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COPY #

ELECTRICAL INTERFACE SPECIFICATION

FOR THE

"J-3"/CONSTANT ROTATOR SYSTEM

[redacted]

Contractor

[redacted]

Contractor

[redacted]

Customer

TOP SECRET [redacted]

1.0 SCOPE

2.0 APPLICABLE DOCUMENTS

3.0 REQUIREMENTS

4.0 QUALITY ASSURANCE PROVISION

5.0 PREPARATION FOR DELIVERY

1.0 SCOPE

This document shall define the electrical interface between the "J-3" system as described in T3-5-016 Requirement Specification - J3 Configuration, and the Constant Rotator system as described in Camera Design Control Specification DCS-397-1, latest revision.

2.0 APPLICABLE DOCUMENTS

The following documents shall form a part of this specification to the extent specified herein. In the event of conflict, this specification shall prevail.

2.1 LMSC Documents:

LMSC 447969B - Specification for Electromagnetic Interference Control Requirement and Electrical Interface for Agena systems.

3.0 REQUIREMENTS

3.1 Electrical Interface Connectors

The "J-3" system will interface electrically with the Constant Rotator (C.R.) system through thirteen (13) connectors. The LMSC half of each connector is defined below. The C.R. shall provide a compatible mating connector in each instance, which shall be physically located per T33-100, -101, -102 interface drawing. Connectors with aluminum shells and gold iridite finish will be used wherever possible.

3.2 Connector Description and Pin Assignments

3.2.1 Command Connector P1001 (PT06SE-16-26S-011)

A. Exposure Control No. 1
B Exposure Control No. 2
C. Exposure Control No. 3
D Exposure Control No. 4

E	V/H Control Voltage
F	V/H Control Return
G	V/H Control Voltage
H	V/H Control Return
J	No. 1 Filter Control Back-up
K	Orbit Mode Signal
L	Orbit Mode Signal
M	Relay Reset
N	Relay Reset
P	No. 1 Operate Command
R	No. 1 Operate Command
S	A to B Transfer Command
T	A to B Transfer Command
U	No. 2 Operate Command
V	No. 2 Operate Command
W	V/H Shield Tie
X	V/H Shield Tie
Y	Fail-Safe No. 1
Z	Fail-Safe No. 2
a	No. 2 Filter Control Back-up
b	No. 1 Slit Width Fail Safe
c	No. 2 Slit Width Fail Safe

Note: E and F are a twisted shielded pair with W as the shield tie

G and H are a twisted shielded pair with X as the shield tie

3.2.2 Power Connector
P1002 (PT06SE-20-16S-011)

A	Unregulated Return #1
B	AC Shield Tie
C	Unregulated Return #1
D	Spare
E	Unregulated Return #2
F	Spare
G	Unregulated Return #2
H	AC Return
J	AC Shield Tie
K	AC Return
L	115 VAC 400 CPS
M	+24VDC Unregulated #1

[redacted]

N	+24 VDC Unregulated #1
P	+24 VDC Unregulated #2
R	+24 VDC Unregulated #2
S	115 VAC 400 CPS

Note: A and M are twisted unshielded pair
C and N are twisted unshielded pair
E and P are twisted unshielded pair
G and R are twisted unshielded pair
H and S are twisted shielded pair with J as shield tie
K and L are twisted shielded pair with B as shield tie

3.2.3 T/M Connector (No. 1)
P1004 (PT06SE-22-55P-011)

A	Spare
B	Temp Sensor #1
C	Temp Sensor #2
D	Temp Sensor #3
E	Temp Sensor #4
F	Temp Sensor #5
G	Temp Sensor #6
H	Temp Sensor #7
J	Temp Sensor #8
K	+5 VDC Temp Sensor Excitation
L	Temp Sensor Return
M	Temp Sensor Shield Tie
N	Launch Mode Monitor
P	Spare
R	Tachometer Feedback Voltage
*S	Servo Amp Output Voltage
*T	Operate Voltage
*U	Drive Motor Voltage
*V	Supply Spool Motor Voltage
*W	99/100 Clutch Command
*X	H.O. Platen Command
*Y	H.O. Shutter Command
Z	Units Cycle Count
a	Tens Cycle Count
b	Hundreds Cycle Count
c	Thousands Cycle Count
d	Cycle Counter Excitation (+ 5 VDC)
e	Cycle Counter Return
*f	Center of Format Command Monitor

	g	Slit Width Position
	h	Input H.G. Platen Position
	i	Output H.G. Platen Position
	j	Position Monitor Common for N, h, i, D, D,
**	k	Input Film Tension Monitor [illegible]
**	m	Input Film Tension Monitor Excitation
	n	Input Metering Roller Pot Excitation
	p	Input Metering Roller Pot Wiper
	q	Input Film Idler Pot Excitation
	r	Input Film Idler Pot Wiper
**	s	Output Film Tension Monitor [illegible]
**	t	Output Film Tension Monitor Excitation
	u	Output Framing Roller Pot Excitation
	v	Output Framing Roller Pot Wiper
	w	Output Film Idler Roller Pot Excitation
	x	Output Film Idler Roller Pot Wiper
	y	Lens Assembly Rotation Pot Excitation
	z	Lens Assembly Rotation Pot Wiper
**	AA	Shuttle Position Monitor [illegible]
**	BB	Shuttle Position Monitor Excitation
	CC	Pot Common for k through BB, & GG, g [illegible]
	DD	Filter Position Mon. [illegible]
	EE	Spare [illegible]
	FF	T/M Ret. for EE [illegible]
	GG	Spare [illegible]
	HH	Spare [illegible]

* These functions require isolation from monitoring circuits external to the C.R.

** These pins reserved for functions listed

3.2.4 T/M Connector (No. 2)
P1005 (PT06SE-22-55PW-011)

A	Spare
B	Temp Sensor #1
C	Temp Sensor #2
D	Temp Sensor #3
E	Temp Sensor #4
F	Temp Sensor #5
G	Temp Sensor #6
H	Temp Sensor #7
J	Temp Sensor #8

K	+5 VDC Temp Sensor Excitation
L	Temp Sensor Return
M	Temp Sensor Shield Tie
N	Launch Mode Monitor
P	Spare
R	Tachometer Feedback Voltage
*S	Servo Amp Output Voltage
*T	Operate Voltage
*U	Drive Motor Voltage
*V	Supply Spool Motor Voltage
*W	99/100 Clutch Command
*X	H.O. Platen Command
*Y	H.O. Shutter Command
Z	Units Cycle Count
a	Tens Cycle Count
b	Hundreds Cycle Count
c	Thousands Cycle Count
d	Cycle Counter Excitation (+5 VDC)
e	Cycle Counter Return
*f	Center of Format Command Monitor
g	Slit Width Position
h	Input H.O. Platen Position
i	Output H.O. Platen Position
j	Position Monitor Common for [illegible]
**k	Input Film Tension Monitor
**m	Input Film Tension Monitor Excitation
n	Input Metering Roller Pot Excitation
p	Input Metering Roller Pot Wiper
q	Input Film Idler Pot Excitation
r	Input Film Idler Pot Wiper
**s	Output Film Tension Monitor
**t	Output Film Tension Monitor Excitation
u	Output Framing Roller Pot Excitation
v	Output Framing Roller Pot Wiper
w	Output Film Idler Roller Pot Excitation
x	Output Film Idler Roller Pot Wiper
y	Lens Assembly Rotation Pot Excitation
z	Lens Assembly Rotation Pot Wiper
**AA	Shuttle Position Monitor
**BB	Shuttle Position Monitor Excitation
CC	Pot Common for k through BB & GG, [illegible]
DD	Filter Position Mon.

EE	Pad Temperature Sensor
FF	Pad Temperature Sensor
GG	Spare [illegible]
HH	Spare [illegible]

* These functions require isolation from monitoring circuits external to the C.R.

** Pins reserved for functions listed

3.2.5 Take-Up (T/U) Control Connector
P1003 (PT06SE-16-26P-011)

A	#2 T/U Control Voltage, Ascent Mode	A SRV
B	#1 T/U Control Voltage, Ascent Mode	
C	#1 T/U Control Voltage Return (A)	
D	#1 T/U Control Voltage Return (A)	
E	#1 T/U Control Voltage Return (B)	
F	#2 T/U Control Voltage, C/W Mode	B SRV
G	#2 T/U Control Voltage Return (A)	
H	#2 T/U Control Voltage Return (A)	
J	#1 T/U Control Voltage, C/W Mode	
K	Spare	
L	#2 T/U Control Voltage Return (B)	
M	#2 T/U Control Voltage (B)	
N	#2 T/U Control Voltage (B)	
P	#2 T/U Control Voltage Return (B)	
R	#1 T/U Control Voltage Return (B)	
S	#1 T/U Control Voltage (B)	
T	#1 T/U Control Voltage (A)	
U	#1 T/U Control Voltage (A)	
V	#1 T/U Control Voltage (B)	
W	#2 T/U Control Voltage (A)	
X	#2 T/U Control Voltage (A)	
Y	Brake Release Command #1	
Z	Brake Release Command #2	
a	Anti-back up Command #1	
b	Anti-back up Command #2	
c	Spare	

3.2.6 Data Connector (No. 1)
P1006 (PT06SE-22-55S-011)

A	Spare
B	Spare
C	Spare

D	Spare
E	Spare
F	Spare
G	Spare
H	Spare
J	Spare
K	Spare
L	Spare
M	Spare
N	Spare
P	Spare
R	Spare
S	Data 3 Column Select
T	Data 4 Column Select
U	Data 5 Column Select
V	Data 2 Column Select
W	Data 1 Column Select
X	Index Column Select
Y	200 PPS Signal Input
Z	No. 1 Interrogate Pulse
a	Bit #1
b	Bit #2
c	Bit #3
d	Bit #4
e	Bit #5
f	Bit #6
g	Bit #7
h	Bit #8
i	Bit #9
j	Bit #10
k	Bit #11
m	Bit #12
n	Bit #13
p	Bit #14
q	Bit #15
r	Bit #16
s	Bit #17
t	Bit #18
u	Bit #19
v	Bit #20
w	Bit #21
x	Bit #22
y	Bit #23
z	Bit #24

[redacted]

AA	Bit #25
BB	Bit #26
CC	Bit #27
DD	Bit #28
EE	Bit #29
FF	Bit #30
GG	Bit #31
HH	Bit #32

3.2.7 Data Connector (No. 2)
P1007 (PT06SE-22-55S-011)

A	Spare
B	Spare
C	Spare
D	Spare
E	Spare
F	Spare
G	Spare
H	Spare
J	Spare
K	Spare
L	Spare
M	Spare
N	Spare
P	Spare
R	Spare
S	Spare
T	Spare
U	Spare
V	Data 2 Column Select
W	Data 1 Column Select
X	Index Column Select
Y	200 PPS Signal Input
Z	No. 2 Interrogate Pulse
a	Bit #1
b	Bit #2
c	Bit #3
d	Bit #4
e	Bit #5
f	Bit #6
g	Bit #7
h	Bit #8
i	Bit #9
j	Bit #10

k	Bit #11
m	Bit #12
n	Bit #13
p	Bit #14
q	Bit #15
r	Bit #16
s	Bit #17
t	Bit #18
u	Bit #19
v	Bit #20
w	Bit #21
x	Bit #22
y	Bit #23
z	Bit #24
AA	Bit #25
BB	Bit #26
CC	Bit #27
DD	Bit #28
EE	Bit #29
FF	Bit #30
GG	Bit #31
HH	Bit #32

3.2.8 Take-up Connector ("A" SRV)
W2P8 (PT06SE-16-26S-011)

A	Temp Sensor Monitor
*B	No. 2 T/U Rotation Monitor Excitation
*C	No. 1 T/U Rotation Monitor
D	No. 2 T/U Film Footage Monitor
E	No. 1 T/U Control Voltage
F	Heater Power
G	No. 2 T/U Motor Voltage Monitor
*H	No. 2 T/U Rotation Monitor
J	No. 2 T/U Anti-Backup Control Voltage
*K	No. 1 T/U Rotation Monitor Excitation
L	No. 1 Film Footage Monitor
*M	No. 1 and No. 2 Rotation Monitors Common
N	No. 1 and No. 2 Control Voltage Return
P	No. 1 T/U Motor Voltage Monitor
R	Shield Tie
S	No. 1 and No. 2 Film Footage Pot Excitation (+5 VDC)
T	Heater Power Return

U	No. 1 Anti-Backup Control Voltage
V	No. 2 T/U Control Voltage
W	No. 2 T/U Control Voltage
X	No. 1 T/U Control Voltage
Y	Temp Sensor Return
Z	#1 T/U Control Voltage, Ascent Mode
a	No. 1 and No. 2 Film Footage Pot Return
b	No. 1 and No. 2 T/U Control Voltage Return
c	#2 T/U Control Voltage, Ascent Mode

* Pins Reserved for functions listed

3.2.9 Take-up Connector ("B" SRV)
W2P8 (PT06SE-16-26S-011)

A	Temp Sensor Monitor
*B	No. 2 T/U Rotation Monitor Excitation
*C	No. 1 T/U Rotation Monitoper
D	No. 2 T/U Film Footage Monitor
E	No. 1 T/U Control Voltage
F	Heater Power
G	No. 2 T/U Motor Voltage Monitor
*H	No. 2 T/U Rotation Monitoper
J	No. 2 T/U Brake Control Voltage
*K	No. 1 T/U Rotation Monitor Excitation
L	No. 1 Film Footage Monitor
*M	No. 1 and No. 2 Rotation Monitors Common
N	No. 1 and No. 2 Control Voltage Return
P	No. 1 T/U Moter Voltage Monitor
R	Shield Tie
S	No. 1 and No. 2 Film Footage Pot Excitation (+5 VDC)
T	Heater Power Return
U	No. 1 T/U Brake Control Voltage
V	No. 2 T/U Control Voltage
W	No. 2 T/U Control Voltage
X	No. 1 T/U Control Voltage
Y	Temp Sensor Return
Z	#1 T/U Control Voltage, C/W Mode
a	No. 1 and No. 2 Film Footage Pot Return
b	No. 1 and No. 2 T/U Control Voltage Return
c	#2 T/U Control Voltage, C/W Mode

* Pins Reserved for functions listed

3.2.10 C.R. to Supply Cassette Harness

LMSC shall supply an electrical harness to interconnect the C.R. No. 3 J-Box connector J-1008 to the supply spool cassette connector J1009. The harness shall be wired to the listing below:

C.R. No. 3 J-Box P1008 PT06SE-16-26P-011		Supply Spool P1009 PT06SE-16-26S-011
From	Wire Description	To
A	20 AWG Single Unshielded	A
B	20 AWG Single Unshielded	B
C	20 AWG Single Unshielded	C
D	20 AWG Single Unshielded	D
E	No connection	E
F	No connection	F
G	No connection	G
H	No connection	H
J	No connection	J
K	No connection	K
L	20 AWG Single Unshielded	L
M	20 AWG Single Unshielded	M
N	20 AWG Single Unshielded	N
P	20 AWG Single Unshielded	P
R	20 AWG Single Unshielded	R
S	20 AWG Single Unshielded	S
T	20 AWG Single Unshielded	T
U	20 AWG Single Unshielded	U
V	22 AWG Single Shielded	V
W	22 AWG Single Shielded	W
X	22 AWG Single Shielded	X
Y	22 AWG Single Shielded	Y
Z	22 AWG Single Shielded	Z
a	20 AWG Single Unshielded	a
b	20 AWG Single Unshielded	b
c	20 AWG Single Unshielded	c

The shields of conductors on pins V, thru Z, shall be commoned and returned to Pin T.

3.2.11 Intermediate Roller Monitor #1 P1010 (PT06-SE-10-6S (SR)

A. Excitation
B. Wiper
C. Common

3.2.12 Intermediate Roller Monitor #2 P1011 (PT06-SE-10-6S (SR)

A. Excitation
B. Wiper
C. Common

3.3 Electrical Interface Design Requirements

3.3.1 Electrical Power

LMSC shall supply unregulated DC and 115 VAC, 400 CPS, 1ϕ power to the C.R. system. Power shall be supplied continuously during a normal mission which includes pre-launch and launch modes. The C.R. system, including take-up and supply cassettes, shall be capable of operating without impairment of function when supplied from the main bus of a central 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.

3.3.1.2 Power Supply Characteristics

3.3.1.2.1 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) Unregulated DC +22.0 to +29.5 volts

(b) 400 CPS, 1 ϕ 113.7 to 117.3 V rms

The allowable line drops from the distribution buses to the C.R. system power input connector is 1.0 volt DC and 2.0 volts rms AC with an average load (see Para. 3.3.1.3.2)

3.3.1.2.2 Output Impedance

The output impedance of the DC power supply shall not exceed 0.25 ohms at +29.5 volts.

3.3.1.2.3 Wave Form Distortion

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.

[redacted]

3.3.1.2.4 Amplitude Modulation

[redacted] modulation shall not exceed [redacted] volts p-p over a period of not less than [redacted] for noise-free utility loads for frequencies below the fundamental supply frequency. These limits shall not be exceeded for [redacted] input voltages as specified in 3.3.1.2.5 with the audio frequency conducted test signal [redacted] as specified in paragraph 4.3.4.1.2 of [redacted]

3.3.1.2.5 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 163.8 volts and shall recover with a time constant (63% response) of [redacted]

3.3.1.2.6 Frequency

The frequency of the vehicle AC supply shall be maintained between 399.992 and 400.008 cps. These limits shall apply for steady state conditions, under 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.

3.3.1.3 Load Characteristics

3.3.1.3.1 Power Utilization

Subsystems utilizing power shall be designed to give required performance when supplied with the types of power having the values and tolerances of parameters at the power distribution buses as specified in 3.3.3.2.

3.3.1.3.2 Power Consumption

The current requirements of the C.R. system, including

IND [redacted]

the take-up and supply cassettes, shall not exceed the limits listed below

DC current: 20 amps average with peaks not to exceed 25 amps during operation with starting surges not to exceed an additional 20 amps for durations not to exceed 500 milliseconds.

AC current: 0.5 amps average during operation with starting surges not to exceed an additional 0.25 amps for durations not to exceed 500 milliseconds

The C.R. system power requirements shall be minimized when not operating. All continuous power requirements of the C.R. system shall be subject to review by LMSC.

3.3.1.3.3 Load Impedance

(a) The impedance presented by the C.R. system to the DC power supply shall be essentially resistive, and noise-free to the greatest extent possible.

(b) The load presented to the vehicle AC supply shall have a power factor as near unity as practicable for all modes of operation and shall not present loads with steady-state power factors less than 0.8 Lagging and 0.95 Leading.

3.3.1.4 Switched Capacitor Loads

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

3.3.1.5 Inductive Spike Suppression

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

3.3.1.6 Cable and Harnessing

Cables and harnesses for the C.R. system and those portions of LMSC cables and harnesses that interface with the C.R. system shall be fabricated conforming to the applicable requirements of paragraph 3.2.11.1.1, 3.2.11.1.4 and paragraph 3.2.6.1.4 through 3.2.6.1.7 of [redacted] to every extent possible.

3.3.1.7 AF Signal Circuits

A.F. signal circuits (0-150 KC) which require shielding for proper operation shall be shielded with the shield grounded by LMSC at the vehicle ground point only. Shields shall not be connected in any way which creates a loop having nominally zero ohms impedance. The shields shall be routed through the pins provided on the various interface connectors. (See Section 3.2)

3.3.1.8 Grounding

The C.R. system shall not 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 (VGP) only. (See [redacted]

3.3.1.8 Bonding

The C.R. system shall conform to the applicable portions of bonding requirements of paragraph 3.2.12.1 through 3.2.12.2.2 and paragraph 3.2.12.3 through 3.2.12.5 of [redacted] to every extent possible.

[redacted]

3.4 Electrical Interface Function Description

3.4.1 Command Descriptions

3.4.1.2 No. 1 Operate Command (P1001-P & R)

The No. 1 Operate Command shall be +24 VDC Unregulated referenced to unregulated return. It shall be continuous throughout each programmed operation. Only the No. 1 camera and its associated supply and take-up cassettes shall begin operation upon receipt of the command and shall cease operation at the end of the next complete cycle after the command is removed. The command length will be a minimum of 23 seconds long with a minimum of 30 seconds between commands The command source shall be capable of supplying 1.0 amps. continuously through isolating diodes which have a 1.0 volt forward drop at 0.5 amps forward current. The C.R. system shall be insensitive to normal relay contact bounce present at the leading and trailing edge of the command.

3.4.1.3 No. 2 Operate Command (P1001-U & V)

The No. 2 Operate Command shall be identical to but electrically isolated from the No. 1 Operate Command. The No. 2 Operate Command shall cause only the No. 2 camera and its associated supply and take-up cassettes to operate.

3.4.1.4 "A" to "B" Transfer Command (P1001-S & T)

The "A" to "B" Transfer Command shall be + 24 V unregulated signal referenced to unregulated return. The "A" to "B" Transfer Command shall be 30 seconds long with a current capacity of 2.0 amps. The No. 1 and No. 2 Operate Commands will be energized for 30 seconds coincident with "A" to "B" Transfer Command. A V/H control voltage shall be supplied by LMSC that will cause the No. 1 and No. 2 cameras to operate a minimum of 4 cycles in 25 seconds. Upon receipt of the "A" to "B" Transfer Command the C. R. system shall transfer from the "A" mode to the "B" mode. The C.R. system shall contain the necessary circuits and components to perform this transfer operation. (The "A" mode is that part of the mission when film is taken up by the cassettes in the "A" or forward SRV. The "B" mode is that part of the mission when film is taken up by the cassettes in the "B" or aft SRV.)

3.4.1.5 V/H Control Voltage (P1001-E & G)

LMSC shall supply a V/H control voltage to the C.R. system referenced to the V/H control voltage return (P1001-F & H). The V/H Control voltage shall vary between 5 volts maximum and 1 volts minimum with a maximum rate of change of $\frac{\pi(V_{max} - V_{min})}{2400}$ volts per second.

The voltage source shall have an output impedance (measured between P1001-E & G and P1001-F & H) of 100 ohms when the voltage source is operating. The C.R. system input impedance (measured between J1001-E & G and J1001-F & H) shall be 10 kilo-ohms resistive or greater. The C.R. system response to the V/H Control voltage shall be repeatable within +1% [illegible] of the V/H Control voltage versus cycle rate. Pins F&H, v/h voltage return shall be isolated from the Unregulated Return."

3.4.1.6 Relay Reset Command (P1001-M & N)

The Relay Reset Command shall be a +24 VDC Unregulated command referenced to unregulated return. The Relay Reset Command shall be a non-flight, pre-launch command of 10 seconds or less duration and has a current capacity of 2 amps. Upon receipt of the command the C.R. system shall be placed in a launch ready mode.

3.4.1.7 Orbit Mode Signal

The Orbit Mode Signal shall be a +24 VDC unregulated signal referenced to unregulated return. The Orbit Mode signal shall be a 15 second long pulse which will indicate the end of powered flight. Upon the receipt of the signal the C.R. system shall be placed in a mission ready condition.

3.4.1.8 Fail Safe No. 1 (P1001-Y)

The No. 1 camera system shall provide switches on each shuttle mechanism which shall be operated (closed to unregulated ground) by either shuttle in extreme overtravel condition. The switches shall be wired in parallel and when operated shall cause the immediate removal of GSE power to the No. 1 camera system. The circuits shall be used for pre-flight operations only. The circuits shall be inoperative during a normal mission.

3.4.1.9 Fail Safe No. 2 (P1001-Z)

The No. 2 camera system shall provide switches and circuits identical to the No. 1 camera. (See paragraph 3.4.1.8).

3.5 Telemetry Signals Description

3.5.1 All rotating idlers and metering roller monitors, in the C.R. system, shall consist of continuously rotating potentiometers having an electrical angle of not less than 350°. The nominal resistance value shall be 5KΩ and the resistance tolerance shall be ± 10% or better. The potentiometer linearity shall be ± 1.0% and the resolution shall be .1% or less.

The functions to be monitored with transducers having these characteristics are as follows:

a) Input Metering Roller

b) Input Film Idler

c) Output Framing Roller

d) Output Film Idler

e) Lens Assembly Rotation

3.5.2 All linear and certain rotary action telemetry monitors shall generate analog outputs that are repeatable to ± 1%. It is preferred to have unconditioned linear resistive outputs from the monitors but if the nature of the transducer is incompatible with this requirement then the output shall be 0 to 5 volts DC.

The functions to be monitored with transducers having these characteristics are as follows:

a) Input Film Tension

b) Output Film Tension

c) Shuttle Position

d) T/U Rotation

3.5.3 Slit Width Monitor (P1004 & P1005 - g)

The C.R. system shall provide a 0 to 5 volt DC signal, referenced to unregulated return, which will indicate the slit width. The monitor output shall be wired to P1004 and P1005-g, and shall be a potentiometer with a resistance of 5,000 ohms ± 10%. Approximately four fifths (4/5) of the total potentiometer available excursion shall be utilized to cover the full range of available slits.

3.5.4 Input H.O. Platen Position (P1004 & P1005 - h)

The input H.O. platen position monitor shall be configured so as to indicate the position of the input H.O. platen. The monitor shall consist of a form A contact arrangement wired so that closed contacts indicate that the platen is clamped and open contacts indicate that the platen is released. The movable contact shall be wired to pin h (P1004 & P1005) and the stationary contact shall be wired to T/M position monitor common pin j (P1004 & P1005).

3.5.5 Output H.O. Platen Position (P1004 & P1005 - i)

The output H.O. Platen position monitor shall be configured so as to indicate the position of the output H.O. platen. The monitor shall consist of a form A contact arrangement wired so that closed contacts indicate that the platen is clamped and open contacts indicate that the platen is unclamped. The movable contact shall be wired to pin i (P1004 & P1005) and the stationary contact shall be wired to T/M position monitor common pin j (P1004 & P1005).

3.5.6 Temperature Sensor Characteristics

Each camera subsystem shall provide eight temperature sensors with the following characteristics:

Nominal Resistance	2000Ω ± 2% at a nominal temperature between 70°F and 78°F.

Coefficient of Resistance	90% ± 2% change in resistance with a 200°F change in temperature from nominal.
Operating Range	-100°F to +400°F
Leakage Resistance	Room temperature leakage resistance with a 50 volt excitation shall be greater than 50 megohms
Power Dissipation	Nominal resistance value shall remain to ± 2% when power is applied (10 to 50 milliwatts) and through resistance stabilization."
Calibration	A four or five point vender calibration shall be furnished with each temperature sensor. The calibration shall cover the range from -50°F to +150°F if possible.

3.5.7 Temperature Monitoring Circuit

Each temperature monitoring circuit shall consist of the temperature sensor of paragraph 3.5.6 in series with a 1.5K ohm divider resistor. The divider resistor shall be rated for 1/4 watt dissipation and the resistance tolerance shall be ± 0.1% with a temperature coefficient of resistance of 100 PPM per degree centigrade or less.

3.5.8 Cycle Counter

The cycle counter shall be a mechanically actuated four place counter. Each decade shall furnish a single wire output signal to indicate the count accumulated in that decade. The signal shall start at 0.5 volts for count of zero and proceed in steps of 0.5 volts to a maximum of 5.0 volts for a count of nine. The four decades shall be provided with isolated excitation on pin d (P1004 & P1005)

and common return on pin e (P1004 and P1005)

3.5.9 Launch Mode Monitor (P1004 & P1005 - N)

The launch mode monitor shall be configured so as to indicate the launch condition of the camera system. The monitor shall be a form A contact arrangement wired so that closed contacts indicate a launch ready condition and open contacts indicate receipt of the orbit mode signal. The movable contact shall be wired to pin N (P1004 & P1005) and the stationary contact shall be sired to T/M position monitor common pin j (P1004 & P1005).

3.5.10 Unconditioned Signal Monitoring

The following functions shall be monitored and the actual unconditioned command and operating voltages shall be provided as signals to the T/M interface:

a) Servo Amp. Output Voltage	Pin S
b) Operate Voltage	Pin T
c) Drive Motor Voltage	Pin U
d) Supply Spool Motor Voltage	Pin V
e) 99/101 Clutch Command	Pin W
f) H.O. Platen Command	Pin X
g) H.O. Shutter Command	Pin Y
h) Center of Format Command	Pin f

The signals shall be isolated from the source by means of emitter followers or any other high input impedance devices. The output impedance of the isolation amplifiers shall be less than 500 ohms and the signals shall be referenced to unregulated return.

3.5.11 Tachometer Feedback Voltage (P1004 & P1005-R)

The C.R. System shall provide a 0 to 5 volt DC signal proportional to the Tachometer Feed back voltage and referenced to unregulated return. The LMSC monitor circuit shall draw a maximum of one milliamp when the telemetry system is operating.

3.5.12 Pad Temperature Sensor (P1005 : EE, FF)

The C. R. System shall provide a single temperature sensor with the characteristics as described in paragraph 3.5.6, located on the C.R. structure so that the sensor will monitor a temperature representative of the C.R. System during all pre-launch activity. The temperature sensor shall have one lead wired directly to J1005-EE and the other wired directly to J1005-FF.

3.5.13 Film Footage Monitor (P1005)

The C. R. System shall provide separate Film Footage monitors on each take-up spool. The monitors shall be potentiometer with maximum resistance of 5000 ohms ± 10%. The output resistance of each potentiometer, measured between the wiper and return, shall vary from the minimum resistance to the maximum resistance as the quantity of film increases from [redacted] spool. The output resistance shall [redacted] minimum value as the quantity of film increases from 70% to 115% of a full spool. A spool is defined as full when the film wrap diameter is coincident with the outer edge of the spool flange. The relationship of potentiometer output resistance to film quantity shall be linear within ±2%.

3.6 Data Signal Description

3.6.1 200 PPS Signal (P1006-Y and P1007-Y)

The Digital Recording Clock Generator (DRCG) shall furnish the C.R. system a 200 pps signal suitable to trigger a pulsing circuit. The 200 pps signal supplied to the C.R. system shall be referenced to unregulated return and conform to the following parameters:

(a) Repetition rate	200 pulses per second
(b) Amplitude	-10 volts ± 1 volt (from ground to -10 volts)
(c) Pulse Width	70 micro seconds, ± 10 micro seconds (at half amplitude)
(d) Rise Time	2 microseconds maximum, 10% to 90%
(e) Allowable Loading	2000 ohms in parallel with 500 pico farads

3.6.2 Interrogate Pulse (P1006-Z and P1007-Z)

The C.R. system cameras shall each generate an interrogate pulse gated by each of their Center-of-Format pulses, and synchronized with a 200 pps pulse. The interrogate pulse shall be referenced to unregulated return and have the following parameters:

(a) Amplitude	+12 volts, +3. -1 volt
(b) Pulse Width	5 microseconds minimum
(c) Rise Time	2 microseconds maximum, 10% to 90%

3.6.3 DRCG Data Bits (P1006-a thru HH and P1007-a thru HH)

The C.R. system shall provide unshielded direct wiring between the Data Connectors, J1006 and J1007, and the Silicon Light Pulser (S.L.P.) data heads. LMSC shall supply conditioned data signals directly to the SLP unit. The columns and rows shall be defined by Fairchild Spec Control Dwg. C700036 Rev. A.

4.0 QUALITY ASSURANCE PROVISION

Not applicable

5.0 PREPARATION FOR DELIVERY

Not applicable

[redacted]