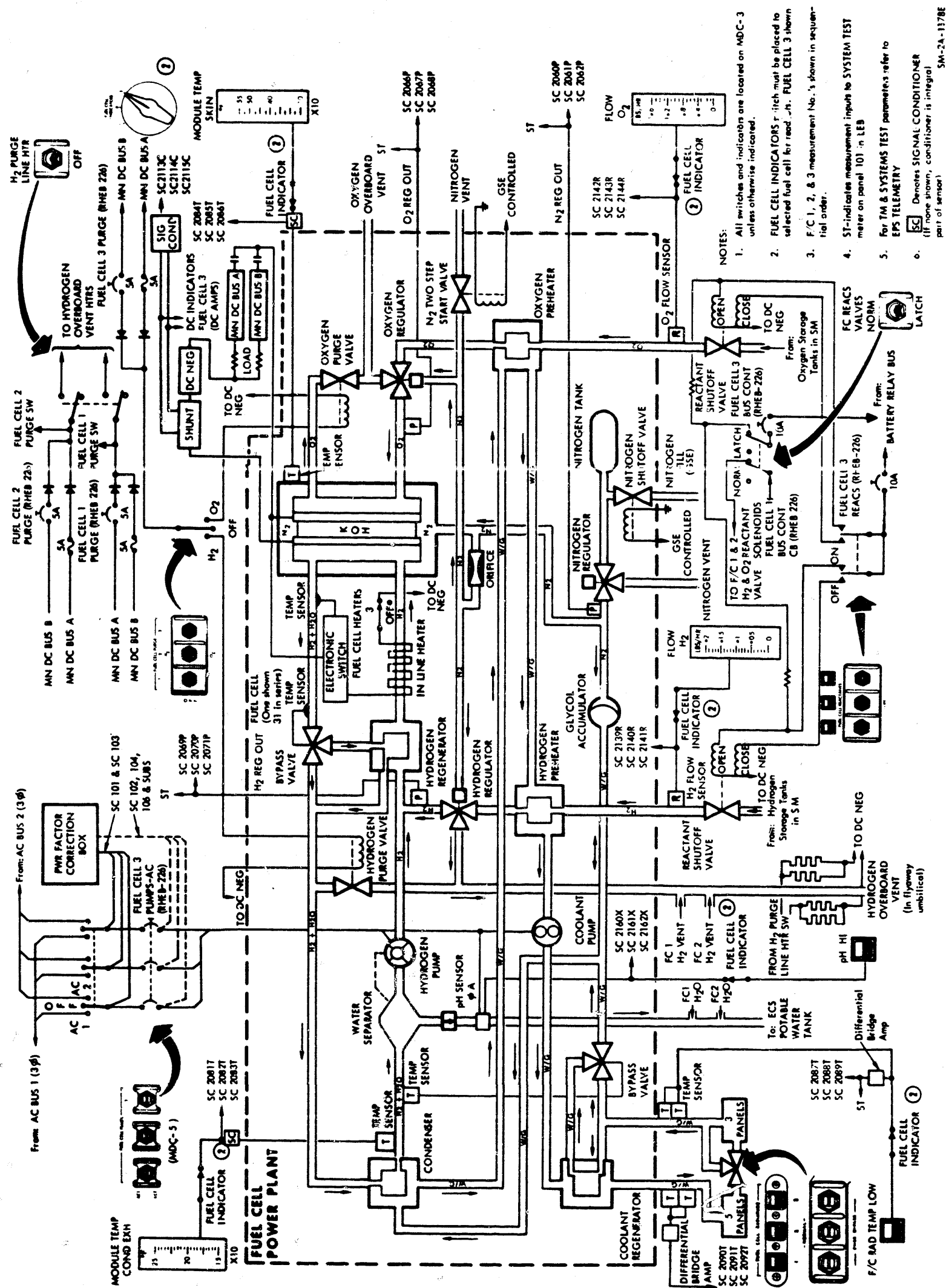


OXYGEN ELECTRODE REACTION

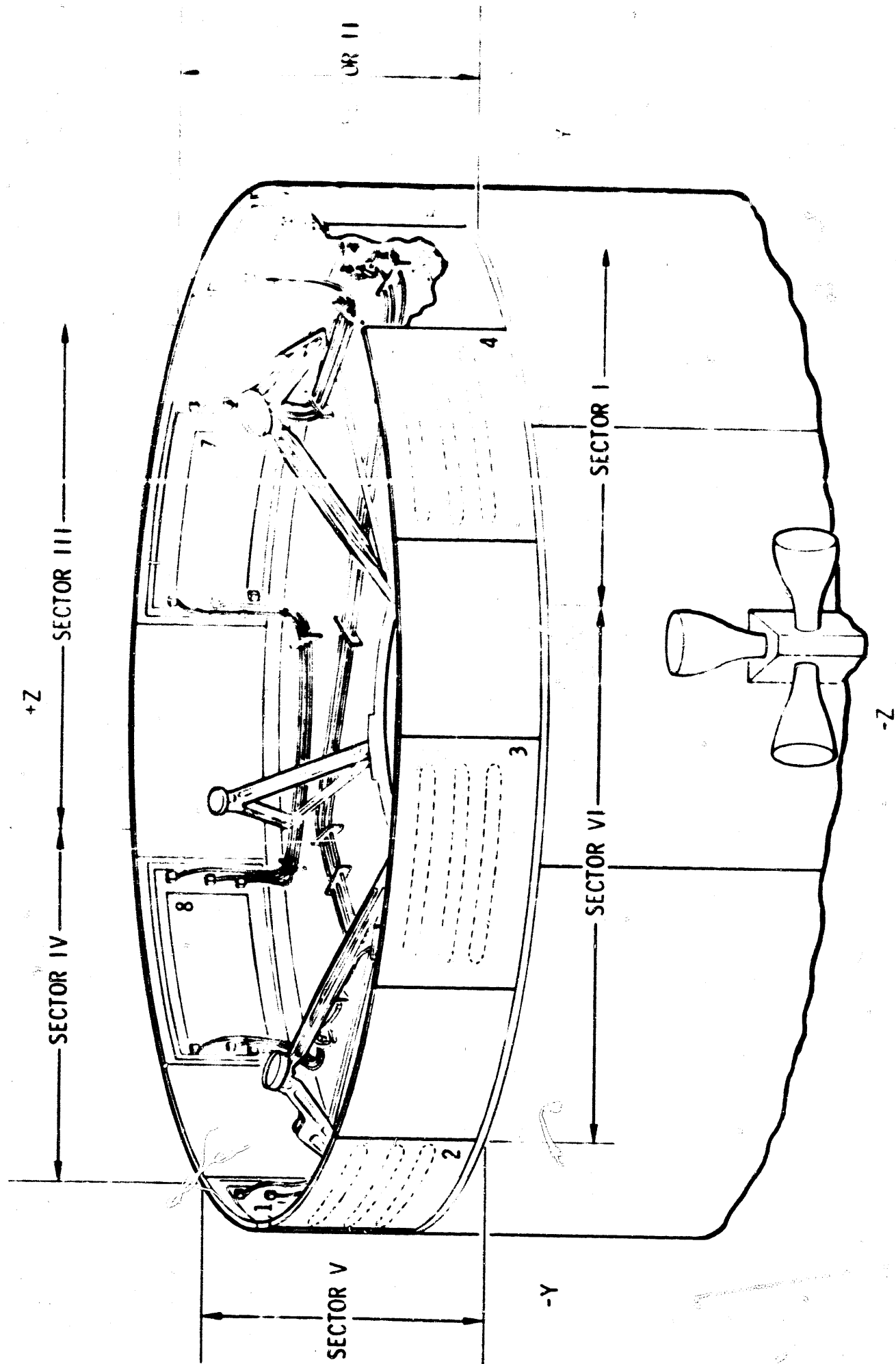




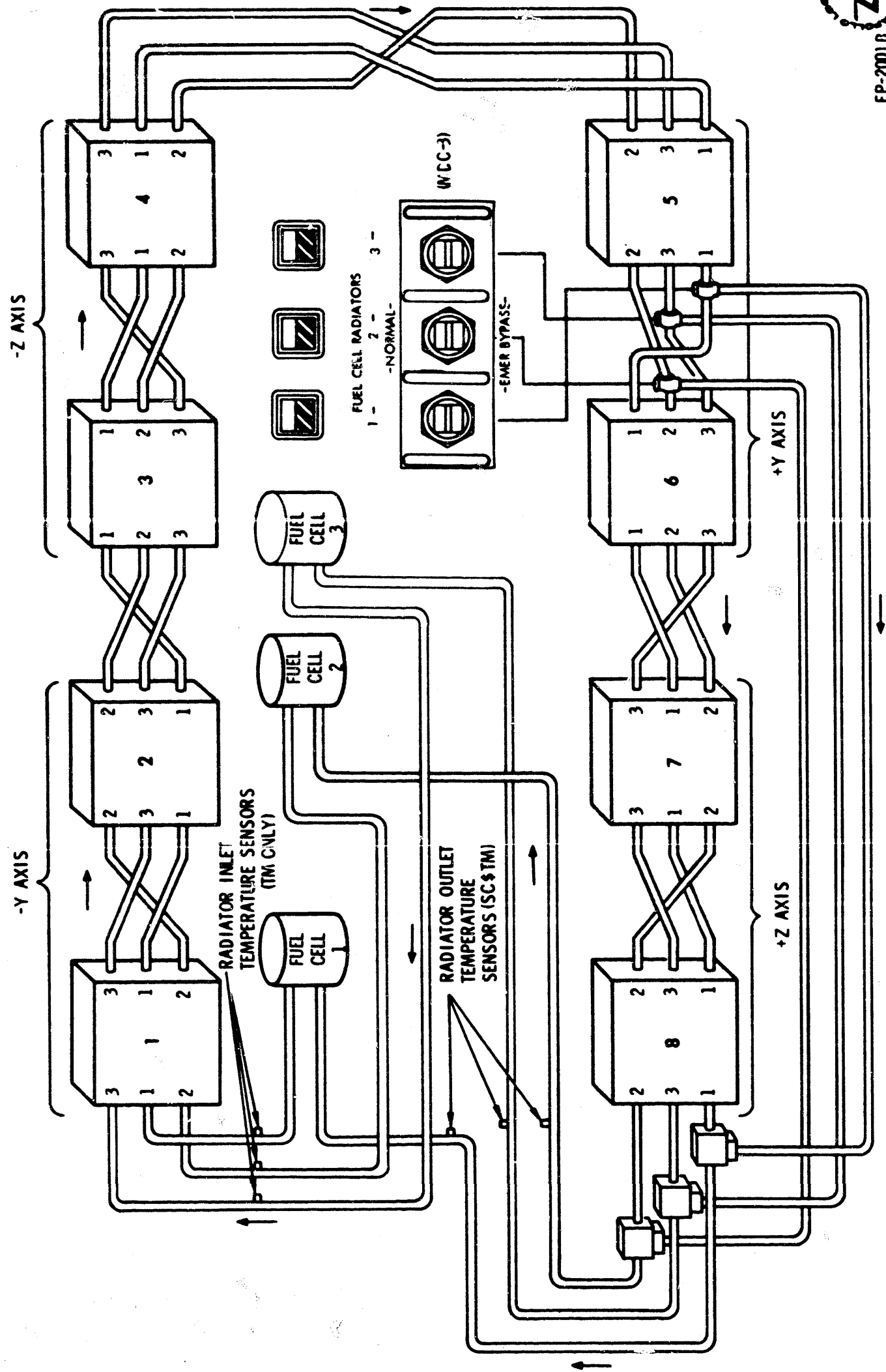




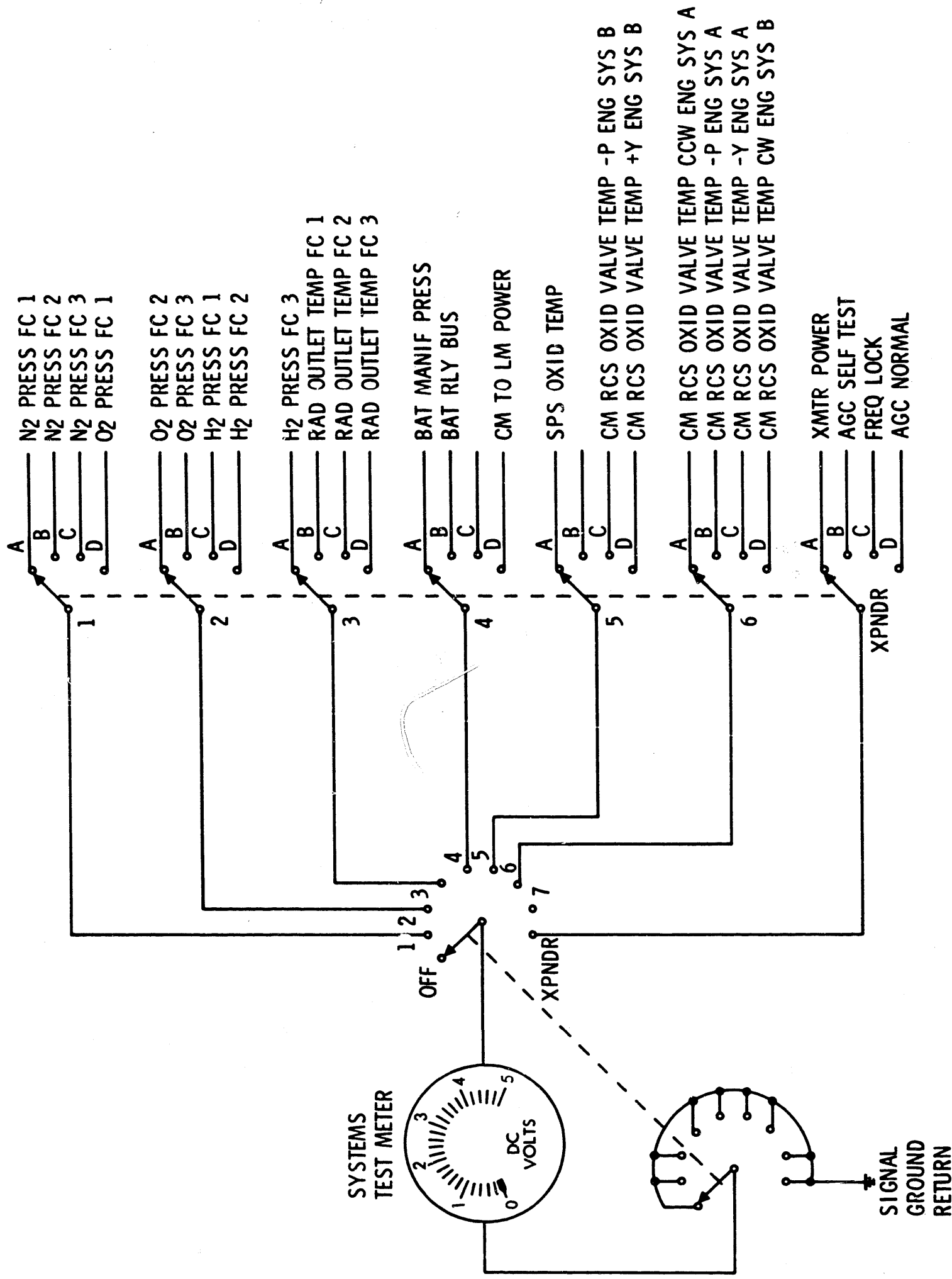
EPS RADIATOR LOCATION



EPS RADIATOR CONTROL



SYSTEMS TEST METER (LEB PANEL 101)

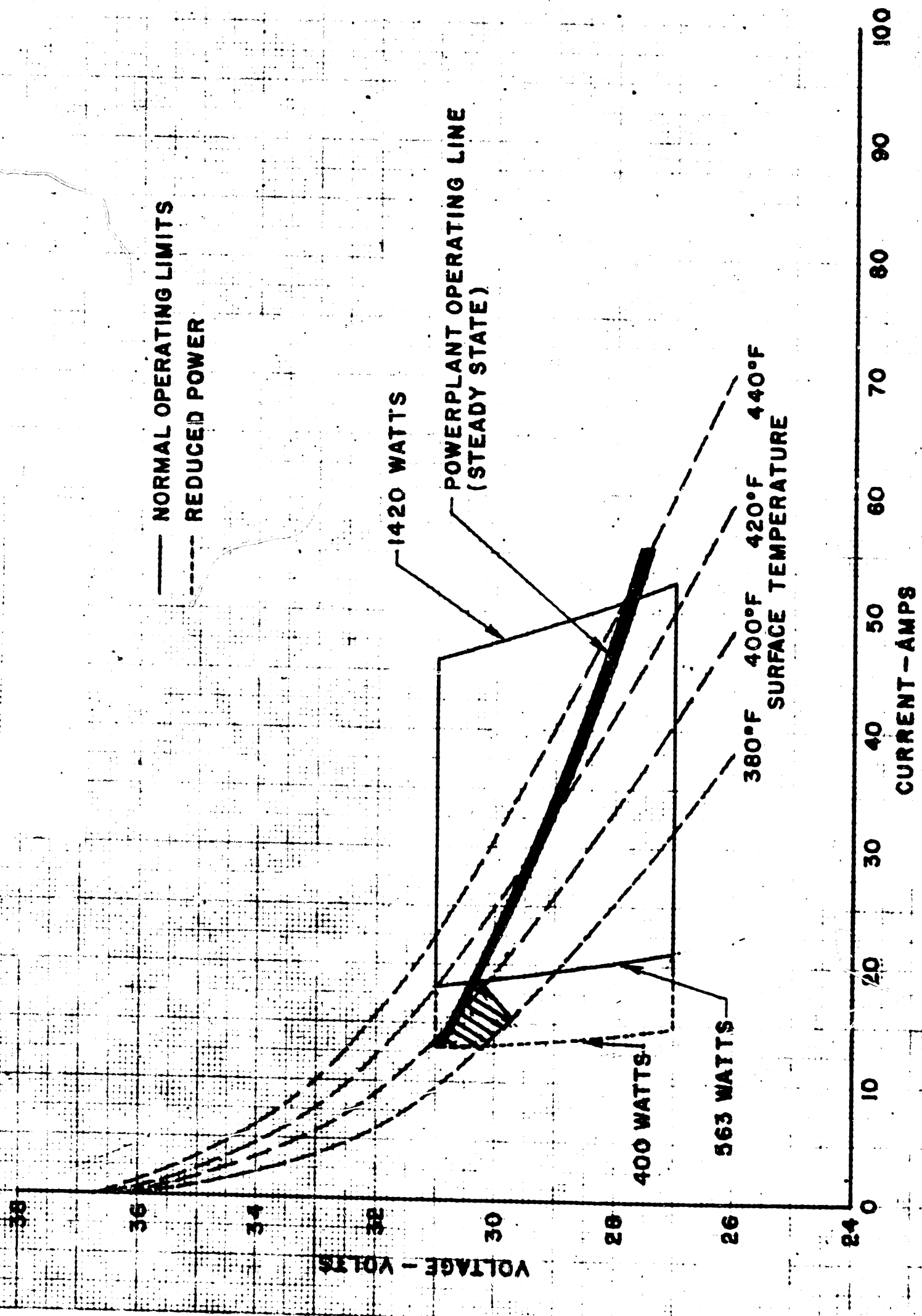


EP-2006L



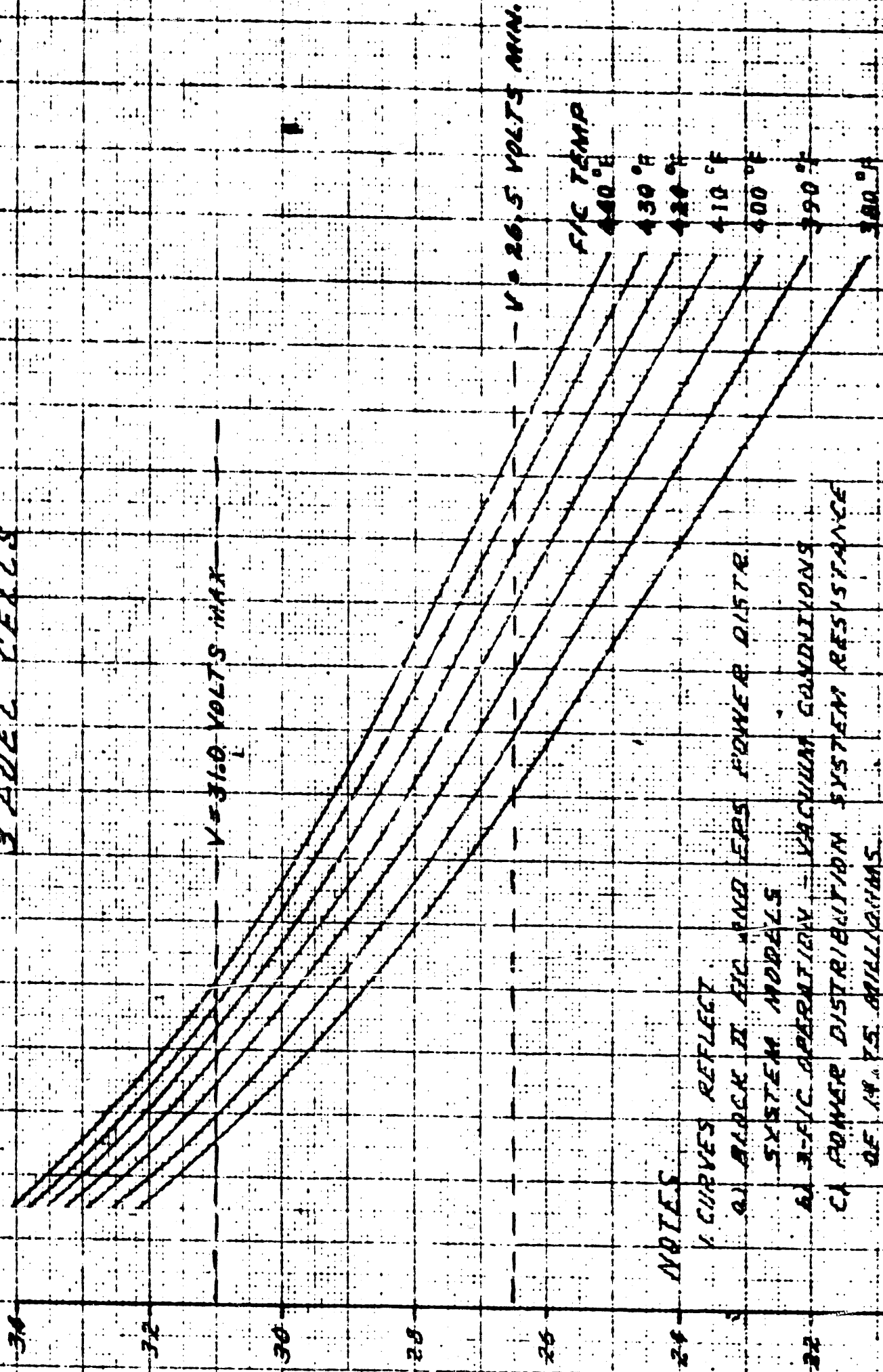
Systems Test Meter Display	N ₂ , O ₂ , H ₂ Pressure (PSIA)	EPS Radiator Outlet Temperature (° F)	CM-RCS Oxidizer Valve Tempera- ture (°F)	LM Power (Amps)	SPS Temperature (°F)	Battery Manifold Pressure (PSIA)	Battery Relay Bus (VDC)
0.0	0	-50	-50	0	0	0.00	0
0.2	3	-36	-46	0.4	8	0.80	1.8
0.4	6	-22	-42	0.8	16	1.60	3.6
0.6	9	-8	-38	1.2	24	2.40	5.4
0.8	12	+6	-34	1.6	32	3.20	7.2
1.0	15	+20	-30	2.0	40	4.00	9.0
1.2	18	+34	-26	2.4	48	4.80	10.8
1.4	21	+48	-22	2.8	56	5.60	12.6
1.6	24	+62	-18	3.2	64	6.40	14.4
1.8	27	+76	-14	3.6	72	7.20	16.2
2.0	30	+90	-10	4.0	80	8.0	18.0
2.2	33	+104	-6	4.4	88	3.0	19.8
2.4	36	+118	-4	4.8	96	9.50	21.6
2.6	39	+132	0	5.2	104	10.40	23.4
2.8	42	+146	+4	5.6	112	11.20	25.2
3.0	45	+160	+10	6.0	120	12.00	27.0
3.2	48	+174	+14	6.4	128	12.80	28.8
3.4	51	+188	+18	6.8	136	13.60	30.6
3.6	54	+202	+22	7.2	144	14.40	32.4
3.8	57	+216	+26	7.6	152	15.20	34.2
4.0	60	+230	+30	8.0	160	16.00	36.0
4.2	63	+244	+34	8.4	168	16.80	37.8
4.4	66	+258	+38	8.8	176	17.60	39.6
4.6	69	+272	+42	9.2	184	18.40	41.4
4.8	72	+286	+46	9.6	192	19.20	43.2
5.0	75	+300	+50	10.0	200	20.00	45.0

FUEL CELL POWERPLANT PC3A-2E NOMINAL PERFORMANCE CHARACTERISTICS DURING NORMAL OPERATION VACUUM CONDITIONS



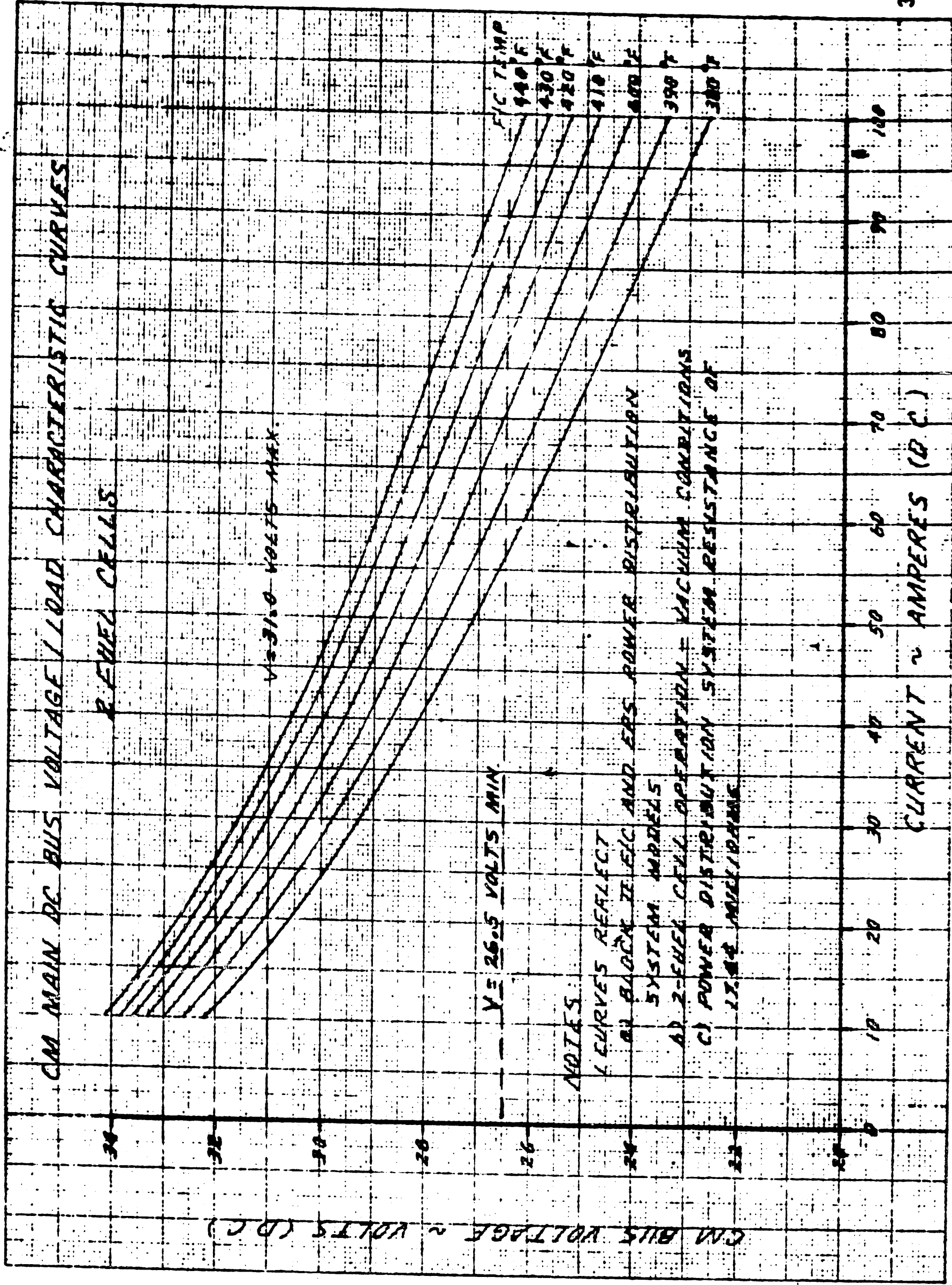
CM MAIN DC BUS VOLTAGE / LOAD CHARACTERISTIC CURVES

3 FUEL CELLS

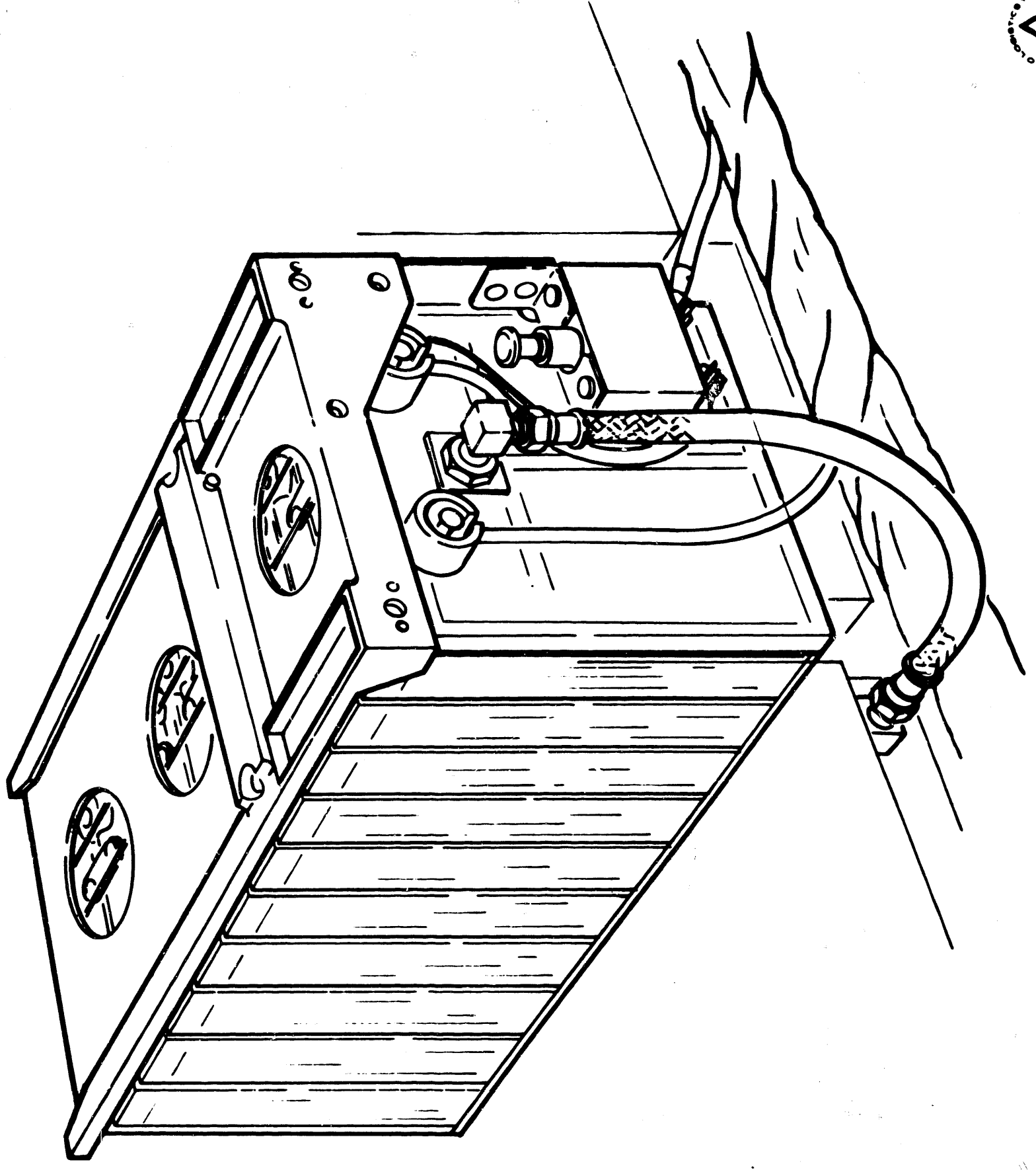


NOTES

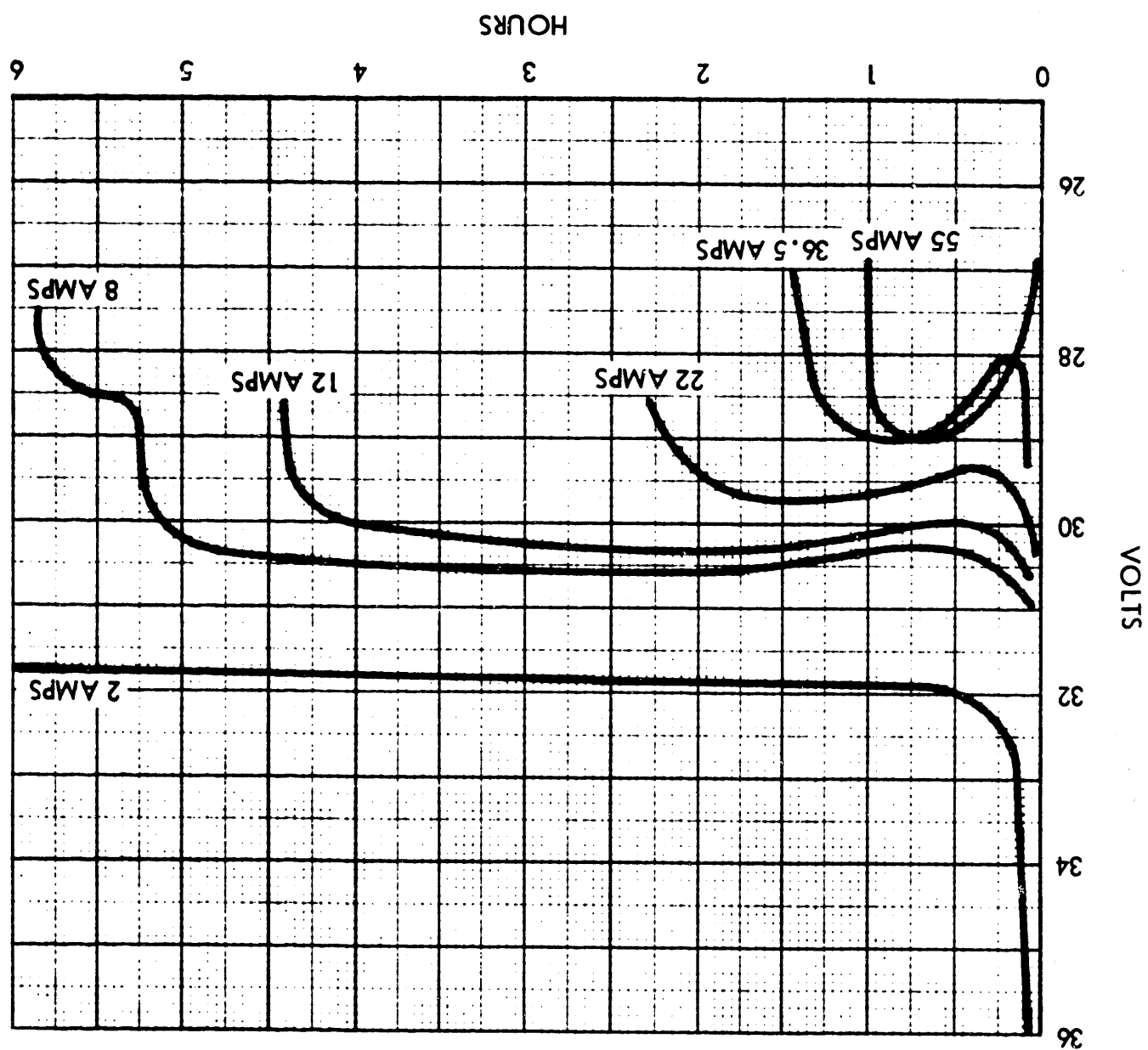
1. CURVES REFLECT
2. BLOCK II AND ERS POWER DISTR SYSTEM MODELS
3. F/C OPERATION - VACUUM CONDITIONS
4. POWER DISTRIBUTION SYSTEM RESISTANCE OF 14.75 MILLIOHMS



ENTRY & POST LANDING BATTERY

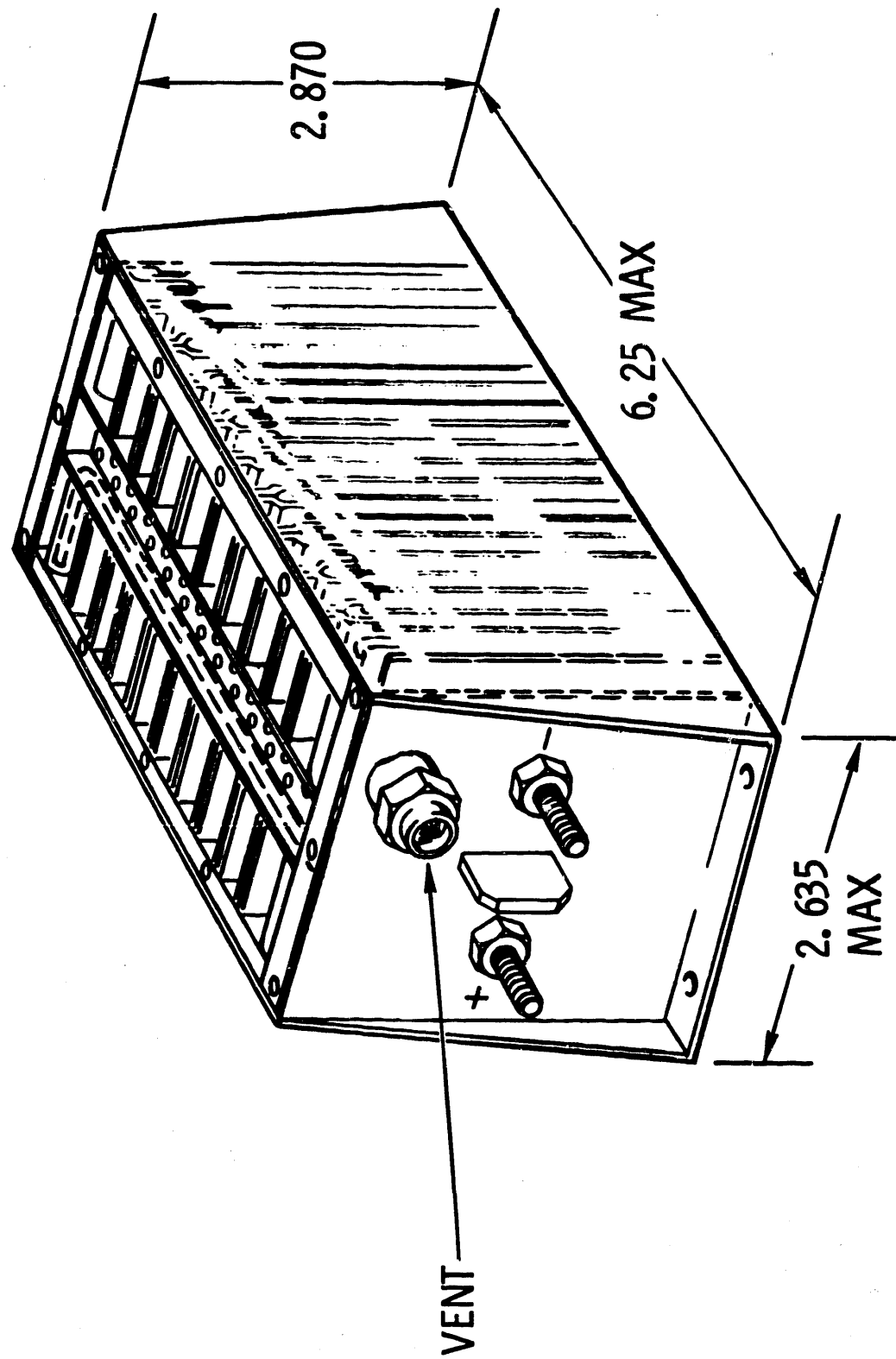


Nominal Discharge Characteristics of Entry and Postlanding Batteries

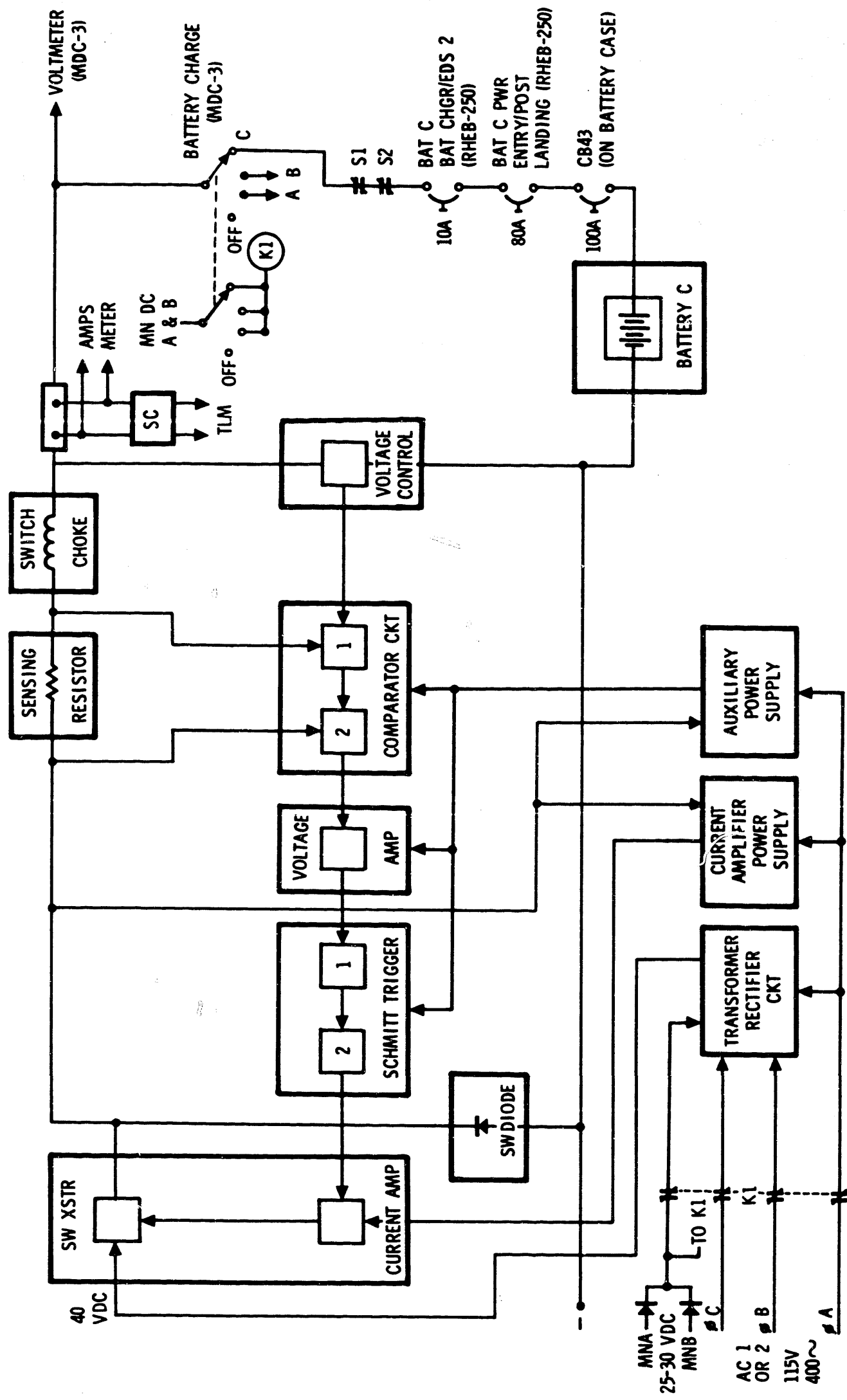


NOTE:
THE CURVES SHOWN IN THIS FIGURE ARE NOMINAL
AND ARE BASED UPON DATA FROM A LIMITED NUMBER
OF TESTS. SIGNIFICANT DEVIATIONS FROM THESE
CURVES CAN BE EXPECTED.

PYRO BATTERY

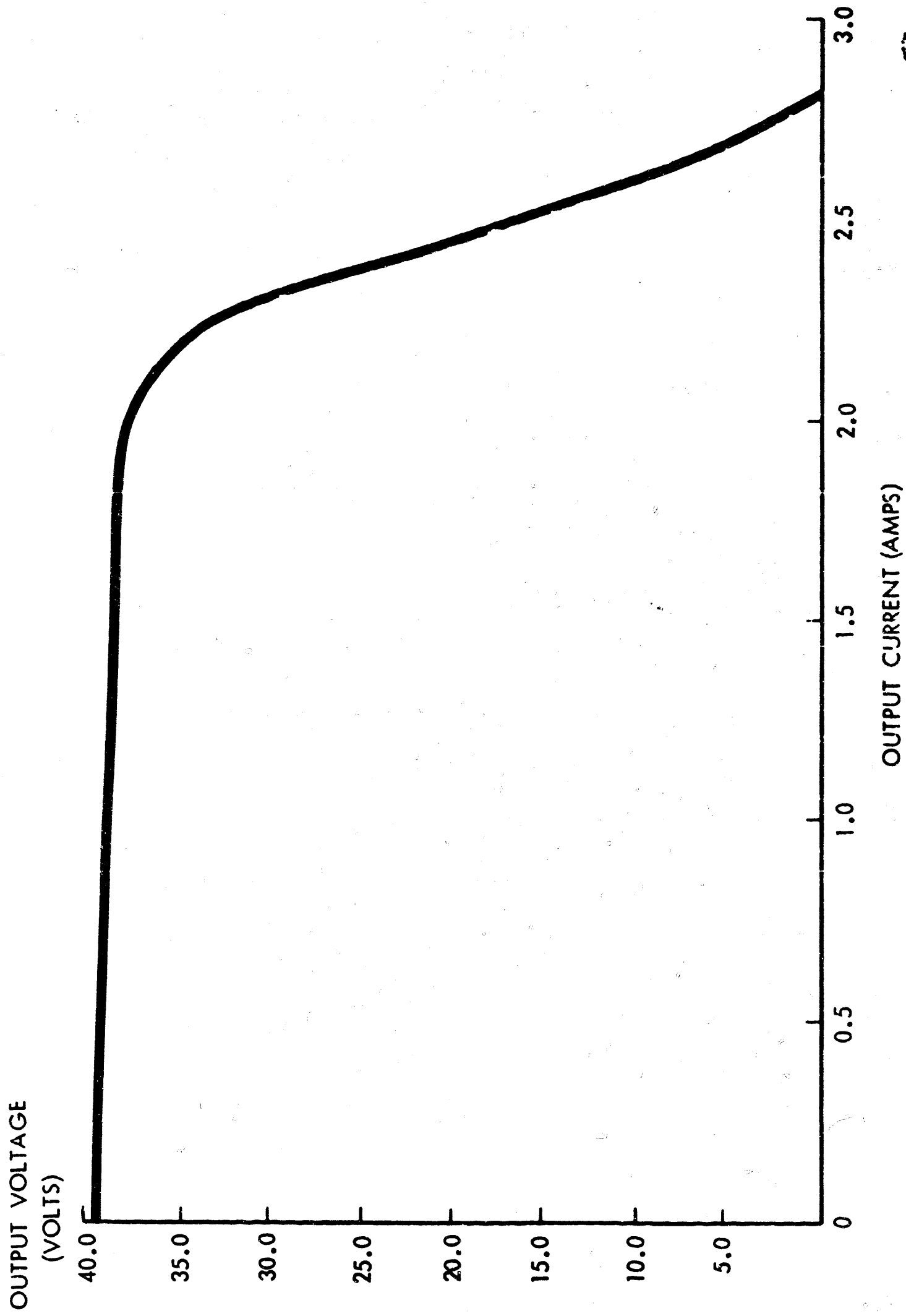


BATTERY CHARGER FUNCTIONAL DIAGRAM



EP-300H

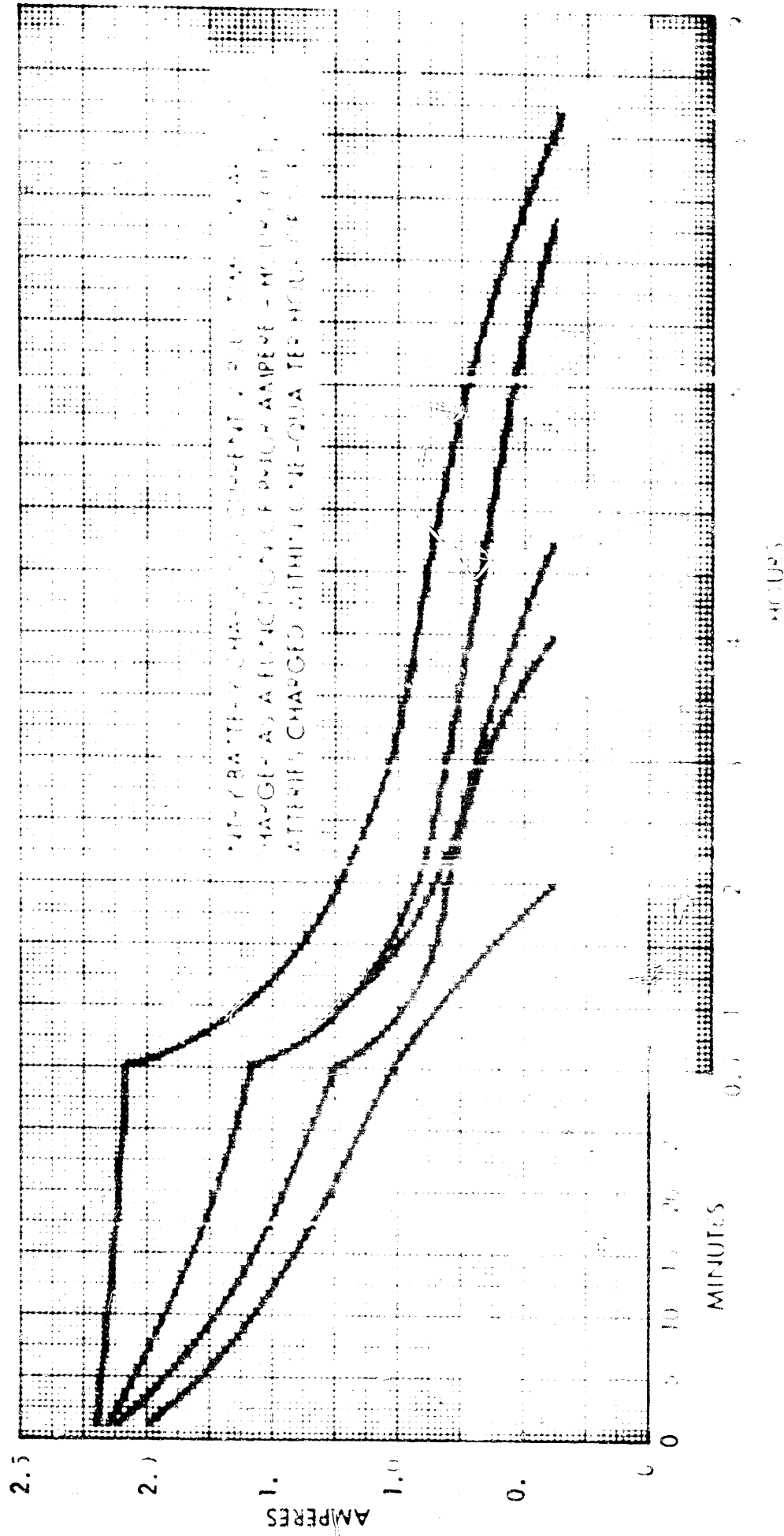
CURRENT VS VOLTAGE REGULATION CURVE



EP-009 A

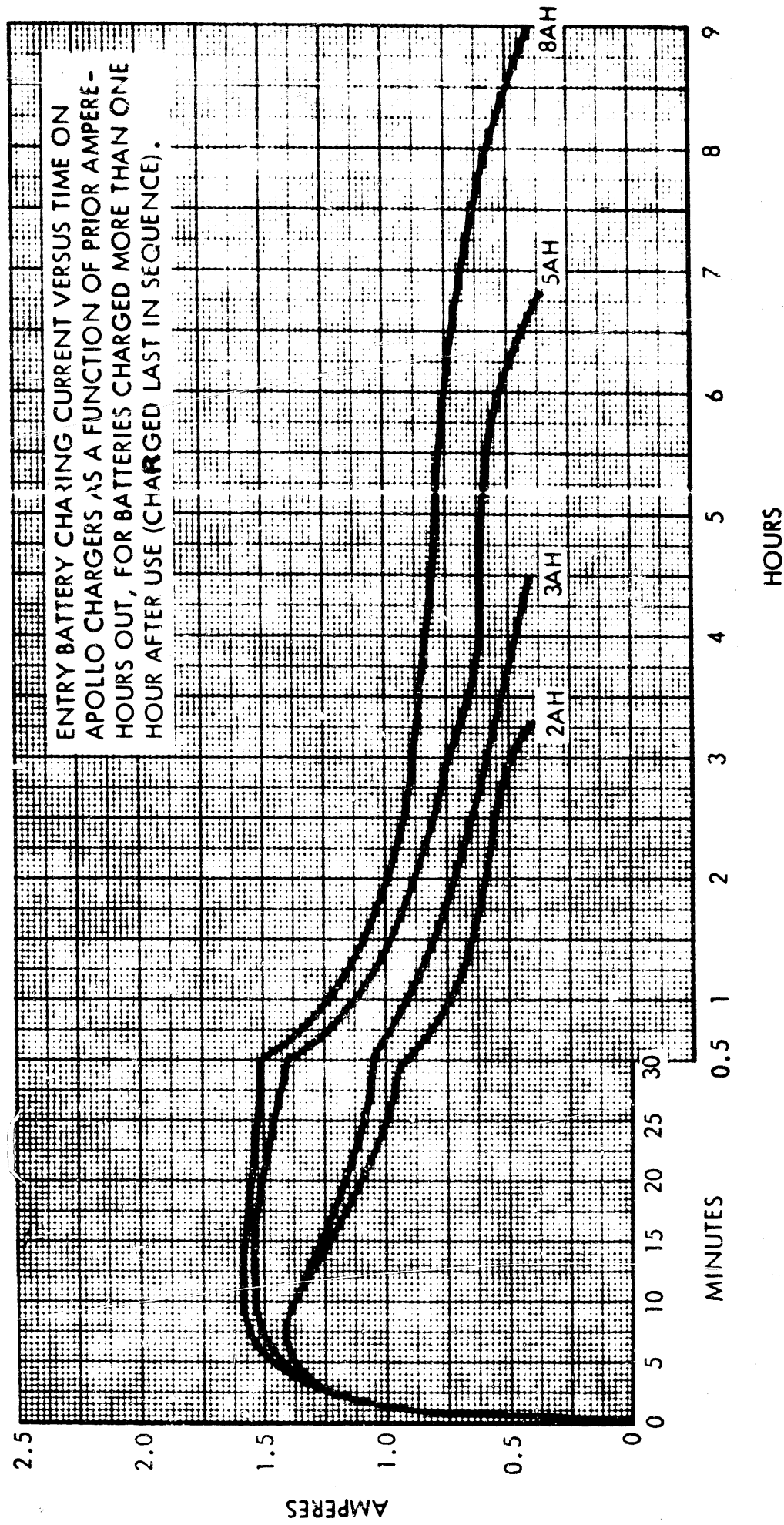
NOTE:

THE CURVES SHOWN IN THIS FIGURE ARE NOMINAL AND ARE BASED UPON DATA FROM A LIMITED NUMBER OF TESTS. SIGNIFICANT DEVIATIONS FROM THESE CURVES CAN BE EXPECTED.



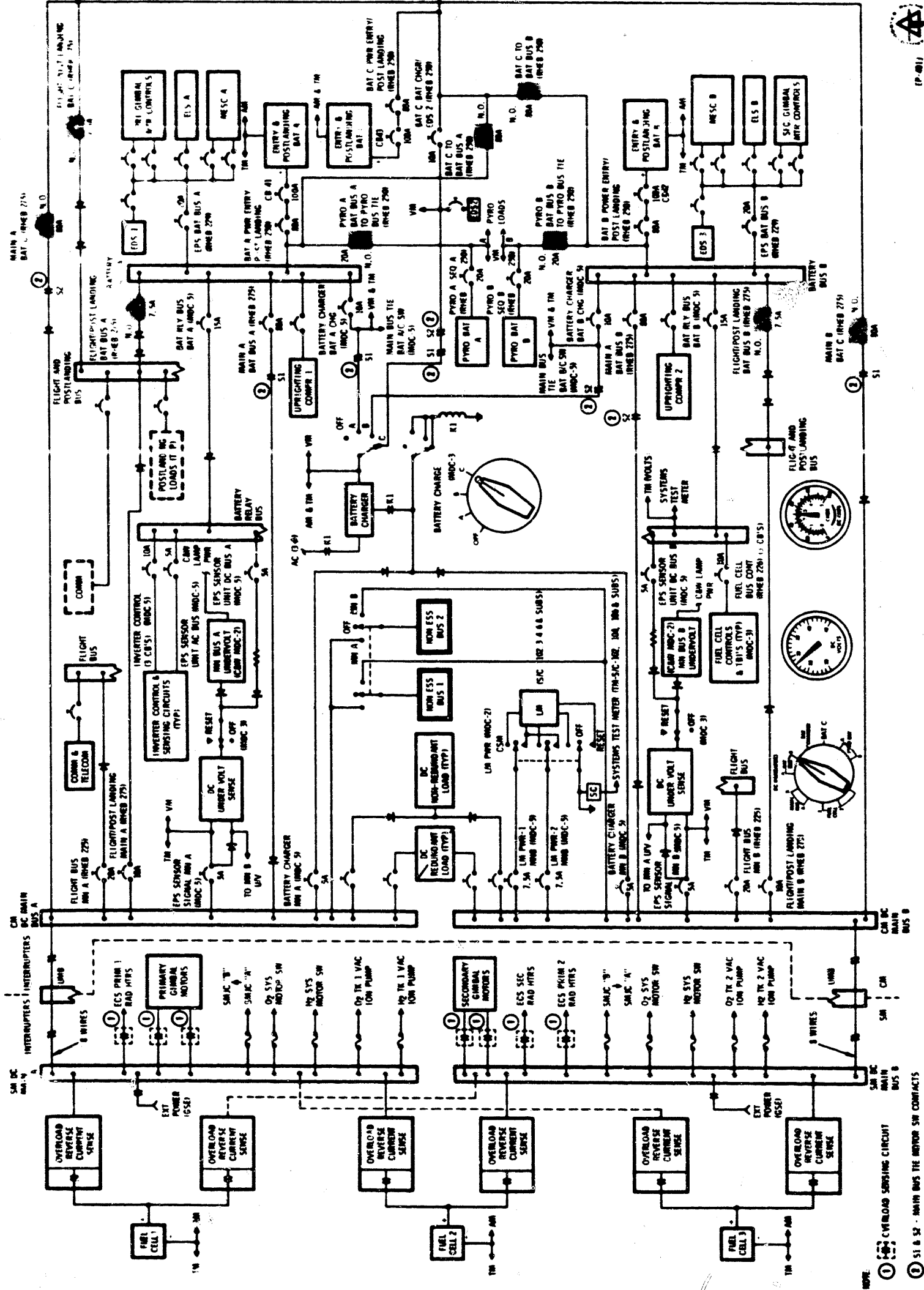
Nominal Charge Current Characteristics, Early Charge

NOTE:
THE CURVES SHOWN IN THIS FIGURE ARE NOMINAL
AND ARE BASED UPON DATA FROM A LIMITED NUMBER
OF TESTS. SIGNIFICANT DEVIATIONS FROM THESE
CURVES CAN BE EXPECTED.

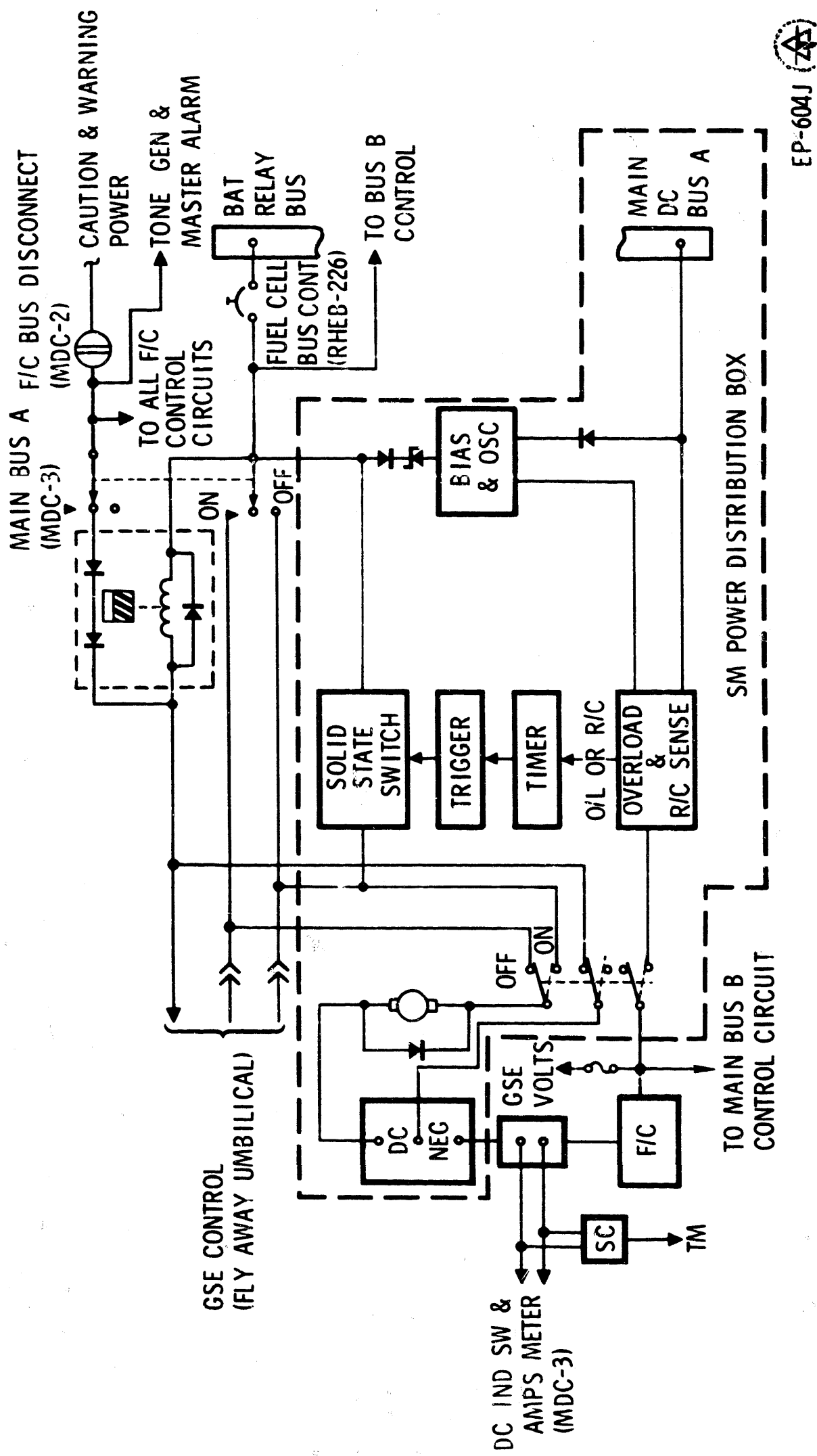


Nominal Charge Current Characteristics, Late Charge

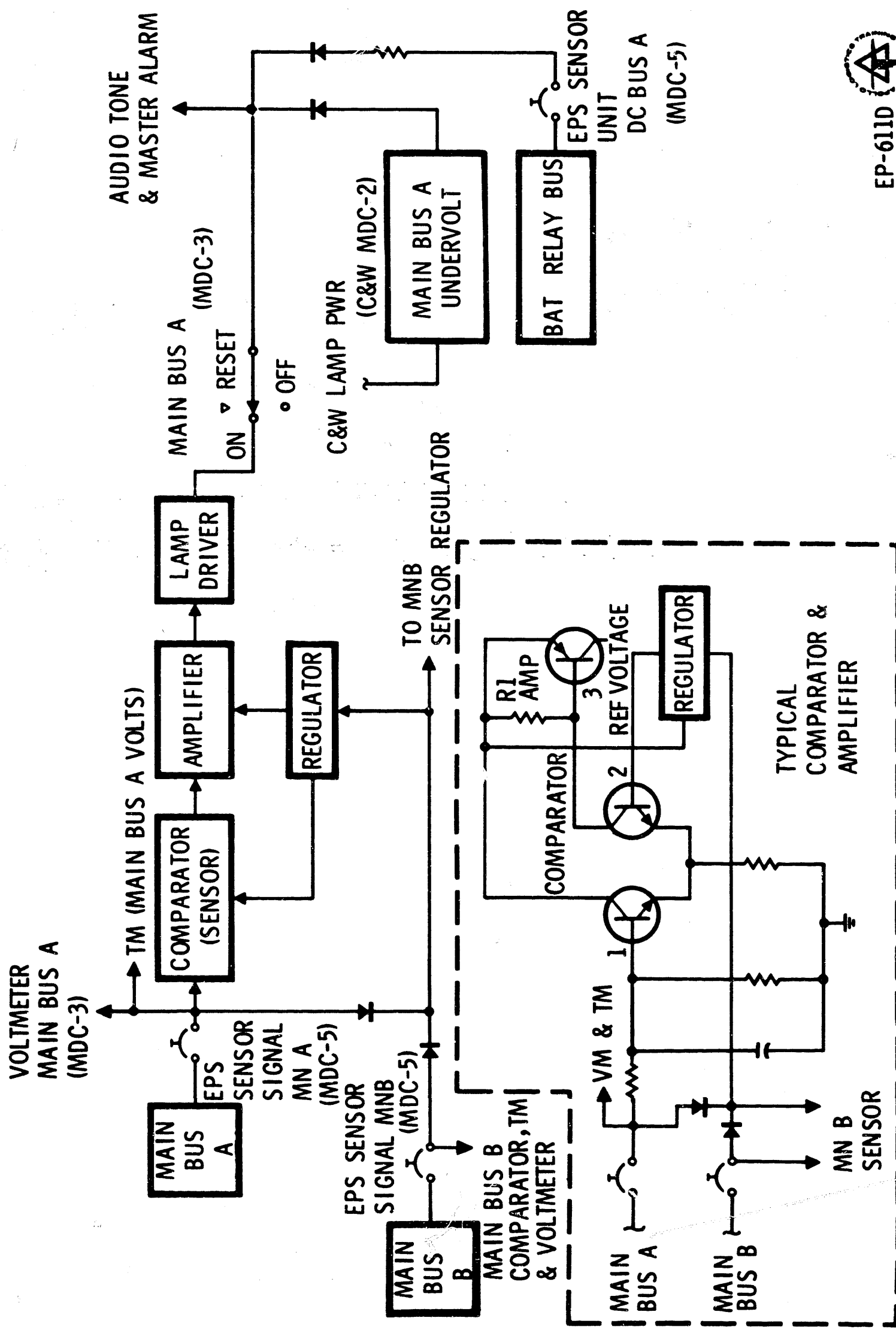
EPS POWER DISTRIBUTION DC POWER SYSTEM



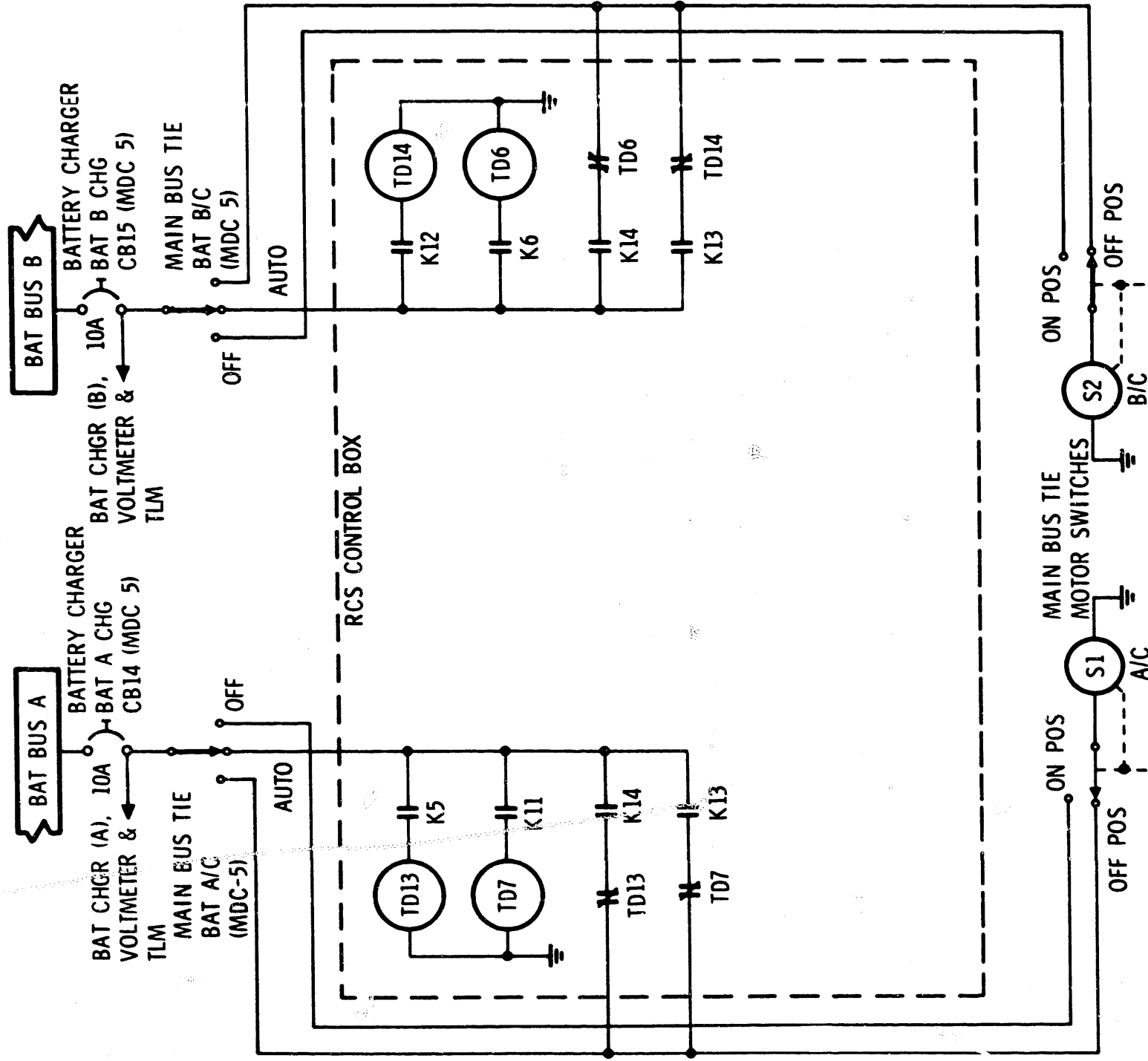
FUEL CELL CONTROL CIRCUIT



DC UNDER VOLTAGE SENSING



ENTRY BATTERY / MAIN BUS TIE CONTROL



NOTE:

**K13 - AUTO RCS TRANSFER
RELAY (SYS A)**

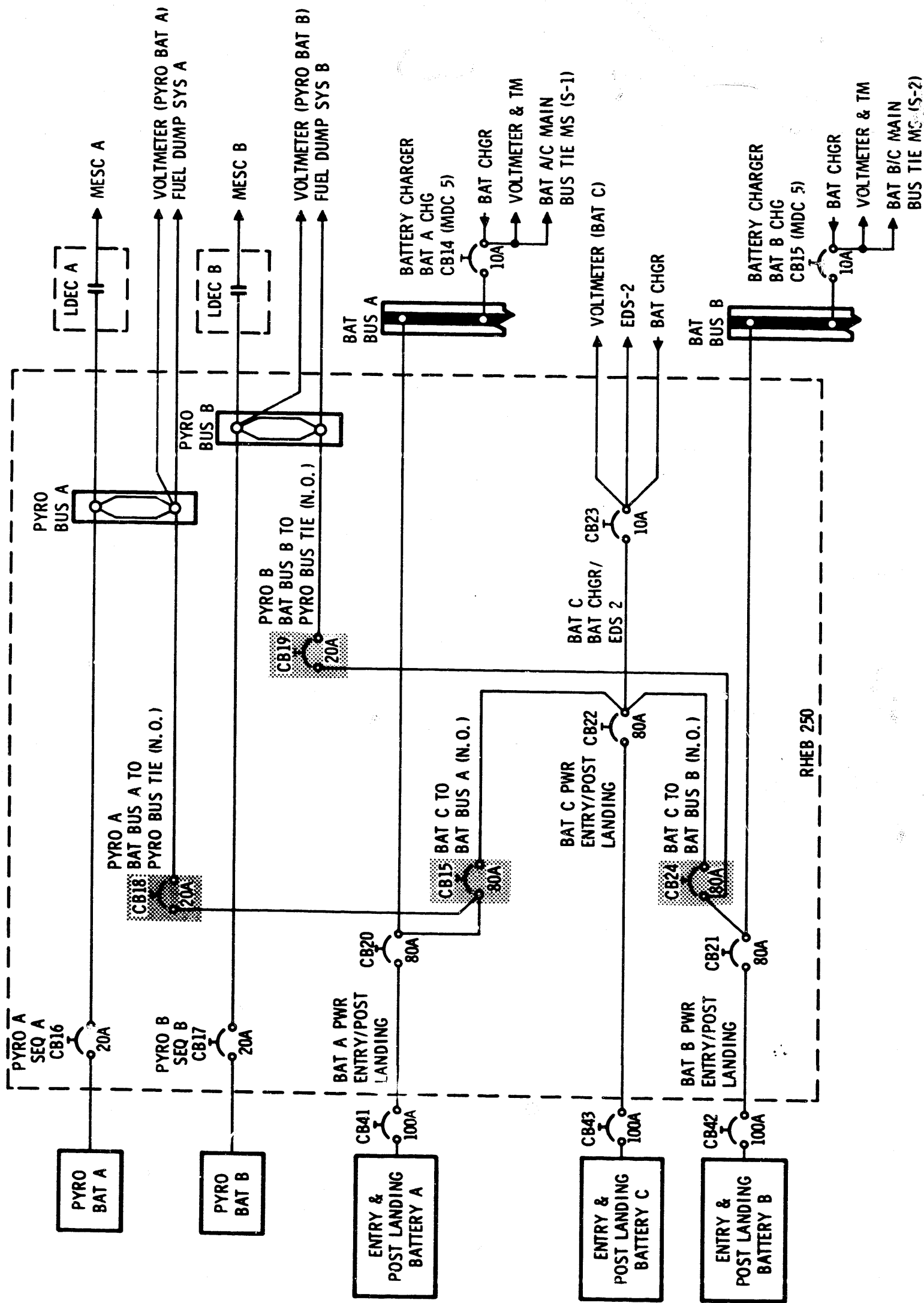
**K14 - AUTO RCS TRANSFER
RELAY (SYS B)**

**(ACTIVATED BY CSM
SEPARATION)**

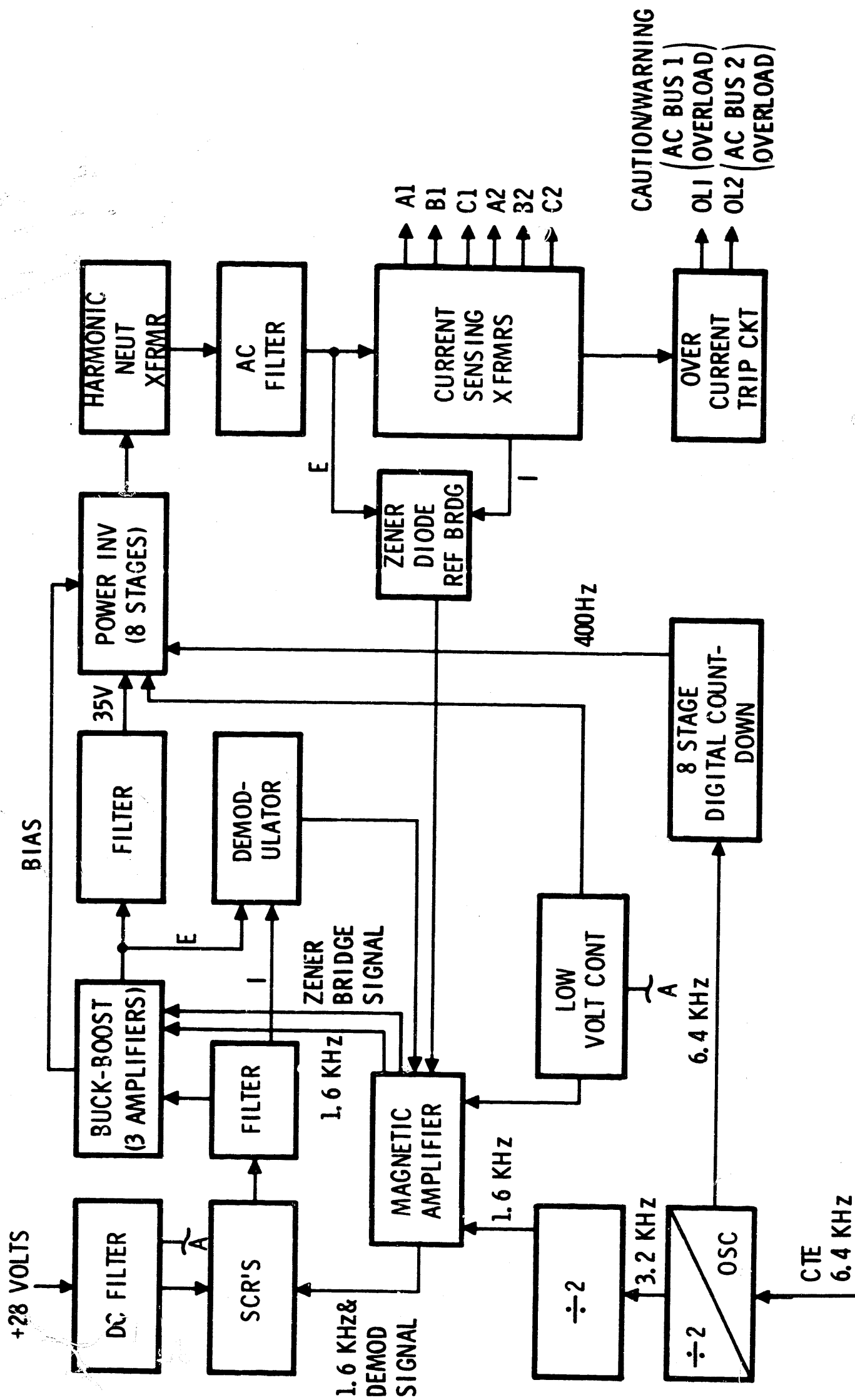
50



BATTERY CIRCUITS

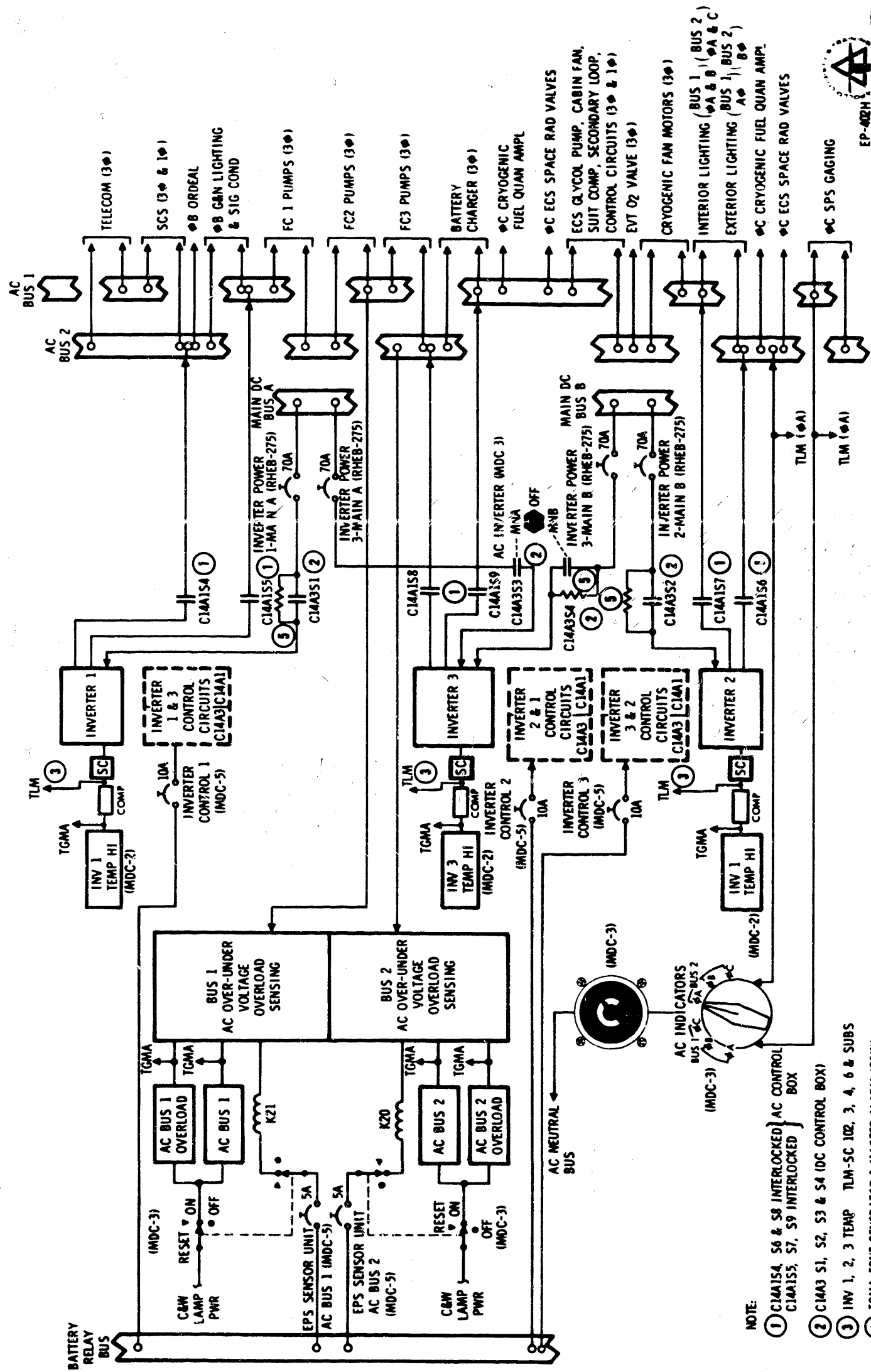


INVERTER BLOCK DIAGRAM

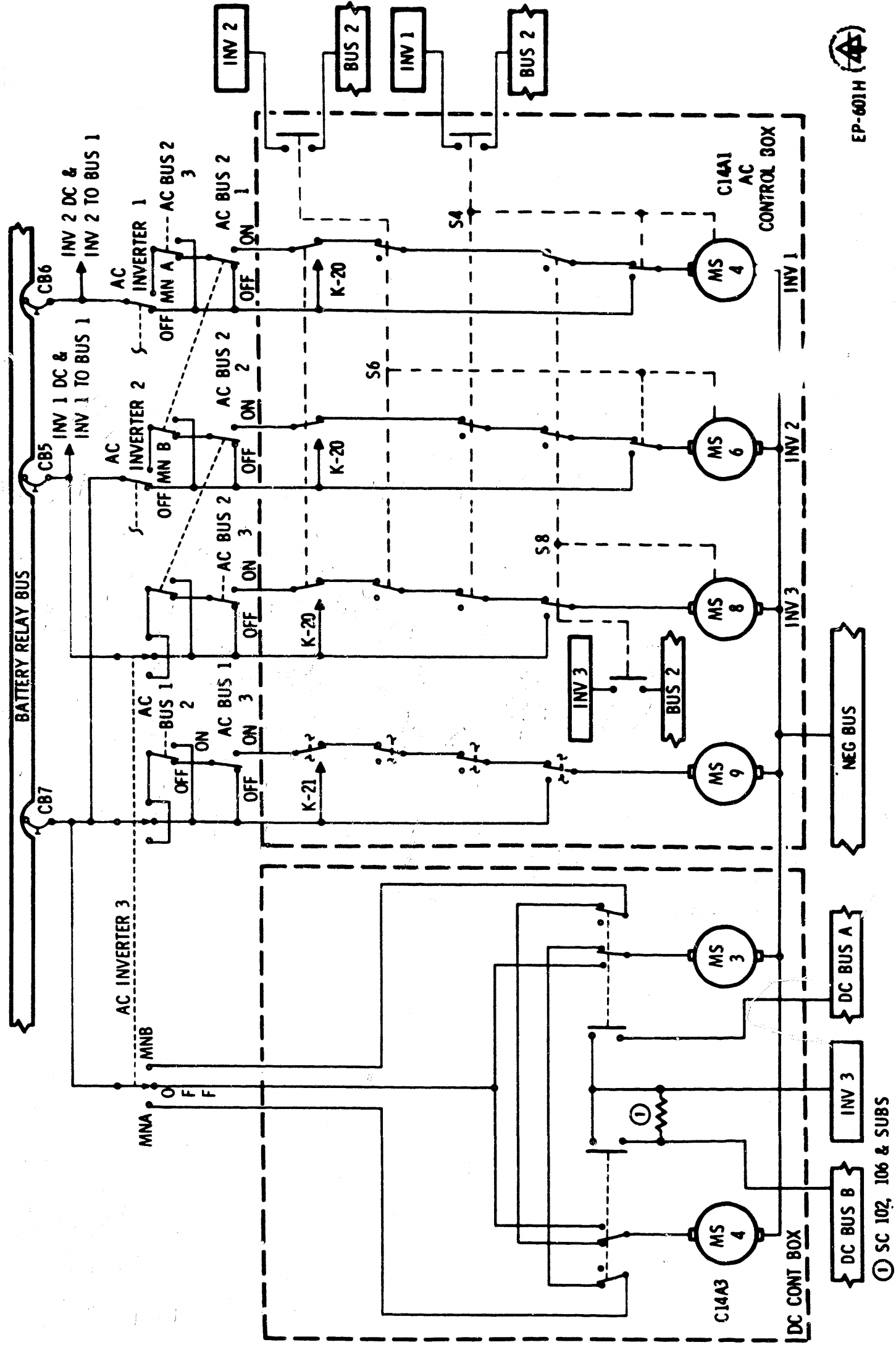


EPS POWER DISTRIBUTION

AC POWER SYSTEM



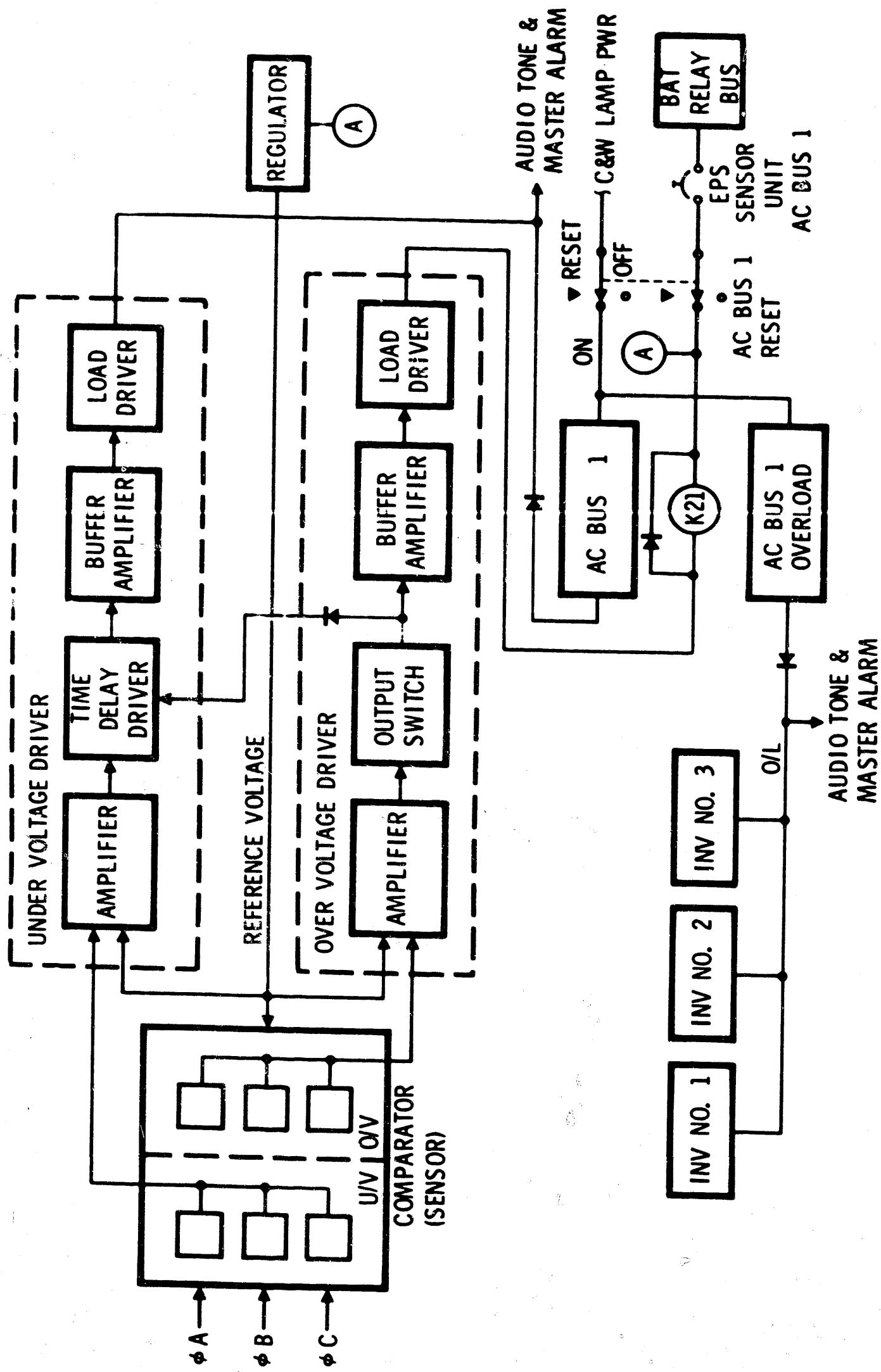
INVERTER CONTROL CIRCUIT



① SC 102, 106 & SUBS

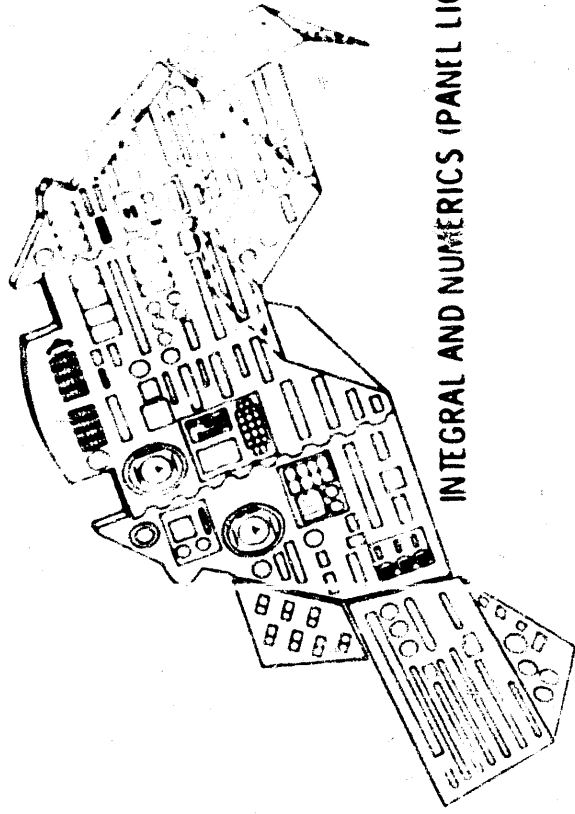
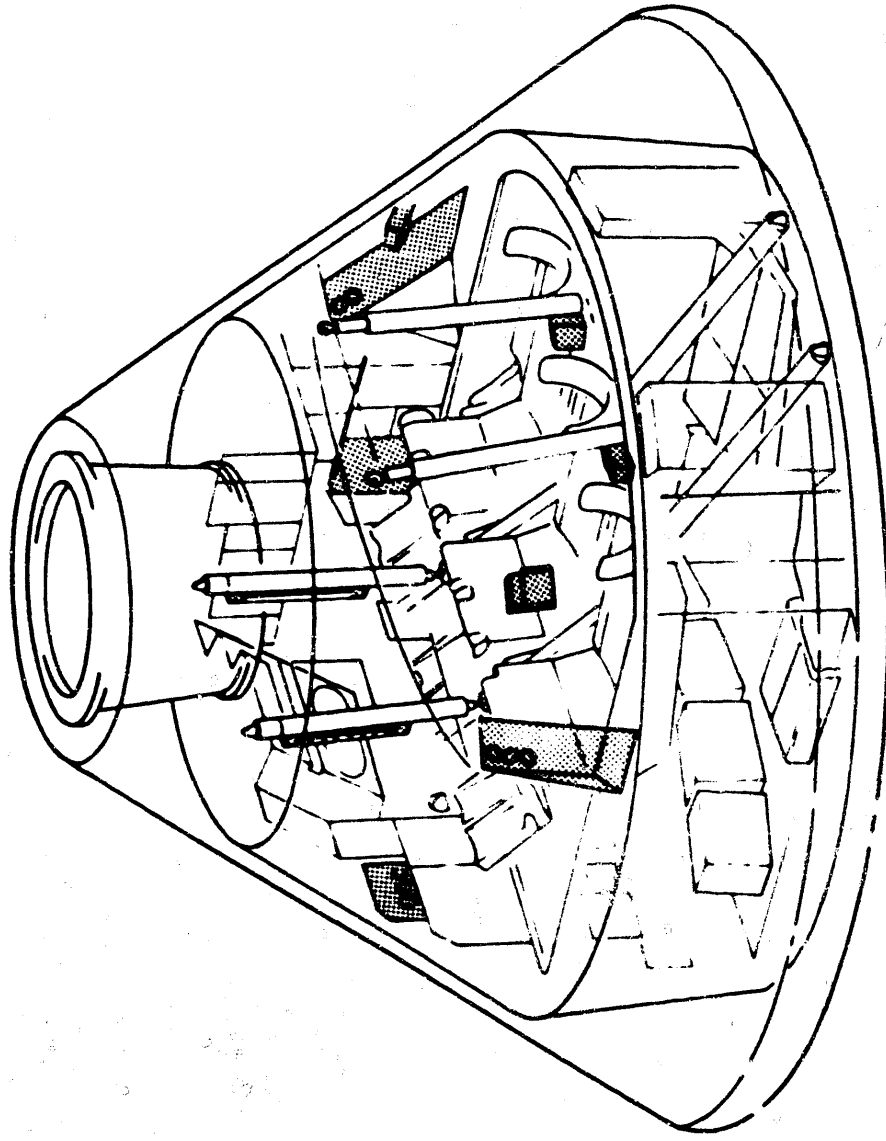
EP-601H (A)

AC SENSING



CM INTERIOR LIGHTING

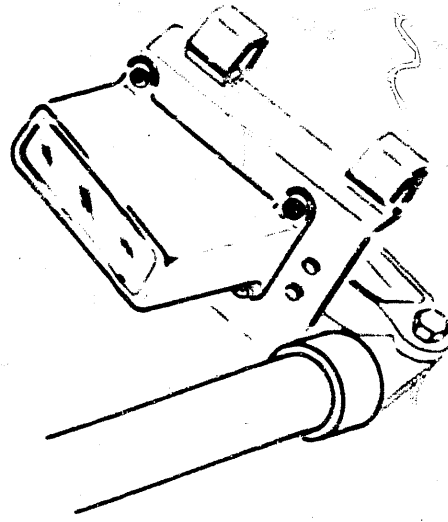
SC 101 AND SUBS



INTEGRAL AND NUMERICS (PANEL LIGHTS)

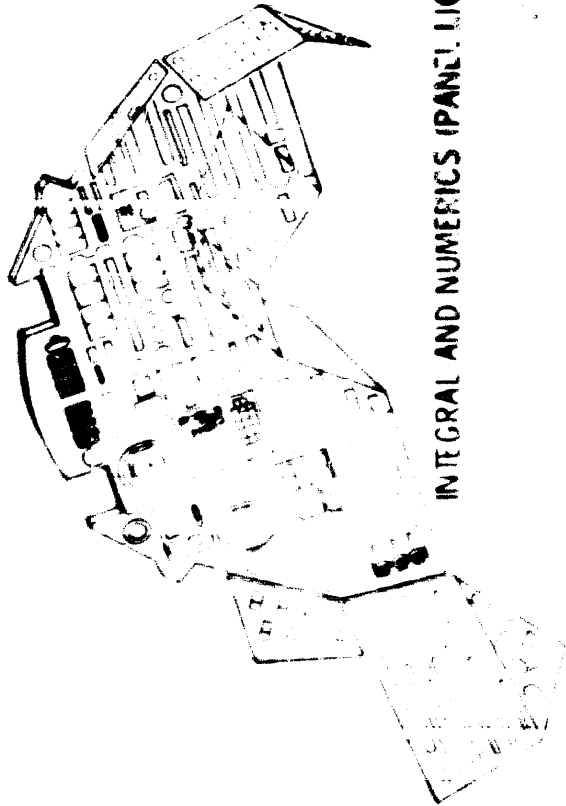
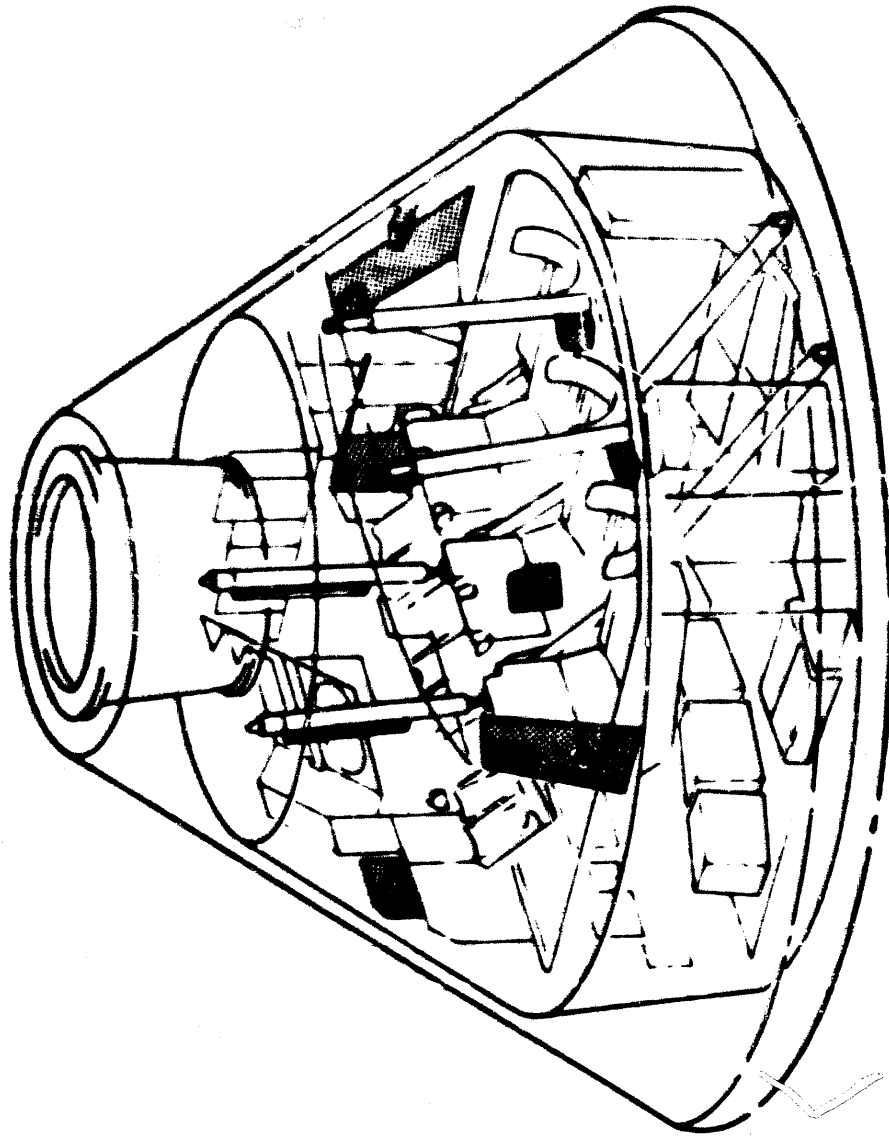


FLOODLIGHT FIXTURES



CM INTERIOR LIGHTING

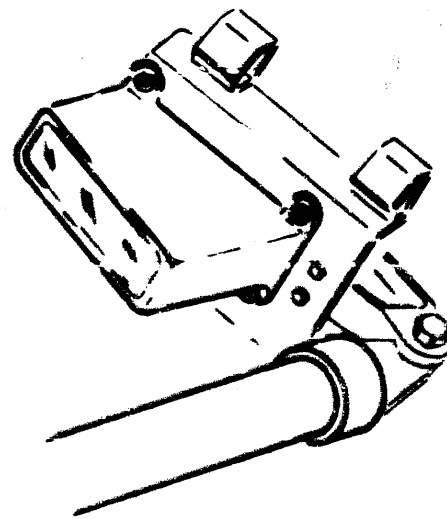
SC 101 AND SUBS



INTEGRAL AND NUMERICS (PANEL LIGHTS)

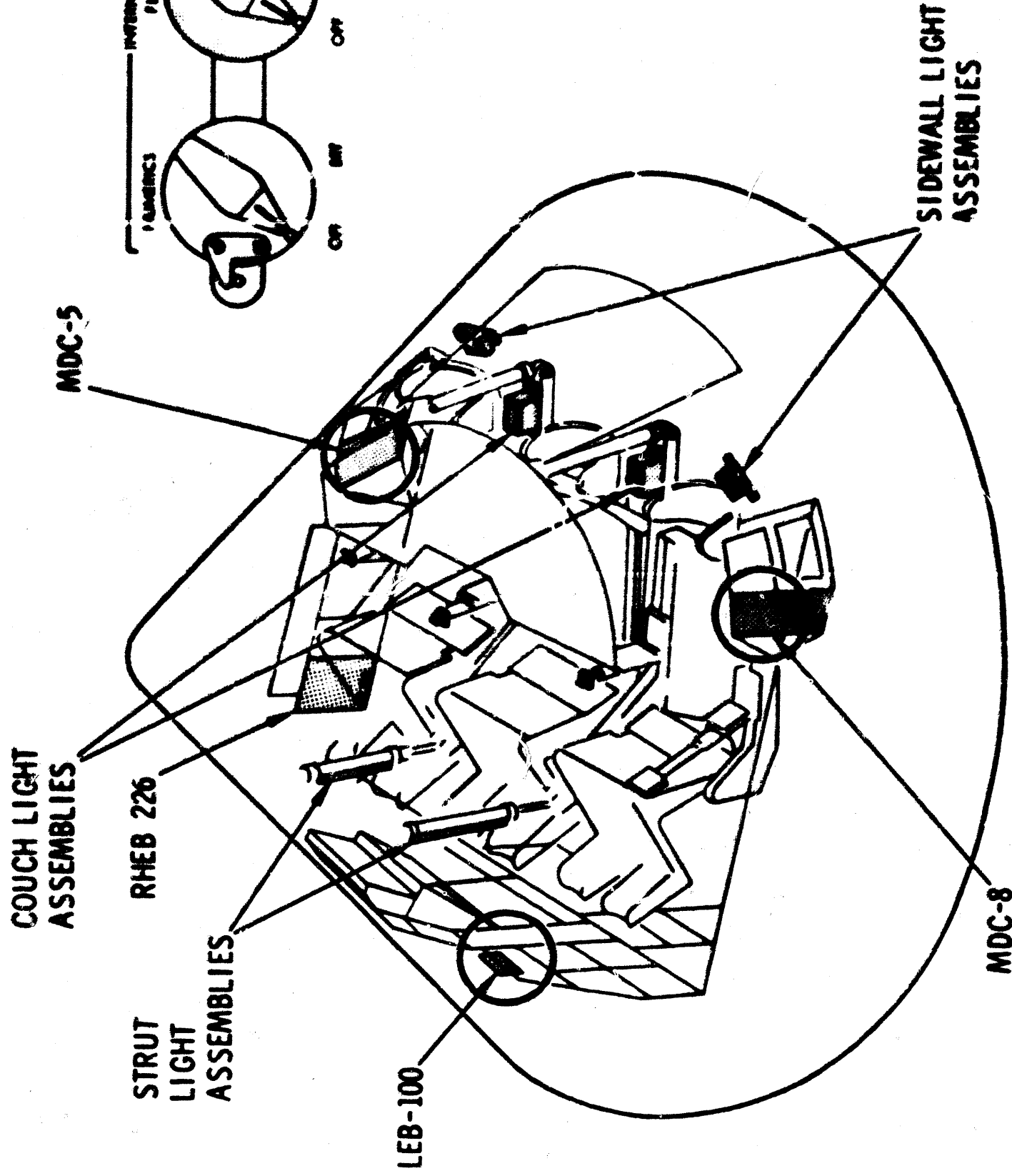
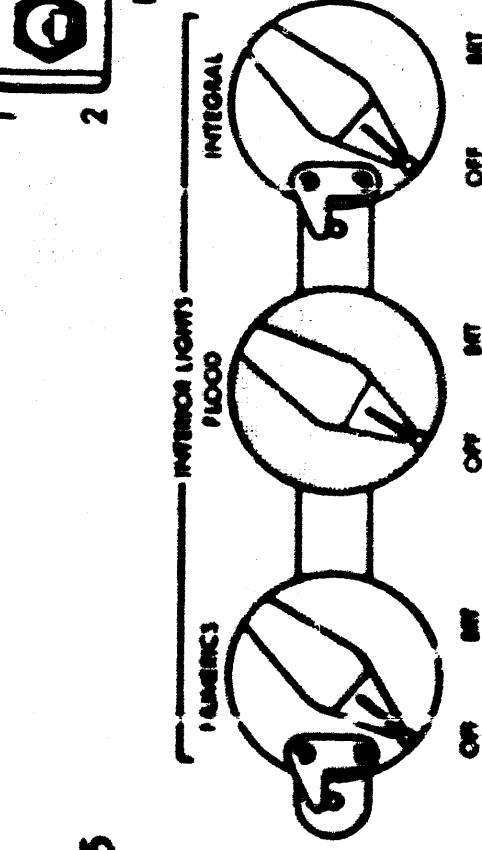
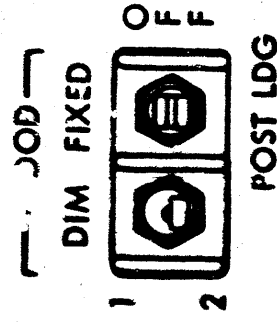


FLOODLIGHT FIXTURES



CM FLOODLIGHT CONFIGURATION

BLOCK II



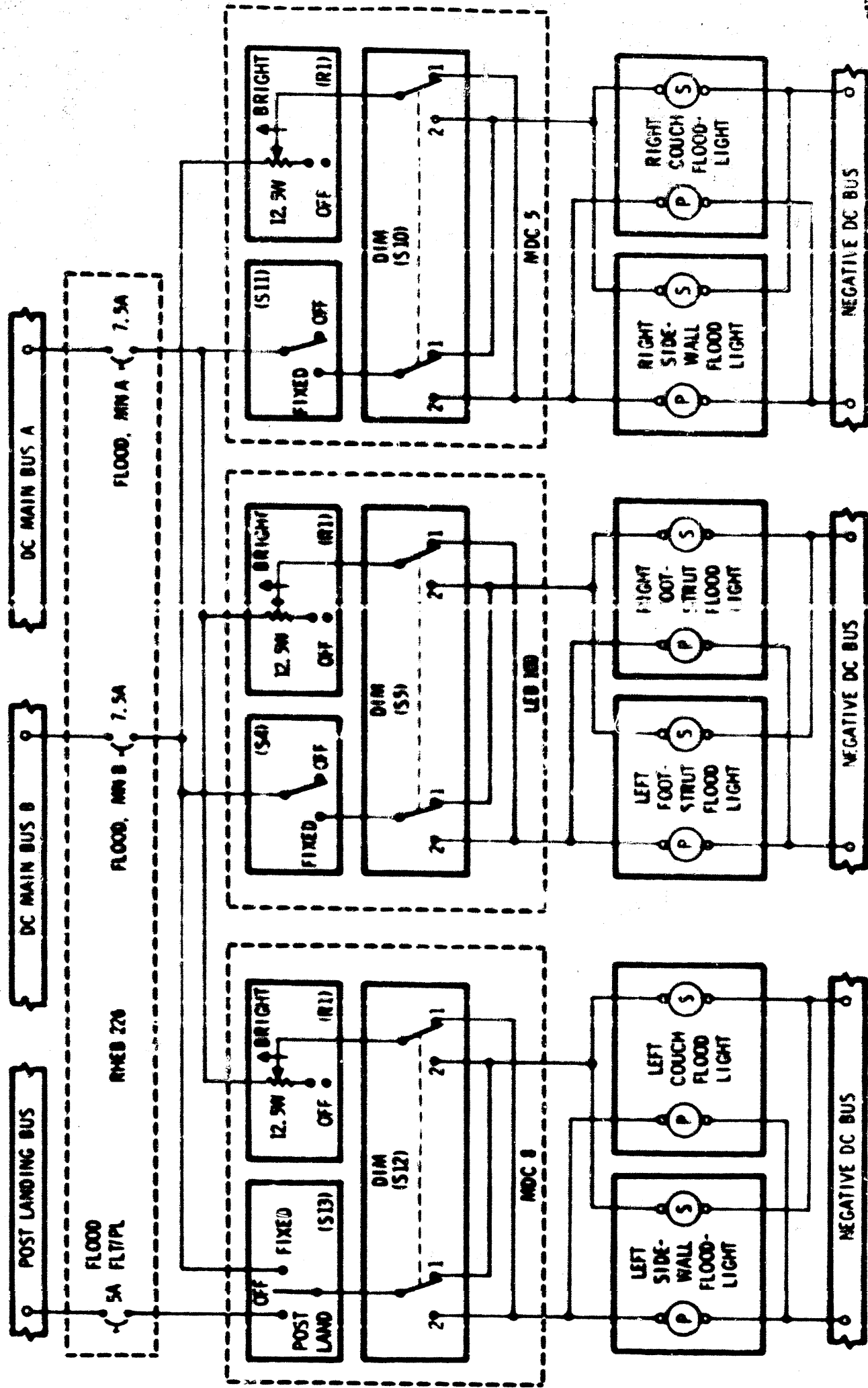
- COMPONENTS**
- 6 LIGHT ASSEMBLIES
 - 3 CONTROL PANELS
 - LH SIDE DISPLAY MDC-8
 - RH SIDE DISPLAY MDC-5
 - LEB 100
 - 3 CIRCUIT BREAKERS
 - RHEB 226



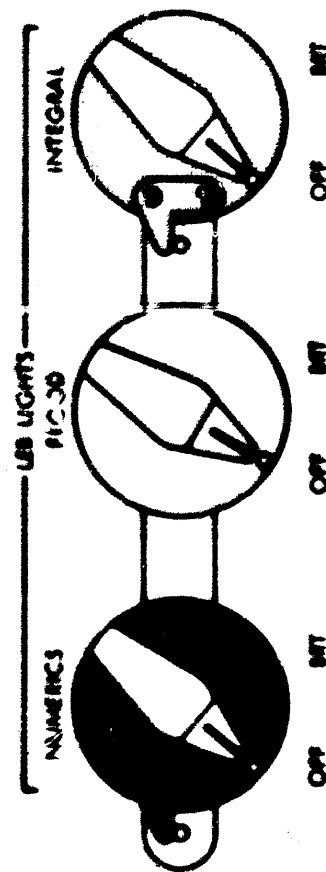
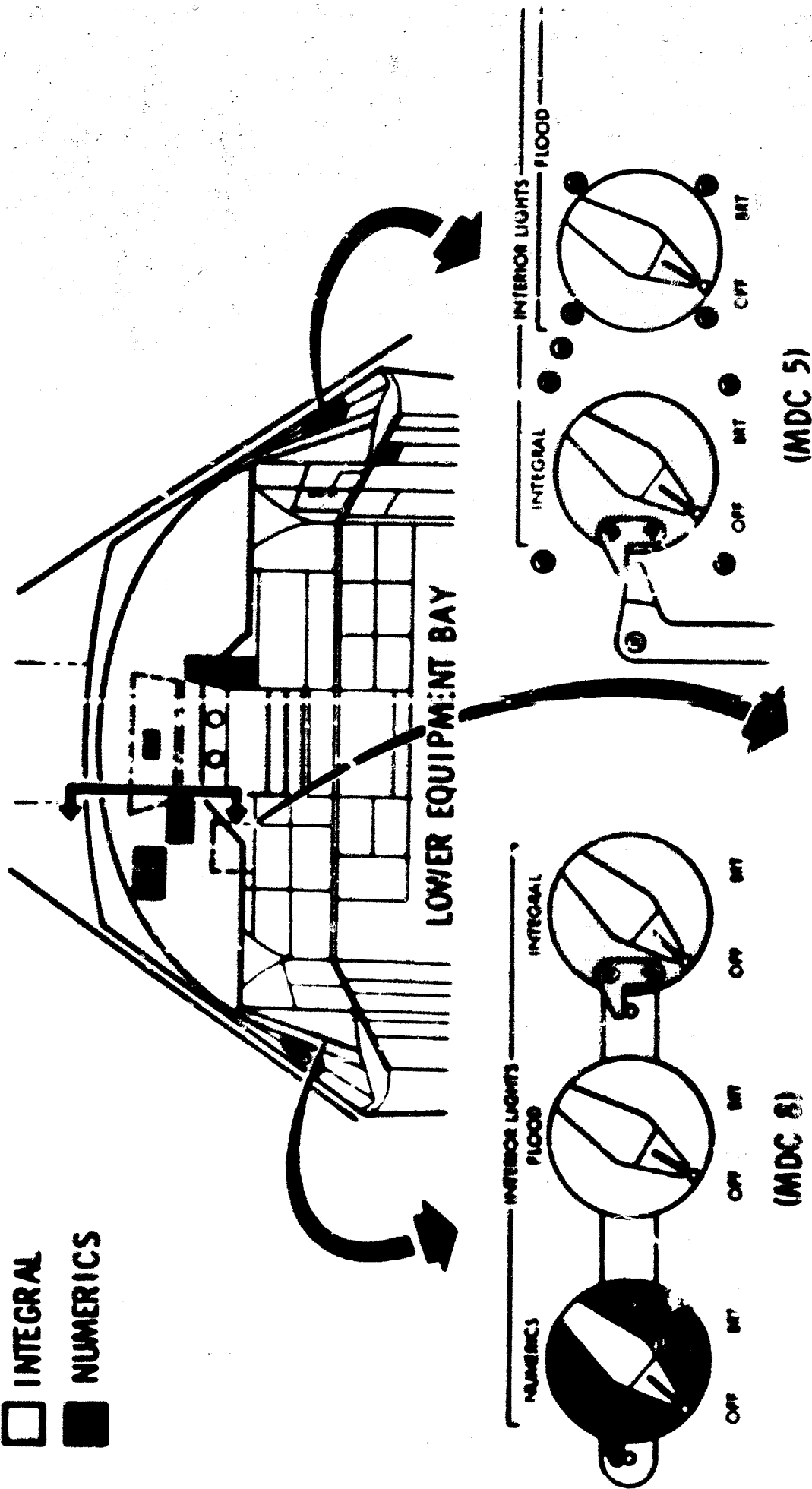
EP-701B

CM FLOODLIGHT SYSTEM SCHEMATIC

BLOCK II

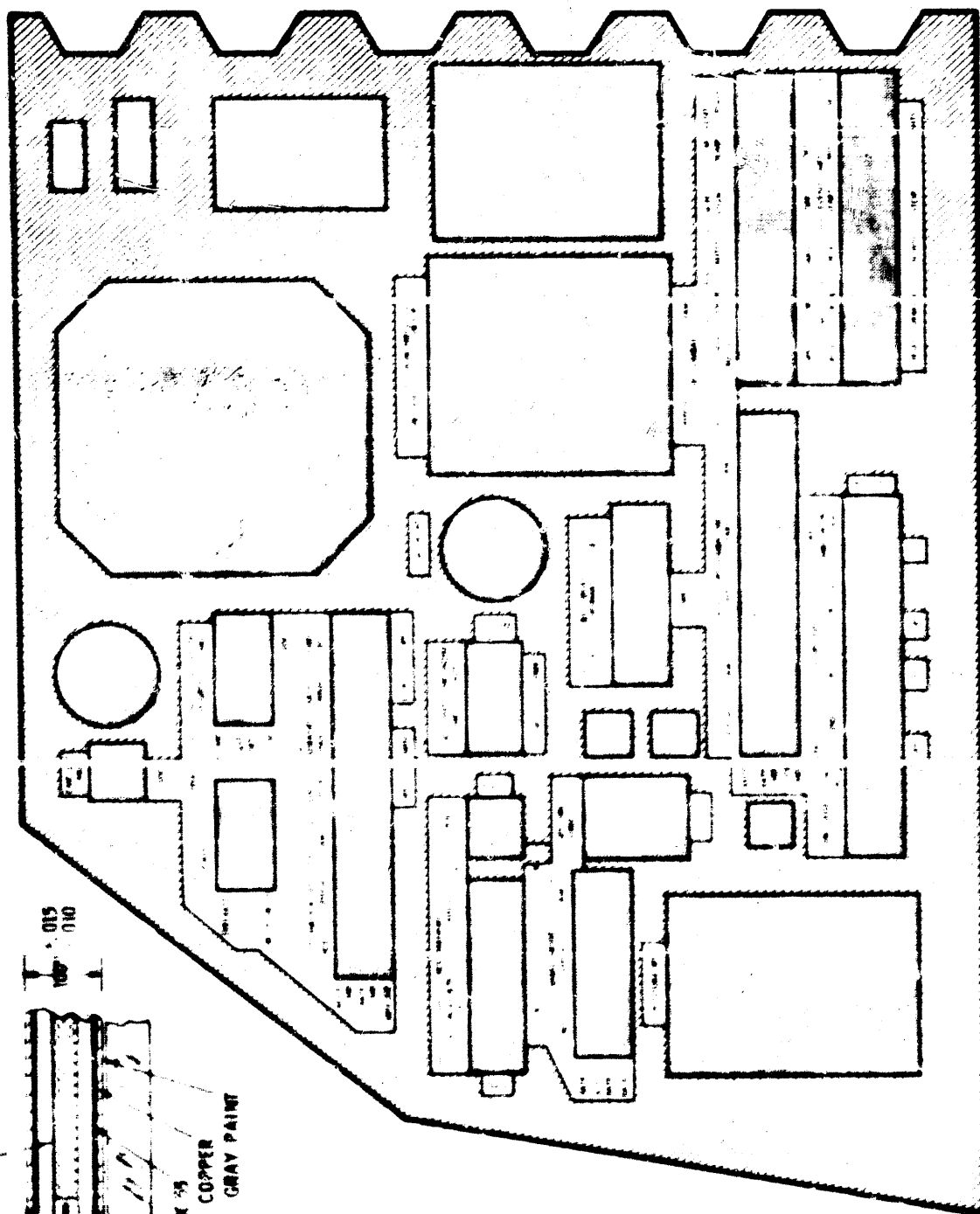
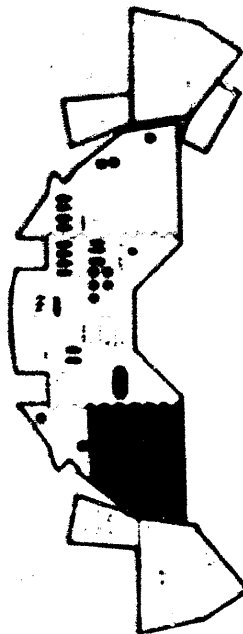
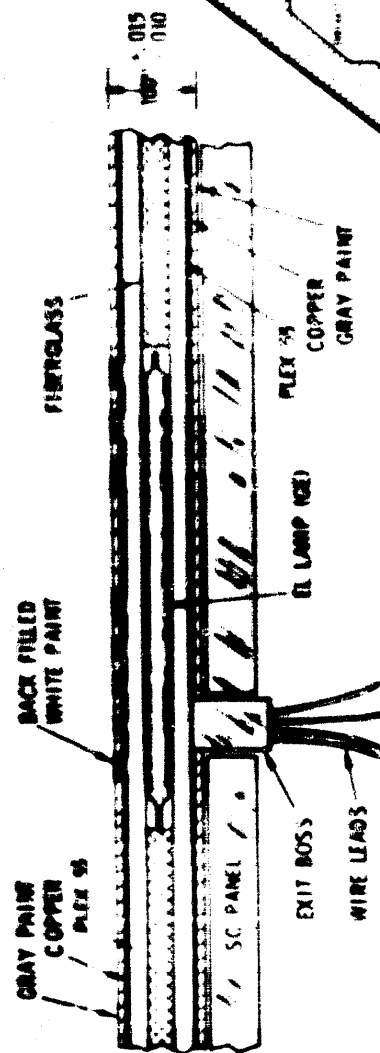


CM INTEGRAL/NUMERICS ILLUMINATION SYSTEM

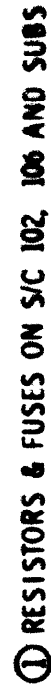


(LFB 100)

INTEGRAL LIGHTING FABRICATION

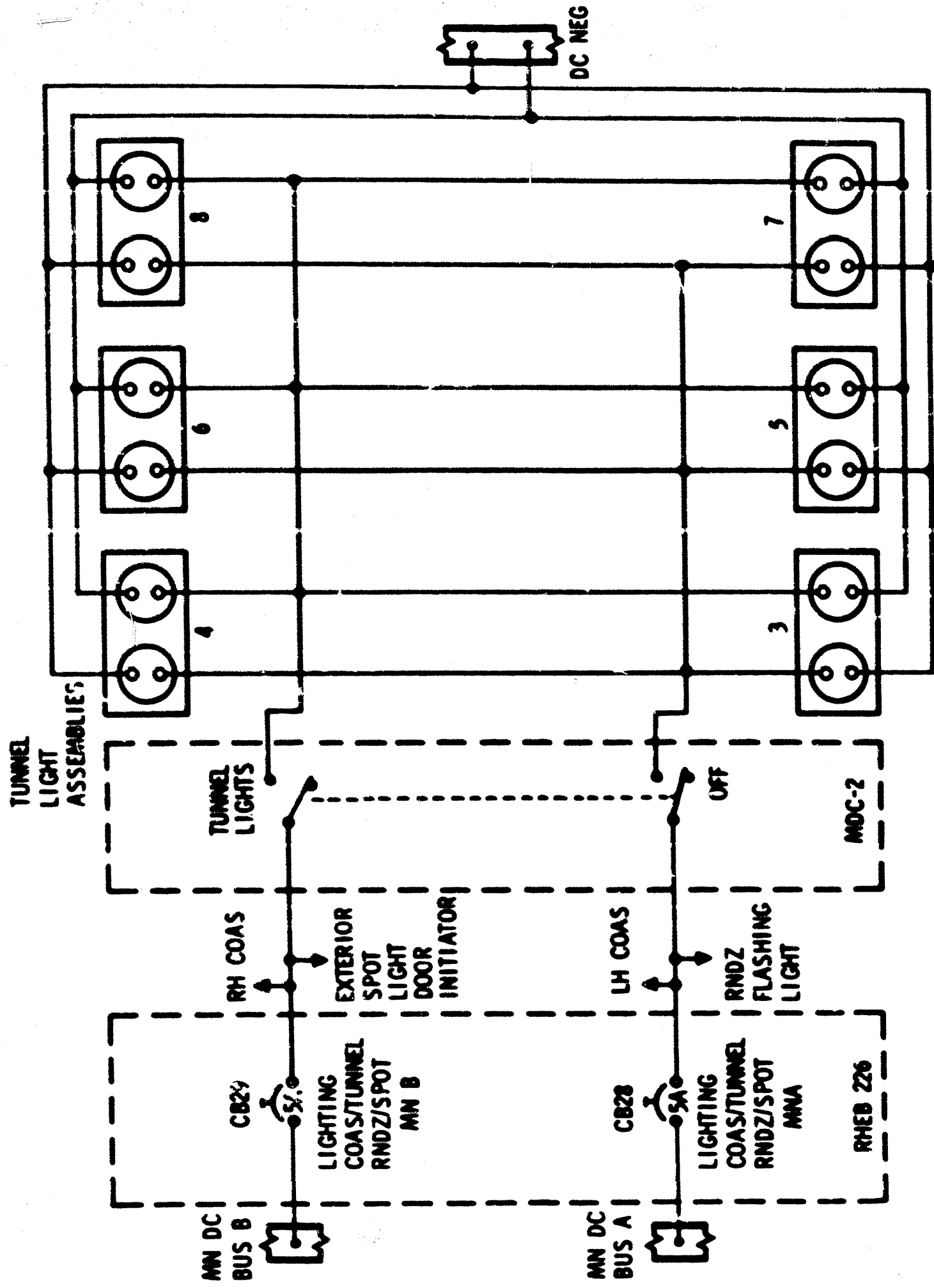


(INTEGRAL & NUMERICS)

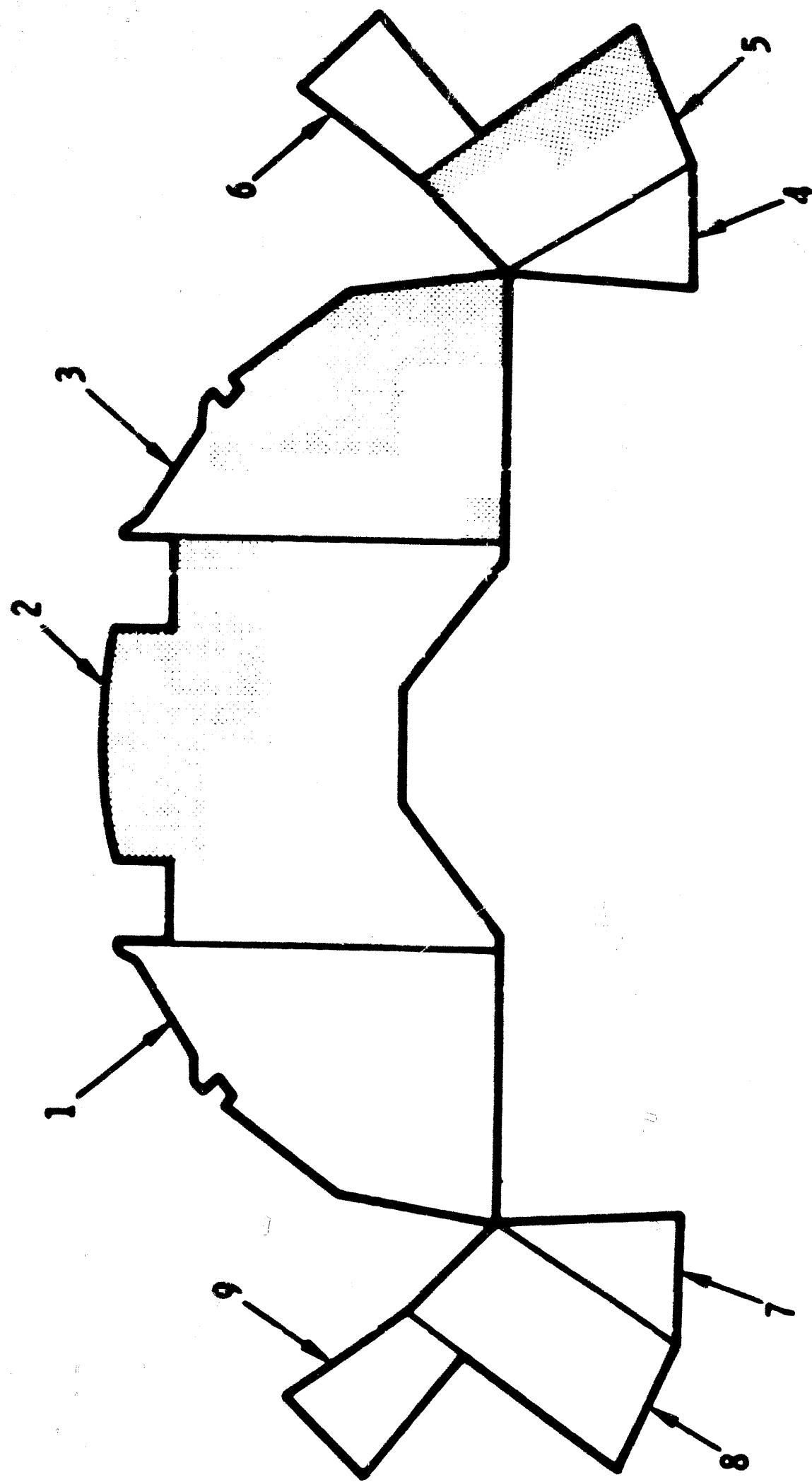


TUNNEL LIGHTING

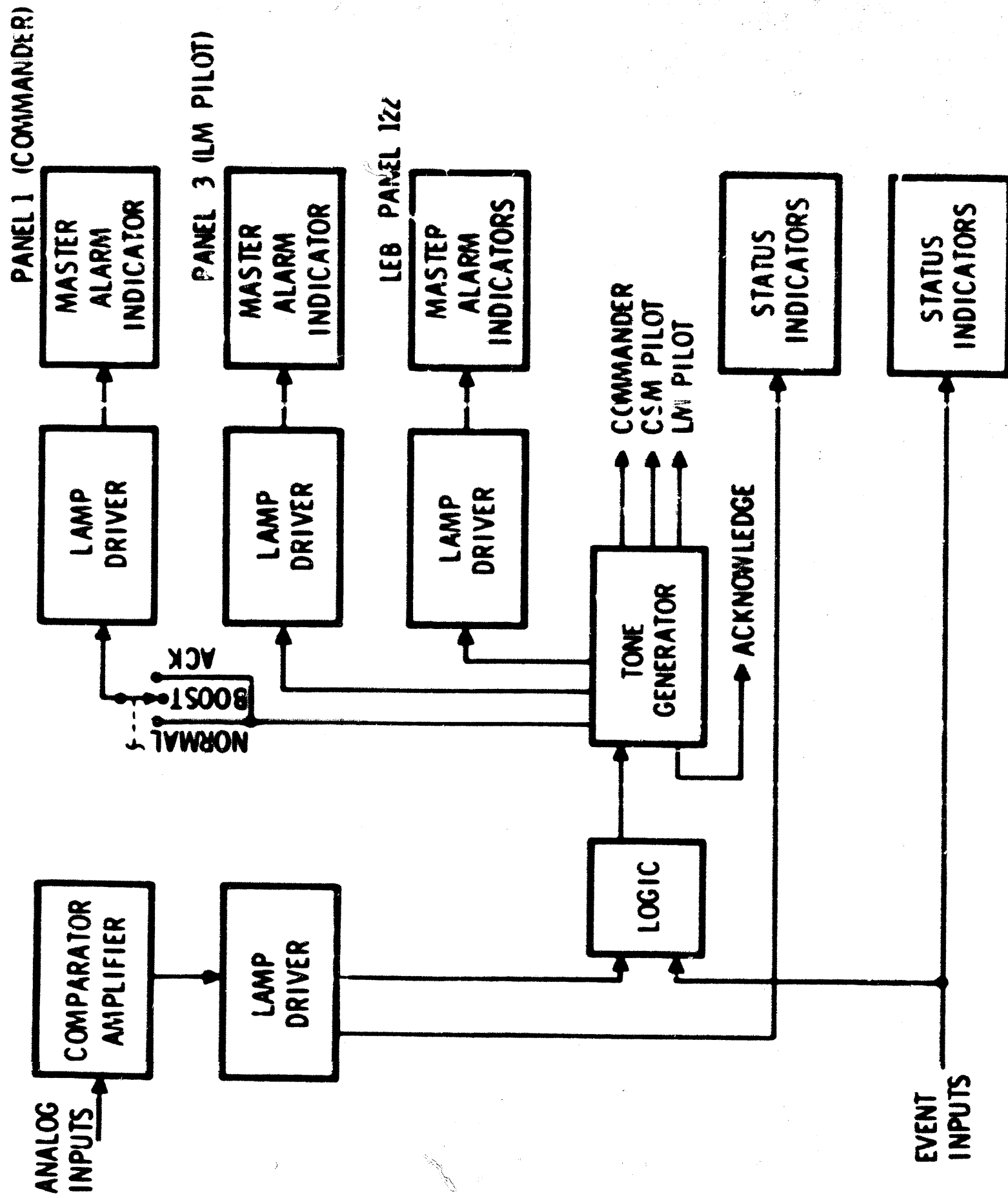
(SC 102, 3, 4, 6 & SUBS)



MAIN DISPLAY CONSOLE LOCATOR



CAUTION & WARNING BLOCK DIAGRAM



TELEMETRY

ELECTRICAL POWER SYSTEM TELEMETRY

MEASUREMENT NUMBER	DESCRIPTION	FANGE	CHANNEL CODE	MINIMUM DATA MODE
<u>FUEL CELLS</u>				
SC 2060P	N ₂ Press FC 1 Reg	0 - 75 PSIA	11A29	
SC 2061P	N ₂ Press FC 2 Reg	0 - 75 PSIA	11A30	
SC 2062P	N ₂ Press FC 3 Reg	0 - 75 PSIA	11A35	
SC 2066P	O ₂ Press FC 1 Reg	0 - 75 PSIA	11A67	
SC 2067P	O ₂ Press FC 2 Reg	0 - 75 PSIA	11A68	
SC 2068P	O ₂ Press FC 3 Reg	0 - 75 PSIA	11A69	
SC 2069P	H ₂ Press FC 1 Reg	0 - 75 PSIA	11A70	
SC 2070P	H ₂ Press FC 2 Reg	0 - 75 PSIA	11A71	
SC 2071P	H ₂ Press FC 3 Reg	0 - 75 PSIA	11A72	
SC 2081T	Temp FC 1 Cond Exh	+150 - + 250 deg F	10A51	+
SC 2082T	Temp FC 2 Cond Exh	+150 - + 250 deg F	10A123	+
SC 2083T	Temp FC 3 Cond Exh	+150 - + 250 deg F	10A69	+
SC 2084T	Temp FC 1 Skin	+30 - +550 deg F	10A72	+
SC 2085T	Temp FC 2 Skin	+30 - +550 deg F	10A75	+
SC 2086T	Temp FC 3 Skin	+30 - +550 deg F	10A78	+
SC 2087T	Temp FC 1 Rad Outlet	-30 - +300 deg F	10A126	+
SC 2088T	Temp FC 2 Rad Outlet	-30 - +300 deg F	10A129	+
SC 2089T	Temp FC 3 Rad Outlet	-30 - +300 deg F	10A132	+
SC 2090T	Temp FC 1 Rad Inlet	-50 - +300 deg F	10A130	
SC 2091T	Temp FC 2 Rad Inlet	-50 - +300 deg F	10A131	
SC 2092T	Temp FC 3 Rad Inlet	-50 - +300 deg F	10A67	
SC 2113C	Current FC 1	0 - 100 A	11A76	+
SC 2114C	Current FC 2	0 - 100 A	11A84	+
SC 2115C	Current FC 3	0 - 100 A	11A85	+

**MIDRUM
DATA
MODE**

**CHANNEL
CODE**

RANGE

DESCRIPTION

**MEASUREMENT
NUMBER**

FUEL CELLS cont'd

SC 2139R	Flow Rate H ₂ FC 1	0 - .2 lb/hr	11A77	
SC 2140R	Flow Rate H ₂ FC 2	0 - .2 lb/hr	11A78	
SC 2141R	Flow Rate H ₂ FC 3	0 - .2 lb/hr	11A79	
SC 2142R	Flow Rate O ₂ FC 1	0 - 1.6 lb/hr	11A80	
SC 2143R	Flow Rate O ₂ FC 2	0 - 1.6 lb/hr	11A81	
SC 2144R	Flow Rate O ₂ FC 3	0 - 1.6 lb/hr	11A82	
SC 2160X	pH FC 1 Event	Norm - High	11E28 - 1	
SC 2161X	pH FC 2 Event	Norm - High	11E28 - 2	
SC 2162X	pH FC 3 Event	Norm - High	11E28 - 3	

CHRYOGENIC

SC 0030Q	Quantity H ₂ Tank 1	0 - 100 Pent	10A141	+
SC 0031Q	Quantity H ₂ Tank 2	0 - 100 Pent	10A144	+
SC 0032Q	Quantity O ₂ Tank 1	0 - 100 Pent	10A147	+
SC 0033Q	Quantity O ₂ Tank 2	0 - 100 Pent	10A42	+
SC 0037P	Pressure O ₂ Tank 1	50 - 1050 PSIA	10A150	+
SC 0038P	Pressure O ₂ Tank 2	50 - 1050 PSIA	10A46	+
SC 0039P	Pressure H ₂ Tank 1	0 - 350 PSIA	10A36	+
SC 0040P	Pressure H ₂ Tank 2	0 - 350 PSIA	10A39	+
SC 0041T	Temp O ₂ Tank 1	-325 - +80 deg F	10A54	+
SC 0042T	Temp O ₂ Tank 2	-325 - +80 deg F	10A57	+
SC 0043T	Temp H ₂ Tank 1	-425 - -200 deg F	10A60	+
SC 0044T	Temp H ₂ Tank 2	-425 - -200 deg F	10A63	+

MEASUREMENT NUMBER	DESCRIPTION	RANGE	CHANNEL CODE	MINIMUM DATA MODE (S/C 103)	(S/C 102, 104, 106 & subs)
<u>DC DISTRIBUTION</u>					
CC 0206V	Main Bus A Volts	0 - 45 VDC	11A57	+	+
CC 0207V	Main Bus B Volts	0 - 45 VDC	11A58	+	+
CC 0210V	Battery Bus A Volts	0 - 45 VDC	11A23		+
CC 0211V	Battery Bus B Volts	0 - 45 VDC	11A24		+
CC 0215C	Battery Charge Current	0 - 5 A	11A73	+	+
CC 0222C	Battery A Current	0 - 100 A	11A74		+
CC 0223C	Battery B Current	0 - 100 A	11A27		+
CC 0224C	Battery C Current	0 - 100 A	11A28		+
CC 0232V	Battery Relay Bus Volts	0 - 45 VDC	11A75	+	+
<u>AC DISTRIBUTION</u>					
CC 0175T	Temp Static Inverter 1	+32 - +248 deg F	10A86		
CC 0176T	Temp Static Inverter 2	+32 - +248 deg F	10A88		
CC 0177T	Temp Static Inverter 3	+32 - +248 deg F	10A89		
CC 0200V	AC Bus 1 Voltage ϕ A	0 - 150 VAC	11A147	+	+
CC 0203V	AC Bus 2 Voltage ϕ A	0 - 150 VAC	11A56	+	+

POWER DISTRIBUTION

BY

CIRCUIT BREAKER

POWER DISTRIBUTION
BY
CIRCUIT BREAKER LISTING

S/C 103

CIRCUIT BREAKER NOMENCLATURE

C/B NO.

FUNCTION

MAIN DISPLAY PANEL 4

SUIT COMPRESSORS

AC 1

Ø A
Ø B
Ø C

1
2
3

Ø A power to suit compressor 1 and/or 2.
Ø B power to suit compressor 1 and/or 2.
Ø C power to suit compressor 1 and/or 2.

AC 2

Ø A
Ø B
Ø C

4
5
6

Ø A power to suit compressor 1 and/or 2.
Ø B power to suit compressor 1 and/or 2.
Ø C power to suit compressor 1 and/or 2.

ECS GLYCOL PUMPS

AC 1

Ø A
Ø B
Ø C

7
8
9

Ø A power to glycol pump 1 or 2 & to glycol auto temp control valve.
Ø B power to glycol pump 1 or 2 & to suit circuit heat exchanger.
Ø C power to glycol pump 1 or 2, manual control of glycol primary evap steam pressure & cool-heat selector.

AC 2

Ø A

10

Ø A power to glycol pump 1 or 2, auto control of glycol water flow & glycol evap steam pressure controllers.

Ø B
Ø C

11
12

Ø B power to glycol pump 1 or 2.
Ø C power to glycol pump 1 or 2.

EPS SENSOR SIGNAL

MN A

MAIN DISPLAY PANEL 5

1 Main dc bus A sampling voltage to main dc bus A undervoltage sensor. Operating voltage to main dc bus A and B undervoltage sensors (diodeed with main dc bus B). Voltage to voltmeter and telemetry.

MN B

2 Main dc bus B sampling voltage to main dc bus B undervoltage sensor. Operating voltage to main dc bus A and B undervoltage sensors (diodeed with main dc bus A). Voltage to voltmeter and telemetry.

AC 1

3 Sampling voltage of each phase of AC bus 1 to over/under voltage sensor. Voltage to AC voltmeter and ϕ A to telemetry.

AC 2

4 Sampling voltage of each phase of AC bus 2 to over/under voltage sensor. Voltage to AC voltmeter and ϕ A to telemetry.

C/W

MN A

52 Main dc bus A power to caution/warning system (diodeed with main dc bus B).

MN B

53 Main dc bus B power to caution/warning system (diodeed with main dc bus A).

LM FWR - 1

MN 3

74 Main dc bus B power thru one of two umbilicals to LM.

INVERTER CONTROL

1

Battery relay bus power to three inverter control circuits:

1. DC input to inverter 1
2. Inverter 1 to AC bus 1
3. Inverter 3 to AC bus 2

Inverter Control cont'd

2	6	Battery relay bus power to three inverter control circuits: 1. DC input to inverter 2 2. Inverter 2 to AC bus 1 3. Inverter 1 to AC bus 2
3	7	Battery relay bus power to four inverter control circuits: 1. Main dc bus A input to inverter 3 2. Main dc bus B input to inverter 3 3. Inverter 3 to AC bus 1 4. Inverter 2 to AC bus 2
EPS SENSOR UNIT DC BUS A	8	Battery relay bus power to main dc bus A under-voltage sensor after undervoltage is detected.
DC BUS B	9	Battery relay bus power to main dc bus B under-voltage sensor after undervoltage is detected.
AC BUS 1	10	Battery relay bus power to AC bus 1 over/under voltage sensor for sensor operation.
AC BUS 2	11	Battery relay bus power to AC bus 2 over/under voltage sensor for sensor operation.
BAT RLY BUS BAT A	12	Battery bus A power to battery relay bus (diode with battery bus B).
BAT B	13	Battery bus B power to battery relay bus (diode with battery bus A).
LM PWR - 2 AN B	66	Main dc bus B power thru second of two umbilicals to LM.

MDC 5 cont'd

ENVIRONMENTAL CONTROL SYSTEM RADIATORS
CONTROLLER

AC 1	68	AC bus 1 ØC power to ECS primary radiator flow proportioning valves.
AC 2	69	AC bus 2 ØC power to ECS secondary radiator flow proportioning valves.
CONT/HTRS MN A	67	Main dc bus A power to ECS Primary 2 radiator heater control circuit logic & ECS auto and manual # 1 proportioning control.
MN B	70	Main dc bus B power to ECS Primary 1 radiator heater control circuit logic & ECS auto and manual # 2 proportioning control.
HTRS OVLD BAT A	72	Battery bus A power to ECS Primary 1 radiator heater overload sensor circuit logic.
BAT B	73	Battery bus B power to ECS Primary 2 and Secondary radiator heater overload sensor circuit logic.
TEMP MN A	36	Main dc bus A power to transducers for suit supply inlet and outlet manifold temp, cabin temp, space radiator outlet temp & glycol evap outlet steam temp (diodes with main dc bus B).
MN B	37	Main dc bus B power to transducers for suit supply inlet and outlet manifold temp, cabin temp, space radiator outlet temp & glycol evap outlet steam temp (diodes with main dc bus A).

MDC 5 cont'd

ENVIRONMENTAL CONTROL SYSTEM
SECONDARY CONTROL LOOP

AC 1 (3Ø)	44	Ac bus 1 3Ø power to secondary glycol pump. to secondary coolant loop evap temp control. (Pump power selective Ac bus 1 or 2).
AC 2 (3Ø)	45	Ac bus 2 3Ø power to secondary glycol pump. (Pump power selective Ac bus 1 or 2).
RAD HTR MN A	71	Main dc bus A power to secondary radiator heater control circuit logic & Temp -- Sec -- outlet and inlet indicators.
XDUCERS MN A	46	Main dc bus A power to transducers for secondary loop glycol pump outlet press, glycol accumulator quantity and press & evap glycol steam outlet press (dioded with main dc bus B).
MN B	47	Main dc bus B power to transducers for secondary loop glycol pump outlet press, glycol accumulator quantity and press & evap glycol steam outlet press (dioded with main dc bus A).
STEAM/URINE DUCT HTR MN A	50	Main dc bus A power to manually controlled urine/waste water dump line heater, urine/waste water dump line strip heater & steam duct heater (dioded with main dc bus B).
MN B	51	Main dc bus B power to manually controlled urine/waste water dump line heater, urine/waste water dump line strip heater & steam duct heater (dioded with main dc bus A).
BATTERY CHARGER BAT A CHG	14	Battery charger tie to battery bus A. Battery bus A power to Main Bus Tie -- Bat A/C control circuit. Battery bus A voltage to voltmeter and telemetry.

MDC 5 cont'd

Battery Charger cont'd

BAT B CHG

15 Battery charger tie to battery bus B. Battery bus B power to Main Bus Tie - Bat B/C control circuit. Battery bus B voltage to voltmeter and telemetry.

MN A 16 Main dc bus A power to battery charger (diode with main dc bus B).

MN B 17 Main dc bus B power to battery charger (diode with main dc bus A).

AC PWR (3Ø) 18 AC bus 1 or 2 power to battery charger (switch selected).

INSTRUMENTS

ESS

MN A 19 Main dc bus A power to operational instrumentation cb's 1, 2, 3 and 4 on RHEB 276 (diode with main dc bus B).

MN B 20 Main dc bus B power to operational instrumentation cb's 1, 2, 3 and 4 on RHEB 276 (diode with main dc bus A).

NON ESS 22 Main dc bus A or B power to non-essential instrumentation (switch selected).

INSTRUMENTS

SCI EQUIP

SEB 1

23 Main dc bus A or B power to non-essential instrumentation (switch selected).

SEB 2 24 Main dc bus A or B power to Panel 162 and 163 utility outlets (switch selected).

HATCH 25 Main dc bus A or B power to Panel 227 utility outlet (switch selected).

ENVIRONMENTAL CONTROL SYSTEM

POT H₂O HTR
MN A

26

Main dc bus A power to potable water heater & to manual control of ECS glycol evap H₂O flow primary valve (diode with main dc bus B).

MN B

27

Main dc bus B power to potable water heater & to manual control of ECS glycol evap H₂O flow primary valve (diode with main dc bus A).

H₂O ACCUM
MN A

28

Main dc bus A power to Accum 1 control.

MN B

29

Main dc bus B power to Accum 2 control.

TRANSDUCER

WASTE/POT H₂O
MN A

30

Main dc bus A power to waste and potable water quantity measuring.

MN B

31

Main dc bus B power to waste and potable water pressure measuring.

PRESS GROUPS 1
MN A

32

Main dc bus A power to pressure transducers for suit compressor inlet press, suit compressor delta press & coolant loop glyco; quantity and press (diode with main dc bus B).

MN B

33

Main dc bus B power to pressure transducers for suit compressor inlet press, suit compressor delta press & coolant loop glycol quantity and press (diode with main dc bus A).

PRESS GROUPS 2
MN A

34

Main dc bus A power to pressure transducers for CO₂ partial press, O₂ flow, O₂ regulator output press, absolute cabin press & glycol evap steam press (diode with main dc bus B).

MN B

35

Main dc bus B power to pressure transducers for CO₂ partial press, O₂ flow, O₂ regulator output press, absolute cabin press & glycol evap steam press (diode with main dc bus A).

MDC 5 cont'd

ECS cont'd

CABIN FAN 1

AC 1 φA
 φB
 φC

38 AC bus 1 φA power to cabin fan 1.
39 AC bus 1 φB power to cabin fan 1.
40 AC bus 1 φC power to cabin fan 1.

AC 2 φA
 φB
 φC

41 AC bus 2 φA power to cabin fan 2.
42 AC bus 2 φB power to cabin fan 2.
43 AC bus 2 φC power to cabin fan 2 & auto cabin
 temp control circuit.

GUIDANCE/NAVIGATION
POWER

AC 1

54 AC bus 1 φB power to G & N power servo assy,
 sextant and SCT reticle lamps & G & N
 caution/warning lamps in lower equipment
 bay (switch selective).

AC 2

55 AC bus 2 φB power to G & N power servo assy,
 sextant and SCT reticle lamps & G & N
 caution/warning lamps in lower equipment
 bay (switch selective).

IMU

MN A

56 Main dc bus A power to inertial subsystem (diode
 with main dc bus B).

MN B

57 Main dc bus B power to inertial subsystem (diode
 with main dc bus A).

IMU HTR

MN A (colored yellow)

58 Main dc bus A power to PIPA, IRIG and optics eye-
 piece heaters (diode with main dc bus B).

MN B (colored yellow)

59 Main dc bus B power to PIPA, IRIG and optics eye-
 piece heaters (diode with main dc bus A).

MDC 5 cont'd

G & N cont'd

COMPUTER

MN A

60 Main dc bus A power to CM computer (dioded
with main dc bus B).

MN B

61 Main dc bus B power to CM computer (dioded
with main dc bus A).

OPTICS

MN A

62 Main dc bus A power to optics (dioded with
main dc bus B).

MN B

63 Main dc bus B power to optics (dioded with
main dc bus A).

MAIN DISPLAY PANEL 8

STAB CONT SYS TVC

AC 1	55	AC bus 1 ϕ A power to TVC servo amplifier 1 power supply 1.
AC 1 (3 ϕ)	9	AC bus 1 3 ϕ power to BMAG 1, Gyro Assy 1 & Electronic Display Assy power supply 1 and/or 2 for FDAI and GPI. ϕ A power to Gyro Display Coupler power supply 1, Electronic Control Assy power supply 1, TVC servo amplifier 2 power supply 2, Reaction jet and engine on-off control power supply 1 or 2 & Electronic Display Assy for signal conditioning.
AC 2 (3 ϕ)	10	AC bus 2 3 ϕ power to BMAG 2, Gyro Assy 2 & Electronic Display Assy power supply 2 and/or 1 for FDAI and GPI. ϕ A power to Gyro Display Coupler power supply 2, TVC servo amplifier 1 power supply 2, Reaction jet and engine on-off control power supply 1 or 2 & Electronic Display Assy for signal conditioning.

STABILIZATION CONTROL SYSTEM ECA/TVC

AC 2	54	AC bus 2 ϕ A power to TVC servo amplifier 2 power supply 1 & Electronic Control Assy power supply 2. (All above - AC bus 1 or 2 by switch selection)
------	----	--

DIRECT ULL NN A

72	Main dc bus A power to direct coils of SN quads B and D for direct ullage with push button on MDC 1.
----	--

NN B

73	Main dc bus B power to direct coils of SM quads A and C for direct ullage with push button on MDC 1.
----	--

MDC 8 cont'd

SCS cont'd

CONTR/DIRECT

1 MN A

13

Main dc bus A power to Rotation Hand Controller #1 for direct control of all engines on all SM quads, or to specific engines on each quad to provide half the control on all axis.

After CSM Sep - Main dc bus A power to all CM engines or to CSM system 1 engines.

1 MN B

14

Main dc bus B power to Rotation Hand Controller #1 for direct control of specific engines on each SM quad to provide half the control on all axis.

After CSM Sep - Main dc bus B power to CM system 2 engines.

2 MN A

70

Main dc bus A power to Rotation Hand Controller #2 for direct control of specific engines on each SM quad to provide half the control on all axis.

After CSM Sep - Main dc bus A power to CM system 2 engines.

2 MN B

71

Main dc bus B power to Rotation Hand Controller #2 for direct control of all engines on all SM quads, or to specific engines on each quad to provide half the control on all axis.

After CSM Sep - Main dc bus B power to all CM engines or to CM system 1 engines.

PITCH

1 MN A

19

Main dc bus A power to auto coils of SM quad A engines 3 and 4 or CM engines 23 and 14 & SM quad C engines 3 and 4 or CM engines 13 and 24.

MDC 8 cont'd

SCS cont'd
Pitch cont'd
MN B

20 Main dc bus B power to auto coils of SM quad A engines A 3 and 4 or CM engines 23 and 14 & SM quad C engines C 3 and 4 or CM engines 13 and 24.

(Main dc bus A or B power by switch selection)

YAW

MN A

21 Main dc bus A power to auto coils of SM quad B engines B 3 and 4 or CM engines 15 and 26 & SM quad D engines D 3 and 4 or CM engines 25 and 16.

MN B

22 Main dc bus B power to auto coils of SM quad B engines B 3 and 4 or CM engines 15 and 26 & SM quad D engines D 3 and 4 or CM engines 25 and 16.

(Main dc bus A or B power by switch selection)

ORDEAL

AC 2

65 AC bus 2 ϕ C power to ordeal box.

MN B

64 Main dc bus B power to ordeal box.

STABILIZATION CONTROL SYSTEM
CONTR/AUTO

MN A

74 Main dc bus A power to Rotation Hand Controller 1 and 2 breakout switches (diodes with main dc bus B).

Power to enable Translation Hand Controller.
Power thru SECS MESC A to enable auto RCS operation.

MN B

75 Main dc bus B power to Rotation Hand Controller 1 and 2 breakout switches (diodes with main dc bus A).

Power to enable Translation Hand Controller.
Power thru SECS MESC B to enable auto RCS operation.

MDC 8 cont'd

SCS cont'd

LOGIC BUS

MN A 1/2

63

Main dc bus A power to SCS logic buses 1 and 2 (dioded with main dc bus B).

3/4

23

Main dc bus A power to SCS logic buses 3 and 4 (dioded with main dc bus B).

MN B 1/4

62

Main dc bus B power to SCS logic buses 1 and 4 (dioded with main dc bus A).

2/3

24

Main dc bus B power to SCS logic buses 2 and 3 (Dioded with main dc bus A).

SYSTEM

MN A

11

Main dc bus A power to BMAG 1, Gyro Assy 1, Electronic Display Assy for FDAI and GPI, Gyro Display Coupler 1 & TVC servo assy for SPS clutch 1 and 2 operation.

MN B

12

Main dc bus B power to BMAG 2, Gyro Assy 2, Electronic Display Assy for FDAI and GPI, Gyro Display Coupler 2 & TVC servo assy for SPS clutch 1 and 2 operation.
(Main dc bus A or B power by switch selection)

REACTION CONTROL SYSTEM

CM HEATERS

1 - MN A

67

Main dc bus A power to direct coils of CM engines 11, 12, 13, 14, 15 and 16 for heating.

2 - MN B

66

Main dc bus B power to direct coils of CM engines 21, 22, 23, 24, 25 and 26 for heating.

SM HEATERS

MN B A

37

Main dc bus B power to heaters on SM quad A (primary or secondary by switch selection).
Power to primary and secondary propellant isolation TEI's for SM quads A and C.

Main dc bus B power to CM RCS system 2 propellant isolation valve TEI's & to CM RCS system 2 propellant isolation valves on aborts to T+42 seconds.

RCS cont'd
SM Heaters cont'd
MN B C

MDC 8 cont'd

38 Main dc bus B power to heaters on SM quad C
(primary or secondary by switch selection).

39 Main dc bus A power to heaters on SM quad B
(primary or secondary by switch selection).
Power to primary and secondary propellant
isolation TEI's on SM quads E and D.
Main dc bus A power to CM RCS system 1 propellant
isolation valve TEI's & to CM RCS system 1
propellant isolation valves on aborts to
T+42 seconds.

40 Main dc bus A power to heaters on SM quad D
(primary or secondary by switch selection).

PRPLNT ISOL
MN A

41 Main dc bus A power to SM quad B and D helium
valves 1 and 2 & primary and secondary
propellant valves (fuel and oxid).
Main dc bus A power to CM RCS system 1 propel-
lant isolation valves after T+42 seconds.

42 Main dc bus B power to SM quad A and C helium
valves 1 and 2 & primary and secondary
propellant valves (fuel and oxid).
Main dc bus B power to CM RCS system 2 propel-
lant isolation valves after T+42 seconds.

RCS LOGIC
MN A

43 Main dc bus A power for auto or manual RCS transfer
(one of two circuits), operation of control
relays in CM RCS system 1 heater circuit & to
propellant jettison A circuits.

44 Main dc bus B power for auto or manual RCS transfer
(second of two circuits), operation of control
relays in CM RCS system 2 heater circuit & to
propellant jettison E circuits.

MDC 8 cont'd

ENS

MN A

52

Main dc bus A power to Entry Monitor System & SPS Thrust On light on MDC 1 (diode with main dc bus B).

MN B

53

Main dc bus B power to Entry Monitor System & SPS Thrust On light on MDC 1 (diode with main dc bus A).

DOCK PROBES

MN A

76

Main dc bus A power to operate System A capture latch motor, TBI and temp telemetry.

MN B

77

Main dc bus B power to operate System B capture latch motor, TBI and temp telemetry.

SERVICE PROPULSION SYSTEM

HTPS/GAUGING

MN A

25

Main dc bus A power to primary and aux SPS gauging (diode with main dc bus B), & to System A SPS heaters.

MN B

26

Main dc bus B power to primary and aux SPS gauging (diode with main dc bus A), & to System B SPS Heaters.

GAUGING

AC 1

27

AC bus 1 ϕ C power to primary and aux SPS gauging.

AC 2

28

AC bus 2 ϕ C power to primary and aux SPS gauging.
(AC bus 1 or 2 by switch selection)

HE VALVE

MN A

29

Main dc bus A power to helium valve 1 and TBI, & to injector prevalue in SPS propellant System Power to FCSM (diode with main dc bus B).

MN B

30

Main dc bus B power to helium valve 2 and TBI, & to injector prevalue in SPS propellant System Power to FCSM (diode with main dc bus A).

MDC 8 cont'd

SPS cont'd

PITCH 1

BAT A

31 Battery bus A power to on - off control circuit and overcurrent sensor logic of SPS primary pitch gimbal motor.

2

BAT B

32 Battery bus B power to on - off control circuit and overcurrent sensor logic of SPS secondary pitch gimbal motor.

YAW 1

BAT A

33 Battery bus A power to on - off control circuit and overcurrent sensor logic of SPS primary yaw gimbal motor.

2

BAT B

34 Battery bus B power to on - off control circuit and overcurrent sensor logic of SPS secondary yaw gimbal motor.

PILOT VALVES

A - MN A

68 Main dc bus A power for arming SPS thrust on-off relays to provide on-off control of SPS gauging & to helium and bi-propellant valves in SPS propellant system A.

B - MN B

69 Main dc bus B power for arming SPS thrust on-off relays to provide on-off control of SPS gauging & to helium and bi-propellant valves in SPS propellant system B.

FLOAT BAG

1 BAT A

6 Battery bus A power to control circuit of Float Bag #1 (Normally open in flight - closed after splashdown if required).

2 BAT B

7 Battery bus B power to control circuit of Float Bag #2 (Normally open in flight - closed after splashdown if required).

3 FLT/FL

8 Flight & Post Landing bus power to control circuit of Float Bag #3 (Normally open in flight - closed after splashdown if required).

MDC 8 cont'd

SEQ EVENTS CONT SYS

LOGIC A

BAT A

3 Battery bus A power to SECS A MESC logic bus
and logic battery bus A.

B

BAT B

4 Battery bus B power to SECS B MESC logic bus
and logic battery bus B.

ARM A

BAT A

1 Battery bus A power to SECS A MESC logic arm
and pyro arm circuits.

B

BAT B

2 Battery bus B power to SECS B MESC logic arm
and pyro arm circuits.

EDS

1 BAT A

49 battery bus A power to EDS bus 1.

2 BAT C

50 E/PL battery C power to EDS bus 2.

3 BAT B

51 Battery bus B power to EDS bus 3.

ELS

BAT A

45 Battery bus A power for manual Apex
Cover jettison, Drogue Chute deploy & Main
Chute deploy in ELS A.

BAT B

46 Battery bus B power for manual Apex Cover
jettison, Drogue Chute deploy & Main Chute
deploy in ELS B.

P/L VENT

FL/PL

5 Flight & Post Landing bus power to post landing
vent and control circuit (Normally open in
flight - closed after splashdown).

RIGHT HAND EQUIPMENT BAY PANEL 225

COMMUNICATIONS

PCM TLM

GROUP 1 (3Ø)

1 AC bus 1 or 2 3Ø power to one of two power supplies for PCM telemetry.

GROUP 2 (3Ø)

2 AC bus 1 or 2 3Ø power to second of two power supplies for PCM telemetry.
(AC bus 1 or 2 by switch selection)

FLT QUAL RCDR

GROUP 1 (3Ø)

24 AC bus 1 or 2 3Ø power to flight qual recorder.

FLT BUS

MN A

3 Main dc bus A power to flight bus (diode with main dc bus B).

MN B

4 Main dc bus B power to flight bus (diode with main dc bus A).

PMP POWER

PRIM FLT BUS

11 Flight bus dc power to primary voltage regulator in premodulation processor.

AUX FLT BUS

12 Flight bus dc power to aux voltage regulator in premodulation processor.
(Normal or aux by switch selection)

CREW STATION AUDIO

L FLT/ POST LDG BUS

7 Flight & Post Landing bus power to commander's audio center, backup power to CM Pilot's microphone amplifier & to VHF Beacon.

CTR FLT/POST LDG BUS

8 Flight & Post Landing bus power to CM Pilot's audio center, backup power to LM Pilot's microphone amplifier & to VHF/AM equipment.

R FLT/POST LDG BUS

9 Flight & Post Landing bus power to LM Pilot's audio center, backup power to Commander's microphone amplifier.

Telecommunications cont'd

UDL

FLIGHT BUS

10

Flight bus dc power to up data link equipment

HIGH GAIN ANTENNA
FLT BUS

5

Flight bus dc power to high gain antenna equip.

GROUP 2 (3Ø)

6

AC bus 1 or 2 3Ø power to high gain antenna equipment (AC bus 1 or 2 by switch selection with Group 2 switch on MDC 4).

S - BAND FM XMTR
DATA STORAGE EQUIP
FLT BUS

13

Flight bus dc power to TV camera, data storage equipment & S Band FM xmtr.

GROUP 1 (3Ø)

14

AC bus 1 or 2 3Ø power to S Band FM Xmtr equipment & to Data Storage equipment (AC bus 1 or 2 by switch selection with Group 1 switch on MDC 4).

CENTRAL TIMING EQUIP

MN A

21

Main dc bus A power to one of two power supplies in central timing equipment.

MN B

22

Main dc bus B power to second of two power supplies in central timing equipment.

RNDZ XPNDR

FLT BUS

15

Flight bus dc power to rendezvous radar transponder power supply and heater circuit.

SIG COND

FLT BUS

16

Flight bus dc power to operate signal conditioning equipment.

RHEB 225 cont'd

Telecommunications cont'd

S BAND PWR AMP/PHASE MOD XPNDR

1 FLT BUS

17 Flight bus dc power for control of power input
to S Band Xpndr power supply #1.

GROUP 1 (3Ø)

18 AC bus 1 3Ø power to S Band Xpndr power supply 1.

2 FLT BUS

19 Flight bus dc power for control of power input
to S Band Xpndr power supply #2.

GROUP 2

20 AC bus 2 3Ø power to S Band Xpndr power supply 2.

RIGHT HAND EQUIPMENT BAY PANEL 226

FUEL CELL 1

PUMPS - AC

(3Ø)

- 1 AC bus 1 or 2 3Ø power to FC 1 H₂/Water Sep and glycol pumps & Ø A to pH sensor (SC 103 only - open ob to disable pumps).
(AC bus 1 or 2 by switch selection on MDC 5)

REACS

- 4 Battery relay bus power to FC 1 H₂ and O₂ reactant valves for open or shut control.
(Normally open after fuel cell activation).

BUS CONT

- 7 Battery relay bus power to FC 1 main dc bus A and main dc bus B control circuits and TBI's, reactant TBI o reactant solenoids for holding voltage during boost

PURGE

- 10 Main dc bus A power to H₂ or O₂ purge valves (flooded with main dc bus B which is thru a fuse), & to one of two H₂ vent line heaters.

RAD

- 13 Battery relay bus power to FC 1 radiator by-pass valve and TBI.

CRYOGENIC

H₂ HTR

1 MW A

- 16 Main dc bus A power to H₂ tank #1 repressurization heaters.

2 MW B

- 17 Main dc bus B power to H₂ tank #2 repressurization heaters.

FUEL CELL 2

PUMPS - AC

(3Ø)

- 5 AC bus 1 or 2 3Ø power to FC 2 H₂/Water Sep and glycol pumps & Ø A to pH sensor.
(AC bus 1 or 2 by switch selection on MDC 5)

REACS

- 5 Battery relay bus power to FC 2 H and O reactant valves for open or shut control.
(Normally open after fuel cell activation).

BUS CONT

- 8 Battery relay bus power to FC 2 main dc bus A and main dc bus B control circuits and TBI's & to reactant TBI.

RHEB 226 cont'd

Fuel Cell 2 cont'd

PURGE

11 Main dc bus B power to FC 2 H₂ and O₂ purge valves (diodes with main dc bus A which is thru a fuse) & to second of two H₂ vent line heaters.

RAD

14 Battery relay bus power to FC 2 radiator by-pass valve and TBI.

CRYOGENIC

O₂ HTR 1 MN A

18 Main dc bus A power to O₂ tank #1 repressurization heaters.

2 MN B

19 Main dc bus B power to O₂ tank #2 repressurization heaters.

FUEL CELL 3

PUMPS - AC

(3Ø)

3 AC bus 1 or 2 3Ø power to FC 3 H₂/Water Sep and glycol pumps & ØA to pH sensor. (SC 103 only - open cb to disable pumps).

(AC bus 1 or 2 by switch selection on MDC 5)

REACS

6 Battery relay bus power to FC 3 H₂ and O₂ reactant valves for open or shut control (Normally open after fuel cell activation).

BUS CONT

9 Battery relay bus power to FC 3 main dc bus A and main dc bus B control circuits and TBI's, reactant TBI & to reactant solenoids for holding voltage during boost.

PURGE

12 Main dc bus B power to FC 3 H₂ or O₂ purge valves (diodes with main dc bus A which is thru a fuse).

RAD

15 Battery relay bus power to FC 3 radiator by-pass valve and TBI.

RHEB 226 cont'd

QTY AMPL 1
AC 1

20 AC bus 1 ϕ C power to H₂ tank #1 and O₂ tank #1
quantity sensors and signal conditioners.

AC 2

21 AC bus 2 ϕ C power to H₂ tank #2 and O₂ tank #2
quantity sensors and signal conditioners.

CRYOGENIC FAN MOTORS

TANK 1

AC 1 ϕ A

22 AC bus 1 ϕ A power to H₂ tank #1 and O₂ tank #1
fan motors.

ϕ B

23 AC bus 1 ϕ B power to H₂ tank #1 and O₂ tank #1
fan motors.

ϕ C

24 AC bus 1 ϕ C power to H₂ tank #1 and O₂ tank #1
fan motors.

TANK 2

AC 2 ϕ A

25 AC bus 2 ϕ A power to H₂ tank #2 and O₂ tank #2
fan motors.

ϕ B

26 AC bus 2 ϕ B power to H₂ tank #2 and O₂ tank #2
fan motors.

ϕ C

27 AC bus 2 ϕ C power to H₂ tank #2 and O₂ tank #2
fan motors.

LIGHTING

COAS/TUNNEL/RNDZ/SPOT
MN A

28 Main dc bus A power to left crew optical alignment sight, six of twelve tunnel lights & rendezvous flashing light.

MN B

29 Main dc bus B power to right crew optical alignment sight, six of twelve tunnel lights & exterior spot light and its door initiator.

**LIGHTING
FLOOD**

MN A

30

Main dc bus A power to Commander's variable intensity control of left floodlights, (MDC 8), variable intensity control of LEB floodlights & fixed control of LM Pilot's floodlights (MDC 5).

MN B

31

Main dc bus B power to Commander's fixed control of left floodlights (MDC 8), fixed control of LEB floodlights & variable control of LM Pilot's floodlights (MDC 5).

FLT/PL

38

Flight & Post Landing bus power to Commander's floodlights (switch selected).

**NUMERICS/INTEGRAL
LEB AC 2**

33

AC bus 2 ϕ A power to control of LEB panel 100 for lighting on panels LEB 100, 122 and DSKY, MDC 10 and LHEB 306 (Rheostat cannot be turned off - cb used to disable circuit completely if necessary). Also to panels 225 and 226 in RHEB.

L MDC -- AC 1

37

AC bus 1 ϕ A power to control on MDC 8 for lighting on panels MDC 1, left half of MDC 2, MDC 8 and 9 (Rheostat cannot be turned off - cb used to disable circuit completely if necessary).

R MDC -- AC 1

34

AC bus 1 ϕ C power to control on panel MDC 5 for lighting on panels MDC 3, 4, 5, 6 and right half of MDC 2, RHEB 229 and 275 (Rheostat cannot be turned off - cb used to completely disable circuit if necessary).

**RUN/EVA/TRGT
AC 1**

40

AC bus 1 ϕ A power to one of two sets of docking lights & one of two sets of EVA lights.

AC 2

39

AC bus 2 ϕ E power to second of two sets of docking lights, second of two sets of EVA lights & to docking target light.

RIGHT HAND EQUIPMENT BAY PANEL 229

EPS

MN A

GROUP 1

26

Main dc bus A power to cb's 19, 23, 40, 41 and 74 on MDC 8.

GROUP 2

28

Main dc bus A power to cb's 11 and 15 on MDC 8.

GROUP 3

30

Main dc bus A power to cb's 21, 39 and 63 on MDC 8.

GROUP 4

32

Main dc bus A power to cb's 17, 25, 29, 52 and 76 on MDC 8. Power to cb 44 on this panel.

GROUP 5

34

Main dc bus A power to cb's 13, 43, 67, 68, 70 and 72 on MDC 8.

UTILITY

R/L STA

36

Main dc bus A power to utility outlets on MDC 15 and 16.

MN B

GROUP 1

27

Main dc bus B power to cb's 20, 24, 38, 42 and 75 on MDC 8.

GROUP 2

29

Main dc bus B power to cb's 12 and 16 on MDC 8.

GROUP 3

31

Main dc bus B power to cb's 22, 37, 62 and 64 on MDC 8.

GROUP 4

33

Main dc bus B power to cb's 18, 26, 30, 53 and 77 on MDC 8. Power to cb 45 on this panel.

GROUP 5

35

Main dc bus B power to cb's 14, 44, 66, 69, 71 and 73 on MDC 8.

UTILITY

LEB

Main dc bus B power to utility outlet on LEB 100.

RHEB 229 cont'd

EPS BAT BUS

A

38 Battery bus A power to cb's 1, 3, 6, 31, 33,
45 and 49 on MDC 8.

B

39 Battery Bus B power to cb's 2, 4, 7, 32, 34,
36 and 51 on MDC 8.

TIMERS

MN A

44 Main dc bus A power to timers on MDC 2 and
LHEB 306.

MN B

45 Main dc bus B power to timers on MDC 1.

MAIN RELEASE

PYRO A

48 Pyro bus A power for main chute release
(Normally open - closed after splashdown).

PYRO B

49 Pyro bus B power for main chute release
(Normally open - closed after splashdown).

The following is effective on SC 102, 106 and subs.

O₂ VAC ION PUMPS

MN A

50 Main dc bus A power to O₂ tank #1 vac ion pump.

MN B

51 Main dc bus B power to O₂ tank #2 vac ion pump.

RIGHT HAND EQUIPMENT BAY PANEL 250

PYRO A

BAT BUS A TO PYRO BUS TIE
(colored yellow)

18

Backup circuit to connect battery bus A power to pyro bus A if pyro battery A drops below 35 vdc. (Normally open - closed after failure of pyro battery A and opening of cb 16 on this panel).

SEQ A

16

Pyro battery A power to pyro bus A and voltmeter (Normally opened after S IV B separation - closed for final CSM/LM separation - closed for CSM separation and entry - closed periodically in flight for pyro battery A voltage check).

PYRO B

BAT BUS B TO PYRO BUS TIE
(colored yellow)

19

Backup circuit to connect battery bus B power to pyro bus B if pyro battery B drops below 35 vdc. (Normally open - closed after failure of pyro battery B and opening of cb 17 on this panel).

SEQ B

17

Pyro battery B power to pyro bus B and voltmeter (Normally opened after S IV B separation - closed for final CSM/LM separation - closed for CSM separation and entry - closed periodically in flight for pyro battery B voltage check).

BAT A PWR ENTRY/POST LANDING

20

E/PL battery A power to all using components.

BAT B PWR ENTRY/POST LANDING

21

E/PL battery B power to all using components.

BAT C PWR ENTRY/POST LANDING

22

E/PL battery C power to all using components.

BAT C TO BAT BUS A

15

Backup circuit to connect battery C to battery bus A after failure of E/PL battery A (Normally open)

RHEB 250 cont'd

BAT C TO BAT BUS B

24 Backup circuit to connect battery C to battery bus B after failure of E/PL battery B (Normally open).

BAT C BAT CHGR/EDS 2

23 Battery charger connection to E/PL battery C & power to EDS bus 2.

RIGHT HAND EQUIPMENT BAY PANEL 275

MAIN A

BAT BUS A

9 Battery bus A power to main dc bus A - controlled by Main Bus Tie - Bat A/C switch on MDC 5.

BAT C

11 E/PL battery C power to main dc bus A - controlled by Main Bus Tie - Bat B/C switch on MDC 5.

MAIN B

BAT C

12 E/PL battery C power to main dc bus B - controlled by Main Bus Tie - Bat A/C switch on MDC 5.

BAT BUS B

10 Battery bus B power to main dc bus B - controlled by Main Bus Tie - Bat B/C switch on MDC 5.

FLIGHT/POST LANDING

BAT BUS A

7 Battery bus A power to Flight & Post Landing bus (Normally open - closed during main chute descent at approx. 600 ft. altitude) (diode'd with battery bus B & battery C).

BAT BUS B

8 Battery bus B power to Flight & Post Landing bus (Normally open - closed during main chute descent at approx. 600 ft. altitude) (diode'd with battery bus A & battery C).

BAT C

13 E/PL battery C power to Flight & Post Landing bus (Normally open - closed during main chute descent at approx. 600 ft. altitude) (diode'd with battery bus A and B).

MAIN A

5 Main dc bus A power to Flight & Post Landing bus (diode'd with main dc bus B) (Normally closed - opened during main chute descent at approx. 600 ft. altitude after closing Bat Bus A & B and Bat C cb's).

MAIN B

6 Main dc bus B power to Flight & Post Landing bus (diode'd with main dc bus A) (Normally closed - opened during main chute descent at approx. 600 ft. altitude after closing Bat Bus A & B and Bat C cb's).

RHEB 275 cont'd

INVERTER POWER

- | | | |
|----------|---|------------------------------------|
| 1 MAIN A | 1 | Main dc bus A power to inverter 1. |
| 2 MAIN B | 2 | Main dc bus B power to inverter 2. |
| 3 MAIN A | 3 | Main dc bus A power to inverter 3. |
| 3 MAIN B | 4 | Main dc bus B power to inverter 3. |

RIGHT HAND EQUIPMENT BAY PANEL 276

INSTRUMENTATION POWER CONTROL

1	1	Main dc bus A & B power to following measurements:	
		CM He Tk A Press	CR 0001P
		CM He Tk A Temp	CR 0001T
		CM Fu Tk A Press	CR 0005P
		CM Ox Tk A Press	CR 0011P
2	2	Main dc bus A & B power to following measurements:	
		Side HS Bond Loc 1 Temp	CA 1800T
		Side HS Bond Loc 4 Temp	CA 1803T
		Side HS Bond Loc 7 Temp	CA 1806T
		Side HS Bond Loc 10 Temp	CA 1809T
		Drogue Dep Relay A	CE 0001X
		Drogue Dep Relay B	CE 0002X
		Main Dep Relay A	CE 0003X
		Main Dep Relay B	CE 0004X
		Main Chute Disc Relay A	CE 0321X
		Main Chute Disc Relay B	CE 0322X
		Suit Cabin Delta Press	CF 0003P
		Surge Tank Press	CF 0006P
		H ₂ O Tank-Glycol Res Press	CF 0120P
		Pri Glycol Flow Rate	CF 0157R
		Pri Evap Inlet Temp	CF 0181T
		H ₂ O Dump Temp	CF 0460T
		Astro 1 EKG Axis 1	CJ 0060J
		Astro 2 EKG Axis 1	CJ 0061J
		Astro 3 EKG Axis 1	CJ 0062J
		Astro 1 Respir	CJ 0200R
		Astro 2 Respir	CJ 0201R
		Astro 3 Respir	CJ 0202R
		Astro 1 Sel Sw Pos	CJ 0210X
		Astro 2 Sel Sw Pos	CJ 0211X
		Astro 3 Sel Sw Pos	CJ 0212X

Instrumentation Power Control cont'd

2 cont'd

CM X Axis Accel	CK 0026A
CM Y Axis Accel	CK 0027A
CM Z Axis Accel	CK 0028A
Dosimeter 1 Radiation	CK 1051K
Dosimeter 2 Radiation	CK 1052K
Dosimeter 3 Radiation	CK 1053K
CM He Tk 3 Press	CR 0002P
CM He Tk 3 Temp	CR 0004T
CM Fu Tk 3 Press	CR 0006P
CM Ox Tk 3 Press	CR 0012P
Docking Probe Temp	CS 0220T

3

3 Main dc bus A & B power to following instrumentation:

Bay 2 Ox Tk Surf Temp	SA 2377T
Bay 3 Fu Tk Surf Temp	SA 2379T
Ox Line Entry Sump Tk Temp	SA 2400T
O ₂ Tk 2 Press	SC 0038P
H ₂ Tk 2 Press	SC 0040P
FC 2 H ₂ Press	SC 2061P
FC 3 H ₂ Press	SC 2062P
FC 2 O ₂ Press	SC 2067P
FC 3 O ₂ Press	SC 2068P
FC 2 H ₂ Press	SC 2070P
FC 3 H ₂ Press	SC 2071P
FC 2 Rad Out Temp	SC 2088T
FC 3 Rad Out Temp	SC 2089T
FC 2 Rad In Temp	SC 2091T
FC 3 Rad In Temp	SC 2092T
FC 2 H ₂ Flow	SC 2040R
FC 3 H ₂ Flow	SC 2041R
FC 2 O ₂ Flow	SC 2043R
FC 3 O ₂ Flow	SC 2044R

Instrumentation Power Control cont'd

3 cont'd

He Tk Press	SP 0001P
Ox Tk Press	SP 0003P
Fu/Ox Vlv 1 Pos	SP 0022H
Fu/Ox Vlv 3 Pos	SP 0024H
SPS Fu Feed Line Temp	SP 0045T
Ox Line 1 Temp	SP 0054T
SPS Vlv Act Press Pri	SP 0600P
Eng Chamber Press	SP 0661P
Fuel HM/Eng Interface Press	SP 0930P

SM He Tk A Press	SR 5001P
SM He Tk C Press	SR 5003P
SM He Tk A Temp	SR 5013T
SM He Tk C Temp	SR 5015T
SM He Press/Temp Ratio A	SR 5025U
SM He Press/Temp Ratio C	SR 5027U
SM Eng Package A Temp	SR 5065T
SM Eng Package C Temp	SR 5067T
SM He Manf A Press	SR 5729P
SM Ox Manf A Press	SR 5733P
SM Fu Manf A Press	SR 5737P
SM He Manf C Press	SR 5817P
SM Ox Manf C Press	SR 5820P
SM Fu Manf C Press	SR 5822P

Proton Ct Rate Chan 1	ST 0820K
Proton Ct Rate Chan 2	ST 0821K
Proton Ct Rate Chan 3	ST 0822K
Proton Ct Rate Chan 4	ST 0823K
Alpha Ct Rate Chan 1	ST 0830K
Alpha Ct Rate Chan 2	ST 0831K
Alpha Ct Rate Chan 3	ST 0832K
Proton Integ Ct Rate	ST 0835K

Instrumentation Power Control cont'd

4 4 Main dc bus A & B power to following instrumentation:

Bay 3 Ox Tr Surf Temp	SA 2378T
Bay 6 Fu Tr Surf Temp	SA 2380T
Fu Line Entry Sump Tk Temp	SA 2401T
O ₂ Tk 1 Press	SC 0037P
H ₂ Tk 1 Press	SC 0039P
FC 1 H ₂ Press	SC 2060P
FC 1 O ₂ Press	SC 2066P
FC 1 H ₂ Press	SC 2069P
FC 1 Rad Out Temp	SC 2087T
FC 1 Rad In Temp	SC 2091T
FC 1 H ₂ Flow	SC 2139R
FC 1 O ₂ Flow	SC 2142R
He Tk Temp	SP 0002T
Fu Tk Press	SP 0006P
Fu/Ox Vlv 2 Pos	SP 0023H
Fu/Ox Vlv 4 Pos	SP 0025H
SPS Vlv Body Temp	SP 0045T
SPS Ox Feed Line Temp	SP 0049T
Fu Line 1 Temp	SP 0057T
SPS Vlv Act Press Sec	SP 0601P
Ox SM/Eng Interface Press	SP 0931P
SM He Tk B Press	SR 5002P
SM He Tk D Press	SR 5004P
SM He Tk B Temp	SR 5014T
SM He Tk D Temp	SR 5016T
SM He Press/Temp Ratio B	SR 5026U
SM He Press/Temp Ratio D	SR 5028U
SM Eng Package B Temp	SR 5066T
SM Eng Package D Temp	SR 5068T
SM He Manf H Press	SR 5776P
SM Ox Manf H Press	SR 5780P
SM Fu Manf H Press	SR 5784P
SM Ox Manf D Press	SR 5821P
SM Fu Manf D Press	SR 5823P
SM He Manf D Press	SR 5830P
Nuclear Particle Det Temp	ST 0840T
Nuclear Particle Anal Temp	ST 0841T

RIGHT HAND EQUIPMENT BAY PANEL 277

INSTRUMENTATION POWER CONTROL

Cb's 5, 6, 7, 8, 9 & 10

Main dc bus A or B power to flight qual instrumentation. (Main dc bus A or B switch selected thru non-ess bus).

RIGHT HAND EQUIPMENT BAY PANEL 278

UPRIGHTING SYSTEM
COMPRESSOR 1

1 Battery bus A power to compressor #1 for
inflating float bags for CM uprighting
(Normally open - closed after splash-
down if required).

2 Battery bus B power to compressor #2 for
inflating float bags for CM uprighting
(Normally open - closed after splash-
down if required).

S IV B/LM SEP
PYRO A

3 Pyro bus A power for separation of LM from
S IV B (Normally open - closed only
during initial docking to separate LM
from S IV B).

PYRO B

4 Pyro bus B power for separation of LM from
S IV B (Normally open - closed only
during initial docking to separate LM
from S IV B).

ENTRY BATTERY CIRCUIT BREAKERS

- CB 41 Located on battery case of E/PL battery A (Not accessible).
- CB 42 Located on battery case of E/PL battery B (Not accessible).
- CB 43 Located on battery case of E/PL battery C (Not accessible) .

SERVICE MODULE MAIN DC BUS POWER DISTRIBUTION

SM MAIN DC BUS A POWER TO:

Primary Pitch Gimbal Motor

Power provided thru motor switch contact and overcurrent sensor which operate with power thru cb SPS - Pitch 1 - Bat A (MDC 8) and cb EPS - Bat Bus A (RHEB 229).

Primary Yaw Gimbal Motor

Power provided thru motor switch contact and overcurrent sensor which operate with power thru cb SPS - Yaw 1 - Bat A (MDC 8) and cb EPS - Bat Bus A (RHEB 229).

Service Module Jettison Controller A

Powered thru fuse in SM Power Distribution Box (diode internally with SM main dc bus B).

O₂ Cryogenic Tanks Automatic Pressure Control Motor Switch

Powered thru fuse in SM Power Distribution Box (diode with main dc bus B).

H₂ Cryogenic Tanks Automatic Pressure Control Motor Switch

Powered thru fuse in SM Power Distribution Box (diode with main dc bus B).

O₂ Tank #1 Vac Ion Pump

Powered thru fuse in SM Power Distribution Box on SC 103 & 104 (fuse pulled before launch).

H₂ Tank #1 Vac Ion Pump

Powered thru fuse in SM Power Distribution Box (All SC - fuse pulled before launch).

ECS Primary #1 Radiator Heater

Powered thru overcurrent sensor which is supplied logic power thru cb Htrs Ovld - Bat B (MDC 5), and heater automatic control circuit which is supplied logic power thru cb Cont/Htrs - Mn B (MDC 5).

SM Main Dc Bus Power Distribution cont'd

SM MAIN DC BUS B POWER TO:

Secondary Pitch Gimbal Motor

Power provided thru motor switch contact and an over-current sensor which operate with power thru cb SPS - Pitch 2 - Bat B (MDC 8) and cb EPS - Bat Bus A (RHEB 229).

Secondary Yaw Gimbal Motor

Power provided thru motor switch contact and an over-current sensor which operate with power thru cb SPS - Yaw 2 - Bat B (MDC 8) and cb EPS - Bat Bus B (RHEB 229).

Service Module Jettison Controller B

Powered thru fuse in SM Power Distribution Box (dioded internally with SM main dc bus A).

O₂ Cryogenic Tanks Automatic Pressure Control Motor Switch

Powered thru fuse in SM Power Distribution Box (dioded with SM main dc bus A).

H₂ Cryogenic Tanks Automatic Pressure Control Motor Switch

Powered thru fuse in SM Power Distribution Box (dioded with SM main dc bus A).

O₂ Tank #2 Vac Ion Pump

Powered thru fuse in SM Power Distribution Box on SC 103 & 104 (fuse pulled before launch).

H₂ Tank #2 Vac Ion Pump

Powered thru fuse in SM Power Distribution Box (All SC - fuse pulled before launch).

ECS Primary 2 Radiator Heater

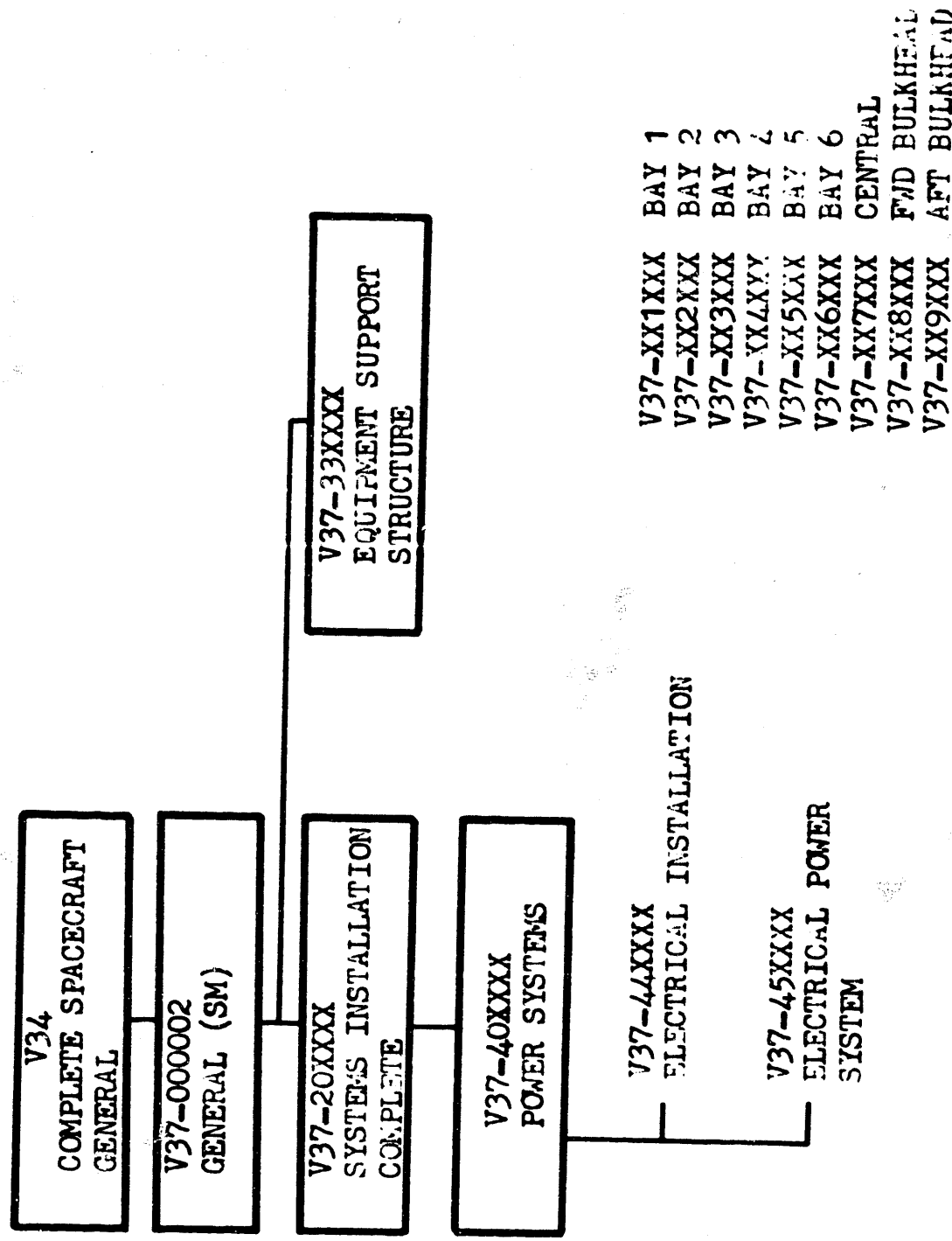
Powered thru overcurrent sensor which is supplied logic power thru cb Htrs Ovld - Bat A (MDC 5), and heater automatic control circuit which is supplied logic power thru cb Cont/Htrs - Mn A (MDC 5).

ECS Secondary Radiator Heater

Powered thru overcurrent sensor which is supplied logic power thru cb Htrs Ovld - Bat A (MDC 5), and heater automatic control circuit which is supplied logic power thru cb ECS - Sec Control Loop - Rad Htr - Mn A (MDC 5).

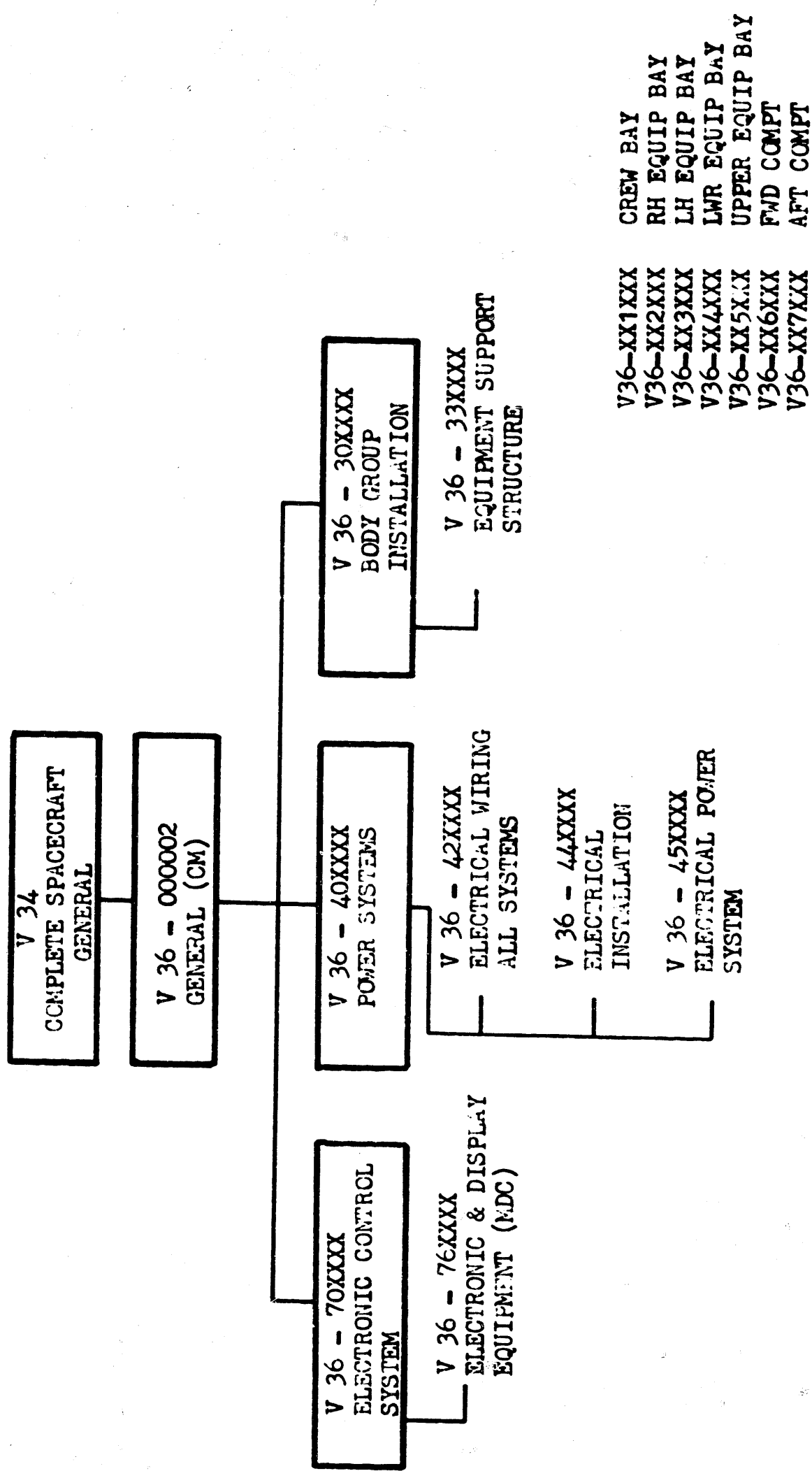
APOLLO SERVICE MODULE DRAWING SYSTEM (V37--)

SERVICE MODULE ELECTRICAL POWER SYSTEMS



APOLLO COMMAND MODULE DRAWING SYSTEM (V36-)

COMMAND MODULE ELECTRICAL POWER SYSTEM



ACRONYMS

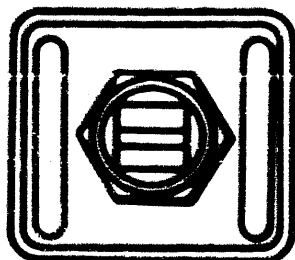
AH	Ampere Hour(s)
AM	Ammeter
AMPS	Amperes
AUX	Auxiliary
BAT	Battery
BTU	British Thermal Units
CCFT	Controlled Current Feedback Transformer
CKT	Circuit
CM	Command Module
COMM	Communications
COMPR	Compressor
COND	Condensor
CRYO	Cryogenic
C&W	Caution and Warning
ECS	Environmental Control Subsystem
ELS	Earth Landing Subsystem
EPS	Electrical Power Subsystem
E&PL	Entry and Post Landing
FC	Fuel Cell
F/F	Flip Flop
BLT BUS	Flight Bus
GSE	Ground Support Equipment
G&N	Guidance and Navigation
H ₂	Hydrogen
He	Helium
HF-1	Hydrogen Fill-Tank 1
HF-2	Hydrogen Fill-Tank 2
HP	Hydrogen Purge (GSE H ₂ Fuel Cell Supply)
HR	Hour
HR	Hydrogen Relief
HTR	Heater
HV-1	Hydrogen Vent. - Tank 1
HV-2	Hydrogen Vent. - Tank 2
HV-EPS	Hydrogen Vent. - EPS (FC H ₂ Purge Vent)
KOH	Potassium Hydroxide
KW	Kilowatt(s)
LM	Lunar Module
MAN	Manifold
MIN	Minimum
MIN DQ/DM	Minimum Heat Energy Per Mass
MN	Main
MS	Motor Switch
N ₂	Nitrogen
NEG	Negative
NEUT	Neutral
N.O.	Normally Open
NON-ESS	Non Essential

O2	Oxygen
OF-1	Oxygen Fill - Tank 1
OF-2	Oxygen Fill - Tank 2
OH	Hydroxyl Ion
O/L - R/C	Overload - Reverse Current
OP	Oxygen Purge (GSE O2 Fuel Cell Supply)
OR	Oxygen Relief
O/V	Overvoltage
OV-1	Oxygen Vent - Tank 1
OV-2	Oxygen Vent - Tank 2
OV-EPS	Oxygen Vent - EPS (FC O2 Purge Vent)
pH	Hydrogen Ion Concentration
POS	Positive
PPM	Parts Per Million
PPS	Pulses Per Second
PRI	Primary
PS	Pressure Switch
PSIA	Pounds Per Square Inch Absolute
PSIG	Pounds Per Square Inch Gauge
PWR	Power
REGEN	Regenerator
RCS	Reaction Control Subsystem
SC	Spacecraft
SEC	Secondary
SECS	Sequential Events Control Subsystem
SIG COND	Signal Conditioner
SM	Service Module
SMJC A	Service Module Jettison Controller A
SMJC B	Service Module Jettison Controller B
SOV	Shut Off Valve
SPEC	Specification
SPS	Service Propulsion Subsystem
SW	Switch
T/D	Time Delay
U/V	Undervoltage
VGP	Vehicle Ground Point
VM	Voltmeter
XDUCER	Transducer
XSTR	Transister
	Cycle

SC 107 FUNCTIONS POWERED THRU CB

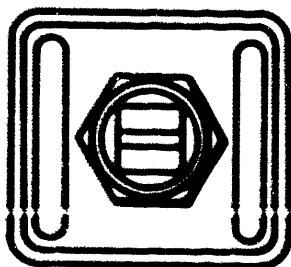
4

SPS
GAUGING

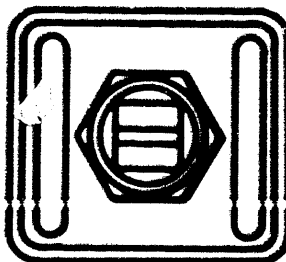


AC1
OFF
AC2

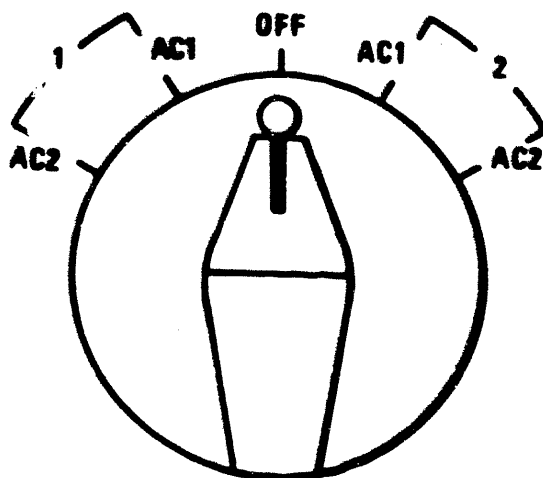
GROUP 1 TELCOM GROUP 2



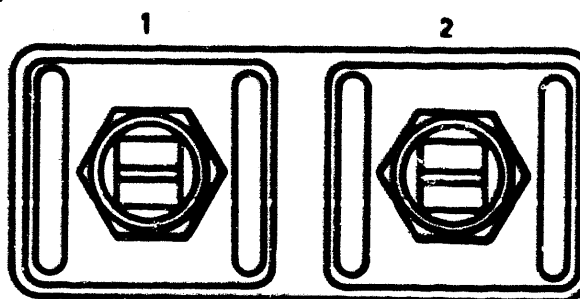
AC1
OFF
AC2



ECS GLYCOL PUMPS



SUIT COMPRESSOR



AC1
OFF
AC2

AC1 AC2
φ A φ B φ C φ A φ B φ C

PWR TO SUIT COMPRESSOR 1 AND/OR 2
PWR TO SUIT COMPRESSOR 1 AND/OR 2
PWR TO SUIT COMPRESSOR 1 AND/OR 2
PWR TO SUIT COMPRESSOR 1 AND/OR 2
PWR TO SUIT COMPRESSOR 1 AND/OR 2
PWR TO SUIT COMPRESSOR 1 AND/OR 2

(SWITCH SELECT OUTPUT)

AC1 AC2
φ A φ B φ C φ A φ B φ C

PWR TO GLYCOL PUMP 1 OR 2
PWR TO GLYCOL PUMP 1 OR 2
PWR TO GLYCOL PUMP 1 OR 2
PWR TO GLYCOL PUMP 1 OR 2
PWR TO GLYCOL PUMP 1 OR 2
PWR TO GLYCOL PUMP 1 OR 2

AUTO CONTROL GLY EVAP INLET TEMP
AUTO CONTROL GLY VLV TO SUIT HEAT EXCHANGER
MANUAL CONTROL EVAP STEAM PRESS VLV
AUTO CONTROL GLY EVAP H2O & STEAM PRESS

LEGEND:

— LINE BETWEEN CIRCUIT BREAKERS
— DESIGNATES DUAL POWER TO FUNCTION
- - - - - DESIGNATES SIMILAR FUNCTIONS
— DESIGNATES DIFFERENT FUNCTIONS

EP 100-7

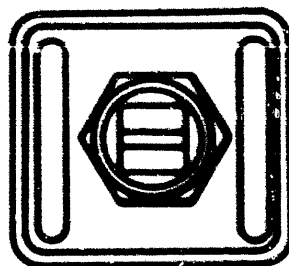
CSM LOGISTICS TRAINING

(FOR TRAINING PURPOSES ONLY)

SC 107 EFFECT OF CB OPENING (REMAINING FUNCTION)

4

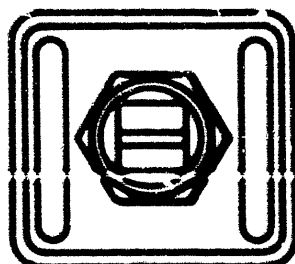
SFS GAUGING



AC1
OFF
AC2

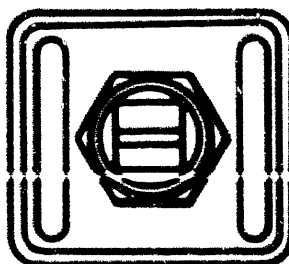
TELCOM

GROUP 1

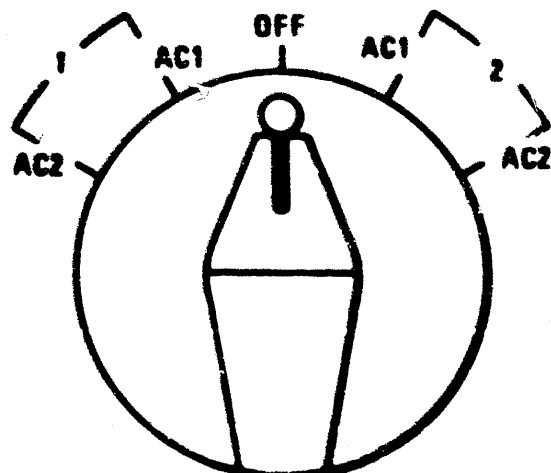


AC1
OFF
AC2

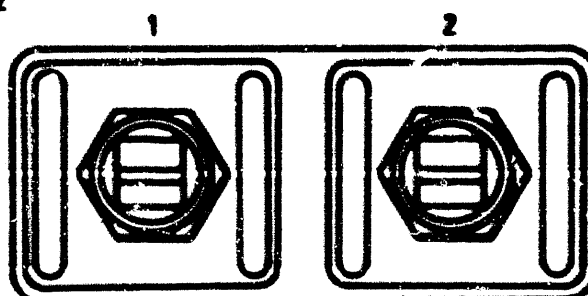
GROUP 2



ECS GLYCOL PUMPS



SUIT COMPRESSOR



AC1
OFF
AC2

AC1		SUIT COMPRESSORS		AC2	
φ A	φ B	φ C	φ A	φ B	φ C
SUIT COMPR WILL RUN ON 28 PWR AT REDUCED RATE AC 2 AVAIL	SUIT COMPR WILL RUN ON 28 PWR AT REDUCED RATE AC 2 AVAIL	SUIT COMPR WILL RUN ON 28 PWR AT REDUCED RATE AC 2 AVAIL	SUIT COMPR WILL RUN ON 28 PWR AT REDUCED RATE AC 1 AVAIL	SUIT COMPR WILL RUN ON 28 PWR AT REDUCED RATE AC 1 AVAIL	SUIT COMPR WILL RUN ON 28 PWR AT REDUCED RATE AC 1 AVAIL

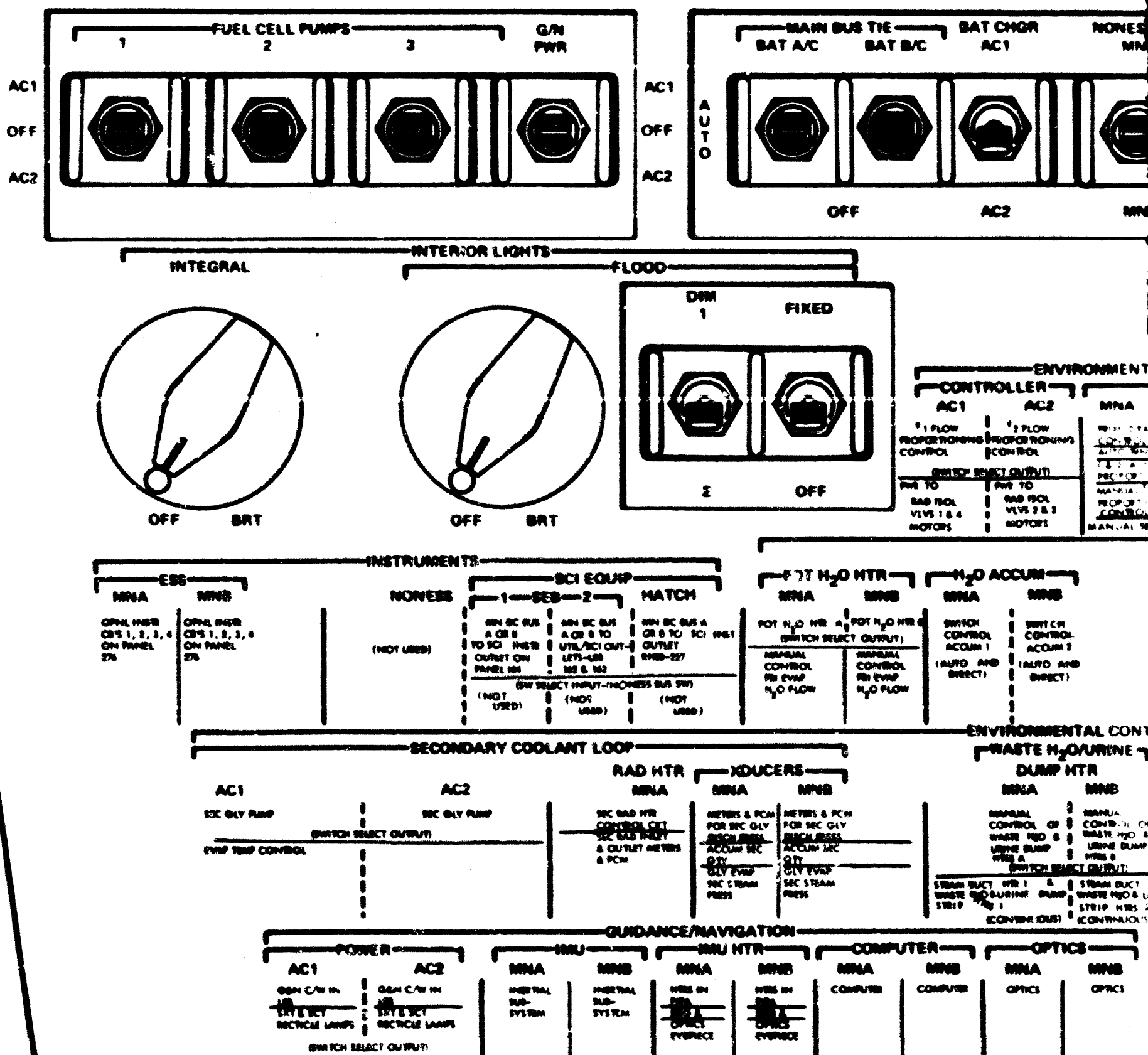
(SWITCH SELECT OUTPUT)

AC1		ECS GLYCOL PUMPS		AC2	
φ A	φ B	φ C	φ A	φ B	φ C
GLYCOL PUMP WILL RUN ON 28 PWR AT REDUCED RATE AC 2 AVAIL	GLYCOL PUMP WILL RUN ON 28 PWR AT REDUCED RATE AC 2 AVAIL	GLYCOL PUMP WILL RUN ON 28 PWR AT REDUCED RATE AC 2 AVAIL	GLYCOL PUMP WILL RUN ON 28 PWR AT REDUCED RATE AC 1 AVAIL	GLYCOL PUMP WILL RUN ON 28 PWR AT REDUCED RATE AC 1 AVAIL	GLYCOL PUMP WILL RUN ON 28 PWR AT REDUCED RATE AC 1 AVAIL
LOSS OF AUTO CONTROL OF GLYF INLET TEMPERATURE (AL AVAIL)		LOSS OF MANUAL CONTROL GLY FLV TO SUIT HEAT EXCH. MANUAL AVAIL	(SWITCH SELECT OUTPUT)		LOSS OF AUTO CONTROL H2O INPUT TO GLY EVAP & STEAM PRESS

(FOR TRAINING PURPOSES ONLY)

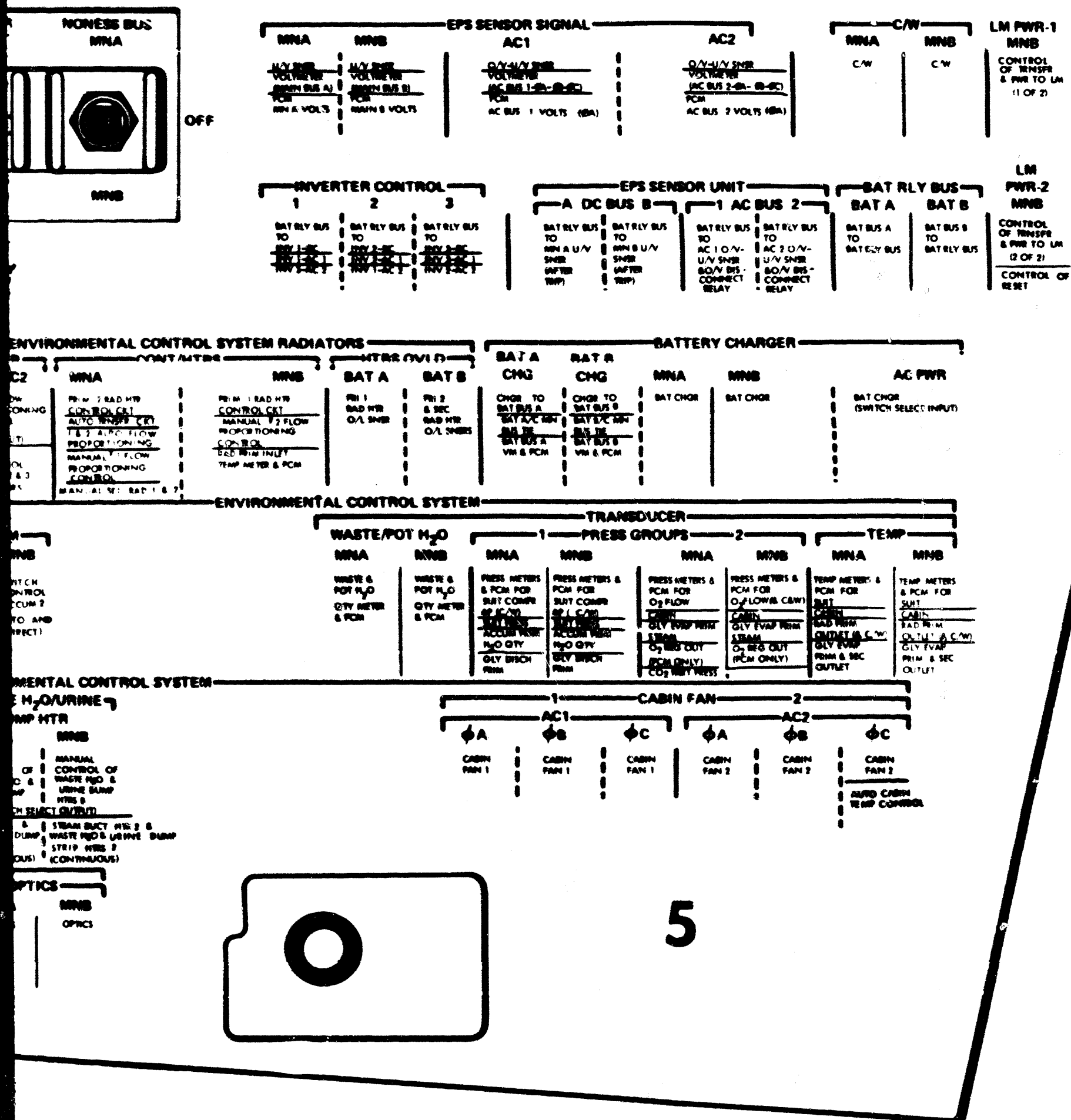
LEGEND:

- LINE BETWEEN CIRCUIT BREAKERS
- DESIGNATES DUAL POWER TO FUNCTION
- DESIGNATES SIMILAR FUNCTIONS
- DESIGNATES DIFFERENT FUNCTIONS



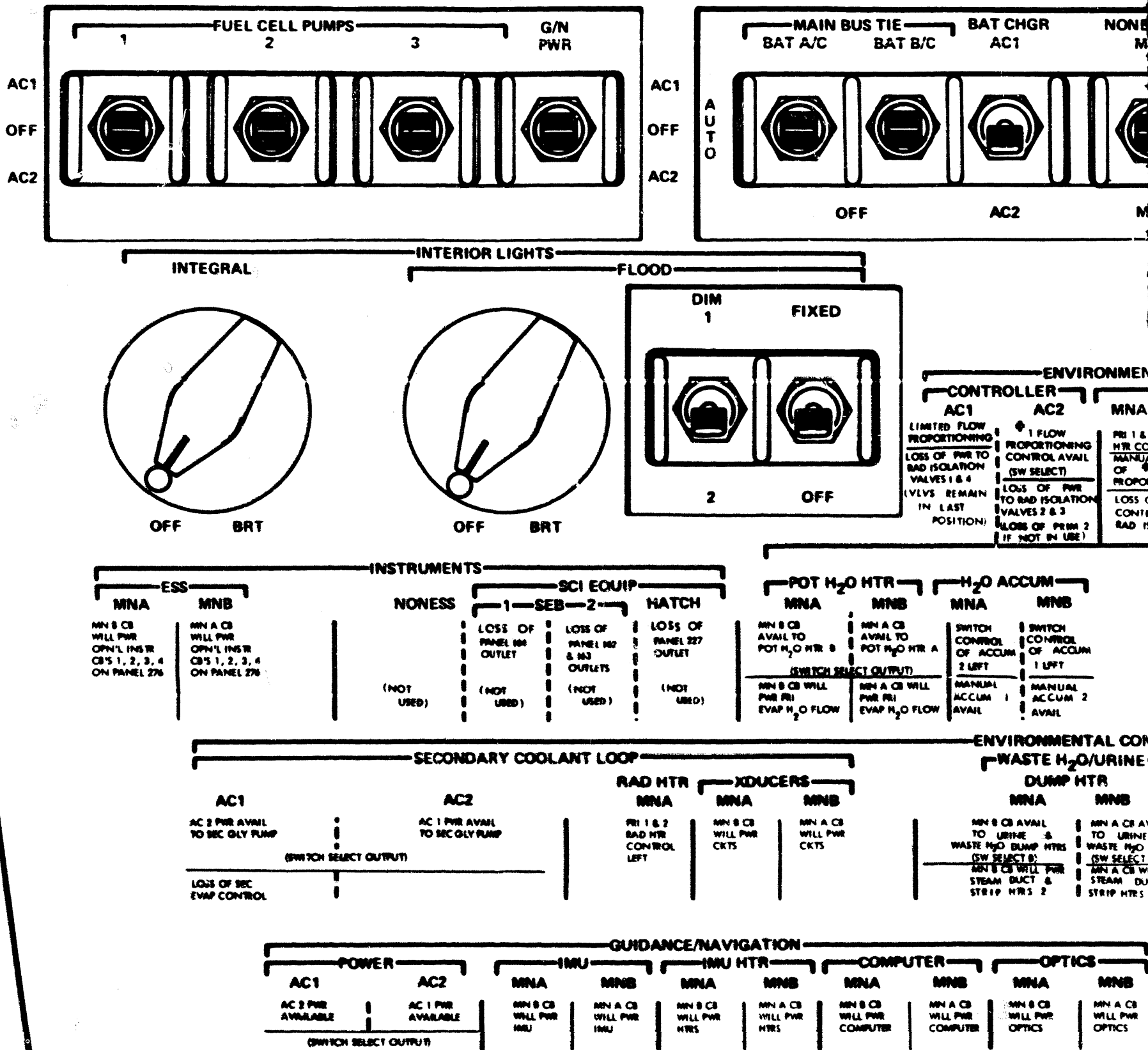
LEGEND:

- LINE BETWEEN CIRCUIT BREAKERS DESIGNATES DUAL POWER TO FUNCTION
- DESIGNATES SIMILAR FUNCTIONS
- DESIGNATES DIFFERENT FUNCTIONS



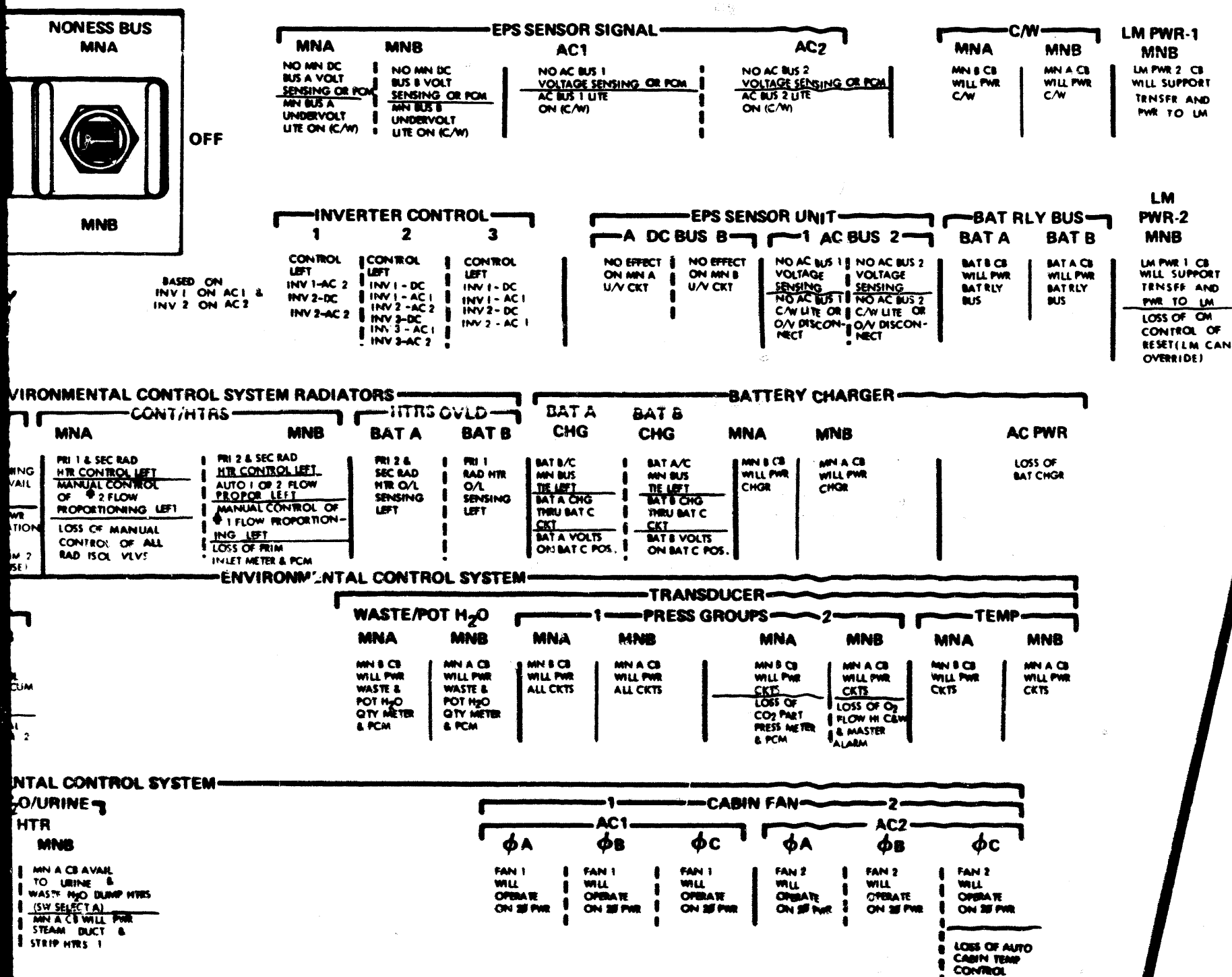
(FOR TRAINING PURPOSES ONLY)

EP 102-7
CSM LOGISTICS TRAINING

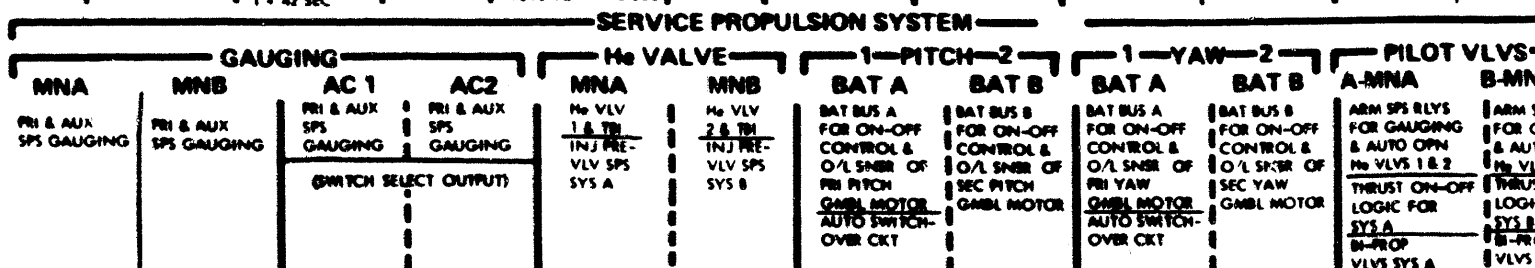
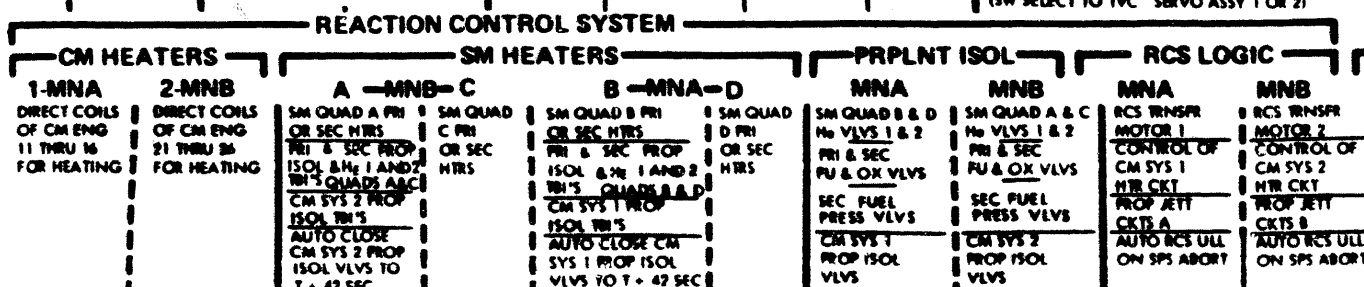
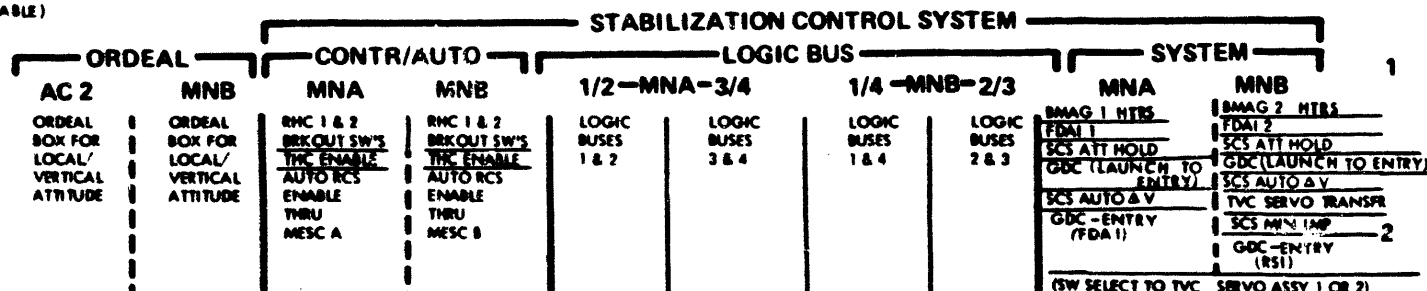
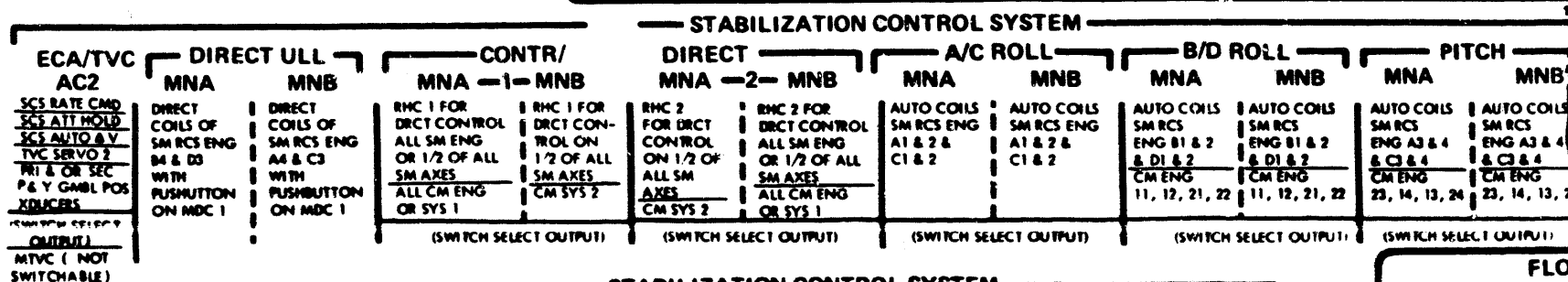
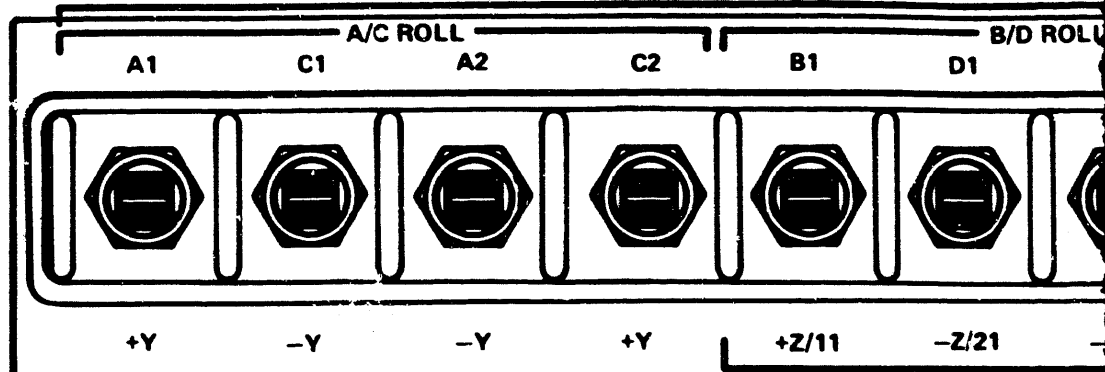
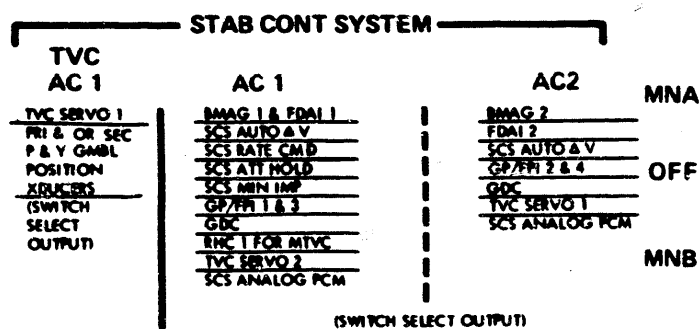


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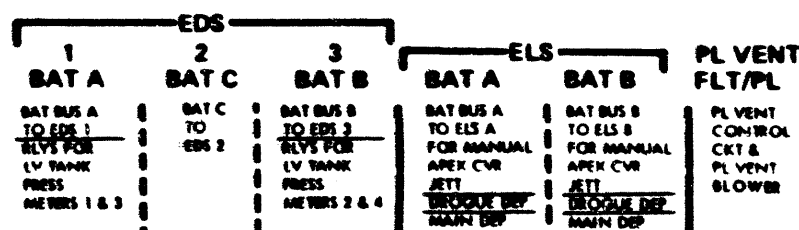
- LINE BETWEEN CIRCUIT BREAKERS
- DESIGNATES DUAL POWER TO FUNCTION
- DESIGNATES SIMILAR FUNCTIONS
- DESIGNATES DIFFERENT FUNCTIONS



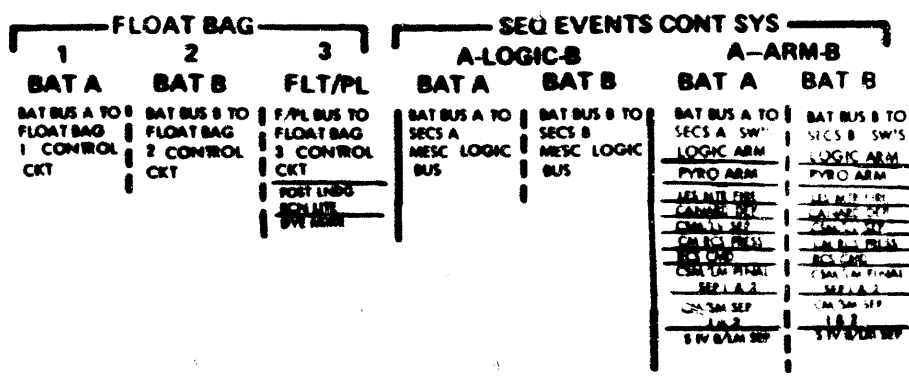
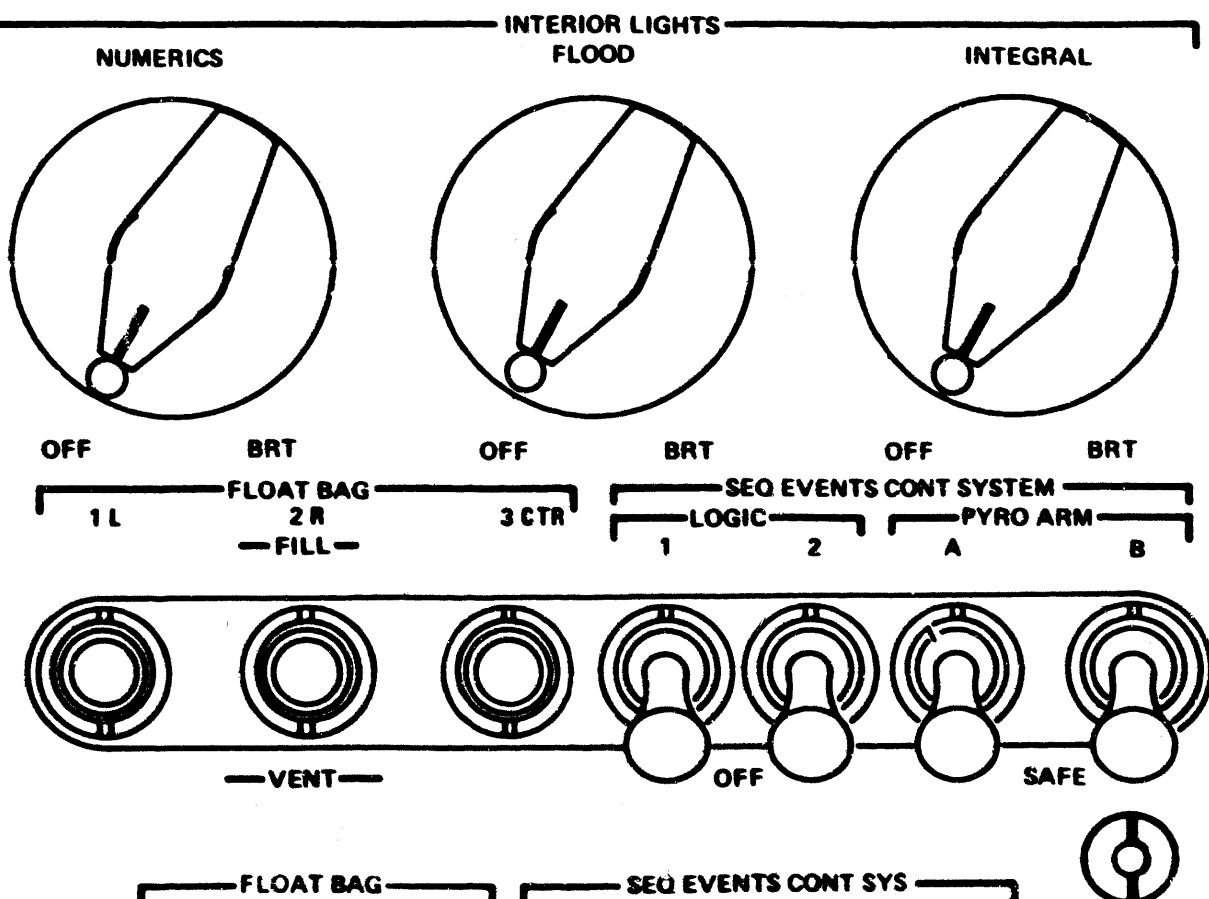
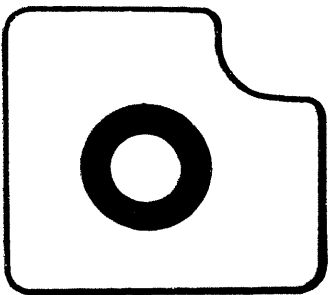
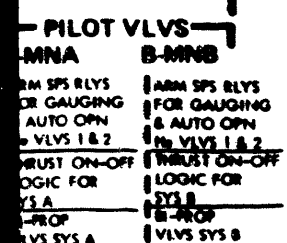
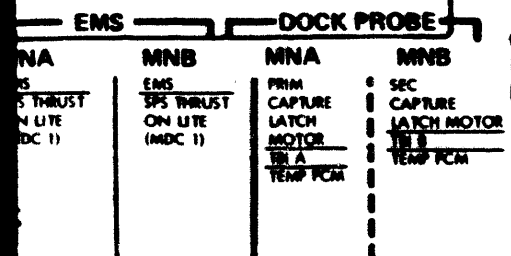
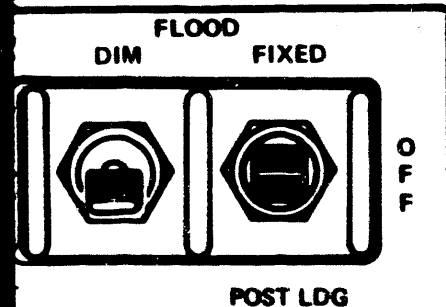
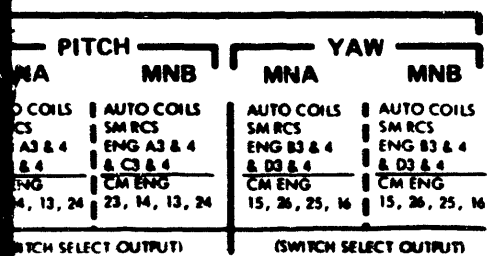
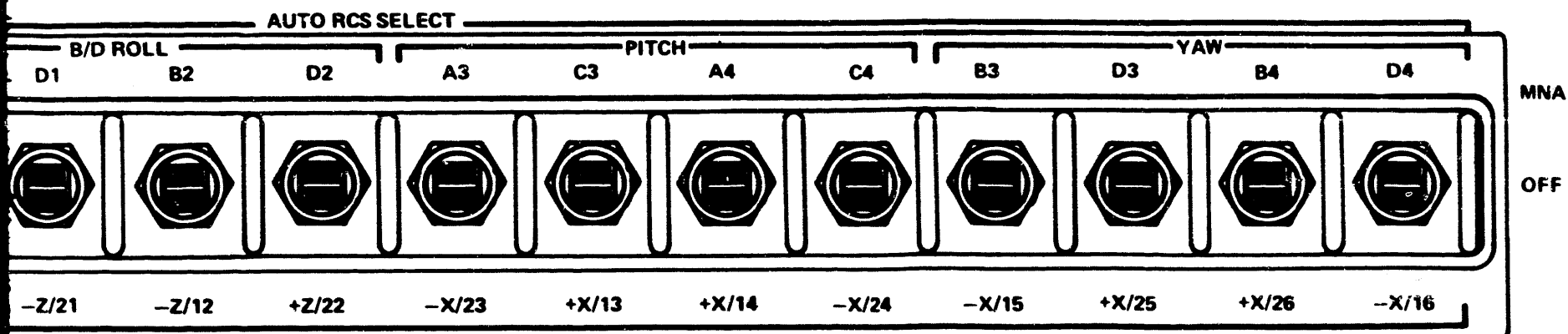
(FOR TRAINING PURPOSES ONLY)



8



(FOR TRAINING PURPOSES ONLY)



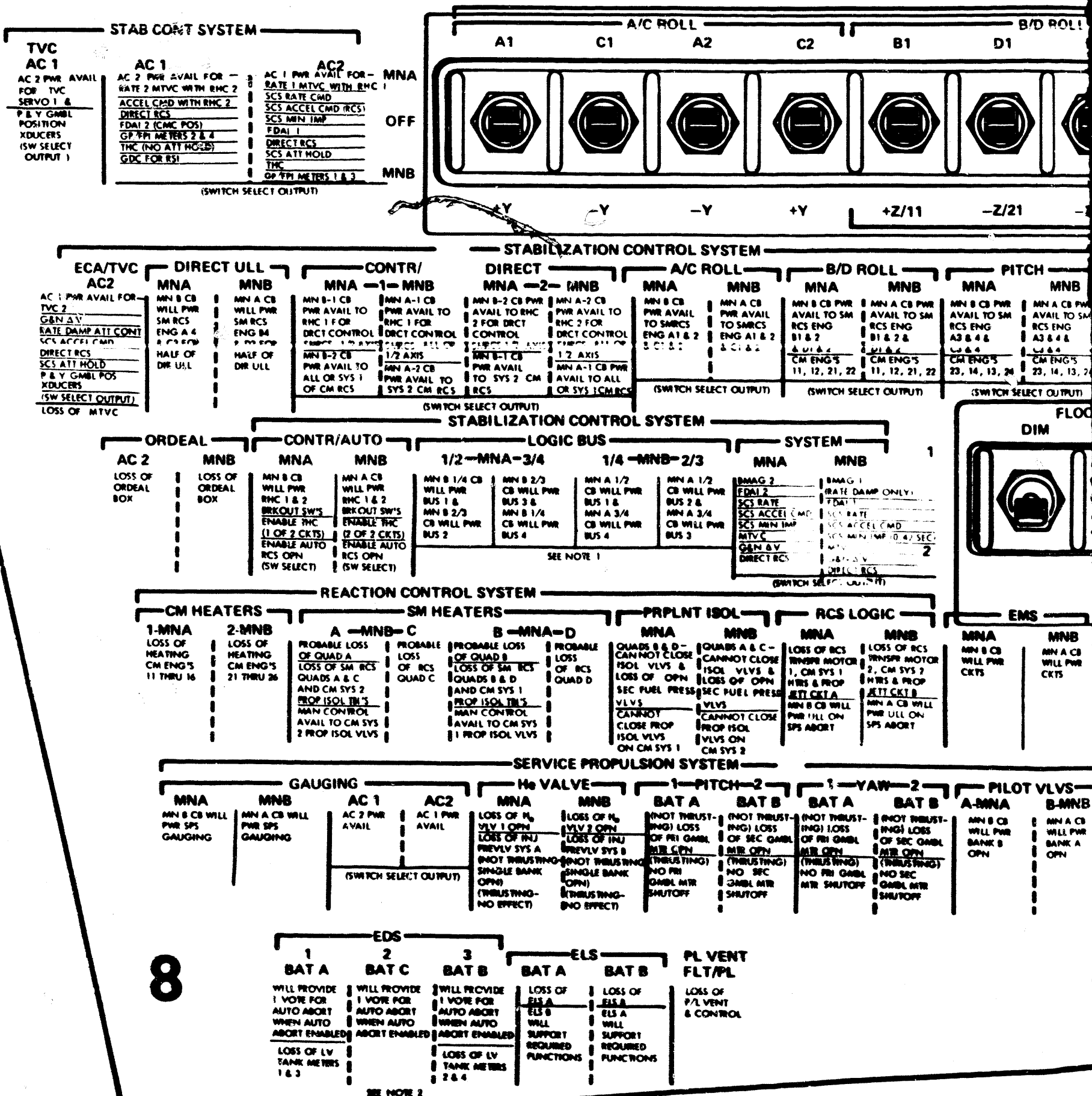
LEGEND:

— LINE BETWEEN CIRCUIT BREAKERS

— DESIGNATES DUAL POWER TO FUNCTION

— DESIGNATES SIMILAR FUNCTIONS

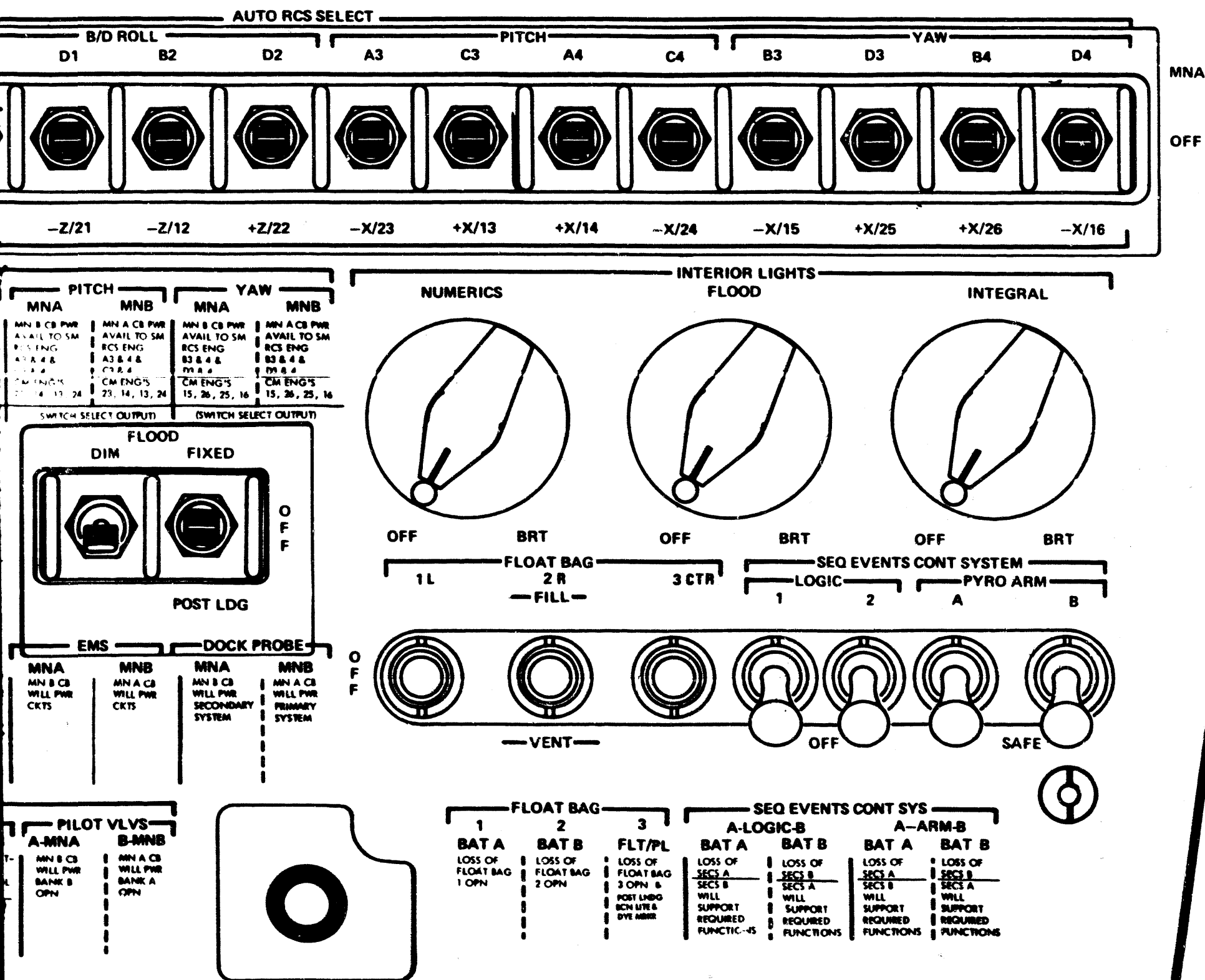
— DESIGNATES DIFFERENT FUNCTIONS



(FOR TRAINING PURPOSES ONLY)

LEGEND:
— LINE BETWEEN CIRCUIT B
— DESIGNATES DUAL POWER
— DESIGNATES SIMILAR FU
— DESIGNATES DIFFERENT F

SC 107
EFFECT OF CB OPENING
(REMAINING FUNCTION)



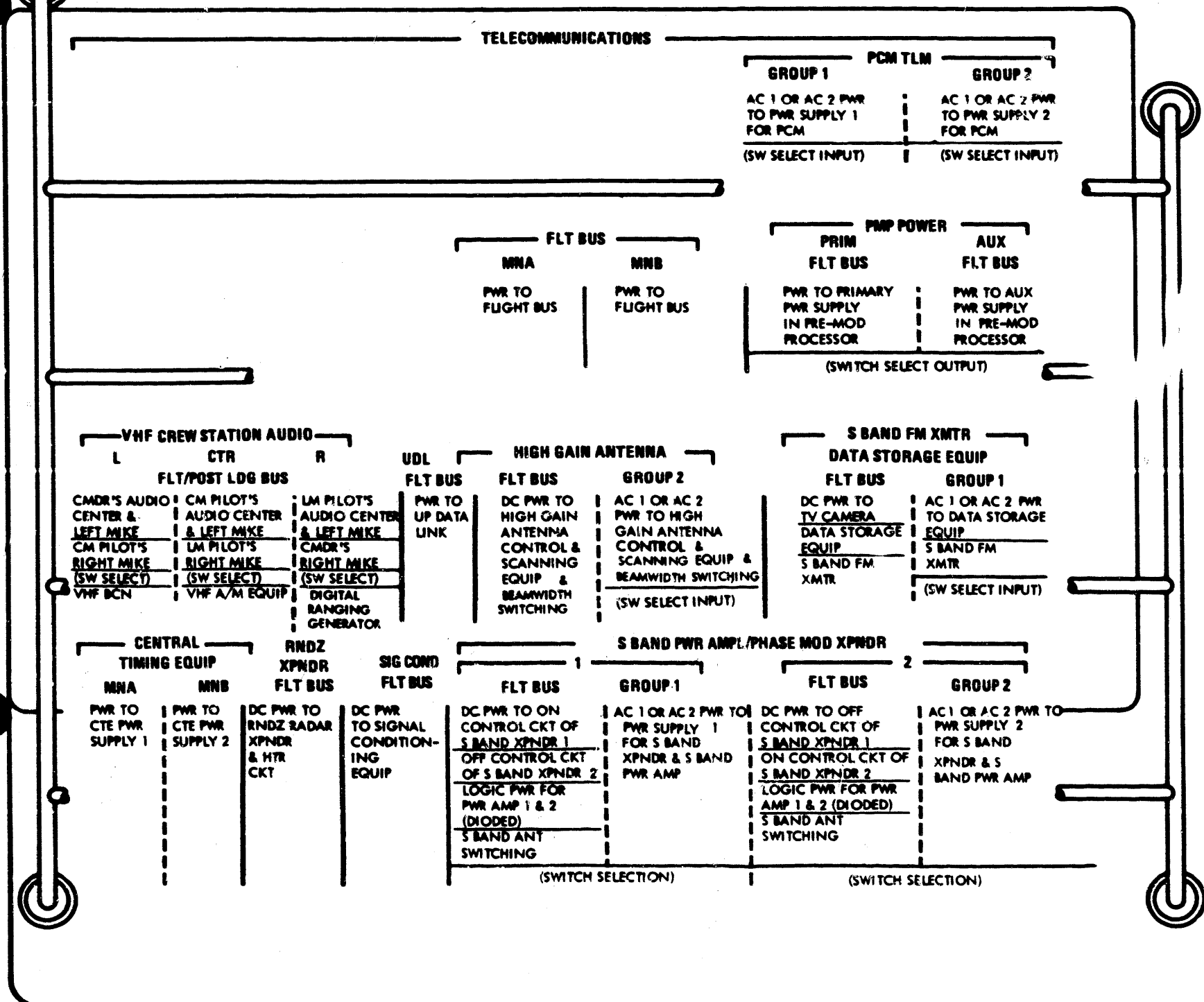
END:
E BETWEEN CIRCUIT BREAKERS
IGNATES DUAL POWER TO FUNCTION
IGNATES SIMILAR FUNCTIONS
IGNATES DIFFERENT FUNCTIONS

NOTE: 1. (SCS-LOGIC BUS) - IF FAULT OCCURS IN BUS, TWO BREAKERS FOR A COMMON BUS WILL PROBABLY OPEN INDICATING THE FAULTED BUS

2. TWO CB'S OPEN WILL INITIATE AN AUTO ABORT (WHEN EDS AUTO ENABLED)

SC 107
FUNCTIONS POWERED THRU CB

225



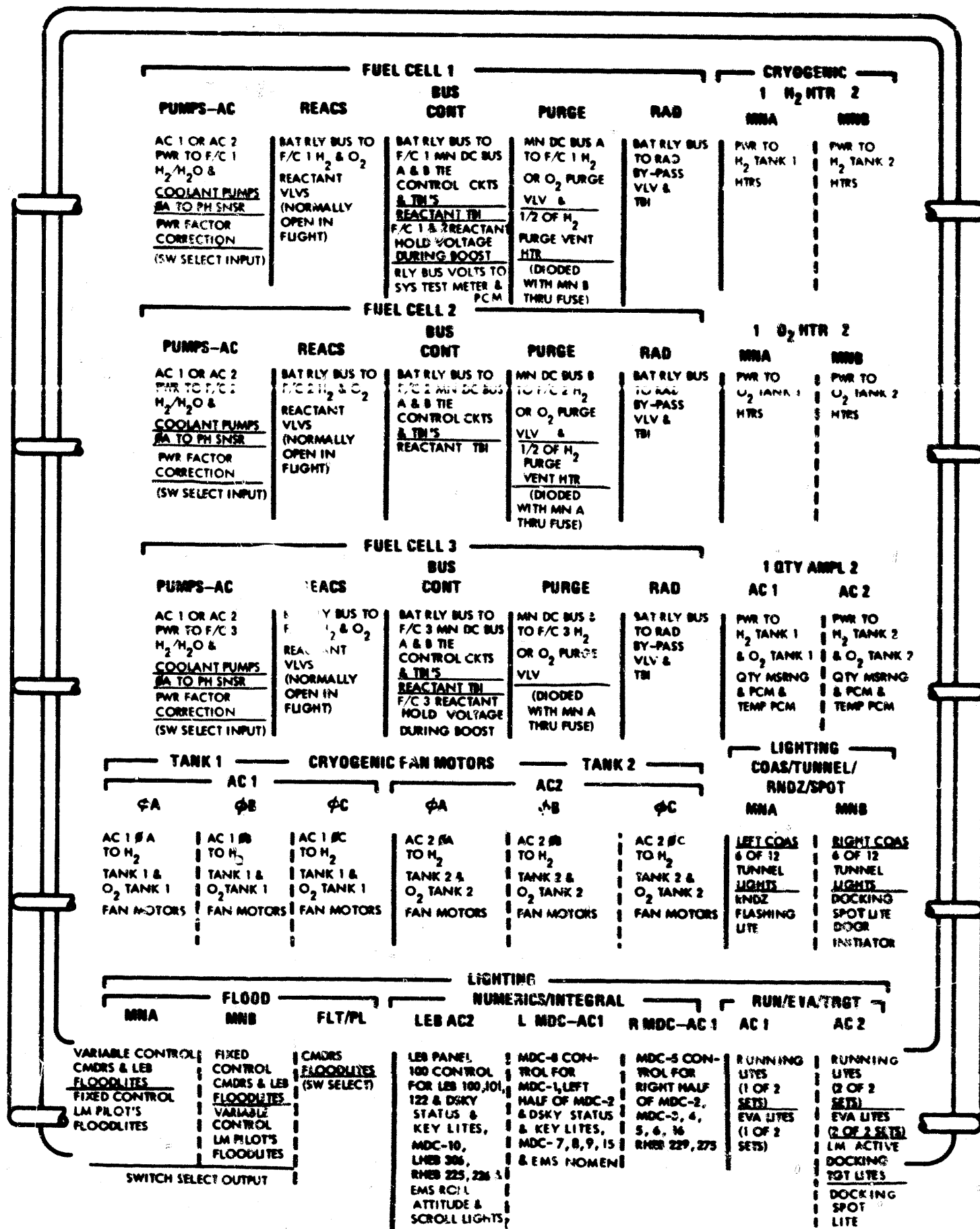
(FOR TRAINING PURPOSES ONLY)

LEGEND:

- LINE BETWEEN CIRCUIT BREAKERS
- DESIGNATES DUAL POWER TO FUNCTION
- ==== DESIGNATES SIMILAR FUNCTIONS
- ===== DESIGNATES DIFFERENT FUNCTIONS

EP 106-7
CSM LOGISTICS TRAINING

226

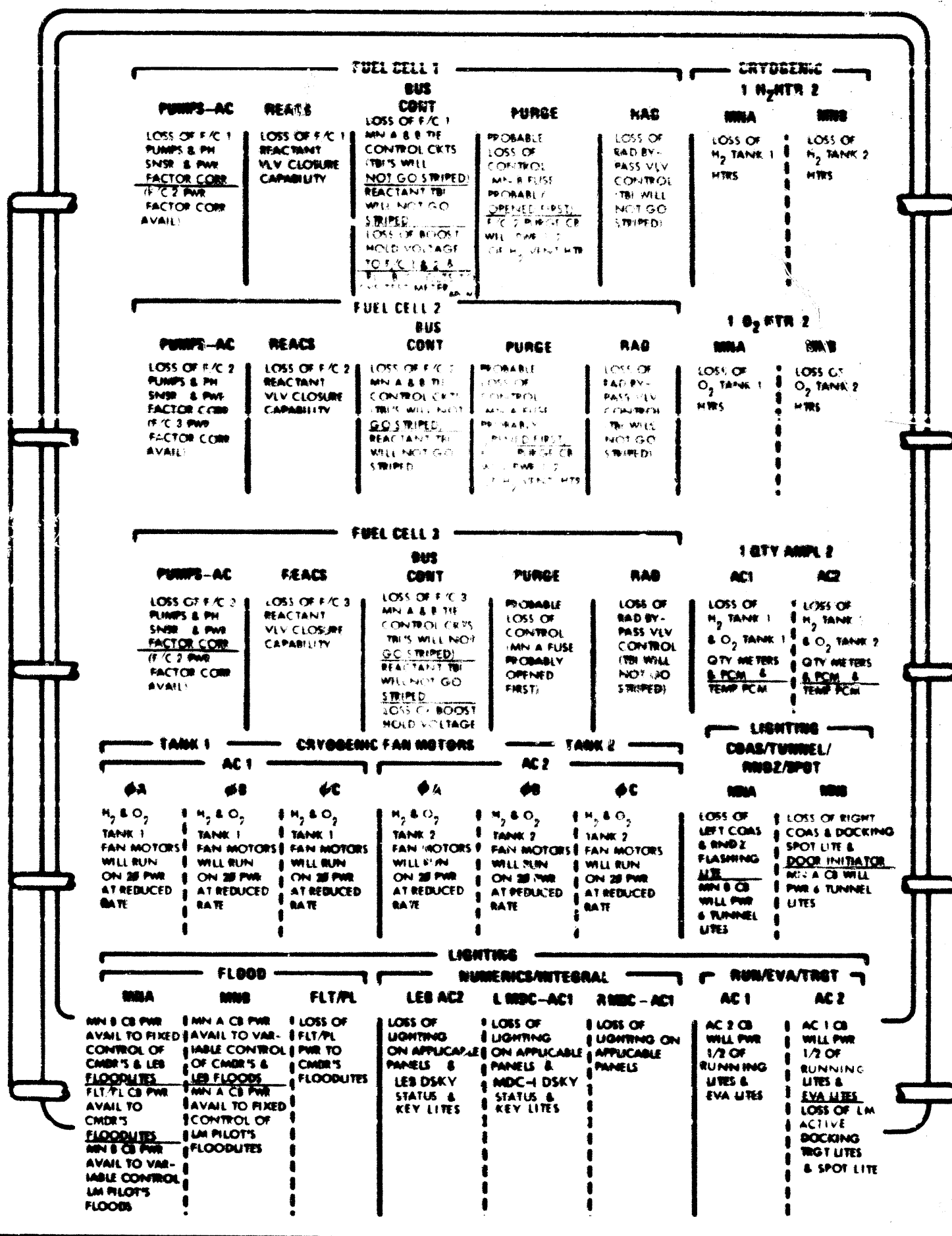


(FOR TRAINING PURPOSES ONLY)

LEGEND:
— LINE BETWEEN CIRCUIT BREAKERS
— DESIGNATES DUAL POWER TO FUNCTION
— DESIGNATES SIMILAR FUNCTIONS
— DESIGNATES DIFFERENT FUNCTIONS

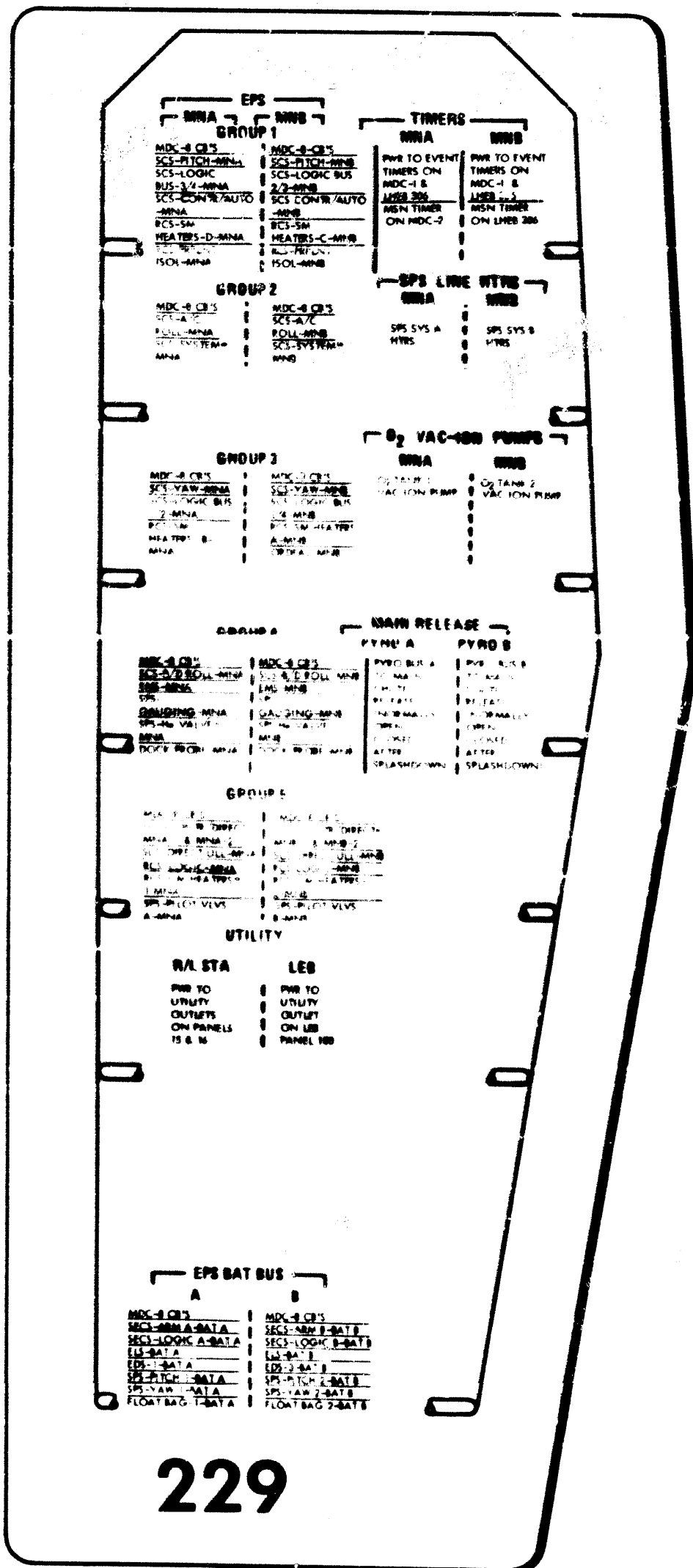
SC 107
EFFECT OF CB OPENING
(REMAINING FUNCTION)

226



(FOR TRAINING PURPOSES ONLY)

LEGEND:
— LINE BETWEEN CIRCUIT BREAKERS
===== DESIGNATES DUAL POWER TO FUNCTION
----- DESIGNATES SIMILAR FUNCTIONS
===== DESIGNATES DIFFERENT FUNCTIONS



229

(FOR TRAINING PURPOSES ONLY)

250

BAT BUS A TO PYRO BUS TIE

BAT BUS A BACK-UP TO PYRO BUS A (NORMALLY OPEN - CLOSED IF PYRO BAT A FAILS)

PYRO A

SEC A

PYRO BAT A TO PYRO BUS A (NORMALLY USED - OPEN IF PYRO BAT A FAILS)

BAT BUS B TO PYRO BUS TIE

BAT BUS B BACK-UP TO PYRO BUS B (NORMALLY OPEN - CLOSED IF PYRO BAT B FAILS)

PYRO B

SEC B

PYRO BAT B TO PYRO BUS B (NORMALLY USED - OPEN IF PYRO BAT B FAILS)

BAT A PWR ENTRY / POST LANDING

E/PL BAT A PWR TO BAT B

BAT B PWR ENTRY / POST LANDING

E/PL BAT B PWR TO BAT BUS B

BAT C PWR ENTRY / POST LANDING

E/PL BAT C PWR TO ALL BAT C CIRCS

BAT C TO BAT BUS A

BAT C BACKUP TO BAT BUS A (NORMALLY OPEN - CLOSED IF E/PL BAT A FAILS)

BAT C TO BAT BUS B

BAT C BACKUP TO BAT BUS B (NORMALLY OPEN - CLOSED IF E/PL BAT B FAILS)

BAT C BAT CHGR / EDS2

BAT CHGR TO BAT C
BAT C TO EDS 2

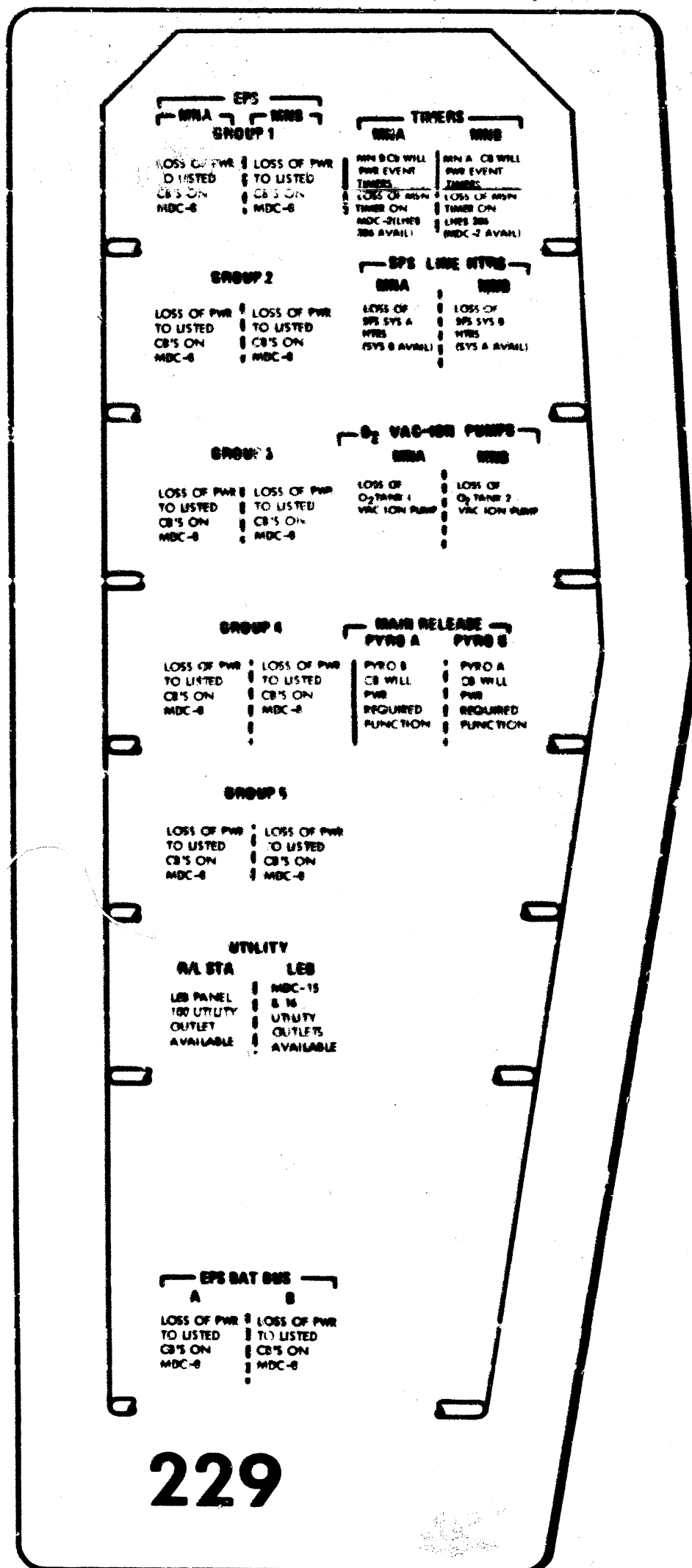
LEGEND:

- LINE BETWEEN CIRCUIT BREAKERS
- ===== DESIGNATES DUAL POWER TO FUNCTION
- DESIGNATES SIMILAR FUNCTIONS
- ===== DESIGNATES DIFFERENT FUNCTIONS

EP 110-7

CSM LOGISTICS TRAINING

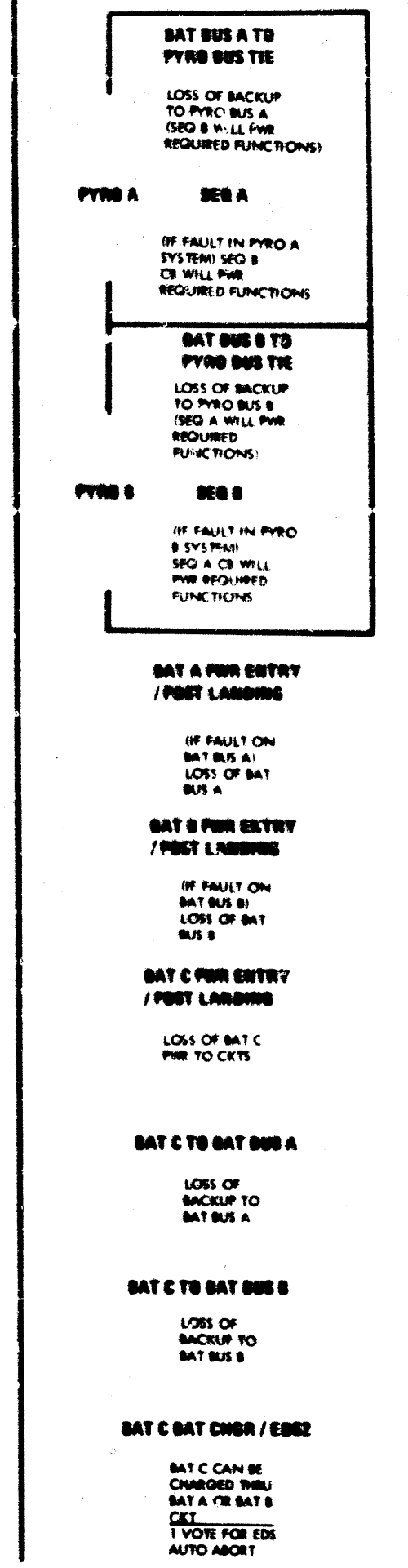
SC 107
EFFECT OF CB OPENING
(REMAINING FUNCTION)



229

(FOR TRAINING PURPOSES ONLY)

250

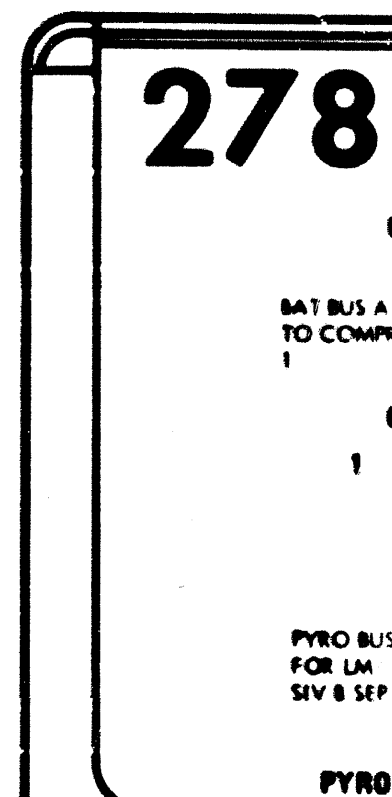
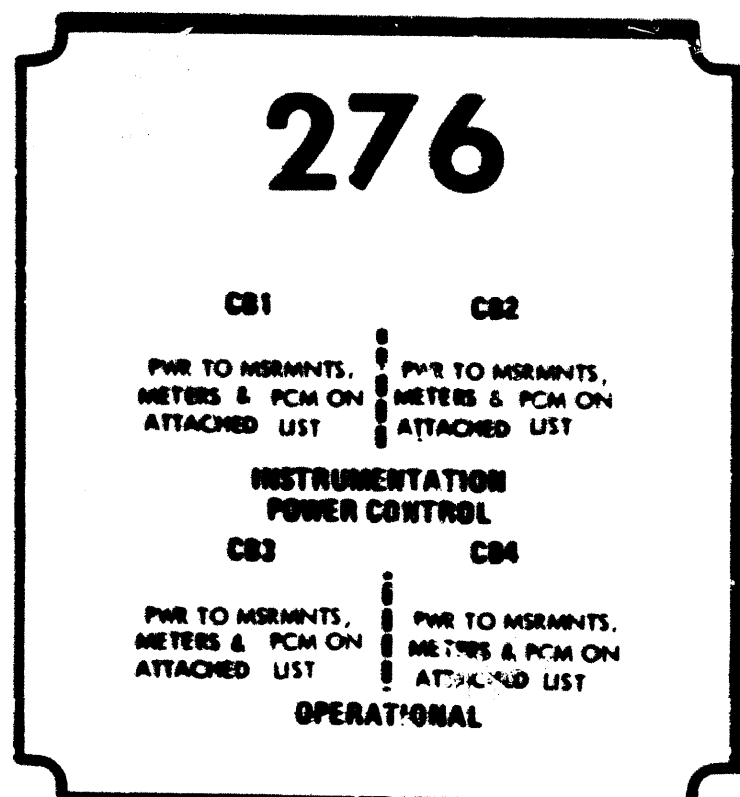
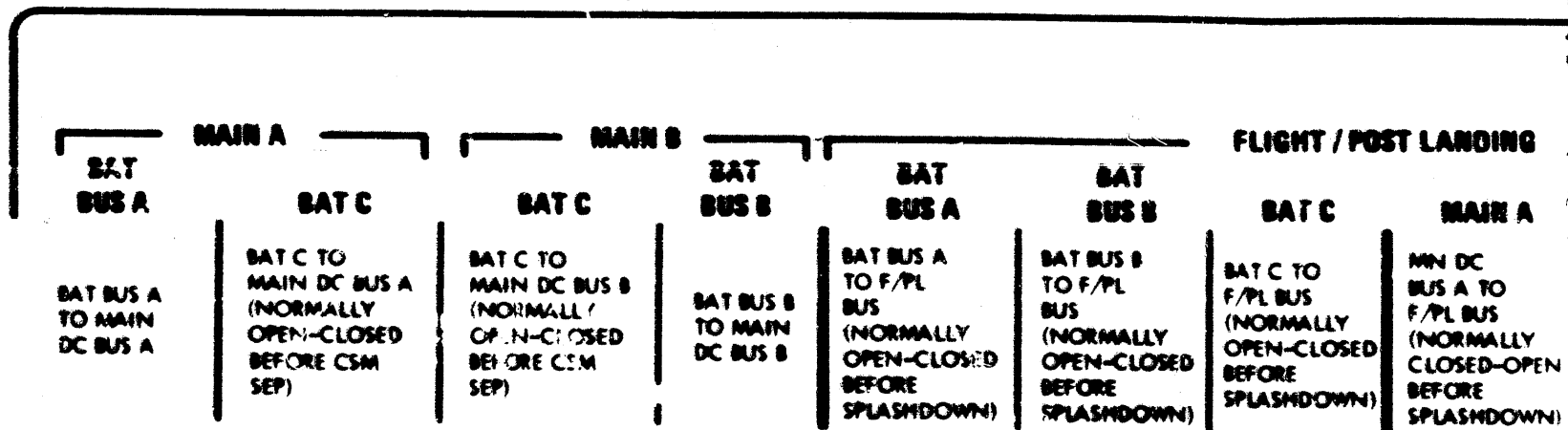


LEGEND:

- LINE BETWEEN CIRCUIT BREAKERS
- ===== DESIGNATES DUAL POWER TO FUNCTION
- DESIGNATES SIMILAR FUNCTIONS
- ===== DESIGNATES DIFFERENT FUNCTIONS

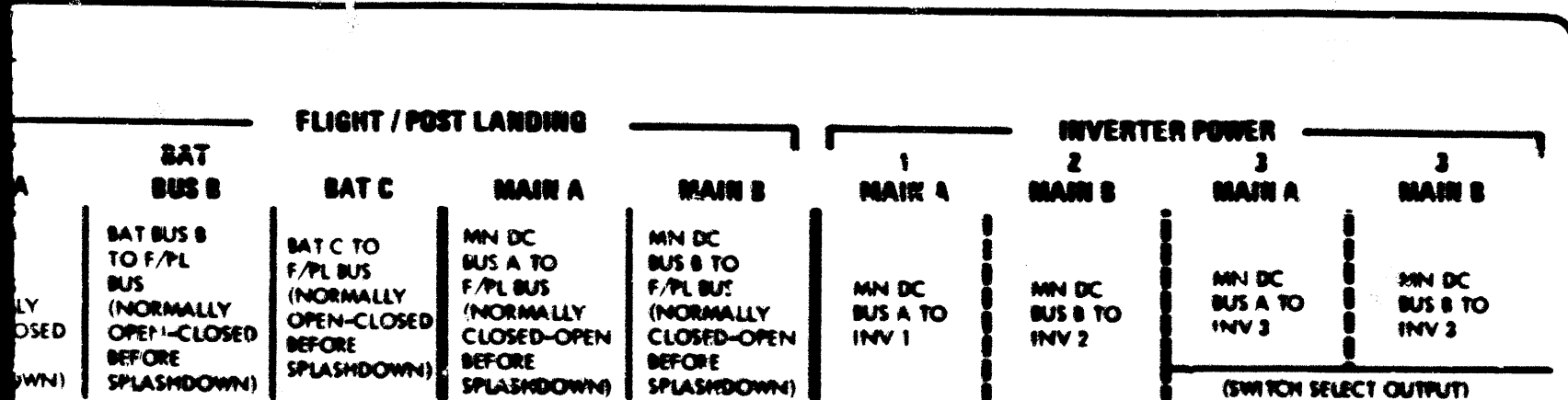
EP 111-7

CSM LOGISTICS TRAINING



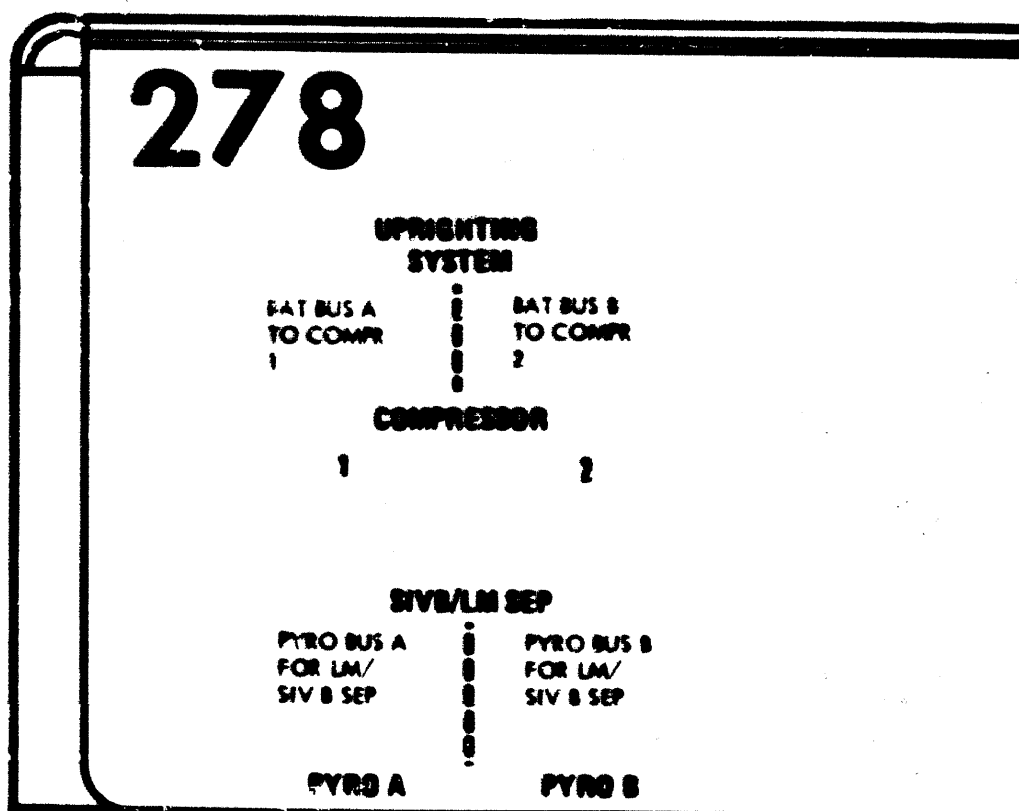
LEGEND:
 — LINE BETWEEN DESIGNATES
 - - - - - DESIGNATES
 ——— DESIGNATES

SC 107
FUNCTIONS POWERED THRU CB



275

278

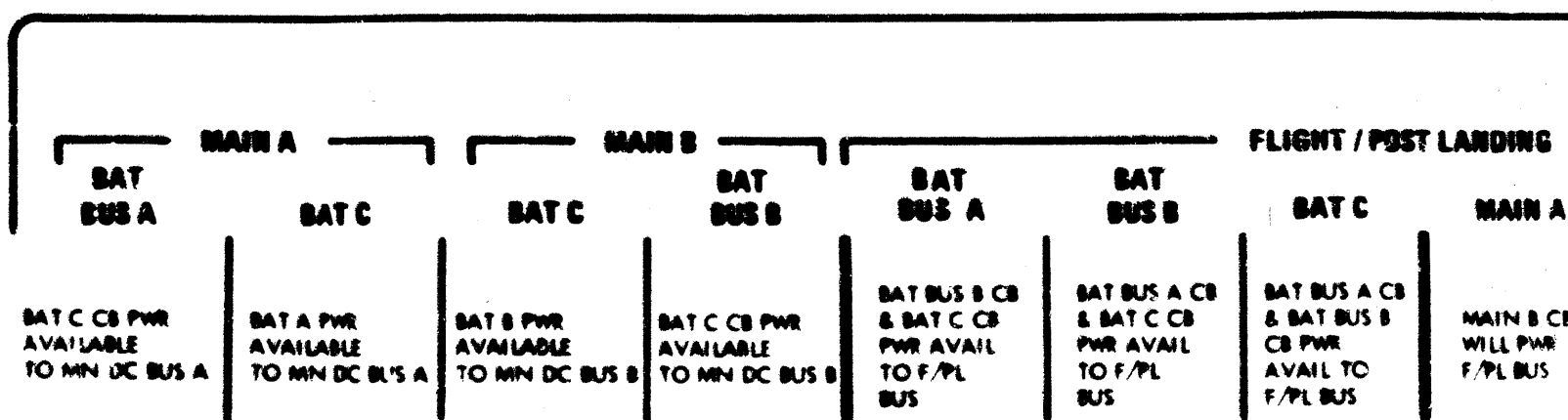


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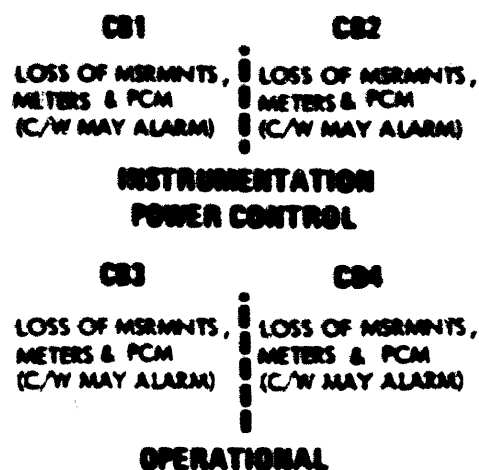
- LINE BETWEEN CIRCUIT BREAKERS
- DESIGNATES DUAL POWER TO FUNCTION
- DESIGNATES SIMILAR FUNCTIONS
- DESIGNATES DIFFERENT FUNCTIONS

EP 112-7
CSM LOGISTICS TRAINING

SC 107
EFFECT OF CB OPENING
(REMAINING FUNCTION)



276



278

COMPR 2
WILL
INFLATE (AT
REDUCED RATE
COM
1
SIV
PYRO B WILL
PWR REQ'D
FUNCTION
PYRO A

LEGEND:

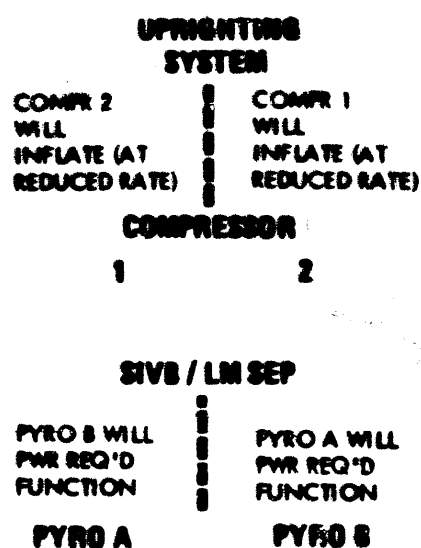
- LINE BETWEEN CIRCUIT BREAKERS
- DESIGNATES DUAL POWER TO FUNCTION
- DESIGNATES SIMILAR FUNCTIONS
- DESIGNATES DIFFERENT FUNCTIONS

SC 107
EFFECT OF CB OPENING
(REMAINING FUNCTION)

FLIGHT / POST LANDING				INVERTER POWER			
BAT BUS B	BAT C	MAIN A	MAIN B	MAIN A	MAIN B	MAIN A	MAIN B
BAT BUS A CB & BAT C CB PWR AVAIL TO F/PL BUS	BAT BUS A CB & BAT BUS B CB PWR AVAIL TO F/PL BUS	MAIN B CB WILL PWR F/PL BUS	MAIN A CB WILL PWR F/PL BUS	LOSS OF INV 1 INVERTERS 2 & 3 AVAILABLE	LOSS OF INV 2 INVERTERS 1 & 3 AVAILABLE	MAIN B CB PWR AVAIL TO INV 3	MAIN A CB PWR AVAIL TO INV 3
				(SWITCH SELECT OUTPUT)			

275

278



(FOR TRAINING PURPOSES ONLY)

EP 113-7
CSM LOGISTICS TRAINING

SC 107
RIGHT HAND EQUIPMENT BAY PANEL 276

MSRMNT TITLE

MSRMNT O. B.
NO. DISPLAY

MSRMNT TITLE

MSRMNT O. B.
NO. DISPLAY

CB 1

Main dc bus A & B power to
following measurements:

H ₂ O Dump Temp	CF 0461T
CM He Tk A Press	CF 0001P SM
CM He Tk A Temp	CR 0003T SM
CM He Manif 1 Press	CR 0035P *
CM He Manif 2 Press	CR 0038P SM*
Temp 16 Eng Inj Sys 1	CR 2103T SM
Temp 12 Eng Inj Sys 1	CR 2114T SM

CB 2

Main dc bus A & B power to
following measurements:

Temp Crew Ablator Surf Loc 1A	CA 1820T
Temp Crew Ablator Surf Loc 4A	CA 1821T
Temp Crew Ablator Surf Loc 7A	CA 1822T
Temp Crew Ablator Surf Loc 10A	CA 1823T
Press Batt Compartment (Manif)	CC 0188P SM
Drogue Dep Relay A	CE 0001X
Drogue Dep Relay B	CE 0002X
Main Dep Relay A	CE 0003X
Main Dep Relay B	CE 0004X
Main Chute Disc Relay A	CE 0321X
Main Chute Disc Relay B	CE 0322X
Suit Cabin Delta Press	CF 0003P M
Surge Tank Press	CF 0006P SM
H ₂ O Tank-Glycol Res Press	CF 0120P
Pri Glycol Flow Rate	CF 0157R
Pri Evap Inlet Temp	CF 0181T
Urine Dump Nozzle Temp	CF 0460T
Astro 1 EKG Axis 1	CJ 0060J
Astro 2 EKG Axis 1	CJ 0061J
Astro 3 EKG Axis 1	CJ 0062J
Astro 1 Respir	CJ 0200R
Astro 2 Respir	CJ 0201R
Astro 3 Respir	CJ 0202R
CM X Axis Accel	CK 0026A
AM Y Axis Accel	CK 0027A
CM Z Axis Accel	CK 0028A
Dosimeter 1 Radiation	CK 1051K
Dosimeter 2 Radiation	CK 1052K
Dosimeter Rate	CK 1053K

Cb 2 cont'd

CM He Tk B Press	CR 0002P SM
CM He Tk B Temp	CR 0004T SM
CM He Manif 2 Press	CR 0036P *
CM He Manif 1 Press	CR 0037P SM*
Temp 14 Eng Inj Sys 1	CR 2100T SM
Temp 24 Eng Inj Sys 2	CR 2110T SM
Temp 25 Eng Inj Sys 2	CR 2116T SM
Temp 21 Eng Inj Sys 2	CR 2119T SM

Docking Probe Temp

CS 0220T

CB 3

Main dc bus A & B power to
following measurements:

Temp Bay 2 Ox Tk Surf	SA 2377T
Temp Bay 5 Fuel Tk Surf	SA 2379T
Ox Transfr Line Entry Sump T	SA 2400T
O ₂ Tk 2 Press	SC 0038P M*
H ₂ Tk 2 Press	SC 0040P M*
FC 2 N ₂ Press	SC 2061P SM
FC 3 N ₂ Press	SC 2062P SM
FC 2 O ₂ Press	SC 2067P SM
FC 3 O ₂ Press	SC 2068P SM
FC 2 H ₂ Press	SC 2070P SM
FC 3 H ₂ Press	SC 2071P SM
FC 2 Rad Out Temp	SC 2088T SM
FC 3 Rad Out Temp	SC 2089T SM
FC 2 Rad In Temp	SC 2091T
FC 3 Rad In Temp	SC 2092T
FC 2 H ₂ Flow	SC 2140R SM*
FC 3 H ₂ Flow	SC 2141R SM*
FC 2 O ₂ Flow	SC 2143R SM*
FC 3 O ₂ Flow	SC 2144R SM*
He Tk Press	SP 0001P
Ox Tks Press	SP 0003P M*
Position Fu/Ox Vlv 1 Pot B	SP 0022H
Position Fu/Ox Vlv 3 Pot B	SP 0024H
Position Fu/Ox Vlv 2 Pot A	SP 0027H M
Position Fu/Ox Vlv 4 Pot A	SP 0029H M
Temp Fuel Eng Feed Line	SP 0034T M
Temp 1 Oxidizer Distr Line	SP 0034T
SPS Prplnt Tanks N ₂ A Press	SP 0600P SM
Eng Chamber Press	SP 0661P SM
Fuel SM/Eng Interface Press	SP 0930P

MSRMNT TITLE	MSRMNT NO.	O. B. DISPLAY	MSRMNT TITLE	MSRMNT NO.	O. B. DISPLAY
Cb 3 cont'd			Cb 4 cont'd		
SM He Tk A Press	SR 5001P	SM	SM He Tk B Press	SR 5002P	SM
SM He Tk C Press	SR 5003P	SM	SM He Tk D Press	SR 5004P	SM
SM He Tk A Temp	SR 5013T	SM	SM He Tk B Temp	SR 5014T	SM
SM He Tk C Temp	SR 5015T	SM	SM He Tk D Temp	SR 5016T	SM
Qty SM Propellant Sys A	SR 5025Q	SM	Qty SM Propellant Sys B	SR 5026Q	SM
Qty SM Propellant Sys C	SR 5027Q	SM	Qty SM Propellant Sys D	SR 5028Q	SM
SM Eng Package A Temp	SR 5065T	SM*	SM Eng Package B Temp	SR 5066T	SM*
SM Eng Package C Temp	SR 5067T	SM*	SM Eng Package D Temp	SR 5068T	SM*
SM He Manf Sys A Press	SR 5729P		SM He Manf Sys B Press	SR 5776P	
SM Ox Manf Sys A Press	SR 5733P		SM Ox Manf Sys B Press	SR 5780P	
SM Fuel Manf Sys A Press	SR 5737P	SM*	SM Fuel Manf Sys B Press	SR 5784P	SM*
SM He Manf Sys C Press	SR 5817P		SM Ox Manf Sys D Press	SR 5821P	
SM Ox Manf Sys C Press	SR 5820P		SM Fuel Manf Sys D Press	SR 5823P	SM*
SM Fuel Manf Sys C Press	SR 5822P	SM*	SM He Manf Sys D Press	SR 5830P	
Proton Ct Rate Chan 1	ST 0820K		Nuclear Particle Det Temp	ST 0840T	
Proton Ct Rate Chan 2	ST 0821K		Nuclear Particle Anal Temp	ST 0841T	
Proton Ct Rate Chan 3	ST 0822K				
Proton Ct Rate Chan 4	ST 0823K				
Alpha Ct Rate Chan 1	ST 0830K				
Alpha Ct Rate Chan 2	ST 0831K				
Alpha Ct Rate Chan 3	ST 0832K				
Proton Integ Ct Rate	ST 0838K				

CB 4

Main dc bus A & B power to following instrumentation:

Temp Bay 3 Ox Tk Surf	SA 2378T
Temp Bay 6 Fuel Tk Surf	SA 2380T
Fuel Trnsfr Line Entry Sump Tk	SA 2401T

O ₂ Tk 1 Press	SC 0037P	SM*
H ₂ Tk 1 Press	SC 0039P	M*
FC 1 N ₂ Press	SC 2060P	SM
FC 1 O ₂ Press	SC 2066P	SM
FC 1 H ₂ Press	SC 2069P	SM
FC 1 Rad Out Temp	SC 2087T	SMB*
FC 1 Rad In Temp	SC 2091T	
FC 1 H ₂ Flow	SC 2139R	SM*
FC 1 O ₂ Flow	SC 2142R	SM*

He Tk Temp	SP 0002T	
Fu Tks Press	SP 0006P	M*
Position Fu/Ox Vlv 2 Pot B	SP 0023H	
Position Fu/Ox Vlv 4 Pot B	SP 0025H	
Position Fu/Ox Vlv 1 Pot A	SP 0026H	M
Position Fu/Ox Vlv 3 Pot A	SP 0028H	M
He Tk Press Display	SP 0035P	SM
Temp Eng Vlv Body	SP 0045T	
Temp Ox Eng Feed Line	SP 0049T	M
Temp 1 Fuel Distr Line	SP 0057T	
SPS Prplnt Tanks N B Press	SP 0601P	SM
Ox SM/Eng Interface Press	SP 0931P	

LEGEND:

O.B. Display = On Board Display
M = Meter
SM = Selectable Meter
B = Talk Back Indicator
* = Input to Caution/Warning