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Space Shuttle Systems Handbook

Douglas Manuel

Volume I - Sections 1 through 9

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SPACE SHUTTLE SYSTEMS HANDBOOK

REVISION E

PREFACE

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REV E

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DWG 14.11 (Sheet 2 of 4)	NEW MCIU DETAILED FIRMWARE	REV E	11/27/90
DWG 14.11 (Sheet 3 of 4)	NEW MCIU DETAILED FIRMWARE	REV E	11/27/90
DWG 14.11 (Sheet 4 of 4)	NEW MCIU FIRMWARE MEMORY MAP	REV E	11/27/90
DWG 14.12 (Sheet 1 of 3)	ROEU ELECTRICAL	REV E	11/27/90
DWG 14.12 (Sheet 2 of 3)	REMOTELY OPERATED ELECTRICAL UMBILICAL MECHANICAL OVERVIEW	REV E	11/27/90
DWG 14.12 (Sheet 3 of 3)	ROEU MECHANICAL	REV E	11/27/90
TBL 14-I	VENDOR DRAWING REFERENCES	REV E	10/23/90
	SECTION 15 MECHANICAL SUPPORT SYSTEMS		
DWG 15.1 (Sheet 1 of 4)	ACTIVE VENT SYSTEM VENT 1 AND 2	REV E	8/24/90
DWG 15.1 (Sheet 2 of 4)	ACTIVE VENT SYSTEM VENTS 3, 4, 5 & 7	REV E	8/24/90
DWG 15.1 (Sheet 3 of 4)	ACTIVE VENT SYSTEM VENTS 6, 8, AND 9	REV E	8/24/90
DWG 15.1 (Sheet 4 of 4)	VENT DOOR SOFTWARE	REV E	9/5/90
DWG 15.2* (Sheet 1 of 4)	ORBITER/ET UMBILICAL CLOSEOUT DOORS	REV E	8/20/90
DWG 15.2* (Sheet 2 of 4)	ORB/ET UMBILICAL CLOSEOUT DOORS (ELECT)	REV E	5/4/90
DWG 15.2 (Sheet 3 of 4)	ET DOOR SOFTWARE PASS AND BFS OI8D AND OI8F	REV E	8/24/90
DWG 15.2 (Sheet 4 of 4)	ET DOOR SOFTWARE PASS AND BFS OI20	REV E	8/23/90
DWG 15.3 (Sheet 1 of 3)	ORBITER ET SEPARATION MECHANICAL	REV E	8/28/90

Item	Title	REV/DCN	Signoff date
	SECTION 15 MECHANICAL SUPPORT SYSTEMS - Concluded		
DWG 15.3 (Sheet 2 of 3)	ORBITER ET SEPARATION MECHANICAL	REV E	9/5/90
DWG 15.3 (Sheet 3 of 3)	ORBITER ET SEPARATION MECHANICAL	REV E	8/28/90
DWG 15.4	(RESERVED)		
DWG 15.5 (Sheet 1 of 2)	HATCHES (SIDE)	REV E	8/9/90
DWG 15.5 (Sheet 2 of 2)	HATCHES (AIRLOCK AND SPACELAB)	REV E	10/24/90
DWG 15.6 (Sheet 1 of 2)	CREW SEATS	REV E	10/25/90
DWG 15.6 (Sheet 2 of 2)	CREW SEATS MECHANICAL/ELECTRICAL	REV E	10/25/90
DWG 15.7* (Sheet 1 of 2)	KU-BAND ANTENNA DEPLOY/STOW/ JETTISON	REV E	10/29/90
DWG 15.7* (Sheet 2 of 2)	KU-BAND MECHANICAL	REV E	10/26/90
DWG 15.8 (Sheet 1 of 2)	MECHANICAL/SOFTWARE OVERVIEW (PASS ONLY) OI8D AND OI8F	REV E	9/17/90
DWG 15.8 (Sheet 2 of 2)	MECHANICAL/SOFTWARE OVERVIEW (PASS ONLY) OI8D AND OI8F	REV E	11/5/90
TBL 15-I	VENDOR DRAWING REFERENCES	REV E	11/5/90
	Volume III - Sections 16 through 20		
	SECTION 16 COMMUNICATIONS SYSTEMS		
DWG 16.1* (Sheet 1 of 6)	COMM OVERVIEW S-BAND	REV E	10/29/90
DWG 16.1B* (Sheet 2 of 6)	COMM OVERVIEW AUDIO	REV E	9/12/90
DWG 16.1C,D* (Sheet 3 of 6)	COMM OVERVIEW AUDIO	REV E	10/17/90
DWG 16.1* (Sheet 4 of 6)	COMM OVERVIEW KU BAND	REV E	10/23/90
DWG 16.1 (Sheet 5 of 6)	COMM OVERVIEW CCTV	REV E	10/18/90

Item	Title	REV/DCN	Signoff date
	SECTION 16 COMMUNICATIONS SYSTEMS - Continued		
DWG 16.1 (Sheet 6 of 6)	PAYLOAD SYSTEM OVERVIEW	REV E	10/23/90
DWG 16.2 (Sheet 1 of 3)	S-BAND PM TRANSPONDER	REV E	8/21/90
DWG 16.2 (Sheet 2 of 3)	S-BAND PM AMPLIFIER SYSTEM	REV E	8/21/90
DWG 16.2 (Sheet 3 of 3)	S-BAND PM/FM SWITCH BEAM ANTENNA SYSTEM	REV E	8/21/90
DWG 16.3 (Sheet 1 of 3)	NETWORK SIGNAL PROCESSOR RETURN LINK	REV E	10/16/90
DWG 16.3 (Sheet 2 of 3)	NETWORK SIGNAL PROCESSOR FORWARD LINK	REV E	11/2/90
DWG 16.3 (Sheet 3 of 3)	COMSEC 1/2	REV E	11/5/90
DWG 16.4 (Sheet 1 of 2)	TEXT AND GRAPHICS SYSTEM	REV E	9/12/90
DWG 16.4 (Sheet 2 of 2)	SECURE TEXT & GRAPHICS SYSTEM TELEVISION INTERFACES	REV E	9/12/90
DWG 16.5 (Sheet 1 of 2)	KU-BAND SYSTEM	REV E	10/10/90
DWG 16.5 (Sheet 2 of 2)	KU-BAND SYSTEM	REV E	10/10/90
DWG 16.6 (Sheet 1 of 1)	TELEPRINTER	REV E	10/23/90
DWG 16.7B (Sheet 1 of 1)	ORBITER EXPERIMENTS SUPPORT SYSTEM FOR OEX	REV E	10/18/90
DWG 16.8 (Sheet 1 of 1)	S-BAND FM SYSTEM	REV E	10/10/90
DWG 16.9 (Sheet 1 of 2)	UHF ORBITER TRANSCEIVER	REV E	10/23/90
DWG 16.9 (Sheet 2 of 2)	OPERATIONAL UHF EVC BACKPACK TRANSCEIVER	REV E	11/26/90
DWG 16.10 (Sheet 1 of 7)	AUDIO PANEL/ATU PLT, CDR	REV E	9/12/90
DWG 16.10 (Sheet 2 of 7)	AUDIO PANEL/ATU MS, PS, AND OS SMU	REV E	10/23/90
DWG 16.10C,D,E (Sheet 3 of 7)	AUDIO PANEL/ATU MID DECK SMU AND CCU	REV E	11/26/90

Item	Title	REV/DCN	Signoff date
	SECTION 16 COMMUNICATIONS SYSTEMS - Continued		
DWG 16.10 (Sheet 4 of 7)	AUDIO PANEL/ATU AIRLOCK	REV E	9/12/90
DWG 16.10B (Sheet 5 of 7)	AUDIO PANEL/ATU AIRLOCK 1 BACKUP	REV E	11/5/90
DWG 16.10B (Sheet 6 of 7)	AUDIO PANEL/ATU MID DECK AUDIO/ AIRLOCK 2 BACKUP	REV E	9/12/90
DWG 16.10B (Sheet 7 of 7)	AUDIO PANEL/ATU OS AND OS SMU	REV E	9/12/90
DWG 16.11 (Sheet 1 of 2)	AUDIO/ACCU	REV E	11/26/90
DWG 16.11 (Sheet 2 of 2)	AUDIO/ACCU	REV E	10/26/90
DWG 16.12 (Sheet 1 of 1)	TV CONTROL	REV E	10/26/90
DWG 16.13 (Sheet 1 of 4)	TV/CAMERA MONITOR	REV E	10/2/90
DWG 16.13 (Sheet 2 of 4)	TV/CAMERA MONITOR	REV E	10/2/90
DWG 16.13 (Sheet 3 of 4)	TV/EMU	REV E	10/2/90
DWG 16.13 (Sheet 4 of 4)	AIRBORNE DIGITIZER UNIT SECURE TELEVISION SYSTEM	REV E	10/2/90
DWG 16.14 (Sheet 1 of 2)	S-BAND PAYLOAD INTERROGATOR	REV E	10/26/90
DWG 16.14 (Sheet 2 of 2)	S-BAND PAYLOAD INTERROGATOR	REV E	10/26/90
DWG 16.15 (Sheet 1 of 1)	PAYLOAD SIGNAL PROCESSOR	REV E	10/23/90
DWG 16.16 (Sheet 1 of 1)	SRB DFI FLIGHT RECORDER	REV E	9/12/90
DWG 16.17 (Sheet 1 of 1)	GROUND COMMAND INTERFACE LOGIC (GCIL) CONTROLLER	REV E	9/12/90
DWG 16.18 (Sheet 1 of 1)	OPS RECORDERS	REV E	10/23/90
DWG 16.19 (Sheet 1 of 1)	P/L RECORDER	REV E	10/23/90
DWG 16.20 (Sheet 1 of 2)	WIRELESS CREW COMM SYS AUDIO INTERFACE UNIT	REV E	10/2/90

Item	Title	REV/DCN	Signoff date
	SECTION 16 COMMUNICATIONS SYSTEMS - Concluded		
DWG 16.20 (Sheet 2 of 2)	WIRELESS CREW COMM SYS CREW REMOTE UNIT	REV E	10/16/90
DWG 16.21	(RESERVED)		
DWG 16.22 (Sheet 1 of 3)	COMMUNICATIONS INTERFACE EQUIPMENT (CONTROL)	REV E	10/26/90
DWG 16.22 (Sheet 2 of 3)	COMMUNICATIONS INTERFACE EQUIPMENT (COMMAND)	REV E	10/23/90
DWG 16.22 (Sheet 3 of 3)	COMMUNICATIONS INTERFACE EQUIPMENT (TELEMETRY)	REV E	10/26/90
DWG 16.23	(RESERVED)		
DWG 16.24 (Sheet 1 of 1)	INTERIM VIDEO TAPE RECORDER	REV E	10/26/90
DWG 16.25 (Sheet 1 of 1)	COMM SYSTEM POWER DISTRIBUTION	REV E	10/2/90
DWG 16.26 (Sheet 1 of 1)	COMM MDM I/F	REV E	10/23/90
TBL 16-I	VENDOR DRAWING REFERENCES	REV E	11/21/90
	SECTION 17 INSTRUMENTATION		
DWG 17.1 (Sheet 1 of 3)	OPERATIONAL INSTRUMENTATION DSC'S AND MDM'S	REV E	10/23/90
DWG 17.1 (Sheet 2 of 3)	OI DEDICATED SIGNAL CONDITIONERS	REV E	10/23/90
DWG 17.1 (Sheet 3 of 3)	OI INST MDM	REV E	10/23/90
DWG 17.2 (Sheet 1 of 1)	OI PCM MASTER UNIT	REV E	10/10/90
DWG 17.3 (Sheet 1 of 3)	PAYLOAD DATA INTERLEAVER	REV E	10/2/90
DWG 17.3 (Sheet 2 of 3)	PAYLOAD DATA INTERLEAVER	REV E	10/23/90
DWG 17.3 (Sheet 3 of 3)	PAYLOAD DATA INTERLEAVER	REV E	10/2/90
DWG 17.4	(RESERVED)		
DWG 17.5	(RESERVED)		
DWG 17.6	(RESERVED)		

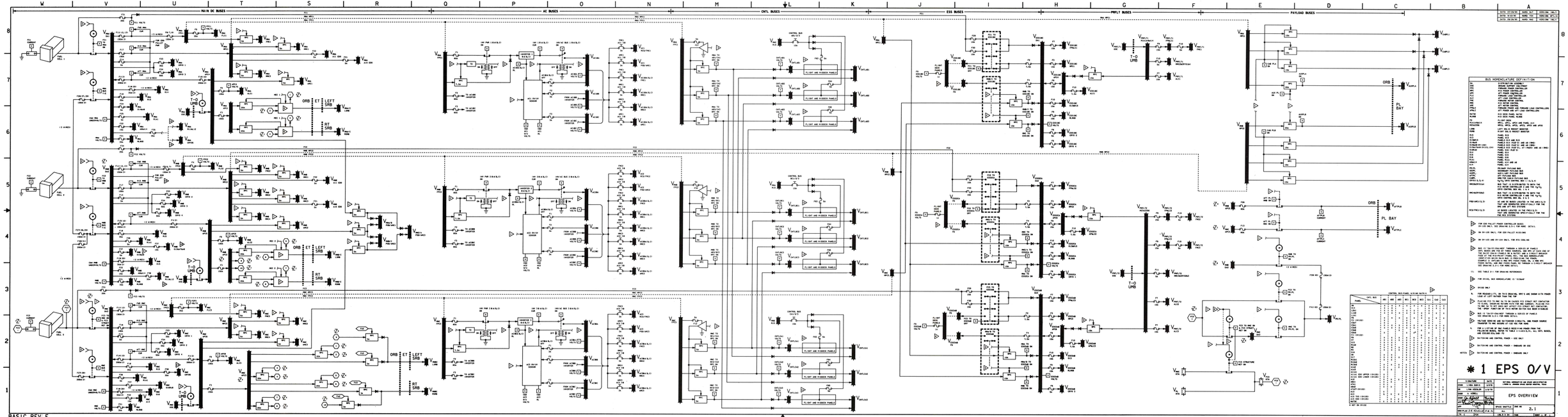
Item	Title	REV/DCN	Signoff date
	SECTION 17 INSTRUMENTATION - Concluded		
DWG 17.7	(RESERVED)		
DWG 17.8	(RESERVED)		
DWG 17.9	(RESERVED)		
DWG 17.10 (Sheet 1 of 1)	BIO MEDICAL INSTRUMENTATION	REV E	10/10/90
DWG 17.11 (Sheet 1 of 1)	MADS EQUIP	REV E	10/10/90
DWG 17.12C,D (Sheet 1 of 1)	MODULE AUXILIARY DATA SYSTEM RECORDER/CONTROLLER SUBSYSTEM	REV E	10/2/90
TBL 17-I	VENDOR DRAWING REFERENCES	REV E	11/2/90
	SECTION 18 ESCAPE SYSTEM		
DWG 18.1* (Sheet 1 of 1)	ESCAPE PANEL	REV E	9/13/90
DWG 18.2 (Sheet 1 of 1)	POLE CREW ESCAPE SYSTEM	REV E	9/28/90
DWG 18.3 (Sheet 1 of 1)	EMERGENCY EGRESS SLIDE/SKYGENIE	REV E	10/15/90
DWG 18.4 (Sheet 1 of 1)	LAUNCH AND ENTRY SUIT/HELMET RETENTION ASSEMBLY	REV E	9/13/90
DWG 18.5 (Sheet 1 of 3)	SURVIVAL GEAR	REV E	9/13/90
DWG 18.5 (Sheet 2 of 3)	SURVIVAL GEAR	REV E	9/13/90
DWG 18.5 (Sheet 3 of 3)	SURVIVAL GEAR	REV E	9/13/90
DWG 18.6 (Sheet 1 of 1)	PERSONAL PARCHUTE ASSEMBLY (PPA)	REV E	11/6/90
TBL 18-I	VENDOR DRAWING REFERENCES	REV E	9/13/90
	SECTION 19 STRUCTURES		
DWG 19.1 (Sheet 1 of 6)	PAYLOAD BAY OVERVIEW 1307 BULKHEAD LOOKING AFT	REV E	9/7/90
DWG 19.1 (Sheet 2 of 6)	PAYLOAD BAY OVERVIEW 582/576 BULKHEAD LOOKING AFT	REV E	9/7/90

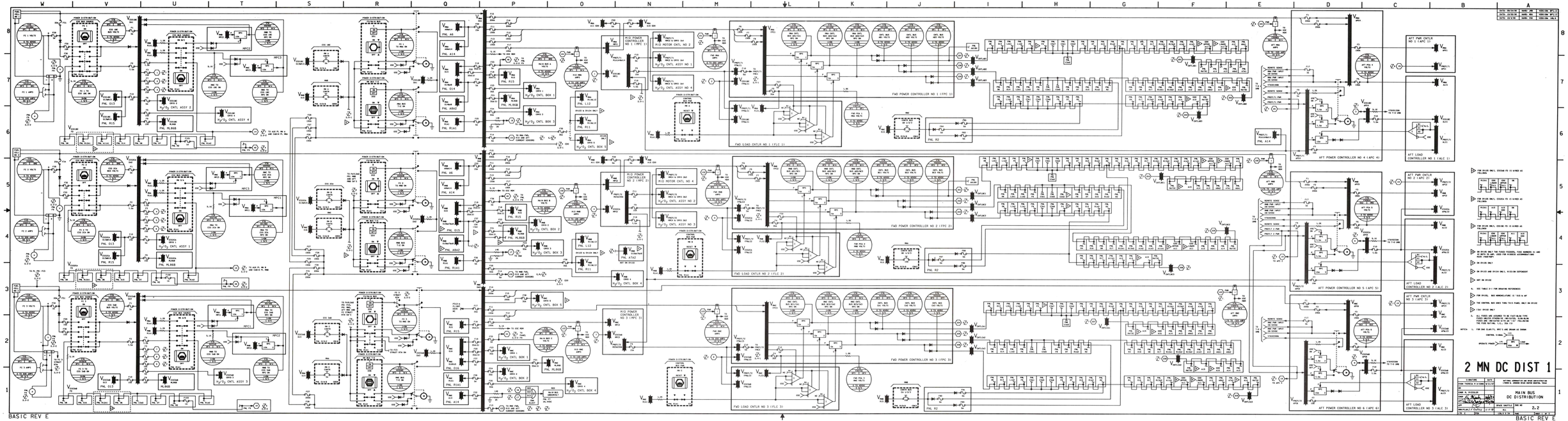
Item	Title	REV/DCN	Signoff date
	SECTION 19 STRUCTURES - Concluded		
DWG 19.1* (Sheet 3 of 6)	STRUCTURES AND SYSTEMS LOCATION	REV E	9/26/90
DWG 19.1* (Sheet 4 of 6)	STRUCTURES AND SYSTEMS LOCATIONS	REV E	10/17/90
DWG 19.1* (Sheet 5 of 6)	STRUCTURES AND SYSTEMS LOCATIONS	REV E	10/3/90
DWG 19.1* (Sheet 6 of 6)	STRUCTURES AND SYSTEMS LOCATIONS	REV E	9/7/90
DWG 19.2 (Sheet 1 of 1)	SRB/ET CONFIGURATION	REV E	8/24/90
DWG 19.3 (Sheet 1 of 3)	PAYLOAD BAY OVERVIEW (LOOKING INBOARD AND DOWN)	REV E	9/6/90
DWG 19.3 (Sheet 2 of 3)	PAYLOAD BAY OVERVIEW PORT SIDE	REV E	9/6/90
DWG 19.3 (Sheet 3 of 3)	PAYLOAD BAY OVERVIEW STARBOARD SIDE	REV E	9/6/90
DWG 19.4* (Sheet 1 of 3)	EXTERNAL SIDE VIEWS	REV E	9/6/90
DWG 19.4* (Sheet 2 of 3)	EXTERNAL VIEWS TOP/BOTTOM	REV E	9/6/90
DWG 19.4* (Sheet 3 of 3)	EXTERNAL PENETRATIONS/ TILE (AFT)	REV E	9/6/90
	SECTION 20 DISPLAYS AND CONTROLS		
DWG 20.1 (Sheet 1 of 4)	DISPLAYS AND CONTROLS FORWARD STATIONS	REV E	10/9/90
DWG 20.1 (Sheet 2 of 4)	DISPLAYS AND CONTROLS FORWARD STATIONS	REV E	10/19/90
DWG 20.1 (Sheet 3 of 4)	DISPLAYS AND CONTROLS FORWARD STATIONS	REV E	10/9/90
DWG 20.1 (Sheet 4 of 4)	DISPLAYS AND CONTROLS FORWARD STATIONS	REV E	10/9/90
DWG 20.2 (Sheet 1 of 3)	DISPLAYS AND CONTROLS AFT STATIONS	REV E	10/12/90
DWG 20.2 (Sheet 2 of 3)	DISPLAYS AND CONTROLS AFT STATIONS AND MISSION UNIQUE PANELS	REV E	10/18/90

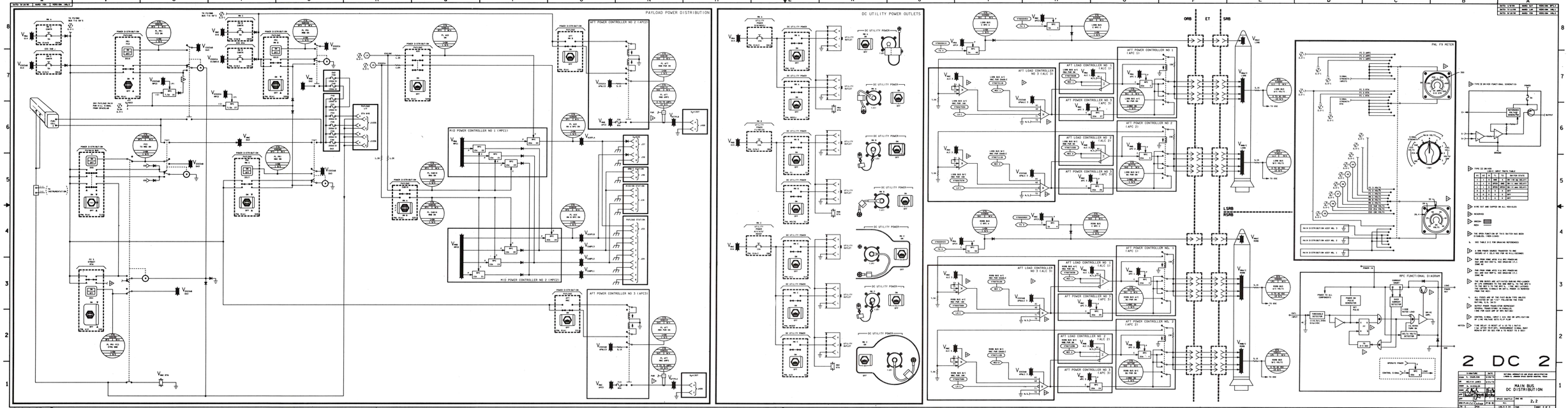
Item	Title	REV/DCN	Signoff date
	SECTION 20 DISPLAYS AND CONTROLS - Concluded		
DWG 20.2 (Sheet 3 of 3)	DISPLAYS AND CONTROLS AFT STATIONS	REV E	10/12/90
DWG 20.3 (Sheet 1 of 1)	DISPLAYS AND CONTROLS MID DECK STATIONS	REV E	10/17/90
DWG 20.4 (Sheet 1 of 1)	DISPLAYS AND CONTROLS AIRLOCK	REV E	10/9/90
TBL 20-I	VENDOR DRAWING REFERENCES	REV E	11/5/90

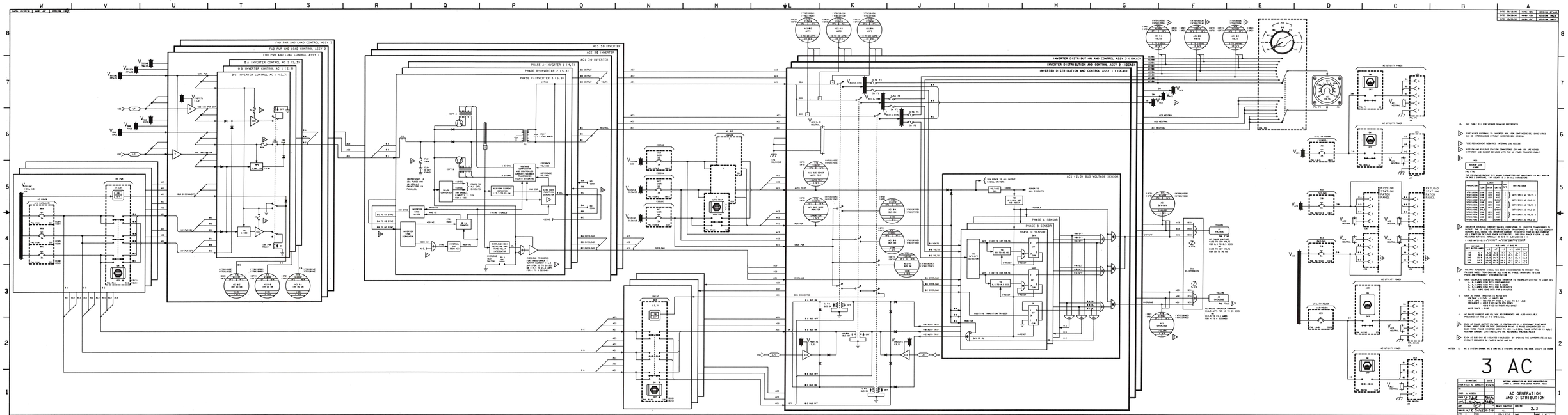
1. BUS NOMENCLATURE

2. ELECTRICAL POWER DISTRIBUTION

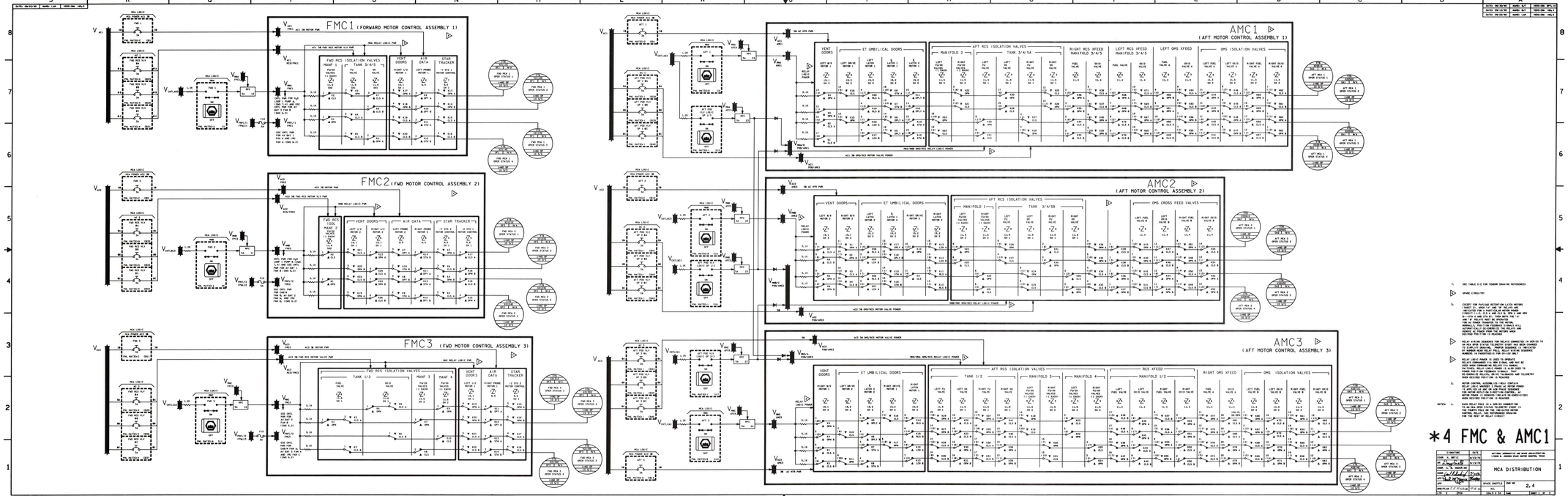

MAIN DC BUSES
AC BUSES
ENTL BUSES
ESS BUSES
PMFT BUSES
PAYLOAD BUSES
BUS NOMENCLATURE DEFINITION
* 1 EPS 0/V
EPS OVERVIEW
BASIC REV E

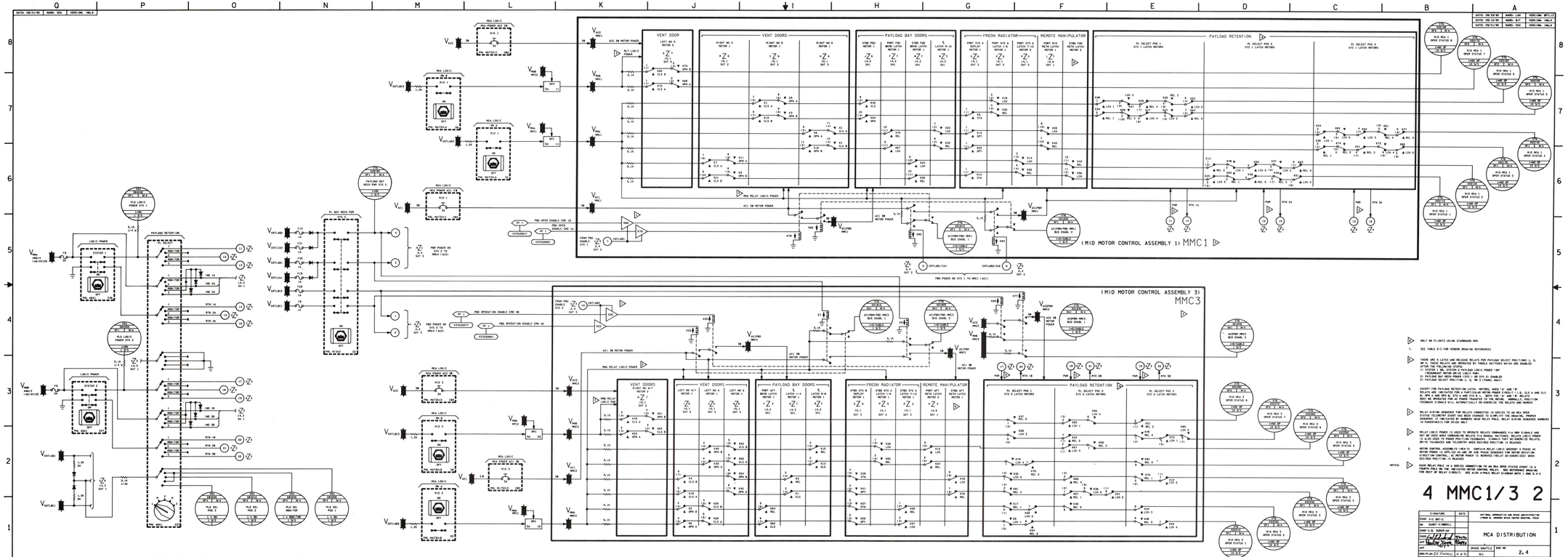

2 MN DC DIST 1
MAIN BUS DC DISTRIBUTION
2-2
FWD POWER CONTROLLER NO 1 (FPC 1)
FWD POWER CONTROLLER NO 2 (FPC 2)
FWD POWER CONTROLLER NO 3 (FPC 3)
AFT POWER CONTROLLER NO 4 (APC 4)
AFT POWER CONTROLLER NO 5 (APC 5)
AFT POWER CONTROLLER NO 6 (APC 6)
FWD LOAD CNTLR NO 1 (FLC 1)
FWD LOAD CNTLR NO 2 (FLC 2)
FWD LOAD CNTLR NO 3 (FLC 3)
AFT PWR CNTLR NO 1 (APC 1)
AFT PWR CNTLR NO 2 (APC 2)
AFT PWR CNTLR NO 3 (APC 3)
AFT LOAD CONTROLLER NO 1 (ALC 1)
AFT LOAD CONTROLLER NO 2 (ALC 2)
AFT LOAD CONTROLLER NO 3 (ALC 3)
MID POWER CONTROLLER NO 1 (MPC 1)
MID POWER CONTROLLER NO 2 (MPC 2)
MID POWER CONTROLLER NO 3 (MPC 3)
BASIC REV E


PAYLOAD POWER DISTRIBUTION
DC UTILITY POWER OUTLETS
AFT POWER CONTROLLER NO 2 (APC2)
MID POWER CONTROLLER NO 1 (MPC1)
MID POWER CONTROLLER NO 2 (MPC2)
AFT POWER CONTROLLER NO 3 (APC3)
AFT LOAD CONTROLLER NO 3 (ALC 3)
AFT POWER CONTROLLER NO 1 (APC 1)
AFT LOAD CONTROLLER NO 1 (ALC 1)
AFT POWER CONTROLLER NO 2 (APC 2)
AFT LOAD CONTROLLER NO 2 (ALC 2)
ORB
ET
SRB
LSRB
RSRB
PNL F9 METER
RPC FUNCTIONAL DIAGRAM
MAIN BUS DC DISTRIBUTION
2 DC 2
BASIC REV E


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)
AC 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 (DCA3)
INVERTER DISTRIBUTION AND CONTROL ASSY 2 (DCA2)
INVERTER DISTRIBUTION AND CONTROL ASSY 1 (DCA1)
ACC 1(2,3) BUS VOLTAGE SENSOR
PHASE A SENSOR
PHASE B SENSOR
PHASE C SENSOR
AC UTILITY POWER
MISSION STATION PANEL
PAYLOAD STATION PANEL
3 AC
AC GENERATION AND DISTRIBUTION
2.3

BASIC REV E


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)
FWD RCS ISOLATION VALVES
AFT RCS ISOLATION VALVES
VENT DOORS
ET UMBILICAL DOORS
AIR DATA
STAR TRACKER
OMS ISOLATION VALVES
OMS CROSS FEED VALVES
RCS XFEED
RIGHT OMS XFEED
LEFT OMS XFEED
MCA DISTRIBUTION
*4 FMC & AMC1
BASIC REV E



DATA: ON/21/90 NAME: SEA VERSION: VML1

DATA: ON/29/90 NAME: LAM VERSION: OPT1/2

DATA: ON/13/91 NAME: BJT VERSION: VML2

DATA: ON/21/91 NAME: SCH VERSION: VML3

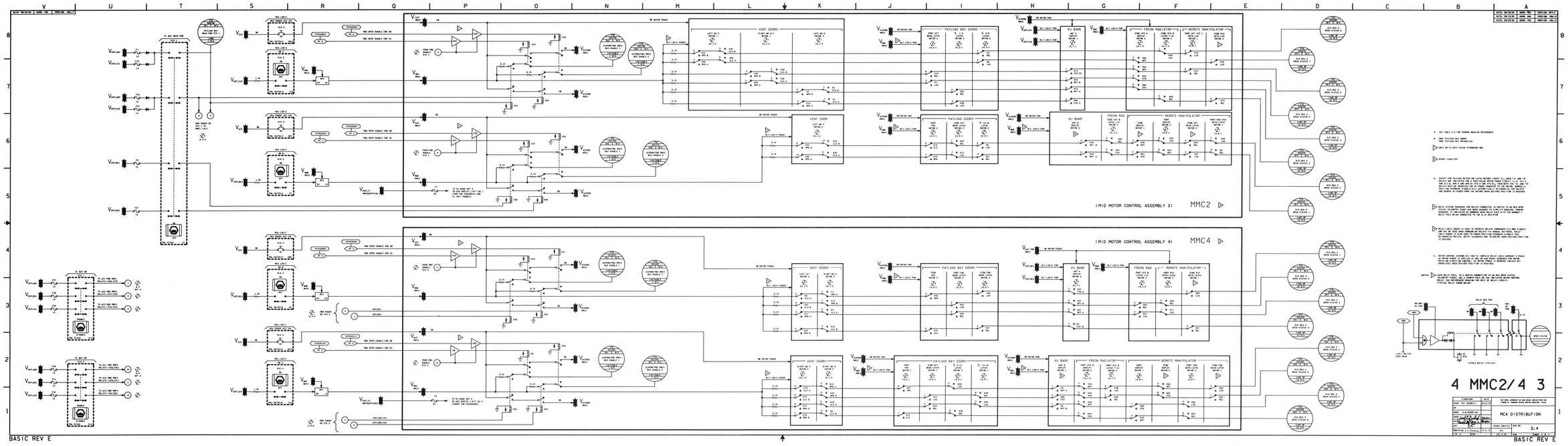
1. ONLY ON FLIGHTS USING STANDARD MMC
2. SEE TABLE D-2 FOR VENDOR DRAWING REFERENCES
3. THERE ARE 5 LATCH AND RELEASE RELAYS PER PAYLOAD SELECT POSITION: 1, 2, OR 3. THESE RELAYS ARE ENERGIZED BY TIMBLE SWITCHES WHICH ARE ENABLED BY ONE OF THE FOLLOWING:
   1) SYSTEM 1 OR SYSTEM 2 PAYLOAD LOGIC POWER "ON"
   2) PAYLOAD BAY DOOR POWER (SYS 1 OR SYS 2) ENABLED
   3) PAYLOAD SELECT POSITION 1, 2, OR 3 (MAN), SELECT
4. EXCEPT FOR PAYLOAD RETENTION LATCH MOTORS, WHEN "A" AND "B" RELAYS ARE ENERGIZED FOR A PARTICULAR MOTOR POWER CIRCUIT (1, 2, 3), CLS A AND CLS B, SPR A AND SPR B, STB A AND STB B (1), BOTH THE "A" AND "B" RELAYS MUST BE DE-ENERGIZED BEFORE THE MOTOR POWER CIRCUIT CAN BE ENERGIZED IN THE OPPOSITE DIRECTION. THIS INTERLOCK WILL AUTOMATICALLY BE COMPLETED THE MULTIPLEXER.
5. RELAY WIRING SEQUENCE FOR RELAYS CONNECTED IN SERIES TO AN MCA SPDR STATUS TELEMETRY POINT HAS BEEN CHANGED TO SIMPLIFY THE DRAWING. PROPER OPERATION OF THE MCA SPDR STATUS WHEN MOTOR RELAY FAILS, RELAY WIRING SEQUENCE REMAINS IN PARAGRAPHICALLY THE SAME ORDER.
6. RELAY LOGIC POWER IS USED TO OPERATE RELAYS COMMANDED VIA MMA SIGNALS AND MAY BE USED WHEN COMMANDING RELAYS VIA PANEL SWITCHES. RELAYS LOGIC POWER IS REMOVED FROM THE RELAYS WHEN THE MOTOR CONTROL ASSEMBLY RELAYS ARE IN DE-ENERGIZED POSITION AS READBACK BY MMA DISCRETE TELEMETRY.
7. MOTOR CONTROL ASSEMBLY 1 (MCA 1) CONTAIN RELAY LOGIC ANDENERGY 3 PHASE AC MOTOR POWER (3 APPLIED AS ARE OR USED PHASE SEQUENCE FOR MOTOR REVERSING DIRECTION CONTROL. AC MOTOR POWER IS REMOVED (RELAY DE-ENERGIZED) WHEN DESIRED POSITION IS REACHED.

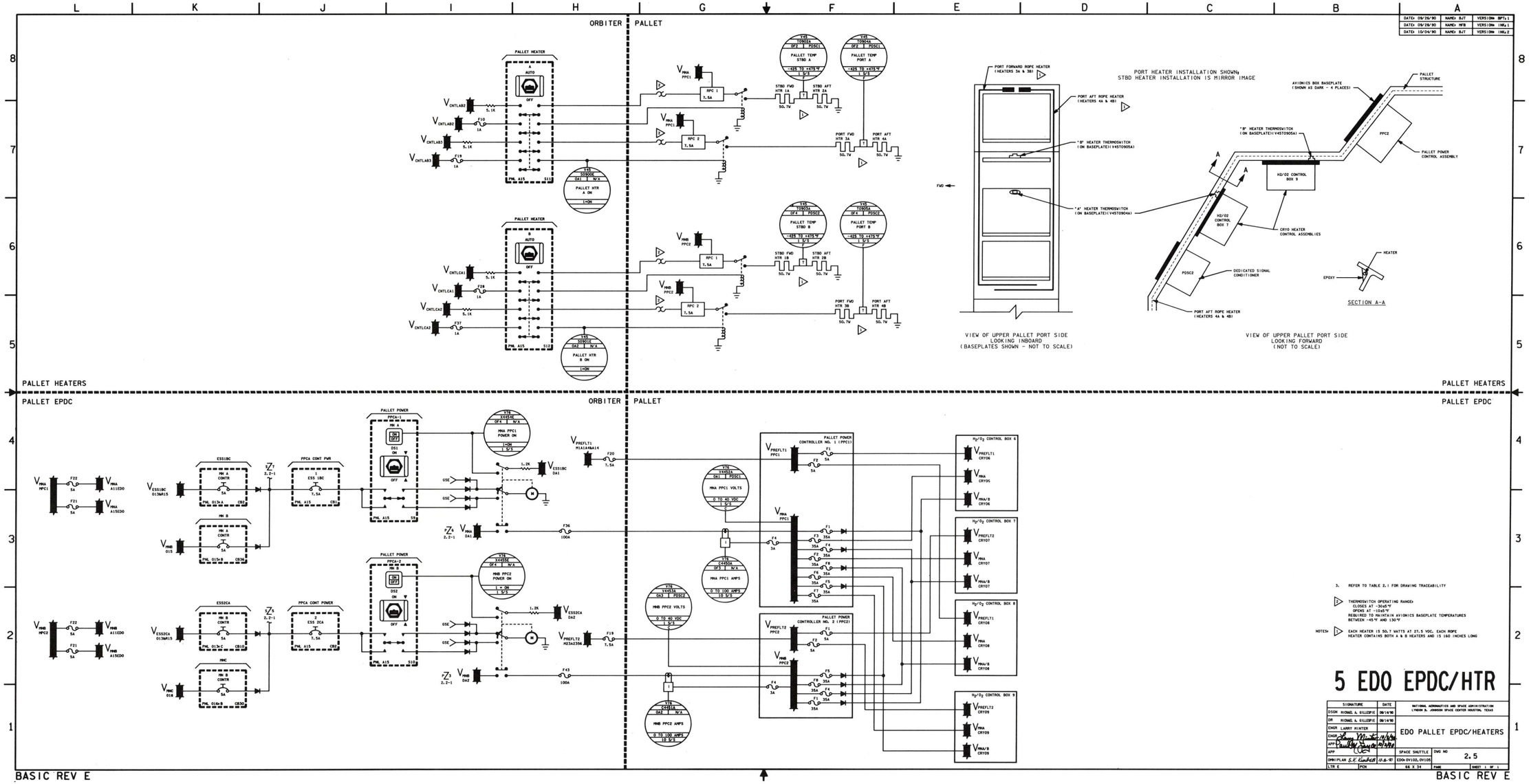
NOTES:

EACH RELAY POLE OF A SERIES CONNECTED TO AN MCA SPDR STATUS EVENT IS A NORMALLY OPEN CONTACT WHICH CLOSES WHEN THE RELAY IS ENERGIZED. EXCEPTIONS FOR NEXT OF RELAY CIRCUITS. SEE ALSO 4-POLE RELAY STANDARD NOTE 1 PAR 8.1.3

4 MMC1/3 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DESGN: M.C. MERTZ		LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR: SANDY KIMBRELL		
CHKR: C.N. SUBRAMANI		MCA DISTRIBUTION
CHIEF:		
APP:		SPACE SHUTTLE DWG NO
ENGINEER:		ALL 2.4
SIZE E	SCALE	SHEET 1 OF 3


(MID MOTOR CONTROL ASSEMBLY 2) MMC2
(MID MOTOR CONTROL ASSEMBLY 4) MMC4
VENT DOORS
PAYLOAD BAY DOORS
KU BAND
FROEN RAD
REMOTE MANIPULATOR
4 MMC2/4 3
MCA DISTRIBUTION
BASIC REV E



3. REFER TO TABLE 2.1 FOR DRAWING TRACEABILITY

1. THERMOSWITCH OPERATING RANGE:
CLOSES AT -30±5°F
OPENS AT -10±5°F
REQUIRED TO MAINTAIN AVIONICS BASEPLATE TEMPERATURES BETWEEN -45°F AND 130°F

NOTES: 1. EACH HEATER IS 50.7 WATTS AT 27.5 VDC. EACH ROPE HEATER CONTAINS BOTH A & B HEATERS AND IS 160 INCHES LONG

5 EDO EPDC/HTR

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN RICHARD A. GILLESPIE	09/14/90	
DR RICHARD A. GILLESPIE	09/14/90	EDO PALLET EPDC/HEATERS
ENGR LARRY HINTER		
ENGR	10/8/90	
APP	10/8/90	SPACE SHUTTLE — DWG NO 2.5
APP		
OMNIPLAN S.K. Kimball	10-8-90	EDO: OV102, OV105
LTR E — PCN		66 X 34 — PAGE — SHEET 1 OF 1

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
2.1	EPS OV	R.I.	VS70-760322	1 - 14	E	11/21/88	MAIN DC POWER DIST SUBSYSTEM (OV-102)
		R. I.	VS70-760309	1-15	H	12/14/89	MAIN DC POWER DIST SUBSYSTEM
		R. I.	VS70-976099	ALL	A16	8/6/90	INTEGRATED SCHEMATIC - ELECTRICAL POWER DIST & CONTROL
		R. I.	VS70-976102	ALL	G19	9/14/90	INTEGRATED SCHEMATIC - ELECTRICAL POWER DIST & CONTROL (OV-102)
		R.I.	VS70-764345	5 OF 7	B	2/20/90	MID POWER CONTROL ASSEMBLY NO. 1
		R.I.	VS70-764355	5 OF 6	B	2/13/90	MID PWR CONTROL ASSEMBLY NO. 2, MID-FUSELAGE
2.2 (SHEET 1)	MAIN BUS DC DISTRIBUTION	R.I.	VS70-764345	5 OF 7	B	2/20/90	MID POWER CONTROL ASSEMBLY NO. 1
		R.I.	VS70-764355	5 OF 6	B	2/13/90	MID PWR CONTROL ASSEMBLY NO. 2, MID-FUSELAGE
2.2 (SHEETS 1-2)	MAIN BUS DC DISTRIBUTION	R.I.	VS70-760309	1 - 14	H	12/14/89	MAIN DC POWER DISTRIBUTION SUBSYSTEM - OV-103, OV-104, OV-105
		R.I.	VS70-760322	1 - 14	E	11/21/88	MAIN DC POWER DISTRIBUTION SUBSYSTEM - OV-102
2.2 (SHEET 2)	MAIN BUS DC DISTRIBUTION	R.I.	VS70-760209	2 OF 3	D	11/13/84	COAS SEAT/SUIT CONTROLS CREW SYSTEMS - OV-103, OV-104, OV-105
		R.I.	VS70-760202	2 OF 3	G	1/14/83	COAS SEAT/SUIT CONTROLS CREW SYSTEMS - OV-102
		R.I.	VS70-760503	4 OF 14 5 OF 14 12 OF 14	D	11/10/89	EVCON SUBSYSTEM - OV-103, OV-104, OV-105
		R.I.	VS70-760502	4 OF 14 5 OF 14 12 OF 14	M	10/20/89	EVCON SUBSYSTEM - OV-102
		R.I.	VS70-710179	1 - 2	D	4/6/88	SOLID RKT BSTR RATE GYRO GDNC & NAV SUBSYSTEM - OV-103, OV-104, OV-105
		R.I.	VS70-710172	1 -2	G	5/18/87	SOLID RKT BSTR RATE GYRO GDNC & NAV SUBSYSTEM - OV-102
		R.I.	VS70-733619	1	B	10/31/89	SCHEMATIC DIAGRAM PANEL F9A2 MAIN DISPLAY CONSOLE
		R.I.	VS70-760809	20 of 24	R	7/7/89	PAYLOAD SUBSYSTEM INTERFACE - ALL VEHICLE

DWG	SIGNATURE		DATE
2.1	ENGR J. AZBELL		
	ENGR Jim Azbell		10/11/90
2.2-1,2	ENGR R. MIESSLER		
	ENGR Ray Miessler		10/12/90
	APP Pamela M Taylor		10/12/90
	APP		
	OMNIPLAN		
	LTR E	PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE ALL

TBL NO 2-I

PAGE 2.I-1

SHEET 1 OF 2

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
2.3	AC GENERATION AND DISTRIBUTION	R. I.	VS70-760402	1-9	L	12/9/88	AC PWR DIST AND CONTROL - SUBSYSTEM
		R. I.	VS70-760409	1-9	D	1/19/89	AC PWR DIST AND CONTROL - SUBSYSTEM
		R.I.	VS70-760202	2	G	1/14/83	COAS, SEAT/SUIT CONTROLS CREW SYSTEMS OV-102
		R.I.	V070-760209	2	D	11/13/84	COAS, SEAT/SUIT CONTROLS CREW SYSTEMS OV-103, OV-104, OV-105
		WESTING-HOUSE ELECTRIC CORP.	947F480	—	A	10/22/75	INVERTER SCHEMATIC
		WESTING-HOUSE ELECTRIC CORP.	9009D37	—	A	10/22/75	CONTROL PWR SUPPLY AND ERC
		WESTING-HOUSE ELECTRIC CORP.	9009D36	—		4/8/75	CCFT STEERING CIRCUIT
		WESTING-HOUSE ELECTRIC CORP.	947F494	—		10/14/75	COMPARITOR SCHEMATIC
		WESTING-HOUSE ELECTRIC CORP.	947F493	—		10/27/75	SINE WAVE SCHEMATIC
2.4 (SHEETS 1-3)	MCA DISTRIBUTION	R.I..	VS70-540302	1 - 8	J	6/6/86	PAYLOAD BAY DOOR CONTS SUBSYSTEM
		R.I.	VS70-540309	1 - 8	E	6/6/86	PAYLOAD BAY DOOR CONTS SUBSYSTEM
		R.I.	VS70-760709	1 - 11	D	8/25/86	MOTOR CONTROL ASSY POWER DISTRIBUTION
		R.I.	VS70-760702	1 - 12	H	8/25/86	MOTOR CONTROL ASSY POWER DISTRIBUTION
		R.I.	VS70-590119	1 - 3	B	11/27/85	KU-BAND ANTENNA DEPLOYMENT
		R.I.	VS70-540304	1 - 5	C	10/28/87	PAYLOAD RETENTION SUBSYSTEM
2.5	PALLET EPDC/HEATERS	R. I.	ECN 105-0044	ALL	A4	1/23/90	PRSD MODS FOR THE 28-DAY MISSION EXTENSION KIT ON OV-105
		R. I.	VS70-945102	ALL	G	7/20/90	INTEGRATED SYSTEM SCHEMATIC ORBITER OV-102 EPS
		JSC	SCR90118	ALL	A	8/23/89	EDO SM MODIFICATIONS

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
2.3	ENGR J. AZBELL			ENGR	
	ENGR Ji Azbell	10/12/90		ENGR	
2.4-1,2,3	ENGR C. B. GUDERIAN			ENGR	
	ENGR [signature]	10/12/90		ENGR	
2.5	ENGR L. MINTER			APP [signature] Paul Joyce	10/24/90
	ENGR Lenny Minter	10/24/90		APP	
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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

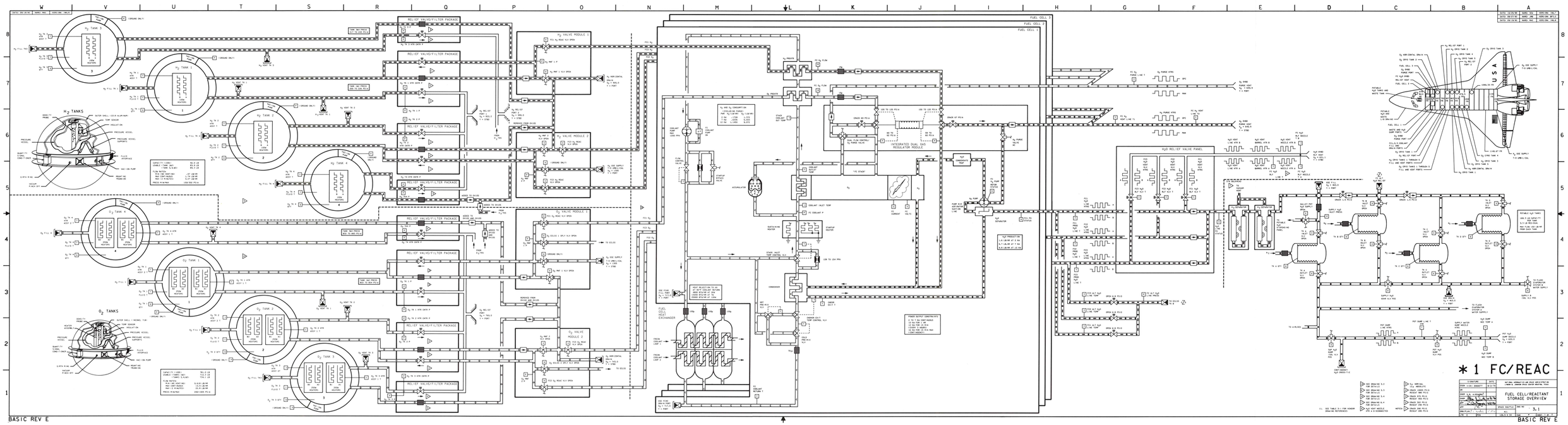
VENDOR DRAWING REFERENCES

SPACE SHUTTLE ALL

TBL NO 2-I

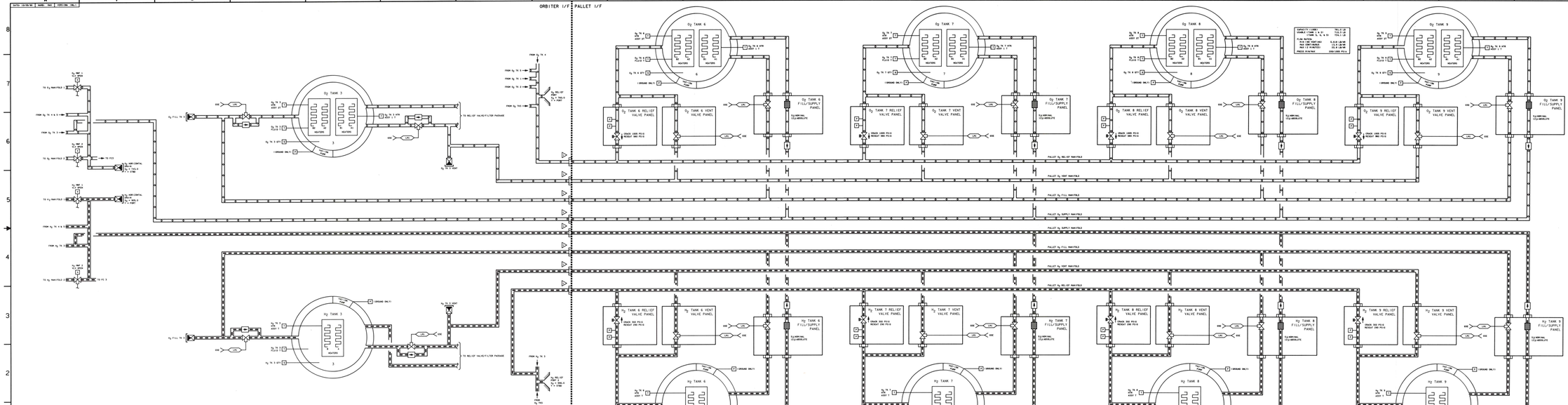
BASIC REV E

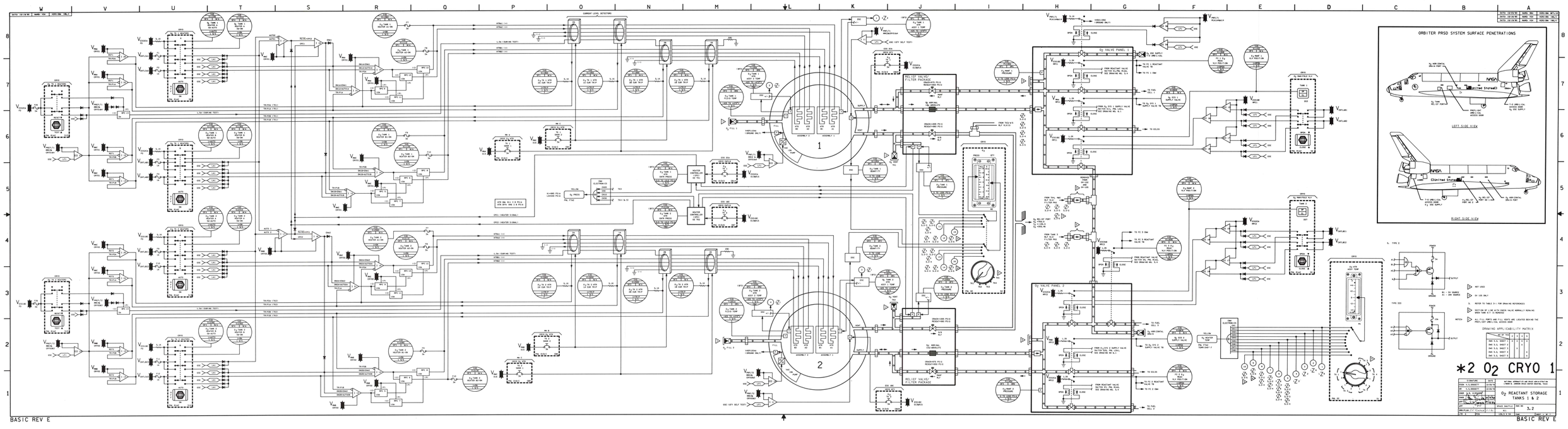
3. ELECTRICAL POWER GENERATION

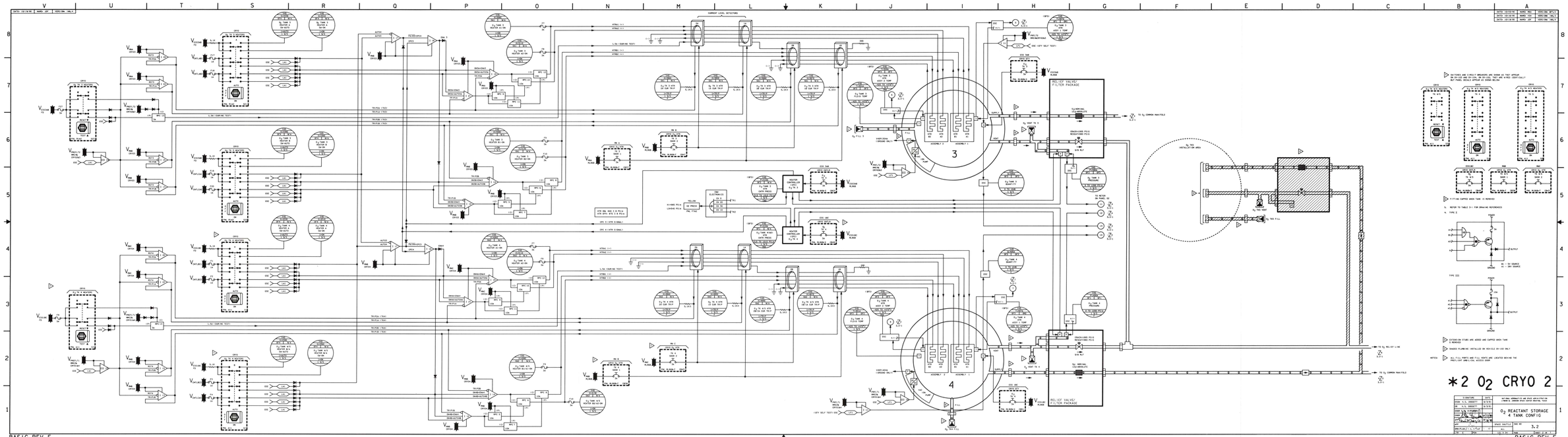

H2 TANKS
O2 TANKS
INTEGRATED DUAL GAS REGULATOR MODULE
H2O RELIEF VALVE PANEL
RELIEF VALVE/FILTER PACKAGE
* 1 FC/REAC
FUEL CELL/REACTANT STORAGE OVERVIEW
BASIC REV E

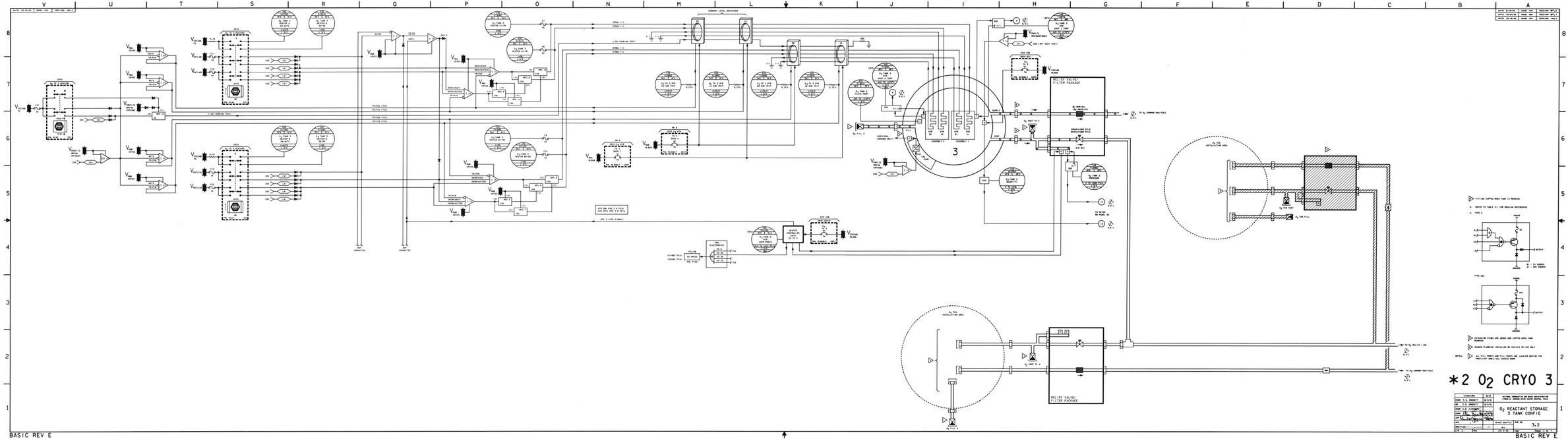
ORBITER I/F

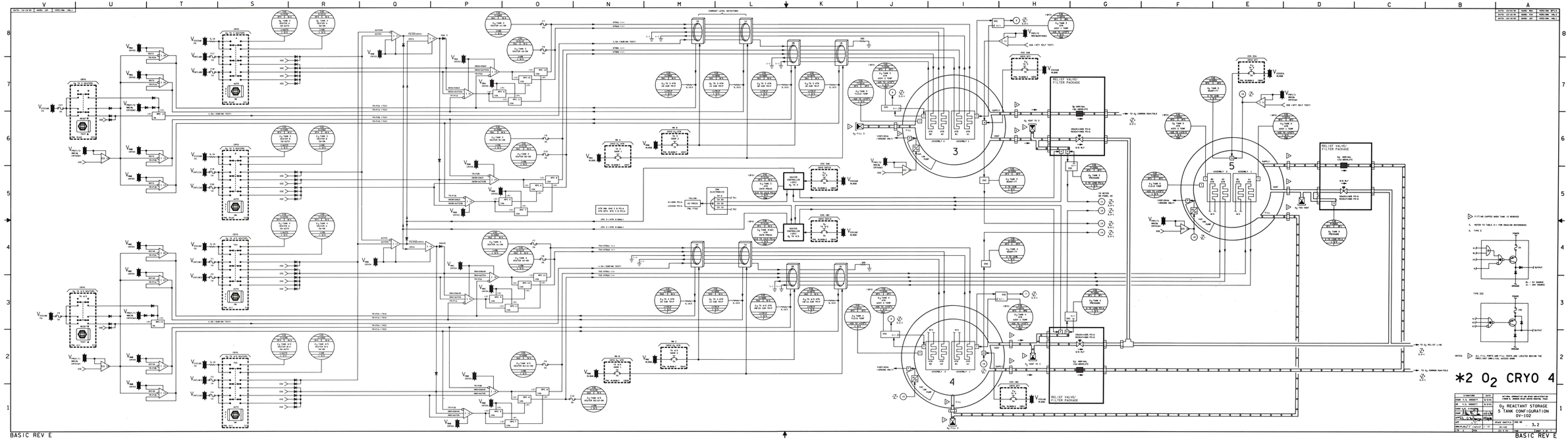
PALLET I/F

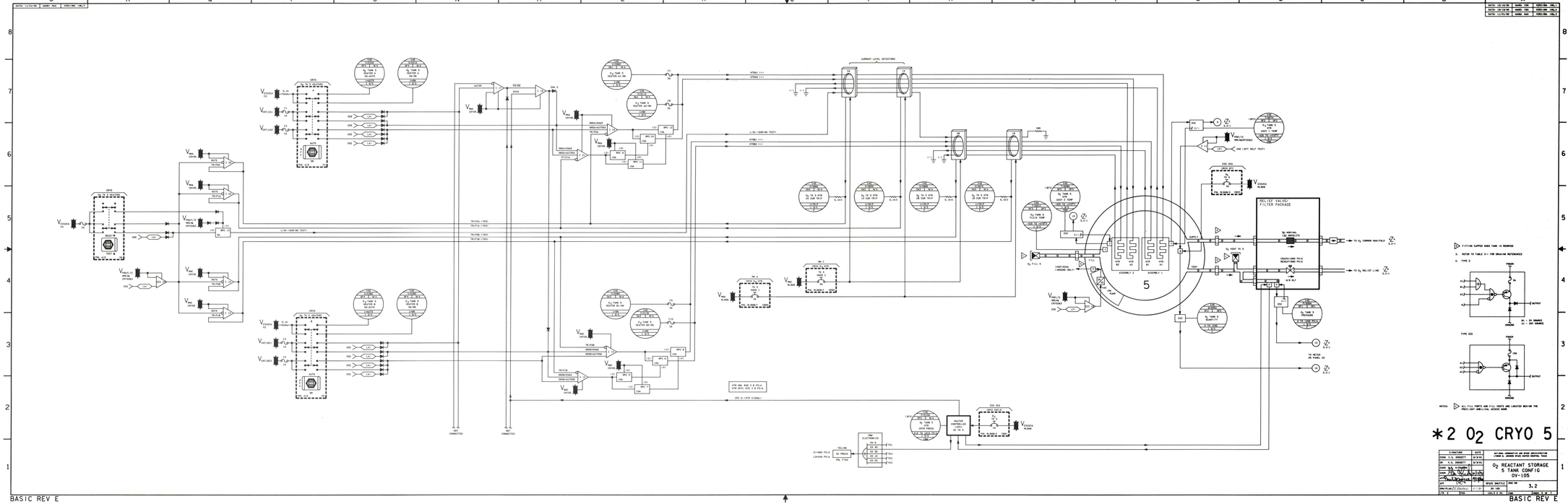

O2 TANK 6
O2 TANK 7
O2 TANK 8
O2 TANK 9
O2 TANK 3
H2 TANK 6
H2 TANK 7
H2 TANK 8
H2 TANK 9
H2 TANK 3
HEATERS
HEATER
GROUND ONLY
O2 TANK 6 RELIEF VALVE PANEL
O2 TANK 6 VENT VALVE PANEL
O2 TANK 6 FILL/SUPPLY PANEL
O2 TANK 7 RELIEF VALVE PANEL
O2 TANK 7 VENT VALVE PANEL
O2 TANK 7 FILL/SUPPLY PANEL
O2 TANK 8 RELIEF VALVE PANEL
O2 TANK 8 VENT VALVE PANEL
O2 TANK 8 FILL/SUPPLY PANEL
O2 TANK 9 RELIEF VALVE PANEL
O2 TANK 9 VENT VALVE PANEL
O2 TANK 9 FILL/SUPPLY PANEL
H2 TANK 6 RELIEF VALVE PANEL
H2 TANK 6 VENT VALVE PANEL
H2 TANK 6 FILL/SUPPLY PANEL
H2 TANK 7 RELIEF VALVE PANEL
H2 TANK 7 VENT VALVE PANEL
H2 TANK 7 FILL/SUPPLY PANEL
H2 TANK 8 RELIEF VALVE PANEL
H2 TANK 8 VENT VALVE PANEL
H2 TANK 8 FILL/SUPPLY PANEL
H2 TANK 9 RELIEF VALVE PANEL
H2 TANK 9 VENT VALVE PANEL
H2 TANK 9 FILL/SUPPLY PANEL
CRACK 1200 PSIG REPEAT 1080 PSIG
CRACK 1000 PSIG REPEAT 880 PSIG
CRACK 950 PSIG REPEAT 830 PSIG
CRACK 900 PSIG REPEAT 780 PSIG
51.0 MPA/SEC (7.4 ABSOLUTE)
PALLET O2 RELIEF MANIFOLD
PALLET O2 VENT MANIFOLD
PALLET O2 FILL MANIFOLD
PALLET O2 SUPPLY MANIFOLD
PALLET H2 SUPPLY MANIFOLD
PALLET H2 FILL MANIFOLD
PALLET H2 VENT MANIFOLD
PALLET H2 RELIEF MANIFOLD
TO O2 MANIFOLD 3
TO O2 MANIFOLD 2
TO H2 MANIFOLD 3
TO H2 MANIFOLD 2
TO FCS 3
TO FCS 2
TO O2 VENT
TO H2 VENT
TO RELIEF VALVE/FILTER PACKAGE
FROM O2 TK 4
FROM O2 TK 5
FROM O2 TK 1
FROM O2 TK 2
FROM O2 TK 3
FROM H2 TK 4
FROM H2 TK 5
FROM H2 TK 1
FROM H2 TK 2
FROM H2 TK 3
O2 RELIEF VALVE 1 P/A = 965.5 PSIG
H2 RELIEF VALVE 1 P/A = 965.5 PSIG
O2 MANUAL ISOLATION VALVE
H2 MANUAL ISOLATION VALVE
O2 FILL
H2 FILL
O2 VENT
H2 VENT
O2 SUPPLY
H2 SUPPLY
O2 RELIEF
H2 RELIEF
O2 FILL TK 1
O2 TK 1 VENT ASSY 1
O2 TK 1 VENT FLOW 1
O2 TK 1 VENT ASSY 2
O2 TK 1 VENT FLOW 2
O2 TK 1 VENT ASSY 3
O2 TK 1 VENT FLOW 3
O2 TK 1 VENT ASSY


ORBITER PRSD SYSTEM SURFACE PENETRATIONS
LEFT SIDE VIEW
RIGHT SIDE VIEW
*2 O2 CRYO 1
O2 REACTANT STORAGE TANKS 1 & 2
DRAWING APPLICABILITY MATRIX
BASIC REV E

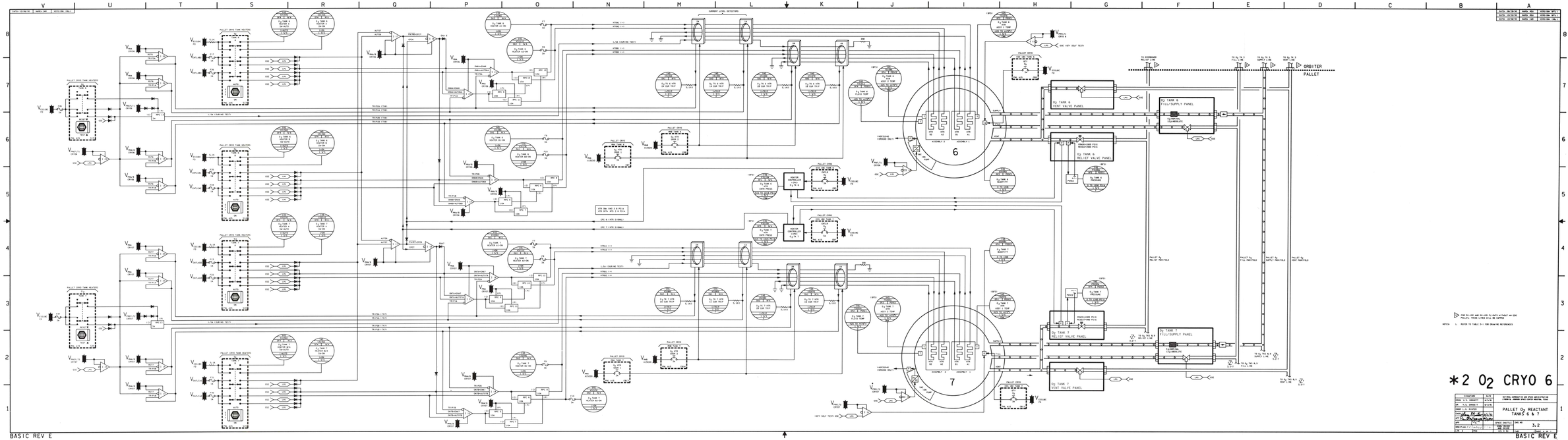

*2 O2 CRYO 2
O2 REACTANT STORAGE
4 TANK CONFIG
BASIC REV E
BASIC REV E


SUMMER LEVEL DETECTORS
RELIEF VALVE/ FILTER PACKAGE
RELIEF VALVE/ FILTER PACKAGE
TO O_2 CRYO MANIFOLD
TO O_2 RELIEF LINE
TO METER ON PANEL 40
TO O_2 HEAT TK 3
TO O_2 HEAT TK 4
TO O_2 TKS INSTALLATION AREA
TO O_2 TKS INSTALLATION AREA
TO O_2 TKS FILL
O_2 FILL 3
O_2 FILL 4
O_2 HEATER CONTROLLER
O_2 HEATER PANEL
O_2 TANK 3 HEATER 40-1A
O_2 TANK 3 HEATER 40-1B
O_2 TANK 3 HEATER 40-2A
O_2 TANK 3 HEATER 40-2B
O_2 TANK 4 HEATER 40-3A
O_2 TANK 4 HEATER 40-3B
O_2 TANK 4 HEATER 40-4A
O_2 TANK 4 HEATER 40-4B
O_2 TANK 3 QUANTITY 40-5A
O_2 TANK 3 QUANTITY 40-5B
O_2 TANK 4 QUANTITY 40-6A
O_2 TANK 4 QUANTITY 40-6B
O_2 TANK 3 PRESS 40-7A
O_2 TANK 3 PRESS 40-7B
O_2 TANK 4 PRESS 40-8A
O_2 TANK 4 PRESS 40-8B
O_2 TANK 3 TEMP 40-9A
O_2 TANK 3 TEMP 40-9B
O_2 TANK 4 TEMP 40-10A
O_2 TANK 4 TEMP 40-10B
O_2 TANK 3 HEATER 40-11A
O_2 TANK 3 HEATER 40-11B
O_2 TANK 4 HEATER 40-12A
O_2 TANK 4 HEATER 40-12B
O_2 TANK 3 HEATER 40-13A
O_2 TANK 3 HEATER 40-13B
O_2 TANK 4 HEATER 40-14A
O_2 TANK 4 HEATER 40-14B
O_2 TANK 3 HEATER 40-15A
O_2 TANK 3 HEATER 40-15B
O_2 TANK 4 HEATER 40-16A
O_2 TANK 4 HEATER

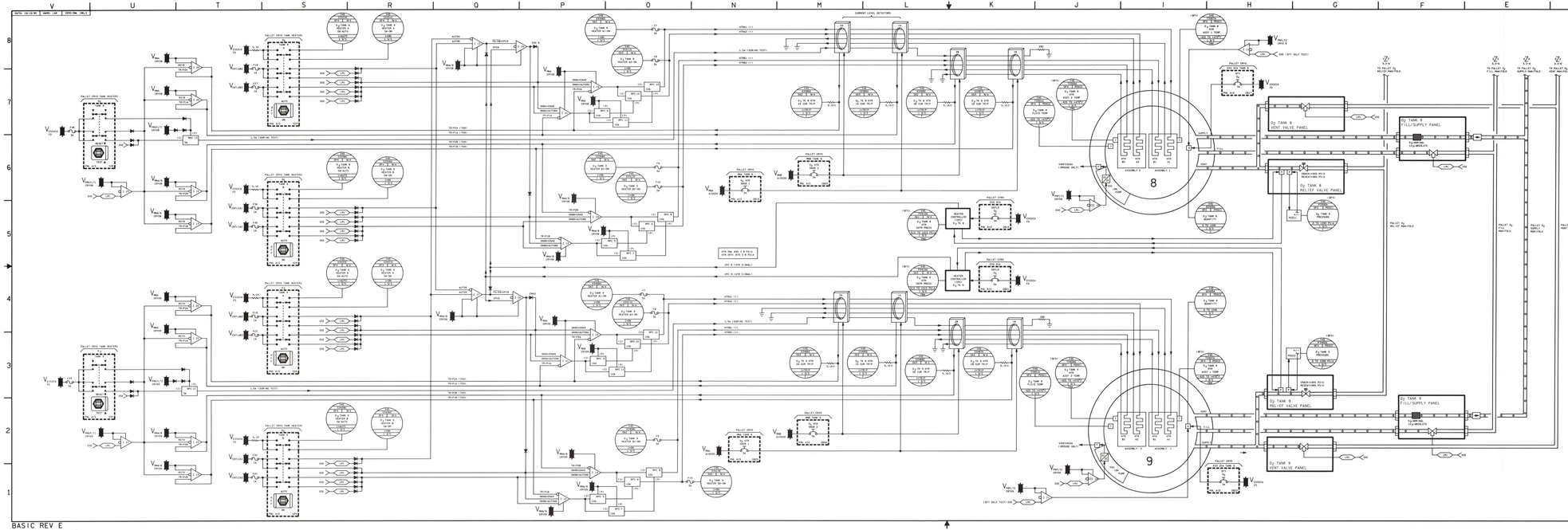

*2 O_2 CRYO 4
O_2 REACTANT STORAGE
5 TANK CONFIGURATION
OV-102
SPACE SHUTTLE
BASIC REV E
BASIC REV E

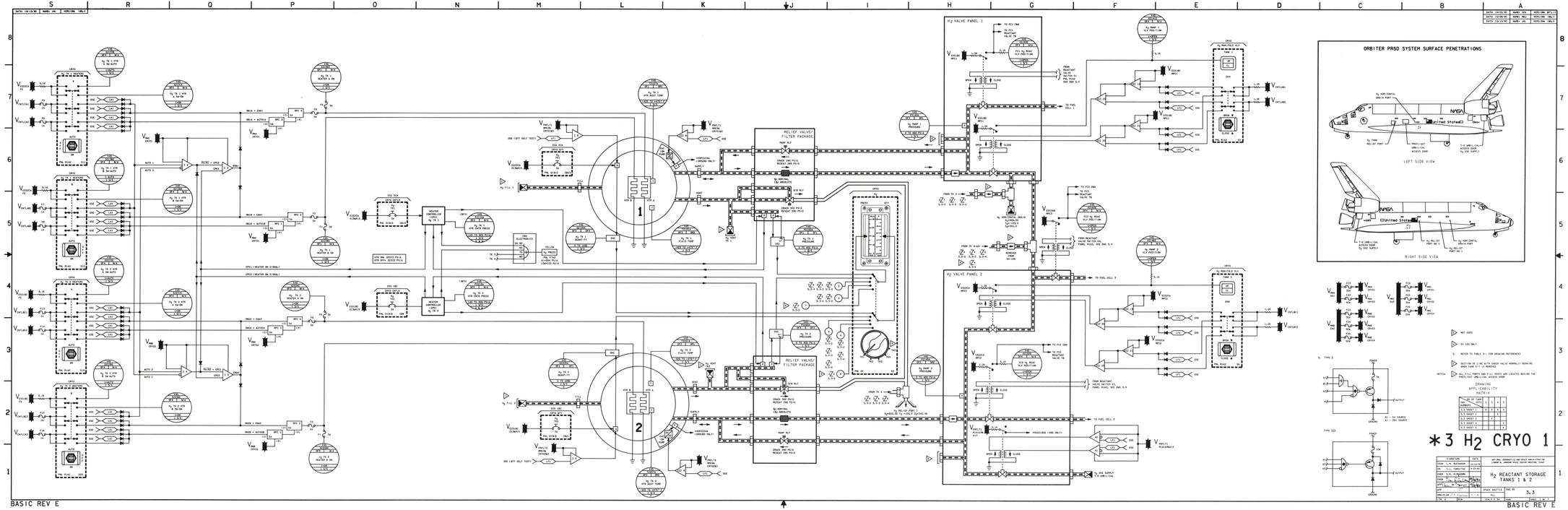


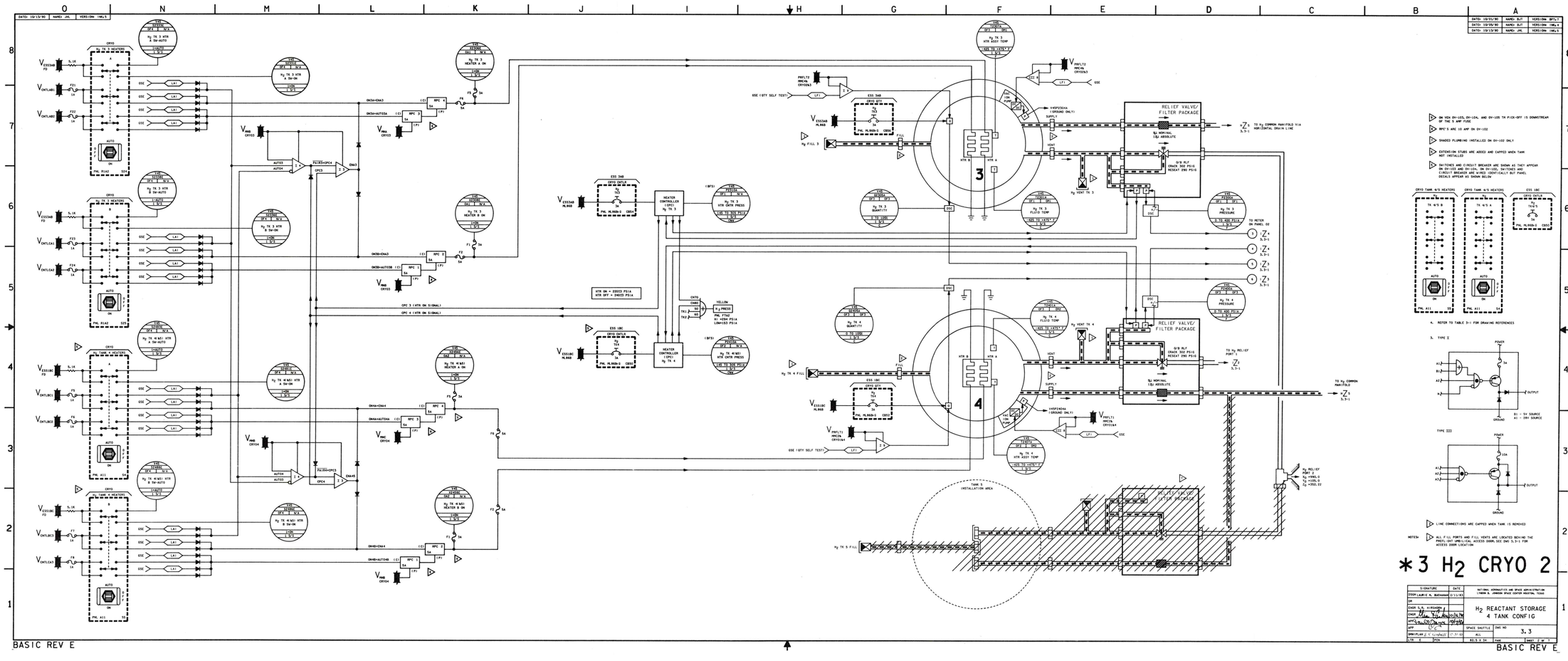
CURRENT LEVEL DETECTORS
RELIEF VALVE/
FILTER PACKAGE
5
*2 O_2 CRYO 5
O_2 REACTANT STORAGE
5 TANK CONFIG
OV-105
3.2
BASIC REV E

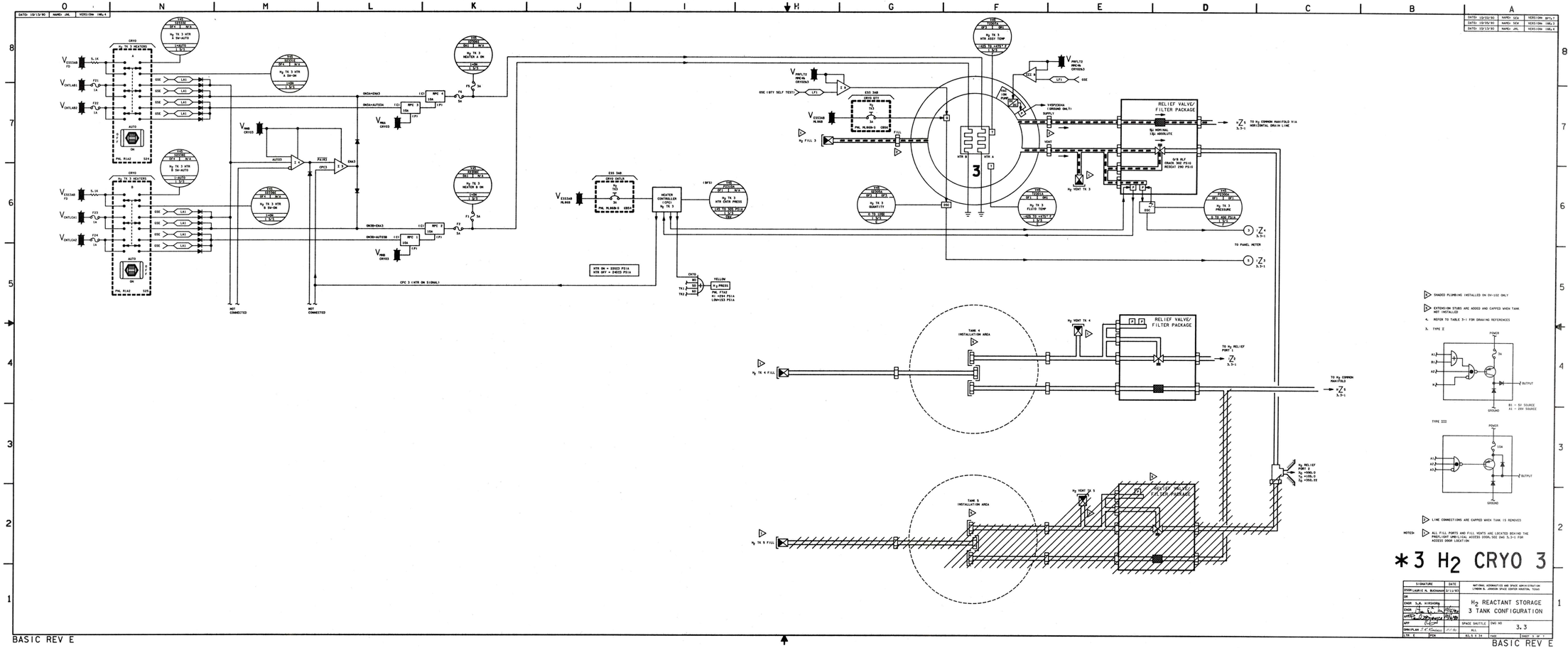


ORBITER PALLET
O2 TANK 6 VENT VALVE PANEL
O2 TANK 6 FILL/SUPPLY PANEL
O2 TANK 6 RELIEF VALVE PANEL
O2 TANK 7 RELIEF VALVE PANEL
O2 TANK 7 FILL/SUPPLY PANEL
O2 TANK 7 VENT VALVE PANEL
6
7
*2 O2 CRYO 6
PALLET O2 REACTANT TANKS 6 & 7
3.2
BASIC REV E


*2 O2 CRYO 7
PALLET O2 REACTANT TANKS 8 & 9
BASIC REV E
BASIC REV E


ORBITER PRSD SYSTEM SURFACE PENETRATIONS
LEFT SIDE VIEW
RIGHT SIDE VIEW
H2 VALVE PANEL 1
H2 VALVE PANEL 2
RELIEF VALVE/ FILTER PACKAGE
RELIEF VALVE/ FILTER PACKAGE
DRAWING APPLICABILITY MATRIX
*3 H2 CRYO 1
H2 REACTANT STORAGE TANKS 1 & 2
SPACE SHUTTLE
3.3
BASIC REV E
BASIC REV E


DATE= 10/15/90 NAME= JHL VERSION= 1MA.5
DATE= 10/05/90 NAME= BUT VERSION= BFLY
DATE= 10/25/90 NAME= BUT VERSION= 1MA.6
DATE= 10/13/90 NAME= JHL VERSION= 1MA.5
CRYO TANK 3 HEATERS
CRYO TANK 4 HEATERS
CRYO TANK 4/5 HEATERS
HEATER CONTROLLER (HTR) Hy TK 3
HEATER CONTROLLER (HTR) Hy TK 4
RELIEF VALVE/ FILTER PACKAGE
RELIEF VALVE/ FILTER MODULE
TANK 5 INSTALLATION AREA
TO Hy COMMON MANIFOLD
TO Hy RELIEF PORT 2
TO METER ON PANEL O2
TO Hy CRYO TANK 4/5 HEATERS
TO Hy CRYO TANK 4/5 HEATERS
Hy TK 3 HTR A SW-AUTO
Hy TK 3 HTR B SW-AUTO
Hy TK 4 HTR A SW-AUTO
Hy TK 4 HTR B SW-AUTO
Hy TK 3 HEATER A ON
Hy TK 3 HEATER B ON
Hy TK 4 HEATER A ON
Hy TK 4 HEATER B ON
Hy TK 3 QUANTITY
Hy TK 3 FLUID TEMP
Hy TK 3 PRESSURE
Hy TK 4 QUANTITY
Hy TK 4 FLUID TEMP
Hy TK 4 PRESSURE
Hy TK 3 HTR DRTY PRESS
Hy TK 4 HTR DRTY PRESS
Hy TK 3 HTR SSSY TEMP
Hy TK 4 HTR SSSY TEMP
HTR ON = 22000 PSIA
HTR OFF = 24000 PSIA
YELLOW
Hy PRESS
PNL F762
XI -4256 PSIA
LOW=153 PSIA
0/B RLF CRACK 302 PSIG RESEAT 290 PSIG
15 MICRON ABSOLUTE
0/B RLF CRACK 302 PSIG RESEAT 290 PSIG
15 MICRON ABSOLUTE
ON VEH OV-105, OV-104, AND OV-105 TK P/CK-OFF IS DOWNSTREAM OF THE 5 AMP FUSE
RPC'S ARE 10 AMP ON OV-102
SHADED PLUMBING INSTALLED ON OV-102 ONLY
EXTENSION STUBS ARE ADDED AND CAPPED WHEN TANK NOT INSTALLED
SWITCHES AND CIRCUIT BREAKER ARE SHOWN AS THEY APPEAR ON OV-103 AND OV-104. ON OV-102, SWITCHES AND CIRCUIT BREAKER ARE WIRED IDENTICALLY BUT PANEL DECALS APPEAR AS SHOWN BELOW.
A. REFER TO TABLE 3-1 FOR DRAWING REFERENCES
B. TYPE I
TYPE III
BI - 5V SOURCE
AI - 28V SOURCE
LINE CONNECTIONS ARE CAPPED WHEN TANK IS REMOVED
NOTES:
ALL FILL PORTS AND FILL VENTS ARE LOCATED BEHIND THE PNEL-1307 UMBILICAL ACCESS DOOR, SEE DWG 3.3-1 FOR ACCESS DOOR LOCATION
*3 H2 CRYO 2
SIGNATURE
DATE
DESIGN LAURIE M. BUCHANAN 2/11/91
CHKR S.A. NICHOLSON
CHKR
APP
APP
SPACE SHUTTLE
DWG NO
3.3
SIZE E
PCN
SHEET 1 OF 1
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
H2 REACTANT STORAGE
4 TANK CONFIG
BASIC REV E
BASIC REV E



1. SHADED PLUMBING INSTALLED ON OV-102 ONLY
2. EXTENSION STUBS ARE ADDED AND CAPPED WHEN TANK NOT INSTALLED
4. REFER TO TABLE 3-1 FOR DRAWING REFERENCES
3. TYPE I

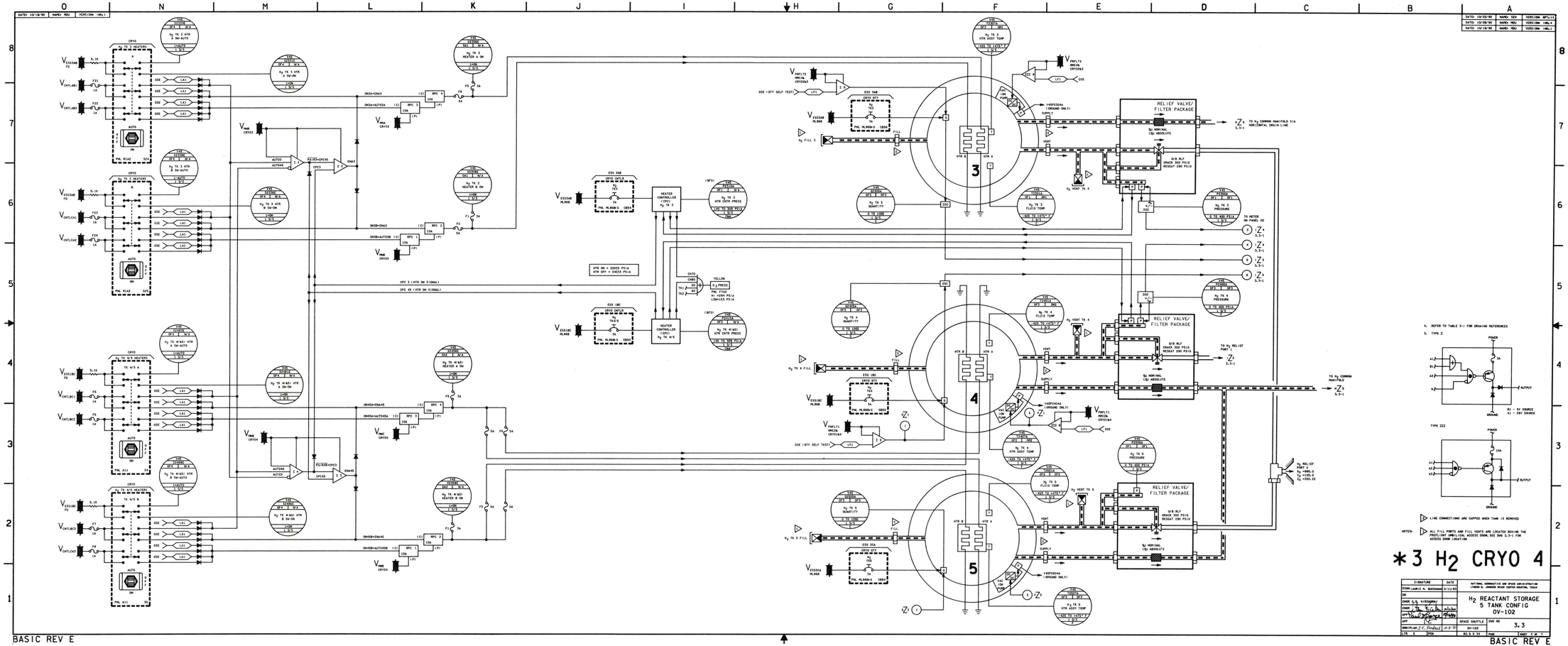
5. LINE CONNECTIONS ARE CAPPED WHEN TANK IS REMOVED

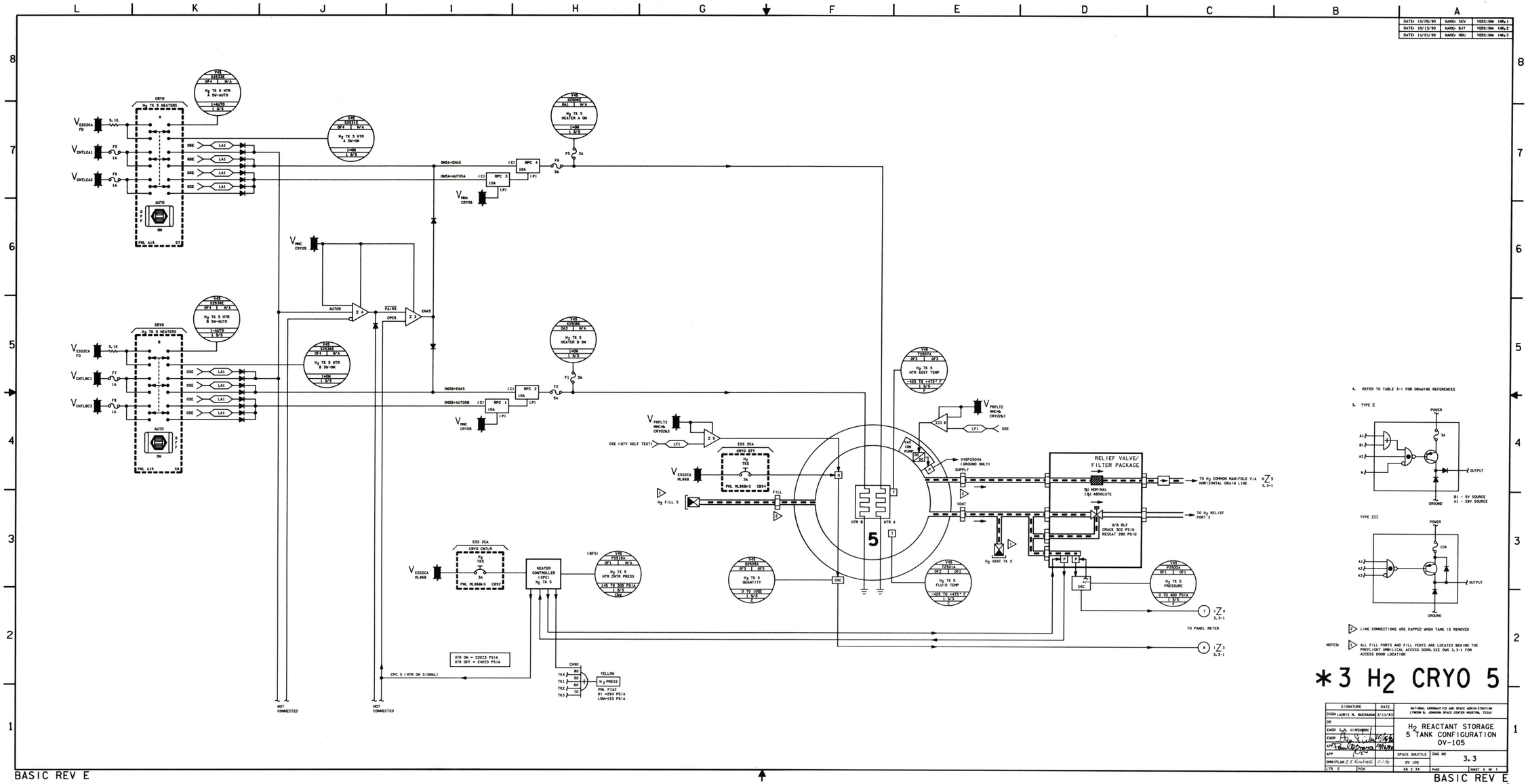
NOTES:
6. ALL FILL PORTS AND FILL VENTS ARE LOCATED BEHIND THE PREFLIGHT UMBILICAL ACCESS DOOR. SEE DWG 3.3-1 FOR ACCESS DOOR LOCATION

*3 H_2 CRYO 3

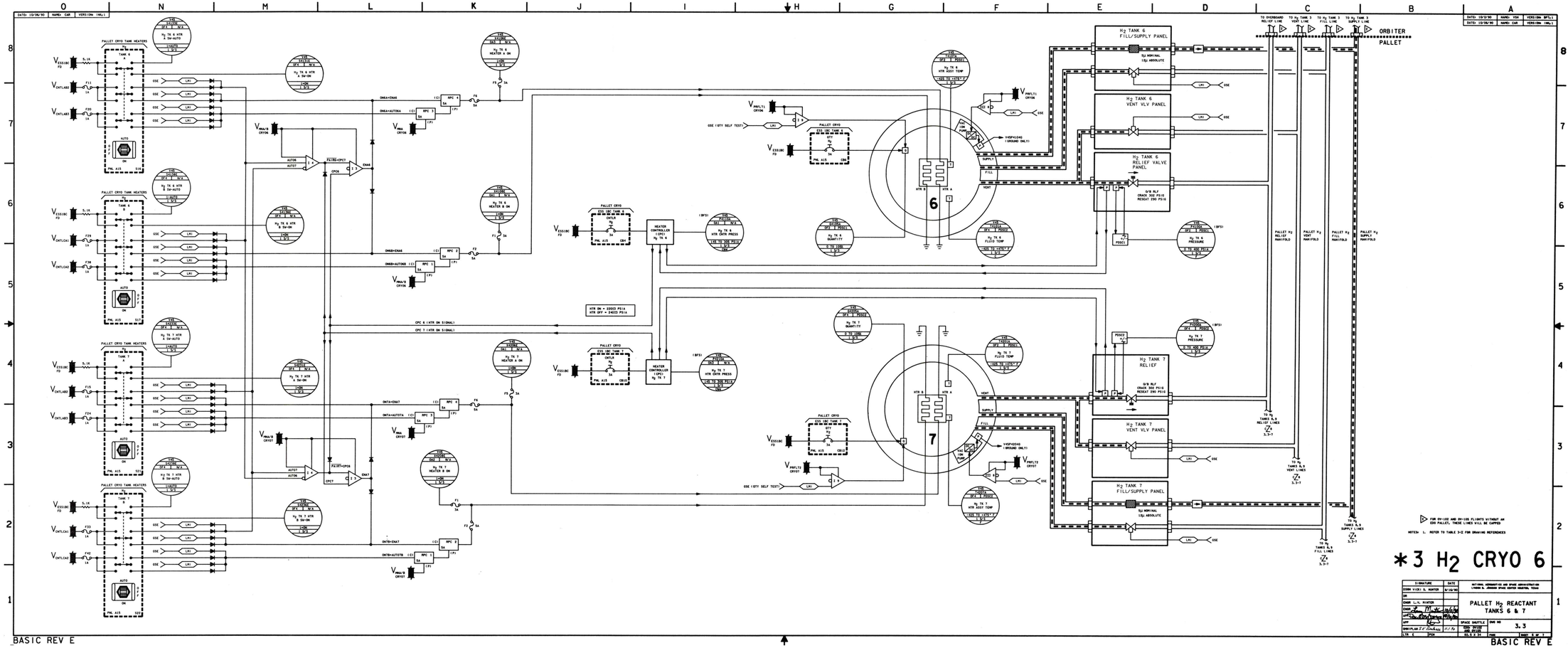
SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
SYSTEM LAURIE A. BUCHANAN	8/11/83	
DR		H_2 REACTANT STORAGE 3 TANK CONFIGURATION
ENGR S.A. HIRSCHBERG		
ENGR		
APP		SPACE SHUTTLE — DWG NO 3.3
GROUP LEAD		ALL
TK E	PCN	REL 5.3 — PAGE — SHEET 3 OF 7

BASIC REV E

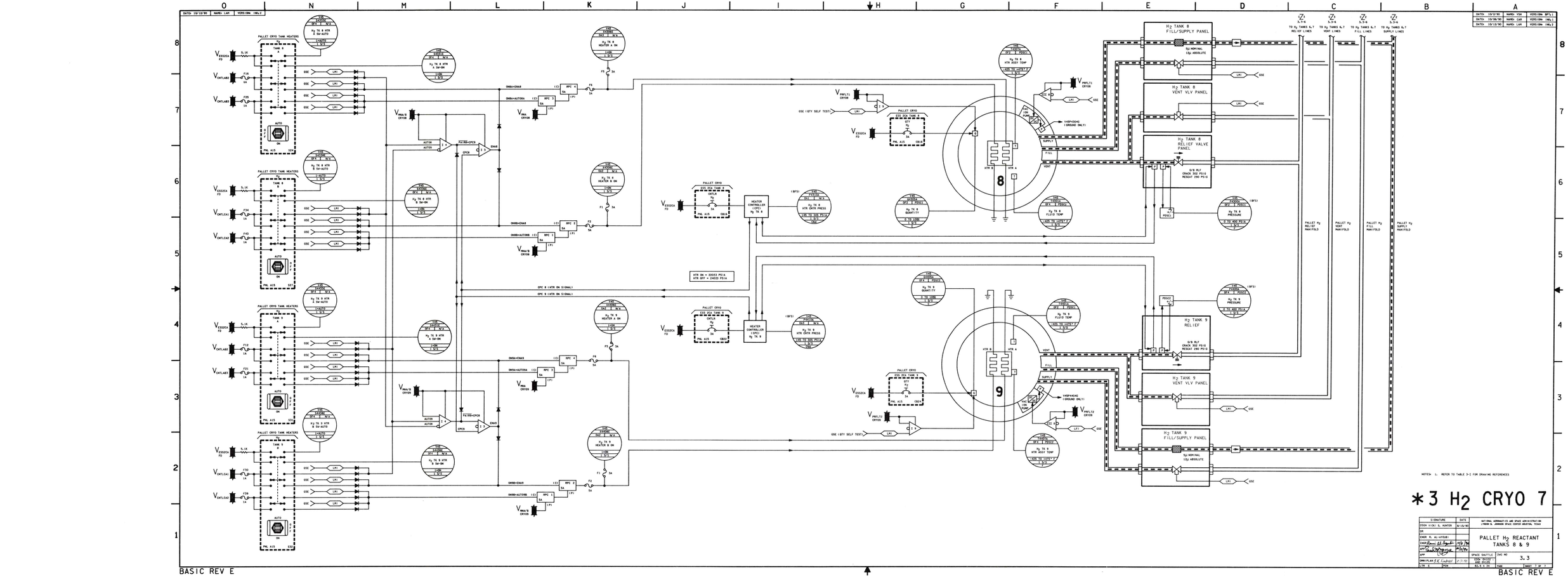

*3 H2 CRYO 4
RELIEF VALVE/ FILTER PACKAGE
HEATER CONTROLLER (CPC) H2 TK 3
HEATER CONTROLLER (CPC) H2 TK 4/5
H2 TK 3 HTR A SW-AUTO
H2 TK 3 HTR B SW-AUTO
H2 TK 4/5 A SW-AUTO
H2 TK 4/5 B SW-AUTO
H2 TK 3 HEATER A SW
H2 TK 3 HEATER B SW
H2 TK 4/5 A SW
H2 TK 4/5 B SW
H2 TK 3 HTR CNTR PRESS
H2 TK 4/5 HTR CNTR PRESS
H2 TK 3 QUANTITY
H2 TK 4 QUANTITY
H2 TK 5 QUANTITY
H2 TK 3 FLUID TEMP
H2 TK 4 FLUID TEMP
H2 TK 5 FLUID TEMP
H2 TK 3 HTR ASSY TEMP
H2 TK 4 HTR ASSY TEMP
H2 TK 5 HTR ASSY TEMP
H2 TK 3 PRESSURE
H2 TK 4 PRESSURE
H2 TK 5 PRESSURE
H2 VENT TK 3
H2 VENT TK 4
H2 VENT TK 5
H2 FILL 3
H2 FILL 4
H2 FILL 5
TO H2 COMMON MANIFOLD VIA HORIZONTAL DRAIN LINE
TO METER ON PANEL 02
TO H2 RELIEF PORT 1
TO H2 COMMON MANIFOLD
HTR ON = 22023 PSIA
HTR OFF = 21023 PSIA
CPC 3 (HTR ON SIGNAL)
CPC 45 (HTR ON SIGNAL)
BASIC REV E
BASIC REV E

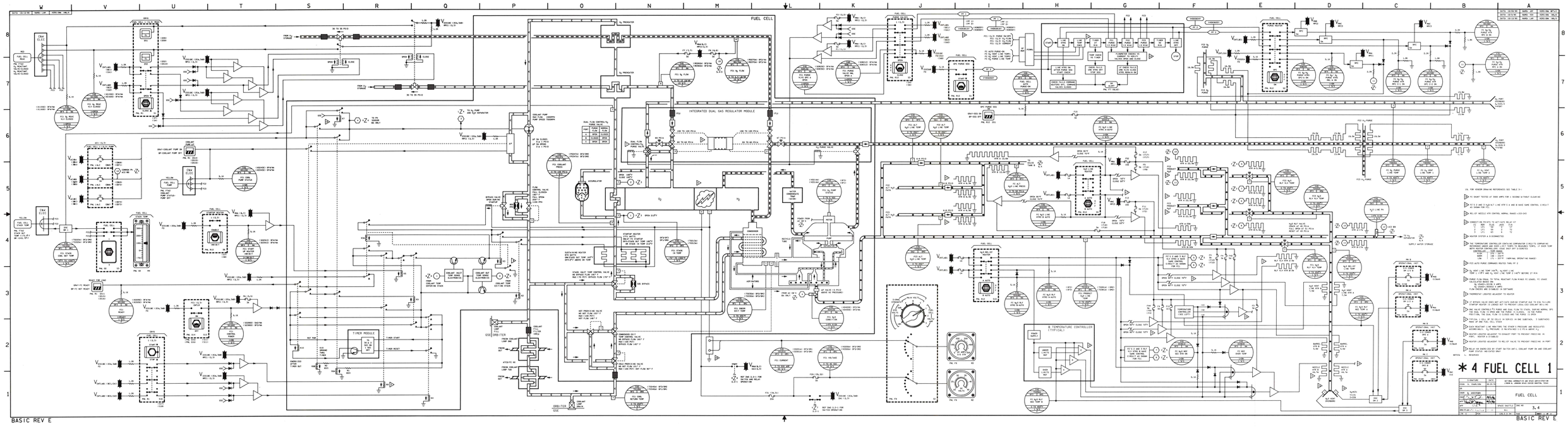


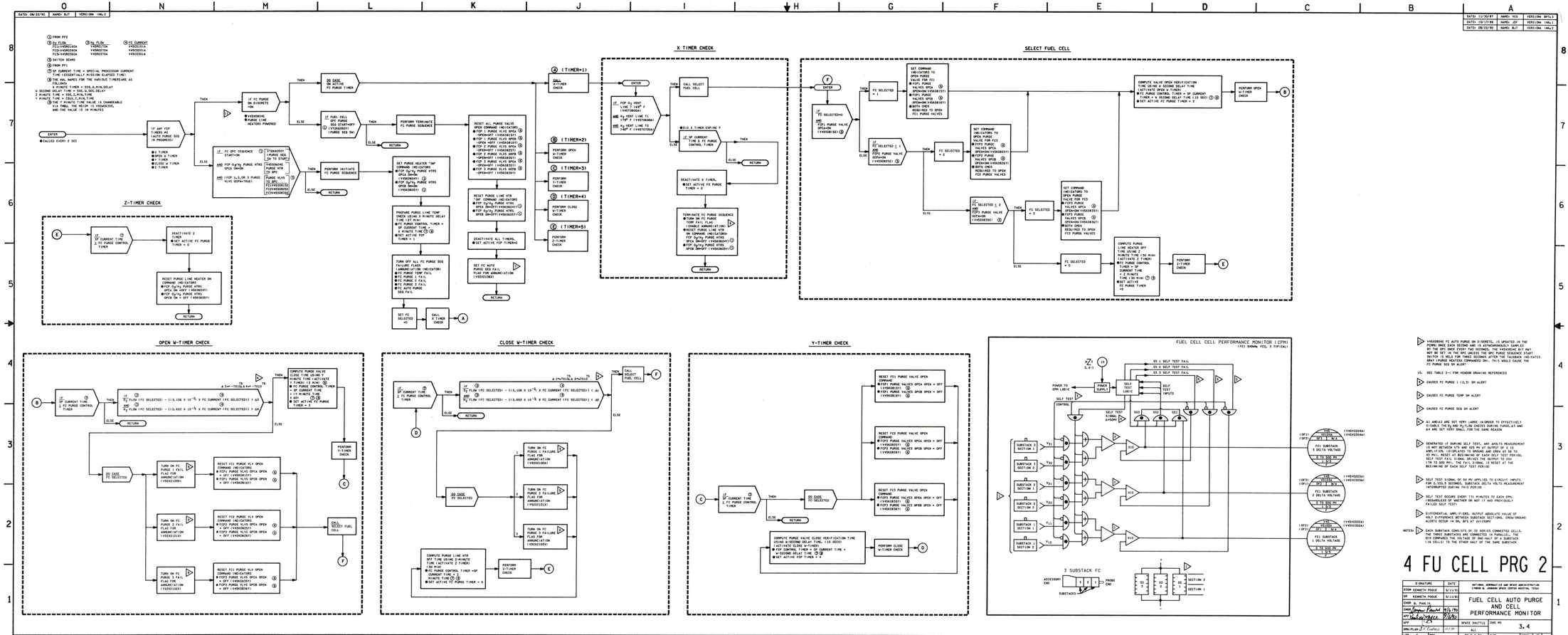
RELIEF VALVE/ FILTER PACKAGE
HEATER CONTROLLER (CPC) H2 TK 5
HTR ON = 22023 PSIA
HTR OFF = 24023 PSIA
CPC 5 (HTR ON SIGNAL)
NOT CONNECTED
TO PANEL METER
TO H2 COMMON MANIFOLD VIA HORIZONTAL DRAIN LINE
TO H2 RELIEF PORT 2
H2 VENT TK 5
H2 FILL 5
HTR A
HTR B
5
4. REFER TO TABLE 3-1 FOR DRAWING REFERENCES
3. TYPE I
TYPE III
POWER
OUTPUT
GROUND
B1 - 5V SOURCE
A1 - 28V SOURCE
LINE CONNECTIONS ARE CAPPED WHEN TANK IS REMOVED
NOTES: 1. ALL FILL PORTS AND FILL VENTS ARE LOCATED BEHIND THE PREFLIGHT UMBILICAL ACCESS DOOR. SEE DWG 3.3-1 FOR ACCESS DOOR LOCATION
*3 H2 CRYO 5
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
H2 REACTANT STORAGE
5 TANK CONFIGURATION
OV-105
SPACE SHUTTLE
OV 105
DWG NO 3.3
SHEET 5 OF 7
BASIC REV E

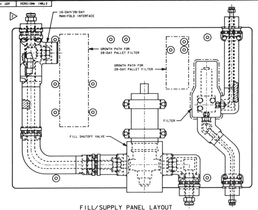


ORBITER
PALLET
H2 TANK 6 FILL/SUPPLY PANEL
H2 TANK 6 VENT VLV PANEL
H2 TANK 6 RELIEF VALVE PANEL
H2 TANK 7 RELIEF
H2 TANK 7 VENT VLV PANEL
H2 TANK 7 FILL/SUPPLY PANEL
PALLET CRYO TANK HEATERS
PALLET CRYO
HEATER CONTROLLER (CPC) Hg TK 6
HEATER CONTROLLER (CPC) Hg TK 7
6
7
FOR OV-102 AND OV-105 FLIGHTS WITHOUT AN EDO PALLET, THESE LINES WILL BE CAPPED
NOTES: 1. REFER TO TABLE 3-2 FOR DRAWING REFERENCES
*3 H2 CRYO 6
PALLET H2 REACTANT TANKS 6 & 7
SPACE SHUTTLE
3.3
BASIC REV E

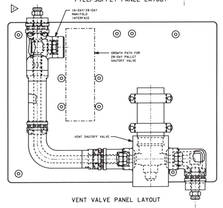

*3 H2 CRYO 7
PALLET H2 REACTANT TANKS 8 & 9
H2 TANK 8 FILL/SUPPLY PANEL
H2 TANK 8 VENT VLV PANEL
H2 TANK 8 RELIEF VALVE PANEL
H2 TANK 9 RELIEF
H2 TANK 9 VENT VLV PANEL
H2 TANK 9 FILL/SUPPLY PANEL
PALLET CRYO TANK HEATERS
PALLET H2 RELIEF MANIFOLD
PALLET H2 VENT MANIFOLD
PALLET H2 FILL MANIFOLD
PALLET H2 SUPPLY MANIFOLD
HTR ON = 20033 PSIA
HTR OFF = 21033 PSIA
CPC 8 HTR ON SIGNAL
CPC 9 HTR ON SIGNAL
NOTES: 1. REFER TO TABLE 3-I FOR DRAWING REFERENCES
BASIC REV E
BASIC REV E


FUEL CELL
INTEGRATED DUAL GAS REGULATOR MODULE
TIMER MODULE
B TEMPERATURE CONTROLLER (TYPICAL)
* 4 FUEL CELL 1
FUEL CELL
3.4
BASIC REV E

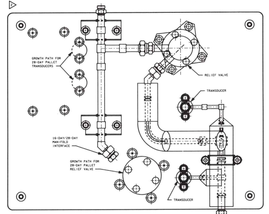

X TIMER CHECK
SELECT FUEL CELL
Z-TIMER CHECK
OPEN W-TIMER CHECK
CLOSE W-TIMER CHECK
Y-TIMER CHECK
FUEL CELL CELL PERFORMANCE MONITOR (CPM)
3 SUBSTACK FC
4 FU CELL PRG 2
FUEL CELL AUTO PURGE AND CELL PERFORMANCE MONITOR
3.4
BASIC REV E



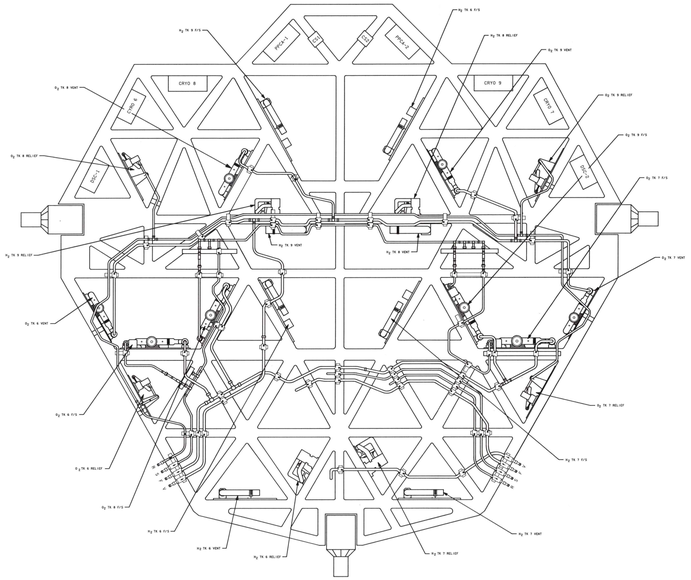
FILL/SUPPLY PANEL LAYOUT



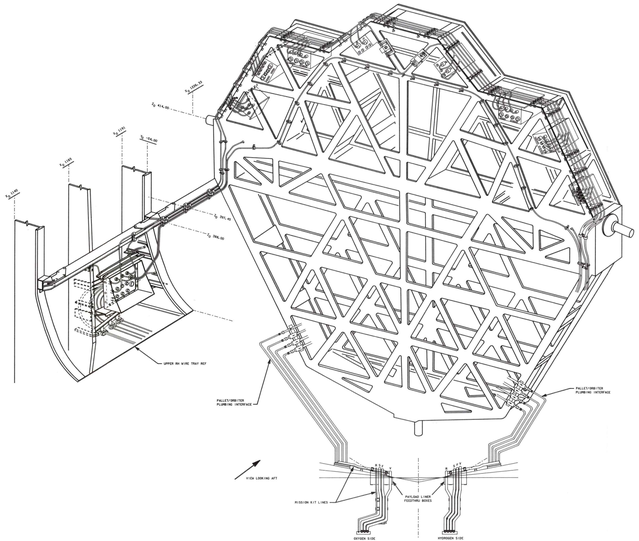
VENT VALVE PANEL LAYOUT



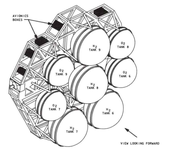
RELIEF VALVE PANEL LAYOUT



EDO PALLET WITH VALVE PANELS AND AVIONICS BOXES



PALLET/ORBITER INTERFACE LAYOUT
CRYO AND AVIONICS



EDO PALLET/CRYO TANKS

DATE	REVISION	MARK
03/28/80	ADDED VIEW	1
03/28/80	ADDED VIEW	2
03/28/80	ADDED VIEW	3

EACH PANEL TYPE IS TYPICAL FOR TANKS 4,5,6,7

NOTES: 1. REFER TO TABLE 3-1 FOR VENDOR DRAWING REFERENCES

5 EDO PALLET 1

SIGNATURE	DATE
EDDIE G.(JR) G. RAMIREZ	03/28/80
MA	
MARK S.A. SCHAFER	
MANAGER, [illegible]	3/28/80
APPROVED [illegible]	3/28/80
QAM	
MANUFACTURING [illegible]	
TPS [illegible]	

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

EDO PALLET

SPACE SHUTTLE | DWG NO. 3.5

FSCM | SIZE | REV LTR
22 N 34 | E

SHEET 1 OF 1

BASIC REV E

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
3.1 (SHEET 1)	FUEL CELL/REACTANT STORAGE OVERVIEW	ROCKWELL	VS70-450212	ALL	C	7/5/84	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM
		ROCKWELL	VS70-450222	ALL	B	10/10/83	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM
		ROCKWELL	VS70-450219	ALL	B01	5/23/89	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM
		NASA/ SHUTTLE OPERATIONS DATA BOOK VOL. I	NSTS-08934 SEC. 4.4.2	1-9	E	8/14/90	POWER REACTANT STORAGE AND DISTRIBUTION
3.1 (SHEET 2)	PALLET REACTANT STORAGE OVERVIEW	R.I	ECN 105-0044	ALL	A4	1/23/90	PRSD MODS FOR THE 28-DAY MISSION EXTENSION KIT ON OV-105
		R.I.	VS70-945102	ALL	G	7/20/90	INTEGRATED SYSTEM SCHEMATIC ORBITER OV-102 EPS
		R.I.	SSV90-7	ALL	—	3/19/90	EXTENDED DURATION ORBITER CRITICAL DESIGN REVIEW (PRELIMINARY DOCUMENT)
3.2 (SHEETS 1-4)	0_2 REACTANT STORAGE	ROCKWELL	VS70-945099	ALL	A11	7/27/90	INTEGRATED SYSTEM SCHEMATIC ELECTRICAL POWER SUBSYSTEM ORBITER VEHICLES - 099, 103 and 104
3.2 (SHEET 5)	O_2 REACTANT STORAGE OV-105	R.I.	VS70-450205	ALL	A	8/28/89	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM OV-105
3.2 (SHEETS 6-7)	PALLET O_2 REACTANT TANKS 6 & 7 (8 & 9)	R.I.	ECN 105-0044	ALL	A4	1/23/90	PRSD MODS FOR THE 28-DAY MISSION EXTENSION KIT ON OV-105
		R.I.	VS70-945102	ALL	G	7/20/90	INTEGRATED SYSTEM SCHEMATIC ORITER OV-102 EPS
		JSC	SCR 90118	ALL	A	8/23/90	EDO SM MODIFICATIONS
3.3 (SHEETS 1-4)	H_2 REACTANT STORAGE	ROCKWELL	VS70-945102	ALL	G07	8/2/90	INTEGRATED SYSTEM SCHEMATIC ORBITER OV-102 EPS
		ROCKWELL	VS70-450212	ALL	C	7/5/84	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM
		ROCKWELL	VS70-450222	ALL	B	10/10/83	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM
		ROCKWELL	VS70-450219	ALL	B01	5/23/89	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM
		ROCKWELL	V070-454929	ALL	D/E01	4/11/90	ELECTRICAL POWER SUBSYSTEM INSTL - R. H. SIDE Xo 693.0 - Xo 919.0
		ROCKWELL	V070-454928	ALL	D/E02	4/11/90	ELECTRICAL POWER SUBSYSTEM L. H. INSTALLATION Xo 693 - Xo 919
		ROCKWELL	V070-454031	ALL	J/K02	7/11/90	ELECTRICAL POWER SUBSYSTEM L. H. INSTALLATION Xo 693 - Xo 919
		ROCKWELL	V070-454041	ALL	J	7/8/88	ELECTRICAL POWER SUBSYSTEM INSTL - R. H. SIDE Xo 693.0 - Xo 919.0
		ROCKWELL	M072-454001	ALL	M	9/12/90	PRSD SYSTEM TANK SET 3 TECH ORDER INSTALLATION MODEL MV0544A (OV-102)
		ROCKWELL	M072-454004	ALL	F	7/7/89	PRSD SYSTEM TANK SET 3 TECH ORDER INSTALLATION MODEL MV0544A (OV-103)
		ROCKWELL	M072-454011	ALL	E/F05	5/4/89	PRSD SYSTEM TANK SET 3 TECH ORDER INSTALLATION MODEL MV0544A (OV-104)
		ROCKWELL	M072-454002	ALL	M	5/22/89	PRSD SYSTEM TANK SET 4 TECH ORDER INSTALLATION MODEL MV0525A (OV-102)
		ROCKWELL	M072-454006	ALL	D	7/25/89	PRSD SYSTEM TANK SET 4 TECH ORDER INSTALLATION MODEL MV0525A (OV-103)
		ROCKWELL	M072-454012	ALL	D/E05	5/4/89	PRSD SYSTEM TANK SET 4 TECH ORDER INSTALLATION MODEL MV0525A (OV-104)
		ROCKWELL	M072-454008	ALL	J	9/10/90	PRSD SYSTEM TANK SET 5 TECH ORDER INSTALLATION MODEL MV0566A (OV-102)

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
3.1-1	ENGR S. HIRSHORN		3.2-7	ENGR R. AL-AYOUBI	
	ENGR Stan Hirshorn	10/29/90		ENGR Rami Al-Ayoubi	10/29/90
3.1-2	ENGR R. AL-AYOUBI		3.3,1-4	ENGR S. HIRSHORN	
	ENGR Rami Al-Ayoubi	10/29/90		ENGR Stan Hirshorn	10/29/90
3.2,1-5	ENGR S. HIRSHORN			APP Paul M Joyce	11/1/90
	ENGR Stan Hirshorn	10/29/90		APP	
3.2-6	ENGR L. MINTER			OMNIPLAN	
	ENGR Larry Minter	10/29/90		LTR E	PCN

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE ALL | TBL NO 3-I | PAGE 3.I-1 | SHEET 1 OF 2

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
3.3 (SHEET 5)	H_2 REACTANT STORAGE OV-105	R.I.	VS70-450205	ALL	A	8/28/89	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM OV-105
3.3 (SHEETS 6-7)	PALLET H_2 REACTANT TANKS 6 & 7 (8 & 9)	R.I.	ECN 105-0044	ALL	A4	1/23/90	PRSD MODS FOR THE 28-DAY MISSION EXTENSION KIT ON OV-105
		R.I.	VS70-945102	ALL	G	7/20/90	INTEGRATED SYSTEM SCHEMATIC ORBITER OV-102 EPS
		JSC	SCR 90118	ALL	A	8/23/90	EDO SM MODIFICATIONS
3.4 (SHEET 1)	FUEL CELL	R.I.	VS70-945102	27	F/G07	8/2/90	FUEL CELL 1 REAR VALVES, FC GAS CONTROL, AND LIVE HEATERS
			VS70-945102	28	F/G07	8/2/90	FC 1 START-UP LOGIC AND FC HEATERS
			VS70-945102	29	F/G07	8/2/90	FC 1 INSTRUMENTATION
			VS70-945102	36	F/G07	8/2/90	FC GAS/$H_2$0 DISCHARGE SYSTEM AND HEATER CONTROL
			VS70-450119	1 of 7	B	6/14/89	FC CONTROL SUBSYSTEM
			VS70-450119	2	B	6/14/89	FC PURGE VALVES and HTRS
		R.I.	VS70-723319	6,7,16	C	7/11/88	TABULATED CONNECTOR INTERFACE
3.4 (SHEET 2)	FUEL CELL AUTO PURGE AND CELL PERFORMANCE MONITOR	AEROSPACE AVIONICS INC.	501054	—	C	11/17/82	CELL PERFORMANCE MONITOR SCHEMATIC ANALOG SIGNAL-CHANNEL
		AEROSPACE AVIONICS INC.	50156	—	C	11/17/82	CELL PERFORMANCE MONITOR POWER SUPPLY SCHEMATIC
		NASA	SS-P-0002-580G	SECTION 6.9	G	10/1/86	SPACE SHUTTLE PROGRAM ORBITER PROJECT COMPUTER PROGRAM DEVELOPMENT SPECIFICATION (CPDS)
		NASA/IBM		3.2.1.18		4/2/82	SPACE SHUTTLE PROGRAM ORBITER AVIONICS SOFTWARE OPERATIONAL (OPS) DETAILED DESIGN SPECIFICATION (DDS)
3.5	EDO PALLET	R.I.	SSV90-7	ALL	-	3/19/90	EXTENDED DURATION ORBITER - CRITICAL DESIGN REVIEW (PRELIMINARY DOCUMENT)
		R.I.	V458-454002	1	-	7/1/90	INSTALLATION, EDO-PALLET PRSD SUB-TIER

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
3.3-5	ENGR S. HIRSHORN		3.4-2	ENGR B. PAWLIK	
	ENGR Steve Hirshorn	11/1/90		ENGR Benjamin Pawlik	11/1/90
3.3-6	ENGR L. MINTER		3.5	ENGR T. SCHAFER	
	ENGR Larry Minter	11/1/90		ENGR Todd W Schafer	11/1/90
3.3-7	ENGR R. AL-AYOUBI			APP Paul M Jeffcoat	11/1/90
	ENGR Rami Al-Ayoubi	11/1/90		APP	
3.4-1	ENGR B. ANDERSON			OMNIPLAN	
	ENGR	11/1/90		LTR E PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE ALL

TBL NO 3-I

BASIC REV E

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

MS FLOOD ELECTRONICS PKG

MS FLOOD

AFT STATIONS

FORWARD STATIONS

FLIGHT DECK

MID DECK

MID DECK FLOOD ELECTRONICS PKG

MID DECK 1 FLOOD ELECTRONICS PKG

MID DECK 1 FLOOD

MID DECK 8 FLOOD/EMERGENCY ELECTRONICS PKG

MID DECK 8 FLOOD

MID DECK 2 FLOOD ELECTRONICS PKG

MID DECK 2 FLOOD

MID DECK 6 FLOOD/EMERGENCY ELECTRONICS PKG

MID DECK 6 FLOOD

MID DECK 5 FLOOD ELECTRONICS PKG

MID DECK 5 FLOOD

MID DECK 7 FLOOD/EMERGENCY ELECTRONICS PKG

MID DECK 7 FLOOD

MID DECK 3 FLOOD ELECTRONICS PKG

MID DECK 3 FLOOD

MID DECK 4 FLOOD ELECTRONICS PKG

MID DECK 4 FLOOD

PERSONAL HYGIENE STATION FLOOD LOCATED ON THE GALLEY

NOTE: GALLEY IS M1010 DEPENDENT.

MPC FLOOD ELECTRONICS

MPC FLOOD

M0130 PNL LT NO 2 ELECTRONICS

M0130 PNL LT NO 2

M0130 PNL LT NO 1 ELECTRONICS

M0130 PNL LT NO 1

BUNK 4 (END)

BUNK 2 (MIDDLE)

BUNK 3 (TOP)

BUNK 1 (BOTTOM)

NOTE: BUNK 1 LIGHTS LOCATED AT HEAD OF BUNKS. IN SLEEP STATION, BUNKS ARE M1010 DEPENDENT.

AIRLOCK

TUNNEL ADAPTER

TUNNEL ADAPTER FLOOD LIGHT NO. 4

TUNNEL ADAPTER FLOOD LIGHT NO. 3

TUNNEL ADAPTER FLOOD LIGHT NO. 2

TUNNEL ADAPTER FLOOD LIGHT NO. 1

AIRLOCK FLOOD 1 ELECTRONICS PKG

AIRLOCK MODULE LT NO 1

AIRLOCK FLOOD 3 ELECTRONICS PKG

AIRLOCK MODULE LT NO 3

AIRLOCK FLOOD 4 ELECTRONICS PKG

AIRLOCK MODULE LT NO 4

AIRLOCK FLOOD 2 ELECTRONICS PKG

AIRLOCK MODULE LT NO 2

MID DECK AND AIRLOCK STATIONS

1. SEE TABLE 9-11 FOR DRAWING REFERENCES

2. OVERHEAD FLOODS ONLY. SEE SPACELAB SYSTEM HANDBOOK VOL 2 & 3 FOR DETAILS OF SPACELAB TUNNEL LIGHTING.

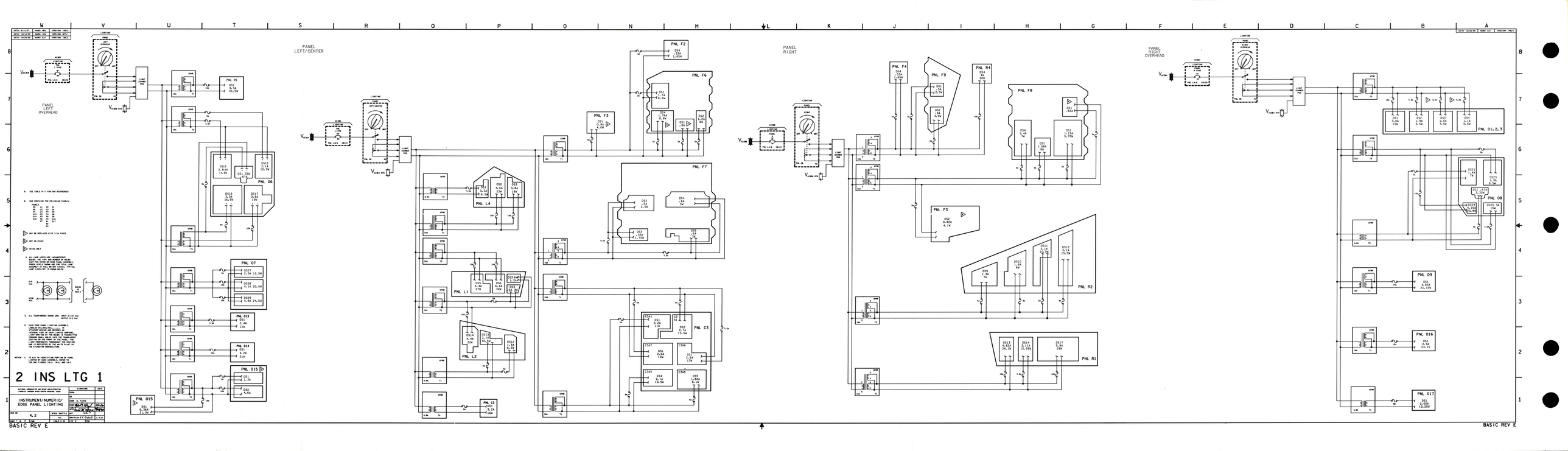
NOTES: CONTROLS MOUNTED ON LIGHT FIXTURE

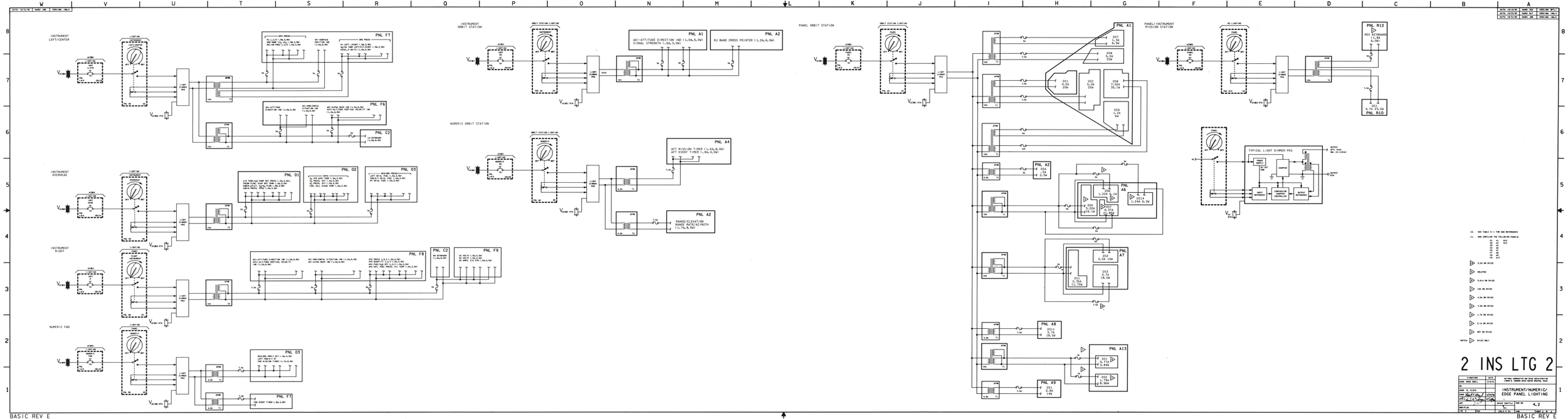
1 INT LTG

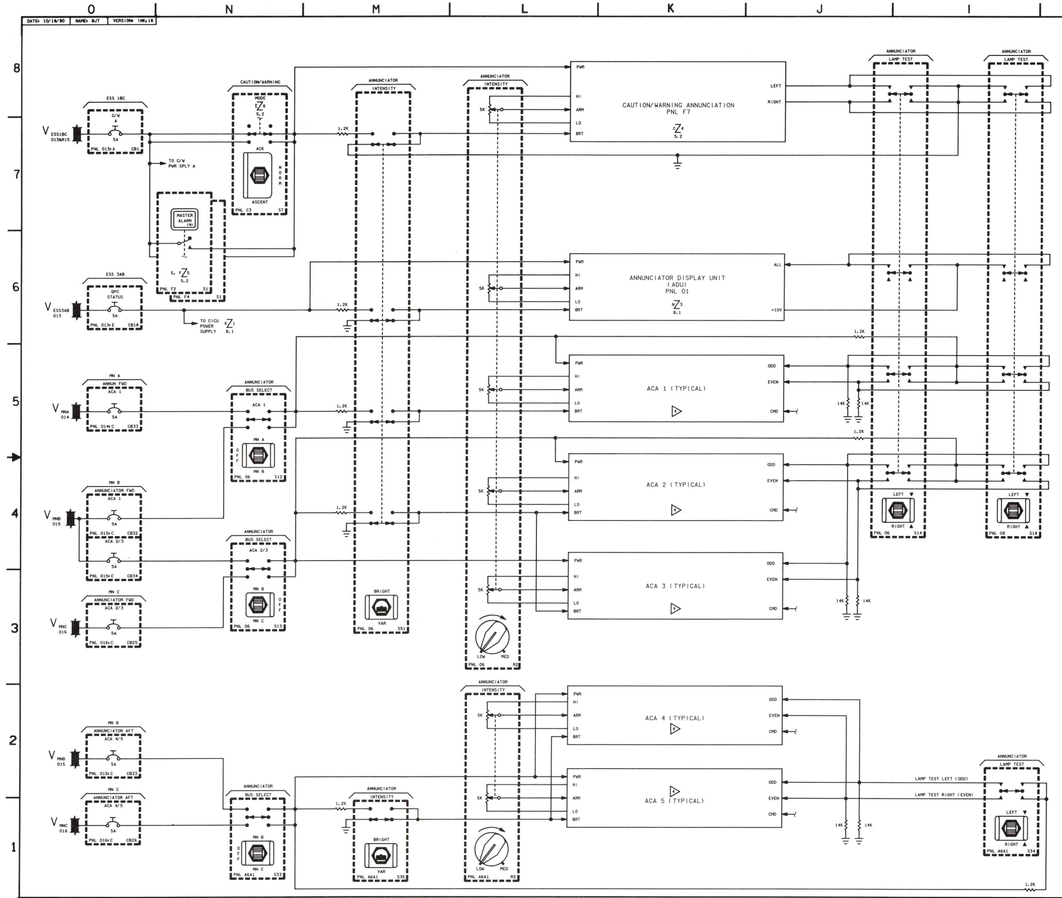
INTERIOR FLOOD LIGHTING

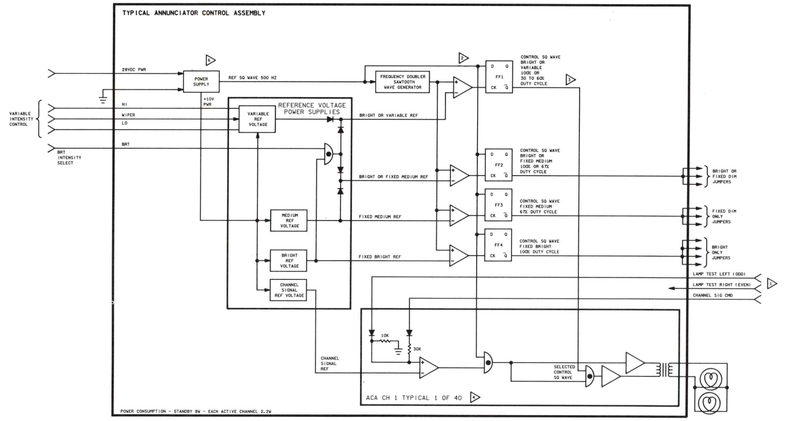
SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ENGR: MELVIN P. JONES	10-26-76	JOHNSON SPACE CENTER HOUSTON, TEXAS
DES: MELVIN P. JONES	10-26-76	
CHIEF: W. FLOOD		
CHIEF:		
CHIEF:		
APP:		SPACE SHUTTLE DWG NO 4.1
DRAFTSMAN: P.C. Kaduck	10-26-76	
SCALE: NONE		SHEET 1 OF 1

BASIC REV E


PANEL LEFT OVERHEAD
PANEL LEFT/CENTER
PANEL RIGHT
PANEL RIGHT OVERHEAD
PNL 05
PNL 06
PNL 07
PNL 013
PNL 014
PNL 015
PNL F2
PNL F6
PNL F3
PNL F7
PNL L4
PNL L1
PNL L2
PNL C3
PNL C2
PNL F4
PNL F9
PNL R4
PNL F8
PNL R2
PNL R1
PNL 01,2,3
PNL 08
PNL 09
PNL 016
PNL 017
2 INS LTG 1
INSTRUMENT/NUMERIC/ EDGE PANEL LIGHTING
BASIC REV E


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 A3
PNL A6
PNL A7
PNL A8
PNL A13
PNL R12
PNL R10
TYPICAL LIGHT DIMMER PKG
2 INS LTG 2
INSTRUMENT/NUMERIC/ EDGE PANEL LIGHTING
SPACE SHUTTLE
4.2
BASIC REV E





DATE: 09/25/90	NAME: SEV	VERSION: INW.18
DATE: 09/26/90	NAME: MDU	VERSION: INW.17
DATE: 10/16/90	NAME: BJT	VERSION: INW.18

5. POWER SUPPLY PROVIDES +20 VDC POWER AND +10 VDC LOGIC TO THE ACA

5. REFERENCE TABLE A-22 FOR DRAWING REFERENCES

6. REFERENCE DWG A-2 FOR ACA ANNUNCIATION CHANNEL ASSIGNMENT

7. LAMP BRIGHTNESS CONTROL CAPABILITY FOR AN ACA CHANNEL IS DETERMINED BY THE SELECTED CONTROL SQ WAVE. ALL CHANNELS 1 THROUGH 30 ARE SELECTED FOR BRIGHT OR VARIABLE (B OR V). CHANNELS 31 THROUGH 40 MAY BE SELECTED BY JUMPER FOR ANY ONE OF THE FOLLOWING:
BRIGHT AND FIXED MEDIUM (B AND M)
FIXED BRIGHT ONLY (BO)
FIXED MEDIUM ONLY (MO)
OR BRIGHT OR VARIABLE (B OR V)
REFERENCE DWG A-2 FOR CHANNEL BRIGHTNESS CONTROL

8. SIMPLIFIED FUNCTIONAL REPRESENTATION

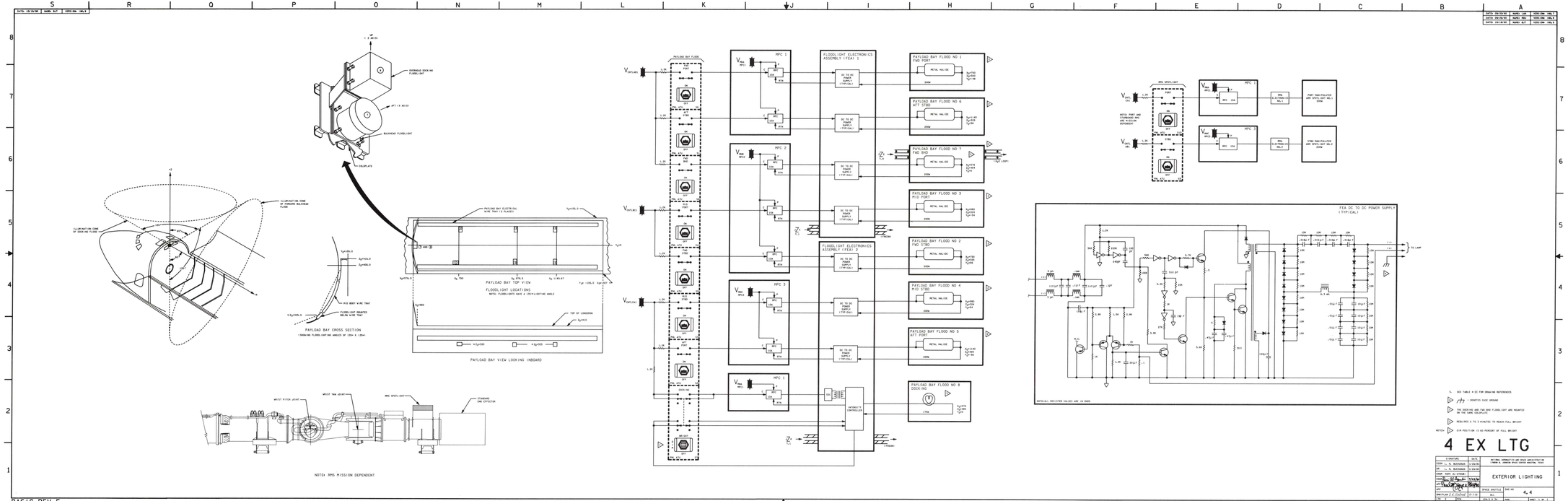
NOTES: 1. LAMP TEST LEFT (ODD) POWERS ODD CHANNELS 1, 3, 5 --- 39. LAMP TEST RIGHT (EVEN) POWERS EVEN CHANNELS 2, 4, 6 --- 40 IN ACA

3 ANNUN

SIGNATURE	DATE	
DSGN: S.K.K.MORELL	4-23-79	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
CHGR RAM AL-ASTUBI		ANNUNCIATOR LIGHTING
CHGR	4/23/79	
APP	4/23/79	
APP		SPACE SHUTTLE — DWG NO 4.3
DRN/PLAN S.C.Cardell	11-7-82	ALL
LTR E	PCN	REV.5 X 34 — PAGE — SHEET 1 OF 1

BASIC REV E

BASIC REV E



NOTES: 1. SEE TABLE 4-22 FOR DRAWING REFERENCES
- DENOTES EXCE GROUND
- THE DOCKING AND FWD BHD FLOODLIGHT ARE MOUNTED ON THE SAME COLLIMATOR
- REQUIRES 2 TO 3 MINUTES TO REACH FULL BRIGHT
- DIM POSITION IS 60 PERCENT OF FULL BRIGHT

4 EX LTG

SIGNATURE	DATE
DSGN L. A. BUCHANAN	1/29/80
CK L. A. BUCHANAN	1/29/80
ENGR MARY A. FIGUEIRA	
PROJ	
APPR	
APPR	
PROJ	
CHK	

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

EXTERIOR LIGHTING

SPACE SHUTTLE
NO. 4.4
SHEET 1 OF 1

BASIC REV E

ALL VEHICLES
REV E

TABLE 4-I. - ANNUNCIATOR CONTROL ASSEMBLY CHANNEL ASSIGNMENTS

ACA NO. 1

LAMP TEST LEFT - ODD

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Pwr	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 Pwr	Brightness Control
C3A6	ORBITAL DAP - CONTROL -- MAN	(S4)	W	2	2		B&V
	- RCS JETS -- NORM	(S5)	W	4	2		B&V
	ROTATION ORBITAL DAP -- ROLL DISC RATE	(S6)	W	6	2		B&V
	PITCH DISC RATE	(S7)	W	10	2		B&V
	YAW DISC RATE	(S8)	W	12	2		B&V
	ROLL ACCEL	(S9)	W	14	2		B&V
	PITCH ACCEL	(S10)	W	18	2		B&V
	YAW ACCEL	(S11)	W	20	2		B&V
	ROLL PULSE	(S12)	W	22	2		B&V
	PITCH PULSE	(S13)	W	26	2		B&V
	YAW PULSE	(S14)	W	28	2		B&V
		(S15)	W	30	2		B&V
F4	MASTER ALARM	(S1)	R	32	2	ACA3	B&M
F7A7	MAIN ENGINE 2 STATUS OUT OF LIMIT LEFT	(XDS2)	R	8	2		B&V
	SHUTDOWN 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 Pwr	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 Pwr	Brightness Control
--	SPARE		--	2	--		B&V
--	SPARE		--	4	--		B&V
--	SPARE		--	6	--		B&V
--	SPARE		--	8	--		B&V
--	SPARE		--	10	--		B&V
F3	ANTISKID FAIL	(XDS4)	Y	12	2		B&V
F4	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 3 STATUS -- SHUTDOWN RIGHT	(XDS3)	R	32	2		B&V
	OUT OF LIMIT RIGHT	(XDS3)	Y	38	2		B&V
F8A5	LANDING GEAR -- ARM	(S1)	Y	36	2		B&V
	DOWN	(S2)	G	40	2		B&V
F4	ANTI-SKID FAIL ▷	(XDS2)	Y	12	2		B&V

ACA NO. 3

LAMP TEST LEFT - ODD

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Pwr	Brightness Control
--	SPARE		--	1	--		B&V
--	SPARE		--	3	--		B&V
--	SPARE		--	5	--		B&V
--	SPARE		--	7	--		B&V
--	SPARE		--	9	--		B&V
F3	NWS FAIL	(XDS3)	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	ACA2	B&V
	RANGE SAFE ARM	(XDS3)	R	39	1	ACA1, 2	BO
F7A5	SM ALERT ▷	(XDS1)	B	29	2	ACA2	B&V
F2	NWS FAIL ▷	(XDS2)	Y	35	2		B&V

LAMP TEST RIGHT - EVEN

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Pwr	Brightness Control
F4	BFC	(XDS3)	Y	24	2		B&V
	MASTER ALARM	(S1)	R	32	2	ACA1	B&M
F7A7	MAIN ENGINE 1 STATUS -- SHUTDOWN CTR	(XDS1)	R	8	2		B&V
	OUT OF LIMIT 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
	TRANSLATION ORBITER DAP -- X HIGH	(S16)	W	10	2		B&V
	Y HIGH	(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 Pwr	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
	TRANSLATION ORBITER DAP -- X HIGH	(S14)	W	9	2		B&V
	Y HIGH	(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 Pwr	Brightness Control
A7A1	VIDEO INPUT -- FWD BAY	(S27)	W	14	2		B&V
	KEEL/EVA	(S28)	W	16	2		B&V
	AFT BAY	(S29)	W	18	2		B&V
	PL 1	(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 Pwr	Brightness Control
A2	MIC	--	W	35	2		B&V
	KEY	--	W	37	2		B&V
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		B&V
	ROTATION ORBITAL DAP ROLL DISC RATE	(S17)	W	9	2		B&V
	PITCH DISC RATE	(S18)	W	11	2		B&V
	YAW DISC RATE	(S19)	W	13	2		B&V
	ROLL ACCEL	(S23)	W	17	2		B&V
	PITCH ACCEL	(S24)	W	19	2		B&V
	YAW ACCEL	(S25)	W	21	2		B&V
	ROLL PULSE	(S29)	W	25	2		B&V
	PITCH PULSE	(S30)	W	27	2		B&V
	YAW PULSE	(S31)	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		-	39	-		B&V

LAMP TEST RIGHT - EVEN

Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Redundant Bulb Pwr	Brightness Control
A7A1	VIDEO INPUT -- RMS STBD	(S30)	W	14	2		B&V
	RMS PORT	(S31)	W	16	2		B&V
	FLY/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	4	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

2. REFER TO TABLE 4-II FOR DRAWING REFERENCES

NOTES: ▷ OV-102 ONLY

	SIGNATURE	DATE
ENGR R. AL-AYOUBI		
ENGR		10/2/84
APP		10/18/84

2568.ART.8

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
4.1	INTERIOR FLOOD LIGHTING	R. I.	VS70-730139	1 OF 3	D	3/26/90	INTERIOR LIGHTING SUBSYSTEM
		R. I.	VS70-730209	1 OF 3	—	5/1/80	AIRLOCK MODULE LIGHTING SUBSYSTEM
		R. I.	VS75-733952	1 OF 2	B	1/17/79	PANEL AW18A - AIRLOCK PANEL NO. 1
		R. I.	VS70-730202	1 OF 3	F	5/1/80	AIRLOCK MODULE LIGHTING SUBSYSTEM
		R. I.	VS70-730142	1 OF 3	E	5/1/90	INTERIOR LIGHTING SUBSYSTEM
		R. I.	VS70-973102	44.1	F/G04	10/1/90	TUNNEL ADAPTER FLOOD LIGHTING
		R. I.	VS70-973099	44.1	A/B03	4/25/90	TUNNEL ADAPTER FLOOD LIGHTING
		JSC	JSC-18827	—	D	9/84	SPACELAB D&C PROCEDURAL NOMENCLATURE
		R. I.	VS70-973099	41	A/B03	4/25/90	INTERIOR LIGHTING CREW COMPARTMENT - PART 1
		R. I.	VS70-973099	42	A/B03	4/25/90	INTERIOR LIGHTING CREW COMPARTMENT - PART 11
		R. I.	VS70-973102	39	F/G04	10/1/90	INTERIOR LIGHTING CREW COMPARTMENT 1
		R. I.	VS70-973102	40	F/G04	10/1/90	INTERIOR LIGHTING CREW COMPARTMENT II
		R. I.	VS70-973102	44	F/G04	10/1/90	AIRLOCK ILLUMINATION
		R. I.	VS70-973099	44	A/B03	4/25/90	AIRLOCK ILLUMINATION
4.2 (SHEETS 1-2)	INST/NUMERIC/EDGE PANEL LIGHTING	R. I.	VS70-730239	1-6	A/BO3	4/25/90	EDGE LIGHTED PANELS
		R. I.	VS70-730229	1-2	B	9/02/82	INSTRUMENT/NUMERIC LIGHTING
		R. I.	VS70-730222	1-2	E	6/5/84	INSTRUMENT/NUMERIC LIGHTING
		R. I.	VS70-730232	1-6	D	10/8/79	INSTRUMENT/NUMERIC LIGHTING
4.3	ANNUNCIATOR LIGHTING	R. I.	VS70-730249	1-8	A	3/8/83	D&C ANNUNCIATOR SUBSYSTEM
		R. I.	VS70-730242	1-8	F	9/30/82	D&C ANNUNCIATOR SUBSYSTEM
		R. I.	VS70-973102	20-24, 30,31	F/G04	10/1/90	INTEGRATED SYSTEM SCHEMATIC - DISPLAYS AND CONTROLS OV-102
		R. I.	VS70-973099	20-24, 30,31	A/BO3	4/25/90	INTEGRATED SYSTEM SCHEMATIC - DISPLAYS AND CONTROLS OV-099, -103 AND -104
		AEROSPACE AVIONICS	SK500T90	N/A	APP	12/13/76	ANNUNCIATOR CONTROL ASSEMBLY
TABLE 4-I	ANNUNCIATOR CONTROL ASSEMBLY CHANNEL ASSIGNMENTS	R. I.	VS70-730249	1-8	A	3/8/83	D&C ANNUNCIATOR SUBSYSTEM
			VS70-730242	1-8	F	9/30/82	D&C ANNUNCIATOR SUBSYSTEM
			VS70-973102	20-24, 30, 31	F/G04	10/1/90	INTEGRATED SYSTEM SCHEMATIC DISPLAYS AND CONTROLS OV-102
			VS70-973099	20-24, 30, 31	A/BO3	4/25/90	INTEGRATED SYSTEM SCHEMATIC DISPLAYS AND CONTROLS OV-099, 103 AND 104

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
4.1	ENGR R. FLOYD			ENGR	
	ENGR Robert S. Floyd	11-5-90		ENGR	
4-2	ENGR R. FLOYD			ENGR	
	ENGR Robert S. Floyd	11-5-90		ENGR	
4.3	ENGR R. AL-AYOUBI			APP Paul M Joyce	11-5-90
	ENGR Rami Al-Ayoubi	11/5/90		APP	
TBL 4-I	ENGR R. AL-AYOUBI			OMNIPLAN	
	ENGR Rami Al-Ayoubi	11/5/90		LTR E PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 4-II	
ALL		
	PAGE 4.II-1	SHEET 1 OF 2

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
4.4	EXTERIOR LIGHTING	R. I.	VS70-730212	1 OF 2	E	3/3/82	MANIPULATOR ARM LIGHTING SUBSYSTEM
		R. I.	VS70-730162	1 OF 2	D	7/22/80	D&C EXTERIOR LIGHTING SUBSYSTEM
		R. I.	VS70-730219	1 OF 2	A	3/3/82	MANIPULATOR ARM LIGHTING SUBSYSTEM
		R. I.	VS70-973102	11	F/G04	10/1/90	ORBITER D&C PANEL CONFIG
		R. I.	VS70-973099	11	A/B03	4/25/90	ORBITER D&C PANEL CONFIG
		R. I.	MC4340062	21 & 22	A		FLODLIGHT ASSEMBLY-PAYLOAD BAY
		R. I.	MC4340066	10			FLOODLIGHT ASSEMBLY OVERHEAD DOCKING
		SPAR	RMS-M 1140-1-004				MANIPULATOR ARM OVERALL DIMENSIONS
		NSTS	07700 VOL. XIV	3-27, 28 8-36	I	SEPT, 1986	SPACE SHUTTLE SYSTEM PAYLOAD ACCOMODATIONS, LEVEL II PROGRAM DEFINITION AND REQUIREMENTS
		R. I.	VS70-973102	43	F/G04	10/1/90	D&C EXTERIOR LIGHTING
		R. I.	VS70-973102	46	F/G04	10/1/90	MANIPULATOR ARM LIGHTING
		R. I.	VS70-973099	43	A/B03	4/25/90	D&C EXTERIOR LIGHTING
		R. I.	VS70-973099	46	A/B03	4/25/90	MANIPULATOR ARM LIGHTING

DWG	SIGNATURE		DATE
4.4	ENGR R. AL-AYOUBI		
	ENGR Rami Al-Ayoubi		11/5/90
	ENGR		
	ENGR		
	APP Paul M Joyce		11-5-90
	APP		
	OMNIPLAN		
	LTR E	PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 4-II
ALL	
	PAGE 4.II-1 SHEET 2 OF 2

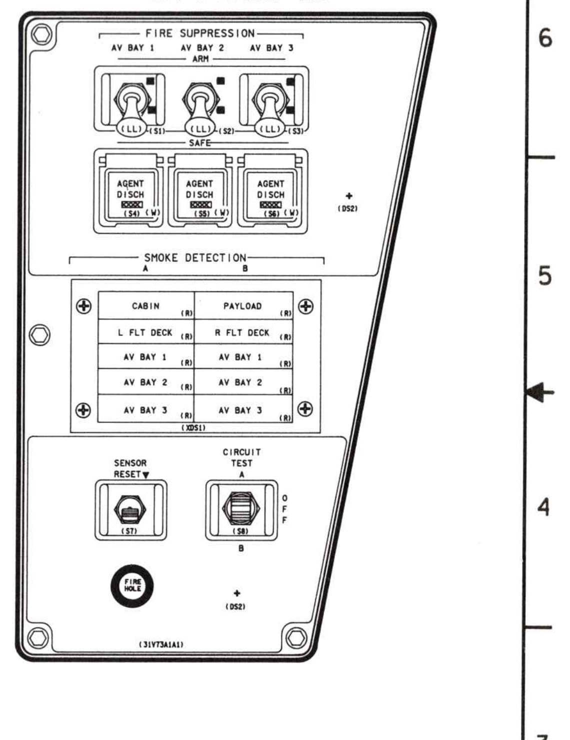
BASIC REV E

CABIN SMOKE DETECTORS, TIME TO ACTIVATE

SMOKE SOURCE		TIME TO ACTIVATE DETECTOR	
LOCATION	STRENGTH GM/MIN	CABIN FAN OUTLET (MIN)	FLIGHT DECK (MIN)
EQUIPMENT BAY	0.2	2.4	5.5
PASSENGER COMPARTMENT	0.2	0.3	1.8
FLIGHT DECK	0.2	*	0.2
EQUIPMENT BAY	0.5	1.8	3.5
PASSENGER COMPARTMENT	0.5	0.1	1.0
FLIGHT DECK	0.5	*	0.1
EQUIPMENT BAY	1.0	1.1	2.9
PASSENGER COMPARTMENT	1.0	0.06	0.8
FLIGHT DECK	1.0	*	0.05

* THE CABIN FAN CIRCULATES THE CABIN ATMOSPHERE EVERY SEVEN MINUTES

ON PANEL L1



7. WHEN THE HALON BOTTLE PRESSURE BECOMES LOWER THAN 60 ± 10 PSIG THE PRESSURE SWITCH OPENS REDIRECTING POWER FROM GROUND TO THE 'BOTTLE EMPTY' TELEMETRY

6. ACA POWERED BY MNB 015 OR MNC 016 DEPENDING ON THE BUS SWITCH POSITION

5 SEE TABLE 5-III FOR DRAWING REFERENCES

4. DISCHARGE WILL PRODUCE AN 8000 TO 9000 UG/M³ CONCENTRATION READOUT FROM HALON ALONE

3. OPTIONAL INPUT - DEPENDS ON PAYLOAD

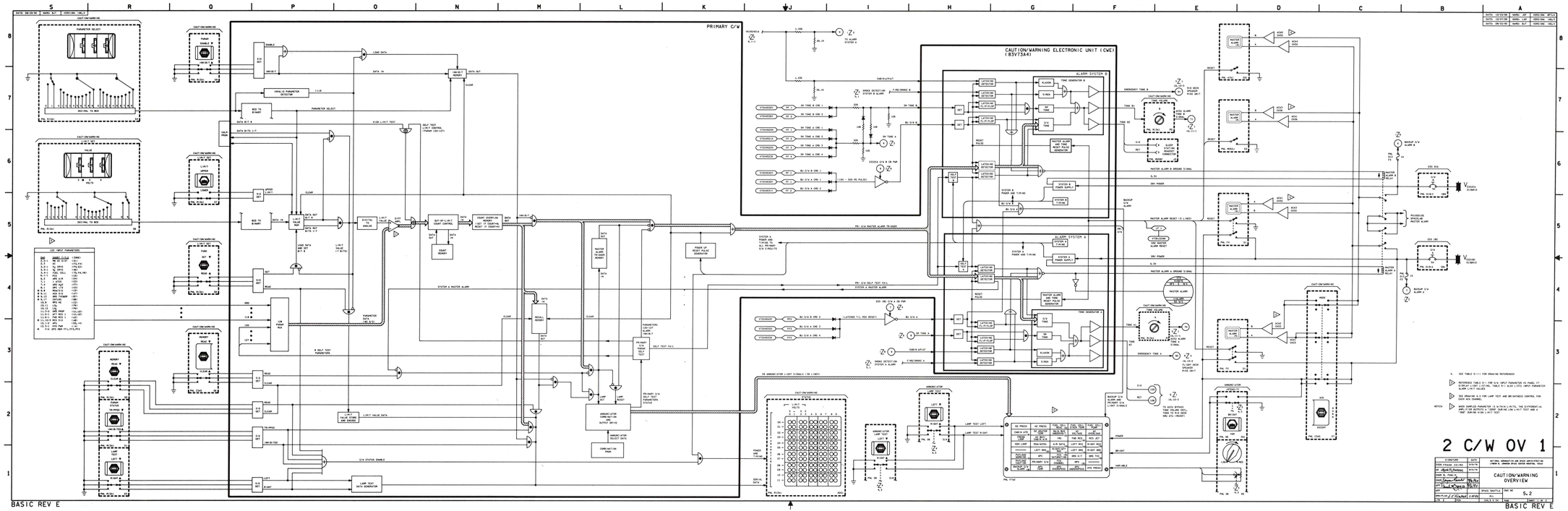
2. A 6A FUSE LINK WITH THE TRIPPING CHARACTERISTICS OF A 3A FUSE

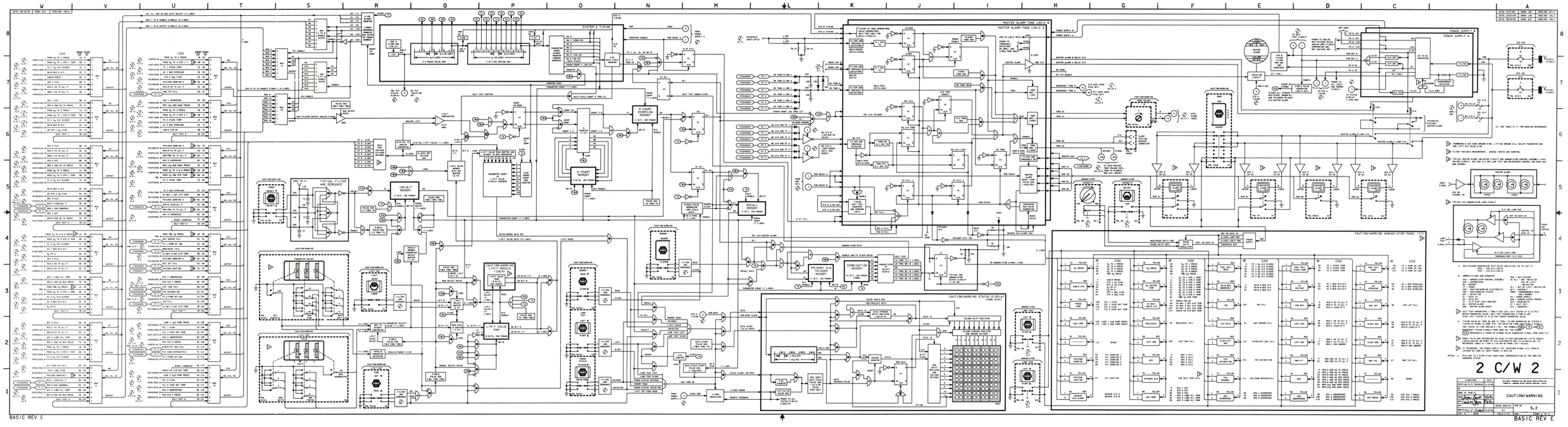
NOTES: 1. TEST FREQUENCY PROFILE INITIATED BY SELF-TEST INPUT SIMULATING A PARTICULATE CONCENTRATION ABOVE 2200 μGM/M³ INCREASING AT A RATE GREATER THAN 22 μGM/M³-SEC

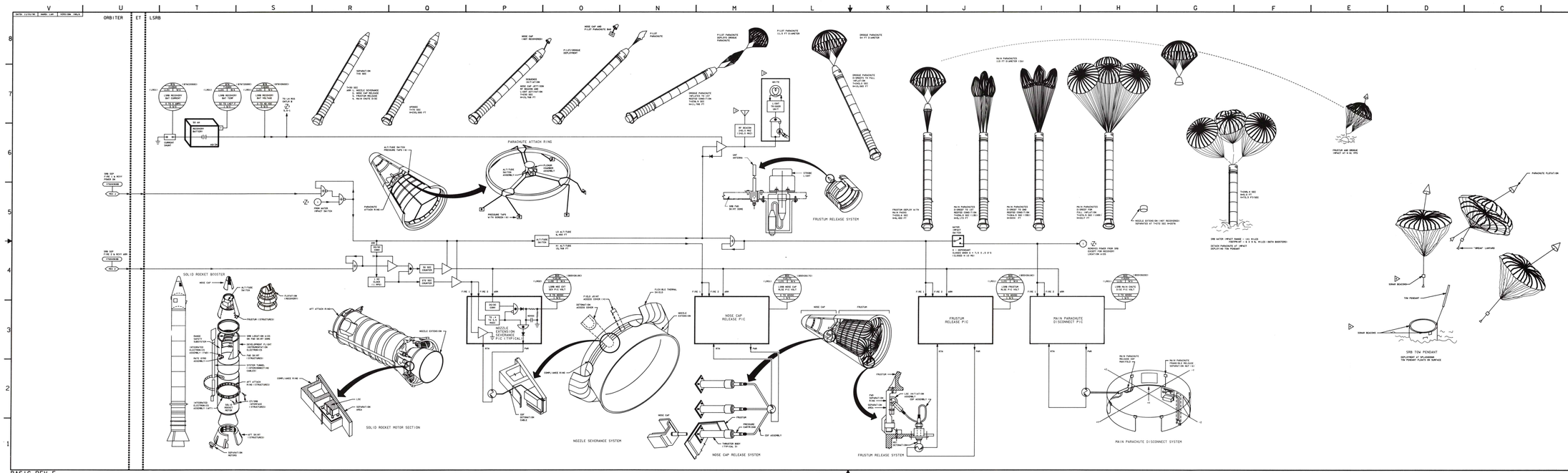
1 SMOKE

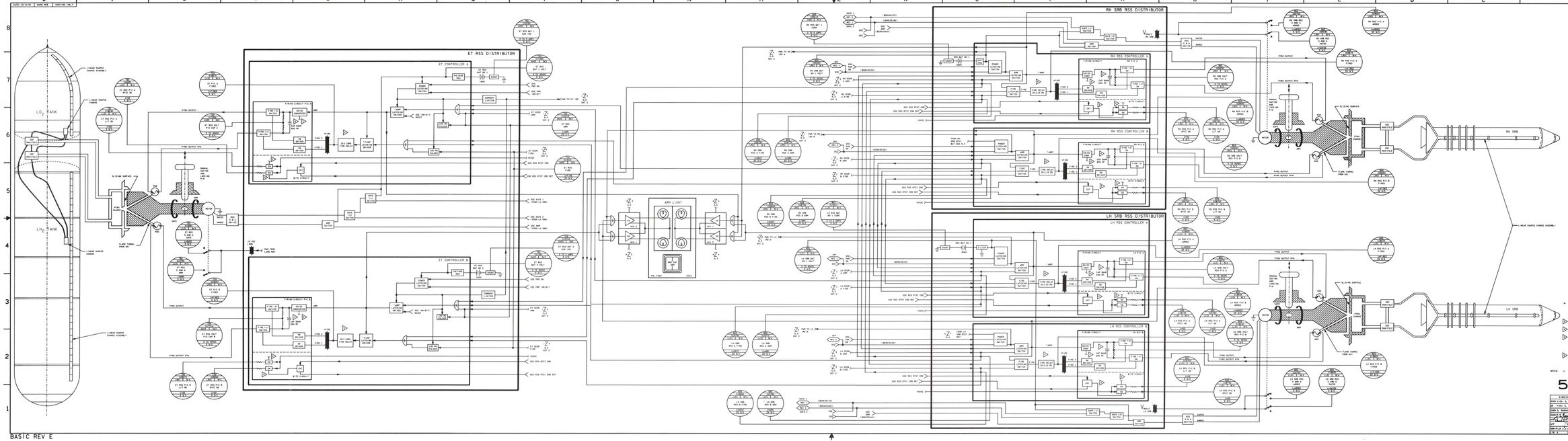
SIGNATURE	DATE	
DSGN LAURIE BUCHANAN	5-14-79	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		SMOKE DETECTION AND FIRE SUPPRESSION
ENGR M. FITZPATRICK	8/27/90	
ENGR [signature]	10/24/90	
APP [signature]	10/29/90	
APP		SPACE SHUTTLE ALL — DWG NO 5.1
OMNIPLAN S. K. Kimbrell	11-14-90	
LTR E / PCN		126.5 X 34 — PAGE — SHEET 1 OF 1

BASIC REV E


PRIMARY C/W
CAUTION/WARNING ELECTRONIC UNIT (CWE)
(83V13A4)
ALARM SYSTEM B
ALARM SYSTEM A
2 C/W OV 1
BASIC REV E


2 C/W 2
CAUTION/WARNING
MASTER ALARM TONE LOGIC B
MASTER ALARM TONE LOGIC A
SYSTEM A TIMING
POWER SUPPLY B
POWER SUPPLY A
CAUTION/WARNING ANNUNCIATOR PANEL (1 of 1)
CAUTION/WARNING STATUS DISPLAY
BASIC REV E


ORBITER
ET
LSRB
SOLID ROCKET BOOSTER
SOLID ROCKET MOTOR SECTION
NOZZLE SEVERANCE SYSTEM
NOSE CAP RELEASE SYSTEM
FRUSTUM RELEASE SYSTEM
MAIN PARACHUTE DISCONNECT SYSTEM
FRUSTUM RELEASE SYSTEM
PARACHUTE ATTACH RING
FRUSTUM RELEASE SYSTEM
SRB TOW PENDANT
4 SRB REC
SOLID ROCKET BOOSTER RECOVERY
BASIC REV E


ET RSS DISTRIBUTOR
ET CONTROLLER A
ET CONTROLLER B
RH SRB RSS DISTRIBUTOR
RH RSS CONTROLLER A
RH RSS CONTROLLER B
LH SRB RSS DISTRIBUTOR
LH RSS CONTROLLER A
LH RSS CONTROLLER B
ARM LIGHT
RH SRB
LH SRB
LO2 TANK
LH2 TANK
LINEAR SHAPED CHARGE ASSEMBLY
FIRING CIRCUIT P/O A
FIRING CIRCUIT P/O B
FIRING OUTPUT
FIRING OUTPUT RTN
SLOSHING SURFACE
FLAME TUNNEL (REAR VIEW)
FLAME TUNNEL (FRONT VIEW)
NOTES:
1. MDI = DATA STANDARD (WITH)
MDR = DATA RECEIVE
MDS = DATA STANDARD (WITHOUT)
LTT = LOAD TEST
RTST = RESISTANCE TEST
2. THE RS FIRE RELAY ENSURES ENOUGH TIME FOR CROSS STRAPPING BETWEEN BOTH RSS WHILE A FIRE COMMAND IS ISSUED
3. CAPACITIVE BANK WILL CHARGE UP TO 28 VDC WITHIN 1.2 SEC
4. R-C RESISTANCE TEST MUST BE APPLIED COMMAND TO TEST THE RESISTANCE OF THE CUTTERS, WHEN RESISTANCE VALUE MEETS THE REQUIREMENTS, THE RSS WILL AUTOMATICALLY SWITCH FROM THE R-C RESIST. A LOAD TO A NORMAL FIRING SEQUENCE FOLLOWING THE CONNECTION TO LOAD TEST TO VERIFY OPERATION
5. LOAD TEST RS CIRCUIT SENSES THE CAPACITOR DISCHARGE WAVEFORM, WHEN SUFFICIENT ENERGY IS STORED IN CAP BANK, LOAD TEST BITE CIRCUITRY WILL ENABLE THE FIRE 1 AND FIRE 2 CIRCUITS TO BE ARMED AND FIRED AS IN THE SRB RSS ENABLING TO VERIFY FIRING CIRCUITRY
NOTES: 1. SEE TABLE S-033 FOR (Interim) REFERENCES
5 RSS 1
SRB/ET RANGE SAFETY SYSTEM
SPACE SHUTTLE
5.5
BASIC REV E

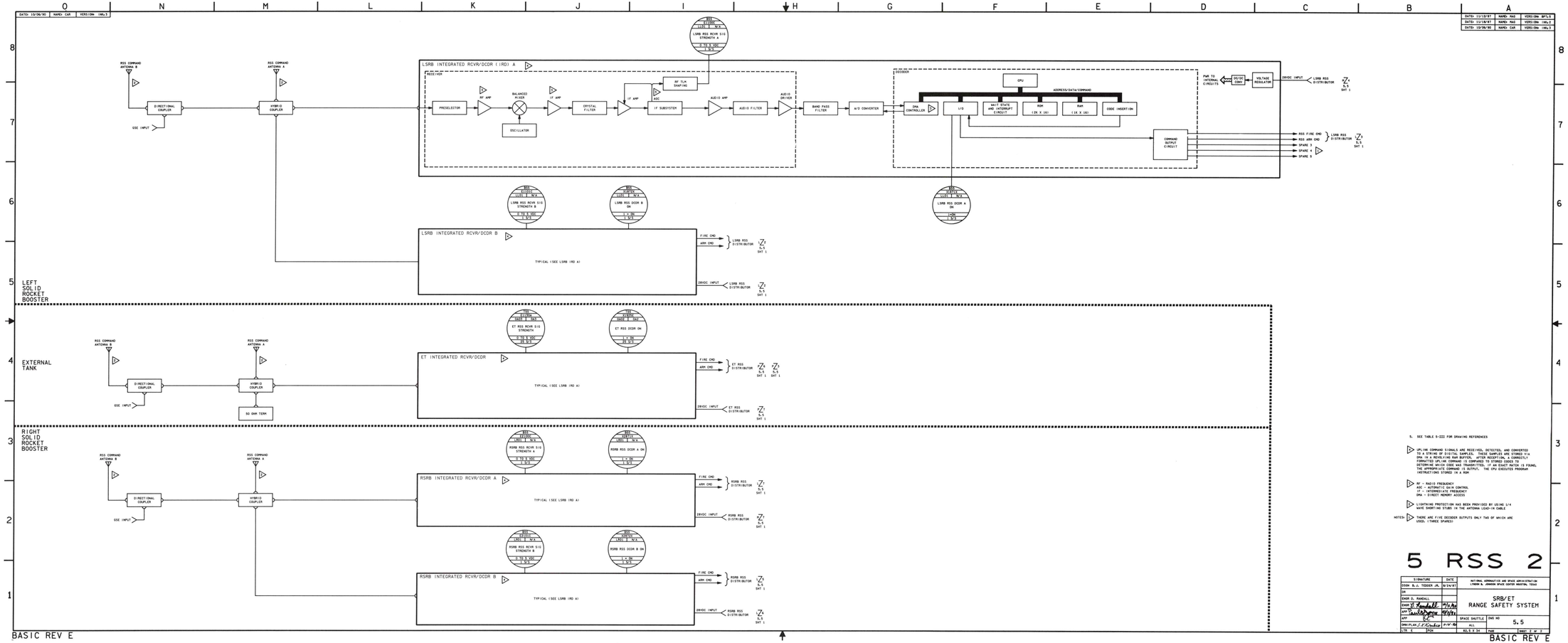

DATE= 10/06/90 NAME= CAR VERSION= IRMU 3
DATE= 11/13/87 NAME= MAS VERSION= BPTU 5
DATE= 12/18/87 NAME= MAS VERSION= IRMU 4
DATE= 10/06/90 NAME= CAR VERSION= IRMU 3
Q N M L K J I H G F E D C B A
8 7 6 5 4 3 2 1
LEFT SOLID ROCKET BOOSTER
EXTERNAL TANK
RIGHT SOLID ROCKET BOOSTER
RSS COMMAND ANTENNA B
RSS COMMAND ANTENNA A
DIRECTIONAL COUPLER
HYBRID COUPLER
GSE INPUT
50 OHM TERM
LSRB INTEGRATED RCVR/DCDR (IRD) A
RECEIVER
PRESELECTOR
RF AMP
BALANCED MIXER
OSCILLATOR
IF AMP
CRYSTAL FILTER
IF AMP
RF TLM SNAPPING
AGC
IF SUBSYSTEM
AUDIO AMP
AUDIO FILTER
AUDIO DRIVER
BAND PASS FILTER
A/D CONVERTER
DECODER
DMA CONTROLLER
I/O
CPU
ADDRESS/DATA/COMMAND
WAIT STATE AND INTERRUPT CIRCUIT
ROM (2K X 16)
RAM (1K X 16)
CODE INSERTION
COMMAND OUTPUT CIRCUIT
PWR TO INTERNAL CIRCUITS
DC/DC CONV
VOLTAGE REGULATOR
DRVDC INPUT
LSRB RSS DISTRIBUTOR
RSS FIRE CMD
RSS ARM CMD
SPARE 3
SPARE 4
SPARE 5
LSRB RSS RCVR S/S STRENGTH A
LSRB RSS DCDR A ON
LSRB RSS DCDR A ON
LSRB INTEGRATED RCVR/DCDR B
LSRB RSS RCVR S/S STRENGTH B
LSRB RSS DCDR B ON
TYPICAL (SEE LSRB (IRD) A)
FIRE CMD
ARM CMD
DRVDC INPUT
ET INTEGRATED RCVR/DCDR
ET RSS RCVR S/S STRENGTH
ET RSS DCDR ON
RSRB INTEGRATED RCVR/DCDR A
RSRB RSS RCVR S/S STRENGTH A
RSRB RSS DCDR A ON
RSRB INTEGRATED RCVR/DCDR B
RSRB RSS RCVR S/S STRENGTH B
RSRB RSS DCDR B ON
NOTES:
1. SEE TABLE S-2222 FOR DRAWING REFERENCES
UPLINK COMMAND SIGNALS ARE RECEIVED, DETECTED, AND CONVERTED TO A STREAM OF DIGITAL SAMPLES. THESE SAMPLES ARE STORED IN A DMA I/O & RECEIVING 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 CPU OUTPUTS A DISCRETE COMMAND (I.E. 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
THERE ARE FIVE DECODER OUTPUTS ONLY TWO OF WHICH ARE USED, (THREE SPARES)
5 RSS 2
SIGNATURE DATE
DSGN B.J. TEDDER JR. 6/24/87
CHR E. RANDALL 9/6/90
APP
APP
DRN/PLAN J.F.Cooke 9-6-90
SYS 1 PCN
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
SRB/ET RANGE SAFETY SYSTEM
SPACE SHUTTLE
ALL
DWG NO 5.5
SIZE D
REV 2
PAGE 1 OF 2
BASIC REV E
BASIC REV E

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/d	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.

[d] 13.66 for OV-102
13.74 for OV-103
13.99 for OV-104

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[e]	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[e]	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..

[e] 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[c]	V41P1533C	MPS LO2 ENG MANF P	HL	4.15/249	3 psia	Same
		79[c]	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.

TABLE 5-I		
	SIGNATURE	DATE
ENGR	B. PAWLIK	
ENGR	Benjamin Pawlik	10-25-90
APP	Paul M Joyce	10/29/90

TABLE 5-II.- SCHEDULED PRIMARY C/W PARAMETER INHIBIT AND LIMIT CHANGES

Time	MML No.	Primary C/W No.	Title	INH/ ENA	New limit (V dc/EU)		
					Lower	Upper	Units
Prelaunch	V61P2405A	004	CABIN PRESS (OV-102)			3.90/15.41	psia
			(OV-103)			3.90/15.54	psia
			(OV-104)			3.80/15.38	psia
	V61P2556A	074	CABIN FAN ΔP		2.65/4.20	4.25/6.80	in. H_2O
	V45P1310A[a]	020	02 TK 3 P	INH			
	V45P1410A[a]	030	02 TK 4 & 5 P	INH			
	V45P2310A[a]	070	H2 TK 3 P	INH			
	V45P2410A[a]	080	H2 TK 4 & 5 P	INH			
	V43P4221C	007	OMS-L OX TK ULL P			3.60/288	psia
	V43P4321C	017	OMS-L FU TK ULL P			3.60/288	psia
	V43P5221C	037	OMS-R OX TK ULL P			3.60/288	psia
	V43P5321C	047	OMS-R FU TK ULL P			3.60/288	psia
	V43P6221C[a]	077	OMS-PBK OX TK ULL P	INH			
	V43P6321C[a]	087	OMS-PBK FU TK ULL P	INH			
	V46T0142A	008	APU 1 EGT	INH			
	V46T0242A	018	APU 2 EGT	INH			
	V46T0342A	028	APU 3 EGT	INH			
	V63T1207A	107	FCL 1 EVAP OUT T			4.30/115	°F
	V63T1407A	117	FCL 2 EVAP OUT T			4.30/115	°F
Postinsertion	V41P1150C	009	MPS-C He TK P	INH			
	V41P1250C	019	MPS-L He TK P	INH			
	V41P1350C	029	MPS-R He TK P	INH			
	V41P1154A	039	MPS-C He REG P	INH			
	V41P1254A	049	MPS-L He REG P	INH			
	V41P1354A	059	MPS-R He REG P	INH			
	V58P0114C	099	HYD SYS 1 P	INH			
	V58P0214C	109	HYD SYS 2 P	INH			
	V58P0314C	119	HYD SYS 3 P	INH			
	V61P2405A	004	CABIN PRESS (OV-102)		3.45/13.66	3.85/15.22	psia
			(OV-103)		3.45/13.74	3.85/15.34	psia
			(OV-104)		3.40/13.79	3.80/15.38	psia
	V63T1207A	107	FCL 1 EVAP OUT T			1.90/64.8	°F
	V63T1407A	117	FCL 2 EVAP OUT T			1.90/64.8	°F
Predeorbit	V58P0114C	099	HYD SYS 1 P	ENA			
	V58P0214C	109	HYD SYS 2 P	ENA			
	V58P0314C	119	HYD SYS 3 P	ENA			
	V41P1154A	039	MPS-C He REG P	ENA	.030/60.0		psia
	V41P1254A	049	MPS-L He REG P	ENA	.030/60.0		psia
	V41P1354A	059	MPS-R He REG P	ENA	.030/60.0		psia
	V41P1533C	069	MPS MANF P LO2	INH			
	V41P1433C	079	MPS MANF P LH2	INH			

[a]When kit is not installed.

TABLE 5-II		
	SIGNATURE	DATE
ENGR	B. PAWLIK	
ENGR	Benjamin Pawlik	11-1-90
APP	Paul M Joyce	11/1/90

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
5.1	SMOKE DETECTION AND FIRE SUPPRESSION	R. I. - DOWNEY	VS70-620109	1 - 6	D	2/21/89	SCHEMATIC DIAGRAM - SMOKE DETECTOR/FIRE EXTINGUISHING
		R. I.	V070-623420	1	B	9/13/88	CM SYSTEM INSTL SMOKE DETECTION & FIRE SUPPRESSION
		R. I.	VS70-960099	68 - 73	A12	1/24/89	SMOKE DETECTOR SUBSYSTEM
		SODB	JSC-08934	4.6.5	D AMEND-MENT 193		
5.2 (SHEETS 1-2)	CAUTION/WARNING OVERVIEW	R.I.	VS70-973099	27-34	A/B03	4/25/90	INTEGRATED SYSTEM SCHEMATICS ORBITER OV-099 DISPLAYS AND CONTROLS
		R.I.	VS70-730622	1-7	A	9/1/83	SCHEMATIC DIAGRAM - CAUTION & WARNING SUBSYSTEM
5.4	SOLID ROCKET BOOSTER RECOVERY	R.I.	VS72-948099	35	A	3/26/90	LSRB RCVY: MAIN CHUTE DEPLOY
				36			LSRB RCVY: NOSE CAP RELEASE
				37			LSRB RCVY: NOZZLE JETTISON
				38			LSRB RCVY: CAP VOLT, LOAD TEST, RTST OK
				39			RSRB RCVY: MAIN CHUTE DEPLOY
				40			RSRB RCVY: NOSE CAP RELEASE
				41			RSRB RCVY: NOZZLE JETTISON
				42			RSRB RCVY: CAP VOLT, LOAD TEST, RTST OK
5.5	SRB/ET RANGE	MSFC	10A00570			7/83	RSS HANDBOOK FOR SRB/ET
(SHEET 1)	SAFETY SYSTEM						
		R. I.	VS72-948099	16	A15	3/26/90	RSS A POWER CNTL & MON
				17			RSS B POWER CNTL & MON
				18			LSRB RSS A CONT & MON
				19			RSRB RSS A CONT & MON
				20			LSRB RSS B CONT & MON
				21			RSRB RSS B CONT & MON
				22			LSRB RSS S & A DEVICE
				23			RSRB RSS S & A DEVICE
				46			ET POWER DISTR BUS A & C
				48			ET RSS A CONT & MON FIRE A
				49			ET RSS A CONT & MON ARM A
				50			ET RSS A CONT & MON PIC A
				51			ET RSS B CONT & MON FIRE B
				52			ET RSS B CONT & MON ARM B
				53			ET RSS B CONT & MON PIC B
				54			ET RSS S & A DEVICE
5.5 (SHEET 2)	SRB/ET RANGE SAFETY SYSTEM	R.I.	VS72-948099	16	A15	3/26/90	RSS A POWER CNTL & MON
				17			RSS B POWER CNTL & MON
				18			LSRB RSS A CONT & MON
				19			RSRB RSS A CONT & MON
				20			LSRB RSS B CONT & MON
				21			RSRB RSS B CONT & MON
				47			ET RSS RF A & B CONT
		CINCINNATI ELECTRONICS CORP.	MSFC CONTRACT #NAS8-33440			12/80	INTEGRATED RECEIVER/DECODER TECHNICAL MANUAL
		MSFC	10A00570			7/83	RSS HANDBOOK FOR SRB/ET

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
5.1	ENGR M. FITZPATRICK			ENGR	
	ENGR Michael D. Fitzpatrick	10/29/90		ENGR	
5.2-1,2	ENGR B. PAWLIK			ENGR	
	ENGR Benjamin Pawlik	10/25/90		ENGR	
5.4	ENGR D. RANDALL			APP Mark J. Jenings	10/29/90
	ENGR David Randall	10/29/90		APP Paul M Boyle	10/29/90
5.5-1,2	ENGR D. RANDALL			OMNIPLAN	
	ENGR David Randall	10/29/90		LTR E PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE | TBL NO 5-III
ALL | PAGE 5.III-1 | SHEET 1 OF 1

*U.S.GOVERNMENT PRINTING OFFICE:1990-561-057/20054

BASIC REV E

6. LIFE SUPPORT SYSTEM

TOTAL USE RATES AND BIT COUNT CHANGE RATES OF METABOLIC DATA FOR VARIOUS CREW SIZES

METABOLIC DATA	5 CREW			6 CREW			7 CREW			8 CREW		
	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX
O2 USE, LB/HR	0.33	0.37	0.43	0.39	0.44	0.52	0.46	0.51	0.61	0.52	0.58	0.70
PPO2 DECAY, PSI/HR	0.025	0.028	0.033	0.03	0.034	0.04	0.035	0.039	0.046	0.04	0.045	0.052
0.02 BIT DECR, MIN	48	43	36	40	35	30	34	30	26	30	27	23
CO2 PROD, LB/HR	0.39	0.44	0.54	0.47	0.53	.065	0.55	0.62	0.75	0.62	0.70	0.86
PPCO2 INCR, MMHG/HR*	1.12	1.26	1.53	1.34	1.51	1.84	1.57	1.76	2.15	1.79	2.02	2.45
.12 BIT INCR, MIN*	6.4	5.7	4.7	5.4	4.8	3.9	4.6	4.1	3.3	4.0	3.6	2.9

* WITHOUT CO_2 REMOVAL

14 ITEM NO.'S REFER TO ROCKWELL HARDWARE NO.'S

13 CABIN PRESSURE BLEED VALVES (ITEM 1.87)
THESE VALVES ARE SERIES MOUNTED IN A COMMON HOUSING AND ARE USED TO VENT THE CABIN PRESSURE DOWN FOLLOWING THE PRELAUNCH CABIN LEAK CHECK AT 16.7 PSIA. CLOSING TIME ≤ 2 SEC WITH 16.7 PSIA VENTING TO 14.7 PSIA AT 70° F

12 POSITIVE PRESSURE RELIEF VALVES (ITEM 1.1)
THESE PRESSURE-COMPENSATED POPPET VALVES ARE SPRING LOADED AGAINST CABIN PRESSURE AND RELIEVE OVERBOARD INTO MIDBODY. MOTORIZED BUTTERFLY VALVES IN SERIES ARE PROVIDED TO CLOSE THE LINE IF THE RELIEF VALVE FAILS OPEN

11 FDA ADDED OI-8D AND SUBS

10 FOR OV-102 ONLY, PPO2C WAS ORIGINALLY IN A METERED CIRCUIT AND REQUIRED A SIGNAL CONDITIONER TO AMPLIFY THE SIGNAL. THE OTHER VEHICLES WERE DESIGNED WITHOUT A METERED PPO2C CIRCUIT AND, THEREFORE, DO NOT NEED A SIGNAL CONDITIONER

9 IF A 'DIVIDE BY ZERO' CONDITION OCCURS, THE COMP WILL DISPLAY AN 'NOK' MEANING 'NOT OK'

8 PRELAUNCH: CABIN PRESSURE UL≅15.5 PSIA
POST INSERT: CABIN PRESSURE UL≅15.2 PSIA

7 OI-8D AND SUBS

6 O_2 BLEED ORIFICE: INSTALLED IN LEH O_2 5 QD POSTSLEEP FD2
REMOVED POSTSLEEP DEORBIT PREP DAY
REINSTALLED FOR 1 DAY WAVE OFFS

5. REFER TO TABLE 6-I FOR DRAWING REFERENCES

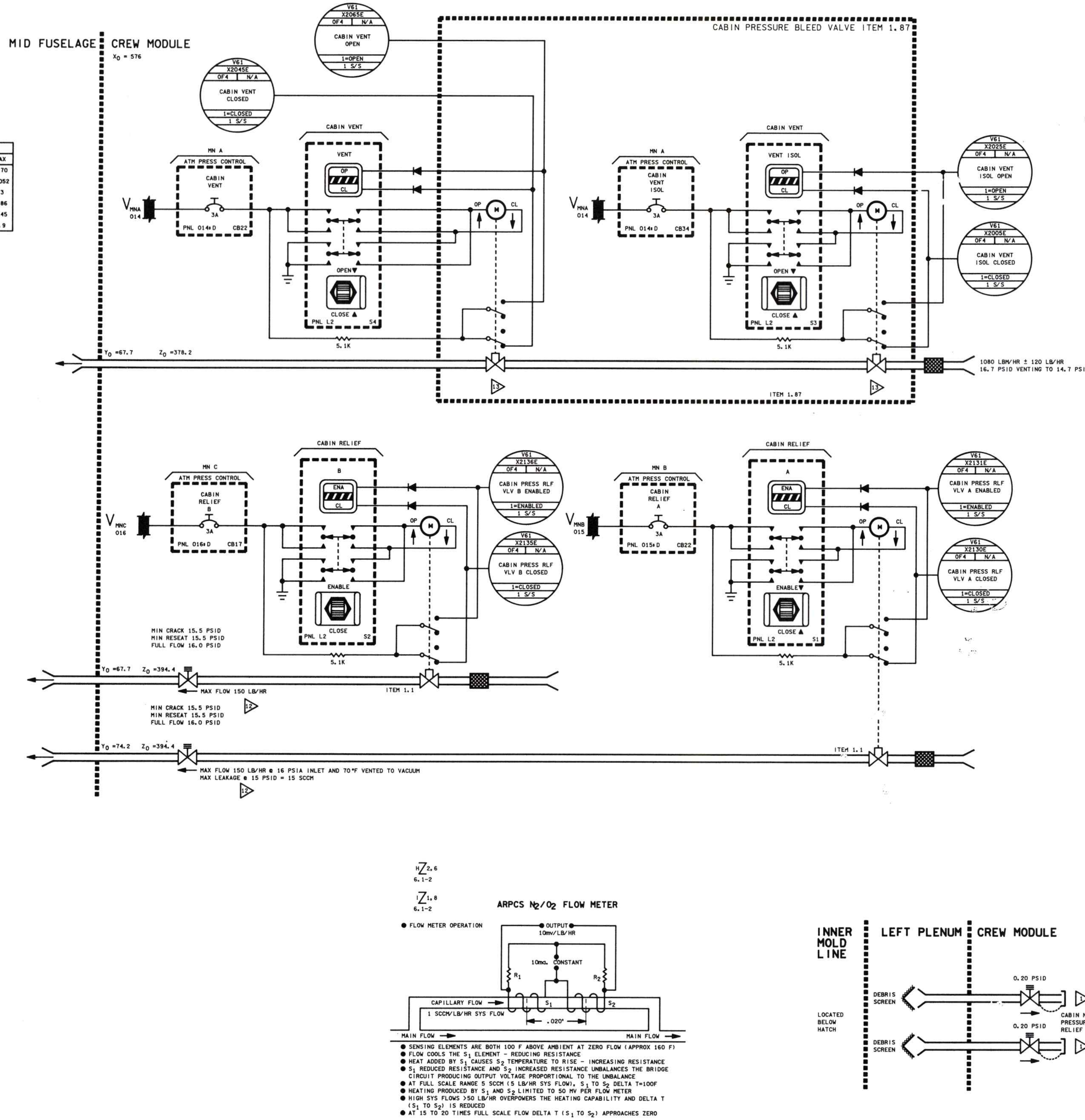
4 BFS OPS 0, OPS 1, OPS 3;
P_0 IS THE CABIN PRESS AT TIME ZERO WHILE P_{30} IS THE CABIN PRESS 30 SEC LATER. THE PRESSURES AND COMP ARE UPDATED EVERY 5 SEC. BFS, SM ALERT OCCURS IF CABIN LEAK RATE IS GREATER THAN -.12 PSIA/MIN

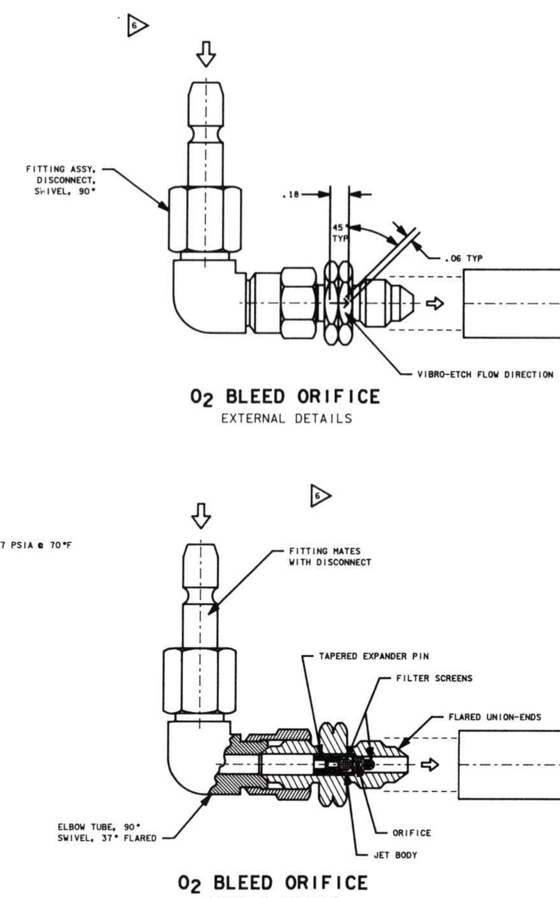
3 KLAXON ANNUNCIATES FOR LOSS OF CABIN PRESSURE ONLY; THEREFORE, THE NEGATIVE SIGN OF dP/dT IS ASSUMED

2 O_2 PARTIAL PRESSURE OPERATION- A DIFFUSION BARRIER, CATALYTIC ELECTRODE, BASIC ELECTROLYTE AND METAL COUNTER ELECTRODE ARE USED TO MEASURE OXYGEN FLOW THROUGH DIFFUSION BARRIER IN DIRECT PROPORTION TO PARTIAL PRESSURE. CHANGE IN ELECTROLYTE CONDUCTIVITY RESULTS IN A 0 TO 5VDC SIGNAL PROPORTIONAL TO OXYGEN

NOTES: 1 CABIN NEGATIVE PRESSURE RELIEF VALVES (ITEM 1.86)
THESE POPPET VALVES PROVIDE RELIEF FROM THE FORWARD FUSELAGE COMPARTMENT DURING ENTRY AFTER A CABIN DEPRESSURIZATION TO 8 PSIA. A REDUNDANT CAP IS PROVIDED TO PREVENT CABIN DECOMPRESSION IF A POPPET VALVE FAILS OPEN. MIN. FLOW 60 LB/MIN AT .5 PSID. ΔP FOR AUTOMATIC CAP RELEASE 0.7 PSID. A PINHOLE IS DRILLED INTO CAP TO MAINTAIN 0.0 ΔP ACROSS CAP

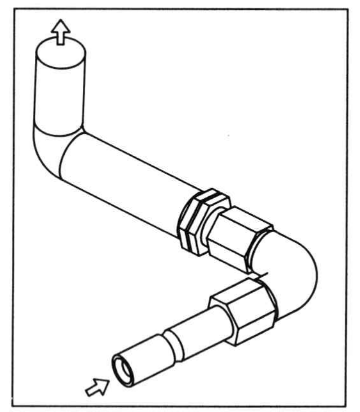
*1 PCS 1





O_2 BLEED ORIFICE
EXTERNAL DETAILS

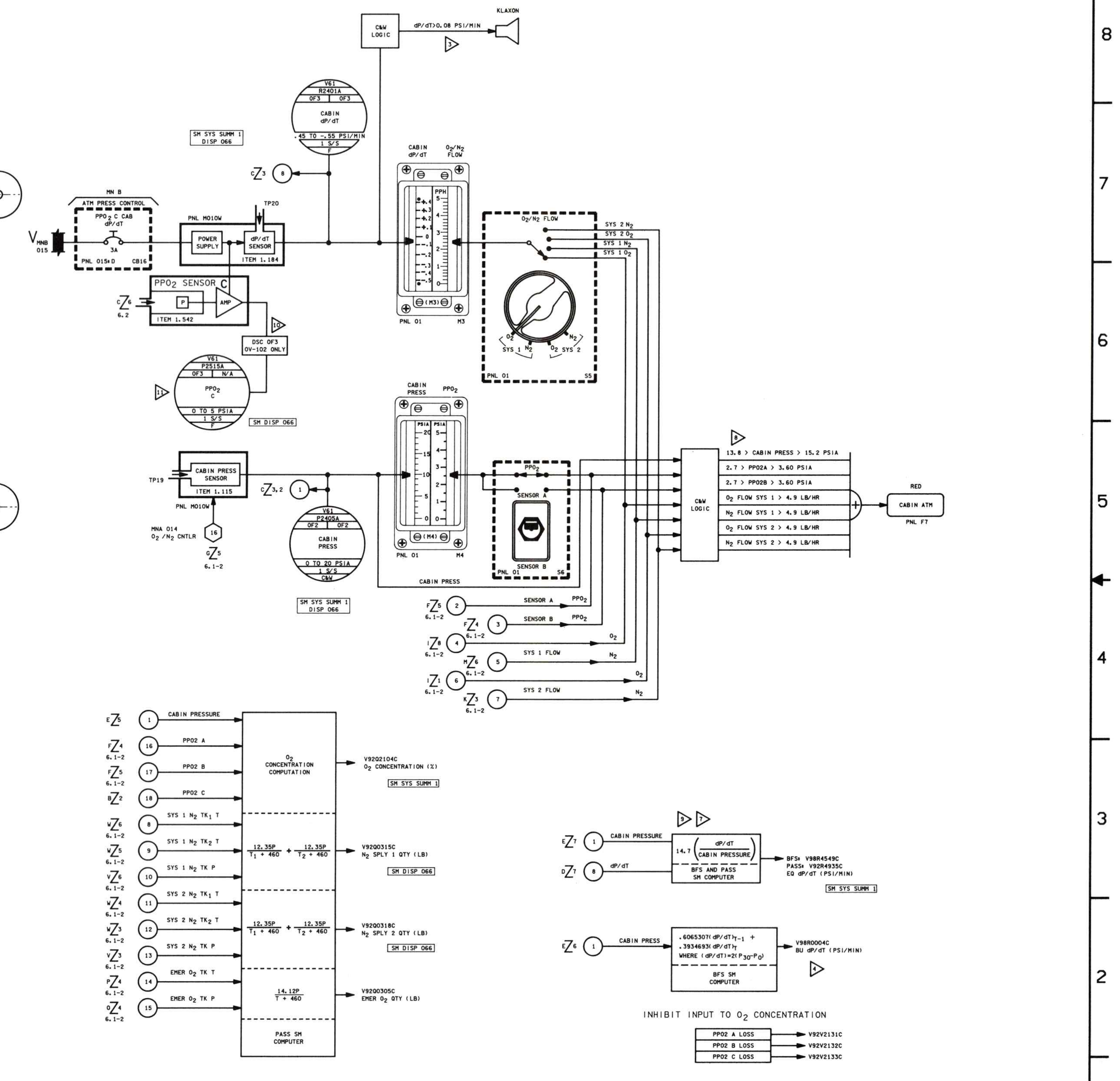
O_2 BLEED ORIFICE
INTERNAL DETAILS



O_2 BLEED ORIFICE
OBLIQUE VIEW

O_2 BLEED ORIFICE SPEC FLOW RATES

CREW SIZE	O_2 SUPPLY PRESSURE PSIA	O_2 MASS FLOW RATE DESIRED	O_2 MASS FLOW RATE PROVIDED
4,5	110.2 ± 10	.24 LB/HR	0.254 +0.052 -0.034 LB/HR
6,7	110.2 ± 10	.36 LB/HR	0.363 +0.064 -0.049 LB/HR



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	SIGNATURE	DATE
	DSGN L.M. BUCHANAN	1/19/83
PRESSURE CONTROL SYSTEM	DR TOM LENERS	1/19/83
	ENGR M.J. FITZPATRICK	
	ENGR [signature]	10/21/90
	APP [signature]	11/26/90
DWG NO 6.1 / SPACE SHUTTLE	APP	
ALL	OMNIPLAN S. K. Kindwell	11-27-90
SHEET 1 OF 2 / PAGE / 82.5X34	LTR E	PCN

BASIC REV E

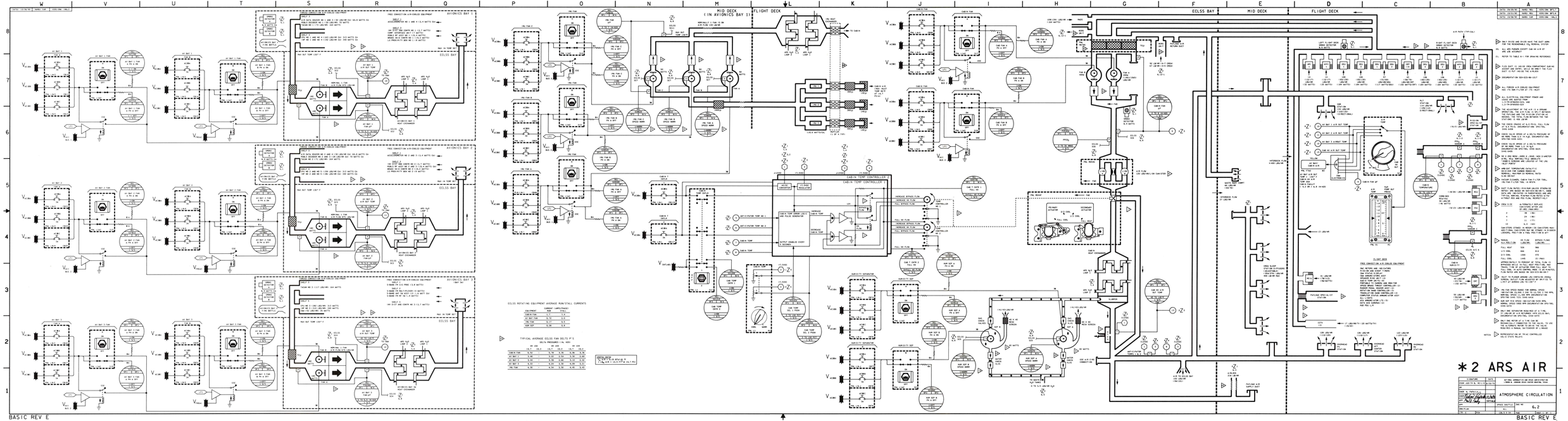
NOTES:

1. ASCENT/ENTRY: SYS 1, 2-OP
   ORBIT: SYS 1(2)-OP(CL)
2. RESERVED
3. VOLUME OF EACH TANK IS 8181 IN^3, BURST P 4950 PSIG
4. $O_2(N_2)$ CONNECTIONS MANIFOLDED SEPARATELY AND ROUTED TO PAYLOAD INTERFACE PANEL
5. O_2/N_2 CNTLR HAS TWO CONTROL POINTS:
   1. NORM - 3.2 ±.25, CONTROLLER PROVIDES OUTPUT SIGNAL WHEN PPO_2 REACHES 3.45 PSIA AND RETURNS TO ZERO WHEN PPO_2 REACHES 2.95 PSIA
   2. EMER - 2.2 ±.25, CONTROLLER PROVIDES OUTPUT SIGNAL WHEN PPO_2 REACHES 2.45 PSIA AND RETURNS TO ZERO WHEN PPO_2 REACHES 1.95 PSIA (SWITCH POSITION NOT USED)
6. PPO_2 SENSOR LIFE 12,000 HRS
   AMPLIFIER OUTPUT ADJUSTABLE (GROUND OPS ONLY)
7. CABIN GAS AT PPO2=3.08 PSI, P_T=14.7 PSI, VOL=2325 FT^3, O_2=36.2 LBM, N_2=136.6 LBM, AIR=172.8 LBM
   CABIN + AIRLOCK GAS AT PPO2=3.08 PSI, P_T=14.7 PSI, VOL=2475 FT^3: O_2=38.6 LBM, N_2=146.0 LBM, AIR=184.6 LBM
8. ASCENT/ENTRY: SYS 1(2)- OP(CL)
   ORBIT: SYS 1(2)- AUTO(CL)
9. ASCENT/ENTRY: SYS 1, 2-CL
   ORBIT: SYS 1(2)- OP(CL)
10. MANUAL VALVES USED TO BLEED DOWN LINE PRESSURE AT FSS FOR REMOVAL/SERVICE. (GROUND OPS ONLY)
11. REFER TO TABLE 6-I FOR DRAWING REFERENCES
12. WATER PRESSURIZATION SYSTEM NITROGEN IS CHANNELED TO 14.7 REGULATOR TO PROVIDE A DESIRED BACKPRESSURE FUNCTION. WHEN THE REGULATOR IS CLOSED, 16 PSIG NITROGEN IMMOBILIZES INTERNAL VALVE ELEMENTS TO MINIMIZE LIFE CYCLE COMPONENT WEAR INDUCED BY RANDOM ASCENT VIBRATION
13. RATED 10 LB/HR AT 300 PSI UPSTREAM PRESSURE
14. O_2 PARTIAL PRESSURE OPERATION- A DIFFUSION BARRIER, CATALYTIC ELECTRODE, BASIC ELECTROLYTE AND METAL COUNTER ELECTRODE ARE USED TO MEASURE OXYGEN FLOW THROUGH DIFFUSION BARRIER IN DIRECT PROPORTION TO PARTIAL PRESSURE. CHANGE IN ELECTROLYTE CONDUCTIVITY RESULTS IN A 0 TO 5VDC SIGNAL PROPORTIONAL TO OXYGEN PARTIAL PRESSURE
15. IF O2/N2 CNTLR 1 OR O2/N2 CNTLR 2 POWER IS LOST THE AUTO AND CLOSE FUNCTIONS CAN BE REGAINED BY SWITCHING THE PPO2 SNSR/VLV TO REVERSE
16. LOSS OF EITHER CONTROL BUS PRECIPITATES LOSS OF THE SWITCH FUNCTION
17. ITEM NUMBERS REFER TO ROCKWELL HARDWARE NUMBERS

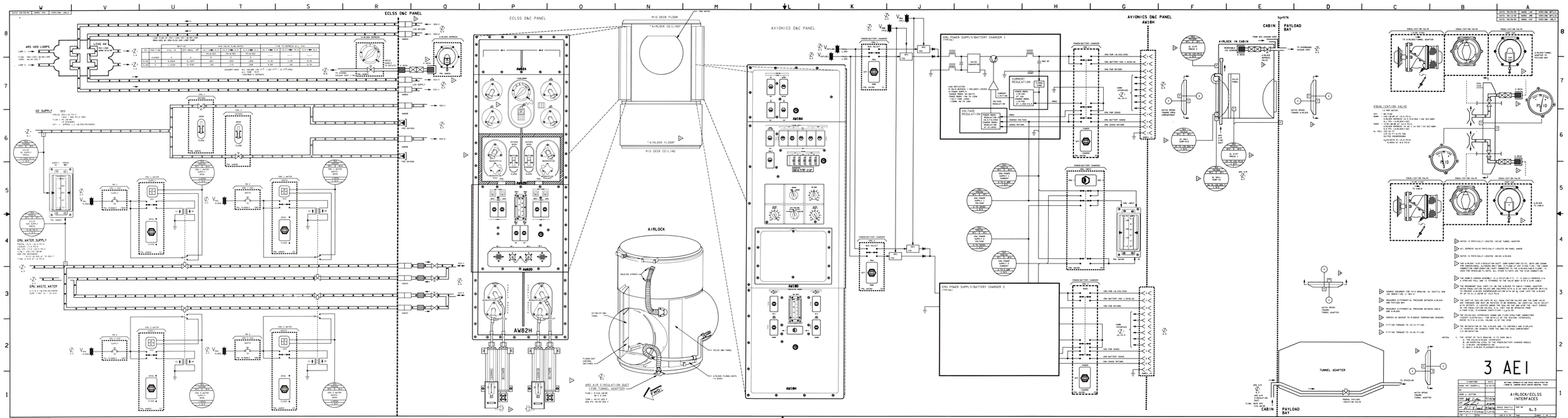
*1 PCS 2

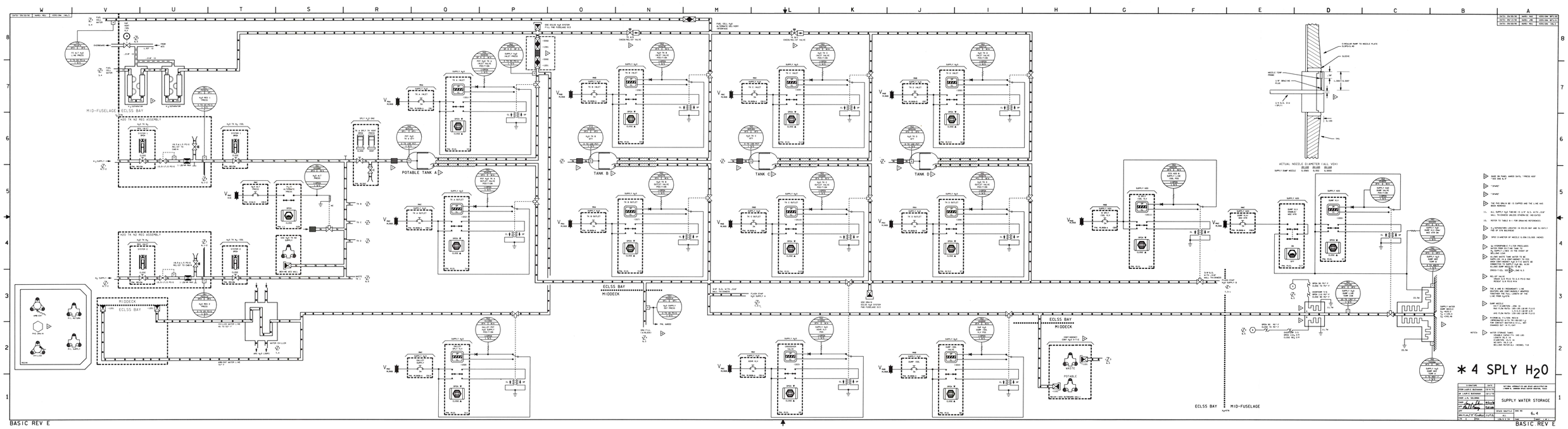
SIGNATURE	DATE	
DSGN LAURIE BUCHANAN	1/19/84	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR TOM LENERS	1/19/84	PRESSURE CONTROL SYSTEM
ENGR M. FITZPATRICK		
ENGR [signature]	11/15/90	
APP [signature]	11/15/90	
APP		SPACE SHUTTLE — DWG NO 6.1
OMNIPLAN S. K. Kimbrell	11-27-90	ALL
LTR E — PCN		126.5 X 34 — PAGE — SHEET 2 OF 2

BASIC REV E


AVIONICS BAY
MID DECK
(IN AVIONICS BAY 3)
FLIGHT DECK
ECLSS BAY
MID DECK
FLIGHT DECK
CABIN TEMP CONTROLLER
CABIN TEMP CONTROLLER 3
ECLSS ROTATING EQUIPMENT AVERAGE RUN/STALL CURRENTS
TYPICAL AVERAGE ECLSS FAN DELTA P'S
*2 ARS AIR
ATMOSPHERE CIRCULATION
6.2

BASIC REV E


ECLSS D&C PANEL
AVIONICS D&C PANEL
AVIONICS D&C PANEL
AW82A
AW81A
AW82
AW82H
AW81
AW81H
MID DECK FLOOR
AIRLOCK CEILING
AIRLOCK FLOOR
MID DECK CEILING
AIRLOCK
ARS H2O LOOPS
LCVG H2O
O2 SUPPLY
EMU WATER SUPPLY
EMU WASTE WATER
EMU POWER SUPPLY/BATTERY CHARGER 1
EMU POWER SUPPLY/BATTERY CHARGER 2
CABIN
PAYLOAD BAY
TUNNEL ADAPTER
EQUALIZATION VALVE
3 AE1
AIRLOCK/ECLSS INTERFACES
6.3


POTABLE TANK A
TANK B
TANK C
TANK D
MID-FUSELAGE ECLSS BAY
MIDDECK
ECLSS BAY
ECLSS BAY MIDDECK
ECLSS BAY MID-FUSELAGE
ACTUAL NOZZLE DIAMETER (ALL VEH)
SUPPLY WATER STORAGE
* 4 SPLY H2O
BASIC REV E

22▷ THE COMPACTOR DRIVE AND ELASTIC NET SHOULD ONLY BE USED ONCE. IT MAKES ROOM IN THE COMMODE BY COMPACTING THE FECAL MATTER INTO A SMALL AREA

21▷ TO USE THE OTHER SEPARATOR LIFT LEVER ARM UP, ROTATE THE MANUAL SELECTOR VALVE 180° AND LOCK IN PLACE

20▷ VAC VENT ISOL VLV: ORIFICE IN VLV PLATE
FLOW: 3.0±0.25 LBS/HR @ 14.7 PSIA INLET PRESSURE
AND A DELTA P OF 6.7 PSID
ORIFICE DIA: 0.0635 TO 0.0638 INCHES
DISCHARGE COEFF.: (C_d): 0.8
KSC TESTING: 4.37±0.36 LBS/HR
@ 6.7 PSID

19▷ SPARE

18▷ CONTINGENCY VACUUM HOSES

- LENGTH
  - BLUE/BLUE - 10 FT
  - RED/RED - 10 FT
  - YELLOW/YELLOW - 8 FT
  - MATERIAL - TEFLON
  - DIAMETER - 1/4 IN OD
- VACUUM NOZZLE (NOT SHOWN)
  LENGTH - ~1 FT
- STOWED IN WINDOW SHADE POUCH

QD COMPATIBILITY

-1101	-3102
-1141	-3142
-1201	-3142, -3302
-1301	-3142, -3302

17▷ QDS NOT COMPATIBLE WITH CONTINGENCY HOSES

16▷ TRASH CAN AND HOSES INSTALLED DURING POST INSERTION AND STOWED DURING DEORBIT PREP

15▷ ALLOWS WASTE TANK TO BE SUPPLIED TO FES IN A CONTINGENCY BY CONNECTING WASTE H2O QD TO SUPPLY H2O QD, ALSO ALLOWS DUMP NOZZLES TO BE CROSS-TIED. SEE 18▷

14▷ FILTER IS REMOVABLE IN FLIGHT

13▷ FAN SEPARATOR: SPEED 5800 RPM, 200 WATTS AC., MIN AIR FLOW 35 CFM, MAX WST WATER FLOW 0.09 LB/SEC

12▷ COMMODE

- VOLUME: 2.5 FT^3
- WEIGHT: 135 LBS
- COLLECTOR AIR OUTLET IS THROUGH A 0.45μ HYDROPHOBIC FILTER WHICH PREVENTS FREE LIQUID FROM EXITING COLLECTOR
- COLLECTOR AIR OUTLET HAS 20 X 20 MESH FILTER WITH .018 IN DIA WIRE, WHICH PREVENTS SOLID WASTE FROM EXITING COLLECTOR

11▷ THE 5A CB AND WIRING IS A HOLD-OVER FROM WHEN THE COMMODE HAD A SLINGER

10▷ DELETED

9▷ 1μ HYDROPHOBIC FILTER PRECLUDES WATER FROM EXITING TANK TO N_2 SUPPLY LINES IN EVENT OF BELLOWS LEAK, BUT WATER WILL BREAK THROUGH THE HYDROPHOBIC FILTER IF THE PRESSURE IS 5 PSID ACROSS IT

8▷ DUMP NOZZLE LOCATED ON THE PORT SIDE OF THE VEHICLE
MAX FLOW RATE: 185-195 LB/HR FLUID
1.5-2.0 LB/HR AIR

7▷ FILTER IS NOT REPLACEABLE IN FLIGHT

6▷ SEPARATOR OUTLET CABIN ODOR/BACTERIA FILTER. CAN BE CHANGED IN FLIGHT, BUT ONLY ONE SPARE IS CARRIED ONBOARD

5▷ COMMODE REPRESS SCREEN:
SCREEN: 40 MESH, 0.0065 WIRE
LINE DIAMETER ENSURES COMMODE REPRESS IN >10 SEC
FILTER: 0.45M ABSOLUTE
0.5 INCH DIA I.D. LINE AND VALVE ACT AS A RESTRICTOR

4▷ RESTRICTOR INSIDE DIAMETER: 1.03 INCHES
MAX FLOW: 30 CFM

3. REFER TO TABLE 6.1 FOR DRAWING REFERENCES

2▷ THE A AND B (REDUNDANT) LINE HEATERS ARE CONTINUOUSLY WRAPPED TOGETHER THE FULL LENGTH OF THE LINE FROM X_0 = 576

NOTES: 1▷ WASTE WATER STORAGE TANK

- USABLE CAPACITY: 165 LBS
- LENGTH: 35.5 IN
- DIAMETER: 15.50 IN
- DRY WEIGHT: 39.5 LBS

*5 WMS

SIGNATURE	DATE	
DSGN LINDA DUMIS	10/10/78	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		WASTE MANAGEMENT
ENGR C. YEE	9/21/90	
ENGR Chris L. Yee	9/21/90	
APP [illegible]	[illegible]	
APP		SPACE SHUTTLE / DWG NO 6.5
OMNIPLAN [illegible]	11-27-90	ALL
LTR E / PCN		121 X 34 / PAGE / SHEET 1 OF 1

BASIC REV E

DATE= 09/18/90	NAME= MAS	VERSION= IML1

DATE= 04/16/88	NAME= RJT	VERSION= IML1
DATE= 05/04/90	NAME= MSV	VERSION= IML1
DATE= 09/18/90	NAME= MAS	VERSION= IML1

6 GALLEY

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DSOM MICHAEL MURPHY	5/4/94	LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR B.A.TEDDER JR.		
CHKR C. YEE	9/11/92	GALLEY
CHKR Chris J. Lee	9/16/92	
APP Paul J. Bury	9/24/92	
APP		SPACE SHUTTLE DWG NO 6.6
SIM/PLAN W.F. Fincher	11-27-91	ALL
SIM E	SCH	SIZE D SCALE NONE SHEET 1 OF 1

HOSE/TUBE SPECIFICATIONS

HOSE **	LENGTH (INCHES)
H2 *	60
H3 *	36
H4	6
H5	15.25
H6	24
H7 *	14.5
H8 *	24
H9 *	18
H10 *	19
H11 *	7.75
H12	5.75
H13 *	9.25
H14 *	24
H15	36
H16	26
H17	27
H18	37
H20	40
H26	9.25
TUBE ***	
HEATING COIL	290

* INSULATED HOSE. INSULATION COVERS THE HOSE LABELS ON INSULATED HOSE.
HOSE INSULATION IS TUBULAR 1 3/8" ID x 1/2" WALL AF ARMAFLEX.
** MATERIAL IS RESISTIVE, NOT CONDUCTIVE (10-1100 PSI/250-500 PSI TESTED) - POLYETHAFLUOROETHYLENE (TFE) CARBON BLACK HOSE COVERED WITH TEFLON IMPREGNATED FABRIC.
*** MATERIAL IS 0.39" STAINLESS STEEL (0.134" ID).

CONTROL ELECTRONICS ASSEMBLY (CEA)

VOLUME/OUNCES 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5

WATER QUANTITY SELECTION SWITCH

REHYDRATION STATION PACKAGE SWITCH

HOT WATER DISPENSER

COLD

COLD WATER PUSHBUTTON

PERSONAL HYGIENE H2O VALVE

PERSONAL HYGIENE VALVE OPERATION
- DEPRESSING HANDLE ALLOWS CONSTANT FLOW WHILE HANDLE IS BEING DEPRESSED
- PLACING HANDLE IN "UP" LOCKED-OPEN POSITION" ALLOWS CONSTANT FLOW WITHOUT CONSTANT PRESSURE ON THE HANDLE

PERSONAL HYGIENE H2O HOSE

AUX H2O GO OUTLET

MICROBIAL FILTER

P/O ECLSS OVEN VALVE

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

HOT WATER TANK

COVER PLATE

RECIRCULATION THERMOSTAT OPEN 145(5)°F CLOSE 140(5)°F MOUNTED EXTERNAL SURFACE OF HOT H2O TANK

WATER TEMPERATURE

HOT H2O RECIRCULATION SOLENOID VALVE (SV2)

HOT H2O PUMP (P1)

RWS HOT H2O DISPENSE SOLENOID VALVE (SV3)

RWS COLD H2O DISPENSE SOLENOID VALVE (SV4)

REHYDRATION STATION (RWS) NEEDLE

RECIRCULATION TEMPERATURE DETECTOR (RTD)

COLD H2O RECIRCULATION SOLENOID VALVE (SV1)

COLD H2O PUMP (P2)

MV-1 OFF MV-2 MV-3 ON

ARMAFLEX

ARM INLET

DRAIN

P/L RTN

P/L SPLY

CHILLED

M2D24K

ECLSS BAY

DISTILLED INLET

MV-1

MV-2

MV-3

H2O

H2

H3

H4

H5

H6

H7

H8

H9

H10

H11

H12

H13

H14

H15

H16

H17

H18

H20

H26

TP4 -1141

-1000 -1001 -1002 -1003 -1004 -1005 -1006 -1007 -1008 -1009 -1010 -1011 -1012 -1013 -1014 -1015 -1016 -1017 -1018 -1019 -1020 -1021 -1022 -1023 -1024 -1025 -1026 -1027 -1028 -1029 -1030 -1031 -1032 -1033 -1034 -1035 -1036 -1037 -1038 -1039 -1040 -1041 -1042 -1043 -1044 -1045 -1046 -1047 -1048 -1049 -1050 -1051 -1052 -1053 -1054 -1055 -1056 -1057 -1058 -1059 -1060 -1061 -1062 -1063 -1064 -1065 -1066 -1067 -1068 -1069 -1070 -1071 -1072 -1073 -1074 -1075 -1076 -1077 -1078 -1079 -1080 -1081 -1082 -1083 -1084 -1085 -1086 -1087 -1088 -1089 -1090 -1091 -1092 -1093 -1094 -1095 -1096 -1097 -1098 -1099 -1100 -1101 -1102 -1103 -1104 -1105 -1106 -1107 -1108 -1109 -1110 -1111 -1112 -1113 -1114 -1115 -1116 -1117 -1118 -1119 -1120 -1121 -1122 -1123 -1124 -1125 -1126 -1127 -1128 -1129 -1130 -1131 -1132 -1133 -1134 -1135 -1136 -1137 -1138 -1139 -1140 -1141

OVEN HEATERS/FANS

WATER HEATERS

OVEN FAN SWITCH

WET WIPES DISPENSER

OVEN

TEMPERATURE GAGE

CONTROL PANEL

TEMPORARY STORAGE COMPARTMENT (E.G., FOOD PACKAGES)

TEMPORARY STORAGE COMPARTMENT (E.G., STRAWS)

REHYDRATION STATION

COND/MOIST DISPENSERS

DC POWER SWITCHES

TEST PORT (TP4)

TEFLON COVER

IDENTIFICATION TAG

AUX H2O GO OUTLET

FOOD TRAYS

TEST CONNECTORS

J104 J105

NOTE: ACTUAL CONNECTORS ARE INVERTED 180° ON GALLEY

GALLEY GENERAL LAYOUT

GALLEY FAN

GALLEY OVEN FAN

OVEN FAN

OVEN FAN SW

GALLEY OVEN

OVEN/RWS

OVEN/RWS SW

GALLEY H2O HEATER

GALLEY

WATER HEATERS

WATER HEATERS SW

AC3 AC2 AC1 RWS

PRIMARY POWER

SECONDARY POWER

V_{AC3} V_{RWS} V_{RWS}

13. SEE TABLE 6-1 FOR DRAWING REFERENCES

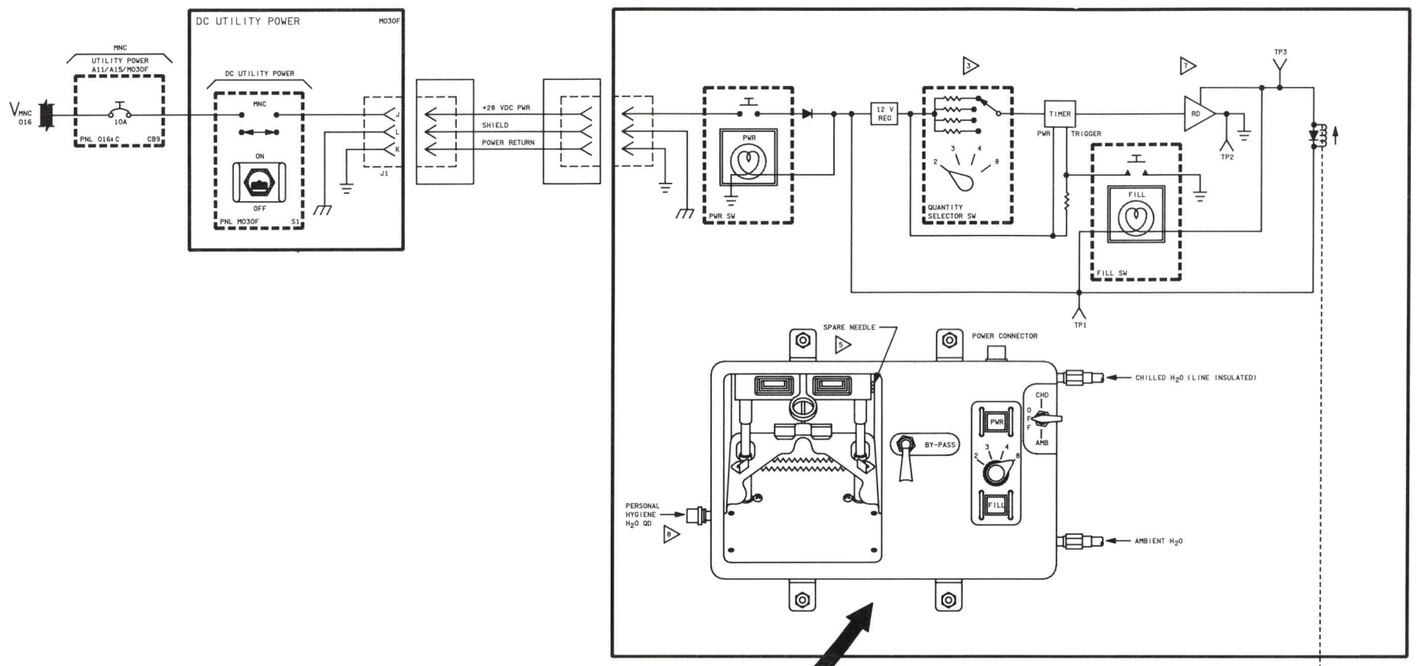
NOTES:

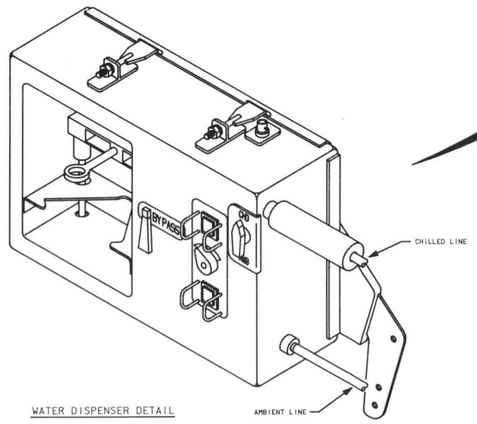
1. THE PERSONAL HYGIENE STATION IS NO LONGER ON THE GALLEY. THE PHS SWITCH WAS RETAINED TO AVOID MAKING A HOLE IN THE GALLEY, THE PHS SWITCH HAS NO OTHER FUNCTION - IT IS NOT ELECTRICALLY CONNECTED TO THE CONTROL ELECTRONICS ASSEMBLY
2. THE TEST CONNECTORS ARE USED TO CHECK THE OPEN/CLOSE OPERATION OF THE HEATER THERMOSTATS
3. MICROBIAL FILTER: RESIN IMPREGNATED WITH TRIIODIDE (-) TO INHIBIT BACTERIAL GROWTH/REPRODUCTION. ALSO KNOWN AS THE MICROBIAL CHECK VALVE (MCV) BUT THIS IS A MISNOMER BECAUSE IT IS NOT A WATER CHECK VALVE
4. THE AMBIENT TEMPERATURE WATER ENTERS A BRAZED COIL ASSEMBLY MADE FROM STAINLESS STEEL TUBING, WRAPS IN A 15.66 INCH INNER DIAMETER COIL. THE COIL HAS SIX STRIP HEATERS BONDED ON THE OUTSIDE OF THE CYLINDRICAL SURFACE. THERE IS A SMALL AIR SPACE BETWEEN THE COIL AND THE WATER TANK
5. WATER TANK CAPACITY IS 12 LBM. THE WATER TANK IS LOCATED BELOW THE OVEN. INSULATION ENCLOSES THE BOTTOM AND CIRCUMFERENCE OF THE WATER TANK. THE TOP OF THE TANK, THE WATER TANK COVER PLATE IS SEALED WITH AN O-RING. THE EXTERNAL HOUSING/SHROUD OF THE WATER TANK ARE 12 INCHES IN DIAMETER AND 6.2 INCHES TALL INCLUDING THE COVER PLATE
6. OPENING MV2 VALVE WAS INTENDED TO ALLOW HOT WATER TO MIX WITH THE AMBIENT WATER TO PROVIDE WARM WATER FOR THE CREW (NOT HOT WATER FOR A HOT BEVERAGE). HOWEVER, HOT WATER PRESSURE IS LOWER THAN AMBIENT WATER PRESSURE AT MV2 AND CANNOT OPEN THE CHECK VALVE EVEN WHEN MV2 IS OPEN. MV2 IS NORMALLY CLOSED (OFF) POSITION. MV2 CANNOT BE ADJUSTED TO COMPLETELY SHUT OFF AMBIENT WATER FLOW TO THE AUX H2O GO OUTLET; THEREFORE, ONLY AMBIENT WATER IS AVAILABLE AT THE AUX H2O GO OUTLET. MV2 SHOULD ALWAYS BE SET TO ITS FULL CCLOSED (OFF) POSITION
7. MV4 IS A STANDPIPE VALVE FOR BLEEDING OUT THE AIR FROM THE HOT WATER TANK DURING FILLING OR THE ORBITER IS IN THE HORIZONTAL POSITION ON THE GROUND. THE STANDPIPE AND VALVE ASSEMBLY ENTERS AT THE BOTTOM OF THE TANK AND ALSO SERVES AS THE AMBIENT WATER INLET
8. WHEN THE COLD WATER TEMPERATURE SENSED BY THE RESISTANCE TEMPERATURE DETECTOR (RTD) EXCEEDS 65°F, THE CONTROL ELECTRONICS ASSEMBLY (CEA) OPENS THE COLD H2O RECIRCULATION SOLENOID VALVE (SV1) AND STARTS THE HOT H2O PUMP (P1) TO RECIRCULATE HOT WATER THROUGH P1, SV2, AND THE TANK FOR 10 SECONDS. IF, AFTER 10 SECONDS OF RECIRCULATION, THE TEMPERATURE AT THE RTD IS BELOW 55°F., THEN THE CEA WILL TERMINATE RECIRCULATION. THE RECIRCULATION PATH RUNS FROM THE WATER CHILLER THROUGH P2 AND SV1 AND RETURNS TO THE SUPPLY WATER SYSTEM THROUGH THE AMBIENT WATER INLET. IF THE RTD IS STILL ABOVE 55°F AFTER 10 SECONDS OF RECIRCULATION, IT IS DUE TO HIGHER THAN NORMAL ARM H2O COOLANT LOOP TEMPERATURES FOR EXAMPLE, THE CEA WILL INHIBIT THE RECIRCULATION PROCESS AFTER 20 SECONDS. THE CEA WILL WAIT 30 MINUTES BEFORE IT WILL ATTEMPT ANOTHER RECIRCULATION. IT WILL REINITIATE RECIRCULATION IF AND WHEN THE RTD TEMPERATURE EXCEEDS 65°F. COLD WATER RECIRCULATION WAS IMPLEMENTED TO INSURE THAT THE COLDEST AVAILABLE WATER WAS IMMEDIATELY AVAILABLE AT THE REHYDRATION STATION. THIS TIMED COLD WATER RECIRCULATION PROCESS IS DESIGNED TO INSURE THAT THE COLDEST AVAILABLE WATER IS DISPENSED IN THE EVENT THE WATER CHILLER TEMPERATURE IS ABOVE THE ASSET POINT
9. WHEN THE HOT WATER TEMPERATURE AT THE HOT WATER RECIRCULATION THERMOSTAT DROPS BELOW 140(5)°F, THE CONTROL ELECTRONICS ASSEMBLY OPENS THE HOT H2O RECIRCULATION SOLENOID VALVE (SV2) AND STARTS THE HOT H2O PUMP (P1) TO RECIRCULATE HOT WATER - THE RECIRCULATION PATH RUNS FROM THE HOT WATER TANK THROUGH P1, SV2, AND THE REHYDRATION STATION (RWS) NEEDLE AND RETURNS TO THE TANK. IF THE RECIRCULATION THERMOSTAT TEMPERATURE REMAINS BELOW 140(5)°F, THE CEA STOPS THE RECIRCULATION PROCESS, TO KEEP THE WATER IN THE HOT WATER TANK HOT, IT MUST BE RECIRCULATED PERIODICALLY BECAUSE THE WATER IS HEATED IN THE TANK WHICH FEEDS THE TANK RATHER THAN IN THE TANK ITSELF
10. DEPRESSION OF THE BLUE COLD WATER PUSHBUTTON ALLOWS DISPENSING OF COLD WATER FROM THE WATER CHILLER. THE BLUE COLD PUSHBUTTON WILL ILLUMINATE WHEN ACTIVATED, WHEN SELECTED VOLUME OF WATER HAS BEEN DISPENSED, THE PUSHBUTTON WILL BEGIN TO FLASH ON AND OFF, THE LIGHT WILL EXTINGUISH WHEN THE REHYDRATION (RWS) PACKAGE SWITCH IS OPENED BY RETRACTING THE FOOD/DRINK PACKAGE. THE SPECIFIC FUNCTIONS THAT OCCUR WHEN THE COLD PUSHBUTTON IS DEPRESSED ARE:
    - THE CONTROL ELECTRONICS ASSEMBLY (CEA) OPENS COLD H2O RECIRCULATION SOLENOID VALVE (SV1) AND STARTS COLD H2O PUMP (P2), COLD WATER IS RECIRCULATED FOR THREE SECONDS TO PURGE THE LINE
    - WHEN THREE SECONDS ARE UP, THE CEA CLOSES SV1 AND OPENS COLD H2O DISPENSE SOLENOID VALVE (SV4) FOR TIMED DISPENSE THE SELECTED QUANTITY
    - WHEN DISPENSE OF THE SELECTED QUANTITY IS COMPLETE, THE CEA CLOSES SV4 AND STOPS PUMP P2. QUANTITY DISPENSED IS A FUNCTION OF TIME AND IS CONTROLLED BY A TIMER IN THE CEA
11. DEPRESSION OF THE YELLOW HOT WATER PUSHBUTTON ALLOWS DISPENSING OF HOT WATER FROM THE HOT WATER TANK. THE YELLOW HOT WATER PUSHBUTTON WILL ILLUMINATE WHEN ACTIVATED, WHEN SELECTED VOLUME OF WATER HAS BEEN DISPENSED, THE PUSHBUTTON WILL BEGIN TO FLASH ON AND OFF, THE LIGHT WILL EXTINGUISH WHEN THE REHYDRATION STATION (RWS) PACKAGE SWITCH IS OPENED BY RETRACTING THE FOOD/DRINK PACKAGE. THE SPECIFIC FUNCTIONS THAT OCCUR WHEN THE HOT PUSHBUTTON IS DEPRESSED ARE:
    - THE CONTROL ELECTRONICS ASSEMBLY (CEA) OPENS HOT H2O RECIRCULATION SOLENOID VALVE (SV2) AND STARTS HOT H2O PUMP (P1), HOT WATER IS RECIRCULATED FOR THREE SECONDS TO PURGE THE LINE
    - WHEN THREE SECONDS ARE UP, THE CEA CLOSES SV2 AND OPENS THE RWS HOT H2O DISPENSE SOLENOID VALVE (SV3) TO DISPENSE THE SELECTED QUANTITY
    - WHEN DISPENSE OF THE SELECTED QUANTITY IS COMPLETE, THE CEA CLOSES SV3 AND STOPS PUMP P1. QUANTITY DISPENSED IS A FUNCTION OF TIME AND IS CONTROLLED BY A TIMER IN THE CEA
12. THE REHYDRATION STATION (RWS) PACKAGE SWITCH SERVES AS AN INTERLOCK SWITCH WHICH MUST BE CLOSED BEFORE THE RWS WATER DISPENSE SOLENOID VALVES (SV3 AND SV4) CAN BE ACTIVATED AND PUSHING IN A FOOD/DRINK PACKAGE TO DEPRESS THE SWITCH PLUNGER TO CLOSED POSITION. ONCE WATER HAS BEEN DISPENSED, THE SWITCH MUST BE OPENED AND THEN CLOSED AGAIN BEFORE MORE WATER CAN BE DISPENSED. WHILE THE RWS PACKAGE SWITCH IS DEPRESSED, RECIRCULATION OF HOT WATER FROM THE HOT WATER TANK IS INITIATED AUTOMATICALLY AS AN INITIALIZATION PROCESS WHERE BOTH HOT AND COLD H2O RECIRCULATE FOR 40 SECONDS, DURING WHICH TIME REHYDRATION STATION (RWS) DISPENSE IS INHIBITED. HAVING THE RWS PACKAGE SWITCH DEPRESSED WILL NOT INHIBIT THIS INITIALIZATION RECIRCULATION PROCESS

BASIC REV E

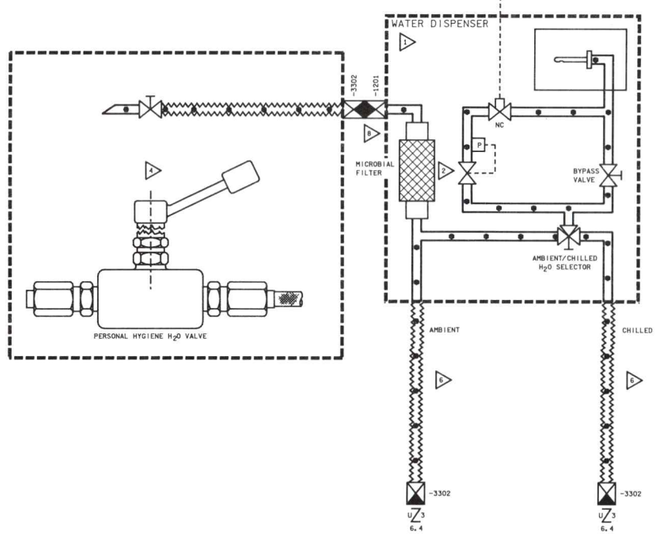
BASIC REV E

DATE: 6/26/87	NAME: TMW	VERSION: BPT$_5$
DATE: 8/6/87	NAME: BJT	VERSION: INK$_2$
DATE: 08/17/90	NAME: MAG	VERSION: INK$_3$





WATER DISPENSER DETAIL



9. REFER TO TABLE 6.1 FOR DRAWING REFERENCES

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

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

▷ 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

▷ 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.

▷ 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 W7-W8 POUCH.

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

▷ MICROBIAL FILTER: RESIN IMPREGNATED WITH TRIIODIDE (I$_3$) FOR CONTACT BACTERIA KILL. NOT CHANGED OUT IN FLIGHT. DESIGNED TO TREAT MINIMUM OF 8640 LBS H_2O EQUIVALENT TO 30 DAY MISSION.

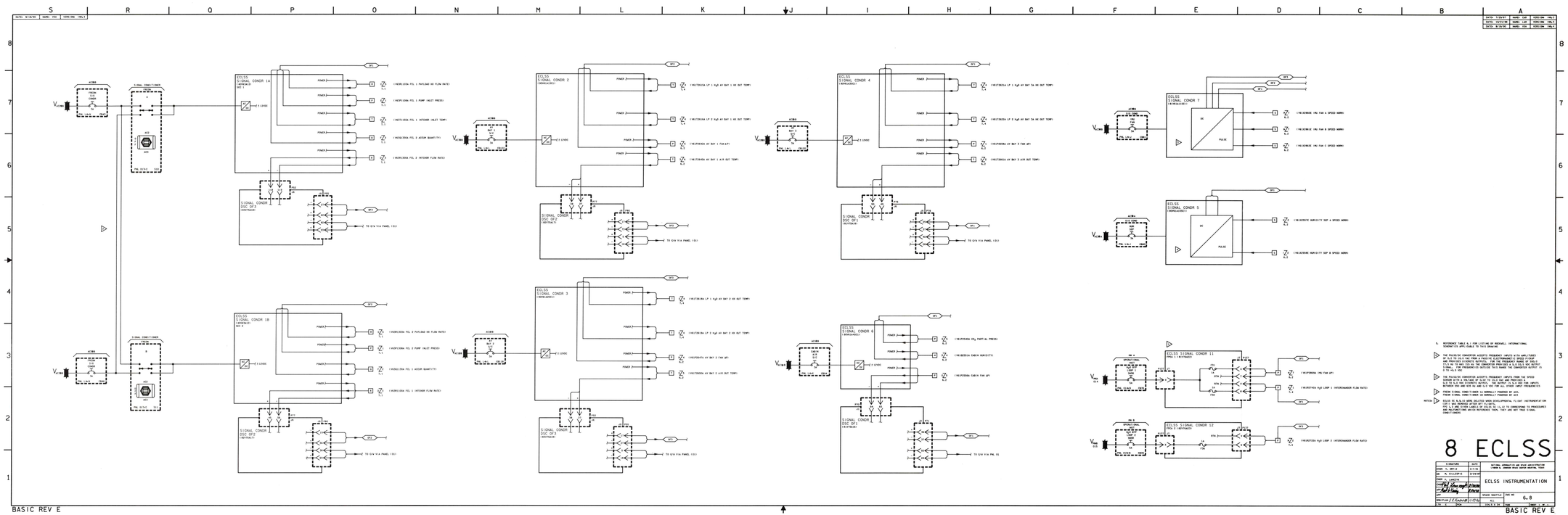
NOTES:
▷ WATER DISPENSER
FLOW RATE: 1.0 TO 1.5 LB/MIN
CURRENT USAGE: 0.5 AMP (MAX)
DISPENSES: 2, 3, 4, OR 8 OZ OF WATER
BYPASS FLOWRATE: 1.48 LB/MIN

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		
ENGR	C. YEE	8/17/90	WATER DISPENSER	
ENGR	Chris Yee	9/13/90		
APP	Mark J. Murphy	9/20/90		
APP			SPACE SHUTTLE	DWG NO 6.7
OMNIPLAN	S. K. Hildreth 11-27-90		ALL	
LTR E	PCN		44 X 34	PAGE SHEET 1 OF 1

BASIC REV E

BASIC REV E



NOTES:

1. REFERENCE TABLE 6.1 FOR LISTING OF MODUNITS, INTERNATIONAL SUBUNITS APPLICABLE TO THIS DRAWING.
2. THE PULSE CONVERTER ACCEPTS FREQUENCY INPUTS WITH AMPLITUDES OF 0.75 TO 15.0 VOLTS AND PROVIDES A FREQUENCY SPEED OF 0 TO 5.0 VOLTS. THE OUTPUT IS A 0 TO 5.0 VOLT PULSE WITH A DUTY CYCLE OF 50 TO 60% AND THE CONVERTER PROVIDES A 5.0 VOLT DC OUTPUT WHEN THE FREQUENCY OUTSIDE THIS RANGE. THE CONVERTER OUTPUT IS 0 TO 10.0 VDC.
3. THE PULSE CONVERTER ACCEPTS FREQUENCY INPUTS FROM THE SPEED SENSOR WITH A VOLTAGE OF 0.50 TO 15.0 VDC AND PROVIDES A 0.75 TO 5.0 VDC FREQUENCY OUTPUT. THE OUTPUT IS A 50% DUTY CYCLE PULSE WITH A DUTY CYCLE OF 50 TO 60% AND THE CONVERTER OUTPUT IS 0 TO 10.0 VDC.
4. FROM SIGNAL CONDITIONER IS NORMALLY POWERED BY ACCS. FROM SIGNAL CONDITIONER IS NORMALLY POWERED BY ACCS.
5. ECLSS SC 6.5.10 WERE DELETED WHEN DEVELOPMENTAL FLIGHT INSTRUMENTATION (DFI) WAS REMOVED AFTER OFT FLIGHT.
6. ECLSS SC 6.5.11 AND 6.5.12 WERE ADDED TO CORRESPOND TO PROCEDURES AND INSTRUMENTS WITH REFERENCE TAPE. THESE ARE NOT PART OF SIGNAL CONDITIONERS.

8 ECLSS

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEXAS	
NAME	5-1-86		
DR. A. SILVERSTEIN	2-24-87	ECLSS INSTRUMENTATION	
CHIEF, ECLSS SYSTEMS DIVISION			
	2/24/87		
	2/24/87		
	2/24/87	SPACE SHUTTLE	DWG NO 6.8
		ALT	
		2/24/87	SHEET 8 OF 10

BASIC REV E

BASIC REV E

18. SCU WATER (COOLING IN, COOLING OUT, FEEDWATER) LINES MAX OPERATING PRESSURE 40 PSIA, PROOF 60 PSIA, BURST 80 PSIA

17. SCU O_2 LINE MAX OPERATING PRESSURE 1050 PSIA, PROOF 1575 PSIA, BURST 2100 PSIA

16. WATER FROM LCVG/PUMP FLOWS THROUGH TEMPERATURE CONTROL VALVE BACK TO LCVG, COMPLETELY BYPASSING SUBLIMATOR/ORBITER HEAT EXCHANGER

15. WHEN SCU IS DISCONNECTED, WATER FROM LCVG/PUMP FLOWS THROUGH BYPASS VALVE TO THE SUBLIMATOR. WHEN SCU IS CONNECTED, BYPASS VALVE IS CLOSED. THEREFORE, WATER FLOWS OUT OF DCM CONNECTOR THROUGH SCU TO ORBITER HEAT EXCHANGER. WATER FLOWS BACK INTO DCM THROUGH SCU TO THE SUBLIMATOR. IN EITHER CASE, AFTER PASSING THROUGH SUBLIMATOR, WATER FLOWS THROUGH TEMPERATURE CONTROL VALVE AND IS FINALLY CIRCULATED THROUGH LCVG

14. TEST PORT F BTA ORIFICE CAP IS REMOVED FOR BTA OPERATIONS. FLOW THROUGH TEST PORT F TRIGGERS OPENING OF LOW MODE RELIEF VALVE (120)

13. BTA IS INSTALLED ON POSITIVE PRESSURE RELIEF VALVE (PPRV) TO ALLOW SPACE SUIT ASSEMBLY TO BE PRESSURIZED UP TO 8.45 PSID FOR BENDS TREATMENT. POPPET KEEPER SCREW IS INSTALLED ON PPRV TO OVERRIDE THE RELIEF VALVE BEFORE BTA IS INSTALLED. POPPET KEEPER SCREW IS STOWED ON BTA HOUSING

12. SOP INTERSTAGE GAGE IS USED TO VERIFY NOMINAL PERFORMANCE OF FIRST STAGE REGULATOR

11. SCOF PRESSURE RELIEF VALVE FUNCTIONALLY REPLACES SOP CHECKOUT PACKAGE RELIEF VALVE (145). 145 IS CURRENTLY UNRELIABLE DUE TO CORROSION PROBLEMS

10. SOP CHECKOUT FIXTURE (SCOF) IS INSTALLED ON HELMET ATTACHING RING (VENT DUCT) TO SEAL OFF VENTILATION CIRCUIT FOR SOP CHECKOUT

9. REFER TO TABLE 6.1 FOR DRAWING TRACEABILITY

8. NOMINAL FILL TIME FOR PRIMARY O2 TANKS IS 15 MINUTES

7. NOMINAL FILL AND DRAIN TIMES FOR FEEDWATER TANKS (PRIMARY 1 & 2 AND RESERVE) ARE 15 MINUTES

6. 12 PSID, NOMINAL

5. PUMP PRIMING VALVE OPENS WHEN H2O SEPARATOR DEVELOPS 2-5 PSI HEAD OR WHEN MANUAL OVERRIDE ON BACK OF PLSS IS PRESSED

4. SOP PRESSURE REGULATED TO:
3.40-3.90 PSID AT 0.06-1.00 LB/HR
3.33-3.90 PSID AT 1.01-4.50 LB/HR
3.33-3.55 PSID AT 4.51-5.26 LB/HR
OVER AMBIENT

3. WATER PRESSURE REGULATED TO:
14.9 ± 0.3 PSID OVER AMBIENT

2. SUIT PRESSURE REGULATED TO:
4.3 ± 0.1 PSID (EVA & PRESS)
0.9 ± 0.5 PSID (IV) OVER AMBIENT

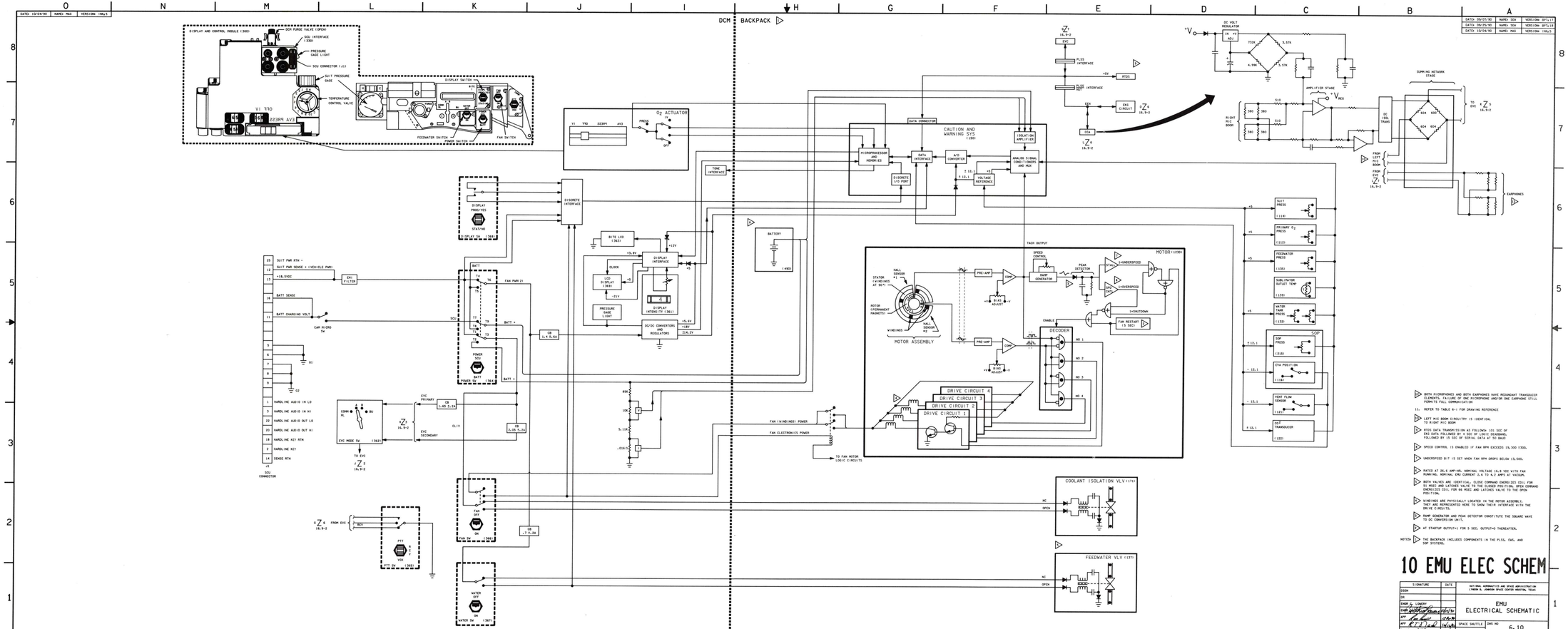
NOTES: 1. COOLANT ISOLATION VALVE OPEN WITH FAN SWITCH

*9 EMU INTRG SYS SCH

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN N. SABBAN	2-6-80	
DR JOAN F. KRANZ	8/4/83	EMU INTEGRATED SYSTEM SCHEMATIC
ENGR S. BLEISATH		
ENGR Scott A. Bleisath	10/9/90	
APP [signature]	9 Oct 90	
APP R T Deal	10/12/90	SPACE SHUTTLE / DWG NO 6.9
OMNIPLAN S. K. Kimbrell	11-27-90	ALL
LTR E / PCN		121 X 34 / PAGE / SHEET 1 OF 1

BASIC REV E

BASIC REV E



BASIC REV E

BASIC REV E

DATE	NAME	VERSION
DATE: 10/04/90	NAME: MAS	VERSION: 1WA.5
DATE: 09/07/90	NAME: SEW	VERSION: 3BTA.12
DATE: 09/25/90	NAME: SEW	VERSION: 3BTA.13
DATE: 10/04/90	NAME: MAS	VERSION: 1WA.5

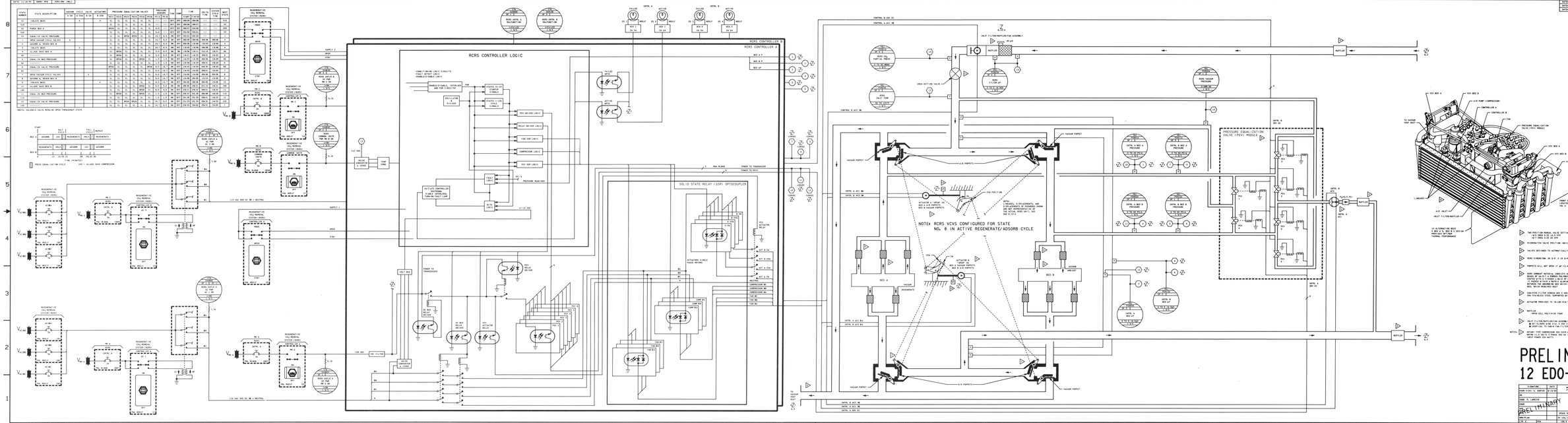
- BOTH MICROPHONES AND BOTH EARPHONES HAVE REDUNDANT TRANSDUCER ELEMENTS. FAILURE OF ONE MICROPHONE AND/OR ONE EARPHONE STILL PERMITS FULL COMMUNICATION
- 1L- REFER TO TABLE 6-I FOR DRAWING REFERENCE
- LEFT MIC BOOM CIRCUITRY IS IDENTICAL TO RIGHT MIC BOOM
- RS232 DATA TRANSMISSION AT 9.6 FOLLOWS: 232 SEC OF EXO DATA FOLLOWED BY 4 SEC OF LOGIC DEASSERT, FOLLOWED BY 15 SEC OF SERIAL DATA AT 50 BAUD
- SPEED CONTROL IS ENABLED IF FAN RPM EXCEEDS 15,300.
- UNDERSPEED BIT IS SET WHEN FAN RPM DROPS BELOW 15,500.
- RATED AT 26.6 AMP-HR, NOMINAL VOLTAGE 16.8 VDC WITH FAN RUNNING. NORMAL ENC CURRENT 3.4 TO 4.2 AMPS AT 14.5VDC.
- BOTH VALVES ARE IDENTICAL. CLOSE COMMAND ENERGIZES COIL FOR LATCHING AND LATCHES VALVE TO THE CLOSED POSITION. OPEN COMMAND ENERGIZES COIL FOR 66 MSEC AND LATCHES VALVE TO THE OPEN POSITION.
- WINDINGS ARE PHYSICALLY LOCATED IN THE MOTOR ASSEMBLY, BUT ARE REPRESENTED HERE TO SHOW THEIR INTERFACE WITH THE DRIVE CIRCUITS.
- RAMP GENERATOR AND PEAK DETECTOR CONSTITUTE THE SQUARE WAVE TO DC CONVERSION UNIT.
- AT STARTUP OUTPUT=1 FOR 5 SEC. OUTPUT=0 THEREAFTER.

NOTES: ▷ THE BACKPACK INCLUDES COMPONENTS IN THE PLSS, CWS, AND SOP SYSTEMS.

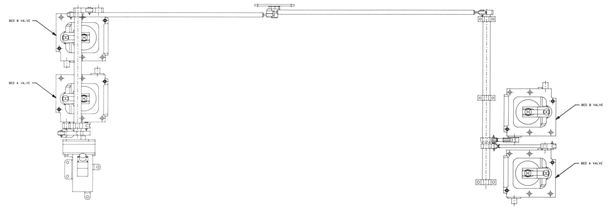
10 EMU ELEC SCHEM

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DSGN		LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
ENGR D. LINDSEY		EMU
CHK [signature]	10/4/90	ELECTRICAL SCHEMATIC
APP [signature]	10/4/90	
APP [signature]	10/4/90	SPACE SHUTTLE DWG NO 6.10
DRAFTSMAN [signature]	10/4/90	
LTR 1 DCN		SIZE D SCALE 3/4 PAGE SHEET 1 OF 1

ORBITER / FSS
FSS / MMU
SYS 1
SYS 2
N2 TANK 1
N2 TANK 2
MANUAL BARREL NUTS
VENT TOGGLE VALVE
GN2 SUPPLY GAUGE
SUPPLY TOGGLE VALVE
COVER PLATE
MMU/FSS ELECTRICAL INTERFACE PNL (-Port)
TO GN2 REGULATION
TO GN2 COMPUTER
TO GN2 PRESS
TO GN2 TEMP
TO GN2 QUANTITY
TO GN2 HEATER
TO GN2 VENT
TO GN2 SUPPLY
TO GN2 PURGE
TO GN2 RELIEF
TO GN2 FILL
TO GN2 DRAIN
TO GN2 SAMPLE
TO GN2 VACUUM
TO GN2 PRESSURIZATION
TO GN2 PRESS TRANSDUCER
TO GN2 TEMP TRANSDUCER
TO GN2 QUANTITY TRANSDUCER
TO GN2 HEATER
TO GN2 COMPUTER
TO GN2 CABIN REGULATION
TO GN2 SAMPLE
TO GN2 VACUUM
TO GN2 PURGE
TO GN2 RELIEF
TO GN2 FILL
TO GN2 DRAIN
TO GN2 PRESSURIZATION
TO GN2 PRESS TRANSDUCER
TO GN2 TEMP TRANSDUCER
TO GN2 QUANTITY TRANSDUCER
TO GN2 HEATER
TO GN2 COMPUTER
LO PURGE
SUPPLY VALVE
VENT VALVE
HEAT VALVE
GN2 SUPPLY GAUGE
PRESSURE REGULATOR
RELIEF VALVE
FILTER
PRESSURE TRANSDUCER
TEMPERATURE TRANSDUCER
QUANTITY TRANSDUCER
HEATER
CHECK VALVE
QUICK DISCONNECT
MANIFOLD
TANK
GAUGE
VENT
PURGE
SAMPLE
VACUUM
FILL
DRAIN
PRESSURIZATION
RECHARGE STATION 1
RECHARGE STATION 2
FORWARD INSTALLATION
AFT INSTALLATION
PORT INSTALLATION
ISOLATION VALVE
REGULATOR/RELIEF VALVE
GROUND TEST VALVE
PRESSURE SENSOR
PROPULSION TANK
TRANSDUCER TRI-MD ASSY
FILTERED, 1 MD MICRONN
TARGET PER VDT 11.7.1.B
MMU/FSS ELECTRICAL INTERFACE PNL (-Port)
MMU PROPULSION SYSTEM
FSS PROPULSION SYSTEM
11 MMU & FSS PROP
MMU & FSS PROPULSION SCHEMATIC
BASIC REV E

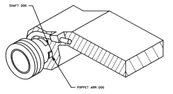

RCRS CONTROLLER LOGIC
RCRS CONTROLLER A
RCRS CONTROLLER B
SOLID STATE RELAY (SSR)- OPTOCOUPLER
NOTE: RCRS VCVS CONFIGURED FOR STATE NO. 8 IN ACTIVE REGENERATE/ADSORB CYCLE
PRELIMINARY
12 EDO-RCRS 1
EDO - RCRS
SPACE SHUTTLE
6.12

BASIC REV E

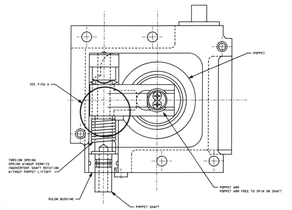


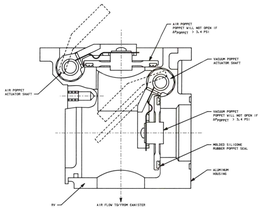
TOP VIEW
ACTUATOR DRIVEN
BED B VACUUM POPPETS
BED A AIR POPPETS

TOP VIEW
ACTUATOR DRIVEN
BED A VACUUM POPPETS
BED B AIR POPPETS

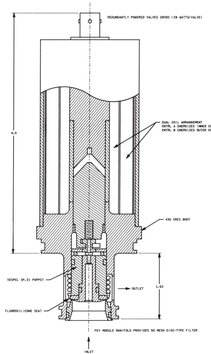


VIEW A

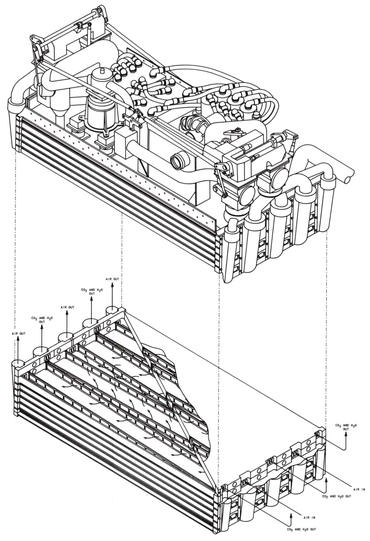


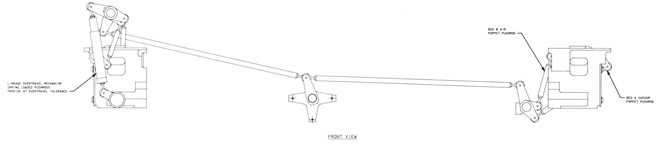


VACUUM CYCLE VALVE (VCV)

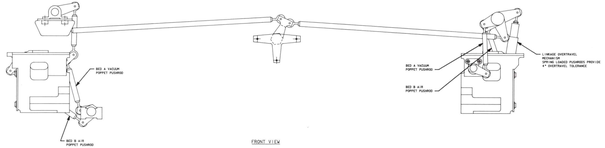


PRESSURE EQUALIZATION VALVE (PEV)





FRONT VIEW



FRONT VIEW

MECHANICAL LINKAGE

PRELIMINARY

*12 RCRS MECH 2

ENGINEER		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DESIGN ALL SYSTEMS JR.		10/26/92	LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEXAS
CHK	S.G.ELSAM-WYATT	10/26/92	
CHAR. RESP.	LANCETA		
CHAR			RCRS MECHANICAL
APPROVAL			
		SPACE SHUTTLE	DWG NO. 6.12
DRAFTING		REV	
TITLE	DATE	SCALE 1/8	SHEET 1 OF 1

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
6.1 (SHEETS 1 & 2)	PRESSURE CONTROL SYSTEM 1, 2	R. I.	VS70-960099	60BA	E	9/19/87	ARPCS - OXYGEN SUPPLY AND CABIN PRESSURE CONTROL
		R. I.	VS70-960099	60BB	E	9/19/87	ARPCS - NITROGEN SUPPLY
		R. I.	VS70-960099	60BC	E	9/19/87	ARPCS - OXYGEN PARTIAL PRESSURE CONTROL
		R. I.	V270-960099	60BE	E	9/19/87	ARPCS - OXYGEN SYSTEM INSTRUMENTATION
		R. I.	VS70-960099	B0BF	E	9/19/87	ARPCS - NITROGEN SYSTEM 1, 2, INSTR
		R. I.	VS70-960099	60BG	E	9/19/87	ARPCS - CABIN PRESSURE CONTROL INSTR
		R. I.	VS70-960099	60BH	E	9/19/87	MMU - FSS PORT
		R. I.	VS70-960099	60BJ	E	9/19/87	MMU - FSS STARBOARD
		R. I.	VS70-960099	60DA	E	9/19/87	AECS - AIRLOCK ENVIRONMENTAL CONTROL
		R. I.	VS70-960099	60DB	E	9/19/87	AECS - AIRLOCK ENVIRONMENTAL CONTROL 1
		R. I.	VS70-960099	60DC	E	9/19/87	AECS - AIRLOCK ENVIRONMENTAL CONTROL 2
		R. I.	VS70-960099	60DE	E	9/19/87	AECS - 0_2 EMERGENCY BREATHING
		R. I.	VS70-960102	60BA	E	3/8/85	ARPCS - OXYGEN SUPPLY & CABIN PRESSURE CONTROL
		R. I.	VS70-960102	60BB	E	3/8/85	ARPCS - NITROGEN SUPPLY
		R. I.	VS70-960102	60BC	E	3/8/85	ARPCS - OXYGEN PARTIAL PRESSURE CONTROL
		R. I.	VS70-960102	60BE	E	3/8/85	ARPCS - OXYGEN SYSTEM INSTRUMENTATION
		R. I.	VS70-960102	60BF	E	3/8/85	ARPCS - NITROGEN SYSTEM 1 & 2 INSTRUMENTATION
		R. I.	VS70-960102	60BG	E	3/8/85	ARPCS - CABIN PRESSURE CONTROL INSTRUMENTATION
		R. I.	VS70-960102	60DA	E	3/8/85	AECS - AIRLOCK ENVIRONMENTAL CONTROL SUBSYSTEM
		R. I.	VS70-960102	60DB	E	3/8/85	AECS - AIRLOCK ENVIRONMENTAL CONTROL SUBSYSTEM, PART 1
		R. I.	VS70-960102	60DC	E	3/8/85	AECS - AIRLOCK ENVIRONMENTAL CONTROL SUBSYSTEM, PART 2
		R. I.	VS70-960102	60DE	E	3/8/85	AECS - 02 EMERGENCY BREATHING
		R. I.	V070-613602		-	10/18/83	COVER - SENSOR, PP02, ASSY OF
		R. I.	V070-613130		G	4/18/82	ATMOSPHERIC REVITALIZATION PRESSURE CONTROL SYSTEM, CREW MODULE, INSTALLATION
		R. I.	V070-613156		D	5/6/83	PANEL ASSEMBLY - EMER BREATHING SYSTEM, MIDDECK
		R. I.	ME273-0126		F	6/20/85	UNION, FEMALE TO BRAZE/WELD, 17-4PH
		R. I.	V070-613103		A	9/22/77	PANEL - 02 TEST PORT
		R. I.	V594-613101		A	2/9/83	RESTRICTOR ASSY - EMERGENCY OXYGEN FLOW, CREW
		R. I.	ME251-0011		B	1/30/84	RESTRICTOR, OXYGEN, FLOW
		R. I.	V594-613102		A	2/10/83	TUBE ASSY. - RESTRICTOR, OXYGEN FLOW
		R. I.	V594-613103		A	2/10/83	TUBE - RESTRICTOR, OXYGEN FLOW
		R. I.	MD273-0025		B	3/15/84	UNION, BRAZED, CRES TUBE
		R. I.	MD273-0026		C	10/3/83	PREFORM, BRAZING ALLOY GOLD BASE
		R. I.	VS70-610106		-	3/28/88	SCHEMATIC DIAGRAM - ATMOSPHERIC REVITALIZATION SUBSYSTEM (OV-105 ONLY)
		R. I.	M072-643300		C	9/23/86	AIRLOCK IN ECLSS PROVISIONS TECH ORDER INSTL
		R. I.	VS70-613205			2/25/85	ATMOSPHERIC REVITALIZATION PRESSURE CONTROL SUBSYSTEM
		R. I.	VS70-613203		A	12/7/82	ATMOSPHERIC REVITALIZATION PRESSURE CONTROL SUBSYSTEM
		R. I.	V070-634465		G	2/5/87	MID-FUS SUBSYSTEM, ECLSS INSTL - FRAME X_a693 THRU X_a807
		R. I.	VS70-610209		E	5/2/84	SCHEMATIC DIAGRAM - ATMOSPHERE REVITALIZATION & PRESSURE CONTROL SYSTEM
		R. I.	V070-614100		B	6/26/84	OXYGEN RESTRICTOR, MID FUSELAGE, ASSEMBLY OF
6.2	ARS AIR	R. I.	VS70610109	ALL	E	3/23/88	SCHEMATIC DIAGRAM - ATMOSPHERE REVITALIZATION SUBSYSTEM
		R.I.	VS70-610102	ALL	J	3/8/88	SCHEMATIC DIAGRAM- ATMOSPHERE REVITALIZATION SUBSYSTEM
		R.I.	V070-613525	ALL	NONE	07/16/82	MUFFLER - SOUND ATTENUATION.
		R.I.	V070-613552	ALL	B	4/7/88	INERTIAL MEASUREMENT UNIT INSTALLATION. ECLSS FAM, MT EXCHR AND DUCTING INSTALLATION - IMU COOLING, ECLSS
		R.I.	V070-613400	ALL	D	5/18/88	DUCTING INSTALLATION - AVIONICS BAY'S I, II, & III, ECLSS
		R.I.	V070-613780	ALL	D	7/21/88	DUCTING INSTALLATION - AIR RETURN, FLIGHT DECK, ECLSS
		R.I.	V070-613760	ALL	D	5/24/85	DUCTING INSTALLATION AIR SUPPLY, FLIGHT DECK, ECLSS
		R.I.	V070-613650	ALL	B	07/31/85	DUCTING INSTALLATION - RETURN AIR, ECLSS BAY & MIDDECK
		R.I.	V070-613724	ALL	E	05/23/80	DUCTING INSTALLATION - SUPPLY AIR, ECLSS BAY & MIDDECK
		R.I.	V070-613170	ALL	A	10/29/84	DUCTING INSTALLATION - SLEEP STATION, ECLSS, AIR COOL ING DUCT AND DIFFUSER, MIDDECK

DWG	SIGNATURE		DATE
6.1	ENGR M. FITZPATRICK		
	ENGR		10/1/90
6.2	ENGR N. PAPALA		
	ENGR		10/1/90
	APP		10/2/90
	APP		
	OMNIPLAN		
	LTR E	PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE: ALL

TBL NO 6-I

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
6.3	AIRLOCK/ECLSS INTERFACES	R.I.	V075-64300				ECLSS A/L PANEL
		R.I.	V075-643021				PANEL-CLOSEOUT, A/L, ECLSS
		R.I.	V075-643022				PANEL-02 AND LCG, A/L, ECLSS, ASSY OF
		R.I.	V075-643024				PANEL ASSY-02 AND LCG, A/L, ECLSS
		R.I.	V075-643025				PANEL ASSY-H20, A/L, ECLSS
		R.I.	V075-730010				PANEL INSTALLATION-A/L, DISPLAYS AND CONTROLS
		R.I.	V075-730150				PANEL ASSY-AW18D, A/L, DISPLAYS AND CONTROLS
		R.I.	V075-730151				PANEL ASSY-AW18H, A/L, DISPLAYS AND CONTROLS
		R.I.	V075-730152				PANEL ASSY-AW18A, A/L, DISPLAYS AND CONTROLS
		R.I.	V075-730153				PANEL ASSY-AW82D, A/L, DISPLAYS AND CONTROLS
		R.I.	V075-740002				CABLE INSTL-COAX, ANTENNA UHF, EVA A/L
		R.I.	V075-750001				INSTR INSTL-DFI, A/L

DWG	SIGNATURE		DATE
6.3	ENGR	J. DUTTON	
	ENGR	Jeff Dutton	
	ENGR		
	ENGR		
	APP		15 Nov 90
	APP		11/16/90
	OMNIPLAN		
	LTR E	PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE ALL

TBL NO 6-I

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
6.4	SUPPLY WATER STORAGE	R. I.	VS70-623103	ALL	B	8/6/79	SCHEMATIC - ECLSS WATER MANAGEMENT SYSTEM
		R .I.	VS70-620309	ALL	E	3/7/89	SCHEMATIC DIAGRAM-WATER MANAGEMENT SUBSYSTEM
		R. I.	VS70-620302	ALL	J	12/6/83	SCHEMATIC DIAGRAM-WATER MANAGEMENT SUBSYSTEM
		R. I.	VS70-640109	ALL	B	6/2/83	SCHEMATIC DIAGRAM-AIRLOCK ENVIRONMENT CONT SUBSYSTEM
		R. I.	VS70-640102	ALL	E	8/16/80	SCHEMATIC-ACTIVE THERMAL CONTROL SUBSYSTEM
		R. I.	VO70 454936	ALL	F	11/2/87	FUEL CELL WATER RELIEF ALTERNATE PATH
		R. I.	VO70623300	ALL	C	8/4/87	INSTALLATION-ON2 PRESSURE/VENT PANEL, MIDDECK WATER MANAGEMENT SYSTEM
		R. I.	VS70-623201	ALL	C	8/8/79	HYDROGEN SEPARATOR AND TANK INSTL-POTABLE WATER, EXLSS EQUIP BAY
		R. I.	VO70-634460	ALL	H	6/15/88	MID-FUS SYBSYSTEM ECLSS INSTL-FRAME $X_0$582 THRU $X_0$693
6.5	WMS	R. I.	VS70-620202	ALL	L	11/20/89	SCHEMATIC DIAGRAM - WASTE MANAGEMENT SUBSYSTEM
		R. I.	VS70-620209	ALL	G	11/21/89	SCHEMATIC DIAGRAM - WASTE MANAGEMENT SUBSYSTEM
		R. I.	VO70-623200	ALL	J	3/10/88	SYSTEM INSTALLATION - WATER MANAGEMENT, ECLSS EQUIPMENT BAY
		R. I.	VO70-623300	ALL	C	3/4/87	INSTALLATION - GN2 PRESSURE/VENT PANEL, MIDDECK WATER MANAGEMENT SUSTEM
		R. I.	VS70-634460	ALL	H	6/15/88	MID-FUS SUBSYSTEM ECLSS INSTL-FRAME X_0 582 THRU X_0 693
		R. I.	VO70-623201	ALL	A	5/27/88	HYDROGEN SEPARATOR AND TANK INSTL-POTABLE WATER, ECLSS EQUIP BAY
		GE	630717539	ALL	A	06/21/85	WASTE COLLECTOR SUBSYSTEM SCHEMATIC

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
6.4	ENGR J. SOLOMON			ENGR	
	ENGR	10/23/90		ENGR	
6.5	ENGR C. YEE			ENGR	
	ENGR Chris J. Yee	10-23-90		ENGR	
	ENGR			APP Mark A. Fleming	10/26/90
	ENGR			APP	
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 6-I
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BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
6.6	GALLEY	NASA	SED39115588	1 OF 1	DCN 71035	12/03/83	ORBITER GALLEY INTERCONNECTION DIAGRAM PLUMBING ALTERED ITEM DRAWING
		NASA	S1D11100249	1 OF 1	-	04/04/83	ALTERED ITEM DRAWING SCHEMATIC DIAGRAM. ELECTRICAL GALLEY
		GENERAL ELECTRIC	47D253031	1 OF 1	A	03/10/81	HOSE ASSEMBLY
		GENERAL ELECTRIC	47E263079	1 OF 1	H	10/01/80	HOT WATER TANK AND COIL ASSEMBLY ORBITER GALLEY
		NASA	SED39115584	2 OF 3	C	12/11/84	ORBITER GALLEY ASSEMBLY ALTERED ITEM
6.7	WATER DISPENSER	NASA/ TECHNOLOGY INCORPORATED	SID40101997	1 OF 1	DCN 70794	06/03/83	SCHEMATIC OPERATIONAL WATER DISPENSER
		NASA/ TECHNOLOGY INCORPORATED	SID46101803	1 OF 1	-	08/24/82	WIRING DIAGRAM OPERATIONAL WATER SIDPENSER
		TECHNOLOGY INCORPORATED	TM821-44-1-F	1 OF 1	-	04/21/82	ORBITER WATER DISPENSER ASSY.
		NASA	SJD32100983	1 - 6	-	08/16/82	OPERATIONAL WATER DISPENSER KIT
		NASA/ TECHNOLOGY INCORPORATED	SED48101600	1 - 3	-	06/04/82	OPERATIONAL WATER DISPENSER ASSY.
		NASA/	SJD48101621	1 OF 1	-	04/26/83	INSTALLATION DRAWING OWDA

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
6.6	ENGR C. YEE			ENGR	
	ENGR Chris L. Yee	10/1/90		ENGR	
6.7	ENGR C. YEE			ENGR	
	ENGR Chris L. Yee	10/1/90		ENGR	
	ENGR			APP Mark J. Fleming	10/26/90
	ENGR			APP	
	ENGR			OMNIPLAN	
	ENGR			LTR E	PCN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 6-I
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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
6.8	ECLSS INSTRUMENTATION	R. I.	VS70-630109		H01	7/15/88	SCHEMATIC DIAGRAM- ACTIVE THERMAL CONTROL SUBSYSTEM
		R. I.	VS70-630102		V01	7/21/87	SCHEMATIC DIAGRAM- ACTIVE THERMAL CONTROL SUBSYSTEM
		R. I.	VS70-610109		E01	4/23/88	SCHEMATIC DIAGRAM- ATMOSPHERIC REVITALIZATION SUBSYSTEM
		R. I.	VS70-610102		J01	4/15/88	SCHEMATIC DIAGRAM- ATMOSPHERIC REVITALIZATION SUBSYSTEM
		R. I.	VS70-750209		H01	3/11/88	SCHEMATIC DIAGRAM- OI POWER AND CONTROL
		R. I.	VS70-750202		K01	3/10/88	SCHEMATIC DIAGRAM- OI POWER AND CONTROL
		R. I.	VS70-960099	60FY	A12	12/28/88	ATC FREON COOLANT LOOP 1 INSTRUMENTATION PART 1
		R. I.	VS70-960099	60FX	A12	12/28/88	ATC FREON COOLANT LOOP 2 INSTRUMENTATION PART 1
		R. I.	VS70-960099	60CJ	A12	12/28/88	ARS AVIONICS BAY 1 FAN CONTROL AND INSTRUMENTATION
		R. I.	VS70-960099	60CK	A12	12/28/88	ARS AVIONICS BAY 2 FAN CONTROL AND INSTRUMENTATION
		R. I.	VS70-960099	60CL	A12	12/28/88	ARS AVIONICS BAY 3 FAN CONTROL AND INSTRUMENTATION
		R. I.	VS70-960099	60CS	F03	9/19/87	ARS WATER COOLANT LOOP 1 INSTRUMENTATION PART II
		R. I.	VS70-960099	60CT	F03	9/19/87	ARS WATER COOLANT LOOP 2 INSTRUMENTATION PART II
		R. I.	VS70-960099	60CC	F03	9/19/87	ARS HUMIDITY CONDENSATE WATER SEPARATOR
		R. I.	VS70-960099	60CM	F03	9/19/87	ARS CABIN AIR CIRCULATION INSTRUMENTATION
		R. I.	VS70-960099	60CH	F03	9/19/87	ARS IMU COOLING
		R. I.	VS70-960102	60FV	F03	10/18/85	ATC FREON COOLANT LOOP 1 INSTRUMENTATION PART 1
		R. I.	VS70-960102	60FX	F03	10/18/85	ATC FREON COOLANT LOOP 2 INSTRUMENTATION PART 1
		R. I.	VS70-960102	60CJ	F04	8/31/89	ARS AVIONICS BAY 1 FAN CONTROL AND INSTRUMENTATION
		R. I.	VS70-960102	60CK	F04	9/8/89	ARS AVIONICS BAY 2 FAN CONTROL AND INSTRUMENTATION
		R. I.	VS70-960102	60CL	F04	9/12/89	ARS AVIONICS BAY 3 FAN CONTROL AND INSTRUMENTATION
		R. I.	VS70-960102	60CS	F03	10/18/85	ARS WATER COOLANT LOOP 1 INSTRUMENTATION PART II
		R. I.	VS70-960102	60CT	F03	10/18/85	ARS WATER COOLANT LOOP 2 INSTRUMENTATION PART II
		R. I.	VS70-960102	60CC	F03	10/18/85	ARS HUMIDITY CONDENSATE WATER SEPARATOR
		R. I.	VS70-960102	60CM	F04	9/14/89	ARS CABIN AIR CIRCULATION INSTRUMENTATION
		R. I.	VS70-960102	60CH	F03	10/18/85	ARS IMU COOLING

DWG	SIGNATURE		DATE
6.8	ENGR P. LAMCZYK		
	ENGR Philip C. Lamczyk		10/1/90
	ENGR		
	ENGR		
	APP Mark D. Fleming		10/26/90
	APP		
	OMNIPLAN		
	LTR E	PCN	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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VENDOR DRAWING REFERENCES

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
6.9, 6.10	EMU INTEGRATED SYSTEM SCHEMATIC, EMU ELECTRICAL SCHEMATIC	HS	SV789200		A	10/27/88	PRIMARY LIFE SUPPORT SUBSYSTEM
		BRUNSWICK/	SV778895/				PRIMARY OXYGEN BOTTLE
		ARDE	SV784099				
		CONRAC/ GULTON	SV778528				PRIMARY OXYGEN PRESSURE SENSOR
		CARELTON CONTROLS	SV778873				PRIMARY PRESSURE CONTROL MODULE CHECK VLV FLOW RESTRICTOR SHUTOFF VLV SUIT PRESSURE REGULATOR WATER TANK PRESSURE REGULATOR
		CONRAC/ GULTON	SV767788				SUIT PRESSURE SENSOR (psid)
		HS	SV778540				SHEAR PLATE ASSY
		MICROSWITCH	SV789111				EVA POSITION SWITCH
		HS	SV785844				DUAL MODE RELIEF VLV BLEED ORIFICE DUAL MODE RELIEF VLV FEEDWATER CHECK VLV
		HS	SV771836				FLOW RESTRICTOR UNIT
		SENSORMEDICS	SV767798				VENT FLOW SENSOR
		HS	SV787994				CARBON DIOXIDE SENSOR FAN/PUMP/WATER SEPARATOR ASSY FAN ROTARY WATER SEPARATOR WATER PUMP BRUSHLESS MOTOR
		HS/MAG TECH	SV785900				PITOT ACTUATED VLV
		HS	SV769480				CO2 TRANSDUCER FILTER AND ORIFICE
		HS	SV772158				CHECK VLV
		HS	SV784996				PUMP INLET FILTER
		HS	SV778543				CHECK VLV AND HOUSING
		HS	SV767699				PRIMARY WATER TANK #1
		HS	SV769592				FEEDWATER SUPPLY PRESSURE SENSOR OXYGEN SIDE WATER SIDE
		CONRAC/ GULTON	SV767793-5,-7				CONDENSATE WATER RELIEF VLV
		HS	SV769403				FEEDWATER RELIEF VLV
		HS	SV769404				FEEDWATER PRESSURE REGULATOR
		HS	SV792528				FEEDWATER SHUTOFF VLV
		ECKEL	SV767660-5,-4				FEEDWATER PRESSURE SENSOR
		CONRAC/ GULTON	SV767793-6,-8				SUBLIMATOR AND HARNESS
		HS	SV792500				TEMPERATURE SENSOR HARNESS
		RDF	SV792503				SUBLIMATOR
		HS	SV783850				GAS TRAP
		HS	SV784943				WATER RELIEF VLV
		HS	SV769405				WATER CHECK VLV
		HS	SV769406				RELIEF VLV AND ORIFICE
		HS	SV785860				POSITIVE PRESSURE RELIEF VLV
		AIR-LOCK	SV787036				NEGATIVE PRESSURE RELIEF VLV
		AIR-LOCK	SV785927				RESERVE WATER TANK
		HS	SV769592				CAUTION AND WARNING
		HS	SV785970				ELECTRICAL POWER HARNESS
		HS	SV789151				ELECTRICAL SIGNAL HARNESS
		HS	SV789152				CAUTION AND WARNING HARNESS
		HS	SV789153				FIBER OPTIC CONVERTER AND CONNECTOR
		HS	SV777266				REAL -TIME DATA SYSTEM HARNESS
		HS	SV789134				PLSS/SOP THERMAL COVER
		ILC	SV772168				PRIMARY WATER TANK #2
		HS	SV769592				MUFFLER
		HUGHES/ TRIETLER/HS	SV785890				COOLANT ISOLATION VLV ASSY
		HS	SV784998				WATER SHUTOFF VLV
		ECKEL	SV784982				COOLANT RELIEF VLV
		HS	SV784985				SIGNAL CONDITIONER (RTDS)
		HS	SV791230				COMMUNICATIONS CARRIER ASSY (CCA)
		ILC	0101-10001		N	11-21-85	HARD UPPER TORSO (HUT)
		ILC	0102-10002		BL	2-6-88	HARD TORSO SHELL
		ILC					EXTRA SMALL
		ILC	SV772325				SMALL
		ILC	SV772335				MEDIUM
		ILC	SV772345				LARGE
		ILC	SV772375				EXTRA LARGE
		ILC	SV772385				

DWG	SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
6.9	ENGR S. BLEISATH				
	ENGR Scott A. Bleisath		11-1-90	VENDOR DRAWING REFERENCES	
6.10	ENGR C. LOWERY				
	ENGR C. Lowery		11-2-90		
	APP		6 Nov 90		
	APP R T Neal		11/6/90	SPACE SHUTTLE	TBL NO 6-I
	OMNIPLAN			ALL	
	LTR E	PCN			PAGE 6.I-6 SHEET 6 OF 9

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
6.9, 6.10 (CONT'D)		ILC	0103-10003		AW	3-26-87	ARMS
		ILC	0103-84025				UPPER ARM ASSY
		ILC	0103-84026				LOWER ARM ASSY
		ILC	0104-10004		CE	10-19-87	LOWER TORSO ASSY
		ILC	0104-82347				WAIST RESTRAINT/BLADDER ASSY
		ILC	0104-84402				WAIST RESTRAINT/BLADDER ASSY
		ILC	0104-84811				WAIST RESTRAINT AND BLADDER
		ILC	0104-82692				WAIST TMG
		ILC	0104-84386				WAIST TMG
		ILC	0104-84905				WAIST TMG
		ILC	0104-84027				TROUSER
		ILC	0104-84028				BOOT ASSY
		ILC	0104-82664				BOOT SIZING INSERT
		ILC	9785, 9787 9789,9791				BODY SEAL CLOSURE
		ILC	9698,9699, 9714				WAIST BEARING
		ILC	0105-10005		T	10-19-87	HELMET
		ILC	0106-10006/ 1600		BJ K	12-8-87 10-19-87	GLOVES
		ILC	0107-10007		AU	2-19-85	LIQUID COOLING AND VENT GARMENT (LCVG)
		ILC	0107-81057				BOOT LEG VENT DUCT
		ILC	0107-84029				GARMENT ASSY
		ILC	0108-10008		W	09-24-86	EXTRAVEHICULAR VISOR ASSY
		ILC	0110-10010		AF	10-19-87	IN SUIT DRINK BAG
		HS	SV767710		E	10-4-88	SECONDARY OXYGEN PACK
		FANSTEEL	SV778880				SECONDARY OXYGEN BOTTLE
		CARELTON CONTROLS	SV778475				SOP PRESSURE CONTROL MODULE
		KULITE	SV773473				SOP PRESSURE TRANSDUCER
		HS	SV792294		A	10-4-88	DISPLAYS AND CONTROLS MODULE
		KRATOS	SV767706				SUIT PRESSURE GAUGE
		AIR-LOCK	SV787027				PURGE VLV
		HS	SV789693				TEMP CONTROL VLV
		AIR-LOCK	SV778872-10				COMMON MULTIPLE CONNECTOR
		HS	SV792294				ELECTRONIC ASSY
		LITTON	SV767784				VOLUME CONTROL
		LITTON	SV767785				DISPLAY INTENSITY CONTROL
		ARMTEC	SV767786				EVC MODE SELECTION SWITCH
		HEWLETT PACKARD	SV789695				BITE INDICATOR
		HS	SV792293				INTERNAL WIRING ASSY
		HS	SV774161				EXTERNAL WIRING ASSY
		HAYDON	SV778596				POWER MODE SELECTION SWITCH
		ARMTEC	SV767794				PUSH TO TALK SWITCH
		ARMTEC	SV771887-2				FAN SWITCH
		ARMTEC	SV767795-2				FEEDWATER VALVE SWITCH
		ARMTEC	SV767792				CAUTION AND WARNING SYSTEM SWITCH
		HEWLETT	SV791145				ALPHANUMERIC DISPLAY (LCD)
		HS	SV779301				OXYGEN, WATER MANIFOLD ASSY
		ILC	SV771987-11				DCM THERMAL COVER
		HS	SV767730			2-7-85	SERVICE AND COOLING UMBILICAL
		AIR-LOCK	SV778872-11				COMMON MULTIPLE CONNECTOR
		TITEFLEX	SV778865				O2 HIGH PRESSURE LINE
		TITEFLEX	SV771722				WATER LINE
		TITEFLEX					POTABLE WATER LINE
		TITEFLEX					COOLING WATER LINE
		TITEFLEX					COOLING WATER OUT-LINE
		IMPQUA	SV767709				BACTERIA FILTER
		HS	SV771717				CONDENSATE WATER REGULATOR
		HS	SV772190				WATER SUPPLY PRESSURE REGULATOR
		HS	SV778504				OXYGEN FILTER AND ORIFICE
		HS	SV784967				BACTERIA CARTRIDGE
		HS	SV784959				POTABLE WATER FILTER
		HS	SV771763				SCU ELECTRICAL HARNESS
		DEUTSCH	SV764255				VEHICLE ELECTRICAL CONNECTOR
		GLENAIR	SV787944				CONNECTOR BACKSHELL
		AIRCLOCK	SV785003				SCU ELECTRICAL CONNECTOR
		GFP	SV771749				SHEATH ASSY
		GFP	SV729617				SHEATH HOOK
		GFP	SV772134				TETHER SHACKLE
		HS	SV767690				EMU ELECTRICAL HARNESS (EEH)
		HS	SV767680				AIRLOCK ADAPTER
		HS	SV792600		J	11-30-87	CONTAMINANT CONTROL CARTRIDGE (CCC)

DWG	SIGNATURE		DATE
6.9	ENGR	S. BLEISATH	
	ENGR	Scott A Bleisath	11-1-90
6.10	ENGR	C. LOWERY	
	ENGR	C. Lowery	11-2-90
	APP		6 Nov 90
	APP	RT Neal	11/6/90
	OMNIPLAN		
	LTR E	PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 6-I
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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
6.9, 6.10 (CONC'D)		YARDNEY	SV767789 SVSK94600		F	10-21-86	BATTERY DCM: ELECTRICAL SCHEMATIC DRAWING (BLUE PRINT)
		HS	SV792740 SV792695 SV792696		G	8-31-88	BENDS TREATMENT ADAPTER PRESSURE GAUGE PRESSURE RELIEF VALVE
6.11	MMU/FSS PROPULSION	MARTIN MARIETTA (M.M.)	ML2050				THERMAL HEATER, TEMP SENSOR ASSY.
		M. M.	MP0030				LINE ASSEMBLY
		M. M.	MP0035				LINE ASSEMBLY
		M. M.	MP0080				RH GAGE LINE ASSEMBLY
		M. M.	MP0085				LH GAGE LINE ASSEMBLY
		M. M.	MP0130				RH FWD TRIAD LINE ASSEMBLY
		M. M.	MP0135				LH FWD TRIAD LINE ASSEMBLY
		M. M.	MP0140				RH AFT TRIAD LINE ASSEMBLY
		M. M.	MP0145				LH AFT TRIAD LINE ASSEMBLY
		M. M.	MP0160				RH TOGGLE/GAGE TO TANK LINE ASSEMBLY
		M. M.	MP0165				LH TOGGLE/GAGE TO TANK LINE ASSEMBLY
		M. M.	MP0445				QUICK DISCONNECT ASSEMBLY
		M. M.	MP0170				FILTER/VALE ASSEMBLY
		M. M.	MP0175				PRESSURE TRANSDUCER ASSY
		M. M.	MP0260				RH TANK TO ISO VALVE LINE ASSY
		M. M.	MP0265				LH TANK TO ISO VALVE LINE ASSY
		M. M.	MP0270				TANK OUTLET ADAPTER ASSY
		M. M.	MP0280				RH MANIFOLD ASSEMBLY
		M. M.	MP0285				LH MANIFOLD ASSEMBLY
		M. M.	MP0368				GAGE DETAILS
		M. M.	MP0443				BRACKET
		M. M.	MT0131				SUPPORT BRACKET DETAILS
		M. M.	MT0150				UPPER SUPPORT BRACKET ASSY
		M. M.	ME2000				PRESSURE GAGE ILLUMINATION ASSY
		M. M.	MP0000				PROPULSION INSTALLATION
		M. M.	FP0000				FSS PROPULSION INSTALLATION
		M. M.	PD4800209				QUICK DISCONNECT
		M. M.	FP0034				TUBE ASSEMBLY
		M. M.	FP0092				TUBE
		M. M.	FP0099				FILTER THERMO SPACER
		M. M.	FP0110				TUBE ASSEMBLY

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
6.9	ENGR S. BLEISATH			ENGR	
	ENGR Scott A Bleisath	11-8-90		ENGR	
6.10	ENGR C. LOWERY			ENGR	
	ENGR C Lowery			ENGR	
6.11	ENGR S. BLEISATH			APP	15 Nov 90
	ENGR Scott A Bleisath	11-8-90		APP R T Neal	15/16/90
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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

VENDOR DRAWING REFERENCES

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
6.12	RCRS	HS	-	-		3/15/19	HS CDR
		RI	VO70-730384			11/8/90	PANEL ASSEMBLY - M051F
		RI	VO70-733882			2/13/90	SCHEMATIC DIAGRAM D&C PANEL M051F
		RI	VS70-610302			2/3/90	SCHEMATIC DIAGRAM

DWG	SIGNATURE	DATE
6.12	ENGR P. LAMCZYK	
	ENGR Philip C. Lamczyk	10/26/90
	ENGR	
	ENGR	
	APP Mark J. Kirring	10 Oct 90
	APP	
	OMNIPLAN	
	LTR E	PCN

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

VENDOR DRAWING REFERENCES

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*U.S.GOVERNMENT PRINTING OFFICE:1990-561-057/20064

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DATE: 4/14/88	NAME: MAG	VERSION: INK, 4
DATE: 8/6/90	NAME: LAM	VERSION: INK, 5
DATE: 9/5/90	NAME: LAM	VERSION: INK, 6

16. REFER TO TABLE 7-I FOR DRAWING REFERENCES

15. HYD FLOW THRU HX DURING CIRC PUMP OPS WHEN HYD TEMP < 105° F. BYPASS HX AT 115° F. HYDRAULIC RESERVOIR PRESSURE IS 60-65 PSIA

14. RADIATORS ARE CONSTRUCTED OF ALUMINIUM (6061-T6) HONEYCOMB. THE SURFACE IS SILVER-TEFLON COATED

13. NOMINAL PRESS LOOP 1 - 105 ± 5 PSIA
LOOP 2 - 90 ± 5 PSIA
LOOP VOLUME FOR FCL 1 (2)
(W/RADIATORS, W/O ACCUM) = 5150 IN^3
ACCUM AT 100% = 1659 IN^3
ACCUM AT 0% = 0 IN^3
RADIATOR (4 PANELS & HOSES) = 1445 IN^3

12. FES PERFORMANCE

PRI A OR PRI B CONDITION	DESIGN BTU/HR	DEV TEST BTU/HR MAX CAPABILITY
BOTH EVAPS/BOTH LOOPS	131 K	148.0 K
LOOP 1	67.5 K	92.8 K
LOOP 2	67.5 K	127.0 K
TOPPING/BOTH LOOPS	30 K	39.0 K
LOOP 1	N/A	24.6 K
LOOP 2	N/A	37.6 K

CONTINGENCY - SEC CONTROLLER

CONDITION	DESIGN BTU/HR	DEV TEST BTU/HR MAX CAPABILITY
HI LOAD/BOTH LOOPS	67.5 K	113 K
TOPPING/BOTH LOOPS	67.5 K	76.8 K

11. ALL ATCS PLUMBING CONSTRUCTED OF STAINLESS STEEL (CRES 21-6-9) WITH .016 INCH WALLS. LINE INSULATED WITH .25 INCH TG15000 AND STAINLESS STEEL FOIL EXCEPT LINES IN AFT BAYS 4, 5, 6, AND FLEX HOSES. HEAT EXCHANGERS ARE CONSTRUCTED OF STAINLESS STEEL. COLD PLATES ARE CONSTRUCTED OF ALUMINIUM. FLEX HOSES ARE 0.75 INCH ID METAL BELLOWS

10. OSL OF CAL CURVE
V63R1100A (1300A) 578.9
V63R1103A (1303A) 159.5
V63R1105A (1305A) -4.5
V63Q1130A (1330A) -11.3
VALUES MAY DIFFER FROM VEHICLE TO VEHICLE

9. PUMP B COMMANDED ON WHEN BUS FAILURE OCCURS AFFECTING WORKING PUMP A (MN BUS VOLTAGE < 20 VOLTS) IN OPS 101 TO 106 ONLY

8. NH_3 GPC COMMAND SENT
- MM602 THRU 603
- MM304 @ 120K FEET & ANTENNA SELECTION FLAG
- OPS 0 & 9 TRANSITIONS WITH COMMAND PREVIOUSLY PRESENT

7.

LEG \ VLV POS	RAD FLOW PL 29K	RAD FLOW PL 21.5K	RAD FLOW ICH	RAD BYPASS PL 29K	RAD BYPASS PL 21.5K	RAD BYPASS ICH
PL	40%	22.4%	9.0%	40%	22%	8.9%
ICH	53%	69.5%	80.8%	53%	69%	81.3%

FLOW PROP VALVE SET AT 29K BTU OR 21.5K BTU PRELAUNCH. NOMINALLY IT IS SET IN 29K BTU POSITION (8 RAD PANEL). FPV IS A 2 POSITION SPOOL VLV

6. FCA CONTROLS TO 38 ± 2° F IN NORM, 57 ± 2° F IN HI

5. THE TURN ON SEQUENCE FOR THE FCA CONTAINS THE FOLLOWING STEPS:

T=0 A. BYPASS VALVE IS DRIVEN TO FULL BYPASS (OPEN POSITION) VIA A 5 SECOND OPEN COMMAND

FLOW CONTROL VALVE IS COMMANDED FOR 2304 PULSES ~ 82.6 SECONDS TO THE FULL HOT POSITION

T=90 SEC B. BYPASS VALVE RECEIVES A SECOND CLOSE COMMAND WHICH DRIVES IT TO THE RAD FLOW POSITION. FLOW CONTROL VALVE IS NOW CONTROLLING THE OUTLET TEMP

4. IF THE AMMONIA BOILER OUT TEMP DROPS BELOW 31.25° F, A 10 SECOND TIMER IS BEGUN. AT THE END OF 10 SECONDS EITHER THE TIMER WILL BE RESET OR SWITCHOVER FROM PRIMARY TO SECONDARY CONTROLLER WILL OCCUR DEPENDING ON THE FOLLOWING:

- IF THE TEMP REMAINS BELOW 31.25° F CONTINUOUSLY FOR 10 SEC, SWITCHOVER WILL OCCUR AND THE SECONDARY CONTROLLER AND VALVE WILL BE SELECTED WITH THE PRIMARY VALVE THEN GOING FULL OPEN
- IF DURING THE 10 SEC THE TEMP RISES ABOVE 31.75° F FOR AS LONG AS 10 MILLISECONDS, THE TIMER IS RESET AND OPERATION CONTINUES ON THE PRIMARY CONTROLLER AND VALVE
- IF DURING THE 10 SEC THE TEMP RISES ABOVE 31.25° F BUT NOT ABOVE 31.75° F, THEN EITHER RESET OR SWITCHOVER MAY OCCUR AT THE OPTION OF THE CONTROLLER

– AUTO SWITCHOVER CAN ONLY OCCUR FROM PRIMARY TO SECONDARY

– TO SWITCH FROM SECONDARY TO PRIMARY (TO RESET THE MALFUNCTION LOGIC) POWER MUST BE REMOVED FROM UNIT AND REAPPLIED

3. UPON INITIAL APPLICATION OF POWER, CONTROLLER DRIVES PRIMARY CONTROL VALVE TO MOST CLOSED POSITION (VALVE IS OPEN WHEN UNPOWERED). CONTROLLER THEN ADJUSTS VALVE TO ESTABLISH AND MAINTAIN THE AMMONIA BOILER FREON OUTLET TEMPERATURE AT 35(34) ±3°F. AS BOILER OUT TEMP INCREASES, CURRENT TO VALVE DECREASES ALLOWING VALVE TO OPEN MORE. AT ZERO CURRENT VALVE IS FULL OPEN. AT 300 TO 315 MILLIAMPS VALVE IS AT MAX CLOSED POSITION (FOR OV102 5-10 PERCENT OF TOTAL FLOW AREA IS STILL OPEN FOR FLOW AT MAX CLOSED POSITION). SPEC MAX FLOW IN CLOSE POSITION IS 45 LBS/HR

2. DRIVER IS ACTUALLY FOUR DRIVERS - ONE FOR EACH OF THE FOUR STEPPING MOTOR COILS. MOTOR IS DRIVEN BY SEQUENTIALLY POWERING THE COILS. DIRECTION CONTROL IS OBTAINED BY VARYING THE SEQUENCE OF POWER APPLICATION TO THE INDIVIDUAL COILS

NOTES: 1. THE FCL INTERCHANGER FLOW RATE TRANSDUCER GOES THROUGH 2 SIGNAL CONDITIONERS. LOSS OF EITHER ONE WILL RESULT IN THE LOSS OF BOTH THE CRT AND THE METER BUT LOSS OF THE MDM WILL RESULT IN THE LOSS OF THE CRT ONLY

*1 ATCS

SIGNATURE		DATE
DSGN	LINDA DUMIS	10/31/78
DR	VIC. ORTIZ	04/04/79
ENGR	M. LANGLEY	
ENGR	[signature]	9/7/90
APP	[signature]	9/7/90
APP		
OMNIPLAN	[signature]	9-17-90
LTR E	PCN	

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

ACTIVE THERMAL CONTROL SYSTEM- FREON COOLANT LOOP 1, 2

SPACE SHUTTLE: ALL | DWG NO 7.1 | 126.5 X 34 | PAGE | SHEET 1 OF 2

BASIC REV E

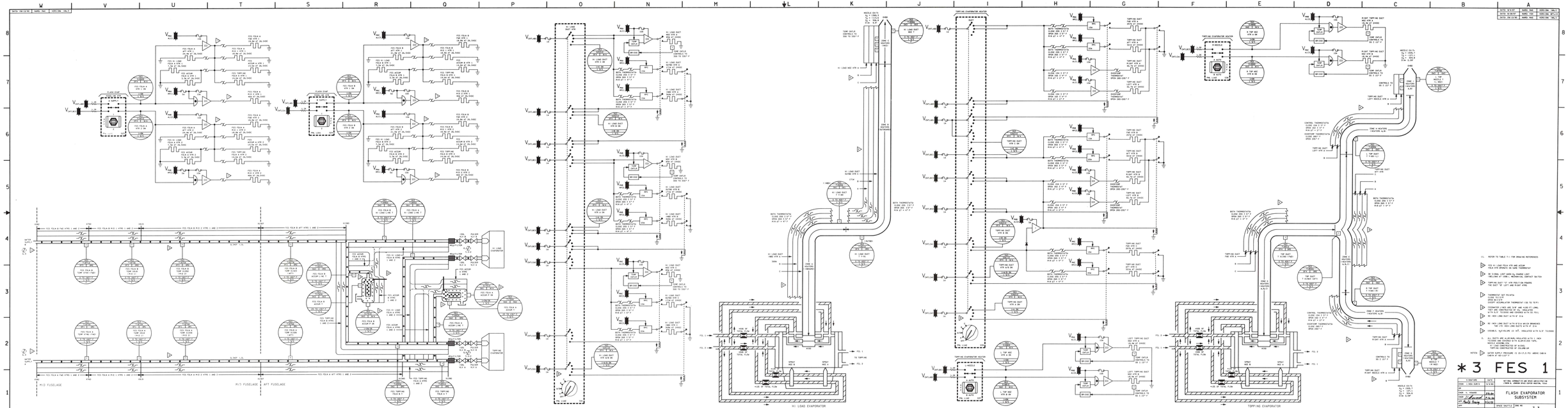
DATE: 7/29/87	NAME: BJT	VERSION: INK, 1
DATE: 8/03/87	NAME: MDU	VERSION: INK, 2
DATE: 9/05/90	NAME: LAM	VERSION: INK, 3

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"

* 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 M. LANGLEY				
ENGR Mary D. Langley		9/7/90		
APP Mark J. Ferrig		9/7/90		
APP			SPACE SHUTTLE	DWG NO 7.1
OMNIPLAN S. K. Kimbrell		10-16-90	ALL	
LTR E	PCN		22 x 17	PAGE SHEET 2 OF 2

BASIC REV E



M10 FUSELAGE
M15 FUSELAGE
AFT FUSELAGE
M1 LOAD EVAPORATOR
TOPPING EVAPORATOR
*3 FES 1
FLASH EVAPORATOR SUBSYSTEM
SPACE SHUTTLE
7.3
BASIC REV E

9. REFER TO TABLE 7-I FOR DRAWING REFERENCES

8 LOGIC 1 IF HI LOAD EVAP ENABLED
LOGIC 0 IF HI LOAD EVAP OFF

7 FES HEAT REJECTION AND INLET TEMPERATURE LIMITS

CONTROLLER	FREON LOOPS OPERATING	FES OPERATING	MAXIMUM HEAT REJECTION (BTU/HR)		PREDICTED MAX INLET TEMP WITH CONTROLLED OUTLET °F	
			DESIGN	TEST	BYP FLOW *	RAD FLOW *
PRIMARY (T = 39°F) OUT	BOTH	BOTH	131,000	148,000	136	147
		TOPPING	30,000	39,000	66	69
	LOOP 1	BOTH	67,500	92,800	165	177
		TOPPING		24,600	73	76
	LOOP 2	BOTH	67,500	127,600	207	224
		TOPPING		37,600	89	95
SECONDARY (T = 62°F) OUT	BOTH	HI LOAD	67,500	113,100	138	146
		TOPPING	67,500	76,800	114	119
	LOOP 2	HILOAD		44,200	120	127

* FLOW RATES (LB/HR) FOR OV102 GROUND FLOW TEST
FCA IN 'BYPASS' POSITION: LOOP 1 PUMP FLOW RATE 2935
LOOP 2 PUMP FLOW RATE 3087
FCA IN 'RADIATOR' POSITION: LOOP 1 PUMP FLOW RATE 2657
LOOP 2 PUMP FLOW RATE 2692

6. CORES - .075 INCHES THICK CYLINDER. DUAL PASSAGE HX
14.5 INCHES LONG AND 11.5 INCHES I.D.
CONSTRUCTED OF ALUMINUM.
HIGH LOAD - FCL 1 FLOWS INSIDE PASSAGE/FCL 2 FLOWS OUTSIDE PASSAGE OF CORE
TOPPER - FCL 2 FLOWS INSIDE PASSAGE/FCL 1 FLOWS OUTSIDE PASSAGE OF CORE

5 SECONDARY CONTROLLER:
- NO SHUTDOWN LOGIC
- 62°F CNTL POINT
- WHEN HI LOAD SW OFF - TOPPER ENABLE (BOTH FEEDLINES)
  SECONDARY TOPPER USES BOTH A AND B FEEDLINES/PULSER VLVS

4 PRIMARY CNTLR:
- A&B IDENTICAL EXCEPT FOR REDUNDANT SHUTDOWN LOGIC FROM SEC CONTROLLER TO A CNTLR
- 39 ±1°F CNTL POINT
- ALL LOGIC RESET AFTER PWR RESET

3 SOLID STATE SWITCH

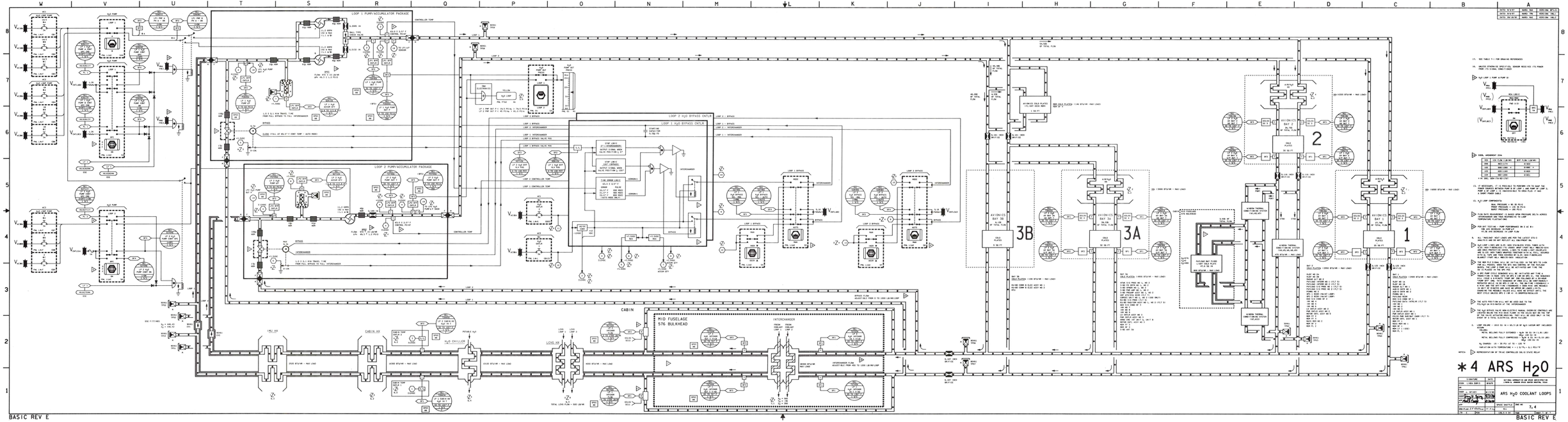
2 INTERNAL LOGIC GROUND (±9 VDC GROUND)

NOTES: 1 WHEN SWITCH IS IN GPC POSITION, EVAPORATORS ARE COMMANDED ON DURING ASCENT (MM 103-106 OR TRANSITION TO 601) AND COMMANDED OFF AT ≈ 100,000 FEET DURING ENTRY (MM 305 OR MM 603)

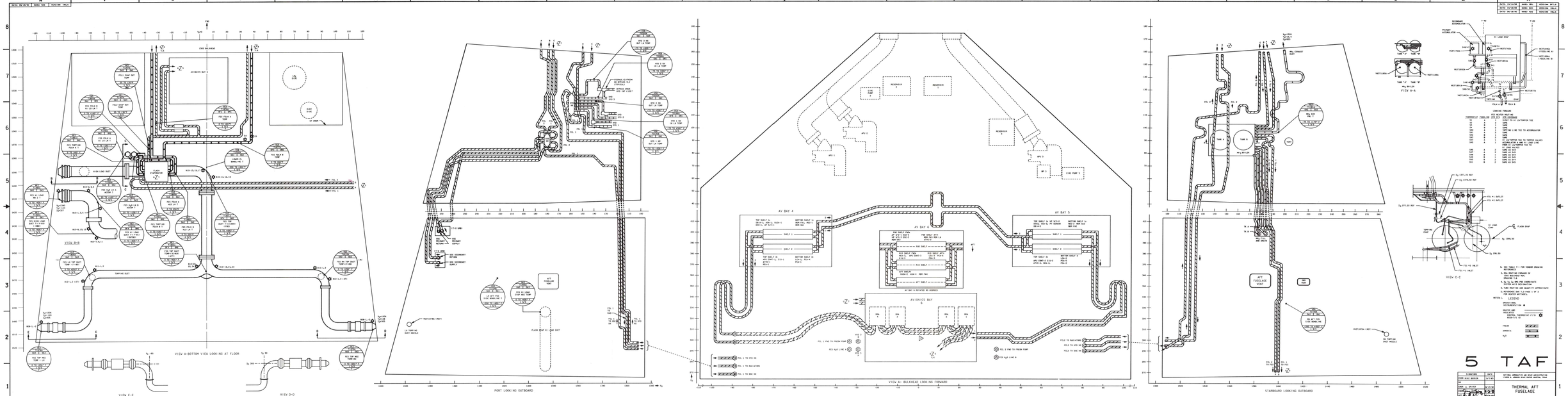
*3 FES 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN VIC ORTIZ	8/9/82		
DR		FLASH EVAPORATOR SUBSYSTEM	
ENGR V. HOWARD	9/21/90		
ENGR V. Howard	9/21/90		
APP Mark A. Fleming	9/21/90		
APP		SPACE SHUTTLE	DWG NO 7.3
OMNIPLAN S. K. [illegible]	10-16-90	ALL	
LTR E / PCN		126.5 X 34	PAGE / SHEET 2 OF 2

BASIC REV E


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
H2O CHILLER
3B
3A
2
1
* 4 ARS H2O
ARS H2O COOLANT LOOPS

BASIC REV E



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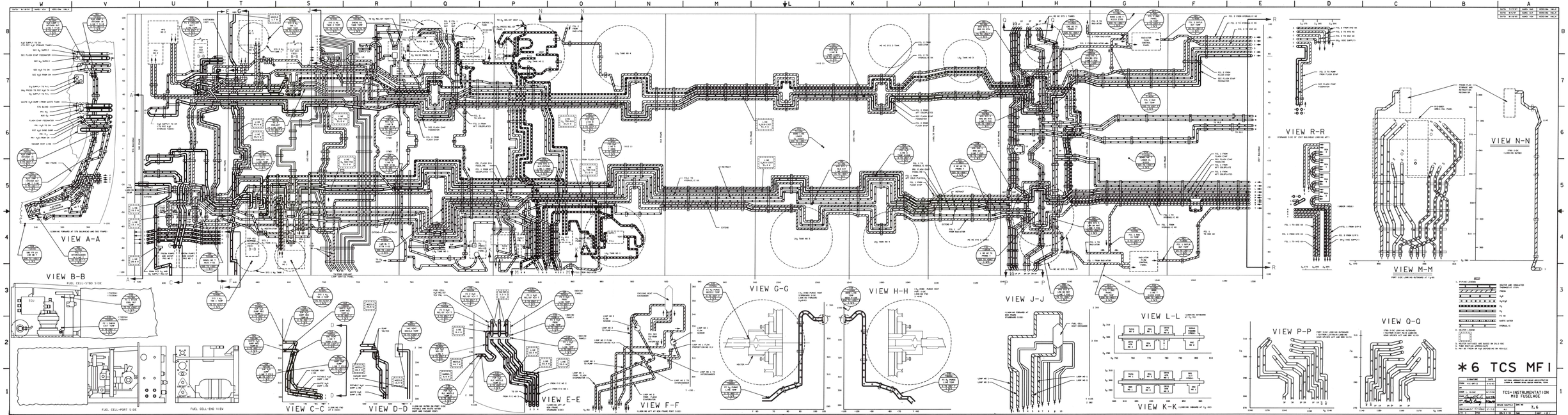
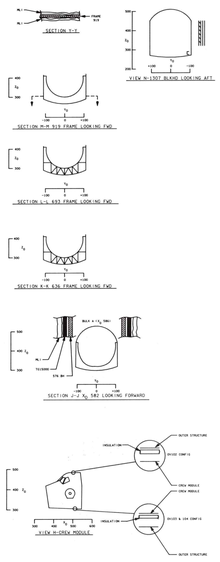
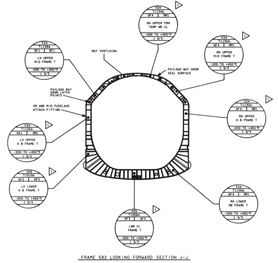
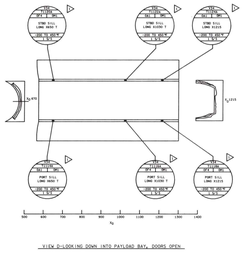
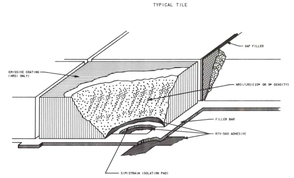
BASIC REV E

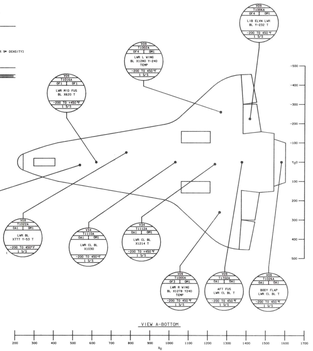

VIEW A-A
VIEW B-B
FUEL CELL-STBD SIDE
FUEL CELL-PORT SIDE
FUEL CELL-END VIEW
VIEW C-C
VIEW D-D
VIEW E-E
VIEW F-F
VIEW G-G
VIEW H-H
VIEW J-J
VIEW K-K
VIEW L-L
VIEW P-P
VIEW Q-Q
VIEW R-R
VIEW M-M
VIEW N-N
*6 TCS MFI
TCS-INSTRUMENTATION MID FUSELAGE
BASIC REV E
BASIC REV E

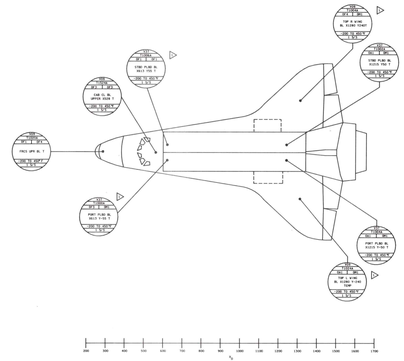


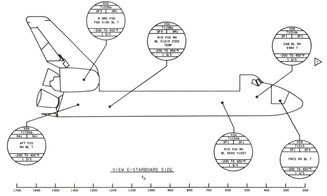


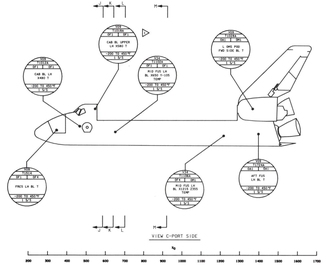


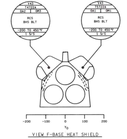












3. FOR VENDOR DRAWING REFERENCES SEE TABLE 7-1

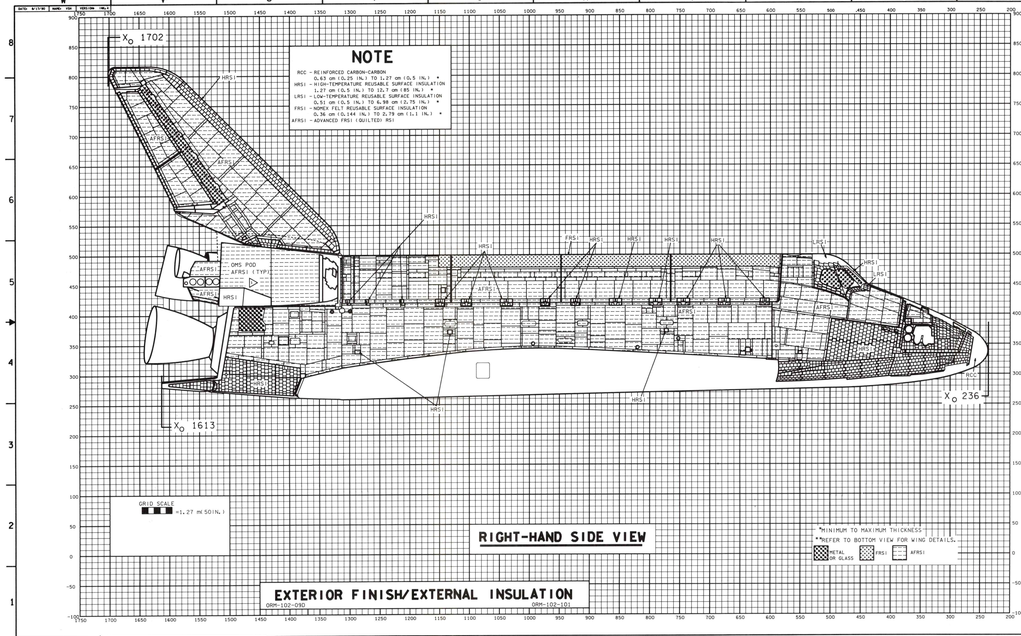
NOTES: ▽ NOT ON SYSTEM

7 TPS INST

CONTRACTOR	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
STOW LIMIT ELIMINATED	3-4-82	LYNDON B. JOHNSON SPACE CENTER, TEXAS
PREP		
CHECK		TPS/STRUCTURE INSTRUMENTATION
APP		
APP		SPACE SHUTTLE DWG NO. 7.7
DISPLAY 2-7 DOUBLE	3-4-82	
SIZE	CODE	REV.
D	81646	SHEET 1 OF 1

BASIC REV E

BASIC REV E



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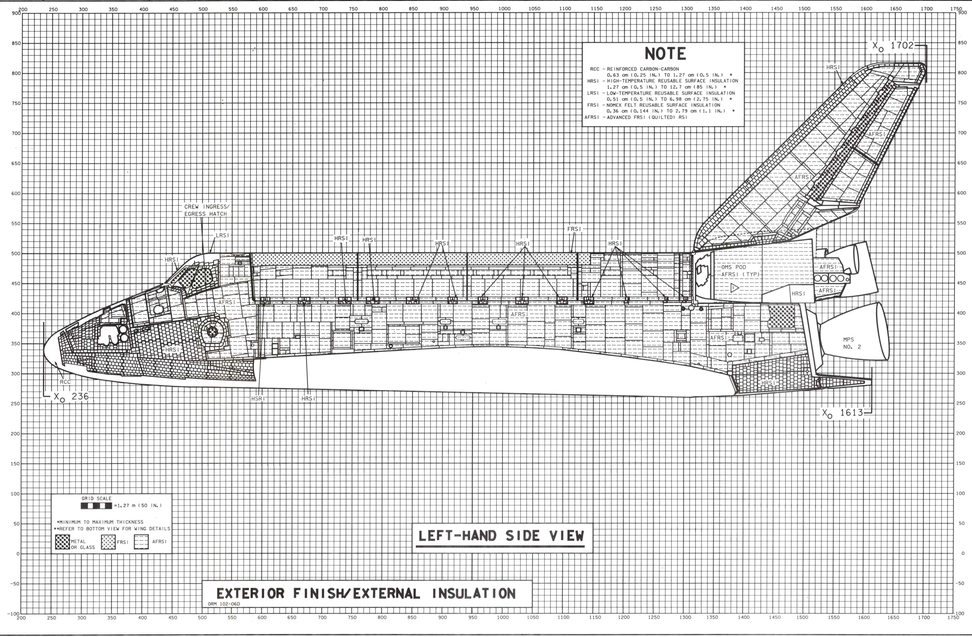
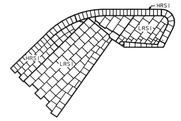




OV-102 VERTICAL STABILIZER

DATE	REVISION	NUMBER	DESCRIPTION
INITIAL RELEASE	11/1/82		
DATE 5/24/83	NUMBER 002	DESCRIPTION ADDED OMS/RCS PODS	
DATE 8/17/83	NUMBER 003	DESCRIPTION ADDED VERT STAB	

3. OV-102/104 TPS CONFIGURATION. OV-102 WILL BE MODIFIED TO THIS CONFIGURATION EXCEPT FOR INSTRUMENTATION TILES

4. REFER TO TABLE 7-1 FOR DRAWING REFERENCES

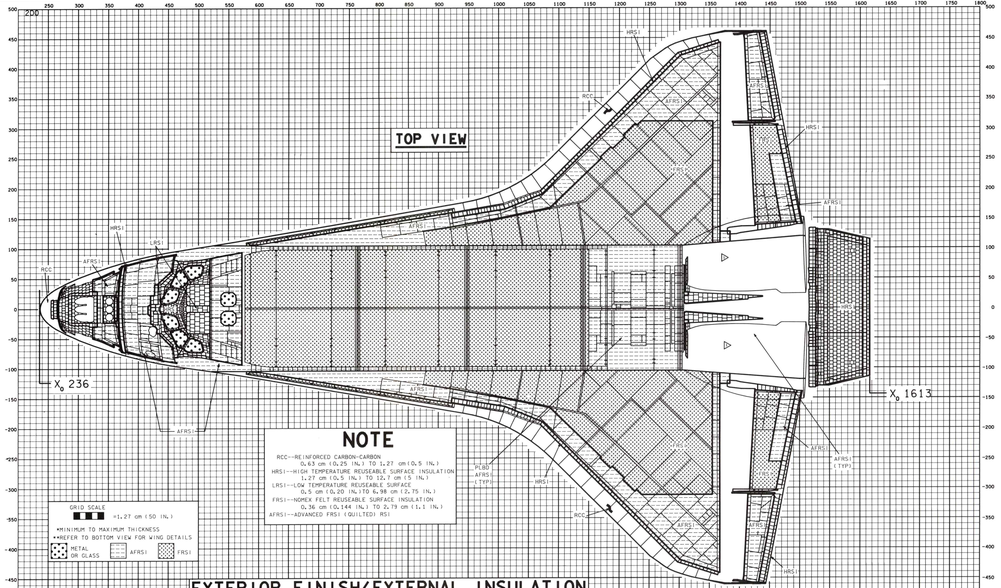
NOTES: ▷ SEE 5.8 SHEET 3 FOR RMS AND TPS DETAILS

*8 EXT SIDES

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PREP. MSFC-MA-MSFC	10/1/82	LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEXAS
PREP. MSFC-MA-MSFC		
CHKD R. TURNER	10/1/82	EXTERNAL SIDE VIEWS
APP'D [signature]	10/1/82	
APP'D [signature]	10/1/82	
APP'D [signature]	10/1/82	
DRAWN [signature]	10/1/82	SPACE SHUTTLE DWG NO. 7.8
CHK'D [signature]	10/1/82	REV.
SCALE NONE		SHEET NO. 1 OF 3

BASIC REV E

TOP VIEW



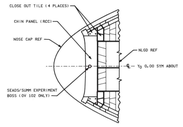
NOTE

RCC--REINFORCED CARBON-CARBON
0.63 cm (0.25 IN.) TO 1.27 cm (0.5 IN.)
HRSI--HIGH TEMPERATURE REUSEABLE SURFACE INSULATION
1.27 cm (0.5 IN.) TO 12.7 cm (5 IN.)
LRSI--LOW TEMPERATURE REUSEABLE SURFACE
0.5 cm (0.20 IN.)TO 6.98 cm (2.75 IN.)
FRSI--NOMEX FELT REUSEABLE SURFACE INSULATION
0.36 cm (0.144 IN.) TO 2.79 cm (1.1 IN.)
AFRSI--ADVANCED FRSI (QUILTED) RSI

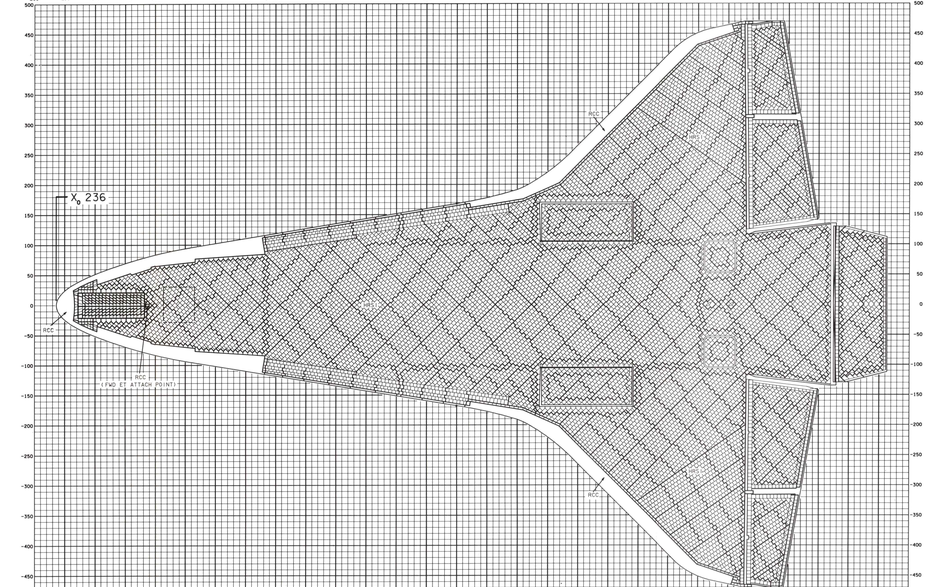
GRID SCALE
=1.27 cm (.50 IN.)
*MINIMUM TO MAXIMUM THICKNESS
**REFER TO BOTTOM VIEW FOR WING DETAILS
METAL OR GLASS | AFRSI | FRSI

EXTERIOR FINISH/EXTERNAL INSULATION

ORM t02-012B ORM t02-012C



CHIN PANEL INSTALLATION (OV102-104 ONLY)



1. OV-103/104 TPS CONFIGURATION, OV-102 WILL BE PRODUCED TO THIS, EXCEPT FOR INSTRUMENTATION TILES
2. REFER TO TABLE 9-1 FOR DRAWING REFERENCES

NOTES: ▷ SEE DWG 5.8 SHEET 3 FOR DMS PDE TPS

*8 TOP/BOTTOM 2

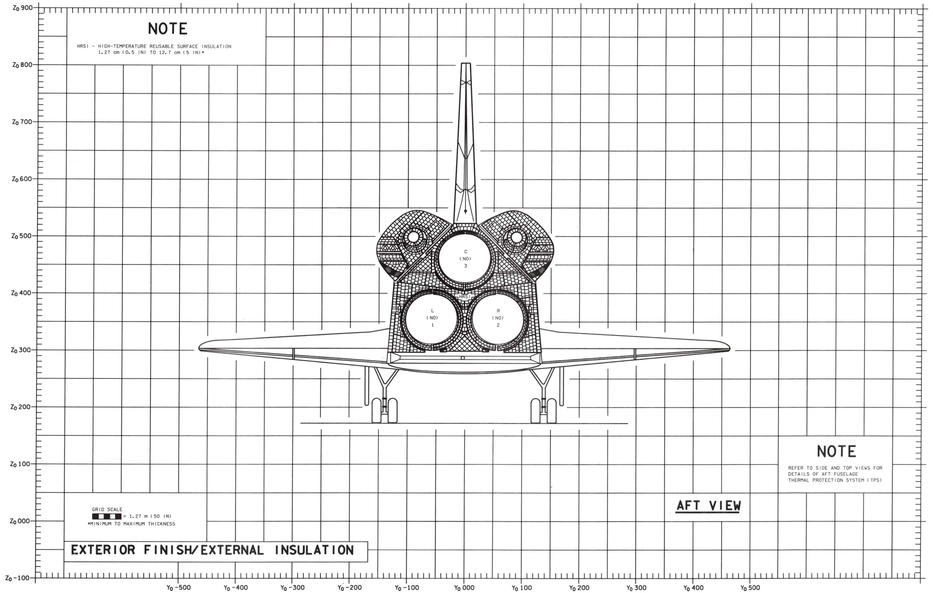
SIGNATURE	DATE
CHIEF TPS LEADER	04/18/98
TPS INTEGRATION MANAGER	04/18/98
CHIEF, TPS ENGINEERING	04/18/98
CHIEF, ENGINEERING INTEGRATION	04/18/98
MANAGER, VEHICLE INTEGRATION	04/18/98

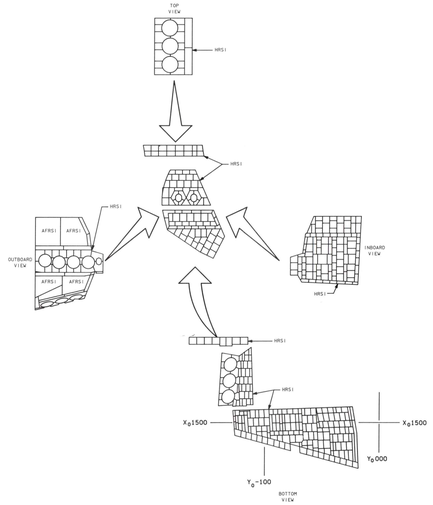
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEXAS

EXTERNAL VIEWS
TOP/BOTTOM

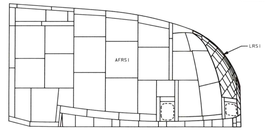
SPACE SHUTTLE DWG NO. 7.8
REV
SHEET 1 OF 1

BASIC REV E

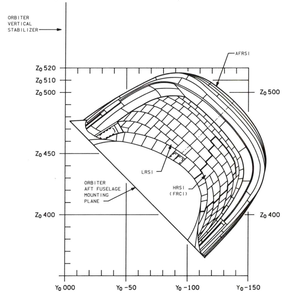


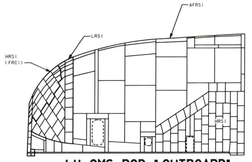


LH POD AFT RCS HOUSING



LH OMS POD "INBOARD"





LH OMS POD "OUTBOARD"

* 8 EX P/TILE 3

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEXAS		SIGNATURE	DATE
EXTERNAL PENETRATIONS/TILE (AFT)		DRAWN Frank Hackney	12/15/78
		CH. THERMAL & SYSTEMS	12/26/78
		CHIEF, TPS ENGINEERING	2/26/79
		MGR, SYSTEMS ENGINEERING & INTEGRATION	2/26/79
		MGR, SHUTTLE PROJECT OFFICE	2/26/79
REV NO 7,8	SPACE SHUTTLE	APP	
	ALL	DRAWING SIZE C	
SHEET 40 OF 111	SHUTTLE	CODE ID 80	DWG

BASIC REV E

DATE 5/14/92 NSRS 1070 VEHICLE ONLY
DATE 7/21/93 NSRS 1070 VEHICLE ONLY
DATE 8/19/93 NSRS 1070 VEHICLE ONLY

RCC - REINFORCED CARBON-CARBON (BLACK)

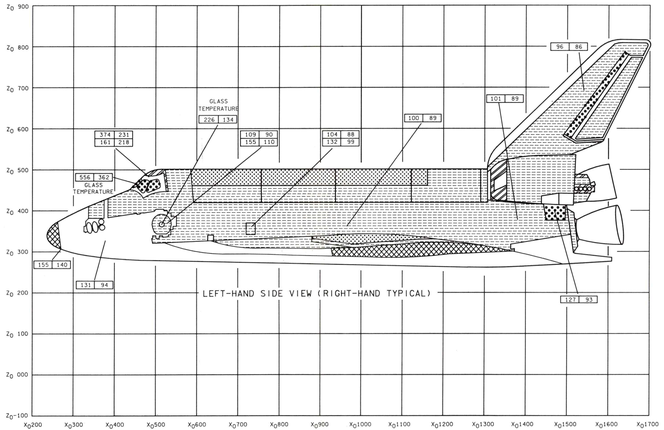
HRSI/FRCI - HIGH-TEMPERATURE REUSABLE SURFACE INSULATION (BLACK)

LRSI - LOW-TEMPERATURE REUSABLE SURFACE INSULATION (WHITE)

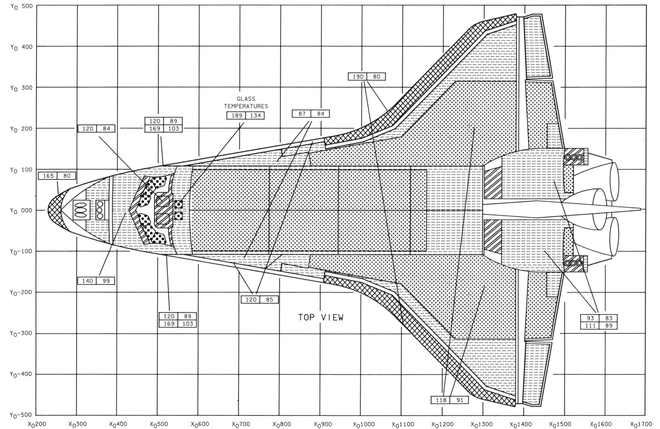
FRSI - FRSI-NOMEX FELT REUSABLE SURFACE INSULATION (WHITE)

METAL OR GLASS

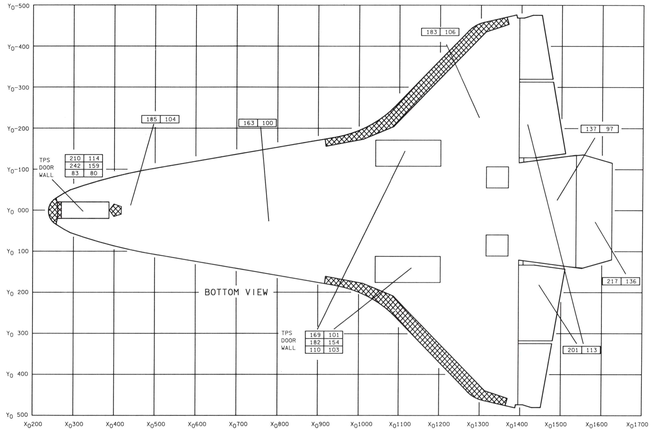
AFRSI - ADVANCED-FRSI (QUILTED) FELT REUSABLE SURFACE INSULATION (WHITE)



LEFT-HAND SIDE VIEW (RIGHT-HAND TYPICAL)



TOP VIEW



BOTTOM VIEW

1. RCC CHIN PANEL ON RIGHT-HAND SIDE ONLY. DELETED ALSO ORBIT TILE
2. TO CONVERT TPS TEMPERATURE, OF USE ALL OR PORTION OF THE FOLLOWING FORMULA: OF USE ONLY ON APPROPRIATE OF TILES
3. REFER TO TABLE 7-1 FOR ENGLISH REFERENCES
4. REFER TO SECTION 7 FOR GENERAL DETAILS AND SPECIFIC DATA/NOTES RELATED TO PROTECTIVE PENETRATION AND EXIT OF AREAS
5. POST-TRANSIENT TEMPERATURES OF THE SPECIFIED AND INDICATED IN THE FOLLOWING MANNER:

COMPONENT RELEASED	TRANSIENT 1 HR	24 HRS
THERMAL PROTECTION SYSTEM (TPS)		
STRUCTURE		

NOTES: 1) SHIELD-LOCK, BONDS INDICATE TPS TEMPERATURE ONLY.

CAUTION: IF ESCAPE PANEL DOOR IS REQUIRED, THERMAL BLANKETS SHOULD BE USED TO PREVENT INJURY TO RESCUE PERSONNEL

8 EX PST TEMP 4

CONTRACT NAS9-17900	DATE 10/93	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEXAS
SPACE SHUTTLE SYSTEM	CR 10/93	
ORB		
DRAWN G. TURNER	10/93	EXTERNAL
CHKD R. S.	10/93	POST TEMPERATURES
APP Neil Dixon	10/93	
APP		
APPROVAL [illegible]	10-21-93	SPACE SHUTTLE DWG NO. 7.8
SUB-SYSTEM	10/93	REV
		SHEET 1 OF 2

BASIC REV E

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
7.1 (Sheets 1 and 2)	ATCS	R. I.	VS70-630109		J	10/7/89	SCHEMATIC DIAGRAM - ACTIVE THERMAL CONTROL
		R. I.	VS70-630102		T	12/5/89	SCHEMATIC DIAGRAM - ACTIVE THERMAL CONTROL
		R. I.	VS70-634102		A	7/31/79	SCHEMATIC - ACTIVE THERMAL CONTROL SUBSYSTEM
		R. I.	V070-634530		C	8/13/85	RADIATOR INSTALLATION ECLSS ACTIVE THERMAL CONTROL SYSTEM
		R. I.	V070-635100		B	4/27/87	COOLANT INSTALLATION AFT AVIONICS EQUIPMENT
		R. I.	VS70-750202		L	6/6/89	SCHEMATIC DIAGRAM - OI POWER AND CONTROL
7.3 (Sheets 1 and 2)	FLASH EVAPORATOR SUBSYSTEM		V070-634485		D	9/13/88	LINE HEATER INSTALLATION
			VS70-630109		H	7/15/88	SCHEMATIC DIAGRAM ACTIVE THERMAL CONTROL
			VS70-630102		T	12/5/84	SCHEMATIC DIAGRAM ACTIVE THERMAL CONTROL
			VS70-634102		A	7/31/79	SCHEMATIC ACTIVE THERMAL CONTROL SUBSYSTEM
7.4	ARS H_2O	R. I.	V070-613896	1-7	E	10/24/85	WATER COOLANT SYSTEM INSTALLATION. ARS, FLIGHT DECK AND DFI. ECLSS
		R. I.	V070-613360	1-3	B/C03	11/3/80	COOLANT INSTL-AVIONICS EQUIPMENT. FORWARD BAY 1 AND 2
		R. I.	V070-613361	1-5	E	11/29/82	COOLANT SYSTEM INSTALLATION AVIONIC EQUIPMENT. CREW MODULE, BAY 3B
		R. I.	V070-613362	1-3	B	3/11/88	INSTALLATION-WATER COOLANT, AVIONICS BAY 3A COLD PLATES
		R. I.	VS70-960102		F04	11/8/89	INTEGRATED SYSTEM SCHEMATIC ORBITER 0V-102 ENVIRONMENTAL CONTROL AND LIFE SUPPORT SUBSYSTEM
		R. I.	VS70-960102	12(60CA)	F04	9/15/89	ARS CABIN AIR CIRCULATION AND TEMPERATURE CONTROLLER 1
		R. I.	VS70-960102	13(60CB)	F04	9/15/89	ARS CABIN AIR CIRCULATION AND TEMPERATURE CONTROLLER 2
		R. I.	VS70-960102	15(60CD)	F04	8/7/89	ARS WATER COOLANT LOOP 1 FLUIDS/CONTROL
		R. I.	VS70-960102	16(60CE)	F01	3/15/84	ARS WATER COOLANT LOOP 1 CONTROL
		R. I.	VS70-960102	17(60CF)	F01	3/16/84	ARS WATER COOLANT LOOP 2 FLUIDS/CONTROL
		R. I.	VS70-960102	18(60CG)	F02	1/17/85	ARS WATER COOLANT LOOP 2 CONTROL
		R. I.	VS70-960102	23(60CM)	F04	7/14/84	ARS CABIN AIR CIRCULATION INSTRUMENTATION
		R. I.	VS70-960102	24(60CN)	E	6/16/83	ARS WATER COOLANT LOOP 1 INSTRUMENTATION, PART I
		R. I.	VS70-960102	25(60CP)	E	6/17/83	ARS WATER COOLANT LOOP 2 INSTRUMENTATION, PART I
		R. I.	VS70-960102	26(60CS)	E	6/17/83	ARS WATER COOLANT LOOP 1 INSTRUMENTATION, PART II
		R. I.	VS70-960102	27(60CT)	E	5/13/83	ARS WATER COOLANT LOOP 2 INSTRUMENTATION, PART II
		R. I.	VS70-960102	1-8	H	7/16/85	SCHEMATIC DIAGRAM-ATMOSPHERIC REVITALIZATION SUBSYSTEM

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
7.1	ENGR M. LANGLEY			ENGR	
	ENGR Mary G Langley	10/1/90		ENGR	
7.3	ENGR V. HOWARD			ENGR	
	ENGR Vern Howard	10/01/90		ENGR	
7.4	ENGR J. SPIVEY			APP Mark J. Ferring	10/22/90
	ENGR Jim L Spivey	10/1/90		APP	
	ENGR			OMNIPLAN	
	ENGR			LTR E	PCN

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE | TBL NO 7-I
ALL

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
7.4 (CONC'D)	ARS H_2O	R. I.	VS70-960099		A12	1/24/84	INTEGRATED SYSTEM SCHEMATIC ORBITER OV-099, -103, AND -104 ENVIRONMENTAL CONTROL AND LIFE SUPPORT SUBSYSTEM
		R. I.	VS70-960099	12(60CA)	A12	12/28/84	ARS CABIN AIR CIRCULATION AND TEMPERATURE CONTROLLER 1
		R. I.	VS70-960099	13(60CB)	A08	5/22/84	ARS CABIN AIR CIRCULATION AND TEMPERATURE CONTROLLER 2
		R. I.	VS70-960099	15(60CD)	A08	5/23/84	ARS WATER COOLANT LOOP 1 FLUIDS/CONTROL
		R. I.	VS70-960099	16(60CE)	A12	1/15/82	ARS WATER COOLANT LOOP 1 CONTROL
		R. I.	VS70-960099	17(60CF)	A07	1/19/84	ARS WATER COOLANT LOOP 2 FLUIDS/CONTROL
		R. I.	VS70-960099	18(60CG)	A12	12/28/88	ARS WATER COOLANT LOOP 2 CONTROL
		R. I.	VS70-960099	23(60CM)	A08	5/25/84	ARS CABIN AIR CIRCULATION INSTRUMENTATION
		R. I.	VS70-960099	24(60CN)	A05	6/02/83	ARS WATER COOLANT LOOP 1 INSTRUMENTATION, PART I
		R. I.	VS70-960099	25(60CP)	A07	1/19/84	ARS WATER COOLANT LOOP 2 INSTRUMENTATION, PART I
		R. I.	VS70-960099	26(60CS)	A05	6/03/83	ARS WATER COOLANT LOOP 1 INSTRUMENTATION, PART II
		R. I.	VS70-960099	27(60CT)	NC	4/17/80	ARS WATER COOLANT LOOP 2 INSTRUMENTATION, PART II
		R. I.	VS70-610109	1-8	E	4/23/88	SCHEMATIC DIAGRAM-ATMOSPHERIC REVITALIZATION SUBSYSTEM
		R. I.	VO70-613891	1-7	E	7/6/87	ARS WATER COOLANT SYSTEM INSTALLATION-CREW MODULE, MID-DECK TO FLIGHT DECK
		R. I.	VO70-613890	1-4	C	6/21/85	WATER SYSTEM INSTALLATION-ARS COOLING CABIN, ECLSS
7.5	THERMAL AFT FUSELAGE	R. I.	V070-635100	1,2	B	4/27/87	COOLANT INSTALLATION - AFT AV EQUIPMENT
		R. I.	V070-635300	1-24	E	8/6/88	THERMAL CONTROL INSTL-ECLSS ACTIVE, AFT FUSELAGE
		R. I.	V070-635103	1-3	A	8/27/79	COLDPLATE - AFT FUS AV EQUIPMENT SHELF 3, BAY 4
		R. I.	V070-705114	1-5	G/H13	4/9/87	EQUIPMENT INSTALLATION - AFT AV BAY 4
		R. I.	V070-705205	1-5	H	4/9/87	EQUIPMENT INSTALLATION - AFT AV BAY 5
		R. I.	V070-705306	1-4	G/H03	3/31/86	EQUIPMENT INSTALLATION - AFT AV BAY 6
		R. I.	V070-755192	1-2	C	11/18/81	INSTRUMENTATION INSTALLATION - ECLSS OPERATIONAL
		R. I.	V070-755102	1-2	E	3/3/89	INSTRUMENTATION INSTALLATION AFT FUSELAGE, OPERATIONAL

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
7.4	ENGR J. SPIVEY			ENGR	
(CONC'D)	ENGR J. L. Spivey	10/1/90		ENGR	
7.5	ENGR J. L. SPIVEY			ENGR	
	ENGR J. L. Spivey	10/1/90		ENGR	
	ENGR			APP Mark J. Fenning	10/23/90
	ENGR			APP	
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE | TBL NO 7-I

ALL

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
7.6	TCS - INSTRUMENTATION MID FUSELAGE	NASA	JSC-18366		-	7/88	OI SPACE SHUTTLE ORBITER TCS TEMPERATURE MEASUREMENT LOCATIONS
		RI	V070-582061			-	TBS
		RI	V070-584050		F	1/17/90	HYDRAULICS SUBSYSTEM INSTALLATION -MID FUSE
		RI	VO70-586096		-	8/27/80	HYDRAULICS SUBSYSTEM INSTALLATION -RH WING AND ELEVON ACTUATORS
		RI	V070-586140		D	11/22/89	HYDRAULICS SUBSYSTEM INSTALLATION
		RI	V070-586145		B	5/27/88	HYDRAULICS SUBSYSTEM INSTALLATION - RIGHT- HAND MLG WHEEL WELL
		RI	V070-586266		C	8/12/88	HYDRAULICS SUBSYSTEM INSTALLATION -STRUT, MAIN LANDING GEAR
		RI	V070-634460		H	6/15/88	MID FUSELAGE SYBSYSTEM ECLSS INSTL - FRAME Xo582 THROUGH Xo693
		RI.	V070-634465				TBS
		RI	V070-754102				TBS
		RI	V070-754109				TBS
		RI	V070-754192		B	02/08/89	INSTRUMENTATION INSTALLATION - OFI MID FUS Xo576 THROUGH Xo1307
7.7	TPS/STRUCTURE INSTRUMENTATION	RI	V070-756101	ALL	-	7/27/81	INSTRUMENTATION INSTALLATION - WING
		RI	V070-754106	ALL	-	7/23/81	INSTRUMENTATION INSTALLATION - PLBD
		RI	V070-751102	ALL	A	10/21/80	INSTRUMENTATION INSTALLATION OPERATIONAL FORWARD FUSELAGE - UPPER
		RI.	V070-192135	ALL	C	10/20/88	TPS INSTALLATION - INSTRUMENTATION
		RI	V070-754104	ALL	-	6/22/81	INSTRUMENTATION INSTALLATION - MID FUSELAGE, LOWER SURFACE
		RI	V070-752102	ALL	D	5/14/87	INSTRUMENTATION INSTALLATION FORWARD FUSELAGE, LOWER
		RI	V070-755102	ALL	E	3/3/89	INSTRUMENTATION INSTALLATION - AFT FUSELAGE, OPERATIONAL
		MD	73A760210	1-10	E	1/5/81	ELECTRICAL INSTALLATION POD - OPERATIONAL
		RI	V070-754103	ALL	-	6/27/81	INSTRUMENTATION INSTALLATION - MID FUSELAGE, SIDEWALL
		RI	V070-751012	ALL	B	4/29/83	INSTRUMENTATION INSTALLATION, FORWARD RCS, STRUCTURE, OFI
		RI	V070-754105	ALL	-	7/21/81	INSTRUMENTATION INSTALLATION - Xo582 FRAME DEVELOPMENT

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
7.6	ENGR L. RICHE			ENGR	
	ENGR L. Riche	10/23/90		ENGR	
7.7	ENGR J. M. SOLOMON			ENGR	
	ENGR J. M. Solomon	10/23/90		ENGR	
	ENGR			APP Mark D. Fenning	10/23/90
	ENGR			APP	
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE ALL

TBL NO 7-I

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
7.8 (SHEETS 1-4)	EXTERNAL TILE DRAWING	R. I.	V70-900-030 V70-900-040	-01	C	7/30/85	LOWER FUSELAGE
		R. I.	V70-900-030 V70-900-040	-02	C	9/16/85	LOWER WING LH
		R. I.	V70-900-030 V70-900-040	-04	C	9/12/85	LOWER WING RH
		R. I.	V70-900-030 V70-900-040	-05	B	9/23/85	UPPER FUSELAGE
		R. I.	V70-900-030 V70-900-040	-06	B	9/13/85	UPPER WING LH
		R. I.	V70-900-030 V70-900-040	-07	B	9/09/85	UPPER WING RH
		R. I.	V70-900-030 V70-900-040	-08	C	7/25/85	FUSELAGE LH SIDE
		R. I.	V70-900-030 V70-900-040	-09	C	9/10/85	FUSELAGE RH SIDE
		R. I.	V70-900-030 V70-900-040	-10	C	5/30/86	VERTICAL STABILIZER
		R. I.	V70-900-030 V70-900-040	-11	C	1/14/85	AFT HEAT SHIELD, OMS POD, RCS POD
		R. I.	V070-391147	-01	-	1/15/87	LOWER FORWARD FUSELAGE CHIN PANEL

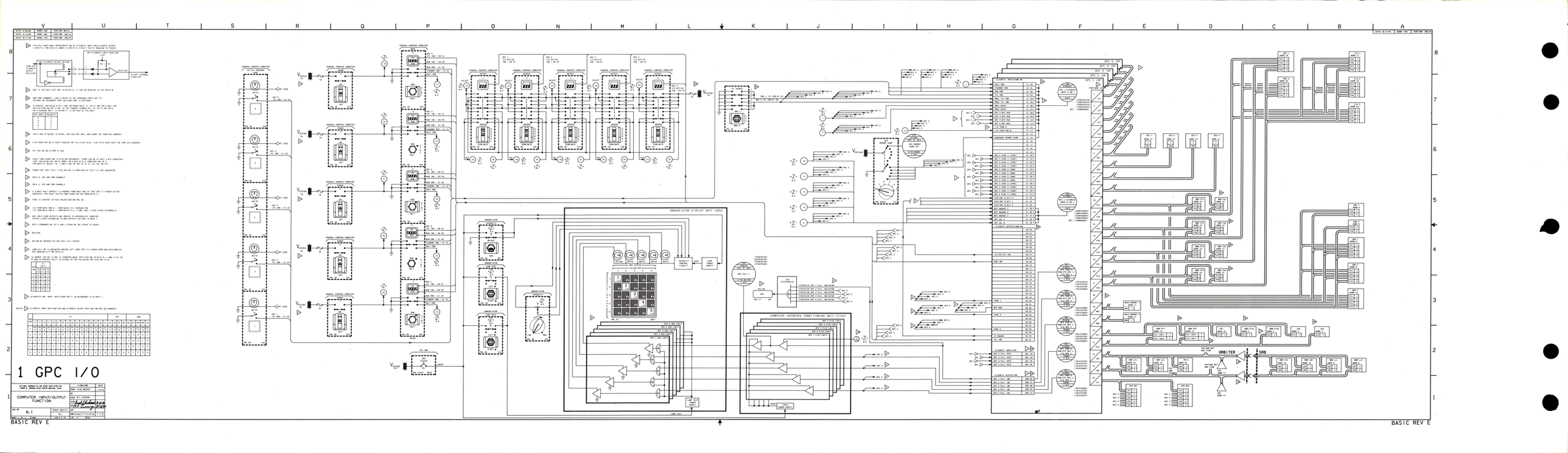
DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
7.8-1,4	ENGR K. TURNER			ENGR	
	ENGR K. Turner	10/2/90		ENGR	
7.8-2,3	ENGR V. HOWARD			ENGR	
	ENGR Vern Howard	10/2/90		ENGR	
	ENGR			APP Mark A. Fleming	10/23/90
	ENGR			APP	
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

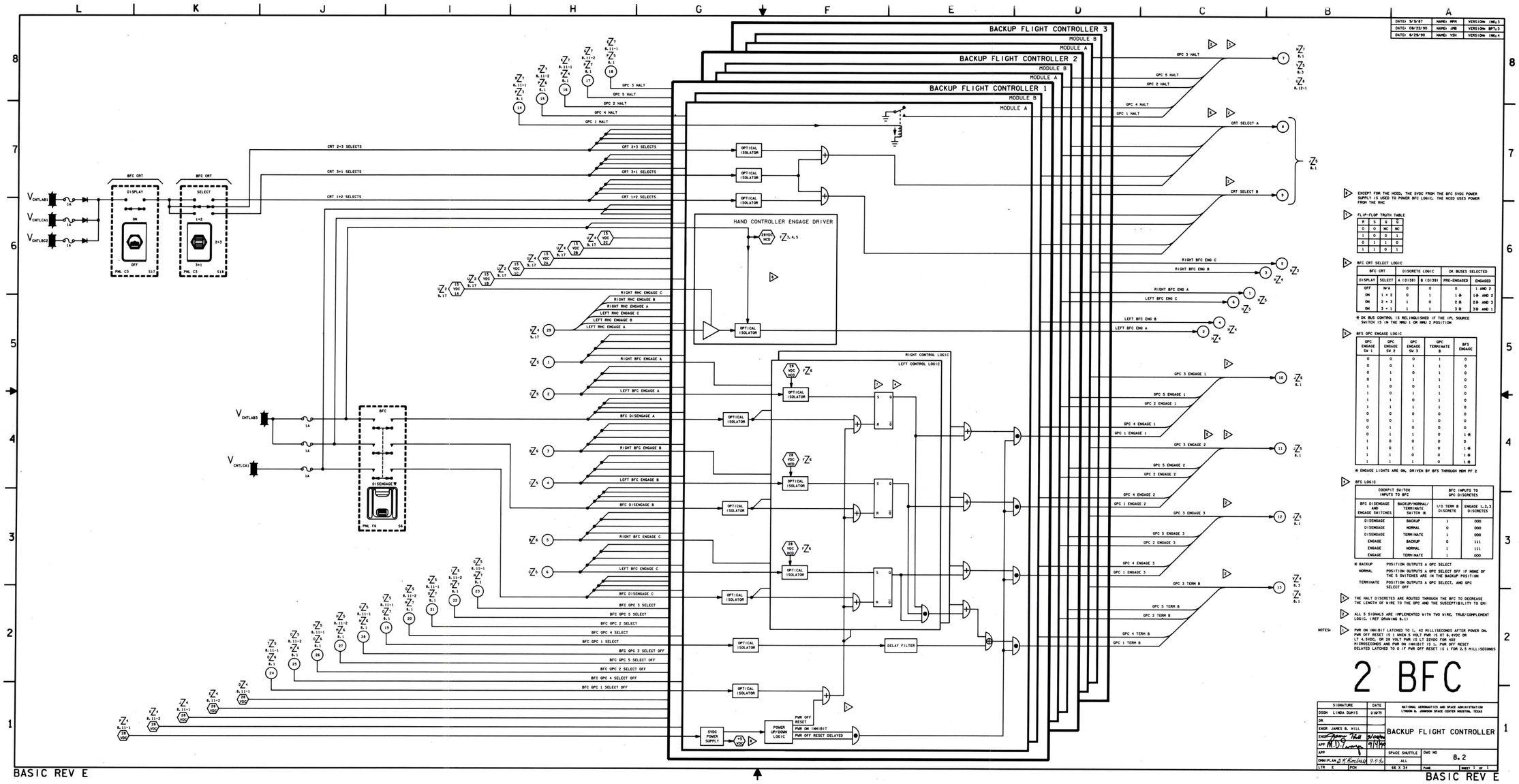
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS

VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 7-I
ALL	
	PAGE 7.I-4 SHEET 4 OF 4

BASIC REV E


1 GPC I/O
COMPUTER INPUT/OUTPUT FUNCTION
8.1
SPACE SHUTTLE
BASIC REV E
GENERAL PURPOSE COMPUTER
ANNUNCIATOR DISPLAY UNIT 1 ASSY
COMPUTER INTERFACE CONDITIONING UNIT 1 ASSY
ORBITER
SRB



DATE= 5/9/87	NAME= MPM	VERSION= IMU-3
DATE= 06/22/90	NAME= JMB	VERSION= BFS-3
DATE= 8/29/90	NAME= VSH	VERSION= IMU-4

▷ EXCEPT FOR THE MCED, THE SVDC FROM THE BFC SVDC POWER SUPPLY IS USED TO POWER BFC LOGIC. THE MCED 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 ONL DRIVEN BY BFS THROUGH MDM FF 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

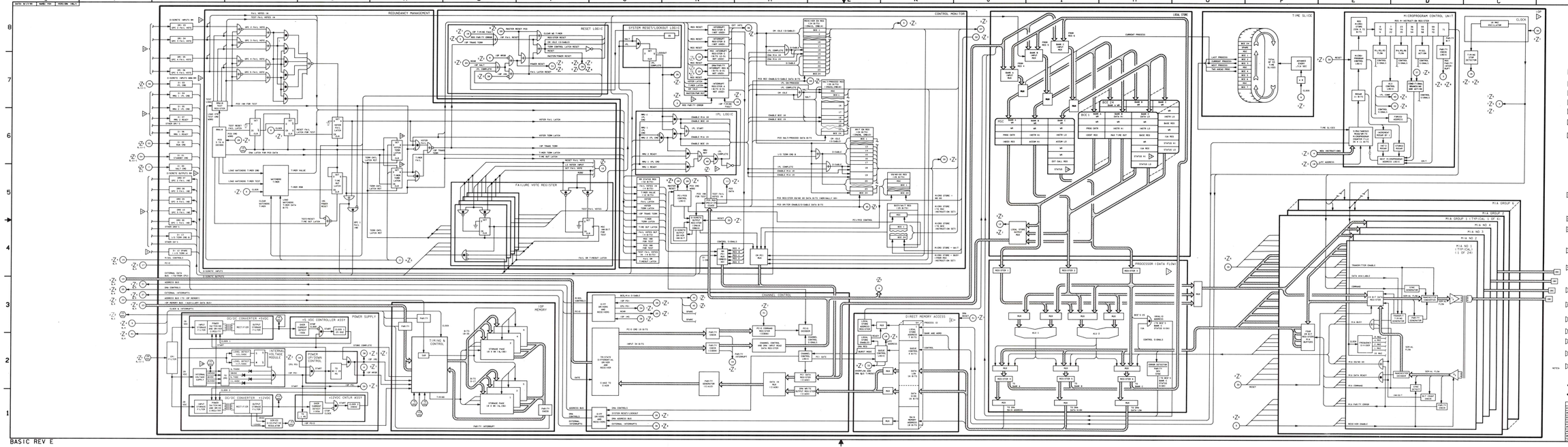
▷ THE HALT DISCRETES ARE ROUTED THROUGH THE BFC TO DECREASE THE LENGTH OF WIRE TO THE GPC AND THE SUSCEPTIBILITY TO EMI

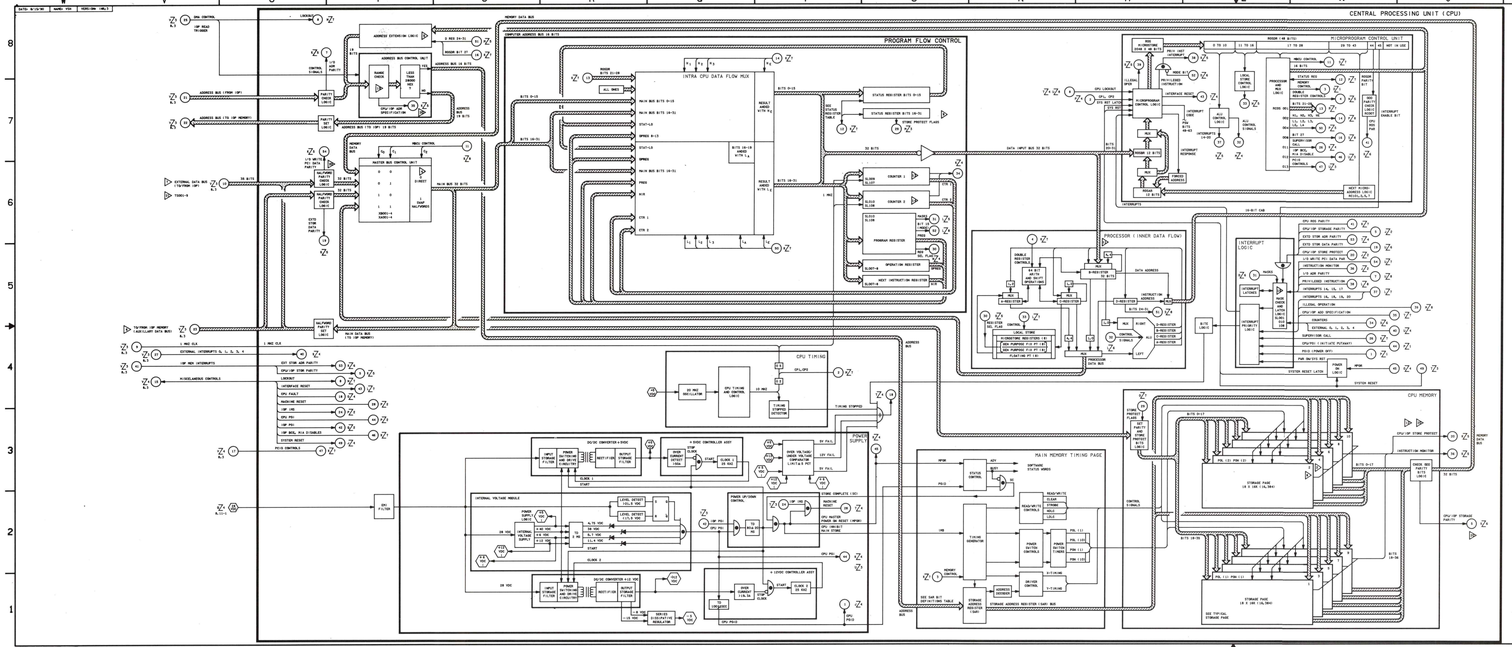
▷ ALL 5 SIGNALS ARE IMPLEMENTED WITH TWO WIRE, TRUE/COMPLEMENT LOGIC. (REF DRAWING 8.1)

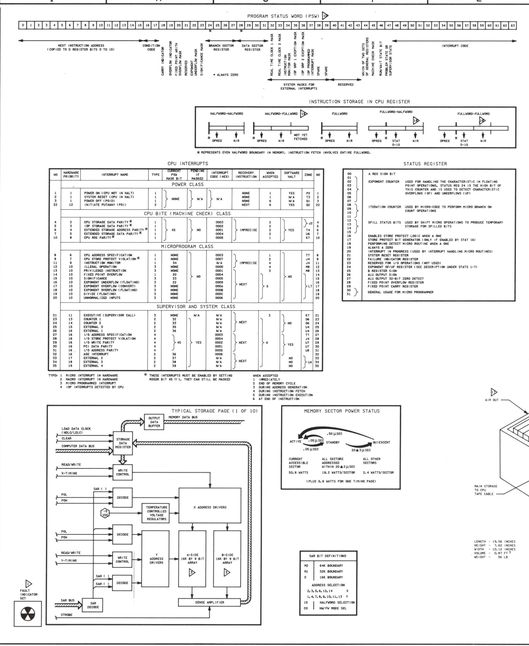
NOTES: ▷ PWR ON INHIBIT LATCHED TO 1, 42 MILLISECONDS AFTER POWER ON. PWR OFF RESET IS 1 WHEN 5 VOLT PWR IS ST 4.49V OR LT 4.5VDC, OR 28 VOLT PWR IS LT 22VDC FOR 400 MICROSECONDS AND PWR ON INHIBIT IS 1. PWR OFF RESET DELAYED LATCHED TO 0 IF PWR OFF RESET IS 1 FOR 2.5 MILLISECONDS

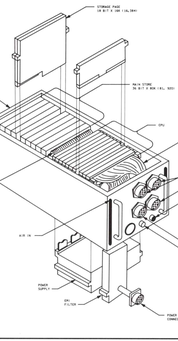
2 BFC

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN LINDA DUMIS	1/16/89	
DR		
ENGR JAMES B. HILL	9/14/90	BACKUP FLIGHT CONTROLLER
APP		SPACE SHUTTLE
APP		ALL
DRAWING APP		8.2
LTR E	PCN	66 X 34
		SHEET 1 OF 3


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



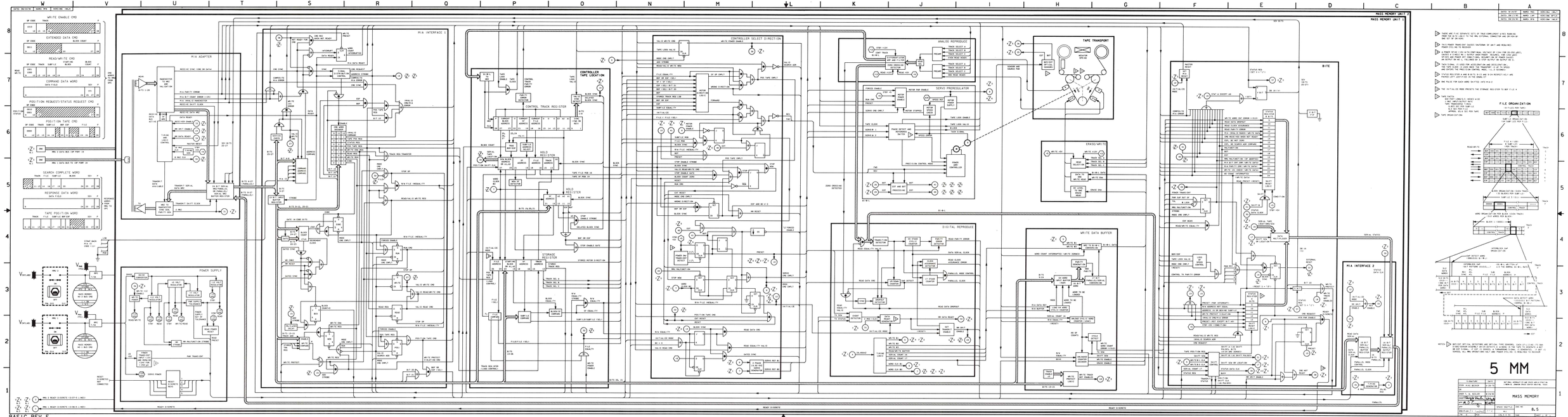


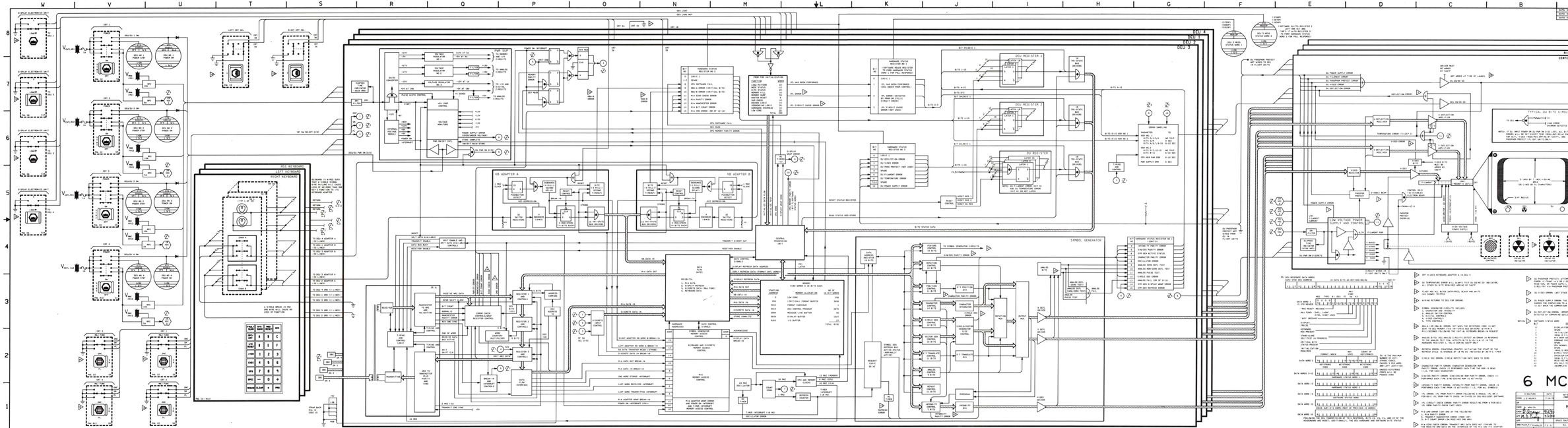


4 CPU 1

SIGNATURE	DATE	
DESIGNED BY: DAVE S.	6-15-70	MILITARY COMPUTER AND SPACE APPLICATIONS
DRAWN BY: DAVE S.	6-15-70	THOMPSON RAMO WOOLDRIDGE INDUSTRIAL TEXAS
CHECKED BY:		
APPROVED BY:		CENTRAL PROCESSING UNIT
PROJECT ENGR:		SPACE SHUTTLE DWG NO.
MFG ENGR:		REV.
QUALITY ASSURANCE:		8.4

BASIC REV E


MASS MEMORY UNIT 1
MASS MEMORY UNIT 1
MIA INTERFACE 1
MIA ADAPTER
MIA INTERFACE 2
WRITE ENABLE CMD
EXTENDED DATA CMD
READ/WRITE CMD
COMMAND DATA WORD
POSITION REQUEST/STATUS REQUEST CMD
POSITION END CMD
SEARCH COMPLETE WORD
RESPONSE DATA WORD
TAPE POSITION WORD
CONTROLLER SELECT DIRECTION
CONTROLLER TAPE LOCATION
CONTROL TRACK REGISTER
HOLD REGISTER
STORAGE REGISTER
ANALOG REPRODUCE
SERVO PROCREGULATOR
DIGITAL REPRODUCE
ERASE/WRITE
TAPE TRANSPORT
WRITE DATA BUFFER
BITE
POWER SUPPLY
FILE ORGANIZATION
5 MM
BASIC REV E


MCDS KEYBOARD
LEFT KEYBOARD
RIGHT KEYBOARD
MSS DU (CRT 4)
LEFT DU (CRT 1)
RIGHT DU (CRT 2)
CENTER DU (CRT 3)
6 MCDS 1
MULTIFUNCTION CRT DISPLAY SYSTEM
BASIC REV E
BASIC REV E

DATE: 08/13/85	MARK: 1.0B	VERIDIM: BPL1
DATE: 08/23/85	MARK: PAD	VERIDIM: BPL1
DATE: 08/29/85	MARK: STA	VERIDIM: VMLS

7 DPS PWR 1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	SIGNATURE	DATE
	DSGN: LINDA DAMLS	8/13/85
	CH:	
DPS ELECTRICAL POWER LOSS	CHKR: ROBERT A. WALTON	8/14/85
	APPD:	
	APPD:	
DWG NO 8.7	SPACE SHUTTLE APP 0	
SHEET 1 OF 3 PWR	ALL SCALE NONE	DRAFTLAM 2/1 CADAM 17.0

BASIC REV E

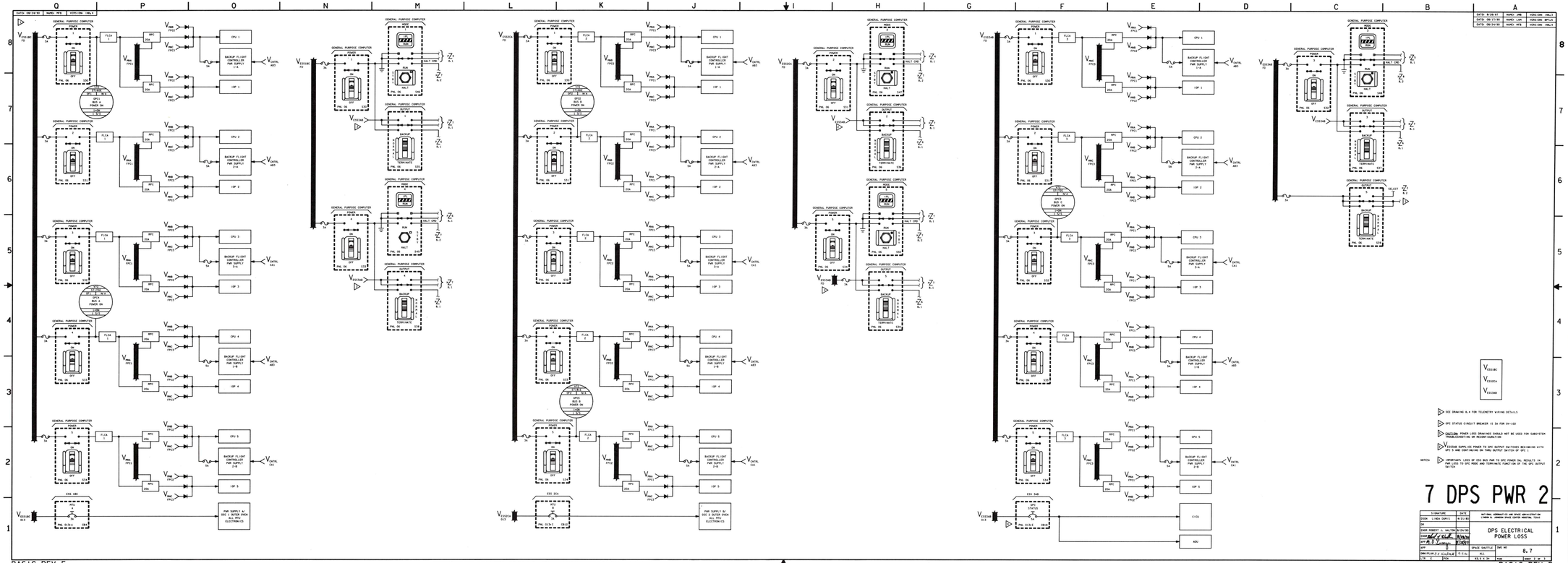
BASIC REV E

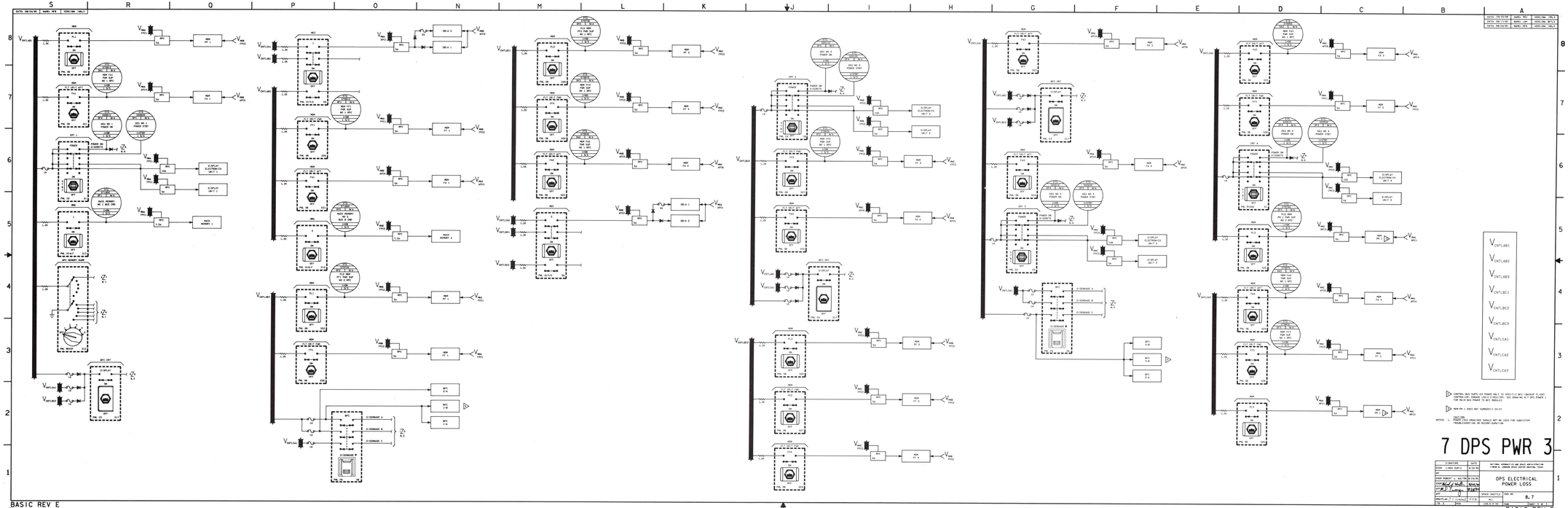
V_{MNA}
V_{MNB}
V_{MNC}
V_{SWPL2}

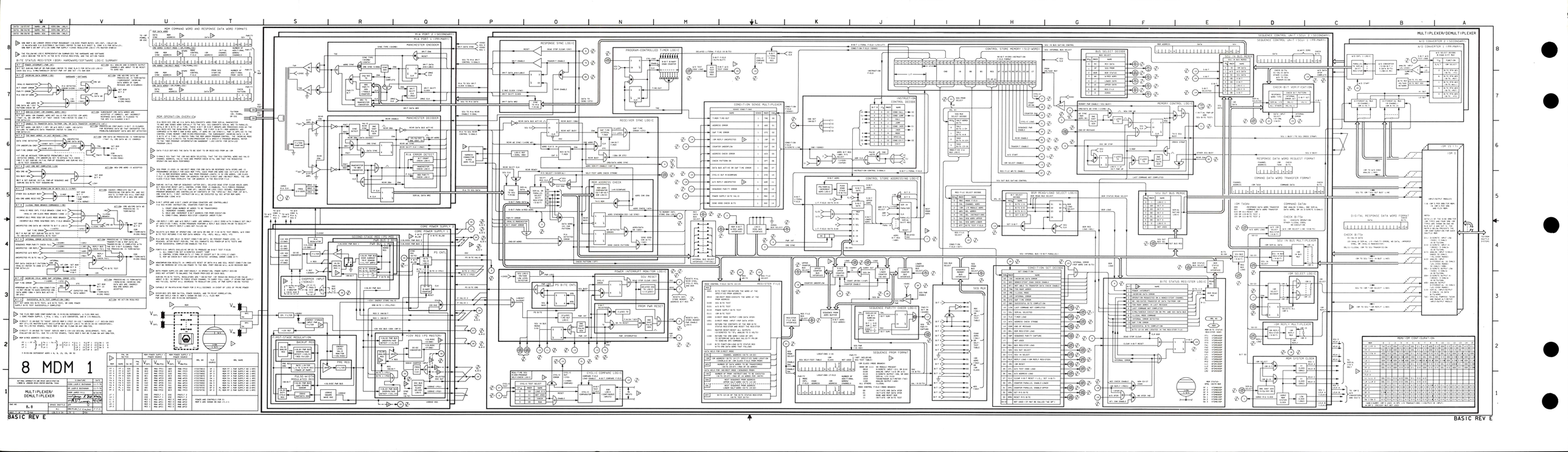
1. POWER TO THIS BUS IS PROVIDED BY V_{MNA} OR V_{MNB} SELECTED VIA A SWITCH (S25) ON PANEL R1
2. LOSS OF POWER TO MEC 1 RESULTS IN LOSS OF POWER SUPPLY A OF MDM LL 01, MDM LL 02, MDM LR 01, AND MDM LR 02
3. D-DIODES FOR GPC 2 AND GPC 5 ARE IN FPC 2
4. D-DIODES FOR GPC 5 ARE IN FPC 3
5. D-DIODES FOR GPC 1 AND GPC 4 ARE IN FPC 1
6. MDM FA 3 DOES NOT CURRENTLY EXIST

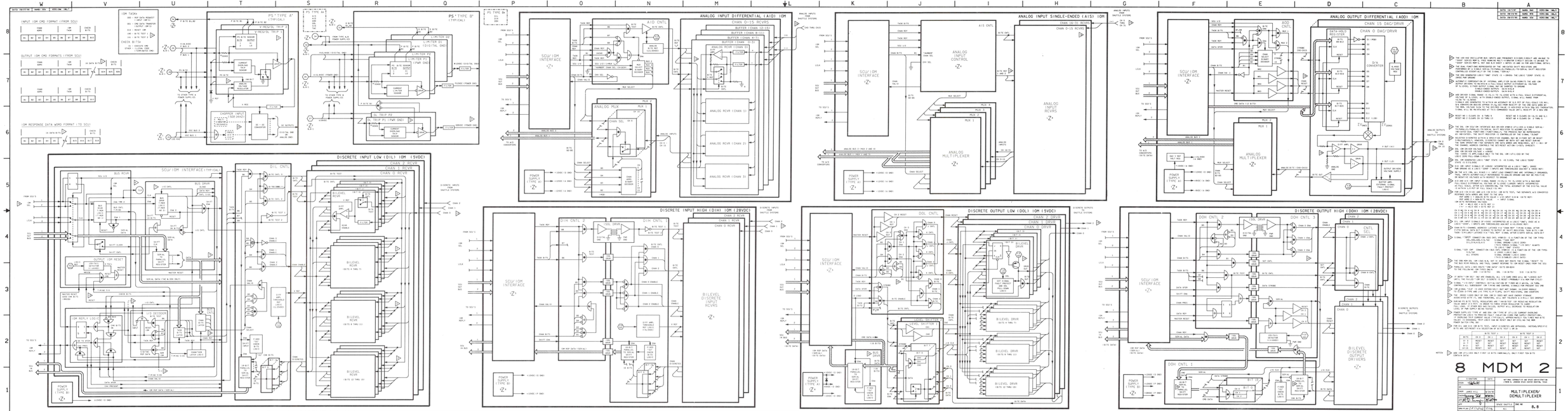
NOTES:

1. CAUTION:
   POWER LOSS DRAWINGS SHOULD NOT BE USED FOR SUBSYSTEM TROUBLESHOOTING OR RECONFIGURATION. FOR DETAILS OF SWITCH WIRING, REFERENCE APPROPRIATE SUBSYSTEM DRAWING
2. THIS IS A MULTI-STAGE DRAWING. TRACING A FUSE OF DPS EQUIPMENT WILL ONLY SHOW THE FIRST STAGE OF THE DPS ELECTRICAL POWER BUSSES AFFECTED. TO TRACE AFFECTED S/S & SWITCH CONTROLLING THOSE BUSSES, ESSENTIAL BUS WILL APPEAR WITH EACH CONTACT
3. TELEMETRY BEFORE THE MPC IS SHOWN WITH ASSOCIATED ESSENTIAL BUS. TELEMETRY AFTER THE MPC IS SHOWN WITH ASSOCIATED MAIN BUS. A, B, OR REDSTONE IS BETWEEN THE TELEMETRY P-DIA DIFF AND THE OPERATIONAL MDM

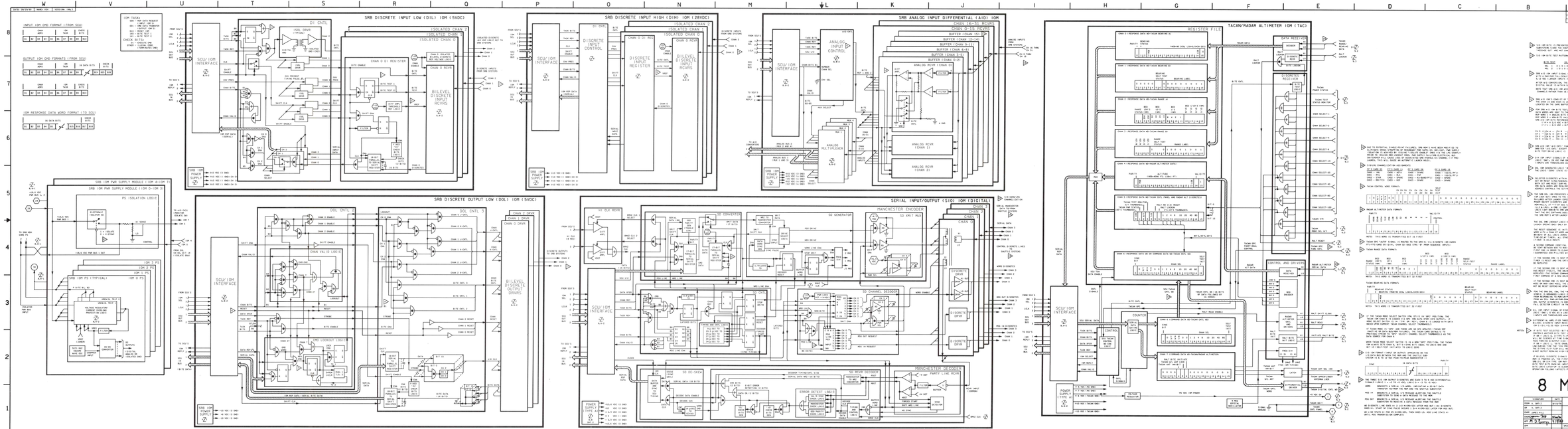

DATE: 08/24/87 NAME: MFG VERSION: VMS.1
DATE: 08/24/87 NAME: JPK VERSION: VMS.1
DATE: 08/17/87 NAME: LAR VERSION: BFS.1
DATE: 08/24/87 NAME: MFG VERSION: VMS.1
GENERAL PURPOSE COMPUTER
POWER
ON
OFF
PRL ON
PRL OFF
FLTA 1
FLTA 2
FLTA 3
MPC 206
SPEC 206
CPU 1
CPU 2
CPU 3
CPU 4
CPU 5
BACKUP FLIGHT CONTROLLER PWR SUPPLY 1-4
BACKUP FLIGHT CONTROLLER PWR SUPPLY 2-5
BACKUP FLIGHT CONTROLLER PWR SUPPLY 3-6
BACKUP FLIGHT CONTROLLER PWR SUPPLY 1-6
BACKUP FLIGHT CONTROLLER PWR SUPPLY 2-6
IOP 1
IOP 2
IOP 3
IOP 4
IOP 5
C1/O2
ASE
ESS 1BC
ESS 2BA
ESS 3BA
ESS 3AB
PWR SUPPLY W/ SSC 1 OUTER OVEN ALL-MDC ELECTRONICS
SPEC SYSTEM BUS A POWER ON
SPEC SYSTEM BUS B POWER ON
HALT
TERMINATE
BACKUP
SELECT
SPEC STATUS
SPEC STATUS BUS A
SPEC STATUS BUS B
HALT ONLY
SEE DRAWING B.4 FOR TELEMETRY WIRING DETAILS
SPC STATUS CIRCUIT BREAKER IS 3A FOR OV-102
CAUTION: POWER LOSS DRAWINGS SHOULD NOT BE USED FOR SUBSYSTEM TROUBLESHOOTING OR RECONFIGURATION
ESS/3AB SUPPLIES POWER TO SPC OUTPUT SWITCHES BEGINNING WITH KEY 5 AND CONTACTING ON THRU OUTPUT SWITCH OF SPC 1
IMPORTANT: LOSS OF ESS BUS PWR TO SPC POWER ON, RESULTS IN PWR LOSS TO SPC MODE AND TERMINATE FUNCTION OF THE SPC OUTPUT SWITCH
NOTES:
7 DPS PWR 2
DPS ELECTRICAL POWER LOSS
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
SPACE SHUTTLE
DWG NO
8.7
SHEET 7 OF 7
BASIC REV E
BASIC REV E

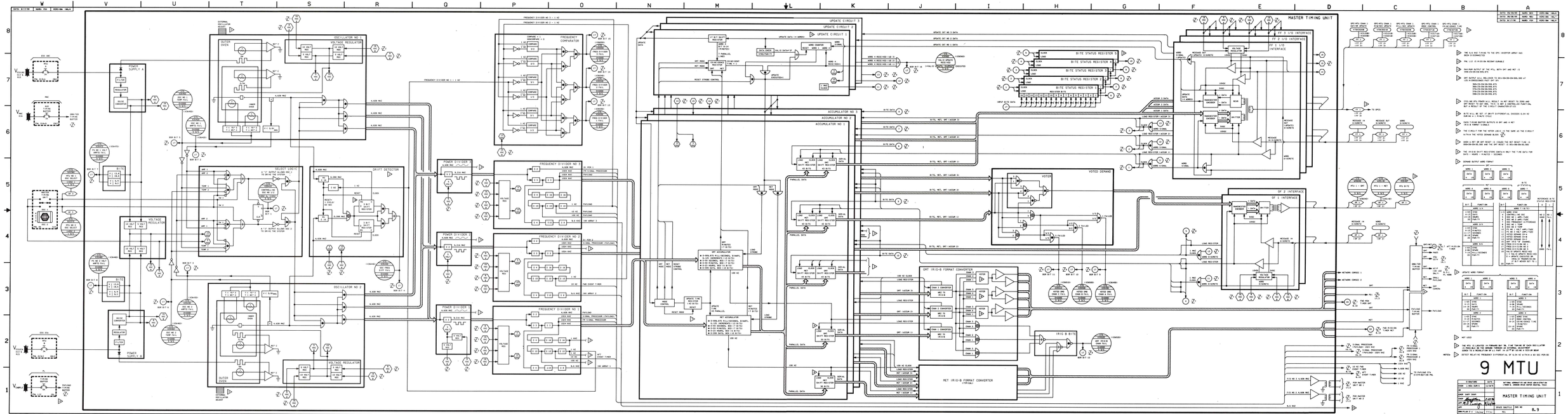

S R Q P O N M L K J I H G F E D C B A
8 7 6 5 4 3 2 1
DATE: 08/24/84 NAME: MFR VERSION: ORIG
DATE: 09/19/84 NAME: AP VERSION: APPLY
DATE: 09/24/84 NAME: MFR VERSION: FINAL
$V_{ENTLAB1}$
$V_{ENTLAB2}$
$V_{ENTLAB3}$
$V_{ENTLBC1}$
$V_{ENTLBC2}$
$V_{ENTLBC3}$
$V_{ENTLCA1}$
$V_{ENTLCA2}$
$V_{ENTLCA3}$
CONTROL BUS SUPPLIES POWER ONLY TO SRSS1/2/3 BFC-1 BACKUP FLIGHT CONTROLLER. ENABLE 1/2/3 S-BUS1/BS. SEE DRAWING 4L19 DPS POWER 1
FOR MAIN BUS POWER TO BFC MODULES
MAIN PWR 3 DOES NOT CURRENTLY EXIST
NOTES: 1. POWER LOSS DRAWINGS SHOULD NOT BE USED FOR SUBSYSTEM TROUBLESHOOTING OR INCORRECT OPERATION
7 DPS PWR 3
SIGNATURE DATE
ORIGINATOR
CHECK
CHIEF ENGINEER
APP
DRAFTSMAN
DPS ELECTRICAL POWER LOSS
SPACE SHUTTLE DWG NO 8.7
ALL
SCALE
SHEET OF
BASIC REV E

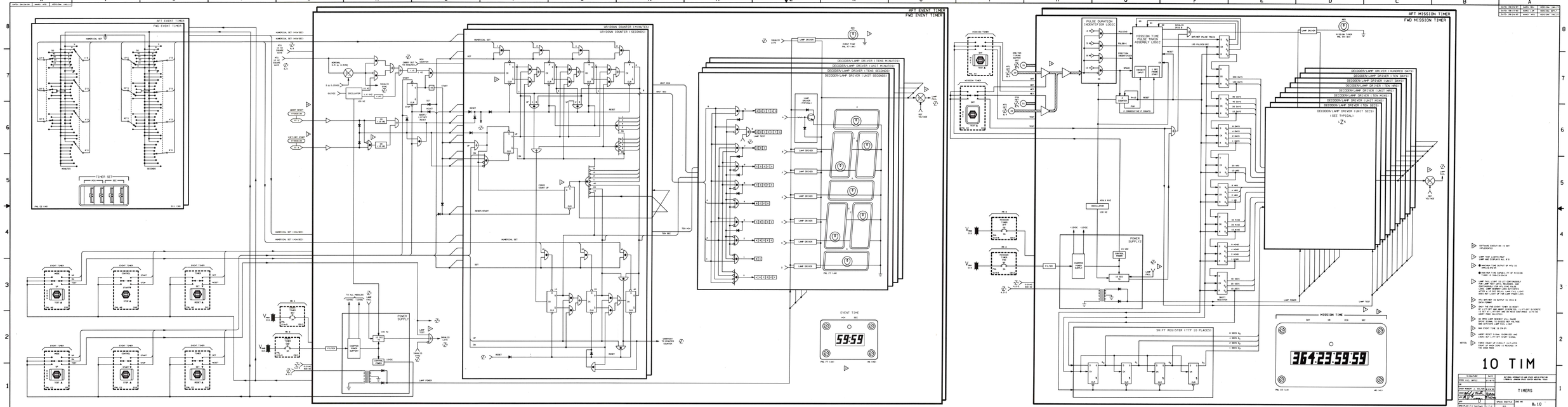

8 MDM 1
MULTIPLEXER/ DEMULTIPLEXER
MULTIPLEXER/DEMULTIPLEXER
BASIC REV E
BASIC REV E



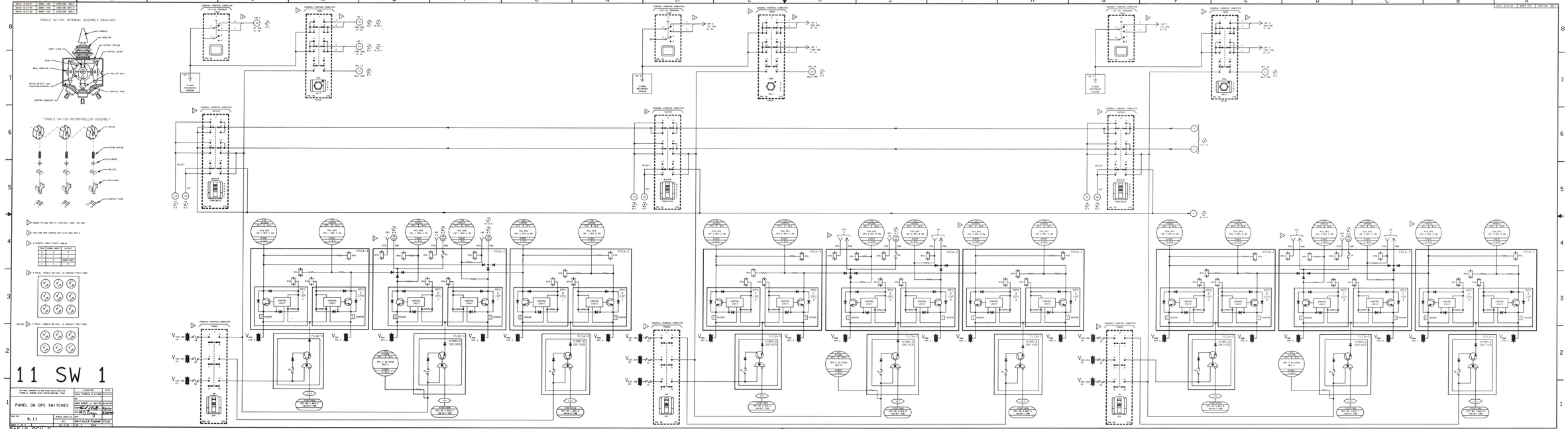
ANALOG INPUT DIFFERENTIAL (AID) IOM
ANALOG INPUT SINGLE-ENDED (AIS) IOM
ANALOG OUTPUT DIFFERENTIAL (AOD) IOM
DISCRETE INPUT LOW (DIL) IOM (5VDC)
DISCRETE INPUT HIGH (DIH) IOM (28VDC)
DISCRETE OUTPUT LOW (DOL) IOM (5VDC)
DISCRETE OUTPUT HIGH (DOH) IOM (28VDC)
SCU/IOM INTERFACE
ANALOG MULTIPLEXER
BILEVEL DISCRETE INPUT RCVRS
BILEVEL DISCRETE OUTPUT DRIVERS
8 MDM 2
MULTIPLEXER/ DEMULTIPLEXER
8.8
BASIC REV E

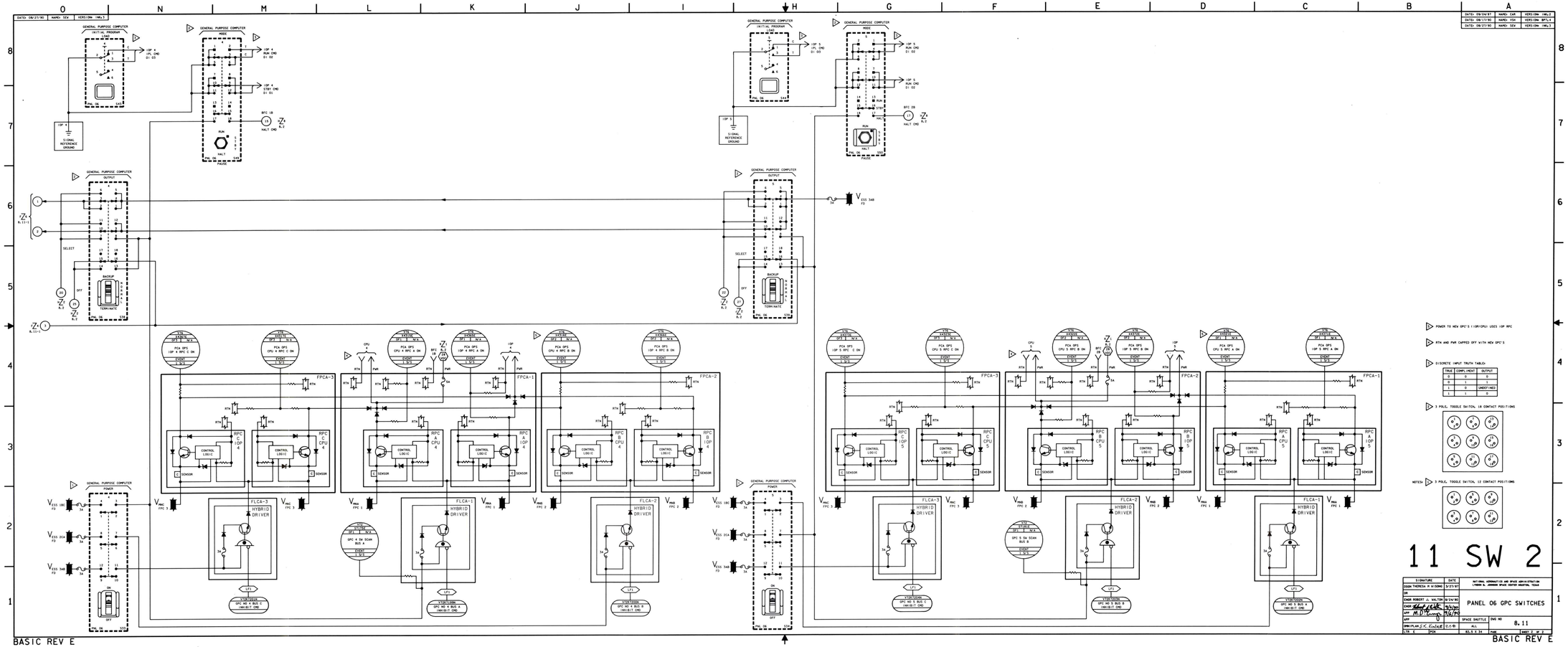

SRB DISCRETE INPUT LOW (DIL) IOM (5VDC)
SRB DISCRETE INPUT HIGH (DIH) IOM (28VDC)
SRB ANALOG INPUT DIFFERENTIAL (AID) IOM
SRB DISCRETE OUTPUT LOW (DOL) IOM (5VDC)
SERIAL INPUT/OUTPUT (SIO) IOM (DIGITAL)
TACAN/RADAR ALTIMETER IOM (TAC)
8 MDM 3
MULTIPLEXER/ DEMULTIPLEXER
BASIC REV E


MASTER TIMING UNIT
9 MTU
OSCILLATOR NO 1
OSCILLATOR NO 2
OUTER OVEN
VOLTAGE REGULATOR
POWER SUPPLY # 1
POWER SUPPLY # 2
SELECT LOGIC
SHIFT DETECTOR
POWER DIVIDER
FREQUENCY DIVIDER NO 1
FREQUENCY DIVIDER NO 2
FREQUENCY DIVIDER NO 3
FREQUENCY COMPARATOR
UPDATE CIRCUIT 1
UPDATE CIRCUIT 2
UPDATE CIRCUIT 3
ACCUMULATOR NO 1
ACCUMULATOR NO 2
ACCUMULATOR NO 3
VOTER
VOTED DEMAND
BITE STATUS REGISTER 1
BITE STATUS REGISTER 2
BITE STATUS REGISTER 3
BITE STATUS REGISTER 4
BITE STATUS REGISTER 5
FF 1 I/O INTERFACE
FF 2 I/O INTERFACE
FF 3 I/O INTERFACE
OF 1 INTERFACE
OF 2 INTERFACE
IRIG B BITE
MET IRIG-B FORMAT CONVERTER
GMT IRIG-B FORMAT CONVERTER
TO SPCS
TO PAYLOAD STA. DISTRIBUTION PNL
BASIC REV E


AFT EVENT TIMER
FWD EVENT TIMER
NUMERICAL SET
MINUTES
SECONDS
TIMER SET
UP/DOWN COUNTER (MINUTES)
UP/DOWN COUNTER (SECONDS)
DECODER/LAMP DRIVER (TENS MINUTES)
DECODER/LAMP DRIVER (UNIT MINUTES)
DECODER/LAMP DRIVER (TENS SECONDS)
DECODER/LAMP DRIVER (UNIT SECONDS)
LAMP DRIVER (TYPICAL)
EVENT TIME
MIN SEC
59:59
AFT MISSION TIMER
FWD MISSION TIMER
PULSE DURATION INDENTIFIER LOGIC
MISSION TIME PULSE TRAIN ASSEMBLY LOGIC
SHIFT REGISTER (TYP 10 PLACES)
DECODER/LAMP DRIVER (HUNDRED DAYS)
DECODER/LAMP DRIVER (TEN DAYS)
DECODER/LAMP DRIVER (UNIT DAYS)
DECODER/LAMP DRIVER (TEN HRS)
DECODER/LAMP DRIVER (UNIT HRS)
DECODER/LAMP DRIVER (TEN MINS)
DECODER/LAMP DRIVER (UNIT MINS)
DECODER/LAMP DRIVER (TEN SECS)
DECODER/LAMP DRIVER (UNIT SECS)
MISSION TIME
DAY HR MIN SEC
364:23:59:59
POWER SUPPLY
10 TIM
TIMERS
SPACE SHUTTLE
8.10

BASIC REV E


TOGGLE SWITCH INTERNAL ASSEMBLY DRAWINGS
TOGGLE SWITCH ROTOR/ROLLER ASSEMBLY
11 SW 1
PANEL 06 GPC SWITCHES
8.11
BASIC REV E
BASIC REV E

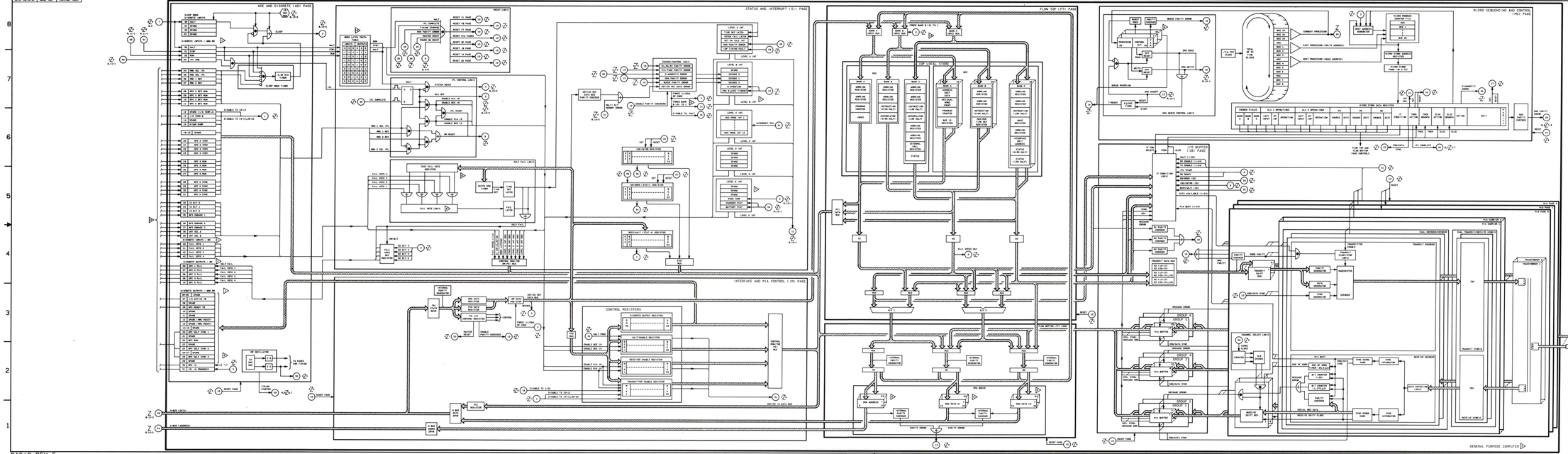


11 SW 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DSGN THERESA M WILSON	5/27/87	LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
ENGR ROBERT A. WALTON	6/24/87	PANEL O6 GPC SWITCHES
ENGR		
APP		SPACE SHUTTLE DWG NO 8.11
APP		
DRN/PLAN	REV	SIZE
CK	DCN	B3.1 X 3.1
		PAGE SHEET 1 OF 2

BASIC REV E

BASIC REV E

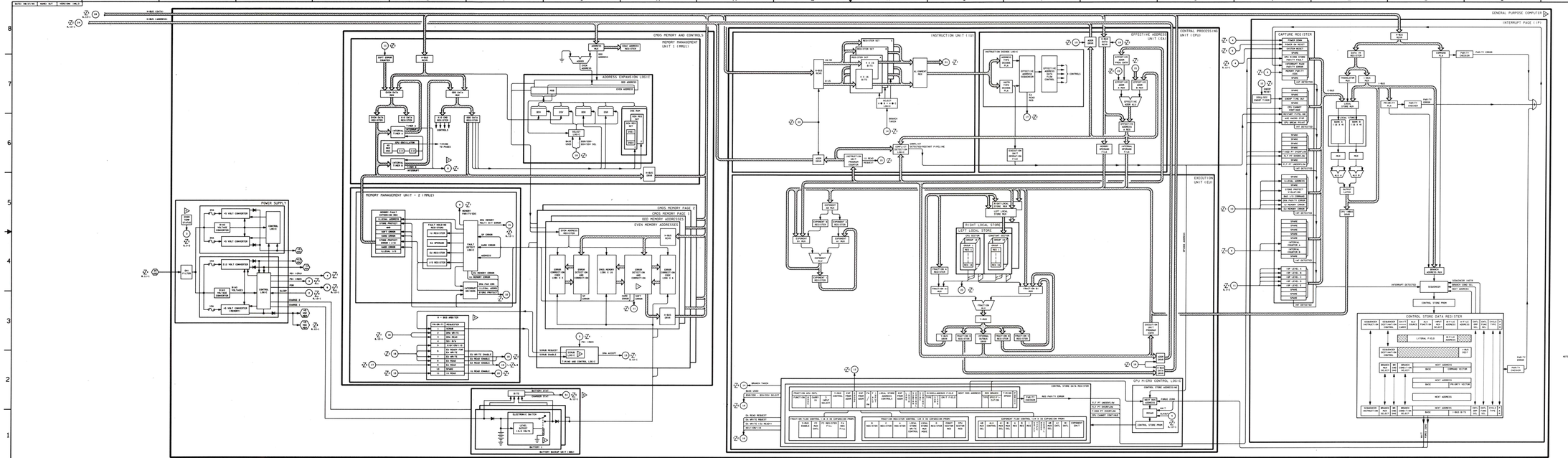


BASIC REV E

12 GPC 1

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION TRANSFER, SPACE SHUTTLE SYSTEM, TEXAS
DRAWN: R.D. SMITH	12/16/80	
CHECKED:		
DESIGN: R.D. SMITH		GENERAL PURPOSE COMPUTER (I/O FUNCTIONS)
APPROVED: R.D. Smith		
DRAWN:		SPACE SHUTTLE	DWG NO. 8.12
DESIGN:		
APPROVED:		
SCALE: 1/4		

BASIC REV E


GENERAL PURPOSE COMPUTER
INTERRUPT PAGE (IP)
CENTRAL PROCESSING UNIT (CPU)
EXECUTION UNIT (EX)
INSTRUCTION UNIT (IU)
EFFECTIVE ADDRESS UNIT (EA)
CMOS MEMORY AND CONTROLS
MEMORY MANAGEMENT UNIT 1 (MMU1)
MEMORY MANAGEMENT UNIT - 2 (MMU2)
CMOS MEMORY PAGE 0
CMOS MEMORY PAGE 1
ODD MEMORY ADDRESSES
EVEN MEMORY ADDRESSES
ADDRESS EXPANSION LOGIC
POWER SUPPLY
BATTERY BACKUP UNIT (BBU)
LEFT LOCAL STORE
RIGHT LOCAL STORE
CPU PI-CORD CONTROL LOGIC
CONTROL STORE DATA REGISTER
CAPTURE REGISTER
A - BUS ARBITER
12 GPC 2
GENERAL PURPOSE COMPUTER (GP1(01-5))
BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
8.1	COMPUTER INPUT/OUTPUT FUNCTION	ROCKWELL	VS70-720222	1-4	J	6/2/85	SCHEMATIC DIAGRAM - COMPUTER POWER AND CONTROLS SUBSYSTEM
			VS70-720239	1-5	B	9/15/88	COMPUTER SYNCHRONIZATION AND FAILS STATUS
			VS70-733262	1-5	H	6/16/85	D & C PANEL 06 OVERHEAD CONSOLE
			VS70-720242	1-8	B	7/21/80	SCHEMATIC DIAGRAM - COMPUTER DATA BUS SUBSYSTEM INTERFACE
8.2	BACKUP FLIGHT CONTROLLER	ROCKWELL	15180507	1	----	----	BACKUP FLIGHT CONTROLLER BOARD
			15180507	2	----	----	BACKUP FLIGHT CONTROLLER BOARD
			15180507	3	----	----	BACKUP FLIGHT CONTROLLER BOARD
			VS70-720269	1-6	E	9/16/88	SCHEMATIC DIAGRAM BACKUP FLIGHT CONTROL COMPUTER INTERFACE
			VS70-971102	115-120	D	9/85	INTEGRATED SYSTEM SCHEMATICS OV102 GNC & DPS
8.3-1	INPUT/OUTPUT PROCESSOR	IBM	6247559	RMB02-30		4/23/76	REDUNDANCY MANAGEMENT LOGIC DIAGRAM
			6247629	SM001-08		4/23/76	SINGER MIA INTERFACE LOGIC DIAGRAM
			6247639	SM101-06		4/23/76	SINGER MIA INTERFACE LOGIC DIAGRAM
			6247609	STA01-64		4/23/76	STATUS MONITOR LOGIC DIAGRAM
			6247619	STB01-38		4/23/76	STATUS MONITOR LOGIC DIAGRAM
			6246359	NA001-13		12/8/75	AUX. MEM. INTERFACE LOGIC DIAGRAM
			6246369	NA101-14		12/8/75	AUX. MEM. INTERFACE LOGIC DIAGRAM
			6247675	PRO 80-99		4/23/76	PROM LOGIC DIAGRAM
			6169569	ROO 01-09	A	4/23/76	ROS CONTROL LOGIC DIAGRAM
			6247219	R01 01-17	A	4/23/76	ROS CONTROL LOGIC DIAGRAM
			6169479	SLO 01-19	A	4/23/76	SELECTOR LOGIC DIAGRAM
			6169489	SLI 01-16	A	4/23/76	SELECTOR LOGIC DIAGRAM
			6247189	TSO 01-14		12/8/75	I/O INTERFACE LOGIC DIAGRAM
			6247199	TSI 01-16		12/8/75	I/O INTERFACE LOGIC DIAGRAM
			6246339	XAO 01-09		12/8/75	MEM INTERFACE LOGIC DIAGRAM
			6246349	XBO 01-09		12/8/75	MEM INTERFACE LOGIC DIAGRAM
			6247129	AGO 01-11	A	4/23/76	AGE LOGIC DIAGRAM
			6247139	AGI 01-10		12/8/75	AGE LOGIC DIAGRAM
			6247879	BPO 01-14	A	4/23/76	BACKPANEL LOGIC DIAGRAM
			6246008	1-52		4/23/76	INPUT/OUTPUT LOGIC DIAGRAMS
		RI	VS70-720211	1	C	3/17/76	MASS MEMORY AND COMPUTER INTERFACE
		RI	VS70-720231	1	B	3/12/76	COMPUTER SYNCHRONIZATION AND FAIL STATUS
		RI	VS70-720241	1	C	3/19/76	COMPUTER DATA BUS INTERFACE
		RI	VS70-720259	1	----	----	IOP/CPU INTERFACE
		RI	VS70-720269	1	E	9/16/88	BACKUP FLIGHT CONTROLLER COMPUTER INTERFACE
		RI	VS70-720512	1	B	5/77	INTERCOMPUTER DATA BUS ICB01-ICB-05
		IBM	6247649	BPO 02-74		4/23/76	ELECTRICAL CONNECTOR - IOP
			6247469	CCA 02-40		4/22/76	DMA CHANNEL CONTROL LOGIC DIAGRAM
			6247479	CCB 02-14		4/23/76	DMA CHANNEL CONTROL LOGIC DIAGRAM
			6247569	CIA 02-34		4/23/76	CPU IOP INTER CABLE LOGIC DIAGRAM
			6247579	CIB 02-28		4/23/76	CPU IOP INTER CABLE LOGIC DIAGRAM
			6247529	CMA 02-28		4/23/76	CONTROL MONITOR LOGIC DIAGRAM
			6247539	CMB 02-34		4/23/76	CONTROL MONITOR LOGIC DIAGRAM
			6247409	DFA 02-34		4/23/76	DATA FLOW LOGIC DIAGRAM
			6247419	DFB 02-28		4/23/76	DATA FLOW LOGIC DIAGRAM
			6247589	DIA 02-22		4/23/76	DISCRETE & AGE CABLE INTER LOGIC DIAGRAM
			6247599	DIB 02-50		4/23/76	DISCRETE & AGE CABLE INTER LOGIC DIAGRAM
			6247489	LSA 02-16		4/23/76	LOCAL STORE LOGIC DIAGRAM
			6247499	LSB 00-12		4/23/76	LOCAL STORE LOGIC DIAGRAM
			6247429	MDA 02-24		4/23/76	MICROSEQUENCING AND CONTROL LOGIC DIAGRAM
			6247439	MDB 02-26		4/23/76	MICROSEQUENCING AND CONTROL LOGIC DIAGRAM
			6247369	MJA 02-06		4/23/76	MICROSEQUENCING AND CONTROL LOGIC DIAGRAM
			6247379	MJB 02-08		4/23/76	MICROSEQUENCING AND CONTROL LOGIC DIAGRAM
			6247509	M1A 02-34		4/23/76	MIA BUFFER LOGIC DIAGRAM
			6247519	M1B 02-34		4/23/76	MIA BUFFER LOGIC DIAGRAM
			6247389	M2A 02-32		4/23/76	MIA BUFFER LOGIC DIAGRAM
			6247399	M2B 02-18		4/23/76	MIA BUFFER LOGIC DIAGRAM
			6247449	QUA 02-18		4/23/76	DMA QUEUE LOGIC DIAGRAM
			6247459	QUB 02-18		4/23/76	DMA QUEUE LOGIC DIAGRAM
			6247549	RMA 02-30		4/23/76	REDUNDANCY MANAGEMENT LOGIC DIAGRAM
		RI	VS70-720502	1	B	3/29/79	DATA PROCESSING AND SOFTWARE FUNCTIONAL INTERFACES
		RI	VS70-720531	1	C	4/6/76	DATA BUSES IP1 THRU IP5
		RI	VS70-720541	1	C	3/31/76	WIRING DP AND S DATA BUS BUB 01, BUB 05 THRU BUB 08
		RI	VS70-720552	1	E	9/30/80	DATA BUS LBB01 AND LBB02
		RI	VS70-720221	1	D	10-27-76	COMPUTER POWER AND CONTROLS

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
8.1	ENGR B. JACKSON			ENGR	
	ENGR Burt T Jackson	9-6-90		ENGR	
8.2	ENGR J. HILL			ENGR	
	ENGR Jana Hill	9-06-90		ENGR	
8.3	ENGR B. JACKSON			APP M. D. Ennis	9/6/90
	ENGR Burt T Jackson	9-6-90		APP	
	ENGR			OMNIPLAN	
	ENGR			TR E / PCN	

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
8.4-1	CENTRAL PROCESSING UNIT	IBM	6247289	CLO 01-14	A	4/23/76	CPU TIMING LOGIC DIAGRAM
			6247299	CLI 01-15	A	4/23/76	CPU TIMING LOGIC DIAGRAM
			6247269	CTO 01-14	A	4/23/76	CPU CONTROL LOGIC DIAGRAM
			6247279	CTI 01-16	A	4/23/76	CPU CONTROL LOGIC DIAGRAM
			6247209	HDO 01-22	A	4/23/76	HIGH DATA LOGIC DIAGRAM
			6247239	HDI 01-07	A	4/23/76	HIGH DATA LOGIC DIAGRAM
			6247102	1-62	A	4/23/76	CPU MICRO LOGIC DIAGRAM
		RI	VS70-720259	1	----	3/19/81	IOP/CPU INTERFACE
8.5	MASS MEMORY	ODETICS	4410394	1	----	7/76	INTERCONNECT DIAGRAM
			4410395	1	----	7/76	STANDBY ELECTRONICS POWER SUPPLY
			4410396	1	----	7/76	SERVO PREREGULATOR
			4410397	1	----	7/76	CONTROLLER READ/WRITE ELECTRONICS
			4410397	2	----	7/76	CONTROLLER READ/WRITE ELECTRONICS
			4410397	3	----	7/76	CONTROLLER READ/WRITE ELECTRONICS
			4410397	4	----	7/76	CONTROLLER READ/WRITE ELECTRONICS
			4410397	5	----	7/76	CONTROLLER READ/WRITE ELECTRONICS
			4410397	6	----	7/76	CONTROLLER READ/WRITE ELECTRONICS
			4410397	7	----	7/76	CONTROLLER READ/WRITE ELECTRONICS
			4410397	8	----	7/76	CONTROLLER READ/WRITE ELECTRONICS
			4410431	1	B	5/76	TACH PREAMP/DRIVER
			4410436	1	----	2/75	READ TRACK SELECT, PREAMPLIFIER
			4410446	1	B	6/76	WRITE HEAD DRIVER
			4410451	1	G	6/76	ANALOG READ ELECTRONICS
			4410481	1	A	5/76	CONTROLLER STATUS CONDITIONING/STANDBY POWER REGULATOR
			4410486	1	A	6/76	MIA ADAPTER
			4410516	1	B	7/76	INTERCONNECT AND POWER DISTRIBUTION ELECTRONICS
		ROCKWELL	VS70-720589	1	----	11/80	SCHEMATIC DIAGRAM DATA BUS MMU 1 & MMU 2
			VS70-720582	1	B	3/78	SCHEM DIA DATA BUS MMU 1 & 2
			VS70-720212	1-2	E	6/85	SCHEMATIC DIAGRAM MMU & COMPUTER INTERFACE
			VS70-720219	1-2	A	8/88	SCHEMATIC DIAGRAM MMU & COMPUTER INTERFACE

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
8.4	ENGR BURT JACKSON			ENGR	
	ENGR Burt Jackson	9-6-90		ENGR	
8.5	ENGR T. KEELER			ENGR	
	ENGR Terry W Keeler	6 Sept 90		ENGR	
	ENGR			APP M.D. Ewing	9/6/90
	ENGR			APP	
	ENGR			OMNIPLAN	
	ENGR			LTR E	PCN

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
8.6	MULTIFUNCTION CRT DISPLAY SYSTEM	IBM	6239700	1	K	11/85	KEYBOARD UNIT
			6239700	2	B	1/76	KEYBOARD UNIT
			6239700	3	C	3/76	KEYBOARD UNIT
			6239704	1	A	4/76	KEYBOARD UNIT ELECTRICAL SCHEMATIC
			6239704	2	A	4/76	KEYBOARD UNIT ELECTRICAL SCHEMATIC
			6239704	3	A	4/76	KEYBOARD UNIT ELECTRICAL SCHEMATIC
			6239704	4	—	6/75	KEYBOARD UNIT ELECTRICAL SCHEMATIC
			6239269	1-23	A	1/76	LOGIC DIAGRAM FOR A01 BACKPANEL
			6239289	1-15	—	6/75	LOGIC DIAGRAM FOR A07A, SMCM
			6239299	1-15	A	1/76	LOGIC DIAGRAM FOR A07B, SMCM
			6239329	1-22	A	1/76	LOGIC DIAGRAM FOR A03A, MIA ADAPTER
			6239339	1-20	A	1/76	LOGIC DIAGRAM FOR A03B INITIALIZES
			6239349	1-12	A	1/76	LOGIC DIAGRAM FOR A04A KEYBOARD ADAPTER A
			6239359	1-12	A	1/76	LOGIC DIAGRAM FOR A04B KEYBOARD ADAPTER B
			6239369	1-22	A	1/76	LOGIC DIAGRAM FOR A05A, SPO CPU
			6239379	1-23	A	1/76	LOGIC DIAGRAM FOR A05B, SPO CPU
			6239389	1-20	A	1/76	LOGIC DIAGRAM FOR A06A DRIVERS
			6239399	1-20	A	1/76	LOGIC DIAGRAM FOR A06B
			6239409	1-22	A	1/76	LOGIC DIAGRAM FOR A11A CHAR GEN
			6239419	1-27	A	1/76	LOGIC DIAGRAM FOR A11B POSITION & TYPE
			6239429	1-22	A	1/76	LOGIC DIAGRAM FOR A12A, REQ & VIDEO
			6239439	1-20	A	1/76	LOGIC DIAGRAM FOR A12B TIMING & ADD
			6239449	1-20	A	1/76	LOGIC DIAGRAM FOR A13A CIRCLES & VECTORS
			6239459	1-22	A	1/76	LOGIC DIAGRAM FOR A13B MODE & ROTATION
			6239469	1-19	A	1/76	LOGIC DIAGRAM FOR A14A, TRANSLATE & STATUS
			6239479	1-5	A	1/76	LOGIC DIAGRAM FOR A14B, STATUS I/O
			6239489	1-26	A	1/76	LOGIC DIAGRAM FOR A15A, BIT WRAP
			6239499	1-14	—	6/75	LOGIC DIAGRAM
			6239509	1-6	A	1/76	LOGIC DIAGRAM FOR A17A
			6239519	1-5	—	6/75	LOGIC DIAGRAM FOR A17B
			6239529	1-5	—	6/75	LOGIC DIAGRAM FOR A18A
			6239539	1-5	—	6/75	LOGIC DIAGRAM FOR A18B
			6239549	1-6	—	6/75	LOGIC DIAGRAM FOR A19A
			6239559	1-6	—	6/75	LOGIC DIAGRAM FOR OUTPUT MUX
			6239569	1-5	A	5/75	CONNECTIONS X-Y DEFLECT
			6239579	1-5	A	5/75	CONNECTIONS OVERSCAN

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
8.6	ENGR G. ARAIZA			ENGR	
	ENGR Gloria Araiza	9/6/90		ENGR	
	ENGR			ENGR	
	ENGR			ENGR	
	ENGR			APP M. D. Zeminger	9/6/90
	ENGR			APP	
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
8.6	MULTIFUNCTION CRT DISPLAY SYSTEM	ROCKWELL	VS70-730109	1-7	D	8/85	SCHEMATICS DIAG - DISPLAY & CONTROLS
			VS70-720579	1-3	A	10/13/88	DP&S DATA BUSES
		NORDEN	1244-00031	1	F		ORBITER DISPLAY BIT CIRCUIT SCHEMATIC
			1244-00141	1	A	/75	ORBITER DISPLAY LVPS
			1244-00213	1	___	/75	VOLTAGE CONTROL REGULATOR & PHOSPHER PROTECTION
			1244-00239	1	B	/75	ORBITER DISPLAY UNIT VIDEO AMPLIFIER SCHEMATIC
			1244-00244	1	___	/75	ORBITER DISPLAY UNIT WIRING SCHEMATIC
			1244-00244	2	___	/75	ORBITER DISPLAY UNIT WIRING SCHEMATIC
			1244-00253	1	___	4/76	ORBITER DEFLECTION AMPLIFIER SCHEMATIC
8.7	DPS PWR 1	ROCKWELL	VS70-720209	1,2	B	4/87	SCHEMATIC DIAGRAM - DATA PROC & SOFTWARE, FLT CONT MDM PWR & CONT
			VS70-720219	1	B	11/88	SCHEMATIC DIAGRAM - MASS MEMORY & COMPUTER INTERFACE SUBSYSTEM
			VS70-720229	1,3	D	9/88	SCHEMATIC DIAGRAM - COMPUTER POWER AND CONTROLS SUBSYSTEM
			VS70-720269	1, 2, 5	E	9/88	SCHEMATIC DIAGRAM BACKUP FLT CONT COMPUTER INTERFACE
			VS70-730109	1,2	D	8/85	SCHEMATIC DIAGRAM - DISPLAYS AND CONTROLS
			VS70-730159	1	----	4/80	SCHEMATIC DIAGRAM - TIMERS SUBSYSTEM
			VS70-733519	1	A	9/84	SCHEMATIC DIAGRAM PANEL F6A5
			VS70-750139	2,3	M	12/87	SCHEMATIC DIAGRAM - MASTER TIMING UNIT
			VS70-750209	2,3	K	6/88	SCHEMATIC DIAGRAM - OI POWER AND CONTROL
			VS70-760503	9	B	4/88	SCHEMATIC DIAGRAM - EVCON SUBSYSTEM
			VS70-948099	6,7	A	10/87	INTEGRATED SCHEMATIC DRAWINGS - SOLID ROCKET BOOSTERS
8.7	DPS PWR 2		VS70-720229	1,3	D	8/88	SCHEMATIC DIAGRAM - COMPUTER POWER AND CONTROLS SUBSYSTEM
			VS70-720239	2	A	5/81	SCHEMATIC DIAGRAM - COMPUTER SYNCHRONIZATION AND FAIL STATUS
			VS70-720269	1, 2, 5	E	8/88	SCHEMATIC DIAGRAM - BACKUP FLT CONT COMPUTER INTERFACE
			VS70-750209	2, 3	K	6/88	SCHEMATIC DIAGRAM - OI POWER AND CONTROL
8.7	DPS PWR 3		VS70-720209	1,2	B	4/87	SCHEMATIC DIAGRAM - DATA PROC & SOFTWARE, FLT CONT MDM PWR & CONT
			VS70-720219	1	B	11/88	SCHEMATIC DIAGRAM - MASS MEMORY & COMPUTER INTERFACE SUBSYSTEM
			VS70-720229	1, 3	D	8/88	SCHEMATIC DIAGRAM - COMPUTER POWER AND CONTROLS SUBSYSTEM
			VS70-720269	1, 2, 5	E	8/88	SCHEMATIC DIAGRAM - BACKUP FLT CONT COMPUTER INTERFACE
			VS70-730109	1, 2	D	8/85	SCHEMATIC DIAGRAM - DISPLAYS AND CONTROLS
			VS70-760503	9	B	4/88	SCHEMATIC DIAGRAM - EVCON SUBSYSTEM

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
8.6	ENGR G. ARAIZA			ENGR	
	ENGR Gloria Araiza	9/6/90		ENGR	
8.7	ENGR R. WALTON			ENGR	
	ENGR Robert J Walton	9/6/90		ENGR	
	ENGR			APP M. D. Berry	9/6/90
	ENGR			APP	
	ENGR			OMNIPLAN	
	ENGR			LIR E PCN	

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE	
8.8	MULTIPLEXER/ DEMULTIPLEXER	ROCKWELL	VS70-720202	1-3	D	3/87	SCHEMATIC DIAGRAM - DATA PROCESSING & SOFTWARE, FLT CONT MDM POWER & CONTROL	
			VS70-720209	1-3	B	12/87	SCHEMATIC DIAGRAM - DATA PROCESSING & SOFTWARE, FLT CONT MDM POWER & CONTROL	
			VS72-948102	6-7,56-57	C/EO/ D15	6/87	INTEGRATED SYS SCHEMATIC SOLID ROCKET BOOSTER	
			VS72-948099	6-7,56-57	N/C/EO/ A12	10/87	INTEGRATED SYS SCHEMATIC SOLID ROCKET BOOSTER	
		SINGER/ KEARFOTT	Y214A367-01	1	A	4/75	SERIAL MIA	
			Y215A030-02	1	B	2/75	SMIA CONTROL / TIMING HYBRID	
			Y215A032-01	1-2	A	9/74	SMIA XMTR / RCVR HYBRID	
			Y215A193-01	1-4	—	1/75	SMIA LSI MICROCIRCUIT HYBRID	
		SPERRY	4027158-902	1-2	A	4/77	MDM MIA INTERFACE MODULE	SRB
			4027159-901	1-5	—	12/75	MDM SCU MODULE	SRB
			4027160-902	1-5	—	5/77	MDM IOM PWR SUPPLY MODULE	SRB
			4027161-901	1-2	—	12/75	MDM A/D CONVERTER MODULE	SRB
			4027162-901	1-7	—	12/75	MDM I/O MODULE (SRB AID)	SRB
			4027341-901	1-3	—	12/75	MDM I/O MODULE (SRB DIH)	SRB
			4027342-901	1-5	—	12/75	MDM I/O MODULE (SRB DIL)	SRB
			4027343-902	1-5	—	9/77	MDM I/O MODULE (SRB DOL)	SRB
			4028012-902	1-4	—	5/77	MDM CORE PWR SUPPLY	SRB
			4022684-901	1-20	A	3/76	MDM SCU MODULE	"5XXX" SERIES ①
			4022685-901	1-7	—	1/75	MDM CORE PWR SUPPLY	"5XXX" SERIES ①
			4022686-901	1-9	B	12/75	MDM A/D CONVERTER MODULE	"5XXX" SERIES ①
			4022687-901	1-8	A	9/76	MDM I/O MODULE (AID)	"5XXX" SERIES ①
			4022688-901	1-9	A	2/76	MDM I/O MODULE (AIS)	"5XXX" SERIES ①
			4022689-901	1-7	—	7/75	MDM I/O MODULE (DIL)	"5XXX" SERIES ①
			4022690-901	1-8	—	5/75	MDM I/O MODULE (DIH)	"5XXX" SERIES ①
			4022691-901	1-9	—	5/75	MDM I/O MODULE (DOL)	"5XXX" SERIES ①
			4022692-901	1-10	A	8/75	MDM I/O MODULE (DOH)	"5XXX" SERIES ①
			4022693-901	1-9	A	11/75	MDM I/O MODULE (AOD)	"5XXX" SERIES ①
			4022694-901	1-17	A	3/76	MDM I/O MODULE (SIO)	"5XXX" SERIES ①
			4022695-801	1-16	—	7/75	MDM I/O MODULE (TAC)	"5XXX" SERIES ①
			4022696-901	1-8	A	10/75	MDM MIA INTERFACE MODULE	"5XXX" SERIES ①
			4024876-913	1-7	—	7/75	MDM IOM PWR SUPPLY MODULE (IOM 0-7)	"5XXX" SERIES ①
			4024876-914	1-5	—	7/75	MDM IOM PWR SUPPLY MODULE (IOM 8-15)	"5XXX" SERIES ①

NOTES

① "5XXX" SERIES MDM'S DEVELOPED FOR ORBITER VEHICLE OV-102 (DDT&E MDM): DESIGN, DEVELOPMENT, TEST, AND EVALUATION VERSION. DUE TO LIMITED SPARES, THESE MDM'S MAY BE FLOWN ON ANY ORBITER VEHICLE.

DWG	SIGNATURE		DATE
8.8	ENGR JAMES HILL		
	ENGR James Hill		9-06-90
	ENGR		
	ENGR		
	APP M. D. Pinney		9/6/90
	APP		
	OMNIPLAN		
	LTR E	PCN	

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8.8	MULTIPLEXER/ DEMULTIPLEXER	SPERRY	4022684-902	1-20	—	5/80	MDM SCU MODULE	"6XXX" SERIES ②
			4022685-903	1-8	A	1/83	MDM CORE PWR SUPPLY	"6XXX" SERIES ②
			4022686-902	1-8	—	5/80	MDM A/D CONVERTER MODULE	"6XXX" SERIES ②
			4022687-902	1-8	—	5/80	MDM I/O MODULE (AID)	"6XXX" SERIES ②
			4022688-902	1-9	—	5/80	MDM I/O MODULE (AIS)	"6XXX" SERIES ②
			4022689-902	1-7	—	5/80	MDM I/O MODULE (DIL)	"6XXX" SERIES ②
			4022690-902	1-8	—	5/80	MDM I/O MODULE (DIH)	"6XXX" SERIES ②
			4022691-902	1-9	—	5/80	MDM I/O MODULE (DOL)	"6XXX" SERIES ②
			4022692-902	1-10	—	5/80	MDM I/O MODULE (DOH)	"6XXX" SERIES ②
			4022693-902	1-9	—	5/80	MDM I/O MODULE (AOD)	"6XXX" SERIES ②
			4022694-902	1-17	—	5/80	MDM I/O MODULE (SIO)	"6XXX" SERIES ②
			4022695-903	1-16	—	5/80	MDM I/O MODULE (TAC)	"6XXX" SERIES ②
			4022696-902	1-8	A	3/79	MDM MIA INTERFACE MODULE	"6XXX" SERIES ②
			4024876-951	1-7	—	4/80	FF MDM IOM PWR SUPPLY MODULE (IOM 0-7)	"6XXX" SERIES ②
			4024876-952	1-7	—	4/80	FF MDM IOM PWR SUPPLY MODULE (IOM 8-15)	"6XXX" SERIES ②
			4024876-953	1-6	—	4/80	FA MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-954	1-6	—	4/80	FA MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-955	1-5	—	4/80	OF1-3 MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-956	1-5	—	4/80	OF1-3 MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-957	1-5	—	4/80	OA MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-958	1-5	—	4/80	OA MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-959	1-5	—	4/80	OF4 MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-960	1-5	—	4/80	OF4 MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-961	1-6	—	4/80	LF/LA MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-962	1-6	—	4/80	LF/LA MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-963	1-7	—	4/80	PF MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②
			4024876-964	1-6	—	4/80	PF MDM IOM PWR SUPPLY MODULE	"6XXX" SERIES ②

NOTES

② "6XXX" SERIES MDM'S DEVELOPED FOR POST OV-102 ORBITERS (INCR III MDM): INCREMENT III VERSION. DUE TO LIMITED SPARES, THESE MDM'S MAY BE FLOWN ON ANY ORBITER VEHICLE.

DWG	SIGNATURE		DATE
8.8	ENGR JAMES HILL		
	ENGR James Hill		9-06-90
	ENGR		
	ENGR		
	APP M. D. Pinyer		9/6/90
	APP		
	OMNIPLAN		
	LTR E	PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 8-I	
ALL	PAGE 8.I-6	SHEET 6 OF 7

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
8.9	MASTER TIMING UNIT	ROCKWELL	VS70-750139		M	12/87	SCHEMATIC DIAGRAM MASTER TIMING UNIT
		WESTINGHOUSE	9RD5137	1-10	E	12/75	MISCELLANEOUS BOARD
			9RD4938	1-3	A	12/75	MOTHERBOARD CONNECTORS
			9RD4940	1	A	12/75	MTU POWER SUPPLY CHASSIS
			9RD4939	1	B	12/75	MTU POWER SUPPLY BOARD
			9RD5133	1-6	C	7/75	ACCUMULATOR BOARD
			9RD5135	1-9	H	12/75	UPDATE BOARD
			9RD5134	1-9	F	12/75	FREQUENCY DIVIDER BOARD
			9RD5136	1-12	F	12/75	VOTED DEMAND BOARD
8.10	TIMERS	CONRAC	7904607	1	A	2/76	EVENT TIMER INTERCONNECTION DIA
			7904586	1-3	D	11/75	LOGIC DIAGRAM, INTERNAL CIRCUIT HYBRID CONDITIONING
			7904630	1	A	2/76	SCHEMATIC DIAGRAM, POWER SUPPLY
			7904638	1-2	A	2/76	MISSION TIMER INTERCONNECTION DIAGRAM
			7904662	1-3	B	10/75	LOGIC DIAGRAM, INTERNAL CIRCUIT HYBRID CONDITIONING
			7904582	1-2	A	8/75	LOGIC DIAGRAM INTERNAL CIRCUIT HYBRID DIRECT CURRENT READOUT
8.11	PANEL 06 GPC SWITCHES	RI	ME452-0102	9 of 13	K	12/87	TOGGLE SWITCH 3 POLE
		RI	VS70-720229	1, 2, 3 of 4	D	8/24/88	SCHEMATIC DIAGRAM - COMPUTER PWR & CONTROLS SUBSYSTEM
		RI	VS70-720269	1, 5 of 6	D	4/11/83	SCHEMATIC DIAGRAM - BACKUP FLT CONT COMPUTER INTERFACE (SUBSYSTEM)
		RI	VS70-971099	146	N/C	EO/A12 5/8/87	COMPUTER POWER & CONTROLS GPC-1
				147			COMPUTER POWER & CONTROLS GPC-2
				148			COMPUTER POWER & CONTROLS GPC-3
				149			COMPUTER POWER & CONTROLS GPC-4
				150			COMPUTER POWER & CONTROLS GPC-5
8.12	TBD						

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
8.9	ENGR GARY SHAM			ENGR	
	ENGR [signature]	9-6-90		ENGR	
8.10	ENGR R. WALTON			ENGR	
	ENGR [signature]	9/6/90		ENGR	
8.11	ENGR R. WALTON			APP [signature]	9/6/90
	ENGR [signature]	9/6/90		APP	
	ENGR			OMNIPLAN	
	ENGR			LTR	PCN

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

VENDOR DRAWING REFERENCES

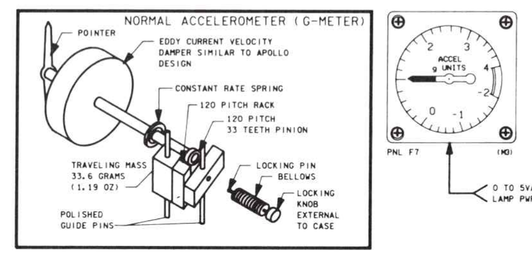
SPACE SHUTTLE | TBL NO 8-I
ALL

BASIC REV E

DATE: 09/14/87	NAME: JMB	VERSION: INK; 8
DATE: 08/21/90	NAME: LAM	VERSION: INK; 9
DATE: 09/04/90	NAME: SEW	VERSION: INK; 10

ADI SCALE SELECTION

OPS MAJOR MODE	SWITCH POSITION	FULL SCALE VALUE					
		ATTITUDE RATE			ATTITUDE ERROR		
		ROLL	PITCH	YAW	ROLL	PITCH	YAW
101-106 601 201, 202 801 301-303	 HIGH MED LOW	deg/sec 10 5 1	deg/sec 10 5 1	deg/sec 10 5 1	deg 10 5 1	deg 10 5 1	deg 10 5 1
304 602, 3 IPH=4, 6 WOWLON=0	 HIGH MED LOW	deg/sec 10 5 1	deg/sec 10 5 1	deg/sec 10 5 1	deg 25 25 10	deg 5 2 1	deg 2.5 2.5 2.5
305 602, 3 IPH≠4, 6 WOWLON=0	 HIGH MED LOW	deg/sec 10 5 1	deg/sec 10 5 1	deg/sec 10 5 1	deg 25 25 10	g 1.25 1.25 0.50	deg 2.5 2.5 2.5
305 603 WOWLON=1	 HIGH MED LOW	deg/sec 10 5 1	deg/sec 10 5 1	deg/sec 10 5 1	deg 20 5 1	deg/sec 10 5 1	deg 2.5 2.5 2.5



10. DDU DOES NOT REQUIRE COOLING

9. PWR SUPPLY 'D' FAILURE NOT DETECTED BY DDU GOOD DISCRETE ON TLM

8. DEFAULT POSITIONS OF SIMPLEX SWITCHES ARE DESIGNATED BY A DECAL '●'

7. SEE DWG 9.17 NOTE 4 FOR SENSE SWITCH APPLICATION

6. ALL FLAGS WILL BE VISIBLE WHEN POWER IS OFF

5. ERROR NEEDLES AND RATE POINTERS ARE SHOWN IN ZERO POSITION. NEEDLES ARE SPRING LOADED AND WILL BE OUTSIDE THE FIELD OF VIEW WHEN POWER IS OFF OR WHEN DRIVE TO STOW POSITION WITH A MINUS 7.25V ANALOG SIGNAL FROM THE DDU

4. THE DISPLAYS ARE DRIVEN BY SIGNALS FROM THE DATA BUS SELECTED BY THE DATA BUS SWITCHES AS FOLLOWS:
DATA BUS- 1, 2, 3, OR 4
HSI- 10 DATA WORDS
ADI- 14 DATA WORDS
AVVI- 6 DATA WORDS
AMI- 6 DATA WORDS
MIA 1 WILL BE SELECTED FOR INCONSISTANT DATA BUS SELECT INPUTS

3. THE SIGNAL FLOW IS FROM THE GPC'S TO DDU'S, THEN TO THE DISPLAYS. THE SYMBOL ⟨DDU⟩ IS USED HERE TO PROVIDE A CONVENIENT MEANS OF ASSOCIATING THE MML NUMBERS AND TLM WITH THEIR RESPECTIVE SIGNALS THAT ARE ACTUALLY GENERATED IN THE GPC'S

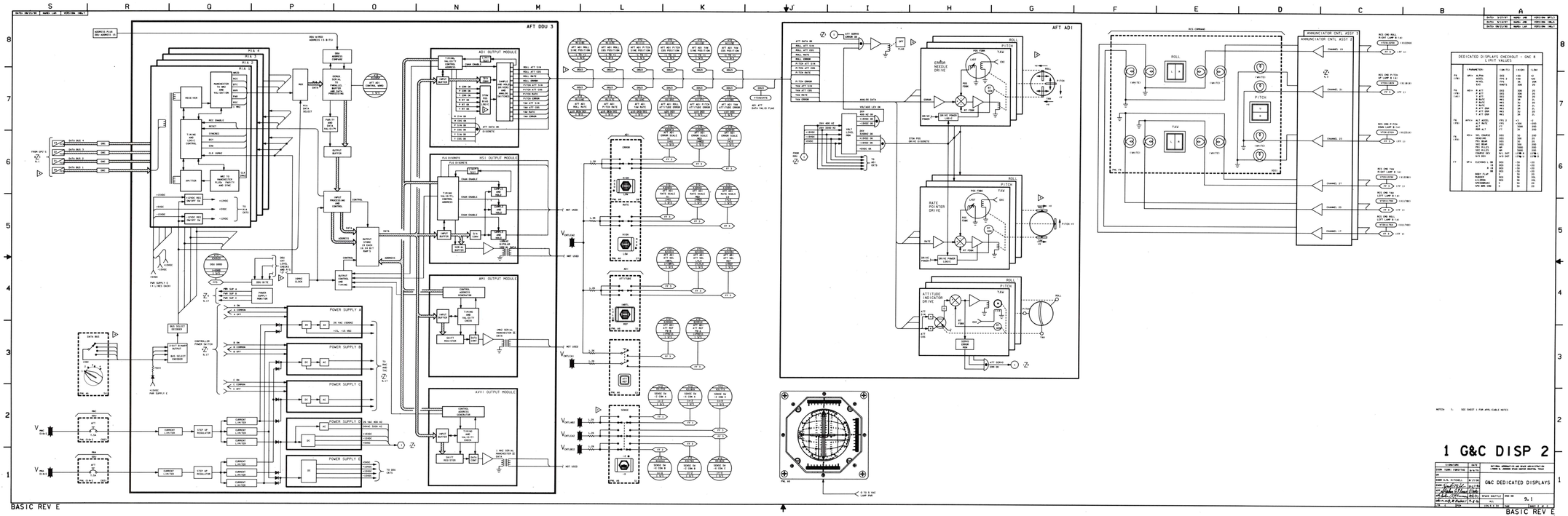
2. THE ALT ACCEL IS PRESENTED BY MEANS OF A MOVING POINTER DISPLAYED AGAINST A FIXED SCALE. THE OTHER THREE INDICATORS (ALT, RDR ALT AND ALT RATE) PRESENT THE DATA BY A MOVING TAPE SCALE BEHIND A FIXED LUBBER LINE

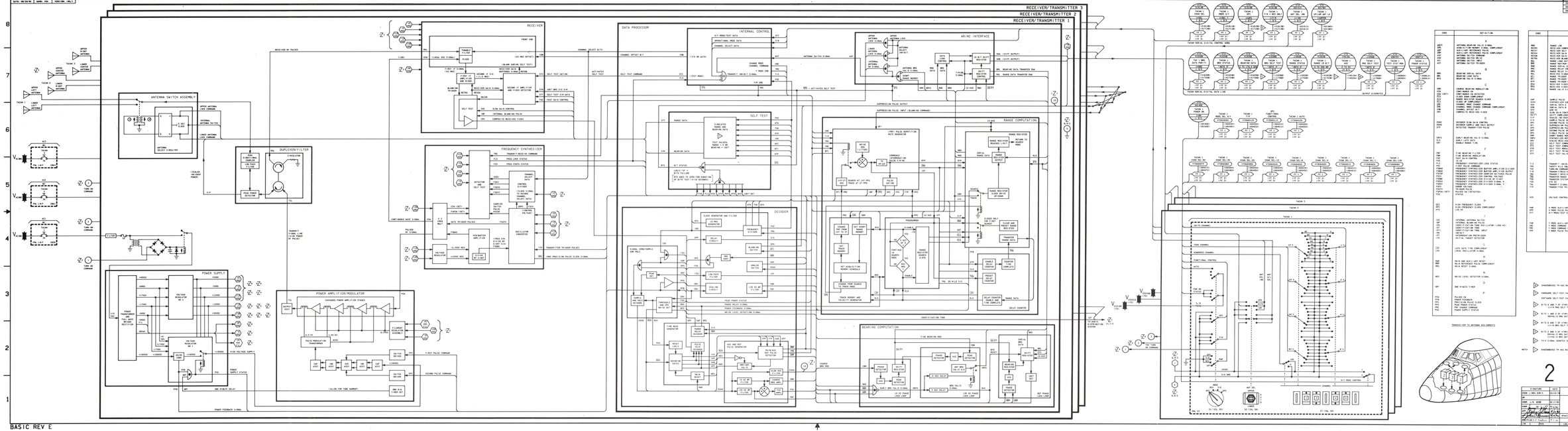
NOTES: 1. THE ANGLE OF ATTACK (ALPHA) IS PRESENTED BY MEANS OF A MOVING POINTER AND MOVING TAPE SCALE. THE POINTER INDICATES AN ANGLE OF ATTACK BETWEEN MINUS 3.33 AND PLUS 23.33 DEGREES. WHEN THE ANGLE OF ATTACK CONTINUES TO INCREASE BEYOND THE POINTER RANGE, THE TAPE SCALE WILL MOVE WHILE THE POINTER REMAINS FIXED. THE OTHER THREE INDICATORS (ACCEL, M/VEL AND EAS) PRESENT THE DATA BY A MOVING TAPE SCALE BEHIND A FIXED LUBBER LINE

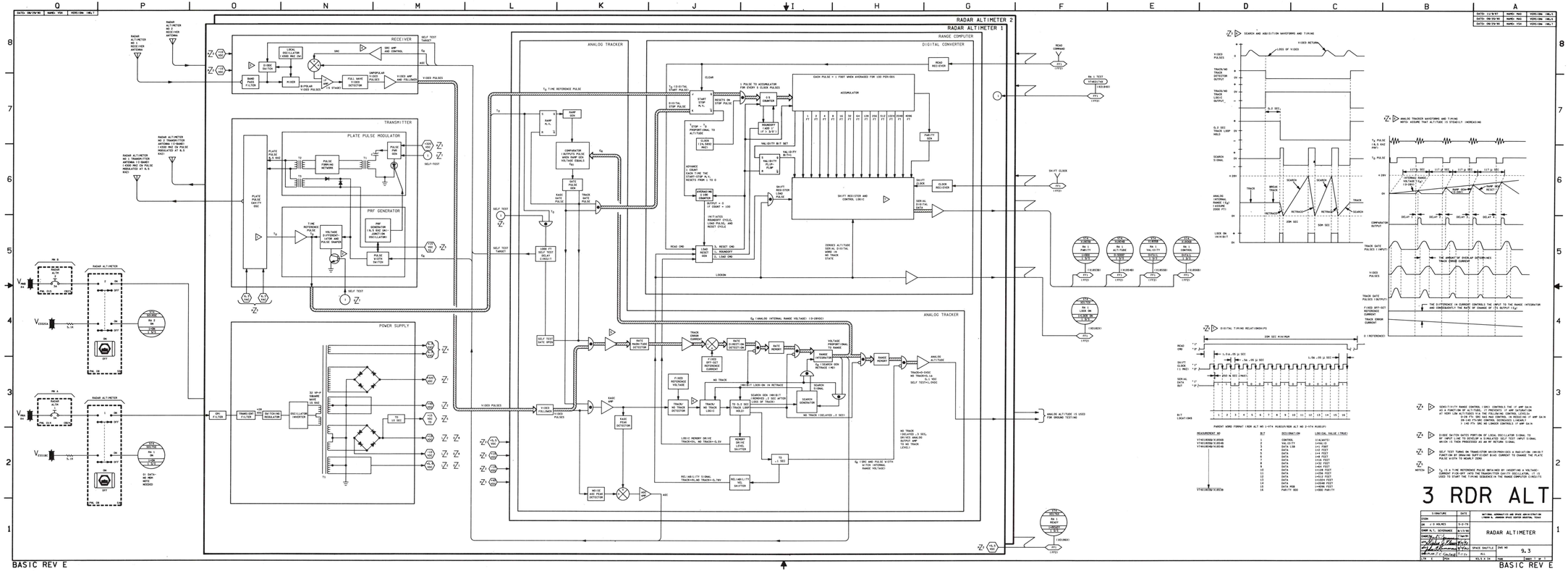
1 G&C DISP 1

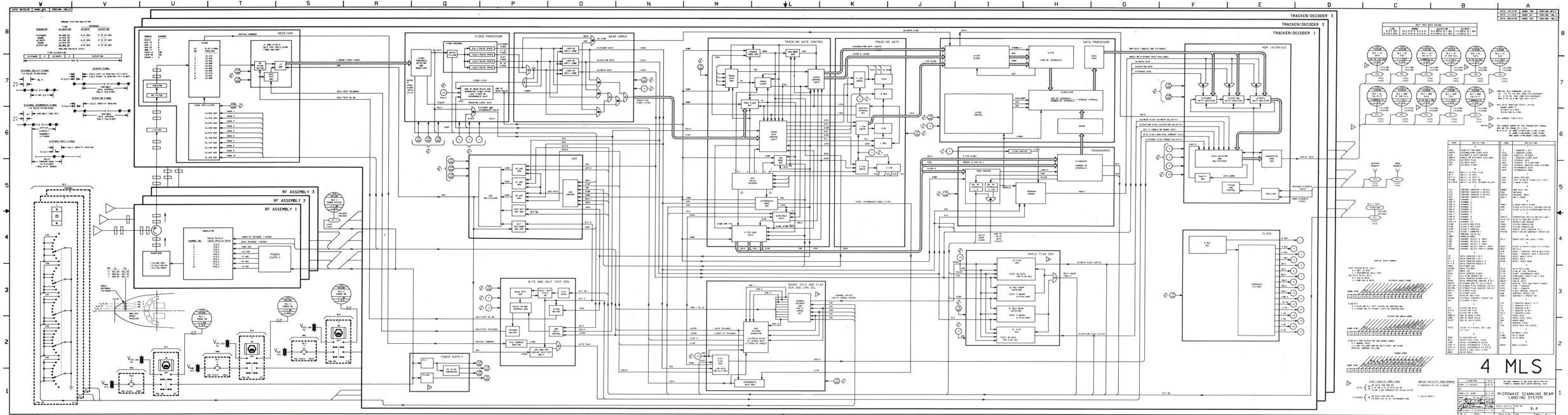
SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN LAURIE BUCHANAN	3/30/79	G&C DEDICATED DISPLAYS	
DR LAURIE M. BUCHANAN	8/14/79		
ENGR H. M. MITCHELL	8/17/90		
ENGR [signature]	8-27-90		
APP Stephen J Elsner	8/30/90		
APP John A Hamman	8/31/90	SPACE SHUTTLE	DWG NO 9.1
OMN: PLAN S K Kimbrell	9-11-90	ALL	
LTR E	PCN	126.5 X 34	PAGE / SHEET 1 OF 2

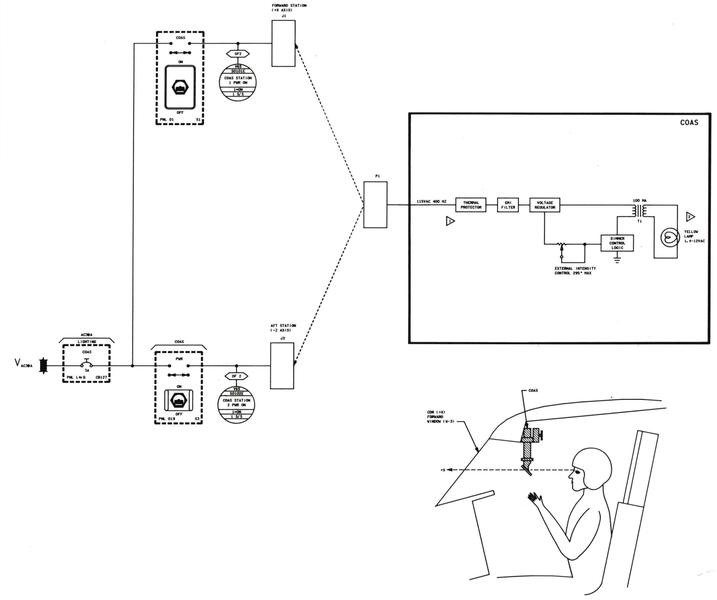
BASIC REV E

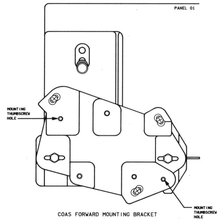

AFT DDU 3
AFT ADI
ADI OUTPUT MODULE
HSI OUTPUT MODULE
AMI OUTPUT MODULE
AVVI OUTPUT MODULE
POWER SUPPLY A
POWER SUPPLY B
POWER SUPPLY C
POWER SUPPLY D
POWER SUPPLY E
ROLL
PITCH
TAW
ERROR NEEDLE DRIVE
RATE POINTER DRIVE
ATTITUDE INDICATOR DRIVE
ANNUNCIATOR CNTL ASSY 7
ANNUNCIATOR CNTL ASSY 2
DEDICATED DISPLAYS CHECKOUT - GNC 8
LIMIT VALUES
1 G&C DISP 2
G&C DEDICATED DISPLAYS
9.1
BASIC REV E


RECEIVER/TRANSMITTER 3
RECEIVER/TRANSMITTER 2
RECEIVER/TRANSMITTER 1
ANTENNA SWITCH ASSEMBLY
DUPLEXER/FILTER
POWER SUPPLY
POWER AMPLIFIER/MODULATOR
RECEIVER
FREQUENCY SYNTHESIZER
DATA PROCESSOR
INTERNAL CONTROL
ARINC INTERFACE
SELF TEST
RANGE COMPUTATION
DECODER
BEARING COMPUTATION
TACAN 1
TACAN 2
TACAN 3
2 TAC
TACAN
BASIC REV E
9.2

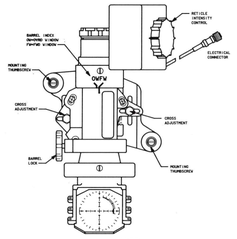

RADAR ALTIMETER 2
RADAR ALTIMETER 1
RECEIVER
TRANSMITTER
PLATE PULSE MODULATOR
PRF GENERATOR
POWER SUPPLY
ANALOG TRACKER
RANGE COMPUTER
DIGITAL CONVERTER
ANALOG TRACKER
3 RDR ALT
RADAR ALTIMETER
9.3
BASIC REV E
BASIC REV E


4 MLS
MICROWAVE SCANNING BEAM LANDING SYSTEM
RECEIVER
VIDEO PROCESSOR
BEAM DEMUX
TRACKING GATE CONTROL
TRACKING GATE
DATA PROCESSOR
PROM INTERFACE
RF ASSEMBLY 3
RF ASSEMBLY 2
RF ASSEMBLY 1
TRACKER/DECODER 3
TRACKER/DECODER 2
TRACKER/DECODER 1
BITE AND SELF TEST GEN
RANGE TRIG AND FLAG GEN AND DVM SEL
ANGLE FLAG GEN
CLOCK
POWER SUPPLY
BASIC REV E
BASIC REV E

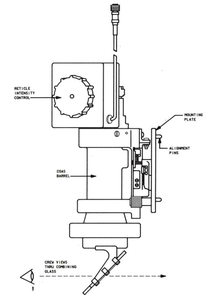




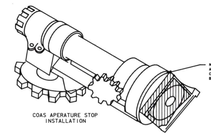
COAS FORWARD MOUNTING BRACKET



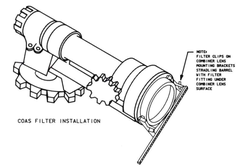
COAS (OPERATIONAL VIEW)



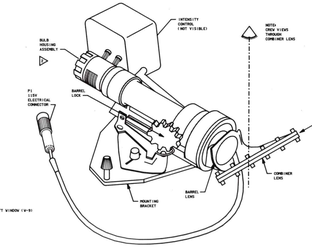
COAS (SIDE VIEW)



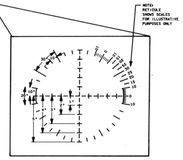
COAS APERATURE STOP INSTALLATION



COAS FILTER INSTALLATION



CREWMAN OPTICAL ALIGNMENT SIGHT



RETICAL PATTERN

COAS CONFIGURATION AND OPERATION

▷ CONTINGENCY PROCEDURE

- CAN REMOVE LIGHT 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
- COAS MOUNTS ON WINDOW (-Z AXIS) OR FORWARD WINDOW (+X AXIS) AND CAN BE STORED DURING MANEUVERS
- COAS RETAINS CAL/BRIGHTNESS WITH REMOVAL TO SAME WINDOW
- 4 SPARE BULBS ARE SUPPLIED IN CARRYING CASE

5 COAS

SIGNATURE	DATE
ITEM LINE	9/29/78
CHECK N.T. REFERENCE	9/27/80
CHECK	
CHECK	
APPR C.F.E.Hoffman	9/29

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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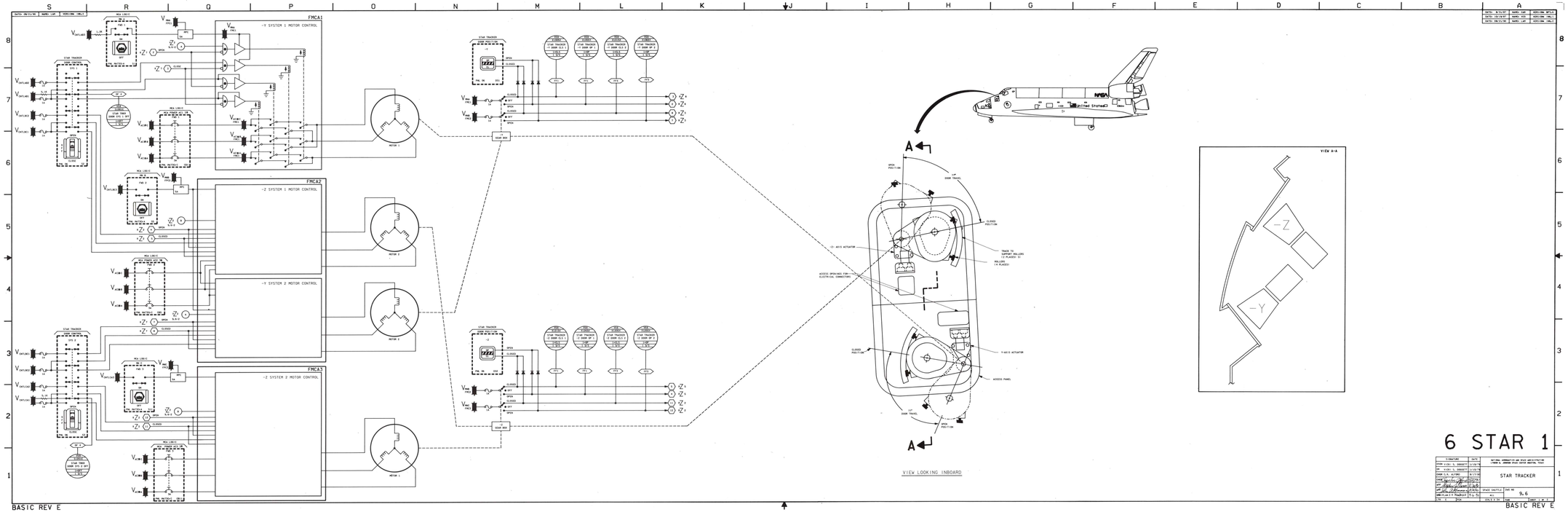
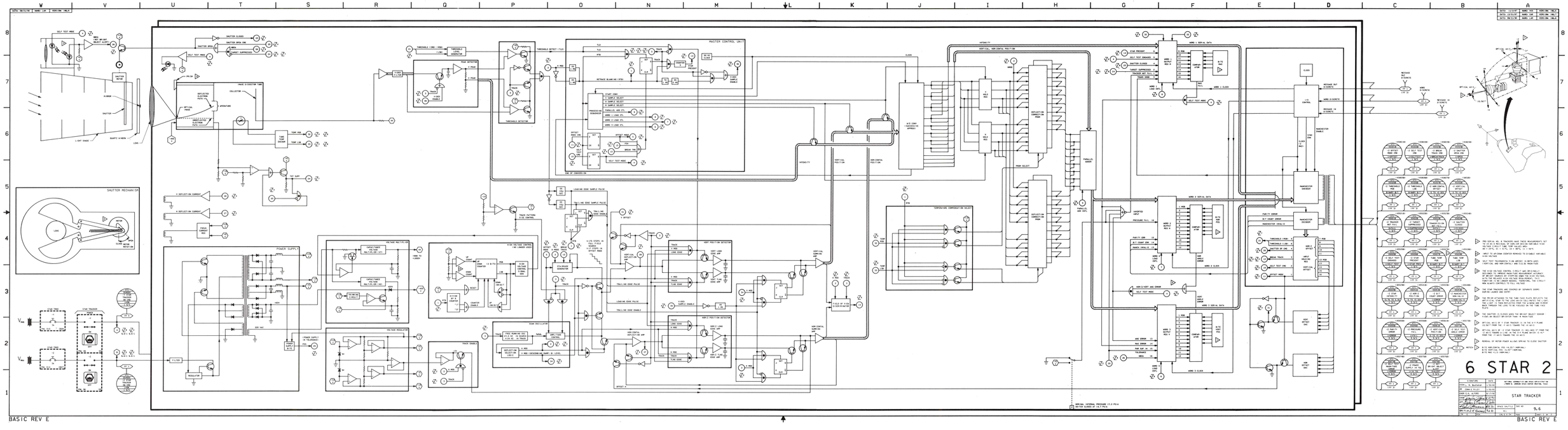
COAS

SPACE SHUTTLE — DWG NO 9.5

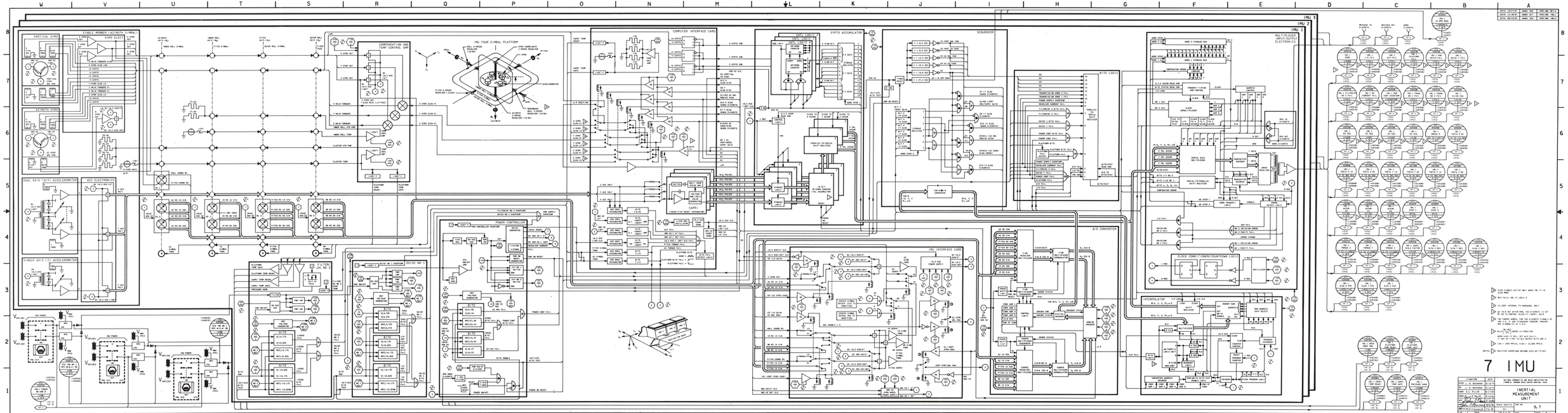
SCALE — SHEET 1 OF 1


FMCA1
-Y SYSTEM 1 MOTOR CONTROL
FMCA2
-Z SYSTEM 1 MOTOR CONTROL
-Y SYSTEM 2 MOTOR CONTROL
FMCA3
-Z SYSTEM 2 MOTOR CONTROL
STAR TRACKER
MCA LOGIC
MOTOR 1
MOTOR 2
MOTOR 3
VIEW LOOKING INBOARD
VIEW A-A
-Z
-Y
6 STAR 1
STAR TRACKER
SPACE SHUTTLE
9.6
BASIC REV E



BASIC REV E

BASIC REV E



DIGITAL OUTPUTS	SIGNAL BUS
DIGITAL INPUTS	SIGNAL BUS
DIGITAL OUTPUTS	SIGNAL BUS
DIGITAL INPUTS	SIGNAL BUS

ELEV GIMBAL ±17.75° ONLY WHEN IMU IS IN ELEV MODE	
BITE FAULT	
IF LOSS VOLTAGE TO HARDWARE, ONLY	
IF ON A REC AFTER PWR, THE DISCRETE IS SET BY ON TO CONTROL VELOCITY LIGHTS ONLY	
THE PARENT WORD, FOR THE DISCRETE SIGNALS OF THE SAME NAME, IS FORMED BY THE CIRCUIT	
$\Delta\theta = \frac{\Delta\theta_{IN}}{2^{14}}$ WHERE $\Delta\theta_{IN}$ = INCREMENT	
WORD HAS 14 BITS, 2'S COMP WITH BIT 1 OF WORD 3	
1 LSB = 1200 PPS/SEC TO 50K = 15,000 PPS/SEC	
REGISTER ASSIGNMENT NOW ACCORD (AS PITCH)	

7 IMU

Prepared by: R. Richmond	10-15-70	INITIAL RELEASE FOR BASIC REV E
Approved by: R. Richmond	10-15-70	
Approved by: [illegible]	10-15-70	
Approved by: [illegible]	10-15-70	
Approved by: [illegible]	10-15-70	
Approved by: [illegible]	10-15-70	
Approved by: [illegible]	10-15-70	
Approved by: [illegible]	10-15-70	

INERTIAL MEASUREMENT UNIT

SHEET 1 OF 1 | 9.7

15. ORBITER RGA LOCATIONS (ORBITER COORDINATES):

	X	Y	Z
RGA 1	1304.5	13.0	295.25
RGA 2	1304.5	21.0	295.25
RGA 3	1304.5	-21.0	295.25
RGA 4	1304.5	-13.0	295.25

14. THE SPIN MOTOR RUN DETECTOR (SMRD) CIRCUIT INDICATES THAT THE RATE GYRO IS SPINNING AT ITS SYNCHRONOUS SPEED OF 24000 RPM. THE SMRD CIRCUIT WILL INDICATE AN INVALID SIGNAL AT 98 PERCENT OR 102 PERCENT OF THE SPIN MOTOR SYNCHRONOUS SPEED. FOR POWER LOSS TO THE RATE GYRO, THE SMRD SIGNAL IS MAINTAINED FOR APPROXIMATELY 16 SECONDS BEFORE BEING SET INVALID

13. SRB RGA COMPENSATED RATES:

		LIMITS LOW/HIGH
SRGA 1 COMP PITCH RATE	V95R4260C	-20.48/20.44
SRGA 1 COMP YAW RATE	V95R4261C	-20.48/20.44
SRGA 2 COMP PITCH RATE	V95R4262C	-20.48/20.44
SRGA 2 COMP YAW RATE	V95R4263C	-20.48/20.44
SRGA 3 COMP PITCH RATE	V95R4270C	-20.48/20.44
SRGA 3 COMP YAW RATE	V95R4271C	-20.48/20.44
SRGA 4 COMP PITCH RATE	V95R4272C	-20.48/20.44
SRGA 4 COMP YAW RATE	V95R4273C	-20.48/20.44

12. ORBITER RGA COMPENSATED RATES:

		LIMITS LOW/HIGH
RGA 1 COMP ROLL RATE	V95R4001C	-40.96/40.88
RGA 2 COMP ROLL RATE	V95R4002C	-40.96/40.88
RGA 3 COMP ROLL RATE	V95R4003C	-40.96/40.88
RGA 4 COMP ROLL RATE	V95R4004C	-40.96/40.88
RGA 1 COMP PITCH RATE	V95R4031C	-20.48/20.44
RGA 2 COMP PITCH RATE	V95R4032C	-20.48/20.44
RGA 3 COMP PITCH RATE	V95R4033C	-20.48/20.44
RGA 4 COMP PITCH RATE	V95R4034C	-20.48/20.44
RGA 1 COMP YAW RATE	V95R4061C	-20.48/20.44
RGA 2 COMP YAW RATE	V95R4062C	-20.48/20.44
RGA 3 COMP YAW RATE	V95R4063C	-20.48/20.44
RGA 4 COMP YAW RATE	V95R4064C	-20.48/20.44

11. BMA COMPENSATED ACCELLERATION:

		LIMITS LOW/HIGH
AA 1 LATERAL	V95A4101C	-32.88/32.88
AA 2 LATERAL	V95A4102C	-32.88/32.88
AA 3 LATERAL	V95A4103C	-32.88/32.88
AA 4 LATERAL	V95A4104C	-32.88/32.88
AA 1 NORMAL	V95A4151C	-131.53/131.53
AA 2 NORMAL	V95A4152C	-131.53/131.53
AA 3 NORMAL	V95A4153C	-131.53/131.53
AA 4 NORMAL	V95A4154C	-131.53/131.53

10. AA WARMUP TIME: 5 MIN

9. RGA WARMUP TIME: 2 MIN

8. AA SELF TEST LIMITS:
(ZERO SENSED ACCEL)
LATERAL 16.1 ± 1.7 FPS 2
NORMAL 64.4 ± 6.7 FPS 2

7. RGA SELF TEST LIMITS:
(ZERO SENSED RATES)

	HIGH TEST	LOW TEST
ROLL	+20 ± 1.12	-20 ± 1.12 DEG/SEC
PITCH	+10 ± 0.56	-10 ± 0.56 DEG/SEC
YAW	+10 ± 0.56	-10 ± 0.56 DEG/SEC

6. AA TRACKING TEST TOL (I-LOADS):

	NORMAL TOL	LATERAL TOL
OPS 1,6	0.063 G	0.08 G
OPS 3	0.2 G	0.13 G
IMVS	0.00 G	0.03 G

5. RGA TRACKING TEST TOL (I-LOADS):

(| SEL RATE |) (LSF) + (CON) DEG/SEC

	(LSF)	(CON)
ORB RGA		
ROLL		
OPS 1,6	0.08	0.80
OPS 3	0.089	1.19
PITCH/YAW		
OPS 1,6	0.065	0.55/0.63
OPS 3	0.060	0.65
ROLL		
IMVS		0.595
PITCH/YAW		
IMVS		0.322
SRB RGA		
PITCH/YAW		
OPS 1	0.05	0.45
IMVS		0.325

4. TRQ CMDS TO SRGA 1 AND 2 NOT ON DOWNLIST IN G1

3. ΦA LEADS ΦB BY 90°

2. SMRD DISCRETES DRIVE THE CRT DISPLAY (SPEC 041/OPS 8) STAT COLUMN (SMRD=PWR OFF OR GYRO NOT IN SYNC, BLANK=PWR ON AND GYRO IN SYNC)

NOTES: 1. MOTOR NEUTRAL CURRENT PICKOFF RESISTOR IS PHYSICALLY LOCATED IN POWER SUPPLY. IT IS SHOWN HERE IN THE GYRO FOR SIMPLICITY

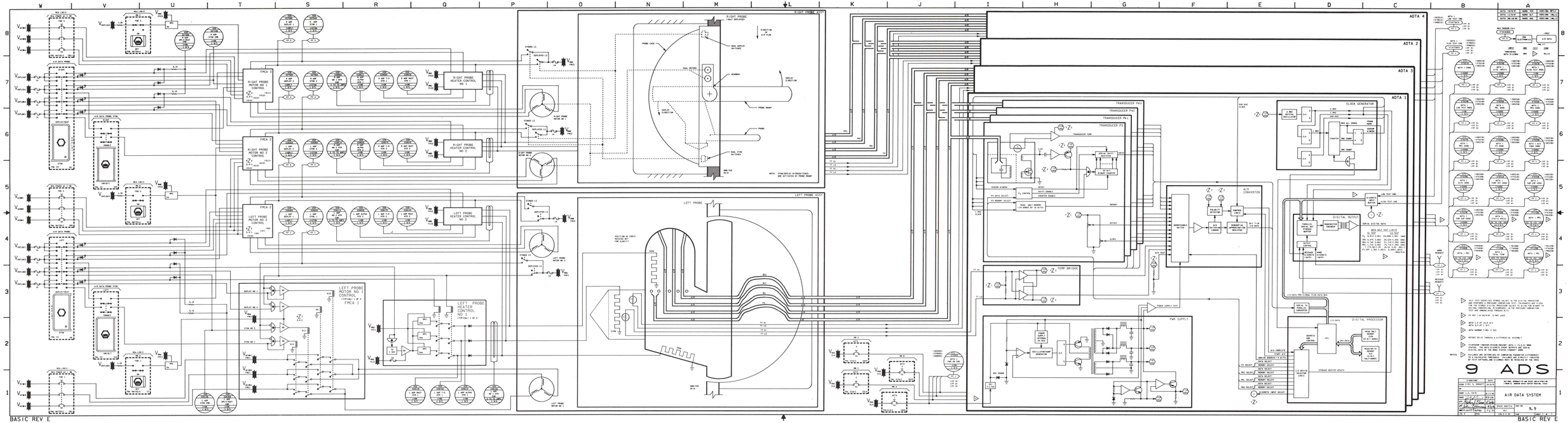
16. AA LOCATIONS (ORBITER COORDINATES):

	X	Y	Z
AA 1	382.8	-6.8	398.2
AA 2	381.7	5.6	406.4
AA 3	381.7	11.6	406.4
AA 4	382.8	-12.8	398.2

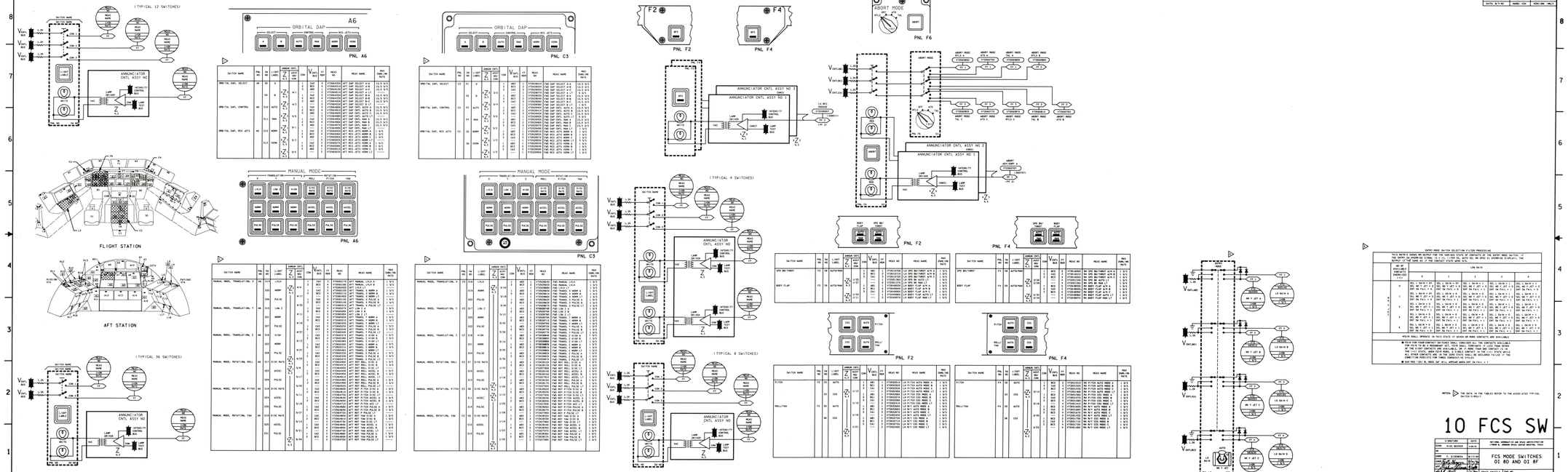
8 RGA/BMA

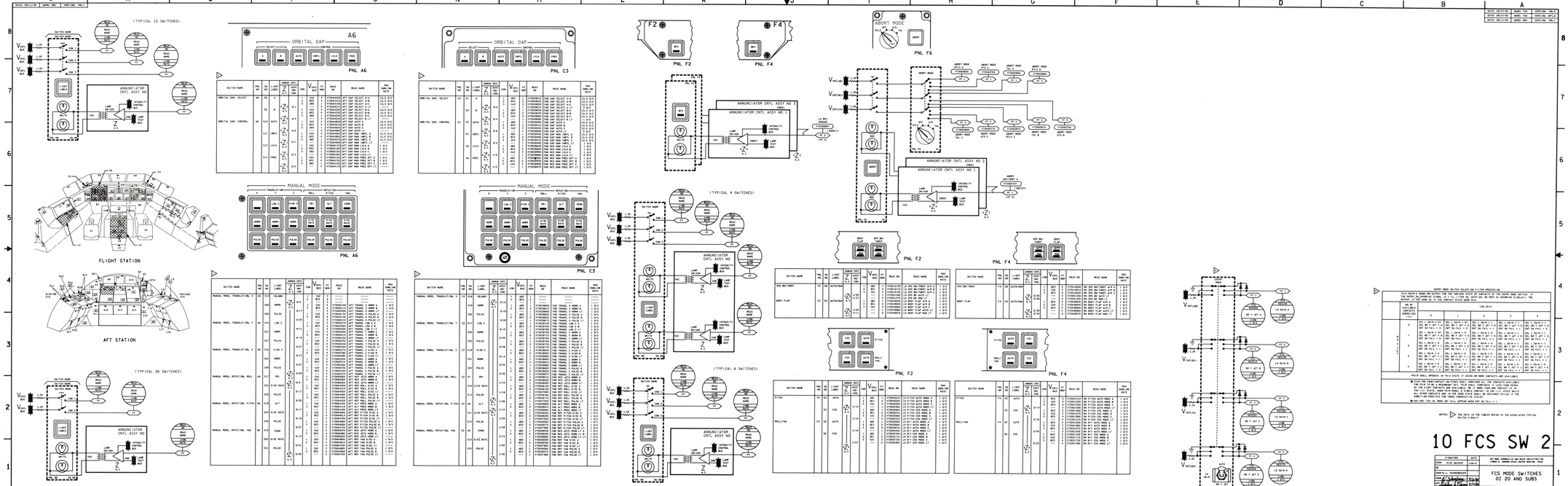
SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN LINDA DUMIS	10/26/79	
DR		RATE GYROS/BODY MOUNTED ACCELEROMETERS
ENGR F.E. TRLICA	8/17/90	
ENGR F.E. Trlica	8/27/90	
APP Stephen J. Elsner	8/30/90	
APP John A. Kamman	9/1/90	SPACE SHUTTLE ALL — DWG NO 9.8
OMNIPLAN S. J. Kimbrell	9-6-90	
LTR E — PCN		126.5 X 34 — PAGE — SHEET 1 OF 1

BASIC REV E



RIGHT PROBE ASSY
LEFT PROBE ASSY
ADTA 4
ADTA 2
ADTA 3
ADTA 1
RIGHT PROBE MOTOR NO 1 CONTROL
RIGHT PROBE HEATER CONTROL NO 1
RIGHT PROBE MOTOR NO 2 CONTROL
RIGHT PROBE HEATER CONTROL NO 2
LEFT PROBE MOTOR NO 2 CONTROL
LEFT PROBE HEATER CONTROL NO 2
LEFT PROBE MOTOR NO 1 CONTROL
LEFT PROBE HEATER CONTROL NO 1
TRANSDUCER PWD
TRANSDUCER PWC
TRANSDUCER PWL
TRANSDUCER PS
CLOCK GENERATOR
A/D CONVERTER
DIGITAL OUTPUT
TEMP BRIDGE
PWR SUPPLY
DIGITAL PROCESSOR
9 ADS
AIR DATA SYSTEM
9.9
BASIC REV E
BASIC REV E


(TYPICAL 12 SWITCHES)
ANNUNCIATOR CNTL ASSY NO
FLIGHT STATION
AFT STATION
(TYPICAL 36 SWITCHES)
ORBITAL DAP
A6
PNL A6
C3
PNL C3
MANUAL MODE
PNL F2
PNL F4
ABORT MODE
PNL F6
(TYPICAL 4 SWITCHES)
(TYPICAL 8 SWITCHES)
ANNUNCIATOR CNTL ASSY NO 3
ANNUNCIATOR CNTL ASSY NO 2
ANNUNCIATOR CNTL ASSY NO 1
10 FCS SW
FCS MODE SWITCHES
OI 8D AND OI 8F
9.10
BASIC REV E



DATE: 09/01/90	NAME: RDS	VERSION: ONLY
DATE: 09/01/90	NAME: FCH	VERSION: BFTL4
DATE: 09/01/90	NAME: MEL	VERSION: ONLY

ENTRY MODE SWITCH SELECTION FILTER PROCESSING

THIS MATRIX IS USED AS OUTPUT FOR THE VARIOUS STATE OF COMPUTER OF THE ENTRY MODE SWITCH. IF THE SWITCH IS IN A DISCRETE POSITION (NOT BETWEEN) ONLY ONE OF THE CONTACTS WILL BE CLOSED. IF THE SWITCH IS BETWEEN TWO DISCRETE POSITIONS, THE NEXT HIGHER OF THE TWO (AS IT HAS CONTACT STATE WHEN BOTH ARE CLOSED) WILL BE USED.

MY GP AVAILABLE ENERGIZED	LOW SWITCH					
	0	1	2	3	4	5
0	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 OFF SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 ON SEL 1 BUS A 2 OFF SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 ON SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 ON SEL 1 BUS A 2 ON SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 OFF SEL 1 BUS A 3 ON SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 ON SEL 1 BUS A 2 OFF SEL 1 BUS A 3 ON SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF
1	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 OFF SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 ON	SEL 1 BUS A 1 ON SEL 1 BUS A 2 OFF SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 ON	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 ON SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 ON	SEL 1 BUS A 1 ON SEL 1 BUS A 2 ON SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 ON	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 OFF SEL 1 BUS A 3 ON SEL 1 BUS A 4 OFF SEL 1 BUS A 5 ON	SEL 1 BUS A 1 ON SEL 1 BUS A 2 OFF SEL 1 BUS A 3 ON SEL 1 BUS A 4 OFF SEL 1 BUS A 5 ON
2	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 OFF SEL 1 BUS A 3 OFF SEL 1 BUS A 4 ON SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 ON SEL 1 BUS A 2 OFF SEL 1 BUS A 3 OFF SEL 1 BUS A 4 ON SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 ON SEL 1 BUS A 3 OFF SEL 1 BUS A 4 ON SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 ON SEL 1 BUS A 2 ON SEL 1 BUS A 3 OFF SEL 1 BUS A 4 ON SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 OFF SEL 1 BUS A 3 ON SEL 1 BUS A 4 ON SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 ON SEL 1 BUS A 2 OFF SEL 1 BUS A 3 ON SEL 1 BUS A 4 ON SEL 1 BUS A 5 OFF
3	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 OFF SEL 1 BUS A 3 OFF SEL 1 BUS A 4 ON SEL 1 BUS A 5 ON	SEL 1 BUS A 1 ON SEL 1 BUS A 2 OFF SEL 1 BUS A 3 OFF SEL 1 BUS A 4 ON SEL 1 BUS A 5 ON	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 ON SEL 1 BUS A 3 OFF SEL 1 BUS A 4 ON SEL 1 BUS A 5 ON	SEL 1 BUS A 1 ON SEL 1 BUS A 2 ON SEL 1 BUS A 3 OFF SEL 1 BUS A 4 ON SEL 1 BUS A 5 ON	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 OFF SEL 1 BUS A 3 ON SEL 1 BUS A 4 ON SEL 1 BUS A 5 ON	SEL 1 BUS A 1 ON SEL 1 BUS A 2 OFF SEL 1 BUS A 3 ON SEL 1 BUS A 4 ON SEL 1 BUS A 5 ON
4	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 OFF SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 ON SEL 1 BUS A 2 OFF SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 ON SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 ON SEL 1 BUS A 2 ON SEL 1 BUS A 3 OFF SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 OFF SEL 1 BUS A 2 OFF SEL 1 BUS A 3 ON SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF	SEL 1 BUS A 1 ON SEL 1 BUS A 2 OFF SEL 1 BUS A 3 ON SEL 1 BUS A 4 OFF SEL 1 BUS A 5 OFF

WHEN SHALL OPERATE IN THIS STATE IF SENSE OR MORE CONTACTS ARE AVAILABLE

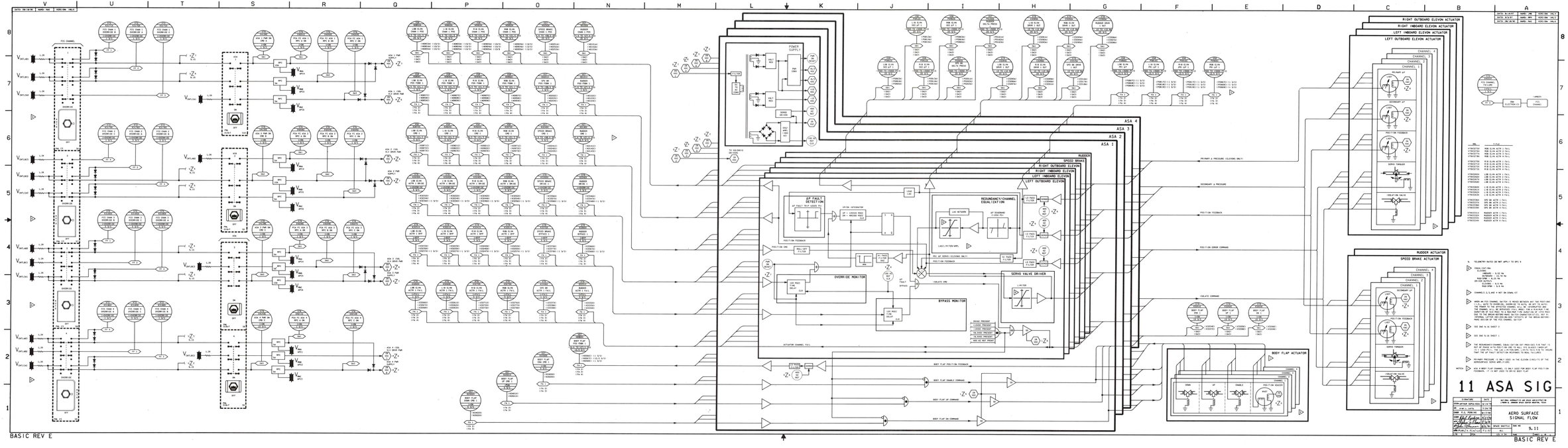
● FOUR OR ITEM CONTACT BUTTONS TYPICAL. WHEN THE BUTTON IS IN THE OPERATE AVAILABLE AND FOR 50 TO BE A PERMANENT SET, ITEM SHALL TERMINATE AT LEAST THREE SENSE CONTACTS. WHEN THE BUTTON IS IN THE RELEASED FAILED POSITION, AT LEAST TWO SENSE CONTACTS SHALL BE CLOSED. IF THE ITEM STATE SHALL BE RELEASED FAILED IF THE TWO CONTACTS ARE IN THE SAME STATE SHALL BE RELEASED FAILED IF THE TWO CONTACTS ARE IN THE SAME STATE.

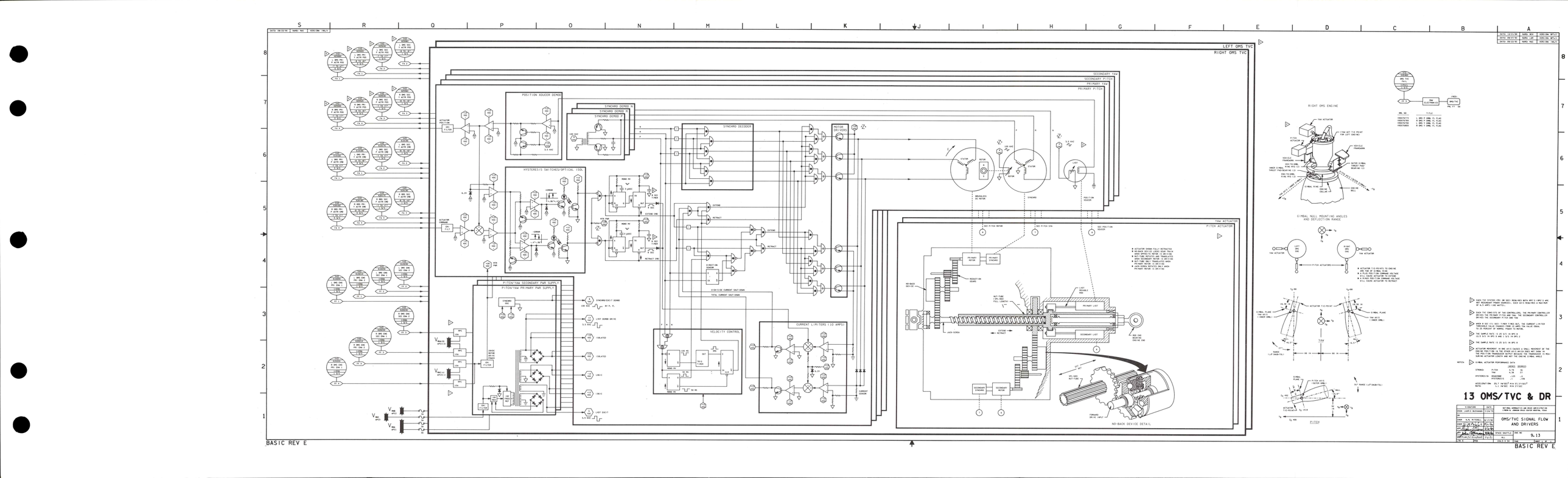
■ SAVE MODE / SEL BL MODE SW WILL APPEAR WHEN BOTH SW FAIL 1-2

NOTES: ▷ THE DATA IN THE TABLES REFER TO THE ASSOCIATED TYPICAL SWITCH CIRCUIT.

10 FCS SW 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ITEM: PLOT BOARD	CAGE NO.	LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEXAS
DR		
CHKR R. L. SCHOENHARDT		FCS MODE SWITCHES OI 20 AND SUBS
APPROVED		
APPROVED		
APPROVED	


11 ASA SIG
AERO SURFACE SIGNAL FLOW
9.11
BASIC REV E
BASIC REV E


LEFT OMS TVC
RIGHT OMS TVC
SECONDARY YAW
SECONDARY PITCH
PRIMARY YAW
PRIMARY PITCH
POSITION XDUCER DEMOD
SYNCHRO DEMOD #3
SYNCHRO DEMOD #2
SYNCHRO DEMOD #1
SYNCHRO DECODER
HYSTERESIS SWITCHES/OPTICAL ISOL
MOTOR DRIVERS
VELOCITY CONTROL
CURRENT LIMITERS (10 AMPS)
PITCH/YAW SECONDARY PWR SUPPLY
PITCH/YAW PRIMARY PWR SUPPLY
YAW ACTUATOR
PITCH ACTUATOR
JACK SCREW
NO-BACK DEVICE DETAIL
RIGHT OMS ENGINE
GIMBAL NULL MOUNTING ANGLES AND DEFLECTION RANGE
PITCH
13 OMS/TVC & DR
OMS/TVC SIGNAL FLOW AND DRIVERS
9.13
BASIC REV E

NOTES:

19. THIS TABLE PROVIDES ACTUATOR PISTON STROKE (SHOWN IN INCHES) CORRESPONDING GIMBAL DEFLECTION (IN DEGREES) AND DRIVER OUTPUT (MA) FOR CENTER OF STROKE AND BOTH POSITIVE AND NEGATIVE SOFTWARE LIMITS

18. THE SRB TVC POSITION TRANSDUCERS ARE POWERED BY THE A4 SIGNAL CONDITIONER IN THE SRB POWER DISTRIBUTION SYSTEM. THE A4 SIGNAL CONDITIONER IN TURN IS REDUNDANTLY POWERED BY MNA AND MNB ORBITER MAIN BUSES. HOWEVER THE TWO SRB MAIN BUSES A AND B RECEIVE POWER FROM MNA APC 1 AND MNB APC2 RESPECTIVELY (REF SSSH DWG 2.2 SHEET 2, F,G Z 2, 1)

17. THE DEVELOPMENT FLIGHT INSTRUMENTATION (DFI) IS NOT CURRENTLY BEING USED

16. RESERVED

15. ANGLE ROTATIONS ARE MEASURED FROM ORBITER BODY AXIS TO NULL POSITION

14. SSME PRIMARY SYSTEM DRIVES THE ACTUATOR UNTIL THE PRIMARY SYSTEM PRESSURE DROPS BELOW 1200 - 1500 PSI

13. MINIMUM ME GIMBAL RATE 10 DEG/SEC

12. HYD FLUID EXPANSION RATE
4 PER CENT/100 DEG F BY VOLUME

11. SRB LOCK VALVE HAS A BYPASS POSITION (NOT SHOWN ON DWG) THAT WHEN OPERATED BY GROUND CREWS, WILL INTERCONNECT ALL FOUR POWER VALVE AND ACTUATOR PORTS

10. CENTER, LEFT AND RIGHT ME'S ARE SOMETIMES CALLED ME'S 1, 2 AND 3 RESPECTIVELY

9. HYD SWITCHING VALVE WILL AUTOMATICALLY SWITCH TO THE SECONDARY POSITION WHEN THE PRIMARY PRESSURE DROPS TO LESS THAN 2050 PSIG ±150 PSIG AT ZERO FLOW

8. SRB TRANSIENT LOAD RELIEF MECH WILL ACTUATE AT HYD PRESSURE GREATER THAN 3600 PSID AND BYPASS FLOW WILL BE PROPORTIONAL TO THE DIFFERENTIAL PRESSURE ABOVE 3600 PSIG

7. ALL SPRING LOADED DEVICES ARE SHOWN IN THE DE-ENERGIZED AND UNPRESSURIZED POSITION. HYDRAULIC RETURN LINES ARE IDENTIFIED WITH AN 'R'. SOURCE PRESS IS ≈ 3000 PSIG

6. BYPASS VALVE SPOOL PRE-LOAD RETURN SPRING IS EQUAL TO 300 PSI

5. THE LOCK VALVE FOR THE SRB'S SHALL ACTUATE TO THE LOCKED POSITION WHEN SYSTEM PRESSURE IS 600 OR LESS. THE VALVE SHALL ACTUATE TO THE UNLOCKED POSITION WHEN SYSTEM PRESSURE IS GREATER THAN 1000 PSI

4. THE LOCK VALVE FOR THE ME'S SHALL ACTUATE TO THE LOCKED POSITION WHEN SYSTEM PRESSURE IS 600 PLUS 100, MINUS 0.0 PSID. THE VALVE SHALL ACTUATE TO THE UNLOCKED POSITION WHEN SYSTEM PRESSURE IS NO GREATER THAN 2000 PSIG

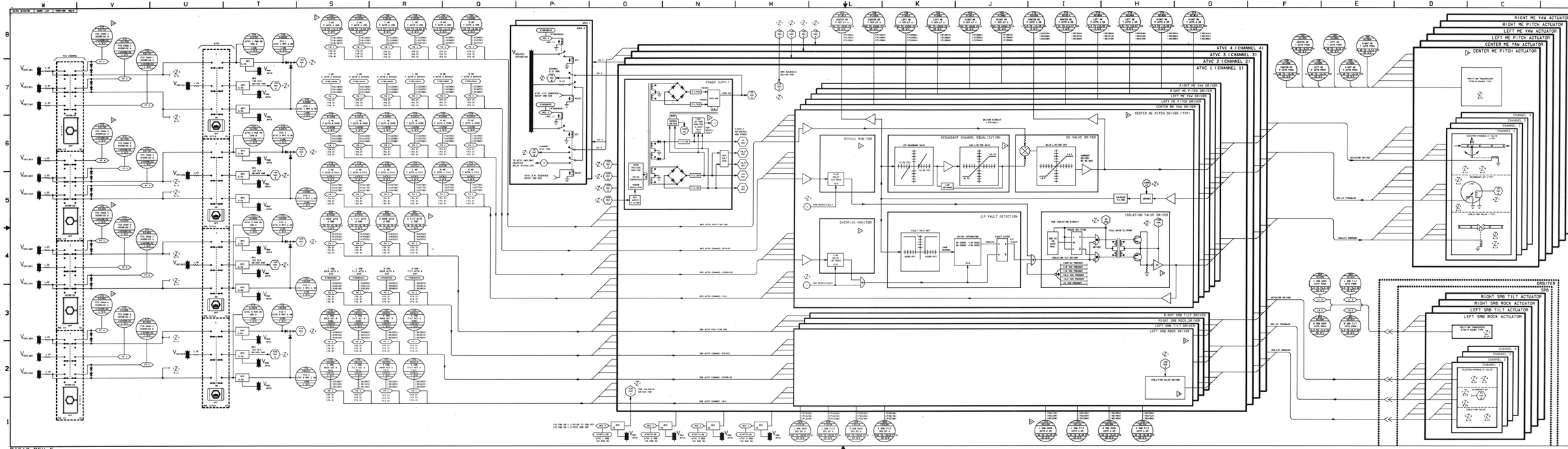
3. THE FORCE LIMITER SHALL LIMIT THE INTERNAL CYLINDER PRESSURE TO 4050 PSIG

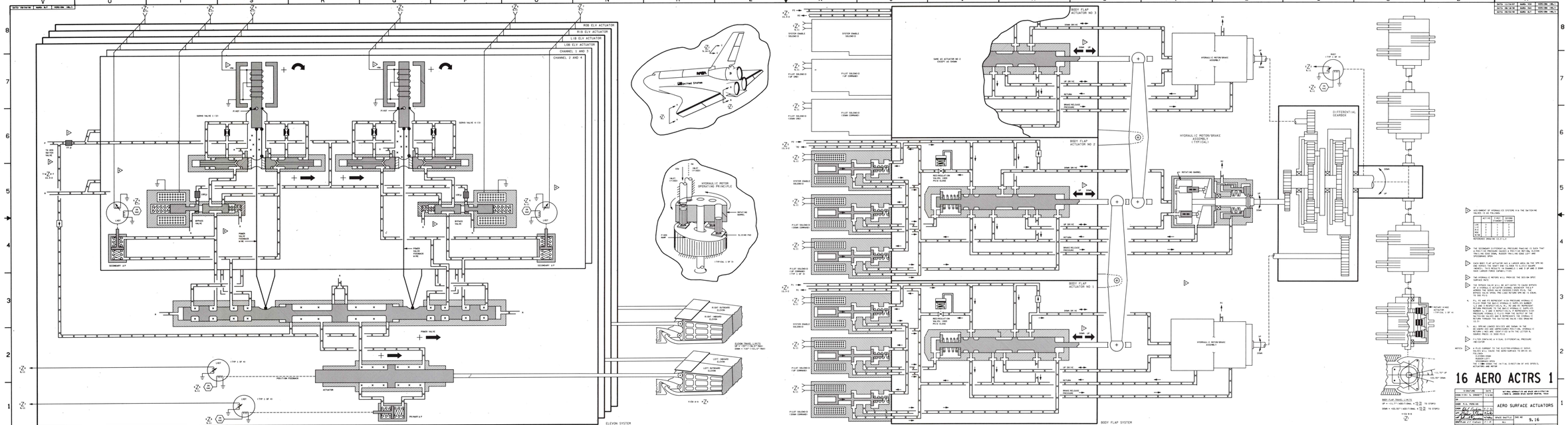
2. FILTER CONTAINS A VISUAL DIFFERENTIAL PRESSURE INDICATOR

1. A PLUS CURRENT TO THE ELECTRO-HYDRAULIC SERVO VALVES WILL CAUSE THE ACTUATOR TO EXTEND AND THE + ➡ SHOW THE INITIAL MOVEMENT DIRECTION OF THE HYD SPOOLS AND MECHANICAL LINKAGE

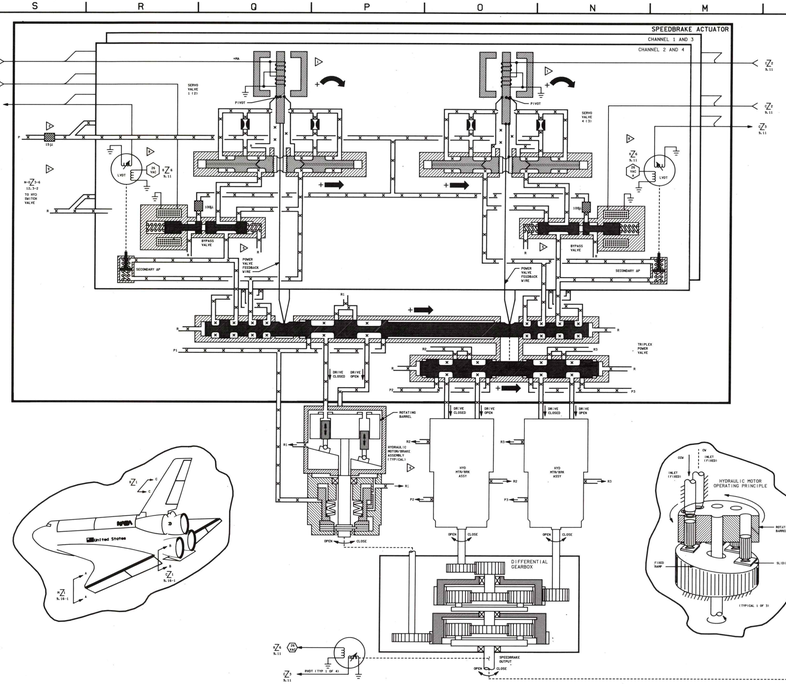
14 ATVC ACTRS

SIGNATURE	DATE	
DSGN L. M. BUCHANAN	12/17/79	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		ME AND SRB TVC ACTUATORS
ENGR D. J. GRUBER		
ENGR D.J. Gruber	9/4/90	
APP Stephen J. Elsner	9/10/90	
APP John A. Hamman	9/10/90	SPACE SHUTTLE — DWG NO 9.14
OMNIPLAN S. K. Kimbrell	9.11.90	ALL
LTR E — PCN	126.5 X 34	PAGE — SHEET 1 OF 1


POWER SUPPLY
ATVC 4 (CHANNEL 4)
ATVC 3 (CHANNEL 3)
ATVC 2 (CHANNEL 2)
ATVC 1 (CHANNEL 1)
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
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 ROCK ACTUATOR
RIGHT SRB TILT ACTUATOR
LEFT SRB ROCK ACTUATOR
LEFT SRB TILT ACTUATOR
15 ASC TVC
ME & SRB TVC SIGNAL FLOW
9.15
BASIC REV E



ROB ELV ACTUATOR
RIB ELV ACTUATOR
LIB ELV ACTUATOR
LOB ELV ACTUATOR
CHANNEL 1 AND 3
CHANNEL 2 AND 4
SERVO VALVE 1 (3)
SERVO VALVE 4 (3)
PILOT
SECONDARY A.P.
PRIMARY A.P.
ACTUATOR
PRIMARY A.P.
ELEVON SYSTEM
HYDRAULIC MOTOR OPERATING PRINCIPLE
BODY FLAP ACTUATOR NO 3
BODY FLAP ACTUATOR NO 2
BODY FLAP ACTUATOR NO 1
HYDRAULIC MOTOR/BRAKE ASSEMBLY (TYPICAL)
DIFFERENTIAL GEARBOX
BODY FLAP SYSTEM
16 AERO ACTRS 1
AERO SURFACE ACTUATORS
9.16
BASIC REV E



NOTE: SEE APPLICABLE NOTES ON SHEET 1

16 AERO ACTRS 2

CHECKED	DATE
STRU. L. A. Buchanan	9.16.94
AERO L. A. Buchanan	9.16.94
SYS P.G. Hill	9.16.94
QUAL	9.16.94
PROJ	9.16.94
CUST	9.16.94

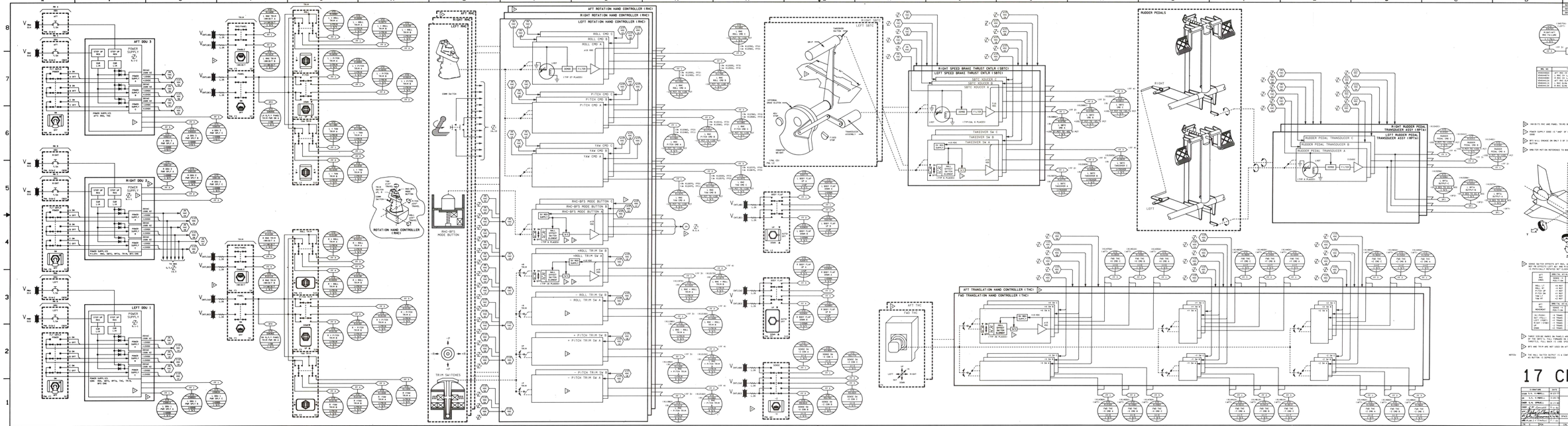
AERO SURFACE ACTUATORS

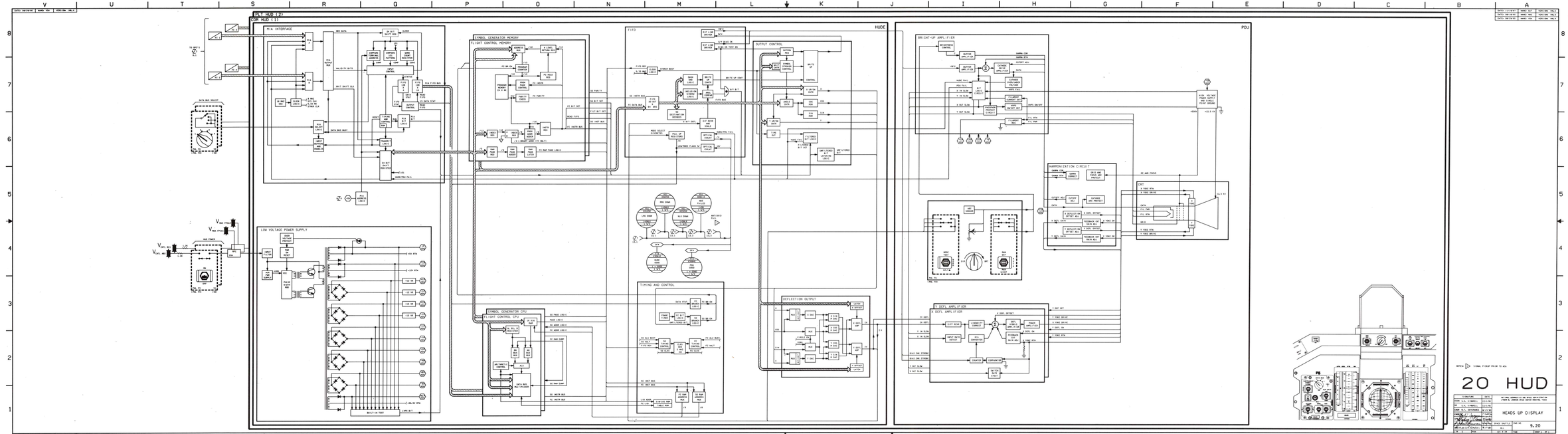
SPACE SHUTTLE	DWG NO
	9.16
SCALE	SHEET 1 OF 1

DATE: 11.14.97	NAME: VCS	NEW: No. HOU/No. HOU-5
DATE: 08.11.98	NAME: JW	NEW: No. HOU/No. HOU-5
DATE: 08.28.98	NAME: SEA	NEW: No. HOU/No. HOU-5

BASIC REV E

BASIC REV E


AFT DDU 3
RIGHT DDU 2
LEFT DDU 1
POWER SUPPLY
AFT ROTATION HAND CONTROLLER (RHC)
RIGHT ROTATION HAND CONTROLLER (RHC)
LEFT ROTATION HAND CONTROLLER (RHC)
ROLL CMD C
ROLL CMD B
ROLL CMD A
PITCH CMD C
PITCH CMD B
PITCH CMD A
YAW CMD C
YAW CMD B
YAW CMD A
RHC-BFS MODE BUTTON C
RHC-BFS MODE BUTTON B
RHC-BFS MODE BUTTON A
+ROLL TRIM SW C
+ROLL TRIM SW B
+ROLL TRIM SW A
- ROLL TRIM SW C
- ROLL TRIM SW B
- ROLL TRIM SW A
+ PITCH TRIM SW C
+ PITCH TRIM SW B
+ PITCH TRIM SW A
- PITCH TRIM SW C
- PITCH TRIM SW B
- PITCH TRIM SW A
ROTATION HAND CONTROLLER (RHC)
COMM SWITCH
RHC-BFS MODE BUTTON
TRIM SWITCHES
LEFT SBTC
TAKEOVER SWITCH
GRIP
TRIGGER
HYDRAULIC BRAKE SELECTOR VALVE
TRANSDUCER ASSEMBLY
GRAPPLE JAW ASSY
RIGHT SPEED BRAKE THRUST CNTLR (SBTC)
LEFT SPEED BRAKE THRUST CNTLR (SBTC)
SBTC ROCKER C
SBTC ROCKER B
SBTC ROCKER A
TAKEOVER SW C
TAKEOVER SW B
TAKEOVER SW A
RUDDER PEDALS
RIGHT
LEFT
RIGHT RUDDER PEDAL TRANSDUCER ASSY (RPTA)
LEFT RUDDER PEDAL TRANSDUCER ASSY (RPTA)
RUDDER PEDAL TRANSDUCER C
RUDDER PEDAL TRANSDUCER B
RUDDER PEDAL TRANSDUCER A
AFT THC
FWD TRANSLATION HAND CONTROLLER (THC)
FWD
LEFT
RIGHT
AFT
DOWN
UP
SENSE SWITCH EFFECTS AFT THC, AFT RHC, AND AFT SBTC. SET ON EFFECTS LEFT AFT, AND SELECTS AFT WHEN IN MDT. THC SET THC 1 POSITIONALLY REFLECTED SET ELSEWISE
THREE SIDE-MOUNTED PANELS ON PANELS 1 AFT AT C5, C6, AND C7 PERMIT POSITIONING OF THE SBTC'S, FULL FORWARD ON CONTROLLER 1 IS DISCONNECT AND USE THROTTLE. FULL BACK IS USE SPEEDBRAKE AND USE THROTTLE
RPTA AND RHC TRIM ARE NOT USED ON AFT RHC
THE RHC, SWITCH OUTPUT IS A CONTINUOUS LEVEL 1 OUTPUT FOR AS LONG AS BUTTON IS DEPRESSED
17 CNTLRS
RHC/SBTC/RPTA/THC
9.17
BASIC REV E
BASIC REV E


DATA ON/ON NE | NAND PDI | VOID ON ONLY
DATA ON/ON NE | NAND PDI | VOID ON ONLY
DATA ON/ON NE | NAND PDI | VOID ON ONLY
DATA ON/ON NE | NAND PDI | VOID ON ONLY
DCP 1&2B (2)
CDR HUD (1)
HUDE
PDU
MIA INTERFACE
SYMBOL GENERATOR MEMORY
FLIGHT CONTROL MEMORY
FIFO
OUTPUT CONTROL
SYMBOL GENERATOR CPU
FLIGHT CONTROL CPU
TIMING AND CONTROL
DEFLECTION OUTPUT
LOW VOLTAGE POWER SUPPLY
BRIGHT-UP AMPLIFIER
HARMONIZATION CIRCUIT
X DEFL AMPLIFIER
Y DEFL AMPLIFIER
HUD ELECTRONICS UNIT
HUD OPTICAL UNIT
HUD COMBINER GLASS
HUD PROJECTOR UNIT
HUD CAMERA
HUD VIDEO RECORDER
HUD VIDEO RECORDER CONTROL PANEL
HUD VIDEO RECORDER MOUNTING TRAY
HUD FILTERED POWER SUPPLY AND CIRCUIT BREAKER
HUD FILTERED POWER SUPPLY AND PILOT GROUND
HUD VIDEO RECORDER CIRCUIT BREAKER
HUD VIDEO RECORDER POWER SUPPLY
HUD VIDEO RECORDER CONTROL PANEL
HUD VIDEO RECORDER MOUNTING TRAY
NOTES
20 HUD
HEADS UP DISPLAY
9.20
BASIC REV E
BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
9.1	G&C DEDICATED DISPLAYS	R.I.	VS70-730109	ALL	D	8/19/85	SCHEMATIC - DISPLAYS & CONTROLS
		R.I.	VS70-730172	ALL	C	8/25/85	SCHEMATIC - DISPLAYS & CONTROLS
		R.I.	VS70-733539	ALL	B	8/22/83	SCHEMATIC - PANEL F6A8 FORWARD MAIN CONSOLE
		R.I.	VS70-730249	ALL	A	9/13/82	SCHEMATIC - D&C ANNUNCIATORS
9.2	TACAN	R.I.	VS70-740179	ALL	D	12/9/88	SCHEMATIC DIAGRAM - COMMUNICATION & TRACKING TACAN SUBSYSTEM
		R.I.	MC409-0014	ALL	A	5/20/74	RECEIVER - TRANSMITTER, AIR NAVIGATION SET, TACTICAL
		HOFFMAN ELECTRONICS	12R5-2ARN-84(V)-2	ALL	---	8/1/73	TECHNICAL MANUAL, INTERMEDIATE MAINTENANCE, NAVIGATION SET, TACAN
9.3	RADAR ALTIMETER	R.I.	VS70-740159	---	D	7/19/88	SCHEMATIC DIAGRAM - COMM AND TRACKING, RADAR ALTIMETER
		HONEYWELL	W0075-T601 -001	---	A	8/22/75	OPERATION AND SERVICE INSTRUCTIONS AND CALIBRATION PROCEDURES FOR THE ORBITER RA
9.4	MICROWAVE SCANNING BEAM LANDING SYSTEM	R.I.	VS70-740569	ALL	C	6/1/88	SCHEMATIC DIAGRAM - COMM & TRACKING, MICROWAVE SCAN BEAM LANDING SYS
9.5	COAS	R.I.	V620-660720	2	A	2/2/77	BRACKETT ASSEMBLY - CREWMAN OPTICAL ALIGNMENT SIGHT, FORWARD
		R.I.	V620-660731	2	A	7/1/77	BRACKETT - AFT OPERATIONAL, CREWMAN OPTICAL ALIGNMENT SIGHT, ASSY OF
		R.I.	V620-660810	2	C	1/30/77	SIGHT - CREWMAN OPTICAL ALIGNMENT, ASSY OF

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
9.1	ENGR H. M. MITCHELL		9.4	ENGR J. M. WEBB	
	ENGR Heather Mitchell	9-11-90		ENGR James M. Webb	9/11/90
9.2	ENGR J. M. WEBB		9.5	ENGR M. T. SEVERANCE	
	ENGR James M. Webb	9/11/90		ENGR Merl T. Severance	11 SEP 90
9.3	ENGR M. T. SEVERANCE			APP Stephen J. Elsner	9/11/90
	ENGR Merl T. Severance	11 SEP 90		APP John A. Kamman	9/11/90
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 9-I
ALL	PAGE 9.I-1 SHEET 1 OF 5

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
9.6 (SHEET 1)	STAR TRACKER	R.I.	VS70-590202	2	E	3/29/83	SCHEMATIC DIAGRAM - STAR TRACKER DOOR ACTUATOR SUBSYSTEM
9.6 (SHEET 2)	STAR TRACKER	R.I.	MC431-0128	---	B	11/12/87	STAR TRACKER SUBSYSTEM SPEC
		BALL BROTHERS	---	---	---	9/18/75	SCHEMATIC DIAGRAM IDT AND PREAMPLIFIER CIRCUITS
		BALL BROTHERS	---	---	---	9/11/75	PARALLEL ADDER
		BALL BROTHERS	---	---	---	9/8/75	LOW VOLTAGE POWER SUPPLY
		BALL BROTHERS	---	---	---	---	PROM COMPENSATION CIRCUIT
		BALL BROTHERS	---	---	---	9/11/75	A/D CONVERTER, PROM SWITCHING NETWORK
		BALL BROTHERS	---	---	---	9/18/75	SCHEMATIC DIAGRAM - COMPENSATION
		BALL BROTHERS	---	---	---	9/18/75	GENERAL TRACKER LOGIC
		BALL BROTHERS	---	---	---	9/18/75	SCHEMATIC DIAGRAM - POWER SUPPLY RANGE CONTROL CIRCUIT
		BALL BROTHERS	---	---	---	9/11/75	VIDEO CIRCUITS
		BALL BROTHERS	---	---	---	9/18/75	SPACE SHUTTLE TRACKER BRIGHT OBJECT SENSOR
		BALL BROTHERS	---	1-2	---	9/18/75	SCHEMATIC DIAGRAM - DEFLECTIONS CIRCUITS
		BALL BROTHERS	---	---	---	9/11/75	SAMPLE LOGIC
		BALL BROTHERS	---	---	---	9/18/75	SERIAL OUTPUT REGISTERS AND BITE COMPARATORS
		BALL BROTHERS	---	---	---	9/23/75	IAU INTERFACE ADAPTER UNIT
		BALL BROTHERS	---	---	---	9/11/75	MISC. CIRCUITS
		BALL BROTHERS	---	---	---	9/11/75	SCHEMATIC DIAGRAM - HIGH VOLTAGE POWER SUPPLY
		BALL BROTHERS	---	---	---	9/11/75	SCHEMATIC DIAGRAM - COMPENSATION CONTROL CIRCUIT
9.7	INERTIAL MEASUREMENT UNIT	R.I.	VS70-971102	41 (44, 47)	D	10/29/85	IMU 1 (2,3) WARMUP
				42 (45, 48)	D	10/29/85	IMU 1 (2,3) STABILIZATION LOOPS AND SINES/COSINES OF ATTITUDE ANGLES
				43 (46,49)	D	10/29/85	IMU 1 (2,3) ACCELEROMETERS AND DATA INPUT/OUTPUT
		R.I.	VS70-710102	1-3	D	3/11/83	SCHEMATIC DIAGRAM - INERTIAL MEASUREMENT UNIT (IMU) G/N SUBSYSTEM
		R.I.	VS70-710109	1-3	---	10/21/80	SCHEMATIC DIAGRAM - INERTIAL MEASUREMENT UNIT (IMU) G/N SUBSYSTEM
		SINGER KEARFOTT	Y254A176	---	---	6/15/76	ORBITER INERTIAL MEASUREMENT UNIT (IMU) TECHNICAL DESCRIPTION

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
	ENGR		9.6	ENGR K. ALFORD	
	ENGR			ENGR Charles Alford	9/11/90
	ENGR		9.7	ENGR D. E. MILLER	
	ENGR			ENGR David E. Miller	9/11/90
	ENGR			APP Stanley J. Elsner	9/11/90
	ENGR			APP John A. Kammon	9/11/90
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
9.8	RATE GYROS/BODY-MOUNTED ACCELERO-METERS	R.I.	VS70-710152	---	E	1/14/81	SCHEMATIC DIAGRAM - ORBITER RATE GYRO GDNC & NAV SYSTEM
		R.I.	VS70-710179	---	D	4/23/88	SCHEMATIC DIAGRAM - SOLID RKT BSTER RATE GYRO GDNC & NAV SUBSYSTEM
		R.I.	VS70-790112	---	C	1/24/80	SCHEMATIC DIAGRAM - ACCELEROMETER ASSY FLT CONTROL SUBSYSTEM
		R.I.	VS70-971102	13-20	D	10/29/85	INTEGRATED SYSTEMS SCHEMATICS OV-102 GNC & DPS
		HONEYWELL	34024066	---	A	9/11/74	AA POWER SUPPLY
		NORTHRUP	101069	---	D	11/17/75	SCHEMATIC POWER SUPPLY ASSEMBLY MODULE
9.9	AIR DATA SYSTEM	R.I.	VS70-590302	1-6	D	1/28/80	AIR DATA PROBE DEPLOYMENT AND HEATER
		R.I.	VS70-590309	1-5	---	10/21/80	AIR DATA PROBE DEPLOYMENT AND HEATER
		R.I.	VS70-971102	50 (51-53)	---	10/29/85	AIR DATA SYSTEM PATH W (2-4)
				101 - 102 (103-104)			AIR DATA PROBE RIGHT (LEFT) DEVELOPMENT AND HEATER
9.10 (SHEETS 1 AND 2)	FCS MODE SWITCHES	R.I.	VS70-733539	---	B	9/22/83	SCHEMATIC DIAGRAM PANEL F6A8 FWD MAIN CONSOLE FOR ABORT SWITCHES
		R.I.	VS70-730249	---	A	3/8/83	SCHEMATIC DIAGRAM D & C ANNUNCIATOR SUBSYSTEM
		R.I.	VS70-790209	---	C	12/4/84	SCHEMATIC DIAGRAM DISPLAY & CONTROL SWITCHES FLIGHT CONTROL SUBSYSTEM
		R.I.	V070-730284	---	B	9/24/79	PANEL ASSEMBLY - C3A6, CENTER CONSOLE, DISPLAYS AND CONTROLS
		R.I.	V070-730325	---	B	1979	PANEL ASSEMBLY - A6C3, AFT CONSOLE, DISPLAYS AND CONTORLS
9.11	AERO SURFACE	R.I.	VS70-790222	---	C	4/4/79	SCHEMATIC DIAGRAM - ASA FLIGHT CONTROLS
	SIGNAL FLOW						SUBSYSTEM
		R.I.	VS70-790229	---	D	11/11/83	SCHEMATIC DIAGRAM - ASA FLIGHT CONTROLS SUBSYSTEM
		R.I.	VS70-7790202	---	E	1/11/85	SCHEMATIC DIAGRAM - D & C FLIGHT CONTROLS SUBSYSTEM
		R.I.	VS70-790209	---	C	12/4/84	SCHEMATIC DIAGRAM - D & C FLIGHT CONTROLS SUBSYSTEM

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
9.8	ENGR F. E. TRLICA		9.10-2	ENGR B. SCHOENBAUER	
	ENGR F. E. Trlica	9-11-90		ENGR Barbara J. Schoenbauer	9-11-90
9.9	ENGR L. E. CAIN		9.11	ENGR P. E. PERKINS	
	ENGR L. E. Cain	9-11-90		ENGR Phil Perkins	9-11-90
9-10-1	ENGR F. DIGENOVA			APP Stephen J. Evans	9/11/90
	ENGR F. DiGenova	9-11-90		APP John D. Zimmerman	9/11/90
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
9.13	OMS/TVC SIGNAL FLOW AND DRIVERS	R.I.	VS70-430309	8	E	8/23/88	OMS SUBSYSTEM CONTROL - LEFT POD (OV - 103 & SUBS)
		R.I.	VS70-420302	8	E	8/23/88	OMS SUBSYSTEM CONTROL - LEFT POD (OV - 102)
		R.I.	VS70-430209	8	B	8/25/82	OMS SUBSYSTEM CONTROL - RIGHT POD (OV - 103 & SUBS)
		R.I.	VS70-430202	8	E	8/1/84	OMS SUBSYSTEM CONTROL - RIGHT POD (OV - 102)
		NASA/ JOHNSON SPACE CENTER	JSC-08934 VOL. I-A	---	F	10/87	SHUTTLE OPERATIONAL DATA BOOK, VOLUME I-A, SHUTTLE SYSTEMS ELECTRICAL EQUIPMENT LIST
9.14	ME AND SRB TVC ACTUATORS	MOOG	A05268	1-2 OF 2	---	7/2/75	HYDRAULIC SCHEMATIC SRB SERVOACTUATOR MODEL 17-310
		MOOG	A05271	1 OF 1	---	7/13/75	ASSEMBLY SRB SERVOACTUATOR MODEL 17-310
		UNITED TECH-NOLOGIES	10400-0833	10 OF 73	---	1/21/87	O. F. ELECTRICAL SCHEMATIC SOLID ROCKET BOOSTER POWER DISTRIBUTION SIGNAL CONDITIONERS
				15 OF 73	---	1/26/87	O. F. ELECTRICAL SCHEMATIC SOLID ROCKET BOOSTER THRUST VECTOR CONTROL - ROCK ACTUATOR
				17 OF 73	---	1/21/87	O. F. ELECTRICAL SCHEMATIC SOLID ROCKET BOOSTER THRUST VECTOR CONTROL-TILT ACTUATOR
		NASA/ MARSHALL SPACE FLIGHT CENTER	16A10241	16 OF 70	8	7/18/76	SRB O. F. ELECTRICAL SCHEMATIC THRUST VECTOR CONTROL ROCK ACTUATOR
				18 OF 70	B	7/17/76	SRB O. F. ELECTRICAL SCHEMATIC THRUST VECTOR CONTROL TILT ACTUATOR
		R.I.	MC621-0015	1-72 OF 72	B	7/27/76	SPECIFICATION SEROACTUATOR, MAIN ENGINE, GIMBAL, ELECTR-COMMAND HYDRAULIC (TYC)
9.15	ME & SRB TVC SIGNAL FLOW	R.I.	VS70-790209	3	C	12/4/84	DISPLAY & CONTROL SWITCHES FLIGHT CONTROL SUBSYSTEM(OV - 103 & SUBS)
		R.I.	VS70-790239	ALL	E	5/8/84	ATVC - FLT CONTROL SUBSYSTEM (OV - 103 & SUBS)
		R.I.	VS70-790232	ALL	E	10/82	ATVC - FLT CONTROL SUBSYSTEM (OV - 102)
		R.I.	VS70-790202	9	E	12/84	DISPLAY & CONTROL SWITCHES FLIGHT CONTROL SUBSYSTEM (OV - 102)
9.16 (SHEETS 1 AND 2)	AERO SURFACE ACUATORS	MOOG	A20537	---	---	5/17/78	ELEVON
		R.I.	MC621-0014	---	---	12/22/80	ELEVON SPEC.
		SUNDSTRAND AVIATION	EP6024-6	---	---	8/12/74	RUDDER/SPEEDBRAKE
		MOOG	A241288	---	---	2/21/78	RUDDER/SPEEDBRAKE
		R.I.	MC621-0053	---	---	10/20/82	RUDDER SPEEDBRAKE SPEC
		SUNDSTRAND AVIATION	EP6038-2001	---	---	11/4/74	BODY FLAP
		R.I.	MC621-0056	---	---	5/15/82	BODY FLAP SPEC
		R.I.	SD72-SH-0105 VOL.1, BOOK 2, APPENDIX A	---	---	12/15/76	REQUIREMENTS/DEFINITION DOCUMENT, FLIGHT CONTROL APPENDIX A - ACTIVATION SUBSYSTEM

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
9.13	ENGR H. M. MITCHELL			ENGR	
	ENGR Heather M. Mitchell	9-11-90		ENGR	
9.14	ENGR D. J. GRUBER			ENGR	
	ENGR D.J. Gruber	9-11-90		ENGR	
9.15	ENGR D. J. GRUBER			APP Stephen J Elsner	9/11/90
	ENGR D.J. Gruber	9-11-90		APP John A Kamman	9/11/90
9.16	ENGR P. E. PERKINS			OMNIPLAN	
	ENGR Phil Perkins	9-11-90		TR [illegible] PCN	

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SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
9.17	RHC/SBTC/RPTA/THC	R.I.	VS70-790129	---	B	05/27/84	ROTATION HAND CONTROL. FLT CONTROL SUBSYSTEM
		R.I.	VS70-790139	---	---	11/17/80	SPEED BRAKE THRUST CONTROL FLT CONTROL SUBSYSTEM
		R.I.	VS70-790149	---	---	11/05/80	RUDDER PEDAL XDCR ASSY FLT CONTROL SUBSYSTEM
		R.I.	VS70-790159	---	---	01/14/81	TRANSLATION HAND CONTROL FLT CONTROL SUBSYSTEM
		R.I.	VS70-790209	---	C	08/17/84	DISPLAY AND CONTROL SWITCHES FLIGHT CONTROL SUBSYSTEM
9.20	HEAD UP DISPLAY	R.I.	VS70-730269	ALL	E	8/09/84	HEADS UP DISPLAY SUBSYSTEM
		KAISER	03944-65002	ALL	---	9/20/80	PDV BLOCK DIAGRAM
		KAISER	03944-65005	ALL	---	---	HUD EXTERNAL INTERCONNECT
		KAISER	03944-65091	ALL	---	4/15/81	PDU INTERCONNECT
		KAISER	03944-65501	ALL	---	1981	HUDE SYSTEM BLOCK DIAGRAM
		KAISER	03944-65701	ALL	---	1/21/81	LOW VOLTAGE POWER SUPPLY

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
9.17	ENGR S. M. SPRUELL			ENGR	
	ENGR S. M. Spruell	9-11-90		ENGR	
9.20	ENGR M. T. SEVERANCE			ENGR	
	ENGR Mark T. Severance	11 SEP 90		ENGR	
	ENGR			APP Stephen J. Elsner	9/11/90
	ENGR			APP John A. Kamman	9/11/90
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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