

BENDIX SYSTEMS DIVISION ANN ARBOR, MICH. NO.

Test Procedure for CPLEE Engineering Model

ATM-630

REV.NO.

PAGE

SUBSYSTEM TEST PROCEDURE

FOR

ENGINEERING MODEL OF CPLEE

SUBSYSTEM OF APOLLO LUNAR SURFACE EXPERIMENT

PACKAGE

Prepared by: 7

Approved by:



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TEST PROCEDURE FOR CPLEE ENGINEERING MODEL

1. PURPOSE OF TEST

This test procedure is designed to prove that the Charged Particle Experiment is operating satisfactorily and that the interfaces are compatible with the ALSEP central station.

2. SCOPE

The engineering model subsystem tests are electrical functional tests performed in a laboratory environment using the experiment test set. These tests must be performed before integrating the experiment with ALSEP.

3. APPLICABLE DOCUMENTS

- (a) IC-314107, Interface Control Specification for CPLEE.
- (b) AL-260000, Performance/Design and Product Configuration Requirements for CPLEE.
- (c) Handbook of Operating and Maintenance Instruction for CPLEE ETS (BRLD Report No. 3889).

4. EQUIPMENT AND POWER REQUIREMENTS

4.1 Equipment

- (a) Charged Particle Experiment Test Set (ETS)
- (b) ALSEP/CPLEE Cable, BxA No. 2331190-7
- (c) Multirange Meter Triplet or Simpson
- (d) Oscilloscope Camera
- (e) Oscilloscope
- (f) Strip Chart Recorder

5. PROCEDURE

5.1 Preliminary Requirements and Procedures Before Experiment Testing

- 5.1.1 Test Sequence All tests will be performed in the order presented. Any deviation must be approved by the Project Engineer and/or BRLD representative.
- 5.1.2 Adjustments and Repairs Should failures occur, the problem will be resolved by the P.E. or BRLD representative and continuation will be at their discretion.



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5.2 Resistance Check of ETS Interface

CAUTION: Make certain that main power switches on the ETS are in the "OFF" position.

Connect the positive lead of a calibrated ohmmeter to the scope test panel terminal A. WARNING: Do not use the ohmmeter on X100 K or higher scale. This would feed +30V into the signal lines. Connect the negative lead to chassis ground. Measure the resistance of each ETS signal and power line by turning Selector "A" through all positions. On position 27 only throw the "EXP. ON" switch into a "Survival HTR PWR Line" to make the reading. Record all measured values in Table I.

5.3 Resistance Check of CPLEE Interface

- 5.3.1 Connect one lead of the ohmmeter to Pin S on connector P65B of jumper cable W65B.

 WARNING: Do not use the ohmmeter on X100 K or higher scale. This would feed +30V into the lines.

 Measure the resistance between each of the other connector pins and Pin S, and record all measured values in Table II.
- 5.3.2 Connect one lead of the ohmmeter to pin r on connector P65B of jumper cable W65B. Measure the resistance between each of the other pins and pin r and record all measured values in Table II.

5.4 Installation of CPLEE in ETS

- 1. Make certain that ETS Experiment and Main Power switches are in the OFF position.
- 2. Attach CPLEE to the mounting bracket assembly.
- 3. Bolt CPLEE and the mounting bracket into the ETS Vacuum Chamber.
- 4. Connect the 9 pin Cannon Connector on the GSE cable of the ETS to the 9 pin Cannon connector on CPLEE.
- 5. Connect the Experiment cable, W65, to the main connector in the ETS vacuum chamber.
- 6. Make certain that ETS and experiment are connected as shown in Figure 1.

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Table I - ETS Isolation of Lines Check(1), ETS

Selector SW Pos. A 2 A 4 A 6 A 9 A 19 A 20 A 21 A 22 A 23 A 24 C-11	ETS Ald Specified 30K Ω + (*) 1800 Ω 1450 Ω 1800 Ω ••• •• •• •• 1700 Ω	Measured	ETS Specified 1.5K (*) 1.3K 1.3K 1.3K 22K 7.3K 6.9K 320 \$\mathbf{N}\$ 5.5K 5.5K 1.3K	with CPLEE Measured
A 2 A 4 A 6 A 9 A 19 A 20 A 21 A 22 A 23 A 24	30K Ω + (*) 1800 Ω 1450 Ω 1800 Ω •• •• •• •• 1700 Ω	Measured	1.5K (*) 1.3K 1.3K 1.3K 22K 7.3K 6.9K 320 N 5.5K 5.5K	Measured
A 4 A 6 A 9 A 19 A 20 A 21 A 22 A 23 A 24	1800 Ω 1450 Ω 1800 Ω		1.3K 1.3K 1.3K 22K 7.3K 6.9K 320 N 5.5K	
A 6 A 9 A 19 A 20 A 21 A 22 A 23 A 24	1800 Ω 1450 Ω 1800 Ω		1.3K 1.3K 1.3K 22K 7.3K 6.9K 320 N 5.5K	
A 6 A 9 A 19 A 20 A 21 A 22 A 23 A 24	1450 Ω 1800 Ω ∞ ∞ ∞ ∞ 1700 Ω		1.3K 1.3K 22K 7.3K 6.9K 320 N 5.5K	
A 19 A 20 A 21 A 22 A 23 A 24	∞ ∞ ∞ ∞ ∞ ∞ 1700 Ω		1.3K 22K 7.3K 6.9K 320 N 5.5K 5.5K	
A 20 A 21 A 22 A 23 A 24	∞ ∞ ∞ ∞ ∞ 1700 Ω		7.3K 6.9K 320 N 5.5K 5.5K	
A 21 A 22 A 23 A 24	∞ ∞ ∞ ∞ 1700 Ω		6.9K 320 N 5.5K 5.5K	
A 22 A 23 A 24	∞ ∞ ∞ 1700 Ω		320 \(\) 5.5K 5.5K	
A 23 A 24	∞ ∞ 1700 ∫		5.5K 5.5K	
A 24	∞ 1700 ∫		5.5K	
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0-11				Copyright Control of the Control of the Copyright Copyri
C-12	1700 Ω		4 —	and the state of t
C-13	1700 N			and gapter the resolution (1000 to 100 to
C-14	1700 <u>N</u>			enganaparis monas, mm. i opplaggangengamma, m. a. alak p. et. et. e
C-15	1700 Ω	and the second s	<u> </u>	n a sur to the sure of the transfer of the tra
C-16	1700 ଛ			andreas and analysis of a security of the second security of the second
C-17	1700 Ω		+	
C-18	1700 Ω	The second control of the second control of the second state is a second state in a second state of the se	1.3K	and the state of t
A 26	74 N		70 N	manda a mandarinin eta egane er era () i manda industria anga distribution di distribution de despetation especial d
A 27 /	∞		70 Ω	والمنافضة الديني بقاة المعادمة والدوان برياضيستانية والآخرين يردد فيد مديدون والدريمة
A 30	00	parameters and service and a service and antique and assessment of the service of	380 ℃	فيدونها والمتارك والمساد والمنطوا والموارد والمتارك والمتارك والميارة والمساد والمتارك والمتارك
A 31	2800 Ω ∞		1.2K	a i i i i i i i i i i i i i i i i i i i
A 32)		1.4K	والمراوية والمروات والمعارفة فالمراونة والمراوية والمراوية والمراوية والمراوية والمراوية والمراوية والمراوية والمراوية
A 33	<i>∞</i>		1.0K	est. Our alles des les lemantes de l'entreprise partire par 100 es describés des despublicaments
A 34	∞		650 N	erithin than th'ithin 1980 ann is primitiseaspy, it was an a stad, he charlester, "age ph' gradysiash tha stadies
A 35		and the second s	310 \(\Omega \)	and the state of t
A 36	~		24K	and the second s
A 37	∞ (*)		300K	

- (1) Refer to Fig. 1 for ETS Selector Switch Designation.
- (*) All resistances are specified to $\pm 25\%$.
- (/) Throw switch on Main Power Panel to "Survival Htr Power Line" position for this measurement only.

Table II - CPLEE C ble Isolatio Measurements

				RESISTAN	CE			1
		Deutsch	Line to Ca	se Grnd (1)		mal Grnd(2)		
No.*	Line	P65B	Specified	Measured	Specified	Measured	Remarks	
1	China	<u>.</u>			∞			
1	Shield	17			1 (77 /2)	The second secon		-
2	Digital Data	V			1.6K (3)			ŀ
3	Shield	s			000			Ė
4	Shift Pulse (Data Clock)	Ū		L	480K	The state of the s		00
5	Shield	i	eth o aga, etc. har than a committee again, and a grand a supply any again and a sec		~			ā
6	Even Frame Mark	T			16K			(I
7	Shield	t			~	A THE STANDARD SPENDS OF THE STANDARD CO. THE TRANSPORTED CO. STANDARD CO.		Ę
8	Case Ground Return	s	033		∞	The first state of the first state of the st		1
9	Demand Pulse	h				Jungs consideration for province () of the consequent of the province of		Ş
10	Signal Return	r			0 N			6
11	Therm.Cont. Bypass On	R			10 Meg	programme and the control of the con		'
12	Therm.Cont. Bypass Off	g			8.5 Meg	manufacture our majorital surpletion, surpletion management		
13	Dust Cover Removal	q			120K			1
14	Auto. Volt Level Seq. On	P			70K]	
15	Step Voltage Level	f			500K			
16	Auto Volt Level Seq. Off	e			500K			1
17	Chann. P.S. Volt INCR On	·			00			1
18	Chann. P.S. Volt INCR Of	1			00	Agendance Secretary Linear South Study Secretary and any effective leading	1	1
110	Chamili .b. von mon or	7 ***				primarial layer has about the same of the same of the same and the same of the	1	L
		I	1	į.	11	į.	1	-

^{*}These flat cable line numbers are the same as connector J65A-P65 (flight connector) numbers.

⁽¹⁾ Connect one lead of the ohmmeter to line 8 (Deutsch Pin S).

⁽²⁾ Connect one lead of the ohmmeter to line 10 (Deutsch Pin r).

⁽³⁾ All resistances are specified to $\pm 25\%$.

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Table II (continued)

			RESISTANCE				
	,	Deutsch	Line to Ca	se Grnd	Line to Sig	gnal Grnd	
No. Line	P65B	Specified	Measured	Specified	Measured	Remarks	
Г <u>1</u> 9	Switchable P.S. Volt	L	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		30K		
20	Channeltron PS #1 volt	K			7.5K		
21	Channeltron PS #2 volt	J			7.0K		
22	DC-DC Converter volt	d	; i		300 冗		.
23	Temperature #1	c	- - - -		5.7K		· •
24	Temperature #2	H	•		5.7K		i ag
25	Spare	P			1		
26	Operating & Heater Pwr	b					
27		G					! -
28		n	Copper of the Co		And the second s	Aconomic approximation of the contract of the	
29		a					ļ
30	Power Return Line	F			1	- color reason National Special Color Colo	•
31		m				the Contract of the Contract o	
32		k				and the second s	
_33	Methodological Sections (Section 1) (Section 1) (Section 2) (Secti	Z					
34	Survival Heater Power	E			1	I ANNOTHER PROPERTY OF THE PRO	
35		Y			1	Chipman Washington Japanese Salah James Amerika	
36		X					
37		D					· ·
		- Comments					

Not Connected - A B C W

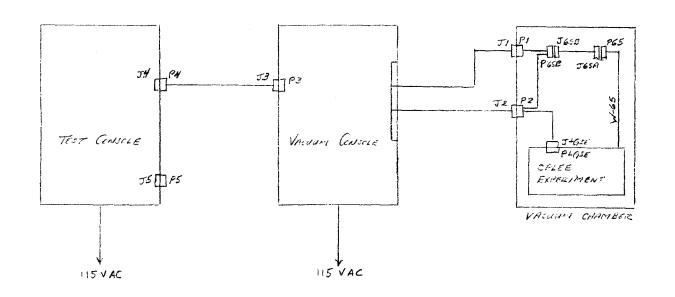


FIGURE 1 CPLEE FREEIMENT HND ETS CABLING DIAGRAM

CONNECTOR	VENDOR	PART No.
PGS	Ex A	23321/2-3
J65A	Bx A	2332118-3
765B	CANNEN	MDB1-513
P 65B	CANNEN	MDEI-SIP
PGSE	CANNON	MD31-9P
JASE	CAMMIEN	MOBI - 95
121	VARIAN	954-5013
ゴノ	CANNON	MS-31068-28-163
PZ	VARIAN	954-5013
T2	CANNON	MS-3106B-28-16S
P3	AMPHENOL	MS-3102A-36-7P
5 3	"	M5-3106A-36-75
P4	"	MS-3106 A-26-7P
J4	"	MS-3102 A-36-75
175	Deutsch	DTK-06-20-41PX-059
τ s	"	DTK-01-20-415X-059

REFERENCE BX H DRAWING 233 1505
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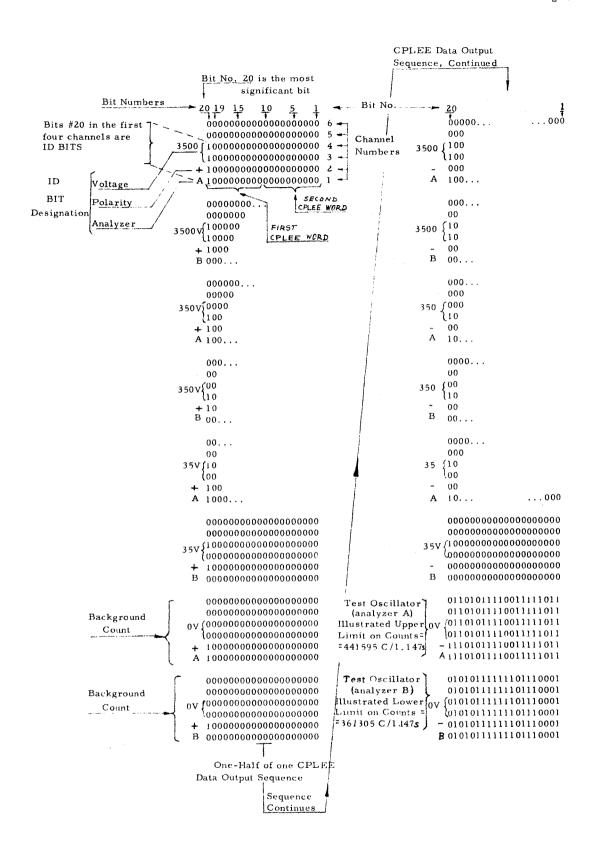


FIGURE 2 - One CPLEE Data Output Sequence

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5.6 Ambient Pressure Functional Tests

CAUTION: Make sure that the jumper cable from TP-8 to TP-7 on the Command Indicator Panel is disconnected. This is necessary to make the Switchable Power Supply and Channeltron Power Supplies inoperative during ambient pressure tests so that they are not damaged due to arcing.

- On the Main Power Panel turn the top switch to "OP & HTR PWR Line" position, and turn the bottom switch to "EXPERIMENT ON" position.

 Read the current on the "+28.5 volts current" meter on the Command Select and High Voltage panel, and record values in Table III.
- 5.6.2 Measure the voltage ripple on the +28.5 volts power line by setting the scope selector switch A to position 26 and using the oscilloscope. Record the value in Table III.

5.6.3 CPLEE Digital Data Output Check

- 1. Depress the "RESET LOGIC" switch on the COMMAND SELECT AND HIGH VOLTAGE panel.
- 2. Turn the Ultraviolet lamp on the Monroe printer "ON". Set the speed on Slow Mode.
- 3. Start the printer and let it operate until about 12 feet of tape is printed.
- 4. Stop the printer and compare at least six complete cycles (96 lines) with the format shown in Figure 2, and record in Table III.
- 5. Figure 2 shows the correct sequence, and the proper digital count for the test oscillator sequence. The test oscillator count is shown in Figure 2 for both specification limits (361, 305 and 441, 595 counts for a 1.147 second period.) Any count between these limits is acceptable. The first three digits right of the ID bits (i.e., bits number 19, 18, and 17) can be used for a quick check as shown below:

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Bit Number

20	19	18	17	16 Oscillator Frequency
ID	1	1	1	0 Too high
ID	0	1	1	l Too low
ID	1	1	0	May be correct - see Fig. 2 to check
ID	1	0	1	May be correct - see Fig. 2 to check

5.6.4 Command Response

5.6.4.1 Thermal Control By-Pass On

- 1. Read the +28.5 volts current meter reading and record in Table III.
- 2. Set CommandSelector Switch on COMMAND INDICATOR panel to position 11 (Thermal Control By-Pass On)
- 3. Press the COMMAND INITIATE button.
- 4. Check that the THERMAL CONTROL BYPASS "ON" indicator light is lighted.
- 5. Check that the THERMAL CONTROL BYPASS "OFF" is not lighted.
- 6. Read the experiment current as indicated on the +28.V current meter and record in Table III.

CAUTION: The experiment must not be left in this condition for more than a few mirrates as it may overheat and be damaged.

Table III - Experiment Functional Tests

Ambient Pressure

Paragraph		Test			67
Number	Test Parameter	Limit	Measured Value	Remarks	
5.6.1	Experiment Current (Heater Off)	80 <u>+</u> 5 ma			Fost
5.6.2	Noise & Ripple	≼ 100 mv p-p	Correct Incorrect	1	Test Procedure for CPLE Engineering Model
5.6.3	Digital Data Sequence	Fig. 2	O O		ring
5.6.3	Test Oscillator Frequency	Fig. 2			Mod fo
5.6.4.1	Experiment Current, Heater Off	80 <u>+</u> 5 ma			el CI
5.6.4.1	Command Indicator Lights Thermal Control Bypass On Automatic Voltage Sequence On Channeltron P.S. Voltage Increase Off	ON ON			PLEE PAGE 11
	All other indicator lights	OFF			
5.6.4.1	Experiment Current (Heater On)	142 <u>+</u> 5 ma			PAGE
5.6.4.2	Experiment Current (Heater Off)	80 <u>+</u> 5 ma			E I
5.6.4.2	Command Indicator Lights Thermal Control Bypass Off	ON			11 of
	Automatic Voltage Sequence On Channeltron P.S. Voltage Increase Off	ON		- -	31
	All other indicators Off	OFF			
					7 A 6 18

Table III - Experiment Functional Tests

Ambient Pressure (continued)

Paragraph Number	Test Parameter	Test Limit	Measured Value	Remarks	
5.6.4.3	Dust Cover Removal Signal + 0.2V Amplitude Duration	_0-0-0.1 18 + 2 m	I The state of the		Test Pro
5.6.4.3	Command Indicator Lights Thermal Control Bypass Off Automatic Voltage Sequence On Channeltron P.S. Voltage Increase Off Dust Cover Removal	ON ON ON			Test Procedure for CPLE Engineering Model
	All other indicators	OFF			
5.6.4.4	Digital Data Sequence, AUTO SEQ.OFF	Fig. 2	ID Bit Check Correct Incorrect		Ħ > RB 0
	Command Indicator Lights Thermal Control Bypass Off Automatic Voltage Sequence Off Channeltron P.S. Voltage Increase Off	ON ON			E PAGE 12
	All other indicators	OFF			TM-
5.6.4.5	Digital Data Sequence, STEP VOLT, LEVE	Fig. 2	ID Bit Check 3,4 3,4 3,4 3,4		
			3,4 3,4 3,4		0F 31
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Paragraph		Test			8/67
Number	Test Parameter	Limit	Measured Value	Remarks	4
5.6.4.5	Command Indicator Lights		Light Check		
5.0.4.5	Thermal Control Bypass Off	ON			四
	Automatic Voltage Sequence Off	ON			90
	Channeltron P.S. Voltage Increase Off	ON			e :
	All other indicators	OFF			Engineering Mo
			Correct Incorrect		60
5.6.4.6	Digital Data Sequence, AUTO SEQ. ON	Fig. 2			Model
	Command Indicator Lights				= :
	Thermal Control Bypass On	ON			
	Automatic Voltage Sequence On	ON	The state of the s	_	
	Channeltron P.S. Voltage Increase Off	ON		-	į
	All other indicators	OFF		-	
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5.6.4.2 Thermal Control By-Pass OFF

- Set the Command Selector Switch to Position 12 (Thermal Control Bypass OFF)
- 2. Press Command initiate button.
- Read the experiment current on the +28.5 V current meter and record in Table III.
- Check that the Thermal Control Bypass "OFF" indicator light is lighted.
- Check that the Thermal Control Bypass "ON" indicator light is not lighted.

5.6.4.3 Dust Cover Removal

- Set A selector on the SCOPE TEST panel to position 35.
- Set Command Select switch on the COMMAND SELECT AND HIGH VOLTAGE panel to Position 13 (Dust Cover Removal).
- First push in and hold the Dust Cover interlock button, then press the Command Initiate button.
- 4. Observe dust cover removal signal on oscillosope.
- Record dust cover removal pulse characteristics 5. in Table III.

5.6.4.4 Automatic Voltage Level Sequence OFF

- l. Set Command Selector Switch to position 16 (Automatic Voltage Level Sequence OFF)
- 2. Press COMMAND INITIATE button.
- 3. Check that Automatic Voltage Level Sequence "ON" indicator light is not lighted.

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5.6.4.4 (continued)

- 4. Check that Automatic Voltage Level Sequence "OFF" indicator light is lighted.
- 5. Turn on Ultraviolet lamp on Monroe printer.
- 6. Start printer and let it operate until 18 lines are printed. Check ID bits to make certain that automatic sequence has stopped. Record results in Table III. (Note that Analyzer or 2 ID bit continues to switch every 1.2 seconds (EFMP)).

5.6.4.5 Step Voltage Level

- 1. Set Command Selector Switch to position 15 (Step Voltage Level).
- 2. Press COMMAND INITIATE button.
- 3. Observe that Automatic Voltage Level Sequence "OFF" indicator light and thermal control bypass "OFF" indicator lights are both lighted.
- 4. Start printer and let it operate until 18 lines are printed. Check the ID bits to make certain that deflection voltage sequence has advanced one step.
- 5. Repeat steps 2, 3, and 4 until all eight deflection voltage operating points have been checked.
- 6. Record results in Table III.

5.6.4.6 Automatic Voltage Level Sequence "ON"

- 1. Set Command Selector Switch to position 14 (Automatic Voltage Level Sequence "ON")
- 2. Press COMMAND INITIATE button.
- 3. Observe that Automatic Voltage Level Sequence ''ON'' indicator light is lighted. Record indicator reading in Table III.

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5.6.4.6 (continued)

- 4. Observe that Thermal Control Bypass "OFF" indicator is lighted and that all other command indicators are not lighted.
- 5. Start the printer and let it operate until 40 lines are printed. Check the digital data output with Figure 2 and print-out from 5.6.3 to verify proper operation. Record results in Table III.

5.6.4.7 Channeltron P.S. Voltage Increase - "ON" & OFF"

These two commands cannot be checked on the engineering model.

5.6.5 Analog Housekeeping Data Check

- 1. Turn the Voltage Selector Switch on the ANALOG TEST panel through positions HK-1 to HK-6 and read the values for each position on the panel meter.
- 2. Record the value for each reading in Table IV.

5.6.6 Check of GSE Test Points

- 1. Turn the A selector on the SCOPE PANEL through switch position 30 to 37 and measure the signals on the GSE connector with the oscilloscope.
- 2. Record the value for each GSE signal in Table V.

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Table IV - Analog Housekeeping Data

Ambient Pressure Condition

Voltage Selector		Analog T/M		
Switch	Title	Nominal	Tolerance	Measured
HK-l	Switchable P.S.	•	The state of the s	
4 128	+3500	0 V	+ 0.2V	Commence of commencements are presented as a page
***	350	0V	+ 0.2V	
*	35	0 V	+ 0.2V	المعاونة والمراجعة والمعاونة والمعاو
ż.	+0	ov	+ 0.1V	For any to the artifement comparison, buildings through
System 1	-3500	0 V	+ 0.2V	
5	-350	0V	+ 0.2V	
, and the same of	-35	0V	+ 0.2V	
	-0	0 V	$\frac{1}{2}$ 0.1V	N. Let the completely all the contract of the party of the contract of the con
HK-2	Channeltron P.S.#1	0V	+ 0.2V	and the second desired the secon
HK-3	Channeltron P.S.#2	ov	+ 0.2 V	
			•	
HK-4	DC-DC Converter	3.10V	+ 0.2V	
HK-5	Temp. of Logic Module Standoff	1.78V (=25°C)	Note 1	The state of the s
IK-6	Temp of Low Voltage P.S.	1.70V(=24°C)	Note 1	

NOTE: Maximum safe operating temperature in vacuum is 45°C. See attached curves for conversion data.



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Table V - GSE Connector Signals

Ambient Pressure Condition

CPLEE GSE Connector	Position of ETS Selector	SIGNAI	L	
(9 Pins)	Switch "A"	Specified	Measured	Remarks
TPl Test Osc. Output	30	Freq.: 315KC to 385KC		
TP2 VFO Input	31	See remarks		Should be zero unless external VFO signal is applied.
TP3 Low Voltage 34V	32	+34VDC (+ 1.0)		
TP4 Power 29V	2	+29VDC (+ 0.5)		
TP5 Supply 6V	34	+ 8VDC $(+ 1.0)$		-
TP6 Dust Cover Remov Signal to Squibs	al 35	3.10 (+ 0.2) VDC		See Note 1
TP7 Channeltron P.S. Low Voltage	36	28.8 (± 0.5) vol	ts DC	
TP8 Channeltron P.S. Return	37	0V		
				The state of the s
				Samuel Committee

This point measures the voltage applied to the collector of a transistor. Note 1 When the dust cover removal command is transmitted, the transistor is turned "ON" and this voltage drops to about +0.5 volts for 20 millisecond.



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5.7 Functional Tests to be Performed Under Vacuum

5.7.1 Vacuum Operation

Prior to starting this portion of the test procedure, CPLEE must be installed in the ETS vacuum chamber and connected in accordance with the requirements of paragraph 5.4.

CAUTION: Make certain that experiment power is turned "OFF" prior to starting pumping operation on the vacuum chamber.

When the vacuum chamber pressure is 5×10^{-5} torr, or less, electrical power may be applied to the experiment.

5.7.2 Experiment Turn-On

- 1. Make certain that the operating mode switch on the MAIN POWER power panel is in the "OP & HTR POWER LINE" position.
- 2. Make certain that the Experiment Power Switch is in the "OFF" position.
- 3. Turn 115 volts AC power switch to "ON" position.
- 4. Turn experiment power switch to "ON" position.
- 5. Read +28V current meter to measure current to experiment. Record reading in Table VIII.
- 6. Connect jumper from TP-8 to TP-7 on COMMAND INDICATOR PANEL.
- 7. Read 28.5V current. Record reading in Table VIII.
- 8. Check to see that "ThermalControl Bypass Off,"
 "Automatic Voltage Level Sequence On" and
 "Channeltron P.S. Voltage Increase Off" indicator
 lights are lighted. All other command indicator
 lights must not be lighted.

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Table VI - Analog Housekeeping Data

Vacuum Condition

Voltage Selector		Analog T/M		
Switch	Title	Nominal	Tolerance	Measured
HK-l	Switchable P.S.	•		
	+3500	3.30V	+ 0.2V	
ļ	350	4.30V	+ 0.2V	
1	35	4.15V	+ 0.2V	
}	+0	0.25V	+ 0.1V	
**	-3500	4.05	+ 0.2V	
\$	-350	4.30V	+ 0.2V	
¥-	-35	4.15V	+ 0.2V	
1 2 3 4 4	-0	0.25V	$\frac{1}{2}$ 0.1V	
HK-2	Channeltron P.S.#1	3.75V	+ 0.2V	
HK-3	Channeltron P.S.#2	3.38V (no load)	+ 0.2V	
HK-4	DC-DC Converter	3.10V	+ 0.2V	
HK-5	Temp. of Logic Module	1.78V'(=25°C)	Note 1	
HK-6	Temp of Low Voltage P.S.	1.70V(=24°C)	Note 1	

NOTE: Maximum safe operating temperature in vacuum is 45°C. See attached curves for conversion data.

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9. Check operating status of experiment (and to confirm command indicator lights) by

- a. Check switchable P.S. analog voltage on HK-1 and verify switching sequence.
- b. Check Channeltron P.S. #1 voltage on HK-2
- c. Check Channeltron P.S. #2 voltage on HK-3

5.7.3 Analog Housekeeping Data Check

- 1. Turn the Voltage Selector Switch on the ANALOG TEST panel through positions HK-1 to HK-6 and read the values for each position on the panel meter.
- 2. Record the value for each reading in Table VI.

5.7.4 Check of GSE Test Points

- 1. Turn the A selector on the SCOPE PANEL through switch position 30 to 37 and measure the signals on the GSE connector with the oscilloscope.
- 2. Record the value for each GSE signal in Table VII.

5.7.5 Digital Data Output

- 1. Depress the "RESET LOGIC" switch on the COMMAND SELECT AND HIGH VOLTAGE panel.
- 2. Turn the Ultraviolet lamp on the Monroe printer "ON".
- 3. Start the printer and let it operate until about 12 feet of tape is printed
- 4. Stop the printer and compare at least six complete cycles (96 lines) with the format shown in Figure 2, and record in Table VIII.

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Table VII - GSE Connector Signals

Vacuum Condition

CPL GSE	EE Connector		Position of ETS Selector	SIGNAI		
(9 P	ins)		Switch "A"	Specified	Measured	Remarks
TPI	Test Osc. Out	put	30	Freq.: 315KC to 385KC		
	VFO Input	To the second se	31	See remarks		Should be zero unless external VFO signal is applied.
	Low Voltage	,	32	+34VDC (+ 1.0)		_
-	Power	29V	33	+29VDC (+ 0.5)	i	
TP5	Supply	6 v	34	+ 8VDC (+ 1.0)		
TP6	Dust Cover R Signal to Squi	,	al 35 13	3.10 (<u>+</u> 0.2) VDC		See Note 1
r P7	Channeltron F Low Voltage	P.S.	36	28.8 (<u>+</u> 0.5) vol	ts DC	
ŗP8	Channeltron F	o.s.	37	0 VDC		When TP-7 is jumpered to
						TP-8 on Command Indicator Panel, TP-8 will read 28.8 (+ 0.5) volts.

Note 1 This point measures the voltage applied to the collector of a transistor.

When the dust cover removal command is transmitted, the transistor is turned "ON" and this voltage drops to about +0.2 volts for 20 milliseconds.

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5. Figure 2 shows the correct sequence, and the proper digital count for the test oscillator sequence. The test oscillator count is shown in Figure 2 for both specification limits (361, 305 and 441, 595 counts for a 1.147 second period.) Any count between these limits is acceptable.

5.7.6 Response to Commands

5.7.6.1 Thermal Control By-Pass On

- 1. Read the +28.5 volts current meter reading and record in Table VIII
- 2. Set Command Selector Switch on COMMAND INDICATOR Panel to position 11 (Thermal Control By-Pass On).
- 3. Press the COMMAND INITIATE button.
- 4. Check that the THERMAL CONTROL BYPASS ''ON'' indicator light is lighted.
- 5. Check that the THERMAL CONTROL BYPASS ''OFF'' is not lighted.
- 6. Read the experiment current as indicated on the +28.V current meter and record in Table VIII

CAUTION: The experiment must not be left in this condition as it may overheat and be damaged.

5.7.6.2 Thermal Control By-Pass OFF

- 1. Set the Command Selector Switch to Position 12 (Thermal Control Bypass OFF).
- 2. Press Command initiate button.
- 3. Read the experiment current on the +28.5V current meter and record in Table VIII

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- 4. Check that the Thermal Control Bypass "OFF" indicator light is lighted.
- 5. Check that the Thermal Control Bypass "ON" indicator light is not lighted.

5.7.6.3 Dust Cover Removal

- 1. Set A selector on the SCOPE TEST panel to position 35.
- 2. Set Command Select switch on the COMMAND SELECT AND HIGH VOLTAGE panel to Position 13 (Dust Cover Removal).
- 3. Simultaneously press the Command Initiate and Dust Cover Interlock Switches.
- 4. Observe dust cover removal command on oscilloscope.
- 5. Record dust cover removal pulse characteristics in Table VIII

5.7.6.4 Automatic Voltage Level Sequence OFF

- 1. Set Command Selector Switch to position 16 (Automatic Voltage Level Sequence OFF).
- 2. Press COMMAND INITIATE button.
- 3. Check that Automatic Voltage Level Sequence "ON" indicator light is not lighted.
- 4. Check that Automatic Voltage Level Sequence "OFF" indicator light is lighted.
- 5. Turn on Ultraviolet lamp on Monroe printer.
- 6. Start printer and let it operate until 18 lines are printed. Check ID bits to make certain that automatic sequence has stopped.

Table VIII - Experiment Functional Tests

Vacuum Operation

Paragraph		Test			3
Number	Test Parameter	Limit	Measured Value	Remarks	
5 7 2 a	Experiment Current (Heater Off), HV supplies	OFF OG ±	. 5ma a	•	Engi
	Experiment Current (Heater Off, HV P.S. On)		5ma b.	_	82 7
	Noise & Ripple	/ · ·	C.		
d.	Noise & Ripple		d.		1 3 8
5.7.5	Digital Data Sequence	Fig. 2	Correct Incorrect	_	Engineering M
5.7.5	Test Oscillator Frequency	Fig. 2	•		Model
5.7.6.1	Experiment Current, Heater Off	98 <u>+</u> 5 m	a.		2 G
5.7.6.1	Command Indicator Lights				
	Thermal Control Bypass On	ON			t.
	Automatic Voltage Sequence On	ON			1
	Channeltron P.S. Voltage Increase Off	ON			
	All other indicator lights	OFF			į
5.7.6.1	Experiment Current (Heater On)	160 <u>+</u> 5 ma	a		PAGE
5.7.6.2	Experiment Current (Heater Off)	98 <u>+</u> 5 ma	t		2
5.7.6.2	Command Indicator Lights				5
	Thermal Control Bypass Off	ON			1
	Automatic Voltage Sequence On	ON			유
	Channeltron P.S. Voltage Increase Off	ON			
	All other indicators Off	OFF			31

Table VIII (continued)

Paragraph	Mark Danier Ann	Test Limit	Nanau Natus		
Number	Test Parameter	Limit	Measured Value	Remarks	
5.7.6.3	Dust Cover Removal Signal Amplitude Duration		$-3.10 \pm 0.2V$ $-0 \Rightarrow 0.2 V$		Engineering
	Duration	18 + 2 m	nsec		9
5.7.6.3	Command Indicator Lights				2 a
	Thermal Control Bypass Off	ON			Z
	Automatic Voltage Sequence On	ON			Model
	Channeltron P.S. Voltage Increase Off	ON			2
	Dust Cover Removal	ON			
	All other indicators	OFF			
5.7.6.4	Digital Data Sequence, AUTO SEQ.OFF	Fig. 2	ID Bit Check Correct Incorrect		
	Command Indicator Lights				
•	Thermal Control Bypass Off	ON			
	Automatic Voltage Sequence Off	ON			
	Channeltron P.S. Voltage Increase Off	ON			PAGE
	All other indicators	OFF			١.
			ID Bit Check		1
5.7.6.5	Digital Data Sequence, STEP VOLT. LEVE	L Fig.2	3,4 3,4 3,4 3,	4	- 11
					S S
			3,4 3,4 3,4 3,	, 4	7 0
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Table VIII continued

Test Parameter	Limit	3		_
		Measured		Remarks
		Light Che	ck	
Command Indicator Lights		•		
Thermal Control Bypass Off	ON			
Automatic Voltage Sequence Off	ON			
Channeltron P.S. Voltage Increase Off	ON			
All other indicators	OFF			
		Correct	Incorrect	
Digital Data Sequence, AUTO SEQ. ON	Fig. 2			
Command Indicator Lights				
-	ON			
• -	ON			
Channeltron P.S. Voltage Increase Off	ON			
All other indicators	OFF			
Turn-On Transient	•			
Auto Volt. Sequence	ON			
Channeltron P.S. Increase Thermal Control Bypass	OFF OFF			
Noise & Ripple on Power Lines	≤100 m V p	- p		
	Thermal Control Bypass Off Automatic Voltage Sequence Off Channeltron P.S. Voltage Increase Off All other indicators Digital Data Sequence, AUTO SEQ. ON Command Indicator Lights Thermal Control Bypass On Automatic Voltage Sequence On Channeltron P.S. Voltage Increase Off All other indicators Turn-On Transient Auto Volt. Sequence Channeltron P.S. Increase Thermal Control Bypass	Thermal Control Bypass Off Automatic Voltage Sequence Off Channeltron P.S. Voltage Increase Off ON All other indicators OFF Digital Data Sequence, AUTO SEQ. ON Fig. 2 Command Indicator Lights Thermal Control Bypass On Automatic Voltage Sequence On Channeltron P.S. Voltage Increase Off All other indicators OFF Turn-On Transient Auto Volt. Sequence Channeltron P.S. Increase Channeltron P.S. Increase Thermal Control Bypass OFF	Thermal Control Bypass Off Automatic Voltage Sequence Off Channeitron P.S. Voltage Increase Off ON All other indicators OFF Correct Digital Data Sequence, AUTO SEQ. ON Fig. 2 Command Indicator Lights Thermal Control Bypass On Automatic Voltage Sequence On Channeltron P.S. Voltage Increase Off ON All other indicators OFF Turn-On Transient Auto Volt. Sequence Channeltron P.S. Increase Thermal Control Bypass OFF Thermal Control Bypass OFF	Thermal Control Bypass Off Automatic Voltage Sequence Off Channeltron P.S. Voltage Increase Off ON All other indicators OFF Correct Incorrect Digital Data Sequence, AUTO SEQ. ON Fig. 2 Command Indicator Lights Thermal Control Bypass On Automatic Voltage Sequence On Channeltron P.S. Voltage Increase Off ON All other indicators OFF Turn-On Transient Auto Volt. Sequence Channeltron P.S. Increase Thermal Control Bypass OFF



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5.7.6.5 Step Voltage Level

- l. Set Command Selector Switch to position 15 (Step Voltage Level).
- 2. Press COMMAND INITIATE button.
- 3. Observe that Automatic Voltage Level Sequence "OFF" indicator light and thermal control bypass "OFF" indicator lights are both lighted.
- 4. Start printer and let it operate until 18 lines are printed. Check the ID bits to make certain that deflection voltage sequence has advanced one step.
- 5. Repeat steps 2, 3, and 4 until all eight deflection voltage operating points have been checked.
- 6. Record proper operation in Table VIII

5.7.6.6 Automatic Voltage Level Sequence "ON"

- 1. Set Command Selector Switch to position 14 (Automatic Voltage Level Sequence "ON")
- 2. Press COMMAND INITIATE button.
- 3. Observe the Automatic Voltage Level Sequence "ON" indicator light is lighted. Record indicator reading in Table III.
- 4. Observe that Thermal Control Bypass 'OFF' indicator is lighted and that all other command indicators are not lighted.
- 5. Start the printer and lit it operate until 40 lines are printed. Check the digital data output with Figure 2 and printout from 5.6.3 to verify proper operation. Record results in Table VIII

5.7.6.7 Channeltron P.S. Voltage Increase - "ON" & "OFF"

These two commands cannot be checked on the engineering model.

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5.7.7 Turn-On Transient

- 1. Turn experiment power switch to OFF position.
- 2. Turn ETS main power switch to OFF position.
- 3. Install a precision, two ohm, non-inductive resistor in the ground return cable of the +28.5 volt prime power circuit in the ETS,
- 4. Connect a Tektronix 545, or equivalent, oscilloscope across the two ohm resistor.
- 5. Adjust the oscilloscope for single sweep, internal positive slope trigger, 200 millivolts per centimeter vertical gain (with a X1 probe) and 5 milliseconds per centimeter sweep speed.
 - . TraceTS mai rower switch to "ON" position.
- 7. Turn on power to experiment, and make certain that experiment is operating in the following mode:
 - (a) Automatic Voltage Level Sequence ON
 - (b) Channeltron P.S. Voltage Increase OFF
- (c) Thermal Control Bypass OFF
 by checking indicator lights on COMMAND INDICATOR
 panel, by checking current drain +28.5 volts supply and by
 observing analog voltages on HK-1, HK-2 and HK-3.
 Record results in Table VIII.
- 8. Turn experiment "OFF" and "ON" at least three times and photograph the turn-on transient with a Polaroid Oscilloscope Camera.

5.7.8 Noise and Ripple on Prime Power Lines

Use the same test set-up required for paragraph 5.7.7 and measure the noise and ripple on the +28.5 volts prime power lines. Record the results in Table VIII. Photograph any noise and ripple with the Polaroid oscilloscope camera.

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5.7.9 Power Profile

- 1. Turn experiment power switch to OFF position.
- 2. Turn ETS main power switch to OFF position.
- 3. Connect one channel of a Sanborn Model 7708, or equivalent, Recorder across the two ohm resistor in the ground return cable of +28.5 volts dc prime power for the experiment. Set recorder sensitivity to 50 mv/div.
- 4. Connect a second channel of the Sanborn Recorder to GND and HK-1 Terminal on Main Power panel of the ETS. Set recorder gain to 10 millivolts per millimeter.
- 5. Turn on main power to ETS.
- 6. Turn experiment power switch to ON position check experiment current.
- 7. Set recorder speed to 10 millimeter per second, and turn recorder "ON"
- 8. Make certain that experiment is operating in the following mode:
 - (a) Automatic Voltage Level Sequence ON
 - (b) Channeltron P.S. Voltage Increase OFF
 - (c) Thermal Control Bypass OFF
- 9. Let experiment and recorder operate for at least 20 seconds to record one complete CPLEE cycle.
- 10. Transmit Thermal Control Bypass ON Command Let experiment and recorder operate for at least 20 seconds.



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11. Transmit Dust Cover Removal Command Let experiment and recorder operate at least 10 seconds.