JSC-11174

Space Shuttle Systems Handbook

Volume I - Sections 1 through 11

Mission Operations Directorate
Systems Division

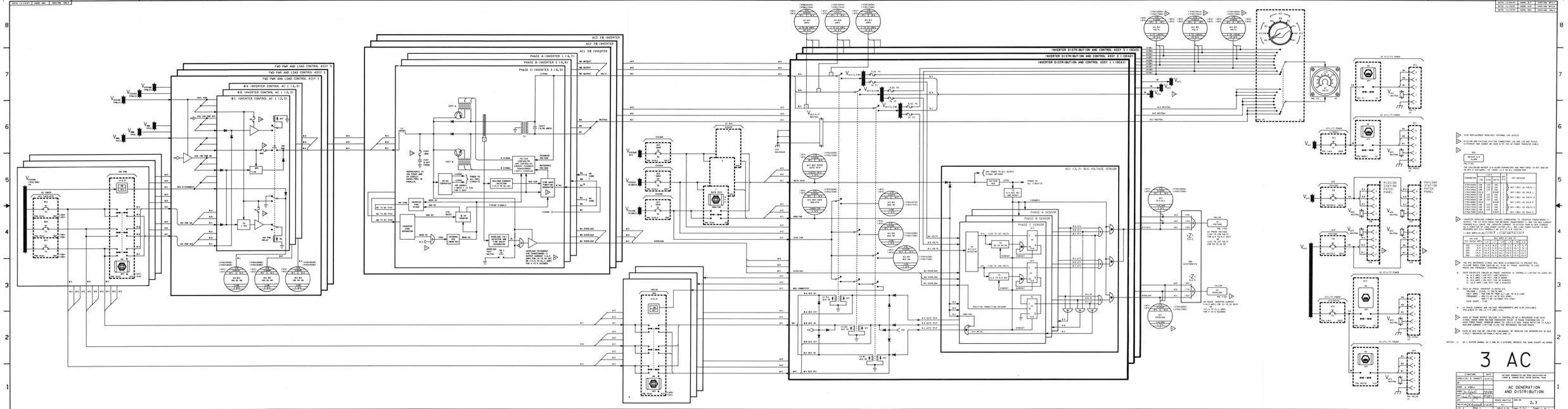
Revision D, DCN-2
April 20, 1988

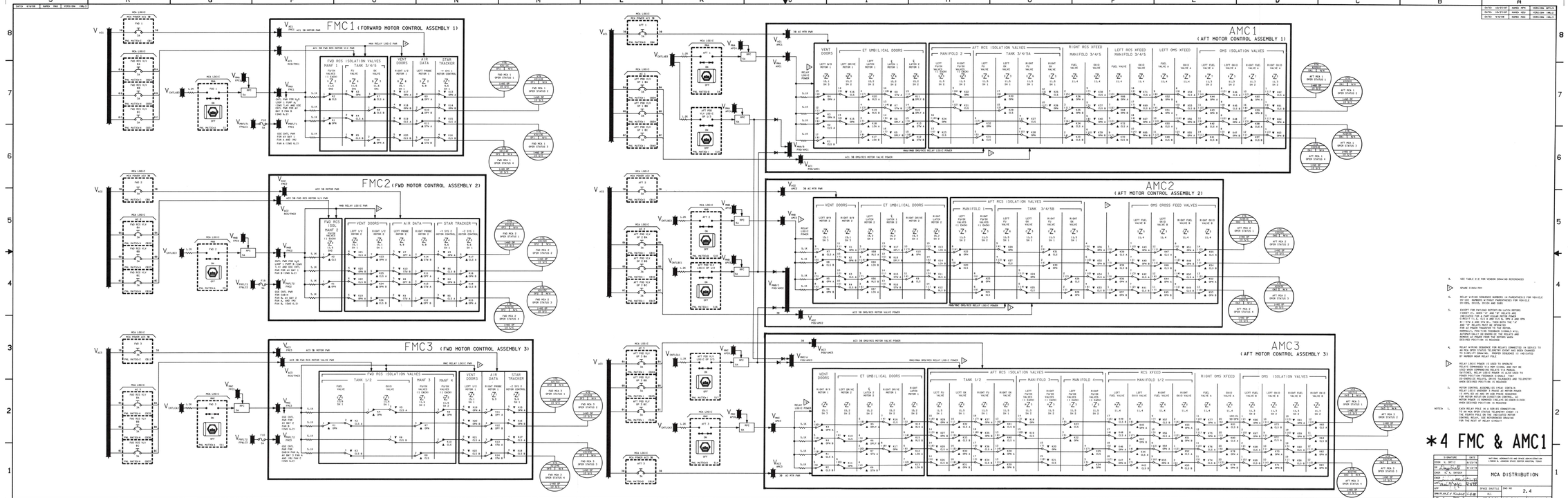
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Includes all updates through
DCN-2, dated April 20, 1988.

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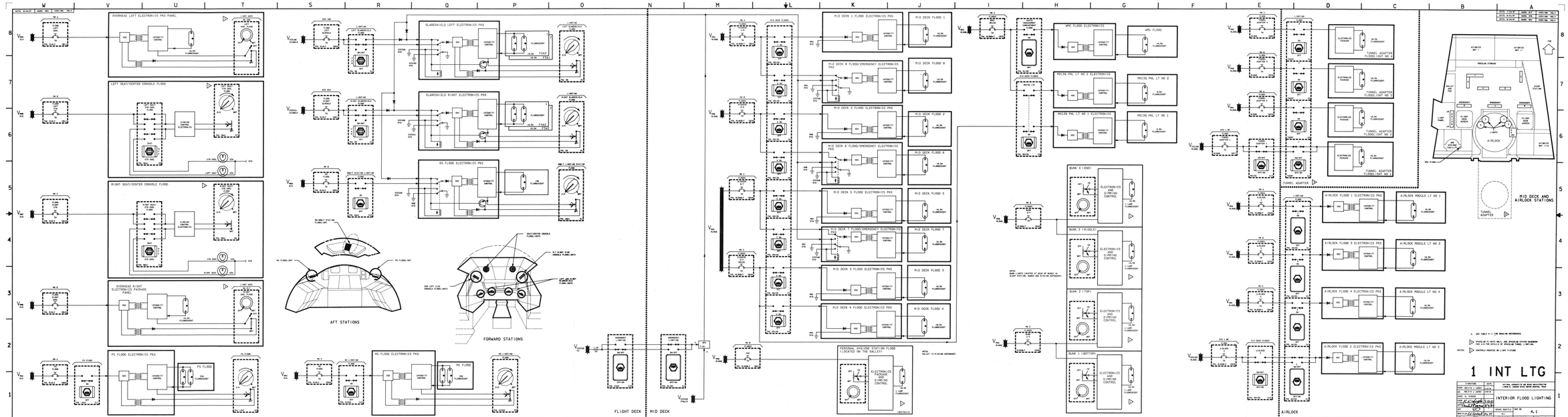
Lyndon B. Johnson Space Center
Houston, Texas

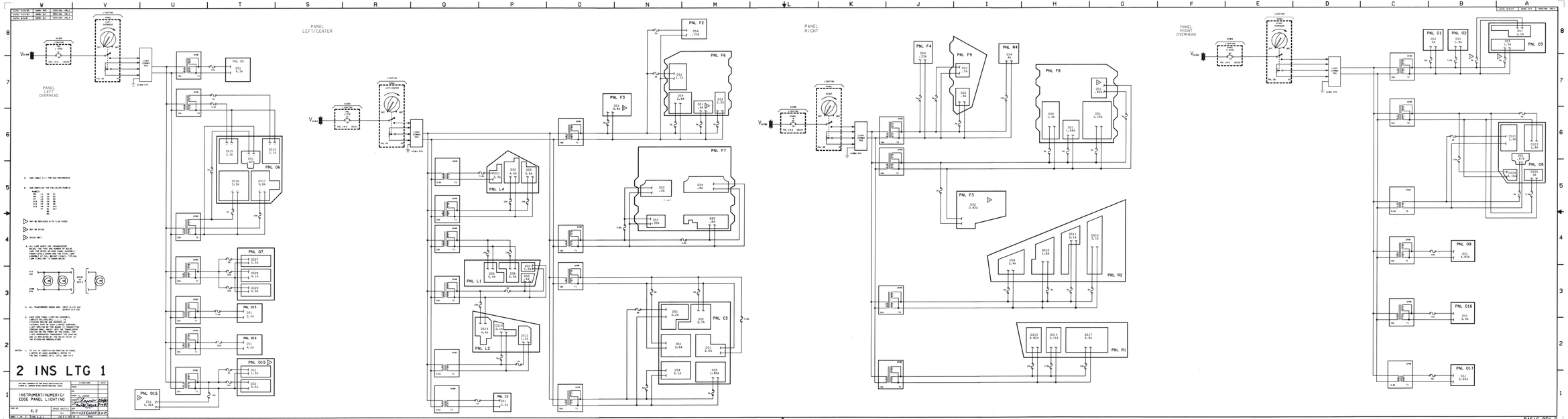
2. ELECTRICAL POWER DISTRIBUTION

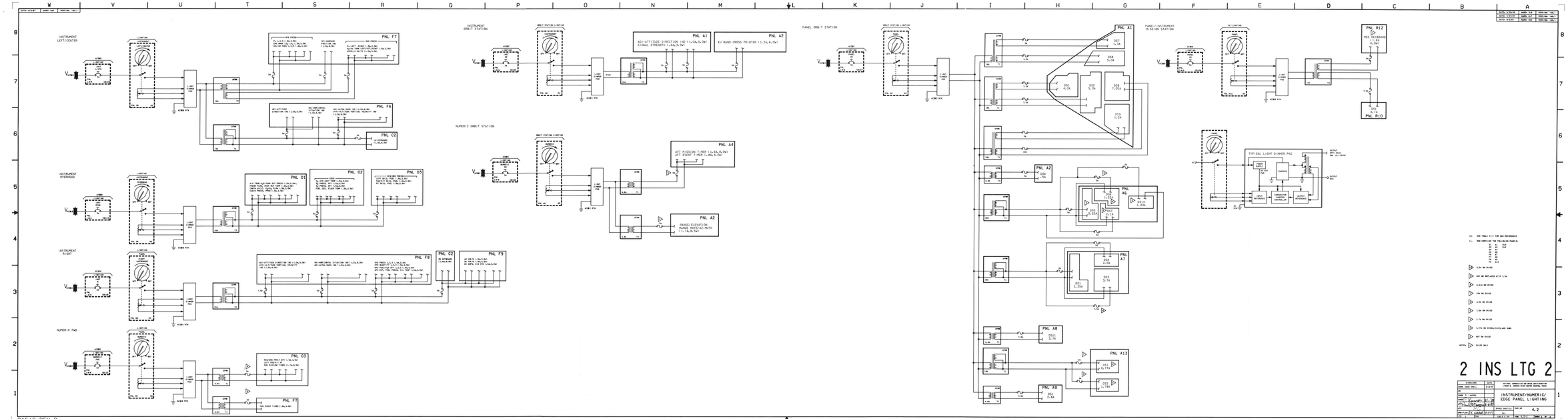

FWD PWR AND LOAD CONTROL ASSY 3
FWD PWR AND LOAD CONTROL ASSY 2
FWD PWR AND LOAD CONTROL ASSY 1
A INVERTER CONTROL AC 1 (2,3)
B INVERTER CONTROL AC 1 (2,3)
C INVERTER CONTROL AC 1 (2,3)
AC3 3Ø INVERTER
AC2 3Ø INVERTER
AC1 3Ø INVERTER
PHASE A-INVERTER 1 (4,7)
PHASE B-INVERTER 2 (5,8)
PHASE C-INVERTER 3 (6,9)
INVERTER DISTRIBUTION AND CONTROL ASSY 3 (-1)(CA3)
INVERTER DISTRIBUTION AND CONTROL ASSY 2 (-1)(CA2)
INVERTER DISTRIBUTION AND CONTROL ASSY 1 (-1)(CA1)
AC3 BUS VOLTAGE SENSOR
AC2 BUS VOLTAGE SENSOR
AC1 BUS VOLTAGE SENSOR
PHASE A SENSOR
PHASE C SENSOR
AC UTILITY POWER
PAYLOAD STATION PANEL
MISSION STATION PANEL
3 AC
AC GENERATION AND DISTRIBUTION
BASIC REV D

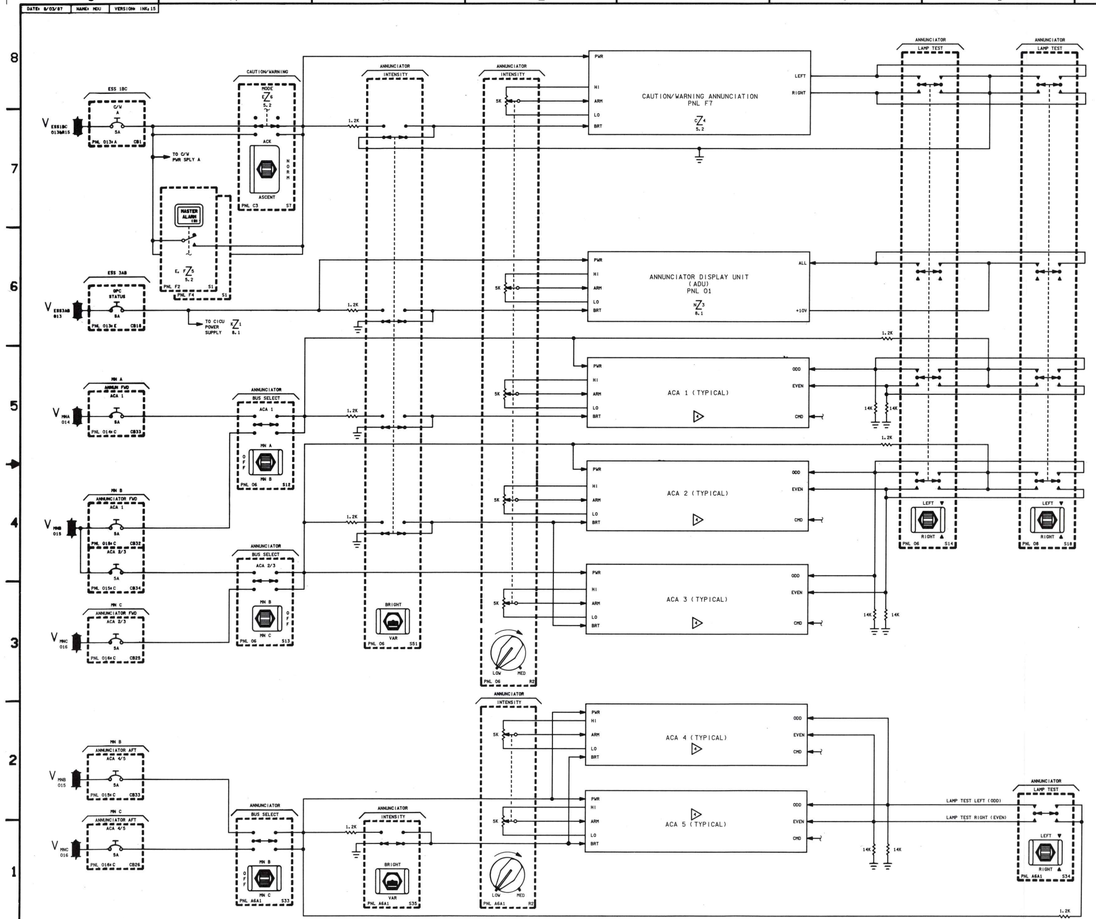

FMC1 (FORWARD MOTOR CONTROL ASSEMBLY 1)
FMC2 (FWD MOTOR CONTROL ASSEMBLY 2)
FMC3 (FWD MOTOR CONTROL ASSEMBLY 3)
AMC1 (AFT MOTOR CONTROL ASSEMBLY 1)
AMC2 (AFT MOTOR CONTROL ASSEMBLY 2)
AMC3 (AFT MOTOR CONTROL ASSEMBLY 3)
*4 FMC & AMC1
MCA DISTRIBUTION
BASIC REV D-2

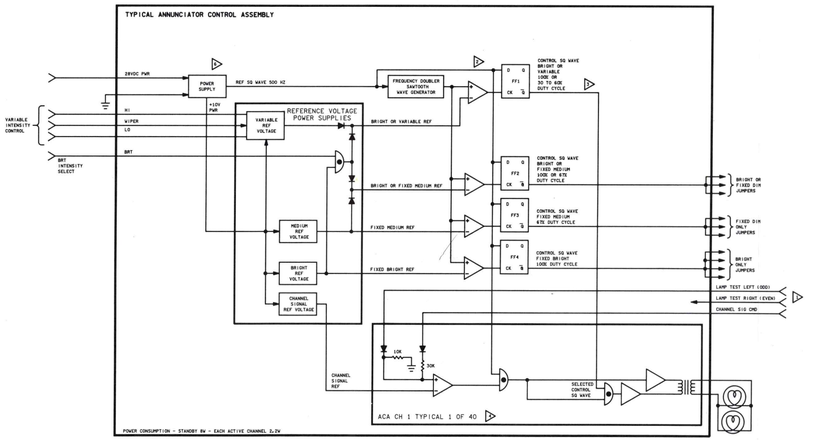
3. ELECTRICAL POWER GENERATION


OVERHEAD LEFT ELECTRONICS PKG PANEL
LEFT SEAT/CENTER CONSOLE FLOOD
RIGHT SEAT/CENTER CONSOLE FLOOD
OVERHEAD RIGHT ELECTRONICS PACKAGE PANEL
PS FLOOD ELECTRONICS PKG
PS FLOOD
GLARESHIELD LEFT ELECTRONICS PKG
GLARESHIELD RIGHT ELECTRONICS PKG
OS FLOOD ELECTRONICS PKG
AFT STATIONS
FORWARD STATIONS
MID DECK 1 FLOOD ELECTRONICS PKG
MID DECK 8 FLOOD/EMERGENCY ELECTRONICS PKG
MID DECK 2 FLOOD ELECTRONICS PKG
MID DECK 6 FLOOD/EMERGENCY ELECTRONICS PKG
MID DECK 5 FLOOD ELECTRONICS PKG
MID DECK 7 FLOOD/EMERGENCY ELECTRONICS PKG
MID DECK 3 FLOOD ELECTRONICS PKG
MID DECK 4 FLOOD ELECTRONICS PKG
MID DECK FLOOD 1
MID DECK FLOOD 8
MID DECK FLOOD 2
MID DECK FLOOD 6
MID DECK FLOOD 5
MID DECK FLOOD 7
MID DECK FLOOD 3
MID DECK FLOOD 4
PERSONAL HYGIENE STATION FLOOD LOCATED ON THE GALLEY
WPC FLOOD ELECTRONICS
WPC FLOOD
MIDDECK PNL LT NO 2 ELECTRONICS
MIDDECK PNL LT NO 2
MIDDECK PNL LT NO 1 ELECTRONICS
MIDDECK PNL LT NO 1
BUNK 4 (END)
BUNK 3 (MIDDLE)
BUNK 2 (TOP)
BUNK 1 (BOTTOM)
ELECTRONICS AND DIMMING CONTROL
AIRLOCK FLOOD 1 ELECTRONICS PKG
AIRLOCK FLOOD 3 ELECTRONICS PKG
AIRLOCK FLOOD 4 ELECTRONICS PKG
AIRLOCK FLOOD 2 ELECTRONICS PKG
AIRLOCK MODULE LT NO 1
AIRLOCK MODULE LT NO 3
AIRLOCK MODULE LT NO 4
AIRLOCK MODULE LT NO 2
ELECTRONICS PACKAGE
TUNNEL ADAPTER FLOOD/LIGHT NO 1
TUNNEL ADAPTER FLOOD/LIGHT NO 2
TUNNEL ADAPTER FLOOD/LIGHT NO 3
TUNNEL ADAPTER FLOOD/LIGHT NO 4
TUNNEL ADAPTER
AIRLOCK
MID DECK AND AIRLOCK STATIONS
1 INT LTG
INTERIOR FLOOD LIGHTING
BASIC REV D


PANEL LEFT OVERHEAD
PANEL LEFT/CENTER
PANEL RIGHT
PANEL RIGHT OVERHEAD
PNL 05
PNL 06
PNL 07
PNL 013
PNL 014
PNL 015
PNL 015
PNL F2
PNL F6
PNL F3
PNL F7
PNL L4
PNL L1
PNL L2
PNL C3
PNL 02
PNL F4
PNL F9
PNL R4
PNL F8
PNL F3
PNL R2
PNL R1
PNL 01
PNL 02
PNL 03
PNL 08
PNL 09
PNL 016
PNL 017
1. SEE TABLE 4-1 FOR DAC REFERENCES
2. DAC CONTROLS THE FOLLOWING PANELS:
PANEL DAC
05 12 03
06 12 04
07 12 05
013 12 06
014 12 07
015 12 08
02 12 09
MAY BE REPLACED WITH 7.5A FUSES
MAY BE USED
BUSED ONLY
3. ALL LAMP LISTS USE INCANDESCENT BULBS. THE TYPE AND NUMBER OF BULBS USED IN EACH PANEL IS SHOWN ON THE PANEL LAMP LISTS SHOWN ON THE TOTAL LAMP ASSEMBLY LIST. IMPORTANT! TYPICAL TYPICAL LAMP LISTINGS IS SHOWN BELOW.
4. ALL TRANSFORMERS SHOWN WHEN INPUT IS 115 VAC OUTPUT 5.5 VAC
5. EACH EDGE PANEL LIGHTING ASSEMBLY, LABELED DS1,DS2,DS3,.....ETC ATTACHED BELOW ARE BUSSED TO SUPPLY POWER TO ALL LAMPS IN THE ASSEMBLY. LIGHT CONTROL BY THE BASIC 5 TRANSISTOR CIRCUIT SHOWN ON THE LEFT. THE CONTROL IS LOCATED ON THE FRONT OF THE PANEL. THE LAMP ASSEMBLY IS MOUNTED ON THE BACK SIDE AND IS REMOVED BY THE QUICK PLUG IN THE STANDARD MANUFACTURE.
NOTES: 1. TO AID IN IDENTIFYING PORTION OF PANEL, THE TWO PANELS ARE LABELED L/C AND R. THE TWO PANELS ARE L/C, 3F/G, AND 3F-J
2 INS LTG 1
INSTRUMENT/NUMERIC/ EDGE PANEL LIGHTING
4.2
BASIC REV D
BASIC REV D


INSTRUMENT LEFT/CENTER
INSTRUMENT OVERHEAD
INSTRUMENT RIGHT
NUMERIC FWD
INSTRUMENT ORBIT STATION
NUMERIC ORBIT STATION
PANEL ORBIT STATION
PANEL/INSTRUMENT MISSION STATION
PNL F7
PNL F6
PNL C2
PNL 01
PNL 02
PNL 03
PNL F8
PNL F9
PNL A1
PNL A2
PNL A4
PNL A6
PNL A7
PNL A8
PNL A9
PNL A13
PNL R12
PNL R10
TYPICAL LIGHT DIMMER PKG
2 INS LTG 2
INSTRUMENT/NUMERIC/ EDGE PANEL LIGHTING
BASIC REV D





1. POWER SUPPLY PROVIDES +20 VDC POWER AND +10 VDC LOGIC TO THE ACA
2. REFERENCE TABLE 4-11 FOR DRAWING REFERENCES
3. REFERENCE TABLE 4-I FOR ACA ANNUNCIATOR CHANNEL ASSIGNMENT
4. LAMP BRIGHTNESS CONTROL CAPABILITY FOR AN ACA CHANNEL IS DETERMINED BY THE SELECTED CONTROL SG WAVE. CONTROL SG WAVE MAY BE SELECTED FOR BRIGHT OR VARIABLE (8 OR 9), CHANNELS 33 THROUGH 40 MAY BE SELECTED BY JUMPER FOR ANY ONE OF THE FOLLOWING
   FIXED BRIGHT AND MEDIUM (8 AND 9)
   FIXED BRIGHT ONLY (8)
   FIXED MEDIUM ONLY (9)
   OR BRIGHT OR VARIABLE (8 OR 9)
   REFERENCE TABLE 4, I FOR CHANNEL BRIGHTNESS CONTROL
5. SIMPLIFIED FUNCTIONAL REPRESENTATION

NOTES:

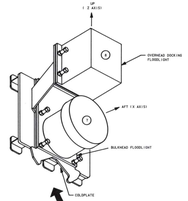
3 ANNUN

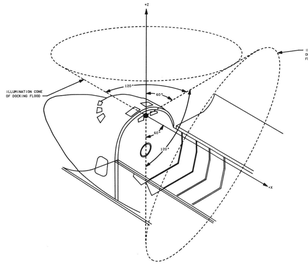
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DSGN S.K.KIMBRELL	4-23-79	
DR		ANNUNCIATOR LIGHTING
CHKR M. FOSTER		
CHKR		
APP		SPACE SHUTTLE DWG NO 4.3
APP		
ORG/PLAN		ALL
LTR 0	PCN	B3, S 3 34 PAGE 4.3-1 SHEET 1 OF 1

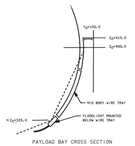
BASIC REV D

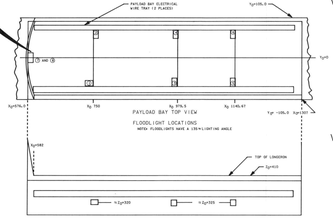
DATA: 10/29/87 NAMO: HOS VERSION: OMS/8

DATA: 8/1/87 NAMO: MTB VERSION: OMS/8
DATA: 10/1/87 NAMO: TKH VERSION: BPS/8
DATA: 10/29/87 NAMO: HOS VERSION: OMS/8

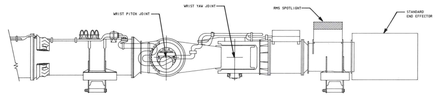




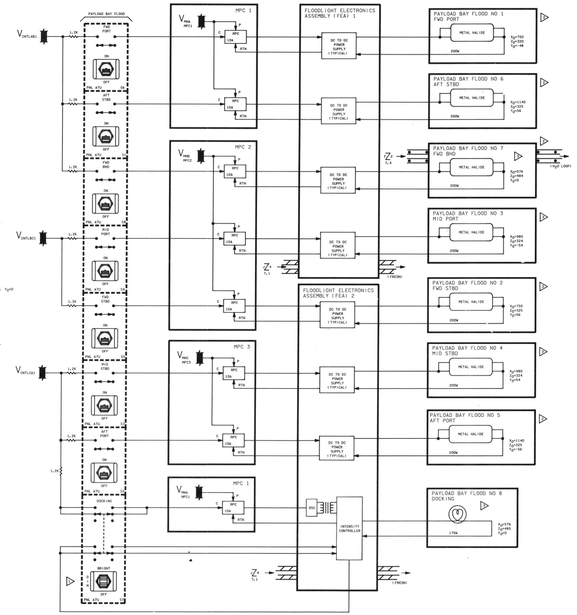


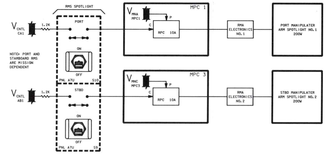


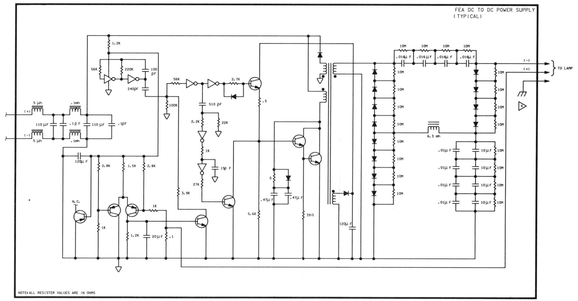
PAYLOAD BAY VIEW LOOKING INBOARD



NOTE: RMS MISSION DEPENDENT







NOTES:
A. SEE TABLE 4-11 FOR DRAWING REFERENCES
B. DENOTES CASE GROUND
C. THE DOCKING AND FWD SHG FLOODLIGHT ARE MOUNTED ON THE SAME COLDPLATE
D. REQUIRES 2 TO 3 MINUTES TO REACH FULL BRIGHT
E. 5VA POSITION IS 60 PERCENT OF FULL BRIGHT

4 EX LTG

SUBSTANCE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DRAWN L. A. BUCKMAN		1/29/82	
CHK L. A. BUCKMAN		1/29/82	
APPD JC PEDRAZA			EXTERIOR LIGHTING
DSGN Rod Rawlins		10/5/87	
APP Richard Richards		10/5/87	
APP			SPACE SHUTTLE DWG NO 4.4
DRAWING STANDARD 11-69-87			REV
SCALE 0	DOC 1		SCALE N.S.H. SHEET 1 OF 1

BASIC REV D-1

TABLE 4-1. - ANNUNCIATOR CONTROL ASSEMBLY CHANNEL ASSIGNMENTS

ALL VEHICLES
REV D

ACA NO. 1

LAMP TEST LEFT - ODD

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Per	Brightness Control
L1A1	SMOKE DETECTION A — CABIN	(XDS1)	R	1	2		B&V
	L FLT DECK	(XDS1)	R	3	2		B&V
	AV BAY 1	(XDS1)	R	5	2		B&V
	AV BAY 2	(XDS1)	R	7	2		B&V
	AV BAY 3	(XDS1)	R	9	2		B&V
F2	PITCH — AUTO	(S2)	W	13	2		B&V
	CSS	(S3)	W	15	2		B&V
	GAIN ENA ⚠	(S4)	W	17	2		B&V
	ROLL/YAW — AUTO	(S5)	W	19	2		B&V
	CSS	(S6)	W	21	2		B&V
	GAIN ENA ⚠	(S7)	W	23	2		B&V
	SPD BK/THROT — AUTO	(S8)	W	25	2		B&V
	MAN	(S8)	W	27	2		B&V
	BODY FLAP — AUTO	(S9)	W	29	2		B&V
	MAN	(S9)	W	11	2		B&V
	BFC	(XDS3)	Y	37	2		B&V
	MASTER ALARM	(S1)	R	33	2	ACA2	B&M
F6A8	ABORT	(S2)	R	31	2	ACA2	B&M
	RANGE SAFE ARM	(XDS3)	R	35	1	ACA2,3	BO
	RANGE SAFE ARM	(XDS3)	R	39	1	ACA2,3	BO

LAMP TEST RIGHT - EVEN

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Per	Brightness Control
C3A6	ORBITAL DAP — CONTROL — MAN	(S4)	W	2	2		B&V
	— RCS JETS — NORM	(S5)	W	4	2		B&V
	— VERN	(S6)	W	6	2		B&V
	MANUAL MODE ROTATION — ROLL DISC RATE	(S7)	W	10	2		B&V
	PITCH DISC RATE	(S8)	W	12	2		B&V
	YAW DISC RATE	(S9)	W	14	2		B&V
	ROLL ACCEL	(S10)	W	18	2		B&V
	PITCH ACCEL	(S11)	W	20	2		B&V
	YAW ACCEL	(S12)	W	22	2		B&V
	ROLL PULSE	(S13)	W	26	2		B&V
	PITCH PULSE	(S14)	W	28	2		B&V
	YAW PULSE	(S15)	W	30	2		B&V
F4	MASTER ALARM	(S1)	R	32	2	ACA3	B&M
F7A7	MAIN ENGINE STATUS LEFT	(XDS2)	R	8	2		B&V
	LEFT	(XDS2)	Y	16	2		B&V
M052J	MASTER ALARM	(S3)	R	36	2	ACA3	MO
—	SPARE		—	24	—		B&V
—	SPARE		—	34	—		B&V
—	SPARE		—	38	—		B&V
—	SPARE		—	40	—		B&V

ACA NO. 2

LAMP TEST LEFT - ODD

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Per	Brightness Control
L1A1	SMOKE DETECTION B — PAYLOAD	(XDS1)	R	1	2		B&V
	R FLT DECK	(XDS1)	R	3	2		B&V
	AV BAY 1	(XDS1)	R	5	2		B&V
	AV BAY 2	(XDS1)	R	7	2		B&V
	AV BAY 3	(XDS1)	R	9	2		B&V
—	SPARE		—	11	—		B&V
—	SPARE		—	13	—		B&V
—	SPARE		—	15	—		B&V
F2	MASTER ALARM	(S1)	R	33	2	ACA1	B&M
F6A8	ABORT	(S2)	R	31	2	ACA1	B&M
	RANGE SAFE ARM	(XDS3)	R	39	1	ACA1,3	BO
	RCS COMMAND — ROLL L	(XDS1)	W	17	1	ACA3	B&V
	ROLL R	(XDS1)	W	19	1	ACA3	B&V
	PITCH U	(XDS1)	W	21	1	ACA3	B&V
	PITCH D	(XDS1)	W	23	1	ACA3	B&V
	YAW L	(XDS1)	W	25	1	ACA3	B&V
	YAW R	(XDS1)	W	27	1	ACA3	B&V
F7A5	SM ALERT	(XDS1)	B	29	2	ACA3	B&V
M029J	MIC	—	W	35	2		MO
	KEY	—	W	37	2		MO

LAMP TEST RIGHT - EVEN

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Per	Brightness Control
—	SPARE		—	2	—		B&V
—	SPARE		—	4	—		B&V
—	SPARE		—	6	—		B&V
—	SPARE		—	8	—		B&V
—	SPARE		—	10	—		B&V
	ANTISKID FAIL	(XDS2)	Y	12	2		B&V
	PITCH — AUTO	(S2)	W	14	2		B&V
	CSS	(S3)	W	16	2		B&V
	GAIN ENA ⚠	(S4)	W	18	2		B&V
	ROLL/YAW — AUTO	(S5)	W	20	2		B&V
	CSS	(S6)	W	22	2		B&V
	GAIN ENA ⚠	(S7)	W	24	2		B&V
	SPD BK/THROT — AUTO	(S8)	W	26	2		B&V
	MAN	(S8)	W	28	2		B&V
	BODY FLAP — AUTO	(S9)	W	30	2		B&V
	MAN	(S9)	W	34	2		B&V
F7A7	MAIN ENGINE STATUS — RIGHT	(XDS3)	R	32	2		B&V
	RIGHT	(XDS3)	Y	38	2		B&V
F8A5	LANDING GEAR — ARM	(S1)	Y	36	2		B&V
	DOWN	(S2)	G	40	2		B&V

⚠ OV-102 ONLY

ACA NO. 3

LAMP TEST LEFT - ODD

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Per	Brightness Control
—	SPARE		—	1	—		B&V
—	SPARE		—	3	—		B&V
—	SPARE		—	5	—		B&V
—	SPARE		—	7	—		B&V
—	SPARE		—	9	—		B&V
	NWS FAIL	(XDS2)	Y	35	2		B&V
L1A1	FIRE SUPPRESSION AV BAY 1 AGENT DISCH	(S4)	Y	11	2		B&V
	2 AGENT DISCH	(S5)	Y	13	2		B&V
	3 AGENT DISCH	(S6)	Y	15	2		B&V
—	SPARE		—	37	—		B&V
F6A5	LANDING GEAR — ARM	(S1)	Y	31	2		B&V
	DOWN	(S2)	G	33	2		B&V
F6A8	RCS COMMAND — ROLL L	(XDS1)	W	17	1	ACA2	B&V
	ROLL R	(XDS1)	W	19	1	ACA2	B&V
	PITCH U	(XDS1)	W	21	1	ACA2	B&V
	PITCH D	(XDS1)	W	23	1	ACA2	B&V
	YAW L	(XDS1)	W	25	1	ACA2	B&V
	YAW R	(XDS1)	W	27	1	ACA1,2	BO
	RANGE SAFE ARM	(XDS3)	R	39	1		B&V
F7A5	SM ALERT	(XDS1)	B	29	2	ACA2	B&V

LAMP TEST RIGHT - EVEN

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Per	Brightness Control
F4	BFC	(XDS3)	Y	24	2		B&V
	MASTER ALARM	(S1)	R	32	2	ACA1	B&M
F7A7	MAIN ENGINE STATUS — CTR	(XDS1)	R	8	2		B&V
	CTR	(XDS1)	Y	16	2		B&V
—	SPARE		—	34	—		B&V
—	SPARE		—	38	—		B&V
—	SPARE		—	40	—		B&V
C3A6	ORBITAL DAP SELECT A	(S1)	W	2	2		B&V
	SELECT B	(S2)	W	4	2		B&V
	CONTROL AUTO	(S3)	W	6	2		B&V
	MANUAL MODE TRANSLATION — LVLH	(S16)	W	10	2		B&V
	LOW Z	(S17)	W	12	2		B&V
	Z HIGH	(S18)	W	14	2		B&V
	X NORM	(S19)	W	18	2		B&V
	Y NORM	(S20)	W	20	2		B&V
	Z NORM	(S21)	W	22	2		B&V
	X PULSE	(S22)	W	26	2		B&V
	Y PULSE	(S23)	W	28	2		B&V
	Z PULSE	(S24)	W	30	2		B&V
M052J	MASTER ALARM	(S3)	R	36	2	ACA1	MO

ACA NO. 4

LAMP TEST LEFT - ODD

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Per	Brightness Control
A6A1	ORBITAL DAP — SELECT — A	(S8)	W	1	2		B&V
	— SELECT — B	(S9)	W	3	2		B&V
	— CONTROL — AUTO	(S10)	W	5	2		B&V
	MANUAL MODE TRANSLATION — LVLH	(S14)	W	9	2		B&V
	LOW Z	(S15)	W	11	2		B&V
	Z HIGH	(S16)	W	13	2		B&V
	X NORM	(S20)	W	17	2		B&V
	Y NORM	(S21)	W	19	2		B&V
	Z NORM	(S22)	W	21	2		B&V
	X PULSE	(S26)	W	25	2		B&V
	Y PULSE	(S27)	W	27	2		B&V
	Z PULSE	(S28)	W	29	2		B&V
—	SPARE		—	7	—		B&V
—	SPARE		—	15	—		B&V
—	SPARE		—	23	—		B&V
—	SPARE		—	31	—		B&V
—	SPARE		—	33	—		B&V
—	SPARE		—	35	—		B&V
—	SPARE		—	37	—		B&V
—	SPARE		—	39	—		B&V

LAMP TEST RIGHT - EVEN

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Per	Brightness Control
A7A1	VIDEO INPUT — A	(S27)	W	14	2		B&V
	B	(S28)	W	16	2		B&V
	C	(S29)	W	18	2		B&V
	YTR	(S33)	W	20	2		B&V
	PL 2	(S34)	W	22	2		B&V
	PL 3	(S35)	W	24	2		B&V
	MID DECK	(S55)	W	34	2		B&V
VIDEO OUTPUT — MON 1		(S19)	W	2	2		B&V
	MON 2	(S23)	W	8	2		B&V
	MUX 1L	(S20)	W	4	2		B&V
	MUX 1R	(S21)	W	6	2		B&V
	MUX 2L	(S24)	W	10	2		B&V
	MUX 2R	(S25)	W	12	2		B&V
GAMMA — WHITE STRCH		(S48)	W	26	2		B&V
	NORM	(S49)	W	28	2		B&V
	BLACK STRCH	(S50)	W	30	2		B&V
MASTER ALARM		(S51)	R	32	2	ACA5	B&M
—	SPARE		—	36	—		B&V
—	SPARE		—	38	—		B&V
—	SPARE		—	40	—		B&V

ACA NO. 5

LAMP TEST RIGHT - ODD

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Per	Brightness Control
A2	MIC	—	W	35	2		B&V
	KEY	—	W	37	2		B&M
A6A1	ORBITAL DAP — CONTROL — MAN	(S11)	W	1	2		B&V
	— RCS JETS — NORM	(S12)	W	3	2		B&V
	— VERN	(S13)	W	5	2		
	MANUAL MODE ROTATION ROLL DISC RATE	(S17)	W	9	2		B&V
	PITCH DISC RATE	(S18)	W	11	2		
	YAW DISC RATE	(S19)	W	13	2		B&V
	ROLL ACCEL	(S23)	W	17	2		
	PITCH ACCEL	(S24)	W	19	2		B&V
	YAW ACCEL	(S25)	W	21	2		
	ROLL PULSE	(S29)	W	25	2		B&V
	PITCH PULSE	(S30)	W	27	2		
	YAW PULSE	(S31)	W	29	2		B&V
—	SPARE		—	7	—		B&V
—	SPARE		—	15	—		
—	SPARE		—	23	—		B&V
—	SPARE		—	31	—		
—	SPARE		—	33	—		B&V
—	SPARE		—	39	—		

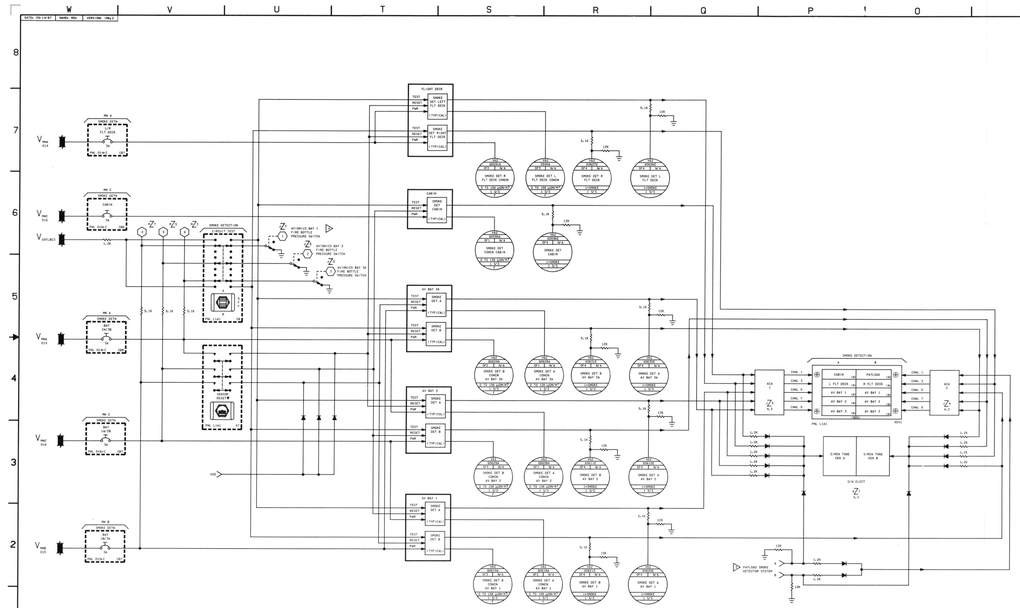
LAMP TEST RIGHT - EVEN

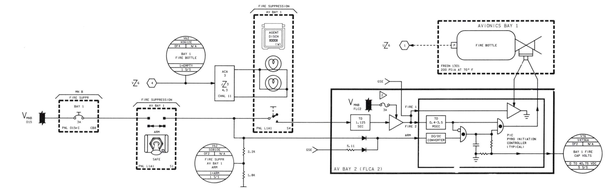
Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Per	Brightness Control
A7A1	VIDEO INPUT — D	(S30)	W	14	2		B&V
	RMS	(S31)	W	16	2		B&V
	FLT DECK	(S32)	W	18	2		B&V
	MUX 1	(S36)	W	20	2		B&V
	MUX 2	(S37)	W	22	2		B&V
	TEST	(S38)	W	24	2		B&V
VIDEO OUTPUT — DOWNLINK		(S22)	W	6	2		B&V
	PAYLOAD	(S26)	W	12	2		B&V
ALC — PEAK		(S45)	W	26	2		B&V
NORM		(S46)	W	28	2		B&V
AVG		(S47)	W	30	2		B&V
MASTER ALARM		(S51)	R	32	2	ACA4	B&M
—	SPARE		—	2	—		B&V
—	SPARE		—	4	—		B&V
—	SPARE		—	8	—		B&V
—	SPARE		—	10	—		B&V
—	SPARE		—	34	—		B&V
—	SPARE		—	36	—		B&V
—	SPARE		—	38	—		B&V
—	SPARE		—	40	—		B&V

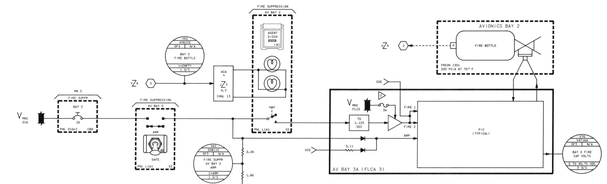
REFER TO TABLE 4-II FOR DRAWING REFERENCES

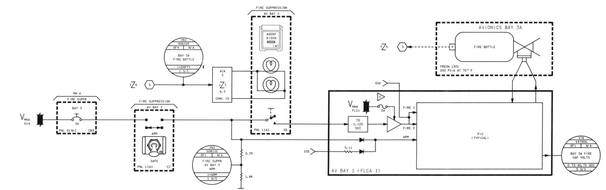
	SIGNATURE	DATE
ENGR	M. FURITT	
ENGR	M Furitt	8/3/87
APP	Sandra Rogers	8/3/87

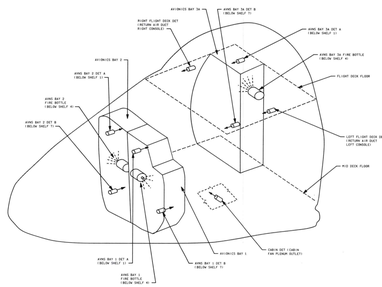
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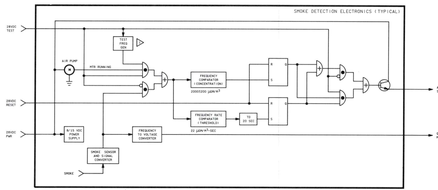












1. SEE TABLE 5-111 FOR DRAWING REFERENCES

△ PRESSURE SWITCH OPENS AT 60 PSID PSID

◇ OPTIONAL INPUT - DEPENDS ON PAYLOAD

△ 4 AA FUSE LINK WITH THE TRIPPING CHARACTERISTICS OF A 3A FUSE

NOTES ▷ TEST FREQUENCY PROFILE INITIATED BY SELF-TEST INPUT SIMULATING A SMOKE CONDITION AT A RATE GREATER THAN 25 µM/MIN

▷ DETECTED AT A RATE GREATER THAN 25 µM/MIN

1 SMOKE

CONTRACT	DATE
BOEING LOGISTICS BUSINESS	12-14-94
DR	
ENGR APPROVAL	12-14-94
MANUFACTURING APPROVAL	12-14-94
QA	
APP	
PRO/PLAN	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
BOEING NORTH AMERICAN, INC. CONTRACTOR

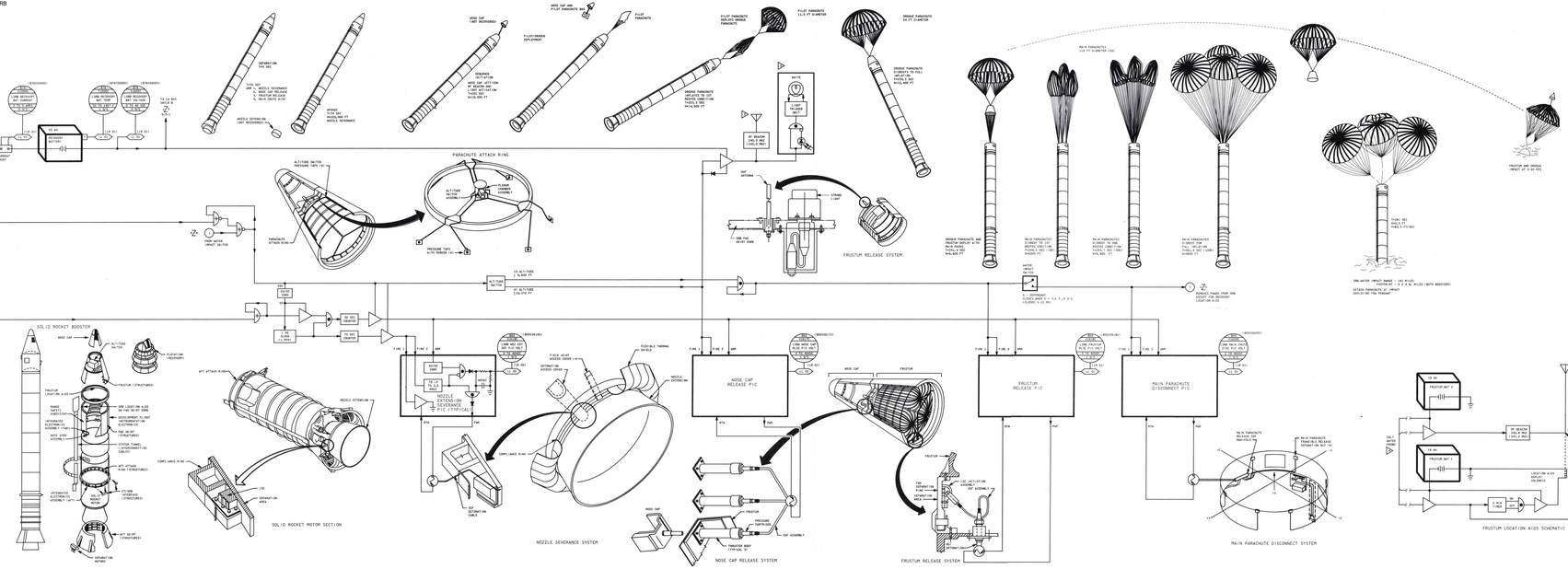
SMOKE DETECTION AND FIRE SUPPRESSION

SPACE SHUTTLE	END NO
ALL	5.1

CAGE NO	DRAWING NO	SHEET NO	REV
65346	10-61010	1 OF 1	D

BASIC REV-D

ORBITER | ET | LSRB



- SONAR BEACONS (2) ARE SALT WATER ACTIVATED AT SAME G-SURFACES OPERATING FREQUENCY OF 296.8 MHZ OR 311.0 MHZ
- MAIN PARACHUTE RECOVERY ASSEMBLY USED BY MEANS OF SALT WATER SWITCH AND RF BEACON FOR PARACHUTES, DETACH AND FINAL (2) HOZ
- SALT WATER PROBE CONTAINS 4 PINS, WATER CONDUCTION CLOSES THE SALT WATER SWITCH (1SWS179)
- RF BEACON
  RF POWER OUTPUT (WATTS) 5
  FOUR W-1
- FLASHING LIGHT ASSEMBLY
  FLASHING RATE 50 TO 60 FLASHES/MIN.
  FLASH INTENSITY 100 CANDLE POWER (EC)
  LIGHT ACTIVATED AT DUSK, OFF AT DAWN

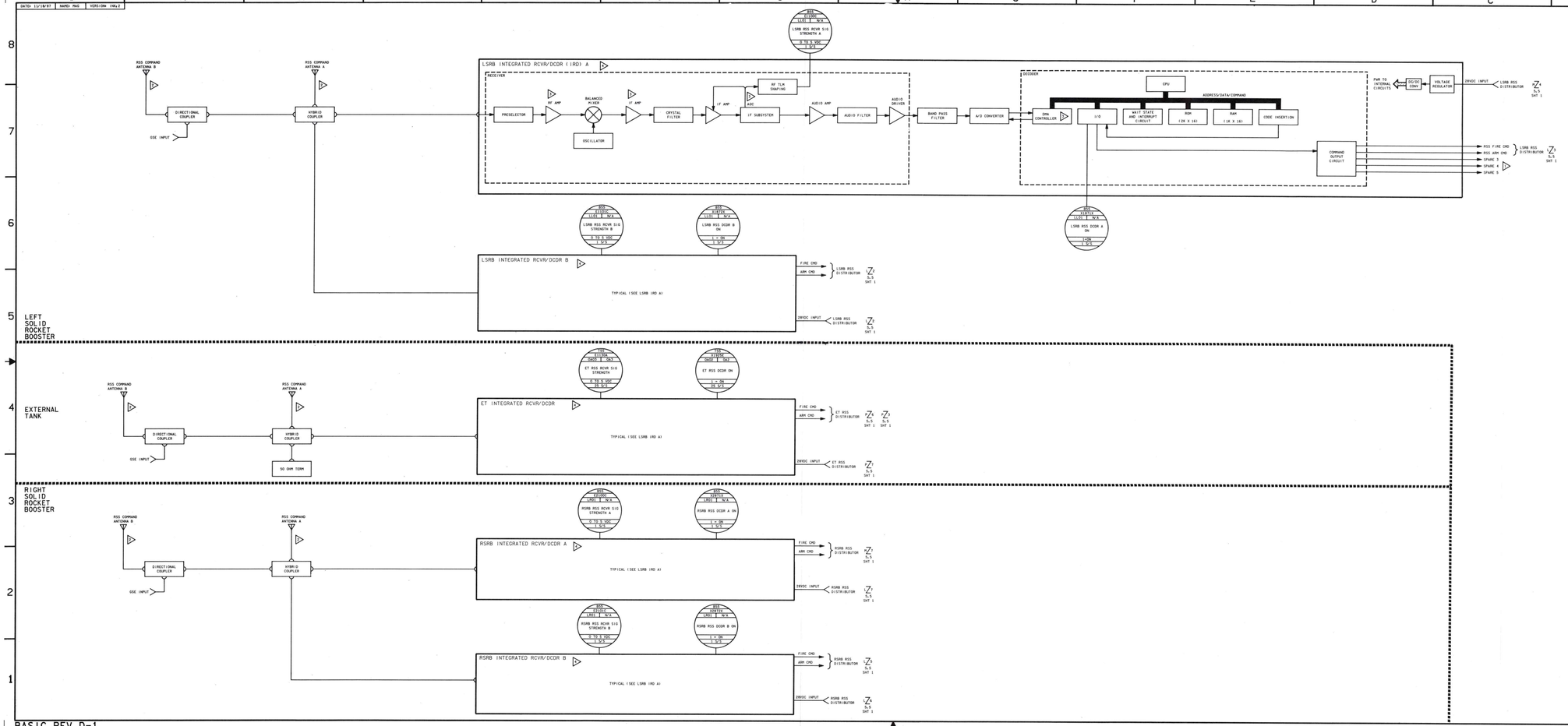
NOTES: 1. (4) ONE GENERAL RELEASE LIGHT-GRAY, TYP 5 (Reg.Use Hex) NOT BEGIN CERT-IT-ED

4 SRB REC

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DRAWN: G. G. BLACKBURN	8-1-74	GEORGE C. MARSHALL SPACE FLIGHT CENTER
CHK:		
ENGR: W.T. BROWN		SOLID ROCKET BOOSTER RECOVERY
PROJ ENGR:		
APP:		SPACE SHUTTLE SYS NO. 5.4
APP:		
MSFC-PROJ-SE&I-1A-01		SIZE A3 CODE I.D. NO.
SCALE: NONE		SHEET 1 OF 1

BASIC REV D

DATE:	NAME:	VERSION:
DATE: 9/11/87	NAME: MAG	VERSION: INRy.1
DATE: 11/12/87	NAME: MAG	VERSION: INRy.2
DATE: 11/19/87	NAME: MAG	VERSION: INRy.2



5. SEE TABLE 5-III FOR DRAWING REFERENCES

△ UPLINK COMMAND SIGNALS ARE RECEIVED, DETECTED, AND CONVERTED TO A STRING OF DIGITAL SAMPLES. THESE SAMPLES ARE STORED VIA DMA IN A REVOLVING RAM BUFFER. AFTER RECEPTION, A CORRECTLY FORMATTED UPLINK COMMAND IS COMPARED TO STORED CODES TO DETERMINE WHICH CODE WAS TRANSMITTED. IF AN EXACT MATCH IS FOUND, THE APPROPRIATE COMMAND IS OUTPUT. THE CPU EXECUTES PROGRAM INSTRUCTIONS STORED IN A ROM

△ RF - RADIO FREQUENCY
AGC - AUTOMATIC GAIN CONTROL
IF - INTERMEDIATE FREQUENCY
DMA - DIRECT MEMORY ACCESS

△ LIGHTNING PROTECTION HAS BEEN PROVIDED BY USING 1/4 WAVE SHORTING STUBS IN THE ANTENNA LEAD-IN CABLE

NOTES: △ THERE ARE FIVE DECODER OUTPUTS ONLY TWO OF WHICH ARE USED, 3 SPARED

5 RSS 2

SIGNATURE	DATE	
DSGN B.A. TEDDER JR.	9/24/87	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
CH		
ENGR J. MONAHAN		SRB/ET RANGE SAFETY SYSTEM
ENGR John Merrell	11/19/87	
APP A.D. Draper	11/19/87	
APP		SPACE SHUTTLE ENG NO 5.5
DRM/PLAN Jeff Rutherford	11-29-87	ALL
LTR 0	PCN 1	82.5 X 34 PAGE 5.5-2 SHEET 2 OF 2

BASIC REV D-1

TABLE 5-I.- PRIMARY C/W PARAMETER PROM LIMITS

C/W Annunciator Loc	Title	Primary C/W No.	MML no.	Title	PROM limits (V dc/eng units)[a] Lower	Upper	Minimum change increment[b]	Backup C/W alarm MML no.
1A	O2 PRESS	0	V45P1110A	O2 TK 1 P	0.25/540	4.70/985	5 psia	Same
		10	V45P1210A	O2 TK 2 P	0.25/540	4.70/985	5 psia	Same
		20[c]	V45P1310A	O2 TK 3 P	0.25/540	4.70/985	5 psia	Same
		30[c]	V45P1410A	O2 TK 4 & 5 P	0.25/540	4.70/985	5 psia	Same
		40		PBK O2 PRESS	HL	2.50/	5/28 V BL	Same
1B	H2 PRESS	50	V45P2110A	H2 TK 1 P	0.25/153	4.65/294	1.6 psia	Same
		60	V45P2210A	H2 TK 2 P	0.25/153	4.65/294	1.6 psia	Same
		70[c]	V45P2310A	H2 TK 3 P	0.25/153	4.65/294	1.6 psia	Same
		80[c]	V45P2410A	H2 TK 4 & 5 P	0.25/153	4.65/294	1.6 psia	Same
		90		PBK H2 PRESS	H/L	2.50/	5/28 V BL	Same
1C	FUEL CELL REAC	2	V45X1150E	FC1 O2 VLV CLOSED	4.80/0	LL	28 V BL	Same
		12	V45X2150E	FC1 H2 VLV CLOSED	4.80/0	LL	28 V BL	Same
		22	V45X1155E	FC2 O2 VLV CLOSED	4.80/0	LL	28 V BL	Same
		32	V45X2155E	FC2 H2 VLV CLOSED	4.80/0	LL	28 V BL	Same
		42	V45X1160E	FC3 O2 VLV CLOSED	4.80/0	LL	28 V BL	Same
		52	V45X2160E	FC3 H2 VLV CLOSED	4.80/0	LL	28 V BL	Same
1D	FUEL CELL STACK TEMP	62	V45T0120A	FC1 STACK TEMP	3.30/173	4.25/244	3.75° F	Same
		72	V45T0220A	FC2 STACK TEMP	3.30/173	4.25/244	3.75° F	Same
		82	V45T0320A	FC3 STACK TEMP	3.30/173	4.25/244	3.75° F	Same
1E	FUEL CELL PUMP	92	V45X0143E	FC1 PUMP ΔP LOW	4.80/0	LL	28 V BL	Same
		102	V45X0243E	FC2 PUMP ΔP LOW	4.80/0	LL	28 V BL	Same
		112	V45X0343E	FC3 PUMP ΔP LOW	4.80/0	LL	28 V BL	Same
2A	CABIN ATM	4[c]	V61P2405A	CABIN PRESS	3.45/13.8	3.80/15.2	0.2 psia	Same
		14	V61R2105A	SYS 1 O2 FLOW	HL	4.90/4.9	0.05 lb/h	Same
		24	V61R2205A	SYS 2 O2 FLOW	HL	4.90/4.9	0.05 lb/h	Same
		34[c]	V61P2511A	O2 PP A	2.70/2.70	3.60/3.60	0.05 psia	Same
		44[c]	V61P2513A	O2 PP B	2.70/2.70	3.60/3.60	0.05 psia	Same
		54	V61R2553A	SYS 1 GN2 FLOW	HL	4.90/4.9	0.05 lb/h	Same
		64	V61R2554A	SYS 2 GN2 FLOW	HL	4.90/4.9	0.05 lb/h	Same
2B	O2 HEATER TEMP	1	V45T1107A	O2 TK 1 HTR 1 T	HL	4.30/349	9° F	Same
		11	V45T1109A	O2 TK 1 HTR 2 T	HL	4.30/349	9° F	Same
		21	V45T1207A	O2 TK 2 HTR 1 T	HL	4.30/349	9° F	Same
		31	V45T1209A	O2 TK 2 HTR 2 T	HL	4.30/349	9° F	Same
		41	V45T1307A	O2 TK 3 HTR 1 T	HL	4.30/349	9° F	Same
		51	V45T1309A	O2 TK 3 HTR 2 T	HL	4.30/349	9° F	Same
		61	V45T1407A	O2 TK 4 HTR 1 T	HL	4.30/349	9° F	Same
		71	V45T1409A	O2 TK 4 HTR 2 T	HL	4.30/349	9° F	Same
		81		PBK O2 HTR T	HL	2.50/	5/28 V BL	Same

[a] Parameters with HL in lower limit column are high limit only channels (fixed by the PROM) and both limits (lower and upper) are high limit tested. For normal limit changes on high limit only channels, only the upper limit need be changed as the PROM lower limit is 5.00 volts. Parameters with LL in upper limit column are low limit only channels and both upper and lower limits are low limit tested. For limit changes down to 0.10 volt on low limit only channels, only the lower limit need be changed as the PROM upper limit is 0.10 volt. Engineering units correspond to specification calibration curve values. Refer to specific vehicle calibration curve for true value.

[b] The minimum change increment is the engineering unit value associated with a panel R13 limit set value thumbwheel setting change of 0.05 volt for analog parameters. Bilevel parameters are indicated as 5 volts or 28 volts.

[c] Reference table 5-II for parameter flight values and inhibit status.

TABLE 5-I.- Continued

C/W Annunciator Loc	Title	Primary C/W No.	MML no.	Title	PROM limits (V dc/eng units)[a] Lower	Upper	Minimum change increment[b]	Backup C/W alarm MML no.
2C	MAIN BUS UNDERVOLT	3	V76V0101A	MN A BUS U/V	3.30/26.4	LL	0.4 V dc	V76V0100A
		13	V76V0201A	MN B BUS U/V	3.30/26.4	LL	0.4 V dc	V76V0200A
		23	V76V0301A	MN C BUS U/V	3.30/26.4	LL	0.4 V dc	V76V0300A
2D	AC VOLTAGE	33	V76X1505E	AC1 BUS O/V - U/V	HL	5.00/28	28 V BL	V76V1500A V76V1501A V76V1502A
		43	V76X1605E	AC2 BUS O/V - U/V	HL	5.00/28	28 V BL	V76V1600A V76V1601A V76V1602A
		53	V76X1705E	AC3 BUS O/V - U/V	HL	5.00/28	28 V BL	V76V1700A V76V1701A V76V1702A
2E	AC OVERLOAD	63	V76X1506E	AC1 BUS OVERLOAD	HL	5.00/28	28 V BL	Same
		73	V76X1606E	AC2 BUS OVERLOAD	HL	5.00/28	28 V BL	Same
		83	V76X1706E	AC3 BUS OVERLOAD	HL	5.00/28	28 V BL	Same
3A	FREON LOOP	106	V63R1100A	FCL 1 FLOW	1.00/1200	LL	26 lb/h[d]	Same
		107[c]	V63T1207A	FCL 1 EVAP OUT T	0.35/32.25	1.90/64.9	0.08° F	Same
		116	V63R1300A	FCL 2 FLOW	1.00/1200	LL	26 lb/h[d]	Same
		117[c]	V63T1407A	FCL 2 EVAP OUT T	0.35/32.35	1.90/64.9	0.08° F	Same
3B	AV BAY/ CABIN AIR	74[c]	V61P2556A	CABIN FAN ΔP	1.75/2.8	4.40/7.04	0.08 IN H_2O	Same
		84	V61T2645A	AV BAY 1 OUT AIR T	HL	4.25/130	1° F	Same
		94	V61T1650A	AV BAY 2 OUT AIR T	HL	4.25/130	1° F	Same
		104	V61T1661A	AV BAY 3 OUT AIR T	HL	4.25/130	1° F	Same
		114	V61T2635A	CABIN HX OUT AIR T	HL	5.00/145	1° F	Same
3C	IMU	103	V72X4560X	IMU FAIL	HL	2.50/5	5 V BL	Same
3D	FWD RCS	6	V42P1115C	RCS-F OX TK ULL P	2.50/200	3.90/312	4 psia	Same
		16	V42P1116C	RCS-F FU TK ULL P	2.50/200	3.90/312	4 psia	Same
		26	V72X6035X	RCS-F LEAK/ULL P	HL	2.50/5	5 V BL	Same
3E	RCS JET	96	V72X4545X	RCS JET FAIL	HL	2.50/5	5 V BL	Same
4A	H2O LOOP	105	V61P2600A	LOOP 1 H2O PUMP P	0.65/19.5	2.65/79.5	1.5 psia	Same
		115	V61P2700A	LOOP 2 H2O PUMP P	1.50/45	2.70/81.0	1.5 psia	Same
4B	RGA/ACCEL	93	V72X4590X	RGA/ACCEL FAIL	HL	2.50/5	5 V BL	Same
4C	AIR DATA	91	V72X4580X	NAV SENSOR FAIL	HL	2.50/5	5 V BL	Same
4D	LEFT RCS	36	V42P2115C	RCS-L OX TK ULL P	2.50/200	3.90/312	4 psia	Same
		46	V42P2116C	RCS-L FU TK ULL P	2.50/200	3.90/312	4 psia	Same
		56	V72X6036X	RCS-L LEAK/ULL P	HL	2.50/5	5 V BL	Same

[a] Parameters with HL in lower limit column are high limit only channels (fixed by the PROM) and both limits (lower and upper) are high limit tested. For normal limit changes on high limit only channels, only the upper limit need be changed as the PROM lower limit is 5.00 volts. Parameters with LL in upper limit column are low limit only channels and both upper and lower limits are low limit tested. For limit changes down to 0.10 volt on low limit only channels, only the lower limit need be changed as the PROM upper limit is 0.10 volt. Engineering units correspond to specification calibration curve values. Refer to specific vehicle calibration curve for true value.

[b] The minimum change increment is the engineering unit value associated with a panel R13 limit set value thumbwheel setting change of 0.05 volt for analog parameters. Bilevel parameters are indicated as 5 volts or 28 volts.

[c] Reference table 5-II for parameter flight values and inhibit status..

[d] Nonlinear calibration, average change increment.

TABLE 5-I.- Continued

C/W Annunciator Loc	Title	Primary C/W No.	MML no.	Title	PROM limits (V dc/eng units)[a] Lower	Upper	Minimum change increment[b]	Backup C/W alarm MML no.
4E	RIGHT RCS	66	V42P3115C	RCS-R OX TK ULL P	2.50/200	3.90/312	4 psia	Same
		76	V42P3116C	RCS-R FU TK ULL P	2.50/200	3.90/312	4 psia	Same
		86	V72X6037X	RCS-R LEAK/ULL P	HL	2.50/5	5 V BL	Same
5A	--------	113		SPARE	HL	2.50/		Same
5B	LEFT RHC	100	V72X4575X	LEFT RHC FAIL	HL	2.50/5	5 V BL	Same
5C	RIGHT/AFT RHC	110	V72X4570X	RIGHT/AFT RHC FAIL	HL	2.50/5	5 V BL	Same
5D	LEFT OMS	7[c]	V43P4221C	OMS-L OX TK ULL P	2.90/232	3.55/284	4 psia	Same
		17[c]	V43P4321C	OMS-L FU TK ULL P	2.90/232	3.55/284	4 psia	Same
		27	V72X4547X	OMS-L ENG ABNORMAL	HL	2.50/5	5 V BL	Same
5E	RIGHT OMS	37[c]	V43P5221C	OMS-R OX TK ULL P	2.90/232	3.55/284	4 psia	Same
		47[c]	V43P5321C	OMS-R FU TK ULL P	2.90/232	3.55/284	4 psia	Same
		57	V72X4548X	OMS-R ENG ABNORMAL	HL	2.50/5	5 V BL	Same
6A	PAYLOAD WARNING	55	P01X5025E	P/L WARN 1	HL	2.50/		
		65	P01X5026E	P/L WARN 2	HL	2.50/		
		75	P01X5027E	P/L WARN 3	HL	2.50/		
		85	P01X5028E	P/L WARN 4	HL	2.50/		
		95	P01X5029E	P/L WARN 5	HL	2.50/		
6B	GPC	5	V72X7011E	GPC 1 FAIL	HL	2.50/5	5 V BL	Same
		15	V72X7012E	GPC 2 FAIL	HL	2.50/5	5 V BL	Same
		25	V72X7013E	GPC 3 FAIL	HL	2.50/5	5 V BL	Same
		35	V72X7014E	GPC 4 FAIL	HL	2.50/5	5 V BL	Same
		45	V72X7015E	GPC 5 FAIL	HL	2.50/5	5 V BL	Same
6C	FCS SATURATION	101	V72X4555X	FCS SATURATION	HL	2.50/5	5 V BL	Same
6D	OMS KIT	77[c]	V43P6221C	OMS-PBK OX TK ULL P	2.90/232	3.55/284	4 psia	Same
		87[c]	V43P6321C	OMS-PBK FU TK ULL P	2.90/232	3.55/284	4 psia	Same
6E	OMS TVC	67	V72X4546X	OMS TVC FAIL	HL	2.50/5	5 V BL	Same
7A	PAYLOAD CAUTION	97	V72X0001Y	P/L CAUTION	HL	2.50/5	5 V BL	Same
7B	PRIMARY C/W	--	--------	CWE SELF TEST FAIL	--	--	--	None
7C	FCS CHANNEL	111	V72X4550X	FCS CH BYPASS/FAIL	HL	2.50/5	5 V BL	Same

[a] Parameters with HL in lower limit column are high limit only channels (fixed by the PROM) and both limits (lower and upper) are high limit tested. For normal limit changes on high limit only channels, only the upper limit need be changed as the PROM lower limit is 5.00 volts. Parameters with LL in upper limit column are low limit only channels and both upper and lower limits are low limit tested. For limit changes down to 0.10 volt on low limit only channels, only the lower limit need be changed as the PROM upper limit is 0.10 volt. Engineering units correspond to specification calibration curve values. Refer to specific vehicle calibration curve for true value.

[b] The minimum change increment is the engineering unit value associated with a panel R13 limit set value thumbwheel setting change of 0.05 volt for analog parameters. Bilevel parameters are indicated as 5 volts or 28 volts.

[c] Reference table 5-II for parameter flight values and inhibit status.

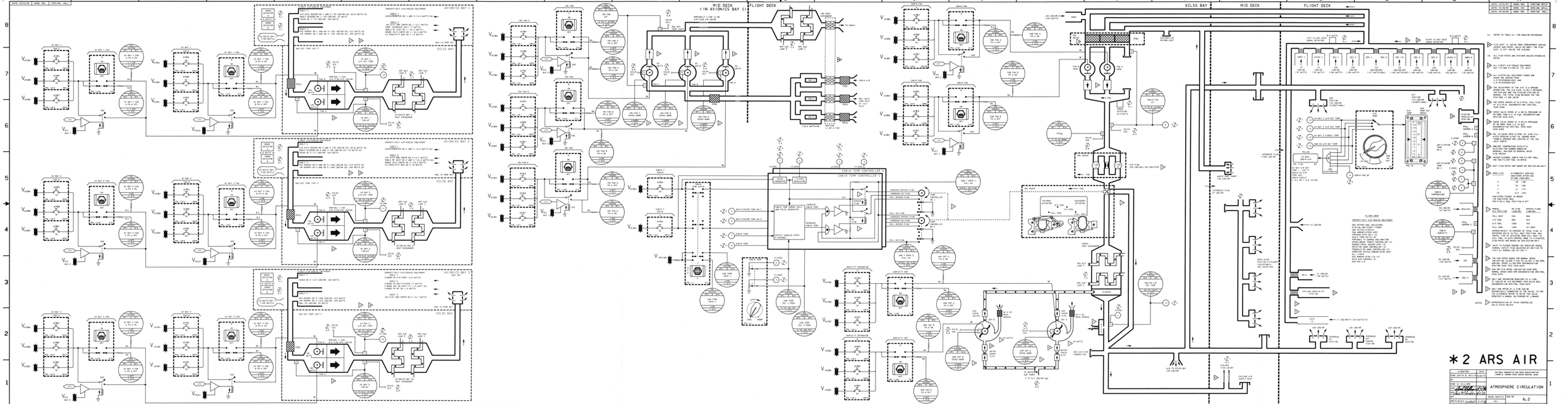
TABLE 5-I.- Concluded

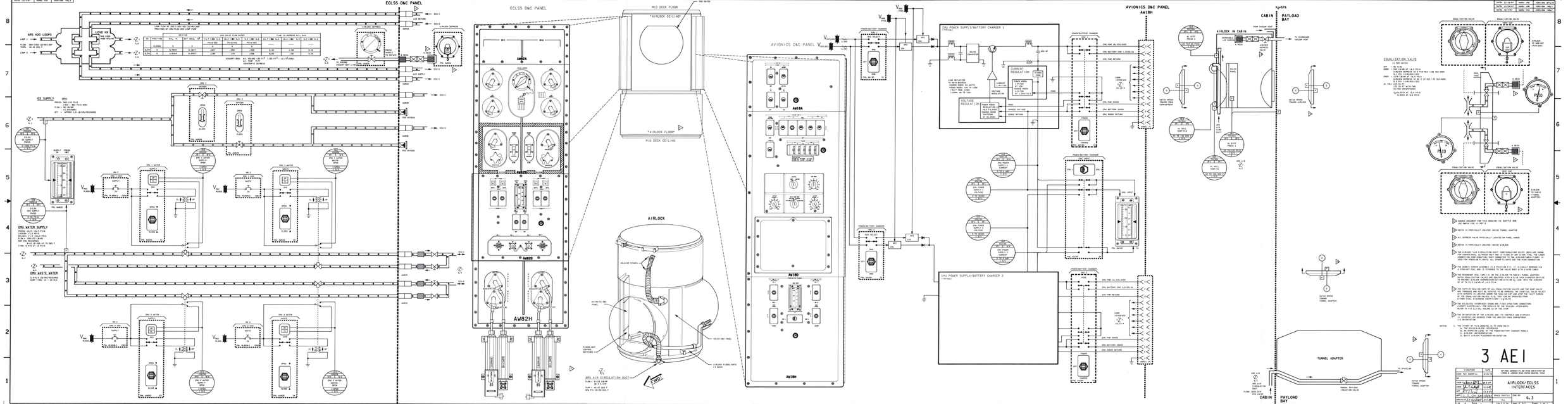
C/W Annunciator Loc	Title	Primary C/W No.	MML no.	Title	PROM limits (V dc/eng units)[a] Lower	Upper	Minimum change increment[b]	Backup C/W alarm MML no.
7D	MPS	9[c]	V41P1150A	MPS-C ENG He TK P	1.15/1150	LL	50 psia	Same
		19[c]	V41P1250A	MPS-L ENG He TK P	1.15/1150	LL	50 psia	Same
		29[c]	V41P1350A	MPS-R ENG He TK P	1.15/1150	LL	50 psia	Same
		39[c]	V41P1154A	MPS-C ENG He REG P	3.40/680	4.05/810	10 psia	SM alert
		49[c]	V41P1254A	MPS-L ENG He REG P	3.40/680	4.05/810	10 psia	SM alert
		59[c]	V41P1354A	MPS-R ENG He REG P	3.40/680	4.05/810	10 psia	SM alert
		69	V41P1533C	MPS LO2 ENG MANF P	HL	4.15/249	3 psia	Same
		79	V41P1433C	MPS LH2 ENG MANF P	HL	3.00/60	1 psia	Same
7E	----------	89		SPARE	HL	2.50/		
8A	BACKUP C/W ALARM	--	V72X4530X	BACKUP C/W A CMD 1	--	--		
		--	V72X4531X	BACKUP C/W A CMD 2	--	--		
		--	V72X4532X	BACKUP C/W A CMD 3	--	--		
		--	V72X4533X	BACKUP C/W A CMD 4	--	--		
		--	V72X4542X	BACKUP C/W B CMD 1	--	--		
			V72X4543X	BACKUP C/W B CMD 2	--	--		
8B	APU TEMP	8[c]	V46T0142A	APU 1 EGT	HL	4.20/1260	15° F	V46T0140A
		18[c]	V46T0242A	APU 2 EGT	HL	4.20/1260	15° F	V46T0240A
		28[c]	V46T0342A	APU 3 EGT	HL	4.20/1260	15° F	V46T0340A
		38	V46T0150A	APU 1 LUBE OIL T	HL	2.90/290	5° F	Same
		48	V46T0250A	APU 2 LUBE OIL T	HL	2.90/290	5° F	Same
		58	V46T0350A	APU 3 LUBE OIL T	HL	2.90/290	5° F	Same
8C	APU OVERSPEED	68	V46X0165E	APU 1 OVERSPEED	HL	5.00/28	28 V BL	V46R0135A
		78	V46X0265E	APU 2 OVERSPEED	HL	5.00/28	28 V BL	V46R0235A
		88	V46X0365E	APU 3 OVERSPEED	HL	5.00/28	28 V BL	V46R0335A
8D	APU UNDERSPEED	98	V46X0166E	APU 1 UNDERSPEED	HL	5.00/28	28 V BL	V46R0135A
		108	V46X0266E	APU 2 UNDERSPEED	HL	5.00/28	28 V BL	V46R0235A
		118	V46X0336E	APU 3 UNDERSPEED	HL	5.00/28	28 V BL	V46R0335A
8E	HYD PRESS	99[c]	V58P0114C	HYD SYS 1 P	3.00/2400	LL	40 psia	V58P0115A
		109[c]	V58P0214C	HYD SYS 2 P	3.00/2400	LL	40 psia	V58P0215A
		119[c]	V58P0314C	HYD SYS 3 P	3.00/2400	LL	40 psia	V58P0315A

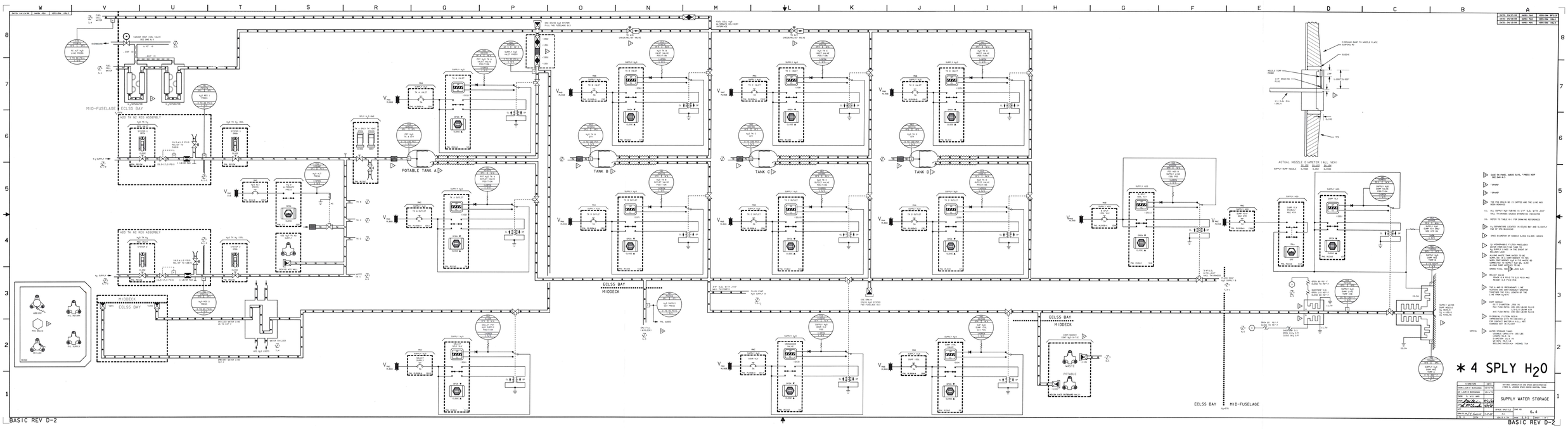
[a] Parameters with HL in lower limit column are high limit only channels (fixed by the PROM) and both limits (lower and upper) are high limit tested. For normal limit changes on high limit only channels, only the upper limit need be changed as the PROM lower limit is 5.00 volts. Parameters with LL in upper limit column are low limit only channels and both upper and lower limits are low limit tested. For limit changes down to 0.10 volt on low limit only channels, only the lower limit need be changed as the PROM upper limit is 0.10 volt. Engineering units correspond to specification calibration curve values. Refer to specific vehicle calibration curve for true value.

[b] The minimum change increment is the engineering unit value associated with a panel R13 limit set value thumbwheel setting change of 0.05 volt for analog parameters. Bilevel parameters are indicated as 5 volts or 28 volts.

[c] Reference table 5-II for parameter flight values and inhibit status.


AVIONICS BAY
ECLSS BAY
MID DECK
FLIGHT DECK
CABIN TEMP CONTROLLER
*2 ARS AIR
ATMOSPHERE CIRCULATION
6.2
BASIC REV D-2


ECLSS D&C PANEL
ARS H2O LOOPS
LOOP 1
LOOP 2
LOOP FLOW OF 200 +/-10% LBS/HR/LOOP
PRESSURIZED BY EPS PLUS ASE LOOP PUMP
LOOP HX
ASE LOOP WATER SPLY
ARS H2O LOOP
ARS H2O LOOP
AIRLOCK EXPRESS
AIRLOCK EXPRESS
PRESS SENSOR
TEMP SENSOR
TO ASE/PRD TRICKLE FLOW
TO ASE/PRD TRICKLE FLOW
PRESS SENSOR
PRESS SENSOR
TEMP SENSOR
TEMP SENSOR


MID-FUSELAGE ECLSS BAY
MIDDECK ECLSS BAY
ECLSS BAY MIDDECK
POTABLE TANK A
TANK B
TANK C
TANK D
ECLSS BAY MID-FUSELAGE
* 4 SPLY H_2O
SUPPLY WATER STORAGE
BASIC REV D-2

DATED 05/04/90 NAMED MDU VERSION IMG.4

DATED 04/19/88 NAMED PAO VERSION IMG.4
DATED 04/18/88 NAMED DJT VERSION IMG.5
DATED 05/04/90 NAMED MDU VERSION IMG.6

CONTROL ELECTRONICS ASSEMBLY (CEA)

VOLUME/OUNCES 6.0 5.5 1.0 7.0 1.5 6.5 2.0 6.0 2.5 5.5 3.0 5.0 3.5 4.5 4.0

WATER QUANTITY SELECTOR SWITCH

PRS — PRESSURE REGULATING SOLENOID

REHYDRATION STATION PACKAGE SWITCH

HOT WATER PUSHBUTTON

COLD WATER PUSHBUTTON

PERSONAL HYGIENE HOSE

-3300 -1341

AUX H2O GO OUTLET

-3317 -1301 -3300

MICROBIAL FILTER

-1301 -3300

PERSONAL HYGIENE VALVE OPERATION
- PUSH AND HOLD FOR 15 SECONDS CONSTANT FLOW WHILE HANDLE IS KEPT DEPRESSED
- PLACING HANDLE IN "UP" LOCKED-OPEN POSITION* ALLOWS FLOW FOR 15 SECONDS WITHOUT CONSTANT PRESSURE ON THE HANDLE

PERSONAL HYGIENE H2O VALVE

W16

MV-2

W12

2 PSID CHECK VALVE

W11

W10

W9

W8

W7

W6

W5

-3302 6.4 AMBIENT INLET

-3302 6.4 CHILLED INLET

ECLSS BAY

OFF MV-1 ON GALLEY

AMBIENT P/L HTR P/G DRAIN P/L SPLY CHILLED MD24K

HOT H2O RECIRCULATION SOLENOID VALVE (-1342)

W15

W14

W13

TP4 -1341

HEATING COIL (HEATERS MOUNTED ON OUTSIDE OF COILED H2O LINE)

HOT WATER TANK

OVEN PLATE

RECIRCULATION THERMOSTAT OPENS 165±5°F CLOSES 140±5°F (MOUNTED ON OUTSIDE SURFACE OF HOT H2O TANK)

MV-4

180 160 200 140 220 120 240 100 260 °F

WATER TEMPERATURE

HOT H2O (TEMP. P31)

RWS HOT H2O DISPENSE SOLENOID VALVE (-1343)

REHYDRATION STATION (RWS) NEEDLE

RESISTANCE TEMPERATURE DETECTOR (-1372)

RWS COLD H2O DISPENSE SOLENOID VALVE (-1344)

COLD H2O RECIRCULATION SOLENOID VALVE (-1351)

COLD H2O (PUMP P2)

W17

W18

W19

W20

W21

W22

W23

W24

W25

W26

W27

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W31

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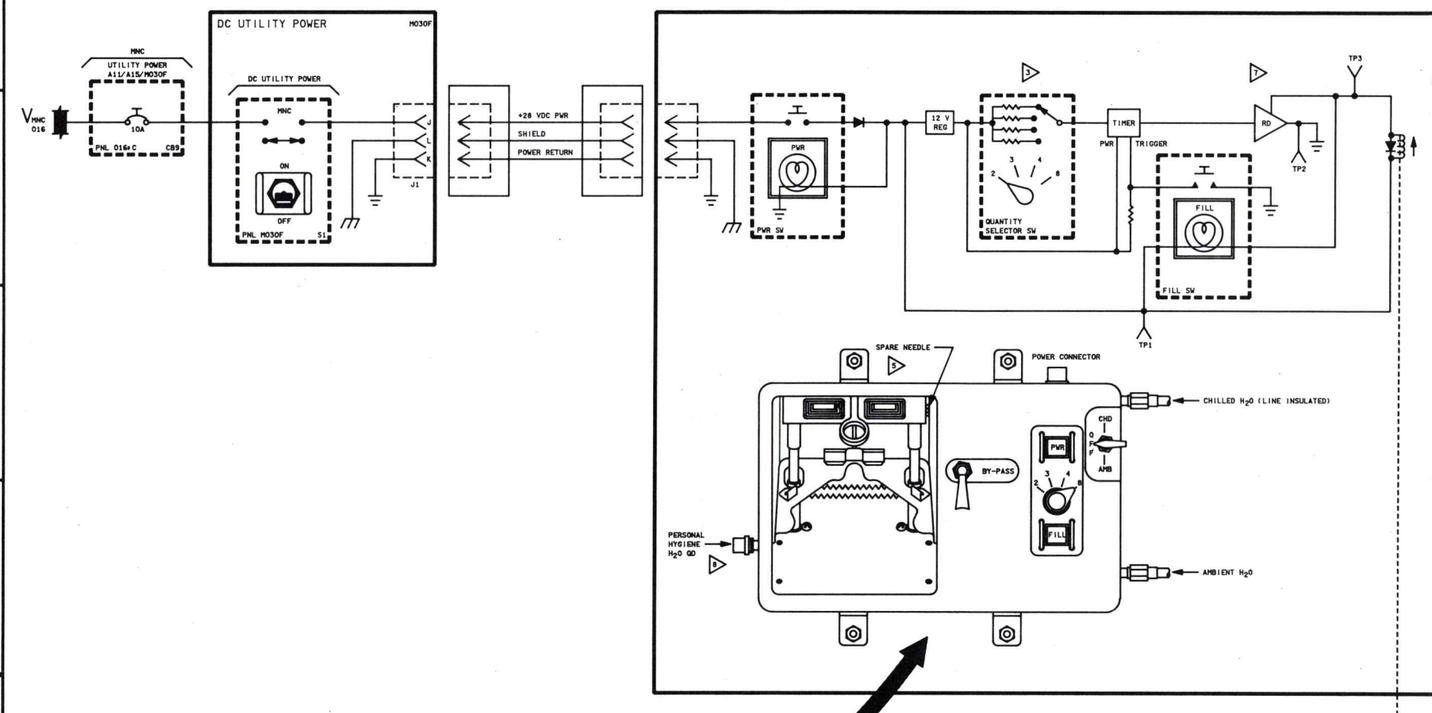
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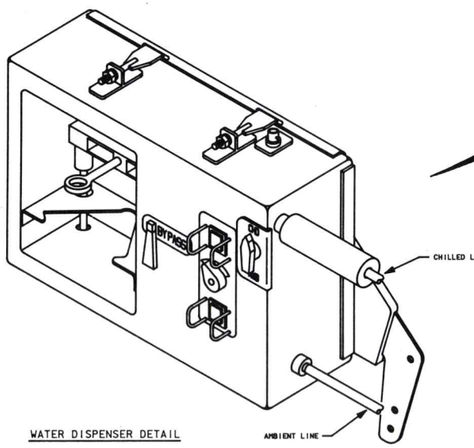
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W55

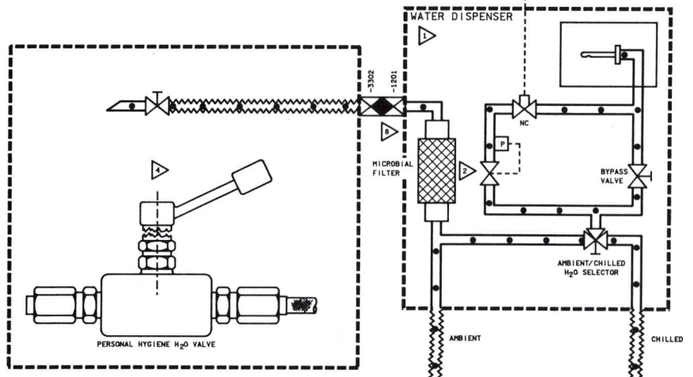
W56

DATE: 2/6/87	NAME: MPM	VERSION: BPT: 4
DATE: 6/26/87	NAME: TMV	VERSION: BPT: 5
DATE: 8/6/87	NAME: BJT	VERSION: INK: 2





WATER DISPENSER DETAIL



9. REFER TO TABLE 6.1 FOR DRAWING REFERENCES

B THE PERSONAL HYGIENE H_2O QD HAS A SCREW-ON CAP WITH A RETAINING WIRE TO PREVENT LOSS OF CAP WHEN REMOVED

D RELAY DRIVER ENABLES GROUND FOR WATER VALVE SOLENOID AND FILL LIGHT

C AMBIENT LINE RESTRAINED BY 5 CLAMPS.
SCREWS SECURING CLAMPS ARE TORQUED TO 20-30 IN-LB.
CHILLED LINE RESTRAINED BY 6 CLAMPS.
SCREWS SECURING CLAMPS ARE TORQUED SAME AS AMBIENT LINE. CHILLED LINE IS INSULATED. BOTH CHILLED AND AMBIENT LINES ARE CONNECTED TO THE WATER DISPENSER BY SCREW-ON TYPE CONNECTORS

D A SPARE REHYDRATION STATION NEEDLE IS STOWED AT THE RIGHT REAR OF THE REHYDRATION COMPARTMENT. THE NEEDLE IS REMOVED AND INSTALLED WITH A 3/8 -INCH OPEN END WRENCH ANOTHER SPARE REHYDRATION STATION NEEDLE IS ALSO STOWED IN THE 1FM MIDDECK LOCKER.

A PERSONAL HYGIENE VALVE OPERATION:
- DEPRESS HANDLE-ALLOWS CONSTANT FLOW OF AMBIENT TEMPERATURE WATER WHILE HANDLE IS DEPRESSED
- PLACING HANDLE IN "UP LOCKED-OPEN POSITION" -ALLOWS CONSTANT FLOW OF WATER WITHOUT DEPRESSING THE HANDLE
- HOSE AND VALVE ARE STOWED IN WINDOW SHADE WT-W8 POUCH.

D TIME REQUIRED TO DISPENSE
2 OZ = 4.8 SEC
3 OZ = 7.2 SEC
4 OZ = 9.6 SEC
8 OZ = 18.6 SEC

D MICROBIAL FILTER: RESIN IMPREGNATED WITH TRIIODIDE (I3) FOR CONTACT BACTERIA KILL. NOT CHANGED OUT IN FLIGHT. DESIGNED TO TREAT MINIMUM OF 8640 LBS H_2O EQUIVALENT TO 30 DAY MISSION.

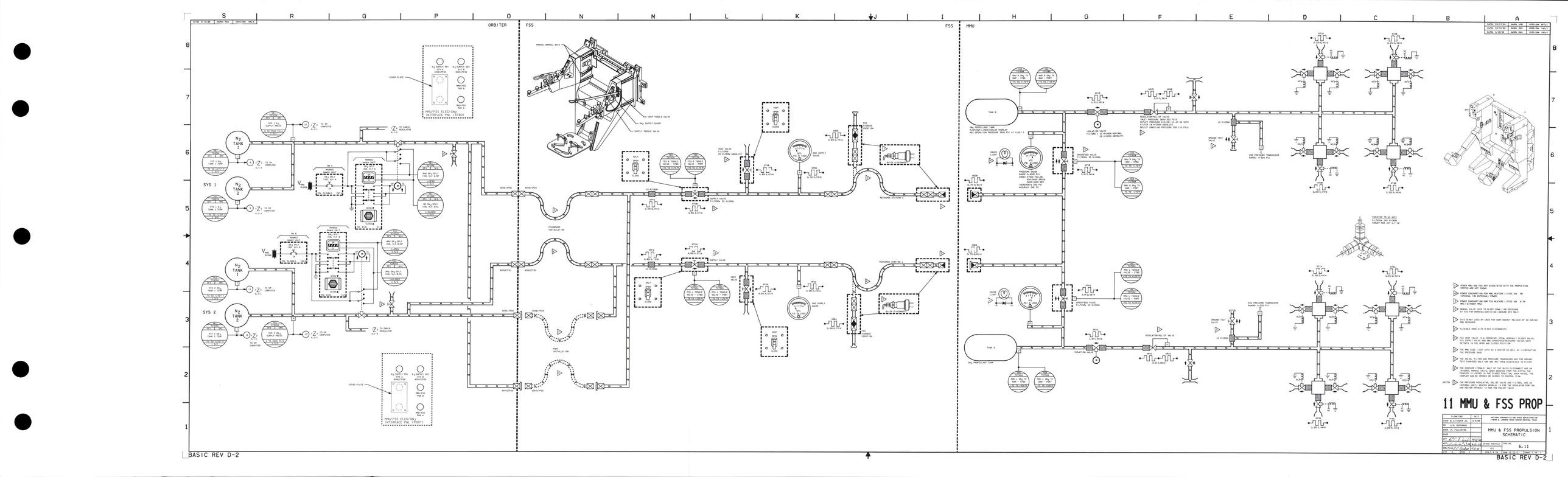
NOTES: D WATER DISPENSER
FLOW RATE: 1.0 TO 1.5 LB/MIN
CURRENT USAGE: 0.5 AMP (MAX)
DISPENSES: 2, 3, 4, OR 8 OZ OF WATER
BYPASS FLOWRATE: 1.48 LB/MIN

7 WTR DISP

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	MICHAEL MURPHY	5/3/84	
DR	MICHAEL MURPHY	5/3/84	WATER DISPENSER
ENGR	J. GREER		
ENGR		8-10-87	
APPD		8-10-87	
QA			SPACE SHUTTLE / DWG NO 6.7
OPNIPLAN		8-10-87	ALL
LTR D	PEN		44 X 34 / PAGE 6.7-1 / SHEET 1 OF 1

BASIC REV D

BASIC REV D



OTHER MMU AND FSS NOT ASSOCIATED WITH THE PROPULSION SYSTEM ARE NOT SHOWN

POWER CONSUMPTION FOR FSS HEATERS LISTED ARE ON INTERNAL FSS EXTERNALLY POWER

POWER CONSUMPTION FOR FSS HEATERS LISTED ARE WITH MMU ATTACHED MMU

MANUAL VALVE USED TO BLEED DOWN LINE PRESSURE AT FSS FOR REMOVAL/DEFLATING (GROUND OPS ONLY)

TACO B-NUT USED BY CREW FOR CONTINGENCY RELEASE OF GO DURING MMU RECHARGE

FLEXIBLE HOSE WITH B-NUT DISCONNECTS

FSS VENT VALVE IS A MONOSTABLE OPEN, NORMALLY CLOSED VALVE. FSS SUPPLY VALVE AND MMU REGULATED/ISOLATION VALVES HAVE DETENTS IN THE OPEN AND CLOSED POSITIONS

THE MMU GAGE LIGHT ACTS AS A HEATER AS WELL AS ILLUMINATING THE PRESSURE GAGE

THE VALVE, FILTER AND PRESSURE TRANSDUCER ARE FOR GROUND TEST PURPOSES ONLY AND ARE NOT OPEN ACCESS/USE IN FLIGHT

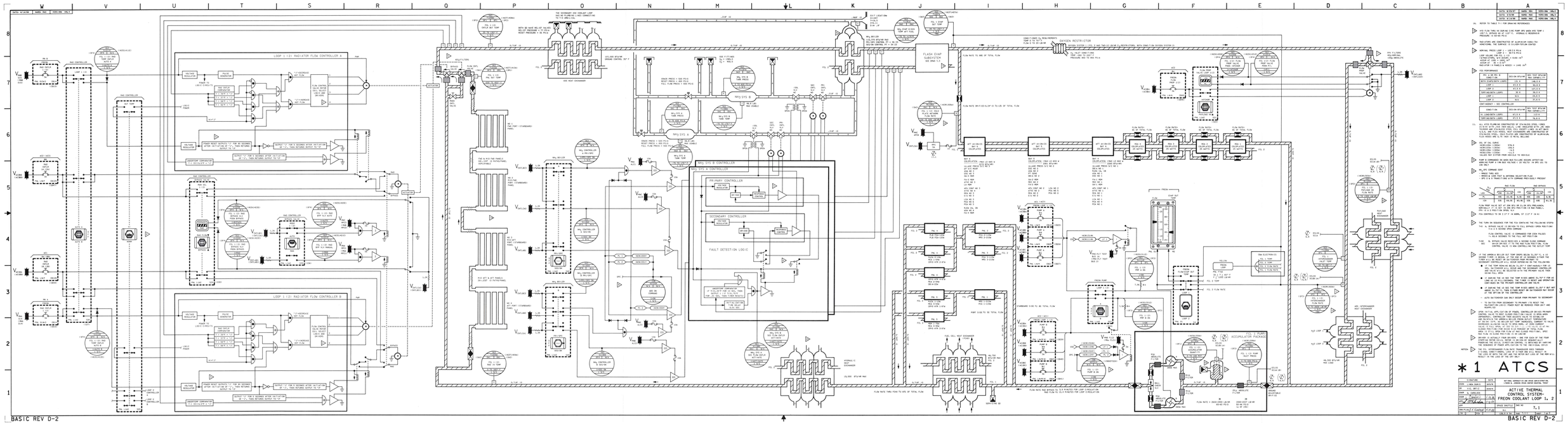
THE COUPLER (TYPICAL) HALF OF THE QUICK DISCONNECT GAS AN INTEGRAL VALVE, HEATER WHICH IS FOR THE REGULATOR PORTION AND HEATER SERVICE IS FOR THE RELIEF VALVE

NOTES

SIGNATURE	DATE
ITEM: B.A.THIBODY JR.	3/4/83
DR: L.N. RICHARDS	
CHKR: A. FULLERTON	
ISSUE	
APP:	
APP:	
APP:	
ENG MGR:	
ITR: 0 SPCN: 0	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS

DATA: 03/23/83	NAME: JPR	VERSION: APPLY
DATA: 03/23/83	NAME: MDJ	VERSION: CHK'D
DATA: 9/22/83	NAME: MDJ	VERSION: CHK'd


LOOP 1 (2) RADIATOR FLOW CONTROLLER A
LOOP 1 (2) RADIATOR FLOW CONTROLLER B
Nmj SYS A
Nmj SYS B
Nmj SYS A CONTROLLER
Nmj SYS B CONTROLLER
PRIMARY CONTROLLER
SECONDARY CONTROLLER
FAULT DETECTION LOGIC
FLASH EVAP SUBSYSTEM
OXYGEN RESTRICTOR
ACCUMULATOR
ACCUMULATOR FILTER
FREON PUMP
FREON PUMP BYP
FREON FILTER
FREON FILTER BYP
FREON FLOW CONTROL VALVE
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FREON FLOW CONTROL VALVE FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER FILTER BYP FILTER
FREON FLOW CONTROL VALVE FILTER

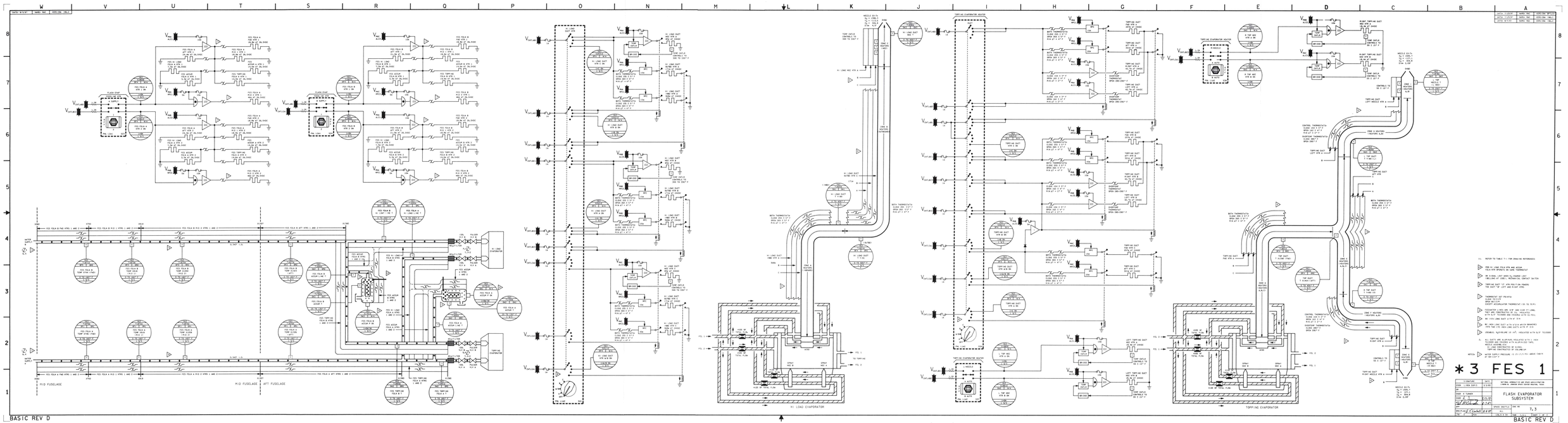
PLUMBING LENGTHS	LOOP 1	LOOP 2
PUMP PACKAGE TO TEE OFF MID C/P BAY 2/3/4	0′, 1"	0′, 1"
TEE OFF MID C/P BAY 2/3/4 TO TEE OFF MID C/P BAY 1/5	4′, 11"	6′, 0"
TEE OFF MID C/P BAY 1/5 TO FC HX	22′, 6"	22′, 2"
FC HX TO TEE IN MID C/P BAY 2/3/4	27′, 2"	18′, 2"
TEE IN MID C/P BAY 2/3/4 TO TEE IN C/P BAY 1/5	0′, 6"	2′, 8"
TEE OFF MID C/P BAY 2/3/4 TO TEE OFF MID C/P BAY 2/3	8′, 5"	9′, 6"
TEE OFF MID C/P BAY 2/3 TO MID C/P 2	4′, 11"	4′, 10"
TEE OFF MID C/P BAY 2/3 TO MID C/P 3	2′, 3"	2′, 8"
MID C/P 2 TO TEE IN MID C/P BAY 2/3	5′, 5"	5′, 5"
MID C/P 3 TO TEE IN MID C/P BAY 2/3	1′, 1"	1′, 0"
TEE IN MID C/P BAY 2/3 TO MID C/P BAY 4	15′, 0"	16′, 2"
MID C/P BAY 4 TO TEE IN MID C/P BAY 2/3/4	14′, 3"	4′, 4"
TEE OFF MID C/P BAY 1/5 TO MID C/P BAY 1	2′, 4"	1′, 11"
MID C/P BAY 1 TO MID C/P BAY 5	17′, 4"	18′, 1"
MID C/P BAY 5 TO TEE IN MID C/P BAY 1/5	4′, 3"	15′, 6"
TEE IN MID C/P BAY 1/5 TO HYDR HX	74′, 11"	91′, 0"
HYDR HX TO TEE OFF RADS	40′, 9"	49′, 6"
TEE OFF RADS TO RAD CNTLR (BYPASS/HOT LEG)	1′, 2"	0′, 7"
TEE OFF RADS TO AFT PNL CONNECTION	11′, 8"	12′, 10"
FRWD PNL CONNECTION TO RAD CNTLR (COLD LEG)	53′, 11"	51′, 3"
RAD CNTLR TO GSE	34′, 10"	50′, 9"
GSE HX TO ABS	19′, 10"	18′, 1"
ABS TO FES	34′, 7"	33′, 9"
FES TO TEE OFF AFT C/P	3′, 4"	5′, 8"
TEE OFF AFT C/P TO FPV	74′, 6"	90′, 3"
FPV TO INTCHGR	14′, 0"	12′, 2"
INTCHGR TO TEE IN INTCHGR/PL	5′, 9"	4′, 2"
FPV TO PL HX	3′, 6"	4′, 0"
PL HX TO TEE IN INTCHGR/PL	8′, 1"	7′, 2"
TEE IN INTCHGR/PL TO TEE IN CP/INTCHGR/PL	1′, 8"	1′, 11"
TEE OFF AFT C/P TO AFT C/P BAY 6	7′, 8"	6′, 2"
AFT C/P BAY 6 TO AFT C/P BAY 5	15′, 5"	15′, 8"
AFT C/P BAY 5 TO AFT C/P BAY 4	8′, 2"	8′, 3"
AFT C/P BAY 4 TO TEE IN CP/INTCHGR/PL	88′, 10"	105′, 5"
TEE IN CP/INTCHGR/PL TO PUMP PACKAGE	0′, 4"	0′, 3"

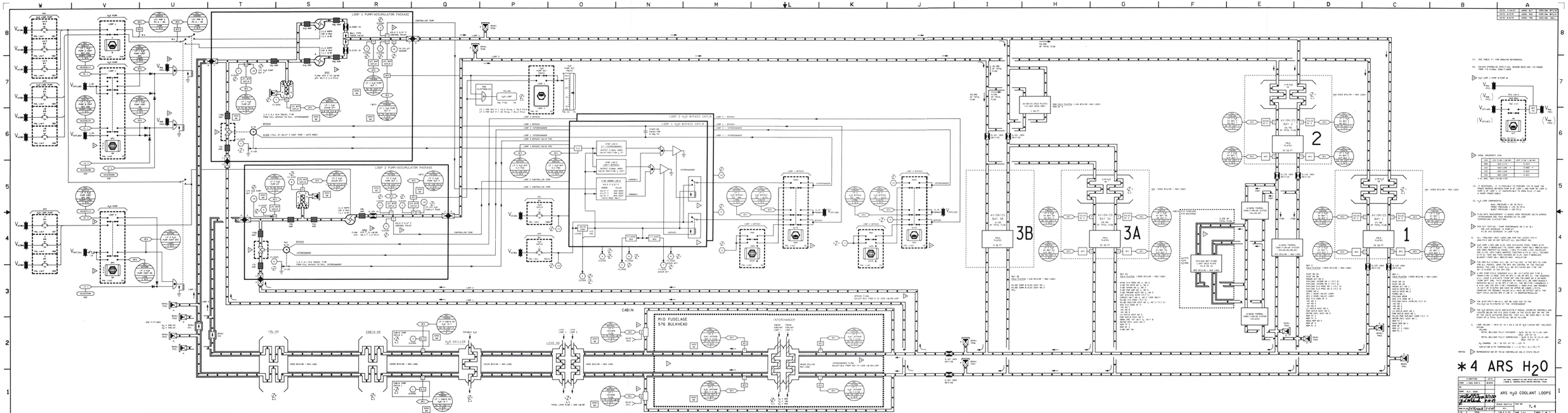
DATE: 7/20/87	NAME: MAG	VERSION: BPT, 2
DATE: 7/29/87	NAME: BJT	VERSION: INK, 1
DATE: 8/03/87	NAME: MDU	VERSION: INK, 2

* 2 ATCS

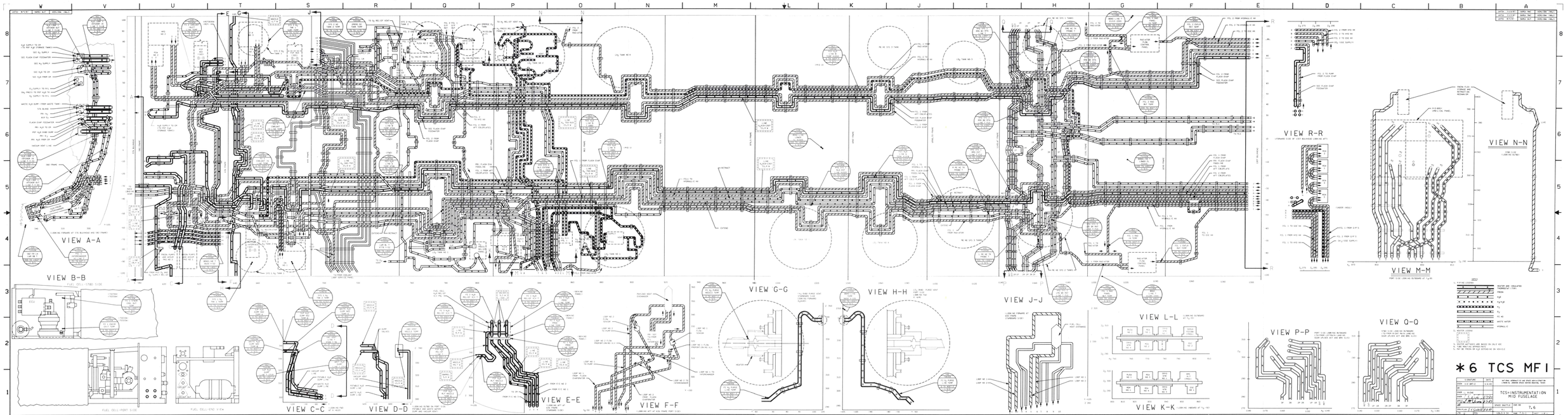
SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN VIC ORTIZ		5/11/87		
DR			ACTIVE THERMAL CONTROL SYSTEM- FREON COOLANT LOOP 1, 2 (PLUMBING LENGTHS)	
ENGR Q. CARELOCK				
ENGR Q. CARELOCK		8/3/87		
APP J. D. Mikulencak		8-3-87		
APP			SPACE SHUTTLE	DWG NO 7.1
OMNIPLAN S. F. Kimbrell		8-6-87	ALL	
LTR D	PCN		22 x 17	PAGE 7.1-2 SHEET 2 OF 2

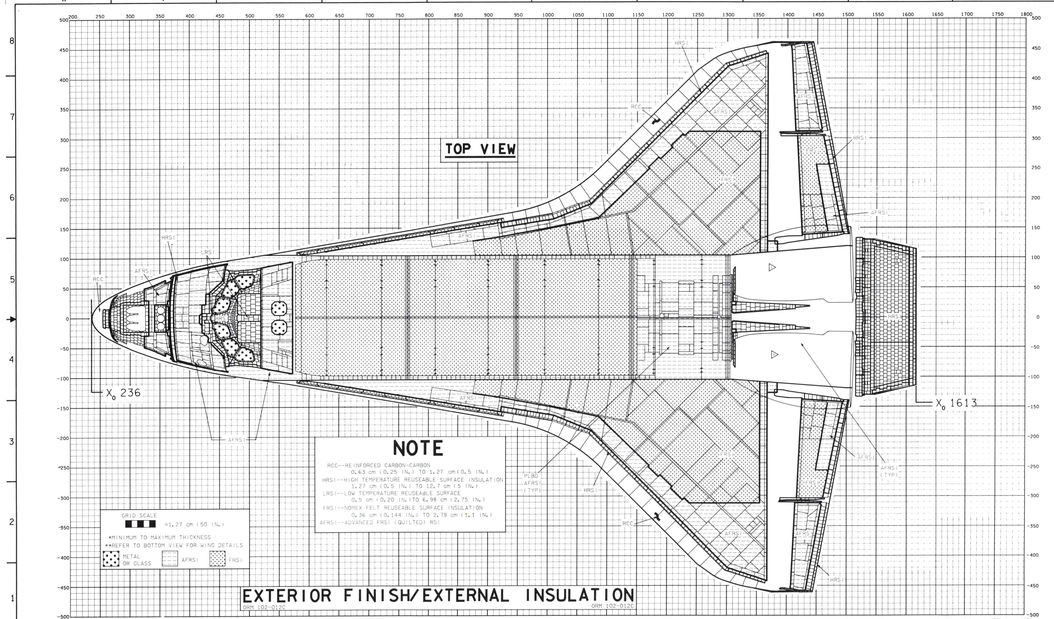
BASIC REV D


M/D FUSELAGE
AFT FUSELAGE
M/D FUSELAGE
M-LOAD EVAPORATOR
TOPPING EVAPORATOR
*3 FES 1
FLASH EVAPORATOR SUBSYSTEM
BASIC REV D
BASIC REV D


LOOP 1 PUMP/ACCUMULATOR PACKAGE
LOOP 2 PUMP/ACCUMULATOR PACKAGE
LOOP 1 H2O BYPASS CNTLR
LOOP 2 H2O BYPASS CNTLR
CABIN
MID FUSELAGE
576 BULKHEAD
INTERCHANGER
3B
3A
2
1
* 4 ARS H2O
ARS H2O COOLANT LOOPS

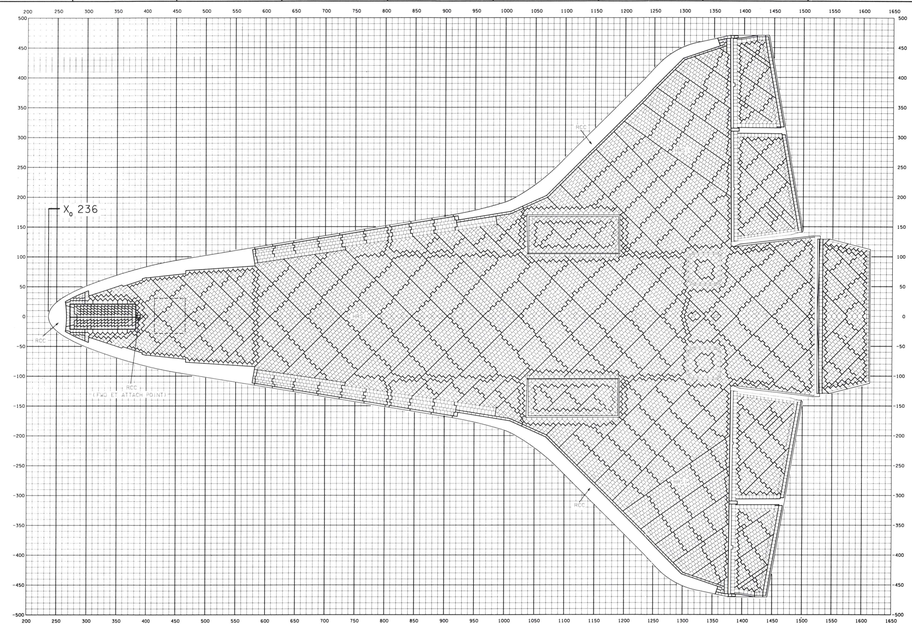
BASIC REV D


VIEW A-A
VIEW B-B
VIEW C-C
VIEW D-D
VIEW E-E
VIEW F-F
VIEW G-G
VIEW H-H
VIEW J-J
VIEW K-K
VIEW L-L
VIEW M-M
VIEW N-N
VIEW P-P
VIEW Q-Q
VIEW R-R
* 6 TCS MFI
TCS-INSTRUMENTATION MID FUSELAGE
BASIC REV D



EXTERIOR FINISH/EXTERNAL INSULATION

OMM 102-012C OMM 102-012C



1. REVISION TO CONFIGURATION, REVISE WILL BE PROVIDED TO FULL SHOPP FOR INSTRUMENTATION FILES

2. REFER TO TABLE 1-1 FOR DRAWING REFERENCES

NOTES: SEE SHT 1-4 SHEET 2 FOR SMG PSC TPS

*4 TOP/BOTTOM

SIGNATURE	DATE
ISSUE TOM COMES	04-14-83
BY THERESA H COMES	
ISSUE JR GRANT	04-14-83
BY JR GRANT	
APPR C.R.BLAIR	4-14
APPR C.R.BLAIR	4-14
APPR FOR CONFIGURATION	4-14

ORIGINATOR	ORIGINATOR AND SPACE ADMINISTRATION JOHNSON SPACE CENTER HOUSTON, TEXAS
TITLE	EXTERNAL VIEWS TOP/BOTTOM
ISSUE DATE	SHEET NO.
04-14-83	7, 8
SCALE	
1/4	

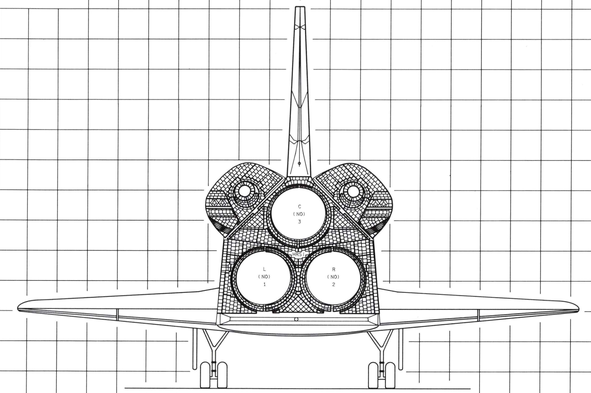
BASIC REV D

BASIC REV D

DATE	NAME	ITEM
DATE: 7/20/87	NAME: TPS	ITEM: (ON ONLY)
DATE: 8/14/87	NAME: MDD	ITEM: (ON OFF)
DATE: 8/18/87	NAME: RJT	ITEM: (ON ONLY)

NOTE

HRSI = HIGH-TEMPERATURE REUSABLE SURFACE INSULATION
1.27 cm (.05 IN) TO 12.7 cm (5 IN)•



GRID SCALE
■■■ = 1.27 m (50 IN)
•MINIMUM TO MAXIMUM THICKNESS

NOTE

REFER TO SIDE AND TOP VIEWS FOR DETAILS OF AFT FUSELAGE THERMAL PROTECTION SYSTEM (TPS)

AFT VIEW

EXTERIOR FINISH/EXTERNAL INSULATION

Z_0 900 · Z_0 800 · Z_0 700 · Z_0 600 · Z_0 500 · Z_0 400 · Z_0 300 · Z_0 200 · Z_0 100 · Z_0 000 · Z_0 -100

Y_0 -500 · Y_0 -400 · Y_0 -300 · Y_0 -200 · Y_0 -100 · Y_0 000 · Y_0 100 · Y_0 200 · Y_0 300 · Y_0 400 · Y_0 500

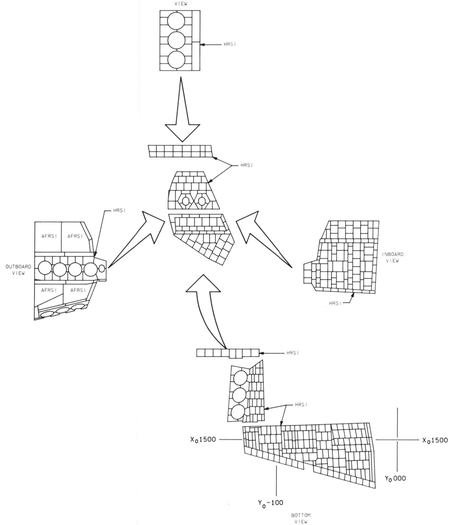
* 8 EX P/TILE 3

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	SIGNATURE	DATE
	ORIG: Chuck Hickey	10/31/84
	CK: THOMAS R. KLEMM	12/20/87
	CHRG: G. CRAIG	
	CHRG: J. GUTIERREZ	9/2/87
	CHRG: J. MILLER	8/27/87
	APP:	
	APP: Mark E. Gaskill	8/27/87

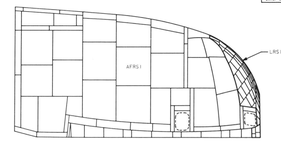
EXTERNAL PENETRATIONS/TILE (AFT)

CSM NO.	SPACE SHUTTLE	
7.8	ALL	
DWG SIZE: D	CAGE NO. 73084	SCALE: N/A
SHEET 1 OF 1	ITEM: 3	TYPE:

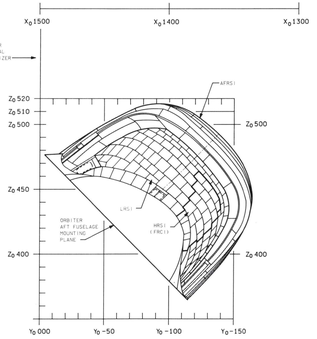
BASIC REV D

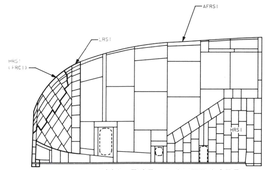


LH POD AFT RCS HOUSING



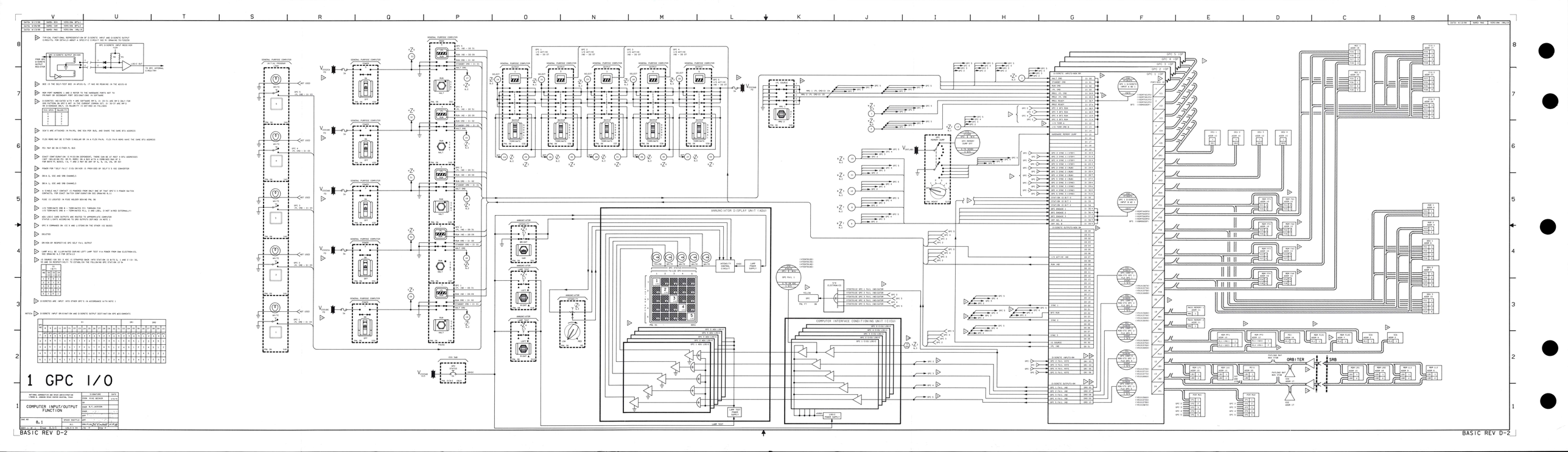
LH OMS POD "INBOARD"

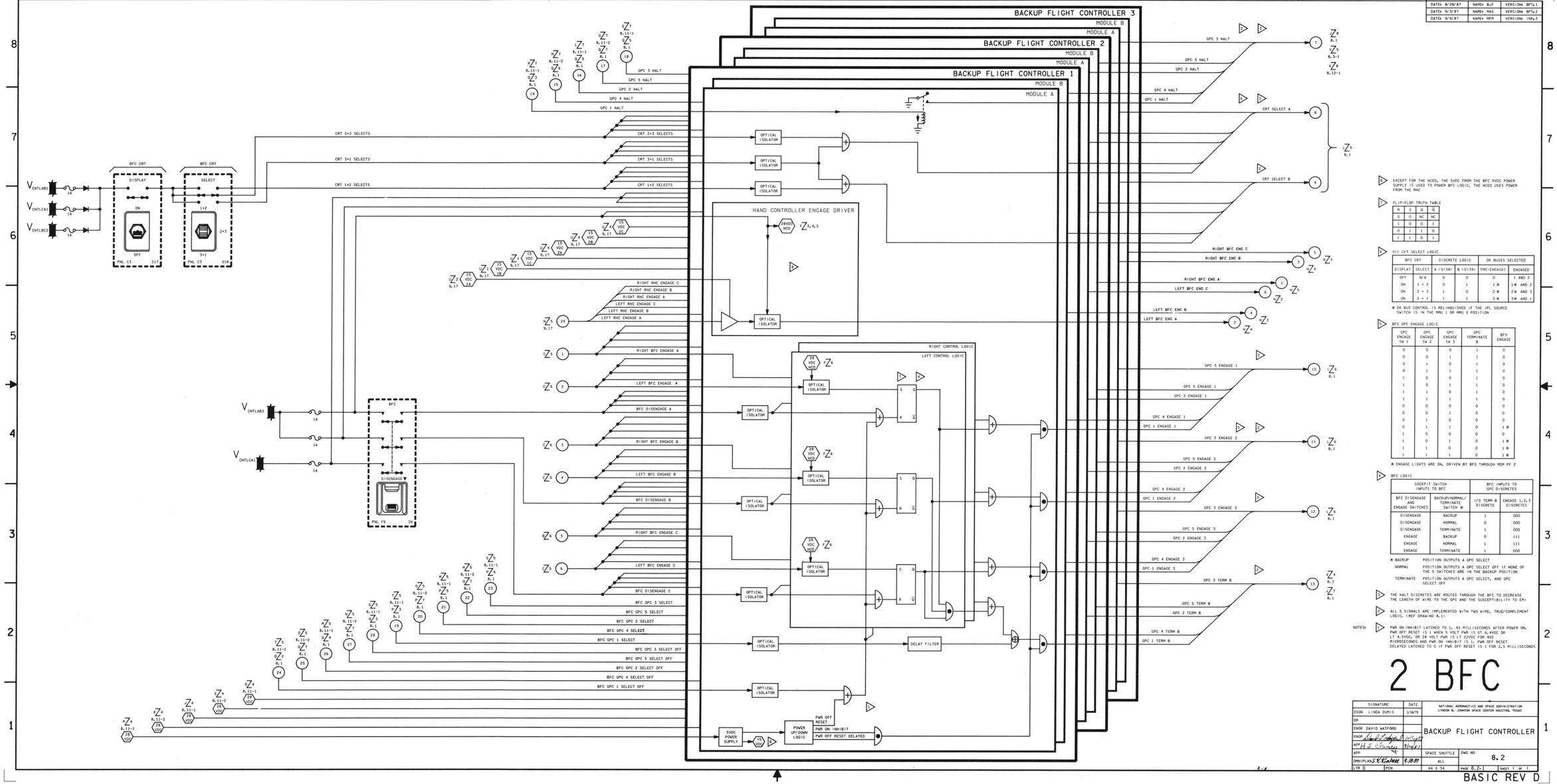




LH OMS POD "OUTBOARD"

BASIC REV D


1 GPC I/O
COMPUTER INPUT/OUTPUT FUNCTION
8.1
SPACE SHUTTLE
BASIC REV D-2
ORBITER
SRB
GENERAL PURPOSE COMPUTER
ANNUNCIATOR DISPLAY UNIT 1 ADJU
COMPUTER INTERFACE CONDITIONING UNIT 1 C1CU1
GPC 1 I/O ACTIVE
GPC 2 I/O ACTIVE
GPC 3 I/O ACTIVE
GPC 4 I/O ACTIVE
GPC 5 I/O
GPC 4 I/O
GPC 3 I/O
GPC 2 I/O
GPC 1 I/O
DISCRETE INPUT/OUTPUT
DISCRETE OUTPUTS
DISCRETE OUTPUTS-RM
DISCRETE INPUTS-RM
MULTIPLEXER INTERFACE ADAPTER
MDM FF1
MDM FF2
MDM FF3
MDM FF4
MDM LF1
MDM LF2
MDM LF3
MDM LF4
MDM RF1
MDM RF2
MDM RF3
MDM RF4
MDM RA1
MDM RA2
MDM LA1
MDM LA2
MDM LA3
MDM LA4
PCM MUX
PAYLOAD DATA INTERLEAVER
PAYLOAD DATA TAPE RECORDER
KU BAND
S BAND
GPS
MMU
RSLS
MLS
TACAN
ADTA
ADDR 17
ADDR 18
ADDR 19
ADDR 20
ADDR 21
ADDR 22
ADDR 23
ADDR 24
ADDR 25
ADDR 26
ADDR 27
ADDR 28
ADDR 29
ADDR 30
ADDR 31
ADDR 32
ADDR 33
ADDR 34
ADDR 35
ADDR 36
ADDR



DATE: 8/28/87	NAME: BJT	VERSION: BFT1
DATE: 9/3/87	NAME: MAG	VERSION: BFT2
DATE: 9/9/87	NAME: MPM	VERSION: INK3

EXCEPT FOR THE HCED, THE SVDC FROM THE BFC SVDC POWER SUPPLY IS USED TO POWER BFC LOGIC. THE HCED USES POWER FROM THE RHC

FLIP-FLOP TRUTH TABLE

R	S	Q	$\bar{Q}$
0	0	NC	NC
1	0	0	1
0	1	1	0
1	1	0	1

BFC CRT SELECT LOGIC

BFC CRT		DISCRETE LOGIC		DK BUSES SELECTED	
DISPLAY	SELECT	A (D138)	B (D139)	PRE-ENGAGED	ENGAGED
OFF	N/A	0	0	0	1 AND 2
ON	1 + 2	0	1	1 ✳	1 ✳ AND 2
ON	2 + 3	1	0	2 ✳	2 ✳ AND 3
ON	3 + 1	1	1	3 ✳	3 ✳ AND 1

✳ DK BUS CONTROL IS RELINQUISHED IF THE IPL SOURCE SWITCH IS IN THE MMU 1 OR MMU 2 POSITION

BFS GPC ENGAGE LOGIC

GPC ENGAGE SW 1	GPC ENGAGE SW 2	GPC ENGAGE SW 3	GPC TERMINATE B	BFS ENGAGE
0	0	0	1	0
0	0	1	1	0
0	1	0	1	0
0	1	1	1	0
1	0	0	1	0
1	0	1	1	0
1	1	0	1	0
1	1	1	1	0
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	0	1 ✳
1	0	0	0	0
1	0	1	0	1 ✳
1	1	0	0	1 ✳
1	1	1	0	1 ✳

✳ ENGAGE LIGHTS ARE ON, DRIVEN BY BFS THROUGH MDM PF 2

BFC LOGIC

COCKPIT SWITCH INPUTS TO BFC		BFC INPUTS TO GPC DISCRETES	
BFC DISENGAGE AND ENGAGE SWITCHES	BACKUP/NORMAL/ TERMINATE SWITCH ✳	I/O TERM B DISCRETE	ENGAGE 1, 2, 3 DISCRETES
DISENGAGE	BACKUP	1	000
DISENGAGE	NORMAL	0	000
DISENGAGE	TERMINATE	1	000
ENGAGE	BACKUP	0	111
ENGAGE	NORMAL	1	111
ENGAGE	TERMINATE	1	000

✳ BACKUP — POSITION OUTPUTS A GPC SELECT
NORMAL — POSITION OUTPUTS A GPC SELECT OFF IF NONE OF THE 5 SWITCHES ARE IN THE BACKUP POSITION
TERMINATE — POSITION OUTPUTS A GPC SELECT, AND GPC SELECT OFF

THE HALT DISCRETES ARE ROUTED THROUGH THE BFC TO DECREASE THE LENGTH OF WIRE TO THE GPC AND THE SUSCEPTIBILITY TO EMI

ALL 5 SIGNALS ARE IMPLEMENTED WITH TWO WIRE, TRUE/COMPLEMENT LOGIC. (REF DRAWING 8.1)

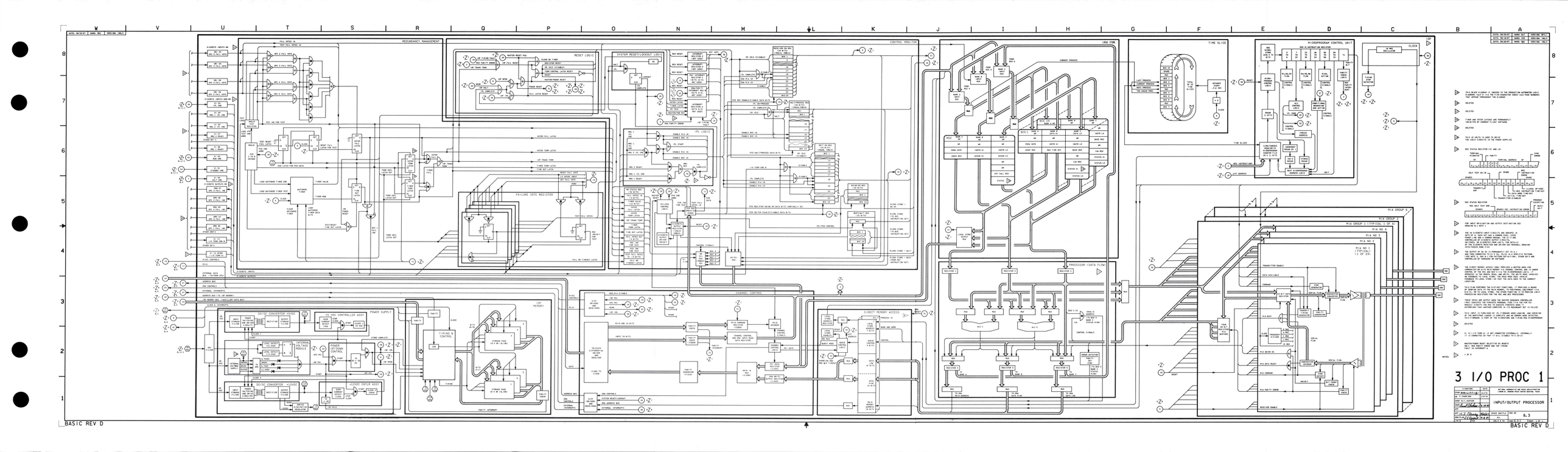
NOTES:

PWR ON INHIBIT LATCHED TO 1; 42 MILLISECONDS AFTER POWER ON. PWR OFF RESET IS 1 WHEN 5 VOLT PWR IS GT 64.4VDC OR LT 4.5VDC, OR 28 VOLT PWR IS LT 23VDC FOR 450 MICROSECONDS AND PWR ON INHIBIT IS 1. PWR OFF RESET DELAYED LATCHED TO 0 IF PWR OFF RESET IS 1 FOR 2.5 MILLISECONDS

2 BFC

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	LINDA DUMIS	3/19/79	
DR			
ENGR	DAVID WATFORD		BACKUP FLIGHT CONTROLLER
APP	H.J. Kilminster	9/14/87	
APP			SPACE SHUTTLE — DWG NO 8.2
OMNIPLAN	S.K. Kinkaid	9.18.87	ALL
LTR	D — PCN		66 X 34 — PAGE 8.2-1 — SHEET 1 OF 1

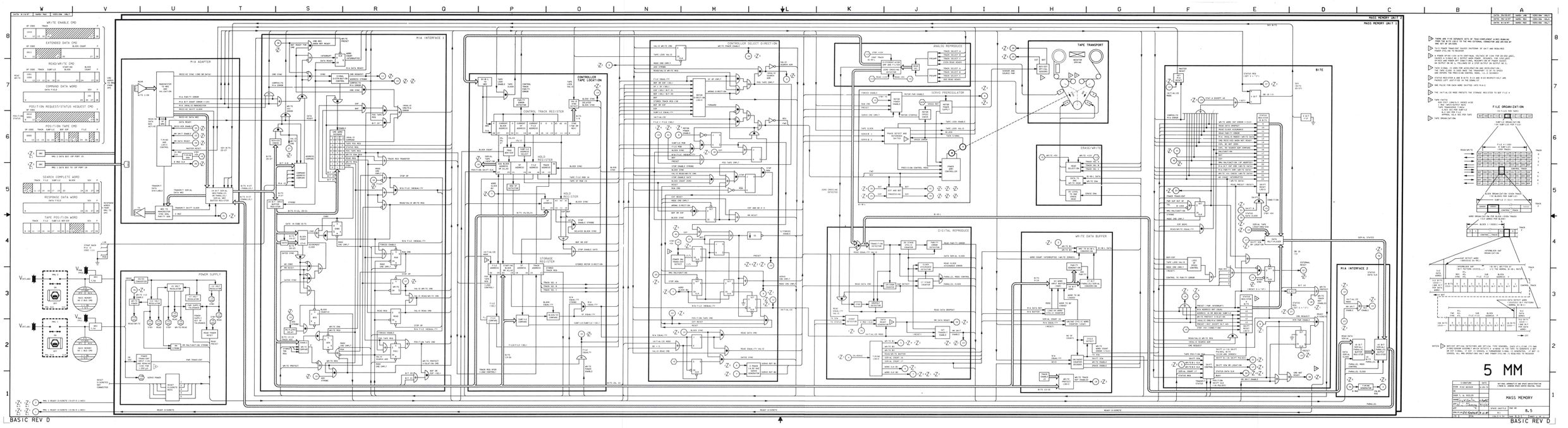
BASIC REV D

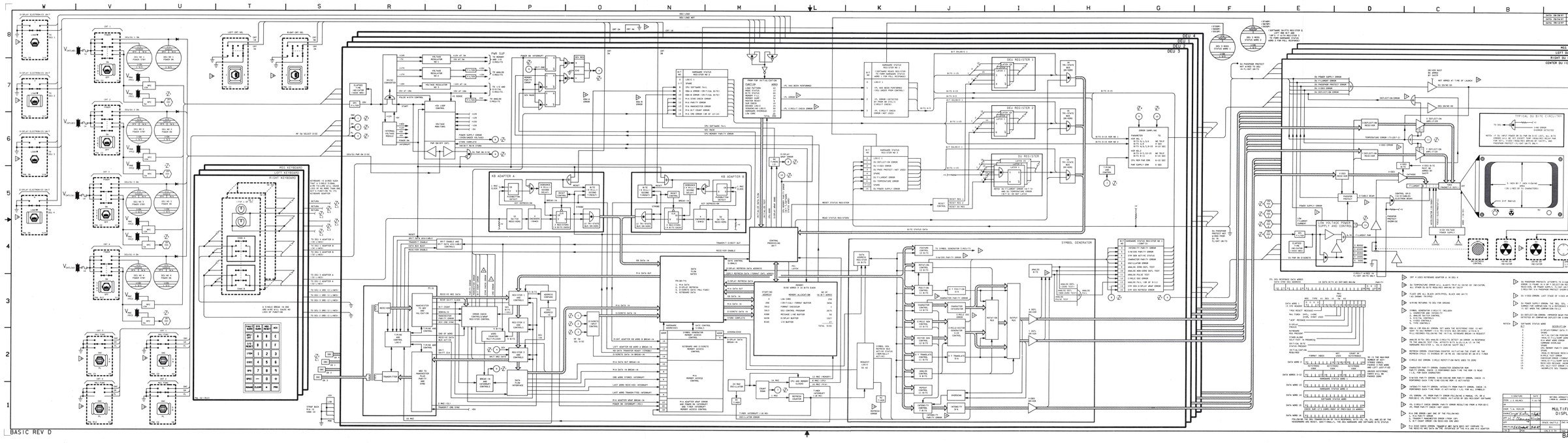

3 I/O PROC 1
INPUT/OUTPUT PROCESSOR
REDUNDANCY MANAGEMENT
RESET LOGIC
SYSTEM RESET/LOCKOUT LOGIC
CONTROL MONITOR
LOGIC STORE
TIME SLICE
MIA GROUP 0
MIA GROUP 1 (TYPICAL 1 OF 4)
MIA NO 4
MIA NO 3
MIA NO 2
MIA NO 1
(1 OF 24)
PROCESSOR I/O DATA FLOW
CHANNEL CONTROL
DIRECT MEMORY ACCESS
POWER SUPPLY
CLOCK
BASIC REV D
BASIC REV D

4 CPU 1

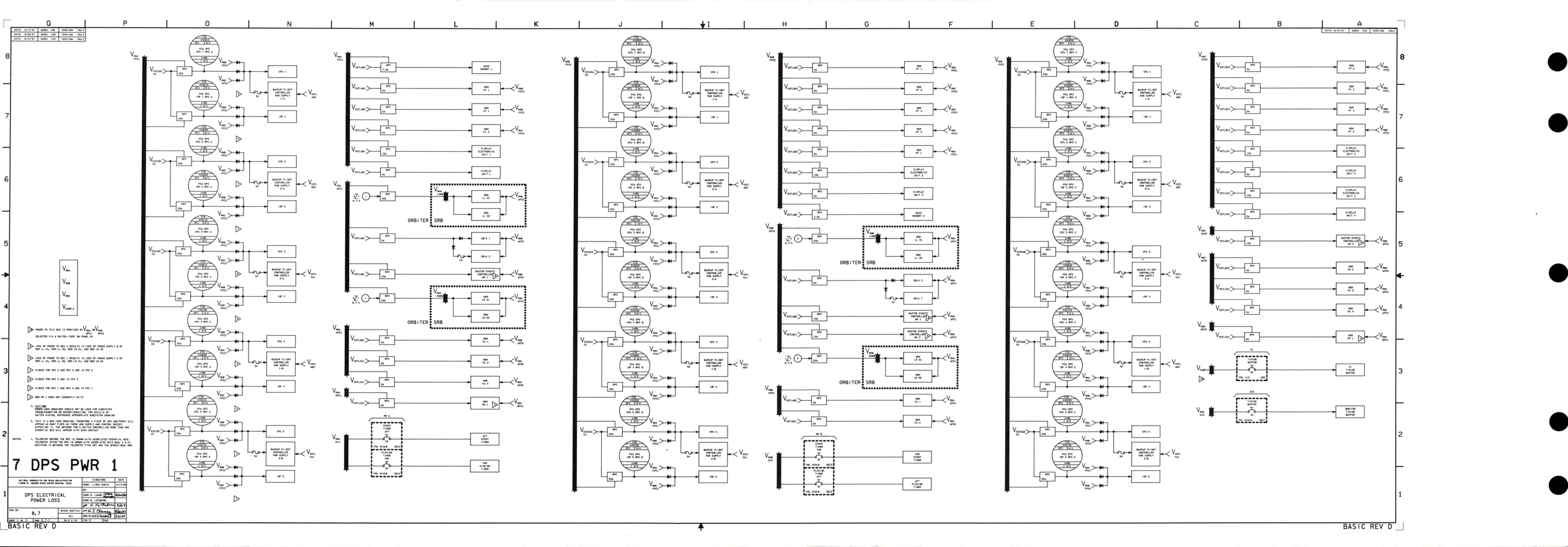
CENTRAL PROCESSING UNIT

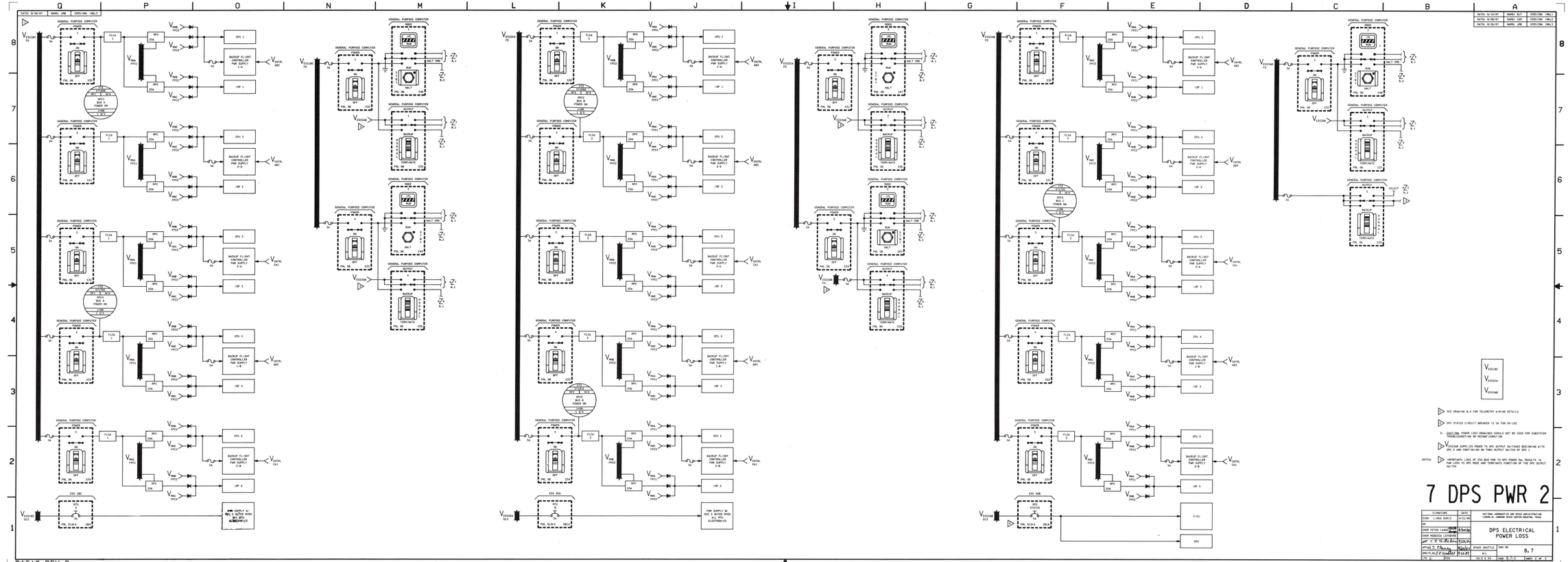
SIGNATURE	DATE
DESIGN MGR. TL. SUPV.	6-14-74
DES. ENGR.	6-14-74
DES. ENGR.	6-14-74
DES. ENGR

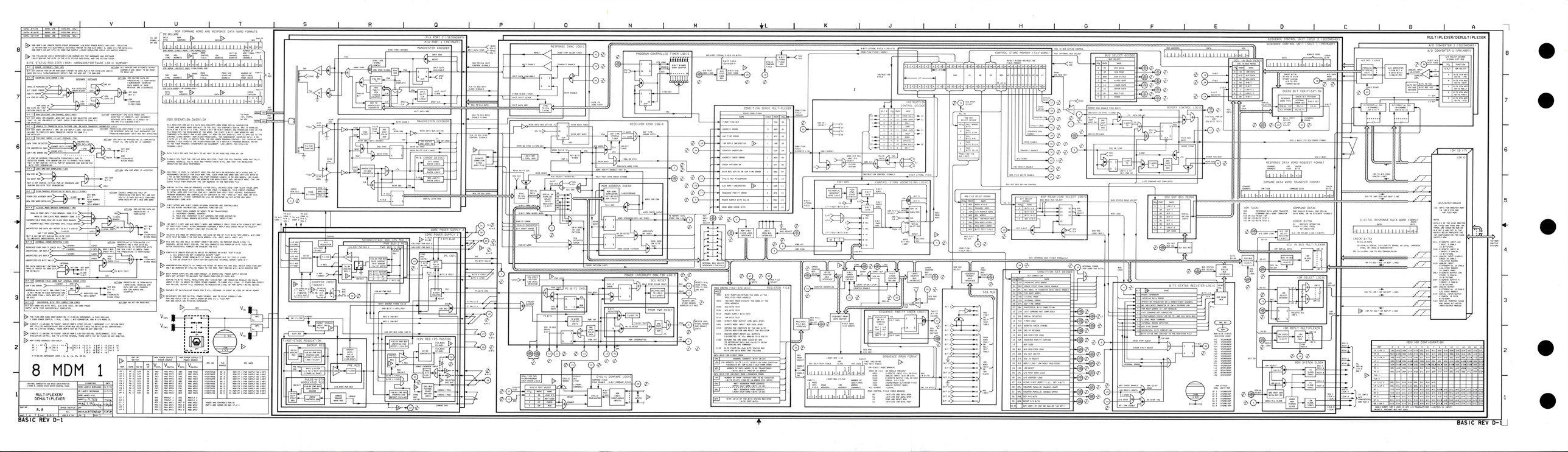

MASS MEMORY UNIT 0
MASS MEMORY UNIT 1
MIA ADAPTER
MIA INTERFACE 1
MIA INTERFACE 2
CONTROLLER TAPE LOCATION
CONTROL TRACK REGISTER
HOLD REGISTER
STORAGE REGISTER
CONTROLLER SELECT DIRECTION
ANALOG REPRODUCE
SERVO PREREGULATOR
TAPE TRANSPORT
ERASE/WRITE
DIGITAL REPRODUCE
WRITE DATA BUFFER
BITE
POWER SUPPLY
FILE ORGANIZATION
5 MM
MASS MEMORY
BASIC REV D

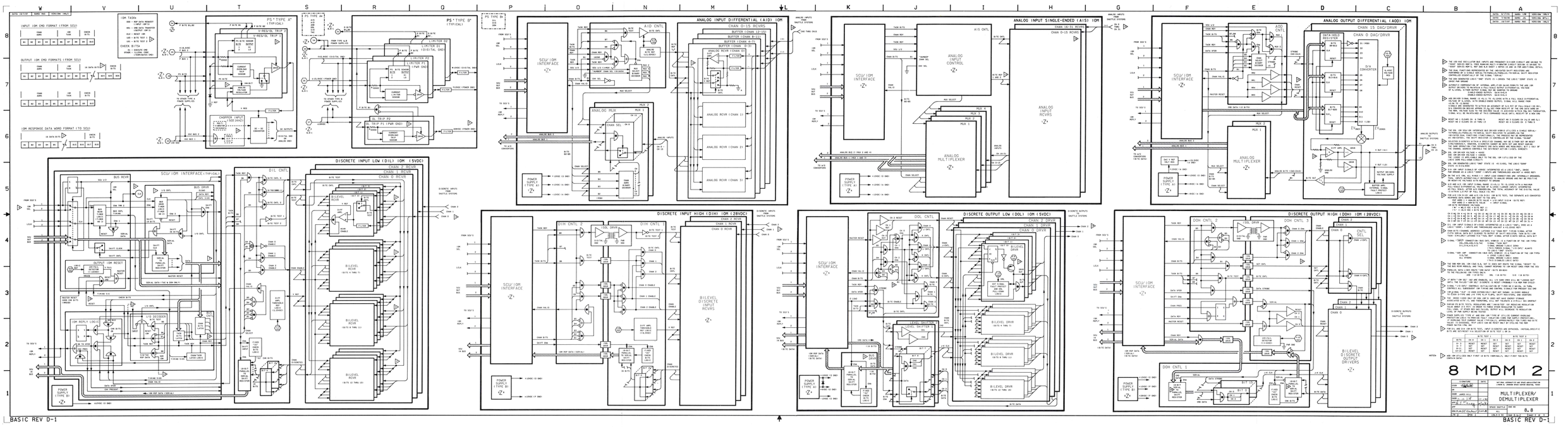

MSS KEYBOARD
LEFT KEYBOARD
RIGHT KEYBOARD
PWR SUP
DEU 1
DEU 2
DEU 3
DEU REGISTER
DU REGISTER
SYMBOL GENERATOR
KB ADAPTER A
KB ADAPTER B
MULTIFUNCTION CRT DISPLAY SYSTEM
BASIC REV D

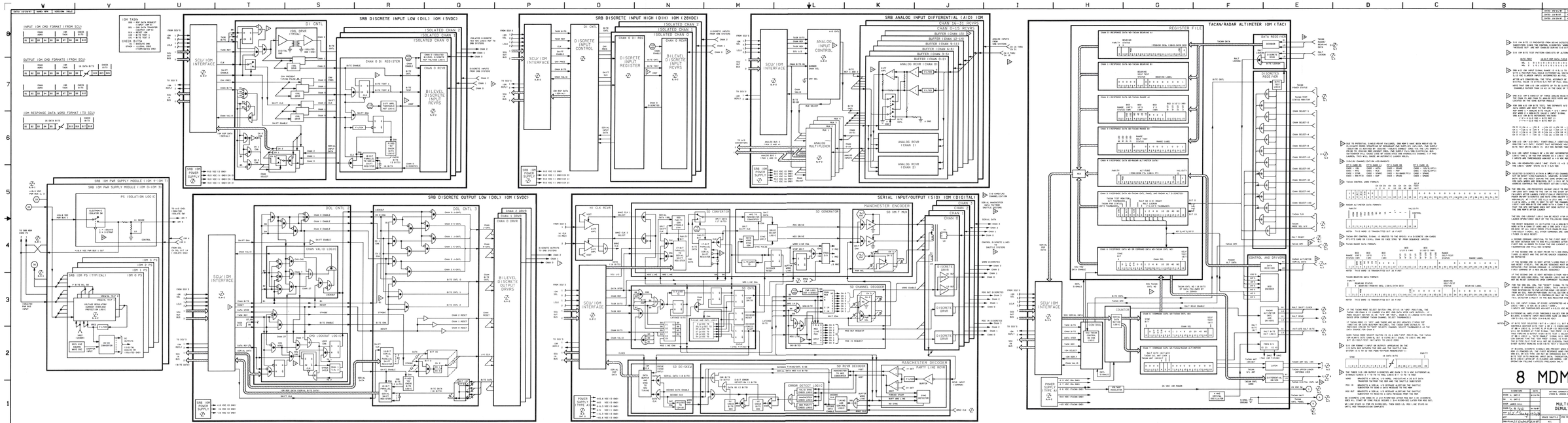
DATE: 6/23/87	NAME: JRB	VERSION: ORB.7
DATE: 9/10/87	NAME: CAR	VERSION: ORB.8
DATE: 9/21/87	NAME: VCO	VERSION: ORB.9

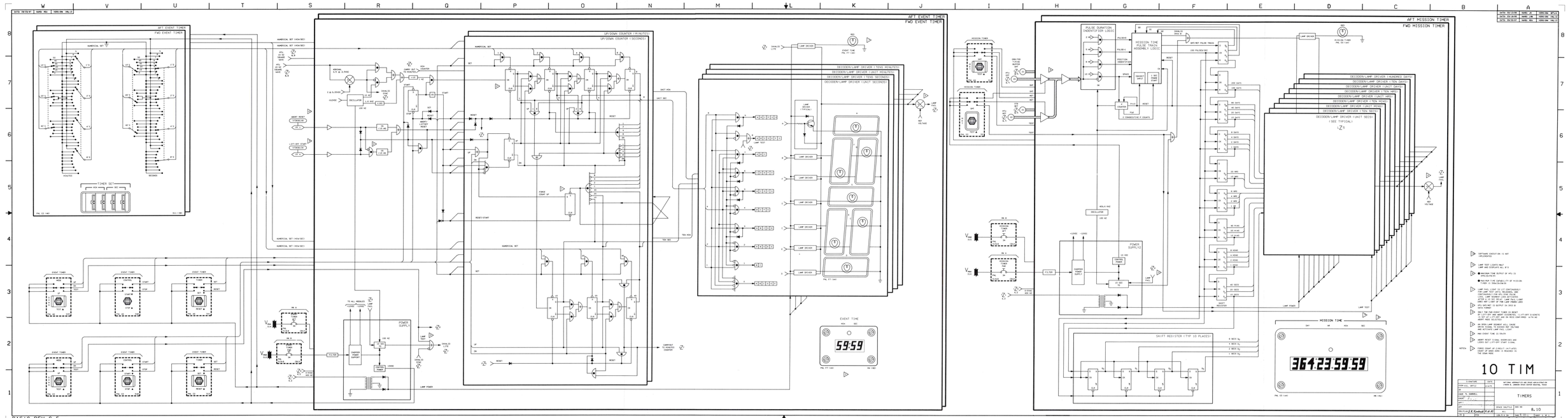



DATE: 8/29/97 NAME: JMB VERSION: rev.1
DATE: 8/15/97 NAME: RJT VERSION: rev.1
DATE: 9/30/97 NAME: CSR VERSION: rev.2
DATE: 9/30/97 NAME: JMB VERSION: rev.3
GENERAL PURPOSE COMPUTER
POWER
OFF
ON
PNL ON
PNL OFF
FLCA 1
FLCA 2
FLCA 3
RPC 20A
RPC 15A
CPU 1
CPU 2
CPU 3
CPU 4
CPU 5
BACKUP FLIGHT CONTROLLER PWR SUPPLY 1-4
BACKUP FLIGHT CONTROLLER PWR SUPPLY 3-6
BACKUP FLIGHT CONTROLLER PWR SUPPLY 1-6
BACKUP FLIGHT CONTROLLER PWR SUPPLY 2-8
BFC PWR SUPPLY 1-4
BFC PWR SUPPLY 3-6
BFC PWR SUPPLY 1-6
BFC PWR SUPPLY 2-8
IDP 1
IDP 2
IDP 3
IDP 4
IDP 5
ESS 1DC
ESS 2DA
ESS 3AB
PWR SUPPLY W/ BUS ISOLATION DIODES ALL PFC ELECTRONICS
C&DU
ADU
OUTPUT
RUN
HALT
HALT GND
TERMINATE
BACKUP
SELECT
BFC BUS A POWER ON
BFC BUS B POWER ON
BFC BUS C POWER ON
BFC STATUS
V_{ESS1AB}
V_{ESS2DA}
V_{ESS3AB}
V_{ESS1DC}
V_{ESS2DA}
V_{ESS3AB}
V_{CNTRL} #83
V_{CNTRL} #81
V_{CNTRL} #1
V_{PWR} FPC1
V_{PWR} FPC2
V_{RTN} FPC1
V_{RTN} FPC2
$-Z^{1}$ R-1
$-Z^{2}$ R-1
$-Z^{3}$ R-1
$-Z^{4}$ R-1
$-Z^{5}$ R-1
$-Z^{6}$ R-1
$-Z^{7}$ R-1
$-Z^{8}$ R-1
V_{ESS1BC}
V_{ESS2CA}
V_{ESS3AB}
▷ SEE DRAWING 6.4 FOR TELEMETRY WIRING DETAILS
▷ DPC STATUS CIRCUIT BREAKER IS 3A FOR OV-102
3. ▷ CAUTION: POWER LOSS DRAWINGS SHOULD NOT BE USED FOR SUBSYSTEM TROUBLESHOOTING OR RECONFIGURATION
▷ V_{ESS3AB} SUPPLIES POWER TO DPC OUTPUT SWITCHES BIDIRECTING WITH DPC 3 AND CONTINUING ON THRU OUTPUT SWITCH OF DPC 1
NOTES: ▷ IMPORTANT: A LOSS OF ESS BUS PWR TO DPC POWER SW. RESULTS IN PWR LOSS TO DPC MODE AND TERMINATE FUNCTION OF THE DPC OUTPUT SWITCH
7 DPS PWR 2
SIGNATURE DATE
DSN LINDA DUPLY 6/21/95
CH
CHIEF PETER LANGHOFF
CHIEF REBECCA LEFEBVRE
MP
MP&S Chief
QM&PA&S Chief
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DPS ELECTRICAL POWER LOSS
SPACE SHUTTLE PWR NO
8.7
SIZE D
DSN 93.5 D 34
SHEET 1 OF 1
BASIC REV D


8 MDM 1
MULTIPLEXER/ DEMULTIPLEXER
MULTIPLEXER/DEMULTIPLEXER
BASIC REV D-1
BASIC REV D-1

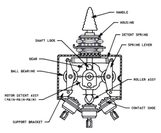

INPUT IOM CMD FORMAT (FROM SCU)
OUTPUT IOM CMD FORMATS (FROM SCU)
IOM RESPONSE DATA WORD FORMAT (TO SCU)
PS "TYPE A" (TYP CAL)
PS "TYPE B" (TYP CAL)
PS "TYPE D" (TYP CAL)
ANALOG INPUT DIFFERENTIAL (A1D) IOM
ANALOG INPUT SINGLE-ENDED (A1S) IOM
ANALOG OUTPUT DIFFERENTIAL (A0D) IOM
DISCRETE INPUT LOW (DIL) IOM (5VDC)
DISCRETE INPUT HIGH (DIH) IOM (28VDC)
DISCRETE OUTPUT LOW (DOL) IOM (5VDC)
DISCRETE OUTPUT HIGH (DOH) IOM (28VDC)
SCU I/OM INTERFACE (TYP LSA)
BUS RCVR
BUS DRVR
IOM REPLY LOGIC
I/O DECODER
DIL CNTL
DIH CNTL 1
DIH CNTL 2
DOL CNTL
DOH CNTL 1
DOH CNTL 2
CHAN 1 RCVR
CHAN 2 RCVR
CHAN 0 RCVR
CHAN 1 DRVR
CHAN 2 DRVR
CHAN 0 DRVR
A1D CNTL
A1S CNTL
A0D CNTL
ANALOG INPUT CONTROL
ANALOG MULTIPLEXER
ANALOG INPUT RCVRS
ANALOG OUTPUT DRVRS
DATA HOLD REGISTER
S/A CONVERTER
CHAN 15 DAC/DRVR
CHAN 0 DAC/DRVR
CHAN 15 RCVRS
CHAN 0-15 RCVRS
CHAN 12-15 RCVRS
CHAN 8-11 RCVRS
CHAN 4-7 RCVRS
CHAN 0-3 RCVRS
BUFFER (CHAN 12-15)
BUFFER (CHAN 8-11)
BUFFER (CHAN 4-7)
BUFFER (CHAN 0-3)
ANALOG RCVR (CHAN 3)
ANALOG RCVR (CHAN 2)
ANALOG RCVR (CHAN 1)
ANALOG RCVR (CHAN 0)
BILEVEL RCVR (8X75 OR 75451)
BILEVEL DRVR (8X75 OR 75451)
BILEVEL DISCRETE INPUT RCVRS
BILEVEL DISCRETE OUTPUT DRIVERS
POWER SUPPLY (TYPE A1)
POWER SUPPLY (TYPE B1)
8 MDM 2
MULTIPLEXER/ DEMULTIPLEXER
8.8
BASIC REV D-1


SRB DISCRETE INPUT LOW (DIL) IOM (5VDC)
SRB DISCRETE INPUT HIGH (DIH) IOM (28VDC)
SRB ANALOG INPUT DIFFERENTIAL (AID) IOM
TACAN/RADAR ALTIMETER IOM (TAC)
SRB DISCRETE OUTPUT LOW (DOL) IOM (5VDC)
SERIAL INPUT/OUTPUT (SIO) IOM (DIGITAL)
SRB IOM PWR SUPPLY MODULE I (IOM A-IOM 3)
SRB IOM PWR SUPPLY MODULE II (IOM D-IOM 3)
SCU/IOM INTERFACE
REGISTER FILE
ISOLATED CHAN 3
ISOLATED CHAN 2
ISOLATED CHAN 1
ISOLATED CHAN 0
CHAN 0 RCVR
CHAN 0 XMTR
CHAN 1 DRIVE
CHAN 0 DRIVE
DISCRETE OUTPUT REGISTER
DISCRETE INPUT CONTROL
BILEVEL DISCRETE INPUT RCVRS
BILEVEL DISCRETE OUTPUT DRIVERS
ANALOG INPUT CONTROL
ANALOG MULTIPLEXER
ANALOG RCVR (CHAN 01)
ANALOG RCVR (CHAN 23)
DISCRETE RECEIVER
DISCRETE DRIVE
CONTROL AND DRIVER
SD CONVERTER
SD GENERATOR
MANCHESTER ENCODER
SD CHANNEL DECODER
SD DE-SKEW
SD RCVR DECODER
MANCHESTER DECODER
SERIAL INPUT/OUTPUT
SCU/IOM INTERFACE
POWER SUPPLY TYPE I
POWER SUPPLY TYPE II
8 MDM 3
MULTIPLEXER/ DEMULTIPLEXER
BASIC REV D
BASIC REV D-1

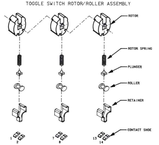

AFT EVENT TIMER
FWD EVENT TIMER
AFT MISSION TIMER
FWD MISSION TIMER
10 TIM
TIMERS
BASIC REV C-5
BASIC REV C-5

DATE/ INITIALS	NAME/ ID	CODE/DWG APPLY
DATE/ 08/30/87	NAME/ MEC	CODE/DWG / MLL1
DATE/ 9/24/87	NAME/ CAP	CODE/DWG / MLL1

TOGGLE SWITCH INTERNAL ASSEMBLY DRAWINGS



TOGGLE SWITCH MOTOR/ROLLER ASSEMBLY



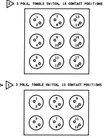
△ POWER TO MDA SPCI'S (-10V/CPU) USES CDP MPC

△ RTA AND PWR CAPPED OFF WITH MDA SPCI'S

△ DIGIMETRIC INPUT TRUTH TABLES

TRUE COMP. INPUT	OUTPUT
A	B
B	A
UNDEF (MID)	A
A	B

△ 3 POLE, TOGGLE SWITCH, 12 CONTACT POSITIONS

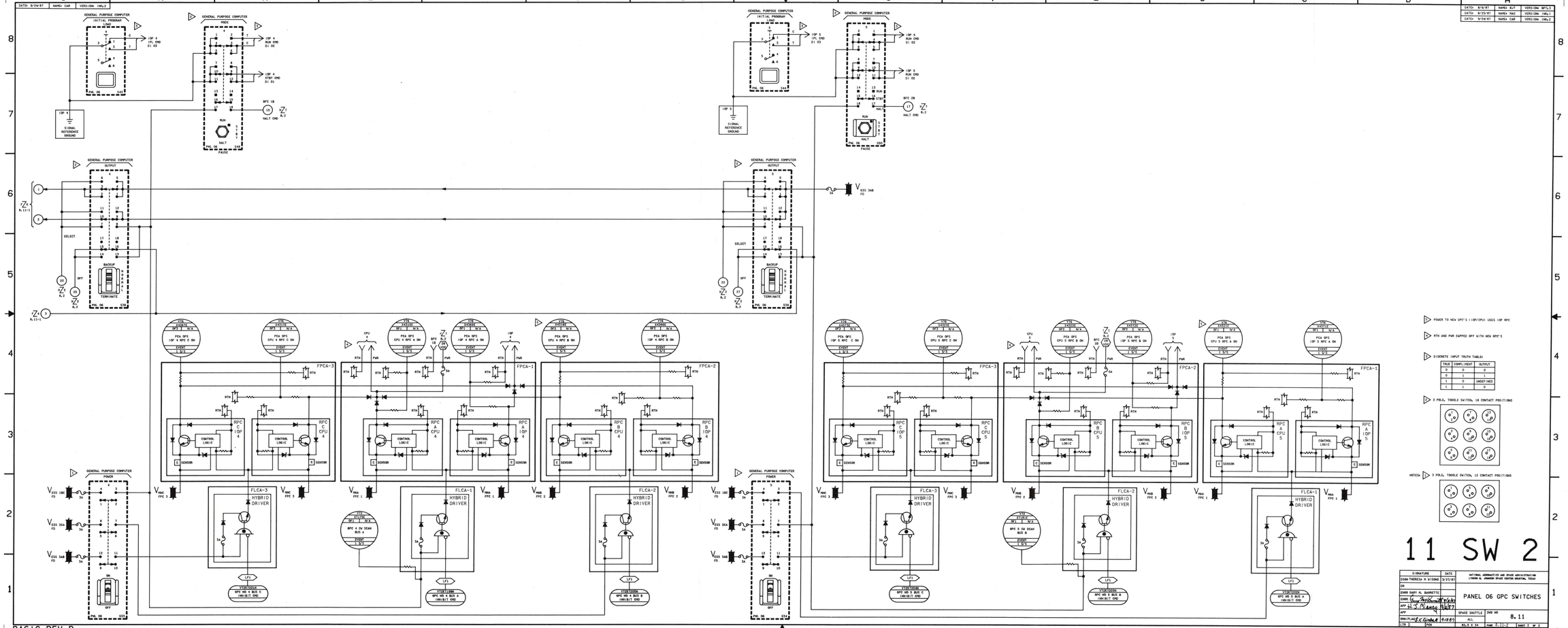


HDTSA △ 3 POLE, TOGGLE SWITCH, 12 CONTACT POSITIONS

11 SW 1

	SIGNATURE	DATE
ORIG. ORGANIZATION AND OTHER IDENTIFICATION (INCLUDING ORIGINAL DRAWING NUMBER, TITLE)	JOHN THOMSEN M S10MS	9/23/87
	DR	
PANEL 06 GPC SWITCHES	CHKR GARY N. BARRETTE	
	APPD (1) Paul Miller	10/2/87
	APPD (2) Stanley Mosk	10/2/87
SHR NO. 8.11	SPACE SHUTTLE APP.	
SIZE / CODE IDENT. NO.	ECL NO.	DRAWING SE Gabriel 9-8-87
SCALE NONE	SHEET NO.	

BASIC REV D



DATE: 9/04/87 NAMEX: CAR VERSION: IMAGE

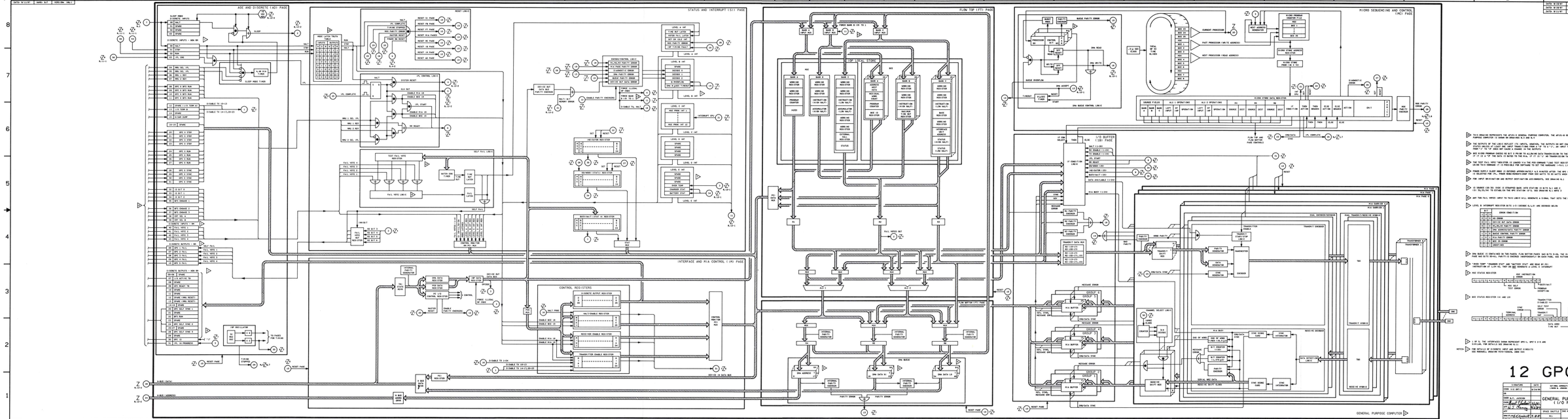
DATE:	NAME:	VERSION:
8/6/87	NAMEX: BUT	VERSION: BFTS 3
8/25/87	NAMEX: PAO	VERSION: IMAGE
9/04/87	NAMEX: CAR	VERSION: IMAGE

11 SW 2

SIGNATURE	DATE	
DOAN THERESA M WISDOM	9/25/87	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
ENGR GARY M. BARRETTE		PANEL O6 GPC SWITCHES
ENGR		
APP		
APP		SPACE SHUTTLE DWG NO 8.11
DRAFTSMAN	ALL	
TITLE	CODE	SIZE B REV SCALE NONE SHEET 2 OF 2

BASIC REV D

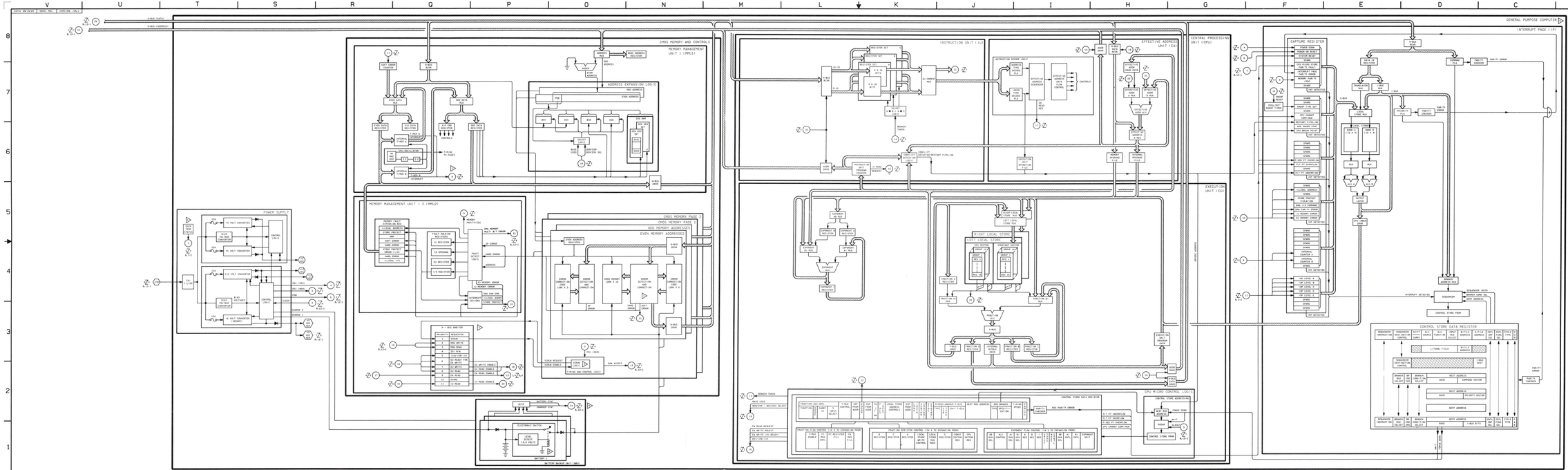
BASIC REV D

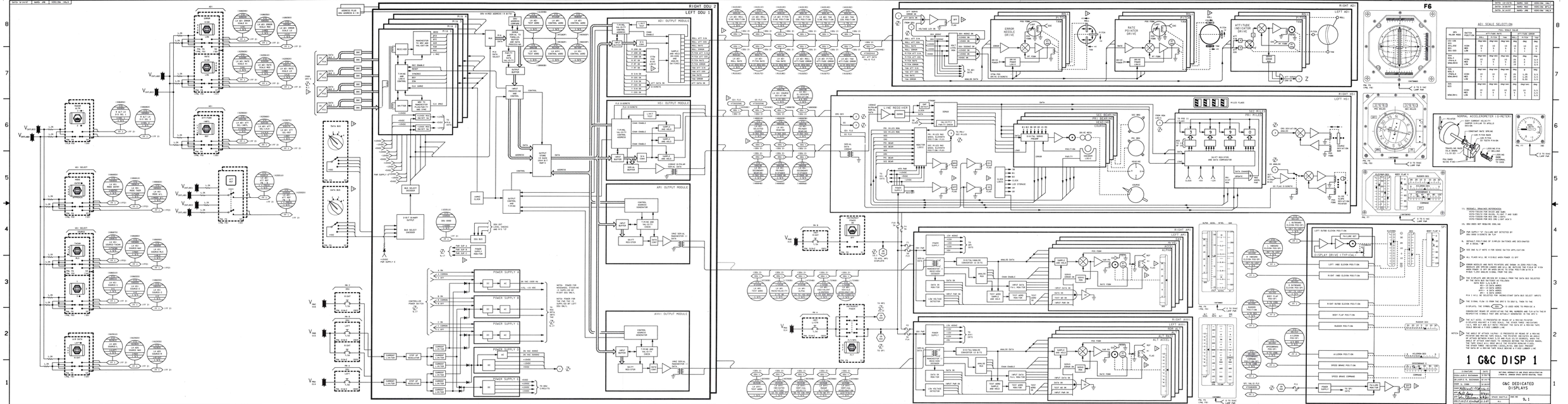


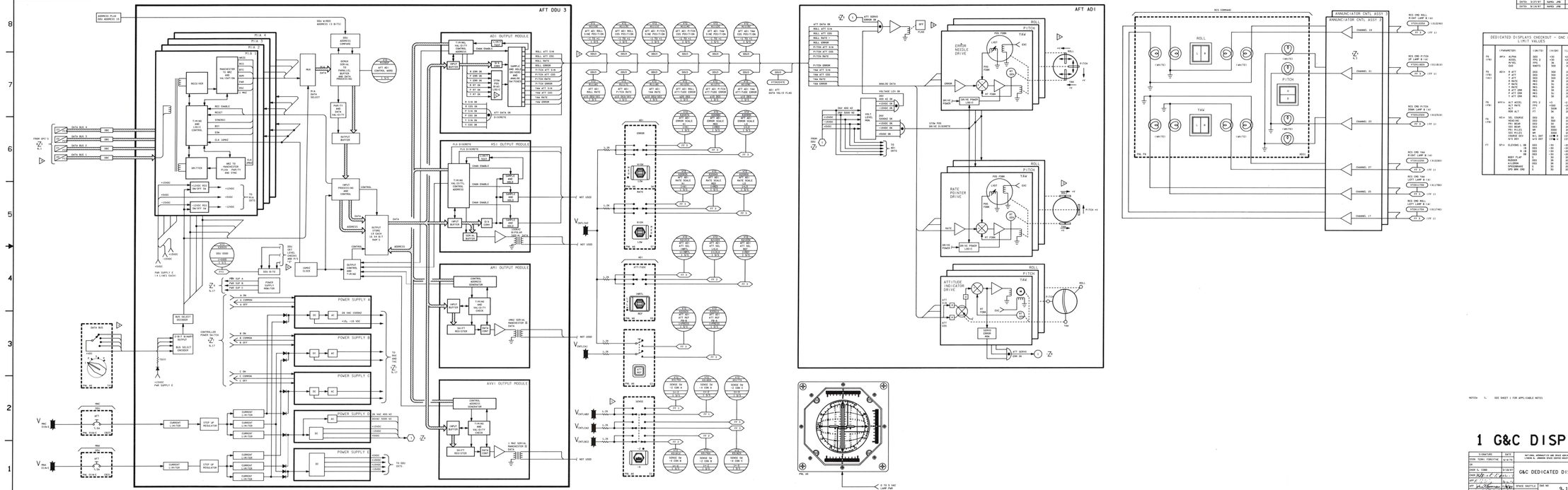
12 GPC 1

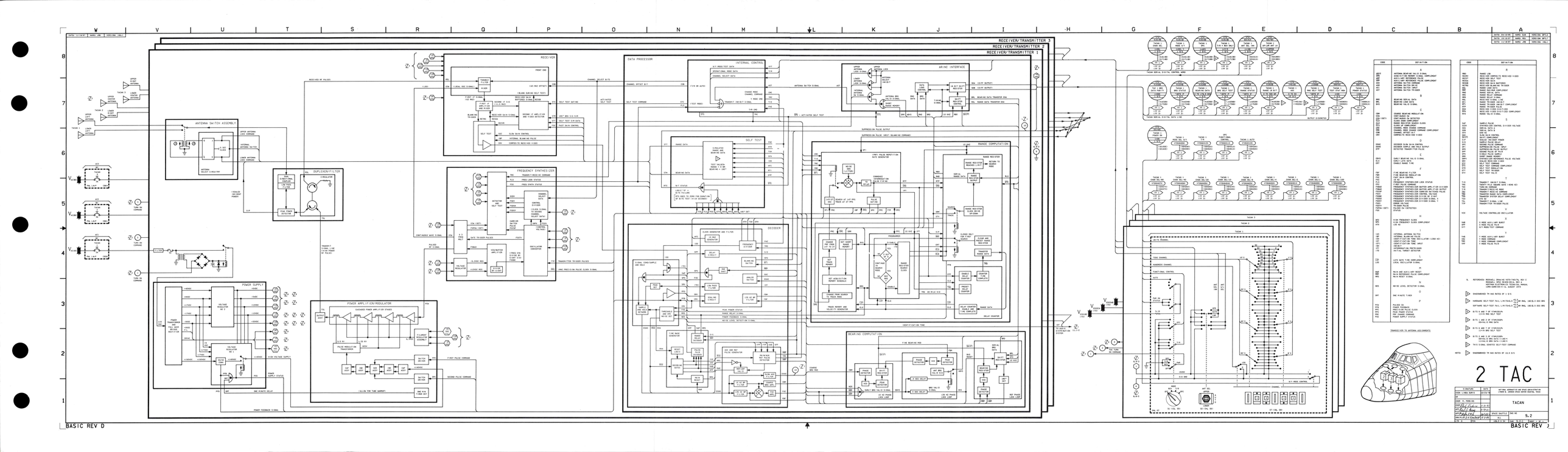
SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DSNN: W.G. BRYCE	10/24/85	GENERAL PURPOSE COMPUTER
DSNN: R.A. JOHNSON	10/24/85	I/O FUNCTIONS
APPROVED:		
APPROVED:		SPACE SHUTTLE DWG NO. B.12
APPROVED:		SCALE: NONE SHEET 1 OF 1

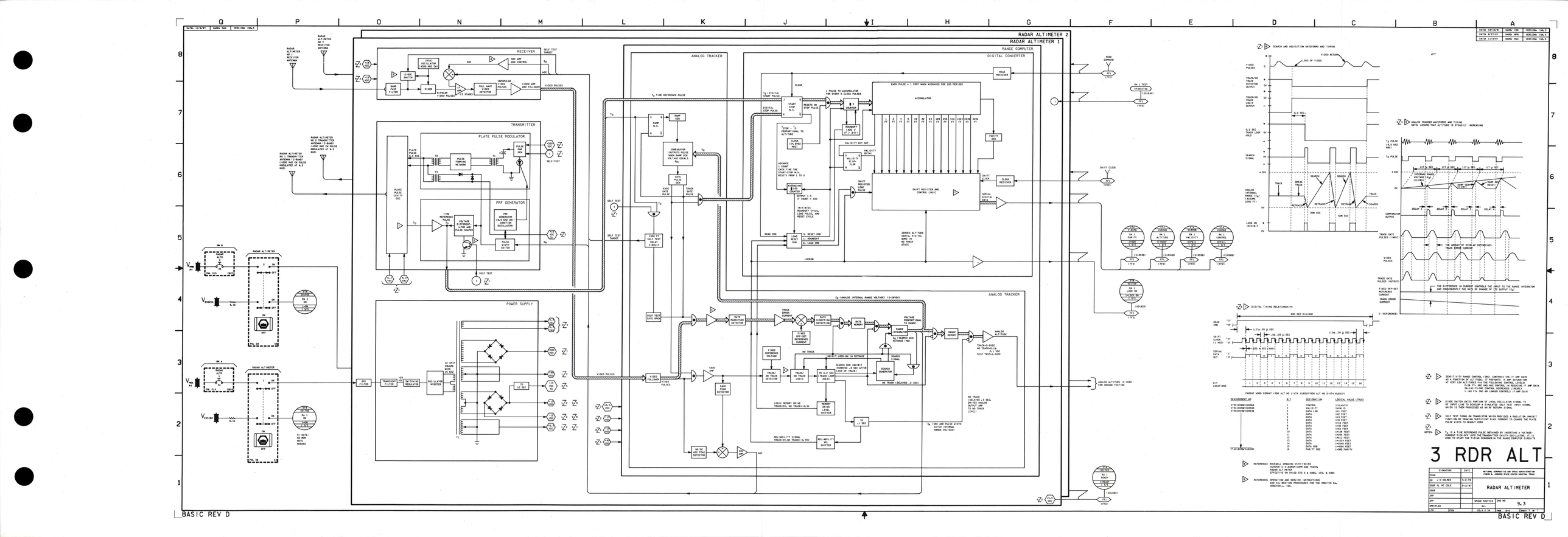
BASIC REV D

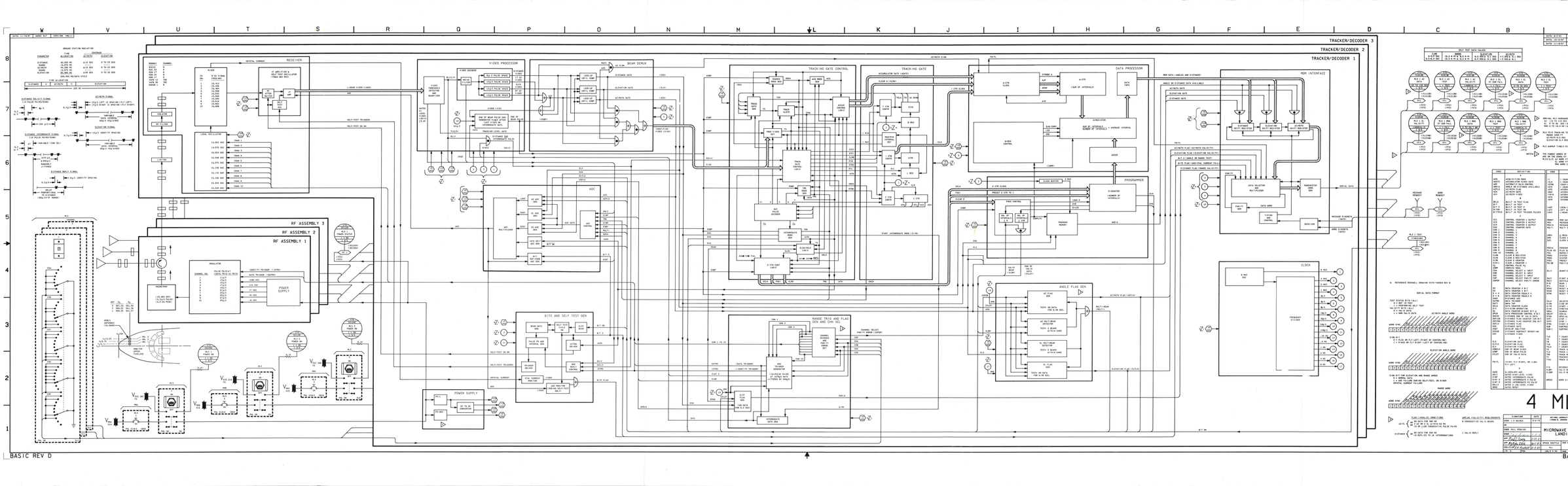

GENERAL PURPOSE COMPUTER
CENTRAL PROCESSING UNIT (CPU)
INSTRUCTION UNIT (IU)
EXECUTION UNIT (EU)
CMOS MEMORY AND CONTROL
MEMORY MANAGEMENT UNIT (MMU)
MEMORY MANAGEMENT UNIT - 2 (MMU2)
CMOS MEMORY PAGE
4000 MEMORY ADDRESSES
EVEN MEMORY ADDRESSES
ODD MEMORY ADDRESSES
ADDRESS EXPANSION LOGIC
POWER SUPPLY
BATTERY BACKUP UNIT (BBU)
CPU MICRO CONTROL LOGIC
CONTROL STORE ADDRESS
CONTROL STORE DATA REGISTER
CONTROL STORE PROM
LEFT LOCAL STORE
RIGHT LOCAL STORE
INTERRUPT PAGE (IP)
H-BUS (16/24)
H-BUS (16/24/32)
INTERRUPT SET/RESTORE
SEQUENCER (16/32)
SEQUENCER
BRANCH CONDITIONS
NEXT ADDRESS
BRANCH ADDRESS
BRANCH CONDITION SELECT
CONTROL STORE ADDRESS
CONTROL STORE DATA REGISTER
PARITY CHECKER
PARITY ERROR
CAPTURE REGISTER
INTERRUPT DETECTION
INTERRUPT CONTROL
INTERRUPT ADDRESS
INTERRUPT ENABLE
INTERRUPT REQUEST
INTERRUPT ACKNOWLEDGE
INTERRUPT ADDRESS
INTERRUPT ENABLE
INTERRUPT REQUEST
INTERRUPT ACKNOWLEDGE
INTERRUPT DETECTED


RIGHT DDU 2
LEFT DDU 1
ADI OUTPUT MODULE
HSI OUTPUT MODULE
AVVI OUTPUT MODULE
RIGHT ADI
LEFT ADI
RIGHT HSI
LEFT HSI
RIGHT AVVI
LEFT AVVI
ALT SCALE
F6
1 G&C DISP 1
G&C DEDICATED DISPLAYS
BASIC REV D


AFT DDU 3
AFT ADI
ADI OUTPUT MODULE
HSI OUTPUT MODULE
AMI OUTPUT MODULE
AVVI OUTPUT MODULE
POWER SUPPLY A
POWER SUPPLY B
POWER SUPPLY C
POWER SUPPLY D
POWER SUPPLY E
ROLL
PITCH
YAW
RATE POINTER DRIVE
ATTITUDE INDICATOR DRIVE
ERROR NEEDLE DRIVE
ANNUNCIATOR CNTL ASSY 7
1 G&C DISP 2
G&C DEDICATED DISPLAYS
BASIC REV D

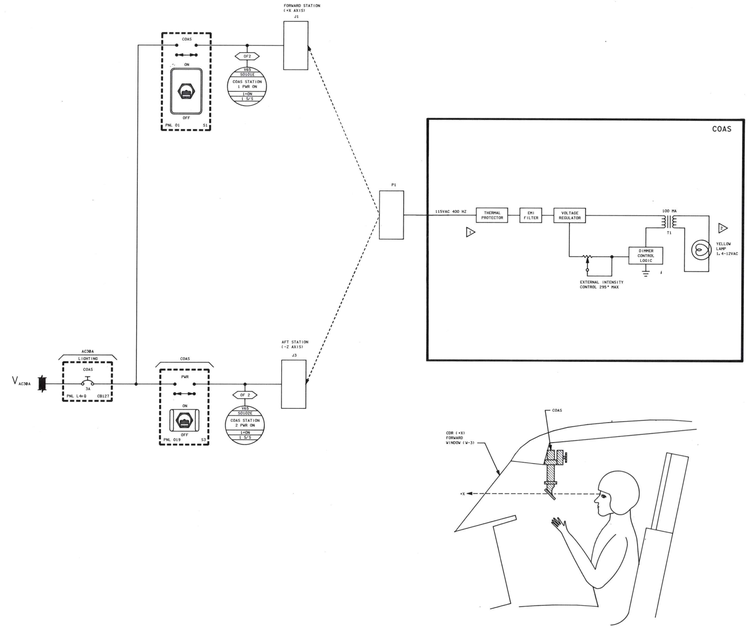

RECEIVER/TRANSMITTER 3
RECEIVER/TRANSMITTER 2
RECEIVER/TRANSMITTER 1
RECEIVER
DATA PROCESSOR
ANTENNA SWITCH ASSEMBLY
DUPLEXER/FILTER
FREQUENCY SYNTHESIZER
POWER SUPPLY
POWER AMPLIFIER/MODULATOR
INTERNAL CONTROL
ARINC INTERFACE
RANGE COMPUTATION
BEARING COMPUTATION
DECODER
SELF TEST
TACAN 1
TACAN 2
TACAN 3
2 TAC
TACAN
BASIC REV D


RADAR ALTIMETER 2
RADAR ALTIMETER 1
RECEIVER
TRANSMITTER
ANALOG TRACKER
RANGE COMPUTER
DIGITAL CONVERTER
POWER SUPPLY
PLATE PULSE MODULATOR
PRF GENERATOR
SEARCH AND ACQUISITION WAVEFORMS AND TIMING
ANALOG TRACKER WAVEFORMS AND TIMING
DIGITAL TIMING RELATIONSHIPS
3 RDR ALT
RADAR ALTIMETER
SPACE SHUTTLE
9.3

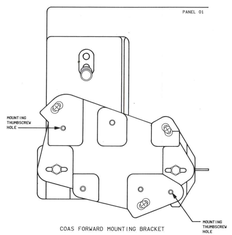

TRACKER/DECODER 3
TRACKER/DECODER 2
TRACKER/DECODER 1
RF ASSEMBLY 3
RF ASSEMBLY 2
RF ASSEMBLY 1
VIDEO PROCESSOR
TRACKING GATE CONTROL
TRACKING GATE
DATA PROCESSOR
PROGRAMMER
MDM INTERFACE
ANGLE FLAG GEN
RANGE TRIG AND FLAG GEN AND CHN SEL
BEAM DEFLN
BITE AND SELF TEST GEN
POWER SUPPLY
CLOCK
4 MLS
MICROWAVE SCANNING BEAM LANDING SYSTEM
BASIC REV D

DATE	NAMED	VERSION
11/2/87	NAMED VCS	VERSION# 1Rev.E

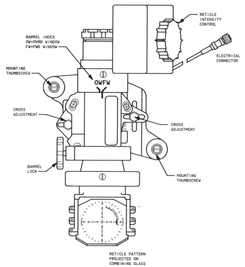
DATE	NAMED	VERSION
7/7/87	NAMED SKR	VERSION# 1Rev.C
9/23/87	NAMED JB	VERSION# 1Rev.D
11/2/87	NAMED VCS	VERSION# 1Rev.E



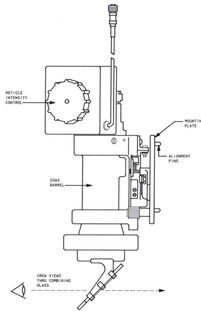
FORWARD STATION (+X AXIS)



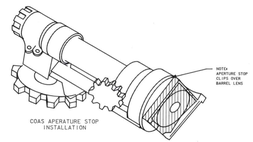
COAS FORWARD MOUNTING BRACKET



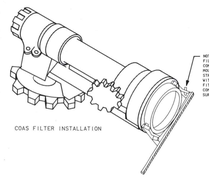
COAS (OPERATIONAL VIEW)



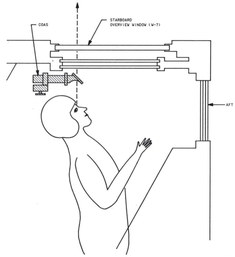
COAS (SIDE VIEW)



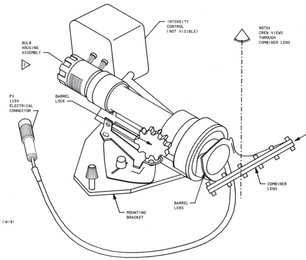
COAS APERATURE STOP INSTALLATION



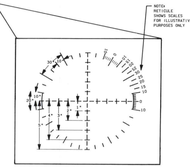
COAS FILTER INSTALLATION



AFT STATION (-Z AXIS)



CREWMAN OPTICAL ALIGNMENT SIGHT



RETICAL PATTERN

COAS CONFIGURATION AND OPERATION

▷ REFERENCE ROCKWELL DRAWINGS
V620-660702N TWO COAS MOUNTING BRACKET
V620-660701N AFT COAS MOUNTING BRACKET
V620-660801N COAS

▷ CONTINGENCY PROCEDURE
- REMOVE COVER, BULB, AND SHINE A FLASHLIGHT THROUGH THE BARREL TO ILLUMINATE RETICLE
- RETICLE BRIGHTNESS CAN BE CONTROLLED BY VARYING THE ANGLE OF THE FLASHLIGHT

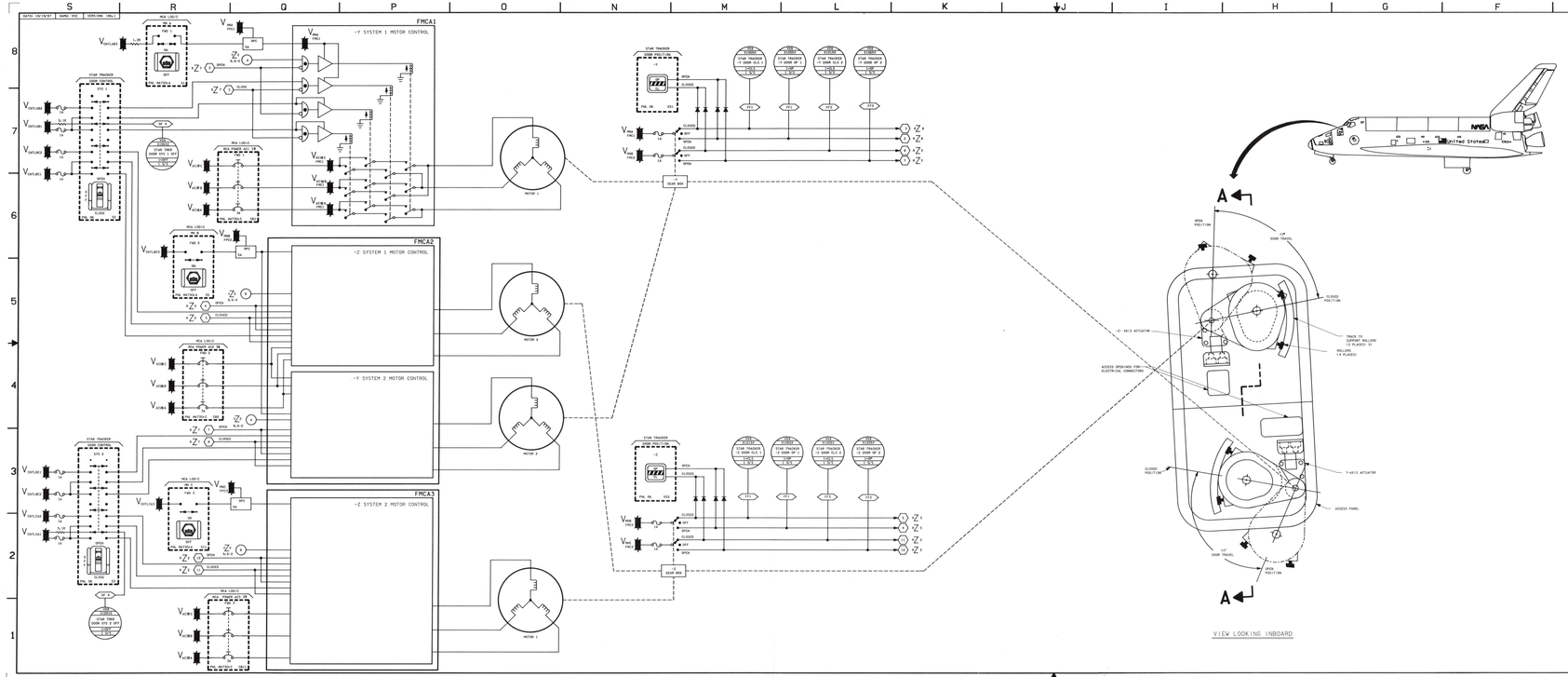
NOTES:▷
- AUTOMATIC RESET ON AMBIENT TEMPERATURE
- TWO MOUNTS (W-2000/40 WINDOW (+Z AXIS) OR STARBOARD WINDOW (+Y AXIS)) ARE REQUIRED FOR ALL CONFIGURATIONS
- POST BETA/HAC CALIBRATION WITH REMOUNTING IN SAME WINDOW
- 8 SPARE BULBS ARE SUPPLIED IN CARRYING CASE

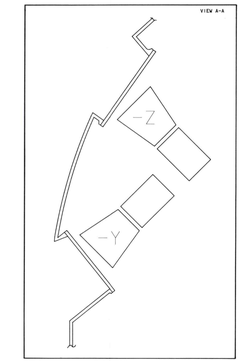
5 COAS

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSRN LMS	6-29-78	
CH		
ENGR		COAS
ENGR [illegible]	7/87	
APP [illegible]	11/87	
APP MANAGER		SPACE SHUTTLE DWG NO 9.5
ORIGINATOR [illegible]		ALL
CM #	DCN	SCALE NONE SHEET 1 OF 1

BASIC REV D

BASIC REV D





NOTES: 1. REFERENCE ROCKWELL DRAWING NO. V070-590002

6 STAR 1

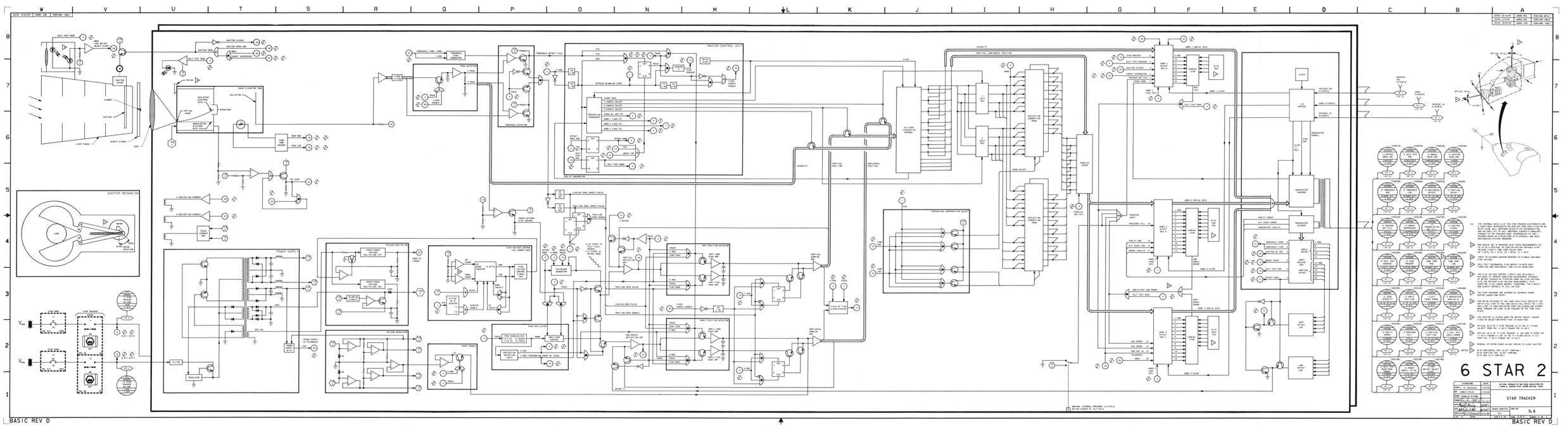
SIGNATURE	DATE
DSM: V.CELI, SL 3000277	V-13-79
DM: V.CELI, SL 3000277	V/13/79
MGR: SL ALFORD	
CHIEF: J. WILSON	
APP: R. MILLER	5/15
APP: PCO: W. FOX	5/16
PROGRAM: J. EDMONDSON	5/20

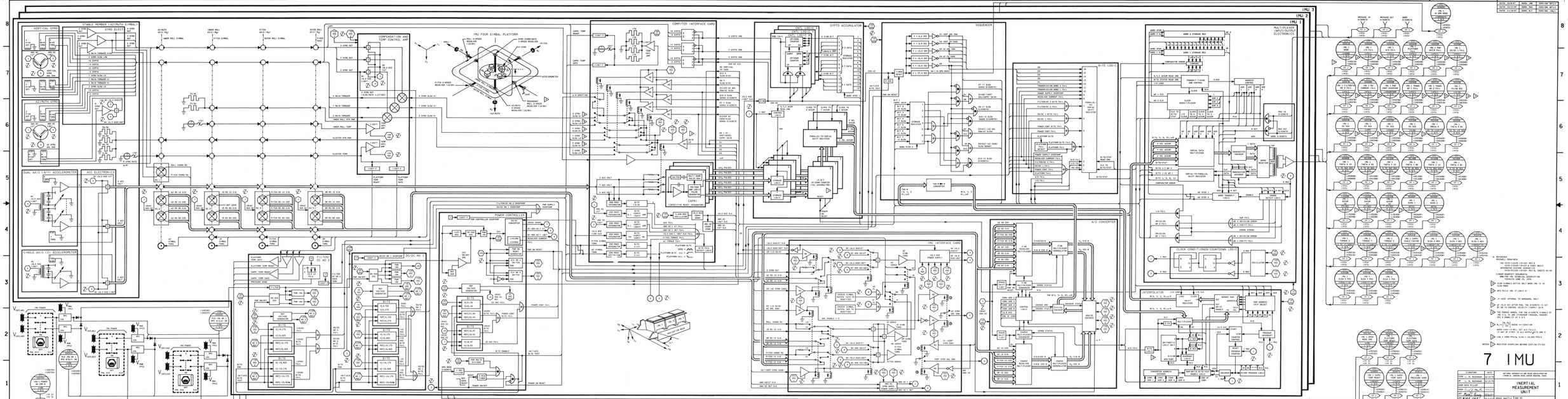
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS

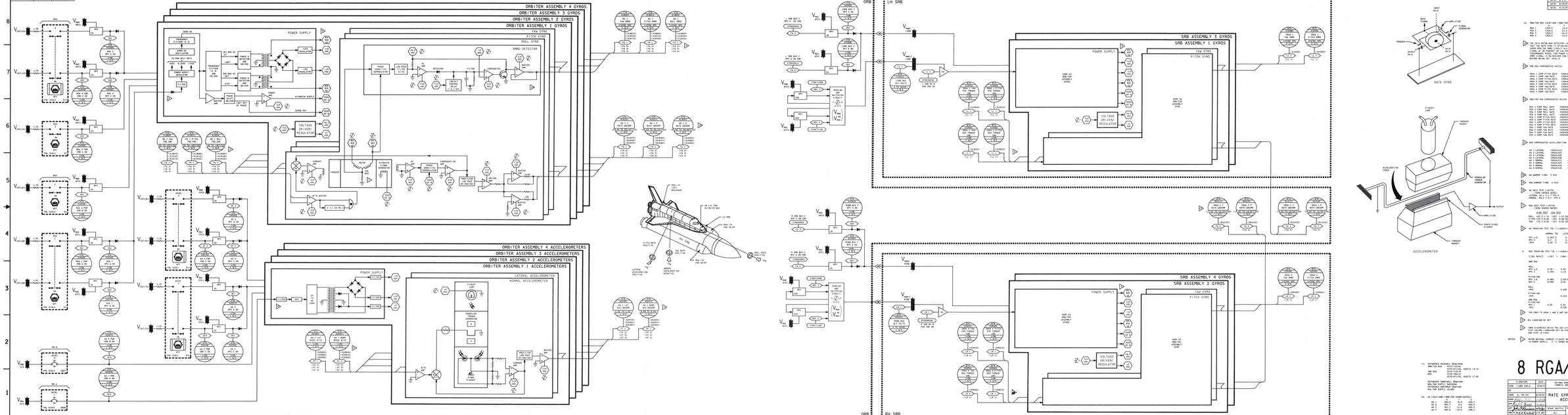
STAR TRACKER

SPACE SHUTTLE	DWG NO
ALL	9.6
CODE I.D. NO.	SHEET 1 OF 1

BASIC REV D


SHUTTER MECHANISM
POWER SUPPLY
MASTER CONTROL UNIT
STAR TRACKER
6 STAR 2
STAR TRACKER
SPACE SHUTTLE IMS NO. 9.6
BASIC REV D


IMU 3
IMU 2
IMU 1
STABLE MEMBER (AZ/AUTO GYROBALL)
VERTICAL GYRO
AZIMUTH GYRO
DUAL AXIS G/F ACCELEROMETER
SINGLE AXIS G/F ACCELEROMETER
ACC ELECTRONICS
COMPENSATION AND TEMP CONTROL AMP
IMU FOUR GIMBAL PLATFORM
COMPUTER INTERFACE CARD
DIFTO ACCUMULATOR
SEQUENCER
BITE LOGIC
MULTIPLEXER/INPUT/OUTPUT ELECTRONICS
POWER CONTROLLER
DC/DC NO 1
DC/DC NO 2
IMU INTERFACE CARD
A/D CONVERTER
INTERPOLATOR
CLOCK CONDITIONER/COUNTDOWN LOGIC
7 IMU
INERTIAL MEASUREMENT UNIT
BASIC REV D



8 RGA/BMA

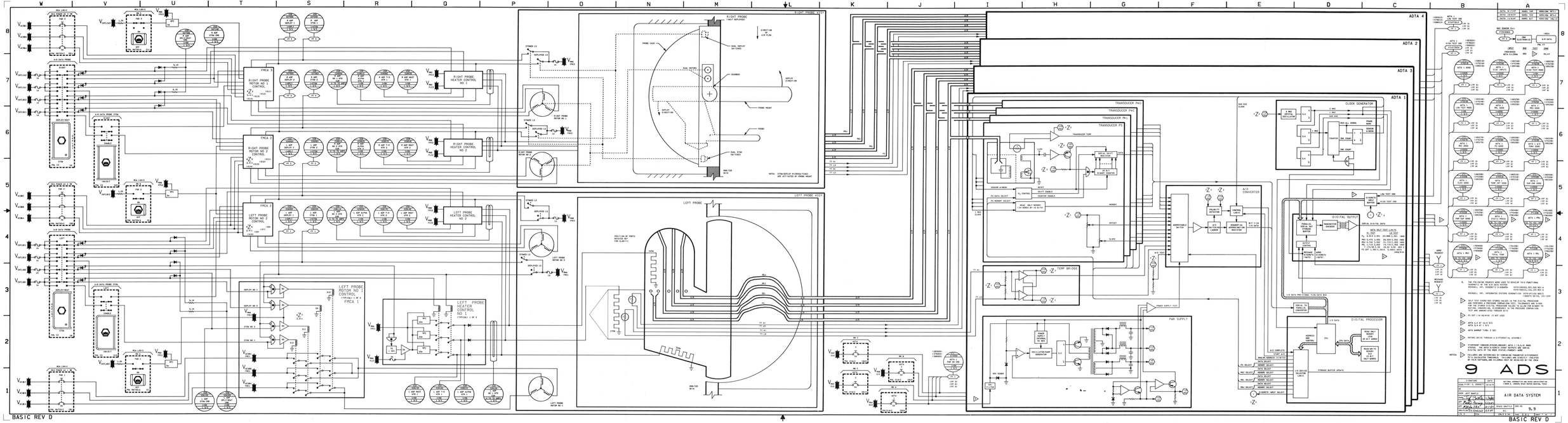
SIGNATURE	DATE	MATERIAL DESIGNATED AS AIR BRAKE (MANUFACTURER, NUMBER & GRADE) OTHER THAN SPECIFIED ON DRAWING
CHIEF, I-MEA DIV'S	8/26/75	
CHIEF, S, TPL CTR	8/26/97	
CHIEF, ENGINEERING	8/26/97	
CHIEF, ENGINEERING	8/26/97	
CHIEF, ENGINEERING	8/26/97	
N/A	DATE	

RATE GYRO/BODY MOUNTED ACCELEROMETERS

TRACE MASTER: 2ND REF: 9.8

SIZE: A | CAGE CODE: 81205 | SHEET: 8 OF 10

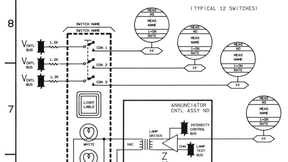
BASIC REV D

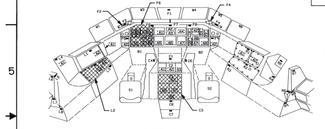

RIGHT PROBE ASSY
LEFT PROBE ASSY
ADTA 1
ADTA 2
ADTA 3
ADTA 4
RIGHT PROBE MOTOR NO 1 CONTROL
RIGHT PROBE MOTOR NO 2 CONTROL
LEFT PROBE MOTOR NO 2 CONTROL
LEFT PROBE MOTOR NO 1 CONTROL
RIGHT PROBE HEATER CONTROL NO 1
RIGHT PROBE HEATER CONTROL NO 2
LEFT PROBE HEATER CONTROL NO 2
LEFT PROBE HEATER CONTROL NO 1
RIGHT PROBE
LEFT PROBE
TRANSDUCER PW2
TRANSDUCER PW1
TRANSDUCER P3
TRANSDUCER TEMP
CLOCK GENERATOR
A/D CONVERTER
DIGITAL OUTPUT
DIGITAL PROCESSOR
PWR SUPPLY
ADTA SELF TEST LIMITS
AIR DATA SYSTEM
9 ADS
BASIC REV D

DATE: 9/29/87 MANG: BJT VERS:ON 1BSJ.2

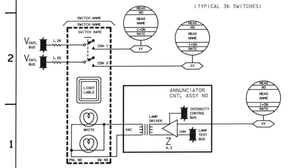
DATE: 10/26/87 MANG: TNG VERS:ON 3FLS
DATE: 9/11/87 MANG: FLS VERS:ON 1BSJ.2
DATE: 9/29/87 MANG: BJT VERS:ON 1BSJ.2

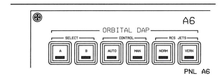
(TYPICAL 12 SWITCHES)





(TYPICAL 36 SWITCHES)





PNL A6

SWITCH NAME	PNL NO	SW NO	LIGHT LABEL	ANNUN CNTL ASSY Z AXIS	ANNUN CNTL ASSY CON	V_{DATA} BUS	FF MEM	HEAD NO	HEAD NAME	MAT'L ONE/ZERO WHEN
ORBITAL DAP, SELECT	A6	B1	A	Z_{A-1}	1	BC2	1	V70642478	AFT DAP SELECT A-A	LS, S W/S
					2	BC1	1	V70642479	AFT DAP SELECT A-B	LS, S W/S
					3	MDI	1	V70642480	AFT DAP SELECT A-C	LS, S W/S
		B1	B	Z_{A-1}	1	BC2	1	V70642481	AFT DAP SELECT B-A	LS, S W/S
					2	BC1	1	V70642482	AFT DAP SELECT B-B	LS, S W/S
					3	MDI	1	V70642483	AFT DAP SELECT B-C	LS, S W/S
ORBITAL DAP, CONTROL	A6	D10	AUTO	Z_{A-2}	1	DAI	1	V70642484	AFT DAP CNTL AUTO A	LS, S W/S
					2	BC2	1	V70642485	AFT DAP CNTL AUTO B	LS, S W/S
					3	BC1	1	V70642486	AFT DAP CNTL AUTO C	LS, S W/S
		D11	MAN	Z_{A-2}	1	DAI	1	V70642487	AFT DAP CNTL MAN A	LS, S W/S
					2	BC2	1	V70642488	AFT DAP CNTL MAN B	LS, S W/S
					3	BC1	1	V70642489	AFT DAP CNTL MAN C	LS, S W/S
ORBITAL DAP, RCS JETS	A6	D12	NORM	Z_{A-3}	1	DAI	1	V70642490	AFT RCS JETS NORM A	LS, S W/S
					2	BC2	1	V70642491	AFT RCS JETS NORM B	LS, S W/S
					3	BC1	1	V70642492	AFT RCS JETS NORM C	LS, S W/S
		D13	NORM	Z_{A-3}	1	MDI	1	V70642493	AFT RCS JETS NORM L	LS, S W/S
					2	DAI	1	V70642494	AFT RCS JETS NORM R	LS, S W/S
					3	BC2	1	V70642495	AFT RCS JETS NORM C	LS, S W/S
					4	BC1	1	V70642496	AFT RCS JETS NORM C	LS, S W/S



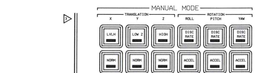
PNL A6

SWITCH NAME	PNL NO	SW NO	LIGHT LABEL	ANNUN CNTL ASSY Z AXIS	ANNUN CNTL ASSY CON	V_{DATA} BUS	FF MEM	HEAD NO	HEAD NAME	MAT'L ONE/ZERO WHEN
MANUAL MODE, TRANSLATION, X	A6	E16	LRCH	Z_{A-1}	1	BC2	1	V70685291	AFT TRANSL X HIGH A	LS, S W/S
					2	BC1	1	V70685292	AFT TRANSL X HIGH B	LS, S W/S
					3	MDI	1	V70685293	AFT TRANSL X HIGH C	LS, S W/S
		E20	NORM		1	BC2	1	V70685294	AFT TRANSL X NORM A	LS, S W/S
					2	BC1	1	V70685295	AFT TRANSL X NORM B	LS, S W/S
					3	MDI	1	V70685296	AFT TRANSL X NORM C	LS, S W/S
		E24	PULSE		1	DAI	1	V70685297	AFT TRANSL X PULSE A	LS, S W/S
					2	DAI	1	V70685298	AFT TRANSL X PULSE B	LS, S W/S
					3	DAI	1	V70685299	AFT TRANSL X PULSE C	LS, S W/S
MANUAL MODE, TRANSLATION, Y	A6	E19	LOW	Z_{A-1}	1	BC2	1	V70685300	AFT TRANSL Y LOW A	LS, S W/S
					2	BC1	1	V70685301	AFT TRANSL Y LOW B	LS, S W/S
					3	MDI	1	V70685302	AFT TRANSL Y LOW C	LS, S W/S
		E23	NORM		1	BC2	1	V70685303	AFT TRANSL Y NORM A	LS, S W/S
					2	BC1	1	V70685304	AFT TRANSL Y NORM B	LS, S W/S
					3	MDI	1	V70685305	AFT TRANSL Y NORM C	LS, S W/S
		E27	PULSE		1	DAI	1	V70685306	AFT TRANSL Y PULSE A	LS, S W/S
					2	DAI	1	V70685307	AFT TRANSL Y PULSE B	LS, S W/S
					3	DAI	1	V70685308	AFT TRANSL Y PULSE C	LS, S W/S
MANUAL MODE, TRANSLATION, Z	A6	E18	HIGH	Z_{A-2}	1	BC2	1	V70685309	AFT TRANSL Z HIGH A	LS, S W/S
					2	BC1	1	V70685310	AFT TRANSL Z HIGH B	LS, S W/S
					3	MDI	1	V70685311	AFT TRANSL Z HIGH C	LS, S W/S
		E22	NORM		1	DAI	1	V70685312	AFT TRANSL Z NORM A	LS, S W/S
					2	DAI	1	V70685313	AFT TRANSL Z NORM B	LS, S W/S
					3	DAI	1	V70685314	AFT TRANSL Z NORM C	LS, S W/S
		E26	PULSE		1	BC2	1	V70685315	AFT TRANSL Z PULSE A	LS, S W/S
					2	BC1	1	V70685316	AFT TRANSL Z PULSE B	LS, S W/S
					3	MDI	1	V70685317	AFT TRANSL Z PULSE C	LS, S W/S
MANUAL MODE, ROTATION, ROLL	A6	E17	DISC RATE	Z_{A-2}	1	DAI	1	V70685318	AFT ROT RGL DISC A	LS, S W/S
					2	BC2	1	V70685319	AFT ROT RGL DISC B	LS, S W/S
					3	BC1	1	V70685320	AFT ROT RGL DISC C	LS, S W/S
		E21	ACCEL		1	DAI	1	V70685321	AFT ROT RGL ACCEL A	LS, S W/S
					2	BC2	1	V70685322	AFT ROT RGL ACCEL B	LS, S W/S
					3	BC1	1	V70685323	AFT ROT RGL ACCEL C	LS, S W/S
		E25	PULSE		1	DAI	1	V70685324	AFT ROT RGL PULSE A	LS, S W/S
					2	DAI	1	V70685325	AFT ROT RGL PULSE B	LS, S W/S
					3	DAI	1	V70685326	AFT ROT RGL PULSE C	LS, S W/S
MANUAL MODE, ROTATION, PITCH	A6	E14	DISC RATE	Z_{A-3}	1	DAI	1	V70685327	AFT ROT PITCH DISC A	LS, S W/S
					2	BC2	1	V70685328	AFT ROT PITCH DISC B	LS, S W/S
					3	BC1	1	V70685329	AFT ROT PITCH DISC C	LS, S W/S
		E15	ACCEL		1	DAI	1	V70685330	AFT ROT PITCH ACCEL A	LS, S W/S
					2	BC2	1	V70685331	AFT ROT PITCH ACCEL B	LS, S W/S
					3	BC1	1	V70685332	AFT ROT PITCH ACCEL C	LS, S W/S
		E13	PULSE		1	DAI	1	V70685333	AFT ROT PITCH PULSE A	LS, S W/S
					2	DAI	1	V70685334	AFT ROT PITCH PULSE B	LS, S W/S
					3	DAI	1	V70685335	AFT ROT PITCH PULSE C	LS, S W/S
MANUAL MODE, ROTATION, YAW	A6	E11	DISC RATE	Z_{A-3}	1	DAI	1	V70685336	AFT ROT YAW DISC A	LS, S W/S
					2	BC2	1	V70685337	AFT ROT YAW DISC B	LS, S W/S
					3	BC1	1	V70685338	AFT ROT YAW DISC C	LS, S W/S
		E10	ACCEL		1	DAI	1	V70685339	AFT ROT YAW ACCEL A	LS, S W/S
					2	BC2	1	V70685340	AFT ROT YAW ACCEL B	LS, S W/S
					3	BC1	1	V70685341	AFT ROT YAW ACCEL C	LS, S W/S
		E12	PULSE		1	DAI	1	V70685342	AFT ROT YAW PULSE A	LS, S W/S
					2	DAI	1	V70685343	AFT ROT YAW PULSE B	LS, S W/S
					3	DAI	1	V70685344	AFT ROT YAW PULSE C	LS, S W/S



PNL C3

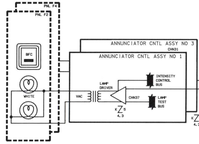
SWITCH NAME	PNL NO	SW NO	LIGHT LABEL	ANNUN CNTL ASSY Z AXIS	ANNUN CNTL ASSY CON	V_{DATA} BUS	FF MEM	HEAD NO	HEAD NAME	MAT'L ONE/ZERO WHEN
ORBITAL DAP, SELECT	C3	B1	A	Z_{A-1}	1	MDI	1	V70639058	FWD DAP SELECT A-A	LS, S W/S
					2	DAI	1	V70639059	FWD DAP SELECT A-B	LS, S W/S
					3	BC2	1	V70639060	FWD DAP SELECT A-C	LS, S W/S
		B2	B	Z_{A-1}	1	MDI	1	V70639061	FWD DAP SELECT B-A	LS, S W/S
					2	DAI	1	V70639062	FWD DAP SELECT B-B	LS, S W/S
					3	BC2	1	V70639063	FWD DAP SELECT B-C	LS, S W/S
ORBITAL DAP, CONTROL	C3	E3	AUTO	Z_{A-2}	1	MDI	1	V70639064	FWD DAP CNTL AUTO A	LS, S W/S
					2	DAI	1	V70639065	FWD DAP CNTL AUTO B	LS, S W/S
					3	BC1	1	V70639066	FWD DAP CNTL AUTO C	LS, S W/S
		E4	MAN	Z_{A-2}	1	MDI	1	V70639067	FWD DAP CNTL MAN A	LS, S W/S
					2	DAI	1	V70639068	FWD DAP CNTL MAN B	LS, S W/S
					3	BC1	1	V70639069	FWD DAP CNTL MAN C	LS, S W/S
ORBITAL DAP, RCS JETS	C3	E5	NORM	Z_{A-3}	1	MDI	1	V70639070	FWD RCS JETS NORM A	LS, S W/S
					2	DAI	1	V70639071	FWD RCS JETS NORM B	LS, S W/S
					3	BC2	1	V70639072	FWD RCS JETS NORM C	LS, S W/S
		E6	NORM	Z_{A-3}	1	MDI	1	V70639073	FWD RCS JETS NORM L	LS, S W/S
					2	DAI	1	V70639074	FWD RCS JETS NORM R	LS, S W/S
					3	BC2	1	V70639075	FWD RCS JETS NORM C	LS, S W/S
					4	BC1	1	V70639076	FWD RCS JETS NORM C	LS, S W/S



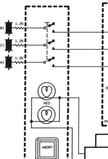
PNL C3

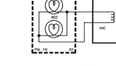
SWITCH NAME	PNL NO	SW NO	LIGHT LABEL	ANNUN CNTL ASSY Z AXIS	ANNUN CNTL ASSY CON	V_{DATA} BUS	FF MEM	HEAD NO	HEAD NAME	MAT'L ONE/ZERO WHEN
MANUAL MODE, TRANSLATION, X	C3	E16	LRCH	Z_{A-1}	1	MDI	1	V70638989	FWD TRANSL X HIGH A	LS, S W/S
					2	DAI	1	V70638990	FWD TRANSL X HIGH B	LS, S W/S
					3	BC2	1	V70638991	FWD TRANSL X HIGH C	LS, S W/S
		E20	NORM		1	MDI	1	V70638992	FWD TRANSL X NORM A	LS, S W/S
					2	DAI	1	V70638993	FWD TRANSL X NORM B	LS, S W/S
					3	BC2	1	V70638994	FWD TRANSL X NORM C	LS, S W/S
		E24	PULSE		1	MDI	1	V70638995	FWD TRANSL X PULSE A	LS, S W/S
					2	DAI	1	V70638996	FWD TRANSL X PULSE B	LS, S W/S
					3	BC2	1	V70638997	FWD TRANSL X PULSE C	LS, S W/S
MANUAL MODE, TRANSLATION, Y	C3	E19	LOW	Z_{A-1}	1	MDI	1	V70638998	FWD TRANSL Y LOW A	LS, S W/S
					2	DAI	1	V70638999	FWD TRANSL Y LOW B	LS, S W/S
					3	BC2	1	V70639000	FWD TRANSL Y LOW C	LS, S W/S
		E23	NORM		1	MDI	1	V70639001	FWD TRANSL Y NORM A	LS, S W/S
					2	DAI	1	V70639002	FWD TRANSL Y NORM B	LS, S W/S
					3	BC2	1	V70639003	FWD TRANSL Y NORM C	LS, S W/S
		E27	PULSE		1	MDI	1	V70639004	FWD TRANSL Y PULSE A	LS, S W/S
					2	DAI	1	V70639005	FWD TRANSL Y PULSE B	LS, S W/S
					3	BC2	1	V70639006	FWD TRANSL Y PULSE C	LS, S W/S
MANUAL MODE, TRANSLATION, Z	C3	E18	HIGH	Z_{A-2}	1	MDI	1	V70639007	FWD TRANSL Z HIGH A	LS, S W/S
					2	DAI	1	V70639008	FWD TRANSL Z HIGH B	LS, S W/S
					3	BC2	1	V70639009	FWD TRANSL Z HIGH C	LS, S W/S
		E22	NORM		1	MDI	1	V70639010	FWD TRANSL Z NORM A	LS, S W/S
					2	DAI	1	V70639011	FWD TRANSL Z NORM B	LS, S W/S
					3	BC2	1	V70639012	FWD TRANSL Z NORM C	LS, S W/S
		E26	PULSE		1	MDI	1	V70639013	FWD TRANSL Z PULSE A	LS, S W/S
					2	DAI	1	V70639014	FWD TRANSL Z PULSE B	LS, S W/S
					3	BC2	1	V70639015	FWD TRANSL Z PULSE C	LS, S W/S
MANUAL MODE, ROTATION, ROLL	C3	E17	DISC RATE	Z_{A-2}	1	MDI	1	V70639016	FWD ROT RGL DISC A	LS, S W/S
					2	DAI	1	V70639017	FWD ROT RGL DISC B	LS, S W/S
					3	BC2	1	V70639018	FWD ROT RGL DISC C	LS, S W/S
		E21	ACCEL		1	MDI	1	V70639019	FWD ROT RGL ACCEL A	LS, S W/S
					2	DAI	1	V70639020	FWD ROT RGL ACCEL B	LS, S W/S
					3	BC2	1	V70639021	FWD ROT RGL ACCEL C	LS, S W/S
		E25	PULSE		1	MDI	1	V70639022	FWD ROT RGL PULSE A	LS, S W/S
					2	DAI	1	V70639023	FWD ROT RGL PULSE B	LS, S W/S
					3	BC2	1	V70639024	FWD ROT RGL PULSE C	LS, S W/S
MANUAL MODE, ROTATION, PITCH	C3	E14	DISC RATE	Z_{A-3}	1	MDI	1	V70639025	FWD ROT PITCH DISC A	LS, S W/S
					2	DAI	1	V70639026	FWD ROT PITCH DISC B	LS, S W/S
					3	BC2	1	V70639027	FWD ROT PITCH DISC C	LS, S W/S
		E15	ACCEL		1	MDI	1	V70639028	FWD ROT PITCH ACCEL A	LS, S W/S
					2	DAI	1	V70639029	FWD ROT PITCH ACCEL B	LS, S W/S
					3	BC2	1	V70639030	FWD ROT PITCH ACCEL C	LS, S W/S
		E13	PULSE		1	MDI	1	V70639031	FWD ROT PITCH PULSE A	LS, S W/S
					2	DAI	1	V70639032	FWD ROT PITCH PULSE B	LS, S W/S
					3	BC2	1	V70639033	FWD ROT PITCH PULSE C	LS, S W/S
MANUAL MODE, ROTATION, YAW	C3	E11	DISC RATE	Z_{A-3}	1	MDI	1	V70639034	FWD ROT YAW DISC A	LS, S W/S
					2	DAI	1	V70639035	FWD ROT YAW DISC B	LS, S W/S
					3	BC2	1	V70639036	FWD ROT YAW DISC C	LS, S W/S
		E10	ACCEL		1	MDI	1	V70639037	FWD ROT YAW ACCEL A	LS, S W/S
					2	DAI	1	V70639038	FWD ROT YAW ACCEL B	LS, S W/S
					3	BC2	1	V70639039	FWD ROT YAW ACCEL C	LS, S W/S
		E12	PULSE		1	MDI	1	V70639040	FWD ROT YAW PULSE A	LS, S W/S
					2	DAI	1	V70639041	FWD ROT YAW PULSE B	LS, S W/S
					3	BC2	1	V70639042	FWD ROT YAW PULSE C	LS, S W/S

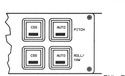




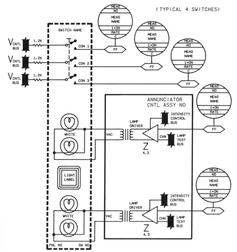




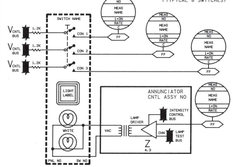




(TYPICAL 4 SWITCHES)



(TYPICAL 8 SWITCHES)

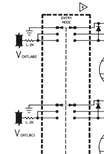


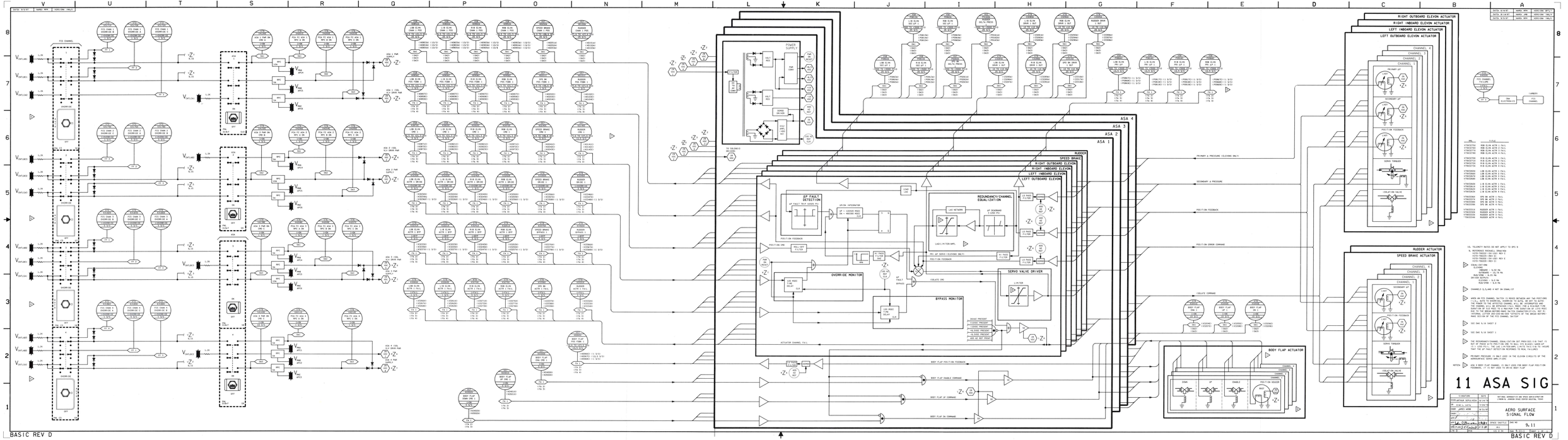
SWITCH NAME	PNL NO	SW NO	LIGHT LABEL	ANNUN CNTL ASSY Z AXIS	ANNUN CNTL ASSY CON	V_{DATA} BUS	FF MEM	HEAD NO	HEAD NAME	MAT'L ONE/ZERO WHEN
SPD BRK/THROT	F2	B8	AUTO/MAN	Z_{A-1}	1	MDI	1	V70615704	LH SPD BRK/THROT A/M A	LS, S W/S
					2	DAI	1	V70615705	LH SPD BRK/THROT A/M B	LS, S W/S
					3	BC2	1	V70615706	LH SPD BRK/THROT A/M C	LS, S W/S
BODY FLAP	F2	B5	AUTO/MAN	Z_{A-1}	1	MDI	1	V70649951	LH BODY FLAP A/M A	LS, S W/S
					2	DAI	1	V70649952	LH BODY FLAP A/M B	LS, S W/S
					3	BC2	1	V70649953	LH BODY FLAP A/M C	LS, S W/S
				Z_{A-2} U/D	1	---	1	V70649954	LH BODY FLAP AUTO LT	LS, S W/S
					2	---	1	V70649955	LH BODY FLAP MAN LT	LS, S W/S

SWITCH NAME	PNL NO	SW NO	LIGHT LABEL	ANNUN CNTL ASSY Z AXIS	ANNUN CNTL ASSY CON	V_{DATA} BUS	FF MEM	HEAD NO	HEAD NAME	MAT'L ONE/ZERO WHEN
PITCH	F2	B2	AUTO	Z_{A-1}	1	MDI	1	V70652516	LH PITCH AUTO MODE A	LS, S W/S
					2	DAI	1	V70652517	LH PITCH AUTO MODE B	LS, S W/S
					3	BC2	1	V70652518	LH PITCH AUTO MODE C	LS, S W/S
		B3	CSS		1	MDI	1	V70652401	LH PITCH CSS MODE A	LS, S W/S
					2	DAI	1	V70652402	LH PITCH CSS MODE B	LS, S W/S
					3	BC2	1	V70652519	LH PITCH CSS MODE C	LS, S W/S
ROLL/YAW	F2	B5	AUTO	Z_{A-1}	1	MDI	1	V70652520	LH R/Y AUTO MODE A	LS, S W/S
					2	DAI	1	V70652521	LH R/Y AUTO MODE B	LS, S W/S
					3	BC2	1	V70652522	LH R/Y AUTO MODE C	LS, S W/S
		B6	CSS		1	MDI	1	V70652523	LH R/Y CSS MODE A	LS, S W/S
					2	DAI	1	V70652524	LH R/Y CSS MODE B	LS, S W/S
					3	BC2	1	V70652525	LH R/Y CSS MODE C	LS, S W/S

SWITCH NAME	PNL NO	SW NO	LIGHT LABEL	ANNUN CNTL ASSY Z AXIS	ANNUN CNTL ASSY CON	V_{DATA} BUS	FF MEM	HEAD NO	HEAD NAME	MAT'L ONE/ZERO WHEN
SPD BRK/THROT	F4	B8	AUTO/MAN	Z_{A-1}	1	BC2	1	V70652850	RH SPD BRK/THROT A/M A	LS, S W/S
					2	DAI	1	V70652851	RH SPD BRK/THROT A/M B	LS, S W/S
					3	MDI	1	V70652852	RH SPD BRK/THROT A/M C	LS, S W/S
BODY FLAP	F4	B5	AUTO/MAN	Z_{A-1}	1	BC2	1	V70649850	RH BODY FLAP A/M A	LS, S W/S
					2	DAI	1	V70649851	RH BODY FLAP A/M B	LS, S W/S
					3	MDI	1	V70649852	RH BODY FLAP A/M C	LS, S W/S
				Z_{A-2} U/D	1	---	1	V70649853	RH BODY FLAP AUTO LT	LS, S W/S
					2	---	1	V70649854	RH BODY FLAP MAN LT	LS, S W/S

SWITCH NAME	PNL NO	SW NO	LIGHT LABEL	ANNUN CNTL ASSY Z AXIS	ANNUN CNTL ASSY CON	V_{DATA} BUS	FF MEM	HEAD NO	HEAD NAME	MAT'L ONE/ZERO WHEN
PITCH	F4	B2	AUTO	Z_{A-1}	1	BC2	1	V70652514	RH PITCH AUTO MODE A	LS, S W/S
					2	DAI	1	V70652515	RH PITCH AUTO MODE B	LS, S W/S
					3	MDI	1	V70652400	RH PITCH AUTO MODE C	LS, S W/S
		B3	CSS		1	BC2	1	V70652403	RH PITCH CSS MODE A	LS, S W/S
					2	DAI	1	V70652404	RH PITCH CSS MODE B	LS, S W/S
					3	MDI	1	V70652516	RH PITCH CSS MODE C	LS, S W/S
ROLL/YAW	F4	B5	AUTO	Z_{A-1}	1	BC2	1	V70652517	RH R/Y AUTO MODE A	LS, S W/S
					2	DAI	1	V70652518	RH R/Y AUTO MODE B	LS, S W/S
					3	MDI	1	V70652519	RH R/Y AUTO MODE C	LS, S W/S
		B6	CSS		1	BC2	1	V70652520	RH R/Y CSS MODE A	LS, S W/S
					2	DAI	1	V70652521	RH R/Y CSS MODE B	LS, S W/S
					3	MDI	1	V70652522	RH R/Y CSS MODE C	LS, S W/S


MODE
PITCH
ROLL/YAW
AUTO
MAN
CSS
MDI
BC1
BC2
DAI
VDATA BUS
VDATA BUS
VDATA BUS
MDI
BC1
BC2
DAI
LS SW A
LS SW B
LS SW C
LS SW D
MDI
BC1
BC2
DAI
MDI
BC1
BC2
DAI
MDI
BC1
BC2
DAI


11 ASA SIG
AERO SURFACE SIGNAL FLOW
RIGHT OUTBOARD ELEVON ACTUATOR
RIGHT INBOARD ELEVON ACTUATOR
LEFT INBOARD ELEVON ACTUATOR
LEFT OUTBOARD ELEVON ACTUATOR
RUDDER ACTUATOR
SPEED BRAKE ACTUATOR
BODY FLAP ACTUATOR
ASA 1
ASA 2
ASA 3
ASA 4
RUDDER
SPEED BRAKE
RIGHT OUTBOARD ELEVON
RIGHT INBOARD ELEVON
LEFT INBOARD ELEVON
LEFT OUTBOARD ELEVON
ΔP FAULT DETECTION
REDUNDANCY/CHANNEL EQUALIZATION
OVERRIDE MONITOR
BYPASS MONITOR
SERVO VALVE DRIVER
POWER SUPPLY
BASIC REV D

DATE	NAME	VERSION
8/31/87		

DATE	NAME	VERSION
9/28/89	WOO	VERSION ONLY
9/28/89	MOJ	VERSION APP'L
8/31/87	CAR	VERSION ONLY

LEFT OMS TVC
RIGHT OMS TVC
SECONDARY YAW
SECONDARY PITCH
PRIMARY YAW
PRIMARY PITCH

POSITION XDUCER DEMOD
SYNCHRO DEMOD 'R'
SYNCHRO DEMOD 'P'
SYNCHRO DECODER
HYSTERESIS SWITCHES/OPTICAL ISOL
MOTOR DRIVERS
PITCH/YAW SECONDARY PWR SUPPLY
PITCH/YAW PRIMARY PWR SUPPLY
VELOCITY CONTROL
CURRENT LIMITERS (10 AMPS)
EXTEND
RETRACT
EXTEND END
RETRACT END
TOTAL CURRENT SHUT-DOWN
SYNCHRO/EXCIT SIGNO
LVDT SIGNO DRIVE
LVDT EXCIT
CURRENT SENSOR

RIGHT OMS ENGINE

GIMBAL NULL MOUNTING ANGLES AND DEFLECTION RANGE

PITCH

NO-BACK DEVICE DETAIL

YAW ACTUATOR
PITCH ACTUATOR

1. REFERENCE ROCKWELL DRAWINGS
   1 OMS PRO V2370-420000 (SV-122) & SUBSI
   V2370-420000 (SV-123)
   R OMS PRO V2370-420000 (SV-122) & SUBSI
   V2370-420000 (SV-123)
2. EACH PC CONSISTS OF TWO CONTROLLERS, THE PRIMARY CONTROLLER DRIVES THE PRIMARY PITCH AND YAW, THE SECONDARY CONTROLLER DRIVES THE SECONDARY PITCH AND YAW
3. OVER A 2 SEC (+1 SEC) CYMER TUNED NULL THECURRENT LIMITER THRESHOLD VALUE CHANGES FROM 10 AMPS TOA VALUE EQUAL TO 25 PERCENT OF NORMAL PHASE TO NEUTRAL
4. THE SAMPLE RATE IS 25 S/S IN SPS # 2 12.5 S/S IN SPS # NO 1 S/S IN SPS #
5. THE SAMPLE RATE IS 25 S/S IN SPS #
6. ACTUATOR MOVEMENT IN ONE AXIS CAUSES A SMALL MOVEMENT OF THE OTHER AXIS. THE AMOUNT OF MOVEMENT IS A FUNCTION OF THE POSITION TRANSDUCER OUTPUT BECAUSE THE TRANSDUCER IS MOUNTED ON THE ACTUATOR CENTER AND NOT THE ENGINE GIMBAL ANGLE

NOTES:

SYMBOL ACTUATOR PERFORMANCE DATA

	DEGREES	DEGREES/SEC
STROKE	PITCH	16.75
	YAW	16.75
HYSTERESIS	DEADZONE	.125
	HYSTERESIS	.1
ACCELERATION RATIO	20LT /W/SEC² MIN 51.5Y/SEC² 5.1 SM/SEC MIN 51Y/SEC	

13 OMS/TVC & DR

SIGNATURE	DATE
EDDIE LAMEE BUCKNAM	7/24/92
OMAR N. MITCHELL	9/29/87

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS

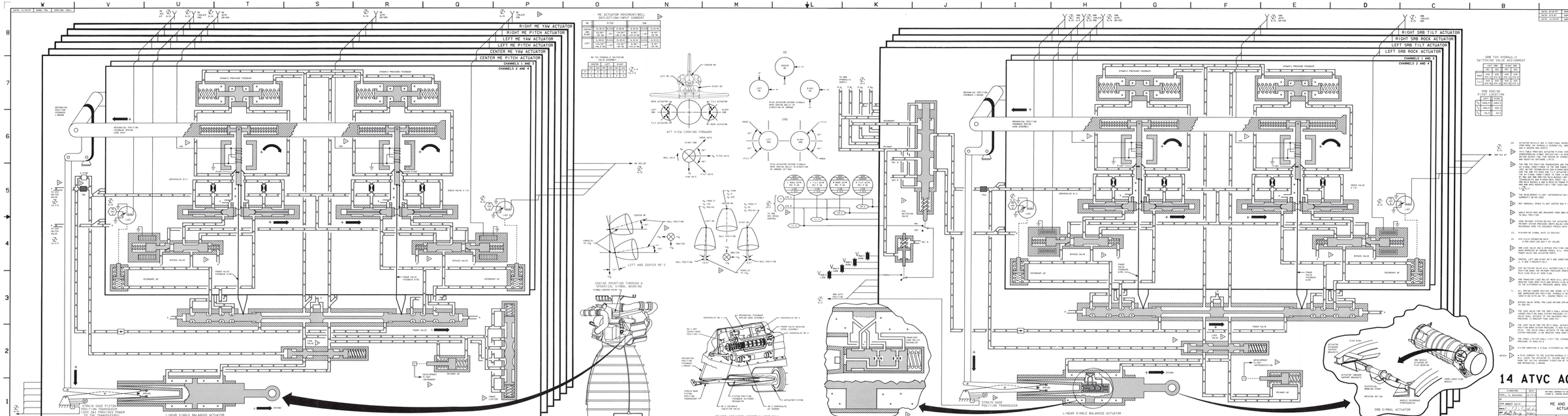
OMS/TVC SIGNAL FLOW AND DRIVERS

SPACE SHUTTLE PRO NO 9.13

SCALE NONE | SHEET 1 OF 1

BASIC REV D

BASIC REV D

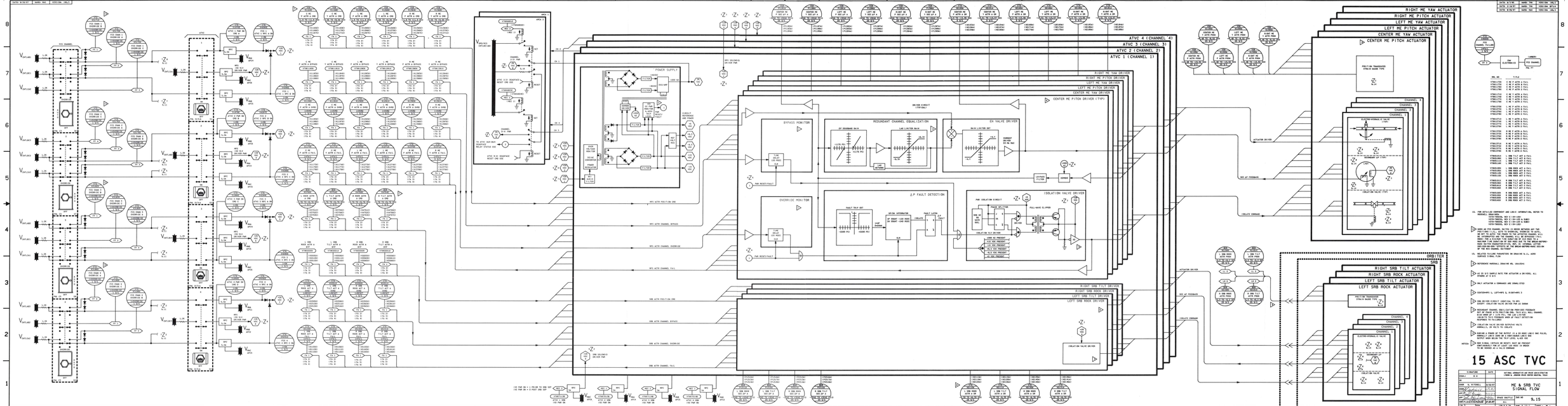


1. ACTUATOR DETAILS ARE A FUNCTIONAL REPRESENTATION (NON-HSI) FROM WHICH THE HYDRAULIC SCHEMATICS, SRB EXTRACTIVATOR SCHEMATICS WERE DRAWN.
2. THIS TABLE PROVIDES ACTUATOR PISTON STROKE (SHOWN IN INCHES) CORRESPONDING SIGNAL DEFLECTION IN DEGREES AND MILLIAMPERES FOR THE ACTUATOR SERVOVALVES AS DEFINED BY THE MDAC AND REMOTE/SAT FLIGHT SOFTWARE (1973)
3. THE SRB TVC POSITION TRANSDUCERS ARE PHASED BY THE 14 ATVC DIRECT/ORDER ON THE SRB POWER SYSTEM/BUTTON SYSTEM SWITCH ASSIGNMENT. THE TRANSDUCERS ARE PHASED SO THAT THE SRB TVC MODE AND TILT ACTUATOR MODE(S) WILL BE ACCOMPLISHED BY THE SRB TVC SWITCH ASSIGNMENT AS SHOWN BY MAX AND MAX DEFLECTION BLOCKED (MDC) (ALSO) THE SRB TVC SWITCH ASSIGNMENT IS SHOWN IN THE TABLE ON THE SRB MAIN BUSSES A AND B RESPECTIVELY POWER FROM APU 1, 2 AND 3 (A, B, C) AND RESPECTIVELY FIRST STEER ONLY SHEET 3A.
4. THE DEVELOPMENT FLIGHT INSTRUMENTATION (DFI) IS NOT CURRENTLY BEING USED
5. ROT MARSHALL SPACE FLIGHT CENTER DWG # 10A10241C
6. ANGLE ROTATIONS ARE MEASURED FROM SRB/SSV BODY AXIS
7. SRB PRIMARY SYSTEM DRIVES THE ACTUATOR UNTIL THAT SYSTEM'S LVDT SENSES THE COMMAND POSITION. (SEE REFERENCE SRB TVC DESIGNED PHASIS/DES)
8. MINIMUM MS SIMBAL RATE IS 350/DEG
9. MTO FLUID EXPANSION RATE
   .4 PER CENT/DEG DEG F BY VOLUME
10. SRB LOCK VALVE WILL BE A BYPASS WITH LOW-RATE SPOOL IN ONLY THAT AREA OPERATED BY ORGANO DRIVEN, #11 INTERCONNECT ALL FOUR POWER VALVE AND ACTUATOR PORTS
11. CENTER, LEFT AND RIGHT ME'S ARE SOMETIMES CALLED ME'S 1, 2 AND 3 RESPECTIVELY
12. MTO SWITCHING VALVE WILL AUTOMATICALLY SWITCH TO THE DESIGNATED SYSTEM WHEN SYSTEM PRESSURE DROPS TO 2225 PSIG FROM 3050 PSIG FOR FILL AT 3050 PSIG
13. SRB TRANSIENT LOAD RELIEF MOD KITS ACTUATE AT MID PRESSURE SWITCH FROM 3050 PSIG TO 3400 PSIG WITH FLOW RATE BY PROPORTIONAL FLOW
14. ALL SPRING LOADED DEVICES ARE SHOWN IN THE DE-ENERGIZED AND DEPRESSURIZED POSITION. HYDRAULIC RETURN LINES ARE VENTED TO AMBIENT
15. BYPASS VALVE SPOOL PRE-LOAD RETURN SPRING IS 250LBS TO 300 PSI
16. THE LOCK VALVE FOR THE SRB'S SHALL ACTUATE TO THE LOCKED POSITION WHEN SYSTEM PRESSURE IS 800 OR LESS. THE LOCK VALVE SHALL ACTUATE TO THE UNLOCKED POSITION WHEN SYSTEM PRESSURE IS GREATER THAN 1000 PSI
17. THE LOCK VALVE FOR THE ME'S SHALL ACTUATE TO THE LOCKED POSITION WHEN SYSTEM PRESSURE IS 1500 PSIG OR LESS. THE LOCK VALVE SHALL ACTUATE TO THE UNLOCKED POSITION WHEN SYSTEM PRESSURE IS 1700 PSIG OR GREATER THAN 3000 PSIG
18. THE STAGE 2 ACTUATOR SHALL LIMIT THE INTERNAL ETC/SRB PRESSURE TO 4000 PSIG
19. PISTON EXPOSURE A EQUAL TO PISTON'AL PRESSURE (SEE-ACTUATOR
NOTES: A PILOT EXPOSED TO THE ELECTRO-HYDRAULIC SERVO VALVES IS SUCH THAT THE PISTON WILL MOVE IN THE DIRECTION OF THE ARROW WHEN THE ELECTRICAL POLARITY/DIRECTION OF THE SIGNALS ARE REVERSED AS SHOWN

14 ATVC ACTRS

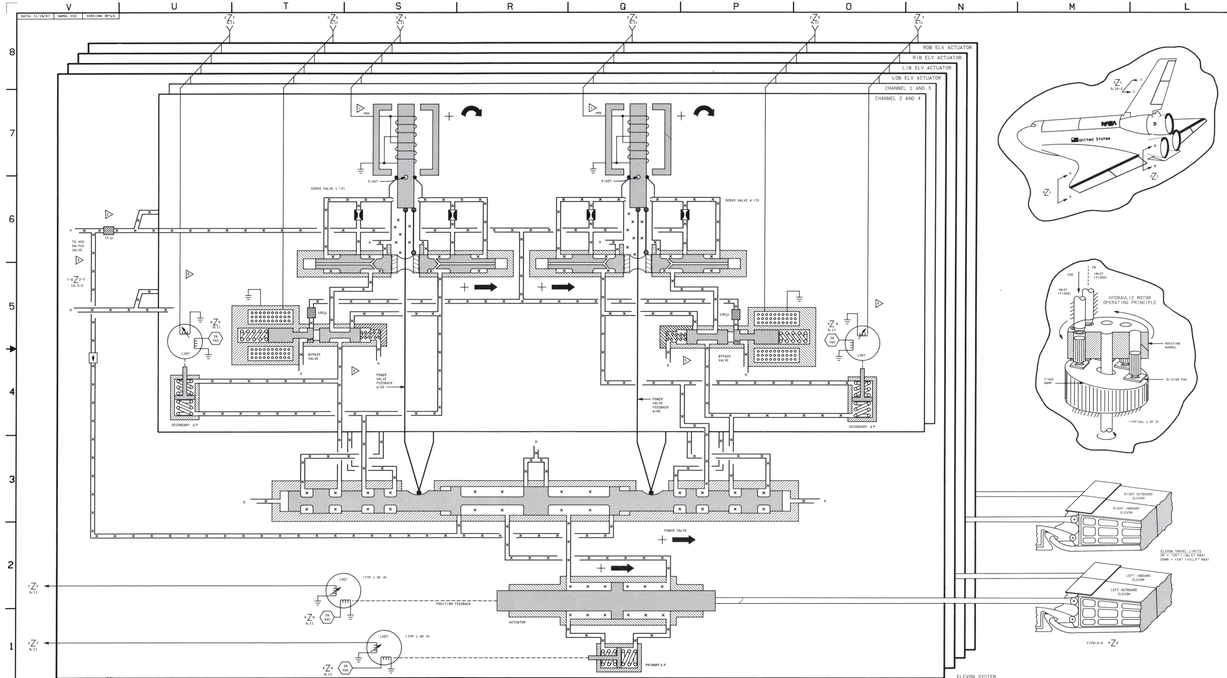
SIGNATURE	DATE	MATERIAL, FABRICATION AND BRAND SPECIFICATIONS
DRAWN: L. N. BUSHMAN	10-1-73	CHEMICAL, MECHANICAL AND ELECTRICAL
CHIEF DRAFTSMAN:		
CHIEF PROJECT ENGINEER:		ME AND SRB TVC ACTUATORS
APPROVED:		
APPROVED:		SPACE SHUTTLE ME 9.14
		SCALE NONE SHEET 1 OF 1

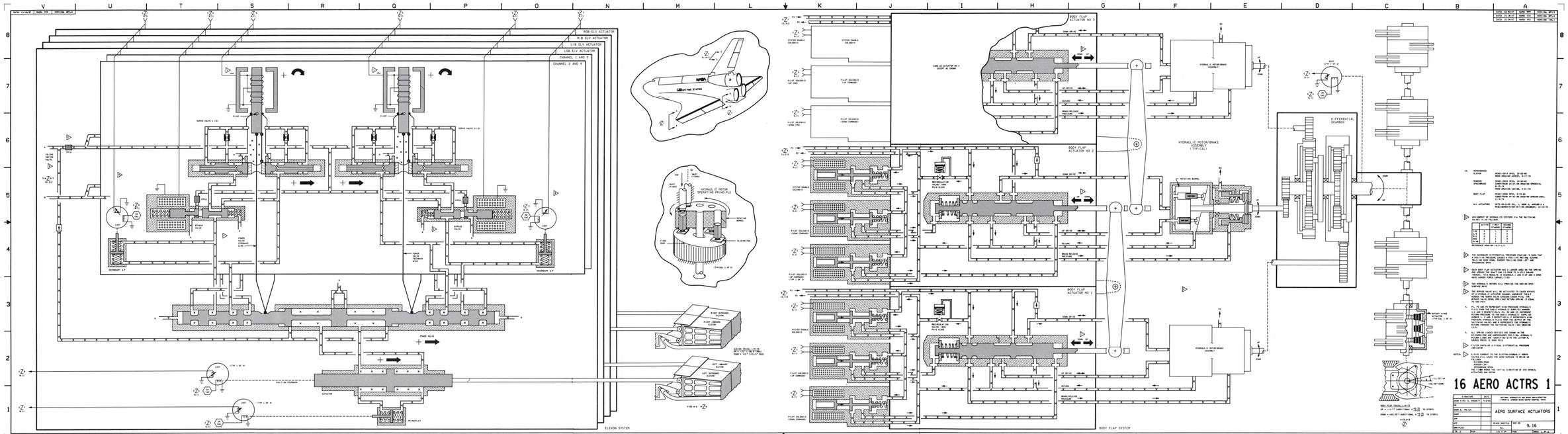
BASIC REV D

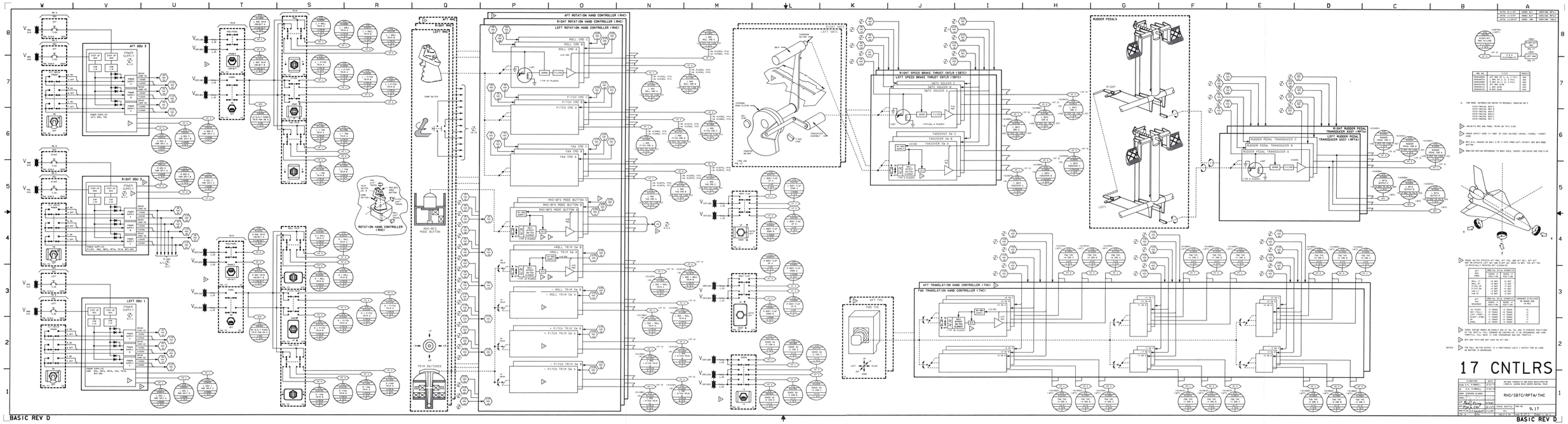

15 ASC TVC
ME & SRB TVC SIGNAL FLOW
9.15
BASIC REV D
ATVC 4 (CHANNEL 4)
ATVC 3 (CHANNEL 3)
ATVC 2 (CHANNEL 2)
ATVC 1 (CHANNEL 1)
RIGHT ME YAW ACTUATOR
RIGHT ME PITCH ACTUATOR
LEFT ME YAW ACTUATOR
LEFT ME PITCH ACTUATOR
CENTER ME YAW ACTUATOR
CENTER ME PITCH ACTUATOR
RIGHT SRB TILT ACTUATOR
RIGHT SRB ROCK ACTUATOR
LEFT SRB TILT ACTUATOR
LEFT SRB ROCK ACTUATOR
RIGHT ME YAW DRIVER
RIGHT ME PITCH DRIVER
LEFT ME YAW DRIVER
LEFT ME PITCH DRIVER
CENTER ME YAW DRIVER
CENTER ME PITCH DRIVER (TYP)
RIGHT SRB TILT DRIVER
RIGHT SRB ROCK DRIVER
LEFT SRB TILT DRIVER
LEFT SRB ROCK DRIVER
BYPASS MONITOR
REDUNDANT CHANNEL EQUALIZATION
EH VALVE DRIVER
OVERRIDE MONITOR
ΔP FAULT DETECTION
ISOLATION VALVE DRIVER
POWER SUPPLY
FCS CHANNEL
ATVC
SRBC
ACTUATOR DRIVER
SOV FEEDBACK
ISOLATE COMMAND
ISOLATION VALVE DRIVER
POSITION TRANSDUCER STROKE RANGE TYPE
ELECTRO-HYDRAULIC VALVE
ISOLATION VALVE
ISOLATION VALVE (TYP)
ATVC 4 (CHANNEL 4)
ATVC 3 (CHANNEL 3)
ATVC 2 (CHANNEL 2)
ATVC 1 (CHANNEL 1)
SRBC
DATA SOURCE
DATA SOURCE
DATA SOURCE
SIGNAL CONDITIONER
TRANSDUCER
ELECTRONICS
SIGNAL CONDITIONER
SIGNAL CONDITIONER
SIGNAL CONDITIONER

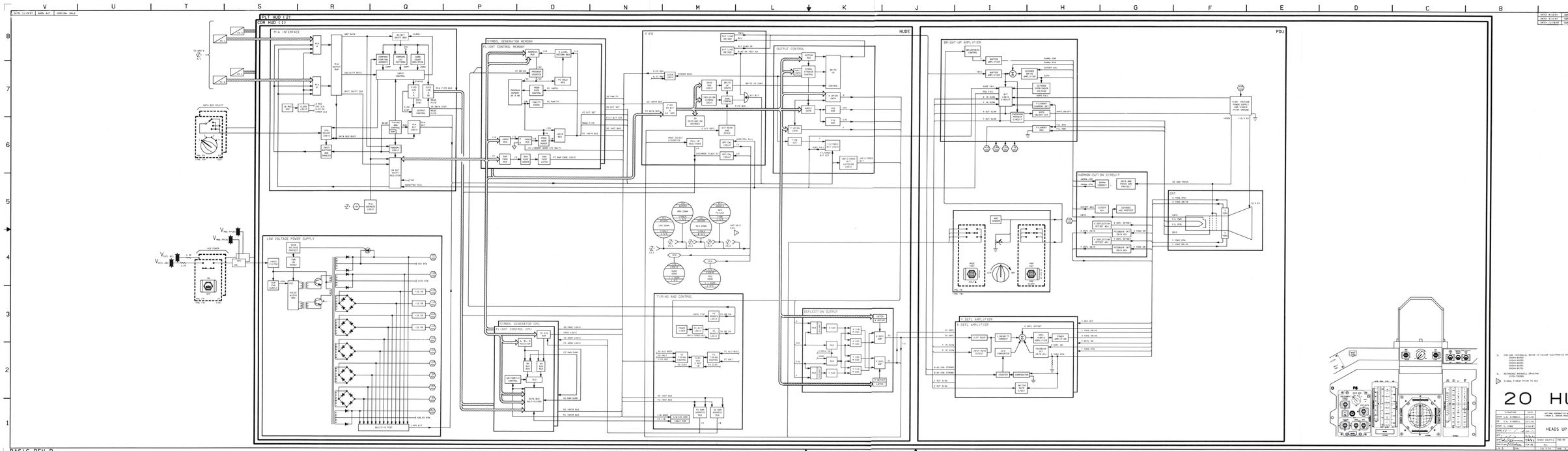
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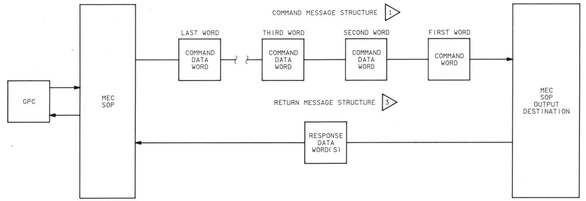
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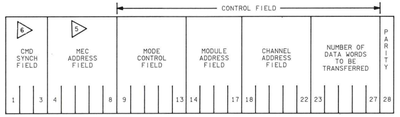

RIB ELV ACTUATOR
LIB ELV ACTUATOR
LOB ELV ACTUATOR
CHANNEL 1 AND 3
CHANNEL 2 AND 4
SERVO VALVE X 1 (3)
PILOT VALVE
BYPASS VALVE
POWER VALVE
ACTUATOR
SECONDARY A/F
ITEM 1 OF 4
ITEM 2 OF 4
ITEM 3 OF 4
POSITION FEEDBACK
ELEVON SYSTEM
HYDRAULIC MOTOR OPERATING PRINCIPLE
ROTATING BARREL
SLIDING PAD
ITEM 4 OF 4
RIGHT OUTBOARD ELEVON
RIGHT INBOARD ELEVON
LEFT INBOARD ELEVON
LEFT OUTBOARD ELEVON
SYSTEM ENABLE SOLENOID
PILOT SOLENOID (UP CMND)
PILOT SOLENOID (DOWN CMND)
RECIRCULATION VALVE (HAS NO SOLENOID)
BODY FLAP ACTUATOR NO 3
BODY FLAP ACTUATOR NO 2
BODY FLAP ACTUATOR NO 1
SAME AS ACTUATOR NO 2 EXCEPT 24 SPLINE
HYDRAULIC MOTOR/BRAKE ASSEMBLY (TYP CALL)
ROTATING BARREL
DIFFERENTIAL GEARBOX
BODY FLAP SYSTEM
BASIC REV D
16 AERO ACTRS 1
AERO SURFACE ACTUATORS
SPACE SHUTTLE
9.16


AFT DDU 3
RIGHT DDU 2
LEFT DDU 1
POWER SUPPLY 3
POWER SUPPLY 2
POWER SUPPLY 1
AFT ROTATION HAND CONTROLLER (RHC)
RIGHT ROTATION HAND CONTROLLER (RHC)
LEFT ROTATION HAND CONTROLLER (RHC)
ROLL CMD 'B'
ROLL CMD 'A'
PITCH CMD 'B'
PITCH CMD 'A'
YAW CMD 'B'
YAW CMD 'A'
RHC-BFS MODE BUTTON 'B'
RHC-BFS MODE BUTTON 'A'
+ROLL TRIM SW 'B'
+ROLL TRIM SW 'A'
- ROLL TRIM SW 'B'
- ROLL TRIM SW 'A'
+ PITCH TRIM SW 'B'
+ PITCH TRIM SW 'A'
- PITCH TRIM SW 'B'
- PITCH TRIM SW 'A'
COMM SW/TCH
TRIM SWITCHES
ROTATION HAND CONTROLLER (RHC)
RIGHT SPEED BRAKE THRUST CNTLR (SBTC)
LEFT SPEED BRAKE THRUST CNTLR (SBTC)
TAKEOVER SW 'C'
TAKEOVER SW 'B'
TAKEOVER SW 'A'
SBTC ROCKER 'A'
SBTC ROCKER 'B'
LEFT SBTC
RUDDER PEDALS
RUDDER PEDAL TRANSDUCER 'C'
RUDDER PEDAL TRANSDUCER 'B'
RUDDER PEDAL TRANSDUCER 'A'
RIGHT RUDDER PEDAL TRANSDUCER ASSY (RPTA)
LEFT RUDDER PEDAL TRANSDUCER ASSY (RPTA)
FWD TRANSLATION HAND CONTROLLER (THC)
AFT TRANSLATION HAND CONTROLLER (THC)
17 CNTLRS
RHC/SBTC/RPTA/THC
BASIC REV D

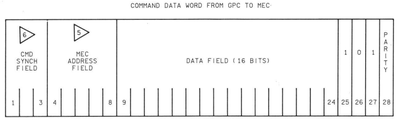

PLT HUD (2)
COR HUD (1)
HUDE
PDU
MIA INTERFACE
SYMBOL GENERATOR MEMORY
LIGHT CONTROL MEMORY
FIFO
OUTPUT CONTROL
BRIGHT-UP AMPLIFIER
LOW VOLTAGE POWER SUPPLY
SYMBOL GENERATOR CPU
LIGHT CONTROL CPU
TIMING AND CONTROL
DEFLECTION OUTPUT
HARMONIZATION CIRCUIT
X DEFL AMPLIFIER
Y DEFL AMPLIFIER
20 HUD
HEADS UP DISPLAY
BASIC REV D



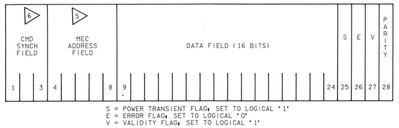
COMMAND WORD FROM GPC TO MEC



COMMAND DATA WORD FROM GPC TO MEC



RESPONSE DATA WORD FROM MEC TO GPC



S = POWER TRANSIENT FLAG, SET TO LOGICAL '1'
E = ERROR FLAG, SET TO LOGICAL '0'
V = VALIDITY FLAG, SET TO LOGICAL '1'

MEC 1 NON-CRITICAL COMMAND DATA WORDS

HEX DECODING LOGIC

HEX CODE	COMMAND DATA WORD 9 10 11 12	13 14 15 16	17 18 19 20	21 22 23 24	COMMAND LETTER	MSID	COMMAND DESCRIPTION
8000	1 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	RES TEST	V76K7001B	PIC RESISTANCE TEST
4000	0 1 0 0	0 0 0 0	0 0 0 0	0 0 0 0	A	V76K7002B	L SRB POWER A
2000	0 0 1 0	0 0 0 0	0 0 0 0	0 0 0 0	B	V76K7003B	R SRB POWER A
1000	0 0 0 1	0 0 0 0	0 0 0 0	0 0 0 0	C	V76K6955B	SRB IGN FIRE 3
0800	0 0 0 0	1 0 0 0	0 0 0 0	0 0 0 0	D	V76K4612B	L T-O UMB REL FIRE 3
0400	0 0 0 0	0 1 0 0	0 0 0 0	0 0 0 0	E	V76K7006B	L SRB RSS POWER OFF
0200	0 0 0 0	0 0 1 0	0 0 0 0	0 0 0 0	F	V76K7007B	R SRB RSS POWER OFF
0100	0 0 0 0	0 0 0 1	0 0 0 0	0 0 0 0	G	V76K6960B	SRB SEP FIRE 3
0080	0 0 0 0	0 0 0 0	1 0 0 0	0 0 0 0	H	V76K4625B	ET/UMB UNLATCH FIRE 3
0040	0 0 0 0	0 0 0 0	0 1 0 0	0 0 0 0	I	V76K9003B	ET DFI POWER ON ▷
0020	0 0 0 0	0 0 0 0	0 0 1 0	0 0 0 0	J	V76K7011B	L SRB POWER C
0010	0 0 0 0	0 0 0 0	0 0 0 1	0 0 0 0	K	V76K7012B	R SRB POWER C
0008	0 0 0 0	0 0 0 0	0 0 0 0	1 0 0 0	L	V76K7013B	ATVC 2 SRB IVD A PWR ON
0004	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 0	M	V76K7014B	ATVC 4 SRB IVD B PWR ON
0002	0 0 0 0	0 0 0 0	0 0 0 0	0 0 1 0	N	V76K4657B	ET/UMB RETR FIRE 3
0001	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 1	O	V76K6921B	ET/ORB STRUCT SEP FIRE 3

MEC 2 NON-CRITICAL COMMAND DATA WORDS

HEX DECODING LOGIC

HEX CODE	COMMAND DATA WORD 9 10 11 12	13 14 15 16	17 18 19 20	21 22 23 24	COMMAND LETTER	MSID	COMMAND DESCRIPTION
8000	1 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	RES TEST	V76K7101B	PIC RESISTANCE TEST
4000	0 1 0 0	0 0 0 0	0 0 0 0	0 0 0 0	A	V76K7102B	L SRB POWER B
2000	0 0 1 0	0 0 0 0	0 0 0 0	0 0 0 0	B	V76K7103B	R SRB POWER B
1000	0 0 0 1	0 0 0 0	0 0 0 0	0 0 0 0	C	V76K6965B	SRB IGN FIRE 3
0800	0 0 0 0	1 0 0 0	0 0 0 0	0 0 0 0	D	V76K4616B	L T-O UMB REL FIRE 3
0400	0 0 0 0	0 1 0 0	0 0 0 0	0 0 0 0	E	V76K7106B	L SRB RSS POWER OFF
0200	0 0 0 0	0 0 1 0	0 0 0 0	0 0 0 0	F	V76K7107B	R SRB RSS POWER OFF
0100	0 0 0 0	0 0 0 1	0 0 0 0	0 0 0 0	G	V76K6970B	SRB SEP FIRE 3
0080	0 0 0 0	0 0 0 0	1 0 0 0	0 0 0 0	H	V76K4626B	ET/UMB UNLATCH FIRE 3
0040	0 0 0 0	0 0 0 0	0 1 0 0	0 0 0 0	I	V76K9103B	ET DFI POWER ON ▷
0020	0 0 0 0	0 0 0 0	0 0 1 0	0 0 0 0	J	V76K7111B	L SRB POWER C
0010	0 0 0 0	0 0 0 0	0 0 0 1	0 0 0 0	K	V76K7112B	R SRB POWER C
0008	0 0 0 0	0 0 0 0	0 0 0 0	1 0 0 0	L	V76K7113B	ATVC 1 SRB IVD A PWR ON
0004	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 0	M	V76K7114B	ATVC 3 SRB IVD B PWR ON
0002	0 0 0 0	0 0 0 0	0 0 0 0	0 0 1 0	N	V76K4661B	ET/UMB RETR FIRE 3
0001	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 1	O	V76K6922B	ET/ORB STRUCT SEP FIRE 3

MEC 1 AND MEC 2 COMMAND WORDS

COMMAND WORD CONTROL FIELD: MODE CONTROL FIELD 9 10 11 12 13	MODULE ADDRESS FIELD 14 15 16 17	CHANNEL ADDRESS FIELD 18 19 20 21	NUMBER OF WORDS FIELD 22 23 24 25 26 27	MEC 1 MSID	MEC 2 MSID	COMMAND DESCRIPTION
0 1 0 1 0	0 0 0 0	X 1 1 0	1 0 0 0 0 1	V76K8351B	V76K8851B	PRE-FLIGHT BITE TEST RESULT CMD
0 1 0 0 0	0 0 0 0	X 0 0 0	0 0 0 0 0 0	V76K8371B	V76K8871B	NON-CRIT DATA VERIF SEND CMD
0 1 0 1 0	0 0 0 0	X 1 1 1	0 0 0 0 0 0	V76K8372B	V76K8872B	NON-CRIT DATA VERIF RETURN CMD
0 0 1 0 0	0 0 0 1	X 0 0 0	0 0 0 0 0 0	V76K8400B	V76K8900B	PIC SIM CAP VOLT ENABLE CMD
0 1 0 0 1	1 1 1 0	X 0 0 0	0 0 0 1 0 1	V76K7099B	V76K7199B	OPER PIC CAPACITOR VOLT READ CMD
0 1 0 0 1	1 1 1 1	X 1 0 0	0 0 0 0 0 1	V76K7059B	V76K7159B	PIC LOAD/RESISTANCE TEST STATUS
0 1 0 1 0	0 0 0 0	X 1 0 1 1	0 0 0 0 0 0	V76K7097B	V76K7197B	OPER BITE TEST RESULT CMD
0 1 0 0 0	1 0 1 1	X 0 0 0 0	0 0 0 0 0 0	V76M7000P	V76M7100P	SET NON-CRITICAL CMD
0 1 0 0 0	0 1 1 1	X 0 0 0 0	0 0 0 0 0 0	V76M7019P	V76M7119P	RESET NON-CRITICAL CMD
0 1 0 0 0	0 0 0 0	X 0 0 0 0	0 0 0 Y Y	N/A	N/A	SET CRITICAL CMD
0 1 0 1 1	0 0 0 0	X 0 0 0 0	0 0 0 0 0 0	V76K7098B	V76K7198B	MASTER RESET (RESET CRIT) CMD

X = EITHER 1 OR 0
Y = FUNCTION OF THE NUMBER OF WORDS

MEC 1 CRITICAL COMMAND DATA WORDS

HEX DECODING LOGIC

HEX CODE	COMMAND DATA WORD 9 10 11 12	13 14 15 16	17 18 19 20	21 22 23 24	MSID	COMMAND DESCRIPTION
3EAC	0 0 1 1	1 1 1 0	1 0 1 0	1 1 0 0	V76K6951B	SRB IGNITION ARM
3E6A	0 0 1 1	1 1 1 0	1 1 1 0	1 0 1 0	V76K6953B	SRB IGNITION FIRE 1
3E42	0 0 1 1	1 1 1 0	0 1 0 0	0 0 1 0	V76K6954B	SRB IGNITION FIRE 2
3154	0 0 1 1	0 0 0 1	0 1 0 1	0 1 0 0	V76K6956B	SRB SEPARATION ARM
316A	0 0 1 1	0 0 0 1	0 1 1 0	1 0 1 0	V76K6958B	SRB SEPARATION FIRE 1
3198	0 0 1 1	0 0 0 1	1 0 0 1	1 0 1 1	V76K6959B	SRB SEPARATION FIRE 2
C121	1 1 0 0	0 0 0 1	0 0 1 0	0 0 0 1	V76K4617B	ET/UMB UNLATCH ARM
C162	1 1 0 0	0 0 0 1	0 1 1 0	0 0 1 0	V76K4619B	ET/UMB UNLATCH FIRE 1
C193	1 1 0 0	0 0 0 1	1 0 0 1	0 0 1 1	V76K4623B	ET/UMB UNLATCH FIRE 2
7463	0 1 1 1	0 1 0 0	0 1 1 0	0 0 1 1	V76K4655B	ET/UMB RETRACT FIRE 1
7498	0 1 1 1	0 1 0 0	1 0 0 1	1 0 0 0	V76K4656B	ET/UMB RETRACT FIRE 2
E117	1 1 1 0	0 0 0 1	0 0 1 1	0 1 1 1	V76K6909B	ET/ORB STRUCT SEP ARM
E168	1 1 1 0	0 0 0 1	0 1 1 0	1 0 0 0	V76K6913B	ET/ORB STRUCT SEP FIRE 1
E199	1 1 1 0	0 0 0 1	1 0 0 1	1 0 0 1	V76K6914B	ET/ORB STRUCT SEP FIRE 2
CEDC	1 1 0 0	1 1 1 0	1 1 0 1	1 1 0 0	V76K4609B	L T-O UMB RELEASE ARM
CE6A	1 1 0 0	1 1 1 0	0 1 1 0	1 0 1 0	V76K4610B	L T-O UMB RELEASE FIRE 1
CE9A	1 1 0 0	1 1 1 0	1 0 0 1	1 0 1 0	V76K4611B	L T-O UMB RELEASE FIRE 2
EBC2	1 1 1 0	1 0 1 1	1 1 0 0	0 0 1 0	V76K7504B	ET TUMBLE ARM
EB68	1 1 1 0	1 0 1 1	0 1 1 0	1 0 0 0	V76K7508B	L SRB RSS SAFE 1
EB95	1 1 1 0	1 0 1 1	1 0 0 1	0 1 0 1	V76K7509B	R SRB RSS SAFE 2
EC86	1 1 1 0	1 1 0 0	1 0 1 1	0 1 1 0	V76K7505B	ET TUMBLE FIRE
EC68	1 1 1 0	1 1 0 0	0 1 1 0	1 0 0 0	V76K7515B	ATVC 2 SRB 26V DEAD FACE
EC9D	1 1 1 0	1 1 0 0	1 0 0 1	1 1 0 1	V76K7516B	ATVC 4 SRB 26V DEAD FACE

MEC 2 CRITICAL COMMAND DATA WORDS

HEX DECODING LOGIC

HEX CODE	COMMAND DATA WORD 9 10 11 12	13 14 15 16	17 18 19 20	21 22 23 24	MSID	COMMAND DESCRIPTION
3EAC	0 0 1 1	1 1 1 0	1 0 1 0	1 1 0 0	V76K6961B	SRB IGNITION ARM
3E6A	0 0 1 1	1 1 1 0	0 1 1 0	1 0 1 0	V76K6963B	SRB IGNITION FIRE 1
3E42	0 0 1 1	1 1 1 0	0 1 0 0	0 0 1 0	V76K6964B	SRB IGNITION FIRE 2
3154	0 0 1 1	0 0 0 1	0 1 0 1	0 1 0 0	V76K6966B	SRB SEPARATION ARM
316A	0 0 1 1	0 0 0 1	0 1 1 0	1 0 1 0	V76K6968B	SRB SEPARATION FIRE 1 & RECOVERY ON
3198	0 0 1 1	0 0 0 1	1 0 0 1	1 0 1 1	V76K6969B	SRB SEPARATION FIRE 2 & RECOVERY ARM
C121	1 1 0 0	0 0 0 1	0 0 1 0	0 0 0 1	V76K4618B	ET/UMB UNLATCH ARM
C162	1 1 0 0	0 0 0 1	0 1 1 0	0 0 1 0	V76K4620B	ET/UMB UNLATCH FIRE 1
C193	1 1 0 0	0 0 0 1	1 0 0 1	0 0 1 1	V76K4624B	ET/UMB UNLATCH FIRE 2
7463	0 1 1 1	0 1 0 0	0 1 1 0	0 0 1 1	V76K4659B	ET/UMB RETRACT FIRE 1
7498	0 1 1 1	0 1 0 0	1 0 0 1	1 0 0 0	V76K4660B	ET/UMB RETRACT FIRE 2
E117	1 1 1 0	0 0 0 1	0 0 1 1	0 1 1 1	V76K6911B	ET/ORB STRUCT SEP ARM
E168	1 1 1 0	0 0 0 1	0 1 1 0	1 0 0 0	V76K6915B	ET/ORB STRUCT SEP FIRE 1
E199	1 1 1 0	0 0 0 1	1 0 0 1	1 0 0 1	V76K6916B	ET/ORB STRUCT SEP FIRE 2
CEDC	1 1 0 0	1 1 1 0	1 1 0 1	1 1 0 0	V76K4613B	R T-O UMB RELEASE ARM
CE6A	1 1 0 0	1 1 1 0	0 1 1 0	1 0 1 0	V76K4614B	R T-O UMB RELEASE FIRE 1
CE9A	1 1 0 0	1 1 1 0	1 0 0 1	1 0 1 0	V76K4615B	R T-O UMB RELEASE FIRE 2
EBC2	1 1 1 0	1 0 1 1	1 1 0 0	0 0 1 0	V76K7604B	ET TUMBLE ARM
EB68	1 1 1 0	1 0 1 1	0 1 1 0	1 0 0 0	V76K7608B	R SRB RSS SAFE 1
EB95	1 1 1 0	1 0 1 1	1 0 0 1	0 1 0 1	V76K7609B	L SRB RSS SAFE 2
EC86	1 1 1 0	1 1 0 0	1 0 1 1	0 1 1 0	V76K7605B	ET TUMBLE FIRE
EC68	1 1 1 0	1 1 0 0	0 1 1 0	1 0 0 0	V76K7615B	ATVC 1 SRB 26V DEAD FACE
EC9D	1 1 1 0	1 1 0 0	1 0 0 1	1 1 0 1	V76K7616B	ATVC 3 SRB 26V DEAD FACE

▷ THE COMMAND SYNCHRONIZATION FIELD IS A THREE BIT TYPE NON-VALID MANCHESTER SYNCHRONIZATION CODE; THUS, EACH WORD HAS A 3 MICROSECOND CODE, WITH THE FIRST 1 1/2 MICROSECONDS IN THE "1" OR "ON" POSITION AND THE NEXT 1 1/2 MICROSECONDS IN THE "0" OR "OFF" POSITION.

▷ THE MEC ADDRESS FIELD IS DEFINED BY TWO POSSIBLE COMBINATIONS, WHEN A COMMAND WORD OR DATA WORD RETURNS FROM OR IS SENT TO EITHER MEC 1 OR MEC 2, THEN THE MEC ADDRESS FIELD BIT COUNT WILL BE AS SHOWN:

4. REFER TO TABLE 10.II FOR VENDOR DRAWING REFERENCES

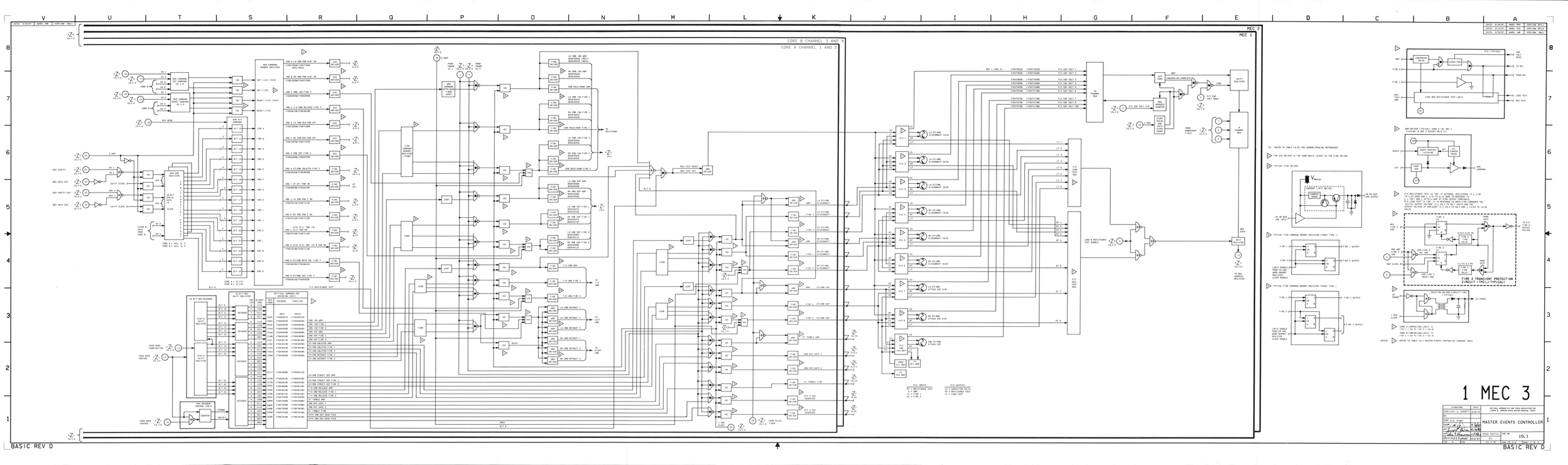
▷ NOT EVERY COMMAND STRING WILL HAVE A RESPONSE DATA WORD, ALL RESPONSE DATA WORDS ARE USED ONLY FOR PRE-FLIGHT CHECKS. NO RESPONSE DATA WORDS ARE TRANSFERRED DURING ACTUAL FLIGHT

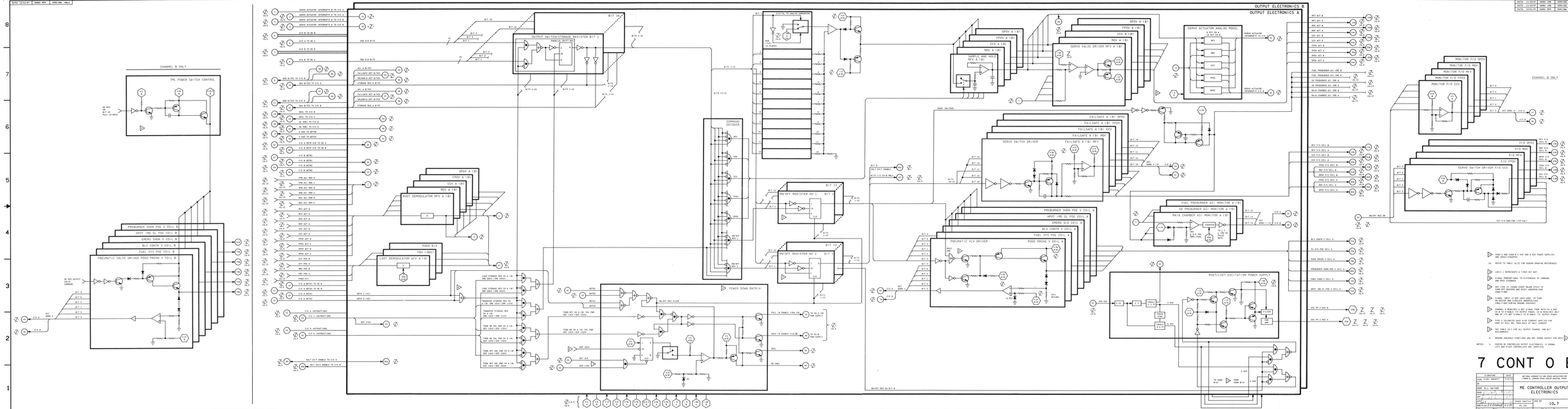
▷ THE "ET DFI POWER ON" COMMANDS ARE NON-EXISTANT IN THE CURRENT MEC SOPS, THEY MAY BE REINSTATED AT A LATER DATE

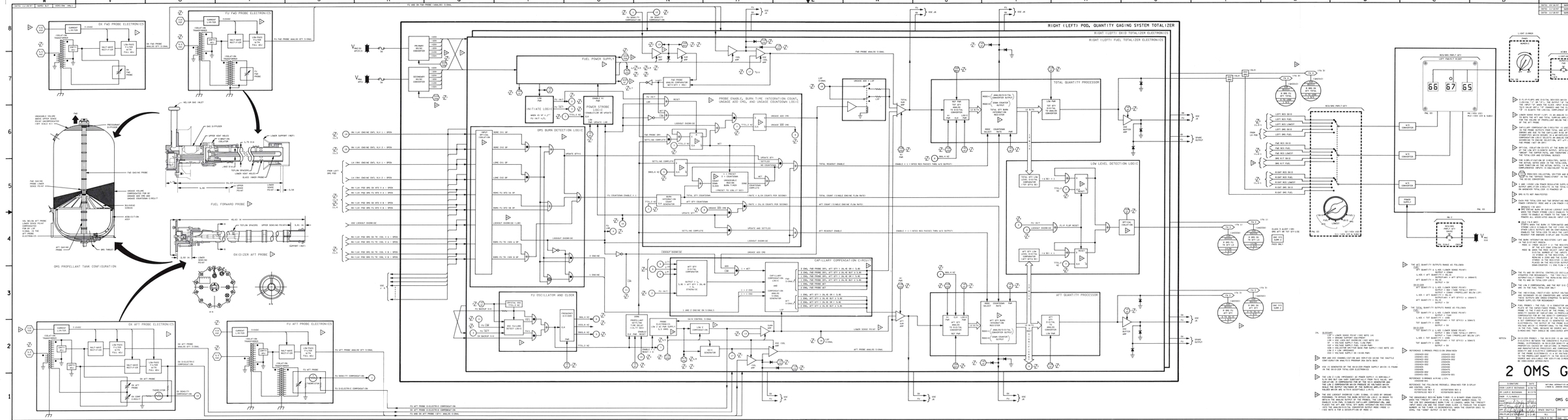
NOTE: ▷ REFERENCE COMMAND MESSAGE OUTPUTS IN DRAWING 10.1« MASTER EVENTS CONTROLLER OVERVIEW

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN M. MCNEIL & ELLEGOOD	8/28/87	
DR M.MCNEIL & ELLEGOOD	8/28/87	MEC COMMAND TABLE TABLE 10.1
ENGR D.A. RIGBY		
ENGR		
APP		SPACE SHUTTLE DWG NO 10.1
APP		ALL
OMNIPLAN		SCALE NONE SHEET 1 OF 4
LTR 0	DCN 0	PAGE 10.1-1

BASIC REV D-2


CORE B CHANNEL 3 AND 4
CORE A CHANNEL 1 AND 2
MEC 2
MEC 1
1 MEC 3
MASTER EVENTS CONTROLLER
BASIC REV D


OUTPUT ELECTRONICS B
OUTPUT ELECTRONICS A
CHANNEL B ONLY
THL POWER SWITCH CONTROL
PREBURNER SHDN PSE Y COIL B
WPST IND SL PSE COIL B
EMERG SHDN Y COIL B
BLV CONTR Y COIL B
FUEL SYS PSE COIL B
PNEUMATIC VALVE DRIVER PSOO PRCHG Y COIL B
SERVO ACTUATOR ANALOG MODEL
SERVO SWITCH DRIVER
SERVO SWITCH DRIVER-F/O CCV
PNEUMATIC VLV DRIVER
MAIN CHAMBER #2 MONITOR A (B)
OX PREBURNER #2 MONITOR A (B)
FUEL PREBURNER #2 MONITOR A (B)
POWER DOWN MATRIX
COMMAND DECODER
ON/OFF REGISTER NO 1
ON/OFF REGISTER NO 2
OUTPUT SWITCH/STORAGE REGISTER BIT 1
SHUT DEMODULATOR MFV A (B)
PSOO R/S
FSV CONTR
MONITOR F/O MFV
MONITOR F/O FPOV
MONITOR F/O CCV
MONITOR F/O OPOV
F/O MFV
F/O FPOV
SERVO SWITCH DRIVER-F/O CCV
RVST/LVST EXCITATION POWER SUPPLY
7 CONT O E
ME CONTROLLER OUTPUT ELECTRONICS
10.7
BASIC REV D


RIGHT (LEFT) POD, QUANTITY GAGING SYSTEM TOTALIZER
RIGHT (LEFT) OXID TOTALIZER ELECTRONICS
RIGHT (LEFT) FUEL TOTALIZER ELECTRONICS
OX FWD PROBE ELECTRONICS
FU FWD PROBE ELECTRONICS
OX AFT PROBE ELECTRONICS
FU AFT PROBE ELECTRONICS
FUEL FORWARD PROBE
OXIDIZER AFT PROBE
OMS PROPELLANT TANK CONFIGURATION
FUEL POWER SUPPLY
FU OSCILLATOR AND CLOCK
PROBE ENABLE, BURN TIME INTEGRATION COUNT, UNGAGE AND CMPL AND UNGAGE COUNTDOWN LOGIC
OMS BURN DETECTION LOGIC
CAPILLARY COMPENSATION CIRCUIT
TOTAL QUANTITY PROCESSOR
AFT QUANTITY PROCESSOR
LOW LEVEL DETECTION LOGIC
2 OMS GAGE
OMS GAGING
11.2
BASIC REV D

DATE▸ 10/14/86	NAME▸ TMJ	VERSION▸ BPT▸5
DATE▸ 11/12/86	NAME▸ JMB	VERSION▸ BPT▸6
DATE▸ 11/21/86	NAME▸ MAG	VERSION▸ BPT▸7

	LEFT	RIGHT
OMS ARM CMD 1	V43S457ZX	V43S557ZX
OMS ARM CMD 2	V43S457JX	V43S557JX
OMS ARM/PRESS CMD 1	V43S457DX	V43S557DX
OMS ARM/PRESS CMD 2	V43S457LX	V43S557LX
OMS VLV PWR ENA 1	V43S457SE	V43S557SE
OMS V1C1	V43K458JX	V43K558JX
OMS V1C2	V43K458AX	V43K558AX
OMS V2C1	V43K458BX	V43K558BX
OMS V2C2	V43K458EX	V43K558EX
BFS ARM/PRESS	V98X07Z3X	V98X07Z4X
BFS ARM	V98X07Z6X	V98X07Z7X
ARM/PRESS SW DIS	V90XT043X	V90XT045X
ARM SW DIS	V90XT042X	V90XT044X

3 FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO ROCKWELL DRAWING NOS. VS70-430302D, VS70-430302E, AND VS70-760709D

△ BOTH VALVES V1 AND V2 REQUIRED TO FIRE OMS ENGINE, COIL 1 OR COIL 2 WILL OPEN ENGINE VALVE

NOTES▸ △ THE SAMPLE RATE IS 1 S/S IN OPS 1

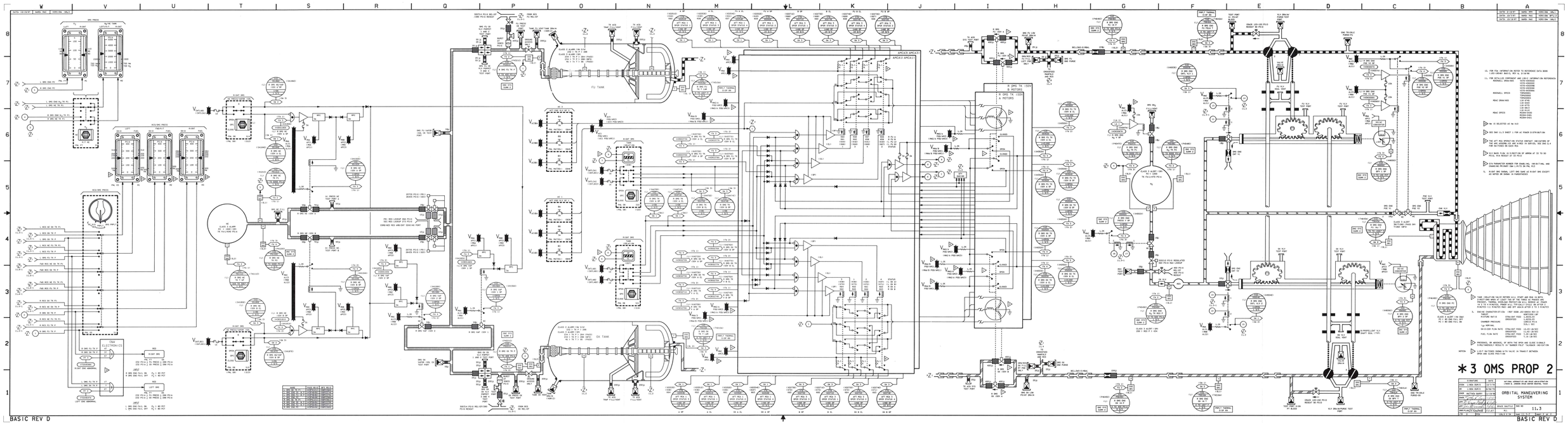
3 OMS 1

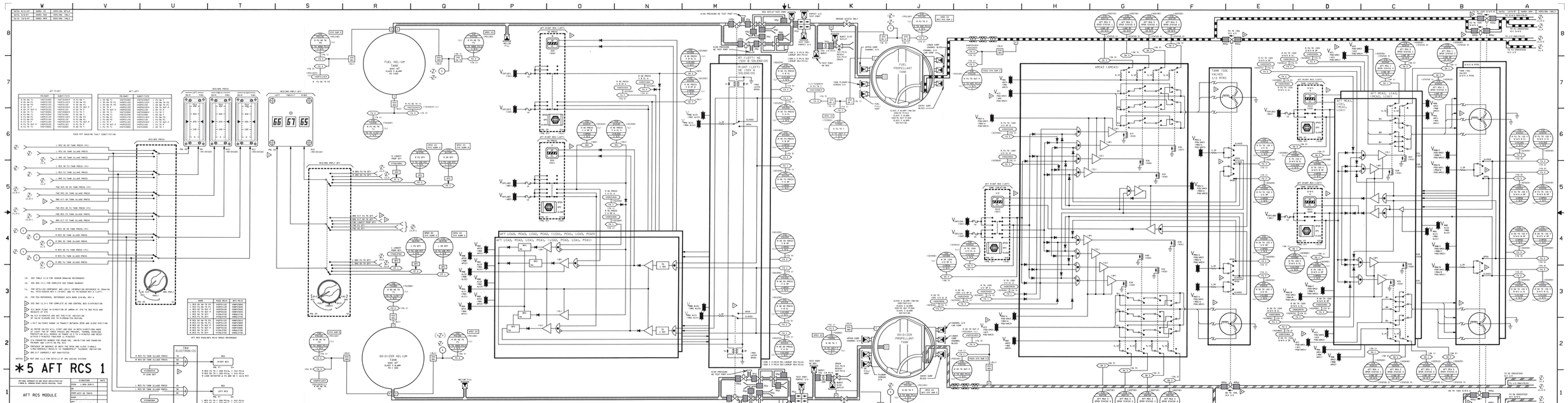
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	SIGNATURE	DATE
OMS/DRIVERS	DSGN VICKI S. HUNTER	8/8/83
	DR VICKI S. HUNTER	8/8/83
	ENGR MATTHEW BARRY	11/19/86
	ENGR	
	APDEV	
	APP	
	OMNIPLAN	

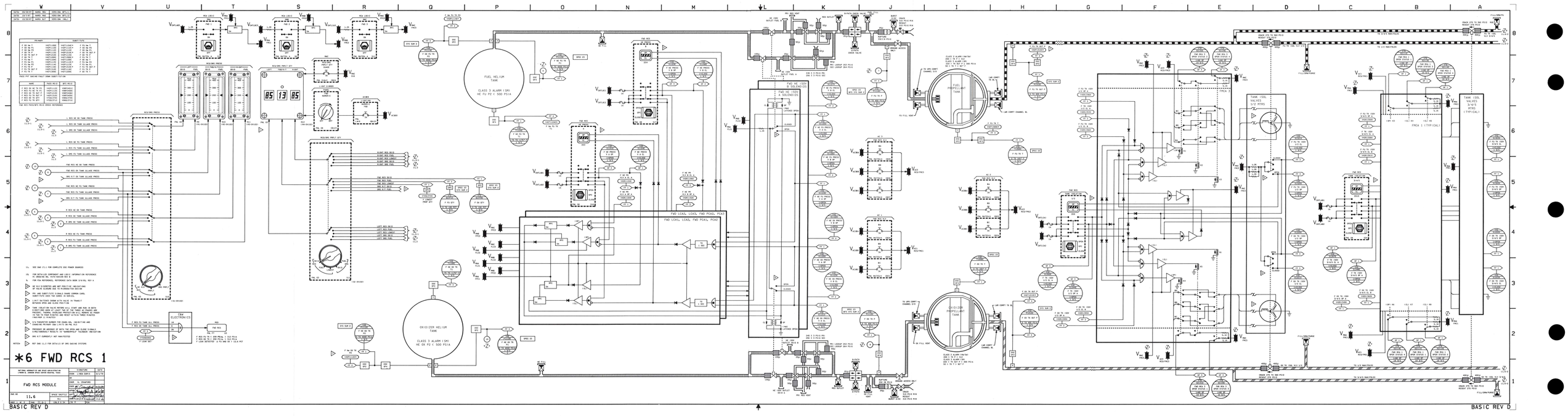
DWG NO 11.3	SPACE SHUTTLE
	ALL
SHEET 1 OF 2 PAGE 11.3-1	66 X 34
	LTR D PCN

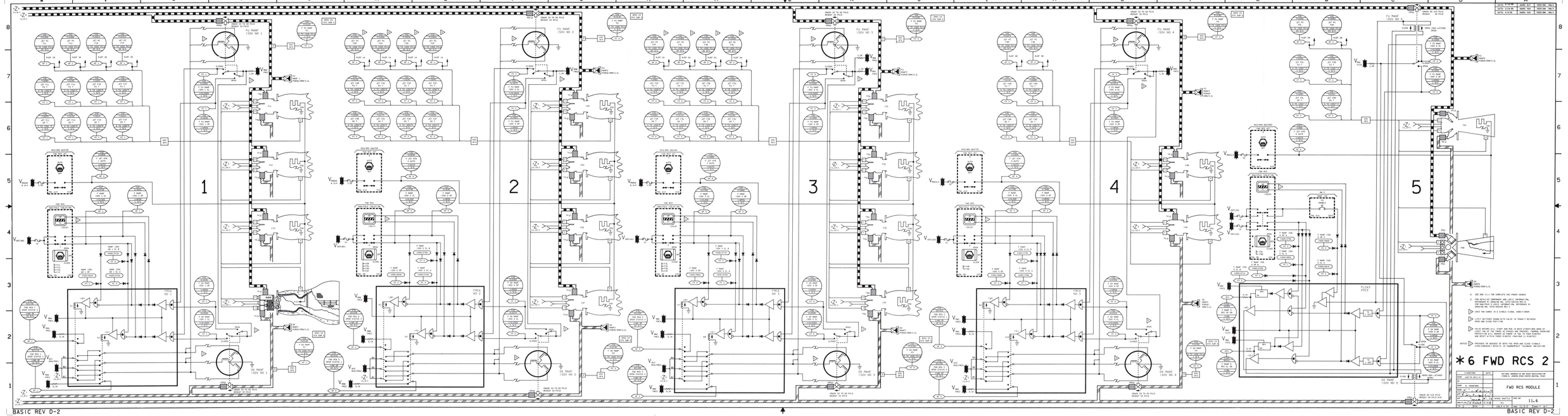
BASIC REV D

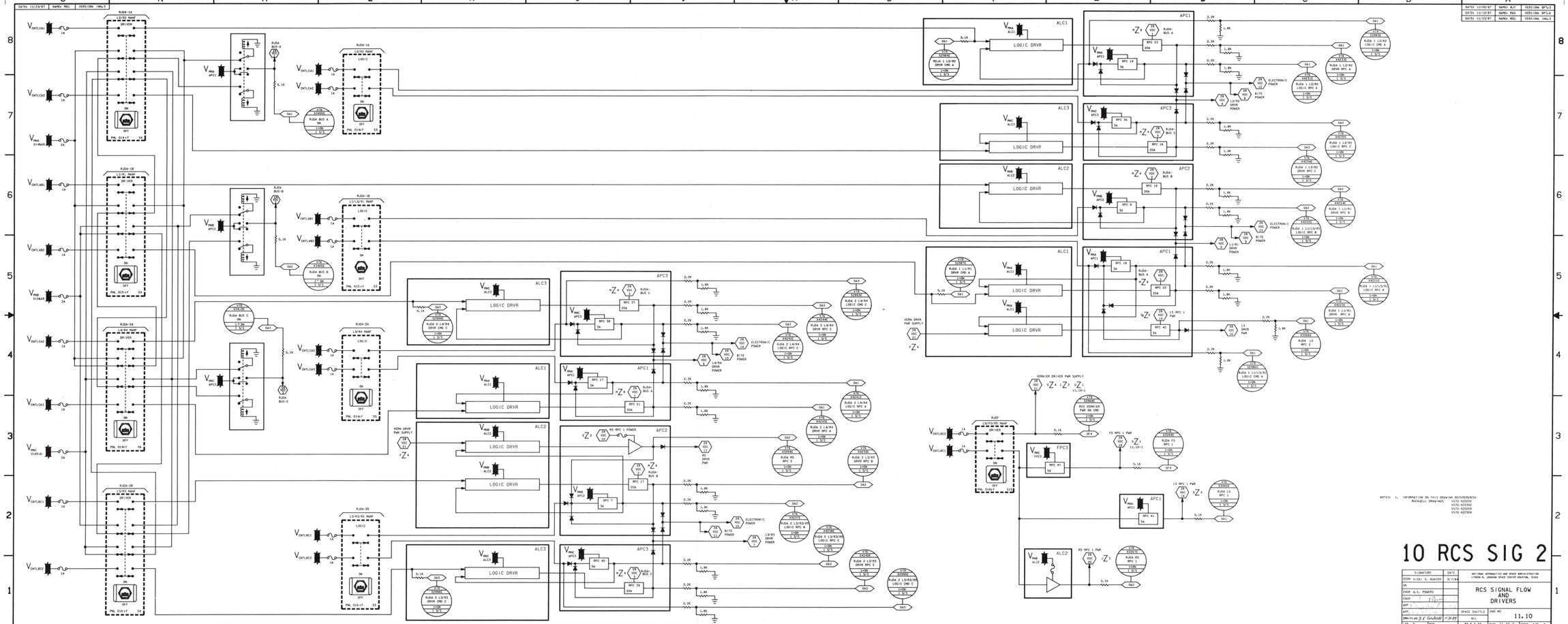
BASIC REV D


W V U T S R Q P O N M L K J I H G F E D C B A
8 7 6 5 4 3 2 1
DATE 10/28/97 NAME/NO VERSION/ME
DATE 10/28/97 NAME/NO VERSION/ME
DATE 10/28/97 NAME/NO VERSION/ME
BASIC REV D
BASIC REV D
FU TANK
OX TANK
APCA3 APCA3
APCA1 APCA1
APCA2 APCA2
APCA4 APCA4
LEFT PODS
RIGHT PODS
AFT BULKHEAD PRESS
FWD BULKHEAD PRESS
PRESS PANEL
T&M ELECTRONICS
LEFT OMS ABNORMAL
RIGHT OMS ABNORMAL
MID
RIGHT OMS
LEFT OMS
MPS
FU TANK
OX TANK
FU MANIFOLD
OX MANIFOLD
FU MANIFOLD
OX MANIFOLD
FU MANIFOLD
OX MANIFOLD


*5 AFT RCS 1
AFT RCS MODULE
FUEL HELIUM TANK
OXIDIZER HELIUM TANK
FUEL PROPELLANT TANK
OXIDIZER PROPELLANT TANK
AFT RCS1 (LCA1, LCA2, LCA3, LCA4)
AFT RCS2 (LCA5, LCA6, LCA7, LCA8)
AFT RCS3 (LCA9, LCA10, LCA11, LCA12)
AFT RCS4 (LCA13, LCA14, LCA15, LCA16)
AFT LCA1, PCA1, LCA2, PCA2, LCA3, PCA3, LCA4, PCA4
AFT LCA5, PCA5, LCA6, PCA6, LCA7, PCA7, LCA8, PCA8
AFT LCA9, PCA9, LCA10, PCA10, LCA11, PCA11, LCA12, PCA12
AFT LCA13, PCA13, LCA14, PCA14, LCA15, PCA15, LCA16, PCA16
AFT RIGHT
AFT LEFT
RCS/OMS PRESS
RCS/OMS PRVLV QTY
AFT RCS PRESSYS RCS CROSS REFERENCE
CRV ELECTRONICS
RIGHT RCS
LEFT RCS
BASIC REV D


*6 FWD RCS 1
FWD RCS MODULE
11.6
BASIC REV D
FUEL HELIUM TANK
CLASS 2 ALARM (SM)
HE FU P2 < 500 PSIA
OXIDIZER HELIUM TANK
CLASS 3 ALARM (SM)
HE OX P2 < 500 PSIA
FUEL PROPELLANT TANK
OXIDIZER PROPELLANT TANK
FWD LOA2, LOA3, FWD PCA2, PCA3
TANK 1 SOL VALVES (2 HTRS) (TYP)
TANK 1 (TYP)
TANK 2 (TYP)
TANK 3 (TYP)
TANK 4 (TYP)
TANK 5 (TYP)
TANK 6 (TYP)
TANK 7 (TYP)
TANK 8 (TYP)
TANK 9 (TYP)
TANK 10 (TYP)
TANK 11 (TYP)
TANK 12 (TYP)
TANK 13 (TYP)
TANK


1
2
3
4
5
*6 FWD RCS 2
FWD RCS MODULE
11.6
BASIC REV D-2
BASIC REV D-2


10 RCS SIG 2
RCS SIGNAL FLOW AND DRIVERS
NOTES: 1. INFORMATION ON THIS DRAWING REFERENCED ROCKWELL DRAWINGS
V570-420302
V570-420309
BASIC REV D

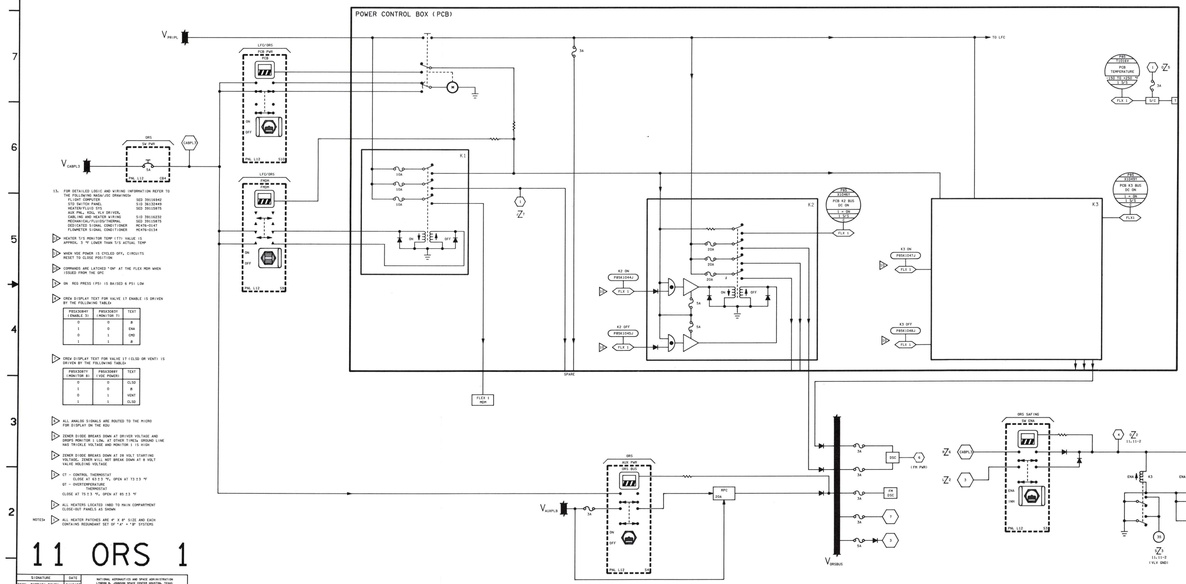
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DATE= 11/24/97	NAME= JMB	VERSION= VAV.1

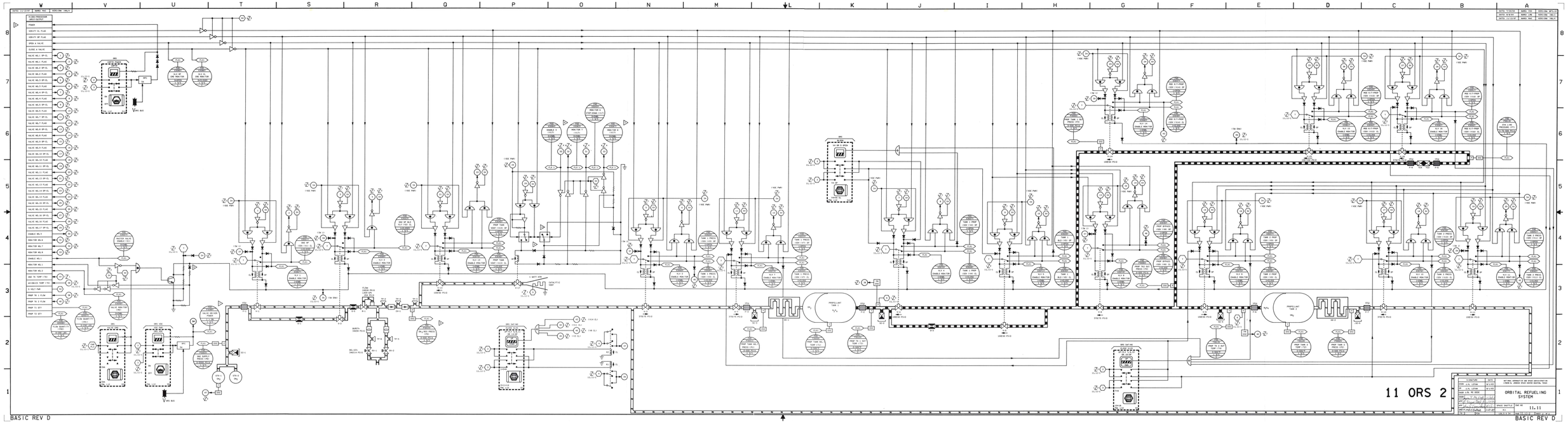
10 RCS SIG 3

SIGNATURE		DATE	
DSGN	VICKI S. HUNTER	5/94	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR			
ENGR	W. G. PINKERS		RCS SIGNAL FLOW AND DRIVERS
ENGR			
APP			
APP			SPACE SHUTTLE DWG NO
CHK/PLAN		0-5-85	ALL 11.10
LTR	9	FSCM	85.5 X 54 PAGE 11-10-5 SHEET 1 OF 3

BASIC REV D

DATE	NAME	VERSION
DATE: 01/24/94	NAME: YOU	VERSION: BETA 7
DATE: 11/23/87	NAME: PAUL	VERSION: BETA 6
DATE: 11/19/87	NAME: PAUL	VERSION: FINAL




11 ORS 2
ORBITAL REFUELING SYSTEM
BASIC REV D
BASIC REV D

Space Shuttle Systems Handbook

Vol.I

Sections 1 through 11

Rev D,
DCN-2
April 20,
1988

SD
MOD
JSC
NASA