Bendix

Aerospace Systems Division

ALSEP

Array E Parts Application Analysis, Data Processor

ATM 955

DATE 6-1-71

The purpose of the ATM is to document the results of the Parts Application Analysis study conducted on Data Processor.

The Data Processor is completely redundant with the redundant circuits in standby unenergized except for filter capacitors and resistors on the data demand lines (Interface Board) and filter capacitors on the data lines (Demand Matrix). The failure of one of these non-redundant components will cause loss of processing of one experiment's data but the other experiments will still have their data processed.

The stress levels shown were determined on the basis of electronic piece parts operating at their nominal values of resistance, capacitance, etc., and nominal application of voltage and current signal levels. The maximum circuit board temperature was 65°C and no semiconductor junctions exceeded the 100°C maximum temperature criterion.

The attached summary sheet provides a list of all the parts which are well within both ALSEP and Bendix established derating criteria. All components were derated per ATM-241E. From the analysis, it can be concluded the Data Processor is designed in a manner to ensure reliable and long operational life.

Prepared by: John G. Smith
J.G. Smith
ALSEP Reliability Dept.

Approved by: for L. C. Fowler
S.J. Ellison, Manager
ALSEP Reliability

TABLE I

A. Summary of Digital Data Processor Discrete Parts Stress Levels

Stress	Quantity
0-12%	108
13-25%	0
26-35%	0
35-50%	0
51-60%	0
>60%	0

B. Summary of Digital Data Processor Integrated Circuit Gate Fan-Out

Gate Fan-Out	Quantity
0-44%	170
45-54%	7
55-64%	32
65-75%	72
* 76-80%	5
>80%	0

* The design goal for integrated circuit loading, as defined in ATM 605A, is 75% of the maximum loading level of each device. An exception to this criteria allows loading to 80% only when the addition of this extra load precludes the addition of another gate to the circuit. Reliability trade-off studies have shown that this additional loading makes the circuit more reliable than the addition of another gate.

PARTS APPLICATION ANALYSIS SUMMARY

PROJECT: ALSEP-E Digital Data Processor **DATE:** 6-1-71
ASSEMBLY: Central Station **SUB ASSEMBLY:** X **SCHEMATIC NO:** _____

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	42	.00210	
RESISTORS	31	.08168	
DIODES	1	.00320	
TRANSISTORS	1	.00100	
MICROCIRCUITS	89	.14426	
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			
		.23224	

TOTAL ASSEMBLY FAILURE RATE .23224 **%/1000 HOURS**

MEAN-TIME-TO-FAILURE _____ **HOURS**

MISSION SUCCESS PROBABILITY _____

PARTS APPLICATION ANALYSIS SUMMARY

PROJECT: ALSEP-E Digital Data Processor DATE: 6-1-71
ASSEMBLY: Central Station SUB ASSEMBLY: Non-Redundant SCHEMATIC NO: _____

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	26	.00130	
RESISTORS	25	.06375	
DIODES			
TRANSISTORS			
RELAYS			
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			
		.06505	

TOTAL ASSEMBLY FAILURE RATE .06505 ___%/1000 HOURS

MEAN-TIME-TO-FAILURE _____ HOURS

MISSION SUCCESS PROBABILITY _____

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: ALSEP (Array E) DATE: 6-1-71

ASSEMBLY: Data Processor SUB ASSEMBLY: TTL Demand Matrix SCHEMATIC NO: 2349416

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C				VOLTAGES				INPUTS		OUTPUTS		SPEED	CLOCK WIDTH	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY				
				ACTUAL AMBIENT	RATED JUNCTION	ACTUAL JUNCTION		DERATED MAXIMUM	ACTUAL	DERATED MINIMUM		FAN IN %	% OF MAX I OR V	FAN OUT %	LOADING %	% OF MAX	MIN / ACTUAL %		RATE (%/1000 HRS)	SOURCE (See below)	FAIL RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7		8	9	10		11	12	13	14	15	16	17	18	19	20	21	22
U1	Dual JK 9, 12 SNA54L73-17 8, 13	TI	DIG	60°C	150°C	70°C		5.3V	5V	4.7V					80% 40%			Demand Generator	.0017	A	1		.0017
U2	Dual JK 9, 12 SNA54L73-17 8, 13														80% 40%								
U3	Dual JK 9, 12 SNA54L73-17 8, 13														80% 40%								
U4	3-3 Input Nand SNA54L10-17					65°C									10%				.0016	A	1		.0016
U5															10%								
U6															10%								
U7	6-Inverters SNA54L04-17 14					70°C									80%				.0017	A	1		.0017
U8	3-3 Input Nand SNA54L10-17					65°C									10%				.0016	A	1		.0016
U9						65°C									10%								

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605 A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6(V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0148 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: ALSEP (Array E)

ASSEMBLY: Data Processor

SUB ASSEMBLY: TTL Demand Matrix

DATE: 6-1-71

SCHEMATIC NO: 2349416

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
U10	3-3 Input Nand SNA54L10-17	TI	DIG	60°C	150°C	65°C	5.3V	5V	4.7V				10%			Demand Generator	.0016	A	1		.0016
U11	6-Inverters SNA54L04-17					70°C							80%				.0017	A	1		.0017
U12	Wired-or SNA54L01-17					65°C							68%			Demand Decoder	.0016	A	1		.0016
U13																					
U14																					
U15																					
U16																					
U17																					
U18																					

23 FAILURE RATE SOURCE (See Column 19)

A ATM 605 A

B

C

D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0145 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: ALSEP (Array E)
ASSEMBLY: Data Processor
SUB ASSEMBLY: TTL Demand Matrix
DATE: 6-1-71
SCHEMATIC NO: 2349416

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C				VOLTAGES				INPUTS		OUTPUTS		SPEED	CLOCK WIDTH	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY				
				ACTUAL AMBIENT	RATED JUNCTION	ACTUAL JUNCTION		DERATED MAXIMUM	ACTUAL	DERATED MINIMUM		FAN IN %	% OF MAX I OR V	FAN OUT %	LOADING %	% OF MAX	MIN / ACTUAL %		RATE (%/1000 HRS)	SOURCE	FAIL RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7		8	9	10		11	12	13	14	15	16	17	18	19	20	21	22
U19	Wired-Or SNA54L01-17	TI	DIG	60°C	150°C	65°C		5.3V	5V	4.7V					68%			Matrix	.0016	A	1		.0016
U20																							
U21																							
U22																							
U23																							
U24																							
U26																							
U27																							
U28																							

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605 A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0144 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

(Microcircuits)

PROJECT: ALSEP (Array E) DATE: 6-1-71

ASSEMBLY: Data Processor SUB ASSEMBLY: TTL Demand Matrix SCHEMATIC NO: 2349416

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See bottom)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
U29	1-8 Input Nand SNA54L30-17	TI	DIG	60°C	150°C	65°C	5.3V	5V	4.7V				20%			Matrix	.0016	A	1		.0016
U30	Duel O-F.F. SNA54L74-17					70°C							20%			Demand Buffer	.0017	A	1		.0017
U31	4-2 Input Nand SNA54L20-17					65°C							20%				.0016	A	1		.0016
U32	6-Inverts SNA54L04-17					70°C							80%				.0017	A	1		.0017
U33	Duel D SNA54L74-17					70°C							10%				.0017	A	1		.0017
U34	Duel D SNA54L74-17					70°C							10%				.0017	A	1		.0017
U35	Duel D SNA54L74-17					70°C							10%				.0017	A	1		.0017
U36	4-2 Input Nand SNA54L20-17					65°C							10%				.0016	A	1		.0016
U37						65°C							10%				.0016	A	1		.0016

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605 A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6(V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0149 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: ALSEP (Array E)

ASSEMBLY: Data Processor

SUB ASSEMBLY: TTL Demand Matrix

DATE: 6-1-71

SCHEMATIC NO: 2349416

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U38	SNA54L30-17	TI	DIG	60°C	150°C	65°C	5.3V	5V	4.7V				10%			Demand Buffer	.0016	A	1		.0016
U39 A	SNA54L04-17					65°C							80%			Demand Generator					
U39 B													80%								
U39 C													80%								
U39 D													80%								
U39 E													80%								
U39 F													80%				.0016	A	1		.0016
U40	4-2 Input Gate SNA54L20-17					65°C							20%			Demand Buffer	.0016	A	1		.0016

22 FAILURE RATE SOURCE (See Column 19)
A ATM 605 A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0048 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

RESISTORS

(Resistors)

PROJECT: ALSEP (Array E) DATE: 6-1-71

ASSEMBLY: Data Processor SUB ASSEMBLY: TTL Demand Matrix SCHEMATIC NO: 2349416

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 25°C	13 SOURCE (SEE BELOW)	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)
R1	RLR05C102GR	MIL-R-39017A	1K	2%	125	.02	<1%		65°C	Bias Resistor	.340	A		.01	.0034		.0034
R2	RLR05C432GR		4.7K	2%	125	1.25	1%	1/5		Wired Or-Resistor							
R3																	
R4																	
R5																	
R6																	
R7																	
R8																	
R9	RLR05C102GR		1K			.02	≤ 1%			Bias Resistor							
R10	RLR05C432GR		4.3K			1.25	1%	1/5		Wired Or-Resistor							
R11																	
R12																	
R13																	
R14																	
R15			4.3K														
R16			4.3K														
R17			4.3K														
R18	RLR05C102GR		1K			.005	<1%			Bias Resistor							

FOR USE OF RELIABILITY DEPT

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

20 CALCULATED MTBF _____ HRS

21 TOTAL FAILURE RATE = .0612 %/1000 HRS

FORM 0321

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

(Capacitors)

PROJECT: ALSEP (Array E) **DATE:** 6-1-71

ASSEMBLY: Data Processor **SUBASSEMBLY:** TTL Demand Matrix **SCHEMATIC NO:** 2349416

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 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) AT 35°C (SEE BELOW)	13 STRUCTURE	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C1	CKR12BX103KR	C-39014	.01nf	10%	100V	5		5%		65°C	Power Supply Filter Capacitor	.005	A		.01			.00005
C2																		
C3																		
C4																		
C5																		
C6																		
C7																		
C8	↓		↓								↓							
C9	CKR11BX561KR		560pf								Signal Filter							
C10																		
C11																		
C13																		
C14																		
C15																		
C16	CKR12BX103KR		.01nf								Power Supply Filter Capacitor							
C17																		
C18																		
C19																		
C20	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

FOR USE OF RELIABILITY DEPT

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

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .00095 X 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: ALSEP (Array E) **DATE:** 6-1-71

ASSEMBLY: Data Processor **SUBASSEMBLY:** TTL Demand Matrix **SCHEMATIC NO:** 2349416

(Capacitors)

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	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) AT 50°C (85°C FOR SEMICON. SEE BELOW)	13 FOR USE OF RELIABILITY DEPT.	14 SPECIAL ENVIRONMENT (DESCRIBE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C21	CKR12BX103KR	C-39014	.01nf	10%	100V	5V		5%		65°C	Power Supply Filter Capacitor	.005 A		.01				.00005

20 **FAILURE RATE SOURCES (FOR COLUMN #14)**
A ATM 605 A B _____
C _____ D _____

21 **CALCULATED MTBF** _____ **HRS**

22 **TOTAL FAILURE RATE** .00005 **% 1000 HRS**

BS-321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

(Microcircuits)

PROJECT: ALSEP (ARRAY E)
ASSEMBLY: DATA PROCESSOR
SUB ASSEMBLY: TIMING AND CONTROL WORD GEN. X-SIDE
DATE: 6-1-71
SCHEMATIC NO: 2349426

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See Column 19)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A U45 C	6-Invert SNA54L04T-17	TI	DIG	60°C	150°C	69°C	5.3v	5v	4.7v			C 30% A 60%				Bit Timer	.0006	A	1		.00060
D U45 B E	↓	↓	↓	↓	↓		↓	↓	↓			DE 10% B 40%				Bit Timer	.0009	↓	↓		.0009
A U46 B I D	SNA54L00T-17			55°C		68°C						A 70% BCD 10%				Bit Timer	.00165				.00165
A U47 B	SNA54L73T-17					69°C						50%				Bit Timer	.00168				.00168
A U48 B	↓					69°C						40%				↓	↓				↓
A U49 B	↓					69°C						50%				↓	↓				↓
CD U50 EB	SNA54L04T-17					69°C						CD 70% EB 10%				Frame Counter	.0012				.00120
U50A	SNA54L04T-17					69°C						A 20%				Frame Counter	.0004				.00040
A U51 D	SNA54L00T-17	↓	↓	↓	↓	68°C	↓	↓	↓			A-D 10%				Control Word Generator	.00165	↓	↓		.00165

22 FAILURE RATE SOURCE (See Column 19)
A ATM 605 A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6(V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .01144 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: ALSEP (ARRAY E)
ASSEMBLY: DATA PROCESSOR
SUB ASSEMBLY: TIMING AND CONTROL WORD GEN X-SIDE
DATE: 6-1-71
SCHEMATIC NO: 2349426

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U52 A/D	SNA54L00T-17	TI	DIG	60° C	150° C	68° C	5.3v	5v	4.7v			A 10% D				Control Word Generator	.00165	A			.00165
U53 A/B/C	SNA54L04T-17	↓	↓	↓	↓	↓	↓	↓	↓			A 10% C				↓	.0009	↓			.00090
U54 A/D	SNA54L00T-17	↓	↓	↓	↓	↓	↓	↓	↓			A 10% D				↓	.00165	↓			.00165
U55 C/B	SNA54L10T-17	↓	↓	↓	↓	↓	↓	↓	↓			A 20% C 10%				↓	.00165	↓			.00165
U56 A/B	SNA54L73T-17	↓	↓	↓	↓	↓	↓	↓	↓			60%				Frame Counter	.00168	↓			.00168
U57 A/B	SNA54L73T-17	↓	↓	↓	↓	↓	↓	↓	↓			50%				↓	↓	↓			↓
U58 A/B	↓	↓	↓	↓	↓	69° C	↓	↓	↓			10%				↓	↓	↓			↓
U59 A/B	2-4 input nand SNA54L20T-17	↓	↓	↓	↓	66° C	↓	↓	↓			A 10% B				Control Word Generator	.0016	↓			.00160
U60 A/B/C	SNA54L10T-17	↓	↓	↓	↓	67° C	↓	↓	↓			A B 10% C				↓	.00163	↓			.00163

FAILURE RATE SOURCE (See Column 19): A ATM 605 A; B ; C ; D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .01412 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: ALSEP (ARRAY E)
ASSEMBLY: DATA PROCESSOR
SUB ASSEMBLY: TIMING AND CONTROL WORD GEN X-SIDE
DATE: 6-1-71
SCHEMATIC NO: 2349426

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN %	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL PART TYPE	TOTAL FAILURE RATE (%/1000 HRS)
A U61 B C	SNA54L10T-17	TI	DIG	60° C	150° C	67° C	5.3v	5v	4.7v			A B 10% C				Control Word Generator	.00163	A			.00163
A U62 B C	↓	↓	↓	↓	↓	67° C	↓	↓	↓			A B 10% C				↓	.00163	↓			.00163
A U63 B	SNA54L20T-17					66° C						A 10% B					.0016				.00160
A U64 B C	3-3 input nand SNA54L10T-17					67° C						A B 10% C					.00163				.00163
A U65 B C	↓					↓						↓					↓				↓
A U66 B C	↓					↓						↓					↓				↓
B U67 F	SNA54L04T-17					69° C						B 70% F 80%				Sub Bit Timer	.0006				.00060
A U67 C E	↓											A C 10% E					.0009				.00090
A U68 B	Duel J K SNA54L73	↓	↓	↓	↓	↓	↓	↓	↓			A 50% B 20%					.00168				.00168

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605 A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .01293 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: ALSEP (ARRAY E) DATE: 6-1-71

ASSEMBLY: DATA PROCESSOR SUB ASSEMBLY: TIMING AND CONTROL WORD GEN X-SIDE SCHEMATIC NO: 2349426

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN %	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	6	8	7	9	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A U69 B	SNA54L78T-17	TI	DIG	60°C	150°C	69°C	5.3v	5v	4.7v			20%				Sub Bit Timer	.00168	A			.00168
A C U70 D	SNA54L00T-17					68°C						AC10% D60%					.00165				.00165
U71	Counter SNA54L93T-17											20%					.00168				.00168
A, U72 C, B	SNA54L00T-17											A B 10% C70%					.0012				.00120
U72 D												D40%					.0004				00040
A U73 B												A20% B60%					.00080				.00080
C U73 D												C20% D 40%					.0008				.00080
A U74 B	SNA54L73T-17					69°C						10%					.00168				.00168
A U75 B												10%									

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A C
B D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6(V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .01157 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: ALSEP ARRAY E

DATE: 6-1-71

ASSEMBLY: DATA PROCESSOR

SUB ASSEMBLY: TIMING AND CONTROL WORD GEN X-SIDE

SCHEMATIC NO: 2349426

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN %	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: SOURCE (See below)	FOR RELIABILITY USE ONLY: FAILURE RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	FOR RELIABILITY USE ONLY: TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A U76 B	SNA54L73T-17	TI	DIG	60°C	150°C	69°C	5.3v	5v	4.7v			30%				Sub Bit Timer	.00168	A			.00168
A U77 B	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
A U78 B	SNA54L10T-17					67°C						A20% B10%				Timing Pulse Gen	.00163				.00163
A U79 B	SNA54L04T-17					69°C						A40% B10%					.00168				.00168
A U80 BD	SNA54L00T-17					68°C						A30% BD10%					.00165				.00165
A U81 BF	SNA54L04T-17					69°C						A20% BF10%				↓	.00168				.00168
A U82 D	SNA54L00T-17					68°C						AD 10%				Modulator	.00165				.00165
A U83 BC	↓											A30% BC10%				Control Logic	.0012				.00120
U83 D	↓	↓	↓	↓	↓	↓	↓	↓	↓			D10%				↓	.0004	↓			.00040

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605 A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6(V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .01325 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: ALSEP (ARRAY E) DATE: 6-1-71

ASSEMBLY: DATA PROCESSOR SUB ASSEMBLY: TIMING AND CONTROL WORD GEN X-SIDE SCHEMATIC NO: 2349426

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN %	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE MULTIPLIER	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
A U84 B	SNA54L20T-17	TI	DIG	60° C	150° C	66° C	5.3v	5v	4.7v			A10% B				Control Word Generator	.0016	A			.00160
A U85 B	SNA54L74T-17	↓	↓	↓	↓	69° C	↓	↓	↓			10%				Control Logic	.00168				.00168
AC U86 F	SNA54L04T-17											ACF 10%				Modul-ator	.0014				.00140
U86B	↓					↓						B30%					.0003				.00030
AC U87 D	SNA54L00T-17					68° C						AC 10% D20%					.00165				.00165
A U88 B	SNA54L74T-17	↓	↓	↓	↓	69° C	↓	↓	↓			10%					.00168				.00168
A U90	SNA54L74T-17					69° C						10%					.00084				.00084

FAILURE RATE SOURCE (See Column 19): ATM 605 A
A — C —
B — D —

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .00915 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: ALSEP (ARRAY E) **DATE:** 6-1-71

ASSEMBLY: DATA FROCESSOR **SUBASSEMBLY:** TIMING AND CONTROL WORD GEN X-SIDE **SCHEMATIC NO:** 2349426

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 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) AT 50% °C 3CT/CS (USE BELOW)	13 SPECIAL ENVIRONMENT (DEFINE)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)
C1	CKR12BX103KR	C-39014	.01	10%	100v	5		5%		65 °C		.005 A		.01	.00005		.00005
C2																	
C3																	
C4																	
C5																	
C6																	
C7																	
C8																	
C9																	
C10																	
C11																	
C12																	
C13																	
C14																	
C15																	
C16																	
C17																	
C18																	
C19	↓	↓	↓	↓	↓	↓		↓		↓		↓		↓	↓		↓

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 A B _____

C _____ D _____

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .00095 % / 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: ALSEP (ARRAY E) **DATE:** 6-1-71

ASSEMBLY: DATA PROCESSOR **SUBASSEMBLY:** TIMING AND CONTROL WORD GEN X-SIDE **SCHEMATIC NO:** 2349426

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 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) AT 25°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C20	CKR12BX103KR	C-39014	.01	10%	100v	5		5%		65°C		.005	A		.01	.00005		.00005

FOR USE OF RELIABILITY DEPT.

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 A B _____
C _____ D _____

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .00005 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

(Resistors)

PROJECT: ALSEP (ARRAY E) DATE: 6-1-71

ASSEMBLY: DATA PROCESSOR SUB ASSEMBLY: TIMING AND CONTROL WORD GEN X-SIDE SCHEMATIC NO: 2349426

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 40°C (SEE FORCE 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)
R1	RLR05C102JS	MIL-R-39017	1KΩ	5%	125	.01	k 1%		65°C	5v power supply test point	.345	A		.001		1	.00345
R2																	
R3																	
R4																	
R5																	
R6																	

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

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .002070 %/1000 HRS

FORM 9551
BS-321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: ALSEP (ARRAY-E) X-Side DATE: 6-1-71

ASSEMBLY: DATA PROCESSOR SUB ASSEMBLY: Interface Board SCHEMATIC NO: 2349456

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	RATED JUNCTION	ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	ACTUAL	DERATED MINIMUM	INPUTS: FAN IN %	% OF MAX I OR V	OUTPUTS: FAN OUT %	LOADING %	SPEED: % OF MAX	CLOCK WIDTH MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE MULTIPLIER	TOTAL QUANT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U1	HEX INVERTER SNA54L04T-17	TI	DIG	60°C	150°	15mw 69°C	5.3v	5.0v	4.7v			10%				Frame Mark	.0017	A		1	.0017
U3	SNA54L04T-17	TI	DIG	60°C	150°	69°C	5.3v	5.0v	4.7v			10%				Data Demand					
U5	SNA54L04T-17	TI	DIG	60°C	150°	69°C	5.3v	5.0v	4.7v			10%				90th Frame					
U9	QUAD-2 INPUT NAND SNA54L00T-17	TI	DIG	60°C	150°	6mw 67°	5.3v	5.0v	4.7v			10%				Shift Line	.0016				.0016
U7	SNA54L04-T-17	TI	DIG	60°C	150°	69°	5.3v	5.0v	4.7v			10%				Data Gate	.0017				.0017

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A C
B D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .00840 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: ALSEP (ARRAY E) DATE: 6-1-71

ASSEMBLY: DATA PROCESSOR SUB ASSEMBLY: X-SIDE INTERFACE BOARD SCHEMATIC NO: 2349456

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	JUNCTION RATED T_J (5)	CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT (7)	25°C CASE (8)	ACTUAL AMBIENT T_A (9)	ACTUAL CASE T_C (10)	ACTUAL (11)	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case) (12)	ACTUAL/RATED T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	V_{CB} ACTUAL V (15)	V_{CEO} RATED V (16)	V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	ACTUAL V (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 FAIL RATE (%/1000 HRS) (25)	TOTAL PER TYPE (26)	COUNT (26)	TOTAL FAILURE RATE (%/1000 HRS) (27)
CR2	1N4371A	Mot	60°	175°	66°	400		370		5	1.4%						2.7v	2.7v	Ref Voltage		.0032	A						.0032
Q1-A	1/2 on Transistor (2N3045) npn 2335191	TI	60°	200°	66°	350		300		5mw	1.5%		70v	2v	55v	2v			voltage sense		.001	A						.0010

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

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

(30) TOTAL FAILURE RATE : .0042 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

(Resistors)

PROJECT: ALSEP (Array E) DATE: 6-1-71

ASSEMBLY: Data Processor SUB ASSEMBLY: X-Interface Board SCHEMATIC NO: 2349456

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 25°C	13 SOURCE (SEE BELOW)	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)
R27	RLR05C512GR	R-39017	5.1K	5%	125	1.8	1.5%		65°C	Power Reset Resistor	.255	A		.01			.00255
R29	RLR05C393GR		39K			.1	< 1%		65°C		.255	A		.01			.00255
R30	RLR05C511GR		510			.18	< 1%		65°C		.255	A		.01			.00255
R31	RLR05C102GR		1K			6.3	5%		70°C		.273	A		.01			.00273
R32	RLR05C102GR		1K			9	7%		75°C		.288	A		.01			.00288
R33	RLR5C512GR		5.1K			1.8	1.5%		65°C		.260	A		.01			.00260
R34	RLR05C511GR		510			.18	< 1%		65°C		.255	A		.01.			.00255

FOR USE OF RELIABILITY DEPT

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

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .01841 %/1000 HRS

FORM 9051

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: ALSEP (Array E) DATE: 6-1-71
ASSEMBLY: Data Processor SUBASSEMBLY: X-Interface Board SCHEMATIC NO: 2349456

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 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) AT 40°C (USE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C23	CKR12BX102KR	C-39014	.001	10%	100V	3		3%		65°C	Time Constant for 5V Sense	.005 A		.01				.00005
C24	CKR13BX104KR	C-39014	.1	10%	100V	5		5%		65°C		.005 A		.01				.00005

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM-605A B _____
C _____ D _____

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .00010 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

(Resistors)

PROJECT: ALSEP (ARRAY E) DATE: 6-1-71

ASSEMBLY: DATA PROCESSOR SUB ASSEMBLY: Non-Redundant Components Interface Board SCHEMATIC NO 2349456

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (mw)	7 MAXIMUM OPERATING POWER (mw)	8 POWER RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 Component TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DERTEN)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1*	RLR05C331GR	R-39017	330	5%	125	.02mw	< 1%		65° C	Filter Resistor	.255	A		.01	.00255	1	.00255
R2*																	
R3*																	
R4*																	
R5*																	
R6*																	
R7*																	
R8*																	
R9*																	
R10*																	
R11*																	
R12*																	
R13*																	
R14*																	
R15*																	
R16*																	
R17*																	
R18*																	

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 A B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .04590 %/1000 HRS

FORM 8031

BS-321A *Non-Redundant

PARTS APPLICATION ANALYSIS

RESISTORS

(Resistors)

PROJECT: ALSEP (Array E) Non-Redundant Components DATE: 6-1-71

ASSEMBLY: Data Processor SUB ASSEMBLY: Interface Board SCHEMATIC NO: 2349456

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 HOT SPOT TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 40°C	13 REF'CE (SEE BELOW)	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)
R21*	RLR05C331GR	R-39017	330	5%	125	.02	< 1%		65°C	Filter Resistor	.255	A		.01			.00255
R28*	RLR05C331GR																
R35*	RLR05C331GR																
R36*																	
R37*																	
R38*																	
R39*																	

FOR USE OF RELIABILITY DEPT

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

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .01785 %/1000 HRS

FORM 9001

BS-321A *Non-Redundant

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: ALSEP (ARRAY E) — Non-Redundant Components — **DATE:** 6-1-71

ASSEMBLY: DATA PROCESSOR — **SUBASSEMBLY:** INTERFACE BOARD — **SCHEMATIC NO:** 2349456

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE (MF)	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 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) AT 25°C, 0 VDC, 0 CURR, RESIDUAL	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C1 *	CKR12BX102KR	C-39014	.001mf	10%	100v	4		4%		65°C	Filter Capacitor	.005	A		.01	.00005	1	.00005
C2 *																		
C3 *																		
C4 *																		
C5 *																		
C6 *																		
C7 *																		
C8 *																		
C9 *																		
C10*																		
C11*																		
C12*																		
C13*																		
C14*																		
C15*																		
C16*																		
C17*																		
C18*																		
C19*	"	"	"	"	"	"		"	"	"	"	"	"		"	"	"	"

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 A B _____
C _____ D _____

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .00095 %/1000 HRS

BS-321A *Non-Redundant

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: ALSEP (Array E) — Non-Redundant Components — **DATE:** 6-1-71

ASSEMBLY: Data Processor — **SUBASSEMBLY:** Interface Board — **SCHEMATIC NO:** 2349456

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 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) AT 35°C, 5-ORCT, ENVIRONMENT	13	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C22*	CKR12BX102KR	C-39014	.001	10%	100V	4		4%		65 °C	Filter Capacitor	.005	A		.01			.00005
C25*																		
C26*																		
C27*																		
C28*																		
C29*																		
C30*																		

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM-605A B _____
C _____ D _____

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .00035 %/1000 HRS

BS-321A *Non-Redundant