This ATM documents the Parts Application Analysis (PAA) performed on the Data Transmitter and its Telemetry circuitry. Since the two redundant Transmitters used in the A2 ALSEP are identical, the data presented in the attached PAA worksheets refer to one Transmitter only.

The PAA data show that all Transmitter electronic parts are electrically stressed well within the derating criteria established by Reliability in ATM 241. In fact, 80% of all parts are stressed less than 10% of their maximum rating, 16% of parts are stressed less than 20% and 3% of these parts are stressed less than 30%.

B The Parts Application Analysis (PAA) has been updated to reflect the modifications to the Data Transmitter circuit since the original release of this ATM. The current analysis reflects the circuit configuration shown in Bendix drawing 2344601, Revision G (with ECN 2344601 G2).

Based on the circuit configuration, the Transmitter has a "parts count" reliability prediction of 0.97492.

Revised by T. W. Fox
T. W. Fox
ALSEP Reliability Department

Approved by P. McGinnis
P. McGinnis
ALSEP Reliability Department

PARTS APPLICATION ANALYSIS

CAPACITORS

(Capacitors)

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUBASSEMBLY: Oscillator Buffer Multiplier
DATE: Jan. 15, 1970
SCHEMATIC NO: 2344656A
Component DWG: 2344655B

1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	4 Capacitance Value pfd	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	Operating Voltage Peak AC	8 Voltage Ratio, Operating/Rated %	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11/12 Circuit Function or Application	13 Basic Failure Rate (λ/1000 HRS) at __°C	14 Source (See Below)	15 Special Environment (Define)	16 Failure Rate Multiplier (Level)	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (λ/1000 HRS)
C1	ECY15102J5	Corning	1000	± 5	500	29V		10%		50			A	Lunar	P			.00004
C2	ECY10151J5	Corning	150	± 5	500	5		10%		50			A		P			.00004
C3	ECY10390J5	Corning	39	± 5	500	16		<10		50			A		P			.00004
C4	ECY10151J5	Corning	150	± 5	500	5		<10		50			A		P			.00004
C5	ECY10200J5	Corning	20	± 5	500	4		<10		50			A		P			.00004
C6	ECY15102J5	Corning	1000	± 5	500	16		<10		50			A		P			.00004
C7	JMC3957-TC	Johanson	0.8-10	---	250	12		<10		50			B		P			.00030
C8	ECY10181J3	Corning	180	± 5	300	<1		<10		50			A		P			.00004
C9	JMC3955-TC	Johanson	0.8-10	---	250	29				50			B		P			.00030
C10	ECY10470F5	Corning	47	± 1	500	9		<10		50			A		P			.00004
C11	ECY10680J5	Corning	68	± 5	500	9		<10		50			A		P			.00004
C12	CKR06BX104KR	Jaco Elect	0.1mfd	±10	100	29		29		50			A		R			.00005
C13	ECY10120J5	Corning	12	± 5	500	12		<10		50			A		P			.00004
C14	ECY10470F5	Corning	47	± 1	500	4		12		50			A		P			.00004
C15	JMC3955-TC	Johanson	0.8-10	---	250	4		<10		50			B		P			.00030
C16	ECY10470F5	Corning	47	± 1	500	29		12		50			A		P			.00004
C17	ECY10220J5	Corning	22	± 5	500	4		<10		50			A		P			.00004
C18	JMC3957-TC	Johanson	0.8-10	---	250	1		<10		50			B		P			.00030
C19	ECY104R3D5	Corning	4.3	±0.5	500	8		<10		50			A		P			.00004

pfd

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B MIL-HDBK-217A
C ______ D ______

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .00181 λ/1000 HRS

XMTR λ = $.30750 \times 10^{-5}$

PARTS APPLICATION ANALYSIS

CAPACITORS

(Capacitors)

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUBASSEMBLY: Oscillator - Buffer - Multiplier
DATE: 1-15-70
SCHEMATIC NO: 2344656 A
Component DWG: 2344655B

1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	4 Capacitance Value pfd	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	Operating Voltage Peak AC	8 Voltage Ratio, Operating/Rated - %	10 Maximum Duty Cycle	11 Bulk Air Temperature (°C)	12 Circuit Function or Application	13 Basic Failure Rate (%/1000 HRS)	Source	14	15 Special Environment (Define)	Level	16 Failure Rate Multiplier	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 HRS)
C20	ECY10470F5	Corning	47	± 1	500	16V		<10%		50			A		Lunar	P				.00004
C21	ECY10820J5	Corning	82	± 5	500	8		<10%		50			A			P				.00004
C22	ECY10820J5	Corning	82	± 5	500	7		<10%		50			A			P				.00004
C23	JMC3955-TC	Johanson	0.8-10	---	250	15		<10%		50			B			P				.00030
C24	ECY10120J5	Corning	12	± 5	500	6		<10%		50			A			P				.00004
C25	JMC3955-TC	Johanson	0.8-10	---	250	16		<10%		50			B			P				.00030
C26	ECY10820J5	Corning	82	± 5	500	16		<10%		50			A			P				.00004
C27	CKR06BX104KR	JacoElect.	0.1mfd	±10	100	29		29%		50			A			R				.00005

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B MIL-HDBK-217A
C ______ D ______

21 CALCULATED MTBF ________ HRS

22 TOTAL FAILURE RATE .00085 % /1000 HRS

BS-321A

(Resistors)

PARTS APPLICATION ANALYSIS

Rev. B

RESISTORS

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUB ASSEMBLY: Oscillator - Buffer - Multiplier
DATE: 6-15-70
SCHEMATIC NO: 2344656A
Component DWG: 2344655B

1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	4 Resistance Value (Ohms)	5 Tolerance (%)	6 Power Rating (Watts)	7 Maximum Operating Power (Watts) x10⁻³	8 Power Ratio Operating/Rated %	9 Maximum Duty Cycle	10 Bulk Air Temperature °C	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) At °C	13 Source (See Below)	For Use of Reliability Dept.	14 Special Environments (Define)	15 Failure Rate Multiplier Level	16 Final Failure Rate (%/1000 Hrs)	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 Hrs)
R1	RCR07G102JS	1	1K		.25	1	< 10%		50			A		Lunar	S			.000167
R2	RCR07G472JS		4.7K				12											.000167
R3	RCR07G102JS		1K			1	< 10											.000167
R4	RCR07G751JS		750			27	11											.000167
R5	RCR07G222JS		2.2K			1	< 10											.000167
R6	RCR07G302JS		3K			27	11											.000167
R7	RCR07G752JS		7.5K			23	< 10											.000167
R8	RCR07G152JS		1.5K			1	< 10											.000167
R9	RCR07G472JS		4.7K			14	< 10											.000167
R10	RCR07G120JS		12			1	< 10											.000167
R11	RCR07G820JS		82			1	< 10											.000167
R12	RCR07G120JS		12			1	< 10											.000167
R13	RCR07G472JS		4.7K			14	< 10											.000167
R14	RCR07G150JS		15			30	12											.000167
R15	RCR07G152JS		1.5K			38	15											.000167
R16	RCR07G680JS		68			47	19											.000167
RT1	2340316-1	BxA	10K		300	< 10	< 10					B						.00300

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A. ATM 605 B. MIL-HDBK-217A
C. ________ D. ________

20 CALCULATED MTBF ________ HRS

21 TOTAL FAILURE RATE .02972 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

(Semiconductors)

PROJECT: A2 ALSEP

DATE: 1-15-70

ASSEMBLY: Data Transmitter

SUB ASSEMBLY: Oscillator - Buffer - Multiplier

SCHEMATIC NO: 2344656A

Component DWG: 2344655B

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: RATED JUNCTION T_J (5)	MAX. TEMP °C: ACTUAL CASE HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT (7)	RATED AT 25°C CASE (8)	RATED AT ACTUAL AMBIENT T_A (9)	RATED AT ACTUAL CASE T_C (10)	ACTUAL (11)	POWER RATIO: ACTUAL / RATED 25°C (Amb. or case) (12)	POWER RATIO: ACTUAL / RATED T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED (14)	V_{CB} ACTUAL (15)	V_{CEO} RATED (16)	V_{CE} ACTUAL (17)	DIODE PIV: RATED (18)	DIODE PIV: ACTUAL (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE MULTIPLIER (24)	FINAL RATE (%/1000 HRS) (25)	TOTAL COUNT PER TYPE (26)	TOTAL FAILURE RATE (%/1000 HRS) (27)
CR1	SIN 944 B		50	175		500				24	<10%									Lunar		A	*P			.00643
CR2	SIN 751 A			175		400				10	<10%												P			.00643
CR3	2340320-1 HP 0180			200		400				4	<10%												R			.01000
Q1	2340332-1 (2N918)			200		200				104	52												P			.00195
Q2	2340332-1 (2N918)			200		200				59	30															.00195
Q3	2340332-1 (2N918)			200		200				65	33															.00195
Q4	2340332-1 (2N918)			200		200				40	20															.00195
XTAL	2340314- McCoyCrystal																					B				.00200

(33) FAILURE RATE SOURCE (See Column 23)
A ATM 605
B MIL-HDBK-217A
C
D

(34) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(35) TOTAL FAILURE RATE .03266 %/1000 HRS.

* Rel. Level

BS-321A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

PROJECT: A2 ALSEP
ASSEMBLY : Data Transmitter
SUB ASSEMBLY: Oscillator-Buffer-Multiplixer
DATE: 6-15-70
SCHEMATIC NO: 2344656A
Component DWG: 2344655B

(Inductors & Transformers)

1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	Construction: 4 Type of Case (See Below)	5 Wire Size, Primary	6 Wire Size, Secondary	7 Insulation Class	8 VA Rating	9 Inductance at Rated Cur.	10 Specified Freq	11 Miscellaneous	Temperature (°C): 12 Operating Ambient	13 Hot Spot (Surface)	14 Rise (ΔR Method)	15 Est. Actual Rise	16 Operating Temp Max.	Primary Current: 17 Actual	18 Rated	19 Primary Voltage	Secondary: 20 No. Windings	21 Winding No.	22 Voltage	Hipot Reading: 23 Windings	24 Volts	25 Basic Failure Rate (%/1000 Hrs) – ΔT ___ °C	26 Source (See Below)	27 Total Failure Rate (%/1000 Hrs)
																								Rel. Dept Use Only		
L1	2340319-19	Delevan						4.7			50														A	.002*
L2	2340319-7	"						.47																		.002
L3	2340319-38							.12																		.002
L4	2340319-7							.47																		.002
L5	2344659	BxA																								.002
L6	2340334-1							1x1[illegible]																		.002
L7	2340319-9	Delevan						.68																		.002
L8	2340319-39	"						.1																		.002
L9	2344660	BxA																								.002

28 Type of Case	29 Failure Rate Sources (For Column #26)	30	31
A. Her. Seal B. Vac. Imp. C. Encap. D. Open	A. MIL-HDBK-217A B. ______ C. ______ D. ______	Calculated MTBF ______ HRS	Total Failure Rate .0180 %/1000 HRS ckt λ = 1.08304 x 10^{-5}

B

* Reflects burn-in level P.

PARTS APPLICATION ANALYSIS

CAPACITORS

(Capacitors)

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUBASSEMBLY: Preamplifier
DATE: 1-15-70
SCHEMATIC NO: 2344681A
Component DWG: 2344680C

1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	4 Capacitance Value pf	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	Peak AC	8 Voltage Ratio, Operating/Rated %	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate λ/1000 hrs	13 Source (See Below)	14 Special Environment (Define) Level	15 Failure Rate Multiplier	16 Final Failure Rate	17 Total Capacitor Count per Type	18 Total Failure Rate (%/1000 hrs)
C1	ECY10470F5	Corning	47		500	29		< 10%		50			A	Lunar	P			.00004
C2	ECY10470F5	"	47		500	29		< 10					A					.00004
C3	ECY10470F5	"	47		500	16		< 10					A					.00004
C4	ECY10820J5	"	82		500	8		< 10					A					.00004
C5	JMC3955-TC	Johanson	.8-10		250	22		< 10					B					.00030
C6	ECY10820JS	Corning	82		500	15.5		< 10					A					.00004
C7	ECY10820JS	"	82		500	7.5		< 10					A					.00004
C8	ECY105R6J5	"	5.6		500	7		< 10					A					.00004
C9	JMC3955-TC	Johanson	.8-10		250	15.5		< 10					B					.00030
C10	ECY10470F5	Corning	47		500	29		< 10					A					.00004
C11	ECY10470F5	"	47		500	6.2		< 10					A					.00004
C12	JMC3955-TC	Johanson	.8-10		250	14		< 10					B					.00030
C13	ECY105R6J5	Corning	5.6		500	15		< 10					A					.00004

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B MIL-HDBK-217A
C ______ D ______

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .00130 % 1000 HRS

PARTS APPLICATION ANALYSIS

RESISTORS

(Resistors)

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUB ASSEMBLY: Preamplifier
DATE: 1-15-70
SCHEMATIC NO: 2344681A
Component DWG 2344680 C

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Resistance Value (Ohms)	5 Tolerance (%)	6 Power Rating (Watts)	7 Maximum Operating Power (Watts) x10-3	8 Power Ratio Operating/Rated %	9 Maximum Duty Cycle	10 Bulk Air Temperature °C	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) at °C	13 Source (See Below)	14 Special Environments (Define)	15 Failure Rate Multiplier Level	16 Final Failure Rate (%/1000 Hrs)	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 Hrs)
R1	RCR07G150JS		15	.250	Negl	<10%			50			A	Lunar	S			.000167
R2	RCR07G752JS		7.5K		23	<10											.000167
R3	RCR07G152JS		1.5K		Negl	<10											.000167
R4	RCR07G472JS		4.7K		14	<10											.000167
R5	RCR07G472JS		4.7K		14	<10											.000167
R6	RCR07G152JS		1.5K		38	<10											.000167
R7	RCR07G333JS		33K		15	<10											.000167
R8	RCR07G103JS		10K		5	<10											.000167
R9	RCR07G621JS		620		58	23											.000167
R10	RCR07G JS				Negl												

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B ______
C ______ D ______

20 CALCULATED MTBF ______ HRS

21 TOTAL FAILURE RATE .00167 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUB ASSEMBLY: Preamplifier
DATE: 1-15-70
SCHEMATIC NO: 2344681 A
Component DWG 2344680 C

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: RATED JUNCTION T_J (5)	MAX. TEMP °C: ACTUAL CASE HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT (7)	RATED AT 25°C CASE (8)	RATED AT ACTUAL AMBIENT T_A (9)	RATED AT ACTUAL CASE T_C (10)	ACTUAL (11)	POWER RATIO: ACTUAL/RATED 25°C (Amb. or case) (12)	POWER RATIO: ACTUAL/RATED T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED (14)	V_{CB} ACTUAL (15)	V_{CEO} RATED (16)	V_{CE} ACTUAL (17)	DIODE PIV: RATED (18)	DIODE PIV: ACTUAL (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE MULTIPLIER (24)	FINAL FAIL. RATE (%/1000 HRS) (25)	TOTAL COUNT PER TYPE (26)	TOTAL FAILURE RATE (%/1000 HRS) (27)
Q1	2340332-1 (2N 918)		50	200		200				64	32%									Lunar		A	* P			.00195
Q2	2340332-1 (2N 918)		↓	200		200				38	19%									Lunar		A	P			.00195
Q3	RCA 40578		↓	200		3.5W				161	< 10%									Lunar		A	P			.00390

(28) FAILURE RATE SOURCE (See Column 23)
A ATM 605
B
C
D

(29) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(30) TOTAL FAILURE RATE .00780 %/1000 HRS.

*Rel. Level

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

(Inductors & Transformers)

PROJECT: A2 ALSEP

ASSEMBLY: Data Transmitter

SUB ASSEMBLY: Preamplifier

DATE: 1-15-70

SCHEMATIC NO: 2344681 A

Component DWG: 2344680C

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	CONSTRUCTION: 4 TYPE OF CASE (SEE BELOW)	5 WIRE SIZE, PRIMARY	6 WIRE SIZE, SECONDARY	7 INSULATION CLASS	8 VA RATING μh	9 INDUCTANCE AT RATED CUR.	10 SPECIFIED FREQ	11 MISCELLANEOUS	TEMPERATURE (°C): 12 OPERATING AMBIENT	13 HOT SPOT (SURFACE)	14 RISE (ΔR METHOD)	15 EST. ACTUAL RISE	16 OPERATING TEMP MAX.	PRIMARY CURRENT: 17 ACTUAL	18 RATED	19 PRIMARY VOLTAGE	SECONDARY: 20 NO. WINDINGS	21 WINDING NO.	22 VOLTAGE	23 WINDINGS	HIPOT READING: 24 VOLTS	REL. DEPT USE ONLY: 25 BASIC FAILURE RATE (%/1000 HRS) — ΔT — °C	26 SOURCE (SEE BELOW)	27 TOTAL FAILURE RATE (%/1000 HRS)
L1	2340319-9	Delevan					.68			50															A	.002*
L2	2340319-39	''					.10																			.002
L3	2344684	BxA					5 turns																			.002
L4	2344685	BxA					4 1/2 turns																			.002
L5	2340319-11	Delevan					1.0																			.002
L6	2340319-1	Delevan					.15																			.002
L7	2340319-1	Delevan					.15																			.002

28 TYPE OF CASE
A. HER. SEAL
B. VAC. IMP.
C. ENCAP.
D. OPEN

29 FAILURE RATE SOURCES (FOR COLUMN #26)
A. ATM 605 B. ______
C. ______ D. ______

30 CALCULATED MTBF ______ HRS

31 TOTAL FAILURE RATE .0140 %/1000 HRS

ckt $\lambda 2 = .02477 \times 10^{-5}$

BxA 321A

PARTS APPLICATION ANALYSIS

CAPACITORS

(Capacitors)

PROJECT: A2 ALSEP

ASSEMBLY: Data Transmitter

SUBASSEMBLY: Modulator

DATE: 1-15-70

SCHEMATIC NO: 2344671A

Component DWG: 2344670B

1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	4 Capacitance Value mf pf	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	Operating Voltage Peak AC	8 Voltage Ratio, Operating/Rated %	10 Maximum Duty Cycle	11 Bulk Air Temperature (°C)	12 Circuit Function or Application	13 Basic Failure Rate (%/1000 HRS) At °C	Source	14 For Use of Reliability Dept.	15 Special Environment (Define)	16 Failure Rate Multiplier Level	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 HRS)
C1	ECY 10560 J5		56		500	24		< 10%		50°			A		Lunar	P			.00004
C2	ECY 10560 J5		56		500	12		< 10					A			P			.00004
C3	JMC 3957 - TC		.8-10		250	12		< 10					B			P			.00030
C4	CKRO 6BX 104KR		.1µf		200	< 1		< 10					A			R			.00005
C5	CKRO6BX104KR		.1µf		200	< 1		< 10					A			R			.00005
C6	ECY 10620 J5		62		500	12		< 10					A			P			.00004

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B MIL-HDBK-217A

C ______ D ______

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .00052 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

(Resistors)

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUB ASSEMBLY: Modulator
DATE: 1-15-70
SCHEMATIC NO: 2344671A
Component DWG 2344670B

1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	4 Resistance Value (Ohms)	5 Tolerance (%)	6 Power Rating (Watts)	7 Maximum Operating Power (Watts) 10^{-3}	8 Power Ratio Operating/Rated %	9 Maximum Duty Cycle	10 Bulk Air Temperature °C	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 HRS)	13 Source (See Below)	14 Special Environments (Define)	15 Failure Rate Multiplier Level	16 Final Failure Rate (%/1000 HRS)	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 HRS)
R1	RCR07G 150 JS		15		.25	< 5	< 10%		50			A	Lunar	S			.000167
R2	RCR07G 512 JS		5.1K			6	< 10										.000167
R3	RCR07G 150 JS		15			< 5	< 10										.000167
R4	RCR07G 680 JS		68			< 5	< 10										.000167
R5	RCR07G 121 JS		120			< 5	< 10										.000167
R6	RCR07G 103 JS		10K			< 5	< 10										.000167
R7	RCR07G 104 JS		100K			< 5	< 10										.000167
R8	RCR07G 103 JS		10K			23	< 10										.000167
R9	RCR07G 104 JS		100K			< 5	< 10										.000167

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B ____
C ____ D ____

20 CALCULATED MTBF ____ HRS

21 TOTAL FAILURE RATE .001503 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUB ASSEMBLY: Modulator
DATE: 1-15-70
SCHEMATIC NO: 2344671A
Component DWG: 2344670B

(Semiconductors)

CKT SYM NO. [1]	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY [2]	MANUFACTURER [3]	MAX. TEMP °C: AMBIENT ACTUAL T_A [4]	MAX. TEMP °C: RATED JUNCTION T_J [5]	MAX. TEMP °C: ACTUAL CASE HOT SPOT T_C [6]	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT [7]	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE [8]	AVG PWR DISSIPATION (mw): RATED AT ACTUAL AMBIENT T_A [9]	AVG PWR DISSIPATION (mw): RATED AT ACTUAL CASE T_C [10]	AVG PWR DISSIPATION (mw): ACTUAL [11]	POWER RATIO: ACTUAL/RATED 25°C (Ambient or case) % [12]	POWER RATIO: ACTUAL/RATED T_A or T_C [13]	MAXIMUM VOLTAGES: V_{CBO} RATED [14]	MAXIMUM VOLTAGES: V_{CB} ACTUAL [15]	MAXIMUM VOLTAGES: V_{CEO} RATED [16]	MAXIMUM VOLTAGES: V_{CE} ACTUAL [17]	DIODE PIV: RATED [18]	DIODE PIV: ACTUAL [19]	CIRCUIT FUNCTION or APPLICATION [20]	PART SPECIAL ENVIRONMENT (Define) [21]	RATE (%/1000 HRS) [22]	SOURCE (See below) [23]	FAIL. RATE MULTIPLIER [24]	FINAL FAIL. RATE (%/1000 HRS) [25]	TOTAL COUNT PER TYPE [26]	TOTAL FAILURE RATE (%/1000 HRS) [27]
CR1	2340318-1 (IN 5140A)		50	175		400				< 10	< 10%									Lunar		A	R*			.01000
CR2	2340318-1 (IN 5140A)			175		400				< 10	< 10											A	R			.01000
CR3	IN 944B			175		500				12	< 10											B	P			.00643
CR4	SIN 944B			175		500				12	< 10															.00643
CR5	TXIN 914			175		250				< 10	< 10															.00211
CR6	SIN 944B			175		500				20	< 10															.00643
Q1	JAN TX-2N 2222A		50	175		500				<10	< 10%											B	P			.00195
Q2	2N 3251A/ ML-3C		50	200		360				< 10	< 10											B	P			.00195

[28] FAILURE RATE SOURCE (See Column 23)
A MIL-HDBK-217A
B ATM 605
C
D

[29] NOTE: It is assumed the transient and peak power does not exceed the safe limit.

[30] TOTAL FAILURE RATE .04530 %/1000 HRS.

*Rel. Level

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUB ASSEMBLY: Modulator
DATE: 6-15-70
SCHEMATIC NO: 2344671A
Component DWG 2344670B

(Inductors & Transformers)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	Construction: 4 Type of Case (See Below)	5 Wire Size, Primary	6 Wire Size, Secondary	7 Insulation Class	8 VA Rating (µh)	9 Inductance at Rated Cur.	10 Specified Freq	11 Miscellaneous	Temperature (°C): 12 Operating Ambient	13 Hot Spot (Surface)	14 Rise (AR Method)	15 Eff. Actual Rise	16 Operating Temp Max.	Primary Current: 17 Actual	18 Rated	19 Primary Voltage	Secondary: 20 No. Windings	21 Winding No.	22 Voltage	Hipot Reading: 23 Windings	24 Volts	Rel. Dept Use Only: 25 Basic Failure Rate (%/1000 Hrs)	26 Source (See Below)	27 Total Failure Rate (%/1000 Hrs)
L1	2340319-1	Delevan					1.0							50											A	.002*
L2	2340319-1	Delevan					1.0							50											A	.002
T1	2344674	BxA												50											A	.002

28 TYPE OF CASE
A. HER. SEAL
B. VAC. IMP.
C. ENCAP.
D. OPEN

29 FAILURE RATE SOURCES (FOR COLUMN #26)
A. MIL-HDBK-217A B. ____
C. ____ D. ____

30 CALCULATED MTBF ____ HRS

31 TOTAL FAILURE RATE .006 %/1000 HRS

$\lambda_3 = .05332 \times 10^{-5}$

B

*Reflects burn-in level P.

BxA 321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter **SUBASSEMBLY:** Power Amplifier (A2)

DATE: 6-15-70
SCHEMATIC NO: 2344640B
Component DWG: 2344603B

(Capacitors)

	1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value pf	5 Tolerance %	Manufacturer's Rated Voltage	6 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage Ratio Operating/Rated %	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 / 12 Circuit Function or Application	13 Basic Failure Rate (%/1000 hrs)	14 Source	Special Environment (Define)	15 Level	16 Failure Rate Multiplier	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 hrs)
	C1	JMC 6003-TC		.8-10		250		1	<10%	<50%	50			B	Lunar	P				.00030
	C2	JMC 3957-TC		.8-10		250		1	<10	>>				B						.00030
	C3	ECY 105R6J5		5.6		500		1	<10	>>				A						.00004
	C4	ECY 10390J5		39		500	29		<10	>50%				A						.00004
	C5	JMC 3957-TC		.8-10		250		1	<10	<50				B						.00030
	C6	JMC 6003-TC		.8-10		250	29		12	>50%				B						.00030
B	C7	ECY10180J5		18		500	29	1	<10	<50				A						.00004
B	C8	DELETED																		
B	C9	DELETED																		
	C10	JMC 3957-TC		.8-10		250		1	<10					B						.00030
	C11	JMC 6003-TC		.8-10		250		1	<10					B						.00030
	C12	JMC 6003-TC		.8-10		250		1	<10					B						.00030
	C13	JMC 6003-TC		.8-10		250	29		12	>50%				B						.00030
	C14	JMC 3957-TC		.8-10		250		1	<10	<50				B						.00030
	C15	ECY 106R2J5		6.2		500		1	<10	<50				A						.00004
	C16	JMC 6003-TC		.8-10		250	15		<10	>50%				B						.00030
B	C17	DELETED																		
	C18	JMC 3957-TC		.8-10		250	29		12	>50%				B						.00030
	C19	CKR06BX104KR		.1pf		100	1		<10	100%				A		R				.00005

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B MIL-HDBK-217A
C ________ D ________

21 CALCULATED MTBF ________ HRS

22 TOTAL FAILURE RATE: .00351 %/1000 HRS B

FOR USE OF RELIABILITY DEPT.

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PARTS APPLICATION ANALYSIS

CAPACITORS

(Capacitors)

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUBASSEMBLY: Power Amplifier (A2)
DATE: 6-15-70
SCHEMATIC NO: 2344640 B
Component DWG: 2344603B

	1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	4 Capacitance Value mfd	5 Tolerance %	Manufacturer's Rated Voltage	6 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage Ratio Operating/Rated %	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 hrs)	13 Source (See Below)	14 Special Environment (Define)	15 Failure Rate Multiplier Level	16 Final Failure Rate	17 Total Capacitor Count per Type	18 Total Failure Rate (%/1000 hrs)
	C20	CKR06BX104KR		.1		100	29		29%	100%	50			A	Lunar	R			.00005
	C21	"		.1			29		29							R			.00005
	C22	"		.1			29		29							R			.00005
	C23	"		.1			29		29							R			.00005
	C24	"		.1			29		29							R			.00005
	C25	"		.1			29		29							R			.00005
	C26	"		.1			29		29							R			.00005
B	C27	CKR 12 BX 561 KR		560		100	20		20					A		R			.00002
B	C28	CKR 12 BX 561 KR		560		100	20		20					A		R			.00002
	FL1	1250-700	Erie	1500p		200	29		15%					B		P			.00030
	FL2	"																	.00030
	FL3	"																	.00030
	FL4	"																	.00030
	FL5	"																	.00030
	FL6	"																	.00030
	FL7	"																	.00030
	FL8	"																	.00030
	FL9	"																	.00030
	FL10	9051-500-0002																	.00030

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B MIL-HDBK-217A
C ______ D ______

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .00339 %/1000 HRS B

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PARTS APPLICATION ANALYSIS

Rev. B

RESISTORS

PROJECT: A2 ALSEP

DATE: 6-15-70

ASSEMBLY: Data Transmitter

SUB ASSEMBLY: Power Amplifier (A2)

SCHEMATIC NO: 2344640 B

Component DWG 2344605B

(Resistors)

	1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Resistance Value (Ohms)	5 Tolerance (%)	6 Power Rating (Watts)	7 Maximum Operating Power (Watts) x10⁻³	8 Power Ratio Operating/Rated %	9 Maximum Duty Cycle	10 Bulk Air Temperature °C	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) at °C / Source (See Below)	13 For Use of Reliability Dept	14 Special Environments (Define)	15 Failure Rate Multiplier / Level	16 Final Failure Rate (%/1000 Hrs)	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 Hrs)
	R1	RCR07G-JS		TBD		250	10	< 10%	<50	50		A		Lunar	S			.000167
	R2	RCR07G-JS		TBD			10	< 10										.000167
	R3	RCR07G-JS		TBD			10	< 10										.000167
	R4	RCR07G200JS		20			10	< 10										.000167
	R5	RCR07G102JS		1K			45	18										.000167
	R6	RCR07G221JS		220			10	< 10										.000167
	R7	RCR07G150JS		15			10	< 10										.000167
	R8	RCR07G JS		TBD			25	10										.000167
B	R9	DELETED																
	R10	RCR07G270JS		27		250	10	< 10										.000167
	R11	RCR07G180JS		18		250	10	< 10										.000167
B	R12	RCR07G151JS		150		.25	3	10				A			S			.000167
B	R13	RCR07G512JS		5.1K		.25	157	63				A			S			.000265

19 Failure Rate Sources (for Column #14)	20	21
A. ATM 605 B. ______ C. ______ D. ______	Calculated MTBF ______ Hrs	Total Failure Rate .002102 %/1000 Hrs B

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUB ASSEMBLY: Power Amplifier (A2)
DATE: 1-15-70
SCHEMATIC NO: 2344640B
Component DWG: 2344603B

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: RATED JUNCTION T_J	MAX. TEMP °C: ACTUAL CASE HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT	RATED AT 25°C CASE	RATED AT ACTUAL AMBIENT T_A	RATED AT ACTUAL CASE T_C	ACTUAL	POWER RATIO: ACTUAL/RATED 25°C (Amb. or case)	POWER RATIO: ACTUAL/RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED	V_{CB} ACTUAL	V_{CEO} RATED	V_{CE} ACTUAL	DIODE PIV: RATED	DIODE PIV: ACTUAL	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: BASE RATE (%/1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	FINAL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Q1	40578 (2 N 3866)		50	200		5. W				.48W	10%									Lunar		A				.00390
Q2	40578 (2 N 3866)		50	200		5. W				.67W	14															.00390
Q3	234032-1 (2 N 3375)		50	200		16.5 W				1.33 W	12															.00390
Q 4	2340322-1 (2 N 3375)		50	200		11.6 W				4.38 W	38															.00390

FAILURE RATE SOURCE (See Column 23)
A ________ C ________
B ________ D ________

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .01560 %/1000 HRS.

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Rev. B

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

(Inductors & Transformers)

PROJECT: A2 ALSEP

ASSEMBLY : Data Transmitter

SUB ASSEMBLY: Power Amplifier (A2)

DATE: 6-15-70

SCHEMATIC NO: 2344640 B

Component DWG 2344603B

Rev.	1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	Construction: 4 Type of Case (See Below)	5 Wire Size, Primary	6 Wire Size, Secondary	7 Insulation Class	8 VA Rating	9 Inductance at Rated Cur.	10 Specified Freq	11 Miscellaneous	Temperature (°C): 12 Operating Ambient (Hot Spot Surface)	13 Rise (AR Method)	14 Est. Actual Rise	15 Operating Temp Max.	16 Actual	Primary Current: 17 Rated	18 Primary Voltage	19 No. Windings	Secondary: 20 Winding No.	21 Voltage	22 Windings	Hipot Reading: 23 Volts	24	25 Basic Failure Rate (%/1000 hrs) — ΔT — °C (Rel. Dept Use Only)	26 Source (See Below) (Rel. Dept Use Only)	27 Total Failure Rate (%/1000 hrs)
	L1	2344647	BxA					TBD		50																A	.002*
	L2	BP-1551-110	Collins Radio	C	#40			1.0																			.002
	L3	"	"	C	#40			1.0																			.002
	L4	2344652	BxA					TBD																			.002
B	L5	BP-1551-110	Collins Radio	C	#40			1.5																			.002
	L6	2344662	BxA					TBD																			.002
	L7	2344653	BxA					TBD																			.002
	L8	2344649	BxA					TBD																			.002
	L9	2344650	BxA					TBD																			.002
B	L10	DELETED																									
	L11	BP-1551-050	"	C	#35			.33																			.002
	L12	2344648	BxA					TBD																			.002
B	L13	DELETED																									
	L14	BP-1551-050	"	C	#40			.33																			.002
	L15	2344654	BxA	C				TBD																			.002
	L16	BP-1551-110	Collins Radio	C	#40			1.0																			.002
	L17	"	"	C	#40			1.0																			.002
	L18	BP-1551-050	"	C	#35			.33																			.002
	L19	"	"	C	#35			.33																			.002

28 TYPE OF CASE	29 FAILURE RATE SOURCES (FOR COLUMN #26)	30	31
A. HER. SEAL B. VAC. IMP. C. ENCAP. D. OPEN	A. MIL-HDBK-217A B. ______ C. ______ D. ______	CALCULATED MTBF ______ HRS	TOTAL FAILURE RATE .03400 %/1000 HRS

B

* Reflects burn-in at Level P

TBD: to be determined.

BxA 321A

Rev. B

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

(Inductors & Transformers)

PROJECT: A 2 ALSEP

ASSEMBLY: Data Transmitter

SUB ASSEMBLY: Power Amplifier (A2)

DATE: 6-15-70

SCHEMATIC NO: 2344640B

Component DWG: 2344603B

	1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	Construction: 4 Type of Case (See Below)	5 Wire Size, Primary	6 Wire Size, Secondary	7 Insulation Class	8 VA Rating	9 Inductance at Rated Cur.	10 Specified Freq	11 Miscellaneous	Temperature (°C): 12 Operating Ambient Hot Spot (Surface)	13 Rise (AR Method)	14 Est. Actual Rise	15 Operating Temp Max.	16 Actual	Primary Current: 17 Rated	18 Primary Voltage	19 No. Windings	Secondary: 20 Winding No.	21 Voltage	22 Windings	Hipot Reading: 23 Volts	24	25 Basic Failure Rate λ/1000 Hrs	26 Source (See Below)	27 Total Failure Rate λ/1000 Hrs
	L20	BP-1551-110	Collins-Radio	C	#40			1.0		50																A	.002
	L21	"	"	C	#40			1.0																			.002
	L22	"	"	C	#40			1.0																			.002
	L23	"	"	C	#40			1.0																			.002
	L24	BP-1551-010	"	C	#33			.33																			.002
	L25	"	"	C	#33			.33																			.002
	L26	"	"	C	#33			.33																			.002
	L27	"	"	C	#33			.33																			.002
	L28	"	"	C	#33			.33																			.002
	L29	"	"	C	#33			.33																			.002
B	L30	2344693	BxA	-	-			3 3/4 Turns																		A	.002
B	SB	5659605/3B	Ferroxcube	-		13 Beads																					NIL

REL. DEPT USE ONLY

28 TYPE OF CASE
A. HER. SEAL
B. VAC. IMP.
C. ENCAP.
D. OPEN

29 FAILURE RATE SOURCES (FOR COLUMN #26)
A. MIL-HDBK-217A
B. ______
C. ______ D. ______

30 CALCULATED MTBF ______ HRS

31 TOTAL FAILURE RATE .022 λ/1000 HRS B

BxA 321A

(Connectors)

PARTS APPLICATION ANALYSIS

(CONNECTORS)

Rev. B

PROJECT: A2 ALSEP

ASSEMBLY: Data Transmitter

SUB ASSEMBLY: Power Amplifier (A2)

DATE: 6-15-70

SCHEMATIC NO: 2344640B

Component DWG: 2344603B

CIRCUIT, REF. DESIG-NATION (1)	TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION (2)	MANUFACTURER (3)	PINS: NUMBER: TOTAL (4)	PINS: NUMBER: ACTIVE (5)	PINS: CURRENT: RATED (6)	PINS: CURRENT: ACTUAL: MAX. (7)	PINS: CURRENT: ACTUAL: MIN. (8)	PINS: VOLTAGE: BETWEEN PINS: RATED (9)	PINS: VOLTAGE: BETWEEN PINS: ACTUAL (10)	PINS: VOLTAGE: BETWEEN PINS: TRANSIENT (11)	PINS: VOLTAGE: ACROSS THE CONTACT: STEADY STATE (12)	PINS: VOLTAGE: ACROSS THE CONTACT: SURGE (13)	AMBIENT TEMP °C (14)	INSERT MAT'L (15)	GUIDE (16)	NO. OF INSERTIONS DURING LIFE (17)	MISCELLANEOUS REMARKS (18)	BASIC FAILURE RATE (19)	SOURCE OF F.R. (20)	F.R. MODIFIER (21)	TOTAL FAILURE RATE (%/1000 Hours) (22)
J201	WST0014M208VH00		14	2									50						A		.001012
J203	Bx 2340323-2		2	2									50						A		.00100

23 REQUIRED LIFE HOURS	24 FAILURE RATE SOURCES (FOR COLUMN 20)	25	26
	A MIL-HDBK-217A B ____ C ____ D ____	CALCULATED MTBF ____ HOURS	TOTAL FAILURE RATE .002012 %/1000 HOURS ckt λ4 = .82614

B

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PARTS APPLICATION ANALYSIS

CAPACITORS

(Capacitors)

PROJECT: A2 ALSEP

DATE: 1-15-70

ASSEMBLY: Data Transmitter

SUBASSEMBLY: X6 Multiplier (A1)

SCHEMATIC NO: 2344610B

Component DWG: 2344602C

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	Operating Voltage Peak AC	8 Voltage Ratio Operating/Rated	10 Maximum Duty Cycle	11 Bulk Air Temperature (°C)	12 Circuit Function or Application	13 Basic Failure Rate (%/1000 Hrs)	14 Source (See Below)	15 Special Environment (Define)	16 Failure Rate Multiplier Level	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 Hrs)
C1	JMC 8554-TC		3-20		250	< 1		< 10%		50			A	Lunar	P			.00030
C2	JMC 3955-TC		.8-10			< 1		< 10					A					.00030
C3	JMC 8554-TC		3-20			< 1		< 10					A					.00030
C4	JMC 3955-TC		.8-10			< 1		< 10					A					.00030
C5	JMC 6188-TC		.8-10			< 1		< 10					A					.00030
C6	JMC 3955-TC		.8-10			< 1		< 10					A					.00030
C7	JMC 6188-TC		.8-10			< 1		< 10					A					.00030
FL1	1250-700	Erie	1500		200	< 1		< 10					A					.00030
FL 2	1250-700	Erie	1500		200	< 1		< 10					A					.00030

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A MIL-HDBK-217A B ____________

C ____________ D ____________

21 CALCULATED MTBF ____________ HRS

22 TOTAL FAILURE RATE .00270 % 1000 HRS

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PARTS APPLICATION ANALYSIS

RESISTORS

PROJECT: A2 ALSEP DATE: 1-15-70
ASSEMBLY: Data Transmitter SUB ASSEMBLY: X6 Multiplier (A1) SCHEMATIC NO: 2344610

(Resistors)

1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	4 Resistance Value (Ohms)	5 Tolerance (%)	6 Power Rating (Watts)	7 Maximum Operating Power (Watts) x 10^-	8 Power Ratio Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature °C	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 HRS) at °C	Source (See Below)	13	14 Special Environments (Define)	15 Failure Rate Multiplier Level	16 Final Failure Rate (%/1000 HRS)	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 HRS)
R1	RCR07G 223JS		22K		.210	< 10	< 10%		50		A			Lunar	S			.000167
R2	RCR07G 473 JS		47K		.250	< 10	< 10%		50		A			Lunar	S			.000167
R3	RNR SSE 1001 FR		1K		.100	< 10	< 10%		50		A			Lunar	S			.00195

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A. ATM 605 B. ______
C. ______ D. ______

20 CALCULATED MTBF ______ HRS

21 TOTAL FAILURE RATE .001284 %/1000 HRS

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(Semiconductors)

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: A2 ALSEP

DATE: 1-15-70

ASSEMBLY: Data Transmitter

SUB ASSEMBLY: X6 Multiplier (A1)

SCHEMATIC NO: 2344610 B

Component DWG: 2344602 C

1 CKT SYM NO.	2 TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	3 MANUFACTURER	MAX. TEMP °C: 4 AMBIENT ACTUAL T_A	MAX. TEMP °C: 5 RATED JUNCTION T_J	MAX. TEMP °C: 6 ACTUAL CASE HOT SPOT T_C	AVG PWR DISSIPATION (mw), RATED AT 25°C: 7 AMBIENT	AVG PWR DISSIPATION (mw), RATED AT 25°C: 8 CASE	AVG PWR DISSIPATION (mw), RATED AT: 9 ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (mw), RATED AT: 10 ACTUAL CASE T_C	AVG PWR DISSIPATION (mw): 11 ACTUAL	POWER RATIO: 12 ACTUAL / RATED 25°C (Amb. or case)	POWER RATIO: 13 ACTUAL / RATED T_A or T_C	MAXIMUM VOLTAGES: 14 V_{CBO} RATED	MAXIMUM VOLTAGES: 15 V_{CB} ACTUAL	MAXIMUM VOLTAGES: 16 V_{CEO} RATED	MAXIMUM VOLTAGES: 17 V_{CE} ACTUAL	DIODE PIV: 18 RATED	DIODE PIV: 19 ACTUAL	20 CIRCUIT FUNCTION or APPLICATION	21 PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: 22 RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: 23 SOURCE (See below)	FOR RELIABILITY USE ONLY: 24 FAIL. RATE MULTIPLIER	FOR RELIABILITY USE ONLY: 25 FINAL FAIL. RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: 26 TOTAL COUNT PER TYPE	27 TOTAL FAILURE RATE (%/1000 HRS)
CR1	2340321-1 (HP 0300)			200		10W				Negl	≪10%									Luna	A	R*				.010
CR2	2340321-1 (HP 0300)			200		10W				Negl	≪10%									Luna	A	R				.010

FAILURE RATE SOURCE (See Column 33)
A MIL-HDBK-217A C ____
B ____ D ____

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .0200 %/1000 HRS.

*Rel Level R

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PARTS APPLICATION ANALYSIS

(CONNECTORS)

(Connectors)

PROJECT: A2 ALSEP

ASSEMBLY: Data Transmitter

SUB ASSEMBLY: X6 Multiplier (A1)

DATE: 1-15-70

SCHEMATIC NO: 2344610B

Component DWG: 2344602C

1 Circuit Ref. Designation	2 Type Designation (CEC, MIL or MFR) and Construction	3 Manufacturer	4 Pins – Number – Total	5 Pins – Number – Active	6 Pins – Current – Rated	7 Pins – Current – Actual – Max.	8 Pins – Current – Actual – Min.	9 Pins – Voltage – Between Pins – Rated	10 Pins – Voltage – Between Pins – Actual	11 Pins – Voltage – Between Pins – Transient	12 Pins – Voltage – Across the Contact – Steady State	13 Pins – Voltage – Across the Contact – Surge	14 Ambient Temp °C	15 Insert Matl	16 Guide	17 No. of Insertions During Life	18 Miscellaneous Remarks	19 Basic Failure Rate (%/1000 Hours)	20 Source of F.R. (See 24)	21 F.R. Modifier	22 Total Failure Rate (%/1000 Hours)
J202	BxA 2344629		2	2									50						A		.001
J204	Bx 2340323-3		2	2									50						A		.001

23 Required Life Hours	24 Failure Rate Sources (for Column 20)	25	26
	A MIL-HDBK-217A B ____ C ____ D ____	Calculated MTBF ____ Hours	Total Failure Rate .002 %/1000 Hours

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(Resistors)

PARTS APPLICATION ANALYSIS

RESISTORS

PROJECT: A2 ALSEP
ASSEMBLY: Data Transmitter
SUB ASSEMBLY: Networks 1 & 2 X6 Multiplier (A1)
DATE: 1-15-70
SCHEMATIC NO: 2344610A (ECN) & COMP. DWG: 2344602A

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Resistance Value (Ohms)	5 Tolerance (%)	6 Power Rating (Watts)	7 Maximum Operating Power (Watts) x10-3	8 Power Ratio Operating/Rated %	9 Maximum Duty Cycle	10 Bulk Air Temperature °C	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) - Source (See Below)	13 For Use of Reliability Dept	14 Special Environments (Define)	15 Failure Rate Multiplier	16 Final Failure Rate (%/1000 Hrs)	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 Hrs)
RV1	BxA 2340316-1		10K		.300	< 10	< 10%		50		A				P*		.00300
RV2	"		10K		.300	< 10	< 10								P		.00300
RV3	"		10K		.300	< 10	< 10								P		.00300
RV4	"		10K		.300	< 10	< 10								P		.00300
RV5	"		10K		.300	< 10	< 10								P		.00300
R2	RNR55E3001FR		3K		.100	< 10	< 10				B				R		.00195
R4	RNR55E3902FR		39K		.100	< 10	< 10				B				R		.00195
R6	RNR55E3001FR		3K		.100	< 10	< 10				B				R		.00195

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A MIL-HDBK-217A B ATM 605
C ______ D ______

20 CALCULATED MTBF ______ HRS

21 TOTAL FAILURE RATE .02085 %/1000 HRS
ckt $\lambda 5 = .04605 \times 10^{-5}$

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PARTS APPLICATION ANALYSIS

RESISTORS

Component DWG: 2344663C

PROJECT: A2 ALSEP

DATE: 1-26-70

ASSEMBLY: Data Transmitter

SUB ASSEMBLY: Telemetry Circuitry

SCHEMATIC NO: 2344664C

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)x10	8 POWER RATIO OPERATING/RATED %	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT °C	13 SOURCE (SEE BELOW)	FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER Level	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RNR55E1502FR		15K		.100	<10	<10%		50°			A		Lunar	R			.00150
R2	RNR55E1502FR		15K		.100	<10	<10								R			.00150
R3	RNR55 FR		TBS		.100	<10	<10								R			.00150
R4	RCR20G822JS		8.2K		.500	70	14								S			.000167
R5	RNR55E1001FR		1K		.100	<10	<10								R			.00150
R6	RNR55E1502FR		15K		.100	<10	<10								R			.00150
R7	RNR55E1502FR		15K		.100	<10	<10								R			.00150
R8	RNR55E3922FR		39.2K		.100	<10	<10								R			.00150
R9	Deleted		—		—	—	—											
R10	RNR55E4991FR		4.99K		.100	14	14								R			.00150
R11	RWR80S2R00FR		2.0		2.00	80	<10								R			.00068
R12	RWR80S2R00FR		2.0		2.00	80	<10								R			.00068
R13	RNR55E3011FR		3.01K		.100	<10	<10								R			.00150
R14	RNR55E1502FR		15K		.100	11	11								R			.00150
R15	RCR07G202JS		2K		.250	98	39								S			.000167
R16	RNR55E1502FR		15K		.100	<10	<10								R			.00150
R17	RNR55E2671FR		2.67K		.100	<10	<10								R			.00150
R18	RNR55E FR		TBS		.100	<10	<10								R			.00150

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B ______

C ______ D ______

20 CALCULATED MTBF ______ HRS

21 TOTAL FAILURE RATE .021194 %/1000 HRS

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PARTS APPLICATION ANALYSIS

Rev. B

RESISTORS

Component DWG: 2344663C

PROJECT: A2 ALSEP

DATE: 6-15-70

ASSEMBLY: Data Transmitter

SUB ASSEMBLY: Telemetry Circuitry

SCHEMATIC NO: 2344664C

(Resistors)

Rev.	1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	4 Resistance Value (Ohms)	5 Tolerance (%)	6 Power Rating (Watts)	7 Maximum Operating Power (Watts)	8 Power Ratio Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature °C	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) at Source (See Below)	13 For Use of Reliability Dept.	14 Special Environments (Define)	15 Failure Rate Multiplier	16 Final Failure Rate (%/1000 Hrs)	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 Hrs)
	R19	RNR5532672FR		26.7K		.100	<10	<10%		50		A		Lunar				.00150
	R20	Deleted		–		–	–											
	R21	RNR55E4991FR		4.99K		.100	14	14										.00150
B	R22	RNR55E3321FR		3.32K		.100	17	17										.00150
	R23	RNR55E5901FR		5.9K		.100	< 10	<10										.00150
	R24	RNR55E5901FR		5.9K		.100	<10	<10										.00150
B	R25	RNR55E3321		3.32K		.100	17	17										.00150
B	RT1	DELETED																
	RT2	BxA 2340316-1		10K		.300	< 10	<10				B						.00300
B	F1	262.031		-	31mA		15mA			50		B						.01000
B	SB	5659065/3B	Ferroxcube		12	Beads		Total			EMI Suppression							NIL

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B MIL-HDBK-217A
C ______ D ______

20 CALCULATED MTBF ______ HRS

21 TOTAL FAILURE RATE .02200 %/1000 HRS B

(Semiconductors)

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

Rev. B

PROJECT: A2 ALSEP

DATE: 6-15-70

ASSEMBLY: Data Transmitter

SUB ASSEMBLY: TM Circuitry

SCHEMATIC NO: 2344664C

Component DWG: 2344633C

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: RATED JUNCTION T_J (5)	MAX. TEMP °C: ACTUAL CASE HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT (7)	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE (8)	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A (9)	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C (10)	AVG PWR DISSIPATION (mw): ACTUAL (11)	POWER RATIO: ACTUAL / RATED 25°C (Amb. or case) (12)	POWER RATIO: ACTUAL / RATED T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED (14)	MAXIMUM VOLTAGES: V_{CB} ACTUAL (15)	MAXIMUM VOLTAGES: V_{CEO} RATED (16)	MAXIMUM VOLTAGES: V_{CE} ACTUAL (17)	DIODE PIV: RATED (18)	DIODE PIV: ACTUAL (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL RATE (%/1000 HRS) (26)	TOTAL PER TYPE (27)	COUNT (28)	TOTAL FAILURE RATE (%/1000 HRS) (29)
AR1	U5B7741312 UNQ1	50	125		500					55	11%									Lunar		A						.00120
AR2	U5B7741312 UNQ1		125		500					55	11%																	.00120
CR1	S1N 751A		175		400					15	<10																	.00643
CR2	S1N 759A		175		400					<10	<10																	.00643
CR3	S1N 965B		175		400					150	37																	.00643
CR4	TX 1N 914		175		250					<10	<10																	.00195
CR5	S1N 759A		175		400					24	<10																	.00643
CR6	S1N 759A		175		400					<10	<10																	.00643
CR7	S1N 759A		175		400					<10	<10																	.00643

(30) FAILURE RATE SOURCE (See Column 23)

A ATM 605 C

B D

(31) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(32) TOTAL FAILURE RATE .04293 %/1000 HRS.

TM CKtry λ = .086192

B

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