

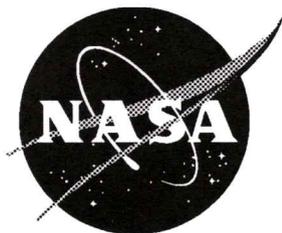
# Space Shuttle Systems Handbook

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Volume I – Sections 1 through 9

Mission Operations Directorate  
Systems Division

Revision E, DCN-6  
August 14, 1996



National Aeronautics and  
Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas

**SPACE SHUTTLE SYSTEMS HANDBOOK****REVISION E, DCN-6****PREFACE**

This three-volume book contains systems level operational schematics for all of the space shuttle systems. These drawings were prepared by shuttle flight controllers in the Mission Operations Directorate, Systems Division, National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, with the technical support of Integrated Documentation Services, Hernandez Engineering.

This document is intended to provide flight controllers and flight crews with reference material on shuttle systems operations during shuttle flight and simulation operations. It is also intended to be used as a training aid for shuttle hardware, software, and avionics systems operations. Caution should be exercised when using these systems drawings for other purposes. For detailed systems component and logic information, refer to the vendor drawing reference tables at the end of each handbook section.

The symbols and drawing layout standards used in this document are defined in the Mission Operations Directorate Drafting Standards, JSC-10506, Revision C, PCN-2, March 1991. The asterisks (\*) that appear after some of the drawing numbers in the table of contents indicate that these schematics are carried onboard in the Systems Data Book during flight operations. Additionally, drawing numbers with letter designators should be used for specific vehicle references only as follows: B = 102, C = 103, D = 104, E = 105.

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# SPACE SHUTTLE SYSTEMS HANDBOOK

REV E-6

AUGUST 14, 1996

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DWG 12.2 (Sheet 3 of 3)	HYDRAULIC/IAPU LINE SCHEMATIC	REV E-3	9/28/93
DWG 12.3* (Sheet 1 of 3)	HYDRAULIC POWER SYSTEM	REV E-5	4/5/95
DWG 12.3* (Sheet 2 of 3)	HYDRAULIC POWER SYSTEM	REV E-2	2/2/93
DWG 12.3* (Sheet 3 of 3)	HYDRAULIC POWER SYSTEM	REV E-6	7/24/96
DWG 12.4* (Sheet 1 of 1)	APU/HYD WATER SPRAY BOILER	REV E-6	5/8/96
TBL 12-I	VENDOR DRAWING REFERENCES	REV E-2	2/19/93
<b>Section 13 Landing Gear</b>			
DWG 13.1 (Sheet 1 of 2)	LANDING GEAR	REV E-2	11/4/92
DWG 13.1 (Sheet 2 of 2)	LANDING GEAR	REV E-2	1/29/93
DWG 13.2 (Sheet 1 of 1)	BRAKES/REDUNDANT WOW	REV E-5	2/23/95
DWG 13.3 (Sheet 1 of 1)	NOSE WHEEL STEERING	REV E-2	11/6/92
DWG 13.4 (Sheet 1 of 2)	DRAG CHUTE MECHANICAL	REV E-2	5/28/92
DWG 13.4 (Sheet 2 of 2)	DRAG CHUTE ELECTRICAL	REV E-2	5/28/92
TBL 13-I	VENDOR DRAWING REFERENCES	REV E-2	2/19/93

\*Flown in Systems Data Book.

Item	Title	Rev/DCN	Signoff date
<b>Section 14 Payload Bay</b>			
DWG 14.1* (Sheet 1 of 3)	PAYLOAD BAY DOORS/RADIATOR OVERVIEW	REV E	10/23/90
DWG 14.1* (Sheet 2 of 3)	PAYLOAD BAY DOOR LATCHES AND EVA SLIDEWIRE	REV E-6	8/22/96
DWG 14.1* (Sheet 3 of 3)	RADIATORS DEPLOY/STOW	REV E-6	5/20/96
DWG 14.2* (Sheet 1 of 2)	PLBD OPEN/CLOSE H/W OVERVIEW	REV E-4	7/7/94
DWG 14.2* (Sheet 2 of 2)	PLBD SOFTWARE OVERVIEW (PASS)	REV E-4	7/7/94
DWG 14.3 (Sheet 1 of 3)	PAYLOAD RETENTION LATCH ELECTRICAL	REV E-4	7/7/94
DWG 14.3 (Sheet 2 of 3)	PAYLOAD RETENTION LATCH-MECH	REV E	10/2/90
DWG 14.3 (Sheet 3 of 3)	PROTECTIVE COVER REMOVAL SYSTEM	REV E	10/12/90
DWG 14.4 (Sheet 1 of 8)	RMS D&C PANEL	REV E-2	12/18/92
DWG 14.4 (Sheet 2 of 8)	DIGITAL SPA	REV E-6	7/18/96
DWG 14.4 (Sheet 3 of 8)	RMS CONTROL SYSTEM (SPA AND MOTOR CONTROL)	REV E-1	10/22/91
DWG 14.4 (Sheet 4 of 8)	RMS CONTROL SYSTEM (BDA)	REV E	8/24/90
DWG 14.4 (Sheet 5 of 8)	RMS CONTROL SYSTEM (EEEU AND MOTOR CONTROL)	REV E-1	11/6/91
DWG 14.4 (Sheet 6 of 8)	RMS THERMOSTAT/HEATER ELEMENTS	REV E	8/31/90
DWG 14.4* (Sheet 7 of 8)	RMS MECHANICAL SYSTEM OVERVIEW	REV E	10/4/90
DWG 14.4* (Sheet 8 of 8)	RMS ELECTRICAL SYSTEM OVERVIEW	REV E	9/19/90
DWG 14.5 (Sheet 1 of 2)	RMS/SOFTWARE OVERVIEW	REV E-6	8/4/95
DWG 14.5 (Sheet 2 of 2)	RMS/SOFTWARE OVERVIEW	REV E-6	8/4/95
DWG 14.6 (Sheet 1 of 3)	PORT MANIPULATOR POSITIONING MECHANISM-MANIPULATOR RETENTION LATCHES ELECTRICAL	REV E	8/31/90

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Item	Title	Rev/DCN	Signoff date
<b>Section 14 Payload Bay (continued)</b>			
DWG 14.6 (Sheet 2 of 3)	PORT MANIPULATOR POSITIONING MECHANISM-MANIPULATOR RETENTION LATCHES MECHANICAL	REV E	8/31/90
DWG 14.6 (Sheet 3 of 3)	PORT RMS JETTISON ELECTRICAL	REV E	9/19/90
DWG 14.7 (Sheet 1 of 3)	FLIGHT RELEASABLE GRAPPLE FIXTURE	REV E-1	11/21/91
DWG 14.7 (Sheet 2 of 3)	RIGIDIZE SENSING GRAPPLE FIXTURE	REV E-1	11/21/91
DWG 14.7 (Sheet 3 of 3)	ELECTRICAL FLIGHT GRAPPLE FIXTURE	REV E-1	11/12/91
DWG 14.8 (Sheet 1 of 3)	MCIU FIRMWARE OVERVIEW	REV E	9/7/90
DWG 14.8 (Sheet 2 of 3)	MCIU FIRMWARE SYNCIR ROUTINE	REV E	9/7/90
DWG 14.8 (Sheet 3 of 3)	MCIU FIRMWARE MEMORY MAP	REV E	9/7/90
DWG 14.9 (Sheet 1 of 5)	SPDS Y <sub>0</sub> ELECTRICAL	REV E	8/31/90
DWG 14.9 (Sheet 2 of 5)	SPDS RDU ELECTRICAL	REV E	8/31/90
DWG 14.9 (Sheet 3 of 5)	SPDS PAYLOAD RELEASE SYSTEM AND PEDESTAL DRIVE TRANSFER SYSTEM	REV E	9/10/90
DWG 14.9 (Sheet 4 of 5)	STABILIZED PAYLOAD DEPLOYMENT SYSTEM MECHANICAL OVERVIEW	REV E	9/10/90
DWG 14.9 (Sheet 5 of 5)	STABILIZED PAYLOAD DEPLOYMENT SYSTEM MECHANICAL OVERVIEW	REV E	9/10/90
DWG 14.10 (Sheet 1 of 1)	NEW RMS MCIU (-5 MCIU)	REV E-1	8/27/91
DWG 14.11 (Sheet 1 of 4)	NEW MCIU FIRMWARE OVERVIEW	REV E-1	8/27/91
DWG 14.11 (Sheet 2 of 4)	NEW MCIU DETAILED FIRMWARE	REV E-1	8/27/91
DWG 14.11 (Sheet 3 of 4)	NEW MCIU DETAILED FIRMWARE	REV E-1	8/27/91
DWG 14.11 (Sheet 4 of 4)	NEW MCIU FIRMWARE MEMORY MAP	REV E-1	8/27/91
DWG 14.12 (Sheet 1 of 3)	ROEU ELECTRICAL	REV E-1	11/14/91
DWG 14.12 (Sheet 2 of 3)	REMOTELY OPERATED ELECTRICAL UMBILICAL MECHANICAL OVERVIEW	REV E-1	11/14/91

Item	Title	Rev/DCN	Signoff date
<b>Section 14 Payload Bay (concluded)</b>			
DWG 14.12 (Sheet 3 of 3)	ROEU MECHANICAL	REV E	11/27/90
TBL 14-I	VENDOR DRAWING REFERENCES	REV E-5	4/7/95
<b>Section 15 Mechanical Support Systems</b>			
DWG 15.1 (Sheet 1 of 3)	ACTIVE VENT SYSTEM VENTS 1 AND 2	REV E-2	11/17/92
DWG 15.1 (Sheet 2 of 3)	ACTIVE VENT SYSTEM VENTS 3, 4, 5 & 7	REV E-2	11/6/92
DWG 15.1 (Sheet 3 of 3)	ACTIVE VENT SYSTEM VENTS 6, 8, AND 9	REV E-2	11/6/92
DWG 15.2* (Sheet 1 of 3)	ORBITER/ET UMBILICAL CLOSEOUT DOORS	REV E-2	12/18/92
DWG 15.2* (Sheet 2 of 3)	ORB/ET UMBILICAL CLOSEOUT DOORS (ELECT)	REV E-2	12/18/92
DWG 15.2 (Sheet 3 of 3)	ET DOOR SOFTWARE PASS AND BFS	REV E-2	12/19/92
DWG 15.3 (Sheet 1 of 3)	ORBITER ET SEPARATION MECHANICAL	REV E-4	7/7/94
DWG 15.3 (Sheet 2 of 3)	ORBITER ET UMBILICAL SEPARATION MECHANICAL	REV E-2	4/13/92
DWG 15.3 (Sheet 3 of 3)	ORBITER ET SEPARATION MECHANICAL	REV E-4	8/9/94
DWG 15.4 (Sheet 1 of 1)	RECUMBENT SEAT SYSTEM	REV E-5	2/17/95
DWG 15.5 (Sheet 1 of 2)	HATCHES (SIDE)	REV E-2	10/28/92
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-4	7/7/94
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-6	5/20/96
DWG 15.7* (Sheet 2 of 2)	KU-BAND MECHANICAL	REV E	10/26/90

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Item	Title	Rev/DCN	Signoff date
<b>Section 15 Mechanical Support Systems (concluded)</b>			
DWG 15.8 (Sheet 1 of 2)	MECH/SW OV (PASS ONLY) OV-105 MAJOR MOD VEHICLES	REV E-1	11/12/91
DWG 15.8 (Sheet 2 of 2)	MECHANICAL/SOFTWARE OVERVIEW (PASS ONLY)	REV E-4	7/12/94
DWG 15.9* (Sheet 1 of 4)	ORBITER DOCKING SYSTEM/STRUCTURAL OVERVIEW	REV E-5	4/3/95
DWG 15.9* (Sheet 2 of 4)	ORBITER DOCKING SYSTEM/DOCKING SENSORS	REV E-5	4/3/95
DWG 15.9* (Sheet 3 of 4)	ORBITER DOCKING SYSTEM/CAPTURE LATCH, HOOKS, SEQUENCE	REV E-5	4/3/95
DWG 15.9* (Sheet 4 of 4)	ORBITER DOCKING SYSTEM/CAPTURE LATCH, HOOKS, AND MECHANISM	REV E-5	4/3/95
DWG 15.10* (Sheet 1 of 1)	ORBITER DOCKING SYSTEM/AVIONICS POWER DISTRIBUTION	REV E-5	3/30/95
DWG 15.11* (Sheet 1 of 1)	ORBITER DOCKING SYSTEM/DOCKING SYSTEM CONTROL UNIT	REV E-5	3/30/95
DWG 15.12* (Sheet 1 of 1)	ORBITER DOCKING SYSTEM/DOCKING MECHANISM CONTROL UNIT	REV E-5	3/30/95
DWG 15.13* (Sheet 1 of 1)	ORBITER DOCKING SYSTEM/PRESSURE ACTUATION CONTROL UNIT	REV E-5	3/30/95
DWG 15.14* (Sheet 1 of 1)	ORBITER DOCKING SYSTEM/LATCH ACTUATOR CONTROL UNIT	REV E-5	4/4/95
DWG 15.15* (Sheet 1 of 1)	ORBITER DOCKING SYSTEM/PYRO FIRING CONTROL UNIT	REV E-5	3/30/95
TBL 15-I	VENDOR DRAWING REFERENCES	REV E-4	9/22/94

### Volume III – Sections 16 through 20

#### Section 16 Communications Systems

DWG 16.1* (Sheet 1 of 6)	COMM OVERVIEW S-BAND	REV E-6	2/14/96
DWG 16.1B* (Sheet 2 of 6)	COMM OVERVIEW AUDIO	REV E-6	5/30/96
DWG 16.1C,D,E (Sheet 3 of 6)	COMM OVERVIEW AUDIO	REV E-6	5/17/96
DWG 16.1* (Sheet 4 of 6)	COMM OVERVIEW KU BAND	REV E-6	7/22/96
DWG 16.1 (Sheet 5 of 6)	COMM OVERVIEW CCTV	REV E-6	7/16/96

\*Flown in Systems Data Book.

Item	Title	Rev/DCN	Signoff date
<b>Section 16 Communications Systems (continued)</b>			
DWG 16.1 (Sheet 6 of 6)	PAYLOAD SYSTEM OVERVIEW	REV E-6	4/11/96
DWG 16.2 (Sheet 1 of 3)	S-BAND PM TRANSPONDER	REV E-4	8/2/94
DWG 16.2 (Sheet 2 of 3)	S-BAND PM AMPLIFIER SYSTEM	REV E-6	2/14/96
DWG 16.2 (Sheet 3 of 3)	S-BAND PM/FM SWITCH BEAM ANTENNA SYSTEM	REV E-4	8/2/94
DWG 16.3 (Sheet 1 of 3)	NETWORK SIGNAL PROCESSOR RETURN LINK	REV E-6	7/22/96
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-6	7/26/96
DWG 16.4 (Sheet 1 of 2)	TEXT AND GRAPHICS SYSTEM	REV E-2	11/4/92
DWG 16.4 (Sheet 2 of 2)	SECURE TEXT & GRAPHICS SYSTEM TELEVISION INTERFACES	REV E-2	12/18/92
DWG 16.5 (Sheet 1 of 2)	KU BAND SYSTEM	REV E-3	9/27/93
DWG 16.5 (Sheet 2 of 2)	KU BAND SYSTEM	REV E-6	7/16/96
DWG 16.6 (Sheet 1 of 1)	PAYLOAD DATA INTERFACE PANEL (PDIP)	REV E-6	3/18/96
DWG 16.7 (Sheet 1 of 1)	VHF RADIO AND AUDIO RADIO INTERFACE UNIT (ARIU)	REV E-6	5/31/96
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-6	7/19/96
DWG 16.9 (Sheet 2 of 2)	OPERATIONAL UHF EVC BACKPACK TRANSCEIVER	REV E-6	7/19/96
DWG 16.10 (Sheet 1 of 7)	AUDIO PANEL/ATU PLT, CDR	REV E-6	7/16/96
DWG 16.10 (Sheet 2 of 7)	AUDIO PANEL/ATU MS, PS, AND OS SU	REV E-6	7/15/96
DWG 16.10C,D,E (Sheet 3 of 7)	AUDIO PANEL/ATU MID DECK SU AND CCU	REV E-6	7/16/96
DWG 16.10 (Sheet 4 of 7)	AUDIO PANEL/ATU AIRLOCK	REV E-6	5/29/96

Item	Title	Rev/DCN	Signoff date
<b>Section 16 Communications Systems (continued)</b>			
DWG 16.10B (Sheet 5 of 7)	AUDIO PANEL/ATU AIRLOCK 1 BACKUP	REV E-6	4/5/96
DWG 16.10B (Sheet 6 of 7)	AUDIO PANEL/ATU MID DECK AUDIO/AIRLOCK 2 BACKUP	REV E-6	7/16/96
DWG 16.10B (Sheet 7 of 7)	AUDIO PANEL/ATU OS AND OS SU	REV E-6	7/16/96
DWG 16.11 (Sheet 1 of 2)	AUDIO/ACCU	REV E-6	7/22/96
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-6	7/16/96
DWG 16.13 (Sheet 1 of 5)	TV/CAMERA POWER	REV E-6	5/29/96
DWG 16.13 (Sheet 2 of 5)	TV/CAMERA - SIT MONITOR	REV E-6	3/15/96
DWG 16.13 (Sheet 3 of 5)	TV/EMU	REV E-1	10/2/90
DWG 16.13 (Sheet 4 of 5)	AIRBORNE DIGITIZER UNIT SECURE TELEVISION SYSTEM	REV E-1	10/23/90
DWG 16.13 (Sheet 5 of 5)	COLOR TV MONITOR (CTVM)	REV E-1	11/20/91
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-6	7/19/96
DWG 16.15 (Sheet 1 of 1)	PAYLOAD SIGNAL PROCESSOR	REV E-6	7/19/96
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-6	3/11/96
DWG 16.18 (Sheet 1 of 1)	OPS RECORDERS	REV E-6	4/1/96
DWG 16.19 (Sheet 1 of 1)	P/L RECORDER	REV E-6	4/1/96
DWG 16.20 (Sheet 1 of 2)	WIRELESS CREW COMM SYS AUDIO INTERFACE UNIT	REV E-6	3/11/96
DWG 16.20 (Sheet 2 of 2)	WIRELESS CREW COMM SYS CREW REMOTE UNIT	REV E-6	5/6/96

Item	Title	Rev/DCN	Signoff date
<b>Section 16 Communications Systems (concluded)</b>			
DWG 16.21	(RESERVED)		
DWG 16.22	(RESERVED)		
DWG 16.23 (Sheet 1 of 1)	EXTENDED RANGE PAYLOAD COMM LINK	REV E-3	9/27/93
DWG 16.24 (Sheet 1 of 1)	8MM VIDEO TAPE RECORDER	REV E-6	5/29/96
DWG 16.25 (Sheet 1 of 1)	COMM SYSTEM POWER DISTRIBUTION	REV E-6	5/1/96
DWG 16.26 (Sheet 1 of 1)	COMM MDM I/F	REV E-6	3/11/96
TBL 16-I	VENDOR DRAWING REFERENCES	REV E-3	10/15/93
<b>Section 17 Instrumentation</b>			
DWG 17.1 (Sheet 1 of 3)	OPERATIONAL INSTRUMENTATION DSC'S AND MDM'S	REV E-1	11/4/91
DWG 17.1 (Sheet 2 of 3)	OI DEDICATED SIGNAL CONDITIONERS	REV E-2	11/4/92
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-6	7/16/96
DWG 17.3 (Sheet 1 of 1)	PAYLOAD DATA INTERLEAVER	REV E-6	7/26/96
DWG 17.4	(RESERVED)		
DWG 17.5	(RESERVED)		
DWG 17.6	(RESERVED)		
DWG 17.7	(RESERVED)		
DWG 17.8 (Sheet 1 of 1)	THERMAL IMPULSE PRINTER SYSTEM (TIPS)	REV E-6	3/11/96
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-6	7/25/96
DWG 17.12C,D (Sheet 1 of 1)	MODULE AUXILIARY DATA SYSTEM RECORDER/ CONTROLLER SUBSYSTEM	REV E-6	7/29/96

Item	Title	Rev/DCN	Signoff date
<b>Section 17 Instrumentation (concluded)</b>			
DWG 17.13 (Sheet 1 of 1)	ORBITER EXPERIMENTS SUPPORT SYSTEM FOR OEX	REV E-6	4/11/96
TBL 17-I	VENDOR DRAWING REFERENCES	REV E	11/2/90
<b>Section 18 Escape System</b>			
DWG 18.1* (Sheet 1 of 1)	ESCAPE PANEL	REV E-4	7/15/94
DWG 18.2* (Sheet 1 of 1)	POLE CREW ESCAPE SYSTEM	REV E-4	7/7/94
DWG 18.3* (Sheet 1 of 1)	EMERGENCY EGRESS SLIDE/SKYGENIE	REV E-4	7/7/94
DWG 18.4 (Sheet 1 of 1)	LAUNCH/ENTRY SUIT AND QUICK-DON MASK	REV E-6	5/10/96
DWG 18.5 (Sheet 1 of 3)	SURVIVAL GEAR RAFT/HARNESS/PARACHUTE	REV E-6	5/10/96
DWG 18.5 (Sheet 2 of 3)	SURVIVAL GEAR	REV E-6	5/20/96
DWG 18.5 (Sheet 3 of 3)	LES/ACES COMPONENTS AND SEAT INTERFACE	REV E-6	5/20/96
DWG 18.6 (Sheet 1 of 1)	PERSONAL PARACHUTE ASSEMBLY (PPA)	REV E-4	8/4/94
DWG 18.7 (Sheet 1 of 1)	SIDE HATCH JETTISON	REV E-1	11/18/91
DWG 18.8 (Sheet 1 of 1)	ADVANCED CREW ESCAPE SUIT & THERMAL ELECTRIC LIQUID COOLING UNIT & QUICK DON MASK	REV E-6	5/20/96
TBL 18-I	VENDOR DRAWING REFERENCES	REV E	11/25/91
<b>Section 19 Structures</b>			
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
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

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Item	Title	Rev/DCN	Signoff date
<b>Section 19 Structure (concluded)</b>			
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
<b>Section 20 Displays and Controls</b>			
DWG 20.1 (Sheet 1 of 4)	DISPLAYS AND CONTROLS FORWARD STATIONS	REV E-3	9/9/93
DWG 20.1 (Sheet 2 of 4)	DISPLAYS AND CONTROLS FORWARD STATIONS	REV E-2	1/28/93
DWG 20.1 (Sheet 3 of 4)	DISPLAYS AND CONTROLS FORWARD STATIONS	REV E-1	11/14/91
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-2	2/1/93
DWG 20.2 (Sheet 2 of 3)	DISPLAYS AND CONTROLS AFT STATIONS AND MISSION UNIQUE PANELS	REV E-1	11/8/91
DWG 20.2 (Sheet 3 of 3)	DISPLAYS AND CONTROLS AFT STATIONS	REV E-1	11/14/91
DWG 20.3 (Sheet 1 of 1)	DISPLAYS AND CONTROLS MID DECK STATIONS	REV E-2	2/1/93
DWG 20.4 (Sheet 1 of 1)	DISPLAYS AND CONTROLS AIRLOCK	REV E-4	8/1/94
TBL 20-I	VENDOR DRAWING REFERENCES	REV E	11/5/90

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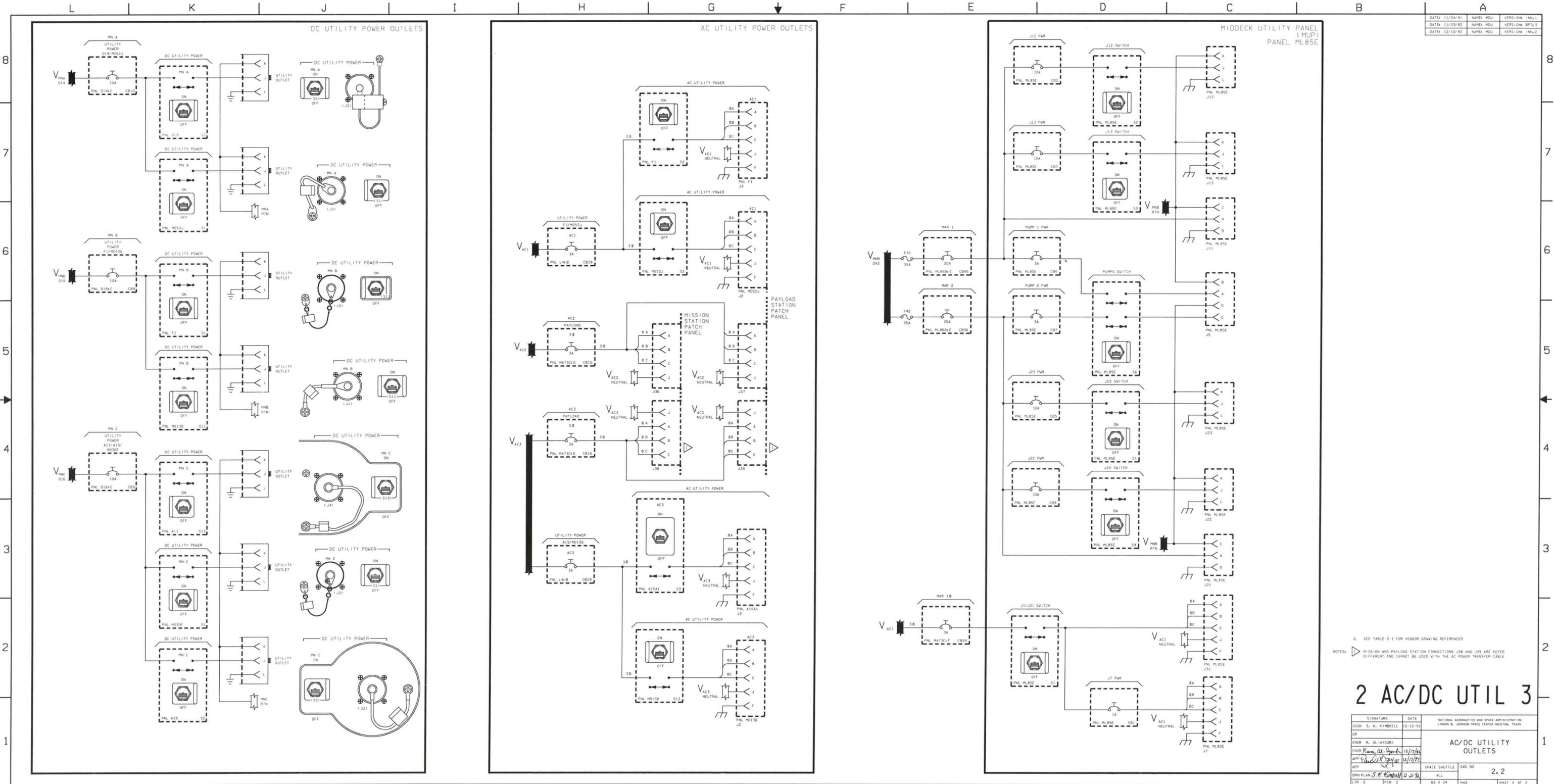


2. ELECTRICAL POWER  
DISTRIBUTION







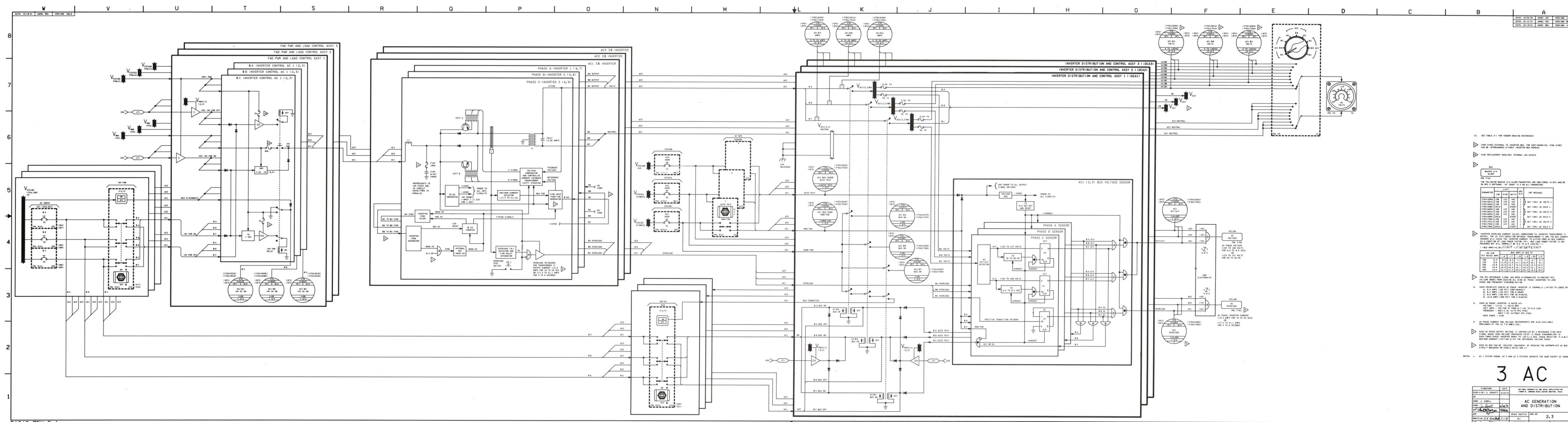


DATE: 11/04/91	NAME: MDU	VERSION: 1NK4.1
DATE: 11/23/92	NAME: MDU	VERSION: 0PFA.3
DATE: 12/10/92	NAME: MDU	VERSION: 1NK4.2

2. SEE TABLE 2-1 FOR VENDOR DRAWING REFERENCES  
 NOTES: MISSION AND PAYLOAD STATION CONNECTIONS J38 AND J39 ARE KEYS DIFFERENT AND CANNOT BE USED WITH THE AC POWER TRANSFER CABLE

## 2 AC/DC UTIL 3

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DR		LINDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
ENGR. R. AL-AYOUBI		AC/DC UTILITY
ENGR. Rami Al-Ayoubi	12/17/92	OUTLETS
APP: [Signature]	12/17/92	
APP: [Signature]	12/17/92	SPACE SHUTTLE
APP: [Signature]	12/17/92	DWG NO. 2.2
APP: [Signature]	12/17/92	ALL
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APP: [Signature]	12/17/92	PAGE
APP: [Signature]	12/17/92	SHEET 3 OF 3



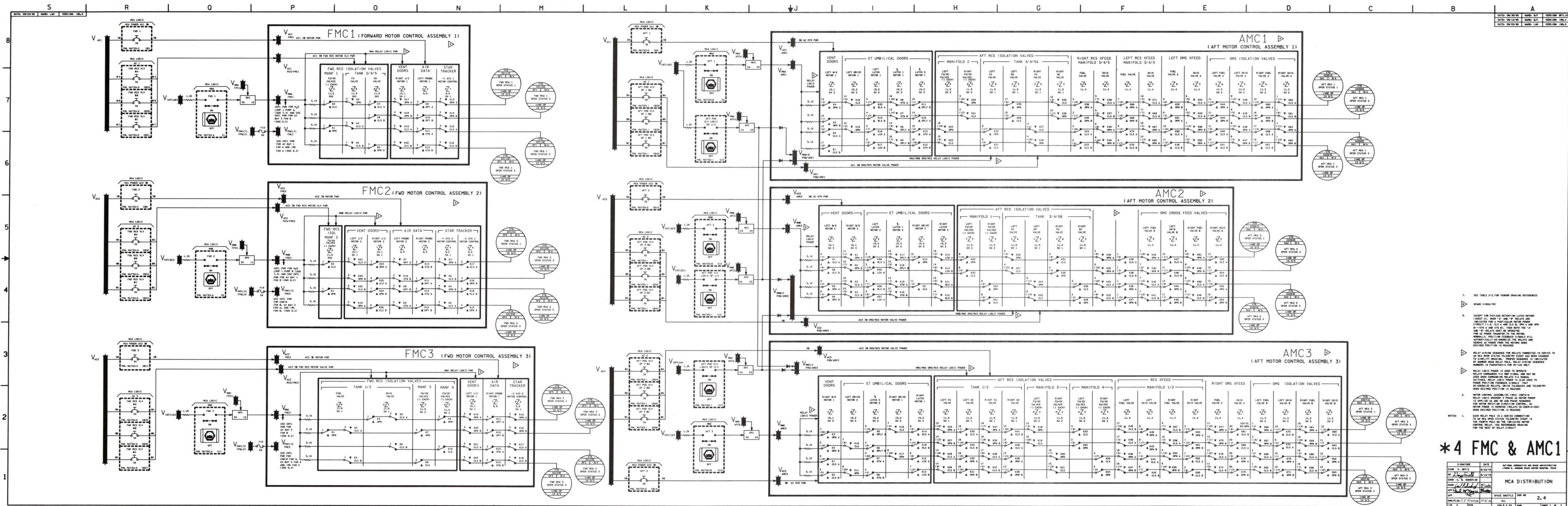
BASIC REV E-1

12. SEE TABLE 2-1 FOR WIRING DRAWING REFERENCES
  13. SYNC WIRES EXTERNAL TO INVERTER BOX. FOR CONTINGENCIES, SYNC WIRES CAN BE INTERCHANGED WITHIN INVERTER BUS INTERNAL.
  14. FUSE REPLACEMENT REQUIRES INTERNAL LRU ACCESS
- BACKUP C/W  
 PH 7742  
 THE FOLLOWING BACKUP C/W ALARM PARAMETERS ARE INSTALLED IN MFS AND/OR SIM OPS 2 SOFTWARE. 'Y' COLUMN IS 'Y' ON ALL PARAMETERS
- | PARAMETER | LIMIT | UNIT | SFC | ORT MESSAGE         |
|-----------|-------|------|-----|---------------------|
| VYR1500A  | 100   | VAC  | 1   | SAT (SH) AC VOLTS 1 |
| VYR1500B  | 100   | VAC  | 1   | SAT (SH) AC VOLTS 2 |
| VYR1500C  | 100   | VAC  | 1   | SAT (SH) AC VOLTS 3 |
| VYR1500A  | 100   | VAC  | 1   | SAT (SH) AC VOLTS 1 |
| VYR1500B  | 100   | VAC  | 1   | SAT (SH) AC VOLTS 2 |
| VYR1500C  | 100   | VAC  | 1   | SAT (SH) AC VOLTS 3 |
| VYR1500A  | 100   | VAC  | 1   | SAT (SH) AC VOLTS 1 |
| VYR1500B  | 100   | VAC  | 1   | SAT (SH) AC VOLTS 2 |
| VYR1500C  | 100   | VAC  | 1   | SAT (SH) AC VOLTS 3 |
1. INVERTER OVERLOAD CURRENT VALUES CORRESPOND TO INVERTER TRANSFORMER T1 OUTPUT. THE 10 PER CENT RATIO BETWEEN TRANSFORMER T1 AND THE BUS CURRENT SENSORS WILL CAUSE THE INVERTER CURRENT TO DIFFER FROM AC BUS CURRENT AS A FUNCTION OF LOAD POWER FACTOR (P.F.). BUS LOW POWER FACTOR IS NOT MEASURED BUT WILL NORMALLY BE 0.8 TO 0.9 LAGGING (1 - 1 BUS AMPS @ 110 PCT, 1.1 BUS AMPS @ 120 PCT, 1.2 BUS AMPS @ 130 PCT)
  2. THE PFI REFERENCE SIGNAL HAS BEEN DISCONNECTED TO PREVENT PFI FAILURE MODES FROM CAUSING ALL LINE AC PHASE INVERTERS TO LOSE PHASE AND PREVENT SYNCHRONIZATION
  3. EACH COOLANT COOLED AC PHASE INVERTER IS THERMALLY LIMITED TO LOADS OF:
    - A. 6.4 AMPS (100 PCT) CONTINUOUSLY
    - B. 6.4 AMPS (100 PCT) FOR 30 MINUTES
    - C. 9.4 AMPS (100 PCT) FOR 10 MINUTES
    - D. 12.4 AMPS (100 PCT) FOR 5 MINUTES
  4. EACH AC PHASE INVERTER IS RATED AT:
    - VOLTAGE - 117V<sub>0</sub> ± 5 VOLTS RMS
    - VOLT AMPS - 100 PER CENT FROM 0.7 LAG TO 0.9 LEAD
    - FREQUENCY - 400 ± 2 HZ WITH PFI SIGNAL
    - 400 ± 2 HZ (WITHOUT PFI SIGNAL)
    - 400 ± 2 HZ (WITHOUT PFI SIGNAL)
  5. EACH AC PHASE INVERTER IS RATED AT:
    - VOLTAGE - 117V<sub>0</sub> ± 5 VOLTS RMS
    - VOLT AMPS - 100 PER CENT FROM 0.7 LAG TO 0.9 LEAD
    - FREQUENCY - 400 ± 2 HZ WITH PFI SIGNAL
    - 400 ± 2 HZ (WITHOUT PFI SIGNAL)
    - 400 ± 2 HZ (WITHOUT PFI SIGNAL)
  6. EACH AC PHASE CURRENT AND VOLTAGE MEASUREMENTS ARE ALSO AVAILABLE PRELAMBDA AT THE LR 1 TO 0 UNLIMITED.
  7. EACH AC PHASE OUTPUT VOLTAGE IS CONTROLLED BY A REFERENCE SINE WAVE SIGNAL. ZERO VOLTAGE CROSSOVER POINT IS PHASE SYNCHRONIZED IN EACH THREE PHASE INVERTER ARRAY TO 100 ± 0.5 DEG. PHASE POSITION IS A.B.C. MAXIMUM CURRENT LIMITING CLIPS THE REFERENCE VOLTAGE PEAKS
  8. EACH AC BUS CAN BE ISOLATED (UNLOADED) BY OPENING THE APPROPRIATE AC BUS CIRCUIT BREAKERS ON PANELS 040A AND 14
- NOTES: 1. AC 1 SYSTEM SHOWN. AC 2 AND AC 3 SYSTEMS OPERATE THE SAME EXCEPT AS SHOWN

3 AC

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LINDSAY S. COBBETT 5/13/78
DRN VICE	S. COBBETT	5/13/78
DR		
ENGR	J. AZBELL	
DRN		
APP		SPACE SHUTTLE DWG NO.
DRN/PLAN	S. S. ENGLISH (1.1.9)	ALL
LTN		2, 3

BASIC REV E-1



BASIC REV E

**\*4 FMC & AMC1**

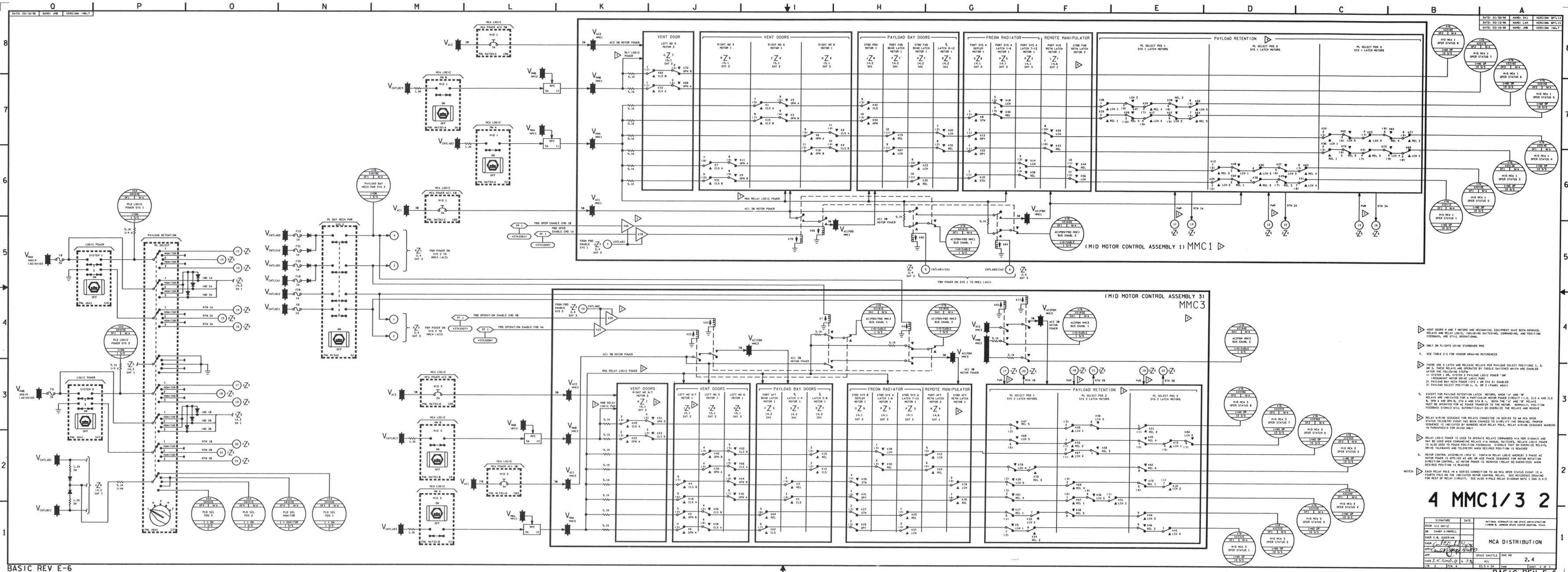
DATE: 06/25/70	NAME: LHM	VERSION: 100.1	DATE: 06/25/70	NAME: LHM	VERSION: 100.1
DATE: 06/25/70	NAME: LHM	VERSION: 100.1	DATE: 06/25/70	NAME: LHM	VERSION: 100.1
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DATE: 06/25/70	NAME: LHM	VERSION: 100.1	DATE: 06/25/70	NAME: LHM	VERSION: 100.1

MCA DISTRIBUTION

DATE: 06/25/70  
 NAME: LHM  
 VERSION: 100.1  
 DATE: 06/25/70  
 NAME: LHM  
 VERSION: 100.1  
 DATE: 06/25/70  
 NAME: LHM  
 VERSION: 100.1  
 DATE: 06/25/70  
 NAME: LHM  
 VERSION: 100.1

BASIC REV E

- SEE TABLE 2-1 FOR VENDOR DRAWING REFERENCES
- SPARE CIRCUITRY
- EXCEPT FOR PAULDAR RETENTION LATCH MOTORS (SEE ECU, WIND-UP, AND SPARE) AND INDICATED FOR A PARTICULAR MOTOR POWER CIRCUIT (I.C.L.S. AND C.L.S. OPEN A AND OPEN B—STV A AND STV B), THE BOTH THE "A" AND "B" RELAYS MUST BE OPERATED FOR AC POWER TRANSFER TO THE MOTOR. NORMALLY, POSITION FEEDBACK SIGNALS WILL INDICATE THE RELAY AND REMOVE AC POWER FROM THE MOTOR WHEN DESIRED POSITION IS REACHED.
- RELAY LOGIC POWER IS USED TO OPERATE RELAY LOGIC POWERED 3 POSITION AC MOTOR POWER CIRCUITS. RELAY LOGIC POWER IS ALSO USED TO POWER POSITION FEEDBACK SIGNALS THAT OPERATE RELAYS. DRIVE TALKBACK AND TELEMETRY WHEN DESIRED POSITION IS REACHED.
- MOTOR CONTROL ASSEMBLIES (MCA) CONTAIN RELAY LOGIC POWERED 3 POSITION AC MOTOR POWER CIRCUITS. RELAY LOGIC POWER IS ALSO USED TO POWER POSITION FEEDBACK SIGNALS THAT OPERATE RELAYS. DRIVE TALKBACK AND TELEMETRY WHEN DESIRED POSITION IS REACHED.
- EACH RELAY POLE IN A SERIES CONNECTION TO AN AC MOTOR STATUS TELEMETRY EVENT IS THE FOURTH POLE ON THE INDICATED MOTOR CONTROL RELAY. SEE REFERENCED DRAWING FOR THE REST OF RELAY CIRCUITRY.



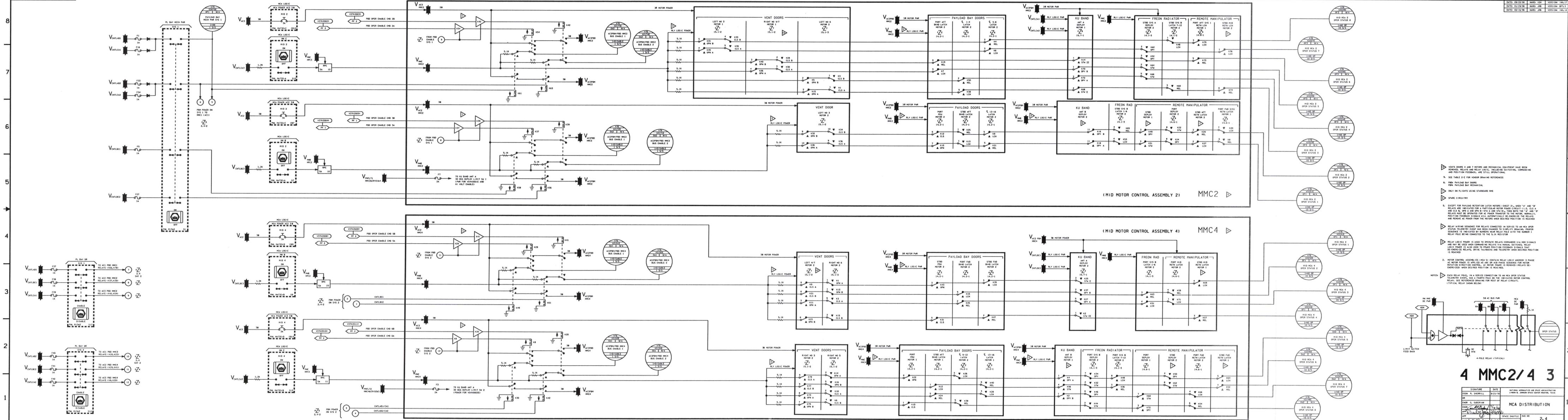
BASIC REV E-6

BASIC REV E-6

- ▽ VENT DOORS 4 AND 7 MOTORS AND MECHANICAL EQUIPMENT HAVE BEEN REWIRED. RELAYS AND RELAY LOGIC, INCLUDING SWITCHING, COMMANDING, AND POSITION FEEDBACK, ARE STILL OPERATIONAL.
- ▽ ONLY ON FLIGHTS USING STANDBY BUS
- 1. SEE TABLE 2-E FOR VENDOR DRAWING REFERENCES
- 2. THERE ARE 2 LATCH AND RELEASE RELAYS PER PAYLOAD SELECT POSITIONS 1, 2, OR 3. THESE RELAYS ARE OPERATED BY TROUBLE SWITCHES WHICH ARE ENHANCED AFTER THE FOLLOWING STEPS:
  - 1) SYSTEM ON
  - 2) PAYLOAD LOGIC POWER 'ON'
  - 3) FREEDOM MOTOR DRIVE LOGIC PWR
  - 4) PAYLOAD BAY MECH POWER SYS 1 OR SYS 2 ENABLED
  - 5) PAYLOAD SELECT POSITION 1, 2, OR 3 (PANEL MEAS)
- 3. EXCEPT FOR PAYLOAD RETENTION LATCH MOTORS, WHEN 'A' AND 'B' RELAYS ARE INDICATED FOR A PARTICULAR MOTOR POWER CIRCUIT (I.E., CLS A AND CLS B), 'A' AND 'B' RELAYS ARE OPERATED BY AC POWER THROUGHTS TO THE MOTOR. NORMALLY, POSITION FEEDBACK SIGNALS WILL AUTOMATICALLY DE-ENERGIZE THE RELAYS AND REMOVE.
- ▽ RELAY WIRING SEQUENCE FOR RELAYS CONNECTED IN SERIES TO AN MCA OPER STATUS TELEMETRY EVENT HAS BEEN CHANGED TO SIMPLIFY THE DRAWING. PROPER SEQUENCE IS INDICATED BY NUMBERS NEAR RELAY POLE. RELAY WIRING SEQUENCE NUMBERS IN PARENTHESES FOR DIVIDED ONLY
- ▽ RELAY LOGIC POWER IS USED TO OPERATE RELAYS COMMANDING VIA NON SIGNALS AND MAY BE USED WHEN COMMANDING RELAYS VIA MANUAL SWITCHES. RELAYS LOGIC POWER IS ALSO USED TO POWER POSITION FEEDBACKS. SIGNALS THAT DE-ENERGIZE RELAYS, DRIVE TALKBACKS AND TELEMETRY WHEN DESIRED POSITION IS REACHED
- 2. MOTOR CONTROL ASSEMBLY'S (MCA'S) CONTAIN RELAY LOGIC WHEREBY 3 PHASE AC MOTOR POWER IS APPLIED AS ARE ON ACB PHASE SEQUENCE FOR MOTOR ROTATION DIRECTION CONTROL. AC MOTOR POWER IS REMOVED (DE-ENERGIZED) WHEN DESIRED POSITION IS REACHED
- NOTES:
  1. EACH RELAY POLE IN A SERIES CONNECTION TO AN MCA OPER STATUS EVENT IS A FOURTH POLE ON THE INDICATED MOTOR CONTROL RELAY. SEE REFERENCE DRAWING FOR REST OF RELAY CIRCUIT. SEE ALSO RELAY SYMBOL NOTE 1 ON DRAWING 2-4-3

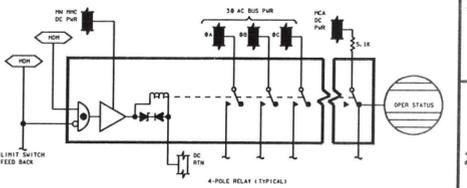
# 4 MMC1/3 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DRSN V.C. ORTIZ	02/12/96	LYNN B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DRSN C.W. GOODWIN	02/12/96	
DRSN J.P. BISHOP	02/12/96	
DRSN S.A. KIMBLE	02/12/96	
APP	SPACE SHUTTLE DSG NO	2.4
LTN E	PCK 4	PAGE 35.5 X 35
		SHEET 6 OF 7



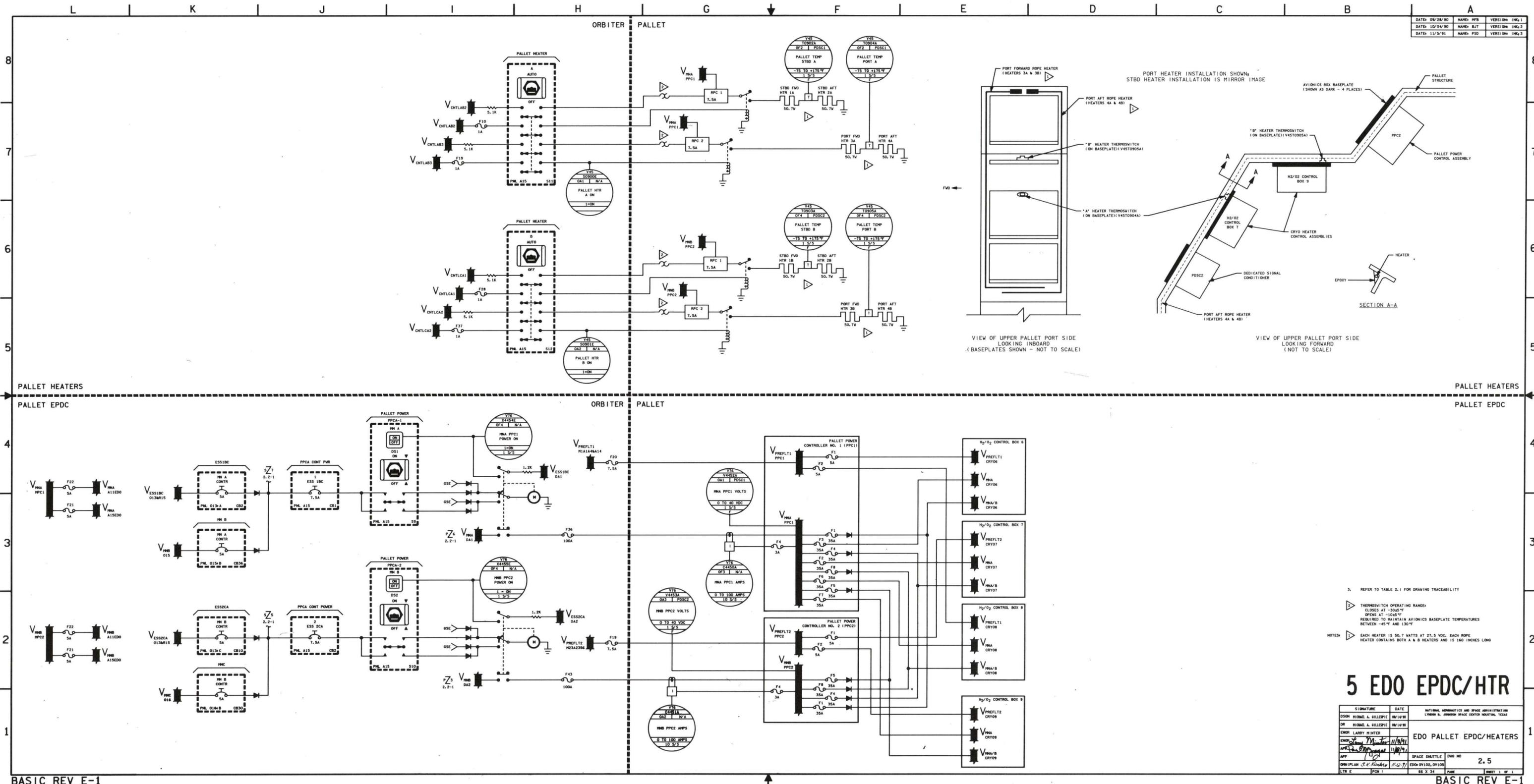
DATE: 02/16/96	NAME: JMB	VERSION: 1M1.13
DATE: 02/23/96	NAME: JMB	VERSION: DPT.1
DATE: 02/16/96	NAME: JMB	VERSION: 1M1.13

- ▽ VENT DOORS 4 AND 3 MOTORS AND MECHANICAL EQUIPMENT HAVE BEEN REMOVED. RELAYS AND RELAY LOGIC, INCLUDING SATURATION, COMPENSING AND POSITION FEEDBACK, ARE STILL OPERATIONAL.
- ▽ SEE TABLE 2-1 FOR YOGOR DRAWING REFERENCES.
- ▽ PBD PAYLOAD BAY DOORS
- ▽ PBM PAYLOAD BAY MECHANICAL
- ▽ ONLY ON FLIGHTS USING STANDARD BMS
- ▽ SPARE CIRCUITRY
- ▽ EXCEPT FOR PAYLOAD RETENTION LATCH MOTORS (SHEET 27), WHEN "A" AND "B" RELAYS ARE INDICATED FOR A PARTICULAR MOTOR POWER CIRCUIT (I.E., CLS A AND CLS B, OPN A AND OPN B AND STW A AND STW B), THEN BOTH THE "A" AND "B" RELAYS MUST BE OPERATED FOR AC POWER TRANSFER TO THE MOTOR. NORMALLY, POSITION FEEDBACK SIGNALS WILL AUTOMATICALLY DE-ENERGIZE THE RELAYS AND REMOVE AC POWER FROM THE MOTORS WHEN DESIRED POSITION IS REACHED.
- ▽ RELAY WIRING SEQUENCE FOR RELAYS CONNECTED IN SERIES TO AN HCA OPER STATUS TELEMETRY EVENT HAS BEEN CHANGED TO SUPPORT DRAWING. PROPER SEQUENCE IS INDICATED BY NUMBERS NEAR RELAY POLE WITH THE NUMBER 1 RELAY POLE BEING CONNECTED TO THE 5.1K RESISTOR.
- ▽ RELAY LOGIC POWER IS USED TO OPERATE RELAYS COMPARED VIA NON SIGNALS AND MAY BE USED WHEN COMPARED RELAYS VIA MANUAL SWITCHES. RELAY LOGIC POWER IS ALSO USED TO POWER POSITION FEEDBACK SIGNALS THAT DE-ENERGIZE RELAYS, DRIVE TALKBACKS AND TELEMETRY WHEN DESIRED POSITION IS REACHED.
- ▽ MOTOR CONTROL ASSEMBLIES (HCA) CONTAIN RELAY LOGIC WHEREBY 3 PHASE AC MOTOR POWER IS APPLIED AS ONE OR MORE PHASES DEPENDENT ON MOTOR ROTATION DIRECTION ON CONTROL. AC MOTOR POWER IS REMOVED (RELAYS DE-ENERGIZED) WHEN DESIRED POSITION IS REACHED.
- NOTES:
  - ▽ EACH RELAY POLE, IN A SERIES CONNECTION TO AN HCA OPER STATUS TELEMETRY EVENT, TAKES A FOURTH POLE ON THE INDICATED MOTOR CONTROL RELAY. SEE REFERENCED DRAWING FOR REST OF RELAY CIRCUIT. TYPICAL RELAY SHOWN BELOW.



4 MMC2/4 3

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DRON P. SHERMILL	6/2/78	LINCOLN & JOHNSON SPACE CENTER, HOUSTON, TEXAS
ENGR. C. GUERIAN		
DRG. S. R. BLOOM		
APP. S. R. BLOOM		
CHKD. S. R. BLOOM		
REV. S. R. BLOOM		



DATE: 09/28/90	NAME: MFB	VERSION: INK.1
DATE: 10/04/90	NAME: BJT	VERSION: INK.2
DATE: 11/5/91	NAME: PSD	VERSION: INK.3

BASIC REV E-1

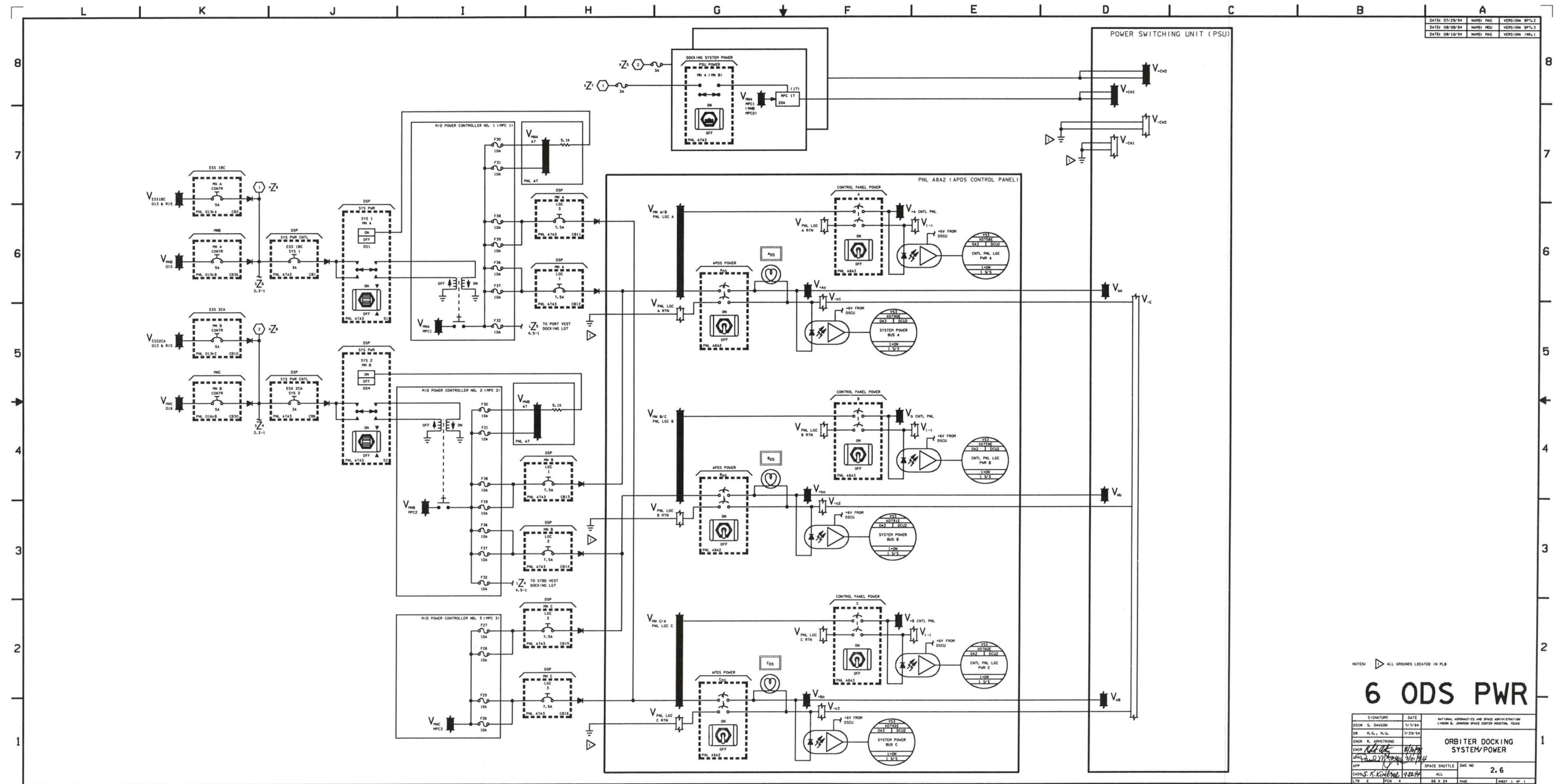
BASIC REV E-1

# 5 EDO EPDC/HTR

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNCH R. JOHNSON SPACE CENTER HOUSTON, TEXAS
DESIGN: RICHARD A. GILLETTE	08/14/90	EDO PALLET EPDC/HEATERS
DR: RICHARD A. GILLETTE	08/14/90	
ENGR: LARRY HINTON	11/19/91	SPACE SHUTTLE
APP: [Signature]	EDON 0V105, 0V105	DWG NO: 2.5
DRN/PLAN: J. R. [Signature]	66 X 34	SCALE: 1:1

3. REFER TO TABLE 2.1 FOR DRAWING TRACEABILITY
- △ THERMISTOR OPERATING RANGE:  
CLOSES AT -30±5°F  
OPENS AT -10±5°F  
REQUIRED TO MAINTAIN AVIONICS BASEPLATE TEMPERATURES  
BETWEEN -65°F AND 130°F
- NOTES: △ EACH HEATER IS 50.7 WATTS AT 27.5 VDC. EACH ROPE  
HEATER CONTAINS BOTH A & B HEATERS AND IS 160 INCHES LONG

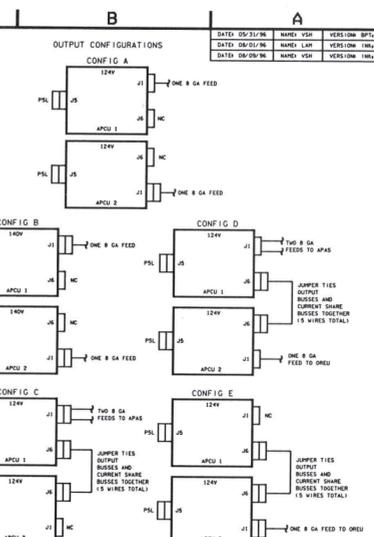
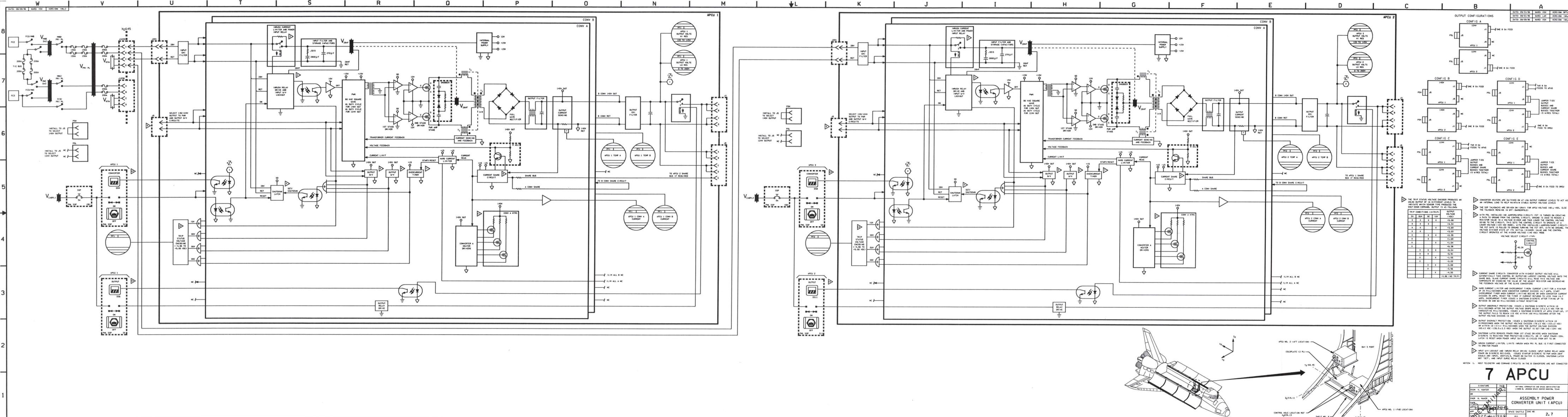
DATE: 07/25/84	NAME: PMS	VERSION: BPT1.2
DATE: 08/05/84	NAME: PDU	VERSION: BPT1.3
DATE: 08/10/84	NAME: PMS	VERSION: TRM1.1



NOTES:  $\nabla$  ALL GROUNDS LOCATED IN PLS

# 6 ODS PWR

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DSGN S. DAVSON	7/27/84	LYNN B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR PL G., PL U.	7/25/84	
ENGR R. ARMSTRONG	8/2/84	ORBITER DOCKING SYSTEM POWER
APP [Signature]	8/2/84	
CDR S. K. KILBING	9/22/84	SPACE SHUTTLE
ELR E	PCH 4	ALL
		DWG NO 2.6
		86 X 24
		SHEET 1 OF 1



- THE TRIP STATUS VOLTAGE ENCODER PRODUCES AN ANALOG OUTPUT OF 16 DIFFERENT LEVELS TO INDICATE WHICH SENSOR TYPE PRODUCED THE SHUTDOWN COMMAND. OUTPUT IS AS FOLLOWS:
- | TRIP CONDITIONS (A=TRIP) | OUTPUT (VOLT) |
|--------------------------|---------------|
| OV                       | +1.00         |
| X                        | +1.50         |
| X                        | +2.00         |
| X                        | +2.50         |
| X                        | +3.00         |
| X                        | +3.50         |
| X                        | +4.00         |
| X                        | +4.50         |
| X                        | +5.00         |
| X                        | +5.50         |
| X                        | +6.00         |
| X                        | +6.50         |
| X                        | +7.00         |
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| X                        | +8.00         |
| X                        | +8.50         |
| X                        | +9.00         |
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| X                        | +99.50        |
| X                        | +100.00       |
- CONVERTER HEATERS ARE SWITCHED ON AT LOW OUTPUT CURRENT LEVELS TO ACT AS AN INTERNAL LOAD TO SELF HEATERS. OUTPUT VOLTAGE LEVELS INDICATE WHICH SENSOR TYPE PRODUCED THE SHUTDOWN COMMAND. OUTPUT IS AS FOLLOWS:
- THE SFP TALKBACKS ARE DRIVEN BY LOGIC FOR APCU VOLTAGE 980 ± VDC. ELSE THE SFP TALKBACKS REMAIN IN OFF (BARBERPOLE)
- WITH PFM, INSTALLED THE JUMPER/OPROTECT CIRCUITRY FEET IS TUNED ON HEATING A PATH TO GROUND FROM THE CONTROL. SHOULD BE USED TO PROTECT A RESISTOR VALUE IN A THEATER WHEN CONVERTER CURRENT EXCEEDS 1.2 AMP. START DISCONNECT FROM WHEN CURRENT LIMITING BEGINS OR WHEN CONVERTER CURRENT EXCEEDS 15 AMP. RESET THE LOGIC TO GROUND DISCONNECTS TO LESS THAN 0.1 AMP. DISCONNECT FROM AFTER TYPING UP TO BETWEEN 30 AND 60 MILLISECONDS WITHOUT RESETTING.
- OUTPUT UNDERVOLT PROTECTION ISSUES A SHUTDOWN DISCRETE WITHIN 10 MILLISECONDS AFTER THE OUTPUT VOLTAGE DROPS BELOW 115V ± 2.5 VDC FOR 60 CONDUCTIVE WILL RECOVER. ISSUES A SHUTDOWN DISCRETE AT APCU START-UP, IF THE OUTPUT FAILS TO REACH 115 VDC WITHIN 100 MILLISECONDS AFTER THE VOLTAGE EXCEEDS 15 VDC
- OUTPUT OVERVOLT PROTECTION ISSUES A SHUTDOWN DISCRETE WITHIN 10 MILLISECONDS WHEN THE OUTPUT VOLTAGE EXCEEDS 118 ± 2 VDC (115V ± 2 VDC) OR WITHIN 10 ± 2 MILLISECONDS WHEN THE OUTPUT VOLTAGE EXCEEDS 140 ± 2 VDC (130V ± 2.5 VDC) WHEN THE OUTPUT IS SET FOR 140V (134V VDC)
- SHUTDOWN LATCH REMOVES POWER FROM 1ST STAGE DRIVERS WHEN SHUTDOWN DISCRETE IS RECEIVED FROM PROTECTION CIRCUITS OR IF INPUT POWER 28V LATCH IS RESET WHEN POWER INPUT SWITCH IS CYCLED FROM OFF TO ON
- URGUS CURRENT LIMITER LATCHES TRIGGERS WHEN PFI PL BUS IS FIRST CONNECTED TO ORBITER POWER
- INPUT UP/LATCH AND URGUS RELAY DRIVEN CLOSURE INPUT SURGE RELAY WHEN POWER ON DISCRETE RECEIVED. ISSUES STARTUP DISCRETE TO PFM WHEN 28V EQUALS 28V INPUT. 28V/24V. POWER ON SWITCH IS CLOSED. SHUTDOWN LATCH NOT TEST AND INPUT SURGE RELAY CLOSED

NOTES: 1. MOST TELEMETRY AND COMMAND CIRCUITS IN THE B CONVERTERS ARE NOT CONNECTED

# 7 APCU

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_ NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
 TITLE: ASSEMBLY POWER CONVERTER UNIT (APCU)  
 DRAWING NO: 2.7  
 SHEET NO: 2 OF 2  
 DATE: 12/13/74

# 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
		R.I.	VS70-953104	11 OF 55		5/13/94	INTEGRATED SCHEMATIC - ORBITER DOCKING SYSTEM (ODS), RUSSIAN MIR MISSION, OV-104
		R.I.	VS70-760309	1 - 14	H	12/14/89	MAIN DC POWER DISTRIBUTION SUBSYSTEM - OV-103, OV-104, OV-105
2.2 (SHEET 2)	MAIN BUS DC DISTRIBUTION	R.I.	VS70-760322	1 - 14	E	11/21/88	MAIN DC POWER DISTRIBUTION SUBSYSTEM - OV-102
		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
		2.2 (SHEET 3)	MAIN BUS DC DISTRIBUTION	JSC	SID39119180	1 OF 1	B
R.I.	VS70-760202			2	G	1/14/83	COAS SEAT/SUIT CONTROL CREW SYSTEMS - OV-102
R.I.	VS70-760209			2	D	11/13/84	COAS SEAT/SUIT CONTROLS CREW SYSTEMS - OV-103, OV-04, OV-105

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		
2.1	ENGR J. AZBELL			ENGR		<b>VENDOR DRAWING REFERENCES</b>		
	ENGR <i>J. Azbell</i>	4/5/95		ENGR				
2.2-1	ENGR R. AL-AYOUBI			ENGR				
	ENGR <i>Rammi Al Ayoubi</i>	4/10/95		ENGR				
2.2-2	ENGR R. AL-AYOUBI			APP				
	ENGR <i>Rammi Al Ayoubi</i>	4/10/95		APP				
2.2-3	ENGR R. AL-AYOUBI			APP		SPACE SHUTTLE	TBL NO	2-1
	ENGR <i>Rammi Al Ayoubi</i>	4/10/95		LTR E		ALL		
						PAGE	2.1-1	SHEET 1 OF 2

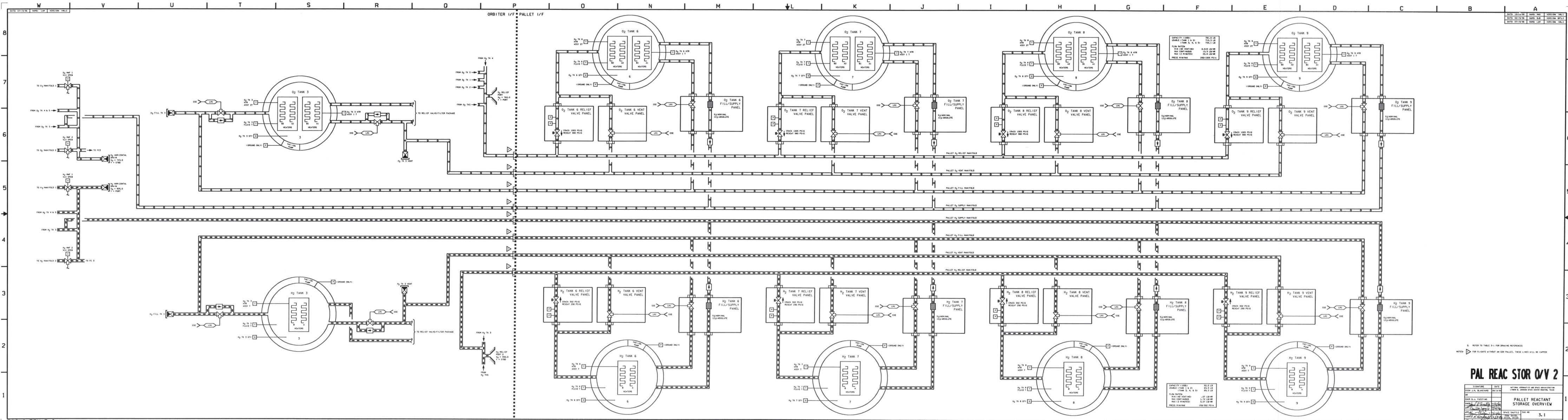
# FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

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.	V570-760402	1-9	L	12/9/88	AC PWR DIST AND CONTROL - SUBSYSTEM
		R. I.	V570-760409	1-9	D	1/19/89	AC PWR DIST AND CONTROL - SUBSYSTEM
		R.I.	V570-760202	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
2.4 (SHEETS 1-3)	MCA DISTRIBUTION	R.I.	V570-540302	1 - 8	K	6/10/91	PAYLOAD BAY DOOR CONTS SUBSYSTEM
		R.I.	V570-540309	1 - 8	E	6/6/86	PAYLOAD BAY DOOR CONTS SUBSYSTEM
		R.I.	V570-760709	1 - 11	E	11/15/90	MOTOR CONTROL ASSY POWER DISTRIBUTION
		R.I.	V570-760702	1 - 12	H	8/25/86	MOTOR CONTROL ASSY POWER DISTRIBUTION
		R.I.	V570-590119	1 - 3	B	12/3/85	KU-BAND ANTENNA DEPLOYMENT
		R.I.	V570-540304	1 - 5	C	12/20/88	PAYLOAD RETENTION SUBSYSTEM
		R. I.	ECN 105-0044	ALL	A4	1/23/90	PRSD MODS FOR THE 28-DAY MISSION EXTENSION KIT ON OV-105
2.5	PALLET EPDC/HEATERS	R. I.	V570-945102	ALL	G	7/20/90	INTEGRATED SYSTEM SCHEMATIC ORBITER OV-102 EPS
		JSC	SCR90118	ALL	A	8/23/89	EDO SM MODIFICATIONS
2.6	ORBITER DOCKING SYSTEM/ POWER	R.I.	V570-953104	1 - 10 OF 55		5/13/94	INTEGRATED SCHEMATIC - ORBITER DOCKING SYSTEM (ODS), RUSSIAN MIR MISSION, OV-104

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
2.3	ENGR J. AZBELL			ENGR		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>J. Azbell</i>	4/5/95		ENGR			
2.4-1,2,3	ENGR B. GUDERIAN			ENGR			
	ENGR <i>Carl B. Guderman</i>	4/10/95		ENGR			
2.5	ENGR L. MINTER			APP		SPACE SHUTTLE	TBL NO
	ENGR <i>Larry Minter</i>	4/5/95		APP			2-1
2.6	ENGR R. ARMSTRONG			APP		ALL	
	<i>Robert E. Armstrong</i>	4/10/95		LTR E	PCN 5	PAGE 2 1-2	SHEET 2 OF 2





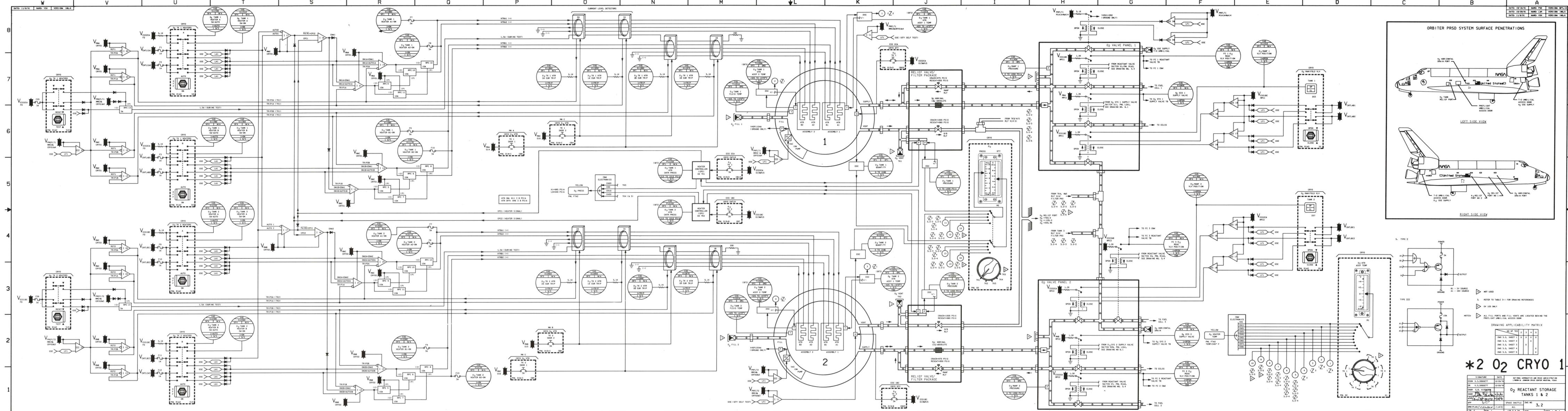


DATE	BY	REV	DESCRIPTION
07/15/96	LAM	1	ISSUE FOR CONSTRUCTION
07/15/96	LAM	2	ISSUE FOR CONSTRUCTION

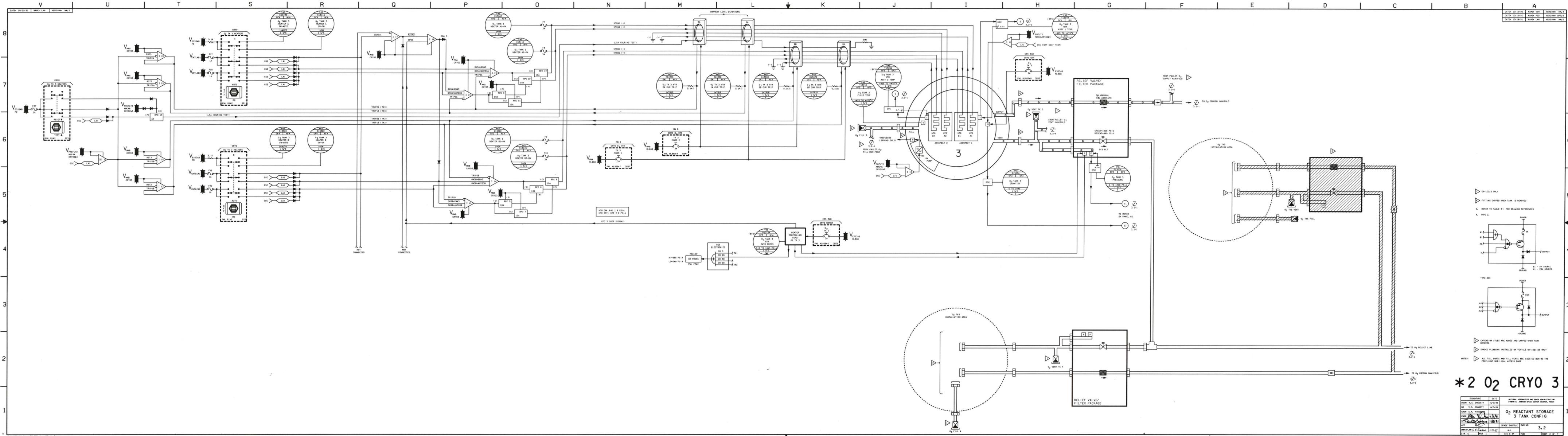
5. REFER TO TABLE 3-1 FOR DRAWING REFERENCES  
 NOTES:  $\nabla$  FOR FLIGHTS WITHOUT AN EDO PALLET, THESE LINES WILL BE CAPPED

### PAL REAC STOR O/V 2

DESIGNER	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ISSUED BY	08/14/96	LINCOLN B. JOHNSON SPACE CENTER WEAVER, TEXAS
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BASIC REV E-1

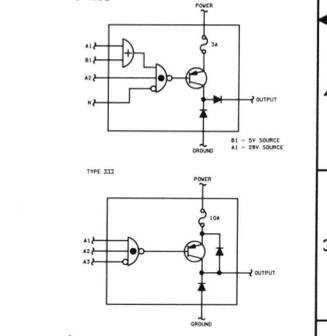
**\*2 O<sub>2</sub> CRYO 3**

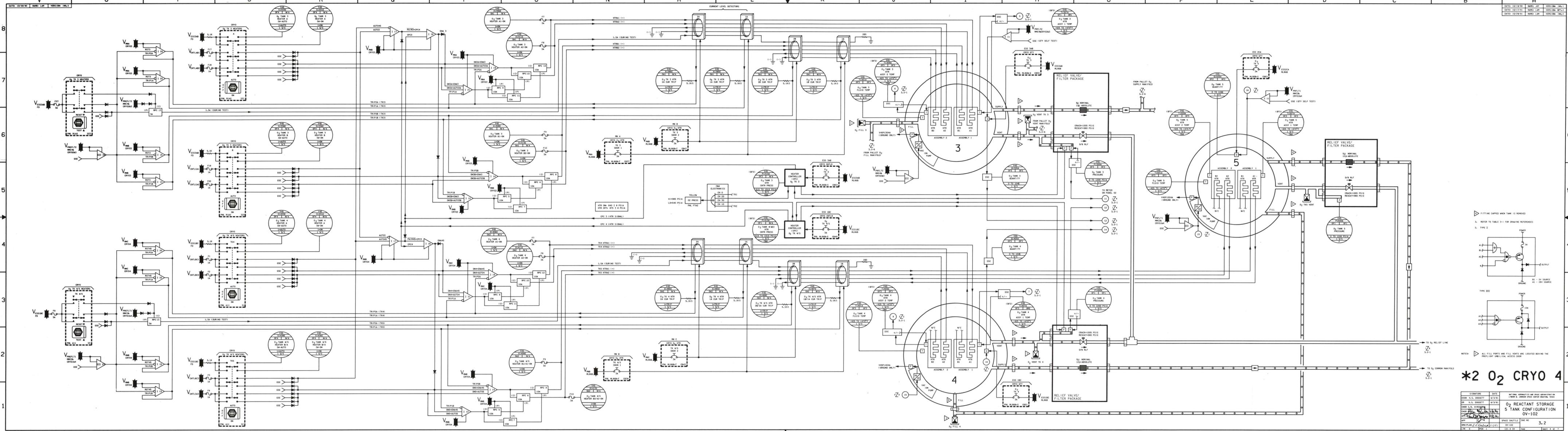
SYMBOL	DATE	DESCRIPTION
DR	V. S. DODDITT	6/2/81
CHKD	S. R. HARRIS	6/2/81
APP	S. R. HARRIS	6/2/81
ELTR	S. R. HARRIS	6/2/81

DATE	BY	DESCRIPTION
6/2/81	V. S. DODDITT	ISSUE FOR CONSTRUCTION
6/2/81	S. R. HARRIS	ISSUE FOR CONSTRUCTION
6/2/81	S. R. HARRIS	ISSUE FOR CONSTRUCTION
6/2/81	S. R. HARRIS	ISSUE FOR CONSTRUCTION

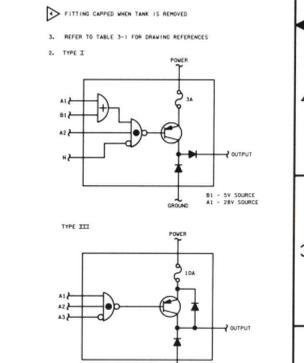
BASIC REV E-1

- 1. O<sub>2</sub>-100'S ONLY
- 2. FITTING CAPPED WHEN TANK IS REMOVED
- 3. REFER TO TABLE 3-1 FOR DRAWING REFERENCES
- 4. TYPE I
- 5. TYPE II
- 6. TYPE III
- 7. EXTENSION STUDS ARE ADDED AND CAPPED WHEN TANK REMOVED
- 8. SHADED PUMPING INSTALLED ON VEHICLE OY-100-105 ONLY
- NOTES: ALL FILL PORTS AND FILL VENTS ARE LOCATED BEHIND THE PRE-EXISTING UNILICAL ACCESS DOOR





BASIC REV E-1



NOTES: ALL FILL PORTS AND FILL VENTS ARE LOCATED WITHIN THE PRELIGHT OPERABLE ACCESS DOOR

**\*2 O<sub>2</sub> CRYO 4**

DATE: 10/18/90	NAME: JDF	VERSION: 1001.1
DATE: 10/18/91	NAME: LHM	VERSION: 001.2
DATE: 10/28/91	NAME: LHM	VERSION: 1001.2

ISSUED FOR: 02 REACTANT STORAGE	ISSUED BY: JDF
ISSUED FOR: 5 TANK CONFIGURATION	ISSUED BY: JDF
ISSUED FOR: OV-102	ISSUED BY: JDF

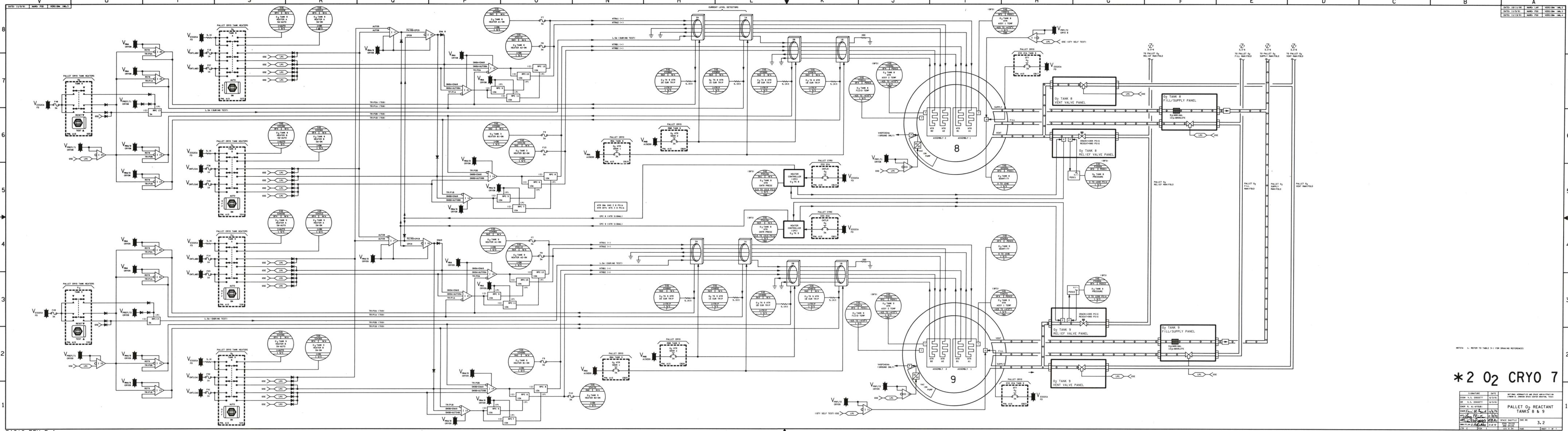
SPACE SHUTTLE: OV-102	REV: 3.2
DATE: 4/91	REV: 3.2

FIG. 1

BASIC REV E-1





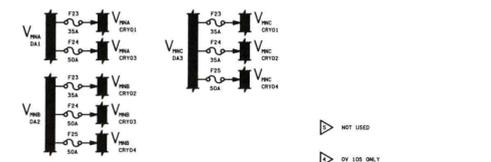
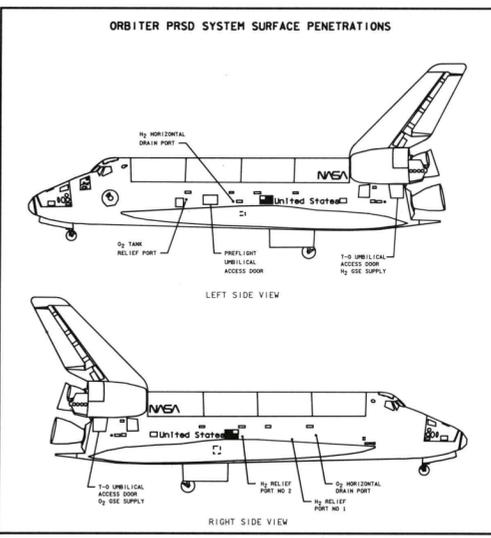
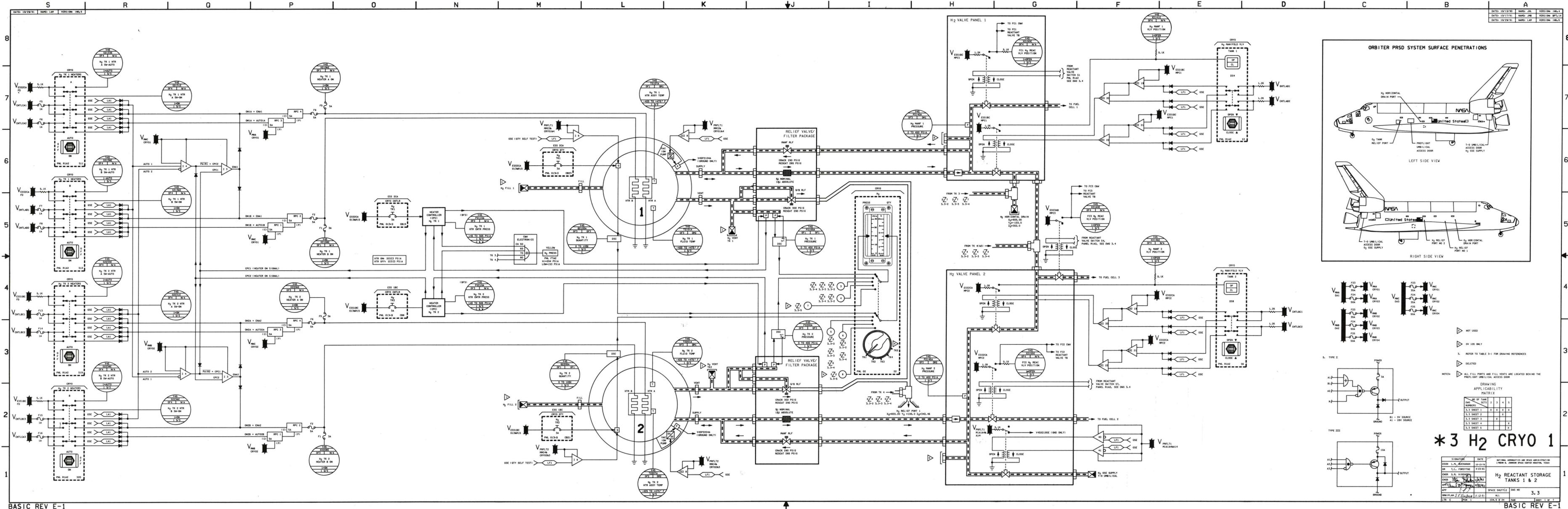


BASIC REV E-1

\*2 O2 CRYO 7

SYMBOL	DATE	REVISION
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96	11/15/91	96
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99	11/15/91	99
100	11/15/91	100

BASIC REV E-1



DRAWING APPLICABILITY MATRIX

NO. OF TANK	1	2	3	4
3.3 SHEET 1	X	X	X	X
3.3 SHEET 2	X	X	X	X
3.3 SHEET 3	X	X	X	X
3.3 SHEET 4	X	X	X	X
3.3 SHEET 5	X	X	X	X

\* 3 H<sub>2</sub> CRYO 1

H<sub>2</sub> REACTANT STORAGE TANKS 1 & 2

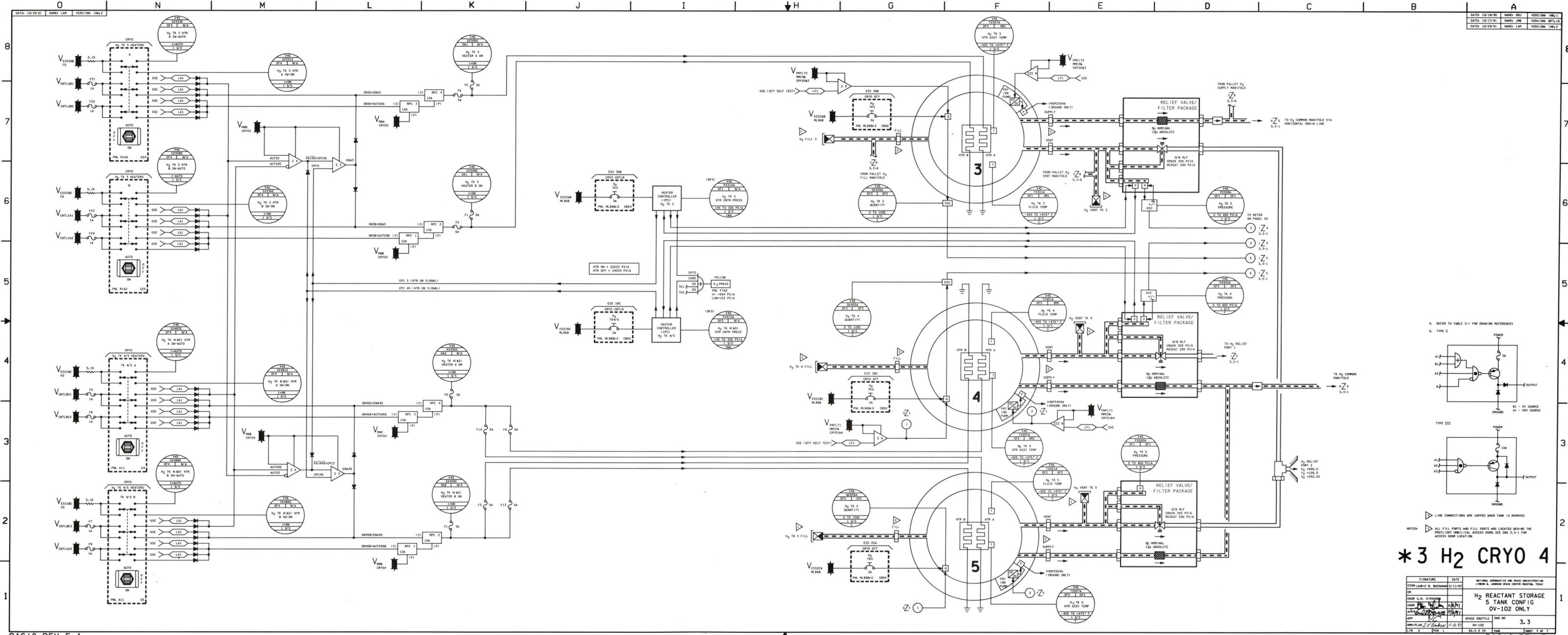
SIGNATURE	DATE	REVISION
DRN L.W. JOHNSON	20-10-75	1
DRN L.W. JOHNSON	14-10-74	2
ENGR S.R. HARRISON	14-10-74	3
CHKR J.C. HARRISON	14-10-74	4
APP'D J.C. HARRISON	14-10-74	5
DRN L.W. JOHNSON	14-10-74	6
APP'D L.W. JOHNSON	14-10-74	7
CHKR J.C. HARRISON	14-10-74	8
APP'D J.C. HARRISON	14-10-74	9
CHKR J.C. HARRISON	14-10-74	10
APP'D J.C. HARRISON	14-10-74	11
CHKR J.C. HARRISON	14-10-74	12
APP'D J.C. HARRISON	14-10-74	13
CHKR J.C. HARRISON	14-10-74	14
APP'D J.C. HARRISON	14-10-74	15
CHKR J.C. HARRISON	14-10-74	16
APP'D J.C. HARRISON	14-10-74	17
CHKR J.C. HARRISON	14-10-74	18
APP'D J.C. HARRISON	14-10-74	19
CHKR J.C. HARRISON	14-10-74	20
APP'D J.C. HARRISON	14-10-74	21
CHKR J.C. HARRISON	14-10-74	22
APP'D J.C. HARRISON	14-10-74	23
CHKR J.C. HARRISON	14-10-74	24
APP'D J.C. HARRISON	14-10-74	25
CHKR J.C. HARRISON	14-10-74	26
APP'D J.C. HARRISON	14-10-74	27
CHKR J.C. HARRISON	14-10-74	28
APP'D J.C. HARRISON	14-10-74	29
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APP'D J.C. HARRISON	14-10-74	31
CHKR J.C. HARRISON	14-10-74	32
APP'D J.C. HARRISON	14-10-74	33
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APP'D J.C. HARRISON	14-10-74	35
CHKR J.C. HARRISON	14-10-74	36
APP'D J.C. HARRISON	14-10-74	37
CHKR J.C. HARRISON	14-10-74	38
APP'D J.C. HARRISON	14-10-74	39
CHKR J.C. HARRISON	14-10-74	40
APP'D J.C. HARRISON	14-10-74	41
CHKR J.C. HARRISON	14-10-74	42
APP'D J.C. HARRISON	14-10-74	43
CHKR J.C. HARRISON	14-10-74	44
APP'D J.C. HARRISON	14-10-74	45
CHKR J.C. HARRISON	14-10-74	46
APP'D J.C. HARRISON	14-10-74	47
CHKR J.C. HARRISON	14-10-74	48
APP'D J.C. HARRISON	14-10-74	49
CHKR J.C. HARRISON	14-10-74	50
APP'D J.C. HARRISON	14-10-74	51
CHKR J.C. HARRISON	14-10-74	52
APP'D J.C. HARRISON	14-10-74	53
CHKR J.C. HARRISON	14-10-74	54
APP'D J.C. HARRISON	14-10-74	55
CHKR J.C. HARRISON	14-10-74	56
APP'D J.C. HARRISON	14-10-74	57
CHKR J.C. HARRISON	14-10-74	58
APP'D J.C. HARRISON	14-10-74	59
CHKR J.C. HARRISON	14-10-74	60
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CHKR J.C. HARRISON	14-10-74	62
APP'D J.C. HARRISON	14-10-74	63
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CHKR J.C. HARRISON	14-10-74	70
APP'D J.C. HARRISON	14-10-74	71
CHKR J.C. HARRISON	14-10-74	72
APP'D J.C. HARRISON	14-10-74	73
CHKR J.C. HARRISON	14-10-74	74
APP'D J.C. HARRISON	14-10-74	75
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CHKR J.C. HARRISON	14-10-74	78
APP'D J.C. HARRISON	14-10-74	79
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APP'D J.C. HARRISON	14-10-74	81
CHKR J.C. HARRISON	14-10-74	82
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CHKR J.C. HARRISON	14-10-74	84
APP'D J.C. HARRISON	14-10-74	85
CHKR J.C. HARRISON	14-10-74	86
APP'D J.C. HARRISON	14-10-74	87
CHKR J.C. HARRISON	14-10-74	88
APP'D J.C. HARRISON	14-10-74	89
CHKR J.C. HARRISON	14-10-74	90
APP'D J.C. HARRISON	14-10-74	91
CHKR J.C. HARRISON	14-10-74	92
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CHKR J.C. HARRISON	14-10-74	94
APP'D J.C. HARRISON	14-10-74	95
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BASIC REV E-1

BASIC REV E-1

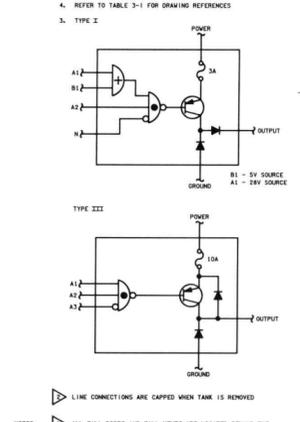




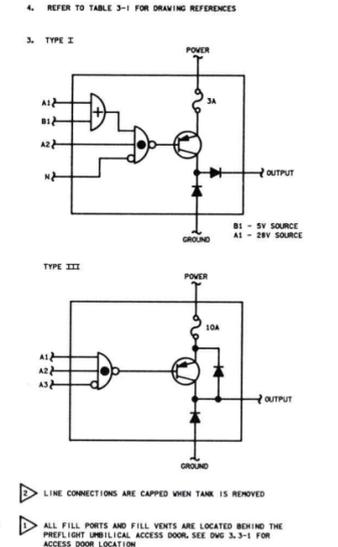
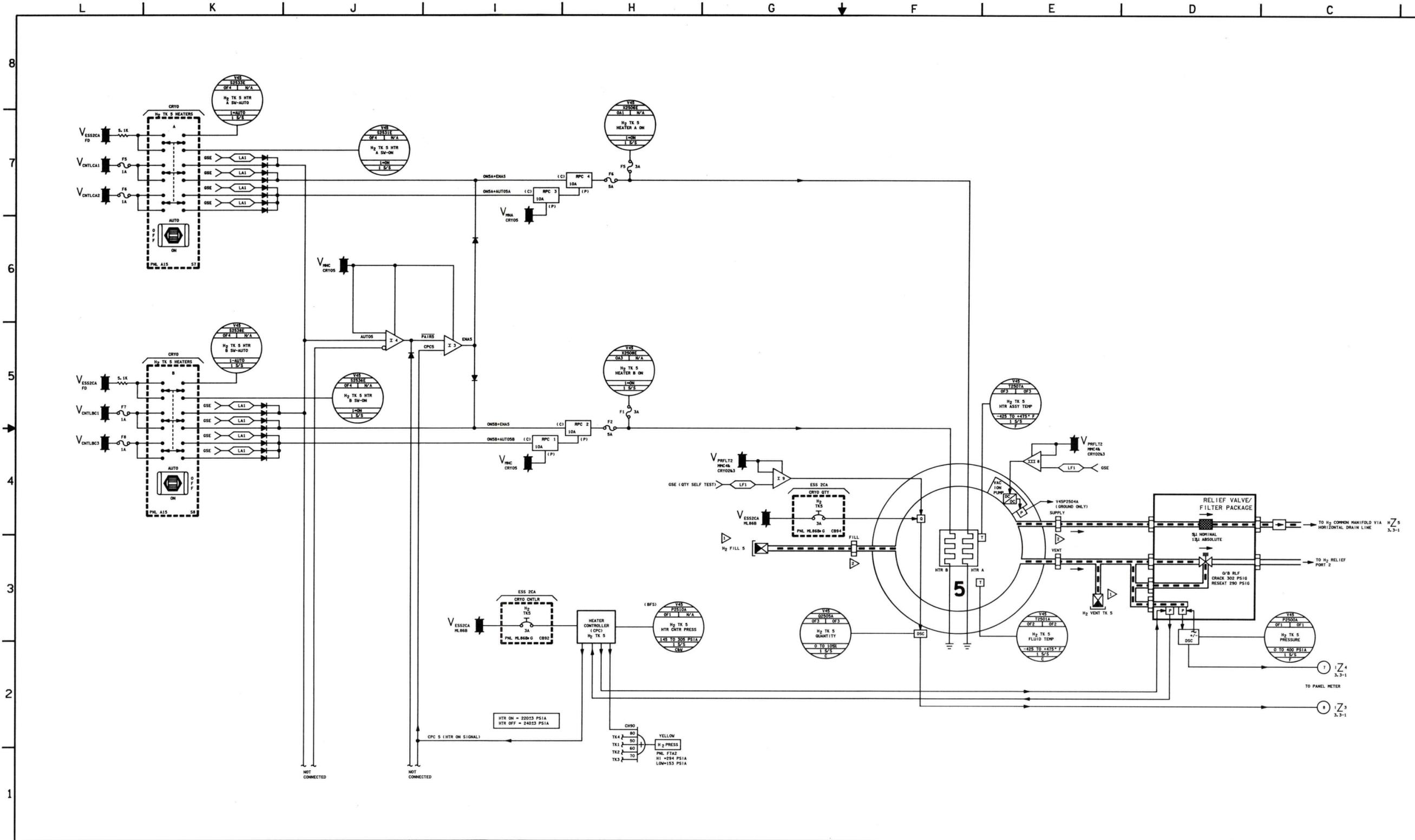


BASIC REV E-1

BASIC REV E-1



DATE: 10/05/90	NAME: SEW	VERSION: 1HG.1
DATE: 10/13/90	NAME: BJT	VERSION: 1HG.2
DATE: 11/01/90	NAME: MDU	VERSION: 1HG.3



# \* 3 H<sub>2</sub> CRYO 5

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DSON LAURIE M. BUCHANAN	27/11/83	LYNCH B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
ENGR S.P. HIRSHMAN		H <sub>2</sub> REACTANT STORAGE 5 TANK CONFIGURATION OV-105
ENGR H. J. WILSON		
APP		SPACE SHUTTLE
ORNIPLAN S. C. KIMMEL	11/1/90	DWG NO
LTN E	PCH	OV 105
		66 X 34
		3.3
		SHEET 3 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	V570-450212	ALL	C	7/5/84	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM
		ROCKWELL	V570-450222	ALL	B	10/10/83	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM
		ROCKWELL	V570-450219	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.	V570-945102	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)	O <sub>2</sub> REACTANT STORAGE	ROCKWELL	V570-945099	ALL	A11	7/27/90	INTEGRATED SYSTEM SCHEMATIC ELECTRICAL POWER SUBSYSTEM ORBITER VEHICLES - 099, 103 and 104
3.2 (SHEET 5)	O <sub>2</sub> REACTANT STORAGE OV-105	R.I.	V570-450205	ALL	A	8/28/89	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM OV-105
3.2 (SHEETS 6-7)	PALLET O <sub>2</sub> 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.	V570-945102	ALL	G	7/20/90	INTEGRATED SYSTEM SCHEMATIC ORBITER OV-102 EPS
		JSC	SCR 90118	ALL	A	8/23/90	EDO SM MODIFICATIONS
3.3 (SHEETS 1-4)	H <sub>2</sub> REACTANT STORAGE	ROCKWELL	V570-945102	ALL	G07	8/2/90	INTEGRATED SYSTEM SCHEMATIC ORBITER OV-102 EPS
		ROCKWELL	V570-450212	ALL	C	7/5/84	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM
		ROCKWELL	V570-450222	ALL	B	10/10/83	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM
		ROCKWELL	V570-450219	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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS														
3.1-1	ENGR S. HIRSHORN		3.2-7	ENGR R. AL-AYOUBI					<b>VENDOR DRAWING REFERENCES</b>											
	ENGR <i>[Signature]</i>	10/29/90		ENGR <i>[Signature]</i>	10/29/90	<b>VENDOR DRAWING REFERENCES</b>														
3.1-2	ENGR R. AL-AYOUBI		3.3,1-4	ENGR S. HIRSHORN								<b>VENDOR DRAWING REFERENCES</b>								
	ENGR <i>[Signature]</i>	10/29/90		ENGR <i>[Signature]</i>	10/29/90										<b>VENDOR DRAWING REFERENCES</b>					
3.2,1-5	ENGR S. HIRSHORN			APP <i>[Signature]</i>	11/11/90													<b>VENDOR DRAWING REFERENCES</b>		
	ENGR <i>[Signature]</i>	10/29/90		APP																
3.2-6	ENGR L. MINTER			OMNIPLAN					SPACE SHUTTLE	TBL NO	3-1									
	ENGR <i>[Signature]</i>	10/29/90		LTR E		ALL	PAGE	3.1-1												
								SHEET 1 OF 2												

BASIC REV E

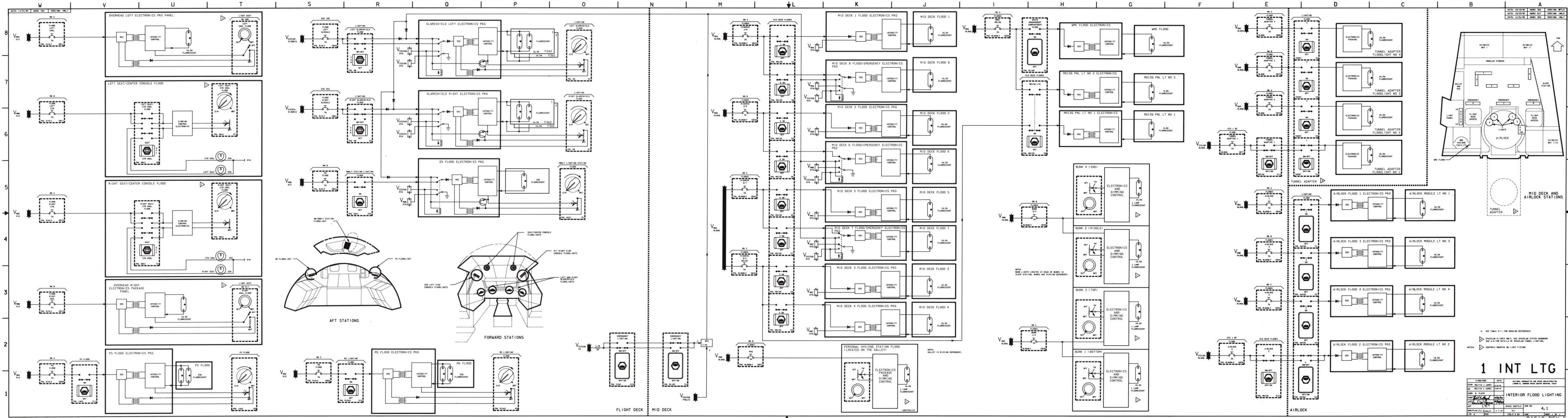
# FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
3.3 (SHEET 5)	H <sub>2</sub> 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 <sub>2</sub> 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
		R.I.	VS70-945102	27	F/G07	8/2/90	FUEL CELL 1 REAR VALVES, FC GAS CONTROL, AND LIVE HEATERS
3.4 (SHEET 1)	FUEL CELL	R.I.	VS70-945102	28	F/G07	8/2/90	FC 1 START-UP LOGIC AND FC HEATERS
		R.I.	VS70-945102	29	F/G07	8/2/90	FC 1 INSTRUMENTATION
		R.I.	VS70-945102	36	F/G07	8/2/90	FC GAS/H <sub>2</sub> O DISCHARGE SYSTEM AND HEATER CONTROL
		R.I.	VS70-450119	1 of 7	B	6/14/89	FC CONTROL SUBSYSTEM
		R.I.	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
		R.I.	VS70-450205	2	B	4/3/91	SCHEMATIC DIAGRAM - CRYO SUBSYSTEM OV-105
3.4 SHEET 2	FUEL CELL TO 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
3.6B	EDO CRYO PALLET PLUMBING	R.I.	VL70-458800	1 of 5	-	11/91	FUEL CELL/POWER REACTANT STORAGE & DISTRIBUTION SYSTEM SCHEMATIC OV-102 (STS-50) VERSION (PRELIMINARY DOCUMENT)

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	VENDOR DRAWING REFERENCES	
3.3-5	ENGR S. HIRSHORN		3.5	ENGR L. FOX			
	ENGR <i>Abu Bakur</i>	2/17/93		ENGR <i>Raymond M. Fox</i>	2-17-93	ALL	3-1
3.3-6	ENGR L. MINTER		3.6B	ENGR L. FOX			
	ENGR <i>Larry Minter</i>	2/17/93		ENGR <i>Raymond M. Fox</i>	2-17-93	SHEET	2 of 2
3.3-7	ENGR R. AL-YOUB			APP <i>Richard M. Janke</i>	2-18-93		
	ENGR <i>Rami Al-Youb</i>	2/18/93		APP			
3.4-1,2	ENGR B. PAWLIK			OMNIPLAN			
	ENGR <i>Bryan Pawlik</i>	2/19/93		LTR E	PCN 2		

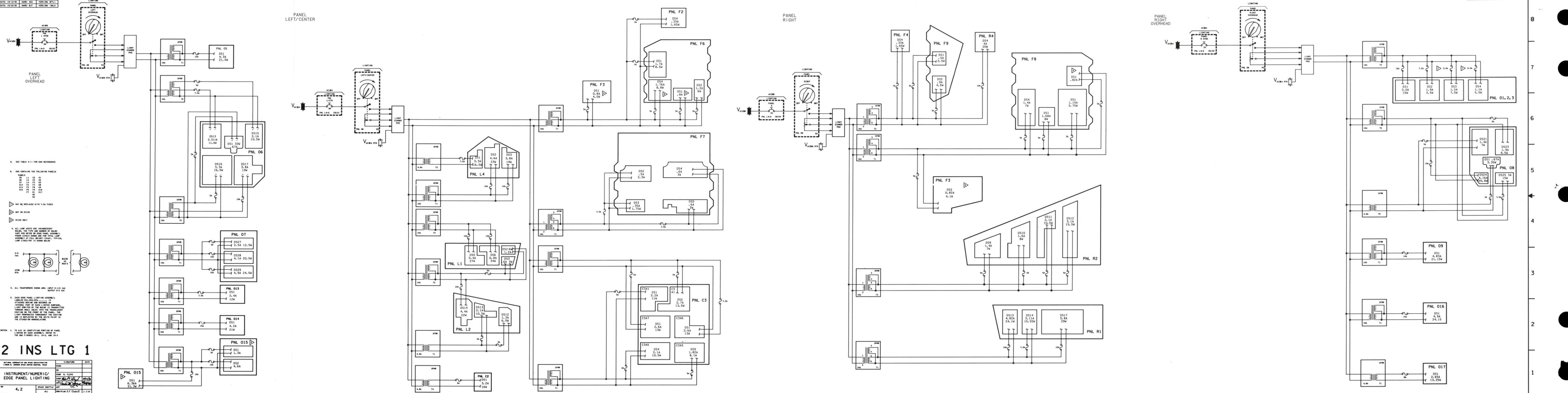
BASIC REV E-2





**1 INT LTG**

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DRAWN BY: MELVIN J. JAMES		04-10-70	LYNN B. JAMES, PROJECT ENGINEER, WASHINGTON, TEXAS
CHECKED BY: FLOYD		04-10-70	
APPROVED BY: [Signature]			INTERIOR FLOOD LIGHTING
DRAWN BY: MELVIN J. JAMES		04-10-70	SPACE SHUTTLE
DATE: 04-10-70		ALL	4.1
REV. 1		125.5 2 84	



9. SEE TABLE 4-11 FOR DWG REFERENCES
8. DWG CONTAINS THE FOLLOWING PANELS:
- | PANEL | NO | LTG | DS |
|-------|----|-----|----|
| 01    | L1 | C2  | O1 |
| 02    | L1 | F3  | O3 |
| 03    | L1 | F3  | O3 |
| 04    | F3 | F3  | O3 |
| 05    | F3 | F3  | O3 |
| 06    | F3 | F3  | O3 |
| 07    | F3 | F3  | O3 |
| 08    | F3 | F3  | O3 |
| 09    | F3 | F3  | O3 |
| 10    | F3 | F3  | O3 |
| 11    | F3 | F3  | O3 |
| 12    | F3 | F3  | O3 |
| 13    | F3 | F3  | O3 |
| 14    | F3 | F3  | O3 |
| 15    | F3 | F3  | O3 |
| 16    | F3 | F3  | O3 |
| 17    | F3 | F3  | O3 |
- △ MAY BE REPLACED WITH 1.5A FUSES
- ▽ NOT ON DIVIDE
- ◇ DIVIDE ONLY
4. ALL LAMP ASSEMBLY USE INCANDESCENT BULBS. THE TYPE AND NUMBER OF BULBS VARY PER METER OR EDGE PANEL ASSEMBLY. POWER LEVELS SHOWN ARE FOR TOTAL LAMP ASSEMBLY AT FULL BRIGHT. TYPICAL LAMP CIRCUITRY IS SHOWN BELOW.
- 0-5 VAC
3. ALL TRANSFORMERS SHOWN AND INPUT 0-115 VAC OUTPUT 0-5 VAC
2. EACH EDGE PANEL LIGHTING ASSEMBLY, LABELED DS1-DSn, IS ATTACHED BEHIND AND RECEIVES AN INTERNAL PART OF EACH LIGHTED INSTRUMENT. LIGHT SUPPLIED BY THE BULBS IS TRANSMITTED THROUGH SMALL HOLES INTO THE TRANSPARENT COATING ON THE FRONT OF THE PANEL. THE LIGHT PROPAGATES THROUGHOUT THE COATING AND IS REFLECTED BY THE WHITE PAINT IN THE ETCHED-ON IMMEDIATE LINE.
- NOTES: 1. TO AID IN IDENTIFYING PORTION OF PANEL LIGHTED BY EACH ASSEMBLY, REFER TO THE DWG FIGURES 19-1, 19-2, AND 19-3

**2 INS LTG 1**

DATE: 8/13/87	NAME: MHI	VERSION: 1064.6	SIGNATURE	DATE
DATE: 10/12/90	NAME: SEV	VERSION: 1071.1		
DATE: 10/22/90	NAME: BUT	VERSION: 1064.6		

INSTRUMENT/NUMERIC/EDGE PANEL LIGHTING

DWG NO: 4.2

SPACE SHUTTLE

ALL

DATE: 11-9-90

BY: [Signature]

CHKD: [Signature]

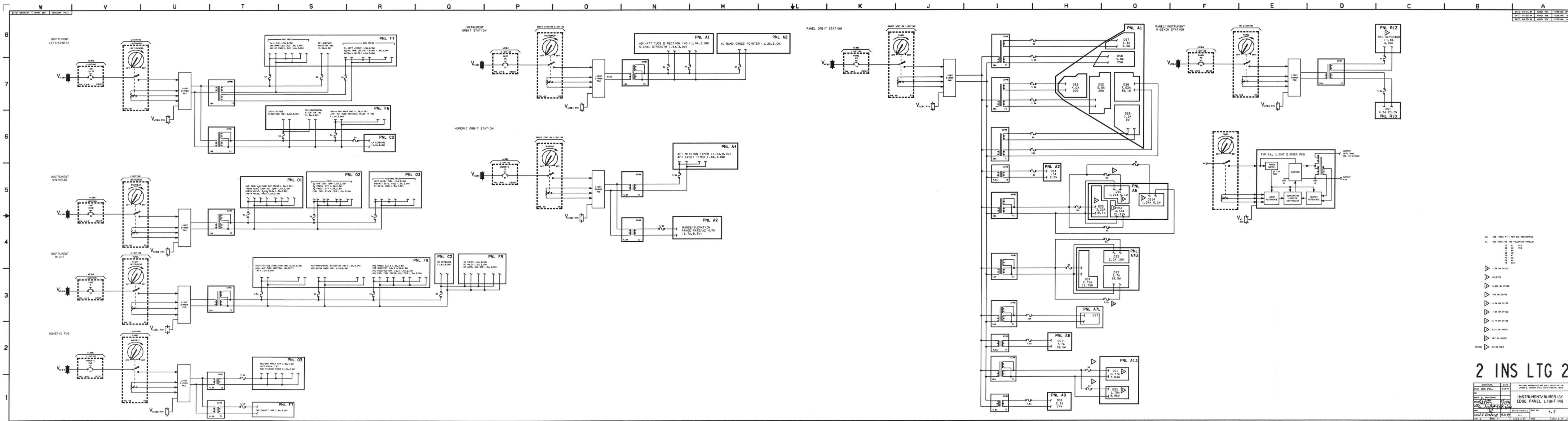
APPV: [Signature]

DATE: 11-9-90

BY: [Signature]

CHKD: [Signature]

APPV: [Signature]



10. SEE TABLE A-11 FOR DIM REFERENCES
11. DIM CONTAINS THE FOLLOWING PANELS:
- DI A1
  - DI A2
  - DI A3
  - DI A4
  - DI A5
  - DI A6
  - DI A7
  - DI A8
  - DI A9
  - DI A10
  - DI A11
  - DI A12
- ▷ 2.5A ON 0102
- ▷ DELETED
- ▷ 3.61A ON 0102
- ▷ 10A ON 0102
- ▷ 4.5A ON 0102
- ▷ 1.5A ON 0102
- ▷ 1.7A ON 0102
- ▷ 2.1A ON 0102
- ▷ NOT ON 0102
- NOTES ▷ 01022 ONLY

# 2 INS LTG 2

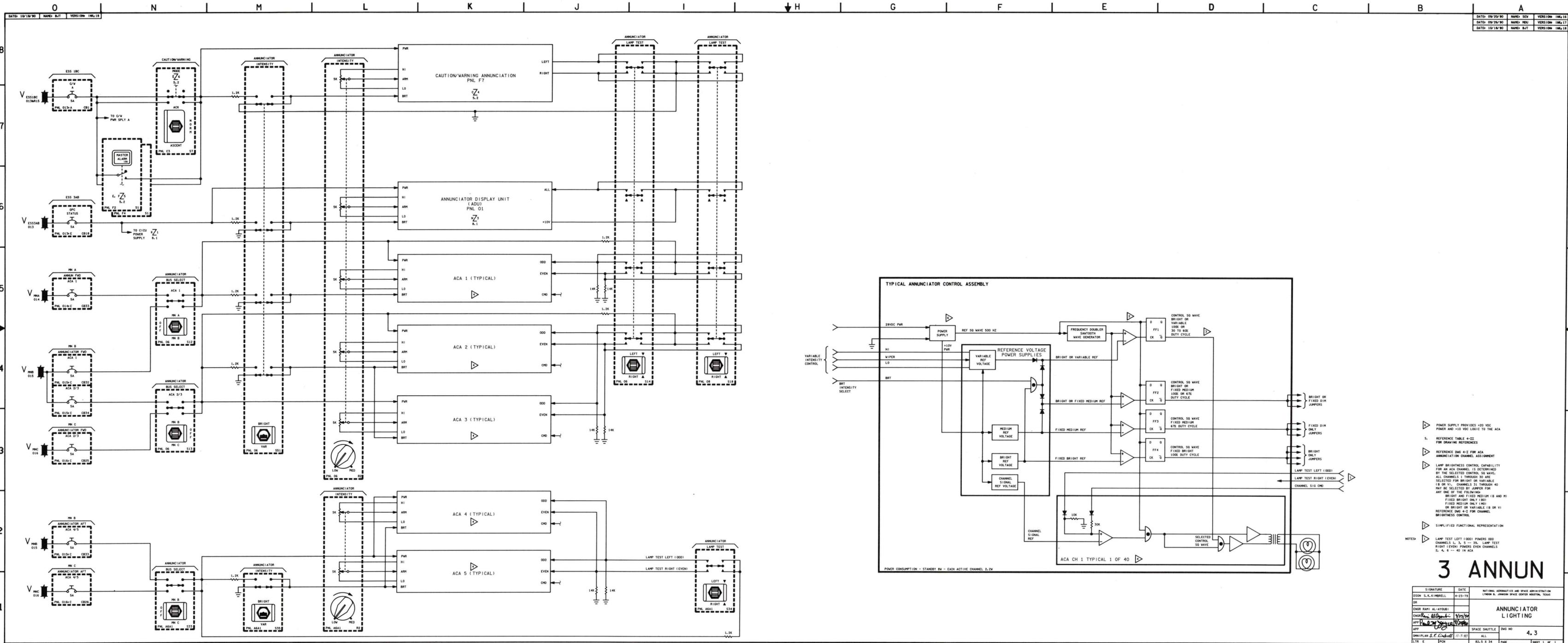
DATE	07/11/84	NAME	LDH	VERSION	001.2
DATE	07/26/84	NAME	JMB	VERSION	001.4
DATE	08/25/84	NAME	SEV	VERSION	001.7

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DDM	8/19/78	LYNN B. JOHNSON SPACE CENTER HOUSTON, TEXAS
CHKD & APPROVED		
APP		
CONTR. C. GIMREY	8/22/79	

INSTRUMENT/NUMERIC/EDGE PANEL LIGHTING	DWG NO.	4, 2
SPACE SHUTTLE	REV.	
136.5.4.34	FIG.	
136.5.4.34	FIG.	



BASIC REV E

BASIC REV E

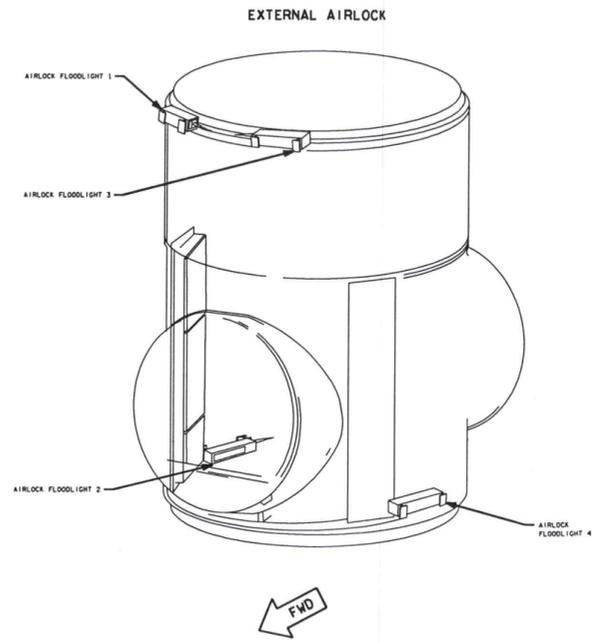
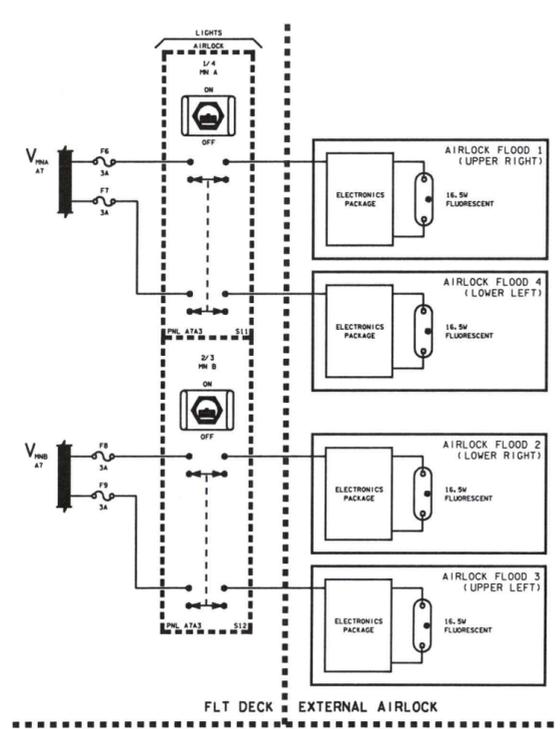
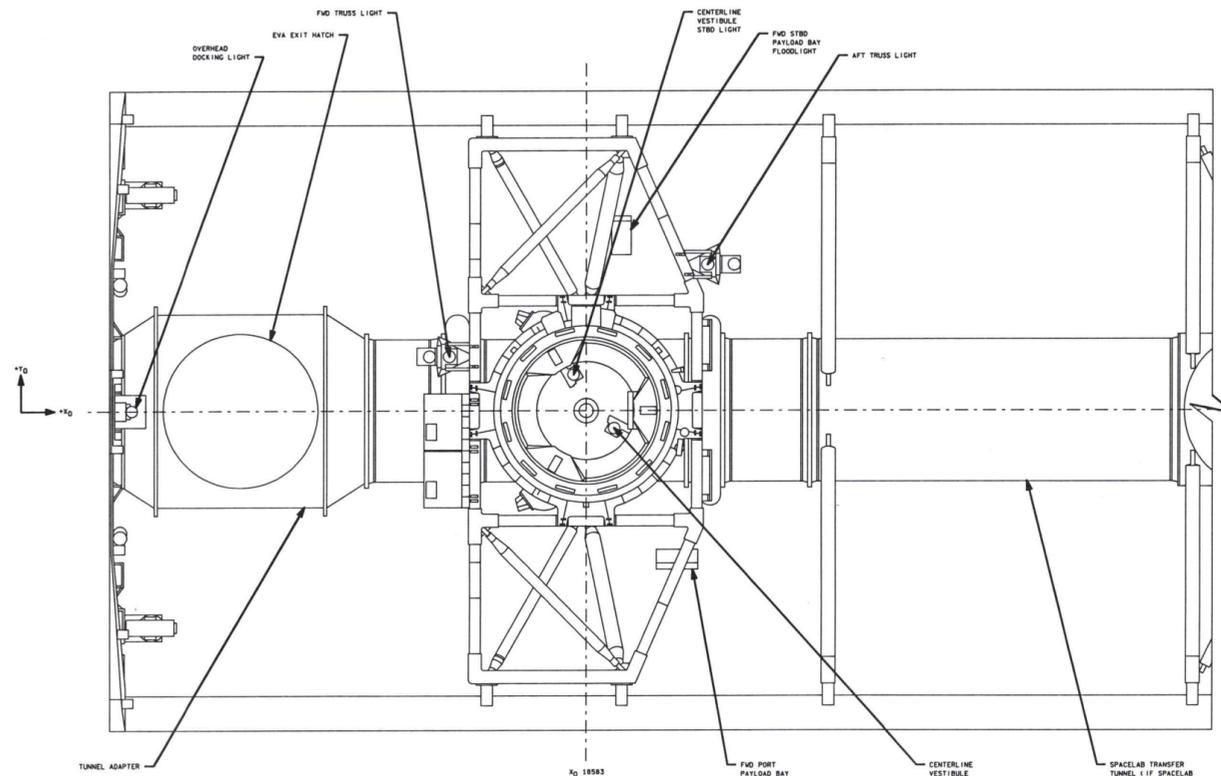
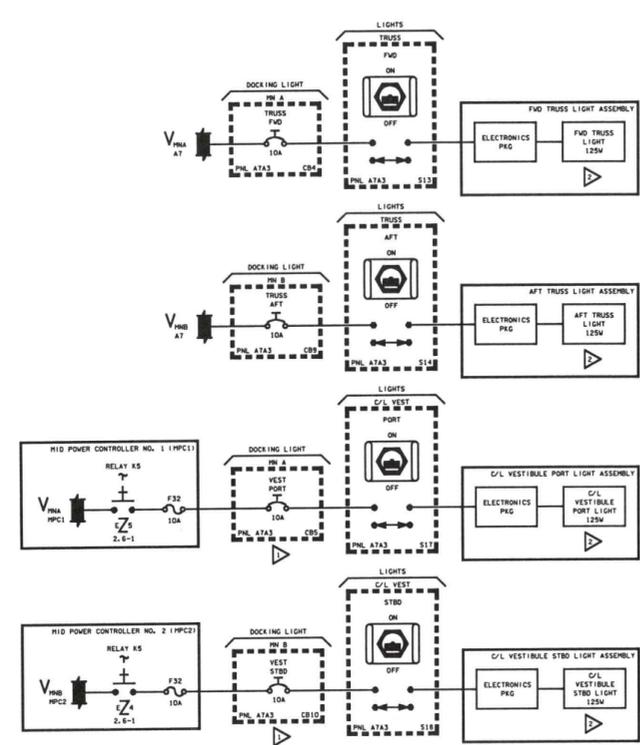
# 3 ANNUN

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DSOH S.K.KIMBELL	4-23-70	LINCOLN B. JOHNSON SPACE CENTER HOUSTON, TEXAS
ANNUNCIATOR LIGHTING		
APP PLAN	SPACE SHUTTLE	DWG NO
OPN PLAN	ALL	4.3
CTR E	PCB	PAGE

3 ANNUN



ORBITER DOCKING SYSTEM LIGHTS  
 WATTS 125 AT 28 VDC  
 LUMENS/WATT 12 MIN/MPM  
 40" X 40"



ORBITER DOCKING SYSTEM (ODS) CAMERA LIGHT LOCATIONS

ODS LIGHTS	CENTERLINE LOCATION					
	X <sub>0</sub>		Y <sub>0</sub>		Z <sub>0</sub>	
	IN	MM	IN	MM	IN	MM
CENTERLINE CAMERA LIGHTS	728.34	18900	11.40	290	441.71	11219
TRUSS CAMERA LIGHTS	740.94	18820	-7.30	-185	441.71	11219
	687.96	17474	17.82	453	419.21	10648
	770.47	19570	47.43	1205	419.21	10648

SHUTTLE CARGO BAY LIGHT COORDINATES

LOCATION OF LIGHTS	ATTACHMENT LOCATION			FIXTURE CENTERLINE			
	X <sub>0</sub>	Y <sub>0</sub>	SIDE	Y <sub>0</sub>	Z <sub>0</sub>	IN	MM
FWD BULKHEAD	576.00	14830	AFT	0.00	0	484.20	12299
FWD STBD	750.00	19050	FORWARD	84.00	1422	320.30	8300
FWD PORT	750.00	19050	AFT	-84.00	-1219	320.00	8126
MID STBD	978.50	24819	FORWARD	54.30	1379	323.90	8027
MID PORT	978.50	24819	FORWARD	-54.30	-1379	323.90	8027
MID T BND	1140.67	28973	FORWARD	56.00	1422	324.90	8252
AFT PORT	1140.67	28973	FORWARD	-56.00	-1422	324.90	8252

NOTES:   
 1. TRUSS AND C/L VESTIBULE LIGHT ASSEMBLIES USE SAME DESIGN AS THE RMS SPOTLIGHT ASSEMBLY.   
 2. 10A CIRCUIT BREAKERS ARE MAINLY USED TO PROVIDE REDUNDANCY AGAINST A FAILED-ON LIGHT FAILURE SCENARIO.

# 5 ODS AL LGTS

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LINDOR & JOHNSON SPACE CENTER HOUSTON, TEXAS
DR: B. TEDDER	01/13/84	
ENGR: R. ARMSTRONG	07/27/84	ORBITER DOCKING SYSTEM/ AIRLOCK LIGHTS
APP: R. K. KOPPEL	08/15/84	
CADD: R. KOPPEL	08-9-84	
STR: E	PCN: 4	SPACE SHUTTLE DVG NO: 4.5
		ALL
		82.5 X 34
		PAGE: 1 OF 1

ACA NO. 1

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

LAMP TEST RIGHT - EVEN						
Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Brightness Control
C3A6	ORBITAL DAP - CONTROL --- MAN - RCS JETS --- NORM --- VERN ROTATION ORBITAL DAP --- ROLL DISC RATE PITCH DISC RATE YAW DISC RATE ROLL ACCEL PITCH ACCEL YAW ACCEL ROLL PULSE PITCH PULSE YAW PULSE	(S4)	W	2	2	B&V
		(S5)	W	4	2	B&V
		(S6)	W	6	2	B&V
		(S7)	W	10	2	B&V
		(S8)	W	12	2	B&V
		(S9)	W	14	2	B&V
		(S10)	W	18	2	B&V
		(S11)	W	20	2	B&V
		(S12)	W	22	2	B&V
		(S13)	W	26	2	B&V
F4	MASTER ALARM	(S1)	R	32	2	ACA3 B&M
		(S1)	R	8	2	B&V
F7A7	MAIN ENGINE 2 STATUS OUT OF LIMIT LEFT SHUTDOWN LEFT	(XDS2)	R	8	2	B&V
		(XDS2)	Y	16	2	B&V
M052J	MASTER ALARM	(S3)	R	36	2	ACA3 MO
		(S3)	R	24	1	B&V
---	SPARE	(S3)	---	34	1	B&V
		(S3)	---	38	1	B&V
		(S3)	---	38	1	B&V
		(S3)	---	40	1	B&V

ACA NO. 3

LAMP TEST LEFT - ODD						
Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Brightness Control
---	SPARE	(S1)	---	1	1	B&V
		(S1)	---	3	1	B&V
		(S1)	---	5	1	B&V
		(S1)	---	7	1	B&V
		(S1)	---	9	1	B&V
F3	NWS FAIL	(XDS3)	Y	35	2	B&V
L1A1	FIRE SUPPRESSION AV BAY 1 AGENT DISCH 2 AGENT DISCH 3 AGENT DISCH	(S4)	Y	11	2	B&V
		(S5)	Y	13	2	B&V
		(S6)	Y	15	2	B&V
---	SPARE	(S1)	---	37	1	B&V
		(S1)	---	37	1	B&V
F6A5	LANDING GEAR --- ARM DOWN	(S1)	Y	31	2	B&V
		(S2)	G	33	2	B&V
F6A8	RCS COMMAND --- ROLL L ROLL R PITCH U PITCH D YAW L YAW R	(XDS1)	W	17	1	ACA2 B&V
		(XDS1)	W	19	1	ACA2 B&V
		(XDS1)	W	21	1	ACA2 B&V
		(XDS1)	W	23	1	ACA2 B&V
		(XDS1)	W	25	1	ACA2 B&V
		(XDS1)	W	27	1	ACA2 B&V
---	RANGE SAFE ARM	(XDS3)	R	39	1	ACA1,2 BO
		(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	Brightness Control
F4	BFC MASTER ALARM	(XDS3)	Y	24	2	B&V
		(S1)	R	32	2	ACA1 B&M
F7A7	MAIN ENGINE 1 STATUS --- SHUTDOWN CTR OUT OF LIMIT CTR	(XDS1)	R	8	2	B&V
		(XDS1)	Y	16	2	B&V
---	SPARE	(S1)	---	34	1	B&V
		(S1)	---	38	1	B&V
---	SPARE	(S1)	---	40	1	B&V
		(S1)	---	40	1	B&V
C3A6	ORBITAL DAP SELECT A SELECT B CONTROL AUTO TRANSLATION ORBITER DAP --- X HIGH Y HIGH Z HIGH X NORM Y NORM Z NORM X PULSE Y PULSE Z PULSE	(S1)	W	2	2	B&V
		(S2)	W	4	2	B&V
		(S3)	W	6	2	B&V
		(S16)	W	10	2	B&V
		(S17)	W	12	2	B&V
		(S18)	W	14	2	B&V
M052J	MASTER ALARM	(S3)	R	36	2	ACA1 MO
		(S3)	R	36	2	ACA1 MO

ACA NO. 5

LAMP TEST RIGHT - ODD						
Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Brightness Control
A2	MIC KEY	(S1)	W	35	2	B&V
		(S1)	W	37	2	B&V
A6A1	ORBITAL DAP - CONTROL --- MAN - RCS JETS --- NORM --- VERN ROTATION ORBITAL DAP ROLL DISC RATE PITCH DISC RATE YAW DISC RATE ROLL ACCEL PITCH ACCEL YAW ACCEL ROLL PULSE PITCH PULSE YAW PULSE	(S11)	W	1	2	B&V
		(S12)	W	3	2	B&V
		(S13)	W	5	2	B&V
		(S17)	W	9	2	B&V
		(S18)	W	11	2	B&V
		(S19)	W	13	2	B&V
		(S23)	W	17	2	B&V
		(S24)	W	19	2	B&V
		(S25)	W	21	2	B&V
		(S29)	W	25	2	B&V
---	SPARE	(S30)	W	27	2	B&V
		(S31)	W	29	2	B&V
---	SPARE	(S31)	---	7	1	B&V
		(S31)	---	15	1	B&V
---	SPARE	(S31)	---	23	1	B&V
		(S31)	---	31	1	B&V
---	SPARE	(S31)	---	33	1	B&V
		(S31)	---	39	1	B&V

ACA NO. 2

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

LAMP TEST RIGHT - EVEN						
Panel Number	Light title	Light No.	Color	Channel	No. bulbs	Brightness Control
---	SPARE	(S1)	---	2	1	B&V
		(S1)	---	4	1	B&V
		(S1)	---	6	1	B&V
		(S1)	---	8	1	B&V
		(S1)	---	10	1	B&V
		(S1)	---	12	1	B&V
		(S1)	---	14	1	B&V
		(S1)	---	16	1	B&V
		(S1)	---	18	1	B&V
		(S1)	---	20	1	B&V
F3	ANTISKID FAIL	(XDS4)	Y	12	2	B&V
		(S2)	W	14	2	B&V
F4	PITCH --- AUTO CSS GAIN ENA ROLL/YAW --- AUTO CSS SPD BK/THROT --- AUTO BODY FLAP --- AUTO	(S3)	W	16	2	B&V
		(S4)	W	18	2	B&V
		(S5)	W	20	2	B&V
		(S6)	W	22	2	B&V
		(S7)	W	24	2	B&V
		(S8)	W	26	2	B&V
		(S8)	W	28	2	B&V
		(S9)	W	30	2	B&V
		(S9)	W	34	2	B&V
		(S9)	W	34	2	B&V
F7A7	MAIN ENGINE 3 STATUS --- SHUTDOWN RIGHT OUT OF LIMIT RIGHT	(XDS3)	R	32	2	B&V
		(XDS3)	Y	38	2	B&V
F8A5	LANDING GEAR --- ARM DOWN	(S1)	Y	36	2	B&V
		(S2)	G	40	2	B&V
F4	ANTI-SKID FAIL	(XDS2)	Y	12	2	B&V
		(XDS2)	Y	12	2	B&V

ACA NO. 4

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

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

LAMP						
------	--	--	--	--	--	--

# 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/B03
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
R. I.	ECN 104-25012A			33 OF 43		1/15/94	THE SHUTTLE/MIR DOCKING SYSTEM - ORBITER DOCKING SYSTEM (ODS)
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/B03	4/25/90	INTEGRATED SYSTEM SCHEMATIC - DISPLAYS AND CONTROLS OV-099, -103 AND -104
TABLE 4-1	ANNUNCIATOR CONTROL ASSEMBLY CHANNEL ASSIGNMENTS	AEROSPACE AVIONICS	SK500T90	N/A	APP	12/13/76	ANNUNCIATOR CONTROL ASSEMBLY
		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/B03	4/25/90	INTEGRATED SYSTEM SCHEMATIC DISPLAYS AND CONTROLS OV-099, 103 AND 104

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
4.1	ENGR C. B. GUDERIAN		TBL 4-1	ENGR R. AL-AYOUBI			
	ENGR <i>C. B. Gudarian</i>	9/12/94		ENGR <i>Rami Al-Ayoubi</i>	9/22/94		
4.2-1	ENGR C. B. GUDERIAN			ENGR			
	ENGR <i>C. B. Gudarian</i>	9/22/94		ENGR			
4.2-2	ENGR R. ARMSTRONG			APR <i>Paul M. Joyce</i>	9/22/94		
	ENGR <i>R. Armstrong</i>	9/22/94		APP			
4.3	ENGR R. AL-AYOUBI			APP			
	ENGR <i>Rami Al-Ayoubi</i>	9/22/94		LTR E	PCN 4		

BASIC REV E-4

# FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

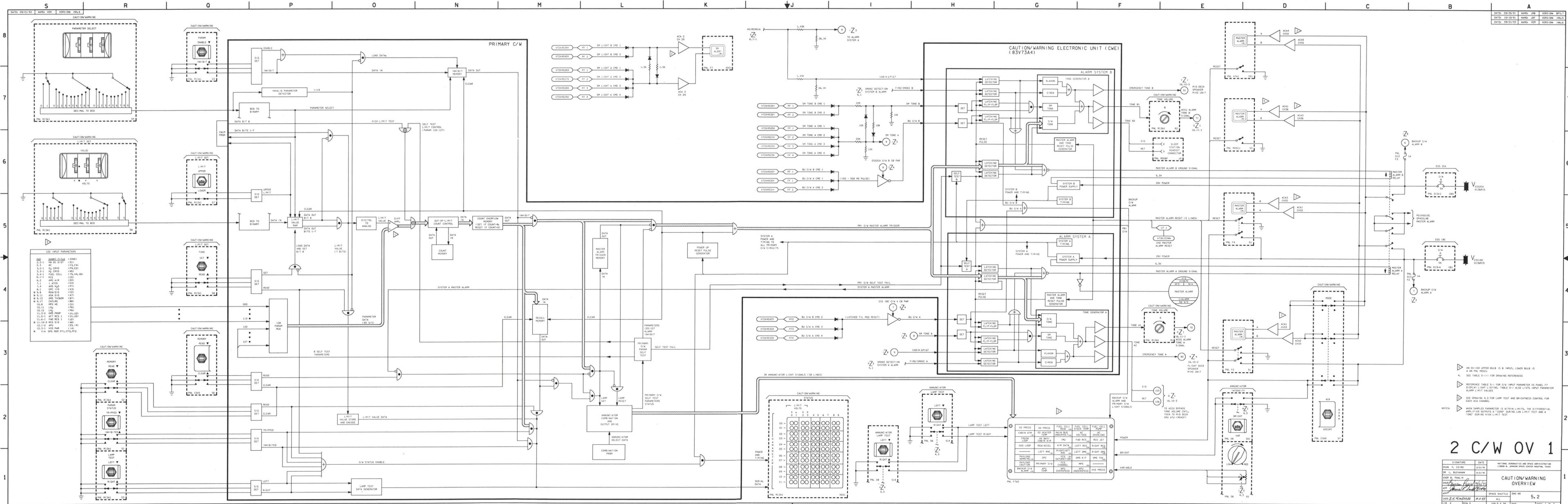
SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
4.4	EXTERIOR LIGHTING	R. I.	VS70-730212	1 OF 2	E	3/3/82	MANIPULATOR ARM LIGHTING SUBSYSTEM
		R. I.	VS70-730162	1 OF 2	D	7/22/80	D&C EXTERIOR LIGHTING SUBSYSTEM
		R. I.	VS70-730219	1 OF 2	A	3/3/82	MANIPULATOR 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		FLOODLIGHT 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
		4.5	ORBITER DOCKING SYSTEM AIRLOCK LIGHTS	R. I.	ECN 104- 25012A	35, 36, 41 OF 43	
NASA/NPOE	NASA/NPOE/ 000/4.02.02			4.02.02.1-6; 4.02.02.1-7		4/2/94	SHUTTLE/MIR PHYSICAL CHARACTERISTICS

DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
4.4	ENGR R. AL-AYOUBI		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>Rami Al-Ayoubi</i>	9/22/94		
4.5	ENGR R. ARMSTRONG			
	ENGR <i>R. Armstrong</i>	9/20/94		
	APP <i>Paul M. Joyce</i>	9/22/94	SPACE SHUTTLE	TBL NO
	APP		ALL	4-11
	APP			
LTR E		PCN 4	PAGE 4-11-2	SHEET 2 OF 2

**BASIC REV E-4**







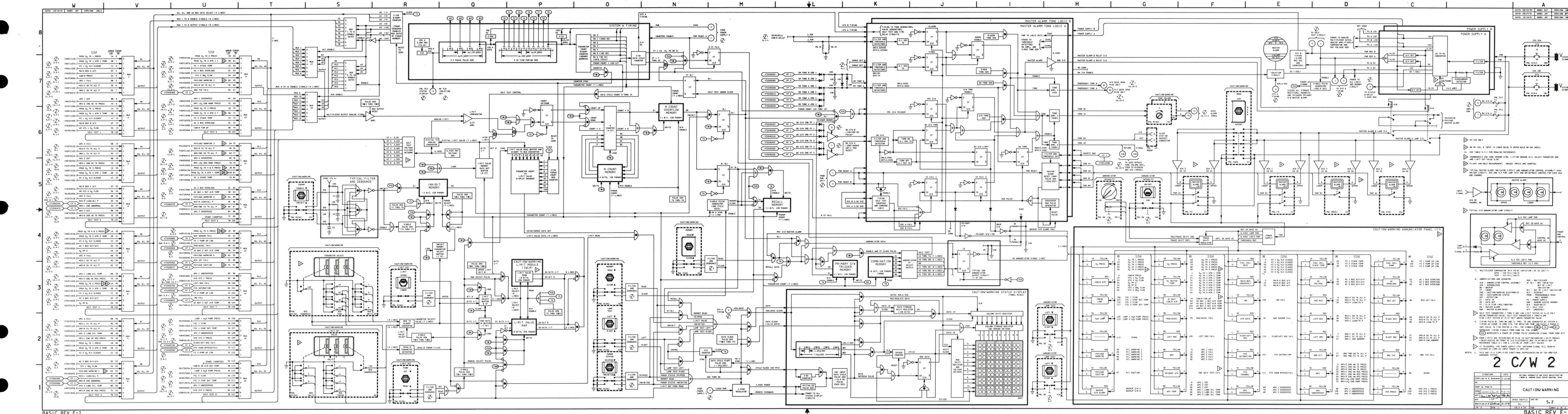
BASIC REV E-3

BASIC REV E-3

2 C/W OV 1

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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ENGR. J. Z. HARRIS	3/29/78	

CAUTION/WARNING  
 SPACE SHUTTLE DWG NO. 5.2  
 100-100 UPPER BULB IS B INPUT, LOWER BULB IS A OR PNL MODJ  
 SEE TABLE S-111 FOR DRAWING REFERENCES  
 REFERENCE TABLE S-1 FOR C/W INPUT PARAMETER VS PANEL FLY DISPLAY LIGHT LISTING, TABLE S-1 ALSO LISTS INPUT PARAMETER ALARM LIMIT VALUE  
 SEE DRAWING A-3 FOR LAMP TEST AND BRIGHTNESS CONTROL FOR EACH ACA CHANNEL  
 NOTES: WHEN SAMPLED PARAMETER IS WITHIN LIMITS, THE DIFFERENTIAL APPLICABLE OUTPUTS A ZERO DURING LOW LIMIT TEST AND A "TONE" DURING HIGH LIMIT TEST



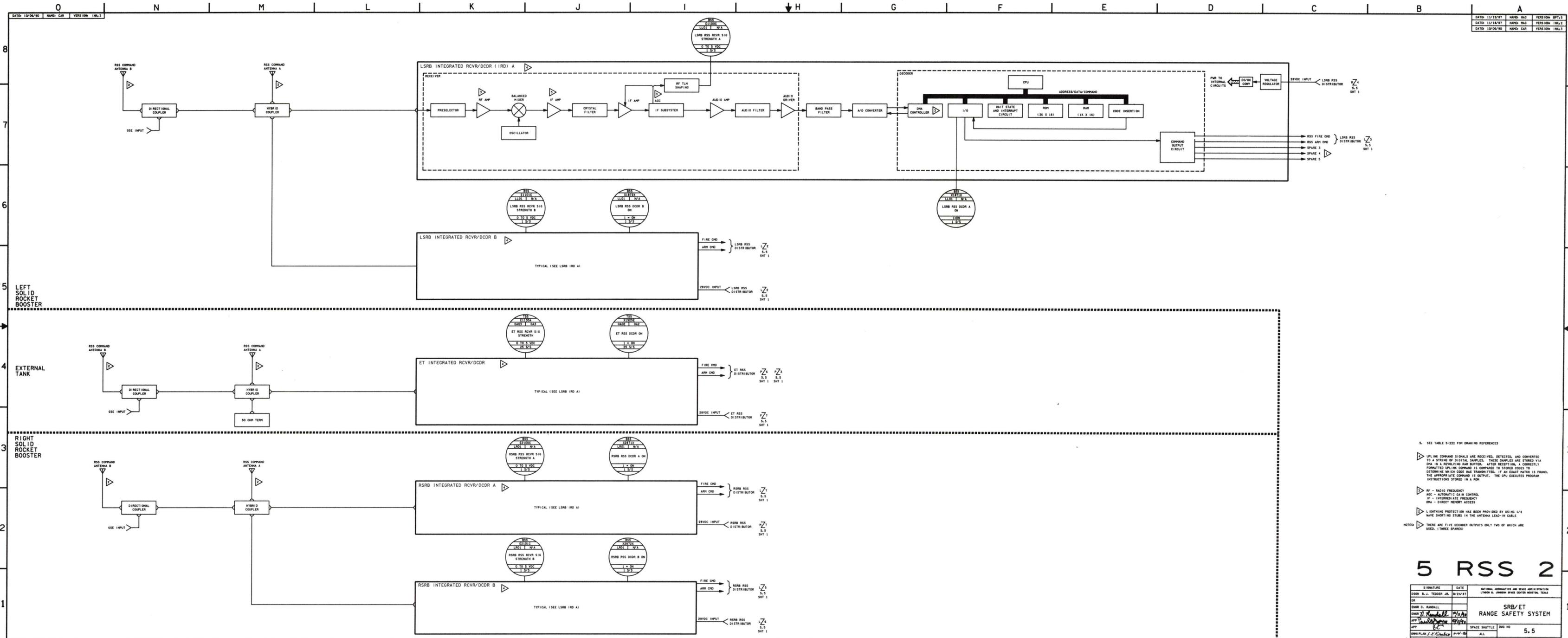
BASIC REV E-1

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10/10/91	JDF	100

CAUTION/WARNING







BASIC REV E

BASIC REV E

5. SEE TABLE 5-III FOR DRAWING REFERENCES
- ▷ UP-LINK COMMAND SIGNALS ARE RECEIVED, DETECTED, AND CONVERTED TO A STRING OF DIGITAL SAMPLES. THESE SAMPLES ARE STORED VIA DMA IN A REVOLVING BUFFER. AFTER RECEPTION, A CORRECTLY FORMATTED UP-LINK COMMAND IS COMPARED TO STORED CODES TO DETERMINE WHICH CODE WAS TRANSMITTED. IF AN EXACT MATCH IS FOUND, THE APPROPRIATE COMMAND IS OUTPUT. THE CPU EXECUTES PROGRAM INSTRUCTIONS STORED IN A ROM
  - ▷ RF - RADIO FREQUENCY
  - ▷ AGC - AUTOMATIC GAIN CONTROL
  - ▷ IF - INTERMEDIATE FREQUENCY
  - ▷ DMA - DIRECT MEMORY ACCESS
  - ▷ LIGHTNING PROTECTION HAS BEEN PROVIDED BY USING 1/4 WAVE SHORTING STUBS IN THE ANTENNA LEAD-IN CABLE
- NOTES: ▷ THERE ARE FIVE DECODER OUTPUTS ONLY TWO OF WHICH ARE USED. (THREE SPARES)

<b>5 RSS 2</b>	
SIGNATURE	DATE
DRON B. J. TEDDER JR.	8/24/81
ENGR D. RANDALL	
APP <i>[Signature]</i>	
DRYDEN J. J. [Signature]	
CTR E	FOR
SRB/ET RANGE SAFETY SYSTEM	
SPACE SHUTTLE	DWG NO
ALL	5.5
82.5 X 34	PAGE
	SHEET 2 OF 2

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

C/W Annunciator Loc	Title	No.	Primary C/W		PROM limits (V dc/eng units) <sup>a</sup>		Minimum change increment <sup>b</sup>	Backup C/W alarm MML no.
			MML no.	Title	Lower	Upper		
1A	O2 PRESS	0	V45P1110A	02 TK 1 P	0.25/540	4.70/985	5 psia	Same
		10	V45P1210A	02 TK 2 P	0.25/540	4.70/985	5 psia	Same
		20 <sup>c</sup>	V45P1310A	02 TK 3 P	0.25/540	4.70/985	5 psia	Same
		30 <sup>c</sup>	V45P1410A	02 TK 4 & 5 P	0.25/540	4.70/985	5 psia	Same
		40 <sup>c,d</sup>	V45P1510A	02 TK 5 P	0.25/540	4.70/985	5 psia	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 <sup>c</sup>	V45P2310A	H2 TK 3 P	0.25/153	4.65/294	1.6 psia	Same
		80 <sup>c</sup>	V45P2410A	H2 TK 4 & 5 P	0.25/153	4.65/294	1.6 psia	Same
		90 <sup>c,d</sup>	V45P2510A	H2 TK 5 P	0.25/153	4.65/294	1.6 psia	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 <sup>c</sup>	V61P2405A	CABIN PRESS	3.45/ <sup>e</sup>	3.80/ <sup>f</sup>	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 <sup>c</sup>	V61P2511A	O2 PP A	2.70/2.70	3.60/3.60	0.05 psia	Same
		44 <sup>c</sup>	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
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 <sup>d</sup>	V45T1507A			O2 TK 5 HTR 1 T	HL	4.30/349	9° F	Same

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> Reference table 5-II for parameter flight values and inhibit status.

<sup>d</sup> OV-105 only.

<sup>e</sup> 13.66 for OV-102      13.71 for OV-104  
13.42 for OV-103      13.78 for OV-105

<sup>f</sup> 15.02 for OV-102      15.10 for OV-104  
14.80 for OV-103      15.17 for OV-105

TABLE 5-I.- Continued

C/W Annunciator Loc	Title	No.	MML no.	Primary C/W Title	PROM limits (V dc/eng units) <sup>a</sup>		Minimum change increment <sup>b</sup>	Backup C/W alarm MML no.
					Lower	Upper		
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 0/V - U/V	HL	5.00/28	28 V BL	V76V1500A V76V1501A V76V1502A
		43	V76X1605E	AC2 BUS 0/V - U/V	HL	5.00/28	28 V BL	V76V1600A V76V1601A V76V1602A
		53	V76X1705E	AC3 BUS 0/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 <sup>c</sup>	V63R1100A	FCL 1 FLOW	1.00/1287	LL	26 lb/h9	Same
		107 <sup>c</sup>	V63T1207A	FCL 1 EVAP OUT T	0.35/32.25	1.90/64.9	0.08° F	Same
		116 <sup>c</sup>	V63R1300A	FCL 2 FLOW	1.00/1287	LL	26 lb/h9	Same
		117 <sup>c</sup>	V63T1407A	FCL 2 EVAP OUT T	0.35/32.35	1.90/64.9	0.08° F	Same
3B	AV BAY/ CABIN AIR	74 <sup>c</sup>	V61P2556A	CABIN FAN ΔP	1.75/2.8	4.40/7.04	0.08 IN H <sub>2</sub> O	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	RG/A/ACCEL	93	V72X4590X	RG/A/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

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> Reference table 5-II for parameter flight values and inhibit status..

<sup>g</sup> Nonlinear calibration, average change increment.

TABLE 5-I.- Continued

C/W Annunciator		No.	MML no.	Primary C/W		PROM limits (V dc/eng units) <sup>a</sup>		Minimum change increment <sup>b</sup>	Backup C/W alarm MML no.
Loc	Title			Title	Lower	Upper			
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 <sup>c</sup>	V43P4221C	OMS-L OX TK ULL P	2.90/232	3.55/284	4 psia	Same	
		17 <sup>c</sup>	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 <sup>c</sup>	V43P5221C	OMS-R OX TK ULL P	2.90/232	3.55/284	4 psia	Same	
		47 <sup>c</sup>	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 <sup>c</sup>	V43P6221C	OMS-PBK OX TK ULL P	2.90/232	3.55/284	4 psia	Same	
		87 <sup>c</sup>	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	

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> Reference table 5-II for parameter flight values and inhibit status.

TABLE 5-I.- Concluded

C/W Annunciator Loc	Title	No.	Primary C/W MML no.	Title	PROM limits (V dc/eng units) <sup>a</sup>		Minimum change increment <sup>b</sup>	Backup C/W alarm MML no.
					Lower	Upper		
7D	MPS	9C	V41P1150A	MPS-C ENG He TK P	1.15/1150	LL	50 psia	Same
		19C	V41P1250A	MPS-L ENG He TK P	1.15/1150	LL	50 psia	Same
		29C	V41P1350A	MPS-R ENG He TK P	1.15/1150	LL	50 psia	Same
		39C	V41P1154A	MPS-C ENG He REG P	3.40/680	4.05/810	10 psia	SM alert
		49C	V41P1254A	MPS-L ENG He REG P	3.40/680	4.05/810	10 psia	SM alert
		59C	V41P1354A	MPS-R ENG He REG P	3.40/680	4.05/810	10 psia	SM alert
		69C	V41P1533C	MPS LO2 ENG MANF P	HL	4.15/249	3 psia	Same
		79C	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	8C	V46T0142A	APU 1 EGT	HL	4.20/1260	15° F	V46T0140A
		18C	V46T0242A	APU 2 EGT	HL	4.20/1260	15° F	V46T0240A
		28C	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	99C	V58P0114C	HYD SYS 1 P	3.00/2400	LL	40 psia	V58P0115A
		109C	V58P0214C	HYD SYS 2 P	3.00/2400	LL	40 psia	V58P0215A
		119C	V58P0314C	HYD SYS 3 P	3.00/2400	LL	40 psia	V58P0315A

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> Reference table 5-II for parameter flight values and inhibit status.

	SIGNATURE	DATE
ENGR	B. PAWLIK	
ENGR	<i>Benjamin Pawlik</i>	9/3/93
APP	<i>Paul M. Joyce</i>	9/7/93

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)		3.45/13.66	3.90/15.41	psia
		(OV-103)		3.55/13.82	3.95/15.40	psia
		(OV-104)		3.45/13.71	3.90/15.50	psia
		(OV-105)		3.45/13.78	3.85/15.37	psia
				2.65/4.20	4.25/6.80	in. H <sub>2</sub> O
		V61P2556A	074 CABIN FAN ΔP			
		V45P1310A <sup>a</sup>	020 02 TK 3 P	INH		
		V45P1410A <sup>a</sup>	030 02 TK 4 & 5 P	INH		
		V45P1510A <sup>b</sup>	040 02 TK 5 P	INH		
		V45P2310A <sup>a</sup>	070 H2 TK 3 P	INH		
		V45P2410A <sup>a</sup>	080 H2 TK 4 & 5 P	INH		
		V45P2510A <sup>b</sup>	090 H2 TK 5 P	INH		
		V45T1407A	061 02 HTR 1 TK 4 <sup>a</sup>	INH		
		V45T1409A	071 02 HTR 2 TK 4 <sup>a</sup>	INH		
		V45T1507A	081 02 HTR 1 TK 5 <sup>b</sup>	INH		
		V43P4221C	007 OMS-L OX TK ULL P			3.60/288
		V43P4321C	017 OMS-L FU TK ULL P			3.60/288
		V43P5221C	037 OMS-R OX TK ULL P			3.60/288
		V43P5321C	047 OMS-R FU TK ULL P			3.60/288
		V43P6221C <sup>a</sup>	077 OMS-PBK OX TK ULL P	INH		
		V43P6321C <sup>a</sup>	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		
		V63R1100A	106 FCL 1 FLOW		0.80/1186	1b/h
	V63R1300A	116 FCL 2 FLOW		0.80/1186	1b/h	
	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)			3.85/15.22	psia
	(OV-103)			3.90/15.20	psia	
	(OV-104)			3.85/15.30	psia	
	(OV-105)			3.80/15.17	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		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	.030/60.0		
	V41P1433C	079 MPS MANF P LH2	INH			

<sup>a</sup>When kit is not installed.  
<sup>b</sup>Unless OV-105 and TK 5 flown.

TABLE 5-II		
	SIGNATURE	DATE
ENGR	B. PAWLIK	
ENGR	<i>Benjamin Pawlik</i>	9/13/93
APP	<i>Ralom Joyce</i>	9/19/93



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	MAX	BIT									
O2 USE, LB/HR	0.23	0.37	0.43	0.29	0.41	0.48	0.31	0.43	0.49	0.30	0.42	0.48
PP02 DECAY, PSI/HR	0.025	0.028	0.033	0.033	0.034	0.039	0.044	0.044	0.045	0.045	0.045	0.052
0.03 BIT DECAY, MIN	48	43	36	40	35	34	30	26	30	27	23	23
CO2 PROD, LB/HR	0.39	0.44	0.47	0.39	0.46	0.52	0.42	0.52	0.52	0.40	0.46	0.46
PP02 INCR, PPM/HR	1.12	1.26	1.53	1.34	1.51	1.84	1.57	1.76	2.02	2.45	2.45	2.45
12 BIT INCR, MIN	6.4	5.7	4.7	5.4	4.8	3.9	4.6	4.1	5.2	4.0	3.4	2.9

\* WITHOUT CO2 REMVAL

PROB. ENA (V202121C), PROB. ENA (V202121D) AND PROB. ENA (V202121E) PROVIDE THE CAPABILITY TO LIMIT BIT PROCS. FROM AND PROCS FROM THE GROUND OR THROUGH A COMP. CHANNEL (PROB. ENA). USABLE PROCS LIMITS ARE DETERMINED BY THE PROB. ENA, PROB. ENA AND PROB. ENA PARAMETERS. VALUES OF THESE PARAMETERS ARE DETERMINED AS FOLLOWS:

PROB. ENA	PROB. ENA	PROB. ENA
ENAB. OR C.	STAT. OFF	STAT. OFF
1	0	0
0	1	1

IF PROCS ENA = 0 OR CAB P = 0, THEN A "NOX" LIMIT MESSAGE IS DISPLAYED FOR X% CONCENTRATION (V202121X).

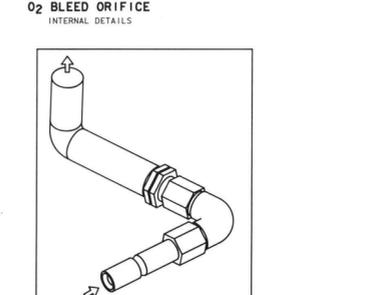
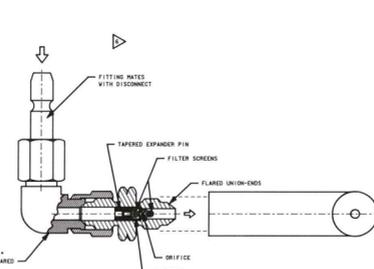
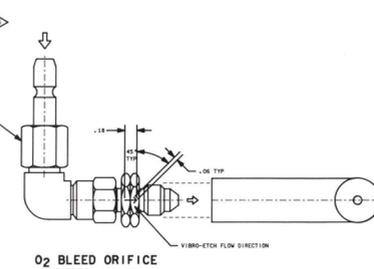
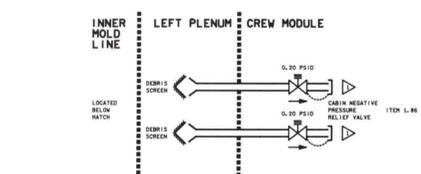
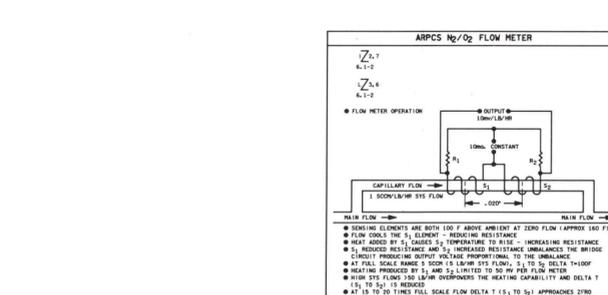
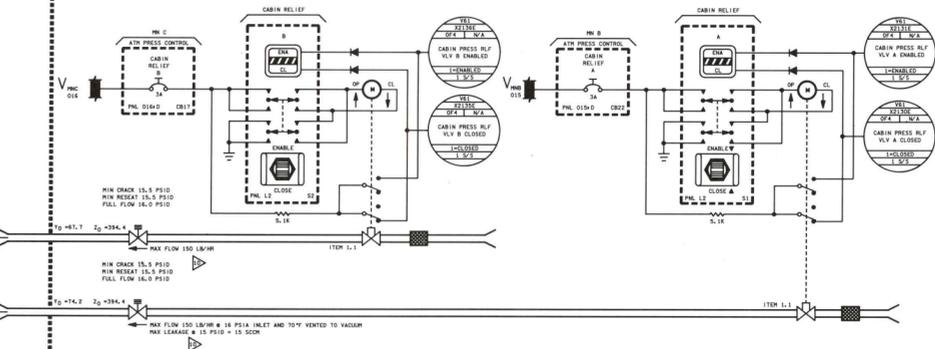
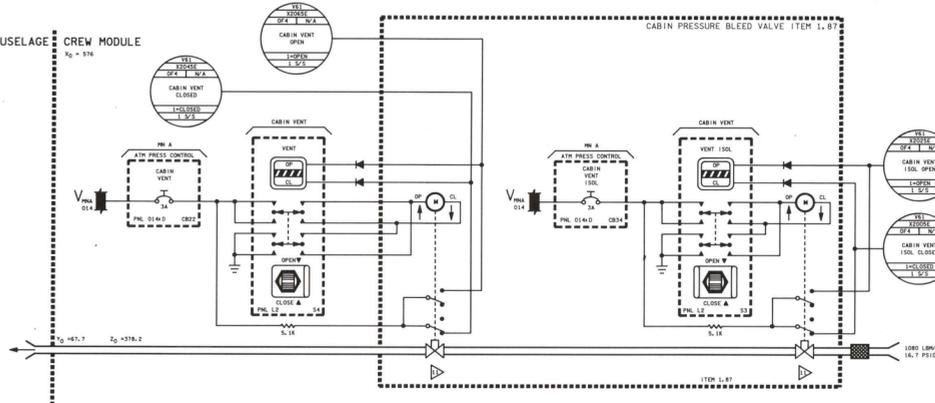
12. ITEM NO.'S REFER TO ROCKWELL HANDBOOK NO.'S

- CAUTION: THESE VALVES ARE SERVICED IN A COMMON HOODING AND ARE USED TO VENT THE CABIN PRESSURE DOWN FOLLOWING THE PRELIMINARY CABIN LEAK CHECK AT 14.7 PSIA. CLOSING TIME IS 2 SEC WITH 14.7 PSIA VENTING TO 14.7 PSIA AT 70°F.
- POSITIVE PRESSURE RELIEF VALVES (ITEM 1.1) THESE PRESSURE-COMPENSATED RELIEF VALVES ARE SPRING LOADED AGAINST CABIN PRESSURE AND RELIEVE OVERBOARD INTO VACUUM. POWERED BUTTERFLY VALVES IN SERIES ARE PROVIDED TO CLOSE THE LINE IF THE RELIEF VALVE FAILS OPEN.
- FOR OV-102 ONLY, PROCS WAS ORIGINALLY IN A METERS CIRCUIT AND REQUIRED A SIGNAL CONDITION TO APPLY THE SIGNAL. THE OTHER VEHICLES WERE DESIGNED WITHOUT A METERS PROCS CIRCUIT AND, THEREFORE, DO NOT HAVE A SIGNAL CONDITIONER.
- IF A "DIVIDE BY ZERO" CONDITION OCCURS, THE COMP WILL DISPLAY AN "NOX" MESSAGE THAT IS:
- PRELIMINARY CABIN PRESSURE IS 15.2 PSIA
- POST INCIDENT CABIN PRESSURE IS 15.2 PSIA
- BE BLED ORIFICE. INSTALLED IN L20 O2 50 PROCS/EEP PROM REMOVED PROCS/EEP PROM CAP REINSTALLED FOR 1 DAY W/ O2'S
- REFER TO TABLE 6-1 FOR DRAWING REFERENCES
- SPS OPS 0, 1, SPS 2 TO 12: THE CABIN PRESS AT THE ZERO WHILE P<sub>0</sub> IS THE CABIN PRESS TO BE LOST. THE PRESSURE AND COMP ARE UPDATED EVERY 5 SEC. SPS ALERT OCCURS IF CABIN LEAK RATE IS GREATER THAN -12 PSI/HR
- ALERT ANNUNCIATES FOR LOSS OF CABIN PRESSURE ONLY. THEREFORE, THE HEATING LAMP OF O2 IS ARMED.
- O<sub>2</sub> PARTIAL PRESSURE OPERATION - A DIFFUSION BARRIER, CATALYTIC ELECTRODE, RESISTIVE ELECTRODE AND COMPENSATED ELECTRODE ARE USED TO MEASURE O<sub>2</sub> FLOW THROUGH A DIFFUSION BARRIER TO PREVENT PROCS FROM THE GROUND OR THROUGH A COMP. CHANNEL (PROB. ENA). CONDUCTIVITY RESULTS IN A 0 TO 5000 SIGNAL PROPORTIONAL TO O<sub>2</sub> FLOW.

NOTE: CABIN NEGATIVE PRESSURE RELIEF VALVES (ITEM 1.8A) THESE POPPET VALVES PROVIDE RELIEF FROM THE FORWARD FUSELAGE COMPARTMENT DURING DIVERT FOR CABIN SUPERPRESSURE TO 8 PSIA. A RESTRAINT CAP IS PROVIDED TO PREVENT CABIN DEPRESSURE IF A POPPET VALVE FAILS TO CLOSE. THE CAP IS 60 LB/HR AT 5 PSIA. AP FOR AUTOMATIC CAP RELEASE IS 0.7 PSIA. A PINNACLE IS DRILLED INTO CAP TO MAINTAIN 0.5 PSI ABOVE CAP

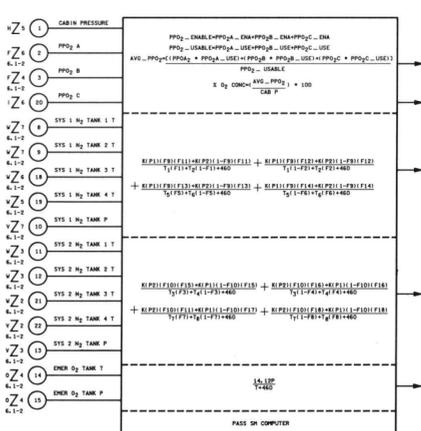
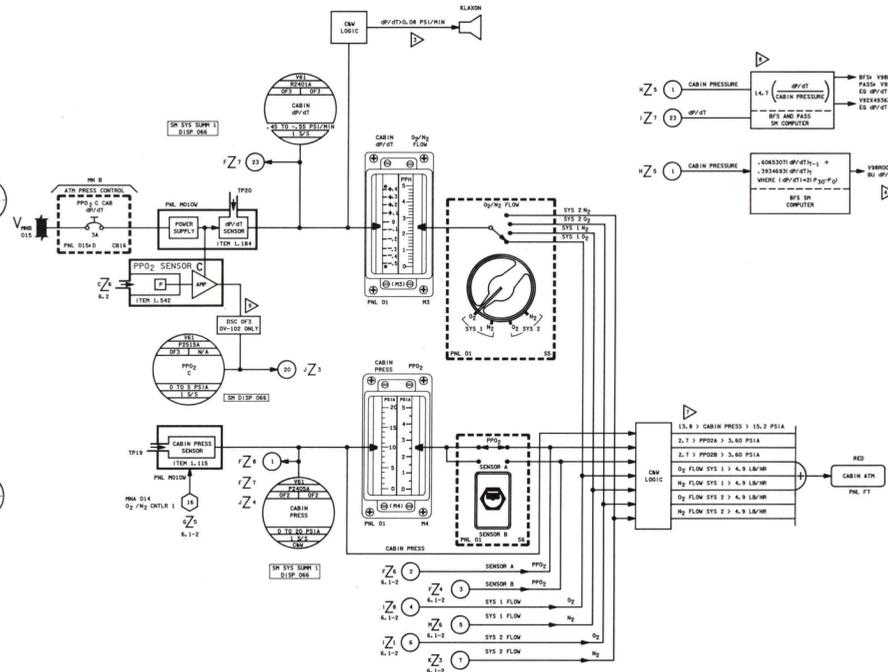
REVISIONS

NO	DATE	BY	REASON
1	11/18/83	OSM/LC, BUSHMAN	ISSUE
2	11/18/83	OSM/LC, BUSHMAN	ISSUE
3	11/18/83	OSM/LC, BUSHMAN	ISSUE
4	11/18/83	OSM/LC, BUSHMAN	ISSUE
5	11/18/83	OSM/LC, BUSHMAN	ISSUE
6	11/18/83	OSM/LC, BUSHMAN	ISSUE
7	11/18/83	OSM/LC, BUSHMAN	ISSUE
8	11/18/83	OSM/LC, BUSHMAN	ISSUE
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95	11/18/83	OSM/LC, BUSHMAN	ISSUE
96	11/18/83	OSM/LC, BUSHMAN	ISSUE
97	11/18/83	OSM/LC, BUSHMAN	ISSUE
98	11/18/83	OSM/LC, BUSHMAN	ISSUE
99	11/18/83	OSM/LC, BUSHMAN	ISSUE
100	11/18/83	OSM/LC, BUSHMAN	ISSUE



O<sub>2</sub> BLEED ORIFICE SPEC FLOW RATES

ORIFICE SIZE	O <sub>2</sub> SUPPLY PRESSURE (PSIA)	O <sub>2</sub> MASS FLOW RATE (LB/HR)	O <sub>2</sub> MASS FLOW RATE (GPM)
4.5	110.0 ± 1.0	24 LB/HR	0.254
6.1	110.0 ± 1.0	38 LB/HR	0.393

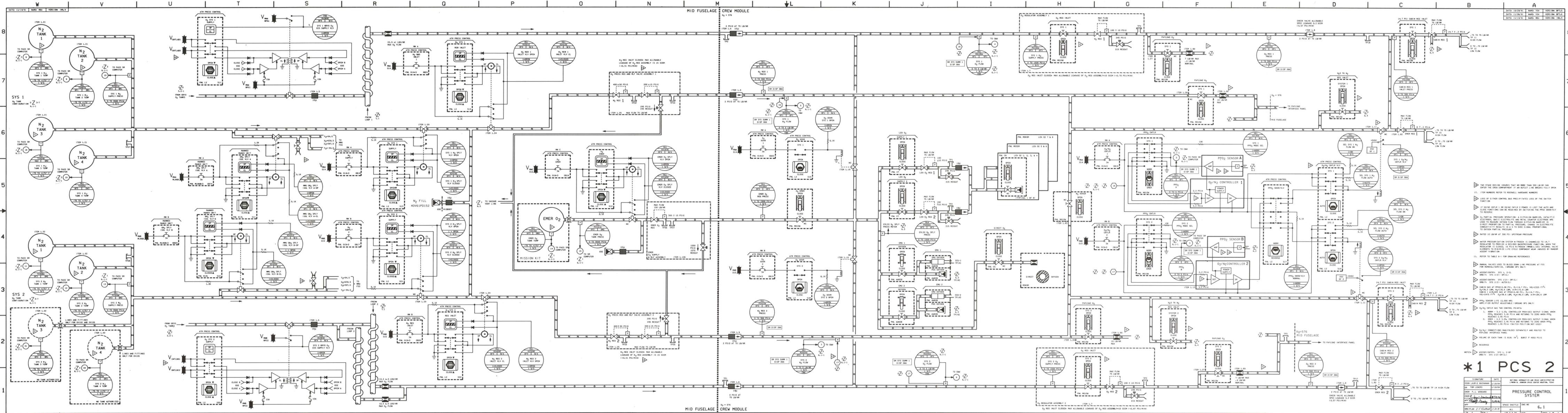


PARAMETER STATUS (ACTIVE/INACTIVE)

PARAMETER	STATUS
PP02	ACTIVE
PP02 A	ACTIVE
PP02 B	ACTIVE
PP02 C	ACTIVE
PP02 D	ACTIVE
PP02 E	ACTIVE
PP02 F	ACTIVE
PP02 G	ACTIVE
PP02 H	ACTIVE
PP02 I	ACTIVE
PP02 J	ACTIVE
PP02 K	ACTIVE
PP02 L	ACTIVE
PP02 M	ACTIVE
PP02 N	ACTIVE
PP02 O	ACTIVE
PP02 P	ACTIVE
PP02 Q	ACTIVE
PP02 R	ACTIVE
PP02 S	ACTIVE
PP02 T	ACTIVE
PP02 U	ACTIVE
PP02 V	ACTIVE
PP02 W	ACTIVE
PP02 X	ACTIVE
PP02 Y	ACTIVE
PP02 Z	ACTIVE

N<sub>2</sub> QTY COMP PARAMETERS

PARAMETER	DESCRIPTION
P1	MANIFOLD PRESS SYS 1 (V2021001)
P2	MANIFOLD PRESS SYS 2 (V2021002)
T1	SYS 1 TANK 1 TEMP (V2021003)
T2	SYS 1 TANK 2 TEMP (V2021004)
T3	SYS 1 TANK 3 TEMP (V2021005)
T4	SYS 1 TANK 4 TEMP (V2021006)
T5	SYS 1 TANK 5 TEMP (V2021007)
T6	SYS 1 TANK 6 TEMP (V2021008)
T7	SYS 1 TANK 7 TEMP (V2021009)
T8	SYS 1 TANK 8 TEMP (V2021010)
T9	SYS 1 TANK 9 TEMP (V2021011)
T10	SYS 1 TANK 10 TEMP (V2021012)
T11	SYS 1 TANK 11 TEMP (V2021013)
T12	SYS 1 TANK 12 TEMP (V2021014)
T13	SYS 1 TANK 13 TEMP (V2021015)
T14	SYS 1 TANK 14 TEMP (V2021016)
T15	SYS 1 TANK 15 TEMP (V2021017)
T16	SYS 1 TANK 16 TEMP (V2021018)
T17	SYS 1 TANK 17 TEMP (V2021019)
T18	SYS 1 TANK 18 TEMP (V2021020)
T19	SYS 1 TANK 19 TEMP (V2021021)
T20	SYS 1 TANK 20 TEMP (V2021022)
T21	SYS 1 TANK 21 TEMP (V2021023)
T22	SYS 1 TANK 22 TEMP (V2021024)
T23	SYS 1 TANK 23 TEMP (V2021025)
T24	SYS 1 TANK 24 TEMP (V2021026)
T25	SYS 1 TANK 25 TEMP (V2021027)
T26	SYS 1 TANK 26 TEMP (V2021028)
T27	SYS 1 TANK 27 TEMP (V2021029)
T28	SYS 1 TANK 28 TEMP (V2021030)
T29	SYS 1 TANK 29 TEMP (V2021031)
T30	SYS 1 TANK 30 TEMP (V2021032)
T31	SYS 1 TANK 31 TEMP (V2021033)
T32	SYS 1 TANK 32 TEMP (V2021034)
T33	SYS 1 TANK 33 TEMP (V2021035)
T34	SYS 1 TANK 34 TEMP (V2021036)
T35	SYS 1 TANK 35 TEMP (V2021037)
T36	SYS 1 TANK 36 TEMP (V2021038)
T37	SYS 1 TANK 37 TEMP (V2021039)
T38	SYS 1 TANK 38 TEMP (V2021040)
T39	SYS 1 TANK 39 TEMP (V2021041)
T40	SYS 1 TANK 40 TEMP (V2021042)
T41	SYS 1 TANK 41 TEMP (V2021043)
T42	SYS 1 TANK 42 TEMP (V2021044)
T43	SYS 1 TANK 43 TEMP (V2021045)
T44	SYS 1 TANK 44 TEMP (V2021046)
T45	SYS 1 TANK 45 TEMP (V2021047)
T46	SYS 1 TANK 46 TEMP (V2021048)
T47	SYS 1 TANK 47 TEMP (V2021049)
T48	SYS 1 TANK 48 TEMP (V2021050)
T49	SYS 1 TANK 49 TEMP (V2021051)
T50	SYS 1 TANK 50 TEMP (V2021052)
T51	SYS 1 TANK 51 TEMP (V2021053)
T52	SYS 1 TANK 52 TEMP (V2021054)
T53	SYS 1 TANK 53 TEMP (V2021055)
T54	SYS 1 TANK 54 TEMP (V2021056)
T55	SYS 1 TANK 55 TEMP (V2021057)
T56	SYS 1 TANK 56 TEMP (V2021058)
T57	SYS 1 TANK 57 TEMP (V2021059)
T58	SYS 1 TANK 58 TEMP (V2021060)
T59	SYS 1 TANK 59 TEMP (V2021061)
T60	SYS 1 TANK 60 TEMP (V2021062)
T61	SYS 1 TANK 61 TEMP (V2021063)
T62	SYS 1 TANK 62 TEMP (V2021064)
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T64	SYS 1 TANK 64 TEMP (V2021066)
T65	SYS 1 TANK 65 TEMP (V2021067)
T66	SYS 1 TANK 66 TEMP (V2021068)
T67	SYS 1 TANK 67 TEMP (V2021069)
T68	SYS 1 TANK 68 TEMP (V2021070)
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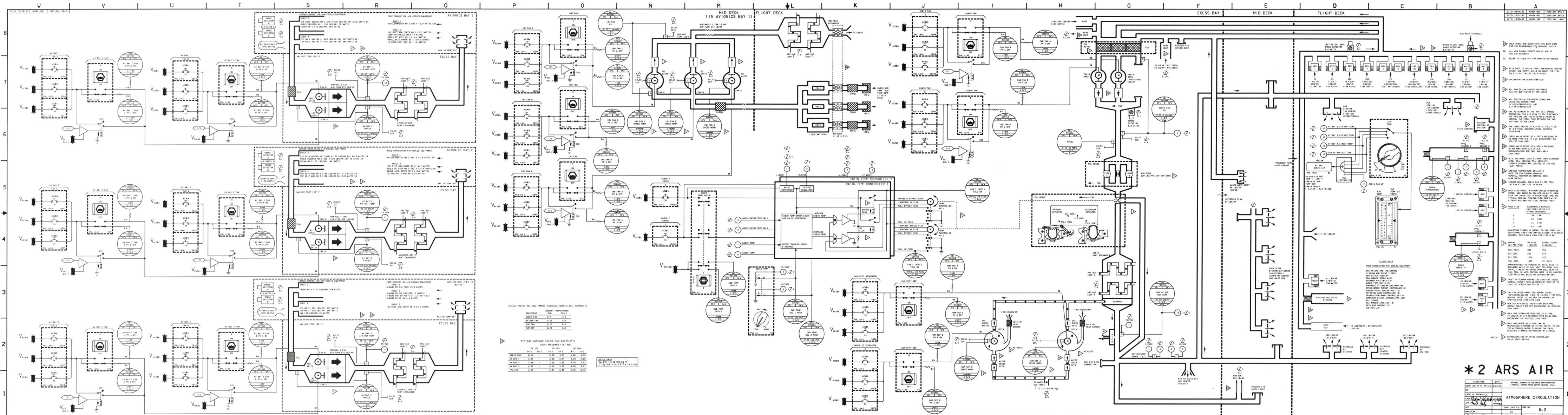


BASIC REV E-1

**\*1 PCS 2**

SIGNATURE	DATE	REVISION
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BASIC REV E-1



BASIC REV E

**\* 2 ARS AIR**

DATE	REVISION	DESCRIPTION
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12-15-74	30	REVISED

ATMOSPHERE CIRCULATION

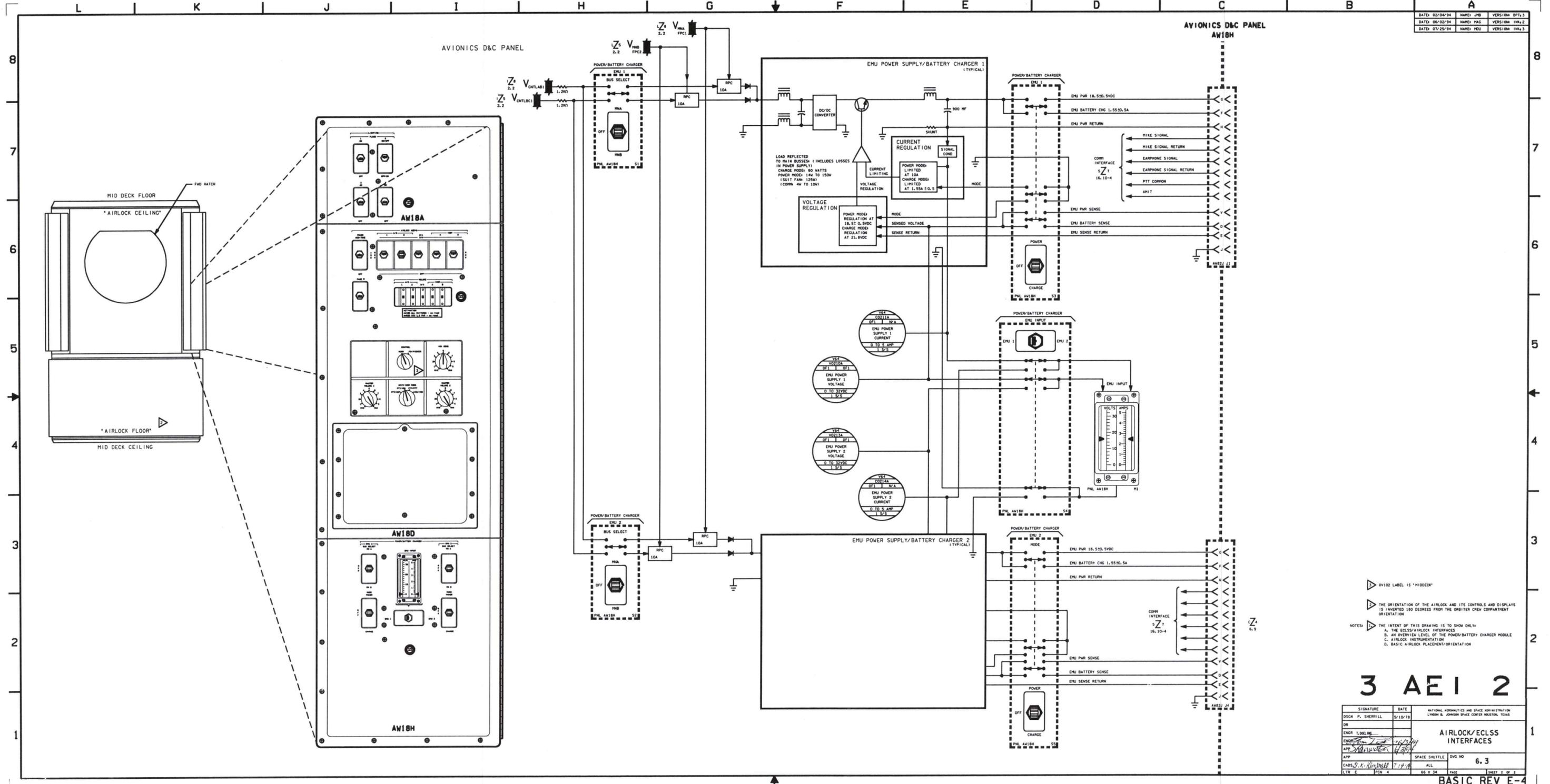
SPACE SHUTTLE (REV) NO. 6, 2

DATE: 12-15-74

REVISION: 1

DESCRIPTION: BASIC REV E



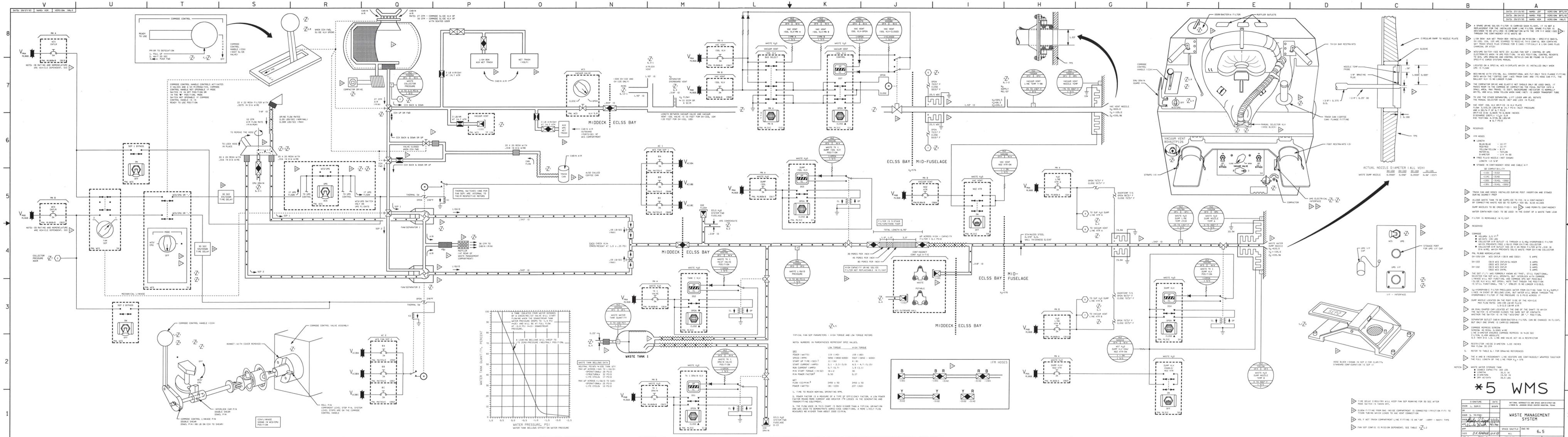


- NOTES:
- ▷ DV102 LABEL IS "HIDDECK"
  - ▷ THE ORIENTATION OF THE AIRLOCK AND ITS CONTROLS AND DISPLAYS IS INVERTED 180 DEGREES FROM THE OBSERVER'S COMPARTMENT ORIENTATION
  - ▷ THE INTENT OF THIS DRAWING IS TO SHOW ONLY:
    - A. THE ECLSS/AIRLOCK INTERFACES
    - B. AN OVERVIEW LEVEL OF THE POWER/BATTERY CHARGER MODULE
    - C. AIRLOCK INSTRUMENTATION
    - D. BASIC AIRLOCK PLACEMENT/ORIENTATION

# 3 AEI 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNN B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR	5/10/78	
ENGR. LABELING		AIRLOCK/ECLSS INTERFACES
APP	7/14/84	SPACE SHUTTLE DWG NO. 6.3
CADD: S. K. [Signature]		ALL 68-234
LTR: E		PAGE 68-234

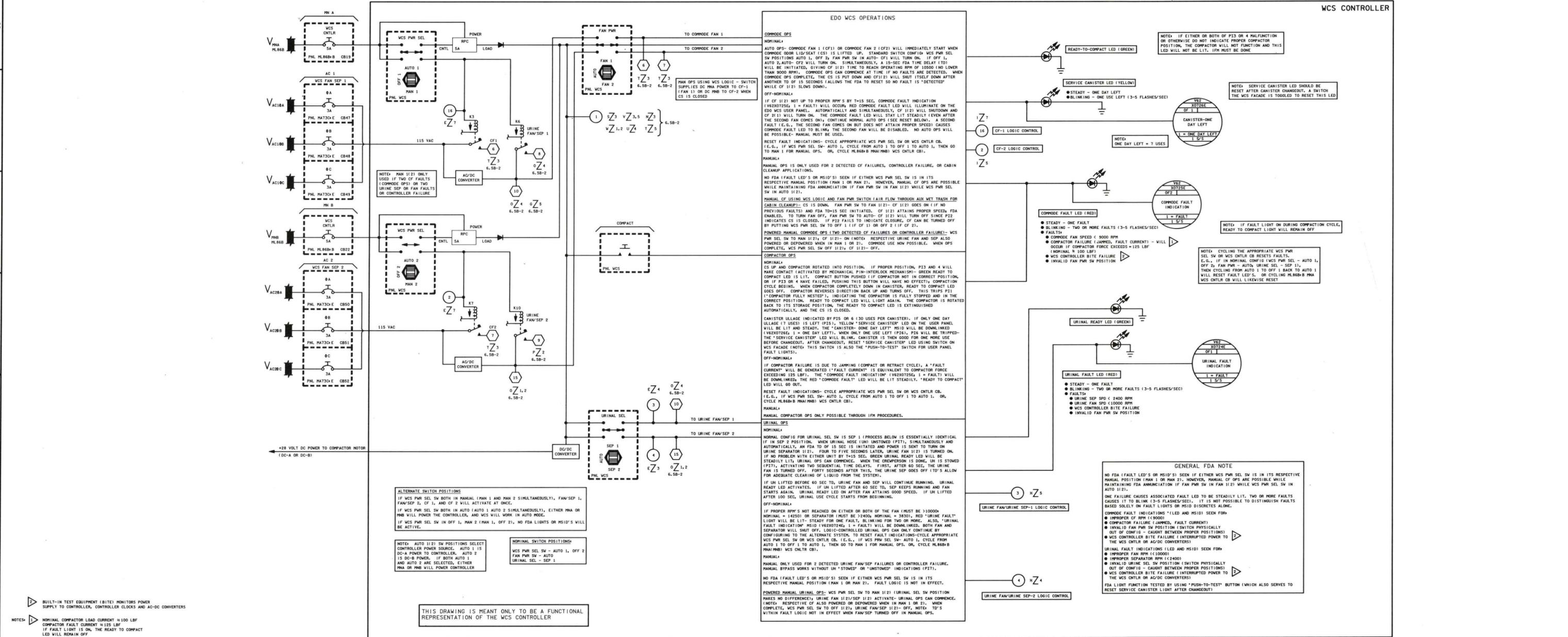




BASIC REV E-3

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BASIC REV E-3



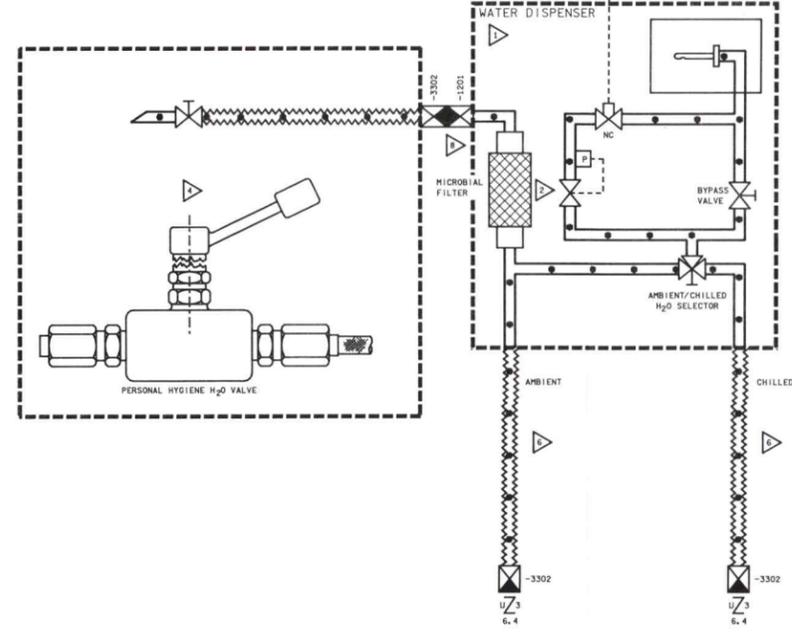
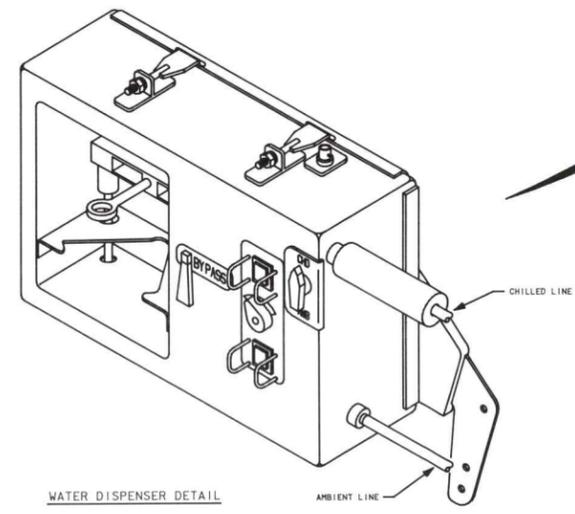
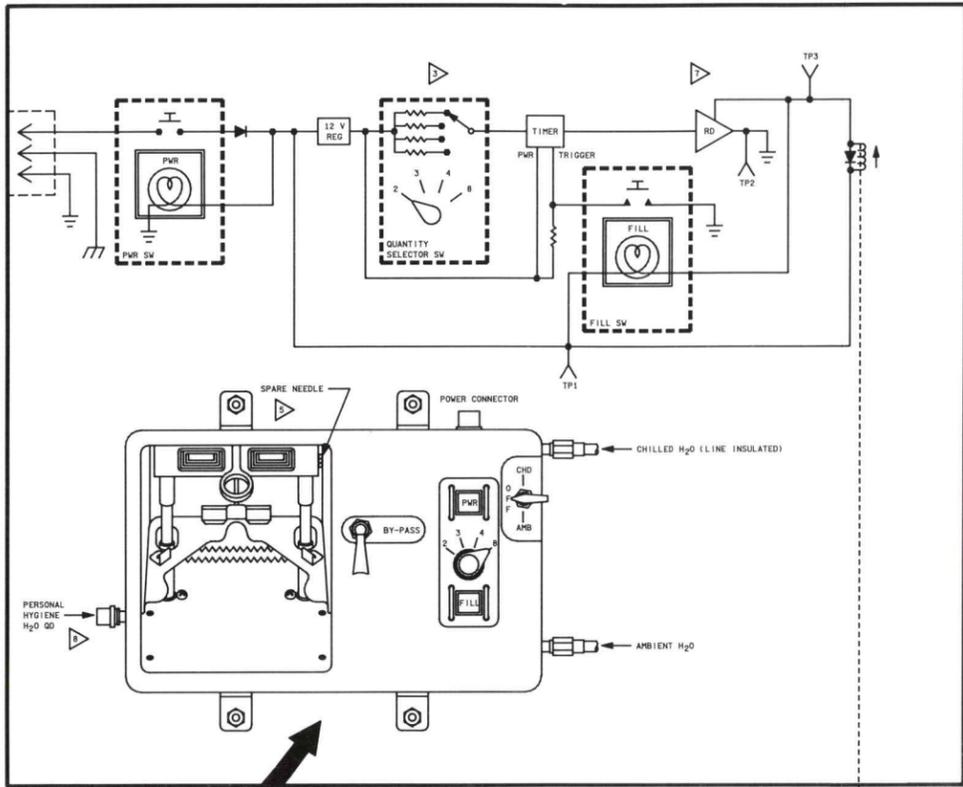
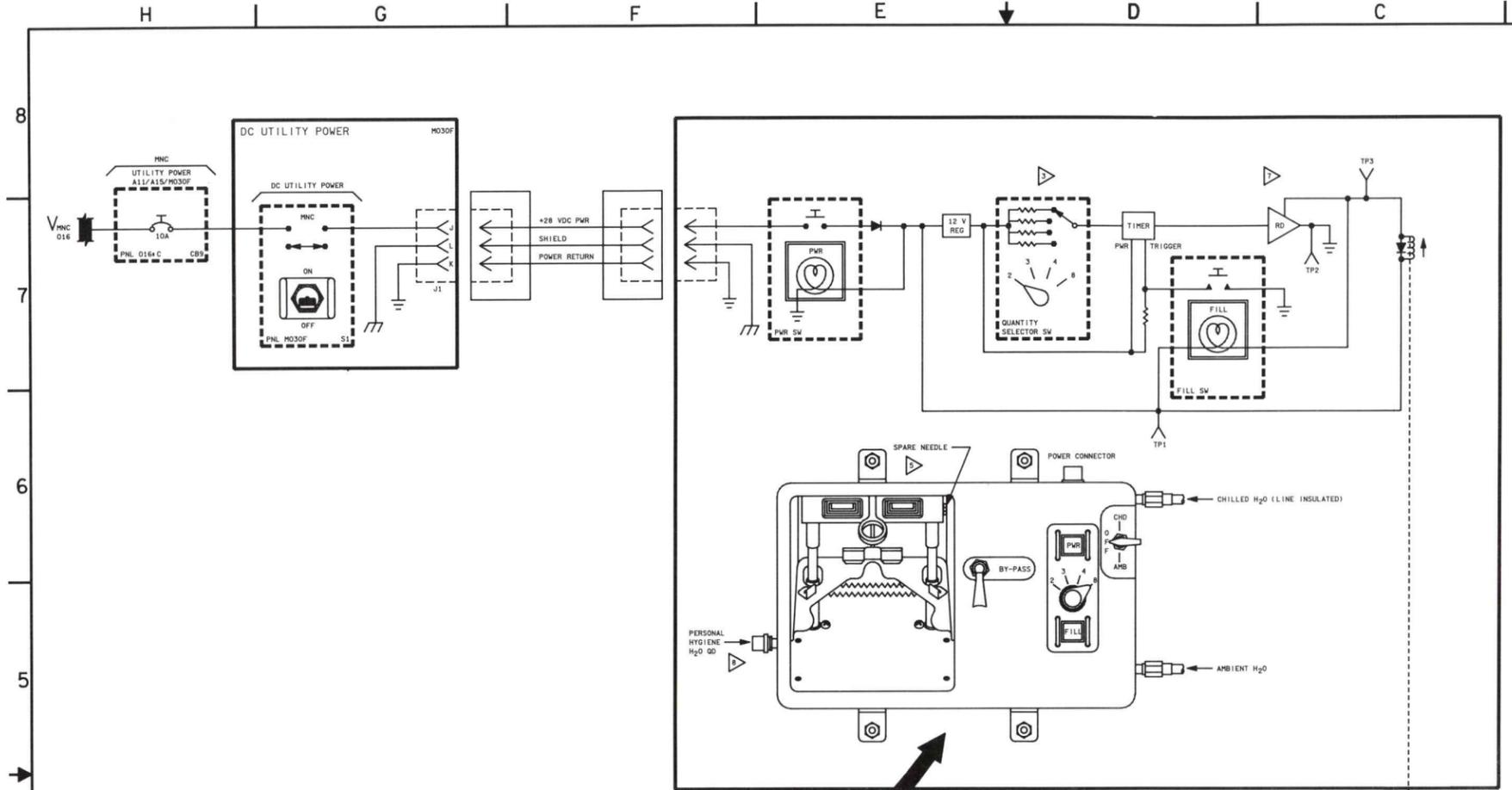
**\* 5 EDO WMS**

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNCH & JOHNSON SPACE CENTER HOUSTON, TEXAS		SIGNATURE	DATE
EDO WASTE MANAGEMENT		DMON CORNIE RILEY	10/26/91
DWG NO. 6.5B		DMR S. TRIPOLI	
SPACE SHUTTLE		DMR S. TRIPOLI	11/19/91
OFF 102		APP. M. J. P. P. P.	11/20/91
DWG PLAN 3.2.2.6.1.1		DMR PLAN 3.2.2.6.1.1	11/6/91
REV. 3.24		CTR. E	10/28/91





DATE	NAME	VERSION
6/26/87	TRM	BPT1.1
8/6/87	BJT	1NK4.2
08/17/90	MAG	1NK4.3



9. REFER TO TABLE 6.1 FOR DRAWING REFERENCES
- ▶ THE PERSONAL HYGIENE H<sub>2</sub>O VV 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 STORED 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 STORED IN THE 15M HYDROCK 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
    - NOSE AND VALVE ARE STORED 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<sub>2</sub>) FOR CONTACT BACTERIA KILL. NOT CHANGED OUT IN FLIGHT. DESIGNED TO TREAT MINIMUM OF 8640 LBS H<sub>2</sub>O 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
  - ▶ BY-PASS FLOWRATE: 1.48 LB/MIN

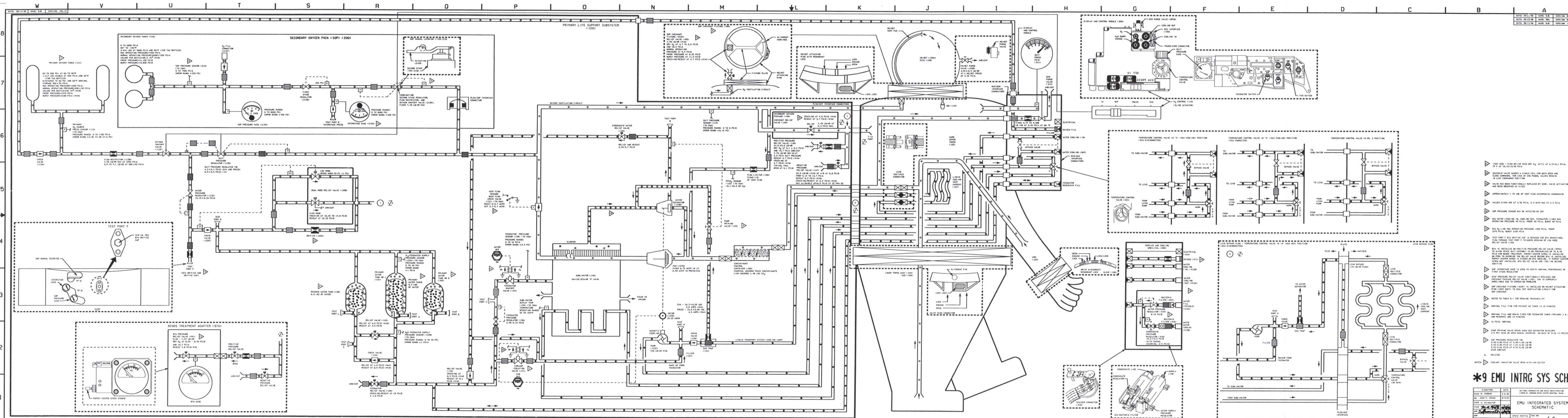
# 7 WTR DISP

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR MICHAEL MURPHY	5/3/84	
ENGR C. YEE	8/17/90	
ENGR <i>Chris Yee</i>	8/13/90	
APP <i>Chris Yee</i>	8/13/90	
APP <i>S.K. Eimbell</i>	11-27-90	
OPN PLAN	SPACE SHUTTLE	DWG NO 6.7
LTR E	PCN	44 X 34 PAGE SHEET 1 OF 1

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BASIC REV E





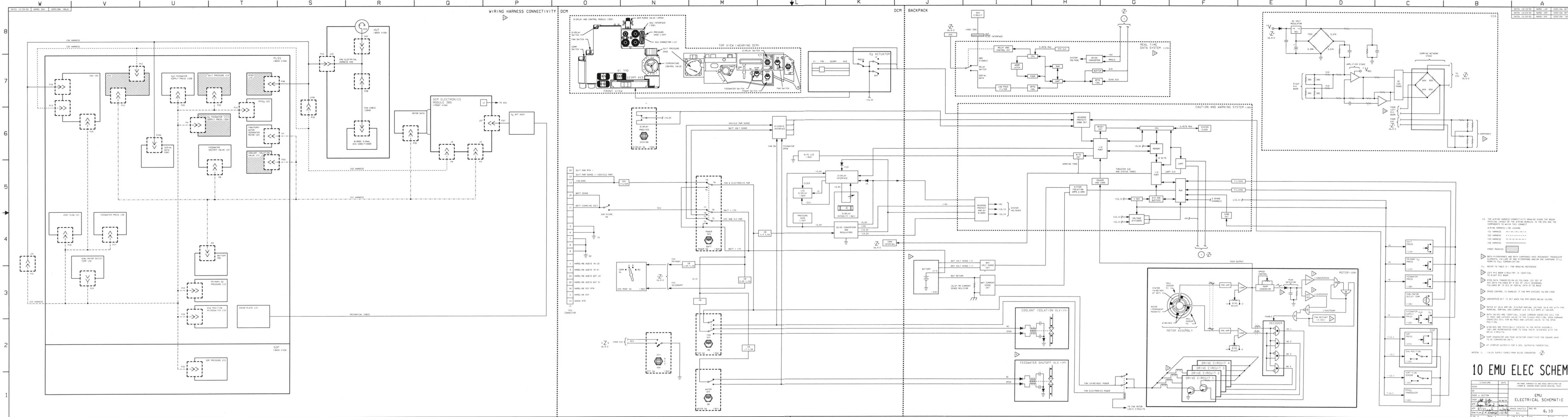
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DATE: 06/11/76	NAME: B.B.	VERSION: 1041.0
DATE: 06/11/76	NAME: B.B.	VERSION: 1041.0

- ITEM 1204 - FLOW 83-145 SCCH DRY O<sub>2</sub> M21 AT 4.35 O.L.P.S.I.A.
- SOLENOID VALVE SHARES A SINGLE COIL FOR BOTH OPEN AND CLOSE OPERATIONS. FOR LOSS OF SHIP POWER, VALVES REMAIN IN LAST COMMAND POSITION.
- VALVE HAS BEEN FUNCTIONALLY REPLACED BY SCOP. VALVE ACTIVATION HAS BEEN OBSERVED AT 1103.
- APPROXIMATELY 1 TO 10% OF VENT FLOW ACCOMPANIES CONDENSATE.
- VALUES GIVEN ARE AT 3.35 PSIA, 5.4 ACFT MAX AT 4.3 PSIA.
- SOP PRESSURE SENSOR MAY BE AFFECTED BY ENH.
- SCU WATER COOLING IN: COOLING OUT: FEEDWATER LINES MAX OPERATING PRESSURE 40 PSIA, PROOF 60 PSIA, BURST 80 PSIA.
- SCU O<sub>2</sub> LINE MAX OPERATING PRESSURE 1050 PSIA, PROOF 1515 PSIA, BURST 2100 PSIA.
- TEST PORT BTA ORIFICE CAP IS REMOVED FOR BTA OPERATIONS. FLOW THROUGH TEST PORT 1 TRIGGERS OPENING OF LOW MODE RELIEF VALVE 1101.
- BTA IS INSTALLED ON POSITIVE PRESSURE RELIEF VALVE 1101 TO ALLOW SPACE SUIT ASSEMBLY TO BE PRESURIZED UP TO 6-8 PSI FOR BOND TREATMENT. POPPET KEEPS SCHEM 11 INSTALLED ON PUMP TO OVERSHOOT THE RELIEF VALVE BEHIND BTA IS INSTALLED. POPPET KEEPER BOND IS STORED ON BTA MODULE. IF POPPET KEEPER SCHEM NOT INSTALLED, BTA RELIEF VALVE AND ITEM 146 BECOME INOPERATIVE.
- SOP INTERFERENCE GAGE IS USED TO VERIFY NOMINAL PERFORMANCE OF FIRST STAGE REGULATOR.
- SCOP PRESSURE RELIEF VALVE FUNCTIONALLY REPLACES SOP CHECKOUT PACKAGE RELIEF VALVE 1145. 1145 IS CURRENTLY UNRELIABLE DUE TO CORROSION PROBLEMS.
- SOP CHECKOUT FIGURE 1050/F IS INSTALLED ON HELMET ATTACHING RING HEAT EXCHANGER TO SEAL OFF VENTILATION CIRCUIT FOR SOP CHECKOUT.
- REFER TO TABLE 4.1 FOR DRAWING TRACEABILITY.
- NOMINAL FILL TIME FOR PRIMARY O<sub>2</sub> TANKS IS 15 MINUTES.
- NOMINAL FILL AND DRAIN TIMES FOR FEEDWATER TANKS 1 AND 2 AND RESERVE ARE 15 MINUTES.
- 12 PSIA, NOMINAL.
- PUMP-PRIMING VALVE OPENS WHEN HOD SEPARATOR DEVELOPS 2-3 PSI HEAD OR WHEN MANUAL OVERRIDE ON BACK OF PLS/SOP IS PRESSED.
- SOP PRESSURE REGULATED TO 3-30-30 PSI AT 0.0-0.1-0.0-0.0 LB/HR.
- 3-33-30 PSI AT 1-01-4-50 LB/HR.
- 3-33-30 PSI AT 4-51-4-50 LB/HR.
- OVER AMBIENT.
- 3. DELETED.
- COOLANT ISOLATION VALVE OPEN WITH FAN SWITCH.

**\*9 EMU INTRC SYS SCH**

DATE: 06/11/76	NAME: B.B.	VERSION: 1041.0
DATE: 06/11/76	NAME: B.B.	VERSION: 1041.0
DATE: 06/11/76	NAME: B.B.	VERSION: 1041.0

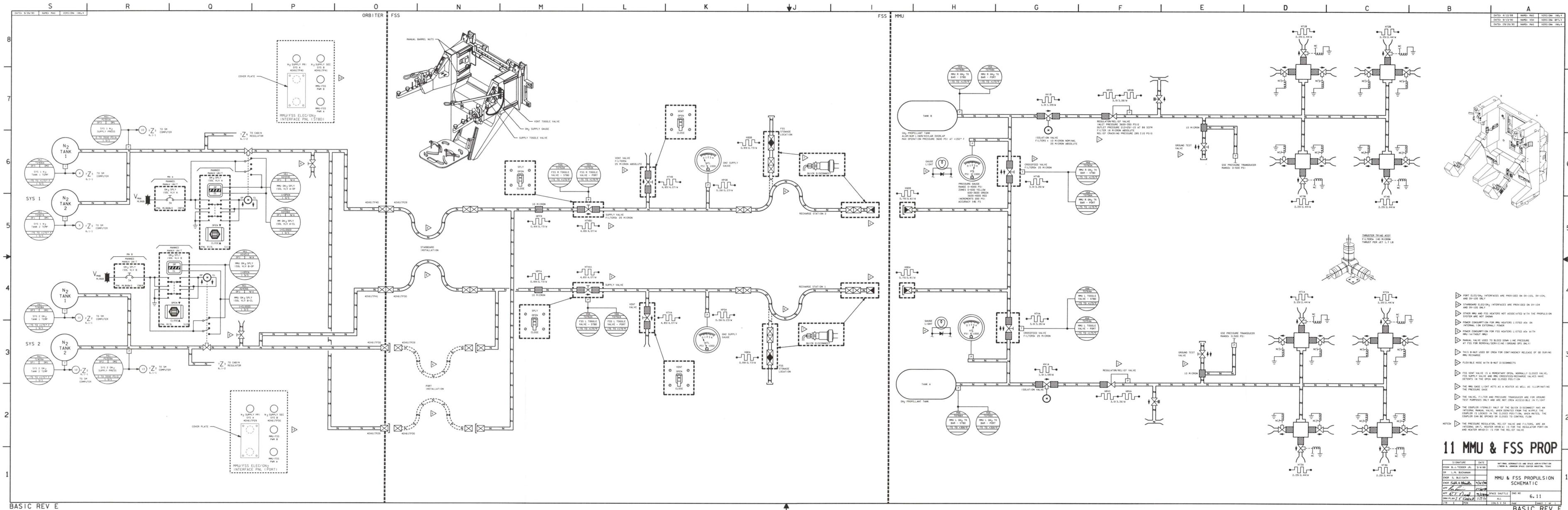
EMU INTEGRATED SYSTEM SCHEMATIC



- THE WIRING HARNESS CONNECTIVITY DRAWING SHOWS THE ROUGH PHYSICAL LAYOUT OF THE WIRING BUNDLES IN THE EMU AND THE COMPONENTS TO WHICH THEY CONNECT.
- WIRING HARNESS LINE LEGEND
- FRONT MOUNTED
- BOTH MICROPHONES AND BOTH EARPHONES HAVE REDUNDANT TRANSDUCER ELEMENTS. FAILURE OF ONE MICROPHONE AND/OR ONE EARPHONE STILL PERMITS FULL COMMUNICATION.
- LEFT MIC BOOM CIRCULARITY IS IDENTICAL TO RIGHT MIC BOOM.
- WTS DATA TRANSMISSION AS FOLLOWS: 101 SEC OF ENG DATA FOLLOWED BY 4 SEC OF LOGIC DRAWING, FOLLOWED BY 15 SEC OF SERIAL DATA AT 50 BAUD.
- SPEED CONTROL IS ENABLED IF FAN RPM EXCEEDS 19,300 R300.
- UNDERSPED BIT IS SET WHEN FAN RPM DROPS BELOW 19,300.
- WATER AT 10.6 AMP-HR. MINIMUM NORMAL VOLTAGE 10.6 SEC WITH FAN RUNNING. NORMAL EMU CURRENT 2.6 TO 4.2 AMPS AT VACUUM.
- BOTH VALVES ARE IDENTICAL. CLOSE COMMAND ENERGIZES COIL FOR 60 SEC AND LATCHES VALVE TO THE CLOSED POSITION. OPEN COMMAND ENERGIZES COIL FOR 60 SEC AND LATCHES VALVE TO THE OPEN POSITION.
- WINDINGS ARE PHYSICALLY LOCATED IN THE MOTOR ASSEMBLY. THEY ARE REPRESENTED HERE TO SHOW THEIR INTERFERENCE WITH THE DRIVE CIRCUITS.
- PUMP GENERATOR AND PEAK DETECTOR CONSTITUTE THE SQUARE WAVE DC CONVERTER ONLY.
- AT STARTUP OUTPUT#1 FOR 5 SEC. OUTPUT#2 THEREAFTER.

**10 EMU ELEC SCHEM**

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DRW	08	11000 A. JOHNSON SPACE SYSTEMS DIVISION, TSCA
ENGR	02	EMU
APP	02	ELECTRICAL SCHEMATIC
APP	02	6. 10
APP	02	ALL
APP	02	100,000,000
APP	02	100,000,000
APP	02	100,000,000



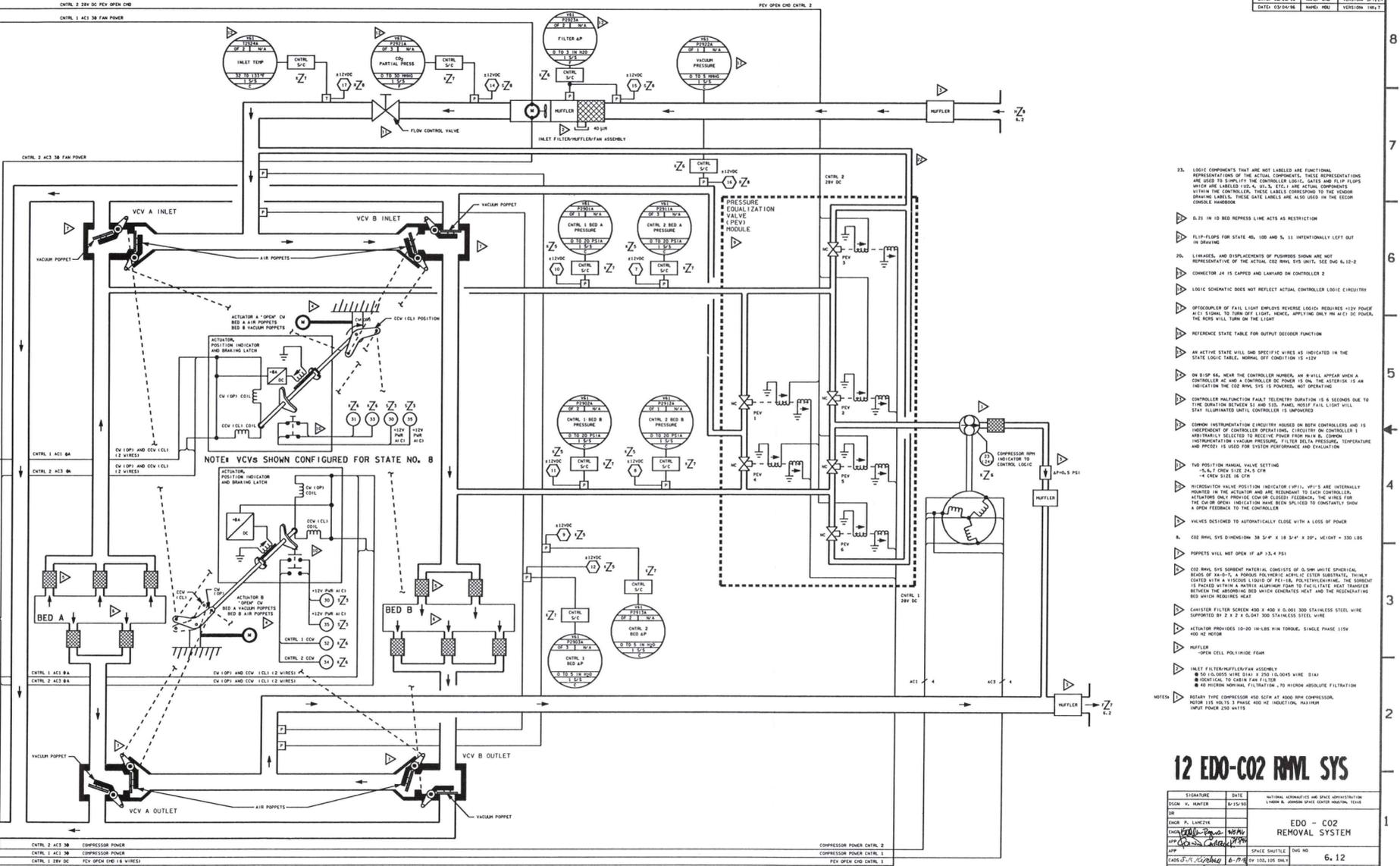
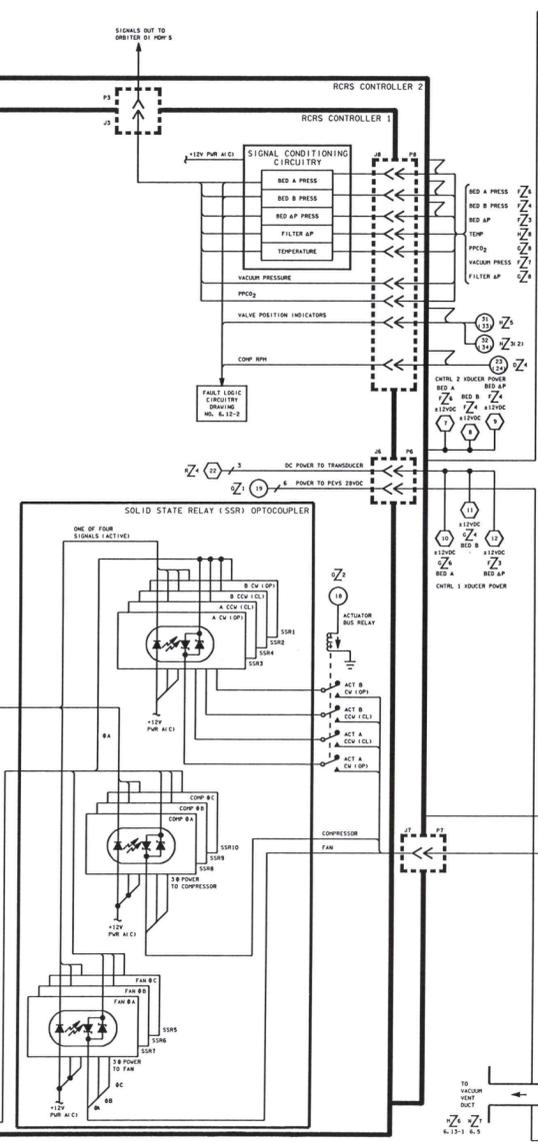
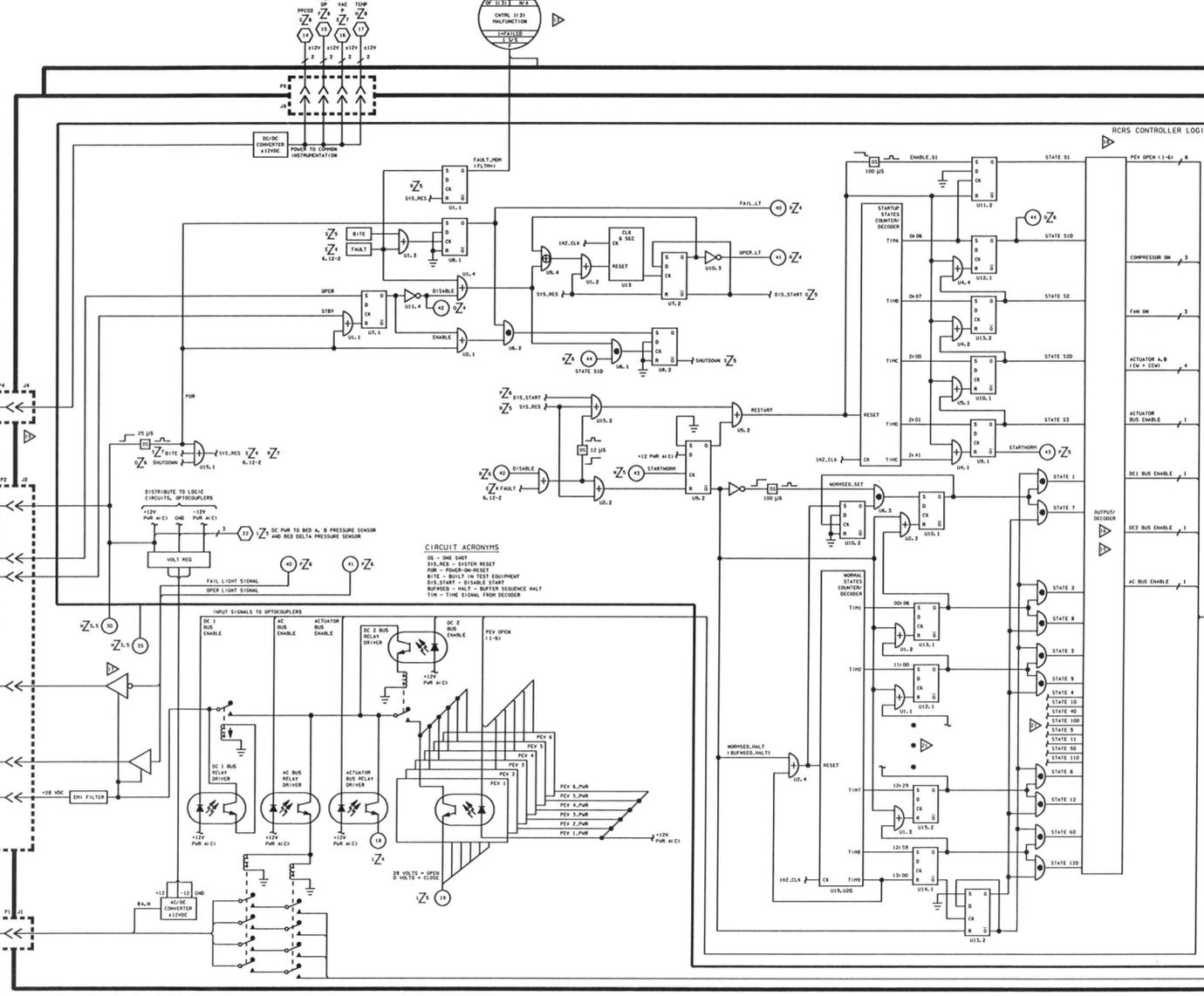
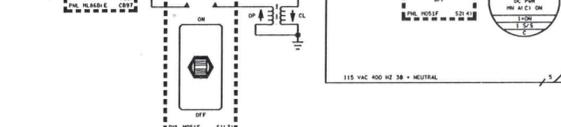
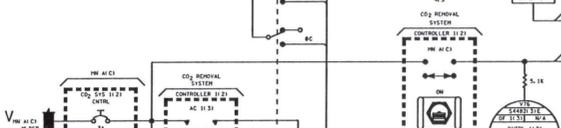
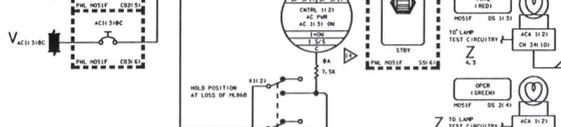
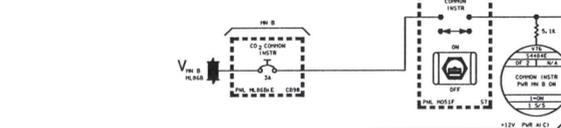
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### 11 MMU & FSS PROP

SIGNATURE	DATE	REVISION
DR L. M. BUCHANAN	3/4/83	1
ENGR S. BLEISATH	7/27/80	2
DR J. J. BROWN	7/27/80	3
DR J. J. BROWN	7/27/80	4
DR J. J. BROWN	7/27/80	5
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DR J. J. BROWN	7/27/80	94
DR J. J. BROWN	7/27/80	95
DR J. J. BROWN	7/27/80	96
DR J. J. BROWN	7/27/80	97
DR J. J. BROWN	7/27/80	98
DR J. J. BROWN	7/27/80	99
DR J. J. BROWN	7/27/80	100

STATE NUMBER	STATE DESCRIPTION	A CV	B CV	ACTIVATION	DEACTIVATION	TIME	DELTA TIME
00	START					00:00	00:00
01	ISOLATE BEDS	X	X			00:06	00:12
02	POPPETS CLOSED					00:12	00:15
03	EQUALIZE VALVE PRESSURE					00:15	00:21
04	OPEN VACUUM COIL VALVES					00:21	00:24
05	ISOLATE BED A	X				00:24	00:26
06	ISOLATE BED B		X			00:26	00:28
07	RELEASE SAVE BED A					00:28	00:30
08	EQUALIZE VALVE PRESSURE					00:30	00:36
09	ISOLATE BED B	X				00:36	00:38
10	RELEASE SAVE BED B					00:38	00:40
11	EQUALIZE VALVE PRESSURE					00:40	00:46
12	ISOLATE BED A	X				00:46	00:48
13	RELEASE SAVE BED A					00:48	00:50
14	EQUALIZE VALVE PRESSURE					00:50	00:56
15	ISOLATE BED B	X				00:56	00:58
16	RELEASE SAVE BED B					00:58	01:00
17	EQUALIZE VALVE PRESSURE					01:00	01:06
18	ISOLATE BED A	X				01:06	01:08
19	RELEASE SAVE BED A					01:08	01:10
20	EQUALIZE VALVE PRESSURE					01:10	01:16
21	ISOLATE BED B	X				01:16	01:18
22	RELEASE SAVE BED B					01:18	01:20
23	EQUALIZE VALVE PRESSURE					01:20	01:26
24	ISOLATE BED A	X				01:26	01:28
25	RELEASE SAVE BED A					01:28	01:30
26	EQUALIZE VALVE PRESSURE					01:30	01:36
27	ISOLATE BED B	X				01:36	01:38
28	RELEASE SAVE BED B					01:38	01:40
29	EQUALIZE VALVE PRESSURE					01:40	01:46
30	ISOLATE BED A	X				01:46	01:48
31	RELEASE SAVE BED A					01:48	01:50
32	EQUALIZE VALVE PRESSURE					01:50	01:56
33	ISOLATE BED B	X				01:56	01:58
34	RELEASE SAVE BED B					01:58	02:00



**12 EDO-CO2 RML SYS**

EDO - CO2 REMOVAL SYSTEM

DATE: 07/28/94  
 DRAWN: LAMZKA  
 CHECKED: [Signature]  
 APPROVED: [Signature]

6.12

BASIC REV E-6







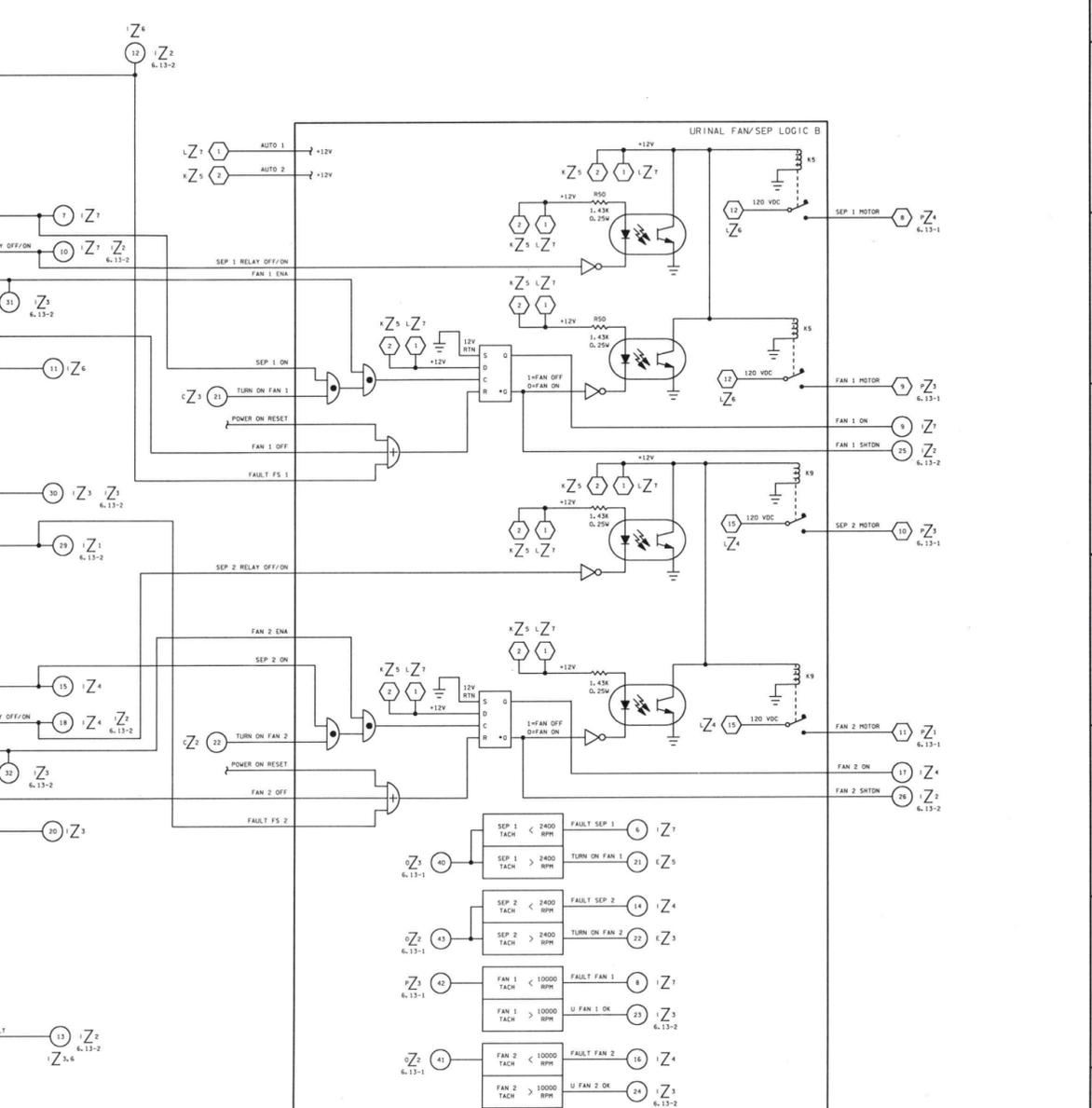
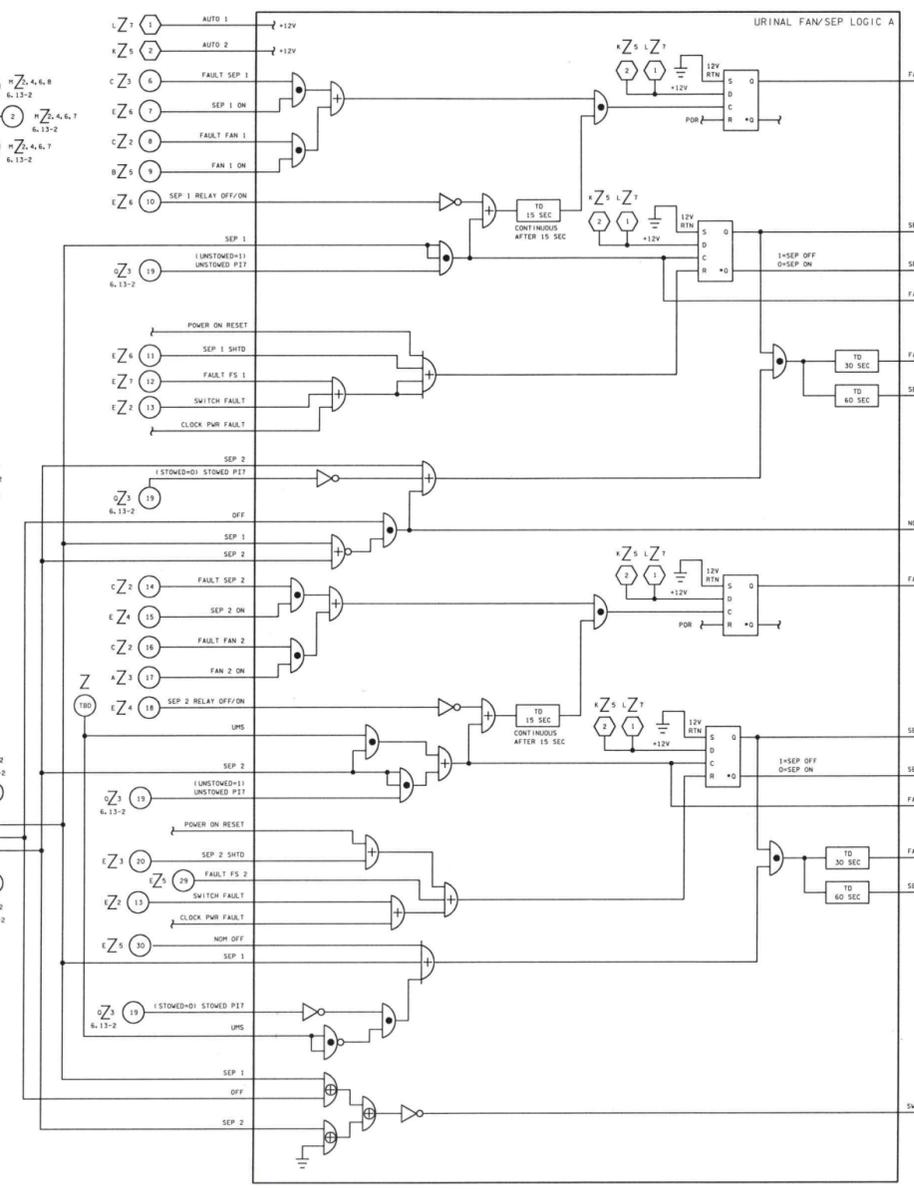
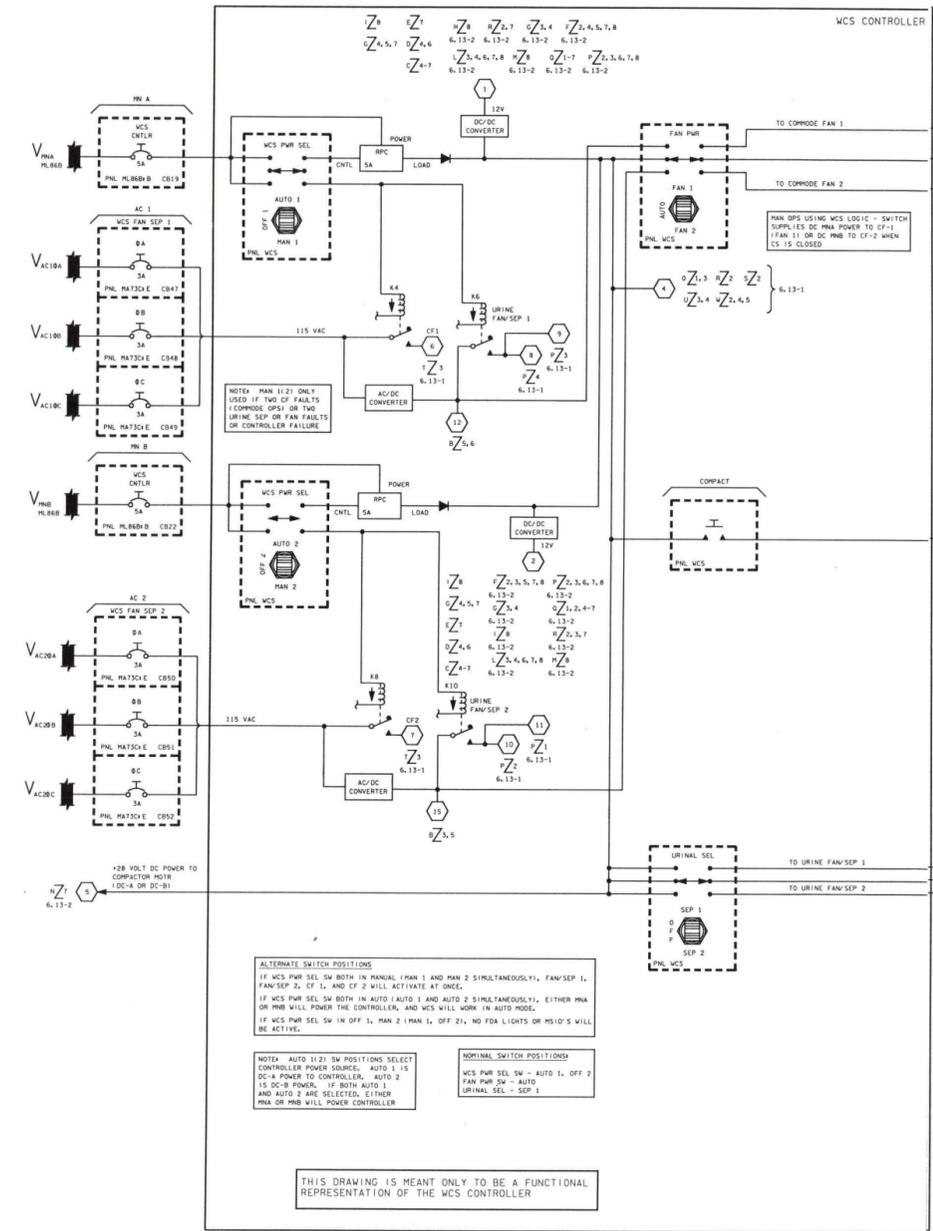
2. EDO WCS CONTROLLER URINAL LOGIC
- THE URINAL SEL SWITCH IS EITHER SELECTED TO SEP 1 OR SEP 2. THE LOGIC FOR BOTH SEPARATORS IS IDENTICAL.
  - WHEN THE URINAL HOSE IS UNSTOWED IT GENERATES THE SIGNAL, UNSTOWED P17 (Z24).
  - THIS SIGNAL IN CONJUNCTION WITH THE SEP 1 (Z26) SIGNAL FROM THE SWITCH GOES THROUGH AN AND GATE (Z26) TO TWO LOCATIONS.
  - ONE OUTPUT OF THE AND GATE GOES TO THE CLOCK INPUT OF A FLIP-FLOP (Z26). THE "0" OUTPUT, SEP 1 RELAY OFF/ON, PROPAGATES THROUGH AN INVERTER (Z26) TO AN OPTOCOUPLER (Z26) THAT CLOSURES THE RELAY THAT POWERS THE SEP MOTOR.
  - THE SEP 1 RELAY OFF/ON SIGNAL ALSO FEEDS BACK (Z27) TO THE FAULT DETECTION LOGIC. THIS SIGNAL PROPAGATES THROUGH AN INVERTER (Z27) THROUGH AN OR GATE (Z27) WHERE IT IS A REDUNDANT INPUT TO A TIME DELAY CIRCUIT (Z27). THE OTHER INPUT IS THE SECOND PART OF THE OUTPUT OF THE SEP 1, UNSTOWED P17 AND GATE (Z26).
  - THE "0" OUTPUT OF THE FLIP-FLOP (Z26), SEP 1 ON, ALSO GOES TWO PLACES. THE FIRST FEEDS BACK INTO THE FAULT LOGIC (Z27) TO ALLOW THE FAULT SIGNAL FROM THE SEP 1 (Z27) TO PROPAGATE THROUGH AN OR GATE (Z27) TO AN AND GATE (Z27) WHERE IT WAITS FOR THE TIME DELAY CIRCUIT TO COMPLETE.
  - IF EVERYTHING IS NORMAL THE FAULT SEP 1 SIGNAL (Z27) SHOULD DROP TO ZERO WELL BEFORE THE TIME DELAY CIRCUIT RUNS OUT.
  - THE SECOND PLACE THE SEP 1 ON SIGNAL (Z27) GOES IS TO AN AND GATE (Z27) WHERE IT WAITS FOR THE SIGNAL FROM THE TACHOMETER THAT THE SEPARATOR HAS REACHED THE ACCEPTABLE SPEED.
  - WHEN THE TACHOMETER DETECTS THAT THE SPEED IS WITHIN LIMITS IT DROPS THE FAULT SEP 1 SIGNAL TO ZERO AND SETS THE TURN ON FAN 1 SIGNAL (Z27) TO 1.
  - THE TURN ON FAN 1 SIGNAL IN CONJUNCTION WITH THE SEP 1 ON SIGNAL (Z27) PROPAGATE THROUGH TWO AND GATES (Z27) TO THE CLOCK INPUT OF A FLIP-FLOP (Z27). THE "0" OUTPUT OF THIS FLIP-FLOP GOES THROUGH AN OPTOCOUPLER (Z27) THAT CLOSURES THE RELAY THAT TURNS THE FAN ON.
  - THE FAN 1 ON SIGNAL FROM THE "0" OUTPUT OF THE FLIP-FLOP (Z27) FEEDS BACK TO THE FAULT LOGIC (Z27) WHERE IT ALLOWS THE FAULT FAN 1 INPUT TO PROPAGATE THROUGH AN OR GATE (Z27) AND AN AND GATE (Z27) WHERE IT WAITS FOR THE TIME DELAY CIRCUIT TO RUN OUT. THE FAN SHOULD COME UP TO SPEED WELL BEFORE THE TIME DELAY EXPIRES.
  - URINAL READY LIGHT
  - WHEN THE URINAL FAN IS UP TO SPEED AND THE TACHOMETER ISSUES THE 1 FAN 1 ON SIGNAL (Z27), IT PASSES THROUGH AN OR GATE (Z27, 6.13-2), IN CONJUNCTION WITH THE FAN 1 ENA SIGNAL (Z27), WHICH ALSO PASSES THROUGH AN OR GATE (Z27, 6.13-2), CLOCKS A FLIP-FLOP (Z27, 6.13-2).
  - THE "0" OUTPUT OF THIS FLIP-FLOP PROPAGATES THROUGH AN OR GATE TO AN INVERTER WHICH LETS THE CURRENT FLOW FROM THE VOLTAGE SOURCE THROUGH THE READY LIGHT (Z27, 6.13-2), THEREBY ILLUMINATING IT.
  - THE READY LIGHT IS EXTINGUISHED WHEN THE FAN 1 SHDN OR THE SEP 1 RELAY OFF/ON SIGNALS (Z27, 6.13-2) IN CONJUNCTION WITH THE SEP 1 SIGNAL (Z27, 6.13-2) RESET THE FLIP-FLOP (Z27, 6.13-2) THAT FIRST CAUSED THE LIGHT TO ILLUMINATE.
  - URINAL FAULT LIGHT
  - IF A FAULT OCCURS, THE FAULT FS 1 SIGNAL (Z27) WILL BE ISSUED.
  - THIS SIGNAL WILL GO THROUGH AN OR GATE (Z27, 6.13-2) TO AN AND GATE (Z27, 6.13-2). THE OTHER INPUT TO THAT AND GATE IS THE OUTPUT OF A NAND GATE (Z27, 6.13-2) THAT WILL OUTPUT A 1 UNLESS BOTH FAN SEP FAULTS HAVE OCCURRED.
  - THE OUTPUT OF THE AND GATE (Z27, 6.13-2) GOES THROUGH AN INVERTER WHICH ALLOWS THE CURRENT FROM THE VOLTAGE SOURCE THROUGH THE LIGHT, THEREBY ILLUMINATING IT.
  - WHEN A SECOND FAULT OCCURS THE OUTPUT OF THE NAND GATE (Z27, 6.13-2) WILL DROP TO ZERO MOMENTARILY EXTINGUISHING THE LIGHT.
  - WHEN THE OUTPUT OF THE NAND GATE (Z27, 6.13-2) DROPS, A CLOCK IS ALLOWED TO RUN WHICH SENDS PULSES THROUGH AN OR GATE (Z27, 6.13-2) THROUGH AN INVERTER, THEREBY PRODUCING THE BLINKING EFFECT.

NOTES: 1. SR FLIP-FLOP WITH DATA TRUTH TABLE

S	R	C	D	Q	*0
1	0	x	x	1	0
0	1	x	x	0	1
0	0	x	x	UNSTABLE	0
0	0	0	1	0	1
0	0	1	0	1	0
0	0	0	0	LAST VALUE	0
1	1	x	x	NOT ALLOWED	

**\* 13 EDO WMS 3**

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LINDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		SIGNATURE	DATE
EDO WASTE MANAGEMENT		DR. S. EGAN-WYER	10/26/93
DWG NO. 6.13		ENGR. M. FITZPATRICK	9/29/93
SPACE SHUTTLE		ENGR. [Signature]	10/14/93
BY 105		CHKD. [Signature]	9/9/93
SHEET 3 OF 3		DATE	REV
PAGE 82.5 X 34		CTR	PCB 3





# 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.	V570-960099	60BA	E	9/19/87	ARPCS - OXYGEN SUPPLY AND CABIN PRESSURE CONTROL		
		R. I.	V570-960099	60BB	E	9/19/87	ARPCS - NITROGEN SUPPLY		
		R. I.	V570-960099	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.	V570-960099	60BF	E	9/19/87	ARPCS - NITROGEN SYSTEM 1, 2, INSTR		
		R. I.	V570-960099	60BG	E	9/19/87	ARPCS - CABIN PRESSURE CONTROL INSTR		
		R. I.	V570-960099	60BH	E	9/19/87	MMU - FSS PORT		
		R. I.	V570-960099	60BJ	E	9/19/87	MMU - FSS STARBOARD		
		R. I.	V570-960099	60DA	E	9/19/87	AECS - AIRLOCK ENVIRONMENTAL CONTROL		
		R. I.	V570-960099	60DB	E	9/19/87	AECS - AIRLOCK ENVIRONMENTAL CONTROL 1		
		R. I.	V570-960099	60DC	E	9/19/87	AECS - AIRLOCK ENVIRONMENTAL CONTROL 2		
		R. I.	V570-960099	60DE	E	9/19/87	AECS - O <sub>2</sub> EMERGENCY BREATHING		
		R. I.	V570-960102	60BA	E	3/8/85	ARPCS - OXYGEN SUPPLY & CABIN PRESSURE CONTROL		
		R. I.	V570-960102	60BB	E	3/8/85	ARPCS - NITROGEN SUPPLY		
		R. I.	V570-960102	60BC	E	3/8/85	ARPCS - OXYGEN PARTIAL PRESSURE CONTROL		
		R. I.	V570-960102	60BE	E	3/8/85	ARPCS - OXYGEN SYSTEM INSTRUMENTATION		
		R. I.	V570-960102	60BF	E	3/8/85	ARPCS - NITROGEN SYSTEM 1 & 2 INSTRUMENTATION		
		R. I.	V570-960102	60BG	E	3/8/85	ARPCS - CABIN PRESSURE CONTROL INSTRUMENTATION		
		R. I.	V570-960102	60DA	E	3/8/85	AECS - AIRLOCK ENVIRONMENTAL CONTROL SUBSYSTEM		
		R. I.	V570-960102	60DB	E	3/8/85	AECS - AIRLOCK ENVIRONMENTAL CONTROL SUBSYSTEM, PART 1		
		R. I.	V570-960102	60DC	E	3/8/85	AECS - AIRLOCK ENVIRONMENTAL CONTROL SUBSYSTEM, PART 2		
		R. I.	V570-960102	60DE	E	3/8/85	AECS - O <sub>2</sub> EMERGENCY BREATHING		
		R. I.	V070-613602				G	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 - O <sub>2</sub> 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.	V570-610106				-	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.	V570-613205				C	2/25/85	ATMOSPHERIC REVITALIZATION PRESSURE CONTROL SUBSYSTEM
		R. I.	V570-613203				A	12/7/82	ATMOSPHERIC REVITALIZATION PRESSURE CONTROL SUBSYSTEM
		R. I.	V070-634465				G	2/5/87	MID-FUS SUBSYSTEM, ECLSS INSTL - FRAME X <sub>3</sub> 693 THRU X <sub>3</sub> 807
		R. I.	V570-610209				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.	V570610109	ALL	E	3/23/88	SCHEMATIC DIAGRAM - ATMOSPHERE REVITALIZATION SUBSYSTEM		
		R. I.	V570-610102	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 COOLING DUCT AND DIFFUSER, MIDDECK		

DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		
6.1	ENGR M. F. ZPATRICK		<b>VENDOR DRAWING REFERENCES</b>		
	ENGR <i>M. F. Zpatrick</i>	10/1/90			
6.2	ENGR N. PAPAIA				
	ENGR <i>N. Papaia</i>	10/1/90			
	APP <i>M. J. ...</i>	10/2/90	SPACE SHUTTLE	TBL NO	<b>6-1</b>
	APP		ALL		
LTR E	PCN		PAGE	6.1-1	SHEET 1 OF 9

**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	
		R.I.	M072-643300				AIRLOCK/ECLSS PROVISIONS	
		R.I.	M072-643501				AIR SUPPLY DUCTING, AIRLOCK/TUNNEL ADAPTER, TECH ORDER INSTL. SPACEHAB	
		R.I.	V075-750001				INSTRUMENTATION INSTL OF1, AIRLOCK	
		R.I.	V519-634110				DUCT - AIRLOCK, AIR SUPPLY TUNNEL ADAPTER ASSY	
		R.I.	M072-643500				ECLSS, ASSY, TUNNEL ADAPTER MV0519A TECH ORDER INSTALLATION	
		IMPQUA	SV767709				2/7/85	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							

DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
6.3	ENGR S. DOERING		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>S. Doering</i>	10/13/95		
	ENGR			
	ENGR			
	APP		SPACE SHUTTLE	TBL NO
	APP		ALL	6-1
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				SHEFT 2 OF 9

**BASIC REV E-3**

# 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 <sub>0</sub> 582 THRU X <sub>0</sub> 693
		R. I.	VO70-623200	ALL	L	3/30/93	SYSTEM INSTALLATION - WATER MANAGEMENT, ECLSS EQUIPMENT BAY
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 <sub>0</sub> 582 THRU X <sub>0</sub> 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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
6.4	ENGR J. SOLOMON			ENGR		<b>VENDOR DRAWING REFERENCES</b> TBL NO <b>6-1</b>	
	ENGR <i>J. M. Johnson</i>	9/26/94		ENGR			
6.5	ENGR S. TRIPODI			ENGR			
	ENGR <i>Stephen S. Tripodi</i>	9/22/94		ENGR			
	ENGR			APR <i>[Signature]</i>	9/22/94	SPACE SHUTTLE	TBL NO <b>6-1</b>
	ENGR			APP		ALL	
	ENGR			APP			
	ENGR			LTR E	PCN 4	PAGE 6.1-3	SHEET 3 OF 9

**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	REPACKAGED GALLEY	NASA	SED39121058			9/24/90	SHUTTLE ORBITER REPACKAGED GALLEY
		NASA	SED39121045			9/19/90	INTERCONNECTION DIAGRAM, ORBITER GALLEY
		NASA	SED39120917		A	9/14/90	SCHEMATIC DIAGRAM, OVEN ASSEMBLY (A5) ORBITER GALLEY
		NASA	SED39121032			7/18/90	SCHEMATIC DIAGRAM, POWER ASSEMBLY (A6) ORBITER GALLEY
		NASA	SED39120899		B	7/6/90	WATER TANK ASSY - HOT WATER SYSTEM, GALLEY
		NASA	SED39121035		E	7/26/90	PLUMBING INSTL - GALLEY
		NASA	SED39121038			7/18/90	SCHEMATIC DIAGRAM, WATER HEATER ASSY (A7) ORBITER GALLEY

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS			
6.6	ENGR S. TRIPODI			ENGR					
	ENGR <i>Stephen Tripodi</i>	9/22/90		ENGR					
	ENGR			ENGR					
	ENGR			ENGR					
	ENGR		APP <i>[Signature]</i>	APP	9/22/90				
	ENGR		APP	APP					
	ENGR		APP	APP		SPACE SHUTTLE			
	ENGR		LTR	E	PCN	4	TBL NO	6-1	
						ALL	PAGE	6.1-4	SHEET 4 OF 9

**BASIC REV E-4**

# 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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
6.8	ENGR P. LAMCZYK		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>Philip C. Lamczyk</i>	10/1/90		
	ENGR			
	ENGR			
	APP <i>Mark D. Young</i>	10/26/90	SPACE SHUTTLE TBL NO <b>6-1</b>	
	APP			
	OMNIPLAN			
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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 BRUNSWICK/ARDE CONRAC/GULTON CARELTON CONTROLS  CONRAC/GULTON HS MICROSWITCH HS  HS SENSORMEDICS HS  HS/MAG TECH HS HS HS HS HS HS HS CONRAC/GULTON  HS HS HS ECKEL CONRAC/GULTON HS RDF HS HS HS HS HS AIR-LOCK AIR-LOCK HS HS HS HS HS ILC HS HUGHES/TRIETLER/HS HS ECKEL HS HS ILC ILC ILC ILC ILC ILC ILC	SV789200 SV778895/ SV784099 SV778528  SV778873  SV767788  SV778540 SV789111 SV785844  SV771836 SV767798 SV787994  SV785900 SV769480 SV772158 SV784996 SV778543 SV767699 SV769592 SV767793-5,-7  SV769403 SV769404 SV792528 SV767660-5,-4 SV767793-6,-8  SV792500 SV792503 SV783850 SV784943 SV769405 SV769406 SV785860 SV787036 SV785927 SV769592 SV785970 SV789151 SV789152 SV789153 SV777266 SV789134 SV772168 SV769592 SV785890  SV784998 SV784982 SV784985 SV791230 0101-10001 0102-10002  SV772325 SV772335 SV772345 SV772375 SV772385		A	10/27/88	PRIMARY LIFE SUPPORT SUBSYSTEM PRIMARY OXYGEN BOTTLE  PRIMARY OXYGEN PRESSURE SENSOR  PRIMARY PRESSURE CONTROL MODULE CHECK VLV FLOW RESTRICTOR SHUTOFF VLV SUIT PRESSURE REGULATOR WATER TANK PRESSURE REGULATOR SUIT PRESSURE SENSOR (psid)  SHEAR PLATE ASSY EVA POSITION SWITCH DUAL MODE RELIEF VLV BLEED ORIFICE DUAL MODE RELIEF VLV FEEDWATER CHECK VLV FLOW RESTRICTOR UNIT VENT FLOW SENSOR CARBON DIOXIDE SENSOR FAN/PUMP/WATER SEPARATOR ASSY FAN ROTARY WATER SEPARATOR WATER PUMP BRUSHLESS MOTOR PITOT ACTUATED VLV CO2 TRANSDUCER FILTER AND ORIFICE CHECK VLV PUMP INLET FILTER CHECK VLV AND HOUSING PRIMARY WATER TANK #1 FEEDWATER SUPPLY PRESSURE SENSOR OXYGEN SIDE WATER SIDE CONDENSATE WATER RELIEF VLV FEEDWATER RELIEF VLV FEEDWATER PRESSURE REGULATOR FEEDWATER SHUTOFF VLV FEEDWATER PRESSURE SENSOR  SUBLIMATOR AND HARNESS TEMPERATURE SENSOR HARNESS SUBLIMATOR GAS TRAP WATER RELIEF VLV WATER CHECK VLV RELIEF VLV AND ORIFICE POSITIVE PRESSURE RELIEF VLV NEGATIVE PRESSURE RELIEF VLV RESERVE WATER TANK CAUTION AND WARNING ELECTRICAL POWER HARNESS ELECTRICAL SIGNAL HARNESS CAUTION AND WARNING HARNESS FIBER OPTIC CONVERTER AND CONNECTOR REAL-TIME DATA SYSTEM HARNESS PLS/SOP THERMAL COVER PRIMARY WATER TANK #2 MUFFLER  COOLANT ISOLATION VLV ASSY WATER SHUTOFF VLV COOLANT RELIEF VLV SIGNAL CONDITIONER (RTDS) COMMUNICATIONS CARRIER ASSY (CCA) HARD UPPER TORSO (HUT) HARD TORSO SHELL EXTRA SMALL SMALL MEDIUM LARGE EXTRA LARGE
					N BL	11-21-85 2-6-88	

DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
6.9	ENGR S. BLEISATH		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>Scott Bleisath</i>	11-1-90		
6.10	ENGR C. LOWERY			
	ENGR <i>C. Lowery</i>	11-2-90		
	APP <i>[Signature]</i>	6/16/90	SPACE SHUTTLE	TBL NO
	APP <i>RT Neal</i>	11/6/90	ALL	6-1
	OMNIPLAN			
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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				BOOT SIZING INSERT	
		ILC	9789,9791				BOOT SIZING INSERT	
		ILC	9698,9699, 9714				BOOT SIZING INSERT	
		ILC	0105-10005			T	10-19-87	HELMET
		ILC	0106-10006/1600			BJ	12-8-87	GLOVES
						K	10-19-87	
						AU	2-19-85	
			ILC	0107-10007				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		SV778475				SOP PRESSURE CONTROL MODULE
		CONTROLS						
		KULITE		SV778473		A	10-4-88	SOP PRESSURE TRANSDUCER
		HS		SV792294				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		SV789695				BITE INDICATOR
		PACKARD						
		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	
	TITFLEX		SV778865				O2 HIGH PRESSURE LINE	
	TITFLEX		SV771722				WATER LINE	
	TITFLEX						POTABLE WATER LINE	
	TITFLEX						COOLING WATER LINE	
	TITFLEX						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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
6.9	ENGR S. BLEISATH		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>Scott A. Bleisath</i>	11-1-90		
6.10	ENGR C. LOWERY			
	ENGR <i>C. Lowery</i>	11-2-90		
	APP <i>[Signature]</i>	6 Nov 90	SPACE SHUTTLE	TBL NO
	APP <i>RT Neal</i>	11/6/90	ALL	6-1
	OMNIPLAN			
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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  THERMAL HEATER, TEMP SENSOR ASSY.
6.11	MMU/FSS PROPULSION	MARTIN MARIETTA (M.M.)	ML2050				
		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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		
6.9	ENGR S. BLEISATH			ENGR		<b>VENDOR DRAWING REFERENCES</b>		
	ENGR <i>Scott Bleisath</i>	11-8-90		ENGR				
6.10	ENGR C. LOWERY			ENGR				
	ENGR <i>C. Lowery</i>			ENGR				
6.11	ENGR S. BLEISATH			APP <i>Tom Linn</i>	1/26/90	SPACE SHUTTLE	TBL NO	6-1
	ENGR <i>Scott A. Bleisath</i>	11-8-90		APP <i>RT Neal</i>	11/16/90			
	ENGR			OMNIPLAN		ALL		
	ENGR			LTR E		PAGE	6-1-8	SHEET 8 OF 9

**BASIC REV E**

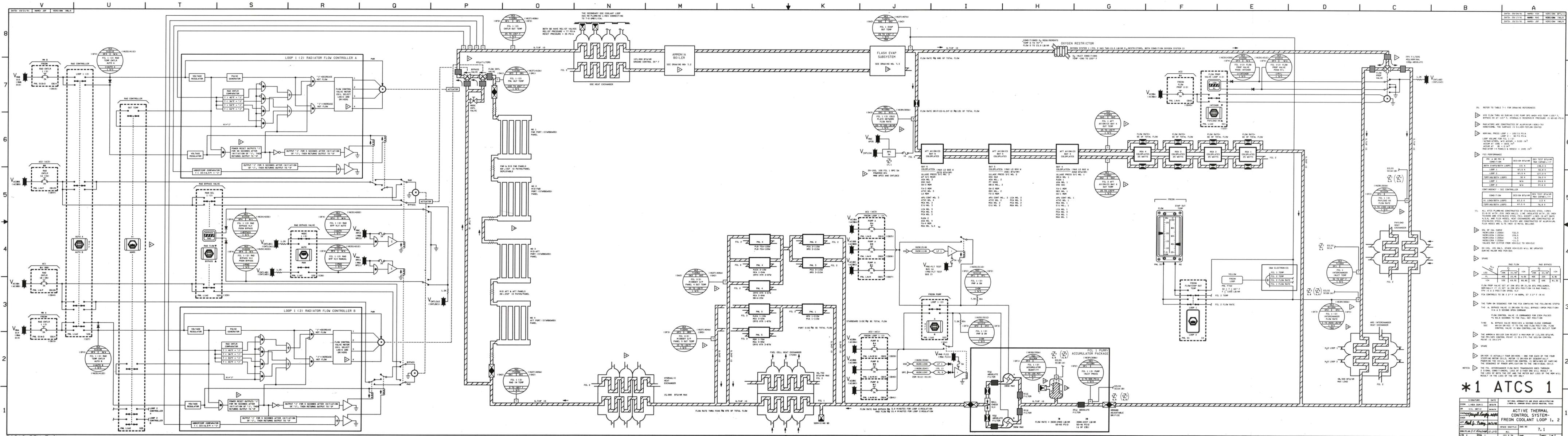
# FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
6.12	RCRS	HS	-	-	-	3/15/91	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
6.13 (SHEETS 1 - 3)	WASTE MANAGEMENT SYSTEM	HS	SV805199	1	B	7/20/90	DRIVE, COMMODE COMPACTOR
		SV805318	1	B	8/16/90	COVER, CANISTER FILTER	
		SV805319	1	B	7/18/89	FILTER, BACTERIA, PLENUM	
		SV805321	1	C	1/23/90	MOTOR, URINE SEPARATOR	
		SV805324	1	B	8/24/90	FILTER, ODOR/BACTERIA, URINAL	
		SV805333	1	A	4/19/90	VALVE, CHECK, CAS	
		SV805334	1	B	1/30/90	CHECK VALVE, DUAL	
		SV805340	1	A	12/1/89	RETAINING RING, PLENUM	
		SV805342	1	B	1/13/90	RING, NUT, CANISTER	
		SV805357	1	-	12/21/89	SWITCH, LIMIT SENSITIVE	
		SV805378	1	C	1/18/90	MOTOR ASSY, FAN	
		SV805380	1	A	1/31/90	MOTOR ASSY, SEPARATOR	
		SV805396	1	A	8/24/90	FILTER, ODOR/BACTERIA, COMMODE	
		SV807455	1 - 3 OF 4	-	3/29/90	TUBE ASSEMBLY, TRANSPORT	
		SV807470	1	-	6/20/90	RUNNER, PISTON	
		SV807583	1	-	7/23/90	YOKE, SLIDE	
		SV809710	1	-	-	TUBE, TRANSPORT	
		SVL16993	1 - 4 OF 4	A	9/15/89	SEPARATOR, URINE	
		SVL16995	3 - 5 OF 5	B	10/20/89	TRANSPORT TUBE ASS'Y	
		SVL16995	1 - 6 OF 6	-	10/21/89	COMMODE INLET, BAG, SEAT RETENTION	
		SVL17094	1	-	-	COMPACTOR ASS'Y, WCS	
		SVL17094	2 - 3 OF 3	-	-	COMPACTOR DETAILS	
		SVL17145	1 - 2 OF 2	D	2/15/90	STATIONARY TRANSPORT TUBE ASS'Y, WCS	
		SVL17230	-	-	3/23/90	PISTON, COMPACTOR SUBASS'Y	
		SVL17230	1	A	3/26/90	PISTON, COMPACTOR SUBASS'Y	
		SVL17282	1 OF 1	B	-	URINE SEP GSE TUBING	
SVL17297	1	-	7/31/90	SEAT & LID ASS'Y WCS			
SVL17363	1	-	-	PLUMBING, URINAL INLET & OUTLET			
SVL17366	1	A	-	ODOR/BACTERIA FILTERS, URINE AND COMMODE - WASTE COLLECTION SUBSYSTEM			
SVL17367	-	-	-	COMMODE TUBES			

DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
6.12	ENGR P. LAMCZYK		VENDOR DRAWING REFERENCES	
	ENGR <i>P. Lamczyk</i>	2/1/93		
6.13	ENGR S. TRIPODI			
	ENGR <i>S. Tripodi</i>	2/17/93		
	APP <i>[Signature]</i>	2/19/93	SPACE SHUTTLE	TBL NO 6-1
	OMNIPLAN		ALL	
LTR E		PCN 2	PAGE 6.19	SHEET 3 OF 3

**BASIC REV E-2**

7. THERMAL



BASIC REV E-1

16. REFER TO TABLE 7-1 FOR DRAWING REFERENCES
17. FLOW THROUGH RAD DURING CIRC PUMP OPS WHEN WTR TEMP > 105°F, BYPASS IN AT 15" H<sub>2</sub>O HYDRAULIC RESISTOR PRESSURE IS 40-60 PSIA
18. RADIATORS ARE CONSTRUCTED OF ALUMINUM LEVELS; NONTOXIC. THE SURFACE IS SILVER-FLUON COATED
19. NOMINAL PRESS LOOP 1 - 105.5 PSIA  
 LOOP 2 - 105.5 PSIA  
 LOOP VOLUME FOR FCL 1 (2) - 10.5 GALS  
 WTR VOLUME FOR FCL 1 (2) - 10.5 GALS  
 ACCUM AT 100% = 10.5 GALS  
 ACCUM AT 50% = 5.25 GALS  
 RADIATOR 1 4 PANELS & HOSES = 1445 IN<sup>2</sup>
- | YES PERFORMANCE      |              | NO PERFORMANCE |                |
|----------------------|--------------|----------------|----------------|
| COND                 | DESIGN BTU/H | DESIGN BTU/H   | MAX CAPABILITY |
| BOTH EXPA/BYPH LOOPS | 131 K        | 146.0 K        |                |
| LOOP 1               | 67.5 K       | 92.0 K         |                |
| TOPPH/BOPH LOOPS     | 30 K         | 36.0 K         |                |
| LOOP 2               | N/A          | N/A            |                |
| LOOP 2               | N/A          | 31.6 K         |                |
- CONTINGENCY - SEC CONTROLLER
- | COND                |        | DESIGN BTU/H |  | MAX CAPABILITY |  |
|---------------------|--------|--------------|--|----------------|--|
| ALL LEAD/BYPH LOOPS | 87.5 K | 113 K        |  |                |  |
| TOPPH/BOPH LOOPS    | 30 K   | 36 K         |  |                |  |
11. ALL ATCS PIPING CONSTRUCTED OF STAINLESS STEEL. COES 21-6-31 WITH 1/8" O.D. HIGH WALLS. LINE INSULATED WITH 25 INCH 200000 AND STAINLESS STEEL FULL DEPTH LINING. IN ATCS BAYS 4, 5, 6, AND FLEX HOSES, HEAT EXCHANGERS ARE CONSTRUCTED OF STAINLESS STEEL. COOL PLATES ARE CONSTRUCTED OF ALUMINUM. FLEX HOSES ARE 0.75 INCH ID METAL BELLOWS
12. ALL VALVES CONSTRUCTED OF STAINLESS STEEL. COES 21-6-31 WITH 1/8" O.D. HIGH WALLS. LINE INSULATED WITH 25 INCH 200000 AND STAINLESS STEEL FULL DEPTH LINING. IN ATCS BAYS 4, 5, 6, AND FLEX HOSES, HEAT EXCHANGERS ARE CONSTRUCTED OF STAINLESS STEEL. COOL PLATES ARE CONSTRUCTED OF ALUMINUM. FLEX HOSES ARE 0.75 INCH ID METAL BELLOWS
13. DR-100, 100 INCH, OTHER VEHICLES WILL BE DELETED
14. SPARE
- | RAD FLOW |       | RAD BYPASS |       |
|----------|-------|------------|-------|
| FCV      | FCV   | FCV        | FCV   |
| FCV 1    | FCV 2 | FCV 1      | FCV 2 |
| FCV 1    | FCV 2 | FCV 1      | FCV 2 |
15. FLOW PROP VALVE SET AT 28K BTU OR 21.5K BTU PRELIMINARILY. NORMALLY IT IS SET IN THE RAD POS POSITION IN RAD PANEL. FCV IS A 2 POSITION SPOL. VLV
16. FCV CONTROLS TO 38 ± 2°F IN NOML, 57 ± 2°F IN HI
17. THE TURN ON SEQUENCE FOR THE FCV CONTAINS THE FOLLOWING STEPS  
 TO A. BYPASS VALVE IS DRIVEN TO FULL BYPASS (OPEN POSITION) VIA A 6 SECOND OPEN COMMAND  
 TO B. RADIATOR VALVE IS DRIVEN TO FULL FLOW POSITION  
 TO C. BYPASS VALVE RECEIVES A SECOND CLOSE COMMAND WHICH DRIVES IT TO THE RAD FLOW POSITION. FLOW CONTROL VALVE IS COMPANDED FOR 2300 PULSES  
 TO D. 6.0 SECONDS TO THE FULL HOT POSITION
18. BYPASS VALVE RECEIVES A SECOND CLOSE COMMAND WHICH DRIVES IT TO THE RAD FLOW POSITION. FLOW CONTROL VALVE IS COMPANDED FOR 2300 PULSES
19. THE AMMONIA BOILER CAN SUBJECT A MAXIMUM OF 15.0 GALS OF AMMONIA TO THE PH/OFC CONTROL POINT IS 30 ± 3°F. THE SEC/ON CONTROL POINT IS 34 ± 3°F
20. SPARE
21. DRIVER IS ACTUALLY FOUR MOTORS - ONE FOR EACH OF THE FOUR STOPPING MOTOR CELLS. MOTOR IS DRIVEN BY SEQUENTIAL PULSED CURRENT. ON/OFF INJECTION CONTROL IS OBTAINED BY VARYING THE FLOW INTERCHANGER FLOW RATE TRANSDUCER ONE THROUGH 2 SIGNAL CONDITIONERS. LOSS OF EITHER ONE WILL RESULT IN THE LOSS OF BOTH THE CRT AND THE WTR BUT LOSS OF THE WTR WILL RESULT IN THE LOSS OF THE CRT ONLY

**\*1 ATCS 1**

ACTIVE THERMAL CONTROL SYSTEM - FREON COOLANT LOOP 1, 2

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 VERSION: 1M.1.1

DATE: 05/15/81  
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BASIC REV E-1

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DATE: 9/05/90	NAME: LAM	VERSION: INK, 3
DATE: 09/03/91	NAME: VSH	VERSION: BPT, 1
DATE: 09/17/91	NAME: MAG	VERSION: INK, 4

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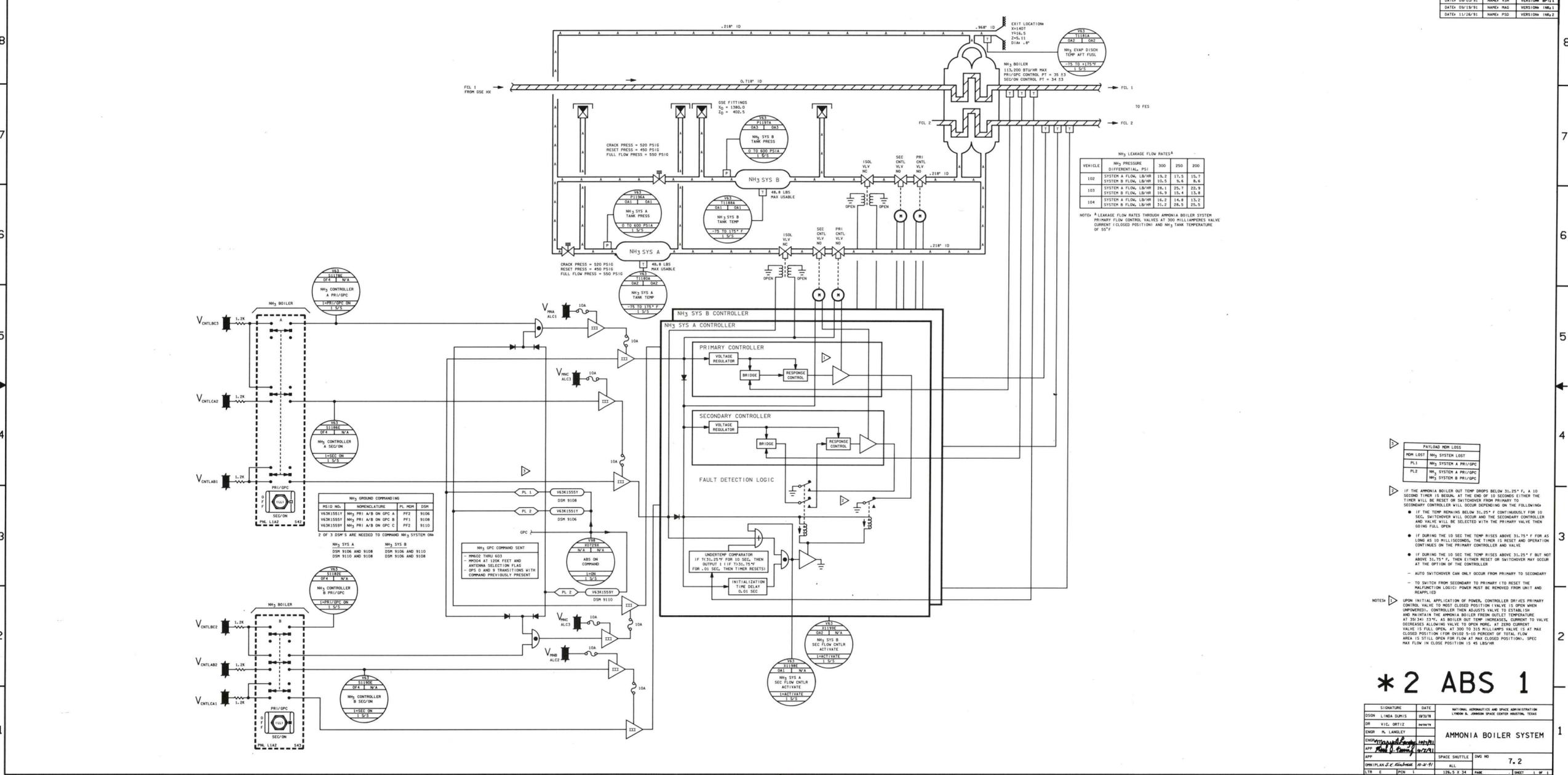
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3  
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1

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"

# \* 1 ATCS 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN VIC ORTIZ	5/11/87	ACTIVE THERMAL CONTROL SYSTEM- FREON COOLANT LOOP 1, 2 (PLUMBING LENGTHS)	
DR			
ENGR M. LANGLEY		SPACE SHUTTLE DWG NO 7.1	
ENGR <i>Mary A. Langley 10/7/91</i>			
APP <i>Macl G. King 10/7/91</i>		ALL	
APP			
OMNIPLAN S. K. Kimble 10-21-91		PAGE SHEET 2 OF 2	
LTR E PCN 1			

DATE: 09/03/91	NAME: JSM	VERSION: 001
DATE: 09/19/91	NAME: MAC	VERSION: 002
DATE: 11/26/91	NAME: PSD	VERSION: 002



NH3 LEAKAGE FLOW RATES<sup>a</sup>

VEHICLE	NH3 PRESSURE DIFFERENTIAL, PSI	300	200	250
102	SYSTEM A FLOW, LB/HR	16.2	13.5	15.1
	SYSTEM B FLOW, LB/HR	10.5	8.6	9.6
103	SYSTEM A FLOW, LB/HR	26.1	21.7	22.9
	SYSTEM B FLOW, LB/HR	16.9	13.4	13.8
104	SYSTEM A FLOW, LB/HR	14.8	13.2	
	SYSTEM B FLOW, LB/HR	11.2	10.3	

NOTE: <sup>a</sup> LEAKAGE FLOW RATES THROUGH AMMONIA BOILER SYSTEM PRIMARY FLOW CONTROL VALVES AT 300 MILLIAMPERES VALVE CURRENT (CLOSED POSITION) AND NH3 TANK TEMPERATURE OF 55°F

PAYLOAD NOM LOSS

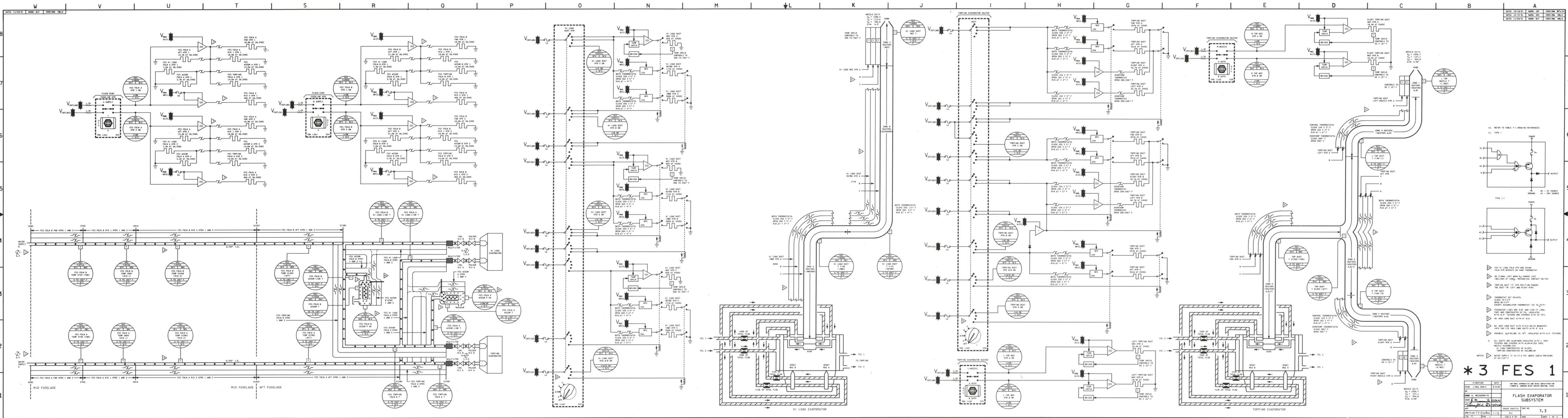
NOM LOST	NH3 SYSTEM A PRI/GPC
PL1	NH3 SYSTEM A PRI/GPC
PL2	NH3 SYSTEM B PRI/GPC

- IF THE AMMONIA BOILER OUT TEMP DROPS BELOW 31.25°F, A 10 SECOND TIMER IS BEGIN. 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 50% FLOW 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

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 FROM BULLET TEMPERATURE AT 330.343 ± 0.7°F. AS BOILER OUT TEMP INCREASES, CURRENT TO VALVE DECREASES ALLOWING VALVE TO OPEN MORE. AT 330.343 ± 0.7°F VALVE IS FULL OPEN. AT 300 TO 315 MILLIAMPS VALVE IS AT MAX CLOSED POSITION FOR 50% PERCENT OF TOTAL FLOW AREA IS STILL OPEN FOR FLOW AT MAX CLOSED POSITION. SPEC MAX FLOW IN CLOSE POSITION IS 45 LB/HR

# \* 2 ABS 1

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DSGN LINDA DUBIS	09/23/91	LINDA B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR V.L.C. ORTIZ	09/24/91	
CHKD M. LANGLEY		
APP <i>[Signature]</i>		
APP PLAN <i>[Signature]</i>		
DSGN/PLAN <i>[Signature]</i>	09-20-91	SPACE SHUTTLE DWS NO
STR E	DSN 1	ALL
		7.2
		126.0 X 21
		SHEET 1 OF 1

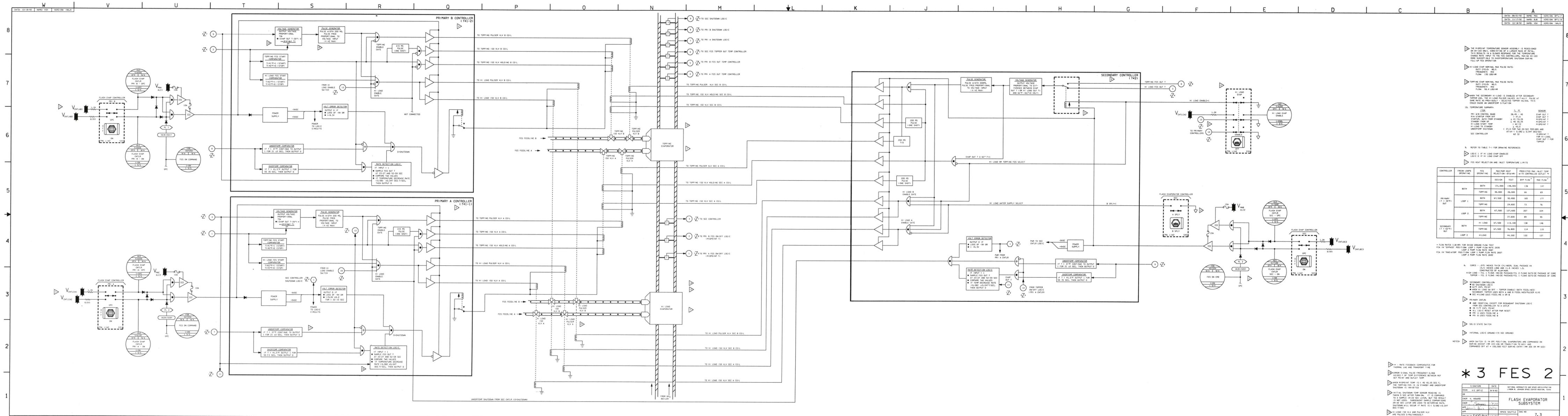


BASIC REV E-1

**\* 3 FES 1**

DATE: 10-19-91	NAME: JDF	VERSION: 001
DATE: 10-19-91	NAME: SAJ	VERSION: 001
DATE: 10-19-91	NAME: BUT	VERSION: 001
<b>FLASH EVAPORATOR SUBSYSTEM</b>		
SPACE SHUTTLE	DSG NO	7.3
1/8" E	1/8" P	1/8" S

BASIC REV E-1



THE MIDPOINT TEMPERATURE SENSOR ASSEMBLY IS REDESIGNED ON ON-100 ONLY, CONSISTING OF A LARGER MASS OF METAL. THIS RESULTS IN A SLOWER RESPONSE FOR THE TEMPERATURE CHANGE RATE INPUT TO THE FES CONTROLLER, MAKING ON-100 MORE SUSCEPTIBLE TO OVERTEMPERATURE SHUTDOWN DURING FULL-UP FES OPERATION

HI-LOAD EXAP NORMAL MAX PULSE RATE:  
DUTY CYCLE: 40%  
FREQUENCY: 100 Hz

FLASH EXAP NORMAL MAX PULSE RATE:  
DUTY CYCLE: 40%  
FREQUENCY: 100 Hz

WHEN THE SECONDARY HI-LOAD IS ENABLED AFTER SECONDARY TOPPING USE THE HI-LOAD PULSER PULSES INITIALLY PULSE AT SAME RATE AS PREVIOUSLY SELECTED TOPPER VALUES. THIS COULD CAUSE AN UNDERTEMP SITUATION

TEMPERATURE SUMMARY:

TEMPERATURE	5...10	SENSE
PRE A/B CONTROL BAND	36.45 - 40	EXAP OUT T
PRE A/B CONTROL BAND	37.45 - 40	EXAP OUT T
STARTUP, AUTO FROM STANDBY	2.41 - 25.25	PROPONENT
STARTUP, AUTO FROM STANDBY	2.41 - 25.25	PROPONENT
HI-LOAD START TEMP	7.62 - 22	PROPONENT
HI-LOAD TO STANDBY	6.45 - 2	PROPONENT
UNDERTEMP SHUTDOWN	< 37.0 FOR 20-SEC PERIODS AND 47.0 FOR 10-SEC PERIODS	PROPONENT
SEC CONTROLLER	82.22	PROPONENT

5. REFER TO TABLE 7-1 FOR DRAWING REFERENCES

LOGIC 1 IF HI-LOAD EXAP ENABLED  
LOGIC 2 IF HI-LOAD EXAP OFF

FES HEAT REJECTION AND INLET TEMPERATURE LIMITS

CONTROLLER	FES LOOP OPERATING	FES OPERATING	MAXIMUM HEAT REJECTION ESTIMATED	PREDICTED MAX HEAT REJECTION WITH CONTROLLED OUTLET TEMP
PRIMARY (T = 34°F) / OUT	BOTH	TOPPING	131,000	148,000
		BOTH	30,000	36,000
	LOOP 1	TOPPING	67,500	82,500
		BOTH	24,800	30,000
	LOOP 2	TOPPING	67,500	105,000
		BOTH	37,600	45,000
SECONDARY (T = 62°F) / OUT	BOTH	HI-LOAD	67,500	115,000
		TOPPING	67,500	76,800
	LOOP 2	HI-LOAD	44,200	120
		TOPPING	44,200	120

FLOW RATES (L/MIN) FOR DIVIDE ORIGIN FLOW TEST  
FCA IN "BYPASS" POSITION: LOOP 1 PUMP FLOW RATE 2955  
LOOP 2 PUMP FLOW RATE 308  
FCA IN "RADIATOR" POSITION: LOOP 1 PUMP FLOW RATE 2857  
LOOP 2 PUMP FLOW RATE 2857

6. CORES - .075 INCHES THICK CYLINDER, DUAL PASSAGE IN 14.5 INCHES LONG AND 11.0 INCHES I.D.

HI-LOAD - FEL 3 FLOWS INSIDE PASSAGE/FEL 3 FLOWS OUTSIDE PASSAGE OF CORE  
TOPPER - FEL 2 FLOWS INSIDE PASSAGE/FEL 1 FLOWS OUTSIDE PASSAGE OF CORE

SECONDARY CONTROLLER:

- NO SHUTDOWN LOGIC
- HI-LOAD EXAP OFF - TOPPER ENABLE (BOTH FEEDLINES)
- SECONDARY TOPPER USES BOTH A AND B FEEDLINE PULSER VALVES
- SEC HI-LOAD USES FEEDLINE A OR B

PRIMARY CONTROLLER:

- ARE IDENTICAL EXCEPT FOR REDUNDANT SHUTDOWN LOGIC
- 38.17°F ONT POINT
- ALL LOGIC RESET AFTER PUR HEIST
- PRE A USES FEEDLINE A
- PRE B USES FEEDLINE B

SOLID STATE SWITCH

INTERNAL LOGIC GROUND (19 VDC GROUND)

NOTES:

- WHEN SWITCH IS IN ON POSITION, EVAPORATORS ARE COMPANDED ON SURVIVE ASSET OR 100-100 OHM TRANSITION TO COIL AND COMPANDED OFF AT 100,000 FEET DURING ENTRY IN 300 OR 600 (M)

**\* 3 FES 2**

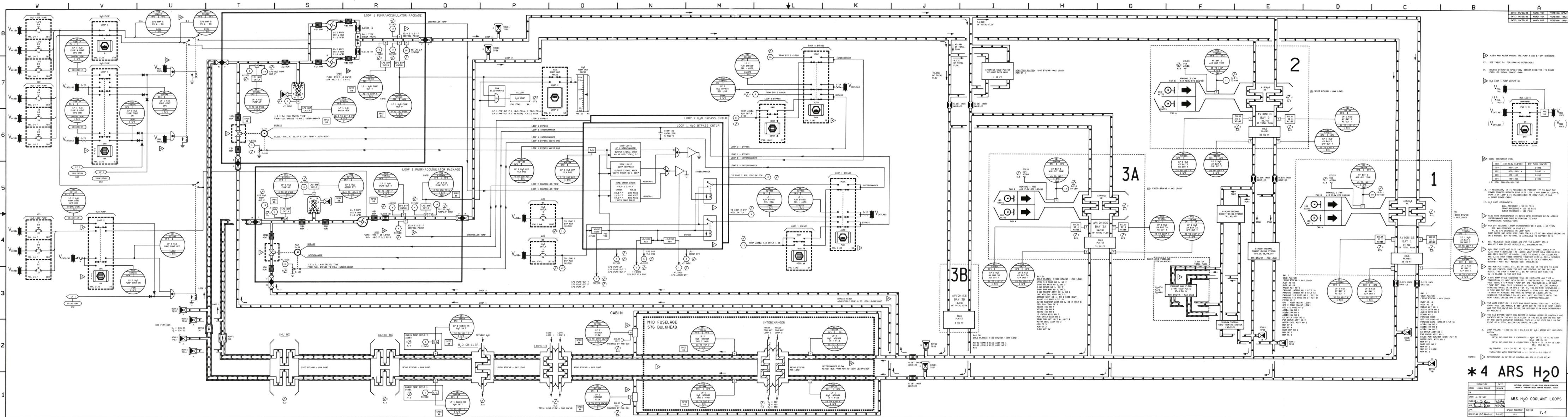
FLASH EVAPORATOR SUBSYSTEM

DATE: 12/18/92 NAME: RJA VERSION: 007.11  
DATE: 12/18/92 NAME: RJA VERSION: 007.11  
DATE: 12/18/92 NAME: RJA VERSION: 007.11

SIGNATURE: DATE: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
WORKING DRAFT - UNLESS OTHERWISE NOTED

ENGR: V. HOWARD  
APP: [Signature]  
APP: [Signature]

SPACE SHUTTLE SWG NO: 7.3  
ALL: [Signature]  
DATE: 12/18/92



DATE	REV	BY	CHKD	APP'D
06/12/78	1	WJS	WJS	WJS
06/12/78	2	WJS	WJS	WJS
06/12/78	3	WJS	WJS	WJS

- 17. ACTS AND ACTS POWERS THE PUMP & BYPASS DISCRETE
- 17. SEE TABLE 7-1 FOR DRAWING REFERENCES
- 18. UNLESS OTHERWISE SPECIFIED, SENSOR RECEIVES ITS POWER FROM THE SIGNAL COND-110W
- 19. H<sub>2</sub>O LOOP 1 PUMP #1
- 20. H<sub>2</sub>O LOOP 1 PUMP #2
- 21. H<sub>2</sub>O LOOP 2 PUMP #1
- 22. H<sub>2</sub>O LOOP 2 PUMP #2
- 23. H<sub>2</sub>O LOOP 2 PUMP #3
- 24. H<sub>2</sub>O LOOP 2 PUMP #4
- 25. H<sub>2</sub>O LOOP 2 PUMP #5
- 26. H<sub>2</sub>O LOOP 2 PUMP #6
- 27. H<sub>2</sub>O LOOP 2 PUMP #7
- 28. H<sub>2</sub>O LOOP 2 PUMP #8
- 29. H<sub>2</sub>O LOOP 2 PUMP #9
- 30. H<sub>2</sub>O LOOP 2 PUMP #10
- 31. H<sub>2</sub>O LOOP 2 PUMP #11
- 32. H<sub>2</sub>O LOOP 2 PUMP #12
- 33. H<sub>2</sub>O LOOP 2 PUMP #13
- 34. H<sub>2</sub>O LOOP 2 PUMP #14
- 35. H<sub>2</sub>O LOOP 2 PUMP #15
- 36. H<sub>2</sub>O LOOP 2 PUMP #16
- 37. H<sub>2</sub>O LOOP 2 PUMP #17
- 38. H<sub>2</sub>O LOOP 2 PUMP #18
- 39. H<sub>2</sub>O LOOP 2 PUMP #19
- 40. H<sub>2</sub>O LOOP 2 PUMP #20
- 41. H<sub>2</sub>O LOOP 2 PUMP #21
- 42. H<sub>2</sub>O LOOP 2 PUMP #22
- 43. H<sub>2</sub>O LOOP 2 PUMP #23
- 44. H<sub>2</sub>O LOOP 2 PUMP #24
- 45. H<sub>2</sub>O LOOP 2 PUMP #25
- 46. H<sub>2</sub>O LOOP 2 PUMP #26
- 47. H<sub>2</sub>O LOOP 2 PUMP #27
- 48. H<sub>2</sub>O LOOP 2 PUMP #28
- 49. H<sub>2</sub>O LOOP 2 PUMP #29
- 50. H<sub>2</sub>O LOOP 2 PUMP #30
- 51. H<sub>2</sub>O LOOP 2 PUMP #31
- 52. H<sub>2</sub>O LOOP 2 PUMP #32
- 53. H<sub>2</sub>O LOOP 2 PUMP #33
- 54. H<sub>2</sub>O LOOP 2 PUMP #34
- 55. H<sub>2</sub>O LOOP 2 PUMP #35
- 56. H<sub>2</sub>O LOOP 2 PUMP #36
- 57. H<sub>2</sub>O LOOP 2 PUMP #37
- 58. H<sub>2</sub>O LOOP 2 PUMP #38
- 59. H<sub>2</sub>O LOOP 2 PUMP #39
- 60. H<sub>2</sub>O LOOP 2 PUMP #40
- 61. H<sub>2</sub>O LOOP 2 PUMP #41
- 62. H<sub>2</sub>O LOOP 2 PUMP #42
- 63. H<sub>2</sub>O LOOP 2 PUMP #43
- 64. H<sub>2</sub>O LOOP 2 PUMP #44
- 65. H<sub>2</sub>O LOOP 2 PUMP #45
- 66. H<sub>2</sub>O LOOP 2 PUMP #46
- 67. H<sub>2</sub>O LOOP 2 PUMP #47
- 68. H<sub>2</sub>O LOOP 2 PUMP #48
- 69. H<sub>2</sub>O LOOP 2 PUMP #49
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- 82. H<sub>2</sub>O LOOP 2 PUMP #62
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- 99. H<sub>2</sub>O LOOP 2 PUMP #79
- 100. H<sub>2</sub>O LOOP 2 PUMP #80
- 101. H<sub>2</sub>O LOOP 2 PUMP #81
- 102. H<sub>2</sub>O LOOP 2 PUMP #82
- 103. H<sub>2</sub>O LOOP 2 PUMP #83
- 104. H<sub>2</sub>O LOOP 2 PUMP #84
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- 106. H<sub>2</sub>O LOOP 2 PUMP #86
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- 108. H<sub>2</sub>O LOOP 2 PUMP #88
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- 110. H<sub>2</sub>O LOOP 2 PUMP #90
- 111. H<sub>2</sub>O LOOP 2 PUMP #91
- 112. H<sub>2</sub>O LOOP 2 PUMP #92
- 113. H<sub>2</sub>O LOOP 2 PUMP #93
- 114. H<sub>2</sub>O LOOP 2 PUMP #94
- 115. H<sub>2</sub>O LOOP 2 PUMP #95
- 116. H<sub>2</sub>O LOOP 2 PUMP #96
- 117. H<sub>2</sub>O LOOP 2 PUMP #97
- 118. H<sub>2</sub>O LOOP 2 PUMP #98
- 119. H<sub>2</sub>O LOOP 2 PUMP #99
- 120. H<sub>2</sub>O LOOP 2 PUMP #100

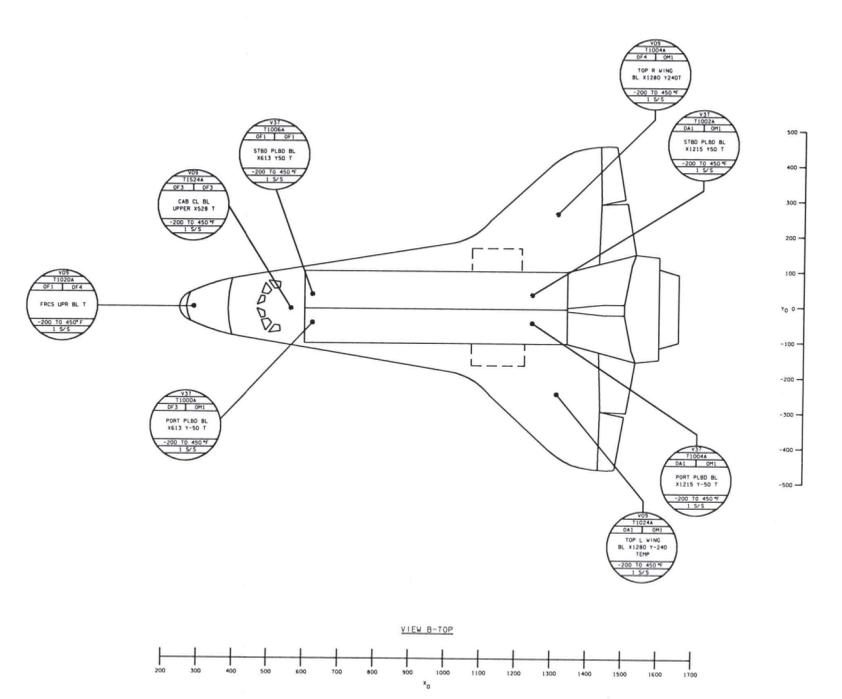
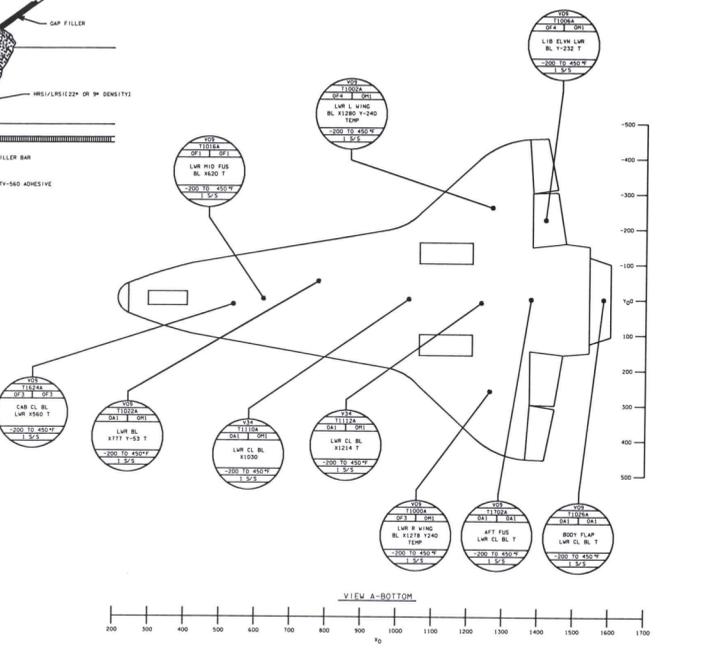
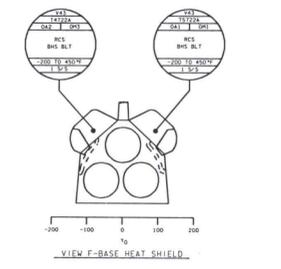
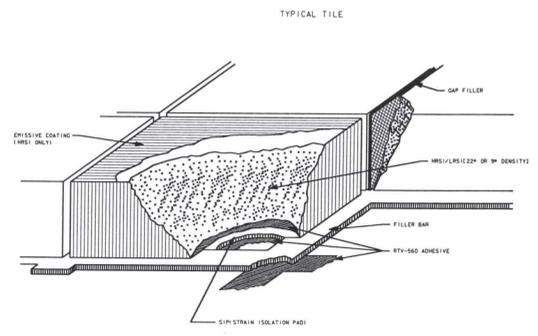
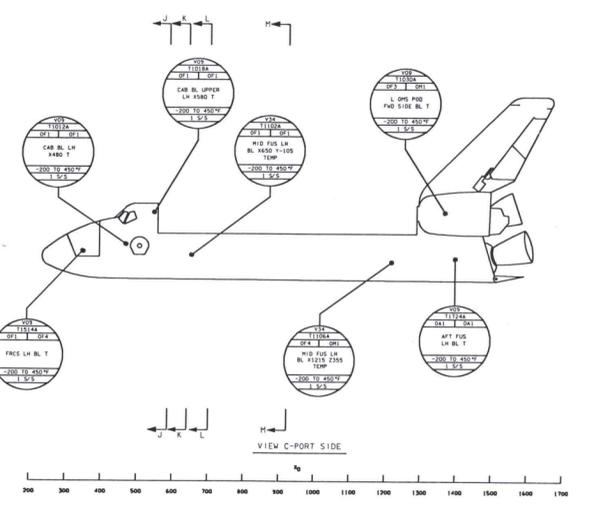
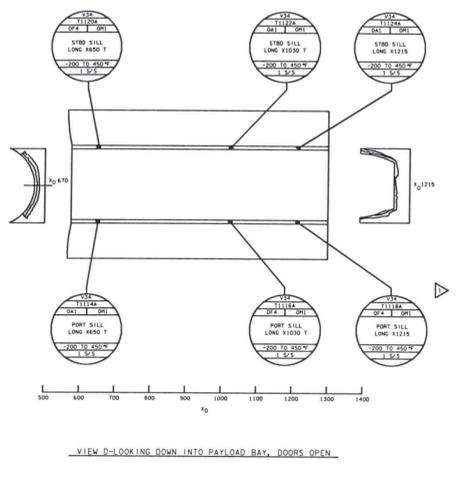
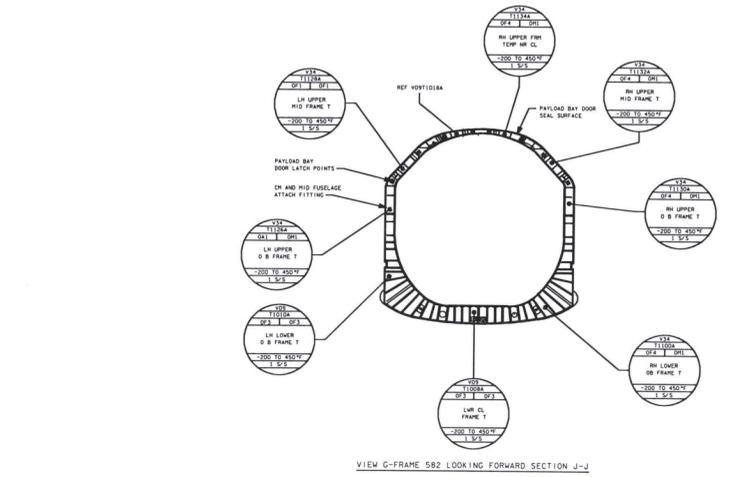
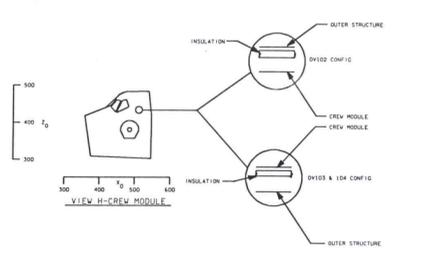
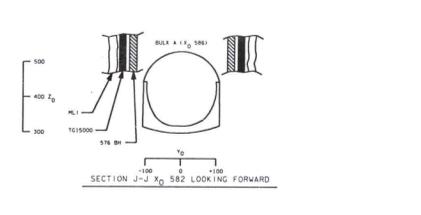
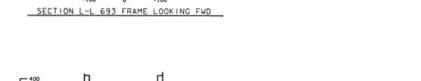
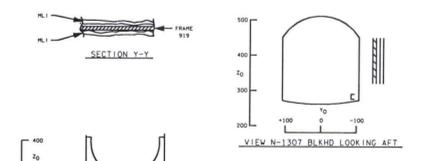
## \* 4 ARS H<sub>2</sub>O

DATE	REV	BY	CHKD	APP'D
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06/12/78	2	WJS	WJS	WJS
06/12/78	3	WJS	WJS	WJS





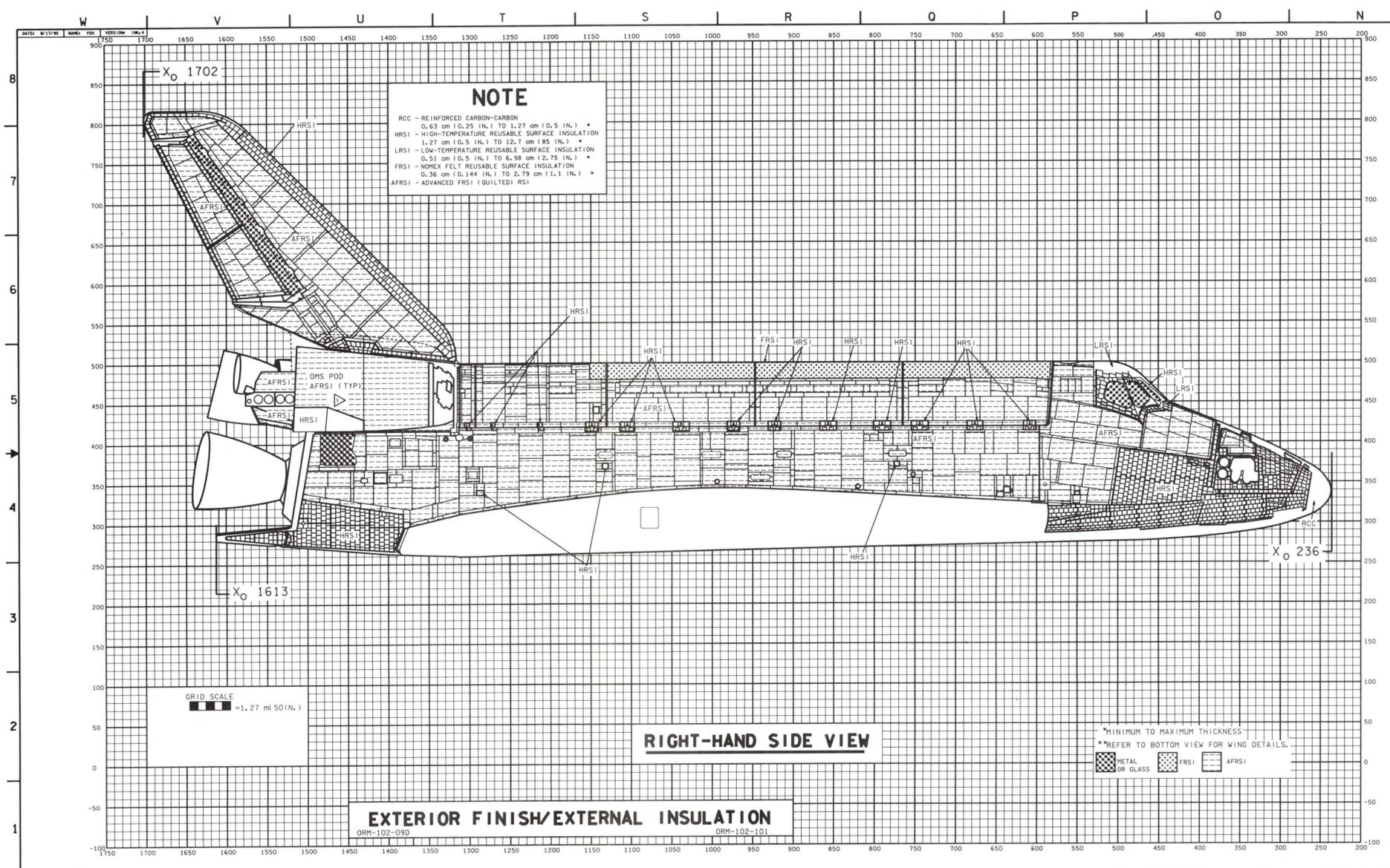
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DATE: 12/20/94	NAME: SEV	VERSION: 100.2



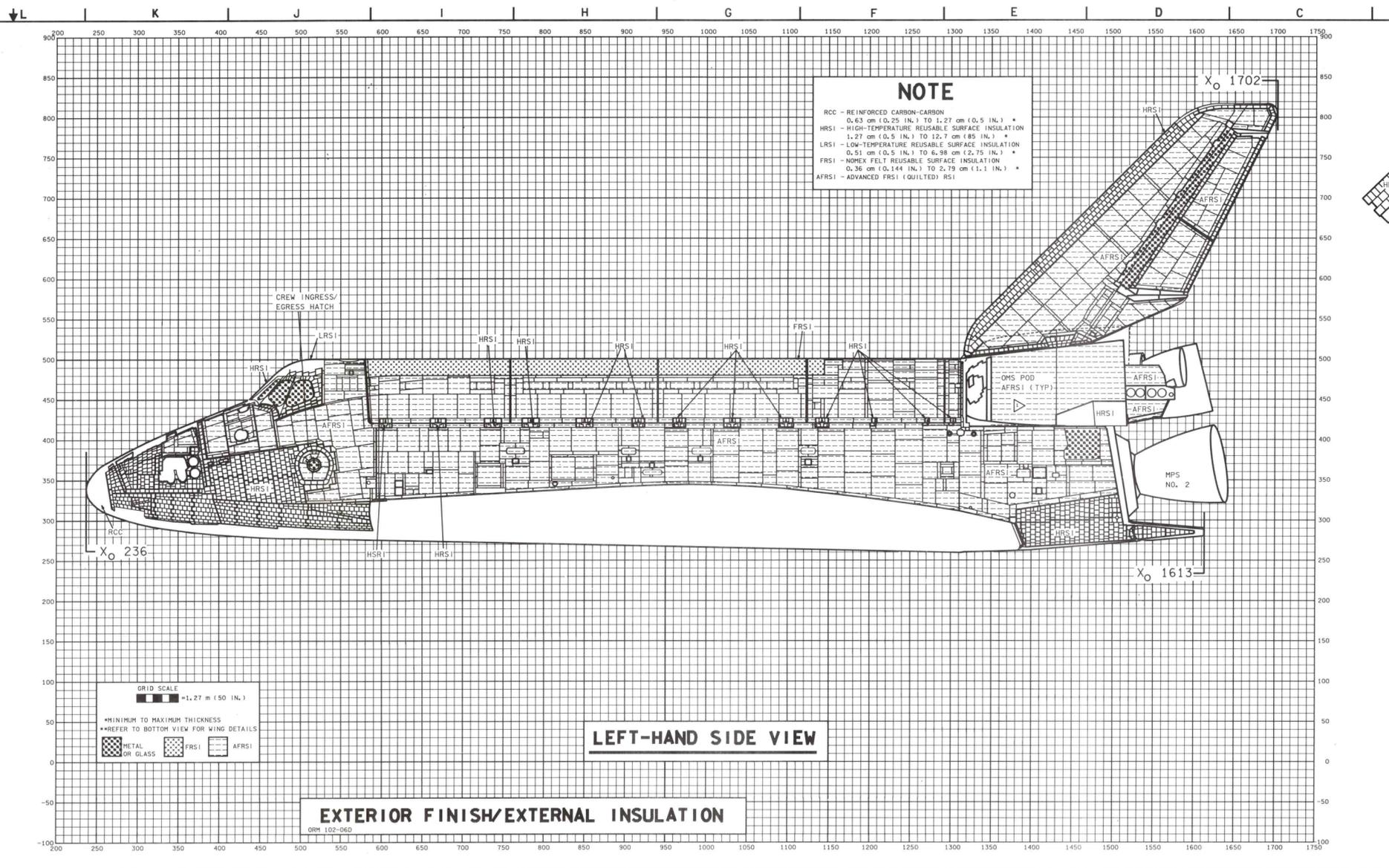
2: FOR VELOCOR REFERENCES SEE TABLE 7-1  
NOTES: NOT ACTIVE ON DVID2

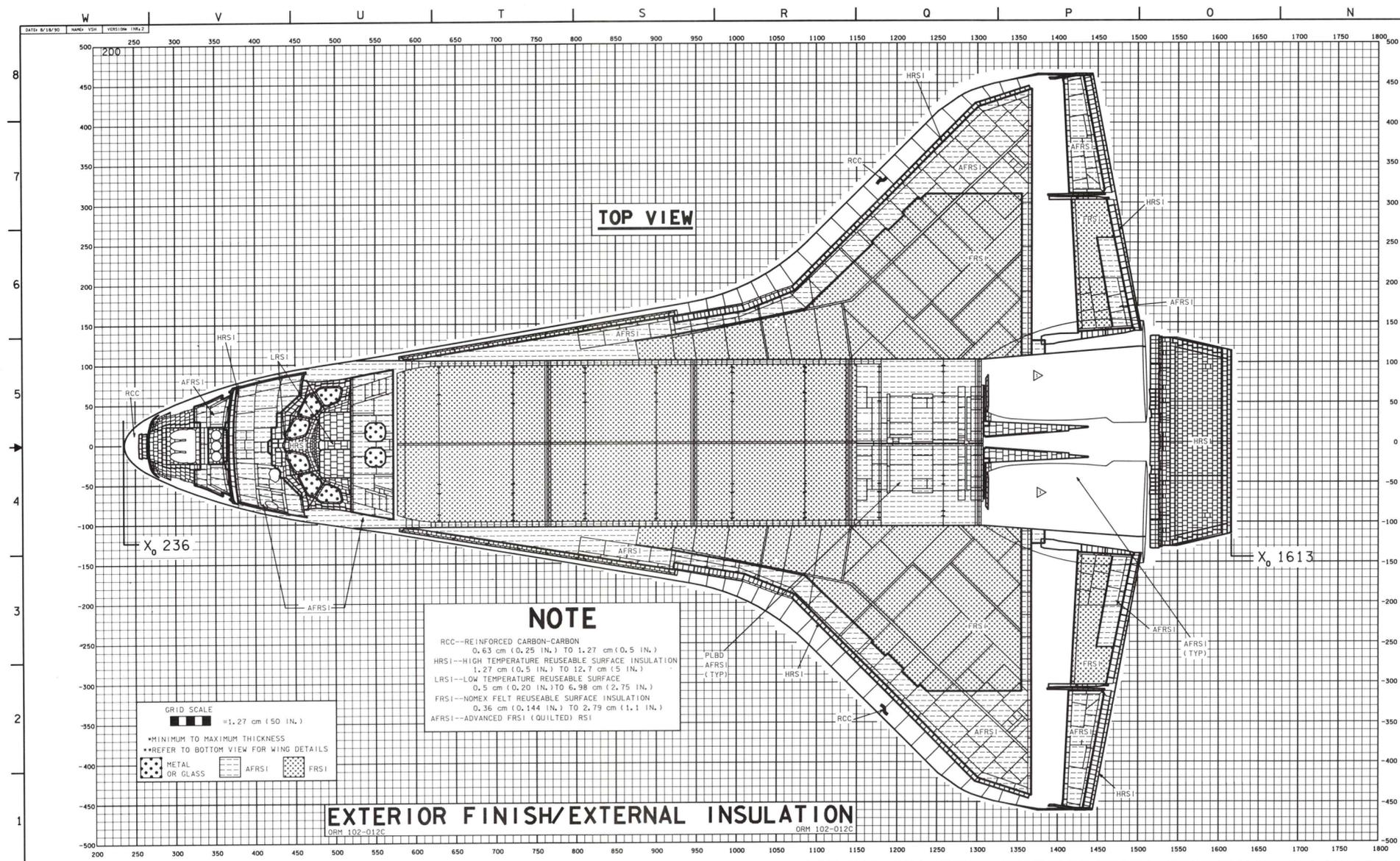
# 7 TPS INST

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DR: JAMES BLANCHARD	04-93	TPS/STRUCTURE INSTRUMENTATION
ENGR: L.V. HOWARD	1-8-79	SPACE SHUTTLE
APP: [Signature]	11/1/85	DWG NO: 7.7
CHKD: [Signature]	1/20/86	ALL
TR: E	DCN: 5	128.5 X 34



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 0.98 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) RS!

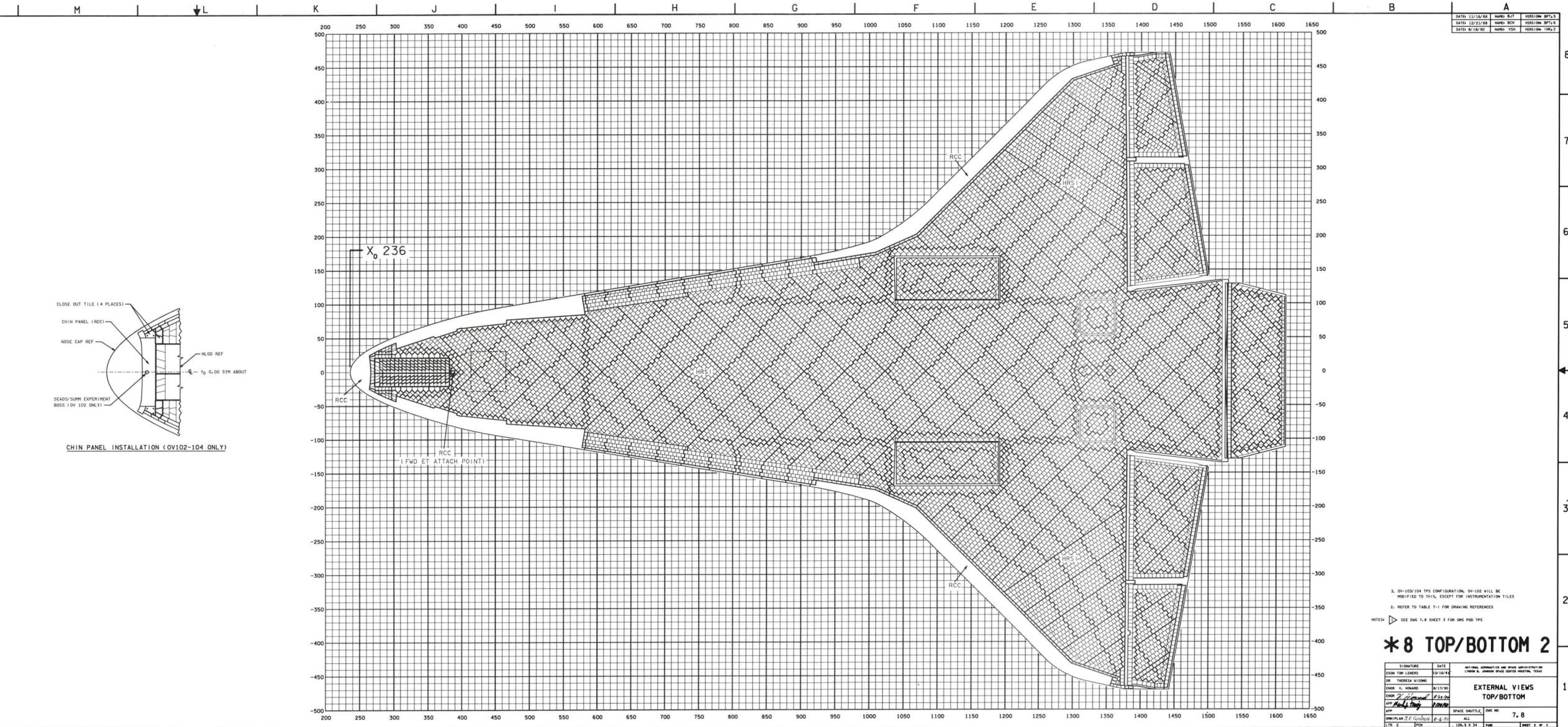
**GRID SCALE**  
 1.27 cm (0.5 IN.)

\*MINIMUM TO MAXIMUM THICKNESS  
 \*\*REFER TO BOTTOM VIEW FOR WING DETAILS

METAL OR GLASS    AFRSI    FRSI

**EXTERNAL FINISH/EXTERNAL INSULATION**

ORM 102-012C



**\*8 TOP/BOTTOM 2**

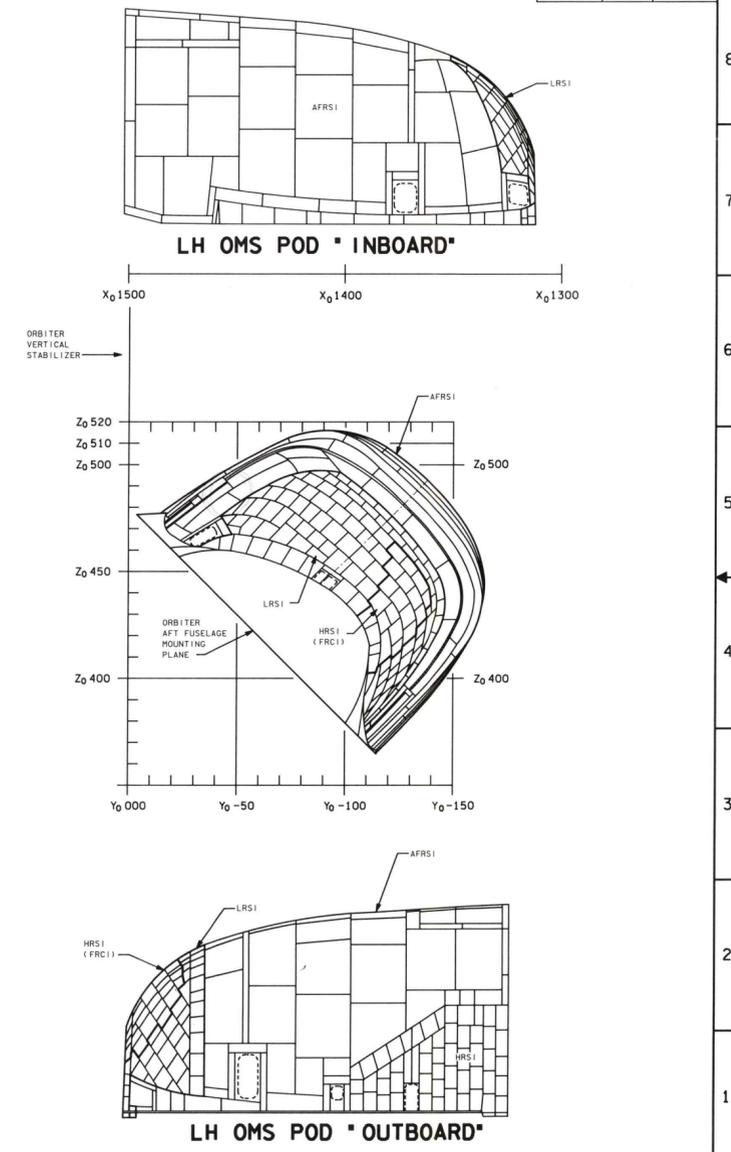
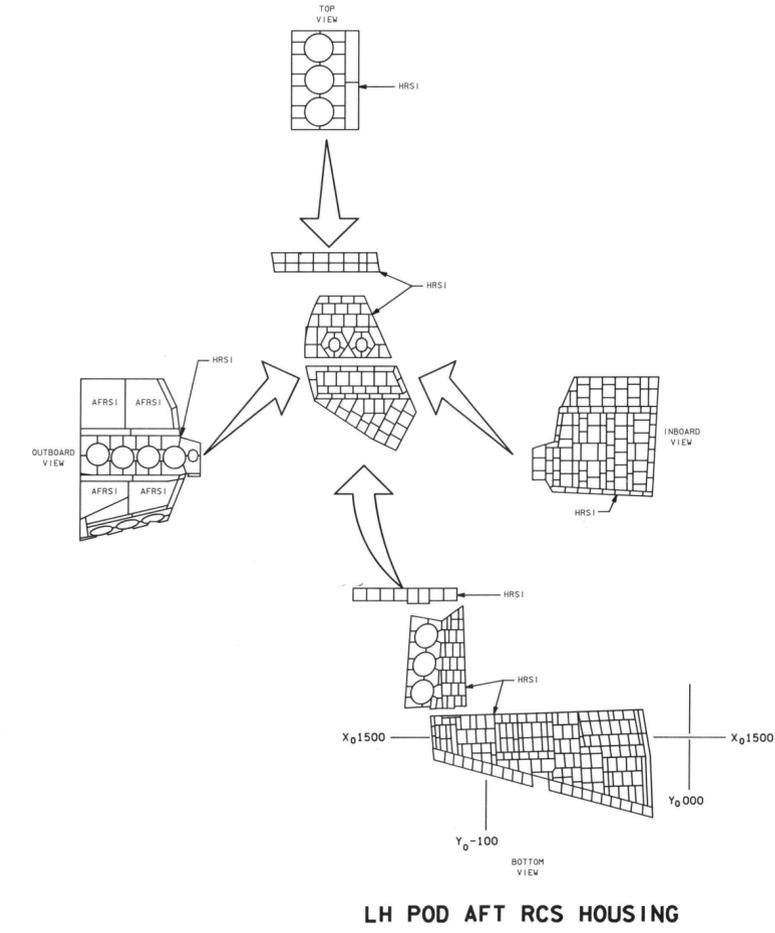
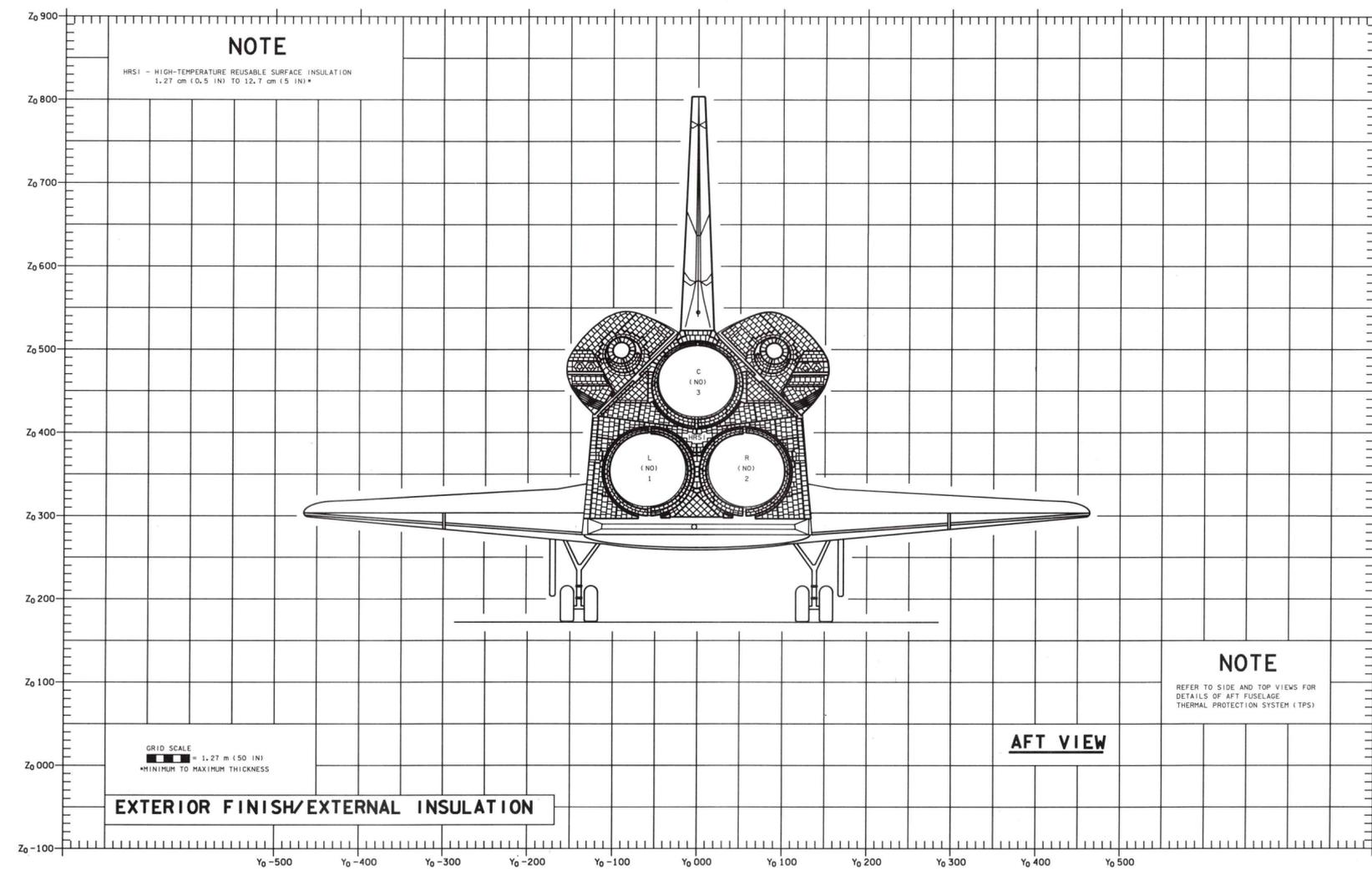
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DATE: 12/21/98	NAME: BJT	VERSION: 0PT.1
DATE: 8/18/99	NAME: YSH	VERSION: 0PT.2

SIGNATURE	DATE	NATIONAL LABORATORY AND SPACE ADMINISTRATION
DRSR TOP LENSES	10/14/98	ORION & JEM/ISS SPACE EDITS (INITIAL YEAR)
DR THUNDER SYSTEM		
DRS V. HANARD	8/17/99	
DRS P. HANARD	8/17/99	
DRS M. HANARD	8/17/99	
DRS S. HANARD	8/17/99	
DRS T. HANARD	8/17/99	
DRS U. HANARD	8/17/99	
DRS V. HANARD	8/17/99	
DRS W. HANARD	8/17/99	
DRS X. HANARD	8/17/99	
DRS Y. HANARD	8/17/99	
DRS Z. HANARD	8/17/99	

DATE	BY	NAME	VERSION
08/26/97	THW	THW	001.1
08/26/97	THW	THW	001.2
08/26/97	THW	THW	001.3

DATE	BY	NAME	VERSION
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08/26/97	THW	THW	001.2
08/26/97	THW	THW	001.3



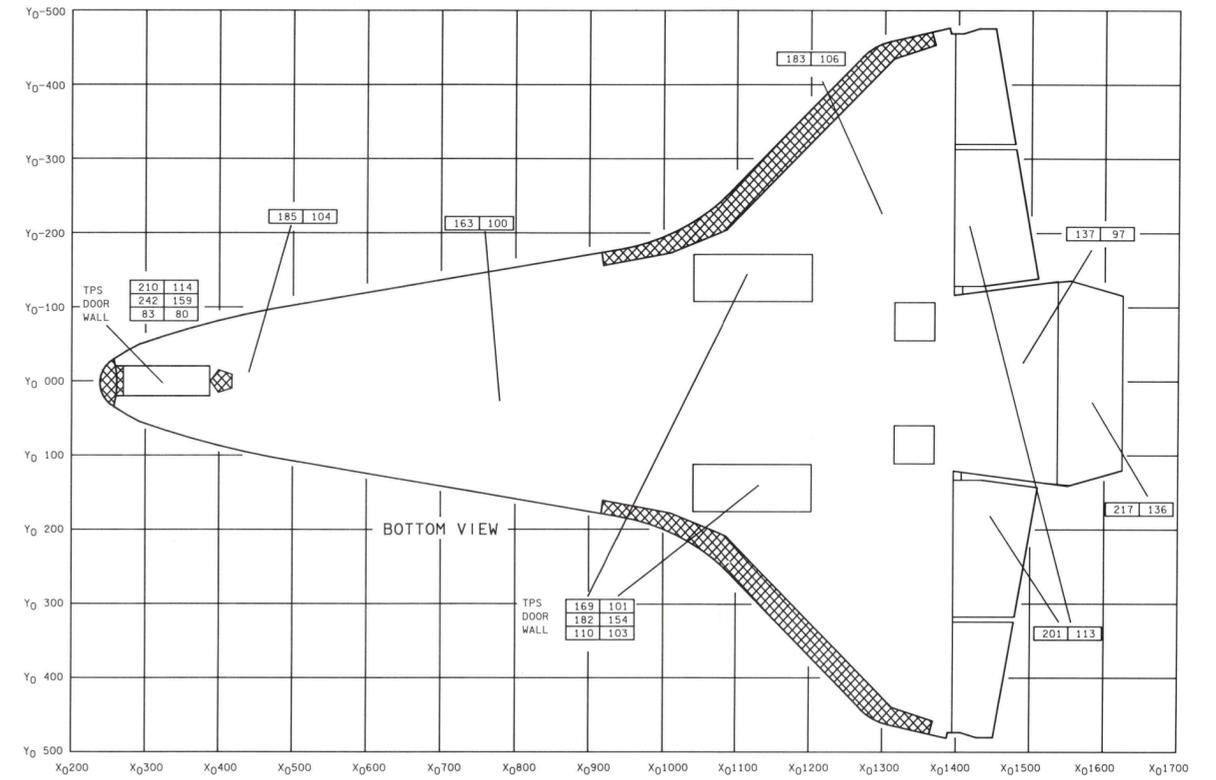
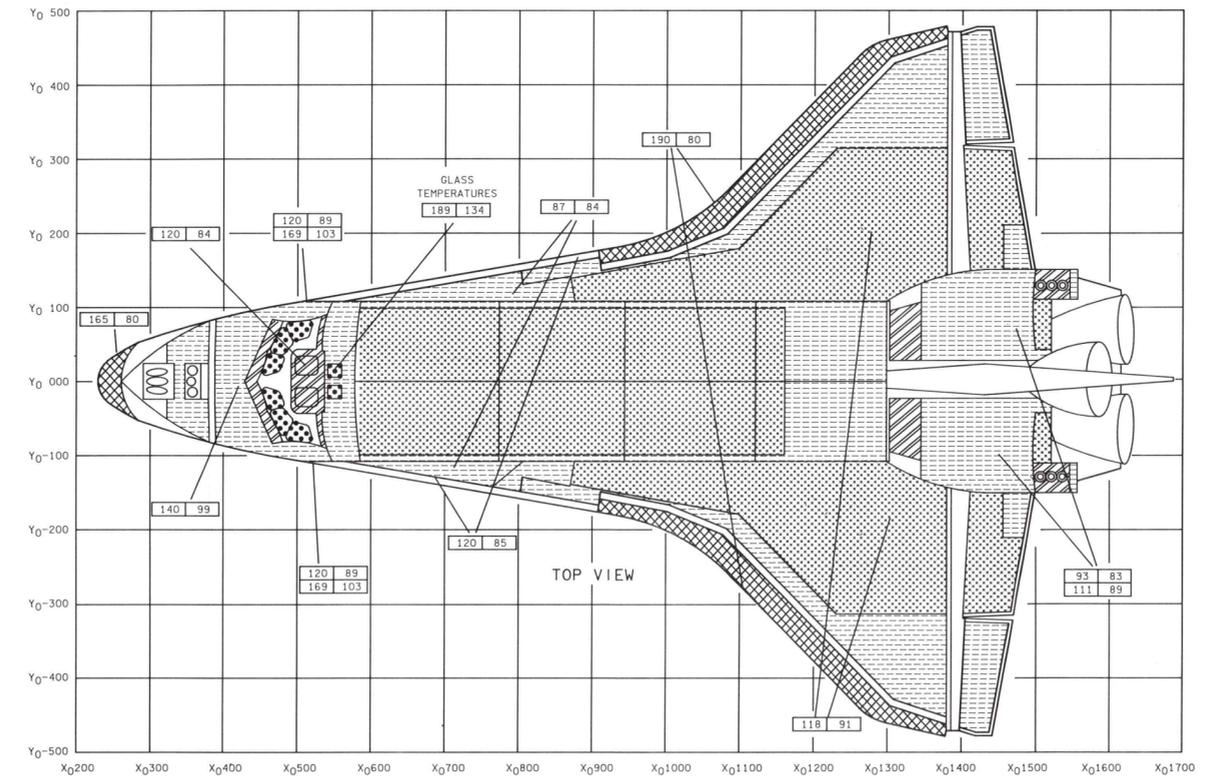
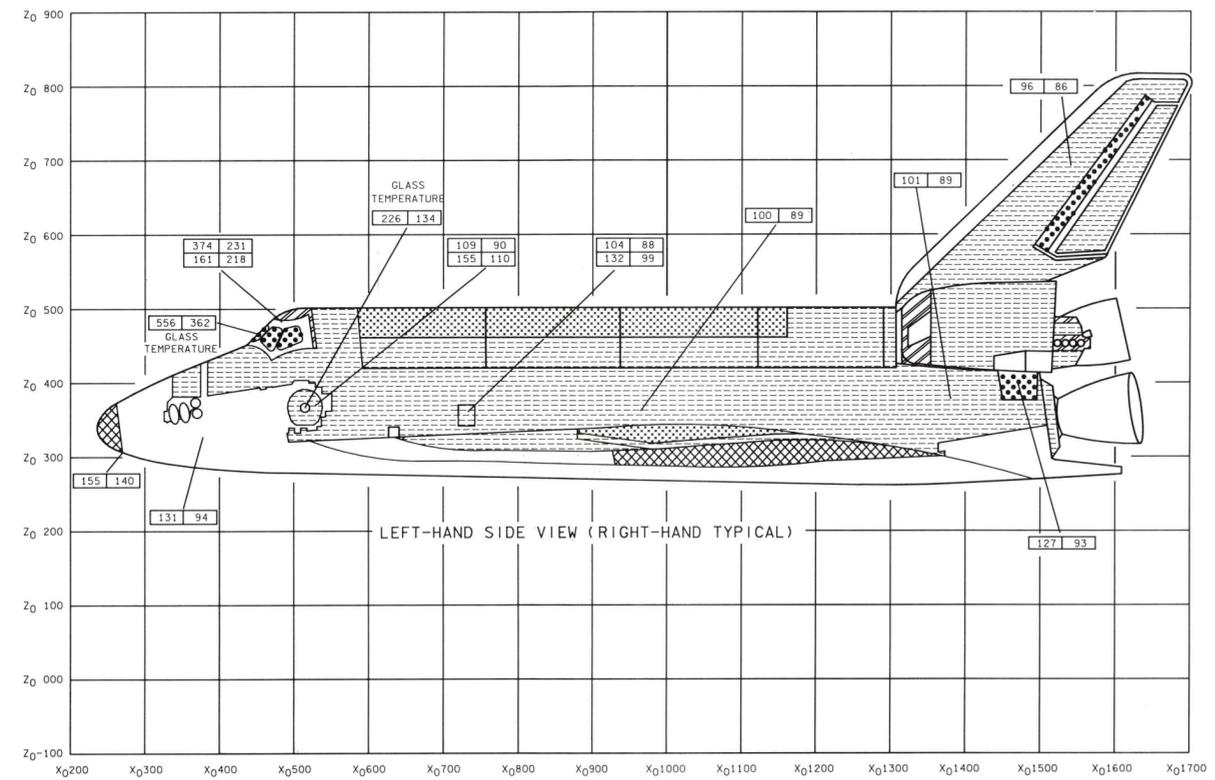
\* 8 EX P/TILE 3

EXTERNAL PENETRATIONS/TILE (AFT)		SIGNATURE		DATE	
DRAWN BY: <i>Theresa M. Wilson</i>		DRAWN BY: <i>Theresa M. Wilson</i>		DATE: 08/26/97	
CHECKED BY: <i>Mark Stoney</i>		CHECKED BY: <i>Mark Stoney</i>		DATE: 08/26/97	
DATE: 08/26/97		DATE: 08/26/97		DATE: 08/26/97	

BASIC REV E

BASIC REV E

	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)



4. REC ORN PANEL ON OVID/104 ONLY. OVID HAS HRSI TILE  
 5. 0.5" OVID TPS CONFIGURATION. 0.5" IS TO BE MODIFIED TO THIS CONFIGURATION EXCEPT FOR INSTRUMENTATION TILES  
 6. REFER TO TABLE 7-1 FOR DRAWING REFERENCES  
 7. REFER TO SECTION 11 FOR GENERAL DETAILS AND SPECIFIC THICKNESS DATA RELATED TO PRESELECTED PENETRATION AND OUT-IN AREAS  
 8. POST-TRANSITION TEMPERATURES OF THE ORBITER ARE INDICATED BY THE FOLLOWING NUMBER

COMPONENT	TEMPERATURE
MEASURES	14 103 120 103
STRUCTURE	

NOTE: 1. SINGLE-LEVEL BOXES INDICATE TPS TEMPERATURE ONLY.  
 CAUTION: IF ESCAPE PANEL RESCUE IS REQUIRED, THERMAL BLANKETS SHOULD BE USED TO PREVENT INJURY TO RESCUE PERSONNEL.

**8 EX PST TEMP 4**

SIGNATURE	DATE	REVISION
OSCAR THREMSA V1508	10/10/84	
DR		
DRG: R. TURNER	04/17/84	
CHKD: J. J. JONES	5/22/84	
APP: <i>[Signature]</i>	8/20/84	
ORBITER PLAN 8 EX PST TEMP 4	0-0-0	
REV: 4	125.3.24	

EXTERNAL POST TEMPERATURES  
 SPACE SHUTTLE ORBITER  
 7.8  
 SHEET 4 OF 4

# 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		B	7/27/90	ACTIVE THERMAL CONTROL SYSTEM - FLUID SCHEMATIC DIAGRAM
		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
7.2	AMMONIA BOILER SYSTEM	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		B	7/27/90	ACTIVE THERMAL CONTROL SYSTEM - FLUID SCHEMATIC DIAGRAM
		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
			VO70-755192		C	11/18/81	INSTRUMENTATION INSTALLATION - ECLSS OPERATIONAL
			VS70-630102		T	12/5/84	SCHEMATIC DIAGRAM ACTIVE THERMAL CONTROL
			VO70-754109		B	2/9/89	INSTRUMENTATION INSTL - OFI MID FUSELAGE
			VS70-634102		A	7/31/79	SCHEMATIC ACTIVE THERMAL CONTROL SUBSYSTEM
			VO70-754102		F	4/15/87	INSTRUMENTATION INSTL - OFI MID FUSELAGE
7.4	ARS H <sub>2</sub> O	R.I.	V070-613896	1-7	E	10/24/85	WATER COOLANT SYSTEM INSTALLATION. ARS, FLIGHT DECK AND DF. 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 EQUIPT 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

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		
7.1	ENGR M. LANGLEY			ENGR		<b>VENDOR DRAWING REFERENCES</b>		
	ENGR <i>Mary A Langley</i>	11/12/91		ENGR				
7.2	ENGR M. LANGLEY			ENGR				
	ENGR <i>Mary A Langley</i>	11/12/91		ENGR				
7.3	ENGR V. HOWARD			APP <i>Mary A Langley</i>	11-15-91	SPACE SHUTTLE TBL NO <b>7-1</b>		
	ENGR <i>V. Howard</i>	11/6/91		APP				
7.4	ENGR J. SPIVEY			OMNIPLAN		ALL PAGE 7-1-1 SHEET 1 OF 4		
	ENGR <i>J. Spivey</i>	11/12/91		LTR E	PCN 1			

**BASIC REV E-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
7.4 (CONC'D)	ARS H <sub>2</sub> O	R. I.	V570-960099		A12	1/24/84	INTEGRATED SYSTEM SCHEMATIC ORBITER OV-099, -103, AND -104 ENVIRONMENTAL CONTROL AND LIFE SUPPORT SUBSYSTEM
		R. I.	V570-960099	12(60CA)	A12	12/28/84	ARS CABIN AIR CIRCULATION AND TEMPERATURE CONTROLLER 1
		R. I.	V570-960099	13(60CB)	A08	5/22/84	ARS CABIN AIR CIRCULATION AND TEMPERATURE CONTROLLER 2
		R. I.	V570-960099	15(60CD)	A08	5/23/84	ARS WATER COOLANT LOOP 1 FLUIDS/CONTROL
		R. I.	V570-960099	16(60CE)	A12	1/15/82	ARS WATER COOLANT LOOP 1 CONTROL
		R. I.	V570-960099	17(60CF)	A07	1/19/84	ARS WATER COOLANT LOOP 2 FLUIDS/CONTROL
		R. I.	V570-960099	18(60CG)	A12	12/28/88	ARS WATER COOLANT LOOP 2 CONTROL
		R. I.	V570-960099	23(60CM)	A08	5/25/84	ARS CABIN AIR CIRCULATION INSTRUMENTATION
		R. I.	V570-960099	24(60CN)	A05	6/02/83	ARS WATER COOLANT LOOP 1 INSTRUMENTATION, PART I
		R. I.	V570-960099	25(60CP)	A07	1/19/84	ARS WATER COOLANT LOOP 2 INSTRUMENTATION, PART I
		R. I.	V570-960099	26(60CS)	A05	6/03/83	ARS WATER COOLANT LOOP 1 INSTRUMENTATION, PART II
		R. I.	V570-960099	27(60CT)	NC	4/17/80	ARS WATER COOLANT LOOP 2 INSTRUMENTATION, PART II
		R. I.	V570-610109	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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		
7.4	ENGR J. SPIVEY			ENGR		<b>VENDOR DRAWING REFERENCES</b>		
(CONC'D)	ENGR <i>J. L. Spivey</i>	10/1/90		ENGR				
7.5	ENGR J. L. SPIVEY			ENGR				
	ENGR <i>J. L. Spivey</i>	10/1/90		ENGR				
	ENGR			APP <i>Mark J. Young</i>	10/23/90	SPACE SHUTTLE	TBL NO	7-1
	ENGR			APP		ALL		
	ENGR			OMNIPLAN				
	ENGR			LTR E	PCN	PAGE	7.1-2	SHEET 2 OF 4

**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	V070-586096			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	NASA	JSC-18366			1/92
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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
7.6	ENGR L. RICHE			ENGR			
	ENGR <i>L. Riche</i>	4/10/95		ENGR			
7.7	ENGR V. HOWARD			ENGR			
	ENGR <i>V. Howard</i>	7/10/85		ENGR			
	ENGR			APP		SPACE SHUTTLE TBL NO ALL 7-1	
	ENGR			APP			
	ENGR			OMNIPLAN			
	ENGR			LTR E	PCN 5	PAGE 713	SHEET 3 OF 4

BASIC REV E-5

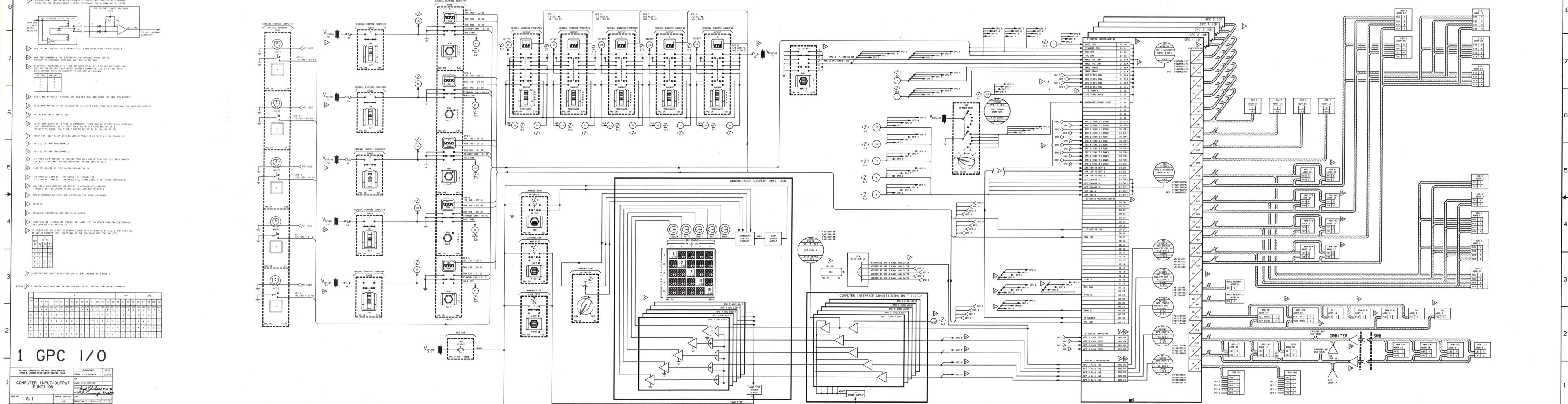
# FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
7.8-1-4	ENGR V. HOWARD			ENGR		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>V. Howard</i>	11/16/85		ENGR			
	ENGR			ENGR			
	ENGR			ENGR			
	ENGR			APP			
	ENGR			APP		SPACE SHUTTLE	TBL NO 7-1
	ENGR			OMNIPLAN		ALL	
	ENGR			LTR E	PCN 5	PAGE 7-1-4	SHEET 4 OF 4

**BASIC REV E-5**





1 GPC I/O

1.1 GPC I/O

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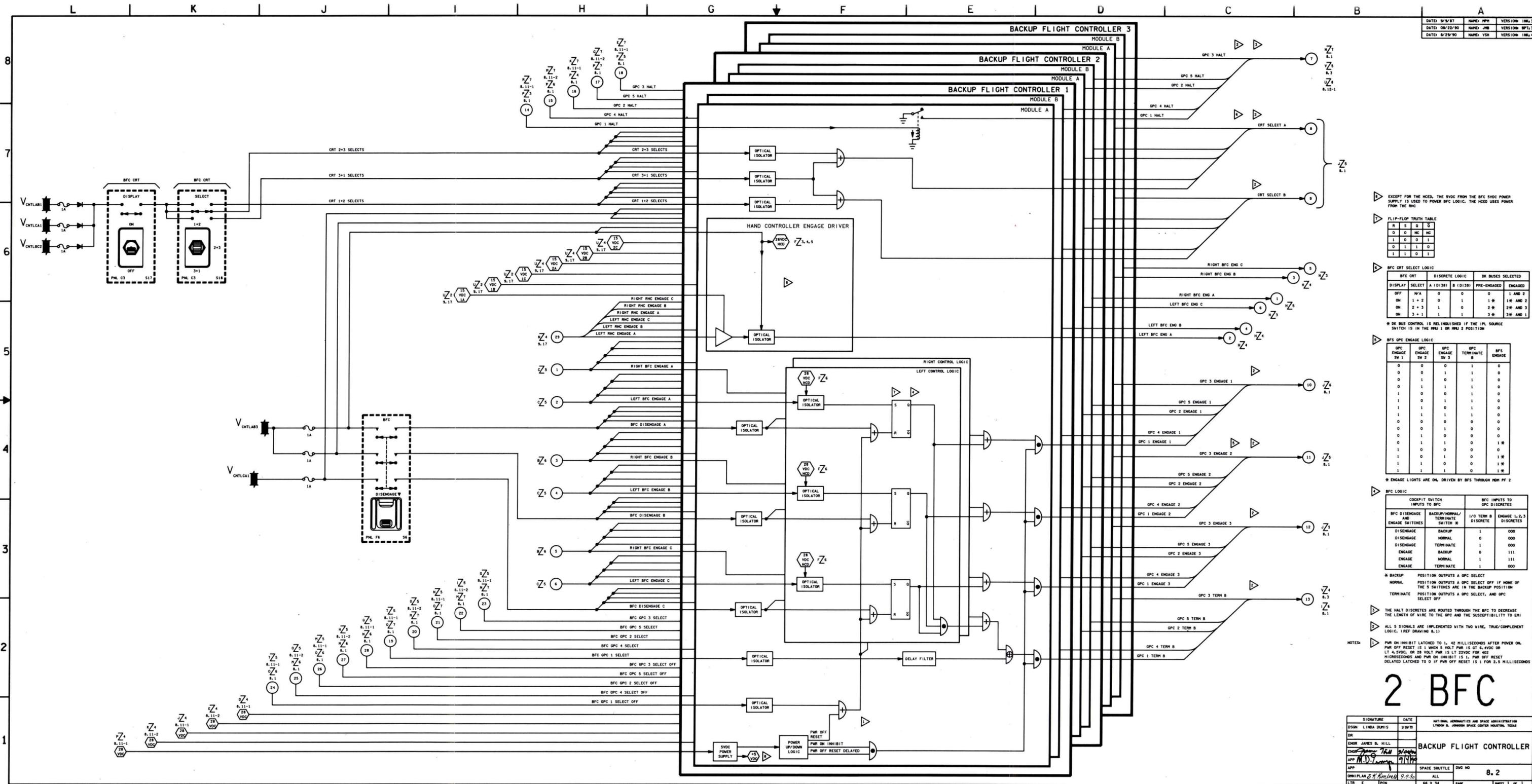
1.96 GPC I/O

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1.99 GPC I/O

1.100 GPC I/O



DATE: 8/5/87	NAME: JPH	VERSION: IMU.3
DATE: 08/22/90	NAME: JMB	VERSION: IMU.3
DATE: 8/28/90	NAME: VSH	VERSION: IMU.4

EXCEPT FOR THE HCD, THE SVDC FROM THE BFC SVDC POWER SUPPLY IS USED TO POWER BFC LOGIC. THE HCD USES POWER FROM THE RIC.

FLIP-FLOP TRUTH TABLE

R	S	Q	Q'
0	0	MC	MC
0	1	0	1
1	0	1	0
1	1	0	0

BFC CRT SELECT LOGIC

DISPLAY	SELECT	A (0138)	B (0139)	PRE-ENGAGED	ENGAGED
OFF	N/A	0	0	0	1 AND 2
ON	2+3	1	0	2-8	2-8 AND 2
ON	3+1	1	1	3-8	3-8 AND 1

\* DK BUS CONTROL IS RELINQUISHED IF THE IPL SOURCE SWITCH IS IN THE PMU 1 OR PMU 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	0
1	0	0	0	1*
1	0	1	0	1*
1	1	0	0	1*
1	1	1	0	1*

\* ENGAGE LIGHTS ARE ON, DRIVEN BY BFS THROUGH PMU PF 2

BFC LOGIC

COCKPIT SWITCH AND ENGAGE SWITCHES	BACKUP/NORMAL/TERMINATE SWITCH #	BFC INPUTS TO GPC 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 OFF IF NONE OF THE 5 SWITCHES ARE IN THE BACKUP POSITION  
 \* NORMAL POSITION OUTPUTS A GPC SELECT OFF IF NONE OF THE 5 SWITCHES ARE IN THE NORMAL 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

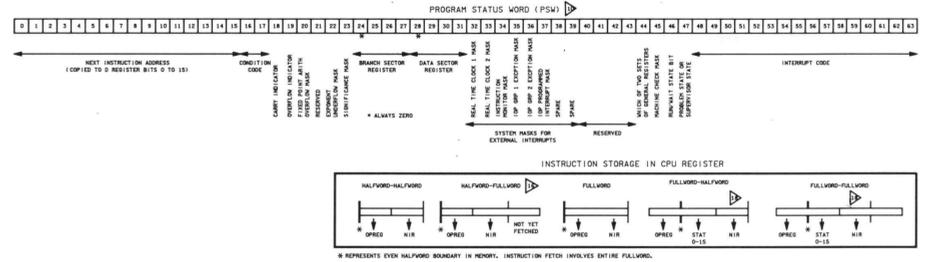
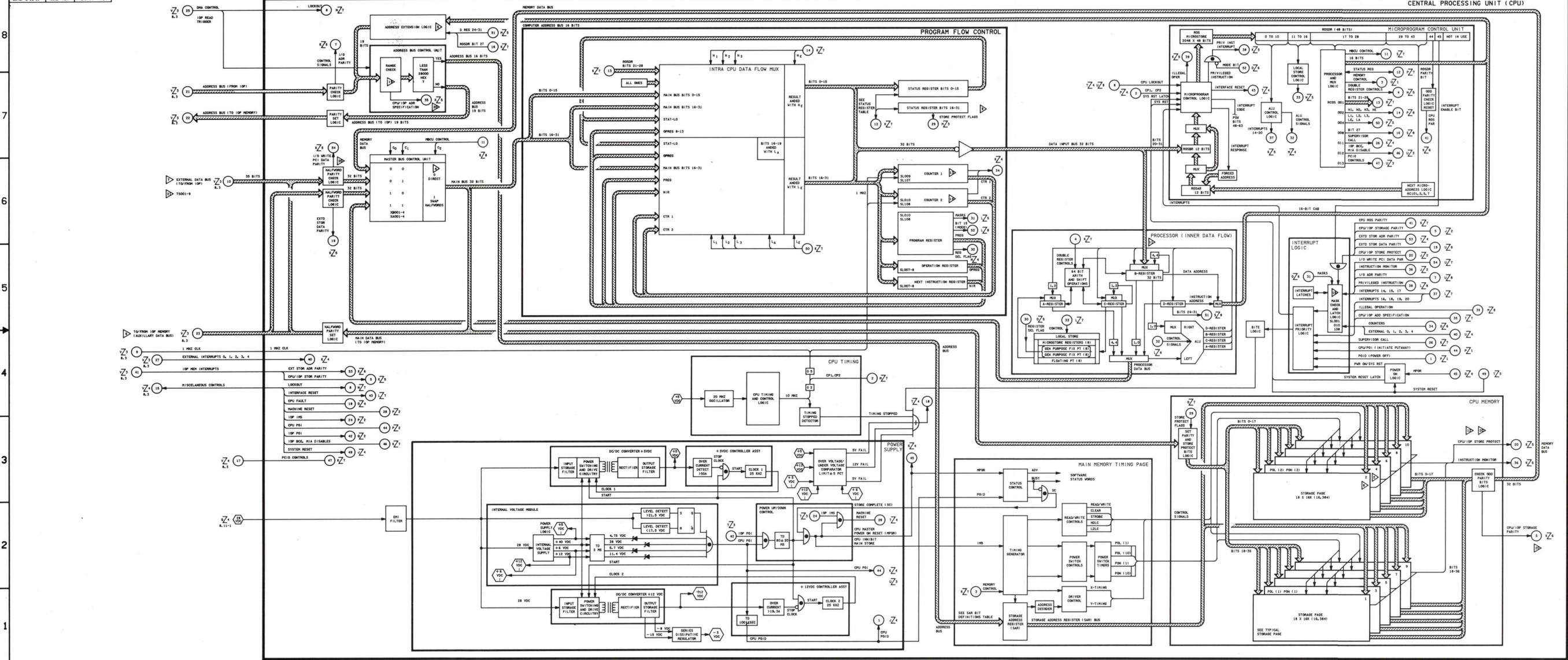
ALL 5 SIGNALS ARE IMPLEMENTED WITH TWO WIRE, TRUE/COMPLEMENT LOGIC (REF DRAWING 8-11)

PMU ON INHIBIT LATCHED TO 1, 42 MILLISECONDS AFTER POWER ON. PMU OFF RESET IS 1 WHEN 5 VOLT PMU IS 0T 6-VDC OR LT 4.5VDC OR 28 VOLT PMU IS LT 22VDC FOR 402 MICROSECONDS AND PMU ON INHIBIT IS 1. PMU OFF RESET DELAYED LATCHED TO 0 IF PMU OFF RESET IS 1 FOR 2.5 MILLISECONDS

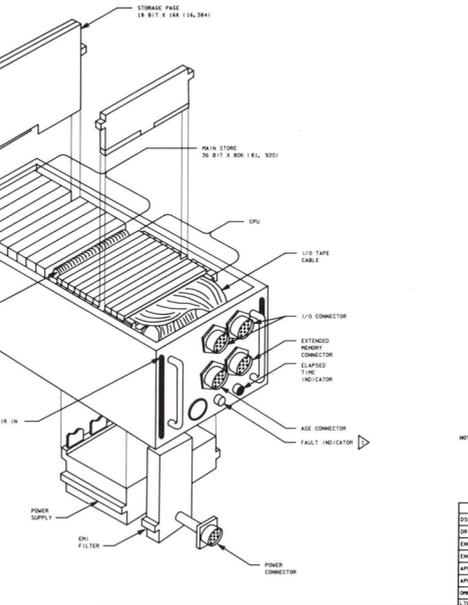
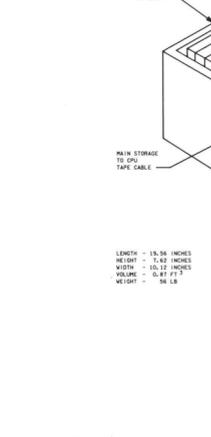
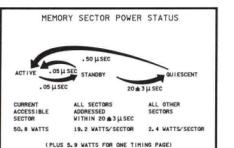
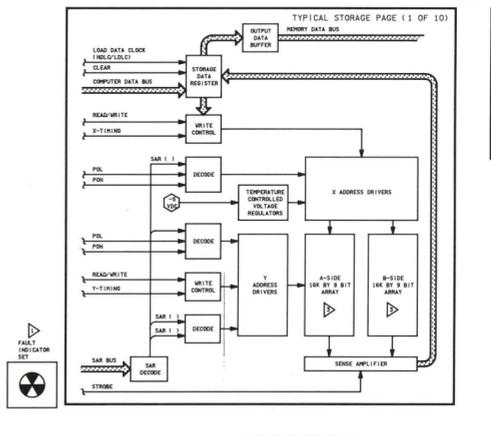
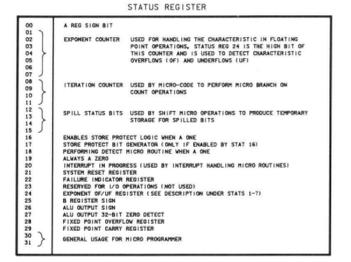
2 BFC

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DR	LINDA DUMIS 1/18/78	LINDA B. JOHNSON SPACE CENTER HOUSTON, TEXAS
ENGR JAMES B. HILL		BACKUP FLIGHT CONTROLLER
APP M.D. [Signature]	9/14/80	
APP	SPACE SHUTTLE	DWG NO 8.2
ORIGIN PLAN 8.1 Rev 10/80	ALL	
LTR E	PCN	PAGE 66 X 34 SHEET 1 OF 1





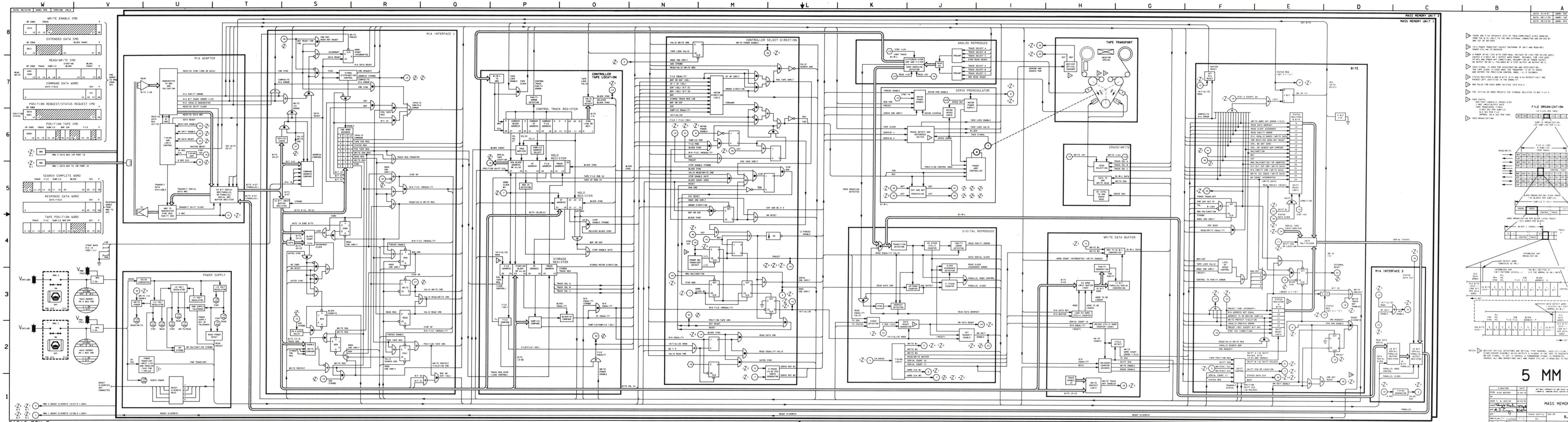
CPU INTERRUPTS table with columns for hardware priority, interrupt name, type, current mask bit, position of mask bit, interrupt code (hex), recovery code (hex), when accepted, software mask, and time. It lists various interrupts like Power On Reset, CPU Storage Data Parity, and Supervisor/Programmer interrupts.



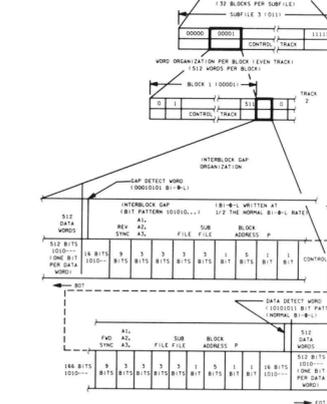
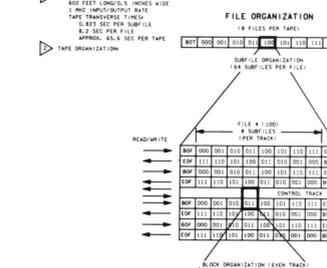
THIS BLOCK DIAGRAM IS ISSUED TO THE PRODUCTION AID'S VIA THE CODES 1-42 (PAGE MARKS) THAT APPEAR THROUGHOUT THE DIAGRAM. THE INTERRUPT HANDLING PROGRAMS WILL DIFFERENTIATE BETWEEN INTERRUPTS SET OFF BY CPU OR ON CPU OPERATIONS. ADDRESS MUST BE LESS THAN OR EQUAL TO 3FFF HEX. AS IMPLEMENTED IN CURRENT FLIGHT SOFTWARE, THIS PARTITION IS ALWAYS ON-SP. CPU WILL OPERATE DOWN TO 0 HZ AND/OR ONE OR TWO FAILURE-LESS OF GAIN PRESSURE ON BOTH PAGES WILL IMPROVISE/IMPACTATE OPERATING CPU AFTER TRIP EVENTS. CPU WILL 'TRIP' NET TWO HALFWORDS (INSTRUCT) ON THE 'LOOK AHEAD' FEATURE! THIS SAYING NO HANDS-ON. AS IMPLEMENTED IN CURRENT FLIGHT SOFTWARE DESIGN, ALL 'HANDS-ON' AND 'TRIP' INTERRUPTS ARE BITES MARKED AND ALIQUIS RESULT IN SOFTWARE HALT RESPONSE. COUNTER 2 IS LOWER 16 BITS OF PROGRAM COUNTER, WHICH IS 16 BITS ADDRESS TO CPU MEMORY HALFWORD. COUNTER 1 IS LOWER 16 BITS OF PROGRAM COUNTER OF THE 'NEXT' 16 BITS ARE STORED IN CPU MEMORY HALFWORD. COUNTER 1 IS LOWER 16 BITS OF PROGRAM COUNTER OF THE 'NEXT' 16 BITS ARE STORED IN CPU MEMORY HALFWORD. ALL READS AND WRITES IN THE PROCESSOR ARE UNDER THE CONTROL OF THE MICROPROGRAM CONTROL UNIT. THE CURRENT FLOW IS STORED IN D REGISTER (PSW BITS 0 TO 31) AND F REGISTER (PSW BITS 32 TO 47) BUT MAY TEMPORARILY BE QUARANTINED INTO OTHER REGISTER ARE BEING USED FOR ARITHMETIC OPERATIONS. IT IS ALSO SWAPPED DURING INTERRUPTS AT THAT TIME, PSW BITS 48 TO 63 ARE SET. STATUS REGISTER BITS CAN BE INDIVIDUALLY SET ON COMMAND FROM MICROPROGRAM CONTROL UNIT. CPU MEMORY WORDS ARE 36 BITS WITH 32 BITS OF DATA WITH 2 PARITY AND 2 STORAGE PROTECT BITS. MEMORY IS ADDRESSABLE TO THE HALFWORD, A PAIR OF PAGES FORMS A SECTOR. EXTERNAL DATA BUS IS THE I/O PATH TO CPU MEMORY FOR DIRECT MEMORY ACCESS (DMA). ALSO, THIS BUS IS THE DATA PATH FOR ALL DATA TRANSFERS TO AND FROM CPU AND EXTERNAL SYSTEMS. AUXILIARY DATA BUS IS THE DATA PATH FOR CPU MEMORY TO MEMORY AND BUS TO CPU MEMORY TRANSFER. THE ADDRESS BUS PROVIDES ADDRESS INFORMATION FOR THESE TRANSFERS. IF BIT 0 IS A ONE, AN EXTRA FOUR BITS ARE PREFIRED TO THE ADDRESS OF THE MICROPROGRAM CONTROL UNIT. DEFAULT IS I/O PROGRAM DATA DIRECT. SIDE A AND B FOLD TO MAKE A 18 BIT HALFWORD PAGE. SIGNALS REPEAT FOR EACH SUBSEQUENT PAGE. POL 1 (POM 1) ARE UNSUBSCRIBED SIGNALS WITH VALUES 1 TO 10. FAULT INDICATOR IS DISCONNECTED.

# 4 CPU 1

Table with columns for SIGNATURE, DATE, NATIONAL AUTHORITY AND SPACE ADMINISTRATION, and other technical specifications for the Central Processing Unit.



- △ THERE ARE FIVE SEPARATE SETS OF TRUE-COMPLEMENT WIRES RUNNING FROM THE BIT LOGIC TO THE PMS EXTERNAL CONNECTOR AND DRIVEN BY ONE SET OF DRIVERS
- △ THIS POWER TRANSIENT CAUSES SHUTDOWN OF UNIT AND REQUIRES POWER CHILLING TO RECOVER
- △ A POWER SPIKE 1.5V WITH CONTINUAL VOLTAGE OF 1.2V FOR 20-50 USEC. CAUSES A SINGLE NO. 1 OUTPUT WHEN POWER RETURNS. FOR 150 USEC. OF PEAK AND POWER OFF CONDITIONS, RECOVERY ON OF POWER CAUSES AN OUTPUT ON NO. 1 FOLLOWED BY A STOP ON INPUT NO. 2.
- △ TAPE CLOCK IS USED FOR ACCELERATION AND DECELERATION AND RECOVERY. THE TAPE CLOCK IS USED SINCE THE TRANSPORT IS UP TO SPEED AND ENTERS THE PRECISION CONTROL MODE. (4.15 SECONDS)
- △ STATUS REGISTER AND B BITS 13-16 AND 17-18 RESPECTIVELY ARE PACKED LEFT JUSTIFIED IN THE DOWNLIST
- △ ONE PULSE FOR EACH WORD SHIFTED INTO MIA-2
- △ THE INITIALIZE MODE PRESETS THE STORAGE REGISTER TO BOF FILE 4
- △ TAPE FACTS:
  - NO. 1 PULSES LONG 0.5 WIDES WIDE
  - NO. 2 PULSES LONG 0.5 WIDES WIDE
  - APPROX. 60.4 SEC PER TAPE
  - APPROX. 1.7 SEC PER FILE



NOTES:
 

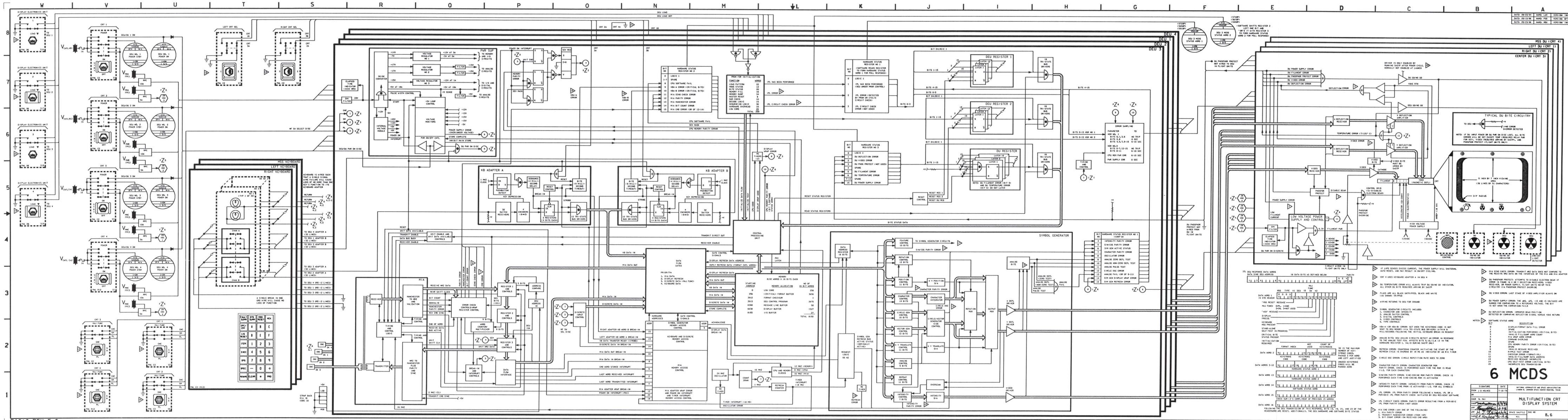
- △ BOT/NOT OPTICAL DETECTORS ARE OPTICAL TYPE SIGNALS. EACH CARRYING ITS OWN DISCUSSION ASSEMBLY WHICH DETECTS A 'W' WORD IN THE TAPE TO GENERATE A BOT OR NOT SIGNAL. IF BOT IS GENERATED, A TURNAROUND SIGNAL IS GENERATED. IF BOT IS SENSED, ALL PM OPERATIONS HALT AND POWER CHILLING IS REQUIRED TO RECOVER

5 MM

MASS MEMORY UNIT 1

8.5

BASIC REV E



DATE 08/25/64	WAW: LHM	VERS: 001
DATE 05/22/64	WAW: PWR	VERS: 001
DATE 05/22/64	WAW: HCU	VERS: 001

STARTING ADDRESS	8-BIT WORDS X 16 BITS EACH	NO OF 16-BIT LOGS
0	LOW CODE	256
1	1 (CRITICAL) FORMAT BUFFER	568
2	FORMAT CHECKSUM	1
3	DEU CONTROL PROGRAM	2815
4	MESSAGE LINE BUFFER	50
5	DISPLAY BUFFER	1537
6	I/O BUFFER	27
		TOTAL: 6162

1. CHARACTER AND INTENSITY  
2. SIMCOD PARITY CONTROL  
3. VIDEOS CONTROL  
4. VIDEOS CONTROL  
5. TIRE CONTROL

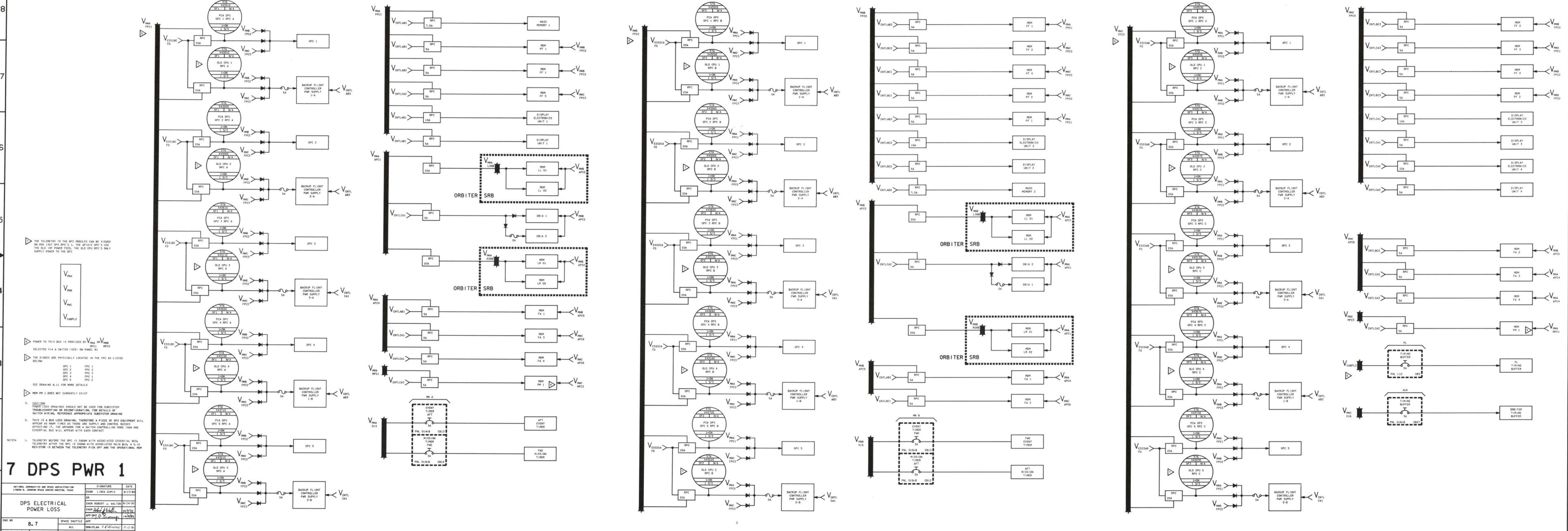
NOTES:  
BIT 0: SOFTWARE STATUS WORD  
BIT 1: DISPLAY/FORMAT DATA FULL ERROR  
BIT 2: INITIALIZATION PERFORMED (CRITICAL BIT)  
BIT 3: INVALID FOLLOWUP WORD COUNT  
BIT 4: CPU MEMORY OVERLOAD  
BIT 5: SPARE  
BIT 6: SPARE  
BIT 7: SPARE  
BIT 8: SPARE  
BIT 9: SPARE  
BIT 10: SPARE  
BIT 11: SPARE  
BIT 12: SPARE  
BIT 13: SPARE  
BIT 14: SPARE  
BIT 15: SPARE

1. CHARACTER AND INTENSITY  
2. SIMCOD PARITY CONTROL  
3. VIDEOS CONTROL  
4. VIDEOS CONTROL  
5. TIRE CONTROL

1. CHARACTER AND INTENSITY  
2. SIMCOD PARITY CONTROL  
3. VIDEOS CONTROL  
4. VIDEOS CONTROL  
5. TIRE CONTROL

1. CHARACTER AND INTENSITY  
2. SIMCOD PARITY CONTROL  
3. VIDEOS CONTROL  
4. VIDEOS CONTROL  
5. TIRE CONTROL

1. CHARACTER AND INTENSITY  
2. SIMCOD PARITY CONTROL  
3. VIDEOS CONTROL  
4. VIDEOS CONTROL  
5. TIRE CONTROL



THE TELEMETRY TO THE RPC MODULES CAN BE VIEWED ON HOK LIST OPS RPC'S 1-5. THE APT/OPS RPC'S USE THE OLD FOR POWER FEEDS. THE OLD CPU RPC'S ONLY SUPPLY POWER TO THE RPC.

POWER TO THIS BUS IS PROVIDED BY V\_PNA OR V\_PNB SELECTED VIA A SWITCH (S25) ON PANEL B3

THE DIODES ARE PHYSICALLY LOCATED ON THE PFC AS LISTED BELOW

GPC 1	RPC 1
GPC 2	RPC 2
GPC 3	RPC 3
GPC 4	RPC 4
GPC 5	RPC 5

SEE DRAWING 8-11 FOR MORE DETAILS

MEM FF 1 DOES NOT CURRENTLY EXIST

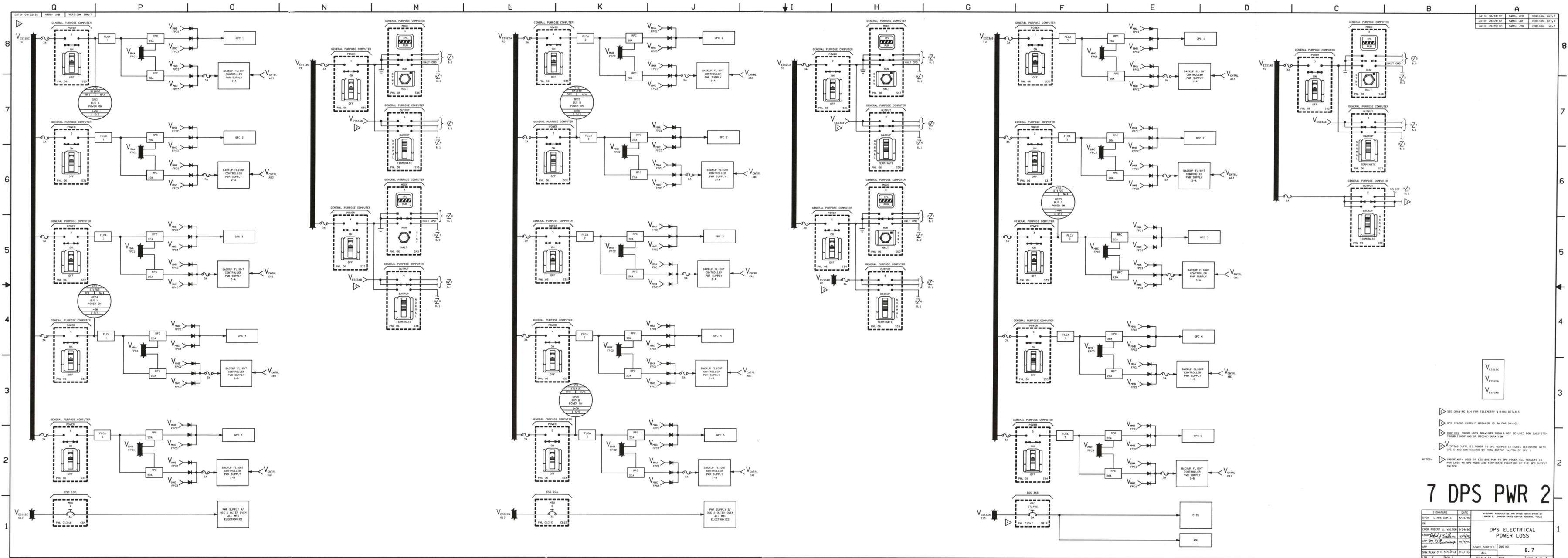
CAUTION: POWER LOSS DRAWINGS SHOULD NOT BE USED FOR SUBSYSTEM TROUBLESHOOTING OR RECONFIGURATION. FOR DETAILS OF SWITCH WIRING, REFERENCE APPROPRIATE SUBSYSTEM DRAWING

THIS IS A BUS LOSS DRAWING. THEREFORE A PIECE OF DPS EQUIPMENT WILL APPEAR AS MANY TIMES AS THERE ARE SUPPLY AND CONTROL BUSES AFFECTING IT. THE NETWORK FOR A SWITCH CONTROLLING MORE THAN ONE ESSENTIAL BUS WILL APPEAR WITH EACH CONTACT

TELEMETRY BEFORE THE RPC IS SHOWN WITH ASSOCIATED ESSENTIAL BUS TELEMETRY AFTER THE RPC IS SHOWN WITH ASSOCIATED MAIN BUS. A 5.1K RESISTOR IS BETWEEN THE TELEMETRY PICK OFF AND THE OPERATIONAL MEM

# 7 DPS PWR 1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LINDOR B. JOHNSON SPACE CENTER HOUSTON, TEXAS		SIGNATURE	DATE
DPS ELECTRICAL POWER LOSS		DESIGN: L. LINDA DUMIS	4/17/89
DRAWN: ROBERT J. WALTON		CHKD: ROBERT J. WALTON	02/24/90
APP'D: D. S. ...		APP'D: D. S. ...	02/24/90
DWG NO: 8.7		SPACE SHUTTLE APP	
REV: ALL		ORIGIN: PLAN 3	REV: 0-13-96
SHEET: 1 OF 3		TR: E	PCN: 2



BASIC REV E-2

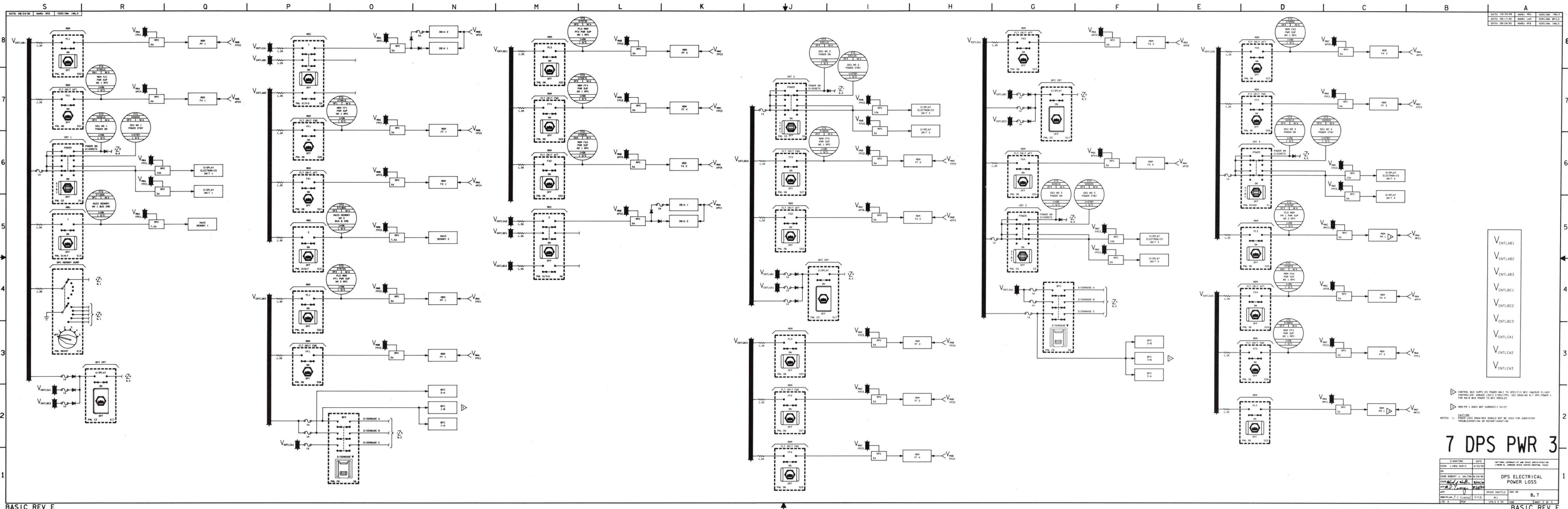
BASIC REV E-2

- SEE DRAWING R-4 FOR TELEMETRY WIRING DETAILS
  - GPC STATUS CIRCUIT BREAKER IS 3A FOR 0V-100
  - CAUTION: POWER LOSS DRAWINGS SHOULD NOT BE USED FOR SUBSYSTEM TROUBLESHOOTING OR RECONFIGURATION
  - V<sub>ESS34B</sub> SUPPLIES POWER TO GPC OUTPUT SWITCHES BEGINNING WITH GPC 5 AND CONTINUING ON THRU OUTPUT SWITCH ON GPC 1
- NOTES
- IMPORTANTLY LOSS OF ESS BUS PWR TO GPC POWER SW, RESULTS IN PWR LOSS TO GPC MODE AND TERMINATE FUNCTION OF THE GPC OUTPUT SWITCH

<b>7 DPS PWR 2</b>	
SIGNATURE	DATE
DESIGN: LINDA DUPUIS	4/21/80
CHKD: ROBERT J. WALTON	8/24/80
ENGR: <i>[Signature]</i>	10/5/80
APP: <i>[Signature]</i>	10/5/80
APP: <i>[Signature]</i>	10/5/80
DRW/PLAN: <i>[Signature]</i>	10/27/80
REV: 1	FIG: 2

DPS ELECTRICAL POWER LOSS

SPACE SHUTTLE	ENG NO
ALL	8.7
ISS: 8.34	FIG: 2



▷ CONTROL BUS SUPPLIES POWER ONLY TO SPECIFIC BFC (BACKUP FLIGHT CONTROLLER) BREAD (BFC) CIRCUITS. SEE DRAWING 8.7 DPS PWR 1 FOR MAIN BUS POWER TO BFC MODULES.  
 ▷ NON-FM 1 DOES NOT CURRENTLY EXIST.  
 CAUTION:  
 1. POWER LOSS DRAWINGS SHOULD NOT BE USED FOR SUBSYSTEM RECONFIGURING OR RECONFIGURATION.

# 7 DPS PWR 3

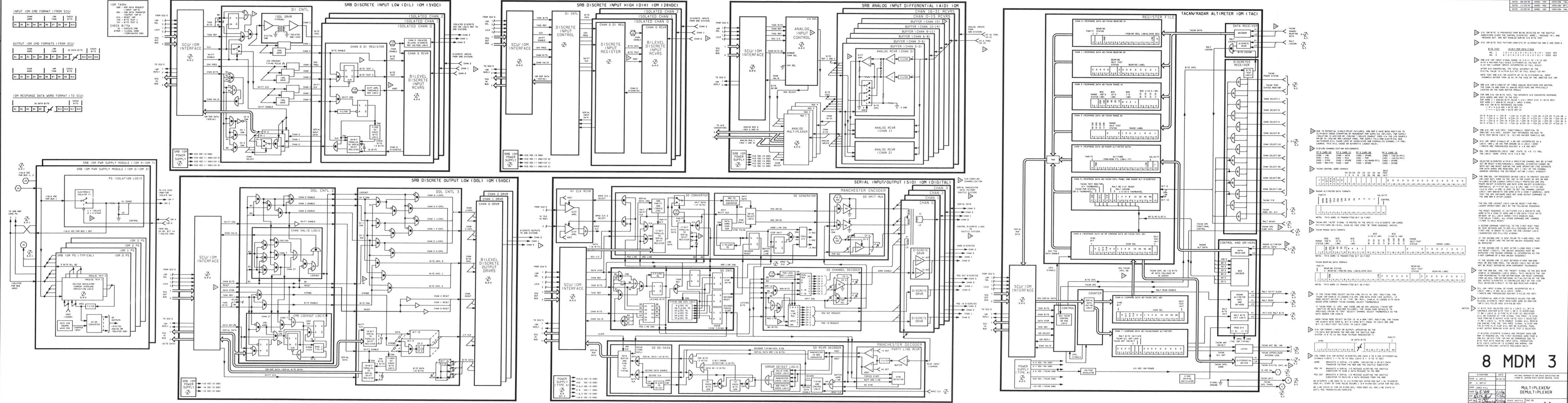
DESCRIPTION	DATE	BY	CHKD	APP'D
DESIGN: LINCOLN DUNN	4/23/90	ENGR ROBERT J. WILTON	8/24/90	
CHKD: <i>[Signature]</i>	9/6/90			
APP'D: <i>[Signature]</i>	9/6/90			
DRWING PLAN: 3.7	4/23/90	ALL	SPACE SHUTTLE	8.7
1/8 E	ENR	154.5 X 34	154.5 X 34	154.5 X 34

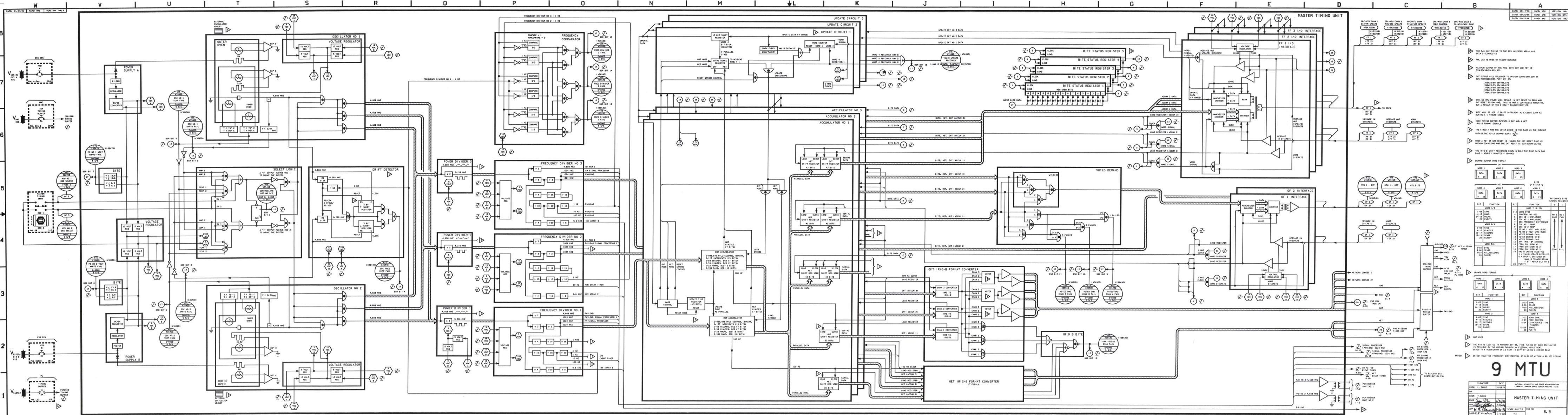
BASIC REV E

BASIC REV E









DATE	BY	NAME	VERSION
01/24/76	W	W	1
02/25/76	V	V	2
01/24/76	U	U	3
01/24/76	T	T	4
01/24/76	S	S	5
01/24/76	R	R	6
01/24/76	Q	Q	7
01/24/76	P	P	8
01/24/76	O	O	9
01/24/76	N	N	10
01/24/76	M	M	11
01/24/76	L	L	12
01/24/76	K	K	13
01/24/76	J	J	14
01/24/76	I	I	15
01/24/76	H	H	16
01/24/76	G	G	17
01/24/76	F	F	18
01/24/76	E	E	19
01/24/76	D	D	20
01/24/76	C	C	21
01/24/76	B	B	22
01/24/76	A	A	23

THE 5.6 KHZ TYPING TO THE EPS INVERTER ARRAY HAS BEEN DISCONNECTED  
 PARALLEL OUTPUT OF THE MET BOTH ON AND MET IS 200V-250V 50/60 HZ  
 GHT OUTPUT WILL HOLD OVER TO 00H:00:00:00:00:00 AT 1200 HOURS  
 200V-250V 50/60 HZ  
 200V-250V 50/60 HZ  
 200V-250V 50/60 HZ  
 CYCLING MTU POWER WILL RESULT IN MET RESET TO 00H:00:00:00:00:00 AND GHT RESET TO 00H:00:00:00:00:00  
 BITE WILL BE SET BY DRIFT DIFFERENTIAL EXCEEDS 0.04 HZ DURING 1 MINUTE CYCLE  
 EACH TIMING BUFFER OUTPUTS 8 GHT AND 4 MET 1818 B FORMAT SIGNALS  
 THE CIRCUIT FOR THE VOTER LOGIC IS THE SAME AS THE CIRCUIT WITHIN THE VOTED DEMAND BLOCK  
 WHEN A MET OR GHT RESET IS ISSUED THE MET RESET IS 00H:00:00:00:00:00 AND THE GHT RESET IS 00H:00:00:00:00:00  
 THE IIRIG-B SHIFT REGISTERS CONTAIN ONLY THE TIME DATA FOR DAYS - HOURS - MINUTES - SECONDS  
 DEMAND OUTPUT WORD FORMAT

WORD 1	WORD 2	WORD 3	WORD 4	WORD 5	WORD 6	WORD 7	WORD 8
DATA							
1	2	3	4	5	6	7	8

BIT	FUNCTION	BIT	FUNCTION
1-3	ENV SYNC	1-3	ENV SYNC
4-13	DAYS	4-13	DAYS
14-19	HOURS	14-19	HOURS
20	PARITY	20	PARITY
1-10	ENV SYNC	1-10	ENV SYNC
11-11	SPARE	11-11	SPARE
12	ENV SYNC	12	ENV SYNC
13	VOTED DEMAND CH-B	13	VOTED DEMAND CH-B
14-15	ENV SYNC	14-15	ENV SYNC
16	ENV SYNC	16	ENV SYNC
17-18	ENV SYNC	17-18	ENV SYNC
19	ENV SYNC	19	ENV SYNC
20	PARITY	20	PARITY

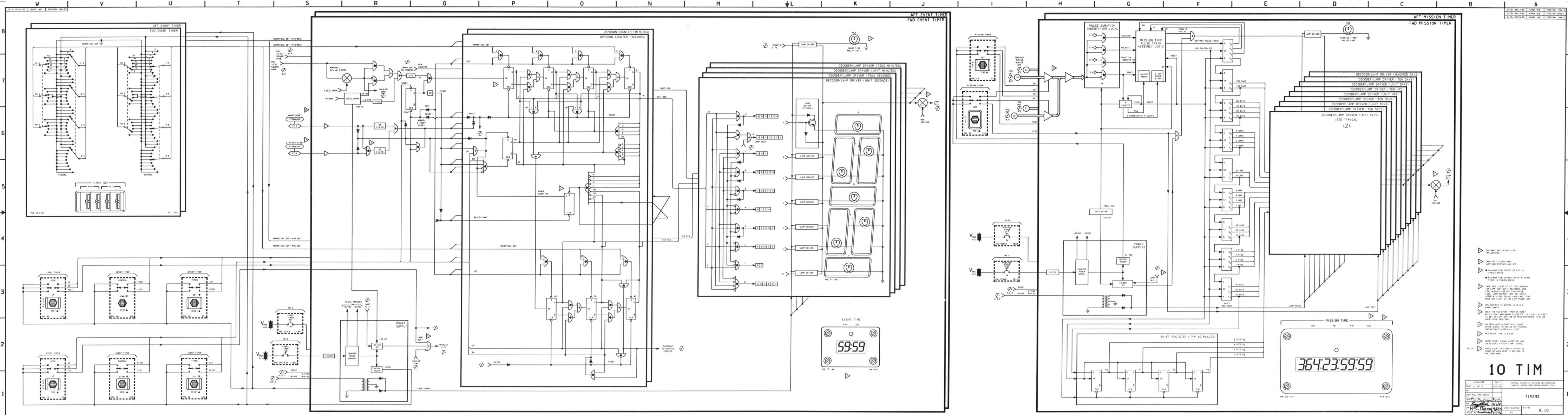
UPDATE WORD FORMAT

WORD 1	WORD 2	WORD 3	WORD 4
DATA	DATA	DATA	DATA
1	2	3	4

NOT USED

THE MTU IS LOCATED IN FORWARD BAY 38. THE TUNING OF EACH OSCILLATOR IS POSSIBLE ON THE GROUND THROUGH AN ADJUSTABLE SCREW TO A RESOLUTION OF 1 PART IN 10<sup>10</sup> BY USING A Cesium BEAM  
 DETECT RELATIVE FREQUENCY DIFFERENTIAL OF 0.04 HZ WITHIN A 40 SEC PERIOD

SIGNATURE		DATE	DATE
0000	L. DAVIS	01/19/76	01/19/76
0001	T. ALLEN	01/20/76	01/20/76
0002	CHOR	01/20/76	01/20/76
0003	CHOR	01/20/76	01/20/76
0004	CHOR	01/20/76	01/20/76
0005	CHOR	01/20/76	01/20/76
0006	CHOR	01/20/76	01/20/76
0007	CHOR	01/20/76	01/20/76
0008	CHOR	01/20/76	01/20/76
0009	CHOR	01/20/76	01/20/76
0010	CHOR	01/20/76	01/20/76
0011	CHOR	01/20/76	01/20/76
0012	CHOR	01/20/76	01/20/76
0013	CHOR	01/20/76	01/20/76
0014	CHOR	01/20/76	01/20/76
0015	CHOR	01/20/76	01/20/76
0016	CHOR	01/20/76	01/20/76
0017	CHOR	01/20/76	01/20/76
0018	CHOR	01/20/76	01/20/76
0019	CHOR	01/20/76	01/20/76
0020	CHOR	01/20/76	01/20/76



- NOTES:
- SOFTWARE EXECUTION IS NOT IMPLEMENTED
  - LAMP TEST LIGHTS HALF LAMP AND DISPLAYS ALL 9'S
  - MAXIMUM TIME CAPABILITY OF MISSION TIMER IS 3999:59:59
  - LAMP FAIL LOCK IS LIT CONTINUOUSLY FOR LAMP TEST UNTIL RELEASED AND CONTINUOUSLY DIM FOR 10 SEC. LOCAL LAMP SEGMENT LOSS ACTIVATES AFTER A 10 SEC DELAY. LAMP FAIL LIGHT DOES NOT LIGHT UP FOR LAMP POWER LOSS
  - MTU OUTPUT IS OUTPUT IN IRIS B DATA FORMAT
  - ONLY THE AFT EVENT TIMER IS RESET BY LIFT-OFF AND ABORT DISCRETE. LIFT-OFF DISCRETE IS SET AT LIFT-OFF AND ON PRESS CONFIRM AT THE NO. ABORT MODE SELECTED
  - AN OPEN LAMP SEGMENT WILL CAUSE DRIVE SIGNAL TO EXCEED REF VOLTAGE AND ACTIVATE LAMP FAIL LIGHT
  - MAX EVENT TIME IS 59:59
  - ABORT RESET SIGNAL OVERRIDES AND LOCKS OUT LIFT-OFF START SIGNAL
  - FORCE COUNT UP CIRCUIT INITIATES COUNT UP WHEN COUNT IS REACHED IN THE DOWN MODE

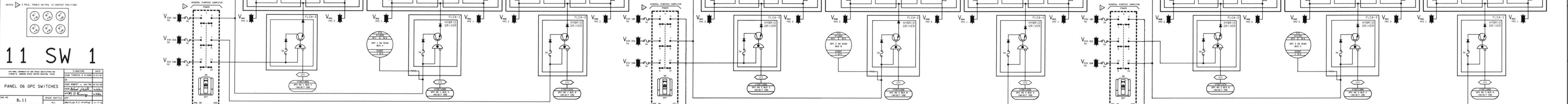
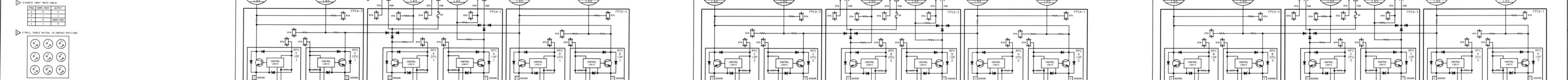
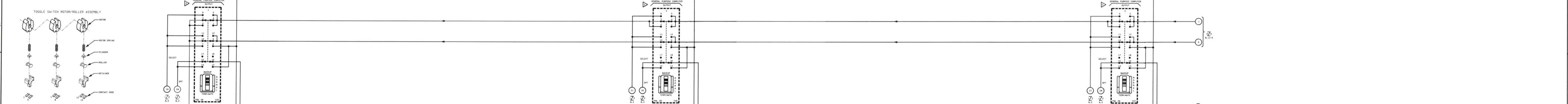
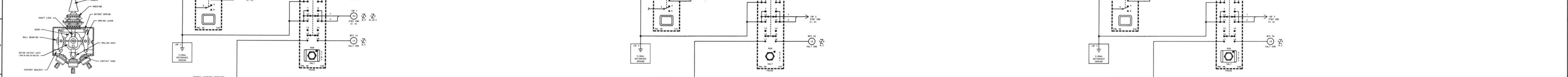
**10 TIM**

DATE: 06/15/95	NAME: BJB	VERSION: 001.0
DATE: 07/20/95	NAME: LAM	VERSION: 001.1
DATE: 07/20/95	NAME: LAM	VERSION: 001.1

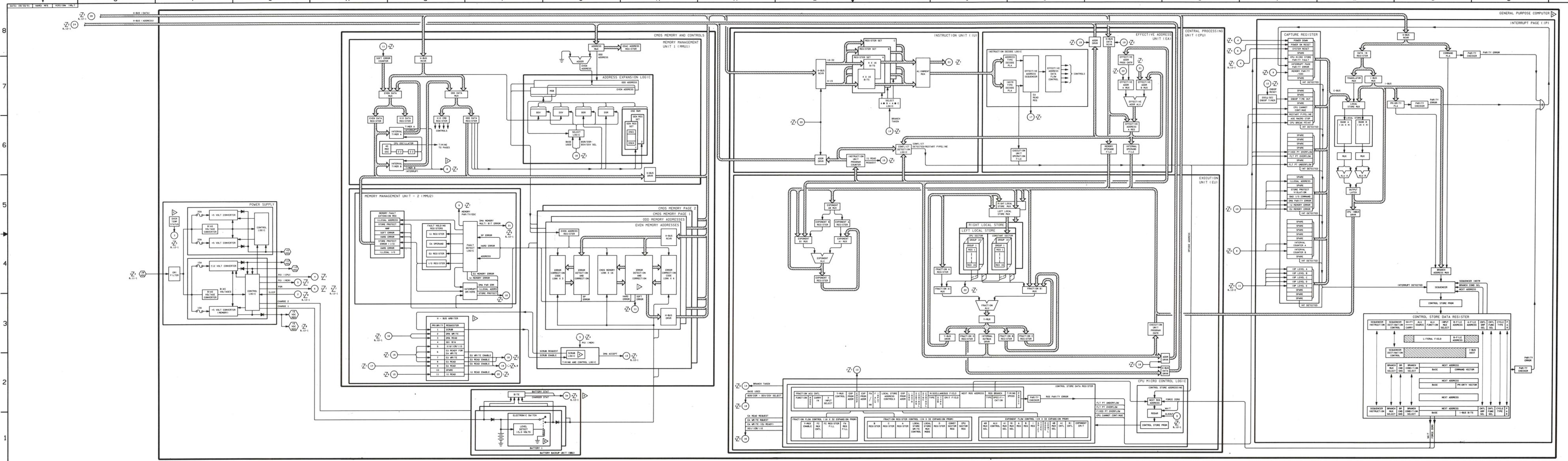
DESIGNED BY: M. J. P. / J. P. S.	DATE: 01-10-79	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ENGINEER: M. J. P. / J. P. S.	DATE: 01-10-79	WASH. D.C. 20546
APP. BY: M. J. P. / J. P. S.	DATE: 01-10-79	ALL
CHECKED BY: M. J. P. / J. P. S.	DATE: 01-10-79	8.10

FIG. 03 1401









# 12 GPC 2

SIGNATURE	DATE	REVISION
DR. R. J. TEEBOK JR.	8/12/84	1
DR. R. F. JACKSON	8/12/84	2
DR. J. J. JACKSON	8/12/84	3
DR. J. J. JACKSON	8/12/84	4
DR. J. J. JACKSON	8/12/84	5
DR. J. J. JACKSON	8/12/84	6
DR. J. J. JACKSON	8/12/84	7
DR. J. J. JACKSON	8/12/84	8
DR. J. J. JACKSON	8/12/84	9
DR. J. J. JACKSON	8/12/84	10
DR. J. J. JACKSON	8/12/84	11
DR. J. J. JACKSON	8/12/84	12
DR. J. J. JACKSON	8/12/84	13
DR. J. J. JACKSON	8/12/84	14
DR. J. J. JACKSON	8/12/84	15
DR. J. J. JACKSON	8/12/84	16
DR. J. J. JACKSON	8/12/84	17
DR. J. J. JACKSON	8/12/84	18
DR. J. J. JACKSON	8/12/84	19
DR. J. J. JACKSON	8/12/84	20
DR. J. J. JACKSON	8/12/84	21
DR. J. J. JACKSON	8/12/84	22
DR. J. J. JACKSON	8/12/84	23
DR. J. J. JACKSON	8/12/84	24
DR. J. J. JACKSON	8/12/84	25
DR. J. J. JACKSON	8/12/84	26
DR. J. J. JACKSON	8/12/84	27
DR. J. J. JACKSON	8/12/84	28
DR. J. J. JACKSON	8/12/84	29
DR. J. J. JACKSON	8/12/84	30
DR. J. J. JACKSON	8/12/84	31
DR. J. J. JACKSON	8/12/84	32
DR. J. J. JACKSON	8/12/84	33
DR. J. J. JACKSON	8/12/84	34
DR. J. J. JACKSON	8/12/84	35
DR. J. J. JACKSON	8/12/84	36
DR. J. J. JACKSON	8/12/84	37
DR. J. J. JACKSON	8/12/84	38
DR. J. J. JACKSON	8/12/84	39
DR. J. J. JACKSON	8/12/84	40
DR. J. J. JACKSON	8/12/84	41
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DR. J. J. JACKSON	8/12/84	44
DR. J. J. JACKSON	8/12/84	45
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DR. J. J. JACKSON	8/12/84	81
DR. J. J. JACKSON	8/12/84	82
DR. J. J. JACKSON	8/12/84	83
DR. J. J. JACKSON	8/12/84	84
DR. J. J. JACKSON	8/12/84	85
DR. J. J. JACKSON	8/12/84	86
DR. J. J. JACKSON	8/12/84	87
DR. J. J. JACKSON	8/12/84	88
DR. J. J. JACKSON	8/12/84	89
DR. J. J. JACKSON	8/12/84	90
DR. J. J. JACKSON	8/12/84	91
DR. J. J. JACKSON	8/12/84	92
DR. J. J. JACKSON	8/12/84	93
DR. J. J. JACKSON	8/12/84	94
DR. J. J. JACKSON	8/12/84	95
DR. J. J. JACKSON	8/12/84	96
DR. J. J. JACKSON	8/12/84	97
DR. J. J. JACKSON	8/12/84	98
DR. J. J. JACKSON	8/12/84	99
DR. J. J. JACKSON	8/12/84	100

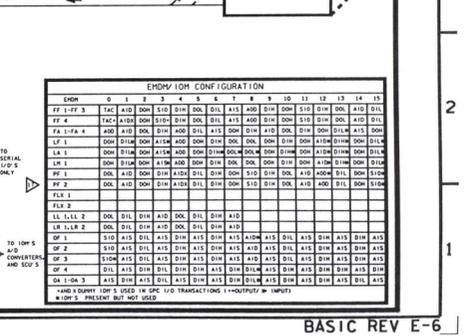
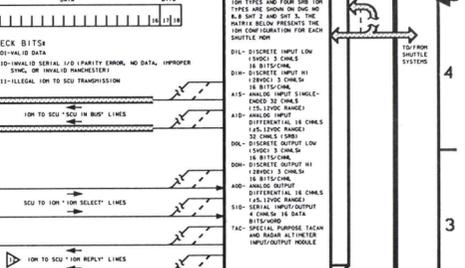
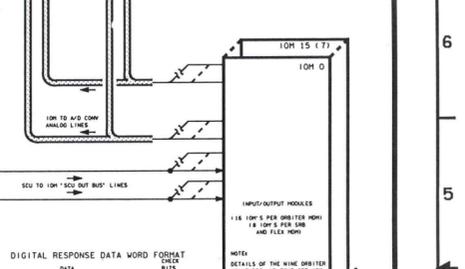
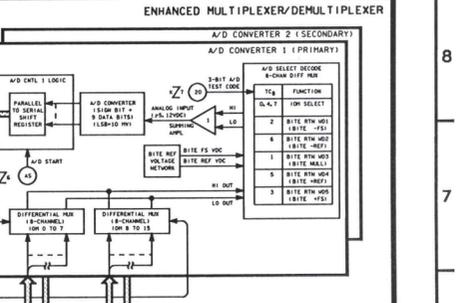
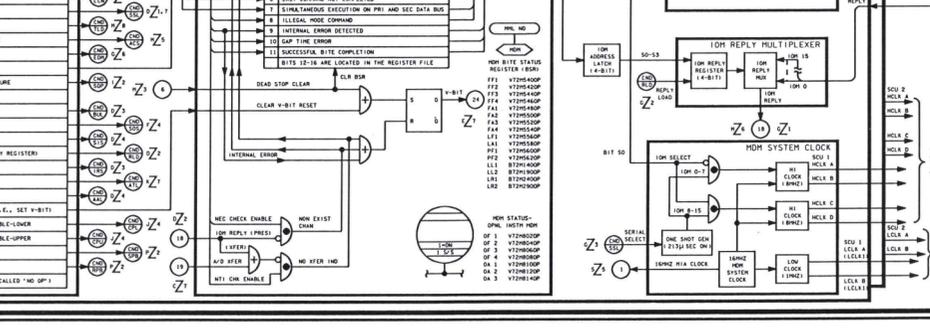
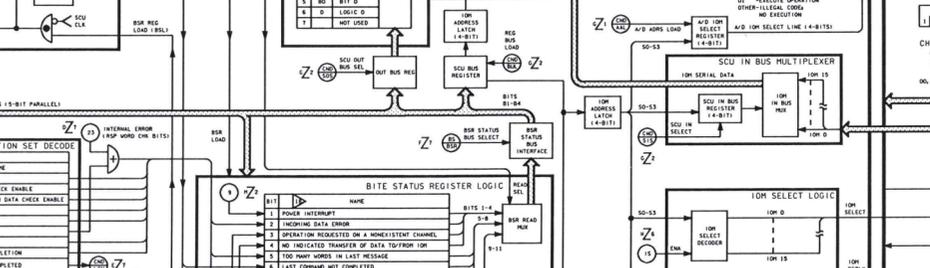
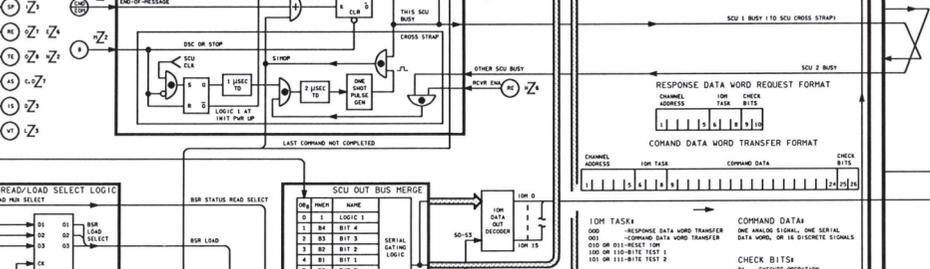
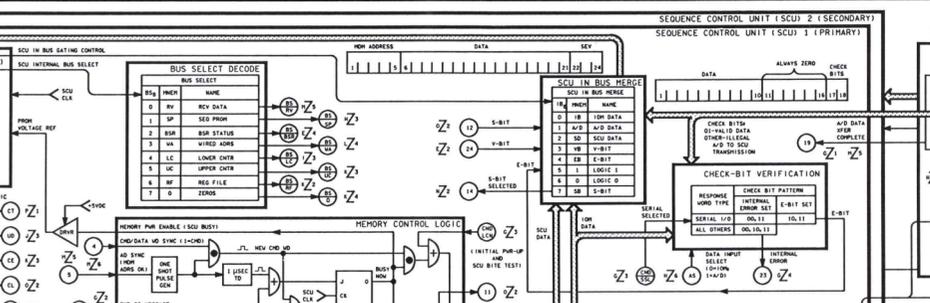
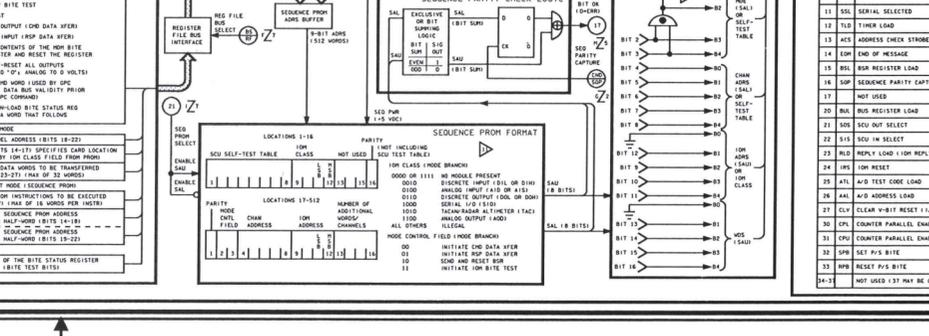
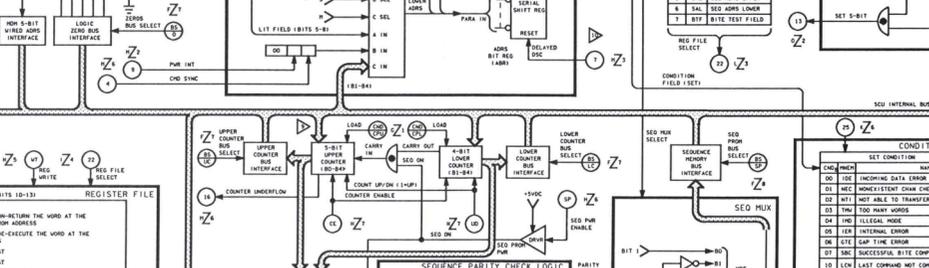
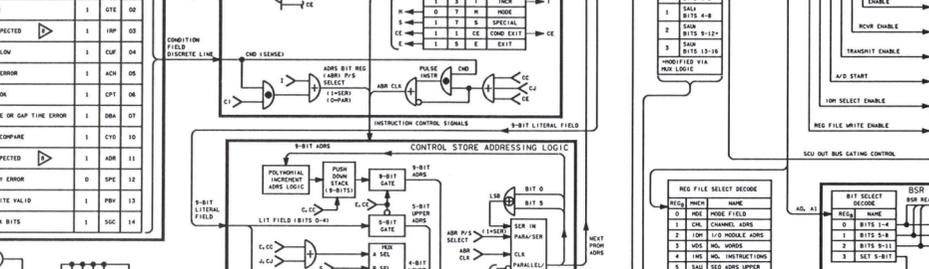
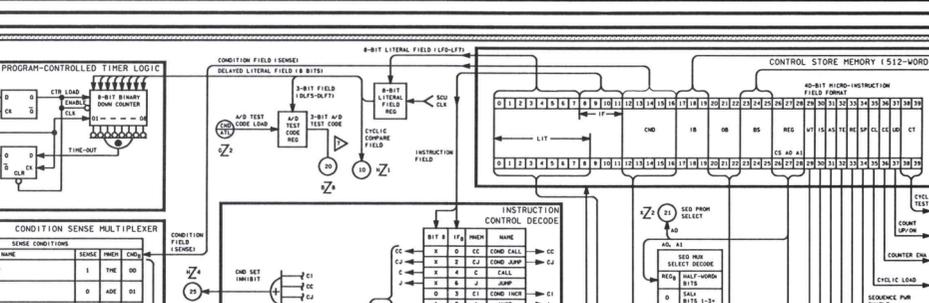
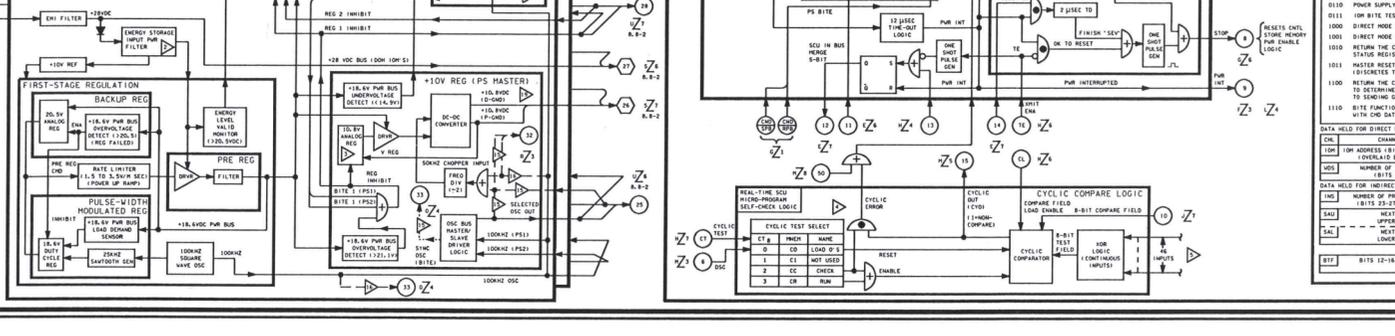
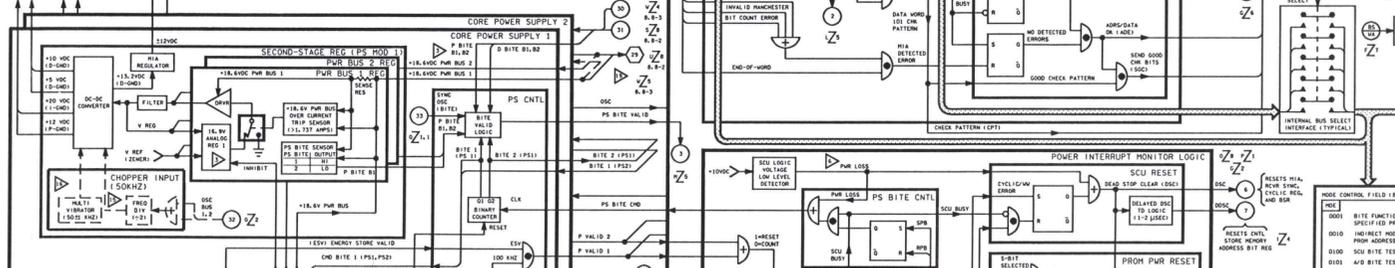
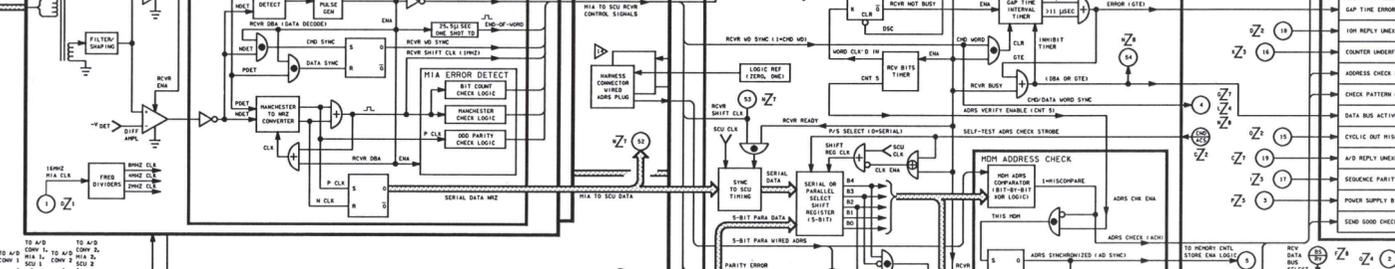
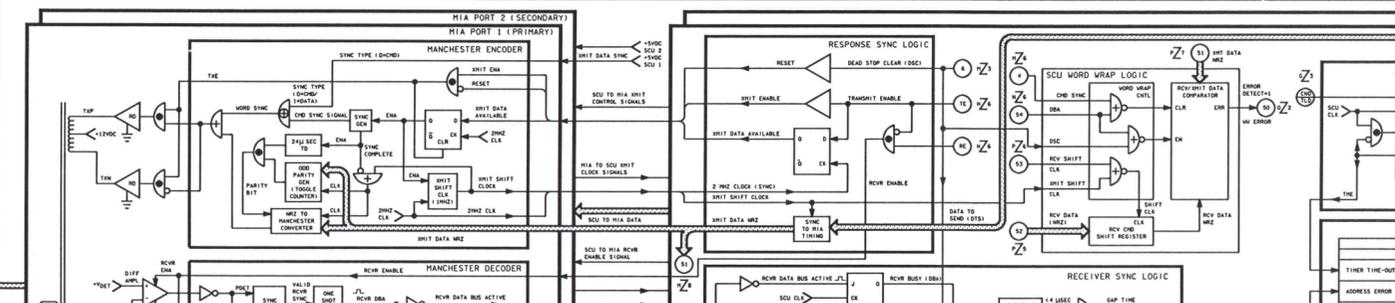
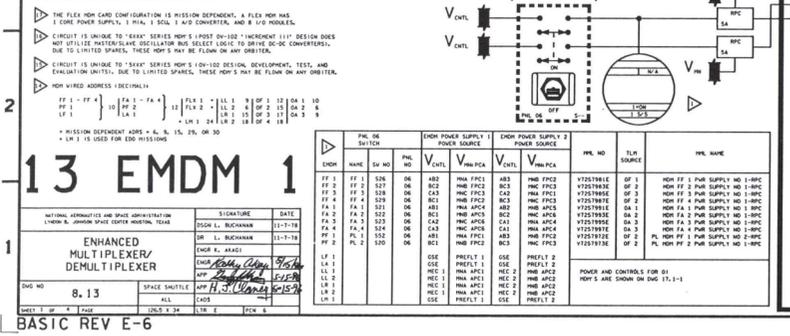
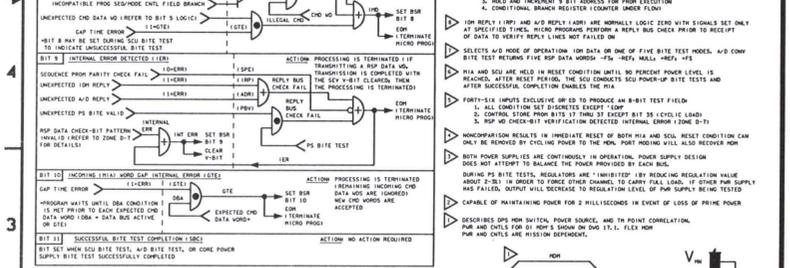
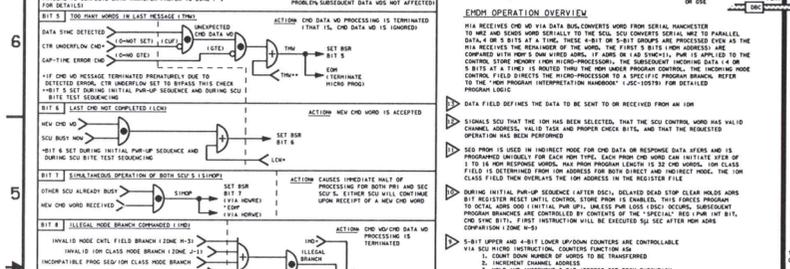
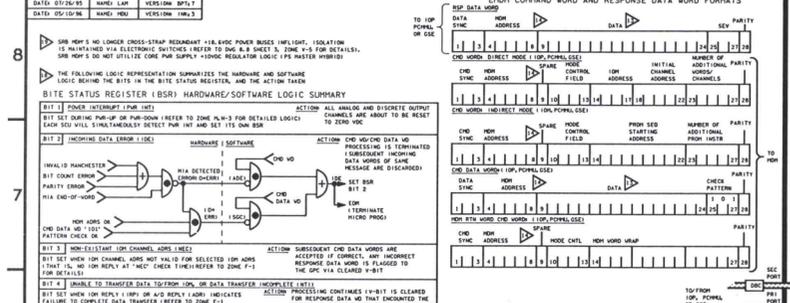


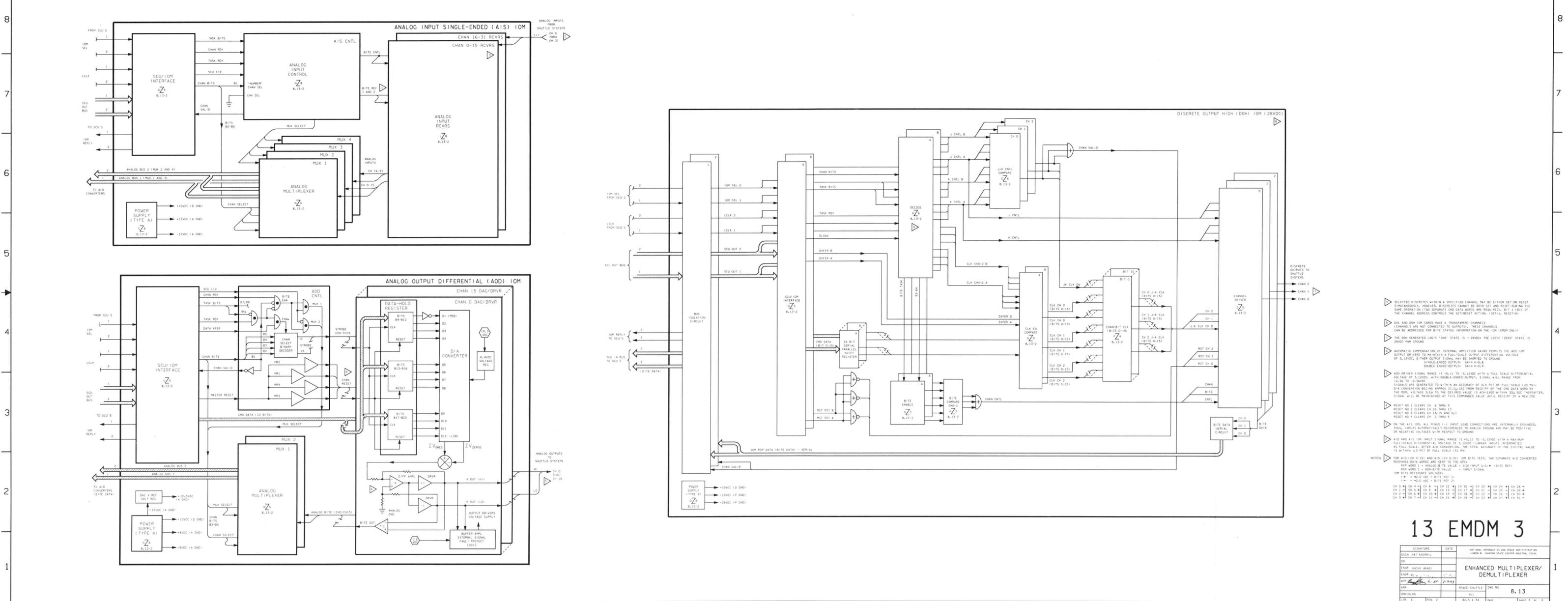
Table with 13 columns and 13 rows, likely a configuration or status table for the EMDM 13.

EMDM 13 BASIC REV E-6

Table with 13 columns and 13 rows, likely a configuration or status table for the EMDM 13.

EMDM 13 BASIC REV E-6





BASIC REV E-2

## 13 EMDM 3

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNN B. JOHNSON SPACE CENTER HOUSTON, TEXAS
ENGR: KATHI ARAGI		<b>ENHANCED MULTIPLEXER/ DEMULTIPLEXER</b>
APP: [Signature]		DWG NO. <b>8.13</b>
DATE: 2-08-93	NAME: SKA	VERSION: IMX.1

BASIC REV E-2



# 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
8.5	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	
		ROCKWELL	4410486	1	A	6/76	MIA ADAPTER
			4410516	1	B	7/76	INTERCONNECT AND POWER DISTRIBUTION ELECTRONICS
			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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS  <b>VENDOR DRAWING REFERENCES</b>
8.1	ENGR R. HUDSON			ENGR		
	ENGR <i>R. Hudson</i>	9-22-94		ENGR		
8.2	ENGR J. HILL			ENGR		
	ENGR <i>J. Hill</i>	9-22-94		ENGR		
8.5	ENGR T. KEELER			APP <i>T. Keeler</i>	9-27-94	
	ENGR <i>T. Keeler</i>	22 Sept 94		APP		SPACE SHUTTLE
	ENGR			APP		TBL NO
	ENGR			LTR E	PCN 4	8-1
						PAGE 8.1-1
						SHEET 1 OF 8

BASIC REV E-4

# 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 OR A06B
			6239409	1-22	A	1/76	LOGIC DIAGRAM OR 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			
			1244-00340	-	-	-	DEFLECTION AMPLIFIER ASSEMBLY SCHEMATIC

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
8.6	ENGR G. ARAIZA YOUNG			ENGR		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>D. Craig Young</i>	9/22/94		ENGR			
	ENGR			ENGR			
	ENGR			ENGR			
	ENGR			APP <i>Robert S. Hagan</i>	9-27-94	SPACE SHUTTLE TBL NO ALL 8-1	
	ENGR			APP			
	ENGR			APP			
	ENGR			LTR E	PCN 4	PAGE 8.1-2	SHEET 2 OF 8

**BASIC REV E-4**

# 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 CONT	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		
			8.7-1	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	
		8.7-1	DPS PWR 2	ROCKWELL	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			
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			
8.7-3	DPS PWR 3	ROCKWELL	VS70-750209	2, 3	K	6/88	SCHEMATIC DIAGRAM - OI POWER AND CONTROL			
			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			
8.7-3	DPS PWR 3	ROCKWELL	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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
8.6	ENGR G. ARAIZA YOUNG			ENGR		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>G. Araiza Young</i>	9/22/94		ENGR			
8.7-1,2,3	ENGR R. WALTON			ENGR			
	ENGR <i>R. Walton</i>	9/22/94		ENGR			
	ENGR			APP <i>Robert F. Lloyd</i>	9-27-94	SPACE SHUTTLE	TBL NO
	ENGR			APP		ALL	<b>8-1</b>
	ENGR			APP			
	ENGR			LTR E	PCN 4	PAGE 8.1-3	SHEET 3 OF 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	
8.8	MULTIPLEXER/ DEMULTIPLEXER	ROCKWELL	V570-720202	1-3	E, EO-E01	7/90	SCHEMATIC DIAGRAM - DATA PROCESSING & SOFTWARE, FLT CONT MDM POWER & CONTROL	
			V570-720209	1-3	D, EO-D01	11/93	SCHEMATIC DIAGRAM - DATA PROCESSING & SOFTWARE, FLT CONT MDM POWER & CONTROL	
			V572-948102	6-7,56-57	C, EO-D17	4/89	INTEGRATED SYS SCHEMATIC SOLID ROCKET BOOSTER	
			V572-948099	6-7,56-57	N/C, EO-A17	6/92	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	
		HONEYWELL	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 ⊙
			4022685-901	1-7	-	1/75	MDM CORE PWR SUPPLY	"5XXX" SERIES ⊙
			4022686-901	1-9	B	12/75	MDM A/D CONVERTER MODULE	"5XXX" SERIES ⊙
			4022687-901	1-8	A	9/76	MDM I/O MODULE (AID)	"5XXX" SERIES ⊙
			4022688-901	1-9	A	2/76	MDM I/O MODULE (AIS)	"5XXX" SERIES ⊙
			4022689-901	1-7	-	7/75	MDM I/O MODULE (DIL)	"5XXX" SERIES ⊙
			4022690-901	1-8	-	5/75	MDM I/O MODULE (DIH)	"5XXX" SERIES ⊙
			4022691-901	1-9	-	5/75	MDM I/O MODULE (DOL)	"5XXX" SERIES ⊙
			4022692-901	1-10	A	8/75	MDM I/O MODULE (DOH)	"5XXX" SERIES ⊙
			4022693-901	1-9	A	11/75	MDM I/O MODULE (AOD)	"5XXX" SERIES ⊙
			4022694-901	1-17	A	3/76	MDM I/O MODULE (SIO)	"5XXX" SERIES ⊙
			4022695-801	1-16	-	7/75	MDM I/O MODULE (TAC)	"5XXX" SERIES ⊙
			4022696-901	1-8	A	10/75	MDM MIA INTERFACE MODULE	"5XXX" SERIES ⊙
			4024876-913	1-7	-	7/75	MDM IOM PWR SUPPLY MODULE (IOM 0-7)	"5XXX" SERIES ⊙
			4024876-914	1-5	-	7/75	MDM IOM PWR SUPPLY MODULE (IOM 8-15)	"5XXX" SERIES ⊙

**NOTES**

⊙ "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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
8.8	ENGR JAMES HILL		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>J. B. Hill</i>	9-22-94		
	ENGR			
	ENGR			
	APP <i>Kats. Alford</i>	9-27-94	SPACE SHUTTLE	TBL NO
	APP		ALL	8-1
	APP			
LTR E		PCN 4	PAGE 8.1-4	SHEET 4 OF 8

**BASIC REV E-4**

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

**NOTES**

© "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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
8.8	ENGR JAMES HILL		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>J.A.Hill</i>	9-22-94		
	ENGR			
	ENGR			
	APP <i>That's Good</i>	9-27-94	SPACE SHUTTLE	TBL NO
	APP		ALL	8-1
	APP			
LTR	E	PCN	4	PAGE 8.1-5
				SHEET 5 OF 8

**BASIC REV E-4**

# 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 WESTINGHOUSE	V570-750139	-	M	12/87	SCHEMATIC DIAGRAM MASTER TIMING UNIT		
			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
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		
			V570-720229	1, 2, 3 of 4	D	8/24/88	SCHEMATIC DIAGRAM - COMPUTER PWR & CONTROLS SUBSYSTEM		
		RI	V570-720269	1, 5 of 6	D	4/11/83	SCHEMATIC DIAGRAM - BACKUP FLT CONT COMPUTER INTERFACE (SUBSYSTEM)		
			V570-971099	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	AP1015 GENERAL PURPOSE COMPUTER	IBM	M7793/2-003	-	-	N/A	METER, TIME TOTAL
					E003A062	-	-	2/26/86	PRINTED WIRING BOARD (PWB), MULTILAYER, A SIDE
106A250-1	E3A76				A	4/6/87	PWB, MULTILAYER		
106A260-1	E3A70				-	3/4/86	PWB, MULTILAYER, A SIDE		
106A270-1	E3A73				-	3/4/86	PWB, MULTILAYER, B SIDE		
106A280-1	E3A71				A	4/6/87	PWB, MULTILAYER, MIB		
106A290-1	E3A57				-	3/14/86	PWB, MULTILAYER, A SIDE		
106A300-1	E3A60				-	3/4/86	PWB, MULTILAYER, MIB		
106A310-1	E26A114				-	8/19/86	PWB, MULTILAYER		
106A320-1	E3A58				-	8/25/86	PWB, MULTILAYER, A SIDE		
106A860-1	E3A70				A	4/6/87	PWB, MULTILAYER		
106A870-1	E3A65				-	3/14/86	PWB-A SIDE		
106A880-1	E3A72				-	3/14/86	PWB-B SIDE		
106A890-1	E3A69				-	3/14/86	PWB-A SIDE		
106A900-1	E3A67				-	3/14/86	PWB-B SIDE		
106A910-1	E3A65				A	4/6/87	PWB, MULTILAYER		
106A920-1	E3A66				-	3/21/86	PWB, MULTILAYER		
106A930-1	E3A64				-	3/21/86	PWB, MULTILAYER		
106A940-1	E3A58				-	3/27/86	PWB, MULTILAYER, A SIDE		
106A950-1	E3A70				-	3/27/86	PWB, MULTILAYER, B SIDE		
106A960-1	E3A53				-	6/30/86	PWB, LAYER 9 & 10		
106A970-1	E3A60				-	6/3/86	PWB, MULTILAYER, B SIDE		
106A980	B3				B	8/15/90	CONNECTOR		
116A783-11	B3				B	8/15/90	CONNECTOR		
116A783-12	B3				B	8/15/90	CONNECTOR		
116A783-13	B3				B	8/15/90	CONNECTOR		
116A783-14	B3				B	8/15/90	CONNECTOR		
116A783-15	B3				B	8/15/90	CONNECTOR		
116A783-16	B3				B	8/15/90	CONNECTOR		
116A783-2	B3				B	8/15/90	CONNECTOR		
116A783-22	B3				B	8/15/90	CONNECTOR		
116A783-4	B3				B	8/15/90	CONNECTOR		
116A783-5	B3				B	8/15/90	CONNECTOR		
116A783-7	B3				B	8/15/90	CONNECTOR		
116A783-8	B3				B	8/15/90	CONNECTOR		
116A783-9	B3				B	8/15/90	CONNECTOR		
121A570	E3A67				A	8/22/88	PWB, MULTILAYER		
6953076-1	-				A	11/29/83	INTERRUPT PAGE - FRAME		
6953166-1	A1E1				A	11/29/83	CPU 1 PAGE - FRAME		

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
8.9	ENGR GARY SHAM			ENGR		<b>VENDOR DRAWING REFERENCES</b>	
	ENGR <i>[Signature]</i>	9-26-94		ENGR			
8.10	ENGR M. LaFLEUR			ENGR			
	ENGR <i>[Signature]</i>			ENGR			
8.11	ENGR R. WALTON			APP <i>[Signature]</i>	9-27-94	SPACE SHUTTLE	TBL NO
	ENGR <i>[Signature]</i>	9/27/94		APP			8-1
8.12	ENGR K. TERRY			APP		ALL	
	ENGR <i>[Signature]</i>	9-26-94		LTR E	PCN 4	PAGE 8.1-6	SHEET 6 OF 8

BASIC REV E-4

# 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
8.12 CONT			6953196-1	A1E1	A	11/29/83	CPU 2 PAGE - FRAME
			6953226	A1E1	A	11/29/83	CPU 3 PAGE - FRAME
			6959260-1	E3A72	E	9/11/92	PWB, MULTILAYER
			6964170-1	E3A71	A	10/10/91	PWB, MULTILAYER
			6966000-23	A032E003	R	8/5/91	GENERAL PURPOSE COMPUTER
			6966005-2	E2	C	1/5/88	RH CHASSIS
			6966006-2	E2	C	1/5/88	LH CHASSIS
			6966007-1	A1E2	B	9/18/87	REAR PLENUM ASSEMBLY
			6966008-1	A2E1	D	9/21/90	COVER, HEAT EXCHANGER
			6966009-2	A2E1	B	7/1/87	TOP COVER ASSEMBLY
			6966010-2	A2E2	D	4/12/88	BOTTOM COVER ASSEMBLY
			6966011-1	E3	C	6/9/86	FRONT PANEL ASSEMBLY
			6966012-2	A3E1A31	J	9/27/88	HARNESS ASSEMBLY
			6966013-2	D1	B	3/5/87	CONNECTOR, ALTERED
			6966015-20	A8E2A45	M	4/22/88	ELECTRICAL CONNECTION PANEL ASSEMBLY
			6966016-1	E1	A	5/9/85	SUPPORT PLATE
			6966022-21	A15E2A12	H	7/22/91	AD PAGE-PAGE ASSEMBLY
			6966023-1	E1	-	6/5/86	AD PAGE-FRAME
			6966025-20	A6E3A8	G	2/15/91	MIA PAGE-PAGE ASSEMBLY
			6966026-1	E1	-	8/16/84	MIA PAGE-FRAME
			6966030-21	A40E3A118	R	3/1/91	MICROSEQ/CONTROL PAGE-PAGE ASSEMBLY
			6966031-1	E1	-	6/28/84	MICROSEQ/CONTROL PAGE-FRAME
			6966035-20	A6E2A20	G	12/19/88	I/O BUFFER PAGE-PAGE ASSEMBLY
			6966040-21	A24E3A151	N	2/15/91	STATUS/INTERRUPT PAGE-PAGE ASSEMBLY
			6966045-20	A10E2A53	H	12/19/88	FLOW BOTTOM PAGE-PAGE ASSEMBLY
			6966050-20	A10E2A28	H	2/15/91	FLOW TOP PAGE-PAGE ASSEMBLY
			6966051-1	E1	A	8/1/84	FLOW TOP PAGE-FRAME
			6966055-20	A6E2A23	L	2/15/91	INTERFACE/MIA CONTROL PAGE-PAGE ASSEMBLY
			6966064-20	A5E3A9	K	2/15/91	CPU 1 PAGE-PAGE ASSEMBLY
			6966065-21	A40E3A93	R	2/15/91	INTERRUPT PAGE-PAGE ASSEMBLY
			6966066-21	A22E3A117	N	5/23/91	MMU 2 PAGE-PAGE ASSEMBLY
			6966067-21	A14E3A26	K	2/15/91	MMU 1 PAGE-PAGE ASSEMBLY
			6966068-21	A20E3A18	J	2/15/91	CPU 3 PAGE-PAGE ASSEMBLY
			6966069-20	A16E3A19	E	2/15/91	CPU 2 PAGE-PAGE ASSEMBLY
			6966070-22	A12E3A2	H	10/31/88	CMOS PAGE-PAGE ASSEMBLY
			6966070-23	A12E3A2	H	10/31/88	CMOS PAGE-PAGE ASSEMBLY
			6966072-1	E1	-	4/23/85	CMOS PAGE-FRAME-A SIDE
			6966073-22	A4E2	J	4/4/89	CMOS MEMORY SUBASSEMBLY B
			6966073-23	A4E2	J	4/4/89	CMOS MEMORY SUBASSEMBLY B
			6966074-1	E1	A	4/23/85	CMOS MEMORY SUBASSEMBLY B-FRAME
			6966079-22	A12E3A2	H	2/15/91	CMOS MEMORY SUBASSEMBLY B-FRAME
			6966079-23	A12E3A2	H	2/15/91	CMOS MEMORY SUBASSEMBLY A-FRAME
			6966081-20	ASA3	C	1/22/91	BATTERY BACKUP UNIT
			6966091-1	D1	-	7/31/85	IDENTIFICATION PLATE
			6966179	B45	-	7/23/86	LOGIC DIAGRAM
			6966189	B44	-	7/23/86	LOGIC DIAGRAM
			6966199	B56	-	7/23/86	LOGIC DIAGRAM
			6966209	B42	-	7/23/86	LOGIC DIAGRAM
			6966219	B62	-	7/23/86	LOGIC DIAGRAM
			6966249	B64	-	7/23/86	LOGIC DIAGRAM
			6966260-1	E2A42	-	1/14/85	PWB, MULTILAYER, B SIDE
			6967089-20	A4E2	H	2/22/91	EMI FILTER ASSEMBLY
			6967090-20	A2E1	C	11/2/87	+ 5V CONVERTER
			6967091-21	A4E1	D	5/19/89	12 V CONVERTER
			6967096-1	E2	A	3/28/85	FILTER FRAME
			6967097-1	D1	-	1/31/86	COVER
			106A869	B64	A	1/4/91	ARITHMETIC LOGIC DIAGRAM
			6966159	B59	-	7/23/86	ARITHMETIC LOGIC DIAGRAM
			6966239	B44	-	7/23/86	ARITHMETIC LOGIC DIAGRAM
			6966229	B40	-	7/23/86	ARITHMETIC LOGIC DIAGRAM
			106A899	B56	A	1/4/91	ARITHMETIC LOGIC DIAGRAM
			106A889	B50	A	1/4/91	ARITHMETIC LOGIC DIAGRAM
			106A909	B57	A	1/4/91	ARITHMETIC LOGIC DIAGRAM
			106A919	B49	A	1/4/91	ARITHMETIC LOGIC DIAGRAM
			6965920	B56	A	1/4/91	ARITHMETIC LOGIC DIAGRAM
			6965919	B55	A	1/4/91	ARITHMETIC LOGIC DIAGRAM
			6965922	B55	-	7/23/86	ARITHMETIC LOGIC DIAGRAM
			6965921	B51	-	7/23/86	ARITHMETIC LOGIC DIAGRAM
			6953329	B44	B	5/25/88	ARITHMETIC LOGIC DIAGRAM
			6953159	B46	B	5/25/88	ARITHMETIC LOGIC DIAGRAM
			6966149	B37	-	7/23/86	ARITHMETIC LOGIC DIAGRAM
			6965979	B35	-	7/23/86	ARITHMETIC LOGIC DIAGRAM
			121A579	B44	-	1/19/88	ARITHMETIC LOGIC DIAGRAM
			6966269	B48	-	7/23/86	ARITHMETIC LOGIC DIAGRAM

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
8.12	ENGR K. TERRY			ENGR			
	ENGR <i>K. Terry</i>	9-24-94		ENGR			
	ENGR			ENGR			
	ENGR			ENGR			
	ENGR			APP <i>[Signature]</i>	9-27-94		
	ENGR			APP		SPACE SHUTTLE	TBL NO
	ENGR			APP		ALL	8-1
	ENGR			LTR E	PCN 4	PAGE 8.1-7	SHEET 7 OF 8

BASIC REV E-4

# 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				
8.12 CONT		RI	V570-720212	1-2	F	7/27/92	MASS MEMORY AND COMPUTER INTERFACE COMPUTER SYNCHRONIZATION AND FAIL STATUS COMPUTER SYNC AND FAIL STATUS COMPUTER DATA BUS INTERFACE BACKUP FLIGHT CONTROLLER COMPUTER INTERFACE BFC COMPUTER INTERFACE INTERCOMPUTER DATA BUS ICB 01-05 ICC DATA BUS DATA BUSES IP 1 - IP 5 WIRING DP AND S DATABUS BUB 01, BUB 05 THROUGH BUB 08 DATA BUS LBB 01 AND LBB 02 COMPUTER POWER AND CONTROLS				
			V570-720239	1-5	B	9/15/88					
			V570-720232	1-4	D	7/27/92					
			V570-720242	1-3	C	7/27/92					
			V570-720262	1-6	J	10/18/91					
			V570-720269	1-6	F	10/18/91					
			V570-720519	1-2	C	10/6/88					
			V570-720512	1	C	7/27/92					
			V570-720539	1-2	A	11/11/88					
			V570-720542	1-3	B	1/20/83					
			V570-720559	1-4	D	11/11/93					
			V570-720222	1-4	K	7/27/92					
			8.13	ENHANCED MULTIPLEXER/DEMULTIPLEXER	ROCKWELL	V570-720202		1-3	D	3/87	SCHEMATIC DIAGRAM - DATA PROCESSING & SOFTWARE FLT CONT MDM POWER & CONTROL
						V570-720209		1-3	B	12/87	
V572-948102	6-7,56-57	C/EO/D15				6/87					
V572-948099	6-7,56-57	V/C/EO/A12				10/87					
SINGER/KEARFOTT	Y214A367-01	1			A	4/75	SERIAL MIA SMIA CONTROL/TIMING HYBRID SMIA XMTR/RCVR HYBRID SMIA LSI MICROCIRCUIT HYBRID				
	Y215A030-02	1			B	2/75					
	Y215A032-01	1-2			A	9/74					
HONEYWELL/SPERRY	4027158-902	1-2			A	4/77	MDM MIA INTERFACE MODULE SRB MDM SCU MODULE SRB MDM IOM PWR SUPPLY MODULE SRB MDM A/D CONVERTER MODULE SRB MDM I/O MODULE (SRB AID) SRB MDM I/O MODULE (SRB DIH) SRB MDM I/O MODULE (SRB DOL) SRB				
	4027159-901	1-5			-	12/75					
	4027160-902	1-5			-	5/77					
	4027161-901	1-2			-	12/75					
	4027162-901	1-7			-	12/75					
	4027341-901	1-3			-	12/75					
	4027342-901	1-5			-	9/77					
HONEYWELL	825807-901	1-5			A	3/89	EMDM SCU MODULE EMDM CORE PWR SUPPLY EMDM A/D CONVERTER MODULE EMDM I/O MODULE (AID) EMDM I/O MODULE (AIS) EMDM I/O MODULE (DIL) EMDM I/O MODULE (DIH) EMDM I/O MODULE (DOL) EMDM I/O MODULE (DOH) EMDM I/O MODULE (AOD) EMDM I/O MODULE (SIO) EMDM I/O MODULE (TAC) EMDM MIA INTERFACE MODULE EMDM IOM POWER SUPPLY MODULE				
	825805-901	1-4			-	3/89					
	8258081-901	1-2			-	3/89					
	8258101-901	1-4			-	3/89					
	8258091-901	1-5			-	3/89					
	8258151-901	1-5			-	3/89					
	8258131-901	1-5			-	3/89					
	8258141-901	1-5			-	3/89					
	8258121-901	1-5			-	3/89					
	8258111-901	1-5	-	3/89							
	8258161-901	1-5	-	3/89							
	8258171-901	1-5	-	3/89							
	8258061-901	1-2	A	3/89							
1901858	1-2	-	2/89								

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
8.12	ENGR K. TERRY			ENGR		<b>VENDOR DRAWING REFERENCES</b>  SPACE SHUTTLE TBL NO <b>8-1</b> ALL	
	ENGR <i>Kim Terry</i>	9-24-94		ENGR			
8.13	ENGR KATHY AKAGI			ENGR			
	ENGR <i>Kathy Akagi</i>	9/23/94		ENGR			
	ENGR			APP <i>Robert S. Floyd</i>	9-27-94		
	ENGR			APP			
	ENGR			APP			
	ENGR			APP			
	ENGR			LTR E	PCN 4	PAGE 8.1-8	SHEET 8 OF 8

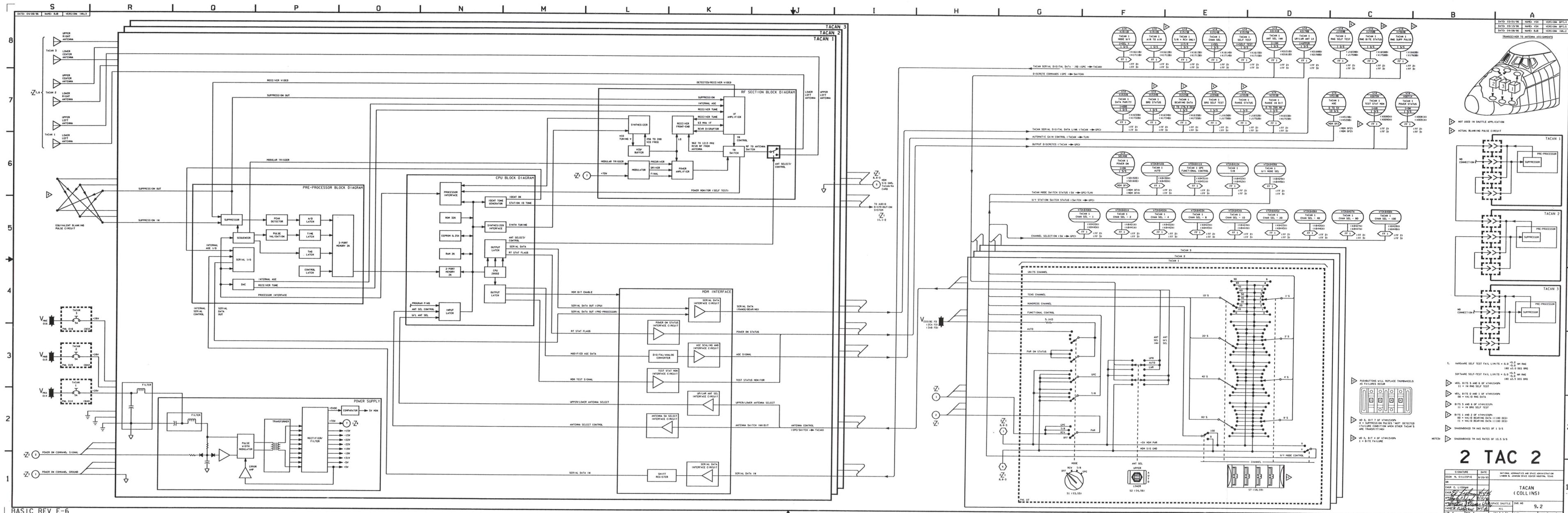
BASIC REV E-4











BASIC REV E-6

# 2 TAC 2

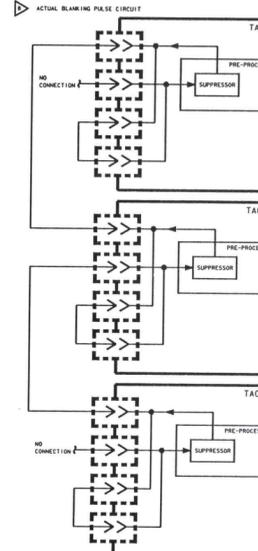
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DRUM P. GILLESPIE	8/20/53	LINCOLN B. JOHNSON SPACE CENTER HOUSTON, TEXAS
TACAN (COLL INS)		
DRUM E. LIEBERMAN		
DRUM J. LIEBERMAN		
DRUM R. LIEBERMAN		
DRUM S. LIEBERMAN		
DRUM T. LIEBERMAN		
DRUM U. LIEBERMAN		
DRUM V. LIEBERMAN		
DRUM W. LIEBERMAN		
DRUM X. LIEBERMAN		
DRUM Y. LIEBERMAN		
DRUM Z. LIEBERMAN		

9.2

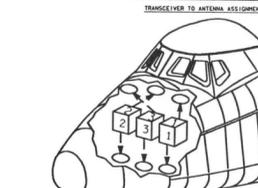
BASIC REV E-6

- 1. HARDWARE SELF-TEST FAIL LIMITS = 0.0 50.0 IN RING  
180 40.0 DEG BRG
- SOFTWARE SELF-TEST FAIL LIMITS = 0.0 50.0 IN RING  
180 40.0 DEG BRG
- NO. 2, BIT 5 AND 6 OF VTH1549P  
11 = IN RING SELF TEST
- NO. 2, BIT 5 AND 6 OF VTH1549P  
11 = IN RING DATA
- NO. 2, BIT 1 OF VTH1549P  
00 = VALID BEARING DATA (180 DEG)
- NO. 2, BIT 1 OF VTH1549P  
11 = VALID BEARING DATA (180 DEG)
- NO. 2, BIT 4 OF VTH1549P  
1 = RATE FAILURE
- NO. 2, BIT 1 OF VTH1549P  
00 = SUPPRESSION PULSES "NOT" DETECTED (FAILURE CONDITION WHEN OTHER TACAN'S ARE TRANSMITTING)
- NO. 2, BIT 4 OF VTH1549P  
1 = RATE FAILURE

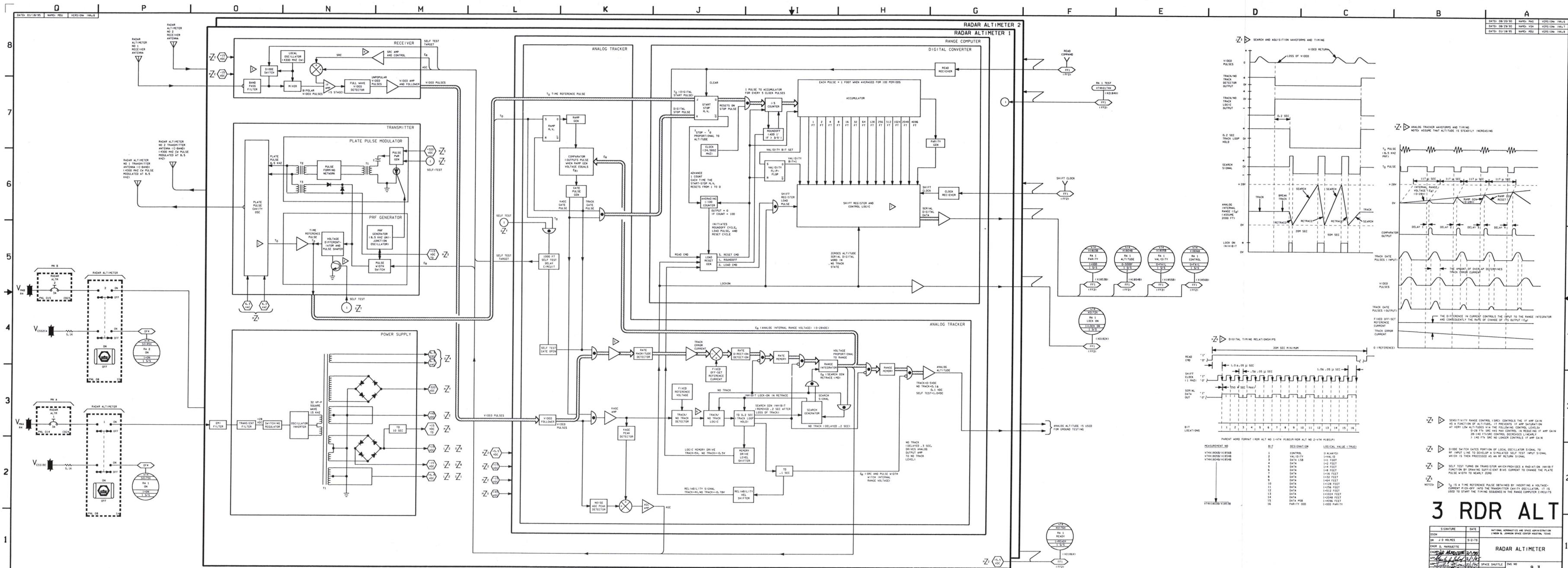
NOT USED IN SHUTTLE APPLICATION



DATE: 03/01/56 NAME: VSR VERSION: OPT. 4  
DATE: 03/13/56 NAME: VSR VERSION: OPT. 5  
DATE: 04/04/56 NAME: BJB VERSION: INR. 2

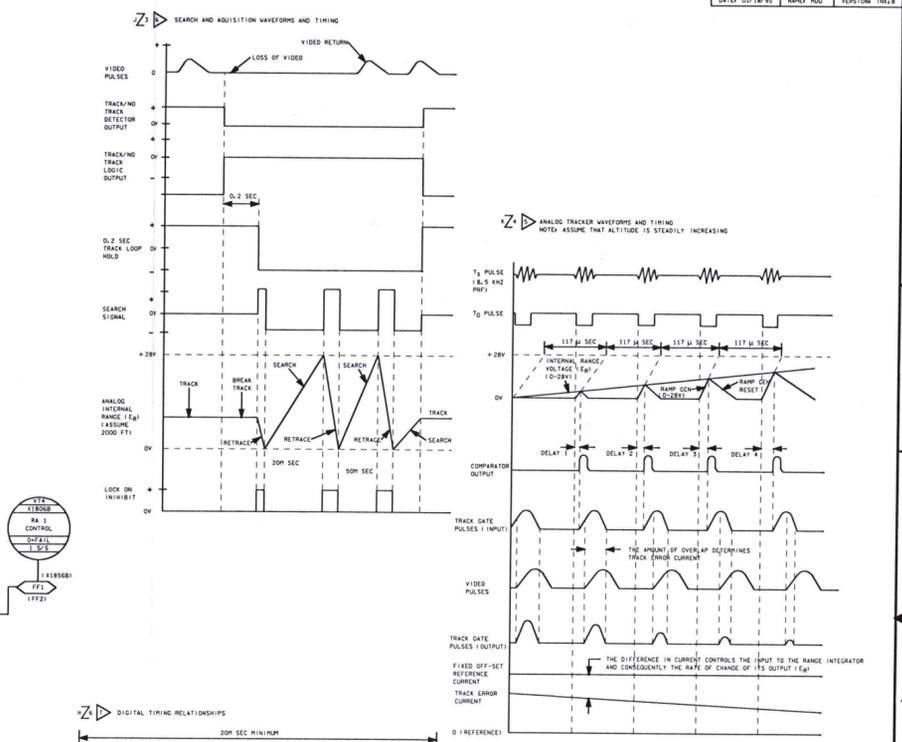


TRANSMITTER TO ANTENNA ASSIGNMENTS



BASIC REV E-5

DATE: 08/20/80 NAME: MSH VERSION: 1N1.6  
 DATE: 08/28/80 NAME: VSH VERSION: 1N1.7  
 DATE: 01/18/85 NAME: MDU VERSION: 1N1.8



MEASUREMENT NO. BIT DESIGNATION LOGICAL VALUE (TRUTH)

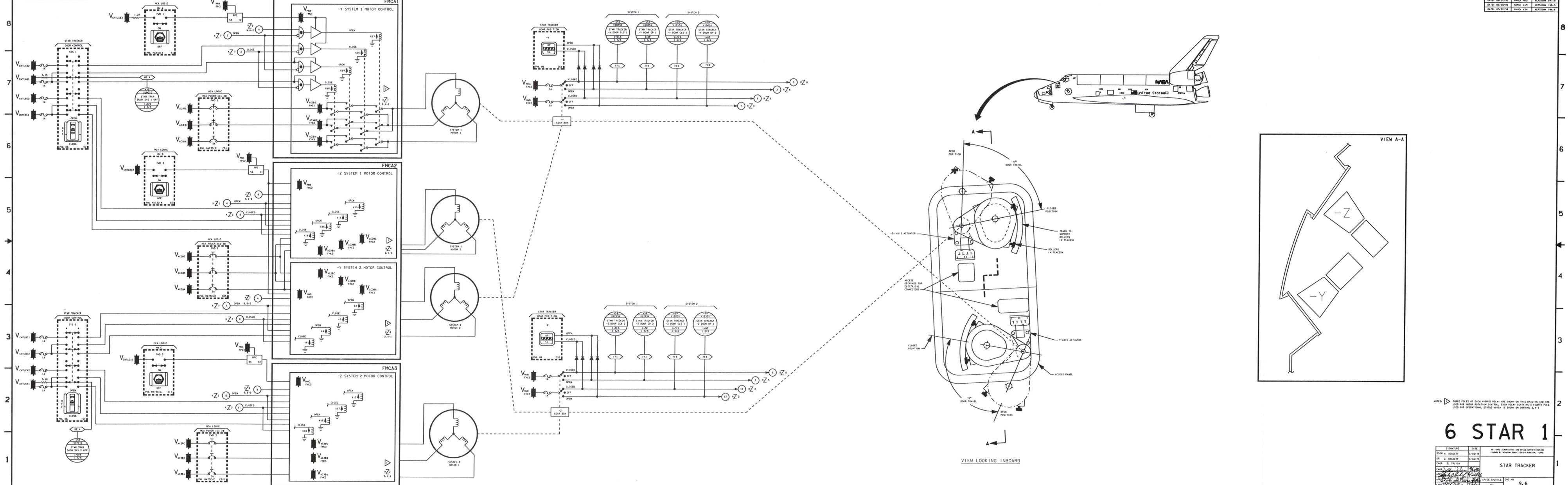
1	CONTROL	31 ALWAYS
2	VALIDITY	1=VALID
3	DATA L0B	1=10 FEET
4	DATA	1=2 FEET
5	DATA	1=4 FEET
6	DATA	1=8 FEET
7	DATA	1=16 FEET
8	DATA	1=32 FEET
9	DATA	1=64 FEET
10	DATA	1=128 FEET
11	DATA	1=256 FEET
12	DATA	1=512 FEET
13	DATA	1=1024 FEET
14	DATA	1=2048 FEET
15	DATA	1=4096 FEET
16	PARITY 000	1=000 PARITY

# 3 RDR ALT

SIGNATURE: DR J. D. HOLMES DATE: 5-2-79  
 INDR S. MARQUETTE  
 NATIONAL INSTRUMENTS AND SPACE ADMINISTRATION  
 LINDSEY B. JOHNSON SPACE CENTER HOUSTON, TEXAS  
 SPACE SHUTTLE ENG NO: 9.3  
 ALL  
 83.5 X 34 PAPER SHEET 1 OF 1





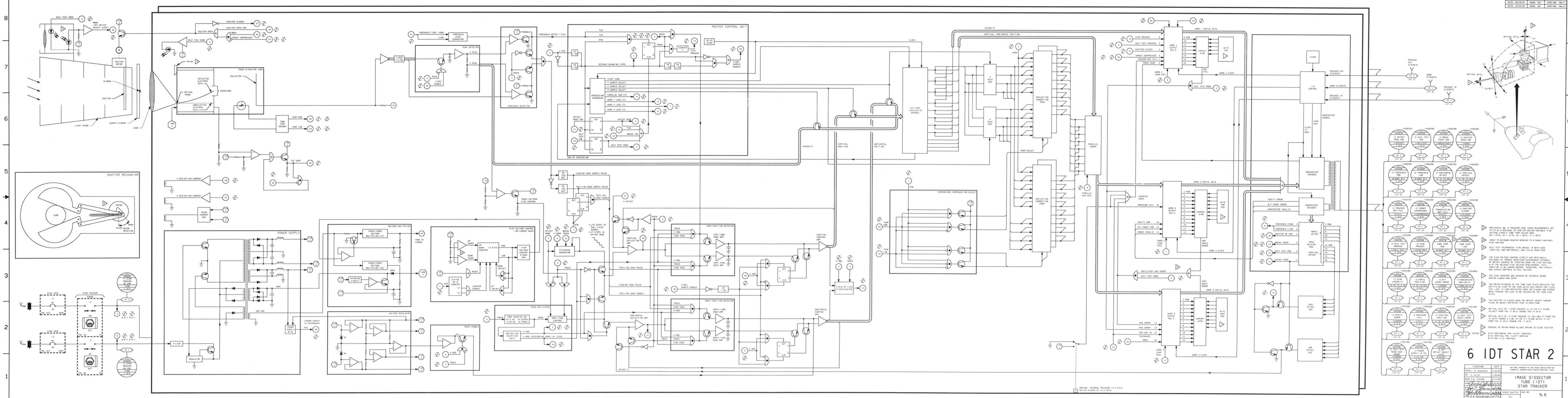


BASIC REV E-6

# 6 STAR 1

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DR. V. DOGGERT	11/10/78	LINDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR. E. TRICA	11/10/78	
<b>STAR TRACKER</b>		
DR. V. DOGGERT DR. E. TRICA CAPT. J. B. ... LTR E		SPACE SHUTTLE ALL 9.6 104.5.3.34 PAGE 1 OF 3

BASIC REV E-6



BASIC REV E-3

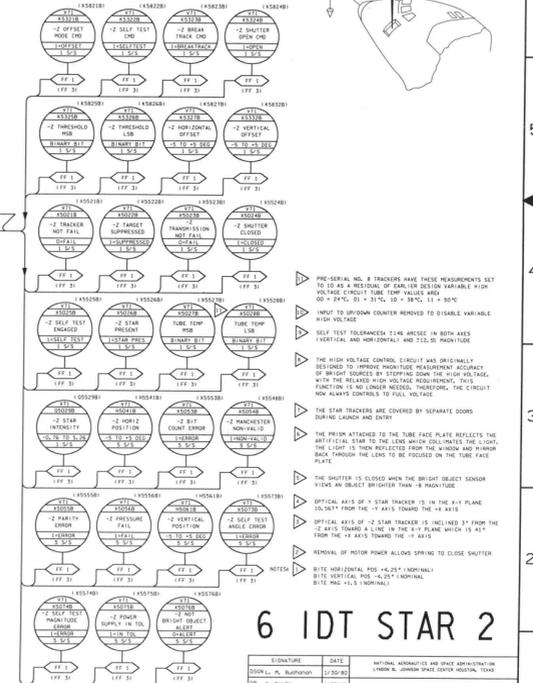
**6 IDT STAR 2**

IMAGE DISECTOR TUBE (IDT) STAR TRACKER

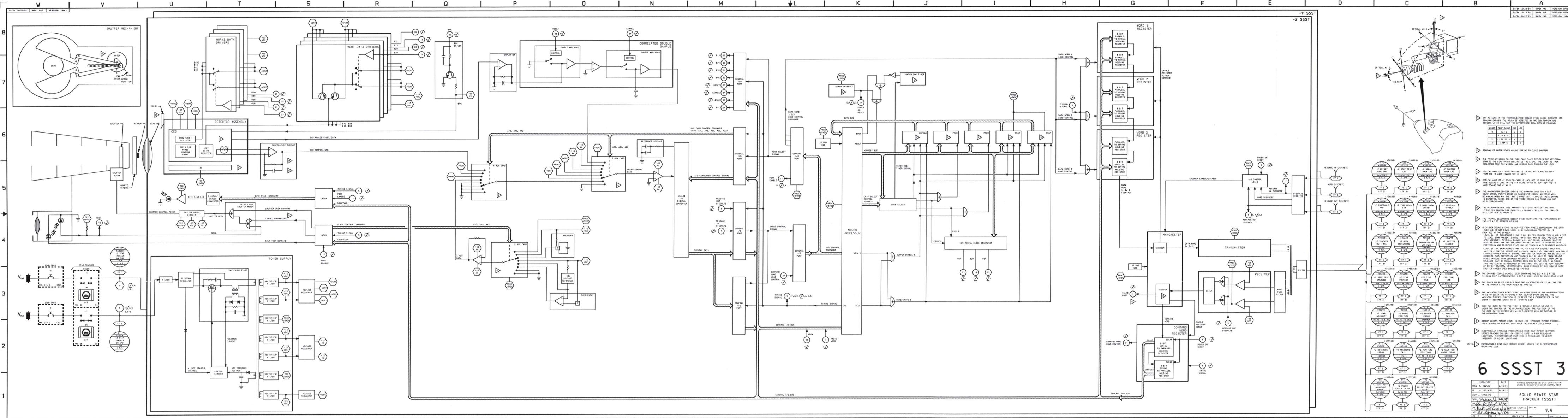
DATE: 12/20/80  
 DESIGNED BY: M. R. BUSHMAN  
 DRAWN BY: M. R. BUSHMAN  
 CHECKED BY: M. R. BUSHMAN  
 APPROVED BY: M. R. BUSHMAN

9.6

BASIC REV E-3



- PRE-HEAT NO. 3 TRACKER AREA THESE MEASUREMENTS SET TO 24 AS A MEASURE OF EARLY DESIGN VARIABLE WITH 80 = 24°C, 01 = 31.7L, 10 = 38°C, 11 = 50°C
- SHUT TO OFF POSITION COUNTER SHOULD BE DIVISIBLE VARIABLE
- SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- THE HIGH VOLTAGE CONTROL CIRCUIT HAS SPECIFICALLY DESIGNED TO IMPROVE PROXIMITY MEASUREMENT ACCURACY OF 0.1 INCHES BY TYPING DOWN THE HIGH VOLTAGE WITH THE RELEASED HIGH VOLTAGE REDUCED, THIS FUNCTION IS NO LONGER NEEDED, THEREFORE, THE CIRCUIT NOW ALWAYS CONTROLS TO FULL VOLTAGE
- THE STAR TRACKERS ARE COVERED BY SEPARATE DOORS
- THE FRONT ATTACHED TO THE TUBE FACE PLATE REFLECTS THE SHUT LIGHT TO THE LOW WINDOW WHICH ILLUMINATES THE LENS, SHUT THROUGH THE LENS TO BE FOCUSED ON THE TUBE FACE PLATE
- THE SHUTTER IS CLOSED WHEN THE BRIGHT OBJECT SENSOR DETECTS AN OBJECT BROADER THAN 18 MICRONS
- OPTICAL AXIS OF 2 STAR TRACKER IS IN THE X-Y PLANE 10.641° FROM THE -Y AXIS TOWARD THE +X AXIS
- OPTICAL AXIS OF 2 STAR TRACKER IS INCLUDED FROM THE 2.4 INCH TOWARD A LONG IN THE Y-Y PLANE OFFER IN 4.1° FROM THE +X AXIS TOWARD THE -Y AXIS
- REMOVING OF MOTOR POWER ALLOWS SPRING TO CLOSE SHUTTER
- NOTE: 1. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 2. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 3. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 4. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 5. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 6. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 7. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 8. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 9. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 10. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 11. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 12. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 13. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 14. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 15. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 16. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 17. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 18. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 19. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 20. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 21. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 22. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 23. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 24. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 25. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 26. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 27. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 28. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 29. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 30. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY
- 31. SELF TEST TOLERANCES 1 INH. ARCS IN BOTH AXES VERTICAL AND HORIZONTAL AND 11.0 IN. PROXIMITY



ANY FAILURE IN THE THERMOELECTRIC COOLER (TEC) WHICH DISRUPTS ITS COOLING CAPABILITY, WHICH BE DETECTED BY THE COOL TEMPERATURE SENSORS WHICH WILL SET THE APPROPRIATE DATA BITS AS FOLLOWS:

ZONES	TEMP RANGE	MSB	LSB
1	22° C	1	1
2	13 TO 21° C	0	1
3	11 TO 23° C	1	0
4	23 TO 27° C	1	1

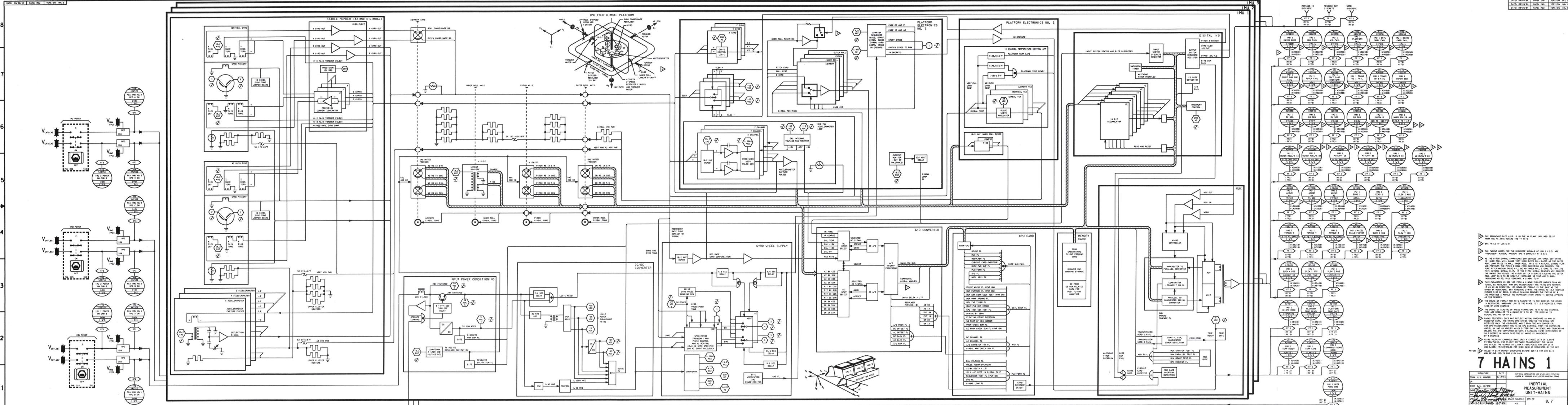
- REMOVAL OF MOTOR POWER ALLOWS SPRING TO CLOSE SHUTTER
- THE PRESSURE ATTACHED TO THE TUBE FACE PLATE REFLECTS THE ARTIFICIAL STAR TO THE LENS WHICH COLLIMATES THE LIGHT, THE LIGHT IS THEN REFLECTED FROM THE WINDOW AND THROUGH THE LENS THROUGH THE WINDOW
- OPTICAL AXIS OF -2 STAR TRACKER IS INCLUDED 3° FROM THE -2 STAR TRACKER LENS IN THE X-Y PLANE WHICH IS 41° FROM THE X-Y AXIS TOWARD THE -Y AXIS
- THE MANCHESTER DECODER CHECKS THE COMMAND WORD FOR A BIT ERROR. PARTIAL ERROR OR MANCHESTER ERROR OR ERROR WILL BE ANNUNCIATED VIA THE "VALID WORD BIT" IF ONE OF THESE ERRORS IS DETECTED, WHILE ONE OF THE THREE ERRORS WAS FOUND CAN NOT BE DIFFERENTIATED
- THE MICROPROCESSOR WILL ANNUNCIATE A STAR TRACKER FAIL BIT IF THE COOL TEMPERATURE EXCEEDS 23 DEGREES CELSIUS. THE TRACKER WILL CONTINUE TO OPERATE
- THE THERMAL ELECTRONIC COOLER (TEC) MAINTAINS THE TEMPERATURE OF THE COOL AT 20 DEGREES CELSIUS
- HIGH BACKGROUND SIGNAL IS DERIVED FROM PIVALS SURROUNDING THE STAR IMAGE AND IS NOT DOWNLEADED. HIGH BACKGROUND PROTECTION IS PROVIDED AT TWO LEVELS:
  - LEVEL 1 - IF BACKGROUND IS MAG 2.00 (200 PPM COUNTS) THEN A AND V SET TO ZERO. STAR PRESENT SIGNAL, INVERTED, AND TO SET. PROTECTS HIGH SPEC ACCURACY. PHYSICAL DAMAGE WILL NOT OCCUR, ALTHOUGH SHUTTER POSITION OPEN AND SHUTTER OPEN CAN BE USED TO DISARM THIS PROTECTION
  - LEVEL 2 - IF BACKGROUND IS MAG 10.769 FOR COUNTS THEN HIGH SHUTTER CLOSE ON ISSUED AND LATCHED. ONLY 107 TRACKERS MAY BE LATCHED RATHER THAN 10. SHUTTER OPEN CAN BE USED TO DISARM THIS PROTECTION. SHUTTER OPEN CAN BE USED TO DISARM THIS PROTECTION. THIS PROTECTION IS REQUIRED BY HIGH SPEC. THE SSST IS VERY TOLERANT OF BRIGHT OBJECTS, UNEXPECTED, LOG TRACKING OF SUN VIEWING WITH SHUTTER FORCED OPEN SHOULD BE AVOIDED
- THE CHANGED SOURCE DEVICE (COD) CONTAINS THE 512 X 512 PIXEL SILICON CHIP APPROXIMATELY 2 CM X 8 CM IN SIZE USED TO SENSE STAR LIGHT
- THE POWER ON RESET ENURES THAT THE MICROPROCESSOR IS INITIALIZED IN THE PROPER STATE WHEN POWER IS APPLIED
- THE WATCHDOG TIMER RESETS THE MICROPROCESSOR IF THE MICROPROCESSOR FAILS TO CLEAR THE WATCHDOG TIMER EVERY 250 MS. THE WATCHDOG TIMER'S FUNCTION IS TO RESET THE MICROPROCESSOR IN THE EVENT IT BECOMES STUCK IN AN INFINITE LOOP
- EACH MUX CARD SWITCH POSITION IS MUTUALLY EXCLUSIVE AND IS UNDER THE CONTROL OF THE MICROPROCESSOR. THE POSITION OF THE MUX CARD SWITCH DETERMINES WHICH PARAMETER WILL BE SAMPLED BY THE MICROPROCESSOR
- RANDOM ACCESS MEMORY (RAM) IS USED FOR TEMPORARY MEMORY STORAGE. THE CONTENTS OF RAM ARE LOST WHEN THE TRACKER LOSES POWER
- ELECTRICALLY ERASABLE PROGRAMMABLE READ ONLY MEMORY (EEPROM) STORES TRACKER EVALUATION COEFFICIENTS BY FOUR REDUNDANT LOCATIONS. MICROPROCESSOR USES CYCLIC REDUNDANCY TO VERIFY INTEGRITY OF MEMORY LOCATIONS
- PROGRAMMABLE READ ONLY MEMORY (PROM) STORES THE MICROPROCESSOR OPERATING CODE

## 6 SSST 3

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DR. M. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. L. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. J. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. K. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. L. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. M. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. N. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. O. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. P. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. Q. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. R. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. S. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. T. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. U. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. V. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. W. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. X. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. Y. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT
DR. Z. STALLARD	02-24-73	WORK IN PROGRESS UNDER CONTRACT

**SOLID STATE STAR TRACKER (SSST)**

9.6  
126.9.3.34  
PAGE 3 OF 3



BASIC REV E-4

DATE	DR/SP/SL	NAME	REV	VERSION	SP/2
08/30/54	W	W	1	1.0	
08/30/54	V	V	1	1.0	
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08/30/54	T	T	1	1.0	
08/30/54	S	S	1	1.0	
08/30/54	R	R	1	1.0	
08/30/54	O	O	1	1.0	
08/30/54	P	P	1	1.0	
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08/30/54	J	J	1	1.0	
08/30/54	I	I	1	1.0	
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**7 HAINS 1**

INERTIAL MEASUREMENT UNIT-HAINS

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 SP/2: 1

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 REV: 1  
 VERSION: 1.0  
 SP/2: 1

DATE: 08/30/54  
 NAME: U  
 REV: 1  
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 SP/2: 1

DATE: 08/30/54  
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 VERSION: 1.0  
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 VERSION: 1.0  
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DATE: 08/30/54  
 NAME: R  
 REV: 1  
 VERSION: 1.0  
 SP/2: 1

DATE: 08/30/54  
 NAME: O  
 REV: 1  
 VERSION: 1.0  
 SP/2: 1

DATE: 08/30/54  
 NAME: P  
 REV: 1  
 VERSION: 1.0  
 SP/2: 1

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 SP/2: 1

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 VERSION: 1.0  
 SP/2: 1

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 REV: 1  
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 SP/2: 1

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 SP/2: 1

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 REV: 1  
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 SP/2: 1

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 SP/2: 1

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 REV: 1  
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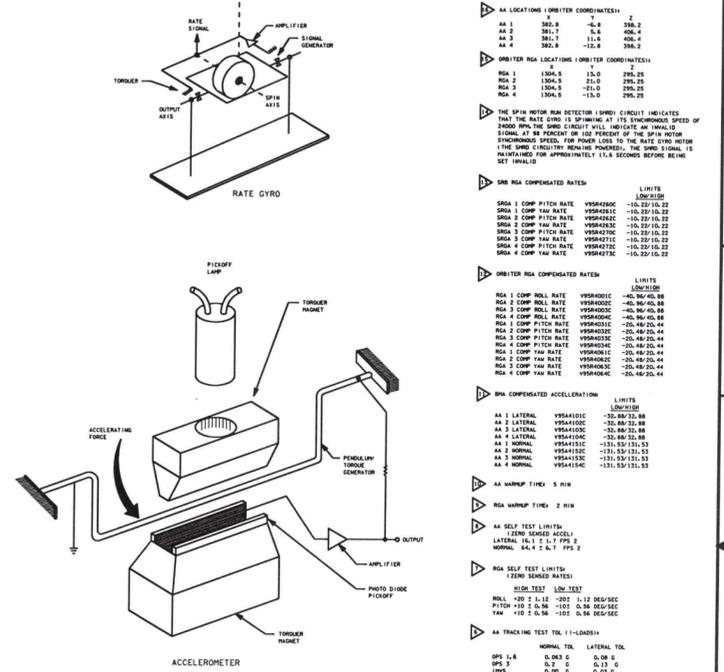
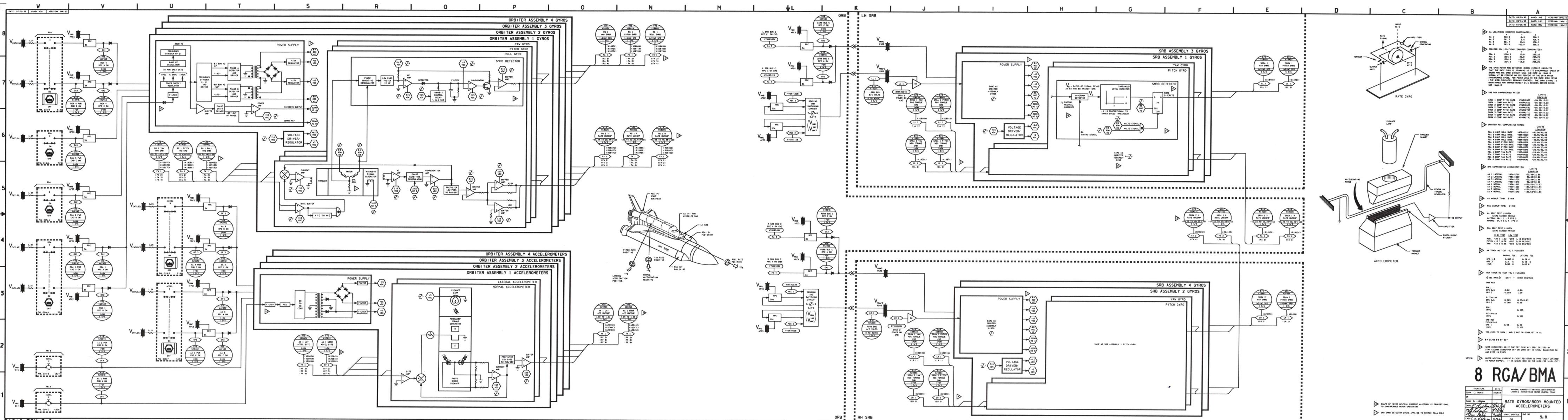
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 SP/2: 1

DATE: 08/30/54  
 NAME: B  
 REV: 1  
 VERSION: 1.0  
 SP/2: 1

DATE: 08/30/54  
 NAME: A  
 REV: 1  
 VERSION: 1.0  
 SP/2: 1

BASIC REV E-4



AA LOCATIONS (ORBITER COORDINATES)	LIMITS
AA 1	± 0.2
AA 2	± 0.2
AA 3	± 0.2
AA 4	± 0.2
SRB RA LOCATIONS (ORBITER COORDINATES)	
SRB RA 1	± 0.2
SRB RA 2	± 0.2
SRB RA 3	± 0.2
SRB RA 4	± 0.2
SRB RA COMPENSATED RATES	LIMITS
SRB 1 COMP PITCH RATE	± 0.2
SRB 2 COMP PITCH RATE	± 0.2
SRB 3 COMP PITCH RATE	± 0.2
SRB 4 COMP PITCH RATE	± 0.2
ORBITER RA COMPENSATED RATES	
ORA 1 COMP PITCH RATE	± 0.2
ORA 2 COMP PITCH RATE	± 0.2
ORA 3 COMP PITCH RATE	± 0.2
ORA 4 COMP PITCH RATE	± 0.2
SRB COMPENSATED ACCELERATION	LIMITS
AA 1 LATERAL	± 0.2
AA 2 LATERAL	± 0.2
AA 3 LATERAL	± 0.2
AA 4 LATERAL	± 0.2
AA 1 NORMAL	± 0.2
AA 2 NORMAL	± 0.2
AA 3 NORMAL	± 0.2
AA 4 NORMAL	± 0.2

**8 RGA/BMA**

**RATE GYROS/BODY MOUNTED ACCELEROMETERS**

DATE: 07/25/76  
 DRAWN: L. DAVIS  
 CHECKED: J. J. [Signature]  
 DESIGNED: E. L. [Signature]  
 APPROVED: [Signature]

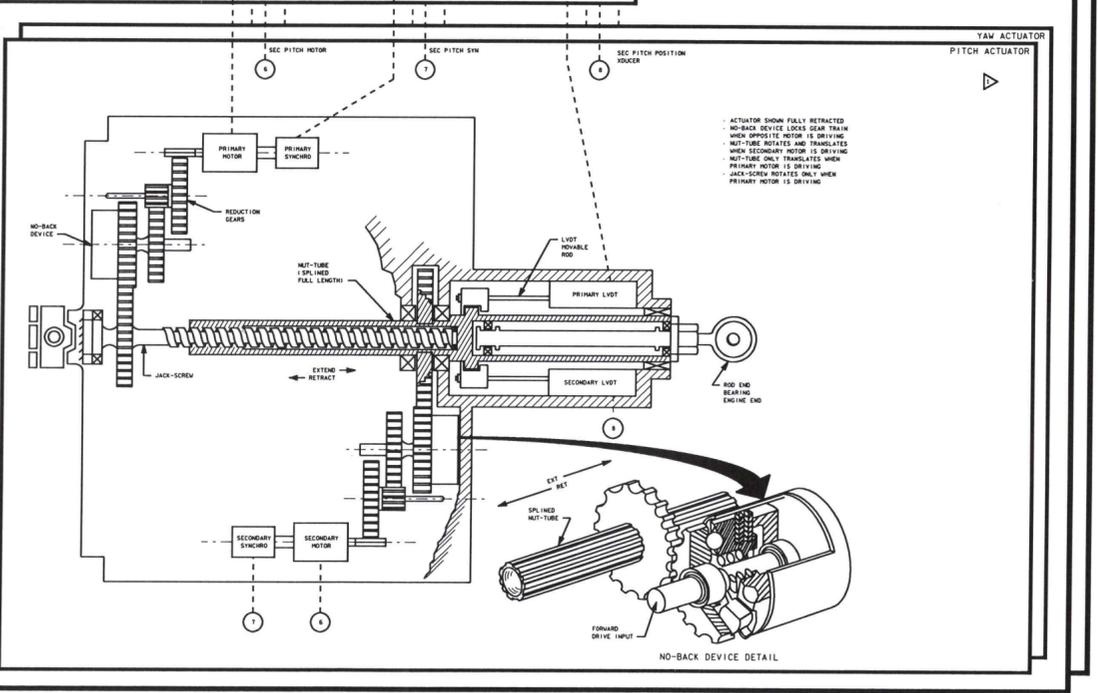
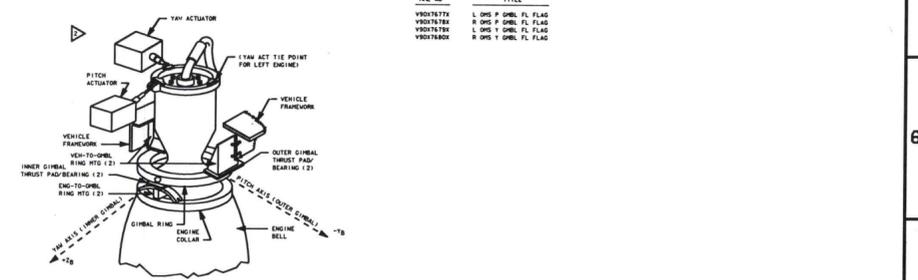
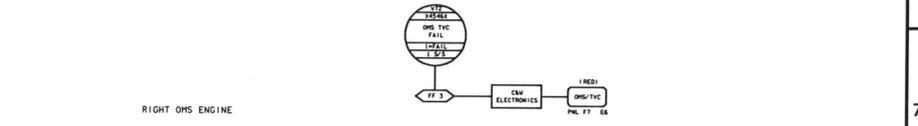
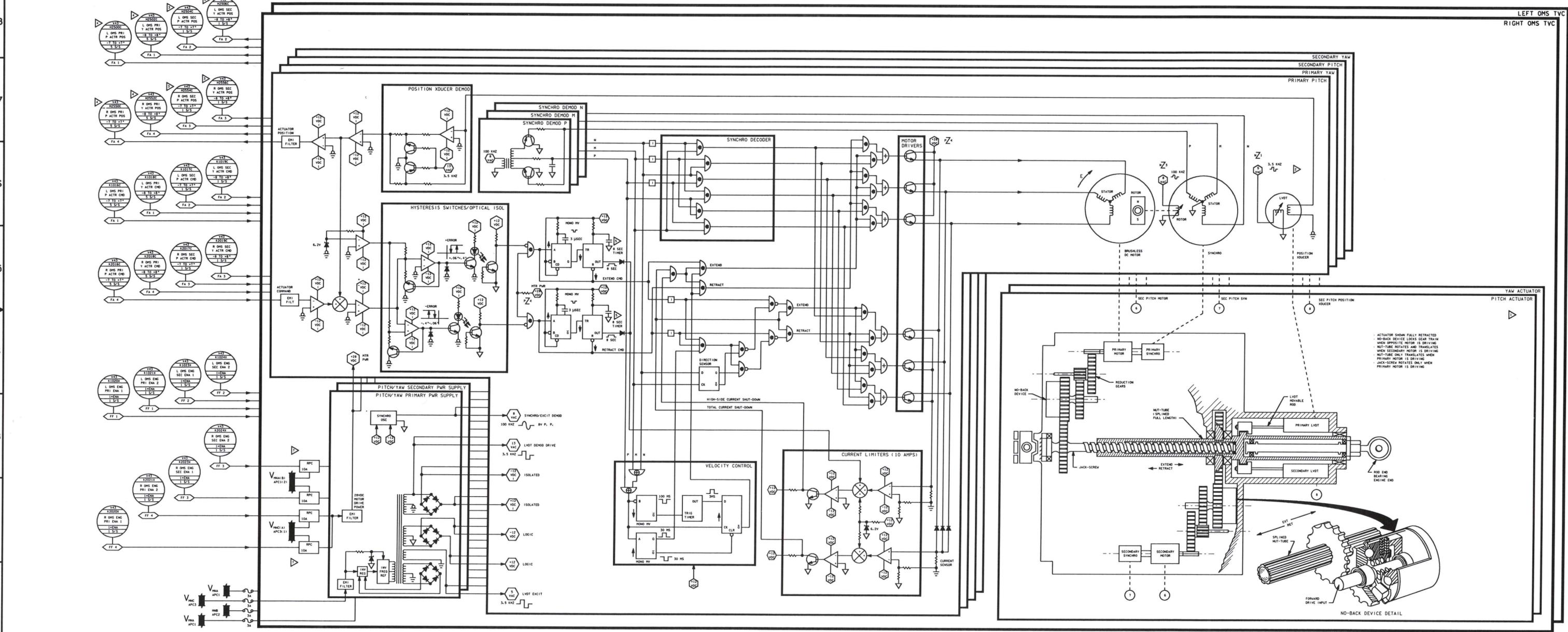
9. 8









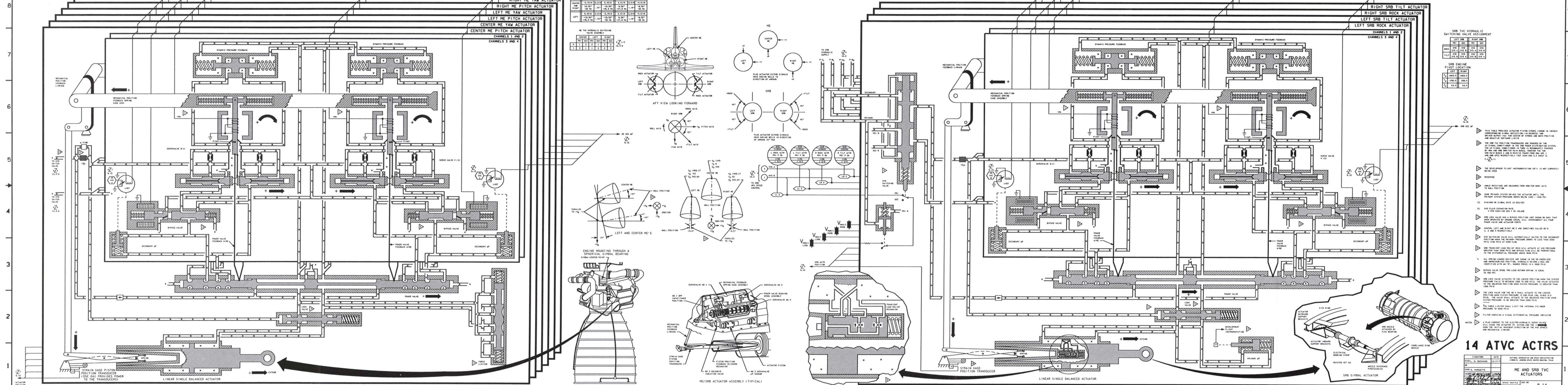


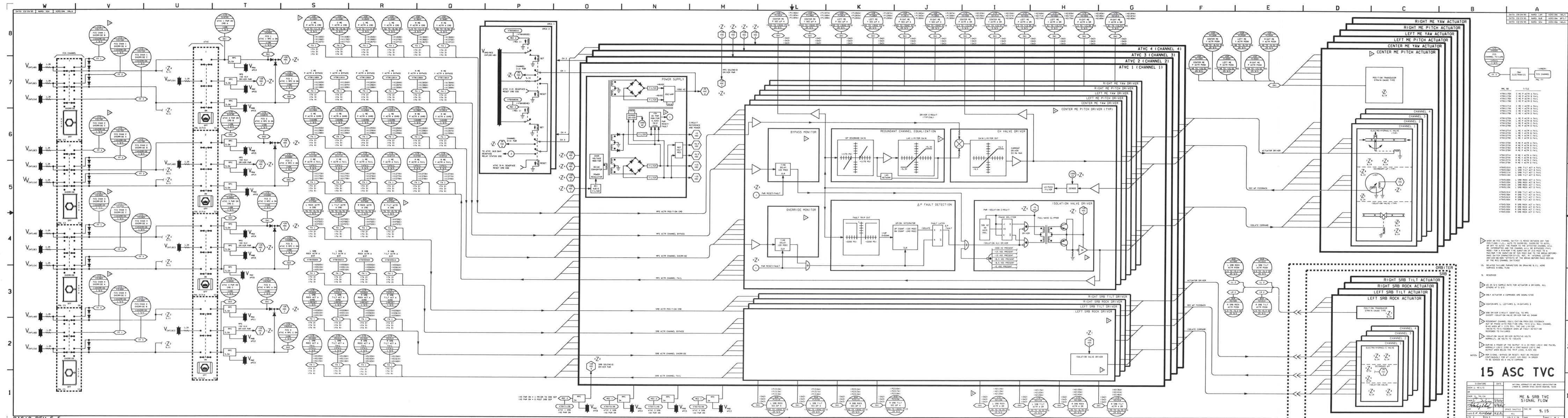
- Each TVC system (PRI or SEC) requires both RPN's (RPN's are NOT REDUNDANT POWER SOURCES). EACH AXIS REQUIRES A MAXIMUM OF 6.5 AMPS (1.88 WATTS).
- Each TVC consists of two controllers. The PRIMARY CONTROLLER drives the PRIMARY PITCH AND YAW. THE SECONDARY CONTROLLER drives the SECONDARY PITCH AND YAW.
- When R SEC (1.3 SEC) TIMER TIMES OUT, THE CURRENT LIMITER THRESHOLD VALUE CHANGES FROM 10 AMPS TO A VALUE EQUAL TO 25 PERCENT OF NORMAL POWER TO MOTOR.
- THE SAMPLE RATE IS 20 S/S IN OPS 8 & 22.5 S/S IN OPS 9 AND 1 S/S IN OPS 2.
- THE SAMPLE RATE IS 20 S/S IN OPS 8.
- ACTUATOR MOVEMENT IN ONE AXIS CAUSES A SMALL MOVEMENT OF THE ENGINE POSITION IN THE OTHER AXIS WHICH DOES NOT SHOW IN THE POSITION TRANSDUCER OUTPUT BECAUSE THE TRANSDUCER IS MEASURING ACTUATOR LENGTH AND NOT THE ENGINE GIMBAL ANGLE.

NOTES

GIMBAL ACTUATOR PERFORMANCE DATA	
STROKE	PITCH 3.78 IN YAW 4.38 IN
HYSTERESIS	DEADZONE ±.125 IN HYSTERESIS ±.1 IN
ACCELERATION	20.7 IN/SEC <sup>2</sup> MIN 51.3 IN/SEC <sup>2</sup> RATE

13 OMS/TVC & DR	
DESIGN	L. BACHMANN
DATE	7/24/79
DR	
ENGR	L. A. BERNHARDT
CHKD	
APP'D	
CAUSE	
REV	





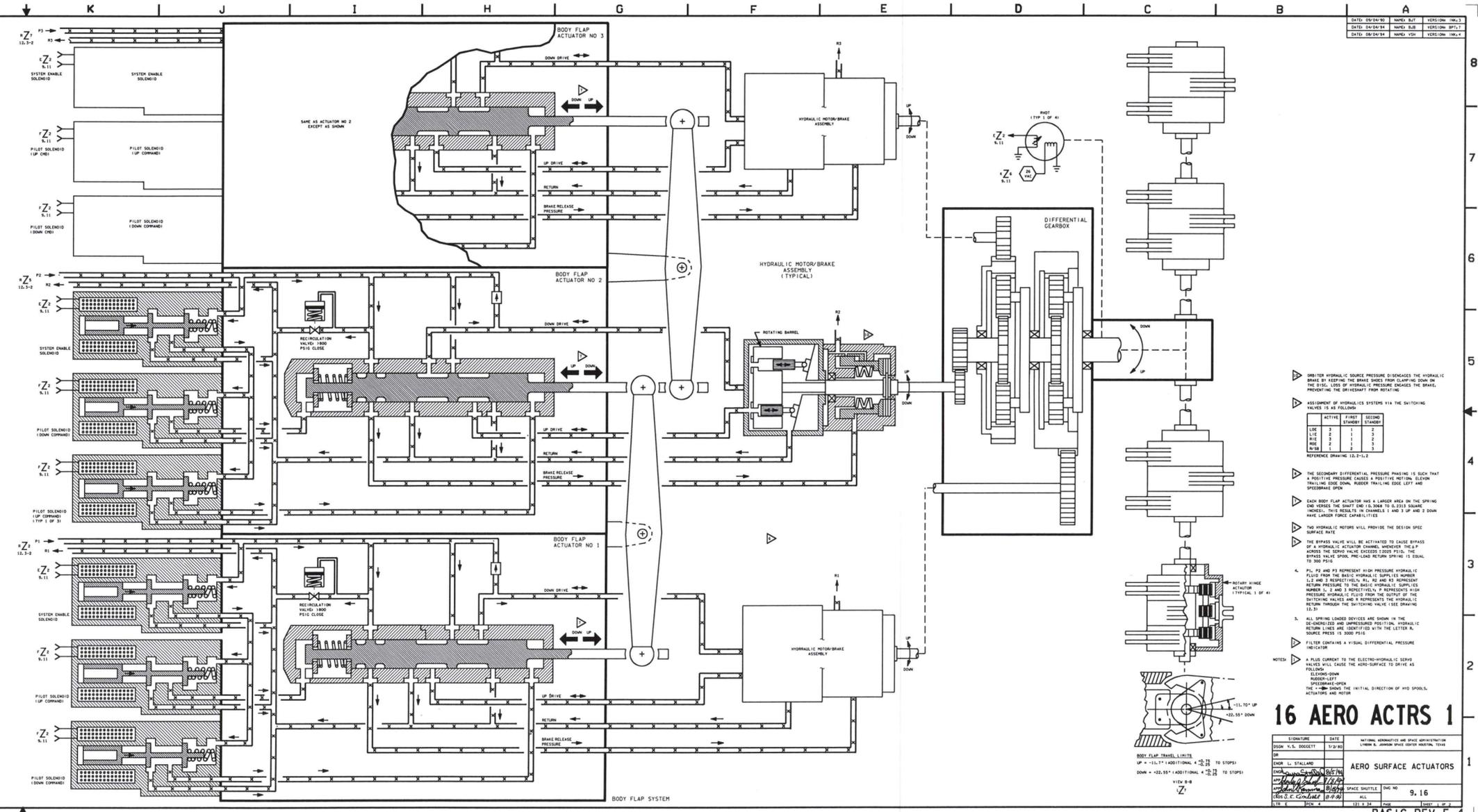
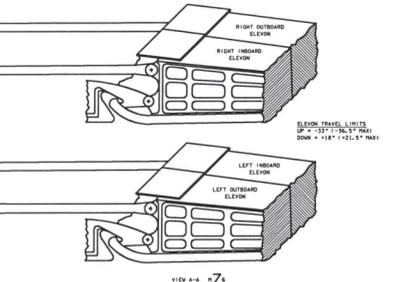
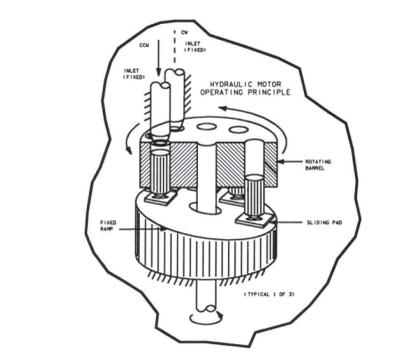
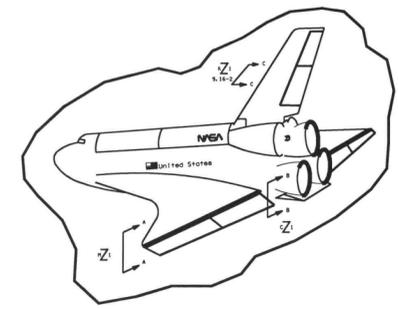
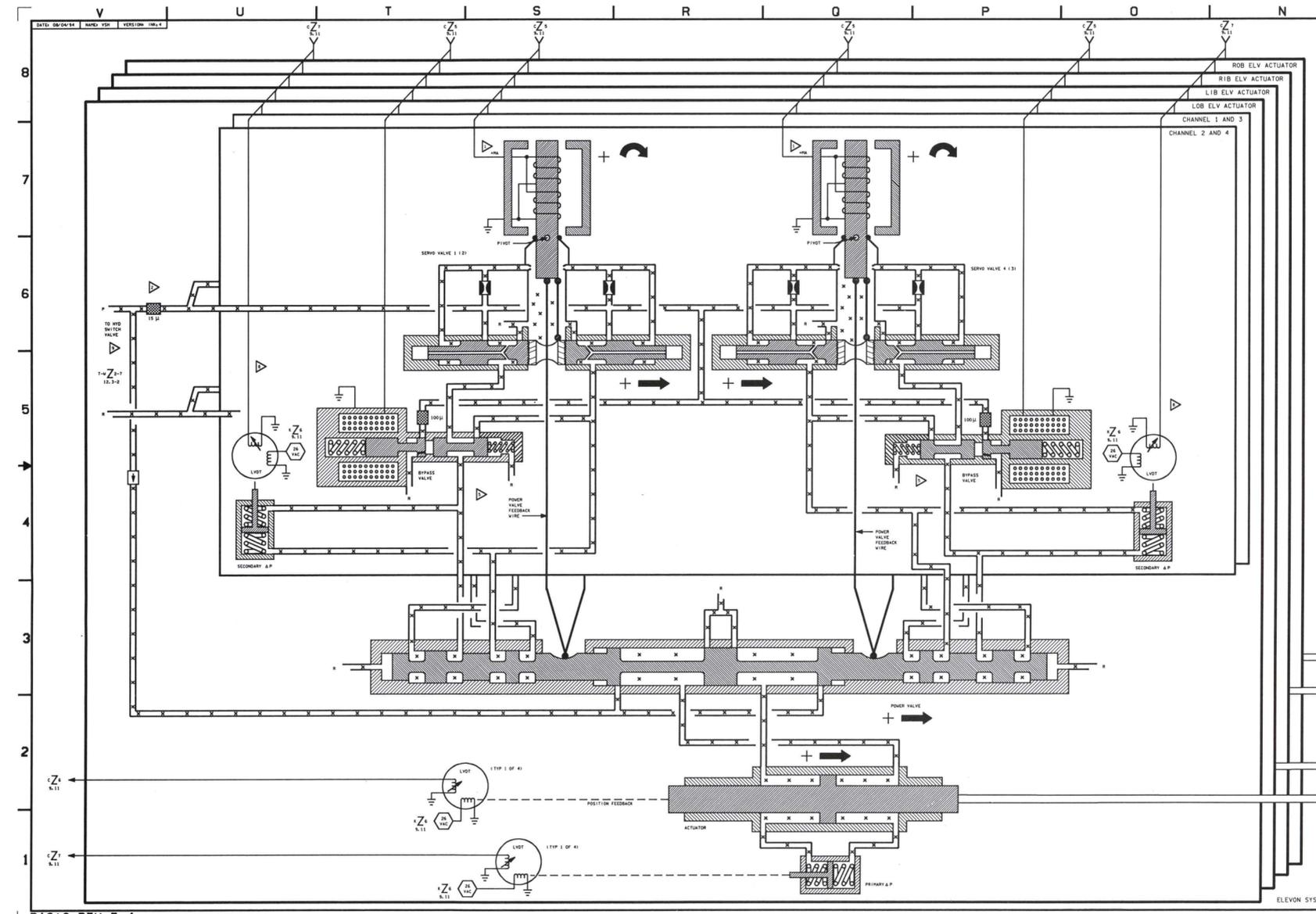
DATE	REV	BY	CHK	APP	DESCRIPTION
03/29/95	1	W	U	T	INITIAL DESIGN
03/29/95	2	W	U	T	REVISED FOR MANUFACTURING
03/29/95	3	W	U	T	REVISED FOR MANUFACTURING

REV	NO	DESCRIPTION
1	1	INITIAL DESIGN
2	2	REVISED FOR MANUFACTURING
3	3	REVISED FOR MANUFACTURING
4	4	REVISED FOR MANUFACTURING
5	5	REVISED FOR MANUFACTURING
6	6	REVISED FOR MANUFACTURING
7	7	REVISED FOR MANUFACTURING
8	8	REVISED FOR MANUFACTURING
9	9	REVISED FOR MANUFACTURING
10	10	REVISED FOR MANUFACTURING
11	11	REVISED FOR MANUFACTURING
12	12	REVISED FOR MANUFACTURING
13	13	REVISED FOR MANUFACTURING
14	14	REVISED FOR MANUFACTURING
15	15	REVISED FOR MANUFACTURING
16	16	REVISED FOR MANUFACTURING
17	17	REVISED FOR MANUFACTURING
18	18	REVISED FOR MANUFACTURING
19	19	REVISED FOR MANUFACTURING
20	20	REVISED FOR MANUFACTURING

WHEN AN FCS CHANNEL SWITCH IS MOVED BETWEEN ANY TWO POSITIONS (I.E., AUTO TO OVERRIDE, OVERRIDE TO AUTO, OR OFF TO AUTO), THE POSITION OF THE AFFECTED CHANNEL WILL BE DETERMINED AND THE CHANNEL WILL BE BYPASSED. IT WILL MODE FOR A MINIMUM TIME QUANTITY OF 210 MSEC TO A MAXIMUM TIME QUANTITY OF 100 MSEC TO THE NEAREST BEFORE MAKE SWITCH CHARACTERISTICS. REF. BY INTERNAL LETTER 882-004-000-0000 FOR THE BREAK-BEFORE-MAKE DESIGN OF THE R/C CHANNEL SWITCHES.

- 10. RELATED FAILURE PARAMETERS DRAWING N11, ZERO SURFACE SIGNAL, FLOW
- 11. RECEIVED
- 12. AS 25 S/S SAMPLE RATE FOR ACTUATOR DRIVERS, ALL OTHERS AT 5 S/S
- 13. ONLY ACTUATOR A COMMANDS ARE DOWNLISTED
- 14. CHANNELS 1, 1 LEFT/MS 3, RIGHT/MS 3
- 15. SRB DRIVER CIRCUIT IDENTICAL TO MS3 EXCEPT ISOLATION VALVE DRIVER PUMP AS SHOWN
- 16. REDUNDANT CHANNEL EQUALIZATION PROVIDES FEEDBACK OUT OF PHASE 90 DEGREE FROM CDR. THIS WILL BEAL CHANNEL. THIS FEEDBACK WHEN AP FAULT DETECTION RESPONSE IS FAILED.
- 17. ISOLATION VALVE DRIVER OUTPUT VOLTAGE NORMALLY 28 VOLTS TO ISOLATE
- 18. DURING A POWER UP THE OUTPUT IS A 20 MSEC LOGIC ONE PULSE. NORMALLY LOGIC ONE ON A CONTINUOUS LOGIC ONE OUTPUT WHEN BELOW THE TRIP LEVEL 4.425 VDC
- 19. NON ISOLATION BYPASS OR RESET MUST BE PRESENT CONTINUOUSLY FOR AT LEAST 100 MSEC IN ORDER TO BE SENSED AS A VALID COMMAND

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CDR R. L. TRULLA		3/29/95	ME & SRB TVC SIGNAL FLOW
ENG R. J. KIRK		3/29/95	
CDR E. K. KIRK		4/2/95	9.15
CDR E. K. KIRK		4/2/95	9.15



- ORATOR HYDRAULIC SOURCE PRESSURE DEBARRS THE HYDRAULIC BRAKE BY KEEPING THE BRAKE PRESSURE FROM CLIPPING DOWN ON THE STOP. LOSS OF HYDRAULIC PRESSURE CHECKS THE BRAKE, PREVENTING THE DRIVEHAFT FROM ROTATING.
- ASSIGNMENT OF HYDRAULICS SYSTEMS VIA THE SWITCHING VALVES IS AS FOLLOWS:

VALVE	ACTIVE	STANDBY
1	1	2
2	2	1
3	3	1
4	1	2
5	2	3
6	3	1

- THE SECONDARY DIFFERENTIAL PRESSURE PHENOMENON IS SUCH THAT A POSITIVE PRESSURE CAUSES A POSITIVE MOTION, ELEVON TRAILING EDGE DOWN, WINGER TRAILING EDGE LEFT AND SPEEDBRAKE OPEN.
- EACH BODY FLAP ACTUATOR HAS A LARGER AREA ON THE SPRING END VERSUS THE SHUNT END TO COVER TO 0.333 SQUARE INCHES; THIS RESULTS IN CHANNELS 1 AND 3 UP AND 2 DOWN HAVE LARGER FORCE CAPABILITY.
- TWO HYDRAULIC MOTORS WILL PROVIDE THE DESIGN SPEC SURFACE RATE.
- THE BYPASS VALVE WILL BE ACTIVATED TO CAUSE BYPASS OF A HYDRAULIC ACTUATOR CHANNEL. WHENEVER THE BYPASS VALVE SPUR, PRE-LOAD RETURN SPRING IS EQUAL TO 300 PSIG.
- P1, P2 AND P3 REPRESENT HIGH PRESSURE HYDRAULIC FLUID FROM THE BASIC HYDRAULIC SUPPLY NUMBER 1, 2 AND 3 RESPECTIVELY. P4, P5 AND P6 REPRESENT PRESSURE HYDRAULIC FLUID FROM THE SUPPLY OF THE SWITCHING VALVES AND B REPRESENTS THE HYDRAULIC RETURN THROUGH THE SWITCHING VALVE LINE DRAWING (12-3).
- ALL SPRING LOADED DEVICES GO DOWN IN THE DE-COMBINED AND UNPRESSURED POSITION. HYDRAULIC RETURN LINES ARE IDENTIFIED WITH THE LETTER R. SOURCE PRESS IS 3000 PSIG.
- FILTER CONTAINS A VISUAL DIFFERENTIAL PRESSURE INDICATOR.
- A PLUS CURRENT TO THE ELECTRO-HYDRAULIC SERVO VALVES WILL CAUSE THE AERO-SURFACE TO DRIVE AS FOLLOWS: DOWN, REVERSE, LEFT, SPEEDBRAKE-OPEN.
- THE - - - SHOWS THE INITIAL DIRECTION OF W/D SPOOLS, ACTUATOR AND MOTOR.

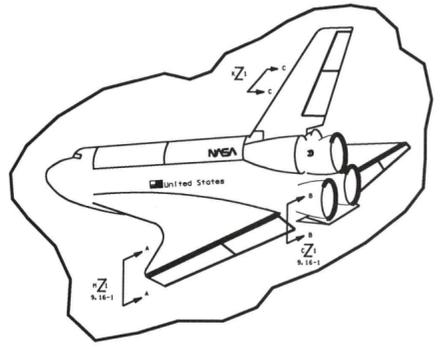
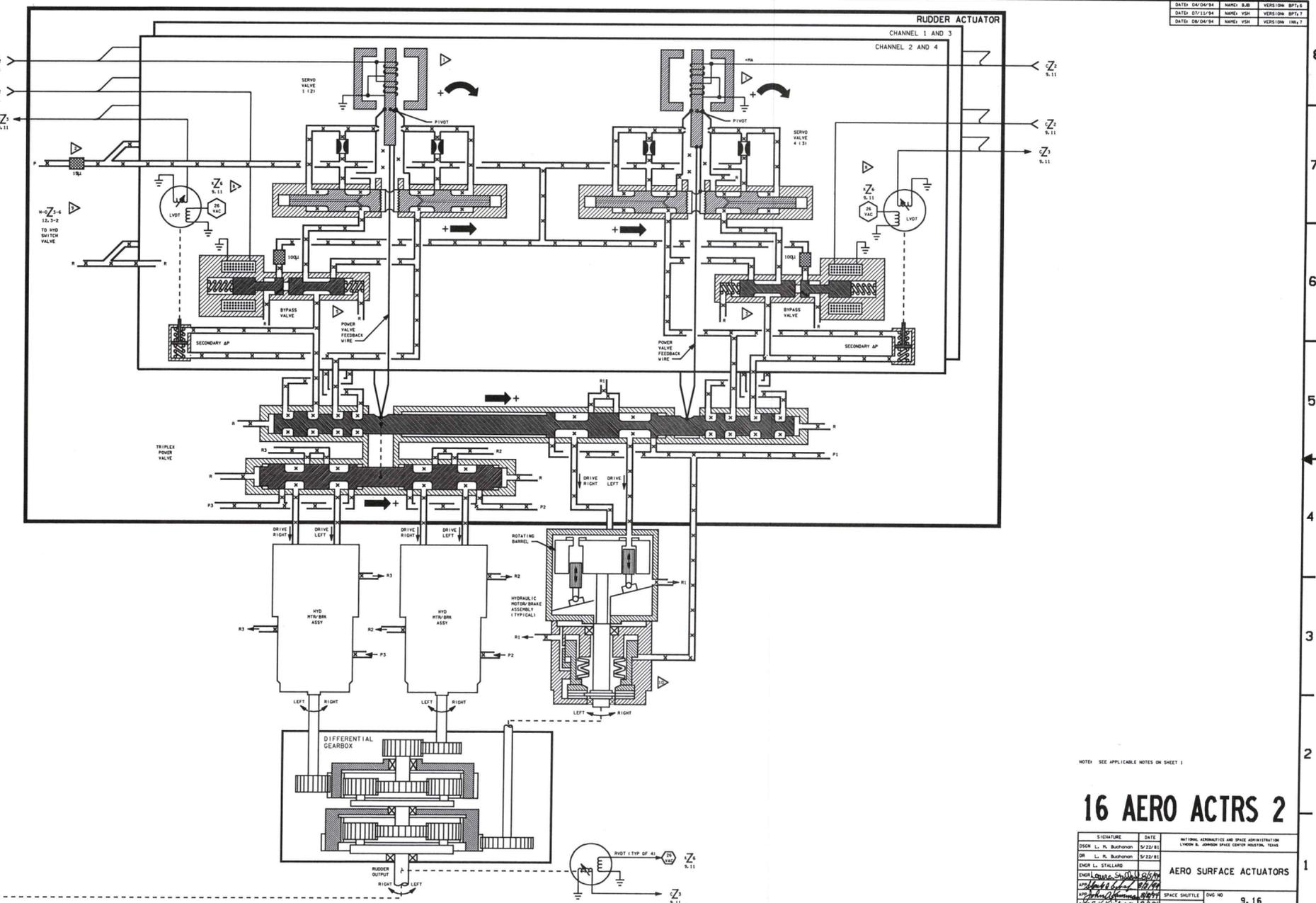
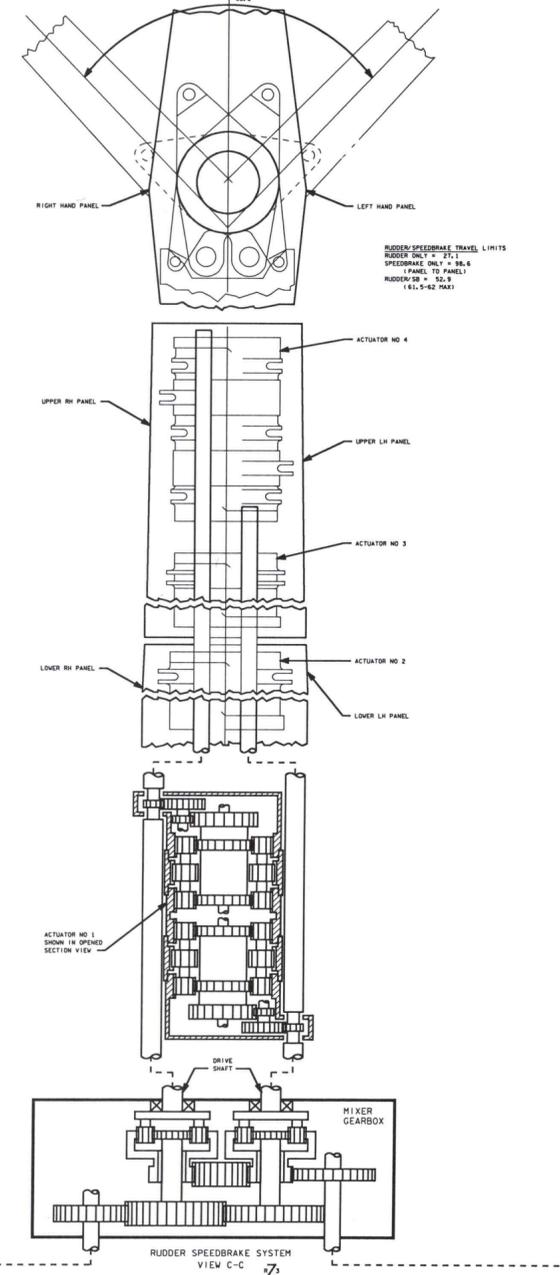
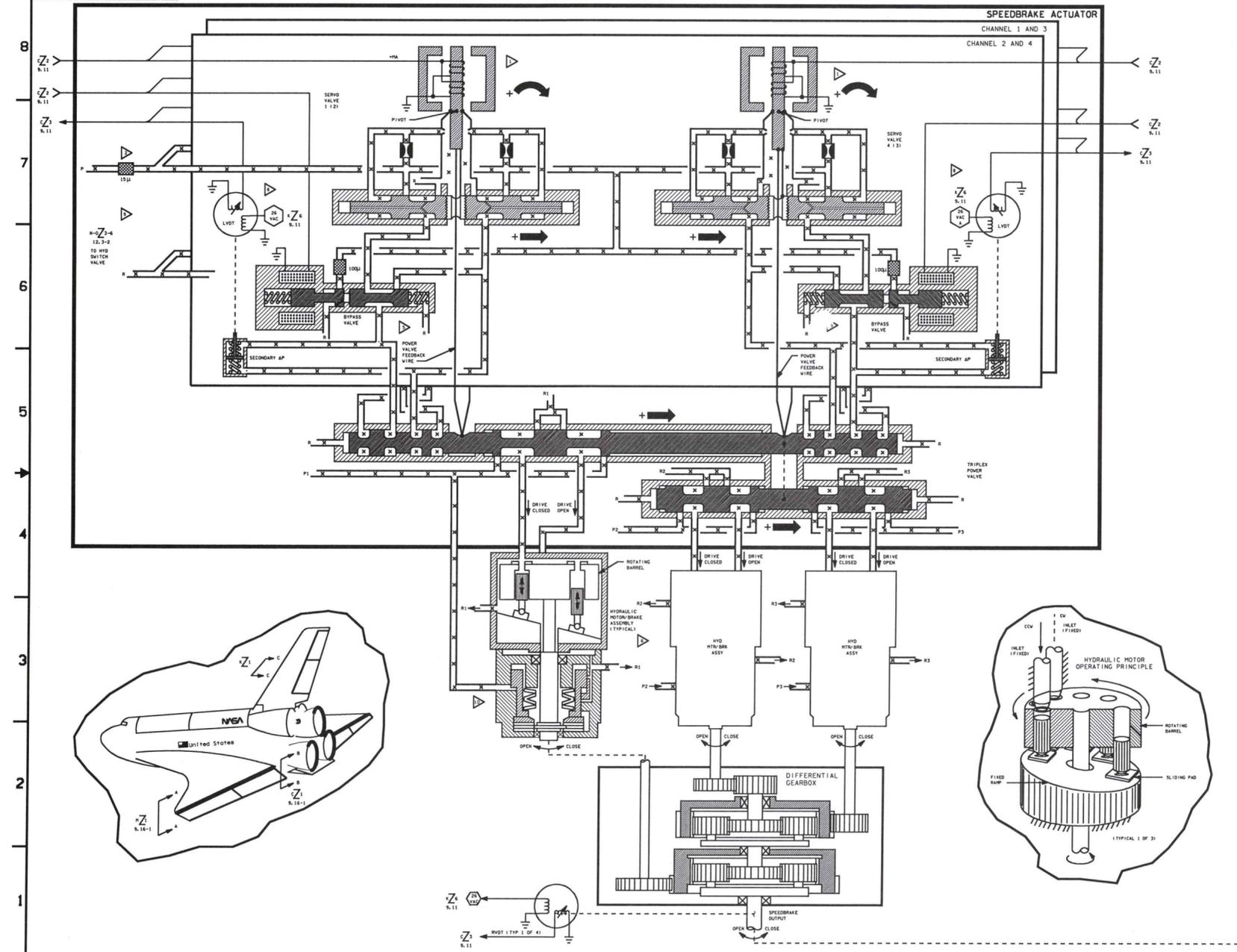
**16 AERO ACTRS 1**

**AERO SURFACE ACTUATORS**

DATE: 08-24-84	VERSION: REV 4	DATE: 08-24-84	VERSION: REV 1
DATE: 08-24-84	VERSION: REV 2	DATE: 08-24-84	VERSION: REV 3
DATE: 08-24-84	VERSION: REV 4	DATE: 08-24-84	VERSION: REV 5

9.16

BASIC REV E-4



NOTE: SEE APPLICABLE NOTES ON SHEET 1

## 16 AERO ACTRS 2

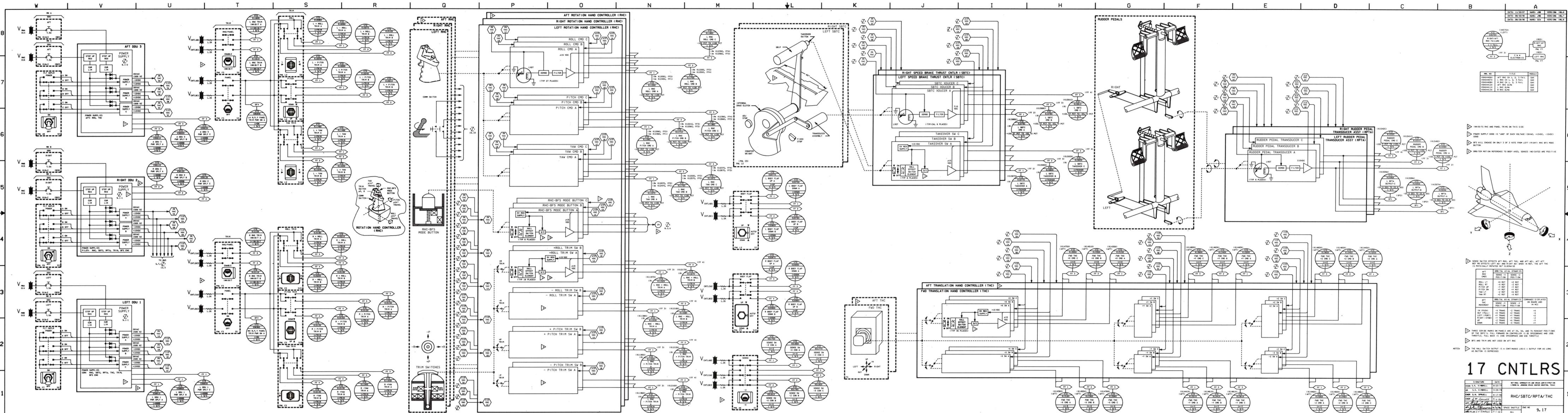
SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ENGR L. K. BUSHROCK	5/25/81	17000 4 - AERO SURFACE ACTUATORS
DR L. K. BUSHROCK	5/25/81	
ENGR L. STALLARD		
ENGR L. STALLARD		
APPROVED FOR RELEASE		
DATE 08-04-94	NAME VSH	VERSION 184.7
DATE 08-04-94	NAME VSH	VERSION 184.7
DATE 08-04-94	NAME VSH	VERSION 184.7

SPACE SHUTTLE DWG NO 9.16

ALL

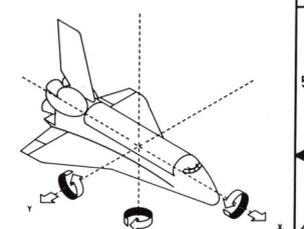
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BASIC REV E-4



REV. NO.	TITLE	MODULE
1	AFT RHC CH. 1, 2, 3 FAIL	CAK
2	AFT RHC CH. 1, 2, 3 FAIL	CAK
3	AFT RHC CH. 1, 2, 3 FAIL	CAK
4	AFT RHC CH. 1, 2, 3 FAIL	CAK
5	AFT RHC CH. 1, 2, 3 FAIL	CAK
6	AFT RHC CH. 1, 2, 3 FAIL	CAK
7	AFT RHC CH. 1, 2, 3 FAIL	CAK
8	AFT RHC CH. 1, 2, 3 FAIL	CAK
9	AFT RHC CH. 1, 2, 3 FAIL	CAK
10	AFT RHC CH. 1, 2, 3 FAIL	CAK

INHIBITS RHC AND PANEL TRIMS ON THIS SIDE  
 POWER SUPPLY GOOD IS AND OF EACH VOLTAGE (+10VDC, -15VDC) GOOD  
 RPS WILL OPERATE ON ONLY 1 OF 3 VOTES FROM LEFT (RIGHT) RHC RPS MODE BUTTON  
 DIRECTION MOTION REFERENCE TO BODY AXES, SENSES INDICATED ARE POSITIVE



AFT	ORBITAL AXIAL DYNAMICS	POSITION
RHC	SENSE -X	SENSE -Z
ROLL LT	+X ROT	+Z ROT
ROLL RT	-X ROT	-Z ROT
PITCH UP	+Y ROT	+X ROT
PITCH DN	-Y ROT	-X ROT
YAW LT	+Z ROT	+Y ROT
YAW RT	-Z ROT	-Y ROT

AFT	ORBITAL AXIAL DYNAMICS	POSITION
RHC	SENSE -X	SENSE -Z
ROLL LT	+X ROT	+Z ROT
ROLL RT	-X ROT	-Z ROT
PITCH UP	+Y ROT	+X ROT
PITCH DN	-Y ROT	-X ROT
YAW LT	+Z ROT	+Y ROT
YAW RT	-Z ROT	-Y ROT

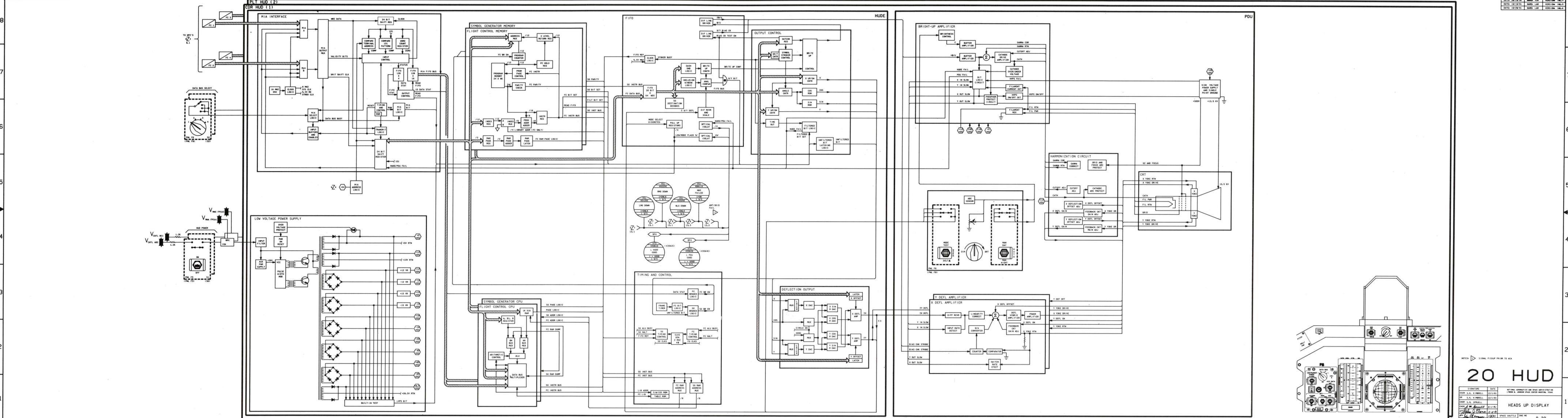
THREE SENSE POINTS ON PANELS ARE AT 50, 50, AND 15 PERCENT POSITIONS OF THE SENSE S. FULL OPERATOR ON CONTROLLER IS 0 (FREEMARK) AND 100% (FULLBACK). FULL BACK IS 100% OPERATOR AND 100% THROTTLE.

RPS AND TRIM ARE NOT USED ON AFT RHC

THE RHC SWITCH OUTPUT IS A CONTINUOUS LOGIC 1 OUTPUT FOR AS LONG AS BUTTON IS DEPRESSED

DATE	BY	REVISION
11/20/87	JMB	1046
08/25/86	JMB	1047
08/25/86	JMB	1048





**20 HUD**

NOTES:  $\nabla$  SIGNAL PICKUP POINT TO A/C

DATE: 08/28/80	BY: S.L. KIMMELL	VERSION: 100_1
DATE: 10/15/81	BY: S.L. KIMMELL	VERSION: 100_2
DATE: 10/28/81	BY: S.L. KIMMELL	VERSION: 100_3

HEADS UP DISPLAY

DATE: 11/18/81  
BY: S.L. KIMMELL  
VERSION: 100\_4

SPACE SHUTTLE DWG NO: 9.20

DATE: 11/18/81  
BY: S.L. KIMMELL  
VERSION: 100\_5

BASIC REV E-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
9.6 (SHEET 1)	STAR TRACKER	R.I.	V570-590202	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		
9.6 (SHEET 3)	STAR TRACKER	BALL	515876	1	A	1/22/90	SCHEMATIC DIAGRAM FOCAL PLANE
		BALL	515879	1	---	9/10/90	SCHEMATIC DIAGRAM SHUTTLE TRACKER POWER SUPPLY
		BALL	515885	1,2,3	B	11/12/89	SCHEMATIC DIAGRAM CIO
		BALL	515888	1,2	C	5/16/90	SCHEMATIC DIAGRAM TRACKER UTILITIES INTERFACE
		BALL	515891	1,2	C	10/9/90	SCHEMATIC DIAGRAM SHUTTLE TRACKER PROCESSOR
BALL	515895	1	A	12/3/90	SCHEMATIC DIAGRAM SSST INTERCONNECT		

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		
9.6	ENGR C.K. ALFORD			ENGR		<b>VENDOR DRAWING REFERENCES</b>		
	ENGR <i>Charles Alford</i>	10/7/93		ENGR				
	ENGR			ENGR				
	ENGR			ENGR				
	ENGR			ENGR				
	ENGR			APP <i>John P. Sumner</i>	10/7/93	SPACE SHUTTLE	TBL NO	<b>9-1</b>
	ENGR			APP <i>John Kamman</i>	10/7/93			
	ENGR			OMNIPLAN		ALL		
	ENGR			LTR E	PCN 3	PAGE 9.1-2	SHEET 2 OF 3	

# 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				
9.7	INERTIAL MEASUREMENT UNIT - HAINS	KEARFOTT	Y256C392			2/91	ORBITER HIGH ACCURACY INERTIAL NAVIGATION SYSTEM TECHNICAL DESCRIPTION				
					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		
9.8	RATE GYROS/BODY-MOUNTED ACCELEROMETERS	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		
				NORTHROP	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
								VS70-590309	1-5	-	10/21/80
VS70-971102	50 (51-53) 101 - 102 (103-104)	-	10/29/85					AIR DATA SYSTEM PATH W (2-4) AIR DATA PROBE RIGHT (LEFT) DEVELOPMENT AND HEATER			
9.10	FCS MODE SWITCHES	R.I.	VS70-733539			B	9/22/83	SCHEMATIC DIAGRAM PANEL F6A8 FWD MAIN CONSOLE FOR ABORT SWITCHES			
				VS70-730249	-	A	3/8/83	SCHEMATIC DIAGRAM D & C ANNUNCIATOR SUBSYSTEM			
				VS70-790209	-	C	12/4/84	SCHEMATIC DIAGRAM DISPLAY & CONTROL SWITCHES FLIGHT CONTROL SUBSYSTEM			
				V070-730284	-	B	9/24/79	PANEL ASSEMBLY - C3A6, CENTER CONSOLE, DISPLAYS AND CONTROLS			
				V070-730325	-	B	1979	PANEL ASSEMBLY - A6C3, AFT CONSOLE, DISPLAYS AND CONTROLS			
				9.11	AERO SURFACE SIGNAL FLOW	R.I.	VS70-790222			C	4/4/79
VS70-790229	-	D	11/11/83					SCHEMATIC DIAGRAM - ASA FLIGHT CONTROLS SUBSYSTEM			
VS70-7790202	-	E	1/11/85					SCHEMATIC DIAGRAM - D & C FLIGHT CONTROLS SUBSYSTEM			
VS70-790209	-	C	12/4/84					SCHEMATIC DIAGRAM - D & C FLIGHT CONTROLS SUBSYSTEM			

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS			
9.7	ENGR G. ALFORD		9.11	ENGR L. STALLARD		<b>VENDOR DRAWING REFERENCES</b>			
	ENGR <i>Charles Alford</i>	4/10/95		ENGR <i>L. Stallard</i>	4/11/95				
9.8	ENGR D. MARQUETTE			ENGR					
	ENGR <i>DAE MARQUETTE</i>	4/10/95		ENGR					
9.9	ENGR K. DUNN			APP		SPACE SHUTTLE	TBL NO	<b>9-1</b>	
	ENGR <i>K. Dunn</i>	4/10/95		APP		ALL			
9-10	ENGR D. J. GRUBER			APP					
	ENGR <i>D.J. Gruber</i>	4/10/95		LTR E	PCN	5	PAGE	9.1-3	SHEET 3 OF :

BASIC REV E-5

# 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
9.12	TRAJECTORY CONTROL SENSOR	NASA	SED39123585	1/1	N/C		Z-AXIS GALVO ASSEMBLY - TRAJECTORY CONTROL SENSOR
		NASA	SID 39123482	1/1	A	12/20/94	OVERALL ELECTRONIC DIAGRAM - TCS
		NASA	SID39123428	1/1	N/C	6/30/94	CW TONE LASER SYSTEM BLOCK DIAGRAM - TCS
		NASA	SID39123430	1/1	B	1/10/95	SCHEMATIC DIAGRAM DC POWER - TCS
		NASA	SED39123488	2/2	N/C		HARNES - TCS
		NASA					2/17/94
9.13	OMS/TVC SIGNAL FLOW AND DRIVERS R.V570-420302	R.I.	V570-430309	8	E	8/23/88	OMS SUBSYSTEM CONTROL - LEFT POD (OV - 103 & SUBS)
				8	E	8/23/88	OMS SUBSYSTEM CONTROL - LEFT POD (OV - 102)
		R.I.	V570-430209	8	B	8/25/82	OMS SUBSYSTEM CONTROL - RIGHT POD (OV - 103 & SUBS)
		R.I.	V570-430202	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 TECHNOLOGIES	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.	V570-790209	3	C	12/4/84	DISPLAY & CONTROL SWITCHES FLIGHT CONTROL SUBSYSTEM(OV - 103 & SUBS)
		R.I.	V570-790239	ALL	E	5/8/84	ATVC - FLT CONTROL SUBSYSTEM (OV - 103 & SUBS)
		R.I.	V570-790232	ALL	E	10/82	ATVC - FLT CONTROL SUBSYSTEM (OV - 102)
		R.I.	V570-790202	9	E	12/84	DISPLAY & CONTROL SWITCHES FLIGHT CONTROL SUBSYSTEM (OV - 102)

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		
9.12	ENGR D. ALLEGA			ENGR		<b>VENDOR DRAWING REFERENCES</b>		
	ENGR <i>David Allega</i>	4/11/95		ENGR				
9.13	ENGR L. STALLARD			ENGR				
	ENGR <i>L. Stallard</i>	4/11/95		ENGR				
9.14	ENGR D. J. GRUBER			APP		SPACE SHUTTLE	TBL NO	9-1
	ENGR <i>D.J. Gruber</i>	4-10-95		APP		ALL		
9.15	ENGR D. J. GRUBER			APP				
	ENGR <i>D.J. Gruber</i>	4-10-95		LTR E	PCN 5	PAGE	9 1-4	SHEET 4 OF 5

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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
9.16 (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
9.17	RHC/SBTC/RPTA/THC	R.I.	V570-790129	05/27/84	B		ROTATION HAND CONTROL. FLT C9CONTROL SUBSYSTEM
		R.I.	V570-790139	-	-	11/17/80	SPEED BRAKE THRUST CONTROL FLT CONTROL SUBSYSTEM
		R.I.	V570-790149	-	-	11/05/80	RUDDER PEDAL XDCR ASSY FLT CONTROL SUBSYSTEM
		R.I.	V570-790159	-	-	01/14/81	TRANSLATION HAND CONTROL FLT CONTROL SUBSYSTEM
		R.I.	V570-790209	-	C	08/17/84	DISPLAY AND CONTROL SWITCHES FLIGHT CONTROL SUBSYSTEM
9.20	HEADS UP DISPLAY	R.I.	V570-730269	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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS					
9.16-1, 2	ENGR L. STALLARD			ENGR		<b>VENDOR DRAWING REFERENCES</b>					
	ENGR <i>L. Stallard</i>	4/11/95		ENGR							
9.17	ENGR S. M. SPRUELL			ENGR							
	ENGR <i>S. M. Spruell</i>	4-5-95		ENGR		<b>VENDOR DRAWING REFERENCES</b>					
9.20	ENGR S. M. SPRUELL			APP					SPACE SHUTTLE	TBL NO	9-1
	ENGR <i>S. M. Spruell</i>	4-5-95		APP					ALL		
	ENGR			LTR E	PCN	5	PAGE	9.1-5	SHEET 5 OF 5		

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