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Space Shuttle Systems Handbook

Volume III – Sections 16 through 20

Mission Operations Directorate
Systems Division

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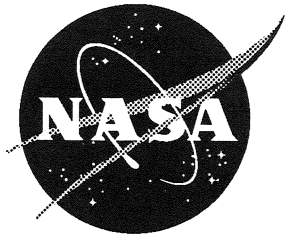

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SPACE SHUTTLE SYSTEMS HANDBOOK

REV E

December 21, 1990

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

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

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

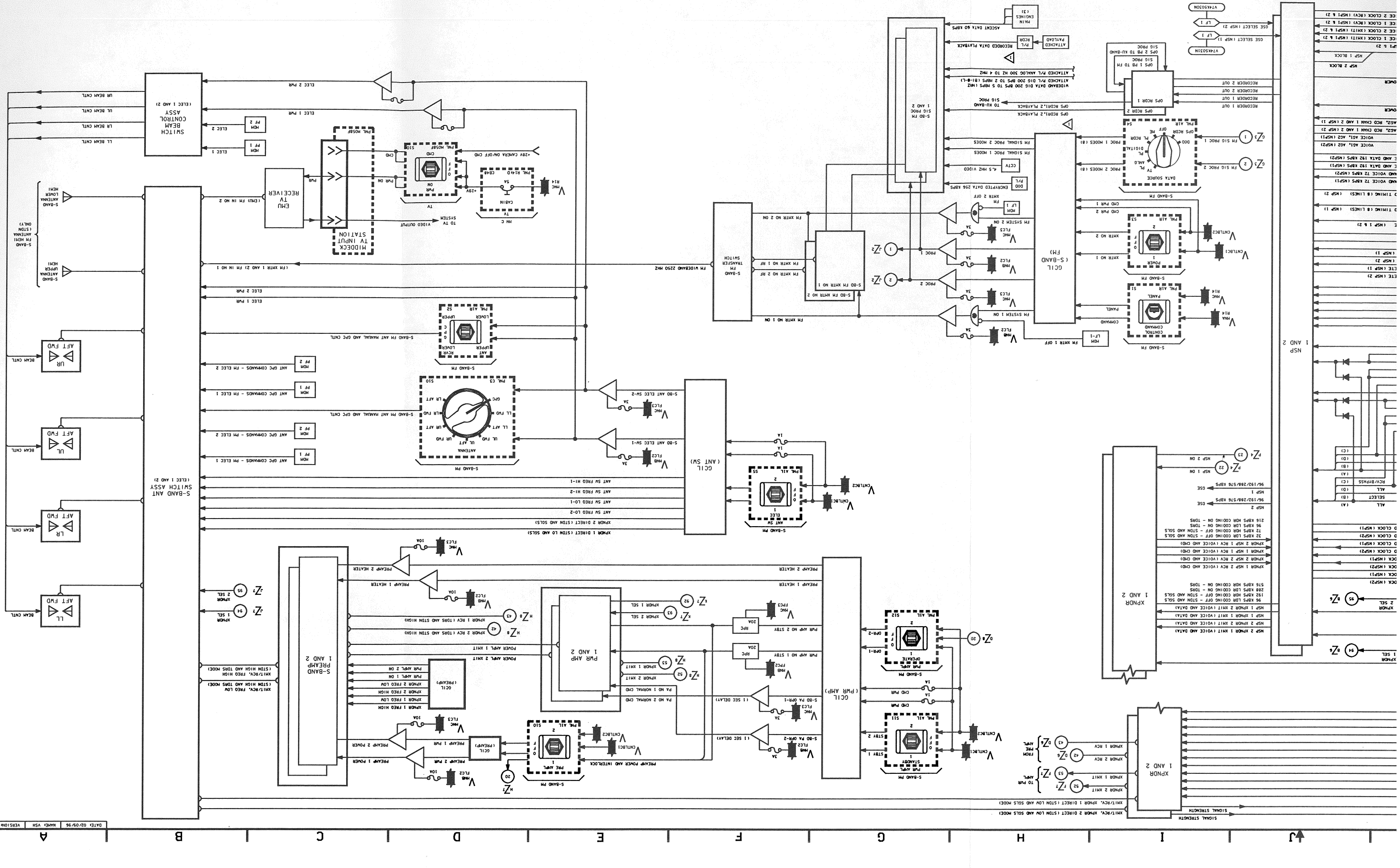
Item	Title	REV/DCN	Signoff date
	SECTION 16 COMMUNICATIONS SYSTEMS - Continued		
DWG 16.10 (Sheet 4 of 7)	AUDIO PANEL/ATU AIRLOCK	REV E	9/12/90
DWG 16.10B (Sheet 5 of 7)	AUDIO PANEL/ATU AIRLOCK 1 BACKUP	REV E	11/5/90
DWG 16.10B (Sheet 6 of 7)	AUDIO PANEL/ATU MID DECK AUDIO/ AIRLOCK 2 BACKUP	REV E	9/12/90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

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

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

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

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


SWITCH BEAM CONTROL ASSY (ELEC 1 AND 2)
UR BEAM CNTL
UL BEAM CNTL
LR BEAM CNTL
LL BEAM CNTL
ELEC 2 PWR
ELEC 1 PWR
MDM PF 2
MDM PF 1
ELEC 2
ELEC 1
PNL M25BF
MIDDECK TV INPUT STATION
EMU TV RECEIVER
(EMU) FM IN NO 2
VIDEO OUTPUT
TO TV SYSTEM
PWR ON
CMD
S10
PNL B14YD
CB14
+28V CAMERA ON/OFF CMD
CABIN
TV
PWC M14
PN C
S-BAND FM ANTENNA LOWER
S-BAND FM ANTENNA UPPER
S-BAND ANT SWITCH ASSY (ELEC 1 AND 2)
(FM XMTR 1 AND 2) FM IN NO 1
ELEC 2 PWR
ELEC 1 PWR
S-BAND FM ANT MANUAL AND GPC CNTL
ANT GPC COMMANDS - FM ELEC 2
ANT GPC COMMANDS - FM ELEC 1
MDM PF 2
MDM PF 1
ANT GPC COMMANDS - PM ELEC 2
ANT GPC COMMANDS - PM ELEC 1
S-BAND PM ANT MANUAL AND GPC CNTL
UR AFT FWD
UL AFT FWD
LR AFT FWD
LL AFT FWD
BEAM CNTL
PNL C3
GPC
UR AFT
UL AFT
LR AFT
LL AFT
UR FWD
UL FWD
LR FWD
LL FWD
ANTENNA
S-BAND PM
PWC FLC3
PWD FLC2
3A
S-BD ANT ELEC SW-2
S-BD ANT ELEC SW-1
ANT SW FREQ HI-1
ANT SW FREQ HI-2
ANT SW FREQ LO-1
ANT SW FREQ LO-2
XPNDR 2 DIRECT (STDN LO AND SOLS)
XPNDR 1 DIRECT (STDN LO AND SOLS)
GCIL (ANT SW)
ANT SW
PNL A11
ELEC
1A
CNTLBC2
CNTLBC1
S-BAND PWR AMP1 AND PWR AMP2 SELECT
S-BAND PREAMP 1 AND 2
PREAMP 2 HEATER
PREAMP 1 HEATER
10A
PWC FLC3
PWD FLC2
PREAMP 2 PWR
PREAMP 1 PWR
PREAMP 2 POWER
PREAMP 1 POWER
PREAMP POWER AND INTERLOCK
GCIL (PREAMP)
PNL A9PE
S10
S-BAND PM
XPNDR 2 SEL
XPNDR 1 SEL
XPNDR 2 RCV (TDRS AND STDN HIGH)
XPNDR 1 RCV (TDRS AND STDN HIGH)
POWER AMPL 2 XMIT
POWER AMPL 1 XMIT
PWR AMPL 2 ON
PWR AMPL 1 ON
XPNDR 2 FREQ LOW
XPNDR 2 FREQ HIGH
XPNDR 1 FREQ LOW
XPNDR 1 FREQ HIGH
XMIT/RCV, FREQ HIGH (STDN HIGH AND TDRS MODE)
XMIT/RCV, FREQ LOW (STDN HIGH AND TDRS MODE)
S-BAND PREAMP 1 AND 2
PWR AMP 1 AND 2
RPC 20A
PWR AMP NO 2 STBY
PWR AMP NO 1 STBY
PWC FPC2
PWD FPC1
PNL A12
S12
OPR-2
OPR-1
S-BAND PM
PWR AMPL OPERATE
STBY 2
STBY 1
S11
STANDBY
CMD PWR
1A
GCIL (PWR AMP)
PA NO 1 NORMAL CMD
PA NO 2 NORMAL CMD
S-BD PA OPR-2
S-BD PA OPR-1
1 SEC DELAY
PWC FLC3
PWD FLC2
3A
S-BD FM XMTR NO 2
S-BD FM XMTR NO 1
FM XMTR NO 2 ON
FM XMTR NO 2 RF
FM XMTR NO 1 RF
FM XMTR NO 1 ON
S-BAND TRANSFER FM SWITCH
FM VIDEOBAND 2250 MHZ
GCIL (S-BAND FM)
FM SYSTEM 2 ON
FM SYSTEM 1 ON
FM XMTR 2 OFF
FM XMTR 1 OFF
HDM LF-2
HDM LF-1
PWC FLC3
PWD FLC2
PANEL
COMMAND
PNL A18
S1
PANEL CONTROL COMMAND
PWA M14
PWC M14
S-BAND FM
PNL A12
S3
PWL A18
OFF
ME
PL RCDR
DIGITAL
AL0
TV
DATA SOURCE
OPS RCDR
000
PROC 1 MODES (8)
PROC 2 MODES (8)
FM SIG PROC 1
FM SIG PROC 2
OPS RCDR 1
OPS RCDR 2
OPS 1 PB TO FM SIG PROC
OPS 2 PB TO KU-BAND SIG PROC
RECORDER 1 OUT
RECORDER 2 OUT
OPS RCDR1,2 PLAYBACK
TO KU-BAND SIG PROC
VIDEOBAND DATA DIG 200 BPS TO 5 MBPS (81-8-1)
ATTACHED PYL DIG 200 BPS TO 2 MBPS (81-8-1)
ATTACHED PYL ANALOG 300 HZ TO 4 MHZ
RECORDED DATA PLAYBACK
ATTACHED PYL RCDR PAYLOAD
MAIN ENGINES (3)
ASCENT DATA 60 KBPS
S-BD FM SIG PROC 1 AND 2
FM SIGNAL PROC 1 MODES
FM SIGNAL PROC 2 MODES
CCTV
4.5 MHZ VIDEO
DOD PYL
ENCRYPTED DATA 256 KBPS
FM XMTR 1 OFF
FM XMTR 2 OFF
HDM LF-1
HDM LF-2
VT4&5D3IN
VT4&5D3ON
GSE SELECT (NSP 1)
GSE SELECT (NSP 2)
LF 1
LF 2
NSP 1 BLOCK
NSP 2 BLOCK
RECORDER
CLOCK 2 CLOCK (RCV) (NSP1 & 2)
CLOCK 1 CLOCK (XMIT) (NSP1 & 2)
CLOCK 2 CLOCK (XMIT) (NSP1 & 2)
NSP 1 BLOCK
NSP 2 BLOCK
RECORDER
RCD CHAN 1 AND 2 (NSP 1)
RCD CHAN 1 AND 2 (NSP 2)
VOICE AD1, AD2 (NSP1)
VOICE AD1, AD2 (NSP2)
AND DATA 192 KBPS (NSP2)
AND DATA 192 KBPS (NSP1)
AND VOICE 72 KBPS (NSP2)
AND VOICE 72 KBPS (NSP1)
TIMING (8 LINES) (NSP 2)
TIMING (8 LINES) (NSP 1)
(NSP 1 & 2)
(NSP 1)
(NSP 2)
GTE (NSP 1)
GTE (NSP 2)
I AND 2 NSP
FM SIG PROC 1
FM SIG PROC 2
Z1
Z2
PROC 1
PROC 2
S-BAND FM
PNL A18
S2
PWL A18
OFF
ME
PL RCDR
DIGITAL
AL0
TV
DATA SOURCE
OPS RCDR
000
PROC 1 MODES (8)
PROC 2 MODES (8)
FM SIG PROC 1
FM SIG PROC 2
OPS RCDR 1
OPS RCDR 2
OPS 1 PB TO FM SIG PROC
OPS 2 PB TO KU-BAND SIG PROC
RECORDER 1 OUT
RECORDER 2 OUT
OPS RCDR1,2 PLAYBACK
TO KU-BAND SIG PROC
S-BD FM SIG PROC 1 AND 2
FM SIGNAL PROC 1 MODES
FM SIGNAL PROC 2 MODES
CCTV
4.5 MHZ VIDEO
DOD PYL
ENCRYPTED DATA 256 KBPS
FM XMTR 1 OFF
FM XMTR 2 OFF
HDM LF-1
HDM LF-2
S-BAND FM
PNL A12
S3
OFF
2
1
PWR AMP 1 AND 2
CNTLBC2
CNTLBC1
CMD PWR 2
CMD PWR 1
XMTR NO 2
XMTR NO 1
S-BAND FM
PNL A18
S1
PANEL CONTROL COMMAND
PWA M14
PWC M14
PANEL
COMMAND
FM SYSTEM 2 ON
FM SYSTEM 1 ON
PWC FLC3
PWD FLC2
3A
FM XMTR NO 2 ON
FM XMTR NO 1 ON
S-BAND FM XMTR NO 2
S-BAND FM XMTR NO 1
FM XMTR NO 2 RF
FM XMTR NO 1 RF
S-BAND TRANSFER FM SWITCH
FM VIDEOBAND 2250 MHZ
GCIL (S-BAND FM)
HDM LF-2
HDM LF-1
FM XMTR 2 OFF
FM XMTR 1 OFF
PWC FLC3
PWD FLC2
3A
S-BD ANT ELEC SW-2
S-BD ANT ELEC SW-1
ANT SW FREQ HI-1
ANT SW FREQ HI-2
ANT SW FREQ LO-1
ANT SW FREQ LO-2
XPNDR 2 DIRECT (STDN LO AND SOLS)
XPNDR 1 DIRECT (STDN LO AND SOLS)
GCIL (ANT SW)
ANT SW
PNL A11
ELEC
1A
CNTLBC2
CNTLBC1
S-BAND PM
PNL A11
S5
OFF
2
1
ANT SW ELEC
XPNDR 1 AND 2
XPNDR 2 SEL
XPNDR 1 SEL
Z3
Z4
Z5
Z6
Z7
Z8
Z9
Z10
NSP 2 ON
NSP 1 ON
NSP 2
NSP 1
GSE
96/192/288/576 KBPS
SELECT
(A)
(B)
ALL
(C)
(D)
RCV/BYPASS
XPNDR 2 NSP 2 RCV (VOICE AND CMD)
XPNDR 1 NSP 2 RCV (VOICE AND CMD)
XPNDR 2 NSP 1 RCV (VOICE AND CMD)
XPNDR 1 NSP 1 RCV (VOICE AND CMD)
32 KBPS LDR COOLING OFF - STDN AND SOLS
12 KBPS MDR COOLING OFF - STDN AND SOLS
96 KBPS LDR COOLING ON - TDRS
216 KBPS MDR COOLING ON - TDRS
516 KBPS MDR COOLING ON - TDRS
288 KBPS LDR COOLING ON - TDRS
192 KBPS MDR COOLING ON - STDN AND SOLS
96 KBPS LDR COOLING OFF - STDN AND SOLS
NSP 2 XPNDR 2 XMIT (VOICE AND DATA)
NSP 2 XPNDR 1 XMIT (VOICE AND DATA)
NSP 1 XPNDR 2 XMIT (VOICE AND DATA)
NSP 1 XPNDR 1 XMIT (VOICE AND DATA)
XPNDR 2 SEL
XPNDR 1 SEL
XMIT/RCV, XPNDR 2 DIRECT (STDN LOW AND SOLS MODE)
XMIT/RCV, XPNDR 1 DIRECT (STDN LOW AND SOLS MODE)
SIGNAL STRENGTH
XPNDR 2 RCV
XPNDR 1 RCV
XPNDR 2 XMIT
XPNDR 1 XMIT
TO PWR AMPL
FROM PRE AMPL
DATE: 02/09/96
NAME: VSN
VERSION: IN45

DATE	NAME	VERSION
DATE: 10/24/90	NAME: MFB	VERSION: INK.4
DATE: 01/29/96	NAME: VSH	VERSION: BPT.9
DATE: 02/09/96	NAME: VSH	VERSION: INK.5

S R Q P O N M L K J

8 7 6 5 4 3 2 1

MN A
GCILC
PML R14,B CB44
V_{MNA} R14

MN C
GCILC
PML R14,B CB49
V_{MNC} R14

S-BAND PM
CONTROL CMD
PANEL
PML C3 S3

COMMAND MNA
COMMAND MNC
NSP RCV HI
NSP RCV LO
XPNDR 2 S/S
XPNDR 1 S/S

S-BAND PM
XPNDR 1
OFF
2
PML A1L S16
$V_{CNTLBC1}$
$V_{CNTLBC2}$
XPNDR 1 ON
XPNDR 2 ON

XPNDR S/S SEL RELAY

GCIL (XPNDR)

SPREAD SPECTRUM DISABLE (XPNDR 1 & 2)
RANGING DISABLE (XPNDR 1 & 2)
FREQ HI (XPNDR 1 AND 2)
FREQ LOW (XPNDR 1 AND 2)
SQLS MODE (XPNDR 1 AND 2)
STDN LOW MODE (XPNDR 1 AND 2)
STDN HIGH MODE (XPNDR 1 AND 2)
TDRS MODE (XPNDR 1 AND 2)
S-BD R/L DATA ENABLE NSP 1 AND 2 (XPNDR 1 & 2)
FLTR NAR (XPNDR 1 AND 2)
FLTR WIDE (XPNDR 1 AND 2)
COMMAND POWER
COMMAND POWER

XPNDR 1 ON
XPNDR 2 ON
V_{MNB} FLC2 10A
V_{MNC} FLC3 10A
XPNDR 1 ON (NSP1 & NSP2)
XPNDR 2 ON (NSP1 & NSP2)

NETWORK SIGNAL PROC
ENCRYPTION
PWR ON
OFF
PML A1L S24
$V_{CNTLAB3}$
$V_{CNTLAB1}$
PWR 2
PWR 1

V_{MNA} FPC1
V_{MNB} FPC2
V_{MNB} FPC2
V_{MNA} FPC1

V_{MNC} FLC3 3A
V_{MNB} FLC2 3A

XPNDR 1 SEL
XPNDR 2 SEL

ENCRYPTION ZEROIZE
NORM
PML R12 S12
ZEROIZE 2
ZEROIZE 1
PAYLOAD STATION

COMSEC 1 AND 2

RTN LINK 96/192 DATA AND CLOCK (NSP2)
RTN LINK 96/192 DATA AND CLOCK (NSP1)
RTN LINK 96/192 DATA AND CLOCK (NSP2)
RTN LINK 96/192 DATA AND CLOCK (NSP1)
FWD LINK 32/72 KBPS DATA AND CLOCK (NSP2)
FWD LINK 32/72 KBPS DATA AND CLOCK (NSP1)
FWD LINK 32/72 KBPS DATA AND CLOCK (NSP2)
FWD LINK 32/72 KBPS DATA AND CLOCK (NSP1)

NETWORK SIGNAL PROC
ENCRYPTION
MODE
ALL
SELECT
PML A1L S25
ALL (A)
SELECT (B)
ALL (D)
RCV/BYPASS (C)
(A)
(B)
(D)
(C)

NETWORK SIGNAL PROC
ENCRYPTION
SELECT
T/R
BYPASS
R C V
PML A1L S26

NSP 1 AND 2

NSP 2 XPNDR 1 XMIT (
NSP 2 XPNDR 2 XMIT (
NSP 1 XPNDR 1 XMIT (
NSP 1 XPNDR 2 XMIT (
96 KBPS LDR CODING
192 KBPS HDR CODING
288 KBPS LDR CODING
576 KBPS HDR CODING
XPNDR 1 NSP 2 RCV (
XPNDR 2 NSP 2 RCV (
XPNDR 1 NSP 1 RCV (
XPNDR 2 NSP 1 RCV (
32 KBPS LDR CODING
72 KBPS HDR CODING
96 KBPS LDR CODING
216 KBPS HDR CODING
NSP 2
96/192/288/576 KBPS
NSP 1
96/192/288/576 KBPS

SIGNAL STRENGTH
S-BAND PM
S-BAND PL
PML A1U S1
KU
SIGNAL STRENGTH
PML A1U M1

S-BAND PM
MODE
STDN LO
HI
TDRS DATA
SQLS
RNG
PML A1L S6
S-BD PM MODES (5) XPNDR 1
S-BD PM MODES (5) XPNDR 2
S-BD R/L DATA ENABLE (NSP 1)
S-BD R/L DATA ENABLE (NSP 2)

MAIN VOLTS
SIGNAL STRENGTH
ESS VOLTS
3AB
2CA
1BC
FUEL CELL
VOLTS/ AMPS
PML F9 S2
BUFFER AMPLIFIER 0 TO 5VDC

DC AMPS/ SIG STR
PML F9 H3

NETWORK SIG PROC
CODING
XMIT ON
OFF
PML A1L S21
NSP 1 ON
NSP 2 ON

NETWORK SIG PROC
CODING
RCV ON
OFF
PML A1L S22

NETWORK SIG PROC
DATA RATE
XMIT HIGH
LOW
PML A1L S18

NETWORK SIG PROC
DATA RATE
RCV HIGH
LOW
PML A1L S19
NSP RCV HI
NSP RCV LO

NETWORK SIG PROC
UPLINK DATA
S-BD
KU
PML A1L S20

AUDIO CENTER
VOICE RECORD SELECT
CHANNEL 1
CHANNEL 2
OFF
A/G1
A/G2
A/A
ICOM A
ICOM B
PML A1R S15
S16

NETWORK SIG PROC
POWER
1
OFF
2
PML A1L S23
$V_{CNTLBC1}$
$V_{CNTLBC2}$

UPLINK NSP BLOCK
ENABLE
PML C3 S13
$V_{CNTLBC2}$
$V_{CNTLAB2}$
NSP 1
NSP 2
V_{MNB} FLC2 1A
V_{MNC} FLC3 1A

GCIL (NSP)

COMMAND POWER
COMMAND POWER
GCIL MODE COMMAND POWER

HDR/LDR
HDR/LDR
OPR 2
OPR 1

NSP 1 ON
NSP 2 ON
KU-SIGNAL PROCESSOR
NSP 1 ON
NSP 2 ON
RIGHT ATU
NSP 1 ON
NSP 2 ON
MS ATU

NSP XMIT CODING ON (NSP1 & 2)
NSP RCV CODING ON (NSP1 & 2)
NSP XMIT DATA RATE (HIGH) (LOW) (NSP1 & 2)
NSP RCV DATA RATE (HIGH) (LOW) (NSP1 & 2)
DATA SOURCE (KU) (S) (NSP1 & 2)
CHANNEL 1/2 VOICE (ON) (OFF) (NSP1 & 2)

MDM FF 3
MDM FF 1
MESSAGE DISCRETE (NSP 2)
MESSAGE DISCRETE (NSP 1)
WORD DISCRETE (NSP 2)
WORD DISCRETE (NSP 1)
NSP 2 DATA
NSP 1 DATA

PCMMU 2
PCMMU 1
PCM 1/2 ENABLE (NSP 1 & 2)
PCMMU DATA AND TIMING (8 LINES) (NSP 1)
PCMMU DATA AND TIMING (8 LINES) (NSP 2)

KU SIGNAL PROC
FWD LINK CMD AND VOICE 72 KBPS (NSP1)
FWD LINK CMD AND VOICE 72 KBPS (NSP2)
RTN LINK VOICE AND DATA 192 KBPS (NSP1)
RTN LINK VOICE AND DATA 192 KBPS (NSP2)

ACCU 1 AND 2
VOICE AG1, AG2 (NSP2)
VOICE AG1, AG2 (NSP1)
DOWNLINK VOICE AG1, AG2, RCD CHAN 1 AND 2 (NSP 2)
DOWNLINK VOICE AG1, AG2, RCD CHAN 1 AND 2 (NSP 1)
NSP 1 POWER
NSP 2 POWER
NSP 2 BLOCK
NSP 1 BLOCK

PAYLOAD STATION
PS/ACCU ENABLE (NSP1 & 2)
PS VOICE 1 AND VOICE 1 CLOCK (XMIT) (NSP1 & 2)
PS VOICE 2 AND VOICE 2 CLOCK (XMIT) (NSP1 & 2)
PS VOICE 1 AND VOICE 1 CLOCK (RCV) (NSP1 & 2)
PS VOICE 2 AND VOICE 2 CLOCK (RCV) (NSP1 & 2)

RECORDER 1 OUT
RECORDER 1 OUT
RECORDER 2 OUT
RECORDER 2 OUT

GSE SELECT (NSP 1)
GSE SELECT (NSP 2)

FM SIG PRO
FM SIG PRO

NOTES: 1. OPS AND PAYLOAD RECORDER PLAYBACKS CAN OCCUR AT A NUMBER OF DIFFERENT DATA RATES, DEPENDING ON THE RECORDED DATA RATE, RECORDED SPEED, AND THE PLAYBACK SPEED

1 COM OV S-BD

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	SIGNATURE	DATE
COMM OVERVIEW S-BAND	DSGN L. M. BUCHANAN	9-17-79
	DR	7-24-79
	ENGR G. HORLACHER	
	ENGR G. Hurlacher	2/14/96
	APP J. Madla	2/14/96
DWG NO 16.1 / SPACE SHUTTLE / ALL	APP J. Mann	2/19/96
	CADD S. K. Kirkley	6-27-79
SHEET 1 OF 6 / PAGE / 104.5 X 34	LTR E / PCN 6	

BASIC REV E-6

DATE: 02/26/96	NAME: SVJ	VERSION INK: 4
DATE: 03/13/96	NAME: LAM	VERSION INK: 5
DATE: 05/08/96	NAME: LAM	VERSION INK: 6

CDR (LEFT) AUDIO PANEL AND ATU

PILOT (RIGHT) AUDIO PANEL AND ATU

RIGHT AUDIO

VOX SENS

TACAN ID

XMIT/ICOM MODE PTT/VOX PTT/PTT PTT/HOT VOX/VOX

CONTROL NORM LEFT

28V TO UHF MODE SWITCH

DUPLEX

SIMPLEX

CDR ATU AUDIO TO PLT ATU FOR BACKUP

PILOT ATU AUDIO TO CDR ATU FOR BACKUP

PNL O5

PILOT PWR SUP +12V

PNL O9

AIRLOCK 1 BACKUP PS AUDIO PANEL AND ATU

MS AUDIO PANEL AND ATU

MISSION STATION AUDIO

A/G A/A T/R ICOM

VOLUME

AIRLOCK AUDIO 1 BACKUP

28V TO UHF MODE SWITCH

DUPLEX

SIMPLEX

PNL MO 58F

PNL L9

MS PWR SUP +12V

PNL R10

MIDDECK AUDIO/AIRLOCK 2 BACKUP

OS AUDIO PANEL AND ATU

MID DECK SPEAKER AUDIO

MASTER SPEAKER VOLUME

TONES ACCU

SPKR PWR SPKR/MIC

ACCU BYPASS

OFF

AIRLOCK AUDIO 2 BACKUP

PNL MO 42F

PNL A13

C&W SYSTEM A

C&W SYSTEM B

28V FROM PILOT AND MS ATU POWER SUPPLY

$V_{ENTLCA2}$

UHF

XMIT FREQ 296.8

SPLX PWR AMP ON

SQUELCH ON

259.7

UHF MODE SIMPLEX

OFF EVA SIMPLEX+G RCV G T/R

PNL O6

DUPLEX

SIMPLEX

AIRLOCK AUDIO 1 TO AIRLOCK 1 BACKUP

AIRLOCK AUDIO 2 TO MIDDECK AUDIO/AIRLOCK 2 BACKUP ATU

AIRLOCK PWR

AIRLOCK AUDIO 2

AIRLOCK AUDIO 1

AIRLOCK PANEL AND ATU

AIRLOCK AUDIO

POWER AUD/TONE

AUD RCV

VOLUME

CONTROL NORM MID-DECK

VOX SENS

MASTER VOL 1

XMIT/ICOM MODE

MASTER VOL 2

PNL AV18O

V_{MNA} R14

MN A

UHF

7.5A

PNL R14J B CB13

V_{MNC} R14

MN C

PNL R14J B CB18

D & C CONTROL

UHF TRANSCEIVER

R 296.8 T

R 259.7 T

R 243.0 T

R 279.0 T

MUX

BYPASS SWITCH

PA

EXTERNAL ANTENNA

AIRLOCK ANTENNA

AUDIO TO UHF

AUDIO FROM UHF

XMIT CONTROL KEY

SERIAL DATA WORD (8 LINES)

MIKE SIGNAL TO ACCU (8 LINES)

EARPHONE AUDIO FROM ACCU (8 LINES)

ACCU

SECONDARY CIRCUITS

PRIMARY CIRCUITS

VSU

ICOM A

ICOM B

PAYLOAD BAY OUTLETS

LAUNCH UMBILICAL STATION

DEAD FACE SIGNAL

NSP 1

NSP 2

OPS RCDR 1

OPS RCDR 2

A/G 1

A/G 2

RCDR 1

RCDR 2

A/A

PAGE

C&W

SPACE LAB

DOCKING RING

ESS 2CA

AUDIO CENTER

AUD CNTR

3A

PNL R14F CB1

PNL C

PNL R14B CB9

V_{ESS2CA} O13 & R14

V_{MNC} R14

OFF

PNL C3 S6

1. SLEEP STATION TONES DO NOT USE ANY OF THE AUDIO DISTRIBUTION EQUIPMENT. THIS OUTLET IS CONNECTED DIRECTLY TO THE C&W SYSTEM
2. WHEN THE ACCU IS BYPASSED, C&W TONES ARE ROUTED DIRECTLY TO THE MIDDECK SU. WHEN NOT BYPASSED, THIS SIGNAL LINE IS TERMINATED
3. PLT AND CDR AUDIO CONTROL SWITCHES ALSO CHANGE THE RHC XMIT PTT SWITCHES TO BACKUP CONTROL
4. EVA AUDIO DOES NOT CONTAIN AN ICOM PTT SIGNAL
5. LINES LABELED "AUDIO" REPRESENT MIKE SIGNAL, EARPHONE OR SPEAKER SIGNAL, XMIT PTT, ICOM PTT AND THE APPROPRIATE RETURN LINES
6. SERVICE AND COOLING UMBILICAL (SCU) CONNECTS EMU TO AIRLOCK FOR HARDLINE SUPPORT WHILE EVA CREWMEN ARE IN AIRLOCK

NOTES:

7. HEADSET ASSEMBLY MAY CONSIST OF EITHER A LAUNCH AND ENTRY HELMET, LIGHTWEIGHT HEADSET, OR A WCES AND HEADSET

1 COM OV AUD 2

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	PAT SHERRILL		
DR	VICKI DOGGETT	5/16/78	COMM OVERVIEW AUDIO
ENGR	L. HOPPE		
ENGR		5/29/96	
APP		5/30/96	
APP		5/30/96	SPACE SHUTTLE / DWG NO
CADS	J. K. Kimbler	6-12-96	OV 102 / 16.1B
LTR	E	PCN 6	126.5 X34 / PAGE / SHEET 2 OF 6

BASIC REV E-6

T S R O P O N M L K J

ESS 1BC
AUDIO
LEFT
3A
V_{ESS1BC} 013 & R14
PNL R14↓F CB4

ESS 2CA
AUDIO
RIGHT
3A
V_{ESS2CA} 013 & R14
PNL R14↓F CB6

MN A
AUDIO
AIRLOCK
I BACKUP
3A
V_{MNA} R14
PNL R14↓A CB3

MN C
AUDIO
PS/AIRLOCK
3A
V_{MNC} R14
PNL R14↓A CB10

MN A
AUDIO
MS/OS
3A
V_{MNA} R14
PNL R14↓A CB2

MN B
AUDIO
MID @ECK
SPKR/CCU
3A
V_{MNB} R14
PNL R14↓A CB5

ORBITER HEADSET
ORBITER HEADSET
EARPHONE
EARPHONE
MIKE POWER
MIKE SIGNAL
MIKE POWER
MIKE SIGNAL

WCCS/CRU
WCCS/CRU
PTT XMIT
PTT ICOM
VOLUME
CHANNEL
A1
A2

WCCS/AIU
MODE SEL
A

POWER
CDR AUDIO
CONNECTED TO LEFT COMM IN PLACE OF HIU & HEADSET WHEN ON ORBIT

HEADSET INTERFACE UNIT
HEADSET INTERFACE UNIT
ICOM
XMIT
(CLIP-ON)

POWER
POWER
CDR AUDIO
PLT AUDIO

LEFT COMM
RIGHT COMM
POWER
ON
OFF
PNL R6

POWER
POWER
FROM AUDIO CENTER
FROM AUDIO CENTER
CDR AUDIO
PLT AUDIO
CDR RHC
PLT RHC
CDR RHC XMIT PTT
PLT RHC XMIT PTT
NSP 2
NSP 1
NSP 2 ON
NSP 1 ON
LDR XMIT

CDR
PILOT (RI

RIGHT AUDIO
POWER AUDIO/TONE
OFF
A/G
A/A T/R
ICOM
A
B
OFF
VOX SENS
MIN
MAX
TACAN ID
ON
OFF
VOLUME
A/G
A/A
ICOM
A
B
TACAN
PAGE
XMIT/ICOM MODE
PTT/VOX
PTT/PTT
PTT/HOT
VOX/VOX
CONTROL
NORM

ORBITER HEADSET
ORBITER HEADSET
EARPHONE
EARPHONE
MIKE POWER
MIKE SIGNAL
MIKE POWER
MIKE SIGNAL

WCCS/CRU
WCCS/CRU
PTT XMIT
PTT ICOM
VOLUME
CHANNEL
B1
B2

WCCS/AIU
MODE SEL
B

POWER
MS AUDIO
CONNECTED TO MS COMM IN PLACE OF HIU & HEADSET WHEN ON ORBIT

HEADSET INTERFACE UNIT
HEADSET INTERFACE UNIT
ICOM
XMIT
(CLIP-ON)

POWER
POWER
PS AUDIO
MS AUDIO

PS COMM
MS COMM
CCU PWR
ON
OFF
PNL A11

POWER
POWER
PS AUDIO
MS AUDIO
MS AUDIO CONTROL
NORM
PS
PNL R11
S13
MS AUDIO TO PS ATU FOR BACKUP
MS AUDIO

POWER
POWER
FROM AUDIO CENTER
FROM AUDIO CENTER
NSP 2
NSP 1
NSP 2 ON
NSP 1 ON
LDR XMIT

MISSION STATION AUDIO
POWER AUDIO/TONE
OFF
A/G
A/A T/R
ICOM
A
B
OFF
VOLUME
A/G
A/A
ICOM
A
B
PAGE
FIRE HOLE

MULTIPLE HEADSET ADAPTER

HEADSET INTERFACE UNIT
HEADSET INTERFACE UNIT
POWER
AUDIO
POWER
AUDIO
POWER
AUDIO

ORBITER HEADSET
ORBITER HEADSET
EARPHONE
EARPHONE
MIKE POWER
MIKE SIGNAL
MIKE POWER
MIKE SIGNAL
MIKE POWER
MIKE SIGNAL
ICOM
XMIT
(CLIP-ON)

ORBITER HEADSET
ORBITER HEADSET
EARPHONE
EARPHONE
MIKE POWER
MIKE SIGNAL
MIKE POWER
MIKE SIGNAL

WCCS/CRU
WCCS/CRU
PTT XMIT
PTT ICOM
VOLUME
CHANNEL
C1
C2

WCCS/AIU
MODE SEL
C

POWER
AUDIO

MIDDECK COMM
MIDDECK COMM AUDIO
OS COMM
CCU PWR
ON
OFF
PNL A11
PNL MO39M

POWER
POWER
OS AUDIO
MIDDECK SU AUDIO
OS SU AUDIO
MIDDECK SU
OS SU
KEY
PNL MO29J
PNL A2
AFT RHC
XMIT PTT TO OS ATU
KLAXON AND SIREN
KLAXON AND SIREN
ALL TONES
C&W SYSTEM A
C&W SYSTEM B

MID DECK SPEAKER AUDIO
POWER AUD/TONE
OFF
A/G
A/A T/R
ICOM
A
B
OFF
VOLUME
A/G
A/A
ICOM
A
B
PAGE
FIRE HOLE
VOX
XMIT/
PTT/VOX
PTT/HOT

MIDDECK SPEAKER AUDIO ACCU/BYPASS
PNL MO42F
S13
BYPASS TONE VOLUME
R3
ALL TONES
C&W SYSTEM A

SLEEP STATION TONES
MO58F
ALL TONES
C&W SYSTEM B

EVA 2
SNOOPY CAP
EVA 1
SNOOPY CAP
EARPHONE 2
EARPHONE 1
MIKE SIGNAL 2
MIKE SIGNAL 1
MIKE POWER 2
MIKE POWER 1

EMU 2 DISPLAY AND CONTROL MODULE
EMU 1 DISPLAY AND CONTROL MODULE
HARDLINE VOLUME
PTT
VOX
A
B
HL
BU
RCV
POWER
SCU
BATTERY

EARPHONE 2
EARPHONE 1
MIKE SIGNAL 2
MIKE SIGNAL 1
XMIT KEY 2
XMIT KEY 1
ORBITER PWR 2
ORBITER PWR 1
BATTERY 2
BATTERY 1

SERVICE AND COOLING UMBILICAL (SCU)
SERVICE AND COOLING UMBILICAL (SCU)

PLSS 2
PLSS 1
BATTERY

EMU 2
EMU 1
POWER
AUDIO
PNL AW82D

AIRLOCK POWER SUPPLY 2
AIRLOCK POWER SUPPLY 1
↓Z3 6.3

EMU 2 AUDIO
EMU 1 AUDIO

ORBITER HEADSET
ORBITER HEADSET
EARPHONE
EARPHONE
MIKE POWER
MIKE SIGNAL
MIKE POWER
MIKE SIGNAL

HEADSET INTERFACE UNIT
HEADSET INTERFACE UNIT
ICOM
XMIT
(CLIP-ON)

POWER
POWER
AIRLOCK AUDIO 2
AIRLOCK AUDIO 1

CCU 2
CCU 1
POWER
ON
OFF
PNL AW82D

POWER
POWER
↓Z5 6
↓Z6 5
AIRLOCK AUDIO 2
AIRLOCK AUDIO 1

ORBITER HEADSET
ORBITER HEADSET

SLEEP STATION TONES
MO58F
ALL TONES
C&W SYSTEM B

↑Z8 1
↓Z6 2
↑Z5 6
↑Z1 2
↑Z5 7
↓Z6 5
↓Z4 6
↓Z2 5

DATE= 05/08/96 | NAME= LAM | VERSION# INK= 6

W V U T S R Q P O N

8 7 6 5 4 3 2 1

AUDIO CENTER
VOICE RECORD SELECT
CHANNEL 1 A/G 2 A/G 1 A/A OFF ICOM A ICOM B
CHANNEL 2 A/G 2 A/G 1 A/A OFF ICOM A ICOM B
RING HOLD
PNL A1R

AUDIO CENTER
DOCKING RING
TONE PAGE A/G 1 2 A/A ICOM A B
ON OFF
PNL A1R

AUDIO CENTER
SPACELAB
TONE PAGE A/G 1 2 A/A ICOM A B
OR OFF
PNL A1R

AUDIO CENTER
UHF A/G 1 2 A/A T/R OFF
PNL A1R

AUDIO CENTER
PLBAY OUTLETS ICOM A B ON OFF
PNL A1R

FROM PILOT ATU PWR SUP
FROM MS ATU PWR SUP
TO PILOT ATU
TO MS ATU

ESS 1BC AUDIO LEFT 3A PNL R14F CB4
ESS 2CA AUDIO RIGHT 3A PNL R14F CB6
MN A AUDIO AIRLOCK BACKUP 3A PNL R14A CB3
MN C AUDIO PS/AIRLOCK 3A PNL R14A CB10
MN A AUDIO MS/OS 3A PNL R14A CB2
MN B AUDIO MID DECK SPKR/CCU 3A PNL R14A CB5

ORBITER HEADSET
EARPHONE
MIKE POWER
MIKE SIGNAL

WCCS/CRU
PTT XMIT
PTT ICOM
VOLUME
CHANNEL
A1 A2 B1 B2 C1 C2

WCCS/AIU
MODE SEL
OFF HL A B

CONNECTED TO LEFT COMM IN PLACE OF HIU & HEADSET WHEN ON ORBIT
CONNECTED TO MS COMM IN PLACE OF HIU & HEADSET WHEN ON ORBIT

HEADSET INTERFACE UNIT
ICOM XMIT (CLIP-ON)
POWER
CDR AUDIO
PLT AUDIO
MS AUDIO
LEFT COMM
RIGHT COMM
MS COMM
CCU PWR ON OFF
PNL R5
PNL L5
PNL A11
PNL A15

MULTIPLE HEADSET ADAPTER
MIDDECK COMM
MIDDECK COMM AUDIO
OS COMM CCU PWR ON OFF
OS AUDIO
PNL M39MM
PNL A1

EVA 2 SNOOPY CAP
EVA 1 SNOOPY CAP
EMU 2 DISPLAY AND CONTROL MODULE
EMU 1 DISPLAY AND CONTROL MODULE
HARDLINE VOLUME
PTT
RCV
VOX
HL A B BU
EARPHONE 1
EARPHONE 2
MIKE SIGNAL 1
MIKE SIGNAL 2
MIKE POWER 1
MIKE POWER 2
XMIT KEY 1
XMIT KEY 2
ORBITER PWR 1
ORBITER PWR 2
BATTERY 1
BATTERY 2
POWER SCU
BATTERY
PLSS 1
PLSS 2
SERVICE AND COOLING UMBILICAL (SCU)
AUDIO
POWER
EMU 1
EMU 2
PNL AW82D
AIRLOCK POWER SUPPLY 1
AIRLOCK POWER SUPPLY 2
EMU 1 AUDIO
EMU 2 AUDIO
AIRLOCK AUDIO 1
AIRLOCK AUDIO 2
CCU 1
CCU 2

BASIC REV E-6

DATE: 06/16/92	NAME: VSH	VERSION: INK: 2
DATE: 01/31/96	NAME: VSH	VERSION: BPT: 5
DATE: 02/22/96	NAME: BJT	VERSION: INK: 3

CDR (LEFT) AUDIO PANEL AND ATU

PILOT (RIGHT) AUDIO PANEL AND ATU

RIGHT AUDIO

VOX SENS

TACAN ID

XMIT/ICOM MODE PTT/VOX PTT/HOT PTT/PTT VOX/VOX

CONTROL NORM LEFT

28V TO UHF MODE SWITCH

DUPLEX

SIMPLEX

CDR ATU AUDIO TO PLT ATU FOR BACKUP

PILOT ATU AUDIO TO CDR ATU FOR BACKUP

PNL O5

PILOT POWER SUPPLY +12V

28V FROM PILOT AND MS POWER SUPPLY

$V_{CNTLCA2}$

UHF XMIT FREQ 296.8 SPLX PWR AMP ON SQUELCH ON 259.7 OFF OFF

UHF MODE SIMPLEX OFF EVA SIMPLEX+G RCV G T/R

FIRE VOLT

PNL O6

DUPLEX

SIMPLEX

PS AUDIO PANEL AND ATU

MS AUDIO PANEL AND ATU

MISSION STATION AUDIO

VOLUME

AIRLOCK AUDIO 1 BACKUP

28V TO UHF MODE SWITCH

DUPLEX

SIMPLEX

PNL R9

PNL R10

MS PWR SUP +12V

MIDDECK SPEAKER AUDIO PANEL/ATU

OS AUDIO

MASTER SPEAKER VOLUME

SPKR PWR SPKR/MIC

AIRLOCK AUDIO 2 BACKUP

PNL M042F

AIRLOCK PWR

AIRLOCK AUDIO 1 TO PS ATU FOR BACKUP

AIRLOCK AUDIO 2 TO MIDDECK SMU ATU FOR BACKUP

AIRLOCK AUDIO 2

AIRLOCK AUDIO 1

AIRLOCK PANEL AND ATU

AIRLOCK AUDIO

POWER AUDIO/TONE

AUD RCV

OFF PAGE/W

CONTROL NORM MID-DECK

VOX SENS

MASTER VOL

XMIT/ICOM MODE PTT/VOX PTT/HOT PTT/PTT VOX/VOX

MASTER VOL

PNL AV18D

C&W SYSTEM B

MN A

V_{MNA} R14

UHF 7.5A

PNL R14+B CB13

MN C

V_{MNC} R14

UHF 7.5A

PNL R14+B CB18

D & C CONTROL

UHF TRANSCEIVER

BYPASS SWITCH

R 296·8 T

R 259·7 T

R 243·0 T

R 279·0

MUX

PA

EXTERNAL ANTENNA

AIRLOCK ANTENNA

AUDIO TO UHF

AUDIO FROM UHF

XMIT CONTROL KEY

ACCU

SECONDARY CIRCUITS

PRIMARY CIRCUITS

SERIAL DATA WORD (8 LINES)

MIKE SIGNAL TO ACCU (8 LINES)

EARPHONE AUDIO FROM ACCU (8 LINES)

VSU

ICOM A

ICOM B

PAYLOAD BAY OUTLETS

ICOM A

ICOM B

DEAD FACE SIGNAL

LAUNCH UMBILICAL STATION

NSP 2

NSP 1

OPS RCDR 2

OPS RCDR 1

A/G 1

A/G 2

RCDR 1

RCDR 2

A/G 1

A/G 2

A/A

ICOM A

ICOM B

PAGE

C&W

SPACE LAB

A/G 1

A/G 2

A/A

ICOM A

ICOM B

PAGE

C&W

DOCKING RING

ESS 2CA

AUDIO AUD CNTR 1 3A

PNL R14+F CB1

MN C

AUDIO AUD CTR 2 3A

PNL R14+B CB9

V_{ESS2CA} 013 & R14

V_{MNC} R14

AUDIO CENTER

1 OFF 2

PNL C3 S6

A AFT RHC XMIT PTT IS DISCONNECTED WHEN 'MS AUDIO CONTROL' PNL R12L IS IN 'PS' POSITION

B SLEEP STATION TONES DO NOT USE ANY OF THE AUDIO DISTRIBUTION EQUIPMENT. THIS OUTLET IS CONNECTED DIRECTLY TO THE C&W SYSTEM

C WHEN THE ACCU IS BYPASSED, C&W TONES ARE ROUTED DIRECTLY TO THE MIDDECK SMU. WHEN NOT BYPASSED, THIS SIGNAL LINE IS TERMINATED

D PLT AND CDR AUDIO CONTROL SWITCHES ALSO CHANGE THE RHC XMIT PTT SWITCHES TO BACKUP CONTROL

E EVA AUDIO DOES NOT CONTAIN AN ICOM PTT SIGNAL

F LINES LABELED 'AUDIO' REPRESENT MIKE SIGNAL, EARPHONE OR SPEAKER SIGNAL, XMIT PTT, ICOM PTT AND THE APPROPRIATE RETURN LINES

G SERVICE AND COOLING UMBILICAL (SCU) CONNECTS EMU TO AIRLOCK FOR HARDLINE SUPPORT WHILE EVA CREWMEN ARE IN AIRLOCK

NOTES: 1 HEADSET ASSEMBLY MAY CONSIST OF EITHER A LAUNCH AND ENTRY HELMET, LIGHTWEIGHT HEADSET, OR A WCES AND HEADSET

1 COM OV AUD 3

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN PAT SHERRILL		
DR VICKI DOGGETT	9-16-78	
ENGR K. KNOLL	02/22/96	COMM OVERVIEW AUDIO
ENGR Karyn T Knoll	5/17/96	
APP Gary Coffman	5/17/96	
APP Sandra K. Morrell	5/17/96	SPACE SHUTTLE / DWG NO 16. 1C, D, E
CADS S.K. Kirshner	6/12/96	OV 103, 104, 105
LTR E / PCN 6		126.5 X34 / PAGE / SHEET 3 of 6

BASIC REV E-6

S R Q P O N M L K J

ESS 1BC AUDIO LEFT 3A PNL R14A F CB4 — V_{ESS1BC} 013 & R14
ESS 2CA AUDIO RIGHT 3A PNL R14A F CB6 — V_{ESS2CA} 013 & R14
MN C AUDIO PS AIRLOCK 3A PNL R14A CB10 — V_{MNC} R14
MN A AUDIO MS 3A PNL R14A CB2 — V_{MNA} R14
MN B AUDIO MID DECK SPKR 3A PNL R14A CB5 — V_{MNB} R14

ORBITER HEADSET — EARPHONE, EARPHONE, MIKE POWER, MIKE SIGNAL, MIKE POWER, MIKE SIGNAL

WCCS/CRU — PTT XMIT, PTT ICOM, VOLUME, CHANNEL A1 / A2

WCCS/AIU — MODE SEL — POWER, CDR AUDIO — CONNECTED TO LEFT COMM IN PLACE OF HIU & HEADSET WHEN ON ORBIT

WCCS/CRU — CHANNEL B1 / B2

WCCS/AIU — MODE SEL — POWER, CDR AUDIO — CONNECTED TO MS COMM IN PLACE OF HIU & HEADSET WHEN ON ORBIT

HEADSET INTERFACE UNIT — ICOM, XMIT — (CLIP-ON) — POWER, PS AUDIO, MS AUDIO

MULTIPLE HEADSET ADAPTER

HEADSET INTERFACE UNIT — (CLIP-ON) — POWER, AUDIO

WCCS/CRU — CHANNEL C1 / C2

WCCS/AIU — MODE SEL — POWER, AUDIO

LEFT COMM — RIGHT COMM — POWER ON/OFF — PNL R6

PS COMM — CCU PWR ON/OFF — PNL A11

MS COMM — CCU PWR ON/OFF — PNL A12

MIDDECK COMM — CCU PWR ON/OFF — PNL M039H

CCU 1 / CCU 2 — POWER ON/OFF

CDR (LEFT) AUDIO PANEL
PILOT (RIGHT) AUDIO PANEL A

RIGHT AUDIO — POWER AUDIO/TONE, A/G, A/A T/R, ICOM, VOX SENS, TACAN ID, VOLUME, XMIT/ICOM MODE, CONTROL, PAGE

FROM AUDIO CENTER (Z6 1, Z5 6)
CDR AUDIO, PLT AUDIO
CDR RHC, PLT RHC — CDR RHC PTT XMIT, PLT RHC PTT XMIT
NSP 1, NSP 2 — NSP 1 ON, NSP 2 ON, LDR XMIT

MISSION STATION AUDIO — POWER AUDIO/TONE, A/G, A/A T/R, ICOM, VOX SENS, VOLUME, XMIT/ICOM MODE, PAGE

FROM AUDIO CENTER (Z5 7, Z1 2)
PS AUDIO, MS AUDIO
AFT RHC — XMIT PTT TO MS ATU
MS AUDIO CONTROL — NORM, PS — TO PS ATU FOR BACKUP
OS AUDIO
SPKR PWR SPKR/MIC PAGE — MASTER SPEAKER VOLUME — PNL A13
NSP 1, NSP 2 — NSP 1 ON, NSP 2 ON, LDR XMIT
OS SU A2 — KEY — PNL A2
OS SU POWER
C&W SYS A — KLAXON AND SIREN

MIDDECK AUDIO — OS AUDIO — POWER AUDIO/TONE, A/G, A/A T/R, ICOM, VOX SENS, VOLUME, XMIT/ICOM MODE, PAGE
MIDDECK COMM AUDIO
MIDDECK SU — KEY — PNL M029J
MIDDECK AUDIO
MIDDECK SU POWER
KLAXON & SIREN — C&W SYS B
ALL TONES
MIDDECK SPEAKER AUDIO — TONES ACCU — ACCU/BYPASS
BYPASS TONE VOLUME — PNL M042F — ALL TONES — C&W SYSTEM A

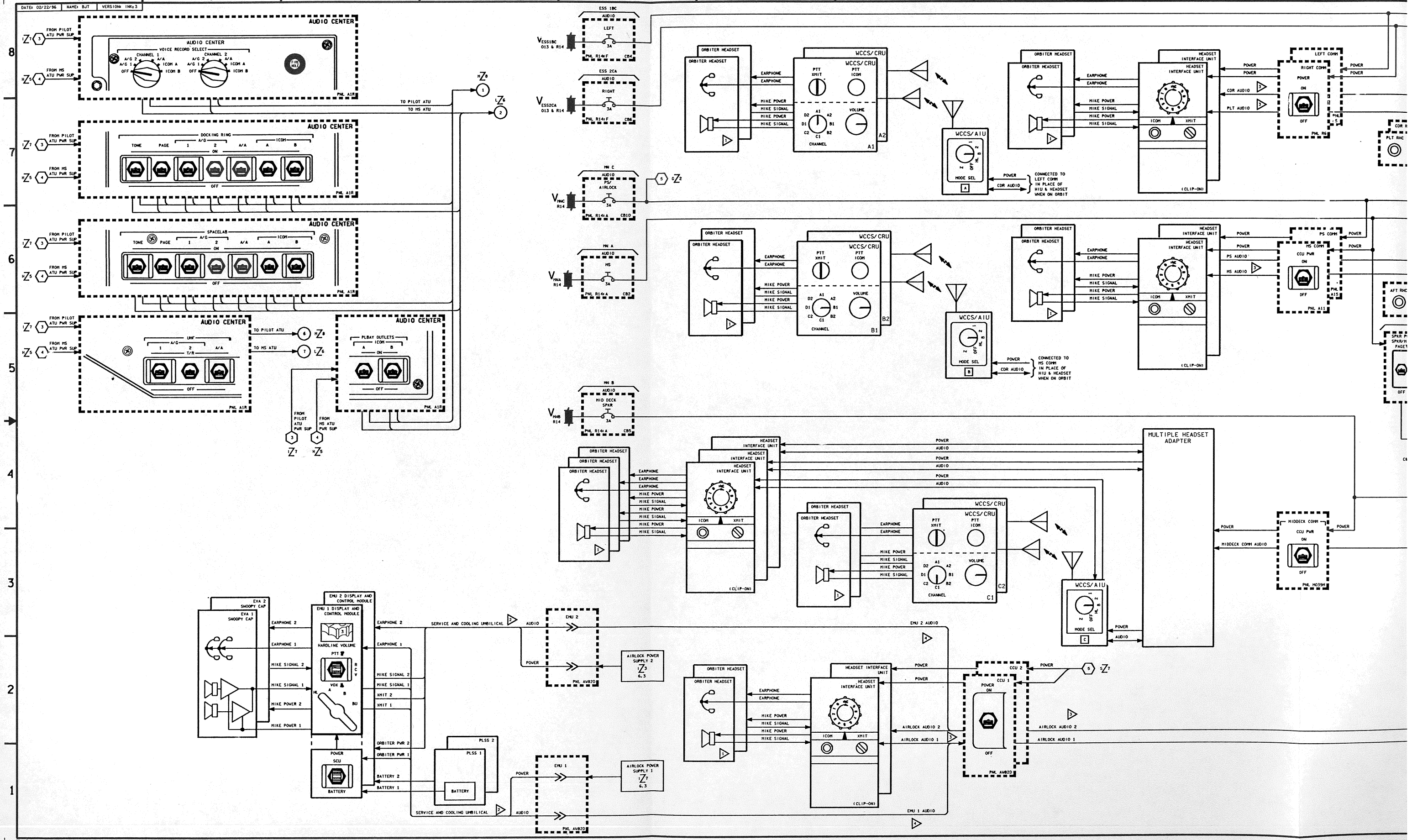
EMU 2 — AUDIO, POWER — PNL AW820 — EMU 2 AUDIO
AIRLOCK POWER SUPPLY 2 (Z5 6.3)
EMU 1 — POWER, AUDIO — PNL AW820 — EMU 1 AUDIO
AIRLOCK POWER SUPPLY 1 (Z7 6.3)
AIRLOCK AUDIO 2, AIRLOCK AUDIO 1

ORBITER HEADSET — SLEEP STATION TONES — ALL TONES — C&W SYSTEM B — PNL M058F

DATE: 02/22/96 | NAME: BJT | VERSION: INK 3

W V U T S R Q P O N

8 7 6 5 4 3 2 1



BASIC REV E-6

DATE:	NAME:	VERSION:
DATE: 02/16/96	NAME: VSH	VERSION: BPT: 5
DATE: 03/01/96	NAME: VSH	VERSION: INR: 9
DATE: 07/19/96	NAME: SVJ	VERSION: INR: 10

ANALOG/DIGITAL DISPLAY INTERFACE

EA 2 RADAR STATUS DATA (SERIAL)

EA 2 CONTROL SIGNALS (SERIAL)

SERIAL DIGITAL INTERFACE

RADAR TRACKING CIRCUITS

LOBING ENABLE
RADAR POWER ON
RADAR POWER STBY
RADAR POWER MEDIUM
RADAR POWER LOW
TARGET PRESENT
ANGLE TRACK ENABLE
RADAR LOBING SIGNALS

RANGE AND RANGE RATE

RANGE AND VELOCITY PROCESSOR

ANTENNA CONTROL ELECTRONICS

KU A DEDICATED DIGITAL DISPLAY DATA TO RANGE/RANGE RATE METER

SCAN GENERATION

TRACK IF FROM DA

RADAR/COMM ALPHA/BETA ΔAZ ΔEL DETECT

RADAR ALPHA/BETA ERRORS

ANGLE PROCESSOR

ALPHA/BETA MOTOR DRIVES TO DA

MDM INTERFACE AND SIGNAL DISTRIBUTION

COMM DATA CHAN V74M2560J

MDM PF1

ACQ CONT WORD V74M2630P

RADAR DATA CHAN V74M2540B

MDM FF3

I/O DETECTOR

ACQUISITION AND SELF TEST CONTROL SIGNAL

156 MHZ REFERENCE

ELECTRONICS ASSEMBLY 2

DELTA CHANNEL SELECT
ENCODER/GIMBALL LOCK DRIVE
WIDEBEAM SELECT
GYRO EXCITATION
SELF TEST SIGNALS
OPERATE STATUS
WIDEBEAM TRANSMIT SELECT
LINEAR POLARIZATION
TRANSMIT ENABLE RADAR
COMM A ON
COMM A STBY
RADAR ON
RADAR STBY
ALPHA/BETA MOTOR DRIVES
TRANSMIT RF PWR
ALPHA/BETA ENCODER SIGNALS
LOBING SIGNALS
TRACK IF (ERROR SIGNALS)
COMM IF AND SIG STR
ENCODER OUTPUTS
156 MHZ REFERENCE
ALPHA/BETA AXIS HIGH/LO

TO FROM DA/EA 1

WAVEGUIDE SWITCH

EA1 TORQUING AND ENCODING SIGNALS

INNER/OUTER GIMBAL ASSEMBLY

RDR RCV ACQ SIGNAL

AZ/EL SWITCH

ΔAZ/ΔEL

MONOPULSE COMPARATOR

WIDEBEAM ACQUISITION HORN

POLARIZATION SWITCH

RADAR/COMM RCV/XMIT

RADAR ACTIVE/PASSIVE SELECT

NARROW BEAM ANTENNA

RADAR ACQ MODE/RCV WIDEBAND SIGNALS

DEPLOY/STOW MOTOR DRIVES

RENDEVOUS RADAR AND COMM ANTENNA DEPLOYMENT ACTUATOR (2 MOTORS)

DPLY/STOW DISCRETES
AC PWR
DC PWR
PREFLIGHT PWR
AC PWR FOR DPLY/STOW
DC PWR (FOR TLM)
PREFLIGHT PWR (FOR 30° DPLY)
DPLY/STOW DISCRETES

MID MCA 4

30° DEPLOY DISCRETE (PREFLITE XMIT ENBL)
BOOM STOW ENABLE 2 EXCITATION
BOOM STOW ENABLE 2 (MICROSWITCH DRIVEN)

28V DMA HEATER PWR (231W)
28V DEA HEATER PWR 1 (134W)
28V DEA HEATER PWR 2 (134W)
28V POWER TO DA

20A

V_{MNB}

MID MOTOR CONTROL ASSEMBLY 2

DEPLOYED
STOWED
BOOM STOW INITIATE
TRANSMIT SCAN ENBL TO EA1
TO DPLY/STOW TALKBACK

DIRECT STOW ENABLE

STOW
GND
DPLY

MNB PWR FROM CB23
MNB PWR FROM CB24

MID POWER CONTROL ASSEMBLY 2

DMA
DEA

TWT BYPASS ENABLE
RADAR POWER MEDIUM
RADAR POWER LOW
FREQUENCY SELECT SIGNALS A, B, C
RADAR SUM CHANNEL ENABLE
RADAR DIFFERENCE CHANNEL ENABLE
GATING SIGNALS FPR VMTR, RCVR, EXCITER
AGC SIGNALS
HIGH SAMPLE RATE SELECT

RADAR POWER MODE SELECT

12 OR 24 DB ATTENUATOR

TWT

WAVEGUIDE TRANSFER SWITCH

RETURN LINK AND RADAR XMIT

DUPLEXER

FWD LINK AND RADAR RCV

TWT BYPASS SELECT

COMM IF

SUM CHANNEL

SUM

RDR RCV WIDEBAND SIG

SUMMING CIRCUIT

DIFFERENCE

DIFFERENCE CHANNEL

RADAR IF

ERROR SIGNALS

MNB PWR FROM CB23

RETURN LINK COMM OR RADAR XMIT

CARRIER REFERENCE

156 MHZ REFERENCE

EXCITER

RETURN LINK DATA

TRANSMIT ENABLE COMM

COMM/RADAR SELECT

GATING SIGNALS

FREQUENCY SELECT SIGNALS

RADAR BLANKING LOGIC AND SWITCH DRIVER

GATING SIGNALS

RADAR/COMM ON/STBY

EA2

EA1

DEPLOYED ASSEMBLY

TRANSMIT/SCAN ENABLE

MID BODY MOTOR CONTROL ASSEMBLY NO 4

DPLY/STOW DISCRETES
PREFLITE PWR (FOR 30° DPLY)
DC PWR (FOR TLM)
AC PWR FOR DPLY STOW
DPLY
GND
STOW
DIRECT STOW ENABLE

ANT DPLY ACTUATOR

FROM DPLY/STOW SW

BOOM STOW INITIATE

BOOM STOW ENABLE 1 (SOFTWARE DRIVEN)

STOW
DEPLOY

MID MCA 2

LOCK DISCRETE

TAS LOOP AND ASE LOCK DEMODULATOR

PN SPREADER

POWER DIVIDER

FWD LINK COMM IF

GIMBAL MOTOR DRIVES

DA/EA 1 INTERFACE SIGNALS

TO DA

RADAR/COMM SIG STR SELECT

RADAR SIGNAL STRENGTH

KU SIGNAL STRENGTH

KU ANT

DPL
STO

A
DEPLOY
STOW

DIRECT STOW ON
OFF

DIRECT STOW ENABLE

FROM MID MCA-2 AND MID MCA-4

TO MID MCA-4

V_{CA1} V_{CA2} V_{BC1} V_{BC2}

SIGNAL STRENGTH

S-BAND PM

S-BAND PL

KU

KU SIGNAL STR

RANGE/ELEVATION

+8888

RANGE RATE/AZIMUTH

+8888

28V MNB PWR FROM PWR SW

DIGITAL DISPLAY DATA FROM EA 1

DIG DISPLAY SELECT R/R

LAMP TEST

DISPLAY SELECT

RANGE/RANGE RATE SELECT

EL/AZ SELECT

ANGLE SET/LAMP TEST

ORBIT STATION LIGHTING

NUMERIC

OFF
BAT

DIMMER
PWR SW
XFMR

AC28C LIGHTING NUMERIC OS

V_{AC28C}

ELECTRONICS ASSEMBLY 1

15 SEE SSSH DWG 15.7-1 7Z5 FOR DETAILS OF DPLY/STOW CIRCUIT

16 SEE SSSH 15.7-1 6Z5 FOR DETAILS OF JETTISON CIRCUIT

17 SEE SSSH DWG 4.2-2 7Z5 FOR DETAILS PNL A2 LIGHTING POWER SUPPLY CIRCUIT

18 THIS LINE CARRIES 5 VAC, 400HZ TO THE METER. RECTIFIED 0-5 VAC POWER IS USED TO DRIVE THE ELEMENTS OF THE DIGITAL METER. 28VDC POWER IS USED TO OPERATE THE LOGIC/PROCESSING CIRCUITS IN THE METER

19 SWITCH S8 ON PANEL R13 ('DIRECT STOW ON') APPLIES A SIGNAL TO MID MCA 2 AND MID MCA 4 WHICH SIMULATES PROPER 'BOOM STOW ENABLE 1' AND 'II' SIGNALS, ALLOWING THE DA TO BE STOWED IN THE ABSENCE OF EITHER OR BOTH 'BOOM STOW ENABLE' SIGNALS

20 THE NARROW BEAM ANTENNA ASSEMBLY IS A 36 INCH DIAMETER PARABOLIC DISH USING A 5 ELEMENT MONOPULSE FEED. THE WIDE BEAM HORN IS A PHYSICALLY SEPARATE ANTENNA USED PRIMARY FOR SIDELOBE SUPPRESSION.

1 EA 2 CONTROL DATA (SERIAL)
ANTENNA READY
ENCODED MODE BIT 1
ENCODED MODE BIT 2
SLEW FAST
SLEW SLOW
MAIN SCAN
MINI SCAN
PROVIDE TEST TARGET
RADAR ACTIVE/PASSIVE

2 EA 2 RADAR STATUS (SERIAL)
RADAR ANGLE RATE DATA GOOD — TRACK
RADAR ANGLE DATA GOOD — DETECT
ANGLE TRACK ENABLE — SIDELOBE
GENERATING TEST TARGET — RANGE BITE 1, 2
RANGE DATA GOOD — RANGE RATE BITE 1, 2
RANGE RATE DATA GOOD — ALPHA ANGLE RATE BITE 1, 2
MINI SCAN 2 — BETA ANGLE RATE BITE 1, 2

3 SPA SERIAL DATA
PRI ACQ MODE 1/2
DATA GOOD
FWD LINK MODE 1/2
GPC DESIG MODE
GPC ACQ MODE
MOD CONTROL 1
MOD CONTROL 2
KU A SELECT
TDRS WEST SELECT
TDRS EAST SELECT

4 V74M2540B - RADAR DATA CHANNEL

V74H2882B - K KU A CH2 STATUS WORD 1	WD1		
V74X2883B - K KU A CH2 COMM-A/RDR MODE (CR)	WD1B00	COMM RDR	EVENT
V74X2884B - K KU A CH2 ANT STRG AUTO (CR)	WD1B01	OFF ON	EVENT
V74X2885B - K KU A CH2 ANT STRG CPC ACQ	WD1B02	DES	EVENT
V74X2886B - K KU A CH2 ANT STRG GPC ACQ (CR)	WD1B03	ACQ	EVENT
V74X2887B - K KU A CH2 PARITY ERROR (CR)	WD1B04	ERROR	EVENT
V74X2888B - K KU A CH2 SYNC ERROR (CR)	WD1B05	ERROR	EVENT
V74X2889B - K KU A CH2 VALIDITY ERROR (CR)	WD1B06	ERROR	EVENT
V74X2890B - K KU A CH2 RDR ANG DATA GD (R)	WD1B07	GOOD	EVENT
V74X2891B - K KU A CH2 RDR ANG RT DG (R)	WD1B08	GOOD	EVENT
V74X2892B - K KU A CH2 RDR STST IN PROG (R)	WD1B09	TEST	EVENT
V74X2893B - K KU A CH2 KU A/B SELECTED (C)	WD1B10	OFF ON	EVENT
V74H2900P - K KU A CH2 STATUS WORD 2	WD2		
V74X2901B - K KU A CH2 SEARCH (CR)	WD2B00	SEARCH	EVENT
V74X2902B - K KU A CH2 DETECT (CR)	WD2B01	DETECT	EVENT
V74X2903B - K KU A CH2 TRACK (CR)	WD2B02	TRACK	EVENT
V74X2904B - K KU A CH2 OPERATE (CR)	WD2B03	OPR	EVENT
V74X2905B - K KU A CH2 EA 1 RDR TST STAT (R)	WD2B04	PASS	EVENT
V74X2906B - K KU A CH2 DA RDR TST STAT (R)	WD2B05	PASS	EVENT
V74X2907B - K KU A CH2 EA2 RDR TST STAT (R)	WD2B06	PASS	EVENT
V74X2908B - K KU A CH2 RDR SYS TST STAT (R)	WD2B07	PASS	EVENT
V74X2909B - K KU A CH2 TDRS WEST (C)	WD2B08	WEST	EVENT
V74X2910B - K KU A CH2 TDRS EAST (C)	WD2B09	EAST	EVENT
V74X2911B - K KU A CH2 FWD LK BIT SYNC (C)	WD2B10	SYNC	EVENT
V74X2912B - K KU A CH2 FWD LK FR SYNC (C)	WD2B11	SYNC	EVENT
V74X2913B - K KU A CH2 DATA PRESENT (C)	WD2B12	PRES	EVENT
V74X2914B - K KU A CH2 SCAN WARN LIMIT (CR)	WD2B13	LIMIT	EVENT
V74X2915B - K KU A CH2 RANGE DATA GOOD (R)	WD2B14	GOOD	EVENT
V74X2916B - K KU A CH2 RANGE RATE GOOD (R)	WD2B15	GOOD	EVENT
V74H2918B - K KU BAND A CH 2 ROLL WORD 3	WD3	-180 +180	DEG
V74H2920B - K KU BAND A CH 2 PITCH WORD 4	WD4	-90 +90	DEG
V74H2922B - K KU BAND A CH 2 RANGE RATE	WD5	+0.05 +1500	FT/S
V74H2923B - K KU BAND A CH 2 RANGE RATE	WD6	+0.05 +1500	FT/S
V74H2924B - K KU BAND A CH 2 RANGE WORD 7	WD7	.100 1823	KF
V74H2925B - K KU BAND A CH 2 RANGE WORD 8	WD8	.100 1823	KF
V74H2926B - K KU BAND A CH 2 ROLL RATE	WD9	+.005 +10	DEG/S
V74H2928B - K KU BAND A CH 2 PITCH RATE	WD10	+.005 +10	DEG/S

5 V74M2560J - COMM DATA CHANNEL KU A

V74M2582P - K KU A CH1 STATUS WORD 1	WD1		
V74X2583J - K KU A CH1 COMM-A/RDR MODE (CR)	WD1B00	COMM RDR	EVENT
V74X2584J - K KU A CH1 ANT STRG AUTO (CR)	WD1B01	OFF ON	EVENT
V74X2585J - K KU A CH1 ANT STRG CPC ACQ (CR)	WD1B02	DES	EVENT
V74X2586J - K KU A CH1 ANT STRG GPC ACQ (CR)	WD1B03	ACQ	EVENT
V74X2587J - K KU A CH1 PARITY ERROR (CR)	WD1B04	ERROR	EVENT
V74X2588J - K KU A CH1 SYNC ERROR (CR)	WD1B05	ERROR	EVENT
V74X2589J - K KU A CH1 VALIDITY ERROR (CR)	WD1B06	ERROR	EVENT
V74X2590J - K KU A CH1 RDR ANG DATA GD (R)	WD1B07	GOOD	EVENT
V74X2591J - K KU A CH1 RDR ANG RT DG (R)	WD1B08	GOOD	EVENT
V74X2592J - K KU A CH1 RDR STST IN PROG (R)	WD1B09	TEST	EVENT
V74X2593J - K KU A CH1 KU A/B SELECTED (C)	WD1B10	OFF ON	EVENT
V74X2594J - K KU A CH1 AUTO HOT S/O OVRD	WD1B11	OFF ON	EVENT
V74M2600P - K KU A CH1 STATUS WORD 2	WD2		
V74X2601J - K KU A CH1 SEARCH (CR)	WD2B00	SEARCH	EVENT
V74X2602J - K KU A CH1 DETECT (CR)	WD2B01	DETECT	EVENT
V74X2603J - K KU A CH1 TRACK (CR)	WD2B02	TRACK	EVENT
V74X2604J - K KU A CH1 OPERATE (CR)	WD2B03	OPR	EVENT
V74X2605J - K KU A CH1 EA 1 RDR TST STAT (R)	WD2B04	PASS	EVENT
V74X2606J - K KU A CH1 DA RDR TST STAT (R)	WD2B05	PASS	EVENT
V74X2607J - K KU A CH1 EA2 RDR TST STAT (R)	WD2B06	PASS	EVENT
V74X2608J - K KU A CH1 RDR SYS TST STAT (R)	WD2B07	PASS	EVENT
V74X2609J - K KU A CH1 TDRS WEST (C)	WD2B08	WEST	EVENT
V74X2610J - K KU A CH1 TDRS EAST (C)	WD2B09	EAST	EVENT
V74X2612J - K KU A CH1 FWD LK FR SYNC (C)	WD2B11	SYNC	EVENT
V74X2613J - K KU A CH1 DATA PRESENT (C)	WD2B12	PRES	EVENT
V74X2614J - K KU A CH1 SCAN WARN LIMIT (CR)	WD2B13	LIMIT	EVENT
V74X2615J - K KU A CH1 RANGE DATA GOOD (R)	WD2B14	GOOD	EVENT
V74X2616J - K KU A CH1 RANGE RATE GOOD (R)	WD2B15	GOOD	EVENT
V74H2618J - K KU BAND A CH 1 ROLL WORD 3	WD3	-180 +180	DEG
V74H2619J - K KU BAND A CH 1 PITCH WORD 4	WD4	-90 +90	DEG
V74H2620J - K KU BAND A CH 1 RANGE RATE BITS 01-19		-26.2 +26.2	KFT/S
V74H2621J - K KU BAND A CH 1 RANGE RATE BITS 01-16	WD5	0.08 2621	FT/S
V74H2622J - K KU BAND A CH 1 RANGE RATE BITS 01-03	WD6	0 0.07	FT/S
V74H2623J - K KU BAND A CH 1 RDR RANGE BITS 01-18		0 2621	KF
V74H2624J - K KU BAND A CH 1 RDR RANGE BITS 01-16	WD7	.040 2621	KF
V74H2625J - K KU BAND A CH 1 RDR RANGE BITS 01-02	WD8	0 0.30	KF
V74H2626J - K KU BAND A CH 1 ROLL RATE	WD9	+.005 +10	DEG/S
V74H2628J - K KU BAND A CH 1 PITCH RATE	WD10	+.005 +10	DEG/S
V74H2630P - K KU A CH1 GPC ACQ CONT WORD 1	WD1		
V74H2648J - K KU BAND A CH 1 DES ROLL WD	WD2	-180 +180	DEG
V74H2650J - K KU BAND A CH 1 DES PITCH WD	WD3	-90 +90	DEG
V74U2651J - K KU CH1 TGT RNG EST BITS 01-18		0 2621	KF
V74H2652B - K KU BAND A CH 1 TGT RNG EST BITS 01-16	WD4	.040 2621	KF
V74H2654B - K KU BAND A CH 1 EST RANGE B	WD5	0 0.30	KF

6 GC1L KU A TELEMETRY (1 = FUNCTION SELECTION)
V74X4807E - KU A STBY
V74X4808E - KU FAIL/SAFE ENABLE
V74X4810E - KU A MANUAL SLEW
V74X4818E - KU A PWR ON
V74X4820E - KU A GPC ACQ
V74X4822E - KU A GPC DESIG
V74X4824E - KU A AUTO TRACK
V74X4828E - KU A HOR PL ANLG
V74X4829E - KU A HOR PL DIG
V74X4830E - KU A HOR TV
V74X4831E - KU A HOR PL MAN
V74X4832E - KU A HOR PL INTERR
V74X4836E - KU A LOR PL INTERR
V74X4837E - KU A LOR PL RCDR
V74X4838E - KU A LOR OPS RCDR
V74X4839E - KU A LOR PL DIGITAL
V74S2430E - KU BAND CONTROL - CMD

7 TEXT AND GRAPHICS HARDCOPIER
V74X8108E POWER ON
V74X8107ESTANDBY
V74X8111E DEV TEMP WARN
V74X8100E TAGS MODE 1
V74X8101E TAGS MODE 2
V74X8102E TAGS MODE 3
V74X8103E TAGS MODE 4
V74X8104E PARTIAL PAGE
V74X8105E FULL PAGE
V74X8106E PAPER EMPTY
V74X8109E PAPER JAM
V74X8110E DEV OVERTEMP

8 HEATERS ARE THERMOSTATICALLY CYCLED

9 GPC ACQ CONT WORD (V74M2630P)
BITS 1-3 SYNC
BIT 6 SEARCH INT
BIT 5 TDRS EAST SEL
BIT 6 TDRS WEST SEL
BIT 7 SP SPEC ON/OFF
BIT 8 KU A/B SEL
BIT 9 SELF TEST ON/OFF
BIT 10 MOD CONT 1
BIT 11 MOD CONT 2
BIT 12 PRI ACQ MODE ON/OFF
BIT 13 MAN/GPC DESIG IMMT STAB ON/OFF
BIT 14 FWD LINK MODE 1/2 SEL
BIT 15-19 SPARE
BIT 20 PARITY

1 KU BAND OV 4

SIGNATURE		DATE
DSGN	S.K. KIMBRELL	10/27/78
DR	S.K. KIMBRELL	10/27/78
ENGR	J. FANELLI	
ENGR		7-24-96
APP		7/24/96
APP		7-26-96
CADS	S.K. Kimbrell	7-26-96

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

COMM OVERVIEW
KU BAND

SPACE SHUTTLE	DWG NO
ALL	16.1
126.5 X 34	PAGE SHEET 4 OF 6

LTR E PCN 6

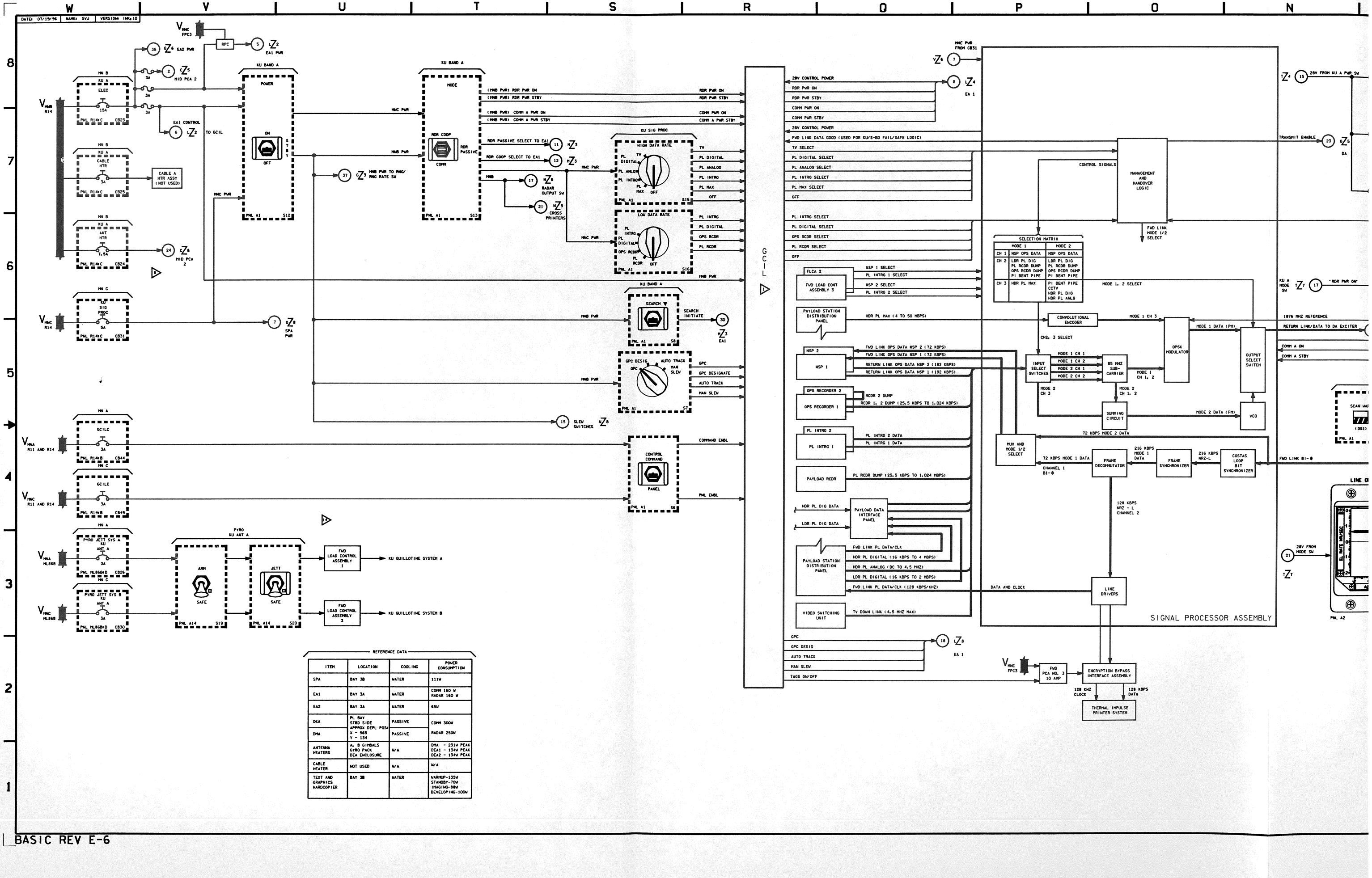
BASIC REV E-6

T S R Q P O N M L K J

BAND A

MODE

(MNB PWR) RDR PWR ON
(MNB PWR) RDR PWR STBY
(MNB PWR) COMM A PWR ON
(MNB PWR) COMM A PWR STBY
RDR PASSIVE SELECT TO EA1
RDR COOP SELECT TO EA1
MNB
MNC PWR
RADAR OUTPUT SW
CROSS PRINTERS
RDR PASSIVE
S13
KU SIG PROC
HIGH DATA RATE
LOW DATA RATE
PL DIGITAL
PL ANLG
PL INTRG
PL MAX
PL RCDR
OPS RCDR
OFF
PML A1
S15
S16
RDR PWR ON
RDR PWR STBY
COMM PWR ON
COMM A PWR STBY
TV
PL DIGITAL
PL ANALOG
PL INTRG
PL MAX
OFF
PL INTRG
PL DIGITAL
OPS RCDR
PL RCDR
MNB PWR
KU BAND A
SEARCH
SEARCH INITIATE
S8
GPC DESIG
AUTO TRACK
GPC
MAN SLEW
S7
GPC
GPC DESIGNATE
AUTO TRACK
MAN SLEW
SLEW SWITCHES
CONTROL COMMAND PANEL
S6
COMMAND ENBL
PML ENBL
GCIL
28V CONTROL POWER
RDR PWR ON
RDR PWR STBY
COMM PWR ON
COMM PWR STBY
28V CONTROL POWER
FWD LINK DATA GOOD (USED FOR KU'S-BD FAIL/SAFE LOGIC)
TV SELECT
PL DIGITAL SELECT
PL ANALOG SELECT
PL INTRG SELECT
PL MAX SELECT
OFF
PL INTRG SELECT
PL DIGITAL SELECT
OPS RCDR SELECT
PL RCDR SELECT
OFF
MNC PWR FROM CB31
EA 1
CONTROL SIGNALS
MANAGEMENT AND HANDOVER LOGIC
FWD LINK MODE 1/2 SELECT
SELECTION MATRIX
MODE 1 / MODE 2
CH 1: NSP OPS DATA / NSP OPS DATA
CH 2: LDR PL DIG, PL RCDR DUMP, OPS RCDR DUMP, PI BENT PIPE / LDR PL DIG, PL RCDR DUMP, OPS RCDR DUMP, PI BENT PIPE
CH 3: HDR PL MAX / PI BENT PIPE, CCTV, HDR PL DIG, HDR PL ANLG
MODE 1, 2 SELECT
FLCA 2
FWD LOAD CONT ASSEMBLY 3
MSP 1 SELECT
PL INTRG 1 SELECT
MSP 2 SELECT
PL INTRG 2 SELECT
PAYLOAD STATION DISTRIBUTION PANEL
HDR PL MAX (4 TO 50 MBPS)
CONVOLUTIONAL ENCODER
MODE 1 CH 3
CH2, 3 SELECT
MODE 1 DATA (PM)
OPSK MODULATOR
OUTPUT SELECT SWITCH
FWD LINK OPS DATA NSP 2 (72 KBPS)
FWD LINK OPS DATA NSP 1 (72 KBPS)
RETURN LINK OPS DATA NSP 2 (192 KBPS)
RETURN LINK OPS DATA NSP 1 (192 KBPS)
NSP 2
NSP 1
INPUT SELECT SWITCHES
MODE 1 CH 1
MODE 1 CH 2
MODE 2 CH 1
MODE 2 CH 2
85 MHZ SUB-CARRIER
MODE 1 CH 1, 2
MODE 2 CH 3
MODE 2 CH 1, 2
SUMMING CIRCUIT
MODE 2 DATA (FM)
VCO
T2 KBPS MODE 2 DATA
OPS RECORDER 2
OPS RECORDER 1
RCDR 2 DUMP
RCDR 1, 2 DUMP (25.5 KBPS TO 1.024 KBPS)
PL INTRG 2
PL INTRG 1
PL INTRG 2 DATA
PL INTRG 1 DATA
PAYLOAD RCDR
PL RCDR DUMP (25.5 KBPS TO 1.024 MBPS)
MUX AND MODE 1/2 SELECT
72 KBPS MODE 1 DATA
CHANNEL 1 BI-0
FRAME DECOMMUTATOR
216 KBPS MODE 1 DATA
FRAME SYNCHRONIZER
216 KBPS NRZ-L
COSTAS LOOP BIT SYNCHRONIZER
FWD LINK BI-0
128 KBPS NRZ-L CHANNEL 2
HDR PL DIG DATA
LDR PL DIG DATA
PAYLOAD DATA INTERFACE PANEL
FWD LINK PL DATA/CLK
HDR PL DIGITAL (16 KBPS TO 4 MBPS)
HDR PL ANALOG (DC TO 4.5 MHZ)
LDR PL DIGITAL (16 KBPS TO 2 MBPS)
FWD LINK PL DATA/CLK (128 KBPS/KHZ)
PAYLOAD STATION DISTRIBUTION PANEL
DATA AND CLOCK
LINE DRIVERS
VIDEO SWITCHING UNIT
TV DOWN LINK (4.5 MHZ MAX)
SIGNAL PROCESSOR ASSEMBLY
GPC
GPC DESIG
AUTO TRACK
MAN SLEW
TAGS ON/OFF
EA 1
V_{MNC} FPC3
FWD PCA NO. 3 10 AMP
ENCRYPTION BYPASS INTERFACE ASSEMBLY
128 KHZ CLOCK
128 KBPS DATA
THERMAL IMPULSE PRINTER SYSTEM
SLEW
AZIMUTH
L
R
S2
AZ SLEW RIGHT
AZ SLEW LEFT
ELEV SLEW UP
ELEV SLEW DOWN
ELEV UP
DOWN
S3
RATE FAST
SLOW
S4
SLEW RATE FAST
SLEW RATE SLOW
28V FROM KU A PWR SW
TRANSMIT ENABLE
DA
GCIL
GPC
GPC DESIG
AUTO TRACK
MAN SLEW
MDM PF1
GPC DESIGNATE CMDS FROM MDM PF1
SERIAL DATA
ANTENNA CONTROL ELECTRONICS
ANALOG/DIGITAL DISPLAY INTERFACE
SCAN GENERATION
TRACK IF FROM DA
RADAR/COMM ALPHA/BETA AAZ AEL DETECT
ALPHA/BETA MOTOR DRIVES TO DA
MDM INTERFACE AND SIGNAL DISTRIBUTION
ACQUISITION AND SELF TEST CONTROL SIGNAL
KU BAND A
RADAR OUTPUT HIGH
SLOW
S14
KU A MODE SW
RDR PWR ON
RADAR POWER HIGH
RADAR POWER MEDIUM
RADAR POWER LOW
1876 MHZ REFERENCE
CRYSTAL OSCILLATOR
RETURN LINK/DATA TO DA EXCITER
FWD LINK FRAME SYNC
COMM A ON
COMM A STBY
KU BAND A
SCAN WARN
TRACK
SEARCH
(DS1)
(DS2)
(DS3)
KU A SCAN WARNING
KU A TRACK STATUS
KU A SEARCH STATUS
LOCK DISCRETE
SERIAL DATA OUT
COSTAS LOOP AND PHASE LOCK DEMODULATOR
LINE OF SIGHT RATES
EL RATE MR/SEC
AZ RATE MR/SEC
PML A2
M1
28V FROM MODE SW
AZIMUTH RATE
ELEVATION RATE
X PNTR SCALE
X1
X10
S2
AZ RATE 0 -20 MR/SEC
AZ RATE 0 - 2 MR/SEC
ELEV RATE 0 - 20 MR/SEC
ELEV RATE 0 - 2 MR/SEC
GCIL
RDR PWR ON
RDR PWR STBY
COMM A PWR ON
COMM A PWR STBY
28V CONTROL PWR
MODE SWITCHING AND SELF TEST CONTROL
SPREAD SPECTRUM ON/OFF
PN DESPREADER
POWER DIVIDER
SELF TEST SIGNALS
TO/DA
FWD LINK COMM IF
RADAR/COMM SIG STR SELECT
SEARCH SW
KU A MODE SW
KU A SEARCH INITIATE
RADAR PASSIVE SEL
RADAR COOP SEL
MNB POWER FROM CB23
MNB CONTROL POWER FROM CB23
ELECTRONICS ASSEMBLY 1


DATE: 07/19/96 NAME: SVJ VERSION: INK10
W V U T S R Q P O N
8 7 6 5 4 3 2 1
MN B KU A ELEC 15A PNL R14C CB23
MN B KU A CABLE HTR 3A PNL R14C CB25
MN B KU A ANT HTR 7.5A PNL R14C CB24
MN C KU SIG PROC 5A PNL R14C CB31
MN A GCILC 3A PNL R14B CB44
MN C GCILC 3A PNL R14B CB45
MN A PYRO JETT SYS A KU ANT A 3A PNL ML868H CB26
MN C PYRO JETT SYS B KU ANT A 3A PNL ML868H CB30
EA2 PWR
MID PCA 2
EA1 PWR
EA1 CONTROL
TO GCIL
CABLE A HTR ASSY (NOT USED)
MID PCA 2
SPA PWR
SLEW SWITCHES
KU BAND A POWER ON OFF STBY PNL A1 S12
KU BAND A MODE RDR COOP COMM RDR PASSIVE PNL A1 S13
MNC PWR
MNB PWR
MNB PWR TO RNG/RNG RATE SW
(MNB PWR) RDR PWR ON
(MNB PWR) RDR PWR STBY
(MNB PWR) COMM A PWR ON
(MNB PWR) COMM A PWR STBY
RDR PASSIVE SELECT TO EA1
RDR COOP SELECT TO EA1
RADAR OUTPUT SW
CROSS PRINTERS
RDR PWR ON
RDR PWR STBY
COMM PWR ON
COMM A PWR STBY
KU SIG PROC
HIGH DATA RATE TV PL DIGITAL PL ANLG PL INTRG PL MAX OFF PNL A1 S15
LOW DATA RATE PL INTRG PL DIGITAL OPS RCDR PL RCDR OFF PNL A1 S16
TV
PL DIGITAL
PL ANALOG
PL INTRG
PL MAX
OFF
OPS RCDR
PL RCDR
KU BAND A SEARCH SEARCH INITIATE PNL A1 S8
GPC DESIG AUTO TRACK MAN SLEW PNL A1 S7
GPC
GPC DESIGNATE
AUTO TRACK
MAN SLEW
CONTROL COMMAND PANEL PNL A1 S6
COMMAND ENBL
PNL ENBL
PYRO KU ANT A ARM SAFE JETT SAFE PNL A14 S19 S20
FWD LOAD CONTROL ASSEMBLY 1
FWD LOAD CONTROL ASSEMBLY 3
KU GUILLOTINE SYSTEM A
KU GUILLOTINE SYSTEM B
GCIL
MNC PWR FROM CB31
28V CONTROL POWER
RDR PWR ON
RDR PWR STBY
COMM PWR ON
COMM PWR STBY
28V CONTROL POWER
FWD LINK DATA GOOD (USED FOR KU'S-BD FAIL/SAFE LOGIC)
TV SELECT
PL DIGITAL SELECT
PL ANALOG SELECT
PL INTRG SELECT
PL MAX SELECT
OFF
PL INTRG SELECT
PL DIGITAL SELECT
OPS RCDR SELECT
PL RCDR SELECT
OFF
EA 1
MANAGEMENT AND HANDOVER LOGIC
CONTROL SIGNALS
FWD LINK MODE 1/2 SELECT
SELECTION MATRIX
MODE 1 / MODE 2
CH 1: HSP OPS DATA / HSP OPS DATA
CH 2: LDR PL DIG, PL RCDR DUMP, OPS RCDR DUMP, PI BENT PIPE / LDR PL DIG, PL RCDR DUMP, OPS RCDR DUMP, PI BENT PIPE
CH 3: HDR PL MAX / PI BENT PIPE, CCTV, HDR PL DIG, HDR PL ANLG
MODE 1, 2 SELECT
FLCA 2
FWD LOAD CONT ASSEMBLY 3
NSP 1 SELECT
PL INTRG 1 SELECT
NSP 2 SELECT
PL INTRG 2 SELECT
PAYLOAD STATION DISTRIBUTION PANEL
HDR PL MAX (4 TO 50 MBPS)
CONVOLUTIONAL ENCODER
MODE 1 CH 3
CH2, 3 SELECT
NSP 2
NSP 1
FWD LINK OPS DATA NSP 2 (72 KBPS)
FWD LINK OPS DATA NSP 1 (72 KBPS)
RETURN LINK OPS DATA NSP 2 (192 KBPS)
RETURN LINK OPS DATA NSP 1 (192 KBPS)
OPS RECORDER 2
OPS RECORDER 1
RCDR 2 DUMP
RCDR 1, 2 DUMP (25.5 KBPS TO 1.024 KBPS)
PL INTRG 2
PL INTRG 1
PL INTRG 2 DATA
PL INTRG 1 DATA
PAYLOAD RCDR
PL RCDR DUMP (25.5 KBPS TO 1.024 MBPS)
HDR PL DIG DATA
LDR PL DIG DATA
PAYLOAD DATA INTERFACE PANEL
FWD LINK PL DATA/CLK
HDR PL DIGITAL (16 KBPS TO 4 MBPS)
HDR PL ANALOG (DC TO 4.5 MHZ)
LDR PL DIGITAL (16 KBPS TO 2 MBPS)
FWD LINK PL DATA/CLK (128 KBPS/KHZ)
PAYLOAD STATION DISTRIBUTION PANEL
VIDEO SWITCHING UNIT
TV DOWN LINK (4.5 MHZ MAX)
DATA AND CLOCK
LINE DRIVERS
INPUT SELECT SWITCHES
MODE 1 CH 1
MODE 1 CH 2
MODE 2 CH 1
MODE 2 CH 2
MODE 2 CH 3
85 MHZ SUB-CARRIER
MODE 1 CH 1, 2
MODE 2 CH 1, 2
QPSK MODULATOR
MODE 1 DATA (FM)
OUTPUT SELECT SWITCH
SUMMING CIRCUIT
MODE 2 DATA (FM)
VCO
T2 KBPS MODE 2 DATA
MUX AND MODE 1/2 SELECT
T2 KBPS MODE 1 DATA
CHANNEL 1 B1-0
FRAME DECOMMUTATOR
216 KBPS MODE 1 DATA
FRAME SYNCHRONIZER
216 KBPS NRZ-L
COSTAS LOOP BIT SYNCHRONIZER
FWD LINK B1-0
128 KBPS NRZ-L CHANNEL 2
SIGNAL PROCESSOR ASSEMBLY
FWD PCA NO. 3 10 AMP
ENCRYPTION BYPASS INTERFACE ASSEMBLY
128 KHZ CLOCK
128 KBPS DATA
THERMAL IMPULSE PRINTER SYSTEM
20V FROM KU A PWR SW
TRANSMIT ENABLE
DA
KU A MODE SW
RDR PWR ON
1876 MHZ REFERENCE
RETURN LINK/DATA TO DA EXCITER
COMM A ON
COMM A STBY
SCAN MAT
(DSI)
28V FROM MODE SW
EL MATE BRACKET
LINE CO
PNL A2
REFERENCE DATA
ITEM | LOCATION | COOLING | POWER CONSUMPTION
SPA | BAY 3B | WATER | 111W
EA1 | BAY 3A | WATER | COMM 160 W RADAR 160 W
EA2 | BAY 3A | WATER | 65W
DEA | PL BAY STBD SIDE APPROX DEPL POS: X - 565 Y - 134 | PASSIVE | COMM 300W
DMA | | PASSIVE | RADAR 250W
ANTENNA HEATERS | A, B GIMBALS GYRO PACK DEA ENCLOSURE | N/A | DMA - 231W PEAK DEA1 - 134W PEAK DEA2 - 134W PEAK
CABLE HEATER | NOT USED | N/A | N/A
TEXT AND GRAPHICS HARDCOPIER | BAY 3B | WATER | WARMUP-135W STANDBY-70W IMAGING-88W DEVELOPING-100W

DATE: 03/08/96	NAME: BJB	VERSION: BPT 4
DATE: 03/18/96	NAME: VSH	VERSION: INK 4
DATE: 07/01/96	NAME: BJB	VERSION: INK 5

CONSOLE MONITOR 3 (NOT INSTALLED)

CONSOLE MONITOR 2

CONSOLE MONITOR 1

VIDEO (PAYLOAD)
VIDEO
VIDEO
NRK VIDEO
NRK VIDEO
NRK VIDEO

POWER ON OFF
SELECT
FUNCTION
CONTRAST
BRIGHTNESS
COLOR
TINT
C-IN
D-IN

FOCUS
FOCUS NEAR
IRIS OPEN
IRIS CLOSE
ZOOM IN
ZOOM OUT
VERT DRIVE
COLOR SYNCH
MANUAL IRIS
+28V SWITCHED PWR
CUE LT ON

FOCUS ZOOM IRIS

COLOR LENS ASSEMBLY/
MONOCHROME LENS ASSEMBLY
LEFT SIDE MANUAL CONTROL

PEAK 0 dB BAY
NORM +12dB CAB
AVG +24 dB DAY
SSF
STS
FOCUS NEAR FAR
ZOOM IN OUT
IRIS OPEN CLOSE

RIGHT SIDE MANUAL CONTROL

TV
PWR ON OFF
(S11) COMMAND
(J1)

019

TV
POWER ON OFF
(S101) COMMAND
(J4)
FIRE HOLE

M058F

(80V73A121)

VARIOUS CABLES, SUCH AS THE PIGHY CABLE, TV POWER CABLE CONNECT HERE. THE V1U, CAMCORDER, TVIP, ETC, ARE THEN CONNECTED WITH THE CABLES. THESE CONFIGS ARE MISSION UNIQUE

STBD RMS TVC ASSEMBLY D

PORT RMS TVC ASSEMBLY
(ELBOW OR WRIST)

CAMR ON CONTR
CAMR ON CONTR
SYNC AND CONTR
SYNC AND CONTR
+28V PWR
FROM RCU

MN A
STBD RMS TV
CAMR/ PAN-TILT D
3A
PNL R14:E CB51
CAMR HTR
3A
PNL R14:E CB52
PAN-TILT HTR
3A
PNL R14:E CB53

V_{MNA} R14

RMS CAMERA

STBD WRIST PORT
ELBOW
S53 S54
PNL A7

STBD WRIST
PORT WRIST
STBD ELBOW
PORT ELBOW

MN B
PORT RMS TV
CAMR/ PAN-TILT
3A
PNL R14:E CB55
CAMR HTR
3A
PNL R14:E CB56
PAN-TILT HTR
3A
PNL R14:E CB57

V_{MNB} R14

+28V PWR
+28V CAMR HTR PWR
+28V CAMR HTR PWR
+28V PTU HTR PWR
+28V PTU HTR PWR

PORT REMOTE VIDEO SWITCHER

STBD RMS VIDEO
PORT RMS VIDEO

+28V PTU HTR PWR

PAN-TILT UNIT

PAN-TILT LIMIT SWITCHES
PAN LEFT
PAN RIGHT
TILT UP
TILT DOWN
VERT DRIVE
+28V SWITCHED PWR
+28V CAMR HTR PWR
+28V PWR
SYNCH AND CONTR
CAMR ON CONTR
ELBOW VIDEO

ALC
PEAK NORM AVG
WHITE STRCH NORM BLACK STRCH
GAMMA
ELBOW TELEVISION CAMERA
REAR MANUAL CONTROL

FOCUS FAR
FOCUS NEAR
IRIS OPEN
IRIS CLOSE
ZOOM IN
ZOOM OUT
VERT DRIVE
COLOR SYNCH
MANUAL IRIS
+28V SWITCHED PWR
CUE LT ON

FOCUS ZOOM IRIS

COLOR LENS ASSEMBLY/
MONOCHROME LENS ASSEMBLY
LEFT SIDE MANUAL CONTROL

+28V CAMR HTR PWR
+28V PWR
SYNCH AND CONTR
CAMR ON CONTR
WRIST VIDEO

ALC
PEAK NORM AVG
WHITE STRCH NORM BLACK STRCH
GAMMA
WRIST TELEVISION CAMERA
REAR MANUAL CONTROL

FOCUS FAR
FOCUS NEAR
IRIS OPEN
IRIS CLOSE
ZOOM IN
ZOOM OUT
VERT DRIVE
COLOR SYNCH
MANUAL IRIS
+28V SWITCHED PWR
CUE LT ON

FOCUS ZOOM IRIS

COLOR LENS ASSEMBLY/
MONOCHROME LENS ASSEMBLY
LEFT SIDE MANUAL CONTROL

P/L 1 VIDEO
P/L 2 VIDEO
P/L 3 VIDEO
ORBITER VIDEO

IRIG TIMING
MASTER TIMING UNIT

VSU

TV DOWNLINK INHIBIT
ENABLE
PNL A7 S11
SIGNAL GND

DOWNLINK ENABLE
DOWNLINK VIDEO

TO RCU

S-BAND FM SIGNAL PROCESSOR
KU-BAND SIGNAL PROCESSOR

SYNC AND CONTR
ICOM B AUDIO
ICOM A AUDIO
FROM RCU

PAYLOAD
(576 BULKHEAD)

ICOM A AUDIO
ICOM B AUDIO
ICOM A AUDIO
ICOM B AUDIO

AUDIO CENTRAL CONTROL UNIT

S-BAND HEMI ANTENNA
EMU TV ANTENNA

+28V PWR
VIDEO

EMU TV RECEIVER/ PROCESSOR

EMU TV HELMET ASSEMBLY
TV CAMERA ELECTRONICS UNIT
XMTR
VIDEO
PWR
PWR
GREEN LED "PWR ON"
BATTERY
PWR ON OFF
HELMET S1

D THE LOCATION OF THE MANUAL CONTROLS ARE DIFFERENT THAN ON THE 506/508 CAMERAS

D THE EMU RECEIVER MAY ALSO BE USED FOR ANY COMPATIBLE VIDEO CAMERA INSTALLED IN THE PAYLOAD BAY

1 ALL CONTROL/VIDEO/POWER SIGNALS GO THROUGH CONNECTORS J1 AND J4

D DETAILS ON THE 019 AND M058F SWITCHES AND CONNECTORS ARE ON 16.13 SHEET 1 H7

D A CTVC OR 506/508 CAMERA MAY BE CONNECTED. MISSION REQUIREMENTS DETERMINE WHICH

1 LOSS OF GC1L MNC PWR CONTROL LOSES CCTV U/L CAPABILITY, BUT THE TV SYSTEM CAN STILL BE POWERED ON AND OFF VIA U/L GC1L CMD

D THIS REPRESENTS A CONNECTOR AT THE END OF THE TV POWER CABLE WHICH CAN BE CONNECTED TO 019 OR M058F. ONLY THE POWER AND VIDEO PINS ARE USED

D TALK-BACK LIGHTS DRIVEN BY (ACA) ANNUNCIATOR CONTROL ASSEMBLY 4. SEE SSSH DRAWING TABLE 4-1

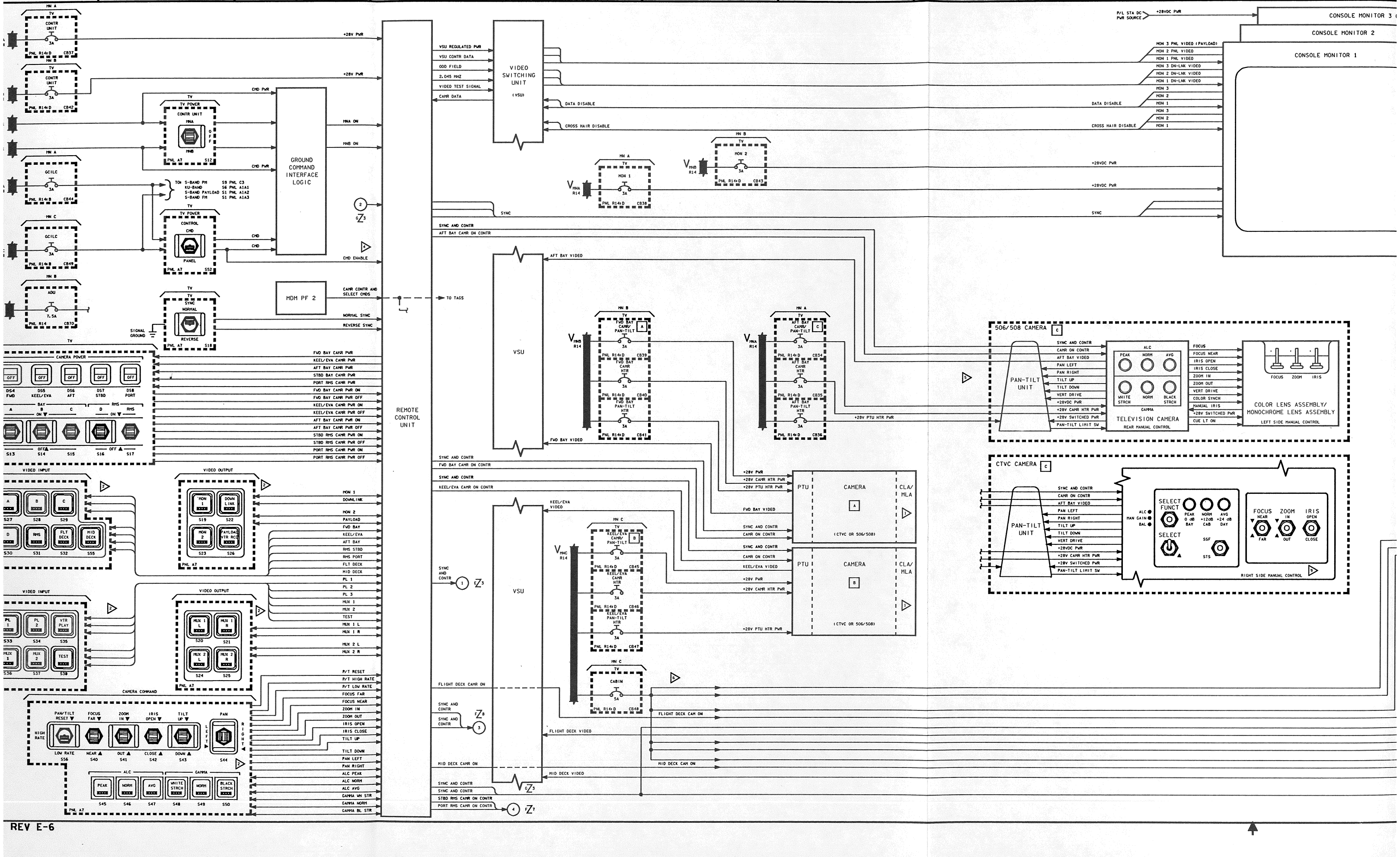
NOTES: 1 CUE LIGHT ON CLA FACE, CTVC DOESN'T HAVE INTERCHANGEABLE LENS ASSEMBLY

1 COM OV CCTV 5

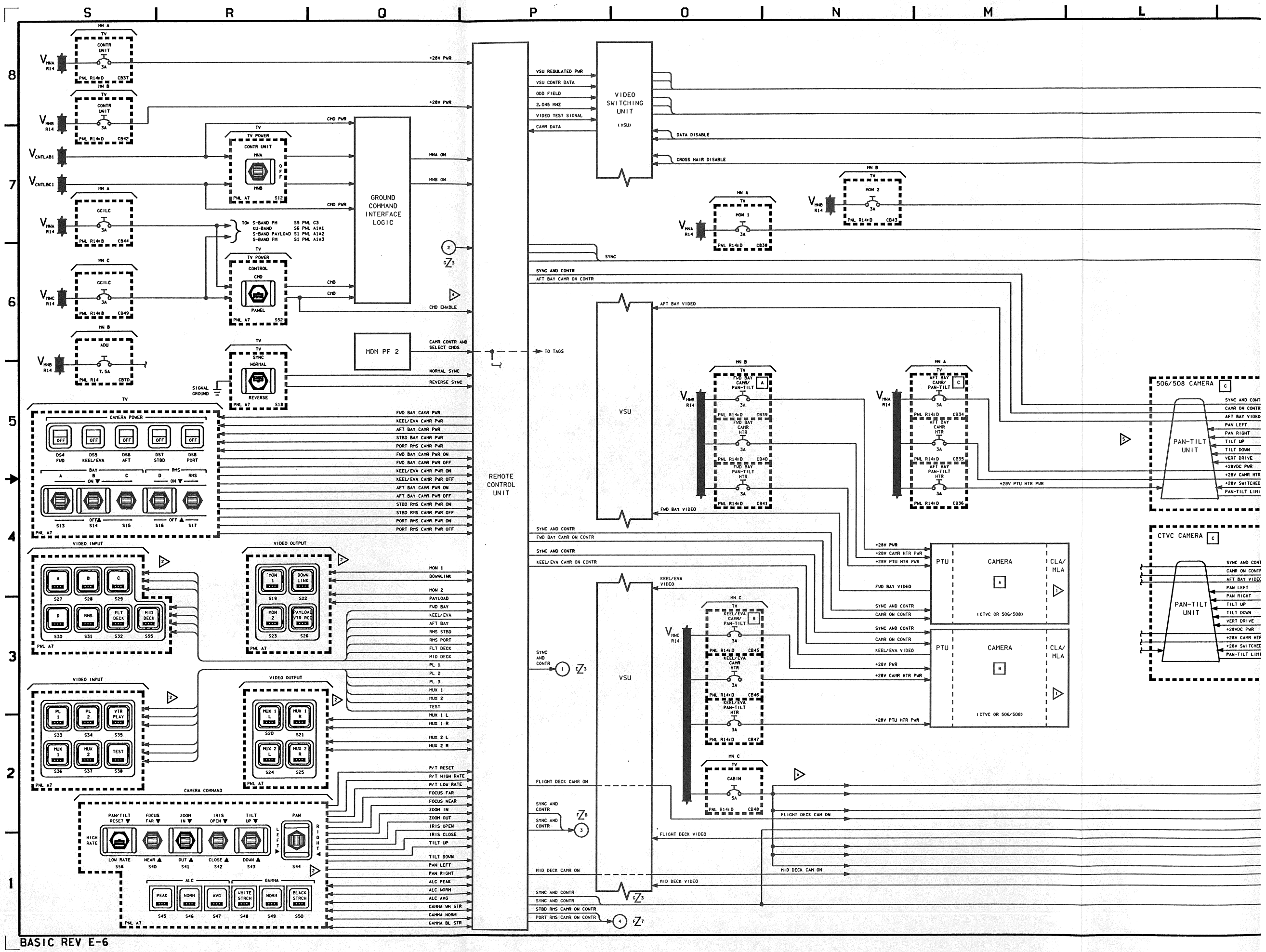
SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	LINDA DUMIS	11/15/78	
DR			COMM OVERVIEW CCTV
ENGR	L. HOPPE		
ENGR		7/16/96	
APP		7/16/96	
APP		7/16/96	SPACE SHUTTLE
CADS	S.K. Kimbrell	7/22/96	ALL
LTR E	PCN 6		104.5 X 34

DWG NO 16.1
PAGE SHEET 5 OF 6

BASIC REV E-6


S R Q P O N M L K J I
MN A
TV CONTR UNIT
3A
PNL R14D CB37
MN B
TV CONTR UNIT
PNL R14D CB42
MN A
GC/LC
PNL R14B CB42
MN C
GC/LC
PNL R14B CB43
MN B
ADU
7.5A
PNL R14 CB70
TV
CAMERA POWER
DS4 FWD
DS5 KEEL/EVA
DS6 AFT
DS7 STBD
DS8 PORT
BAY A B C D RMS
S13 S14 S15 S16 S17
VIDEO INPUT
S27 S28 S29 S30 S31 S32 S55
VIDEO OUTPUT
MON 1 S19
DOWN LINK S22
MON 2 S23
PAYLOAD VTR RCD S26
PNL A7
VIDEO INPUT
S33 S34 S35 S36 S37 S38
VIDEO OUTPUT
MUX 1 L S20
MUX 1 R S21
MUX 2 L S24
MUX 2 R S25
PNL A7
CAMERA COMMAND
PAN/TILT RESET S56
FOCUS FAR S40
ZOOM IN S41
IRIS OPEN S42
TILT UP S43
PAN S44
HIGH RATE
LOW RATE
NEAR
OUT
CLOSE
DOWN
LEFT
RIGHT
ALC PEAK S45
ALC NORM S46
ALC AVG S47
GAMMA WH STR S48
GAMMA NORM S49
GAMMA BL STR S50
PNL A7
+28V PWR
+28V PWR
CMD PWR
TV POWER CONTR UNIT
MNA
MNB
PNL A7 S12
CMD PWR
TO: S-BAND PH S9 PNL C3
KU-BAND S6 PNL A1A1
S-BAND PAYLOAD S1 PNL A1A2
S-BAND FH S1 PNL A1A3
TV POWER CONTROL CMD
PANEL
PNL A7 S52
CMD
CMD
CMD ENABLE
GROUND COMMAND INTERFACE LOGIC
MNA ON
MNB ON
MDM PF 2
CAMR CONTR AND SELECT CMDS
TV SYNC NORMAL
REVERSE
PNL A7 S18
NORMAL SYNC
REVERSE SYNC
SIGNAL GROUND
TO TAGS
REMOTE CONTROL UNIT
FWD BAY CAMR PWR
KEEL/EVA CAMR PWR
AFT BAY CAMR PWR
STBD BAY CAMR PWR
PORT RMS CAMR PWR
FWD BAY CAMR PWR ON
FWD BAY CAMR PWR OFF
KEEL/EVA CAMR PWR ON
KEEL/EVA CAMR PWR OFF
AFT BAY CAMR PWR ON
AFT BAY CAMR PWR OFF
STBD RMS CAMR PWR ON
STBD RMS CAMR PWR OFF
PORT RMS CAMR PWR ON
PORT RMS CAMR PWR OFF
MON 1
DOWNLINK
MON 2
PAYLOAD
FWD BAY
KEEL/EVA
AFT BAY
RMS STBD
RMS PORT
FLT DECK
MID DECK
PL 1
PL 2
PL 3
MUX 1
MUX 2
TEST
MUX 1 L
MUX 1 R
MUX 2 L
MUX 2 R
P/T RESET
P/T HIGH RATE
P/T LOW RATE
FOCUS FAR
FOCUS NEAR
ZOOM IN
ZOOM OUT
IRIS OPEN
IRIS CLOSE
TILT UP
TILT DOWN
PAN LEFT
PAN RIGHT
ALC PEAK
ALC NORM
ALC AVG
GAMMA WH STR
GAMMA NORM
GAMMA BL STR
VSU REGULATED PWR
VSU CONTR DATA
ODD FIELD
2.045 MHZ
VIDEO TEST SIGNAL
CAMR DATA
VIDEO SWITCHING UNIT (VSU)
DATA DISABLE
CROSS HAIR DISABLE
MN A TV MON 1 3A PNL R14D CB38
MN B TV MON 2 3A PNL R14D CB43
SYNC
SYNC AND CONTR
AFT BAY CAMR ON CONTR
AFT BAY VIDEO
VSU
MN B TV FWD BAY CAMR/PAN-TILT A 3A PNL R14D CB39
FWD BAY CAMR HTR 3A PNL R14D CB40
FWD BAY PAN-TILT HTR 3A PNL R14D CB41
MN A TV AFT BAY CAMR/PAN-TILT C 3A PNL R14D CB34
AFT BAY CAMR HTR 3A PNL R14D CB35
AFT BAY PAN-TILT HTR 3A PNL R14D CB36
+28V PTU HTR PWR
FWD BAY VIDEO
SYNC AND CONTR
FWD BAY CAMR ON CONTR
SYNC AND CONTR
KEEL/EVA CAMR ON CONTR
KEEL/EVA VIDEO
MN C TV KEEL/EVA CAMR/PAN-TILT B 3A PNL R14D CB45
KEEL/EVA CAMR HTR 3A PNL R14D CB46
KEEL/EVA PAN-TILT HTR 3A PNL R14D CB47
MN C TV CABIN 5A PNL R14D CB48
SYNC AND CONTR
FLIGHT DECK CAMR ON
FLIGHT DECK VIDEO
MID DECK CAMR ON
MID DECK VIDEO
SYNC AND CONTR
STBD RMS CAMR ON CONTR
PORT RMS CAMR ON CONTR
+28V PWR
+28V CAMR HTR PWR
+28V PTU HTR PWR
FWD BAY VIDEO
SYNC AND CONTR
CAMR ON CONTR
SYNC AND CONTR
CAMR ON CONTR
KEEL/EVA VIDEO
+28V PWR
+28V CAMR HTR PWR
+28V PTU HTR PWR
PTU CAMERA A CLA/MLA (CTVC OR 506/508)
PTU CAMERA B CLA/MLA (CTVC OR 506/508)
P/L STA DC PWR SOURCE
+28VDC PWR
CONSOLE MONITOR 3
CONSOLE MONITOR 2
CONSOLE MONITOR 1
MON 3 PNL VIDEO (PAYLOAD)
MON 2 PNL VIDEO
MON 1 PNL VIDEO
MON 3 DN-LNK VIDEO
MON 2 DN-LNK VIDEO
MON 1 DN-LNK VIDEO
DATA DISABLE
CROSS HAIR DISABLE
MON 3 MON 2 MON 1
+28VDC PWR
+28VDC PWR
SYNC
506/508 CAMERA C
SYNC AND CONTR
CAMR ON CONTR
AFT BAY VIDEO
PAN LEFT
PAN RIGHT
TILT UP
TILT DOWN
VERT DRIVE
+28VDC PWR
+28V CAMR HTR PWR
+28V SWITCHED PWR
PAN-TILT LIMIT SW
PAN-TILT UNIT
ALC PEAK NORM AVG
GAMMA WHITE STRCH NORM BLACK STRCH
TELEVISION CAMERA REAR MANUAL CONTROL
FOCUS
FOCUS NEAR
IRIS OPEN
IRIS CLOSE
ZOOM IN
ZOOM OUT
VERT DRIVE
COLOR SYNCH
MANUAL IRIS
+28V SWITCHED PWR
CUE LT ON
FOCUS ZOOM IRIS
COLOR LENS ASSEMBLY/ MONOCHROME LENS ASSEMBLY
LEFT SIDE MANUAL CONTROL
CTVC CAMERA C
SYNC AND CONTR
CAMR ON CONTR
AFT BAY VIDEO
PAN LEFT
PAN RIGHT
TILT UP
TILT DOWN
VERT DRIVE
+28VDC PWR
+28V CAMR HTR PWR
+28V SWITCHED PWR
PAN-TILT LIMIT SW
PAN-TILT UNIT
ALC
MAN GAIN
BAL
SELECT FUNCT
PEAK 0 dB BAY
NORM +12dB CAB
AVG +24 dB DAY
SELECT
SSF
STS
FOCUS NEAR FAR
ZOOM IN OUT
IRIS OPEN CLOSE
RIGHT SIDE MANUAL CONTROL

REV E-6


S R Q P O N M L
8 7 6 5 4 3 2 1
MN A
TV CONTR UNIT
3A
PNL R14D CB37
MN B
PNL R14D CB42
MN A
GC/LC
PNL R14B CB44
MN C
PNL R14B CB49
MN B
ADU
7.5A
PNL R14 CB70
V_{MNA} R14
V_{MNB} R14
V_{MNC} R14
$V_{CNTLAB1}$
$V_{CNTLBC1}$
+28V PWR
CMD PWR
TV POWER CONTR UNIT
MNA
MNB
OFF
PNL A7 S12
TO: S-BAND PM S-BAND PAYLOAD S-BAND FM KU-BAND
S9 PNL C3 S6 PNL A1A1 S1 PNL A1A2 S1 PNL A1A3
TV POWER CONTROL CMD PANEL
PNL A7 S52
TV SYNC NORMAL REVERSE
PNL A7 S18
SIGNAL GROUND
GROUND COMMAND INTERFACE LOGIC
MNA ON
MNB ON
CMD
CMD ENABLE
MDM PF 2
CAMR CONTR AND SELECT CMDS
NORMAL SYNC
REVERSE SYNC
TO TAGS
REMOTE CONTROL UNIT
TV CAMERA POWER
DS4 FWD
DS5 KEEL/EVA
DS6 AFT
DS7 STBD
DS8 PORT
BAY A B C RMS D RMS
ON
S13 S14 S15 S16 S17
PNL A7
FWD BAY CAMR PWR
KEEL/EVA CAMR PWR
AFT BAY CAMR PWR
STBD BAY CAMR PWR
PORT RMS CAMR PWR
FWD BAY CAMR PWR ON
FWD BAY CAMR PWR OFF
KEEL/EVA CAMR PWR ON
KEEL/EVA CAMR PWR OFF
AFT BAY CAMR PWR ON
AFT BAY CAMR PWR OFF
STBD RMS CAMR PWR ON
STBD RMS CAMR PWR OFF
PORT RMS CAMR PWR ON
PORT RMS CAMR PWR OFF
VIDEO INPUT
A B C D RMS FLT DECK MID DECK
S27 S28 S29 S30 S31 S32 S55
PNL A7
VIDEO OUTPUT
MON 1 DOWN LINK MON 2 PAYLOAD VTR RCD
S19 S22 S23 S26
PNL A7
MON 1
DOWNLINK
MON 2
PAYLOAD
FWD BAY
KEEL/EVA
AFT BAY
RMS STBD
RMS PORT
FLT DECK
MID DECK
VIDEO INPUT
PL 1 PL 2 VTR PLAY MUX 1 MUX 2 TEST
S33 S34 S35 S36 S37 S38
PNL A7
VIDEO OUTPUT
MUX 1 L MUX 1 R MUX 2 L MUX 2 R
S20 S21 S24 S25
PNL A7
PL 1
PL 2
PL 3
MUX 1
MUX 2
TEST
MUX 1 L
MUX 1 R
MUX 2 L
MUX 2 R
CAMERA COMMAND
PAN/TILT RESET FOCUS FAR ZOOM IN IRIS OPEN TILT UP PAN
HIGH RATE LOW RATE NEAR OUT CLOSE DOWN LEFT RIGHT
S56 S40 S41 S42 S43 S44
PNL A7
P/T RESET
P/T HIGH RATE
P/T LOW RATE
FOCUS FAR
FOCUS NEAR
ZOOM IN
ZOOM OUT
IRIS OPEN
IRIS CLOSE
TILT UP
TILT DOWN
PAN LEFT
PAN RIGHT
ALC PEAK
ALC NORM
ALC AVG
GAMMA WH STR
GAMMA NORM
GAMMA BL STR
ALC PEAK NORM AVG
GAMMA WHITE STRCH NORM BLACK STRCH
S45 S46 S47 S48 S49 S50
VSU REGULATED PWR
VSU CONTR DATA
ODD FIELD
2.045 MHZ
VIDEO TEST SIGNAL
CAMR DATA
VIDEO SWITCHING UNIT (VSU)
DATA DISABLE
CROSS HAIR DISABLE
MON 1
MON 2
SYNC
SYNC AND CONTR
AFT BAY CAMR ON CONTR
AFT BAY VIDEO
VSU
FWD BAY VIDEO
SYNC AND CONTR
FWD BAY CAMR ON CONTR
SYNC AND CONTR
KEEL/EVA CAMR ON CONTR
KEEL/EVA VIDEO
SYNC AND CONTR
FLIGHT DECK CAMR ON
FLIGHT DECK VIDEO
MID DECK CAMR ON
MID DECK VIDEO
SYNC AND CONTR
STBD RMS CAMR ON CONTR
PORT RMS CAMR ON CONTR
FWD BAY CAMR/ PAN-TILT
FWD BAY CAMR HTR
FWD BAY PAN-TILT HTR
PNL R14D CB39 CB40 CB41
AFT BAY CAMR/ PAN-TILT
AFT BAY CAMR HTR
PNL R14D CB34 CB35 CB36
KEEL/EVA CAMR/ PAN-TILT
KEEL/EVA CAMR HTR
KEEL/EVA PAN-TILT HTR
PNL R14D CB45 CB46 CB47
CABIN
5A
PNL R14D CB48
+28V PTU HTR PWR
+28V PWR
+28V CAMR HTR PWR
PTU
CAMERA
CLA/ MLA
(CTVC OR 506/508)
506/508 CAMERA
CTVC CAMERA
PAN-TILT UNIT
SYNC AND CONTR
CAMR ON CONTR
AFT BAY VIDEO
PAN LEFT
PAN RIGHT
TILT UP
TILT DOWN
VERT DRIVE
+28VDC PWR
+28V CAMR HTR
+28V SWITCHED
PAN-TILT LIMI

BASIC REV E-6

DATE: 01/30/96	NAME: VSH	VERSION# BPT: 9
DATE: 02/27/96	NAME: BJB	VERSION# BPT: 10
DATE: 03/14/96	NAME: JMB	VERSION# INT: 5

S-BAND PAYLOAD ANTENNA — LEFT OR RIGHT HAND CIRCULAR

STANDARD SWITCH PANEL 2 — 28V P/L 3; 28V CABIN P/L 3

L12 — DIGITAL CAM (DATA, RATE HIGH/LOW (S3)); DC POWER 1 CABIN P/L ON (S1) OFF (J2); DC POWER 2 CABIN P/L ON (S2) OFF (J3); FIRE WIRE (J4); INPUTS 1 2 3 4 (J101 J103 J105 J107)

PAYLOAD DATA INTERFACE PANEL (PDIP) DWG 16.6

HDR P/L DIGITAL DATA

LDR P/L DIGITAL DATA

J6 21 — CIU DOD MODE CNTL

(PART OF) PAYLOAD STATION DISTRIBUTION PANEL (PSDP)

(ALSO CALLED PAYLOAD PATCH PANEL)

DOD CMDS

DOD CMDS

DOD DATA

DOD DATA

DOD MODE

DOD MODE

BULKHEAD 576

CREW MODULE — PAYLOAD BAY

SMALL P/L ACCOMMODATIONS SWITCH PANEL (SPASP) PNL A6L

ON-ORBIT DISTRIBUTION PANEL (OOSDP)

CNTL/MON

NASA OR DOD P/L DATA ('BENT PIPE')

(16 KBPS TO 1.024 MBPS INPUT) 16, 64, 256 KBPS

128 KBPS COMMAND LINE

P/L INTGR 1

P/L INTGR 2

KU-BAND SIGNAL PROCESSOR DWG 16.5-1

HDR P/L MAX

HDR P/L CLK

LDR P/L DIGITAL DATA

HDR P/L DIGITAL DATA

HDR P/L ANALOG DATA

FWD P/L LINK 128 KBPS

CMD TO CIE

COMMUNICATIONS INTERFACE UNIT (CIU)

(IUS UNIQUE)

16/64 KBPS IUS/TDRSS DATA

128 KBPS

64 KB/S BI-Φ-L P/L TLM (FOR PLR)

PI CMDS

PI TLM

UP TO 64 KBPS DATA AND CLOCK

DOD MODE CNTL

SERIAL DIGITAL PB

256 KBPS BI-Φ-L MAX (DOD)

SERIAL DIGITAL PB

16/64 KBPS IUS/TDRSS DATA (TLM)

CIE TLM P/L

FM SIGNAL PROCESSOR DWG 16.8

P/L ANALOG SIG

DOD DATA

P/L DIGITAL DATA

P/L (IUS) DATA

PAYLOAD RECORDER

POWER

ON

OFF

PNL AIR S13

V_{PNA} FPC1

$V_{CNTLCA1}$

$V_{CNTLCA2}$

V_{PNC} FPC3

RPC 5A

RPC 5A

+28VDC POWER

+28VDC POWER

PROGRAM PLUG

SPD 1 SPD 2 SPD 3 SPD 4

PAYLOAD RECORDER

MODE

SERIAL RCD STOP RCD PRL PB REV PB REV PB FWD PB FWD ERASE

PNL AIR S10

PAYLOAD RECORDER

SPEED

1 2 3 4

PNL AIR S14

BIT 4

BIT 2

BIT 1

BIT 12

BIT 3

BIT 13

BIT 14

BIT 7

BIT 6

BIT 15

BIT 16

5V DC CONTROL POWER

PAYLOAD RECORDER

PANEL CONTROL

PNL AIR DS6

PAYLOAD RECORDER

MODE RCD PL

PNL AIR DS7

RECORD

PLAYBACK

FWD LOAD ASSY-1

BITS 1-3

BITS 12-16

BIT 3

BIT 1

BIT 2

TAPE MOTION

BITS 1-16

BITS 1-3 AND 12-16

BITS 4-11

DSC OF1

15 VDC

PAYLOAD RECORDER

DWG 16.19

PARALLEL ANALOG/DIGITAL PB

(PART OF) T-O UMBILICAL

SERIAL DIGITAL INPUT B

SERIAL DIGITAL INPUT A1

SERIAL DIGITAL INPUT A2

SERIAL DIGITAL PB

PARALLEL ANALOG INPUTS TRACKS 1-14

PARALLEL DIGITAL INPUTS TRACKS 1-14

PARALLEL ANALOG/DIGITAL TRACK ID - 3 LINES

PARALLEL ANALOG/DIGITAL TRACK ID - 3 LINES

AUDIO CENTRAL CONTROL UNIT (ACCU) DWG 16.11-1&2

AG 1 AG 2 A/A ICOM A ICOM B PAGE PAGE KEY P/L C/W TONE

AUDIO IN (SPACELAB)

AUDIO OUT (SPACELAB)

P/L INTGR 1

P/L INTGR 2

UP TO 64 KBPS DATA AND CLOCK

CIU PLR OUTPUT

VIDEO SWITCHING UNIT (VSU) DWG 16.12

VIDEO

(PART OF) 576 BULKHEAD

AUDIO IN (SPACELAB OR SPACEHAB)

AUDIO OUT (SPACELAB OR SPACEHAB)

258 MISSION UNIQUE LINES

VIDEO

50 CMD LINES 2 SPARES

52 CMD LINES

PF1 SENSOR SIO

PF1 SENSOR SIO

SMALL PAYLOADS ACCOMMODATIONS TERMINAL (SPAT)

CNTL/MON

CNTL/TLM

EXTENDED RANGE PAYLOAD COMM LINK (ERPCL) DWG 16.23 (SPAT)

CNTL/MON

CNTL/TLM

AUDIO IN

AUDIO OUT

VIDEO

CMD

TLM

SPACEHAB

ADU

7.5A

PNL R14 CB7D

V_{MNB} R14

MDM PF-2

MDM PF-1

DWG 16.26 (I/F)

COMMANDS IN FROM SM GPC

TLM TO SM GPC

P/L 50 CMD LINES, 2 SPARES

PF 2 P/L 50 CMD LINES 2 SPARES

P/L SENSOR SIO

P/L SENSOR SIO

52 CMD LINES

SPACE LAB

P/L 1-5 DATA (INPUTS 1-5)

P/L 1-5 DATA

P/L 1-5 CLOCK

P/L 1-5 CLOCK

16 KHZ CMD (5 LINES)

16 KHZ CMD (5 LINES)

'LOAD DATA TERLEAVER (PDI)

WG 17.3

GPC DATA BUS (DECOM FMT LOADING I/F)

GPC 1 GPC 2 GPC 3 GPC 4 GPC 5

1.152 MHZ CLOCK

1.152 MHZ CLOCK

PCM 2 DATA BUS

PCM 1 DATA BUS

PCM MU 2

PCM MASTER UNIT 1 DWG 17.2

PI CMDS (TO PI)

PI TLM (FROM PI)

NOTES:

1. SEE PCMMU DWG 17.2 FOR DETAILS
2. UP TO 64 KB/S OF CIU DATA (INCLUDES PDI OVERHEAD). NORMALLY PATCHED TO PDI INPUT 5
3. ALL VIDEO OUTPUTS FROM THE VSU HAVE SYNC LINES ASSOCIATED FROM RCU TO PSDP
4. DOD MODE IN THE PI ALLOWS PI TLM AND CMD TO GO DIRECTLY TO/FROM THE PSDP, INSTEAD OF GOING TO/FROM THE PSP. THIS SIGNAL IS A VOLTAGE, 1=DOD MODE, SUPPLIED BY THE CIE OR CIU, THRU THE PSDP
5. PI TLM IS AS DEMODULATED FROM S-BAND CARRIER, TYPICALLY CONSISTING OF BI-Φ DATA ON A 1024 OR 1300 KHZ SUBCARRIER. PI CMDS ARE BASE B AND TYPICALLY BI-Φ (NASA), OR SGLS CODE 6 (THREE-TONE OR TERNARY, DOD)
6. THIS COMMAND LINE USES THE 'TAGS' 128 KB/S PATH FORWARD LINE
7. OPWS = ORBITER PAYLOAD WORK STATION, NOT IMPLEMENTED, LINES SHOWN FOR COMPLETENESS
8. THESE LINES USED TO ACQUIRE EXPERIMENT AND SUBSYSTEM COMPUTER (ECDS/SCDS) TELEMETRY ON SPACELAB FLIGHTS
9. THESE DEVICES ARE MISSION-DEPENDANT
10. CONNECTIONS TO THIS PANEL ARE MISSION UNIQUE

1 P/L OV 6

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN L. M. BUCHANAN	11/20/86	
DR L. M. BUCHANAN	11/20/86	
ENGR D. EPPERSON		PAYLOAD SYSTEM OVERVIEW
ENGR	4/11/96	
APP	4/11/96	
APP	4/11/96	SPACE SHUTTLE — DWG NO 16.1
CADS		ALL
LTR E	PCN 6	126.5 X 34 — PAGE — SHEET 6 OF 6

BASIC REV E-6

T S R Q P O N M L K J

(PART OF) GROUND COMMAND INTERFACE LOGIC — DWG 16.14 (PI) — DWG 16.17 (GCIL)

INTRG 1 ON
INTRG 2 ON
1 ON
2 ON
CMD MN A
CMD MN C
PDI PWR ON
PDI PWR ON

TO KU-BAND SIGNAL PROCESSOR
TO P/L STA DIST PANEL
P/L RF XFER SW CONTROL NO 1 28V
P/L RF XFER SW CONTROL NO 2 28V

S-BAND PAYLOAD — ANT POLAR — L CIRC — R CIRC — PNL AIL 52
P/L INTRG 2 L CIRC
P/L INTRG 2 R CIRC
P/L INTRG 1 L CIRC
P/L INTRG 1 R CIRC

V_{MNB} FLC2 10A — 3A — TO PL INTRG NO 1
V_{MNC} FLC3 10A — 3A — TO PL INTRG NO 2

S-BAND PAYLOAD — XMTR PWR — HIGH — MED — LOW — PNL AIL 54
P/L INTRG 2 XMTR PWR HIGH
P/L INTRG 2 XMTR PWR MED
P/L INTRG 2 XMTR PWR LOW
P/L INTRG 1 XMTR PWR HIGH
P/L INTRG 1 XMTR PWR MED
P/L INTRG 1 XMTR PWR LOW

S-BAND PAYLOAD — CHANNEL SELECT — INTRG 1 — INTRG 2 — PNL AIL 57
CH SEL INTEG 2
CH SEL INTEG 1
CHANNEL 1 2 4 8 CHANNEL 10 20 40 80 CHANNEL 100 200 400 800 — INTRG 2 BCD SEL CODE
CHANNEL 1 2 4 8 CHANNEL 10 20 40 80 CHANNEL 100 200 400 800 — INTRG 1 BCD SEL CODE

V_{MNA} — FPC 1 — RPC — PWR ON — PDI — T — Z2
FPC 3 — RPC — PWR ON — PDI
V_{MNC}

S-BAND PAYLOAD — FREQ SWEEP ON — OFF — PNL AIL 58
P/L INTRG 2 XMTR FREQ SWEEP ON
P/L INTRG 2 XMTR FREQ SWEEP OFF
P/L INTRG 1 XMTR FREQ SWEEP ON
P/L INTRG 1 XMTR FREQ SWEEP OFF

S-BAND PAYLOAD — MOD ON — OFF — PNL AIL 59
P/L INTRG NO 2 MOD ON
P/L INTRG NO 2 MOD OFF
P/L INTRG NO 1 MOD ON
P/L INTRG NO 1 MOD OFF

S-BAND PAYLOAD — INTRG — PNL UMB — PNL AIL 515
PSP 1 P/L INTRG SELECT
PSP 1 P/L UMBILICAL SELECT
PSP 2 P/L INTRG SELECT
PSP 2 P/L UMBILICAL SELECT
PSP 1 COMMAND POWER
PSP 2 COMMAND POWER

V_{MNB} FLC2 3A — PSP NO 1 ON
V_{MNC} FLC3 3A — PSP NO 2 ON

(PART OF) GROUND COMMAND INTERFACE LOGIC (GCIL) — DWG 16.14 (PI) — DWG 16.17 (GCIL)

PSP 1 28VDC POWER
PSP 2 28VDC POWER
MDM LF 1 — GSE OUTPUT SEL 28VDC
GSE OUTPUT SEL 28VDC
MASTER TIMING UNIT — 1.024 MHZ CLK

V_{MNB} FLC2 10A — V_{MNC} FLC3 10A — FWD LCA NO 2 — FWD LCA NO 2
FROM FLC2 — FROM FLC3 — 28VDC PWR — 28VDC PWR

INTRG 1 LH/2 RH
INTRG 2 LH/1 RH
RF COMMON INPUT/OUTPUT
RF COMMON INPUT/OUTPUT

P/L INTRG 2 — PAYLOAD INTERROGATOR 1 (P/L INTRG 1) — DWG 16.14
DOD CMDS
DOD CMDS
DOD DATA
DOD DATA
DOD MODE
DOD MODE
DOD/NASA P/L DATA (KU BENT PIPE)

P/L INTRG 2 P/L XMTR PWR OUT HIGH
P/L INTRG 2 P/L XMTR PWR OUT MED
P/L INTRG 2 P/L XMTR PWR OUT LOW
P/L INTRG 1 P/L XMTR PWR OUT HIGH
P/L INTRG 1 P/L XMTR PWR OUT MED
P/L INTRG 1 P/L XMTR PWR OUT LOW

INTRG NO 2 CHANNEL SELECT (12)
INTRG NO 1 CHANNEL SELECT (12)

P/L INTRG 2 XMTR FREQ SWEEP ON
P/L INTRG 2 XMTR FREQ SWEEP OFF
P/L INTRG 1 XMTR FREQ SWEEP ON
P/L INTRG 1 XMTR FREQ SWEEP OFF

P/L INTRG 2 MODULATION ON
P/L INTRG 2 MODULATION OFF
P/L INTRG 1 MODULATION ON
P/L INTRG 1 MODULATION OFF

PSP 2 — PAYLOAD SIGNAL PROCESSOR PSP 1 — DWG 16.15
P/L INTRG SELECT
P/L UMBILICAL SELECT
P/L INTRG SELECT
P/L UMBILICAL SELECT

16 KHZ NASA CMDS PI 2
16 KHZ NASA CMDS PI 1
NASA P/L TLM 1.024 MHZ (1, 2, 4, 8, 16 KBPS)
NASA P/L TLM 1.024 MHZ (1, 2, 4, 8, 16 KBPS)

COMMAND SIO CHANNEL (2 PORTS)
COMMAND SIO CHANNEL (2 PORTS)

PAYLOAD INTERROGATOR R/F SWITCH — DWG 16.14
S-BAND PAYLOAD ANTENNA — LEFT OR RIGHT HAND CIRCULAR
STANDARD SWITCH PANEL 2

COMMUNICATIONS INTERFACE UNIT (CIU) (IUS UNIQUE)
16/64 KBPS IUS/TDRSS DATA
128 KBPS
64 KB/S BI0-L P/L TLM (FOR PLR)
PI CMDS — 19 — Z2
PI TLM — 20 — Z2
UP TO 64 KBPS DATA AND CLOCK — 3 — Z5
DOD MODE CNTL — 21 — Z8
G&N DATA UPLINK CMD DATA SIO

AGC OUT — 15 16 — V6
AGC OUT — 4 5 — V6

PAYLOAD RECORDER — FUNCTION — OPERATE — ERASE A — PNL AIR 59
PAYLOAD RECORDER — SPEED — PNL AIR 514
PAYLOAD RECORDER — MODE — SERIAL — RCD — PB REV — PB FWD — ERASE — STOP — PNL AIR
PAYLOAD RECORDER — PANEL CONTROL — PNL AIR DS4
PAYLOAD RECORDER — MODE — RCD — PL — PNL AIR DS7 — RECORD — PLAYBACK

PCMMU 2 — PULSE CODE MODULATION MASTER UNIT 1 (PCMMU 1) — DWG 17.2
RECORDER OUTPUT
PNL 05 — PCMMU1 DATA J4 — PCMMU2 DATA J5 — PGSC WITH PCDECOM S/W
PNL M030F — PCMMU1 DATA J4 — PCMMU2 DATA J6 — PGSC WITH PCDECOM S/W
1.024 MHZ TLM — FROM T-O UMB 01
16 KHZ CMD — TO T-O UMB 01
28 VDC

MTU — IRIG B — Z3 — 8, 9
PAYLOAD DATA INTERLEAVER (PDI) — DWG 17.3
GPC DATA BUS (DECOM FMT LOADING I/F) — GPC 1 GPC 2 GPC 3 GPC 4 GPC 5
1.152 MHZ CLOCK
1.152 MHZ CLOCK
PCM 2 DATA BUS
PCM 1 DATA BUS
P/L 1-5 DATA (INPUTS
P/L 1-5 CLOCK
PSP 2 TLM DATA (P/L 6 INPUT)
PSP 1 TLM DATA (P/L 6 INPUT)
PSP 2 CLOCK
PSP 1 CLOCK
16 KHZ CMD (5 LINES)
16 KHZ CMD (5 LINES)

DATE: 03/14/96 | NAME: JMB | VERSION: INK-5

W V U T S R Q P O N

8 7 6 5 4 3 2 1

(PART OF) GROUND COMMAND INTERFACE LOGIC

DWG 16.14 (PI)

DWG 16.17 (GCIL)

PSP NO 2 CMD POWER ON
PSP NO 1 CMD POWER ON
P/L INTERROGATOR NO 2 CMD PWR ON
P/L INTERROGATOR NO 1 CMD PWR ON

$V_{CNTLBC1}$ 1A
$V_{CNTLBC1}$ 1A
$V_{CNTLBC2}$ 1A

S-BAND PAYLOAD POWER SYSTEM — PNL A1L S13

S-BAND PAYLOAD POWER SELECT — PNL A1U S14

P/L INTRG 1 ON
P/L INTRG 2 ON
PSP 1 ON
PSP 2 ON

S-BAND PAYLOAD INTRG — PSP — PNL A1U S14

S-BAND PM — S-BAND PL — PNL A1U S1

15 P/L INTRG NO. 2 AGC RTN
4 P/L INTRG NO. 1 AGC RTN
16 P/L INTRG NO 2 AGC
9 P/L INTRG NO 1 AGC

MN A — V_{MNA} R11&14 — GCIL — PNL R14-B CB44
MN C — V_{MNC} R11&14 — GCIL — PNL R14-B CB49

COMMAND POWER

S-BAND PAYLOAD CONTROL COMMAND PANEL — PNL A1L S1

S-BAND CONTROL PAYLOAD CMD MN A
S-BAND CONTROL PAYLOAD CMD MN C
COMMAND POWER

TO CONTROL SWITCHES
S-BD PM PNL C3 S9
TV PWR PNL A7L S52
KU-BAND PNL A1R S6
S-BAND FM PNL A1R S1

S-BAND PAYLOAD PDI POWER — PNL A1L S17

$V_{CNTLBC1}$ 1.2K
$V_{CNTLBC2}$ 1.2K
PDI PWR ON
PDI PWR ON

V_{MNB} FLC2 10A — 3A
V_{MNC} FLC3 10A — 3A

TO PL INTRG NO 1 — $^{H}Z_{7}$
TO PL INTRG NO 2 — $^{H}Z_{7}$

V_{MNA}
FPC 1 — RPC — PWR ON — PDI
FPC 3 — RPC — PWR ON — PDI
V_{MNC}

$^{K}Z_{2}$

V_{MNB} FLC2 3A — PSP NO 1 ON
V_{MNC} FLC3 3A — PSP NO 2 ON

TO KU-BAND SIGNAL PROCESSOR — $^{F}Z_{7}$
TO P/L STA DIST PANEL — $^{E}Z_{5}$

P/L RF XFER SW CONTROL NO 1 28V
P/L RF XFER SW CONTROL NO 2 28V

S-BAND PAYLOAD ANT POLAR — L CIRC / R CIRC — PNL A1L S2

P/L INTRG 2 L CIRC
P/L INTRG 2 R CIRC
P/L INTRG 1 L CIRC
P/L INTRG 1 R CIRC

S-BAND PAYLOAD XMTR PWR — HIGH / MED / LOW — PNL A1L S4

P/L INTRG 2 XMTR PWR HIGH
P/L INTRG 2 XMTR PWR MED
P/L INTRG 2 XMTR PWR LOW
P/L INTRG 1 XMTR PWR HIGH
P/L INTRG 1 XMTR PWR MED
P/L INTRG 1 XMTR PWR LOW

S-BAND PAYLOAD CHANNEL SELECT — PNL A1L S7

CH SEL INTEG 2
CH SEL INTEG 1

INTRG 1 — INTRG 2

CHANNEL 1 2 4 8 CHANNEL 10 20 40 80 CHANNEL 100 200 400 800 — INTRG 2 BCD SEL CODE

CHANNEL 1 2 4 8 CHANNEL 10 20 40 80 CHANNEL 100 200 400 800 — INTRG 1 BCD SEL CODE

S-BAND PAYLOAD FREQ SWEEP ON — OFF — PNL A1L S8

P/L INTRG 2 XMTR FREQ SWEEP ON
P/L INTRG 2 XMTR FREQ SWEEP OFF
P/L INTRG 1 XMTR FREQ SWEEP ON
P/L INTRG 1 XMTR FREQ SWEEP OFF

S-BAND PAYLOAD MOD ON — OFF — PNL A1L S9

S-BAND PAYLOAD INTRG — PNL UMB — PNL A1L S15

P/L INTRG NO 2 MOD ON
P/L INTRG NO 2 MOD OFF
P/L INTRG NO 1 MOD ON
P/L INTRG NO 1 MOD OFF

PSP 1 P/L INTRG SELECT
PSP 1 P/L UMBILICAL SELECT
PSP 2 P/L INTRG SELECT
PSP 2 P/L UMBILICAL SELECT
PSP 1 COMMAND POWER
PSP 2 COMMAND POWER

PSP 1 28VDC POWER
PSP 2 28VDC POWER

MDM LF 1
GSE OUTPUT SEL 28VDC
GSE OUTPUT SEL 28VDC

MASTER TIMING UNIT
1.024 MHZ CLK

V_{MNB} FLC2 10A — V_{MNC} FLC3 10A — FWD LCA NO 2 — FWD LCA NO 2

$^{S}Z_{7}$

P/L INTRG 2 P/L XMTR PWR OUT HIGH
P/L INTRG 2 P/L XMTR PWR OUT MED
P/L INTRG 2 P/L XMTR PWR OUT LOW
P/L INTRG 1 P/L XMTR PWR OUT HIGH
P/L INTRG 1 P/L XMTR PWR OUT MED
P/L INTRG 1 P/L XMTR PWR OUT LOW

12 INTRG NO 2 CHANNEL SELECT
12 INTRG NO 1 CHANNEL SELECT

P/L INTRG 2 XMTR FREQ SWEEP ON
P/L INTRG 2 XMTR FREQ SWEEP OFF
P/L INTRG 1 XMTR FREQ SWEEP ON
P/L INTRG 1 XMTR FREQ SWEEP OFF

P/L INTRG 2 MODULATION ON
P/L INTRG 2 MODULATION OFF
P/L INTRG 1 MODULATION ON
P/L INTRG 1 MODULATION OFF

PSP 2

PAYLOAD SIGNAL PROCESSOR PSP 1

P/L INTRG SELECT
P/L UMBILICAL SELECT
P/L INTRG SELECT
P/L UMBILICAL SELECT

DWG 16.15

16
16
NASA P/L TLM 1.
NASA P/L TLM 1.

1.024 MHZ
16 KHZ CH

BASIC REV E-6

DATE: 11/10/92	NAME: MAG	VERSION: INK, 16
DATE: 07/12/94	NAME: PSD	VERSION: BPT, 19
DATE: 07/28/94	NAME: BJB	VERSION: INK, 17

S-BD PM TRANSPONDER 2
S-BD PM TRANSPONDER 1

RCVR WIDEBAND DETECTOR AND 2ND IF

WIDE BAND DETECTOR

RCVR PREAMP/1ST IF

DUAL TRIPLEXER

FREQUENCY SOURCE

1ST LO LOOP

LINEAR PHASE MODULATOR

TRANSMITTER

THIS PARAMETER USED BY AM TO DETERMINE WHETHER TO SELECT ANTENNAS FOR TDRS OR GROUND SITES

THESE RELAYS ROUTE THE SIGNAL STRENGTH TO THE PML A1 AND F9 METERS FOR THE POWERED TRANSPONDER

SWITCHING IS ACCOMPLISHED BY FORWARD AND REVERSE BIASING OF CONTROL DIODES TO BLOCK OR COMPLETE PATH

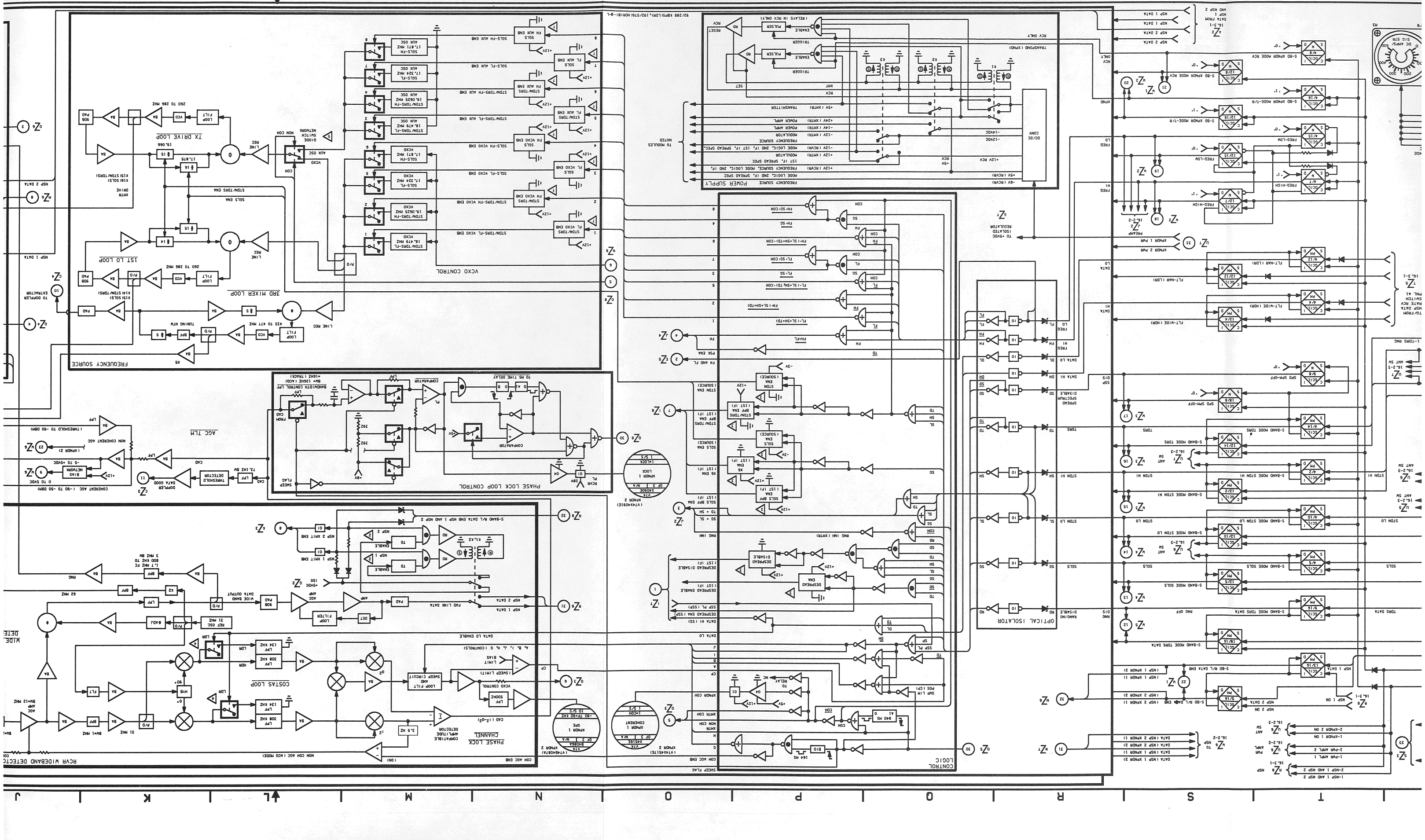
NOTES:
1. TIME DELAY (TD) CIRCUIT '1' IN '1' OUT DELAY 0.3 MS '0' IN '0' OUT DELAY 50 MS
2. TIME DELAY (TD) CIRCUIT '1' IN '1' OUT DELAY 0.3 MS '0' IN '0' OUT DELAY 100 MS

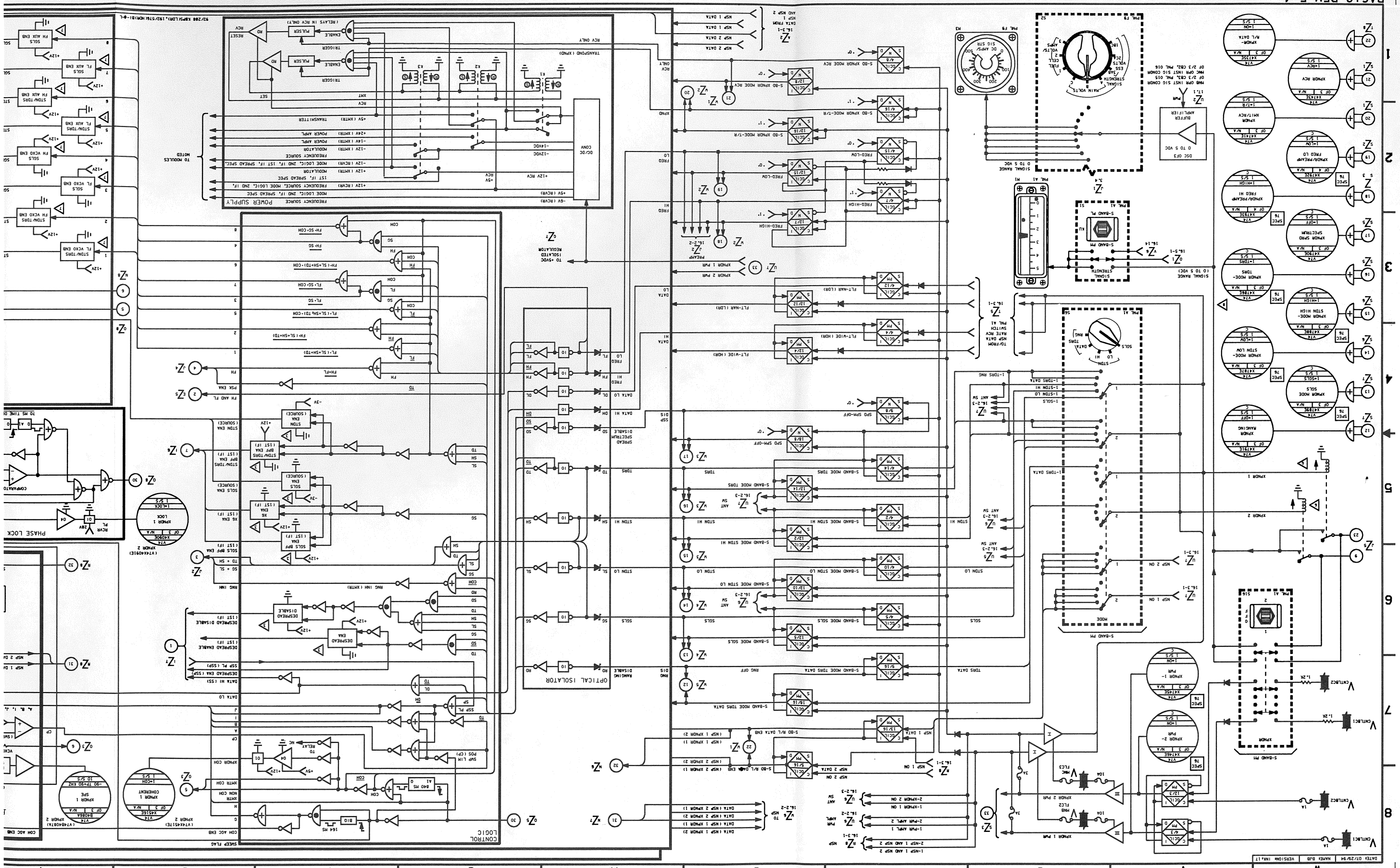
2 S-BD PM 1

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	V. DOGGET	8/11/78	
DR	L. BUCHANAN	10/11/78	S-BAND PM TRANSPONDER
ENGR	G. HORLACHER		
ENGR		8/1/94	
APP		8/2/94	
APP		8/2/94	SPACE SHUTTLE
CADS			ALL
LTR	E	PCN 4	126.5 X 34

DWG NO 16.2
PAGE 16.2-1
SHEET 1 OF 3

BASIC REV E-4


FREQUENCY SOURCE
VCXO CONTROL
3RD MIXER LOOP
1ST LO LOOP
TX DRIVE LOOP
PHASE LOCK LOOP CONTROL
POWER SUPPLY
RCVR ONLY
XMT ONLY
OPTICAL ISOLATOR
LOGIC CONTROL
COSTAS LOOP
PHASE LOCK CHANNEL
RCVR WIDEBAND DETECTOR
AGC TLM
SWEEP FLAG
S-BAND R/L DATA END NSP 1 AND NSP 2
S-BAND MODE TDRS
S-BAND MODE SOLS
S-BAND MODE STDN HI
S-BAND MODE STDN LO
S-BAND MODE TDRS DATA
FREQ-LOW
FREQ-HIGH
FLT-NAR (LDR)
FLT-WIDE (MDR)
SPD SPM-OFF
RNG OFF
S-BD XPNDR MODE-T/R
S-BD XPNDR MODE RCV
S-BD R/L DATA END
NSP 1 AND NSP 2
1-NSP 1 AND NSP 2
2-NSP 1 AND NSP 2
1-XPNDR 1 ON
2-XPNDR 2 ON
1-PWR AMPL 1
2-PWR AMPL 2
NSP 1 ON
NSP 2 ON
NSP 1 DATA
NSP 2 DATA
XPNDR 1 PWR
XPNDR 2 PWR
PREAMP
TO +5VDC ISOLATED REGULATOR
TO MODULES NOTED
TO DOPPLER EXTRACTOR
TO SYDC
-5 TO +5VDC
-90 TO -50 DBM
COHERENT AGC (-90 TO -50 DBM)
NON COHERENT AGC
(THRESHOLD TO -90 DBM)
(XPNDR 2)
(XPNDR 1)
DATA FROM NSP 1 AND NSP 2
ANT SW
16.2-3
16.3-1
16.2-2
16.3-2
I-TDRS RNG
SIO STR
M3


POWER SUPPLY
FREQUENCY SOURCE MODE LOGIC, SPREAD SPEC
FREQUENCY SOURCE, MODE LOGIC, 2ND IF,
1ST IF, SPREAD SPEC
MODE LOGIC, 2ND IF, 1ST IF, SPREAD SPEC
TRANSMITTER
DC/DC CONV
CONTROL LOGIC
OPTICAL ISOLATOR
S-BAND PM
S-BAND MODE SOLS
S-BAND MODE TONS
S-BAND MODE STDN HI
S-BAND MODE STDN LO
S-BAND MODE TONS DATA
S-BAND R/L END
S-BAND PM
S-BAND MODE
S-BAND PM
S-BAND PM
S-BAND PM

PREAMPLIFIER ASSEMBLY

PRE AMPL (2 LOGIC)

PRE AMPL 1 LOGIC

PRE AMPL 2

PRE AMPL 1

CIRCULATOR ASSEMBLY

SELECT LOGIC

RELAY DRIVER 1

RELAY DRIVER 2

DUAL DIPLEXER

VOLTAGE DIVIDER

LOGIC POWER

PWR AMPL 2 ON

PWR AMPL 1 ON

XPNDR 2 FREQ H1

XPNDR 1 FREQ H1

XPNDR 2 FREQ LO

XPNDR 1 FREQ LO

XPNDR 1 RCV

XPNDR 2 RCV

PREAMP 2 HEATER

PREAMP 1 HEATER

PREAMP 2 PWR

PREAMP 1 PWR

FILTER

NOT USED

10K POSITION 3B

10K POSITION 3A

10K POSITION 2B

10K POSITION 2A

10K POSITION 1B

10K POSITION 1A

(1A7) THRU (3B7)
(6 LINES)

(SWITCH TALKBACK)

TALKBACK

TYPICAL (2)

TYPICAL (4)

PA2

PA1

XP2H

XP1H

XP2L

XP1L

TSHS

CHARGE=1T

TRIGGER=1T

CUTOFF 75 MS

POWER ON INHIBIT 0.1 MS DELAY

OFF

ON

INH

END

75 MS PULSER

VARACTOR BIAS

PA1 + 11.5 DC

IDLE FREQ STOP

50Ω

95.25°

175.1°F

TRANSISTOR AMPL

PARAMETRIC AMPL

CONVERTER AND REGULATORS

OSCILLATOR (60 GHZ PUMP)

ATTN

ISOLATOR

PUMP BANDPASS

FILTER

TUNE CKT (F0)

SOURCE ISOLATION

G00 PROPORTIONAL CONTROLLER

G00 HEATER

CIRCULATOR PROPORTIONAL CONTROLLER

PRE 1

PRE 2

PREAMP HTR 2-ON

PREAMP HTR 1-ON

XMIT/RCV, HIGH FREQ (STDN M1 AND TDMS MODE)

XMIT/RCV, LOW FREQ (STDN M1 AND TDMS MODE)

XMIT HI

XMIT LO

RCV HI

RCV LO

TRANSMIT HI 2280.5 MHZ

RECEIVE HI 2106.4 MHZ

TRANSMIT LO 2211.5 MHZ

RECEIVE LO 2041.9 MHZ

1A2-XPNDR 1 PRE 2
1B1-XPNDR 1 PRE 2
1B2-XPNDR 2 PRE 1
1A1-XPNDR 2 PRE 1

3A1-PA1 HI FREQ
3B2-PA1 HI FREQ
3B1-PA2 HI FREQ
3A2-PA2 LO FREQ

2B1-PRE 2 HI FREQ
2A2-PRE 1 HI FREQ
2B2-PRE 1 LO FREQ
2A1-PRE 2 LO FREQ

16.2-1

16.2-3

T S R Q P O N M L K J

S-BAND POWER AMPLIFIER ASSEMBLY

PA NO 2

PA NO 1

RF DIODE SWITCH (OFF) (ON) (OFF)

CNTL (DIODE BIAS)

SWITCHABLE AUTOMATIC LEVEL CONTROLLER

PIN DIODE ATTENUATOR (+/- 6 DB)

PIN DIODE ATTENUATOR (+/- 6 DB)

BPF

BPF

RF DETECTOR

RF DETECTOR

50Ω

50Ω

AUTOMATIC LEVEL CONTROL

FILTER

+15VDC

DC BIAS SUPPLY

28VDC

RD

DI

PA2/X1

PA1/X2

K1 (NOT USED)

28VDC

LOW VOLTAGE CONVERTER 2

36VAC (DRIVE)

36VAC (SYNC)

NORM BIAS

BUCK REG

V REG (21VDC) (RAMP UP)

DUTY CYCLE CONTROL

CURRENT INVERTER AND HIGH VOLTAGE SUPPLY

CATHODE (-3 KV)

ANODE (+1 KV)

ANODE SHUNT REG

HELIX REG

HELIX

COLLECTOR 1 (-600V)

COLLECTOR 2 (-800V)

XPNDR 1 SEL

XPNDR 2 SEL

+18VDC

+5VDC

LOW VOLTAGE CONVERTER 1

STANDBY BIAS

6.2V BIAS

DRIVE

+11/-11VDC

-11VDC

TLM AMPS

200V HV FEEDBACK

50% DUTY CYCLE REFERENCE

AC VOLTAGE FEEDBACK

28VDC LINE VOLTAGE SENSE

+18VDC BIAS

BIAS CONTROL (GND=STANDBY)

PULSE WIDTH MODULATOR

DUTY CYCLE CONTROL

PA 2 NORMAL CMD

PA 1 NORMAL CMD

RF THRESHOLD RF LOW = 0

LOW VOLTAGE SUPPLY

FF

18VDC REG

5VDC REG

OSC 30KHZ

STANDBY

RD

K2

-11VDC

REFERENCE (30KHZ)

STANDBY

+5VDC

NORMAL CMD

NORM BIAS ON (TURNS BUCK REG ON)

(ENABLE)

+5VDC

RESET

+28VDC

(24V=RESET)

VOLTAGE COMPARATOR

140 SEC TIMER

1=HIGH VOLTAGE (ON)

K1

+18VDC

LOGIC

36VAC PWR

HEATER XFMR

TWT

TRAVELING WAVE TUBE

(THERMISTOR)

DUAL POWER MONITOR

+11/-11VDC

BPF

DIODE DET

TLM AMP

PA 1 RF OUT

BPF

DIODE DET

TLM AMP

TEMP AMP

SPEC 76 V74 E4512A OF 3 N/A PWR AMP RF OUT 1 0 TO 150 WATT 1 S/S P

RF OUT 2 (V74E4513A)

SPEC 76 V74 T4514A OF 3 N/A PWR AMP 1 TEMP 32 TO 266° F 1 S/S P

PWR AMPL 2 TEMP (V74T4515A)

SPEC 76 V74 E4540A OF 3 N/A PWR AMP RF RFL 1 0 TO 200 WATT 1 S/S

REFLECTED PWR 2 (V74E4541A)

SPEC 76 V74 X4776E OF 3 N/A PREAMP 1-ON 1=ON 1 S/S C

SPEC 76 V74 X4777E OF 3 N/A PREAMP 2-ON 1=ON 1 S/S C

V74 X4707E OF 3 N/A PREAMP HTR 1-ON 1=ON 1 S/S

V74 X4708E OF 3 N/A PREAMP HTR 2-ON 1=ON 1 S/S

SZ8 16.2-1

V_{MNB} FLC2 10A PREAMP 1 HEATER

V_{MNC} FLC3 10A PREAMP 2 HEATER

V_{MNC} FLC3 10A

V_{MNB} FLC2 10A

PREAMP

PREAMP

S-BAND PM PRE AMPL

$V_{CNTLBC2}$ 1A 5.1K

$V_{CNTLBC1}$ 1A 5.1K

GCIL 9/7 '1'

GCIL 18/7 '1'

GCIL 12/13

GCIL 4/13

1 OFF 2

PNL A1 S10

PA 1 STBY PWR

PA 2 STBY PWR

POWER AMP 2/PRE AMP SWITCH INTERLOCK

POWER AMP 1/PRE AMP SWITCH INTERLOCK

SZ2 16.2-1

XPNDR 1

XPNDR 2

XPNDR 1

XPNDR 2

PWR AMP

PWR AMP

DATE: 07/25/94	NAME: BJB	VERSION: IN#: T
DATE: 01/25/96	NAME: VSH	VERSION: BPT: 11
DATE: 02/05/96	NAME: VSH	VERSION: IN#: 8

S-BAND POWER AMPLIFIER ASSEMBLY

PA NO 2

PA NO 1

S-BAND PM PWR AMPL

STANDBY

OPERATE

PNL A1 S11

PNL A1 S12

$V_{CNTLBC1}$ 1A 5.1K

$V_{CNTLBC2}$ 1A 5.1K

V_{PMC} FPC3

V_{PMB} FPC2

V_{PMC} FLC3

V_{PMB} FLC2

RPC 20A

OPR 2

OPR 1

STBY 2

STBY 1

GC/IL 10/8

GC/IL 12/1

GC/IL 10/3

GC/IL 4/1

GC/IL 12/9

GC/IL 4/5

(1 SEC DELAY)

3A

SPEC 76

V74 X4749E PWR AMP 2 STANDBY

V74 X4747E PWR AMP 1 STANDBY

V74 X4785E PWR AMP 2 ON

V74 X4784E PWR AMP 1 ON

1=ON 1 S/S C

OF 3 N/A

S-BD PA STBY-2

S-BD PA STBY-1

PA 2 NORMAL CMD

PA 1 NORMAL CMD

(4/12)

(12/12)

4/12 PRE AMP 1 ON (GCIL INTERLOCK)

12/12 PRE AMP 2 ON (GCIL INTERLOCK)

Z_4 16.2-1 XPNDR 2 XMIT

Z_4 16.2-1 XPNDR 1 XMIT

RF DIODE SWITCH (OFF) (ON) (ON) (OFF)

CNTL (DIODE BIAS)

SWITCHABLE AUTOMATIC LEVEL CONTROLLER

PIN DIODE ATTENUATOR (+/- 6 DB)

PIN DIODE ATTENUATOR (+/- 6 DB)

BPF

RF DETECTOR

50Ω

50Ω

FILTER

AUTOMATIC LEVEL CONTROL

+15VDC

DC BIAS SUPPLY

28VDC

RD

D1

K1 (NOT USED)

PA2/X1

PA1/X2

Z_7 16.2-1 XPNDR 1 SEL

XPNDR 2 SEL

LOW VOLTAGE CONVERTER 2

LOW VOLTAGE CONVERTER 1

NORM BIAS

BUCK REG

V REG (21VDC) (RAMP UP)

36VAC (DRIVE)

36VAC (SYNC)

+18VDC

+5VDC

DRIVE

+11V/-11VDC

-11VDC

3 TLM AMPS

STANDBY BIAS

6.2V BIAS

LOW VOLTAGE SUPPLY

18VDC REG

5VDC REG

OSC 30KHZ

FF

RF THRESHOLD RF LOW = '0'

+5VDC

RESET

(24V=RESET)

+28VDC

VOLTAGE COMPARATOR

140 SEC TIMER

1=HIGH VOLTAGE (ON)

(ENABLE)

+18VDC

LOGIC

TWT

HEATER xFMR

36VAC PWR

TRAVELING WAVE TUBE

DUAL POWER MONITOR

(THERMISTOR)

TEMP AMP

DIODE DET

BPF

TLM AMP

PA 1 RF OUT

+11/-11VDC

DUTY CYCLE CONTROL

CATHODE (-3 KV)

ANODE (+1 KV)

ANODE SHUNT REG

HELIX REG

HELIX

COLLECTOR 1 (-600V)

COLLECTOR 2 (-800V)

CURRENT INVERTER AND HIGH VOLTAGE SUPPLY

200V HV FEEDBACK

50% DUTY CYCLE REFERENCE

AC VOLTAGE FEEDBACK

28VDC LINE VOLTAGE SENSE

+18VDC BIAS

BIAS CONTROL (GND=STANDBY)

PULSE WIDTH MODULATOR

DUTY CYCLE CONTROL

STANDBY

+5VDC

REFERENCE (30KHZ)

NORMAL CMD

NORM BIAS ON (TURNS BUCK REG ON)

K1

K2

SPEC 76

V74 T45144A PWR AMP 1 TEMP

32 TO 266° F

PWR AMP 2 TEMP (V74T45154A)

$V_{CNTLBC2}$

$V_{CNTLBC1}$

PA 1 STBY PWR

PA 2 STBY PWR

NOTES:

LRU	PARAM	FDA LIMIT
PA1	RF OUT TEMP	<60 * >230**
PA2	RF OUT TEMP	<60 * >230

* PRECONDITIONED WITH TDRS OR SIDN HI AND PA SELECTED

** PA SN 64 (CURRENTLY PA1 ON OV103) OPERATES HOTTER THAN THE REST OF THE FLEET. THE LIMIT ON THIS LRU SHOULD BE TMBYD TO 260 DURING POST INSERTION WHEN IT IS FLOWN

2 S-BD PM 2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		SIGNATURE	DATE
S-BAND PM AMPLIFIER SYSTEM		DSGN L. M. BUCHANAN	12/8/78
		DR L. M. BUCHANAN	12/8/78
		ENGR G. HORLACHER	
		ENGR	2/14/96
DWG NO 16.2	SPACE SHUTTLE	APP	2/14/96
	ALL	APP	2/14/96
		CADS S.K. Kimball	6-17-96
SHEET 2 OF 3 PAGE	126.5 X 34	LTR E PCN 6	

BASIC REV E-6

DATE: 07/26/90	NAME: LAM	VERSION INK: 1
DATE: 07/11/94	NAME: VSH	VERSION BPT: 11
DATE: 07/15/94	NAME: JMB	VERSION INK: 2

SWITCH BEAM CONTROL ELECTRONICS

ELECTRONICS 2

ELECTRONICS 1

FROM S-BD ANTENNA SWITCH S10 PNL C3

$^{n}Z_4$

GPC

F_M

LL_M

UL_M

UR_M

LR_M

A_M

A/B

FWD BEAM MAN GATES

AFT BEAM MAN GATES

MAN GPC SELECTOR AND FWD/AFT BEAM LOGIC

A0 A1 A2 A3 A4 A5 A6 A7

Z_0 Z_4 Z_3 Z_7

$(GPC \cdot F_G \cdot LL_G) + (\overline{GPC} \cdot F_M \cdot LL_M)$

$(GPC \cdot A_G \cdot LL_G) + (\overline{GPC} \cdot A_M \cdot LL_M)$

$(GPC \cdot F_G \cdot LR_G) + (\overline{GPC} \cdot F_M \cdot LR_M)$

$(GPC \cdot A_G \cdot LR_G) + (\overline{GPC} \cdot A_M \cdot LR_M)$

PULSER

A1 1F B1 1A A2 2F B2 2A

FWD

AFT

+28 VDC MNC

+28 VDC MNB

TO SWITCH BEAM ANTENNAS

MDM PF2

MDM PF1

$^{n}Z_6$ 16.26

TO S-BAND PM ANTENNA SWITCH LRU

$^{n}Z_3$ FM1 FM2

$^{0}Z_5$ PM1 PM2

F_G LL_G UL_G UR_G LR_G A_G

FWD BEAM GPC GATES

AFT BEAM GPC GATES

B0 B1 B2 B3 B4 B5 B6 B7

Z_1 Z_5 Z_2 Z_6

$(GPC \cdot F_G \cdot UL_G) + (\overline{GPC} \cdot F_M \cdot UL_M)$

$(GPC \cdot A_G \cdot UL_G) + (\overline{GPC} \cdot A_M \cdot UL_M)$

$(GPC \cdot F_G \cdot UR_G) + (\overline{GPC} \cdot F_M \cdot UR_M)$

$(GPC \cdot A_G \cdot UR_G) + (\overline{GPC} \cdot A_M \cdot UR_M)$

A3 3F B3 3A A4 4F B4 4A

MNC FLC 3 RPC POWER

MNB FLC 2 RPC POWER

FILTER

REGULATOR

+V LOGIC POWER

V74 X6491E OF 3 N/A
S-BD SW BEAM CNTL ASSY 1 POWER ON
1=ON 1 S/S

V74 X6492E OF 3 N/A
S-BD SW BEAM CNTL ASSY 2 POWER ON
1=ON 1 S/S

$^{n}Z_5$ 24 LL — LOWER LEFT SWITCH BEAM ANTENNA

$^{n}Z_5$ 25 LR — LOWER RIGHT SWITCH BEAM ANTENNA

$^{n}Z_5$ 26 UL — UPPER LEFT SWITCH BEAM ANTENNA

$^{n}Z_5$ 27 UR — UPPER RIGHT SWITCH BEAM ANTENNA

3db HYBRID COUPLER 90°Φ 0°Φ

FWD PRI SEC AFT

S1 A1 FWD B1 AFT A2 FWD B2 AFT

CROSS DIPOLE ANTENNAS Φ2 Φ1 Φ3 Φ4

AFT ← BEAM POSITION → FWD

LOWER LEFT QUAD

LOWER RIGHT QUAD

UPPER LEFT QUAD

UPPER RIGHT QUAD

$V_{CNTLBC1}$

V74 X7094E OF 3 N/A S-BD QUAD ANT-LLF 1=LLF 1 S/S F

V74 X7095E OF 3 N/A S-BD QUAD ANT-LLA 1=LLA 1 S/S F

V74 X7096E OF 3 N/A S-BD QUAD ANT-LRF 1=LRF 1 S/S F

V74 X7097E OF 3 N/A S-BD QUAD ANT-LRA 1=LRA 1 S/S F

V74 X7098E OF 3 N/A S-BD QUAD ANT-ULF 1=ULF 1 S/S F

V74 X7099E OF 3 N/A S-BD QUAD ANT-ULA 1=ULA 1 S/S F

V74 X7092E OF 3 N/A S-BD QUAD ANT-URF 1=URF 1 S/S F

V74 X7093E OF 3 N/A S-BD QUAD ANT-URA 1=URA 1 S/S F

V74 X7078E OF 3 N/A PM ANT SW POS-S3A 1=S3A 1 S/S P

V74 X7082E OF 3 N/A PM ANT SW POS-S4A 1=S4A 1 S/S P

V74 X7080E OF 3 N/A PM ANT SW POS-S3B 1=S3B 1 S/S P

V74 X7084E OF 3 N/A PM ANT SW POS-S4B 1=S4B 1 S/S P

V74 X6476E OF 3 N/A FM ANT POS S5B ON 1=LON 1 S/S C

Δ5 THIS PARAMETER USED BY SM AM IN A SPECIAL COMP TO DETERMINE WHICH HEMI IS CURRENTLY SELECTED. THE RESULTANT COMP IS DISPLAYED ON SPEC 201. IT IS ALSO USE IN A COMPARISON TO DRIVE THE HEMI FAIL INDICATION WHICH IS ALSO DISPLAYED ON SPEC 201

Δ6 THIS PARAMETER USED BY SM AM IN A SPECIAL COMP TO DETERMINE WHICH ANTENNA IS CURRENTLY SELECTED. THE RESULTANT COMP IS DISPLAYED ON SPEC 201 AND DOWNLISTED. IT IS ALSO USED IN A COMPARISON TO DRIVE THE ANTENNA MESSAGE ONBOARD

Δ7

DIPOLE	PHASE	BEAM POSITION AFT	BEAM POSITION FWD
1	Q_1	0°	90°
	Q_2	90°	180°
2	Q_3	90°	0°
	Q_4	180°	90°

Δ8 ALL LOGIC EQUATIONS SIMPLIFIED. INPUT TO PULSER IS ACTUALLY INVERTED TO GIVE DRIVER OUTPUT TO RELAYS IN ANTENNA

NOTES: Δ9 LL, LR, UL AND UR SIGNALS TO ANTENNA SWITCH AND SWITCH BEAM ELECTRONICS ARE FROM THE SAME MDM CHANNELS FOR BOTH OF THE LRU'S (CD2 CH1)

2 S-BD PM 3

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN L. M. BUCHANAN	2/17/82	
DR L. M. BUCHANAN	2/17/82	S-BAND PM/FM SWITCH BEAM ANTENNA SYSTEM
ENGR C. HORLACHER		
ENGR Jerry Horlacher	7/15/94	
APP Allan Morin	7/15/94	
APP Jackie D. Evans	8/1/94	SPACE SHUTTLE
CROSS R. Killing	8/1/94	ALL

DWG NO 16.2

LTR E PCN 4 | 121 X 34 | PAGE 16.2-3 | SHEET 3 OF 3

BASIC REV E-4

U T S R Q P O N M L K

S-BAND ANTENNA SWITCH

PM ELEC 2
PM ELEC 1

FM ELEC 2
FM ELEC 1

LOGIC GATES

PULSER

SELECTOR

REGULATOR +V LOGIC PWR

S-BAND PM ANTENNA

S-BAND FM ANTENNA

TO SW BEAM CNTL ELECT

TO SWITCH BEAM ANTENNAS

TO S-BAND PM ANTENNA SWITCH LRU

S-BAND FM HEMI ANTENNAS

FILTER

ELEC 1

ELEC 2

ELEC 1 PWR (MNB)

ELEC 2 PWR (MNC)

FM 1/2

EMU

EMU TV

FM XMTR 1/2 INPUT

ANT SW FREQ LO-1

ANT SW FREQ LO-2

ANT SW FREQ HI-1

ANT SW FREQ HI-2

XPNDR 1 DIRECT (STDN LOW AND SGLS)

XPNDR 2 DIRECT (STDN LOW AND SGLS)

XMIT/RCV, FREQ LOW (STDN HIGH AND TDRS MODE)

XMIT/RCV, FREQ HIGH (STDN HIGH AND TDRS MODE)

XMIT/RCV, XPNDR 1 DIRECT (STDN LOW AND SGLS MODE)

XMIT/RCV, XPNDR 2 DIRECT (STDN LOW AND SGLS MODE)

TO/FROM PREAMPL

TO/FROM XPNDR 1 AND 2

FROM MDM PF1 AND PF2

(4/2)+(12/2) STDN HIGH XPNDR-1/2

(4/14)+(12/14) TDRS XPNDR-1/2

TDRS MODE XPNDR 1

STDN HIGH MODE XPNDR 1

STDN HIGH MODE XPNDR 2

TDRS MODE XPNDR 2

FLCA 2 (XPNDR 1 ON)

FLCA 3 (XPNDR 2 ON)

(4/5)+(12/5) SGLS XPNDR-1/2

(4/10)+(12/10) STDN LOW XPNDR-1/2

SGLS MODE XPNDR 2

STDN LOW MODE XPNDR 2

SGLS MODE XPNDR 1

STDN LOW MODE XPNDR 1

PM/FM ANT SW 1-ON

PM/FM ANT SW 2-ON

S-BD ANT ELEC SW-1

S-BD ANT ELEC SW-2

DECK 1

DECK 2

DECK 5

S10

PNL C3

PNL A1

S2

GPC LL

GPC UL

GPC UR

GPC LR

GPC LH

FWD

AFT

PULSER (TYPICAL)

TD 100 MS

LOWER LEFT

LOWER RIGHT

UPPER LEFT

UPPER RIGHT

DATE: 07/15/94 | NAME: JMB | VERSION: INK 2

BASIC REV E-4

NETWORK SIGNAL PROCESSOR (NSP 2)

NETWORK SIGNAL PROCESSOR (NSP 1)

RECORD MODE PROCESSOR

RCD DATA/V DATA
TX HI/LO
PCM 1/2
128 KBPS PCM DATA NO 1
64 KBPS PCM DATA NO 1
100 PPS PCM CLOCK NO 1
128 KBPS PCM DATA NO 2
64 KBPS PCM DATA NO 2
100 PPS PCM CLOCK NO 2
DIFFERENTIAL LINE RECEIVERS
S1/S2
128 KBPS
64 KBPS
100 PPS
HI
LO
RETURN LINK PCM
(CLEAR)
PCM 1/2 SELECTOR
1.152 MHZ
SYNC AND TRANSFER TIMING
RM SYNC
RCD DATA/V DATA
128 KBPS BI-Ø
XFER
192 KHZ
VOICE AND DATA MUX (48 BIT SR)
32 LINES
8 LINES
8 LINES
32 BIT SR (PCM)
8 BIT SR (VOICE 2)
8 BIT SR (VOICE 1)
NRZ TO BI-Ø
RM BI-Ø DATA
RM 384 KHZ
FREQUENCY CONVERTER
+6
+9
+36
+3
128 KHZ
RM 32 KHZ
RM 384/384 KHZ
RCDR VOICE 1 AND 2
RECORD MODE MULTIPLEXER

FREQUENCY CONVERTER

INTL SYNC
VOICE CLOCK AND SYNC SELECT
32 KHZ
32 KHZ
SYNC 2
SYNC 1
SYNC 1
SYNC 2
PCM DATA BLOCKS
192/96 KHZ
576/288 KHZ
COM CLOCK
1.152 MHZ
1.152 MHZ
QUENCY CONVERTER

INTERNAL MODE
INTERNAL MODE LOGIC
SYNC 1
SYNC 1
192/96 KHZ
TX LO
VOIC AND TLM MUX CONTROLLER
VOICE AG1 SELECT
VOICE AG2 SELECT
TLM SELECT
INTERNAL MODE
RETURN LINK PCM
SERIAL PARALLEL SHIFT REGISTER
SYNC PATTERN CHECK
(WORD 2)
SYNC FAIL/SUCCESS COUNTER (3 FAIL 3 SUCCESS)
INTL (3 FAIL)
INTL·TLM
128/64 KHZ
100 PPS
128/64 KHZ
FREQUENCY DIVIDER (16,384)
70.3 HZ
INTL (3 SUCCESS)
INTL·TLM
INTERNAL MODE LOGIC
TIMING BUS

RETURN LINK DATA BUFFERS
SYNC 2
SYNC 2
RETURN LINK PCM
TLM CLEAR
192/96 KHZ
128/64 KHZ
1.152 KHZ
INTERNAL SYNC PATTERN AND FILL DATA GENERATOR
(LOAD)
(RESET)
(CLOCK)
TLM BUFFER 16 BIT SHIFT REGISTER
(DATA)
(RESET)
(LOAD)
DATA OUTPUT CLOCK
TLM CLR
VOICE AG1 SEL (192/96 CLOCK OUT ENABLE)
INTL·TLM
TLM DATA
INTL·TLM
VOICE AG1
VOICE AG2
32 KHZ CLOCK
PS INTERFACE
PS VOICE AG1
PS VOICE AG2
PS VOICE AG1 CLOCK
PS VOICE AG2 CLOCK
PS/ACCU
SA/SB
CLOCK SYNC
VOICE AG1 CLOCK
VOICE AG2 CLOCK
VOICE AG1
VOICE AG2
VOICE AG1 CLK IN
VOICE AG2 CLK IN
VOICE AG1 BUFFER SHIFT REGISTER
VOICE AG1 BUFF BITE (OVERFLOW) = "0"
VOICE AG1 DATA
VOICE AG2 SEL (192/96 CLOCK OUT ENABLE)
VOICE AG2 BUFFER SHIFT REGISTER
VOICE AG2 BUFF BITE (OVERFLOW) = "0"
VOICE AG2 DATA
VOICE AG1 BUFF BITE
VOICE AG2 BUFF BITE
TLM VOICE MUX
VOICE DATA
PAYLOAD STATION/AUDIO COMM CONTROL UNIT SELECTOR
RETURN LINK DATA BUFFERS

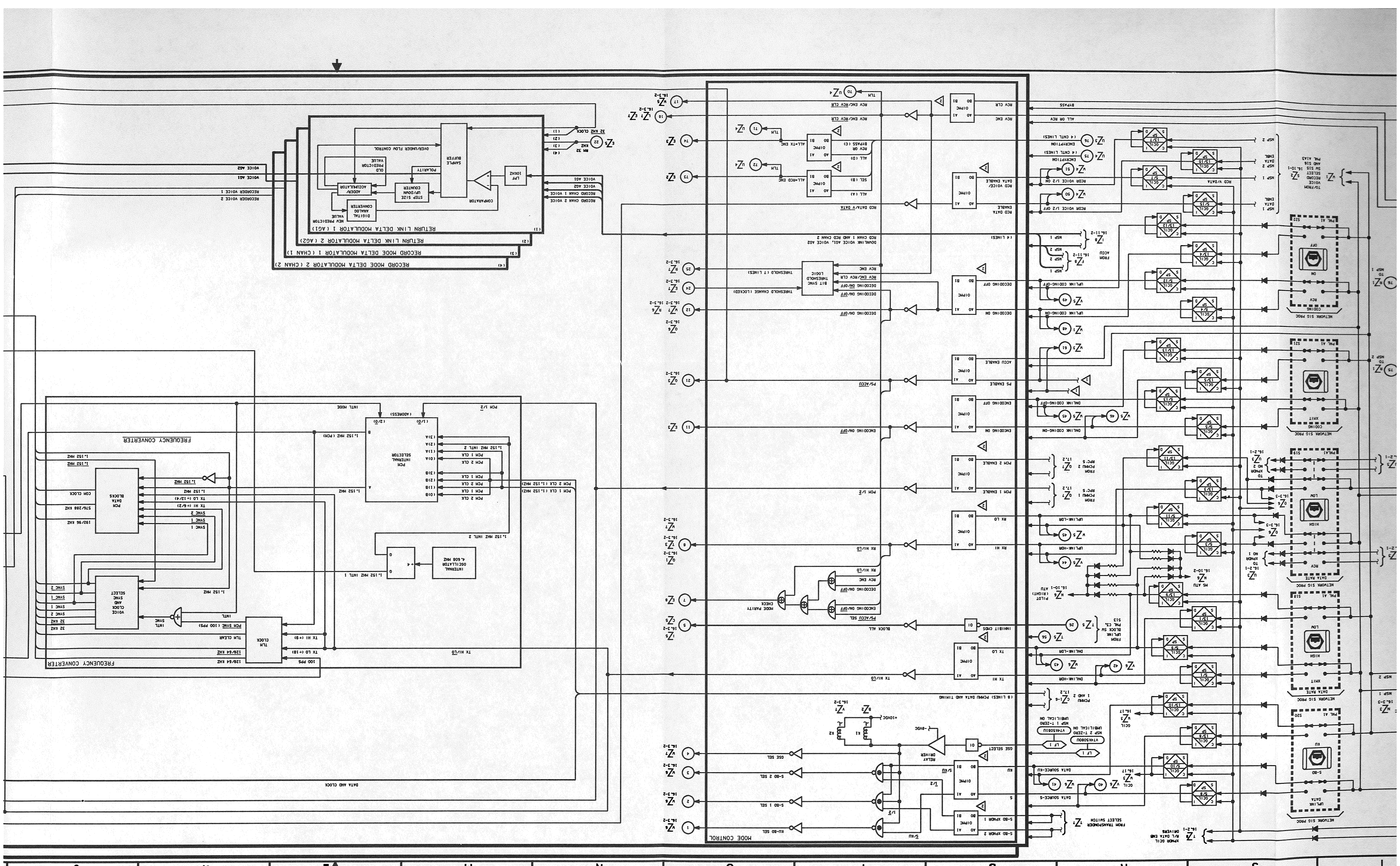
SUMMARY BITE
NSP 1 BIT SYNC LOCK
NSP FRAME SYNC LOCK
NSP MESSAGE VALID 1
NSP 1 BITE STATUS GOOD
FRAME SYNC LOCK
MESSAGE VALID
MODE PARITY CHECK
RM SYNC
RM BI-Ø DATA
RM 384 KHZ
RCD DATA/V DATA
ALL WORD DISC
RESET
RECORD MODE SYNC CHECK
UPLINK CLOCK
÷4096
÷10
1.302HZ
CLR IN
DELAY (2 CLK TIMES)
THRESHOLD CHANGE (LOCK)
CLOCK OUT
BIT SYNC LOCK AND QUALITY CHECK
OVERFLOW
INITIALIZE
+10VDC SUPPLY
VOLTAGE COMPARATOR
REINITIALIZE
INPUT REGISTER FULL AG1
INPUT REGISTER FULL AG2
UPLINK CLOCK
SETS LATCH OUT HIGH
VOICE AG1 AND AG2 INPUT CHECK (LATCH)
OUTPUT REGISTER EMPTY AG1
VOICE CLOCK AG1
VOICE AG1 OUT CHECK (LATCH)
DEMUX CHECK
OUTPUT REGISTER EMPTY AG2
VOICE CLOCK AG2
VOICE AG2 OUT CHECK (LATCH)
INTERNAL MODE
VOICE AG1 BUFFER BITE
VOICE AG2 BUFFER BITE
BCH VALID
RETURN LINK VOICE MUX CHECK
DATA READY
MSG DISC
STATUS CLR
WORD DISC
NSP BITE STATUS
NSP STATUS
RESET
LATCHES
RECORD MODE MUX
MODE PARITY ODD
MODE PARITY EVEN
PARALLEL LOAD (HIGH)
SERIAL DATA RECYCLE
BCH VAL
FRAME SYNC LOCK
BIT SYNC QUAL
BIT SYNC LOCK
SEC PWR CHECK
DEMUX CHECK
MDM BITE REGISTER
CMD BLOCK ALL
STATUS DATA
BRACKET DATA STATUS
INTERNAL MODE
MUX CHECK
BCH VAL NOT
DATA READY
MSG DISC
STATUS CLR

COMSEC INTERFACE
RETURN LINK DATA
TX ENC (ALL)
COM CLOCK (192/96 KHZ)
COMSEC CLOCK
COMSEC DATA
COMSEC DATA OUT
COMSEC CLOCK OUT
COMSEC CLOCK IN
COMSEC DATA IN
TO/FROM COMSEC 1 AND COMSEC 2

RETURN LINK INTERFACE
RM BI-Ø DATA
RCD ENC
CODING ON/OFF
RCD ENC
COMSEC DATA
COMSEC CLOCK
"0"
TX ENC
RL DATA
COM CLK (192/96 KHZ)
SA/SB
DATA
CLK
DATA RECLOCK
NRZ TO BI-Ø
UNCODED DATA
192 KBPS
96 KBPS
BI-Ø
ENABLE = "1"
INHIBIT = "1"
CONVOLUTIONAL ENCODER (K=7, R=3)
NRZ BI-Ø
CODED DATA BI-Ø
288 KBPS
576 KBPS
GSE
192/96 KHZ
576/288 KHZ
SYNC 2
1.152 MHZ
(INPUT CLK)
(OUTPUT CLK)
(TRANSFER)
RETURN LINK INTERFACE
MODE SELECTOR
RECORDER 1 OUT
RECORDER 2 OUT
KU BAND DATA
S-BAND NO. 1 DATA
S-BAND NO. 2 DATA
PS INTERFACE 32 KHZ
PS VOICE AG1
PS VOICE AG2
PS VOICE AG1 CLOCK
PS VOICE AG2 CLOCK
PAYLOAD STATION TBD

V74X5189E
V74X5188E 0F3 N/A NSP 1 BIT SYNC LOCK 1=LOCK 1 S/S C
V74X5177E
V74X5176E 0F3 N/A NSP FRAME SYNC LOCK 1 1=ON 1 S/S C
V74X5181E
V74X5182E 0F3 N/A NSP MSG VALID 1 1=PULSE 50 S/S C
V74X5185E
V74X5184E 0F3 N/A NSP 1 BITE STATUS 0 =GOOD 1 S/S F

BASIC REV E-6


MODE CONTROL
RECORD MODE DELTA MODULATOR 2 (CHAN 2)
RECORD MODE DELTA MODULATOR 1 (CHAN 1)
RETURN LINK DELTA MODULATOR 2 (A02)
RETURN LINK DELTA MODULATOR 1 (A01)
FREQUENCY CONVERTER
DATA AND CLOCK
TX HI/LO
VOICE A01
VOICE A02
RECORDER VOICE 1
RECORDER VOICE 2
RECORD CHAN 1 VOICE
RECORD CHAN 2 VOICE
32 KHZ CLOCK
COMPARATOR
SAMPLE BUFFER
STEP SIZE UP/DOWN COUNTER
ADDER/ ACCUMULATOR
DIGITAL ANALOG CONVERTER
OLD PREDICTOR VALUE
NEW PREDICTOR VALUE
POLARITY
OVER/UNDER FLOW CONTROL
LPF 10KHZ
INTERNAL OSCILLATOR 4.608 MHZ
PCM INTERFACE SELECTOR
PCM 1/2
INTL MODE
PCM 1 CLK
PCM 2 CLK
1.152 MHZ INTL 2
1.152 MHZ INTL 1
1.152 MHZ (PCM)
PCM CLK (1.152 MHZ)
VOICE CLOCK AND SYNC SELECT
PCM SYNC (100 PPS)
INTL SYNC
TLM CLOCK
TLM CLEAR
128/64 KHZ
32 KHZ
SYNC 1
SYNC 2
100 PPS
TX HI (+9)
TX LO (+18)
PCM DATA BLOCKS
COM CLOCK
TX LO (+12/4)
TX HI (+6/2)
576/288 KHZ
192/96 KHZ
1.152 MHZ
DOWNLINK VOICE A01, VOICE A02
RCD CHAN 1 AND RCD CHAN 2
(4 LINES)
(8 LINES) PCMDU DATA AND TIMING
THRESHOLD CHANGE (LOCKED)
THRESHOLD (7 LINES)
BIT SYNC THRESHOLD LOGIC
MODE PARITY CHECK
RCV ENC/RCV CLR
DECODING ON/OFF
ENCODING ON/OFF
PS/ACCU
PS/ACCU SEL
BLOCK ALL
INHIBIT CMDS
RELAY DRIVER
+10VDC
-8VDC
R1
R2
OSC SELECT
S-BD 1 SEL
S-BD 2 SEL
RU-BD SEL
S-BD XPNDR 1
S-BD XPNDR 2
S/RU
T/Z
RCV CLR
RCV ENC
BYPASS
ALL ON RCV
ALL (A)
ALL (B)
ALL (4)
ALL-TX ENC
ALL-RCD ENC
SEL (B)
RCV ON BYPASS (C)
RCD DATA/Y DATA
RCD DATA ENABLE
RCD VOICE/ DATA ENABLE
RCDM VOICE 1/2 OFF
RCDM VOICE 1/2 ON
RCD Y/DATA
ENCRYPTION
(4 CNTL LINES)
NSP 1
NSP 2
DATA ENABLE
TO/FROM RECORD VOICE SELECT SW 516 16:10-1 PWL A1A3
FROM ACCU
PILOT (HIGH)
16.10-1 ATU
HS ATU
PCMDU 1 AND 2
DATA RATE
DATA SOURCE-S
DATA SOURCE-RU
ENCODING OFF
ENCODING ON
DECODING OFF
DECODING ON
UPLINK COD/DEC-OFF
UPLINK COD/DEC-ON
DNLINK COD/DEC-OFF
DNLINK COD/DEC-ON
UPLINK-HDR
UPLINK-MDR
UPLINK-LDR
DNLINK-HDR
DNLINK-MDR
DNLINK-LDR
PS ENABLE
ACCU ENABLE
PCM 1 ENABLE
PCM 2 ENABLE
PCMDU 1 RPC-S
PCMDU 2 RPC-S
PCMDU 1 AND 2
FROM TRANSPONDER SELECT SWITCH
XPNDR OCIL R/L DATA END DRIVERS
NETWORK SIG PROC
COD/DEC
XMIT
RCV
HIGH
LOW
MID
S-BD
RU
S20
S19
S18
S16
S13
S12
S21
OFF
ON
OCIL
PWL A1
NSP 1
NSP 2
TO NSP 1
TO NSP 2
TO XPNDR NO 1
TO XPNDR NO 2
VT4K50B1U
VT4K50B2U
NSP 1 T-ZERO UNBILICAL ON
NSP 2 T-ZERO UNBILICAL ON
LF 1
LF 2
BYPASS (C)
16.2-1
16.3-2
16.3-3
16.10-2
16.11-2
16.17

DATE: 02/23/96	NAME: BJT	VERSION: BPT: 11
DATE: 03/15/96	NAME: VSH	VERSION: INR: 10
DATE: 07/25/96	NAME: LAM	VERSION: INR: 11

3 NSP RTN LINK 1

NETWORK SIGNAL PROCESSOR RETURN LINK

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	SIGNATURE	DATE
	DSGN: J. D. HOLMES	12-15-78
	DR:	
	ENGR: G. SLUSSER	
	ENGR:	
	APP:	7/22/96
DWG NO: 16.3	APP:	7/23/96
SPACE SHUTTLE: ALL	CADS: S. K. Kinkaid	7-29-96
SHEET 1 OF 3 PAGE	LTR: E PCN: 6	126.5 x 34

BASIC REV E-6

▷ THESE PARAMETERS ARE USED BY THE SM TO ANNUNCIATE THE NSP BITE MESSAGE

▷ THESE PARAMETERS ARE USED BY THE SM TO DISPLAY DATA ON SPEC 76. THE STRING 1 AND STRING 2 PARAMETERS ARE COMBINED TOGETHER FOR THE DISPLAY

▷ THESE MSID'S GO THROUGH THE SAME MDM AS THE OI (V74) MSID, BUT ARE AVAILABLE THROUGH DOWNLIST ONLY (V92 GNC, V98 BFS)

▷ THE OIPMC DEVICE CONTAINS AN OPTICAL ISOLATOR (OI) AND POSITIVE MODE CONTROL (PMLOGIC) WHICH FUNCTIONS AS FOLLOWS:

CONTROL SIGNAL		OUTPUTS	
A0	B0	A1	B1
HIGH	LOW	LOW	HIGH
LOW	HIGH	HIGH	LOW
LOW	LOW	NO CHANGE	NO CHANGE
HIGH	HIGH	NO CHANGE	NO CHANGE

NOTES: ▷ SWITCH PROVIDED FOR DOD FLIGHTS TO SELECT PS OR ACCU MODE, CONTROL (28 VDC) HARDWIRED (AS SHOWN) FOR NASA FLIGHTS

MODE CONTROL

PCM 1 CLK (1.152 MHZ)

PCM 2 CLK (1.152 MHZ)

T S R Q P O N M L K

BIT SYNC

A/D CONVERTER (COMPARATOR)
SOFT DECISION DATA DETECTION AND CLOCK GENERATION
DATA MAPPING
LOCK DETECTOR
THRESHOLD CONTROL LINES (7)
(MODE DEPENDENT)
HALF SYMBOL INTEGRATIONS
INTEGRATION TIME
BIT SYNC LOCK
8 FS CLOCK
DATA CLOCK
32 FS CLOCK
BIT 3 (MSB)
6 MHZ
DECODING ON/OFF
12 MHZ OSCILLATOR

CONVOLUTIONAL DECODER

DUPLICATE ENCODER
DATA INVERT
INPUT WORD HOLDING LATCHES (3-3 BIT)
BRANCH METRIC GENERATOR
ADD COMPARE SELECT LOGIC
SURVIVING LOGIC
RENORMALIZE BEST STATE LOGIC
LOGIC RESYNC
COUNT 3 LOGIC
TIMING LOGIC
READ/WRITE COUNTER
METRIC MEMORY LOGIC
PATH RETRACE LOGIC
READ LOGIC
INTEGRATOR
BIT ERROR RATE
CD STROBE
CONVOLUTIONAL DECODED DATA
OUTPUT DECISION CLOCK
RCV ENC/RCV CLR
NASA
UNCODED DATA
DECODED DATA

FRAME SYNC DETECT AND LOCK LOGIC

DATA INVERT CUE (MODE 1)
DATA INVERT LOGIC
BIT SUM
CORRELATION LOGIC
LOCK LOGIC
BRACKET DATA STATUS LOGIC (BDS)
FRAME SYNC LOCK
ROUTINE CORRELATION
INITIALIZE
NO CORRELATION
SEARCH (RESET)

COMMAND PROCESSOR

CMD CLOCK
CMD ENB
BRACKET DATA STATUS (BDS)
48 BIT REGISTER
VEH ADD
50 BIT REGISTER AND BCH CODE VERIFICATION LOGIC
UPLINK DATA 1
UPLINK CLOCK
BCH ENB 1 (SEQUENCE)
BCH ENB 2 (SEQUENCE)
DOP ENB (RESET)
BCH VALID
COMMAND DATA
COMMAND VAL
MESSAGE VALID
WORD L/32
MESSAGE DISCRETE (COUNT REQUESTS)
CMD CLK (1 MHZ)
BUFFER CLK INH
CLOCK IN
UPLINK CLOCK
SELECT FLIP FLOP
TOGGLE BUFFERS
10 COMMAND BUFFER A (480 BIT SR)
10 COMMAND BUFFER B (480 BIT SR)
COUNT 480
COUNT 48
COUNT 432
COUNT 42
COUNT 12
20 MS INHIBIT (CLEAR)
MESSAGE DISCRETE CONTROL LOGIC
DATA READY FLIP FLOPS
DISABLE DATA FLAG
COMMAND SYNC
COMMAND VAL
INITIALIZE

UPLINK PROGRAMMER

PROGRAM COUNTER
INSTRUCTION STORE
BIT COUNTER
LATCH DECODER
FLIP FLOPS
VOICE AG1 ENABLE
VOICE AG2 ENABLE
FRAME ENABLE
DOP ENABLE
BCH 1 ENABLE
BCH 2 ENABLE
CMD ENABLE
TERMINAL COUNT
(END OF INSTRUCTION)
TO MODE CONTROL SUMMARY BITE (SHT 1) AND BIT SYNC MODULES (SHT 2)
TO ALL NSP MODULES FWD LINK AND RTN LINK
POWER ON INITIALIZE (POWER DETECT)

VOICE BUFFERS

VOICE BUFFER AG-1 (128 BIT BUFFER)
VOICE BUFFER AG-2 (128 BIT BUFFER)
FWD LINK AUDIO CLK GENERATOR
AUDIO CLK 1 (HI-32KHZ) (LO-24KHZ)
AUDIO CLOCK 2
32 KHZ

PS/ACCU SELECTOR

ACCU/PAYLOAD STATION VOICE AND CLOCK

VOICE DELTA DEMODULATOR 1
VOICE DELTA DEMODULATOR 2
BINARY STEP SIZE UP/DOWN COUNTER
8 BIT ADDER
8 BIT LATCH (ACCUMULATOR)
DIGITAL TO ANALOG CONVERTER
BPF
300 TO 2300 HZ
ANALOG VOICE AG1
ANALOG VOICE AG2

DATE: 10/31/90 | NAME: BJT | VERSION: INK 9

W V U T S R Q P O N

8 7 6 5 4 3 2 1

BIT SYNC

FRAME SYNC DETECT AND LOCK LOGIC

FRAME SYNC DETECT

POWER CONVERTER

UPLINK PROGRAMMER

VOICE BUFFERS

PS/ACCU SELECTOR

BASIC REV E

DATE: 02/23/96	NAME: BJT	VERSION: BPT 6
DATE: 03/15/96	NAME: VSH	VERSION: INK 7
DATE: 07/25/96	NAME: LAM	VERSION: INK 8

COMSEC 2 (KGX-60)

COMSEC 1 (KGX-60)

DEMUX AND AUTHENTICATE

UNAUTHENTICATED 32/72 KBPS DATA

24 BIT SHIFT REGISTER

FRAME SYNC WORD DETECTOR

COUNT 24

FRAME SYNC COUNTER CONTROL

FRAME SYNC COUNTER

STATE DETECTED

DECODE LOGIC

SEARCH (PRESET TO 25)

BIT COUNTER

BIT DECODER

FETCH

FRAME SYNC

1 (ALARM)

2

3

5

BITE COUNTER

HI/LO

DATA RATE MUX

FRAME SYNC LOGIC

100 KHZ

RATE VALID

CONTROL CLK

÷ 400

1KHZ

IRIG B

TIMING CTR

LOGIC 0

LOGIC 1

MARK

DATA DET

DATA

ENABLE

MARKER

START TIME WD 2 CONSEC MARKS

MARKER COUNTER ÷5 END TIME WD

SHIFT CLK GEN

TIME WORD SHIFT REG

10 SEC

20 SEC

>10 SEC COMPARE LOGIC

TRANSFER TIME WORD

BYTE 2

TIME WORD FORMAT MUX

TIME WORD STORAGE

NEW

NEW ⊙ OLD

TIME WORD STORAGE

DATA REGISTER MUX

128 BIT DATA REGISTER

DATA

OUTPUT DATA MUX

AUTHENTICATED 32/72 DATA

DATA CLOCK MUX

MUX CONTROL LOGIC

BCH ERROR

100 KHZ

COMMAND DATA STORAGE LOGIC

FETCH

FETCH

TIME WORD

EX-OR

TIME WORD ⊙ CMD DATA

TIME AUTHENTICATE

BCH GENERATOR

EX-OR FEED BACK

BCH VERIFICATION LOGIC

BCH ERROR DETECT

AUTHENTICATE

100 KHZ

BCH AUTHENTICATE

TIME WORD

AUTHENTICATE

BUS AND CONTROL

CORE

FRAME SYNC

BITE 1 (ALARM)

BITE 2

BITE 3

BITE 5

CORE

RED OUTPUT ENABLE

32/72 KBPS DATA

32/72 KBPS CLK

32/72 KBPS CLK

RED I/O

D

Q

C

NSP2

NSP1

16.3-1 FWD LNK

BITE 1 (ALARM)

2 XMIT-FULL OPR

3 RCV-FULL OPR

4 CVM ZEROIZED

5 MASTER BITE

6 FRAME SYNC

7 AUTHENTICATE

01

BITE ASSEMBLY

V74 X5001E 0F3 | N/A COMSEC 1 AUTHENTICATE 1=AUTH 50 S/S — V74X5002E COMSEC 2

V74 X5003E 0F3 | N/A COMSEC 1 MASTER BITE 0=BITE — V74X5004E COMSEC 2

SPEC T6

V74 X5015E 0F3 | N/A COMSEC 1 RCV FULL-OPERATE 1=RCV — V74X5016E COMSEC 2

V74 X5017E 0F3 | N/A COMSEC 1 ALARM CONDITION 1=ALARM 1 S/S — V74X5018E COMSEC 2

V74 X5019E 0F3 | N/A COMSEC 1 FRAME SYNC 1=SYNC 10 S/S — V74X5020E COMSEC 2

V74 X5011E 0F3 | N/A COMSEC 1 CVM ZEROIZED 1=ZEROIZED — V74X5012E COMSEC 2

V74 X5013E 0F3 | N/A COMSEC 1 XMIT FULL-OPERATE 1=XMIT — V74X5014E COMSEC 2

BLACK I/O

BLACK OUTPUT ENABLE

96/192 KBPS DATA

96/192 KBPS CLK

96/192 KBPS CLK

NSP2

NSP1

16.3-1 RTN LNK

96/192 KBPS DATA

ALARM

CV, XMIT

XMIT

RCV

UTHENTICATE

T MEMORY PWR

ULSE

D

4. THESE PARAMETERS ARE USED BY THE SM TO ANNUNCIATE COMSEC MESSAGE

3. REFERENCE TABLE 16.1 FOR DRAWING TRACEABILITY

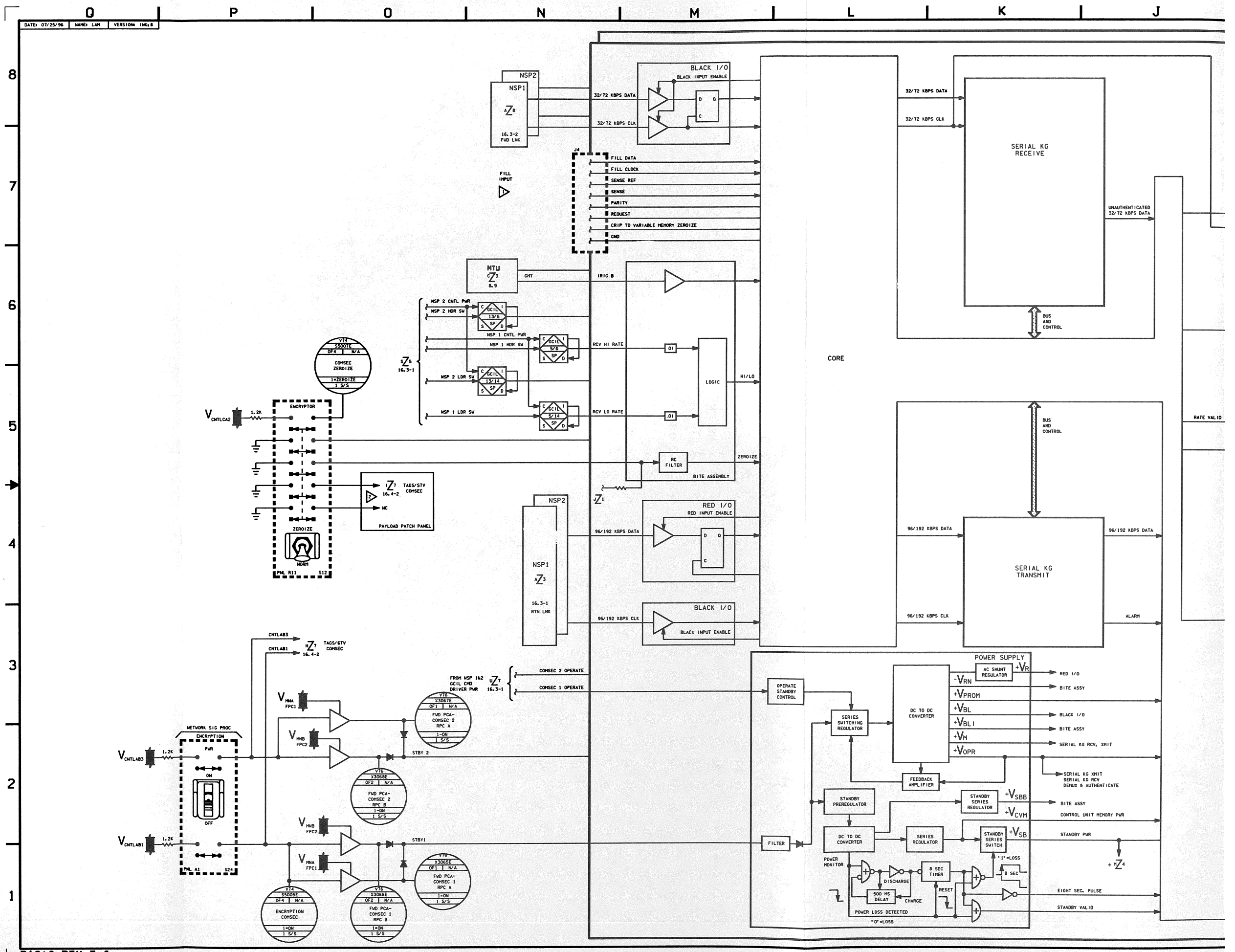
2. NORMAL ORBITER CONFIGURATION SHOWN. WHEN CIU USED WITHOUT ITS OWN ZEROIZE SWITCH BOTH POLES OF S12 ARE USED FOR CIU. TAGS/TV COMSEC ZEROIZE FUNCTION (NORM) JUMPERED AT PAYLOAD PATCH PANEL

NOTES: 1. KEY LOADED VIA PORTABLE UNIT PRIOR TO LAUNCH.

3 COMSEC 3

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	J. H. LEFAN	3/22/82	
DR	J. H. LEFAN	3/22/82	
ENGR	C. COUNTS		COMSEC 1/2
ENGR			
APP			
APP			SPACE SHUTTLE / ALL — DWG NO 16.3
CADS	S. L. Rinker	7-29-82	
LTR E	PCN 6		93.5 x 34 — PAGE — SHEET 3 OF 3

BASIC REV E-6


DATE: 07/25/96
NAME: LAM
VERSION: INK, B
CORE
NSP2
NSP1
16.3-2 FWD LNK
32/72 KBPS DATA
32/72 KBPS CLK
BLACK I/O
BLACK INPUT ENABLE
J4
FILL DATA
FILL CLOCK
SENSE REF
SENSE
PARITY
REQUEST
CRIP TO VARIABLE MEMORY ZEROIZE
GND
FILL INPUT
MTU
8,9
GHT
IRIG B
NSP 2 CNTL PWR
NSP 2 HDR SW
NSP 1 CNTL PWR
NSP 1 HDR SW
NSP 2 LDR SW
NSP 1 LDR SW
16.3-1
GCIL 13/6
GCIL 5/6
GCIL 13/14
GCIL 5/14
RCV HI RATE
RCV LO RATE
.01
LOGIC
HI/LO
ZEROIZE
RC FILTER
BITE ASSEMBLY
SERIAL KG RECEIVE
BUS AND CONTROL
UNAUTHENTICATED 32/72 KBPS DATA
RATE VALID
SERIAL KG TRANSMIT
96/192 KBPS DATA
96/192 KBPS CLK
ALARM
RED I/O
RED INPUT ENABLE
VT4 S5007E OF4 N/A
COMSEC ZEROIZE
1=ZEROIZE 1 S/S
ENCRYPTOR
$V_{CNTLCA2}$
1.2K
ZEROIZE
NORM
PNL A11 S12
TAGS/STV COMSEC
16.4-2
NC
PAYLOAD PATCH PANEL
Z_1
Z_3
Z_7
Z_8
CNTLAB3
CNTLAB1
$V_{CNTLAB3}$
$V_{CNTLAB1}$
NETWORK SIG PROC
ENCRYPTION
PWR
ON
OFF
PNL A1 S24
V_{MNA} FPC1
V_{MNB} FPC2
VT6 X3067E OF1 N/A
FWD PCA-COMSEC 2 RPC A
1=ON 1 S/S
STBY 2
VT6 X3068E OF2 N/A
FWD PCA-COMSEC 2 RPC B
STBY1
VT6 X3065E OF1 N/A
FWD PCA-COMSEC 1 RPC A
VT6 X3066E OF2 N/A
FWD PCA-COMSEC 1 RPC B
VT4 S5005E OF4 N/A
ENCRYPTION COMSEC
FROM NSP 1&2 GCIL CMD DRIVER PWR
COMSEC 2 OPERATE
COMSEC 1 OPERATE
96/192 KBPS DATA
96/192 KBPS CLK
NSP1
16.3-1 RTN LNK
POWER SUPPLY
OPERATE STANDBY CONTROL
AC SHUNT REGULATOR
$+V_R$
$-V_{RN}$
$+V_{PROM}$
$+V_{BL}$
$-V_{BLI}$
$+V_M$
$+V_{OPR}$
RED I/O
BITE ASSY
BLACK I/O
BITE ASSY
SERIAL KG RCV, XMIT
SERIAL KG XMIT
SERIAL KG RCV
DEMUX & AUTHENTICATE
SERIES SWITCHING REGULATOR
DC TO DC CONVERTER
FEEDBACK AMPLIFIER
STANDBY PREREGULATOR
STANDBY SERIES REGULATOR
$+V_{SBB}$
$+V_{CVM}$
BITE ASSY
CONTROL UNIT MEMORY PWR
FILTER
DC TO DC CONVERTER
SERIES REGULATOR
STANDBY SERIES SWITCH
$+V_{SB}$
STANDBY PWR
POWER MONITOR
8 SEC TIMER
DISCHARGE
CHARGE
RESET
500 MS DELAY
8 SEC
EIGHT SEC. PULSE
STANDBY VALID
POWER LOSS DETECTED
"0" =LOSS
"1" =LOSS

BASIC REV E-6

DATE: 08/29/90	NAME: SEW	VERSION: INK 5
DATE: 10/13/92	NAME: LAM	VERSION: INK 6
DATE: 11/09/92	NAME: VSH	VERSION: INK 7

TEXT AND GRAPHICS HARDCOPIER

MODE: 1 2 3 4 — PAPER: PAGE IMAGED, DEVELOPING, JAM/EMPTY, OVER TEMP

LM1 LM2 LM3 LM4 LPE LDEV LJAM LOT

PWR ON LIGHT

KU SIGNAL PROCESSOR 16.5-1

V_{MNG}

OSC 17/14 KU

RPC 10A

MASTER POWER — ENABLE — OFF

ELAPSED TIME METER 4 3 2 7 HOURS

V_{CNTL} CA1

PWR ON/ADV/LAMP TEST — LAMP — ADV

PAPER CUTTER SOLENOID

POWER SUPPLY

EMI FILTER — REGULATOR — PULSE WIDTH MODULATOR — SOFT START — DRIVER/CONVRTER — OVER CURRENT SENSE

~120VDC RECT/FILT/REG — 6.3VDC RECT/FILT — +10VDC RECT/FILT/REG — +10VDC REFT/FILT — +5VDC REFT/FILT — -10VDC RECT/FILT/REG

POWER UP RESET — +5VDC REFERENCE — INVERTER — ERROR CORRECTION AMPLIFIER

~120VDC — +6.3VDC — +10VDCa — +10Vd — +5Vd — -10Va — +5V ref — -5V ref — RTN — ANALOG GND

DEVELOPER TEMPERATURE SYSTEM

DEVELOPER TEMPERATURE REGULATOR #3

DEVELOPER TEMPERATURE REGULATOR #2

DEVELOPER TEMPERATURE REGULATOR #1

+10Va — +5VDC PRECISION REGULATOR — +5Va ref

+10Va — -5VDC PRECISION REGULATOR — -5Va ref

PULSE WIDTH MODULATOR — DRIVER — COMPENSATION AMPLIFIER — DEVELOPER OVERTEMP DETECT 280°F — BIAS ADJUST — BMS OPEN DETECT

TEMP NORM — DEVELOPER TEMP NORMAL – DETECT 260°F

DEVELOPER OVERTEMP

DEVELOPER ASSEMBLY

HEATER 16.1Ω — BMS OPENS 294°F

HEATER 24.8Ω — BMS OPENS 294°F

HEATER 16.1Ω — BMS OPENS 294°F

ANALOG INTERFACE

PE C_0 C_1 C_2 C_3 ÷ 6 COUNTER TC — CK

SYNC'D DATA — SYNC DATA CK — 6 BIT PARALLEL OUT SHIFT REGISTER

LATCH — GAMMA (ROM)

DO-D7 8 LATCHES QO-Q7 — DVO-DV7 — DIGITAL/ANALOG CONV — VREF

VIDEO GAMMA — NORMAL — MIN — MAX — S3

SEL LINES — 8 TO 3 ENCODER

VIDEO CONTRAST — MAX — NORM — MIN — S1

VIDEO BRIGHTNESS — MAX — NORM — MIN — S2

LIGHT — DARK

AO 4 TO 1 MUX — LEVEL REF — DAC REF

-120 VDC — G1 -60V CUTOFF

+10Va — SW

VIDEO PROCESSOR

SYNC PULSE — SYNC DATA CLK — 8 BIT SR

LINE START — RETRACE COUNTER — RETRACE

SYNC LOCK — BLANK — SWEEP

CORRECTION START COUNTER — CORRECTION COUNTER — QO-Q9 — PO-P9

MC0, MC1

CRT COIL CONTROL

DYNAMIC FOCUS (ROM) — DFO-7 — DAC — STATIC FOCUS — FOCUS ADJ — DYN FOCUS — COIL DRIVER — FOCUS — CURRENT FEEDBACK

SWEEP WIDTH — HORIZ DEFLECTION — HORIZ DEFL — CURRENT FEEDBACK

PINCUSSION CORRECTION (ROM) — PCO-7 — LINEARITY ADJ — HORIZ CNTL ADJ

AMPLITUDE CNTL — VERTICAL DEFLECTION — VERTICAL DEFL (WOBBLE)

500 HZ RAMP GENERATOR

+28VDC — 1 KV POWER SUPPLY — G2

HVON — 15 KV POWER SUPPLY — ANODE

CRT — FIBEROPTICS

CAPSTAN MOTOR

DEVELOPER MOTOR — TACH — COMMUTATOR WHEEL — (WHEEL)

CAPSTAN MOTOR DRIVE SERVO

DEVELOPER MOTOR DRIVE SERVO

Φ3 DRIVER — Φ2 DRIVER — Φ1 DRIVER — DRIVER — FEEDBACK AMPLIFIER — MOTOR PROGRAM ROM

V74 X8100E OF4 N/A	V74 X8101E OF4 N/A	V74 X8102E OF4 N/A
MODE 1 (TEXT) 1=M1 1 S/S	MODE 2 (MAP) 1=M2 1 S/S	MODE 3 (SCHEMATIC) 1=M3 1 S/S
V74 X8103E OF4 N/A	V74 X8104E OF4 N/A	V74 X8105E OF4 N/A
MODE 4 (PHOTO) 1=M4 1 S/S	PARTIAL PAGE READY 1=PPR 1 S/S	FULL PAGE READY 1=FPR 1 S/S
V74 X8106E OF4 N/A	V74 X8115E OF4 N/A	V74 X8108E OF4 N/A
PAPER READY 1=PR 1 S/S	DEVELOPING 1=STBY 1 S/S	POWER ON 1=ON 1 S/S
V74 X8109E OF4 N/A	V74 X8110E OF4 N/A	V74 X8111E OF4 N/A
PAPER JAM 1=JAM 1 S/S	DEVELOPER OVERTEMP 1=DOT 1 S/S	DEVELOPER TEMP NORMAL 1=DTN 1 S/S

1. REFER TO TABLE 16.1 FOR DRAWING TRACEABILITY LIST

4 TAGS/OHC 1

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN L. M. BUCHANAN	4/30/82	
DR L. M. BUCHANAN	4/30/82	
ENGR C. A. COUNTS		TEXT AND GRAPHICS SYSTEM
ENGR [signature]	11/4/92	
APP [signature]	11/4/92	
APP		SPACE SHUTTLE — DWG NO 16.4
OMNIPLAN S. L. Crandall	11-7-92	ALL
LTR E PCN 2		126.5 X 34 — PAGE — SHEET 1 OF 2

BASIC REV E-2

T | S | R | Q | P | O | N | M | L | K | J

SYNC GENERATOR

PROGRAMMABLE COUNTER

CPU CONTROL INPUT

SYNC STATE

SYNC DECODER

INTERFACE

PAPER TRANSPORT MOTOR CONTROL

PAPER SENSORS

CENTRAL PROCESSOR UNIT

MEMORY

DATE: 11/05/92 | NAME: VSH | VERSION: INK 7

W V U T S R Q P O N

8 7 6 5 4 3 2 1

CENTRAL PROCESSOR UNIT

OSC 10.24 MHZ — 5.12 MHZ; 2.56 MHZ (CPU); 1.28 MHZ (SYNC CLK)

1802 MICRO PROCESSOR

MRD, MWR, INSTB, TPA, TPB

MA0-MA7, MA8, MA9, MA10, MA11, MA12

MA0-A9, MA10-MA12, E0-E3, E4-E7, ENA, DECODER

PROGRAM MEMORY FOUR 1024 ROM'S

TEMPORARY MEMORY EIGHT 1024 RAM'S

MEMORY D0-D7

OUTPUT CONTROL, OUTPUT PORT DO 0-7 DI 0-7 CS1 CS2

DB 0-7

SYNC LOCK, SERVICE REQUEST, SERVICE REQUEST

LATCH, I/O SELECTOR, I/O A

PAPER SENSORS

+5Va

PS1 PAPER EMPTY

PS2 CUTTER CLEAR

PS3 DEVELOPER IN

PS4 DEVELOPER OUT

LAMP TEST

MDM PF 2 — C Z 6 16.26

CCTV RCU — B Z 7 16.12 — TV — TAGS — A0-A13

ENCRYPTION BYPASS ISOLATION ASSEMBLY — C Z 3 16.4-2 — DATA +, DATA -, CLOCK +, CLOCK -

SYNC GENERATOR

U/L DATA IN

32 BIT SHIFT REGISTER

SYDATCK, SYNC DAT CK, SYNC CLK

SYNC'D DATA OUT

SYNC DECODER

SYNC WORD DETECT (SWD) (00000011111100000011111100100111)

SYNC ALGORITHM LOGIC

STATE COUNTER — J0 J1 J2 J3 J4 J5 J6 J7 — CET SR CEP CK

C3, 1GCTC, C9, ECTC, C7, SWD, C9, ECTC, C3 (JE0), C7 (JE1), C9 (JE2)

ECTC, SYNC GEN RESET, ONE SHOT, SYNC CLK

STATE DECODER (U49) — A B C D — C0-C9 — (SYNC STATE)

SYNC STATE

SYNC FF — SYNC CK — SYNC LOCK — SYNC LOCK (EF2)

ECPE, BCPE, 2GCPE, 1GCPE, SCPE

SYNC CK, (U36), SCTC

9 TO 1 SELECTOR — A B C E0 — 10 11 12 13 14 15 16 17 18 — Y — SWD, 2GCTC, BCTC, 1GCTC

COUNT LOAD REGISTERS — PL, PO-7, QO-7 — MRD, TPB, CK — I/O 2, DB0-DB7

COUNT DATA, COUNTER PARALLEL ENABLES

SIX PROGRAMMABLE COUNTERS — PO-P7, PE1 PE0, PE1 PE2 PE3 PE4 PE5, SYDATCK, CK, CEP

TC3 SYNC COUNT (SCTC)

TC6 BLANK COUNT (BCTC)

TC5 1 GATE COUNT (1GCTC)

TC2 2 GATE COUNT (2GCTC)

TC4 ERROR COUNT (ECTC)

TC5

SYNC PULSE

CPU CONTROL INPUT

PROGRAMMABLE COUNTER

INTERFACE

8A7-8A13, 8A0-8A6, 8A7-8A13

01'S 0-13

80 KHZ

COUNTER

GROUND CMD STROBE

GROUND COMMAND

D10-7, IN4, SR, CS2 CS1

I/O 4, INST B, I/O 3, MRD

CS1 CS2, D17, D16, IN3, D15, D14, D13, D12, D11, D10, CK

TAC PULSES, NEXT PAGE (NP), SYNC WORD DETECTOR (SWD)

DOOR INTERLOCK, DINTL

ADVANCE SWITCH, ADVSW

PAPER ADVANCE — OPEN

SYNC CLK — 80KHZ

DEVELOPER IN PS4, DEVELOPER OUT PS3, CUTTER CLEAR PS2, PAPER EMPTY PS1

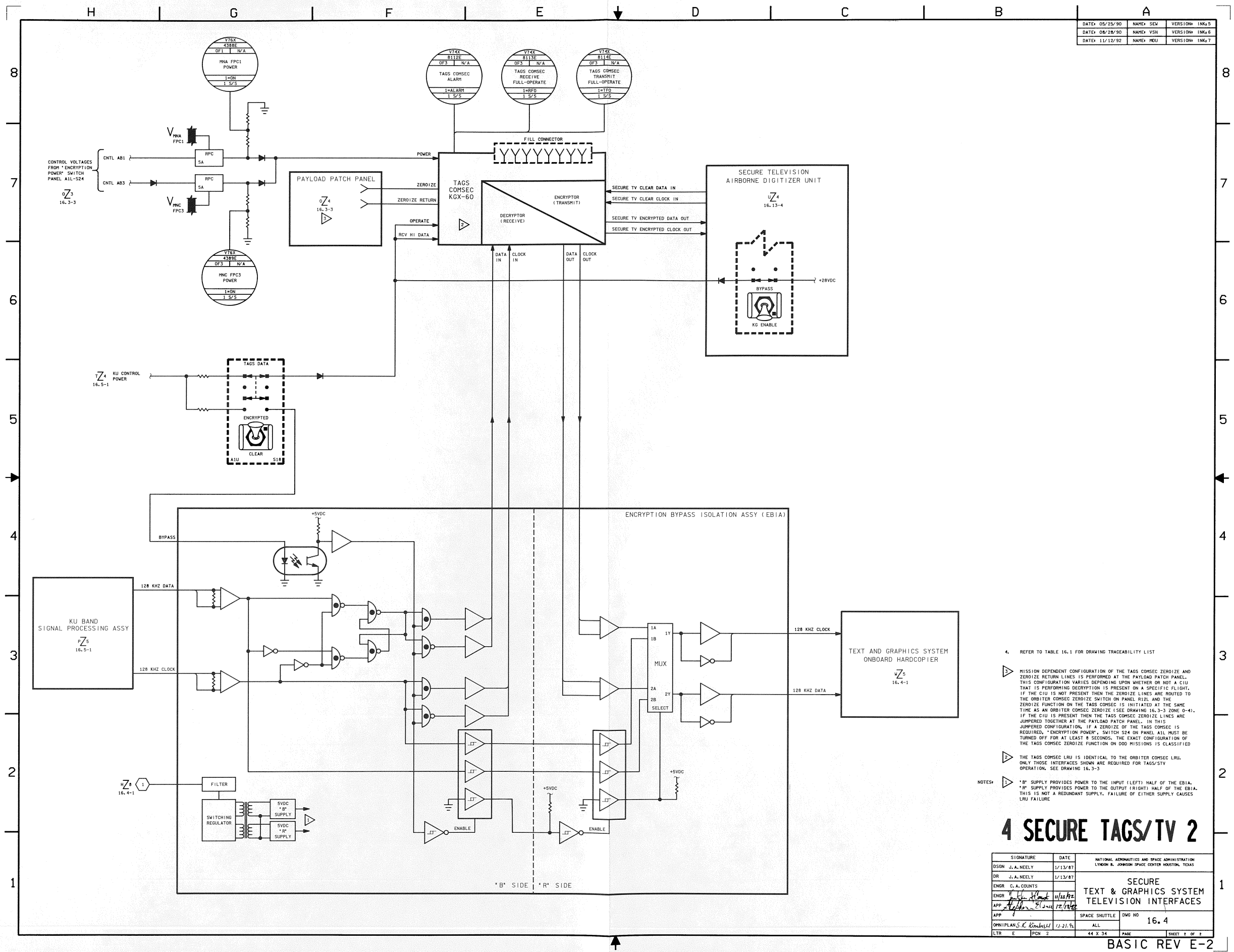
(TRST) — TRANSPORT RESET

PAPER SENSOR CIRCUIT

DBO-7, I/O NO 3, TPB, CK, MRD, SYNC LOCK (EF2), DB4, DB5, I/O 6, I/O 7, 5.12 MHZ, CLR

BASIC REV E-2

DATE: 05/25/90	NAME: SEW	VERSION: INK: 5
DATE: 08/28/90	NAME: VSH	VERSION: INK: 6
DATE: 11/12/92	NAME: MDU	VERSION: INK: 7



4. REFER TO TABLE 16.1 FOR DRAWING TRACEABILITY LIST

3 MISSION DEPENDENT CONFIGURATION OF THE TAGS COMSEC ZEROIZE AND ZEROIZE RETURN LINES IS PERFORMED AT THE PAYLOAD PATCH PANEL. THIS CONFIGURATION VARIES DEPENDING UPON WHETHER OR NOT A CIU THAT IS PERFORMING DECRYPTION IS PRESENT ON A SPECIFIC FLIGHT. IF THE CIU IS NOT PRESENT THEN THE ZEROIZE LINES ARE ROUTED TO THE ORBITER COMSEC ZEROIZE SWITCH ON PANEL R12L AND THE ZEROIZE FUNCTION ON THE TAGS COMSEC IS INITIATED AT THE SAME TIME AS AN ORBITER COMSEC ZEROIZE (SEE DRAWING 16.3-3 ZONE D-4). IF THE CIU IS PRESENT THEN THE TAGS COMSEC ZEROIZE LINES ARE JUMPERED TOGETHER AT THE PAYLOAD PATCH PANEL. IN THIS JUMPERED CONFIGURATION, IF A ZEROIZE OF THE TAGS COMSEC IS REQUIRED, "ENCRYPTION POWER", SWITCH S24 ON PANEL A1L MUST BE TURNED OFF FOR AT LEAST 8 SECONDS. THE EXACT CONFIGURATION OF THE TAGS COMSEC ZEROIZE FUNCTION ON DOD MISSIONS IS CLASSIFIED

2 THE TAGS COMSEC LRU IS IDENTICAL TO THE ORBITER COMSEC LRU. ONLY THOSE INTERFACES SHOWN ARE REQUIRED FOR TAGS/STV OPERATION. SEE DRAWING 16.3-3

NOTES: 1 "B" SUPPLY PROVIDES POWER TO THE INPUT (LEFT) HALF OF THE EBIA. "R" SUPPLY PROVIDES POWER TO THE OUTPUT (RIGHT) HALF OF THE EBIA. THIS IS NOT A REDUNDANT SUPPLY. FAILURE OF EITHER SUPPLY CAUSES LRU FAILURE

4 SECURE TAGS/TV 2

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	J. A. NEELY	1/13/87	
DR	J. A. NEELY	1/13/87	
ENGR	C. A. COUNTS		SECURE TEXT & GRAPHICS SYSTEM TELEVISION INTERFACES
ENGR		11/22/92	
APP		12/14/92	
APP			SPACE SHUTTLE / DWG NO 16.4
OMNIPLAN	S. K. Kimbrell	12.21.92	ALL
LTR	E	PCN 2	44 X 34 / PAGE / SHEET 2 OF 2

DATE: 09/13/93 | NAME: MDU | VERSION: INK4

CREW MODULE | PAYLOAD BAY

COMMUNICATIONS SIGNAL PROCESSOR (SPA)

RETURN LINK DATA MOD CARRIER 1.875 GHZ

MOD CARRIER 1.875 GHZ → 8 WZ7 TO EXCITER 16.5-2

1.875 GHZ REFERENCE

IN PHASE INTEGRATE AND DUMP

QUADRATURE INTEGRATE AND DUMP

I AND D CONTROL

VXCO 912 MHZ

FORWARD LINK TIMING

432 KHZ CLOCK

216 KBPS BI-PHASE L DATA

MODE 72/216

TRANSMIT ENABLE COMM A → TRANSMIT ENABLE COMM A → 9 WZ5 16.5-2

RADAR/COMM INTERFACE AND CONTROL (EA-1)

21.88 MHZ

DEMUX | DET | BPF 0.6 MHZ | P/D | P/D | ALC ATTEN | P/D | BPF 9 MHZ | AGC ATTEN

X3 | X4 | REF OSC 156.28 MHZ

156 MHZ REFERENCE → 156 MHZ REFERENCE → 10 WZ7 TO EXCITER 16.5-2

21.88 MHZ 2ND I.F. BPF | 625 MHZ 2ND L.O. | BPF 10 MHZ

DATA IF 647 MHZ → DATA IF 647 MHZ → 11 XZ3 16.5-2

5.92 KHZ DITHER | MUX

3.028 MHZ | TIMING GENERATOR | GOLD CODE PN GENERATOR | EARLY PN CODE | LATE PN CODE | LATE LATE PN CODE | 739 HZ DITHER

1.46 KHZ | 369 HZ | 739 HZ | 893 HZ | 4.6 MHZ | 8.3 MHZ

BPF 1 MHZ | LEVEL DET | AGC

369 HZ | 739 HZ | ANGLE ERROR DETECT | Q ERR | β ERR

ENV DET | LPF | AGC ATTEN | BPF 8 MHZ

COMM TRK IF 647 MHZ → COMM TRK IF 647 MHZ → 12 XZ2 16.5-2

ON TIME PN CODE

PN LK DET | V_{REF} | LPF 5 HZ | DEMUX | SQ LAW DET | BPF 0.6 MHZ | MUX

β GIMBAL SERVO

Q GIMBAL SERVO

GAIN ADJ Q | CMD RATE β | CMD RATE Q | RDR β ERR | RDR Q ERR | RDR/$\overline{\text{COMM}}$ β | RDR/$\overline{\text{COMM}}$ Q | β TRK/$\overline{\text{PT}}$ | Q TRK/$\overline{\text{PT}}$

Q LO | β LO | Q HI | β HI

CMD RATE | LOW | HIGH | β TORQUE CMD

AMP AND SHAPER | RFI ADJUST | Q SERVO ONLY | Q DUTY CYCLE MODULATOR | Q MOTOR DRIVE

β DRIVE 1 | Q DRIVE 1 | β DRIVE 2 | Q DRIVE 2 → ANTENNA CONTROL → 13 $\overline{\text{E}}$Z5 16.5-2

ALC

ALC | SIGNAL DET | S+N LEVEL DET | BPF F_C=21.88 2 MHZ | NOISE LEVEL DET | BPF F_C=18.85 1 MHZ | V_{REF} | P/D

8.3 KHZ | TRIANGLE WAVE GEN

4.6 KHZ GYRO PRIMARY EXCITATION

893 HZ | PHASE SHIFTER | 0° | 90°

GYRO SPIN MTR EXCIT 0°

GYRO SPIN MTR EXCIT 90°

LOBING AZ/EL

0°/180° LOBING

AZ/EL LOBING

DEA CONTROL → 14 WZ2 16.5-2

DEA CONTROL (RDR) → 15 WZ2 16.5-2

RADAR SIGNAL PROCESSOR (EA-2)

ANALOG PROCESSOR

I 0° | Q 90° | PHASE SHIFTER | BPF | ÷ 2

156 MHZ REFERENCE

RDR 2ND I.F. 78 MHZ → 16 XZ2 16.5-2

20db AGC ATTN | IF STEP AGC | P/D

LPF 237 KHZ | LPF 4 MHZ | LPF 14.5 MHZ | A/D CONV | STROBE | HI SAMP

I DATA (9) | Q DATA (9) | FILTER PROCESSOR | SEQ I AND Q DATA (8) | DIGITAL PRE PROCESSOR | I DATA (14) | Q DATA (14) | SINGLE PULSE HIT

BASIC REV E-3

Q P O N M L K J I H G

COMMUNICATIONS SIGNAL PROCESSOR (SPA)

LDR PL RECORDER SEL
LDR OPS RECORDER SEL
LDR PL DIGITAL
LDR PL INTERROGATOR SEL
HDR OFF
HDR PL MAX SEL
HDR PL INTERROGATOR SEL
HDR PL ANALOG SEL
HDR PL DIGITAL SEL
HDR TV SEL
GCIL CMD DRIVER PWR

HDR PL INTRG
LDR PL INTRG
HDR PL ANALOG
LDR PL RECORDER
HDR PL DIGITAL
LDR OPS RECORDER
HDR TV
LDR PL DIGITAL
HDR PL MAX

PL DIST PANEL
OPS 2
OPS 1 RCDR
NSP 1
NSP 2
PL RCDR
PI 2
VSU
PI 1
PL DIST PANEL
FLCA-2
FLCA-3

HDR PL MAX DATA (2-50 MBPS)
HDR PL MAX CLOCK
RETURN LINK OPS DATA NSP 1
RETURN LINK OPS DATA NSP 2
PL RECORDER DUMP DATA
OPS 1 OR 2 RECORDER DUMP DATA
LDR PL DIGITAL DATA
PL INTERROGATOR 1
PL INTERROGATOR 2
CLOSED CIRCUIT TV
HDR PL DIGITAL DATA
HDR PL ANALOG DATA

DATA SOURCE SELECTOR

NSP 1 SEL (S4)
PL INTERROG 1 SEL (S7/11)
NSP 2 SEL (S5)
PL INTERROG 2 SEL (S6/12)
LDR PL RCDR SEL (S2)
LDR OPS RCDR SEL (S3)
LDR PL DIGITAL SEL (S1)
LDR PL INTERROG SEL (S6/7)
HDR TV SEL (S10)
HDR PL DIGITAL SEL (S9)
HDR PL ANALOG SEL (S8)
HDR PL INTERROG SEL (S11/12)
HDR PL MAX SEL (PM ENA)
HDR OFF (FM ENA)
GCIL CMD DRVR PWR

DISCRETE INPUT/ OUTPUT

LVPS ON
COMM STBY
COMM ON

LOW VOLTAGE POWER SUPPLY
+20VDC
-20VDC
+15VDC
-15VDC
+12VDC
-12VDC
+5VDC
-5VDC
-2VDC

TO KU FAIL SAFE
DATA GOOD

PM HDR DATA
OPS DATA 192 KBPS BI Φ-L
FM/PM LDR DATA
FM HDR DATA

ASSYMETERY CORRECTOR
CONVOLUTIONAL ENCODER
QPSK MODULATOR
1.875 GHZ
HDR OUTPUT AMP
MODE FM/PM
MOD OFF/ON
1.875 GHZ REFERENCE
RETURN LINK DATA MOD CARRIER 1.875 GHZ

SQUAREWAVE OSCILLATOR 8.5 MHZ
0°
-63°
-180°
-243°
MULTIPLEXER
LDR & OPS DATA (QPSK)
BPF
LPF
SUMMER
FM VCO 1.875 GHZ
P/D

MICROPROCESSOR
OUTPUT BUFFER
MOD OFF/ON
MODE FM/PM
MODE 72/216
XMIT ENA COMM A
FRAME SYNC
SERIAL INTERFACE

128 KBPS PL DATA
128 KHZ CLK
128 KBPS TAGS DATA
128 KHZ CLOCK
DATA BUFFER AMPS
128 KBPS NRZ-L DATA
DATA SEL
256 BIT SHIFT REGISTER
72 KBPS NRZ-L DATA
NRZ-L TO BI Φ-L CONVERTER
72 KBPS BI Φ-L
MODE 72/216
144 KHZ CLK
72 KBPS BI-PHASE L DATA
FRAME DECOMMUTATOR

CORRELATION DETECTOR
+COR
-COR
NO COR
MODE CONTROL
RESET
DATA SELECT
INVERT
BIT DETECTOR
216 KHZ CLK
AMBIGUITY RESOLVER
BYTE COUNTER
BYTE CLK 4.5 KHZ
FRAME COUNTER
FRAME CLK 500 HZ
FRAME SYNC
T&G/PL BYTE SEL (250 HZ)
128 KHZ CLK
OPS BYTE SEL (2.25 KHZ)
72 KHZ CLK
144 KHZ CLK
FRAME DECOM TIMING
432 KHZ CLK
6.912 MHZ CLK
FRAME SYNCHRONIZER

THRESHOLD DETECTOR
IN PHASE INTEGRATE AND DUMP
THRESHOLD DETECTOR
QUADRATURE INTEGRATE AND DUMP
ANALOG GATE
SAMPLE AND HOLD
ANALOG GATE
SAMPLE AND HOLD
I AND D CONTROL
LOOP FILTER
VXCO 6.912 MHZ
216 KHZ CLK
216 KHZ CLK
FORWARD LINK TIMING
432 KHZ CLOCK
216 KBPS BI-PHASE L DATA
MODE 72/216
72 KBPS BI-PHASE L DATA
BIT SYNCHRONIZER

RADAR COOPERATIVE MODE
RADAR PASSIVE MODE
COMM ON
RADAR STBY
COMM STANDBY
RADAR ON
RDR POWER OUT HIGH
RDR POWER OUT MEDIUM
RDR POWER OUT LOW
KU BAND A
GCIL CMD DRIVER PWR
GPC
GPC DESIGNATE
AUTO TRACK
MANUAL SLEW
SEARCH INITIATE
GPC DESIG
AUTO TRACK GPC
MAN SLEW
SLEW LEFT
SLEW RIGHT
SLEW UP
SLEW DOWN
SLEW
RATE
SLEW RATE FAST
SLEW RATE SLOW
FAST
SLOW

GCIL TAGS CMD DRIVER PWR
GCIL CMD DRIVER PWR
GCIL KU'S FAIL SAFE CMD DRIVER PWR
PL DIST PANEL
128 KBPS PL DATA
128 KHZ CLK
TEXT AND GRAPHICS
128 KBPS T&G DATA
128 KHZ CLK
NSP 1
72 KBS BI Φ-L
NSP 2
72 KBS BI Φ-L
28VDC
COMM ON
COMM STBY
COMM DISCRETE DATA
COMM SERIAL

RDR COOP MODE
RDR PASS MODE
COMM ON
RDR STANDBY
COMM STANDBY
RDR ON
RDR PWR HIGH
RDR PWR MEDIUM
RDR PWR LOW
ANTENNA STRG GPC
ANT STRG GPC DESIG
ANT STRG AUTO TRK
ANT STRG MAN SLEW
SEARCH INITIATE
SLEW LEFT
SLEW RIGHT
SLEW UP
SLEW DOWN
SLEW RATE FAST
SLEW RATE SLOW
SCAN WARN
TRACK
SEARCH

MICROPROCESSOR
OBSCURATION PROFILE
RADAR SELF TEST
CONICAL SCAN GENERATOR
COORDINATE CONVERSION
DISCRETE INPUT/ OUTPUT
ANALOG OUTPUT
DIGITAL OUTPUT
RADAR SERIAL DATA
CONTROL & STATUS INTERFACE MODULE

EL RATE 0-20 MR/S
EL RATE 0-2 MR/S
AZ RATE 0-20 MR/S
AZ RATE 0-2 MR/S
KU SIG STRENGTH

XMIT ENA (FULL DPLY)
WIDE BEAM SEL
ENCODER DRIVE
B ENCODER OUTPUT
Q ENCODER OUTPUT
ANTENNA GIMBAL LOCKDRIVE
BOOM STOW ENABLE I
BOOM STOW INITIATE
XMIT ENA (FULL DEPLOY)
DATA GOOD (DETECT)
SPREAD SPCTRUM OFF
COMM ON
RDR ON
ALC (COMM SIG STR)
TRK/PT Q/B
GAIN ADJUST Q
CMD RATE Q/B
RDR SLF TST/TWT INH
RDR SLF TST/ATTEN SEL A
RDR SLF TST ATTEN SEL B
WB XMIT SEL
LINEAR/CIRC POLARIZATION
OPERATE (DEA)
COMM STBY
RDR STBY
TRACK
RDR/COMM Q/B

RADAR DISCRETE AND ANALOG DATA
RDR ON
RDR STANDBY
RDR PWR MED
RDR PWR LOW
RDR SIG STR

MDM PF 1
MDM FF 3
MDM SIO

SCAN WARN (DS1)
TRACK (DS2)
SEARCH (DS3)
PNL A1

RANGE/ELEVATION
+888.8
RANGE RATE/AZIMUTH
+888.8
PNL A2 M2
R/R
EL/AZ
LAMP TEST
DIG DISPLAY SELECT
R/R
EL/A
LAMP TEST
PNL A2 S1

LINE OF SIGHT RATES
EL RATE HR/SEC
AZ RATE HR/SEC
OFF
PNL A2 M1
X PNTR SCALE
X1
X10
PNL A2 S2
EL RATE 0-20 MR/S
EL RATE 0-2 MR/S
AZ RATE 0-20 MR/S
AZ RATE 0-2 MR/S
SIGNAL STRENGTH
PNL A1 M1
SIGNAL STRENGTH
S-BAND PM
KU
S-BAND PL
PNL A1 S1
KU SIG STR
KUSIG STR/AGC
28 VDC
VAC1 ØC 4.2-2
0-5VAC
VAC2 ØC 4.2-2
0-5VAC

LOW VOLTAGE POWER SUPPLY
+15VDC
-15VDC
+5VDC
-5VDC
-2VDC
LVPS ON

MODE INTERFACE AND RANGE CORRECTION LOGIC
RDR SUM CH ENA
RDR DIFF CH ENA
HI SAMP RATE SEL
FREQ SEL A
FREQ SEL B
FREQ SEL C
PRF SEQ CODE
RANGE SRCH SEQ CODE
RDR LOBING 0°/180°
RDR LOBING AZ/EL
RDR LOBING ENABLE
RDR ON
RDR STANDBY
RDR PWR LOW
RDR PWR MED
MODE SIGNALS
LONG PULSE MODE
PRF CODE
TEST CMD
CLK AND STROBES
RANGE SRCH SEQ CODE
MODE SIGNALS
HI SAMPLE
SAMPLE RANGE
PRE SUM RATIO
RANGE TO SMGL PLSE HIT

DEA GATES AND PROCESSOR TIMING
RCVR GATE
XMIT GATE
EXCITER GATE
RDR PWR LO
RDR PWR MED
A/D CONTROL AND PRE PROCESSOR TIMING
SEARCH CMD
24 MHZ
VCO 49 MHZ
HI SAMPLE
STROBE
SINGLE PULSE HIT
SERIAL DATA PROCESSOR
(18) RANGE DESIG
Q ANGLE RATE
Φ ANGLE RATE

RDR RANGE RATE
VELOCITY PROCESSOR
FILTER NO. (4)
TARGET HIT
(12) RANGE RATE
RANGE PROCESSOR
(23)
ANGLE PROCESSOR
Φ ERROR
Q ERROR
DISCRIMINANT GENERATOR
TGT DET
RADAR SIGNAL STRENGTH
ACQ PROCESSOR
TWT BYPASS
XMIT LMTR AGC
STEP IF AGC
LINEAR AGC
2ND IF STEP AGC
LOG CONVERTER
POST DETECTION INTEGRATOR
MAGNITUDE DETECTOR
I DATA (9)
Q DATA (9)
FILTER PROCESSOR
SEQ I AND Q DATA (8)
DIGITAL PRE PROCESSOR
I DATA (4)
Q DATA (4)
SINGLE PULSE HIT
FILTER NUMBER CONTROL
A/D CONV
STROBE
HI SAMP
LPF 237 KHZ
LPF 4 MHZ

FWD LINK DATA

COSTAS DEMODULATOR
LPF 650 KHZ
AGC DET
LPF 3 MHZ
BI Φ MOD
I MIXER
P/D
DATA DET
HARD LMTR
MUX
AC COUPLE
LOOP FILTER AND SWEEP
VCO
21.88 MHZ
PHASE SHIFTER
0°
90°
SWEEP ON
AC COUPLE ON
BW CONTROL
ACQ/TRK CONTROL
5.92 KHZ DITHER AND ON TIME PN CODE
PHASE INVERT
LPF 3 MHZ
Q MIXER
COSTAS LOCK
ON TIME PN CODE

COSTAS LOCK DETECTOR
RF MUX
LPF 5 HZ
SQ LAW DET
LMTR
LPF 1.8 MHZ
BI Φ MOD SPREADER
1.48 KHZ DITHER
DATA GOOD
COSTAS LOCK
SPREAD SPECTRUM OFF
PN LOCK

2ND I.F. 21.88 MHZ
TAU DITHER ACQ AND TRK
SCAN
SUM
LPF
DIFF
DEMUX
DET
BPF 0.6 MHZ
5.92 KHZ DITHER
BW CNTL
LOOP FILTER
VCXO 12.112 MHZ
3.028 MHZ
TIMING GENERATOR
1.48 MHZ
369 HZ
739 HZ
893 HZ
4.6 KHZ
8.3 KHZ
GOLD CODE PN GENERATOR
EARLY PN CODE
LATE PN CODE
LATE LATE PN CODE
739 HZ DITHER
MUX
ON TIME PN CODE
PN LK DET
VREF
LPF 5 HZ
DEMUX
SQ LAW DET
BPF 0.6 MHZ
PN LOCK
1.48 KHZ DITHER
ALC
SIGNAL DET
S+N LEVEL DET
NOISE LEVEL DET
BPF FC-21.88 2 MHZ
BPF FC-18.85 1 MHZ
VREF
COSTAS LOCK
COMM ON
TRACK
RDR LOBING 0°/180°
RDR ON
RDR LOBING ENA
RDR LOBING AZ/EL
0°/180° LOBING
AZ/EL LOBING

DATE: 05/20/93	NAME: VEM	VERSION: BPT: 13
DATE: 07/15/93	NAME: PSD	VERSION: BPT: 14
DATE: 09/13/93	NAME: MDU	VERSION: INK: 4

3 PDIP CONFIGURATION IS MISSION DEPENDANT

4 +15 VDC POWER FROM THE DEPLOYED ELECTRONICS ASSEMBLY LOW VOLTAGE POWER SUPPLY IS USED TO POWER THE RATE SENSOR ASSEMBLY LOGIC CIRCUITRY (GYRO ERROR SIGNALS), AND THE ELECTRONICS ASSEMBLY NO.1 LOBING CIRCUITS (0°/180° AND AZ/EL), WHICH HELP GENERATE THE DIFFERENCE CHANNEL ERROR SIGNALS TO CORRECT THE ANTENNA POINTING. LOSS OF THIS POWER WILL RESULT IN ERRATIC ANTENNA POINTING IN BOTH ANTENNA AXES

5 0-5VAC POWER IS USED TO ILLUMINATE THE FACE OF THE SIGNAL STRENGTH (PANEL A1 M1) AND LINE OF SIGHT RATE (PANEL A2 M1) METERS. RECTIFIED 0-5VAC POWER IS USED TO DRIVE THE ELEMENTS ON THE DIGITAL (PANEL A2 M2) METER. 28VDC POWER IS USED TO OPERATE THE LOGIC/PROCESSING CIRCUITS IN BOTH PANEL A2 METERS.

6 GCIL COMMAND DRIVER POWER IS PROVIDED ONLY IN THE COMM MODE

7 THE SPA PROVIDES COMMAND DRIVER POWER TO THE HDR AND LDR SELECT, TAGS AND KU'S FAIL SAFE ENABLE DRIVERS IN THE GCIL

8 TELEMETRY STATUS INFORMATION ONLY.

9

V74M2630P - GPC ACQ CONT WORD	WD1	
V74K2631J - KU-A CH1 SEARCH INIT (CR)	WD1B00	
V74K2632J - KU-A CH1 TDRS EAST SEL (C)	WD1B01	
V74K2633J - KU-A CH1 TDRS WEST SEL (C)	WD1B02	
V74K2634J - KU-A CH1 SPRD SPRD SPCT ON/OFF (C)	WD1B03	
V74K2635J - KU-A CH1 KU A/B SELECT (C)	WD1B04	
V74K2636J - KU-A CH1 SELF TST ON/OFF (R)	WD1B05	
V74K2637J - KU-A CH1 MODLN CONT B1 (C)	WD1B06	
V74K2638J - KU-A CH1 MODLN CONT B2 (C)	WD1B07	
V74K2639J - KU-A CH1 PRI ACQ M ON/OFF (C)	WD1B08	
V74K2640J - KU-A CH1 INTL STB ON/OFF (CR)	WD1B09	
V74K2641J - KU-A CH1 FWD LK MODE 1/2 (C)	WD1B10	
V74K2642J - KU-A CH1 RDR THLD VAR/FIX (R)	WD1B11	
V74K2643J - KU-A CH1 OBSC INTLK OVRD (CR)	WD1B12	
V74K2644J - KU-A CH1 TWTA OFF (CR)	WD1B13	
V74K2645J - KU-A CH1 MASK SELECT (C)	WD1B14	
V74M2582P - KU A CH1 STATUS WORD 1	WD1	
V74X2583J - KU A CH1 COMM-A/RDR MODE (CR)	WD1B00	COMM RDR EVENT
V74X2584J - KU A CH1 ANT STRG AUTO (CR)	WD1B01	OFF ON EVENT
V74X2585J - KU A CH1 ANT STRG GPC DESIG (CR)	WD1B02	DES EVENT
V74X2586J - KU A CH1 ANT STRG GPC ACQ (CR)	WD1B03	ACQ EVENT
V74X2587J - KU KU A CH1 PARITY ERROR (CR	WD1B04	ERROR EVENT
V74X2588J - KU A CH1 SYNC ERROR (CR)	WD1B05	ERROR EVENT
V74X2589J - KU A CH1 VALIDITY ERROR (CR)	WD1B06	ERROR EVENT
V74X2590J - KU A CH1 RDR ANG DATA GO (R)	WD1B07	GOOD EVENT
V74X2591J - KU A CH1 RDR ANG RT DG (R)	WD1B08	GOOD EVENT
V74X2592J - KU A CH1 RDR STST IN PROG (R)	WD1B09	TEST EVENT
V74X2593J - KU A CH1 KU A/B SELECTED (C)	WD1B10	OFF ON EVENT
V74X2594J - KU A CH1 RDR THRSHLD VAR/FIXED	WD1B11	OFF ON EVENT
V74X2595J - KU A CH1 OBSCURATION INTLK OVERRIDE	WD1B12	OFF ON EVENT
V74M2600P - KU A CH1 STATUS WORD 2	WD2	
V74X2601J - KU A CH1 SEARCH (CR)	WD2B00	SEARCH EVENT
V74X2602J - KU A CH1 DETECT (CR)	WD2B01	DETECT EVENT
V74X2603J - KU A CH1 TRACK (CR)	WD2B02	TRACK EVENT
V74X2604J - KU A CH1 OPERATE (CR)	WD2B03	OPR EVENT
V74X2605J - KU A CH1 EA 1 RDR TST STAT (R)	WD2B04	PASS EVENT
V74X2606J - KU A CH1 DA RDR TST STAT (R)	WD2B05	PASS EVENT
V74X2607J - KU A CH1 EA2 RDR TST STAT (R)	WD2B06	PASS EVENT
V74X2608J - KU A CH1 RDR SYS TST STAT (R)	WD2B07	PASS EVENT
V74X2609J - KU A CH1 TDRS WEST (C)	WD2B08	WEST EVENT
V74X2610J - KU A CH1 TDRS EAST (C)	WD2B09	EAST EVENT
V74X2612J - KU A CH1 FWD LK FR SYNC (C)	WD2B11	SYNC EVENT
V74X2613J - KU A CH1 DATA PRESENT (C)	WD2B12	PRES EVENT
V74X2614J - KU A CH1 SCAN WARN LIMIT (CR)	WD2B13	LIMIT EVENT
V74X2615J - KU A CH1 RANGE DATA GOOD (R)	WD2B14	GOOD EVENT
V74X2616J - KU A CH1 RANGE RATE GOOD (R)	WD2B15	GOOD EVENT
V74X2618J - KU BAND A CH 1 ROLL WORD 3	WD3	-180 +180 DEG
V74H2619J - KU BAND A CH 1 PITCH WORD 4	WD4	-90 +90 DEG
V74R2621J - KU BAND A CH 1 RANGE RATE BITS 01-16	WD5	±0-819.20 FT/S
V74U2623J - KU BAND A CH 1 RDR RANGE BITS 01-23		0.31-1,310,720 FT
V74H2624J - KU BAND A CH 1 RDR RANGE BITS 01-16	WD7	40-1,310,720 FT
V74X2625J - KU BAND A CH 1 RDR RANGE BITS 17-23	WD8	0.31-20 FT
V74R2626J - KU BAND A CH 1 ROLL RATE	WD9	±0.001-8.19 DEG/S
V74R2628J - KU BAND A CH 1 PITCH RATE	WD10	±0.001-8.19 DEG/S
V74H2648J - KU BAND A CH 1 DES ROLL WD	WD2	-180 +180 DEG
V74H2650J - KU BAND A CH 1 DES PITCH WD	WD3	-90 +90 DEG
V74U2652J - KU CH1 TGT RNG EST BITS 01-18		10-1,310,720 FT
V74H2652J - KU CH1 TGT RNG EST BITS 1-16	WD4	40-1,310,720 FT
V74H2654J - KU CH1 TGT RNG EST BITS 1-2	WD5	10-20 FT
V74H2655J - BETA ANGLE BITS 5-16	WD5	-85° TO +75°

10 RADAR ON & STANDBY COMMAND DRIVERS CANNOT BE COMMANDED. THEY ARE POWERED TO MAINTAIN SYSTEM CONFIGURATION WHEN SWITCHING FROM PANEL TO COMMAND.

NOTES: 1 THESE DEVICES USED IN THE RADAR MODE ONLY.

5 KU BD SYS 1

		SIGNATURE	DATE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		DSGN L.M. BUCHANAN	10/25/82
KU BAND SYSTEM		DR	
		ENGR T.N. DIEP	
		ENGR Thien T. Diep	9/07/93
		APPR Stanley D. Glover	9/27/93
DWG NO 16.5	SPACE SHUTTLE	APPR	9/27/93
	ALL	CADS S. E. Knobel	10-5-93
SHEET 1 OF 2	PAGE 126.5 X 34	LTR E	PCN 3

BASIC REV E-3

DATE: 05/.3/93	NAME: MDU	VERSION: INK.5
DATE: 03/20/96	NAME: BJB	VERSION: BPT.13
DATE: 07/10/96	NAME: VSH	VERSION: INK.6

ANTENNA ELECTRONICS

α GIMBAL

β GIMBAL

ROTARY JOINT

P/D

20db

DEA WG SW DPDT COMM

DIPLEXER

FERRITE SWITCH

BPF

T/R LIMITER

RATE SENSOR ASSEMBLY

ENCODER INPUT

ENCODER OUTPUT

ENCODER

DRIVE 1

DRIVE 2

Q AXIS HIGH

Q AXIS LOW

AZ RATE GYRO

GYRO SPIN MTR EXCIT 1

GYRO PRI EXCIT

GYRO SPIN MTR EXCIT 2

EL RATE GYRO

β AXIS HIGH

β AXIS LOW

ON 5°F ±5°F
OFF 35°F ±5°F
40W

ON 5°F ±5°F
OFF 35°F ±5°F
130W

ON 149°F ±5°F
OFF 151°F ±5°F
18W

ON 5°F ±5°F
OFF 35°F ±5°F
22W

XMIT PWR

WB XMIT SEL

WB SEL

DELTA CHAN SEL

DMA WG POS (A)

DMA WG POS (B)

POWER DET

WIDEBEAM HORN

AZ/EL SWITCH

Δ AZ

Δ EL

AZ/EL LOBING

MONOPULSE COMPARATOR

DIFFERENCE ANTENNA REC ONLY

REFLECTOR

POLARIZATION SWITCH LIN/RHC

LIN

CIRC

SUM ANT T/R

RDR SELF TEST DIPOLE

ANTENNA CONTROL

16.5-1

TO GSE

COMM - 13.775 GHZ
13.779 GHZ
13.831 GHZ
RDR COOP - 13.883 GHZ
13.936 GHZ
13.987 GHZ
RADAR PASS

FET LOW NOISE AMP

COMM - 13.128 GHZ
13.180 GHZ
RDR COOP - 13.232 GHZ
13.284 GHZ
13.336 GHZ
RADAR PASS

BPF 300 MHZ

3db

PHASE SHIFTER 0°/45° 0°/180°

1ST IF AMP

SUM CHAN DISABLE

DIFF CHAN DISABLE

BPF 18 MHZ

COMM 1ST IF AMP

COMM DATA IF 647 MHZ

COMM TRK IF 647 MHZ

56dB

60dB

RDR STEP AGC

RDR LINEAR AGC

BPF 10 MHZ

BPF 3 MHZ

ANTENNA GIMBAL LOCK CIRCUITRY

ANT GIMBAL LOCK/UNLOCK COMMAND

±28V POWER AND RETURN SIGNALS

LOCK

UNLOCK

(SEQUENCE SWITCH)

LOCKED

LOCKING PIN 1

LOCKING PIN 2

(STATUS SWITCH)

BOOM STOW EXCITATION

BOOM STOW ENABLE

WIDE BEAM HORN SIDE OF ANTENNA (TOP)
α GIMBAL LOCK

GYRO PKG SIDE OF ANTENNA (BOTTOM)
β GIMBAL LOCK

MID-POWER CONTROL ASSEMBLY NO. 2

β GIMBAL

FEED

GYRO

α GIMBAL

RCVR

XMTR

DMA HTR PWR

DEA HTR PWR 1

DEA HTR PWR 2

DEA PWR

K7B

K7A

K6B

K6A

20A

V_{MNB} MPC2

K1

K2

KU ANT

ARM

SAFE

PNL A14

S19

F38 3A

V_{CNTL} AB1

V76 50901E 4 | N/A
ARM COMMAND
1 = ARM
1 S/S

V74 T2497A 3 | 3
KU XMTR TEMP
-75 TO 300°F
1 S/S
C

V74 T2965A 3 | 3
A AXIS GMBL TEMP
-75 TO 300°F
1 S/S
C

V74 T2967A 1 | 1
ANT GYRO TEMP
-75 TO 300°F
1 S/S
C

V74 T2961A 3 | 3
KU RCVR TEMP
-75 TO 300°F
1 S/S
C

V74 T2969A 3 | 3
B AXIS GMBL TEMP
-75 TO 300°F
1 S/S
C

V74 T2963A 1 | 1
KU ANT FEED TEMP
-75 TO 300°F
1 S/S
C

8 THE ANT GIMBAL LOCK CIRCUITRY IS COMMANDED BY EA-1 TO DRIVE THE LOCK PINS TO THEIR LOCKED/UNLOCKED POSITION. THERE IS A 4 SEC DELAY IN BETWEEN DRIVING THE GIMBALS TO STOW ANGLES AND DRIVING THE LOCK PINS. THE GIMBAL LOCK MOTORS ARE COMMANDED TO LOCK/UNLOCK THE LOCKING PINS FOR 30 SEC

7 EACH LOCK PIN PREVENTS ROTATION OF BOTH GIMBAL MOTORS (BY LOCKING THE ANTENNA FRAME STRUCTURE). DURING LOCKING SEQUENCE, PIN 2 MOTOR IS GROUNDED BY SEQUENCING SWITCH UNTIL PIN 1 IS LOCKED. DURING UNLOCKING, BOTH MOTORS ARE POWERED SIMO, BUT UNLOCK AS A FUNCTION OF THEIR AS-BUILT IMPEDENCES

6 SPEC T6 IS LABELED PA TEMP FOR THIS PARAMETER

5 THE ARM POSITION DETAILS NOT SHOWN. REFER TO DRAWING 16.7-1 FZ3 FOR DETAILS

4 ±15 VDC POWER FROM THE DEPLOYED ELECTRONICS ASSEMBLY LOW VOLTAGE POWER SUPPLY IS USED TO POWER THE RATE SENSOR ASSEMBLY LOGIC CIRCUITRY (GYRO ERROR SIGNALS), AND THE ELECTRONICS ASSEMBLY NO. 1 LOBING CIRCUITS (0°/180° AND AZ/EL), WHICH HELP GENERATE THE DIFFERENCE CHANNEL ERROR SIGNALS TO CORRECT THE ANTENNA POINTING. LOSS OF THIS POWER WILL RESULT IN ERRATIC ANTENNA POINTING IN BOTH ANTENNA AXES

3 BOTH THERMOSTATS OPERATE OVER THE SAME TEMPERATURE RANGE:
ON 5°F±5°F
OFF 35°F±5°F

2 THE GIMBAL LOCKING PIN ORDER IS PIN NUMBER 1 (WIDE BEAM HORN SIDE) FIRST AND PIN NUMBER 2 (GYRO PKG SIDE) SECOND

NOTES: 1 THESE DEVICES USED IN THE RADAR MODE ONLY

5 KU BD SYS 2

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	L. M. BUCHANAN	10/25/82		
DR	L. M. BUCHANAN	10/25/82		
ENGR	L. HOPPE		KU BAND SYSTEM	
ENGR		7/16/96		
APP		7/16/96		
APP		7/16/96	SPACE SHUTTLE	DWG NO 16.5
CADS		7-22-96	ALL	
LTR E	PCN 6		126.5 X 34	PAGE SHEET 2 OF 2

BASIC REV E-6

T S R Q P O N M L K J

DEPLOYED ELECTRONICS ASSEMBLY

EXCITER

72GHZ BPF

CHAN 1 BPF 156 MHZ
CHAN 2 BPF 208 MHZ
CHAN 3 BPF 260 MHZ
CHAN 4 BPF 312 MHZ
CHAN 5 BPF 364 MHZ
FREQ. SEL
CHAN DET LOGIC
FREQ SEL A B C
ZERO BEAT DET

COMM - 13.128 GHZ, 13.180 GHZ
RADAR COOP - 13.232 GHZ, 13.284 GHZ, 13.336 GHZ
RADAR PASS

SWEEP DSBL
SWEEP GEN
LOOP FILTER
GUNN VCO
P/D
P/D

MOD. CARR. 1.875 GHZ

COMM UP CONVERTER BPF
RDR UP CONVERTER BPF P/D
651 MHZ RDR OFFSET
RDR EXCITER GATE
RDR SELF TEST
ATTEN SEL A
ATTEN SEL B
VAR ATTEN
18 Z6

TWT SEL
STEP ATTENUATOR 0/12/24 db 12 24
RDR PWR MED
RDR PWR LOW

÷ 3
52 MHZ
HARM PHASE COMP
BPF
P/D
3db
651 MHZ

COMM ON

REQ SEL A
REQ SEL B
REQ SEL C
EL
WR MED
WR LOW
MTR LMTR AGC
E
WT INHIBIT
DEPLOY)
SEL
T

RDR SELF TEST/TWT INHIBIT
XMIT ENA (FULL DEPLOY)
XMIT ENA (30° DEPLOY)

RCVR 1 ST LO

COMM ON
LVPS ON
OPERATE

RADAR RCVR 2ND LO 573 MHZ

TRANSMITTER

RF IN
TRAVELING WAVE TUBE (TWT) AMPLIFIER
RF OUT

ANODE/FILAMENT PS ON
RDR STBY
COMM STBY
RDR ON
COMM ON
XMIT ENA COMM A
XMIT ENA (FULL DPLY)
XMIT ENA (30° DPLY)
RDR SELF TEST/TWT INH

TD 3.5 MIN
HVPS ENA
BC CATH OV FLT
FAULT AUTO RESET
+12VDC
RFLCTD PWR FLT
Z2 17 28VDC
ANODE / FILAMENT PS
FIL 6.3VDC
ANODE 200V
HVPS
CATHODE -7.0KV
COLL 1-4, 6KV
COLL 2-5, 3KV
COLL 3-6, 6KV
BEAM CUR FAULT
CATH OV
CATHODE UV

RF ON/OFF
RF OFF
RF ON
R S Q

DEA WG POS A WB
DMA WG POS B DELTA CHAN
DMA WG POS A WIDE BEAM
WB XMIT SEL
DEA WG POS B NB

MICROWAVE ASSEMBLY

WB XMIT SEL (A)
NB SEL (B)
DEA WG POS B
DEA WG POS A
DEA WG 10W DPOT
COMM
HARM FILTER
DIPLEXER
DIPLEXER
FERRITE SWITCH
RADAR
RDR XMIT GATE
RDR TWT BYPASS SEL
TWT BYPASS SIGNAL
REFLECTED POWER FAULT
RDR XMTR LIMITER AGC SEL

RECEIVER

COMM - 13.775 GHZ, 13.779 GHZ, 13.831 GHZ
RDR COOP - 13.883 GHZ, 13.936 GHZ, 13.987 GHZ
RADAR PASS

COMM - 13.128 GHZ, 13.180 GHZ
RDR COOP - 13.232 GHZ, 13.284 GHZ, 13.336 GHZ
RADAR PASS

3db
P/D
RCVR 1ST LO
PHASE SHIFTER 0°/45° 0°/180°
LINEAR/CIRC POLARIZATION
LOBING 180°/0°

RDR RCV INHIBIT
RDR SUM CHAN ENA
RDR DIFF CHAN ENA
COMM ON
RDR SELF TEST

B/Z5 16.5-1 11 COMM DATA IF 647 MHZ
B/Z4 16.5-1 12 COMM TRK IF 647 MHZ

RDR STEP AGC

RDR HI SAMPLE
BPF 10 MHZ
BPF 3 MHZ
RDR 2ND IF 78 MHZ

B/Z1 16.5-1 16

LOW VOLTAGE PWR SUPPLY

LVPS ON
FILTER
LINEAR REGULATOR
DC TO DC CONVERTER
+25VDC
-25VDC
+15VDC
-15VDC
+12VDC
-12VDC
+5VDC
-5VDC

N/Z6 17 28VDC

R1 100W
R2 100W
R3 100W
R4 100W
ON 5°F ±5°F
OFF 35°F ±5°F

23 F/Z2
22 F/Z2
24 F/Z1

DATE: 07/10/96 | NAME: VSM | VERSION: INK 6

DEPLOYED ELECTRONICS ASSEMBLY

EXCITER

TRANSMITTER

MOD CARR 1.875 GHZ

156 MHZ REFERENCE

12.972GHZ

CHAN 1 BPF 156 MHZ

CHAN 2 BPF 208 MHZ

CHAN 3 BPF 260 MHZ

CHAN 4 BPF 312 MHZ

CHAN 5 BPF 364 MHZ

FREQ SEL

CHAN DET LOGIC

ZERO BEAT DET

COMM - 13.128 GHZ
13.180 GHZ
RADAR COOP - 13.232 GHZ
13.284 GHZ
13.336 GHZ
RADAR PASS

SWEEP DSBL

SWEEP GEN

LOOP FILTER

GUNN VCO

MOD. CARR. 1.875 GHZ

COMM UP CONVERTER

RDR UP CONVERTER

651 MHZ RDR OFFSET

RDR EXCITER GATE

RDR SELF TEST

ATTEN SEL A

ATTEN SEL B

VAR ATTEN

TWT SEL

STEP ATTENUATOR 0/12/24 dB

RDR PWR MED

RDR PWR LOW

52 MHZ

HARM PHASE COMP

651 MHZ

RDR RCVR GATE

COMM ON

RCVR 1 ST LO

RADAR RCVR 2ND LO 573 MHZ

XMIT ENA (30° DEPLOY)

TRANSMIT ENA COMM A

RDR FREQ SEL A

RDR FREQ SEL B

RDR FREQ SEL C

RDR TWT BYPASS

RDR PWR MED

RDR PWR LOW

RDR XMTR LHTR AGC

RDR HI SAMPLE

RDR STEP AGC

RDR EXCITER GATE

RDR SELF TEST/TWT INH

XMIT ENA (FULL DEPLOY)

WIDE BEAM SEL

WB XMIT SEL XU

OPERATE

RDR XMIT GATE

LINEAR/CIRC POLARIZATION

LOBING PHASE 180°/0°

RDR SUM CHAN ENA

RDR DIFF CHAN ENA

RDR LINEAR AGC

RDR SELF TEST/TWT INHIBIT

WB XMIT SEL

RDR TWT BYPASS SEL

RDR SELF TEST

RDR RCVR INHIBIT

RDR XMIT GATE

DEA CONTROL

DEA CONTROL (RDR)

ANT GIMBAL LOCK DRIVE

MID MOTOR CONTROL ASSEMBLY 244

XMIT SCAN ENA (FULL DEPLOY)

BOOM STOW ENABLE I

BOOM STOW INITIATE

BOOM STOW EXCITATION

BOOM STOW ENABLE II

RDR STBY

COMM STBY

RDR ON

COMM ON

XMIT ENA COMM A

XMIT ENA (FULL DPLY)

XMIT ENA (30° DPLY)

RDR SELF TEST/TWT INH

ANODE/FILAMENT PS ON

TO 3.5 MIN

HVPS ENA

BC CATH OV FLT

RFLCTD PWR FLT

FAULT AUTO RESET

+12VDC

ANODE / FILAMENT PS

HVPS

BEAM CUR FAULT

CATH OV

28VDC

LOW VOLTAGE PWR SUPPLY

LVPS ON

FILTER

LINEAR REGULATOR

DC TO DC CONVERTER

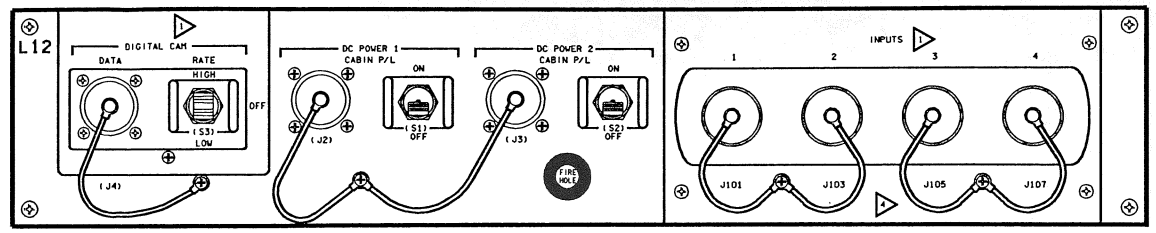
+25VDC
-25VDC
+15VDC
-15VDC
+12VDC
-12VDC
+5VDC
-5VDC

R1 100W
R2 100W
R3 100W
R4 100W

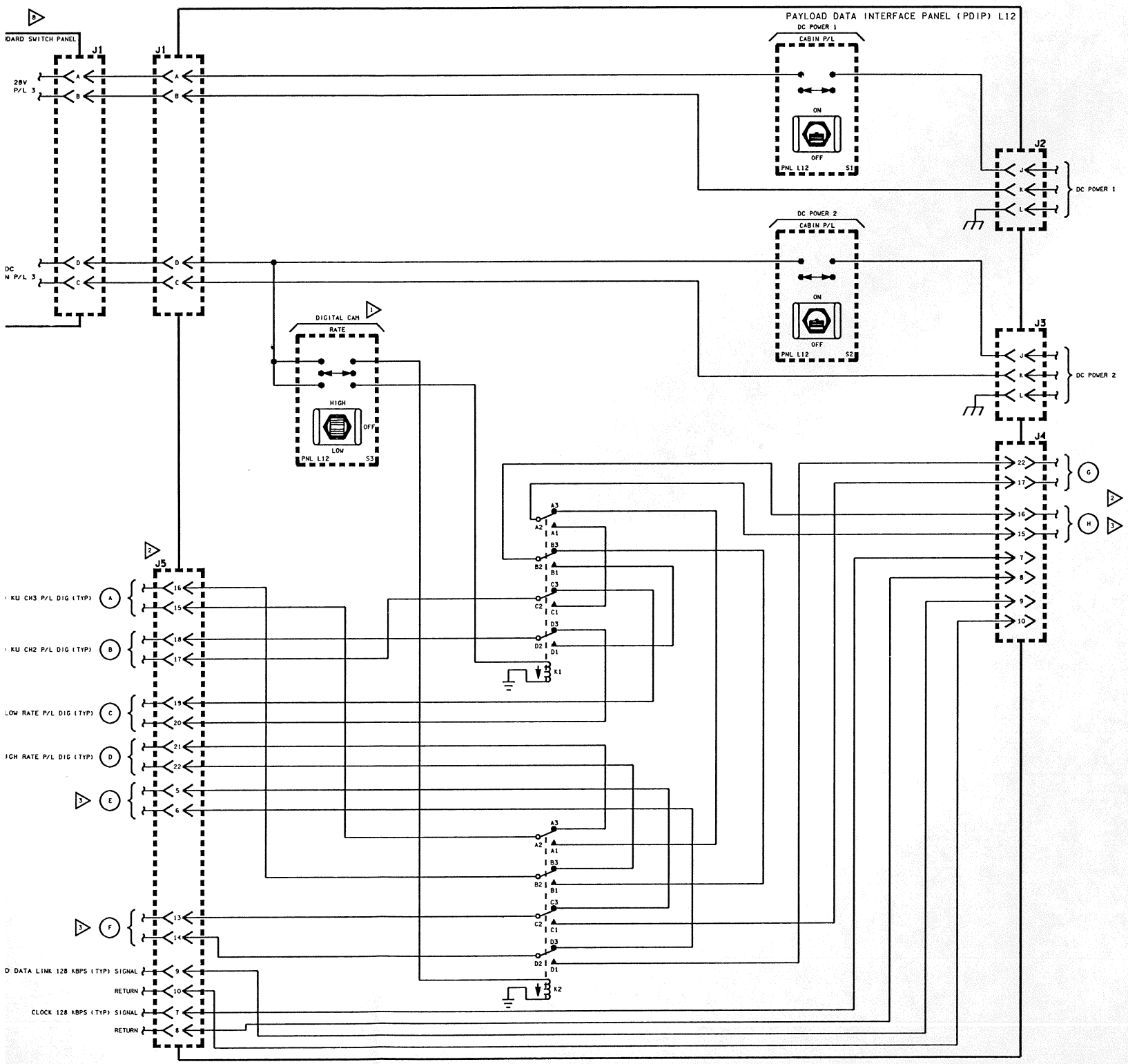
ON 5°F ±5°F
OFF 35°F ±5°F

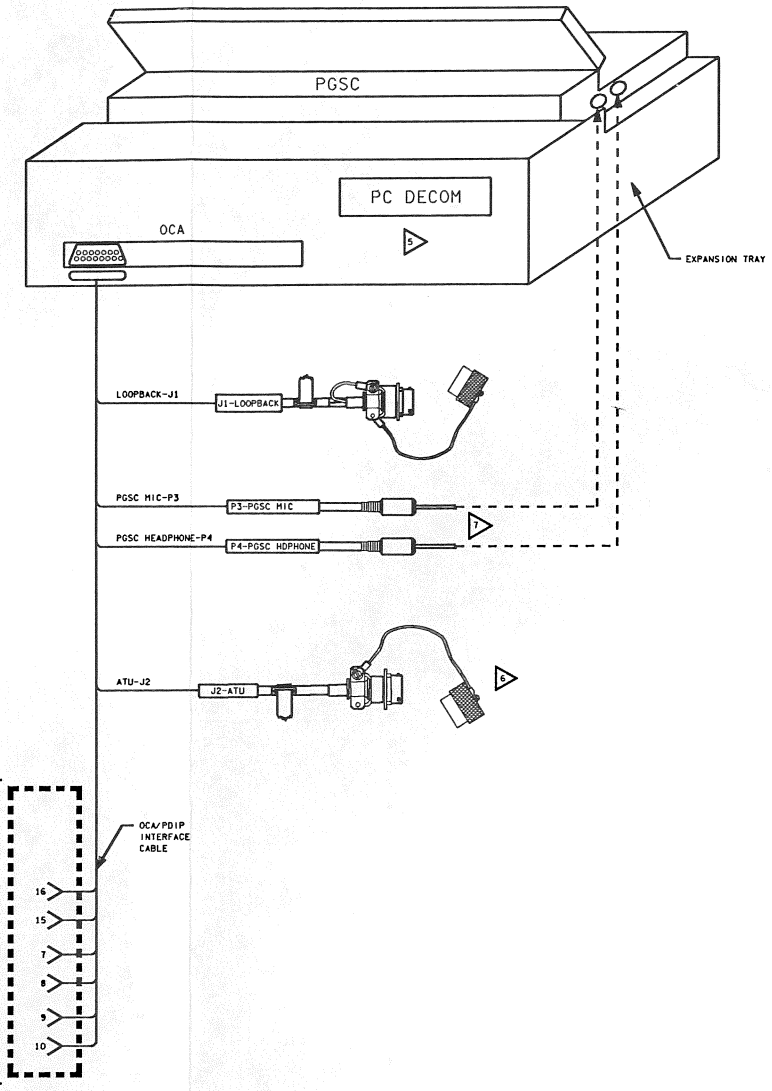
BASIC REV E-6

DATE: 03/04/96	NAME: SVJ	VERSION: BPT: 3
DATE: 03/07/96	NAME: BJB	VERSION: INK: 2
DATE: 03/13/96	NAME: SVJ	VERSION: INK: 3



PDIP PANEL - FRONT





△ THE SSP AND POWER SOURCE ARE MISSION-SPECIFIC. CONSULT MISSION-SPECIFIC INTEGRATED SCHEMATICS. J3 AND THE DIGI CAM COULD SHARE THE SAME FUSE IN THE SSP. IF THE FUSE BLOWS, DIGI CAM RATE WILL BE FORCED OFF

△ THE 2 PGSC CABLES, ALONG WITH A VIDEO-TELECONFERENCING CARD, ALLOW MIC AUDIO FROM THE PGSC AND HEADPHONE AUDIO TO THE PGSC FROM THE OCA, BYPASSING THE ADS

△ THE ATU CABLE STUB CONNECTS WITH THE PADM/ATU CABLE. THEN TO A CCU TO ACCESS THE ADS

△ THIS SLOT IS INTERCHANGEABLE WITH OTHER CARDS SUCH AS A VIDEO TELECONFERENCING CARD

△ CONNECTORS USED FOR MISSION-SPECIFIC ROUTING OF VIDEO, TELEMETRY, COMMAND, SYNC, AND/OR POWER. CONSULT MISSION-SPECIFIC SCHEMATICS FOR DETAILS

△ TABLE BELOW SHOWS INTERNAL PDIP ROUTING. THIS LOGIC IS STANDARD FOR ALL MISSIONS

PDIP INTERNAL ROUTING

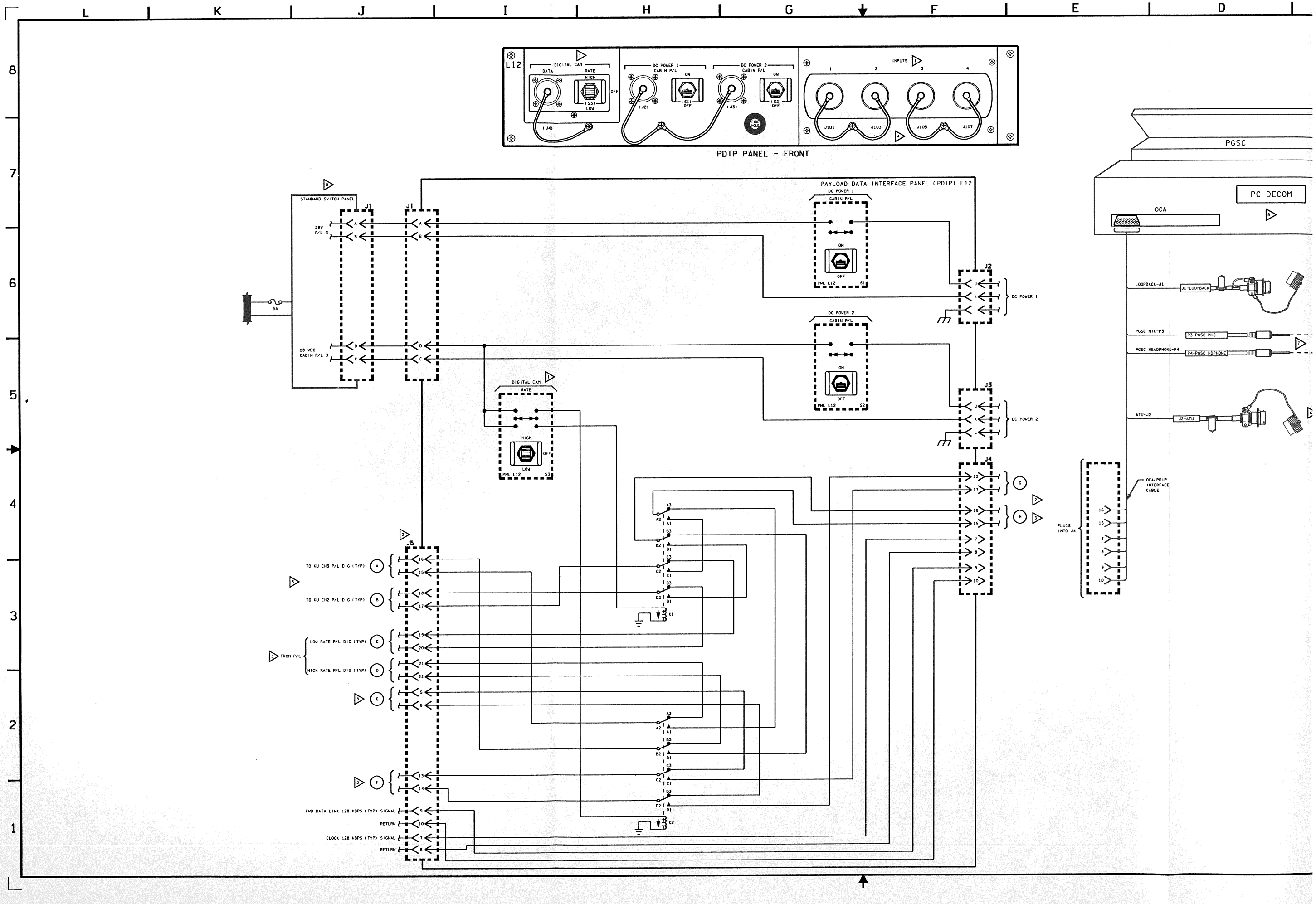
SWITCH POSITION	CONNECTIONS			N/C
HIGH	(A-M)	(F-G)	(B-C)	(D, E)
OFF	(A-D)	(E-F)	(B-C)	(G, H)
LOW	(A-D)	(E-F)	(B-M)	(C, G)

△ EXTERNAL ROUTING OF J5 AND J4 IS MISSION-SPECIFIC. CONSULT MISSION-SPECIFIC INTEGRATED SCHEMATICS. THE CONNECTIONS SHOWN ARE OF A TYPICAL CONFIGURATION

NOTES: △ PANEL LABELING MAY VARY WITH MISSION CONFIGURATION (TYPICAL SHOWN)

6 PDIP/OCA

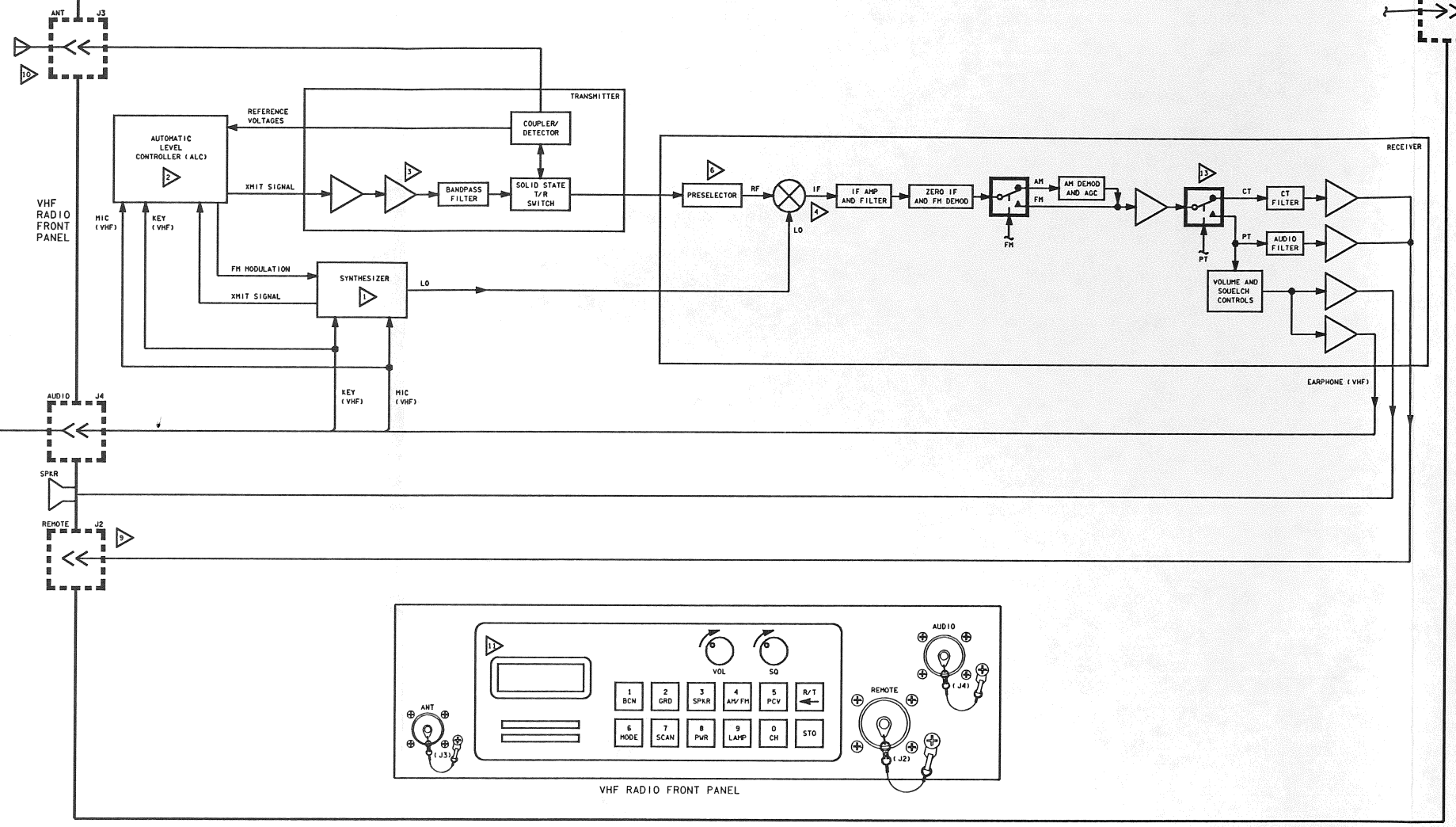
SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	M. GILLESPIE	6/23/94		
DR			PAYLOAD DATA INTERFACE PANEL (PDIP)	
ENGR	L. HOPPE			
ENGR		7/5/96		
APP		7/10/96		
APP		8/10/96	SPACE SHUTTLE	DWG NO 16.6
CADS	S.K. Kimbrell	6-17-96	ALL FLIGHTS	
LTR E	PCN 6		66 X 34	PAGE SHEET 1 OF 1


L12
DIGITAL CAM
DATA
RATE
HIGH
LOW
(S3)
OFF
(J4)
DC POWER 1
CABIN P/L
ON
(S1)
(J2)
DC POWER 2
(S2)
(J3)
FINE HOLE
INPUTS
1
2
3
4
J101
J103
J105
J107
PDIP PANEL - FRONT
PAYLOAD DATA INTERFACE PANEL (PDIP) L12
STANDARD SWITCH PANEL
J1
28V P/L 3
28 VDC CABIN P/L 3
5A
A
B
C
D
PNL L12
S1
S2
S3
J2
J3
J4
J5
DC POWER 1
DC POWER 2
TO KU CH3 P/L DIG (TYP)
TO KU CH2 P/L DIG (TYP)
FROM P/L
LOW RATE P/L DIG (TYP)
HIGH RATE P/L DIG (TYP)
FWD DATA LINK 128 KBPS (TYP) SIGNAL
RETURN
CLOCK 128 KBPS (TYP) SIGNAL
RETURN
K1
K2
PGSC
PC DECOM
OCA
LOOPBACK-J1
J1-LOOPBACK
PGSC MIC-P3
P3-PGSC MIC
PGSC HEADPHONE-P4
P4-PGSC HDPHONE
ATU-J2
J2-ATU
OCA/PDIP INTERFACE CABLE
PLUGS INTO J4

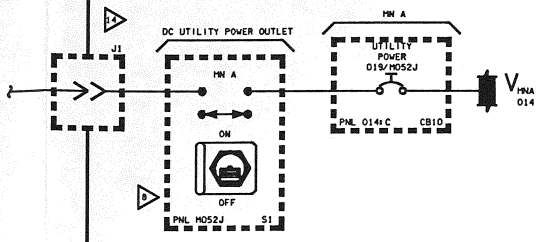
DATE: 05/09/96	NAME: CAR	VERSION# INK: 3
DATE: 05/16/96	NAME: LAM	VERSION# INK: 4
DATE: 05/30/96	NAME: VSH	VERSION# INK: 5

CE UNIT (ARIU)

VERY HIGH FREQUENCY (VHF) RADIO



VHF RADIO FRONT PANEL



△5 CONTROL INPUT CLOSES SWITCH WHEN ENABLED

△4 THIS CASE HAS BEEN MODIFIED FOR EXTERNAL POWER INSTEAD OF BATTERY POWER

△3 CT AND PT REPRESENT THE CIPHER TEXT AND PLAIN TEXT MODES OF THE VHF RADIO, RESPECTIVELY. THESE MODES ARE REGULATED USING THE FRONT PANEL KEYBOARD. NOMINALLY, ALL TRANSMISSIONS OCCUR IN PLAIN TEXT MODE.

△2 PRESSING THE MIU ICOM WILL NOT KEY THE VHF RADIO, HOWEVER, ANY LOOP (ICOM INCLUDED) CONFIGURED FOR T/R AT THE ATU MAY KEY THE VHF RADIO

△1 THERE ARE SIX POSSIBLE ERROR MESSAGES
"ERR--EEPR" = DATA CANNOT BE WRITTEN TO EEPROM
"ERR--FACT" = FACTORY INITIALIZATION HAS NOT BEEN COMPLETED
"ERR--TRPR" = THE VFWD VOLTAGE IN THE POWER AMP IS BELOW THE CALCULATED THRESHOLD VALUE
"TOO HOT" = THE TRANSMITTER POWER AMPLIFIER TEMP IS ABOVE NORMAL RANGE. THE RADIO WILL AUTOMATICALLY REDUCE POWER BY HALF UNTIL THE TEMP RETURNS TO NORMAL RANGE
"ERR--NOSC" = THE RADIO CANNOT ENTER SCAN MODE BECAUSE THE SCAN LIST CONTAINS LESS THAN TWO CHANNELS
"ERR--VOLT" = THE 70-VOLT SUPPLY IS OUT OF ITS NORMAL RANGE EITHER LOW OR HIGH

△D THE CENTER FREQUENCY OF THE VHF WINDOW ANTENNA IS 121.75 MHZ. IF FLOWN, THE CENTER FREQUENCY OF THE SAREX ANTENNA IS TUNED FLIGHT SPECIFIC BETWEEN 144 TO 146 MHZ APPROX

△D REMOTE IS NOT PRESENTLY CONNECTED IN VHF SETUP. REMOTE CONNECTS THE VHF RADIO TO THE COMSEC, REMOTE CONTROL UNIT AND TEST EQUIPMENT

△D ANY DC UTILITY POWER OUTLET WHICH RECEIVES CURRENT THROUGH A CB MAY BE USED, DUE TO THE INRUSH CURRENT OF 30 AMPS

△D THE ARIU MAY BE CONNECTED TO ANY CCU/ATU

△C THE SIGNAL IS FILTERED AND AMPLIFIED WITHIN THE RANGE OF 115 TO 174 MHZ FOR A VHF SETTING AND WITHIN THE RANGE OF 225 TO 400 MHZ FOR A UHF SETTING. THE RADIO OPERATES IN TUNING INCREMENTS OF 0.250 MHZ AND 0.125 MHZ

△B AN ATU VOLUME THUMBWHEEL SETTING OF 5 IS THE RECOMMENDED MINIMUM SETTING TO CONSISTENTLY TRIGGER THE VOX-2 SENSING

△A THE IF SIGNAL IS A 45 MHZ SIGNAL

△B THE SIGNAL IS AMPLIFIED TO A MAXIMUM OF 10 WATTS OUTPUT POWER. HOWEVER, DO NOT OPERATE THE VHF RADIO IN HI POWER (10 WATTS), IT EXCEEDS ALLOWABLE CABIN RADIATION LEVELS AND CAN DAMAGE THE WINDOW ANTENNA

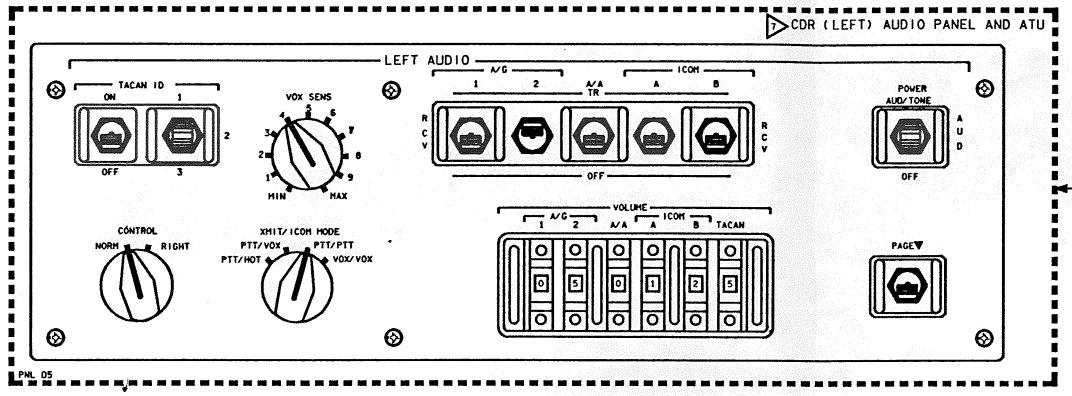
△A THE ALC REGULATES THE TRANSMITTER OUTPUT POWER TO WITHIN 2 DB OF THE DESIRED OUTPUT POWER

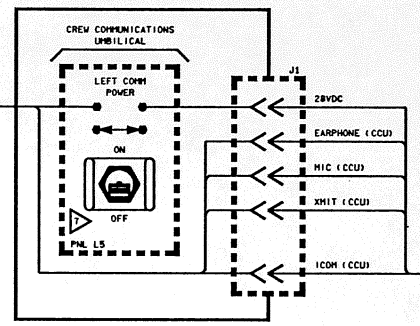
NOTES: △1 THE SYNTHESIZER GENERATES THE TRANSMIT SIGNAL WHEN THE RADIO IS IN TRANSMIT MODE

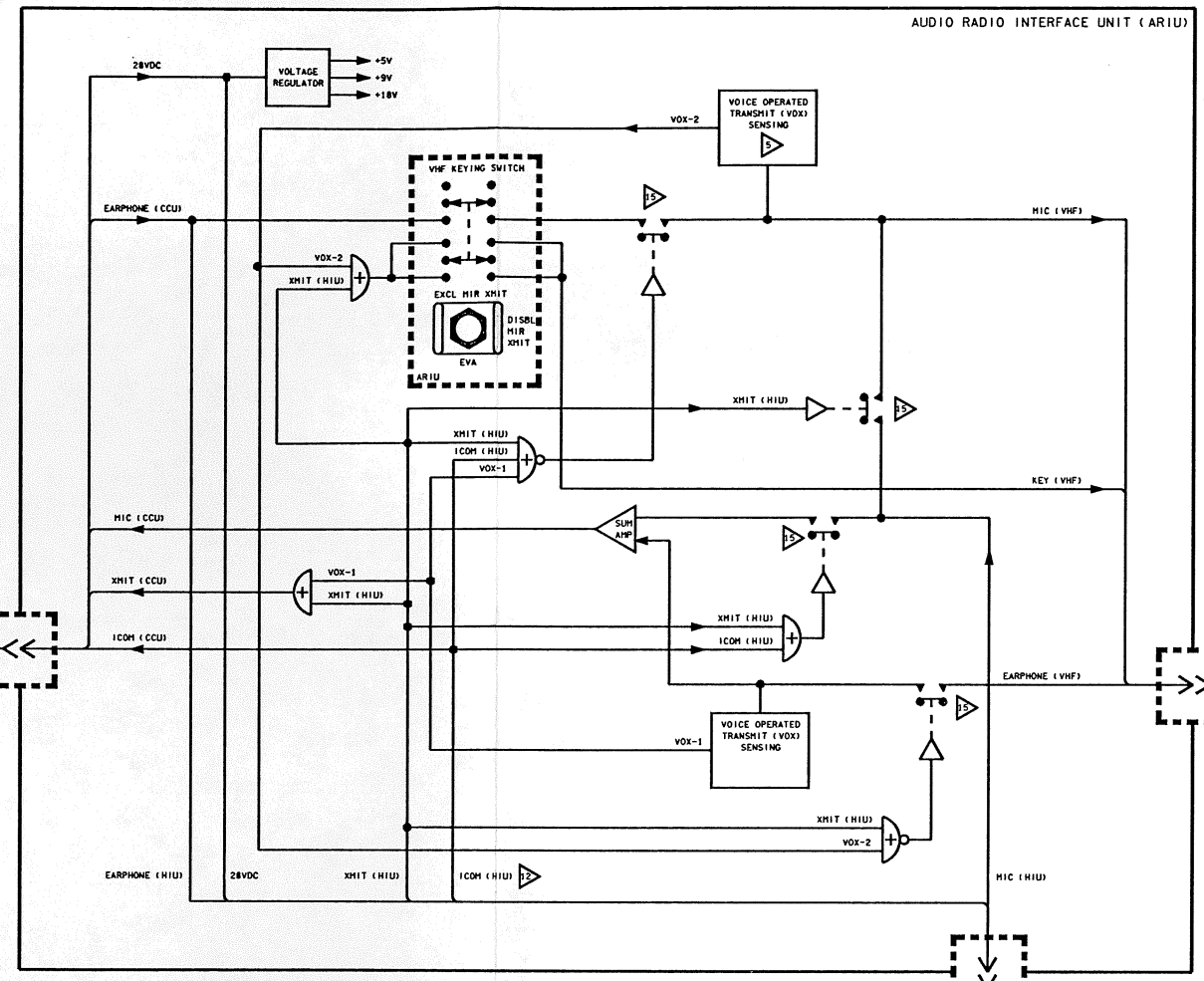
7 VHF & ARIU

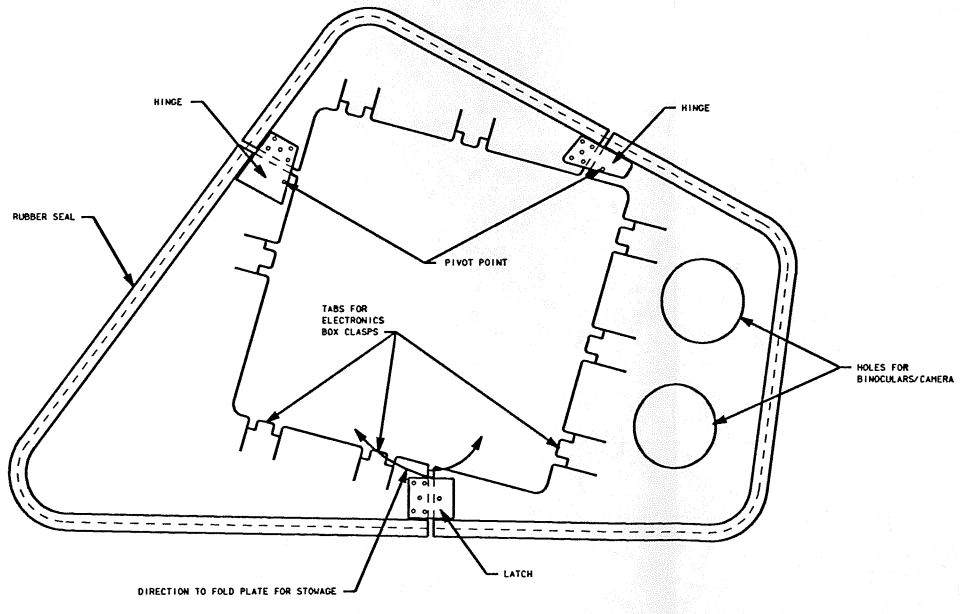
SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	V. HUNTER	2/12/96	
DR			VHF RADIO AND AUDIO RADIO INTERFACE UNIT (ARIU)
ENGR	L. STEURY		
ENGR	Gary Chenkel	5/31/96	
APP	Gary Chenkel	5/31/96	
APP	Jonathan Mabry	7/14/96	SPACE SHUTTLE / DWG NO 16.7
CADS	S.R. Rhodes	7-22-96	ALL
LTR E	PCN 6		104.5 X 34 / PAGE / SHEET 1 OF 1

BASIC REV E-6



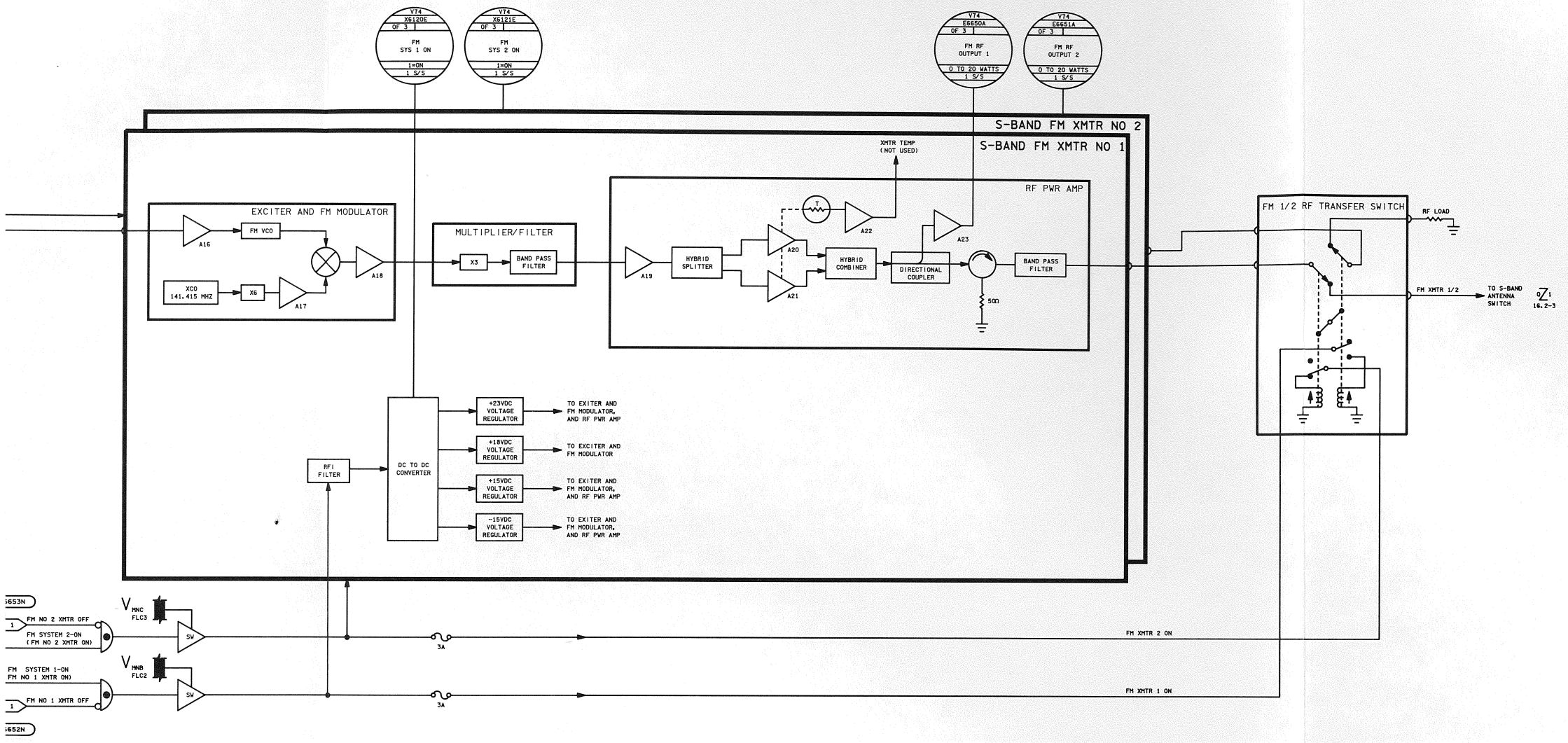






WINDOW 1/WINDOW 6 ANTENNA ADAPTER PLATE

DATE: 4/7/87	NAME: JN	VERSION: BPT: 5
DATE: 9-8-90	NAME: SKK	VERSION: BPT: 6
DATE: 10/05/90	NAME: SEW	VERSION: INK: 4



NOTES:
1. GSE OUTPUT SIGNAL CONTACTS ON K15 RELAY ARE USED ONLY ON UNIT NO 1
2. DUAL AMPLIFIERS (a) ARE SHOWN WITH ONLY ONE LEAD CONNECTED. THE OTHER IS OMMITED FOR SIMPLICITY
3. SYSTEM 1 AND 2 DRIVER INTERLOCKS ARE STRAPPED TOGETHER
4. THE SIGNAL PROCESSOR J8 CONNECTOR PROVIDES THE PATH FOR THE DOD INPUT AND THE J9 CONNECTOR PROVIDES THE PATH FOR THE P/L DIGITAL INPUT

8 FM

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN LAURIE BUCHANAN	12-5-78		
DR			
ENGR M.H.O'HARE		S-BAND FM SYSTEM	
ENGR M.F. O'Hare	10/10/78		
APP [illegible]	10/10/78		
APP R.W. Rodin	10-10-90	SPACE SHUTTLE	DWG NO 16.8
OMNIPLAN S.K. Kimbrell	11-28-90	ALL	
LTR E	PCN	126.5 X 34	PAGE SHEET 1 OF 1

BASIC REV E

S-BAND FM SIGNAL PROCESSOR

UNIT NO 1

UNIT NO 2

OUTPUT NO 1

OUTPUT NO 2

GSE NO 1

GSE NO 2

GSE TO T-O UMBILICAL

28VDC FM NO 1

28VDC FM NO 2

FM-MAIN ENG (1)

FM-MAIN ENG (2)

FM SPL T-O UMB-ON

FM SPT T-O UMB-ON

V74X6081U

LF 1

DATA MODE MAIN ENG

DATA MODE DOO

DATA MODE OPS RCDR

DATA MODE PL RCDR

DATA MODE PL DIGI

DATA MODE PL ANLG

DATA MODE TV

MASTER TIMING UNIT

1024 KHZ CLOCK NO 1

1024 KHZ CLOCK NO 2

ENGINE INTERFACE UNIT NO 1

ENGINE INTERFACE UNIT NO 2

ENGINE INTERFACE UNIT NO 3

MAIN ENGINE DATA NO 1

MAIN ENGINE DATA NO 2

MAIN ENGINE DATA NO 3

XCO 9.216 KHZ

XCO 12.286 KHZ

÷16

÷16

AMPLITUDE DETECTOR

BPF 485 TO 665 KHZ

BPF 680 TO 860 KHZ

BPF 935 TO 1115 KHZ

PAD

DC TO DC CONVERTER

REGULATOR +15VDC

REGULATOR -15VDC

REGULATOR +5VDC

+5VDC ENABLE

TO LOGIC +5VDC AND A1, A2, A3 AND A4

TO A1, A2, A3, A4, A9, A10 +15VDC

TO A5, A6 +15VDC

TO A7, A8 +15VDC

TO A11 +15VDC

TO A12 +15VDC

-15VDC

PAYLOAD DISTRIBUTION PANEL

PAYLOAD RECORDER

VIDEO SWITCHING UNIT

PL DIGITAL

PL RCDR

OPS RCDR

PL ANALOG

TV

DOO

FM-DOO (1)

FM-DOO (2)

FM-OPS RCDR (1)

FM-OPS RCDR (2)

FM-PL RCDR (1)

FM-PL RCDR (2)

FM-DIGI PL (1)

FM-DIGI PL (2)

FM-ANLG PL (1)

FM-ANLG PL (2)

FM-TV (1)

FM-TV (2)

DATA SOURCE

S-BAND FM

PNL A1A3

FM SYSTEM 1-ON (FM NO 1 XMTR ON)

FM SYSTEM 2-ON (FM NO 2 XMTR ON)

FM NO 1 XMTR OFF

FM NO 2 XMTR OFF

V74X6653N

V74X6652N

U Z3

U Z7

V FLC2

V FLC3

PNB

PNC

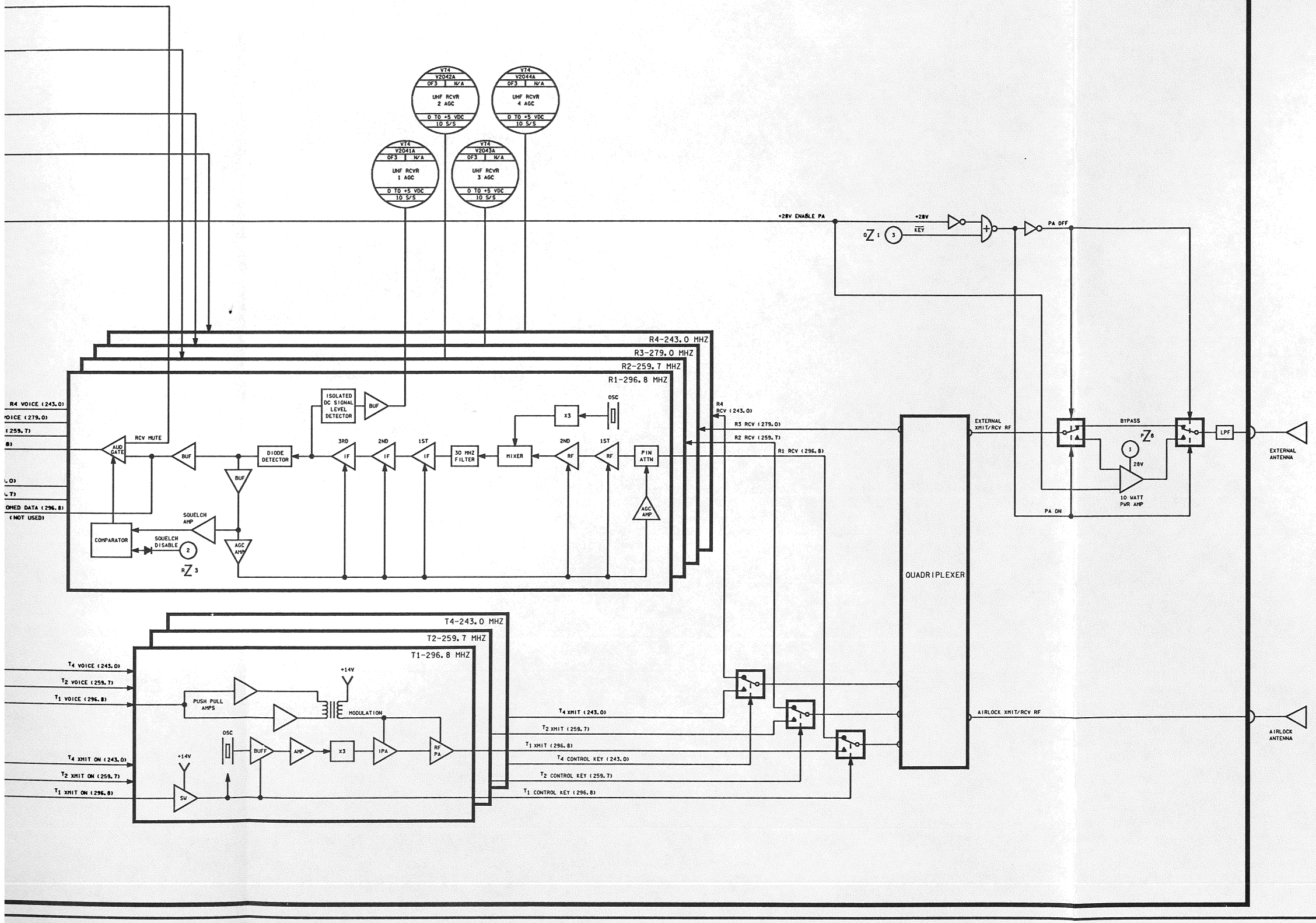
U T S R P O N M L K

BASIC REV E

28VDC FM NO 1
28VDC FM NO 2
FM SP1 T-O UMB-ON
FM SP2 T-O UMB-ON
FM-MAIN ENG (1)
FM-MAIN ENG (2)
DATA MODE MAIN ENG
DATA MODE DOD
DATA MODE OPS RCDR
DATA MODE PL RCDR
DATA MODE PL DIGI
DATA MODE PL ANLG
DATA MODE TV
FM-DOD (1)
FM-DOD (2)
FM-OPS RCDR (1)
FM-OPS RCDR (2)
FM-PL RCDR (1)
FM-PL RCDR (2)
FM-DIGI PL (1)
FM-DIGI PL (2)
FM-ANLG PL (1)
FM-ANLG PL (2)
FM-TV (1)
FM-TV (2)
1024 KHZ CLOCK NO 1
1024 KHZ CLOCK NO 2
MAIN ENGINE DATA NO 3
MAIN ENGINE DATA NO 2
MAIN ENGINE DATA NO 1
PL RCDR
OPS RCDR
PL DIGITAL
PL ANALOG
TV
+15VDC
-15VDC
+5VDC
TO A1, A2, A3, A4, A5, A10
TO LOGIC AND A1, A2, A3 AND A4
DC TO DC CONVERTER
REGULATOR
ENABLE
AMPLITUDE DETECTOR
BPF 12.286 KHZ
BPF 935 TO 1115 KHZ
BPF 680 TO 860 KHZ
BPF 485 TO 665 KHZ
PAD
MASTER TIMING UNIT
ENGINE INTERFACE UNIT NO 1
ENGINE INTERFACE UNIT NO 2
ENGINE INTERFACE UNIT NO 3
RECORDER
PAYLOAD DISTRIBUTION PANEL
VIDEO SWITCHING UNIT
DATA SOLMCE
S-BAND FM
POWER
FM SYSTEM 1-ON (FM NO 1 XMTR ON)
FM SYSTEM 1-ON (FM SIG PROC NO 1 ON)
FM SYSTEM 2-ON (FM NO 2 XMTR ON)
FM SYSTEM 2-ON (FM SIG PROC NO 2 ON)
CNTLBC1
CNTLBC2
VPWR PLC2
VPWR PLC3
1.2KΩ
PNL A1A1
PNL A1A3
DATE 10/05/90 | NAME SEW | VERSION# INK4

DATE: 10/24/90	NAME: MAG	VERSION: INK, 4
DATE: 01/30/96	NAME: VSH	VERSION: BPT, 11
DATE: 05/07/96	NAME: MDU	VERSION: INK, 5

UHF TRANSCEIVER



ORBITER TRANSCEIVER OPERATIONAL MODES

XMIT FREQ		MODE: EVA	OFF	SIMPLEX	SIMPLEX + G RCV	G T/R
296.8		296.8 MHZ T/R PTT OR VOX VOICE 259.7 MHZ RCV VOICE AND DATA 279.0 MHZ RCV VOICE & DATA XMIT 0.25 WATT	OFF	296.8 MHZ T/R PTT VOICE XMIT 10 WATT	296.8 MHZ T/R PTT VOICE 243.0 MHZ RCV VOICE XMIT 10 WATT	243.0 MHZ T/R PTT VOICE XMIT 10 WATT
259.7		259.7 MHZ T/R PTT OR VOX VOICE 296.8 MHZ RCV VOICE XMIT 0.25 WATT	OFF	259.7 MHZ T/R PTT VOICE XMIT 10 WATT	259.7 MHZ T/R PTT VOICE 243.0 MHZ RCV VOICE XMIT 10 WATT	243.0 MHZ T/R PTT VOICE XMIT 10 WATT

VOX CIRCUIT AND GATE ONLY PRESENT IN 296.8 & 259.7

NOTES: ISOLATOR OUTPUT IS LOW WHEN INPUT IS LOW (MODE SELECTED). ALL OTHER ISOLATOR OUTPUTS ARE HIGH (UNSELECTED)

9 UHF XCVR 1

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN R. COLBY	1/23/80	
DR		
ENGR D. BROWN		UHF ORBITER TRANSCEIVER
ENGR	7/19/96	
APP	7/19/96	
APP	7/19/96	SPACE SHUTTLE — DWG NO 16.9
CADS S. K. Linsley	7-22-96	ALL
LTR E — PCN 6		121 X 34 — PAGE — SHEET 1 OF 2

BASIC REV E-6

S R Q P O N M L K J

V74 S2010E — OFF | N/A — UHF GUARD XCVR T/R ON — 1=G T/R — 1 S/S

MN A — UHF — 7.5A — PML R14B CB13 — V_{MNA} R14

MN C — UHF — 7.5A — PML R14B CB18 — V_{MNC} R14

V74 S2016E — OFF | N/A — UHF POWER AMP-OFF CMD — 1=OFF — 1 S/S

UHF — SPLX PWR AMP — ON / OFF — PML 06 S10 — $V_{CNTLCA1}$

V74 S2040E — OFF | N/A — UHF TRANSMIT FREQ 296.8 SELECT — 1=296.8 — 1 S/S

UHF — XMIT FREQ — 296.8 / 259.7 — PML 06 S17 — $V_{CNTLCA2}$

V74 S2001E — OFF | N/A — UHF SQUELCH OFF — 1=OFF — 1 S/S

UHF — SQUELCH — ON / OFF — PML 06 S9 — $V_{CNTLCA2}$ — ② $_JZ_3$

POWER CONVERTER #1 — FILTER — +28V POWER AMP — ① $_DZ_4$ $_FZ_6$

ENABLE

ISOLATORS — G T/R — SIMPLEX — EVA — SIMPLEX + GUARD RCV

ENABLE

POWER CONVERTER #2

LOW POWER REGULATOR #1 — FILTER — +14V (BIOMED) T2, R1, R2 +14V — R1, R2, +10V

LOW POWER REGULATOR #2 — FILTER — +14V (BIOMED) T1, T4, R3, R4 +14V — R3, R4, +10V

RCV AUDIO, LOGIC, BYPASS SW

LOGIC

296.8 SEL — T_1 (296.8) CARRIER ON — T_1 XMIT ON (296.8)

259.7 SEL — T_2 (259.7) CARRIER ON — T_2 XMIT ON (259.7)

T_4 (243.0) CARRIER ON — T_4 XMIT ON (243.0)

R_1 MUTE (296.8)

R_2 MUTE (259.7)

R_3 MUTE (279.0)

R_4 MUTE (243.0)

EVA

PA ON

① $_FZ_8$ +28VDC

296.8 SELECT

259.7 SELECT

95 RCV AUDIO — $_FZ_6$ 16.11-1 TO ACCU

T_4 (243.0) CARRIER ON

TRANSMITTER VOX ENABLE (EVA) (296.8 AND 259.7)

01 BIOMED ENABLE (EVA)

VOX ENABLE (EVA)

RCV AUDIO

PWR AMP — AUD AMP — WPF — AUTO VOLUME CONTROL — LPF — LPF

R4 VOICE (243.0)

R3 VOICE (279.0)

R2 VOICE (259.7)

R1 VOICE (296.8)

RCV MUTE — AUD GATE

BIOMED

SUBCARRIER DISCRIMINATOR B — R3 BIOMED DATA (279.0)

SUBCARRIER DISCRIMINATOR A — R2 BIOMED DATA (259.7)

R1 BIOMED DATA (296.8) (NOT USED)

$_FZ_8$ 17.10 — $_FZ_8$ 17.10 — TO BIO MEDICAL INSTRUMENTATION

COMPARATOR — SQUEL DISAB

XMTR 4 (243.0) BASEBAND

XMTR 2 (259.7) BASEBAND

XMTR 1 (296.8) BASEBAND

AUTO VOLUME CONTROL — ATT — AMP — GATE — CLIPPER — LPF — AMP

VOX CIRCUIT

T_1 CARRIER ON — T_2 CARRIER ON

FROM ACCU — 94 XMIT AUDIO — $_BZ_8$ 16.11-1

96 XMIT CONTROL KEY (KEY = "0") FROM ACCU — $_HZ_1$ 16.11-1

KEY — ③ $_FZ_5$

$_VZ_4$ 5.6 SLSH — UHF KEY FROM PAYLOAD STATION (SPACELAB)

T_4 VOICE (243.0)

T_2 VOICE (259.7)

T_1 VOICE (296.8)

T_4 XMIT ON (243.0)

T_2 XMIT ON (259.7)

T_1 XMIT ON (296.8)

V74 S2032E — UNF TRANSCEIVER MODE-EVA — 1=EVA
V74 S2034E — UNF TRANSCEIVER MODE-SIMPLEX — 1=SIMPLEX
V74 S2036E — UNF XCVR MODE-SIMPLEX & GUARD RCV — 1=SIMPLEX + GUARD RCV
V74 S2010E — UNF GUARD XCVR T/R ON — 1=G T/R

UNF MODE

$V_{CNTLCA2}$

V_{HNA} R14 — MN A — UNF 7.5A — PML R14B — CBI3

V_{HNC} R14 — MN C — UNF 7.5A — PML R14B — CBI8

$_{K}Z_{8}$ 16.10-2 — 44 — 62 — 63 — TO MS ATU — $_{N}Z_{5}$ 16.10-2

$_{K}Z_{8}$ 16.10-1 — 44 — 92 — 93 — TO PILOT ATU — $_{N}Z_{5}$ 16.10-1

SIMPLEX / SIMPLEX+G RCV / OFF / EVA / G T/R — PML 06 — S6

V74 S2016E — UNF POWER AMP-OFF CMD — 1=OFF

UNF SPLX PWR AMP — ON / OFF — PML 06 — S10

$V_{CNTLCA1}$

V74 S2040E — UNF TRANSMIT FREQ 296.8 SELECT — 1=296.8

UNF XMIT FREQ — 296.8 / 259.7 — PML 06 — S7

$V_{CNTLCA2}$

V74 S2001E — UNF SQUELCH OFF — 1=OFF

UNF SQUELCH — ON / OFF — PML 06 — S9

$V_{CNTLCA2}$ — 2 — $_{J}Z_{3}$

POWER CONVERTER #1 — FILTER — +28V POWER AMP — 1 — $_{D}Z_{4}$ $_{J}Z_{6}$

ENABLE

ISOLATORS — 1

G T/R
SIMPLEX
EVA
SIMPLEX + GUARD RCV

ENABLE

POWER CONVERTER #2

LOW POWER REGULATOR #1 — FILTER — +14V (BIOMED) T2, R1, R2 +14V R1, R2, +10V

LOW POWER REGULATOR #2 — FILTER — +14V (BIOMED) T1, T4, R3, R4 +14V R3, R4, +10V

RCV AUDIO, LOGIC, BYPASS SW

296.8 SEL
T_1 (296.8) CARRIER ON
259.7 SEL
T_4 (243.0) CARRIER ON

T_1 XMIT ON (29
T_2 (259.7) CARRIER ON
T_2 XMIT ON (2
T_4 XMIT ON (24
R_1 MUTE (2
R_2 MUTE (2
R_3 MUTE (275.0)
R_4 MUTE (2

296.8 SELECT
259.7 SELECT

95 — RCV AUDIO — TO ACCU — $_{E}Z_{8}$ 16.11-1

PWR AMP — AUD AMP — HPF — AUTO VO CONTR

T_4 (243.0) CARRIER ON

TRANSMITTER VOX ENABLE (EVA) (296.8 AND 259.7) — 01 — BIOMED ENABLE (EVA)

VOX ENABLE (EVA)

XMTR 4 (243.0) BASEBAND
XMTR 2 (259.7) BASEBAND
XMTR 1 (296.8) BASEBAND

AUTO VOLUME CONTROL — ATT — AMP — GATE — CLIPPER — LPF — AMP — 2

VOX CIRCUIT

T_1 CARRIER ON — T_2 CARRIER ON

FROM ACCU — 94 — XMIT AUDIO — $_{E}Z_{8}$ 16.11-1

96 — XMIT CONTROL KEY (KEY = "0") — FROM ACCU — $_{H}Z_{1}$ 16.11-1

KEY — 3 — $_{F}Z_{5}$

$_{V}Z_{4}$ 5, 6 SLSH — UNF KEY FROM PAYLOAD STATION (SPACELAB)

DATE: 11/26/90	NAME: VSH	VERSION: INK: 10
DATE: 01/30/96	NAME: VSH	VERSION: BPT: 3
DATE: 05/07/96	NAME: MDU	VERSION: INK: 11

AUDIO INTERFACE

HARDLINE AUDIO SIGNAL
HARDLINE AUDIO RETURN
EMU - CAUTION AND WARNING SUBSYSTEM
(STATUS - 10 SEC DISCRETE) (ALERT - 0.5 SEC DISCRETE)
WARNING - 10 SEC DISCRETE
THRUSTER CUE DISCRETE
(NOT USED)
CAUTION TONE 1.5 KHZ
WARNING TONE 1515HZ
THRUST CUE NOISE GENERATOR
STATUS TONE
ALERT TONE
WARNING TONE (WARBLE)
THRUSTER CUE
EARPHONE DRIVER
AUDIO AMP

HARDLINE AUDIO VIA SCU (SERVICE AND COOLING UMBILICAL)

RCV AUDIO

EXTERNAL VOLUME CONTROL
VOLUME CONTROL RCVR 1, ML
VOLUME CONTROL RCVR 2, 3 EMU
LPF
LPF
14V ALL MODES
HARDLINE RCV AUDIO
R1 (296.8) AUDIO
T2 (259.7) SIDETONE
14V ALL MODES
R2 (259.7) AUDIO
R3 (279.0) AUDIO
T3 (279.0) SIDETONE

R3 279.0 MHZ
R2 259.7 MHZ
R1 296.8 MHZ
R2 (259.7) MUTE
COMPARATOR
SQUELCH AMP
DC
RCV MUTE
BUFFER
AUDIO GATE
AGC AMP
BUFFER
DC + MOD
DIODE DET
3RD IF
2ND IF
1ST IF
30 MHZ FILTER
MIXER
X3
OSC
88.933 MHZ
2ND RF
1ST RF
PIN ATTN
AGC AMP
RCV
RCV
RCV

HARDLINE KEY
+14V ML MODE
HARDLINE AUDIO OUT
HARDLINE BUFFER AMP
O1
PTT (ON)
PTT
PTT
VOX
RCV
EMU
VOX DISABLE
MIKE INPUT
MIKE INPUT
VOX DISABLE
PTT
LOW MIKE SIGNAL (NOT USED)
PRE AMP
14V ALL MODES
14V ALL MODES

FROM RTDS AND BIOMED
+14V
BIOMED OSCILLATOR

T3 - 279.0
T2 - 259.7
XMIT
TRANSMIT KEY
TRIPLEXER

AUTO VOLUME CONTROL
ATT
AMP
VOX
GATE
VOICE
CLIP
LPF
BASEBAND MODULE
AUDIO AMP
+14V
MODULATION
BUF
AMP
X3
IPA
RF PA
+14V
TRANSMIT KEY
XMIT
T2(259.7) (ON)

RIGHT MIKE PWR
LEFT MIKE PWR
HL CABLE
A CABLE
B CABLE
BU CABLE
HL BATT
A BATT
B BATT
BU BATT
A B
HL BU
EMU
+14V HL REG
+14V B REG
+10V B REG
A CABLE OR A BATT
+10V A REG
+14V A, BU REG
+10V
+14V HL AMP
+14V T3 BIOMED (MODE B ONLY)
+14V ALL MODES RCV AUDIO
+10V R2 (MODE B OR BU)
+14V R1 R2 (MODE A, B, BU)
+10V R1 (MODE A, B, BU)
+10V R3 (MODE A ONLY)
+14V T2, R3 (MODE A OR BU)
+14V BIOMED (MODE A ONLY)
T2 (259.7) ON
SU
R2 MUTE

EVC OPERATIONAL MODES

A	B	BACKUP
XMIT 259.7 MHZ RCV 279.0 AND 296.8 MHZ	XMIT 279.0 MHZ RCV 296.8 AND 259.7 MHZ	XMIT/RCV 259.7 MHZ RCV 296.8 MHZ

▷ MMI SIGNAL INPUT THIS LINE IS HIGH FOR THE LENGTH OF THRUSTER FIRING

NOTES: ▷ THE ONLY RCVR MUTED IS R2(259.7) WHEN T2(259.7) XMTR IS KEYED

9 UHF EVC 2

SIGNATURE		DATE	
DSGN	TERRI FORSYTHE	1/8/79	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR			
ENGR	D. BROWN		OPERATIONAL UHF EVC BACKPACK TRANSCEIVER
ENGR		7/19/96	
APP		7/19/96	
APP		7/19/96	SPACE SHUTTLE / ALL — DWG NO 16.9
CADS	S.K. Kirkland	7-22-96	66 X 34 — PAGE — SHEET 2 OF 2
LTR	E	PCN 6	

BASIC REV E-6

L K J I H G F E D

8 7 6 5 4 3 2 1

AUDIO INTERFACE

HARDLINE AUDIO SIGNAL
HARDLINE AUDIO RETURN

EMU CAUTION AND WARNING SUBSYSTEM

(STATUS - 10 SEC DISCRETE) (ALERT - 0.5 SEC DISCRETE)
WARNING - 10 SEC DISCRETE
THRUSTER CUE DISCRETE (NOT USED)

CAUTION TONE 1.5 KHZ
STATUS TONE
ALERT TONE
WARNING TONE 1515HZ
WARNING TONE (WARBLE)
THRUST CUE NOISE GENERATOR
THRUSTER CUE

EARPHONE SIGNAL
EARPHONE RETURN
EARPHONE DRIVER
AUDIO AMP

CCA (SKYLAB SNOOPY HEADSET)

TO AIRLOCK ATU
$\frac{S}{16.10-4}$ Z S

EMU D&H COMMON CONNECTOR

HARDLINE KEY
HARDLINE AUDIO OUT
+14V HL MODE
HARDLINE BUFFER AMP

LOW MIKE SIGNAL (NOT USED)
PRE AMP
14V ALL MODES
HIGH MIKE SIGNAL
HIGH MIKE SIGNAL

ORBITER AIRLOCK PANEL AW18H DWG. 6.3 Z 7,2

RIGHT MIKE PWR
LEFT MIKE PWR

+17.V EMU PWR
+21.8V MAX EMU BATT CHARGE
SOLID STATE CB
EMU BATTERY
POWER SCU
BATTERY

HL CABLE
A CABLE
B CABLE
BU CABLE
HL BATT
A BATT
B BATT
BU BATT

+14V HL REG
+14V B REG
+10V B REG
+10V A REG
+14V A, BU REG
A CABLE OR A BATT

+14V HL AMP
+14V T3 BIOMED (MODE B ONLY)
+14V ALL MODES RCV AUDIO
+10V R2 (MODE B OR BU)
+14V R1 R2 (MODE A, B, BU)
+10V R1 (MODE A, B, BU)
+10V R3 (MODE A ONLY)
+14V T2, R3 (MODE A OR BU)
+14V BIOMED (MODE A ONLY)

Z 4 (1) T2 (259.7) ON
5V
(2) R2 MUTE Z 7

HARDLINE AUDIO VIA SCU (SERVICE AND COOLING UMBILICAL)

RCV AUDIO

EXTERNAL VOLUME CONTROL
VOLUME CONTROL RCVR 1, HL
VOLUME CONTROL RCVR 2, 3 EMU

LPF
14V ALL MODES
HARDLINE RCV AUDIO
R1 (296.8) AUDIO
T2 (259.7) SIDETONE
14V ALL MODES
R2, (259.7) AUDIO
R3 (279.0) AUDIO
T3 (279.0) SIDETONE

PTT (ON)
PTT
PTT
VOX
EMU
VOX DISABLE
MIKE INPUT
MIKE INPUT
VOX DISABLE
PTT

AUTO VOLUME CONTROL
ATT
AMP
VOX
GATE
VOICE
CLIP
LPF

BASEBAND MODULE

Z 2 (2) R2 (259.7) MUTE

SQUELCH AMP
COMPARATOR
DC
RCV MUTE
DC + MOD
AUDIO GATE
BUFFER
AGC AMP
BUFFER

+14V
FROM RTDS AND BIOMED
BIOMED OSCILLATOR

DATE: 05/12/96	NAME: PSD	VERSION: INK 6
DATE: 06/14/96	NAME: VSH	VERSION: INK 7
DATE: 06/25/96	NAME: SVJ	VERSION: INK 8

CDR AUDIO PANEL/ATU 05

PILOT AUDIO PANEL/ATU 09

PILOT ATU POWER SUPPLY

8V

EMI FILTER

20V SERIES REG

6V SHUNT REG

12V SERIES REG

10V SHUNT REG

+6V

+12V

+20V

+10V

TO MIKE CKTS AND LOGIC

TO EARPHONE CKTS

DIGITAL CLOCK GENERATOR

CLOCK TO PILOT MULTIPLEXERS

TO ACCU

57 T, Z4 U, Z4.7 V, Z7

5.1K

5.1K

RIGHT AUDIO

VOX SENS

VOX ENABLE

VOX THRESHOLD DETECTOR

VOX LEVEL SET

5K

22K

1300

+6V

+12V

MIN

MAX

PNL 09 R1

MIKE SIG TO ACCU

SIDE TONE SWITCH

EARPHONE AUDIO FROM ACCU

SIDETONE ENABLE

ICOM PTT

HOT MIKE

VOX MODE

VH BIT 27

PTT 2 BIT 26

PTT 1 BIT 25

PAGE BIT 31

PTT 1 BIT 25

BIT 31

PTT 1

PTT 2

VOX

BITS 8, 24, 40, 56, 72, 88-95, 104-111, AND 120-124

Z8 Z5 Z5

48

RIGHT AUDIO

ICOM B

ICOM A

A/G 2

A/G 1

A/A

T/R

RCV

OFF

PNL 09 S11

S2

S3

S4

S5

S6

S7

S8

S9

S10

S11

S12

S13

S14

S15

S16

S17

S18

S19

S20

S21

S22

S23

S24

S25

S26

S27

S28

S29

S30

S31

S32

S33

S34

S35

S36

S37

S38

S39

S40

S41

S42

S43

S44

S45

S46

S47

S48

S49

S50

S51

S52

S53

S54

S55

S56

S57

S58

S59

Z4 46

BIT 30 A/A ENABLE

BIT 43 A/G1 ENABLE

BIT 29 A/G2 ENABLE

BIT 42 ICOM A ENABLE

BIT 41 ICOM B ENABLE

ICOM B

ICOM A

A/G 2

A/G 1

A/A

ENABLE

DEC TO BCD CONV

RIGHT AUDIO VOLUME ICOM B

RIGHT AUDIO VOLUME ICOM A

A/G2

A/G1

BIT 32

BIT 33

BIT 34

BIT 35

BIT 36

BIT 37

BIT 38

BIT 39

BIT 48

BIT 49

BIT 50

BIT 51

BIT 44

BIT 45

BIT 46

BIT 47

BIT 52

BIT 53

BIT 54

BIT 55

PNL 09 S9

RIGHT AUDIO TACAN ID

ON

OFF

PNL 09 S12

RIGHT AUDIO TACAN ID

PNL 09 S13

5.1K

5.1K

5.1K

ENABLE

RIGHT AUDIO VOLUME TACAN

DEC TO BCD CONV

BIT 60

BIT 61

BIT 62

BIT 63

PNL 09 S5

NAV 1 BIT 57

NAV 2 BIT 58

NAV 3 BIT 59

BIT 24 VOX

BIT 25 PTT 1

BIT 26 PTT 2

BIT 27 VH

BIT 28 C&W

BIT 29 A/G 2 EN

BIT 30 A/A EN

BIT 31 PAGE EN

BIT 32 ICOM B VOL B0

BIT 36 ICOM A VOL B0

BIT 40 VOX

BIT 44 A/G 1 VOL B0

BIT 48 A/G 2 VOL B0

BIT 52 A/A VOL B0

BIT 56 VOX

BIT 60 NAV VOL B0

BIT 33 ICOM B VOL B1

BIT 37 ICOM A VOL B1

BIT 41 ICOM B EN

BIT 45 A/G 1 VOL B1

BIT 49 A/G 2 VOL B1

BIT 53 A/A VOL B1

BIT 57 NAV 1 EN

BIT 61 NAV VOL B1

BIT 34 ICOM B VOL B2

BIT 38 ICOM A VOL B2

BIT 42 ICOM A EN

BIT 46 A/G 1 VOL B2

BIT 50 A/G 2 VOL B2

BIT 54 A/A VOL B2

BIT 58 NAV 2 EN

BIT 62 NAV VOL B2

BIT 35 ICOM B VOL B3

BIT 39 ICOM A VOL B3

BIT 43 A/G 1 EN

BIT 47 A/G 1 VOL B3

BIT 51 A/G 2 VOL B3

BIT 55 A/A VOL B3

BIT 59 NAV 3 EN

BIT 63 NAV VOL B3

MULTIPLEXER

BIT 8

"1" 0-7 FRM SYNC

"0" 8-15 SPARE

24-31

0-15, 24-31

32-63

BITS 0 TO 127

MANCHESTER ENCODER

16-23, 64-95

96-124

49

50

Z6

Z5

CDR SERIAL DATA WORD TO ACCU

PILOT SERIAL DATA WORD TO ACCU

65

66

Z4 16.11-1

A EACH MHA PROVIDES CONNECTIONS FOR THREE MIU'S

B SYSTEM CONFIGURATION CONTROL BITS ARE PROVIDED BY THE MS ATU (PRIMARY) AND PILOT ATU (SECONDARY) AND ARE BITS 16-23, 64-87, 96-103, 112-119

C STATION (ATU) CONFIGURATION CONTROL BITS ARE BITS 24-63

D ORBITER HEADSETS ARE: COMM CAP, MINI-HEADSET, WIRELESS HEADSET, OR LIGHTWEIGHT HEADSET

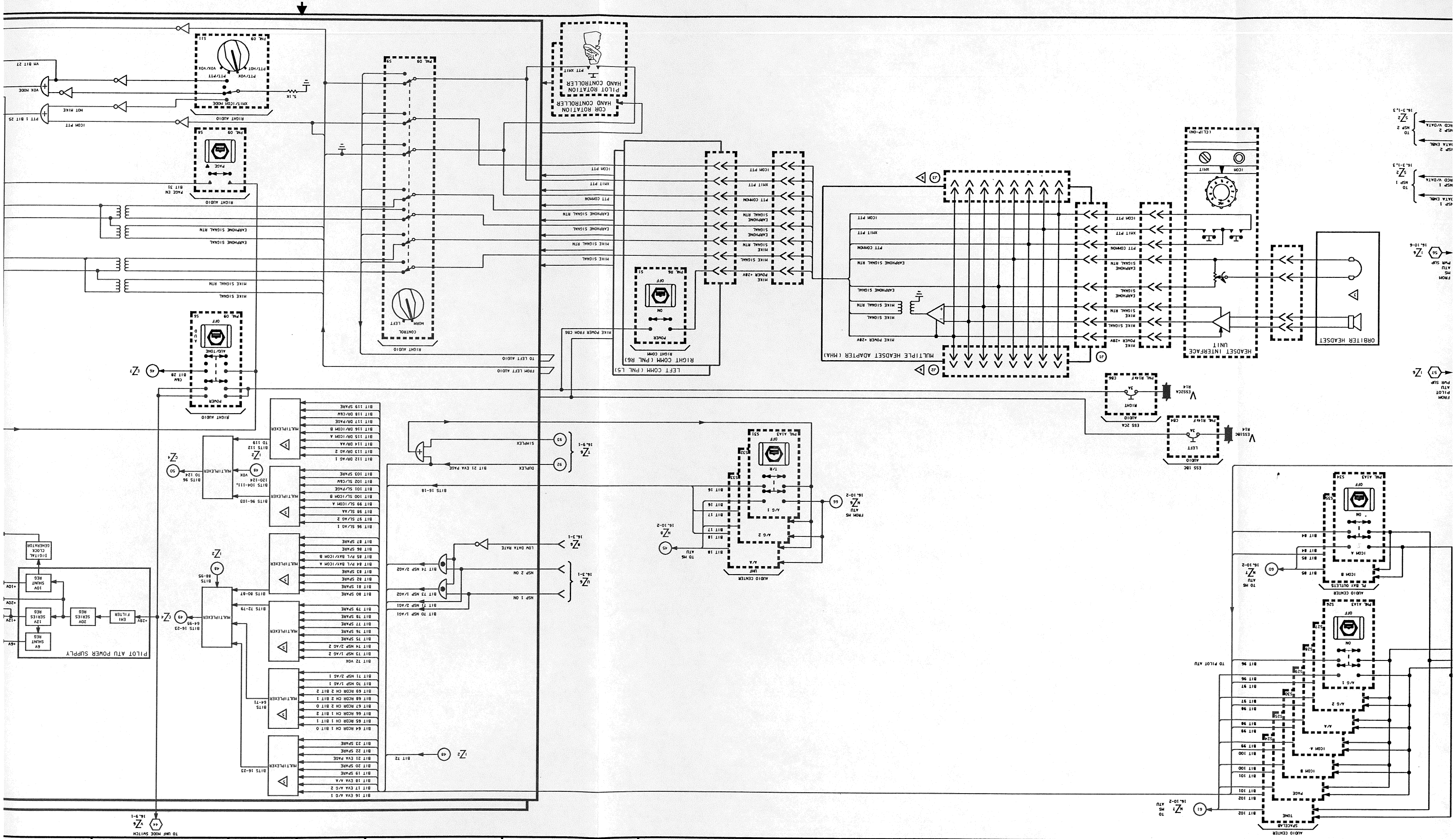
2. PTT 1 = ICOM PTT OR HOT MIKE
   PTT 2 = PTT XMIT POSITION OF THE PTT SWITCH SELECTED

NOTES: 1. VOX = VOX MODE SELECTED AND VOX THRESHOLD EXCEEDED
   VM = VOX XMIT POSITION OF THE MODE SWITCH SELECTED

10 ATU 1

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN S.K. KIMBRELL	8-28-81	
DR		
ENGR L. HOPPE		AUDIO PANEL/ATU PLT, CDR
ENGR	7/1/96	
APP Tony Clark	7/16/96	
APP Frankie D. Mullen	7/16/96	SPACE SHUTTLE / DWG NO 16.10
CADS J. K. Kimbrell 272-2		ALL
LTR E PCN 6		126.5 X 34 PAGE SHEET 1 OF 7

BASIC REV E-6


PILOT ROTATION HAND CONTROLLER
PTT XMIT
COR ROTATION HAND CONTROLLER
RIGHT AUDIO
LEFT AUDIO
RIGHT COMM (PNL R6)
LEFT COMM (PNL L5)
MULTIPLE HEADSET ADAPTER (MHA)
HEADSET INTERFACE UNIT
ORBITER HEADSET
ICOM PTT
XMIT PTT
PTT COMMON
EARPHONE SIGNAL RTN
EARPHONE SIGNAL
MIKE SIGNAL RTN
MIKE SIGNAL
MIKE POWER +28V
MULTIPLEXER
PILOT ATU POWER SUPPLY
DIGITAL CLOCK GENERATOR
AUDIO CENTER
SPEAKER
ESS 2CA
ESS 1BC
TO UHF MODE SWITCH
TO PILOT ATU
TO LEFT AUDIO
FROM LEFT AUDIO
MIKE POWER FROM C66
SIMPLEX
DUPLEX
LOW DATA RATE
NSP 1 ON
NSP 2 ON
BIT 21 EVA PAGE
BITS 16-18
BIT 12
BIT 72 NSP 1/A02
BIT 73 NSP 1/A02
BIT 74 NSP 2/A02
BIT 70 NSP 1/A01
BIT 71 NSP 2/A01
BITS 16-23
BITS 24-31
BITS 32-39
BITS 40-47
BITS 48-55
BITS 56-63
BITS 64-71
BITS 72-79
BITS 80-87
BITS 88-95
BITS 96-103
BITS 104-111
BITS 112-119
BITS 120-124
BITS 16-23
BITS 64-95
BITS 96-124
BIT 112 DM/AG 1
BIT 113 DM/AG 2
BIT 114 DM/AA
BIT 115 DM/ICOM A
BIT 116 DM/ICOM B
BIT 117 DM/PAGE
BIT 118 DM/CLK
BIT 119 SPARE
BIT 96 SL/AG 1
BIT 97 SL/AG 2
BIT 98 SL/AA
BIT 99 SL/ICOM A
BIT 100 SL/ICOM B
BIT 101 SL/PAGE
BIT 102 SL/CLK
BIT 103 SPARE
BIT 104 SPARE
BIT 105 SPARE
BIT 106 SPARE
BIT 107 SPARE
BIT 108 SPARE
BIT 109 SPARE
BIT 110 SPARE
BIT 111 SPARE
BIT 120 SPARE
BIT 121 SPARE
BIT 122 SPARE
BIT 123 SPARE
BIT 124 SPARE
BIT 125 SPARE
BIT 126 SPARE
BIT 127 SPARE
BIT 80 SPARE
BIT 81 SPARE
BIT 82 SPARE
BIT 83 SPARE
BIT 84 PVL BAY/ICOM A
BIT 85 PVL BAY/ICOM B
BIT 86 SPARE
BIT 87 SPARE
BIT 72 VOX
BIT 73 NSP 1/AG 2
BIT 74 NSP 2/AG 2
BIT 75 SPARE
BIT 76 SPARE
BIT 77 SPARE
BIT 78 SPARE
BIT 79 SPARE
BIT 64 RCDR CH 1 BIT 0
BIT 65 RCDR CH 1 BIT 1
BIT 66 RCDR CH 1 BIT 2
BIT 67 RCDR CH 2 BIT 0
BIT 68 RCDR CH 2 BIT 1
BIT 69 RCDR CH 2 BIT 2
BIT 70 NSP 1/AG 1
BIT 71 NSP 2/AG 1
BIT 16 EVA A/G 1
BIT 17 EVA A/G 2
BIT 18 EVA A/A
BIT 19 SPARE
BIT 20 SPARE
BIT 21 EVA PAGE
BIT 22 SPARE
BIT 23 SPARE
PNL 09
PNL R6
PNL L5
PNL A14J3
PNL R14J7
PNL L14J7
PNL A14J4
PNL A14J5
PNL A14J6
PAGE
VOX
HOT MIKE
ICOM PTT
PAGE EN
VOX MODE
PTT 1 BIT 25
VM BIT 27
AUD/TONE
POWER
ON
OFF
NORM
LEFT
CONTROL
PTT/VOX
PTT/HOT
VOX/VOX
5.1K
+28V
+15V
+10V
+20V
+5V
-15V
-20V
-10V
+6V
6V SHUNT REG
10V SHUNT REG
12V SERIES REG
20V SERIES REG
EMI FILTER
10W SHUNT REG
ICOM A
ICOM B
A/A
A/G 1
A/G 2
T/R
PAGE
TONE
PLAY OUTLETS
SPEAKER
RIGHT
LEFT
ESS 2CA
ESS 1BC
VESS24
VESS1C
R14
J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
J11
J12
J13
J14
J15
J16
J17
J18
J19
J20
J21
J22
J23
J24
J25
J26
J27
J28
J29
J30
J31
J32
J33
J34
J35
J36
J37
J38
J39
J40

W V U T S R Q P O N

8 7 6 5 4 3 2 1

AUDIO CENTER
DOCKING RING
TONE
PAGE
ICOM B
ICOM A
A/A
A/G 2
A/G 1
ON
OFF
PNL A1A3 S19
BIT 118 BIT 117 BIT 116 BIT 115 BIT 114 BIT 113 BIT 112
TO PILOT ATU
FROM MS ATU PWR SUP
FROM PILOT ATU PWR SUP
64 TO MS ATU NZ5 16.10-2

AUDIO CENTER
SPACELAB
TONE
PAGE
ICOM B
ICOM A
A/A
A/G 2
A/G 1
ON
OFF
PNL A1A3 S26
BIT 102 BIT 101 BIT 100 BIT 99 BIT 98 BIT 97 BIT 96
TO PILOT ATU
61 TO MS ATU NZ7 16.10-2
FROM MS ATU PWR SUP
FROM PILOT ATU PWR SUP

AUDIO CENTER
PL BAY OUTLETS
ICOM B
ICOM A
ON
OFF
PNL A1A3 S34
BIT 85 BIT 84
60 TO MS ATU NZ7 16.10-2

AUDIO CENTER
LWF
A/A
A/G 2
A/G 1
T/R
ON
OFF
PNL A1A3 S33
BIT 18 BIT 17 BIT 16
45 TO MS ATU NZ8 16.10-2
66 FROM MS ATU NZ6 16.10-2

NSP 1 ON
NSP 2 ON
LOW DATA RATE
UZ6 16.3-1
RZ6 16.3-1
92 DUPLEX
93 SIMPLEX
ZZ6 16.9-1

TO PILOT ATU

AUDIO CENTER
VOICE RECORD SELECT
CHANNEL 2
BIT 67
BIT 68
BIT 69
FROM PILOT ATU PWR SUP
57 ZZ6
TO MS ATU 59 NZ7 16.10-2
FROM MS ATU PWR SUP
56 ZZ6 16.10-2
FROM NSP ZZ2 16.3-1,3
NSP 1 CNTL PWR
NSP 2 CNTL PWR
A/G 2 A/A A/G 1 ICOM A OFF ICOM B
PNL A1A3 S16

AUDIO CENTER
VOICE RECORD SELECT
CHANNEL 1
BIT 64
BIT 65
BIT 66
FROM PILOT ATU PWR SUP
57 ZZ6
TO MS ATU 58 NZ7 16.10-2
FROM MS ATU PWR SUP
56 ZZ6 16.10-6
NSP 1 DATA ENBL
NSP 1 RCD W/DATA
TO NSP 1 SZ2 16.3-1,3
NSP 2 DATA ENBL
NSP 2 RCD W/DATA
TO NSP 2 SZ2 16.3-1,3
A/G 2 A/A A/G 1 ICOM A OFF ICOM B
PNL A1A3 S15

ESS 1BC
AUDIO
LEFT
3A
PNL R14F CB4
V_{ESS1BC} R14

ESS 2CA
AUDIO
RIGHT
3A
PNL R14F CB6
V_{ESS2CA} R14

ORBITER HEADSET

HEADSET INTERFACE UNIT
MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT
ICOM XMIT
(CLIP-ON)

J1 J2 J3
MULTIPLE HEADSET ADAPTER (MHA)
MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

LEFT COMM (PNL L5)
RIGHT COMM (PNL R6)
RIGHT COMM
POWER
ON
OFF
PNL R6 S1
MIKE POWER FROM CB6
FROM LEFT AUDIO
TO LEFT AUDIO
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

CDR ROTATION HAND CONTROLLER
PILOT ROTATION HAND CONTROLLER
PTT XMIT

DATE: 05/12/96	NAME: PSD	VERSION: INK: 8
DATE: 06/14/96	NAME: VSH	VERSION: INK: 9
DATE: 06/24/96	NAME: SVJ	VERSION: INK: 10

PS AUDIO PANEL/ATU L9

MS AUDIO PANEL/ATU R10

TO LMF MODE SWITCH 44 ▽Z6 16.9-1

TO ACCU 67 67 68 68 ○Z4 16.11-1

TO OS SU 73 ○Z5 12

MS ATU POWER SUPPLY

ITS 16-23 4-95 49 ▽Z4 +28V

EMI FILTER

20V SERIES REG

6V SHUNT REG +6V

12V SERIES REG +12V

TO MIKE CKTS AND LOGIC

+20V

10V SHUNT REG +10V

TO EARPHONE CKTS

DIGITAL CLOCK GENERATOR

CLOCK TO MS MULTIPLEXERS

56 T, ▽Z3 U, ▽Z7 16.10-1

ITS 96 D 124 50 ▽Z4

5.1K 5.1K

IDIO

C&W BIT 28 46 ▽Z7

MISSION STATION AUDIO

VOX ENABLE

VOX THRESHOLD DETECTOR

VOX LEVEL SET

VOX SENS

5K 22K 1300 +6V +12V

MIN MAX

PML R10 R1

MIKE SIG TO ACCU

SIDE TONE SWITCH

EARPHONE AUDIO FROM ACCU

SIDETONE ENABLE

TO OS SU

PAGE EN BIT 31

ICOM PTT

HOT MIKE

VOX MODE

VH BIT 27

PTT 1 BIT 25

PTT 2 BIT 26

PAGE BIT 31

PTT 1 BIT 25

BIT 31

PTT 1

PTT 2

VOX

BITS 8, 24, 40, 56, 72, 88-95, 104-111, AND 120-124

▽Z8 ▽Z6 ▽Z5 48

▽Z4 46

BIT 30 A/A ENABLE

BIT 43 A/G1 ENABLE

BIT 29 A/G2 ENABLE

BIT 42 ICOM A ENABLE

BIT 41 ICOM B ENABLE

MISSION STATION AUDIO

ICOM B

ICOM A

A/G 2

A/G 1

A/A

T/R OFF RCV

PML R10 S1 S2 S3 S4 S5

ICOM B

ICOM A

A/G 2

A/G 1

A/A

ENABLE

MISSION STATION AUDIO VOLUME

ICOM B ICOM A A/G2 A/G1 A/A

DEC TO BCD CONV

BIT 32 BIT 33 BIT 34 BIT 35 BIT 36 BIT 37 BIT 38 BIT 39 BIT 48 BIT 49 BIT 50 BIT 51 BIT 44 BIT 45 BIT 46 BIT 47 BIT 52 BIT 53 BIT 54 BIT 55

BIT 24 VOX
BIT 25 PTT 1
BIT 26 PTT 2
BIT 27 VH
BIT 28 C&W
BIT 29 A/G 2 EN
BIT 30 A/A EN
BIT 31 PAGE EN

BIT 32 ICOM B VOL B0
BIT 36 ICOM A VOL B0
BIT 40 VOX
BIT 44 A/G 1 VOL B0
BIT 48 A/G 2 VOL B0
BIT 52 A/A VOL B0
BIT 56 VOX
BIT 60 NAV VOL B0

BIT 33 ICOM B VOL B1
BIT 37 ICOM A VOL B1
BIT 41 ICOM B EN
BIT 45 A/G 1 VOL B1
BIT 49 A/G 2 VOL B1
BIT 53 A/A VOL B1
BIT 57 NAV 1 EN
BIT 61 NAV VOL B1

BIT 34 ICOM B VOL B2
BIT 38 ICOM A VOL B2
BIT 42 ICOM A EN
BIT 46 A/G 1 VOL B2
BIT 50 A/G 2 VOL B2
BIT 54 A/A VOL B2
BIT 58 NAV 2 EN
BIT 62 NAV VOL B2

BIT 35 ICOM B VOL B3
BIT 39 ICOM A VOL B3
BIT 43 A/G 1 EN
BIT 47 A/G 1 VOL B3
BIT 51 A/G 2 VOL B3
BIT 55 A/A VOL B3
BIT 59 NAV 3 EN
BIT 63 NAV VOL B3

MULTIPLEXER

BIT 8
"1" 0-7 FRM SYNC
"0" 9-15 SPARE
24-31

0-15, 24-31

32-63

BITS 0 TO 127

16-23, 64-95 49 ▽Z6

96-124 50 ▽Z5

MANCHESTER ENCODER

PS SERIAL DATA WORD TO ACCU 65

MS SERIAL DATA WORD TO ACCU 65

○Z4 16.11-1

12 PS AND AIRLOCK ATU/CCU SHARE SAME POWER CB

11 EACH MHA PROVIDES CONNECTIONS FOR THREE HIU'S

10 ON OV-102 SIDETONE ENABLE GENERATED FROM OS ATU

9 CB2 NOMENCLATURE ON OV-102 IS MS/OS

8 ON OV-102 THE OS SU AND THE AFT ROTATION HANDCONTROLLER WORK IN CONJUNCTION WITH THE OS ATU VERSUS THE MS ATU

7 PS ATU IS BACKUP FOR CCU NO. 1 IN THE AIRLOCK

6 THE KLAXON AND SIREN SIGNALS ARE CONNECTED TO A SEPARATE SPEAKER. THE SPEAKER POWER SWITCH DOES NOT HAVE TO BE ON IN ORDER FOR THE KLAXON AND SIREN TO BE HEARD

5 SYSTEM CONFIGURATION CONTROL BITS ARE PROVIDED BY THE MS ATU (PRIMARY) AND PILOT ATU (SECONDARY) AND ARE BITS 16-23, 64-87, 96-103, 112-119

4 STATION (ATU) CONFIGURATION CONTROL BITS ARE BITS 24-63

3 ORBITER HEADSETS ARE: COMM CAP, MINI-HEADSET, WIRELESS HEADSET, OR LIGHTWEIGHT HEADSET

2. PTT 1 = ICOM PTT OR HOT MIKE
PTT 2 = PTT XMIT POSITION OF THE PTT SWITCH SELECTED

NOTES: 1. VOX = VOX MODE SELECTED AND VOX THRESHOLD EXCEEDED
VH = VOX XMIT POSITION OF THE MODE SWITCH SELECTED

10 ATU 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN S.K. KIMBRELL	8-28-81	
DR		AUDIO PANEL/ATU MS, PS, AND OS SU
ENGR L. HOPPE		
ENGR	7/11/96	
APP	7/15/96	
APP	7/15/96	SPACE SHUTTLE
CADD R. Kimbrell	7-22-96	ALL
LTR E PCN 6		104.5 X 34

DWG NO 16.10

PAGE SHEET 2 OF 7

BASIC REV E-6

S R Q P O N M L K J

8 7 6 5 4 3 2 1

OS SU A2

POWER SUPPLY
HEAT SINK
FILTER
VOLTAGE REG 1
VOLTAGE REG 2
DRIVER AMP
TO LOGIC AND AMPS

OS AUDIO
SPKR POWER
SPKR/MIC
SPKR
OFF
PNL A13 S10

TO ACA5
FROM ACA5
LD2
CHANNEL SIGNAL CMD
KEY LAMP
VOX/PTT DETECT
C&W DETECT
EARPHONE SIGNAL
EARPHONE SIGNAL RETURN
TONE A
KLAXON (ΔP) AND SIREN (FIRE)

MN A
AUDIO
MS
3A
PNL R14 A CB2
FROM CAUTION & WARNING
16.108-7 (OV 102 ONLY)

AFT ROTATION HANDCONTROLLER
PNL A7
NOT USED
PTT COMMON
XMIT
ICOM
JUMPERED
MIKE SIGNAL
MIKE SIGNAL RETURN

OS AUDIO
MASTER SPEAKER VOLUME
MIN MAX
PNL A13 R2

BITS 16-18
BIT T2
NSP 1 ON
NSP 2 ON
LOW DATA RATE
BIT T0 NSP 1/AG1
BIT T1 NSP 2/AG1
BIT T3 NSP 1/AG2
BIT T4 NSP 2/AG2
DUPLEX
SIMPLEX
BIT 21 EVA PAGE
FROM OS SU AUDIO
TO PS AUDIO

BIT 16 EVA A/G 1
BIT 17 EVA A/G 2
BIT 18 EVA A/A
BIT 19 SPARE
BIT 20 SPARE
BIT 21 EVA PAGE
BIT 22 SPARE
BIT 23 SPARE
BIT 64 RCDR CH 1 BIT 0
BIT 65 RCDR CH 1 BIT 1
BIT 66 RCDR CH 1 BIT 2
BIT 67 RCDR CH 2 BIT 0
BIT 68 RCDR CH 2 BIT 1
BIT 69 RCDR CH 2 BIT 2
BIT 70 NSP 1/AG 1
BIT 71 NSP 2/AG 1
BIT 72 VOX
BIT 73 NSP 1/AG 2
BIT 74 NSP 2/AG 2
BIT 75 SPARE
BIT 76 SPARE
BIT 77 SPARE
BIT 78 SPARE
BIT 79 SPARE
BIT 80 SPARE
BIT 81 SPARE
BIT 82 SPARE
BIT 83 SPARE
BIT 84 P/L BAY/ICOM A
BIT 85 P/L BAY/ICOM B
BIT 86 SPARE
BIT 87 SPARE
BIT 96 SL/AG 1
BIT 97 SL/AG 2
BIT 98 SL/AA
BIT 99 SL/ICOM A
BIT 100 SL/ICOM B
BIT 101 SL/PAGE
BIT 102 SL/C&W
BIT 103 SPARE
BIT 112 DR/AG 1
BIT 113 DR/AG 2
BIT 114 DR/AA
BIT 115 DR/ICOM A
BIT 116 DR/ICOM B
BIT 117 DR/PAGE
BIT 118 DR/C&W
BIT 119 SPARE
MULTIPLEXER
BITS 16-23
BITS 64-71
BITS 72-79
BITS 80-87
BITS 88-95
BITS 16-23 64-95
BITS 96-103
BITS 104-111, 120-124
BITS 112 TO 119
BITS 96 TO 121
VOX

TO UHF MODE SWITCH
16.9-1

MS ATU POWER SUPPLY
+28V
EMI FILTER
20V SERIES REG
6V SHUNT REG
12V SERIES REG
10V SHUNT REG
DIGIT CLOCK GENERA

MISSION STATION AUDIO
POWER
AUD/TONE
OFF
PNL R10 S8
C&W BIT 28
MISSION STATION AUDIO
MS AUDIO CONTROL
NORM PS
PNL R12 S13
MISSION STATION AUDIO
PAGE
PAGE EN BIT 31
PNL R10
MISSION STATION AUDIO
XMIT/ICOM MODE
PTT/VOX PTT/PTT PTT/HOT VOX/VOX
PNL R10 S11
5.1K
ICOM PTT
HOT MIKE
VOX MODE
PTT 1 BIT 25
VM BIT 27

ORBITER HEADSET
HEADSET INTERFACE UNIT
ICOM XMIT
(CLIP-ON)
MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT
J1 J2 J3
MULTIPLE HEADSET ADAPTER (MHA)

PS COMM (PNL A15)
MS COMM (PNL A11)
MS COMM
CCU POWER
ON
OFF
PNL A11 S11
FROM AIRLOCK CCU 1
MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

BASIC REV E-6

DATE: 05/13/96	NAME: MDU	VERSION: INK 6
DATE: 06/14/96	NAME: VSH	VERSION: INK 7
DATE: 06/25/96	NAME: SVJ	VERSION: INK 8

J I H G F E D C B A

8 7 6 5 4 3 2 1

TO MIDDECK SU — uZ2 — 69, 70

uZ5 16.11-1 — TO ACCU — 67, 68 — uZ4 16.11-1 — MIDDECK TO SU — 73 — uZ2

MID DECK SPEAKER AUDIO
SPKR POWER
SPKR/MIC
SPKR
OFF
PNL M042F S10

MIDDECK ATU POWER SUPPLY
EMI FILTER
20V SERIES REG
6V SHUNT REG — +6V
12V SERIES REG — +12V — TO MIKE CKTS AND LOGIC
+20V — TO EARPHONE CKTS
10V SHUNT REG — +10V
DIGITAL CLOCK GENERATOR — CLOCK TO MIDDECK DIGITAL CIRCUITS

5.1K 5.1K

MID DECK SPEAKER AUDIO
ICOM B
ICOM A
A/G 2
A/G 1
A/A
T/R
RCV
OFF
PNL M075F S4

MID DECK SPEAKER AUDIO
VOLUME
ICOM B
ICOM A
A/G2
A/G1
A/A
DEC TO BCD CONV
PNL M042F S5

ICOM B
ICOM A
A/G 2
A/G 1
A/A
ENABLE

BIT 30 A/A ENABLE
BIT 43 A/G1 ENABLE
BIT 29 A/G2 ENABLE
BIT 42 ICOM A ENABLE
BIT 41 ICOM B ENABLE

BIT 32
BIT 33
BIT 34
BIT 35
BIT 36
BIT 37
BIT 38
BIT 39
BIT 48
BIT 49
BIT 50
BIT 51
BIT 44
BIT 45
BIT 46
BIT 47
BIT 52
BIT 53
BIT 54
BIT 55

uZ4 — 46

BIT 24 VOX
BIT 25 PTT 1
BIT 26 PTT 2
BIT 27 VM
BIT 28 C&W
BIT 29 A/G 2 EN
BIT 30 A/A EN
BIT 31 PAGE EN

BIT 32 ICOM B VOL B0
BIT 36 ICOM A VOL B0
BIT 40 VOX
BIT 44 A/G 1 VOL B0
BIT 48 A/G 2 VOL B0
BIT 52 A/A VOL B0
BIT 56 VOX
BIT 60 NAV VOL B0

BIT 33 ICOM B VOL B1
BIT 37 ICOM A VOL B1
BIT 41 ICOM B EN
BIT 45 A/G 1 VOL B1
BIT 49 A/G 2 VOL B1
BIT 53 A/A VOL B1
BIT 57 NAV 1 EN
BIT 61 NAV VOL B1

BIT 34 ICOM B VOL B2
BIT 38 ICOM A VOL B2
BIT 42 ICOM A EN
BIT 46 A/G 1 VOL B2
BIT 50 A/G 2 VOL B2
BIT 54 A/A VOL B2
BIT 58 NAV 2 EN
BIT 62 NAV VOL B2

BIT 35 ICOM B VOL B3
BIT 39 ICOM A VOL B3
BIT 43 A/G 1 EN
BIT 47 A/G 1 VOL B3
BIT 51 A/G 2 VOL B3
BIT 55 A/A VOL B3
BIT 59 NAV 3 EN
BIT 63 NAV VOL B3

MULTIPLEXER

BIT 8
"1" — 0-7 FRM SYNC
"0" — 9-15 SPARE
24-31

0-15, 24-31
32-63
16-23, 64-95 — uZ6 — 49
96-124 — uZ5 — 50
BITS 0 TO 127
MANCHESTER ENCODER
MID DECK SPEAKER SERIAL DATA WORD TO ACCU — 69 — uZ4 16.11-1

MID DECK SPEAKER AUDIO
VOX SENS
VOX LEVEL SET
5K
22k
130Ω
+6V
+12V
MIN
MAX
PNL M042F R1
VOX ENABLE
VOX THRESHOLD DETECTOR

MIKE SIG TO ACCU
SIDE TONE SWITCH
EARPHONE AUDIO FROM ACCU
SIDETONE ENABLE
TO MIDDECK SMU

ICOM PTT
HOT MIKE
PTT 1 BIT 25
VOX MODE
PTT/PTT
VOX/VOX
S11
VOX
VM BIT 27
PTT 2 BIT 26

PAGE BIT 31
PTT 1 BIT 25
BIT 31
PTT 1
PTT 2
BITS 8, 24, 40, 56, 72, 88-95, 104-111, AND 120-124
uZ8 uZ5 uZ5 — 48

1. VOX = VOX MODE SELECTED AND VOX THRESHOLD EXCEEDED
   VM = VOX XMIT POSITION OF THE MODE SWITCH SELECTED
2. PTT 1 = ICOM PTT OR HOT MIKE
   PTT 2 = PTT XMIT POSITION OF THE PTT SWITCH SELECTED

NOTES:
- ▷ EACH MHA PROVIDES CONNECTIONS FOR THREE HIU'S
- ▷ THE KLAXON AND SIREN SIGNALS ARE CONNECTED TO A SEPARATE SPEAKER. THE SPEAKER POWER SWITCH DOES NOT HAVE TO BE ON IN ORDER FOR THE KLAXON AND SIREN TO BE HEARD
- ▷ SYSTEM CONFIGURATION CONTROL BITS ARE PROVIDED BY THE MS ATU (PRIMARY) AND PILOT ATU (SECONDARY) AND ARE BITS 16-23, 64-87, 96-103, 112-119
- ▷ STATION (ATU) CONFIGURATION CONTROL BITS ARE BITS 24-63
- ▷ ORBITER HEADSETS ARE: COMM CAP, MINI-HEADSET, WIRELESS HEADSET OR LIGHTWEIGHT HEADSET

10 ATU 3

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN R. COLLINGS JR.	12/30/87	
DR M. GILLESPIE	7/29/86	AUDIO PANEL/ATU MID DECK SU AND CCU
ENGR L. HOPPE		
ENGR	7/1/96	
APP Gary Clark	7/10/96	
APP Ronald S. Miller	7/16/96	SPACE SHUTTLE — DWG NO 16.10 C.D.E
CADS S.K. Kinslow	7-29-96	OV 103, 104, 105
LTR E — PCN 6		126.5 X 34 — PAGE — SHEET 3 OF 7

BASIC REV E-6

MULTIPLE HEADSET ADAPTER (MHA)
J1
J2
J3
MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

MID DECK COMM (PNL M039M)
MID DECK COMM
CCU POWER
ON
OFF
PNL M039M S1
MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

MN B
AUDIO
SPKR
3A
PNL R14 A CB5
V_{MNB} R14

MID DECK SU M029J
POWER SUPPLY
FILTER
VOLTAGE REG 1
VOLTAGE REG 2
HEAT SINK
DRIVER AMP
TO LOGIC AND AMPS
TO ACA5 Z1 4,3 CHANNEL SIGNAL CMD
FROM ACA5 LD2
KEY LAMP
VOX/PTT DETECT
C&W DETECT
KLAXON (ΔP) AND SIREN (FIRE)

NOT USED
XMIT
ICOM
PTT COMMON
JUMPERED
MIKE SIGNAL
MIKE SIGNAL RETURN
EARPHONE SIGNAL
EARPHONE SIGNAL RETURN

FROM CAUTION AND WARNING Z6 5,2-2
106 RETURN
105 TONE A2
C & W A TONES
BYPASS TONE VOLUME
CW
PNL M042F R3
MID DECK SPEAKER AUDIO
TONES
ACCU
ACCU/BYPASS
PNL M042F S13
300Ω 1W
TONES/AUDIO MIXING CIRCUIT

90 Z2 16,10-4 FROM AIRLOCK CCU 2
FROM MID DECK CCU

BIT 16 EVA A/G 1
BIT 17 EVA A/G 2
BIT 18 EVA A/A
BIT 19 SPARE
BIT 20 SPARE
BIT 21 EVA PAGE
BIT 22 SPARE
BIT 23 SPARE
MULTIPLEXER
BITS 16-23

BIT 64 RCDR CH 1 BIT 0
BIT 65 RCDR CH 1 BIT 1
BIT 66 RCDR CH 1 BIT 2
BIT 67 RCDR CH 2 BIT 0
BIT 68 RCDR CH 2 BIT 1
BIT 69 RCDR CH 2 BIT 2
BIT 70 NSP 1/AG 1
BIT 71 NSP 2/AG 1
MULTIPLEXER
BITS 64-71

BIT 72 VOX
BIT 73 NSP 1/AG 2
BIT 74 NSP 2/AG 2
BIT 75 SPARE
BIT 76 SPARE
BIT 77 SPARE
BIT 78 SPARE
BIT 79 SPARE
MULTIPLEXER
BITS 72-79

BIT 80 SPARE
BIT 81 SPARE
BIT 82 SPARE
BIT 83 SPARE
BIT 84 P/L BAY/ICOM A
BIT 85 P/L BAY/ICOM B
BIT 86 SPARE
BIT 87 SPARE
MULTIPLEXER
BITS 80-87

BIT 96 SL/AG 1
BIT 97 SL/AG 2
BIT 98 SL/AA
BIT 99 SL/ICOM A
BIT 100 SL/ICOM B
BIT 101 SL/PAGE
BIT 102 SL/C&W
BIT 103 SPARE
MULTIPLEXER
BITS 96-103

BIT 112 DR/AG 1
BIT 113 DR/AG 2
BIT 114 DR/AA
BIT 115 DR/ICOM A
BIT 116 DR/ICOM B
BIT 117 DR/PAGE
BIT 118 DR/C&W
BIT 119 SPARE
MULTIPLEXER
BITS 104-111, 120-124
VOX
BITS 112 TO 119

BIT 72
NSP 1 ON
NSP 2 ON
LOW DATA RATE
NOT USED
BIT 70 NSP 1/AG1
BIT 71 NSP 2/AG1
BIT 73 NSP 1/AG2
BIT 74 NSP 2/AG2
DUPLEX
SIMPLEX
BIT 21 EVA PAGE

MULTIPLEXER
BITS 16-23, 64-95
BITS 88-95
BITS 96 TO 124

MIDDECK ATU POWER SUPPLY
+28V
EMI FILTER
20V SERIES REG
6V SHUNT REG
12V SERIES REG
10V SHUNT REG
DIGITAL CLOCK GENERATOR
+6V
+12V
+20V
+10V

MID DECK SPEAKER AUDIO
POWER
AUD/TONE
OFF
PNL M042F S1
C&W BIT 28

MID DECK SPEAKER AUDIO
MASTER VOLUME
5K
MIN
MAX
PNL M042F R2

MID DECK SPEAKER AUDIO
PAGE
PNL M042F S7
PAGE EN BIT 31

MIKE SIGNAL
MIKE SIGNAL RETURN
EARPHONE SIGNAL
EARPHONE SIGNAL RETURN
ICOM
PTT COMMON
XMIT

MID DECK SPEAKER AUDIO
XMIT/ICOM MODE
PTT/VOX
PTT/HOT
PTT/PTT
VOX/VOX
PNL M042F S11
5.1K
ICOM PTT
HOT MIKE
VOX MODE
PTT 1 BIT 25
VH BIT 27

DATE: 06/25/96 | NAME: SVJ | VERSION: INK, 8

W V U T S R Q P O N

8 7 6 5 4 3 2 1

ORBITER HEADSET

HEADSET INTERFACE UNIT

ICOM XMIT

(CLIP-ON)

MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

J1 J2 J3

MULTIPLE HEADSET ADAPTER (MHA)

MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

MID DECK COMM (PNL M039M)

MID DECK COMM

CCU POWER
ON
OFF
PNL M039M S1

MIKE POWER +28V

MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

NOT USED

NSP 1 ON
NSP 2 ON
LOW DATA RATE
DUPLEX BIT
SIMPLEX

MN B
AUDIO
SPKR
3A
PNL R14 A CB5

V_{MNB} R14

90
Z2 16.10-4
FROM AIRLOCK CCU 2

J1
SLEEP STA TONE
(J1)
TONE B2
RETURN
PNL M058F

Z6 5.2-2 FROM CAUTION AND WARNING

MID DECK SU M029J

POWER SUPPLY
HEAT SINK
FILTER
VOLTAGE REG 1
VOLTAGE REG 2
DRIVER AMP
TO LOGIC AND AMPS

TO ACAS X1 4.3 CHANNEL SIGNAL CMD
FROM ACAS LD2

KEY LAMP

Z8 69 MID DECK SPEAKER
70 MID DECK SPEAKER/MIKE
73 MID DECK SPEAKER

VOX/PTT DETECT
C&W DETECT

FROM CAUTION AND WARNING Z7 5.2-2 91 TONE B
Z1 16.108-6
KLAXON (ΔP) AND SIREN (FIRE)

NOT USED
XMIT
ICOM
PTT COMMON

JUMPERED
MIKE SIGNAL
MIKE SIGNAL RETURN

EARPHONE SIGNAL
EARPHONE SIGNAL RETURN

FROM CAUTION AND WARNING Z6 5.2-2
106 RETURN
105 TONE A2
C & W A TONES

BYPASS TONE VOLUME
CW
PNL M042F R3

MID DECK SPEAKER AUDIO
TONES
ACCU
ACCU/BYPASS
PNL M042F S13
300Ω 1W

TONES/AUDIO MIXING CIRCUIT

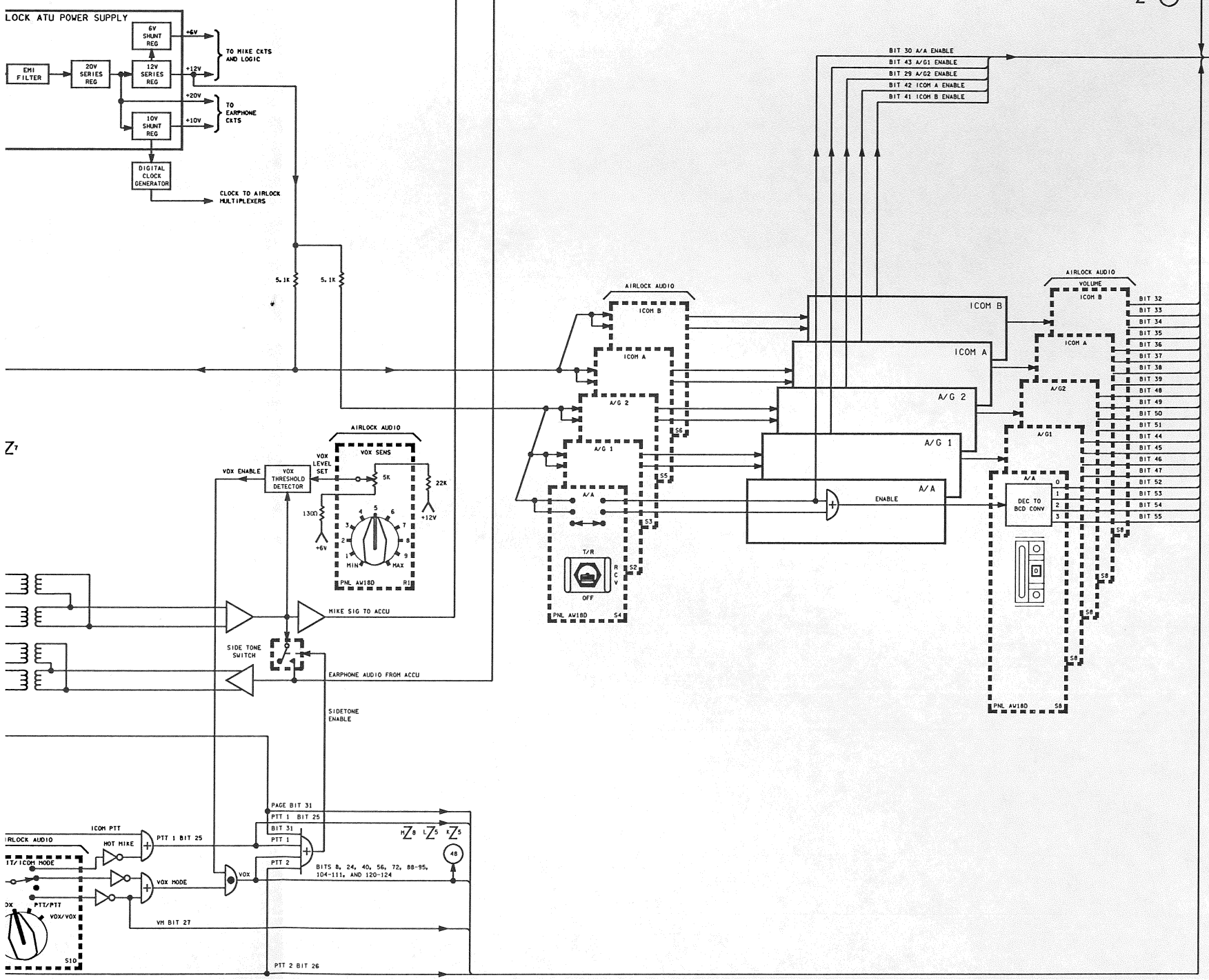
BASIC REV E-6

DATE: 02/28/96	NAME: VSH	VERSION: BPT.6
DATE: 04/08/96	NAME: SVJ	VERSION: INK.5
DATE: 05/12/96	NAME: PSD	VERSION: INK.6

J I H G F E D C B A

8 7 6 5 4 3 2 1

TO ACCU 67 68



▷ EACH MHA PROVIDES CONNECTIONS FOR THREE HIU'S

▷ SYSTEM CONFIGURATION CONTROL BITS ARE PROVIDED BY THE MS ATU (PRIMARY AND PILOT ATU (SECONDARY) AND ARE BITS 16-23, 64-87, 96-103, 112-119

▷ STATION (ATU) CONFIGURATION CONTROL BITS ARE BITS 24-63

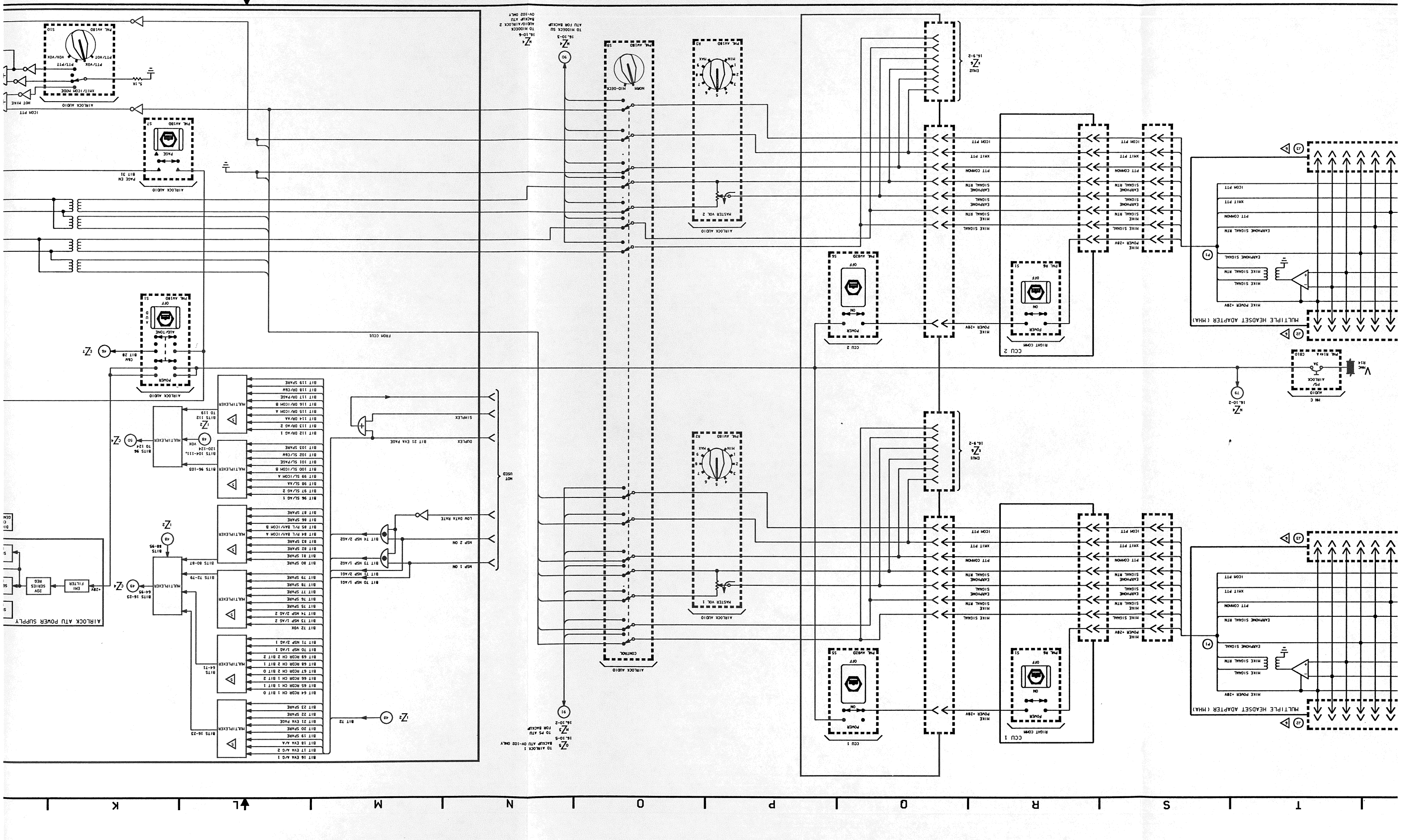
▷ ORBITER HEADSETS ARE: COMM CAP, MINI-HEADSET, WIRELESS HEADSET OR LIGHTWEIGHT HEADSET

NOTES: 1. VOX = VOX MODE SELECTED AND VOX THRESHOLD EXCEEDED
VM = VOX XMIT POSITION OF THE MODE SWITCH SELECTED
2. PTT 1 = ICOM PTT OR HOT MIKE
PTT 2 = PTT XMIT POSITION OF THE PTT SWITCH SELECTED

10 ATU 4

SIGNATURE	DATE	
DSGN S.H. OREN	3/8/82	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
ENGR L. HOPPE		AUDIO PANEL/ATU AIRLOCK
ENGR	5/7/96	
APP	5/13/96	
APP	5/24/96	SPACE SHUTTLE — DWG NO 16.10
CADS S.A. Kirchner	6/17/96	ALL — PAGE — SHEET 4 OF 7
LTR E — DCN 6		126.5 x 34

BASIC REV E-6


AIRLOCK AUDIO
AIRLOCK ATU POWER SUPPLY
MULTIPLE HEADSET ADAPTER (MHA)
CCU 1
CCU 2
ICOM PTT
XMIT PTT
PTT COMMON
EARPHONE SIGNAL RTN
EARPHONE SIGNAL
MIKE SIGNAL RTN
MIKE SIGNAL
MIKE POWER +28V
FROM CCU1
NOT USED
DUPLEX
SIMPLEX
LOW DATA RATE
NSP 1 ON
NSP 2 ON
MASTER VOL 1
MASTER VOL 2
MULTIPLEXER
POWER
AUD/TONE
PTT/VOX
PTT/HOT
VOX/VOX
XMIT/ICOM MODE
HOT MIKE
MIC
AIRLOCK

W V U T S R Q P O N

8 7 6 5 4 3 2 1

ORBITER HEADSET

HEADSET INTERFACE UNIT

ICOM XMIT

(CLIP-ON)

MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

J1 J2 J3 P1

MULTIPLE HEADSET ADAPTER (MHA)

CCU 1

RIGHT COMM

POWER ON OFF

PNL R6 S1

CCU 1

POWER ON OFF

PNL AW82D S5

EMU1 Z6 16.9-2

AIRLOCK AUDIO CONTROL

AIRLOCK AUDIO MASTER VOL 1

MIN MAX

PNL AW18D R2

HN C AUDIO PS/ AIRLOCK 3A

PNL R14A CB10

V_{HNC} R14

Z4 16.10-2 T9

CCU 2

RIGHT COMM

POWER ON OFF

PNL R6 S1

CCU 2

POWER ON OFF

PNL AW82D S6

EMU2 Z6 16.9-2

AIRLOCK AUDIO MASTER VOL 2

NORM MID-DECK

PNL AW18D S2

PNL AW18D R3

Z5 16.10-5 TO AIRLOCK 1 BACKUP ATU OV-102 ONLY

Z3 16.10-2 TO PS ATU FOR BACKUP

91

NSP 1 ON
NSP 2 ON
LOW DATA RATE
NOT USED
DUPLEX
SIMPLEX

90

Z4 16.10-3 TO MIDDECK SU ATU FOR BACKUP

Z4 16.10-6 TO MIDDECK AUDIO/AIRLOCK 2 BACKUP ATU OV-102 ONLY

DATE: 11/01/90	NAME: MDU	VERSION INK: 3
DATE: 01/29/96	NAME: VSH	VERSION BPT: 1
DATE: 02/22/96	NAME: BJT	VERSION INK: 1

AIRLOCK 1 BACKUP AUDIO/ATU M058F

TO ACCU 67 68

MIDDECK ATU POWER SUPPLY

+28V → EMI FILTER → 20V SERIES REG → 12V SERIES REG, 6V SHUNT REG, 10V SHUNT REG

+6V, +12V → TO MIKE CKTS AND LOGIC

+20V, +10V → TO EARPHONE CKTS

DIGITAL CLOCK GENERATOR → CLOCK TO MIDDECK DIGITAL CIRCUITS

5.1K, 5.1K

BIT 30 A/A ENABLE
BIT 43 A/G1 ENABLE
BIT 29 A/G2 ENABLE
BIT 42 ICOM A ENABLE
BIT 41 ICOM B ENABLE

AIRLOCK 1 BACKUP AUDIO — ICOM B, ICOM A, A/G 2, A/G 1, A/A

ICOM B, ICOM A, A/G 2, A/G 1, A/A → ENABLE

AIRLOCK 1 BACKUP AUDIO VOLUME — ICOM B, ICOM A, A/G2, A/G1, A/A → DEC TO BCD CONV

BIT 32, BIT 33, BIT 34, BIT 35, BIT 36, BIT 37, BIT 38, BIT 39, BIT 40, BIT 49, BIT 50, BIT 51, BIT 44, BIT 45, BIT 47, BIT 52, BIT 53, BIT 54, BIT 55

T/R: R C V, OFF — PNL M058F S49

BIT 24 VOX
BIT 25 PTT 1
BIT 26 PTT 2
BIT 27 VH
BIT 28 CSW
BIT 29 A/G 2 EN
BIT 30 A/A EN
BIT 31 PAGE EN

BIT 32 ICOM B VOL B0
BIT 36 ICOM A VOL B0
BIT 40 VOX
BIT 44 A/G 1 VOL B0
BIT 48 A/G 2 VOL B0
BIT 52 A/A VOL B0
BIT 56 VOX
BIT 60 NAV VOL B0

BIT 33 ICOM B VOL B1
BIT 37 ICOM A VOL B1
BIT 41 ICOM B EN
BIT 45 A/G 1 VOL B1
BIT 49 A/G 2 VOL B1
BIT 53 A/A VOL B1
BIT 57 NAV 1 EN
BIT 61 NAV VOL B1

BIT 34 ICOM B VOL B2
BIT 38 ICOM A VOL B2
BIT 42 ICOM A EN
BIT 46 A/G 1 VOL B2
BIT 50 A/G 2 VOL B2
BIT 54 A/A VOL B2
BIT 58 NAV 2 EN
BIT 62 NAV VOL B2

BIT 35 ICOM B VOL B3
BIT 39 ICOM A VOL B3
BIT 43 A/G 1 EN
BIT 47 A/G 1 VOL B3
BIT 51 A/G 2 VOL B3
BIT 55 A/A VOL B3
BIT 59 NAV 3 EN
BIT 63 NAV VOL B3

MULTIPLEXER ×4 → MULTIPLEXER (BIT 8: 0-7 FRM SYNC, 9-15 SPARE, 24-31) → MULTIPLEXER → MULTIPLEXER (32-63) → MULTIPLEXER (0-15, 24-31; BITS 0 TO 127) → MANCHESTER ENCODER

AIRLOCK 1 BACKUP SERIAL DATA WORD TO ACCU 69

46 → VOX ENABLE, VOX THRESHOLD DETECTOR, VOX LEVEL SET, VOX SENS (5K, 22K, 130Ω, +6V, +12V, MIN, MAX) — PNL M058F R1

MIKE SIG TO ACCU

SIDE TONE SWITCH

EARPHONE AUDIO FROM ACCU

SIDETONE ENABLE

PAGE BIT 31

ICOM PTT — HOT MIKE, VOX MODE, VOX

LOCK 1 BACKUP AUDIO — xMIT/ICOM MODE, T/VOX, PTT/PTT, VOX/VOX — PNL M058F S118

PTT 1 BIT 25 → BIT 31, PTT 1, PTT 2

BITS 8, 24, 40, 56, 72, 88-95, 104-111, AND 120-124 → 48

VH BIT 27

PTT 2 BIT 26

7. AIRLOCK 1 BACKUP AUDIO ATU EXISTS ON OV-102 ONLY

6 SIGNALS ARE ROUTED VIA THE AIRLOCK AUDIO CNTL SW WHEN IN BACKUP POSITION

5 SYSTEM CONFIGURATION CONTROL BITS ARE PROVIDED BY THE MS ATU (PRIMARY) AND PILOT ATU (SECONDARY) AND ARE BITS 16-23, 64-87, 96-103, 112-119

4 STATION (ATU) CONFIGURATION CONTROL BITS ARE BITS 24-63

3 ORBITER HEADSETS ARE: COMM CAP, MINI-HEADSET, WIRELESS HEADSET OR LIGHTWEIGHT HEADSET

2. PTT 1 = ICOM PTT OR HOT MIKE
PTT 2 = PTT XMIT POSITION OF THE PTT SWITCH SELECTED

NOTES: 1. VOX = VOX MODE SELECTED AND VOX THRESHOLD EXCEEDED
VH = VOX XMIT POSITION OF THE MODE SWITCH SELECTED.

10 ATU 5

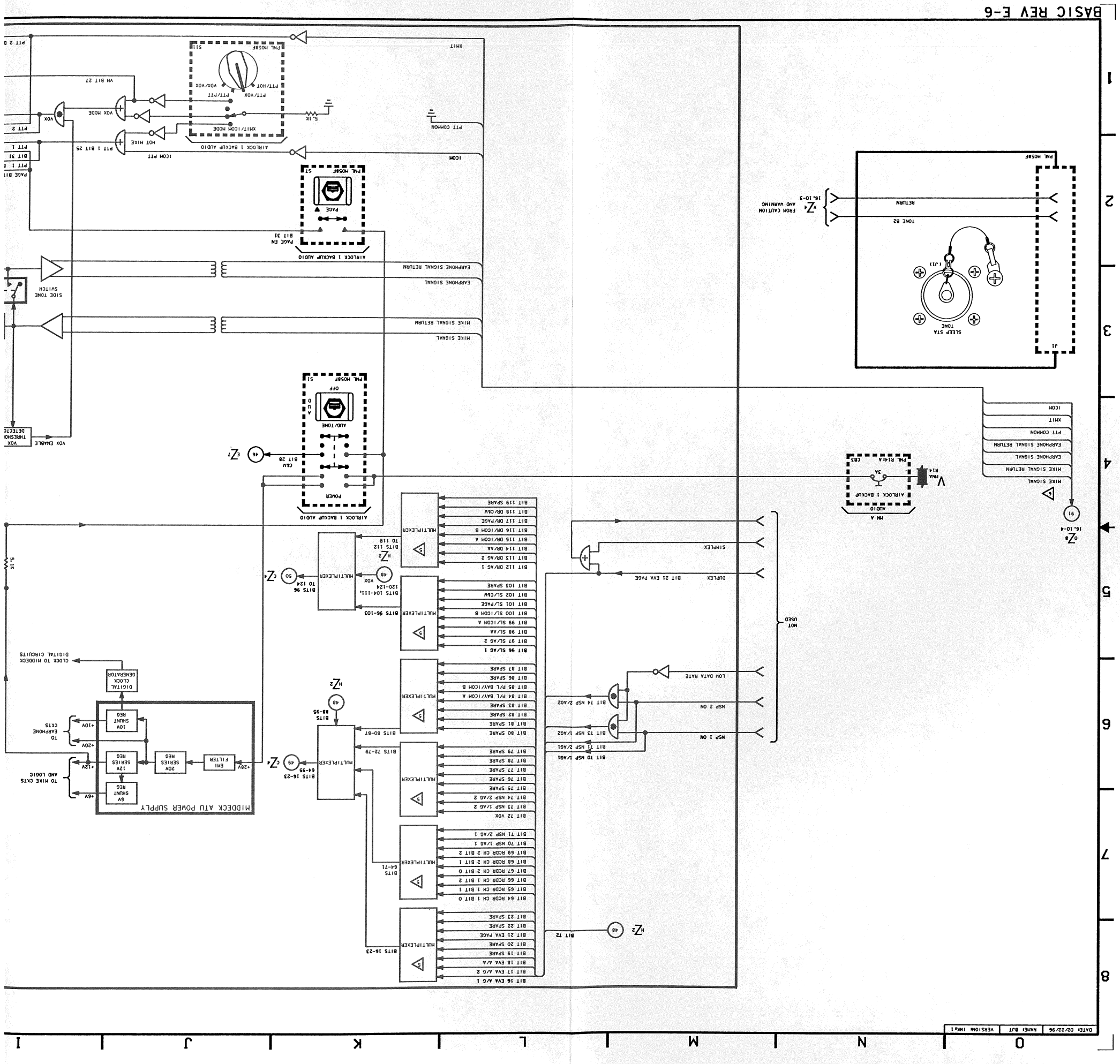
SIGNATURE	DATE
DSGN R. COLLINGS JR.	12/30/87
DR M. GILLESPIE	7/25/88
ENGR K. KNOLL	
ENGR Karyn T Knoll	7/15/96
APP	7/15/96
APP	7/15/96
CADD K. K. Kimbrell	6-17-98

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

AUDIO PANEL/ATU
AIRLOCK 1 BACKUP

SPACE SHUTTLE | DWG NO 16.10B
OV 102 | PAGE | SHEET 5 OF 7
LTR E | PCN 6 | 82.5 X 34

BASIC REV E-6


PAE HOSBF
J1
SLEEP STA TONE
TONE B2
RETURN
FROM CAUTION AND WARNING
16.10-3
AIRLOCK 1 BACKUP AUDIO
PAE HOSBF
S1
PAGE
PAGE EN BIT 31
AIRLOCK 1 BACKUP AUDIO
PAE HOSBF
S1
PTT/VOX
PTT/PTT
PTT/HOT
VOX/VOX
XMIT7/ICOM MODE
VOX MODE
HOT MIKE
ICOM PTT
PTT 1 BIT 25
AIRLOCK 1 BACKUP AUDIO
ICOM
PTT COMMON
EARPHONE SIGNAL RETURN
EARPHONE SIGNAL
MIKE SIGNAL RETURN
MIKE SIGNAL
SIDE TONE SWITCH
VOX ENABLE
PAE HOSBF
S1
OFF
AUD/TONE
POWER
AIRLOCK 1 BACKUP AUDIO
CLV BIT 28
46
Z7
PAE R144
CB3
3A
AIRLOCK 1 BACKUP
AUDIO
PAA
R14
PAA R14 A
MIKE SIGNAL
MIKE SIGNAL RETURN
EARPHONE SIGNAL
EARPHONE SIGNAL RETURN
PTT COMMON
XMIT
ICOM
91
0Z9
16.10-4
XMIT
ICOM
PTT COMMON
PTT 2 B
PTT 1
BIT 31
PAGE BIT
VM BIT 27
VOX
5.1K
5.1K
MULTIPLEXER
BITS 112 TO 119
BIT 112 DB/AS 1
BIT 113 DB/AS 2
BIT 114 DB/AA
BIT 115 DB/ICOM A
BIT 116 DB/ICOM B
BIT 117 DB/PAGE
BIT 118 DB/CLV
BIT 119 SPARE
MULTIPLEXER
BITS 96-103
BIT 96 SL/AG 1
BIT 97 SL/AG 2
BIT 98 SL/AA
BIT 99 SL/ICOM A
BIT 100 SL/ICOM B
BIT 101 SL/PAGE
BIT 102 SL/CLV
BIT 103 SPARE
MULTIPLEXER
BITS 80-87
BIT 80 SPARE
BIT 81 SPARE
BIT 82 SPARE
BIT 83 SPARE
BIT 84 PL/ BAY/ICOM A
BIT 85 PL/ BAY/ICOM B
BIT 86 SPARE
BIT 87 SPARE
MULTIPLEXER
BITS 72-79
BIT 72 VOX
BIT 73 NSP 1/AG 2
BIT 74 NSP 2/AG 2
BIT 75 SPARE
BIT 76 SPARE
BIT 77 SPARE
BIT 78 SPARE
BIT 79 SPARE
MULTIPLEXER
BITS 64-71
BIT 70 NSP 1/AG 1
BIT 71 NSP 2/AG 1
BIT 64 RCDR CH 1 BIT 0
BIT 65 RCDR CH 1 BIT 1
BIT 66 RCDR CH 1 BIT 2
BIT 67 RCDR CH 2 BIT 0
BIT 68 RCDR CH 2 BIT 1
BIT 69 RCDR CH 2 BIT 2
MULTIPLEXER
BITS 16-23
BIT 16 EVA A/G 1
BIT 17 EVA A/G 2
BIT 18 EVA A/A
BIT 19 SPARE
BIT 20 SPARE
BIT 21 EVA PAGE
BIT 22 SPARE
BIT 23 SPARE
BITS 88-95
BITS 64-95
BITS 16-23
BITS 96-103
BITS 104-111, 120-124
BITS 112 TO 119
BITS 96 TO 124
50
49
48
46
MIDDECK ATU POWER SUPPLY
+28V
EMI FILTER
20V SERIES REG
12V SERIES REG
6V SHUNT REG
10V SHUNT REG
+12V
+6V
+10V
+20V
TO EARPHONE CKT3
TO MIKE CKT5 AND LOGIC
DIGITAL CLOCK GENERATOR
CLOCK TO MIDDECK DIGITAL CIRCUITS
BIT 21 EVA PAGE
DUPLEX
SIMPLEX
NOT USED
LOW DATA RATE
NSP 2 ON
NSP 1 ON
BIT 74 NSP 2/A02
BIT 73 NSP 1/A02
BIT 71 NSP 2/A01
BIT 70 NSP 1/A01
BIT 72
AIRLOCK 1 BACKUP AUDIO
PAA R14
PAA R14 A
3A
V
AUDIO
PAA
1
2
3
4
5
6
7
8
O
N
M
L
K
J
I
DATE 02/22/96
NAME BJT
VERSION IMA.1

DATE: 05/12/96	NAME: PSD	VERSION: INK 3
DATE: 06/14/96	NAME: VSH	VERSION: INK 4
DATE: 06/24/96	NAME: SVJ	VERSION: INK 5

MID DECK AUDIO/AIRLOCK 2 BACKUP M042F

TO MIDDECK SMU ZZ2 — 68, 70

TO ACCU — OZ5 16.11-1 — 67, 68 — OZ4 16.11-1

MIDDECK TO SU — 73 ZZ2

MID DECK SPEAKER AUDIO
SPKR POWER
SPKR/MIC VOX SPKR
OFF
PNL M042F S10

K ATU POWER SUPPLY
6V SHUNT REG +6V → TO MIKE CKTS AND LOGIC
20V SERIES REG
12V SERIES REG +12V
+20V, +10V → TO EARPHONE CKTS
10V SHUNT REG +10V
DIGITAL CLOCK GENERATOR → CLOCK TO MIDDECK DIGITAL CIRCUITS

5.1K, 5.1K

ZZ4 46

BIT 30 A/A ENABLE
BIT 43 A/G1 ENABLE
BIT 29 A/G2 ENABLE
BIT 42 ICOM A ENABLE
BIT 41 ICOM B ENABLE

MID DECK AUDIO/AIRLOCK 2 BACKUP
ICOM B
ICOM A
A/G 2
A/G 1
A/A
T/R
OFF
PNL M042F S4

ICOM B
ICOM A
A/G 2
A/G 1
ENABLE
BIT 32 … BIT 55

MID DECK AUDIO/AIRLOCK 2 BACKUP
VOLUME
ICOM B
ICOM A
A/G2
A/G1
A/A
DEC TO BCD CONV
0 1 2 3
PNL M042F S8

BIT 24 VOX
BIT 25 PTT 1
BIT 26 PTT 2
BIT 27 VM
BIT 28 C&W
BIT 29 A/G 2 EN
BIT 30 A/A EN
BIT 31 PAGE EN
BIT 32 ICOM B VOL B0
BIT 36 ICOM A VOL B0
BIT 40 VOX
BIT 44 A/G 1 VOL B0
BIT 48 A/G 2 VOL B0
BIT 52 A/A VOL B0
BIT 56 VOX
BIT 60 NAV VOL B0
BIT 33 ICOM B VOL B1
BIT 37 ICOM A VOL B1
BIT 41 ICOM B EN
BIT 45 A/G 1 VOL B1
BIT 49 A/G 2 VOL B1
BIT 53 A/A VOL B1
BIT 57 NAV 1 EN
BIT 61 NAV VOL B1
BIT 34 ICOM B VOL B2
BIT 38 ICOM A VOL B2
BIT 42 ICOM A EN
BIT 46 A/G 1 VOL B2
BIT 50 A/G 2 VOL B2
BIT 54 A/A VOL B2
BIT 58 NAV 2 EN
BIT 62 NAV VOL B2
BIT 35 ICOM B VOL B3
BIT 39 ICOM A VOL B3
BIT 43 A/G 1 EN
BIT 47 A/G 1 VOL B3
BIT 51 A/G 2 VOL B3
BIT 55 A/A VOL B3
BIT 59 NAV 3 EN
BIT 63 NAV VOL B3

MULTIPLEXER ×4

BIT 8
"1" 0-7 FRM SYNC
"0" 9-15 SPARE
24-31
MULTIPLEXER

MULTIPLEXER ×3
MULTIPLEXER
MULTIPLEXER
0-15, 24-31
32-63
MULTIPLEXER
BITS 0 TO 127
MANCHESTER ENCODER
MID DECK SERIAL DATA WORD TO ACCU → 69 OZ4 16.11-1

16-23, 64-95 → 49 ZZ6
96-124 → 50 ZZ5

MID DECK AUDIO/AIRLOCK 2 BACKUP
VOX SENS
VOX LEVEL SET
VOX THRESHOLD DETECTOR
VOX ENABLE
5K, 22K, 130Ω, +6V, +12V
MIN, MAX
PNL M042F R18

MIKE SIG TO ACCU
SIDE TONE SWITCH
EARPHONE AUDIO FROM ACCU
SIDETONE ENABLE
TO MIDDECK SMU

ICOM PTT
HOT MIKE → PTT 1 BIT 25
VOX MODE → VOX
VM BIT 27
PTT 2 BIT 26

PAGE BIT 31
PTT 1 BIT 25
BIT 31
PTT 1
PTT 2
BITS 8, 24, 40, 56, 72, 88-95, 104-111, AND 120-124
MZ8 LZ5 XZ5 48

△ EACH MHA PROVIDES CONNECTIONS FOR THREE HTU'S

7. MIDDECK AUDIO/AIRLOCK 2 BACKUP EXISTS ON OV-102 ONLY

△6 THE KLAXON AND SIREN SIGNALS ARE CONNECTED TO A SEPARATE SPEAKER. THE SPEAKER POWER SWITCH DOES NOT HAVE TO BE ON IN ORDER FOR THE KLAXON AND SIREN TO BE HEARD

△5 SYSTEM CONFIGURATION CONTROL BITS ARE PROVIDED BY THE MS ATU (PRIMARY) AND PILOT ATU (SECONDARY) AND ARE BITS 16-23, 64-87, 96-103, 112-119

△4 STATION (ATU) CONFIGURATION CONTROL BITS ARE BITS 24-63

△3 ORBITER HEADSETS ARE: COMM CAP, MINI-HEADSET, WIRELESS HEADSET OR LIGHTWEIGHT HEADSET

2. PTT 1 = ICOM PTT OR HOT MIKE
PTT 2 = PTT XMIT POSITION OF THE PTT SWITCH SELECTED

NOTES: 1. VOX = VOX MODE SELECTED AND VOX THRESHOLD EXCEEDED
VM = VOX XMIT POSITION OF THE MODE SWITCH SELECTED

10 ATU 6

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN R. COLLINGS JR.	12/30/81		
DR M. GILLESPIE	7/28/86	AUDIO PANEL/ATU MID DECK AUDIO/ AIRLOCK 2 BACKUP	
ENGR L. HOPPE			
ENGR	7/1/96		
APPR	7/16/96		
APPR	7/16/96	SPACE SHUTTLE	DWG NO 16.10B
CADS S.R. Rimmer	7-22-96	OV 102	
LTR E PCN 6		121 X 34	PAGE SHEET 6 OF 7

BASIC REV E-6

MID DECK SU M029J

POWER SUPPLY

HEAT SINK

DRIVER AMP

VOLTAGE REG 1

VOLTAGE REG 2

TO LOGIC AND AMPS

KEY LAMP

L02

JUMPERED

MIKE SIGNAL RETURN

MIKE SIGNAL

EARPHONE SIGNAL RETURN

EARPHONE SIGNAL

TONES/AUDIO MIXING CIRCUIT

MID DECK AUDIO/AIRLOCK 2 BACKUP

ACCU/BYPASS TONES

PNL M042F S13

BYPASS TONE VOLUME

PNL M042F R3

TONE A2

RETURN

FROM CAUTION AND WARNING S.Z-2

C & W A TONES

HOT USED

XMIT

ICOM

PTT COMMON

MID DECK CREW STATION

MID DECK COMM (PNL M039M)

PNL M039M S1

CDU POWER

MIKE POWER +28V

MIKE SIGNAL RTN

EARPHONE SIGNAL

EARPHONE SIGNAL RTN

PTT COMMON

XMIT PTT

ICOM PTT

MULTIPLE HEADSET ADAPTER (MHA)

J5

MID DECK AUDIO/AIRLOCK 2 BACKUP

MASTER VOL

PNL M042F R2

MIN

MAX

MID DECK SPEAKER AUDIO

PNL M042F S4

SPKR/MIC

SPKR POWER

MIDDECK ATU POWER SUPPLY

+28V

EMI FILTER

20V SERIES REG

12V SERIES REG

6V SHUNT REG

10V SHUNT REG

+12V

+6V

+10V

+20V

TO MIKE CKTS AND LOGIC

TO EARPHONE CKTS

DIGITAL CLOCK GENERATOR

CLOCK TO MIDDECK DIGITAL CIRCUITS

MULTIPLEXER

BITS 16-23

BITS 64-71

BITS 72-79

BITS 80-87

BITS 88-95

BITS 96-103

BITS 104-111, 120-124

BITS 112 TO 119

BITS 96 TO 124

BIT 12

BIT 16 EVA A/G 1

BIT 17 EVA A/G 2

BIT 18 EVA A/A

BIT 19 SPARE

BIT 20 SPARE

BIT 21 EVA PAGE

BIT 22 SPARE

BIT 23 SPARE

BIT 64 RCDR CH 1 BIT 0

BIT 65 RCDR CH 1 BIT 1

BIT 66 RCDR CH 1 BIT 2

BIT 67 RCDR CH 2 BIT 0

BIT 68 RCDR CH 2 BIT 1

BIT 69 RCDR CH 2 BIT 2

BIT 70 NSP 1/AG 1

BIT 71 NSP 2/AG 1

BIT 72 VOX

BIT 73 NSP 1/AG 2

BIT 74 NSP 2/AG 2

BIT 75 SPARE

BIT 76 SPARE

BIT 77 SPARE

BIT 78 SPARE

BIT 79 SPARE

BIT 80 SPARE

BIT 81 SPARE

BIT 82 SPARE

BIT 83 SPARE

BIT 84 PL BAT/ICOM A

BIT 85 PL BAT/ICOM B

BIT 86 SPARE

BIT 87 SPARE

BIT 96 SL/AG 1

BIT 97 SL/AG 2

BIT 98 SL/AA

BIT 99 SL/ICOM A

BIT 100 SL/ICOM B

BIT 101 SL/PAGE

BIT 102 SL/CAW

BIT 103 SPARE

BIT 112 DR/AG 1

BIT 113 DR/AG 2

BIT 114 DR/AA

BIT 115 DR/ICOM A

BIT 116 DR/ICOM B

BIT 117 DR/PAGE

BIT 118 DR/CAW

BIT 119 SPARE

SIMPLEX

DUPLEX

BIT 21 EVA PAGE

LOW DATA RATE

NSP 2 ON

NSP 1 ON

BIT T4 NSP 2/A02

BIT T3 NSP 1/A02

BIT T1 NSP 2/A01

BIT T0 NSP 1/A01

NOT USED

MID DECK SPEAKER/CDU

PNL R141A CB5

AUDIO

RN 8

R14

VR8

MIKE POWER +28V

MIKE SIGNAL RTN

MIKE SIGNAL

EARPHONE SIGNAL RTN

EARPHONE SIGNAL

PTT COMMON

XMIT PTT

ICOM PTT

MIKE SIGNAL RETURN

EARPHONE SIGNAL RETURN

EARPHONE SIGNAL

MIKE SIGNAL

FROM MID DECK CDU

FROM AIRLOCK CDU 2

16, 10-4

Z1

90

Z7

46

CAW BIT 28

AUDIO/TONE

OFF

PNL M042F S1

POWER

Z4

50

48

VOX

Z2

49

64-95

88-95

Z2

Z4

Z4

Z2

48

BIT 12

Z2

48

VOX ENABLE

VOX THRESHOLD DETECTOR

SIDE TONE SWITCH

VOX MODE

HOT MIKE

ICOM PTT

PTT 1 BIT 25

PTT 2 BIT 26

PTT 1

PTT 2

PAGE BIT 31

PAGE EN BIT 31

PNL M042F S7

PAGE

PNL M042F S11

PTT/VOX

PTT/HOT

VOX/VOX

XMIT/ICOM MODE

5.1K

VM BIT 27

XMIT

ICOM

PTT COMMON

MID DECK AUDIO/AIRLOCK 2 BACKUP

MIKE SIGNAL RETURN

EARPHONE SIGNAL

EARPHONE SIGNAL RETURN

MIKE SIGNAL

FROM MID DECK CDU

MID DECK AUDIO/AIRLOCK 2 BACKUP

PAGE

PNL M042F S7

PAGE EN BIT 31

MID DECK AUDIO/AIRLOCK 2 BACKUP

PNL M042F S11

PTT/VOX

PTT/HOT

VOX/VOX

XMIT/ICOM MODE

5.1K

VOX MODE

HOT MIKE

ICOM PTT

PTT 1 BIT 25

PTT 2 BIT 26

PTT 1

PTT 2

VM BIT 27

XMIT

ICOM

PTT COMMON

MID DECK AUDIO/AIRLOCK 2 BACKUP

MASTER VOL

PNL M042F R2

MIN

MAX

TONES/AUDIO MIXING CIRCUIT

MID DECK AUDIO/AIRLOCK 2 BACKUP

ACCU/BYPASS TONES

PNL M042F S13

BYPASS TONE VOLUME

PNL M042F R3

TONE A2

RETURN

FROM CAUTION AND WARNING S.Z-2

C & W A TONES

HOT USED

XMIT

ICOM

PTT COMMON

MID DECK CREW STATION

MID DECK COMM (PNL M039M)

PNL M039M S1

CDU POWER

MIKE POWER +28V

MIKE SIGNAL RTN

EARPHONE SIGNAL

EARPHONE SIGNAL RTN

PTT COMMON

XMIT PTT

ICOM PTT

MULTIPLE HEADSET ADAPTER (MHA)

J5

MID DECK AUDIO/AIRLOCK 2 BACKUP

MASTER VOL

PNL M042F R2

MIN

MAX

MID DECK SPEAKER AUDIO

PNL M042F S4

SPKR/MIC

SPKR POWER

MIDDECK ATU POWER SUPPLY

+28V

EMI FILTER

20V SERIES REG

12V SERIES REG

6V SHUNT REG

10V SHUNT REG

+12V

+6V

+10V

+20V

TO MIKE CKTS AND LOGIC

TO EARPHONE CKTS

DIGITAL CLOCK GENERATOR

CLOCK TO MIDDECK DIGITAL CIRCUITS

MULTIPLEXER

BITS 16-23

BITS 64-71

BITS 72-79

BITS 80-87

BITS 88-95

BITS 96-103

BITS 104-111, 120-124

BITS 112 TO 119

BITS 96 TO 124

BIT 12

BIT 16 EVA A/G 1

BIT 17 EVA A/G 2

BIT 18 EVA A/A

BIT 19 SPARE

BIT 20 SPARE

BIT 21 EVA PAGE

BIT 22 SPARE

BIT 23 SPARE

BIT 64 RCDR CH 1 BIT 0

BIT 65 RCDR CH 1 BIT 1

BIT 66 RCDR CH 1 BIT 2

BIT 67 RCDR CH 2 BIT 0

BIT 68 RCDR CH 2 BIT 1

BIT 69 RCDR CH 2 BIT 2

BIT 70 NSP 1/AG 1

BIT 71 NSP 2/AG 1

BIT 72 VOX

BIT 73 NSP 1/AG 2

BIT 74 NSP 2/AG 2

BIT 75 SPARE

BIT 76 SPARE

BIT 77 SPARE

BIT 78 SPARE

BIT 79 SPARE

BIT 80 SPARE

BIT 81 SPARE

BIT 82 SPARE

BIT 83 SPARE

BIT 84 PL BAT/ICOM A

BIT 85 PL BAT/ICOM B

BIT 86 SPARE

BIT 87 SPARE

BIT 96 SL/AG 1

BIT 97 SL/AG 2

BIT 98 SL/AA

BIT 99 SL/ICOM A

BIT 100 SL/ICOM B

BIT 101 SL/PAGE

BIT 102 SL/CAW

BIT 103 SPARE

BIT 112 DR/AG 1

BIT 113 DR/AG 2

BIT 114 DR/AA

BIT 115 DR/ICOM A

BIT 116 DR/ICOM B

BIT 117 DR/PAGE

BIT 118 DR/CAW

BIT 119 SPARE

SIMPLEX

DUPLEX

BIT 21 EVA PAGE

LOW DATA RATE

NSP 2 ON

NSP 1 ON

BIT T4 NSP 2/A02

BIT T3 NSP 1/A02

BIT T1 NSP 2/A01

BIT T0 NSP 1/A01

NOT USED

MID DECK SPEAKER/CDU

PNL R141A CB5

AUDIO

RN 8

R14

VR8

MIKE POWER +28V

MIKE SIGNAL RTN

MIKE SIGNAL

EARPHONE SIGNAL RTN

EARPHONE SIGNAL

PTT COMMON

XMIT PTT

ICOM PTT

MIKE SIGNAL RETURN

EARPHONE SIGNAL RETURN

EARPHONE SIGNAL

MIKE SIGNAL

FROM MID DECK CDU

FROM AIRLOCK CDU 2

16, 10-4

Z1

90

Z7

46

CAW BIT 28

AUDIO/TONE

OFF

PNL M042F S1

POWER

Z4

50

48

VOX

Z2

49

64-95

88-95

Z2

Z4

Z4

Z2

48

BIT 12

Z2

48

VOX ENABLE

VOX THRESHOLD DETECTOR

SIDE TONE SWITCH

PTT 1 BIT 25

PTT 2 BIT 26

PTT 1

PTT 2

PAGE BIT 31

PAGE EN BIT 31

PNL M042F S7

PAGE

PNL M042F S11

PTT/VOX

PTT/HOT

VOX/VOX

XMIT/ICOM MODE

5.1K

VOX MODE

HOT MIKE

ICOM PTT

PTT 1 BIT 25

PTT 2 BIT 26

PTT 1

PTT 2

VM BIT 27

XMIT

ICOM

PTT COMMON

MID DECK AUDIO/AIRLOCK 2 BACKUP

MASTER VOL

PNL M042F R2

MIN

MAX

TONES/AUDIO MIXING CIRCUIT

MID DECK AUDIO/AIRLOCK 2 BACKUP

ACCU/BYPASS TONES

PNL M042F S13

BYPASS TONE VOLUME

PNL M042F R3

TONE A2

RETURN

FROM CAUTION AND WARNING S.Z-2

C & W A TONES

HOT USED

XMIT

ICOM

PTT COMMON

MID DECK CREW STATION

MID DECK COMM (PNL M039M)

PNL M039M S1

CDU POWER

MIKE POWER +28V

MIKE SIGNAL RTN

EARPHONE SIGNAL

EARPHONE SIGNAL RTN

PTT COMMON

XMIT PTT

ICOM PTT

MULTIPLE HEADSET ADAPTER (MHA)

J5

S R Q P O N M L K J

TO MIDDECK SW1

DATE: 06/24/96 | NAME: SVJ | VERSION: INK 5

V U T S R Q P O N M

8 7 6 5 4 3 2 1

ORBITER HEADSET

HEADSET INTERFACE UNIT

ICOM XMIT

(CLIP-ON)

MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

J1 J2 J3

MULTIPLE HEADSET ADAPTER (MHA)

MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

MID DECK COMM (PNL M039M)

MID DECK COMM

CCU POWER
ON
OFF
PNL M039M S1

MIKE POWER +28V

MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

MN B
AUDIO
MID DECK SPKR/CCU
3A
PNL R14 A CB5
V_{MNB} R14

MID DECK SU M029J

POWER SUPPLY
HEAT SINK
FILTER
VOLTAGE REG 1
VOLTAGE REG 2
DRIVER AMP
TO LOGIC AND AMPS

NOT USED
XMIT
ICOM
PTT COMMON

JUMPERED
MIKE SIGNAL
MIKE SIGNAL RETURN

EARPHONE SIGNAL
EARPHONE SIGNAL RETURN

KEY LAMP

TO ACA5 FROM ACA5 LD2
CHANNEL SIGNAL CMD

69 MID DECK SPEAKER
70 MID DECK SPEAKER/MIKE
73 MID DECK SPEAKER

VOX/PTT DETECT
C&W DETECT

FROM CAUTION AND WARNING 16.10-3 91 TONE B
KLAXON (ΔP) AND SIREN (FIRE)

FROM CAUTION AND WARNING 5.2-2 C & W A TONES
106 RETURN
105 TONE A2

BYPASS TONE VOLUME
CW
PNL M042F R3

MID DECK AUDIO/AIRLOCK 2 BACKUP
TONES
ACCU
ACCU BYPASS
PNL M042F S13
300Ω 1W

TONES/AUDIO MIXING CIRCUIT

MID DECK AUDIO/AIRLOCK 2 BACK
MASTER VOL
5K
MIN MAX
PNL M042F R2

NOT USED
NSP 1 ON
NSP 2 ON
LOW DATA RATE
DUPLEX BIT 21 EVA PAGE
SIMPLEX

90
16.10-4 FROM AIRLOCK CCU 2

FROM MID DECK CCU

BASIC REV E-6

DATE: 05/11/96	NAME: BJB	VERSION: INK: 6
DATE: 06/14/96	NAME: VSH	VERSION: INK: 7
DATE: 06/24/96	NAME: SVJ	VERSION: INK: 8

J I H G F E D C B A

TO ACCU 67 — 68 — TO OS SU 73

OS AUDIO PANEL/ATU A13

OS ATU POWER SUPPLY

6V SHUNT REG → +6V → TO MIKE CKTS AND LOGIC
20V SERIES REG
12V SERIES REG → +12V
+20V → TO EARPHONE CKTS
10V SHUNT REG → +10V
DIGITAL CLOCK GENERATOR → CLOCK TO OS MULTIPLEXERS

5.1K 5.1K

OS AUDIO
VOX SENS
VOX LEVEL SET
VOX ENABLE
VOX THRESHOLD DETECTOR
5K 22K 130Ω +6V +12V
MIN MAX R1 PNL A13

MIKE SIG TO ACCU
SIDE TONE SWITCH
EARPHONE AUDIO FROM ACCU
SIDETONE ENABLE
TO OS SMU

ICOM PTT
HOT MIKE
VOX MODE
PTT 1 BIT 25
VOX
PAGE BIT 31
PTT 1 BIT 25
BIT 31
PTT 1
PTT 2
BITS 8, 24, 40, 56, 72, 88-95, 104-111, AND 120-124
VH BIT 27
PTT 2 BIT 26

OS AUDIO VOLUME: ICOM B, ICOM A, A/G 2, A/G 1, A/A

ICOM B
ICOM A
A/G 2
A/G 1
A/A
ENABLE
DEC TO BCD CONV
T/R: OFF, RCV, XMIT — PNL A13 S2

BIT 30 A/A ENABLE
BIT 43 A/G1 ENABLE
BIT 29 A/G2 ENABLE
BIT 42 ICOM A ENABLE
BIT 41 ICOM B ENABLE

BIT 32 BIT 33 BIT 34 BIT 35 BIT 36 BIT 37 BIT 38 BIT 39 BIT 48 BIT 49 BIT 50 BIT 51 BIT 44 BIT 45 BIT 46 BIT 47 BIT 52 BIT 53 BIT 54 BIT 55

BIT 24 VOX
BIT 25 PTT 1
BIT 26 PTT 2
BIT 27 VH
BIT 28 C&W
BIT 29 A/G 2 EN
BIT 30 A/A EN
BIT 31 PAGE EN

BIT 32 ICOM B VOL B0
BIT 36 ICOM A VOL B0
BIT 40 VOX
BIT 44 A/G 1 VOL B0
BIT 48 A/G 2 VOL B0
BIT 52 A/A VOL B0
BIT 56 VOX
BIT 60 NAV VOL B0

BIT 33 ICOM B VOL B1
BIT 37 ICOM A VOL B1
BIT 41 ICOM B EN
BIT 45 A/G 1 VOL B1
BIT 49 A/G 2 VOL B1
BIT 53 A/A VOL B1
BIT 57 NAV 1 EN
BIT 61 NAV VOL B1

BIT 34 ICOM B VOL B2
BIT 38 ICOM A VOL B2
BIT 42 ICOM A EN
BIT 46 A/G 1 VOL B2
BIT 50 A/G 2 VOL B2
BIT 54 A/A VOL B2
BIT 58 NAV 2 EN
BIT 62 NAV VOL B2

BIT 35 ICOM B VOL B3
BIT 39 ICOM A VOL B3
BIT 43 A/G 1 EN
BIT 47 A/G 1 VOL B3
BIT 51 A/G 2 VOL B3
BIT 55 A/A VOL B3
BIT 59 NAV 3 EN
BIT 63 NAV VOL B3

MULTIPLEXER (A) — BIT 8: "1" 0-7 FRM SYNC; "0" 9-15 SPARE, 24-31
MULTIPLEXER (A)
MULTIPLEXER (A)
MULTIPLEXER (A)
MULTIPLEXER — 0-15, 24-31
MULTIPLEXER — 32-63
MULTIPLEXER — 16-23, 64-95 (49); 96-124 (50)
BITS 0 TO 127
MANCHESTER ENCODER
OS SERIAL DATA WORD TO ACCU 69 → 16.11-1

(A) EACH MHA PROVIDES CONNECTIONS FOR THREE HHU'S

7. OS ATU EXISTS ON OV-102 ONLY

(C) THE KLAXON AND SIREN SIGNALS ARE CONNECTED TO A SEPARATE SPEAKER, THE SPEAKER POWER SWITCH DOES NOT HAVE TO BE ON IN ORDER FOR THE KLAXON AND SIREN TO BE HEARD

(D) SYSTEM CONFIGURATION CONTROL BITS ARE PROVIDED BY THE MS ATU (PRIMARY) AND PILOT ATU (SECONDARY) AND ARE BITS 16-23, 64-87, 96-103, 112-119

(B) STATION (ATU) CONFIGURATION CONTROL BITS ARE BITS 24-63

(A) ORBITER HEADSETS ARE: COMM CAP, MINI-HEADSET, WIRELESS HEADSET, OR LIGHTWEIGHT HEADSET

2. PTT 1 = ICOM PTT OR HOT MIKE
   PTT 2 = PTT XMIT POSITION OF THE PTT SWITCH SELECTED

NOTES: 1. VOX = VOX MODE SELECTED AND VOX THRESHOLD EXCEEDED
   VH = VOX XMIT POSITION OF THE MODE SWITCH SELECTED

10 ATU 7

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN S. K. KIMBRELL	8/28/81	
DR		
ENGR L. HOPPE		AUDIO PANEL/ATU OS AND OS SU
ENGR	7/1/96	
APP Danny Elliott	7/16/96	
APP Pamela Mireles	7/16/96	SPACE SHUTTLE — DWG NO 16.10B
CADS S. K. Kimbrell	7-22-96	OV-102
LTR E PCN 6		104.5 X 34 — PAGE — SHEET 7 OF 7

BASIC REV E-6

8 7 6 5 4 3 2 1

DATE: 06/24/96 | NAME: SVJ | VERSION: INK.8

OS SU A2

POWER SUPPLY
HEAT SINK
FILTER
VOLTAGE REG 1
VOLTAGE REG 2
DRIVER AMP
TO LOGIC AND AMPS

AFT ROTATION HANDCONTROLLER
PNL A7

NOT USED
PTT COMMON
XMIT
ICOM

JUMPERED
MIKE SIGNAL
MIKE SIGNAL RETURN

OS AUDIO
SPKR POWER
SPKR/MIC
SPKR
OFF
PNL A13 S10

TO ACA5 Z1 4, 3 FROM ACA5 LD2
CHANNEL SIGNAL CMD

VOX/PTT DETECT
C&W DETECT
KEY LAMP

EARPHONE SIGNAL
EARPHONE SIGNAL RETURN

OS AUDIO
MASTER SPEAKER VOLUME
MIN MAX
PNL A13 R2

MN A AUDIO
MS/OS
3A
PNL R14A CB2
V MNA R14

Z4 16, 10-2 TONE A
KLAXON (ΔP) AND SIREN (FIRE)

Z2 48 BIT 72

BIT 16 EVA A/G 1
BIT 17 EVA A/G 2
BIT 18 EVA A/A
BIT 19 SPARE
BIT 20 SPARE
BIT 21 EVA PAGE
BIT 22 SPARE
BIT 23 SPARE
MULTIPLEXER
BITS 16-23

BIT 64 RCDR CH 1 BIT 0
BIT 65 RCDR CH 1 BIT 1
BIT 66 RCDR CH 1 BIT 2
BIT 67 RCDR CH 2 BIT 0
BIT 68 RCDR CH 2 BIT 1
BIT 69 RCDR CH 2 BIT 2
BIT 70 NSP 1/AG 1
BIT 71 NSP 2/AG 1
MULTIPLEXER
BITS 64-71

BIT 72 VOX
BIT 73 NSP 1/AG 2
BIT 74 NSP 2/AG 2
BIT 75 SPARE
BIT 76 SPARE
BIT 77 SPARE
BIT 78 SPARE
BIT 79 SPARE
MULTIPLEXER
BITS 72-79

BIT 80 SPARE
BIT 81 SPARE
BIT 82 SPARE
BIT 83 SPARE
BIT 84 P/L BAY/ICOM A
BIT 85 P/L BAY/ICOM B
BIT 86 SPARE
BIT 87 SPARE
MULTIPLEXER
BITS 80-87

MULTIPLEXER
BITS 16-23 64-95
Z4 49
BITS 88-95
Z2 48

NSP 1 ON
NSP 2 ON
LOW DATA RATE
NOT USED
DUPLEX
SIMPLEX
BIT 70 NSP 1/AG1
BIT 71 NSP 2/AG1
BIT 73 NSP 1/AG2
BIT 74 NSP 2/AG2
BIT 21 EVA PAGE

BIT 96 SL/AG 1
BIT 97 SL/AG 2
BIT 98 SL/AA
BIT 99 SL/ICOM A
BIT 100 SL/ICOM B
BIT 101 SL/PAGE
BIT 102 SL/C&W
BIT 103 SPARE
MULTIPLEXER
BITS 96-103

BIT 112 DR/AG 1
BIT 113 DR/AG 2
BIT 114 DR/AA
BIT 115 DR/ICOM A
BIT 116 DR/ICOM B
BIT 117 DR/PAGE
BIT 118 DR/C&W
BIT 119 SPARE
MULTIPLEXER
BITS 112 TO 119

BITS 104-111, 120-124
46 VOX
Z2
MULTIPLEXER
BITS 96 TO 124
50 Z4

OS ATU POWER SUPPLY
+28V
EMI FILTER
20V SERIES REG
6V SHUNT REG
12V SERIES REG
10V SHUNT REG
DIGITAL CLOCK GENERATOR
+6V
+12V
+20V
+10V
TO MIKE CKTS AND LOGIC
TO EARPHONE CKTS
CLOCK TO OS MULTIPLEXERS

5.1K

OS AUDIO
POWER
AUD/TONE
AUD
OFF
PNL A13 S1
C&W BIT 28 46 Z7

FROM OS SMU AUDIO

VOX ENABLE
VOX THRESHOLD DETECTOR
VOX LEVEL SET
130K
+6V

ORBITER HEADSET
HEADSET INTERFACE UNIT
ICOM
XMIT
(CLIP-ON)

J1
MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

J2
MULTIPLE HEADSET ADAPTER (MHA)
MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT
J3

OS COMM (PNL A13)
DS COMM
CCU POWER
ON
OFF
PNL A13 S12
MIKE POWER

MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN

OS AUDIO
PAGE
PAGE EN BIT 31
PNL A13 S17

SIDE TONE SWITCH
EARPHONE
SIDETONE ENABLE

PAGE BIT 31
PTT 1 BIT 25
PTT 1
PTT 2
PTT 2 BIT 26
BITS 8, 24, 104-111, AND

OS AUDIO
XMIT/ICOM MODE
5.1K
PTT/VOX
PTT/HOT
PTT/PTT
VOX/VOX
PNL A13 S11

ICOM PTT
HOT MIKE
VOX MODE
VOX
VM BIT 27

S R O P O N M L

8 7 6 5 4 3 2 1

OS SU A2

POWER SUPPLY
HEAT SINK
FILTER
VOLTAGE REG 1
VOLTAGE REG 2
DRIVER AMP
TO LOGIC AND AMPS

AFT ROTATION HANDCONTROLLER
PNL A7

NOT USED
PTT COMMON
XMIT
ICOM

JUMPERED
MIKE SIGNAL
MIKE SIGNAL RETURN

OS AUDIO
SPKR POWER
SPKR/MIC
SPKR
OFF
PNL A13 S10

TO ACA5 Z1 4,3 FROM ACA5 LD2
CHANNEL SIGNAL CMD

VOX/PTT DETECT
C&W DETECT
KEY LAMP
EARPHONE SIGNAL
EARPHONE SIGNAL RETURN

TONE A
KLAXON (ΔP) AND SIREN (FIRE)
Z4 16,10-2

OS AUDIO
MASTER SPEAKER VOLUME
MIN MAX
PNL A13 R2

MN A AUDIO MS/OS 3A CB2
PNL R14A
V MNA R14

NOT USED

BIT 72
BIT 16 EVA A/G 1
BIT 17 EVA A/G 2
BIT 18 EVA A/A
BIT 19 SPARE
BIT 20 SPARE
BIT 21 EVA PAGE
BIT 22 SPARE
BIT 23 SPARE
MULTIPLEXER
BITS 16-23

BIT 64 RCDR CH 1 BIT 0
BIT 65 RCDR CH 1 BIT 1
BIT 66 RCDR CH 1 BIT 2
BIT 67 RCDR CH 2 BIT 0
BIT 68 RCDR CH 2 BIT 1
BIT 69 RCDR CH 2 BIT 2
BIT 70 NSP 1/AG 1
BIT 71 NSP 2/AG 1
MULTIPLEXER
BITS 64-71

BIT 72 VOX
BIT 73 NSP 1/AG 2
BIT 74 NSP 2/AG 2
BIT 75 SPARE
BIT 76 SPARE
BIT 77 SPARE
BIT 78 SPARE
BIT 79 SPARE
MULTIPLEXER
BITS 72-79

BIT 80 SPARE
BIT 81 SPARE
BIT 82 SPARE
BIT 83 SPARE
BIT 84 P/L BAT/ICOM A
BIT 85 P/L BAT/ICOM B
BIT 86 SPARE
BIT 87 SPARE
MULTIPLEXER
BITS 80-87

BIT 96 SL/AG 1
BIT 97 SL/AG 2
BIT 98 SL/AA
BIT 99 SL/ICOM A
BIT 100 SL/ICOM B
BIT 101 SL/PAGE
BIT 102 SL/C&W
BIT 103 SPARE
MULTIPLEXER
BITS 96-103

BIT 112 DR/AG 1
BIT 113 DR/AG 2
BIT 114 DR/AA
BIT 115 DR/ICOM A
BIT 116 DR/ICOM B
BIT 117 DR/PAGE
BIT 118 DR/C&W
BIT 119 SPARE
MULTIPLEXER
BITS 112 TO 119

MULTIPLEXER
BITS 88-95
BITS 104-111, 120-124
VOX
Z2 48

NSP 1 ON
NSP 2 ON
LOW DATA RATE
DUPLEX
SIMPLEX
BIT 21 EVA PAGE

FROM OS SMU AUDIO

OS AUDIO
POWER
AUD/TONE
OFF
PNL A13

MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN

OS AUDIO
PAGE
PNL A13

OS AUDIO
XMIT/ICOM MODE
5.1K
PTT/VOX
PTT/PTT
PTT/HOT
VOX/VC
PNL A13 S1

ORBITER HEADSET

HEADSET INTERFACE UNIT
ICOM XMIT
(CLIP-ON)

J1
MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

J2
MULTIPLE HEADSET ADAPTER (MHA)
MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT
J3

OS COMM (PNL A13)
OS COMM
CCU POWER
ON
OFF
PNL A13 S12
MIKE POWER

MIKE POWER +28V
MIKE SIGNAL
MIKE SIGNAL RTN
EARPHONE SIGNAL
EARPHONE SIGNAL RTN
PTT COMMON
XMIT PTT
ICOM PTT

BASIC REV E-6

G F E D C B A

8 7 6 5 4 3 2 1

FROM UHF RCVR (95) RZ4 16.9-1

TO UHF XMTR (94) RZ2 16.9-1

0Z8 16.11-2

PRI AND SEC PAGE RECEIVE INPUT LINES
PRI AND SEC AA RECEIVE INPUT LINES
PRI AND SEC AG 2 RECEIVE INPUT LINES
PRI AND SEC AG 1 RECEIVE INPUT LINES
PRI AND SEC ICOM B RECEIVE INPUT LINES
PRI AND SEC ICOM A RECEIVE INPUT LINES

0Z5 16.11-4

SEC BUS CIRCUITS

PRI BUS CIRCUITS

SUMMING NETWORK

INVERTING AMP

0Z6
(54) PRI PWR
(55) SEC PWR
0Z7

SECONDARY UHF AUDIO CIRCUITS

PRIMARY UHF AUDIO CIRCUITS

PAGE — BIT 21
AG 1 — BIT 16
AG 2 — BIT 17
AA — BIT 18

TO EVA/ATC XMTR

PRI AND SEC ICOM A BUSSES
PRI AND SEC ICOM B BUSSES
PRI AND SEC AG1 BUSSES
PRI AND SEC AG2 BUSSES
PRI AND SEC AA BUSSES
PRI AND SEC PAGE BUSSES
PRI AND SEC C&W BUSSES

0Z4 16.11-2

PZ3
(43) FROM MS
(42) FROM PLT
DATA
CLOCK
FRAME SYNC

(ACCU2) SECONDARY CONFIGURATION CONTROL
(ACCU1) PRIMARY CONFIGURATION CONTROL

SERIAL DATA
STORAGE REGISTER
DATA
BIT COMPARATOR
STROBE GENERATOR
STROBE
PRIMARY CONFIGURATION CONTROL REGISTER

SEC SYSTEM CONFIGURATION CONTROL BITS
PRI SYSTEM CONFIGURATION CONTROL BITS

0Z4 16.11-2

PZ3
(41) PILOT SERIAL DATA WORD
(40) MS SERIAL DATA WORD

MANCHESTER DECODER
DATA
CLOCK
FRAME SYNC

CLOCK
FRAME SYNC

SYNC DETECTOR
SYNC OK

C&W TONE SELECT

TONE A
TONE A SWITCH CONTROL
VOX
TONE B SWITCH CONTROL
TONE B

SEC PWR (55) 0Z7
PRI PWR (54) 0Z8

SEC PWR (55) 0Z7
PRI PWR (54) 0Z8

(71) (70) FROM C&W SYSTEM FZ6 5.2-2

0Z1 16.11-2

BASIC REV E-6

P O N M L K J I H G

AIR LOCK SWITCHING CIRCUITS

MS SWITCHING CIRCUITS

PLT SWITCHNG CIRCUITS

INCLUDES:
AIRLOCK 1 BACKUP SWITCHING CIRCUITS (USED ON OV-102 ONLY)
MIDDECK SPEAKER SWITCHING CIRCUITS
OS SWITCHING CIRCUITS (USED ON OV-102 ONLY)
PS SWITCHING CIRCUITS
CDR SWITCHING CIRCUITS

PRIMARY POWER
SECONDARY POWER
PRIMARY AND SECONDARY POWER

PILOT PWR SUPPLY → TO PILOT SWITCHING CIRCUITS-THIS MODULE

16.11-2

FROM AIRLOCK ATU
FROM MS ATU
FROM PLT ATU

TO AIRLOCK FROM ATU
TO MS ATU
TO PLT ATU

FROM AIRLOCK ATU
FROM MS ATU
FROM PLT ATU

TALK
LISTEN

MANCHESTER DECODER
FRAME SYNC
CLOCK
SERIAL DATA
STORAGE REGISTER
BIT COMPARATOR
STROBE
VOX DETECTOR
16 BIT COUNTER
SYNC DECODER
SYNC
TO PRIMARY CONFIGURATION CONTROL

STATION CONTROL REGISTER
INPUT GATES
OUTPUT LATCHES
BITS 24-63

VM BIT 27
VOX
PTT 2 BIT 26
PTT 1 BIT 25
XMIT ENABLE
ICOM ENABLE

AG1 ENABLE BIT 26
AG2 ENABLE BIT 29
AA ENABLE BIT 30
ICOM A ENABLE BIT 42
ICOM B ENABLE BIT 41
SYNC
PAGE ENABLE BIT 31

AG1 TALK
AG2 TALK
AA TALK
UHF KEY
ICOM A TALK
ICOM B TALK
PAGE TALK

TO PLT DECODER (SEC)
TO MS DECODER (PRI)

ICOM A VOLUME CONTROL — LISTEN BITS 36 TO 39
ICOM B VOLUME CONTROL — LISTEN BITS 32 TO 36
AG 1 VOLUME CONTROL — LISTEN BITS 44 TO 47
AG 2 VOLUME CONTROL — LISTEN BITS 48 TO 51
AA VOLUME CONTROL — LISTEN BITS 52 TO 55
PAGE LISTEN
BIT 28 C&W
TACAN VOLUME CONTROL — TONES (CDR AND PLT ONLY) BITS 60 TO 63

TALK VOICE CANCELLER

PLT INPUT (TALK)
SEC ICOM A (LISTEN + TALK)
PRI ICOM A (LISTEN + TALK)
SEC ICOM B (LISTEN + TALK)
PRI ICOM B (LISTEN + TALK)
SEC AG 1 (LISTEN + TALK)
PRI AG 1 (LISTEN + TALK)
SEC AG 2 (LISTEN + TALK)
PRI AG 2 (LISTEN + TALK)
SEC AA (LISTEN + TALK)
PRI AA (LISTEN + TALK)
SEC PAGE (LISTEN + TALK)
PRI PAGE (LISTEN + TALK)
C&W TONES
TACAN 1
TACAN 2
TACAN 3

ICOM A BUS INPUT
ICOM B BUS INPUT
AG 1 BUS INPUT
AG 2 BUS INPUT
AA BUS INPUT
PAGE BUS INPUT
UHF KEY

ICOM A TALK
ICOM B TALK
AG 1 TALK
AG 2 TALK
AA TALK
PAGE TALK

TACAN 1 BIT 57
TACAN 2 BIT 58
TACAN 3 BIT 59

8 LINES
2 LINES
1 LINE
3 LINES

SUMMING NETWORK
INVERT AMP
PRI BUS
SEC B

TO CDR TACAN CKTS

UHF RADIO KEY CIRCUITS
IRAM
IRFM
NOT USED
AA KEY

C&W TONE S
TONE A
TONE A SWITCH CONTROL
VOX
TONE B SWITCH CONTROL
TONE B

TO UHF RCVR
FROM TACAN RCVR
FROM C&W SYSTEM

DATE	NAME	VERSION
DATE: 01/30/96	NAME: VSH	VERSION: BPT: 6
DATE: 07/10/96	NAME: VSH	VERSION: BPT: 7
DATE: 07/17/96	NAME: BJB	VERSION: INK: 6

ACCU

ESS2CA
013 & R14

AUDIO
AUD CTR
1
3A
PNL R14 CB1

MM C
AUDIO
AUD CTR
2
3A
PNL R14 CB9

V_{ESS2CA}

V_{MNC} R14

AUDIO CENTER
1
OFF
2
PNL C3 S6

PRIMARY POWER SUPPLY REGULATORS
54
PRIMARY INVERTER
SECONDARY POWER SUPPLY REGULATORS
55
SECONDARY INVERTER
16.11-2

PILOT PWR SUPPLY → TO PILOT SWITCHING CIRCUITS-THIS MODULE

PRIMARY POWER
SECONDARY POWER
PRIMARY AND SECONDARY POWER

67
68
69
16.10-1 16.10-2 16.10-3 16.10-4 16.10-5 16.10-6 16.10-7

8 LINES
FROM AIRLOCK ATU
FROM MS ATU
FROM PLT ATU
TO AIRLOCK FROM ATU
TO MS ATU
TO PLT ATU

41
40
43
42
TO PLT DECODER (SEC)
TO MS DECODER (PRI)

TALK
LISTEN

MANCHESTER DECODER
FRAME SYNC
CLOCK
SERIAL DATA
STORAGE REGISTER
BIT COMPARATOR
STROBE
VOX DETECTOR
16 BIT COUNTER
SYNC DECODER
SYNC
TO PRIMARY CONFIGURATION CONTROL

STATION CONTROL REGISTER
INPUT GATES
OUTPUT LATCHES
BITS 24-63

VM BIT 27
VOX
PTT 2 BIT 26
PTT 1 BIT 25
XMIT ENABLE
ICOM ENABLE

AG1 ENABLE BIT 26
AG2 ENABLE BIT 29
AA ENABLE BIT 30
ICOM A ENABLE BIT 42
ICOM B ENABLE BIT 41
SYNC
PAGE ENABLE BIT 31

AG1 TALK
AG2 TALK
AA TALK
UHF KEY
ICOM A TALK
ICOM B TALK
PAGE TALK

ICOM A VOLUME CONTROL — LISTEN BITS 36 TO 39
ICOM B VOLUME CONTROL — LISTEN BITS 32 TO 36
AG 1 VOLUME CONTROL — LISTEN BITS 44 TO 47
AG 2 VOLUME CONTROL — LISTEN BITS 48 TO 51
AA VOLUME CONTROL — LISTEN BITS 52 TO 55
PAGE LISTEN
TACAN VOLUME CONTROL — TONES (COR AND PLT ONLY) BITS 60 TO 63

TALK VOICE CANCELLER

PLT INPUT (TALK)
SEC ICOM A (LISTEN + TALK)
PRI ICOM A (LISTEN + TALK)
ICOM A TALK
SEC ICOM B (LISTEN + TALK)
PRI ICOM B (LISTEN + TALK)
ICOM B TALK
SEC AG 1 (LISTEN + TALK)
PRI AG 1 (LISTEN + TALK)
AG 1 TALK
SEC AG 2 (LISTEN + TALK)
PRI AG 2 (LISTEN + TALK)
AG 2 TALK
SEC AA (LISTEN + TALK)
PRI AA (LISTEN + TALK)
AA TALK
SEC PAGE (LISTEN + TALK)
PRI PAGE (LISTEN + TALK)
PAGE TALK

C&W TONES
BIT 28 C&W
TACAN 1
TACAN 2
TACAN 3
TACAN 1 BIT 57
TACAN 2 BIT 58
TACAN 3 BIT 59

AIR LO
MS SW
PLT SWIT

NOTES: 1. VOX = VOX MODE SELECTED AND VOX THRESHOLD EXCEEDED
2. PTT 1 = ICOM PTT OR HOT MIKE
4. PRIMARY MODULES ARE ACCU1
SECONDARY MODULES ARE ACCU2
6. STATION (ATU) CONFIGURATION CONTROL BITS ARE BITS 24-63
5. SYSTEM CONFIGURATION CONTROL BITS ARE PROVIDED BY THE MS ATU (PRIMARY) AND PILOT ATU (SECONDARY) ONLY AND ARE BITS 16-23, 64-87, 96-103, 112-119
5. THE UHF KEYING CIRCUITS ARE DUAL REDUNDANT

11 ACCU

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	SIGNATURE	DATE
AUDIO/ACCU	DSGN	
	DR	
	ENGR L. HOPPE	
	ENGR	7/19/96
	APP	7/22/96
DWG NO 16.11	APP	7/23/96
SPACE SHUTTLE ALL	CADS S.R. Kinder	7/23/96
SHEET 1 OF 2 PAGE	LTR E PCN 6	
104.5 x 34		

BASIC REV E-6

DATE: 6/26/87	NAME: VCO	VERSION: INK 4
DATE: 10/04/90	NAME: LAM	VERSION: BPT 5
DATE: 10/23/90	NAME: MAG	VERSION: INK 5

ACCU

SECONDARY NSP RECORDER CIRCUITS
PRIMARY NSP RECORDER CIRCUITS
CHAN 1
CHAN 1
CHAN 2
CHAN 2
IT 70 NSP 1
IT 71 NSP 2

PRI AND SEC PAGE RECEIVE INPUT LINES
PRI AND SEC AA RECEIVE INPUT LINES
PRI AND SEC AG2 RECEIVE INPUT LINES
PRI AND SEC AG1 RECEIVE INPUT LINES
PRI AND SEC ICOM B RECEIVE INPUT LINES
PRI AND SEC ICOM A RECEIVE INPUT LINES

PRI AND SEC ICOM A BUSSES
PRI AND SEC ICOM B BUSSES
PRI AND SEC AG1 BUSSES
PRI AND SEC AG2 BUSSES
PRI AND SEC AA BUSSES
PRI AND SEC PAGE BUSSES
PRI AND SEC C&W BUSSES

SPACE LAB
SL PAGE AUDIO CIRCUITS
SL AG2 AUDIO CIRCUITS
SL AG1 AUDIO CIRCUITS
SL AA AUDIO CIRCUITS
SL ICOM B AUDIO CIRCUITS
SL ICOM A AUDIO CIRCUITS

SEC PWR 55 PZ7 16.11-1
54 QZ8 16.11-1 PRI PWR

C & W TONES UZ7 SPACELAB 2.9
AUDIO TO SL LOOPS WZ7 SPACELAB 5.6

TO NSP1 / TO NSP2 — RZ3 16.3-1
FROM NSP1 / TO NSP2 — AZ2 16.3-2
FROM NSP2 — AZ2 16.3-2

SECONDARY NSP AUDIO CIRCUIT
PRIMARY NSP AUDIO CIRCUIT
FROM NSP 1 (UPLINK)
AG1
BIT 70
FROM NSP 2 (UPLINK)
AG1
BIT 71
FROM NSP 1 (UPLINK)
AG2
BIT 73
FROM NSP 2 (UPLINK)
AG2
BIT 74
PRI AG1
PRI AG1
PRI AG2
PRI AG2
SEC
PRI

PRIMARY POWER 54 QZ8 16.11-1
55 SECONDARY POWER PZ7 16.11-1

TO NSP1 DOWNLINK / TO NSP2 DOWNLINK — RZ2 16.3-1

DOCKING RING
DR PAGE KEY
DR PAGE AUDIO CKTS
DR AG2 AUDIO CKTS
DR AG1 AUDIO CKTS
DR AA AUDIO CKTS
DR ICOM B AUDIO CKTS
DR ICOM A AUDIO CKTS
PRIMARY CIRCUIT
PRI
PRIMARY BIT 115
SECONDARY CIRCUIT
SEC
SECONDARY BIT 115
BIT 117
BIT 113
BIT 112
BIT 114
BIT 116
BIT 115
PRIMARY
DR C&W
SECONDARY
PRIMARY POWER
SECONDARY POWER
PRIMARY BIT 118
SECONDARY BIT 118
55 PZ7 16.11-1
54 QZ8 16.11-1

AUDIO FROM PAYLOAD BAY
PAYLOAD BAY OUTLETS ICOM B
PAYLOAD BAY OUTLETS ICOM A
PRIMARY AUDIO CIRCUIT
PRIMARY
BIT 84
SECONDARY AUDIO CIRCUIT
SECONDARY
BIT 84
BIT 85
AUDIO TO PAYLOAD BAY
54 UZ8 16.11-1 PRIMARY POWER
55 PZ7 16.11-1 SECONDARY PWR

LAUNCH UMBILICAL STATION AUDIO CIRCUIT ICOM B
LAUNCH UMBILICAL STATION AUDIO CIRCUIT ICOM A
PRI
SEC
AUDIO TO UMBILICAL STATION
PRI PWR 54 QZ8 16.11-1
SEC PWR 55 PZ7 16.11-1

ICOM A IN
ICOM B IN
ICOM A OUT
ICOM B OUT
DEAD FACE SIGNAL OUT
AFT FUSELAGE
LAUNCH UMBILICAL

PAYLOAD BAY
ICOM STATION 1 CCU RECEPTACLE
ICOM STATION 2 CCU RECEPTACLE
110
111
RZ1 16.12 TO TV SYSTEM FOR INTERLEAVED VOICE

AUDIO FROM DOCKING RING LOOPS
PAGE KEY
DOCKING RING INTERFACE
AUDIO TO DOCKING RING LOOPS

NOTES:
1. FOR SPACELAB AND DOCKING RING CIRCUITS ONLY: BITS 101 AND 117 OPERATE ONLY THE SOLID STATE SWITCH ON THE RIGHT HAND HALF OF THE CIRCUIT. THE SOLID STATE SWITCHES ON THE LEFT HALF OF THE PAGE CIRCUITS ARE OPERATED BY SEPARATE PAGE KEYS FROM SPACELAB AND DOCKING RING RESPECTIVELY

11 ACCU 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN TERRI FORSYTHE	5/9/79	
DR		AUDIO/ACCU
ENGR M.W. SMITH		
ENGR [signature]	10-26-90	
APP [signature]	10/26/90	
APP R.W. Rood	10-26-90	SPACE SHUTTLE / DWG NO 16.11
OMNIPLAN S.K. Kinard	11-28-90	ALL / SHEET 2 OF 2
LTR E PCN		82.5 X 34 / PAGE

BASIC REV E

DATE: 10/23/90 | NAME: MAG | VERSION: INK-5

SECONDARY NSP RECORDER CIRCUITS
PRIMARY NSP RECORDER CIRCUITS

SEC PWR
PRI PWR
BIT 64
BIT 65
BIT 66
BIT 70
BIT 71
BIT 67
BIT 68
BIT 69
BINARY TO DECIMAL DECODER
PRIMARY CHANNEL 1
PRIMARY CHANNEL 2
CHAN 1
CHAN 2
BIT 70 NSP 1
BIT 71 NSP 2
TO NSP1
TO NSP2
FROM NSP1
FROM NSP2
FROM NSP 1 (UPLINK)
FROM NSP 2 (UPLINK)
AG1
AG2
BIT 70
BIT 71
BIT 73
BIT 74

PRI AND SEC PAGE RECEIVE INPUT LINES
PRI AND SEC AA RECEIVE INPUT LINES
PRI AND SEC AG2 RECEIVE INPUT LINES
PRI AND SEC AG1 RECEIVE INPUT LINES
PRI AND SEC ICOM B RECEIVE INPUT LINES
PRI AND SEC ICOM A RECEIVE INPUT LINES
PRI AND SEC SYSTEM CONFIGURATION CONTROL BITS
PRI AND SEC ICOM A BUSSES
PRI AND SEC ICOM B BUSSES
PRI AND SEC AG1 BUSSES
PRI AND SEC AG2 BUSSES
PRI AND SEC AA BUSSES
PRI AND SEC PAGE BUSSES
PRI AND SEC C&W BUSSES

SPACE LAB
SL PAGE KEY
SL PAGE AUDIO CIRCUITS
SL AG2 AUDIO CIRCUITS
SL AG1 AUDIO CIRCUITS
SL AA AUDIO CIRCUITS
SL ICOM B AUDIO CIRCUITS
SL ICOM A AUDIO CIRCUITS
PRIMARY CIRCUIT
SECONDARY CIRCUIT
PRIMARY BIT 99
SECONDARY BIT 99
BIT 101
BIT 97
BIT 96
BIT 98
BIT 100
BIT 99

PRIMARY
SECONDARY
SL C&W
PRIMARY BIT 102
SECONDARY BIT 102

DR PAGE KEY
PRIMARY BIT 115
SECONDARY BIT 115
BIT 117
BIT 113
BIT 112
BIT 114
BIT 116
BIT 115
DR C&W
PRIMARY BIT 118
SECONDARY BIT 118

PAGE KEY FROM SL
AUDIO FROM SL LOOPS
SPACELAB 5.6
C & W TONES
SPACELAB 2.9
AUDIO TO SL LOOPS
SPACELAB 5.6
AUDIO FROM DOCKING RING LOOPS
PAGE KEY
DOCKING RING INTERFACE

BASIC REV E

VIDEO SWITCHING UNIT (VSU)

DATE: 10/[illegible]/90	NAME: MAG	VERSION: INK 5
DATE: 04/26/96	NAME: JMB	VERSION: BPL 9
DATE: 07/01/96	NAME: BJB	VERSION: INK 6

12 TV CNTL

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN VICTOR ORTIZ	3/15/78	
DR		TV CONTROL
ENGR L. HOPPE		
ENGR	7/16/96	
APP	7/16/96	
APP	7/16/96	SPACE SHUTTLE — DWG NO 16.12
CAD/ES	7-22-96	ALL
LTR E PCN 6		126.5 X 34 — PAGE — SHEET 1 OF 1

BASIC REV E-6

REMOTE CONTROL UNIT (RCU)

MICROCOMPUTER

FLASH DRIVER (10)
(FLASH IS NOT USED)

TYPICAL OF 64

T S R Q P O N M L K J

DATE: 07/01/96 | NAME: BJB | VERSION: INK 6

ANNUNCIATOR CONTROL ASSEMBLY 4 (REF DWG 4.3) B + V LAMP TEST RIGHT

ANNUNCIATOR CONTROL ASSEMBLY 5 (REF DWG 4.3) B + V LAMP TEST RIGHT

MICROCOMPUTER

FLASH DRIVER (10) (FLASH IS NOT USED)

BASIC REV E-6

DATE: 02/27/96	NAME: VSH	VERSION BPT: 4
DATE: 03/19/96	NAME: VSH	VERSION INK: 19
DATE: 04/24/96	NAME: JMB	VERSION INK: 20

FLIGHT DECK TV INPUT STATION (PNL 019)

TV PWR ON OFF COMMAND PNL 019 S1

VIDEO OUTPUT (J8 16.12) 26
SYNC (J2 16.12) 19
CUE LITE ENABLE (J4 16.12) 15
PWR ON
CMD

LOCATION LOGIC: LOC 1, LOC 2, LOC 4, LOC 8

MIDDECK TV INPUT STATION (PNL M058F)

TV PWR ON OFF COMMAND PNL M058F S10

VIDEO OUTPUT (J8 16.12) 27
SYNC (J2 16.12) 20
CUE LITE ENABLE (J6 16.12) 16
PWR ON
CMD

LOCATION LOGIC: LOC 1, LOC 2, LOC 4, LOC 8

MN B V_{MNB} R14

MN B PORT RMS TV CAMR HTR 3A PNL R14±E CB56 — +28V CAMERA HTR PWR

+28V TVC/PTU PWR

J5 16.12 14 — +28V CAMERA ON/OFF CMD

MN B PORT RMS TV CAMR/PAN-TILT 3A PNL R14±E CB55

RMS CAMERA: PORT, WRIST, ELBOW — PNL A7 S54

J2 16.12 25 — SYNC

J6 16.12 31 — VIDEO

MN B PORT RMS TV PAN-TILT HTR 3A PNL R14±E CB57 — +28V PAN TILT HTR PWR

PORT RMS TV INPUT STATION (PAYLOAD BAY)

PORT REMOTE VIDEO SWITCHER

PORT
STBD
PORT
STBD

PORT RMS WRIST CAMERA

WRIST ON/OFF CMD
WRIST SYNC
WRIST VIDEO OUTPUT
P379 RMS CODE PLUG
LOC 1
LOC 2
LOC 4
LOC 8
TV SIGNAL RETURN

LENS ASSEMBLY: +28V SWT PWR, MANUAL IRIS, IRIS CLK, COLOR ID, ZOOM IN, IRIS OPEN, FOCUS FAR, COLOR SYNC, FOCUS/ZOOM CLK, ZOOM OUT, IRIS CLOSE, FOCUS NEAR

J4: VFM VIDEO, +28V SWT PWR

PAN TILT UNIT (P1 J1 J2 P2)

+28V TVC/PTU PWR
ELBOW ON/OFF CMD
ELBOW SYNC
ELBOW VIDEO OUTPUT
CAMERA HTR PWR
LOC 1
LOC 2
LOC 4
LOC 8
TV SIGNAL RETURN

PORT RMS ELBOW CAMERA

LENS ASSEMBLY: +28V SWT PWR, MANUAL IRIS, IRIS CLK, COLOR ID, ZOOM IN, IRIS OPEN, FOCUS FAR, COLOR SYNC, FOCUS/ZOOM CLK, ZOOM OUT, IRIS CLOSE, FOCUS NEAR

J4: VFM VIDEO, +28V SWT PWR

STBD RMS TV INPUT STATION (PAYLOAD BAY)

TVC VIDEO OUTPUT (J7 16.12) 32
SYNC/CMD INPUT (J2 16.12) 24
ON/OFF CMD (J5 16.12) 13
+28V PTU/TVC PWR

MN A V_{MNA} R14

MN A STBD RMS TV CAMR/PAN-TILT D 3A PNL R14±E CB51

MN A STBD RMS TV CAMR HTR D 3A PNL R14±E CB52 — +28V CAMERA HTR PWR

MN A STBD RMS TV PAN-TILT HTR D 3A PNL R14±E CB53 — +28V PAN/TILT HTR PWR

LOC 1
LOC 2
LOC 4
LOC 8

PAN TILT UNIT (P1 J1 J2 P2)

+28V SWITCHED PWR
TV SIGNAL RETURN

STBD RMS CAMERA (D)

LENS ASSEMBLY: +28V SWT PWR, MANUAL IRIS, IRIS CLK, COLOR ID, ZOOM IN, IRIS OPEN, FOCUS FAR, COLOR SYNC, FOCUS/ZOOM CLK, ZOOM OUT, IRIS CLOSE, FOCUS NEAR

J4: VFM VIDEO, +28V SWT PWR

8. REFER TO TABLE 16.1 FOR DRAWING TRACEABILITY

1. NEW CTVC CAMERAS DO NOT HAVE THE INTERCHANGEABLE LENS ASSEMBLY, BUT DO HAVE THE SAME FUNCTIONALITY/SIGNAL REQUIREMENTS
2. REFERENCE DRAWING NO. TBD FOR DETAILS ON THE CABLES
3. A CABLE MAY ALSO BE ROUTED FROM 019/M058F TO THE TVIP PANEL TO PROVIDE EXTERNAL CAMERA SYNC AND TO RECEIVE EXTERNAL CAMERA VIDEO
4. THE CABLES MENTIONED IN NOTE 3 DO NOT NECESSARILY USE THE SAME INTERNAL PIN CONNECTIONS(I.E. VIU/ORBITER CABLE USES VIDEO OUTPUT AND POWER ONLY)
5. THE TV POWER CABLE, PIGMY CABLE OR VIU/ORBITER CABLE CONNECT TO 019 OR M058F, WHICH CAN CONNECT TO THE VIU WHICH IS CONNECTED VIA OTHER CABLES TO THE L1 OR L2 CAMCORDER
6. LOGIC TO DETERMINE WHICH CAMERA PORT IS BEING USED IS NOT REQUIRED WITH CAMCORDER, NEITHER IS THE SYNC, CUE LITE ENABLE OR CMD SIGNALS

NOTES: 7. LOCATION BIT 16 IS ALWAYS OPEN

13 TV/CAMR PWR

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN VICKI DOGGETT	3/27/96	
DR		
ENGR L. HOPPE		TV/CAMERA POWER
ENGR	5/29/96	
APP	5/29/96	
APP	5/29/96	SPACE SHUTTLE — DWG NO 16.13
CADS J.K. Kimbrell	6-12-96	ALL
LTR E — PCN 6		93.5 X 34 — PAGE — SHEET 1 OF 5

BASIC REV E-6

KEEL/EYA TV INPUT STATION (PAYLOAD BAY) J2

PAN TILT UNIT J1 P1 J2 P2

KEEL/EYA CAMERA B J1 P1

LENS ASSEMBLY J1 P1

FORWARD BAY TV INPUT STATION (PAYLOAD BAY)

FORWARD BAY CAMERA A

AFT BAY TV INPUT STATION (PAYLOAD BAY)

AFT BAY CAMERA C

+28V SUITCHED PWR

+28V SWT PWR

+28V PAN/TILT MTR PWR

+28V CAMERA MTR PWR

+28V PTLT/TVC PWR

TVC VIDEO OUTPUT

SYNC/CMD INPUT

ON/OFF CMD

TV SIGNAL RETURN

VFM VIDEO

LOC 1

LOC 2

LOC 4

LOC 8

FOCUS NEAR

IRIS CLOSE

ZOOM OUT

FOCUS/ZOOM CLK

COLOR SYNC

FOCUS FAR

IRIS OPEN

ZOOM IN

COLOR ID

IRIS CLK

MANUAL IRIS

+28V SWT PWR

LOCATION LOGIC

PWR MOSRF S10

COMMAND

ON

OFF

PWR

TV

+28V CAMERA ON/OFF CMD

PWR MOSRF CB40

CABIN

PWR MOSRF CB41

FWD BAY PAN-TILT MTR

PWR MOSRF CB42

KEEL/EYA PAN-TILT MTR

PWR MOSRF CB43

KEEL/EYA CAMR MTR

PWR MOSRF CB44

KEEL/EYA CAMR/ PAN-TILT

PWR MOSRF CB45

PWR MOSRF CB46

PWR MOSRF CB39

FWD BAY CAMR/ PAN-TILT

PWR MOSRF CB40

FWD BAY CAMR MTR

PWR MOSRF CB35

AFT BAY CAMR MTR

PWR MOSRF CB36

AFT BAY PAN-TILT MTR

PWR MOSRF CB34

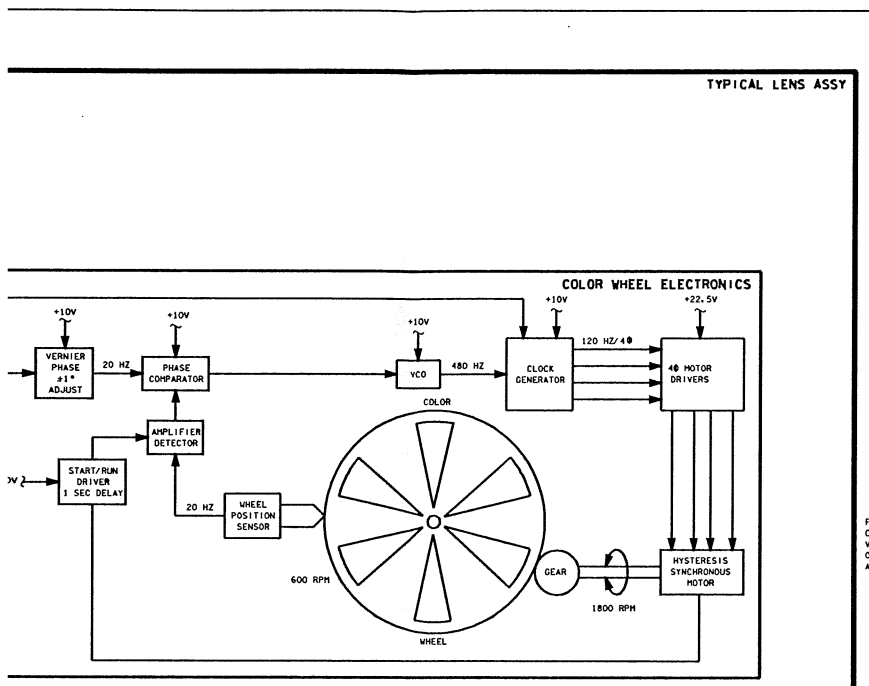
AFT BAY CAMR/ PAN-TILT

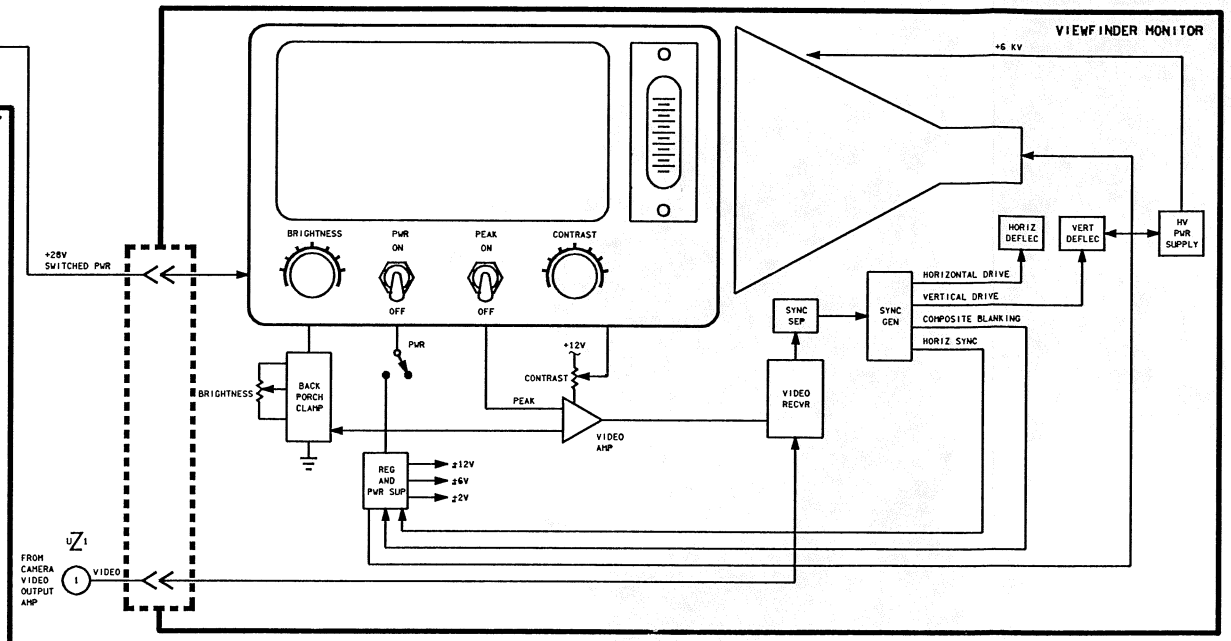
PWR MOSRF S1

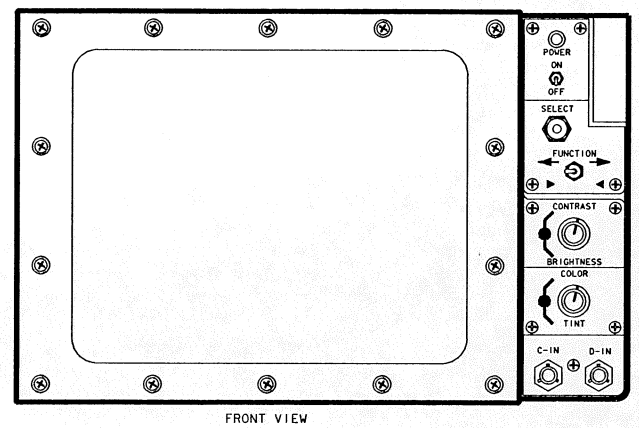
COMMAND

DATE: 06/26/96 NAME: JMB VERSION IN#320

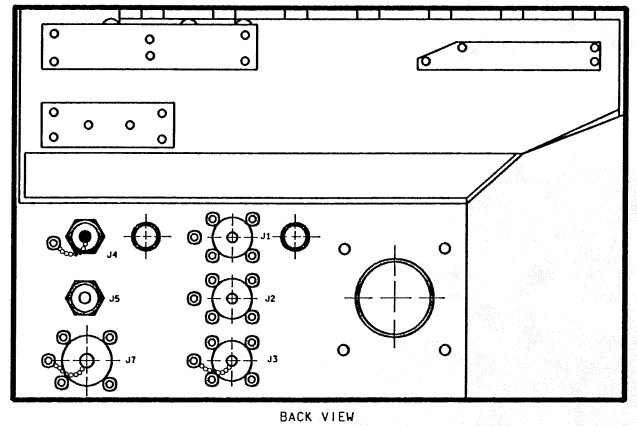
DATE: 02/1 /96	NAME: BJB	VERSION: BPT: 4
DATE: 02/27/96	NAME: SVJ	VERSION: INK: 14
DATE: 03/08/96	NAME: BJB	VERSION: INK: 15



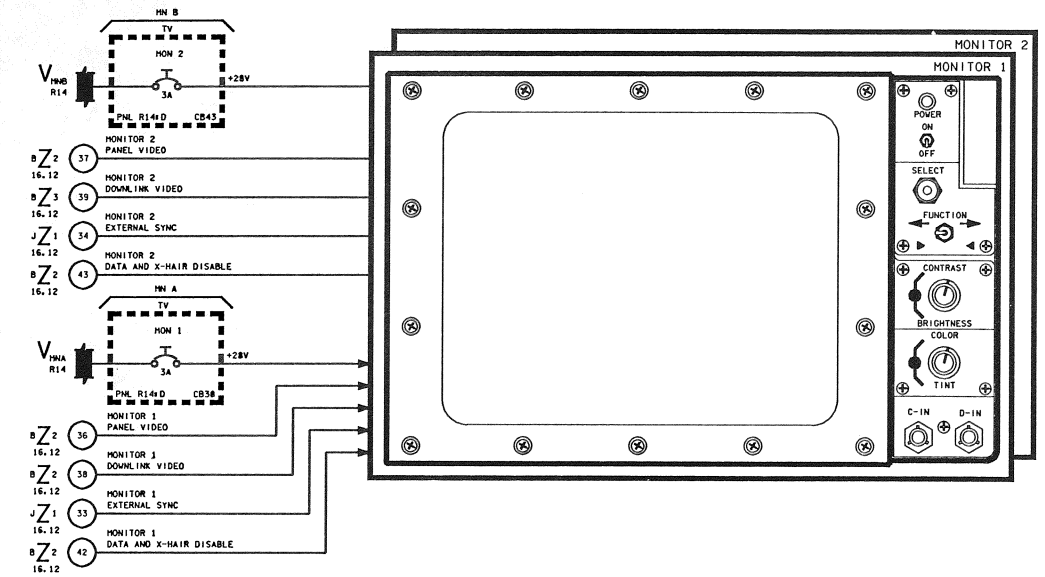


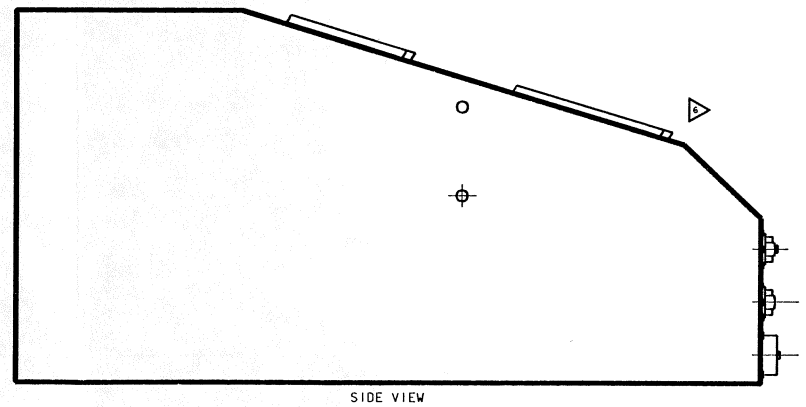


FRONT VIEW



BACK VIEW





SIDE VIEW

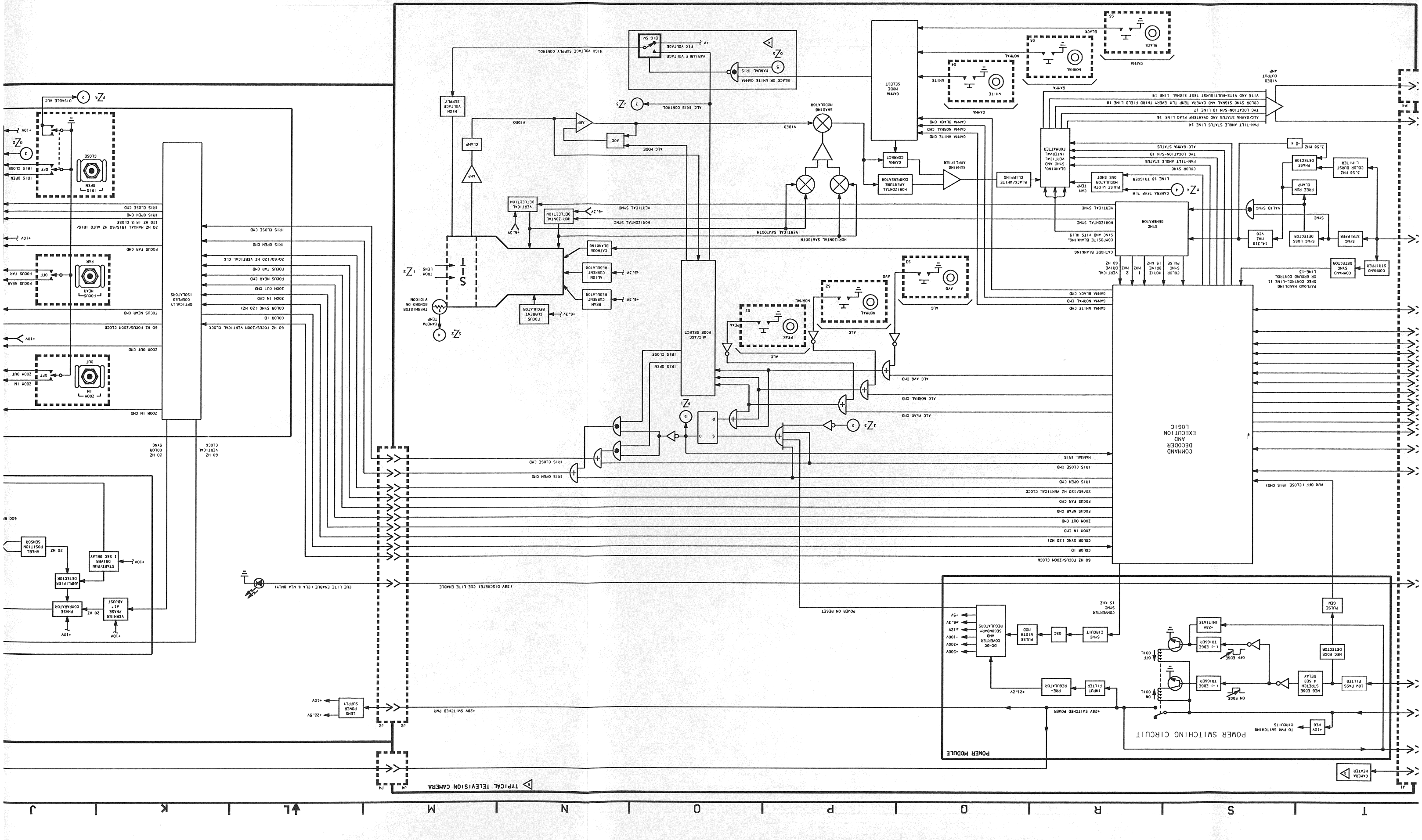
7. REFER TO TABLE 16.1 FOR DRAWING TRACEABILITY

NOTES:
- SEE DRAWING NO. 16.13 SHT 5 OF 6 FOR CTVM SCHEMATIC
- SEE DRAWING NO. TBD FOR A CTVC SCHEMATIC
- CCTV (508) CAMERAS FEATURE SELECTION OF FIX OR VARIABLE VOLTAGE TO HIGH VOLTAGE POWER SUPPLY. CCTV (506) CAMERAS ONLY FEATURE VARIABLE VOLTAGE CONTROL
- CAMERA HEATERS ARE THERMOSTATICALLY CONTROLLED TO BE ON BETWEEN 0°C AND 8°C
- PTU HEATERS ARE THERMOSTATICALLY CONTROLLED TO BE ON BETWEEN 0°C AND 8°C
- ELECTRICAL STOP SWITCH

13 TV 2

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	VICKI DOGGETT	3/30/79		
DR	VICKI DOGGETT	3/30/79		
ENGR	L. HOPPE		TV/CAMERA-SIT MONITOR	
ENGR		3/15/96		
APP		3/15/96		
APP		3/15/96	SPACE SHUTTLE	DWG NO 16.13
CADD	K. Kimbrell	6-17-96	ALL	
LTR E	PCN 6		126.5 X 34	PAGE SHEET 2 OF 5

BASIC REV E-6


POWER MODULE
POWER SWITCHING CIRCUIT
COMMAND DECODER AND EXECUTION LOGIC
TYPICAL TELEVISION CAMERA
POWER ON RESET
+28V SWITCHED PWR
+28V SWITCHED POWER
+28V DISCRETE) CUE LITE ENABLE (CLA & VLA ONLY)
CUE LITE ENABLE (CLA & VLA ONLY)
IRIS CLOSE CMD
IRIS OPEN CMD
MANUAL IRIS
60 HZ FOCUS/ZOOM CLOCK
COLOR ID
COLOR SYNC (20 HZ)
ZOOM IN CMD
ZOOM OUT CMD
FOCUS NEAR CMD
FOCUS FAR CMD
20/60/120 HZ VERTICAL CLOCK
PWR OFF (CLOSE IRIS CMD)
10 PWR SWITCHING CIRCUITS
+12V REG
LOW PASS FILTER
NEG EDGE SWITCH 4 SEC DELAY
NEG EDGE DETECTOR
ON EDGE
OFF EDGE
ON COIL
OFF COIL
(-) EDGE TRIGGER
INITIATE
PULSE GEN
DC-DC CONVERTER SECONDARY AND REGULATORS
+5V
+5.3V
+12V
-10V
+30V
+50V
PULSE WIDTH MOD
OSC CIRCUIT
SYNC
CONVERTER 15 KHZ
INPUT FILTER
PRE-REGULATOR
+21.2V
CAMERA HEATER
J1
P4
J4
J2
P2
LENS POWER SUPPLY
+22.5V
+10V
LENS MOTOR POSITION SENSOR
HALL EFFECT SENSOR
START/RUN DRIVER 1 SEC DELAY
AMPLIFIER DETECTOR
VERNIER PHASE ADJUST
PHASE COMPARATOR
20 HZ
600 R
OPTICALLY COUPLED ISOLATORS
IRIS OPEN
IRIS CLOSE
FOCUS FAR
FOCUS NEAR
ZOOM OUT
ZOOM IN
DISABLE ALC
20 HZ COLOR SYNC
60 HZ VERTICAL CLOCK
20 HZ MANUAL IRIS/60 HZ AUTO IRIS/ 120 HZ IRIS CLOSE
60 HZ FOCUS/ZOOM CLOCK
COLOR ID
COLOR SYNC (20 HZ)
THERMISTOR BONDED ON VIDICON
CAMERA TEMP
FROM LENS
IRIS
CLAMP
AMP
AGC
ALC MODE
VIDEO
HIGH VOLTAGE SUPPLY
HIGH VOLTAGE SUPPLY CONTROL
VARIABLE VOLTAGE
FIX VOLTAGE
DIG SW
MANUAL IRIS
BLACK OR WHITE GAMMA
ALC IRIS CONTROL
SHADING MODULATOR
SUMMING AMPLIFIER
BLACK/WHITE CLIPPING
GAMMA CORRECT
HORIZONTAL APERTURE COMPENSATOR
BLANK/WHITE VERTICAL INTERVAL FORMATTER
PULSE WIDTH MODULATOR ONE SHOT
CAM TEMP
CAMERA TEMP TLM
LINE 18 TRIGGER
PAN-TILT ANGLE STATUS
TEC LOCATION-S/N ID
ALC-GAMMA STATUS
3.58 MHZ
÷4
FREE RUN CLAMP
PHASE DETECTOR
3.58 MHZ COLOR BURST LIMITER
VALID SYNC
SYNC STRIPPER
14.318 MHZ VCO
SYNC LOSS DETECTOR
SYNC GENERATOR
COMPOSITE BLANKING, SYNC AND VITS MLI9
CATHODE BLANKING
HORIZONTAL SYNC
VERTICAL SYNC
COLOR PULSE 15 KHZ
HORIZ DRIVE 15 KHZ
VERTICAL DRIVE 60 HZ
COMMAND SYNC STRIPPER
PAYLOAD HANDLING OR GROUND CONTROL SPEC CONTROL-LINE 11 LINE-13
VIDEO OUTPUT AMP
VITS AND VITS-MULTIBURST TEST SIGNAL LINE 19
COLOR SYNC SIGNAL AND CAMERA TEMP TLM EVERY THIRD FIELD LINE 18
TEC LOCATION-S/N ID LINE 17
ALC/GAMMA STATUS AND OVERTEMP FLAG LINE 16
PAN-TILT ANGLE STATUS LINE 14
GAMMA BLACK CMD
GAMMA NORMAL CMD
GAMMA WHITE CMD
GAMMA MODE SELECT
BLACK
NORMAL
WHITE
S6
S5
S4
ALC
AVG
S3
S2
PEAK
S1
ALC/AGC MODE SELECT
ALC AVG CMD
ALC NORMAL CMD
ALC PEAK CMD
FOCUS CURRENT REGULATOR
BEAM CURRENT REGULATOR
ALIGN CURRENT REGULATOR
CATHODE BLANKING
VERTICAL DEFLECTION
HORIZONTAL DEFLECTION
VERTICAL SYNC
HORIZONTAL SYNC
HORIZONTAL SAWTOOTH
VERTICAL SAWTOOTH
+6.3V
+4.5V
S
I
IRIS
FROM LENS
CAMERA TEMP
VIDICON
Z1
Z2
Z3
Z4
Z5
J1
J2
J3
J4
P1
P2
P3
P4

DATE: 03/08/96 | NAME: BJB | VERSION: INK=15

W V U T S R Q P O N

8 7 6 5 4 3 2 1

TYPICAL PAN-TILT UNIT

P1 J1 J2 P2 P1 J1

+28V

+28V CAMERA HEATER PWR

CAMERA HEATER

PTU POWER SUPPLY +10V +22.5V

+28V SWITCHED PWR

+28V CAMERA PTU PWR

RCU

POWER ON/OFF CMD

POWER MODULE

POWER SWITCHING CIRCUIT

+12V REG

TO PWR SWITCHING CIRCUITS

LOW PASS FILTER

NEG EDGE STRETCH 4 SEC DELAY

ON EDGE

(-) EDGE TRIGGER

ON COIL

OFF EDGE

(-) EDGE TRIGGER

OFF COIL

+28V INITIATE

NEG EDGE DETECTOR

PULSE GEN

+28V SWITCHED POWER

INPUT FILTER

PRE-REGULATOR

+21.2V

SYNC CIRCUIT

OSC

PULSE WIDTH MOD

DC-DC COVERTER AND SECONDARY REGULATORS

+500V +300V -100V ±12V ±6.3V +5V

CONVERTER SYNC 15 KHZ

POWER ON RESET

RCU CUE LITE ENABLE

LEFT LIMIT SW

RIGHT LIMIT SW

+22.5V +10V

PAN STEPPER MOTOR

MOTOR BRIDGE DRIVER

LEFT RIGHT

PAN CONTROL LOGIC

LEFT RIGHT

PAN-TILT CNTR CLK

OPTICALLY COUPLED ISOLATORS

TILT STEPPER MOTOR

UP DOWN

TILT CONTROL LOGIC

UP DOWN

LEFT LIMIT

RIGHT LIMIT

PAN LEFT CMD

PAN RIGHT CMD

PAN/TILT CNTR CLK (FAST=60 HZ, SLOW=6 HZ)

TILT UP CMD

TILT DOWN CMD

CAMERA LOCATION CODE PER ORBITER LOCATION

LOC 1 LOC 2 LOC 4 LOC 8 LOC 16

UP LIMIT SW

DOWN LIMIT SW

UP LIMIT

DOWN LIMIT

PTU HEATER 2

PTU HEATER 1

+28V

PWR OFF (CLOSE IRIS CMD)

COMMAND DECODER AND EXECUTION LOGIC

60 HZ FOCUS/ZOOM CLOCK

COLOR ID

COLOR SYNC (20 HZ)

ZOOM IN CMD

ZOOM OUT CMD

FOCUS NEAR CMD

FOCUS FAR CMD

20/60/120 HZ VERTICAL CLOCK

IRIS OPEN CMD

IRIS CLOSE CMD

MANUAL IRIS

ALC PEAK CMD

ALC NORMAL CMD

ALC AVG CMD

ALC

PEAK NORMAL AVG

S1 S2 S3

ALC/AGC MODE SELECT

IRIS OPEN

IRIS CLOSE

PAYLOAD HANDLING SPEC CONTROL-LINE 11 OR GROUND CONTROL LINE-13

COMMAND STRIPPER

COMMAND SYNC DETECTOR

RCU

COMPOSITE SYNC FROM RCU (CAMERA CONTROL COMMANDS, COLOR SYNC, VITS, 3.58 COLOR BURST)

SYNC STRIPPER

SYNC LOSS DETECTOR

14.318 MHZ VCO

SYNC

VALID SYNC

FREE RUN CLAMP

3.58 MHZ COLOR BURST LIMITER

PHASE DETECTOR

3.58 MHZ ÷4

COLOR SYNC PULSE

HORIZ DRIVE 15 KHZ

1 MHZ

2 MHZ

VERTICAL DRIVE 60 HZ

SYNC GENERATOR

CATHODE BLANKING

COMPOSITE BLANKING, SYNC AND VITS HL19

HORIZONTAL SYNC

VERTICAL SYNC

CAMERA TEMP TLM

LINE 18 TRIGGER

PULSE WIDTH MODULATOR ONE SHOT

CAM TEMP

COLOR SYNC

PAN-TILT ANGLE STATUS

TVC LOCATION-S/N ID

ALC-GAMMA STATUS

BLANKING, SYNC AND VERTICAL INTERVAL FORMATTER

BLACK/WHITE CLIPPING

SUMMING AMPLIFIER

HORIZONTAL APERTURE COMPENSATOR

GAMMA CORRECT

GAMMA WHITE CMD

GAMMA NORMAL CMD

GAMMA BLACK CMD

GAMMA MODE SELECT

GAMMA WHITE NORMAL BLACK

S4 S5 S6

HORIZONTAL SAWTOOTH

VERTICAL SAWTOOTH

SHADING MODULATOR

VIDEO

ALC MODE

AGC

AMP

VIDEO

ALC IRIS CONTROL

BLACK OR WHITE GAMMA

MANUAL IRIS

VARIABLE VOLTAGE

FIX VOLTAGE

DIG SW

HIGH VOLTAGE SUPPLY CONTROL

+6.3V

FOCUS CURRENT REGULATOR

BEAM CURRENT REGULATOR

ALIGN CURRENT REGULATOR

CATHODE BLANKING

HORIZONTAL DEFLECTION

VERTICAL DEFLECTION

HORIZONTAL SYNC

VERTICAL SYNC

VIDEO OUT

VSU

PAN-TILT ANGLE STATUS LINE 14

ALC/GAMMA STATUS AND OVERTEMP FLAG LINE 16

TVC LOCATION-S/N ID LINE 17

COLOR SYNC SIGNAL AND CAMERA TEMP TLM EVERY THIRD FIELD LINE 18

VITS AND VITS-MULTIBURST TEST SIGNAL LINE 19

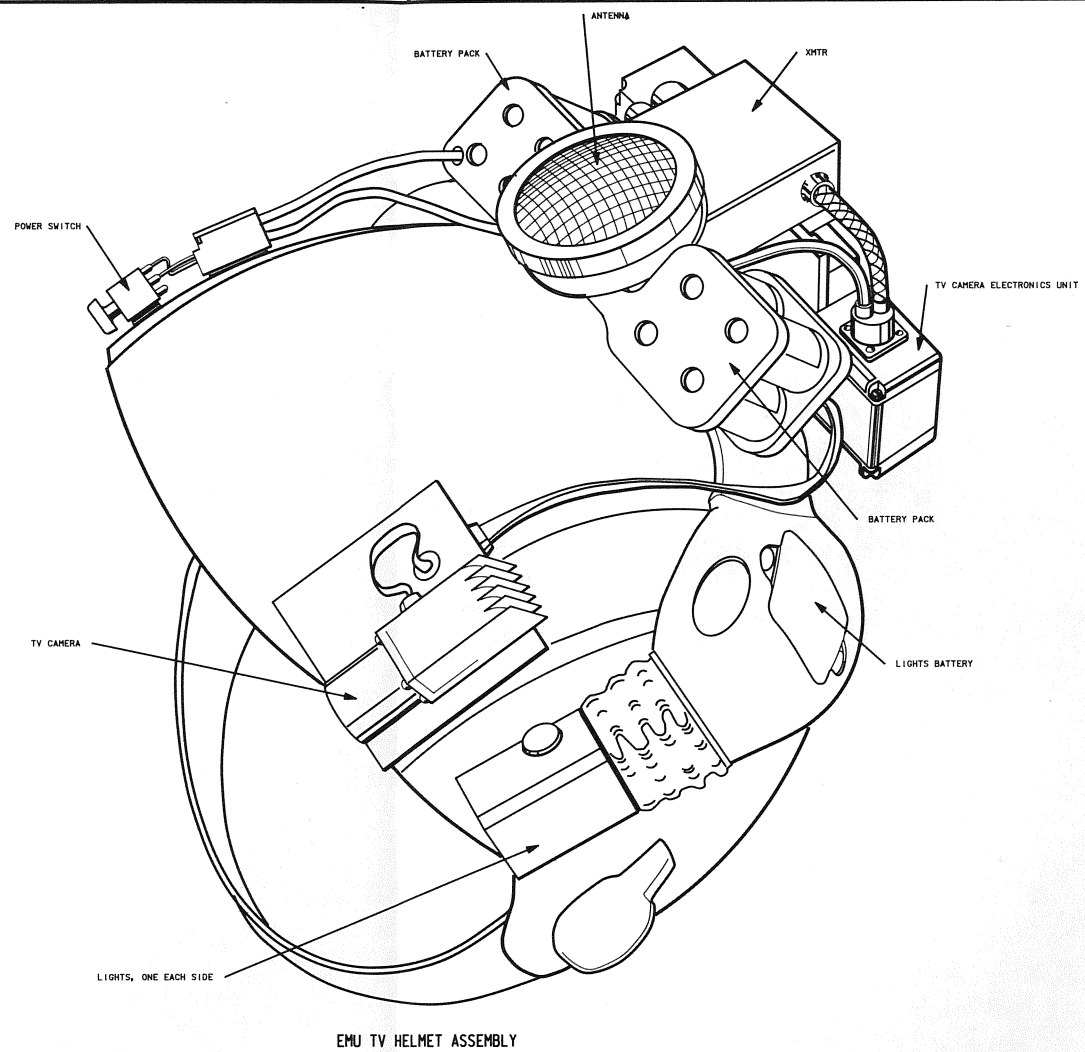
VIDEO OUTPUT AMP

J4 P4

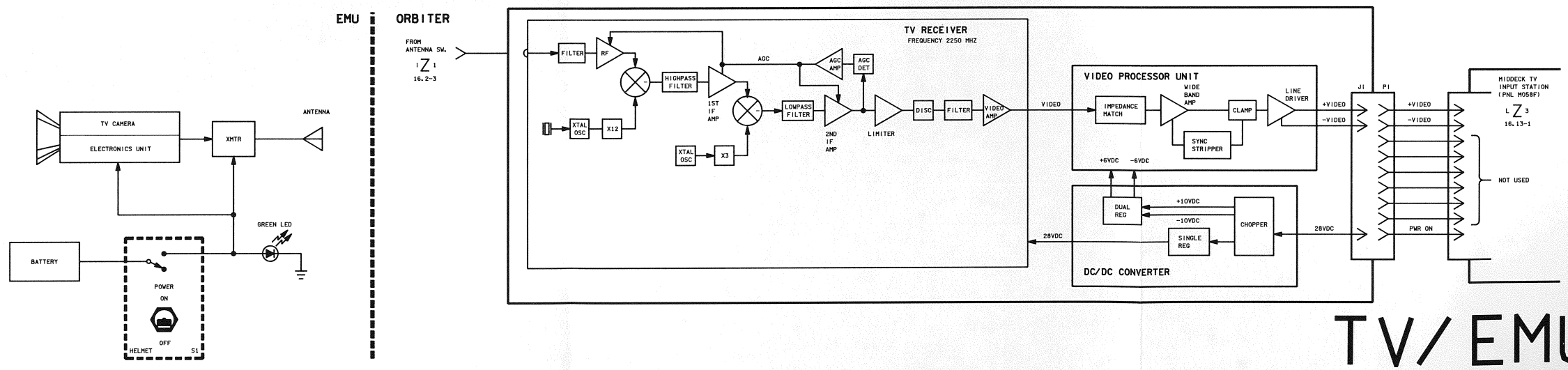
TO VFM

BASIC REV E-6

DATE: 8/1/87	NAME: MFB	VERSION: ING-6
DATE: 05/14/90	NAME: JMB	VERSION: ING-7
DATE: 11/18/91	NAME: LAM	VERSION: ING-8



EMU TV HELMET ASSEMBLY



TV/EMU

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	H. BLATCH	11/21/80	
DR			
ENGR	R. MOOLCHAN		TV/EMU
ENGR	[signature]	10-2-90	
APP	[signature]	10/2/90	
APP	R. W. Koch	10-2-90	SPACE SHUTTLE
OMNIPLAN	S.F. Kirschbaum	11/29/90	ALL
LTR	E	PCN 1	44 X 34

DWG NO 16.13
PAGE SHEET 3 OF 5

BASIC REV E-1

DATE: 05/13/90	NAME: JMB	VERSION: INK 7
DATE: 10/05/90	NAME: LAM	VERSION: INK 8
DATE: 11/18/91	NAME: LAM	VERSION: INK 9

AIRBORNE DIGITIZER UNIT (ADU)

P1 P2 P3 FSC NTSC B/W S14 S15 S16

A2 (WRITE CONTROLLER)

A3 (READ CONTROLLER & SELF TEST CONTROLLER)

A4,5,6,7 (FIELD MEMORY) — A4 FIELD MEMORY, A5 FIELD MEMORY, A6 FIELD MEMORY, A7 FIELD MEMORY

A13 (OUTPUT SELECT) — 56 MHz XTAL OSCILLATORS AND DIVIDERS; 20.48 MHz XTAL OSCILLATOR AND DIVIDERS; FREQUENCY SELECT DECODING AND SWITCHING CIRCUITRY; OUTPUT BUFFERS

A1 (SIGNAL PROCESSOR) — VIDEO DIGITIZER; CLK; Y-DATA; I-DATA; Q-DATA; VIDEO DATA

A8 (INPUT PROCESSOR) — OSCILLATOR C; TIMING AND STATUS LOGIC

ADU (SEE NOTES) SWITCH OR LED

(DOWNLINK ROUTING) LED'S SITUATED ABOVE DOWNLINK ROUTING SWITCHES

(MEMORY SELECT) LED'S SITUATED ABOVE MEMORY SELECT SWITCHES

(VIDEO MODE) LED'S

(MEMORY SELECT) S18-S20

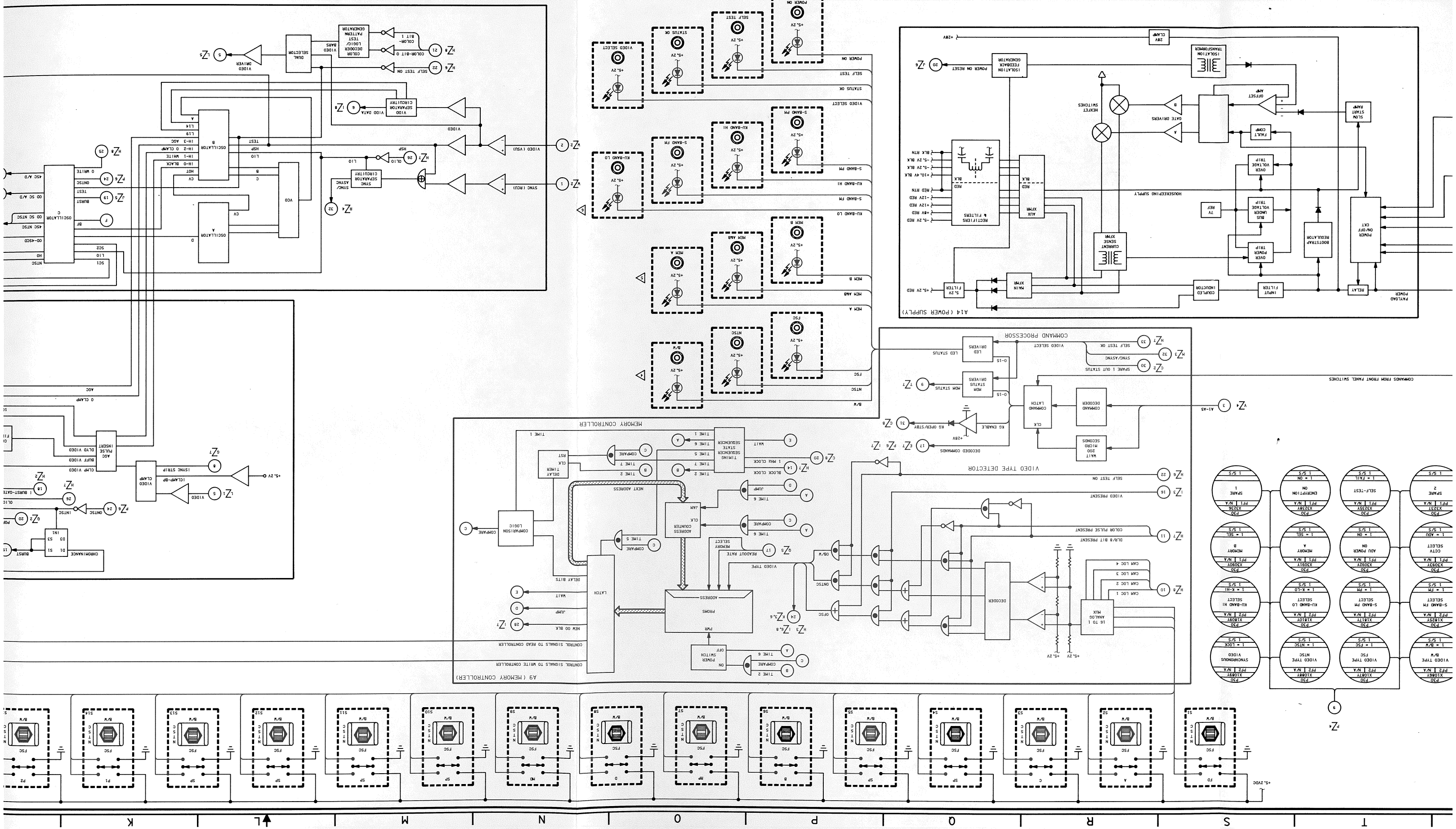
(DOWNLINK ROUTING) S22-S25

NOTES: (CAMERA SELECT) S1-S16 ONE FOR EACH POSSIBLE CCTV CAMERA CONNECTION

13 ADU STV 4

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	M. GILLESPIE	6/16/87	
DR	M. GILLESPIE	6/16/87	AIRBORNE DIGITIZER UNIT SECURE TELEVISION SYSTEM
ENGR	L. MACFARLANE		
ENGR		2/27/90	
APP		10/2/90	
APP		10-27-90	SPACE SHUTTLE / DWG NO 16.13
OMNIPLAN		11-28-90	ALL
LTR	E	PCN 1	126.5 X 34 / PAGE / SHEET 4 OF 8

BASIC REV E-1


A14 (POWER SUPPLY)
PAYLOAD POWER
POWER ON/OFF CKT
RELAY
SLOW START RAMP
INPUT FILTER
COUPLED INDUCTOR
MAIN XFMR
5.2V FILTER
+5.2V RED
AUX XFMR
RECTIFIERS & FILTERS
BLK RTN
-5.2V BLK
+10.4V BLK
+8V RED
+12V RED
-12V RED
RED
BLK
CURRENT XFMR
HOUSEKEEPING SUPPLY
BOOTSTRAP REGULATOR
OVER VOLTAGE TRIP
BUS UNDER VOLTAGE TRIP
OVER POWER TRIP
TV REF
FAULT COMP
OFFSET AMP
GATE DRIVERS
A
B
HEXFET SWITCHES
ISOLATION FEEDBACK GENERATOR
POWER ON RESET
ISOLATION TRANSFORMER
28V CLAMP
+28V
COMMAND PROCESSOR
VIDEO SELECT
SELF TEST OK
SYNC/ASYNC
SPARE 1 OUT STATUS
LED DRIVERS
LED STATUS
PDM STATUS DRIVERS
MDM STATUS
COMMAND LATCH
COMMAND DECODER
CLK
WAIT 200 MICRO SECONDS
DECODED COMMANDS
XO ENABLE
XO OPEN/STBY
COMMANDS FROM FRONT PANEL SWITCHES
A1-43
VIDEO TYPE DETECTOR
SELF TEST ON
VIDEO PRESENT
COLOR PULSE PRESENT
DLY'D BIT PRESENT
CAM LOC 4
CAM LOC 3
CAM LOC 2
CAM LOC 1
16 TO 1 ANALOG MUX
DECODER
+5.2V
MEMORY CONTROLLER
TIME 1
TIME 2
TIME 5
TIME 6
TIME 7
WAIT
JUMP
NEW DD BLK
DELAY BITS
CONTROL SIGNALS TO READ CONTROLLER
CONTROL SIGNALS TO WRITE CONTROLLER
LATCH
PROMS
ADDRESS
PWR
ADDRESS COUNTER
CLK
JUMP
DELAY TIMER
CLK
RST
SEQUENCER STATE
WAIT
1 MHz CLOCK
BLOCK CLOCK
COMPARE
COMPARISON LOGIC
POWER SWITCH
ON
OFF
READOUT MEMORY SELECT
VIDEO TYPE
08/W
ONTSC
OFSC
A9 (MEMORY CONTROLLER)
SELF TEST OK
POWER ON
STATUS OK
VIDEO SELECT
S-BAND FM
S-BAND PM
XU-BAND HI
XU-BAND LO
MEM A
MEM A&B
MEM B
NTSC
FSC
B/W
SELF TEST
+5.2V
S-BAND FM
S-BAND PM
XU-BAND HI
XU-BAND LO
VIDEO (SVU)
SYNC (RCU)
SYNC/ ASYNC
SYNC SEPARATOR CIRCUITRY
DL10
HSP
TEST
VIDEO DATA
SEPARATOR CIRCUITRY
VIDEO
DUAL SELECTOR
VIDEO BIAS
COLOR/ DECODER TEST PATTERN GENERATOR
COLOR-BIT 0
COLOR-BIT 1
SELF TEST ON
VIDEO DRIVER
OSCILLATOR A
OSCILLATOR B
OSCILLATOR C
VCO
SYNC STRIP
ISYNC STRIP
CLAMP-BP
VIDEO CLAMP
BLKP VIDEO
DLYD VIDEO
AGC PULSE INSERT
CLAMP VIDEO
0 CLAMP
AGC
CHRONI.HANCE
INT
D1 S1
D3 S3
INTSC
ONTSC
BURST-GATE
BURST
WRITE
BLACK
WHITE
AGC
CLAMP
SCI
SC2
L10
L14
L19
A
B
C
D
CV
BF
F
HO
NTSC
00 SC NTSC
00 SC A/D
00-ASCD
ASC A/D
P1
P2
SP
FD
FSC
B/W
NTSC
S1
S2
S3
S4
S5
S10
S11
S12
S13
S14
+5.2VDC
T
S
R
Q
P
O
N
M
L
K

UPLINK	COMMANDS
8001	FM DOWNLINK
8002	PDI DOWNLINK
8003	KU LOR DOWNLINK
8004	KU HOR DOWNLINK
8005	MEM A SELECT
8006	MEM B SELECT
8007	MEM A&B SELECT
8008	ADU SELF TEST
8009	ADU POWER ON
8010	ADU POWER OFF

+5.2VDC

S-BAND FM S22 · S-BAND FM S23 · KU-BAND LO S24 · KU-BAND HI S25 · MEM A S18 · MEM B S19 · MEM A&B S20 · SELF TEST S27 · SNAPSHOT S21 · BYPASS KG ENABLE S17

PF2 J5 UPLINK COMMANDS → 3 ↓Z4

COMMANDS FROM FRONT PANEL SWITCHES

CCTV ADU 7.5A PNL R15 CB70 — V_{MNB} R15

MDM POWER ON CMD

↑Z4 → 9

P30	PF2	N/A	1 S/S
X1086Y	VIDEO TYPE B/W		1 = B/W
X1087Y	VIDEO TYPE FSC		1 = FSC
X1088Y	VIDEO TYPE NTSC		1 = NTSC
X1089Y	SYNCHRONOUS VIDEO		1 = LOCK
X1825Y	S-BAND FM SELECT		1 = FM
X1817Y	S-BAND PM SELECT		1 = PM
X1810Y	KU-BAND LO SELECT		1 = K-LO
X1809Y	KU-BAND HI SELECT		1 = K-HI
X3093Y	CCTV SELECT	PF1	1 = ADU
X3092Y	ADU POWER ON	PF1	1 = ON
X3091Y	MEMORY A	PF1	1 = SEL
X3090Y	MEMORY B	PF1	1 = SEL
X3237	SPARE 2	PF1	
X3235Y	SELF-TEST	PF1	1 = FAIL
X3238Y	ENCRYPTION ON	PF1	1 = ON
X3236	SPARE 1	PF1	

+5.2VDC

FD · A · C · SP · SP · B · RP · D · MD — FSC — NTSC / B/W — S1 · S2 · S3 · S4 · S5 · S6 · S7 · S8 · S9

A9 (MEMORY CON

16 TO 1 ANALOG MUX — CAM LOC 1 · CAM LOC 2 · CAM LOC 3 · CAM LOC 4 ← ↑Z8 10

DECODER — +5.2V · +5.2V

↑Z7 11 — DLR/8 BIT PRESENT · COLOR PULSE PRESENT

↑Z3 16 — VIDEO PRESENT

↑Z6 22 — SELF TEST ON

OFSC · ONTSC · OB/W

VIDEO TYPE DETECTOR

TIME 2 · COMPARE · TIME 6 — POWER SWITCH ON/OFF

↑Z3 ↓Z6,8 24 ↑Z5,6 — PWR · PROMS · ADDRESS

↓Z5 17 — READOUT RATE · MEMORY SELECT

TIME 6 · COMPARE — ADDRESS COUNTER CLK · JAM

TIME 6 · JUMP

↑Z7 14 — BLOCK CLOCK · 1 MHz CLOCK

↓Z5 20 — TIMING SEQUENCER STATE SEQUENCER

WAIT

LATCH

CONTROL SIGNALS TO WRITE CONTROLLER

CONTROL SIGNALS TO READ CONTROLLER

NEW 00 BLK → 28 ↓Z7

JUMP → D

WAIT → E

DELAY BITS

COMPARISON LOGIC

NEXT ADDRESS

TIME 2 · TIME 7 · TIME 5 · TIME 6 · TIME 1 — DELAY TIMER CLK · RST

MEMORY CONTROLLER

WAIT 200 MICRO SECONDS

COMMAND DECODER · CLK · COMMAND LATCH

↑Z4 3 A1-A5

DECODED COMMANDS → 17 ↓Z7 ↑Z6 ↑Z7

KG ENABLE · +28V · KG OPER/STBY → 31 ↓Z8

0-15 MDM STATUS DRIVERS → MDM STATUS → 9 ↑Z7

0-15 LED DRIVERS → LED STATUS

↓Z2 30 SPARE 1 OUT STATUS

↑Z3 32 SYNC/ASYNC

↑Z7 33 SELF TEST OK

VIDEO SELECT

COMMAND PROCESSOR

A14 (POWER SUPPLY)

PAYLOAD POWER → RELAY → POWER ON/OFF CKT

INPUT FILTER → COUPLED INDUCTOR → MAIN XFMR → 5.2V FILTER → +5.2V RED

BOOTSTRAP REGULATOR

OVER POWER TRIP · BUS UNDER VOLTAGE TRIP · TV REF · OVER VOLTAGE TRIP · FAULT COMP

CURRENT SENSE XFMR

AUX XFMR — RED · BLK

RECTIFIERS & FILTERS — RED · BLK

+5.2V RED · -5.2V RED · +8V RED · +12V RED · -12V RED · RED RTN · +10.4V BLK · -5.2V BLK · -5.2V BLK · BLK RTN

HOUSEKEEPING SUPPLY

POWER ON · OFF S28

SLOW START RAMP · OFFSET AMP · GATE DRIVERS A · B · HEXFET SWITCHES

ISOLATION TRANSFORMER · ISOLATION FEEDBACK GENERATOR · POWER ON RESET → 20 ↓Z6

28V CLAMP · +28V

CCTV RCU SYNC → 1 ↑Z2 (16.12 ↑Z3)

CCTV VSU VIDEO → 2 ↑Z2 (16.12 ↓Z4)

B/W · NTSC · FSC · MEM A · MEM A&B · MEM B · KU-BAND LO · S-BAND FM · KU-BAND HI · S-BAND PM · VIDEO SELECT · STATUS OK · SELF TEST · POWER ON — +5.2V

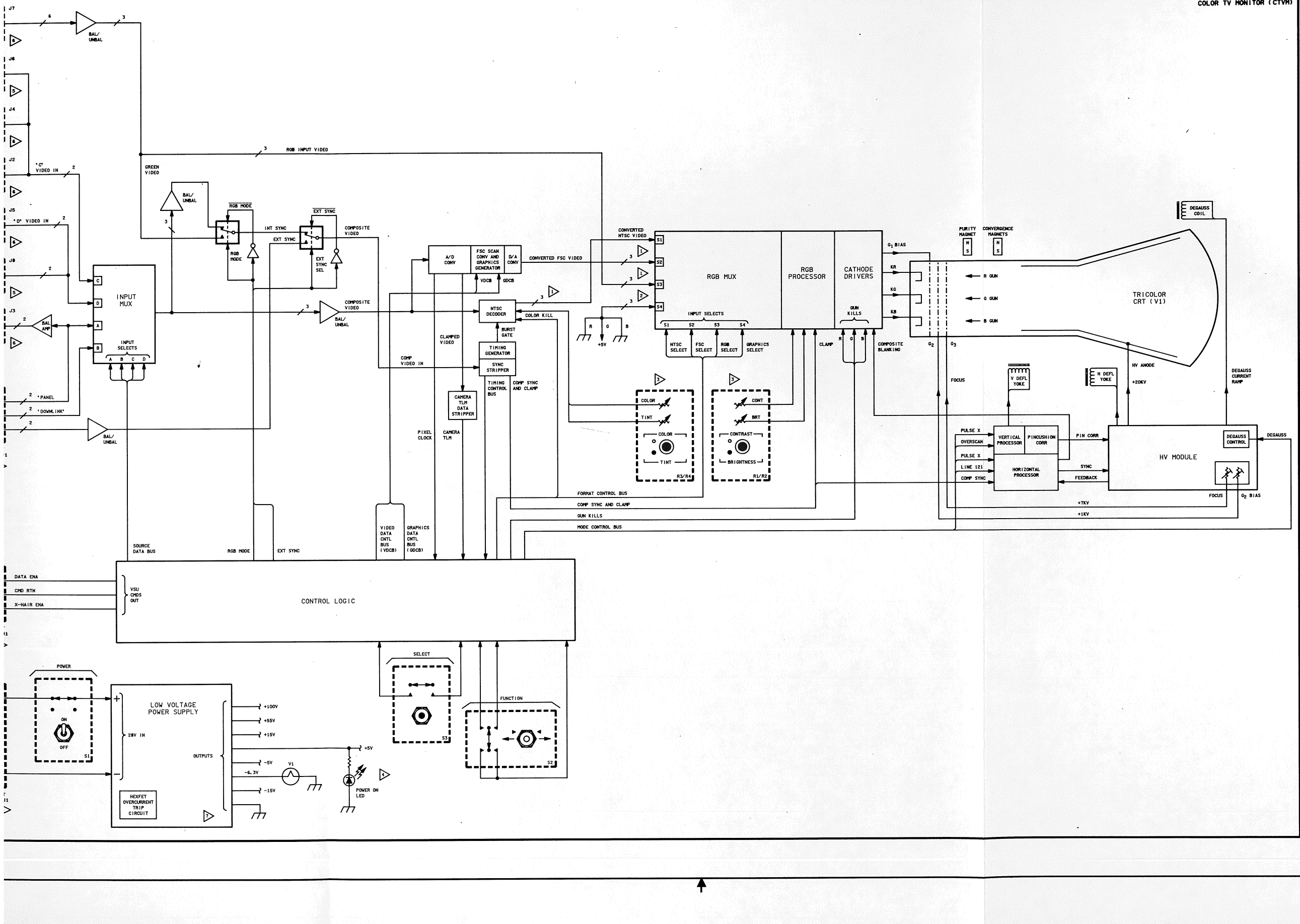
↓Z2 1 SYNC (RCU)

↓Z2 2 VIDEO (VSU)

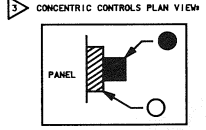
BASIC REV E-1

DATE: 11/07/91	NAME: MAG	VERSION: BPT: 4
DATE: 11/14/91	NAME: MDU	VERSION: INR: 1
DATE: 11/21/91	NAME: JDF	VERSION: INR: 2

COLOR TV MONITOR (CTVM)



1. MONITOR POWER DEPENDS ON WHICH TVM POSITION THE MONITOR IS LOCATED IN. PNL A3, MON 1 IS V_{MNA}, R15, PNL A3, MON 2 IS V_{MNB}, R15. SSSH 16.13-2 D_{Z8} TO D_{Z4}.
2. HEXFET OVC TRIP CIRCUIT MONITORS HEXFET SWITCH SOURCE CURRENTS AND SHUTS DOWN ALL POWER OUTPUTS FOR OVERCURRENT
3. REAR PANEL CONNECTOR
4. FRONT PANEL CONNECTOR
5. NO TITLE ON PANEL
6. CONCENTRIC CONTROLS PLAN VIEW



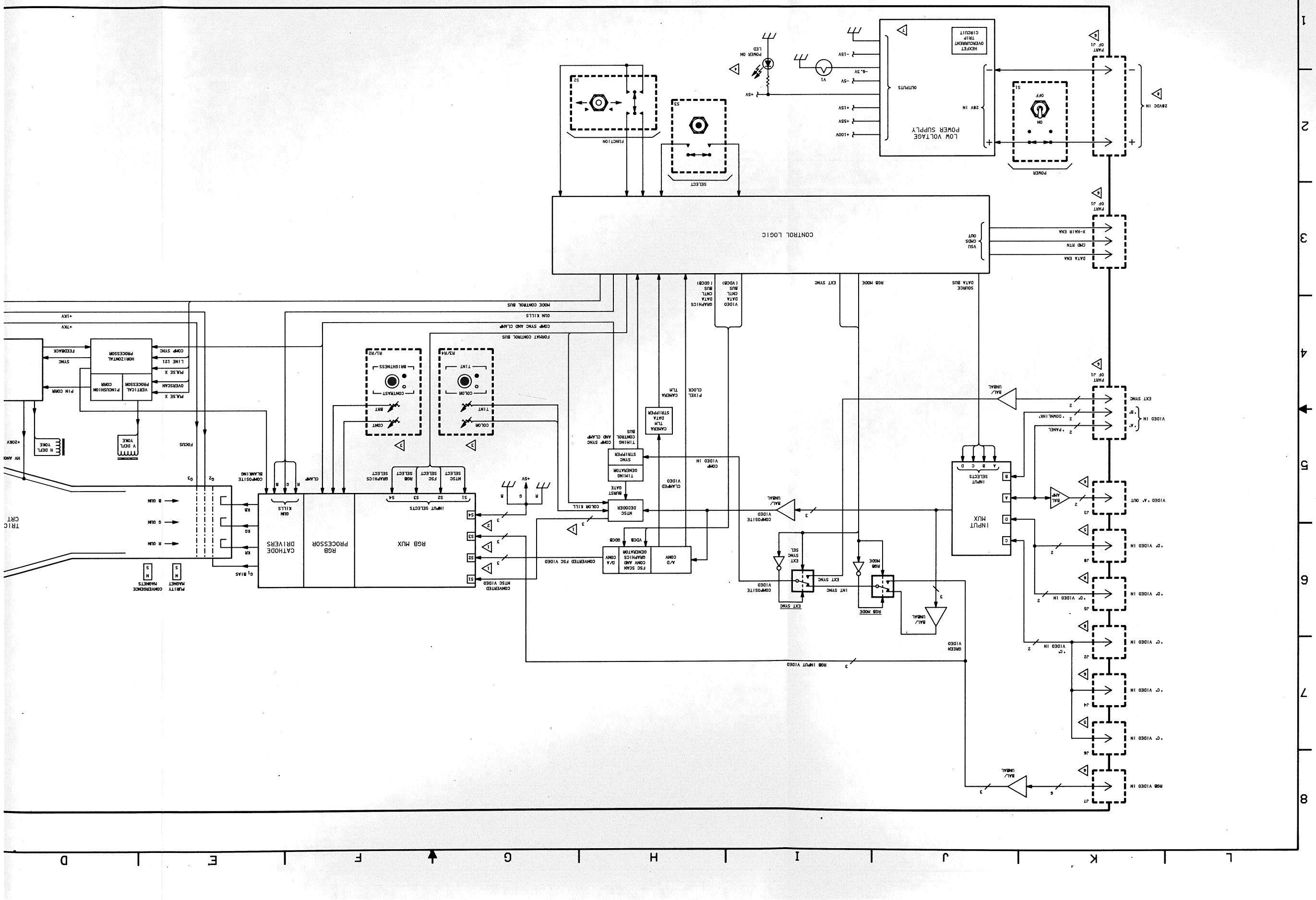
7. WHEN THE CONTROL LOGIC CALLS FOR A GRAPHICS PIXEL, S4 IS SELECTED TURNING RED AND BLUE OFF, AND GREEN ON. THIS FUNCTION IS NOT USED TO GENERATE THE ONSCREEN MENU, BUT IS USED TO GENERATE "GREEN" CAMERA DATA AND X-HAIR

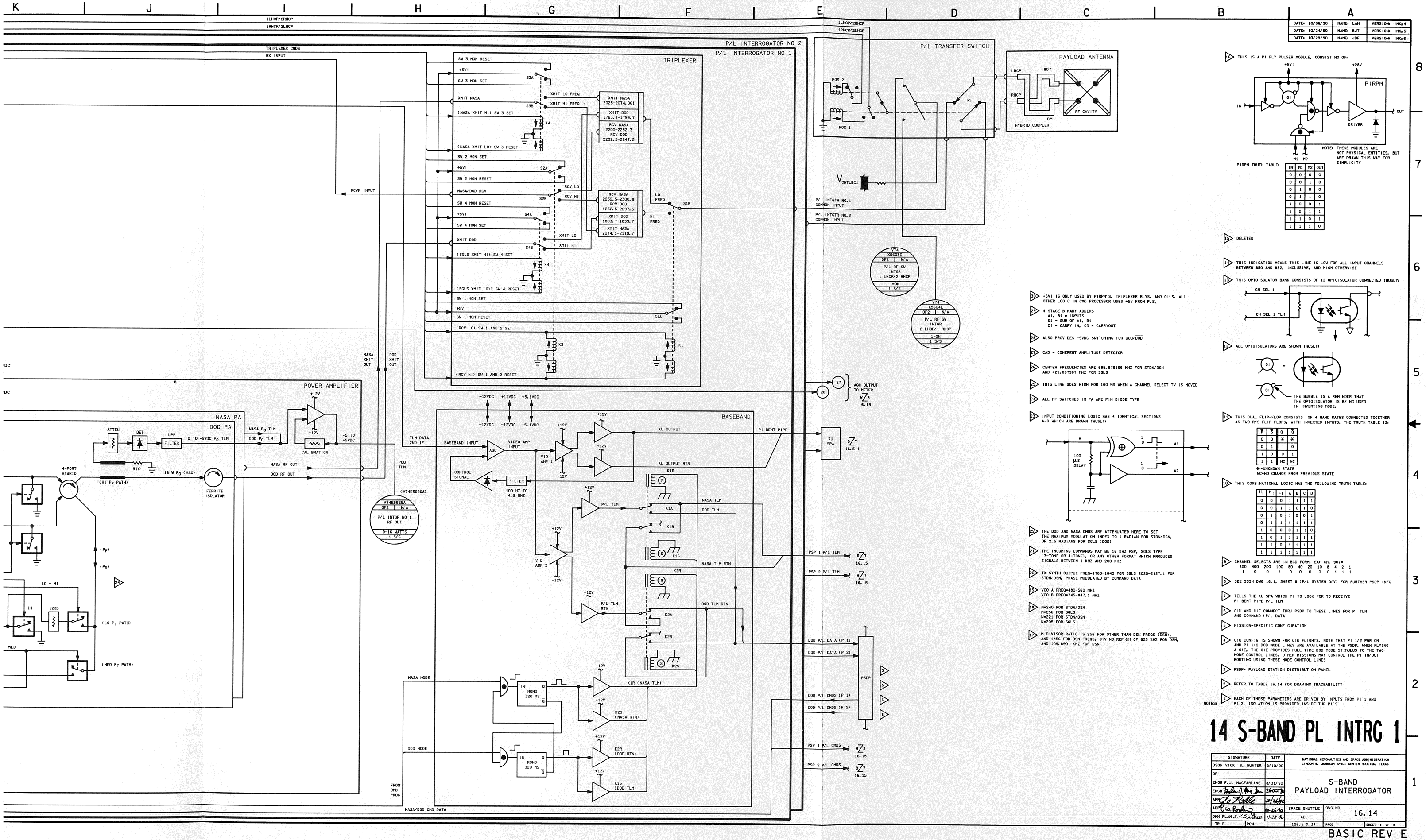
NOTES: 1. 3 LINES, ONE EACH RED, GREEN, AND BLUE VIDEO

13 COLOR TV MON 5

SIGNATURE	DATE	
DSGN VICKI S. HUNTER	7/31/91	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
ENGR F.J. MCFARLANE		COLOR TV MONITOR (CTVM)
ENGR	10/30/91	
APP		
APP	11-20-91	SPACE SHUTTLE / DWG NO 16.13
OMNIPLAN S.K. Kontanis	11-14-91	ALL
LTR E PCN 1		66 X 34 PAPER / SHEET 5 OF 5

BASIC REV E-1


LOW VOLTAGE POWER SUPPLY
OUTPUTS
+10V
+5V
+15V
-5V
-5.2V
-15V
HICCUP OVERCURRENT TRIP CIRCUIT
28V IN
28VDC IN
POWER
ON
OFF
S1
POWER ON LED
V1
S2
FUNCTION
S3
SELECT
CONTROL LOGIC
VSU CMDS OUT
X-HAIR EXA
CMD RTN
DATA EXA
SOURCE DATA BUS
RGB MODE
EXT SYNC
GRAPHICS DATA CNTL BUS (GCCB)
VIDEO DATA CNTL BUS (VCCB)
MODE CONTROL BUS
GUN KILLS
COMP SYNC AND CLAMP
FORMAT CONTROL BUS
CAMERA TLM DATA
CAMERA TLM STRIPPER
PIXEL CLOCK
TIMING CONTROL BUS
COMP SYNC
TIMING GENERATOR
TIMING STRIPPER SYNC
BURST GATE
NTSC DECODER
COLOR KILL
VDCB
CLAMPED VIDEO
COMP VIDEO IN
A/D CONV
FSC SCAN AND CONV GRAPHICS GENERATION
D/A CONV
DCCB
CONVERTED NTSC VIDEO
CONVERTED FSC VIDEO
RGB MUX
RGB PROCESSOR
CATHODE DRIVERS
GUN KILLS
INPUT SELECTS
S1 S2 S3 S4
NTSC SELECT
FSC SELECT
RGB SELECT
GRAPHICS SELECT
CLAMP
COMPOSITE BLANKING
R G B
R1/R2
BRIGHTNESS
CONTRAST
BRT
CONT
R3/R4
TINT
COLOR
TINT
CONT
BRT
FOCUS
V DEFL YOKE
H DEFL YOKE
+20KV
HV ANODE
TRICOLOR CRT
R GUN
G GUN
B GUN
K1 K2 K3
G1 BIAS
G2
G3
PURITY MAGNET
CONVERGENCE MAGNETS
N S
HORIZONTAL PROCESSOR
VERTICAL PROCESSOR
PINCUSHION CORR
OVERSCAN
PLUSE X
LINE 121
COMP SYNC
FEEDBACK
SYNC
PIN CORR
+12V
INPUT MUX
INPUT SELECTS
A B C D
BAL AMP
BAL/ UNBAL
VIDEO IN
"A" VIDEO OUT
"A" VIDEO IN
"B" VIDEO IN
"C" VIDEO IN
"D" VIDEO IN
"A" "B" "C" "D"
"PANEL"
"DOWNLINK"
EXT SYNC
RGB VIDEO IN
GREEN VIDEO
RGB INPUT VIDEO
INT SYNC
EXT SYNC SEL
RGB MODE
PART OF J1
J1 J2 J3 J4 J5 J6 J7
1 2 3 4 5 6 7 8
L K J I H G F E D



DATE: 10/06/90	NAME: LAM	VERSION: INK 4
DATE: 10/24/90	NAME: BJT	VERSION: INK 5
DATE: 10/29/90	NAME: JDF	VERSION: INK 6

(18) THIS IS A PI RLY PULSER MODULE, CONSISTING OF:

NOTE: THESE MODULES ARE NOT PHYSICAL ENTITIES, BUT ARE DRAWN THIS WAY FOR SIMPLICITY

PIRPM TRUTH TABLE:

IN	M1	M2	OUT
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

(19) DELETED

(20) THIS INDICATION MEANS THIS LINE IS LOW FOR ALL INPUT CHANNELS BETWEEN 850 AND 882, INCLUSIVE, AND HIGH OTHERWISE

(21) THIS OPTOISOLATOR BANK CONSISTS OF 12 OPTOISOLATOR CONNECTED THUSLY:

(22) ALL OPTOISOLATORS ARE SHOWN THUSLY:

(30) +5V1 IS ONLY USED BY PIRPM'S, TRIPLEXER RLYS, AND OI'S. ALL OTHER LOGIC IN CMD PROCESSOR USES +5V FROM P.S.

(28) 4 STAGE BINARY ADDERS
A1, B1 = INPUTS
SI = SUM OF A1, B1
CI = CARRY IN, CO = CARRYOUT

(29) ALSO PROVIDES -9VDC SWITCHING FOR DOD/$\overline{\text{DOD}}$

(27) CAD = COHERENT AMPLITUDE DETECTOR

(26) CENTER FREQUENCIES ARE 685.979166 MHZ FOR STDN/DSN AND 429.667967 MHZ FOR SGLS

(25) THIS LINE GOES HIGH FOR 160 MS WHEN A CHANNEL SELECT TW IS MOVED

(24) ALL RF SWITCHES IN PA ARE PIN DIODE TYPE

(23) INPUT CONDITIONING LOGIC HAS 4 IDENTICAL SECTIONS A-D WHICH ARE DRAWN THUSLY:

(17) THIS DUAL FLIP-FLOP CONSISTS OF 4 NAND GATES CONNECTED TOGETHER AS TWO R/S FLIP-FLOPS, WITH INVERTED INPUTS. THE TRUTH TABLE IS:

$\overline{R}$	$\overline{S}$	Q	$\overline{Q}$
0	0	*	*
0	1	1	0
1	0	0	1
1	1	NC	NC

*=UNKNOWN STATE
NC=NO CHANGE FROM PREVIOUS STATE

(16) THIS COMBINATIONAL LOGIC HAS THE FOLLOWING TRUTH TABLE:

H_1	M_1	L_1	A	B	C	D
0	0	0	1	1	1	1
0	0	1	1	0	1	0
0	1	0	1	0	0	1
0	1	1	1	1	1	1
1	0	0	0	1	1	0
1	0	1	1	1	1	1
1	1	0	1	1	1	1
1	1	1	1	1	1	1

(22) THE DOD AND NASA CMDS ARE ATTENUATED HERE TO SET THE MAXIMUM MODULATION INDEX TO 1 RADIAN FOR STDN/DSN, OR 2.5 RADIANS FOR SGLS (DOD)

(21) THE INCOMING COMMANDS MAY BE 16 KHZ PSP, SGLS TYPE (3-TONE OR 4-TONE), OR ANY OTHER FORMAT WHICH PRODUCES SIGNALS BETWEEN 1 KHZ AND 200 KHZ

(20) TX SYNTH OUTPUT FREQ=1760-1840 FOR SGLS 2025-2127.1 FOR STDN/DSN, PHASE MODULATED BY COMMAND DATA

(19) VCO A FREQ=480-560 MHZ
VCO B FREQ=745-847.1 MHZ

(18) M=240 FOR STDN/DSN
M=256 FOR SGLS
N=221 FOR STDN/DSN
N=205 FOR SGLS

(17) M DIVISOR RATIO IS 256 FOR OTHER THAN DSN FREQS ($\overline{\text{DSN}}$), AND 1456 FOR DSN FREQS, GIVING REF $\div$M OF 625 KHZ FOR $\overline{\text{DSN}}$, AND 109.8901 KHZ FOR DSN

(7) TELLS THE KU SPA WHICH PI TO LOOK FOR TO RECEIVE PI BENT PIPE P/L TLM

(6) CIU AND CIE CONNECT THRU PSDP TO THESE LINES FOR PI TLM AND COMMAND (P/L DATA)

(5) MISSION-SPECIFIC CONFIGURATION

(4) CIU CONFIG IS SHOWN FOR CIU FLIGHTS. NOTE THAT PI 1/2 PWR ON AND PI 1/2 DOD MODE LINES ARE AVAILABLE AT THE PSDP. WHEN FLYING A CIE, THE CIE PROVIDES FULL-TIME DOD MODE STIMULUS TO THE TWO MODE CONTROL LINES. OTHER MISSIONS MAY CONTROL THE PI IN/OUT ROUTING USING THESE MODE CONTROL LINES

(3) PSDP= PAYLOAD STATION DISTRIBUTION PANEL

(2) REFER TO TABLE 16.14 FOR DRAWING TRACEABILITY

(6) CHANNEL SELECTS ARE IN BCD FORM, EX: CH. 907=
800 400 200 100 80 40 20 10 8 4 2 1
1 0 0 1 0 0 0 0 0 1 1 1

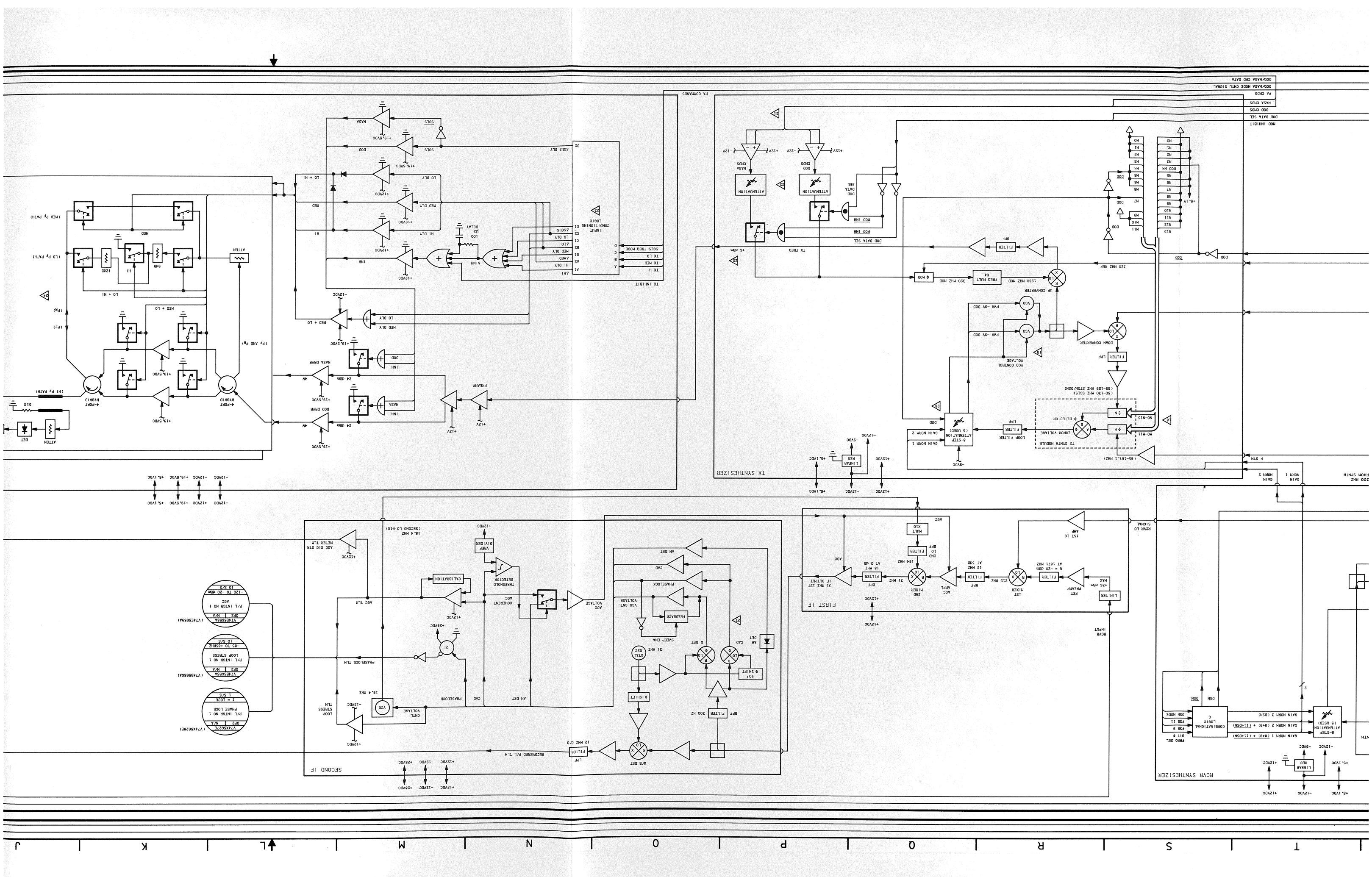
(5) SEE SSSH DWG 16.1, SHEET 6 (P/L SYSTEM S/W) FOR FURTHER PSDP INFO

NOTES:
(1) EACH OF THESE PARAMETERS ARE DRIVEN BY INPUTS FROM PI 1 AND PI 2. ISOLATION IS PROVIDED INSIDE THE PI'S

14 S-BAND PL INTRG 1

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN VICKI S. HUNTER	9/10/90	
DR		S-BAND PAYLOAD INTERROGATOR
ENGR F.J. MACFARLANE	9/31/90	
ENGR	2600 90	
APPR	10/24/90	
APPR	10-26-90	SPACE SHUTTLE / DWG NO 16.14
OMNIPLAN J.K. Cantrell	11-28-90	ALL
LTR E PCN		126.5 X 34 / PAGE / SHEET 1 OF 2

BASIC REV E


TX SYNTHESIZER
RCVR SYNTHESIZER
FIRST IF
SECOND IF
PA CMDS
MOD DATA SEL
MOD INH
MOD INH BIT
TX INH BIT
TX SYNTH MODULE
LOOP FILTER
ERROR VOLTAGE
VCO CONTROL VOLTAGE
UP CONVERTER
DOWN CONVERTER
1280 MHZ MOD
320 MHZ REF
320 MHZ MOD
FREQ MULT X4
TX FREQ
+6 dBm
(65-167.1 MHZ)
(50-130 MHZ SOLS)
(59-159 MHZ STUN/OSN)
GAIN NORM 1
GAIN NORM 2
GAIN NORM 3 (OSN)
8-STEP ATTENUATION (5 USED)
COMBINATIONAL LOGIC
OSN MODE
FREQ SEL BIT 0
FSB 9
FSB 11
OSN
320 MHZ FROM SYNTH
RCVR LO SIGNAL
RCVR INPUT
LIMITER
FET PREAMP
+36 dBm
MAX
1ST MIXER
215 MHZ
BPF
12 MHZ
ACC AMPL
2ND MIXER
31 MHZ
184 MHZ
BPF
18 MHZ
AT 3 dB
1ST IF OUTPUT
31 MHZ 1ST
AGC
MULT X10
2ND LO BPF
1ST LO AMP
1871 MHZ
AT 3dB
G = -20 dBm
PREAMP
LINEAR REG
+5.1VDC
-9VDC
+12VDC
-12VDC
AGC SIG STR METER TLM
AGC TLM
THRESHOLD DETECTOR
CALIBRATION
COHERENT AGC
AGC VOLTAGE
VCO CNTL VOLTAGE
FEEDBACK
SWEEP ENA
PHASELOCK
PHASELOCK TLM
LOOP STRESS TLM
CNTL VOLTAGE
AM DET
CAD
Φ DET
Φ SHIFT
90° Φ SHIFT
31 MHZ XTAL OSC
BPF 300 HZ
LPF 12 MHZ C/O
W/B DET
RECOVERED P/L TLM
18.4 MHZ
(SECOND LO ÷10)
P/L INTGR NO 1 AGC
P/L INTGR NO 1 LOOP STRESS
P/L INTGR NO 1 PHASE LOCK
-120 TO -20 dBm
10 S/S
-85 TO +85KHZ
1 = LOCK
(V74C656A)
(V74C656A)
(V74X627E)
(V74X626E)
ATTEN
DET
51Ω
4-PORT HYBRID
(H1 PA PATH)
(LO PA PATH)
(MED PA PATH)
(PA)
(PF)
(PF AND PR)
ATTEN
12dB
9dB
H1
MED
LO + H1
MED + LO
H1 DLY
MED DLY
LO DLY
L.O DLY
SOLS DLY
SOLS
NASA
DOD
NASA DRVR
DOD DRVR
24 dBm
4W
PREAMP
+19.5VDC
+12VDC
-12VDC
+28VDC
+5.1VDC
A1 H1 DLY
A2 MED DLY
B1 A.MED
B2 A.LO
C1 A.LO DLY
C2 LO DLY
D1 SOLS DLY
D2
A1INH
100 µS DELAY
INPUT CONDITIONING LOGIC
SOLS FREQ MODE
TX LO
TX MED
TX HI
A
B
C
D
PA COMMANDS
DOD DATA SEL
DOD CMDS
NASA CMDS
PA CMDS
DOD/NASA MODE CNTL SIGNAL
DOD/NASA CMD DATA
ATTENUATION
DOD CMDS
NASA CMDS
DOD INH
DOD
NASA
M0-M13
N0-N13
÷N
Φ DETECTOR
LOOP FILTER
LPF
BPF
VCO
÷20
÷16
÷2
÷4
÷8
÷10
÷5
÷6
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÷11
÷12
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÷60

BASIC REV E

TX SYNTHESIZER

RCVR SYNTHESIZER

FIRST IF

TX INHIBIT

RCVR INPUT

RCVR LO SIGNAL

PA COMMANDS

MOD INHIBIT
DDO DATA SELECT
DDO CMOS
NASA CMOS
PA CMDS
DDO/NASA MODE CNTL SIGNAL
DDO/NASA CMD DATA

TX OFFSET
SOLS FREQ MODE
PA MODE COMMANDS
DDO/NASA MODE CNTL SIGNAL
MOD INHIBIT
DDO DATA SELECT

TX SYNTH MODULE
RCVR SYNTH MODULE
INPUT CONDITIONING LOGIC
COMBINATIONAL LOGIC C
LINEAR REG
6-STEP ATTENUATION (5 USED)
ATTENUATION
LOOP FILTER
VCO CONTROL VOLTAGE
UP CONVERTER
DOWN CONVERTER
FREQ MULT X4
FREQ MULT X2
REF ÷M
RCV FREQ ÷N
TX FREQ
REF FREQ TO TX SYNTH
RCV FREQ FROM SYNTH
320 MHZ REF
160 MHZ
1280 MHZ MOD
320 MHZ MOD
(65-167.1 MHZ)
(50-130 MHZ SOLS)
(59-159 MHZ STDN/OSN)
GAIN NORM 1 (8+9) + (11+OSN)
GAIN NORM 2 (8+9) + (11+OSN)
GAIN NORM 3 (OSN)
1985-2085 MHZ
705-805 MHZ
(M=256 OR 1456)
(N= 0 TO 2047)
MO-M11
NO-N13
FREQ SEL BIT 1
FREQ SEL BIT 8
OSN MODE
FSB 11
FSB 9
FSB 8
+5.1V
+5.1VDC
+12VDC
-12VDC
-9VDC
+6 dBm
-36 dBm
0 = -20 dBm
6
2
1
DATE 10/25/90 | NAME: JOF | VERSION: 1Ma6
1 LHCP/2 RHCP
1 RHCP/2 LHCP
TRIPLEXER CMDS

DATE: 07/17/96 | NAME: BJB | VERSION: INK=4

1 LHCP/2 RHCP
1 RHCP/2 LHCP
TRIPLEXER CMDS
→Z8 16.14-1

CMD PROCESSOR

ISOLATED +5.1VDC
TX HI PWR
TX LO PWR
TX MED PWR
MOD INHIBIT
SWEEP ENABLE
SWEEP NARROW
NASA MODE (TO BASEBAND)
DOD MODE (TO BASEBAND)
DOD MODE (TO TX SYNTH)

H_0
$(H_0 \oplus M_0) = L_0$
M_0

+5V1
TX PWR HI TLM
TX PWR LO TLM
TX PWR MED TLM
+6V TLM
LINEAR REG
+28V

FREQ SEL BIT 9
FREQ SEL BIT 10
FREQ SEL BIT 11
FREQ SEL BIT 5
FREQ SEL BIT 6
FREQ SEL BIT 7
FREQ SEL BIT 8
FREQ SEL BIT 1
FREQ SEL BIT 2
FREQ SEL BIT 3
FREQ SEL BIT 4
ADDER A
ADDER B
(900-919)● A
900-919
B
C
D

ADDER A-A1/B1 OUT
850-882
A-L IN
A-C IN
DECODER LOGIC
D1 910-919
D2 (900-909)
D3 1-420
D4 421-808
D5 850-882
D6 854-882
D7 850-853
D8 900-919
DSN FREQ MODE TO SYNTH
SGLS FREQ MODE TO SYNTH SOURCE
SGLS FREQ MODE TO TX SYNTH

SW1,SW2 SET (RX FREQ HI) (421-808) + (850-882) + (910-919)
SW2 SET MONITOR
SW1 SET MONITOR
PIRPM S1S, S2S M2 M1

(1-420) + (900-909)
S1,2 RESET (RX FREQ LO)
SW2 RST MON
SW1 RST MON
PIRPM S1R, S2R M2 M1

(421-808) + (850-882)
SW3 SET (NASA TX FREQ HI)
SW3 MON
PIRPM S3S M2 M1

D3 (1-420)
SW3 RST (NASA TX FREQ LO)
SW3 RST MON
PIRPM S3R M2 M1

D1 (910-919)
SW4 SET (SGLS TX FREQ HI)
SW4 SET MON
PIRPM S4S M2 M1

D2 (900-909)
SW4 RST (SGLS TX FREQ LO)
SW4 RST MON
PIRPM S4R M2 M1

MONITOR CONTACT PWR
+5V1

(D1 ⊕ D4 ⊕ D5)
(D2 ⊕ D3)
OS 160MS
OS 160MS
Δ FREQ
D7 (850-853)
TX INH (TO PA)

SYNTHESIZER SOURCE

VCXO 80 MHZ
FREQ MULT X2
160 MHZ
LINEAR REG
+5V
+12VDC
-12VDC
→Z8 16.14-1

SWEEP ENA
SWEEP NARROW
SGLS
SE
SN
COMBINATIONAL LOGIC D
A = SGLS + SN
B = SGLS + SN
C = SGLS + SN
D = SGLS + SN
+12V STDN
+12V SGLS

SCALING CONTROL SIGNALS
SWEEP SCALER
FREQ CNTL VOLTAGE
SWEEP OSCILLATOR
POWER CONTROL SIGNAL
(SWEEP RAMP)
CONTROL VOLTAGE
STDN/DSN
VCXO 68.597916 MHZ
FREQ MULT X2
FREQ MULT X5
VCXO 71.611361 MHZ
FREQ MULT X2
FREQ MULT X3
+12V SGLS
TX OFFSET OUT

FREQ SEL BIT 1-11 + DSN MODE
→Z5 16.14-1
TX OFFSET TO TX SYNTH
→Z3 16.14-1
SGLS FREQ MODE TO TX SYNTH
→Z3 16.14-1

MOD INHIBIT
DOD DATA SELECT
PA MODE CMDS
DOD/NASA CONTROL SIGNAL
→Z1 16.14-1

NASA MODE
NASA MODE

BASIC REV E-6

T S R Q P O N M L K J

KU SPA

INTGTR 1 CONT
INTGTR 2 CONT

S-BAND PAYLOAD
ANT POLAR
2 LHCP
2 RHCP
1 LHCP
1 RHCP
L CIRC
R CIRC
PNL A1L S2

S-BAND PAYLOAD
XMTR PWR
HIGH
LOW
PNL A1L S4

S-BAND PAYLOAD
MOD
ON
OFF
PNL A1L S9

S-BAND PAYLOAD
FREQ SWEEP
ON
OFF
PNL A1L S8

2LHCP
2RHCP
1LHCP
1RHCP

MOD OFF
S-BD PI SWEEP OFF

28VDC

XMTR NO 2 PWR HIGH
XMTR NO 2 PWR MED
XMTR NO 2 PWR LOW
XMTR NO 1 PWR HIGH
XMTR NO 1 PWR MED
XMTR NO 1 PWR LOW
P/L INTRG NO 2 MOD ON
P/L INTRG NO 2 MOD OFF
P/L INTRG NO 1 MOD ON
P/L INTRG NO 1 MOD OFF
P/L INTRG 2 XMTR FREQ SWEEP ON
P/L INTRG 2 XMTR FREQ SWEEP OFF
P/L INTRG 1 XMTR FREQ SWEEP ON
P/L INTRG 1 XMTR FREQ SWEEP OFF

TX PWR HI
PI 1 DISCRETE TLM
TX PWR MED
PI 1 ON TLM
TX PWR LO

MOD ON
MOD OFF
SWEEP ON
SWEEP OFF

CHANNEL 1
CHANNEL 2
CHANNEL 4
CHANNEL 8
CHANNEL 10
CHANNEL 20
CHANNEL 40
CHANNEL 80
CHANNEL 100
CHANNEL 200
CHANNEL 400
CHANNEL 800
CHAN 1
CHAN 2
CHAN 4
CHAN 8
CHAN 10
CHAN 20
CHAN 40
CHAN 80
CHAN 100
CHAN 200
CHAN 400
CHAN 800
(12 DRIVERS) INTRG 2

NO. 1
NO. 2
HNDS
TENS
UNITS
BCD CODER
(TYP OF 3)
S7

PI 1 ON
PI 2 ON

PSDP

CIU
MODE SELECTION
PAYLOAD LINK
HARDLINE 64 KBPS
HARDLINE 16 KBPS
RF
PNL L11 S

PS DOD MODE
PS DOD MODE (PI1)

CHANNEL SELECT
CHANNEL SELECT TLM

P/L INTRG NO 2 SWP NARROW
P/L INTRG NO 2 SWP WIDE
P/L INTRG NO 1 SWP NARROW
P/L INTRG NO 1 SWP WIDE
P/L INTRG NO. SWEEP NARROW
P/L INTRG NO. 1 SWEEP WIDE

GCIL ONLY FALSE
GCIL ONLY FALSE

SWITCHING POWER CONVERTER
+19.5VDC
+28VDC
-12VDC
+5.6VDC
+12.5VDC
+12VDC/+5.1VDC VOLTAGE REGULATOR (LINEAR)
+12VDC
+5.1VDC
LINEAR REG
+28V
ISOLATED +5V (+5V1)
+5.1VDC
+5.1VDC

COMBINATIONAL LOGIC A
DUAL FF
MOD ON TLM
FREQ SWP ON TLM
PI 1 PWR ON TLM
SWP WIDE ON TLM
SWP NARROW ON TLM
DOD MODE

OPTO ISOLATOR BANK
CH SEL TLM
COMBINATIONAL LOGIC B
A-L OUT
B-C-D OUT
A0-A9 OUT
PROM A
PROM B
CH 2-4-8 (B-C-D)

ADDER A
ADDER B
FREQ S

(V74X5630E)
L INTRG NO 1 CHAN SEL 1
(V74X5634E) P/L INTRG NO 1 CHAN SEL 4
(V74X5638E) P/L INTRG NO 1 CHAN SEL 10
(V74X5642E) P/L INTRG NO 1 CHAN SEL 40
(V74X5646E) P/L INTRG NO 1 CHAN SEL 100
(V74X5650E) P/L INTRG NO 1 CHAN SEL 400
(V74X5632E) P/L INTRG NO 1 CHAN SEL 2
(V74X5636E) P/L INTRG NO 1 CHAN SEL 8
(V74X5640E) P/L INTRG NO 1 CHAN SEL 20
(V74X5644E) P/L INTRG NO 1 CHAN SEL 80
(V74X5648E) P/L INTRG NO.1 CHAN SEL 200
(V74X5652E) P/L INTRG NO 1 CHAN SEL 800
1=ON 1 S/S
OF2 N/A

DATE	NAME	VERSION
DATE: 10/29/90	NAME: MAG	VERSION INR: 3
DATE: 01/30/96	NAME: VSH	VERSION BPT: 3
DATE: 07/17/96	NAME: BJB	VERSION INR: 4

14 S-BAND PL INTRG 2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	SIGNATURE	DATE
S-BAND PAYLOAD INTERROGATOR	DSGN VICKI S. HUNTER	8/10/90
	DR	
	ENGR F.J. MACFARLANE	8/31/90
	ENGR	7/19/96
DWG NO 16.14 / SPACE SHUTTLE ALL	APP	7/19/96
	APP	7/19/96
SHEET 2 OF 2 / PAGE / 104.5 X 34	CADS S.K. Kimbrough	7-22-96
	LTR E / PCN 6	

BASIC REV E-6

DATE:	NAME:	VERSION:
DATE: 9/05/90	NAME: MAG	VERSION: BPT: 12
DATE: 01/30/96	NAME: VSH	VERSION: BPT: 13
DATE: 07/17/96	NAME: BJB	VERSION: INK: 10

PSP NO. 2

PSP NO. 1

MEMORY I/O CNTLR

SERIAL TO PARALLEL

FRAME SYNC LOCK LOGIC

AND PWR TRANSIENT DETECTOR

TELEMETRY DATA MEMORY BITS 1 AND 2

TELEMETRY DATA MEMORY BITS 3 AND 4

TELEMETRY DATA MEMORY BITS 5 AND 6

TELEMETRY DATA MEMORY BITS 7 AND 8

PARALLEL TO SERIAL SHIFT REGISTER

PSP 1 FR SYNC

PSP 1 B/S LOCK

CONFIG MSG LOAD CONTLR

TLM DATA CNTLR

TLM DATA FORMATTER

CONFIG/ STATUS READ CNTLR

CONF MSG REGISTER (CONF REFRESH BUFFER)

CONF MSG REGISTER

STATUS MSG REGISTER

CONFIG MSG REGISTER/ DECODER

STATUS MSG OUTPUT BUFFER

CMD OUTPUT SELECTOR

SEL UMB 1

SEL UMB 2

SEL UMB 3

SEL UMB 4

SEL UMB 5

K1

K2

K3

K4

K5

K6

K7

BPF

PDI

TO PAYLOAD BAY PAYLOADS (HARDLINE)

T/O UMB

TO INTRG 2 16.14

TO INTRG 1 16.14

SM DOWNLIST PARAMETERS

MSID NO.	NOMENCLATURE
V92X0325X	PSP 1 BYPASS
V92X0329X	PSP 2 BYPASS
V92X0800X	BUFFER AVAILABLE
V92X0801X	BUFFER BUSY
V92X0802X	REPEAT MESSAGE
V92X0803X	CONFIGURATION MESSAGE ERROR
V92X0804X	CONFIGURATION-INITIALIZED
V92X0805X	PAYLOAD COMMAND ERROR
V92X0806X	NEW CONFIGURATION MESSAGE
V92J080TC	PAYLOAD COMMAND RATE
V92J080IC	PAYLOAD COMMAND DATA TYPE
V92X0809X	IDLE PATTERN ENABLE
V92X0810X	PAYLOAD INTGTL OUTPUT SELECT
V92X0811X	UMBILICAL OUTPUT SELECT
V92X0812X	GSE OUTPUT SELECT
V92X0813X	PAYLOAD INTGTR TLM SELECT
V92X0814X	GSE TLM SELECT
V92J0815C	PSP TLM RATE
V92J0816C	PSP TLM DATA TYPE
V92J0817C	PSP UMBILICAL SELECTED
V92J0818C	PSP FRAME SYNC WORD LENGTH
V92X0819X	PSP BIT SYNC LOCK
V92X0820X	PSP FRAME SYNC LOCK
V92J0821C	PSP TLM FRAME SYNC WORD 1
V92J0822C	PSP TLM FRAME SYNC WORD 2
V92J0823C	PSP TLM FRAME LENGTH
V92X1102X	PSP LOAD REJECT
V92J1103C	LAST PSP CONFIG. MESSAGE ID.
V92J1104C	PSP LOAD REJECT/INCREMENT CTR.
V92X1115X	PSP ILLEGAL STATUS MESSAGE
V92X1116X	PSP CMD LOAD XFER INCOMPLETE
V92X1120X	PSP TEC REJECT FLAG
V92X1124X	PSP UPLINK INVALID REQUEST
V92X1127X	PSP UPLINK REJECT FLAG
V92X1128X	GNC XFER REJECT FLAG
V92X1129X	CC SPEC REJECT FLAG

1. REFER TO TABLE 16.15 FOR DRAWING TRACEABILITY

15 P/L SIG PROC

SIGNATURE	DATE	
DSGN VICKI S. HUNTER	5/12/82	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
ENGR J.O. SAYLER		PAYLOAD SIGNAL PROCESSOR
ENGR	7/17/96	
APP	7/19/96	
APP	7/9/96	SPACE SHUTTLE / DWG NO 16.15
CADS S.K. Kinlaw	7-22-96	ALL
LTR E PCN 6		126.5 X 34 / PAGE / SHEET 1 OF 1

BASIC REV E-6

DMS NO	CHD NAME	OCL CHNNCR	OCL FUNCTION
4600	PL SYSTEM 1-ON	131	10/9 ON	P/L SYS #1
			10/10 OFF	P/L SYS #2
4601	PL SYSTEM-OFF	133	10/9 OFF	P/L SYS #1
			10/10 OFF	P/L SYS #2
4602	PL SYSTEM 2-ON	132	10/10 ON	P/L SYS #2
4603	PL PSP-SEL	134	7/6 ON	P/L SIG PROC #1
			15/6 ON	P/L SIG PROC #2
			8/7 ON	P/L INTERN #1
			16/7 OFF	P/L INTERN #2
4604	PL INTGN-SEL	135	8/7 ON	P/L INTERN #1
			16/7 ON	P/L INTERN #2
			7/6 OFF	P/L SIG PROC #1
			15/6 OFF	P/L SIG PROC #2
4605	PL PSP/INTGN-SEL	136	7/6 ON	P/L SIG PROC #1
			15/6 ON	P/L SIG PROC #2
			8/7 ON	P/L INTERN #1
			16/7 ON	P/L INTERN #2

DATE: 07/17/96 | NAME: BJB | VERSION: INR-10

W V U T S R Q P O N

8 7 6 5 4 3 2 1

DMS NO	CMD NAME	GCIL CMD	GCIL DRIVER	GCIL FUNCTION
4800	PL SYSTEM 1-ON	131	10/5 ON 10/10 OFF	P/L SYS #1 P/L SYS #2
4801	PL SYSTEM-OFF	133	10/5 OFF 10/10 OFF	P/L SYS #1 P/L SYS #2
4802	PL SYSTEM 2-ON	132	10/10 ON 10/5 OFF	P/L SYS #2 P/L SYS #1
4803	PL PSP-SEL	134	7/6 ON 15/6 ON 8/7 OFF 16/7 OFF	P/L SIG PROC #1 P/L SIG PROC #2 P/L INTERR #1 P/L INTERR #2
4804	PL INTGR-SEL	135	8/7 ON 16/7 ON 7/6 OFF 15/6 OFF	P/L INTERR #1 P/L INTERR #2 P/L SIG PROC #1 P/L SIG PROC #2
4805	PL PSP/INTGR-SEL	136	7/6 ON 15/6 ON 8/7 ON 16/7 ON	P/L SIG PROC #1 P/L SIG PROC #2 P/L INTERR #1 P/L INTERR #2

BASIC REV E-6

DATE: 6/1/87	NAME: VOC	VERSION: INK, 6
DATE: 8/9/90	NAME: VSH	VERSION: BPT, 1
DATE: 08/27/90	NAME: JMB	VERSION: INK, 7

SRB DFI FLIGHT RECORDER

RCDR REWIND
RCDR AT BOT
TEST
K24
RCDR POWER OFF
K7
(B78X788TX) LSRB (LLO1)
B78 X8888X | LRO1 | N/A (N/A)
RH FLIGHT RCDR NO GO
1=NO GO 1 S/S
CONTROL POWER
N/A)
REWIND
K9
RESET
RCDR INHIBIT
K8-1
B78 X8888X | LRO1 | N/A (N/A)
RH FLIGHT RCDR RCD
1=RUN 1 S/S
TEST
RECORDING
K10
RCDR INHIBIT
K8-2
RCDR REPRODUCE
K12
RCDR AT EOT
K25
TEST

BEGINNING OF TAPE
TRANSPORT POWER
TRANSPORT VOLTAGE REGULATOR
15V
5V
TO TRANSPORT LOGIC AND SERVOS
POWER ON
BROKEN TAPE
PLAYBACK VOLTAGE REGULATOR
20V
TO PB AMPS
RECORDER POWER ON
PROTECTION CIRCUIT LOGIC
SENSOR LAMPS
REVERSE RELAY CONTROL
POWER ON
BIAS POWER IN
RECORD REGULATOR OUT
RECORD REGULATOR IN
RCD VOLTAGE REG
BIAS OSC 4.85 MHZ
BIAS AMP
RECORD INDICATOR
SW
RCD REG PWR ON
BIAS PWR ON
UP TO SPEED
1.6 MHZ OSC
SPEED CONTROL
PHASE DET
CAPSTAN SERVO AMP
RCD AMPS (7)
RCD AMPS (7)
PB AMPS (7) ODD
PB AMPS (7) EVEN
END OF TAPE
REFERENCE SIGNAL 100 KHZ
ODD TRACKS
EVEN TRACKS
PCM 1
MUX 1 PRI
MUX 1 SEC
PCM 2
MUX 2 PRI
MUX 2 SEC
IRIG - B TIME CODE
FDM 1 A2A1
FDM 1 A2A2
FDM 2 A1A1
FDM 2 A1A2
ODD TRACKS
EVEN TRACKS

TAKE-UP REEL
BEGINNING OF TAPE SENSOR
BROKEN TAPE SENSOR
SLACK TAPE CONTROL RELAY
K31
220
+15VDC
BRAKES
REEL SERVO AMP
SENSOR LAMPS
CAPSTAN MOTOR CONTROL RELAY
K32
CAPSTAN
RCD HEAD ODD TRKS
PB HEAD ODD TRKS
RCD HEAD EVEN TRKS
PB HEAD EVEN TRKS
CAPSTAN
÷ 5
970 KHZ
BULK ERASE
FROM SLACK CONTROL RELAY
END OF TAPE SENSOR
SUPPLY REEL

A PROTECTION CIRCUIT SHUTS DOWN RCDR IF
1. TAPE BROKEN OR MISTHREADED
2. TAPE TENSION SENSOR LAMP FAILED

B RECORDER OPERATES AT ONE SPEED (60 IPS) IN BOTH FORWARD AND REVERSE DIRECTION MINIMUM RECORD TIME IS 12 MINUTES

C SWITCHES CLOSE IF TAPE IS SLACK AND CAUSE CAPSTAN TO SPEED UP/SLOW DOWN AND REMOVE SLACK (FOR INITIAL SET UP)

D EOT/BOT FORCES RCDR INTO STANDBY MODE. RCD AMPS ETC ARE OFF, RCDR IS STILL POWERED

E BRAKES APPLIED WHENEVER TRANSPORT POWER IS REMOVED

NOTES: 1. THE LEFT AND RIGHT SOLID ROCKET BOOSTER FLIGHT RECORDERS AND ASSOCIATED CIRCUITRY ARE IDENTICAL

16 SRB RCDR

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	S. K. KIMBRELL	2-9-77	
DR	S. K. KIMBRELL	10-5-78	
ENGR	G.C. HOMLACHER		SRB DFI FLIGHT RECORDER
ENGR		09-12-90	
APP		9/12/90	
APP	R.W. Rohe	9.12.90	SPACE SHUTTLE / DWG NO 16.16
OMNIPLAN	S.K. Kimbrell	11-28-90	ALL
LTR E	PCN		82.5 X 34 / PAGE / SHEET 1 OF 1

BASIC REV E

DATE: 08/27/90 | NAME: JMB | VERSION: INK.7

0 N M L K J I H

8 7 6 5 4 3 2 1

GSE DFI TAIL PLUG

DFI FLT RCDR REWIND

DFI FLT RCDR AT BEGINNING OF TAPE

DFI FLT RCDR POWER OFF

28VDC TEST VOLTAGE

DFI FLT RCDR RECORDING

DFI FLT RCDR INHIBIT

DFI FLT RCDR REPRODUCE

DFI FLT RCDR AT END OF TAPE

ODD TRACKS 1 TO 13

EVEN TRACKS 2 TO 14

RCDR REWIND

RCDR AT BOT

TEST

LLO1 — LRO1 — DFI FLT RCDR REVERSE

RSRB B78K6004X

LSRB (B78K5004X)

K24

RCDR POWER OFF

K7

(B78X7887X) LSRB (LLO1) — B78 X7887X — LRO1 | N/A (N/A) — RH FLIGHT RCDR NO GO — 1=NO GO 1 S/S

LSRB (B78K5001X)

RSRB B78K6001X

LRO1 — LLO1 — DFI POWER OFF

DFI BATT 50 AMP HR

FROM WATER IMPACT SWITCH

TD 5 MIN

K20

LSRB (B78K5000X)

RSRB B78K6000X

LRO1 — LLO1 — DFI POWER ON

K1

(B78X7914X) LSRB (LLO1) — B78 X8914X — LRO1 | N/A (N/A) — RH TIME CODE GEN OK — 1=OK 1 S/S

TIME CODE GENERATOR

RESET

REWIND

K9

RCDR INHIBIT

K8-1

(B78X7888X) LSRB (LLO1) — B78 X8888X — LRO1 | N/A (N/A) — RH FLIGHT RCDR RCD — 1=RUN 1 S/S

TEST

RECORDING

K10

LLO1 — LRO1 — DFI FLT RCDR FWD INHIBIT

RSRB B78K6003X

LSRB (B78K5003X)

RCDR INHIBIT

K8-2

RCDR REPRODUCE

K12

RCDR AT EOT

K25

TEST

IRIG - B TIME CODE

SRB DFI FLIGHT RECORDER

BEGINNING OF TAPE

TRANSPORT POWER — 1 — 6Z7 — 0Z2.8

TRANSPORT VOLTAGE REGULATOR — 15V, 5V — TO TRANSPORT LOGIC AND SERVOS

POWER ON

BROKEN TAPE

RECORDER POWER ON

PROTECTION CIRCUIT LOGIC

SENSOR LAMPS

K30

PLAYBACK VOLTAGE REGULATOR — 20V — TO PB AMPS

CONTROL POWER

REVERSE RELAY CONTROL

POWER ON

BIAS POWER IN

RECORD REGULATOR OUT

RECORD REGULATOR IN

RCD VOLTAGE REG

BIAS OSC 4.85 MHZ

RECORD INDICATOR — SW — RCD REG PWR ON — BIAS PWR ON — UP TO SPEED

END OF TAPE

REFERENCE SIGNAL 100 KHZ

ODD TRACKS

EVEN TRACKS

PCM 1	MUX 1 PRI	1	ODD TRACKS
	MUX 1 SEC	14	EVEN TRACKS
PCM 2	MUX 2 PRI	6	
	MUX 2 SEC	3	
FDM 1 AZA1	MUX 1 PRI	8	
	MUX 1 SEC	13	
FDM 1 AZA2	MUX 2 PRI	5	
	MUX 2 SEC	2	
FDM 2 A1A1	MUX 1 PRI	7	
	MUX 1 SEC	4	
FDM 2 A1A2	MUX 2 PRI	9	
	MUX 2 SEC	10	
		11	
		12	

ODD TRACKS

EVEN TRACKS

BASIC REV E

DATE: 02/06/96	NAME: BJB	VERSION: BPL 6
DATE: 02/16/96	NAME: JMB	VERSION: INL 3
DATE: 02/27/96	NAME: VSH	VERSION: INL 4

PRA
+13V
+6V
SELECT A
SEL DECODER A
A0 THROUGH A8

A8, A9, A11, A12, A13, A14, A15, A16, A17, A18

DECODER DRIVER A3

3, 4, 5, 6, 9, 10, 11, 12, 13, 14

SERIES INTLK
CMD PWR
INTLK
DRIVER OUTPUT
TLM
SWITCH INPUT
CMD ENABLE
PWR
DISABLE

DRIVER 7, 8, 15, 16

DRIVER SENSE
SERIES INTLK
CMD PWR
INTLK
DRIVER OUTPUT
TLM
SWITCH INPUT
CMD ENABLE
PWR
DISABLE

$\overline{A0}$ $\overline{A1}$ $\overline{A2}$ $\overline{A3}$ $\overline{A4}$ $\overline{A5}$ $\overline{A6}$ $\overline{A7}$ $\overline{A8}$
ISOLATOR
A0 A1 A2 A3 A4 A5 A6 A7 A8

PROM
A CMD ON 1
A CMD OFF 1
A CMD ON 2
A CMD OFF 2
A CMD ON 3
A CMD OFF 3
A CMD ON 4
A CMD OFF 4

PROM
A CMD ON 5
A CMD OFF 5
A CMD ON 6
A CMD OFF 6
A CMD ON 7
A CMD OFF 7
A CMD ON 8
A CMD OFF 8

PROM
A CMD ON 9
A CMD OFF 9
A CMD ON 10
A CMD OFF 10

SELECT A
SEL DECODER A
+13V
+6V
ISOLATOR
ONE SHOT 65μS
ONE SHOT 15μS
CLR
STROBE A
STROBE B
SEL DECODER B
SELECT B

$\overline{B0}$ $\overline{B1}$ $\overline{B2}$ $\overline{B3}$ $\overline{B4}$ $\overline{B5}$ $\overline{B6}$ $\overline{B7}$ $\overline{B8}$
ISOLATOR
B0 B1 B2 B3 B4 B5 B6 B7 B8

PROM
B CMD ON 1
B CMD OFF 1
B CMD ON 2
B CMD OFF 2
B CMD ON 3
B CMD OFF 3
B CMD ON 4
B CMD OFF 4

PROM
B CMD ON 5
B CMD OFF 5
B CMD ON 6
B CMD OFF 6
B CMD ON 7
B CMD OFF 7
B CMD ON 8
B CMD OFF 8

PROM
B CMD ON 9
B CMD OFF 9
B CMD ON 10
B CMD OFF 10

$\overline{B0}$ THROUGH $\overline{B8}$
SEL DECODER B
SELECT B
+6V
+13V
$\overline{PRC}$

SEL DECODER A
$\overline{PRA}$
A CMD ON
SEL DEC A
B CMD ON
A CMD OFF
B CMD OFF
STROBE A
STROBE B
SEL DEC B
$\overline{PRA}$
$\overline{PRC}$
CMD CNTL
1Z7

DECODER DRIVER A10

DRIVER 1, 2, 3, 6, 7, 8

DRIVER SENSE
ON
OFF
ONE SHOT 7.5μS
MUX
SEL B
J FLIP FLOP CLK K
'1'
'0'
CMD ENABLE
PWR
DISABLE
ONE SHOT 5MS
CLR FLIP FLOP
ONE SHOT 20μS
ONE SHOT 9μS
TD 25MS
SERIES INTLK
CMD PWR
INTLK
DRIVER OUTPUT
TLM
SWITCH INPUT

DRIVER 4, 5, 9, 10

DRIVER SENSE
ON
OFF
ONE SHOT 7.5μS
MUX
SEL B
J FLIP FLOP CLK K
'1'
'0'
CMD ENABLE
PWR
DISABLE
ONE SHOT 5MS
CLR FLIP FLOP
ONE SHOT 20μS
ONE SHOT 9μS
TD 25MS
DRIVER SENSE
SERIES INTLK
CMD PWR
INTLK
DRIVER OUTPUT
TLM
SWITCH INPUT

1. RU F/S LOGIC WILL CAUSE THE GCIL TO DECODE CMD 509, 509 CONFIGURES S-BD PM UPLINK FOR LDR
   XPNDR RCV LDR FILTER NARROW
   XPNDR TDRS MODE
   NSP CODING RCV ON
   NSP UPLINK SOURCE S-BD
   NSP UPLINK LDR
2. THIS PARAMETER IS USED BY THE SM GPC TO DRIVE THE S76 GCIL MESSAGE
3. ONE SHOT — THE ONE SHOT WILL HOLD THE OUTPUT X AMOUNT OF TIME
4. XμS
5. GCIL ACTIVE TELEMETRY PARAMETER 1 = GCIL ACTIVE, AND 0 = REVERT TO PANEL
6. PROVIDES THE COMMAND CONTROL VOLTAGE TO THE COMMAND DRIVERS ASSOCIATED WITH ITS SYSTEM
7. PROM CMD OUTPUTS CONNECT TO RESPECTIVE DRIVER INPUTS I.E. CMD NO 1 TO DRIVER NO 1)

NOTES:
1. GROUND COMMAND SYMBOL — GCIL, XXXX, SW INPUT, DRIVER OUTPUT

DESIGNATIONS
XXXX - CARD NUMBER/DRIVER NUMBER
PM - S-BAND PM CREW CONTROL SWITCH
FM - S-BAND FM CREW CONTROL SWITCH
KU - KU-BAND CREW CONTROL SWITCH
PL - PAYLOAD CREW CONTROL SWITCH
W - NO CREW CONTROL SWITCH

SERIES INTLK - S - (WHEN HIGH, ENABLES THE COMMAND DRIVER)

DRIVER SENSE - D - (WHEN HIGH, WILL HOLD THE DRIVER OUTPUT ON WHEN THE CONTROL SWITCH IS MOVED FROM THE PANEL POSITION TO THE COMMAND POSITION)

DRIVER OUTPUT - STIMULUS TO THE LRU

INTERLOCK OUTPUT 1 (PRESENT WHEN EITHER COMMAND OR PANEL DRIVER ON)

CMD PWR - C

SWITCH INPUT - STIMULUS FROM THE LRU CONTROL SWITCH

17 GCIL

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN HEITIG/BUCHANAN	9/26/79	
DR		
ENGR J.E. CONNER		GROUND COMMAND INTERFACE LOGIC (GCIL) CONTROLLER
ENGR J.E. Conner	3/11/96	
APP Lenny Chatman	3/11/96	
APP Frankie D. Martin	3/11/96	SPACE SHUTTLE — DWG NO 16.17
CADS S.K. Kinslow	6-17-96	ALL
LTR E PCN 6		126.5 X 34 — PAGE — SHEET 1 OF 1

BASIC REV E-6

T S R P O N M L K J

DRIVER 7, 8, 15, 16

DRIVER SENSE

DRIVER 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14

DECODER DRIVER A4, A5, A6, A7, A8, A9, A11, A12, A13, A14, A15, A1

ISOLATOR

MDM A DATA BUFFER A1

MDM B DATA BUFFER A2

DECODE A ALL ONE-S AND GATE

ALL ONE-S TLM

ALL ZERO-S TLM

NOT USED

S-BAND CONFIGURATION

RU-BAND FAIL SAFE LOGIC

FAIL SAFE ENABLE

DATA SOURCE RU

DATA SOURCE RU

GCIL POWER SUPPLY 2 ON

GCIL POWER SUPPLY 1 ON

GCIL ACTIVE

SPEC 16

SYSTEM #2 MODE CONTROL

SYSTEM #1 MODE CONTROL

GCIL ONLY

SELECT A

SELECT B

SEL DECODER A

SEL DECODER B

THROUGH A8

THROUGH B8

+13V

+6V

PRA

PRB

PRC

GCIL

MDM A PF 1 CARD 07 CHANNEL 02

MDM B PF 2 CARD 07 CHANNEL 02

MDM A DATA BUFFER A1

MDM B DATA BUFFER A2

ISOLATOR

POWER SUPPLY A20

POWER SUPPLY A19

S-BAND PM

TV

KU-BAND

S-BAND PAYLOAD

S-BAND FM

GCIL ACTIVE

GCIL POWER SUPPLY 2 ON

GCIL POWER SUPPLY 1 ON

KU DATA GOOD

KU FAIL SAFE ENABLE

KU-BAND SIGNAL PROCESSOR

REVERT TO PNL RESET

ANT SW FREQ

PREAMP MIR

XPNDR (FREQ, SPD SPN, T/R)

P/L XMTR SWEEP

SYSTEM #2 DRIVERS

SYSTEM #1 DRIVERS

GCIL ONLY MODE CONTROL

ALL ZERO'S TLM

NOT USED

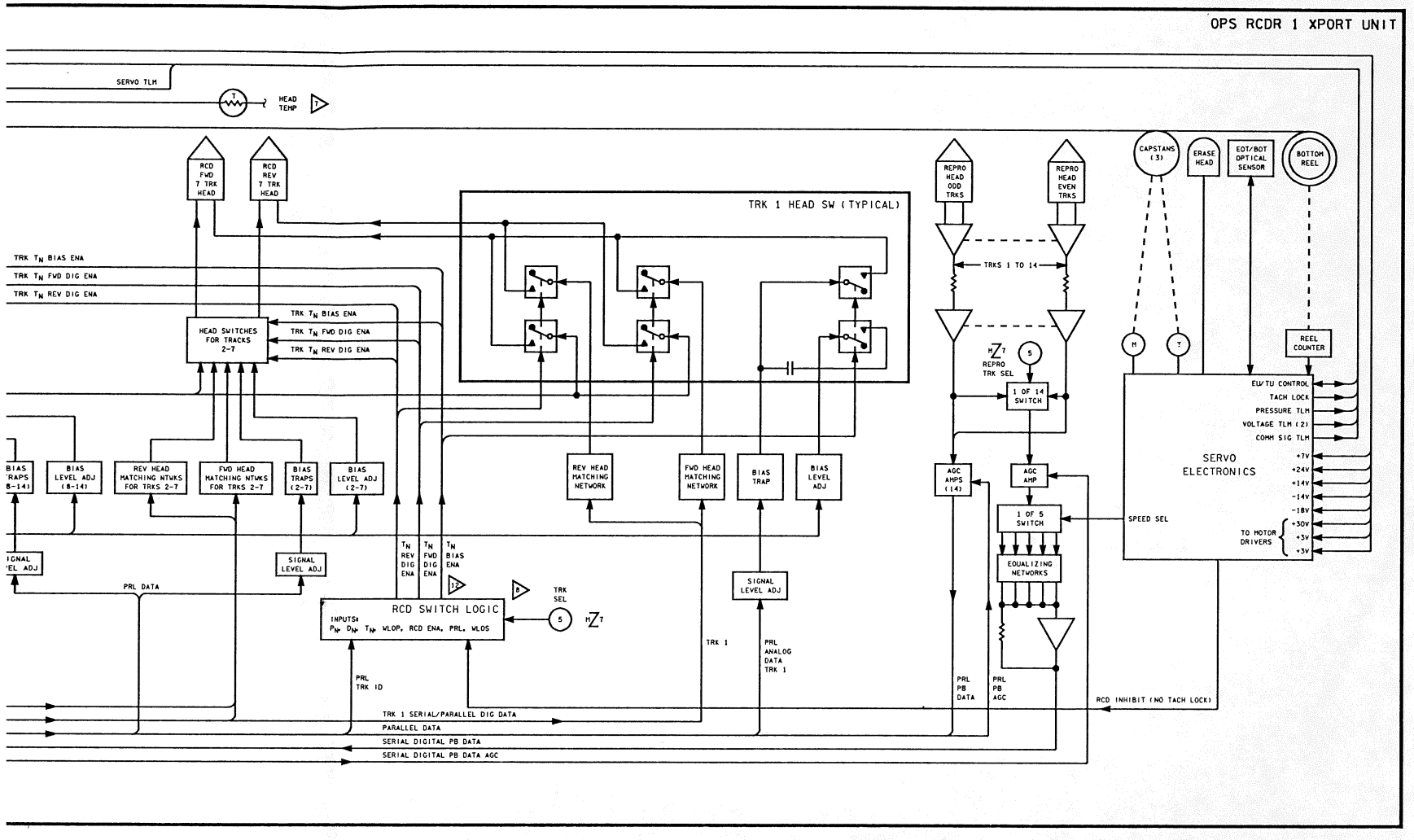
DECODE A ALL ONE'S AND GATE

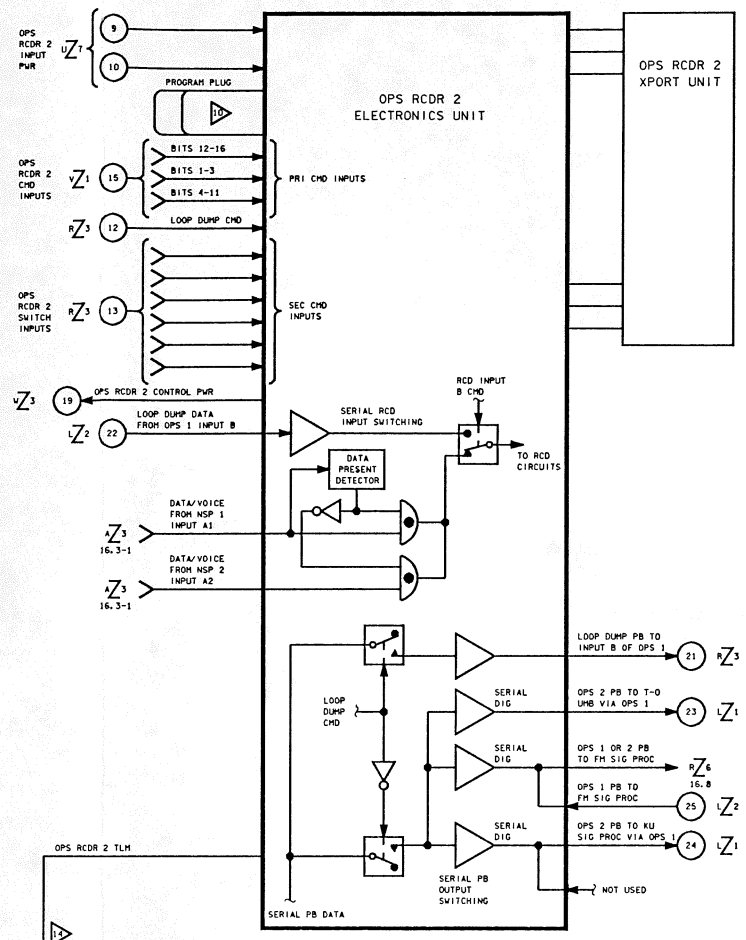
S-BAND CONFIGURATION

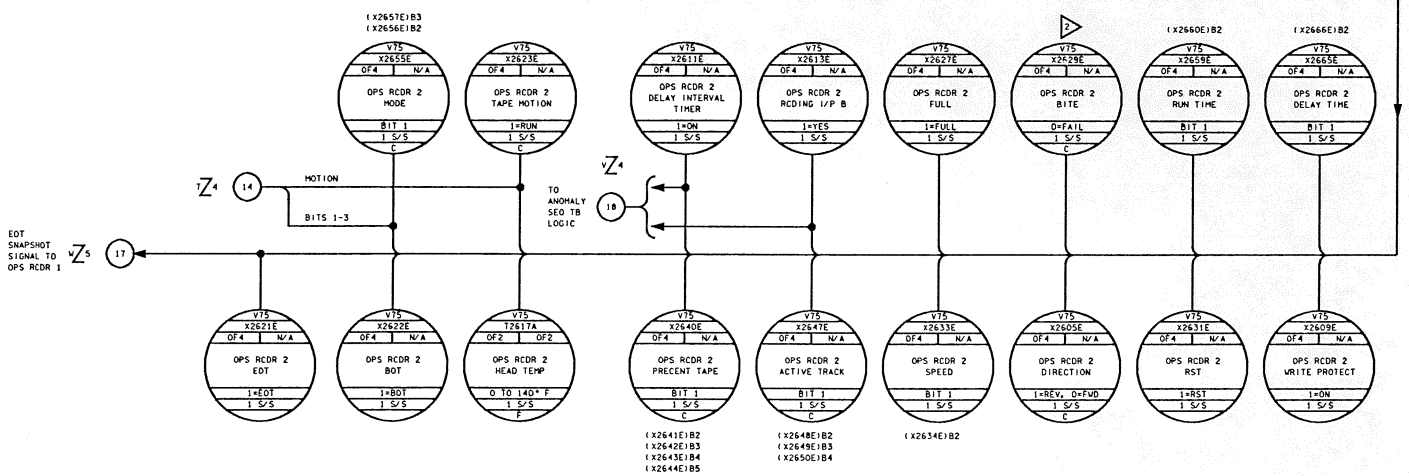
KU-BAND FAIL SAFE LOGIC

DATE 02/27/96 | NAME VSH | VERSION INA4

DATE: 07/07/94	NAME: BJB	VERSION INR: B
DATE: 02/15/96	NAME: BJB	VERSION BPT: 12
DATE: 03/15/96	NAME: VSH	VERSION INR: 9







RECORDER MODE			
BIT 1	BIT 2	BIT 3	MODE
0	0	0	STBY
1	0	0	RCDA
0	1	0	PB
1	1	0	LOOP
0	0	1	RCDB
1	0	1	RCDP
0	1	1	PB-P
1	1	1	STOP

RECORDER SPEED		
BIT 6	BIT 7	SPEED
0	0	1
1	0	2
0	1	3
1	1	4

RECORDER DELAY TIME		
BIT 8	BIT 9	SPEED
0	0	NONE
1	0	1
0	1	2
1	1	3

RECORDER RUN TIME		
BIT 10	BIT 11	RUN TIME
0	0	CONT
1	0	1
0	1	2
1	1	3

BIT 4 ALLOWS DIRECTION REVERSAL
BIT 5 UNUSED
BIT 12 INTERRUPTS ANY AUTOMATIC SEQUENCE IN PROGRESS AND DETERMINES THE FUNCTION OF BIT 13 ▶16

RECORDER ACTIVE TRACK				
BIT 13	BIT 14	BIT 15	BIT 16	TRACK
1	0	0	0	1
0	1	0	0	2
1	1	0	0	3
0	0	1	0	4
1	0	1	0	5
0	1	1	0	6
1	1	1	0	7
0	0	0	1	8
1	0	0	1	9
0	1	0	1	10
1	1	0	1	11
0	0	1	1	12
1	0	1	1	13
0	1	1	1	14

RECORDER PERCENT TAPE						
BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	PCT. 1
0	0	0	0	0	0
1	0	0	0	0	3
0	1	0	0	0	6
1	1	0	0	0	10
0	0	1	0	0	13
1	0	1	0	0	16
0	1	1	0	0	19
1	1	1	0	0	23
0	0	0	1	0	26
1	0	0	1	0	29
0	1	0	1	0	32
1	1	0	1	0	35
0	0	1	1	0	39
1	0	1	1	0	42
0	1	1	1	0	45
1	1	1	1	0	48
0	0	0	0	1	52
1	0	0	0	1	55
0	1	0	0	1	58
1	1	0	0	1	61
0	0	1	0	1	65
1	0	1	0	1	68
0	1	1	0	1	71
1	1	1	0	1	74
0	0	0	1	1	77
1	0	0	1	1	81
0	1	0	1	1	84
1	1	0	1	1	87
0	0	1	1	1	90
1	0	1	1	1	94
0	1	1	1	1	97
1	1	1	1	1	100

(12) TLM PARAMETERS WITH AN SM DISPLAY CATEGORY OF 'C' OR 'F' APPEAR ON SPEC 76

(13) BIAS PARALLEL RECORDING (ANALOG ON TRACKS 1-14 OR DIGITAL ON TRACKS 4-14) IS ONLY AVAILABLE ON FLIGHT UNITS 1-7. THIS TYPE OF RECORDING CAPABILITY, INCLUDING INPUT RECORDING AND OUTPUT PLAYBACK CIRCUITS, BIAS SIGNAL TLM AND PLAYBACK AGC CIRCUITRY HAS BEEN DELETED FROM FLIGHT UNITS 8 AND ABOVE

(14) BIAS RECORDING IS ONLY ENABLED FOR PARALLEL ANALOG RECORDING ON TRACKS 1-14 OR PARALLEL DIGITAL RECORDING ON TRACKS 4-14

(15) WHEN AN AUTO SEQUENCE IS COMMANDED, MODE, SPEED, DELAY TIME AND RUN TIME INPUT BIT CONFIGURATIONS ARE DETERMINED BY SELECTING THE PROGRAM PLUG INPUTS

(16) THE OPS RCDR 2 PROGRAM PLUG IS PROGRAMMED THE SAME AS THE OPS 1 PLUG

(17) OPS RCDR 1 IS CONFIGURED FOR PARALLEL DIGITAL RECORDING OF MAIN ENGINE DATA ON TRKS 1, 2, AND 3

(18) P_{IN} = TOTAL NUMBER OF PARALLEL TRKS; D_{IN} = TOTAL NUMBER OF PARALLEL TRKS; T_{IN} = TRK BEING ADDRESSED; WLOP=WRITE LOCKOUT PARALLEL; WLOS=WRITE LOCKOUT SERIAL; RCD ENA=SERIAL RCD CMD; PRL=PARALLEL RCD CMD

(19) HEAD TEMP SENSOR IS LOCATED ON THE MAIN FRAME NEAR THE RCD HEADS

(20) ANY OF THE BITS 1-4 OR 12-16 ON THE PRIMARY CMD DRIVERS WILL CAUSE THE INPUTS TO THE SEC CMD DRIVERS TO BE IGNORED. AUTO SEQ BITS/CMDS WILL OVERRIDE DIRECT CMDS/BITS IN THE SEC CMD INPUT DRIVERS

(21) POWER TO THE XPORT UNIT AND EU RCD/REPRO AMPS IS SWITCHED ON/OFF BASED ON MODE SELECTED

(22) TAPE SEARCH IS USED ONLY IN AUTO SEQ MODES

(23) WHEN POWER IS APPLIED TO THE RECORDER, THE SERIAL TRK SELECT LOGIC IS RESET TO TRK 1. LAST RCD POSITION IS RESET TO BOT, AND THE SERIAL/PARALLEL WRITE LOCKOUTS ARE RESET

(24) BITE MAY APPEAR AT BOT/EOT OF EACH TRK DURING TURN AROUND (1 TO 2 SEC)

NOTES: (1) ONCE PWR HAS BEEN APPLIED TO THE RECORDER AND SUFFICIENT RECORD TIME HAS ACCUMULATED TO FILL TRK 1, POWER SHOULD NOT BE REMOVED. THIS COULD CAUSE LOSS OF DATA DUE TO A TRK RESET WHEN PWR IS RE-APPLIED.

18 OPS RCDRS

SIGNATURE	DATE	
DSGN L. BUCHANAN	1/29/79	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEXAS
DR		
ENGR D. MILLER		OPS RECORDERS
ENGR	4/1/96	
APP	4/23/96	
APP	4/1/96	SPACE SHUTTLE / ALL / DWG NO 16.18
CADS S.K. Kimbrell	6/17/96	SHEET 1 OF 1
LTR E / PCN 6		126.5 X 34 / PAGE

BASIC REV E-6

T S R Q P O N M L K J

OPS RCDR 1 ELECTRONICS UNIT

AUTO SEQ NO 4 TREND
AUTO SEQ NO 2 LOOP DUMP WITHOUT DELAY
AUTO SEQ NO 1 LOOP DUMP WITH DELAY
PROGRAM PLUG
SPD 1 | RUN TIME 2 | RCD SER A | SPD 1 | RUN TIME 1 | RCD SER B | SPD 1 | RUN TIME 1 | DLY TIME 1 | RCD SER B | SPD 4 15 IPS | SPD 3 7.5 IPS | SPD 2 120 IPS | SPD 1 24 IPS | .156 MIN RUN TIME 2 | 5 MIN RUN TIME 1 | 2.5 MIN DLY TIME 1
SPEEDS | RUN TIMES | DELAY TIME

OPS RECORDERS 1 MODE RCD PB — PNL AIR DS3
OPS RECORDERS 1 PLAYBACK SPEED RECORD — PNL AIR S5
OPS RECORDERS 1 PANEL CONTROL — PNL AIR DS1
GRAY = PNL CNTL
BP = MDM CNTL
FWD LOAD CNTLR ASSY 2
PAYLOAD MDM PF 1
BITS 4-11
BITS 1-3
BITS 12-16
(16)
PRI CMD DRIVERS
PRI/SEC PRIORITY DETECTOR AND 16 BIT DATA SELECTOR
16 BIT EDGE DETECTOR AND DIGITAL NOISE FILTER
STROBE
COMMAND STORAGE LATCHES
AUTO/TRK SEL BITS
TO TRK SEQ
AUTO SEQUENCE DECODER
AUTO INTERRUPT BIT
LOGIC OR'S
MODE, SPEED, DELAY TIME AND RUN TIME BITS FOR AUTO SEQ CMDS
SEQ CMD DRIVERS
MODE, SPEED, DELAY TIME, AND RUN TIME BITS
9 BIT DATA SELECTOR
SPEED SELECTOR 1 OF 4
DELAY TIME SELECTOR 1 OF 3
RUN TIME SELECTOR 1 OF 3
MODE SELECTOR
DELAY/RUN TIME TLM
MODE TLM
SPD SEL TLM
CHANGE DIRECTION BIT
+5VDC CONTROL PWR
LOOP DUMP CMD
ROUTINE LOGIC
OPS RCDR 1 CONTROL PWR

MASTER TIMING AND SYNC CIRCUITS
÷10 ÷5 ÷8 1 OF 2 DATA SEL ÷4
OSC OSC
SERVO REF SERVO REF
HI SPD OSC 16 MHZ
MED SPD OSC 12.8 MHZ
LO SPD OSC 10.133 MHZ
÷16
1 OF 8 DATA SEL
1740 HZ OSC
÷16 ÷16
16X 8X 4X 2X CMD CLK
SPEED SEL LOGIC
SPEED CMD
DELAY TIMER
DELAY TIMER TLM
RUN TIMER

INITIALIZATION CONTROL LOGIC AND RESET
+5V

ELECTRONICS UNIT POWER SUPPLY
CURRENT LIMITER
REGULATOR
REGULATOR
DC/DC CONVERTER
REGULATOR
SUM AMP
+7V +7V -18V +12V -12V
REGULATOR
+5V TO LOGIC CIRCUITS

TRANSPORT UNIT POWER SUPPLY
SWITCHING REG AND DC/DC CONVERTER
+3V +3V +30V
DC/DC CONVERTER
+24V +14V -14V +7V -18V

TLM AMPLIFIERS
TLM
EU/TU CONTROLS

TRACK ID, RCDR FULL TLM
TRACK SEQUENCER
TRK SEL FROM CMD LATCHES
TRK SEL
TAPE MOTION SELECT
FWD/REV TO TU
RUN CMD TO TU
TAPE DIRECTION TLM
TAPE POSITION INDICATOR
REEL PULSES
TACH PULSES
EOT/BOT TO TU
EOT/BOT RESET
EOT, BOT, PCT TAPE TLM
TAPE SEARCH LOGIC
OPS LOGIC PROGRAMS
POWER SWITCHING CONTROLS TO TU AND EU
RCD INPUT B
LOOP DUMP
PRL MODE
WRITE PROTECT, RCD I/P B, RESET TLM

SERVO TLM
TOP REEL
RCD FWD 7 TRK HEAD
RCD REV 7 TRK HEAD
RCD FWD 7 TRK HEAD
RCD REV 7 TRK HEAD
TRK T_N BIAS ENA
TRK T_N FWD DIG ENA
TRK T_N REV DIG ENA
HEAD SWITCHES FOR TRACKS 8-14
HEAD SWITCHES FOR TRACKS 2-7
2 MHZ ERASE OSC
REV HEAD MATCHING NTWKS FOR TRKS 8-14
FWD HEAD MATCHING NTWKS FOR TRKS 8-14
BIAS TRAPS (8-14)
BIAS LEVEL ADJ (8-14)
REV HEAD MATCHING NTWKS FOR TRKS 2-7
FWD HEAD MATCHING NTWKS FOR TRKS 2-7
BIAS SIG TLM
6 MHZ BIAS OSC
SIGNAL LEVEL ADJ
PRL DATA

SERIAL DIGITAL DATA TRKS 4 TO 14
SERIAL/PARALLEL DIGITAL DATA TRKS 1 TO 3
PARALLEL RCD/PB DATA AND AGC (NOT USED)
SERIAL/PARALLEL DIGITAL DATA TRKS 1-3

FWD LOAD CNTLR ASSY 2
OPS RECORDERS 2 MODE RCD PB — PNL AIR DS4
OPS RECORDERS 2 PLAYBACK SPEED RECORD — PNL AIR S6
LOOP DUMP CMD TO OPS 2
OPS RCDR 2 SWITCH INPUTS
BIT 2 BIT 6 BIT 12 BIT 1 BIT 13 BIT 14 BIT 15 BIT 16

DATA/VOICE FROM MSP 2
DATA/VOICE FROM MSP 1
INPUT A2
INPUT A1
DATA PRESENT DETECTOR
RCD INPUT B
INPUT B
LOOP DUMP DATA FROM OPS 2
SERIAL TRK SELECT
TRK 1 TRK 2 TRK 3
SERIAL PRL
MAIN ENGINE DATA
EIU 1 (CTR) TRK 1 PRL DIGITAL DATA
EIU 2 (LFT) TRK 2 PRL DIGITAL DATA
EIU 3 (RT) TRK 3 PRL DIGITAL DATA

BITE STATUS PROCESSING
CURRENT LIMITER TEMP HIGH
HEAD TEMP HIGH (> 140°F)
PRESSURE HIGH
COMMUTATOR SIG NOT PRESENT
XPORT ANALOG V HI/LO
XPORT LOGIC V LOW
BIAS SIG LOW
EU LOGIC V LOW
EU ANALOG V HI/LO
SERIAL DIGITAL DATA TRKS 4 TO 14
SERIAL DIGITAL/PARALLEL DIGITAL DATA TRKS 1 TO 3

SERIAL DIGITAL PLAYBACK DATA
SERIAL DATA AGC
FILTER SELECT
1 OF 14 FILTERS
AGC DETECTOR
OUTPUT XFMRS
PARALLEL PLAYBACK DATA (NOT USED)

PARALLEL ANALOG/DIGITAL RECORD AND PLAYBACK CIRCUIT (TYPICAL OF 14) NOT USED
TRK 4 PRL DIGITAL INPUTS (NOT USED)
TRK 14 PRL DIGITAL INPUTS (NOT USED)
TRK 1 PRL ANALOG INPUTS (NOT USED)
TRK 14 PRL ANALOG INPUTS (NOT USED)
ATTENUATOR
INPUT ISOLATION AMPLIFIERS
AGC AMP
DRIVER INPUT SWITCHING LOGIC
RCD/PB DRIVER
DRIVER OUTPUT SWITCHING LOGIC
PRL MODE (RCD/PB)
PARALLEL ANALOG/DIGITAL RCD DATA
PARALLEL ANALOG/DIGITAL PB DATA
TRK DIG ID
TRK PRL ID
PRL RCD AGC
AGC DETECTOR
PRL PB AGC
DIGITAL/ANALOG PARALLEL TRK ID DECODER
DIGITAL/ANALOG PARALLEL TRK ID
LOOP DUMP

SERIAL DIGITAL PLAYBACK DATA
SERIAL DIGITAL PLAYBACK DATA
SERIAL DIGITAL PLAYBACK DATA
SERIAL DIGITAL PLAYBACK DATA

22 OPS RCDR 1 LOOP DUMP PLAYBACK TO INPUT B OF OPS 2
25 OPS RCDR 1 PLAYBACK TO FM SIGNAL PROCESSOR VIA OPS 2
OPS RCDR 1 (2) PLAYBACK TO T-O UMBILICAL
23 OPS RCDR 2 PLAYBACK TO T-O UMBILICAL
OPS RCDR 1 (2) PLAYBACK TO KU SIGNAL PROCESSOR
24 OPS RCDR 2 PLAYBACK TO KU SIGNAL PROCESSOR

(X2557E)B3 (X2556E)B2
(X2548E)B2 (X2549E)B3 (X2550E)B4
(X2534E)B2
(X2560E)B2
(X2566E)B2
V75 X2511E OPS RCDR 1 DELAY INTERVAL TIMER 1=ON 1 S/S
V75 X2527E OPS RCDR 1 FULL 1=FULL 1 S/S
V75 X2559E OPS RCDR 1 RUN TIME BIT 1 1 S/S
V75 X2523E OPS RCDR 1 TAPE MOTION 1=RUN 1 S/S
V75 X2513E OPS RCDR 1 RCDING I/P B 1=YES 1 S/S
V75 X2529E OPS RCDR 1 BITE 0=FAIL 1 S/S
V75 X2565E OPS RCDR 1 DELAY TIME BIT 1 1 S/S
TO ANOMALY SEQ TB LOGIC
V75 X2554E OPS RCDR 1 ACTIVE TRACK BIT 1 1 S/S
V75 X2533E OPS RCDR 1 SPEED BIT 1 1 S/S
V75 X2505E OPS RCDR 1 DIRECTION 1=REV, 0=FWD 1 S/S
V75 X2531E OPS RCDR 1 RESET 1=RST 1 S/S
V75 X2509E OPS RCDR 1 WRITE PROTECT 1=ON 1 S/S
SPEC 16

DATE: 03/15/96 | NAME: VSH | VERSION#: INK.9

W V U T S R Q P O N

8 7 6 5 4 3 2 1

OPS RECORDERS POWER

$V_{CNTLAB1}$ 1.2K $V_{CNTLAB2}$ 1.2K $V_{CNTLBC1}$ 1.2K $V_{CNTLBC2}$ 1.2K

ON / OFF — PNL AIR S11 — PNL AIR S12

V75 S2501E OF1 N/A — OPS RCDR 1 AB1 PWR ON — 1=ON 1 S/S

V76 X4383E OF1 N/A — OPS RCDR 1 MNA ON — 1=ON 1 S/S

V76 X4384E OF2 N/A — OPS RCDR 1 MNB ON — 1=ON 1 S/S

$V_{MNA\ FPCA1}$ RPC 5A — $V_{MNB\ FPCA2}$ RPC 5A

V75 S2601E OF2 N/A — OPS RCDR 2 BC1 PWR ON — 1=ON 1 S/S

V76 X4386E OF2 N/A — OPS RCDR 2 MNB ON — 1=ON 1 S/S

$V_{MNB\ FPCA2}$ RPC 5A — $V_{MNC\ FPCA3}$ RPC 5A

V76 X4387E OF3 N/A — OPS RCDR 2 MNC ON — 1=ON 1 S/S

PWR TO OPS RCDR 2 — 9, 10 — $^{U}Z_{8}$

FWD LOAD CNTLR ASSY 2 — MOTION BIT 1, BIT 3, BIT 2 — 11 $^{U}Z_{1}$ — +5V FROM DEDICATED SIGNAL CONDITIONER OF2

AUTO SEQ NO 4 TREND | AUTO SEQ NO 2 LOOP DUMP WITHOUT DELAY | AUTO SEQ NO 1 LOOP DUMP WITH DELAY — PROGRAM PLUG 10

	SPD 1	RUN TIME 2	RCD SER A	SPD 1	RUN TIME 1	RCD SER B	SPD 1	RUN TIME 1	DLY TIME 1	RCD SER B	SPD 4 15 IPS	SPD 3 7.5 IPS	SPD 2 120 IPS	SPD 1 24 IPS	.156 MIN RUN TIME 2	5 MIN RUN TIME 1	2.5 MIN DLY TIME 1
	SPEEDS				RUN TIMES				DELAY TIME								

OPS RECORDERS 1 MODE — RCD PB — PNL AIR DS3

OPS RECORDERS 1 PANEL CONTROL — PNL AIR DS1 — GRAY = PNL CNTL, BP = MDM CNTL

FWD LOAD CNTLR ASSY 2

PAYLOAD MDM PF 1 — BITS 4-11, BITS 1-3, BITS 12-16

OPS RECORDERS 1 PLAYBACK — STBY — RECORD — PNL AIR S6

BITS 4-11 / 1-3 / 12-16 — PRI CMD DRIVERS

PRI/SEC PRIORITY DETECTOR AND 16 BIT DATA SELECTOR (16)

16 BIT EDGE DETECTOR AND DIGITAL NOISE FILTER — STROBE

COMMAND STORAGE LATCHES — AUTO/TRK SEL BITS — TO TRK SEQ 3 $^{U}Z_{7}$

AUTO SEQUENCE DECODER — LOGIC OR'S — AUTO INTERRUPT BIT

MODE, SPEED, DELAY TIME AND RUN TIME BITS FOR AUTO SEQ CMDS

MODE, SPEED, DELAY TIME, AND RUN TIME BITS

9 BIT DATA SELECTOR — DELAY/RUN TIME TLM

SPEED SELECTOR 1 OF 4 (2) — DELAY TIME SELECTOR 1 OF 3 (2) — RUN TIME SELECTOR 1 OF 3 (2) — MODE SELECTOR (2) — MODE TLM

SPD SEL TLM

CHANGE DIRECTION BIT — +5VDC CONTROL PWR

BITS 2 / 6 / 12 / 1 — SEQ CMD DRIVERS (16)

BITS 13 / 14 / 15 / 16

LOOP DUMP CMD 20 $^{U}Z_{5}$ — 20 $^{U}Z_{5}$ LOOP DUMP CMD

OPS RCDR 1 CONTROL PWR

MASTER TIMING AND SYNC CIRCUITS

÷10 ÷5 ÷8 — 1 OF 2 DATA SEL — ÷4 — OSC — OSC — SERVO REF — SERVO REF

HI SPD OSC 16 MHZ — MED SPD OSC 12.8 MHZ — LO SPD OSC 10.133 MHZ — ÷16 — 1 OF 8 DATA SEL

174.0 HZ OSC — ÷16 — ÷16 — 16X 8X 4X 2X CMD CLK

SPEED SEL LOGIC — SPEED CMD

DELAY TIMER — DELAY TIMER TLM

RUN TIMER

ROUTINE LOGIC — 20 $^{U}Z_{5}$ LOOP DUMP CMD

OPS LOGIC PROGRAMS

RCD INPUT B — LOOP DUMP — PRL MODE

WRITE PROTECT, RCD I/P B, RESET TLM

INITIALIZATION CONTROL LOGIC AND RESET — 3

CURRENT LIMITER — 6 $^{U}Z_{4}$

REGULATOR — +5V — +7V +7V

REGULATOR — +5V TO LC CIRCUITS

TRACK ID, RCDR FULL TLM — TRACK SEQUENCER — TRK SEL FRC — TRK SEL

TAPE MOTION SELECT — FWD/REV T — RUN CMD T — TAPE DIRE

TAP POSIT INDIC

TAP SEAR LOG

TLM

SERIAL DIGITAL DATA TRK

SERIAL/PARALLEL DIGITAL

PARALLEL RCD/PB DATA AN

SERIAL DIGITAL PLAYBACK DATA — SERIAL DATA AGC

FILTER SELECT — 1 OF 14 FILTERS

AGC DETECTOR

EOT SNAPSHOT SIGNAL FROM OPS RCDR 2 — 17 $^{U}Z_{2}$

AUTO SEQ 4

OPS RECORDERS

OPS RCDR 2 RCD INPUT B (RCDR 1 LOOP DUMP)

OPS RCDR 1 RCD INPUT B (RCDR 2 LOOP DUMP)

16 $^{U}Z_{1}$ OPS RCDR 1 STATUS

FWD LOAD CNTLR ASSY 2 — RCDING I/P B — DELAY TIMER — RCDING I/P B — DELAY TIMER

ANOMALY SEQ — PNL AIR DS5 — GRAY = ANOMALY SEQUENCE, BP = NO ANOMALY SEQUENCE (NORMAL OPS)

$^{U}Z_{3}$ 18 OPS RCDR 2 STATUS

$^{U}Z_{6}$ 19 OPS RCDR 2 CONTROL PWR

SEQ START — ERASE MAINT RCDR — PNL AIR S9

EOT SNAPSHOT SIGNAL FROM OPS RCDR 1

AUTO SEQ 4 / AUTO SEQ 2 / AUTO SEQ 2 / AUTO SEQ 1 / AUTO SEQ 1

ANOMALY SEQ 2 / ANOMALY SEQ 1

PAYLOAD MDM PF 2

MAN 1 MAINT 2 LOOP / 2 MAINT 1 LOOP — PNL AIR S8

FWD LOAD CNTLR ASSY 2 — OPS RECORDERS 2 PANEL CONTROL — PNL AIR DS2 — GRAY = PNL CNTL, BP = MDM CNTL

BITS 12-16 / BITS 1-3 / BITS 4-11 — 15 $^{U}Z_{7}$

TO MODE TB LOGIC — BITS 1-3 MOTION — 11 $^{U}Z_{7}$

TO ANOMALY SEQ TB LOGIC — 16 $^{U}Z_{4}$

OPS RECORDERS 2 MODE — RCD PB — PNL AIR DS4

FWD LOAD CNTLR ASSY 2 — MOTION BIT 1, BIT 3, BIT 2 — 14 $^{U}Z_{3}$ — +5V FROM DEDICATED SIGNAL CONDITIONER OF2

OPS RECORDERS 2 PLAYBACK — STBY — RECORD — PNL AIR S6

LOOP DUMP CMD TO OPS 2 — 12 $^{U}Z_{7}$

OPS RCDR 2 SWITCH INPUTS — 13 $^{U}Z_{7}$ — BIT 2, BIT 6, BIT 12, BIT 1, BIT 13, BIT 14, BIT 15, BIT 16

SPEC T6

V75 X2555E OF2 N/A — OPS RCDR 1 MODE — BIT 1 1 S/S C — (X2557C)B3 (X2556E)B2

V75 X2523E OF2 N/A — OPS RCDR 1 TAPE MOTION — 1=RUN 1 S/S C — (X2541E)B2 (X2542E)B3 (X2543E)B4 (X2544E)B5

V75 X2511E OF2 N/A — OPS RCDR 1 DELAY INTERVAL TIMER — 1=ON 1 S/S — (X2548C)B2 (X2549E)B3 (X2550E)B4

V75 X2513E OF2 N/A — OPS RCDR 1 RCDING I/P B — 1=YES 1 S/S

V75 X2527E OF2 N/A — OPS RCDR 1 FULL — 1=FULL 1 S/S — (X2534E)B2

V75 X2559E OF2 N/A — OPS RCDR 1 RUN TIME — BIT 1 1 S/S C — (X2560E)B2

V75 X2529E OF2 N/A — OPS RCDR 1 BITE — 0=FAIL 1 S/S C

V75 X2565E OF2 N/A — OPS RCDR 1 DELAY TIME — BIT 1 1 S/S C — (X2566E)B2

V75 X2521E OF2 N/A — OPS RCDR 1 EOT — 1=EOT 1 S/S

V75 X2522E OF2 N/A — OPS RCDR 1 BOT — 1=BOT 1 S/S

V75 Y2517A OF2 OF2 — OPS RCDR 1 HEAD TEMP — 0 TO 140° F 1 S/S F

V75 X2540E OF2 N/A — OPS RCDR 1 PERCENT TAPE — BIT 1 1 S/S C

V75 X2547E OF2 N/A — OPS RCDR 1 ACTIVE TRACK — BIT 1 1 S/S C

V75 X2533E OF2 N/A — OPS RCDR 1 SPEED — BIT 1 1 S/S C

V75 X2505E OF2 N/A — OPS RCDR 1 DIRECTION — 1=REV, 0=FWD 1 S/S C

V75 X2531E OF2 N/A — OPS RCDR 1 RESET — 1=RST 1 S/S

V75 X2508E OF2 N/A — OPS RCDR 1 WRITE PROTECT — 1=ON 1 S/S

DATA/VOICE FROM MSP 2 $^{U}Z_{3}$ 16.3-1 — INPUT A2

DATA/VOICE FROM MSP 1 $^{U}Z_{3}$ 16.3-1 — INPUT A1

DATA PRESENT DETECTOR

RCD INPUT B 1 $^{U}Z_{5}$

21 INPUT B $^{C}Z_{5}$ LOOP DUMP DATA FROM OPS 2

$^{U}Z_{7}$ 5 SERIAL TRK SELECT — TRK 1, TRK 2, TRK 3

BITE STATUS PROCESSING

- CURRENT LIMITER TEMP HIGH
- HEAD TEMP HIGH (> 140°F)
- PRESSURE HIGH
- COMMUTATOR SIG NOT PRESENT
- XPORT ANALOG V HI/LO
- XPORT LOGIC V LOW
- BIAS SIG LOW
- EU LOGIC V LOW
- EU ANALOG V HI/LO

6 8 $^{U}Z_{8}$ $^{U}Z_{7}$ $^{U}Z_{7}$

SERIAL DIGITAL DATA TRKS 4 TO 14

SERIAL PRL — SERIAL PRL — SERIAL PRL

SERIAL DIGITAL/PARALLEL DIGITAL DATA TRKS 1 TO 3

MAIN ENGINE DATA $^{U}Z_{3}$ 10.3

EIU 1 (CTR) — TRK 1 PRL DIGITAL DATA

EIU 2 (LFT) — TRK 2 PRL DIGITAL DATA

EIU 3 (RT) — TRK 3 PRL DIGITAL DATA

TRK 4 PRL DIGITAL INPUTS (NOT USED) — ATTENUATOR

TRK 14 PRL DIGITAL INPUTS (NOT USED)

TRK 1 PRL ANALOG INPUTS (NOT USED) — INPUT ISOLATION AMPLIFIERS

TRK 14 PRL ANALOG INPUTS (NOT USED)

DIGITAL/ ANALOG PARALLEL TRK ID DECODER

PARALLEL ANALOG/DIGITAL RECORD AND PLAYBACK CIRCUIT (TYPICAL OF 14) NOT USED

AGC AMP — DRIVER INPUT SWITCHING LOGIC — $^{U}Z_{5}$ 4 PRL MODE (RCD/PB)

RCD/PB DRIVER — DRIVER OUTPUT SWITCHING LOGIC

PARALLEL ANALOG/DIGITAL RCD DATA

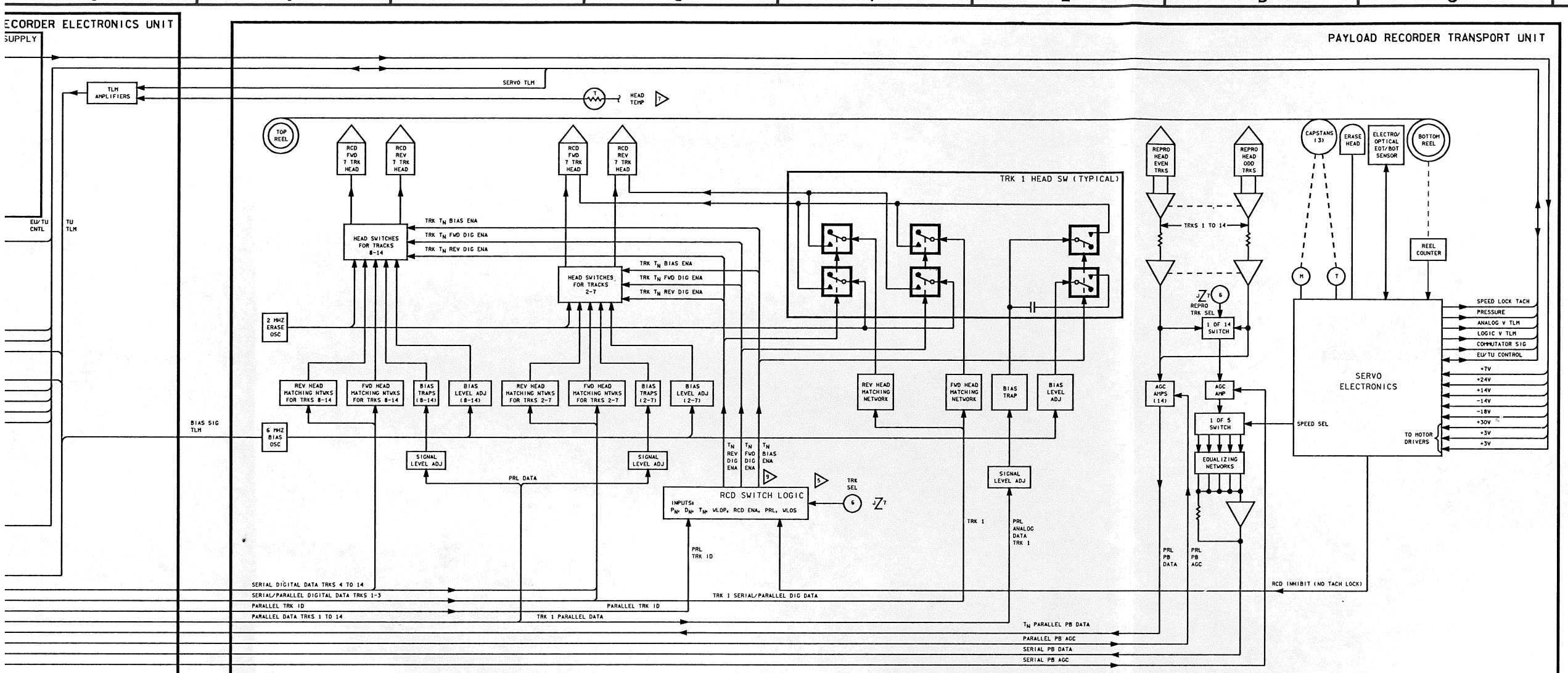
PARALLEL ANALOG/DIGITAL PB DATA

TRK DIG ID — TRK PRL ID — PRL RCD AGC — AGC DETECTOR — PRL PB AGC

DIGITAL/ANALOG PARALLEL TRK ID

BASIC REV E-6

DATE: 07/07/94	NAME: BJB	VERSION: INK 9
DATE: 02/15/96	NAME: BJB	VERSION: BPT 9
DATE: 03/15/96	NAME: VSH	VERSION: INK 10



(12) BIAS PARALLEL RECORDING (ANALOG ON TRACKS 1-14 OR DIGITAL ON TRACKS 4-14) IS ONLY AVAILABLE ON FLIGHT UNITS 1-7. THIS TYPE OF RECORDING CAPABILITY, INCLUDING INPUT RECORDING AND OUTPUT PLAYBACK CIRCUITS, BIAS SIGNAL TLM, AND PLAYBACK AGC CIRCUITRY HAS BEEN DELETED FROM FLIGHT UNITS 8 AND ABOVE

(11) THE PLUG SHOWN MAY BE REPLACED WITH ANOTHER PLUG WHICH ALLOWS OPERATING SPEEDS OF 15, 30, 60, AND 120 IPS FOR SPEED SELECTS 1, 2, 3, AND 4 RESPECTIVELY. THIS IS NORMALLY DONE FOR S/L FLIGHTS

(10) BITE MAY APPEAR AT EOT/BOT OF EACH TRACK DURING TURN AROUND (1 TO 2 SEC)

(9) BIAS RECORDING IS ONLY ENABLED FOR PARALLEL ANALOG RECORDING ON TRACKS 1-14 OR PARALLEL DIGITAL RECORDING ON TRACKS 4-14

(8) WHEN AN AUTO SEQUENCE IS COMMANDED, MODE, SPEED, DELAY TIME AND RUN TIME INPUT BIT CONFIGURATIONS ARE DETERMINED BY SELECTING THE PROGRAM PLUG INPUTS

(7) HEAD TEMP SENSOR IS LOCATED ON RCDR MAIN FRAME NEAR THE RECORD HEADS

(6) IF ANY OF BITS 1-4 OR 12-16 ARE PRESENT AT THE PRI CMD INPUTS, THE SEC CMD INPUTS WILL BE IGNORED BY THE RECORDER. WITH RESPECT TO SEC CMD INPUTS, ANY AUTO SEQUENCE WILL OVERRIDE ANY OTHER DIRECT SEC CMD INPUT DEFINED BY BITS 1, 2, 3, 4, 6 AND 7, I.E. ANY HI ON BITS 13, 14, 15 AND 16 WILL CAUSE BITS 1, 2, 3, 4, 6 AND 7 TO BE IGNORED

(5) P_N - NUMBER OF PARALLEL TRKS TO BE USED
D_N - NUMBER OF DIGITAL PARALLEL TRKS USED
T_N - TRK BEING ADDRESSED
WLOP - WRITE LOCKOUT FOR PARALLEL DATA
WLOS - WRITE LOCKOUT FOR SERIAL DATA
PRL - PARALLEL RCD CMD
RCD ENA - SERIAL RCD

(4) PARALLEL DIGITAL DATA ON TRKS 1, 2 AND 3 ARE NOT ROUTED THROUGH THE PARALLEL RCD/PB DRIVERS IN THE RECORD MODE

(3) POWER TO XPORT UNITS, EU RCD AND REPRO AMPS IS SWITCHED OFF/ON BASED ON MODE SELECTED

(2) TAPE SEARCH IS USED ONLY IN AUTO SEQ MODES

NOTES: (1) WHEN POWER IS APPLIED TO THE RECORDER, THE SERIAL TRK SELECT LOGIC IS RESET TO TRK 1, SERIAL/PARALLEL WRITE LOCKOUTS ARE RESET, AND LAST SERIAL RCD POSITION IS SET TO BOT

19 P/L RCDR

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN L. BUCHANAN	2/1/79		
DR L. KEESLER	2/17	P/L RECORDER	
ENGR D. MILLER			
ENGR	4/1/96		
APP	4/1/96		
APP	4/19/96	SPACE SHUTTLE	DWG NO 16.19
CADS	6-17-96	ALL	
LTR E	PCN 6	121 X 34	PAGE SHEET 1 OF 1

BASIC REV E-6

PAYLOAD RECORDER ELECTRONICS UNI

D RECORDER
POWER
ON
OFF
S13

V_{MNA} FPCA1
V_{MNC} FPCA3
RPC 5A
RPC 5A

V75 X2702E OF3 N/A — P/L RCDR PWR ON — 1=ON 1 S/S
V76 X4380E OF1 N/A — PL RCDR RPC A ON — 1=ON 1 S/S
V76 X4382E OF3 1 N/A — P/L RCDR RPC C ON — 1=ON 1 S/S

PROGRAM PLUG (1)

SPD 1 6 IPS	SPD 2 7.5 IPS	SPD 3 30 IPS	SPD 4 120 IPS

PAYLOAD MDM PF 1
BITS 4-11
BITS 1-3
BITS 12-16

PANEL CONTROL
GRAY = PNL
BP = GND/MDM
PNL A1R DS6

FWD LOAD CNTLR ASSY NO 1

PAYLOAD RECORDER
MODE
STOP
SERIAL
RCD
PB REV
PB FWD
ERASE
PRL
PNL A1R
S10

BITS 4-11
BITS 1-3
BITS 12-16
PRI CMD DRIVERS
(16)
BIT 4
BIT 2
SEC CMD DRIVERS
BIT 1
BIT 12
BIT 3
BIT 7
BIT 6
BIT 13
BIT 14
BIT 15
BIT 16

PRIORITY DETECTOR AND 16 BIT DATA INPUT SELECTOR
16 BIT EDGE DETECTOR DIGITAL NOISE FILTER
STROBE
COMMAND STORAGE LATCHES
AUTO/TERK SEL BITS
AUTO INTRPT BIT
TRACK SELECT
AUTO SEQUENCE DECODER
LOGIC OR'S
MODE, SPEED, DELAY TIME AND RUN TIME BITS FOR AUTO SEQ CMDS
MODE, SPEED, DELAY TIME AND RUN TIME BITS FOR DIRECT CMDS
9 BIT DATA SELECTOR
SPEED SELECTOR
DELAY TIME SELECTOR
RUN TIME SELECTOR
MODE SELECTOR
SPEED SEL TLM
TLM
CHG DIRECTION BIT
+5VDC CONTROL POWER

MASTER TIMING AND SYNC CIRCUITS
+10
+5
+8
1 OF 2 DATA SEL
+4
OSC
SERVO REF
HI SPEED OSC 16MHZ
MED SPEED OSC 12.8MHZ
LO SPEED OSC 10.133MHZ
+16
1 OF 8 DATA SEL
1740HZ OSC
16X 8X 4X 2X CMD CLK
SPEED SEL LOGIC
DELAY TIMER
DELAY TIMER TLM
RUN TIMER
ROUTINE LOGIC

INITIALIZATION CONTROL LOGIC AND RESETS
+5V CONTROL POWER TO PANEL SWITCHES

ELECTRONIC UNIT POWER SUPPLY
CURRENT LIMITER
REGULATOR
DC/DC CONVERTER
SUM AMP
+7V +7V -18V +12V -12V
+5V LOGIC CKTS

TRANSPORT UNIT POWER SUPPLY
REGULATOR AND DC/DC CONVERTER
+3V +3V +30V
DC/DC CONVERTER
+24V +14V -14V +7V -18V

EU/TU CNTL
TU TLM
TLM AMPLIFIERS

TRACK ID, RCDR FULL TLM
TRACK SEQUENCER
TRACK SEL FROM CMD LATCHES
TRACK SEL TO TU
TAPE MOTION LOGIC
RUN CMD TO TU
FWD/REV TO TU
TAPE DIRECTION TLM
TAPE POSITION INDICATOR
EOT, BOT, PCT TAPE TLM
REEL PULSES
TACH PULSES
EOT/BOT
EOT/BOT RST
TAPE SEARCH LOGIC
OPS LOGIC PROGRAMS
RCD INPUT B
PARALLEL RCD MODE
PWR SWITCHING CNTLS TO EU AND TU
PARALLEL PB MODE
LOOP DUMP
TLM WRITE PROTECT, RCD I/P B, RESET
TLM
SERIAL DIGITAL DATA TRKS 4 TO 14
SERIAL/PARALLEL DIGITAL DATA TRKS 1 TO 3
PARALLEL TRK ID
PARALLEL ANALOG DATA TRKS 1 TO 14/PARALLEL DIGITAL DATA TRKS 4 TO 14
PARALLEL PB DATA
PARALLEL PB AGC
SERIAL PLAYBACK DATA
SERIAL DATA AGC

BITE STATUS PROCESSING
CURRENT LIMITER TEMP HIGH
HEAD TEMP HIGH (> 140°F)
PRESSURE HIGH
COMMUTATOR SIG NOT PRESENT
XPORT ANALOG V HI/LO
XPORT LOGIC V LOW
BIAS SIGNAL LOW
EU LOGIC V LOW
EU ANALOG V HI/LO
XPORT UNIT TLM

V75 X2709E OF1 N/A — P/L RCDR WRITE PROTECT — 1=ON 1 S/S
V75 X2729E OF1 N/A — P/L RCDR BITE — 0=FAIL 1 S/S C — (10) SPEC 76
V75 X2731E OF1 N/A — P/L RCDR RESET — 1=RST 1 S/S
V75 X2713E OF1 N/A — P/L RCDR RCDING INPUT B — 1=YES 1 S/S
V75 X2727E OF1 N/A — P/L RCDR FULL — 1=FULL 1 S/S
V75 X2759E OF1 N/A — P/L RCDR RUN TIME — BIT 1 1 S/S — (X2760E)B2
V75 X2722E OF1 N/A — P/L RCDR EOT — 1=EOT 1 S/S
V75 X2765E OF1 N/A — P/L RCDR DELAY TIME — BIT 1 1 S/S — (X2766E)B2
V75 X2733E OF1 N/A — P/L RCDR SPEED — BIT 1 1 S/S — (X2734E)B2
V75 X2755E OF1 N/A — P/L RCDR MODE — BIT 1 1 S/S C
V75 X2747E OF1 N/A — P/L RCDR ACTIVE TRK — BIT 1 1 S/S C — (X2748E)B2 (X2749E)B3 (X2750E)B4 — SPEC 76
V75 X2723E OF1 N/A — P/L RCDR TAPE MOTION — 1=RUN 1 S/S C
V75 X2740E OF1 N/A — P/L RCDR PERCENT TAPE — BIT 1 1 S/S C — (X2741E)B2 (X2742E)B3 (X2743E)B4 (X2744E)B5 — SPEC 76

PAYLOAD INTERFACE "576" BULKHEAD
PAYLOAD STATION DISTRIBUTION PANEL
DIGITAL SERIAL INPUTS A2 A1 B
PARALLEL DIGITAL INPUTS
PARALLEL ANALOG INPUTS
DIGITAL/ ANALOG PARALLEL TRK ID

DATA PRESENT DETECTOR
RCD INPUT B
SERIAL TRK SELECT
TRK 1
TRK 2
TRK 3
SERIAL PRL
DIGITAL PRL DATA TRK 1
DIGITAL PRL DATA TRK 2
DIGITAL PRL DATA TRK 3
SERIAL DIGITAL DATA, TRK 4-14
SERIAL/PRL DIGITAL DATA, TRKS 1-3

PARALLEL DIGITAL TRKS 4-14
ATTENUATOR
DIGITAL PARALLEL DATA
TRK 1 TRK 2 TRK 3 TRK 4 TRK 5 TRK 6 TRK 7 TRK 8 TRK 9 TRK 10 TRK 11 TRK 12 TRK 13 TRK 14
INPUT ISOLATION AMPLIFIERS (14)
ANALOG PARALLEL DATA
DIGITAL/ ANALOG PARALLEL TRK ID DECODER
TRK DIG ID
TRK ANALOG ID
PARALLEL TRK ID

PARALLEL ANALOG/DIGITAL RECORD AND PLAYBACK CIRCUIT (TYPICAL OF 14)
PARALLEL PB DATA FROM XPORT
PARALLEL PB CMD
PARALLEL PB DATA
AGC AMP
RECORD/ PLAYBACK LINE DRIVER
PARALLEL RCD DATA
PARALLEL RCD CMD
PARALLEL RCD AGC
AGC DETECTOR
PARALLEL PB AGC

FILTER SELECT
1 OF 14 FILTERS
AGC DETECTOR
OUTPUT XFMRS (14)
TRK 1 TRK 2 TRK 3 TRK 4 TRK 5 TRK 6 TRK 7 TRK 8 TRK 9 TRK 10 TRK 11 TRK 12 TRK 13 TRK 14
LOOP DUMP
SERIAL DIGITAL PLAYBACK DATA

DATE: 03/15/96 | NAME: VSH | VERSION: INH.10

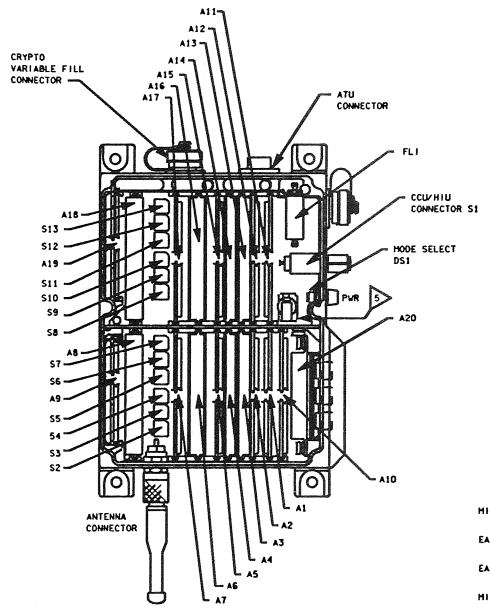
PAYLOAD RECORDER
POWER
ON
OFF
PNL A1R S13
$V_{CNTLCA1}$
$V_{CNTLCA2}$
1.2K
1.2K
V_{PNA} FPCA1
V_{PNC} FPCA3
RPC 5A
RPC 5A
V75 52702E OF3 | N/A
P/L RCDR PWR ON
1=ON 1 S/S
V76 X4380E OF1 | N/A
PL RCDR RPC A ON
1=ON 1 S/S
V76 X4382E OF3 | N/A
P/L RCDR RPC C ON
1=ON 1 S/S
PROGRAM PLUG
SPD 1 6 IPS | SPD 2 7.5 IPS | SPD 3 30 IPS | SPD 4 120 IPS
PAYLOAD MDM PF 1
BITS 4-11
BITS 1-3
BITS 12-16
PRI CMD DRIVERS
PANEL CONTROL
GRAY = PNL
BP = GND/MDM
PNL A1R DS6
FWD LOAD CNTLR ASSY NO 1
PAYLOAD RECORDER
FUNCTION
OPERATE
ERASE
MODE
PNL A1R S9
PAYLOAD RECORDER
SPEED
PNL A1R S14
PAYLOAD RECORDER
MODE
SERIAL
RCD
STOP
PRL
PB REV
PB FWD
ERASE
PNL A1R S10
BIT 4
BIT 2
SEC CMD DRIVERS
BIT 1
BIT 12
BIT 3
BIT 7
BIT 6
BIT 13
BIT 14
BIT 15
BIT 16
(16)
6
PRIORITY DETECTOR AND 16 BIT DATA INPUT SELECTOR
16 BIT EDGE DETECTOR DIGITAL NOISE FILTER
STROBE
COMMAND STORAGE LATCHES
AUTO/TRK SEL BITS
AUTO INTRPT BIT
TRACK SELECT
AUTO SEQUENCE DECODER
LOGIC OR'S
MODE, SPEED, DELAY TIME AND RUN TIME BITS FOR AUTO SEQ CMDS
MODE, SPEED, DELAY TIME AND RUN TIME BITS FOR DIRECT CMDS
9 BIT DATA SELECTOR
8
CHG DIRECTION BIT
SPEED SELECTOR
SPEED SEL TLM
DELAY TIME SELECTOR
DELAY TIMER
DELAY TIMER TLM
RUN TIME SELECTOR
RUN TIMER
MODE SELECTOR
ROUTINE LOGIC
TLM
+5VDC CONTROL POWER
MASTER TIMING AND
÷10
÷5
÷8
1 OF 2 DATA SEL
÷4
HI SPEED OSC 16MHZ
MED SPEED OSC 12.8MHZ
LO SPEED OSC 10.133MHZ
÷16
1 OF 8 DATA SEL
1740HZ OSC
÷16
÷16
16X 8X 4X 2X CMD CLK
SPEED SEL LOGIC
BITE STATUS PROCESSING
CURRENT LIMITER TEMP HIGH
HEAD TEMP HIGH (> 140°F)
PRESSURE HIGH
COMMUTATOR SIG NOT PRESENT
XPORT ANALOG V HI/LO
XPORT LOGIC V LOW
BIAS SIGNAL LOW
EU LOGIC V LOW
EU ANALOG V HI/LO
XPORT UNIT TLM
SERIAL DIGITAL DATA, TRK 4-14
SERIAL/PRL DIGITAL DATA, TRKS 1-3
SERIAL
PRL
DIGITAL PRL DATA TRK 1
DIGITAL PRL DATA TRK 2
DIGITAL PRL DATA TRK 3
RCD INPUT B
SERIAL TRK SELECT
DATA PRESENT DETECTOR
TRK 1
TRK 2
TRK 3
SPEC 76
V75 T2717A OF1 | OF1 P/L RCDR HEAD TEMP 0 TO 140° F 1 S/S F
V75 X2709E OF1 | N/A P/L RCDR WRITE PROTECT 1=ON 1 S/S
V75 X2729E OF1 | N/A P/L RCDR BITE 0=FAIL 1 S/S C
10
V75 X2711E OF1 | N/A P/L RCDR DLY INT TIMER 1=ON 1 S/S
V75 X2731E OF1 | N/A P/L RCDR RESET 1=RST 1 S/S
V75 X2713E OF1 | N/A P/L RCDR RCDING INPUT B 1=YES 1 S/S
V75 X2727E OF1 | N/A P/L RCDR FULL 1=FULL 1 S/S
V75 X2705E OF1 | N/A P/L RCDR DIRECTION 1=REV, 0=FWD 1 S/S C
V75 X2759E OF1 | N/A P/L RCDR RUN TIME BIT 1 1 S/S
(X2760E)B2
V75 X2722E OF1 | N/A P/L RCDR BOT 1=BOT 1 S/S
V75 X2765E OF1 | N/A P/L RCDR DELAY TIME BIT 1 1 S/S
(X2766E)B2
V75 X2721E OF1 | N/A P/L RCDR EOT 1=EOT 1 S/S
V75 X2733E OF1 | N/A P/L RCDR SPEED BIT 1 1 S/S
(X2734E)B2
+5V FROM DEDICATED SIGNAL CONDITIONER OF 1
FWD LOAD CNTLR ASSY NO1
MODE
RCD
PB
PNL A1R DS7
BIT 3
BIT 1
BIT 2
TAPE MOTION
(X2756E)B2 (X2757E)B3
V75 X2755E OF1 | N/A P/L RCDR MODE BIT 1 1 S/S C
V75 X2747E OF1 | N/A P/L RCDR ACTIVE TRK BIT 1 1 S/S C
(X2748E)B2 (X2749E)B3 (X2750E)B4
V75 X2723E OF1 | N/A P/L RCDR TAPE MOTION 1=RUN 1 S/S C
V75 X2740E OF1 | N/A P/L RCDR PERCENT TAPE BIT 1 1 S/S C
(X2741E)B2 (X2742E)B3 (X2743E)B4 (X2744E)B5
PAYLOAD INTERFACE "576" BULKHEAD
PAYLOAD STATION DISTRIBUTION PANEL
DIGITAL SERIAL INPUTS
A2
A1
B
PARALLEL DIGITAL INPUTS
PARALLEL ANALOG INPUTS
DIGITAL/ ANALOG PARALLEL TRK ID
PARALLEL DIGITAL TRKS 4-14
ATTENUATOR
DIGITAL PARALLEL DATA
TRK 1
TRK 2
TRK 3
TRK 4
TRK 5
TRK 6
TRK 7
TRK 8
TRK 9
TRK 10
TRK 11
TRK 12
TRK 13
TRK 14
INPUT ISOLATION AMPLIFIERS (14)
ANALOG PARALLEL DATA
DIGITAL/ ANALOG PARALLEL TRK ID DECODER
TRK DIG ID
TRK ANALOG ID
PARALLEL TRK ID
PARALLEL ANALOG/DIGITAL RECORD AND PLAYBACK CIRCUIT (TYPICAL OF 14)
PARALLEL PB DATA FROM XPORT
PARALLEL PB CMD
PARALLEL PB DATA
AGC AMP
RECORD/ PLAYBACK LINE DRIVER
PARALLEL RCD DATA
PARALLEL RCD CMD
PARALLEL RCD AGC
AGC DETECTOR
PARALLEL PB AGC

BASIC REV E-6

AUDIO INTERFACE UNIT (AIU)

DATE: 02/27/96 | NAME: SVJ | VERSION: INT-6

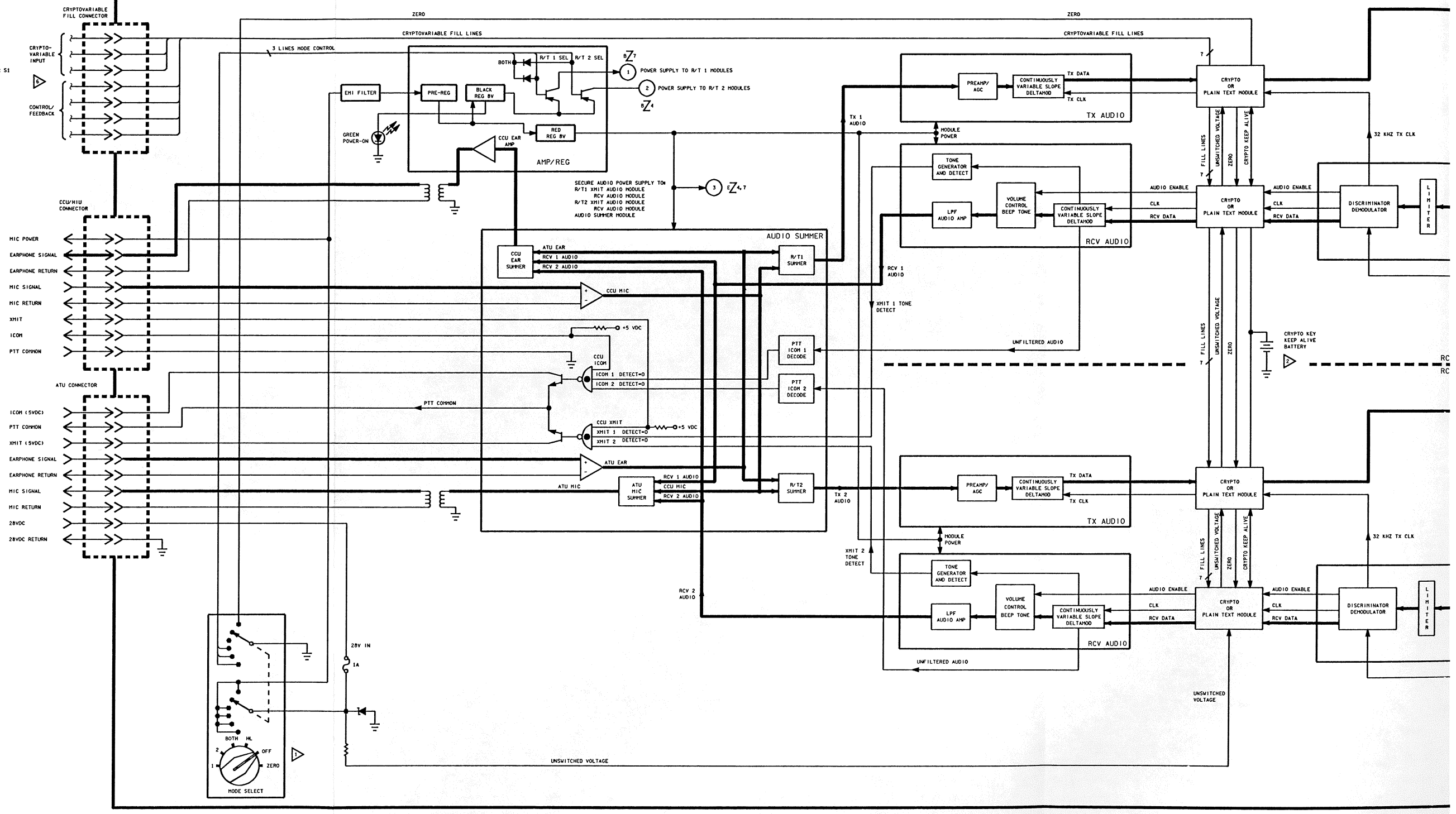
DATE: 09/13/90	NAME: JMB	VERSION: INK.5
DATE: 02/15/96	NAME: BJB	VERSION: BPT.4
DATE: 02/27/96	NAME: SVJ	VERSION: INK.6



A1U ASSEMBLY

R/T 1	R/T 2
A1 XMIT AUDIO MODULE	A11 XMIT AUDIO MODULE
A2 RCV AUDIO MODULE	A12 RCV AUDIO MODULE
A3 COMSEC MODULE	A13 COMSEC MODULE
A4 COMSEC MODULE	A14 COMSEC MODULE
A5 IF AMP/DEMOD MODULE	A15 IF AMP/DEMOD MODULE
A6 SYNTHESIZER MODULE	A16 SYNTHESIZER MODULE
A7 UHF RCVR MODULE	A17 UHF RCVR MODULE
A8 SYNTHESIZER MODULE	A18 SYNTHESIZER MODULE
A9 UHF TRANSMIT MODULE	A19 UHF XMIT MODULE

A10 AUDIO SUMMER MODULE
A20 AMP/REGULATOR MODULE



A THE CRYPTO FILL EQUIPMENT IS GSE AND IS ONLY USED DURING CRYPTOVARIABLE KEY LOADING PROCEDURE PRELAUNCH

B THE CRYPTO KEY KEEP ALIVE POWER SOURCE IS INSTALLED + POLARITY DOWN AS SHOWN BY THE ASSEMBLY VIEW

C TUNING CURVE GENERATOR (TCG) FREQUENCY CONTROL INFORMATION FROM THE RCV FREQ SELECT SWITCHES IS PASSED AS AN INTEGER. THE EIGHT LINES SHOWN ARE THE BCD REPRESENTATION OF THE TENS AND ONES UNITS OF THE SELECTED FREQUENCY IN MHZ

D THE ROTARY SWITCHES PROVIDE FREQUENCY SELECTION INDICATIONS AS SHOWN IN THE TABLE

FREQUENCY (MHZ)

	HUNDREDS	TENS	UNITS	TENTHS
RCV 1	HARDWIRED 3	S2	S3	S4
XMIT 1	HARDWIRED 3	S5	S6	S7
RCV 2	HARDWIRED 3	S8	S9	S10
XMIT 2	HARDWIRED 3	S11	S12	S13

EXAMPLE: FOR A TRANSMIT CHANNEL 1 FREQUENCY OF 374.2 MHZ
THE SWITCHES S5, S6 AND S7 INDICATE THE FREQUENCY.
THE HUNDREDS DIGIT IS HARDWIRED 300
SWITCH S5 IS SELECTING 7X10 MHZ 70
SWITCH S6 IS SELECTING 4X1 MHZ 4
SWITCH S7 IS SELECTING 2X0.1 MHZ 0.2
374.2 MHZ

E THE CRYPTO KEY KEEP ALIVE POWER SOURCE IS A STACK OF THREE SILVER OXIDE CELLS CONNECTED IN SERIES. (REQUIRED ONLY FOR CRYPTO OPERATIONS)

F THE ROTARY SWITCH MUST BE PULLED OUT AND TURNED TO THE POSITION LABELED "ZERO" TO CLEAR THE COMSEC VARIABLE KEY

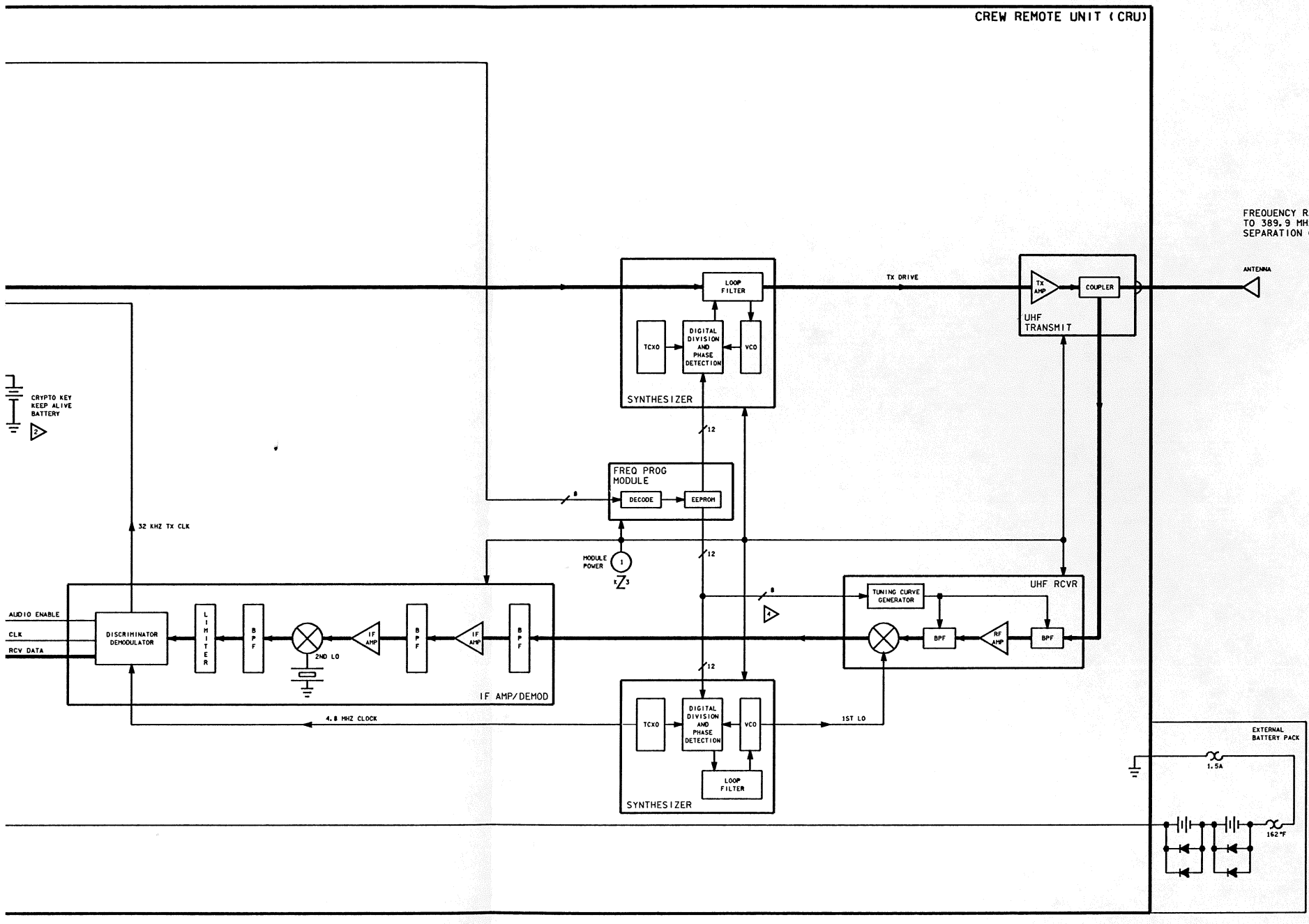
20 WCCS AIU 1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS		SIGNATURE	DATE
WIRELESS CREW COMM SYS AUDIO INTERFACE UNIT		DSGN V ORTIZ	4/25/87
		DR	
		ENGR G. HORLACHER	
		ENGR	3/11/96
		APP	3/11/96
DWG NO 16.20	SPACE SHUTTLE ALL	APP	6-7-96
SHEET 1 OF 2 PAGE	82.5 X 34	LTR E PCN	

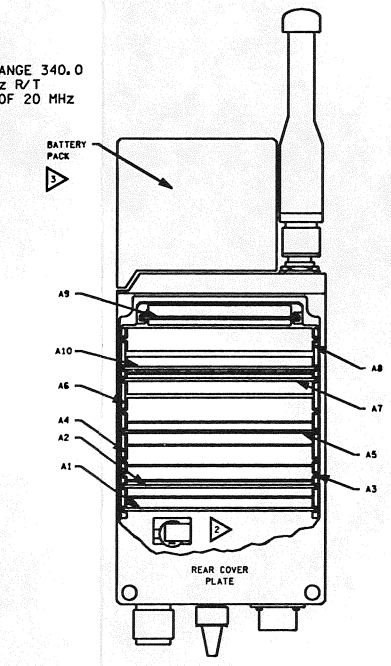
BASIC REV E-6

DATE: 10/19/90	NAME: JDF	VERSION: INK 4
DATE: 04/18/96	NAME: SVJ	VERSION: BPT 5
DATE: 05/01/96	NAME: BJB	VERSION: INK 5

CREW REMOTE UNIT (CRU)

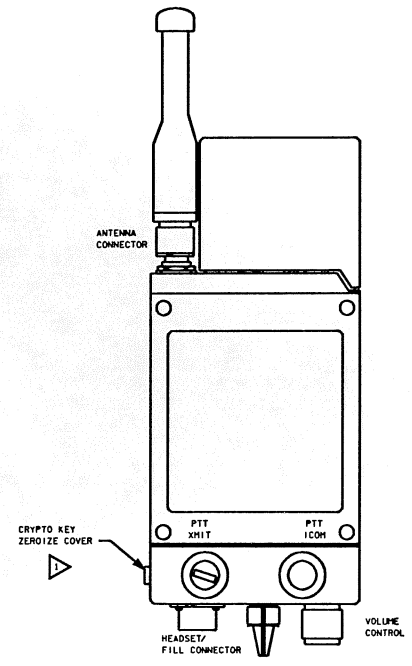


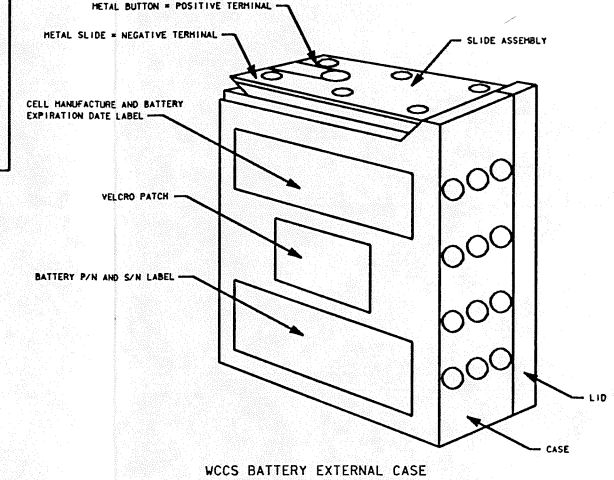
FREQUENCY RANGE 340.0 TO 389.9 MHz R/T SEPARATION OF 20 MHz



CRU ASSEMBLY

A1 XMIT AUDIO MODULE
A2 RCV AUDIO MODULE
A3 COMSEC MODULE/PLAIN TEXT
A4 COMSEC MODULE/PLAIN TEXT
A5 IF AMP/DEMOD MODULE
A6 SYNTHESIZER MODULE
A7 UHF RCVR MODULE
A8 SYNTHESIZER MODULE
A9 UHF TRANSMIT MODULE
A10 FREQUENCY PROGRAMMING MODULE





WCCS BATTERY EXTERNAL CASE

NOTES:

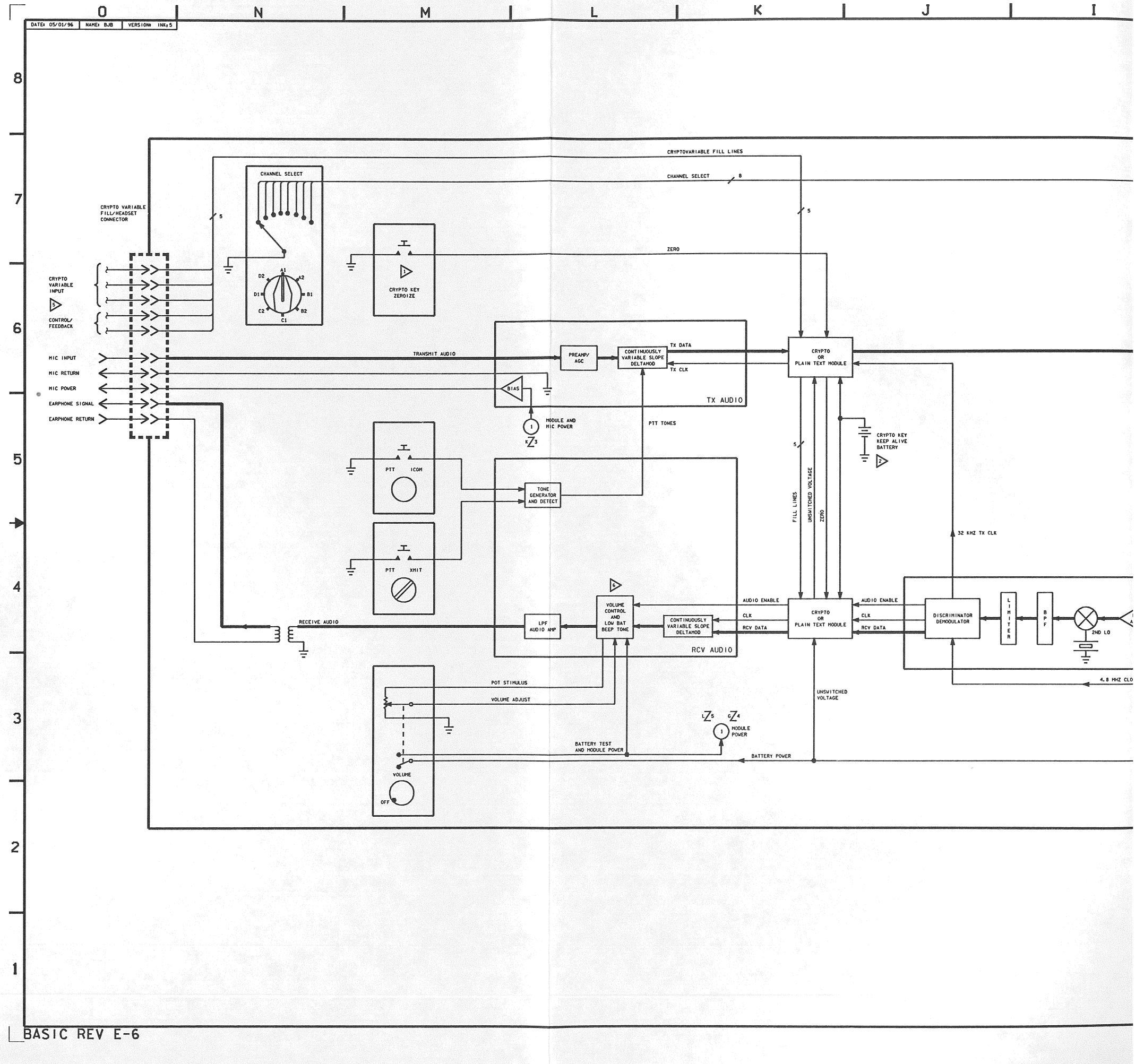
1. THE CRYPTO KEY ZEROIZE PUSHBUTTON HAS A SPRING-LOADED COVER LOCATED ON THE LEFT SIDE OF THE CASE
2. THE CRYPTO KEY KEEP ALIVE POWER SOURCE IS A STACK OF THREE SILVER OXIDE CELLS ARRANGED IN SERIES. THEY ARE INSTALLED + POLARITY DOWN AS SHOWN BY THE REAR ASSEMBLY VIEW (REQUIRED ONLY FOR CRYPTO OPERATION)
3. THE BATTERY PACK CONTAINS TWO LI-BCX C-CELLS CONNECTED IN SERIES AND PROTECTED BY A 1.5A FUSE, 162°F THERMOFUSE, PARALLEL BYPASS DIODES, AND INTERNAL CELL 4A FUSES. TYPICAL LIFETIME IS APPROXIMATELY 36 HOURS
4. THE TUNING CURVE GENERATOR FREQUENCY CONTROL INFORMATION FROM THE FREQUENCY PROGRAMMING MODULE IS PASSED AS AN INTEGER. THE EIGHT LINES SHOWN ARE THE BCD REPRESENTATION OF THE TENS AND ONES UNITS OF THE SELECTED FREQUENCY IN MHZ
5. THE CRYPTO FILL EQUIPMENT IS GSE AND IS ONLY USED DURING CRYPTOVARIABLE KEY LOADING PROCEDURE PRELAUNCH
6. DESIGNED SUCH THAT A LOW LEVEL BEEP TONE WILL STILL BE OUTPUTTED WITH VOLUME ALL THE WAY DOWN. BEEP TONE LEVEL CONTROLLED BY VOLUME CONTROL

20 WCCS CRU 2

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	VIC ORTIZ	4/23/87		
DR				
ENGR	G. C. HORLACHER		WIRELESS CREW COMM SYS CREW REMOTE UNIT	
ENGR	G.C. Horlacher	5/6/96		
APP	G.C. Horlacher	5/6/96		
APP	Linda Wrench	5/6/96	SPACE SHUTTLE	DWG NO 16.20
CADS	S.K. Kimbrell	6/12/96	ALL	
LTR E	PCN 6		82.5 X 34	PAGE SHEET 2 OF 2

BASIC REV E-6

DATE: 05/01/96 | NAME: BJB | VERSION: INK: 5



BASIC REV E-6

DATE: 6/24/87	NAME: TMW	VERSION: INK: 2
DATE: 10/08/90	NAME: JMB	VERSION: BPT: 7
DATE: 10/23/90	NAME: MAG	VERSION: INK: 3

CIE B (CONTROL)

CIE A (CONTROL)

AO-A9

INTERTIE STORAGE

ADO-7 CD XCVR T/R DO-7 — BUFFER

AO-9 CE EEPROM 1 (1024X8) OE DO-7 — PWR

AO-9 CE EEPROM 2 (1024X8) OE DO-7 — PWR

1=ON PWR SW 2QS

1=ON PWR SW 1QS

LEVEL SHIFT +12V

500 KHZ 44 7Z3 16.23-3

CONTROL /DATA BUS (DO-D7)

US (AO-A10)

STACK/TEMP STORAGE

AO-10 CE0 CE1 CE2 CE3 8192X8 PROM CDO-7

AO-9 1024X8 RAM CDO-7

S (CDO-CD7)

AO-4

BDS 0

BDS 1-17

BDS22

TQ0 TQ1 NC — TQ3 27 E,6Z8,7

1E 2E 3E 4E 5E 6E 7E NC

BOARD SELECT DECODER

I/O ADDRESS DECODE

DECODE LOGIC

1Q3 1Q4 EEPROM 1 E1OE E1CE EEPROM 2 E2OE E2CE

IO/M OS1 OS2

7QO 7Q1

WR CONT

RD F BS18 BS19 BS20 BS21 CLR

DO-7 1 DO-7 LATCH 1 CK1 2 DO-7 LATCH 2 CK2 — OUTPUT PORTS

1Q1 2 3 4 5 6 7 8 2Q1 2 3 4 5 6 7 8

FM REC DISABLE 45 5Z2 16.22-3

RF/PI SELECT 50 1Z6 16.22-3

2Q1

CTU DATA CTU CLK CTU HEALTH

INT RESET 29 2Z5

DEV CLR 30 1Z4

XCVR T/R — INPUT PORTS

STAT 1-8 — STAT 1-19

STAT 9-16

STAT 17-19

MANCH ERR

SPARE

PS STAT (STAT 22) 22 1Z2

SSP1 SSP3 20 1Z5

CTU MODE A CTU MODE B CTU DATA IN OPWS BUF DATA RD OPERATE/TEST STAT 30-32 SPARE

CONTROL/DATA BUS 0Z1,8 16.22-2 1Z6 16.22-3 5Z1 16.22-3

WR CONT

DS ES 2Q7 — BINARY COUNTER CK R

MAO-9 WR CS DO D1 1024X1 RAM

DS ES CS TD DO SDO — 27 7Q3 1Z4

MSG OUT MSG IN 2Q2

M&G OUT 34 6Z7 — 2Q1

FLT IND (STATUS J7-9) FLAG 5 5Z6 — "1" = OK

OS1 OS2 A1 B1 A2 B2 OS 1Q — WAIT F 7 1Z5 — 2Q8

DATA RX DATA TX

ENABLE B1PO/1 IN B1PO/1

OPWS ENCODER DECODER

ES CLK SEND ES

DS CLK TD DS

SD IN SDO VW

D CLK ENCODER 12 MHZ CLK 43 1Z3 16.22-3

S CLK IN ÷6

D RESET

WORD MSG IN — 16 BIT PERIOD ENA

1Z4 27 7Q3 — DO Q C — BUF READ

6Z7 34 — D S Q CK R — MANCH ERROR

WORD

POT X10181Y PF2 PF1 — MDM I/T ERROR 1=PR 1=S/S

STAT 1 1Z3 16.22-2
STAT 2
STAT 3 0Z7 16.22-2
STAT 4
STAT 5 0Z2 16.22-2
STAT 6 K Z5 16.22-2
STAT 7
STAT 8
STAT 9 F Z5 16.22-3
STAT 10
STAT 11
STAT 12
STAT 13
STAT 14 K Z2 16.22-3
STAT 15
STAT 16
STAT 17 0Z6 16.22-3
STAT 18 0Z4 16.22-3
STAT 19 1Z2 16.22-3

3 STATUS TALKBACKS NOT OPERATIONAL

2 CIE A AND B HEALTH AND STATUS TELEMETRY

	CIE A EAA (PF2)	CIE B EAB (PF1)	TITLE
STAT1	P07X1001Y	P07X2001Y	MDM MSG WORD ERROR
STAT2	P07X1002Y	P07X2002Y	MDM TO MOD SIG PRES
STAT3	P07X1004Y	P07X2004Y	KUFLD TO MOD SIG PRES
STAT5	P07X1005Y	P07X2005Y	OPWS INPUT-PLL LOCK
STAT9	P07X1007Y	P07X2007Y	RF 1.024MHZ SYNC
STAT10	P07X1008Y	P07X2008Y	PI 1.024MHZ SYNC
STAT11	P07X1009Y	P07X2009Y	RF 1.7MHZ SYNC
STAT12	P07X1010Y	P07X2010Y	PI 1.7MHZ SYNC
STAT13	P07X1011Y	P07X2011Y	P/L-1 DATA PRES
STAT14	P07X1012Y	P07X2012Y	P/L-2 DATA PRES
STAT15	P07X1013Y	P07X2013Y	P/L-3 DATA PRES
STAT16	P07X1014Y	P07X2014Y	P/L-4 DATA PRES
STAT17	P07X1015Y	P07X2015Y	KU BAND R/L SYNC
STAT18	P07X1016Y	P07X2016Y	R/L RCDR DIG SYNC
STAT19	P07X1017Y	P07X2017Y	FM/FM DEMOD SYNC
	P07X1018Y	P07X2018Y	MDM INTERTIE ERROR
STAT22	P07X1019Y	P07X2019Y	PWR SUPPLY IN TOL OK
	P07J1021J	P07J2021J	PROC ERR/CMD SECTION
	P07J1022J	P07J2022J	CPU DETECTED FAULTS
	P07J1023J	P07J2023J	CPU DETECTED WARNINGS
STAT6&7	P07J1006J	P07J2006J	FWD LINK CLOCK
STAT6&7	P07J1006J	P07J2006J	NO SYNC, NO BYPASS
STAT6&7	P07J1006J	P07J2006J	NO SYNC, PYPASS MODE
STAT6&7	P07J1006J	P07J2006J	NORMAL OPS (CARD OK)
	P07X1020Y	P07X2020Y	INTERTIE SW POS (MSB)
	P07X1024Y	P07X2024Y	INTERTIE SW POS (LSB)
	P07X1028J	P07X2028J	INTERTIE 2 SOURCE
	P07J1025J	P07J2025J	EEPROM COUNT LO BYTE
	P07J1027J	P07J2027J	EEPROM COUNT HI BYTE
	P07M1005P	P07M2005P	INTERTIE WORD 5
	P07M1006P	P07M2006P	INTERTIE WORD 6
	P07M1007P	P07M2007P	INTERTIE WORD 7
	P07M1008P	P07M2008P	INTERTIE WORD 8
	P07M1009P	P07M2009P	INTERTIE WORD 9
	P07M1010P	P07M2010P	INTERTIE WORD 10
	P07M1011P	P07M2011P	INTERTIE WORD 11
	P07M1012P	P07M2012P	INTERTIE WORD 12
	P07M1013P	P07M2013P	INTERTIE WORD 13
	P07M1014P	P07M2014P	INTERTIE WORD 14
	P07M1015P	P07M2015P	INTERTIE WORD 15
	P07M1016P	P07M2016P	INTERTIE WORD 16
	P07M1017P	P07M2017P	INTERTIE WORD 17
	P07M1018P	P07M2018P	INTERTIE WORD 18
	P07M1019P	P07M2019P	INTERTIE WORD 19
	P07M1020P	P07M2020P	INTERTIE WORD 20
	P07M1021P	P07M2021P	INTERTIE WORD 21

NOTES: 1 OPTICAL ISOLATORS

22 CIE CNTL 1

SIGNATURE	DATE	
DSGN THERESA H WISONG	11/21/85	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
ENGR G. POHLE		COMMUNICATIONS INTERFACE EQUIPMENT (CONTROL)
ENGR G. Pohle	10/24/90	
APP G. Pohle	10/24/90	
APP R.O. Ewing	10-22-90	SPACE SHUTTLE DWG NO 16.22
OMNIPLAN S. Kimbler	11/23/90	ALL
LTR E PCN		121 X 34 PAGE SHEET 1 OF 3

BASIC REV E

RELAY CONTROL MODULE

RELAY DRIVER

RELAY DRIVER

POWER SUPPLY

INITIATE

CPU

MODE CNTL A
MODE CNTL B
INITIATE
DATA IN
DATA OUT
CLOCK
HEALTH

CTU SEL

CTU PWR

+28VF

+5

32

CTU TEST (A)

CTU TEST (B)

CMD MODE

(A OFF)

(A ON)

BACKUP POWER SELECT B

BACKUP POWER SELECT A

POWER SELECT A

POWER SELECT B

SSP2

OFF

ON

+28 VDC B PWR

PWL MODE OFF

PWL MODE ON

PWL MODE SEL

A ON
B OFF

A OFF
B ON

SELECT INTERFACE

CIE A STATUS

CIE B STATUS

PWR OFF = 0 (BP)
CIE FAIL = 0 (BP)
OK = 1 (GRAY)

NOT FOR FLIGHT USE

TEST LOOP

LOOP TEST CNTL

OPERATE

OUTPUTS ARE LOW IN TEST MODE

PULSE WIDTH MOD

PWR ON

OVER CURRENT SENSE

FEEDBACK

+5V REG

-12V REG

+12V REG

PRE REG

PLT

POWER SUPPLY OUTPUT SENSE

PS OUT OF TOL (STAT 22)

PWR SPLY IN TOL OK
1=OK
0=FAIL OR NO PWR

TO ALL CARDS

TO ALL CARDS EXCEPT: DIGITAL DRIVERS I&2 MSM 510 OPS LINE RCVR

DATA TX

DATA RX

TXI

RXI

T2

(TWO WAY)

BIO DATA

1=MH

MSO IN

MSO OUT

WORD

(CH1)

(A)

(B)

PF2

PF1

MOM

CIE HEALTH AND STATUS MDM 510

MSO IN

MSO OUT

WORD

(CH1)

INTERFACE

SELECT

SSP2

S1

S2

S3

S4

S11

S12

S8

S7

SSP SW1

SSP SW2

SSP SW3

INT RST

INTERFACE READY)

FWD LINK DECODER INTR

MSO IN

MSO OUT

TIMING

PM/FM DEMOD & 4 MHZ CLK

COMPARATOR

PLT

XMT

RCV

RSTA

RSTB

RSTC

INTR

WAIT

BREQ

PS

NM1

RESET 1

RESET 2

(RESET 2)

SET 1

SET 2

(SET 2)

A

B

C

D

+28VF

F1

F2

F3

F4

F5

F6

F7

F8

F9

F10

F11

F12

F13

F14

F15

F16

F17

F18

F19

F20

F21

F22

F23

F24

F25

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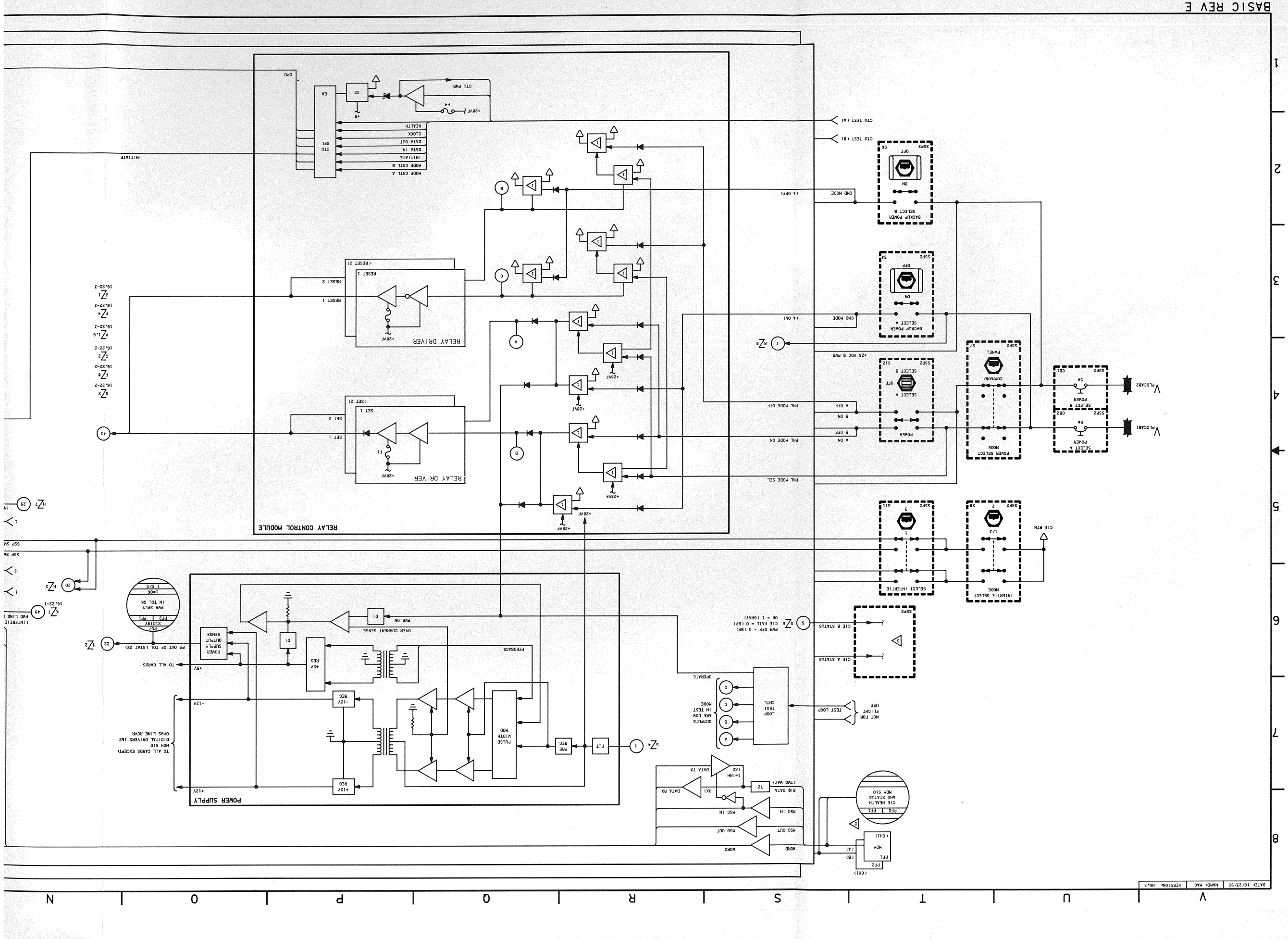

RELAY CONTROL MODULE
RELAY DRIVER
RELAY DRIVER
POWER SUPPLY
CTU SEL
MODE CNTL A
MODE CNTL B
INITIATE
DATA IN
DATA OUT
CLOCK
HEALTH
CTU PWR
CTU TEST (A)
CTU TEST (B)
CMD MODE
BACKUP POWER SELECT B
BACKUP POWER SELECT A
+28 VDC B PWR
PWL MODE OFF
PWL MODE ON
PWL MODE SEL
SELECT A
SELECT B
POWER
POWER SELECT MODE
COMMAND PANEL
VLOCAB2
VLOCAB1
CIE RTN
INTERTIE SELECT MODE
SELECT INTERTIE
CIE A STATUS
CIE B STATUS
TEST LOOP
LOOP TEST CNTL
OPERATE
MSO IN
MSO OUT
VORD
DATA TX
DATA RX
BIO DATA
CIE HEALTH AND STATUS MDM SIO
MDM
PFS OUT OF TOL (STAT 22)
TO ALL CARDS
TO ALL CARDS EXCEPT: MDM SIO DIGITAL DRIVERS 1&2 OPWS LINE RCVR
OVER CURRENT SENSE
FEEDBACK
PULSE WIDTH MOD
PWR ON
PWR SPLY 16.22-1 I>OK IN TOL OK
FWD LINK (INTERFACE)
SSP SW

DATE: 6/8/87	NAME: MPH	VERSION: INK: 1
DATE: 10/08/90	NAME: JMB	VERSION: BPT: 9
DATE: 10/19/90	NAME: CAR	VERSION: INK: 2

CIE B (COMMAND)

CIE A (COMMAND)

CONTROL/DATA BUS

ANALOG DRIVER 2

ANALOG DRIVER 1

OPWS MODULATOR 1

MDM MODULATOR 2

FLD MODULATOR 3

FLD

MDM

OPWS

DATA C

DATA D

DATA CL

MODE A

DATA RATE

20K TIMING

1.024M TIMING

DECODER

DIGITAL SYNTHESIZER

9 BIT ACCUM

VRD

NASCOM

PHASE SHIFT

256X8 PROM

"ONES" COMP

SIGN

9 BIT MUX D/A

SUBCARRIER TONE GEN

I/V

SAMPLE AND HOLD

LPF

MOD

DET

8 BIT UP/DN CNTR

32X8 PROM

DATA SEL

8 BIT D/A

AM WAVE GEN
DIGITAL SYNTHESIZER

FLD INT
49
N5
16.22-1

STAT 6 AND 7
E3
16.22-1

STAT 4

STAT 2

STAT 3

E3
16.22-1

POT X1005Y
PF2 | PF1
OPWS INPUT PHASE LOCK LOOP
0=LOCK
1 S/S

POT X1002Y
PF2 | PF1
MDM TO MOD SIG PRESENCE
1=PRES
1 S/S

POT X1004Y
PF2 | PF1
KU FLD TO MOD SIG PRESENCE
1=PRES
1 S/S

P2
T-D ANA

N1
4
16.22-1

S
R

DO-7
WR
BS15
RD
BS16
"0"
E
LATCH
(8)
CD
T/R
XCVR
D1 (MSB)
D2
D3
D4
D5
D6
D7
D0 (LSB)
ENA
ADDRESSABLE LATCH
A14
A13
A12
A11
A10
A9
A8
D (INH A,B,C)
C (A9-21)
B (A9-21)
A (A9-21)
MOD 1
2
3
T-D ANA
4 TO 1 ANALOG SWITCH (3)
A
B
C
B6
OFF SET
K1
K2
K3
SET
RESET
+28V
+5V
PI ON

PL3, PL4, RF ANALOG
PL1, PL2, PI ANALOG
+28V
RF ON
+28V
RF ON
+28V
PI ON
+28V
PI ON
PAYLOAD STATION DISTRIBUTION PANEL
NOT USED
MNB FLCA4 P/L INTEG 1
PS DOD MODE P/L INTEG 1
MNC FLCA3 P/L INTEG 2
PS DOD MODE P/L INTEG 2
T2 16.14
Q1 16.14
T2 16.14
Q1 16.14
PAYLOAD STATION DISTRIBUTION PANEL

ANALOG COMMAND

BYPASS

MDM
MDM

DIGITAL DRIVER 2

DIGITAL DRIVER 1

FLD C
FLD D
FLS INH
FLD CLK
AO
A1
F DECODER
FO
F1
F2
F3
F CLK 1
F CLK 2
MDMC (AO)
MDMD (A1)
MDM MODE
MDM DIS
MDM CLK
M DECODER
MO
M1
M2
M3
M CLK 1
M CLK 2

OPWS LINE RCVR

1 RCVR
S RCVR
C RCVR
O RCVR
CH1-C
CH2-C
CH3-C
CH4-C
CH1-O
CH2-O
CH3-O
CH4-O
C RCVR
O RCVR
CH 1, 2, 3, 4-C
SELECT
D1
D2
D3
D4
A0, B1
A1, B0
(I)
(S)
(C)
I(D1-D4)
S(D1-D4)
C(D1-D4)
O

DIGITAL COMMAND

MODE A
MODE B
DATA RATE
B2
B3
B6
VCO
TIMING (PLL)
1.024 MHZ
20 KHZ
DATA CLK
TIMING
NO LOCK
CONVERTER
CONVERTER
B2-B5
DATA D
DATA C
STAT 5
E3
16.22-1
N4
4
16.22-1
POT X1003Y
PF2 | PF1
OPWS INPUT PH LOCK
1=LOCK
1 S/S

DRIVER X-2

DRIVER X-1

MDM DIS (C1)
FLS INH (C2)
4x1 SEL
ENA A0 A1
6x1 SELECTOR (5)
D-FF (4)
M0, F0 (D0-1)
CH1-4(0) (D4-7)
M1, F1 (D0-1)
CH1-4(5)
M2, F2 (D0-1)
CH1-4(52)
M3, F3 (D0-1)
CH1-4(1)
MCLK2, FCLK2 (D0-1)
CH1-4(C)
B0, B3, B2, B1
INH A0 A1 A2
MCLK1
FCLK1
(C1)
(C2)
(C3)
(C4)
B4, B7, B6
ENA A0 A1
SET
RESET
K1
K2
K3
K4
K5

PL 4 DIGITAL
PL 3 DIGITAL
PL 2 DIGITAL
PL 1 DIGITAL
(0, I, S, C)
PAYLOAD STATION DISTRIBUTION PANEL

OPTICAL ISOLATOR
NOTES: 1

XCVR
LATCH
DO-7
RD
BS0
WR
CLR
BS1
BS3
CONTROL/DATA BUS

22 CIE CMD 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN LOUIS VETRANO	11/25/85	
DR		COMMUNICATIONS INTERFACE EQUIPMENT (COMMAND)
ENGR G. POHLE		
ENGR	10/23/90	
APP	10/23/90	
APP	10-23-90	SPACE SHUTTLE
OMNIPLAN	11-29-90	ALL
LTR E	PCN	104.5 X 34

DWG NO 16.22

PAGE SHEET 2 OF 3

BASIC REV E

S R Q P O N M L K J

8 7 6 5 4 3 2 1

COMMAND LINE RCVR

KU 128 KBPS
KU 128 CLK
OPWS (B)
OPWS (A)
OPFL NRZ
OPFL CLK
KU FL
KU VT
KU FL CLK
KU FL CLK
K2
K3
A1 B1 A2 B2 A3 B3 A4 B4 A/B
O1 O2 O3 O4
OPWS NRZ
OPWS CLK
KU NRZ
KU CLK
OPWS WRD
OPWS OUT
OPWS (0,1,5,CLK)

CONTROL DATA BUS
CLR WR BS1 RD DO-7
DO-5
CLR LATCH
CK
CD XCVR T/R
'0'
D CLR
AO-A7
AO-A5
A6 (W)
A3

FORWARD LINK DECODER

16 BIT S/P REGISTER
Q1 (A7) Q8 (A0) Q9 (A7) Q16 (A0)
512X16 PROM
FRAME SYNC DETECTOR
1Q0-1Q3
2Q0-2Q7
SYNC DETECT
INVERT
TIMING
COUNTER
RESET
205 206 (A1) 207 (B1)
1 OF 4 DECODER
LATCH
INT CMD F
BYPASS
PL CMD
FWD LINK DECODER INTERRUPT
FLD INT
49
16.22-1

128KHZ
F/8 (128KHZ)
F/4 (CYOUTF)
VCO/ PHASE LOCK LOOP
1M
TIMING
FLD INT
ORCLK
WRCLK
DRCLK
128K
TIMING
INT READY
D CLR
DCLR
BUF DATA
A1, A2
DATA CONVERTER
A/B SEL
DATA CLK
FLDD
DATA D
FLDC
DATA C
DCLR
DIS (FLS INH)
DATA RATE (A3)
MODE A
MODE B
MODE DECODE
DECODE
DIBIT
128K
INTERTIE DATA
INTERTIE BUFFER
INT DATA A7
KU SEL (A4)
BPDIS
A5
BYPASS MODE
BPDIS
AO-A3
AO-A2
AO-A5
AO-11
BO-11
AO-8
AO, 1, 2
R DATA
R DATA 4096X1 RAM
4096X1 RAM
A=B
ORCLK
CNTR
SUMMING REGISTER
128 KBPS BYPASS
KU CLK DET.
CLK FAIL (KU)
STATUS
STAT 6
STAT 7
DATA DECODER
DEC DATA
INTCMD
WRCK
DCLR (PE)
1M
BORF
CNTR

FLD
MDM
OPWS
DECODER
DATA C
DATA D
DATA CL
MODE A
MODE B
DATA RATE
20K TIMING
1.024M TIMING
WRD
NASC

STAT 6 AND 7
16.22-1

POT X1001Y PF2 PF1
FWD LINK CLOCK (2 BITS)
0 (HEX) 1 S/S

1 (HEX) NO SYNC, NO BYPASS
2 (HEX) NO SYNC, BYPASS MODE
3 (HEX) NORMAL OPS (CARD ON)

(CH 0)
MDM PF2
PF1 MDM (CH 0)
(B)
(A)
ORB DATA
ORB MSG
ORB WRD
T1
OBA
MDM SER
MDM MSG IN
WORD IN

T-O-CNTL (B)
T-O-CNTL (A)
TO-UMB
TO-OLT
RELAY RST
RELAY SET
K4
K1
T-O ANA
40
16.22-1
T-O CNTL
O1
+12V
+12V

MDM S/O

SERIAL DATA
WORD
MSG
1.024 MHZ
12 MHZ
4 KHZ
CLR
MANCH DECODER
TIMING
GATE
4096X1 BUFFER
4096X1 BUFFER
TIMING
TIMING
IDLE PATTERN GENERATOR
DATA RATE/FORMAT
MODE A
MODE B
DATA C
DATA D
DATA RATE
DATA CLK
OUTPUT DIS
MODE
WORD ERROR
STAT 1
MDM
POT X1001Y PF2 PF1
MDM MSG WORD ERROR
1=ERROR 1 S/S
42
16.22-3
XCVR
T/R CD
'1'
'0'
RD BS14 WR
DO-7
CONTROL DATA BUS
16.22-1

CH1-C
CH2-C
CH3-C
CH4-C
C RCVR
CH 1,2,3,4-C
CH1-O
CH2-O
CH3-O
CH4-O
O RCVR
T/R
'0'
DO-7

BASIC REV E

DATE: 09/09/90	NAME: MAG	VERSION: BPT.6
DATE: 10/23/90	NAME: MAG	VERSION: INK.4
DATE: 10/30/90	NAME: MDU	VERSION: INK.5

CIE B (TELEMETRY)
CIE A (TELEMETRY)

DATA RATE UP-CONVERTER

P1 1.7 MHZ DATA FORMATTER 4
P1 1.024 MHZ DATA FORMATTER 3
RF 1.7 MHZ DATA FORMATTER 2
RF 1.024 MHZ DATA FORMATTER 1

DATA FORMAT CONTROL

P/L RECORDER DATA RATE UP-CONVERTER

KU-BAND DATA RATE UP-CONVERTER

TLM SWITCH

OPWS TLM LINE DRIVER

PL RECORDER DIGITAL
PL RECORDER ANALOG
PAYLOAD RECORDER
PAYLOAD DATA INTERLEAVER
FM SIGNAL PROCESSOR
KU-BAND SIGNAL PROCESSOR
LDR PL DIGITAL DATA

OPWS B 1,2,3,4 } NOT USED
OPWS A 1,2,3,4 }

NOTES:
1. IF THE PROGRAMMED TELEMETRY TYPE IS BI-PHASE-L THE BIT SYNC FORMATTER'S STATUS WILL ALWAYS INDICATE "DATA PRESENT"
2. UNFILTERED NOISE FROM THE BIT SYNC RCVR VCO'S WILL CAUSE THE BIT SYNC FORMATTER TO ERRONEOUSLY CREATE A SIGNAL IN THE ABSENCE OF ANY INPUT DATA. THIS SIGNAL WILL BE CREATED AT A RATE THAT IS APPROXIMATELY 40X OF THE PROGRAMMED DATA RATE. FOR EXAMPLE IF THE PROGRAMMED RATE IS 16 KBPS, WHENEVER THERE IS NO SIGNAL INPUT TO THE EA, THE EA WILL OUTPUT A SIGNAL AT ABOUT 6.25 KBPS
3. PDI DECOMS MAY LOCK TO THE OUTPUT OF THE EA WHEN THERE IS NO TELEMETRY STREAM INPUT TO THE EA

22 CIE TM 3

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN		
DR J. A. NEELY	10/3/86	COMMUNICATIONS INTERFACE EQUIPMENT (TELEMETRY)
ENGR G. POHLE		
ENGR	10/26/90	
APP	10/26/90	SPACE SHUTTLE
APP	10-26-90	DWG NO 16.22
OMNIPLAN S. K. KOHLER	10-28-90	ALL
LTR E PCN		126.5 X 34 PAGE SHEET 3 OF 3

BASIC REV E

T | S | R | Q | P | O | N | M | L | K | J

CONTROL/DATA BUS

BIT SYNC CLK RECEIVER 1
BIT SYNC CLK RECEIVER 2
BIT SYNC CLK RECEIVER 3
BIT SYNC CLK RECEIVER 4
BIT SYNC DATA FORMATTER 1
BIT SYNC DATA FORMATTER 2
BIT SYNC DATA FORMATTER 3
BIT SYNC DATA FORMATTER 4
RF PSK COSTAS 1, 1.024 MHZ
RF PSK COSTAS 2, 1.7 MHZ
PI PSK COSTAS 1, 1.024 MHZ
PI PSK COSTAS 2, 1.7 MHZ
RF 1.024 MHZ BIT SYNC AND PSK LOCK IND 1
RF 1.7 MHZ BIT SYNC AND PSK LOCK IND 2
PI 1.024 MHZ BIT SYNC AND PSK LOCK IND 1
PI 1.7 MHZ BIT SYNC AND PSK LOCK IND 2
PSK LOCK IND
DATA INTEGRATOR
B10 DATA DETECTOR
FM/PM DEMOD AND TIMING

DATE: 10/30/90 | NAME: MDU | VERSION#: INK5.5

W V U T S R Q P O N

8 7 6 5 4 3 2 1

TLM RCVR

PL1 DATA/CLK
PL2 DATA/CLK
PL3 DATA/CLK
PL4 DATA/CLK
RF PORT
PL TM INPUT (P1401)

PL1 DATA
PL1 CLK
PL2 DATA
PL2 CLK
PL3 DATA
PL3 CLK
PL4 DATA
PL4 CLK
RF PORT

K1 NRZ/BIΦ 1
K2 BIT CLK 1
K3 NRZ/BIΦ 2
K4 BIT CLK 2
K5 NRZ/BIΦ 3
K6 BIT CLK 3
K7 NRZ/BIΦ 4
K8 BIT CLK 4
K9

PSK DMD 1
PSK DMD 2
PSK DMD 3
PSK DMD 4
FM/FM DMD

RF
PI

PAYLOAD INTERROGATOR NO 2 (6Z2 16.14)
PI NO 1
PI NO 1
PI NO 2 DOD PL DATA
(6Z5 16.22-1) 50 RF/PI SEL

(NZ4 16.22-1) 40 SET RESET
K1 K3 K5 K7 K9
K2 K4 K6 K8

(1Z1 16.22-1) CONTROL/DATA BUS

PI PSK COSTAS 2, 1.7 MHZ
PI PSK COSTAS 1, 1.024 MHZ
RF PSK COSTAS 2, 1.7 MHZ
RF PSK COSTAS 1, 1.024 MHZ

4D2 3D2 2D2 1D2
(1 1Z7)
PSK DMD 4
PSK DMD 3
PSK DMD 2
PSK DMD 1
(T4Z4 8)
100 HZ
CLRF

LPF3 THD 3
R DATA
BW
LPF
LIMITER
ABS DET
+V
Q
90°
8.192 MHZ
A
SWEEP
2
LPF2
VCXO
COSTAS LOOP
F(S)
BW
BPF
AGC
I
E
Q
I⊕Q
LPF1
THD 1
TIMING
J Q K R
STDY ST DET
LPF
BW
ABS DET
RESET
DIVIDER
10 HZ
50 HZ

4D0-4D2, 4D6
1D0-1D2, 1D6
D0A-D2A, D6A
TO
T4
T3
T2
T1
S/H
R DATA
2A
TOF
D6A
BIΦ NRZ
S1 S2 S3 S4 S5 S6
TO⊕T3
CLR

MASTER TIMING UNIT (6Z2 8.9)
1.024 MHZ MTU
0
VCXO 8.192 MHZ
8.192 MHZ PHASE LOCKED LOOP
DIVIDERS
1.024 MHZ
128 KHZ
32 KHZ
16 KHZ
4 KHZ
100 HZ
4 MHZ B
12 MHZ B
12 MHZ A
500 KHZ
÷100
÷30
12 MHZ PHASE LOCKED LOOP
÷12
÷2
(46 A32 Z)
(47 1Z6 16.22-1)
(48 A32 Z)
(42 NZ2 16.22-1)
(8 1Z6)
(41 1Z8 16.22-1)
(43 1Z6 16.22-1)
(44 1Z8 16.22-1)

FM/FM DEMOD AND TIMING
(NZ3 2)
100 KHZ
DEMODULATOR
1.7 MHZ
BPFL 200 KHZ
LIMITER
VCO
÷4
1.7 MHZ (QUAD)
STAT 19
(EZ2 16.22-1)
POT X10107Y PF1 PF2
FM/FM DEMOD SYNC
0=SYNC 1 S/S
(11 6Z6)
FM ON/OFF
(6Z5 16.22-1) 45
ON
OFF
K1
S FM OUT
R NC
SET
RESET
(NZ4 40)

OPWS (NOT USED)
INV 1,2,3
INV 1,2,3
(10 1Z3)

BIT SYNC CLK RECEIVER 4
BIT SYNC CLK RECEIVER 3
BIT SYNC CLK RECEIVER 2
BIT SYNC CLK RECEIVER 1

NRZ CNTRL 1
BIT CLK 1
BIΦ CNTRL 1
Y = A⊕B + C⊕D
NRZ/BIΦ DAT 1
DATA 1
Y = A⊕B⊕C + D⊕E⊕F
CLR
CLR PD - P3 QA QB QC CK
CLR F
4A0-4A3
3A0-3A3
2A0-2A3
1A0-1A3
BIΦ DATA DETECTOR
A0-A3
32 X 8 PROM
BIT RATE DECODE
A1-A3
LOOP FILTER
PHASE LOCK LOOP
VCO 870.4 KHZ
VCO 8.192 MHZ
A3 A4
A/B
2 X CLK 1
BIΦ CLK 1
PD P7
PD P1
PD P3
÷4
÷8

Q0-Q5
Q6
DATA 4
DATA 3
DATA 2
DATA 1
BIΦ & 2 X CLK 4
BIΦ & 2 X CLK 3
BIΦ & 2 X CLK 2
BIΦ & 2 X CLK 1
BIΦ CLK 1
2 X CLK 1
ONE SHOT FF
T/R XCVR
1" D0-7
CONTROL/DATA BUS

(EZ1 16.22)

BASIC REV E

DATE:	NAME:	VERSION:
DATE: 03/01/93	NAME: MDU	VERSION: INK: 1
DATE: 07/13/93	NAME: BJT	VERSION: BPT: 2
DATE: 09/13/93	NAME: MDU	VERSION: INK: 2

ERPCL

HEATER CIRCUIT

PRIME POWER CIRCUIT

5 ± 15 VOLT DC - DC CONVERTER

±5 ± 15 VOLT DC - DC CONVERTER

REGULATED PWR

28 VOLT DC - DC CONVERTER

REGULATED PWR

28V SWITCHED

HEATER CONTROL LOGIC

85°C

HTR

PM TX

DIGITAL FREQ SYNTHESIZER

BASEPLATE TEMP SENSOR

PWR

TX PWR SENSOR ANALOG TLM

TEMP SENSOR ANALOG TLM

TRANSMIT SIGNAL

RF INHIBIT

MOD INPUT

SWEEP

CHAN DATA

RF SW1

RF SW2

RF SW3

HIGH

LOW

RF SW CNTL DATA

HIGH BAND DIPLEXER

LOW BAND DIPLEXER

HORN ANTENNA

TALKBACK DRIVER LOGIC

S4	S5	SPASP DISPLAY DATA
0	0	PWR ON TB CHANNEL GOOD TB RX LOCK TB TX PWR DATA
0	1	PWR ON TB CHANNEL GOOD TB RX LOCK TB TEMP DATA
1	X	RX PWR DATA

RF SW CONF TLM

TX PWR TLM

RX PWR TLM

TEMP TLM

RX LOCK TLM

CHANNEL SELECT CIRCUIT

CH A

CH B

RX CHAN DATA

TX CHAN DATA

RF SWITCH DATA

TO DS1

TO DS2

TO DS3

TO DS4

TO DS5

TO DS6

1A

DATA COMPAR

RF SW TLM DATA - HIGH TLM

RF SW TLM DATA - LOW TLM

RF SW CONF TLM (DS2)

TX PWR A/D

TX PWR TLM (DS4, 5, 6)

RX PWR A/D

RX PWR TLM (DS1-6)

TEMP A/D

TEMP TLM (DS4, 5, 6)

AND

RX LOCK TLM (DS3)

PM LOCK TLM

DEMOD LOCK TLM

TALKBACK DRIVERS

5-DB CARRIER PM DEMOD

PM RX

1.024 MHZ SUBCARRIER DEMOD

RX PWR SENSOR ANALOG TLM

PM LOCK TLM (PHASE)

DEMOD LOCK TLM (PHASE, BIT, FRAME)

RECEIVED DATA AND CLOCK

LOW NOISE AMP

RECEIVED SIGNAL

LOW TLM

HIGH TLM

+5V

RF INHIBIT CIRCUIT

BALANCED/ UNBALANCED CONVERTER

PM TX MOD CTRL

75 OHM DRIVER

PSP S.C. DETECTOR

TX RF INHIBIT DELAY

TX RF INHIBIT LOGIC

1. WILL INHIBIT PM TX IF TEMP > 70°C

2. S-BD SUBCARRIER DEMOD CAN DEMOD 16 KBPS SIGNAL ONLY

3. TRANSMITTED POWER LEVEL IS MEASURED AT THE OUTPUT OF THE PM XMTR. THE POWER LEVEL DROPS 2db AT THE DIPLEXER AND RAISES 12db AT THE HORN ANTENNA (ACTUAL RADIATED POWER LEVEL IS 10db HIGHER THAN MEASURED AT XMTR)

4. INTERFACE ACCOMPLISHED THROUGH THE PAYLOAD STATION DISTRIBUTION PANEL (PSDP)

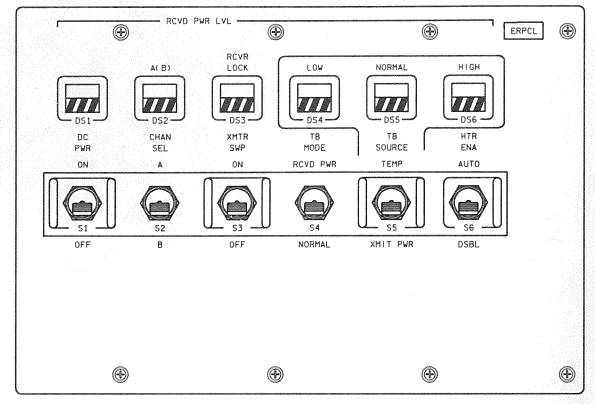
5. THE PAT BOX IS LOCATED ON THE P/L WIRE TRAY ALONG THE SILL OF THE PAYLOAD BAY

6.

RF SW 1	RF SW 2	RF SW 3	FREQUENCY	A(B) to POS'N*
L	L	L	LOW	GRAY
H	H	H	HIGH	GRAY
ALL ELSE			—	BARBER POLE

* ASSUMING S4 IN NORMAL POS'N

NOTES: 1. 1=GRAY, 0=BARBERPOLE



WHEN S4 IS IN THE NORMAL POSITION AND S5 IS IN THE XMIT PWR POSITION THE TALKBACKS WILL INDICATE THE FOLLOWING:

DS1 - POWER ON/OFF
DS2 - A/B
DS3 - RCVR LOCK
DS4 - XMIT PWR LOW
DS5 - XMIT PWR NORMAL
DS6 - XMIT PWR HIGH

DS4	DS5	DS6	RF POWER RANGE	STATUS
1	0	0	P ≤ 30 DBM	LOW OR OFF
1	1	0	30 < P ≤ 33 DBM	LOW NOMINAL
0	1	0	34 < P ≤ 36 DBM	NOMINAL
0	1	1	36 < P ≤ 38 DBM	HIGH NOMINAL
0	0	1	38 < P	HIGH

WHEN S4 IS IN THE NORMAL POSITION AND S5 IS IN THE TEMP POSITION THE TALKBACKS WILL INDICATE THE FOLLOWING:

DS1 - POWER ON/OFF
DS2 - A/B
DS3 - RCVR LOCK
DS4 - TEMP LOW
DS5 - TEMP NORMAL
DS6 - TEMP HIGH

DS4	DS5	DS6	TEMPERATURE RANGE	STATUS
1	0	0	T ≤ -20 C	LOW
1	1	0	-20 C < T ≤ +10 C	LOW NOMINAL
0	1	0	+10 C < T ≤ +40 C	NOMINAL
0	1	1	+40 C < T ≤ +70 C	HIGH NOMINAL
0	0	1	+70 C < T	HIGH

WHEN S4 IS IN THE RCVD PWR POSITION ALL THE TALKBACKS WILL INDICATE A LEVEL OF RCVD POWER

DS1	DS2	DS3	DS4	DS5	DS6	RECEIVED POWER LEVEL	STATUS
1	1	1	1	1	1	-89 < PR	HIGH
1	1	1	1	1	0	-97 < PR ≤ -89 DBM	HIGH NOMINAL
1	1	1	1	0	0	-103 < PR ≤ -97 DBM	NOMINAL
1	1	1	0	0	0	-120 < PR ≤ -103 DBM	LOW NOMINAL
1	1	0	0	0	0	PR ≤ -120 DBM	LOW
1	0	0	0	0	0	PR ≤ -120 DBM	LOW
0	0	0	0	0	0	PR ≤ -120 DBM	LOW

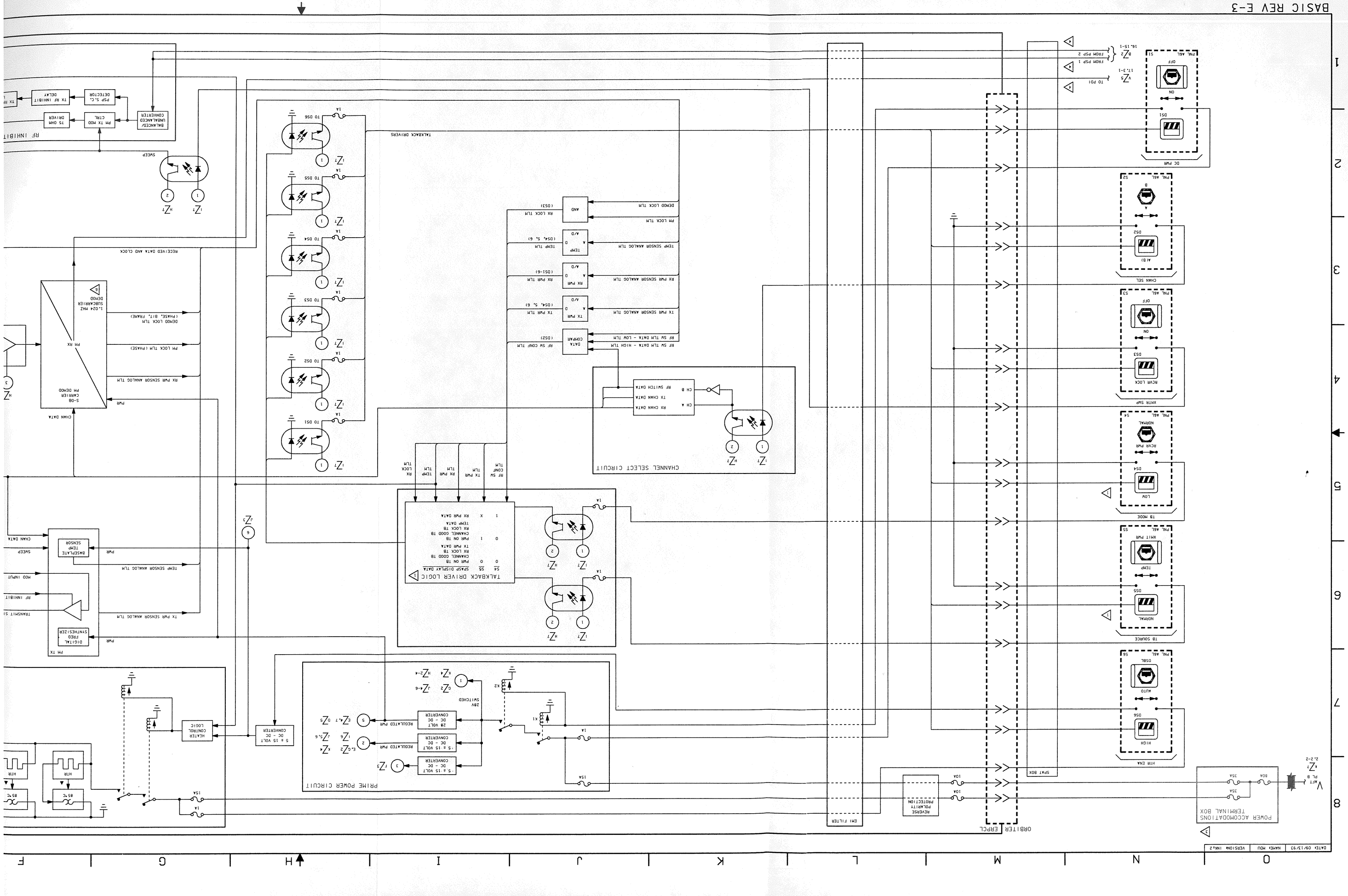
23 ERPCL

SIGNATURE		DATE	
DSGN	STACY DAWSON	02/1/93	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR			
ENGR	GARY HORLACHER		EXTENDED RANGE PAYLOAD COMM LINK
ENGR	Gary Chlebek	9/27/93	
APP	Gordon McElroy	9/27/93	
APP	William Norman	9/27/93	SPACE SHUTTLE
CADS	S.K. Rombold	10-6-93	ALL
LTR E	PCN 3		82.5 X 34

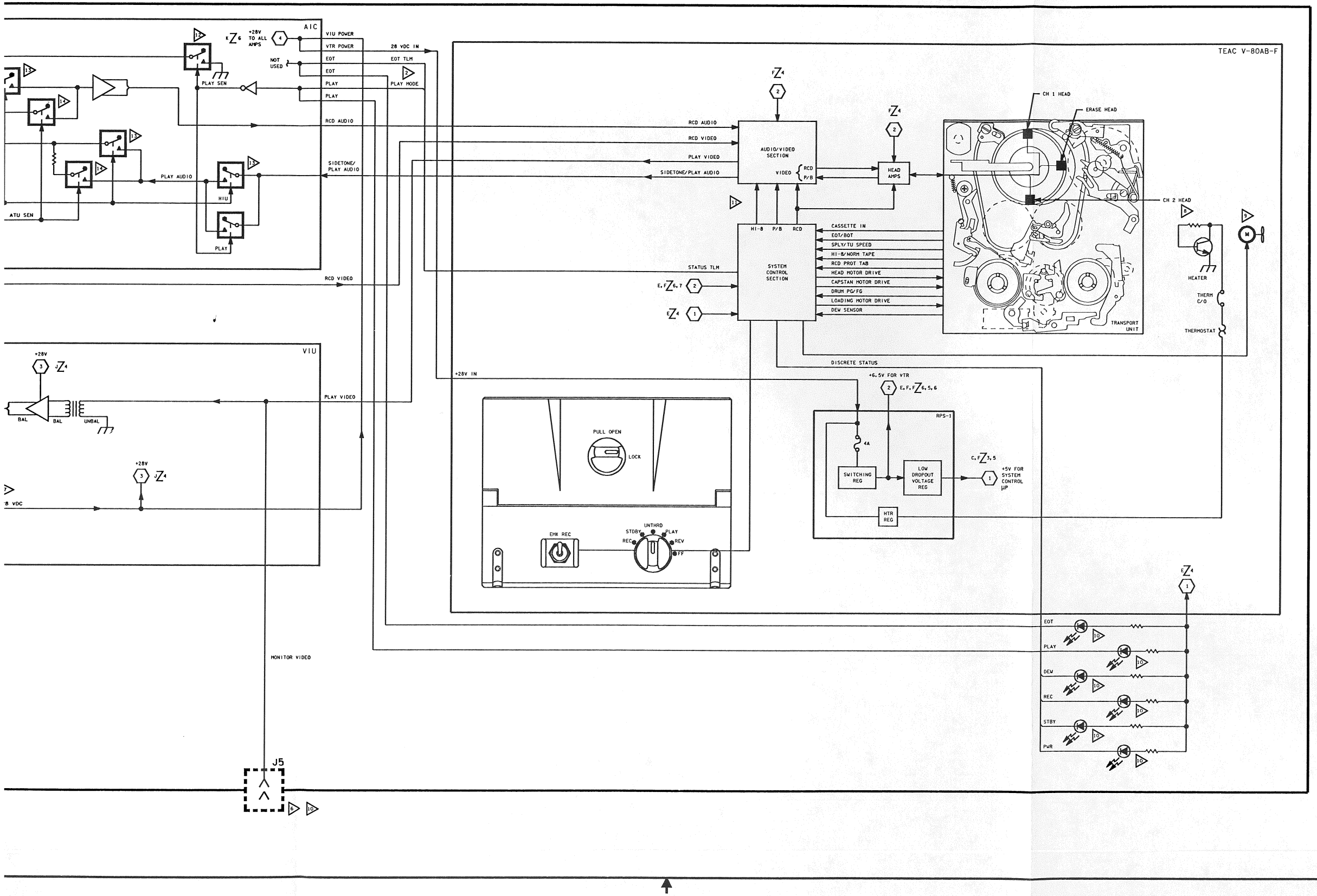
DWG NO 16.23

PAGE SHEET 1 OF 1

BASIC REV E-3


PRIME POWER CIRCUIT
CHANNEL SELECT CIRCUIT
TALKBACK DRIVERS
TALKBACK DRIVER LOGIC
RECEIVED DATA AND CLOCK
CHAN DATA
SWEEP
RF INHIBIT
MOD INPUT
TRANSMIT SIGNAL
PM TX
PM RX
CHAN SEL
XMTR SWP
TB MODE
TB SOURCE
HTR ENA
DC PWR
ORBITER
EMI FILTER
SPAT BOX
POWER ACCOMODATIONS TERMINAL BOX
REVERSE POLARITY PROTECTION
DATE 09/13/93
NAME MDU
VERSION INA.2

DATE: 02/13/96	NAME: VSH	VERSION: BPT, 1
DATE: 02/27/96	NAME: VSH	VERSION: BPT, 2
DATE: 03/19/96	NAME: VSH	VERSION: INK, 2



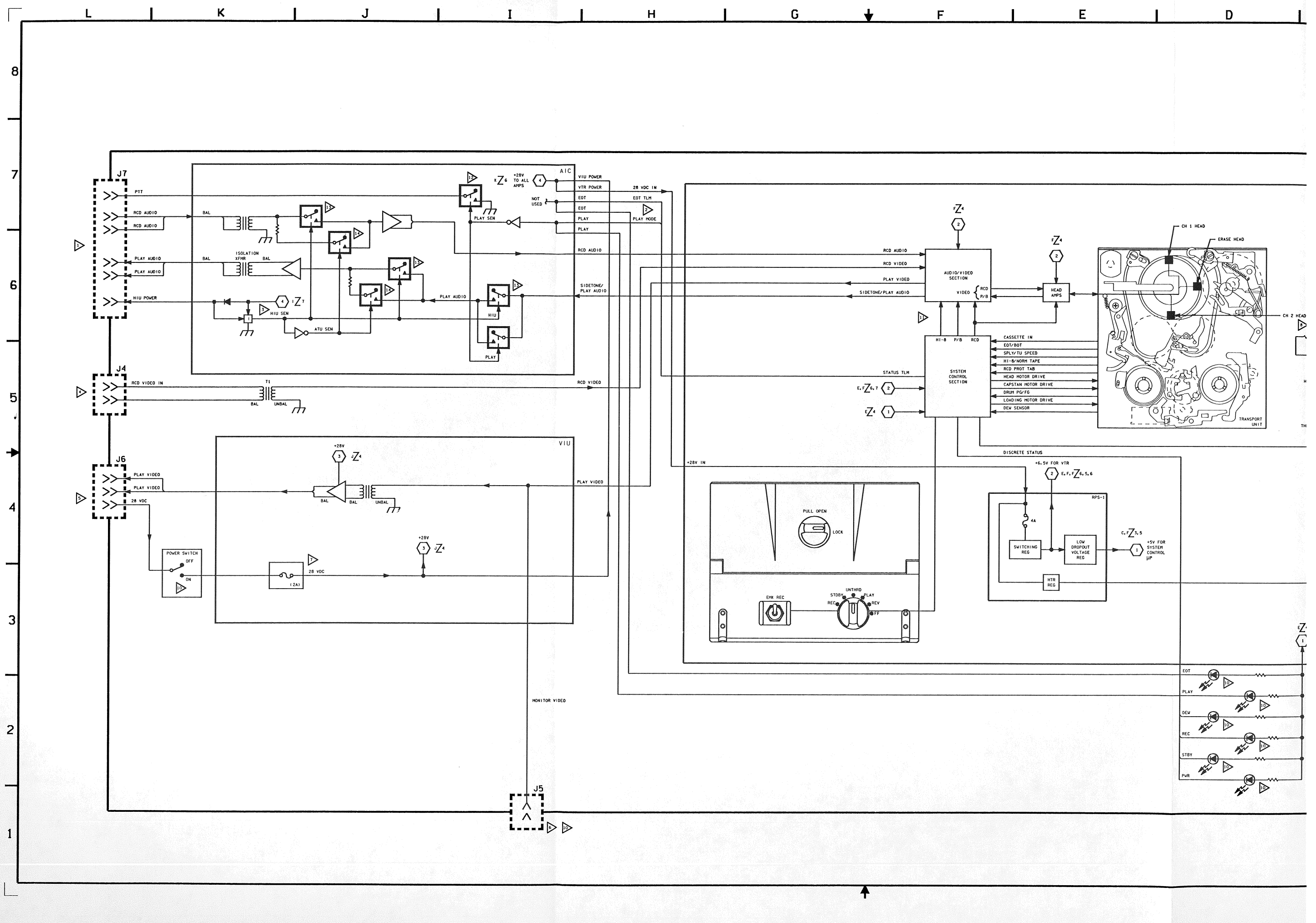
- ▲4 W/O HIU POWERED, RELAYS CLOSE (ATU USED)
- ▲3 WHEN HIU POWERED, RELAYS CLOSE
- ▲2 PROVIDES KEY TO ATU FOR PLAYBACK AUDIO
- ▲1 WHEN NOT IN PLAY MODE, AUDIO AND VIDEO ARE TURNED AROUND AND OUTPUT TO THE PLAY VIDEO AND SIDETONE/PLAY AUDIO LINES
- 10 ON FRONT PANEL
- 9 SMALL FAN MOVES AIR AROUND WITHIN VTR TRANSPORT UNIT
- 8 FOUR POWER TRANSISTOR ASSEMBLIES MAKE UP THE HEATER
- 7 THE 2A FUSE IS ACCESSIBLE BY THE CREW AFTER VTR HOUSING REMOVAL, ON OUTSIDE OF VIU IS A SLOT WHERE FUSE IS INSERTED
- 6 CONNECTS TO AN LCD 3" MONITOR USING A SPECIAL CABLE. 3" LCD MONITOR USUALLY STOWED WITH VTR, USES 6 SIZE "AA" BATTERIES
- 5 CONNECTS TO PANEL 019 OR MO58F VIA THE TV POWER CABLE OR VIA THE PIGMY CABLE. ANY STUB OF THE PIGMY PROVIDES POWER, BUT NOT ALL HAVE SYNC + VIDEO CAPABILITY
- 4 CONNECTS TO MONITOR 2 (1) J3 (PANEL VIDEO OUTPUT) USING A SPECIAL CABLE - J3 IS ON MONITOR 2 (1) REAR PANEL
- ▲3 WHEN THIS DEVICE SENSES CURRENT FLOW OUT OF THE HIU POWER LINE, IT SETS "HIU SEN" HIGH
- ▲2 THESE LINES PULLED LOW IN PLAY MODE

NOTES: 1 REAR PANEL. CONNECTS TO EITHER HIU AND VLWHS OR ADS-VTR CABLE AND ATU. BOTH CONFIGS SUPPORT RCD AND PLAY OF AUDIO. SWITCH ON ADS-VTR CABLE SHOULD BE LEFT IN "PLAY"

24 8MM VTR

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	MICHAEL A. GILLESPIE	10/25/92		
DR				
ENGR	L. HOPPE		8MM VIDEO TAPE RECORDER	
ENGR		4/4/96		
APP		5/9/96		
APP		5/29/96	SPACE SHUTTLE	DWG NO 16.24
CADS	S.K. Kimbrew	6/17/96	ALL FLIGHTS	
LTR E	PCN 8		66 X 34	PAGE SHEET 1 OF 1

BASIC REV E-6


J7
PTT
RCD AUDIO
RCD AUDIO
PLAY AUDIO
PLAY AUDIO
HIU POWER
BAL
ISOLATION XFMR
BAL
BAL
HIU SEN
ATU SEN
PLAY AUDIO
PLAY SEN
HIU
PLAY
AIC
+28V TO ALL AMPS
NOT USED
VIU POWER
VTR POWER
EOT
EOT
PLAY
PLAY
RCD AUDIO
SIDETONE/ PLAY AUDIO
28 VDC IN
EOT TLM
PLAY MODE
J4
RCD VIDEO IN
T1
BAL
UNBAL
RCD VIDEO
J6
PLAY VIDEO
PLAY VIDEO
28 VDC
VIU
+28V
BAL
BAL
UNBAL
PLAY VIDEO
POWER SWITCH
OFF
ON
28 VDC
(2A)
+28V
MONITOR VIDEO
J5
RCD AUDIO
RCD VIDEO
PLAY VIDEO
SIDETONE/PLAY AUDIO
AUDIO/VIDEO SECTION
VIDEO
RCD
P/B
HEAD AMPS
CH 1 HEAD
ERASE HEAD
CH 2 HEAD
TRANSPORT UNIT
HI-8
P/B
RCD
SYSTEM CONTROL SECTION
STATUS TLM
CASSETTE IN
EOT/BOT
SPLY/TU SPEED
HI-8/NORM TAPE
RCD PROT TAB
HEAD MOTOR DRIVE
CAPSTAN MOTOR DRIVE
DRUM PG/FG
LOADING MOTOR DRIVE
DEW SENSOR
DISCRETE STATUS
+28V IN
PULL OPEN
LOCK
EMR REC
STDBY
UNTHRD
PLAY
REC
REV
FF
+6.5V FOR VTR
RPS-1
4A
SWITCHING REG
LOW DROPOUT VOLTAGE REG
HTR REG
+5V FOR SYSTEM CONTROL µP
EOT
PLAY
DEW
REC
STBY
PWR

DATE: 04/08/96	NAME: BJB	VERSION: BPT: 13
DATE: 04/15/96	NAME: MDU	VERSION: BPT: 14
DATE: 04/24/96	NAME: BJB	VERSION: INK: 4

CONTROL BUSES:

1	V76V0120A#	CNTL BUS AB1 VOLTS
2	V76V0121A#	CNTL BUS AB2 VOLTS
3	V76V0122A#	CNTL BUS AB3 VOLTS
4	V76V0220A#	CNTL BUS BC1 VOLTS
5	V76V0221A#	CNTL BUS BC2 VOLTS
6	V76V0222A#	CNTL BUS BC3 VOLTS
7	V76V0320A#	CNTL BUS CA1 VOLTS
8	V76V0321A#	CNTL BUS CA2 VOLTS
9	V76V0322A#	CNTL BUS CA3 VOLTS

△3 CONFIG FOR VEHICLE OV-102 ONLY

△4 BOTH CONTROL BUSES NECESSARY FOR GPC BLOCK4 DEFAULT TO ENABLE

△5 UHF PA PWRED BY MNA ONLY

△2 POWERED VIA MIDDECK TV INPUT STATION

NOTES: △1 COLOR OR B/W LENS MISSION SELECTABLE

25 COMM PWR DIST 1

SIGNATURE	DATE	
DSGN BARBARA BOWEN	5/18/82	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
ENGR D. MILLER		COMM SYSTEM POWER DISTRIBUTION
ENGR	4/25/96	
APP	5/1/96	
APP	4/25/96	SPACE SHUTTLE / DWG NO 16.25
CADD S.K. Rinkle	6-19-96	ALL
LTR E	PCN 6	126.5 X 34 / PAGE / SHEET 1 OF 1

BASIC REV E-6

T S R Q P O N M L K J

TV RCU/VSU
POWER CONSUMPTION RCU/VSU 46.2W
FROM CNTLBC1 BUS
TV CONTR UNIT
PNL R14 D CB42

ERPCL
PAT BOX 35A 80A 35A
DC POWER ON OFF A6L S1
TO HEATER CIRCUIT 10A
TO HEATER CIRCUIT 10A
FROM TALKBACK DRIVERS
TO PRIME PWR CIRCUIT
POWER CONSUMPTION AT LOW TEMPS 139W 259W

MADS
MADS POWER MNB 5A PNL A7L CB3
MASTER MADS POWER ON OFF PNL C345 S1
MADS RECORDER POWER PCM/WB ENA ON OFF PNL A7L S1
RPC 10A TO RECORDER
WB/PCM
MADS CONTROL MODULE POWER CONSUMPTION 20.7W
MADS RECORDER CONSUMPTION 110W (59W STBY)
EOT/BOT
MADS STRAIN GAGE PCM ENA ON OFF PNL A7L S4
PCM
RPC 15A PART OF MADS
MADS STRAIN EQUIPMENT
SGSC 6W EA
WBSC 0.6W EA
FDH 50W EA
MADS PCM PWR CONS 68W

OCIL 3A PNL R14B CB49
COLOR TV MONITOR 2 POWER CONSUMPTION 36.4W
FWD BAY CAMERA POWER CONSUMPTION 19.04W
PAN-TILT UNIT MODE - STBY 0.19W -1MTR 2.68W -2MTR 5.17W
B&W LENS ASSEMBLY MODE-STBY 0.20W -1MTR 2.44W -2MTR 4.48W -3MTR 6.72W
FWD BAY CAMR HTR 3A PNL R14D CB40
FWD BAY CAMERA HEATER POWER CONSUMPTION 19.9W
FWD BAY PAN-TILT HTR 3A PNL R14D CB41
FWD BAY PTU HEATER POWER CONSUMPTION 8.2W
PORT RMS CAMR PAN-TILT 3A PNL R14E CB55
PORT RMS WRIST AND ELBOW CAMERAS POWER CONSUMPTION 19.04W
ELBOW PAN-TILT UNIT MODE - STBY 0.19W -1MTR 2.68W -2MTR 5.17W
B&W LENS ASSEMBLY MODE-STBY 0.20W -1MTR 2.44W -2MTR 4.48W -3MTR 6.72W
PORT RMS CAMR HTR 3A PNL R14E CB56
RMS PORT RMS CAMERA HEATERS POWER CONSUMPTION 19.9W
PORT RMS PAN-TILT HTR 3A PNL R14E CB57
RMS PORT RMS ELB PTU HEATER POWER CONSUMPTION 8.2W
MIDDECK AUDIO/AIRLOCK 2 BACKUP AUDIO POWER CONSUMPTION 11.8W MODE-SIGNAL 4.3W -NO SIGNAL
AUDIO MID DECK SPKR 3A PNL R14A CB5
MIDDECK SPEAKER ATU POWER CONSUMPTION 11.8W MODE-SIGNAL 4.3W -NO SIGNAL
MIDDECK SU POWER CONSUMPTION 14.9W MODE-SIGNAL 3.0W -NO SIGNAL
KUA ELEC 15A PNL R14C CB23
SECURE TV CCTV ADU 7.5A PNL R14D CB70
KUA ANT HTR 7.5A PNL R14C CB24
KU-BAND EA1 POWER CONSUMPTION 150W
KU-BAND DIG DISPLAY AND X-PNTR POWER CONSUMPTION 15W
KU-BAND EA2 POWER CONSUMPTION 48W
RPC 10A
KU-BAND DMA HEATER POWER CONSUMPTION 115.5W
KU-BAND DEA HEATER 1 POWER CONSUMPTION 134W
KU-BAND DEA HEATER 2 POWER CONSUMPTION 134W
KU-BAND DA
DEA POWER CONSUMPTION MODE -CDMM ON 290W -CDMM STBY 112W -RADAR ON 244W -RADAR STBY 112W
DMA POWER CONSUMPTION ANT GIMBAL MOTORS 20.83W PEAK 4.5W AVG
MID POWER CONTROLLER NO. 2 20A
TO ESS1BC DA1 BUS

FUEL CELL 2 20A 3A V45V0200A FC 2 VOLTS 10A (2)
POWER DISTRIBUTION FC/MAIN BUS B ON OFF PNL R1A1 DS3 S11
POWER DISTRIBUTION ESS BUS SOURCE FC 2 ON PNL R1A1 S8
POWER DISTRIBUTION PAYLOAD CABIN MNA MNB PNL R1A1 S25
FROM S4 ESS1BC BUS SOURCE
POWER DISTRIBUTION ESS BUS SOURCE MNC/A ON PNL R1A1 S9
FROM BUS MNC R1A1
FROM BUS MNA R1A1
FROM BUS MNC MPC3
RPC 10A 7.5A
ESS 2CA AUDIO AUD CTR 1 3A PNL R14F CB1
ACCU 1 POWER CONSUMPTION 36.3W
ESS 2CA AUDIO RIGHT 3A PNL R14F CB6
PILOT ATU POWER CONSUMPTION MODE-SIGNAL -NO SIGNAL 11.8W 4.3W CABIN
V76V0230A ESS 2CA BUS VOLTS
V76V0200A MAIN BUS B VOLTS
V76C3076A FWD MNB AMPS
V76C3086A MID MNB AMPS
POWER DISTRIBUTION MN BUS TIE B ON OFF PNL R1A1 DS4
TO SV4e ESS1BC BUS SOURCE
PDIP PNL L12 POWER CONSUMPTION 100 MILLIAMPS
SSP J1
DC POWER 1 CABIN P/L ON OFF PNL L12 S1 TO DC POWER 1 J2
DC POWER 2 CABIN P/L ON OFF PNL L12 S2 TO DC POWER 2 J3
DIGITAL CAM RATE HI LOW PNL L12 S3 TO DIGITAL STILL CAMERA RELAYS
FLT SPECIFIC
RPC 15A
V763075A FWD MNA AMPS
V76V3071A FWD PCA 1 MNA VOLTS 35A 150A (3)
V76V3072A FWD PCA2 MNB VOLTS 35A 150A (3)
NSP COMSEC UNITS 1 AND 2 POWER CONSUMPTION MODE-OPERATE -STBY 25.0W 2.5W
TLM COMSEC 1 ZEROIZE
OPS RECORDER 1 POWER CONSUMPTION -REPRO -RCD -STBY 84.0W 56.0W 17.0W
P/L RECORDER 1 POWER CONSUMPTION -REPRO -RCD -STBY 84.0W 55.0W 17.0W
UPLINK BLOCK SW GPC BLOCK POSITION
PCMMU 2 POWER CONSUMPTION 55W
PCMMU 1 POWER CONSUMPTION 55W
AC CONTROL AC1 0A 0B 0C 3A PNL R1A1 CB1 CB2 CB3
AC1 GEN AND PWR DIST 3Φ
MAR 3Φ PNL MA73C4F CB59
J7/J31 SW ON OFF PNL ML85E S1
J31 PNL ML85E
TIPS 2 J2 0C 3A
TIPS 1 J2 0B 3A
POWER CONSUMPTION STBY 100W MODE 1 140W MODE 2 200W

DATE: 04/24/96 | NAME: BJB | VERSION: INK 4

W V U T S R Q P O N

8 7 6 5 4 3 2 1

POWER DISTRIBUTION — MN BUS TIE — A ON — ON/OFF — OFF A — DS2 — PNL R1A1 — S13

MN A — GCIL — 3A — PNL R14B CB44 — POWER CONSUMPTION 50.9W

MN A — TV RM LIGHT CONTR UNIT — 3A — PNL R14D CB37

MN A — UHF — 7.5A — PNL R14B CB13 — TO UHF EVA/ATC PA & SCVR

MN A — TV MON 1 — 3A — PNL R14D CB38 — COLOR TV MONITOR 1 — POWER CONSUMPTION 36.4

MN A — TV AFT BAY CAMR/PAN-TILT — 3A — PNL R14D CB34

C AFT BAY CAMERA — POWER CONSUMPTION 19.04W — PAN-TILT UNIT: MODE – STBY 0.19W, -1HTR 2.68W, -2HTR 5.17W — B&W LENS ASSEMBLY: MODE-STBY 0.20W, -1HTR 2.44W, -2HTR 4.48W, -3HTR 6.72W

MN A — TV AFT BAY CAMR HTR — 3A — PNL R14D CB35

C AFT BAY CAMR HEATER — POWER CONSUMPTION 19.9W

MN A — TV AFT BAY PAN-TILT HTR — 3A — PNL R14D CB36

D AFT BAY PTU HEATER — POWER CONSUMPTION 8.2W — COOLANT SOURCE: NOT ACTIVELY COOLED PLB — LOCATION TURN-ON TEMP: -10°C (14°F)

MN A — STBD RMS TV CAMR/PAN-TILT — 3A — PNL R14E CB51

D STBD RMS WR & ELB CAMERA — POWER CONSUMPTION 19.04W — ELBOW PAN-TILT UNIT: MODE – STBY 0.19W, -1HTR 2.68W, -2HTR 5.17W — B&W LENS ASSEMBLY: MODE-STBY 0.20W, -1HTR 2.44W, -2HTR 4.48W, -3HTR 6.72W

MN A — STBD RMS TV CAMR HTR — 3A — PNL R14E CB52

D STBD RMS TV CAMR HEATERS — POWER CONSUMPTION 19.9W

MN A — STBD RMS TV PAN-TILT HTR — 3A — PNL R14E CB53

D STBD RMS ELB PTU HEATER — POWER CONSUMPTION 8.2W

MN A — AUDIO MS/OS — 3A — PNL R14A CB2

MS ATU — POWER CONSUMPTION MODE-SIGNAL 11.8W, -NO SIGNAL 4.3W

OS SU — POWER CONSUMPTION MODE-SIGNAL 14.9W, -NO SIGNAL 5.0W

OS ATU — POWER CONSUMPTION MODE-SIGNAL 11.8W, -NO SIGNAL 4.3W

MN A — AUDIO AIRLOCK 1 BACKUP — 3A — PNL R14A CB3

AIRLOCK 1 BACKUP AUDIO — POWER CONSUMPTION MODE-SIGNAL 11.8W, -NO SIGNAL 4.3W

TV RCU/VSU — POWER CONSUMPTION RCU/VSU 46.2W — FROM CNTLBC1 BUS — MN B TV CONTR UNIT — 3A — PNL R14D CB42

POWER DISTRIBUTION — FC/MAIN BUS — A ON — OFF — DS1 — PNL R1A1 — S10 — FUEL CELL 1 — 20A — 3A — V45V0100A FC 1 VOLTS

POWER DISTRIBUTION — ESS BUS SOURCE — FC 1 — ON — OFF — PNL R1A1 — S7 — FC 1

POWER DISTRIBUTION — ESS BUS SOURCE — MN B/C — ON — OFF — PNL R1A1 — S4 — TO S25 CABIN PAYLOAD — FROM BUS MNB R1A1 — FROM BUS MNC R1A1 — 7.5A

FROM BUS MNB HPC2 — RPC 10A — MN B

FROM BUS MNC HPC3 — RPC 10A — MN C

ESS 1BC — AUDIO LEFT — 3A — PNL R14F CB5

CDR ATU — POWER CONSUMPTION MODE – SIGNAL 11.8W, -NO SIGNAL 4.3W

V_{ESS1BC} DA1 — 10A — V_{ESS1BC} 0136R14 (PNL R14)

V76V0130A ESS 1 BC BUS VOLTS

35A — V76V0100A MAIN BUS A VOLTS — V76C3085A MID MNA AMPS — 100A — V_{MNA} APC4 — V_{MNA} APC1 — 150A (2) — 150A — 5A — 150A (3)

V_{MNA} Q14 & AB — 17.1

AC CONTROL — AC1 — 0A — 0B — 0C — 3A — PNL R1A1 — CB1 — CB2 — CB3 — AC1 GEN AND PWR DIST 30

MAR 30 — 3A — PNL MA73C×F CB59

J7Y J31 SW — ON — OFF — S1 — PNL ML85E

J31 — J2 TIPS 2 — 0C — 3A — J2 TIPS 1 — 0B — 3A — POWER CONSUMPTION: STBY 100W, MODE 1 140W, MODE 2 200W

PAT BOX — 35A — 80A — 35A — V_{AFT} PLB

DC POWER — ON/OFF — ON — OFF — A6L — S1 — V_{MNB} DA2

ERPCL — 10A — TO HEATER CIRCUIT — 10A — TO HEATER CIRCUIT — FROM TALKBACK DRIVERS — TO PRIME PWR CIRCUIT — POWER CONSUMPTION AT LOW TEMPS 139W / 259W

V_{MNB} A14

MADS POWER MNB — MNB — 5A — PNL A7L — CB1

MASTER MADS POWER — ON — OFF — PNL C3A5 — S1

MADS — MADS CONTROL MODULE POWER CONSUMPTION 20.7W — MADS RECORDER CONSUMPTION 110W (59W STBY) — EOT/BOT — WB/PCM — PCM

MADS RECORDER POWER — PCM/WB ENA — ON — PNL A7L — S1

V_{MNB} FPCA2 — RPC 10A — TO RECORDER

V_{MNA} FLCA1 — V_{ESS1BC} FP&LC1 — RO — REV RCD CAPABILITY

MADS STRAIN GAGE — PCM ENA — ON — PNL A7L — S4 — +28V — PART OF MADS

V_{MNA} HPCA1 — RPC 15A

V_{MNB} HPCA2 — RPC 15A

MADS STRAIN EQUIPMENT — SGSC 6W EA, WBSC 0.6W EA, FDM 50W EA

MADS PCM — PWR CONS 68W

MN C — GCIL — 3A — PNL R14B CB49

150A (3) — 150A (2)

V_{MNB} R14

POWER DISTRIBUTION — FC/MAIN BUS — B ON — OFF — DS3 — PNL R1A1 — S11

FUEL CELL 2 — 20A — 3A — V45V0200A FC 2 VOLTS — 10A (2)

POWER DISTRIBUTION — ESS BUS SOURCE — FC 2 — ON — OFF — PNL R1A1 — S8 — FC 2

V_{ESS2CA} DA2 — 10A

POWER DISTRIBUTION — PAYLOAD CABIN — MNA — MNB — PNL R1A1 — S25 — FROM S4 ESS1BC BUS SOURCE

POWER DISTRIBUTION — ESS BUS SOURCE — MNC/A — ON — OFF — PNL R1A1 — S5 — FROM BUS MNC R1A1 — FROM BUS MNA R1A1 — FROM BUS MNC HPC3 — 7.5A

RPC 10A — MNC — RPC 10A — MNA

V_{ESS2CA} 0136R14 (PNL R14)

ESS 2CA — AUDIO AUD CTR — 3A — PNL R14F CB1 — ACCU 1 — POWER CONSUMPTION 36.3W

ESS 2CA — AUDIO RIGHT — 3A — PNL R14F CB6 — PILOT ATU — POWER CONSUMPTION MODE-SIGNAL 11.8W, -NO SIGNAL 4.3W — CABIN 11.8W, 4.3W

V76V0230A ESS 2CA BUS VOLTS

V_{MNA} HPC1 — RPC 15A — RPC 15A — V_{CABPL3}

SSP — J1 — FLT SPECIFIC

DC POWER 1 — CABIN P/L — ON — OFF — PNL L12 — S1 — TO DC POWER 1 J2

DC POWER 2 — CABIN P/L — ON — OFF — PNL L12 — S2 — TO DC POWER 2 J3

DIGITAL CAM — RATE — HI — LOW — PNL L12 — S3 — TO DIGITAL STILL CAMERA RELAYS

PDIP PNL L12 — POWER CONSUMPTION 100 MILLIAMPS

POWER DISTRIBUTION — MN BUS TIE — ON — OFF — OFF A — DS4 — PNL R1A1 — S14

TO SV4 ESS1BC BUS SOURCE — 5A

V_{MNB} R1A1 — 35A — V76V0200A MAIN BUS B VOLTS — 3A — V76C3076A FWD MNB AMPS — 150A (3)

V_{MNB} DA2 — 150A (2) 150A (2) — 5A

V_{MNA} FPC1 — 150A (3)

V76C3075A FWD MNA AMPS

V76V3071A FWD PCA 1 MNA VOLTS — 35A

NSP COMSEC UNITS 1 AND 2 — POWER CONSUMPTION MODE-OPERATE 25.0W, -STBY 2.5W — TLM COMSEC 1 ZEROIZE

OPS RECORDER 1 — POWER CONSUMPTION -REPRO 84.0W, -RCD 56.0W, -STBY 17.0W

P/L RECORDER — POWER CONSUMPTION -REPRO 84.0W, -RCD 55.0W, -STBY 17.0W

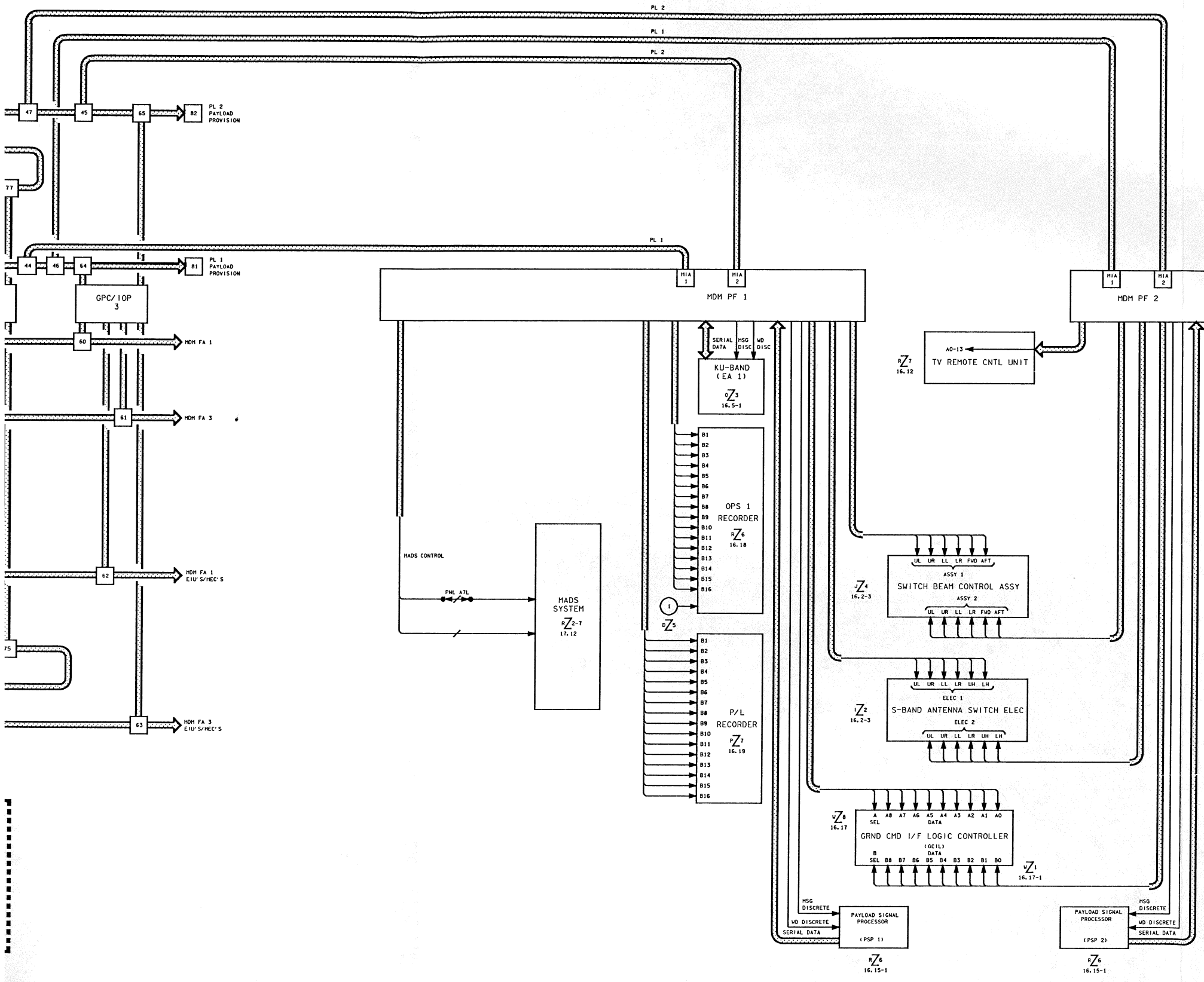
$V_{CNTLAB3}$ — $V_{CNTLAB2}$ — $V_{CNTLAB1}$ — $V_{CNTLCA2}$ — $V_{CNTLCA1}$

UPLINK BLOCK SW — GPC BLOCK POSITION

PCMMU 2 — POWER CONSUMPTION 55W

BASIC REV E-6

DATE: 10/13/90	NAME: JML	VERSION: INT 6
DATE: 01/30/96	NAME: VSH	VERSION: BPT 7
DATE: 02/28/96	NAME: BJB	VERSION: INT 7



2. MDM INPUT/OUTPUT CHANNELIZATION

OUTPUTS

MDM	CARD	CARD TYPE	CHANNEL	LRU
PF1	0	DOL	0	PL RECORDER
PF1	0	DOL	1	GEX SCM
PF1	2	DOH	1	FM 1 HEMI SELECTS S-BAND ANT SWITCH ELECTRONICS 1 SELECTS SWITCH BEAM CONTROL ASSEMBLY 1 SELECTS
PF1	7	DOH	1	MADS FDM, SEQUENCE 3 SELECTS
PF1	7	DOH	2	GCIL
PF1	8	SIO	1	PSP 1
PF1	8	SIO	2	KU-BAND
PF1	10	DOL	1	OPS RECORDER 1 (PRIMARY)
PF1	14	DOH	2	MADS RECORDER
PF2	2	DOH	1	FM 2 HEMI SELECTS S-BAND ANT SWITCH ELECTRONICS 2 SELECTS SWITCH BEAM CONTROL ASSEMBLY 2 SELECTS
PF2	7	DOH	1	CCTV CAMERA CONTROL SELECTS
PF2	7	DOH	2	GCIL
PF2	8	SIO	1	PSP 2
PF2	10	DOL	1	OPS RECORDER 2 (PRIMARY)
PF2	10	DOL	2	OPS RECORDERS 1 AND 2 (SECONDARY)

INPUTS

MDM	CARD	CARD TYPE	CHANNEL	LRU
PF1	8	SIO	1	PSP 1 STATUS DATA
PF1	8	SIO	2	KU-BAND STATUS DATA, DATA ACQ
PF2	8	SIO	1	PSP 2 STATUS DATA
FF1	9	DIH	1	NSP 1 POWER DISCRETE
FF1	11	SIO	3	NSP 1 STATUS WORD/RESPONSE WORD
FF3	3	SIO	3	KU-BAND STATUS DATA/RESPONSE WORD
FF3	11	SIO	3	NSP 2 STATUS WORD/RESPONSE WORD
FF3	12	DIH	1	NSP 2 POWER DISCRETE

1. REFER TO TABLE 16.1 FOR DRAWING TRACEABILITY

OBC NO	OBC ID	OBC LOCATION	LRU NAME	LRU ID	LRU LOCATION	DATA BUS
40	81V72A41A1	F AV BAY 1	FF 1	81V72A3	F AV BAY 1	FC 1
41	82V72A44A13	F AV BAY 2				FC 5
42	30V72A58A5	FLT DK	FF 3	83V72A5	F AV BAY 3	FC 3
43	30V72A58A6	FLT DK				FC 7
44	81V72A42A22	F AV BAY 1	PF 1	81V72A38	F AV BAY 1	PL 1
45	82V72A45A24	F AV BAY 2				PL 2
46	81V72A42A23	F AV BAY 1	PF 2	82V72A34	F AV BAY 2	PL 1
47	82V72A45A23	F AV BAY 2				PL 2
48	81V72A42A1	F AV BAY 1	IOP 1	81V72A16	F AV BAY 1	FC 1
49	81V72A42A28	F AV BAY 1				FC 3
50	82V72A45A26	F AV BAY 2				FC 5
51	82V72A45A6	F AV BAY 2				FC 7
52	81V72A42A10	F AV BAY 1				PL 1
53	82V72A45A20	F AV BAY 2				PL 2
54	81V72A42A2	F AV BAY 1	IOP 2	82V72A17	F AV BAY 2	FC 1
55	81V72A42A29	F AV BAY 1				FC 3
56	82V72A45A25	F AV BAY 2				FC 5
57	82V72A45A5	F AV BAY 2				FC 7
58	81V72A42A19	F AV BAY 1				PL 1
59	82V72A45A19	F AV BAY 2				PL 2
60	90V72A51A3D	ECLSS	IOP 3	83V72A18	F AV BAY 3A	FC 1
61	90V72A51A6	ECLSS				FC 3
62	90V72A51A3	ECLSS				FC 5
63	90V72A51A27	ECLSS				FC 7
64	90V72A51A11	ECLSS				PL 1
65	90V72A51A8	ECLSS				PL 2
66	81V72A42A3	F AV BAY 1	IOP 4	81V72A19	F AV BAY 1	FC 1
67	81V72A42A30	F AV BAY 1				FC 3
68	82V72A45A18	F AV BAY 2				FC 5
69	82V72A45A8	F AV BAY 2				FC 7
70	81V72A42A20	F AV BAY 1				PL 1
71	82V72A45A22	F AV BAY 2				PL 2
72	81V72A42A4	F AV BAY 1	IOP 5	82V72A20	F AV BAY 2	FC 1
73	81V72A42A31	F AV BAY 1				FC 3
74	82V72A45A27	F AV BAY 2				FC 5
75	82V72A45A7	F AV BAY 2				FC 7
76	81V72A42A21	F AV BAY 1				PL 1
77	82V72A45A21	F AV BAY 2				PL 2
78	81V72A40A3	F AV BAY 1	PDI	81V75A8	F AV BAY 1	PL 1
79	30V72A53A4	FLT DK	DDU 1	30V73A1	FLT DK	FC 3
80	30V72A53A3	FLT DK	DDU 2	30V73A2	FLT DK	FC 3
81	40V72A347	MID FUSE	P/L 1 PROV		MID FUSE	PL 1
82	40V72A348	MID FUSE	P/L 2 PROV		MID FUSE	PL 2

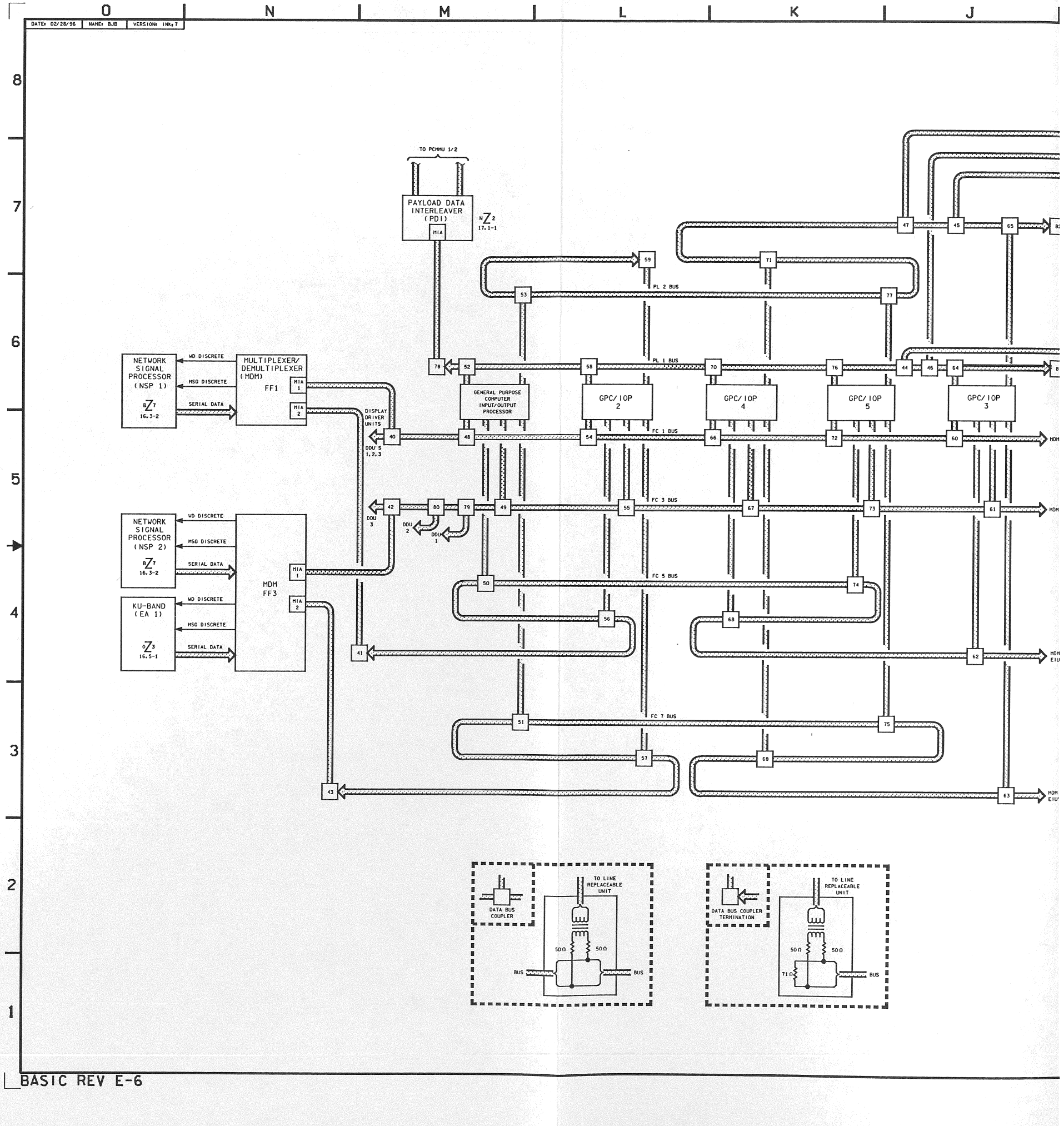
26 COMM MDM I/F

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	TERRI FORSYTHE	4/6/82	
DR			
ENGR	D. MILLER		COMM MDM I/F
ENGR		3/1/96	
APP		3/11/96	
APP		3/11/96	SPACE SHUTTLE
CADS		6-17-96	ALL
LTR	E	PCN 6	82.5 X 34

DWG NO 16.26

PAGE SHEET 1 OF 1

BASIC REV E-6


DATE: 02/28/96
NAME: BJB
VERSION: INR7
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2
1
TO PCMMU 1/2
PAYLOAD DATA INTERLEAVER (PDI)
MIA
NSP 2 17.1-1
PL 2 BUS
PL 1 BUS
NETWORK SIGNAL PROCESSOR (NSP 1)
NSP 1 16.3-2
WD DISCRETE
MSG DISCRETE
SERIAL DATA
MULTIPLEXER/ DEMULTIPLEXER (MDM) FF1
MIA 1
MIA 2
DISPLAY DRIVER UNITS
DDU S 1, 2, 3
GENERAL PURPOSE COMPUTER INPUT/OUTPUT PROCESSOR
GPC/IOP 2
GPC/IOP 4
GPC/IOP 5
GPC/IOP 3
FC 1 BUS
MDM FIU
NETWORK SIGNAL PROCESSOR (NSP 2)
NSP 2 16.3-2
DDU 3
DDU 2
DDU 1
FC 3 BUS
MDM FF3
KU-BAND (EA 1)
KU 16.5-1
FC 5 BUS
FC 7 BUS
DATA BUS COUPLER
TO LINE REPLACEABLE UNIT
50Ω
BUS
DATA BUS COUPLER TERMINATION
71Ω

BASIC REV E-6

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
16.1 (SHEET 1)	COMM OVERVIEW S-BAND						REFERENCE SSSHB SCHEMATIC TRACEABILITY LIST FOR THE FOLLOWING DRAWINGS: S-BAND PM TRANSPONDER, 16.2-1 S-BAND PM AMPLIFIER SYSTEM, 16.2-2 S-BAND PM/FM SWITCH BEAM ANTENNA SYSTEM,16.2-3 NETWORK SIGNAL PROCESSOR RETURN LINK, 16.3-1 NETWORK SIGNAL PROCESSOR FORWARD LINK, 16.3-2 NETWORK SIGNAL PROCESSOR COMSEC 1/2 , 16.3-3
16.1B (SHEET 2) 16.1C,D (SHEET 3)	COMM OVERVIEW AUDIO (102) COMM OVERVIEW AUDIO (103/104)						REFERENCE SSSHB SCHEMATIC TRACEABILITY LIST FOR THE FOLLOWING DRAWINGS: AUDIO PANEL/ATU PLT, CDR, 16.10-1 AUDIO PANEL/ATU MS, PS AND OS SMU, 16.10-2 AUDIO PANEL/ATU MIDDECK SMU & CCU, 16.10-3 AUDIO PANEL/ATU AIRLOCK, 16.10-4 AUDIO PANEL/ATU MIDDECK, 16.10-5 AUDIO PANEL/MIDDECK SMU, 16.10-6 AUDIO PANEL/ATU OS AND SMU, 16.10-7 AUDIO/ACCU, 16.11-1,2
16.1 (SHEET 4)	COMM OVERVIEW KU-BAND						REFERENCE SSSHB SCHEMATIC TRACEABILITY LIST FOR THE FOLLOWING DRAWINGS KU-BAND SYSTEM, 16.5-1,2:
16.1 (SHEET 5)	COMM OVERVIEW CCTV						REFERENCE SSSHB SCHEMATIC TRACEABILITY LIST FOR THE FOLLOWING DRAWINGS: TV CONTROL, 16.12 TV/CAMERA MONITOR, 16.13-1,2 TV/EMU, 16.13 TV/SECURE, 16.13-4
16.1 (SHEET 6)	PAYLOAD SYSTEM OVERVIEW						REFERENCE SSSHB SCHEMATIC TRACEABILITY LIST FOR THE FOLLOWING DRAWINGS: S-BAND PAYLOAD INTERROGATOR, 16.14 S-BAND PAYLOAD SIGNAL PROCESSOR, 16.15

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
16.1-1	ENGR R. E. LABRODE		16.1-5	ENGR D. BROWN	
	ENGR R. E. LaBrode Jr	11-5-90		ENGR D. Brown	
16.1B-2	ENGR S. A. COUNTS		16.1-6	ENGR F. J. MACFARLANE	
16.1C,D-3	ENGR Christopher Edwards	11/5/90		ENGR	5NOV90
	ENGR			APP	
16.1-4	ENGR F. J. MACFARLANE			APP	
	ENGR	5NOV90		OMNIPLAN	
	ENGR			LTR E PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE ALL

TBL NO 16-I

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
16.2 (SHEET 1)	S-BAND PM TRANSPONDER						ORBITER SCHEMATIC LIST
		R. I.	VS70-740129		E	9/18/84	SCHEMATIC DIAGRAM, C&T NETWORK S-BAND TRANSPONDER
		R. I.	VS70-240299		F	4/29/88	SCHEMATIC DIAGRAM, C&T GCIL
							LRU SCHEMATIC LIST
							TRIPLEXER ASSEMBLY TRANSPONDER PWR CONVERTER
		TRW	D292167				INPUT SWITCH
		TRW	D292029				SGLS BPF
		TRW	D292096				STDN/TDRS BPF
		TRW	D292197				OUTPUT SWITCH
		TRW	D292099				AGC NETWORK
		TRW	D292104				POST AGC BPF
		TRW	D292091				SECOND AND THIRD MIXER
		TRW	D292093				NONCOHERENT AGC
		TRW	D292087				POWER AMP AND SWITCH
		TRW	D292089				X6 AND X7 MULTIPLIER
		TRW	D292111		NC	1-19-77	INTERCONNECT DIAGRAM
		TRW	D292117				SSPI AND COHERENT AGC
		TRW	D292119				31 MHz BPF
		TRW	D292121				PHASE DETECTOR AND CAD
		TRW	D292123m				REFERENCE SOURCE
		TRW	D292107				WIDEBAND DETECTOR
		TRW	D292109				62 MHz BPF
		TRW	D292595				31 MHz AMPLIFIER
		TRW	D292126		B	12-19-77	COSTAS AND PHASELOCK
		TRW	D293658		NC	1-23-78	INTERCONNECT DIAGRAM - DUAL DUPLEXER
		TRW	D292003		B	11-21-77	INTERCONNECT DIAGRAM - S-BAND TRANSPONDER
		TRW	D292131		A	7-26-77	INTERCONNECT DIAGRAM - FREQ SOURCE
		TRW	D292139				300 MHz ANALOG CIRCUIT
		TRW	D292142				500 MHz ANALOG CIRCUIT
		TRW	D292145				REGULATOR AND SWITCH
		TRW	D292148				500 MHz DIGITAL CIRCUIT
		TRW	D292136				300 MHz DIGITAL ÷ 15/16 CIRCUIT
		TRW	D292635				300 MHz DIGITAL ÷ 14/15 CIRCUIT
		TRW	D292161		A	7-26-77	INTERCONNECT DIAGRAM SPREAD SPEC
		TRW	D292171				RF SECTION
		TRW	D292174				CODE ACQUISITION AND PN GENERATOR
		TRW	D292177				TRACKING AND ACQUISITION CHANNEL
		TRW	D292181		A	1-23-78	INTERCONNECT DIAGRAM
		TRW	D292199				INTERFACE AND LOGIC NO. 1
		TRW	D292202				INTERFACE AND LOGIC NO. 2
		TRW	D292188				CAD CHANNEL
		TRW	D292191				WIDEBAND CHANNEL
		TRW	D292071				X2 MULTIPLIER
		TRW	D292061		A	7-26-77	INTERCONNECT DIAGRAM, MODULATOR MULTIPLIER
		TRW	D292067				UHF BUFFER, LINEAR PHASE MOD, X4 MULTIPLIER
		TRW	D292069				AMPLIFIER, BUFFER, S-BAND
		TRW	D292076				RANGING TONE AMP AND AGC
		TRW	D292079				MODULATOR BASEBAND
		TRW	D292081		A	7-8-77	FIRST IF
		TRW	D292050				PREAMPLIFIER
		TRW	D292045				DRIVER
		TRW	D292047				POWER AMPLIFIER
		TRW	D292031				POWER AMPLIFIER
		TRW	D292059				TLS AMPLIFIER
		TRW	D292056				CONTROL/REGULATOR
16.2 (SHEET 2)	S-BAND PM AMPLIFIER SYSTEM						ORBITER SCHEMATIC LIST
		R. I.	VS70-740139		E	2/19/88	SCHEMATIC DIAGRAM, C&T POWER AMP SUBSYSTEM
		R. I.	VS70-740299		F	4/29/88	SCHEMATIC DIAGRAM, C&T GCIL
							LRU SCHEMATIC LIST
		WATKINS JOHNSON	701271		E	12-30-77	SCHEM DIAG, LOW VOLTAGE
		WATKINS JOHNSON	701252		F	11-30-77	SCHEM DIAG, S-BAND AMPLIFIER
		WATKINS JOHNSON	701287		E	8-1-84	SCHEM DIAG, HIGH VOLTAGE
		WATKINS JOHNSON	701255		C	11-17-77	WIRE LIST, EMI FILTER

DWG	SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
6.2-1,2	ENGR E. B. WALTERS			
	ENGR E. B. Walters		11/4/80	**VENDOR DRAWING REFERENCES**
	ENGR			
	ENGR			
	APP			
	APP			SPACE SHUTTLE / TBL NO 16-I
	OMNIPLAN			ALL
	LTR E	PCN		PAGE 16.I-2 / SHEET 2 OF 13

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
16.2 (SHEET 3)	S-BAND PM/FM SW BEAM ANT SYS						ORBITER SCHEMATIC LIST
		R. I	VS70-740259		H	5/6/88	SCHEMATIC DIAGRAM, S-BAND ANTENNA SWITCH SUBSYSTEM
		R. I.	VS70-740299		F	4/29/88	SCHEMATIC DIAGRAM, C&T GCIL
							LRU SCHEMATIC LIST
		TELEDYNE MICROWAVE	2701349		A	4/4/77	S-BAND SWITCH ASSY SCHEMATIC
		TELEDYNE MICROWAVE	2701349		NC	10/28/77	S-BAND SWITCH ASSY LOGIC CIRCUITRY TRUTH TABLE
		TELEDYNE MICROWAVE	2702502		NC	1/12/81	SCHEMATIC, SWITCH BEAM CNTL, MODEL 4292
16.3 (SHEET 1)	NETWORK SIGNAL PROCESSOR RETURN LINK	R. I.	VS70-740229		F	4/29/88	ORBITER SCHEMATIC LIST SCHEMATIC DIAGRAM, C&T NETWORK SIGNAL PROCESSOR
16.3 (SHEET 2)	NETWORK SIGNAL PROCESSOR FORWARD LINK	R. I.	VS70-740299		F	4/29/88	SCHEMATIC DIAGRAM, C&T GCIL LRU SCHEMATIC LIST NSP LRU
16.3 (SHEET 3)	NETWORK SIGNAL PROCESSOR COMSEC 1/2	TRW	29299	1-9	NC	9/18/88	RETURN LINK PROCESSOR
		TRW	292311	1-8	NC		RECORD MODE PROC.
		TRW	292301	1-10	NC		RETURN LINK PROC.
		TRW	292281	1-9	NC		CONVOLUTION A DEC.
		TRW	292341	1-6	NC		BIT SYNC ANALOG
		TRW	292351	1-8	NC		PHASE DET. (ETC.)
		TRW		1-8	NC		MODE CNTL & SUM. BITE
		TRW	292321	1-8	NC		FRM DET. & DELTA DEMOD
		TRW	292291	1-9	NC		FWD LINK PROC
		TRW					NSP INTERCONNECT DIAG
		MOTOROLA					COMSEC LRU ELWELL 11 PRELIMINARY DESIGN REVIEW, JANUARY 29-31, 1980

DWG	SIGNATURE		DATE
16.2-3	ENGR E. B. WALTERS		
	ENGR E. B. Walters		11/5/90
16.3-1,2,3	ENGR T. A. KALVELAGE		
	ENGR T. A. Kalvelage		11/5/90
	APP		
	APP		
	OMNIPLAN		
	LTR E	PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 16-I	
ALL		
	PAGE 16.I-3	SHEET 3 OF 13

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
16.4 (SHEET 1)	TAGS SYS HARDCOPIER	NAVAL AVIONICS CTR	AV14424	1		TBS	BOARD, LED LARGE 1A1A1A1
		NAVAL AVIONICS CTR	AV14426	1		TBS	BOARD, LED SMALL 1A1A1A2
		NAVAL AVIONICS CTR	AV14443	1-4	E	TBS	SLIP RING ASSEMBLY
		NAVAL AVIONICS CTR	AV14451	1-2		TBS	BULKHEAD, REAR INTERMEDIATE POWER COMPONENTS
		NAVAL AVIONICS CTR	AV14453	1-16	H	TBS	UPLINK TEXT AND GRAPHICS HARDCOPIER FINAL ASSEMBLY 1A1
		NAVAL AVIONICS CTR	AV14459	1		TBS	HEATER, FLEXIBLE, ETCHED FOIL WITH THERMOMETERS
		NAVAL AVIONICS CTR	AV14463	1-8	E	TBS	DRIVE ASSEMBLY, ELECTRO/MECHANICAL
		NAVAL AVIONICS CTR	AV14465	1-8	D	TBS	POWER SUPPLY, MODULAR, +28 VDC INPUT TO +1.2 kV OUTPUT
		NAVAL AVIONICS CTR	AV14469	1-9	B	TBS	POWER SUPPLY, MODULAR, +28 VDC INPUT TO +17.5 kV OUTPUT
		NAVAL AVIONICS CTR	AV14474	1-11		TBS	MICROCIRCUIT, DIGITAL, CMOS, HEX OPEN DRAIN N-CHANNEL BUFFER
		NAVAL AVIONICS CTR	AV14475	1-13		TBS	MICROCIRCUIT, DIGITAL, CMOS, 8 BIT INPUT/OUTPUT PORT
		NAVAL AVIONICS CTR	AV14476	1-15		TBS	MICROCIRCUIT, DIGITAL, 8192 BIT, SCHOTTKY, BIPOLAR, ROM
		NAVAL AVIONICS CTR	AV14477	1-11		TBS	MICROCIRCUIT, DIGITAL, QUAD 2-INPUT NAND GATE, CMOS
		NAVAL AVIONICS CTR	AV14478	1-24		TBS	MICROCIRCUIT, DIGITAL, COSMAC MICROPROCESSOR CPU
		NAVAL AVIONICS CTR	AV14479	1-12		TBS	MICROCIRCUIT, DIGITAL, TYPE D FLIP-FLOP, DUAL, CMOS
		NAVAL AVIONICS CTR	AV14480	1-12		TBS	MICROCIRCUIT, DIGITAL, BCD TO DECIMAL DECODER,
		NAVAL AVIONICS CTR	AV14481	1-12		TBS	MICROCIRCUIT, DIGITAL, QUAD D LATCH, MOS
		NAVAL AVIONICS CTR	AV14482	1-12		TBS	MICROCIRCUIT, DIGITAL, CMOS, STATIC RAM, 1024 x 4 BIT
		NAVAL AVIONICS CTR	AV14483	1-11		TBS	MICROCIRCUIT, DIGITAL, CMOS, QUAD 2-INPUT OR GATE
		NAVAL AVIONICS CTR	AV14484	1-11		TBS	MICROCIRCUIT, DIGITAL, CMOS, 3 STATE HEX NON-INVERT BUFFER
		NAVAL AVIONICS CTR	AV14485	1-11		TBS	MICROCIRCUIT, DIGITAL, 3 STATE HEX INVERT BUFFER
		NAVAL AVIONICS CTR	AV14486	1-12		TBS	MICROCIRCUIT, DIGITAL, 8-BIT, D-TYPE LATCH, 3-STATE OUTPUT
		NAVAL AVIONICS CTR	AV14487	1-13		TBS	MICROCIRCUIT, DIGITAL, TTL 8 TO 3 LINE PRIORITY ENCODER
		NAVAL AVIONICS CTR	AV14488	1-11		TBS	MICROCIRCUIT, DIGITAL, QUAD 2-INPUT POSITIVE-AND GATE, OC OUTPUT
		NAVAL AVIONICS CTR	AV14500	1-5	B	TBS	CIRCUIT CARD ASSEMBLY, SYNC GENERATOR 1A1A8A1
		NAVAL AVIONICS CTR	AV14502	1-4	A	TBS	CIRCUIT CARD ASSEMBLY, CPU 1A1A8A2
		NAVAL AVIONICS CTR	AV14504	1-4		TBS	CIRCUIT CARD ASSY, VIDEO PROCESSING INTERFACE 1A1A8A3
		NAVAL AVIONICS CTR	AV14506	1-3	E	TBS	CIRCUIT CARD ASSEMBLY, ANALOG VIDEO 1A1A8A4
		NAVAL AVIONICS CTR	AV14508	1-9	C	TBS	CIRCUIT CARD ASSEMBLY, MDM AND FRONT INT 1A1A8A5
		NAVAL AVIONICS CTR	AV14510	1-5	D	TBS	CIRCUIT CARD ASSEMBLY, CRT CONTROL 1A1A8A6
		NAVAL AVIONICS CTR	AV14512	1-4	D	TBS	CIRCUIT CARD ASSEMBLY, HEATER CONTROL
		NAVAL AVIONICS CTR	AV14514	1-3	F	TBS	CIRCUIT CARD ASSEMBLY, MOTOR CONTROL 1A1A8A8
		NAVAL AVIONICS CTR	AV14516	1-3	C	TBS	MOTHER BOARD ASSEMBLY 1A1A8
		NAVAL AVIONICS CTR	AV14525	1-12		TBS	MICROCIRCUIT, DIGITAL, 8-INPUT NAND GATE, CMOS
		NAVAL AVIONICS CTR	AV14527	1-12		TBS	MICROCIRCUIT, DIGITAL, 8-INPUT NOR GATE, CMOS
		NAVAL AVIONICS CTR	AV14528	1-7		TBS	MICROCIRCUIT, DIGITAL, DUAL MONOSTABLE MULTIVIBRATOR
		NAVAL AVIONICS CTR	AV14529	1-14		TBS	MICROCIRCUIT, DIGITAL, CMOS SEVEN STAGE BINARY RIPPLE COUNTER

DWG	SIGNATURE		DATE
16.4-1	ENGR	C.A. COUNTS	
	ENGR		11/5/90
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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
16.4 (SHEET 1) (CONT'D)	TAGS SYS HARDCOPIER	AV14530 AVIONICS CTR	1-11			TBS	MICROCIRCUIT, DIGITAL, CMOS HEX NON-INVERTING BUFFER
		NAVAL AVIONICS CTR	AV14531	1-11		TBS	MICROCIRCUIT, DIGITAL, HEX INVERTER, CMOS
		NAVAL AVIONICS CTR	AV14532	1-13		TBS	MICROCIRCUIT, DIGITAL, SHIFT REGISTER, 4-BIT, BIDIRECTIONAL
		NAVAL AVIONICS CTR	AV14533	1-13		TBS	MICROCIRCUIT, DIGITAL, 4-BIT BINARY COUNTER W/SYNCHRONOUS CLOCK
		NAVAL AVIONICS CTR	AV14535	1-11		TBS	MICROCIRCUIT, DIGITAL, CMOS DUAL 4-INPUT NOR GATE
		NAVAL AVIONICS CTR	AV14538	1-12		TBS	MICROCIRCUIT, DIGITAL, 8-CHANNEL DATA SELECTOR, 3-STATE OUTPUT
		NAVAL AVIONICS CTR	AV14539	1-12		TBS	MICROCIRCUIT, DIGITAL, DUAL 4-BIT STATIC SHIFT REGISTER, CMOS
		NAVAL AVIONICS CTR	AV14540	1-12		TBS	MICROCIRCUIT, DIGITAL, CMOS HEX INVERTING BUFFER
		NAVAL AVIONICS CTR	AV14541	1-3	C	TBS	SWITCH, THERMOSTATIC
		NAVAL AVIONICS CTR	AV14543	1	A	TBS	BOARD, LED LARGE ASSY 1A1A1A1
		NAVAL AVIONICS CTR	AV14544	1		TBS	BOARD, LED SMALL ASSY 1A1A1A2
		NAVAL AVIONICS CTR	AV14550	1-18		TBS	MICROCIRCUIT, DIGITAL, PHASE-LOCKED LOOP, MICROPOWER, CMOS
		NAVAL AVIONICS CTR	AV14551	1-11		TBS	MICROCIRCUIT, LINEAR, QUAD OPERATIONAL AMPLIFIER, HIGH PERFORMANCE
		NAVAL AVIONICS CTR	AV14552	1-11		TBS	MICROCIRCUIT, LINEAR, OPERATIONAL AMPLIFIER, HIGH VOLTAGE
		NAVAL AVIONICS CTR	AV14553	1-12		TBS	MICROCIRCUIT, DIGITAL, BINARY TO 1 OF 4 DECODER/DEMUX, DUAL
		NAVAL AVIONICS CTR	AV14554	1-12		TBS	MICROCIRCUIT, DIGITAL, HEX SCHMITT TRIGGER, CMOS
		NAVAL AVIONICS CTR	AV14555	1-12		TBS	MICROCIRCUIT, DIGITAL, 8-BIT ADDRESSABLE LATCH, CMOS
		NAVAL AVIONICS CTR	AV14556	1-13		TBS	MICROCIRCUIT, LINEAR, TRANSISTOR ARRAY, NPN, SILICON, QUAD
		NAVAL AVIONICS CTR	AV14559	1-13		TBS	MICROCIRCUIT, LINEAR, 8-BIT MULTIPLYING D/A CONVERTER
		NAVAL AVIONICS CTR	AV14560	1-12		TBS	MICROCIRCUIT, DIGITAL, CMOS, DUAL 4-CHANNEL ANALOG MULTIPLEXER
		NAVAL AVIONICS CTR	AV14562	1-12	A	TBS	MICROCIRCUIT, DIGITAL, ANALOG SWITCH, QUAD, SPST, CMOS
		NAVAL AVIONICS CTR	AV14563	1-14		TBS	MICROCIRCUIT, LINEAR, CONTROL, SWITCH MODE REGULATOR
		NAVAL AVIONICS CTR	AV14564	1-12		TBS	MICROCIRCUIT, LINEAR, CURRENT AMPLIFIER, THICK FILM HYBRID
		NAVAL AVIONICS CTR	AV14565	1-13	A	TBS	MICROCIRCUIT, DIGITAL, CMOS HEX SCHMITT TRIGGER
		NAVAL AVIONICS CTR	AV14567	1-14		TBS	MICROCIRCUIT, DIGITAL, CMOS QUAD R/S LATCH W/3-STATE OUTPUTS
		NAVAL AVIONICS CTR	AV14569	1-3	D	TBS	CIRCUIT CARD ASSEMBLY, POWER SUPPLY 1A1A7A1
		NAVAL AVIONICS CTR	AV14572	1-3	B	TBS	CIRCUIT CARD ASSEMBLY, POWER REGULATOR 1A1A7A2
		NAVAL AVIONICS CTR	AV14573	1-6	B	TBS	ELECTRICAL SCHEMATIC INTERCONNECTION & WIRING DIAGRAM
		NAVAL AVIONICS CTR	AV14579	1-12		TBS	MICROCIRCUIT, LINEAR, DUAL CHANNEL OPTOCOUPLER
		NAVAL AVIONICS CTR	AV14580	1-11		TBS	MICROCIRCUIT, LINEAR, HERMETICALLY SEALED, 4-CHANNEL, OPTOCOUPLER
		NAVAL AVIONICS CTR	AV14582	1-11		TBS	MICROCIRCUIT, LINEAR, OPERATIONAL, AMPLIFIER, THICK FILM HYBRID
		NAVAL AVIONICS CTR	AV14583	1-20		TBS	MICROCIRCUIT, LINEAR, SWITCHMODE REGULATOR CONTROL
		NAVAL AVIONICS CTR	AV14584	1-11		TBS	MICROCIRCUIT, LINEAR, PRECISION VOLTAGE REFERENCE, +5 VDC
		NAVAL AVIONICS CTR	AV14592	1-11		TBS	MICROCIRCUIT, LINEAR, POSITIVE VOLTAGE REGULATOR, ADJUSTABLE
		NAVAL AVIONICS CTR	AV14593	1-11		TBS	MICROCIRCUIT, LINEAR, NEGATIVE VOLTAGE REGULATOR, ADJUSTABLE
		NAVAL AVIONICS CTR	AV14620	1-4	B	TBS	ASSEMBLY, POWER SUPPLY :A1A7

DWG	SIGNATURE		DATE
16.4-1	ENGR C.A. COUNTS		
	ENGR		11/5/90
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	PAGE 16.I-5	SHEET 5 OF 13

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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
16.4 (SHEET 1) (CONC'D)	TAGS SYS HARDCOPIER	AV14633 AVIONICS CTR	1-11			TBS	MICROCIRCUIT, DIGITAL, HMOS, STATIC RAM, 1024 x 4 BIT
		NAVAL AVIONICS CTR	AV14660	1-12		TBS	MICROCIRCUIT, TRANSISTOR ARRAY, DARLINGTON, 7-CHANNEL
		NAVAL AVIONICS CTR	AV14661	1-11		TBS	MICROCIRCUIT, INTERFACE, 8-CHANNEL DRIVER
		NAVAL AVIONICS CTR	AV14669	1	B	TBS	CIRCUIT CARD ASSEMBLY, TRANSFORMER MOUNT
		NAVAL AVIONICS CTR	AV14680	1-4		TBS	CIRCUIT CARD ASSY, VIDEO PROCESSING INTERFACE 1A1A8A11
		NAVAL AVIONICS CTR	AV14696	1-4		TBS	CIRCUIT CARD ASSEMBLY, CPU 1A1A8A2
		NAVAL AVIONICS CTR	AV14698	1-3	B	TBS	FILTER ASSEMBLY, UPLINK GRAPHIC HARDCOPIER 1A1A9
		NAVAL AVIONICS CTR	AV14732	1		TBS	CAPSTAN/DEVELOPER MOTOR ASSY
		NAVAL AVIONICS CTR	AV14733	1-2	A	TBS	CRT ASSY
		NAVAL AVIONICS CTR	AV14740	1-2		TBS	PROGRAM MEMORY SPECIFICATION, U27
		NAVAL AVIONICS CTR	AV14741	1-2		TBS	PROGRAM MEMORY SPECIFICATION, U28
		NAVAL AVIONICS CTR	AV14742	1-2		TBS	PROGRAM MEMORY SPECIFICATION, U29
		NAVAL AVIONICS CTR	AV14743	1-2		TBS	PROGRAM MEMORY SPECIFICATION, U30
		NAVAL AVIONICS CTR	AV14744	1-2		TBS	PROGRAM MEMORY SPECIFICATION, U1
		NAVAL AVIONICS CTR	AV14745	1-2		TBS	PROGRAM MEMORY SPECIFICATION, U2
		NAVAL AVIONICS CTR	AV14746	1-2		TBS	PROGRAM MEMORY SPECIFICATION, U3
		NAVAL AVIONICS CTR	AV14747	1	A	TBS	PROGRAM MEMORY SPECIFICATION, MOTOR CONTROL, U11-U12
		NAVAL AVIONICS CTR	AV14776	1-3		TBS	CIRCUIT CARD ASSEMBLY, MOTOR CONTROL, 1A1A8A8
		NAVAL AVIONICS CTR	AV14778	1-3	A	TBS	CIRCUIT CARD ASSEMBLY, ANALOG VIDEO 1A1A8A4
16.4 (SHEET 2)	SECURE TAGS/TV I/F	R. I.-DOWNEY	VS70-740199	1-2	D	3/11/88	SCHEMATIC DIAGRAM TEXT AND GRAPHICS SUBSYSTEM
		R.I.-ANAHEIM DEFENSE ELECTRONICS OPERATIONS	25851-514	1		11/5/85	SCHEMATIC-ENCRYPTION BYPASS ISOLATION ASSY

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
16.4-1	ENGR CHRISTOPHER A. COUNTS			ENGR	
	ENGR Christopher A Counts	11/13/90		ENGR	
16.4-2	ENGR CHRISTOPHER A. COUNTS			ENGR	
	ENGR Christopher A Counts	11/13/90		ENGR	
	ENGR			APP Joe Tuttle	11/21/90
	ENGR			APP Richard W Bohn	11-21-90
	ENGR			OMNIPLAN	
				LTR E PCN	

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SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
16.5 (SHEETS 1 & 2)	KU-BAND SYSTEM	R. I.	VS70-740102		J	2/16/88	ORBITER SCHEMATIC LIST SCHEMATIC, KU-BAND COMM (OV102)
		R. I.	VS70-740109		E	2/15/88	SCHEMATIC, KU-BAND COMM (OV103/4)
		R. I.	VS70-590119		B	11/18/85	SCHEMATIC, KU-BAND ANTENNA DEPLOYMENT MMCA 2 & 4
		R. I.	VS70-740299		F	4/29/88	SCHEMATIC, C&T GCIL
		R. I.	VS70-764359		C	11/03/87	SCHEMATIC, MID POWER CONTROL ASSY-2
		R. I.	VS70-763362		K	10/29/88	SCHEMATIC, FWD POWER CONTROL ASSY-3
							LRU SCHEMATIC LIST
		HUGHES	3526150-410				SIGNAL PROCESSOR ASSEMBLY
		HUGHES	3582632				SIGNAL PROC. ASSY I/F DIAGRAM
		HUGHES	3582651				LVPS (SPA) SCHEMATIC
		HUGHES	3555411				LINEAR REG/LOGIC SCHEMATIC
		HUGHES	3555441				CONVOLUTIONAL ENCODER SCHEMATIC
		HUGHES	3555431				MGT./HANDOVER SCHEMATIC
		HUGHES	3555080				FM SWITCH/GENERATOR SCHEMATIC
		HUGHES	3555461				FM MODULE INTERCONNECT
		HUGHES	3555451				QPSK MODULATOR INTERCONNECT
		HUGHES	3555561				BIT SYNC SCHEMATIC
		HUGHES	3555571				BIT SYNC SCHEMATIC
							BIT/FRAME/DECOMM SCHEMATIC
		HUGHES	3555131				ELECTRONIC ASSEMBLY NO. 1
		HUGHES	3555141				SERVO LOOP SHAPING SCHEMATIC
		HUGHES	3555151				RATE INTEGRATING GYRO SCHEMATIC
		HUGHES	3555161				MOTOR DRIVER SCHEMATIC
		HUGHES	3555171				MDM INTERFACE SCHEMATIC
		HUGHES	3555181				PN DESPREADER (BD #2) SCHEMATIC
		HUGHES	3555191				PN DESPREADER (BD #1) SCHEMATIC
		HUGHES	3555201				PSK DEMODULATOR (BD #1) SCHEMATIC
		HUGHES	3555231				PSK DEMODULATOR (BD #2) SCHEMATIC
		HUGHES	3582672				GYRO HTR/LOOP ELECTRONICS
		HUGHES	3582685				LVPS SCHEMATIC
		HUGHES	3680761				LINEAR REG/LOGIC SCHEMATIC
		HUGHES	3680750				I/O PROCESSOR (BD #1) SCHEMATIC
		HUGHES	3680755				I/O PROCESSOR (BD #2) SCHEMATIC
		HUGHES	3707579				MICROCOMPUTER (BD #2) SCHEMATIC
		HUGHES	3680767				MICROCOMPUTER (BD #1) SCHEMATIC
		HUGHES	3680799				MDM INTERFACE (BD #2) SCHEMATIC
		HUGHES	3526101-410				MDM INTERFACE (BD #1) SCHEMATIC
							EA-1 BLOCK DIAGRAM
		HUGHES	3526140-210				ELECTRONIC ASSEMBLY NO. 2
		HUGHES	3555692				EA-2 SCHEMATIC
		HUGHES	3582615				LVPS (EA-2) SCHEMATIC
		HUGHES	3555615				LINEAR REG/LOGIC SCHEMATIC
		HUGHES	3555625				ANALOG PROC. SCHEMATIC
		HUGHES	3555635				PREPROCESSOR SCHEMATIC
		HUGHES	3555645				MASTER TIMING/CONTROL SCHEMATIC
		HUGHES	3555655				FILTER PROC. SCHEMATIC
		HUGHES	3555665				PDI & SEQUENCE DATA SCHEMATIC
		HUGHES	3555675				DETECTION/AGC SCHEMATIC
		HUGHES	3555685				RANGE/VELOCITY SCHEMATIC
							ANGLE/SERIAL DATA SCHEMATIC
		HUGHES	3526180-310				DEPLOYED ASSEMBLY
		HUGHES	3561952				DEA SCHEMATIC
		HUGHES	3561962				LVPS SCHEMATIC
		HUGHES	3555811				LINEAR REG/LOGIC SCHEMATIC
		HUGHES	3555821				STANDBY CONTROL LOGIC SCHEMATIC
		HUGHES	3555831				PULSE WIDTH MODULATOR SCHEMATIC
		HUGHES	3555841				RF ENABLE LOGIC SCHEMATIC
		HUGHES	3555851				MICROWAVE LOGIC SCHEMATIC
		HUGHES	3555861				PWM REG SCHEMATIC
		HUGHES	3555871				FILAMENT REG/CONVERTER SCHEMATIC
		HUGHES	3555881				D.C. MOTOR DRIVE SCHEMATIC
		HUGHES	3555891				TRANSMITTER PWR/REG SCHEMATIC
		HUGHES	3561801				HIGH VOLTAGE RECT/REG SCHEMATIC
		HUGHES	3561811				EXCITER SCHEMATIC
		HUGHES	3561826				HARMONIC PHASE COMPARATOR SCHEMATIC
		HUGHES	3561831				SELF TEST LOGIC I/F SCHEMATIC
		HUGHES	3561841				BUFF/DIV/27dB AMPL SCHEMATIC
		HUGHES	3561851				FREQ SYNTHESIZER SCHEMATIC
		HUGHES	3561891				FET LIMITING AMPL SCHEMATIC
		HUGHES	3561868				GUNN VLT. REG. SCHEMATIC
							RCVR BLANKING LOGIC SCHEMATIC

DWG	SIGNATURE	DATE
16.5-1, 2	ENGR MARTIN T. O'HARE	
	ENGR	11/21/90
	ENGR	
	ENGR	
	APP	11/21/90
	APP	11-21-90
	LTR E PCN	

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
16.5 (SHEETS 1 & 2)		HUGHES	3599951				ECL LOGIC I/F SCHEMATIC
		HUGHES	3599961				ML LOGIC I/F SCHEMATIC
		HUGHES	3555901				MICROWAVE ASSY SCHEMATIC
		HUGHES	3574801				RECEIVER SCHEMATIC
		HUGHES	3574811				IF AMPL (COMM) SCHEMATIC
		HUGHES	3574821				IF AMPL (RADAR) SCHEMATIC
		HUGHES	3574831				2ND IF AMPL (RADAR) SCHEMATIC
		HUGHES	3574841				BUFFER AMPL (RADAR) SCHEMATIC
		HUGHES	3574851				RECEIVE TRK LOGIC SCHEMATIC
		HUGHES	3555802				TRANSMITTER INTERCONNECTION
		HUGHES	3561589				DMA WIRING DIAGRAM
		HUGHES	3561601				DA WIRING DIAGRAM
		HUGHES	3555788				DEA BLOCK DIAGRAM
16.7B	ORBITER EXPERIMENTS SUPPORT SYSTEM FOR OEX	JSC				9/82	SSO ICD LEVEL III (OEX SCM MODULE INTERFACES)
		LEMSCO			PRELIM	6/87	PRELIMINARY SCM INTERFACE DRAWINGS
16.8	S-BAND FM SYSTEM						ORBITER SCHEMATIC LIST
		R. I.	VS70-740262		D	9/13/84	SCHEMATIC, S-BAND FM SIGNAL PROCESSOR (OV102)
		R. I.	VS70-740269		B	9/13/84	SCHEMATIC, S-BAND FM SIGNAL PROCESSOR (OV103 & SUBS)
		R. I.	VS70-740272		D	9/13/84	SCHEMATIC, S-BAND FM TRANSMITTER (OV102)
		R. I.	VS70-740279		D	11/13/84	SCHEMATIC, S-BAND FM TRANSMITTER (OV103 & SUBS)
							LRU SCHEMATIC LIST
		TELEDYNE	SK2008736				FM TRANSMITTER
		TELEDYNE	SK2008748				MODULATOR/EXCITER
		TELEDYNE	SK2008750				POWER SUPPLY
		TELEDYNE	SK2008763				TLM PROCESSOR
		TELEDYNE	SK2008925				RF POWER AMPLIFIER
							INTERCONNECTION DIAGRAM
		CONRAC	7905345				FM SIGNAL PROCESSOR
		CONRAC	7905348				POWER SUPPLY
		CONRAC	7905351				LOGIC TV, ANLG & ME OUTPUT
		CONRAC	7905354				MAIN ENGINE PROCESSING
		CONRAC	7905360				INTERCONNECTION DIAGRAM
							DIGITAL DATA PROCESSING
16.9 (SHEETS 1 & 2)	UHF TRANSCEIVER/ EVC TRANSCEIVER						ORBITER SCHEMATIC LIST
		R. I.	VS70-740119		A	12/18/81	SCHEMATIC DIAGRAM, UHF EVA/ATC TRANSCEIVER
		R. I.	WS330-102-74-5				WIRNG DIAGRAM UHF EVA/ATC TRANSCEIVER
		R. I.	VS70-740112		E	11/18/82	SCHEMATIC DIAGRAM - COMM & TRACK UHF EVA/ATC TRANSCEIVER
		R. I.	VS70-760802		K	4/5/82	SCHEMATIC DIAGRAM - PAYLOAD SUBSYSTEM INTERFACE
							LRU SCHEMATIC LIST
		RCA	ICD-3-0061-03		A		UHF CDR NO. 552-1021 SHUTLE ORBITER EVA ATC TRANSCEIVER

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
16.5-1, 2	ENGR MARTIN T. O'HARE		16.8	ENGR MARTIN T. O'HARE	
	ENGR	11/21/92		ENGR	11/21/92
	ENGR		16.9-1,2	ENGR D. R. BROWN	
	ENGR			ENGR	
16.7B	ENGR S. M. KAKADELIS			APP	11/21/92
	ENGR	11-21-92		APP	11-21-90
	ENGR				
	ENGR			LTR E PCN 3	

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SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
16.10	AUDIO PANEL						ORBITER SCHEMATIC LIST
(SHEETS 1 - 7)		R. I.	VS70-740242		H	11/14/86	SCHEMATIC, AUDIO C&T SUBSYSTEM (OV102)
		R. I.	VS70-740249		D		SCHEMATIC, AUDIO C&T SUBYSTEM (OV103/104)
							LRU SCHEMATIC LIST
							AUDIO CENTRAL CONTROL UNIT
		TELEPHONICS	480G101-2				SCHEMATIC, 20 VDC REGULATOR & CLOCK
		TELEPHONICS	480G106-3				SCHEMATIC, STATION AUDIO
		TELEPHONICS	480G111-2				SCHEMATIC, STATION CONTROL PWR & AUDIO INPU
		TELEPHONICS	480G116-4				SCHEMATIC, DR OR AP OR (LU,PBS,IRAM,IRFM)
		TELEPHONICS	480G121-3				SCHEMATIC, NSP & OIC
16.11	AUDIO/ACCV	TELEPHONICS	480G126-2				SCHEMATIC, C&W, EIC, PAGE & NAV
(SHEETS 1 & 2)		TELEPHONICS	480G131-2				SCHEMATIC, CONFIGURATION & A/A
		TELEPHONICS	480G136-3				SCHEMATIC, EVA,AG1,AG2,RELAYS & EXP RCDR
		TELEPHONICS	480G141-2				SCHEMATIC, MAIN POWER REGULATOR & KEYLINE
		TELEPHONICS	480G146-2				SCHEMATIC, AMPLIFIER & RECTIFIER (A33 & A34)
							AUDIO TERMINAL UNIT
		TELEPHONICS	480D221-2				SCHEMATIC, PWR STAGES, PWR SUPPLY & EARPHONE DRIVER
		TELEPHONICS	480H226-2				SCHEMATIC, DIGITAL "B"
		TELEPHONICS	480G231-2				SCHEMATIC, DIGITAL "A"
		TELEPHONICS	480G236-4				SCHEMATIC, ANALOG MIC & DIGITAL "C"
		TELEPHONICS	480D241-4				SCHEMATIC, PWR SUPPLY & EARPHONE DRIVER
							SPEAKER/MICROPHONE UNIT
		TELEPHONICS	480D325-1				CKT CARD ASSY, SPEAKER DRVR AND PWR SUPPLY
		TELEPHONICS	480D330-2				CKT CARD ASSY, LOGIC & I/O INTERFACE
		TELEPHONICS	480D335-1				CKT CARD ASSY, MIC CKT AMP
							MULTIPLE HEADSET ADAPATER
		TELEPHONICS	480C1211-3				SCHEMATIC
16.12	TV CONTROL						ORBITER SCHEMATIC LIST
		R. I.	VS70-740189		F	5/24/88	SCHEMATIC, TV COMM & TRACKING SUBSYSTEM
							LRU SCHEMATIC LIST
		RCA	2297157		A		RCU A8
		RCA	2297160		A		RCU A11
		RCA	2297161		A		RCU A5
		RCA	2297195		A		RCU SCHEMATIC
		RCA	2297250		C		RCU A1
		RCA	2297252		D		RCU A2
		RCA	2297254		F		RCU SCHEMATIC
		RCA	2297256		B		RCU A4
		RCA	2297261		B		RCU A7
		RCA	2297402		J		VSU SCHEMATIC
		RCA	2297404		C		VSU A2
		RCA	2297427		L		VSU A3
		RCA	2297430		B		VSU A4/A5
		RCA	2297432		C		VSU A6/A7
		RCA	2297434		C		VSU A9
		RCA	2297159		-		RCU A10
		RCA	2297263		C		RCU A12
16.13	TV/CAMERA MONITOR						ORBITER SCHEMATIC LIST
(SHEETS 1 - 3)		R. I.	VS70-740189		F	5/24/88	SCHEMATIC, TV COMM & TRACKING SUBSYSTEM
		R. I.	K200-793010		NC	10/17/80	EMU TV KIT
		R. I.	K200-893010		NC	10/17/80	EMU TV KIT
		R. I.	ICD-3-0050-01			2/19/80	SHUTTLE ORBITER CCTV SYSTEM (PART 1)
		R. I.	ICD-3-0050-01			2/19/80	SHUTTLE ORBITER CCTV SYSTEM (PART 2)
							LRU SCHEMATIC LIST
		R. I.	MCR 7475 2293179		2	7/21/82	ADDITION OF EMU-TV CABLE
		RCA	2293180				
		RCA	2293292		B		
		RCA	2294841		A		
		RCA	2295434		A		
		RCA	2306439		B		

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
6.10, 1-7	ENGR M. W. SMITH		6.12	ENGR R. MOOLCHAN	
	ENGR M. Williams Smith	11/13/90		ENGR R. Moolchan	11/21/90
6.11-1, 2	ENGR M. W. SMITH		6.13, 1-3	ENGR R. MOOLCHAN	
	ENGR M. Williams Smith	11/13/90		ENGR R. Moolchan	11/21/90
	ENGR			APP	11/21/90
	ENGR			APP	11-21-90
	ENGR			OMNIPLAN	
				LTR E PCN	

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FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
16.13 (SHEET 4)	TV/SECURE						ORBITER SCHEMATIC LIST
		RCA				9/10/85	SECURE TELEVISION SYSTEM (STV) CRITICAL DESIGN REVIEW DATA PACKAGE
		RCA	2623127	1-6		2/2/85	SCHEMATIC ADU A1 SIGNAL PROCESSOR
		RCA	2623147	1-21		2/12/85	LOGIC DIAGRAM ADU A2 WRITE CONTROLLER
		RCA	2623143	1-14		4/2/85	LOGIC DIAGRAM ADU A3 BOARD READ CONTROLLER AND OUTPUT MUX
							LRU SCHEMATIC LIST
		R.I.	V738-740002	1-3	B	4/15/88	SCHEMATIC DIAGRAM- CCTV AIRBORNE DIGITIZER UNIT SUBSYSTEM
		R.I.	NAS9-14000 IRD-TM453C WBS 5.9.68	1-73		5/30/85	SECURED CCTV SYSTEM (STVS) INTEGRATION HARDWARE PDR DATAPACK
16.14	S-BAND PAYLOAD INTERROGATOR						ORBITER SCHEMATIC LIST
		R.I.	VS70-740239	1-4	D	5/10/88	SCHEMATIC DIAGRAM, C&T PAYLOAD INTERROGATOR
		R.I.	VS70-740299		F	4/29/88	SCHEMATIC DIAGRAM, C&T GCIL
							LRU SCHEMATIC LIST
		TRW	700651		A	3/11/82	INTERCONNECT DRAWING, POWER AMP
		TRW	700673		A	2/24/81	SCHEMATIC DIAGRAM, DETECTOR, DOD (A10)
		TRW	700677		B	9/22/81	SCHEMATIC DIAGRAM, FINAL AMP A&B (DOD)
		TRW	700681		B	9/22/81	SCHEMATIC DIAGRAM, FINAL AMP A&B (NASA)
		TRW	700688		A	2/24/81	SCHEMATIC DIAGRAM, DETECTOR NASA (A9)
		TRW	700691		B	10/12/81	SCHEMATIC DIAGRAM, WIDEBAND PREAMP & SWITCH PWR AMP MODULE
		TRW	700694		A	8/12/80	SCHEMATIC DRAWING, TLM & SWITCH DRIVER
		TRW	700711		A	10/8/81	SCHEMATIC DIAGRAM, FIRST LO DRIVER
		TRW	700719		A	12/11/81	SCHEMATIC DIAGRAM, 1ST BAND PASS FILTER
		TRW	700723		A	1/14/81	SCHEMATIC DIAGRAM, RCVR AGC NETWORK
		TRW	700727		A	12/3/81	SCHEMATIC DIAGRAM, 2ND BAND PASS FILTER
		TRW	700731		A	3/13/80	SCHEMATIC DIAGRAM, SECOND MIXER
		TRW	700735		A	5/13/81	SCHEMATIC DIAGRAM, AGC AMPLIFIER
		TRW	700739		B	1/14/81	SCHEMATIC DIAGRAM, IF AMP
		TRW	700743		A	4/25/80	SCHEMATIC DIAGRAM, 184 MHz BPF
		TRW	700747		A	12/1/80	SCHEMATIC DIAGRAM, X5, X2 MULTIPLIER
		TRW	700751		C	4/6/82	INTERCONNECT DIAGRAM, 2ND IF
		TRW	700761		B	8/31/81	SCHEMATIC DIAGRAM, VCX0 2ND IF MODULE
		TRW	700765		B	3/11/81	SCHEMATIC DIAGRAM, PHASE DETECTOR AND COHERENT AMPLITUDE DETECTOR
		TRW	700769		A	6/10/80	SCHEMATIC DIAGRAM, REFERENCE SOURCE
		TRW	700773		A	5/16/80	SCHEMATIC DIAGRAM, RCVR W/B DETECTOR
		TRW	700781		C	2/4/81	SCHEMATIC DIAGRAM, PHASELOCK & TLM
		TRW	700793		C	9/16/81	SCHEMATIC DIAGRAM, AGC/TLM
		TRW	700815		B	10/5/81	SCHEMATIC DIAGRAM, X3/X5 MULTIPLIER BOARD FREQ SOURCE MODULE
		TRW	700843		A	8/28/80	SCHEMATIC DIAGRAM, GAIN NORMALIZER & FILTER RCVR SYNTHESIZER MODULE
		TRW	700851		A	8/4/81	INTERCONNECT DIAGRAM, RCVR SYNTHESIZER
		TRW	700861		A	11/21/80	SCHEMATIC DIAGRAM, RX SYNTHESIZER BOARD
		TRW	700865		B	1/6/81	SCHEMATIC DIAGRAM, REF X2 & PWR DIVIDER
		TRW	700873		A	2/5/81	SCHEMATIC DIAGRAM, RF AMP & DN CONVERTER
		TRW	700881		C	1/13/82	SCHEMATIC DIAGRAM, RCVR OFFSET, X2
		TRW	700885		A	1/12/81	SCHEMATIC DIAGRAM, UP CONVERTER AMP
		TRW	700888		A	1/29/81	SCHEMATIC DIAGRAM, LOOP IF AMP & FILTER
		TRW	700891		B	11/26/80	SCHEMATIC DIAGRAM, UP CONVERTER, X4
		TRW	700901		B	10/5/81	INTERCONNECT DIAGRAM, XMTR SYNTHESIZER MODULE
		TRW	700911		A	11/25/81	SCHEMATIC DIAGRAM, XMTR SYN MODULE
		TRW	700915		C	1/16/82	SCHEMATIC DIAGRAM, BASEBAND BOARD
		TRW	700920		B	12/7/81	SCHEMATIC DIAGRAM, XMTR LOOP VCO & POWER DIVIDER
		TRW	700927		A	3/13/80	SCHEMATIC DIAGRAM, LOOP IF AMP & FILTER
		TRW	700931		B	10/21/80	SCHEMATIC DIAGRAM, LINEAR PHASE MODULATOR
		TRW	700939		B	11/25/80	SCHEMATIC DIAGRAM, UPCONVERTER, X4
		TRW	700948		A	10/5/81	SCHEMATIC DIAGRAM, GAIN NORMALIZER & FILTER
		TRW	700961			1/30/80	SCHEMATIC DIAGRAM, CMD PROCESSOR (A1)
		TRW	700965		A	8/22/80	SCHEMATIC DIAGRAM, CMD PROCESSOR (A2)
		TRW	700969		A	12/3/80	SCHEMATIC DIAGRAM, CMD PROCESSOR (A3)
		TRW	700973		B	2/16/81	SCHEMATIC DIAGRAM, CMD PROCESSOR (A4)
		TRW	700982		C	3/22/82	SCHEMATIC DIAGRAM, RCVR LOOP VCO & PWR DIVIDER
		TRW	701001		A	9/27/82	INTERCONNECT DIAGRAM, PI
		TRW	701006		D	5/1/80	SCHEMATIC DIAGRAM, TRIPLEXER/SWITCH-SRU
		TRW	701043		A	1/14/81	SCHEMATIC DIAGRAM, VOLT REG (+5.1v/+12v)
		TRW	701034		A	4/29/80	SCHEMATIC DIAGRAM, RF PWR SWITCH (DOD)

DWG	SIGNATURE		DATE
6.13-4	ENGR F. MACFARLANE		
	ENGR		5NOV90
6.14	ENGR F. MACFARLANE		
	ENGR		5NOV90
	APP		
	APP		
	OMNIPLAN		
	LTR E	PCN	

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SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
16.14 (CONC'D)		TRW	701037		A	4/29/80	SCHEMATIC DIAGRAM, RF PWR SWITCH (NASA)
		TRW	701051		A	11/4/80	SCHEMATIC DIAGRAM, PWR CONVERTER
		TRW	701086		B	1/15/81	INTERCONNECT DIAGRAM, BASEBAND MODULE
		TRW	701094		C	6/8/81	SCHEMATIC DIAGRAM, VIDEO AMP & SWITCHES
		TRW	701100		C	3/10/81	SCHEMATIC DIAGRAM, AGC ASSEMBLY
		TRW	709176		A	11/9/81	SCHEMATIC DIAGRAM, REF TCXO FREQ SOURCE
		TRW	709184		A	11/9/81	SCHEMATIC DIAGRAM, STDN VCXO ASSY
		TRW	709191		A	11/9/81	SCHEMATIC DIAGRAM, SGLS VCXO ASSY
		TRW	709195		A	10/5/81	SCHEMATIC DIAGRAM, LOOP IF AMP & FILTER
		TRW	709199		A	1/14/81	SCHEMATIC DIAGRAM, TCXO X2
		TRW	709206		B	4/9/81	SCHEMATIC DIAGRAM, DOD X2 STDN X2
		TRW	709227		A	11/24/80	SCHEMATIC DIAGRAM, OUTPUT AMP "A"
		TRW	709235		A	11/21/80	SCHEMATIC DIAGRAM, OUTPUT AMP "B"
		TRW	709509			12/4/80	SCHEMATIC DIAGRAM, UPCONVERTER AMP
		TRW	709516			4/9/81	SCHEMATIC DIAGRAM, FET SWITCH PRESET
16.15	PAYLOAD SIGNAL PROCESSOR						ORBITER SCHEMATIC LIST
		R. I.	VS70-740239	1-4	D	5/10/88	SCHEMATIC DIAGRAM, C&T PAYLOAD INTERROGATOR
		R. I.	VS70-740299		F	4/29/88	SCHEMATIC DIAGRAM, C&T GCIL
							LRU SCHEMATIC LIST
							LABELED SNEAK CIRCUIT ANALYSIS
		TRW	704231			2/24/81	SCHEMATIC DIAGRAM, PSP CMD PROCESSOR A
		TRW	704241			5/2/79	SCHEMATIC DIAGRAM, PSP CMD PROCESSOR B
		TRW	704162			6/20/79	SCHEMATIC DIAGRAM, PSP GENERAL, BOX
		TRW	704164			NO DATE	INTERCONNECT DIAGRAM, PSP
		TRW	704211			2/28/79	SCHEMATIC DIAGRAM, PSP TLM PROC A
		TRW	704221			3/1/79	SCHEMATIC DIAGRAM, PSP TLM PROC B
		TRW	704191			NO DATE	SCHEMATIC DIAGRAM, PSP BIT SYNC A
		TRW	704201			NO DATE	SCHEMATIC DIAGRAM, PSP BIT SYNC B
		TRW	704181			1/11/79	SCHEMATIC DIAGRAM, PSP PSK DEMODULATOR
16.16		SRB DFI FLIGHT					ORBITER SCHEMATIC LIST
	RECORDER	MSFC	16A10242		L		LSRB DFI CABLE INTERCONNECT
		MSFC	16A10243		F		LSRB DFI ELECT SCHEMATIC
		MSFC	16A10244		L		RSRB DCI CABLE INTERCONNECT
							LRU SCHEMATIC LIST
		BELL & HOWELL	PN 533001			5/77	BASIC RECORDER/TAPE TRANSPORT, TECHNICAL MANUAL
		MSFC	19A01050				FLIGHT TAPE RECORDER (19A02050)
16.17	GROUND COMMAND INTERFACE LOGIC						ORBITER SCHEMATIC LIST
		R. I.	VS70-740299		F	4/29/88	SCHEMATIC, C&T GROUND COMMAND INTERFACE LOGIC CONTROLLER
							LRU SCHEMATIC LIST
		CONRAC, INC.	7954927-001		A		WIRE RUN LIST
		CONRAC, INC.	7102889		A	9/30/82	GCIL CONTROLLER DRIVER BOARD PARTITIONING TABLE DOCUMENT
		CONRAC, INC.	7906817		A	7/7/81	LOGIC DIAGRAM, MDM A DATA BUFFER A1
		CONRAC, INC.	7906819		A	7/6/81	LOGIC DIAGRAM, MDM B DATA BUFFER A2
		CONRAC, INC.	7906821		A	7/7/81	LOGIC DIAGRAM, DECODER DRIVER A3 THRU A9, A11 THRU A18
		CONRAC, INC.	7906823		A	7/6/81	LOGIC DIAGRAM, COMPLEX DECODER DRIVER A10
		CONRAC, INC.	7906825		A	7/7/81	SCHEMATIC DIAGRAM POWER SUPPLY A19 & A20
16.18	OPS RECORDERS						ORBITER SCHEMATIC LIST
		R. I.	VS70-750119		E	4/11/83	SCHEMATIC DIAGRAM, RECORDERS - OPS1/OPS2
							LRU SCHEMATIC LIST
		ODETICS, INC.	4410651		E	5/12/77	INTERMEDIATE AMP SCHEMATIC
		ODETICS, INC.	4410701	2	E	5/10/77	INTERCONNECT DIAGRAM, ELECTRONICS UNIT
		ODETICS, INC.	4410941	2	C	6/30/76	PARALLEL/SERIAL REPRO AMP SCHEMATIC
		ODETICS, INC.	4410961		C	6/30/79	SERVO POWER SUPPLY SCHEMATIC
		ODETICS, INC.	4410971	2	C	3/2/76	DIGITAL REPRO SCHEMATIC
		ODETICS, INC.	4410976	6	C	5/3/76	SERIAL DATA REPRO PWR SUPPLY/TLMY SCHEMATIC
		ODETICS, INC.	4411016		C	4/26/76	ERASE OSCILLATOR SCHEMATIC
		ODETICS, INC.	4411034	3	C	5/7/79	TRANSPORT UNIT SERVO SCHEMATIC
		ODETICS, INC.	4411056			6/10/76	DIRECTION SENSOR SCHEMATIC
		ODETICS, INC.	4411716		C	5/9/78	BIAS OSCILLATOR SCHEMATIC
		ODETICS, INC.	4411721		B	11/2/77	RECORD HEAD SWITCHER SCHEMATIC
		ODETICS, INC.	4410709			3-5-76	7 CHANNEL PREAMPLIFIER (TRKS 1-7)
		ODETICS, INC.	4411051			1/15/76	7 CHANNEL PREAMPLIFIER (TRKS 8-14)
		ODETICS, INC.	4411111		A	6/12/85	DIGITAL RECORD COMPENSATION SCHEMATIC
		ODETICS, INC.	4411916		B	7/15/85	DIGITAL REPRO SCHEMATIC

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
16.14	ENGR F. MACFARLANE		16.17	ENGR J. CONNER	
	ENGR [signature]	5 NOV 90		ENGR [signature]	11-5-90
16.15	ENGR J. O. SAYLER		16.18	ENGR R. E. LABRODE	
	ENGR [signature]	5 NOV 90		ENGR [signature]	11.5.90
16.16	ENGR MARTIN T. O'HARE			APP	
	ENGR [signature]	11/5/90		APP	
	ENGR				
	ENGR		LTR E	PCN	

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SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
16.19	P/L RECORDERS	R. I.	VS70-750142		K	4/9/83	ORBITER SCHEMATIC LIST SCHEMATIC DIAGRAM, PAYLOAD RECORDER SUBSYSTEM LRU SCHEMATIC LIST RECORDER COMPONENTS SCHEMATIC
		ODETICS, INC.	4410651		E	5/12/77	INTERMEDIATE AMP SCHEMATIC
		ODETICS, INC.	4410701	2	E	5/10/77	INTERCONNECT DIAGRAM, ELECTRONICS UNIT
		ODETICS, INC.	4410941	2	C	6/30/76	PARALLEL/SERIAL REPRO AMP SCHEMATIC
		ODETICS, INC.	4410961		C	6/30/79	SERVO POWER SUPPLY SCHEMATIC
		ODETICS, INC.	4410971	2	C	3/2/76	DIGITAL REPRO SCHEMATIC
		ODETICS, INC.	4410976	6	C	5/3/76	SERIAL DATA REPRO PWR SUPPLY/TLMY SCHEMATIC
		ODETICS, INC.	4411016		C	4/26/76	ERASE OSCILLATOR SCHEMATIC
		ODETICS, INC.	4411034	3	C	5/7/79	TRANSPORT UNIT SERVO SCHEMATIC
		ODETICS, INC.	4411056			6/10/76	DIRECTION SENSOR SCHEMATIC
		ODETICS, INC.	4411716		C	5/9/79	BIAS OSCILLATOR SCHEMATIC
		ODETICS, INC.	4411721		B	11/2/77	RECORD HEAD SWITCHER SCHEMATIC
		ODETICS, INC.	4410709			3/5/76	7 CHANNEL PREAMPLIFIER (TRKS 1-7)
		ODETICS, INC.	4411051			1/15/76	7 CHANNEL PREAMPLIFIER (TRKS 8-14)
		ODETICS, INC.	4411111		A	6/12/85	DIGITAL RECORD COMPENSATION SCHEMATIC
		ODETICS, INC.	4411916		B	7/15/85	DIGITAL REPRO SCHEMATIC
16.20 (SHEET 1)							ORBITER SCHEMATIC LIST NONE - SEE 16.10-1 THRU 7 FOR AUDIO INTERFACE LRU SCHEMATIC LIST
	WIRELESS CCU AIU	GTE GOV SYS	00-1388301		-	1/16/86	INTERCONNECT DIAGRAM - AIU
		GTE GOV SYS	00-1380321		C	7/25/83	SCHEMATIC UHF RECEIVER MODULE
		GTE GOV SYS	00-1388111		A	11/14/85	SCHEMATIC UHF TRANSMIT MODULE
		GTE GOV SYS	00-1388141		B	11/14/85	SCHEMATIC IF AMP/DEMOD MODULE
		GTE GOV SYS	00-1388151		A	11/14/85	SCHEMATIC RECEIVE AUDIO MODULE
		GTE GOV SYS	00-1388161		-	11/14/85	SCHEMATIC TRANSMIT AUDIO MODULE
		GTE GOV SYS	00-1388191		B	11/14/85	SCHEMATIC AUDIO SUMMER MODULE
		GTE GOV SYS	00-1388351		-	7/27/85	SCHEMATIC AMP/REG MODULE
16.20 (SHEET 2)	WIRELESS CCU CRU	GTE GOV SYS	00-1388201		-	1/16/86	INTERCONNECT DIAGRAM - CRU
		GTE GOV SYS	00-1380321		C	7/25/83	SCHEMATIC UHF RECEIVER MODULE
		GTE GOV SYS	00-1388111		A	11/14/85	SCHEMATIC UHF TRANSMIT MODULE
		GTE GOV SYS	00-1388141		B	11/14/85	SCHEMATIC IF AMP/DEMOD MODULE
		GTE GOV SYS	00-1388151		A	11/14/85	SCHEMATIC RECEIVE AUDIO MODULE
		GTE GOV SYS	00-1388161		-	11/14/85	SCHEMATIC TRANSMIT AUDIO MODULE
		GTE GOV SYS	00-1388171		-	11/14/85	SCHEMATIC FREQUENCY PROGRAMMING MODULE
16.23	EXTENDED RANGE PAYLOAD COMM LINK	NASA/JSC	SID39123695	1	-	1/28/93	ERPCL RF INTERCONNECTION DIAGRAM
		NASA/JSC	SIDE9123389	1	A	10/01/92	ERPCL WIRING DIAGRAM
		NASA/JSC	SED39123773	1	-	10/01/92	ERPCL CONNECTOR KEY ASSEMBLY
		NASA/JSC	SID39123359	1	-	9/28/92	ERPCL POWER BOARD SCHEMATIC DIAGRAM
		NASA/JSC	SID39123363	1-4	-	9/28/92	ERPCL LOGIC BOARD #1 SCHEMATIC DIAGRAM
		NASA/JSC	SID39123367	1-5	-	9/29/92	ERPCL LOGIC BOARD #2 SCHEMATIC DIAGRAM
		NASA/JSC	SID39123371	1-4	-	9/29/92	ERPCL INTERCONNECT BOARD SCHEMATIC DIAGRAM
		NASA/JSC	SID39122415	1	C	8/12/92	ERPCL EMI ENCLOSURE SCHEMATIC DIAGRAM
		NASA/JSC	SID39123394	1	-	1/28/93	ERPCL TEST CONNECTOR HOUING SCHEMATIC DIAGRAM
		AACOM	33011	1-3	B	9/26/91	L BAND EXCITER BOARD SCHEMATIC
		AACOM	33389	1	B	12/16/91	POWER AMPLIFIER BOARD SCHEMATIC
		AACOM	33015	1-2	C	5/-/92	AT27055 TRANSMITTER FINAL ASSEMBLY

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
16.19	ENGR R. E. LABRODE			ENGR	
	ENGR RE LaBrode	10/7/93		ENGR	
16.20-1,2	ENGR G. C. HORLACHER			ENGR	
	ENGR G C Horlacher	10/07/93		ENGR	
16.23	ENGR G. C. HORLACHER			APP Stephen J Elsner	10/7/93
	ENGR G C Horlacher	10/07/93		APP Allen F. Morris	10/1/93
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN 3	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE | TBL NO 16-I
ALL

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
16.24 (Sheet 1)	INTERIM VIDEO TAPE RECORDER	R. I.	VS70-740182		-	10/31/84	ORBITER SCHEMATIC LIST SCHEMATIC DIAGRAM, TV COMM AND TRACKING SUBSYSTEM LRU SCHEMATIC LIST
		NASA JSC	SID16101765	1-2	B		WIRING DIAGRAM, SWITCHBOX, VTR
		NASA JSC	SED16101767	1-2	B		CABLE ASSEMBLY, INTERCONNECTION DIAGRAM, VTR/SWITCHBOX - VTR HOUSING
		NASA JSC	SID16101769	1-2	B		INTERCONNECTION WIRING DIAGRAM, VTR
		NASA JSC	SID16101772	1	B		SCHEMATIC DIAGRAM, SIDETONE AMPLIFIER, VTR
		NASA JSC	SID16101775	1	-		SCHEMATIC DIAGRAM, SV-10 BOARD, VTR
		NASA JSC	SID16101776	1	A		SCHEMATIC DIAGRAM, COL BOARD, VTR
		NASA JSC	SID16101798	1	-		SCHEMATIC DIAGRAMS, LM-3/BS BOARD, VTR
		NASA JSC	SID16101777	1	A		SCHEMATIC DIAGRAM, SV-2A BOARD VTR
		NASA JSC	SID16101779	1	B		DRAWING TREE, VTR HOUSING
		NASA JSC	SID16101780	1	A		DRAWING TREE, RECORDER ASSEMBLY, VTR
		NASA JSC	SID16101782	1	B		SCHEMATIC, MD BOARD, VTR
		NASA JSC	SID16101786	1	B		SCHEMATIC, VIDEO OUTPUT AMPLIFIER, VTR HOUSING
		NASA JSC	SID16101791	1	B		SCHEMATIC, VIDEO INTERFACE/AUDIO-AGC-COLOR, VTR
		NASA JSC	SID16101797	1	A		SCHEMATIC DIAGRAM, AV BOARD, VTR
		NASA JSC	SID16101799	1	-		SCHEMATIC DIAGRAMS, PD/FR/MA-1/RL BOARDS, VTR
		NASA JSC	SID16101801	1	A		SCHEMATIC, CO BOARD
16.24 (Sheet 2)	8MM VIDEO TAPE RECORDER	NASA JSC	SID33104526	1	-	6/12/92	SCHEMATIC DIAGRAM, VTR V-80AB-F
		NASA JSC	SID33104450	1	-	6/30/92	SCHEMATIC DIAGRAM, AUDIO INTERFACE - TEAC
		NASA JSC	SID33104458	1-2	-	1/15/92	VIDEO TAPE RECORDER ASSEMBLY - VTR V-80AB-F
16.25 (Sheet 1)	COMM POWER DISTRIBUTION						REFERENCE SSSHB SCHEMATIC TRACEABILITY LIST FOR THE FOLLOWING DRAWINGS: S-BD PM TRANSPONDER, 16.2-1 S-BD PM AMPLIFIER SYS, 16.2-2 S-BD PM/FM SW BEAM ANT SYS, 16.2-3 NSP RTN LINK, 16.3-1 NSP COMSEC 1/2, 16.3-3 TAGS/SECURE TAGS, 16.4-1,2 KU-BD SYSTEM, 16.5-1,2 S-BD FM SYS, 16.8-1 UHF XCVR, 16.9-1 AUDIO PANEL, 16.10-1,2,3,4,5,6,7 AUDIO/ACCU, 16.11-2 TV CONTROL, 16.12-1 TV/CAMERA MONITOR, 16.13-1,2 TV/SECURE, 16.13-4 S-BD PI, 16.14-1 PSP, 16.15-1 GCIL, 16.17-1 OPS RCDRS, 16.18-1 P/L RCDR, 16.19-1 CIE, 16.22-1 IVTR, 16.24-1 OI PCMMU, 17.2-1 PDI, 17.3-1
16.26 (Sheet 1)	COMM MDM I/F	RI RI	VS70-720569 VS70-720599		A	5/18/81 11/14/80	ORBITER SCHEMATIC LIST DP&S DATA BUSES, FC 1-8 DATA BUS PLB01 AND PLB02 REFERENCE SSSHB SCHEMATIC TRACEABILITY LIST FOR THE FOLLOWING DRAWINGS: NSP FWD LINK, 16.3-2 KU-BD SYS, 16.5-1 OI DSC/MDM, 17.1-1 CIE CNTL, 16.22-1 MADS RCDR, 17.12 OPS RCDRS, 16.18 P/L RCDR, 16.19 P/L SIG PROC, 16.15 GCIL, 16.17 S-BD PM, 16.2-3 TV CNTL, 16.12 ADU STV, 16.3-4 TAGS/OHC, 16.4-1

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
16.24-1,2	ENGR F. J. MACFARLANE			ENGR	
	ENGR Parker J. Mac	1/FEB/93		ENGR	
16.25	ENGR A. MORRISON			ENGR	
	ENGR Allen L. Morrison	2/18/93		ENGR	
16.26	ENGR S. M. KAKADELIS			APP Stephen J. Elsner	2/19/93
	ENGR S. Kakadelis	11 5 92		APP	
	ENGR			OMNIPLAN	
	ENGR			LTR E	PCN 2

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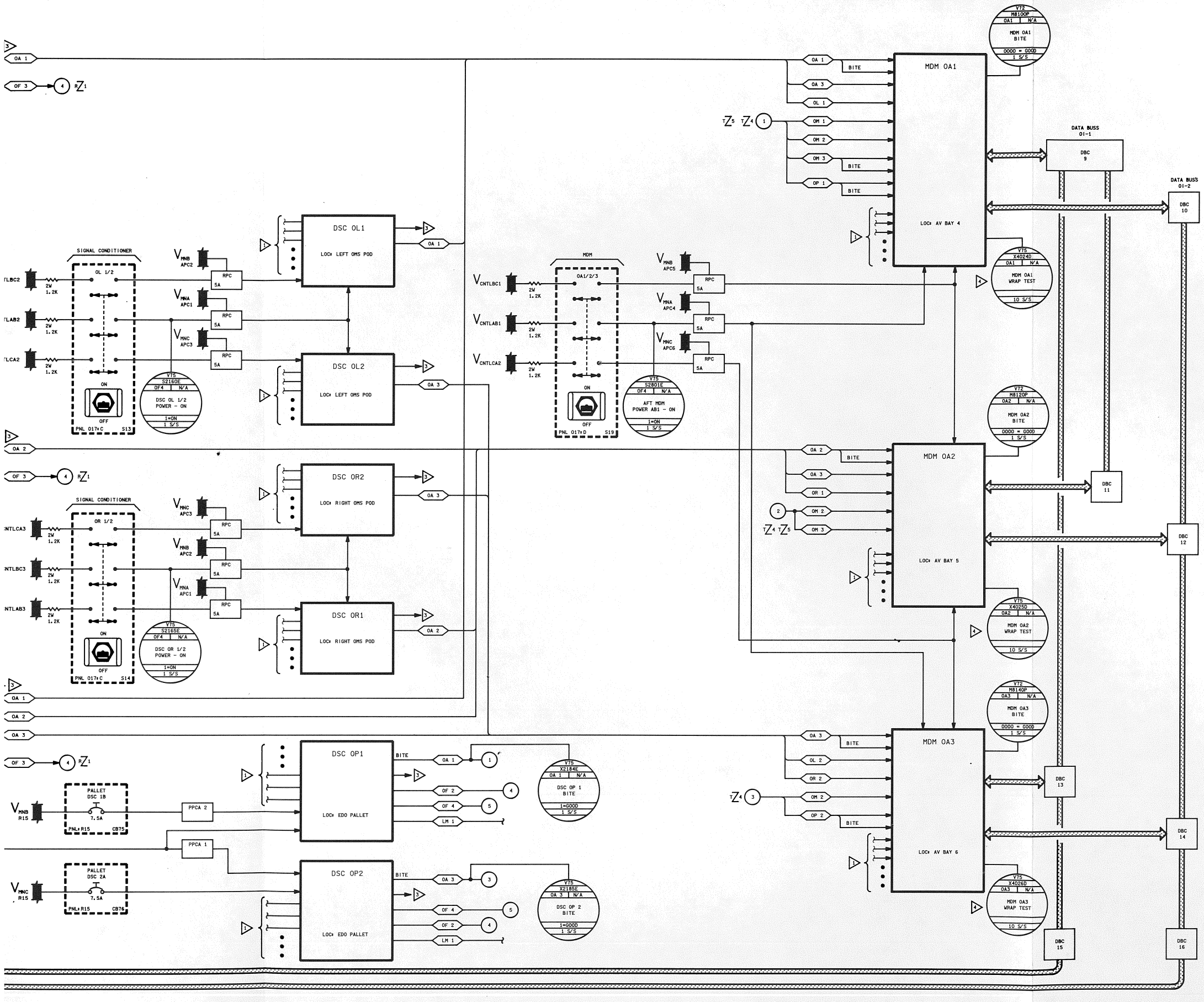
VENDOR DRAWING REFERENCES

SPACE SHUTTLE — ALL

TBL NO 16-I

BASIC REV E-2



DATE: 10/03/91	NAME: JDF	VERSION: BPT: 11
DATE: 10/23/91	NAME: SEW	VERSION: INR: 6
DATE: 11/5/91	NAME: VSH	VERSION: INR: 7

△3 OI DATA ROUTING FOR OV-103 AND OV-104 REFER TO IPCL OR SCAP FOR DETAILS

SRC	DESTINATION														
OI DSC	OI MDM'S							FC MDM'S							D&C	C&W *
	OF1	OF2	OF3	OF4	OA1	OA2	OA3	FF1	FF2	FF3	FF4	FA1	FA2	FA3	FA4	
OF1	●			●												●	CW
OF2		●							●	●	●					●	CW
OF3		●	●	●						●						●	CE
OF4	●			●				●	●		●					●	W
OA1			●		●							●			●	●	CW
OA2			●			●							●	●		●	CW
OA3			●			●	●							●	●	●	CW
OM1	●		●			●										●	C
OM2		●	●			●	●									●	C
OL1						●						●		●		●	W
OL2							●					●	●	●	●	●	W
OR1							●					●	●	●	●	●	W
OR2							●						●		●	●	W
OM3		●	●	●	●	●										●	●

OI DATA ROUTING FOR OV-102
REFER TO IPCL OR SCAP FOR DETAILS

SRC	DESTINATION														
OI DSC	OI MDM'S							FC MDM'S							D&C	C&W *
	OF1	OF2	OF3	OF4	OA1	OA2	OA3	FF1	FF2	FF3	FF4	FA1	FA2	FA3	FA4	
OF1	●			●												●	CW
OF2		●							●	●	●					●	CW
OF3		●	●	●						●						●	CE
OF4	●			●				●	●		●					●	W
OA1			●		●							●			●	●	CW
OA2	●		●			●							●	●		●	CW
OA3	●		●			●	●							●	●	●	CW
OM1	●		●			●										●	C
OM2		●	●			●	●									●	C
OL1						●						●		●		●	W
OL2							●					●	●	●	●	●	W
OR1							●					●	●	●	●	●	W
OR2							●						●		●	●	W
OM3		●	●	●	●	●										●	●

* C=CAUTION W=WARNING E=EMERGENCY

OI DATA ROUTING FOR OV-102 AND OV-105 16 DAY EDO
FLIGHTS REFER TO IPCL OR SCAP FOR DETAILS

SRC	DESTINATION								
OI DSC	OI MDM'S				OTHER MDM'S			D&C	C&W *
	OF1	OF2	OF3	OF4	OA1	OA2	OA3	LM1		
OP1		●		●	●			●		
OP2		●		●			●	●		

2. DATA BUS COUPLERS (DBC'S)

DBC			LRU				DATA BUS
NO	ID	LOCATION	NAME	ID	LOCATION	PORT	
1	81V72A41A27	AV BAY 1	MDM OF1	81V75A10	AV BAY 1	1	OI-1
2	82V72A44A12	AV BAY 2				2	OI-2
3	81V72A41A29	AV BAY 1	MDM OF2	82V75A11	AV BAY 2	1	OI-1
4	82V72A44A11	AV BAY 2				2	OI-2
5	90V72A51A18	AV BAY 1	MDM OF3	83V75A12	AV BAY 3A	1	OI-1
6	90V72A51A13	AV BAY 2				2	OI-2
7	30V72A57A1	FLT DECK	MDM OF4	30V75A9	FLT DECK	1	OI-1
8	30V72A57A2	FLT DECK				2	OI-2
9	50V72A75	AFT FUS	MDM OA1	54V75A13	AV BAY 4	1	OI-1
10	54V72A76	AV BAY 4				2	OI-2
11	55V72A77	AV BAY 5	MDM OA2	55V75A14	AV BAY 5	1	OI-1
12	50V72A78	AFT FUS				2	OI-2
13	50V72A79	AFT FUS	MDM OA3	56V75A15	AV BAY 6	1	OI-1
14	50V72A80	AFT FUS				2	OI-2
15	40V72A345	MID FUS				1	OI-1
16	50V72A346	MID FUS				2	OI-2
17	81V72A41A28	AV BAY 2	PCMMU-1	81V75A1	AV BAY 1	-	OI-1
18	82V72A43A7	AV BAY 3	PCMMU-2	82V75A2	AV BAY 2	-	OI-2
19	81V72A41A11	AV BAY 1	PCMMU-1				P/L-1
20	81V72A41A12	AV BAY 1	PDI	81V75A8			P/L-1
21	82V72A43A5	AV BAY 2	PCMMU-2				P/L-2
22	82V72A43A6	AV BAY 2	PDI				P/L-2
23	81V72A42A36	AV BAY 1	GPC1	81V72A16	AV BAY 1		IP1
24	81V72A41A26	AV BAY 1	PCMMU-1				IP1
25	81V72A40A5	AV BAY 1	PCMMU-2				IP1
26	82V72A45A28	AV BAY 2	GPC2	82V72A17	AV BAY 2		IP2
27	82V72A44A26	AV BAY 2	PCMMU-1				IP2
28	82V72A43A8	AV BAY 2	PCMMU-2				IP2
29	83V72A46A3	AV BAY 3	GPC3	83V72A18	AV BAY 3		IP3
30	80V72A48A5	CREW DECK	PCMMU-2				IP3
31	80V72A49A5	CREW DECK	PCMMU-1				IP3
32	81V72A42A9	AV BAY 1	GPC4	81V72A19	AV BAY 1		IP4
33	81V72A41A6	AV BAY 1	PCMMU-1				IP4
34	81V72A40A2	AV BAY 1	PCMMU-2				IP4
35	82V72A45A9	AV BAY 2	GPC5	82V72A20	AV BAY 2		IP5
36	82V72A44A2	AV BAY 2	PCMMU-1				IP5
37	82V72A45A9	AV BAY 2	PCMMU-2				IP5
38	40V72A353	MID FUS	EXP/SCOS		SPACELAB		P/L-1
39	40V72A354	MID FUS	EXP/SCOS		SPACELAB		P/L-2

NOTES: △1 INPUTS DIRECTLY FROM SENSORS AND TRANSDUCERS

6. REFER TO TABLE 17.1 FOR DRAWING TRACEABILITY

△5 THE PWR FOR THIS XDUCR WILL CHANGE FROM MNA APC 6 TO MNB APC 5 ON OV-105 AND ALL OTHER ORBITERS AFTER THEIR MAJOR MOD

△4 THE MDM WRAP TEST IS A BUS STATUS CHECK BETWEEN THE OI MDM'S AND THE POWERED PCMMU WHICH IS PERFORMED 10 TIMES EACH SECOND. EACH MEASUREMENT SHOWN IS AN 8-BIT MEAS MADE UP OF ALTERNATING 1'S AND 0'S AND EACH SUCCESSIVE MEAS IS THE ONE'S COMPLEMENT OF THE PREVIOUS.

1 OI DSC/MDM 1

SIGNATURE		DATE
DSON	L. M. BUCHANAN	2/18/83
DR	L. M. BUCHANAN	2/18/83
ENGR	S. KAKADELIS	
ENGR	S. Kakadelis	11/4/91
APP	S. Kakadelis	11/4/91
APP	K. U. Bohring	11-4-91
CPMM PLAN	S. K. Hamblin	11-12-91

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

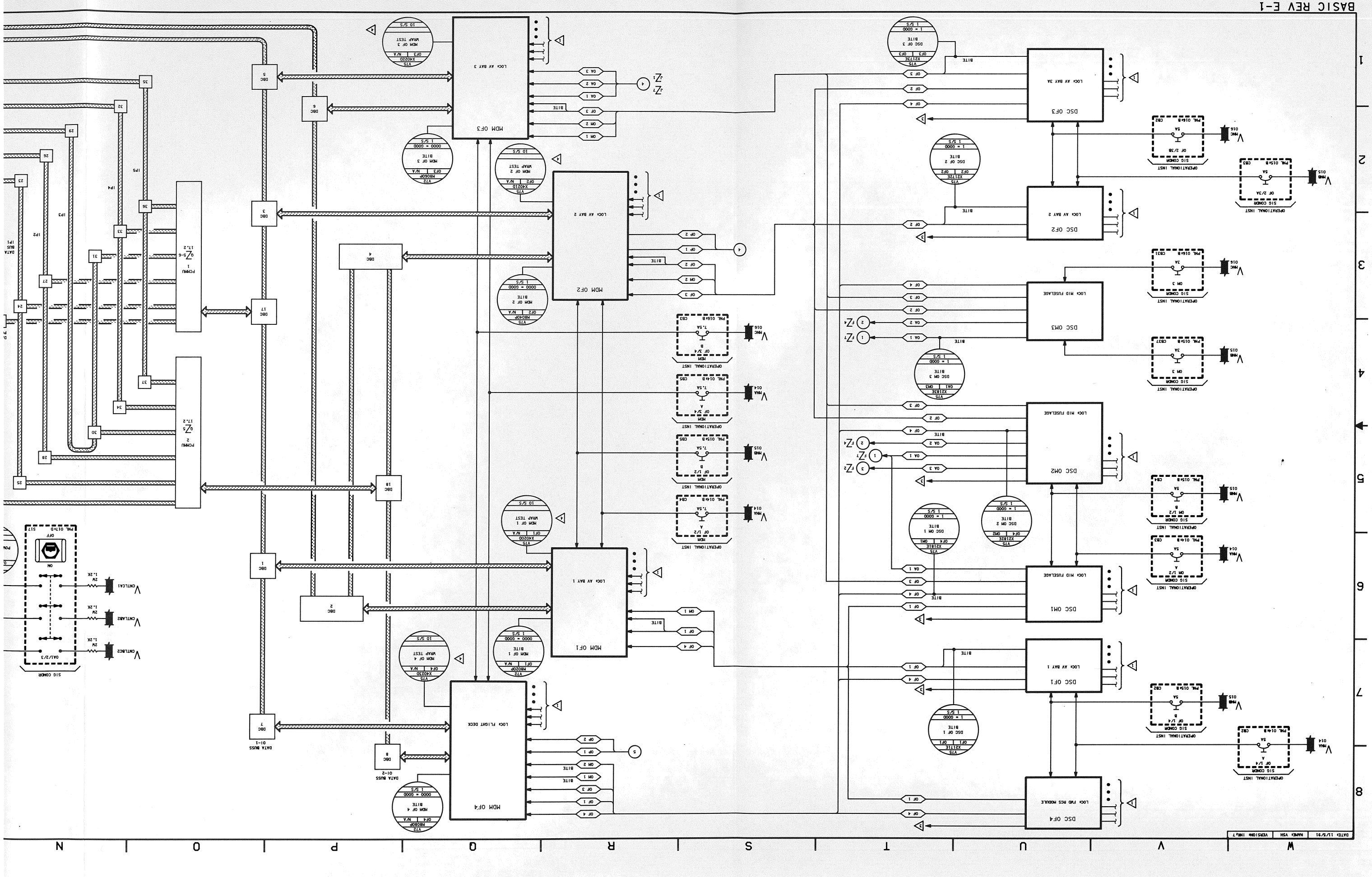
OPERATIONAL INSTRUMENTATION
DSC'S AND MDM'S

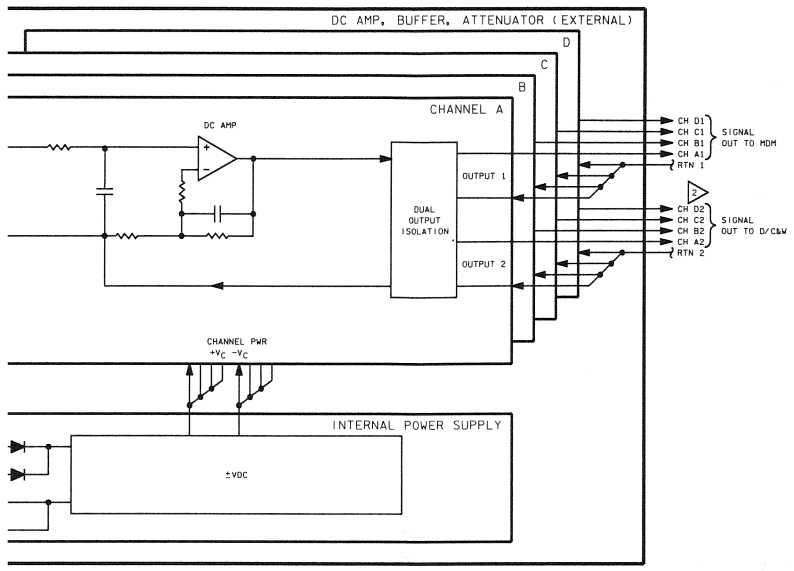
SPACE SHUTTLE | DWG NO 17.1
ALL
126.5 X 34 | PAGE | SHEET 1 OF 3

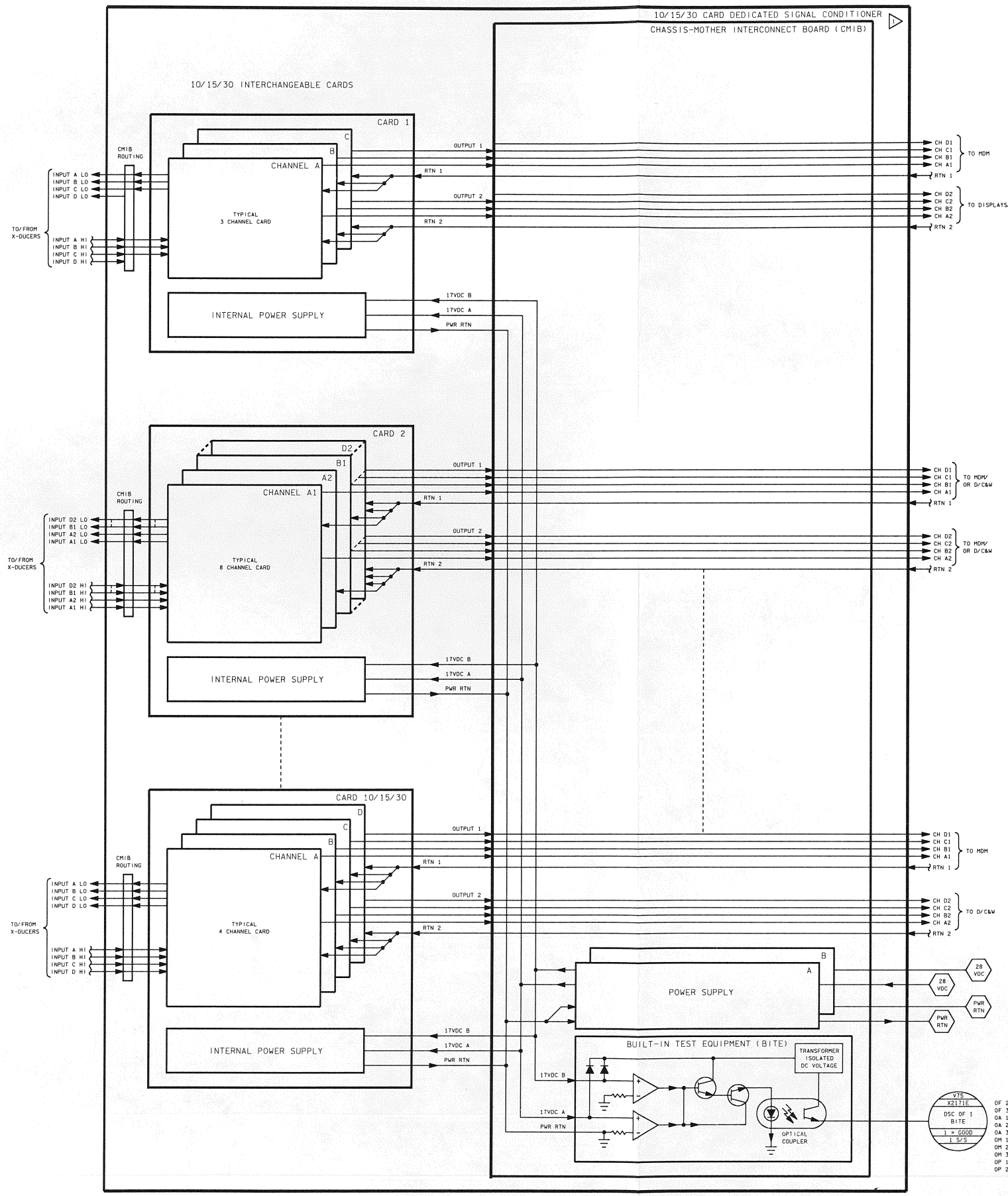
LTR E | PCN 1

BASIC REV E-1

MDM OF4
LOCI FLIGHT DECK
MDM OF1
LOCI AV BAY 1
MDM OF2
LOCI AV BAY 2
MDM OF3
LOCI AV BAY 3
DSC OA1
LOCI AV BAY 4
DSC OA2
LOCI AV BAY 5
DSC OA3
LOCI AV BAY 6
DATA BUSS OI-2
DATA BUSS OI-1
SIG CONDR OA1/2/3
SIGNAL CONDITIONER
SPACELAB ECOS/SCOS
PDI
GPC/IOP 1
GPC/IOP 2
GPC/IOP 3
GPC/IOP 4
GPC/IOP 5
AFT DSC POWER ABZ - ON
PALLET DSC 1A
PALLET DSC 1B
PALLET DSC 2A


LOCK AV BAY 3
MDM OF3
LOCK AV BAY 2
MDM OF2
LOCK AV BAY 1
MDM OF1
LOCK FLIGHT DECK
MDM OF4
DSC OF3
DSC OF2
DSC OM3
DSC OM2
DSC OM1
DSC OF1
DSC OF4
LOCK MID FUSELAGE
LOCK FWD RCS MODULE
DBC
PCMMU
SIG CONDR
OPERATIONAL INST
DATA BUSS
BITE
MDM OF 3 BITE
MDM OF 2 BITE
MDM OF 1 BITE
MDM OF 4 BITE
DSC OF 3 BITE
DSC OF 2 BITE
DSC OM 3 BITE
DSC OM 2 BITE
DSC OM 1 BITE
DSC OF 1 BITE
MDM OF 3 WRAP TEST
MDM OF 2 WRAP TEST
MDM OF 1 WRAP TEST
MDM OF 4 WRAP TEST
DATA BUS IP1
DATA BUS 01-1
DATA BUS 01-2
CNTLCA1
CNTLCA2
CNTLBC2
PWL 015A B2
PWL 014A B3
PWL 015B B5
PWL 014B B4
PWL 015A B2
PWL 014A B3
PWL 015B B2
PWL 014B B2
PWL 015B B4
PWL 014A B3
PWL 015B B2
PWL 014B B2
PWL 017B S17
ON
OFF
DATE 11/5/91
NAMEK VSK
V3R3IMM INST





DATE= 10/03/91	NAME= JDF	VERSION BPT= 7
DATE= 10/23/91	NAME= SEW	VERSION INR= 5
DATE= 10/19/92	NAME= VEM	VERSION INR= 6

DSC vs. CARD CONFIGURATION

	15 CARD DSC'S			
CARD NO	OL 1	OL 2	OR 1	OR 2
1	D	D	D	D
2	D	D	D	D
3	A (INT)	A (INT)	A (INT)	A (INT)
4	A (INT)	A (INT)	A (INT)	A (INT)
5	A (INT)	A (INT)	A (INT)	A (INT)
6	A (INT)	A (INT)	A (INT)	A (INT)
7	A (INT)	A (INT)	A (INT)	A (INT)
8	D	A (INT)	D	A (INT)
9	D	D	D	D
10	D	D	D	D
11	D	D	D	D
12	D	D	D	D
13	A (INT)	A (INT)	A (INT)	A (INT)
14	D	D	D	D
15	A (INT)	D	A (INT)	D

TABLE 1

DSC vs. CARD CONFIGURATION

	30 CARD DSC'S									
CARD NO	OF 1	OF 2	OF 3	OF 4	OA 1	OA 2	OA 3	OM 1	OM 2	OM 3
1	VA	VA	VA	D	VA	VA	A (EXT)	A (EXT)	A (EXT)	--
2	VD	VD	VD	D	VA	VA	VA	D	D	--
3	VD	VD	VD	A (INT)	PD	PD	PD	D	D	--
4	PD	PD	PD	A (INT)	A (INT)	A (INT)	PD	D	D	D
5	A (EXT)	A (EXT)	A (EXT)	A (INT)	A (INT)	A (INT)	A (INT)	D	D	D
6	D	--	A (INT)	A (INT)	D	D	D	A (INT)	D	D
7	SD	SD	SD	D	D	D	D	D	D	D
8	A (INT)	A (INT)	A (INT)	--	D	D	D	D	D	A (INT)
9	A (INT)	A (INT)	A (INT)	D	A (INT)	A (INT)	A (INT)	A (INT)	A (EXT)	A (INT)
10	A (INT)	A (INT)	A (INT)	D	D	D	D	D	D	--
11	A (INT)	A (INT)	A (INT)	D	A (INT)	D	D	D	A (INT)	--
12	A (INT)	A (INT)	A (INT)	A (INT)	D	D	D	D	D	--
13	A (INT)	A (INT)	A (INT)	A (INT)	A (INT)	A (INT)	A (INT)	D	D	--
14	A (INT)	A (INT)	A (INT)	D	A (INT)	A (INT)	A (INT)	A (INT)	A (INT)	--
15	A (INT)	A (INT)	A (INT)	--	D	D	D	A (INT)	A (INT)	--
16	A (INT)	A (INT)	A (INT)	--	D	D	D	A (INT)	A (INT)	--
17	A (INT)	D	A (INT)	--	D	D	D	D	D	--
18	A (INT)	D	A (INT)	--	D	D	D	D	D	--
19	A (INT)	A (INT)	A (INT)	--	D	D	D	D	A (INT)	--
20	D	A (INT)	D	--	D	D	D	D	A (INT)	--
21	A (INT)	A (INT)	D	--	D	D	D	D	D	--
22	A (EXT)	A (INT)	A (INT)	--	A (INT)	A (EXT)	A (INT)	D	D	--
23	D	D	D	--	D	D	A (INT	D	D	--
24	--	D	A (INT)	--	D	D	D	D	D	--
25	D	D	A (INT)	--	A (INT)	A (INT)	D	D	D	--
26	D	D	D	--	D	D	D	D	A (INT)	--
27	--	A (INT)	D	--	A (INT)	A (INT)	A (INT)	D	D	--
28	--	A (INT)	A (INT)	--	A (INT)	A (INT)	A (INT)	D	D	--
29	--	D	--	--	D	D	D	D	D	--
30	--	D	D	--	A (INT)	A (INT)	D	D	D	--

TABLE 2

DSC vs. CARD CONFIGURATION

	10 CARD EDO DSC'S	
CARD NO	OP1	OP2
IT	INTERNAL TEST	INTERNAL TEST
01	A (EXT)	A (EXT)
02	A (INT)	A (INT)
03	A (EXT)	A (INT)
04	D	D
05	D	D
06	D	D
07	D	D
08	--	--
09	A (EXT)	A (EXT)
10	A (EXT)	A (EXT)

TABLE 3

INSTRUMENTATION PROGRAM AND COMPONENT LIST (IPCL) REFERENCE TABLE

CARD NAME	IPCL FIELD: CHANNEL (CHARACTER 1*)	CARD NO (1-15 OR 1-30) (CHARACTERS 2* 3*)	CARD TYPE AND RANGE ID (CHARACTERS 4** 5 ← 6*** → 7*)	
	CHANNEL LIST			RANGE LIST
RTER, PULSE TO DC	X (A-C)	X X	X P D X	X (1-5)
RTER, VAR RES TO DC	X (A-D)	X X	X D X	X (1-53)
RTER, VOLTAGE AC TO DC	X (A-D)	X X	X V A	X (1 & 2)
RTER, VOLTAGE DISCRETE AC	X (A-D)	X X	X V D X	X (1)
R, 5VDC DISCRETE	X (A-D)	X X	X 5 D X	X (1)
FIER, BUFFER, ATTENUATOR (INTERNAL)	X (A-D)	X X	X A X X	X (1-17)
FIER, BUFFER, ATTENUATOR (EXTERNAL)	X (A-D)	X X	X A X	X (18,19,20)

THE IPCL CHARACTERS DESIGNATED BY AN 'X' VARY ACCORDING TO THE ACCOMPANYING LISTS
CHARACTER 4 OF THE IPCL IDENTIFIES THE PLUG AND PIN CONFIGURATION
CHARACTER 6 OF THE IPCL VARIES FROM IDENTIFYING CARD TYPE AND IDENTIFYING RANGE

1. THE CONVERTER DISCRETE A/C CARD HAS 8 CHANNELS WITH ONLY 1 OUTPUT EACH. MDM OR DISPLAY/C&W ROUTING IS DETERMINED BY THE MEASUREMENT AND HOW IT IS TO BE USED
2. POWER TO THE OPEN/CLOSE SENSOR MAY BE EXTERNAL OR INTERNAL, ACCORDING TO THE DASH NUMBER SPECIFICATION
3. INTERNALLY SUPPLIED TRANSDUCER POWER MAY BE EITHER 5 OR 10VDC, ACCORDING TO THE CARD'S DASH NUMBER SPECIFICATION
4. CONDITIONER CARDS ARE ADJUSTED FOR INPUT RANGES ACCORDING TO ITS DASH NUMBER AS SPECIFIED BY ITS CARD TYPE SPECIFICATION
5. EACH CARD HAS ITS OWN 32 PIN CONNECTOR ON THE CMIB THROUGH WHICH THE CARD'S POWER, TRANSDUCER SIGNALS, AND OUTPUTS 1 AND 2 ARE ROUTED. OUTPUTS 1 AND OUTPUTS 2 ARE ROUTED SEPARATELY BY THE 'MOTHER BOARD' TO THE MDM'S AND DISPLAYS/CONTROLS, RESPECTIVELY. THE OUTPUT SIGNALS HAVE A RANGE OF 0-5VDC, EXCEPT AS NOTED

NOTES: 1. SHOWN ARE THE TWO BASIC DEDICATED SIGNAL CONDITIONERS. A DSC IS DESIGNED TO CONTAIN A FLEXIBLE MIX OF CARDS. SHOWN ARE THREE TYPES OF CARDS IN CONVENIENT LOCATIONS. USE THE REFERENCE TABLES TO DETERMINE A CARD TYPE FOR A SPECIFIC DSC AND CARD

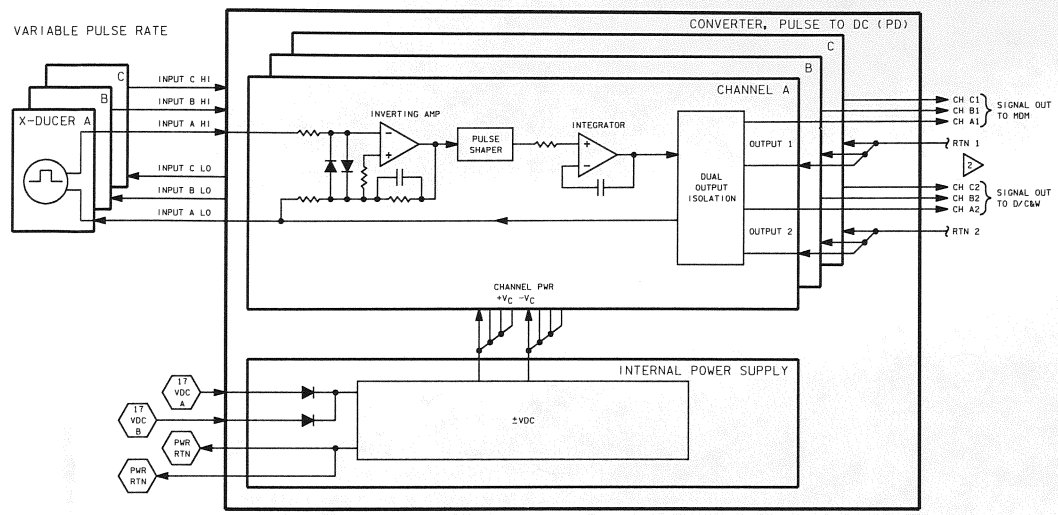
1 01 S/C 2

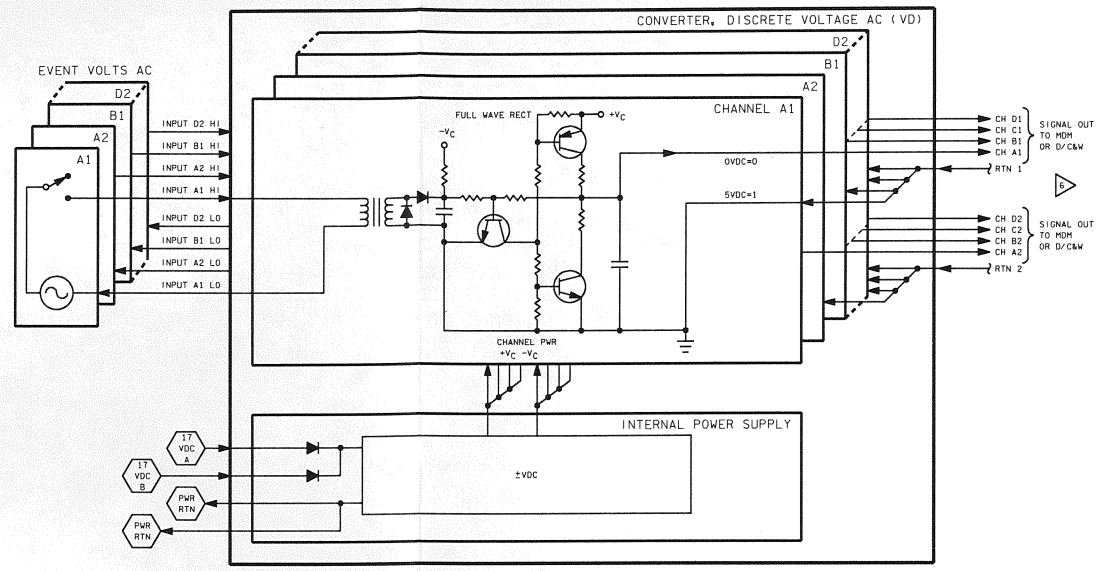
SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN LINDA DUMIS	2/8/83	
DR		
ENGR M. KOCHANSKI		01 DEDICATED SIGNAL CONDITIONERS
ENGR M. Kochanski	11/4/92	
APP Stephen P. Bland	11/4/92	
APP		SPACE SHUTTLE
OMNIPLAN S.K. Lindsey	11-6-92	ALL
LTR E	PCN 2	104.5 X 34

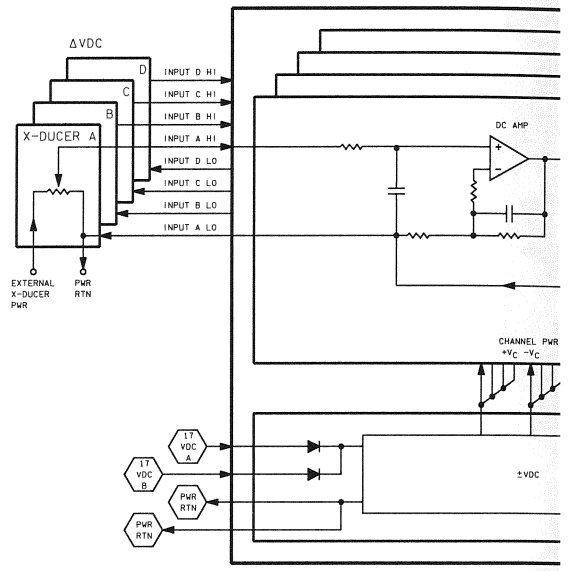
DWG NO 17.1
PAGE SHEET 2 OF 3

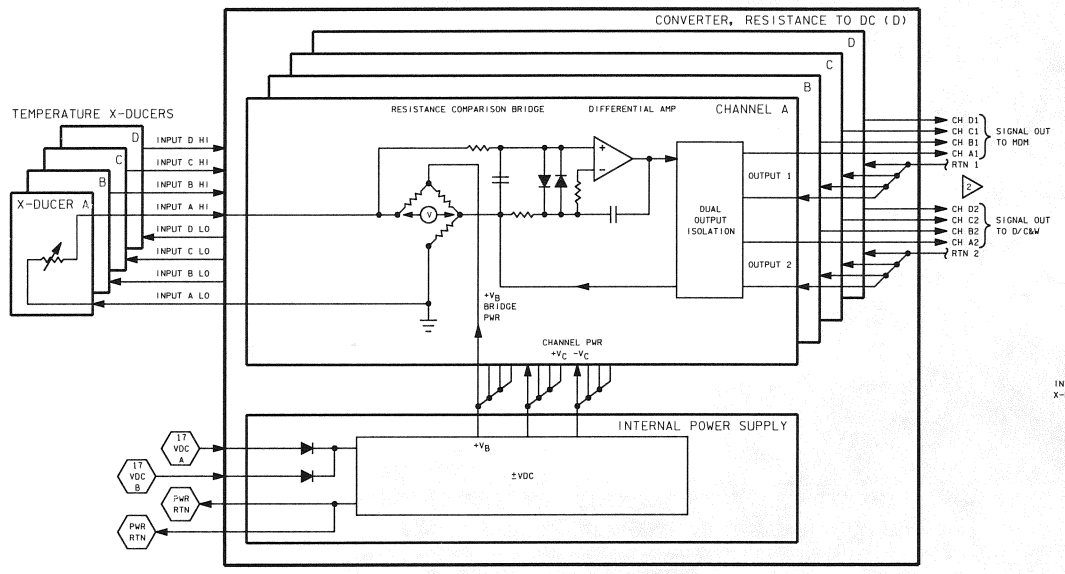
BASIC REV E-2

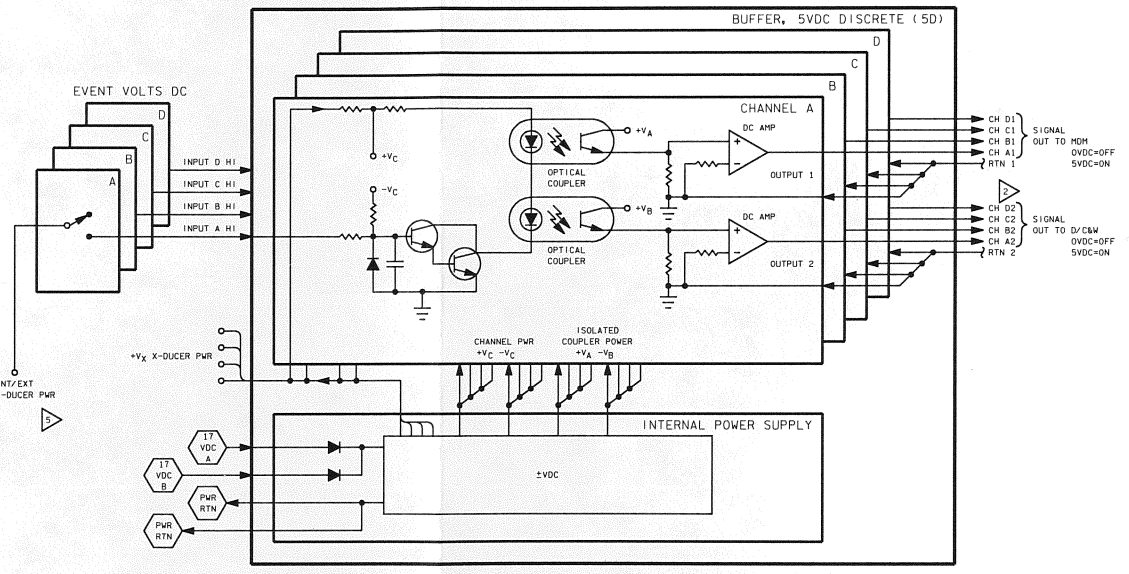
DATE: 10/19/92 | NAME: VEM | VERSION: INK4.6

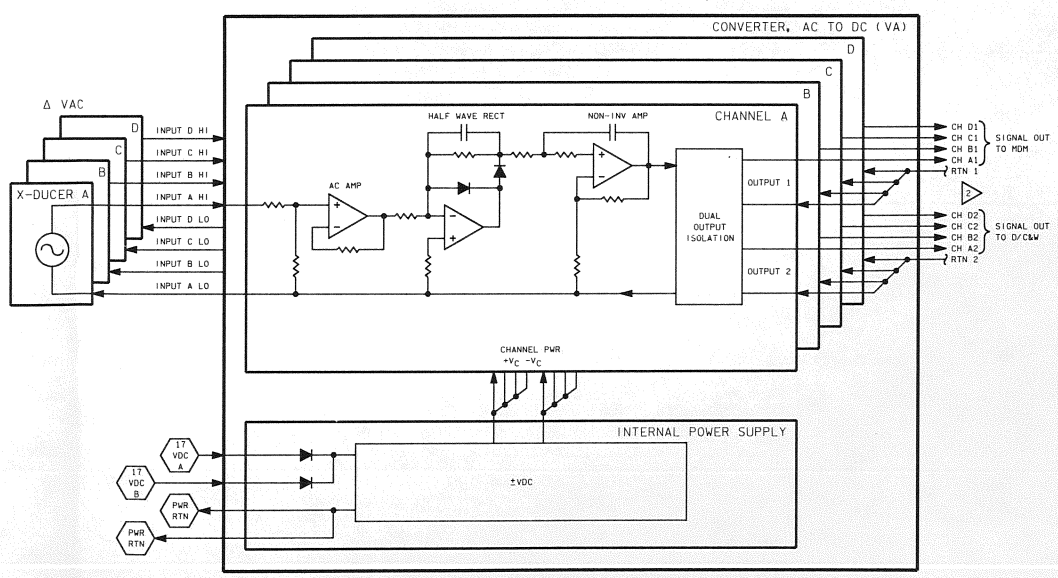


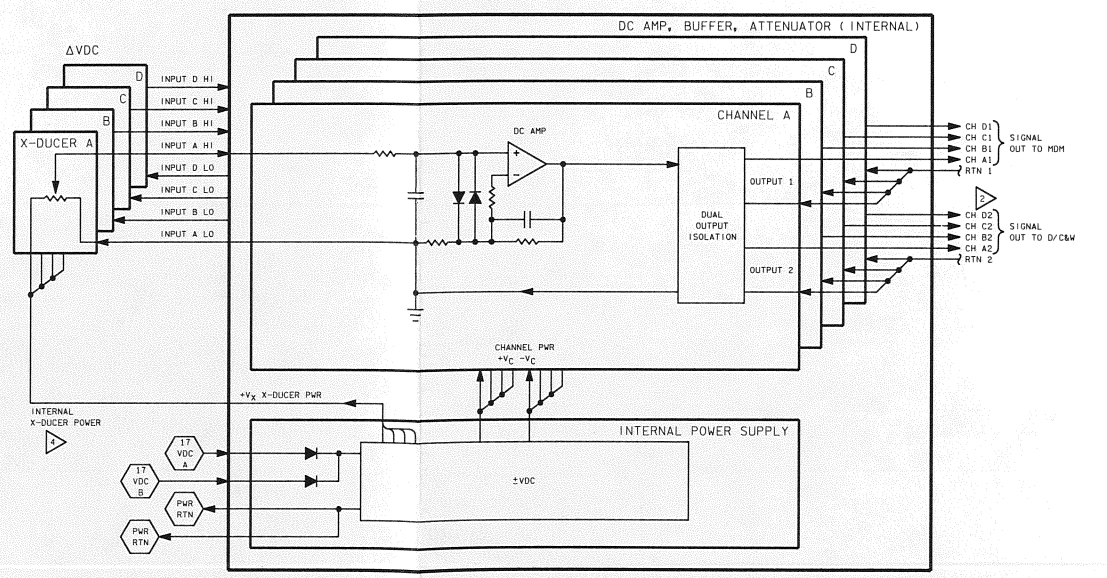










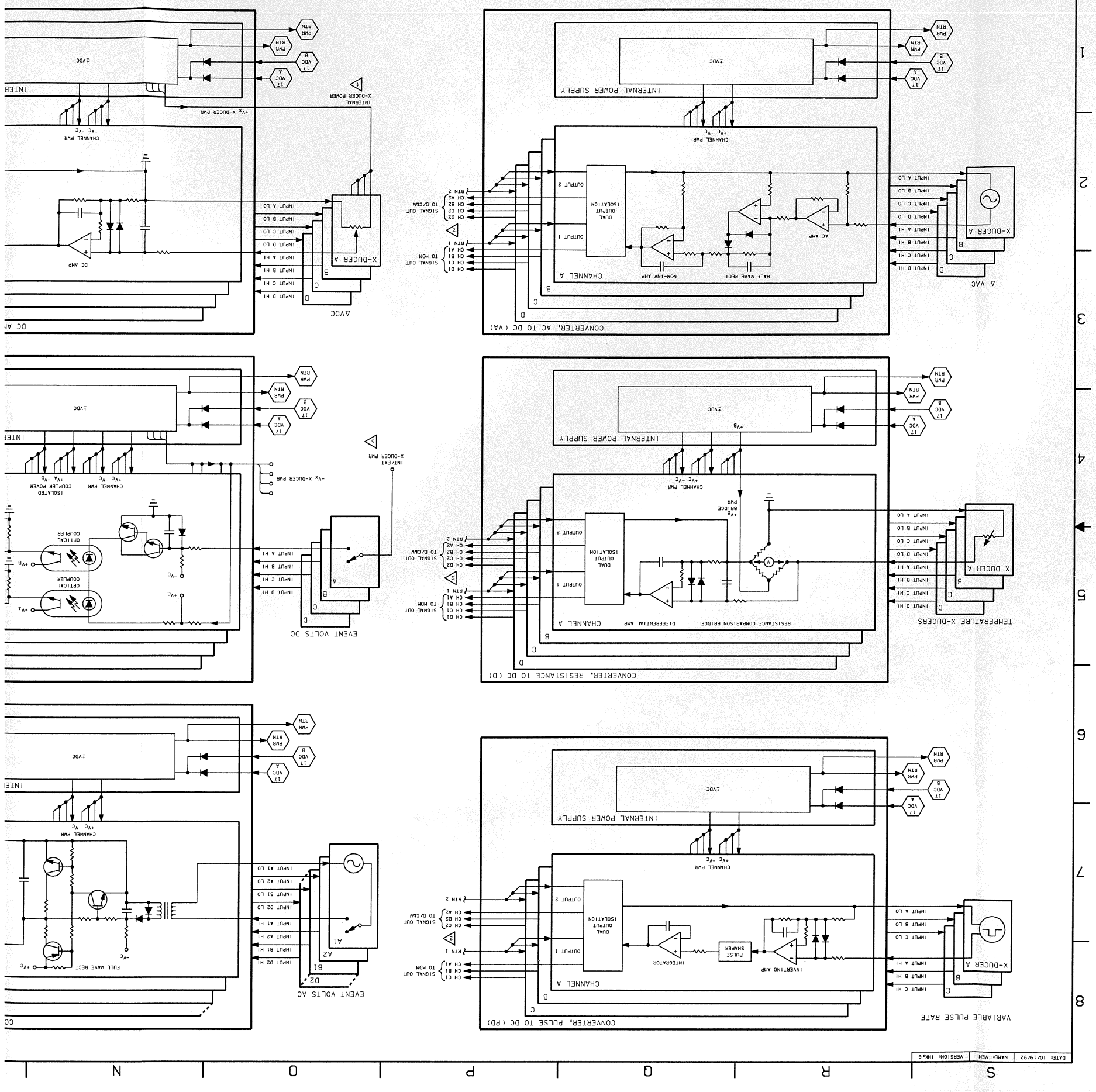


INSTRUMENTATION PROGRAM A
REFERENC

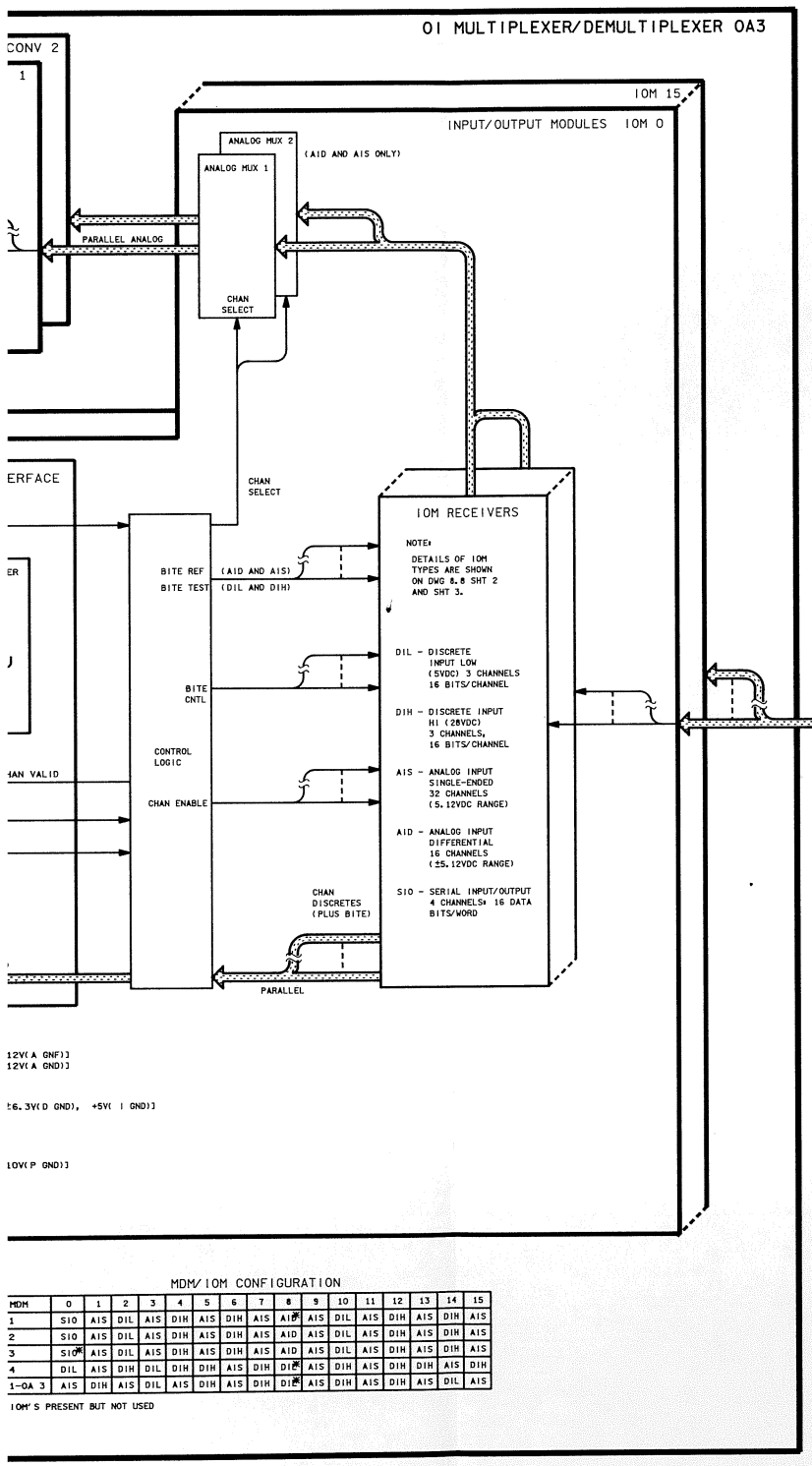
CARD NAME	CHANNEL / CHARACTER (*
	CHANNEL LIST
CONVERTER, PULSE TO DC	X (A-C)
CONVERTER, VAR RES TO DC	X (A-D)
CONVERTER, VOLTAGE AC TO DC	X (A-D)
CONVERTER, VOLTAGE DISCRETE AC	X (A-D)
BUFFER, 5VDC DISCRETE	X (A-D)
AMPLIFIER, BUFFER, ATTENUATOR (INTERNAL)	X (A-D)
AMPLIFIER, BUFFER, ATTENUATOR (EXTERNAL)	X (A-D)

* THE IPCL CHARACTERS DESIGNATED BY AN 'X' VARY
** CHARACTER 4 OF THE IPCL IDENTIFIES THE PLUG AN
*** CHARACTER 6 OF THE IPCL VARIES FROM IDENTIFYIN

BASIC REV E-2


CONVERTER, AC TO DC (VA)
CONVERTER, RESISTANCE TO DC (D)
CONVERTER, PULSE TO DC (PD)
INTERNAL POWER SUPPLY
CHANNEL A
DUAL OUTPUT ISOLATION
X-DUCER A
TEMPERATURE X-DUCERS
VARIABLE PULSE RATE
EVENT VOLTS DC
EVENT VOLTS AC
Δ VDC
Δ VAC
DC AMP
AC AMP
HALF WAVE RECT
NON-INV AMP
DIFFERENTIAL AMP
INTEGRATOR
INVERTING AMP
PULSE SHAPER
OPTICAL COUPLER
CHANNEL PWR
INTERNAL X-DUCER PWR
SIGNAL OUT TO D/C&W
SIGNAL OUT TO MUX
DATE 10/19/92
NAME VEM
VERSION INA.6

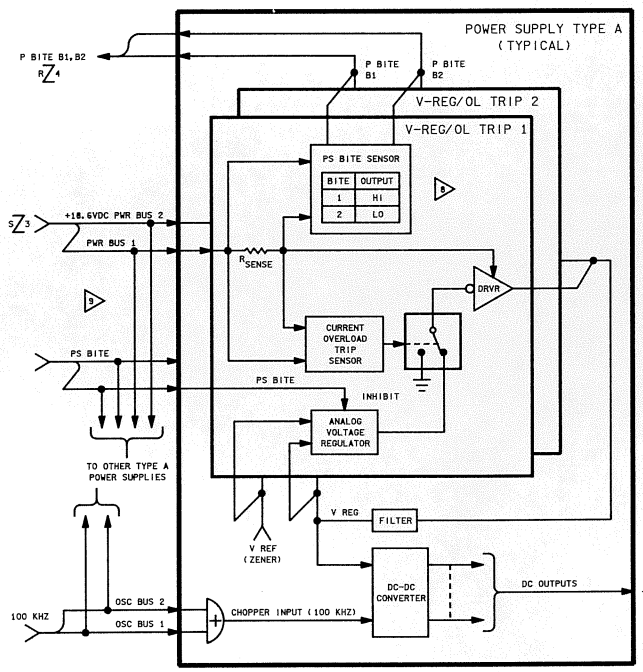
DATE: 09/21/90	NAME: JMB	VERSION: BPT, 2
DATE: 10/05/90	NAME: MDU	VERSION: BPT, 3
DATE: 10/13/90	NAME: JHL	VERSION: INK, 3



MDM/IOM CONFIGURATION

MDM	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	SIO	AIS	DIL	AIS	DIH	AIS	DIH	AIS	AID	AIS	DIL	AIS	DIH	AIS	DIH	AIS
2	SIO	AIS	DIL	AIS	DIH	AIS	DIH	AIS	AID	AIS	DIL	AIS	DIH	AIS	DIH	AIS
3	SIO	AIS	DIL	AIS	DIH	AIS	DIH	AIS	AID	AIS	DIL	AIS	DIH	AIS	DIH	AIS
4	DIL	AIS	DIH	DIL	DIH	DIH	AIS	DIH	DIL	AIS	DIH	AIS	DIH	DIH	AIS	DIH
1-OA 3	AIS	DIH	AIS	DIL	AIS	DIH	AIS	DIH	DIL	AIS	DIH	AIS	DIH	AIS	DIL	AIS

IOM'S PRESENT BUT NOT USED



13 THE FOLLOWING LOGIC REPRESENTATION SUMMARIZES THE HARDWARE AND SOFTWARE LOGIC BEHIND THE BITS IN THE BITE STATUS REGISTER, AND THE ACTION TAKEN

BITE STATUS REGISTER (BSR) HARDWARE/SOFTWARE LOGIC SUMMARY

BIT 1 POWER INTERRUPT (PWR INT)
BIT SET DURING PWR-UP OR PWR-DOWN (REFER TO ZONE P-3 FOR DETAILED LOGIC)
EACH SCU WILL SIMULTANEOUSLY DETECT PWR INT AND SET ITS OWN BSR
ACTION: ALL ANALOG AND DISCRETE OUTPUT CHANNELS ARE ABOUT TO BE RESET TO ZERO VDC

BIT 2 INCOMING DATA ERROR (IDE)
HARDWARE / SOFTWARE
INVALID MANCHESTER
BIT COUNT ERROR
PARITY ERROR
MIA END-OF-WORD
MIA DETECTED ERROR(=ERR) (ADE)
MDM ADRS OK
CMD DATA WD *101*
PATTERN CHECK OK
(=ERR) (SGC)
CMD WD
CMD DATA WD
IDE
SET BSR BIT 2
EOM (TERMINATE MICRO PROG)
ACTION: CMD WD/CMD DATA WD PROCESSING IS TERMINATED (SUBSEQUENT INCOMING DATA WORDS OF SAME MESSAGE ARE DISCARDED)
REFER TO ZONE Q-5

BIT 3 NON-EXISTANT IOM CHANNEL ADRS (NEC)
BIT SET WHEN IOM CHANNEL ADRS NOT VALID FOR SELECTED IOM ADRS (THAT IS, NO IOM REPLY AT 'NEC' CHECK TIME) (REFER TO ZONE N-5 FOR DETAILS)
ACTION: SUBSEQUENT CMD DATA WORDS ARE ACCEPTED IF CORRECT. ANY INCORRECT RESPONSE DATA WORD IS FLAGGED TO THE GPC VIA CLEARED V-BIT

BIT 4 UNABLE TO TRANSFER DATA TO/FROM IOM, OR DATA TRANSFER INCOMPLETE (NTI)
BIT SET WHEN IOM REPLY ((IRP) OR A/D REPLY (ADR) INDICATES FAILURE TO COMPLETE DATA TRANSFER (REFER TO ZONE N-5 FOR DETAILS)
ACTION: PROCESSING CONTINUES (V-BIT IS CLEARED FOR RESPONSE DATA WD THAT ENCOUNTED THE PROBLEM; SUBSEQUENT DATA WDS NOT AFFECTED)

BIT 5 TOO MANY WORDS IN LAST MESSAGE (TMW)
DATA SYNC DETECTED
CTR UNDERFLOW CND*
GAP-TIME ERROR CND
(=NOT SET) (CUF)
(=NO GTE)
UNEXPECTED CMD DATA WD
(GTE)
TMW
TMW**
SET BSR BIT 5
EOM (TERMINATE MICRO PROG)
*IF CMD WD MESSAGE TERMINATED PREMATURELY DUE TO DETECTED ERROR, CTR UNDERFLOW SET TO BYPASS THIS CHECK
**BIT 5 SET DURING INITIAL PWR-UP SEQUENCE AND DURING SCU BITE TEST SEQUENCING
ACTION: CMD DATA WD PROCESSING IS TERMINATED (THAT IS, CMD DATA WD IS IGNORED)
REFER TO ZONE P-3

BIT 6 LAST CMD NOT COMPLETED (LCN)
NEW CMD WD
SCU BUSY NOW
SET BSR BIT 6
LCN*
*BIT 6 SET DURING INITIAL PWR-UP SEQUENCE AND DURING SCU BITE TEST SEQUENCING
ACTION: NEW CMD WORD IS ACCEPTED
REFER TO ZONE P-6

BIT 7 SIMULTANEOUS OPERATION OF BOTH SCU'S (SIMOP)
OTHER SCU ALREADY BUSY
NEW CMD WORD RECEIVED
SIMOP
SET BSR BIT 7 (VIA HDWRE)
*EOM (VIA HDRWE)
ACTION: CAUSES IMMEDIATE HALT OF PROCESSING FOR BOTH PRI AND SEC SCU'S. EITHER SCU WILL CONTINUE UPON RECEIPT OF A NEW CMD WORD
REFER TO ZONE P-6

BIT 8 ILLEGAL MODE BRANCH COMMANDED (IMD)
INVALID MODE CNTL FIELD BRANCH
INVALID IOM CLASS MODE BRANCH
INCOMPATIBLE PROG SEQ/IOM CLASS MODE BRANCH
INCOMPATIBLE PROG SEQ/MODE CNTL FIELD BRANCH
UNEXPECTED CMD DATA WD
GAP TIME ERROR
(1=GTE)
(GTE)
IMD*
ILLEGAL BRANCH
ILLEGAL CMD
CMD WD
IMD
SET BSR BIT 8
EOM (TERMINATE MICRO PROG)
*BIT 8 MAY BE SET DURING SCU BITE TEST TO INDICATE UNSUCCESSFUL BITE TEST
ACTION: CMD WD/CMD DATA WD PROCESSING IS TERMINATED
REFER TO ZONE P-3

BIT 9 INTERNAL ERROR DETECTED (IER)
SEQUENCE PROM PARITY CHECK FAIL
UNEXPECTED IOM REPLY
UNEXPECTED A/D REPLY
UNEXPECTED PS BITE VALID
RSP DATA CHECK BIT PATTERN INVALID
(0=ERR)
(1=ERR)
(1=ERR)
(SPE)
(IRP)
(ADR)
(PBV)
REPLY BUS CHECK FAIL
REPLY BUS CHECK FAIL
INER
INT ERR
SET BSR BIT 9
CLEAR V-BIT
PS BITE TEST
IER
EOM (TERMINATE MICRO PROG)
ACTION: PROCESSING IS TERMINATED (REMAINING INCOMING CMD DATA WDS ARE IGNORED) NEW CMD WORDS ARE ACCEPTED
REFER TO ZONE N-6

BIT 10 INCOMING (MIA) WORD GAP INTERNAL ERROR (GTE)
GAP TIME ERROR
(1=ERR)
(GTE)
GTE
OBA
EXPECTED CMD DATA WORD*
SET BSR BIT 10
EOM (TERMINATE MICRO PROG)
*PROGRAM WAITS UNTIL OBA CONDITION IS NET PRIOR TO EACH EXPECTED CMD DATA WORD (OBA = DATA BUS ACTIVE OR GTE)
ACTION: PROCESSING IS TERMINATED (REMAINING INCOMING CMD DATA WDS ARE IGNORED) NEW CMD WORDS ARE ACCEPTED
REFER TO ZONE Q-5

BIT 11 SUCCESSFUL BITE TEST COMPLETION (SBC)
BIT SET WHEN SCU BITE TEST, A/D BITE TEST, OR CORE POWER SUPPLY BITE TEST SUCCESSFULLY COMPLETED
ACTION: NO ACTION REQUIRED

14 MDM IS DESIGNED TO OPERATE FROM EITHER INPUT PORT, I.E., PCMMU 1 OR PCMMU 2. SHOULD A FAILURE OCCUR EXTERNAL TO THE MDM OR TO THE PRIMARY MIA, SCU OR A/D WITHIN THE MDM, FAULT RECOVERY CAN BE EFFECTED BY SWITCHING PCMMU'S, RESULTING IN USE OF THE BACKUP MIA, SCU, AND A/D

15 DURING PS BITE TEST, REGULATORS ARE 'INHIBITED' (BY REDUCING REGULATION VALUE ABOUT 2-3%) IN ORDER TO FORCE OTHER REGULATOR TO CARRY FULL LOAD. IF OTHER REG HAS FAILED, OUTPUT WILL DECREASE TO REGULATION LEVEL OF PWR SUPPLY BEING TESTED

16 POWER SUPPLY 'TYPE A' UTILIZES CURRENT OVERLOAD PROTECTION LOGIC TO PROVIDE FAULT ISOLATION (CORE PWR SUPPLY PROTECTION). IF OVERLOAD TRIP CURRENT VALUE (TYPICALLY, APPROXIMATELY TEN TIMES MAX BITE VALUE) IS EXCEEDED, TRIP LOGIC CAN BE RESET ONLY BY CYCLING THE MDM POWER SWITCH

17 MIA AND SCU ARE HELD IN RESET CONDITION UNTIL 80% POWER LEVEL IS REACHED. AFTER RESET PERIOD, THE SCU CONDUCTS SCU POWER-UP BITE TESTS AND AFTER SUCCESSFUL COMPLETION ENABLES THE MIA

18 NONCOMPARISON RESULTS IN IMMEDIATE RESET OF BOTH MIA AND SCU. RESET CONDITION CAN ONLY BE REMOVED BY RECYCLING POWER TO THE MDM

19 BOTH POWER SUPPLIES ARE CONTINUOUSLY IN OPERATION. POWER SUPPLY DESIGN DOES NOT ATTEMPT TO BALANCE THE POWER PROVIDED BY EACH BUS.
DURING PS BITE TESTS, REGULATORS ARE 'INHIBITED' (BY REDUCING REGULATION VALUE ABOUT 2-3%) IN ORDER TO FORCE OTHER CHANNEL TO CARRY FULL LOAD. IF OTHER PWR SUPPLY HAS FAILED, OUTPUT WILL DECREASE TO REGULATION LEVEL OF PWR SUPPLY BEING TESTED.
NOTE: POWER INTERRUPT BIT OF BITE STATUS REGISTER IS NOT SET IN THIS CASE.

20 PWR AND CNTLS FOR 01 MDM'S SHOWN ON DWG NO. 17.1-1

21 REFER TO COMM MDM I/F DWG 16.2-6 FOR ADDITIONAL PL 1 AND PL 2 DATA BUS FLOW

22

DBC NO	DBC ID	DBC LOCATION	LRU NAME	LRU ID	LRU LOCATION	LRU PORT	DATA BUS
1	81V72A41A27	AV BAY 1	MDM OF1	81V75A10	AV BAY 1	1	01-1
2	82V72A44A12	AV BAY 2				2	01-2
3	81V72A41A29	AV BAY 1	MDM OF2	82V75A11	AV BAY 2	1	01-1
4	82V72A44A11	AV BAY 2				2	01-2
5	90V72A51A18	AV BAY 1	MDM OF3	83V75A12	AV BAY 3A	1	01-1
6	90V72A51A13	AV BAY 2				2	01-2
7	30V72A57A1	FLT DECK	MDM OF4	30V75A9	FLT DECK	1	01-1
8	30V72A57A2	FLT DECK				2	01-2
9	50V72A75	AFT FUS	MDM OA1	54V75A13	AV BAY 4	1	01-1
10	54V72A76	AV BAY 4				2	01-2
11	55V72A77	AV BAY 5	MDM OA2	55V75A14	AV BAY 5	1	01-1
12	50V72A78	AFT FUS				2	01-2
13	50V72A79	AFT FUS	MDM OA3	56V75A15	AV BAY 6	1	01-1
14	50V72A80	AFT FUS				2	01-2
15	40V72A345	MID FUS				1	01-1
16	50V72A346	MID FUS				2	01-2
17	81V72A41A28	AV BAY 2	PCMMU-1	81V75A1	AV BAY 1	–	01-1
18	82V72A43A7	AV BAY 3	PCMMU-2	82V75A2	AV BAY 2	–	01-2
19	81V72A41A11	AV BAY 1	PCMMU-1				P/L-1
20	81V72A41A12	AV BAY 1	PDI	81V75A8			P/L-1
21	82V72A43A5	AV BAY 2	PCMMU-2				P/L-2
22	82V72A43A6	AV BAY 2	PDI				P/L-2
23	81V72A42A36	AV BAY 1	GPC1	81V72A16	AV BAY 1		IP1
24	81V72A41A26	AV BAY 1	PCMMU-1				IP1
25	81V72A40A5	AV BAY 1	PCMMU-2				IP1
26	82V72A45A28	AV BAY 2	GPC2	82V72A17	AV BAY 2		IP2
27	82V72A44A26	AV BAY 2	PCMMU-1				IP2
28	82V72A43A8	AV BAY 2	PCMMU-2				IP2
29	83V72A46A3	AV BAY 3	GPC3	83V72A18	AV BAY 3		IP3
30	80V72A48A5	CREW DECK	PCMMU-2				IP3
31	80V72A49A5	CREW DECK	PCMMU-1				IP3
32	81V72A42A9	AV BAY 1	GPC4	81V72A19	AV BAY 1		IP4
33	81V72A41A6	AV BAY 1	PCMMU-1				IP4
34	81V72A40A2	AV BAY 1	PCMMU-2				IP4
35	82V72A45A9	AV BAY 2	GPC5	82V72A20	AV BAY 2		IP5
36	82V72A44A2	AV BAY 2	PCMMU-1				IP5
37	82V72A45A9	AV BAY 2	PCMMU-2				IP5
38	40V72A353	MID FUS	EXP/SCOS		SPACELAB		P/L-1
39	40V72A354	MID FUS	EXP/SCOS		SPACELAB		P/L-2

NOTES: 23

DBC NO	DBC ID	DBC LOCATION	LRU NAME	LRU ID	LRU LOCATION	DATA BUS
44	81V72A42A22	F AV BAY 1	PF 1	81V72A38	F AV BAY 1	PL 1
46	81V72A42A23	F AV BAY 1	PF 2	82V72A34	F AV BAY 2	PL 1
52	81V72A42A10	F AV BAY 1	IOP1	81V72A16	F AV BAY 1	PL 1
58	81V72A42A19	F AV BAY 1	IOP2	82V72A17	F AV BAY 2	PL 1
64	90V72A51A11	ECLSS	IOP3	83V72A18	F AV BAY 3A	PL 1
70	81V72A42A20	F AV BAY 1	IOP4	81V72A19	F AV BAY 1	PL 1
76	81V72A42A21	F AV BAY 1	IOP5	82V72A20	F AV BAY 2	PL 1
78	81V72A40A3	F AV BAY 1	PDI	81V75A8	F AV BAY 1	PL 1
81	40V72A347	MID FUSE	P/L 1 PROV		MID FUSE	PL 1

1 INST MDM 3

SIGNATURE		DATE
DSGN	VICKI S. HUNTER	2/22/82
DR		
ENGR	A. MORRISON	
ENGR	A. Morrison	10-23-90
APP	D. Pryfle	10/23/90
APP	R. W. Johnson	10-23-90
OMNIPLAN	S.K. Kondo	11/1/90

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

O/I INST MDM

LTR	PCN		SPACE SHUTTLE	DWG NO
E		126.5 X 34	ALL	17.1
		PAGE		SHEET 3 OF 3

BASIC REV E

MDM/IOM CONFIGURATION

MDM	0	1	2	3	4	5	6	7	8	9	10	11	12	13
OF 1	SIO	AIS	DIH	DIL	AIS	DIH	AIS	DIH	AIS	AIS*	DIL	AIS	DIH	AIS
OF 2	SIO	AIS	DIL	AIS	DIH	AIS	DIH	AIS	AIO	AIS	DIL	AIS	DIH	AIS
OF 3	SIO*	AIS	DIL	AIS	DIH	AIS	DIH	AIS	AIO	AIS	DIL	AIS	DIH	AIS
OF 4	DIL	AIS	DIH	DIL	AIS	DIH	AIS	DIH	AIO	AIS	DIL	AIS	DIH	AIS
OA 1-OA 3	AIS	DIH	AIS	DIL	AIS	DIH	AIS	DIH	AIO*	AIS	DIL	AIS	DIH	AIS

* IOM'S PRESENT BUT NOT USED

DATE: 10/13/90 | NAME: JHL | VERSION: INK 3

W V U T S R Q P O N

8 7 6 5 4 3 2 1

DATA BUS PCM PL 2
SPACELAB ECOS/SCOS
DATA BUS PCM PL 1
PAYLOAD DATA INTERLEAVER
PL1
DATA BUS IP1
IP2
IP3
IP4
IP5
GENERAL PURPOSE COMPUTER 1
GPC 2
GPC 3
GPC 4
GPC 5
MDM PF1
MDM PF2
PAYLOAD PROVISION
PCMMU 2
PCMMU 1
MDM OF4
OF1
OF2
OF3
OA1
OA2
BUS 01-2
BUS 01-1
PCMMU 2 I/F
PCMMU 1 I/F
RPC
28V
ON
OFF
(TYPICAL)
DATA BUS COUPLER
DATA BUS COUPLER TERMINATION
50Ω
1.4
75Ω
TO LINE REPLACEABLE UNIT
MULTIPLEXER INTERFACE ADAPTER (MIA) PORT 2
MULTIPLEXER INTERFACE ADAPTER (MIA) PORT 1
MANCHESTER ENCODER
DATA SYNC GEN
NRZ TO MANCHESTER CONVERTER
PARITY GEN
XMTR
MANCHESTER DECODER
SYNC DETECTOR
MANCHESTER TO NRZ CONVERTER
MIA ERROR DETECTION
RCVR
TO A/D CONV 1
MIA 1 SCU 1
TO A/D CONV 2
MIA 2 SCU 2
PWR SUPPLY 2
PWR SUPPLY 1
MIA REG
±12VDC
+5V +5.3V +10V +20V +12V DC-DC CONVERTER
BITE VALID LOGIC
EMI FILTER
ENERGY STORAGE INPUT POWER FILTER
DUAL-REDUNDANT VOLTAGE REGULATORS
PWR BUS 2
PWR BUS 1
PRIMARY REGULATOR
ENERGY LEVEL VALID MONITOR
DC-DC CONVERTER
10 VOLT DC REGULATOR
28VDC
10.8VDC
DIG GND REF
PWR (28VDC) GND REF
18.6VDC
18.6V
FROM IOM TYPE A AND B POWER SUPPLIES
PS BITE VALID
TO IOM TYPE B POWER SUPPLY
TO IOM TYPE A POWER SUPPLY
MIA INTERFACE LOGIC
XMIT CNTL LOGIC
RSP SYNC
DEAD STOP CLEAR
XMIT ENABLE
SYNC TO MIA TIMING
MDM WIRED ADRS
MDM ADRS FIELD DECODER/ COMPARE LOGIC
ADRS OK
RCVR SYNC
RCVR SYNC CNTL LOGIC
SERIAL TO PARALLEL CONVERTER (5 BITS)
SYNC TO SCU TIMING
DATA BUS WORD ERROR DETECT LOGIC
BSR BIT 2
BSR BITS 10,5
MIA DETECTED ERR
DATA WD 101
GAP-TIME ERR
SCU BUSY CROSS STRAP
BSR BITS 6,7
MEM CONTROL LOGIC
SCU CLK
CMD SENSE DISCRETES
MICROPROGRAM CNTRL UNIT
PWR ENA
CONTROL STORE ROM
ROM MICROPROGRAM BUFFER
INSTRUCTION DECODER AND ROM ADDRESS SELECT
SEL
CMD SENSE MUX
MICROPROGRAM CONTROLLED TIMER
SEV BITS
E-BIT
V-BIT
S-BIT
SCU SERIAL OUT BUS MUX
5 BITS
SCU INT BUS DATA-FLOW CONTROL UNIT
BITE STATUS REG
REG FILE FIELD DECODER
SCU BUS OUT REG
MUX
BSR BUS I/F
MDM WIRED ADDRESS
WIRED ADRS BUS I/F
RECEIVE BUS INTERFACE
REG FILE BUS I/F
COUNTERS BUS I/F
SEQ PROM BUS I/F
LOGIC ZEROES BUS I/F
REGISTER FILE
MODE CONTROL FIELD (BSR BIT 8)
PARALLEL CTRS
UPPER CTR
LOWER CTR
CTR UNDERFLOW (BSR BIT 5)
SEQUENCE PROM
(512 WD X 16 BITS)
BUS LOAD REGISTER
PWR INTERRUPT/MONITOR LOGIC
SCU +10V FAIL DETECTOR
DEAD STOP CLEAR (DSC) LOGIC
PWR SUPPLY BITE ENABLE INTERFACE
DELAYED DSC LOGIC(1 - 2 SEC)
PWR INTERRUPT MONITOR
PWR INT RESET LOGIC
RESET S BIT
STOP MICROPROGRAM
RESETS MIA, RCVR SYNC, CYCLIC REG AND BSR
RESETS CNTL STORE MEMORY ADDRESS BIT REG
PWR INT (BSR BIT1)
S-BIT STATUS
MISCOMPARE
CYCLIC COMPARE LOGIC
MICROPROGRAM CONTROLLED REALTIME SELF TEST
CONTROL DISCRETES
8 BIT COMPARE FIELD
CONTINUOUS INPUTS (46)

BASIC REV E

DATE: 04/05/96	NAME: BJB	VERSION: INR:8
DATE: 05/14/96	NAME: MDU	VERSION: BPT:8
DATE: 06/13/96	NAME: BJT	VERSION: INR:9

PCM MASTER UNIT 2
PCM MASTER UNIT 1

TOGGLE BUFFER 1 (TYPICAL 1 OF 5)

TELEMETRY FORMATS AND CONTROL

01/PL DATA RAM

BITE STATUS REGISTER (BSR)

BIT 1 POWER STATUS	BIT 2 MTU INPUT	BIT 3 FETCH CMD PARITY	BIT 4 HDR TM DMLK	BIT 5 LDR TM DMLK	BIT 6 HDR TM PARITY	BIT 7 HDR TM COUNTERS	BIT 8 LDR TM PARITY/ COUNTERS
BIT 9 RCDR DATA OUT	BIT 10 INPUT DATA VALID	BIT 11 01 RAM PARITY	BIT 12 PL RAM PARITY	BIT 13 TOGGLE BUFFER PARITY	BIT 14 NO RESPONSE GPC	BIT 15 NO RESPONSE 01/PL	BIT 16 HDR TM 0=FIXED 1=PRGM

PNL M030F

PNL 05

SIGNATURE	DATE	
DSGN LINDA DUMIS	7/10/79	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR		
ENGR M. PICKENS		01 PCM MASTER UNIT
ENGR Mark A. Pickens	7/16/96	
APP Gary C. Hunt	7/16/96	
APP David J. Marvin	7/16/96	SPACE SHUTTLE
CADS S.K. Kimbrell	7-22-96	ALL
LTR E PCN 6		126.5 X 34

DWG NO 17.2
PAGE
SHEET 1 OF 1

*2 01 PCMMU

BASIC REV E-6

PCMMU 01/PL RAM MAP Z_4

18-P01 SWITCH MAT ← 19,20,21,22-DPL 1,2,3,4

RESERVED 13 P01 47

MDM OF3 1115 1179

MDM OF2 1179 1178

MDM OE3 1178 948

MDM OE2 948 717

MDM OE1 717 487

MDM OA3 487 257

MDM OA2 257 27

MDM OF4 2784 2554

MDM OF1 2554 2324

MDM OA1 2324 2094

MDM OA4 2094 1864

MDM OF2 1864 1634

MDM OE4 1634 1404

MDM OE1 1404 1174

MDM OA2 1174 944

MDM OF4 944 714

MDM OF1 714 484

MDM OA1 484 254

MDM OA4 254 24

S/L ECOS 3543 3313

S/L SCOS 3313 3083

S/L SCOS (5 AT 20, 8 AT 10, 60 AT 5 S/S) 3083 2853

PDI RAM DATA (5 S/S) 2853 2623

PDI TOOLE BUFFER DATA (50 S/S) 1429 1433

PDI RAM DATA (5 S/S) 2068 2038

S/L DYNAMIC WRAP 2037 (SCOS1) AND 2067 (ECOS1)

S/L BSR-2068 (SCOS1) AND 2067 (ECOS1)

SPARES (2039-2041) SPARES (2046-2049)

PCM BIT 2 (2042) MTU CNT USED FOR CPC SYNC-FETCH 3940 VIA OF1 AT 1 S/S (2043-2045)

LOCATIONS-1430 PDI DYNAMIC WRAP V75X40070, 1431 AND 1432 PDI BSR

SPARES (2031-2033) PDI SLOWMAX

PDI BIT 2 V75X40030 (2050)

SPARE (4093) NON-VOTED MTU VIA OF2 (4088-4094) VOTED MTU VIA OF1 (4081-4087) OF4 MDM DATA (4078-4080)

4077

Z_4 4,608 MHZ MTU INPUT

Z_1 6,9

Z_2

Z_1

TO BSR

SPEC 62

FETCH CMD PARITY BSR BIT 3 X21230 V75 1=GOOD

FETCH COMMAND READOUT CONTROL

DATA BUS DECODE (01 OR PL) AND GATE LOGIC

FETCH COMMAND CLOCK 4 KHZ

FETCH FORMAT 4000 X 44 BITS

PARITY CHECK

FETCH FROM CONTENT

CMD WORD | PCMMU RAM ADDR | V | P | VALIDITY

1 2 25 26 30 31 42 43 44

DATA | FILL

1 10 11

ANALOG DATA (TYP)

NUMBER OF RESPONSE WORDS

ISSUED TO MDM, PDI OR S/L

1 = 01

0 = P/L

DOD PARITY

VALIDITY

16 17 18

DATA

1

01 MUX INTERFACE ADAPTER

PL MUX INTERFACE ADAPTER

XMIT SHIFT CLOCK

XMIT COMMAND SYNC

XMIT DATA (24 BITS)

M2 TO MANCHESTER

PARITY GEN

SYNC GEN

TX

RCVR

TIMING AND CONTROL

RCVR ENABLE

XMIT ENABLE

RESET

TX DATA AVAILABLE

RCV DATA BUS BUSY

TX DATA BUS BUSY

16 MHZ CLOCK

END OF WORD

SYNC DETECT AND MANCHESTER TO M2

VALID MANCHESTER CHECK

BIT COUNT CHECK

PARITY CHECK

MANCHESTER CODE ERROR

BIT COUNT ERROR

PARITY ERROR

SEV ERROR

TIMING CONTROL LOGIC

TO/FROM PDI AND/OR SPACELAB I/O

17,1-1

01 MDM INPUT/OUTPUT BUFFER

PL INPUT/OUTPUT BUFFER

01 DATA RAM STARTING ADDRESS

PARALLEL OUTPUT REGISTER

16 BIT

01 DATA

SHIFT OUT INHIBIT

BSR BIT 15

SEV ERROR

16 BIT PARALLEL OUTPUT REGISTER

FETCH COMMAND OUTPUT CONTROL

01 DATA RAM STARTING ADDRESS

PL DATA RAM STARTING ADDRESS (5 BITS)

PL VALIDITY (BIT 17)

PL DATA (16 BITS)

01 VALIDITY (BIT 17)

01 DATA (16 BITS)

ADDRESS CHECK + 101 CHECK

ADDRESS CHECK TIMING WORD COUNT RETURN TIME-OUT FIRST WORD RETURN

24 BIT INPUT SERIAL/PARALLEL BUFFER REGISTER

TIMING AND CONTROL

TO/FROM 01 MDMS

17,1-1

GPC CMD WORD

GPC DATA WORD

GPC VALIDITY BIT

DATA BIT (1-16)

VALIDITY (BIT 17)

PARITY (BIT 18)

2K X 18

01 DATA RAM

PL DATA RAM

2047

2048

4095

0

ADDRESS DECODE AND ROUTE

BIT 12

WRITE LOGIC

READ LOGIC

PARITY CHECK

01/PL DATA RAM

64 KBPS RECOUEST

SEE R-Z_1-4

FOR PCMMU 01/PL RAM MAP DETAILS

RESPONSE DATA TO GPC

GPC COMMAND WORD (CW) OR DATA WORD (DW)

128 KBPS REQUEST

PL INPUT/OUTPUT BUFFER 1 (TYPICAL 1 OF 5)

GPC INPUT/OUTPUT BUFFER 1 (TYPICAL 1 OF 5)

16 BITS DATA

17 BIT INPUT BUFFER

PARALLEL/SERIAL XMIT BUFFER CONTROL LOGIC AND PARITY BIT GEN

XMIT SYNC

XMIT SHIFT CLOCK

M2 DATA 24 BITS (SERIAL)

S BIT SET TO 1

V BIT SET TO 1

CMD WORD OUTPUT REGISTER

SHIFT OUT INHIBIT

16 BIT DATA WORD OUTPUT REGISTER

GPC DATA WORD

CMD WORD

SHIFT OUT INHIBIT

ADDRESS CHECK + 101 CHECK

SEV BITS = 101 CHECK

SEV ERROR

ADDRESS CHECK TIMING WORD COUNT RETURN TIME OUT

BSR BIT 19

SPEC 62

TO BSR

NO RESP GPC

0=NO RESPONSE 1 S/S

BSR BIT 14

V75 X21240

GPC VALIDITY (BIT 17)

INPUT DATA

BSR BIT 10

V75 X21200

1=VALID 0=NOT VALID

ADDRESS CHECK

STORED ADDRESS FOR 108 1

CMD WORD GATE

DATA SYNC DETECT AND GATE

SERIAL/PARALLEL INPUT BUFFER

24 BITS M2 (SERIAL)

TIMING AND CONTROL

TO/FROM SPACELAB I/O AND/OR 01/PL MIAS

17,1-1

GPC MIA 1 SIMILAR TO (TYPICAL 1 OF 5)

GPC MIA 5

GPC MIA 4

GPC MIA 3

GPC MIA 2

GPC MIA 1

TO/FROM DATA BUS COUPLERS

Z_1 8,1

Z_5 17,1-1

TO PCMMU 2

TO PCMMU 1

TO NSP 16,3-1

1A

5A

RPC

PMA

PMB

PMC

PMD

PCMMU 2 RPC 2

PCMMU 2 RPC 1

PCMMU 1 RPC 2

PCMMU 1 RPC 1

PCMMU 2 PMA

PCMMU 2 PMB

PCMMU 1 PMC

PCMMU 1 PMD

V76 X42746 V76 X42728 V76 X42656 V76 X42612

V75 S21090 V75 S21070 V75 S21050 V75 S21030

LPF

GSE

V75X21210N V75X21210M V75X21210B V75X21210A

CNTLBC1 CNTLAB1 CNTLAC1

01 PCMMU

PMA C3

ST

Z

Y

X

$\frac{\text{50 MINOR FRAMES}}{\text{1 MAJOR FRAME}} \times \frac{\text{1 MAJOR FRAME}}{\text{2 SECONDS}} = 51.2$ KBPS

128 WORDS

50 MINOR FRAMES

127

SELECTED GPC DOWNLIST FORMAT (16-BIT WORDS)

OR FRAME

CSPONSE GPC

CW S1

17 18 19

POWER SUPPLY

EMI SHIELD

EMI FILTER

PRE-REGULATOR

DC/DC CONVERTER

OVERVOLTAGE PROTECT

POWER ON RESET CIRCUIT

SENSING REGULATOR

+5VDC

+5.25VDC

+12VDC

-12VDC

POWER RESET LOGIC CONTROLS

V75 X21210 PWR STATUS BSR BIT 1

1=GOOD 0=BAD

SPEC 62

TO BSR

I Z_6 Z_5

3 Z_6

1 Z_5

V75 X21200 INPUT DATA VALID BSR BIT 10

1=VALID 0=NOT VALID

SPEC 62

TO BSR

V75 X21240 NO RESP GPC BSR BIT 14

0=NO RESPONSE 1 S/S

SPEC 62

TO BSR

V75 X21230 FETCH CMD PARITY BSR BIT 3

1=GOOD 0=BAD

SPEC 62

TO BSR

Z_1

Z_2

Z_4

Z_5

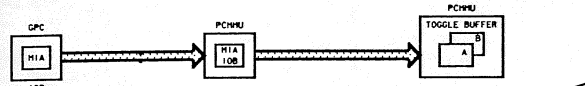
Z_6

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108

S R Q P O N M L K J

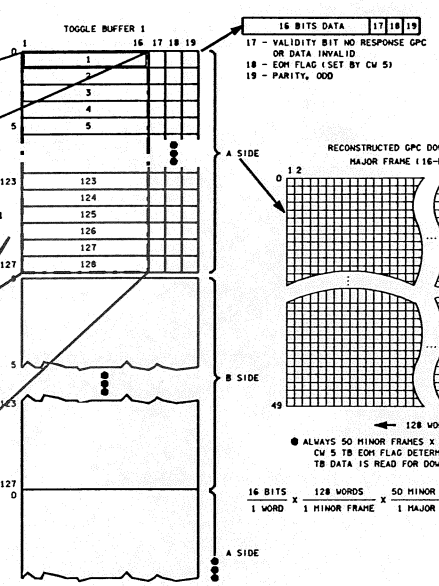
DATE: 06/13/96 | NAME: BJT | VERSION# INK=9

SAMPLE GPC DOWNLIST ACTIVITY (GNC)

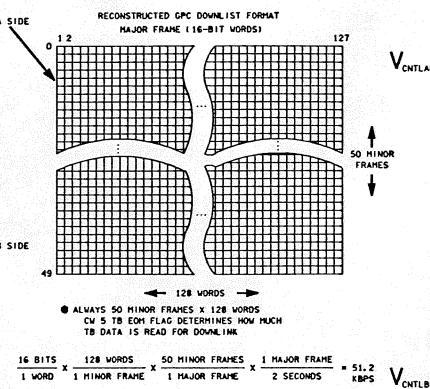


IP BUS TRAFFIC FOR SINGLE GPC MINOR FRAME/SINGLE TOGGLE BUFFER LOAD

CW5 SETS "WRITE" COMPLETE AND SETS EOM FLAG (BIT 18) WITH DATA IN TOGGLE BUFFER FOR END OF NEXT READ CYCLE



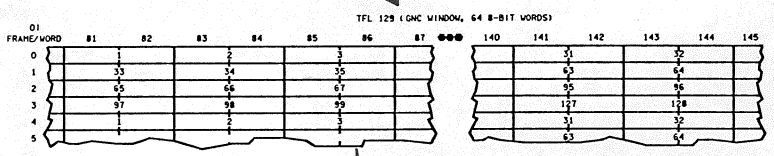
16 BITS DATA | 17 | 18 | 19
17 - VALIDITY BIT NO RESPONSE GPC OR DATA INVALID
18 - EOM FLAG (SET BY CW 5)
19 - PARITY, ODD

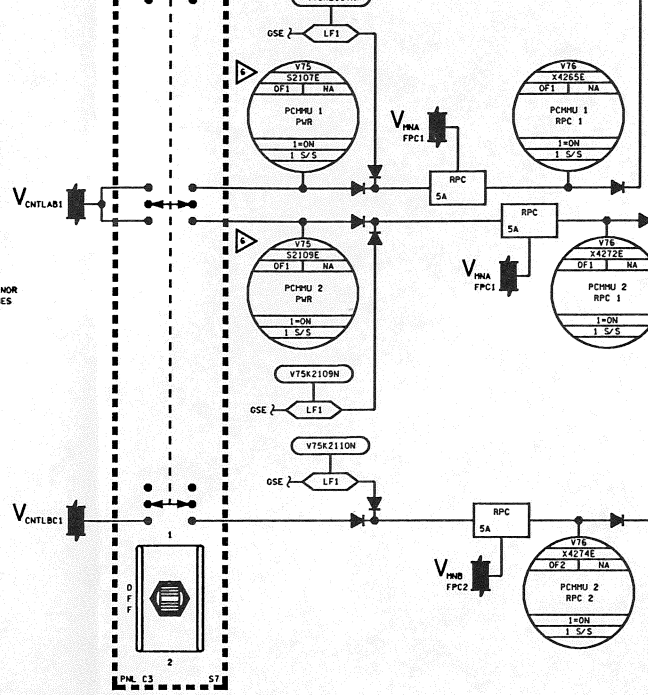


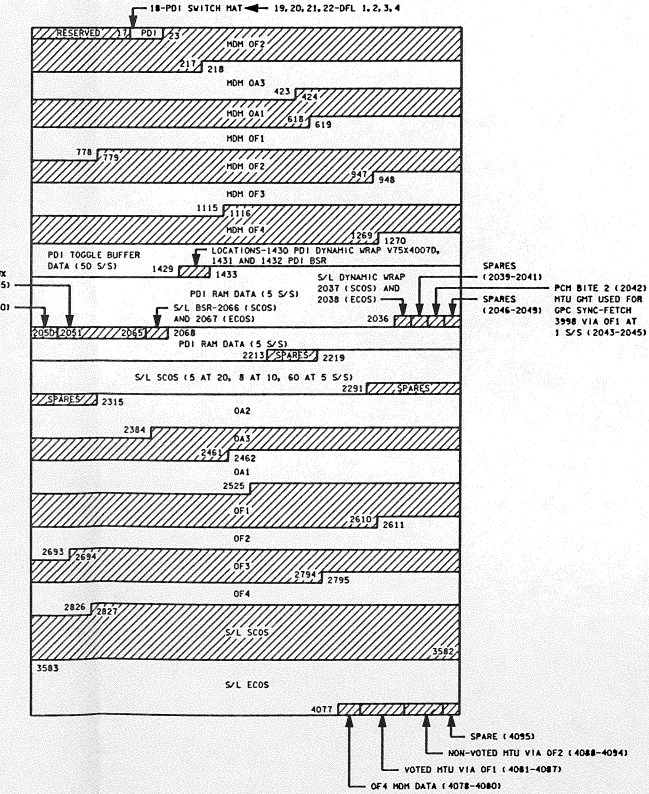
● ALWAYS 50 MINOR FRAMES X 128 WORDS
CW 5 TB EOM FLAG DETERMINES HOW MUCH TB DATA IS READ FOR DOWNLINK

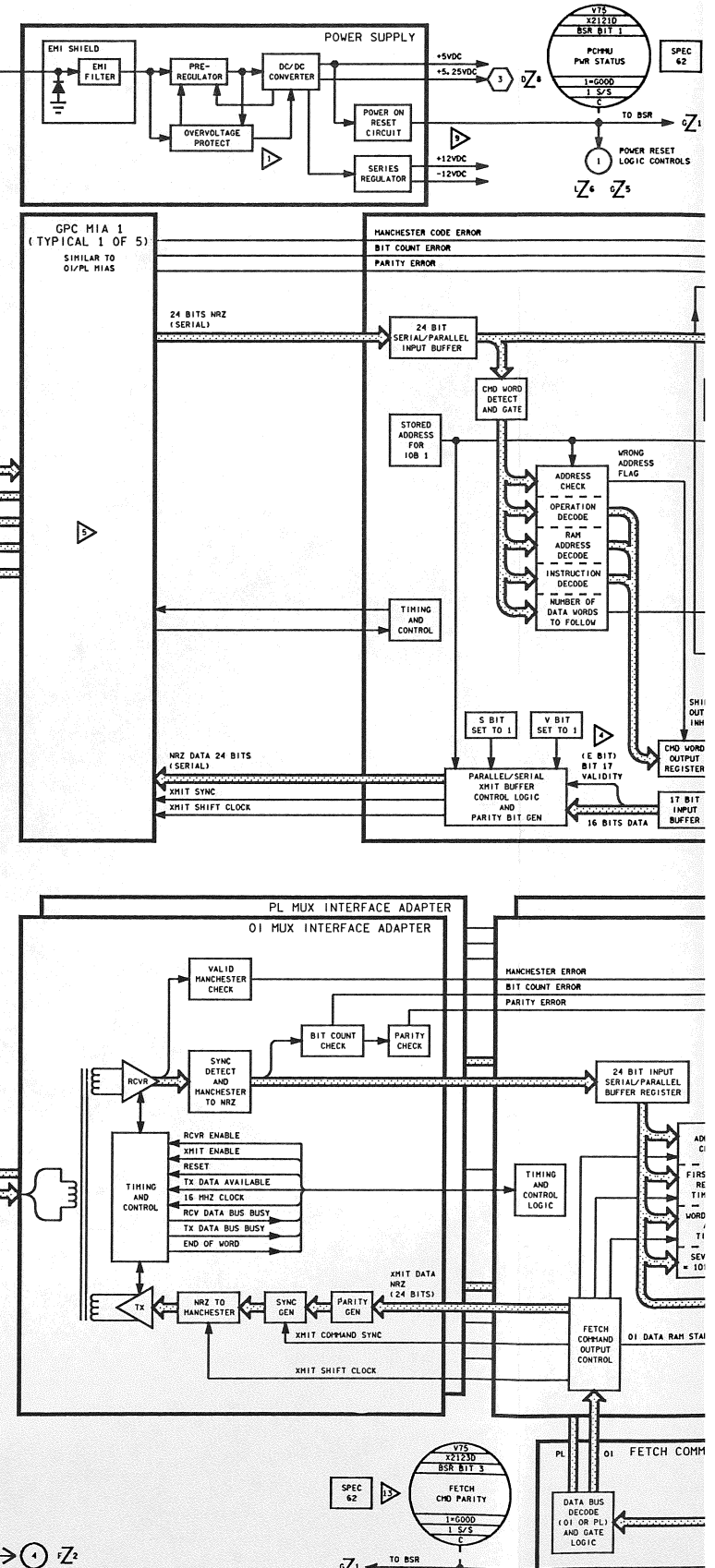
$$\frac{16\ \text{BITS}}{1\ \text{WORD}} \times \frac{128\ \text{WORDS}}{1\ \text{MINOR FRAME}} \times \frac{50\ \text{MINOR FRAMES}}{1\ \text{MAJOR FRAME}} \times \frac{1\ \text{MAJOR FRAME}}{2\ \text{SECONDS}} = 51.2\ \text{KBPS}$$

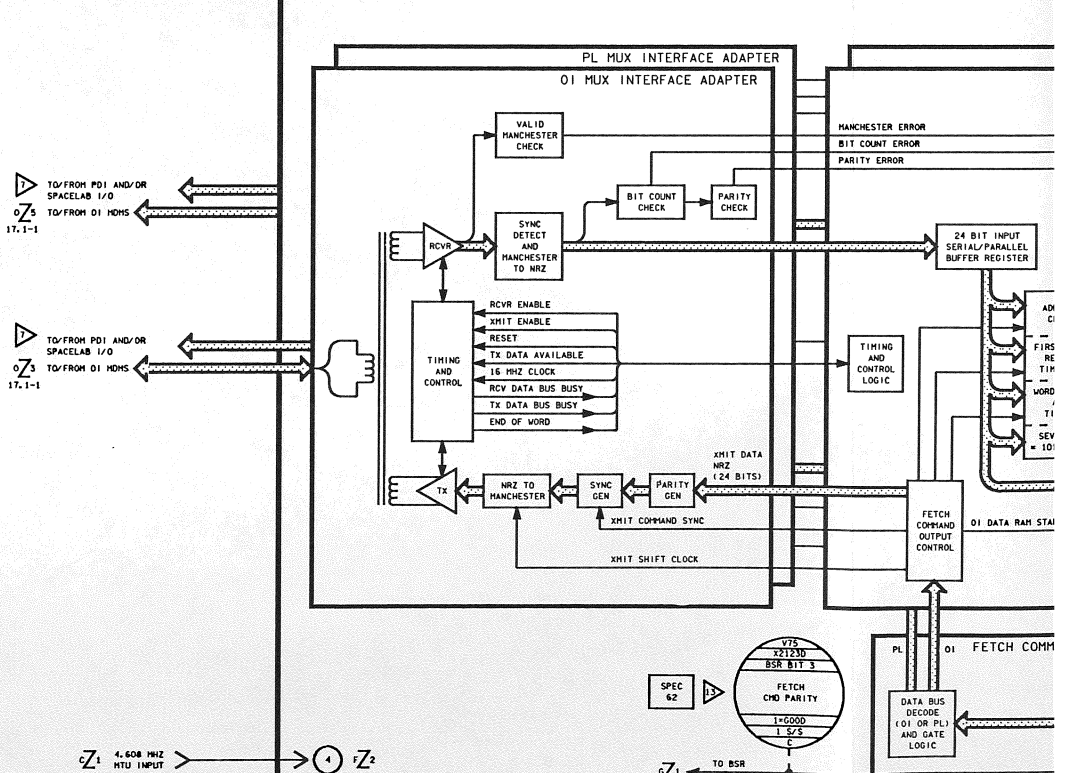
TFL 129 (GNC WINDOW, 64 8-BIT WORDS)











DATE: 05/13/96	NAME: MDU	VERSION BPT: 2
DATE: 06/13/96	NAME: BJT	VERSION INR: 2
DATE: 07/25/96	NAME: MDU	VERSION INR: 1

RAM AND TB SECTION FOR DCM 4
RAM AND TB SECTION FOR DCM 3
RAM AND TB SECTION FOR DCM 2
RAM AND TB SECTION FOR DCM 1
MFC OR MFS WORD (8 BITS)
MFC OR MFS WORD POS BIT
8 BIT WORD SELECTOR
8 BITS
DATA
8 BIT RAM DATA
RAM SELECT
RAM HOLDING REGISTER
BYTE 1 OR BYTE 2 SEL
FILL 1 GENERATOR FOR BYTE 2
SEL BYTE 1
SEL BYTE 2
8 BIT BYTE 2
8 BIT BYTE 1
TOGGLE BUFFER HOLDING REG
XFER
STATUS REG 16 BITS
STATUS REG ACCUM
STATUS REG XFER
BR ACC
DFL ID
TYPE 4 SYNC SEL
TYPE 4 SYNC WORDS (UP TO 4, 8 BIT WORDS)
SYNC 1 ENABLE
SYNC 2 ENABLE
SYNC 3 ENABLE
SYNC 4 ENABLE
SELECT FILL ONES
EVEN
ODD
IRIG TIME
V75 X64100 VRD SYNC 3 VRD LOCK BSR BIT 10 WORD 1 1=LOCK 1 S/S
V75 X64140 VRD SYNC 4 VRD LOCK BSR BIT 14 WORD 1 1=LOCK 1 S/S
V75 X64090 DCH 3 MF FRM SYNC BSR BIT 9 WORD 1 1=GOOD 1 S/S
V75 X64130 DCH 4 MF FRM SYNC BSR BIT 13 WORD 1 1=GOOD 1 S/S
V75 X64280 FPM PARITY GOOD BSR BIT 9 WORD 2 1=GOOD 1 S/S C
SPEC 62
MASTER FRAME SYNC
EO
MF 1500B
RAM CNTL
CNTL
MASTER FRAME SYNC
MASTER FRAME SYNC DETECTOR
MASTER FRAME COUNT AND COMPARE
COUNT UP/DOWN
MASTER FRAME PSUEDO MINOR FRAME COUNT
MF SYNC DETECT
ADDRESS INDEX COUNT AND COMPARE SAMP RATE Y
ADDRESS INDEX COUNT AND COMPARE SAMP RATE Y/A
ADDRESS INDEX COUNT AND COMPARE SAMP RATE Y/B
ADDRESS INDEX COUNT AND COMPARE SAMP RATE Y/C
ADDRESS INDEX COUNT AND COMPARE SAMP RATE Y/D
ADDRESS INDEX COUNT AND COMPARE SAMP RATE Y/E
ADDRESS INDEX COUNT AND COMPARE SAMP RATE Y/F
INITAL VALUES FROM SAMP RATE INITILIZATION TABLES
WORDS 512 THRU 576 SAMP RATE TABLES
RAM SELECT
TYPE 2 SEL
TYPE 3 SEL
COUNT UP/DOWN
BIT 14
TYPE 1
TYPE 2
TYPE 3
TYPE 4
BIT 9
BIT 8
WORD 528 FMT CONST SECTION
EVEN
ODD
ODD EVEN COUNT
BIT 1 TB SEL
BIT 9 TO SEL
STAT REG XFER
SEL FILL "1"S
BIT 2 LAST TB
BIT 10 LAST TB
SYNC POSITION BIT
BIT 3 SPEC PROC BIT
BIT 11 SPEC PROC
TYPE 4 SYNC SEL
RAM SELECT
RESET ENA
BIT 4 RAM SEL
BIT 12 RAM SEL
BIT 5 FIRST RAM WORD
BIT 13 FIRST RAM
BITS 6,7,8 RATE SELECT
BITS 16,15,14 RATE SELECT
NO RAM
Y RATE
Y/A RATE
Y/B RATE
Y/C RATE
Y/D RATE
Y/E RATE
Y/F RATE
SAMPLE RATE CODE
INSERT 1 WORD TYPE 4 SYNC
INSERT 2 WORD TYPE 4 SYNC
INSERT 3 WORD TYPE 4 SYNC
INSERT 1 WORD TYPE 4 SYNC
TYPE 4 SYNC INSERT
WORDS 0 → 511 BITS 1 → 16 OP CODE SEC
REQUEST PORT 1
REQUEST PORT 2
REQUEST PORT 3
REQUEST PORT 4
REQUEST DCH 1
REQUEST DCH 2
REQUEST DCH 3
REQUEST DCH 1
REQUEST LATCH ASSEMBLY AND SYNCRONIZER
PRIORITY REGISTER
DATA BUS
ADDRESS BUS
INTERNAL/ EXTERNAL BUS CONTROL
DEVICE CNTL BITS 7→11 CW
1 1 0 1 0 LOAD SW MATRIX
1 1 0 0 0 READ SW MATRIX
0 1 0 1 0 LOAD DCH 1
0 1 0 0 0 READ DCH 1
0 1 1 1 0 LOAD DCH 2
0 1 1 0 0 READ DCH 2
1 0 0 1 0 LOAD DCH 3
1 0 0 0 0 READ DCH 3
1 0 1 1 0 LOAD DCH 4
1 0 1 0 0 READ DCH 4
1 1 1 0 0 READ TB
0 0 0 1 0 WRITE DATA RAM
0 0 0 0 0 READ DATA RAM
0 0 1 0 1 RTN RCVD WORD
0 0 1 0 0 READ BSR
0 0 0 1 1 LOAD FPM
0 0 0 0 1 READ FPM
NRZ RCVR REGISTER 24 BITS
NRZ XMIT REGISTER 24 BITS
GPC J3 MIA ADD 100XX
PCM 1 J2 MIA ADD 001XX
PCM 2 J1 MIA ADD 001XX
DATA RCV
CMD SYNC
BIT ERROR
SERIAL DATA MHZ
PARITY ERROR
B/B ERROR
SEV PAT ERR
DATA CHECK
SYNC DETECT PARITY CHECK B/B VALIDATION
RCVR
XMIT MHZ
XMIT CMD SYNC
SERIAL DATA MHZ
NRZ TO B/B CONVERTER PARITY BIT SYNC INSERTION
XMITTER
SEV PAT
BIT ERROR
BIT COUNT
PARITY
RCVR ENA
XMIT ENA
RESET
DATA AVAILABLE
RCVR BUS ACTIVE
DB BUSY
END OF WORD
CONTROL AND TIMING LOGIC
RESET
TX ENA
XMIT CMD SYNC
XMIT DATA AVAIL
RCVR ENA
CMD SYNC
GAP TM
16 MHZ OSC
PCM 2 J1 MIA ADD 001XX
GPC (PL)
01 PCMM1
01 PCMM2
TO/FROM GPC
TO/FROM PCMMU
V75 X64260 DATA INVALID MIA 3 BSR BIT 6 WORD 2 1=GOOD 1 S/S C
V75 X64240 DATA INVALID MIA 2 BSR BIT 4 WORD 2 1=GOOD 1 S/S C
V75 X64220 DATA INVALID MIA 1 BSR BIT 2 WORD 2 1=GOOD 1 S/S C
V75 X64210 NO RESPONSE MIA 1 BSR BIT 1 WORD 2 1=GOOD 1 S/S C
V75 X64230 NO RESPONSE MIA 2 BSR BIT 3 WORD 2 1=GOOD 1 S/S C
V75 X64250 NO RESPONSE MIA 3 BSR BIT 5 WORD 2 1=GOOD 1 S/S C
V75 X64300 DCH 1 PARITY GOOD BSR BIT 10 WORD 2 1=GOOD 1 S/S C
V75 X64310 DCH 2 PARITY GOOD BSR BIT 11 WORD 2 1=GOOD 1 S/S C
V75 X64320 DCH 3 PARITY GOOD BSR BIT 12 WORD 2 1=GOOD 1 S/S C
V75 X64330 DCH 4 PARITY GOOD BSR BIT 13 WORD 2 1=GOOD 1 S/S C
DCM 4
DCM 3
DCM 2
DCM 1
338.5 KHZ
WRD LOCK
READ REQ
TRI STATE BUFFER
WRITE REQUEST
READ PARITY
READ/WRITE CONTROL AND ADDRESSING
READ/ WRITE DATA INTO ADDRESS 0 THRU 2046
WORD COUNTER
MEMORY TIMING
SYNC CHECK/ SOMF
WORD COMPARE COUNTER
GPC WRITE CHECK SUM REGISTER
GPC CHECK SUM READ ENA SWITCH MATRIX DATA
DCM FMT ID
SYNC POSITION UP/DOWN COUNT
MF WORD 1 SYNC VALUE
MF WORD 2 SYNC VALUE
MF WORD 3 SYNC VALUE
MF WORD 4 SYNC VALUE
TB STARTING ADDRESS
NUMBER OF WORD PER FRAME
TYPE 4 SYNC WORD 1
TYPE 4 SYNC WORD 2
TYPE 4 SYNC WORD 3
TYPE 4 SYNC WORD 4
BIT RATE VALUE
DATA TYPE CODE

▷ ONLY WORD 2 OF PDI BSR IS DISPLAYED ON SPEC 62

NOTES: ▷ SPEC 62 IS AVAILABLE DURING 09 OR 52 ONLY.
SPEC 62 IS NOT AVAILABLE IN BFS

3 P/L DAT INTRLVR

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	V.S. HUNTER	6/7/82	
DR	L.M. BUCHANAN	7/15/82	PAYLOAD DATA INTERLEAVER
ENGR	M. PICKENS		
ENGR	Mark Pickens	7/16/96	
APP	Gary Cyr	7/16/96	
APP	Ben Whitmore	7/25/96	SPACE SHUTTLE — DWG NO 17.3
CADS	S.E. Kinard	7/25/96	ALL
LTR	PCN		126.5 X 34 — PAGE — SHEET 1 OF 1

BASIC REV E-6

TB/DCM 1 READ/WRITE CONTROL

TB/DCM 2 READ/WRITE CONTROL

TB/DCM 3 READ/WRITE CONTROL

TB/DCM 4 READ/WRITE CONTROL

WORD AND FRAME SYNC FOR DCM 1

WORD AND FRAME SYNC FOR DCM 2

WORD AND FRAME SYNC FOR DCM 3

WORD AND FRAME SYNC FOR DCM 4

BIT SYNC FOR DCM 1

BIT SYNC FOR DCM 2

BIT SYNC FOR DCM 3

BIT SYNC FOR DCM 4

POWER SUPPLY

CENTRAL TIMING

IRIG 'B' DECODER

BIT STATUS REGISTER

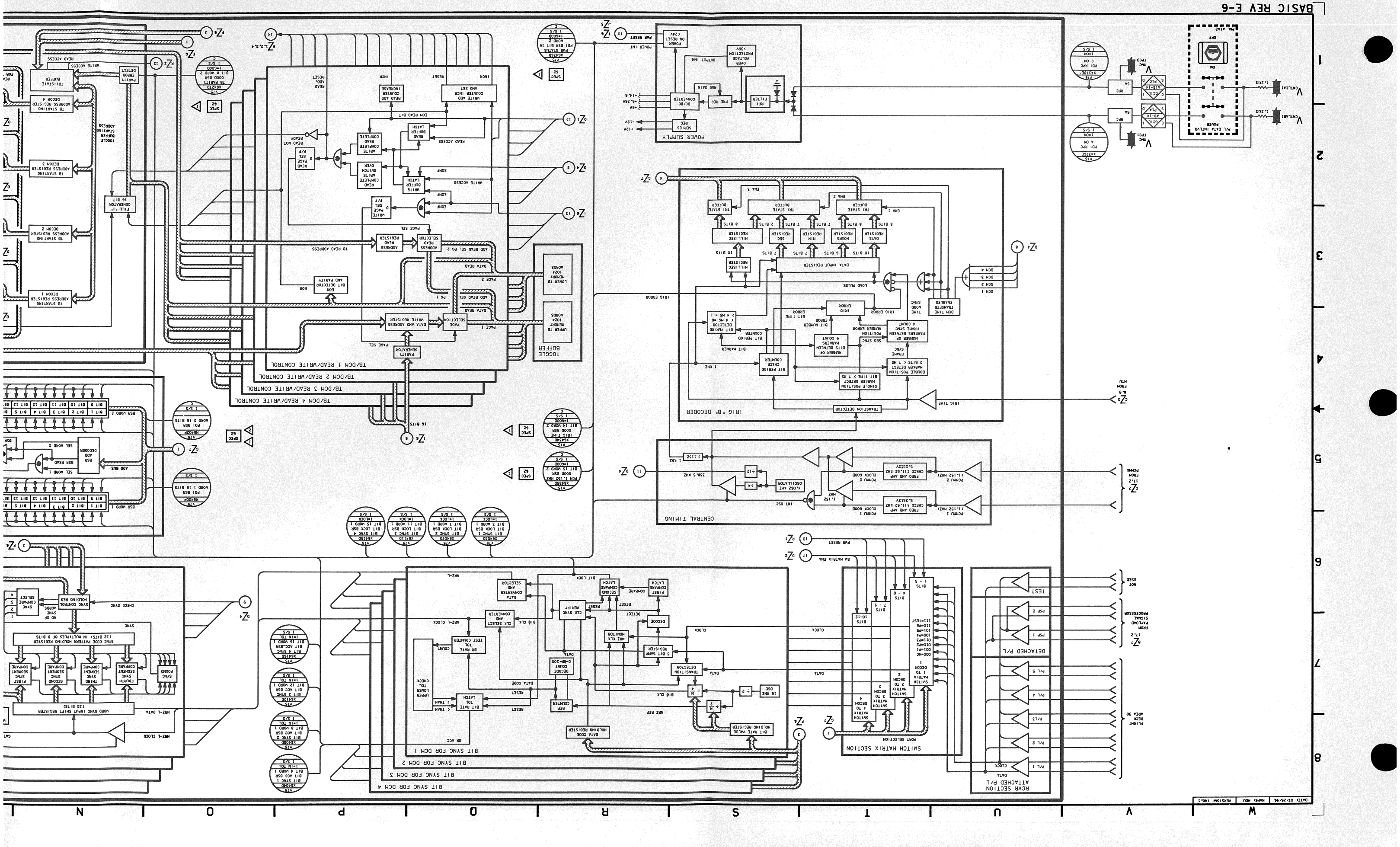
DCM 1 RAM CNTL

DCM 2 RAM CNTL

DCM 3 RAM CNTL

DCM 4 RAM CNTL

S | R | Q | P | O | N | M | L | K | J | I


POWER SUPPLY
CENTRAL TIMING
IRIG 'B' DECODER
SWITCH MATRIX SECTION
RCVR SECTION ATTACHED P/L
DETACHED P/L
TOGGLE BUFFER
TB/DCM 1 READ/WRITE CONTROL
TB/DCM 2 READ/WRITE CONTROL
TB/DCM 3 READ/WRITE CONTROL
TB/DCM 4 READ/WRITE CONTROL
BIT SYNC FOR DCM 1
BIT SYNC FOR DCM 2
BIT SYNC FOR DCM 3
BIT SYNC FOR DCM 4
DATA 07/25/96
NAME MDU
VERSION# 1Ma1

DATE: 07/15/94	NAME: JMB	VERSION: INK 1
DATE: 01/30/96	NAME: VSH	VERSION: BPT 4
DATE: 02/28/96	NAME: BJB	VERSION: INK 2

LOCKER

TIPS

CIB

AUDIO IN

AUDIO OUT AND PTT

+12

-12

+5

GND

BPF

+5V

VCC

IN

LOWF

.1μF

475K

FSK MOD

GND

LOCK

LOCK

DATA OUT

TC

TC

VCO

S-BAND FIFO

D7

Q7

D0

Q0

RD

WR

RST

FRAME A K-BAND FIFO

FRAME B K-BAND FIFO

FIFO 0-7 SERIAL

S-BAND DATA 8 PARALLEL LINES

GPIB I/O

S DATA IN

NOTS LOCK

17

IO

NOT KU LOCK

TONE

FILTER CLOCK

LOW PASS FILTER

OUT 1.56 Vpp

REF

+12VDC

-12VDC

450 HZ STATUS TONE

-3dB AT 570 HZ 7TH ORDER LOW PASS

40m Vpp OUTPUT 600Ω LOAD

CONNECTOR PORT

S-BAND LOCK

LED 3 GREEN

S-BAND VAL

LED 4 GREEN

OPTO ISOLATOR

NC

PUSH TALK LOW

PUSH TALK HIGH

GPIB ERROR

LED 5 YELLOW

PE

GND

VCC

DB

TRANSISTOR 1

B8

B1

D0

8 PARRALLEL DATA LINES

J2

GPIB CONNECTOR

DO-D8 8 PARRALLEL DATA LINES

GPIB TALKER

GPIB INTERFACE LINES

TRANSISTOR 2

GPIB ON LINE

LED 1 GREEN

GPIB OVER RUN

LED 2 YELLOW

OVERHEAT

PAPER FAULT

J3

PC BOARD CONNECTOR

K-BAND INTERFACE LOGIC

KU SRCHLED

KU LOCKED LED

KU SEARCH

KU LOCK

LED 7 GREEN

LED 6 GREEN

KU LOCKED

RDA

WRTA

RSTA

RDB

WRTB

RSTB

SAM

NRST

17

IO

F11-F15

F5-F10

MUX MOD

OPERATION

SAM CLK

KU OR S CLK

S INIT FLAG

S FIFO

KU FRAME AVAIL

SAM TEST FLAG

SAM SRQ

SAM NFRD

NDAC OR NAV

SAM RST

REED SOLOMON DECODER

PT

D7

PO

DO

DFAIL

GND

DIMS

DCLK

WE

COUNTER

REGSEL

REED SOLOMON DATA 0-7

RST

RSO

DFAIL

KU FAIL

KU ERR

LED 8 YELLOW

RSREG

RSWRT

RSCOUNTER

DCLK

DIMS

PARRALLEL DATA LINES 0-7

PDO

PD7

KU DATA

CLK

PPL LOCK LED

PPL LOCK

PPL LOCK

LED 9 GREEN

LCK

IN2

IN1

VCO

VCO

VCC

PLL GENERATES 1X CLOCK

BYTE CONT HI DLY

COUNTER ZERO

BYTE CT HI DLY

CTR ZERO

CLK

KU FIFO READ

KU DEC BYTE CNT

OSC

1.8432 MHZ ±50 PPM

GROUND

VCC

.22μF

KU DEC BYTE CT

KU FIFO RD

TRANSPORT ASSY

PAPER GUIDE ASSY

FROM EBIA KU DATA

UPLINK KU-BAND DATA

OPTO ISOLATOR

KU INTERFACE PORT

FROM EBIA KU CLOCK

128 KHZ KU-BAND CLOCK

OPTO ISOLATOR

12 TAGS POWER ON COMMAND MUST BE ISSUED TO ENABLE THE EBIA LINK FOR TIPS KU BAND UPLINK

11 FANS DRAW AMBIENT AIR ACROSS THERMAL HEAD THROUGH VENT ON FRONT OF BOX AND EXHAUST AIR OUT THROUGH THE FANS IN REAR OF BOX

10 600 BAUD, FSK TONES: 2057 HZ - LOGIC HIGH
1600 HZ - LOGIC LOW

9 N=5 POLE CHEBYSHEV BPF 1dB RIPPLE -3dB POINTS 1000 HZ, 2657 HZ (-38dB AT 451 HZ)

8 CIB IS INSTALLED INSIDE RAYTHEON TDU-850 FOR RECEIVING POWER ONLY. THERE ARE NO OTHER INTERNAL CONNECTIONS

7 UP TO 3 POSC'S MAY BE CONNECTED TO GPIB TO RECEIVE UPLINK DATA FROM GROUND OR FOR FUTURE CONTROL OF EXPERIMENT/PAYLOAD DATA

6 LEDS FOR CIB ARE VIEWABLE ON BACK OF THE TIPS BOX

5 IEEE-488 BOARD SWITCH SETTINGS

	ON	OFF
12	■	
11	■	
10		■
9	■	
8		■
7		■
6		■
5		■
4		■
3	■	
2	■	
1		■

SWITCHES FOR THE PWB AND 4888 ARE ACCESSIBLE ON THE BACK OF THE BOX

4 PROCESSOR BOARD SWITCH SETTINGS

	ON	OFF
11	■	
10	■	
9	■	
8	■	
7		■
6	■	
5	■	
4		■
3	■	
2		■
1		■

3 TIPS PANEL INDICATOR: POWER LENS COVERING IS GREEN. ALL OTHER LENS COVERINGS ARE WHITE

ON LINE	READY
FORM FEED	RAPID ADV
OVER HEAT	PAPER FAULT
TEST	POWER

2 NORMALLY CONNECTED TO PS CCU OUTLET, HOWEVER, MAY BE CONNECTED TO ANY CCU OUTLET, CABLE LENGTH PERMITTING

NOTES: 1 A/G LOOP BEING USED BY TIPS SHOULD BE CONFIGURED FOR RCV ONLY ON ALL OTHER AUDIO PANELS. A/G VOLUME FOR TIPS DOES NOT AFFECT UPLINK

8 TIPS

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN V. HUNTER	1/19/94	
DR -		
ENGR D. MILLER		THERMAL IMPULSE PRINTER SYSTEM (TIPS)
ENGR	3/11/96	
APP	3/14/96	
APPR	3/14/96	SPACE SHUTTLE
CADS S.K. Kimbley	6-17-96	ALL
LTR E	PCN 6	126.5 X 34

DWG NO 17.8

PAGE SHEET 1 OF 1

BASIC REV E-6

T S R Q P O N M L K J

PS AUDIO PANEL ATU L9

L9

(31V73A9A2)

PS COMM

PS COMM

CCU PWR

ON

OFF

PWL A15 S1

A15 MIC POWER NOT USED

EARPHONE SIGNAL

EARPHONE RETURN

MIC SIGNAL

MIC RETURN

PTT COMM

PTT XMIT

AUDIO EXTENSION CABLE

J2 P2

TIPS AUDIO CABLE

"Y" CABLE

J1

AUDIO IN

AUDIO OUT AND PTT

EBIA KU DATA

EBIA KU CLOCK

A

B

PZ1,2

FROM POSC(S)

GPIB BUS

AUDIO IN

AUDIO OUT AND PTT

CONTROL PANEL

POWER S1 WHITE

ON LINE WHITE

RAPID ADV S2

TEST S3

FORM FEED S4

PAPER FAULT WHITE

READY WHITE

OVERHEAT WHITE

+5V

A4J8-6 A4J8-5 A4J8-10 A4J8-2 A4J8-4 A4J8-11 A4J8-9 A4J8-3

128 KHz DATA

128 KHz CLK

EBIA KU DATA

EBIA KU CLOCK

TAG/KU DATA/CLK CABLE

J2 P2

KUBAND EXTENSION CABLE

P2 J2

TIPS KUBAND CABLE

PZ3 16,4-2

PROCESSOR PWB (PRINTED WIRING BOARD)

GND +5

(488 PORT) IEEE THERMAL DATA INTERFACE

GND +5

J8

TEST A253-COM

OVER-HEAT A2053-1

FORM FEED A254-COM

ON LINE IND A255DS1-1

ON LINE A255-COM

GND

READY A2DS2-1

RAPID ADV A252-COM

PAPER FAULT A2DS1-1

2 3 4 5 6 8 9 10 11

MOTHER BOARD TDU-850

J2

+12

-12

+5

GND

INTERLOCK SWITCH

PAPER FAULT SENSOR

FORM FEED SESNOR

GND

O1

O2

O3

O4

AC 1

MAR 30 3A

PWL MA73CHF CB59

$V_{AC\ 1}$

PANEL ML85E

AC

J1/J31/CB1

ON

OFF

PWL ML85E S1

J31

TIPS INTERFACE AC POWER CABLE

J2

POWER SUPPLY MODULE

115V AC

FAN

FAN

POWER SUPPLY 1

+12V

+5V

-12V

-5V

115V AC

+5V

POWER SENSE

FAN RELAY

INH HV RELAY

GND

18V

HV CAP RELAY

+5V

115V AC

INH

POWER SUPPLY 2

-OUT

+OUT

HV CAPACITOR PWB

J2

J1

THERMISTOR +5 STROBE O1 O2 O3 O4 DATA LOAD CLOCK DATA OUT UDD HEATER DISABLE

GND

SERIAL

J2

THERMAL PRINT HEAD

STEPPER MOTOR

TRANSPORT ASSY

PAPER GUIDE ASSY

DETECTOR PWB ASSY

S1

FROM EBIA KU DATA

FROM EBIA KU CLOCK

KU INTERFACE PORT

REED DE

PT

PD

DIMS

DCLK

PZ4,7

A

B

EBIA KU DATA

EBIA KU CLOCK

DATE: 02/28/96 | NAME: BJB | VERSION: INK=2

W V U T S R Q P O N

8 7 6 5 4 3 2 1

PS AUDIO PANEL ATU L9

PS FLOOD
ON (S11) OFF
DIM (S12) BRT
+ (DS1)
PAYLOAD STATION AUDIO
A/G 1 2 | A/A T/R | ICOM A B
POWER AUD/TONE (S6) OFF
AUD (S2) (S3) (S1) (S4) (S5) OFF RCV
VOLUME A/G 1 2 | A/A | ICOM A B (S9)
PAGE (S8)
VOX SENS (R11) MIN MAX
XMIT/ICOM MODE (S10)
PTT/VOX PTT/HOT PTT/PTT VOX/VOX
FIRE HOLE
ACTIVATION
L9 ALL SWITCHES - AS REQ'D
A15 PS COMM CCU PRV-ON
(31V73A9A2)
L9

PS COMM
PS COMM
CCU PWR
ON
OFF
PML A15 S1
A15 MIC POWER NOT USED
EARPHONE SIGNAL
EARPHONE RETURN
MIC SIGNAL
MIC RETURN
PTT COMM
PTT XMIT
AUDIO EXTENSION CABLE J2 P2
TIPS AUDIO CABLE "Y" CABLE J1
AUDIO IN
AUDIO OUT AND PTT
EBIA Ku DATA (A)
EBIA Ku CLOCK (B)
Z1,2

POWER (S1) WHITE
A4J8-6 ON LINE (S2) WHITE
A4J8-5 RAPID ADV (S3)
A4J8-10 TEST (S4)
A4J8-2 FORM FEED
A4J8-4 PAPER FAULT WHITE
A4J8-11 READY WHITE

TIPS KuBAND CABLE
Z3 16,4-2
128 KHz DATA
128 KHz CLK
EBIA Ku DATA
EBIA Ku CLOCK
TAG/KU DATA/CLK CABLE J2 P2
KuBAND EXTENSION CABLE P2 J2

PANEL ML85E
AC 1
$V_{AC\ 1}$
MAIN 30 3A
PML MA73C1-F CB59
AC
J7/J51/CB1
ON
OFF
PML ML85E S1
J31
TIPS INTERFACE AC POWER CABLE
J2

POWER SUPPLY MODULE
115V AC
FAN
FAN
115V AC INH
POWER SUPPLY 2
-OUT
+OUT
POWER SUPPLY 1
+12V +5V -12V -5V
115V AC
+5V
POWER SENSE
FAN RELAY
INH HV RELAY
GND
18V
HV CAP RELAY
+5V

TEST A253-COM | OVER-HEAT A2DS3-1 | FORM FEED A254-COM | ON LINE IND A255DS1-1 | ON LINE A255-COM | GND | READY A2DS2-1 | RAPID ADV A252-COM | PAPER FAULT A2DS1-1
J8 2 3 4 5 6 8 9 10 11
PROC (PRINTED

THERMISTOR | +5 | STROBE 01 | 02 | 03 | 04
SERIAL

HV CAPACITOR PWB
J2
J1

Z4,7 (A) EBIA KU DATA (B) EBIA KU CLOCK

BASIC REV E-6

DATE: 08/25/87	NAME: MPH	VERSION: INK, 7
DATE: 05/23/87	NAME: MDU	VERSION: INK, 8
DATE: 09/18/90	NAME: SEW	VERSION: INK, 9

PS BIOMED

PNL A15A1

FROM PILOT SPECIALIST

P3657

(J7)

MS BIOMED

PNL A11A1

FROM MISSION SPECIALIST

P3616

(J10)

EVA/ATC XCVR
83V74A21
259.7
EVA 1

EVA/ATC XCVR
83V74A21
279.0
EVA 2

MID DECK BIOMED
CENTER

FIRE HOLE

(J1)

LEFT

RIGHT

(J2)

(J3)

M062M

(80V73A125)

BIO MED
CHANNEL 1

BIO MED
CHANNEL 2

BLUE TAB

ADHESIVE TAB

ELECTRODE

LOWER CHEST

BIO MED
SUIT CABLE

GAIN

SIGNAL CONDITIONER

V67
V01000A
OF2 | N/A
CHANNEL 1
ECG
0-5VDC
100 S/S

V67
V02000A
OF2 | N/A
CHANNEL 2
ECG
0-5VDC
100 S/S

V67 X0110E
OF4 | OF3
BIO MED CHAN 1
MS SW POS
1=ON
1 S/S

V67 X0112E
OF4 | OF3
BIO MED CHAN 1
PS SW POS
1=ON
1 S/S

V67 X0114E
OF4 | OF3
BIO MED CHAN 1
MID DECK L SW POS
1=ON
1 S/S

V67 X0116E
OF4 | OF3
BIOMED CHAN 1
MID DECK STR SW POS
1=ON
1 S/S

V67 X0118E
OF4 | OF3
BIO MED CHAN 1
MID DECK R SW POS
1=ON
1 S/S

V67 X0120E
OF4 | OF3
BIOMED CHAN 1
EVA 1 SW POS
1=ON
1 S/S

V67 X0220E
OF4 | OF3
BIO MED CHAN 2
EVA 2 SW POS
1=ON
1 S/S

V67 X0218E
OF4 | OF3
BIO MED CHAN 2
MID DECK R SW POS
1=ON
1 S/S

V67 X0216E
OF4 | OF3
BIO MED CHAN 2
MID DECK CTR SW POS
1=ON
1 S/S

V67 X0214E
OF4 | OF3
BIO MED CHAN 2
MID DECK L SW POS
1=ON
1 S/S

V67 X0212E
OF4 | OF3
BIO MED CHAN 2
PS SW POS
1=ON
1 S/S

V67 X0210E
OF4 | OF3
BIO MED CHAN 2
MS SW POS
1=ON
1 S/S

MS
PS
MID DECK L
MID DECK CTR
MID DECK R
EVA 1

MS
PS
MID DECK L
MID DECK CTR
MID DECK 3
EVA 2

MID DECK
L
CTR
R
PS
MS
EVA 1
R10A2
S13

MID DECK
L
CTR
R
PS
MS
EVA 2
R10A2
S14

+5V
+5V
1B
71
P47
J1
DEDICATED SIGNAL
CONDITIONER
BF3

10 BIO MED INST

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	DOUG SNELL	1/4/79	
DR	DOUG SNELL	3/22/79	
ENGR			BIO MEDICAL INSTRUMENTATION
ENGR		10/10/90	
APP		10/10/90	
APP		10-10-90	SPACE SHUTTLE / DWG NO 17.10
OMNIPLAN		11-7-90	ALL
LTR E	PCN		66 X 34 / PAGE / SHEET 1 OF 1

BASIC REV E

L K J I H G F E D

8 7 6 5 4 3 2 1

PS BIOMED

FROM PILOT SPECIALIST

P9657

(J7)

PNL A15A1

MS BIOMED

FROM MISSION SPECIALIST

P9616

(J10)

PNL A11A1

EVA/ATC XCVR
83V74A21
259.7
EVA 1

EVA/ATC XCVR
83V74A21
279.0
EVA 2

BLUE TAB

ADHESIVE TAB

ELECTRODE

GROUND

UPPER CHEST

LOWER CHEST

BIO MED SUIT CABLE

GAIN

SIGNAL CONDITIONER

BIO MED
CHANNEL 1

A

B

C

V67
V0100A
OF2 | M/A
CHANNEL 1
ECG
0-5VDC
100 S/S

MS
PS
MID DECK L
MID DECK CTR
MID DECK R
EVA 1

MID DECK CTR
L
R
PS
MS
EVA 1
R10A2
S13

V67 X0110E
OF4 | OF3
BIO MED CHAN 1
MS SW POS
1=ON
1 S/S

V67 X0112E
OF4 | OF3
BIO MED CHAN 1
PS SW POS
1=ON
1 S/S

V67 X0114E
OF4 | OF3
BIO MED CHAN 1
MID DECK L SW POS
1=ON
1 S/S

V67 X0116E
OF4 | OF3
BIOMED CHAN 1
MID DECK STR SW POS
1=ON
1 S/S

V67 X0118E
OF4 | OF3
BIOMED CHAN 1
MID DECK R SW POS
1=ON
1 S/S

V67 X0120E
OF4 | OF3
BIOMED CHAN 1
EVA 1 SW POS
1=ON
1 S/S

V67 X0220E
OF4 | OF3
BIO MED CHAN 2
EVA 2 SW POS
1=ON
1 S/S

V67 X0218E
OF4 | OF3
BIO MED CHAN 2
MID DECK R SW POS
1=ON
1 S/S

V67 X0216E
OF4 | OF3
BIO MED CHAN 2
MID DECK CTR SW POS
1=ON
1 S/S

V67 X0214E
OF4 | OF3
BIO MED CHAN 2
MID DECK L SW POS
1=ON
1 S/S

V67 X0212E
OF4 | OF3
BIO MED CHAN 2
PS SW POS
1=ON
1 S/S

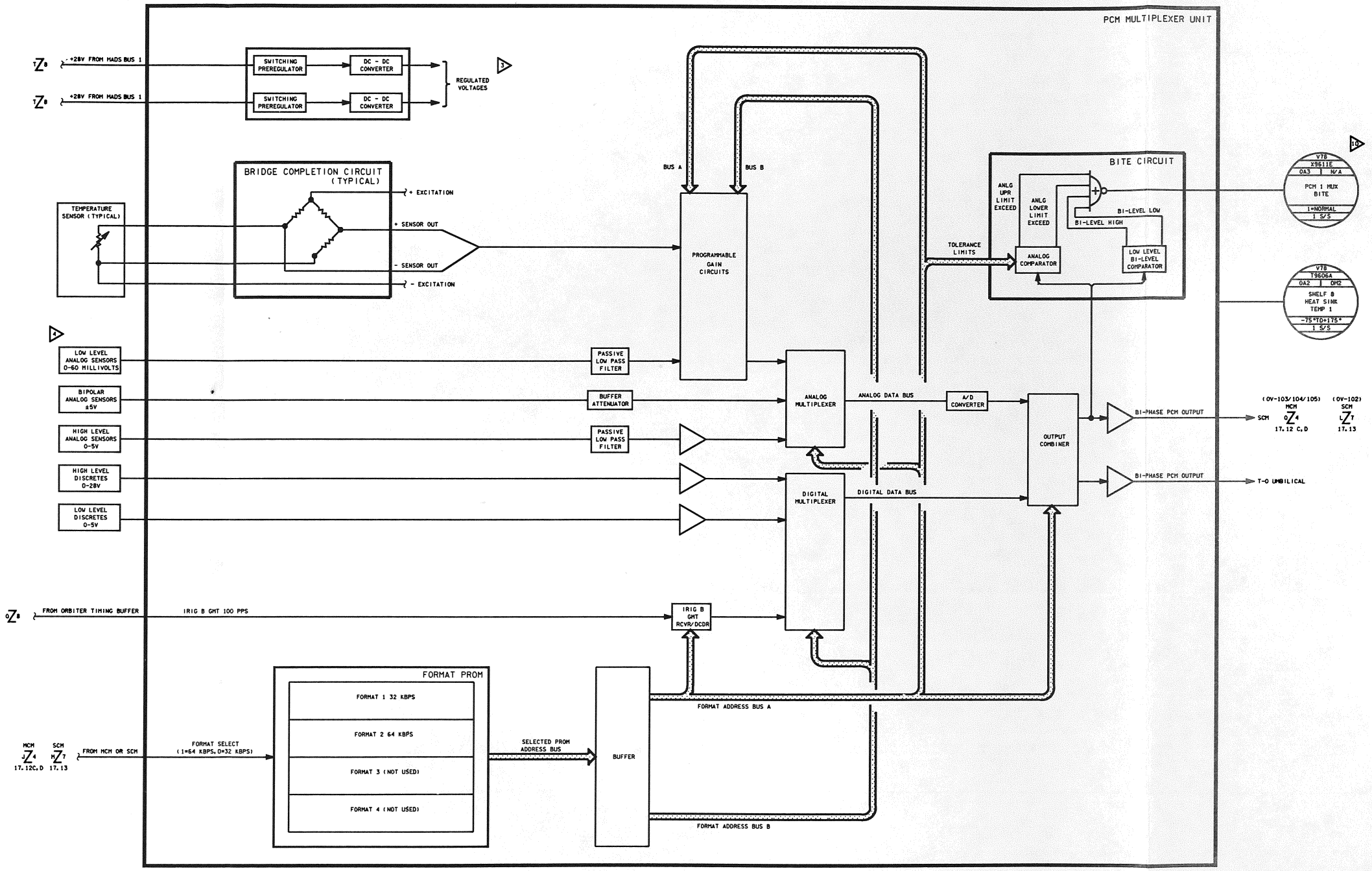
+5V +5V

P47
18 71
J1

DEDICATED SIGNAL CONDITIONER
BF3

BASIC REV E

DATE: 03/15/96	NAME: VSH	VERSION INK: 7
DATE: 04/16/96	NAME: MDU	VERSION INK: 8
DATE: 07/25/96	NAME: LAM	VERSION INK: 9



OV-102 MEASUREMENT ONLY

PML A6L FOR OV-104

THERE MAY BE MORE PCM'S INSTALLED. EACH HAS ITS OWN BITE
PCM 2 MUX BITE: V78X9614E
PCM 3 MUX BITE: V78X9615E
BOTH USE MDM OA3 AND NO DSC

IF A SECOND FDM IS INSTALLED, THE MUX BITES FOR FDM 2 ARE:
FDM 2 MUX 1 BITE: V78X9590E FDM 2 MUX 2 BITE: V78X9591E
FDM 2 MUX 3 BITE: V78X9592E FDM 2 MUX 4 BITE: V78X9593E
THEY USE MDM OA3 & NO DSC

IF A SECOND FDM IS INSTALLED, "FDM 2 WB DATA MODE" IS V78X9310E, USING THE SAME DSC & MDM AS FDM 1 WB DATA MODE

ET PCM DATA SUPPLIED BY HEAVY WEIGHT ET ONLY (INSTRUMENTED ET USED EARLY IN STS PROGRAM)

MUX CHAN FREQ

CHAN	FREQ(KHZ)
1	12
2	16
3	20
4	24
5	28
6	32
7	36
8	48
9	64
10	80
11	96
12	112
13	128
14	144
15	184

THE BITE CIRCUITRY MONITORS FOR AN INCREASE OR DECREASE OF 3 ± 1 DB IN THE FDM COMPOSITE OUTPUT VOLTAGE

LOW LEVEL ANALOGS ARE GROUPED INTO 0-10 MV, 0-15MV, 0-20MV, 0-30MV, 0-40MV AND 0-60MV RANGES

BOTH POWER SUPPLIES ARE REQUIRED FOR PROPER PCMU OPERATION, i.e. THEY ARE NOT REDUNDANT

FASCO STANDS FOR MAIN ENGINE FLIGHT ACCELEROMETER SYSTEMS CUTOFF. EACH UNIT SUPPLIES 6 VIBRATION MEASUREMENTS TO THE FDM

NOTES:

SHELF TEMPERATURE TRANSDUCERS ARE ACTUALLY LOCATED ADJACENT TO THESE LRU'S ON THE SHELF SURFACE AND THESE TEMPS WILL LAG LRU TEMPS

11 MADS EQUIP

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	T. LENERS	8/13/82		
DR	T. LENERS	8/13/82		
ENGR	D. EPPERSON		MADS EQUIP	
ENGR		7/25/96		
APP		7/25/96		
APP		7/25/96	SPACE SHUTTLE	DWG NO 17.11
CADS		7-30-96	ALL	
LTR	E	PCM 6	121 X 34	PAGE SHEET 1 OF 1

BASIC REV E-6

FREQUENCY DIVISION MULTIPLEXER

FM ANALOG COMPOSITE MUX 1

FM ANALOG COMPOSITE MUX 2

MUX 3

MUX 4

CALIBRATION

POWER SUPPLY A

POWER SUPPLY B

INTERNAL POWER SUPPLY

WIDE BAND SIGNAL CONDITIONER (TYPICAL)

HALF WAVE STRAIN GUAGE SIGNAL CONDITIONER

TYPICAL 4 CHANNELS

CONVERTER MODULE

DETAIL SAME AS POWER SUPPLY A

FROM ORBITER TIMING BUFFER

TO MADS PCMU

+28V FROM MADS BUS 1

+28V FROM MADS BUS 1

FROM MCM OR SCM

TO MADS MULTIPLEXER

TO PCM MADS MULTIPLEXER

TO PCM MUX 4

TO PCM MUX 3

TO PCM MUX 2

TO PCM MUX 1

TO PCM MADS MULTIPLEXER

TO SCM

TO MCM

TO FDM

FROM FDM

FROM SENSOR INPUTS

TO MUX 1 AND MUX 2 AND MUX 3 AND MUX 4

TO ORBITER GMT

TO ORBITER TIMING BUFFER

TO MADS PCMU

TO MADS MULTIPLEXER

TO FDM MUX 4 CHANNEL 15 INPUT

TO FDM WIDE BAND DATA MODE

50 HZ AC CAL TO ET

50 HZ OSC

+12V DC

CALIBRATION POSITION SWITCH DRIVERS

0 PCT

25 PCT

50 PCT

75 PCT

100 PCT

50 HZ AC

0.0 VDC

1.25 VDC

2.5 VDC

3.75 VDC

5.0 VDC

OPTICAL ISOLATOR

LOGIC DECODER

CAL SIGNAL

CAL ENBL

DATA ENBL

CH INPUT (TYPICAL OF 15)

SENSOR INPUTS

CH 15

CH 1

CH 2 INPUT (TYPICAL OF 14)

REFERENCE OSCILLATOR 240 KHZ

REMAINING CHANNEL INPUTS

VCO 184-216 KHZ

VCO 121 KHZ

LOW PASS FILTER 500 HZ

LEVEL DETECTOR

VIDE BAND MUX 1 BITE

VIDE BAND MUX 2 BITE

VIDE BAND MUX 3 BITE

VIDE BAND MUX 4 BITE

FM ANALOG COMPOSITE MUX 1

FM ANALOG COMPOSITE MUX 2

FM ANALOG COMPOSITE MUX 3

FM ANALOG COMPOSITE MUX 4

T-0 UMB

SHELF & HEAT SINK TEMP 2

-75TO+125°

T-0 OA2 | 0H2

I S/S

X9303E

OA3 | N/A

I=6000

-28V REGULATOR

+28V REGULATOR

-12V REGULATOR

+12V REGULATOR

+5V REGULATOR

DC/DC CONV

PRE REGULATOR

EMI FILTER

DC-DC CONVERTER

VOLTAGE REGULATOR

EXCITATION VOLTAGE REGULATOR

PRE REG

DC-DC CONV

EMI FILTER

REG

CHARGE AMP

ACTIVE FILTER

SVDC P-P

-9VDC

0 VDC

-9 VDC

+9 VDC

50 MV AC

0.25 0.5 0.75 1.0 AC

DC

PWL A7A2

FDM CAL 18

MADS

SENSOR INPUTS

LOW LEVEL DISCRETES 0-5V

HIGH LEVEL DISCRETES 0-28V

HIGH LEVEL ANALOG SENSORS 0-5V

BIPOLAR ANALOG SENSORS ±5V

LOW LEVEL ANALOG SENSORS 0-60 MILLIVOLTS

THERMISTOR SENSOR (TYPICAL)

(0V-102/104/105) TO SCM

(0V-102/104/105) TO MCM

17,12C,D 17,13

17,12C,D 17,13

I=64

IRIG

A B C D E F G H J K L M N O P Q R S

DATE: 07/25/96 | NAME: LAM | VERSION# INK=9

V U T S R Q P O N

8 7 6 5 4 3 2 1

POWER DISTRIBUTION ASSEMBLY

(OV-102) SCM ↓Z5 17.13 | (OV-103/104/105) MCM ↓Z3 17.12C,D

MADS BUS 1 — 5A — TO MADS PCM MULTIPLEXER ↓Z7

MADS BUS 2 — 3A

MADS BUS 3 — 3A, 3A, 3A, 5A

HALF WAVE STRAIN GUAGE SIGNAL CONDITIONER

TYPICAL 4 CHANNELS

HALF WAVE STRAIN GUAGE

EXCITATION VOLTAGE REGULATOR

EMI FLTER | PRE REG | DC-DC CONV | REG

INTERNAL POWER SUPPLY

TO MADS PCM MULTIPLEXER ↓Z5

WIDE BAND SIGNAL CONDITIONER (TYPICAL)

SENSOR — CHARGE AMP — ACTIVE FILTER — TO FDM SENSOR INPUTS ↑Z1-8

0VDC | -9VDC | 5VDC P-P

EMI FILTER | DC-DC CONVERTER | VOLTAGE REGULATOR

CONVERTER MODULE

0 VDC | -9 VDC | +9 VDC

PRESSURE SENSORS (10) → TO PCM MADS MULTIPLEXER ↓Z5

FASCOS NO 1 → TO FDM MUX 3 INPUT

FASCOS NO 2 → TO FDM MUX 4 INPUT

↑Z2 10.13 | ↑Z2 10.13 | ▷Z3,4

ACIP PCM MASTER/SLAVE → TO MCM ↓Z4 17.12C,D (OV-103/104/105) | TO SCM ↑Z2 17.13 (OV-102)

ET PCM — 16KBPS → TO FDM MUX 4 CHANNEL 15 INPUT ↓Z3

ORBITER TIMING BUFFER — IRIG B GMT

↓Z3 TO MADS PCMU

V78 X9305E OA3 | OA3 — FDM WIDE BAND DATA MODE — 1=DATA 1 S/S

V78K90911 — PF1 — 07/01 — (OV-103/104/105)

(OV-102) SCM ↑Z4 17.13

V_{MNA} FLCA1 — AUTO CAL ON/OFF

CAL SIGNALS TO ET

MADS FDM MAN CALIB — PNL A7A2 S8

MADS FDM CONTROL — AUTO CALIB — DATA — MAN CALIB — PNL A7A2 S7

(OV-103/104/105) V_{MNB} — 3A

(OV-102) $V_{CNTLCA3}$

DC 0 25 50 75 100 AC

POWER SUPPLY A

EMI FILTER → PRE REGULATOR → DC/DC CONV → +24V REGULATOR | -12V REGULATOR | +12V REGULATOR | +5V REGULATOR → TO MUX 1 MUX 2 AND CALIBRATION

POWER SUPPLY B

DETAIL SAME AS POWER SUPPLY A

→ TO MUX 3 AND MUX 4

CALIBRATION

OPTICAL ISOLATOR → LOGIC DECODER

CALIBRATION POSITION SWITCH DRIVERS

0 PCT — 0.0 VDC

25 PCT — 1.25 VDC

50 PCT — 2.5 VDC

75 PCT — 3.75 VDC

100 PCT — 5.0 VDC

50 HZ AC

+12V DC

50 HZ OSC → 50 HZ AC CAL TO ET FDM

CAL SIGNAL

DATA ENBL

CAL ENBL

FREQ

FM

CH 1 … CH 2 INPUT (TYPICAL OF 14) — SENSOR INPUTS S,RZ4,5

LOW PASS FILTER 500 HZ → VCO 12 ± 1 KHZ → VCO

REMAINING CHANNEL INPUTS

REFERENCE CRYSTAL OSCILLATOR 240 KHZ

DATA ENBL | CAL ENBL | CAL SIGNAL

FM

CH 1 … CH 15 — SENSOR INPUTS S,RZ4,5

DATA ENBL | CAL ENBL | CAL SIGNAL

CH 1 … CH 15 — SENSOR INPUTS S,RZ4,5

CH INPUT (TYPICAL OF 15)

DATA ENBL | CAL ENBL | CAL SIGNAL

VCO 184 ± 16 KHZ

REMAINING CHANNEL INPUTS

REFERENCE CRYSTAL OSCILLATOR 240 KHZ

BASIC REV E-6

DATE: 03/19/96	NAME: VSH	VERSION: INK: 6
DATE: 04/16/96	NAME: MDU	VERSION: INK: 7
DATE: 07/25/96	NAME: LAM	VERSION: INK: 8

MADS RECORDER

POWER IN

TRANSPORT PWR OUT

XPORT PWR

TRANSPORT VOLTAGE REGULATOR — +25V, +15V, +5V — TO TRANSPORT LOGIC AND SERVOS

POWER ON

RECORDER BITE GOOD

PROTECTION CIRCUIT LOGIC

MADS RCDR BITE — V78 X9603E — OF1 | NA — 1=GOOD — 1 S/S

REVERSE

15 IPS SEL

3 3/4 IPS SEL

60 IPS SEL

RCD CIRCUITS PWR

TRACK SEQ PASS 3 — V78 X9613E — OF1 | NA — 1=PASS 3 — 1 S/S

MADS RCDR RECORD — V78 X9604E — OF1 | NA — 1=RCD — 1 S/S

FORMAT SELECT

MADS PCM UNIT DWG 17.11

TRACK SEQ STATUS — V78 X9612E — OF1 | NA — 1=FWD — 1 S/S

GSE

ERASE

MADS RCDR TAPE MOTION — V78 X9605E — OF1 | OF1 — 1=MOTION — 1 S/S

MADS RCDR PERCENT TAPE — V78 096024 — OF1 | OF1 — 0 TO 100% — 10 S/S

DSC OF1

+5V POWER

TAPE MOTION

PERCENT TAPE

TRACK SELECTS (28)

RCD VOLTAGE REG — +20V

RCD PWR ON

BIAS PWR ON

UP TO SPEED

BIAS OSC 4.85 MHZ

BIAS AMP

RCD AMPS (14)

TRACK SELECT RELAYS (14)

RCD AMPS (14)

TRACK SELECT RELAYS (14)

÷5

970 KHZ

1.6 MHZ OSC

SPEED SELECT

PHASE DET

SERVO AMP

TAPE MOTION CIRCUITS

NEOT

BOT EOT SENSOR

PB REVERSE LIMIT SENSE RELAY

SENSOR LAMPS

PB REVERSE MOTOR POLARITY RELAY

TAKE-UP REEL

BRAKES

TRANSPORT PWR

+15VDC

SERVO AMP

CAPSTAN

RCD HEAD ODD TRKS

RCD HEAD ODD TRKS

RCD HEAD EVEN TRKS

PB HEAD ODD TRKS

PB HEAD EVEN TRKS

CAPSTAN

BULK ERASE

+15VDC

REEL SERVO AMP

SENSOR LAMPS

OPTICAL TAPE MOTION SENSOR

BRAKES

TRANSPORT PWR

SUPPLY REEL

TAPE QUANTITY SENSOR

TO GSE

1. LOSS OF V_{MNA} A FLC1 OR ESSIBC SUBBUS WILL CAUSE LOSS OF REVERSE RECORDING CAPABILITY
2. PML A6L ON OV-104
3. RECORDER POWER IS CONTROLLED VIA THE MCM OR PF MDM CMD IN THE PCM/MB ENA POSITION
4. THIS RELAY SELECTS SEVEN (7) OF THE FOURTEEN SEQUENCE NO 1 TRACKS. THE SEVEN ET TRACKS ARE SELECTED BY RELAY K4 IN APCA3 WHICH IS CONTROLLED BY MASTER EVENTS CONTROLLER NO 2 (MEC2). THESE TRACKS ARE DESELECTED AT ET SEP AND CANNOT BE DESELECTED OR RESELECTED BY CMD
5. THE REPEAT CYCLE TIMER CONTROLS SAMPLE MODE OPERATIONS. THE SAMPLE MODE POWERS UP THE EQUIPMENT, WAITS 10 SECONDS, COMMANDS RCD AT 3 3/4 IPS FOR 10 SECONDS, WAITS 10 SECONDS, POWERS OFF THE EQUIPMENT THEN WAITS 600 SECONDS AND REPEATS THE SEQUENCE
6. BIAS PWR TIED TO RCD PWR SINCE THE RCDR RECORD MODE
7. PROTECTION CIRCUIT INDICATES BITE IF 1. TAPE TENSION SENSOR LIGHT FAILED 2. PWR IS ABOVE 31V OR BELOW 22V
8. OPTICAL SENSOR GENERATES PULSE TRAIN WHEN GUIDE ROLLER IS ROTATING. FREQUENCY OF PULSES COMPARED TO REFERENCE BY TAPE MOTION CIRCUITS
9. SPEED IS SELECTED BY GROUNDING APPROPRIATE INPUT
10. SWITCHES CLOSE IF TAPE IS SLACK AND CAUSE CAPSTAN TO SPEED UP/SLOW DOWN AND REMOVE SLACK (FOR INITIAL SET UP)

NOTES: 1. BRAKES APPLIED WHENEVER TRANSPORT POWER IS REMOVED

12 MADS RCDR

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	L. M. BUCHANAN	4/16/82	MODULAR AUXILIARY DATA SYSTEM RECORDER/ CONTROLLER SUBSYSTEM
DR	L. M. BUCHANAN	4/16/82	
ENGR	D. EPPERSON		
ENGR	Debra Epperson	7/19/82	
APP	Gene Cliff	7/21/82	
APP	Frank Mathis	7/22/82	SPACE SHUTTLE — DWG NO 17.12C.D
CADS	S. K. Kimbrough	7-29-82	OV 103/104
LTR	E	PCN 6	104.5 X 34 — PAGE — SHEET 1 OF 1

BASIC REV E-6

/25/96 | NAME: LAM | VERSION: INK: B

MADS CONTROL MODULE

MADS POWER MNB — MN B — 5A — PNL ATL — CB1 — 10

MASTER MADS POWER — ON / OFF — PNL C3A5 — S11

MADS PCM RCD MODE — SAMPLE / CONT — PNL ATL — S2 — 10

V78K9622Y — 14/02 — PF1 — PCM ON/OFF

MADS PCM — CMD ON/OFF — ON — PNL ATL — S6 — 10

V78K9621Y — 14/02 — PF1 — WB/ACIP ON/OFF

MADS WIDEBAND/ACIP PCM — CMD ON/OFF — ON — PNL ATL — S5 — 10

V78K9634Y — 14/02 — PF1 — MADS RCDR PWR ON/OFF

MADS RECORDER POWER — PCM/WB ENA — ON — PNL ATL — S1 — 10

V_{MNB} MPCA2 — RPC 10A — TO RCDR

V78K9623Y — 14/02 — PF1 — MADS RCDR REWIND BOT

V78K9626Y — 07/01 — PF1 — MADS TRACK SEQ 3 ON/OFF

DATA FROM MADS PCM, ACIP PCM, MADS FDM — DWG 17.11

MADS STRAIN GAGE — PCM ENA — ON — PNL ATL — S4 — 10

V_{MNB} MPCA2 — RPC 15A — PCM EQUIP DWG 17.11 uZ8 — (MADS BUS 1)

V78K9624Y — 14/02 — PF1 — MADS RCDR REWIND EOT

MADS RECORDER — PB FWD — CMD ON/OFF — ON — PNL ATL — S12 — 10

REWIND EOT

5V PWR SUPPLY → +5V, +28V

RECORDER POWER

PCM RECORD 3 3/4 IPS — 6 — +Z3

+28V — 3

+28V — 1

TAPE CONTROL

EQUIP PWR

TIMER ON (WB+PCM)

REPEAT CYCLE TIMER

RCD 15 IPS

PCM PWR

DATA LINES (6)

V_{MNA} FLCA1 — V_{ESS1BC} FP AND LC1 — 7 — DZ8 — RD — 11

+28V

V_{MNA} MPCA1 — RPC 15A — MADS BUS 2 — STRAIN EQUIP DWG 17.11 uZ6

WB DATA TO TRK SEQ 1

WB DATA TO TRK SEQ 2

WB DATA TO TRK SEQ 3

K1 K3

TRACK SELECTS SEQ 3

TRACK SELECT SEQ 1 (TRK SEQ 3 @ REVERSE)

PCM DATA TO TRK SEQ 1

PCM DATA TO TRK SEQ 2

MADS PCM / ACIP PCM

PCM DATA TO TRK SEQ 3

TRK SEL PASS 2

TRK SEL PASS 3

TRK SEL PASS 1

K2 K4

REVERSE

60 IPS

RECORD

TRACK SEQ 3 TLM

FORWARD SELECT

K5 K6

HEOT — K7

K8

6 — DZ7 — K9

WIDEBAND MODE (RCD 15 IPS)

K10

TRACK SELECTS

DATA TO RCDR

PB FWD

32/64 KBPS (GND=32 KBPS) — FORMAT SELECT — MADS PCM UNIT DWG 17.11 Z5

V_{MNA} MPCA1

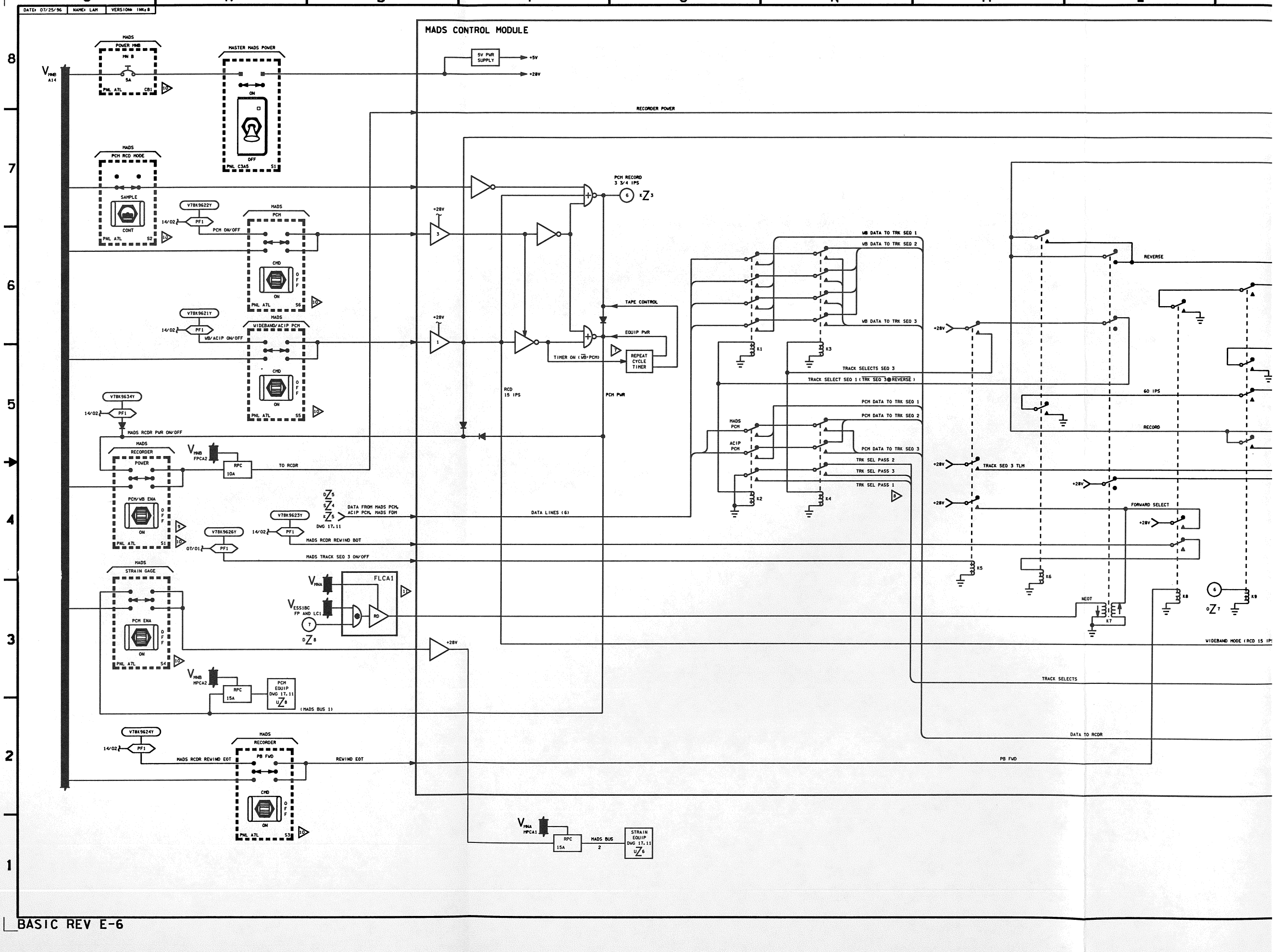
V78 X9603E — OF1 | NA — MADS RCDR BITE — 1=GOOD — 1 S/S

V78 X9613E — OF1 | NA — TRACK SEQ PASS 3 — 1=PASS 3 — 1 S/S

V78 X9612E — OF1 | NA — TRACK SEQ STATUS — 1=FWD — 1 S/S

V78 X9605E — OF1 | OF1 — MADS RCDR TAPE MOTION — 1=MOTION — 1 S/S

V78 096024 — OF1 | OF1 — MADS RCDR PERCENT TAPE — 0 TO 100% — 10 S/S


DATE: 07/25/96
NAME: LAM
VERSION: INK 8
S R Q P O N M L
8 7 6 5 4 3 2 1
MADS CONTROL MODULE
MADS POWER MNB
MN B
5A
PNL ATL CB1
MASTER MADS POWER
ON
OFF
PNL C3A5 S1
5V PWR SUPPLY
+5V
+28V
RECORDER POWER
MADS PCM RCD MODE
SAMPLE
CONT
PNL ATL S2
V78K9622Y
PF1
PCM ON/OFF
MADS PCM
CMD
ON
OFF
PNL ATL S6
PCM RECORD 3 3/4 IPS
TAPE CONTROL
EQUIP PWR
TIMER ON (WB+PCM)
REPEAT CYCLE TIMER
V78K9621Y
WB/ACIP ON/OFF
MADS WIDEBAND/ACIP PCM
PNL ATL S5
RCD 15 IPS
PCM PWR
V78K9634Y
MADS RCDR PWR ON/OFF
MADS RECORDER POWER
PCM/WB ENA
PNL ATL S1
RPC 10A
TO RCDR
DATA FROM MADS PCM, ACIP PCM, MADS FDM
DWG 17.11
V78K9623Y
V78K9626Y
MADS RCDR REWIND BOT
MADS TRACK SEQ 3 ON/OFF
DATA LINES (6)
MADS STRAIN GAGE
PCM ENA
PNL ATL S4
FLCA1
RD
PCM EQUIP DWG 17.11
(MADS BUS 1)
V78K9624Y
MADS RCDR REWIND EOT
REWIND EOT
MADS RECORDER PB FWD
CMD
PNL ATL S3
STRAIN EQUIP DWG 17.11
MADS BUS 2
WB DATA TO TRK SEQ 1
WB DATA TO TRK SEQ 2
WB DATA TO TRK SEQ 3
TRACK SELECTS SEQ 3
TRACK SELECT SEQ 1 (TRK SEQ 3 REVERSE)
PCM DATA TO TRK SEQ 1
PCM DATA TO TRK SEQ 2
PCM DATA TO TRK SEQ 3
TRK SEL PASS 2
TRK SEL PASS 3
TRK SEL PASS 1
MADS PCM
ACIP PCM
K1
K2
K3
K4
REVERSE
60 IPS
RECORD
TRACK SEQ 3 TLM
FORWARD SELECT
NEOT
K5
K6
K7
K8
K9
WIDEBAND MODE (RCD 15 IPS
TRACK SELECTS
DATA TO RCDR
PB FWD

BASIC REV E-6

DATE: 11/10/92	NAME: MAG	VERSION: INK.9
DATE: 02/22/96	NAME: MDU	VERSION: BPT.1
DATE: 03/13/96	NAME: SVJ	VERSION: INK.10

OEX RECORDER

OEX RCD BITE OUT
PWR IN
BRAKE CNTL
TRANSPORT VOLTAGE REGULATOR
+25V
+15V
+5V
TO TRANSPORT LOGIC AND SERVOS
POWER ON
PROTECTION CIRCUIT LOGIC
RECORDER BITE GOOD
TRANSPORT PWR OUT
REVERSE IN
2, 3-3/4, 1-7/8 IPS
TRK SELECTS IN
RCD CKT PWR IN
RCD VOLTAGE REG
+20V
PCM
SGSC
WB
MADS EQUIP
RCD PWR ON
OEX RCDR RCD OUT
BIAS PWR ON
UP TO SPEED
DATA TO RCDR TRACKS IN
ERASE IN
TAPE MOTION IN
TAPE MOTION OUT
1.6 MHZ OSC
SPEED SELECT
PHASE DET
SERVO AMP
RCD AMPS (14)
TRACK SELECT RELAYS (14)
RCD AMPS (14)
TRACK SELECT RELAYS (14)
BIAS OSC 4.85 MHZ
BIAS AMP
÷5
970 KHZ
TAPE MOTION CIRCUITS
BOT EOT SENSOR
PB REVERSE LIMIT SENSE RELAY
PB REVERSE MOTOR POLARITY RELAY
TAKE-UP REEL
TRANSPORT PWR
BRAKES
TENSION ARM
SENSOR LIGHTS
SERVO AMP
CAPSTAN
RCD HEAD ODD TRKS
PB HEAD ODD TRKS
RCD HEAD EVEN TRKS
PB HEAD EVEN TRKS
BULK ERASE
TO CAPSTAN SERVO AMP
SENSOR LIGHTS
TENSION ARM
SERVO AMP
OPTICAL TAPE MOTION SENSOR
BRAKES
TRANSPORT PWR
SUPPLY REEL
TAPE QUANTITY SENSOR

△ WIRING IS CAPPED AND STOWED

8. INCO SECTION RESPONSIBLE FOR SCM, OEX RCDR, AND MADS

△ BIAS PWR TIED TO RCD PWR SINCE THE RCDR OPERATES IN THE DIRECT RECORD MODE

△ PROTECTION CIRCUIT INDICATES BITE IF
1. TAPE TENSION SENSOR LIGHT FAILED
2. PWR IS ABOVE 37V OR BELOW 22V

△ OPTICAL SENSOR GENERATES PULSE TRAIN WHEN GUIDE ROLLER IS ROTATING. FREQUENCY OF PULSES COMPARED TO REFERENCE BY TAPE MOTION CIRCUITS

△ SPEED IS SELECTED BY GROUNDING APPROPRIATE INPUT

△ SWITCHES CLOSE IF TAPE IS SLACK AND CAUSE CAPSTAN TO SPEED UP/SLOW DOWN AND REMOVE SLACK (FOR INITIAL SET UP)

△ EOT/BOT CAUSES RCDR TO RUN AT ZERO SPEED, RCD AMPS, ETC, ARE STILL POWERED

NOTES: △ BRAKES APPLIED WHENEVER TRANSPORT POWER IS REMOVED

13 OEX SSO

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN B. J. TEDDER JR.	7/13/87	
DR		
ENGR D. EPPERSON		ORBITER EXPERIMENTS SUPPORT SYSTEM FOR OEX
ENGR Debra Epperson	4/11/96	
APP Gary Hulet	4/11/96	
APP Donald W. Stuit	4/11/96	SPACE SHUTTLE / DWG NO 17.13
CADS S.K. Grinstead	6-17-96	ALL
LTR E / PCN 2		93.5 X 34 / PAGE / SHEET 1 OF 1

BASIC REV E-6

SCM (SYSTEM CONTROL MODULE)

SILTS POWER

SILTS CAMERA

ENABLE

MASTER OEX POWER

OEX EQUIP

MADS CONTROL

MADS FDM

ORBITAL TIMING BUFFER

TACHOMETER PULSES

6 SPEED SELECTS 60, 30, 15, 7-1/2, 3-3/4, 1-7/8 IPS

MPCA-3

DATE: 02/12/96 | MARK: SVJ | VERSION: INR.10

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
17.1 (SHEET 1)	0I DSC'S AND MDM'S	RI					SIGNAL CONDITIONER ASSEMBLY
			V070-751061-003		C/C3	10/20/82	Forward RCS Oper
			V070-753261-007	1 OF 1	C/C3	10/22/82	Fwd Av Bay
			V070-753261-009	1 OF 1	C/C3	10/22/82	Fwd Av Bay
			V070-753261-010	1 OF 1	C/C3	10/22/82	Fwd Av Bay
			V070-753262-003	2 OF 2	C/C3	10/22/82	Fwd Av Bay
			V070-753262-005	2 OF 2	C/C3	10/22/82	Fwd Av Bay
			V070-753263-007	3 OF 3	C/3D	11/76	Fwd Av Bay
			V070-753263-008	3 OF 3	C/3D	11/76	Fwd Av Bay
			V070-754161-002		D	6/16/87	Fuel-Cell A Mid1
			V070-754163-010		D	6/16/87	Fuel-Cell B Mid2
			V070-755261-005		C	4/29/83	Avionics Bay4-AFT
			V070-755261-009		C/3D	12/76	Avionics Bay4-AFT
			V070-755262-005		C/3D	12/76	Avionics Bay6-AFT
			V070-755262-008		C/3D	12/76	Avionics Bay6-AFT
			V070-755263-005		C/3D	12/76	Avionics Bay 6-AFT
			V070-755263-008		C/3D	12/76	Avionics Bay6-AFT
		SCAP/Shuttle Data Tape					LH OMS Pod-1
							RH OMS Pod-1
							LH OMS Pod-2
							RH OMS Pod-2
17.1 (SHEET 2)	OI DED. SIG. COND.	ELDEC LYNNWOOD WASH.	S7-040300		-	1/4/75	POWER CONDITIONER/CMIB
			S7-040400		-	10/15/74	BITE CMIB
			S7-043		-	11/13/74	Converter Pulse to DC
			S7-044		-	10/16/74	Concerter Variable Res. to DC
			S7-047		-	12/03/74	Converter AC to DC
			S7-049		-	04/07/75	Converter Voltage Discrete AC
			S7-051		-	10/23/74	Buffer 5 VDC Discrete
			S7-052		-	08/10/74	DC Amplifier, Buffer, Attenuator
17.1 (SHEET 3)	TBD						
17.2	OI PCM MASTER UNIT	ROCKWELL	VS70-750129	1 - 3	F	6/8/88	SCHEMATIC DIAGRAM PCM MASTER, VEH 103/104
			VS70-750122	1 - 3	H	5/24/88	SCHEMATIC DIAGRAM PCM MASTER, VEH 102

DWG	SIGNATURE	DATE
17.1-1,2	ENGR S. M. KAKADELIS	
	ENGR S. Kakadelis	11.15.90
17.2	ENGR A. MORRSION	
	ENGR	4/15/92
	APP	11.15.90
	APP	
	OMNIPLAN	
	LTR E PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE ALL

TBL NO 17-I

BASIC REV E

FOR DETAILED COMPONENT AND LOGIC INFORMATION REFER TO:

SSSH DWG NO.	SSSH DWG TITLE	VENDOR NAME	VENDOR DWG NO.	VENDOR SHEET NO.	REV	DATE	VENDOR DRAWING TITLE
17.3 (SHEETS 1-3)	PAYLOAD DATA INTERLEAVER	ROCKWELL	VS70-750169		H	5/24/88	PAYLOAD DATA INTERLEAVER
		Harris	619105	1	A	9/14/76	Logic Diagram, Electrical-I/O Buffer Decoder,Chip 5
		Harris	620341	1	A	9/14/76	I/O Buffer, First Stage I/O, Chip 1
		Harris	620342	1	A	9/14/76	I/O Buffer, Second Stage I/O, Chip 2
		Harris	620343	1	A	9/14/76	I/O Buffer, First Stage I/O, Chip 3
		Harris	620344	1	A	9/14/76	I/O Buffer Control, Chip 4
		Harris	622141	1	N/C	7/20/78	Schematic Diagram, Electrical-Power Supply
		Harris	622143	1	N/C	7/20/78	Logic Diagram, Electrical-I/O Buffer
		Harris	622146	1	A	4/13/78	Logic Diagram, Electrical-Memory Module
		Harris	622147	1-4	N/C		Logic Diagram, Electrical-Priority, Buss Control
		Harris	622148	1-4	N/C		Logic Diagram, Electrical-Timing & Irig
		Harris	622149	1-2	N/C	2/12/79	Logic Diagram, Electrical-Rcvr & Scom
		Harris	622150	1-5	N/C	2/26/79	Logic Diagram, Electrical-Bit/Word Sync
		Harris	622151	1-4	N/C	2/26/79	Logic Diagram, Electrical-Decom T-1
		Harris	622152	1-4	N/C	2/26/79	Logic Diagram, Electrical-Decom Control - Type II
		Harris	622153	1-3	N/C	2/26/79	Logic Diagram, Electrical-Decom Control, Type 3
		Harris	622154	1-4	N/C	2/26/79	Logic Diagram, Electrical-Decom Type 4
		Harris	622155	1-5	N/C	2/26/79	Logic Diagram, Electrical-Fpm, Tb Cont
		Rockwell	VS70-750169	1-2	H	5/24/88	Schematic Diagram - Payload Data Interleaver
		Harris	138693	1-304	N/C	5/16/79	Run List, PDI Motherboard
17.4 THRU 17.9	RESERVED						
17.10	BIO MEDICAL INSTRUMENTATION	R.I.	VS70-974099	31	A-13	11/17/86	COMM. 7 TRACKING INTEGRATED SCHEMATICS PART I
17.11	TBD						
17.12C, D	TBD						

DWG	SIGNATURE		DATE
17.3	ENGR A. MORRSION		
	ENGR		11/2/90
17.10	ENGR C. COUNTS		
	ENGR		11/2/90
	APP		11/2/90
	APP		11/2/90
	OMNIPLAN		
	LTR E	PCN	

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

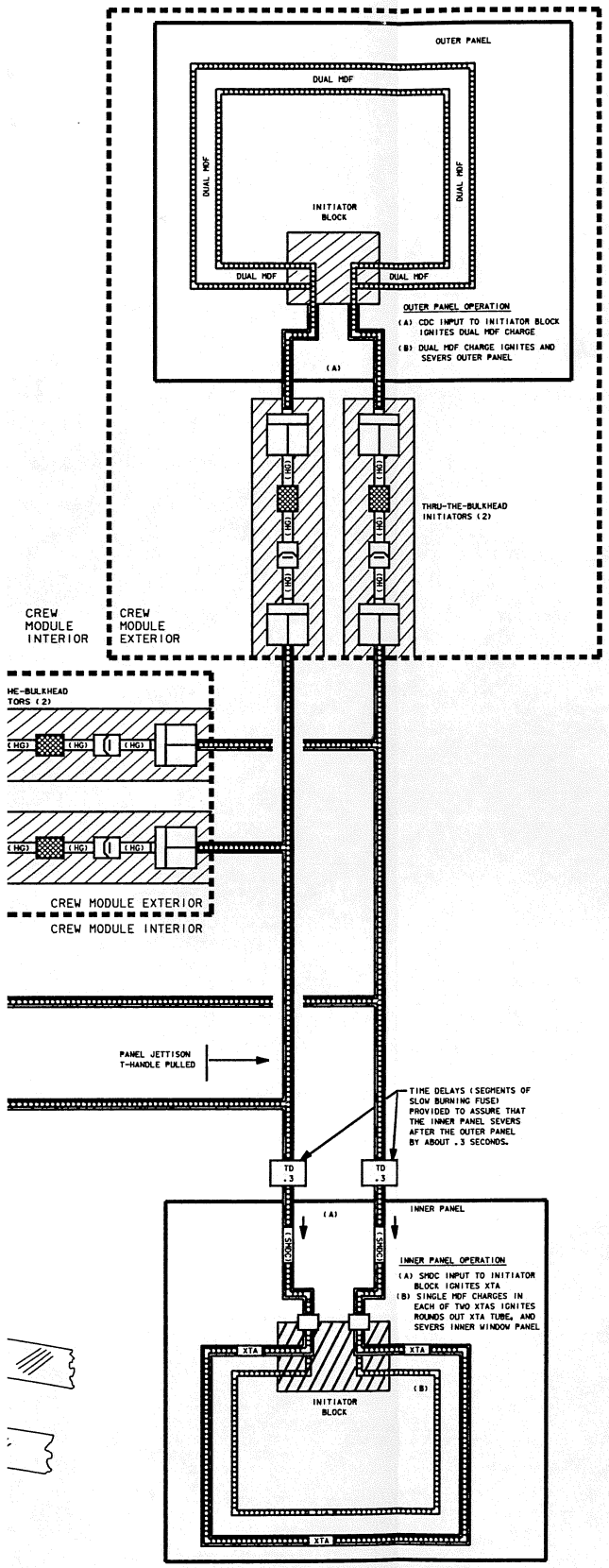
VENDOR DRAWING REFERENCES

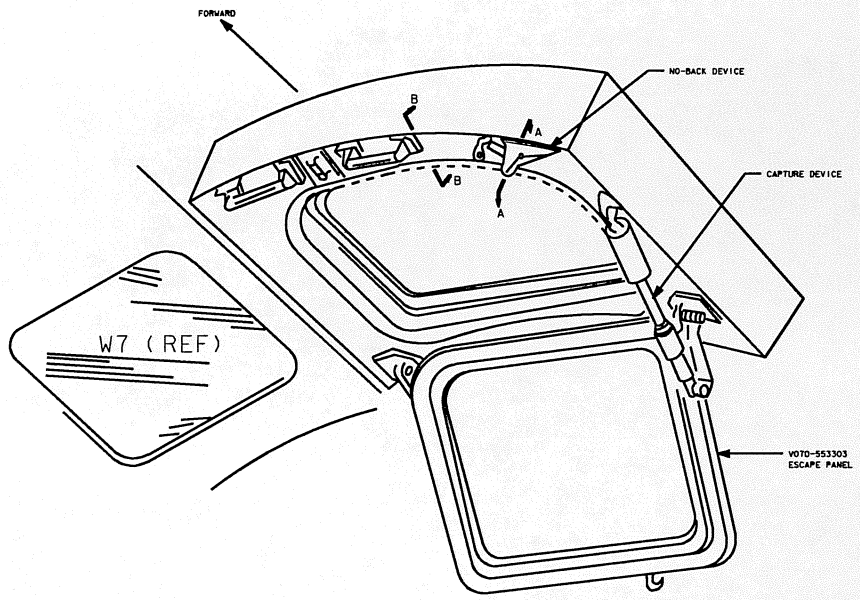
SPACE SHUTTLE | TBL NO 17-I
ALL

*U.S.GOVERNMENT PRINTING OFFICE:1990-561-057/20055

BASIC REV E

DATE: 06/10/94	NAME: BJT	VERSION: INT-5
DATE: 07/11/94	NAME: VSH	VERSION: BPT-5
DATE: 07/13/94	NAME: SEW	VERSION: INT-6

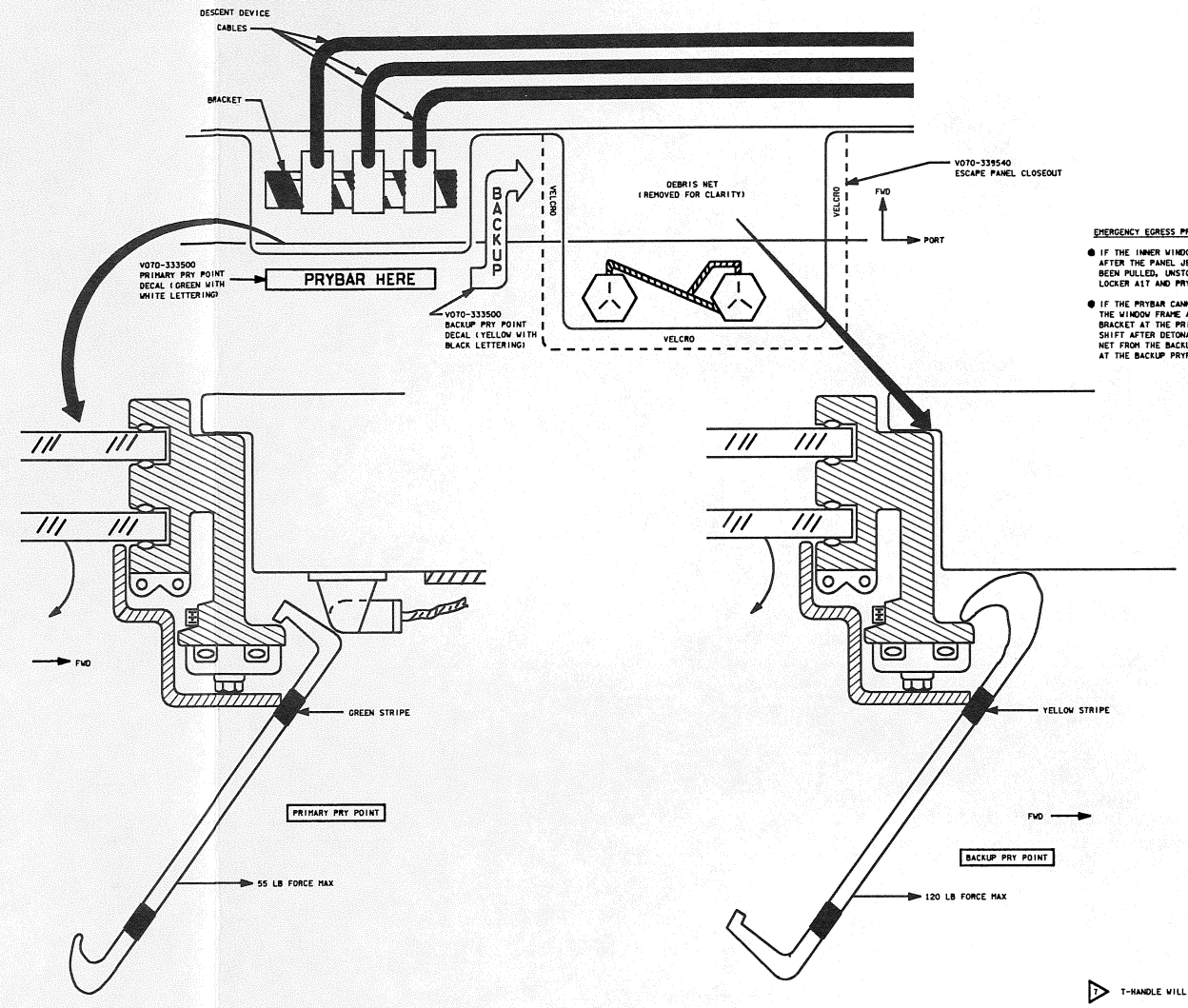




INNER WINDOW OPERATION

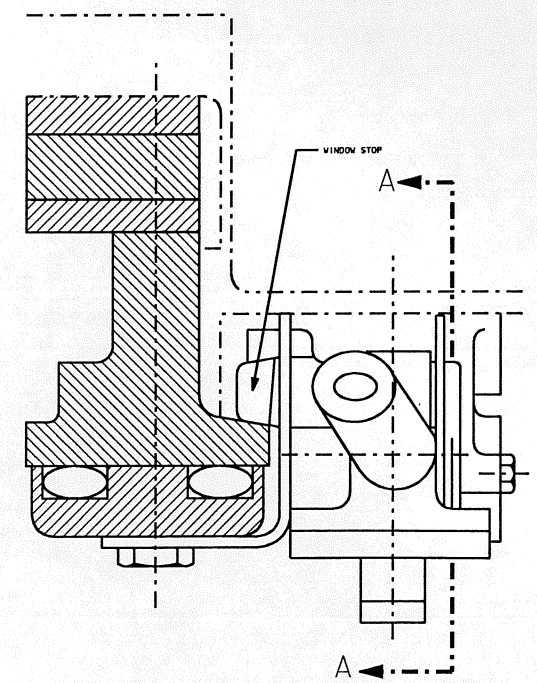
- WHEN CABIN TO ATMOSPHERIC ΔP ≤ 0.25 PSID, THE WINDOW OPENS AND THE CAPTURE DEVICE HOLDS THE WINDOW FULL OPEN FOR EGRESS.
- WHEN CABIN TO ATMOSPHERIC ΔP > 0.25 PSID, AND ≤ 0.44 PSID, THE WINDOW OPENS AND THE NO-BACK DEVICE ENGAGES TO PREVENT SUBSEQUENT WINDOW CLOSING DURING CABIN PRESSURE EQUALIZATION.
- WHEN CABIN TO ATMOSPHERIC ΔP > 0.44 PSID, THE WINDOW WILL NOT OPEN FAR ENOUGH TO ENGAGE THE NO-BACK DEVICE. THE PRYBAR MUST BE USED TO PRY THE WINDOW OPEN TO ENGAGE THE NO-BACK DEVICE AND ALLOW CABIN PRESSURE EQUALIZATION.
- AFTER CABIN PRESSURE EQUALIZATION, THE WINDOW WEIGHT (150 LB) WILL OPEN THE WINDOW.

SECTION B-B

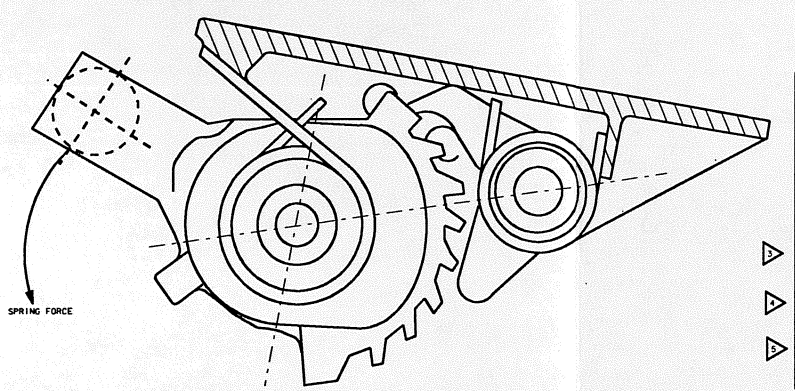


EMERGENCY EGRESS PRYBAR OPERATION

- IF THE INNER WINDOW DOES NOT OPEN AFTER THE PANEL JETTISON T-HANDLE HAS BEEN PULLED, UNSTOW THE PRYBAR FROM LOCKER A1T AND PRY THE WINDOW OPEN.
- IF THE PRYBAR CANNOT BE INSERTED BETWEEN THE WINDOW FRAME AND THE DESCENT DEVICE BRACKET AT THE PRIMARY PRY POINT (WINDOW SHIFT AFTER DETONATION), REMOVE THE DEBRIS NET FROM THE BACKUP ACCESS CUTOUT AND PRY AT THE BACKUP PRYPOINT.



SECTION A-A



NO-BACK DEVICE

INNER WINDOW OPENING

MAXIMUM CABIN TO ATMOSPHERIC ΔP (PSID)	FORCE OPPOSING WINDOW OPENING (LB)	WINDOW OPENING (IN.)	NO-BACK TOOTH ENGAGED	PRYBAR FORCES (LB)		CABIN BLEED TIME (SEC)
				PRIMARY END	BACKUP END	
0.25	155	FULL OPEN	NA	NA	NA	NA
0.29	180	0.57	2	NA	NA	2
0.44	272	0.18	1	NA	NA	5
1.14	706	0.57	2	19	42	8
1.14	706	0.18	1	19	42	12
2.35	1455	0.57	2	39	86	13
2.35	1455	0.18	1	39	86	24
3.3	2043	0.57	2	55	120	23
3.3	2043	0.18	1	55	120	34

- WINDOW OPENING BEYOND THE SECOND TOOTH OF THE NO-BACK DEVICE CANNOT BE ACHIEVED WITH THE PRYBAR AND WOULD NOT APPRECIABLY REDUCE THE TIME REQD FOR CABIN PRESSURE EQUALIZATION.

1. T-HANDLE WILL PULL FREE OF INITIATOR WHEN SQUEEZED AND PULLED
2. 2 TORO-SET FASTENERS ADDED TO PREVENT IN ADVERTENT PANEL OPENING AND IGNITION OF PYROS DURING ENTRY. FIRE RESCUE PERSONNEL MUST REMOVE BOTH FASTENERS WITH NO. 10 TORO-SET SCREWDRIVER PRIOR TO PUNCHING THROUGH SMALL RED DEPRESSION IN TILE, JUST ABOVE EXTERNAL PANEL JETTISON T-HANDLE ACCESS DOOR
3. HIGHEST PREDICTED ΔP AT NOR. STS-3 ΔP WAS 2.38 PSID
4. HIGHEST PREDICTED ΔP AT EDW. STS-1, 2, 4, 5 ΔP'S RANGED FROM 1.12 TO 1.76 PSID
5. HIGHEST PREDICTED ΔP AT KSC
6. THE FOLLOWING ACRONYMS ARE USED ON THIS DRAWING:
   H.G. - HOT GAS
   SMDC - SHIELDING MILD DETONATING CHARGE (RIGID)
   CDC - CONTAINED DETONATING CHARGE (FLEXIBLE)
   XTA - EXPANDING TUBE ASSEMBLY
   MDF - MILD DETONATING FUSE
7. ARROWS (⟶) INDICATE DIRECTION OF FLOW OF FORCE WHEN SYSTEM WAS BEEN ACTUATED

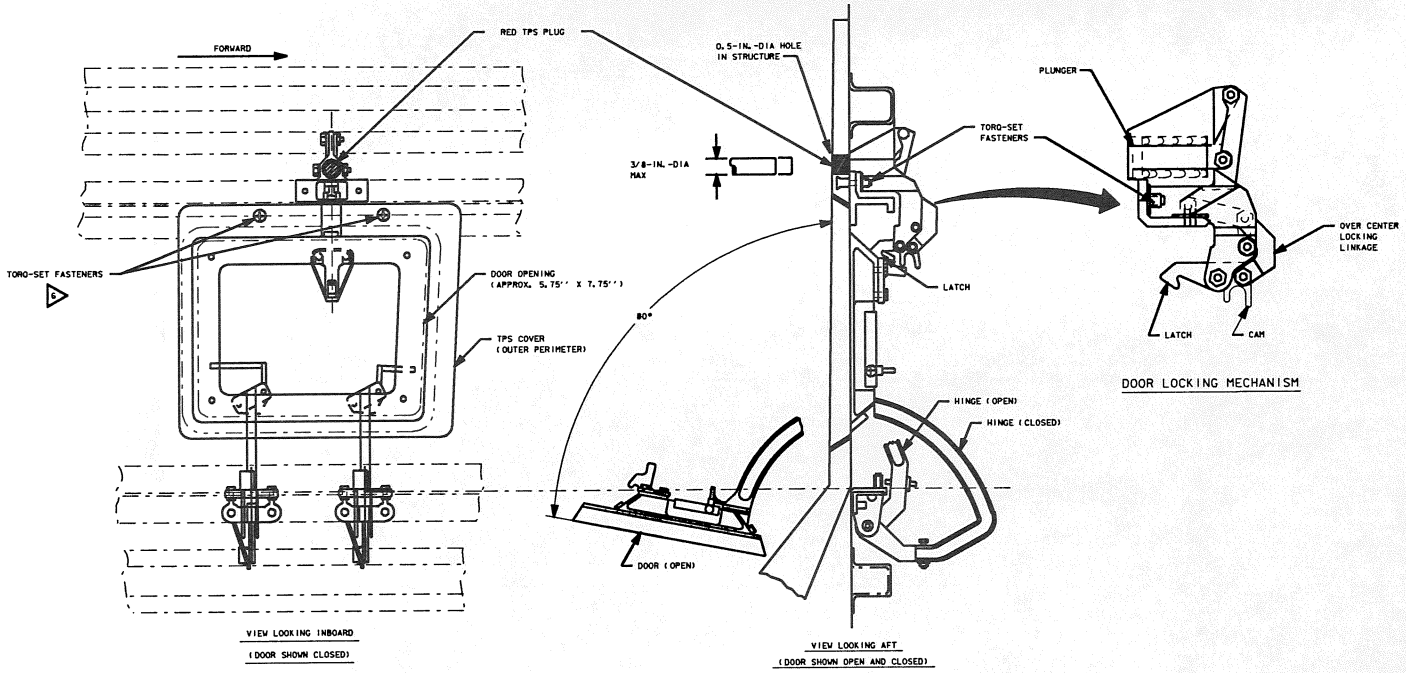
NOTES: FOR DETAILED COMPONENT AND LOGIC INFORMATION SEE TABLE 18-1

ESC PNL

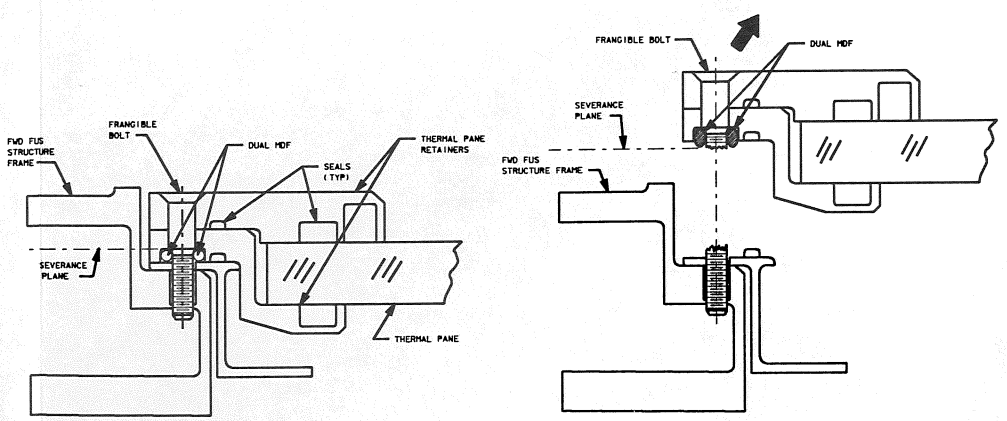
SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	VICKI S. HUNTER	5/4/83	
DR			
ENGR	K. PORTER		ESCAPE PANEL
ENGR		7/14/94	
APP		7/15/94	
APP			SPACE SHUTTLE / DWG NO 18.1
CADS	S.K. KIMBREL	7-18-94	ALL / SHEET 1 OF 1
LTR E	PCN 4		121 X 34 / PAGE

BASIC REV E-4

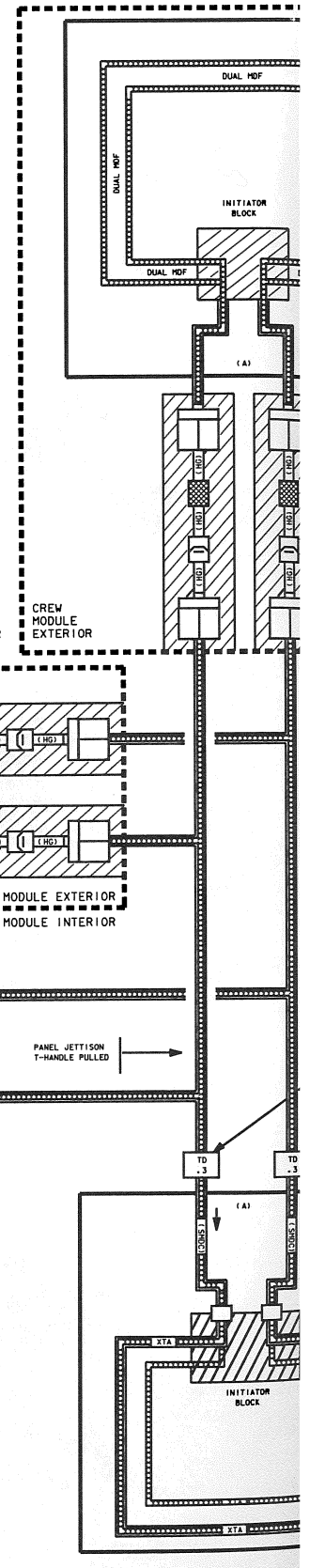
T S R Q P O N M L K J

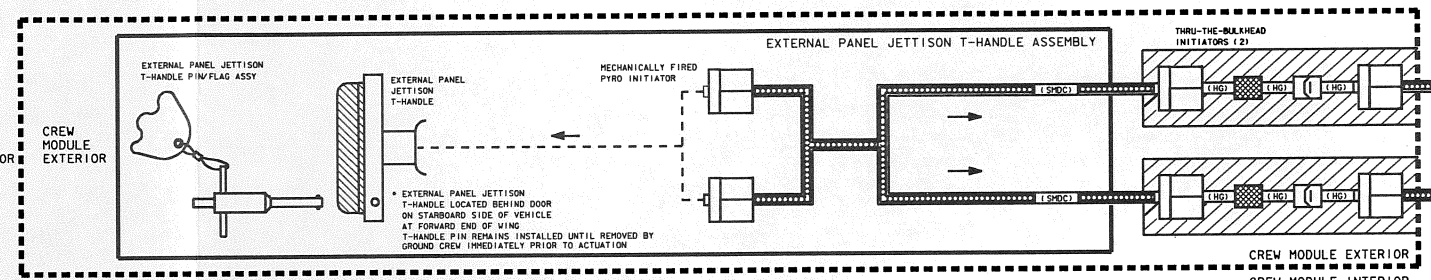


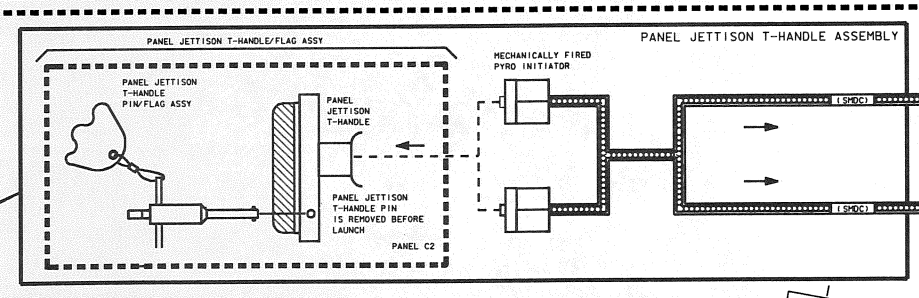
DOOR LOCKING MECHANISM

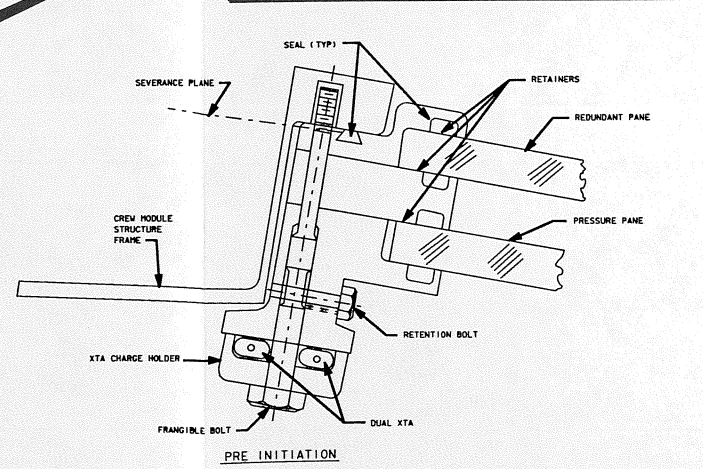


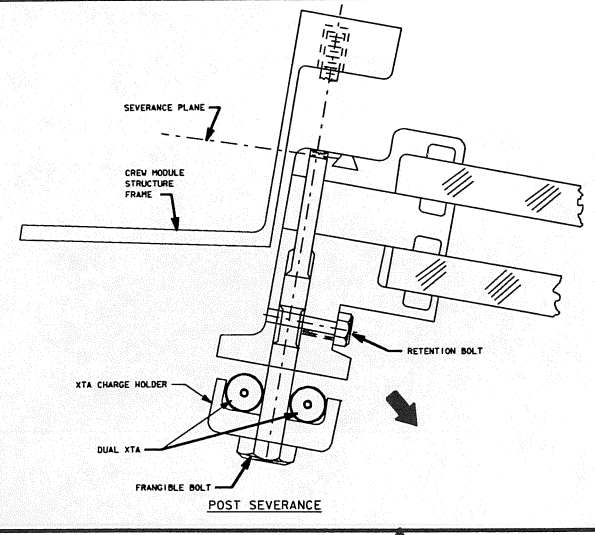
OUTER WINDOW SEVERANCE SYSTEM



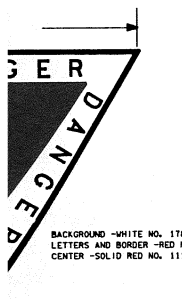








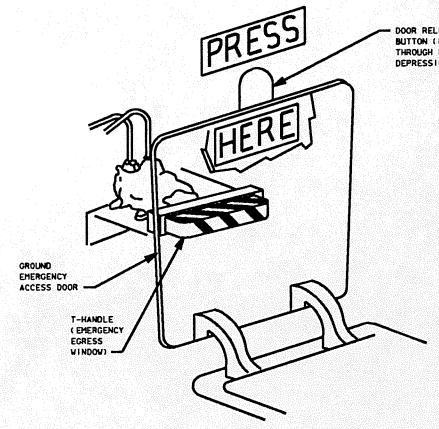
INNER WINDOW SEVERANCE SYSTEM

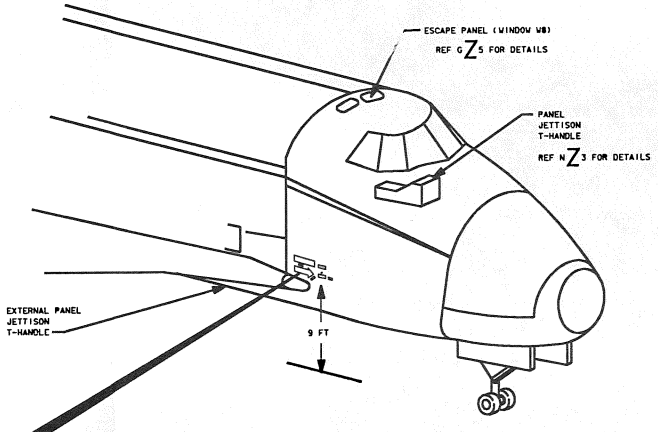


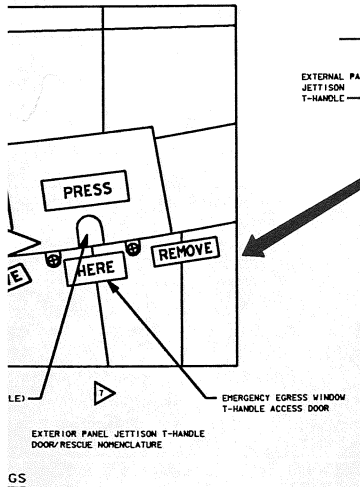
W DANGER
ATURE

EXTERNAL PANEL JETTISON T-HANDLE ACCESS DOOR OPERATION

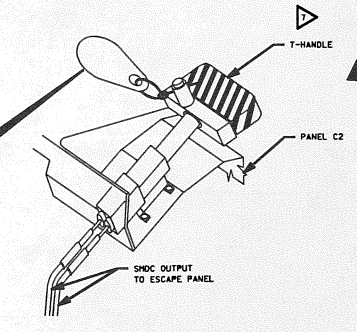
- TO OPEN DOOR, PUSH ROD (MAX DIA 3/8 IN) THROUGH RED TPS PLUG UNTIL ACCESS DOOR RELEASE BUTTON IS DEPRESSED
- LOCKING MECHANISM LINKAGE ROTATES CAM/LATCH LINK
- LATCH RELEASES DOOR AND CAM BREAKS SEAL AND PUSHES DOOR OPEN



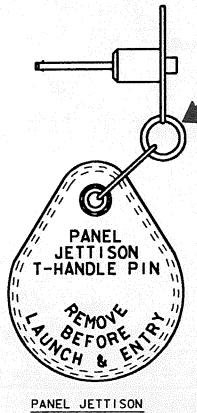




GS

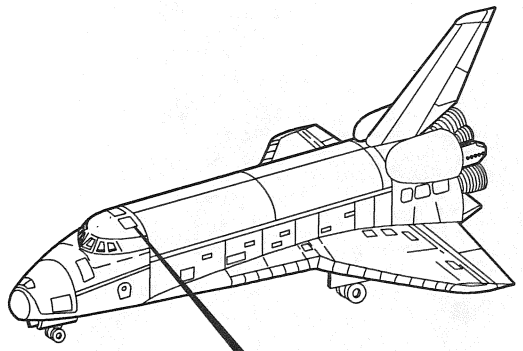


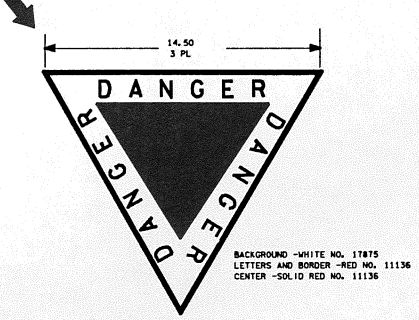
PANEL JETTISON T-HANDLE



PANEL JETTISON T-HANDLE PIN/FLAG ASSEMBLY

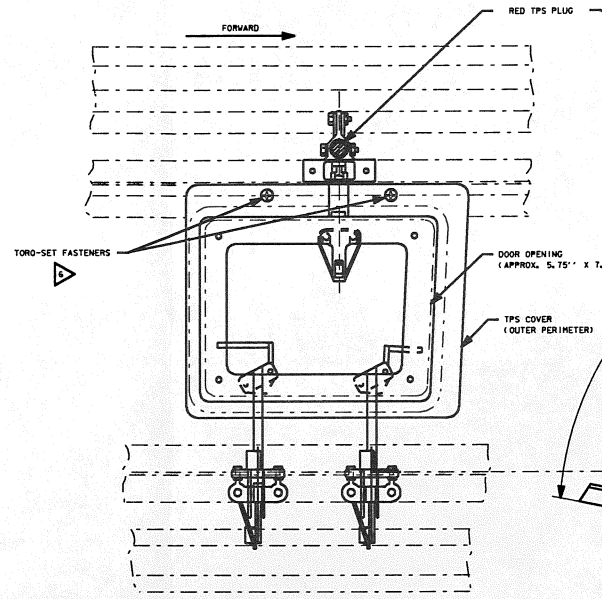
DATE= 07/13/94 | NAME= SEW | VERSION= INKx6



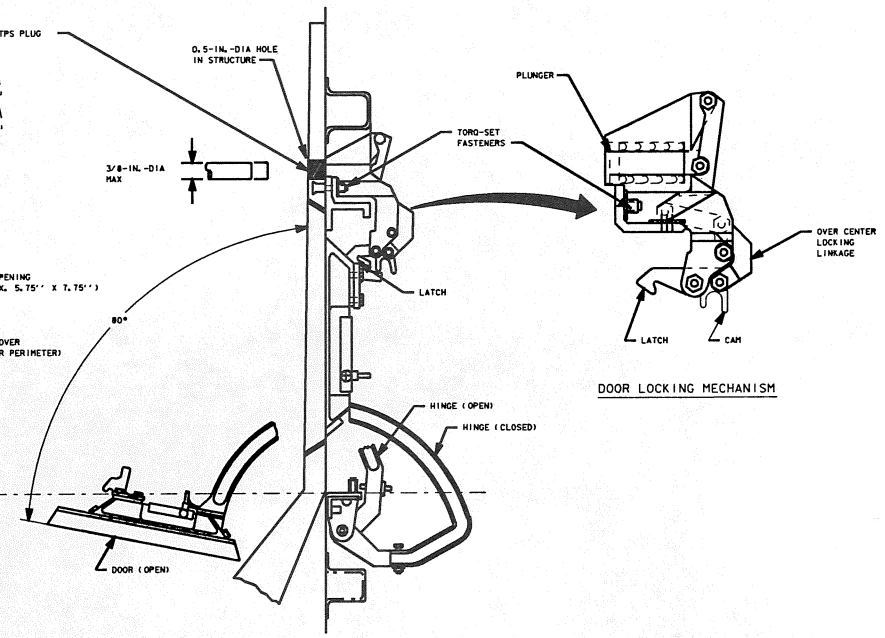


BACKGROUND -WHITE NO. 17875
LETTERS AND BORDER -RED NO. 11136
CENTER -SOLID RED NO. 11136

EGRESS WINDOW DANGER NOMENCLATURE

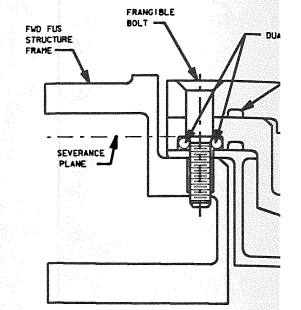


VIEW LOOKING INBOARD
(DOOR SHOWN CLOSED)



VIEW LOOKING AFT
(DOOR SHOWN OPEN AND CLOSED)

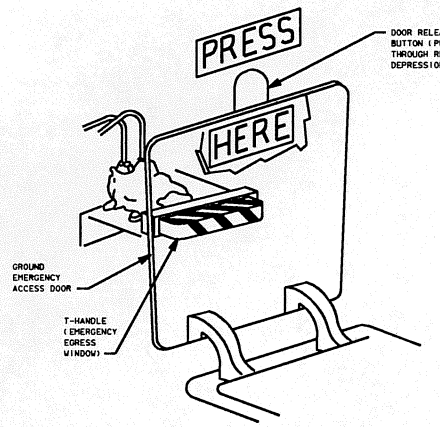
DOOR LOCKING MECHANISM



PRE INITIATIO

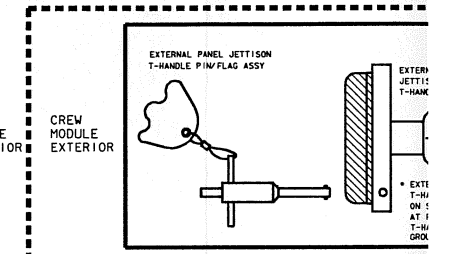
EXTERNAL PANEL JETTISON T-HANDLE ACCESS DOOR OPERATION

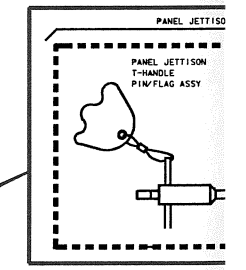
- TO OPEN DOOR, PUSH ROD (MAX DIA 3/8 IN) THROUGH RED TPS PLUG UNTIL ACCESS DOOR RELEASE BUTTON IS DEPRESSED
- LOCKING MECHANISM LINKAGE ROTATES CAM/LATCH LINK
- LATCH RELEASES DOOR AND CAM BREAKS SEAL AND PUSHES DOOR OPEN

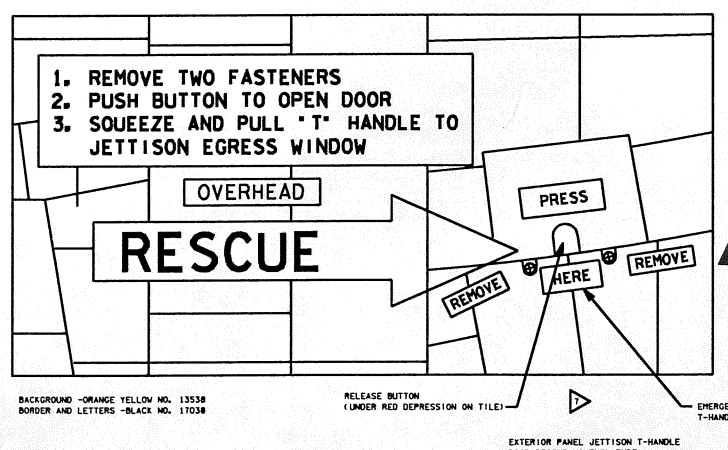


CREW MODULE INTERIOR

CREW MODULE EXTERIOR







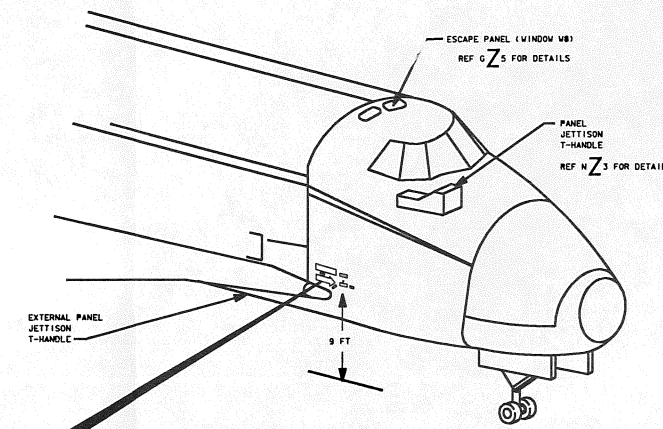
BACKGROUND -ORANGE YELLOW NO. 13538
BORDER AND LETTERS -BLACK NO. 17038

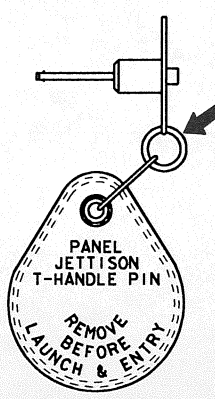
RELEASE BUTTON
(UNDER RED DEPRESSION ON TILE)

EMERGENCY EGRESS WINDOW
T-HANDLE ACCESS DOOR

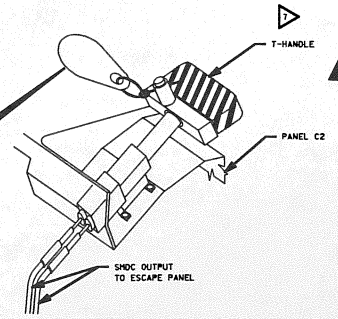
EXTERIOR PANEL JETTISON T-HANDLE DOOR/RESCUE NOMENCLATURE

ORBITER ESCAPE SYSTEM EXTERIOR MARKINGS

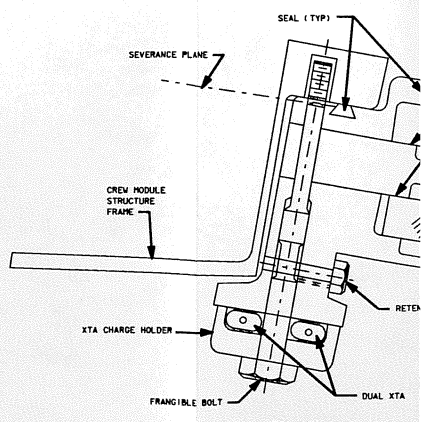




PANEL JETTISON
T-HANDLE
PIN/FLAG ASSEMBLY

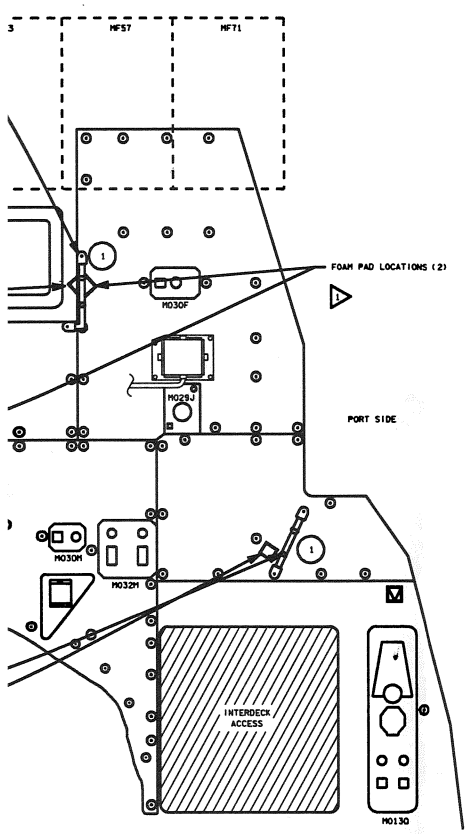


PANEL JETTISON T-HANDLE



PRE INITIATION

DATE: 02/14/94	NAME: LAM	VERSION: BPT: 9
DATE: 03/22/94	NAME: LAM	VERSION: BPT: 10
DATE: 06/10/94	NAME: BJT	VERSION: INT: 4



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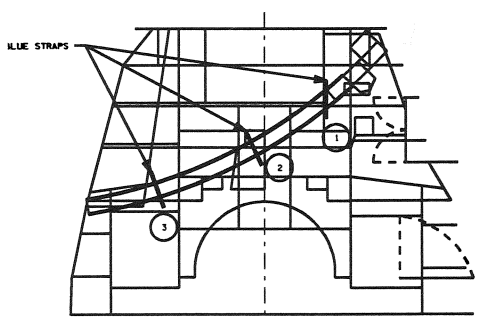
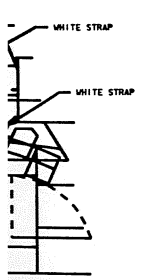
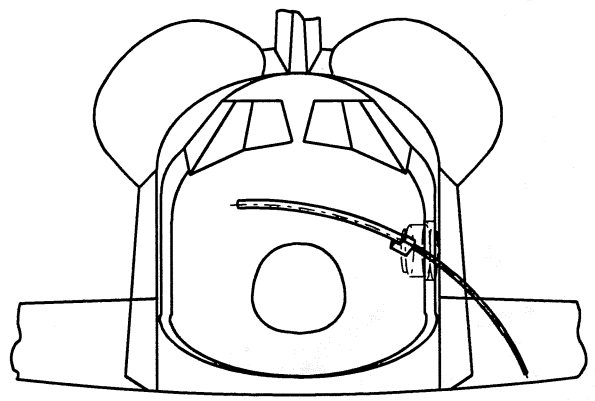
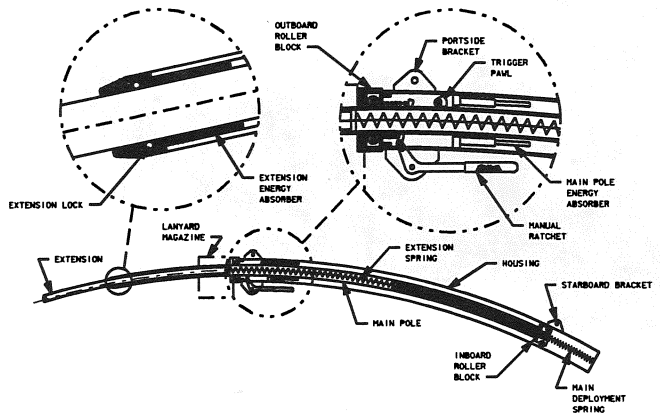


SECONDARY
(BLUE STRAPS NO. 1, 2, 3)

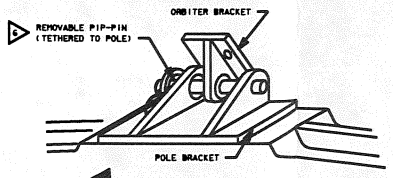




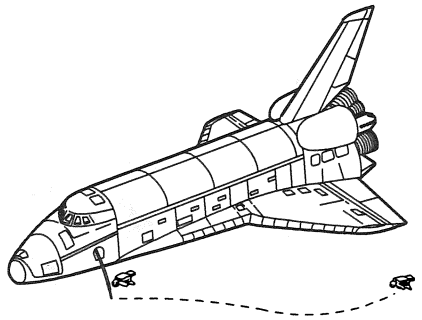
DEPLOYED POLE
(LOOKING AFT)



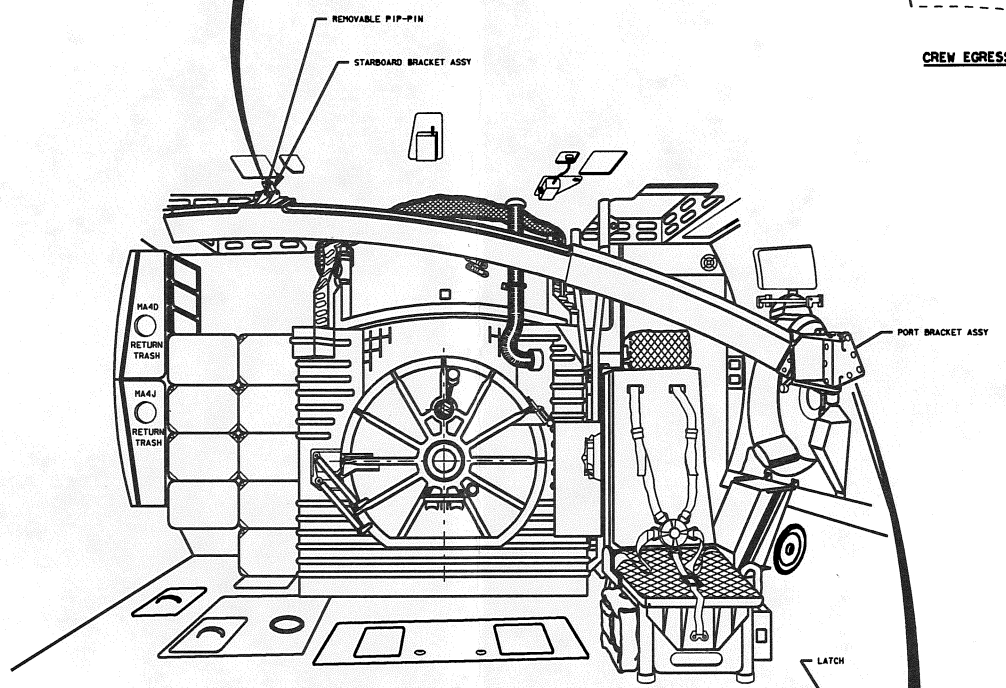
▷▷ **DEPLOYED POLE ASSY**
(LOOKING FORWARD)



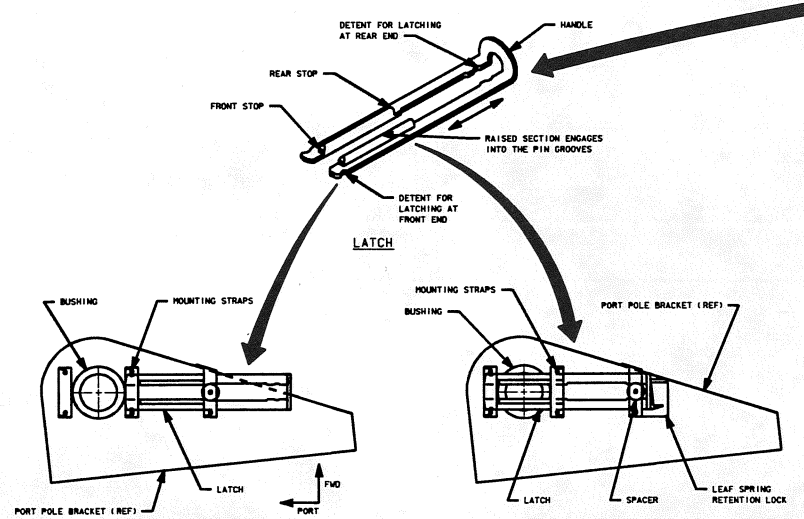
STARBOARD BRACKETS
(POLE-TO-ORBITER MATE)



CREW EGRESS/WING CLEARANCE

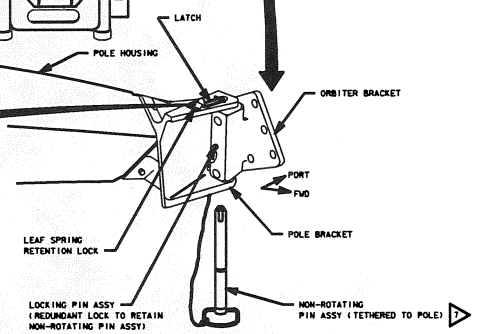


POLE CES
LAUNCH/ENTRY INSTALLATION
MIDDECK LOOKING AFT
(5 CREW)



UNLATCHED POSITION

LATCHED POSITION



PORT BRACKETS
(POLE-TO-ORBITER MATE)

▷ MINIMUM HANDLE TRAVEL TO RELEASE POLE= 22°

▷ RATCHET PIN IS 3/16" (.188") OUTER DIAMETER AND 1.8" LONG

▷ NON-ROTATING PIN ASSEMBLY IS .748"-.745" OUTER DIAMETER AND 8.625" LONG (NOT INCLUDING LATCH GROOVES AND END)

▷ REMOVABLE PIP PIN IS 0.50" OUTER DIAMETER AND 2.00" LONG

5. REFER TO TABLE 18.1 FOR DRAWING TRACEABILITY

▷ PHYSICAL DATA: MASS OF POLE ASSY=267 LB
EXTENSION POLE- EXTENDS 32" FROM MAIN POLE WHEN DEPLOYED, 2.25" O. D.
MAIN POLE- EXTENDS 103" FROM MAGAZINE WHEN DEPLOYED, 3.0" O. D.
MAGAZINE- 9"
POLE HOUSING- 126" (BACK OF MAGAZINE TO THE END OF HOUSING)

▷ GREEN STRIPE DENOTES POLE IS FULLY DEPLOYED. IF NO GREEN STRIPE AFTER DEPLOYMENT, MANUALLY RATCHET POLE UNTIL GREEN STRIPE APPEARS

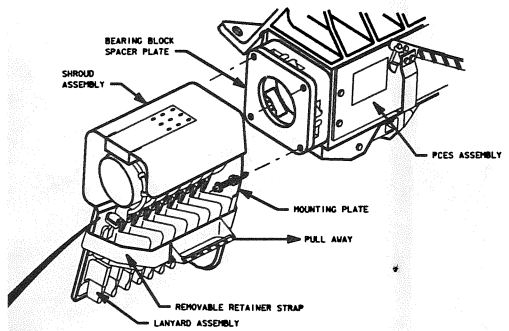
▷ SPRING DEPLOYMENT OF POLE TAKES ≈ 1 SEC AT A MAX FORCE OF 375 LBS

NOTES: ▷ THERE ARE 2 FOAM PADS USED AS CEILING STAND-OFFS WHEN STRAPING POLE TO CEILING. THERE ARE 4 DIFFERENT POSITIONS THE PADS CAN BE CONFIGURED IN: LAUNCH POSITION, PRIMARY STOWAGE POSITION, SECONDARY STOWAGE POSITION AND TERTIARY. THE VARIOUS STOWAGE POSITIONS DEPEND ON THE CONFIGURATION OF THE MIDDECK. REFER TO CCCD FOR SPECIFIC CONFIGURATIONS

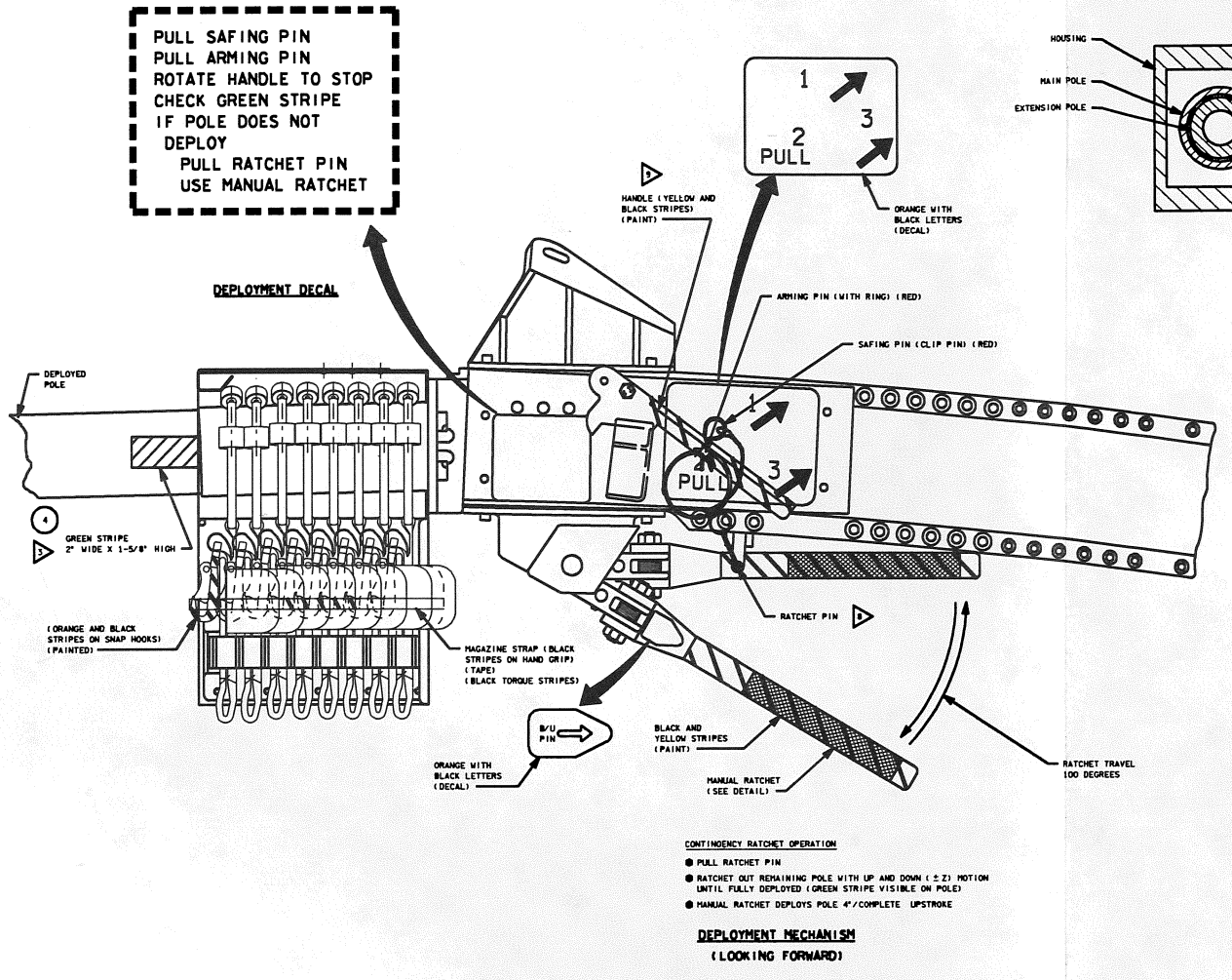
2 PCES

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	B. TEDDER JR.	9/6/88		
DR				
ENGR	Karen Porter	6/17/94	POLE CREW ESCAPE SYSTEM	
ENGR	K. PORTER	3/8/94		
APP	B. Patterson	7/1/94		
APP			SPACE SHUTTLE	DWG NO 18.2
CADDS	K. Porter	7-15-94	ALL	
LTR E	PCN 4		126.5 X 34	PAGE SHEET 1 OF 1

BASIC REV E-4



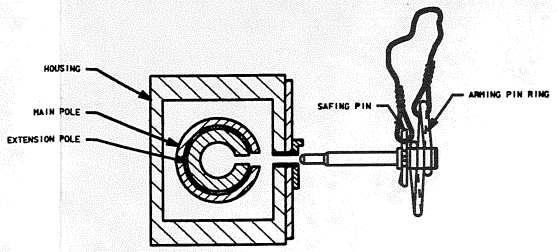
LANYARD MAGAZINE ASSEMBLY/ POLE ATTACHMENT LOCATION



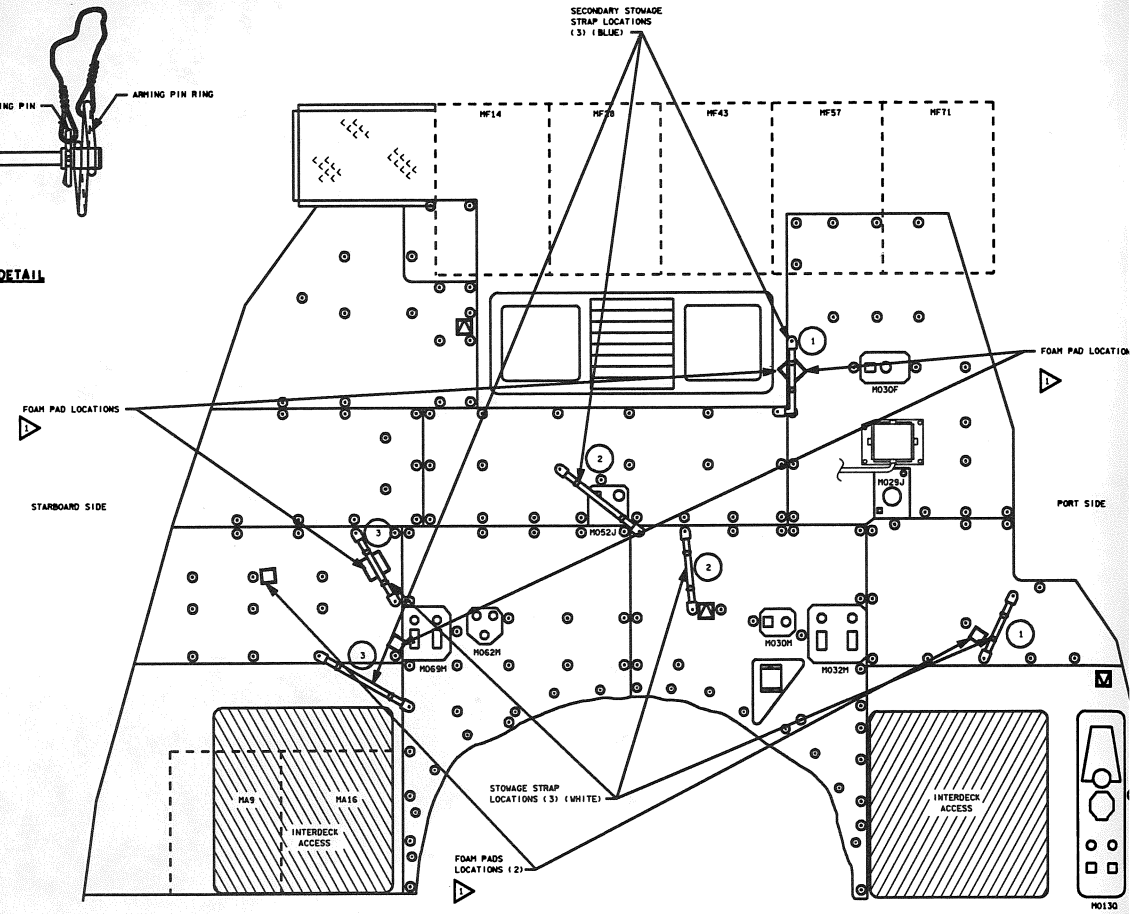
CONTINGENCY RATCHET OPERATION

- PULL RATCHET PIN
- RATCHET OUT REMAINING POLE WITH UP AND DOWN (±2) MOTION UNTIL FULLY DEPLOYED (GREEN STRIPE VISIBLE ON POLE)
- MANUAL RATCHET DEPLOYS POLE 4"/COMPLETE UPSTROKE

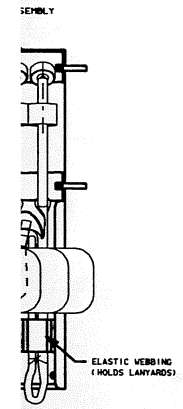
DEPLOYMENT MECHANISM
(LOOKING FORWARD)



ARMING PIN DETAIL

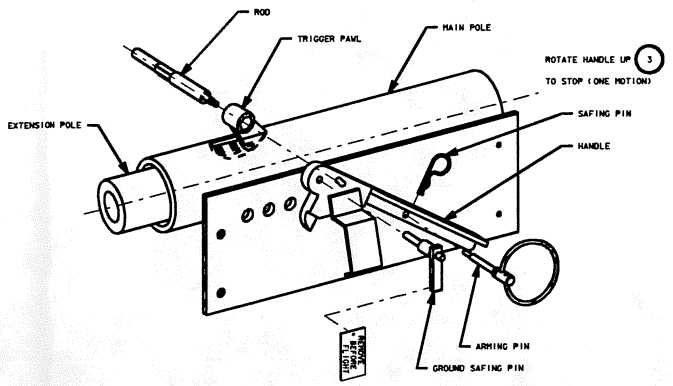


ON-ORBIT POLE STOWAGE INSTALLATION
(FACING AFT, LOOKING UP)

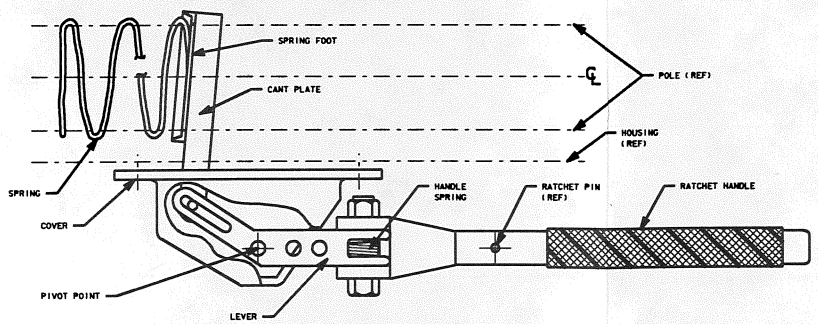


SEMBLY

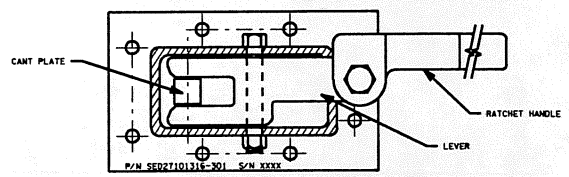
SBLY



TRIGGER SCHEMATIC

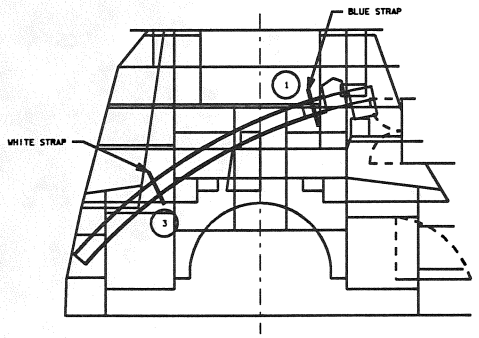


SIDE VIEW

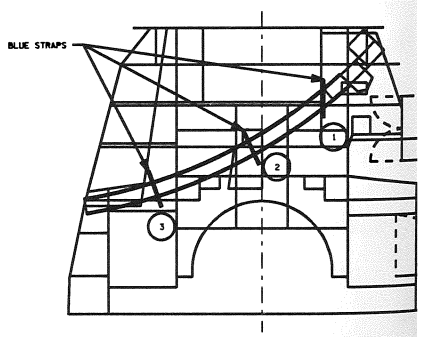


BOTTOM VIEW

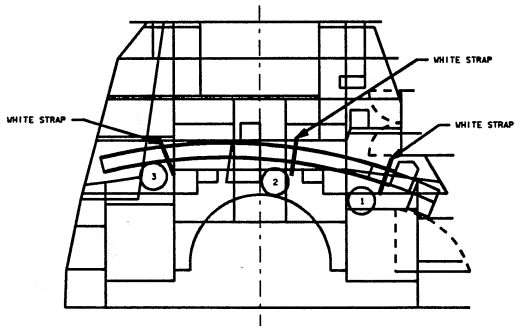
MANUAL RATCHET DETAIL



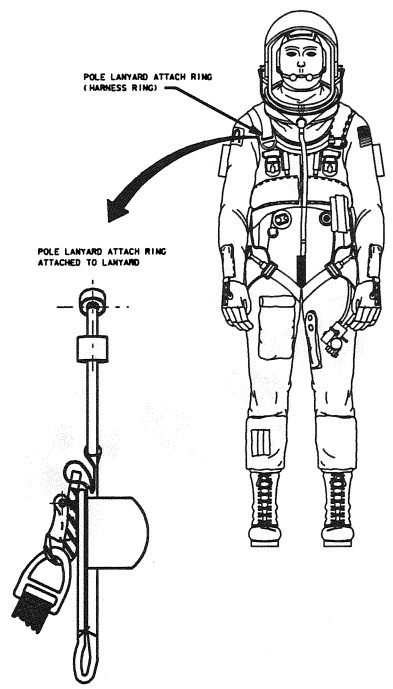
PRIMARY
(WHITE NO. 3 AND BLUE NO. 1 STRAP)

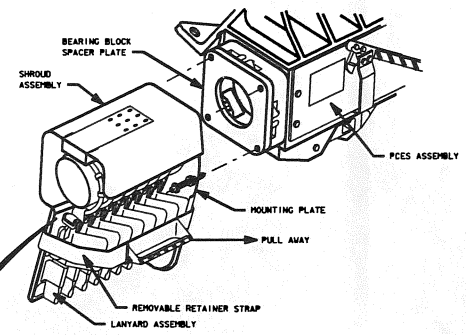


SECONDARY
(BLUE STRAPS NO. 1, 2, 3)

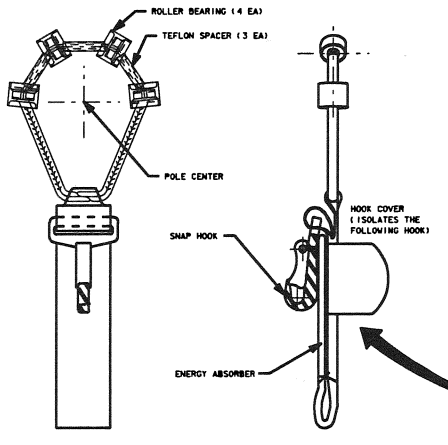


TERTIARY
(WHITE STRAPS NO. 1, 2, 3)

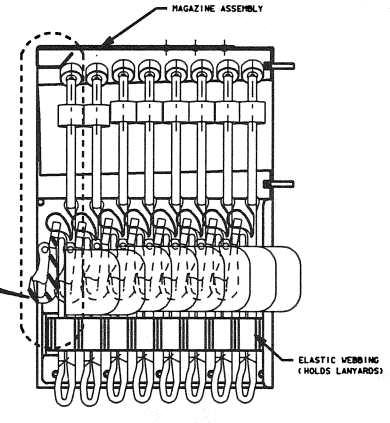




LANYARD MAGAZINE ASSEMBLY/
POLE ATTACHMENT LOCATION

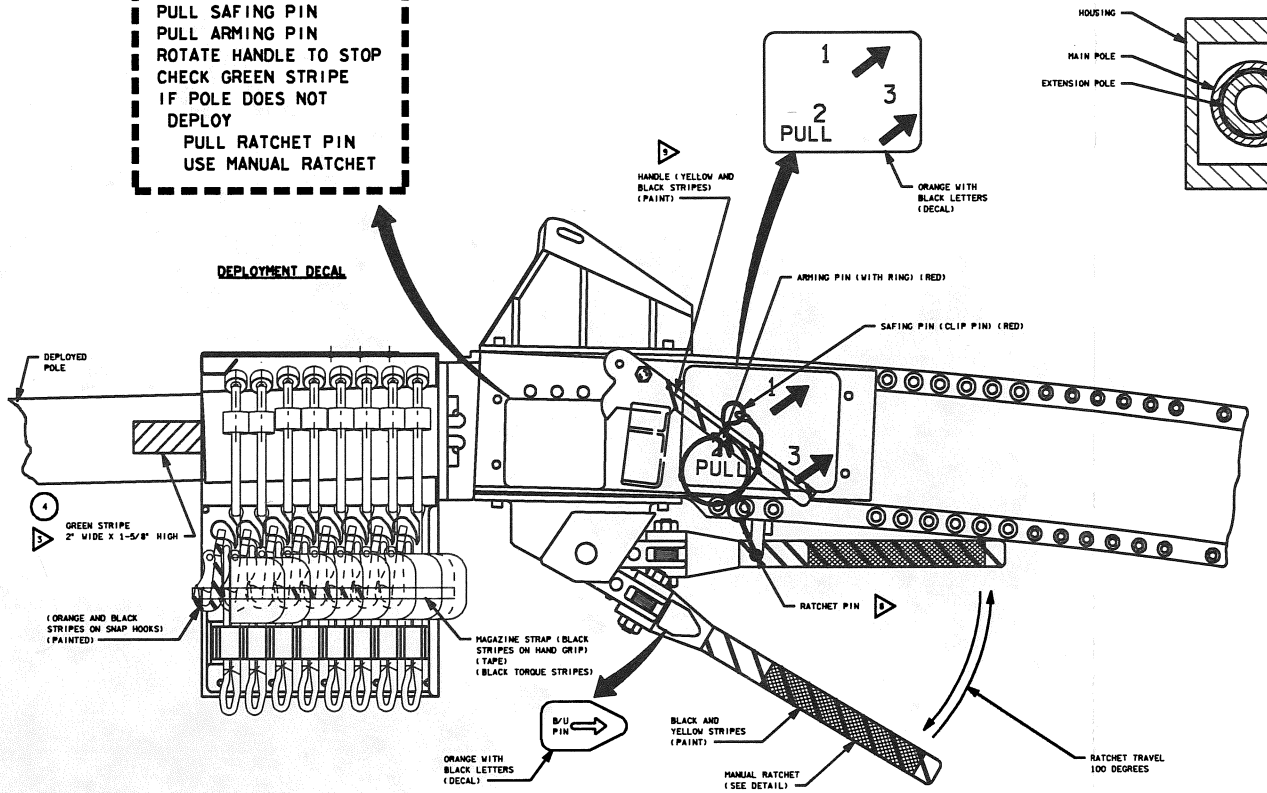


LANYARD ASSEMBLY DETAIL



LANYARD MAGAZINE ASSEMBLY

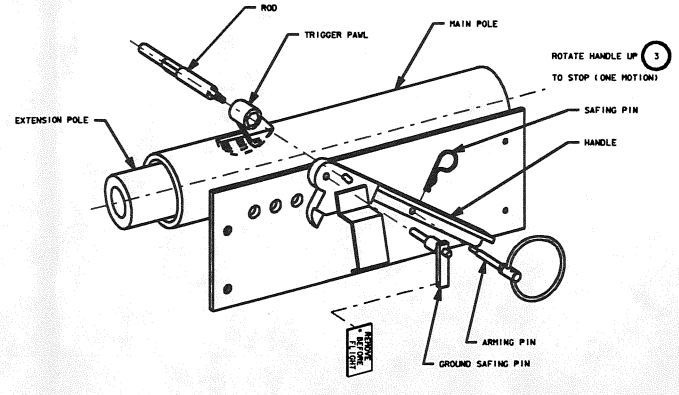
PULL SAFING PIN
PULL ARMING PIN
ROTATE HANDLE TO STOP
CHECK GREEN STRIPE
IF POLE DOES NOT DEPLOY
PULL RATCHET PIN
USE MANUAL RATCHET



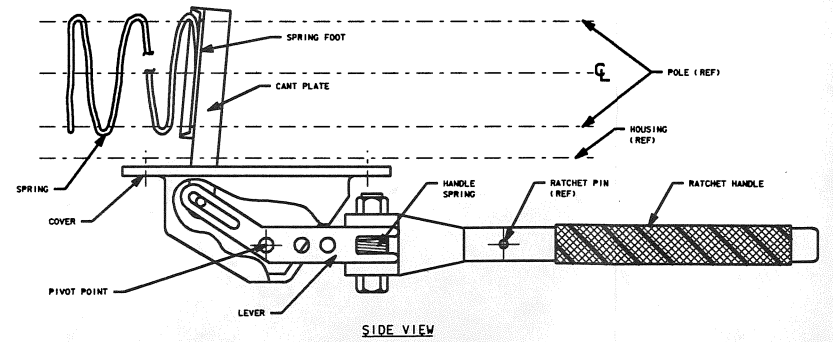
CONTINGENCY RATCHET OPERATION

- PULL RATCHET PIN
- RATCHET OUT REMAINING POLE WITH UP AND DOWN (± Z) MOTION UNTIL FULLY DEPLOYED (GREEN STRIPE VISIBLE ON POLE)
- MANUAL RATCHET DEPLOYS POLE 4"/COMPLETE UPSTROKE

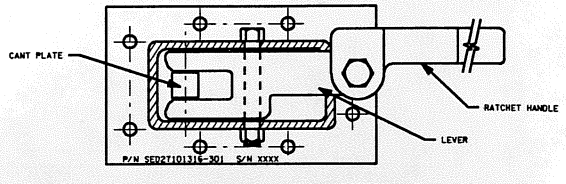
DEPLOYMENT MECHANISM
(LOOKING FORWARD)



TRIGGER SCHEMATIC



SIDE VIEW

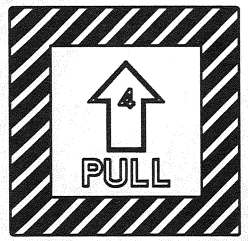


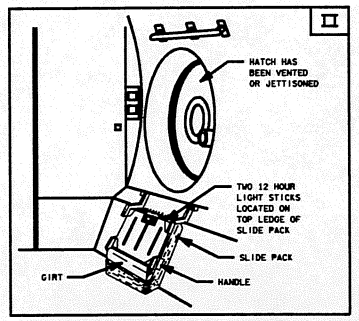
BOTTOM VIEW

MANUAL RATCHET DETAIL

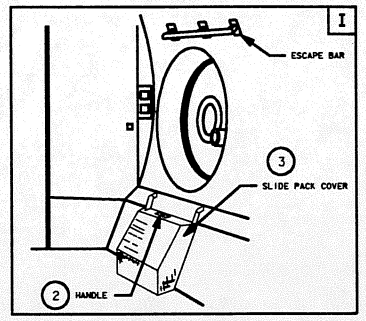
DATE: 04/06/94	NAME: JMB	VERSION: INK 6
DATE: 06/10/94	NAME: BJT	VERSION: INK 7
DATE: 07/25/94	NAME: MDU	VERSION: INK 8

EMERGENCY EGRESS SLIDE DEPLOYMENT SEQUENCE

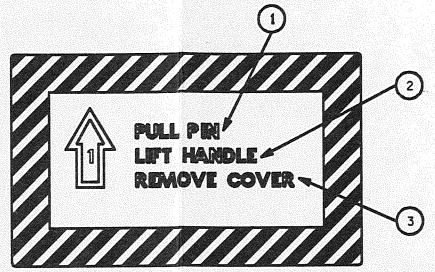




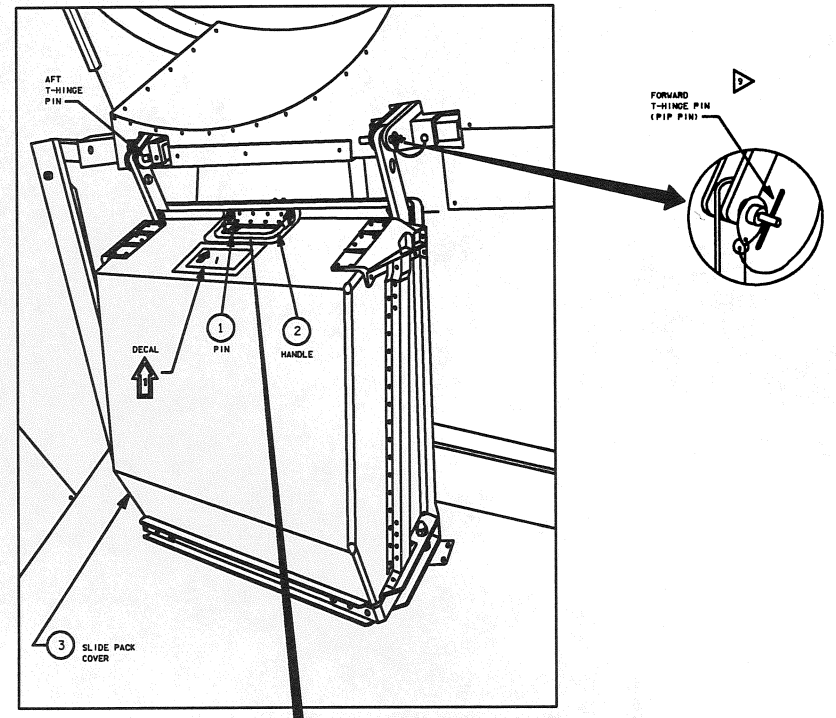
SLIDE PACK COVER REMOVED

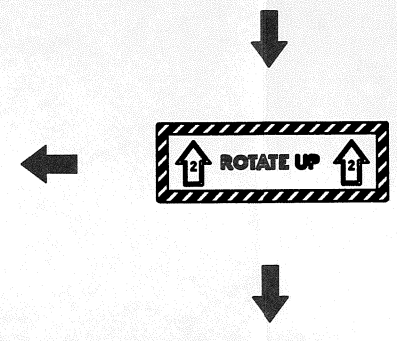


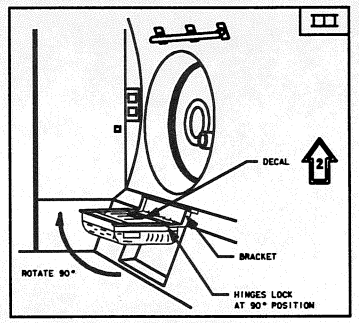
SLIDE PACKED



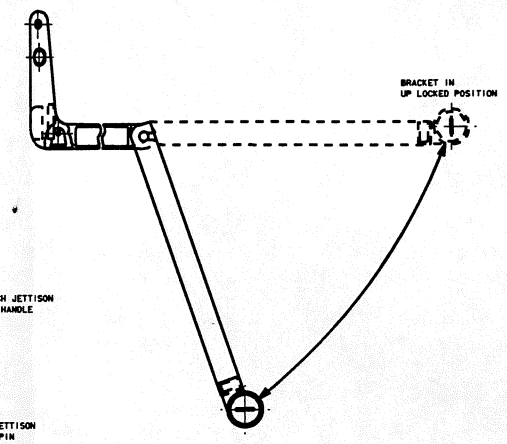
EMERGENCY EGRESS SLIDE (PACKED)



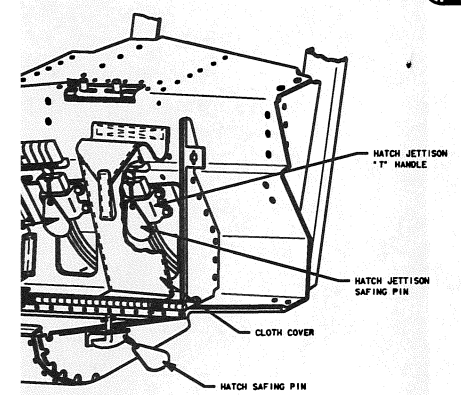




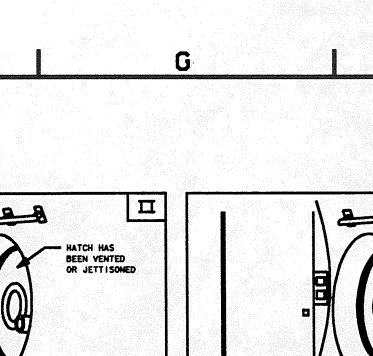
SLIDE ROTATED 90°



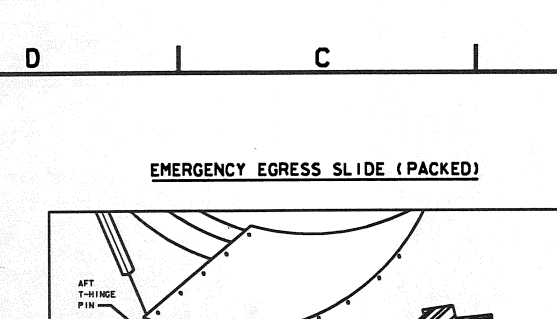
SLIDE BRACKET



ATOR - TEE HANDLES



SLIDE ROTATED TOTAL OF 270°- HATCH JETTISONED



EMERGENCY EGRESS SLIDE ACTIVATION

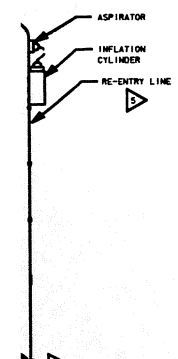
SIDE HATCH OPENING AND SLIDE INFLATION
(AFTER VEHICLE HAS ROLLED TO A STOP)
- ROTATE HATCH HANDLE TO VENT POSITION
  IF HANDLE WILL NOT ROTATE TO VENT, PERFORM HATCH IFM IF TIME PERMITS AND VENT HATCH
  - PULL PIN TO RELEASE COVER HANDLE AND LIFT HANDLE
  - PULL HANDLE AND REMOVE COVER
  - ROTATE SLIDE PACK UP 90 DEGREES FIRST TO LOCK GIRT BRACKET THEN INTO HATCH TUNNEL
  - PULL "T" HINGE PINS SIMULTANEOUSLY TO RELEASE SLIDE BRACKETS
  - LIFT SLIDE AND INSERT BRACKETS INTO LATCH HOUSINGS UNTIL LOCKED
  - ROTATE HATCH HANDLE TO OPEN POSITION AND OPEN HATCH
  - PUSH SLIDE PACK OFF OUTBOARD EDGE OF HATCH
  - INFLATE SLIDE BY PULLING LANYARD RELEASE HANDLE MARKED "PULL". PULL LANYARD ALL THE WAY OUT WITHOUT RELEASING
  - EGRESS

IF IFM NO JOY OR TIME DOES NOT PERMIT HATCH IFM, CONSIDER BLOWING HATCH

CAUTION
DO NOT JETTISON SIDE HATCH WITHOUT CONCURRENCE OF CDR

WARNING
NEVER ACTIVATE PYRO VENT VALVE POST-LANDING

AFTER HATCH IS JETTISONED
- PULL PIN TO RELEASE COVER HANDLE AND LIFT HANDLE
- PULL HANDLE AND REMOVE COVER
- ROTATE SLIDE PACK UP 90 DEGREES FIRST TO LOCK SIDE RAILS THEN 180 DEGREES INTO TUNNEL (TOTAL OF 270°)
- PUSH SLIDE PACK OVERBOARD
- INFLATE SLIDE BY PULLING LANYARD RELEASE HANDLE MARKED "PULL". PULL LANYARD ALL THE WAY OUT WITHOUT RELEASING
- EGRESS



ATCH/
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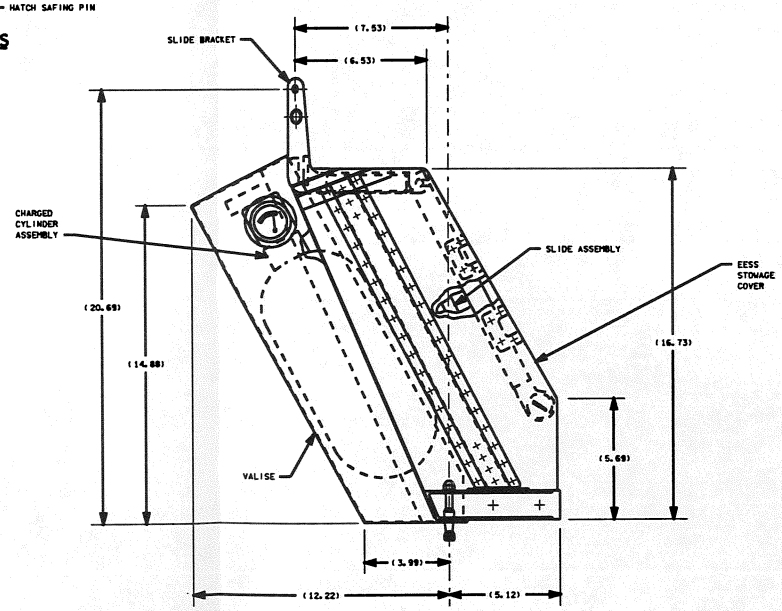
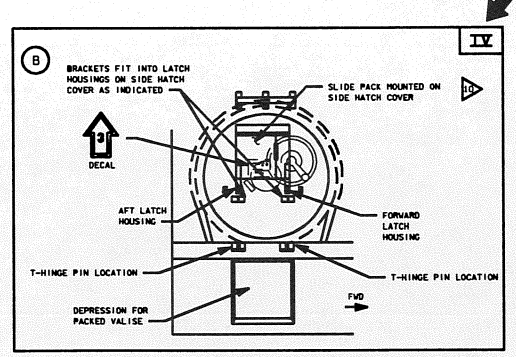
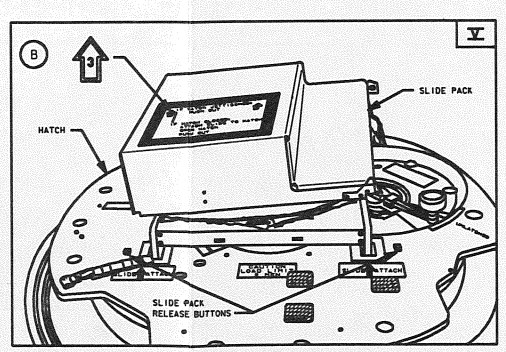


PACKED EESS



LOOKING PORT AT HATCH CLOSED



LOOKING THROUGH SIDE HATCH TUNNEL AT OPEN HATCH WITH SLIDE ATTACHED

1. PULL FORCE ON SLIDE COVER HANDLE < 30LBS
2. PULL FORCE ON PIN < 8LBS
3. THIN PLASTIC TIE WRAPS ON PIN PREVENT IT FROM BACKING OUT
4. SLIDE PACK AFTER COVER REMOVED WEIGHES ≈ 45LBS
5. T-HINGE PINS (PIP PINS) USED TO CONNECT SLIDE PACK TO ORBITER ARE 3/8"(.375") DIAMETER, AFT PIN GRIP LENGTH IS ≈ 1.2", FORWARD PIN GRIP LENGTH IS ≈ 1.1"
6. DETACH LINE IS USED BY GROUND CREW TO RELEASE SLIDE FROM ORBITER, SMALL WRITING ABOVE PULL ARROW SAYS "TO DETACH FROM ORBITER". 30-50LB OF FORCE IS REQUIRED TO ACTUATE
7. REFER TO TABLE 18-1 FOR DRAWING TRACEABILITY
8. PROVISIONS (HANDHOLDS) ARE LOCATED AT BOTTOM OF THE SLIDE FOR 2 PERSONS TO RESTRAIN SLIDE IF DEPLATED AND STILL ALLOW EGRESS OF REMAINING PERSONNEL
9. RE-ENTRY LINE (STRAP) ALLOWS MEANS TO CLIMB BACK UP INFLATABLE SLIDE
10. T-HINGE PINS ARE PULLED AFTER FULL ROTATION INTO HATCH TUNNEL TO ALLOW EASE IN ATTACHMENT OF SLIDE TO HATCH FOR HATCH CLOSED CASE
11. FLUSH VALVE IS GSE INTERFACE WHICH ALLOWS EVACUATION OF RESIDUAL GAS REMAINING IN THE INFLATABLE, THEREBY FACILITATING REPACKING
12. INLET FLAPPERS CLOSE WHENEVER POSITIVE PRESSURE IS DETECTED BY THE POSITIVE CLOSURE MECHANISM WITHIN THE ASPIRATOR, UPSTREAM OF THE NOZZLE ARRAY

NOTES:
13. VALVE/REGULATOR REGULATES THE DOWNSTREAM PRESSURE INITIALLY AT APPROXIMATELY 380 PSI UPON ACTIVATION. SUBSEQUENT FULL FLOW IS THEN REGULATED AT 400 PSI (MAX) UNTIL PRESSURE DECAY BELOW 400 PSI WITHIN THE BOTTLE BEGINS. THE REGULATOR IS THEN IN A FULL OPEN SETTING AND REMAINS THAT WAY. THE SLIDE CONTINUES TO INFLATE TO APPROXIMATELY 2.75 PSI WHICH OCCURS AT APPROXIMATELY THE SAME TIME AS THE ARGON BOTTLE DEPLETION. THE RELIEF VALVE THEN BLEEDS OFF ANY RESIDUAL OVER PRESSURE GREATER THAN 3 PSI IF NECESSARY

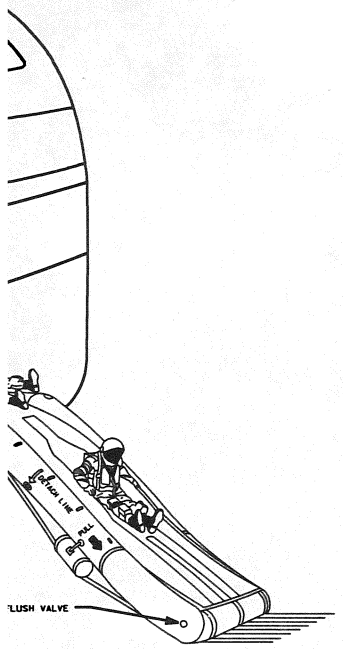
3 EES 1

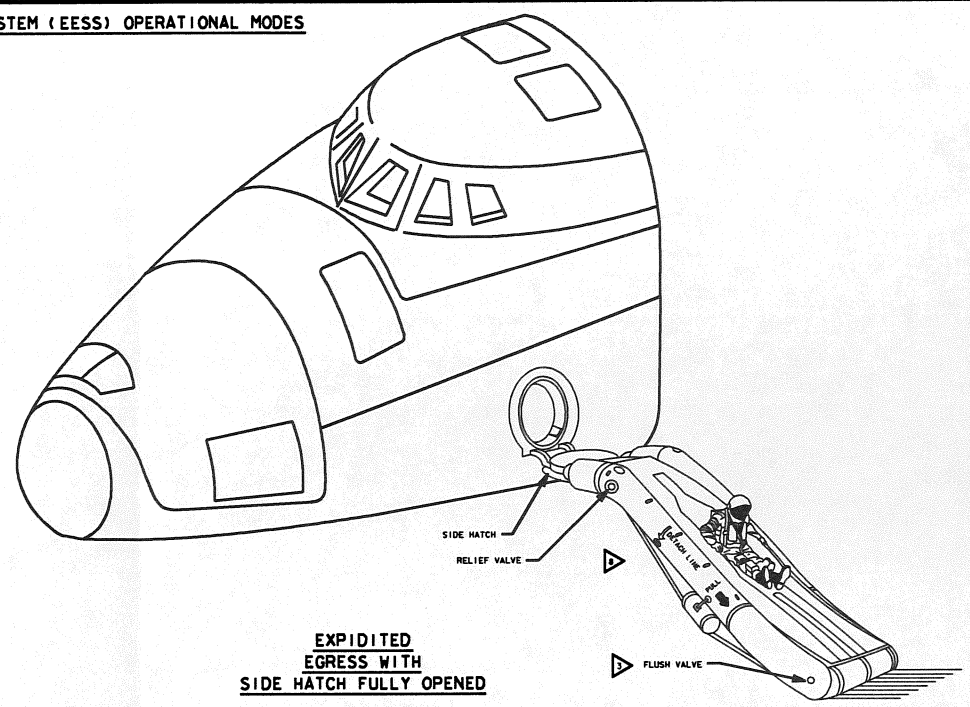
SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN MARTINDALE	9/27/88	
DR HAMITER, GILLESPIE		EMERGENCY EGRESS SLIDE/SKYGENIE
ENGR K. TRUJILLO	9/7/94	
ENGR	9/7/94	
APP		SPACE SHUTTLE — DWG NO 18.3
APP		
CADS S.K. Kimbrough 7-14-94		ALL
LTR E — PCN 4		126.5 X 34 — PAGE — SHEET 1 OF 1

BASIC REV E-4

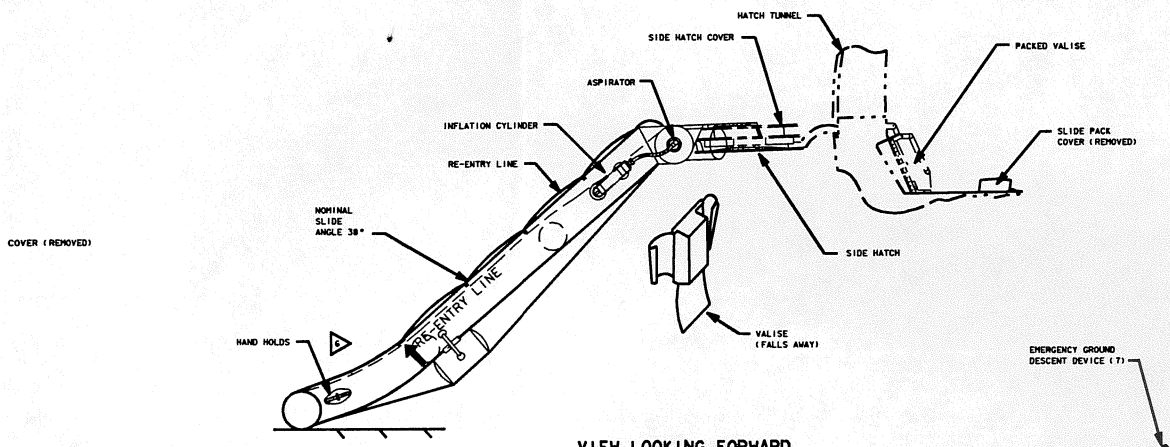
U T S R Q P O N M L K

EMERGENCY EGRESS SLIDE SYSTEM (EESS) OPERATIONAL MODES

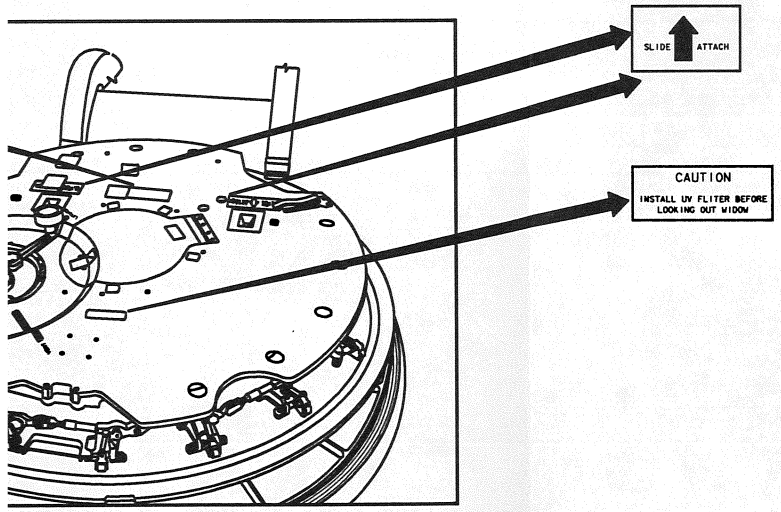




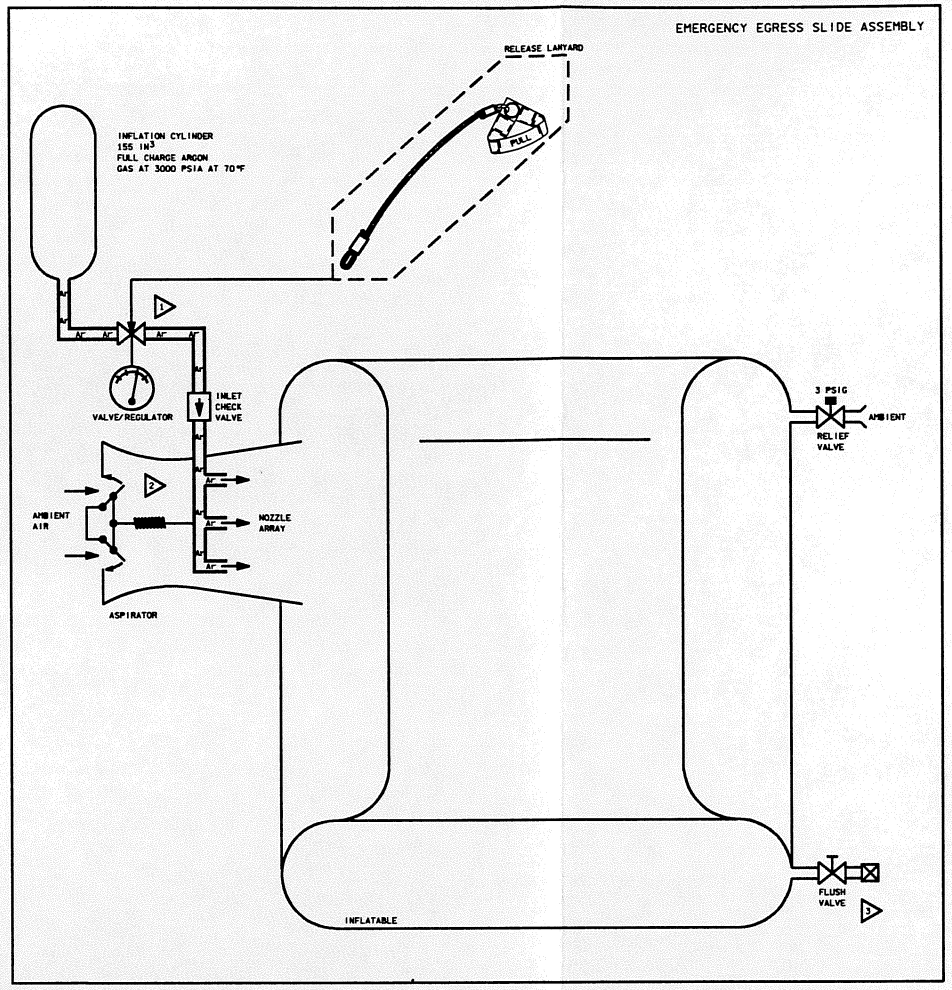
EXPIDITED
EGRESS WITH
SIDE HATCH FULLY OPENED

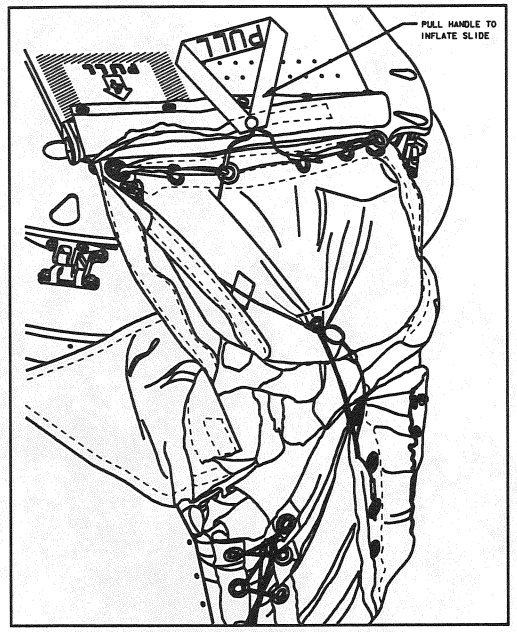


VIEW LOOKING FORWARD
PRIMARY DEPLOYMENT CONFIGURATION

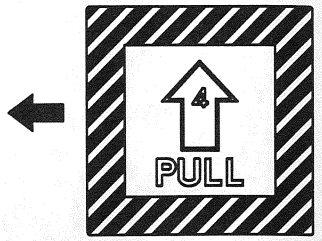


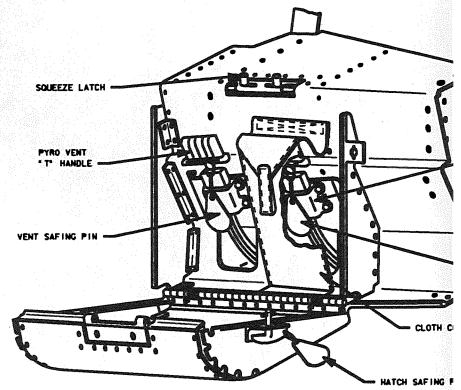
)UTER HATCH (SHOWN OPEN)



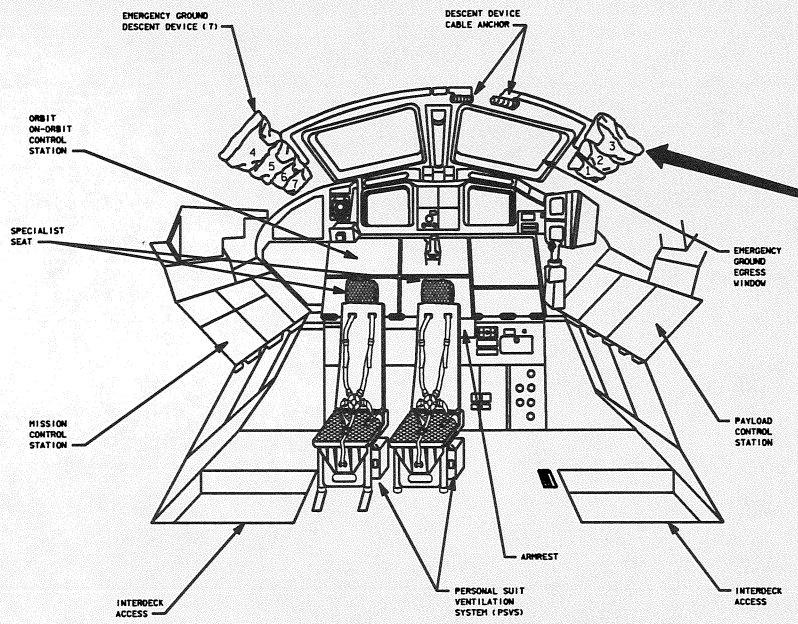


PACKED VALISE HANGING OFF SIDE HATCH
PRIOR TO SLIDE DEPLOYMENT

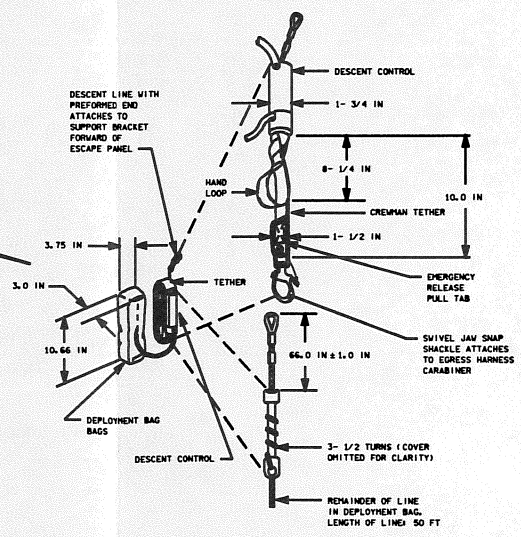


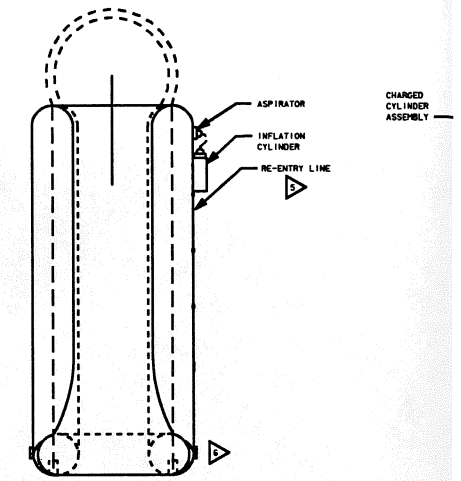


PYRO INITIATOR - TEE HANDLES



CONTINGENCY DESCENT DEVICE
SKYGENIE

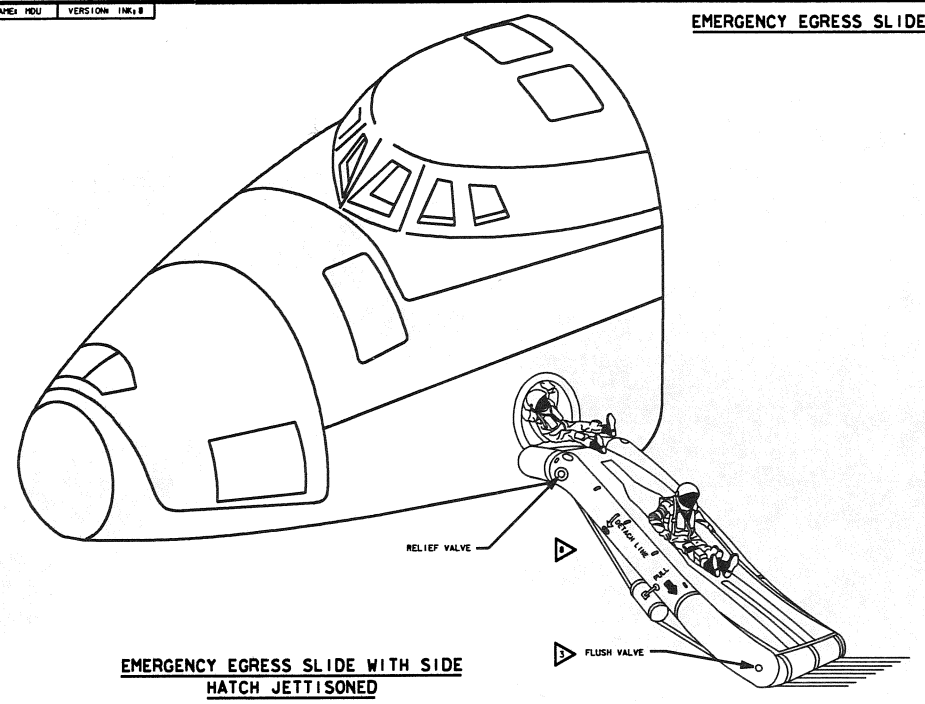




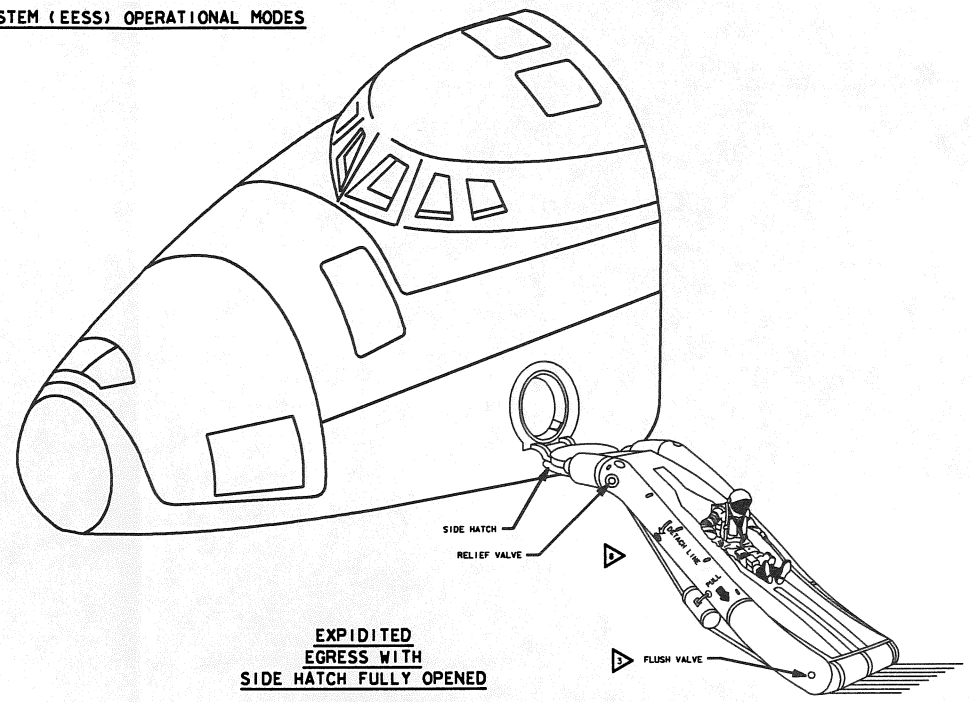
VIEW FACING OPEN HATCH/
PORT SIDE OF ORBITER

DATE: 07/25/84 | NAME: MDU | VERSION: INK-8

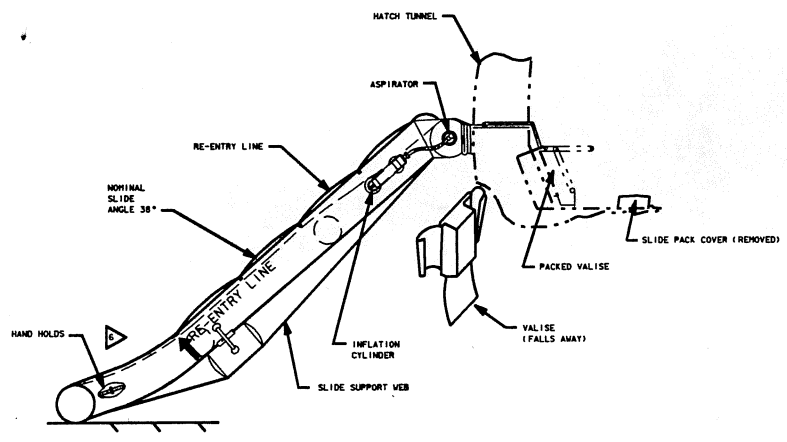
EMERGENCY EGRESS SLIDE SYSTEM (EESS) OPERATIONAL MODES



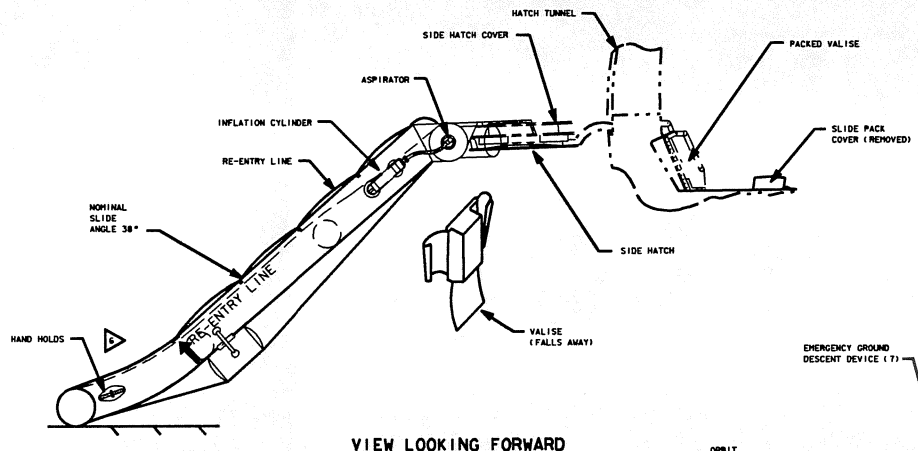
EMERGENCY EGRESS SLIDE WITH SIDE HATCH JETTISONED



EXPIDITED EGRESS WITH SIDE HATCH FULLY OPENED



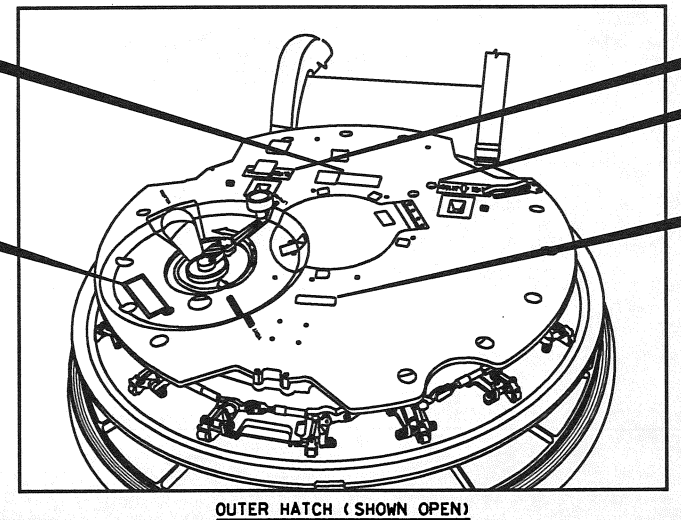
VIEW LOOKING FORWARD
SECONDARY DEPLOYMENT CONFIGURATION



VIEW LOOKING FORWARD
PRIMARY DEPLOYMENT CONFIGURATION

CAUTION
LOAD LIMIT
2 MEN

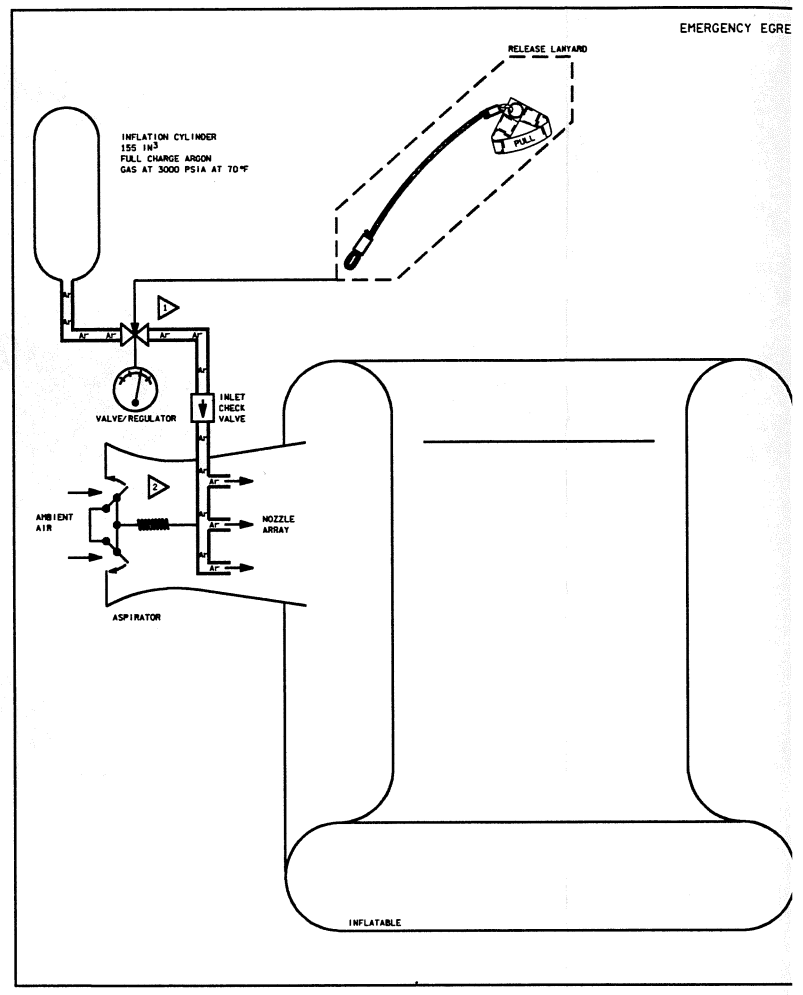
HATCH OPENING
1. LOCK LEVER UNLOCKED
2. HANDLE CCW TO VENT
3. WAIT 2 MINUTES
4. HANDLE - CCW TO UNLATCHED
5. HATCH - PUSH OPEN

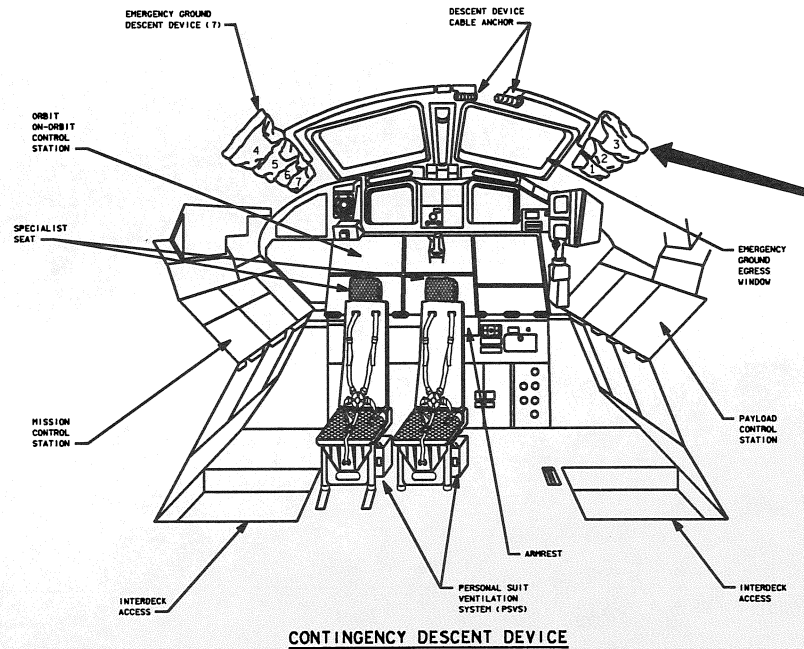


SLIDE ATTACH

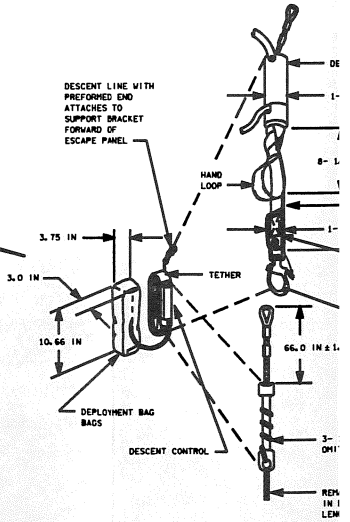
CAUTION
INSTALL UV FLITER BEFORE LOOKING OUT WIDOW

OUTER HATCH (SHOWN OPEN)



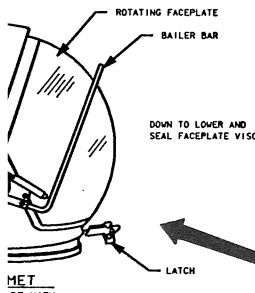


CONTINGENCY DESCENT DEVICE
SKYGENIE

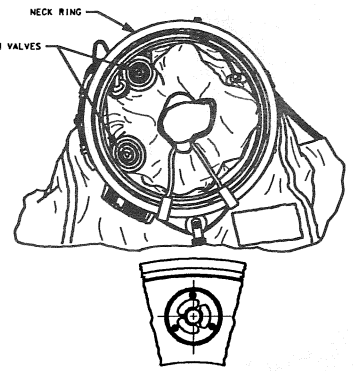


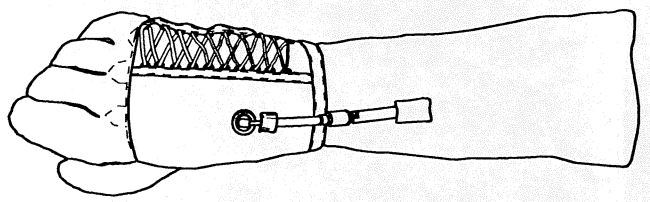
BASIC REV E-4

DATE: 07/25/94	NAME: MDU	VERSION: INK; 7
DATE: 03/18/96	NAME: SVJ	VERSION: BPT; 13
DATE: 04/16/96	NAME: SVJ	VERSION: INK; 8

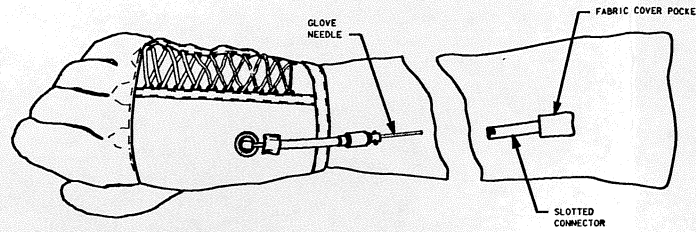


MET
DE VIEW

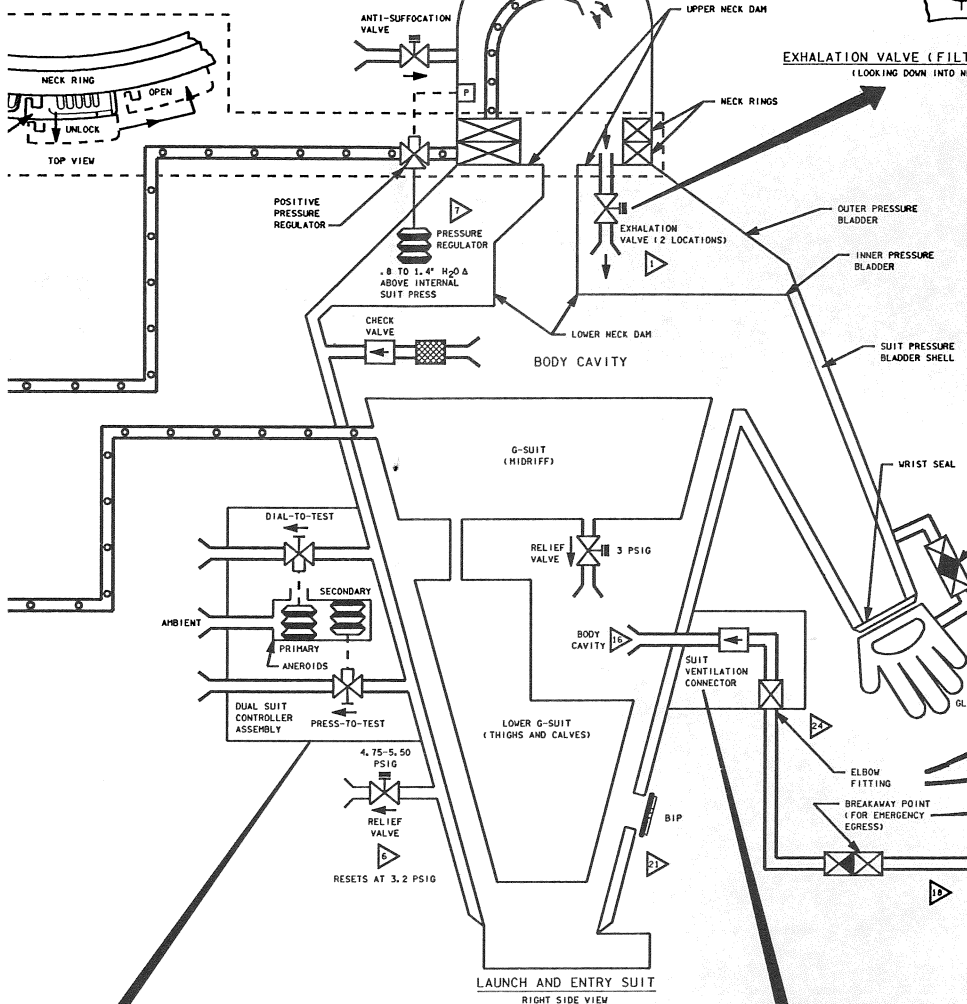




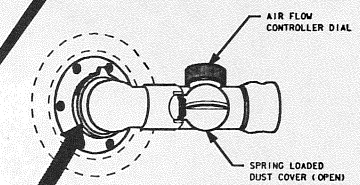
PARTIAL PRESSURE GLOVE
TWIST CONNECTOR CONNECTED

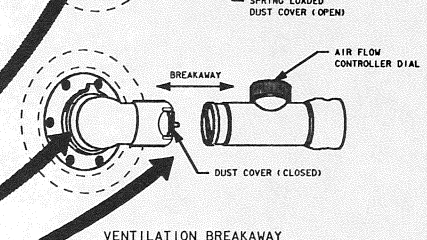


PARTIAL PRESSURE GLOVE
TWIST CONNECTOR DISCONNECTED

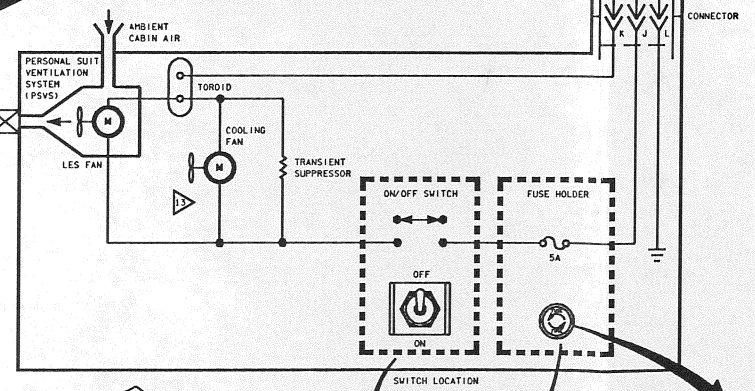


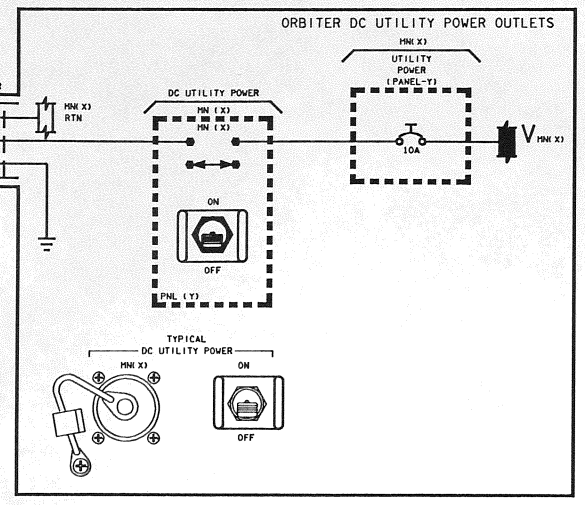
LAUNCH AND ENTRY SUIT
RIGHT SIDE VIEW

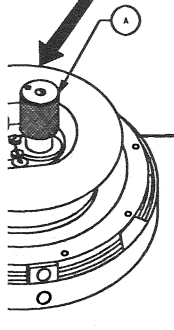




VENTILATION BREAKAWAY



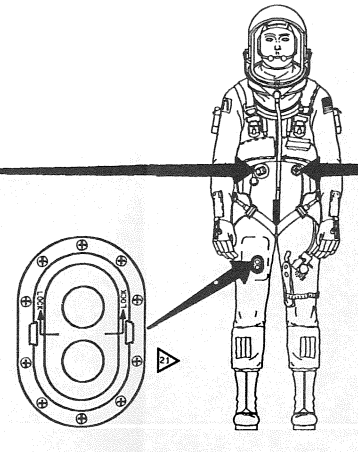


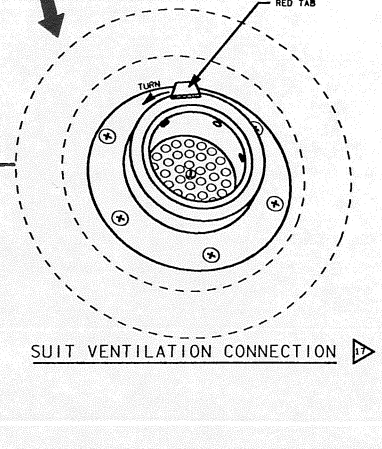


NTROLLER ASSEMBLY

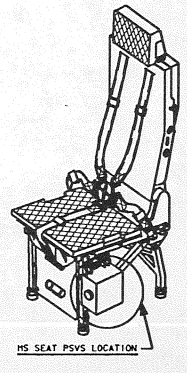
IAL-TO-TEST CONTROL

-TO-TEST BUTTON

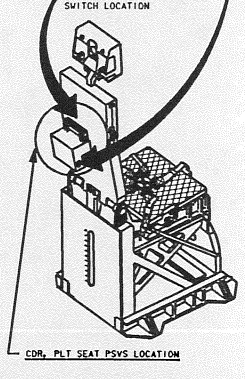




SUIT VENTILATION CONNECTION



HS SEAT PSVS LOCATION



CDR, PLT SEAT PSVS LOCATION

FUSE HOLDER LOCATION (NEXT TO POWER CONNECTOR)

22. THIS FITTING IS NOT A QUICK DISCONNECT. INSTEAD, IT IS AN ELBOW FITTING

23. QUICK DON MASKS STOWED FOR ASCENT ANND ENTRY DEPLOYED DURING POST INSERTION ACTIVITIES LOCATED IN VOL 3B

22. PSVS MAY BE MOUNTED ON OPPOSITE SIDE IF MIDDECK ACCOMODATIONS RACK (MAR) IS MANIFESTED. ON/OFF SWITCH IS RAISED FOR EASE OF ACCESS

21. BIO INSTRUMENTATION PASS-THROUGH (BIP) AND PLUG. PLUG IS USED WHEN PORT IS NOT REQUIRED. TO REMOVE BIP, SLIDE RED LEVERS UP AND IN OPPOSITE DIRECTION OF THE ARROWS. LIFT UP. TO REPLACE, SNAP IN AND SLIDE RED LEVERS TO THE LOCKED POSITION

20. HELMET COVERED WITH REFLECTIVE TAPE

19. SUIT VENTILATION FAN POWER CABLE LENGTHS:
CDR (S1): 8 FT. 3 IN.
PLT (S2): 11 FT. 0 IN.
MS1, MS2: Y - CABLE
MS1 (S3) BRANCH: 4 FT. 6 IN.
MS2 (S4) BRANCH: 6 FT. 6 IN.
MS3 (S5): 15 FT. 0 IN. (17 FT. WHEN MAR IS MANIFESTED)
MS4/PS1: 15 FT. 6 IN. (11 FT. FROM OUTLET TO "Y"
MS5/PS2: 15 FT. 6 IN. (4 FT. 6 IN. FROM "Y" TO PSVS)

18. SUIT VENTILATION FAN HOSE LENGTHS:
CDR AND PLT: 30 INCHES
MS, PS: 24 INCHES

17. SLIDE RED TAB AWAY FROM SUIT AND TURN CCW TO UNLOCK AND DISCONNECT NOZZLE. TO ATTACH NOZZLE, RED TAB IN UNLOCK POSITION, PRESS NOZZLE INTO SUIT VENTILATION PORT AND TURN RED TAB CW TO LOCK

16. 3 SUIT VENTILATION INLETS. 1 AT CHEST, 2 AT LOWER BACK

15. THE MICROPHONES IN THE COMM CAP ARE DYNAMIC WHICH REQUIRE NO POWER FOR OPERATION

14. ACTIVATION OF GREEN APPLE TURNS O_2 FLOW RELEASE SCREW ARROW TO THE ON POSITION

13. EACH FAN DRAWS A CURRENT OF 1.4 AMPS WHEN RUNNING (10 AMP START) AND POWER OF 39.2 WATTS. EACH FAN PROVIDES AN AIR FLOW OF ≈ 10 FT^3/MIN

12. COMMANDER, PILOT, AND MISSION SPECIALIST 1 ORBITER O_2 HOSE IS 7 FEET IN LENGTH. ALL OTHER POSITIONS HAVE 14 FOOT ORBITER O_2 HOSES

11. DELETED

10. REFER TO J, I, H Z 6, 7, 8 FOR ADDITIONAL HELMET DETAIL

9. REFER TO TABLE 18-1 FOR DRAWING TRACEABILITY

8. SHUT OFF VALVE WHICH IS ACTIVATED BY THE CONTROLLER CLIP
- CLIP IN - MANUAL REGULATION OF G-SUIT PRESSURE WITH PRESSURE DIAL (PUSH BUTTON FLUSH WITH TOP OF VALVE BODY)
- CLIP OUT - PUSH BUTTON POPS UP ABOVE VALVE BODY AND LAST-DIALED IN PRESSURE (≤ 3 PSIG, RELIEF PRESSURE) IS RETAINED IN G-SUIT BLADDERS

7. MAX FLOW RATE: 90 L/MIN

6. RESEATS AT 3.2 PSIG

5. O_2 SUPPLY PROVIDES 30 L/MIN FLOW FOR 10 MINUTES, NOMINALLY.

4. MANUAL DIAL FOR G-SUIT PRESSURE CONTROL (EA 'CLICK' INTO DETENT = 0.5 PSIG) ADJUSTABLE RANGE: 0-2.5 PSIG

3. NEGATIVE PRESSURE RELIEF VALVE WHICH CRACKS WHEN Δ=1.5" H_2O

2. AMBIENT PRESSURE AT OR BELOW 3.38-2.95 PSIA CAUSES PRIMARY ANEROID TO EXTEND AND CONTROLS ORIFICE FLOW IN VALVE BODY WHICH CAUSES THE SUIT BLADDER SHELL TO RETAIN PRESSURE
MANUAL PRESSURIZATION OF SUIT:
A. ADJUSTABLE DIAL IS MANUAL CAPABILITY TO CONTROL ORIFICE FLOW IN ORDER TO PRESSURIZE SUIT BELOW ANEROID ACTIVATED ALTITUDE (35,500 - 38,200 FT)
B. SPRING LOADED RELIEF VALVE, MANUALLY OPERATED, USED TO TEST SUIT PRESSURIZATION ON THE GROUND AND AT ALTITUDE

CHARACTERISTICS	PRIMARY SYSTEM	SECONDARY SYSTEM
ABSOLUTE SUIT PRESSURE	3.38 - 2.95 PSIA (35,500 - 38,200 FT)	3.0 - 2.7 PSIA (38,000 - 40,000 FT)
MANUAL PRESS-TO-TEST PRESSURE	———	2.1 PSIG
DIAL-TO-TEST PRESSURE	3.0 PSIG	———

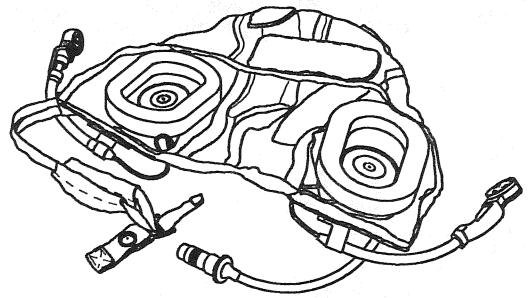
NOTES: 1. EXHALATION VALVE - 1.65 ±0.15 INCHES H_2O ABOVE SUIT BLADDER PRESSURE AT MINIMUM INPUT FLOW ≤ 25 CC/MINUTE

4 LES/QDM

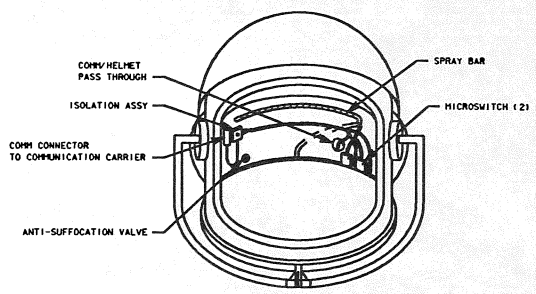
SIGNATURE	DATE	
DSGN: R. TEDDER, M. GILLESPIE,	9/26/88	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR: S. EGAN-VER		
ENGR: SCOTT GILL		LAUNCH/ENTRY SUIT AND QUICK-DON MASK
ENGR: Scott Gill	5/8/96	
APP: Rob Ortt	5/8/96	
APP: Norm Rommel	5/8/96	SPACE SHUTTLE
CABS: J.K. Rimbert	6-17-96	ALL
LTR: E	PCN: 6	121 X 34

DWG NO: 18.4
PAGE: SHEET 1 OF 1

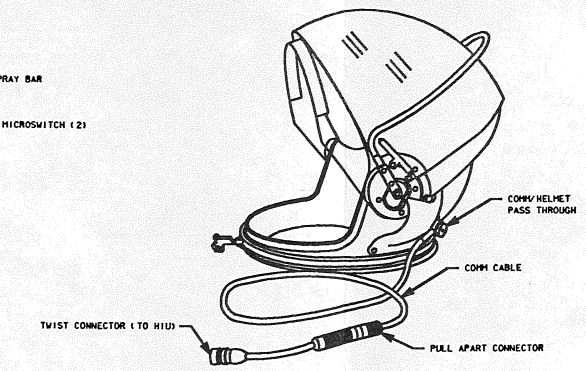
BASIC REV E-6



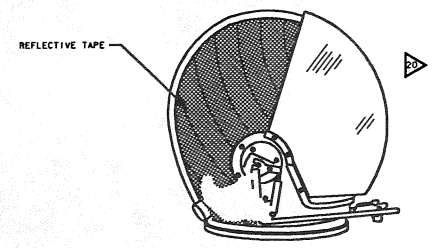
COMMUNICATION CARRIER ASSY (COMM CAP)
FRONT VIEW



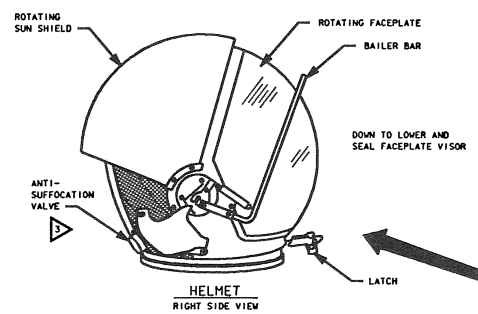
HELMET
FRONT VIEW



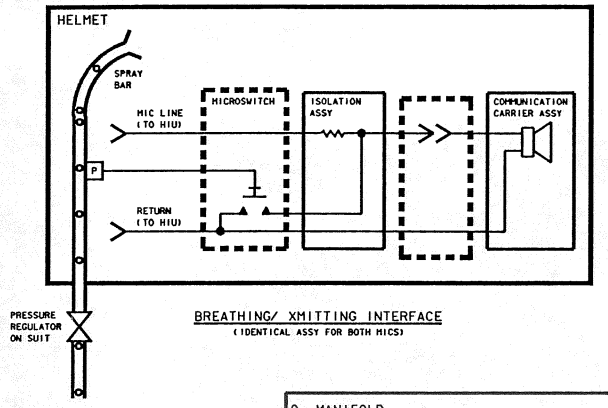
HELMET
LEFT SIDE VIEW
(VISORS UP)



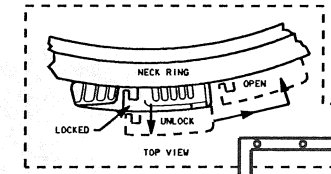
HELMET
RIGHT SIDE VIEW



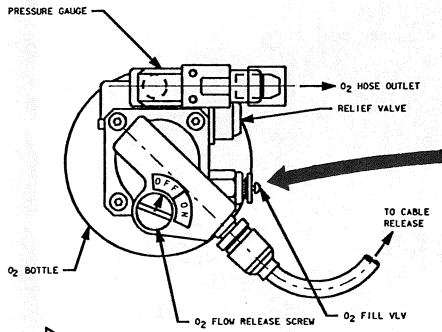
HELMET
RIGHT SIDE VIEW



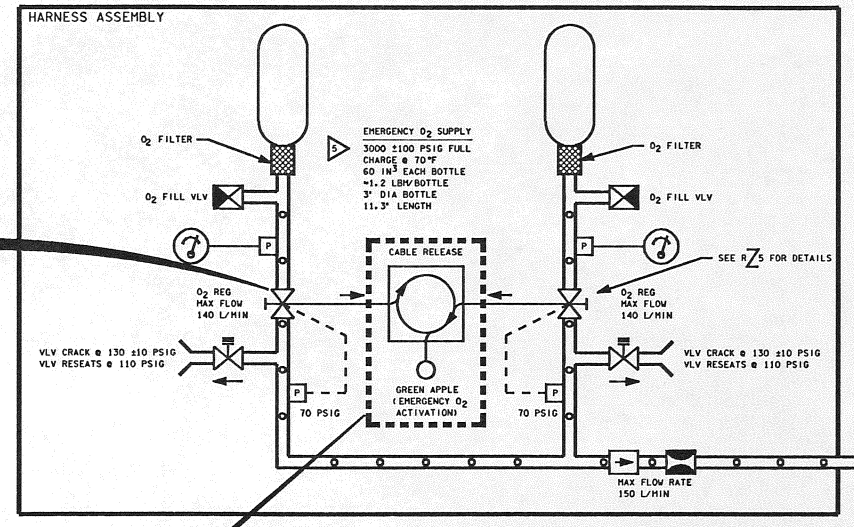
BREATHING/ XMITTING INTERFACE
(IDENTICAL ASSY FOR BOTH HICS)

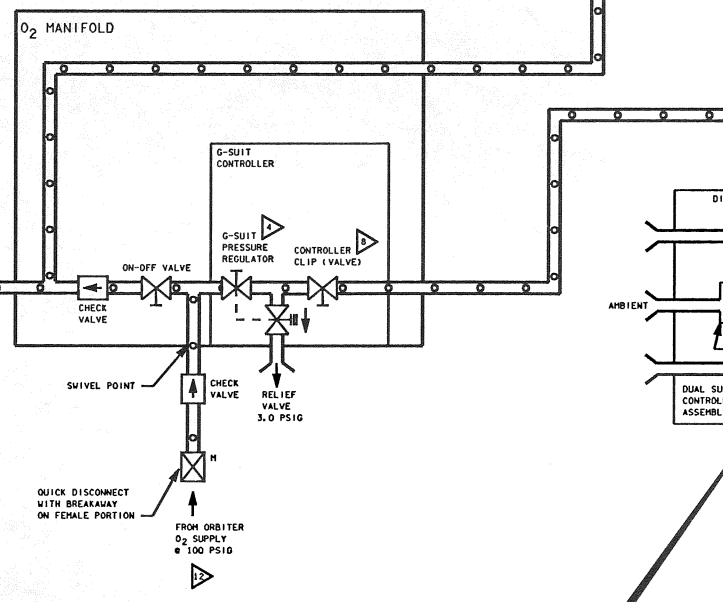


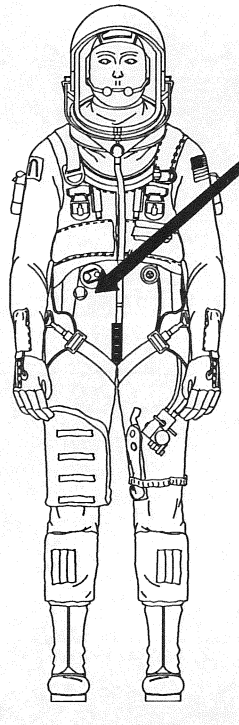
TOP VIEW



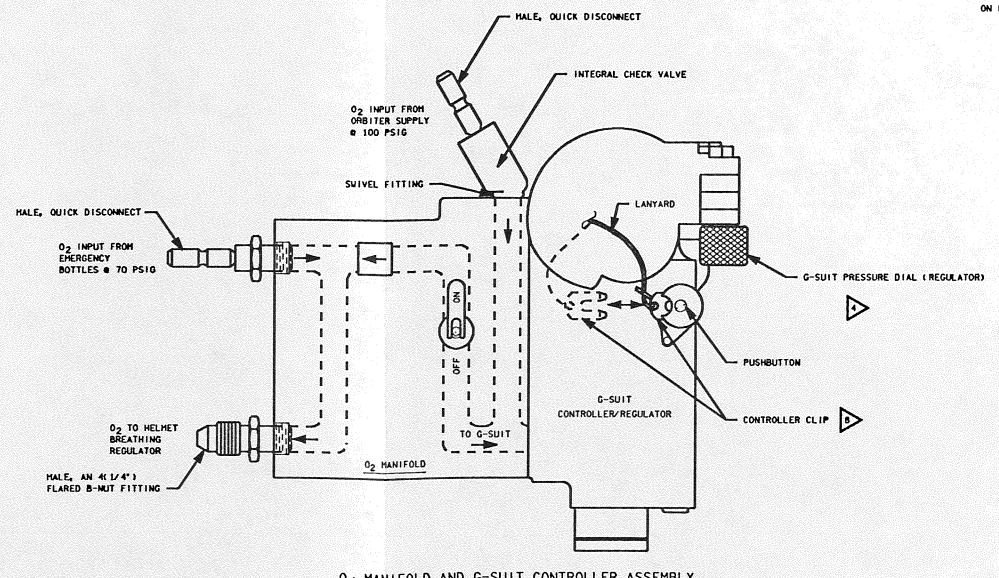
O_2 REGULATOR & VALVE CONTROL
(LOOKING DOWN ON NECK OF O_2 BOTTLE)



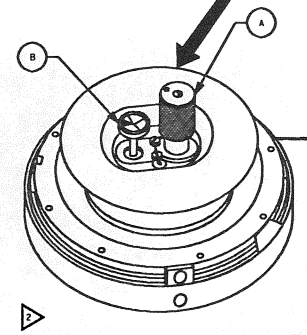




QUICK DON MASK
PANEL LOCATIONS=
C6 - LEH O2 #1 - #4 M032M - LEH O2 #5 - #6 M069M - LEH O2 #7 - #8
STOWAGE LOCATIONS= REFER TO FLIGHT SPECIFIC REFERENCE DATA BOOK
SUPPLY HOSE LENGTH= 40 INCHES



O_2 MANIFOLD AND G-SUIT CONTROLLER ASSEMBLY
CONNECTED TO LEFT LEG OF SUIT



DUAL SUIT CONTROLLER ASSEMBLY

(A) ADJUSTABLE DIAL-TO-TEST CONTROL

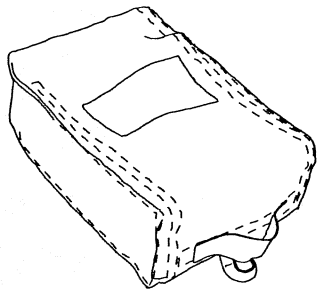
(B) MANUAL PRESS-TO-TEST BUTTON

SR SHELL/VISOR

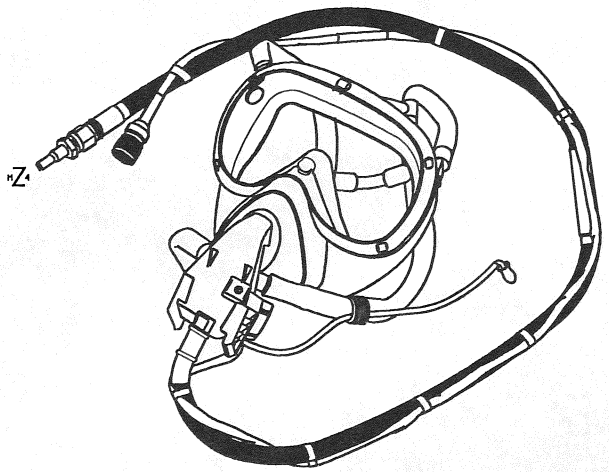
— HARNESS ACTIVATION SWITCH

BREATHING SUPPLY HOSE

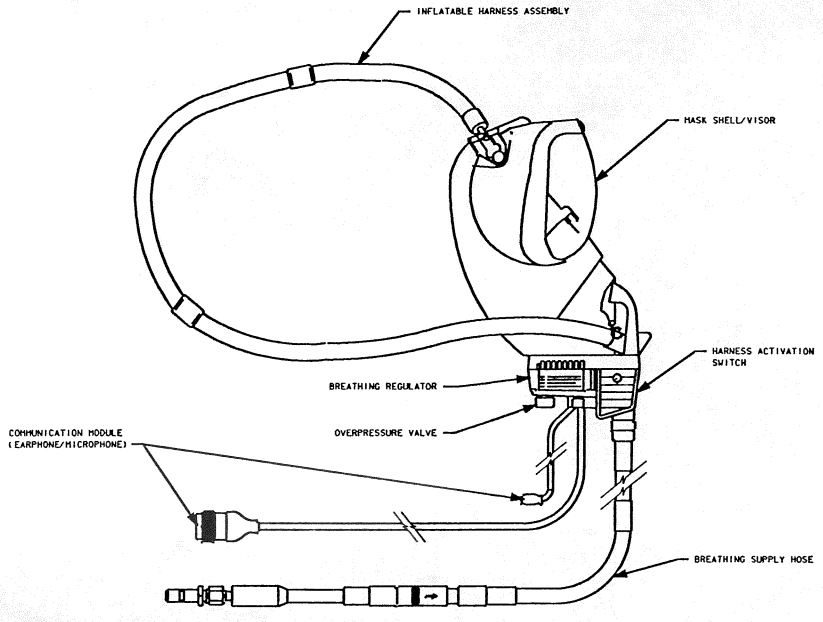
DATE: 04/16/96 | NAME: SVJ | VERSION: INK 8



STOWAGE BAG

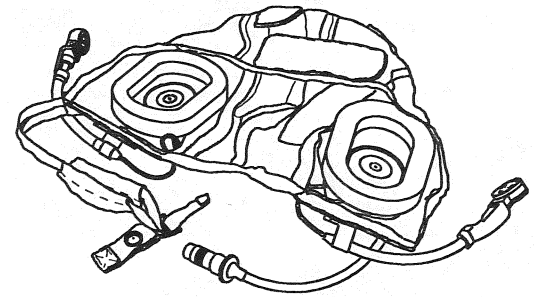


QUICK-DON MASK

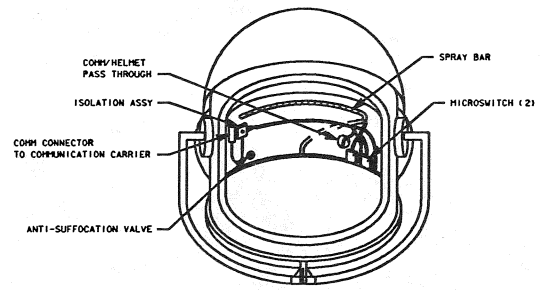


QUICK-DON MASK ASSEMBLY

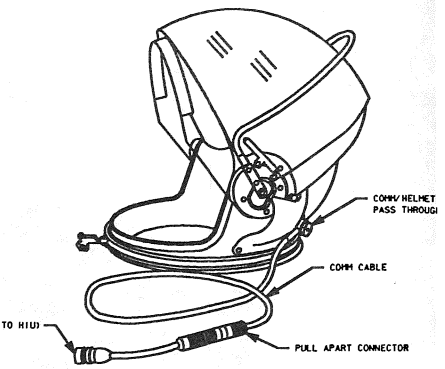
QUICK DON MASK
PANEL LOCATIONS:
C6 - LEH O2 #1 - #4 M032M - LEH O2 #5 - #6 M069M - LEH O2 #7 - #8
STOWAGE LOCATIONS: REFER TO FLIGHT SPECIFIC REFERENCE DATA BOOK
SUPPLY HOSE LENGTH: 40 INCHES



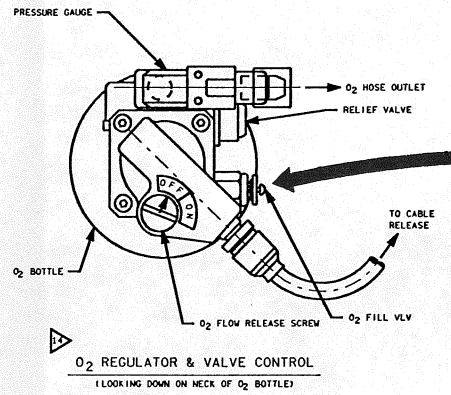
COMMUNICATION CARRIER ASSY (COMM CAP)
FRONT VIEW



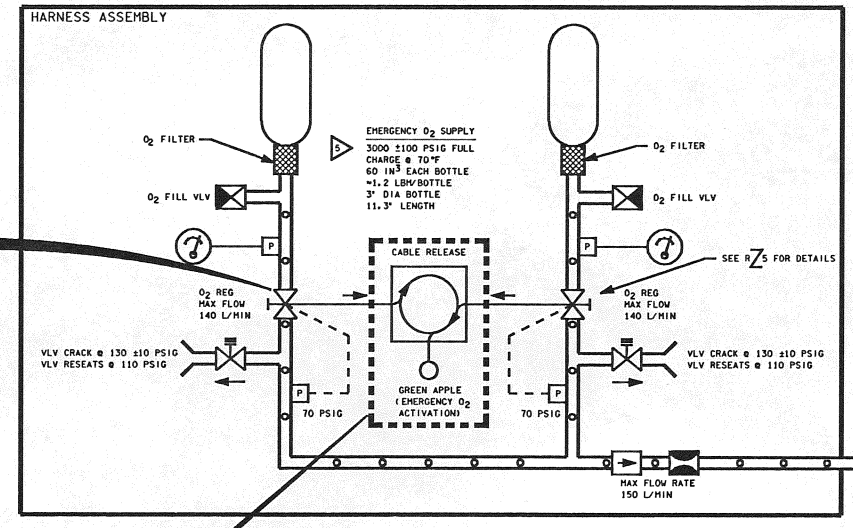
HELMET
FRONT VIEW

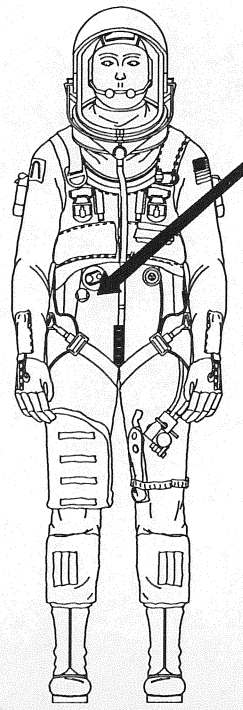


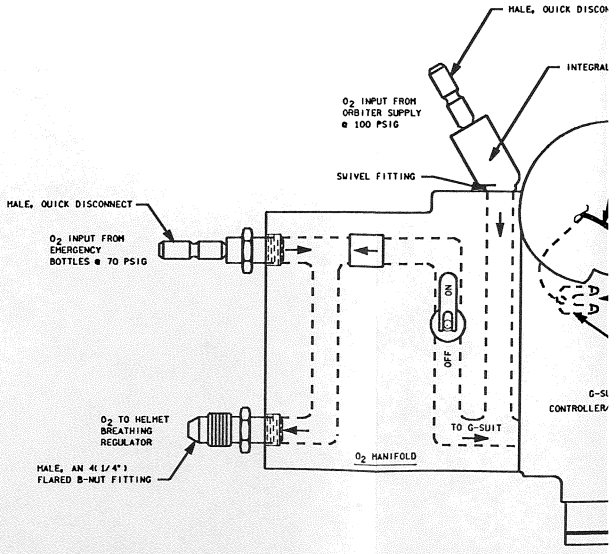
HELMET
LEFT SIDE VIEW
(VISORS UP)



O_2 REGULATOR & VALVE CONTROL
(LOOKING DOWN ON NECK OF O_2 BOTTLE)

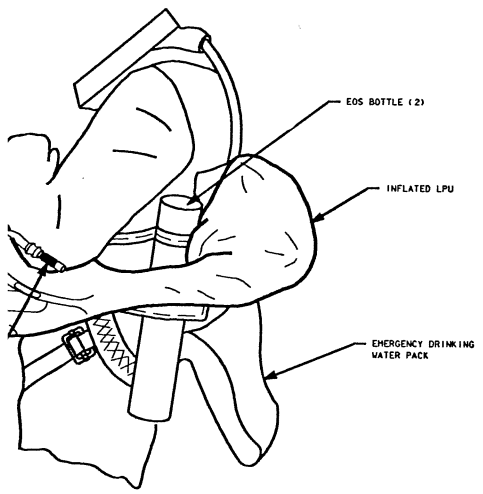




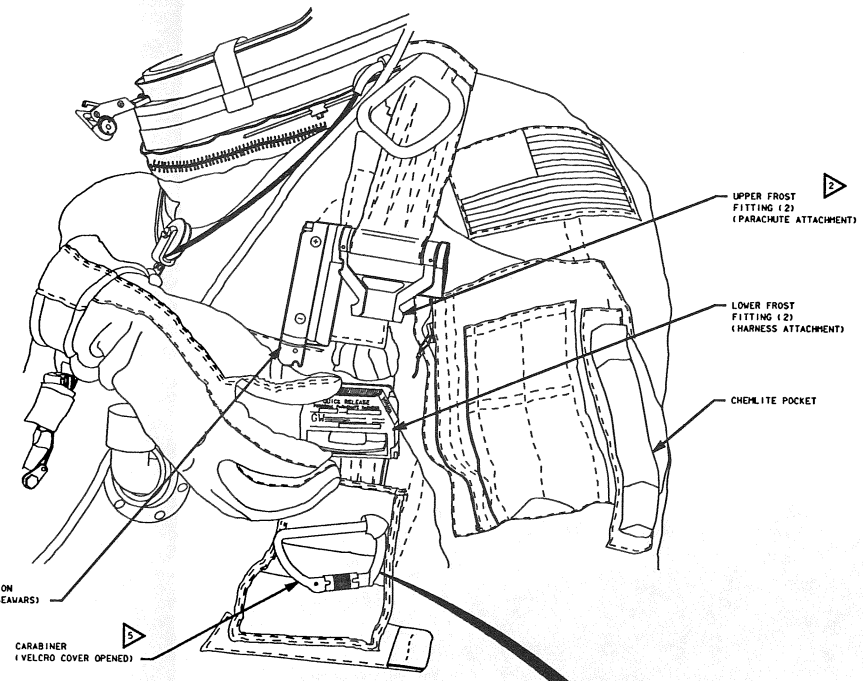


O_2 MANIFOLD AND G-SUIT CONTROLLER
CONNECTED TO LEFT LEG OF SUIT

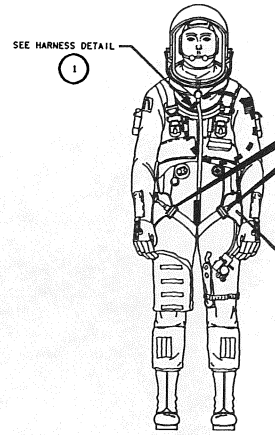
DATE: 06/13/94	NAME: BJT	VERSION INK: B
DATE: 03/13/96	NAME: SVJ	VERSION BPT: 7
DATE: 04/16/96	NAME: SVJ	VERSION INK: 9

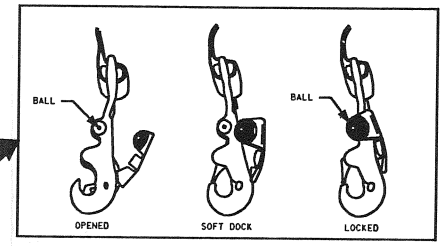


D LIFE PRESERVER UNIT (LPU) 11

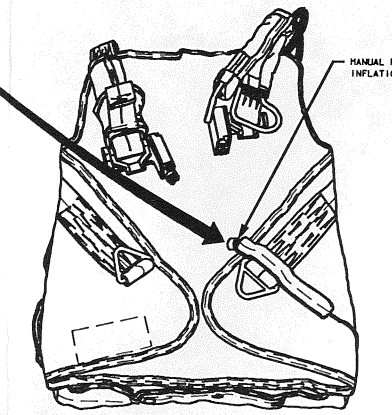


HARNESS DETAIL (1)



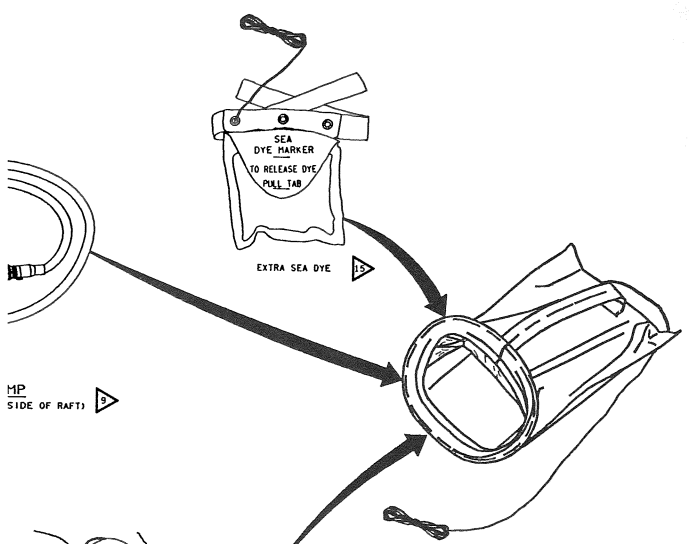


EJECTOR SNAP POSITIONS 3
(LOWER PARACHUTE ATTACH FITTINGS)



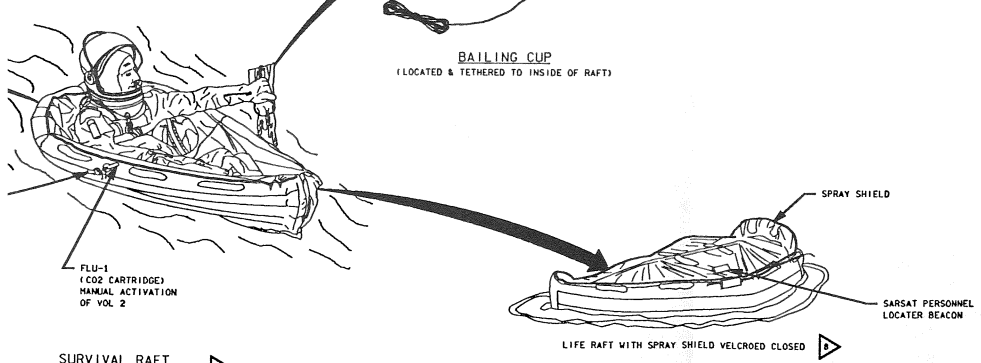
PARACHUTE PACK
(FRONT VIEW)

DETAIL CARABINER
DETAIL OPEN/CLOSED



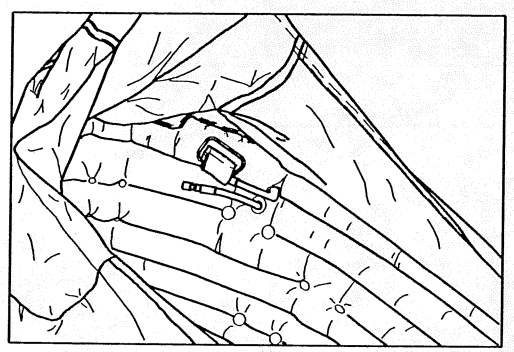
MP
SIDE OF RAFT) 4

BAILING CUP
(LOCATED & TETHERED TO INSIDE OF RAFT)

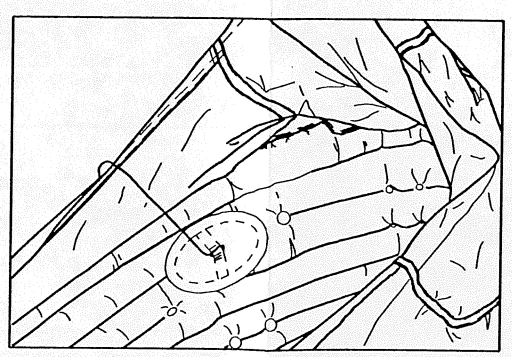


LIFE RAFT WITH SPRAY SHIELD VELCROED CLOSED 8

SURVIVAL RAFT
(13' TETHER TO PARACHUTE PACK) 12



ORAL INFLATION TUBES
(LOCATED INSIDE RAFT ON PORT SIDE) 7



BAILING CUP
TETHER LOCATION FOR SEA DYE MARKER
BAILING CUP AND SIPHON TUBE
(STB SIDE)

12 LOCKING CARABINER LOCATED UNDER A VELCRO PATCH IS USED TO TETHER TO THE SNAP SHACKLE ON THE SKY GENIE OR TO SEARCH AND RESCUE EQUIPMENT

11 SARSAT BEACON IS ACTIVATED WHEN MAIN CANOPY OF PARACHUTE IS DEPLOYED. IT IS POWERED BY FOUR D/3 A LI MnO_2 BATTERIES. IT HAS A USEFUL LIFE OF 24+ HRS. IT IS STOWED IN A POCKET ON THE LEFT HAND SPRAY SHIELD AND ITS ANTENNA IS ROUTED AROUND TO THE SPRAY SHIELD FOR MAXIMUM TRANSMISSION CAPABILITY

10 AN EXTRA SEA DYE MARKER IS STOWED IN THE RAFT AND IS USED WHEN REQUESTED BY SAR FORCES. IT IS TETHERED TO THE ATTACH POINT ON THE STB AND STOWED IN THE BAILING CUP. IT HAS NO WICK AND THUS NEEDS TO BE OPENED

9 RAFT MATERIAL IS POLYURETHANE COATED NYLON WHICH IS PERMEABLE TO CO2. AFTER RAFT HAS BEEN INFLATED MORE THAN 4 HOURS, THE PRESSURE IN THE RAFT COULD BE LOW FROM SEEPAGE AND REQUIRE MANUAL INFLATION USING THE ORAL INFLATION TUBES

13 GREEN APPLE PULL FORCE REQUIRED TO ACTIVATE BOTH EOS BOTTLES IS 25 ±10 lbf

12 EMERGENCY OXYGEN SYSTEM CONSISTS OF TWO 11.3 INCH BOTTLES WITH AN OUTER DIAMETER OF 3 INCHES. IT IS 3000 PSIG FULL CHARGE AT 70°F, 60 CUBIC INCHES PER BOTTLE AND APPROX. 1.2 LBM PER SYSTEM (2 BOTTLES = 1.2+). UNDER A MODERATE WORK LOAD OF 38 LITERS PER MINUTE THE BOTTLE WILL LAST APPROX 10 MINUTES AT SEA LEVEL

11 LPU IS COMPOSED OF TWO INFLATABLE VOLUMES; AN INNER VOLUME COMPLETELY SURROUNDED BY AN OUTER VOLUME (BACKUP FOR LEAKAGE). THE INNER VOLUME CAN BE INFLATED BY THE FLU-9, MANUALLY OR WATER ACTIVATED, OR BY THE RIGHT ORAL INFLATION TUBE. THE RIGHT TUBE CAN MANUALLY INFLATE OR DEFLATE THE INNER VOL. THE LEFT ORAL INFLATION TUBE CAN MANUALLY INFLATE OR DEFLATE THE OUTER VOL. THE TWO TUBES CAN BE CONFIGURED TO HOLD LPU FRONT LOBES TOGETHER BY LOOPING THE LEFT ORAL INFLATION TUBE THROUGH A LOOP ON THE RIGHT ORAL INFLATION TUBE

10 A SEA DYE MARKER IS ATTACHED TO THE SEA ANCHOR. ONCE SUBMERGED IN WATER THE WICK WILL RELEASE A FLORESCENT GREEN DYE WHICH CAN BE SEEN FROM 10 MILES AND AT AN ALTITUDE OF 3000 FT. THE DYE EXHAUSTS IN 20 TO 30 MINUTES. MARKER IS AN INEFFECTIVE TARGET AFTER 1 TO 3 HOURS HOURS DEPENDING ON THE CONDITIONS OF THE SEA

8 BAILING PUMP IS USED TO BAIL WATER OUT OF RAFT. TAPERED END STAYS IN RAFT WHILE PUMPING AND OTHER END IS POSITIONED OUT OF RAFT. HOSE LENGTH IS 75 INCHES. HOSE INSIDE DIAMETER IS 1-4 INCH AND OUTSIDE DIAMETER IS 1-2 INCH. IT IS STOWED IN AND TETHERED TO THE BAILING CUP

4 SPRAY SHIELD CAN BE USED TO BAIL WATER OUT OF RAFT AND CAN BE VELCROED CLOSED FOR WARMTH AND TO PREVENT WATER FROM ENTERING RAFT. THE SARSAT BEACON IS STOWED IN A POCKET ON THE LEFT HAND SPRAY SHIELD. THERE ARE PATCHES OF REFLECTIVE TAPE ON THE SPRAY SHIELD TO AID IN SEARCH AND RESCUE ACTIVITY

7 ORAL INFLATION TUBES ARE USED TO MANUALLY INFLATE/DEFLATE VOL 1 AND VOL 2 OF RAFT. UPPER TUBE IS USED FOR VOL 2 AND LOWER TUBE IS USED FOR VOL 1. TO USE, UNSCREW & DEPRESS FITTING AND ORALLY INFLATE OR DEFLATE RAFT. TIGHTEN FITTING AFTER USE TO PREVENT UNINTENTIONAL DEFLATION

6 VOLUME 1 OF RAFT CONSISTS OF RINGS 2,3 AND 4 (FROM TOP)
VOLUME 2 OF RAFT CONSISTS OF RINGS 1,5 - ALL (FROM TOP)

5 CARABINER CAN BE USED DURING POSTLANDING EGRESS OR WATER RESCUE

4 SEAWARS WILL AUTOMATICALLY RELEASE THE PARACHUTE FROM THE HARNESS WHEN SUBMERGED IN SALT WATER ONLY

3 MANUAL RAFT INFLATION KNOB WILL ACTIVATE THE RAFT'S FLU-9 (CO2 CARTRIDGE) WHICH WILL INFLATE VOLUME 1 OF RAFT (UPPER PORTION OF RAFT)

2 TWO EJECTOR SNAPS AND TWO FROST FITTING ASSY'S, RELEASE THE PARACHUTE FROM THE HARNESS. OPENED, SOFT DOCK AND CLOSED POSITIONS

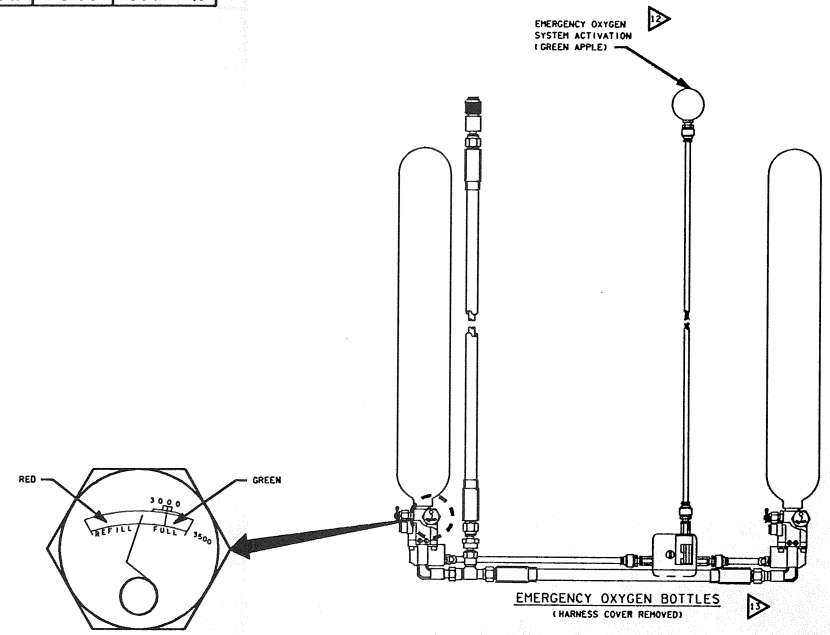
NOTES:
1 BENEATH THE PRESSURE BLADDERS AND GORTEX LINER ARE THE THERMAL UNDERWEAR, SOCKS AND A URINE COLLECTION DEVICE OR DISPOSABLE ABSORPTION GARMENT, IN THE CLOSED POSITION THE BAIL MUST ALIGN WITH THE HOLE ON THE THUMB SPRING

5 SG 1

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN M. GILLESPIE	08/28/89	
DR		
ENGR SCOTT GILL		SURVIVAL GEAR RAFT/HARNESS/PARACHUTE
ENGR SC. H. Gill	5/8/96	
APP [illegible]	5/8/96	
APP [illegible]	5/10/96	SPACE SHUTTLE / DWG NO 18.5
CARD S.K. Kimbell	6/7/96	ALL FLIGHTS
LTR E / PCN 4		93.5 X 34 / PAGE / SHEET 1 OF 3

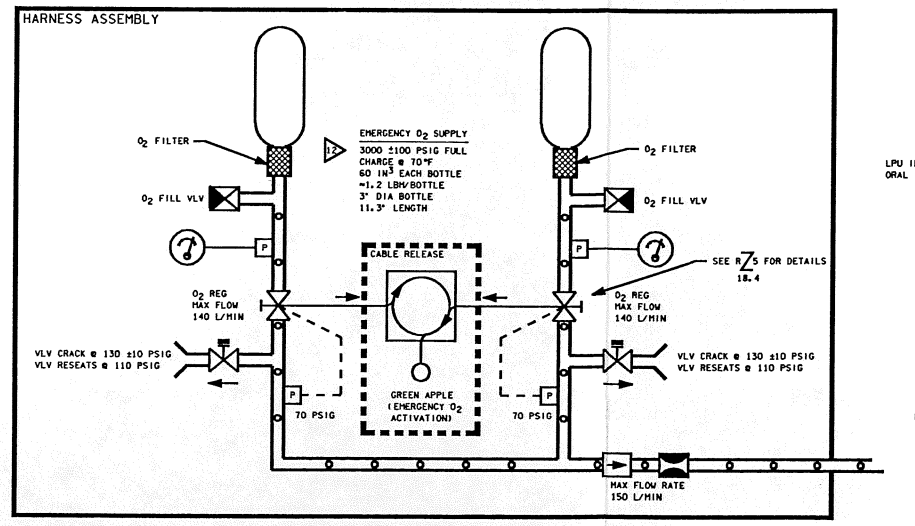
BASIC REV E-4

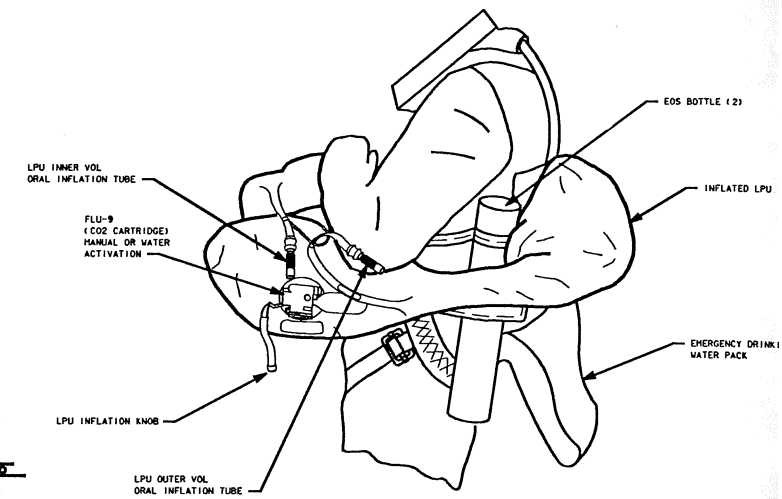
DATE: 04/16/96 | NAME: SVJ | VERSION: INK 9



PRESSURE GUAGE (2)

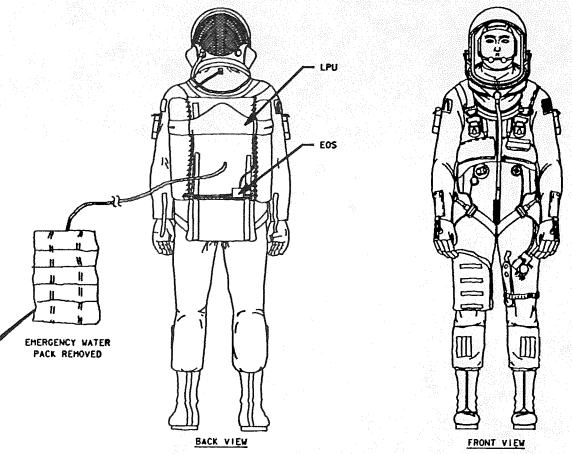
EMERGENCY OXYGEN BOTTLES
(HARNESS COVER REMOVED)



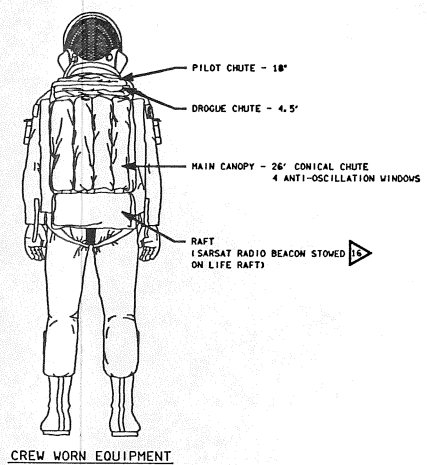


INFLATED LIFE PRESERVER UNIT (LPU)

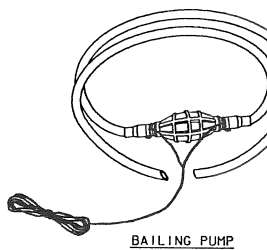
SEAWAT RELEAS



CREW WORN EQUIPMENT
(WITHOUT PARACHUTE PACK)

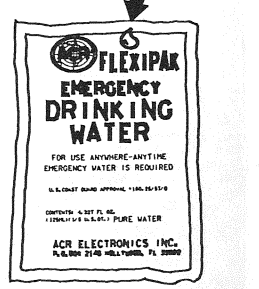


CREW WORN EQUIPMENT
(ENTIRE ASSEMBLY - BACK VIEW, BACK FLAP REMOVED FOR CLARITY)

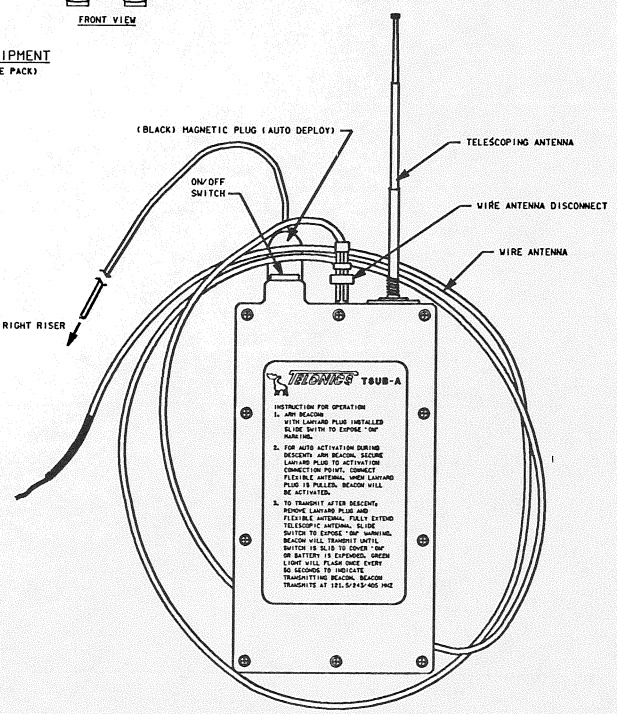


BAILING PUMP
(LOCATED & TETHERED TO INSIDE OF RAFT)

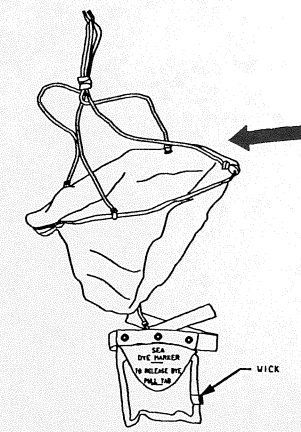
(LOCATED &



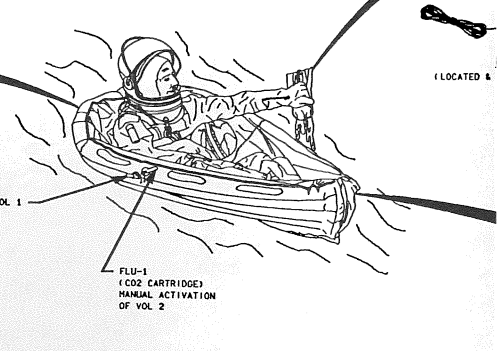
EMERGENCY DRINKING WATER
PACK OF 16 BAGS (2 LITERS TOTAL) VELCROED AND TETHERED TO BACK OF HARNESS WITH 3 FT TETHER



SIGNAL BEACON - SARSAT
(STOWED IN POCKET ON LEFT SPRAY SHIELD OF LIFE RAFT)



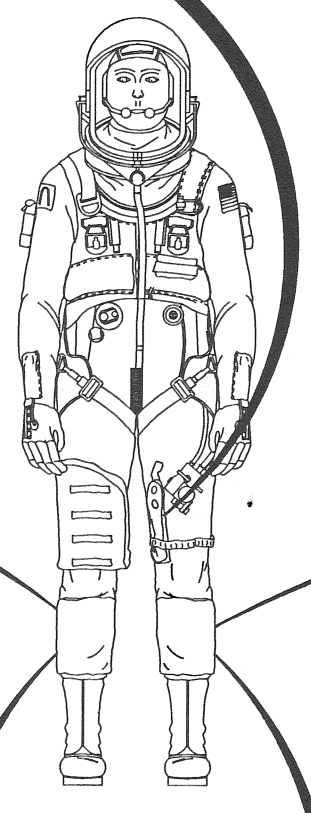
SEA ANCHOR/SEA DYE MARKER
(LOCATED IN RAFT - 12' TETHER CONNECTED TO OUTSIDE HEAD OF RAFT)



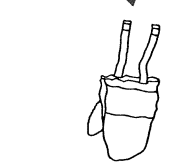
SURVIVAL RAFT
(13' TETHER TO PARACHUTE PACK)

DATE: 03/13/96	NAME: SVJ	VERSION: BPT: 5
DATE: 04/30/96	NAME: SVJ	VERSION: BPT: 6
DATE: 05/11/96	NAME: BJB	VERSION: INK: 2

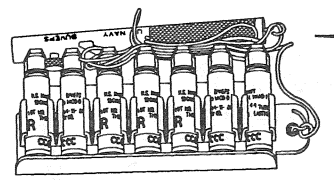
HOOK BLADE



'OSURE MITTEN
BEHIND SURVIVAL PACK B)



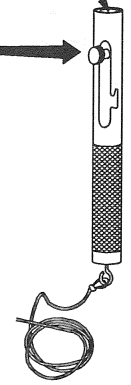
EXPOSURE MITTEN
(STOWED BEHIND SURVIVAL PACK A)



SIGNAL KIT, ILLUMINATION
MK 79 MOD 0
CONSISTING OF
7 SIGNALS, HAND FIRED MK 80 MOD 0
1 PROJECTOR, SIGNAL, SURFACE MK 31 MOD 0

PEN GUN FLARE KIT ▷

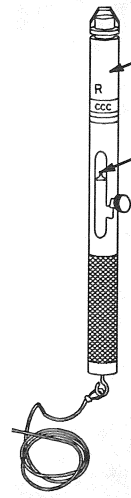
SHADE THREAD



UNCOCKED
(POST FIRING)

SIGNAL SCREWED IN

FIRING PIN VISABLE



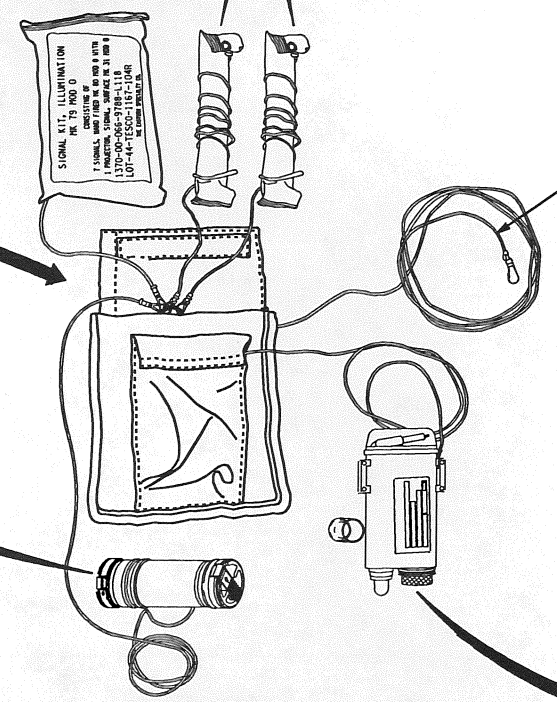
COCKED
(READY TO LOAD AND FIRE) ▷

IMPORTANT: KEEP SEALED IN FOIL WRAPPER UNTIL READY FOR USE. DO NOT PUNCTURE. THE INGREDIENTS IN CYALUME® LIGHTSTICK ARE NON-TOXIC. IN CASE OF EYE CONTACT, THOROUGHLY RINSE WITH WATER. INGREDIENTS WILL NOT CAUSE INJURY TO THE EYE, BUT MAY CAUSE TEMPORARY DISCOMFORT

CHEMICAL LIGHTSTICK (2)
12 HR HIGH INTENSITY - GREEN LIGHT

SIGNAL KIT OPERATING INSTRUCTIONS (LOCATED INSIDE KIT PACK)

1. PULL TRIGGER SCREW INTO ANGULAR (SAFETY) SLOT.
2. BEND PROTECTIVE TAB AWAY FROM SIGNAL IN BANDOLEER TO ALLOW ATTACHMENT OF PROJECTOR.
3. MATE PROJECTOR WITH SIGNAL AND ROTATE TO RIGHT UNTIL SIGNAL IS SEATED.
4. HOLD PROJECTOR, ARM FULLY EXTENDED, OVERHEAD.
5. GRIP PROJECTOR FIRMLY. WITH SNAPPING THUMB ACTION, PULL TRIGGER FROM SAFETY SLOT AND RELEASE INTO FIRING SLOT.
6. IF SIGNAL MISFIRES, AT LEAST ONE MORE ATTEMPT SHOULD BE MADE TO FIRE IT.
7. UNSCREW MISFIRED OR SPENT SIGNAL.



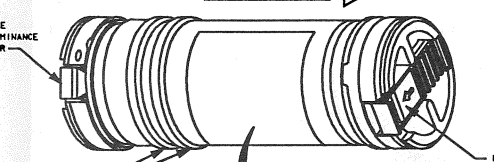
SUIT POCKET TETHER

SURVIVAL PACK A
(STOWED AND TETHERED IN SUIT LEG POCKET)

PEN GUN FLARE KIT
DAY/NIGHT FLARE
STROBE LIGHT
CHEMICAL LIGHTSTICK

DAY/NIGHT FLARE ▷

WHITE ILLUMINANCE LEVER



RED LEVER

2 SMOOTH RIDGES ON NIGHT END

USNAVY NAVSEA
SIGNAL,
SMOKE AND ILLUMINATION
MARINE MK 124 MOD 0
□□□□□□□
1370-01-030-8550 L285
ADL31397348003

CCC FLARE END-NIGHT USE CCC

INSTRUCTIONS

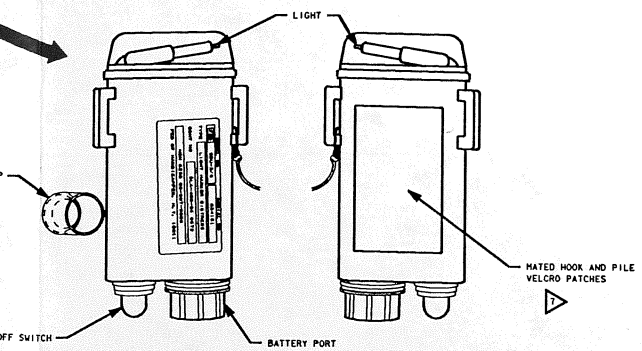
1. REMOVE CAP FROM END TO BE IGNITED.
2. SLIDE LEVER HORIZONTALLY TO FULLY EXTEND.
3. PULL LEVER DOWNWARD UNTIL FIRING PIN RELEASES.
4. IF SMOKE FLARES, BRIEFLY IMMERSE IN WATER OR HOLD AGAINST SOLID OBJECT
5. AFTER USING ONE END SAVE OTHER END FOR FUTURE USE.

WARNING

1. DURING AND AFTER IGNITION, FULLY EXTEND ARM OVERHEAD AT 45° ANGLE AND DO NOT LOOK AT SIGNAL.
2. PRIOR TO PULLING LEVER DOWNWARD, POSITION ALL FINGERS BELOW TOP OF SIGNAL.
3. AFTER IGNITION HOLD SIGNAL AT 45° ANGLE.

CCC SMOKE END-DAY USE CCC

DAY/NIGHT FLARE DECAL
(AROUND FLARE CYLINDER)



STROBE LIGHT ▷
(TETHERED IN OUTER POUCH OF SURVIVAL PACK A)

BACK SIDE

▷ EACH RADIO HAS A CREW MEMBER SPECIFIC IDENTIFICATION CODE

▷ MICROPHONE IS MUTED ANYTIME EARPHONE IS CONNECTED

▷ PILE VELCRO PATCH CAN BE USED TO ADHERE THE STROBE LIGHT TO THE CREWMEMBERS HELMET AND OTHER LOCATIONS ON RAFT

▷ A STRIP OF TRANSLUCENT KAPTON TAPE COVERS THE ROTARY ON/OFF SWITCH TO KEEP THE DIAL FROM BEING INADVERTENTLY TURNED

▷ DAY/NIGHT FLARE CONSISTS OF A DAY SMOKE FLARE AND A NIGHT ILLUMINATION FLARE.
NIGHT FLARE END: WHITE TRIGGER - RED FLARE
BURNS 20 SECONDS AND IS VISIBLE FOR 30 MILES
DAY FLARE END: RED TRIGGER - ORANGE SMOKE BURNS 20 SECONDS AND IS VISIBLE FOR 7 MILES.

▷ PEN GUN FLARE KIT HAS SEVEN SIGNALS, EACH WITH A MINIMUM DURATION OF 4.5 SECONDS. THEY CAN BE LAUNCHED UP TO 200 FEET

▷ STROBE LIGHT USES A 4.5V MERCURY BATTERY AND HAS A LIFE OF 6-9 HOURS CONTINUOUS USE AND APPROXIMATELY 18 HOURS INTERMITTENT. NO SPARE BATTERY CARRIED. LIGHT IS VISIBLE FOR 50 MILES

▷ SIGNAL MIRROR CAN BE VISIBLE OVER 40 MILES, ON A CLEAR SUNNY DAY. THE MIRROR REFLECTS THE EQUIVALENT OF 8 MILLION CANDLEPOWER

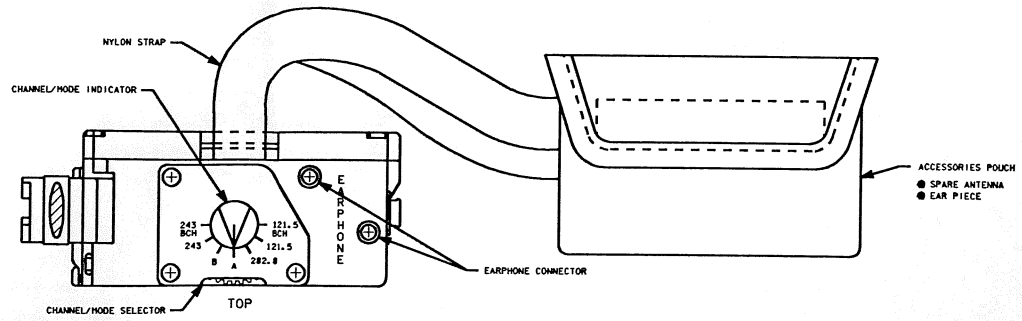
NOTES: ▷ SURVIVAL RADIO USES A BA-5117/U LITHIUM BATTERY AND HAS A SERVICE LIFE OF 24 HRS WITH 90 PERCENT RECEIVE 10 PERCENT TRANSMIT

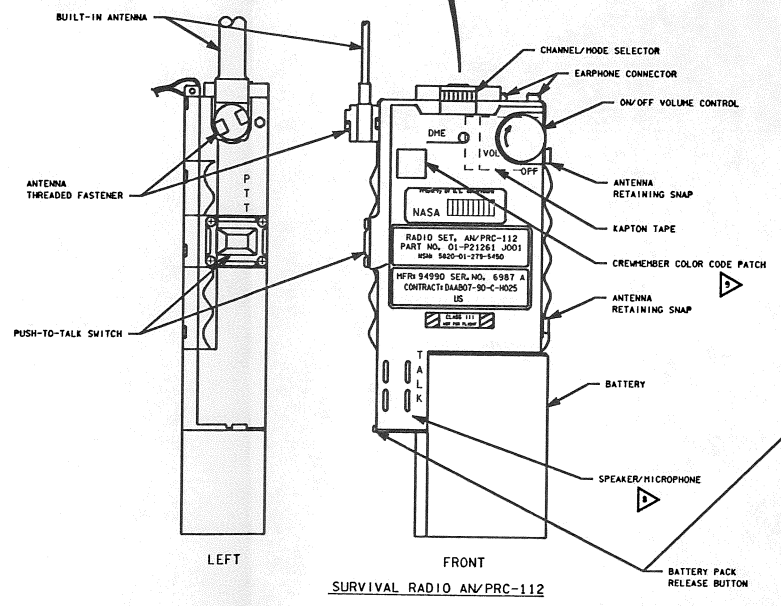
5 SG 2

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	B. TEDDER, R. LORIALES	9/26/88		
DR	R. GILLESPIE, S. EGAN-VER	9/26/88		
ENGR	S. GILL		SURVIVAL GEAR	
ENGR	[signature]	5/14/96		
APP	[signature]	5/14/96		
APP	[signature]	5/30/96	SPACE SHUTTLE	DWG NO 18.5
CM	[signature]	6/19/96	ALL	
LTR E	PCN 6		93.5 X 34	PAGE SHEET 2 OF 3

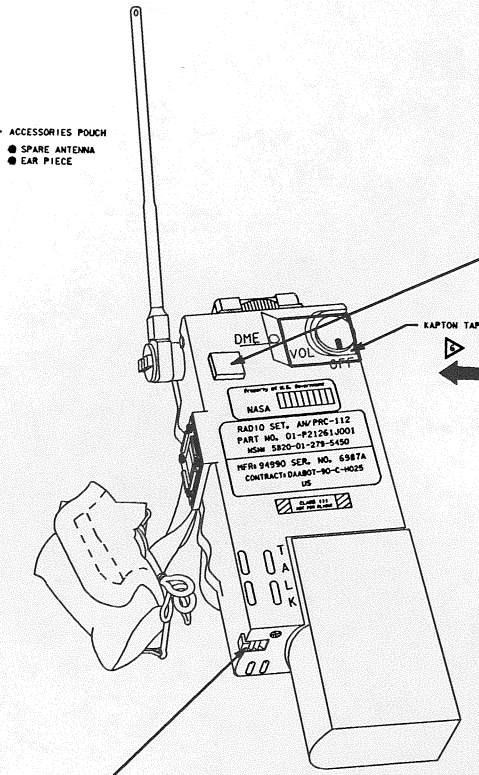
BASIC REV E-6

DATE: 05/11/96 | NAME: BJB | VERSION: INK 2

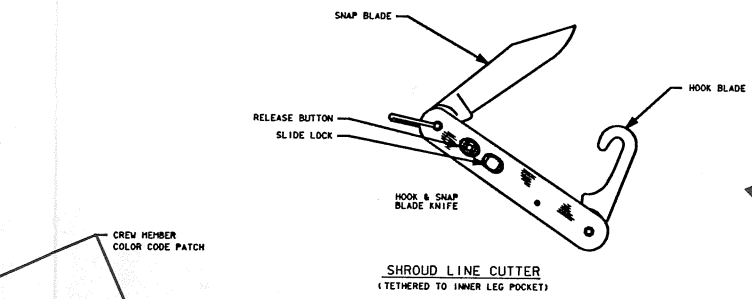




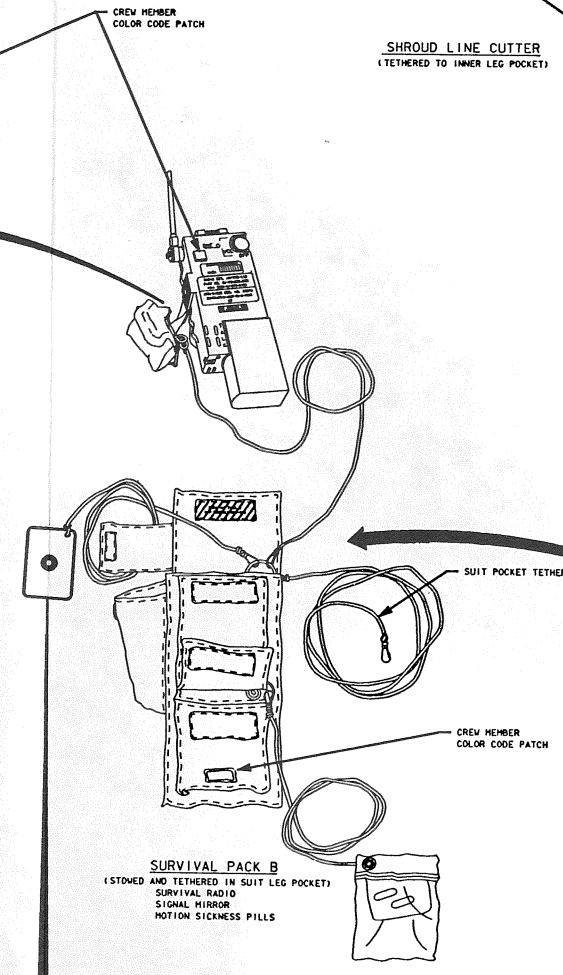
SURVIVAL RADIO AN/PRC-112



SURVIVAL RADIO AN/PRC-112

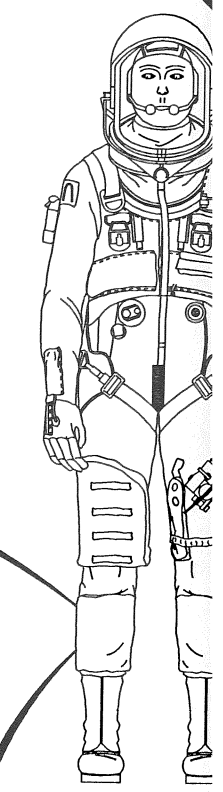


SHROUD LINE CUTTER
(TETHERED TO INNER LEG POCKET)



SURVIVAL PACK B
(STOWED AND TETHERED IN SUIT LEG POCKET)
SURVIVAL RADIO
SIGNAL MIRROR
MOTION SICKNESS PILLS

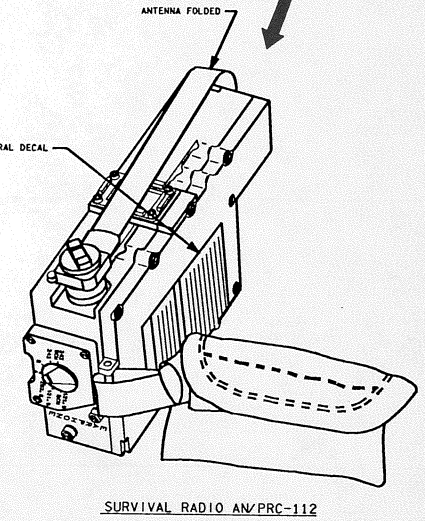
MOTION SICKNESS PILLS
(TETHERED IN LOWER POUCH ON SURVIVAL PACK B



EXPOSURE MITTEN
(STOWED BEHIND SURVIVAL PACK B)

PRC-112 RADIO INSTRUCTIONS
● EXTEND SARSAT TELESCOPING ANTENNA, THEN DISCONNECT WIRE ANTENNA
● CONTINUE SARSAT BEACONING
● TURN ON PRC-112 AND MONITOR 282.8 (VOICE)
● STANDBY FOR RADIO CONTACT WITH SAR FORCES
● FOLLOW INSTRUCTIONS FROM SAR FORCES
● RETURN TO 282.8 IF CONTACT WITH SAR FORCES LOST
● VERIFY SARSAT BEACON TONES WITH PRC-112 BY MOMENTARILY LISTENING TO 243.0 (VOICE) AND 121.5 (VOICE)

ADDITIONAL INFORMATION	
121.5 BCN	INTERNATIONAL EMERGENCY FREQUENCY (VHF/BEACON)
121.5	INTERNATIONAL EMERGENCY FREQUENCY (VHF/VOICE)
243.0 BCN	MILITARY EMERGENCY FREQUENCY (UHF/BEACON)
243.0	MILITARY EMERGENCY FREQUENCY (UHF/VOICE) DME
282.8	PRIMARY SAR OPERATIONS FREQUENCY (UHF/VOICE) DME
A.	SECONDARY SAR OPERATIONS (259.7) FREQUENCY (SHUTTLE A/G) (UHF/VOICE) DME
B.	BACKUP SAR OPERATIONS (236.0) FREQUENCY (UHF/VOICE) DME



SURVIVAL RADIO AN/PRC-112

MIRROR SIGNALING INSTRUCTIONS

1. REFLECT SUNLIGHT FROM MIRROR ONTO A NEARBY SURFACE, RAFT, HAND, ETC.

2. SLOWLY BRING MIRROR UP TO EYE LEVEL AND LOOK THROUGH SIGHTING HOLE. YOU WILL SEE A BRIGHT LIGHT SPOT. THIS IS THE AIM INDICATOR.

3. HOLD MIRROR CLOSE TO THE EYE AND SLOWLY TURN AND MANIPULATE IT SO THAT THE BRIGHT LIGHT SPOT IS ON THE TARGET.

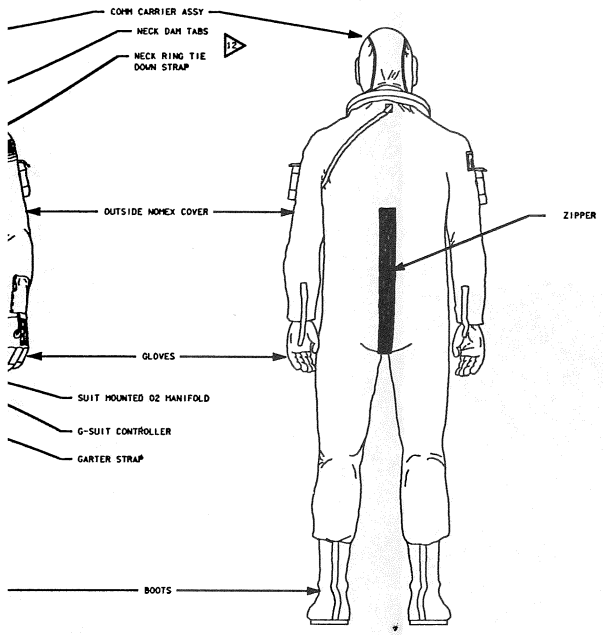
4. EVEN THOUGH NO AIRCRAFT OR SHIPS ARE IN SIGHT CONTINUE SWEEPING THE HORIZON FOR MIRROR FLASHES MAY BE SEEN FOR MANY MILES, EVEN IN HAZY WEATHER.

MIRROR, EMERGENCY SIGNALING, MARK 3
MIL-M-18371E MANUFACTURER S. I. HOWARD GLASS
TYPE I CONTRACT NO DLA400-86-C-5285

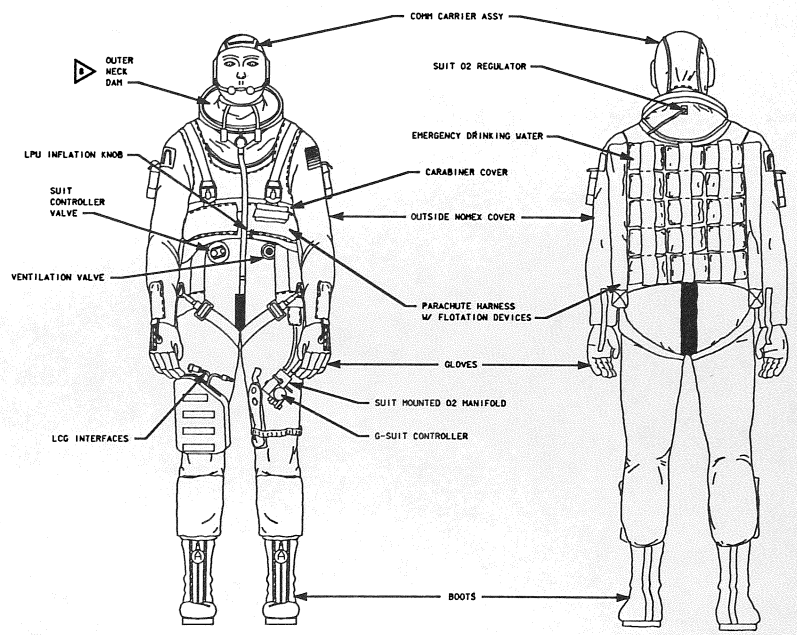
SIGNAL MIRROR
(TETHERED IN UPPER POUCH IN SURVIVAL PACK B)

BASIC REV E-6

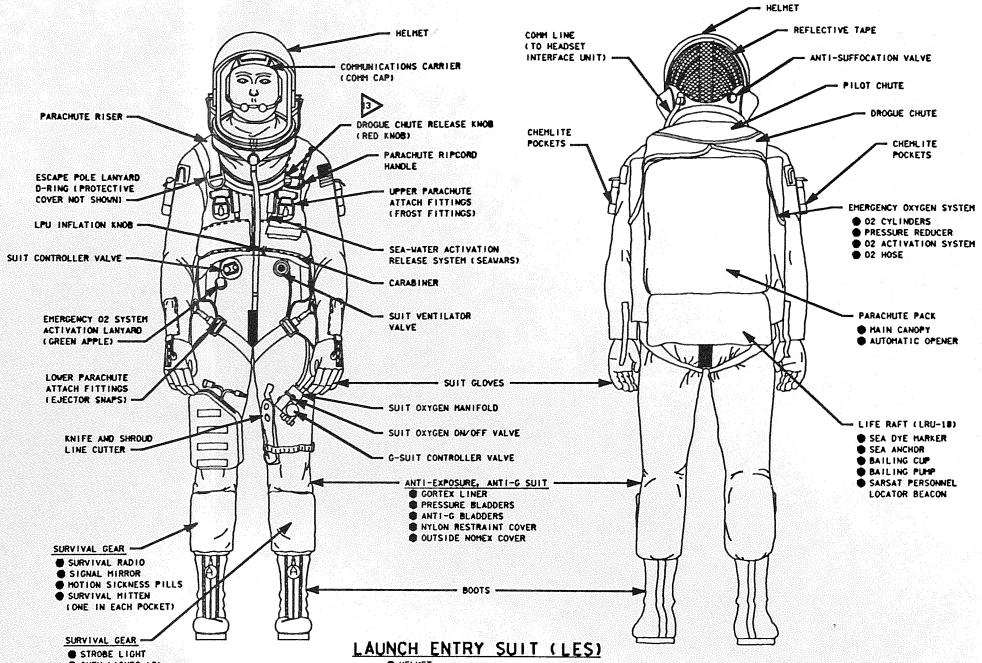
DATE: 03/13/96	NAME: SVJ	VERSION: BPTs 8
DATE: 04/24/96	NAME: BJB	VERSION: BPTs 9
DATE: 05/11/96	NAME: BJB	VERSION: INKs 5



LES
CREW WORN EQUIPMENT
(WITHOUT PARACHUTE PACK, HARNESS OR HELMET)



LES
CREW WORN EQUIPMENT
(WITHOUT PARACHUTE PACK, HELMET OR WATER PACK COVER)



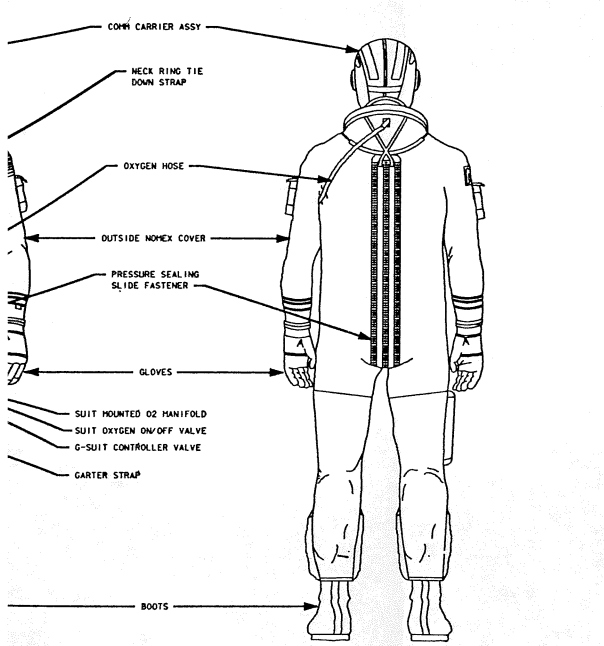
LAUNCH ENTRY SUIT (LES)
● HELMET
● C.C.A. COMMUNICATIONS CAP
● COUNTER PRESSURE GARMENT
● ANTI-EXPOSURE, ANTI-G SUIT

CREW WORN EQUIPMENT
(ENTIRE ASSEMBLY)

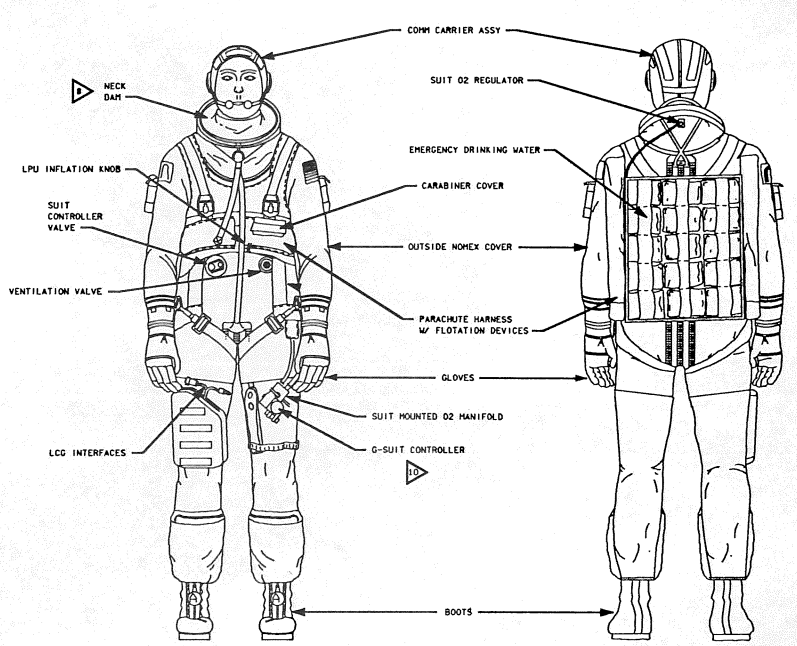
14. ACRONYMS:
- ACES - ADVANCED CREW ESCAPE SUIT
  - FULL PRESSURE SUIT
  - USES BOTH TYPES OF ANTI-G-SUITS
- BIP - BIO INSTRUMENTATION PORT
  - ENTRY POINT FOR DSO LINES AND COOLING UNIT WATER LINES
  - WATER SEAL ON LES
  - WATER AND PRESSURE SEAL ON ACES
- HIU - HEADSET INTERFACE UNIT
- LCG - LIQUID COOLING GARMENT
  - USED WITH TELCU
  - USED WITH LES OR ACES
- LES - LAUNCH/ENTRY SUIT
  - PARTIAL PRESSURE SUIT
  - USES ONLY CSU-13 ANTI-G-SUIT
- PSVS - PERSONAL SUIT VENTILATION SYSTEM (SUIT FAN)
- REAGS - RE-ENTRY ANTI-G-SUIT
  - NO ABDOMINAL PRESSURE BLADDER
  - DEMATES FROM ACES - NOT USED WITH LES
  - STOWED PRE-LAUNCH
- TELCU - THERMAL ELECTRICAL LIQUID COOLING UNIT
  - USED WITH LIQUID COOLING GARMENT
  - USED WITH ACES OR LES

13. REFER TO DRAWING 18.6 SZ7 FOR DETAILS OF DROGUE CHUTE RELEASE KNOB
12. NECK DAM TABS ON ACES IS OPTIONAL
11. SEE DRAWING 18.8 E,FZ7,8 FOR FULL PRESSURE GLOVE DETAILS
10. SEE DRAWING 18.8 PZ2 FOR G-SUIT CONTROLLER/O2 DISTRIBUTION MANIFOLD DETAILS
9. ALL INTERFACES ARE THE SAME FOR LES OR ACES
8. THE LES HAS INNER AND OUTER NECK DAMS. THE ACES HAS ONLY ONE NECK DAM
7. LIQUID COOLING GARMENT (LCG) CAN BE USED WITH EITHER LES OR ACES
6. REAGS TO REPLACE CSU-13 G-SUIT. REAGS DOES NOT HAVE AN ABDOMINAL BLADDER. REAGS AND CSU-13 CAN BE DEMATED FROM ACES AND STOWED FOR PRE-LAUNCH UNSTOWED AND REMATED FOR ENTRY
5. LES HAS FOUR WATER ENTRY POINTS: VISOR, NECK DAM, MAIN ZIPPER, BIP
4. ACES HAS SIX WATER ENTRY POINTS: VISOR, NECK DAM, 2 GLOVES, MAIN ZIPPER, BIP
3. LES HAS TWO PRESSURE SEALS: VISOR, NECK DAM
2. ACES HAS SIX PRESSURE SEALS: VISOR, NECK DAM, 2 GLOVES, MAIN ZIPPER, BIP

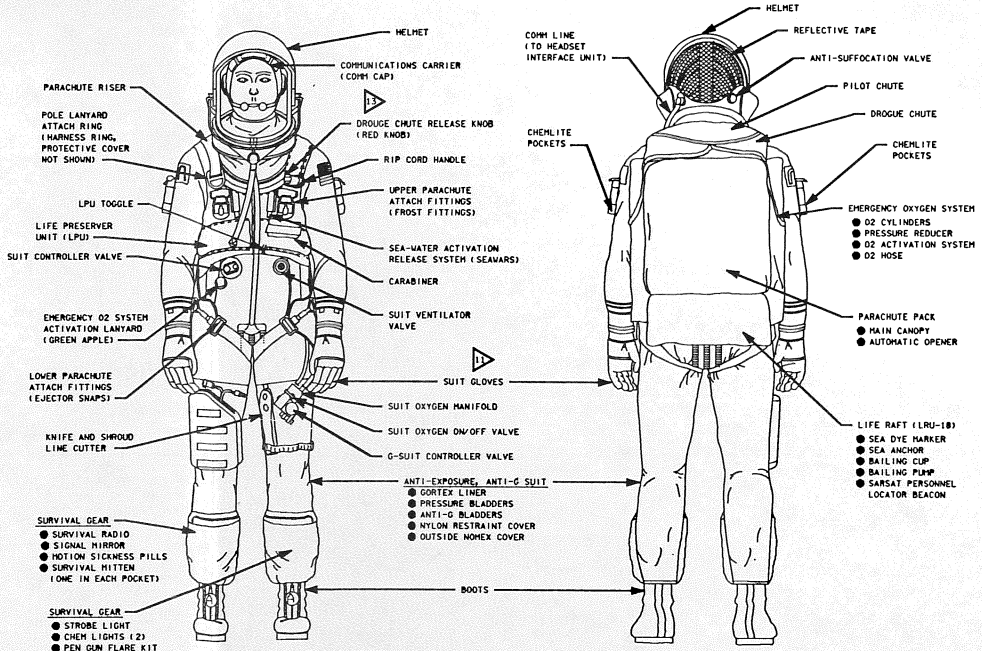
NOTES:
1. ACES SEAT INTERFACE THE SAME



ACES
CREW WORN EQUIPMENT
(WITHOUT PARACHUTE PACK, HARNESS OR HELMET)



ACES
CREW WORN EQUIPMENT
(WITHOUT PARACHUTE PACK, HELMET OR WATER PACK COVER)



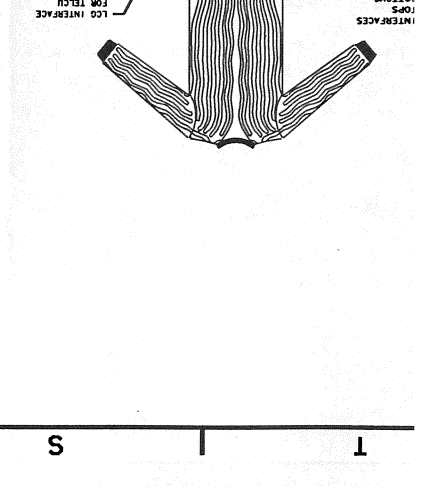
ADVANCED CREW ESCAPE SUIT (ACES)
● HELMET
● COMMUNICATION CARRIER ASSEMBLY
● COUNTER PRESSURE/ANTI-EXPOSURE GARMENT
● ANTI-G SUIT

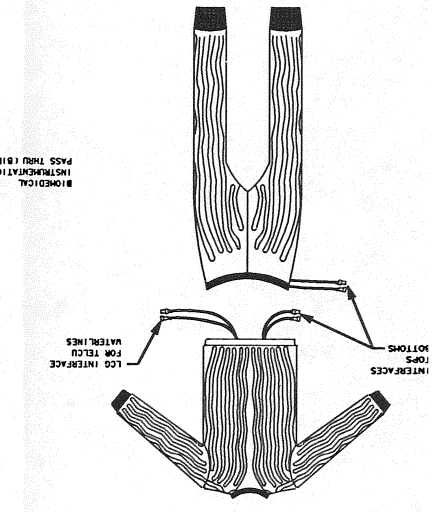
CREW WORN EQUIPMENT
(ENTIRE ASSEMBLY)

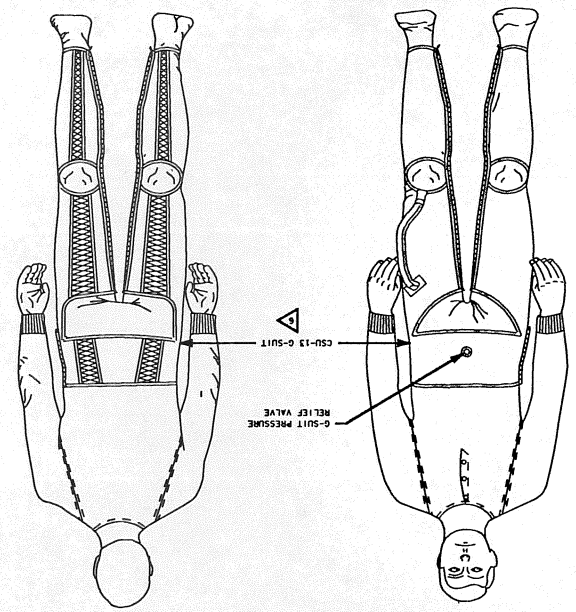
5 LES/ACES COMP & SEAT I/F 3

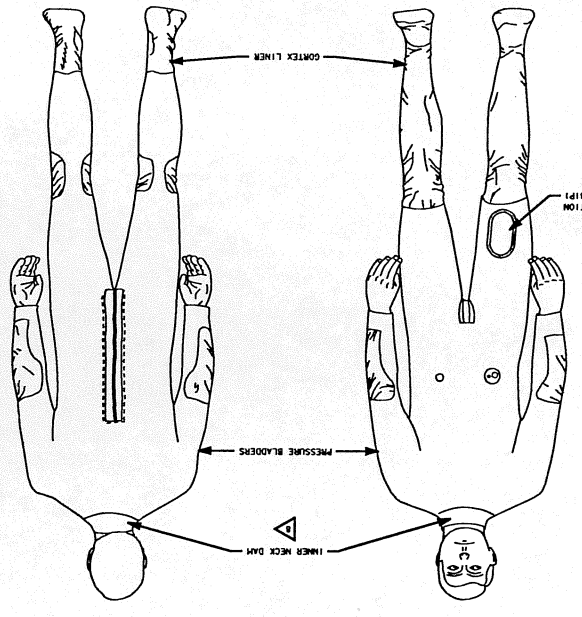
SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	M. GILLESPIE			
DR	M. URDIALES	12/13/94	LES/ACES COMPONENTS AND SEAT INTERFACE	
ENGR	S. GILL			
ENGR	S. Gill	5/14/96		
APP	P. Hof	5/14/96		
APP	John Kamman	5/17/96	SPACE SHUTTLE	DWG NO 18.5
CCB	S.K. Kimbrough	6-12-96	ALL	
LTR E	PCN 6		126.5 X 34	PAGE SHEET 3 OF 3

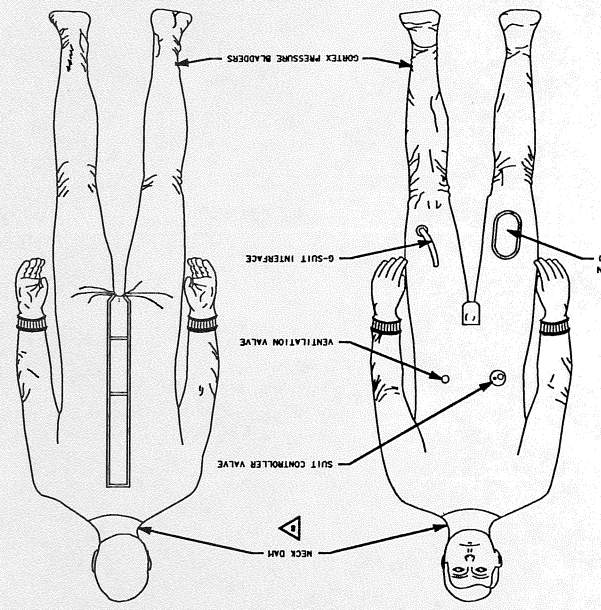
BASIC REV E-6

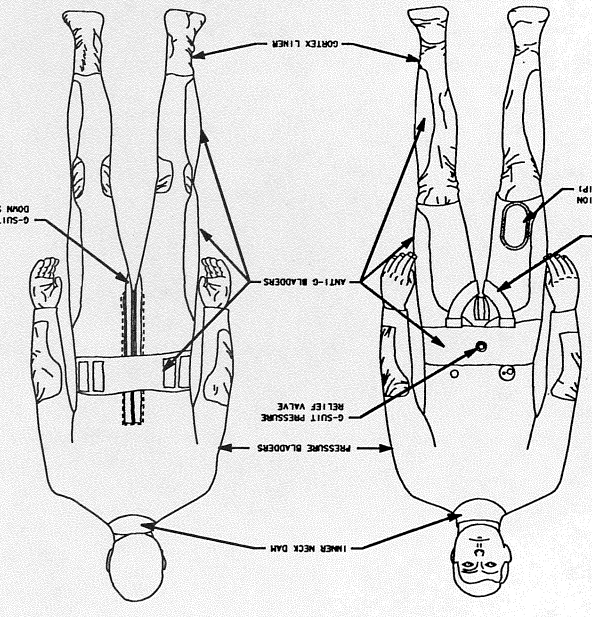


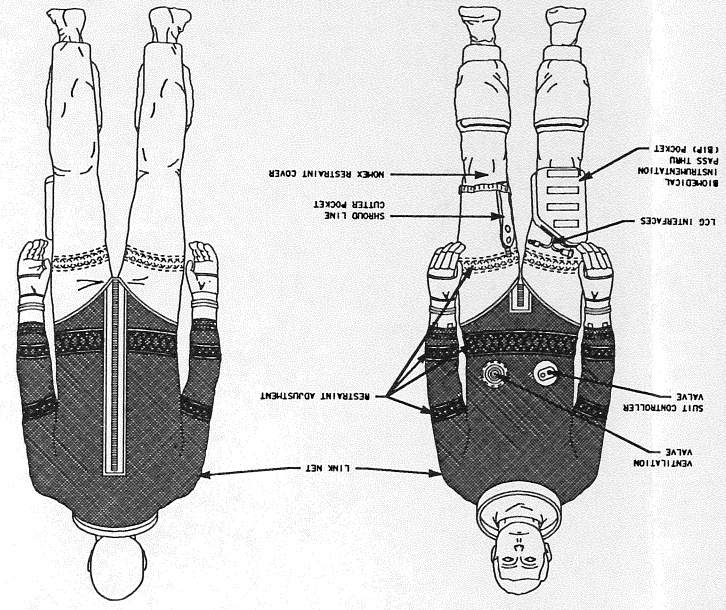


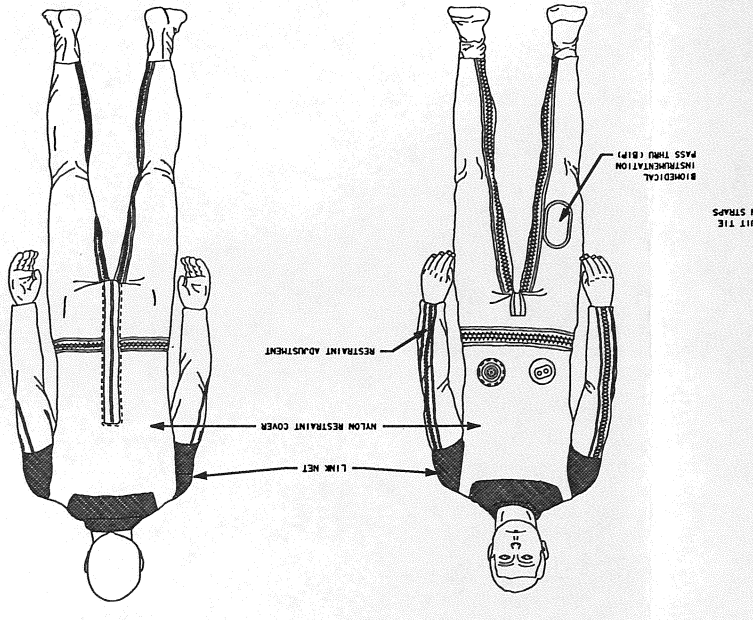


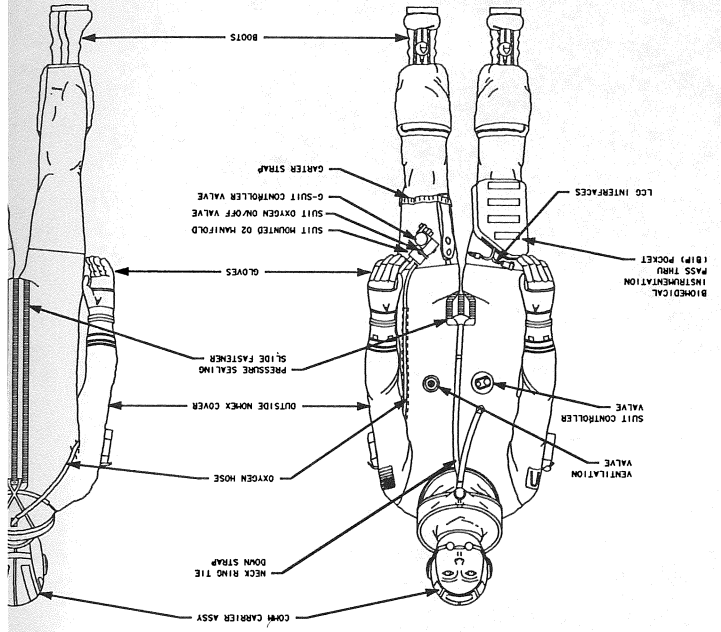


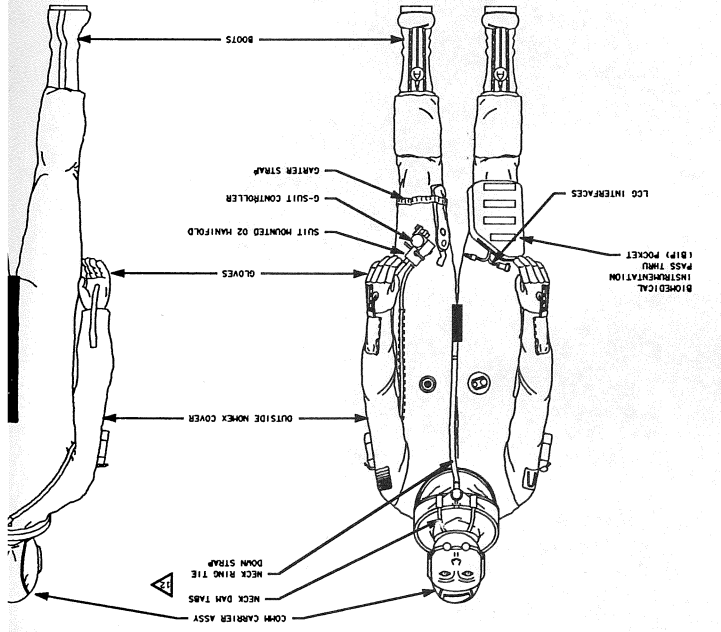




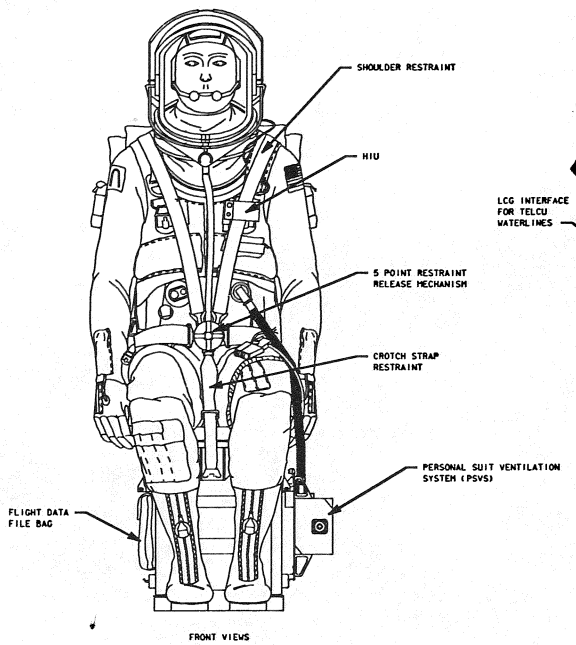






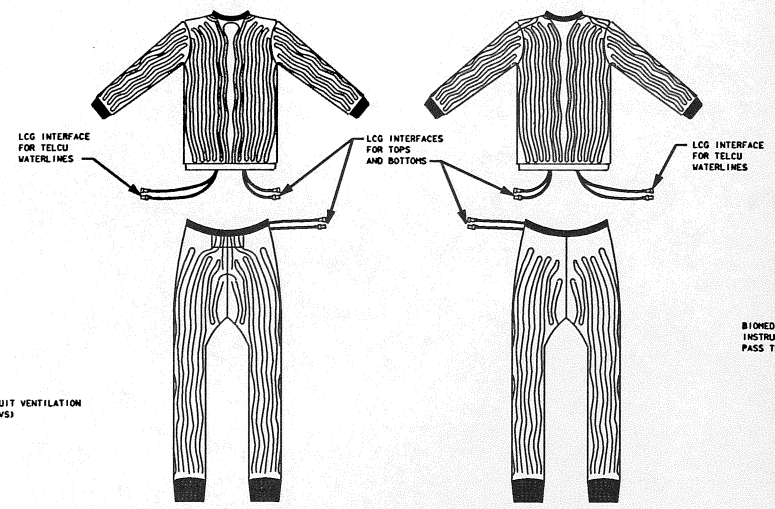


T | S | R | Q | P | O | N | M | L | K | J

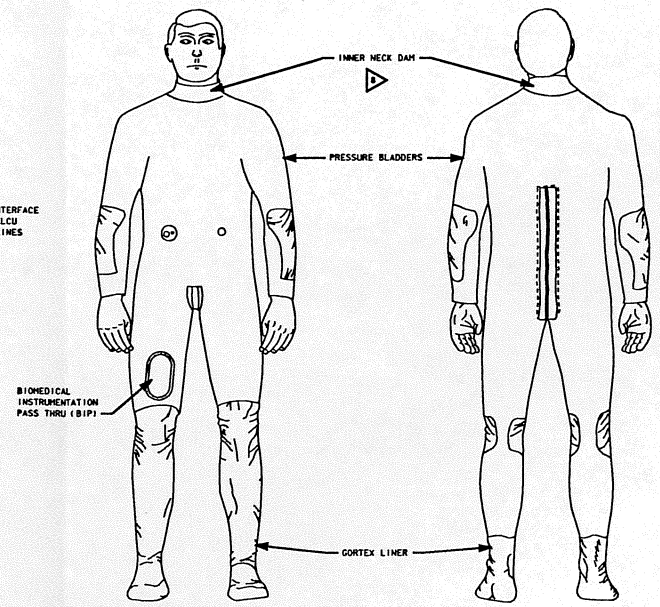


FRONT VIEWS

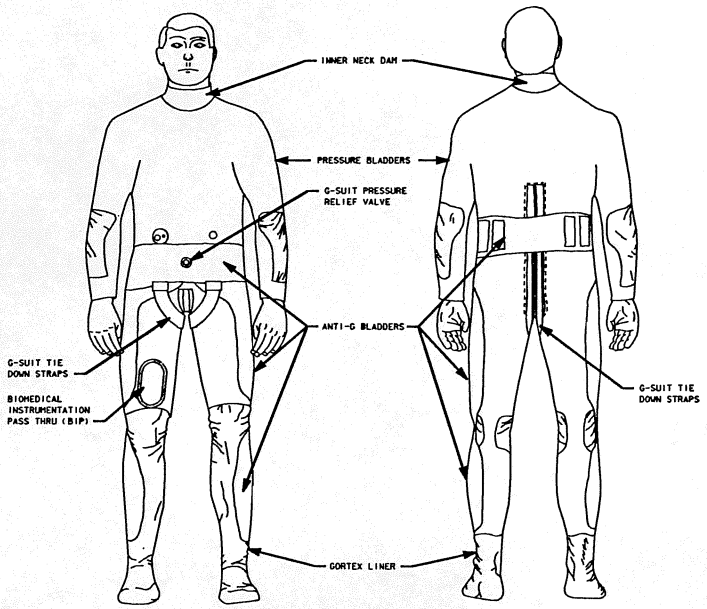
SEAT INTERFACE
PSVS AND LES SHOWN (1)



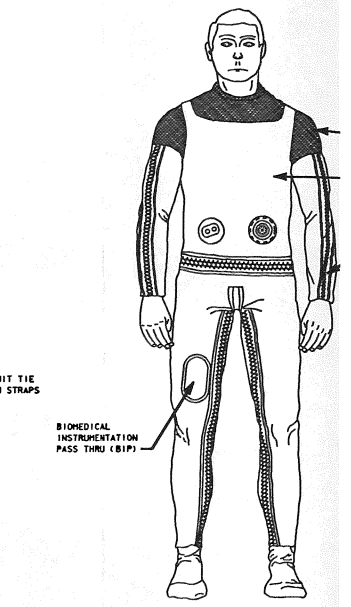
LIQUID COOLING GARMENT (LCG) (2)



LES
CREW WORN EQUIPMENT (F)
(WITHOUT OUTSIDE NOMEX COVER OF SUIT, NYLON RESTRAINT ASSEMBLY OR ANTI-G BLADDERS)



LES
CREW WORN EQUIPMENT (E)
(WITHOUT OUTSIDE NOMEX COVER OF SUIT OR NYLON RESTRAINT ASSEMBLY)



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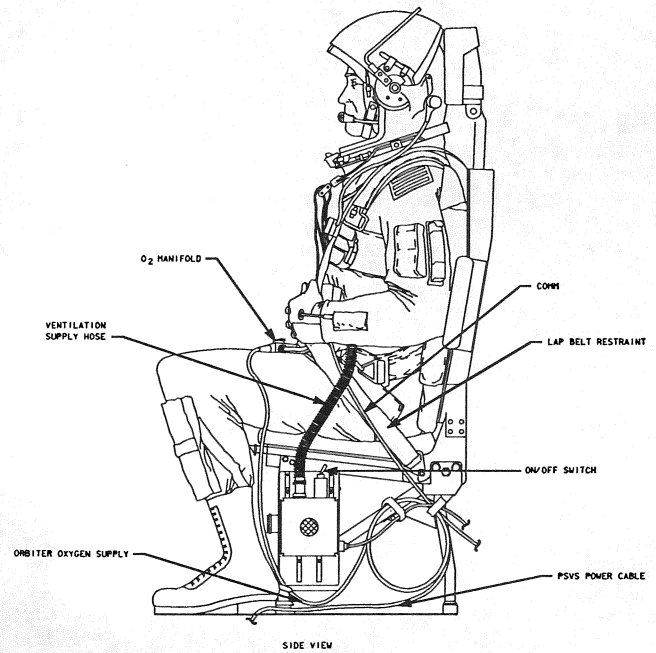
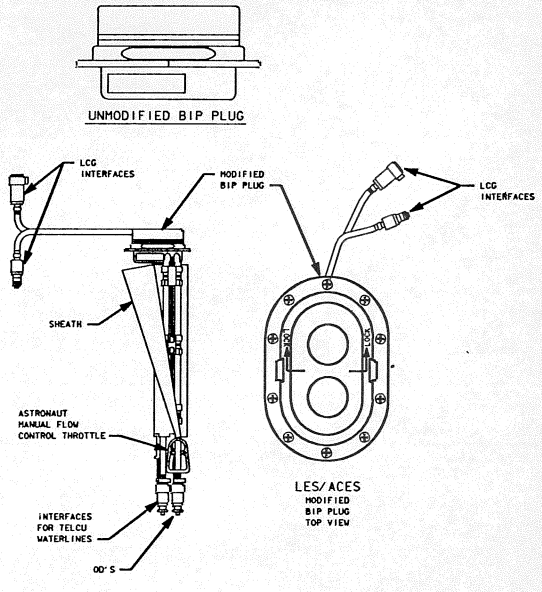
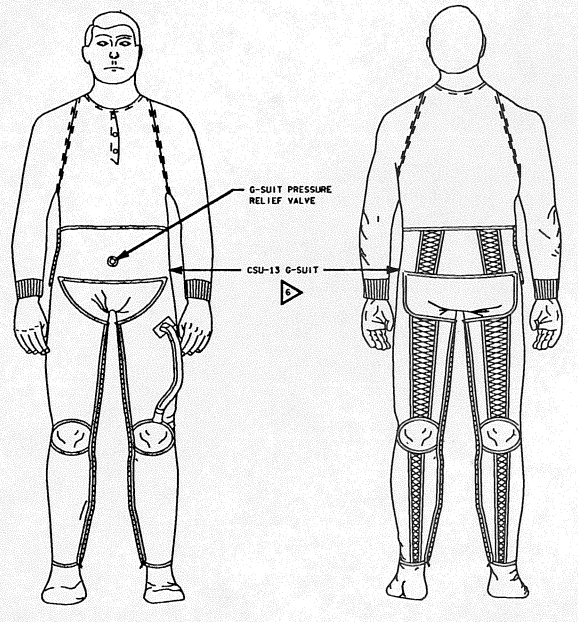


SIDE VIEW

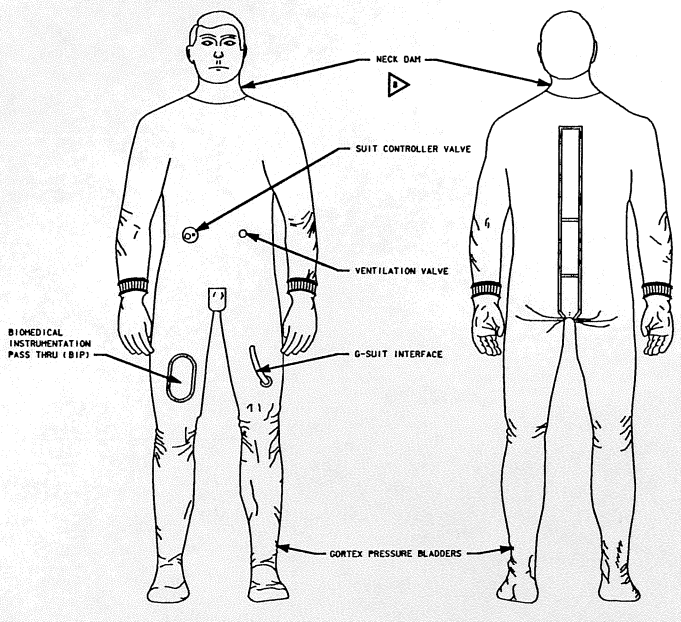
SEAT INTERFACE
PSVS AND LES SHOWN (1)



LCG/BIP/TELCU INTERFACES (4)



ACES
CREW WORN EQUIPMENT (F)
(WITHOUT OUTSIDE NOMEX COVER OF SUIT OR NYLON RESTRAINT ASSEMBLY)



ACES
CREW WORN EQUIPMENT (E)
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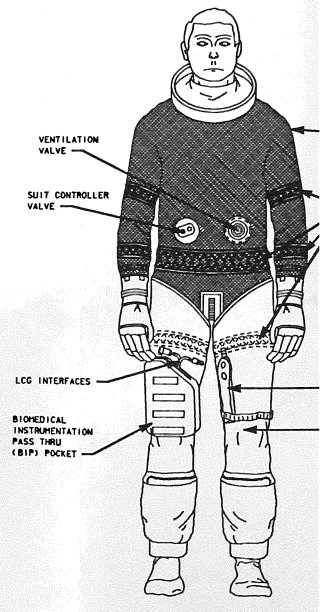

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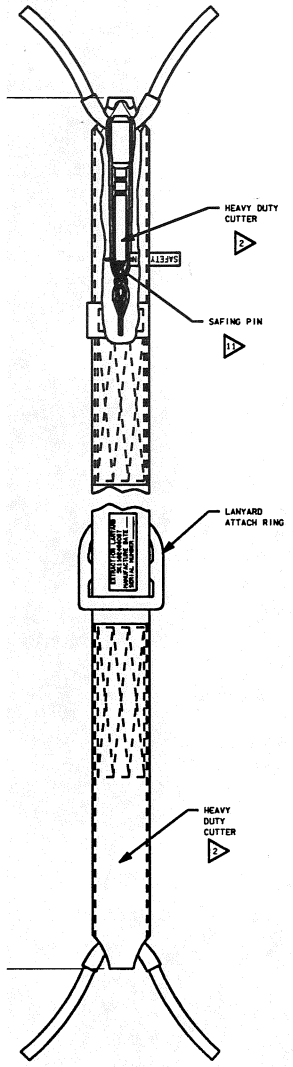
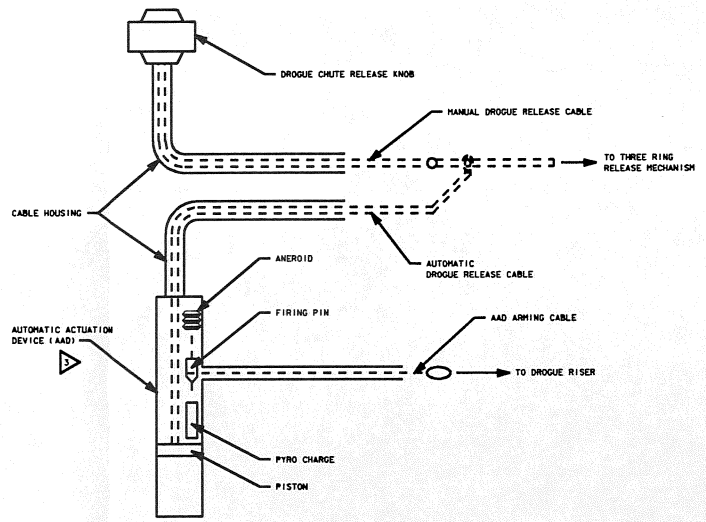
BASIC REV E-6

DATE: 02/15/94	NAME: VSH	VERSION: BPT.5
DATE: 03/22/94	NAME: PSD	VERSION: INR.2
DATE: 06/17/94	NAME: BJB	VERSION: INR.1



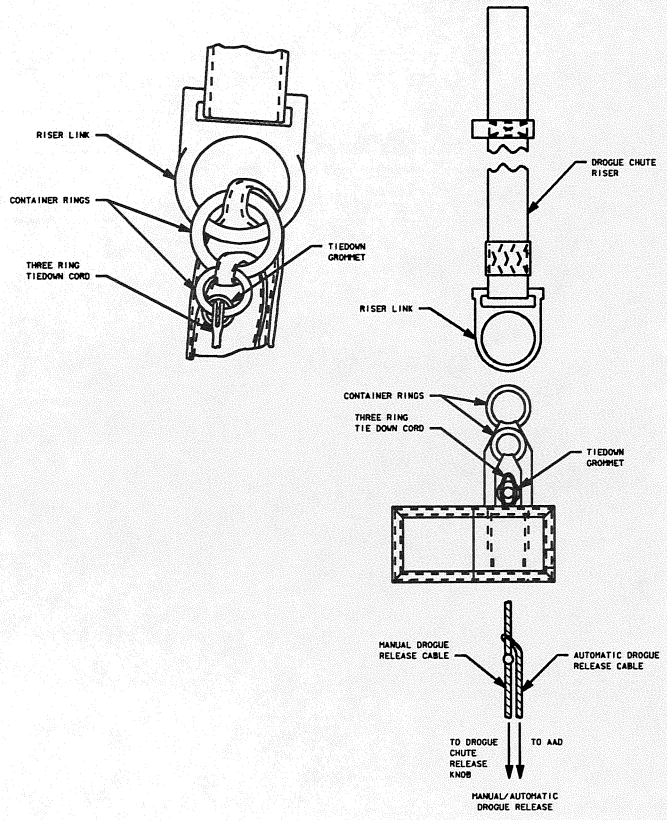
A EXTRACTION BRIDLE



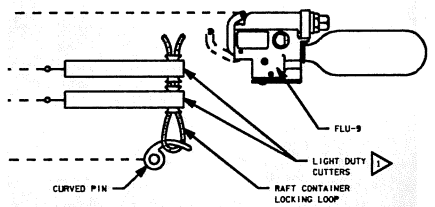
AUTOMATIC DROGUE RELEASE
1. DROGUE CHUTE DEPLOYMENT ARMS AUTOMATIC ACTUATION DEVICE (AAD) BY REMOVING ARMING CABLE FROM FIRING PIN
2. ANEROID IN AAD SENSES 14,000 FT. PRESSURE ALTITUDE
3. FIRING PIN IS RELEASED AND FIRES PYROTECHNIC CHARGE
4. PISTON PULLS AUTOMATIC DROGUE RELEASE CABLE WHICH RELEASES THREE RING ASSEMBLY
5. DROGUE CHUTE IS RELEASED AND DEPLOYS MAIN CANOPY

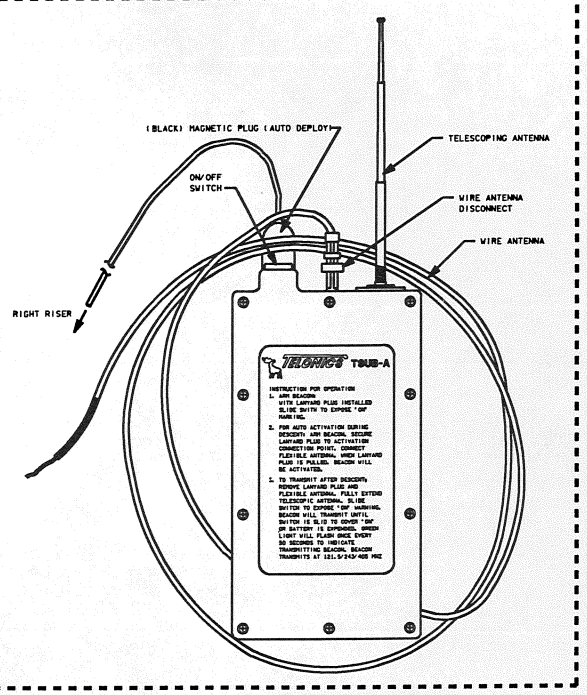
MANUAL DROGUE RELEASE
1. CREWMEMBER PULLS DROGUE CHUTE RELEASE KNOB WHICH IS ATTACHED TO MANUAL DROGUE RELEASE CABLE
2. MANUAL DROGUE RELEASE CABLE RELEASES THREE RING ASSEMBLY
3. DROGUE CHUTE IS RELEASED AND DEPLOYS MAIN CANOPY

B AAD/MANUAL DROGUE CHUTE RELEASE KNOB

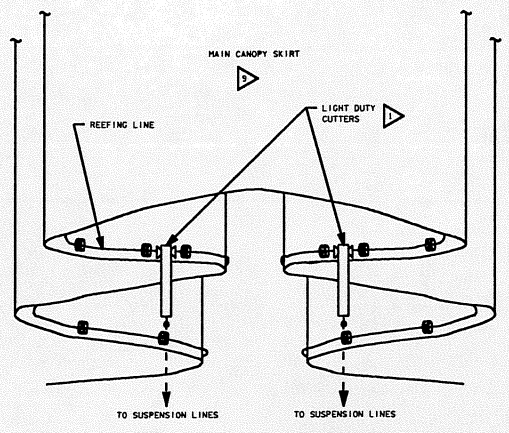


C THREE RING RELEASE ASSEMBLY

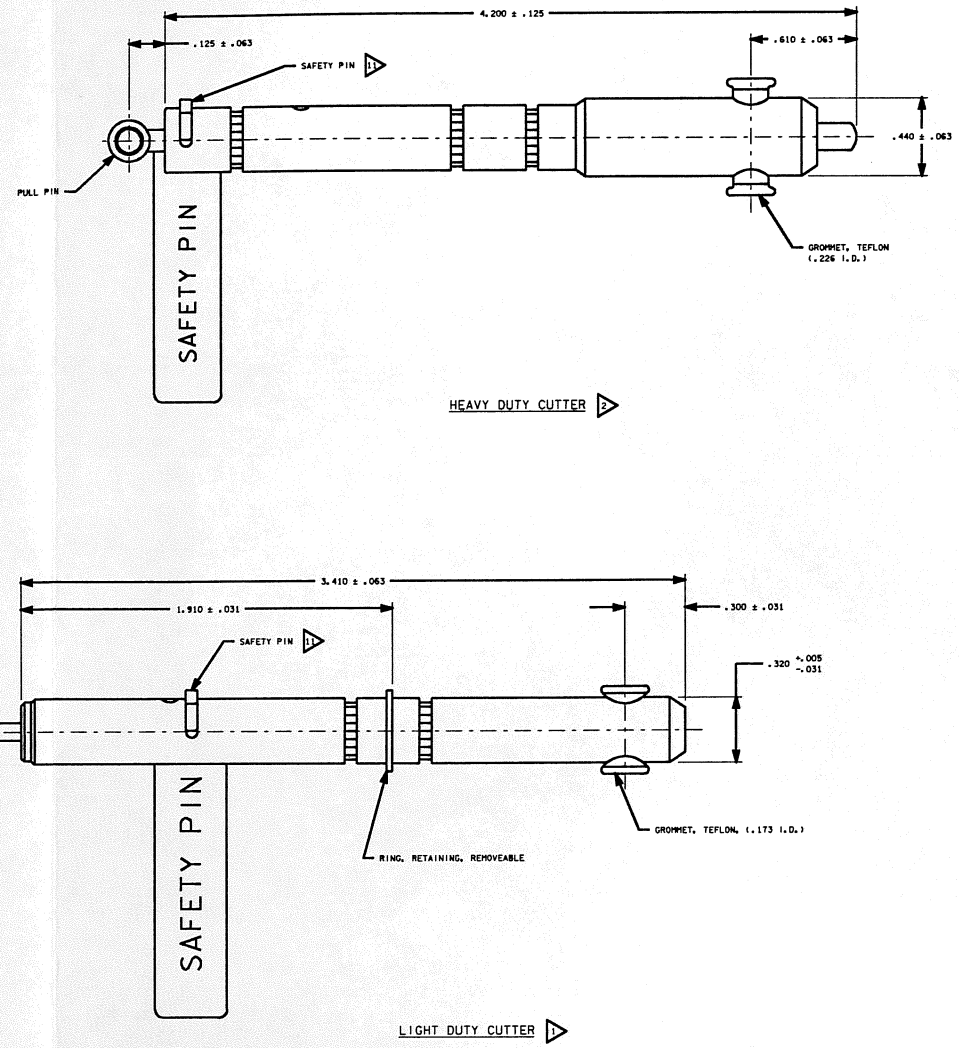


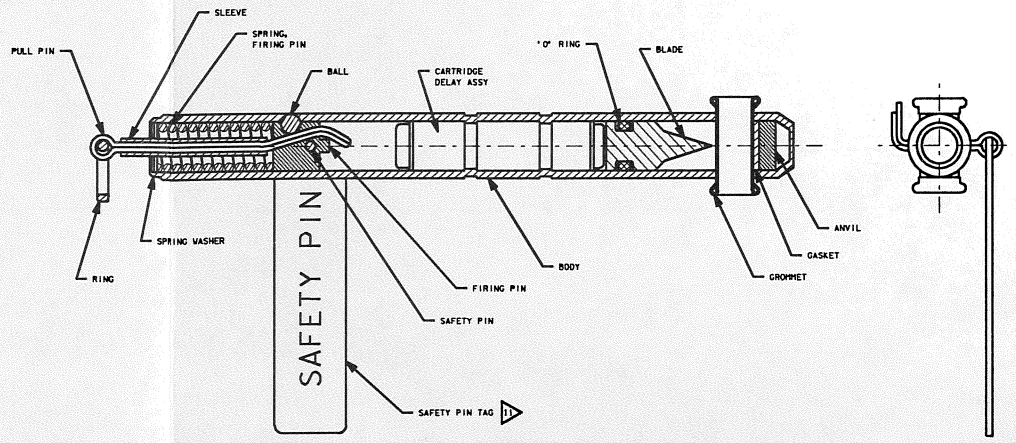


D LIFE RAFT CONTAINER DETAIL



E REEFING LINE CUTTERS





12 SARSAT BEACON STOWED IN POCKET ON LEFT SPRAY SHIELD OF LIFE RAFT. WIRE ANTENNA LOCATED AROUND SPRAY SHIELD

11 SAFETY PIN INSTALLED ONLY DURING REMOVAL AND INSTALLATION OF PYROTECHNIC CUTTERS

10 DESCENT RATES: DROGUE - 120 FPS
MAIN CANOPY (REEFED) - 80 FPS
MAIN CANOPY (OPEN) - 24 FPS
DESCENT RATES ASSUME 200 LBM CREWMEMBER

9 REEFED MAIN CANOPY IS 70% OF FULLY OPEN. 80 FPS DESCENT RATE

8 ANTI-OSCILLATION WINDOWS REDUCE OSCILLATION DURING DESCENT

7 MAIN CANOPY IS A BIAS CORE NYLON CONSTRUCTED CONICAL CANOPY WITH KEVLAR REINFORCEMENT

6 BRIDLE SEPARATED FROM PARACHUTE PACK BY TWO HEAVY DUTY CUTTERS. BRIDLE AND LANYARD ASSEMBLY FALLS AWAY FROM CREWMEMBER

5 DROGUE CHUTE PACKED IN DEPLOYMENT SLEEVE TO ENSURE LINE FIRST DEPLOYMENT. PILOT CHUTE AND DROGUE DEPLOYMENT SLEEVE FALL AWAY AFTER DROGUE CHUTE DEPLOYMENT

4 150 LBF. MINIMUM FORCE REQUIRED TO EXTEND BRIDLE AND ACTIVATE SYSTEM

3 AAD SHALL ACTIVATE AT 14,000 FT., ± 1000 FT., BASED ON ICAO STANDARD ATMOSPHERE VALUES. SHALL OPERATE FROM -40°F TO +160°F AMBIENT TEMPERATURE, 14.7 PSIA TO 1.0 PSIA AMBIENT PRESSURE

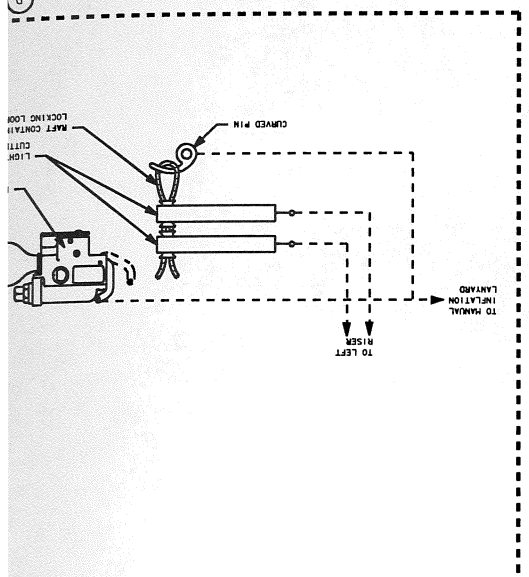
2 DOT CLASS 'C' EXPLOSIVE
- CUTTING CAPACITY: 8000 POUND KEVLAR LINE
- DELAY TIME: 1.5 SECONDS

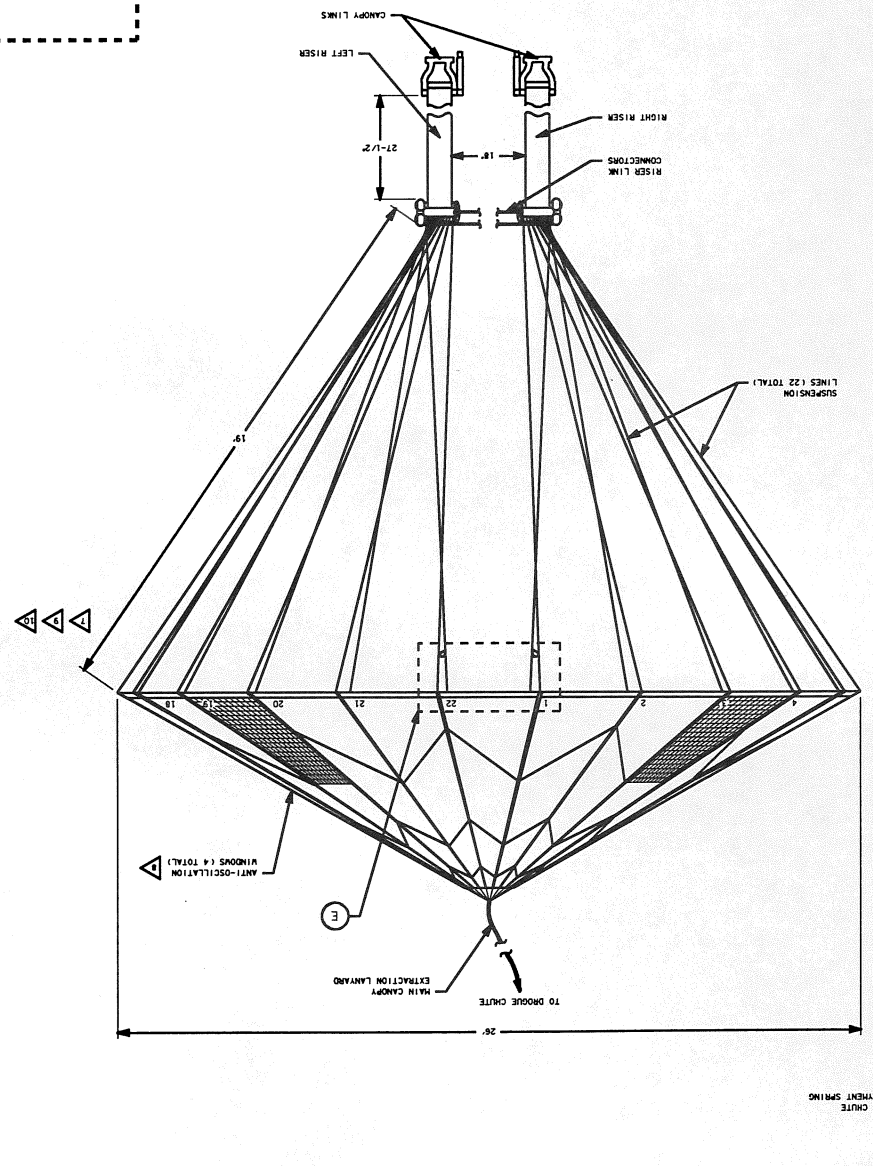
NOTES: 1 DOT CLASS 'C' EXPLOSIVE
- CUTTING CAPACITY: 750 POUND NYLON LINE OR 2000 POUND KEVLAR LINE
- DELAY TIME: 2.0 SECOND, MIN. 1.6 SEC., MAX 2.8 SEC. OR 3.0 SECOND, MIN. 2.0 SEC., MAX 4.0 SEC.

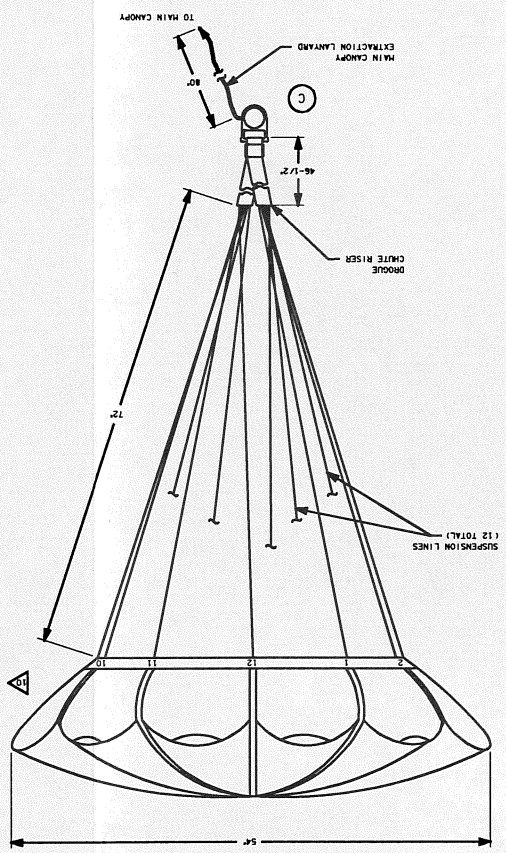
6 PPA

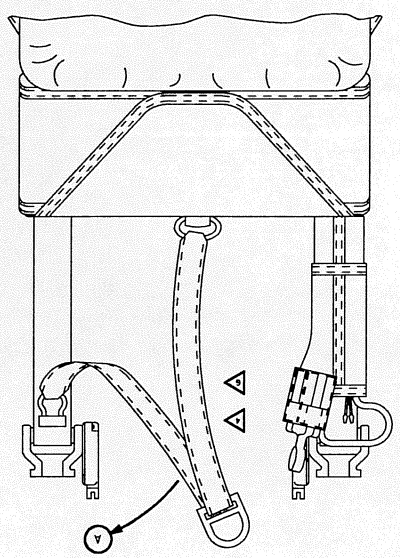
SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	B. J. TEDDER JR.	10/10/90	
DR			
ENGR	K. PORTER	05/11/94	PERSONAL PARACHUTE ASSEMBLY (PPA)
ENGR		8/2/94	
APP		8/4/94	
APP			SPACE SHUTTLE / DWG NO 18.6
CAD	S. K. Kimbrell	8-5-94	ALL
LTR E	PCN 4		126.5 X 34 / PAGE / SHEET 1 OF 1

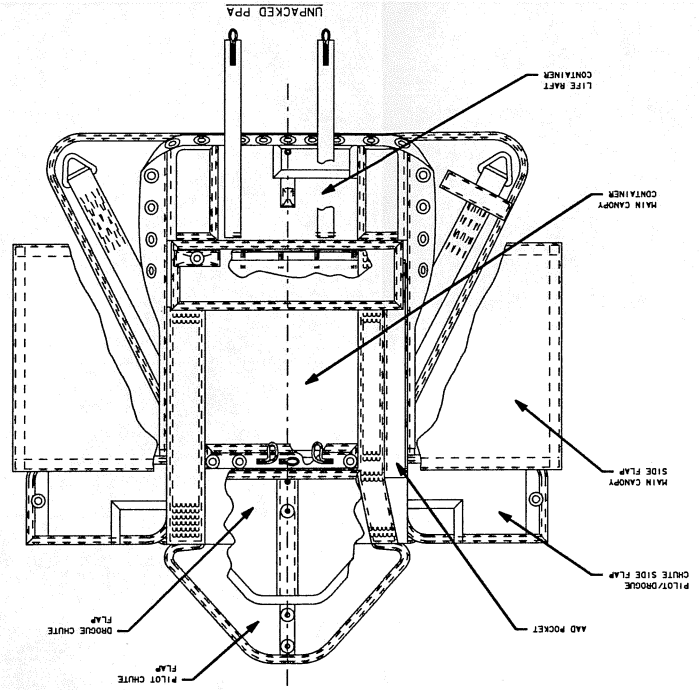
BASIC REV E-4

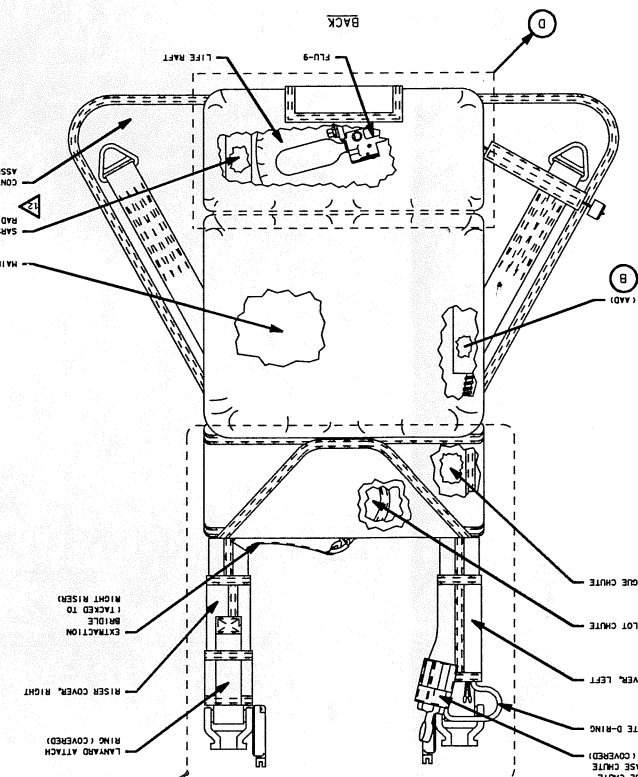


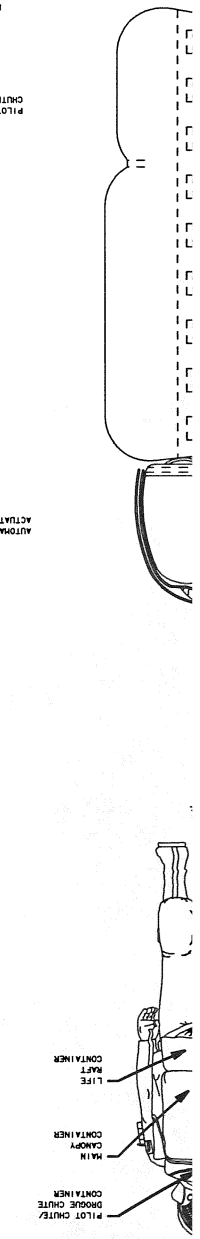


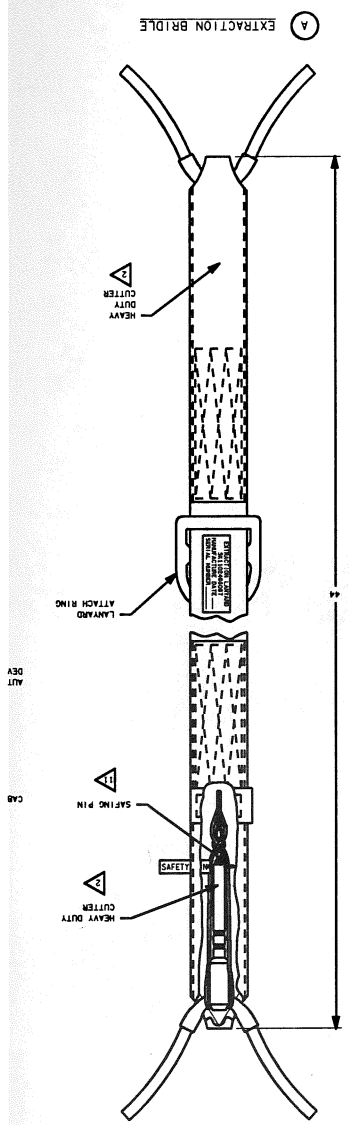












MAIN CANOPY

AUTOMATIC SEQUENCE

1. EXTRACTION LOADS ON BRIDLE ASSEMBLY BEGINS AUTO SEQUENCE.
2. 1.5 SECOND DELAY, HEAVY DUTY CUTTERS SEPARATE
3. 1.5 SECOND DELAY (3.0 SECONDS POST LOADING), LIGHT DUTY CUTTERS OPEN PILOT CHUTE FLAP
4. SPRING DEPLOYED PILOT CHUTE PULLS DROGUE CHUTE OUT OF PACK, PILOT CHUTE PULLS AAAF
5. DROGUE CHUTE DISTINCT ARMS AAD, DROGUE CHUTE CONNECTED TO PARACHUTE PACK AT THREE RING RELEASE ASSEMBLY
6. AAD FIRES AT 14,000 FT, AND RELEASES THREE RING RELEASE ASSEMBLY, DROGUE CHUTE DEPLOYS MAIN CANOPY
7. MAIN CANOPY RISERS ACTIVATE SARSAT PERSONNEL LOCATOR BEACON AND FIRE LIGHT DUTY CUTTERS TO OPEN LIFE RAFT CONTAINER
8. MAIN CANOPY INITIALLY REEFED UPON DEPLOYMENT, 2.0 SECOND DELAY, LIGHT DUTY CUTTERS CUT MAIN CANOPY REEFING LINE, MAIN CANOPY OPENS FULLY
9. SEAMANS RELEASE MAIN CANOPY RISERS FROM HARNESS UPON IMPACTION IN SALT WATER

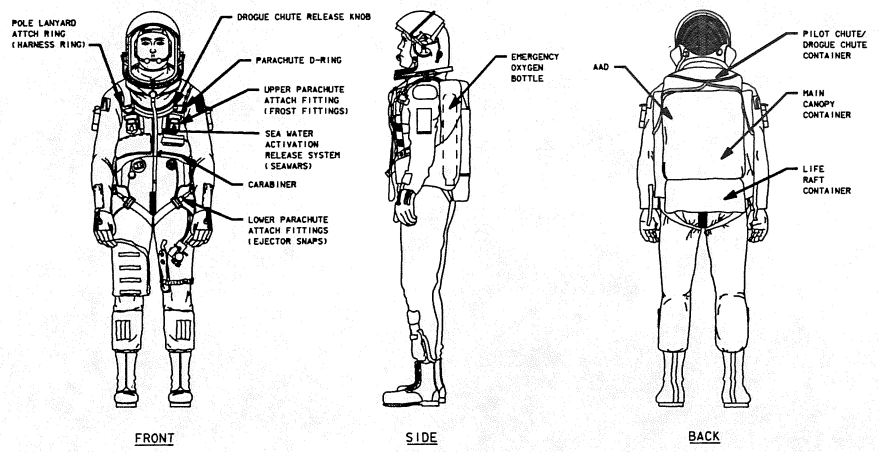
MANUAL SEQUENCE

1. CHECK REMOVE PULLS MANUAL PARACHUTE D-RING
2. 2.0 SECOND DELAY, LIGHT DUTY CUTTER OPENS PILOT CHUTE FLAP
3. SEQUENCE SAME AS 4-8 ABOVE

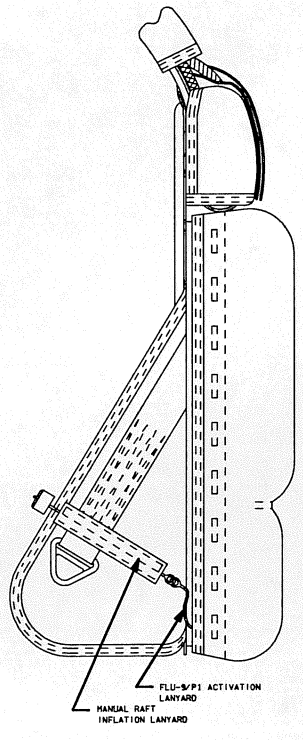
MANUAL DROGUE CHUTE RELEASE

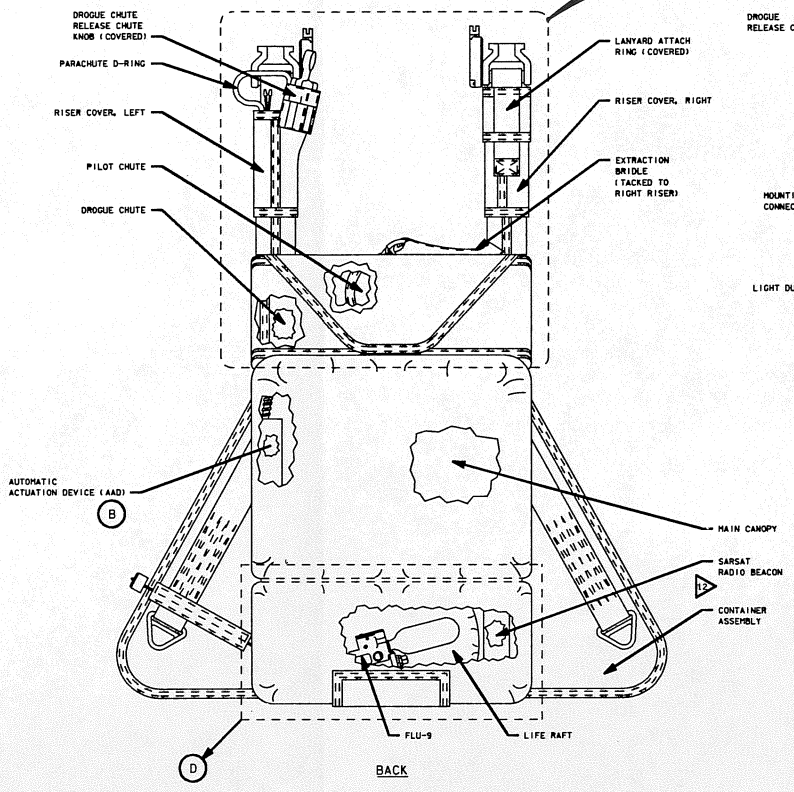
1. CHECK REMOVE BELOW 14,000 FT., NO MAIN CANOPY
2. PULL DROGUE CHUTE RELEASE KNOB, RELEASE THREE RING RELEASE ASSEMBLY
3. SEQUENCE SAME AS T-8 ABOVE

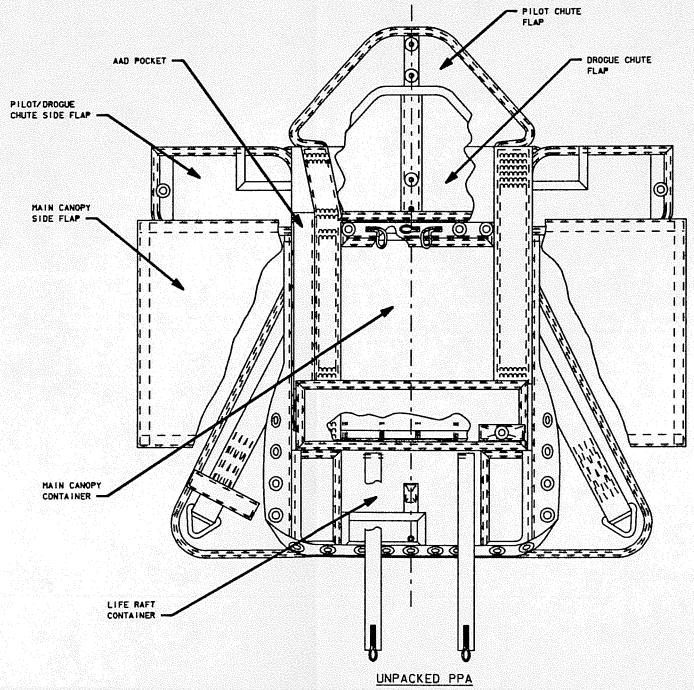
DATE: 06/17/94 | NAME: BJB | VERSION: INK: 1



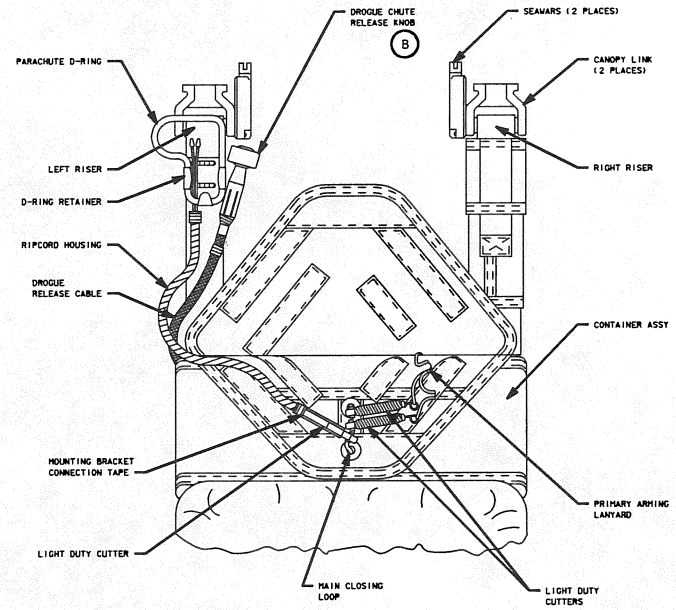
LAUNCH/ENTRY SUIT WITH PARACHUTE PACK AND HARNESS

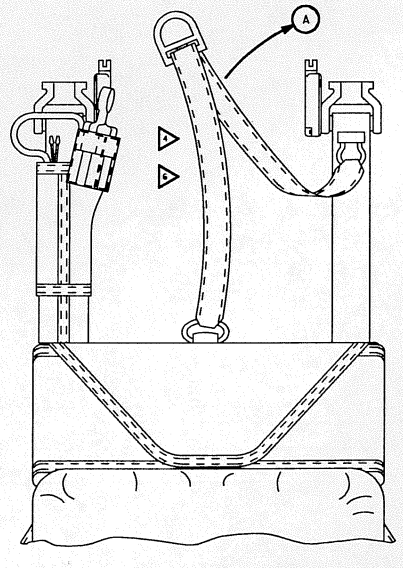


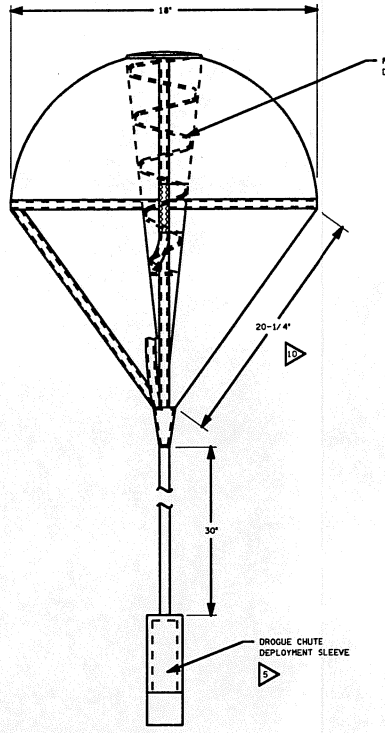


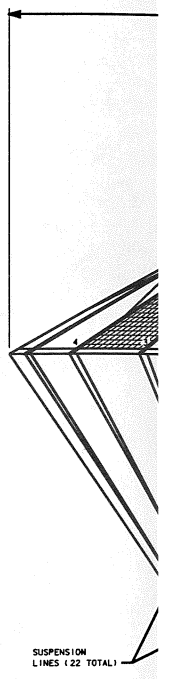


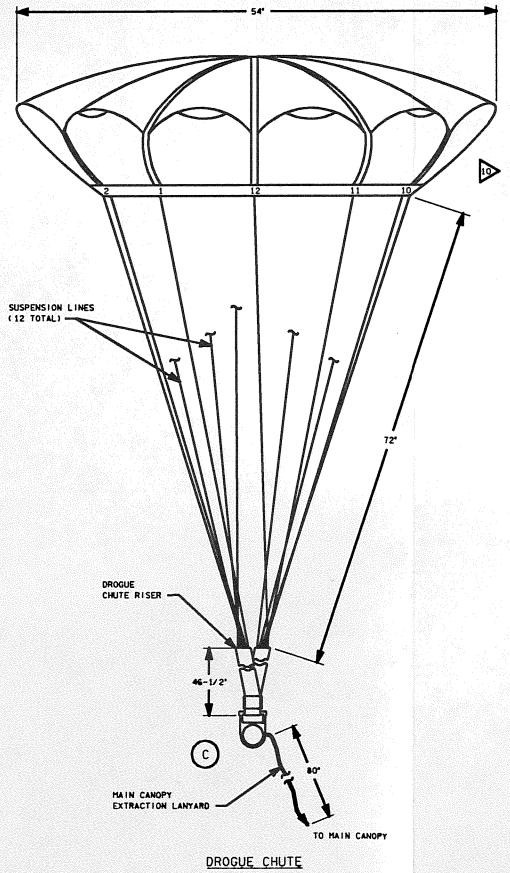
PARACHUTE PACK











BASIC REV E-4

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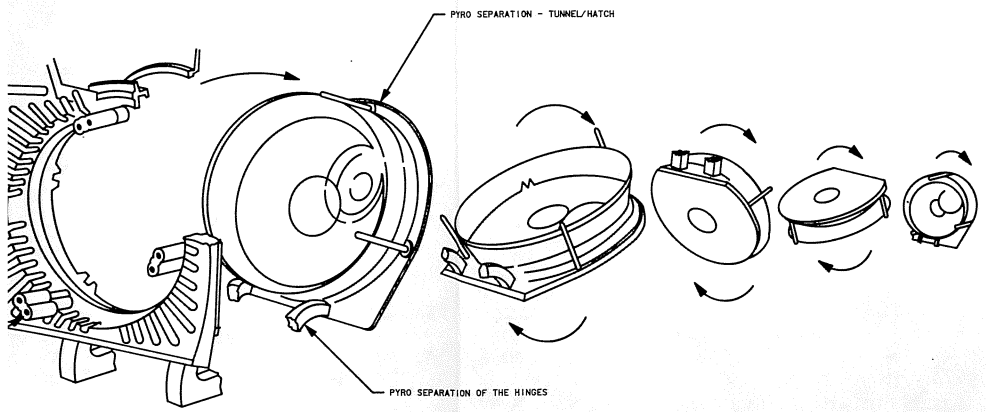
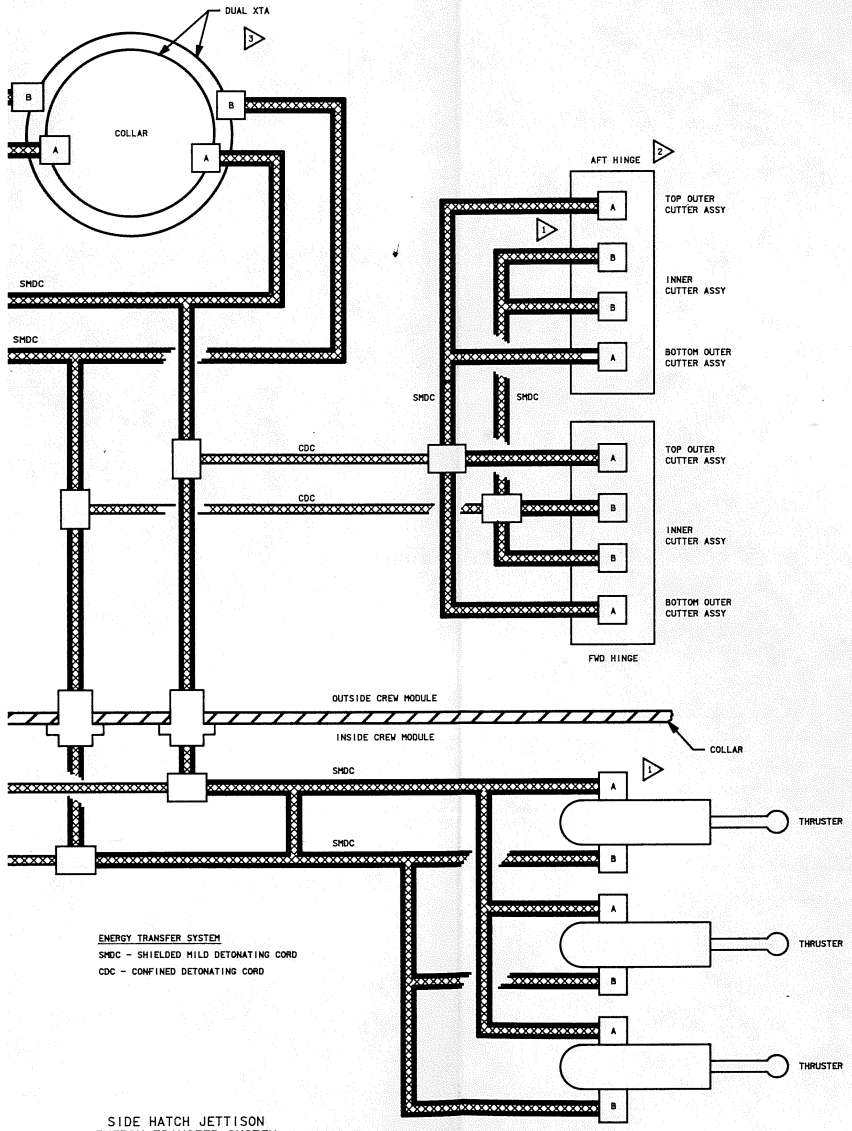
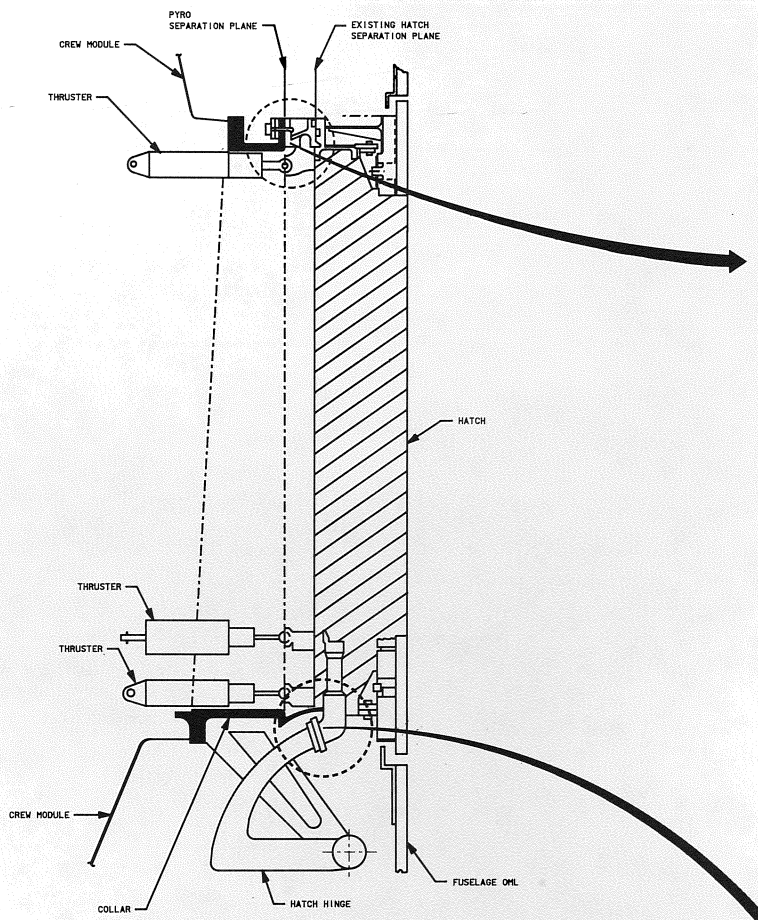


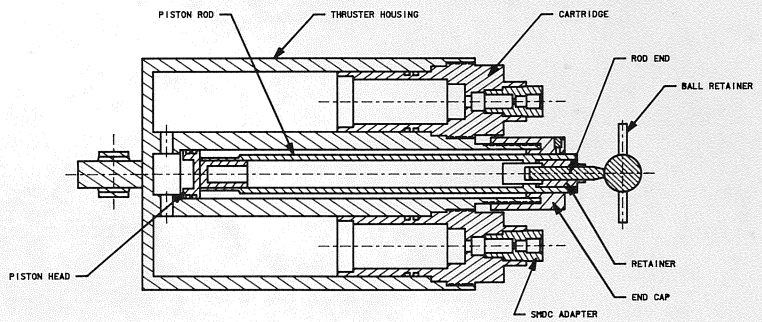
HATCH JETTISON



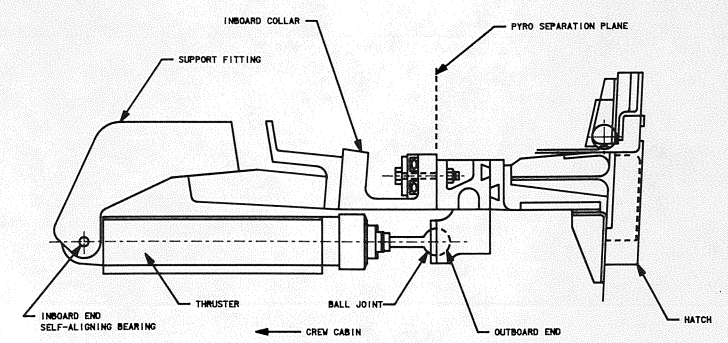
SIDE HATCH JETTISON
ENERGY TRANSFER SYSTEM



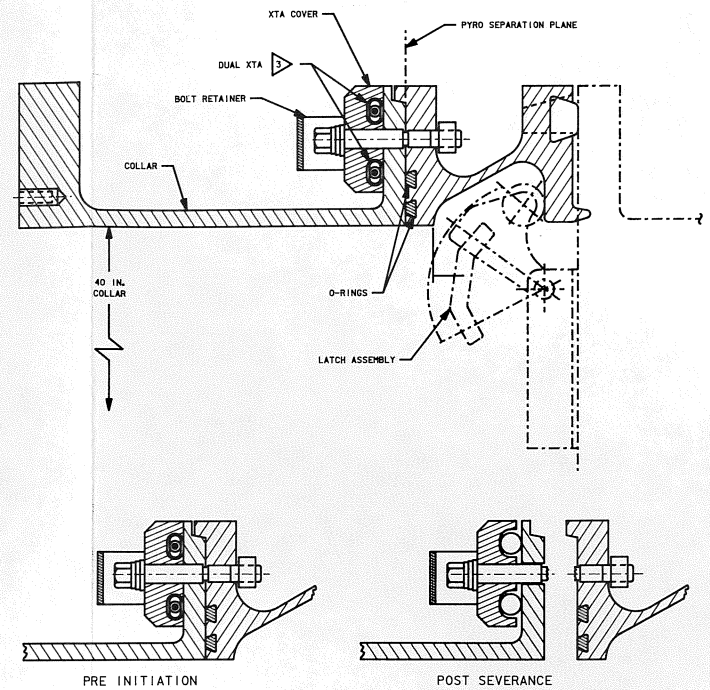
HATCH SEVERANCE SYSTEM SIDE VIEW DETAIL



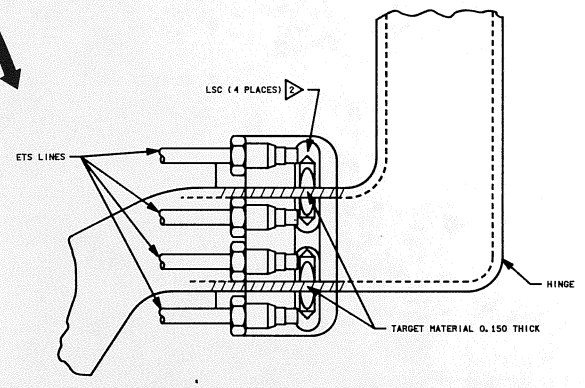
THRUSTER ASSEMBLY



TYPICAL THRUSTER INSTALLATION INSET



FRANGIBLE BOLT SEVERANCE



SIDE HATCH
HINGE SEVERANCE

△4 THREE THRUSTER PACKS PUSH THE SEVERED HATCH AWAY FROM THE ORBITER. THRUSTERS DO NOT CYCLE WITH HATCH

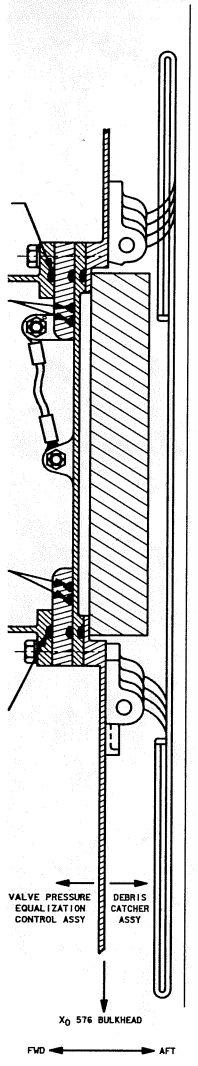
△3 REDUNDANT XTA (EXPANDING TUBE ASSEMBLIES) SEVER THE TO FRANGIBLE BOLTS HOLDING HATCH ADAPTER RING TO THE ORBITER

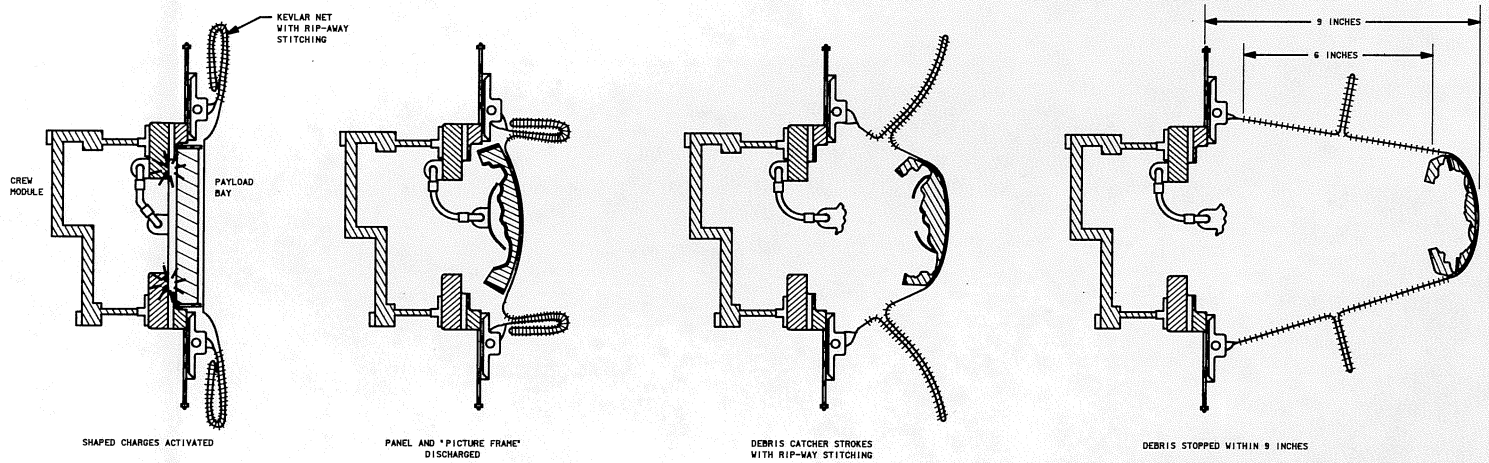
△2 FOUR LINEAR SHAPED CHARGES (TWO PER HINGE, FOR REDUNDANCY) SEVER HINGES

NOTES: △1 A OR B INDICATES EXPLOSIVE OUTPUT TIP

7 SIDE HCH JETT

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	VICKI S. HUNTER	8/14/91		
DR			SIDE HATCH JETTISON	
ENGR	J. KREYKES			
ENGR		8/14/91		
APP		10 Oct 91		
APP		10/24/91	SPACE SHUTTLE	DWG NO 18.7
OMNIPLAN	S.K. Kimbrew	11-19-91	ALL	
LTR E	PCN 1		126.5 X 34	PAGE SHEET 1 OF 1

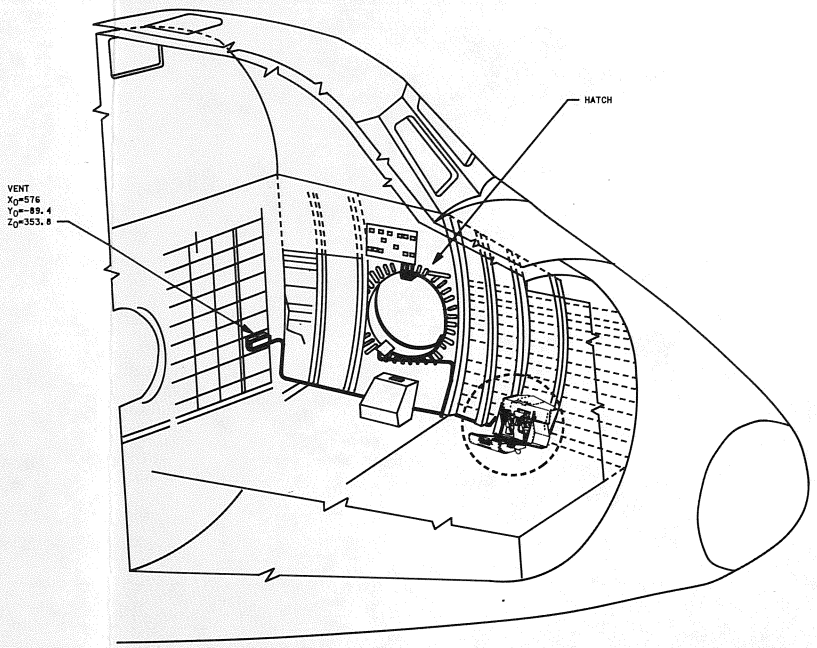




DEBRIS CATCHER OPERATION

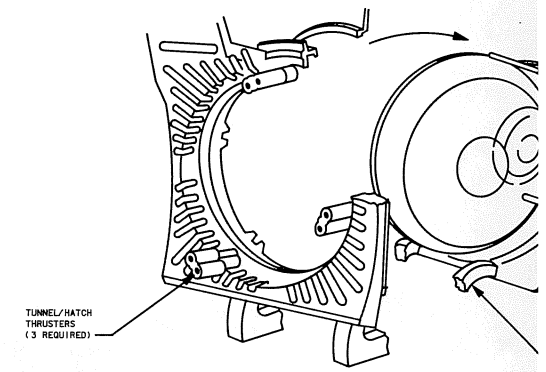
VENT SEVERANCE SYSTEM CROSS SECTION
VIEW A-A

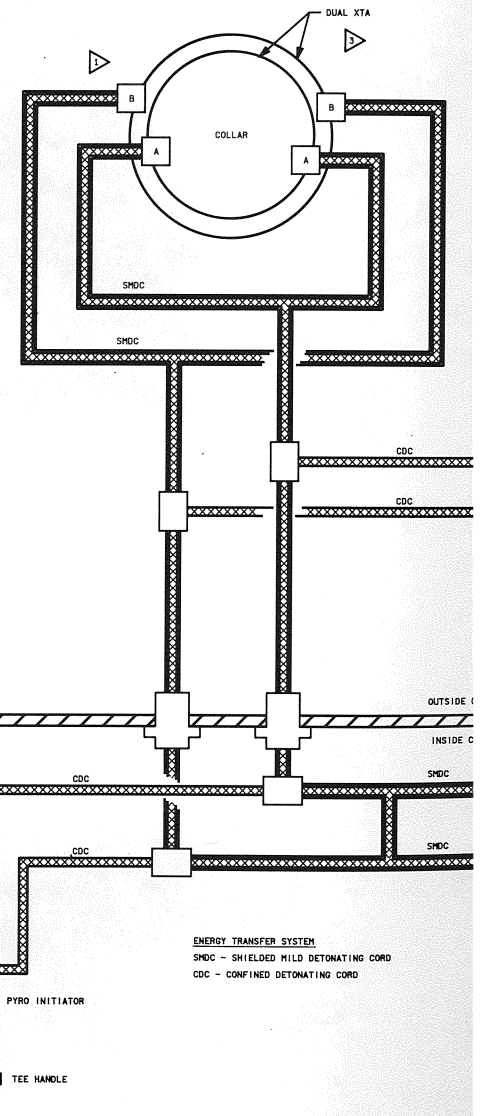
FWD ◄——► AFT



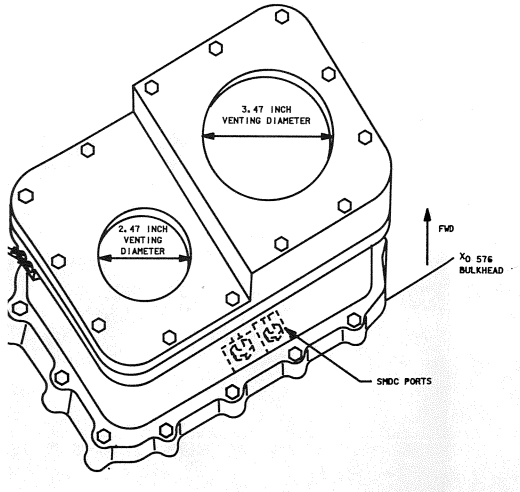
HATCH JETTISON BOX DECAL

IN EMERGENCY
- TO VENT CABIN/JETT HATCH
  - REMOVE PIN/SQUEEZE AND PULL VENT HANDLE AFTER CABIN PRESS EQUALIZED
  - PULL DOWN FLAP
  - REMOVE PIN/SQUEEZE AND PULL JETT HANDLE

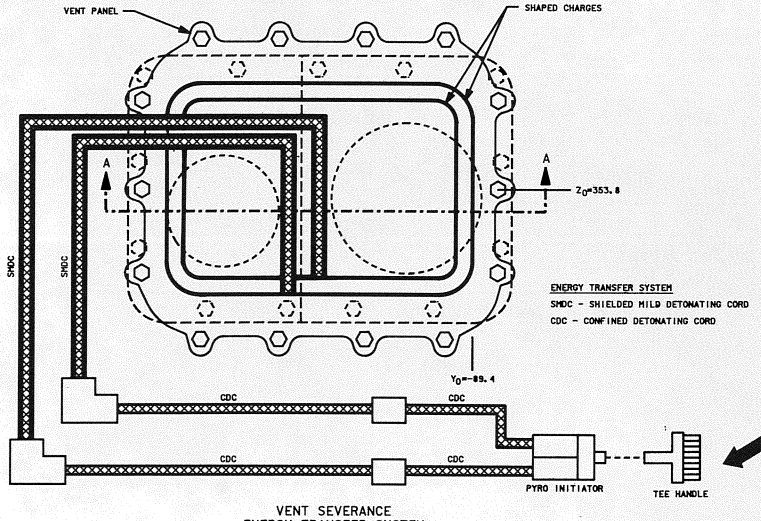




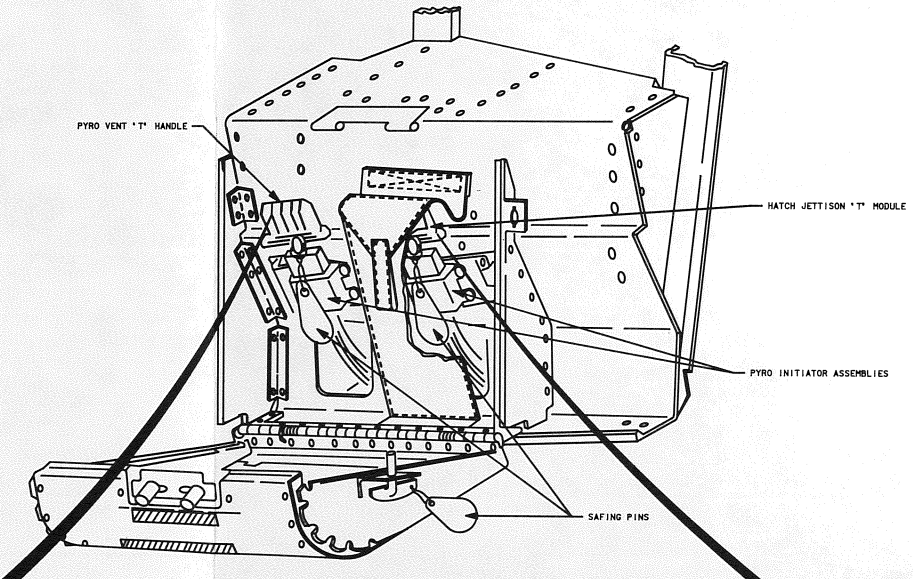
SIDE HATCH JETTISON
ENERGY TRANSFER SYSTEM



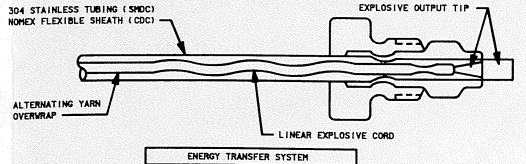
VALVE CONTAINMENT ASSEMBLY
VIEW FROM CREW MODULE LOOKING AFT



VENT SEVERANCE
ENERGY TRANSFER SYSTEM

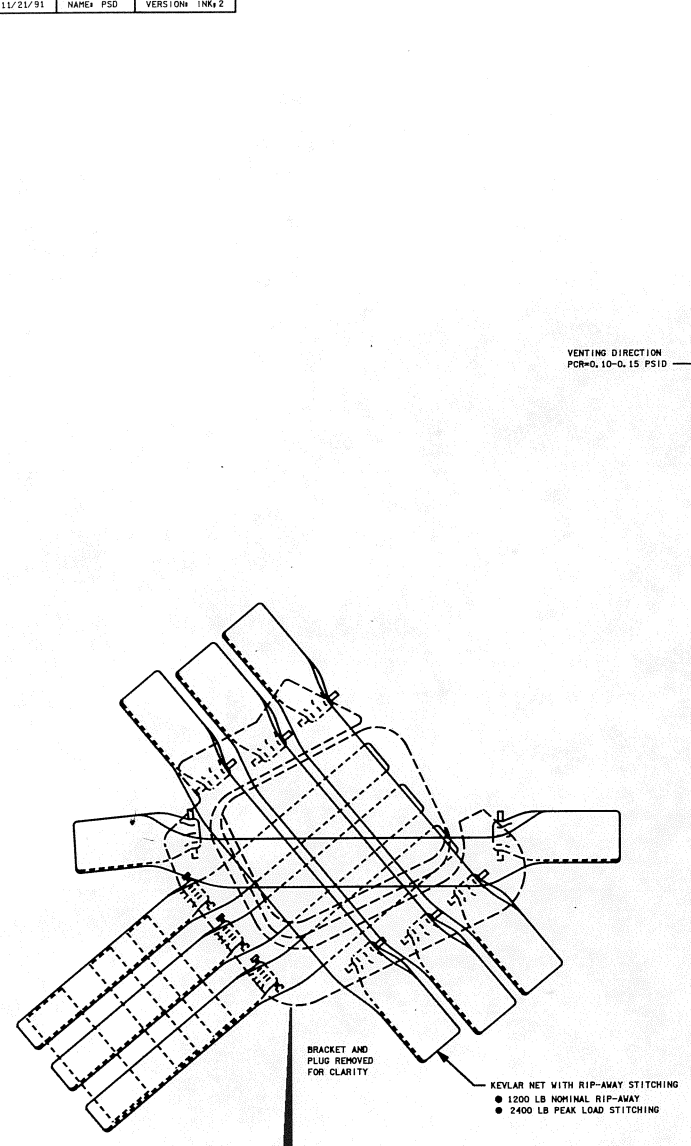


- PYRO INITIATOR - TEE HANDLES
  - LOCATED ON PORT FWD MIDDECK FLOOR NEXT TO MS3'S LEFT FOOT
  - BOX IS OPENED BY SQUEEZING THE LATCH ON THE TOP OF THE BOX AND PULLING COVER OPEN
  - BOTH T HANDLES HAVE SAFING PINS WHICH MUST BE REMOVED BEFORE THE HANDLES CAN BE PULLED
  - T HANDLES PULL FREE OF INITIATOR ASSEMBLIES

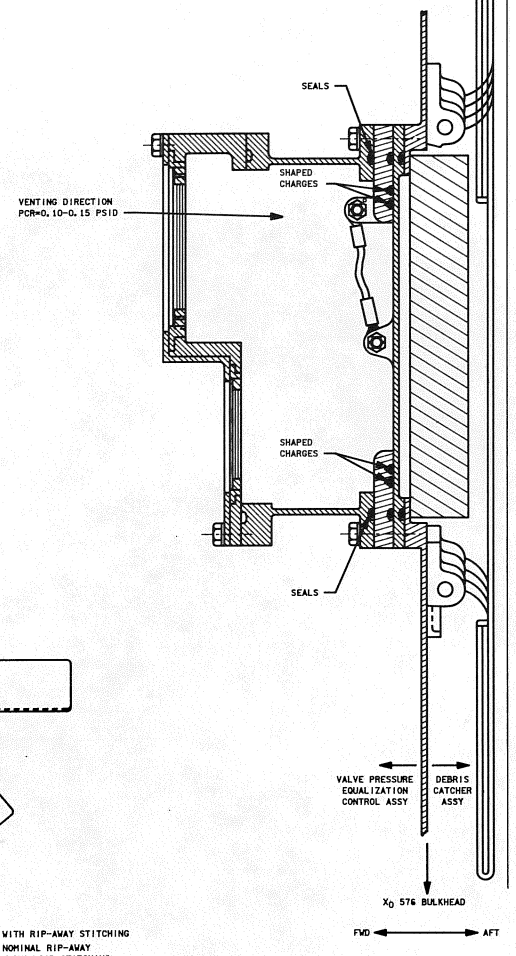


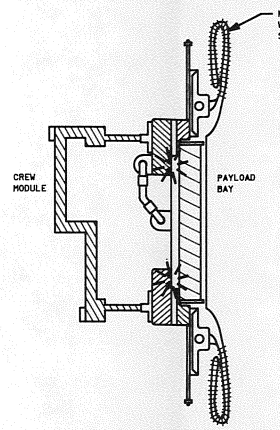
ENERGY TRANSFER SYSTEM
SMDC - SHIELDED MILD DETONATING CORD
CDC - CONFINED DETONATING CORD

DATE: 11/21/91 | NAME: PSD | VERSION: INKx2

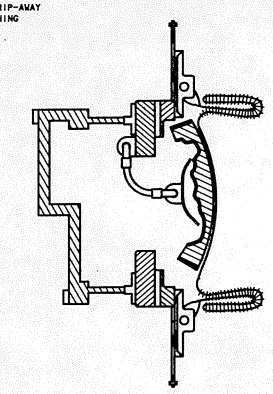


DEBRIS CATCHER ASSEMBLY
VIEW FROM PAYLOAD BAY LOOKING FWD





SHAPED CHARGES ACTIVATED

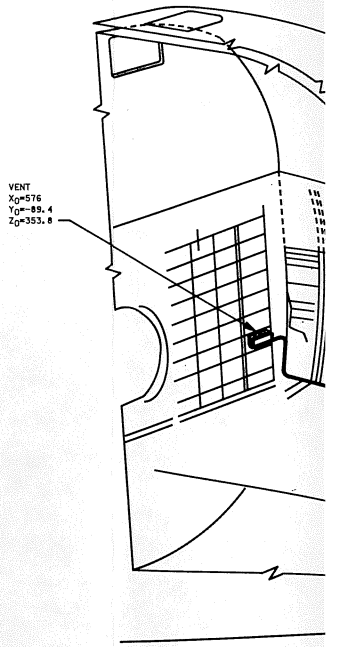


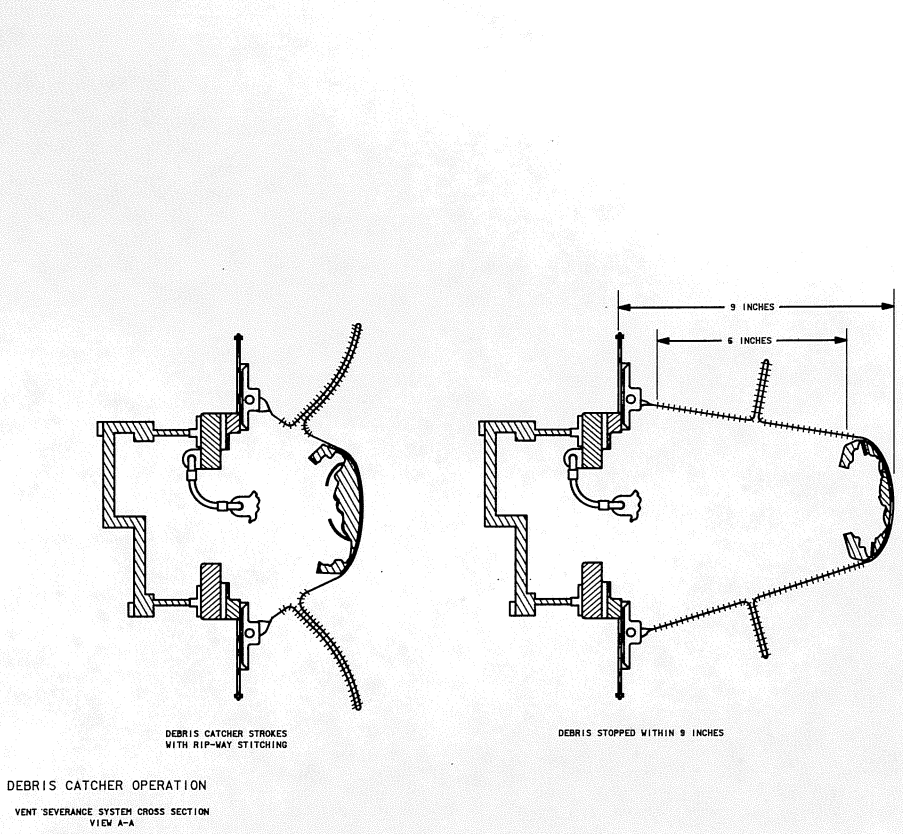
PANEL AND "PICTURE FRAME" DISCHARGED

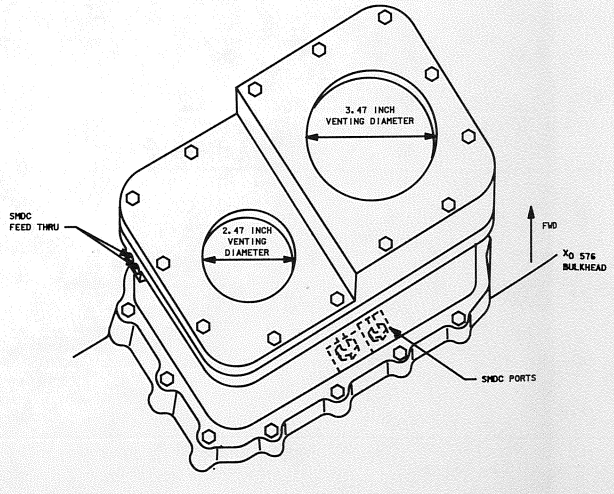
DEBRIS CATCHER STROKES WITH RIP-WAY STITCHING

DEBRIS STOPPED WITHIN 9 INCHES

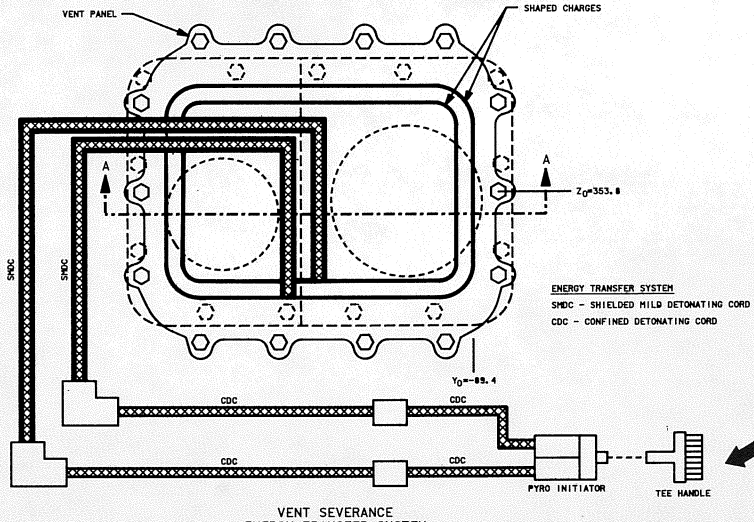
DEBRIS CATCHER OPERATION





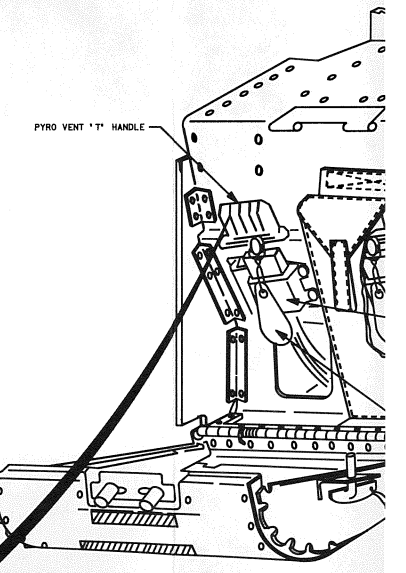


VALVE CONTAINMENT ASSEMBLY
VIEW FROM CREW MODULE LOOKING AFT



ENERGY TRANSFER SYSTEM
SMDC - SHIELDED MILD DETONATING CORD
CDC - CONFINED DETONATING CORD

VENT SEVERANCE
ENERGY TRANSFER SYSTEM



● PYRO INITIATOR - TEE HANDLES
● LOCATED ON PORT FWD MIDDECK FLOOR NEXT TO MS
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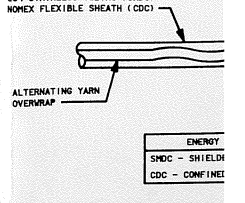
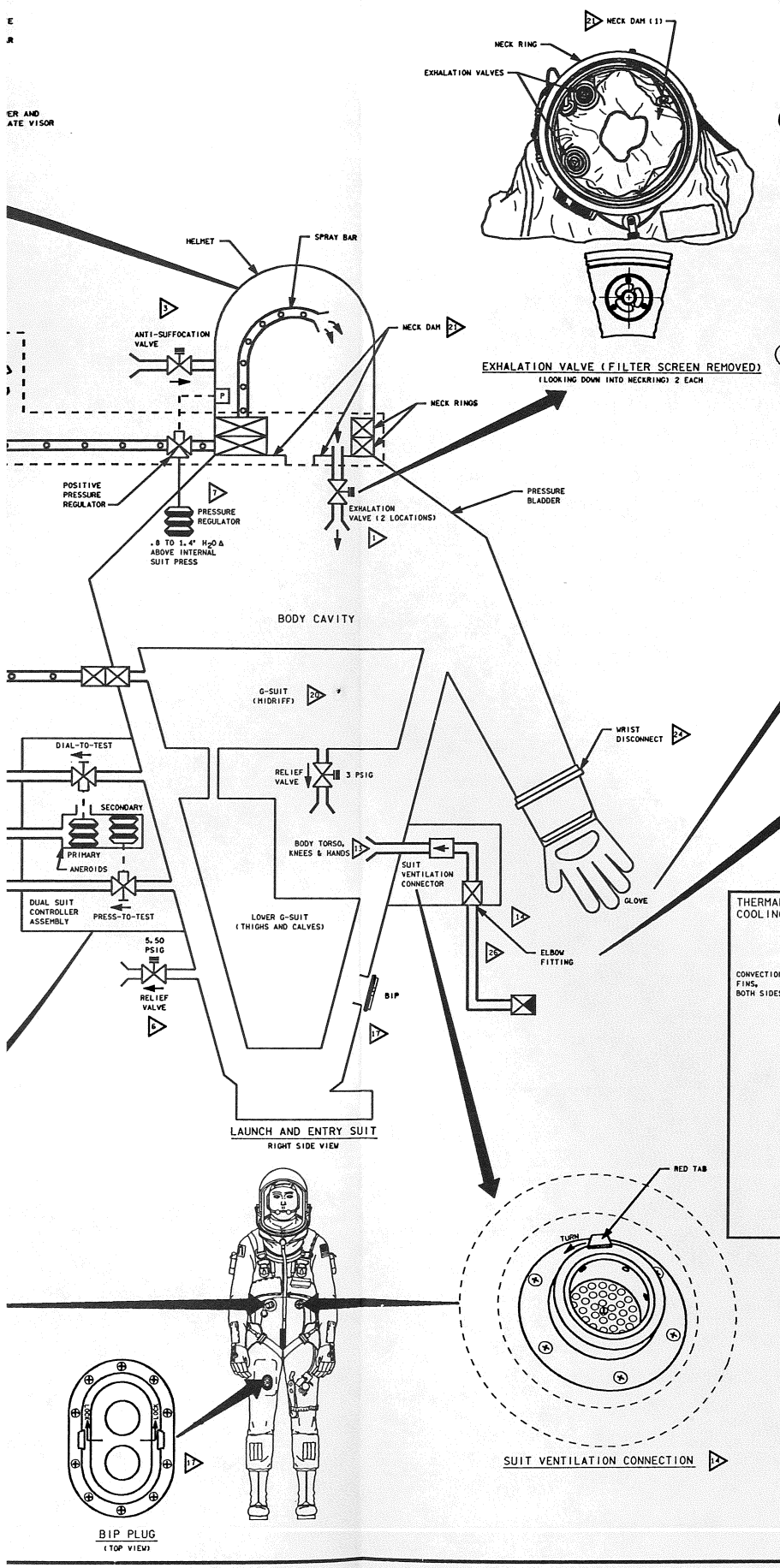


ENERGY
SMDC - SHIELD
CDC - CONFINE

HATCH JETTI

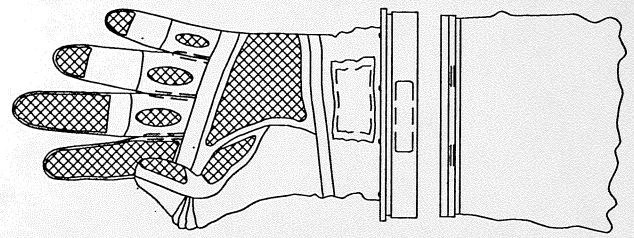
IN EM
● TO VENT CABI
● REMOVE PIN/SQUEEZ AFTER CABIN PRESS
● PULL DOWN FLAP
● REMOVE PIN/SQUEEZ

DATE: 03/14/96	NAME: SVJ	VERSION: BPT.5
DATE: 04/27/96	NAME: BJB	VERSION: BPT.6
DATE: 05/11/96	NAME: BJB	VERSION: INK.3

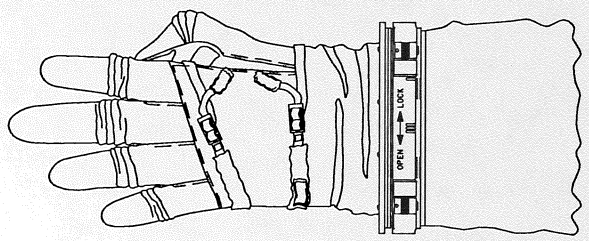


LAUNCH AND ENTRY SUIT
RIGHT SIDE VIEW

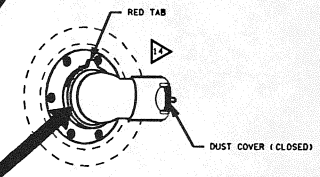
EXHALATION VALVE (FILTER SCREEN REMOVED)
(LOOKING DOWN INTO NECKRING) 2 EACH



FULL PRESSURE GLOVE-DE-MATED



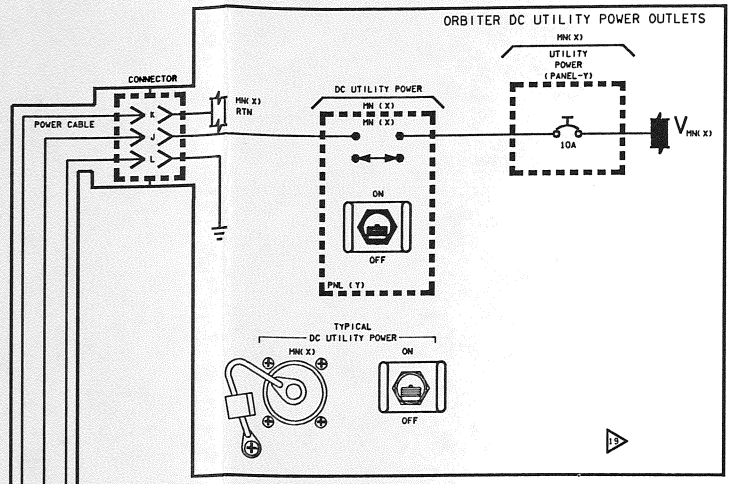
FULL PRESSURE GLOVE-MATED

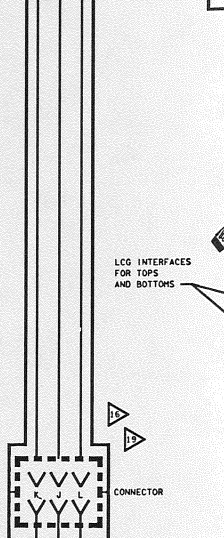


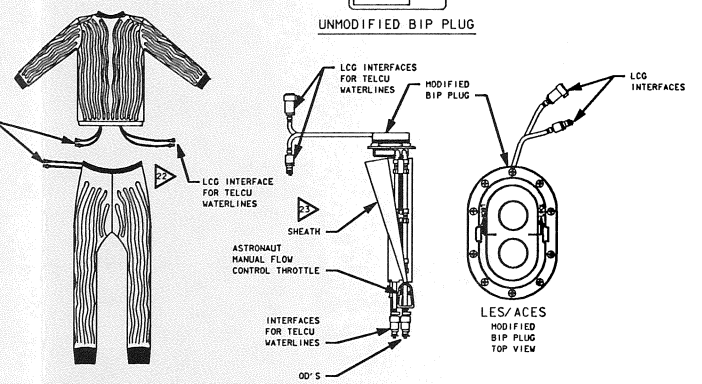
VENTILATION NOZZLE BREAKWAY

SUIT VENTILATION CONNECTION

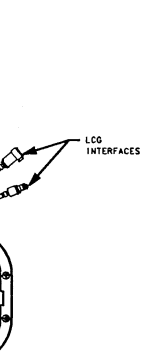
BIP PLUG
(TOP VIEW)



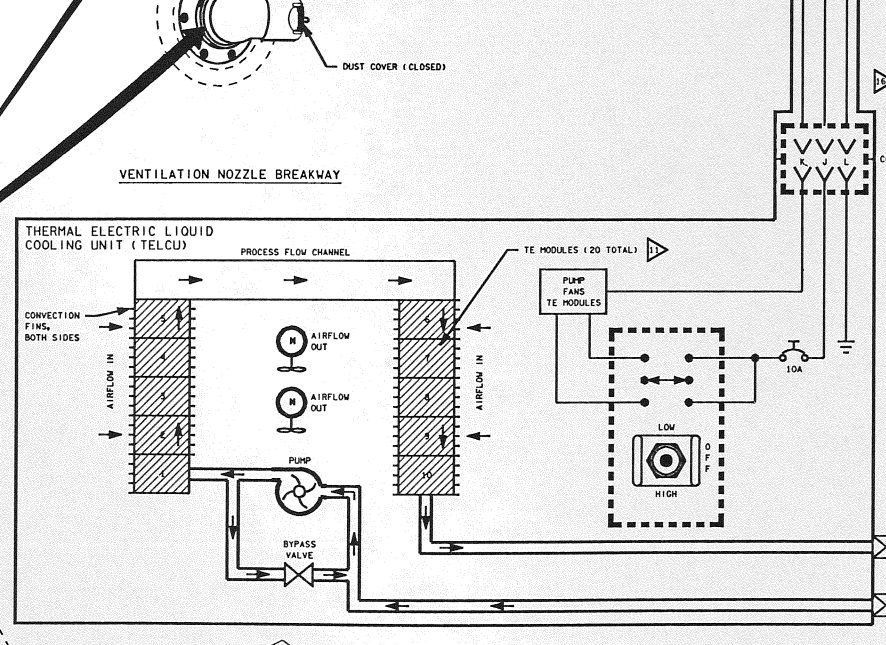


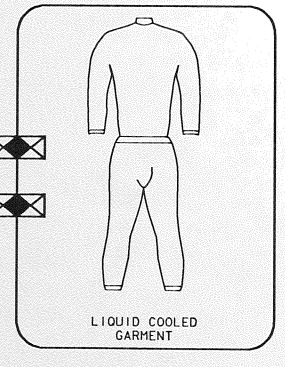


BACK

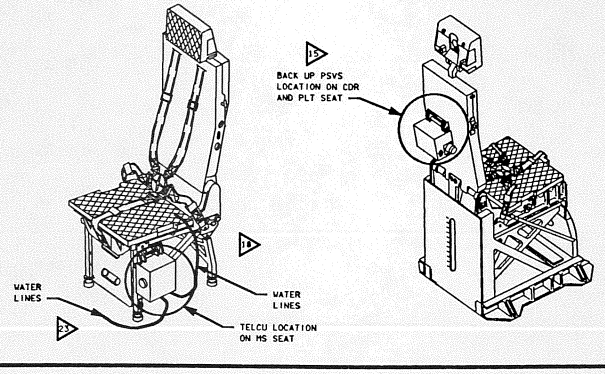


LCG/BIP/TELCU INTERFACES





LIQUID COOLED GARMENT



27. ACES HAS SIX PRESSURE SEALS: VISOR, NECK DAM, MAIN ZIPPER, BIP PLUG, GLOVES (2)

1. THIS FITTING IS NOT A QUICK DISCONNECT. INSTEAD, IT IS AN ELBOW FITTING

2. STOWED IN VOL 3B

3. GLOVES MUST BE LOCKED TO SLEEVE FOR SUIT TO PRESSURIZE

4. WATERLINES ENCLOSED IN THERMAL SHEATH AND TAPED TO THE FLOOR, CDR & PLT WATER LINES ARE ROUTED UNDER THE HARD FDF CONTAINER AND UP AND BACK AROUND TO THE BIP

5. WATER CONTAINS SILVER NITRATE AT 1 PART/MILLION FOR ANTI FUNGAL PROTECTION OF LCG
   - NO DANGER TO ASTRONAUTS IF LCG WATER LEAK
   - LCG CAN INTERFACE WITH ACES AND LES
   - EITHER TOP OR BOTTOM PARTS OF LCG CAN BE USED WITH TELCU

6. ACES HAS ONLY ONE NECK DAM. TABS ARE OPTIONAL AND ARE ONLY USED DURING GROUND COOLING WHEN HOOKED UP TO VENTILATORS. (O&C BUILDING, ASTRO VAN, AND WHITE ROOM

7. G-SUIT CAN BE DEMATED AND STOWED PRE LAUNCH AND REMATED FOR ENTRY. CSU13 G-SUIT SHOWN HERE

8. SEE REF DATA FOR FLIGHT SPECIFIC COOLING UNIT LOCATION/PWR DISTRIBUTION/ CABLE ROUTING

9. TELCU MAY BE MOUNTED ON OPPOSITE SIDE. FITS EXISTING PSVS BRACKET 11.5 LBS PER TELCU 12"H X 8"W X 5"D

10. LCG CONDUITS AND DSO CONDUITS ARE INCORPORATED INTO A MODIFIED BIP PLUG. TO REMOVE BIP PLUG, SLIDE RED LEVERS UP AND IN OPPSITE DIRECTION OF THE ARROWS, LIFT UP. TO REPLACE, SNAP IN AND SLIDE RED LEVERS TO THE LOCKED POSITION. ACES BIP IS A PRESSURE SEAL AND WATER SEAL

11. POWER CABLE LENGTHS FOR STANDARD COOLING UNIT CONFIGURATION
    SEAT 1: 8 FT 3 IN.
    SEAT 2: 15 FT 6 IN. (11 FT FROM OUTLET TO "Y" AND 4 FT 6 IN. FROM "Y" TO PSVS
    SEAT 3: 15 FT 6 IN. (11 FT FROM OUTLET TO "Y" AND 4 FT 6 IN. FROM "Y" TO TELCU
    SEAT 4: 8 FT 3 IN.
    SEAT 5: 15 FT 0 IN. (17 FT WHEN MAR MANIFESTED)
    SEAT 6: 15 FT 6 IN. (11 FT FROM OUTLET TO "Y" AND 14 FT 6 IN. FROM "Y" PSVS
    SEAT 7: 15 FT 6 IN. (11 FT FROM OUTLET TO "Y" AND 14 FT 6 IN. FROM "Y" PSVS
    TELCU HAS CIRCUIT BREAKER LOCATED ON UNIT (VERSUS FUSE LOCATED ON THE PSVS)
    TELCU USES SAME DC OUTLETS AS PSVS COOLING FANS
    TELCU USES SAME DC POWER CABLES AS PSVS FANS

12. PSVS SUIT FAN HOSE LENGTHS:
    FLT DECK PSVS: 30 INCHES
    PSVS HOSE INTERFACE WITH ACES SAME AS LES (DWG 18.4)
    PSVS USED AS BACKUP COOLING OPTION FOR TELCU

13. SLIDE RED TAB AWAY FROM SUIT AND TURN CCW TO UNLOCK AND DISCONNECT NOZZLE. TO ATTACH NOZZLE, RED TAB IN UNLOCK POSITION, PRESS NOZZLE INTO SUIT VENTILATION PORT AND TURN RED TAB CW TO LOCK. USED FOR PRE INGRESS CREW MEMBER COOLING OR IF TELCU FAILS AND BACKUP PSVS IS USED. WATER ENTRY POINT IF VENTILATION NOZZLE NOT MATED

14. 3 SUIT VENTILATION INLETS. 1 AT CHEST, 2 AT LOWER BACK

15. ACTIVATION OF GREEN APPLE TURNS O_2 FLOW RELEASE SCREW ARROW TO THE ON POSITION

16. LOW & HIGH POWER POSITIONS
    LOW MODE -
    70°F WATER TEMP DELIVERED TO LCG
    1.43 AMPS / TELCU
    493 BTU'S/HR COOLING (BASED ON 75°F CABIN)
    HIGH MODE -
    59°F WATER TEMP DELIVERED TO LCG
    3.23 AMPS / TELCU
    480 BTU'S/HR COOLING (BASED ON 90°F CABIN)
    IN THE LOW MODE - 75% (15) OF TE MODULES ARE POWERED. IN THE HIGH MODE - 100% (20) TE MODULES ARE POWERED

17. COMMANDER, PILOT, AND MISSION SPECIALIST 1 ORBITER O_2 HOSE IS 7 FEET IN LENGTH. ALL OTHER POSITIONS HAVE 14 FOOT ORBITER O_2 HOSES

9. REFER TO TABLE 18-1 FOR DRAWING TRACEABILITY

18. SHUT OFF VALVE WHICH IS ACTIVATED BY THE CONTROLLER CLIP
    - CLIP IN - MANUAL REGULATION OF G-SUIT PRESSURE WITH PRESSURE DIAL (PUSH BUTTON FLUSH WITH TOP OF VALVE BODY)
    - CLIP OUT - PUSH BUTTON POPS UP ABOVE VALVE BODY AND LAST-DIALED IN PRESSURE (≤ 3 PSIG, RELIEF PRESSURE) IS RETAINED IN G-SUIT BLADDERS

19. MAX FLOW RATE: 90 L/MIN

20. RESEATS AT 3.5 PSIG

21. O_2 SUPPLY PROVIDES 38 L/MIN FLOW FOR 10 MINUTES, NOMINALLY.

22. MANUAL DIAL FOR G-SUIT PRESSURE CONTROL (EA 'CLICK' INTO DETENT = 0.5 PSIG) ADJUSTABLE RANGE: 0-2.5 PSIG

23. NEGATIVE PRESSURE RELIEF VALVE WHICH CRACKS WHEN Δ=1.5" H_2O

24. AMBIENT PRESSURE AT OR BELOW 3.67-3.24 PSIA CAUSES PRIMARY ANEROID TO EXTEND AND CONTROLS ORIFICE FLOW IN VALVE BODY WHICH CAUSES THE SUIT BLADDER SHELL TO RETAIN PRESSURE
    MANUAL PRESSURIZATION OF SUIT:
    A. ADJUSTABLE DIAL IS MANUAL CAPABILITY TO CONTROL ORIFICE FLOW IN ORDER TO PRESSURIZE SUIT BELOW ANEROID ACTIVATED ALTITUDE (34,000 - 36,500 FT)
    B. SPRING LOADED RELIEF VALVE, MANUALLY OPERATED, USED TO TEST SUIT PRESSURIZATION ON THE GROUND AND AT ALTITUDE

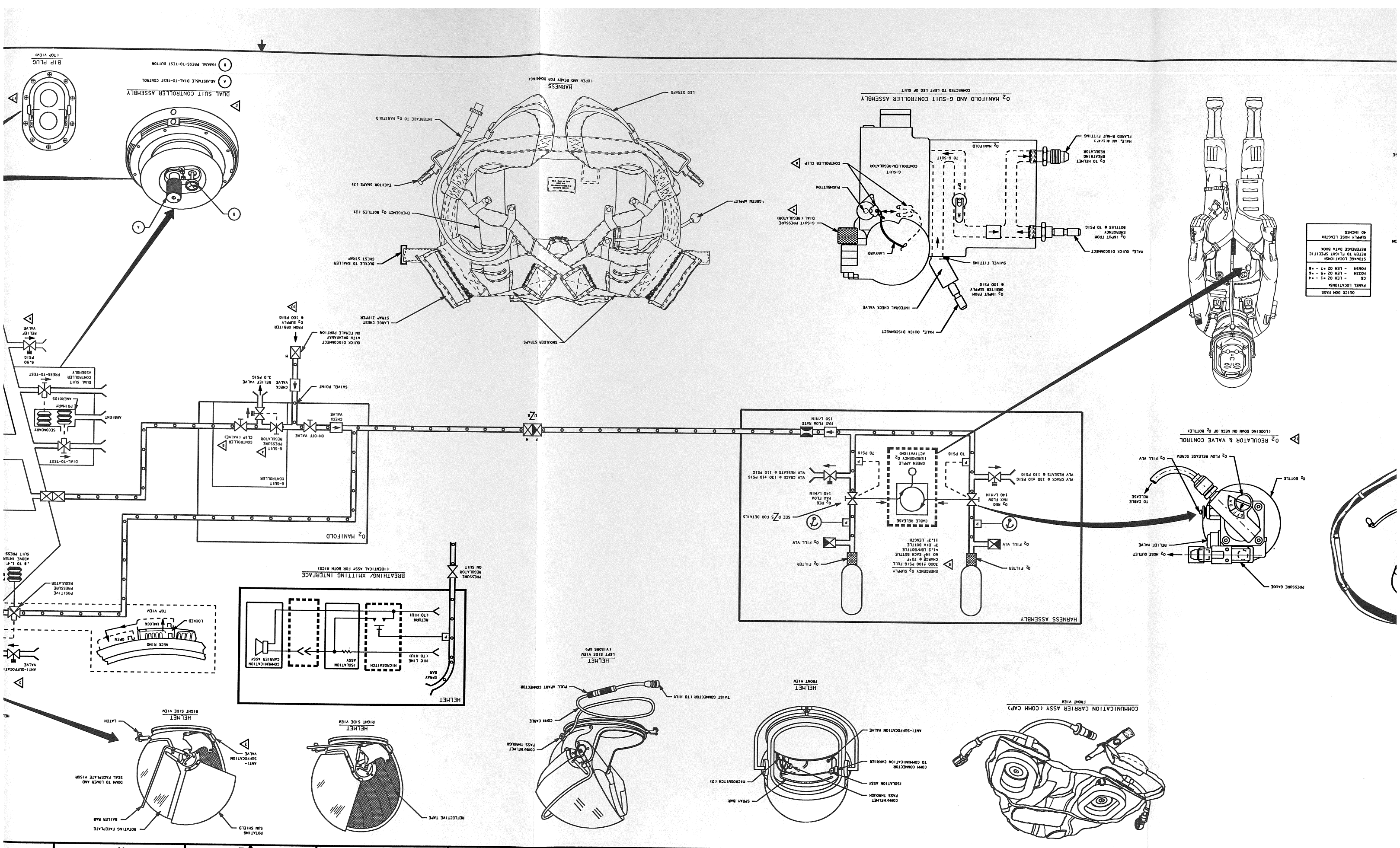
CHARACTERISTICS	PRIMARY SYSTEM	SECONDARY SYSTEM
ABSOLUTE SUIT PRESSURE	3.67 - 3.24 PSIA (34,000 - 36,500 FT)	3.48 - 3.05 PSIA (35,000 - 38,000 FT)
MANUAL PRESS-TO-TEST PRESSURE	———	2.3 PSIG
DIAL-TO-TEST PRESSURE	3.5 PSIG	———

NOTES: 1. EXHALATION VALVE - 1.65 ±0.15 INCHES H_2O ABOVE SUIT BLADDER PRESSURE AT MINIMUM INPUT FLOW ≤ 25 CC/MINUTE

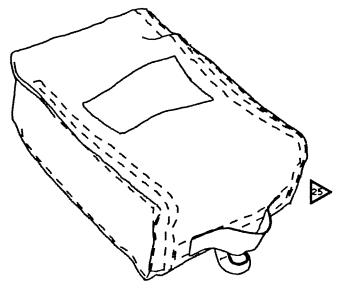
* 8 ACES/TELCU/ODM

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN: B. TEDDER, K. GILLESPIE,	9/26/88	
DR: S. EGAN-WYER		ADVANCED CREW ESCAPE SUIT & THERMAL ELECTRIC LIQUID COOLING UNIT & QUICK DON MASK
ENGR: S. GILL		
ENGR: S. Gill	5/14/96	
APP: P. Zipf	5/15/96	
APP: John A. Kommerstad	6/6/96	SPACE SHUTTLE — DWG NO 18.8
CABS: S.K. Kimbrell	6-7-96	ALL
LTR: E — PCN: 6		126.5 X 34 — PAGE — SHEET 1 OF 1

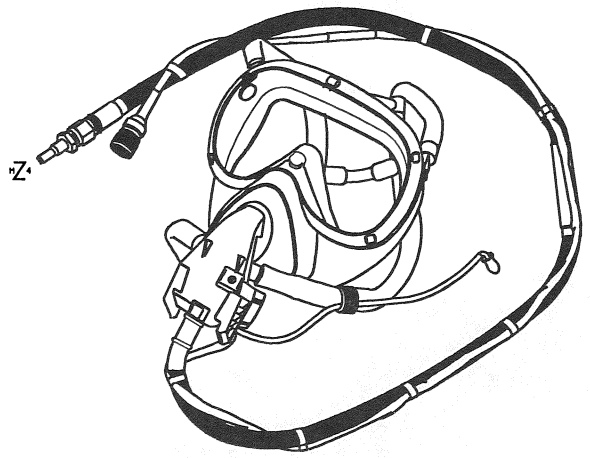
BASIC REV E-6


DUAL SUIT CONTROLLER ASSEMBLY
A ADJUSTABLE DIAL-TO-TEST CONTROL
B MANUAL PRESS-TO-TEST BUTTON
BIP PLUG (TOP VIEW)
HARNESS (OPEN AND READY FOR DONNING)
LEG STRAPS
INTERFACE TO O2 MANIFOLD
EJECTOR SNAPS (2)
EMERGENCY O2 BOTTLES (2)
BUCKLE TO SMALLER CHEST STRAP
LARGE CHEST STRAP ZIPPER
SHOULDER STRAPS
"OPEN APPLE"
O2 MANIFOLD AND G-SUIT CONTROLLER ASSEMBLY
CONNECTED TO LEFT LEG OF SUIT
MALE, AN 4 (1/4") FLARED B-NUT FITTING
O2 TO HELMET BREATHING REGULATOR
O2 MANIFOLD
G-SUIT CONTROLLER/REGULATOR
CONTROLLER CLIP
PUSHBUTTON
G-SUIT PRESSURE DIAL (REGULATOR)
LANYARD
TO G-SUIT
MALE, QUICK DISCONNECT
O2 INPUT FROM EMERGENCY BOTTLES @ 70 PSIG
SWIVEL FITTING
INTEGRAL CHECK VALVE
O2 INPUT FROM ORBITER O2 SUPPLY @ 100 PSIG
MALE, QUICK DISCONNECT
QUICK DON MASK
PANEL LOCATIONS
CG - LCH O2 #1 - #4
MO2M - LCH O2 #5 - #6
MO6M - LCH O2 #7 - #8
SUPPLY HOSE LENGTH
40 INCHES
STOWAGE LOCATIONS
NEEDED TO FLIGHT SPECIFIC
REFERENCE DATA BOOK
O2 REGULATOR & VALVE CONTROL
(LOOKING DOWN ON NECK OF O2 BOTTLE)
O2 FLOW RELEASE SCREW
O2 FILL VLV
O2 BOTTLE
TO CABLE RELEASE
O2 NOSE OUTLET
RELIEF VALVE
PRESSURE GAUGE
O2 MANIFOLD
DUAL SUIT CONTROLLER ASSEMBLY
PRESS-TO-TEST
DIAL-TO-TEST
AMBIENT
PRIMARY
SECONDARY
ANDRIOIDS
5.50 PSIG
RELIEF VALVE
ANTI-SUFFOCATION VALVE
POSITIVE PRESSURE REGULATOR
.8 TO 1.4" ABOVE INTRA SUIT PRESS
TOP VIEW
NECK RING
LOCKED
OPEN
UNLOCK
FROM ORBITER O2 SUPPLY @ 100 PSIG
QUICK DISCONNECT WITH BREAKAWAY ON FEMALE PORTION
SWIVEL POINT
RELIEF VALVE 3.0 PSIG
CHECK VALVE
ON-OFF VALVE
G-SUIT PRESSURE REGULATOR
CONTROLLER CLIP (VALVE)
G-SUIT CONTROLLER
O2 MANIFOLD
F
H
Z6
MAX FLOW RATE 150 L/MIN
10 PSIG
VLV CRACK @ 130 ±10 PSIG
VLV RESEATS @ 110 PSIG
O2 REG MAX FLOW 140 L/MIN
GREEN APPLE (EMERGENCY O2 ACTIVATION)
CABLE RELEASE
O2 FILL VLV
O2 FILTER
SEE RZ5 FOR DETAILS
EMERGENCY O2 SUPPLY 3000 ±100 PSIG FULL CHARGE @ 70°F 60 IN³ EACH BOTTLE 3" DIA BOTTLE 11.3" LENGTH
HARNESS ASSEMBLY
BREATHING/ SPEAKING INTERFACE (IDENTICAL ASSY FOR BOTH MICS)
PRESSURE REGULATOR ON SUIT
HELMET
RETURN (TO HUD)
MIC LINE (TO HUD)
MICROSWITCH
ISOLATION ASSY
COMMUNICATION CARRIER ASSY
SPRAY BAR
HELMET LEFT SIDE VIEW (VISORS UP)
PULL APART CONNECTOR
TWIST CONNECTOR (TO HUD)
COMM CABLE
COMM/HELMET PASS THROUGH
HELMET FRONT VIEW
ANTI-SUFFOCATION VALVE
COMM CONNECTOR TO COMMUNICATION CARRIER
ISOLATION ASSY
MICROSWITCH (2)
SPRAY BAR
COMMUNICATION CARRIER ASSY (COMM CAP) FRONT VIEW
HELMET RIGHT SIDE VIEW
LATCH
ANTI-SUFFOCATION VALVE
DOWN TO LOWER AND SEAL FACEPLATE VISOR
BAILER BAR
ROTATING FACEPLATE
ROTATING SUN SHIELD
HELMET RIGHT SIDE VIEW
REFLECTIVE TAPE
T
S
R
Q
P
O
N
M
L
K

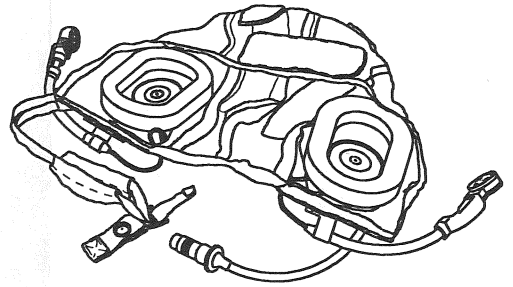
DATE: 05/11/96 | NAME: BJB | VERSION: INK#3



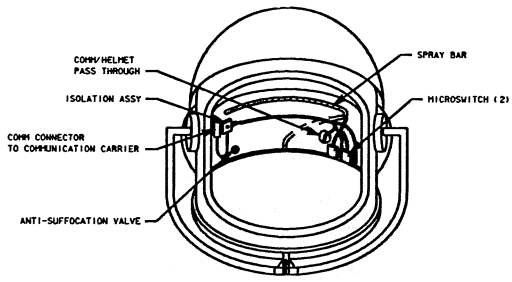
STOWAGE BAG



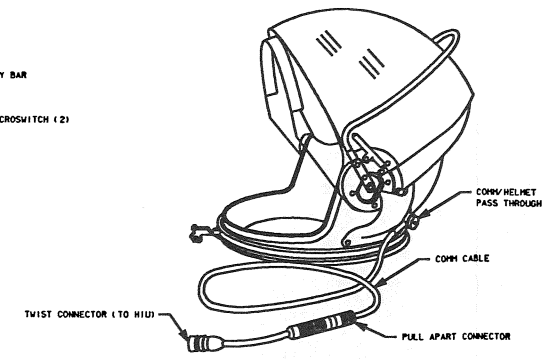
QUICK-DON MASK



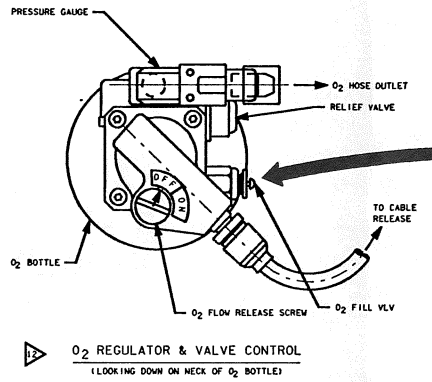
COMMUNICATION CARRIER ASSY (COMM CAP)
FRONT VIEW



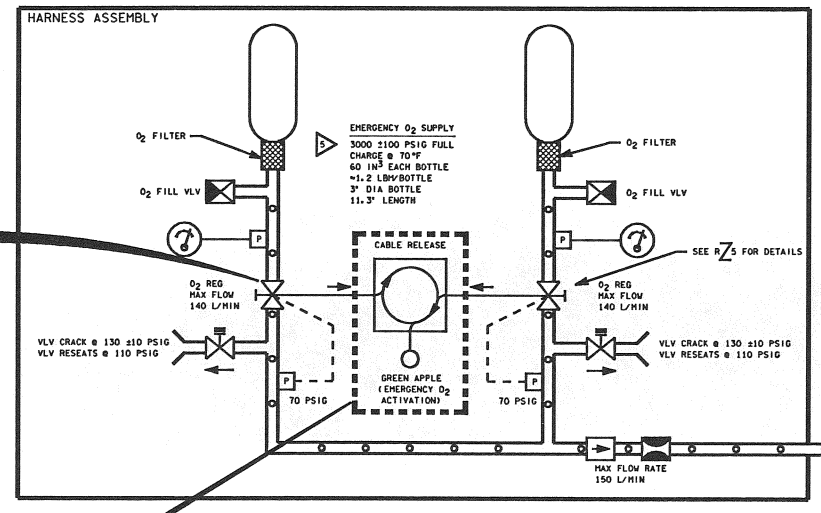
HELMET
FRONT VIEW

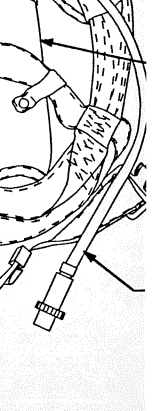


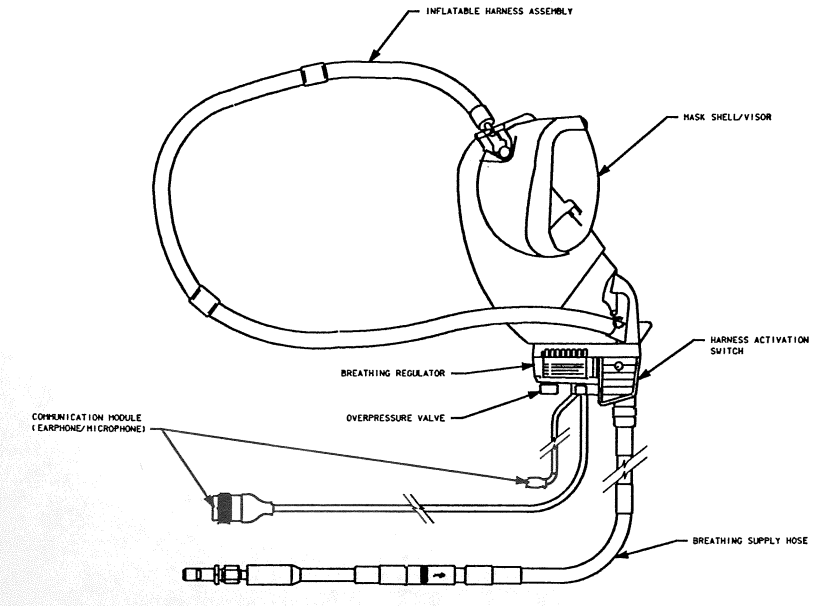
HELMET
LEFT SIDE VIEW
(VISORS UP)



△12 O_2 REGULATOR & VALVE CONTROL
(LOOKING DOWN ON NECK OF O_2 BOTTLE)

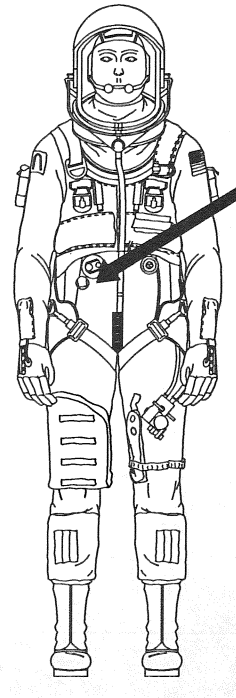


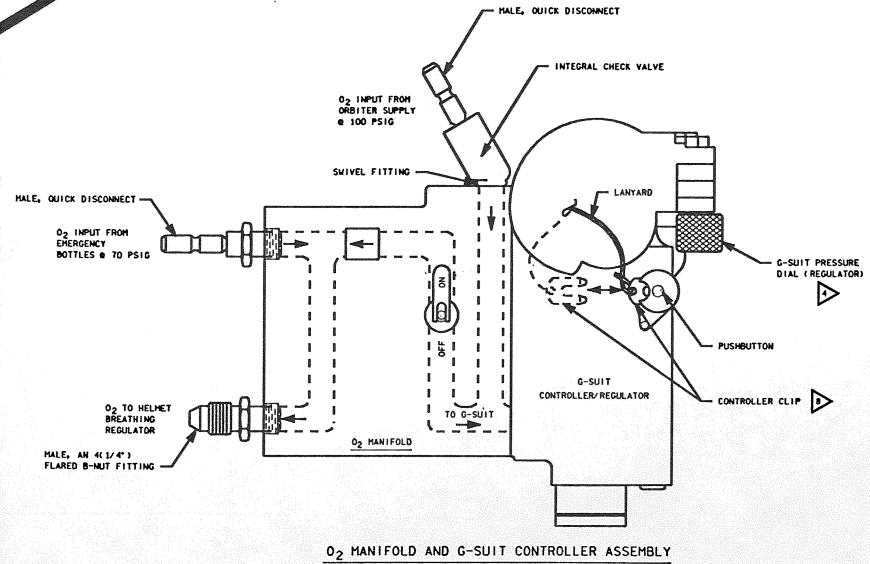




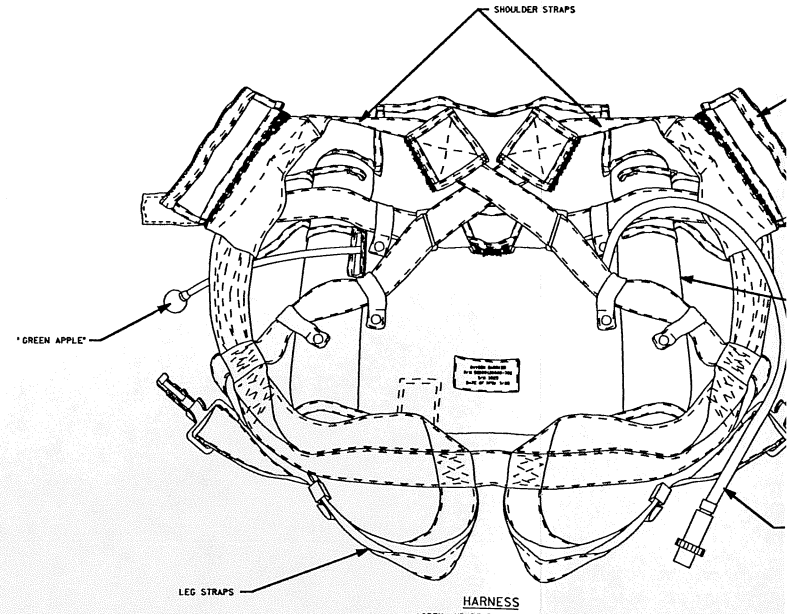
QUICK-DON MASK ASSEMBLY

QUICK DON MASK
PANEL LOCATIONS:
C6 - LEH O2 #1 - #4 MO32M - LEH O2 #5 - #6 MO69M - LEH O2 #7 - #8
STOWAGE LOCATIONS: REFER TO FLIGHT SPECIFIC REFERENCE DATA BOOK
SUPPLY HOSE LENGTH: 40 INCHES





O_2 MANIFOLD AND G-SUIT CONTROLLER ASSEMBLY
CONNECTED TO LEFT LEG OF SUIT



HARNESS
(OPEN AND READY FOR DONNING)

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
18.1	ESCAPE PANEL	ROCKWELL	V070-553303	ALL	C	10-12-84	WINDOW INSTL-CM, EMERG EGRESS SYSTEM

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
18.1	ENGR J. KREYKES				
	ENGR Jimmie Rawlins	11-6-90		ENGR	
	ENGR			ENGR	
	ENGR			ENGR	
	ENGR			APP Paul Hyde	8 Nov 90
	ENGR			APP R T Neal	11/9/90
	ENGR			OMNIPLAN	
	ENGR			LTR E PCN	

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

VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 18-I	
ALL	PAGE 18.1-1	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
18.2	POLE CREW ESCAPE SYSTEM	NASA/JSC (LOCKHEED)	SID 27101410ALL	ALL	D	7-11-88	DRAWING TREE, POLE CREW ESCAPE SYSTEM
18.3	EMERGENCY EGRESS SLIDE/SKYGENIE	INFLATABLE SYSTEMS INTER-NATIONAL	D102900	ALL	D	3-11-88	EGRESS SLIDE TOP ASSEMBLY
		ROCKWELL	V651-000002	ALL	D	3-88	MISSION KIT
		NASA	JSC-12770	3.5-10	B	8-14-87	SHUTTLE FLIGHT OPERATIONS MANUAL VOL 12
18.4	LAUNCH AND ENTRY SUIT	NASA/JSC (DAVID CLARK)	SED 39120495	ALL	D	9-22-88	LAUNCH & ENTRY SUIT ASSEMBLY/CREW ESCAPE SYSTEM
		(AIRLOCK, INC.)	SED 39120496			10-27-88	PERSONAL SUIT VENTILATION SYSTEM ASSEMBLY
18.5 (SHEETS 1-3)	SURVIVAL GEAR	NASA-JSC	S88-37773 S88-37775 S88-37778 S88-39725 S88-39751 S88-39753 S88-39754 S88-44404 S88-53741 S88-53742				
18.6	PERSONAL PARACHUTE ASSEMBLY	NAVAL AIR SYSTEMS COMMAND	SX 1102410187	ALL		6-89	DRAWING TREE, PERSONAL PARACHUTE ASSEMBLY
18.7	SIDE HCH JETT	ROCKWELL	CONTRACT NAS9-14000 IRD MA335T3 WBS 9.8.8.5	13-30		3/6/87	SIDE HATCH CREW ESCAPE SYSTEM PRELIMINARY DESIGN REVIEW (PDR) FINAL BOARD REPORT
				21-40 175-215		2/24/87	SIDE HAtCH CREW ESCAPE SYSTEM PRELIMINARY DESIGN REVIEW (PDR) INTRODUCTORY BRIEFING

DWG	SIGNATURE	DATE	DWG	SIGNATURE	DATE
18.2	ENGR K. TRUJILLO		18.6	ENGR K. TRUJILLO	
	ENGR Kenneth D Trujillo	11/25/91		ENGR Kenneth D Trujillo	11/25/91
18.3	ENGR K. TRUJILLO		18.7	ENGR J. KREYKES	
	ENGR Kenneth D Trujillo	11/25/91		ENGR Jennifer Kreykes	11/25/91
18.4	ENGR K. TRUJILLO			APP	
	ENGR Kenneth D Trujillo	11/25/91		APP	
18.5,1-3	ENGR K. TRUJILLO			OMNIPLAN	
	ENGR Kenneth D Trujillo	11/25/91		LTR E PCN 1	

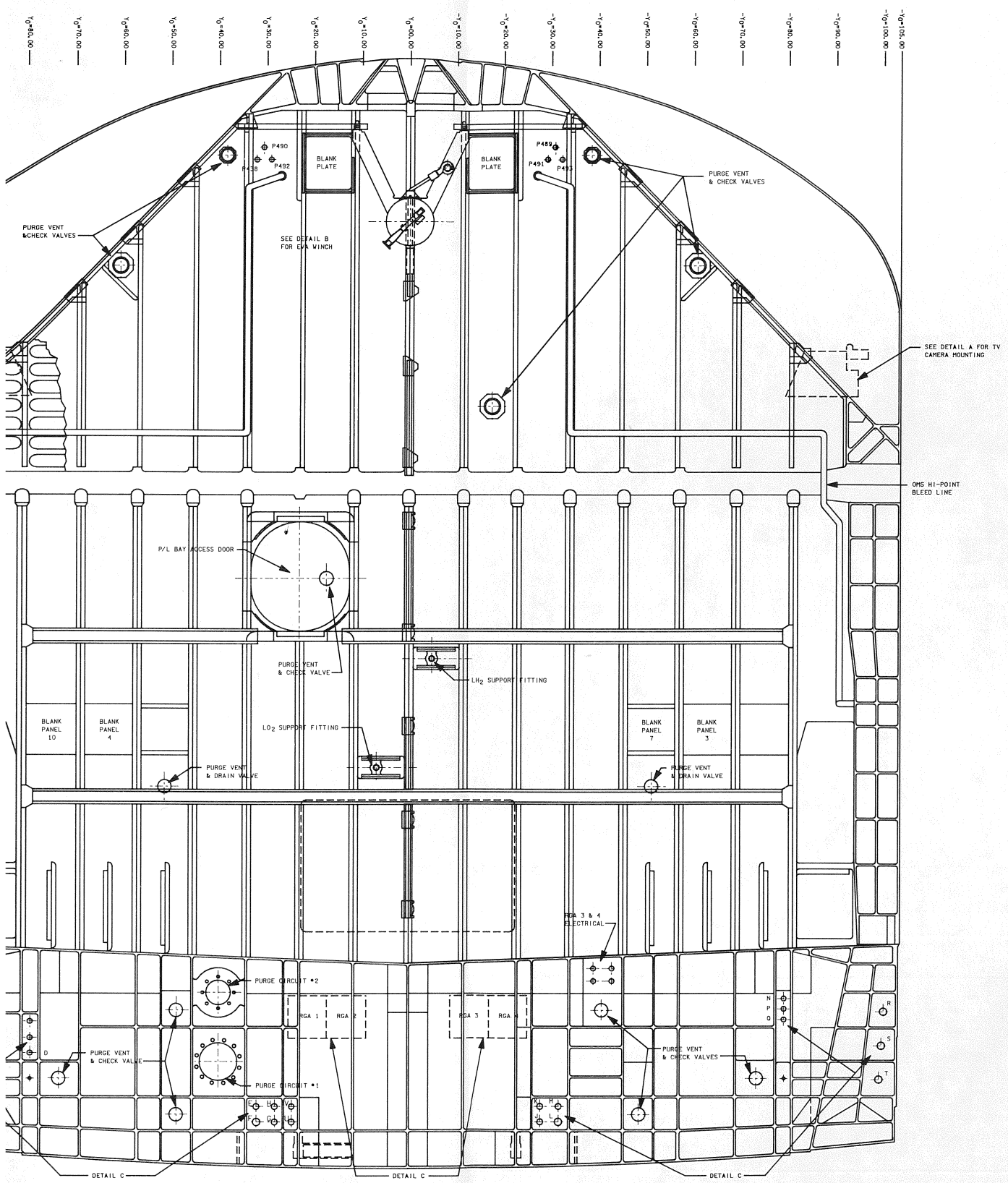
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS

VENDOR DRAWING REFERENCES

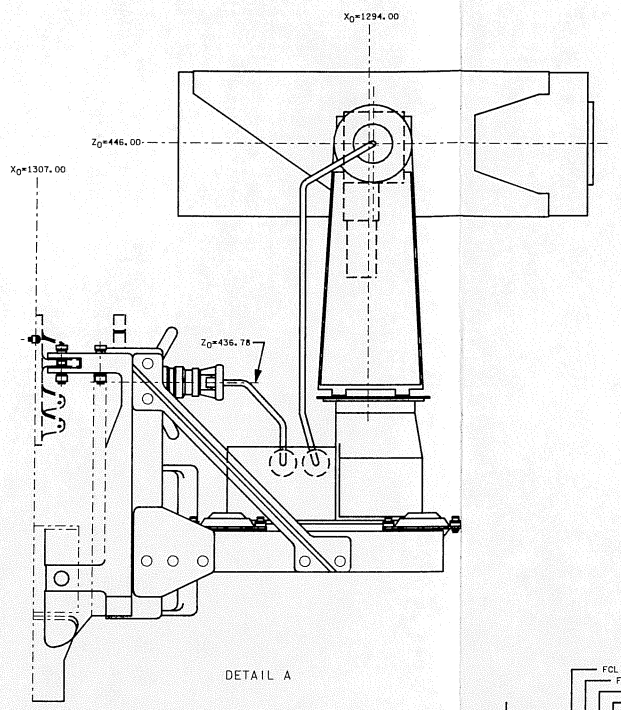
SPACE SHUTTLE	TBL NO	
ALL	18-I	
	PAGE 18.1-2	SHEET 2 OF 2

BASIC REV E-1

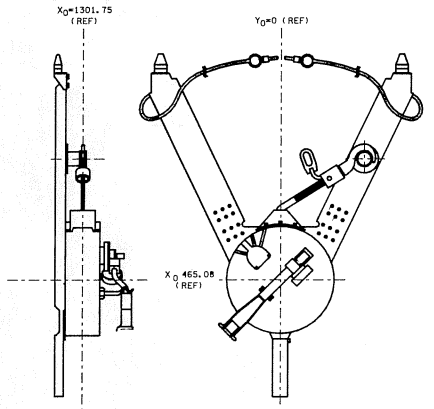
DATE: 09/11/87	NAME: VCO	VERSION: INK 1
DATE: 10/08/87	NAME: TPH	VERSION: INK 2
DATE: 08/22/90	NAME: MDU	VERSION: INK 3



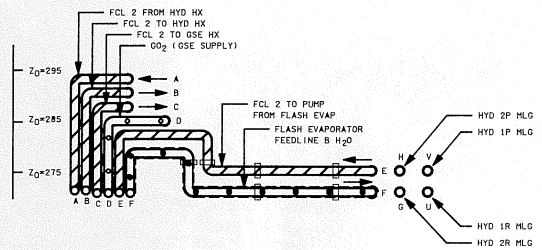
1307 BULKHEAD LOOKING AFT



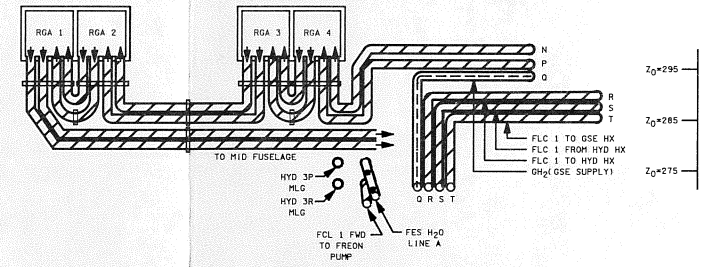
DETAIL A

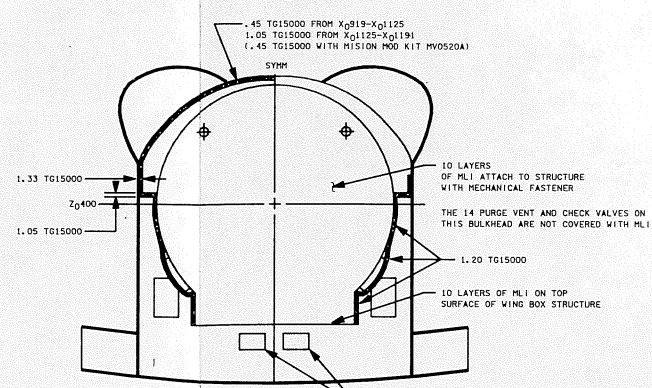


DETAIL B



FORWARD SIDE OF 1307 BULKHEAD LOOKING AFT
DETAIL C





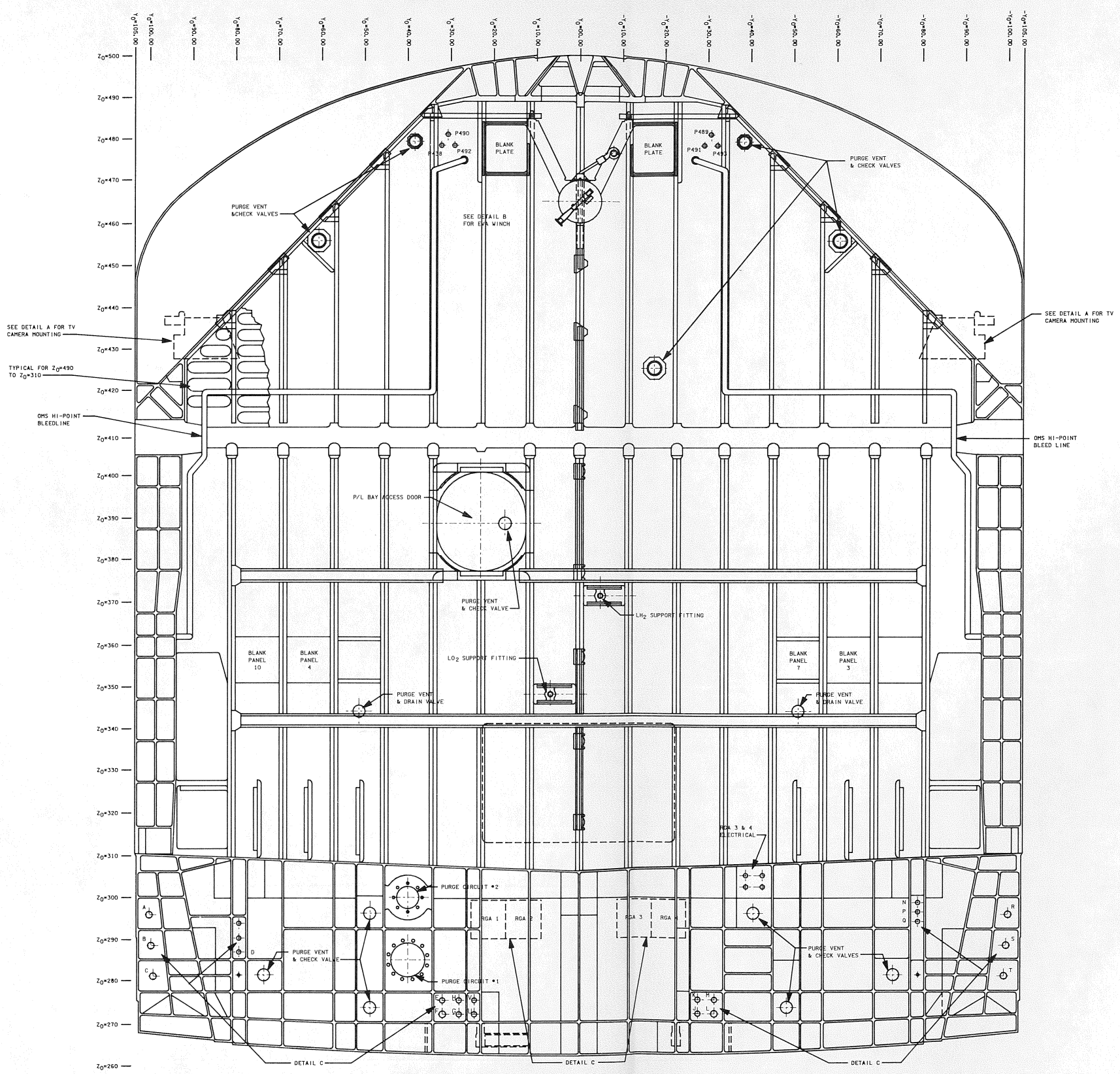
1307 INSULATION DETAIL
LOOKING AFT FROM 1191 TO 1307
SCALE 1/20

NOTES: THIS DRAWING IS ONLY APPROXIMATE

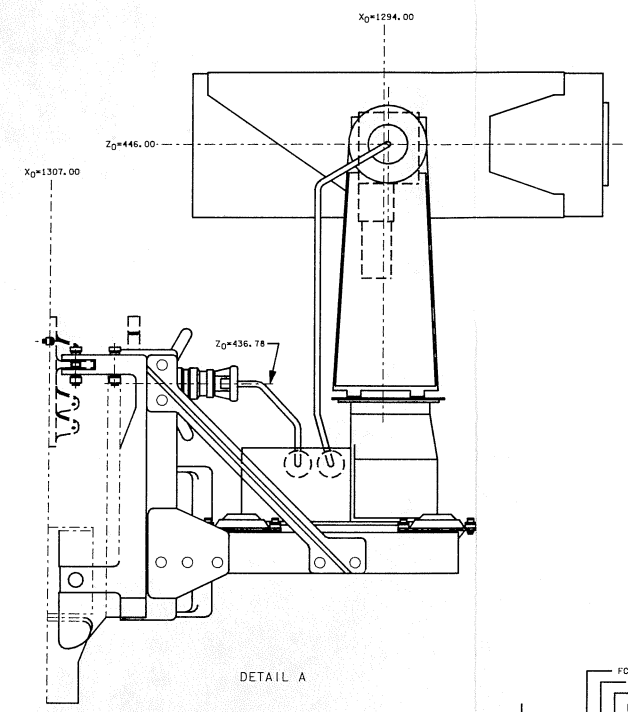
PLV OV 1

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	MICHAEL MURPHY	7/25/83	
OR			PAYLOAD BAY OVERVIEW 1307 BULKHEAD LOOKING AFT
ENGR	H.K. POHL		
ENGR	H.K. Pohl	8/1/90	
APP	[illegible]	7-24-90	
APP	R.T. Neal	9/1/90	SPACE SHUTTLE / DWG NO 19.1
OMNIPLAN	[illegible]	[illegible] 90	ALL
LTR E	PCN		66 X 34 / PAGE / SHEET 1 OF 6

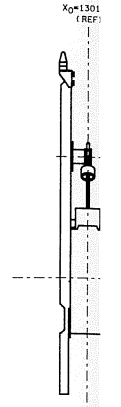
BASIC REV E

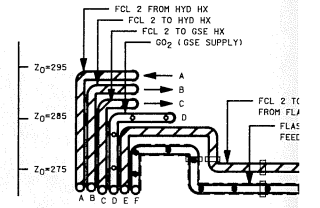


1307 BULKHEAD LOOKING AFT

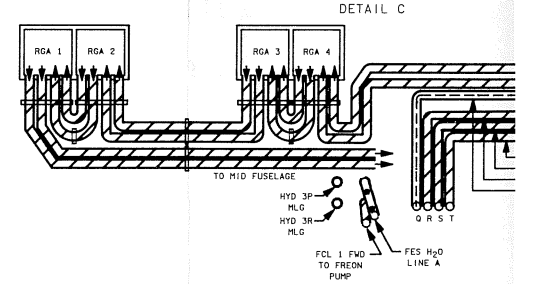


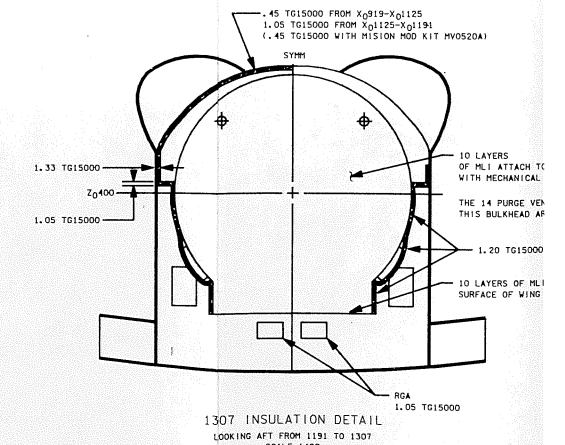
DETAIL A





FORWARD SIDE OF 1307 BULKHEAD LOOKING AFT
DETAIL C

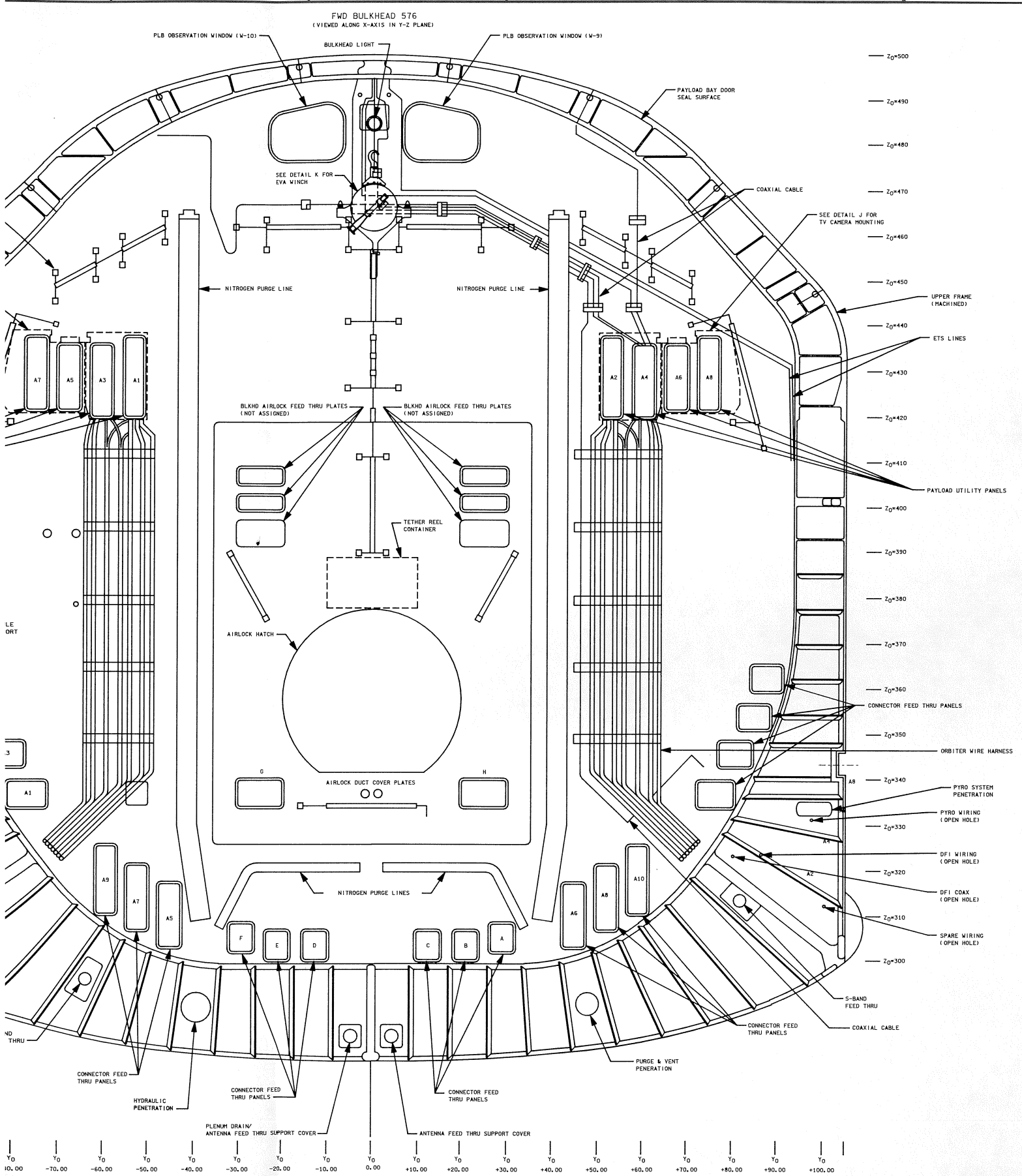


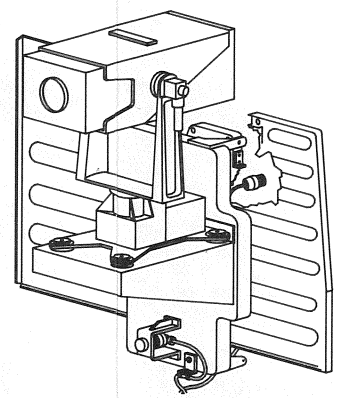


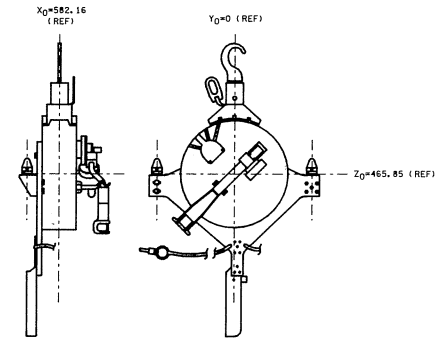
1307 INSULATION DETAIL
LOOKING AFT FROM 1191 TO 1307
SCALE 1/20

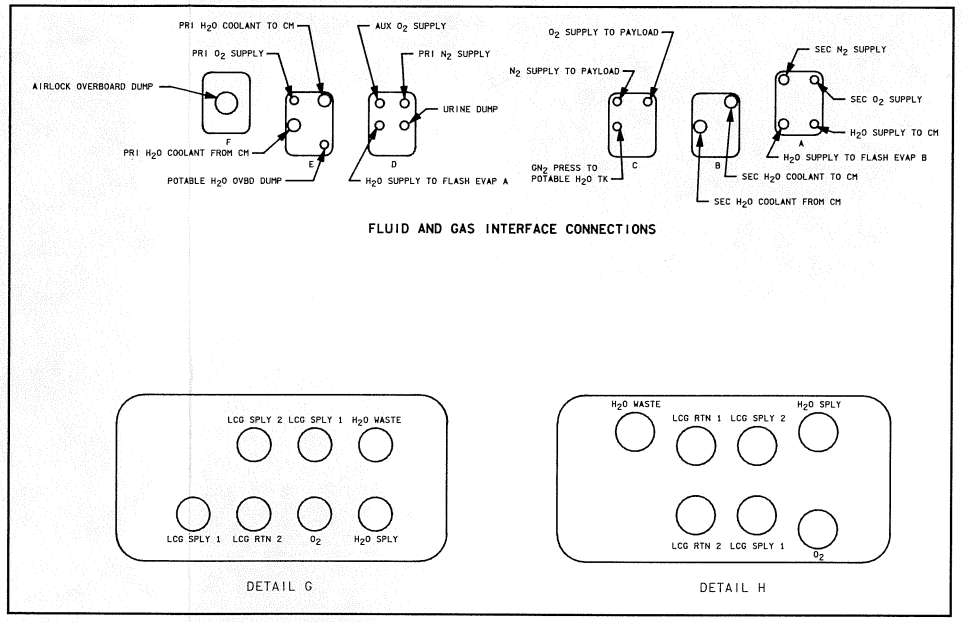
BASIC REV E

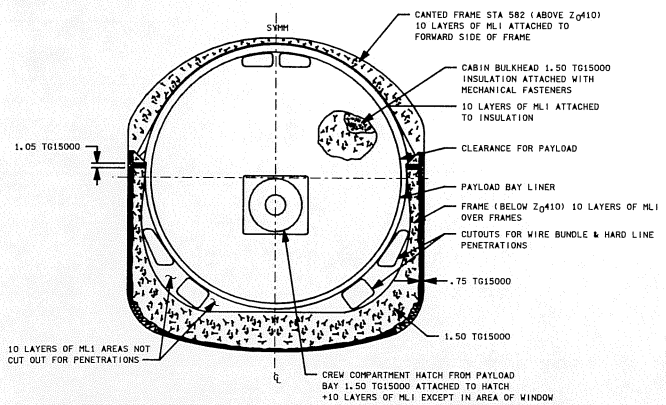
DATE: 10/9/87	NAME: TMW	VERSION: INK 2
DATE: 08/22/90	NAME: MDU	VERSION: INK 3
DATE: 09/07/90	NAME: LAM	VERSION: INK 4











582 INSULATION DETAIL

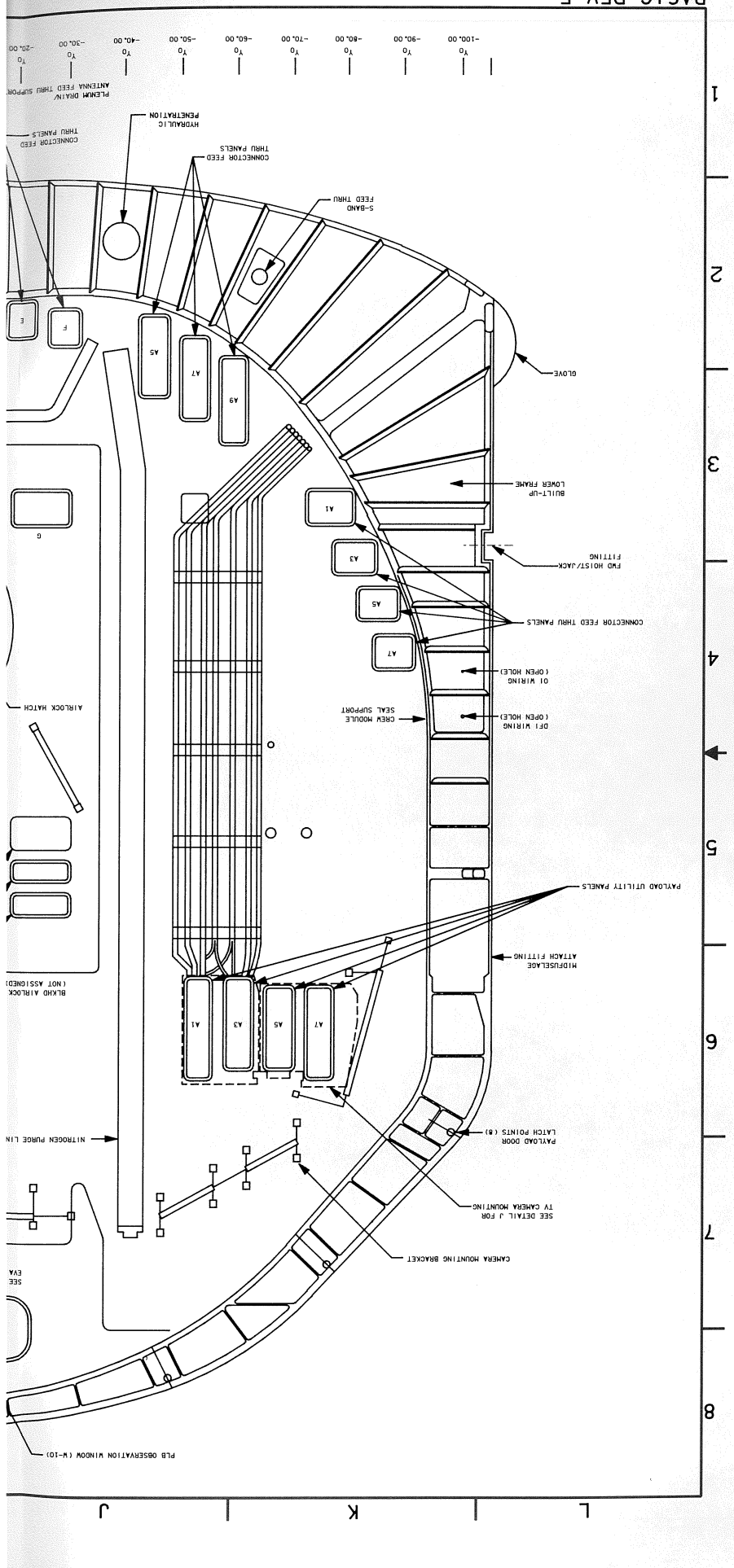
LOOKING FWD AT 582 & CABIN BULKHEAD 576
SCALE 1/20

NOTES: 1. THIS DRAWING IS ONLY APPROXIMATE

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN	MICHAEL MURPHY	8/2/83	PAYLOAD BAY OVERVIEW 582/576 BULKHEAD LOOKING AFT	
DR	MICHAEL MURPHY	8/2/83		
ENGR	H. KARL POHL			
ENGR	H. Karl Pohl	9/7/90		
APP	[illegible]	9/7/90		
APP	R T Neal	9/7/90	SPACE SHUTTLE	DWG NO 19.1
OMNIPLAN	S. K. Rinehart	10-25-90	ALL	
LTR E	PCN		121 X 34	PAGE SHEET 2 OF 6

BASIC REV E

BASIC REV E


-100.00
-90.00
-80.00
-70.00
-60.00
-50.00
-40.00
-30.00
-20.00
PLDMM DRAIN/ ANTENNA FEED THRU SUPPORT
HYDRAULIC PENETRATION
CONNECTOR FEED THRU PANELS
S-BAND FEED THRU
GLOVE
BULT-UP LOWER FRAME
FWD HOIST/JACK FITTING
CONNECTOR FEED THRU PANELS
DI WIRING (OPEN HOLE)
DFI WIRING (OPEN HOLE)
CREW MODULE SEAL SUPPORT
AIRLOCK HATCH
PAYLOAD UTILITY PANELS
MIDFUSELAGE ATTACH FITTING
PAYLOAD DOOR LATCH POINTS (3)
SEE DETAIL J FOR TV CAMERA MOUNTING
CAMERA MOUNTING BRACKET
PLD OBSERVATION WINDOW (W-10)
BLKHD AIRLOCK (NOT ASSIGNED)
NITROGEN PURGE LIN
SEE EVA
A1
A3
A5
A7
A9
E
F
G
1
2
3
4
5
6
7
8
J
K
L

DATE: 10/08/87	NAME: MDU	VERSION: INK 5
DATE: 09/07/90	NAME: SEW	VERSION: INK 6
DATE: 09/21/90	NAME: MDU	VERSION: INK 7

K J I H G F E D C B A

X° 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650

200 150 100 50 0 -50 -100 -150 -200

8 7 6 5 4 3 2 1

1090.33 1140.67 1191

1249 1307 1365 1400 1437 1465 1498

HYD LINES TO RH ELEVON 2R/P, 1P/R, 3R/P

FES TOP NOZ RH

RADIATOR FLOW CONTROL PANEL FCL 2

HE 11

N2 SYS 1 TANK EDO (OV-102)

HE 7

HE 6

LO_2 SYS 3

HYD 3

ELEC DUCT

FCL 2 TO FES

FCL 1 TO FES

HE TK 1

HE TK 3

HYD SYS 3 P/R TO BODY FLAP

HYD 2

HYD 1

FES H_2O LINE B

NO. 2 LANDING GEAR ISOVALVE NO. 1

AV BAY 6 COLDPLATES

FES

BODY FLAP ACTUATOR

HYD SYS 3 P

RGA

FES EVAPORATOR

FCL 1 AND 2

FCL

FES H_2O LINE A

OLEOPHOBIC FILTER

HYD 1

HYD 3

LO_2

HE TK 2

HE TK 4

HYD SYS 1 P/R TO BODY FLAP

HYD 2 R

ELEC DUCT

HYD SYS 2 P/R TO BODY FLAP

O_2 SYS 4

HE 10

HE 8

N2 SYS 2 TANK EDO (OV-102)

HE 9

FCL 1 FROM RAD

RADIATOR FLOW CONTROL PANEL FCL 1

FCL 1 TO RAD

HYD LINES TO LH ELEVON 2R/P, 1P/R, 3P/R

FES HI LOAD DUCT

FES TOP NOZ LH

Y°

NOTE: THIS DRAWING IS ONLY APPROXIMATE

(INSIDE LOOKING DOWN FROM BOTTOM)

*1 STRUC & SYS LOC 3

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	MELVIN JAMES	7-13-81	
DR	VICTOR ORTIZ	7-13-81	
ENGR	H. KARL POHL		STRUCTURES AND SYSTEMS LOCATION
ENGR		9-26-90	
APP		9-28-90	
APP	RTV Leal	10/4/90	SPACE SHUTTLE / DWG NO 19.1
OMNIPLAN	S.K. Kimbrell	11-28-90	ALL
LTR E	PCN		126.5 X 34 / PAGE / SHEET 3 OF 6

BASIC REV E

400 450 500 550 600 650 700 750 800 850 900 950 1000 1050 1100

T S R Q P O N M L K

582 636 693 750 807 863 919 979.5 1040 1090.33 11

LMG

RMG

FLIGHT DEPENDENT

HE 4Ø

HE 11

LO2 SYS 4

LO2 SYS 3

N2 SYS 2 TANK EQD (OV-102)

N2 SYS 1 TANK EQD (OV-102)

LH2 SYS 3

LH2 SYS 1

LO2 SYS 1

LH2 SYS 2

LO2 SYS 2

LH2 SYS 4

F21 RADIATOR

F21 FLASH EVAP

F21 AFT COLD PLATE TO PUMP

H_2O SUPPLY TO FLASH EVAP

DFI RETURN

DFI SUPPLY

FREON

HYD TO NOSE WHEEL

HYD TO NOSE WHEEL

H_2O

FREON LOOP 1

H_2O

FREON LOOP 2

PANEL 5

CRYO HTR-1

MCA-3

RMA-1

MJCA-1

SYS 1 N_2 TK 1

SYS 1 N_2 TK 2

MPD 1

FCA 1

FCP 401

FREON 1

FREON 2

S BAND PM LB (QUAD)

HYD SYS 1 TO NLG

PRESSURE

RETURN

TACAN 1 LOWER

NO. 1 RAD ALT REC

NO. 1 RAD ALT TRANS-MITTER

UHF ANTENNA

TACAN 3 LOWER

S BAND FM LOWER (HE M1)

WASTE WATER

POTABLE H_2O TANK C

POTABLE H_2O TANK D

POTABLE H_2O TANK E

FWD ATTACH POINT

TACAN 2 LOWER

NO. 2 RAD ALT TRANS-MITTER

NO. 2 RAD ALT REC

S BAND PM LB (QUAD)

MPD 2

FCP 402

PCA 2

FCP 403

PCA 3

MPD 3

SYS 2 N_2 TK 1

MJCA-2

RMA-2

SYS 2 N_2 TK 2

MCA-2

EMERGENCY O_2

CRYO HTR-2

PANEL 4

FLIGHT DEPENDANT

DATE: 05/21/90 | NAME: MDU | VERSION: INK.7

SYSTEM	SYMBOLOGY
STRUCTURE AND GRID	
HYDRAULICS SYS 1,2,3	
H2 TKS 1,2	
O2 TKS 1,2	
N2 SYS 1,2	
FREON SYS 1,2	
H2O	
HE	
APU 1,2,3	
DUMP	
FLASH EVAPORATION	
AVIONICS/FUELCELL	
ELECTRICAL	
HYD DRAIN LINES	
NH3	
MMH	
N2O4	

W V U T S R Q P O N

200 250 300 350 400 450 500 550 600 650 700 750 800 850

8 7 6 5 4 3 2 1

200 150 100 50 0 -50 -100 -150 -200

239.5

582 636 693 750 807 863

NLDG

FWD ATTACH POINT

HYD SYS 1 TO NLG

PRESSURE

RETURN

TACAN 2 LOWER

NO. 2 RAD ALT TRANS-MITTER

NO. 2 RAD ALT REC

UHF ANTENNA

S BAND FM LOWER (HE MI)

TACAN 3 LOWER

WASTE WATER

POTABLE H_2O TANK D

POTABLE H_2O TANK C

TACAN 1 LOWER

NO. 1 RAD ALT REC

NO. 1 RAD ALT TRANS-MITTER

S BAND PM LB (QUAD)

S BAND PM LB (QUAD)

MPD 2

PCA 2

FCP 402

MPD 3

PCA 3

FCP 403

SYS 2 N_2 TK 1

RMA-2

MJCA-2

SYS 2 N_2 TK 2

MCA-2

EMERGENCY O_2

CRYO HTR

PANE

LO_2 SYS 2

LH_2 SYS 2

FRE

FREON

FREON 2

FREON 1

FCP 401

PCA 1

MPD 1

LO_2 SYS 1

SYS 1 N_2 TK 1

SYS 1 N_2 TK 2

MJCA-1

RMA-1

MCA-3

CRYO HTR-1

BASIC REV E

BASIC REV E

* 1 STRUC & SYS LOC 4

(VIEW LOOKING OTBD STBD SIDE)

NOTES: 1. THIS DRAWING IS ONLY APPROXIMATE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	SIGNATURE	DATE	
	DSGN VICTOR ORTIZ	7/13/91	
	DR PAUL KETTLER	7/13/91	
	ENGR H. KARL POHL		
	ENGR		
	APP		
	APP		
STRUCTURES AND SYSTEMS LOCATIONS			
	ORBITPLAN		
DWG NO SPACE SHUTTLE			
19.1	ALL		
SHEET 4 OF 6	PAGE	93.5 X 34	LTR E PCN

T-0 UMBILICAL PANEL

DATE 09/21/90	NAME: MAO	VERSION: BPT 4	
DATE 09/28/90	NAME: MDU	VERSION: INC 6	
DATE 10/16/90	NAME: SEV	VERSION: INC 7	

DATE: 10/16/90 | NAME: SEV | VERSION: INK 7

Q P O N M L K J

8 7 6 5 4 3 2 1

200 250 300 350 400 450 500 550 600 650 700 750 800 850 900

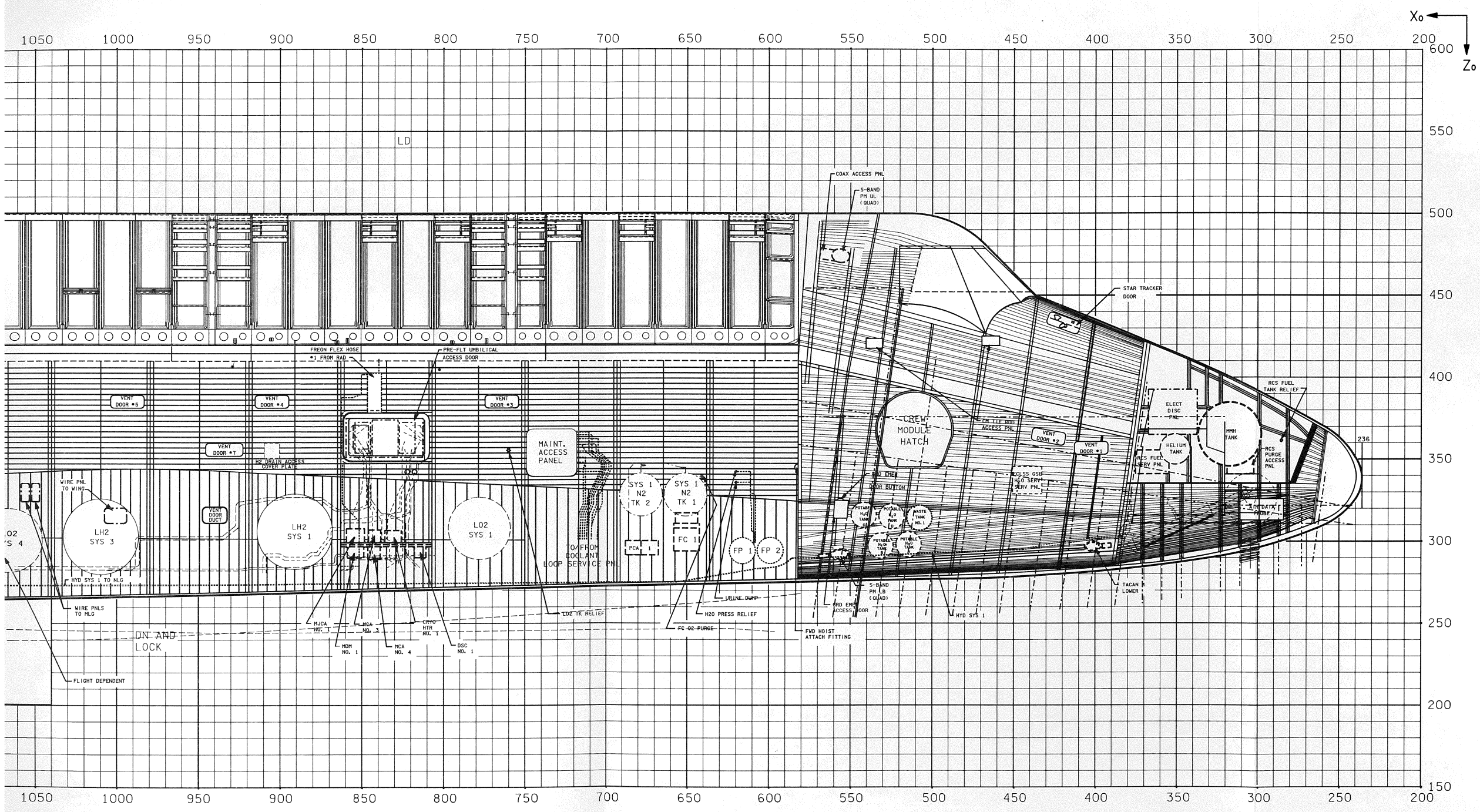
600 550 500 450 400 350 300 250 200 150

SYSTEM	SYMBOLOGY
STRUCTURE AND GRID	
HYDRAULICS SYS 1,2,3	
N2 SYS 1,2	
N2 SYS 3,4	
N2 SYS 5,6	
FREON SYS 1,2	
H2O	
N2	
APU 1,2,3	
DUCT	
FLASH EVAPORATION	
AVIONICS/WHEELWELL	
ELECTRICAL	
H2O DRAIN LINES	
MMH	
NTO	
N2O4	

S-BAND PM UR (QUAD)
COAS ACCESS PNL
KU BAND ANTENNA
RCS PURGE PNL ACCESS
KU BAND MSBLS 1
FWD RCS OXID TK RELIEF
KU BAND MSBLS 2
236
KU BAND MSBLS 3
N204
ELEC DISC PNL
HELIUM TANK
RCS OXID SERV PNL
HYD
AIR DATA PROBE
VENT DOOR #1
VENT DOOR #2
VENT DOOR #3
VENT DOOR #4
RCS TIE RODS ACCESS PNL
FREON FLEX HOSE SYS. 2 FROM RAD
FC H2O VENT
FC GHE PURGE
H2O DRAIN ACCESS PNL
GHE RELIEF VENT
SYS 2 N2 TK 1
SYS 2 N2 TK 2
EMER O2
LO2 SYS 2
LH2 SYS 2
LH2 SYS 4
PCA 2
MPD 2
FC 2
PCA 3
MPD 3
FC 3
WASTE TANK NO. 1
POTABLE H2O TANK B
POTABLE H2O TANK A
POTABLE H2O TANK C
TACAN 2 LOWER
GROUND EMERGENCY ESCAPE PANEL JETTISON T-HANDLE ACCESS
S-BAND PM LR (QUAD)
FWD ATTACH FITTING
MJCA 2
MCA 1
MCA 2
CRYO HTR 2
DBIA
DSC 2
SERVO FEEDBACK PROV
FL

BASIC REV E

DATE: 09/11/87	NAME: MPM	VERSION: INK, 4
DATE: 09/22/90	NAME: BJT	VERSION: BPT, 4
DATE: 09/28/90	NAME: MDU	VERSION: INK, 5



NOTES: 1. THIS DRAWING IS ONLY APPROXIMATE

(VIEW LOOKING OTBD PORT SIDE)

*1 STRUC & SYS LOC 5

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN MIKE BECKER	7/13/81	
DR PAUL KETTLER	7/13/81	STRUCTURES AND SYSTEMS LOCATIONS
ENGR H. KARL POHL		
ENGR [signature]	10-3-90	
APP [signature]	10-4-90	
APP RT Neal	10/4/90	SPACE SHUTTLE / DWG NO 19.1
OMNIPLAN		ALL
LTR E PCN		93.5 X 34 / PAGE / SHEET 5 OF 6

BASIC REV E

DATE: 05/28/90 | NAME: MDU | VERSION: INK.5

BASIC REV E

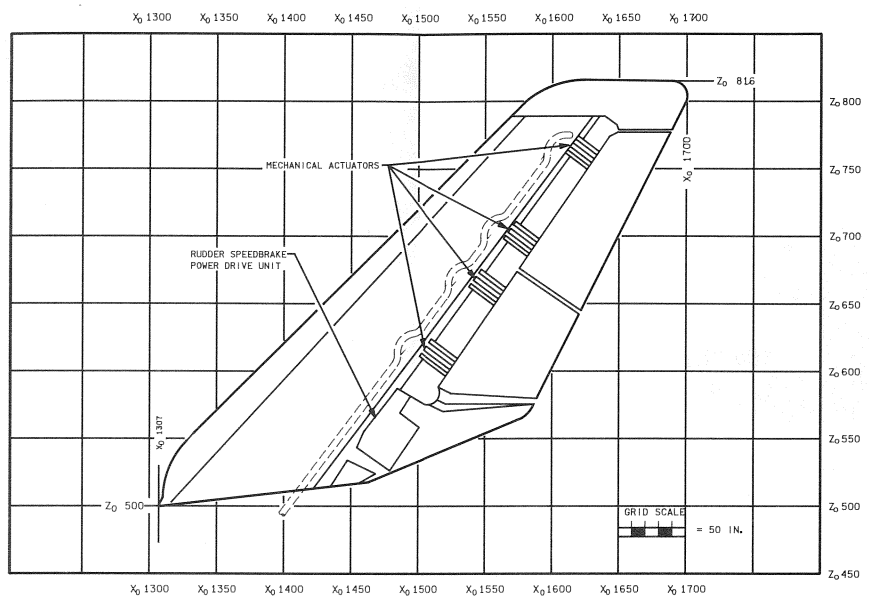
SYSTEM	SYMBOLOGY
STRUCTURE AND GRID	
HYDRAULIC SYS 1,2,3	
O2 TVS 1,2	
O2 SYS 1,2	
N2 SYS 1,2	
FREON SYS 1,2	
H2O	
GN2	
RP	
APU 1,2,3	
GH2	
FLASH EVAPORATOR	
AVIONICS/PURGE/ECLSS	
METEOROID	
H2O DRAIN LINES	
GO2	
GH2	
N2H4	

T-0 UMBILICAL PANEL

LH2 HI-POINT BLEED DISC (MPS)
SPARE
GSE COOLANT SUPPLY PRIMARY (ECLSS)
GSE COOLANT RETURN PRIMARY (ECLSS)
MPS GN2 PURGE DISC
OV/ET LH2 PURGE DISC
P/L GAS LEAK DETECTION
MID FUS GAS LEAK DETECTION
PAYLOAD LH2 TANK VENT
PAYLOAD LH2 FILL & DRAIN
AFT FUSELAGE LEAK DETECTION
SPARE
LH2 HE PRE-PRESS DISCONNECT (MPS)
SPARE
GSE COOLANT RETURN SECONDARY (ECLSS)
GSE COOLANT SUPPLY SECONDARY (ECLSS)
HE SUPPLY DISCONNECT (MPS)
ELECTRICAL CONN *22
ELECTRICAL CONN *22
LIQUID HYDROGEN (LH2) FILL & DRAIN
ELECTRICAL CONN *22
ELECTRICAL CONN *22
ELECTRICAL CONN *36
ELECTRICAL CONN *22
H2 GAS SUPPLY (PRSD)
SPARE
PAYLOAD COLD HELIUM FILL

OMS/RCS ATTACH PT ACCESS PNL
HYD FLOW JUNCTION
APU FUEL PUMP DRAIN 2
ACCUMU-LATOR SYS 1
ACCUMU-LATOR SYS 2
OMS/RCS ATTACH PT ACCESS PNL
T-0 UMB PANEL
APU 1 FUEL TANK
APU FUEL PUMP DRAIN 1
OMS/RCS/GSE TEST PORT ACCESS PANEL
APU 2 FUEL TANK
AFT COMPT ACCESS DOOR
AV BAY 5
PAYLOAD UMBILICAL PNL
APU SERV. PNL SYS 3
VENT DOOR *8
VENT DOOR *9
FES HI LOAD DUCT
FES
RGA 3, 4
HE TK 2
PNEU HE TK 4
1613
FES TOP NOZ
H2O/FCL
WING ELECT+HYD LINES 6HYD, 9ELECT
MLG HYD
RAD FLOW CNTL PNL
HE TK9
HE TK 8
EDO H_2 SYS 2 TANK
HE TK 10
LO2 SYS 4
LH2 SYS 3
LH2 SYS 1
AFT HOIST ATTACH FITTING
FREON FLEX HOSE *1 FROM RAD
VENT DOOR *6
VENT DOOR *5
VENT DOOR *4
VENT DOOR *7
H2 DRAIN ACCESS COVER PLATE
VENT DOOR DUCT
WIRE PNL TO WING
HYD SYS 1 TO MLG
WIRE PNLS TO MLG
LH WHEEL WELL DOOR
DN AND LOCK
FLIGHT DEPENDENT
MUCA NO. 2
MUCA NO. 1
MDM NO. 1

DATE: 9/11/87	NAME: TMV	VERSION: INK.1
DATE: 11/23/87	NAME: MAG	VERSION: INK.2
DATE: 09/04/90	NAME: MDU	VERSION: INK.3

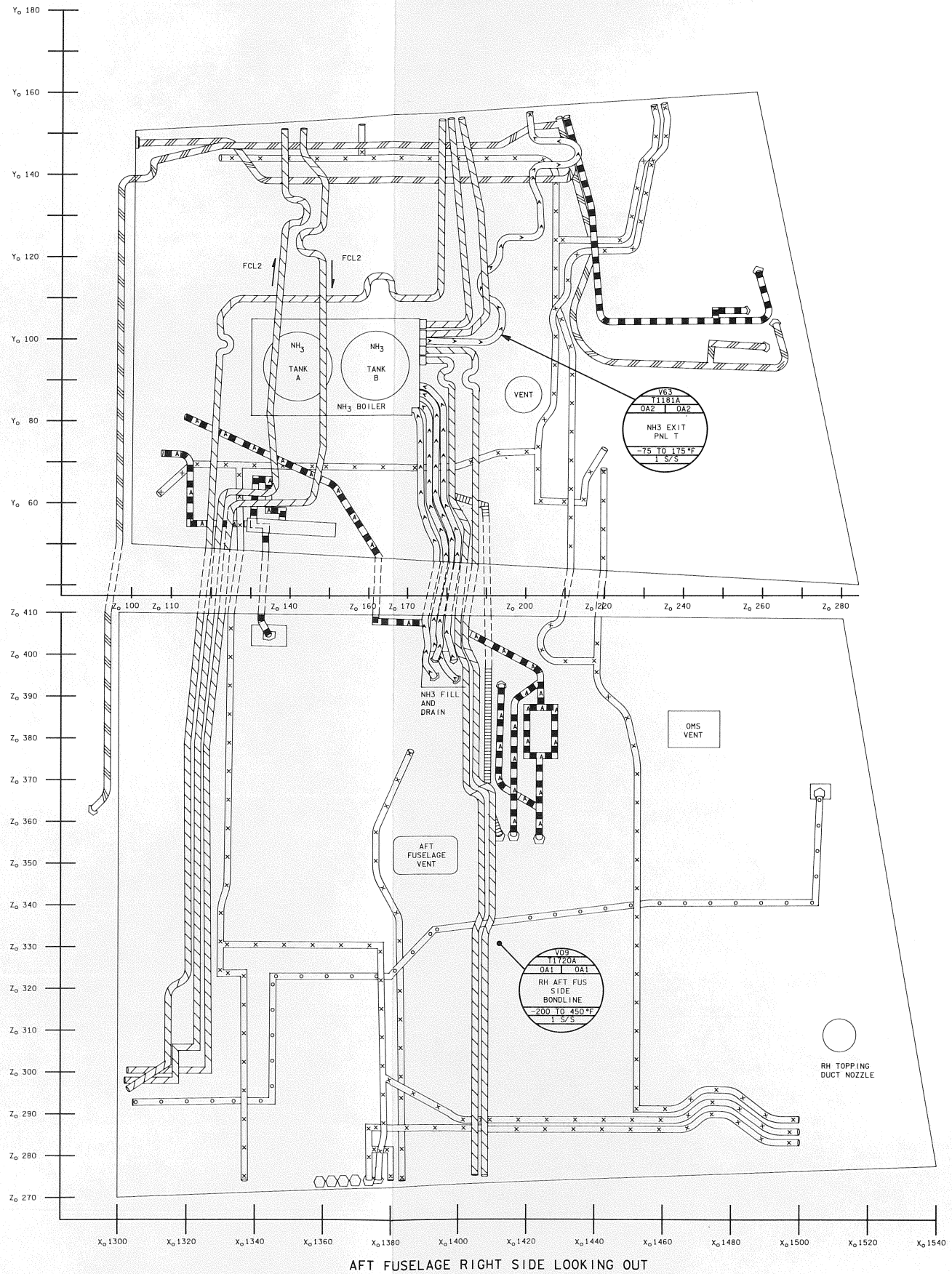


VERTICAL STABILIZER

AFT FUSELAGE SECTIONS

LEGEND

- AMMONIA
- FREON
- OXIDIZER
- OMS FUEL (MMH)
- APU FUEL (HYDRAZINE) A
- HYDRAULIC FLUID X
- HELIUM
- OXYGEN O



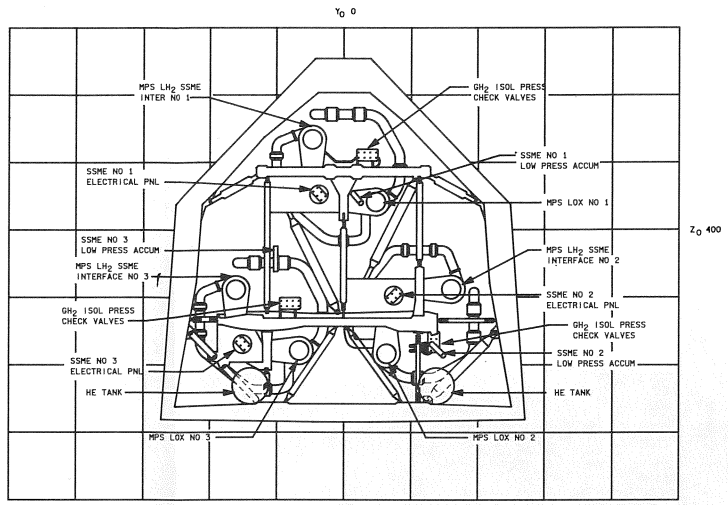
AFT FUSELAGE RIGHT SIDE LOOKING OUT

NOTE: 1. THIS DRAWING IS ONLY APPROXIMATE

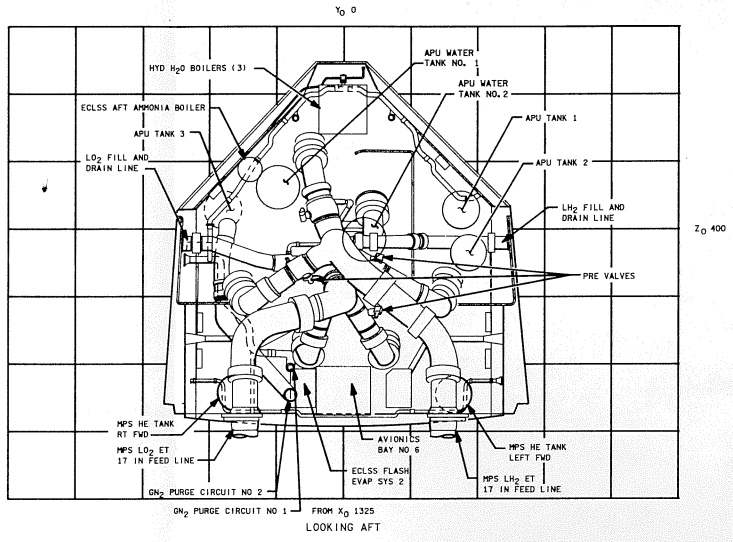
1 WINGS/AFT 6

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN VICTOR ORTIZ		
DR		
ENGR H.K. POHL		STRUCTURES AND SYSTEMS LOCATION
ENGR H. Karl Pohl	9/7/90	
APP D. W. Rice	9/7/90	
APP R.T. Reed	9/7/90	SPACE SHUTTLE / DWG NO 19.1
OMNIPLAN S.L. Lunsford	10-25-90	ALL
LTR E / PCN		121 X 34 / PAGE / SHEET 6 OF 6

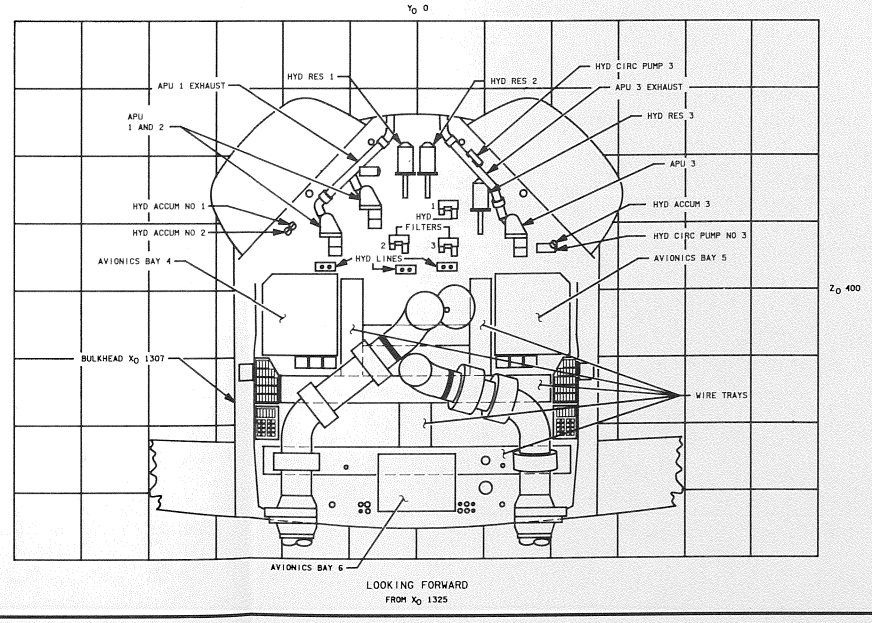
BASIC REV E



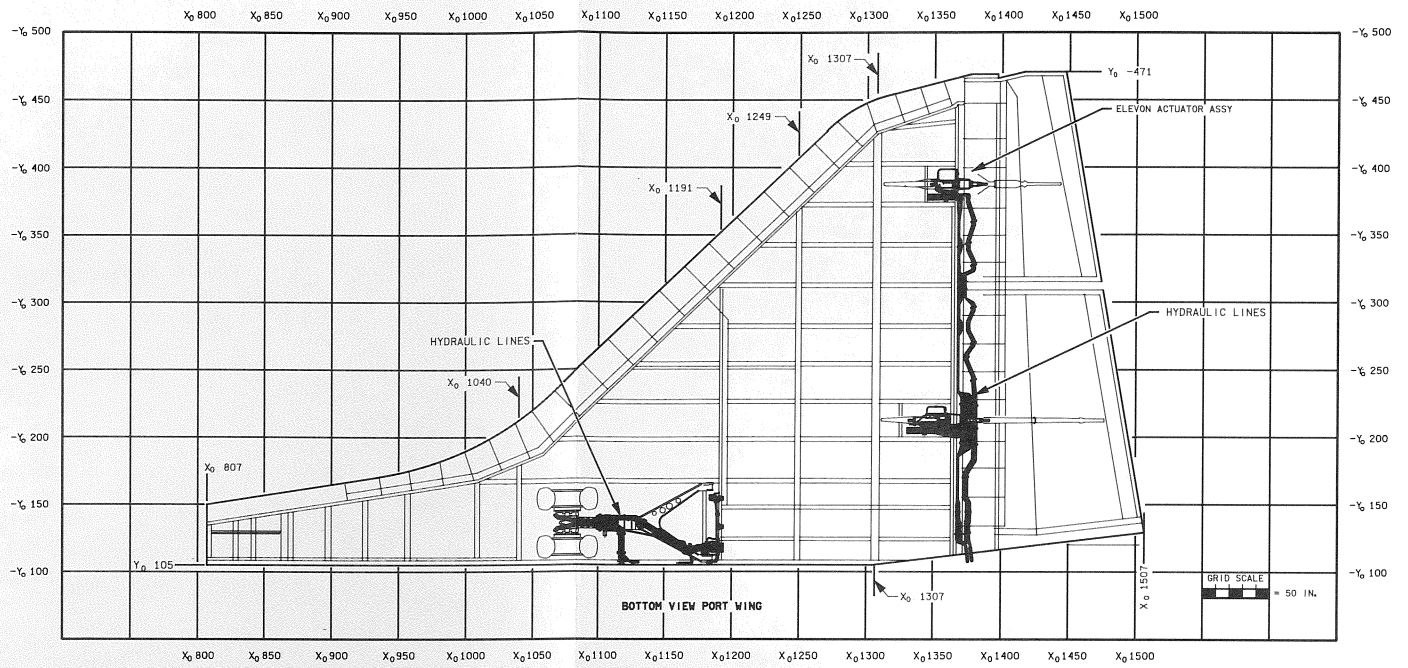
LOOKING AFT
FROM CANTED FRAME STA X_O 1454



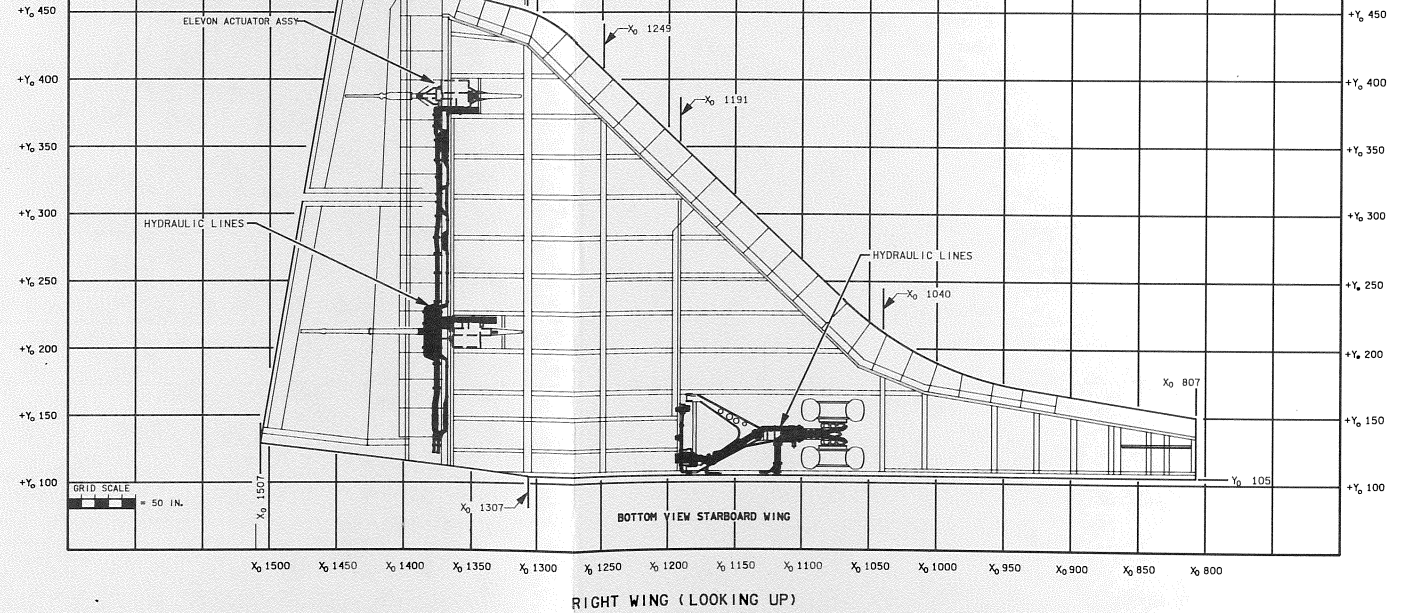
LOOKING AFT



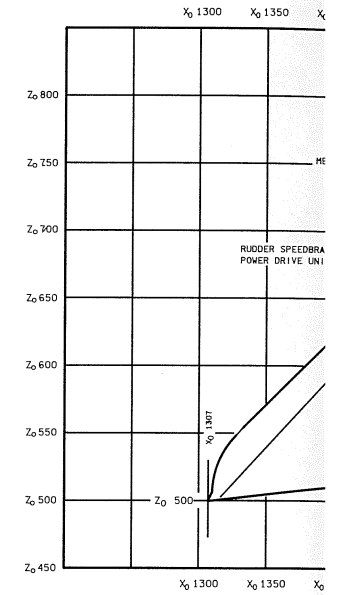
LOOKING FORWARD
FROM X_O 1325



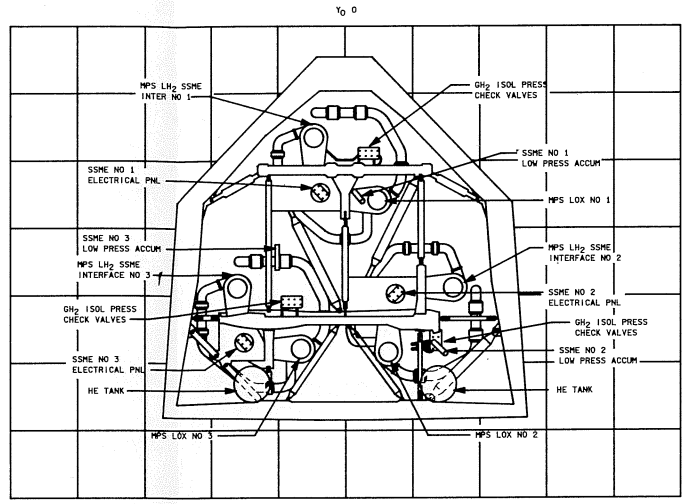
LEFT WING (LOOKING UP)



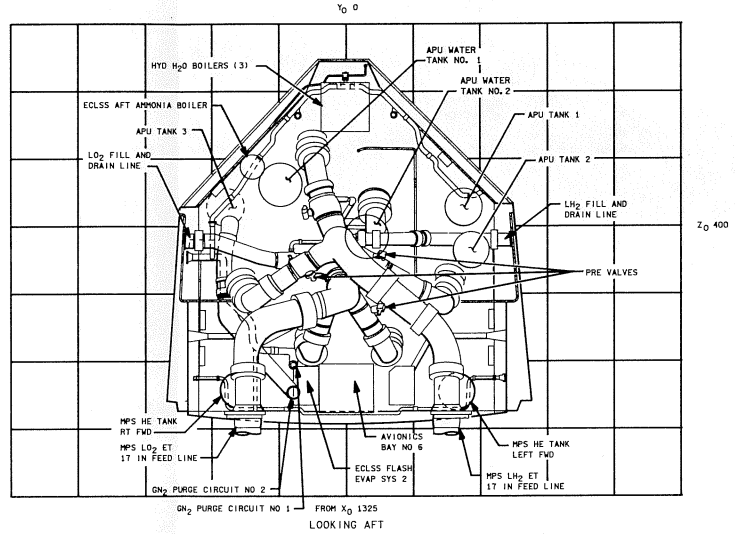
RIGHT WING (LOOKING UP)



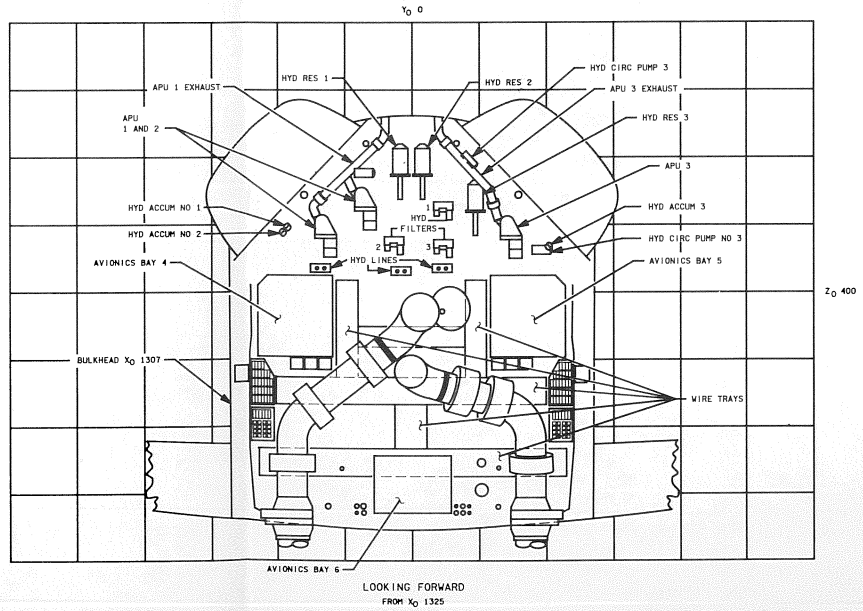
DATE: 05/04/90 | NAME: MDU | VERSION: INR-3



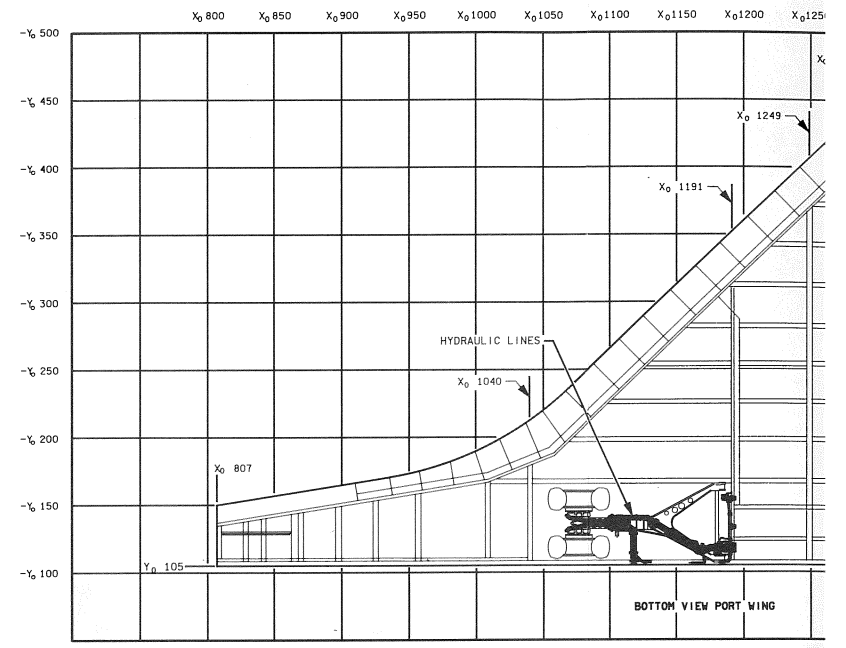
LOOKING AFT
FROM CANTED FRAME STA X_O 1454



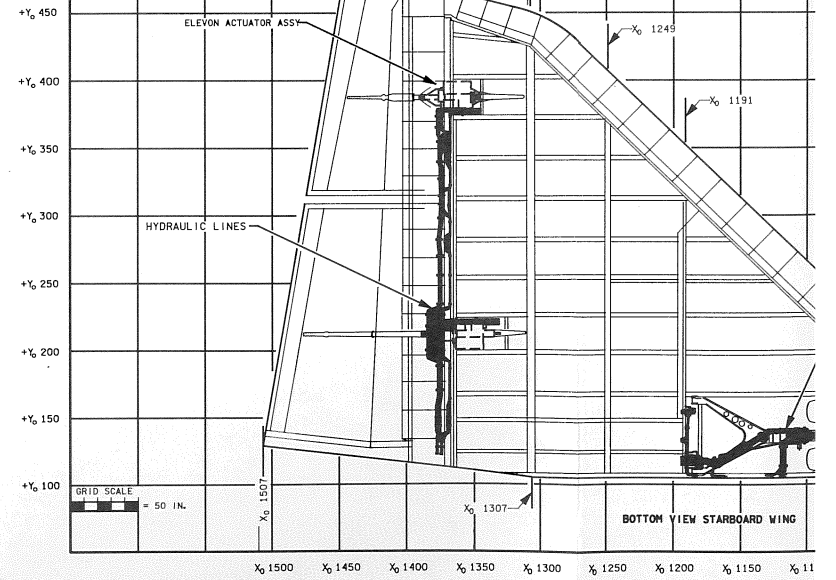
LOOKING AFT



LOOKING FORWARD
FROM X_O 1325

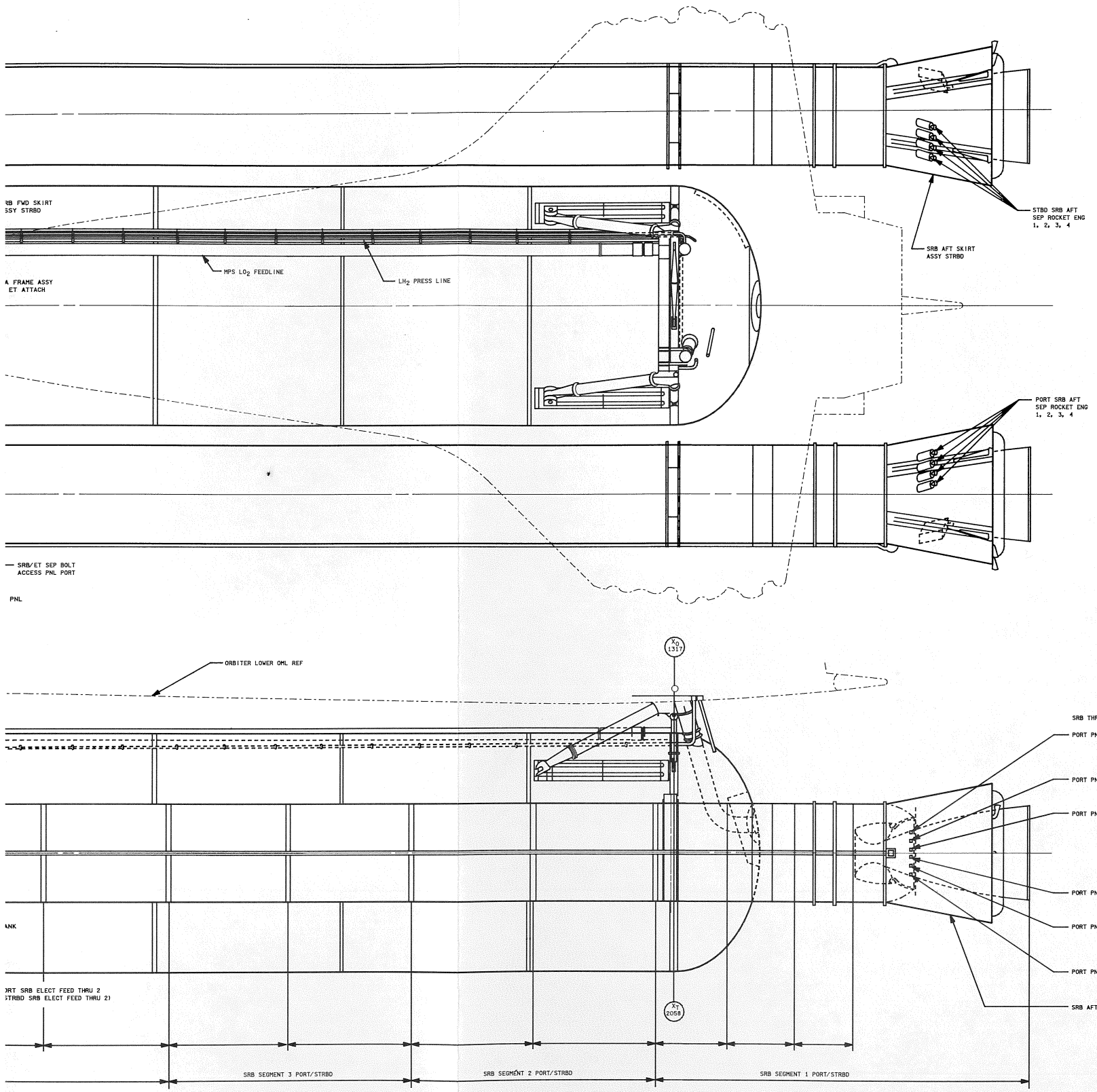


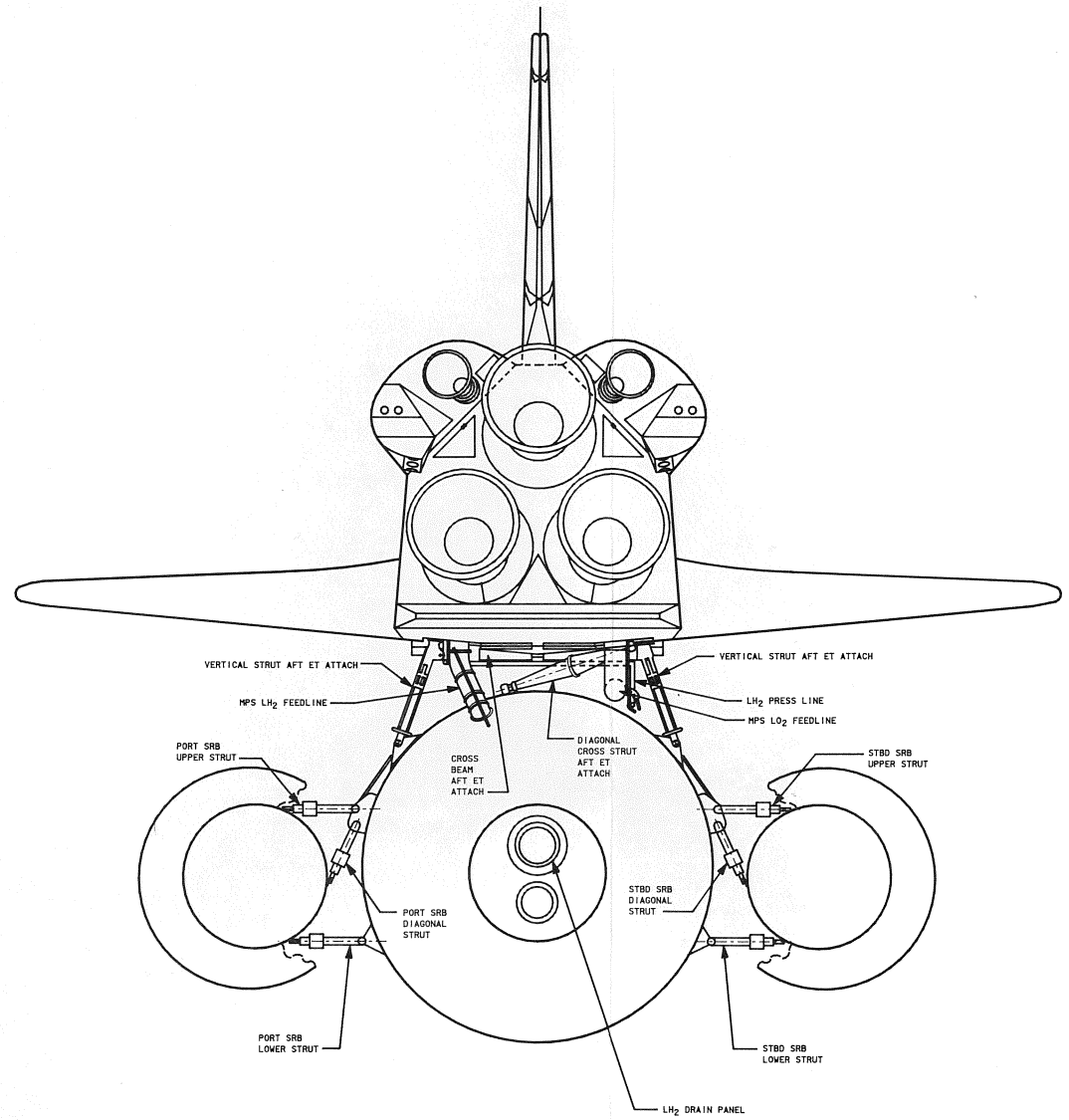
LEFT WING (LOOKING UP)



RIGHT WING (LOOKING UP)

DATE: 11/18/87	NAME: BJT	VERSION: INK: 1
DATE: 08/09/90	NAME: JMB	VERSION: BPT: 2
DATE: 08/17/90	NAME: VSH	VERSION: INK: 2





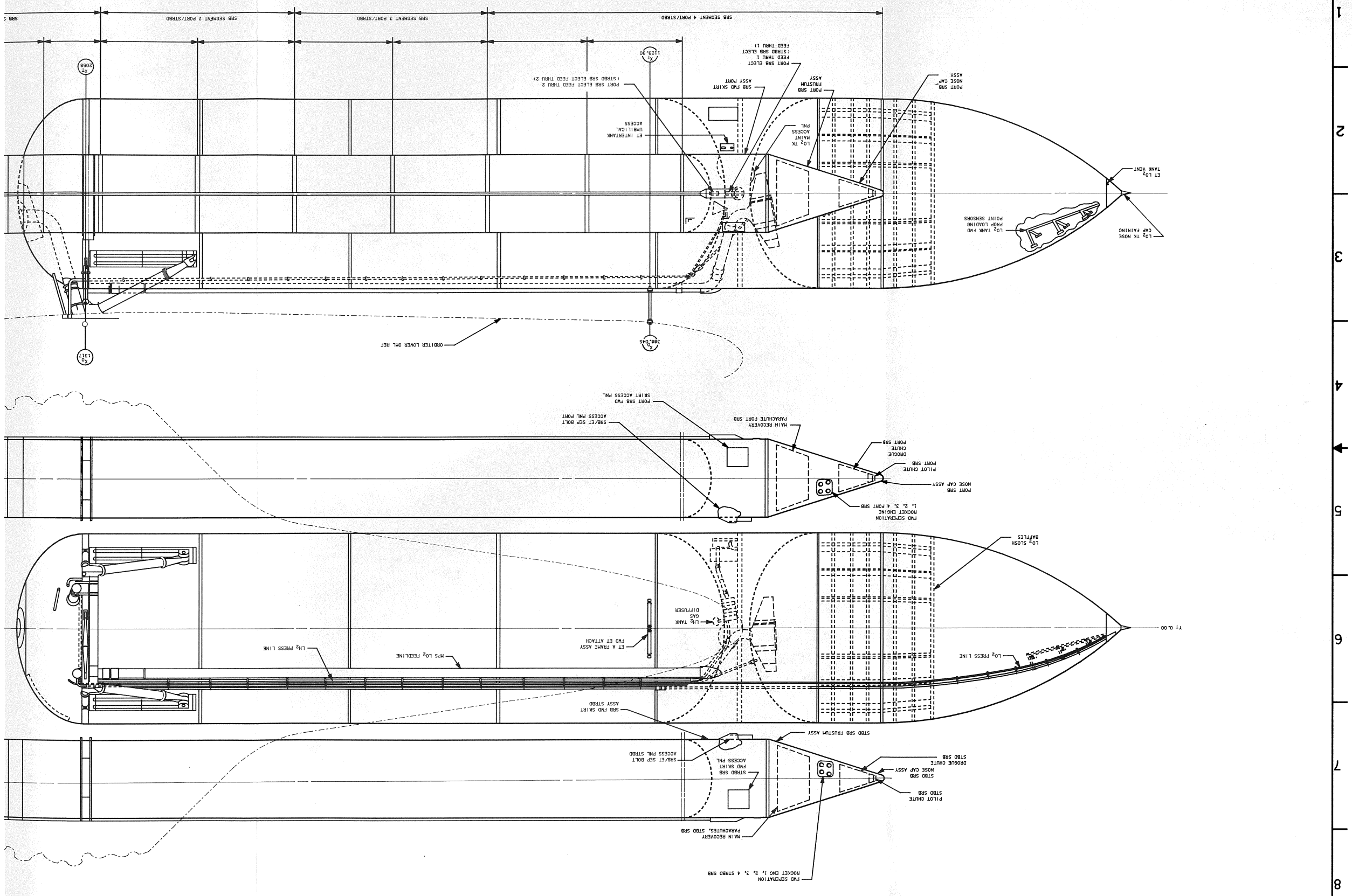
NOTES: 1. THIS DRAWING IS ONLY APPROXIMATE

2 SRB/ET

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN			
DR VICTOR J. HOISINGTON		1/8/80	SRB/ET CONFIGURATION
ENGR N.D. KNIGHT			
ENGR		8/24/90	
APP		8/24/90	
APP		8/24/90	SPACE SHUTTLE / DWG NO 19.2
OMNIPLAN		10-25-90	ALL
LTR E	PCN		82.5 X 34 / PAGE / SHEET 1 OF 1

BASIC REV E

BASIC REV E

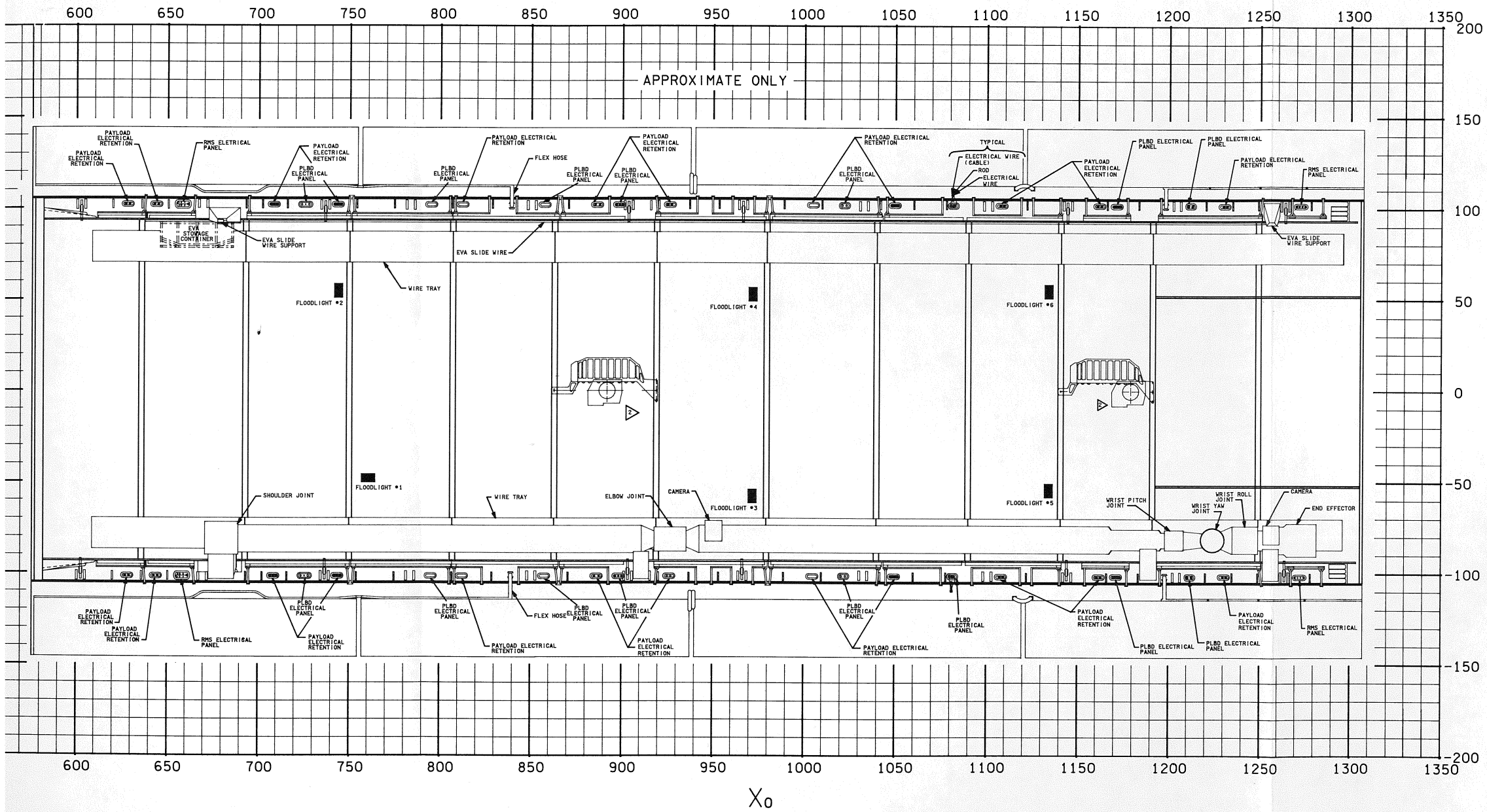


DATE	NAME	VERSION
08/17/90	VSH	NM4-2

H J I K L M N O

1 2 3 4 5 6 7 8

DATE: 05/05/87	NAME: MFB	VERSION: INK 8
DATE: 09/24/87	NAME: MPM	VERSION: INK 9
DATE: 08/22/90	NAME: MDU	VERSION: INK 10



TYPICAL PAYLOAD KEEL FITTING CONFIGURATION. A PAYLOAD KEEL FITTING CAN BE INSERTED BETWEEN SUCCESSIVE FRAMES AS PARTICULAR FLIGHT DICTATES.

NOTES: 1. THIS DRAWING IS ONLY APPROXIMATE

(TOP LOOKING DOWN)

3 PLB OVERVIEW

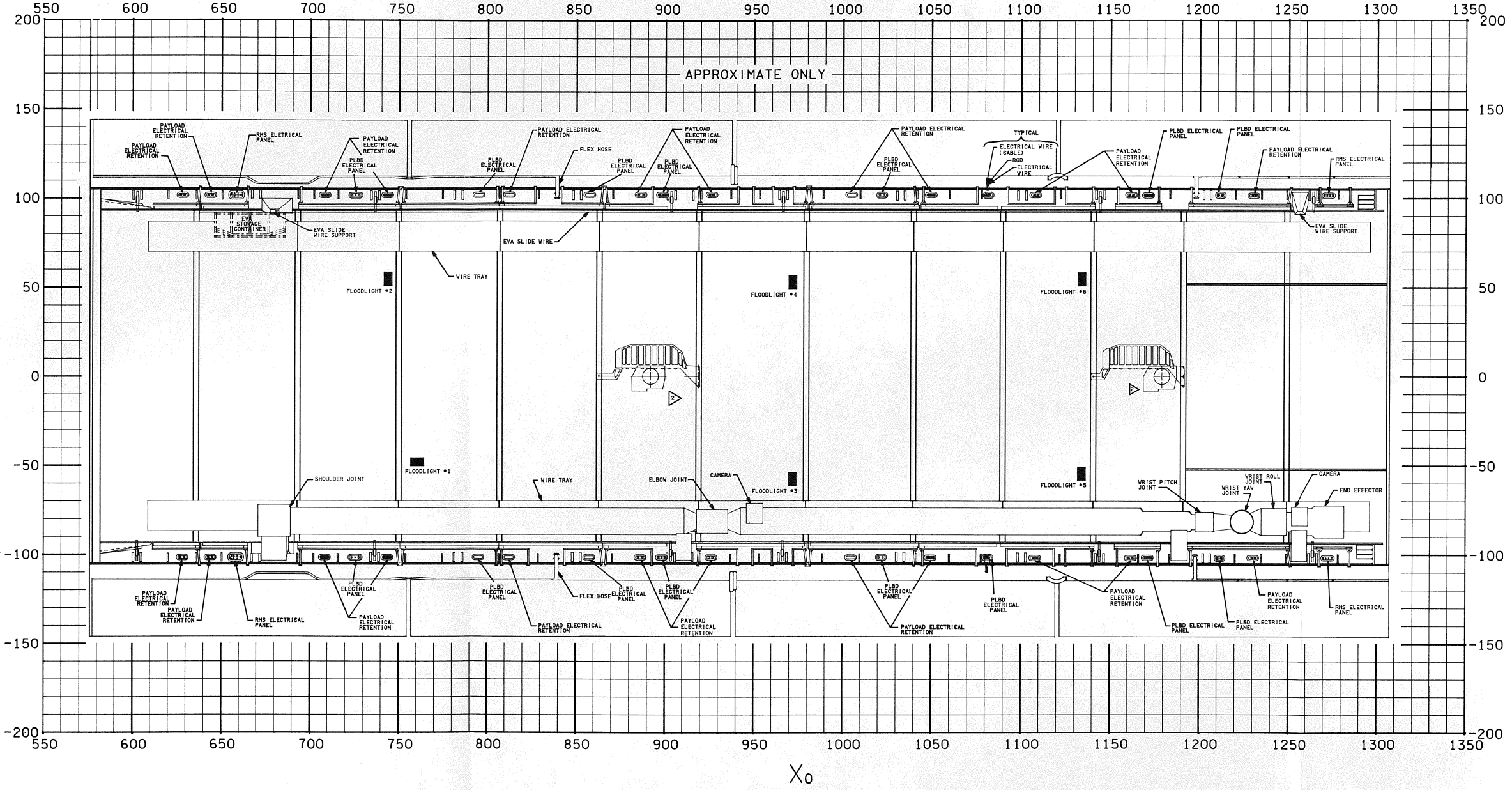
SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	PAUL KETTLER	7/1/81	
DR	PAUL KETTLER	7/1/81	
ENGR	H.K. POHL		PAYLOAD BAY OVERVIEW (LOOKING INBOARD AND DOWN)
ENGR	H. Karl Pohl	9/4/90	
APP	[illegible]	7 Sept 90	
APP	R T Neal	9/7/90	SPACE SHUTTLE
OMNIPLAN	S.K. Kimmell	10-25-90	ALL
LTR E	PEN		66 X 34

DWG NO 19.3

PAGE SHEET 1 OF 3

BASIC REV E

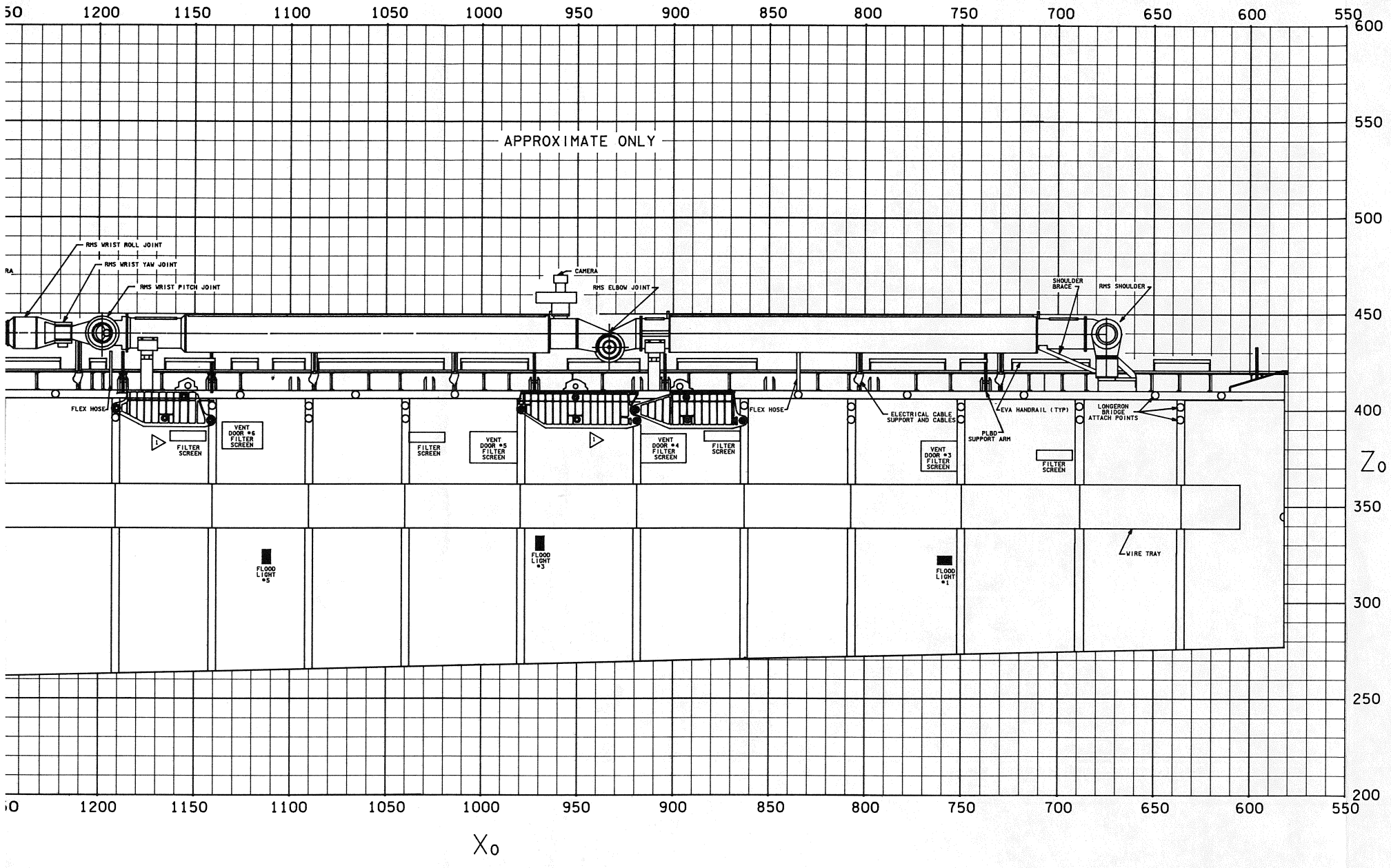
APPROXIMATE ONLY

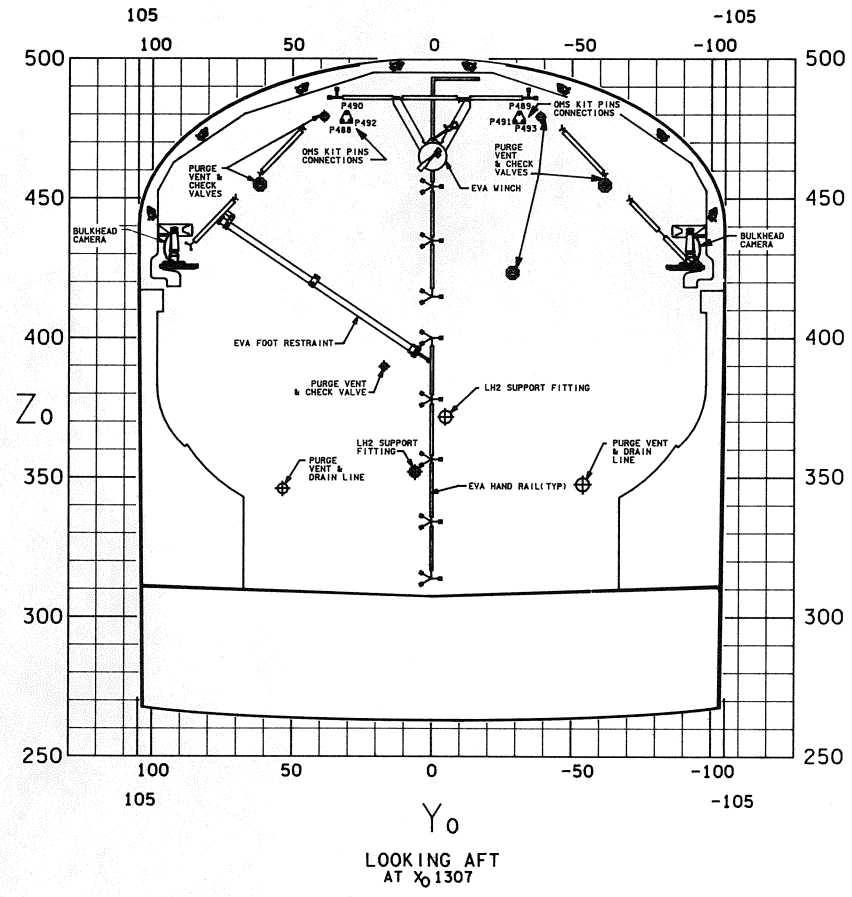


BASIC REV E

DATE: 05/04/87	NAME: MDU	VERSION: INK: 7
DATE: 05/28/87	NAME: MDU	VERSION: INK: 8
DATE: 05/28/87	NAME: MDU	VERSION: INK: 9

P/L BAY PORT SIDE
(LOOKING OUTBOARD)





LOOKING AFT
AT X_0 1307

NOTES: 1. TYPICAL PAYLOAD LONGERON BRIDGE CONFIGURATION. PAYLOAD LONGERON BRIDGES CAN BE LOCATED BETWEEN ADJACENT FRAMES
2. THIS DRAWING IS ONLY APPROXIMATE

PORT SIDE

3 P/L BAY 2

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN THOMAS LEINERS		7/13/81		
DR JACK HEBERLIG JR.		7/27/81	PAYLOAD BAY OVERVIEW PORT SIDE	
ENGR H. K. POHL				
ENGR		9/6/90		
APP		9/6/90		
APP R.T. Neal		9/7/90	SPACE SHUTTLE	DWG NO 19.3
OMNIPLAN		10-25-90	ALL	
LTR E	PCN		66 X 34	PAGE SHEET 2 OF 3

BASIC REV E

P/L BAY PORT SIDE
(LOOKING OUTBOARD)

APPROXIMATE ONLY

RMS WRIST ROLL JOINT
RMS WRIST YAW JOINT
RMS WRIST PITCH JOINT
RMS END EFFECTOR
CAMERA
CAMERA
RMS ELBOW JOINT
SHOULDER BRACE
RMS SHOULDER
FLEX HOSE
FLEX HOSE
ELECTRICAL CABLE SUPPORT AND CABLES
EVA HANDRAIL (TYP)
PLBD SUPPORT ARM
LONGERON BRIDGE ATTACH POINTS
OMS KIT P/L FUEL PANEL PRE. MPS HE FILL PANEL
FILTER SCREEN
VENT DOOR #6 FILTER SCREEN
FILTER SCREEN
VENT DOOR #5 FILTER SCREEN
VENT DOOR #4 FILTER SCREEN
FILTER SCREEN
VENT DOOR #3 FILTER SCREEN
FILTER SCREEN
FLOOD LIGHT #5
FLOOD LIGHT #3
FLOOD LIGHT #1
WIRE TRAY

1350 1300 1250 1200 1150 1100 1050 1000 950 900 850 800 750 700 650 600 550 X_0

600 550 500 450 400 350 300 250 200 Z_0

105 100 500 450 400 350 300 250 Z_0

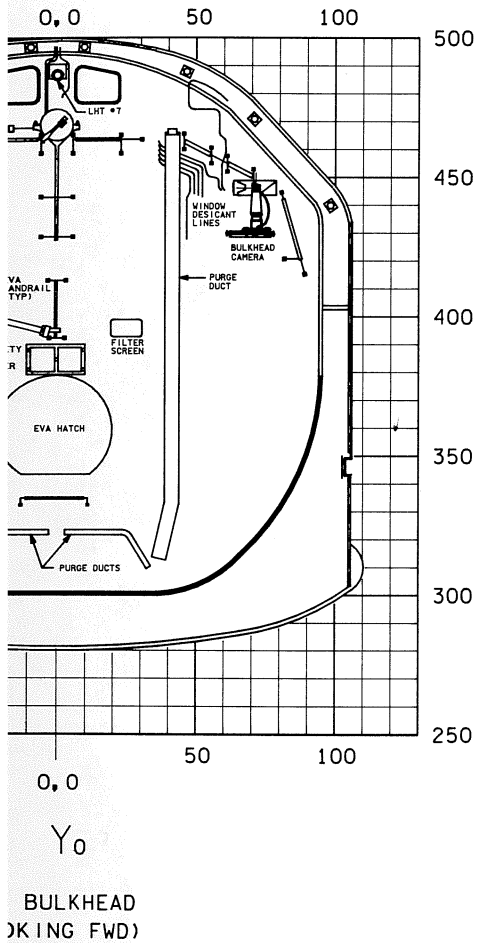
PURGE VENT & CHECK VALVES
BULKHEAD CAMERA
EVA

100 105

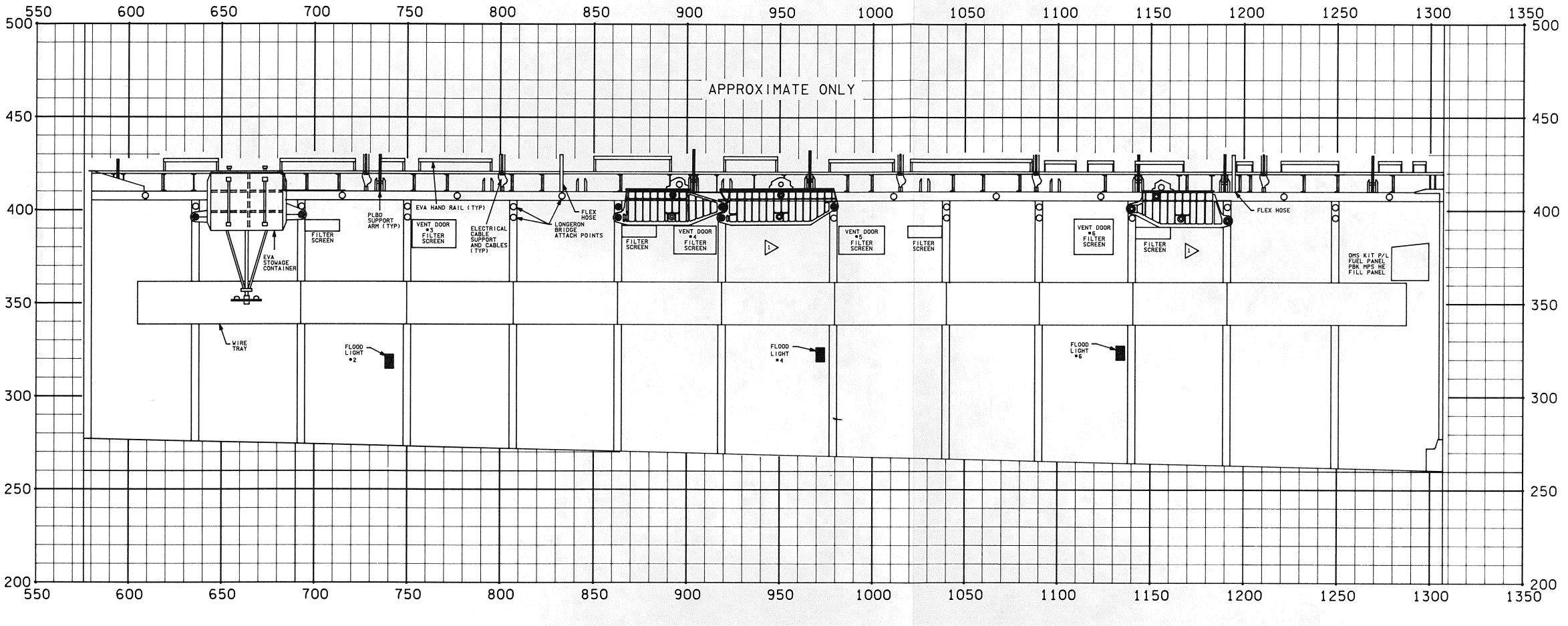
BASIC REV E

DATE: 05/05/87	NAME: MPH	VERSION: INK. 6
DATE: 05/29/87	NAME: MDU	VERSION: INK. 7
DATE: 08/22/90	NAME: MDU	VERSION: INK. 8

P/L BAY STARBOARD SIDE
(LOOKING OUTBOARD)



BULKHEAD
)KING FWD)



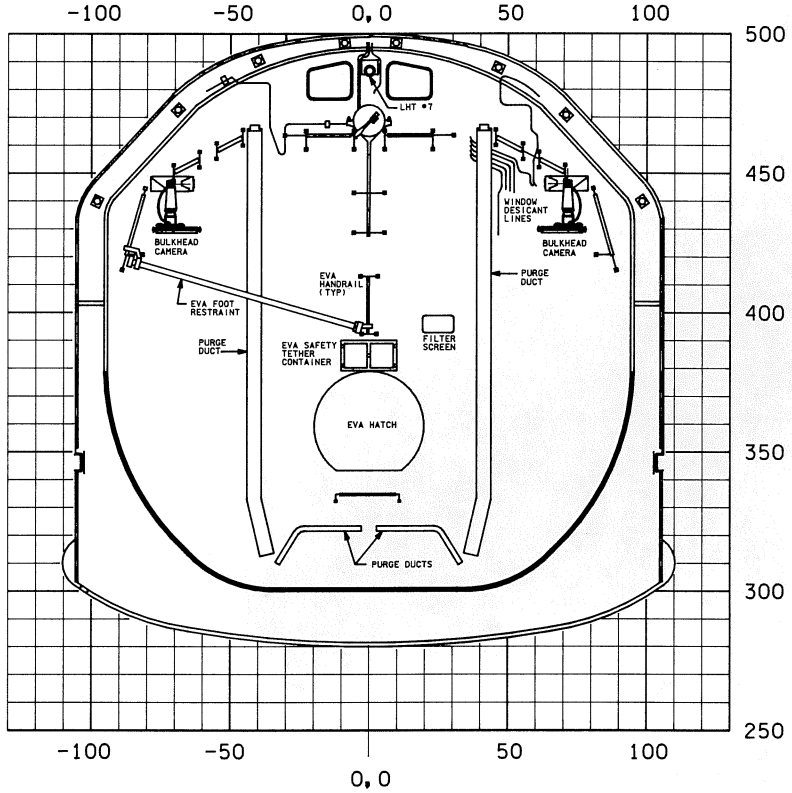
NOTES:
1. ▷ TYPICAL PAYLOAD LONGERON BRIDGE CONFIGURATION. PAYLOAD LONGERON BRIDGES CAN BE LOCATED BETWEEN ADJACENT FRAMES
2. THIS DRAWING IS ONLY APPROXIMATE

STARBOARD SIDE

3 PLB OV 3

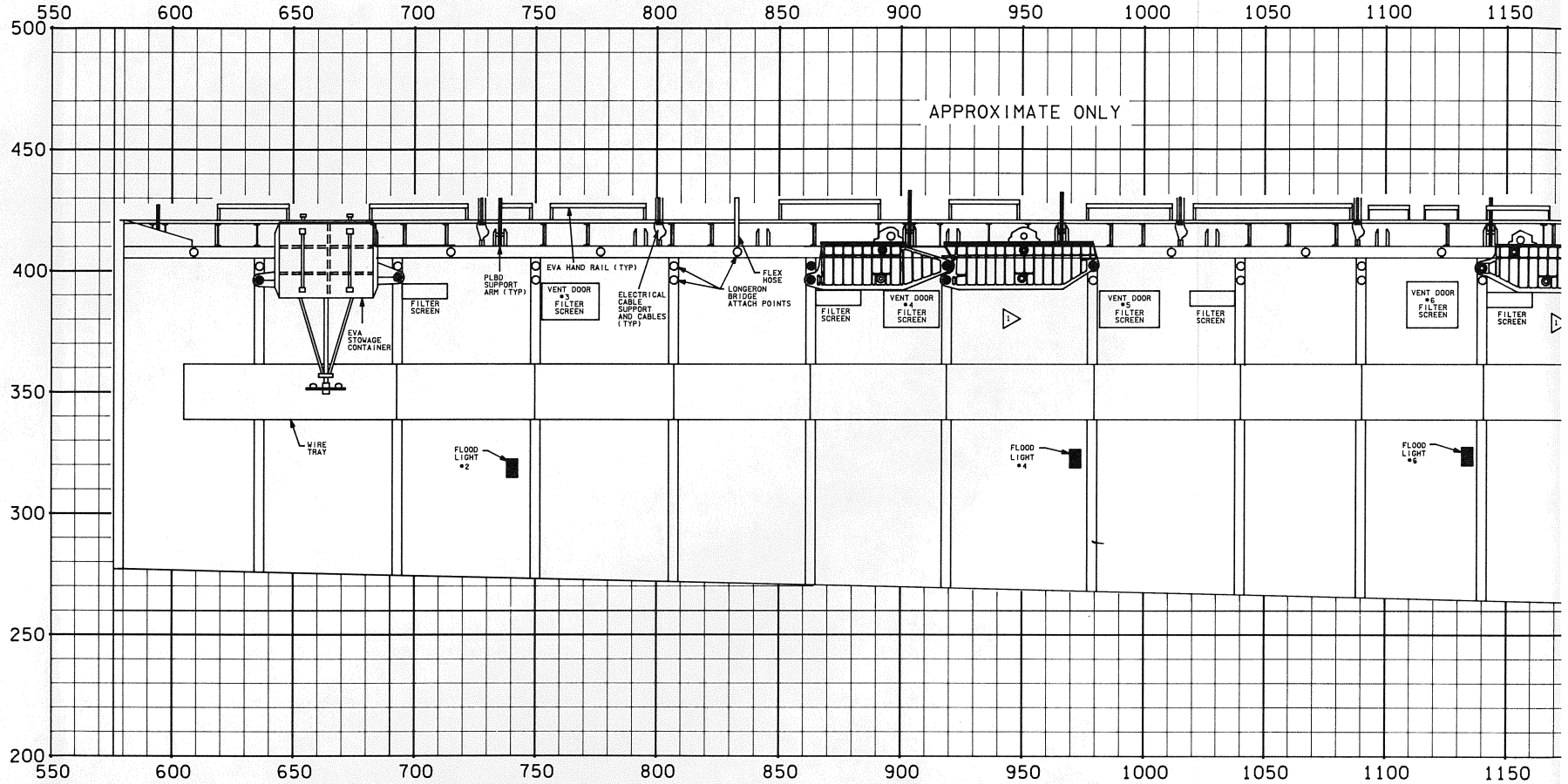
SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	MIKE BECKER	3/6/81	
DR			
ENGR	H.K. POHL		PAYLOAD BAY OVERVIEW STARBOARD SIDE
ENGR	H.K. Pohl	9/6/90	
APP	[illegible]	9 Sept 90	
APP	K.T. Paul	9/7/90	SPACE SHUTTLE / DWG NO 19.3
OMNIPLAN	S.S. Lumpkin		ALL
LTR	E	PCN	66 X 34 / PAGE / SHEET 3 OF 3

BASIC REV E



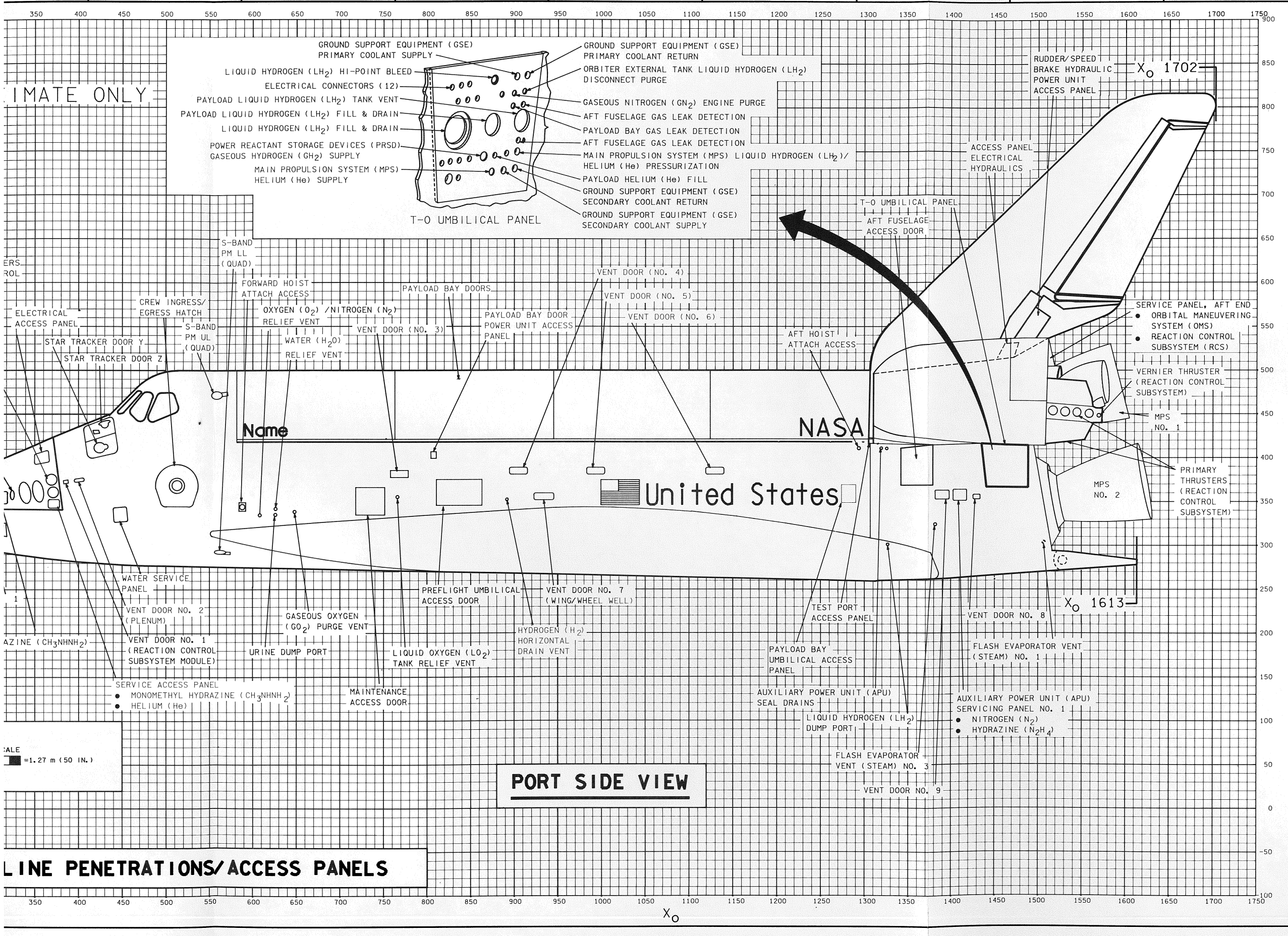
582 BULKHEAD
(LOOKING FWD)

P/L BAY STARBOARD SIDE
(LOOKING OUTBOARD)



BASIC REV E

DATE:	10/19/87	NAME:	MAG	VERSION:	BPT. 4
DATE:	10/30/87	NAME:	MDU	VERSION:	INK 1
DATE:	08/16/90	NAME:	JMB	VERSION:	INK 2



IMATE ONLY

LINE PENETRATIONS/ACCESS PANELS

NOTE: THIS DRAWING IS ONLY APPROXIMATE

4 EXT SIDES

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS	
DSGN MIKE BECKER	10/14/87		
DR		EXTERNAL SIDE VIEWS	
ENGR W. KARL POHL			
ENGR W. Karl Pohl	9/6/90		
APP [illegible]	7-Sep-90	SPACE SHUTTLE	DWG NO 19.4
APP R.T. Neal	9/7/90	ALL	
OMNIPLAN S.K. Limited	10-25-90	126.5 X 34	SHEET 1 OF 3
LTR E	PCN		

BASIC REV E

T S R Q P O N M L K J

1300 1250 1200 1150 1100 1050 1000 950 900 850 800 750 700 650 600 550 500 450 400 350 300 250 200

900 850 800 750 700 650 600 550 500 450 400 350 300 250 200 150 100 50 0 -50 -100

Z_O

X_O

APPROXIMATE ONLY

PAYLOAD HELIUM (He) FILL
MPS LIQUID OXYGEN (LO_2) PREPRESSURIZATION
AFT FUSELAGE PURGE
MPS LIQUID OXYGEN (LO_2) BLEED
MIDFUSELAGE & PAYLOAD BAY PURGE
PRSD GASEOUS OXYGEN (GO_2) SUPPLY
FWD FUSELAGE & OMS POD PURGE
ORBITER EXTERNAL TANK DISCONNECT PURGE
ELECTRICAL CONNECTORS (12)
LIQUID OXYGEN (LO_2) FILL & DRAIN
PAYLOAD LIQUID OXYGEN (LO_2) FILL & DRAIN
SPARE
PAYLOAD GROUND COOLANT SUPPLY
PAYLOAD GROUND COOLANT RETURN

T-O UMBILICAL PANEL

1. PUSH BUTTON TO OPEN DOOR
2. SQUEEZE AND PULL 'T' HANDLE TO JETTISON EGRESS WINDOW
OVERHEAD
RESCUE
PRESS
HERE

AFT END
NEUVERING
1S)
CONTROL
(RCS)

AMMONIA (NH3) SERVICING PANEL
TEST PORT ACCESS PANEL
AFT HOIST ATTACH ACCESS
VENT DOOR NO. 6
VENT DOOR NO. 5
PAYLOAD BAY DOORS
VENT DOOR NO. 4
PAYLOAD BAY DOOR POWER UNIT ACCESS
VENT DOOR NO. 3
S-BAND PM UR (QUAD)
ELECTRICAL DISCONNECT PANEL
PRIMARY THRUSTERS (REACTION CONTROL SUBSYSTEM)
NITROGEN TETROXIDE(N_2O_4) RELIEF VENT
AIR DATA SENSOR PROBE
X_O 236
VENT DOOR NO. 2 (PLENUM)
VENT DOOR NO. 1 (REACTION CONTROL SUBSYSTEM)
FORWARD HOIST ATTACH ACCESS
S-BAND PM LR (QUAD)
PURGE AND DRAIN ACCESS PANEL
• NITROGEN TETROXIDE(N204)
• HELIUM(He)
VERNIER THRUSTER (REACTION CONTROL SUBSYSTEM)
SERVICING ACCESS PANEL
• NITROGEN TETROXIDE(N204)
• HELIUM(He)
GROUND EMERGENCY ESCAPE PANEL JETTISON T-HANDLE ACCESS
PAYLOAD BAY UMBILICAL ACCESS PANEL
MAINTENANCE ACCESS PANEL
GASEOUS HYDROGEN (GH2) RELIEF VENT
GASEOUS HYDROGEN (GH2) RELIEF VENT
VENT DOOR NO. 7 (WING/WHEEL WELL)
GASEOUS HYDROGEN (GH2) PURGE PORT
OXYGEN (O2) HORIZONTAL DRAIN
WATER (H2O) RELIEF VENT
USELAGE
SS DOOR
UNIT (APU)
SEAL DRAIN

NASA
Name
United States

STARBOARD SIDE VIEW

SS PANELS

APPROXIMATE ONLY

PRIMARY THRUSTERS (REACTION CONTROL SUBSYSTEM)
ELECTRICAL ACCESS PANEL
STAR TRACKER DOOR Y
STAR TRACKER DOOR Z
VERNIER THRUSTER (REACTION CONTROL SYSTEM)
MONOMETHYL HYDRAZINE (CH_3NHNH_2)
TANK RELIEF VENT
X_O 236
AIR DATA SENSOR NO. 1
PURGE AND DRAIN ACCESS PANEL
• MONOMETHYL HYDRAZINE (CH_3NHNH_2)
• HELIUM (He)
WATER SERVICE PANEL
VENT DOOR NO
(PLENUM)
VENT DOOR NO
(REACTION CO
SUBSYSTEM
SERVICE ACCESS
• MONOMETHYL
• HELIUM (He)

GRID SCALE
=1.27 m (50 IN.)

MOLDLINE PENETRATIO

MOLDLINE PENETRATIONS/ACCESS PANELS

STARBOARD SIDE VIEW

APPROXIMATE ONLY

NASA

Name

United States

X_o 1702

X_o 1613

X_o 236

Z_o

X_o

PAYLOAD HELIUM (He) FILL
MPS LIQUID OXYGEN (LO_2) PREPRESSURIZATION
AFT FUSELAGE PURGE
MPS LIQUID OXYGEN (LO_2) BLEED
MIDFUSELAGE & PAYLOAD BAY PURGE
PRSD GASEOUS OXYGEN (GO_2) SUPPLY
FWD FUSELAGE & OMS POD PURGE
ORBITER EXTERNAL TANK DISCONNECT PURGE
ELECTRICAL CONNECTORS (12)
LIQUID OXYGEN (LO_2) FILL & DRAIN
PAYLOAD LIQUID OXYGEN (LO_2) FILL & DRAIN
SPARE
PAYLOAD GROUND COOLANT SUPPLY
PAYLOAD GROUND COOLANT RETURN

T-O UMBILICAL PANEL

1. PUSH BUTTON TO OPEN DOOR
2. SQUEEZE AND PULL "T" HANDLE TO JETTISON EGRESS WINDOW

OVERHEAD
RESCUE
PRESS
HERE

SERVICE PANEL, AFT END
- ORBITAL MANEUVERING SYSTEM (OMS)
- REACTION CONTROL SUBSYSTEM (RCS)

RUDDER/SPEED BRAKE HYDRAULIC POWER UNIT ACCESS PANELS
ACCESS PANEL
- ELECTRICAL
- HYDRAULICS

VERNIER THRUSTER (REACTION CONTROL) SUBSYSTEM
MPS NO. 1
MPS NO. 3
PRIMARY THRUSTERS (REACTION CONTROL) SUBSYSTEM
FLASH EVAPORATOR VENT (STEAM) NO. 2
VENT DOOR NO. 8
AUXILIARY POWER UNIT (APU) SERVICING PANEL NO. 2
- NITROGEN (N_2)
- HYDRAZINE(N_2H_4)

VENT DOOR NO. 9
LIQUID OXYGEN (LO2) RELIEF VENT
AFT FUSELAGE ACCESS DOOR
AUXILIARY POWER UNIT (APU) SEAL DRAIN
PAYLOAD BAY UMBILICAL ACCESS PANEL
AMMONIA (NH3) SERVICING PANEL
TEST PORT
ACCESS PANEL
AFT HOIST ATTACH ACCESS
MAINTENANCE ACCESS PANEL
GASEOUS HYDROGEN (GH2) RELIEF VENT
VENT DOOR NO. 7 (WING/WHEEL WELL)
VENT DOOR NO. 6
VENT DOOR NO. 5
VENT DOOR NO. 4
VENT DOOR NO. 3
PAYLOAD BAY DOORS
PAYLOAD BAY DOOR POWER UNIT ACCESS
GASEOUS HYDROGEN (GH2) RELIEF VENT
OXYGEN (O2) HORIZONTAL DRAIN
GASEOUS HYDROGEN (GH2) PURGE PORT
WATER (H2O) RELIEF VENT
S-BAND PM UR (QUAD)
S-BAND PM LR (QUAD)
ELECTRICAL DISCONNECT PANEL
PRIMARY THRUSTERS (REACTION CONTROL SUBSYSTEM)
NITROGEN TETROXIDE(N_2O_4) RELIEF VENT
AIR DATA SENSOR PROBE
VENT DOOR NO. 2 (PLENUM)
VENT DOOR NO. 1 (REACTION CONTROL SUBSYSTEM)
FORWARD HOIST ATTACH ACCESS
PURGE AND DRAIN ACCESS PANEL
- NITROGEN TETROXIDE(N204)
- HELIUM(He)

SERVICING ACCESS PANEL
- NITROGEN TETROXIDE(N204)
- HELIUM(He)

VERNIER THRUSTER (REACTION CONTROL SUBSYSTEM)
GROUND EMERGENCY ESCAPE PANEL JETTISON T-HANDLE ACCESS

GRID SCALE
=1.27 m (50 IN.)

BASIC REV E

DATE: 09/30/87	NAME: TMW	VERSION: BPT$_X$ 4
DATE: 10/20/87	NAME: VCO	VERSION: INK$_X$ 1
DATE: 08/16/90	NAME: JMB	VERSION: INK$_X$ 2

APPROXIMATE ONLY

BOTTOM VIEW

S-BAND PM LL (QUAD)
S-BAND FM LOWER (HEMI)
NO. 1 RAD ALT REC
NO. 1 RAD ALT TRANSMITTER
TACAN 1 LOWER
TACAN 3 LOWER
MAIN LANDING GEAR DOORS
ORBITER EXTERNAL TANK AFT ATTACH POINT
JACK PAD
LIQUID HYDROGEN (LH2) UMBILICAL DISCONNECTS
EXTERNAL TANK SEPARATION SUBSYSTEM CLOSEOUT DOOR NO. 1 (OPEN POSITION)
X_0 1702
X_0 1613
EXTERNAL TANK SEPARATION SUBSYSTEM CLOSEOUT DOOR NO. 2 (OPEN POSITION)
LIQUID OXYGEN (LO_2) UMBILICAL DISCONNECTS
JACK PAD
ORBITER EXTERNAL TANK AFT ATTACH POINT
TACAN 2 LOWER
NO. 2 RAD ALT TRANSMITTER
NO. 2 RAD ALT REC
S-BAND PM LR (QUAD)

ERNAL TANK
ACH POINT
ACCESS
236

GRID SCALE
=1.27 cm (50 IN.)

INE PENETRATIONS/ACCESS PANELS

X_0

NOTES: 1. THIS DRAWING IS ONLY APPROXIMATE

*4 TOP/BOTTOM

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN TOM LENERS	10/16/81	
DR		
ENGR H. KARL POHL		EXTERNAL VIEWS TOP/BOTTOM
ENGR	11/6/90	
APP	7-24-90	
APP	9/7/90	SPACE SHUTTLE / DWG NO 19.4
OMNIPLAN	10-25-90	ALL
LTR E	PCN	126.5 X 34 / PAGE / SHEET 2 OF 3

BASIC REV E

APPROXIMATE ONLY

BOTTOM VIEW

S-BAND PM LL (QUAD)
S-BAND FM LOWER (HEMI)
NO. 1 RAD ALT REC
NO. 1 RAD ALT TRANSMITTER
TACAN 1 LOWER
TACAN 3 LOWER
MAIN LANDING GEAR DOORS
ORBITER EXTERNAL TANK FORWARD ATTACH POINT
NOSE LANDING GEAR DOORS
UHF ANTENNA AND ANTENNA ACCESS
TACAN 2 LOWER
X_0 236
NO. 2 RAD ALT TRANSMITTER
NO. 2 RAD ALT REC
S-BAND PM LR (QUAD)
ORBITER EXTERNAL TANK AFT ATTACH POINT
JACK PAD
LIQUID HYDROGEN (LH_2) UMBILICAL DISCONNECTS
EXTERNAL TANK SEPARATION SUBSYSTEM CLOSEOUT DOOR NO. 1 (OPEN POSITION)
X_0 1702
X_0 1613
EXTERNAL TANK SEPARATION SUBSYSTEM CLOSEOUT DOOR NO. 2 (OPEN POSITION)
LIQUID OXYGEN (LO_2) UMBILICAL DISCONNECTS
JACK PAD
ORBITER EXTERNAL TANK AFT ATTACH POINT

GRID SCALE
=1.27 cm (50 IN.)

MOLDLINE PENETRATIONS/ACCESS PANELS

Y_0
X_0

MOLDLINE PENETRATIONS/ACCESS PANELS

APPROXIMATE ONLY

TOP VIEW

USA

- AUXILIARY POWER UNIT (APU) EXHAUST PORT NO. 3
- AUXILIARY POWER UNIT (APU) EXHAUST PORT NO. 1
- AUXILIARY POWER UNIT (APU) EXHAUST PORT NO. 2
- ELEVON SEAL PANELS (TYPICAL)
- WATER SPRAY BOILER VENT NO. 3, NO. 1, NO. 2
- AMMONIA (NH_3) VENT
- PRESSURANT CHECKOUT SERVICE PANEL, AFT END
  - ORBITAL MANEUVERING SYSTEM (OMS)
  - REACTION CONTROL SUBSYSTEM (RCS)
- MPS ENGINE NO. 3
- MPS ENGINE NO. 1
- MAIN PROPULSION SYSTEM (MPS) ENGINE NO. 2
- ORBITAL MANUEVERING SYSTEM (OMS)
- PRIMARY THRUSTERS (REACTION CONTROL SUBSYSTEM)
- LIQUID HYDROGEN (LH_2) EMERGENCY RELIEF VENT
- ACCESS PANELS
  - ORBITAL MANUEVERING SYSTEM (OMS)
  - REACTION CONTROL SUBSYSTEM (RCS)
  (RIGHT HAND TYPICAL)
- EMERGENCY EGRESS WINDOW (OBSERVATION WINDOW)
- ELECTRICAL DISCONNECT ACCESS PANEL
- S-BAND PM UR (QUAD)
- OBSERVATION WINDOW
- S-BAND PAYLOAD
- RENDEZVOUS LIGHT
- S-BAND FM UPPER (HEMI)
- TACAN 3 UPPER
- TACAN 2 UPPER
- Ku-BAND MSBLS 2
- Ku-BAND MSBLS 3
- K-BAND MSBLS 1
- TACAN 1 UPPER
- STAR TRACKER DOOR Z
- STAR TRACKER DOOR Y
- S-BAND PM UL (QUAD)
- ELECTRICAL DISCONNECT ACCESS PANEL
- PRIMARY THRUSTERS (REACTION CONTROL SUBSYSTEM)
- DANGER DANGER DANGER

X_0 236

X_0 170

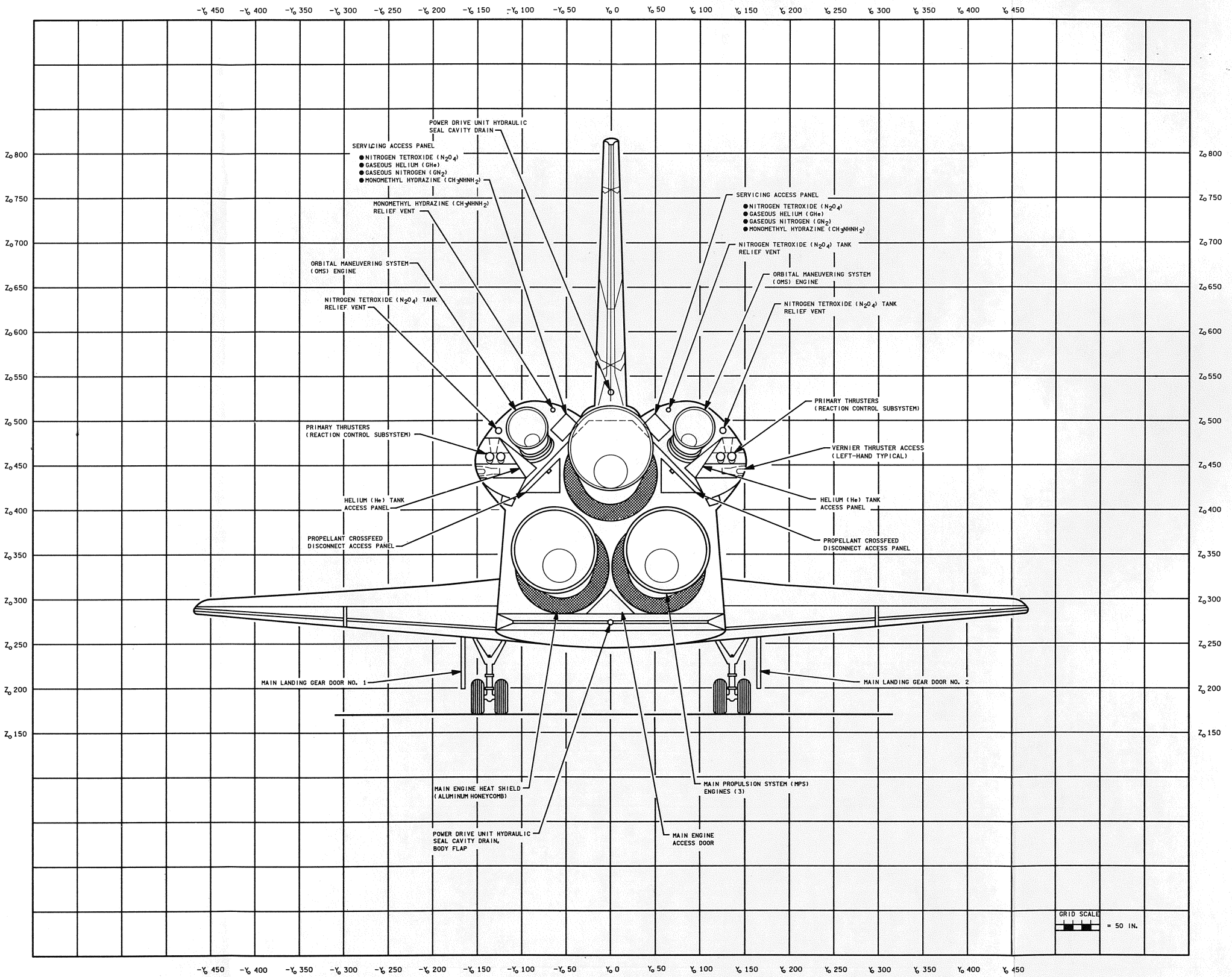
GRID SCALE =1.27 cm (50 IN.)

X_0 Y_0

BASIC REV E

DATE: 05/23/87	NAME: MDU	VERSION: INK 2
DATE: 08/16/90	NAME: JMB	VERSION: INK 3
DATE: 10/26/90	NAME: BJT	VERSION: INK 4

APPROXIMATE ONLY



AFT FUSELAGE (LOOKING FWD)

NOTE: THIS DRAWING IS ONLY APPROXIMATE

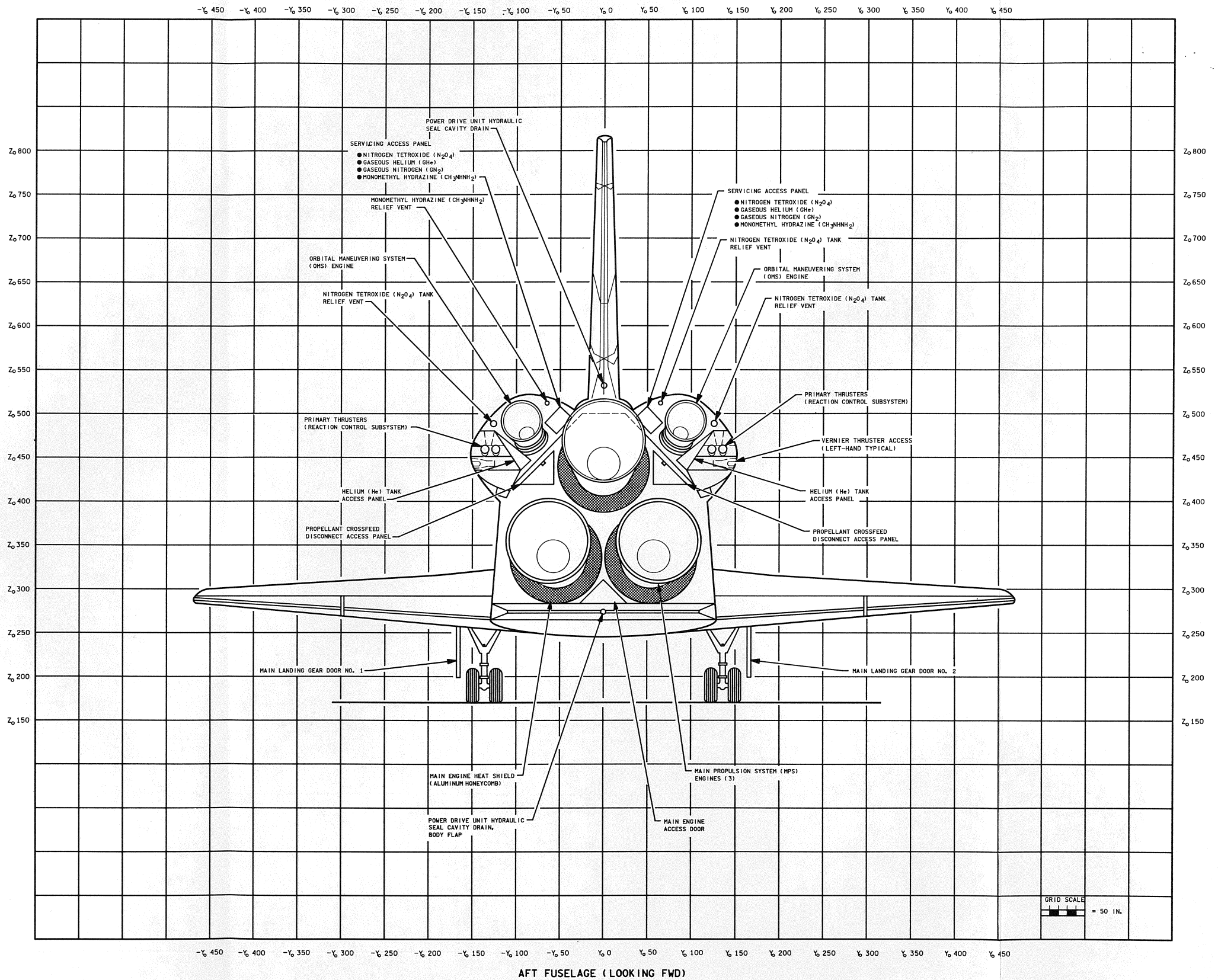
SIGNATURE		DATE	
DSGN	Linda Hadley	10/31/84	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR	Linda Hadley	10/31/84	EXTERNAL PENETRATIONS/TILE (AFT)
ENGR	H. KARL POHL		
ENGR	H. Karl Pohl	9-6-90	
APP	[illegible]	7 Sept 90	
APP	R T Mead	9/7/90	SPACE SHUTTLE
OMNIPLAN	S.K. Brodnax	10-26-90	ALL
LTR E	PCN		86 X 34

DWG NO 19.4

PARC SHEET 3 OF 3

BASIC REV E

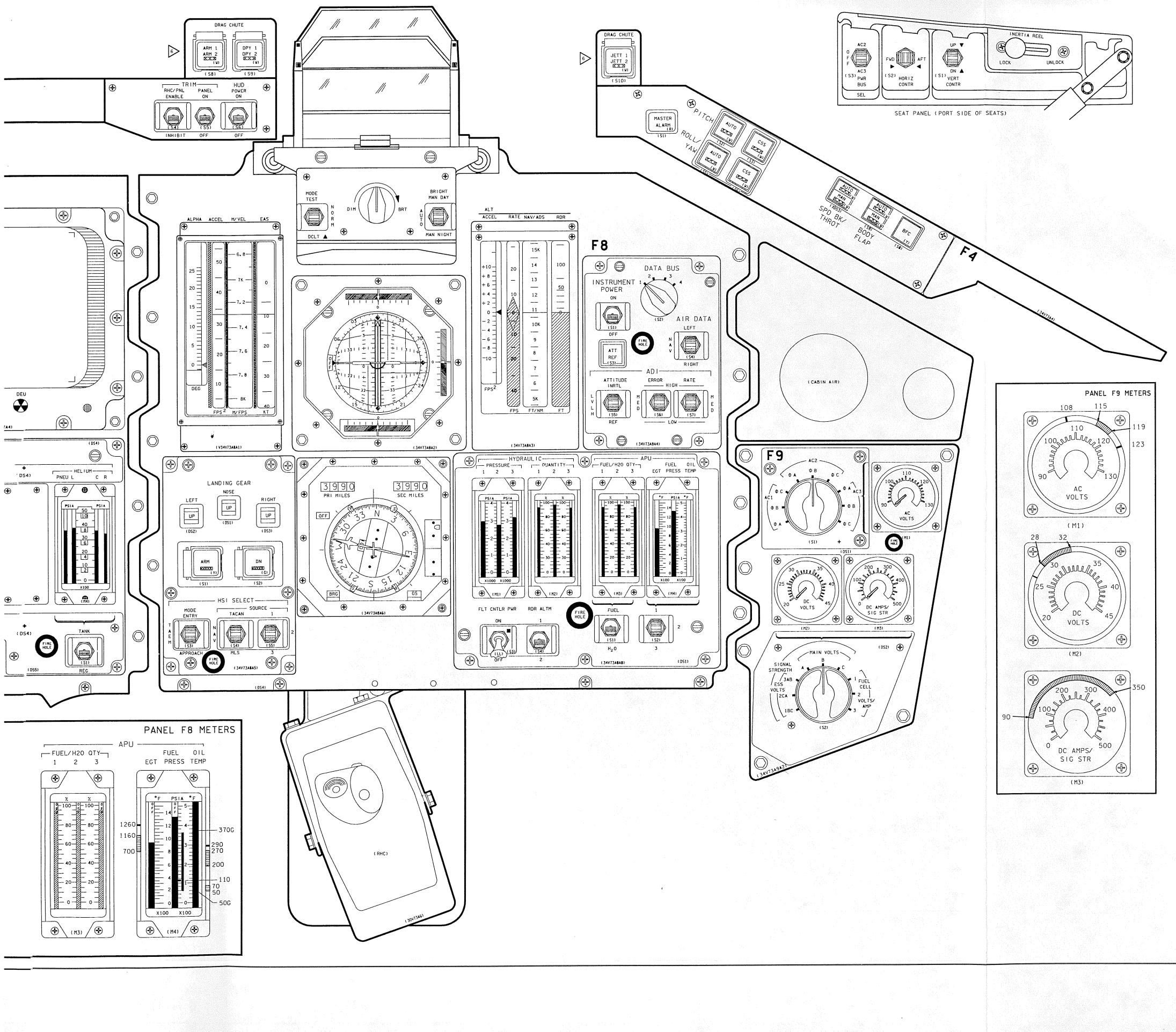
APPROXIMATE ONLY

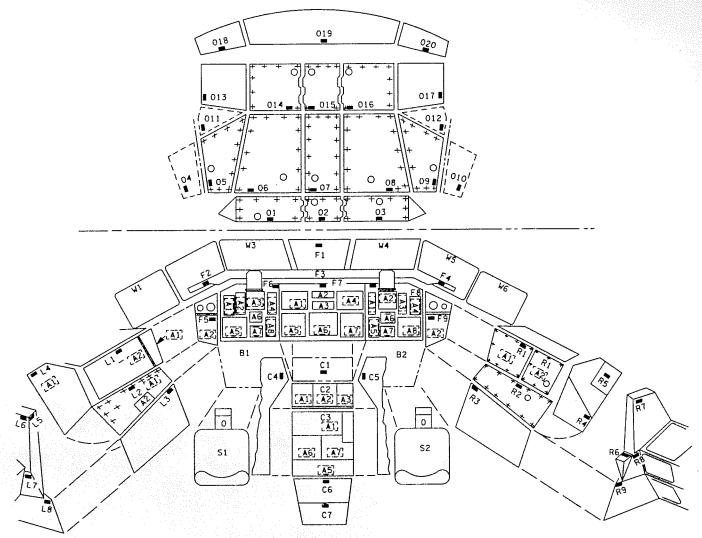


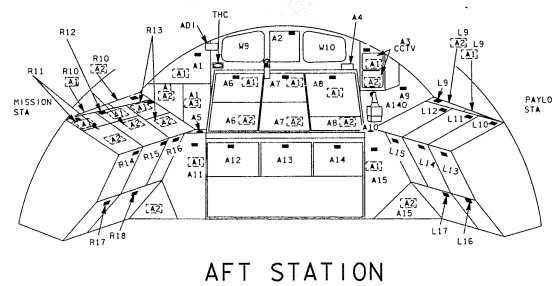
AFT FUSELAGE (LOOKING FWD)

BASIC REV E

DATE:	NAME:	VERSION:
DATE: 10/23/91	NAME: MDU	VERSION: INK 6
DATE: 11/04/91	NAME: BJT	VERSION: INK 7
DATE: 09/02/93	NAME: VEH	VERSION: INK 8







ORBITER PANEL CONFIGURATION

F1
F2
F3
F4
F5
F6
F7
F8
F9
SEATS

▷ DRAG CHUTE PB!'S ARE FOR OV-105 AND MAJOR MODES ONLY

5. REFER TO TABLE 20-1 FOR VENDOR DRAWING REFERENCES

4. EVENT INDICATOR LEGENDS ARE AS FOLLOWS:

DRAWING LEGEND CODE	EVENT IND LEGEND	TYPE IND.	LEGEND MEANING
CL	OP-CL	2 STATE (2A)	OPEN-CLOSE
OFF	ON-OFF	2 STATE (2B)	ON-OFF
B.P.*	GRAY-B.P.	2 STATE (2C)	YES-NO, GOOD-BAD
X10	X10-X1	2 STATE (2D)	TIMES 10, TIMES 1
OP	OP-B.P.-CL	3 STATE (3A)	OPEN-B.P.-CLOSE
UP	UP-B.P.-DN	3 STATE (3B)	UP-O-DOWN
STO	STO-B.P.-DPY	3 STATE (3C)	DEPLOY-O-STOW
ENA	ENA-B.P.-CL	3 STATE (3D)	ENABLE-O-CLOSE
RUN	RUN-B.P.-IPL	3 STATE (3E)	RUN-O-IPL
RCD	RCD-B.P.-PB	3 STATE (3F)	RCD-O-PLAYBACK
LAT	LAT-B.P.-REL	3 STATE (3G)	LATCH-O-RELEASE
ICH	ICH-B.P.-PL	3 STATE (3H)	INTERCHANGER-O-PAYLOAD
RAD	RAD-B.P.-BYP	3 STATE (3I)	RADIATOR-O-BYPASS

* B.P. INDICATES A BARBER POLE
O INDICATES EITHER 'IN TRANSIT' OR THAT NEITHER OF THE TWO STATES IS ENERGIZED

3. SYMBOLS ▼ OR ▲ INDICATES MOMENTARY SWITCH POSITION

▷ G = GREEN =
Y = YELLOW =
R = RED =

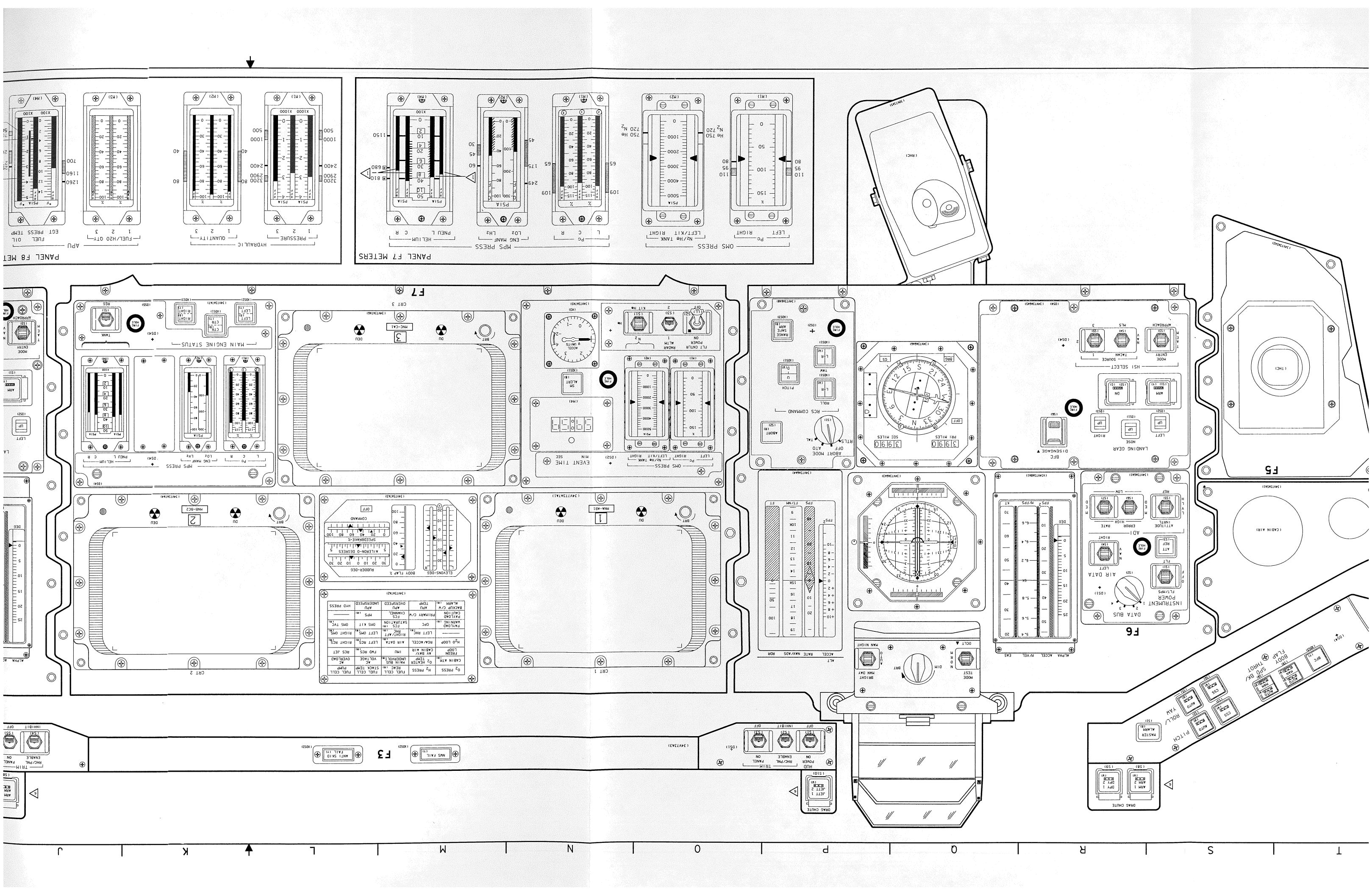
NOTE: ▷ BARS ARE GREEN DECAL MARKINGS

1 D&C FWD 1

SIGNATURE		DATE	
DSGN	D. J. LAVATO	6/1/78	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR	C. A. RILEY	7/30/82	
ENGR	B. PAWLIK		DISPLAYS AND CONTROLS FORWARD STATIONS
ENGR		9/6/93	
ENGR			
APP		7/9/93	SPACE SHUTTLE
CADS	J. K. KINKADE	10-4-93	ALL
LTR E	PCN 3		121 X 34

DWG NO 20.1
PAGE SHEET 1 OF 4

BASIC REV E-3


PANEL F8 METERS
APU
FUEL OIL
EGT PRESS TEMP
FUEL/H2O QTY
HYDRAULIC
QUANTITY
PRESSURE
PANEL F7 METERS
MPS PRESS
HELIUM
PNEU L
C R
END MANF
LO2 LH2
PC
L C R
N2/H2 TANK
LEFT/KIT RIGHT
OMS PRESS
LEFT RIGHT
F7
F6
F5
F3
MAIN ENGINE STATUS
CRT 1
CRT 2
CRT 3
TRIM
HEAD
REC/PNL
ENABLE
ON
OFF
INHIBIT
DRAG CHUTE
ARM 1
ARM 2
OPT 1
OPT 2
JETT 1
JETT 2
NWS FAIL
ANTI SKID
FAIL
MASTER
ALARM
PITCH
ROLL/
YAW
BODY FLAP
SPD BK/
THRTT
EVENT TIME
MIN
SEC
ABORT MODE
ATO
AUTO
TAL
RLS
RCS COMMAND
PITCH
ROLL
YAW
L-R
U
D
ARM
ENTRY
NOSE
ON
LANDING GEAR
NOSE
LEFT
RIGHT
DISENGAGE
HSI SELECT
SOURCE
TACAN
MLS
APPROACH
AIR DATA
INSTRUMENT
POWER
FLT/MPS
ATT
REF
ADI
ATTITUDE
ERROR
RATE
HIGH
LOW
DATA BUS
MODE
TEST
BRIGHT
MAN NIGHT
DIM
BRT
ALPHA ACCEL M/VEL EAS
ACCEL RATE NAV/ADS ROM
ALT
FPS
FT/MN
PRI MILES
SEC MILES
3990
ENTRY
MAIN
ENGINE
STATUS
TANK
MPS PRESS
HELIUM
PNEU L
END MANF
LO2 LH2
PC
L C R
CRT 1
CRT 2
CRT 3
MNB-A1
MNB-B2
MNB-C4
DU
DEU
BRT
SLUDGE-DEG
SPEEDBRAKE-%
AILERON-O DEGREES
ELEVONS-DEG
BOOT FLAP %
COMPASS
OFF
BACKUP C/W
ALARM
CABIN ATM
O2 PRESS
H2 PRESS
O2 HEATER
TEMP
FUEL CELL
MAIN BUS
UNDERVOLT
AMPS
CHANNEL
PRIMARY C/W
CABIN AIR
TEMP
OVERSPEED
UNDERSPEED
APU
HYD PRESS
FUEL CELL
STACK TEMP
AC
VOLTAGE
AC
OVERLOAD
APU
TEMP
RCS JET
RIGHT RCS
LEFT RCS
AIR DATA
RCS
RIGHT/AFT
LEFT OMS
OMS KIT
OMS TVC
PRESS
LEFT HRC
RCS
SATURATION
RCS
CHANNEL
MPS
H2O LOOP
RCM/ACCEL
AIR DATA
PRESS
PAYLOAD
WARNING
PAYLOAD
CAUTION
PAYLOAD
ALARM
CABIN
LOOP
FREON
AV BAY/
CABIN AIR
PWD RCS
RCS JET
MAIN BUS
UNDERVOLT
AC
VOLTAGE
AC
OVERLOAD
FUEL CELL
STACK TEMP
FUEL CELL
REAC
APU
TEMP
OVERSPEED
UNDERSPEED
HYD PRESS
MPS
CHANNEL
OMS KIT
OMS TVC
RIGHT/AFT
LEFT OMS
RIGHT OMS
RCS
SATURATION
RCS
CHANNEL
MPS
PRIMARY C/W
CAUTION
PAYLOAD
WARNING
PAYLOAD
ALARM
BACKUP C/W
ALARM
(RHC)
(THC)
CABIN AIR
(3V72A43)
(3V72A44)
(3V72A45)
(3V72A46)
(3V72A47)
(3V72A48)
(3V72A49)
(3V72A50)
(3V72A51)
(3V72A52)
(3V72A53)
(3V72A54)
(3V72A55)
(3V72A56)
(3V72A57)
(3V72A58)
(3V72A59)
(3V72A60)
(3V72A61)
(3V72A62)
(3V72A63)
(3V72A64)
(3V72A65)
(3V72A66)
(3V72A67)
(3V72A68)
(3V72A69)
(3V72A70)
(3V72A71)
(3V72A72)
(3V72A73)
(3V72A74)
(3V72A75)
(3V72A76)
(3V72A77)
(3V72A78)
(3V72A79)
(3V72A80)
(3V72A81)
(3V72A82)

DATE: 09/02/93 | NAME: VEM | VERSION: INK, B

V U T S R Q P O N

8 7 6 5 4 3 2 1

F1

DC UTILITY POWER
MN B
ON
(S31)
OFF
(S23)
FIRE WIRE
AC UTILITY POWER
AC 1
ON
(S21)
OFF
(S41)

F2

(DS4)
(34V73A3)
BFC
(S57)
AUTO
(S55)
(S56)
BODY FLAP
CSS
(S53)
AUTO
(S52)
(S54)
SPD BK/ THROT
DRAG CHUTE
ARM 1
ARM 2
(S8)
DPY 1
DPY 2
(S9)
MASTER ALARM
(S1)
CSS
(S51)
AUTO
(S50)
PITCH
CSS
(S49)
AUTO
(S48)
ROLL/ YAW

F6

DATA BUS
1 2 3 4
(DS1)
INSTRUMENT POWER
FLT/MPS
(S1)
FLT
(S2)
AIR DATA
LEFT
ATT REF
(S3)
FIRE WIRE
(S4)
RIGHT
ADI
ATTITUDE INRTL
ERROR
RATE
HIGH
LOW
(S5)
REF
(S6)
(S7)
(34V73A6A1)
ALPHA ACCEL M/VEL EAS
FPS² M/FPS KT
(V34V73A8A1)
(34V73A6A3)
ALT
ACCEL RATE NAV/ADS RDR
FPS²
FPS FT/NM FT
(34V73A6A4)
DRAG CHUTE
JETT 1
JETT 2
(S10)
HUD POWER ON
TRIM
RHC/PNL ENABLE
PANEL ON
(S21)
OFF
(S21)
INHIBIT
(S21)
OFF
(DS1)
(34V73A3)
MODE TEST
NORM
DIM
BRT
BRIGHT MAN DAY
DCLT
MAN NIGHT
CRT 1
BRT
DU
1
MNA-AB1
DEU
(34V773A7A1)
(CABIN AIR)
(34V73A5A1)
F5
(THC)
(34V73A5A2)
LANDING GEAR
NOSE
LEFT
UP
(DS2)
UP
(DS1)
RIGHT
UP
(DS3)
BFC DISENGAGE ▼
(S6)
FIRE WIRE
ARM
(S1) (F)
DN
(S2) (G)
HSI SELECT
MODE ENTRY
(S3)
APPROACH
SOURCE
TACAN
(S4)
MLS
1
(S5)
2
3
(DS4)
(DS4) (34V73A6A5)
3990
PRI MILES
3990
SEC MILES
OFF
BRG
GS
(34V73A6A6)
ABORT MODE
OFF ATO
RTLS TAL
(S11)
ABORT
(B)
(S2)
RCS COMMAND
ROLL
L R
(V)
(XDS1)
PITCH
U
D (V)
(XDS1)
YAW
L R
(V)
(XDS1)
FIRE WIRE
(DS2)
RANGE SAFE ARM
(B)
(XDS3)
(34V73A6A8)
OMS PRESS
Pc
LEFT RIGHT
N2/He TANK
LEFT/KIT RIGHT
EVENT TIME
MIN SEC
(DS2)
(M4)
FIRE WIRE
SM ALERT
(B)
(XDS11)
FLT CNTLR POWER
ON
OFF
(S2)
RADAR ALTM
1
2
(S3)
N2
(S1)
KIT He
ACCEL
G UNITS
(M3)
(34V73A7A5)
(RHC)
(30V73A5)
OMS PRESS
Pc
LEFT RIGHT
N2/He TANK
LEFT/KIT RIGHT
110
95
80
150
100
50
0
%
PSIA
5000
4000
3000
2000
1000
0
He 750
N2 720
750 He
720 N2
(M1)
(M2)
Pc
L C R
109
65
115
100
80
60
40
20
0
(M1)
MPS
ENG MA
LO2
249
175
45
300
200
100
0
PSI
(M2)

BASIC REV E-3

DATE: 11/30/92	NAME: VEM	VERSION: BPT 11
DATE: 01/06/93	NAME: SEW	VERSION: BPT 12
DATE: 01/25/93	NAME: BJB	VERSION: INK 14

J I H G F E D C B A

8 7 6 5 4 3 2 1

C2
C3
C5
C6
C7
L1
L2
L4
L5
R1A1
R1A2
R2
R4
R6

R6

RIGHT COMM
POWER
ON
(S11)
OFF
(31V73A61)

R1

POWER DISTRIBUTION
CONTROL BUS PWR
MN A RESET (S1)
ESS BUS SOURCE
MN B/C ON (S6) ESS 1BC (S7) FC 1 ON
FC/MAN BUS A
MN BUS TIE A
MN B RESET (S2)
MN C/A ON (S6) ESS 2CA (S8) FC 2 ON
MN C RESET (S3)
MN A/B ON (S6) ESS 3AB (S9) FC 3 ON
MN A
MN B
MN C
PAYLOAD
CABIN MN A (S25)
PRI MN B (S26) PRI FC 3 (S27) PRI MN C (S28)
AUX ON (DS13) (S29)
AFT MN B (S30)
AFT MN C (S31)
CABIN PL
PRI PL
AUX PL A
AUX PL B
AFT PL B
AFT PL C
INV PWR
INV/AC BUS
AC CONTR
AC BUS SNSR PAUSE
AUTO TRIP
MONITOR
FIRE WOLF
(32V73A1A1)
(DS14)

CRYO
O2 MANIFOLD VLV
FUEL CELL 1 REAC
H2 MANIFOLD VLV
O2 TK1
O2 TK3
O2 TK4
O2 TK2
H2 TK1
H2 TK3
H2 TK4
H2 TK2
SYS 1
SYS 2
ATM PRESS CONTROL (L2)
TANK 1
TANK 2
FUEL CELL 3 REAC
FUEL CELL 2 REAC
O2 TK1 HEATERS
H2 TK1 HEATERS
O2 TK2 HEATERS
H2 TK2 HEATERS
O2 TK3 HEATERS
H2 TK3 HEATERS
FUEL CELL
READY FOR LOAD
COOLANT PUMP ΔP
(32V73A1A2)

R2

MPS
PRPLT DUMP BACKUP
SEQUENCE START
LH2 VLV OPEN
STOP
CLOSE
ENGINE POWER
LEFT AC2
CTR AC1
RIGHT AC3
He ISOLATION A
He ISOLATION B
LEFT
CTR
RIGHT
OPEN
CLOSE
APU/HYD
READY TO START
APU OPERATE
START/RUN
INJECTOR COOL
PNEUMATICS
L ENG He XOVR
He ISOL
LH2 ULLAGE PRESS
APU SPEED SELECT
HIGH
NORM
He INTERCONNECT
IN OPEN
HYD MAIN PUMP PRESS
APU FU TK VLV ENA
HYD CIRC PUMP
APU CNTLR PWR
OUT OPEN
LOW
APU FUEL TK VLV
APU AUTO SHUT DOWN
ENABLE
INHIBIT
BOILER CNTLR/HTR
BOILER PWR
ET UMBILICAL DOOR
CENTERLINE LATCH
LEFT DOOR
LEFT LATCH
RIGHT DOOR
RIGHT LATCH
MODE GPC
GND
STOW
OPEN
RELEASE
CLOSE
LATCH
BOILER N2 SUPPLY
(32V73A2)

C6

30V64TP152
30V64TP153
LEH O_2 1
LEH O_2 2
LEH O_2 3
LEH O_2 4
30V64TP154
30V64TP155

C7

LEH O_2 SUPPLY
TP1
TP2
OPEN
CLOSED

C5

DIRECT O_2
CLOSED
OPEN

R4

MAIN PROPULSION SYSTEM
ENGINE CNTLR HTR
MANF PRESS LO_2 LH_2
HYDRAULICS
BRAKE HEATER
BRAKE ISOL VLV
MPS/TVC ISOL VLV
PROPELLANT FILL/DRAIN
LO_2 LH_2
H_2 PRESS LINE VENT
LO_2 PREVALVE
LH_2 PREVALVE
FEEDLINE RLF ISOL
LG/NWS HYD SYS
AUTO 1/2
SYS 2 INHIBIT
LG EXTEND ISO VALVE
(32V73A1A3)

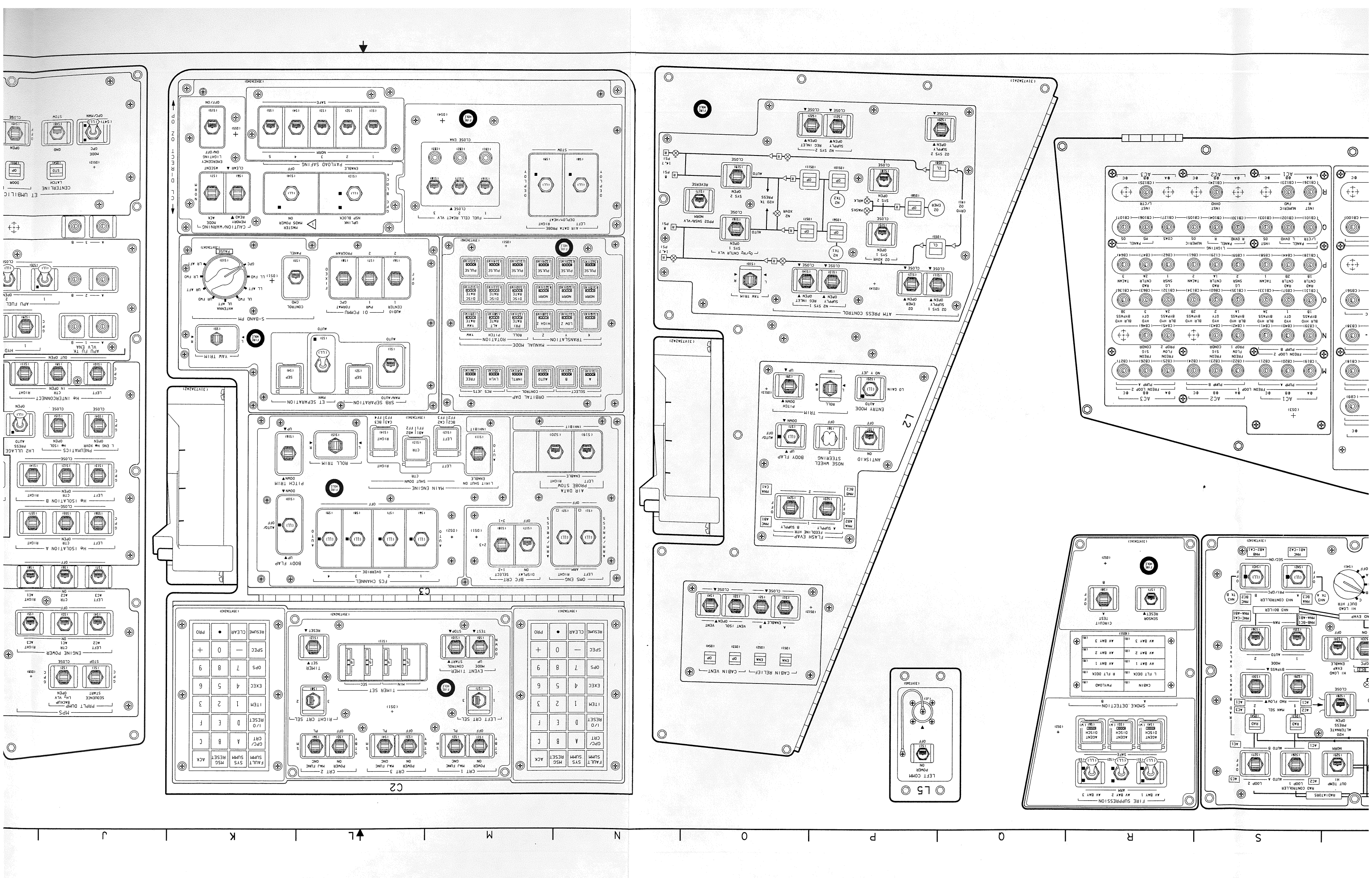
2. REFER TO TABLE 20-I FOR VENDOR DRAWING REFERENCES

NOTES: ▷ OV102 READS "MASTER OEX POWER"

1 D&C FWD 2

SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN		
DR C.A. RILEY	7/23/82	DISPLAYS AND CONTROLS FORWARD STATIONS
ENGR J. AZBELL		
ENGR		
APP		
APP		SPACE SHUTTLE / DWG NO 20.1
OMNIPLAN S.K. Bennett 2-2-93		ALL
LTR E / PCN 2		126.5 X 34 / PAGE / SHEET 2 OF 4

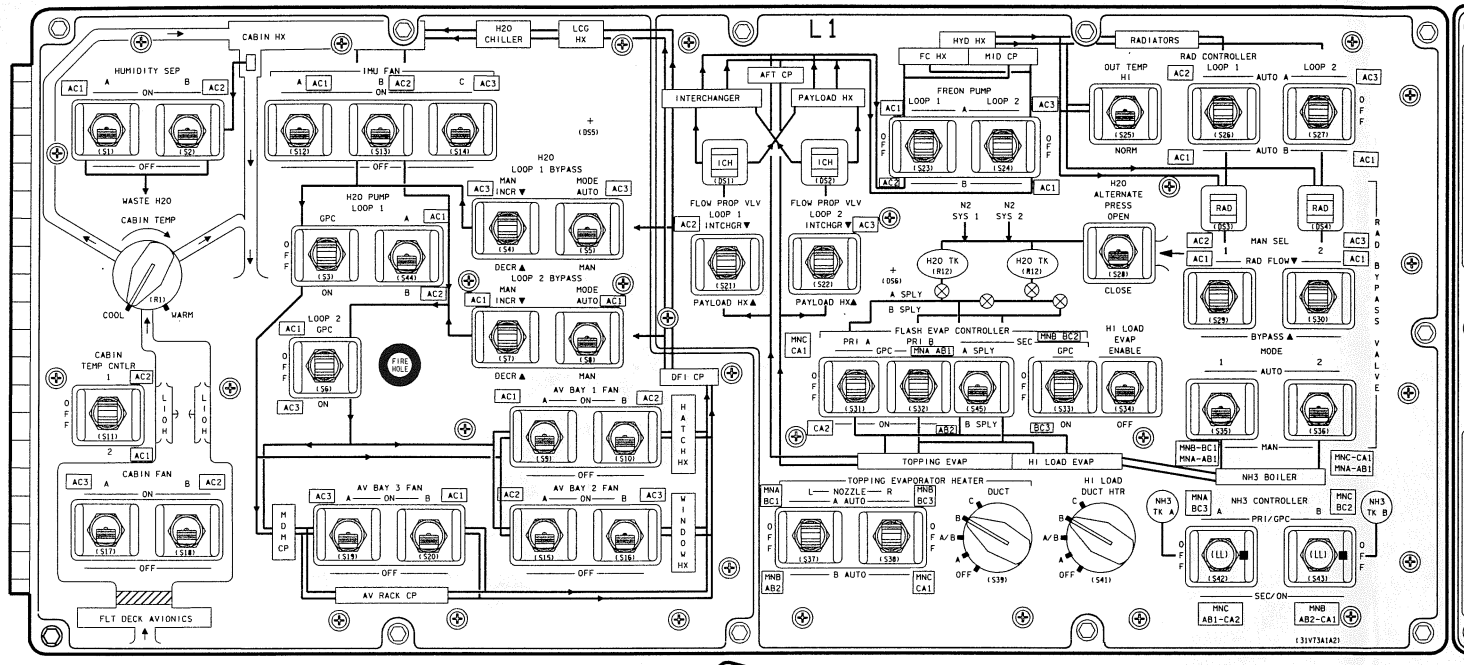
BASIC REV E-2

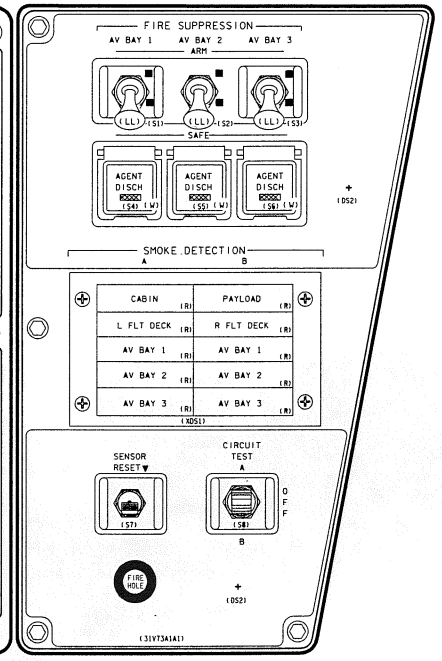

C3
C2
L2
L5
CAUTION/WARNING
MODE
RESET
CLEAR
ACK
MSG
SYS
SUMM
FAULT
I/O
CRT
GPC
PRO
SPEC
OPS
EXEC
ITEM
MASTER
MDP ON
PANEL
PROGRAM
AUDIO CENTER
CONTROL
ATM PRESS CONTROL
ENTRY MODE
TRIM
NOSE WHEEL STEERING
BODY FLAP
ANTISKID
FLASH EVAP
FREEZE LINE HTR
RADIATORS
RAD CONTROLLER
CABIN
PAYLOAD
SMOKE DETECTION
FIRE SUPPRESSION
LEFT COMM
POWER
CIRCUIT TEST
SENSOR RESET
MANUAL MODE
ORBITAL DAP
SRB SEPARATION
ET SEPARATION
S-BAND PM
PAYLOAD
MAIN ENGINE
AIR DATA PROBE
OMS ENG
FCS CHANNEL
BFC CRT
CRT 1
CRT 2
CRT 3
RIGHT CRT SEL
LEFT CRT SEL
TIMER
EVENT TIMER
CABIN VENT
CABIN RELIEF
ENGINE POWER
APU FUEL
HYD
MPS
PNEUMATICS
He ISOLATION A
He ISOLATION B
He INTERCONNECT
ET UMBILICAL
CENTERLINE
LATCH
DOOR
GPC/MAN
STOW
MODE
OVHD
MNEMONIC
LIGHTING
CAUTION
WARNING
ALTERNATE
PRESS
MAIN SEL
MAIN BUS
AUTO
OFF
CLOSE
OPEN

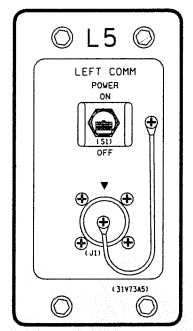
DATE: 01/25/93 | NAME: BJB | VERSION: INK.14

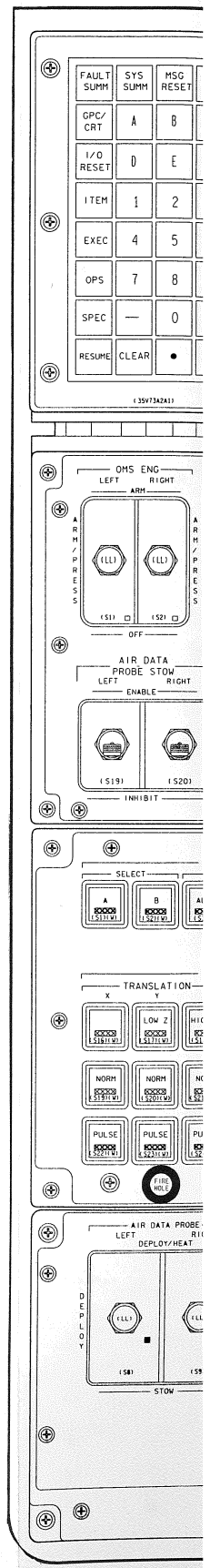
W V U T S R Q P O N

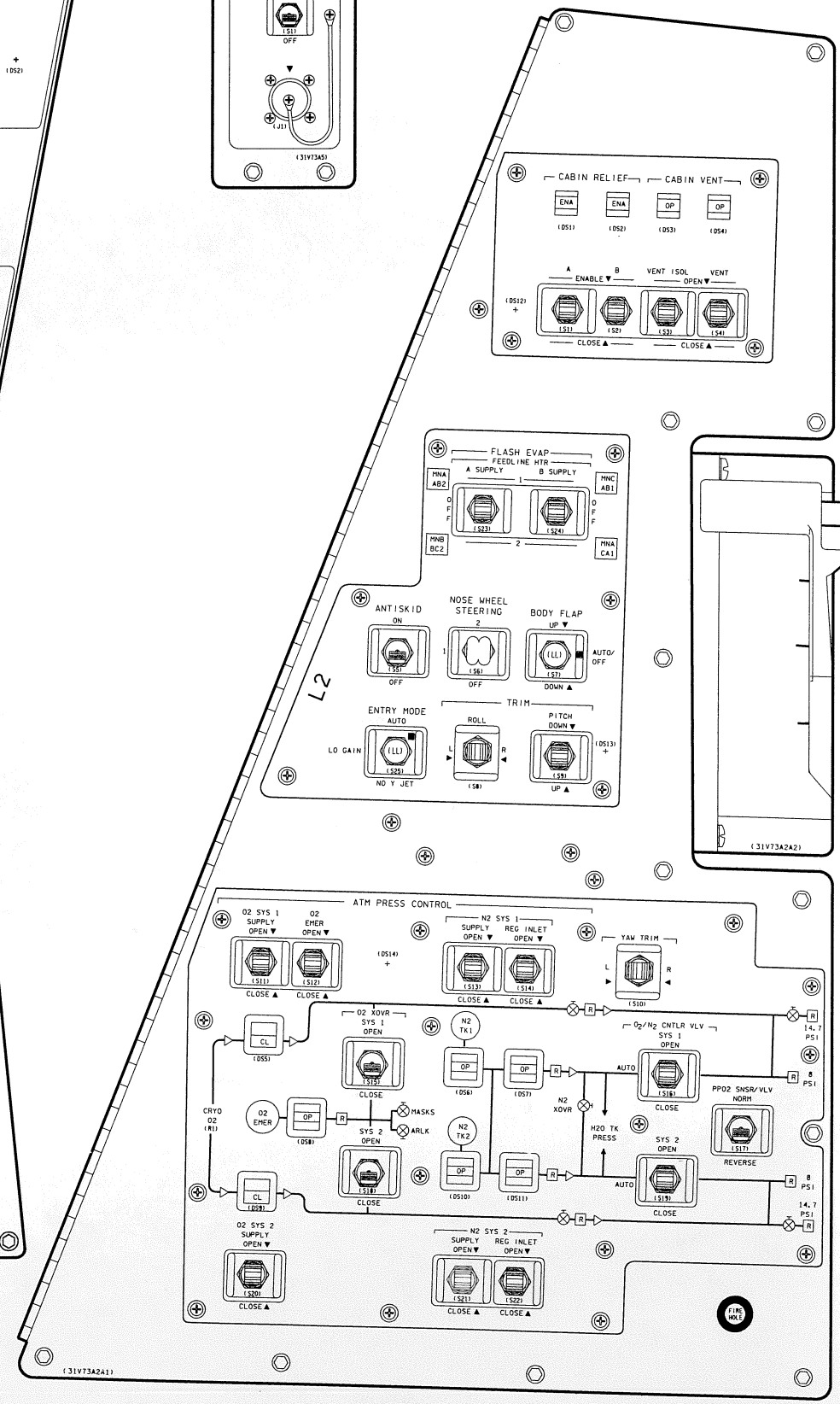
8 7 6 5 4 3 2 1

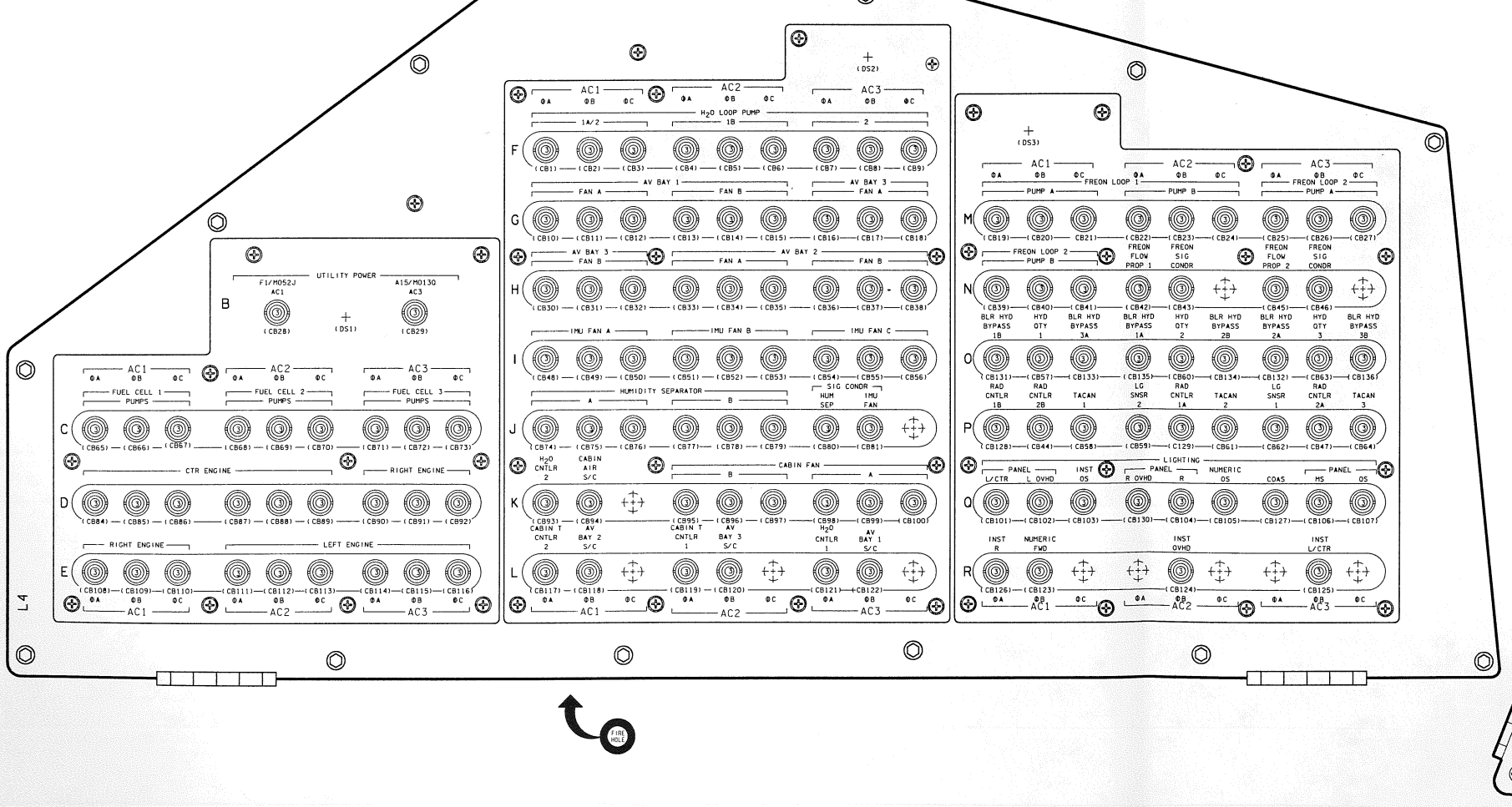




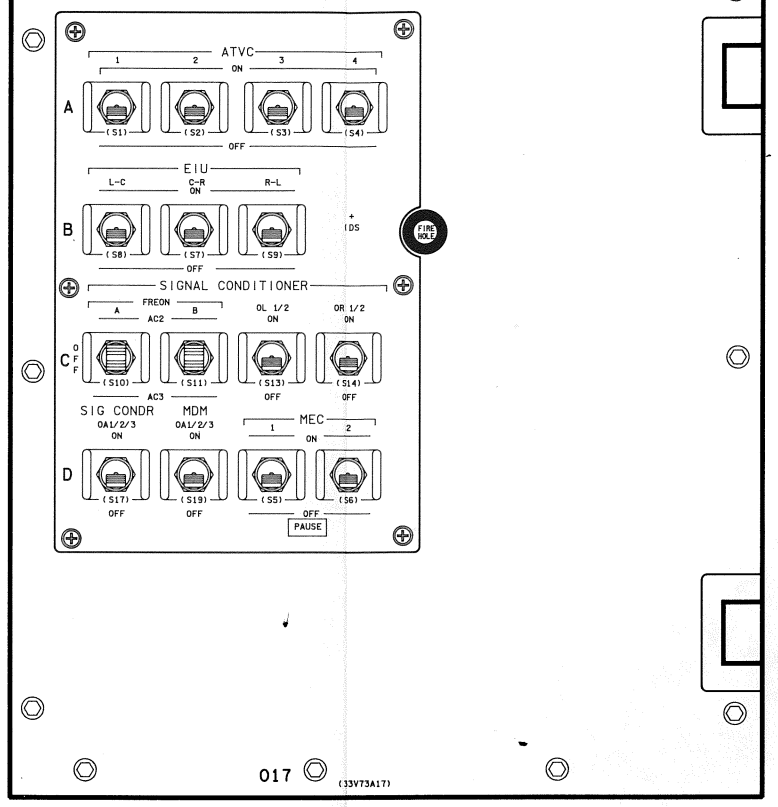


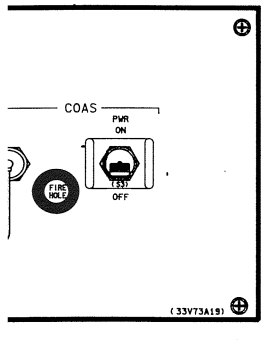


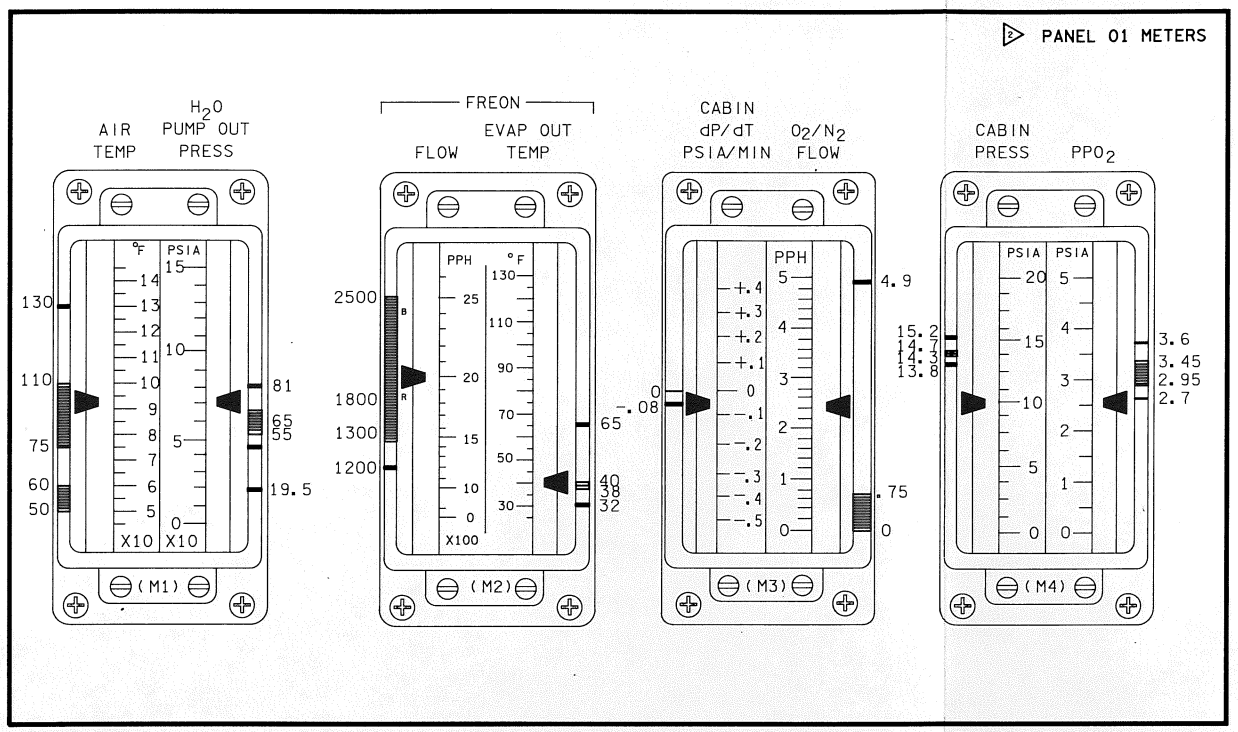


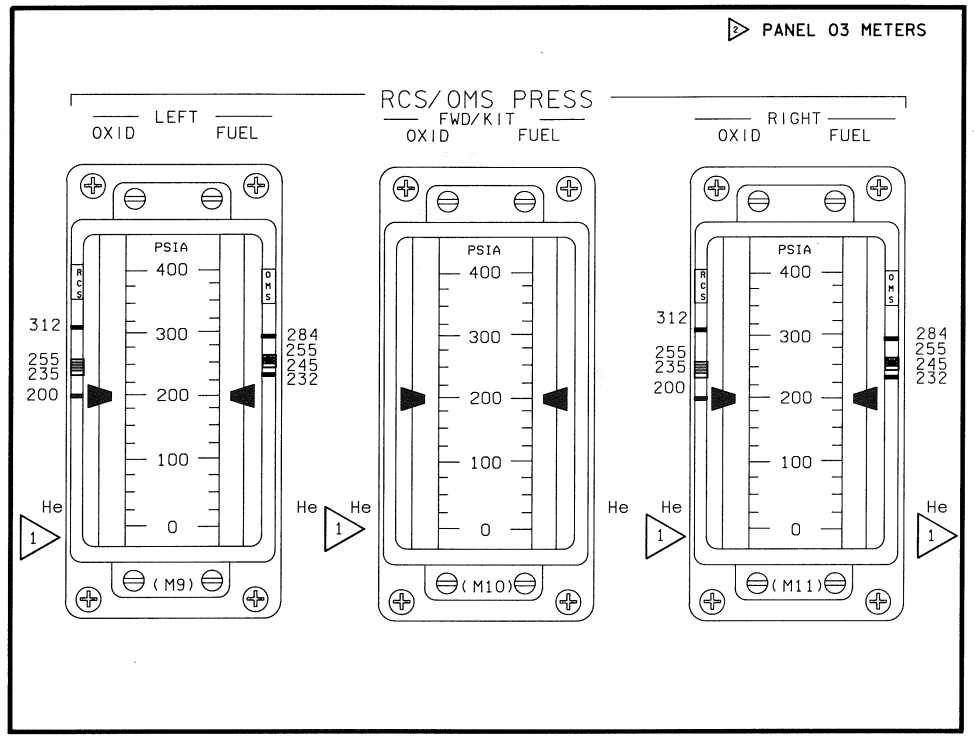


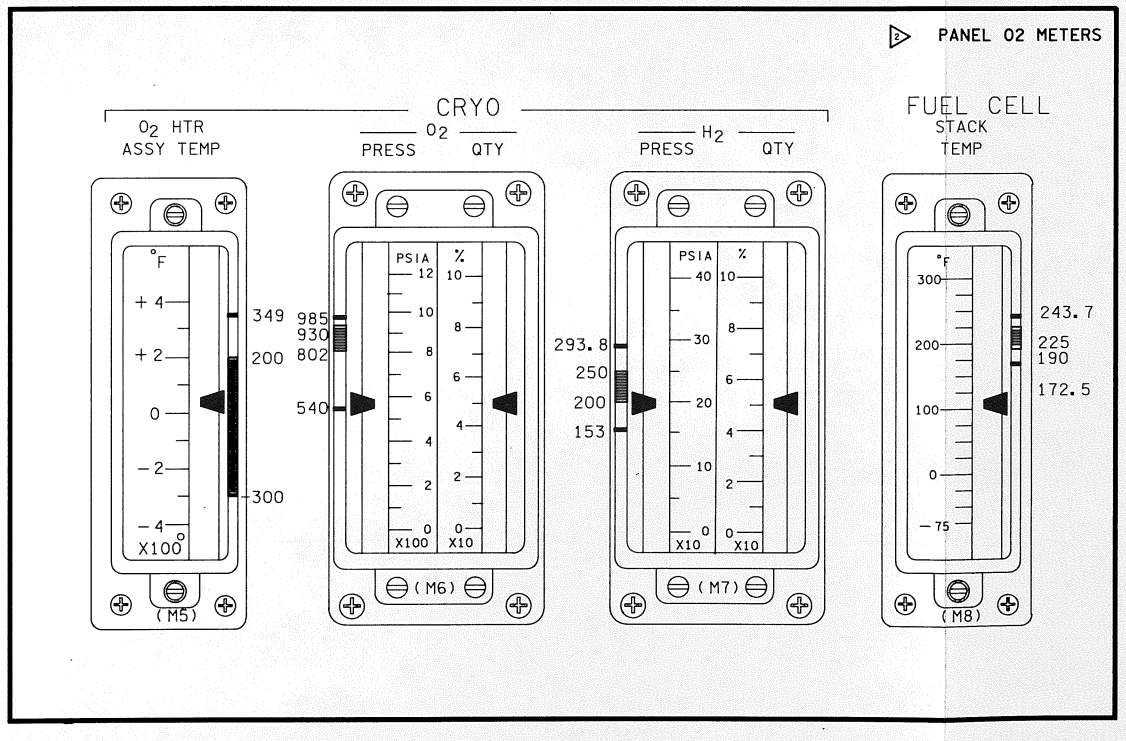
DATE: 10/23/91	NAME: MDU	VERSION# INK: 15
DATE: 11/04/91	NAME: BJT	VERSION# INK: 16
DATE: 11/12/91	NAME: MDU	VERSION# INK: 17











▷8 TK5 ON OV-105 ONLY

▷7 OV-105 AND MAJOR MOD VEHICLES ONLY

6. REFER TO TABLE 20-1 VENDOR DRAWING REFERENCES

▷5 MOVED FOR OV102

▷4 OV102 PANEL DIFFERENT SHAPE

▷3 EXPANDED VIEW ON RIGHT OF DRAWING

▷2 G = GREEN = ▒

Y = YELLOW = - - - - -

R = RED = ———

NOTES: ▷1 He IS SELECTED AS He X10

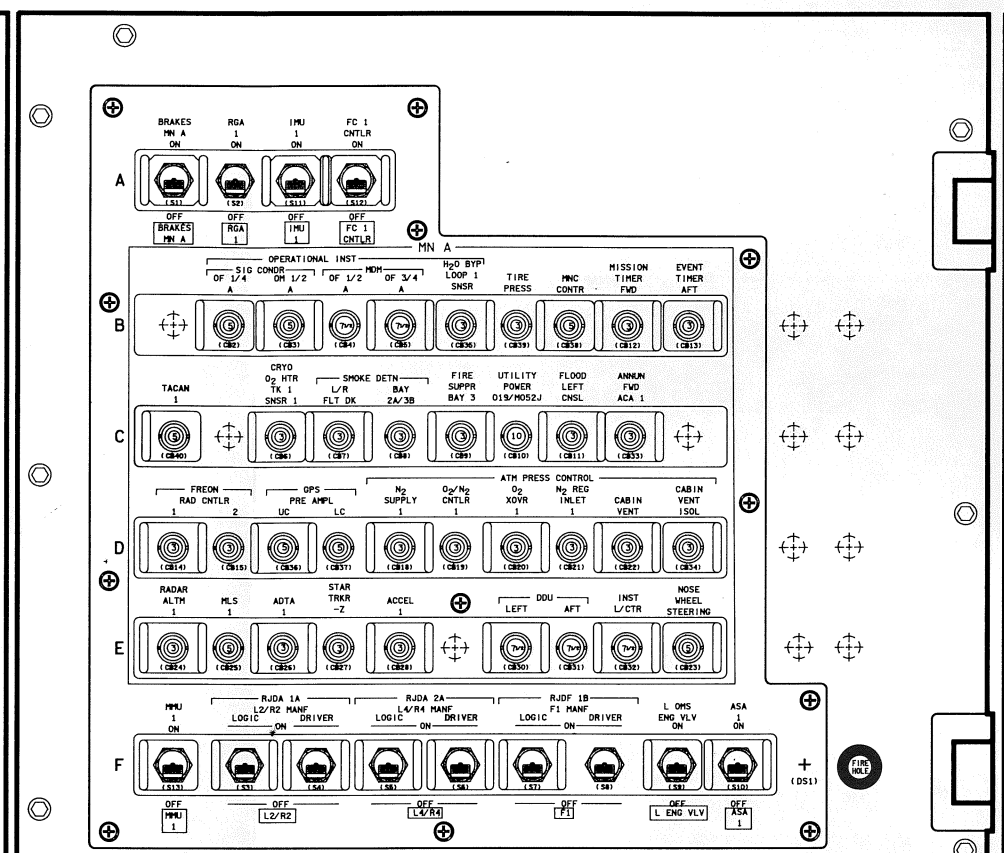
01
02
03
013
014
015
016
017
019

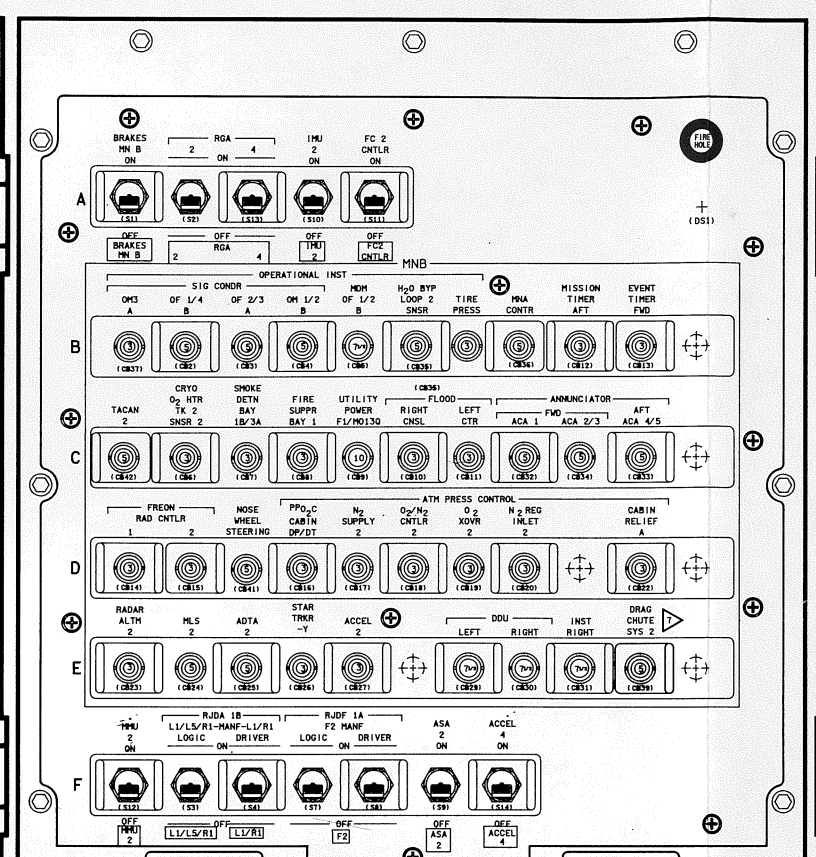
1 D&C FWD 3

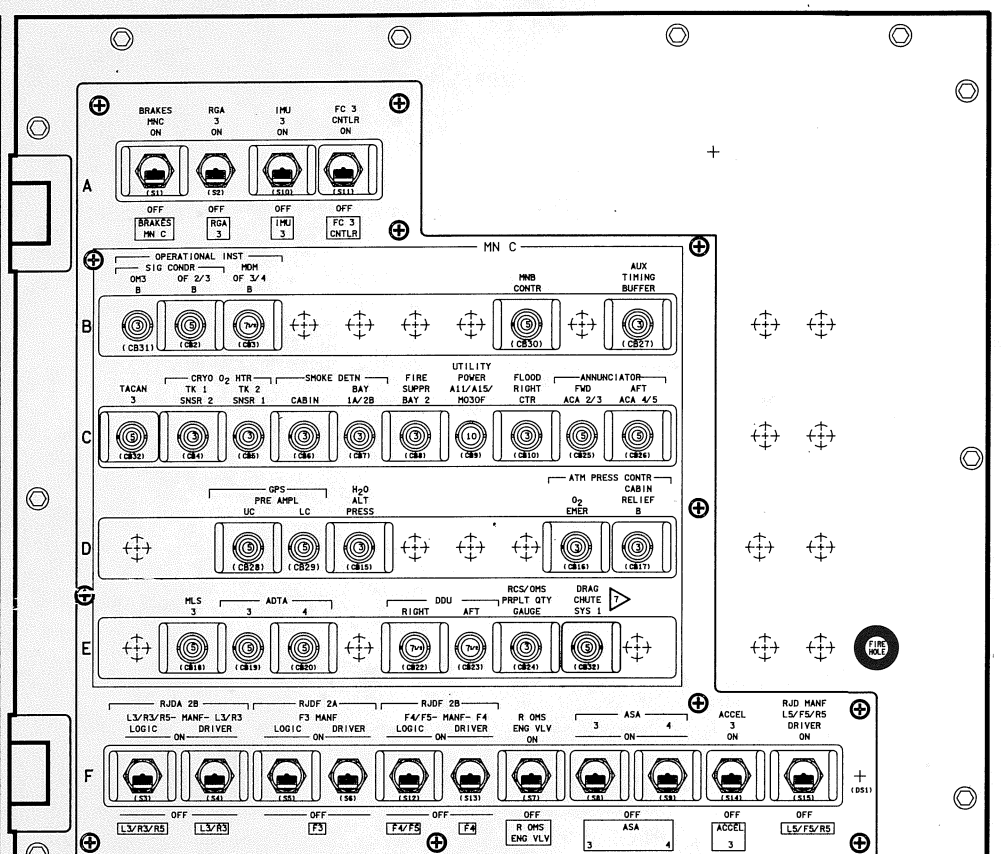
SIGNATURE		DATE	
DSGN	L.M. BUCHANAN	7/26/82	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DR	L.M. BUCHANAN	7/26/82	
ENGR	M.D. FUGITT		DISPLAYS AND CONTROLS FORWARD STATIONS
ENGR	Mark Fugitt	11/04/91	
APP	John M. Logsdon	11/12/91	
APP			SPACE SHUTTLE / DWG NO 20.1
OMNIPLAN	J.K. Kinlaw	11.8.91	ALL
LTR E	PCN 1		121 X 34 / PAGE / SHEET 3 OF 4

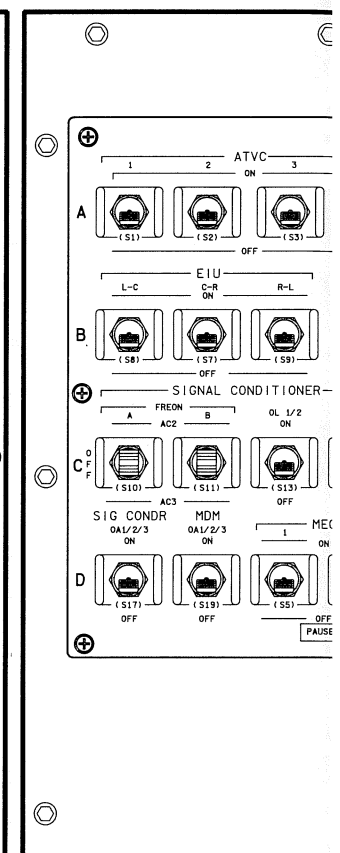
BASIC REV E-1

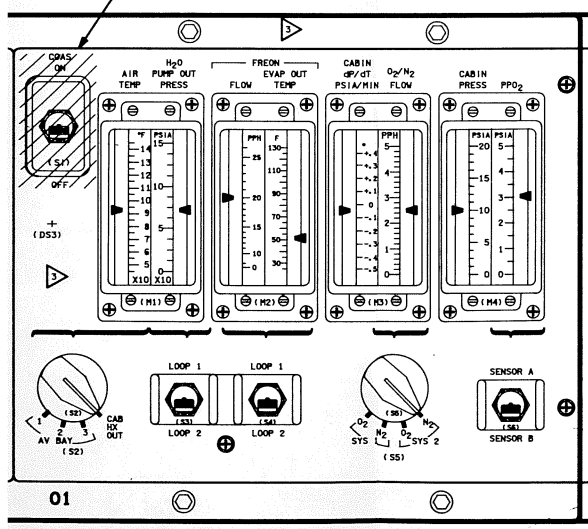
T S R Q P O N M L K J

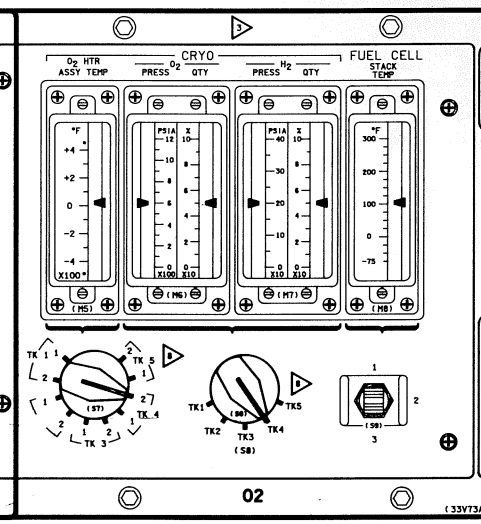


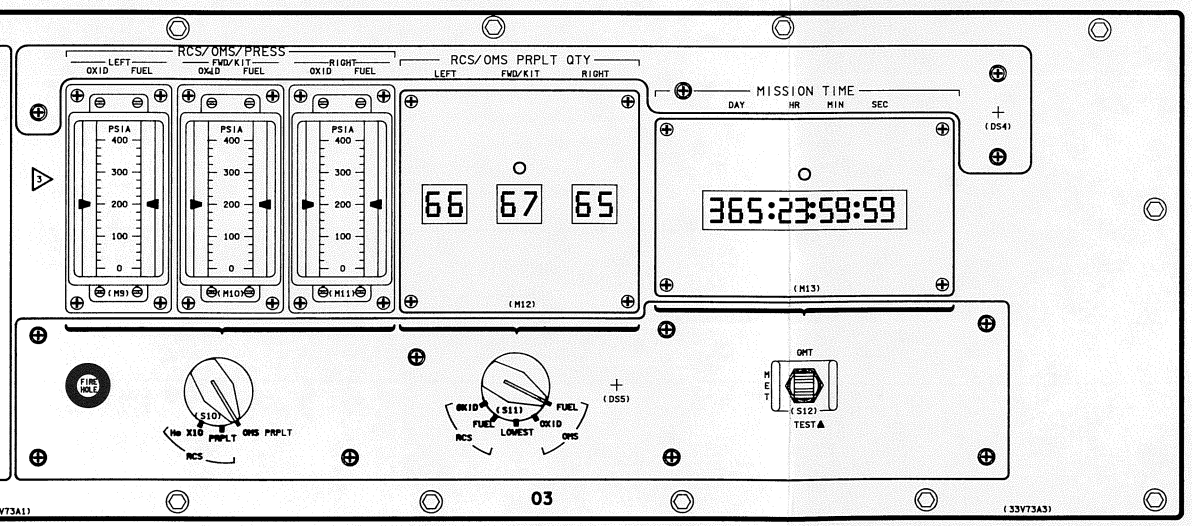


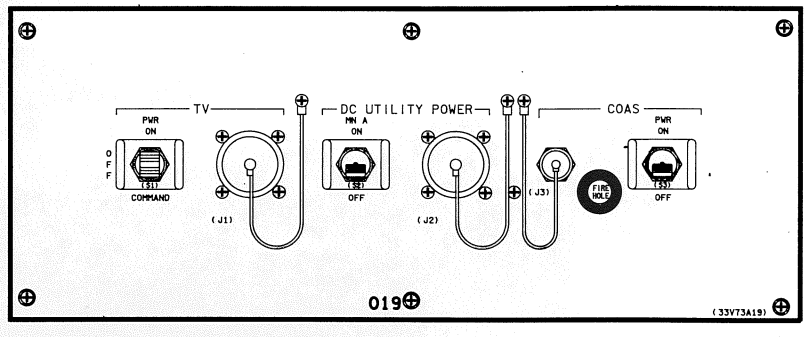












DATE: 11/12/91 | NAME: MDU | VERSION: INC: 17

V U T S R Q P O N

8 7 6 5 4 3 2 1

ESS 1BC
C/W A | MN A CONTR | AC1 SNSR | MTU A
CRYO CNTLR O2 TK 2 H2 TK 2 | CRYO QTY O2 TK 2 H2 TK 2
ESS 2CA
C/W B | MN B CONTR | AC2 SNSR | MTU B
CRYO CNTLR O2 TK 1 H2 TK 1 | CRYO QTY O2 TK 1 H2 TK 1
ESS 3AB
MN C CONTR | AC3 SNSR | GPC STATUS
FIRE WIRE

013 (33V73A13)

BRAKES MN A ON | RGA 1 ON | IMU 1 ON | FC 1 CNTLR ON
OFF BRAKES MN A | OFF RGA 1 | OFF IMU 1 | OFF FC 1 CNTLR
MN A
OPERATIONAL INST
SIG CONDR OM 1/2 A | OF 1/4 A | OF 1/2 A | MDM OF 3/4 A | H2O BYP LOOP 1 SNSR | TIRE PRESS | MNC CONTR | MISSION TIMER FWD | EVENT TIMER AFT
TACAN 1 | CRYO O2 HTR TK 1 SNSR 1 | SMOKE DETN L/R FLT DK | BAY 2A/3B | FIRE SUPPR BAY 3 | UTILITY POWER O1B/MO52J | FLOOD LEFT CNSL | ANNUN FWD ACA 1
FREON RAD CNTLR 1 2 | GPS PRE AMPL UC | LC | O2/H2 CNTLR 1 | O2 XOVR 1 | N2 REG INLET 1 | CABIN VENT | CABIN VENT ISOL
RADAR ALTM 1 | MLS 1 | ADTA 1 | STAR TRKR -Z | ACCEL 1 | DDU LEFT | AFT | INST L/CTR | NOSE WHEEL STEERING
MMU 1 ON | RJDA 1A L2/R2 MANF LOGIC | DRIVER ON | RJDA 2A L1/R4 MANF LOGIC | DRIVER ON | RJDF 1B F1 MANF LOGIC | DRIVER ON | L OMS ENG VLV ON | ASA 1 ON
OFF MMU 1 | OFF L2/R2 | OFF L1/R4 | OFF F1 | OFF L ENG VLV | OFF ASA 1
FIRE WIRE

014 (33V73A14)

BRAKES MN B ON | RGA 2 ON | 4 ON | IMU 2 ON | FC 2 CNTLR ON
OFF BRAKES MN B | OFF RGA 2 | 4 | OFF IMU 2 | OFF FC2 CNTLR
MNB
OPERATIONAL INST
SIG CONDR OM3 A | OF 1/4 B | OF 2/3 A | OM 1/2 B | MDM OF 1/2 B | H2O BYP LOOP 2 SNSR | TIRE PRESS | MNA CONTR | MISSION TIMER AFT | EVENT TIMER FWD
TACAN 2 | CRYO O2 HTR TK 2 SNSR 2 | SMOKE DETN BAY 1B/3A | FIRE SUPPR BAY 1 | UTILITY POWER FL/MO13Q | FLOOD RIGHT CNSL | LEFT CTR | ANNUNCIATOR FWD ACA 1 | ACA 2/3 | AFT ACA 4/5
FREON RAD CNTLR 1 2 | NOSE WHEEL STEERING | PPO2C CABIN DP/DT | N2 SUPPLY 2 | O2/N2 CNTLR 2 | O2 XOVR 2 | N2 REG INLET 2 | CABIN RELIEF A
RADAR ALTM 2 | MLS 2 | ADTA 2 | STAR TRKR -Y | ACCEL 2 | DDU LEFT | RIGHT | INST RIGHT | DRAG CHUTE SYS 2
MMU 2 ON | RJDA 1B L1/LS/R1-MANF-L1/R1 LOGIC | DRIVER ON | RJDF 1A F2 MANF LOGIC | DRIVER ON | ASA 2 ON | ACCEL 4 ON
OFF MMU 2 | OFF LL/LS/R1 | OFF L1/R1 | OFF F2 | OFF ASA 2 | OFF ACCEL 4
FIRE WIRE

015 (33V73A15)

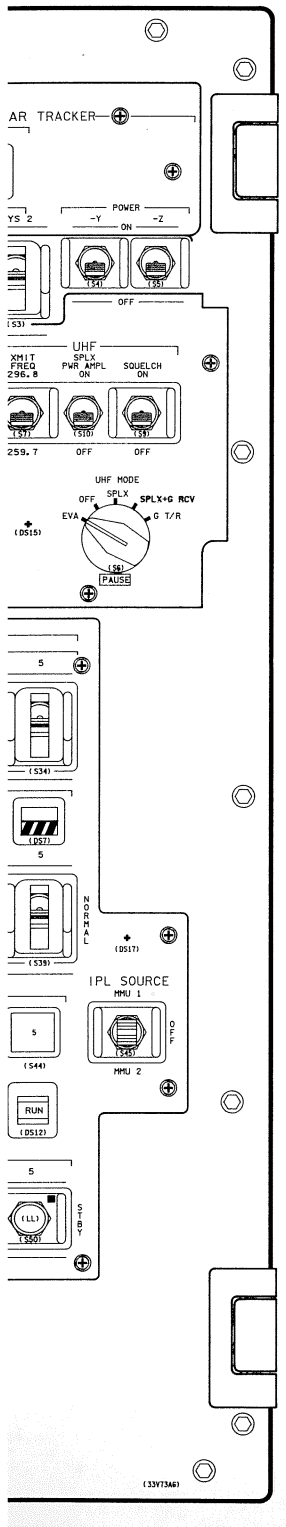
OV102 ONLY

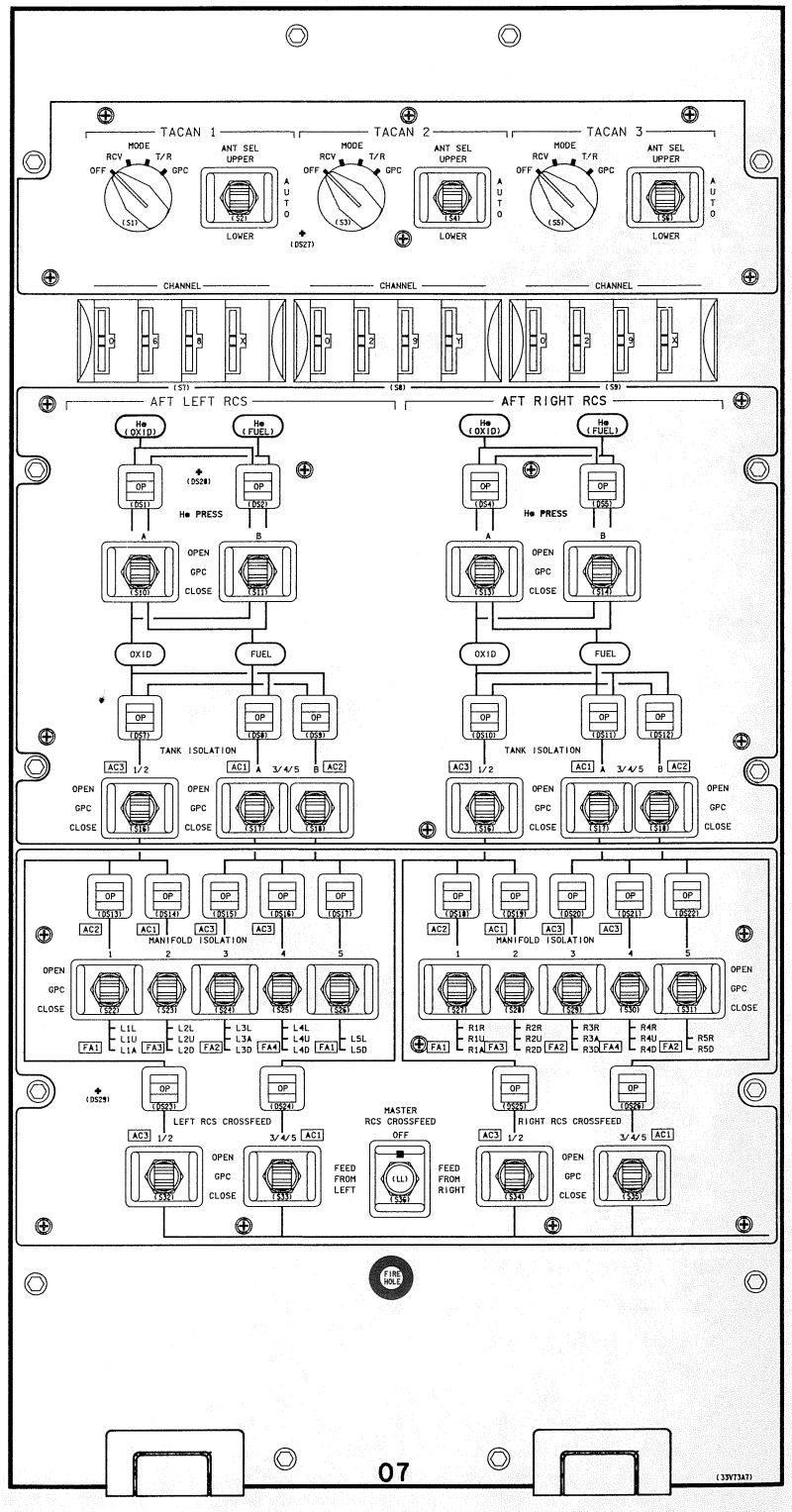
COAS | OFF | ON
GPC STATUS FAILED GPC 1 2 3 4 5
VOTING GPC 1 2 3 4 5
AIR TEMP | H2O PUMP OUT PRESS | FREON FLOW | FREON EVAP OUT TEMP | CABIN dP/dT PSIA/MIN | O2/H2 FLOW | CABIN PRESS | PPO2
LOOP 1 | LOOP 2 | AV BAY | CAB HX OUT | SYS 1 | SYS 2 | SENSOR A | SENSOR B
O2 HTR ASSY TEMP | CRYO O2 PRESS QTY | H2 PRESS QTY | FUEL CELL STACK TEMP
TK 1 | TK 2 | TK 3 | TK 4 | TK 5
RCS/OMS/PRESS LEFT OXID FUEL | FWD/AFT OXID FUEL | RIGHT OXID FUEL
RCS/OMS PRPLT QTY LEFT | FWD/AFT | RIGHT
MISSION TIME DAY HR MIN SEC
66 67 65
365:23:59:59
Hw X10 PRPLT | RCS | OMS PRPLT
OXID FUEL | FUEL OXID | RCS LOWEST OMS
GMT | MET | TEST

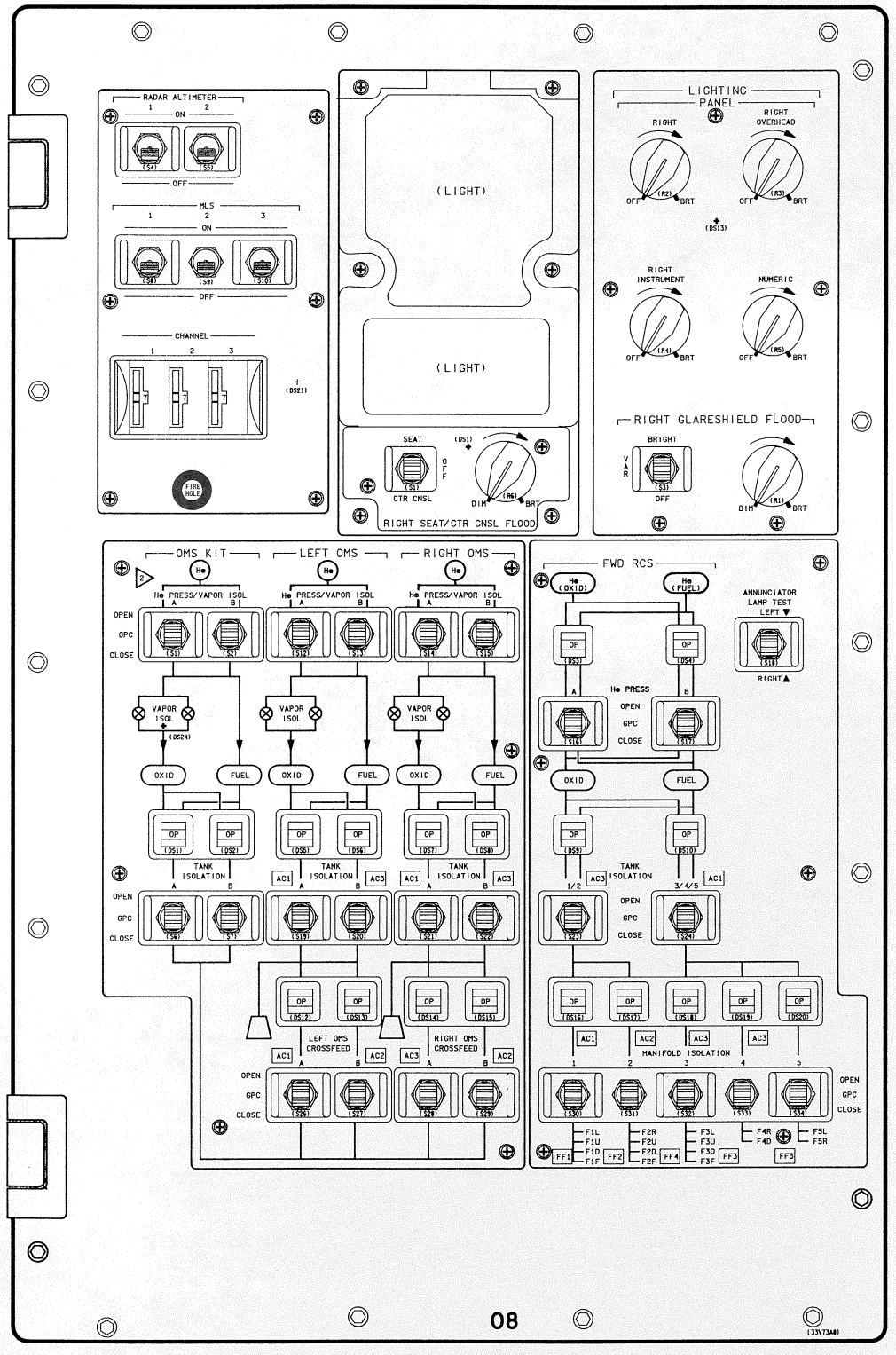
01 02 03 (33V73A1)

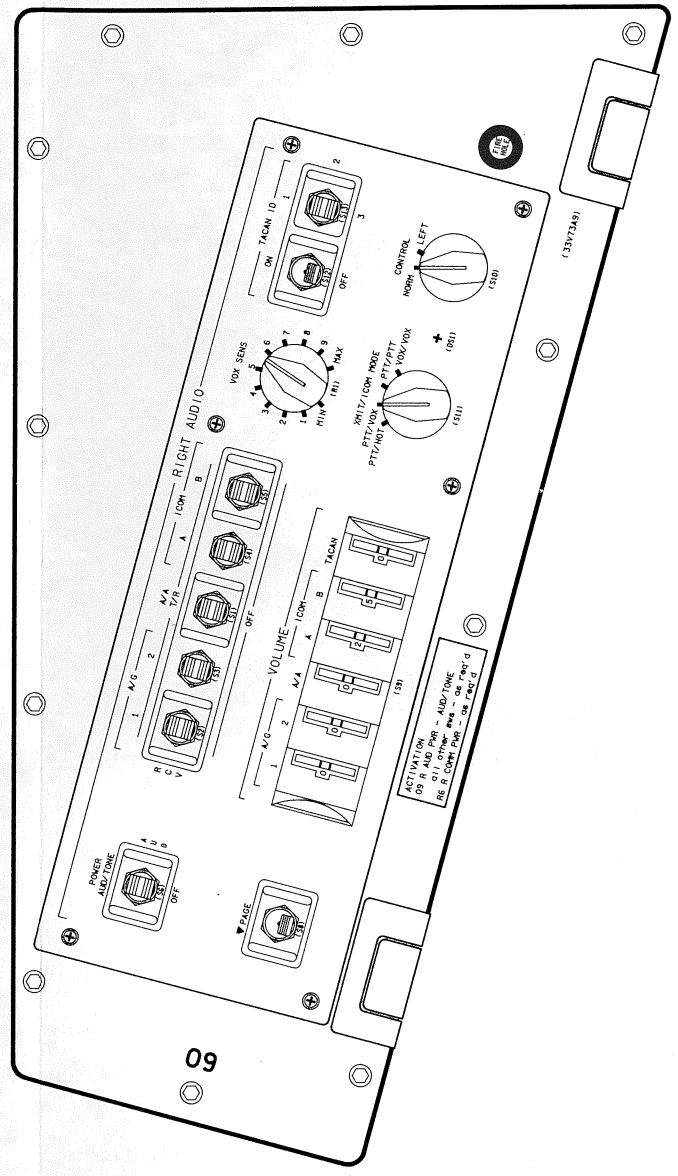
BASIC REV E-1

DATE: 10/25/88	NAME: JDF	VERSION: INK 4
DATE: 10/3/90	NAME: MFB	VERSION: INK 5
DATE: 10/11/90	NAME: BJT	VERSION: INK 6









05
06
07
08
09

OMS KIT VALVES NOT INSTALLED BUT SVITCHES LEFT ON

NOTES: 1. REFER TO TABLE 20-1 FOR VENDOR DRAWING REFERENCES

1 D&C FWD 4

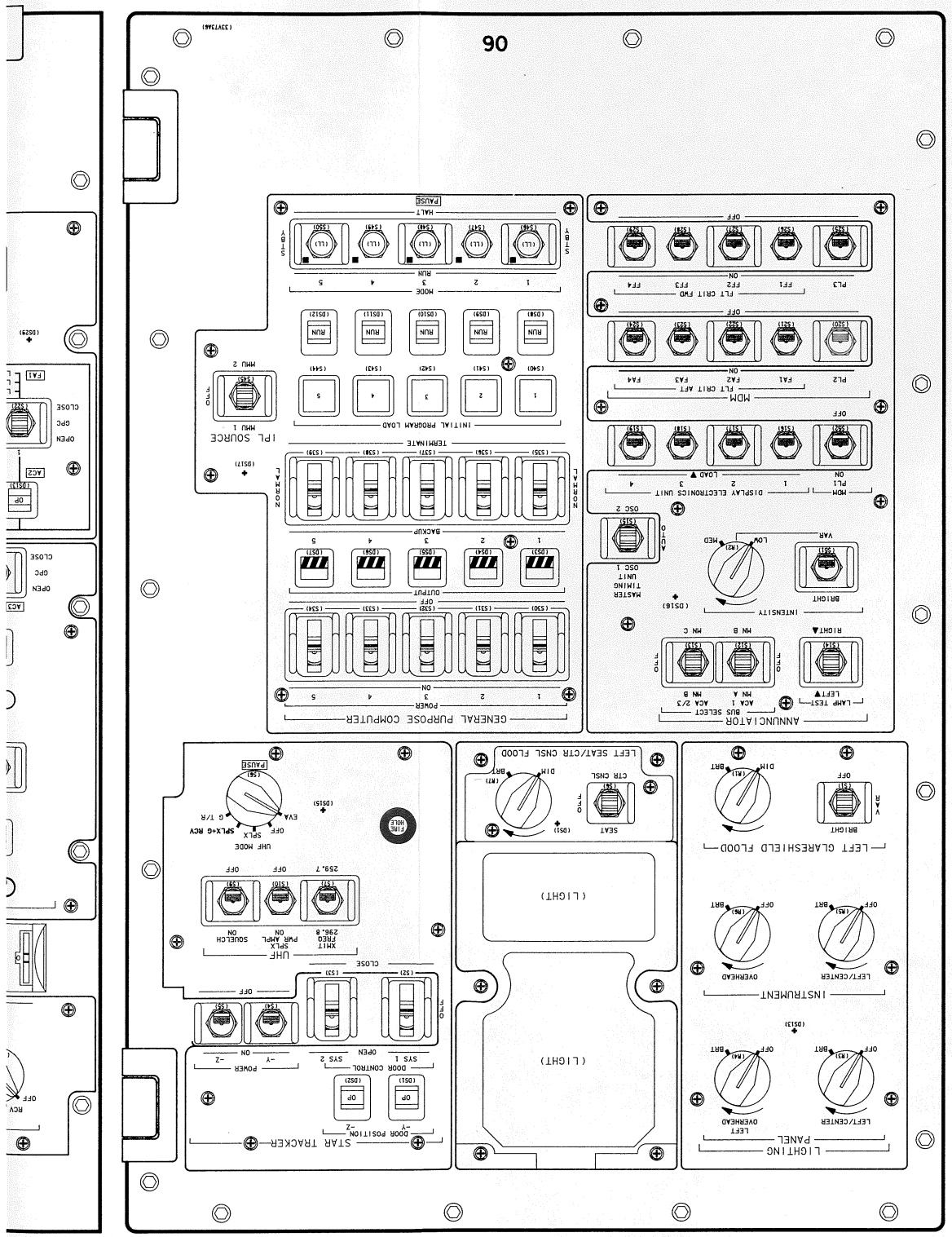
SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN			
DR	CONNIE RILEY	7-19-82	DISPLAYS AND CONTROLS FORWARD STATIONS
ENGR	M.D. FUGITT		
ENGR	Mark Fugitt	10/9/90	
APP		10/10/90	
APP			SPACE SHUTTLE
OMNIPLAN			ALL
LTR E	PCN		93.5 X 34

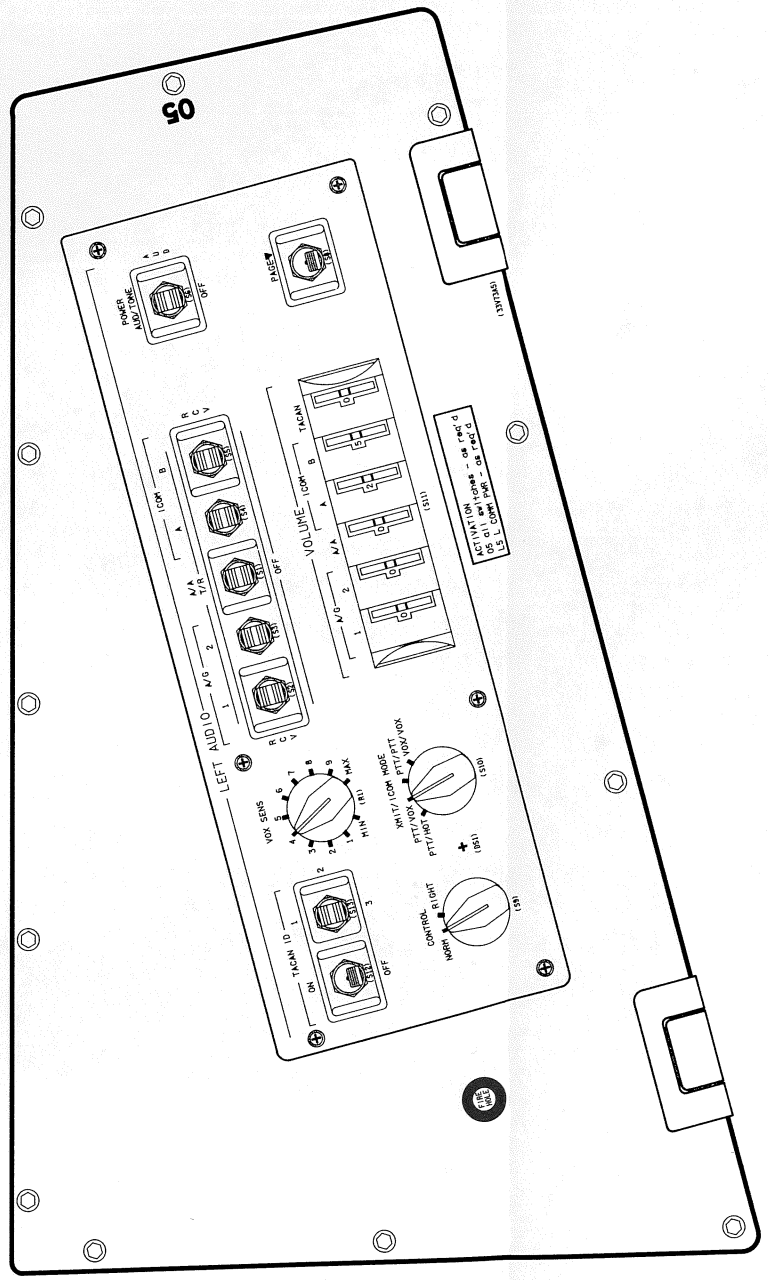
DWG NO 20.1

PAGE SHEET 4 OF 4

BASIC REV E

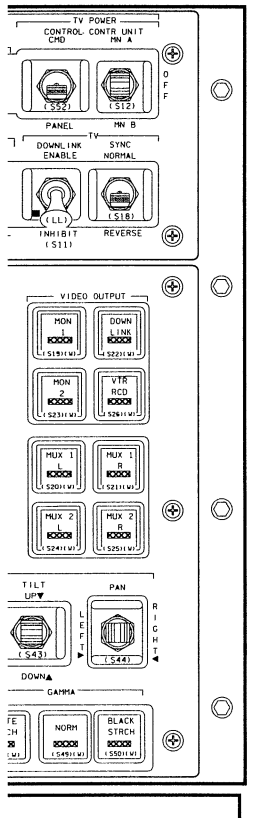
BASIC REV E

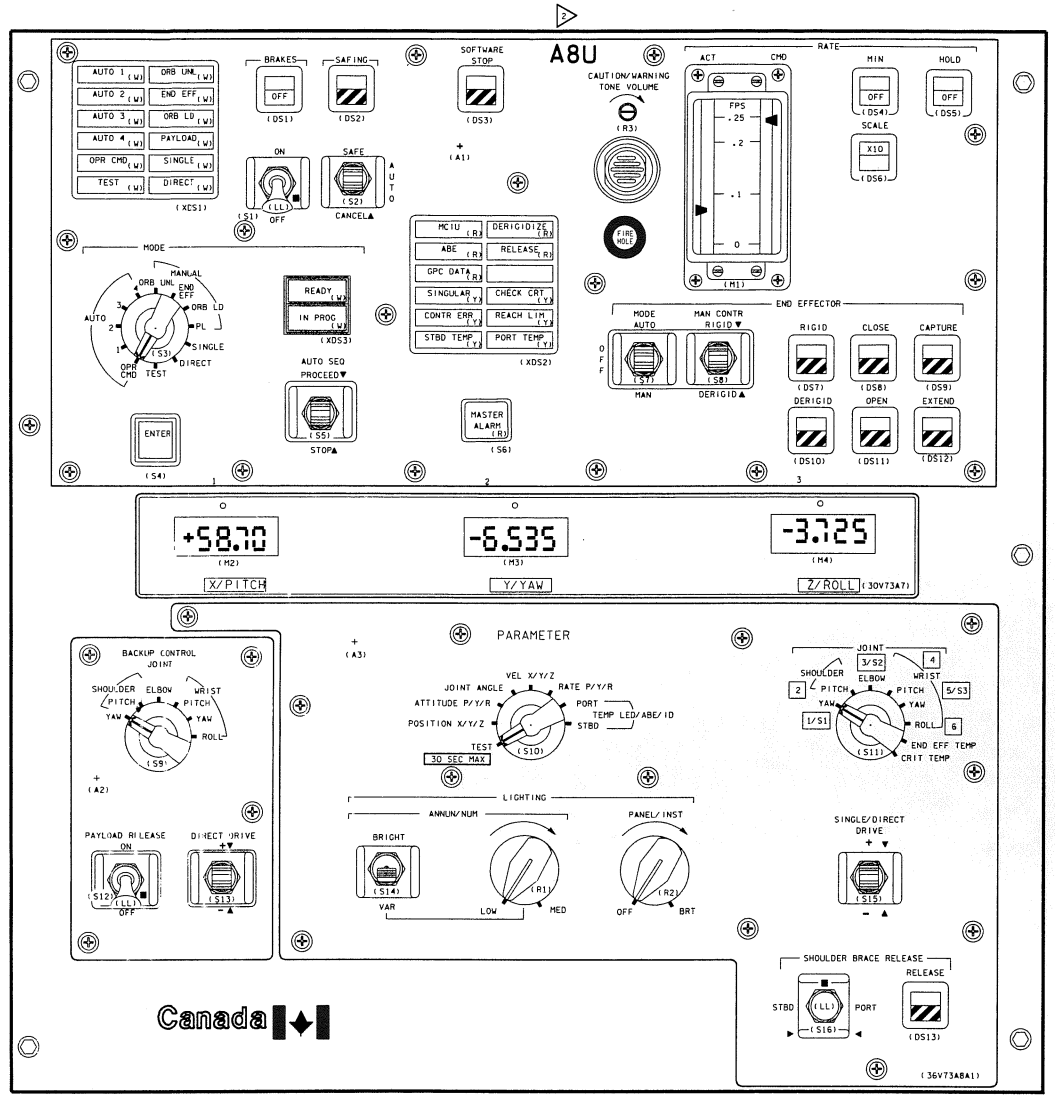


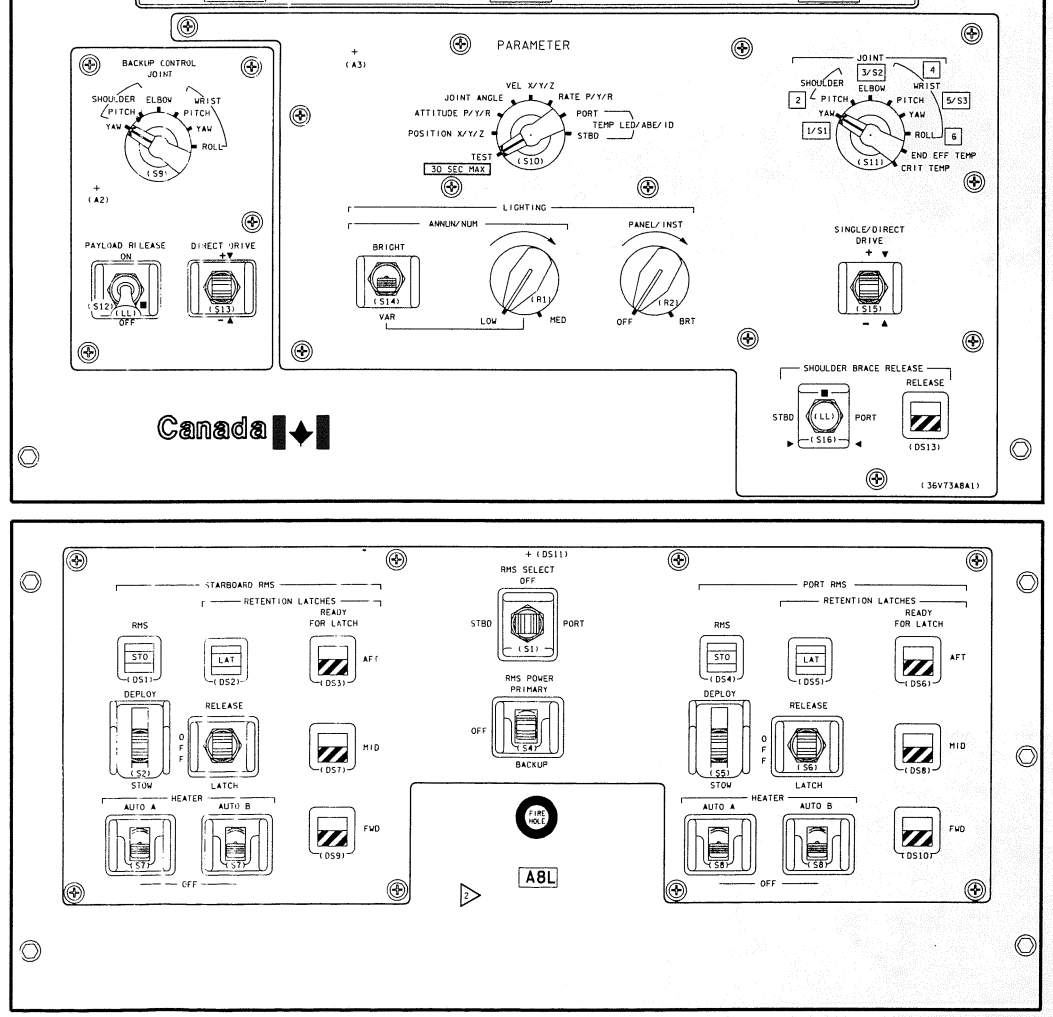


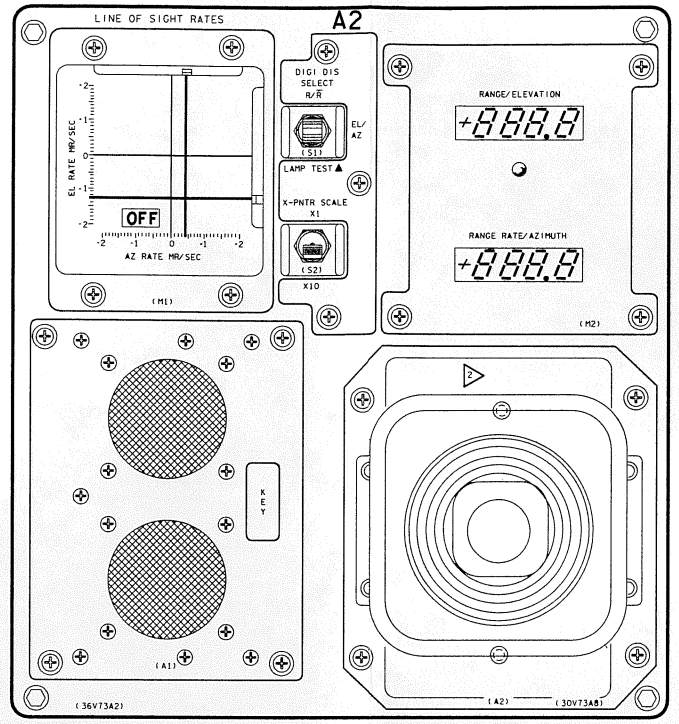
DATE: 10/11/80	NAME: BJT	VERSION# INK6

DATE: 11/30/92	NAME: VEM	VERSION: BPT: 14
DATE: 01/06/93	NAME: SEV	VERSION: BPT: 15
DATE: 01/25/93	NAME: BJB	VERSION: INK: 10

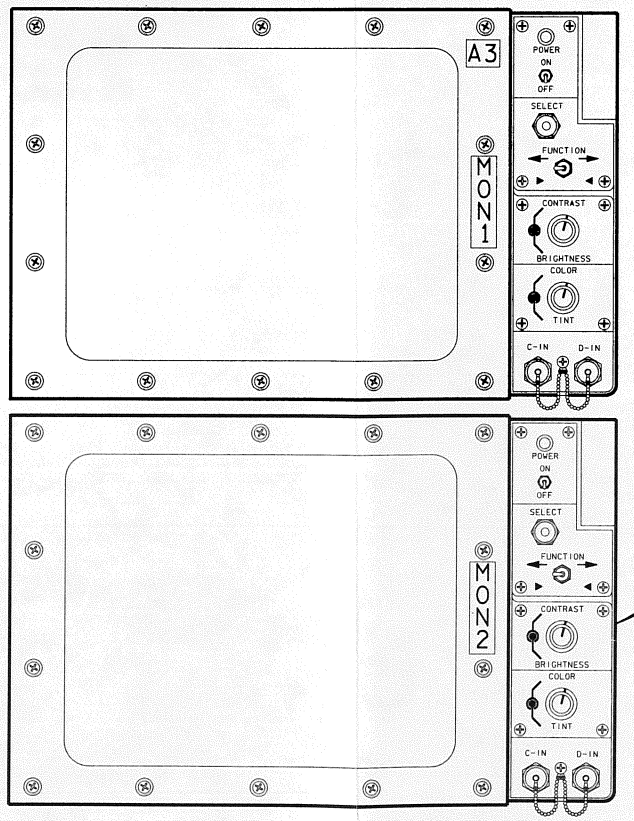








(PAYLOADS)



A3

AIU (A1A1)
AIL (A1A2)
AIR (A1A3)
A2
A3A1
A3A2
A4
A6U (A6A1)
▷ A6L (A6A2)
A7U (A7A1)
A7L (A7A2)
A8U (A8A1)
A8L (A8A2)
A134

3. REFER TO TABLE 20-1 FOR VENDOR DRAWING REFERENCES

▷ ONLY FLIGHTS USING RMS

NOTES: ▷ REFER D&C PROCEDURAL NOMENCLATURE-BOOK

2 D&C AFT 1

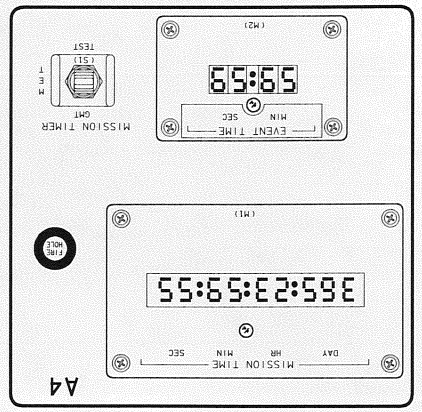
SIGNATURE		DATE
DSGN LAVATO		
DR BUCHANAN		
ENGR J. AZBELL		
ENGR		1/28/93
APP		2/1/93
APP		
OMNIPLAN	S.K. Kimbrell	2-2-93
LTR E	PCN 2	

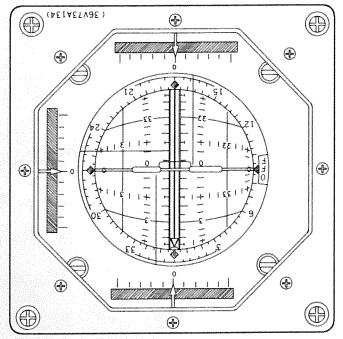
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS

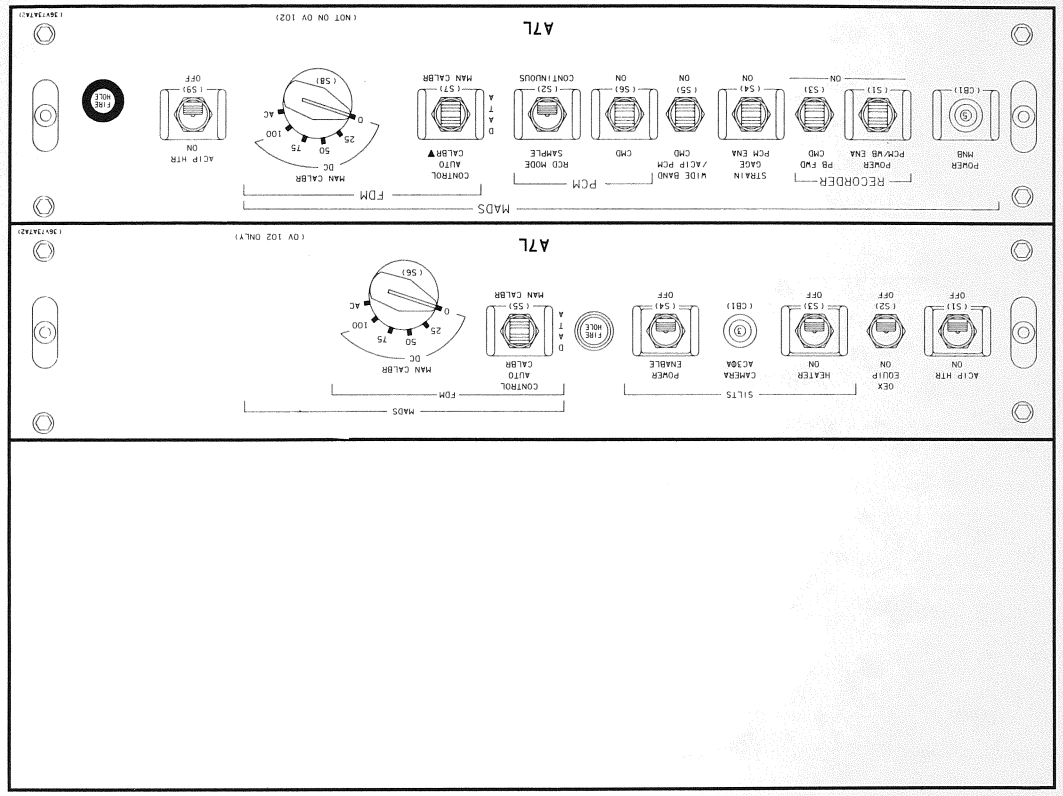
DISPLAYS AND CONTROLS
AFT STATIONS

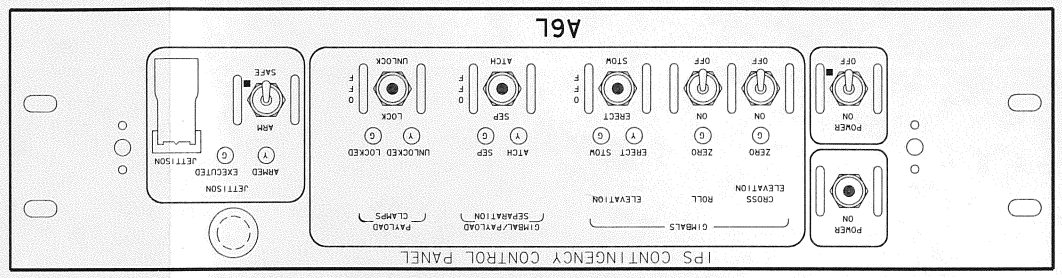
SPACE SHUTTLE | DWG NO 20.2
ALL
121 X 34 | PAGE | SHEET 1 OF 3

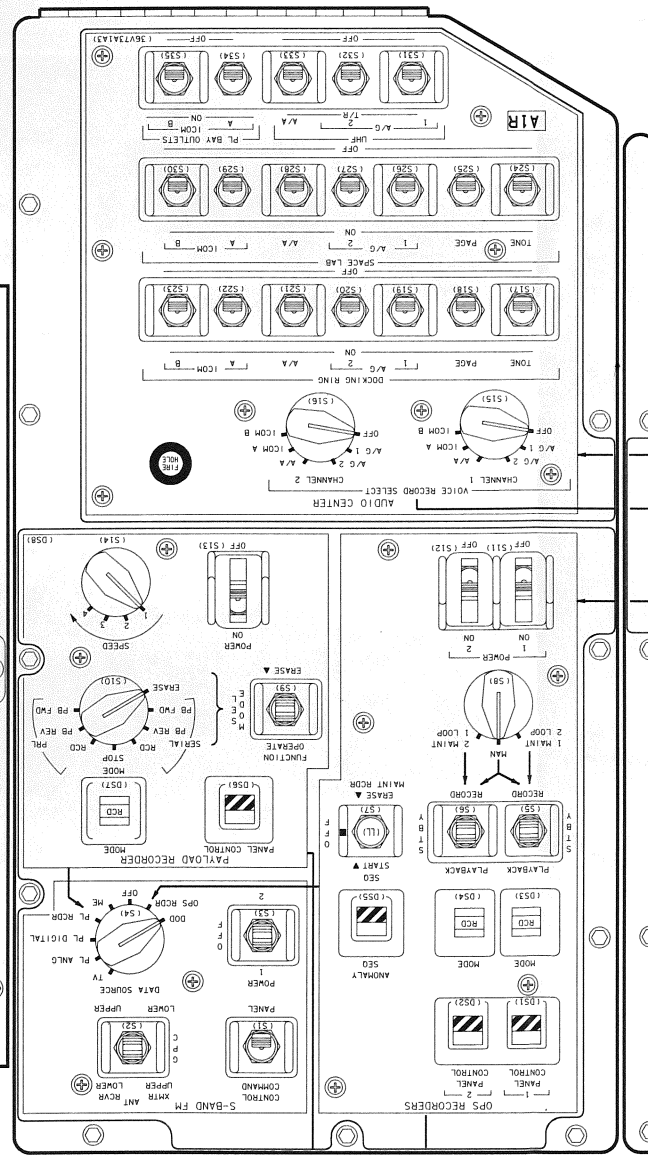
BASIC REV E-2

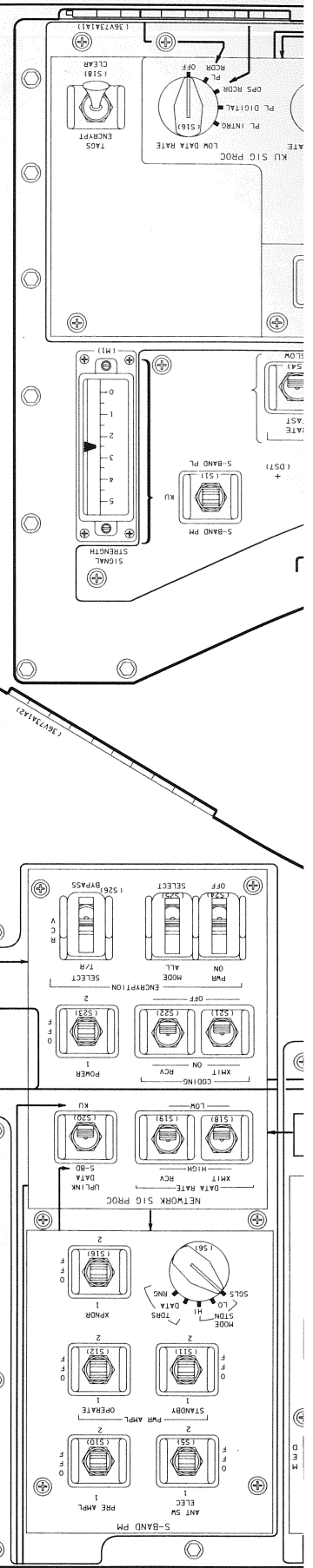

A4
MISSION TIMER
EVENT TIME
MISSION TIME
DAY HR MIN SEC

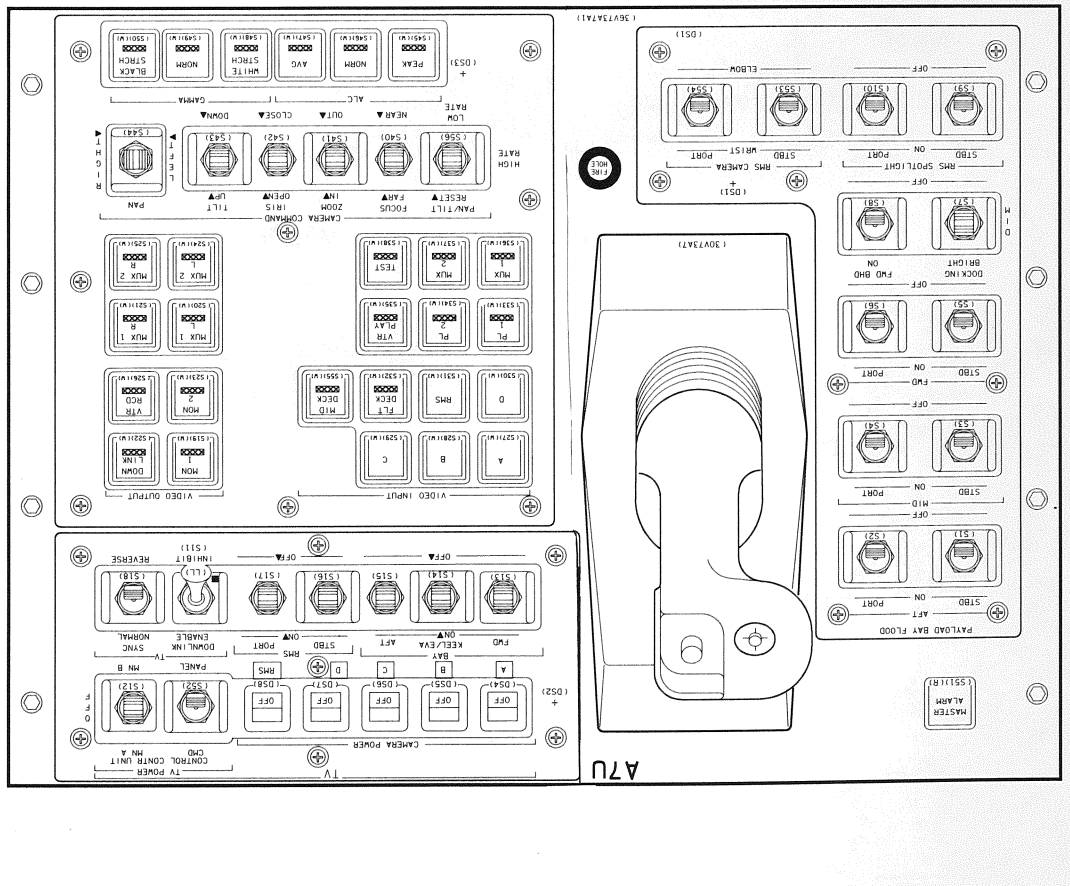

A134

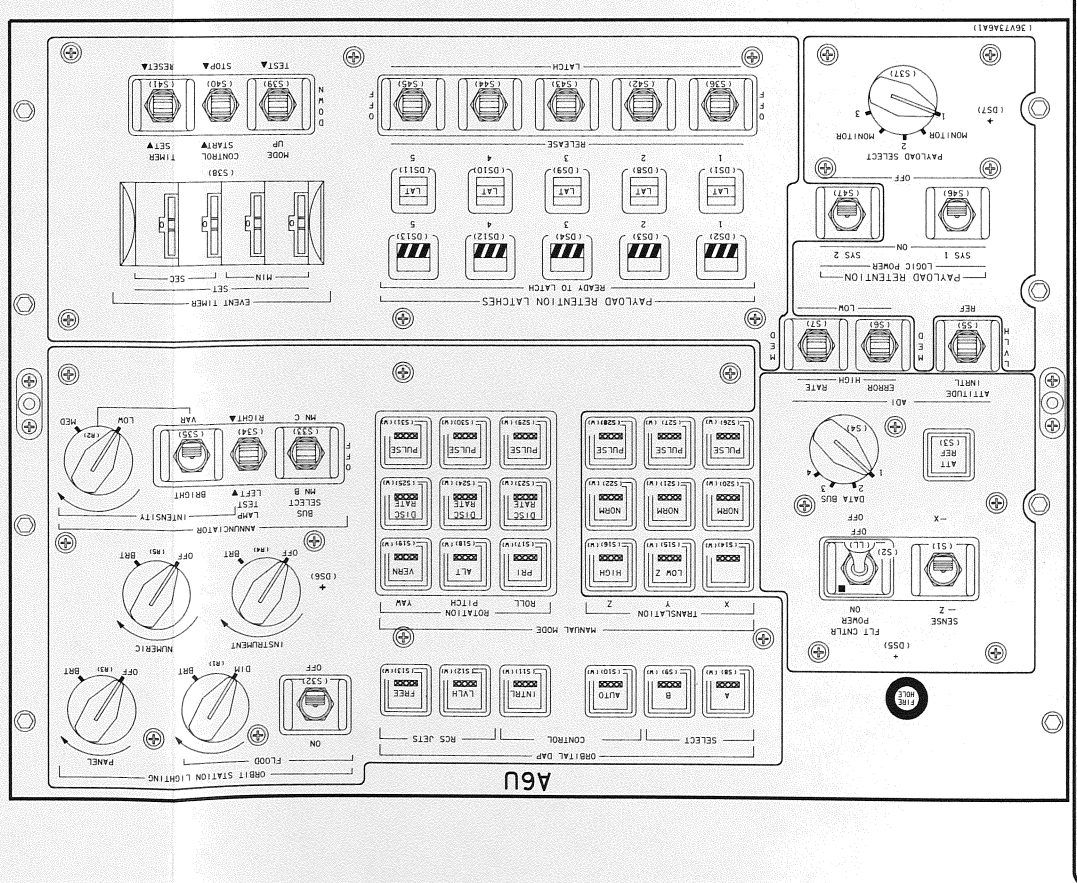

A7L
MADS
RECORDER
PCM
FDM
A7L
MADS
SILTS
FDM
PCM


A6L
IPS CONTINGENCY CONTROL PANEL
JETTISON
GIMBAL/PAYLOAD SEPARATION
GIMBALS
ELEVATION
PAYLOAD

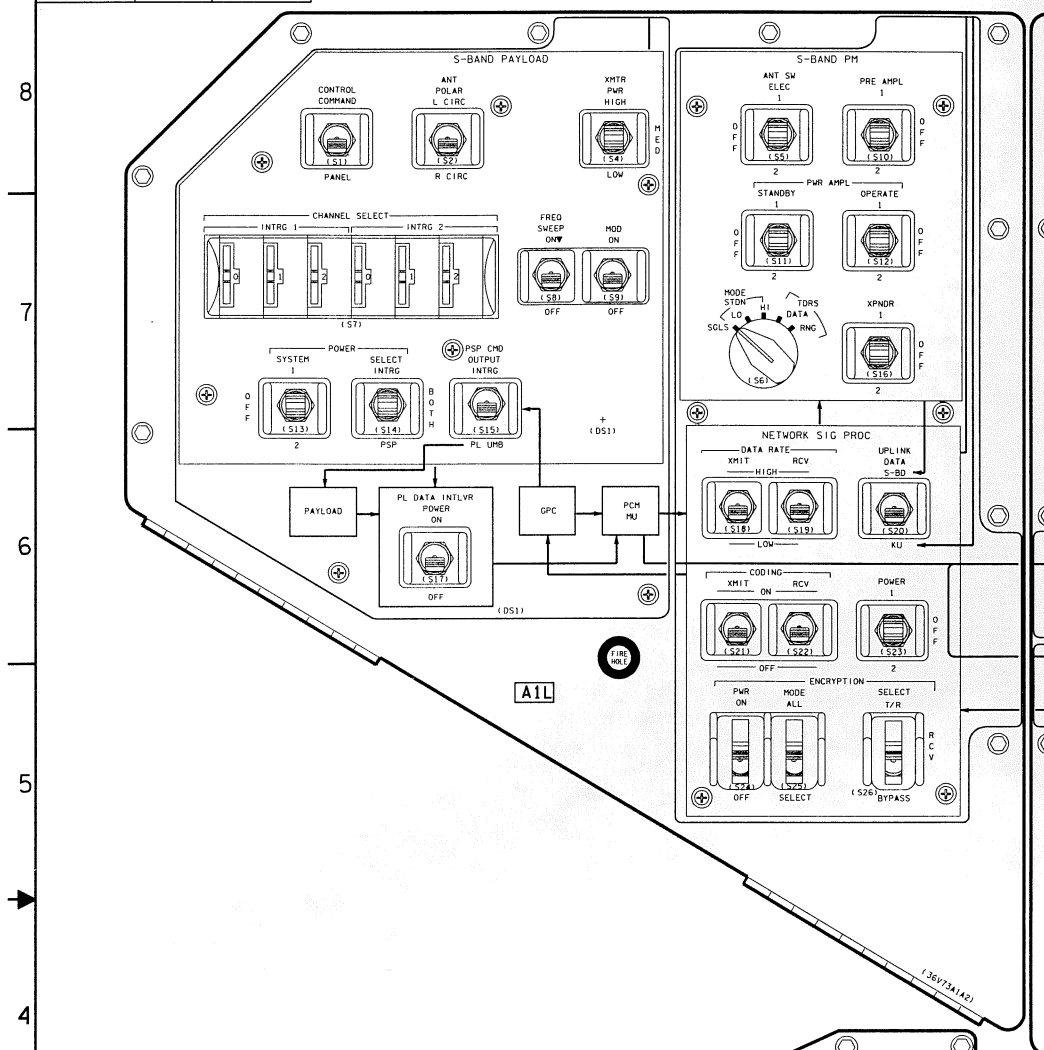

AIR
AUDIO CENTER
PAYLOAD RECORDER
OPS RECORDERS
S-BAND PM
S-BAND FM

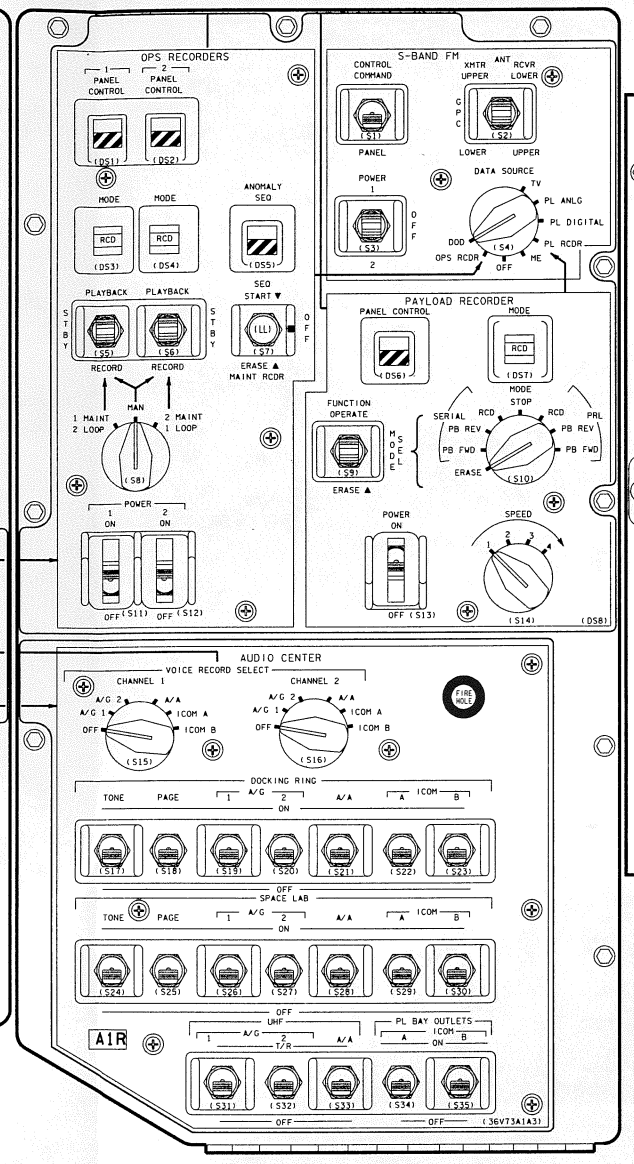

KU SIG PROC
NETWORK SIG PROC
S-BAND PM

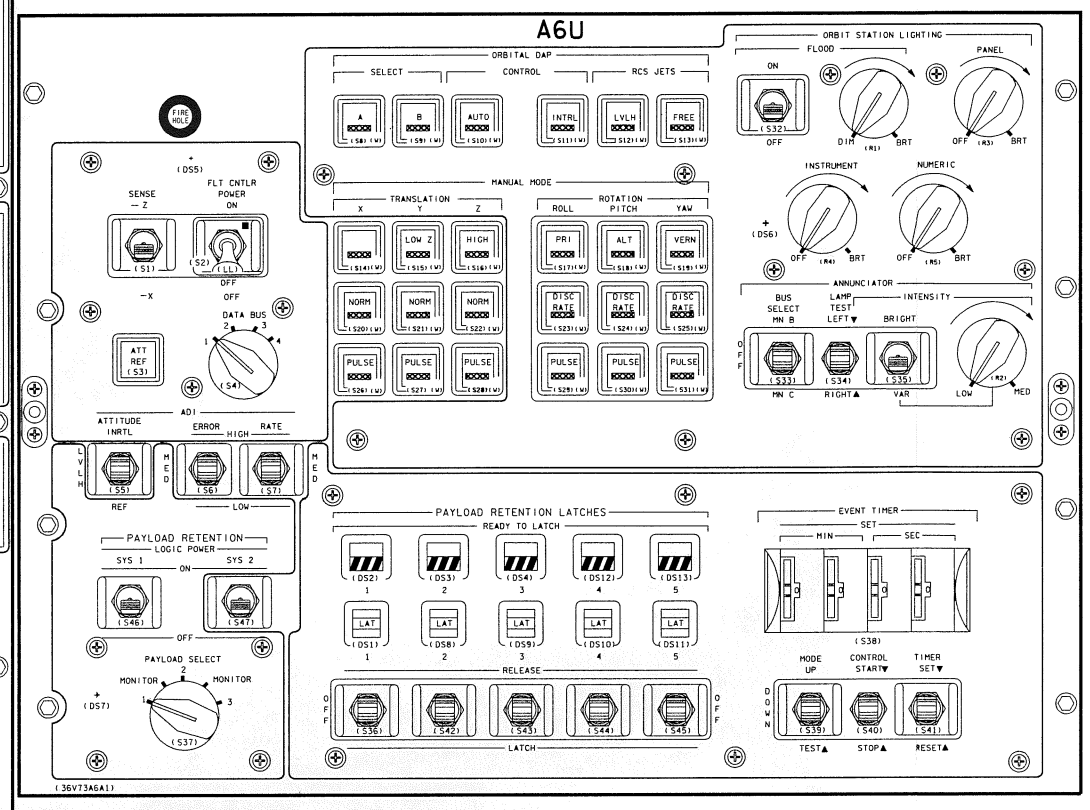

A7U
CAMERA POWER
VIDEO INPUT
VIDEO OUTPUT
CAMERA CONTROL
PANEL
FLOOD
ART
STBD
PORT
DOCKING
FWD BHD
MIO
RMS SPOTLIGHT
RMS CAMERA
WRIST
ELBOW
PALOAD BAY FLOOD
MASTER ALARM

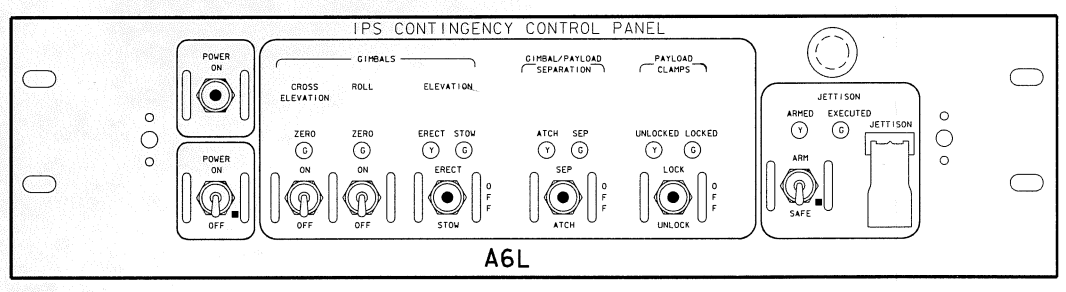

A6U
PAYLOAD RETENTION LATCHES
READY TO LATCH
RELEASE
LATCH
EVENT SET TIMER
ORBITAL DAP
CONTROL
RCS JETS
SELECT
MANUAL MODE
TRANSLATION
ROTATION
ROLL
ATTITUDE
ERROR
RATE
PAYLOAD RETENTION
LOGIC POWER
PAYLOAD SELECT
ORBIT STATION LIGHTING
ANNUNCIATOR
INTENSITY
LAMP TEST
BUS SELECT
PAN B
PAN C
RIGHT ▲
LEFT ▼
NUMERIC
INSTRUMENT
DIM
FLOOD
PANEL

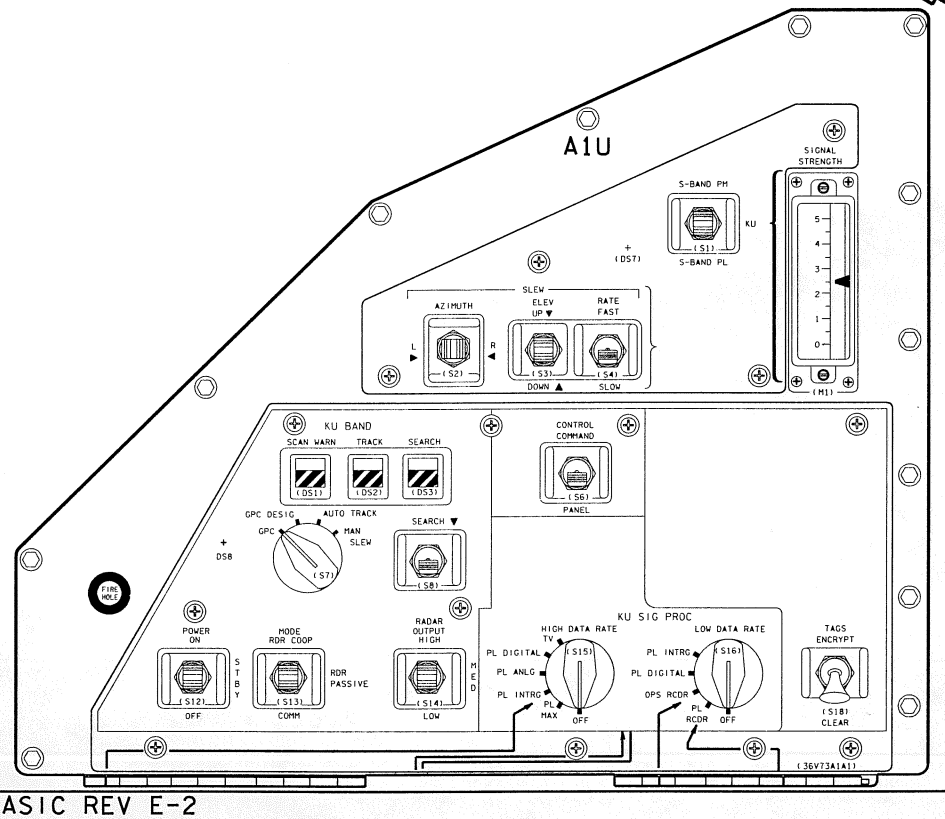
DATE: 01/25/93 | NAME: BJB | VERSION: INK.10

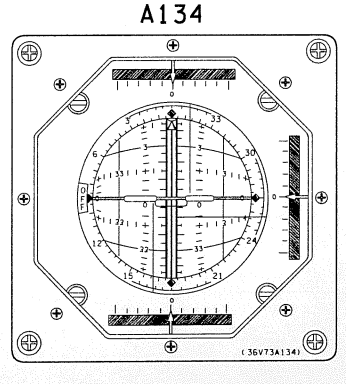


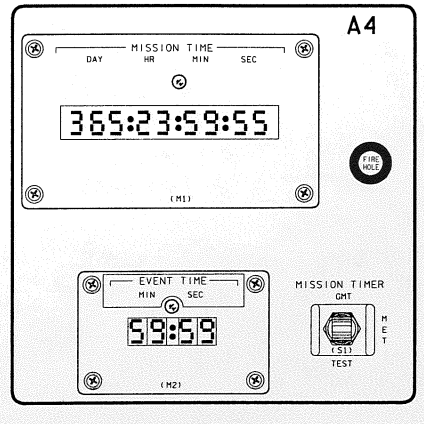












BASIC REV E-2

DATE: 08/23/91	NAME: MAG	VERSION: BPT.10
DATE: 09/28/91	NAME: JDF	VERSION: INK.8
DATE: 10/09/91	NAME: JDF	VERSION: INK.9

L10 IUS POWER CONTROL

UPPER SWITCH POSITION = GRAY
LOWER SWITCH POSITION = BP

POWER SOURCE — IUS

ASE BATTERIES — PRI (S3), ALT (S33)
ORBITER — S/C CONV PWR: PRI (S4), ALT (S34)
S/C BATTERY — PRI (S5), ALT (S35); STAGE 1 ON; STAGE 1 & II OFF
BUS A BATTERIES — PRI (S9), ALT (S39); STAGE 1 ON; STAGE 1 & II OFF
BUS B BATTERIES — PRI (S11), ALT (S41)
PANEL — MODE: PRIMARY (S61), ALTERNATE
POWER: PRI CB1, ALT CB2

S/C CONV

S/C SUPPORT
S/C REG PWR: PRI (S2), ALT (S32)
S/C POWER: PRI (S6), ALT (S36)
S/C REG
IUS CONV PWR: PRI (S1), ALT (S31)
IUS CONV

IUS SUPPORT
A FEED: PRI (S10), ALT (S40)
B FEED: PRI (S12), ALT (S42)
MATRIX STATUS: PRI (S60), ALT (S61)
TEST: GRAY (S63), BARBER POLE, ALT (S73)

IUS SUPPORT
HEATERS: BATTERY PRI (S21), ALT (S51); GUARD PRI (S22), ALT (S52)
WBDI: PRI (S23), ALT (S53); WBD1
IUS POWER: PRI (S8), ALT (S38)
NORM BUS PWR: PRI (S7), ALT (S37)
IUS SUPPORT AUTO SHUTDOWN STANDBY MODE: PRI (S20), ALT (S50); ENABLE (S70)
STANDBY BUS A
STANDBY BUS B

TILT TABLE ACTUATOR
DRIVE ENABLE: PRI 1 (S13), ALT 2 (S43); MAXIMUM, INTERMEDIATE
MOTION: RAISE (S14), LOWER (S44); PRI 1 (S14), ALT 2 (S44)
POSITION: PRI 1 (S61), ALT 2 (S71)
PRI DR: ACT 1 ENGAGED (S76)
ALT DR: ACT 2 ENGAGED (S77), ACT 1 DISENGAGE (S57)
CMD PATH ENABLED: HARDLINE (S65), RF, HARDLINE

PYRO BUS: PRI (S24), ALT (S54); ON; OFF
UMBILICALS: ENABLE PRI (S18), ALT (S48); RELEASE PRI (S19), ALT (S49); OFF
IUS DEPLOYMENT: ENABLE PRI (S25), ALT (S55); DEPLOY PRI (S26), ALT (S56); OFF
POWER KILL: KILL (S62), OFF

L11 COMMUNICATION INTERFACE UNIT AUXILIARY CONTROLS

MEMORY ZEROIZED (DS1)
FAULT ALARM: CMD TLM (DS2)
MODE: CLR (DS3)
POWER OPERATE: STANDBY (S1)
VARIABLE LOAD (DS4)
CLEAR: SECURE (S2)

COMMUNICATION INTERFACE UNIT

POWER: ON, OFF (S3)
LIGHTING: BRIGHT, VAR (S4), LOW, MED (R1)
MDM ERROR: UPLINK (S5), GPC (S6)
COMMAND VERIFICATION: CMD WORD, VCC OCTAL
MODE SELECTION
DOWN LINK: S BAND FM (S7), KU BAND WBDI (S8), PAYLOAD RCDR (S9)
PAYLOAD LINK: HARDLINE 64 KBPS, HARDLINE 16 KBPS, RF 16 KBPS (S10)
SELECT (S13)
CMD REJECT (DS5)
COMMAND SOURCE: PANEL, T-O UMB (A), T-O UMB (B), MDM, KU 128, SPARE (S11)
PAYLOAD SELECT (S12)
GENERATION: CLEAR (DS6), ENTER (DS7), SEND (DS8)

L12 STANDARD SWITCH PANEL

(DS1)–(DS19), (S1)–(S19), (CB1)–(CB4), (DS20)–(DS24), AUX I/O

STANDARD SWITCH PANEL

(DS1)–(DS19), (S1)–(S19), (CB1)–(CB4), (DS20)–(DS24), AUX I/O

DEPLOYMENT

DISC SYS SEL: A, OFF, B (S1)
ARM: SAFE (S2)
RETRACT: SAFE (S3)

L12 MANUAL POINTING CONTROL

SELECT: 1, 2, 3 (S4)
POWER ON: OFF (S5)
UMBILICAL

RCS/OMS HEATERS

OMS KIT: A AUTO (S6), A AUTO (S7), B AUTO (S8)
RIGHT POD: A AUTO (S52), A AUTO (S54), B AUTO (S55)
OMS CRSFD LINES: B AUTO (S53), OFF
RCS JET: 3 AUTO (S16), 4 (S17), 5 (S18)
RCS JET: 3 AUTO (S11), 4 (S12), 5 (S13)
OFF

PYRO
KU ANT: ARM (S19), JETT (S20)
STARBOARD RMS: ARM JETT (S21), FWD JETT (S22), MID JETT (S23), AFT JETT (S24), SAFE (S25); GUILLOTINE
PORT RMS: ARM JETT (S28), FWD JETT (S29), MID JETT (S30), AFT JETT (S31), SAFE (S32); GUILLOTINE
RMS JETT LATCHES GND RESET: SAFE (S33), DEADFACE

A14 (36V73A14)

PAYLOAD STATION AUDIO

PS FLOOD: ON (S11), OFF; DIM, BRT (R1)
POWER AUD/TONE (S6): OFF
A/G 1 (S2), 2 (S3); A/A T/R (S4); ICOM A (S5), B (S6); OFF; RCV AUD
VOX SENS (R1): MIN, MAX
VOLUME: A/G 1 (S9), 2; A/A; ICOM A, B
PAGE (S8) (DS1)
XMIT/ICOM MODE (S10): PTT/VOX, PTT/HOT, PTT/PTT, VOX/VOX

ACTIVATION
L9 ALL SWITCHES - AS REQ'D
A15 PS COMM CCU PRW-ON

(31V73A9A2) L9

MODE: 1, 2, 3
GAIN: HI, LO; MED
POWER: CLW, CW
MANUAL POINTING CONTROLLER

UMBILICAL CABLE

1. NOMENCLATURE ON OV-105 WILL READ PPCA - 1/3, PPCA - 2/4
2. CRYO PALLET FLOWN ON EDO MISSIONS ONLY
3. SWITCHES ON OV105 ONLY
4. OFF FUNCTION NOT WIRED SHADED NOMENCLATURE TAPED OVER
5. REFER TO TABLE 20-1 FOR VENDOR DRAWING REFERENCES
6. IUS MISSIONS ONLY
7. REFER PROCEDURAL NOMENCLATURE BOOK FOR LABELING
8. SHADED AREA INDICATES OV102 ONLY

NOTE: 1 SHOWN WITH HINGED COVER OPEN

2 D&C AFT 2

SIGNATURE		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN	CONNIE RILEY	7-12-82	
DR	CONNIE RILEY	7-12-82	DISPLAYS AND CONTROLS AFT STATIONS AND MISSION UNIQUE PANELS
ENGR	M.D. FUGITT		
ENGR	Mark Fugitt	11/8/91	
APP	Paul Mayaya	11/8/91	
APP			SPACE SHUTTLE — DWG NO 20.2
OMNIPLAN	S.K. Humbrier	11-2-91	ALL
LTR E	PEN 1		126.5 X 34 — PAGE — SHEET 2 OF 3

BASIC REV E-1

L9
L10
L11
L12
L15
A11
A12
A13
A14
A15

A11
CRYO TANK 4/5 HEATERS
(OV102 ONLY)
(OV103 AND OV104 ONLY)
MS BIOMED
DC UTILITY POWER
MAIN ON
CCU PWR ON
MS COMM
OS COMM
TEST
TK 4 AUTO
TK 5 RESET
TK 4/5A
TK 4/5B
A13
(ALL EXCEPT OV102)
(OV102 ONLY)
OS AUDIO
POWER
AUD/TONE
VOX SENS
MASTER SPEAKER VOLUME
SPKR PWR SPKR/MIC
XMIT/ICOM MODE
PTT/VOX
PTT/HOT
VOX/VOX
PAGE
VOLUME
A/G
ICOM
A12
APU HEATER
GAS GEN/FUEL PUMP
LUBE OIL LINE
A AUTO
LC ARM/ON RESET
RC 3 STRUCT RTN
GPS
RECEIVER/PROCESSOR ASSY
MODE
POWER
PRE ARMED
MAIN A
MAIN C
LC
UC
HYDRAULIC HEATER
BOOM FLAP
ELEVON
AFT FUSELAGE
HYD CIRC PUMP POWER
MAIN A
MAIN B
MAIN C
A14
RCS/OMS HEATERS
OMS
RCS
LEFT POD
RIGHT POD
PYRO
AFT RCS JET
FWD RCS JET
AUTO
OFF
ON
A15
CRYO TANK 5 HEATERS
PALLET CRYO
PALLET CRYO TANK HEATERS
TANK 6
TANK 7
TANK 8
TANK 9
ESS 18C
ESS 24A
MAA
MAB
MAIN
RESET
TEST
PPCA CONT PWR
PALLET POWER
PPCA-1
PPCA-2
AC UTILITY POWER
PS BIOMED
CCU PWR
PS COMM
L10
IUS POWER
POWER SOURCE
ORBITER
ASE BATTERIES
S/C BATTERY
IUS CONV
S/C CONV PWR
S/C REG PWR
S/C POWER
S/C SUPPORT
UMBILICALS
PYRO BUS
ENABLE
STAGE 1 ON
STAGE 1 & 2 OFF
TILT TABLE AC
MOTION
DRIVE ENABLE
RAISE
LOWER
INTERMEDIATE
HEATERS
BATTERY QUAD
WBDI
IUS SUPPORT
L15
IMAX POWER ONLY
(AUX A)

DATE: 10/09/91 | NAME: JDF | VERSION: INK.9

W V U T S R Q P O N

8 7 6 5 4 3 2 1

A11

CRYO TANK 4 HEATERS

O_2 H_2

A — AUTO — B

RESET ▼

(S1) (S2) (S3) TEST ▲ (S4) (S5)

ON

OFF A

PALLET CRYO TANK HEATERS

TANK 10

(S16) (S17) (S18) (S19) (S20)

OFF B

TANK 11

(S21) (S22) (S23) (S24) (S25)

OFF C

TANK 12

(S26) (S27) (S28) (S29) (S30)

OFF D

FINE HOLE

MS COMM CCU PWR

ON (S11) OFF

(J1)

MS BIOMED

DC UTILITY POWER

MN C ON (S13) OFF

(J10) (J4)

PALLET CRYO TANK HEATERS

TANK 13

(S31) (S32) (S33) TEST ▲ (S34) (S35)

OFF E

PALLET CRYO

ESS 1BC MN A MN B

TANK 10

CNTLR O_2 H_2 QTY O_2 H_2 O_2 HTR SNSR 1 SNSR 2

(CB1) (CB2) (CB3) (CB4) (CB5) (CB6)

OFF F

TANK 11

(CB7) (CB8) (CB9) (CB10) (CB11) (CB12)

OFF G

ESS 3AB MN A MN B

TANK 12

(CB13) (CB14) (CB15) (CB16) (CB17) (CB18)

OFF H

TANK 13

(CB19) (CB20) (CB21) (CB22) (CB23) (CB24)

OFF I

PALLET HEATER

C — AUTO — D

(S14) OFF (S15)

(OV105 ONLY)

A11

CYRO TANK 4 HEATERS

O_2 H_2

A AUTO B

RESET ▼

(S1) (S2) (S3) TEST ▲ (S4) (S5)

ON

OFF

MS COMM

CCU PWR ON (S11) OFF

(J1)

MS BIOMED

DC UTILITY POWER

MNC ON (S13) OFF

(J10) (J4)

(OV103 AND OV104 ONLY)

A11

CYRO TANK 4/5 HEATERS

O_2 H_2

TK 4 TK 5 TK 4/5 TK 4/5A TK 4/5B

AUTO RESET ▼ AUTO

(S1) (S2) (S3) TEST ▲ (S4) (S5)

ON

OFF

MS COMM OS COMM

CCU PWR ON (S11) OFF CCU PWR ON (S12) OFF

(J1) (J2)

MS BIOMED

DC UTILITY POWER

MNC ON (S13) OFF

(J10) (J4)

(OV102 ONLY)

APU HEATER

GAS GEN/FUEL PUMP 1 2 3 — LUBE OIL LINE 1 2 3

A AUTO

(S1) (S2) (S3) (S4) (S5) (S6)

LG ARM/DN RESET ▼ (LL1) (S13)

FC 3 STRUCT RTN ON (DS4) ON ▼ (S30) OFF ▲

B AUTO

TANK/FUEL LINE/H_2O SYS 1A 1B 2A 2B 3A 3B AUTO

(S7) (S8) (S9) (S10) (S11) (S12)

OFF

HYDRAULIC HEATER

RUDDER SPD BK — BODY FLAP — ELEVON — AFT FUSELAGE — A AUTO B

(S17) (S28) (S18) (S29) (S21) (S22) (S19) (S20)

OFF

HYD CIRC PUMP POWER 1 MN A 2 MN B 3 MN C

(S25) (S26) (S27)

MN B MN C MN A

(36V73A12)

A12

GPS

PRE AMPL UC MN A (S13) MN C

RECEIVER/PROCESSOR ASSY POWER 1 ON 2 (S14) (S15) OFF

MODE 1 RUN 2 (S16) (S17) DUMP HALT

LC MN C (S12) MN A (DS2)

OS AUDIO

MASTER SPEAKER VOLUME (R2) MIN MAX

SPKR PWR SPKR/MIC (DS1) (S10) OFF SPKR

FINE HOLE

(ALL EXCEPT OV102)

A13

(36V73A13)

OS AUDIO

POWER AUDI/TONE (S1) OFF AUD

A/G 1 2 A/A T/R A ICOM B (S2) (S3) (S4) (S5) (S6) OFF RCV

VOX SENS (R1) MIN MAX

MASTER SPEAKER VOLUME (R2) MIN MAX

PAGE ▼ (S7)

VOLUME A/G 1 2 A/A A ICOM B (S8)

XMIT/ICOM MODE PTT/VOX PTT/PTT PTT/HOT VOX/VOX (S11)

SPKR PWR SPKR/MIC (S10) OFF SPKR

(DS1)

(OV102 ONLY)

A13

(36V73A13)

CRYO TANK 5

O_2

A B C

PALLET POWER PPCA-1 PPCA-2 OFF (S9) OFF (S10)

MN A ON ▼ (S9) MN B (S10) OFF ▲

PALLET CRYO TA

O_2

D E F G

TANK 6 A AUTO B (S13) (S14) ON

TANK 7 (S18) (S19) ON

TANK 8 (S23) (S24) ON

TANK 9 (S28) (S29) ON

PALLET

ESS 1BC

TANK 6

CNTLR O_2 H_2 QTY O_2

(CB3) (CB4) (CB5)

H I J K

TANK 7 (CB9) (CB10) (CB11)

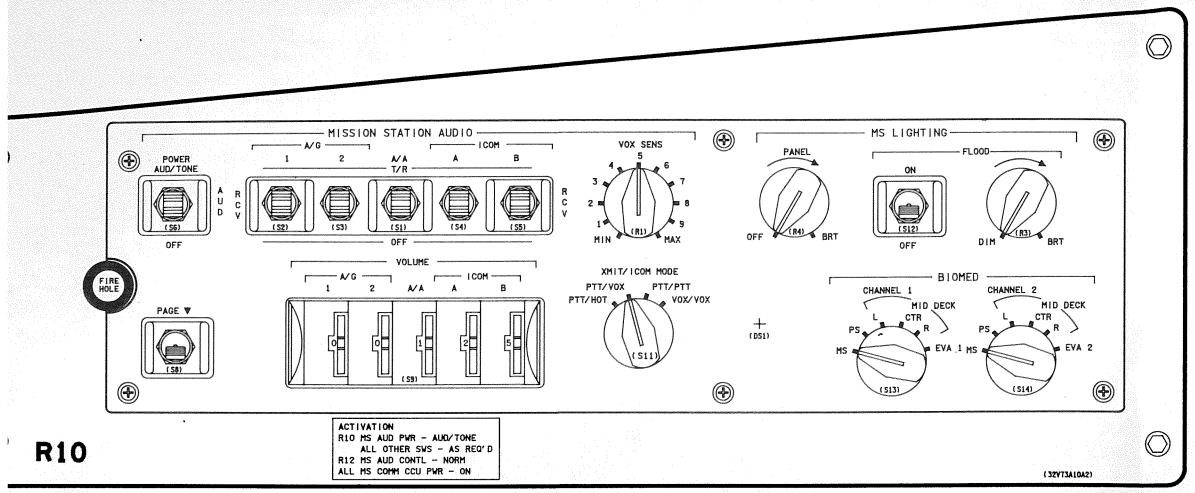
ESS 2CA

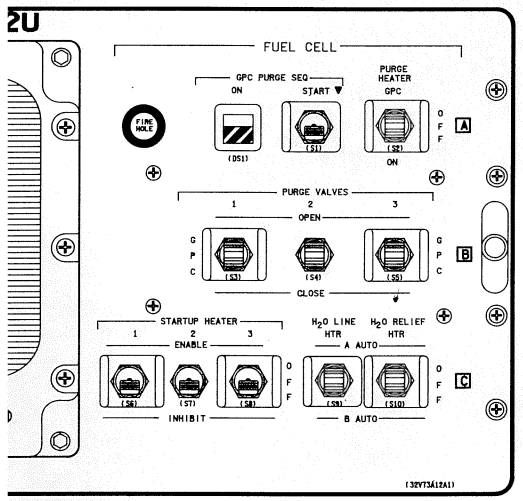
TANK 8 (CB15) (CB16) (CB17)

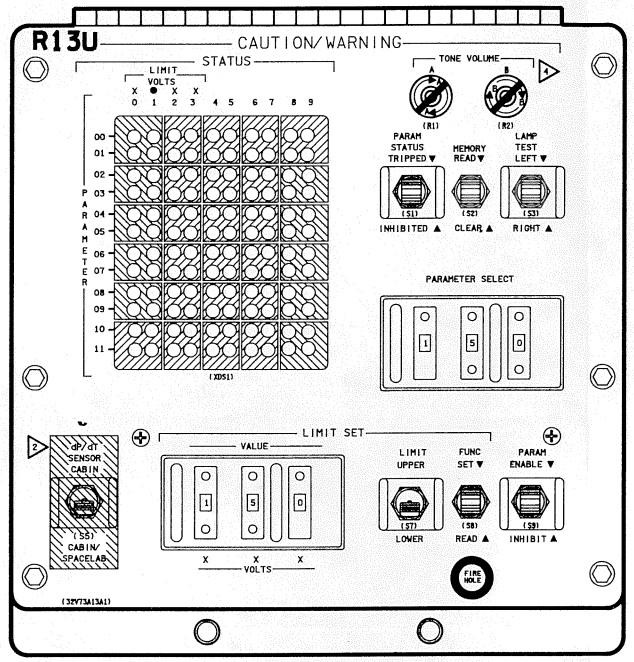
TANK 9 (CB21) (CB22) (CB23)

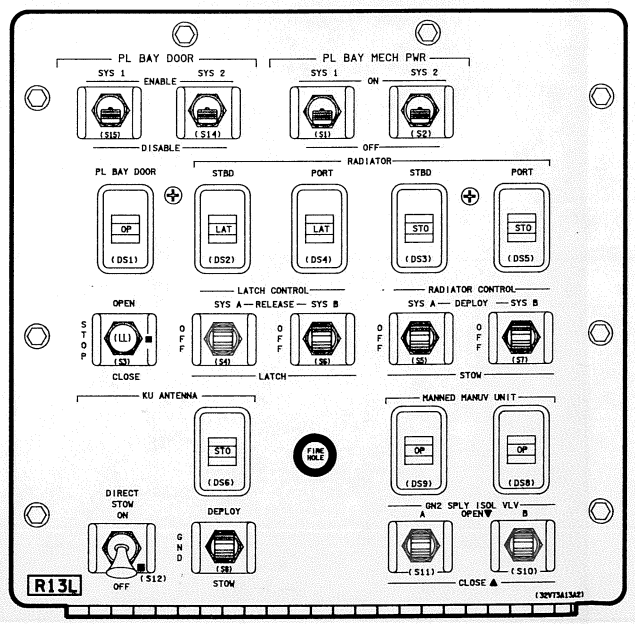
BASIC REV E-1

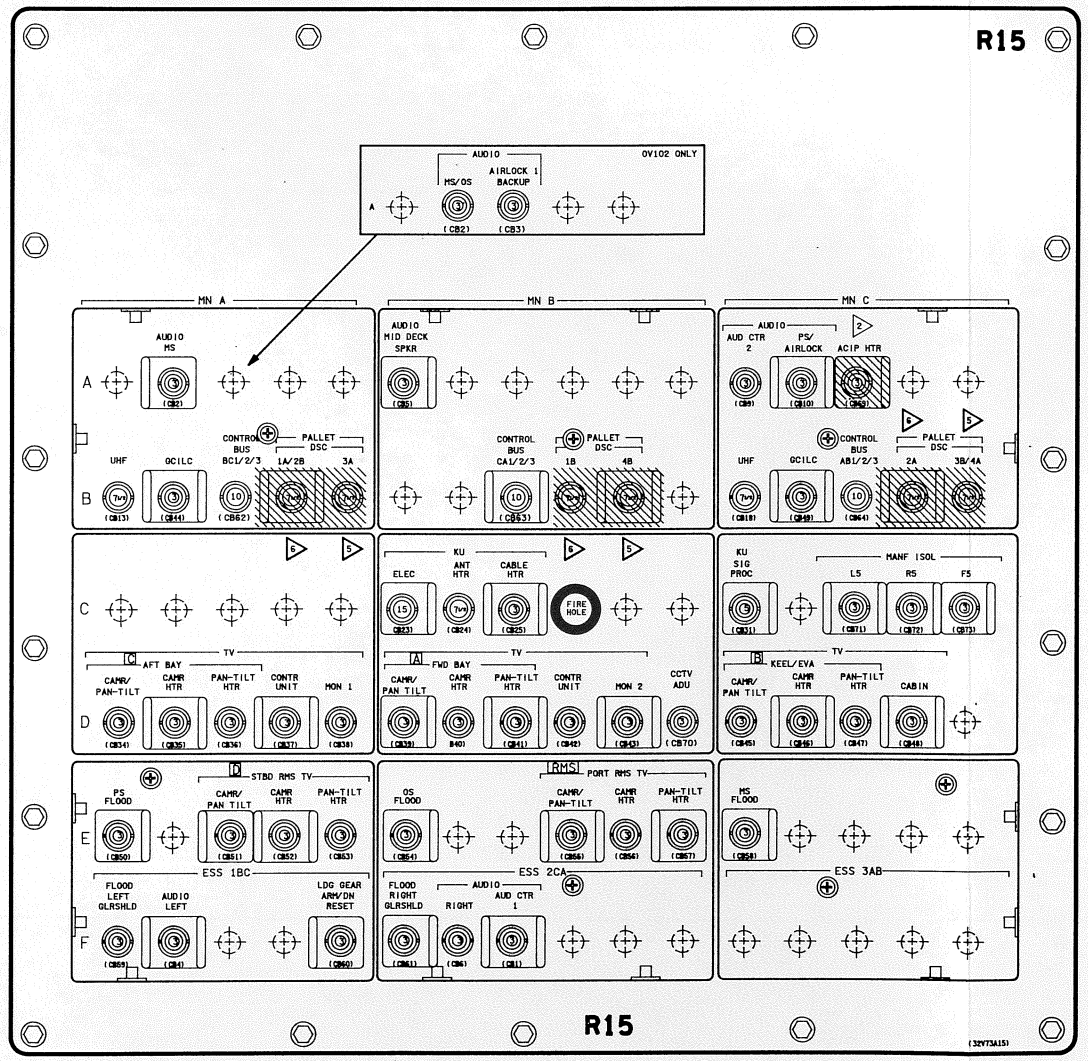
DATE: 09/26/91	NAME: MDU	VERSION: BPT, 9
DATE: 10/18/91	NAME: MDU	VERSION: BPT, 10
DATE: 11/12/91	NAME: MDU	VERSION: INK, 10











▷ R7
R10
R11U
R11L
(R12A1) R12U
(R12A2) R12L
(R13A1) R13U
(R13A2) R13L
R15

▷ PANELS R12U & R12L MOVED OVER INTO R11 SLOT ON SPACELAB MISSIONS WHEN A DDS 15 FLOWN IN THE R12 CONFIGURATION

▷ PALLET DSC 1&2 CB'S ON OV-102 & OV-105 ONLY

▷ PALLET DSC 3&4 CB'S ON OV-105 ONLY

▷ ON OV-102, B CHANNEL LOCATED ON THE LEFT

3. REFER TO TABLE 20-1 FOR VENDOR DRAWING REFERENCES

▷ OV-102 ONLY

NOTES: ▷ SPACELAB ONLY, REFER TO SPACELAB SYSTEMS HANDBOOK

2 D&C AFT 3

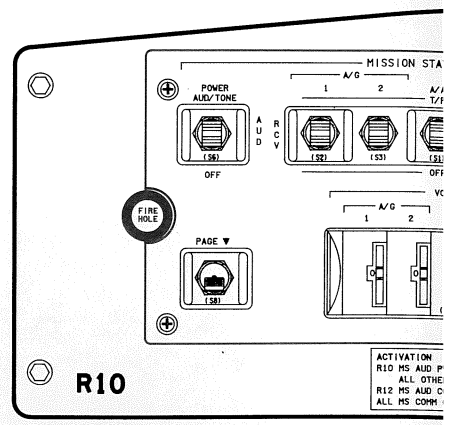
SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN D. J. LAVATO	6/6/79	
ENGR M. D. FUGITT		DISPLAYS AND CONTROLS AFT STATIONS
ENGR Mark Fugitt	11/19/91	
ENGR		
APP Paul McGavock	11/19/91	
APP		SPACE SHUTTLE / DWG NO 20.2
OMNIPLAN S. Klimbrew	11-19-91	ALL
LTR E PCN 1		93.5 X 34 / PAGE / SHEET 3 OF 3

BASIC REV E-1

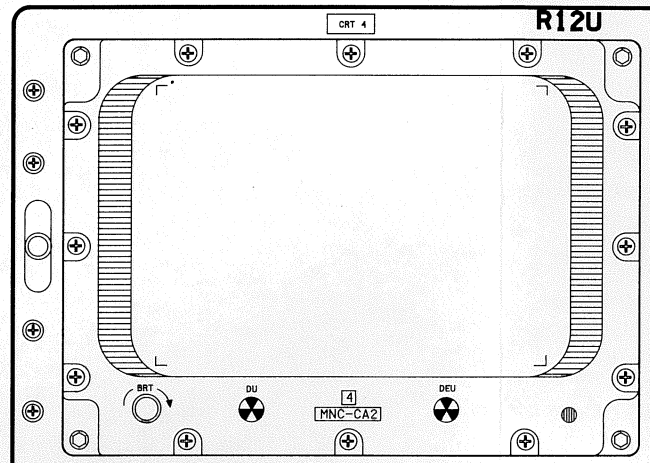
Q P O N M L K J

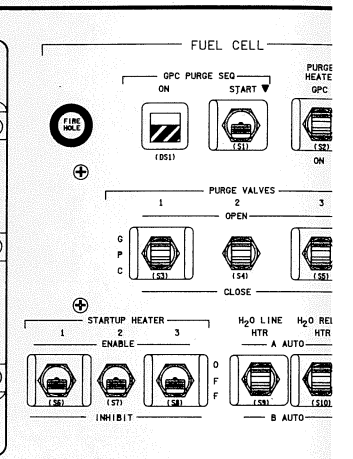
8 7 6 5 4 3 2 1

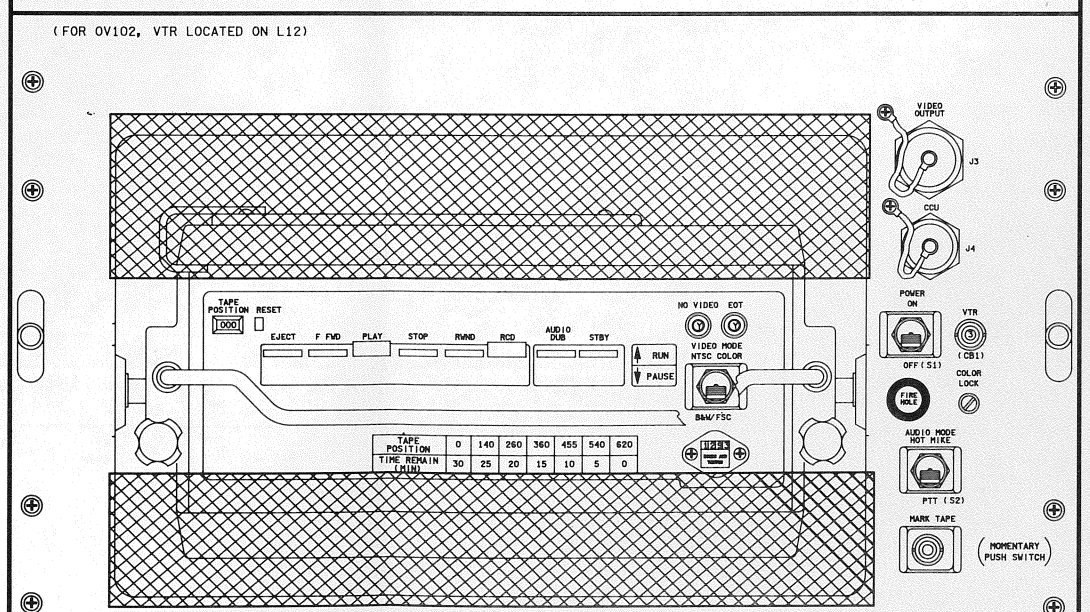
DATE: 11/12/91 | NAME: MDU | VERSION: INK.10



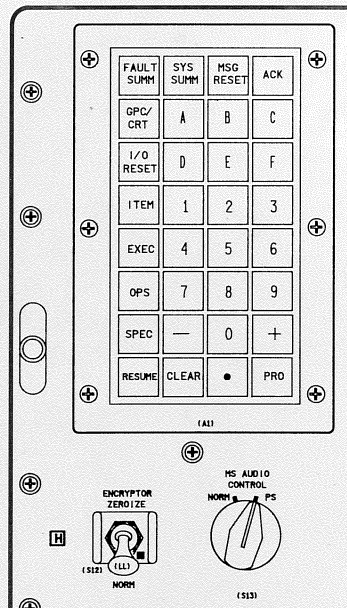
R11U

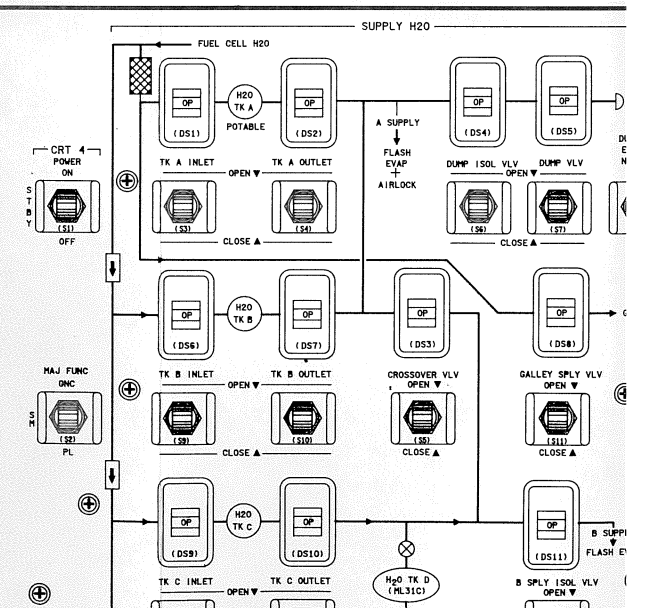






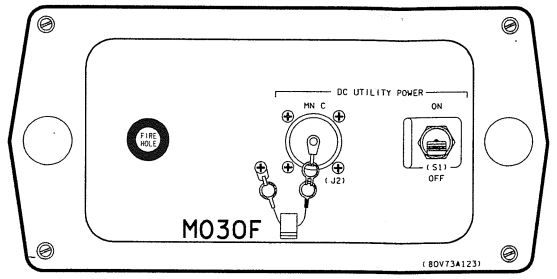
(R11L)

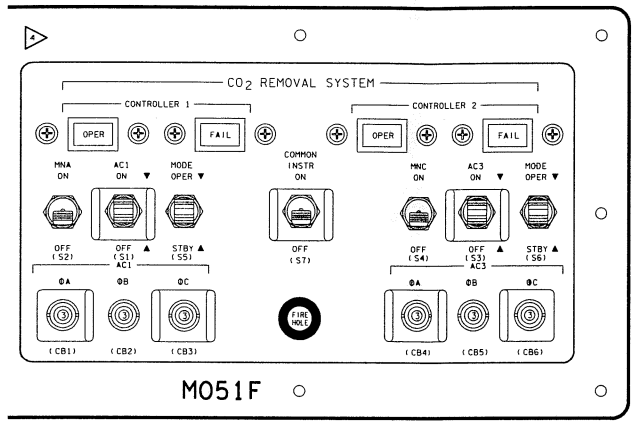


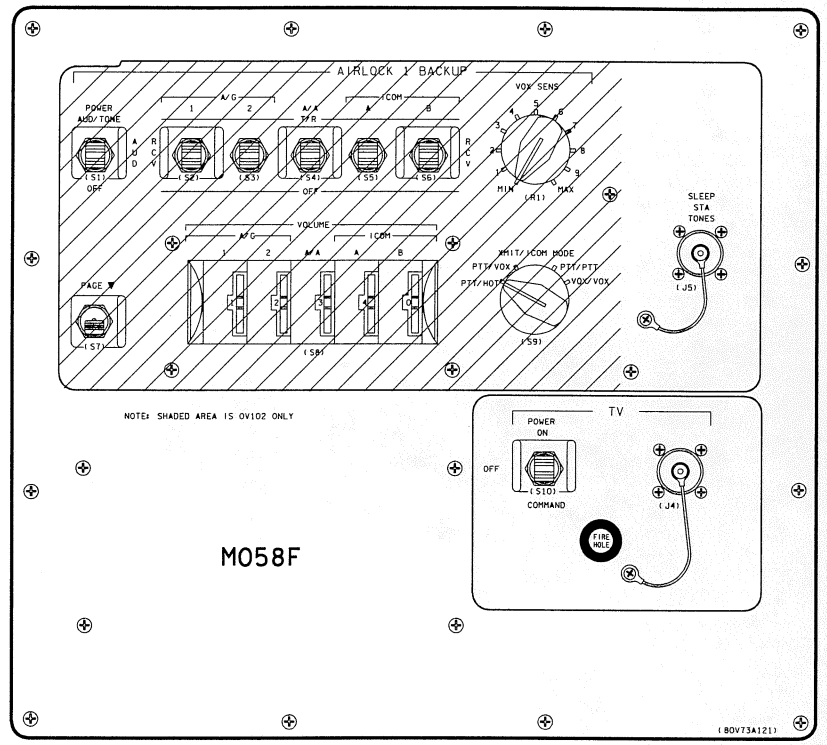


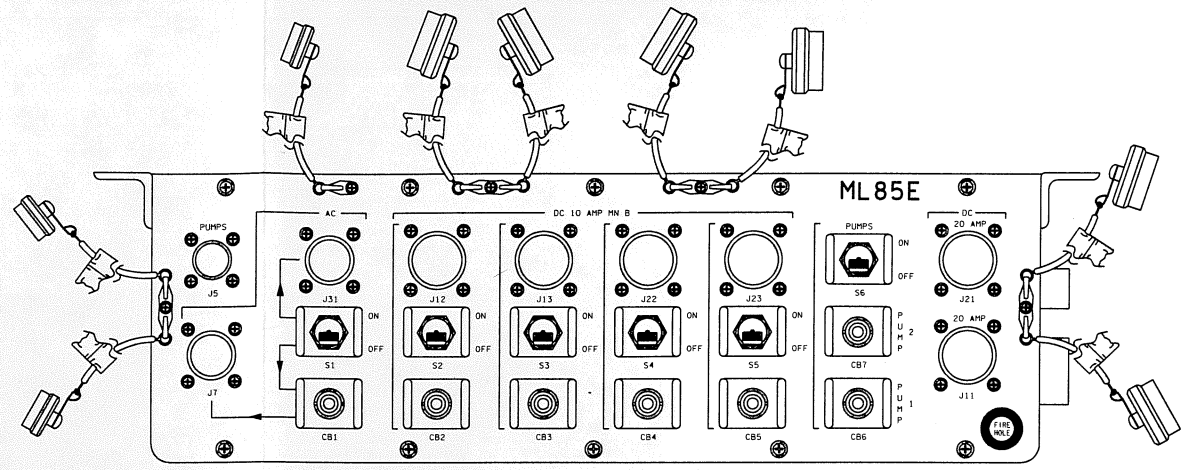
BASIC REV E-1

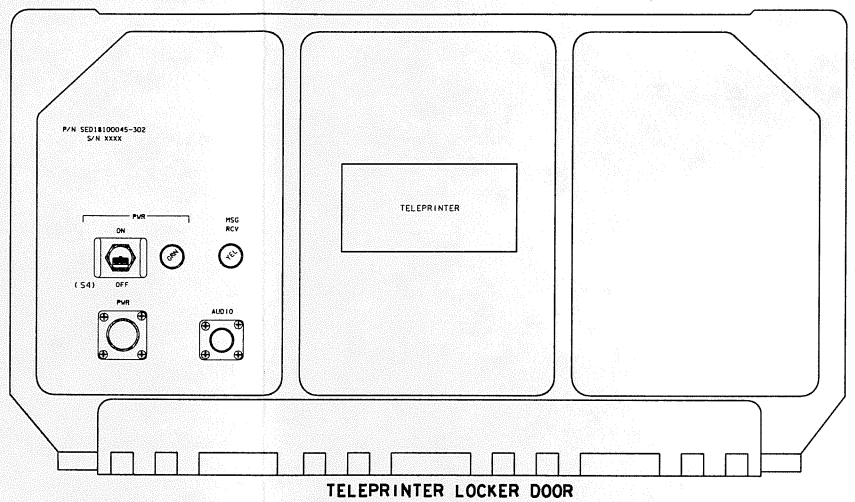
DATE: 11/30/92	NAME: VEM	VERSION: BPT.6
DATE: 01/07/93	NAME: SEW	VERSION: BPT.7
DATE: 01/25/93	NAME: BJB	VERSION: INK.13

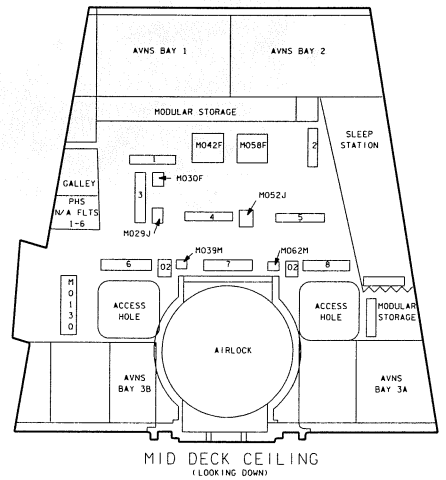


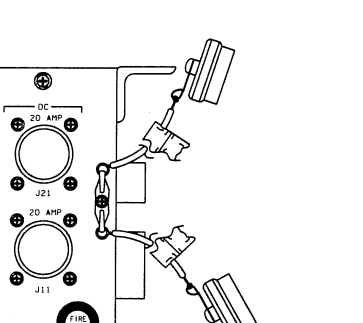


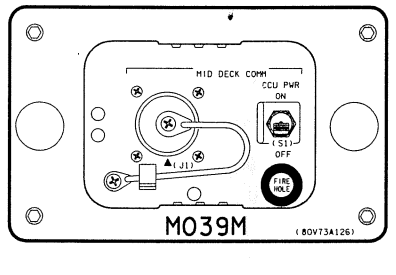


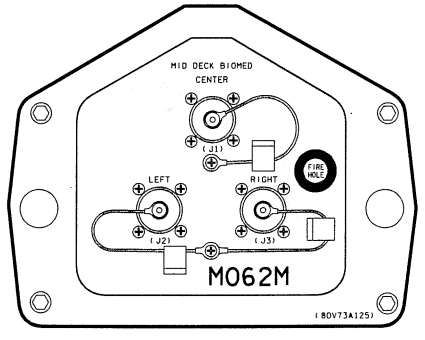


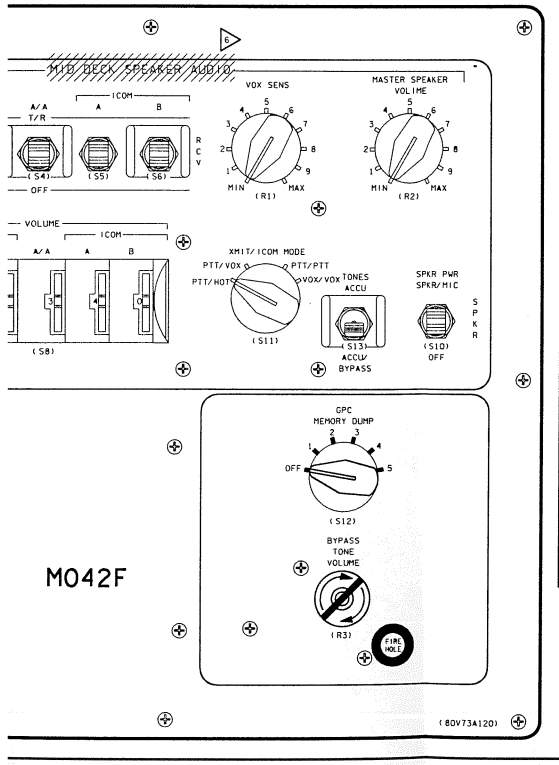


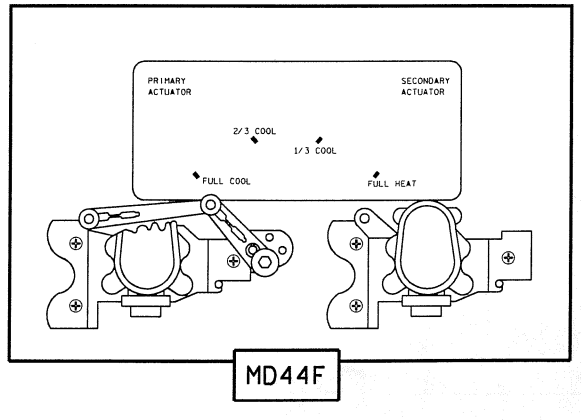


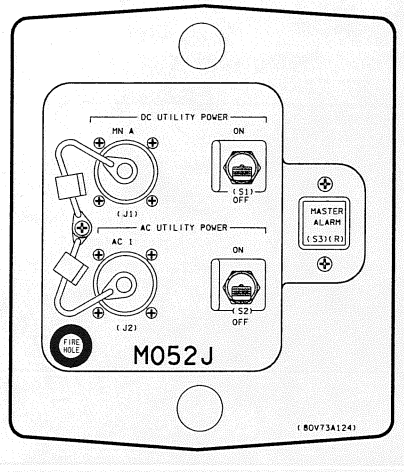


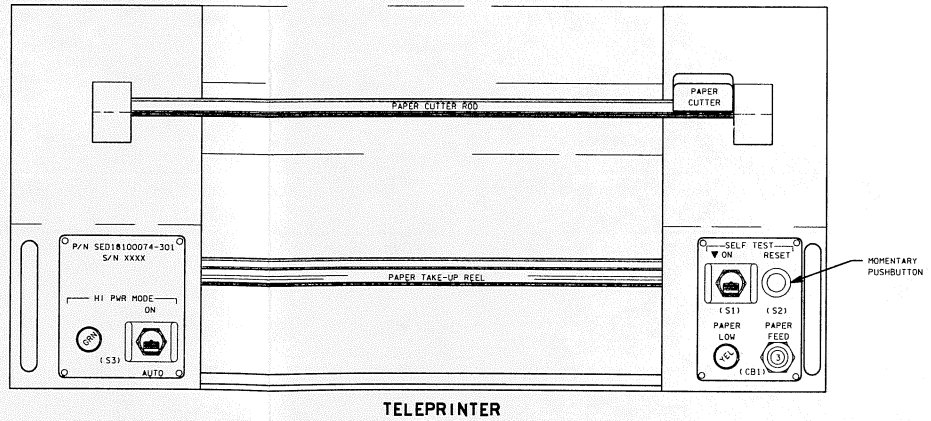












MA73C
MD24K
ML18F
ML26C
ML31C
ML85E
ML86B
WCS
M010W
M013Q
M029J
M030F
M032M
M039M
M042F
M044F
M051F
M052J
M058F
M062M
M069M
TELEPRINTER

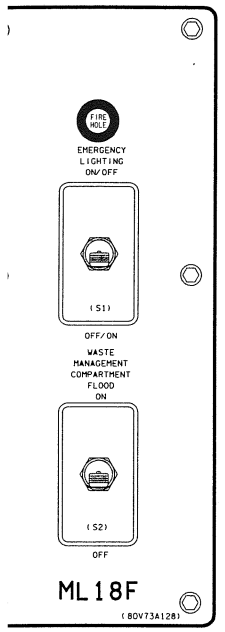
NOTES:
1. ◁E▷ SHADED NOMENCLATURE READS "MID DECK AUDIO/AIRLOCK 2 BACKUP" ON OV-102
2. ◁B▷ CB'S ARE OV-102 ONLY
3. ◁A▷ OV-102 AND OV-105 ONLY
3. REFER TO TABLE 20-I FOR VENDOR DRAWING REFERENCES
2. ◁D▷ SHADED NOMENCLATURE READS "4/5" ON OV102 ONLY AND TK5 SNSRS ON OV-105 ONLY
1. ◁C▷ CB'S ARE OV-105 ONLY

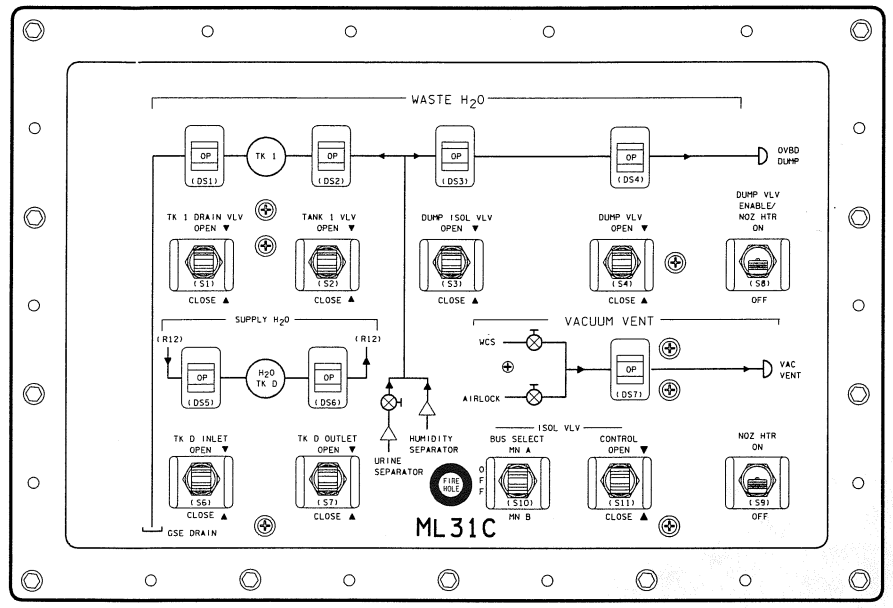
3 D&C MIDDECK

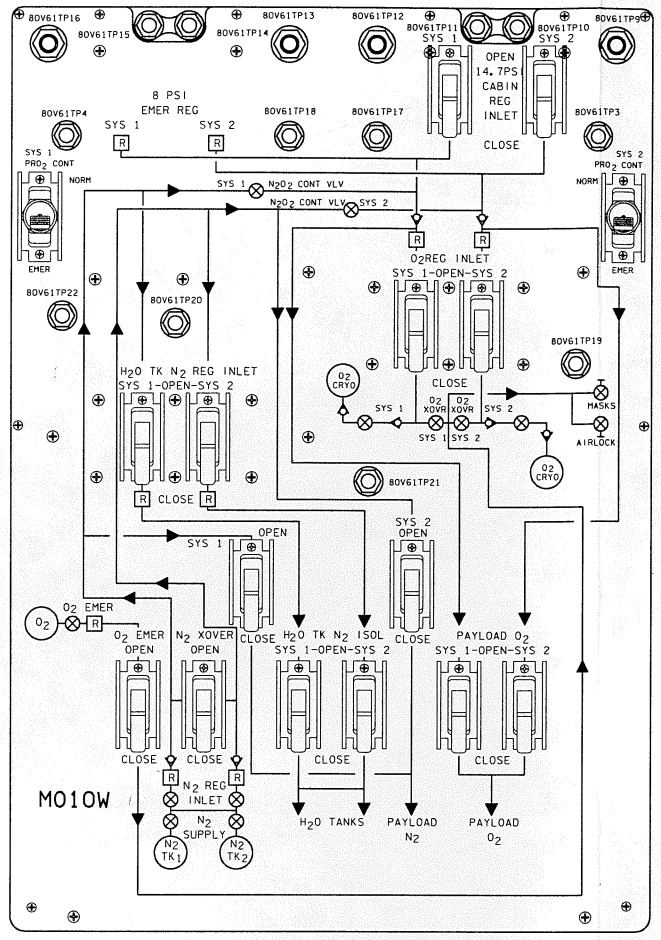
SIGNATURE	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS
DSGN LAVATO		
DR BUCHANAN		
ENGR J. AZBELL		DISPLAYS AND CONTROLS MID DECK STATIONS
ENGR J. Azbell	1/29/93	
APP		
APP		SPACE SHUTTLE / DWG NO 20.3
OMNIPLAN S.K. Kimbro	2-2-93	ALL / PAGE / SHEET 1 OF 1
LTR E	PCN - 2	126.5 X 34

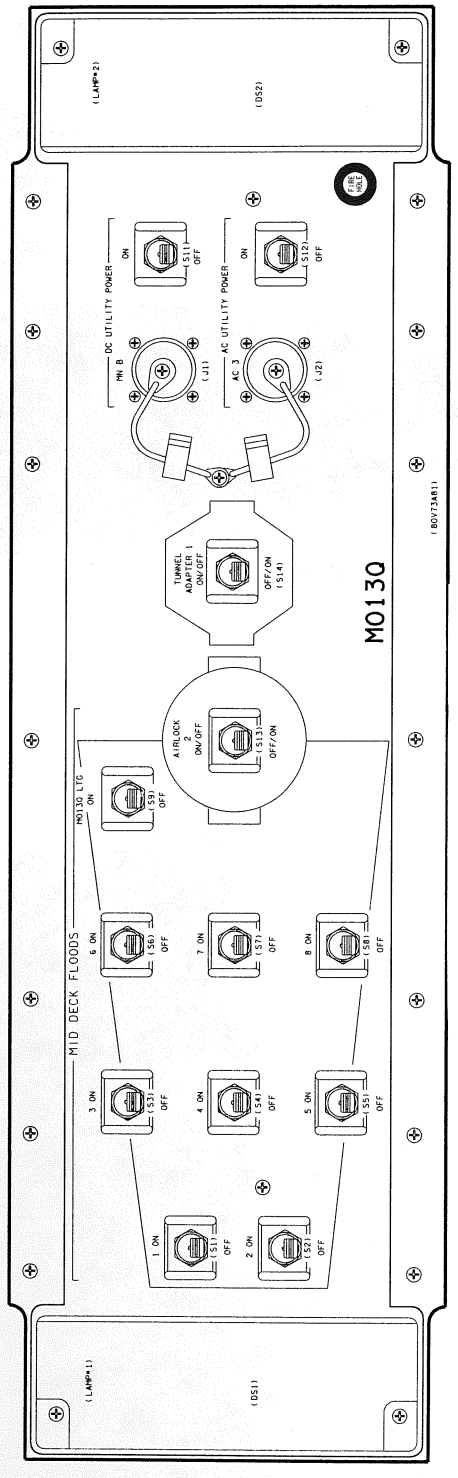
BASIC REV E-2

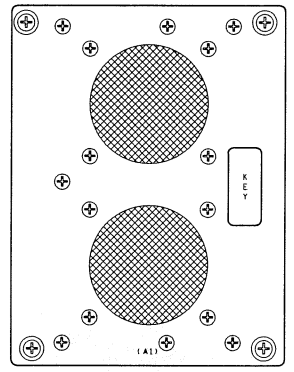
T S R Q P O N M L K J

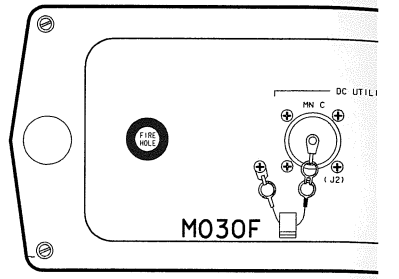


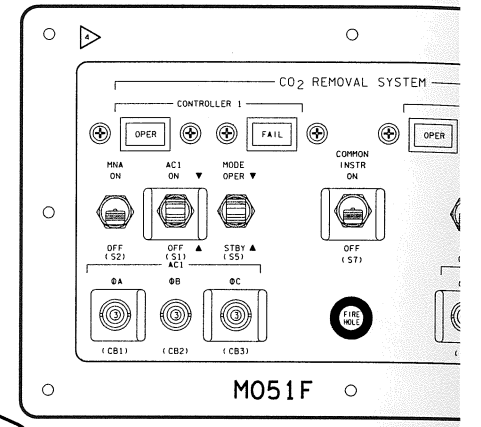


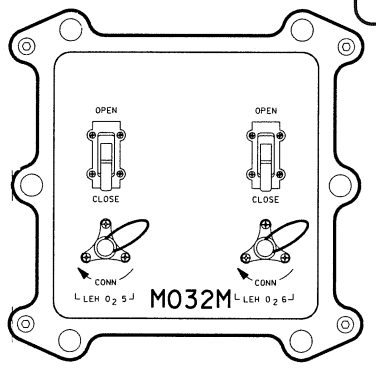


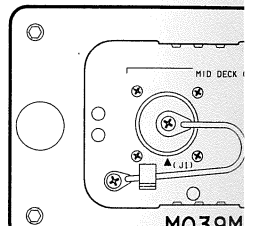


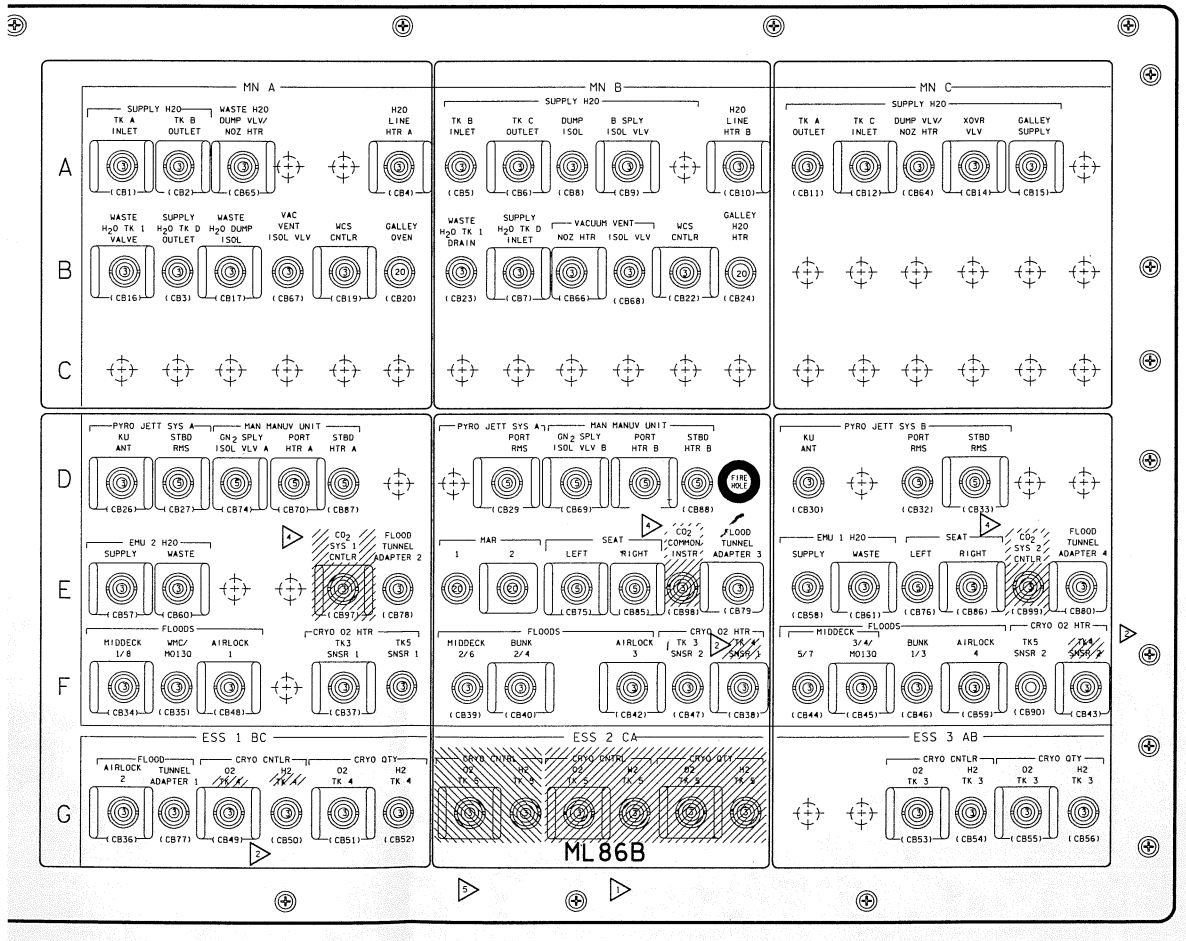






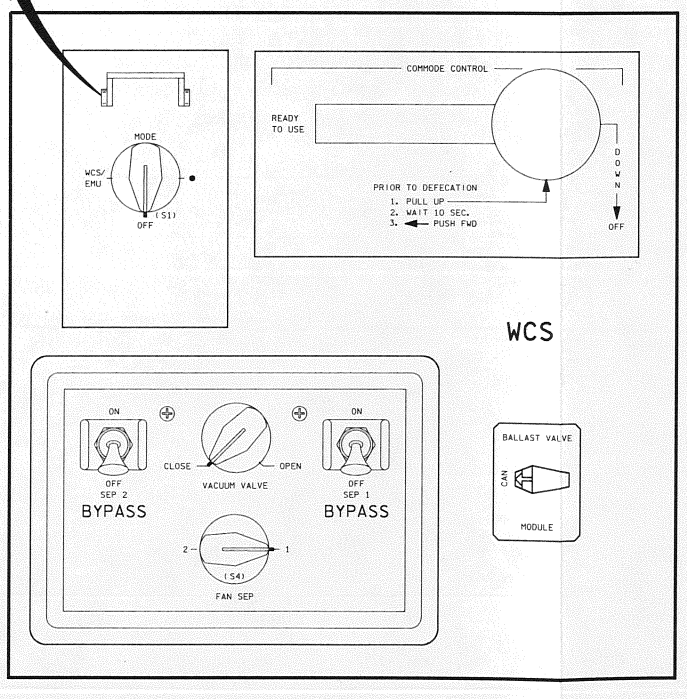


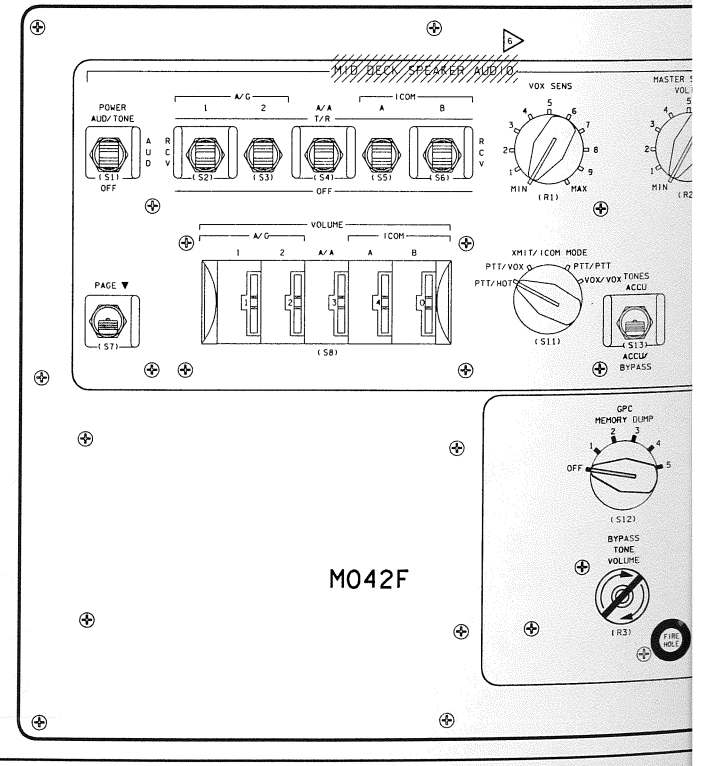




EMU SERVICE IN PROGRESS

SIDE VIEW





DATE: 01/25/93 | NAME: BJB | VERSION: INK.13

W V U T S R Q P O N

8 7 6 5 4 3 2 1

MA73C

MCA LOGIC — MN A — FWD 1 — MID 1 — ON — OFF — AFT 1 — MID 3 — MCA POWER AC 1 30 — FWD 1 — MID 1 — AFT 1 — MID 3

MCA LOGIC — MN B — FWD 2 — MID 1 — MID 2 — AFT 2 — MID 3 — MID 4 — MCA POWER AC 2 30 — FWD 2 — MID 1 — MID 2 — AFT 2 — MID 3 — MID 4

MCA LOGIC — MN C — FWD 3 — MID 2 — AFT 3 — MID 4 — MCA POWER AC 3 30 — FWD 3 — MID 2 — AFT 3 — MID 4

AC 1 — WCS FAN SEP 1 — ΦA ΦB ΦC — RMS PRIMARY ΦA — MAR 30 ΦC — OPS INST HYD ACTR ΦC — OMS KIT VLV — OMS KIT VLV LOGIC ON — FWD RCS VLV — AFT POD VLV GP 1 — AFT POD VLV LOGIC GP 1/3 ON

AC 2 — WCS FAN SEP 2 — PAYLOAD 30 — RMS BACKUP ΦA — LEFT SEAT 30 — OPS INST HYD ACTR ΦC — OMS KIT VLV — RIGHT SEAT 30 — FWD RCS VLV — AFT POD VLV GP 2 — AFT POD VLV LOGIC GP 1/2 ON

AC 3 — PAYLOAD 30 — LEFT SEAT 30 — GALLEY FAN — RIGHT SEAT 30 — FWD RCS VLV — AFT POD VLV GP 3 — AFT POD VLV LOGIC GP 2/3 ON

(85V73A129)

ML18F

FIRE HOLD

EMERGENCY LIGHTING ON/OFF — (S1) — OFF/ON

WASTE MANAGEMENT COMPARTMENT FLOOD ON — (S2) — OFF

(80V73A128)

ML31C

WASTE H_2O — (DS1) (DS2) (DS3) (DS4) — TK 1 — OVBD DUMP

TK 1 DRAIN VLV OPEN (S1) CLOSE — TANK 1 VLV OPEN (S2) CLOSE — DUMP ISOL VLV OPEN (S3) CLOSE — DUMP VLV OPEN (S4) CLOSE — DUMP VLV ENABLE/NOZ HTR ON (S8) OFF

SUPPLY H_2O — (R12) — H_2O TK D — (DS5) (DS6) — TK D INLET OPEN (S6) CLOSE — TK D OUTLET OPEN (S7) CLOSE — HUMIDITY SEPARATOR — URINE SEPARATOR — GSE DRAIN

VACUUM VENT — WCS — AIRLOCK — (DS7) — VAC VENT — ISOL VLV — BUS SELECT MN A (S10) MN B — CONTROL OPEN (S11) CLOSE — NOZ HTR ON (S9) OFF

FIRE HOLD

MD24K

AMBIENT — P/L RTN — PHS DRAIN — P/L SPLY — CHILLED

ML26C

SUPPLY H_2O GN_2 — TK A SPLY — TK VENT — OPEN — PRESS — CLOSE — VENT

ML86B

MN A — SUPPLY H2O — TK A INLET — WASTE H2O TK B OUTLET — WASTE H2O DUMP VLV/NOZ HTR — H2O LINE HTR A — (CB1) (CB2) (CB65) (CB4)

MN B — SUPPLY H2O — TK B INLET — TK C OUTLET — DUMP ISOL — B SPLY ISOL VLV — H2O LINE HTR B — (CB5) (CB6) (CB8) (CB9) (CB10)

MN C — SUPPLY H2O — TK A OUTLET — TK C INLET — DUMP VLV/NOZ HTR — XOVR VLV — GALLEY SUPPLY — (CB11) (CB12) (CB64) (CB14) (CB15)

A

WASTE H_2O TK 1 VALVE — SUPPLY H_2O TK B OUTLET — WASTE H_2O DUMP ISOL — VAC VENT ISOL VLV — WCS CNTLR — GALLEY OVEN — (CB16) (CB3) (CB17) (CB67) (CB19) (CB20)

WASTE H_2O TK 1 DRAIN — SUPPLY H_2O TK D INLET — VACUUM VENT NOZ HTR — ISOL VLV — WCS CNTLR — GALLEY H2O HTR — (CB23) (CB7) (CB66) (CB68) (CB22) (CB24)

B

PYRO JETT SYS A — KU ANT — STBD RMS — MAN MANUV UNIT — GN_2 SPLY ISOL VLV A — PORT HTR A — STBD HTR A — (CB26) (CB27) (CB74) (CB70) (CB87)

PYRO JETT SYS A — MAN MANUV UNIT — PORT RMS — GN_2 SPLY ISOL VLV B — PORT HTR B — STBD HTR B — (CB29) (CB69) (CB88)

PYRO JETT SYS B — KU ANT — PORT RMS — STBD RMS — (CB30) (CB32) (CB33)

D

EMU 2 H2O SUPPLY — WASTE — CO_2 SYS 1 CNTLR — FLOOD TUNNEL ADAPTER 2 — (CB57) (CB60) (CB97) (CB78)

MAR 1 2 — SEAT LEFT RIGHT — CO_2 COMMON INSTR — FLOOD TUNNEL ADAPTER 3 — (CB75) (CB85) (CB98) (CB79)

EMU 1 H2O SUPPLY — WASTE — SEAT LEFT RIGHT — CO_2 SYS 2 CNTLR — FLOOD TUNNEL ADAPTER 4 — (CB58) (CB61) (CB76) (CB86) (CB99) (CB80)

E

FLOODS — MIDDECK 1/8 — WMC/MO13G — AIRLOCK 1 — CRYO O2 HTR TK3 SNSR 1 — TK5 SNSR 1 — (CB34) (CB35) (CB48) (CB37)

FLOODS — MIDDECK 2/6 — BUNK 2/4 — AIRLOCK 3 — CRYO O2 HTR TK 3 SNSR 2 — TK4 SNSR 2 — (CB39) (CB40) (CB42) (CB47) (CB38)

FLOODS — MIDDECK 5/7 — 3/4/MO13G — BUNK 1/3 — AIRLOCK 4 — CRYO O2 HTR TK5 SNSR 2 — TK4 SNSR 1 — (CB44) (CB45) (CB46) (CB59) (CB90) (CB43)

F

ESS 1 BC — FLOOD AIRLOCK 2 — TUNNEL ADAPTER 1 — CRYO CNTLR O2 TK 4 — H2 TK 4 — CRYO QTY O2 TK 4 — H2 TK 4 — (CB36) (CB77) (CB49) (CB50) (CB51) (CB52)

ESS 2 CA — CRYO CNTLR O2 TK 5 — H2 TK 5 — CRYO QTY O2 TK 5 — H2 TK 5 — (CB40) (CB41) (CB42) (CB43)

ESS 3 AB — CRYO CNTLR O2 TK 3 — H2 TK 3 — CRYO QTY O2 TK 3 — H2 TK 3 — (CB53) (CB54) (CB55) (CB56)

G

MO10W

8PSI EMER REG — SYS 1 — SYS 2 — OPEN 14.7PSI CABIN REG INLET — CLOSE — SYS 1 PRD O_2 CONT — NORM — EMER — SYS 1 N_2O_2 CONT VLV — SYS 2 N_2O_2 CONT VLV — O_2REG INLET SYS 1-OPEN-SYS 2 — H_2O TK N_2 REG INLET SYS 1-OPEN-SYS 2 — O_2 CRYO — O_2 XOVR — MASKS — AIRLOCK — O_2 EMER — OPEN — N_2 XOVER — CLOSE — H_2O TK N_2 ISOL SYS 1-OPEN-SYS 2 — PAYLOAD O_2 SYS 1-OPEN-SYS 2 — N_2 REG INLET — N_2 SUPPLY — N_2 TK1 — N_2 TK2 — H_2O TANKS — PAYLOAD N_2 — PAYLOAD O_2

EMU SERVICE IN PROGRESS

SIDE VIEW

WCS

MODE — WCS/EMU — (S1) — OFF

COMMODE CONTROL — READY TO USE — PRIOR TO DEFECATION 1. PULL UP 2. WAIT 10 SEC. 3. PUSH FWD — DOWN — OFF

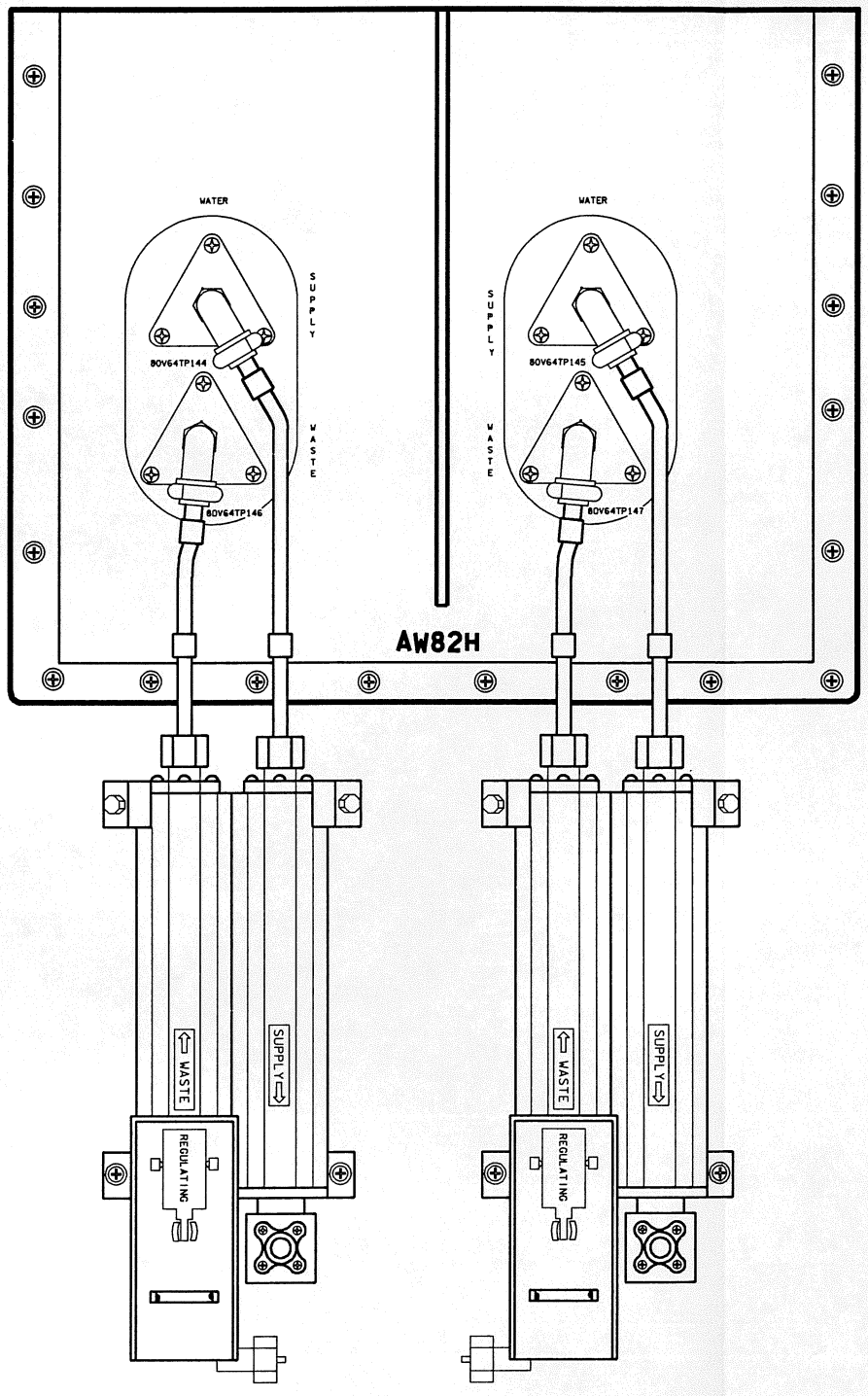
ON — OFF SEP 2 — BYPASS — CLOSE — VACUUM VALVE — OPEN — ON — OFF SEP 1 — BYPASS — (S4) — FAN SEP

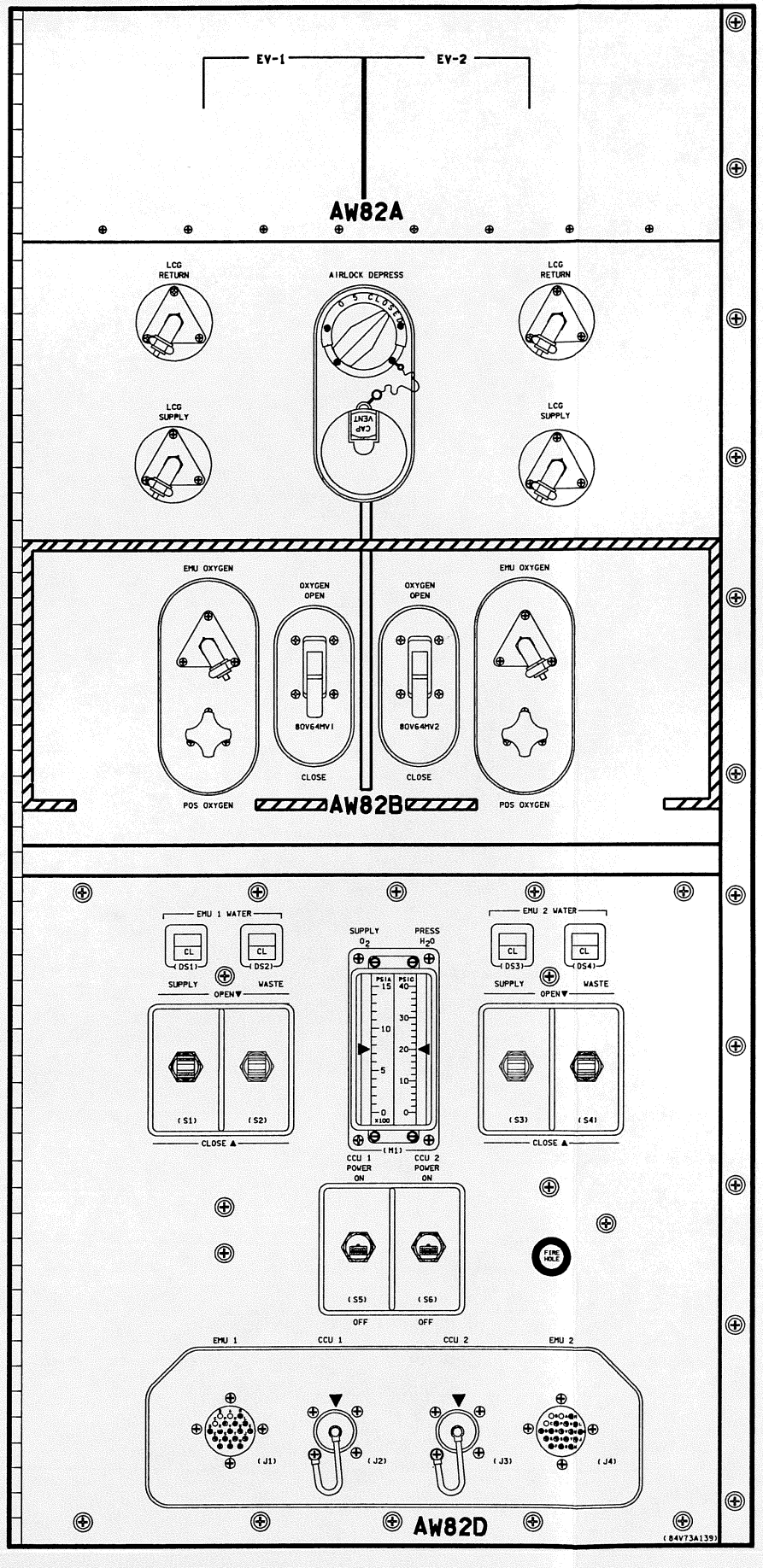
BALLAST VALVE — CAN — MODULE

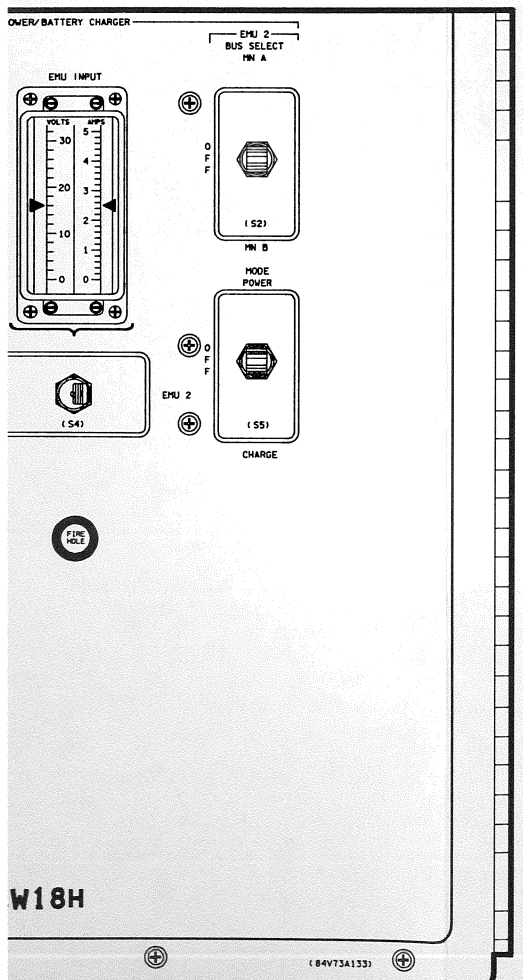
MID DECK FLOODS

BASIC REV E-2

DATE: 10/11/90	NAME: MDU	VERSION: INK: 7
DATE: 01/26/94	NAME: BJB	VERSION: BPT: 3
DATE: 07/27/94	NAME: JMB	VERSION: INK: 8







AW18A
AW18D
AW18H
AW82B
AW82D
AW82H

OV102 LABEL IS "MIDDECK"

NOTES: 1. REFER TO TABLE 20-I FOR VENDOR DRAWING REFERENCES

4 D&C AIRLOCK

SIGNATURE		DATE
DSGN	L. DUMIS	7/3/79
DR		
ENGR	J. AZBELL	
ENGR	J. Azbell	8/1/94
APP	Paul M. Dunn	8/1/94
APP		
CADS	K. Kirmeyer	8-5-94
LTR	E	PCN 4

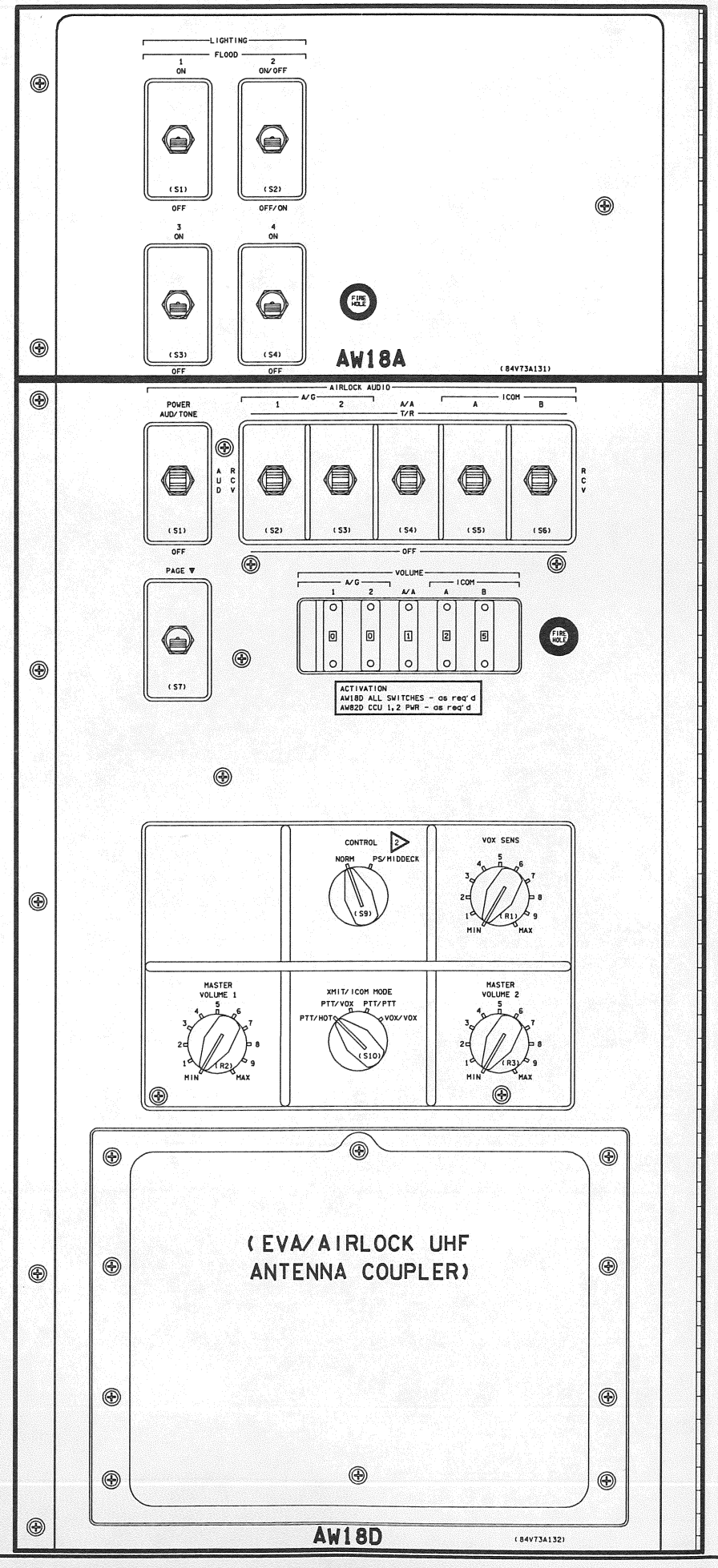
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS

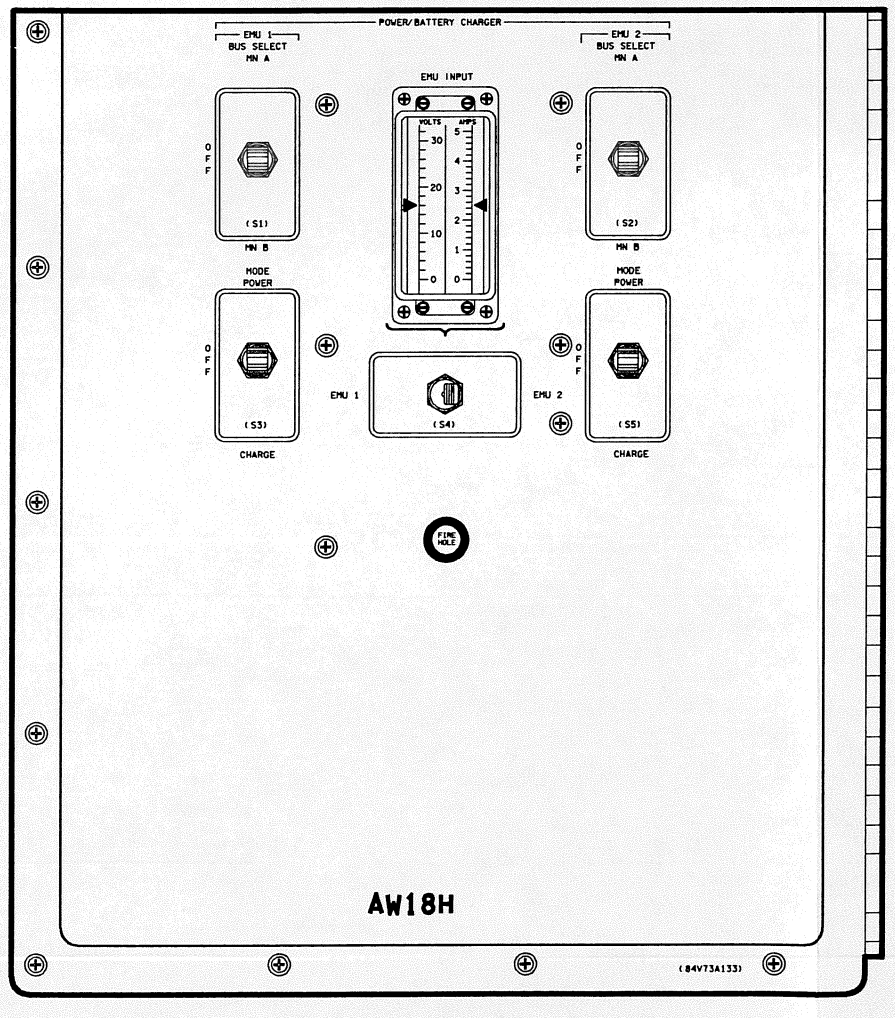
DISPLAYS AND CONTROLS
AIRLOCK

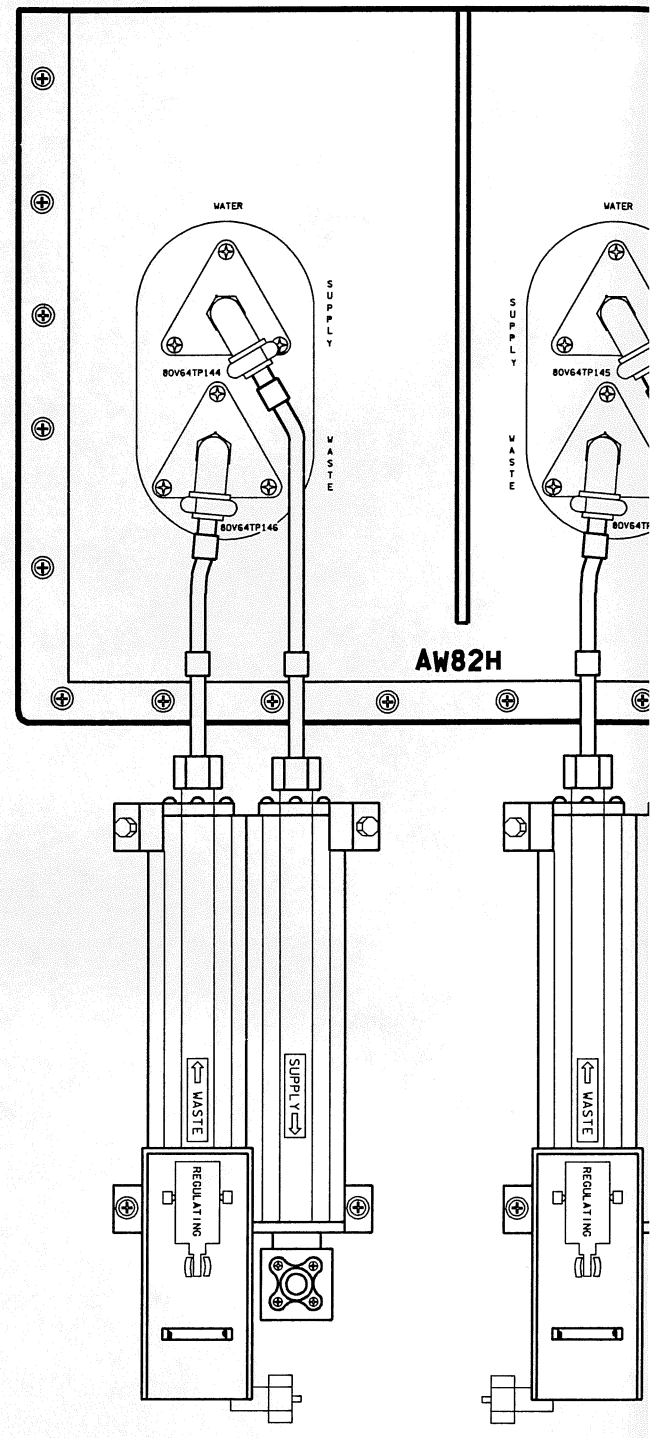
SPACE SHUTTLE | DWG NO 20.4
ALL | SHEET 1 OF 1
82.5 X 34

BASIC REV E-4

DATE: 07/27/94 | NAME: JMB | VERSION: INK: 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
20.1 (SHEETS 1-4)	D&C FWD STATIONS	ROCKWELL	VS70-973099	1-13	A/B03	4/25/90	ORB D&C PANEL CONFIG.
20.2 (SHEETS 1-3)	D&C AFT STATIONS	ROCKWELL	VS70-973102	1-13	F/G04	10/1/90	ORB D&C PANEL CONFIG.
20.3	D&C MIDDECK STATIONS						
20.4	D&C AIRLOCK						

DWG	SIGNATURE		DATE
20.1,2,3,4	ENGR M. FUGITT		
	ENGR Mark Fugitt		11-5-90
	ENGR		
	ENGR		
	APP Paul M Joyce		11-5-90
	APP		
	OMNIPLAN		
	LTR E	PCN	

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LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS

VENDOR DRAWING REFERENCES

SPACE SHUTTLE	TBL NO 20-I
ALL	
PAGE 20.1-1	SHEET 1 OF 1

BASIC REV E

JSC–11174

Space Shuttle Systems Handbook

Volume III
Sections 16 through 20

Rev E, DCN–6
August 14, 1996

SD
MOD
JSC
NASA