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C/F# 24

TRACKING, TELEMETRY, COMMANDS, POWER
AND
PYROTECHNIC INTERFACE SPECIFICATION
FOR
ADVANCED PROJECTS PAYLOAD
AND
PIPERAM 241 AGENA ORBITAL VEHICLE

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Prepared by: _____

Advanced Projects Manager

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PIPERAM 241 Manager

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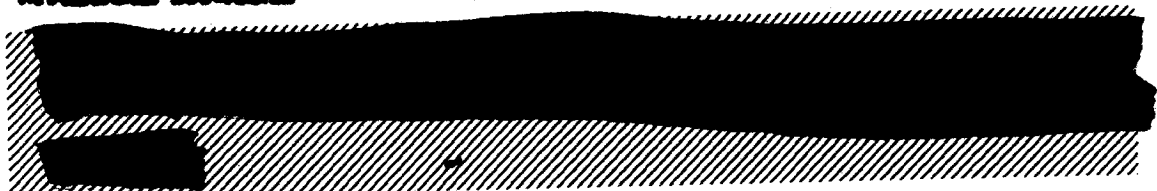
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1.0 SCOPE

1.1 This document shall define the electrical interface requirements of Advanced Projects Payload Systems and the Program 241 Agena Orbital Vehicles. Specifically, the areas affecting tracking, telemetry, commands, power, and pyrotechnics are discussed. The requirements defined in this specification will allow both the Advanced Projects Payload System, J-1, as described in Requirements Specification T3-4-001, and J-3 as described in Requirements Specification T3-5-016 to be electrically compatible with Program 241 Agena Orbital Vehicles 1641 and up as described in IMSC detail Specification, Program 241 Satellite System.

2.0 APPLICABLE DOCUMENTS



REFERENCES:

IMSC 447969B - Specification for Electromagnetic Interference Control Requirements and Electrical Interface for Agena Systems.

REFERENCES:

134217 - Interface-Payload/Vehicle (Mechanical)

3.0 REQUIREMENTS:

3.1 Electrical Interface Connectors

The Payload Systems (hereafter known as the Payload)/Program 241 Agena Orbital Vehicle (hereafter known as the Vehicle) electrical interface shall consist of six (6) connectors. The payload connectors shall be physically located per IMSC 134217 Interface, Payload/Vehicle (Mechanical) interface drawing. The vehicle shall provide compatible mating connectors wired to the payload connectors. The payload connectors and functions are

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3.2 Connector **66-C3 022**

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3.2.1 Pyro Power Connector
AJ-20X (F7758-1 -112-(01))

Vehicle Function	J-1 Function	J-3 Function
A Continuity Loop	None	Pre-ignition c/o
B Pyro Shield Tie	None	Same as vehicle
C Pyro Bus Return	None	Same as vehicle
D +24 VDC Pyro Bus	None	Same as vehicle
E Pyro Shield Tie	None	Same as vehicle
F Pyro Bus Return	None	Same as vehicle
G Continuity Loop	None	Same as vehicle
H Pyro Shield	None	Same as vehicle
J Pyro Bus Return	None	Same as vehicle
K +24 VDC Pyro Bus	None	Same as vehicle
L +24 VDC Pyro Bus	None	Same as vehicle

Note: Pins G and A shall be jumpered on vehicle side.

Pins C and D are a twisted shielded pair with pin B as the shield tie.

Pins F and L are twisted shielded pair with pin E as the shield tie.

Pins J and X are a twisted shielded pair with pin H as the shield tie.

The J-1 Payload System does not have an AJ-20X interface connector. The J-1 payload system receives pyro power through the pyro signal connector AJ-21X.

Reference paragraph 3.2.2.

3.2.2 Pyro Signal Connector
AJ-21X (F7758-22-21 FN (C21))

Vehicle Function	J-1 Function	J-3 Function
A Pyro Bus Return	Same as Vehicle	Spare
B Pyro Bus Return	Same as Vehicle	Spare
C Pyro Shield Tie	Same as Vehicle	Spare

etc.

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Vehicle ⁶⁶⁻⁰³⁰²² Junction

Vehicle Junction	J-1 Function	J-3 Function
D Transfer to Ext. No. 2	Switch Recovery sequence signals	Spare
E Transfer to Ext. No. 2	from "A" SW circuits to "B" SW circuits	Spare
F Arm Signal	A & B SW Arm. Funct.	Same as J-1
G Arm Signal	A & B SW Arm. Funct.	Same as J-1
H AP Orbit Mode Signal	Pyload to Orbit	Same as J-1
J AP Orbit Mode Signal	Pyload	Same as J-1
K Separation Signal	A & B SW Pyload Sep.	Same as J-1
L Separation Signal	A & B SW Pyload Sep.	Same as J-1
M Continuity Loop	Prel. uncl. circ	Same as J-1
N Disconnect Signal	None - Spare	A & B SW Conn. Disconnect
O +04 VDC Pyro Bus	Same as vehicle	Spare
P +04 VDC Pyro Bus	Same as vehicle	Spare
Q In-Flight Reset	Door Eject	Same as J-1
R In-Flight Reset	Door Eject	Same as J-1
S Transfer Signal	A & B SW Transfer Function	Same as J-1
T Transfer Signal	A & B SW Transfer Function	Same as J-1
	Spare	A & B SW Conn. Disconnect



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Primary Power Connector
AJ- (PROT. - 1P (Oil))

Terminal	J-1 Function	J-3 Function
A 115V Unreg.	Primary Power	Same as J-1
B 115V Unreg.	Primary Power	Same as J-1
C 115V Unreg.	Primary Power	Same as J-1
D 115V Unreg.	Primary Power	Same as J-1
E 115V VDC Reg.	Primary Power	Spare
F 115V VDC Reg.	Primary Power	Spare
G 115V VDC Reg.	Primary Power	Spare
H 115V VDC Reg.	Primary Power	Spare
I AC Shield Tie	Primary Power	Same as J-1
K 115V 400 Hz (B) Ret.	Primary Power Ret.	Same as J-1
L 115V 400 Hz (A)	Primary Power Ret.	Same as J-1
M 115V 400 Hz (C)	Primary Power	Same as J-1
N Unreg. Return	Primary Power Ret.	Same as J-1
P Unreg. Return	Primary Power Ret.	Same as J-1
R Unreg. Return	Primary Power	Same as J-1
S Unreg. Return	Primary Power	Same as J-1
T Reg. Ret.	Primary Power Ret.	Spare
U Reg. Ret.	Primary Power Ret.	Spare
V 115V 400 Hz (D)	Primary Power	Same as J-1
W 115V 400 Hz (E)	Primary Power	Same as J-1
X 115V 400 Hz (F)	Primary Power	Same as J-1
Y 115V 400 Hz (G)	Primary Power	Same as J-1
Z 115V 400 Hz (H)	Primary Power	Same as J-1

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3.2.3 Primary Power Connectors (Continued)

- Notes: Pins A and B are a twisted pair.
 Pins B and P are a twisted pair.
 Pins C and R are a twisted pair.
 Pins D and S are a twisted pair.
 Pins K, L, and M are a twisted shielded triad with pin J as the shield tie.
 Pins V, W, and X are a twisted shielded triad with pin J as the shield tie.
 Pins E and F and T are a twisted triad.
 Pins G and H and U are a twisted triad.

3.2.4 Command Connector (AJ-23V (PTOTSE-22-55P (011)))

<u>Vehicle Function</u>	<u>J-1 Function</u>	<u>J-3 Function</u>
A VIF Cmd 101	Spare	CR No. 1 Exposure Control Override
B VIF Cmd 102	Spare	CR No. 2 Exposure Control Override
C VIF Cmd 103	Spare	CR No. 1 Filter Control
D VIF Cmd 104	Spare	CR No. 2 Filter Control
E KIM-Servo 38	Same as J-1	Early A to B Transfer
F KIM-Servo 39	Spare	DISIC Early A to B Transfer
G Servo Motor	Spare	AP TIM Com. Motor On for Tape Recording
H	Spare	SRV Battery Monitor CR
I	Spare	Exposure Control Relay
J	Red Lights On	Exposure Control
K	SRV Servo Motor/ Spare	DISIC Motor Control
L	Spare	
M	Spare	
N	Spare	
O	Spare	
P	Spare	
Q	Spare	
R	Spare	
S	Spare	
T	Spare	
U	Spare	

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<u>Vehicle Junction</u>	<u>J-1 Junction</u>	<u>J-3 Junction</u>
P STC 52	Spare	Exposure Control
R V/R Shield Return	Same as vehicle	Same as vehicle
S AP to Tape Recorder Track 1	Tl. Data	Same as J-1
T VHF Cmd 110	Spare	Emergency Ops. Select/ Mode By-Pass
U AP to Tape Recorder Track 2	Tl. Data	Same as J-1
V Spare	Spare	Spare
W AHA 6/VHF Cmd 106	V/H Ramp Select	CR Prog. Select
X AP Umb. Cmd No. 3 (J100-40)	Stereo Operate	Same as J-1
Y AP Umb. Cmd No. 1 (J100-40)	Spare	Continuity Loop Power
Z SFC 17	(a) Clock Interrogate (b) Switch Chas. 18 to clock from IR roller non.	CR Dynamic TEM Enable
a SFC 27	V/H Programmer Start	Same as J-1
b SFC 28	Redundant OFF & FO Lights OFF all programs.	Redundant OFF, all programs
c SFC 29	Counter & TEM Par. ON	Intermix advance
d SFC 30	Program 1 - ON	Same as J-1
e SFC 31	Program 1 - OFF	Same as J-1



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Vehicle P.	J-1 Function	J-2 Function
[REDACTED]	[REDACTED]	[REDACTED]
t SFC 44	Program 8 - ON	Same as J-1
u SFC 45	Program 8 - OFF	Same as J-1
v SFC 46	Program 9 - ON	Same as J-1
w SFC 47	Program 9 - OFF	Same as J-1
x SFC 48	Intermix Control	DI:IC ON
y SFC 49	Cont. TH Channels Inhibit	DI:IC OFF
z SFC 50	Commutator 2 TH Pr. OFF	Exposure Control
AA SFC 14	(a) V/H Delay Homing Cmd. (b) Yaw Prog. Start	(a) V/H delay reset (b) V/H oblateness start (c) Exposure control reset (d) Yaw Programmer start
BB SFC 20, Cmd No. 2	Arm By-pass No. 2	Same as J-1
CC SFC 21/VHF Cmd 106	V/H Ramp Amp. Select	OP Select No. 1
DD SFC 22/VHF Cmd 107	Program Select	OP Select No. 2
EE SFC 23/VHF Cmd 110	V/H Ramp Start Select	CR Mode Select
FF SFC 24/VHF Cmd 111	OP Mode Select	V/H Start level select
GG SFC 25/VHF Cmd 112	Intermix 1 Select	V/H half-cycle level
HH SFC 26/VHF Cmd 113	Intermix 2 Select	V/H delay Select

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3.2.4 Command Connector (continued)

NOTE: SPC - Stored Program Command

ANA - S-Quad Analog Command

VHF Control NET Digital Receiver Command

3.2.5 Telemetry Connector
AJ-24 (PCY 7-55: (012))

<u>Vehicle Junction</u>	<u>J-1 Junction</u>	<u>J-3 Junction</u>
A Spare	Spare	Spare
B Link 1	Redundant TM	Spare
C Spare	Spare	Spare
D Link 2	Link 2, Conn. 1	Spare
E AP 237	Redundant TM	Spare
F AP 238	Redundant TM	Spare
G AP 239	Redundant TM	Spare
H AP 240	Redundant TM	Spare
J AP Umb. Mon. 6	Red Temp Mon	Same as J-1
K AP 241	Redundant TM	Spare
L AP 242	Redundant TM	Spare
M AP 243	Redundant TM	Spare
N AP 244	Redundant TM	Spare
P AP 231	Redundant TM	Spare
R AP 232	Redundant TM	Spare
S AP 233	Redundant TM	Spare
T AP 234	Redundant TM	Spare
U AP 235	Redundant TM	Spare
V AP 236	Redundant TM	Spare
W Link 3 TM ON Sig.	20 VDC TM Par. ON	TM Connectors ON and Conn. Check Redundant

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<u>Item No.</u>	<u>J-1 Function</u>	<u>J-3 Function</u>
X Link I: 120 TV Sig.	Computer ON	ILN Computers ON and Cont. Clock Readout
Y Urb. TV Signal Ant.	Same as Vehicle	Same as J-1
Z AP Unit. Mon. 1	Continuity Loop ILN ON Mon.	Spare
a AP 15-2	Spare	Link II, Chan. 15
b AP 16-	Spare	Link II, Chan. 16
c AP 14G	Continuity Loop	Spare
d A 218	Operation Mon.	Spare
e AP 7	Link I, Chan. 7	Same as J-1
f Thrust Mon. No. 1	Spare	Same as Vehicle
g AP 9	Link I, Chan. 9	Same as J-1
h Thrust Mon. No. 2	Spare	Same as Vehicle
i AP 10	Link I, Chan. 10	Same as J-1
j Thrust Mon. No. 3	Spare	Same as Vehicle
k AP 6	Link I, Chan. 6	Same as J-1
l Spare	Spare	Spare
m AP 13	Link I, Chan. 13	Same as J-1
n AP 13	Link I, Chan. 13	Same as J-1
o AP 11	Link I, Chan. 11	Same as J-1
p AP 8	Link I, Chan. 8	Same as J-1
q AP 18	Link I, Chan. 18	Same as J-1
r Thrust Mon. No. 4	Spare	Same as Vehicle
s TV Sig. Ant.	Same as Vehicle	Same as Vehicle
t TV Sig. Ant.	Same as Vehicle	Same as Vehicle
u Computer		

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<u>Vehicle Function</u>	<u>J-1 Function</u>	<u>J-3 Function</u>
EM Shield Tie	Same as Vehicle	Same as Vehicle
ES Shield Tie	Same as Vehicle	Same as Vehicle
AP Umb. Conn. No. 1	Arm Bypass Int.	Same as J-1
AP Relay Inset	Same as Vehicle	Same as Vehicle
AP Relay Inset	Same as Vehicle	Same as Vehicle
Trust Mon. No. 1	Spare	Same as Vehicle
Trust Mon. No. 2	Spare	Same as Vehicle
AP Umb. Mon. No. 4	Spare	Continuity Loop
Relative Humidity Mon.	Same as Vehicle	Same as Vehicle
Relative Humidity Pot.	Same as Vehicle	Same as Vehicle
AP Umb. Mon. No. 5	+28V Pad c/o Mon.	AP Orbit Mode Mon.
AP Conn. No. 5	+28V Pad c/o	AP Orbit Mode Control

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3.2.6 Test Connector (Flight Functions) J-1 (PTR-95FOW)

<u>Vehicle Function</u>	<u>J-1 Function</u>	<u>J-3 Function</u>
A Roll Program Input	Low Programmer Voltage Output	Same as J-1
B Roll Program Int.	Low Programmer Return	Same as J-1
C Shield Tie	Low Programmer Shield Tie	Same as J-1
D Flight Int	Flight Spares	Same as J-1

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Electrical Interface Requirements

3.3.1 Electrical Power

The vehicle shall supply regulated DC and unregulated DC for primary power, unregulated DC for pyrotechnic power and 115 V 400 Hz single phase power to the payload. Power shall be supplied continuously during a normal mission. It includes pre-flight and in-flight operations except that pyrotechnic power will be removed from the payload interface when the vehicle internal external power switch is in the external position. The payload and all of its subsystems including O/W systems shall be capable of operating without impairment of function when supplied from the main bus of a control system with power within the limits and characteristics specified in the following subsections and under the conditions of power utilization prescribed by Section 3.3.1.

3.3.1.1 Power Supply Characteristics

3.3.1.1.1 Steady State Voltages

The steady state voltages of the central power supplies measured at distribution buses in the vehicle shall be within the limits specified below at zero load.

- a. Primary unregulated DC +22.0 to +29.5 volts.
- b. Pyrotechnic unregulated DC +22.0 to +29.5 volts.
- c. Regulated Positive DC 27.75 to 28.87 volts
- d. Regulated Negative DC 27.75 to 28.87 volts
- e. 115 V 400 Hz 120-130 Vrms rms

These voltages are measured from the vehicle distribution buses at the payload interface. Voltage tolerance is 0.5 volt DC and 1.0



The total non-fundamental frequency content of the voltage wave form of the vehicle AC supply measured as distortion of the fundamental shall not exceed 5% for noise-free linear loads from zero to rated load for frequencies above the fundamental supply frequency.

3.3.1.1.1 Amplitude Modulation

The amplitude modulation of the AC supply shall not exceed 7 volts p-to-p over a period of not less than 1 second for noise-free linear loads for frequencies below the fundamental supply frequency. These limits shall not be exceeded for DC input voltages as specified in 3.3.1.1.1.

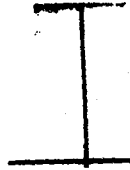
3.3.1.1.2.3 Voltage Transients

The dynamic regulation of the vehicle AC supply shall be such that, under the worst combination of step function changes in all input voltages within prescribed limits and in load current from no load to rated load or vice-versa, the peak output voltage shall remain within +100 volts and -50 volts of 120.6 volts and shall return to 120V ± 5% within 300 milliseconds.

3.3.1.1.2.4 Voltage

The voltage of the vehicle AC supply shall be maintained within

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399.972 and 400.008 Hz. These limits shall apply for steady state conditions and under worst combinations of step function changes in input voltages within prescribed limits and in load current from no load to rated load or vice versa.

3.3.1.1.3 Pyrotechnic Power Supply Characteristics

The pyrotechnic power supply shall be capable of supplying 60 amp for 5 milliseconds while maintaining a bus voltage of 24 to 28.5 volts at the pyrotechnic junction. No pyrotechnic power requirements exist during fault, recovery sequences, or upon receipt by the payload of other secure commands.

3.3.1.1.4 Regulated Supply Characteristics

3.3.1.1.4.1 Output Impedance

The output impedance of the Regulated DC supply shall not exceed 0.1 ohm open circuit and 0.4 ohm with a 4 ohm to 200K ohm load.

3.3.1.1.4.2 Transient Response

The dynamic regulation of the vehicle regulated supply shall be such that, under the worst combination of step function changes in all input voltages within prescribed limits and in load current from no load to rated load or vice-versa the output voltage shall remain within ± 5 volts of ± 28.5 volts and comply with a time constant (63% response) of 0.1 milliseconds.

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3.1.1.2 Load Characteristics

3.1.1.2.1 J-1 Primary Power Consumption

The current requirements of the J-1 payload system shall not exceed the limits listed below for the mode 1 (all systems in operation) and mode 2 (all systems quiescent) conditions.

DC Regulated Current:

- A. Mode 1 (not to exceed 5 hrs. with a duty cycle of 30 min. ON / 70 min. OFF.)
 - 1. Average - 12 amps
 - 2. Peaks - 25 amps max. not to exceed 200 milliseconds.
- B. Mode 2 (continuous during mission)
 - 1. Average - 1.5 amps
 - 2. Peaks - None

Plus Regulated DC Current

- A. Mode 1 (not to exceed 5 hrs. with a duty cycle of 20 min ON / 70 min OFF.)
 - 1. Average - 5 amps
 - 2. Peaks - 10 amps max. not to exceed 200 milliseconds.
- B. Mode 2 (continuous during mission)
 - 1. Average - 0.6 amps
 - 2. Peaks - None

Minus Regulated DC Current:

- A. Mode 1 (not to exceed 5 hrs. with a duty cycle of 20 min ON / 70 min. OFF.)
 - 1. Average - 0.25 amps
 - 2. Peaks - None
- B. Mode 2 (continuous during mission)
 - 1. Average - 0.25 amps
 - 2. Peaks - None

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Mode 1 and Mode 2 - 150 milliamps average

All continuous power requirements shall be maintained and subject to design review by Program 241 CSE

3.2.1.2.2 J-3 Primary Power Consumption

The current requirements of the J-3 Payload system shall not exceed the limits listed below for Mode 1 (all systems in operation) Mode 2 (all systems quiescent) and Mode 3 (secondary system in operation).

Unregulated Currents:

- A. Mode 1 (not to exceed 15 hrs. with a duty cycle of 10 min ON, 70 min. OFF.)
 - 1. Average - 30 amps
 - 2. Peaks - 60 amps not to exceed 100 milliseconds.
- B. Mode 2 (continuous during mission)
 - 1. Average - 3 amps
 - 2. Peaks - none
- C. Mode 3 (not to exceed 15 hours with a duty cycle of 45 min ON, 45 min OFF.)
 - 1. Average - 8 amps
 - 2. Peaks - 12 amps not to exceed 200 milliseconds.

AC Current

- A. Mode 1 (not to exceed 5 hrs. with a duty cycle of 20 min ON, 70 min. OFF.)

MODE 1

- 1. Average - 0.6 amps
- 2. Peaks - 0.85 amps not to exceed 500 milliseconds

- B. Mode 2 (continuous during mission)

MODE 2

- 1. Average - 0.1 amps
- 2. Peaks - none

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Mode 3 (not to exceed 15 hrs.)

None required for secondary system.

All continuous power requirements shall be minimized and subject to design review by Program P41 CHE.

3.3.1.2.1 Load Impedance

- a. The impedances presented by each payload subsystem to the vehicle DC power supply shall be essentially linear and noise-free to the greatest extent possible.
- b. The loads presented to the vehicle AC supply by each payload subsystem shall have a power factor as near unity as practicable for all modes. Loads shall not be presented with steady state power factors less than 0.80 lagging and 0.95 leading, nor with unsymmetrical half wave loading.

3.3.1.3 Switched Capacitor Loads

Switched capacitor loads shall have surge current limiting resistors in series.

3.3.1.4 Inductive Spike Suppression

The use of diodes (or other equally effective devices) to suppress spikes that result from collapsing magnetic fields is mandatory in every case where a current that flows through an inductance is interrupted. The diode (or other suppression device) shall be mounted as close to the inductance as possible.

3.3.1.5 Cables and Connectors

Cables and connectors for the payload system shall be fabricated conforming to the applicable requirements of paragraphs 3.3.2.1, 3.3.2.1.2, 3.3.2.1.4, and paragraphs 3.3.4.1.4 - 3.3.4.1.7 of this document to every extent possible.

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3.3.1.6 AF Signal Circuits

AF signal circuits (0-150 KC) which require shielding for proper operation shall be connected with the shield ground at the vehicle ground point only. Shields shall not be connected in any way which creates a loop inductance or inductively coupling inductance. The shields shall be connected through the pins provided on various interface connectors (see paragraph 3.2).

3.3.1.7 Grounding

Neither the payload nor any of its subsystems shall ground any power or signal returns to chassis or structure. All airborne ground return leads shall be grounded to the vehicle frame through the vehicle ground point. (See IBC 4479698, Paragraph 3.2.8.1). However B.F. by-pass devices may be utilized to control BU.

3.3.1.8 Bonding

The payload and its subsystems shall conform to applicable portions of bonding requirements of paragraph 3.2.12.1 - 3.2.12.2.2 and paragraphs 3.2.12.3 - 3.2.12.5 of IBC 4479698 to every extent possible.

3.4 Operational Interface Command and Function Descriptions

3.4.1 Operational Commands

3.4.1.1 AF Commands (AF-BK Pins A, B, C, D, J, N, R, T)

1. **AF Command Description.** Encoded, real time commands may be transmitted during vehicle acquisition and shall be disabled at all other times. Minimum time between the trailing edge and leading edge of consecutive commands shall be 1 second.

c. Electrical Requirements

1. Duration 250 ± 100 ns.
2. Source Current Capacity - 2 A maximum
3. Command Voltage - +24 V regulated referenced to unregulated return.
4. The command lines shall present an open circuit to the payload in the absence of a command.

3.4.1.2 Analog S-band commands (AJ2IX - Pins L, W, CC, DD, EE, FF, GG, HH)

a. Signal Description - The unsecure real time commands may be initiated during vehicle acquisition and shall be disabled at all other times. Minimum time between trailing and leading edge of consecutive commands shall be 1 second.

b. Electrical Requirements

1. Pulse Duration - 1 second maximum
2. Source Current Capacity - 2 amps maximum
3. Command Voltage - 24 VDC unregulated referenced to unreg. return.
4. The command lines shall present an open circuit to the payload in the absence of a command.

NOTE: All S-band commands are backed up by VHF commands. Payload circuits requiring S-band commands shall be capable of satisfactory operation when commanded from either source. See Para. 3.4.1.1 Sec. 3.

3.4.1.3 S-band Secure Commands (TIN-00700 38 and 39 (AJ2IX - Pins R, S))

a. Signal Description - Secure, real time commands may be initiated during vehicle acquisition and shall be disabled

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at all other times including ascent. The command source will generate only one command output per acquisition. Disable circuits, to protect physical functions from repeated commands, if required, shall be in the physical design.

1. Electrical Requirements

1. Duration - 1 second minimum but may be as long as 15 minutes.
2. Source Current - capacity 2 amps maximum.
3. Command Voltage - 48 VDC is req. referenced to common return.

3.4.1.4 Stored Program Commands (AJ23: Pins K, L, M, a - s, AA)

- a. Signal Description - The stored Program Command source shall be the vehicle orbital programmer. The commands are stored in the form of square holes in 35 um tape. The tape speed and position shall be kept synchronized with the orbital period so commands shall occur at the desired times. The commands shall take the form of a secondary ground pulse.

1. Electrical Requirements

Duration - 1.5 ± 0.5 seconds.

Source Current Capacity - 200 ma per command, with

total current for all commands at 200 ma.

3.4.2 Recovery Signals

The recovery signals shall be considered by the payload systems as a sequence of signals that are time related. The signals shall be generated in order: Arm, Transfer, Disconnect, Separate and Transfer to Experiment No. 2. The Arm, Transfer, Disconnect and Separate Signals shall be terminated simultaneously, and their signal lines will be shorted together after removal of power and prior to Recovery Timer Reset.

A recovery signal sequence is required for each of the two Satellite Recovery Vehicles, known as the A and B SVV's, that form a part of the J-1 and J-3 payload systems. The recovery timer accuracy between events shall be 0.5 seconds or 0.11 percent, whichever is greater.

NOTE: For differences in recovery signal requirements of the J-1 and J-3 payload systems reference paragraphs 3.4.2.2, 3.4.2.3 and 3.4.2.5. SVV recovery may be effected without an AF Recovery Enable Signal but this does not negate the requirement for the AF Recovery Enable Signal.

3.4.2.1 Arm Signal (AF-418 pins F & G)

a. Signal Description. The Arm signal shall be the signal that initiates the recovery sequence. The receipt of this signal shall be the start of the recovery sequence and shall be the start of the recovery timer. The signal shall be a pulse of 1.0 second duration and shall be terminated at this time to prevent any further action.

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B. Electrical Description

1. Time of Initiation - T-76 seconds
2. Duration - 104 seconds
3. Source Current Capacity - 2 amps max.
4. Signal Voltage - 24 VDC unregulated referenced to unregulated return.

3.4.2.2 Transfer Signal (AJ-71X pins U & V)

a. Signal Description - The transfer signal shall be the second signal of the recovery sequence. Upon receipt of the transfer signal the J-1 and J-3 payloads and all JFC shall activate those functions required at this time to prepare for the ejection of that JFC.

b. Electrical Description

1. Time of Initiation - T-1 second
2. Duration - 29 seconds
3. Source Current Capacity - 2 amps max.
4. Signal Voltage - +24 VDC unregulated referenced to unregulated return.

3.4.2.3 Disconnect Signal (AJ-21X pins N & W)

a. Signal Description - The Disconnect signal shall be the third signal of the recovery sequence. Upon receipt of the disconnect signal the J-3 payloads shall cause the VSC interface to be disconnected. The J-3 payloads shall also cause the JFC interface to be disconnected. The JFC interface shall be disconnected at the time of the disconnect signal.

1.2

Electrical Description

1. Time of Initiation - T-0 seconds
2. Duration - 28 seconds
3. Source Current Capacity - 2 amps max.
4. Signal Voltage - +24 VDC unregulated referenced to unregulated return.

2.4 Separation Signal (AJ-21X pins K & L)

a. Signal Description. The Separate signal shall be the fourth signal of the recovery sequence. Upon receipt of the separate signal the J-1 and J-3 payload systems shall cause the physical separation of the payload and an SW.

b. Electrical Description

1. Time of Initiation - T + 1 second
2. Duration - 27 seconds
3. Source Current Capacity - 2 amps max.
4. Signal Voltage - +24 VDC unregulated referenced to unregulated return.

2.5 Transfer to Experiment No. 2 (AJ-21X pins 9 & 8)



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b. Electrical Description

1. Time of Initiation - 7.98 seconds
2. Duration - 34 seconds
3. Source Current Capacity - 2 amps max.
4. Signal Voltage - 24 VDC unregulated referenced to unregulated return.

34.3 Special Approval Commands

34.3.1 In-flight Reset (AJ-21X Pins S & J)

a. Signal Description - The In-flight reset signal shall be initiated by the physical separation of the vehicle and its booster adapter, nominally 2.5 seconds after the separation command (160 seconds after lift off). Exact time is mission peculiar.

b. Electrical Description

1. Duration - 1 second minimum required. Signal may be continuous for duration of mission.
2. Source Current Capacity - 2 amps max.
3. Signal Voltage - 24 VDC unregulated referenced to unregulated return.

NOTE: To conserve vehicle power the payload shall remove all loads from the In-flight reset command as soon as practicable, after receipt of the command.

34.3.2 AP Orbit Mode Signal (AJ-21X Pins H & J)

a. Signal Description - The AP Orbit Mode Signal shall be initiated by the vehicle to indicate the end of powered flight, nominally 430 seconds after lift-off. Exact time is mission

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peculiar Upon receipt of the signal the payload shall be placed in a mission ready condition.

b. Electrical Description

1. Duration - 5 seconds \pm 1 second
2. Source Current Capacity - 2 amps max.
3. Signal Voltage - +24 VDC unregulated referenced to unregulated return.

3.3.3.3 AP Data Enable (AJ-23X Pin G)

a. Signal Description - The AP Data Enable signal shall be initiated by the vehicle each time payload functions are to be tape recorded. The exact times shall be coordinated on a per mission basis.

b. Electrical Description

1. Duration - Continuous during the tape recording of desired data - 10% of an Orbit period maximum.
2. Source Current Capacity - 1 amp max.
3. Signal Voltage - +24 VDC unregulated referenced to unregulated return.

3.4.3.4 AP Recovery Enable (AJ-23X Pin H)

a. Signal Description - The AP Recovery Enable Signal shall be initiated by the vehicle at the time of enabling a Primary recovery sequence or at the time of executing a Lifesat UI or UI recovery sequence.

b. Electrical Description

1. Duration - 1 sec. min required. Command may be continuous from initiation to Recovery timer event No. 18 (3 hrs.)

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- 2. Source Current Capacity - 2 amp max.
- 3. Signal Voltage - +24 VDC unregulated referenced to unregulated return.

3.4.3. Link I TIM OV Signal (AJ-24X Pins V & M)

a. Signal Description - The Link I TIM OV Signal shall be initiated by the vehicle TIM OV signal when the Link I TIM system is operating. The signal shall be generated during acquisition.

b. Electrical Description

- 1. Duration - continuous during each acquisition (15 minutes average)
- 2. Source Current capacity - 1 amp max.
- 3. Signal Voltage - +24 VDC unregulated referenced to unregulated return.

3.4.4 Telemetry Data

The vehicle shall provide TIM channels as required for in-flight monitoring of the payload system.

3.4.4.1 Primary Telemetry Data (AJ-24X Pins a, b, c, g, i, k, n, p, q, r and s.

Payload generated TIM data shall conform to the following requirements. Channel 13, Link I shall be required for Ascent & Orbit monitoring - all other channels shall be required for Orbit Monitoring only.

a. Electrical Requirements

- 1. Signal Voltage Range - 0 to 5 VDC referenced to TIM signal return.
- 2. Payload Circuit Impedance - 10 kilo-ohms max. measured

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from a data line to 'L' signal return.

3. 'L' input impedance - 1 megohm \pm 10%.

3.4.4.2 A218 (Payload SRV Separation Monitors)

a. Monitor Description - The payload shall provide a TM monitor to the vehicle that will indicate payload-SRV physical separation. The monitor shall provide three discrete voltage levels referenced to TM signal return.

b. Electrical Description

1. 0.3 volts both SRV's on board.
2. 1.3 volts "A" SRV ejected.
3. 4.7 volts "B" SRV ejected.

3.4.4.3 Thrust Monitors (AJ-24X- f, h, j, t, BE, CC)

a. Monitor Description - The vehicle shall provide a monitor from each thrust valve. The monitor shall indicate thrust valve activation.

b. Electrical Description

1. Pulse duration - 15 milliseconds each.
2. Pulse Repetition Rate - Determined by external torque on vehicle (1 to 10 pps avg.)
3. Pulse Configuration - 48 VDC unreg. continuous - zero VDC during pulse.
4. Source Impedance - 10 kilo-ohms minimum in series with voltage source.
5. Payload Impedance - 80 kilo-ohms minimum, referenced to TM signal return

3.4.4.4 AP to Tape Recorder Track 1 (AJ-23X Pin 5)

The vehicle shall provide on orbit tape recording capability for the payload system. Tape recorder Track 1 shall be available to the payload a minimum of 10 percent of each orbit and during each recovery sequence commencing with the Arm Signal and terminating after the Separation Signal. The payload data to be recorded shall have a maximum pulse repetition rate of 24 pps and shall meet the electrical requirements of paragraph 3.4.4.1, a 1 and 2. The payload data on AJ-23X Pin 5 shall be monitored in real time during vehicle powered flight.

3.4.4.5 AP to Tape Recorder Track 2 (AJ-23X Pin U)

The vehicle shall provide on orbit tape recording capability for the payload system. Tape recorder Track 2 shall be available to the payload during each recovery sequence commencing with the Arm Signal and terminating after the Separation Signal. The payload data to be recorded shall have a maximum pulse repetition rate of 24 pps and shall meet the electrical requirements of paragraph 3.4.4.1, a 1 and 2. The payload data on AJ-23X Pin U shall be monitored in real time during vehicle powered flight.

3.4.5 System Electrical Requirements

The vehicle shall provide electrical lines for control and

status monitoring during pre-launch and coast-down

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

3.4.5.1 Unlabeled Commands

3.4.5.1.1 Unlabeled Command No. 1 (AJ-23X Pin Y)

Electrical Requirements

- 1. Command Duration - 5 secs or less
- 2. Command Source - Momentary Switch
- 3. Command Voltage - +24 VDC unregulated referenced to vehicle unregulated return.
- 4. Command Current - 2 amps max.

3.4.5.1.2 AP Unlabeled Command No. 2 (AJ-23Y Pin BB)

Electrical Requirements

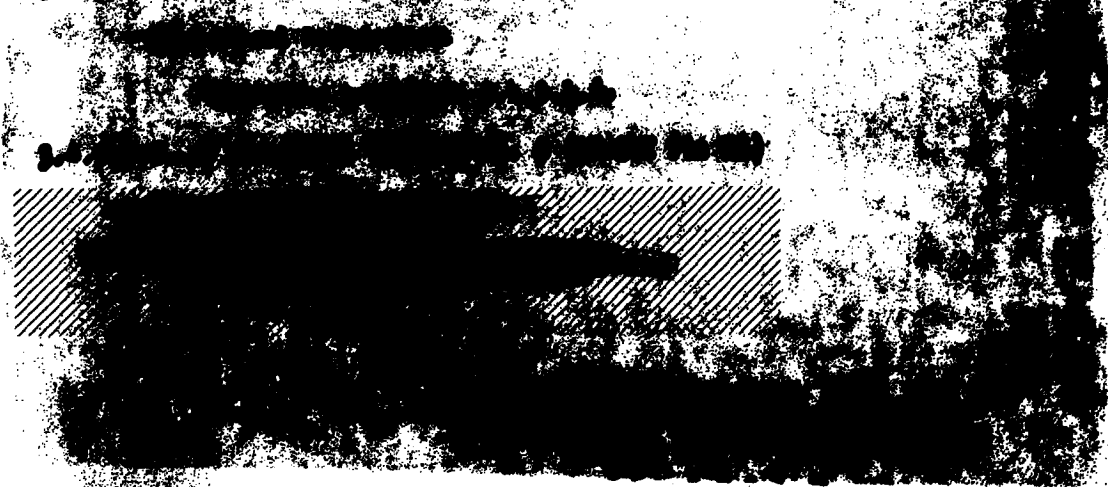
Reference paragraph 3.4.5.1.1

3.4.5.1.3 AP Unlabeled Command No. 3 (AJ-23Y Pin X)

Electrical Requirements

- 1. Command Duration - continuous for required duration not to exceed 5 minutes.
- 2. Command Source - ON/OFF switch
- 3. Command Voltage - +24 VDC unregulated referenced to vehicle unregulated return.
- 4. Command Current - 2 amps max.

3.4.5.1.4 AP Unlabeled Command No. 4 (AJ-23X Pin Y)



3.4.5.1.6 AP Relay Reset Command (AJ 2M Pins 2 & 11)

Electrical Requirements

1. Command Duration 5 secs. or less
2. Command Source Emittery switch
3. Command Voltage 54 VDC approx. and referenced to vehicle unregulated output.
4. Command Current 5 amps max.

3.4.5.2 Auxiliary Command Lines

3.4.5.2.1 Stored Program Lines

ACB shall provide test connector command capability for SP's 14, 17, 18, 20, 49 and 50. The command source shall be on the payload control panel in each launch complex. For electrical requirements reference paragraph 3.4.1.4 sec. b.

3.4.5.2.2 8-band Analog Commands

ACB shall provide test connector command and monitor capability for AM 6, 8, 9, 10, 11, 12, 14 and 15. For electrical requirements reference paragraph 3.4.1.2. These lines may be terminated on the Communications Control Panel.

3.4.5.2.3 VHF Commands

ACB shall provide test connector command capability for VHF channels 101, 102, 103, 104, 105, 107 and 113.

3.4.5.2.4 (2-1 Pins 1, 2)

The payload shall generate an emergency signal to the ground control system referenced to 3.4.1.2. The signal shall cause the vehicle to be jettisoned. The payload shall provide real time status of the payload during launch.

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b. Electrical Description

1. Function duration = 31. \pm 1 minute/per cycle.
2. Phase shift (relative to function) $0 \pm 5^\circ$ and $180 \pm 5^\circ$.
3. Function voltage = 12. millivolts max. based on 1.67 millivolts per quarter degree of phase.
4. Output impedance (loaded) 100 ohms max. at function voltage.
5. Output impedance (unloaded) 100 ohms max. at zero volts.

NOTE: Appropriate security measures shall be taken to prevent disclosure of payload yaw programmer input to vehicle guidance system. For electrical requirements reference paragraph 3.4.1.1.

3.4.7 Umbilical Indicators

The vehicle shall provide umbilical monitor lines for the payload for use during pre-launch and countdown activities.

3.4.7.1 AF Mon. No. 1 and TRK OF Mon. (AJ-24X Pin 7)

AGE shall provide on each payload control panel two lamp indicators. One shall be wired to +4 VDC unregulated voltage and one shall be wired to unregulated return. These shall be a switch interrupt capability on this line at the payload control panel.

3.4.7.2 AF Mon. No. 2



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Point termination designated AP Mon 6.

3.4.6.5 Relative Humidity Monitor (W 24K Pin KE)

ACE shall provide on each payload control (10111) a Red Test point termination designated R.H. Mon.

3.4.7.6 Relative Humidity Monitor (W 24K Pin FF)



Provider shall provide to monitor payload data from all eight
lines available on the 1 real time. Data shall be recorded on
a minimum of 1000 permanent paper recordings.

The monitor label shall be "1" applied on vehicle side of

AP-207 to pins 1, 2, AP 1 Mon.

3, AP 2 Mon.

4, AP 10 Mon.

5, AP 6 Mon.

6, AP 13 Mon.

7, AP 8 Mon.

8, AP 18 Mon.

6.0 WEIGHT ATTACHANCE

Not Applicable

9.0 STRONGARM FOR DELIVERY

Not Applicable.

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