Bendix

Aerospace Systems Division

LMS RELIABILITY PART APPLICATION ANALYSIS

Contract No. NAS 9-5829

NO.	REV. NO.
ATM-966	B

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DATE 9 March 1972

Presented herein are the parts application analysis results as performed on the Lunar Mass Spectrometer. Parts application analysis worksheets are presented in Appendix A for BxA and in Appendix B for UTD.

The A Revision herein has been updated to include the Lock Out Switching Circuit (page 190).

The B Revision applies to the Flight Model only and is different in that the Flight Model has the Multimode Emission Control Ion Source Voltage (Assembly #151-550) while the Qual Model has the Fixed Mode Emission Control Ion Source Voltage (Assembly #151-700). Both Emission Control Assemblies are electrically interchangeable.

Prepared by: J E Hendrickson for
R. Hiebert
LSM Reliability P. E.

Approved by: S. J. Ellison
S. J. Ellison, Manager
ALSEP Reliability

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1.0 Introduction:

This ATM contains the parts application analysis for each electronic circuit used in the Lunar Mass Spectrometer (LMS).

Each component is categorized by circuit and generic type. In addition each component's electrical and thermal stress level is listed. These stress levels were derived by thermal and electrical analysis of the circuit in question. From the stress levels, the value of the failure rate was determined for each component using ATM 605A and MIL HDBK 217A. A summary sheet is given for each circuit. This summary contains the part count and total (sum) failure rate (in % per 1000 hours) for each generic part type.

2.0 Applicable Documents:

1. ATM 605A "FAILURE RATE DATA FOR ALSEP" dated 10/26/70
2. MIL HDBK 217A "RELIABILITY STRESS AND FAILURE RATE DATA FOR ELECTRONIC EQUIPMENT" dated 12/1/65
3. BxA Internal Letter No 71-210-177 "Revised LMS Prototype Preliminary Temperature Summary" dated 3/23/71

3.0 Assumptions and Calculations:

3.1 Mean Time To Failure MTTF:

The value of MTTF is given by:

$$MTTF = 1/\lambda$$

where: λ is expressed in failures per unit time (hours). The units of MTTF is hours.

3.2 Mission Success Probability

This value is equal to exp ($-\lambda t$) where λ is expressed in failures/hour and t equals 17,520 hours or two years.

3.3 Component Failure Rate (%/1000 hrs)

The basic failure rate was calculated taking into account both the stress level and temperature of the device in question. The "heat sink" profile is given in Table I for each element as it existed on February 15, 1971 and was used for BxA predictions herein. Table II is a subsequent thermal refinement to the LMS prototype wherein the results for both tables were developed from a thermal math model with a computer program.

The value of "λ" is the average between the λ for lunar day and lunar night, i. e.

$$\lambda = \frac{1}{2} \quad (\lambda \text{ day} + \lambda \text{ night})$$

The temperature rise of the device in question is based on the following:

3.3.1 Resistors: The temperature rise for resistors is not calculated per se but is assumed to be incorporated in the power ratio stress level. Failure rate values are given for the sink temperature and stress (power ratio) level.

3.3.2 Capacitors: For the LMS circuits, essentially no power is dissipated, therefore the temperature of the capacitors is that of the heat sink. The failure rate for capacitors is a function of the sink temperature and the ratio of applied to max voltage level.

3.3.3 Semiconductors: The failure rate for semiconductors is based on the normalized temperature of the device. This is given by:

$$T_J = (T_J - T_S)/(T_{J_{max}} - T_S) \qquad (1)$$

$$T_J = (T_A + (T_{J_{max}} - T_S) \frac{PJ}{Pmax} \qquad (2)$$

where:

T_S is the temperature at which derating begins (125°C)

T_{Jmax} is the maximum junction temperature (usually 200°C)

T_A is the heat sink temperature

For $T_J < 25°C$ use a $T_N = 0.00$.

3.3.4 Microcircuits: The total power dissipated in the device is calculated. The temperature of the device is calculated using .1°C/mW.

All of the above devices have their failure rates derived from ATM 605A.

Relays and circuit board connectors have their failure rates derived from MIL-HDBK 217A.

4.0 Revisions

4.1 See Page 190 for "A" Revision change discription.

4.2 Due to the design change for the Flight Emission Control Assembly, pages 99 through 120 have been revised. In addition pages 191 through 195 have been added to include the new parts an the newly added cordwood module EC-4. These changes make up the "B" Revision.

5.0 Summary

All parts used in the LMS have the stress levels indicated within the PAA work sheets. All parts are derated in accordance with the guidelines of ATM 241E.

TABLE I

LMS PROTOTYPE MODEL

PRELIMINARY TEMPERATURE SUMMARY

COMPONENT	OPERATING TEMPERATURE OF LUNAR NIGHT °F	°C	LUNAR NOON °F	°C
60 IN^2 RADIATOR	24	-4.4	109	42.7
ELECTRONICS CASE	-161	-107	245	118
ANALYZER CASE	-246	-154	248	120
EMISSION CONTROL	56	+13.3	139	59.5
PROGRAM SWEEP HIGH VOLTAGE	44	+8.7	129	54.0
LOW VOLTAGE POWER SUPPLY	39	+3.9	124	51.0
HIGH VOLTAGE POWER SUPPLY	38	+3.3	123	50.5
HOUSEKEEPING	55	+12.8	148	64.5
SIGNAL CONDITIONER	66	+18.9	149	65.0
DATA COMPRESSOR	90	+32.2	168	75.5
BASE PLATE	-57	-49.5	149	65.0

10.99 WATTS INTERNAL DISSIPATION

TABLE II

LMS PROTOTYPE MODEL
PRELIMINARY TEMPERATURE SUMMARY

COMPONENT	OPERATING TEMPERATURE		STANDBY TEMPERATURE
	LUNAR NIGHT*	LUNAR NOON	LUNAR NIGHT
60 IN^2 RADIATOR	-12°F	96°F	-37°F
BASE PLATE	-98°F	121°F	-113°F
ANALYZER CASE (84)	-309°F	137°F	-310°F
ELECTRONIC CASE (86)	-274°F	137°F	-277°F
EMISSION CONTROL	33°F	134°F	-36°F
PROGRAM SWEEP HIGH VOLTAGE	6°F	114°F	-37°F
LOW VOLTAGE POWER SUPPLY	-2°F	107°F	-37°F
HIGH VOLTAGE POWER SUPPLY	-4°F	106°F	-37°F
HOUSEKEEPING	9°F	117°F	-37°F
SIGNAL CONDITIONER	15°F	124°F	-37°F
DATA COMPRESSOR	34°F	143°F	-38°F
PRE AMP - DISCRIMINATOR	0°F	110°F	-38°F
CONTROL & MONITOR	-8°F	101°F	-36°F
	9.21 WATTS ELECTRONIC DISSIPATION		8 WATTS HEATER POWER

(* 0.5 WATTS HEATER POWER)

APPENDIX A

BxA PARTS APPLICATION ANALYSIS

WORKSHEETS

PARTS APPLICATION ANALYSIS SUMMARY

1.1 APPENDIX A

Rev. B

PROJECT: 94004

DATE: 4/26/71

ASSEMBLY: _____ SUB ASSEMBLY: _____ SCHEMATIC NO: 2347552

COUNTING AND DATA COMPRESSION

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	7	.000035	
RESISTORS			
DIODES			
MICROCIRCUITS	75	.152664	
RELAYS			
TRANSFORMERS			
CONNECTORS	1	.001200	60 pins/ 12 active
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .153899 %/1000 HOURS

MEAN-TIME-TO-FAILURE 6.50×10^5 HOURS

MISSION SUCCESS PROBABILITY .9733971

PARTS APPLICATION ANALYSIS

CAPACITORS

1.1 APPENDIX A

PROJECT: 94004 DATE: 4/26/71

ASSEMBLY: Counting & Data Compression SUBASSEMBLY: SCHEMATIC NO: 2347552

(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 BULB AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C (DERATE SEE BELOW)	13	14 SPECIAL ENVIRONMENT (DEFINE) x10⁻³	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C1, 3, 5	CKR12BX222KS		.0022	10%	100	5		>.1	50%	—	Time Constant	.005	A		.001	.005	3	.000015
C2, 4, 6	CKR12BX332KS		.0033	10%	100	5		>.1	50%		Time Constant	.005	A		.001	.005	3	.000015
C7	CKR12BX103KS		.01	10%	100	5		>.1	100%		Filter	.005	A		.001	.005	1	.000005

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 .000035 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.1 APPENDIX A

PROJECT: 94004

ASSEMBLY: Counting & Data Compression SUB ASSEMBLY: _____

DATE: 4/26/71

SCHEMATIC NO: 2347552

(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	FAILURE RATE MULTIPLIER	TOTAL QUALITY PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U1 2	SN54L04T-17	TI	TTL	14/78	150	15/80	5.3	5.0	4.7			25	25			HEX-A	.000333	A			.000333
U1 6												25	25								
U1 8												50	50								
U1 10												25	25								
U1 12												25	25								
U1 14												50	50								
U5 2												25	25			HEX-B					
U5 6												25	25								
U5 8	04T-17	TI	TTL	14/78	150	15/80	5.3	5.0	4.7			50	50			HEX-B	.000333	A			.000333

ATM 605A

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .002997 %/1000 HRS

8xA 879

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.1 APPENDIX A

PROJECT: 94004
ASSEMBLY: Counting & Data Compression
SUB ASSEMBLY:
DATE: 4/26/71
SCHEMATIC NO: 2347552

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	JUNCTION RATED	JUNCTION ACTUAL	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 Col. 19)	FAIL RATE MULTIPLIER	TC TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U5/10	SN54L04-T-17	TI	TTL	14/78	150	15/80	5.3	5.0	4.7			25	25			HEX-B	.000333	A			.000333
U5/12												25	25								
U5/14												50	50								
U9/2												25	25			HEX-C					
U9/6												25	25								
U9/8												50	50								
U9/10												25	25								
U9/12												25	25								
U9/14	SN54L04-T-17	TI	TTL	14/78	150	15/80	5.3	5.0	4.7			50	50				.000333	A			.000333

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .002997 %/1000 HRS

8-A 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94004 — 1.1 APPENDIX A — DATE: 4/26/71

ASSEMBLY: Counting & Data Compression — SUB ASSEMBLY: — SCHEMATIC NO: 2347552

(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	FAILURE RATE	MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U48 2	SN54L04-T-17	TI	TTL	14 / 78	150	15 / 80	5.3	5.0	4.7			20	20			HEX-A	.000 333	A				.000333
U48 6												10	10									
U48 8												10	10									
U48 12												25	25									
U48 14												25	25									
U52 2												20	20			HEX-B						
U52 6												10	10									
U52 8												10	10									
U52 12	SN54L04-T-17	TI	TTL	14 / 78	150	15 / 80	5.3	5.0	4.7			25	25			HEX-B	.000 333	A				.000333

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE 002997 %/1000 HRS

8xA 879

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94004 — 1.1 APPENDIX A — DATE: 4/26/71

ASSEMBLY: Counting & Data Compression — SUB ASSEMBLY: — SCHEMATIC NO: 2347552

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	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	FAILURE RATE	MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U52/14	SN54L04-T-17	TI	TTL	14/78	150	15/80	5.3	5.0	4.7			25	25			HEX-B	.000333	A				.000333
U56/2												20	20			HEX-C						
U56/6												10	10									
U56/8												10	10									
U56/12												25	25									
U56/14	SN54L04-T-17					15/80						25	25				.000333					.000333
U2/9	SN54L95-T-17					18/82						10	10			Shift Reg. A	.0021					.002100
U6/9						18/82						10	10			Shift Reg. B	.0021					.002100
U10/9	SN54L95-T-17	TI	TTL	14/78	150	18/82	5.3	5.0	4.7			10	10			Shift Reg. C	.0021	A				.0021

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

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

TOTAL FAILURE RATE .008298 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94004 — 1.1 APPENDIX A — DATE: 4/26/71

ASSEMBLY: Counting & Data Compression — SUB ASSEMBLY: — SCHEMATIC NO: 2347552

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C. AMBIENT ACTUAL	MAX TEMP °C. JUNCTION RATED	MAX TEMP °C. JUNCTION ACTUAL	VOLTAGES DERATED MAXIMUM	VOLTAGES ACTUAL	VOLTAGES DERATED MINIMUM	INPUTS FAN IN	INPUTS % OF MAX DRV	OUTPUTS FAN OUT	OUTPUTS % LOADING	SPEED % OF MAX	CLOCK WIDTH MIN / ACTUAL	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U3 9	SN54L95-T-17	TI	TTL	14/78	150	78/82	5.3	5.0	4.7			20	20			Shift Reg. A	.0021	A			.0021
U7 9												20	20			Shift Reg. B					
U11 9												20	20			Shift Reg. C					
U18 9												10	10			Shift Reg. A					
U22 9												10	10			Shift Reg. B					
U26 9												10	10			Shift Reg. C					
U19 9												10	10			Shift Reg. A					
U23 9												10	10			Shift Reg. B					
U27 9	SN54L95-T-17	TI	TTL	14/78	150	18/82	5.3	5.0	4.7			10	10			Shift Reg. C	.0021	A			.0021

FAILURE RATE SOURCE (See Column 19)

A ATM 605A — C

B — D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8\,(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8\,(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .018900 %/1000 HRS

B&A 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.1 APPENDIX A

PROJECT: 94004

ASSEMBLY: Counting & Data Compression

SUB ASSEMBLY: _____

DATE: 4/26/71

SCHEMATIC NO: 2347552

(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	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U34/9	SN54L95T-17	TI	TTL	14/78	150	18/82	5.3	5.0	4.7			10	10			Shift Reg A	.0021	A			.0021
U38/9												10	10			B					
U42/9												10	10			C					
U35/9												10	10			A					
U39/9												10	10			B					
U43/9												10	10			C					
U50/9												10	10			A					
U54/9												10	10			B					
U58/9	SN54L95T-17	TI	TTL	14/78	150	18/82	5.3	5.0	4.7			10	10			C	.0021	A			.0021

FAILURE RATE SOURCE (See Column 18)
A — ATM 605A
B —
C —
D —

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .018900 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.1 APPENDIX A

PROJECT: 94004
ASSEMBLY: Counting & Data Compression
SUB ASSEMBLY:
DATE: 4/26/71
SCHEMATIC NO: 2347552

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT 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	FAIL RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U66/9	SN54L95T-17	TI	TTL	14/78	150	18/82		5.3	5.0	4.7			10	10			Shift Reg A	.0021	A			.0021
U70/9						18/82							10	10			B					
U74/9	SN54L95T-17					18/82							10	10			C					
U4/13	SN54L93T-17					17/81							20	20			Counter A					
U8/13													20	20			B					
U12/13													20	20			C					
U20/13													20	20			A					
U24/13													20	20			B					
U28/13	SN54L93T-17	TI	TTL	14/78	150	17/81		5.3	5.0	4.7			20	20			C	.0021	A			.0021

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .018900 %/1000 HRS

BnA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.1 APPENDIX A

PROJECT: 94004 DATE: 4/26/71

ASSEMBLY: Counting & Data Compression SUB ASSEMBLY: SCHEMATIC NO: 2347552

(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	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U33 13	SN54L93T-17	TI	TTL	14/78	150	17/81	5.3	5.0	4.7			40	40			Counter A	.0021	A			.0021
U37 13												40	40			B					
U41 13												40	40			C					
U36 13												20	20			A					
U40 13												20	20			B					
U44 13												20	20			C					
U51 13												20	20			A					
U55 13												20	20			B					
U59 13	SN54L93T-17	TI	TTL	14/78	150	17/81	5.3	5.0	4.7			20	20			C	.0021	A			.0021

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .018900 %/1000 HRS

8xA 879

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.1 APPENDIX A

PROJECT: 94004

ASSEMBLY: Counting & Data Compression

SUB ASSEMBLY:

DATE: 4/26/71

SCHEMATIC NO: 2347552

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	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	FAILURE RATE MULTIPLIER	TQ COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U67/13	SN54L93T-17	TI	TTL	14/78	150	17/81	5.3	5.0	4.7			20	20			Counter A	.0021	A			.0021
U71/13						17/81						20	20			B	.0021				.0021
U75/13	SN54L93T-17					17/81						20	20			C	.0021				.0021
U14/8	SN54L73T-17					15/80						70	70			F/F A	.0010				.0010
U14/13												20	20			A					
U15/8												70	70			B					
U15/13												20	20			B					
U16/8												70	70			C					
U16/13	SN54L73T-17	TI	TTL	14/78	150	15/80	5.3	5.0	4.7			20	20			C	.0010	A			.0010

FAILURE RATE SOURCE (See Column 19)

A ATM 605A C

B D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .012300 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.1 APPENDIX A

PROJECT: 94004
ASSEMBLY: Counting & Data Compression
SUB ASSEMBLY:
DATE: 4/26/71
SCHEMATIC NO: 2347552

(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 + OR V~~ PINS	OUTPUTS FAN OUT %	LOADING %	SPEED % OF MAX	CLOCK WIDTH MIN ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY RATE (%/1000 HRS)	SOURCE	FAILURE RATE MULTIPLIER	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U49/8	SN54L73T17	TI	TTL	14/78	150	15/80	5.3	5.0	4.7		8/9	40/20	40/20			FF A	.0010	A			.0010
U49/12												40	40			A					
U53/8											8/9	40/20	40/20			B					
U53/12												40	40			B					
U57/8											8/9	40/20	40/20			C					
U57/12	SN54L73T17					15/80						40	40			C	.0010				.0010
U17/2	SN54L20T17					14/78						20	20			Gate A	.000975				.000975
U17/10												10	10			A					
U21/2	SN54L20T17	TI	TTL	14/78	150	14/78	5.3	5.0	4.7			20	20			B	.000975	A			.000975

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .008925 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94004 — 1.1 APPENDIX A — DATE: 4/26/71

ASSEMBLY: Counting & Data Compression — SUB ASSEMBLY: — SCHEMATIC NO: 2347552

(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 1 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	FAIL RATE	MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U21/10	SN54L20T17	TI	TTL	14/78	150	14/78	5.3	5.0	4.7			10	10			Gate B	.000975	A				.000975
U25/2												20	20			C						
U25/10												10	10			C						
U45/2												10	10			A						
U45/10												40	40			A						
U46/2												10	10			B						
U46/10												40	40			B						
U47/2												10	10			C						
U47/10	SN54L20T17	TI	TTL	14/78	150	14/78	5.3	5.0	4.7			40	40			C	.000975	A				.000975

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5\,(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5\,(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .008775 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94004 — 1.1 APPENDIX A — DATE: 4/26/71

ASSEMBLY: Counting & Data Compression — SUB ASSEMBLY: — SCHEMATIC NO: 2347552

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	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)
U29/10	SN54L72T17	TI	TTL	14/78	150	15/79	5.3	5.0	4.7			20	20			F/F A	.0020	A			.0020
U30/10												20	20			B	.0020				.0020
U31/10	SN54L72T17											20	20			C	.0020				.0020
U60/3	SN54L00T17											NA	NA			Gate A Oscillator	.000500				.000500
U60/5												NA	NA			A					
U60/8												40	40			A					
U60/14												30	30			A					
U32/3												NA	NA			B					
U32/5	SN54L00T17	TI	TTL	14/78	150	15/79	5.3	5.0	4.7			NA	NA			B	.000500	A			.000500

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5\,(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5\,(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .009000 %/1000 HRS

B-A 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94004 — 1.1 APPENDIX A — DATE: 4/26/71

ASSEMBLY: Counting & Data Compression — SUB ASSEMBLY: — SCHEMATIC NO: 2347552

(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	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U32/8	SN54L00T17	TI	TTL	14/78	150	15/79	5.3	5	4.7			40	40			GateB Oscillator	.000500	A			.000500
U32/14												30	30			B					
U13/3												NA	NA			C					
U13/5												NA	NA			C					
U13/8												40	40			C					
U13/14												30	30			C					
U61/3												10	10			GateA					
U61/5												30	30			A					
U61/8	SN54L00T17	TI	TTL	14/78	150	15/79	5.3	5	4.7			90	90			A	.000500	A			.000500

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8\,(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8\,(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .004500 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94004 — 1.1 APPENDIX A — DATE: 4/26/71

ASSEMBLY: Counting & Data Compression — SUB ASSEMBLY: — SCHEMATIC NO: 2347553

(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 (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 Notes)	FAILURE RATE MULTIPLIER	TCOUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U61/14	SN54L00T17	TI	TTL	14/78	150	15/79	5.3	5.0	4.7			30	30			Gate A	.000500	A			.000500
U62/3												10	10			B					
U62/5												30	30			B					
U62/8												90	90			B					
U62/14												30	30			B					
U63/3												10	10			C					
U63/5												30	30			C					
U63/8												90	90			C					
U63/14	SN54L00T17	TI	TTL	14/78	150	15/79	5.3	5.0	4.7			30	30			C	.000500	A			.000500

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8\,(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8\,(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .004500 %/1000 HRS

8=A 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94004 — 1.1 APPENDIX A — DATE: 4/26/71

ASSEMBLY: Counting & Data Compression — SUB ASSEMBLY: — SCHEMATIC NO: 2347552

(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	FAILURE RATE MULTIPLIER	TOTAL TCOUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U64/3	SN54L00T13	TI	TTL	14/78	150	15/79	5.3	5.0	4.7			20	20			GateA	.000500	A			.000500
U64/14												20	20			A					
U68/3												20	20			B					
U68/14												20	20			B					
U72/3												20	20			C					
U72/14	SN54L00T13											20	20			C	.000500				.000500
U65/3	SN54L10T13											20	20			A	.000975				.000975
U65/13												10	10			A	.000975				.000975
U65/5	SN54L10T13	TI	TTL	14/78	150	15/79	5.3	5.0	4.7			20	20			A	.000975	A			.000975

FAILURE RATE SOURCE (See Column 18)
A — ATM 605A — C — D — B

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .005925 %/1000 HRS

B&A 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94084 1.1 APPENDIX A DATE: 4/26/71

ASSEMBLY: Counting & Data Compression SUB ASSEMBLY: SCHEMATIC NO: 2347552

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 (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	FAILURE RATE MULTIPLIER	TQ COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U69/3	SN54L10T13	TI	TTL	14/78	150	15/79	4.7	5.0	5.3			20	20			Gate A	.000975	A			.000975
U69												20	20			A					
U69/13												10	10			B					
U73/3												20	20			B					
U73/5												20	20			C					
U73/13	SN54L10T13	TI	TTL	14/78	150	15/79	4.7	5.0	5.3			10	10			C	.000975	A			.000975

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .3 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .3 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .005850 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(CONNECTORS)

1.1 APPENDIX A

PROJECT: 94004

ASSEMBLY: Counting & Data Compression

SUB ASSEMBLY:

DATE: 4/26/71

SCHEMATIC NO: 2347552

(Connectors)

1 CIRCUIT, REF. DESIGNATION	2 TYPE DESIGNATION (CSC, MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	PINS: 4 NUMBER TOTAL	5 NUMBER ACTIVE	6 CURRENT RATED	7 CURRENT ACTUAL MAX.	8 CURRENT ACTUAL MIN.	9 VOLTAGE BETWEEN PINS RATED	10 VOLTAGE BETWEEN PINS ACTUAL	11 VOLTAGE BETWEEN PINS TRANSIENT	12 VOLTAGE ACROSS THE CONTACT STEADY STATE	13 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)
J-1	Pin, Header 2349497-8	AMP	60	12	NA							NA				4 Max		.001	A	.1	.0001/Pin .0012/ Connector

23 REQUIRED LIFE HOURS

24 FAILURE RATE SOURCES (FOR COLUMN 20) A MIL HDBK 217A B C D

25 CALCULATED MTBF HOURS

26 TOTAL FAILURE RATE .0012%/1000 HOURS

(BS-321A

PARTS APPLICATION ANALYSIS SUMMARY

Rev. B

1.2 APPENDIX A

PROJECT: 94004
ASSEMBLY: _____ SUB ASSEMBLY: _____

DATE: 3/15/71
SCHEMATIC NO: 2347542

Signal Conditioner & Command Decode

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	12	.000063	"S" Level
RESISTORS	2	.000044	"S" Level
DIODES			
TRANSISTORS			
MICRO-CIRCUITS	36	.052794	
TRANSFORMERS			
CONNECTORS	1	.008800	
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .061701 %/1000 HOURS

MEAN-TIME-TO-FAILURE 1.621×10^6 HOURS

MISSION SUCCESS PROBABILITY .989248

PARTS APPLICATION ANALYSIS

CAPACITORS

1.2 APPENDIX A

PROJECT: 94004 DATE: 3-15-71

ASSEMBLY: SIGNAL CONDITIONER & COMMAND DECODER -LMS SUBASSEMBLY: SCHEMATIC NO: 2347542

(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% STRESS LEVEL	13 SCREEN	14 SPECIAL ENVIRONMENT (QUOTED)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE X10-3	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C1	CKR13BX104KS	Aerovox	0.1	10	100		5.3	.053		0/64		.005	A		.001	.005		.000005
C2	CKR12BX102KS		0.0010	10														
C3																		
C4																		
C5																		
C6																		
C7																		
C8																		
C10																		
C11																		
C12			0.0010									.005				.005		.000005
C9	CSR13G105KS		1.0		50		5.3			0/64		.008	A		.001	.008		.000008

FOR USE OF RELIABILITY DEPT.

20 FAILURE RATE SOURCES (FOR COLUMN #12)
A ATM 605A B
C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE 000063 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

1.2 APPENDIX A

(Resistors)

PROJECT: 94004 DATE: 3-15-71

ASSEMBLY: SIGNAL CONDITIONER & COMMAND DECODER - TMS SUB ASSEMBLY: SCHEMATIC NO: 2347542

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or RETR) 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 RMS AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (SEE NOTES)	15 FAILURE RATE MULTIPLIER x10	16 TOTAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR07G472JS	Allen Bradley	47K	5	0.25		2.12		0/64		.022	A		.001	.022		.000022
R2	RCR07G331JS		330	5	0.25		2.12		0/64		.022	A		.001	.022		.000022

19 FAILURE RATE SOURCES (FOR COLUMN #12)
A ATM 605 A B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000044 %/1000 HRS

FORM 9004

BS-321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004

ASSEMBLY: Signal Conditioner & Command Decoder – LMS

SUB ASSEMBLY:

DATE: 3-15-71

SCHEMATIC NO: 2347542

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	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	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U29/8	SN5400T-17	TI	TTL	0/64	150	8.5/72.5	5.3	5.0	4.7			10	10			Gate	.440	A			.000440
U29/14												10	10								
U29/3												58	58								
U29/5	SN5400T-17					8.5/72.5						58	58				.440				.000440
U30/14	SN54L00T-17					0/65						80	80				.392				.000392
U30/5												50	50								
U30/8												80	80								
U30/3												80	80								
U31/14	SN54L00T-17	TI	TTL	0/64	150	0/65	5.3	5.0	4.7			10	10			Gate	.392	A			.000392

FAILURE RATE SOURCE (See Column 19)
A ATM605A
B
C
D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .003720 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94004 1.2 APPENDIX A DATE: 3-15-71

ASSEMBLY: Signal Conditioner & Command Decoder—LMS SUB ASSEMBLY: SCHEMATIC NO: 2347542

(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 Column 18)	FOR RELIABILITY USE ONLY: FAIL RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL NO. PER TYPE	FOR RELIABILITY USE ONLY: TOTAL FAILURE RATE (%/1000 HRS)
U31/3	SN54L00T-17	TI	TTL	0/64	150	1/65	5.3	5.0	4.7			10	10			Gate	.392	A			.000392
U31/5												10	10								
U31/8												10	10								
U26/5												10	10								
U26/8												10	10								
U26/3												80	80								
U25/8	SN5404			0/64	150	1/75	5.3	5.0	4.7			58	58			Hex	.310	A			.000310

FAILURE RATE SOURCE (See Column 18)

A AT34605A C

B D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE 003054 %/1000 HRS

9xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004

ASSEMBLY: Signal Conditioner & Command Decoder—LMS

SUB ASSEMBLY:

DATE: 3-15-71

SCHEMATIC NO: 2347542

(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	FOR RELIABILITY USE ONLY: FAILURE RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U25/6	SN5404T-17	TI	TTL	0/64	150	1/75	5.3	5.0	4.7			33	33			Hex	.310	A			.000310
U25/10												35	35								
U25/2												35	35								
U25/12												20	20								
U25/14												25	25								
U28/2												10	10								
U28/6												20	20								
U28/10												20	20								
U28/14	SN5404T-17	TI	TTL	0/64	150	1/75	5.3	5.0	4.7			10	10			Hex	.310	A			.000310

FAILURE RATE SOURCE (See Column 19)
A ATM605A
B
C
D

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

TOTAL FAILURE RATE .002790 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004

ASSEMBLY: Signal Conditioner & Command Decoder – LMS

SUB ASSEMBLY: _____

DATE: 3-15-71

SCHEMATIC NO: 2347542

(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	FOR RELIABILITY USE ONLY: FAIL RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TCOUNT PER TYPE	FOR RELIABILITY USE ONLY: TOTAL FAILURE RATE (%/1000 HRS)
U28/12	SN5404T-17	TI	TTL	0/64	150	1/75	5.3	5.0	4.7			10	10			Hex	.310	A			.000310
U28/8	SN5404T-17					11/75						5	5				.310				.000310
U1/2	SN54L04T-17					2/65						10	10				.268				.000268
U1/6												10	10								
U1/8												20	20								
U1/10												10	10								
U1/12												10	10								
U1/14												20	20								
U2/2	SN54L04T-17	TI	TTL	0/64	150	2/6.5	5.3	5.0	4.7			20	20			Hex	.268	A			.000266

FAILURE RATE SOURCE (See Column 19)

A ATM605A C _____

B _____ D _____

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .002496 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004

ASSEMBLY: Signal Conditioner & Command Decoder – LMS

SUB ASSEMBLY:

DATE: 3-15-71

SCHEMATIC NO: 2347542

(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	FOR RELIABILITY USE ONLY: FAILURE RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U2/6	SN54L04T-17	TI	TTL	0/64	150	2/65	5.3	5.0	4.7			20	20			Hex	.268	A			.000268
U2/8												20	20								
U2/10												10	10								
U2/12												10	10								
U2/14												20	20								
U17/6												40	40								
U17/8												80	80								
U17/10												80	80								
U17/12	SN54L04T-17	TI	TTL	0/64	150	2/65	5.3	5.0	4.7			20	20			Hex	.268	A			.000268

FAILURE RATE SOURCE (See Column 19)
A ATM605A
B
C
D

NOTE: DERATED VOLTAGE IS DETERMINED BY.
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE 002412 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004

ASSEMBLY: Signal Conditioner & Command Decoder — LMS

SUB ASSEMBLY:

DATE: 3-15-71

SCHEMATIC NO: 2347542

(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) NO^{-3}	SOURCE	FAIL RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U23 / 2	SN54L04T-17	TI	TTL	0/64	150	2 / 65	5.3	5.0	4.7			20	20			Hex	.268	A			.000268
U23 / 6												80	80								
U23 / 8												80	80								
U23 / 10												80	80								
U23 / 12												80	80								
U23 / 14	SN54604T-17					11 / 75						80	80				.268				.000268
U32 / 2	SN5404T-17											7.5	7.5				.310				.000310
U32 / 6												7.5	7.5				.310				.000310
U32 / 8	SN5404T-17	TI	TTL	0/64	150	11 / 75	5.3	5.0	4.7			10	10			Hex	.310	A			.000310

FAILURE RATE SOURCE (See Column 19)

A ATM605A

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 .002538 %/1000 HRS

9xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004

ASSEMBLY: Signal Conditioner & Command Decoder — LMS

SUB ASSEMBLY: _____

DATE: 3-15-71

SCHEMATIC NO: 2347542

(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) X10⁻³	SOURCE	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U32/10	SN5404T-17	TI	TTL	0/64	150	11/75	5.3	5.0	4.7			75	75			Hex	.310	A			.000310
U32/12						11/75						7.5	7.5				.310				.000310
U32/14	SN5404T-17					11/75						50	50				.310				.000310
U33/2	SN54L04T-17					2/65						20	20				.268				.000268
U33/6												50	50								
U33/8												40	40								
U33/10												30	30								
U33/12												20	20								
U33/14	SN54L04T-17	TI	TTL	0/64	150	2/65	5.3	5.0	4.7			30	30			Hex	.268	A			.000268

FAILURE RATE SOURCE (See Column 19)

A ATM 605A C _____

B _____ D _____

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5\,(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5\,(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE 002538 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004
ASSEMBLY: SIGNAL CONDITONER & COMMAND DECODER - LMS
SUB ASSEMBLY:
DATE: 3-15-71
SCHEMATIC NO: 2347542

(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) X10⁻³	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
U3 12/13	SN54L78T-17	TI	TTL	0/64	150	2/65	5.3	5.0	4.7			10/60	10/60			FF	.790	A			.000790
U3 9/8												30/60	30/60								
U4 12/13												20/60	20/60								
U4 9/8												30/60	30/60								
U5 12/13												20/60	20/60								
U5 9/8												40/60	40/60								
U20 9/8												10	10								
U19 9/8												80/90	80/90								
U22 8	SN54L78T-17	TI	TTL	0/64	150	2/65	5.3	5.0	4.7			80	80			FF	.790	A			.000790

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

20 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

23 TOTAL FAILURE RATE .007110 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004

ASSEMBLY: SIGNAL CONDITIONER & COMMAND DECODER - LMS

SUB ASSEMBLY:

DATE: 3-15-71

SCHEMATIC NO: 2347542

(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				TOTAL FAILURE RATE (%/1000 HRS)
				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) X10⁻³	SOURCE	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	
U15/13	SN54L78T-17	TI	TTL	0/64	150	2/69	5.3	5.0	4.7			10	10			FF	.790	A			.000790
U15/9/8												10/40	10/40								
U16/8												30	30								
U18/8												10	10								
U27/8	SN54L78T-17											10	10								
U21/13/12	SN54L73T-17											80/90	80/90								
U21/9/8	SN54L73T-17											80/80	80/80			FF					
U24/10	SN54L20T-17											10	10			GATE					
U24/2	SN54L20T-17	TI	TTL	0/64	150	2/69	5.3	5.0	4.7			10	10			GATE	.790	A			.000790

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .007110 %/1000 HRS

8xA 678

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004
ASSEMBLY: SIGNAL CONDITIONER & CAMMAND DECODER - LMS
SUB ASSEMBLY:
DATE: 3-15-71
SCHEMATIC NO: 2347542

(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				
				AMBIENT ACTUAL	JUNCTION RATED	JUNCTION ACTUAL	DERATED MAXIMUM	ACTUAL	DERATED MINIMUM	FAN IN %	% OF MAX I OR V	FAN OUT %	LOADING %	% OF MAX	MIN ACTUAL %		RATE (%/1000 HRS) X10⁻³	SOURCE	MULTIPLIER FAIL RATE	TQUANT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U35/2	SN54L20T-17	TI	TTL	0/64	150	2/65	5.3	5.0	4.7			80	80			GATE	.790	A			.000790
U35/10												80	80								
U36/2												80	80								
U36/10												80	80								
U6/2												60	60								
U6/10												40	40								
U12/2												20	20								
U12/10												20	20								
U13/2	SN54L20T-17	TI	TTL	0/64	150	2/65	5.3	5.0	4.7			40	40			GATE	.790	A			.000790

FAILURE RATE SOURCE (See Column 18)
A — ATM 605A
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 .007110 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004

ASSEMBLY: SIGNAL CONDITIONER & COMMAND DECODER - LMS

SUB ASSEMBLY:

DATE: 3-15-71

SCHEMATIC NO: 2347542

(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) X10-3	SOURCE	FAILURE RATE	MULTIPLIER	TOTAL FAILURE RATE (%/1000 HRS)
U13/10	SN54L20T-17	TI	TTL	0/64	150	0/65	5.3	5.0	4.7			20	20			GATE	.790	A			.000790
U9/2																					
U9/10												60	60								
U10/2												10	10								
U10/10												20	20								
U11/2												50	50								
U11/10	SN54L20T-17					0/65						40	40			GATE	.790				.000790
U34/9	SN54L93T-17					3.0/67						30	30			FF	.400				.00400
U34/10	SN54L93T-17	TI	TTL	0/64	150	3.0/67	5.3	5.0	4.7			30	30			FF	.400				.000400

FAILURE RATE SOURCE (See Column 19)

A: ATM 605A B: C: D:

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .006330 %/1000 HRS

8nA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.2 APPENDIX A

PROJECT: 94004

ASSEMBLY: SIGNAL CONDITIONER & COMMAND DECODER - LMS

SUB ASSEMBLY:

DATE: 3-15-71

SCHEMATIC NO: 2347542

(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				
				AMBIENT ACTUAL	JUNCTION RATED	JUNCTION ACTUAL	DERATED MAXIMUM	ACTUAL	DERATED MINIMUM	FAN IN %	% OF MAX I OR V	FAN OUT %	LOADING %	% OF MAX	MIN / ACTUAL %		RATE (%/1000 HRS) X10-3	SOURCE	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U34/12	SN54L93T-17	TI	TTL	0/64	150	3/67	5.3	5.0	4.7			20	20			FF	.400	A			.000400
U7/12	SN54L30T-17					0/64						30	30			GATE	1.55				.001550
U8/12	SN54L30T-17					0/64						30	30								
U14/12	SN54L30-T-17					0/64						50	50			GATE	1.55				.001550
U17/2	SN54L04T-17					2/65						80	80			hex	.268				.000268
U17/14	SN54L04T-17					2/65						80	80			hex	.268				.000268
		TI	TTL	18.9/65	150		5.3	5.0	4.7									A			

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE 005586 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(CONNECTORS)

PROJECT: 94004 1.2 APPENDIX A DATE: 3-15-71

ASSEMBLY: SIGNAL CONDITIONER & COMMAND DECODER SUB ASSEMBLY: SCHEMATIC NO: 2347542

(Connectors)

CIRCUIT REF. DESIG-NATION 1	TYPE DESIGNATION (CHC, 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 THR CONTACT STEADY STATE 12	PINS: VOLTAGE ACROSS THR CONTACT SURGE 13	AMBIENT TEMP °C 14	INSERT MATL 15	GUIDE 16	NO. OF INSERTIONS DURING LIFE 17	MISCELLANEOUS REMARKS 18	BASIC FAILURE RATE (%/1000 Hours) 19	SOURCE OF F.R. (See 24) 20	P.R. MODIFIER 21	TOTAL FAILURE RATE (%/1000 Hours) 22
	Circuit Board Connector	AMP	60	43		ima			12	NA			18.9/65			5		.088	217 A	.1	.008800

23 REQUIRED LIFE HOURS

24 FAILURE RATE SOURCES (FOR COLUMN 20) A MILHDBK 217A B C D

25 CALCULATED MTBF HOURS

26 TOTAL FAILURE RATE .0088 %/1000 HOURS

(BS-321A

PARTS APPLICATION ANALYSIS SUMMARY

1.3 APPENDIX A

Rev. B

PROJECT: 94004

DATE: 4-29-71

ASSEMBLY: Housekeeping Multiplexer SUB ASSEMBLY: _____

SCHEMATIC NO: 2347557

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE %/1Khr	COMMENTS
CAPACITORS	17	.000086	"S" level
RESISTORS	42	.006590	"S" level
DIODES	2	.001600	
TRANSISTORS			
MICROCIRCUITS	40	.093565	
TRANSFORMERS			
CONNECTORS	1	.007100	
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .108941 %/1000 HOURS

MEAN-TIME-TO-FAILURE 9.18×10^5 HOURS

MISSION SUCCESS PROBABILITY .981095

PARTS APPLICATION ANALYSIS

CAPACITORS

1.3 APPENDIX A

PROJECT: 94004
ASSEMBLY: Housekeeping Multiplexer
SUBASSEMBLY:
DATE: 4-29-71
SCHEMATIC NO: 2347557

(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	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) at __°C	14 Source (See Below)	For Use of Reliability Dept.	15 Special Environment (Define)	16 Failure Rate Multiplier	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 Hrs)
C2	CKR13BX104KS		0,1	10	100	5.3		053		-5.6/58		005	A			.001			.000005
C3						12		12											
C4						-12		12											
C5						-15		15											
C10						12		12											
C12						12		12											
C1	CKR12BX332KS		0,001			5.3		053											
C7																			
C14																			
C9	CKR12BX101KS		100pf			12		12											
C13						12		12											
C15						5.3		053											
C17						12		12											
C16						-12		12											
C11					100	-15		15				005							.000005
C8	CSR13G105KS		1,0	10	50	5.3		106				0063							.0000063
C6	CKR12BX472KS		0,0047	10	100	5.3		053		-5.6/58		005	A			.001			.000005

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM605A B ______
C ______ D ______

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .000086 % 1000 HRS

PARTS APPLICATION ANALYSIS

RESISTORS

1.3 APPENDIX A

(Resistors)

PROJECT: 94004 DATE: 4-29-71

ASSEMBLY: Housekeeping Multiplexer SUB ASSEMBLY: SCHEMATIC NO: 2347557

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/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 (DERATING)	15 FAILURE RATE MULTIPLIER	16 TOTAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R7	RNR55E4322FS		43.2K	1	.1	2.88	<.1	58/58			.171	A		.001			.000171
R8	RNR55E4992FS		49.9K	1	.1	2.88	<.1										
R10	RNR55E2000FS		200	1	.1	<1	<.1										
R11	RNR55E4322FS		43.2K	1	.1	2.01	<.1				.171						.000171
R16	RCRD7G331JS		330	5	.25	.011	<.1				.023						.000023
R2	RCR07G472JS		4.7K	5	.25	6.	<.1										
R1	RCR07G102J		1K	5	.25	1.17	<.1										
R15	RCR07G102J		1K	5	.25	1.56					.023						.000023
R18	RNR55E1004FS		100K	1	.01	<1	<1				.171						.000171
R20																	
R37																	
R38																	
R39																	
R40																	
R41																	
R42																	
R12						>1	>1										
R13	RNR55E1005FS		1M	1	.1	<1	<1	59/59			.171	A		.001			.000171

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM605A B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE: .002486 %/1000 HRS

FORM 0307

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

1.3 APPENDIX A

PROJECT: 94004 DATE: 4-29-71

ASSEMBLY: Housekeeping Multiplexer SUB ASSEMBLY: SCHEMATIC NO: 2347557

(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)	8 POWER RATIO OPERATING/RATED	9 MAXIMUM BUTT CYCLE	10 BULB AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DERATING)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R26	RNR55E2002FS		20K	1	.1	5	.05		58		.171 A			.001			.000171
R25	RNR55E1002FS		10K			1	.011										
R27			10K			2.5	.025										
R29			10K			1.3	.013										
R31			10K			1.3	.013										
R3	RNR55E4992FS		49.9K			>1	>1										
R28	RNR55E1003FS		100K			>1	>1										
R30			1			>1	>1										
R19	RNR55E1003FS		100K			>1	>1										
R4	RNR55E2000FS		200			--	>.01										
R22			200			--	>.01										
R5	RNR55E1212FS		21.1K			9.6	.096										
R21	RNR55E1004FS		100K			>1	>1										
R23	RNR55E4022FS		40.2K			2.88	.0288										
R24	RNR55E8061FS		8.06K			---	>.01										
R32	RNR55E2872FS		28.7K			7.84	.0784										
R33	RNR55E9091FS		9.09K			4.75	.0475										
R34	RNR55E6341FS		6.34K	1	1	---	>.01				.171 A			.001			.000171

19 FAILURE RATE SOURCES (FOR COLUMN #12)

A ATM605A B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .003078 %/1000 HRS

BS-321A

(Resistors)

PARTS APPLICATION ANALYSIS

RESISTORS

1.3 APPENDIX A

PROJECT: 94004 DATE: 4-29-71

ASSEMBLY: Housekeeping Multiplexer SUB ASSEMBLY: SCHEMATIC NO: 2347557

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 Operated/Rated	9 Maximum Duty Cycle	10 Hole 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	16 Final Failure Rate (%/1000 Hrs)	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 Hrs)
R17	RNR55E5004FS		500K	1	.1	>1	≤1		50		.160	A			.001			.000180
R14	RNR55E1005FS		1M								.160							.000180
R6	RNR55E100rFS		100K								.16							.000171
R9	RNR55E1004FS		100K								.16							.000171
R36	RNR55E1004FS		100K								.16							.00171
R35	RNR55E1004FS		100K	1	.1	< 1	< 1		50		.16							.000171

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A. ATM605A B. ______

C. ______ D. ______

20 CALCULATED MTBF ______ HRS

21 TOTAL FAILURE RATE .001026 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

1.3 APPENDIX A

PROJECT: 94004
ASSEMBLY: Housekeeping Multiplexer
SUB ASSEMBLY:
DATE: 4-29-71
SCHEMATIC NO: 2347557

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A ACTUAL	MAX. TEMP °C: AMBIENT T_A RATED	MAX. TEMP °C: JUNCTION T_J ACTUAL HOT SPOT	MAX. TEMP °C: CASE T_C ACTUAL	AVG PWR DISSIPATION (watts): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (watts): RATED AT 25°C: CASE	AVG PWR DISSIPATION (watts): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (watts): ACTUAL CASE T_C	AVG PWR DISSIPATION (watts): ACTUAL	POWER RATIO: ACTUAL P/R RATED (Amb or case)	POWER RATIO: ACTUAL T_A or T_C RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: SOURCE (See footnote)	FOR RELIABILITY USE ONLY: FAIL. RATE	FOR RELIABILITY USE ONLY: MULTIPLIER	FOR RELIABILITY USE ONLY: FINAL FAIL. RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	FOR RELIABILITY USE ONLY: COUNT	TOTAL FAILURE RATE (%/1000 HRS)
CR1	SM1N914	TI	50	200		250		-56/58										200	5			.0008	A						.0008
CR2	"	"	"	"		"		"										"	"			"	"						"

FAILURE RATE SOURCE (See Column 23)
A ATM605A C
B D

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

TOTAL FAILURE RATE .001600 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.3 APPENDIX A

PROJECT: 94004

ASSEMBLY: Housekeeping Multiplexer

SUB ASSEMBLY:

DATE: 4-29-71

SCHEMATIC NO: 2347557

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	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)
U 10/1	SNA54121	TI	TTL	-5.6 / 58	150	+5.9 / 70	5.3	5	4.7			10				One Shot	.0017	A			.001700
U 2/12	SNA54L51					0 / 60						20				Gate	.000725				.000725
U 1/12	SNA54L51											20									
U 4/12	SNA54L51											20									
U 3/12	SNA54L51											20									
U 6/12	SNA54L51											20									
U 5/12	SNA54L51											20									
U 5/10	SNA54L51											20									
U 20/3	SNA54L20	TI	TTL	-5.6 / 58	150	0 / 60	5.3	5	4.7			20				Gate	.000725	A			.000484

FAILURE RATE SOURCE (See Column 19)

A ATM605A

B

C

D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .007500 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.3 APPENDIX A

PROJECT: 94004
ASSEMBLY: Housekeeping Multiplexer
SUB ASSEMBLY:
DATE: 4/29/71
SCHEMATIC NO: 2347557

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	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	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U 20/5	SNA54L20T-17	TI	TTL	-5.6 / 58	150	0/ 60	5.3	5	4.7			20				GATE	.000725	A			.000484
U 20/13	SMA54L20T-17	TI	TTL			0/ 60						20					.000725	A			.000484
U 9/5	SNA54L00T-17					0/ 60						80					.000363				.000363
U 7/5	SNA5400					0/ 65						80					.000400				.000400
U 9/1	SNA54L00					0/ 60						40					.000363				.000363
U 7/1	SNA5400T-17					0/ 65						92.5					.000400				.000400
U 8/1	SNA5400					0/ 65						85					.000400				.000400
U 7/8	SNA5400					0/ 65						42.5					.000400				.000400
U 8/5	SNA5400T	TI	TTL	-5.6/ 58	150	0/ 60	5.3	5	4.7			10				GATE	.000400	A			.000400

FAILURE RATE SOURCE (See Column 16)
A - ATM605A
B -
C -
D -

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

TOTAL FAILURE RATE .003694 %/1000 HRS

8xA 879

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.3 APPENDIX A

PROJECT: 94004
ASSEMBLY: Housekeeping Mulitplexer
SUB ASSEMBLY:
DATE: 4-29-71
SCHEMATIC NO: 2347557

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN %	INPUTS: % OF MAX 1 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 (Ref Source)	FOR RELIABILITY USE ONLY: FAIL RATE	FOR RELIABILITY USE ONLY: MULTIPLIER	FOR RELIABILITY USE ONLY: TQ QUANT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U 8/8	SNA5400	TI	TTL	-5.6/58	150	0/65	5.3	5	4.7			50				GATE	.000400	A				.000400
U 9/8	SNA54L00					0/60						20					.000363					.000363
U 9/14	SNA54L00					0/60						50					.000363					.000363
U 2/10	SNA54L51					0/60						80					.000725					.000725
U 8/14	SNA5400					0/65						50				GATE	.000400					.000400
U12 9/8	SNA54L78					0/60						10/10				F/F	.000725					.000725
U13 12/13	SNA54L78											10/10										
U13 9/8	SNA54L78											10/10										
U14 12/13	SNA54L78	TI	TTL	-5.6/58	150	0/60	5.3	5	4.7			10/10				F/F	.000725					.000725

FAILURE RATE SOURCE (See Column 19)
A ATM605A
B
C
D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .005151 %/1000 HRS

BxA 879

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.3 APPENDIX A

PROJECT: 94004

ASSEMBLY: Housekeeping Multiplexer

SUB ASSEMBLY:

DATE: 4-29-71

SCHEMATIC NO: 2347557

(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	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U14 9/8	SNA54L78T-17	TI	TTL	-5.6/58	150	0/60	5.3	5.	4.7			10/10				F/F	.000725	A			.000725
U15 12/13																					
U15 9/8																					
U16 12/13																					
U17 12/13																					
U17 9/8												10/10					.000725				.000725
U11 12/13																	NOT USED				
U11 9/8												23/10					.000725				.000725
U19 12/13	SNA54L78T-17	TI	TTL	-5.6/58	150	0/60	5.3	5	4.7			23/10				F/F	.000725	A			.000725

FAILURE RATE SOURCE (See Column 19)

A ATM605A

B

C

D

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

TOTAL FAILURE RATE .005800 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.3 APPENDIX A

PROJECT: 94004

ASSEMBLY: Housekeeping Multiplexer

SUB ASSEMBLY: _____

DATE: 4-29-71

SCHEMATIC NO: 2347557

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	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	FOR RELIABILITY USE ONLY: FAIL RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U19 / 9/8	SNA54L78T-17	TI	TTL	-5.6 / 58	150	0 / 60	5.3	5	4.7			23 / 10				F/F	.000725	A			.000725
U18 / 12/13																					
U18 / 9/8																					
U22 / 12/13																					
U22 / 9/8																					
U21 / 12/13																					
U21 / 9/8																					
U24 / 12/13																					
U24 / 9/8	SNA54L78T-17	TI	TTL	-5.6 / 58	150	0/60	5.3	5	4.7			23 / 10				F/F	.000725	A			.000725

FAILURE RATE SOURCE (See Column 19)

A ATM605A C _____

B _____ D _____

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .006525 %/1000 HRS

B×A 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: 94004 | 1.3 APPENDIX A | DATE: 4-29-71

ASSEMBLY Housekeeping Multiplexer | SUB ASSEMBLY: | SCHEMATIC NO: 2347557

(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 (Ref Source)	FAILURE RATE MULTIPLIER	TOO MANY PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
U23 12/13	SNA54L78T-17	TI	TTL	-56/58	150	0/60	5.3	5	4.7			23/10				F/F	.000725	A			.000725
U23 9/8	SNA54L78T-17				50																
U26 12/13	SNA54L78T-17				50																
U26 9/8	SNA54L78T-17				50																
U25 12/13	SNA54L78T-17				50							23/10					.000725				.000725
U25 9/8	SNA54L78T-17				50	0/60										F/F	NOT USED				
U12 12/13	SNA54L78T-17				20	0/60						10/10				F/F	.000725				.000725
U 7/14	SNA5400				-56/58	0/65						80				GATE	.000400				.000400
U 6/10	SNA54L51	TI	TTL	-56/58	150	0/60	5.3	5	4.7			80				GATE	.000634	A			.000725

FAILURE RATE SOURCE (See Column 19)

A ATM605A B — C — D —

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8\,(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8\,(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .005475 %/1000 HRS

8xA 678

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.3 APPENDIX A

PROJECT: 94004
ASSEMBLY: Housekeeping Multiplexer
SUB ASSEMBLY:
DATE: 4-29-71
SCHEMATIC NO: 2347557

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	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	FAILURE RATE MULTIPLIER	TOTAL QUANTITY PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Q1	CDA2-1	Crystalonics	Dual hybrid	-56/58	200	0/58	5.3	5.	4.7							Switches	.00634	A			.00634
Q2																					
Q3																					
Q4																					
Q5																					
Q6																					
Q7																					
Q8	CDA2-1	Crystalonics	Dual hybrid	-56/58	200	0/58	5.3	5	4.7							Switches	.00634	A			.00634

FAILURE RATE SOURCE (See Column 18)
A ATM605A
B
C
D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .050720 %/1000 HRS

B×A 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.3 APPENDIX A

PROJECT: 94004

ASSEMBLY: Housekeeping Multiplexer

SUB ASSEMBLY: _____

DATE: 4-29-71

SCHEMATIC NO: 2347557

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	INPUTS: FAN IN %	INPUTS: φ @ 0db	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: GAIN	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: SOURCE	FOR RELIABILITY USE ONLY: FAILURE RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TCOUNT PER TYPE	FOR RELIABILITY USE ONLY: TOTAL FAILURE RATE (%/1000 HRS)
AR1	LM108A	NSC	linear	-56/58	150	0/60	5.3	5	4.7		90°			36db		AMP	.00145	A			.00145
AR2														-10db							
AR3														0db							
AR4														0db							
AR5														-12db							
AR6	LM108A	NSC	linear	-56/58	150	0/60	5.3	5	4.7		90°			-10db		AMP	00145	A			.00145

FAILURE RATE SOURCE (See Column 19)

A ATM605A

B _____ C _____

D _____

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .008700 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(CONNECTORS)

PROJECT: 94004 — 1.3 APPENDIX A — DATE: 4/29/71

ASSEMBLY: Housekeeping Multiplexer — SUB ASSEMBLY: _____ — SCHEMATIC NO: 2347557

(Connectors)

1 CIRCUIT REF. DESIGNATION	2 TYPE DESIGNATION (CBC, MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	PINS: 4 NUMBER TOTAL	5 NUMBER ACTIVE	6 CURRENT RATED	7 CURRENT ACTUAL MAX.	8 CURRENT ACTUAL MIN.	9 VOLTAGE BETWEEN PINS RATED	10 VOLTAGE BETWEEN PINS ACTUAL	11 VOLTAGE BETWEEN PINS TRANSIENT	12 VOLTAGE ACROSS THE CONTACT STEADY STATE	13 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 34)	21 F.R. MODIFIER	22 TOTAL FAILURE RATE (%/1000 Hours)
	Circuit Board Connector	AMP	60	37									-56 / 58					.071	A	.10	.0071

23 REQUIRED LIFE HOURS

34 FAILURE RATE SOURCES (FOR COLUMN 20): A MIL HDBK 217A B _____ C _____ D _____

35 CALCULATED MTBF _____ HOURS

36 TOTAL FAILURE RATE .0071 %/1000 HOURS

DD Form

(BS-321A

PARTS APPLICATION ANALYSIS SUMMARY

1.4 APPENDIX A

PROJECT: 94004
ASSEMBLY: LVPS SUB ASSEMBLY: _____ DATE: 4-6-71
SCHEMATIC NO: 2347482

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE %/1K hr.	COMMENTS
CAPACITORS	32	.000746	"S" Level
RESISTORS	57	.012553	"S" Level
DIODES	19	.013080	
TRANSISTORS	17	.033200	
MICROCIRCUITS	5	.006450	
TRANSFORMERS	1	.002000	
CONNECTORS	1	.002000	17 Pins
COILS & CHOKES	5	.001000	

TOTAL ASSEMBLY FAILURE RATE .071029 %/1000 HOURS

MEAN-TIME-TO-FAILURE 1.41×10^6 HOURS

MISSION SUCCESS PROBABILITY .987633

PARTS APPLICATION ANALYSIS

CAPACITORS

1.4 APPENDIX A

PROJECT: 94004 DATE: 4-3-71

ASSEMBLY: Low Voltage Power Supply SUBASSEMBLY: SCHEMATIC NO: 2347482

(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	Peak AC	8 Voltage Ratio Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	13 Base Failure Rate (%/1000 hrs) at	14 Source	15 (For use of Reliability Dept.)	Special Environment (Define)	Failure Rate Multiplier	17 Final Failure Rate x 10-3	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 hrs)
M. B.	C_1	CSR13G226KS	Sprague	22		50	29		.58	100%	-12/52	Filt.	.084	A			.001	.084	1	.000084
	C_2 C_3	CMR02F392F3S	Elmeneo	.0039		300	12		>.1			Timing Osc.	.017					.017	2	.000034
A-1	C_1	CKR12BX101KS	Aerovox	100pf	±10	100	6		>.1			Compensation	.005					.005	1	.000005
	C_2	CKR12BN03KS		0.01		100	12		.12			Compensation	.005					.005	1	.000005
A-2	C_1 C_3	CKR06BX103KK		0.01		200	15		>.1			Compensation	.005					.005	2	.000010
	C_2 C_4	CSR13G475KS	Sprague	4.7		50	15		.3			Filter	.013					.013	2	.000026
A-3	C_1 C_3	CKR05BX101KS		100pf		200	12		>.1			Compensation	.005					.005	2	.000010
	C_4	CSR13G475KS		4.7		50	12		.24			Filter	.007					.007	1	.000007
A-4	C_1 C_4	CKR06BX472KS	Aerovox	.0047		200	3		>.1			Compensation	.005					.005	2	.000010
	C_2	CSK13F685KS	Sprague	6.8		35V	12		.34			Timing	.015					.015	1	.000015
	C_3	CKR06BX103KS	Aerovox	0.01		200	14		>.1			Noise Filter	.005					.005	1	.000005
	C_5	CKR05BX102KS		.001		200	0		0			Noise Filter	.005					.005	1	.000005
A5	C_1	CSR130156KS	Sprague	15		50	29		.58			Turn On	.084					.084	1	.000084
	C_2	CSR136105KS		1		50	29		.58			Turn On	.084					.084	1	.000084
	C_3 C_4	CSK13F685KS		6.8		35	20		.57			Filter	.084					.084	2	.000168
	C_5 C_6	CSR13G105KS		1		50	12		.24			Filter	.010					.010	2	.000020
	C_7 C_8	CSR13D226KS		22		15	5		.33			Filter	.015					.015	2	.000030
	C_9 C_{10} C_{12}	CSR13G475KS		4.7		50	12		.24			Filter	.010					.010	3	.000030
	C_{11}	CSR13G105KS		1		50	12		.24		-12/52	Filter	.010				.001	.010	1	.000010

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605A B

C D

21 CALCULATED MTBF ____ HRS

22 TOTAL FAILURE RATE .000642 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

1.4 APPENDIX A

PROJECT: 94004
ASSEMBLY: Low Voltage Power Supply
SUBASSEMBLY:
DATE: 4-3-71
SCHEMATIC NO: 2347482

(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 Operated Voltage DC	7 Operated Voltage Peak AC	8 Voltage Ratio, Operated/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	12 Circuit Function or Application	13 Basic Failure Rate (%/1000 HRS) at °C	14 Source (See Below)	For use of Reliability Dept	15 Special Environment (Define)	16 Failure Rate Multiplier	17 Final Failure Rate x10^-3	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 HRS)
T1	C1	CKR06BX472KS	Aerovox	.0047		200	29		.15	100%	-12 / 52		.005	A			.001	.005	1	.000005
A-3	C2	CSR13F685KS	Sprague	6.8		35	12		.34	100%	-12 / 52	Filter	.015	A			.001	.015	1	.000015
MB	C4	CSR13G105KS	Sprague	.1		50	29		.58	100%	-12 / 52		.084	A			.001	.084	1	.000084

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

21 CALCULATED MTBF ________ HRS

22 TOTAL FAILURE RATE .000104 %/1000 HRS

PARTS APPLICATION ANALYSIS

RESISTORS

1.4 APPENDIX A

PROJECT: 94004 DATE: 4-3-71

ASSEMBLY: Low Voltage Power Supply SUB ASSEMBLY: ______ SCHEMATIC NO: 2347482

(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)	8 Power Ratio Operating/Rated (mw)	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	16 Final Failure Rate (%/1000 Hrs) x10^-3	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 Hrs)
M. B	R1	RWR81SR100FS		0.1	1	1	.3	.3		-12 / +52	Current Sence.	.121	A			.001	.000 121	1	.000121
	R2 R3	RNR55E3011FS		3.01K	.1	.1	.012	.1			LVPS Temp Mon.	.159					.159	2	.000318
	RT1	2335661-2	Fenwal									.003					3.0	1	.003
A-1	R1 R2	RNR55E8062FS		80.6	1	.1	>1	>.1			Current Mont.	.159					.159	2	.000318
	R3, 4, 5 6, 7	RNR65C1004FS		1M	1	.25	>1	>.1			Current Mont.	.159					.159	5	.000795
A-2	R1, 2 4, 5	To be selected		TBS*	*	.1	>10	>.1			VR	.159					.159	4	.000636
A-3	R1	RCR07G560JS		56	5	.25	>10	>.1			VR	.022					.022	1	.000022
	R2	RNR55E1432FS		14.3K	1	.1	>10	>.1			VR	.159					.159	1	.000159
	R3	RNR55E2401DS		2.4K	.5	.1	>10	>.1			VR	.159					.159	1	.000159
	R4	RCR07G270JS		27	5	.25	>10	>.1			VR	.022					.022	1	.000022
	R5 R6	To be selected		TBS*	X	.1	>10	>.1			VR	.159					.159	2	.000318
A-4	R1 R4	RNR55E4701DS		4.7K	.5	.1	12	.1			Oscil. & Protect.	.159					.159	2	.000318
	R2 R3	RNR55E6812DS		68.1K	.5	.1	18	.2				.159					.159	2	.000318
	R5	RCR07G101JS		100	5	.25	>10	>.1				.022					.022	1	.000022
	R6 R19	RNR55E3321DS		3.3K	.5	.1	>10	>.1				.159					.159	2	.000318
	R7	RNR55E2672FS		26.7K	5	.1	>26	>.3				.159					.159	1	.000159
	R8	RCR07G333JS		33K	5	.25	>20	>.2				.022					.022	1	.000022
	R9, 20	RCR07G470JS		47	5	.25	>10	>.1		-12 / 52		.022				.001	.022	2	.000044

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A. ATM605A B. ______

C. ______ D. ______

20 CALCULATED MTBF ______ HRS

21 TOTAL FAILURE RATE .007069 %/1000 HRS

BS-321A

*See PBM-2347490 for range of values

PARTS APPLICATION ANALYSIS

RESISTORS

1.4 APPENDIX A

PROJECT: 94004 DATE: 4-3-71
ASSEMBLY: Low Voltage Power Supply SUB ASSEMBLY: SCHEMATIC NO: 2347482

(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 (mw)	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	16 Final Failure Rate (%/1000 Hrs) x10-3	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 Hrs)
A-4	R10	RCR07G683JS		68K	5	.25	>10	>.1		-12/52	Oscil & Protect	.022	A			.001	.022	1	.000022
	R11, 13	RCR07G243JS		24K	5	.25	>10	>.1				.022				.001	.022	2	.000044
	R12	RNR55E3320FS		332	1	.1	>10	>.1				.154				.001	.159	1	.000159
	R14	RNR55E1432FS		14.3K	1	.1	>10	>.1				.159				.001	.159	1	.000159
	R16, R18	RCR07G201JS		200	5	.25	>10	>.1				.022				.001	.022	2	.000044
	R17	RWR81S1R00FS		1	1	1	40	>.1				.060				.001	.060	1	.000060
A-5	R1	RCR07G102JS		1K	5	.25	*	*			Turn-On Delay	.022				.001	.022	1	.000022
A-6	R1, 2, 5, 6, 9, 10	RNR55E3572FS		357K	1	.1	>10	>.1			Control CKT	.159				.001	.159	6	.000954
	R3, 4, 7, 8, 11, 12	RNR55E491FS		4.99K	1	.1	30	.3			Control CKT	.159				.001	.159	6	.000954
A-4	R21	RCR07G272JS		2.7K	5	.25	>10	>.1				.022				.001	.022	1	.000022
A2	R6	RCR07G100JS		10	5	.25	>10	>.1				.022				.001	.022	1	.000022
A2	R3	RCR07G750JS		75	5	.25	>10	>.1				.022				.001	.022	1	.000022
A3	ART1	2346238-1	YSI	Thermistor			>10	>.1		-12/52	Temp Comp. VR	.003				---	3.0	1	.003000

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #12)
A. ATM605A B. ______
C. ______ D. ______

20 CALCULATED MTBF ______ HRS

21 TOTAL FAILURE RATE .005484 %/1000 HRS

*Peak Power at turn on is 800mw-exp. decay.
Avg power is less than .1 mw

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: 94004 — 1.4 APPENDIX A — DATE: 4-3-71

ASSEMBLY: Low Voltage Power Supply — SUB ASSEMBLY: — SCHEMATIC NO: 2347482

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A	MAX. TEMP °C: 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	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE T_N	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED (Amb. or case)	POWER RATIO: ACTUAL/RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) X 10⁻¹	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL RATE (%/1000 HRS)	COUNT: TOTAL	COUNT: PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
A2 Q_1	PNP S2N2905A	MOT TI	-12	52	200	-12 52	750	0 .15			100										VR		2.9	A	E			1	.00290
A3 Q1	NPN S2N4863	SOL TI			-12	-12 53	3W	0 .15			130												2.6		1			1	.00260
A4 Q1	(2) NPN S2N2920	GE TI			200	-12 53	750	0 .15			>10												1.3		1			2*	.00260
A4 Q2	NPN S2N2222A	TI			200	-12 53	500	0 .15			≈0												1.3		1			1	.00130
A4 Q3	(2) NPN S2N2060	GE MOT TI			120	-12 52	750	0 .15			>10												1.3		1			2*	.00260
A4 Q4 Q6	NPN SZN4863	SOL TI			200	-13 53	300	0 .15			16												2.6		1			2	.00520
A4 Q5 Q7	NPN S2N4863	SOL TI			200	-13 53	3W	0 .15			316												2.6		1			2	.00520
A4 CR 1&2	S1N914	GE TI			200	-12 52	250	0 .15			>10												.66		1			2	.00132
A4 CR3	S1N914	GE TI			200	-12 52	250	0 .15			>10												.66		1			1	.00066

FAILURE RATE SOURCE (See Columns 29): A ATM605A B C D

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

TOTAL FAILURE RATE .00438 %/1000 HRS.

*Dual transistors

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

1.4 APPENDIX A

PROJECT: 94004

ASSEMBLY: Low Voltage Power Supply

SUB ASSEMBLY:

DATE: 4-3-71

SCHEMATIC NO: 2347482

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (watts): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (watts): RATED AT 25°C: CASE RN	AVG PWR DISSIPATION (watts): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (watts): ACTUAL CASE T_C	AVG PWR DISSIPATION (watts): ACTUAL	POWER RATIO: ACTUAL @ 25°C Amb or case	POWER RATIO: ACTUAL T_C or T_A / RATED T_J	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL RATE (%/1000 HRS)	TOTAL COUNT 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	23	24	25	26	27	28	29
A4 CR 3, 4	S1N914	CE TI	-12 52	200	-12 52	250	0 .15			>10											X 10^{-3} .66	A	1		2	.00132
A4 CR 5, 6	S1N914	GE TI			-12 52	250	0 .15			>10											.66	A	1		2	.00132
A5 CR 1, 2	S1N4942	SCM			12 52	1 W	0 .15			>10											.66	A	1		2	.00132
A5 CR 7, 8	S1N5417	SEM			+2 +66	3 W	0 .20			250											.79	A	1		2	.00159
A5 CR 6, 9	S1N5417	Sem			-12 52	3 W	0 .15			35											.79	A	1		2	.00159
A5 CR 5, 10	S1N4942	Sem			-10 54	1 W	0 .15			>10											.66	A	1		2	.00132
A5 CR 4, 11	S1N4942	Sem			-10 54	1 W	0 .15			>10											.66	A	1		2	.00132
A5 CR 3, 12	S1N4942	Sem			-10 54	1 W	0 .15			-10											.66	A	1		2	.00132

FAILURE RATE SOURCE (See Column 25)
A ATM 605A C
B D

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

TOTAL FAILURE RATE .01110 %/1000 HRS.

Form BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

1.4 APPENDIX A

PROJECT: 94004 DATE: 4-3-71

ASSEMBLY: Low Voltage Power Supply SUB ASSEMBLY: SCHEMATIC NO: 2347482

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A ACTUAL	MAX. TEMP °C: AMBIENT T_A RATED	MAX. TEMP °C: JUNCTION T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (watts) RATED AT 25°C: AMBIENT	RATED AT 25°C: CASE	AVG PWR DISSIPATION (watts): AMBIENT T_A ACTUAL	AVG PWR DISSIPATION (watts): CASE T_C ACTUAL	AVG PWR DISSIPATION (watts): ACTUAL	POWER RATIO: ACTUAL °C RATED (Amb. or case)	POWER RATIO: ACTUAL RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED	MAXIMUM VOLTAGES: V_{CB} ACTUAL	MAXIMUM VOLTAGES: V_{CEO} RATED	MAXIMUM VOLTAGES: V_{CE} ACTUAL	DIODE PIV: RATED	DIODE PIV: ACTUAL	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) X 10^{-3}	SOURCE (See below)	FAIL RATE	MULTIPLIER	FINAL RATE (%/1000 HRS)	TOTAL FAIL PER TYPE	COUNT TOTAL	TOTAL FAILURE RATE (%/1000 HRS)
A5	S2N4863	S01	-12	52	200	-5	3	0			120																			
$Q_{1,2}$	NPN	TI				69	W	20																						
A6	S2N2920	GE	-12	52	200	-12	750	0			>10																			
$Q_{1,3,5}$	NPN	TI				52		15																						
A6	S2N2060	GE	-12	52	120	-12	750	0			>10																			
$Q_{2,4,6}$	NPN	MOT TI				52		15																						

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

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

TOTAL FAILURE RATE .010800 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

1/4 APPENDIX A

PROJECT: 94004

ASSEMBLY: Low Voltage Power Supply

SUB ASSEMBLY:

DATE: 4-3-71

SCHEMATIC NO: 2347482

(Inductors & Transformers)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (OIL or DRY) AND CONSTRUCTION	3 MANUFACTURER	CONSTRUCTION 4 TYPE OF CASE (SEE BELOW)	5 WDG SEC. PRIMARY	6 WDG SEC. SECONDARY	7 INSULATION CLASS	8 VA RATING	9 INDUCTANCE AT RATED CUR.	10 SPECIFIED FREQ	11 MISCELLANEOUS	TEMPERATURE (°C) 12 OPERATING AMBIENT (NOT HOT SURFACE)	13 RISE (AS METHOD)	14 EST. ACTUAL RISE	15 OPERATING TEMP MAX.	16 ACTUAL	PRIMARY CURRENT 17 RATED	18 PRIMARY VOLTAGE	SECONDARY 19 NO. WINDINGS	20 WINDING NO.	21 VOLTAGE	22 WORKING VOLTS	23 HIPOT READING	24 BASIC FAILURE RATE (λb/1000 HRS)	25 SOURCE (SEE BELOW)	26 TOTAL FAILURE RATE (λ/1000 HRS)
																								REL. DEPT USE ONLY		
T1	2347630-1	O. Schott	C																				002	A	.002
A5L1,2	2346204-1																						002		.0004
L1	2340394-4																						002		.0002
A5L 3	2346209-1																						002		.0002
A5L 4	2346211-1																						002		.0002

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

29 FAILURE RATE SOURCES (FOR COLUMN 25)
A. ATM605A B.
C. D.

30 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .003 λ/1000 HRS

BxA 321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.4 APPENDIX A

PROJECT: 94004 DATE: 4-3-71

ASSEMBLY: Low Voltage Power Supply SUB ASSEMBLY: SCHEMATIC NO: 2347482

(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: Rated P.W. (mw)	OUTPUTS: ACT PW	SPEED: % OF MAX	CLOCK WIDTH: MIN ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE	FAILURE RATE	MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
A3 VR1	SM105G	NSC	LN	-12/ 52	150							500	150			Positive VR	.00129	A			1	.00129
A3 VR2	SM105G				150							500	80			Positive VR					1	
A2 VR1	SM104G				150							500	160			Negative VR					1	
A2 VR2	SM104G	NSC			150							500	35			Negative VR					1	
A1 AR1	LM108AH	NSC	LN	-12 52	125							500	7			Op-Amp.	.00129				1	.00129

FAILURE RATE SOURCE (See Column 19)
A ATM605A C
B D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .00645 %/1000 HRS

BxA 678

PARTS APPLICATION ANALYSIS

(CONNECTORS)

1.4 APPENDIX A

PROJECT: 94004

ASSEMBLY: Low Voltage Power Supply SUB ASSEMBLY:

DATE: 4-3-71

SCHEMATIC NO: 2347482

(Connectors)

1 CIRCUIT, REF. DESIGNATION	2 TYPE DESIGNATION (CHC, MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	4 PINS TOTAL	5 PINS ACTIVE	6 CURRENT RATED	7 CURRENT ACTUAL MAX.	8 CURRENT ACTUAL MIN.	9 VOLTAGE BETWEEN PINS RATED	10 VOLTAGE BETWEEN PINS ACTUAL	11 VOLTAGE BETWEEN PINS TRANSIENT	12 VOLTAGE ACROSS THE CONTACT STEADY STATE	13 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. X # of Pin	22 TOTAL FAILURE RATE (%/1000 Hours)
N/A	P.C. Board	Amp	40	17*									-12 52			3	FR Pin	118	A	17 x10	.002 -3

23 REQUIRED LIFE HOURS

24 FAILURE RATE SOURCES (FOR COLUMN 20) A MIL H.B. 217A B C D

25 CALCULATED MTBF _____ HOURS

26 TOTAL FAILURE RATE .002 %/1000 HOURS

*Adjusted for redundancy.

(BS-321A

PARTS APPLICATION ANALYSIS SUMMARY

1.5 APPENDIX A

Rev. B

PROJECT: 94004
ASSEMBLY: _____ SUB ASSEMBLY: _____

DATE: 5-15-71
SCHEMATIC NO: 2347571

Electron Multiplier H.V.P.S.

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	19	.0001302	"S" level
RESISTORS	21	.000471	"S" level
DIODES	23	.019760	
TRANSISTORS	6	.019350	
RELAYS	2	.000574	
TRANSFORMERS	1	.002000	
CONNECTORS			
MICROCIRCUITS	1	.001300	
		.0430112	

TOTAL ASSEMBLY FAILURE RATE .043068 %/1000 HOURS

MEAN-TIME-TO-FAILURE 2.32x10^6 HOURS

MISSION SUCCESS PROBABILITY .992492

PARTS APPLICATION ANALYSIS

CAPACITORS

1.5 APPENDIX A

(Capacitors)

PROJECT: 94004

DATE: 5-15-71

ASSEMBLY: Electron Multiplier High Voltage Power Supply

SUBASSEMBLY:

SCHEMATIC NO: 2347571
Assy. 2347567

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value µfd	5 Tolerance %	6 Manufacturer's Rated Voltage	Operating Voltage DC	Operating Voltage Peak AC	Voltage Ratio Operating/Rated	Maximum Duty Cycle	Bulk Temperature (°C)	Circuit Function or Application	13 Basic Failure Rate (%/1000 hrs) at °C	14 Source (See Below)	15 Special Environment (Define)	16 Failure Rate Multiplier	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 hrs)
C1,2, 3,8	CKR06BX103KS		.01	10	200	29		.15	100	-13 +53		.0050	A		.001	.005	4	.000020
C4,5, 9	CKR06BX104KS		0.10		100	29		.30				.0050				.005	3	.000015
C6	CSR13D226KS		22		15	.5		.03			Charge	.0065				.006	1	.000006
C7	CSR13G186KS		18		50	25		.50			Filter	.0387				.039	1	.000039
C1-4	2340399-3	EOD	5000 pfd		6000v	3000		.50			Filter (2347430)	.0050				.005	4	.000020
C1-6	2544389-2	Bx-EOD	5000 pfd	10	6000v	500		.09		-13 +53	Charge (2347429)	.0050	A		.001	.005	6	.000030

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

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .000130 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

1.5 APPENDIX A

PROJECT: 94004 DATE: 5-15-71

ASSEMBLY: Multiplier H.V.P.S. SUB ASSEMBLY: Assy 2347567 SCHEMATIC NO: 2347571

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OR ATM) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER AVAIL	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 (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DERATE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR05G225JS		2.2M	5	1/8	<1	<.1	100%	-13 +53		.022 A			.001	.022	1	.000022
R2,4	RCR05G565JS		5.6M			<1	<.1									2	.000044
R3	RCR05G335JS		3.3M			<1	<.1									1	.000022
R5,10 16	RCR05G474JS		470K			<1	<.1									3	.000066
R6,7	RCR05G393JS		39K			<1	<.1									2	.000044
R8,9	RCR05G911JS		910			<1	<.1									2	.000044
R11	RCR05G274JS		270K			<1	<.1									1	.000022
R12	RCR05G471JS		470			<1	<.1				.022				.022	1	.000022
R13	RCR05G822JS		8.2K			78	≈.5				.031				.031	1	.000031
R14	RCR05G8R2JS		8.2			<1	<.1				.022				.022	1	.000022
R15	RCR05G104JS		100K			<1	<.1									1	.000022
R17, R20	To be selected			5	1/8	<1	<.1									2	.000044
R1,5	RCR05G273JS		27K	5	1/4	5	<.1				.0					2	.000044
R6	MOX 1125	VICT.	1G		1	9	<.1	100%	-13 53	(5000 V) Filter (2347430)	.022 A			.001	.002	1	.000022

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

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .00047 %/1000 HRS

FORM 9894
BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

1.5 APPENDIX A

PROJECT: 94004

ASSEMBLY: Electron Multiplier High Voltage Power Supply

SUB ASSEMBLY:

DATE: 5-15-71

SCHEMATIC NO: 2347571 Assy 2347567

1 CKT SYM NO.	2 TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	3 MANUFACTURER	4 MAX. TEMP °C: AMBIENT ACTUAL T_A	5 MAX. TEMP °C: RATED JUNCTION T_J	6 MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	7 AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT	8 RATED AT 25°C CASE	9 ACTUAL AMBIENT T_A	10 ACTUAL CASE T_C	11 ACTUAL	12 POWER RATIO: ACTUAL / RATED 25°C (Amb or case)	13 ACTUAL / RATED T_A or T_C	14 MAXIMUM VOLTAGES: V_{CBO} RATED V	15 V_{CB} ACTUAL V	16 V_{CEO} RATED V	17 V_{CE} ACTUAL V	18 DIODE PIV: RATED V	19 DIODE PIV: ACTUAL V	20 CIRCUIT FUNCTION or APPLICATION	21 PART SPECIAL ENVIRONMENT (Define)	22 RATE (%/1000 HRS)	23 SOURCE (See below)	24 FAIL. RATE	25 MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	26 TOTAL COUNT PER TYPE	27 TOTAL FAILURE RATE (%/1000 HRS)
Q1	PNP JANTX 2N2905A	MOT	-13 / +53	200		600	3w	.46	.26 / .62	280				60		60			VR			A			x 10-3 11.3	1	.011300
Q4	NPN JANTX 2N2484	TI				360	1.2 w	.09	0 / .25	34				—		—			VR						1.61	1	.001610
Q2/3	NPN 2N4863					3w		>.01	0 / .16	30				140		120			Osc						1.61	2	.003220
Q5	NPN JANTX 2N2484	TI				360		>.01	0 / .16	1				—		—			S.C. Prot						1.61	1	.001610
Q6	NPN JANTX 2N2484	TI				360	1.2 w	>.01	0 / .16	1				60		60			VR						1.61	1	.001610
CR1 thru CR10	1N4833			200		400		>.01	0 / .16	<1							70		G.P.	.000 67					67	10	.006700
CR1 thru CR12	SS4948 (Mult Assy 2347429)			175		1.2 w		>.01	0 / .19								1000		H.V. Rec	.000 92					92	12	.011040
VR1	1N4103		-13 / +53	200		250		>.01	0 / .16								9.1	VZ	VR	.00 202					2.02	1	.002020

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

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

30 TOTAL FAILURE RATE .039110 %/1000 HRS.

BS-321A

(Semiconductors)

PARTS APPLICATION ANALYSIS

(RELAYS)

1.5 APPENDIX A

PROJECT: 94004 DATE: 5/15/71

ASSEMBLY: Multiplier H.V.P.S. SUB ASSEMBLY: SCHEMATIC NO: 2347571 Assy 2347567

(Relays)

1 CIRCUIT REFERENCE DESIGNATION	2 TYPE DESIGNATION (COC, MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	CONTACT LOAD: 4 RATED VOLTAGE V	5 RATED CURRENT A	6 ACTUAL VOLTAGE STEADY STATE V	7 ACTUAL VOLTAGE PEAK V	8 ACTUAL CURRENT STEADY STATE A	9 ACTUAL CURRENT SURGE A	10 TYPE OF LOAD	11 NUMBER OF POLES TOTAL	12 NUMBER OF POLES ACTIVE	RELAY COIL: 13 POWER MAX. RATED	14 POWER ACTUAL	15 VOLTAGE MAX. PULL IN	16 VOLTAGE MIN. OPER.	17 RATE OF OPERATIONS PER HOUR OR SECOND	18 REQ'D LIFE OPERATIONS	19 MISCELLANEOUS REMARKS	20 BASIC FAILURE RATE (%/1000 HRS)	21 SOURCE OF F.R. (SEE BELOW)	22 F.R. MODIFIER	23 TOTAL FAILURE RATE (%/1000 HOURS)
K1	Latching D.P.D.T. (24176)	Teledyne	12V				500 Ma		Res							100K hr.	50			A	.01	.000287
K2	Latching D.P.D.T. (24176)	Teledyne	12V				500 Ma		Res							100K hr	50			A	.01	.000287
	NOTE: $Q = \frac{N}{10^{+4}} X.01 = N \times 10^{-6}$	where N =	50																			
	$Q = 5 \times 10^{-5}$																					

24 DEVICE AVERAGE AMBIENT TEMPERATURE °C

25 FAILURE RATE SOURCES (FOR COLUMN NO. 21)
A MIL HDBK 217A B
C D

26 CALCULATED MTBF HOURS

27 TOTAL FAILURE RATE .000574 %/1000 HRS

BS-321 A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

1.5 APPENDIX A

PROJECT: 94004 DATE: 5-15-71

ASSEMBLY: Electron Multiplier High Voltage Power Supply SUB ASSEMBLY: Assy 2347567 SCHEMATIC NO: 2347571

(Inductors & Transformers)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	CONSTRUCTION: 4 TYPE OF CASE (SEE BELOW)	5 TURNS SIZE, PRIMARY	6 TURNS SIZE, SECONDARY	7 INSULATION CLASS	8 VA RATING	9 INDUCTANCE AT RATED CUR.	10 SPECIFIED FREQ	11 MEGGER READING	TEMPERATURE (°C): 12 OPERATING AMBIENT (EXPT. SPOT SOLDER)	13 RISE (AS METHOD EST. ACTUAL RISE	14 OPERATING TEMP MAX.	15 ACTUAL	PRIMARY CURRENT: 16 RATED	17 ACTUAL	18 PRIMARY VOLTAGE	SECONDARY: 19 NO. WINDINGS	20 WINDING NO.	21 VOLTAGE	22 WINDINGS	HIPOT READING: 23 VOLTS	24 BASIC FAILURE RATE (%/1000 HRS) – λ_b =	25 SOURCE (SEE BELOW)	26	27 TOTAL FAILURE RATE (%/1000 HRS)
																								REL. DEPT USE ONLY			
T-1	3544871 Transformer	EOD								-13 +53														A			.002

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

29 FAILURE RATE SOURCES (FOR COLUMN #25)
A. ATM 605A B.
C. D.

30 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .002 %/1000 HRS

BxA 321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.5 APPENDIX A

PROJECT: 94004

ASSEMBLY: Electron Multiplier High Voltage Power Supply

SUB ASSEMBLY: _____

DATE: 5-15-71

SCHEMATIC NO: 2347571 Assy 2347567

(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: Gain	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 Column 19)	FOR RELIABILITY USE ONLY: FAIL RATE	FOR RELIABILITY USE ONLY: MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
AR1	LM108A (OP AMP)	NAT. SEMI		-12.8 +57.5	150	0 53	±13.8	±12	NA			Odb				Amp	.00130	A				.00130 22.75

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .00130 %/1000 HRS

GAA 679

PARTS APPLICATION ANALYSIS
SUMMARY

1.6 APPENDIX A

Rev. B

PROJECT: 94004
ASSEMBLY: Ion Pump HVPS
SUB ASSEMBLY: _____
DATE: 5/15/71
SCHEMATIC NO: 2347570

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	27	.000209	"S" level
RESISTORS	47	.000902	"S" level
DIODES	3	.015180	
TRANSISTORS	6	.015440	
RELAYS	1	.000287	
TRANSFORMERS	1	.002000	
MICROCIRCUIT	3	.003990	
MISC. PARTS	2	.000040	

TOTAL ASSEMBLY FAILURE RATE .038048 %/1000 HOURS

MEAN-TIME-TO-FAILURE 2.63 x 106 HOURS

MISSION SUCCESS PROBABILITY .993334

PARTS APPLICATION ANALYSIS

CAPACITORS

1.6 APPENDIX A

(Capacitors)

PROJECT: 94004 DATE: 5-15-71
ASSEMBLY: ION PUMP HVPS -/S SUBASSEMBLY: SCHEMATIC NO: 2347570
Assy 2347556.

1 Circuit Symbol Number	2 Type Designation (MIL or MFR) and Construction	3 Manufacturer	4 Capacitance Value MM	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)	12 Circuit Function or Application	13 Basic Failure Rate (%/1000 Hrs) at __ °C	14 Source (See Below)	For Use of Reliability Dept.	15 Special Environment (Define)	16 Failure Rate Multiplier	17 Final Failure Rate $x10^{-3}$	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 Hrs)
C6	CKR06BX103KS		.01	10%	200	12		<.1	100%	-12.8 / 52.5		005	A			.001	.005	1	.000005
C9	CKR05BX470KS		47 Pfd		200	1		<.1											
C17	CKR05BX470KS		[illegible]		200	3		<.1											
C7	CKR06BX103KS		.01		200	12		<.1											
C10	CKR06BX103KS		.01		200	12		<.1											
C14	CKR05BX470KS		47 Pfd		200	1		<.1											
C11	CKR05BX103KS		.01		200	12		<.1											
C8	CMR0GE222J03		.0022		200	3		<.1											
C12	CKR06BX103KS		.01		200	12		<.1											
C13	CKR06BX103KS		.01		200	12		<.1											
C17	CKR05BX470KS		47 Pfd		200	1		<.1											
C15	CKR06BX103KS		.01		200	12		<.1											
C16	CKR05BX103KS		.01		200	12		<.1				005				001	.005	.	.000005
C1	CSR13D226KS		22		15V	6.8		.45				.029				001	.029		.000029
C2	CSR13G186KS		18		50V	28		.56				.053				.001	.053		.000053
C3	CKR05BX471KS		47Pfd		200	14		<.1				.005				.001	.005		.000005
C4	CKR06BX333KS		.033		100	1.2		<.1				.005				.001	.005		.000005
C5	CSR13C475KS		4.7	10%	10	5		.50				007				.001	.007	1	.000007
C1-C9	3544389-2		.005		20000			.23	100%	-12.8 / +52.5	Assy 2347442	.005	A				.005	9	.000045

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM605A B ____
C ____ D ____

21 CALCULATED MTBF ____ HRS

22 TOTAL FAILURE RATE .000209 % 1000 HRS

PARTS APPLICATION ANALYSIS

RESISTORS

1.6 APPENDIX A

PROJECT: 94004 DATE: 5-15-71

ASSEMBLY: Ion Pump H. V. P. S. SUB ASSEMBLY: SCHEMATIC NO: 2347570 Assy 2347566

(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) (MW)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULB AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% STRESS (SEE BELOW)	13	14 SPECIAL ENVIRONMENTS (DERATE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS) $\times 10^{-3}$	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR05G270JS		27	5%	1/8	10	< .1	100%	-128 +52.5		.022	A		.001	.022	1	.000022
R2	RCR05G224JS		220K			< 1										1	.000022
R3,	Note 1 (Kit 2347641)		?							Trim						2	.000044
R19, R21	Note 1		?													2	
R23, R29	Note 1		?													2	
R35, R42	Note 1		?							Trim						2	.000044
R4	RCR05G154JS		150K	5%												1	.000022
R6	RCR05G561JS		560	5%												1	
R7	RCR05G623JS		62K													1	
R9, R30	RCR05G103JS		10K													1	
R10	RCR05G513JS		51K													1	
R11	RCR05G334JS		330K													1	.000022
R12, R20	RCR05G104JS		100K													2	.000044
R22, R24																2	
R27, R28																2	
R34, R43	RCR05G104JS		100K													2	.000044
R13	RCR05G223JS		22K	5%	1/8	< 1	< .1	100%	-12.6 +52.5		.022	A		.001	.022	1	.000022

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #16)

A ATM605A B

C B

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000550 %/1000 HRS

BS-321A

Note 1: Choosen at final assay.

PARTS APPLICATION ANALYSIS

RESISTORS

1.6 APPENDIX A

(Resistors)

PROJECT: 94004
ASSEMBLY: Ion Pump H.V.P.S.
SUB ASSEMBLY:
DATE: 5-15-71
SCHEMATIC NO: 2347570
Assy 2347566

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) (MW)	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	16 Final Failure Rate (%/1000 HRS) x10⁻³	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 HRS)
R14 R37	M0X1125	Vict.	10G		1	< 1	< .1	100%	-128 / 52.5	(5KV)	.022	A		.001	.022	2	.000044
R15 R38	RCR05G126JS		12M	5	1/8	< 1	< .1									2	.000044
R39	RCR05G126JS		12M			< 1	< .1									1	.000022
R16 R25	RCR05G225JS		2.2M			< 1	< .1									2	.000044
R17 R18	RCR05G472JS		4.7K													2	.000044
R40 R41	RCR05G472JS		4.7K													2	.000044
R26	RCR05G102JS		1K													1	.000022
R31	RCR05G153JS		15K	5	1/8	< 1	< .1									1	
R33	RCR05G106JS		10M	5	1/8	< 1	< .1									1	
R36	RCR05G473JS		47K	5	1/8	< 1	< .1			Note 2						1	
A-1 R1	RCR05G104JS		100K	5	1/8	< 1	< .1	100%	-128 / 52.5	(5KV)(Assy 2347442)	.022	A	3500VPC	.001	.022	1	.000022

19	20	21
FAILURE RATE SOURCES (FOR COLUMN #14) A ATM605A B ______ C ______ D ______	CALCULATED MTBF ______ HRS	TOTAL FAILURE RATE .000352 %/1000 HRS

Note 2: at 10ua out, Voltage drop is 100 volts

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: 94004 — 1.6 APPENDIX A — DATE: 5-15-71

ASSEMBLY: ION PUMP High Voltage P/S — SUB ASSEMBLY: — SCHEMATIC NO: 2347570 Assy 2347556

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A ACTUAL	MAX. TEMP °C: AMBIENT T_A RATED	MAX. TEMP °C: JUNCTION T_J ACTUAL	MAX. TEMP °C: CASE (SOT SPOT) T_C ACTUAL	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT T_A	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL RATED T_A or T_C (Amb/Case)	POWER RATIO: ACTUAL RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED	MAXIMUM VOLTAGES: V_{CB} ACTUAL	MAXIMUM VOLTAGES: V_{CEO} RATED	MAXIMUM VOLTAGES: V_{CE} ACTUAL	DIODE PIV: RATED	DIODE PIV: ACTUAL	CIRCUIT FUNCTION OR APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/10^3 HRS)	SOURCE (See below)	FAIL RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL PER TYPE	TOTAL COUNT	TOTAL FAILURE RATE (%/1000 HRS)
																								$\times 10^{-3}$				$\times 10^{-3}$			
VR1	IN 4099		70	200			400		71		1.7	NA							NA	6.8	Z		.66	A			.66	1	.000660
CR 1-16	SS 4948		70	200			200		70		71								IKV	>300	Assy 2347442		.66	A			.66	16	.010560
CR 1-6	IN 483B		70	200			500		70		71								70	12			.66	A			.66	6	.00396

(A-1)

FAILURE RATE SOURCE (See Column 29)
A ATM 605A
B
C
D

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

TOTAL FAILURE RATE .015180 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

1.6 APPENDIX A

PROJECT: [illegible] 94004

ASSEMBLY: ION PUMP HVPS

SUB ASSEMBLY:

DATE: 5-15-71

SCHEMATIC NO: 2347570
Assy 2347566

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	JUNCTION RATED T_J	CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (watts): RATED AT 25°C: AMBIENT	CASE	ACTUAL: AMBIENT T_A	CASE T_C	ACTUAL	POWER RATIO: ACTUAL / RATED (Amb or case)	ACTUAL / RATED @ T_A °C	MAXIMUM VOLTAGES: V_{CEO} RATED V	V_{CB} ACTUAL V	V_{CBO} RATED V	V_{CB} ACTUAL V	DIODE PIV: RATED V	ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL RATE (%/1000 HRS)	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
	(2340375-1)		-12.8		0																						
Q1	2N2484 NPN	TI	52	200	52	360			< 1	< 1	.15	< .1	60	6.8	60	6.8						A				1	.00132
Q4	2N2484 NPN	TI			0 / 52	360			< 1	< 1	.15	< .1	60	21	60	21										1	.00132
	(SM)	M O T			20																						
Q3	2N2907 A PNP				82	400			70	70	.33	.17	60	8	40	8										1	.00452
Q2	2N2907 A PNP	M O T			0 / 52	400			< 1	< 1	.15	< .1	60	8	40	8										1	.00290
Q5	(S) 2N4863 NPN	Sdi tron			0 / 56	3W			70	.70	.18	< .1	140	29	120	29										1	.00274
Q6	(2346243-1) 2N3811ANPN	TI			0 / 52	750			< 1	< 1	.15	< .1	60	1	60	1										1	.00132

FAILURE RATE SOURCE (See Column 32)
A ATM 605A C
B D

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

TOTAL FAILURE RATE .01544 %/1000 HRS.

Form BS-321A

PARTS APPLICATION ANALYSIS

(RELAYS)

1.6 APPENDIX A

PROJECT: 94004

ASSEMBLY: Ion Pump H.V.P.S. SUB ASSEMBLY:

DATE: 5/15/71

SCHEMATIC NO: 2347570

Assy No. 2347566

(Relays)

CIRCUIT REFERENCE DESIGNATION 1	TYPE DESIGNATION (CSC, MIL OR MFR) AND CONSTRUCTION 2	MANUFACTURER 3	CONTACT LOAD: RATED VOLTAGE V 4	CONTACT LOAD: RATED CURRENT A 5	CONTACT LOAD: ACTUAL VOLTAGE STEADY STATE V 6	CONTACT LOAD: ACTUAL VOLTAGE PEAK V 7	CONTACT LOAD: ACTUAL CURRENT STEADY STATE A 8	CONTACT LOAD: ACTUAL CURRENT SURGE A 9	TYPE OF LOAD 10	NUMBER OF POLES: TOTAL 11	NUMBER OF POLES: ACTIVE 12	RELAY COIL: POWER MAX. RATED 13	RELAY COIL: POWER ACTUAL 14	RELAY COIL: VOLTAGE MAX. PULL IN 15	RELAY COIL: VOLTAGE MIN. OPER. 16	RATE OF OPERATIONS PER HOUR OR SECOND 17	REQ'D LIFE OPERATIONS 18	MISCELLANEOUS REMARKS 19	BASIC FAILURE RATE (%/1000 HRS) 20	SOURCE OF F.R. (SEE BELOW) 21	F.R. MODIFIER 22	TOTAL FAILURE RATE (%/1000 HOURS) 23
K1	Latching D.P.D.T. (24176)	Teledyne	12V				500 Ma		Res								10bK/hr	50			A	.01	.000287
NOTE: $Q = \frac{NX.01}{10^4} = N \times 10^{-6}$ where N = 50 operations																							
	$= 5 \times 10^{-5}$																						

DEVICE AVERAGE AMBIENT TEMPERATURE °C 24

FAILURE RATE SOURCES (FOR COLUMN NO. 21) 25

A MIL HDBK 217A B _____

C _____ D _____

CALCULATED MTBF _____ HOURS 26

TOTAL FAILURE RATE .000287 %/1000 HRS 27

BS-321 A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

PROJECT: 94004 | 1.6 APPENDIX A | DATE: 5-15-71

ASSEMBLY: Ion Pump HVPS | SUB ASSEMBLY: | SCHEMATIC NO: 2347570 Assy 2347566

(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 COND.	10 SPECIFIED FREQ	11 MISCELLANEOUS	TEMPERATURE (°C) 12 OPERATING AMBIENT (HOT SPOT SURFACE)	13 USE (AS METHOD)	14 EST. ACTUAL RISE	15 OPERATING TEMP MAX.	16 ACTUAL	17 RATED	PRIMARY CURRENT 18 PRIMARY VOLTAGE	SECONDARY 19 NO. WINDINGS	20 WINDING NO.	21 VOLTAGE	22 WINDINGS	23 VOLTS	HIPOT READING 24	25 BASIC FAILURE RATE (1/1000 HRS)	26 SOURCE (SEE BELOW)	27 TOTAL FAILURE RATE (1/1000 HRS)
																								REL. DEPT USE ONLY		
T_1	Transformer (2544870)	EOD																						A	.002	

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

29 FAILURE RATE SOURCES (FOR COLUMN 25)
a. MLHB 217A
b.
c.

29 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .002 1/1000 HRS

BxA 321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.6 APPENDIX A

PROJECT: 94004

ASSEMBLY: ION Pump High Voltage Power Supply SUB ASSEMBLY: _____

DATE: 5-15-71

SCHEMATIC NO: 2347570
Assy 2347566

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	AMBIENT RATED	JUNCTION ACTUAL	VOLTAGES: DERATED MAXIMUM	ACTUAL	DERATED MINIMUM	INPUTS: Gain (min)	Gain max	OUTPUTS: FAN OUT %	LOADING %	SPEED % OF MAX	CLOCK WIDTH MIN ACTUAL	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
AR1	LM108AH/883 (OP AMP)	NSC	linear	-12.8 / 52	150	0 / 54	±10.2	±12	±13.8	4.5 x10^{-3}	300 x10^{3}					Log Amp	.00133	A	1	1	.00133
AR2	LM108AH/883	NSC		-12.8 / 52		0 / 54				8 x 10^{-4}	300 x10^{3}					Log Amp Comp	.00133	A	1	1	.00133
AR3	LM108AH/883	NSC		-12.8 / 52		0 / 54	±10.2	±12	±13.8	1	1					Compar-ator	.00133	A	1	1	.00133

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8\,(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8\,(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .00399 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MISC. PARTS)

PROJECT: 94004 1.6 APPENDIX A DATE: 5-15-71

ASSEMBLY: Ion Pump High Voltage Power Supply SUB ASSEMBLY: Assy 2347566 SCHEMATIC NO: 2347570

(Misc. Parts)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (COC, MIL OR MFR) and CONSTRUCTION	3 MANUFACTURER	TEMPERATURE RANGE 4 MAX	TEMPERATURE RANGE 5 MIN	ELECTRICAL STRESS 6 RATED	ELECTRICAL STRESS 7 USE	8 PERCENT DUTY CYCLE	9 MAJOR CHARACTERISTICS and APPLICATION	FOR RELIABILITY USE ONLY 10 BASIC FAILURE RATE (%/1000 HOURS) at °C	11 SOURCE OF (REF. (15))	12 PART SPECIAL ENVIRONMENT (SYSTEM)	13 FAILURE RATE MULTIPLIER	14 TOTAL FAILURE RATE (%/1000 HOURS)
	3544447-5								.000				
R5	Sensitor	TI	52	0	1/8w		100%		.020			1	.000020
	Q81								.000				
R32	Sensitor	TI	52	0	1/8w		100%		.020			1	.000020

15 FAILURE RATE SOURCES (FOR COLUMN 11)
A. _____ B. _____
C. _____ D. MIL-HDBK-217 Chart 5.2.1.V

16 CALCULATED MTBF _____ HOURS

17 TOTAL FAILURE RATE .000040 %/1000 HOURS

BS-321A

PARTS APPLICATION ANALYSIS SUMMARY

1.7 APPENDIX A

PROJECT: ~~Apollo~~
ASSEMBLY: _____ SUB ASSEMBLY: _____ DATE: 5/1/71
SCHEMATIC NO: 2347532

Control and Monitor

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	4	.000119	"S" level
RESISTORS	17	.046820	"S" level
DIODES	6	.003960	
TRANSISTORS	8	.027900	
RELAYS	5	.000971	
MICROCIRCUITS	1	.001300	
CONNECTORS	1	.001000	9 active pins
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .082070 %/1000 HOURS

MEAN-TIME-TO-FAILURE 1.22×10^6 HOURS

MISSION SUCCESS PROBABILITY .985803

PARTS APPLICATION ANALYSIS

CAPACITORS

1.7 APPENDIX A

PROJECT: 94004 **DATE:** 5-1-71

ASSEMBLY: Control and Monitor **SUBASSEMBLY:** **SCHEMATIC NO:** 2347532 Assy 2347530

(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	13 Source	14 For Use of Reliability	15 Special Environment (Define)	16 Failure Rate Multiplier	17 Final Failure Rate X10^-3	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 hrs)
C1, 2, 3	CSR 13C 225KS	SP	220	10	10V	5		50%		-14 +51	Timing	.037	A			.001	.037		.000111
	t = 28 hr since unit has to operate only during the first 28 hrs after deployment																		
C4	CSRBG 102KS	SP	1	10	50	V		20%		-14 +51	D. C. Filter	.008	A			.001	.008		.000008

FAILURE RATE SOURCES (FOR COLUMN 13)
A ____ B ____
C ____ D ____

CALCULATED MTBF ____ HRS

TOTAL FAILURE RATE .000119 %/1000 HRS

PARTS APPLICATION ANALYSIS

RESISTORS

1.7 APPENDIX A

PROJECT: 94004 **DATE:** 5-1-71

ASSEMBLY: Control and Monitor **SUB ASSEMBLY:** **SCHEMATIC NO:** 2347432 Assy 2347530

(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 mW	8 Power Ratio (Operating/Rated)	9 Maximum Duty Cycle	10 Bulk Air Temperature °C	11 Circuit Function or Application (Location)	12 Basic Failure Rate (%/1000 hrs) at °C	Source (See below)	13 For use of reliability dept	14 Special Environments (Define)	Failure Rate Multiplier	15 Final Failure Rate (%/1000 hrs)	16 Total Resistor Count per Type	17 Total Failure Rate (%/1000 hrs)
C. B.	R1, 2, 10, 11	RNR55E4991FS		4.99K		.1	20	.2		-14 +51		.172	A			.001		4	.000688
	R3, 4, 8*	RNR55E3572FS		35.7K		.1	< 1	<.1				.159						3	.000476
	R12, 13	RNR55E3572FS		35.7K		.1	< 1	<.1				.159						2	.000318
	R5	RNR55E3011FS		3.01K		.1	< 1	<.1				.159						1	.000159
	R6*	RNR55E2942FS		29.4K		.1	< 1	<.1				.159						1	.000159
	R7*	RNR55E2432FS		24.3K		.1	< 1	<.1				.159						1	.000159
	R9*	RWR80S8R45FS		8.45		2	760	.4		-14 +51		.161				.001		1	.000161
** Remote Elements	R14, R15			193						32°	Survival Heater	.120				.1		2	.024000
	R20*			9			810				Dust Cover Release Heater	.12				.1		1	.012000
	R21	RER60F		TBD			1W	.2		32°	Backup Heater	.087	A			.1		1	.008700

Note* R6, R7, R8, R9, R20 need function for the first 5 hours after turnon

**Remote located elements included in this input; used wire wound valves at 100°C

T = 8 K hrs.

19 FAILURE RATE SOURCES (FOR COLUMN 14)	20	21
A ATM 605A B ____ C ____ D ____	CALCULATED MTBF ____ HRS	TOTAL FAILURE RATE .046820 %/1000 HRS

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

1.7 APPENDIX A

PROJECT: 94004

ASSEMBLY: Control and Monitor

SUB ASSEMBLY:

DATE: 5-1-71

SCHEMATIC NO: 2347532
Assy 2347530

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)	ACTUAL AMBIENT T_A (9)	ACTUAL CASE T_C (10)	ACTUAL (11)	POWER RATIO: ACTUAL / RATED (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	PART SPECIAL ENVIRON-MENT (Define)	RATE (%/1000 HRS)	SOURCE (See below)	FAIL RATE MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Q_4 1	2N2920 NPN		-14 / 51	200	0 / 51	300		-14 / 51		<1	<.1	<.1										A			4	(.0068) .01072
Q_5 2	2N2920 NPN		-14 / 51	200	0 / 54	300		-14 / 51		5	<.1	<.1										A			4	(.00290) .01160
Q_{3A}*	2N2920 NPN		-14 / 51	200	0 / 51	300		-14 / 51		<1	<.1	<.1										A			1	.00268
CR 1, 2, 3, 4, 5, 6	SIN 645		-14 / 51	200	-0 / 51	600		-14 / 51		<1	<.1	<.1					100		Spike Suppression			A	I		6	.00066 .00396
Q_{3B}*	2N2920 NPN		-14 / 51	200	0 / 54	300		-14 / 15		5	<.1	<.1										A			1	.00290

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

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

TOTAL FAILURE RATE .031860 %/1000 HRS.

* t = 28 hrs since circuit has to operate only during the first 28 hrs after deployment.

(Semiconductors)

PARTS APPLICATION ANALYSIS

(RELAYS)

PROJECT: 94004 — 1.7 APPENDIX A — DATE: 4/29/71

ASSEMBLY: Control and Monitor — SUB ASSEMBLY: — SCHEMATIC NO: 2347532 Assy 2347530

(Relays)

CIRCUIT REFERENCE DESIGNATION (1)	TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION (2)	MANUFACTURER (3)	CONTACT LOAD: RATED VOLTAGE V (4)	CONTACT LOAD: RATED CURRENT A (5)	CONTACT LOAD: ACTUAL VOLTAGE STEADY STATE V (6)	CONTACT LOAD: ACTUAL VOLTAGE PEAK V (7)	CONTACT LOAD: ACTUAL CURRENT STEADY STATE A (8)	CONTACT LOAD: ACTUAL CURRENT SURGE A (9)	TYPE OF LOAD (10)	NUMBER OF POLES: TOTAL (11)	NUMBER OF POLES: ACTIVE (12)	RELAY COIL: POWER MAX. RATED (13)	RELAY COIL: POWER ACTUAL (14)	RELAY COIL: VOLTAGE MAX. PULL IN (15)	RELAY COIL: VOLTAGE MIN. OPER. (16)	RATE OF OPERATIONS PER HOUR OR SECOND (17)	REQ'D LIFE OPERATIONS (18)	MISCELLANEOUS REMARKS (19)	FAILURE RATE (%/1000 HRS) (20)	SOURCE OF F.R. (SEE BELOW) (21)	F.R. MODIFIER (22)	TOTAL FAILURE RATE (%/1000 HOURS) (23)
$K_{1,3}$	2346264-1 DPST	Teledyne	28V	.5A	29	29	35 ma		Resistive	2	2	12V				104	30			A	2	.000342
K_2	2346739-1 SPDT	Teledyne	28V	.5	29	29	35 ma		Resistive	2	2						50				1	.000287
$K_{4,5}$	Hi Volt Relay (Radiator Plate)		5KV	1@ 30	1450	/354			Resistive	2	2					104	30				2	.000342
	NOTE: Q = 10^{-4} Operations = .01 x N Operations																						

DEVICE AVERAGE AMBIENT TEMPERATURE °C (24)

FAILURE RATE SOURCES (FOR COLUMN NO. 22) (25)
A ATM605A
B
C
D

CALCULATED MTBF _____ HOURS (26)

TOTAL FAILURE RATE .000971 %/1000 HRS (27)

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PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

1.7 APPENDIX A

PROJECT: 94004 DATE: 5-1-71

ASSEMBLY: Control and Monitor SUB ASSEMBLY: SCHEMATIC NO: 2347532 Assy 2347530

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 OR REMARKS	FOR RELIABILITY USE ONLY: FAILURE RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	FOR RELIABILITY USE ONLY: TOTAL FAILURE RATE (%/1000 HRS)
U1	SN54121	TI	TTL	-14 / 51	200	-0 / 53	5.3	5.0	4.7			10	10			Mono Stable	.0013		1		.0013
	T = 28 hr since the unit has to operate only during the first 28 hrs after deployment																				

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8\,(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8\,(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .001300 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(CONNECTORS)

1.7 APPENDIX A

PROJECT: 94004

ASSEMBLY: Control & Monitor

SUB ASSEMBLY:

DATE: 5-1-71

SCHEMATIC NO: 2347532 Assy 2347530

(Connectors)

CIRCUIT, REF. DESIGNATION	TYPE DESIGNATION (CSC, MIL OR MFR) AND CONSTRUCTION	MANUFACTURER	PINS: NUMBER TOTAL	PINS: NUMBER ACTIVE	PINS: CURRENT RATED	PINS: CURRENT ACTUAL MAX.	PINS: CURRENT ACTUAL MIN.	PINS: VOLTAGE BETWEEN PINS RATED	PINS: VOLTAGE BETWEEN PINS ACTUAL	PINS: VOLTAGE BETWEEN PINS TRANSIENT	PINS: VOLTAGE ACROSS THR. CONTACT STEADY STATE	PINS: VOLTAGE ACROSS THR. CONTACT SURGE	AMBIENT TEMP °C	INSERT MATL	GUIDE	NO. OF INSERTIONS DURING LIFE	MISCELLANEOUS REMARKS	BASIC FAILURE RATE (%/1000 Hours)	SOURCE OF F.R. (See 24)	P.R. MODIFIER	TOTAL FAILURE RATE (%/1000 Hours)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
J1	Pin Header Ass'y 2349497-4	Amp		9									-14 / 51			3		.0011	A	.1	.00011/Pin / .0010

23 REQUIRED LIFE HOURS

24 FAILURE RATE SOURCES (FOR COLUMN 20) A MIL HDBK 217A B C D

25 CALCULATED MTBF HOURS

26 TOTAL FAILURE RATE .001000 %/1000 HOURS

CRD 0363

(BS-321A

2.0 APPENDIX B

UTD PARTS APPLICATION ANALYSIS

WORKSHEETS

PARTS APPLICATION ANALYSIS
SUMMARY
2.1 APPENDIX B

PROJECT: LMS
DATE: 10 Feb. 1971
ASSEMBLY: Spectrometer Assembly
SUB ASSEMBLY: Spectrometer Assembly
SCHEMATIC NO: 151-405

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
BREAKSEAL	1	.000100	
RESISTORS	48	.001329	
ION SOURCE FIL 1, FIL 2	1	.00820D	
*ION PUMP	1	.050	
MULTIPLIER TUBES	1	.012000	
TRANSFORMERS			
BAKE OUT HEATER	1	.010000	
TEMP SENSOR	1	.002780	
		.034409	

* NOT INCLUDED IN TOTAL FAILURE RATE

TOTAL ASSEMBLY FAILURE RATE .034409 **%/1000 HOURS**

MEAN-TIME-TO-FAILURE 2.91×10^6 **HOURS**

MISSION SUCCESS PROBABILITY .993990

PARTS APPLICATION ANALYSIS

(MISC. PARTS)

2.1 APPENDIX B

(Misc. Parts)

PROJECT: LMS
ASSEMBLY: Spectrometer Assembly
SUB ASSEMBLY:
DATE: 10 February 1971
SCHEMATIC NO:

CIRCUIT SYMBOL NUMBER (1)	TYPE DESIGNATION (CSC, MIL OR MFR) and CONSTRUCTION (2)	MANUFACTURER (3)	TEMPERATURE RANGE MAX (4)	TEMPERATURE RANGE MIN (5)	ELECTRICAL STRESS RATED (6)	ELECTRICAL STRESS USE (7)	PERCENT DUTY CYCLE (8)	MAJOR CHARACTERISTICS and APPLICATION (9)	FOR RELIABILITY USE ONLY: BASIC FAILURE RATE (%/1000 HOURS) at ___°C (10)	SOURCE (SEE 015) (11)	PART SPECIAL ENVIRONMENT (DEFINE) (12)	FAILURE RATE MULTIPLIER (13)	TOTAL FAILURE RATE (%/1000 HOURS) (14)
1-3	151-365 Multiplier		+250	-300					.004			3	.012000
1-R	151-363 Resistors		+250	-300					00044			48	.001329
	Filaments								.0041			2	.00820
	Temp. Sensor												.002780
	Heater												.01000
	Breakseal												.000100
	151-366 Ion-pump												.050 *

15 FAILURE RATE SOURCES (FOR COLUMN 11)
A. ______ B. ______
C. ______ D. Mil Std 217 Chart XXIV

16 CALCULATED MTBF ______ HOURS

17 TOTAL FAILURE RATE .034409 %/1000 HOURS

GCD Form 9836

* NOT INCLUDED IN THE TOTAL FAILURE RATE.

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PARTS APPLICATION ANALYSIS SUMMARY

ATM 966 Rev. B

2.2.1 APPENDIX B

PROJECT: LMS **DATE:** 9 March 1972

ASSEMBLY: Emission Control **SUB ASSEMBLY:** Mother Board **SCHEMATIC NO:** 151-552

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	6	.00072	
RESISTORS	51	.06437	
DIODES	32	.03350	
TRANSISTORS	10	.01533	
RELAYS	6	.00120	
TRANSFORMERS	7	.00800	
[illegible] Photo Switch.	7	.01260	
[illegible] Micro Circuits	2	.00275	

TOTAL ASSEMBLY FAILURE RATE .13847 **%/1000 HOURS**

MEAN-TIME-TO-FAILURE 7.22×10^5 **HOURS**

MISSION SUCCESS PROBABILITY .97599

PARTS APPLICATION ANALYSIS

CAPACITORS

2.2.1 APPENDIX B

PROJECT: LMS DATE: 9 March 1972

ASSEMBLY: Emission Control SUBASSEMBLY: Mother Board SCHEMATIC NO: 151-552

(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% CONFIDENCE LEVEL	13 SOURCE	14 SPECIAL ENVIRONMENT (DISTRIBUTED)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
~~C1~~	~~CSR13G106K~~	~~M39003/01 2898~~	~~.10~~	~~10~~	~~75~~	~~29~~		~~.4~~	~~100~~	~~60~~		~~.0230~~		~~.01~~				~~.000230~~
C2	CSR13G106K	M39003/01 2898	.10	10	75	29		.4	100	60		.0236		.01				.000236
C3	CKR05BX102K	0317	.001	10	200	29		.15	100	60		.005		.01				.00005
C4	CKR13BX104K	0153	.1	10	100	5		<.1	100	60		.005		.01				.00005
C5	CKR13BX104K	0153	.1	10	100	5		<.1	100	60		.005		.01				.00005
C6	CKR13BX103K	.0153	.01	10	50	3		.06	50	60		.017		.01				.00005
C7	151-360 DD 30-202	Central lab	.002		3000	150		.5	100	60		.016		.01				.00016

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 .000722 X 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

2.2.1 APPENDIX B

(Resistors)

PROJECT: LMS DATE: 9 March 72

ASSEMBLY: Emission Control SUB ASSEMBLY: Mother Board SCHEMATIC NO: 151-552

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	13 SOURCE (SEE BELOW)	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	RCR20G104JS	39008	100K	5	.5	9	<.1	100	60		.022	A			.001			.000022
R2	RCR07G220JS	39008	22	5	.250	1	<.1	100	60		.022				.001			.000022
R3	RCR07G221JS	39008	220	5	.250	20	<.1	100	60		.022				.001			.000022
R4	RCR07G103JS	39008	10K	5	.250	2.5	<.1	100	60		.022				.001			.000022
R5	RCR070471JS	39008	470	5	.250	54	.2	100	60		.022				.001			.000022
R6	RCR32G180JS	39008	18	5	1.0	180	.18	100	60		.022				.001			.000022
R7	RCR32G180JS	39008	18	5	1.0	180	.18	100	60		.022				.001			.000022
R8	RCR07G103JS	39008	10K	5	.25	2.5	<.1	100	60		.022				.001			.000022
R9	RCR070471JS	39008	470	5	.25	54	.2	100	60		.022				.001			.000022
R10	RCR07G561JS	39008	560	5	.25	25	.1	100	60		.022				.001			.000022
R11	RCR07G682JS	39008	6.8K	5	.25	16	<.1	100	60		.022				.001			.000022
R12	RCR07G682JS	39008	6.8K	5	.25	16	<.1	100	60		.022				.001			.000022
R13	RCR070561JS	39008	360	5	.25	25	.1	100	60		.022				.001			.000022
R14	RCR07G103JS	39008	10K	5	.25	2.5	<.1	100	60		.022				.001			.000022
R15	RCR070472JS	39008	4.7K	5	.25	5	<.1	100	60		.022				.001			.000022
R27	151-351 PME 60	Pyrofilm	*	1	125	3	<.1	100	60		.168				01			.00168
R28	" "	Pyrofilm	*	1	125	3	<.1	100	60		.168				01			.00168
R29	" "	Pyrofilm	*	1	125	3	<.1	100	60		.168				01			.00168

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

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .005370 %/1000 HRS

FMEA 9/69

BS-321A *Selected during final test

PARTS APPLICATION ANALYSIS

RESISTORS

(Resistors)

PROJECT: LMS DATE: 9 March 72

ASSEMBLY: Emission Control SUB ASSEMBLY: Mother Board SCHEMATIC NO: 151-552

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 (DERATING)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R30	151-351 PME 60n	Pyrofilm	*	1	125	3	<.1	100	60		.168	A		.01			.00168
R31	151-351PME 60n	Pyrofilm	*	1	125	3	<.1	100	60		.168			.01			.00168
R32	151-351PME 60n	Pyrofilm	*	1	125	3	<.1	100	60		168			.01			.00168
R33	151-351PME 60n	Pyrofilm	*	1	125	3	<.1	100	60		168			.01			.00168
R34	151-351PME 60n	Pyrofilm	*	1	125	3	<.1	100	60		168			.01			.00168
R35	151-351PME 60n	Pyrofilm	*	1	125	3	<.1	100	60		.168			.01			.00168
R23	151-351PME 60n	39008	*	5	250	5	<.1	100	60		.022			.001			.000022
R24	RCR07GXXXJS	39008	*	5	250	2.5	<.1	100	60		.022			.001			.000022
R25	RCR07G753JS	39008	*	5	250	2.5	<.1	100	60		.022			.001			.000022
R26	RCR07G753JS	39008	75K	5	250	6.5	<.1	60			.022	A		.001			.000022
R16	RCR07G681JS	39008	680	5	250	23	<.1	60			.022	A		.001			.000022
R17	RCR07G681JS	39008	680	5	250	23	<.1	60			.022	A		.001			.000022
R18	RCR07G631JS	39008	680	5	250	23	<.1	60			.022	A		.001			.000022
R19	RCR076681JS	39008	680	5	250	6	<.1	60									.000022
R20	RCR07G472JS	39008	4.7K	5	250	25	.1	60									.000022
R21	151-351-02-500	Pyrofilm	50M	1		Max Voltage/Oper volt. 2.500/1367											.000022
R22	RCR07G184JS	39008	180K	5	250	1	<.1										.000022
R37	RCR07G103JS	39008	10K	5	250	<1	<.1										.000022

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 .01034 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

2.2.1 APPENDIX B

(Resistors)

PROJECT: LMS DATE: 9 March 1972

ASSEMBLY: Emission Control SUB ASSEMBLY: Mother Board SCHEMATIC NO: 151-552

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 FOR USE OF RELIABILITY DEPT SOURCES (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DERATED)	15 FAILURE RATE MULTIPLIER	16 TOTAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R38	RCR07G103JS	39008	10K	5	250	<1	≤.1										.000022
R39	RCR07G103JS	39008	10K	5	250	<1	≤.1										.000022
R40	RCR07G103JS	39008	10K	5	250	2.5	≤.1										.000022
R41	RCR07G103JS	39008	10K	5	250	2.5	<.1										.000022
R42	RCR07G103JS	39008	10K	5	250	2.5	<.1										.000022
R36	RCR07G474JS	39008	47K	5	250	<1	<.1										.000022

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A_____ B_____

C_____ D_____

20 CALCULATED MTBF_____ HRS

21 TOTAL FAILURE RATE .00013 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

(Semiconductors)

PROJECT: LMS **DATE:** 9 March 1972

ASSEMBLY: Emission Control **SUB ASSEMBLY:** Mother Board **SCHEMATIC NO:** 151-552

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED @ 25°C (Amb. or case)	POWER RATIO: ACTUAL/RATED @ T_J or T_A	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See Below)	FAIL. RATE	MULTIPLIER	FINAL RATE (%/1000 HRS)	TOTAL FAIL. PER TYPE	COUNT	TOTAL FAILURE RATE (%/1000 HRS)
CR1	151-364 IN4942	SEM	60	175	60	750	750	720	720	<1							200	30				A				1	.00050
CR2 thru CR9	SMIN914A		60	175	60	250	250	191	191	3	<.1	<.1					75	5	.006							8	.00050
CR21 thru C28	151-364-01 IN4942		60	175	60	750	750	720	720	<1	<.1	<11					200			.0005						8	.00050
CR17 thru CR20	151-364 IN4942		60	175	60	750	750	720	720	5	<.1	<.1					200									4	.00050
CR30 thru CR32	SMKN914A		60	175	60	250	250	191	191	<1	<.1	<.1					200									3	.00050
CR16 CR29	151-369-01 IN4942		60	175	60	750	750	720	720	<1	<.1	<.1														2	.00050
CR11	151-497-XX Zener			200	70	380		380	10	10	<.1						7.5v		Ref							1	.00410
CR12				200	70	380		380		10	<.1						10v		Ref							1	.00410
CR13				200	80	380		380		10	<.1						7.5v		Ref							1	.00410
CR19	151-368 IN4942			175	60	720	720	720	700	<1	<.1	<.1	<.1				200		com.							1	.00050
CR15	151-498-XX Zener			200	70	380		380		10	<.1						8.2v		Ref							1	.00410
CR18			60	200	80	380		380		10	<.1						13v		Ref							1	.00410

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

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

30 TOTAL FAILURE RATE .03350 %/1000 HRS.

7088

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LMS 2.2.1 APPENDIX B DATE: 9 March 1972

ASSEMBLY: Emission Control SUB ASSEMBLY: Mother Board SCHEMATIC NO: 151-552

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mW): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mW): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mW): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mW): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mW): ACTUAL	POWER RATIO: ACTUAL/RATED @ Amb or case	POWER RATIO: ACTUAL T_A or T_C/RATED	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL PER TYPE	COUNT	TOTAL FAILURE RATE (%/1000 HRS)
Q1	NPN S2N1486	Sol	60	200	62	25w		19.7		500	<.1	<.1	100	58	100	58						A						.002624
Q2	S2N1486	Sol	60	200	62	25w		19.7		500	<.1	<.1	100	58	100	58												.002624
Q3	NPN S2N2102	RCA	60	200	64	1w	5w	.80	4.0	100	.125	.025	120		65													.00141
Q4	NPN S2N2102	RCA	60	200	64	1w	5w	.80	4.0	100	.125	.025	120		65													.00141
Q5	S2N2222A		60	175	60	500	1.8	383	1.44	.18	<.1	<.1	60	5	60	5												.001210
Q6	S2N2222A	TI	60	175	60	500	1.8 w	383	1.37	.18	<.1	<.1	60	5	30	5												.001210
Q7	S2N2222A		60	175	60	500	1.8 w	383	1.37	.18	<.1	<.1	60	5	30	5												.001210
Q8	S2N2222A		60	175	60	500	1.8 w	383	1.37	.18	<.1	<.1	60	5	30	5												.001210
Q9 Q10	S2N2222A		60	175	60	500	1.8	383	1.37	2.40	<.1	<.1	60	5	30	5												.002420

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

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

TOTAL FAILURE RATE .. 015328 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(RELAYS)

PROJECT: LMS | 2.2.1 APPENDIX B | DATE: 9 March 1972

ASSEMBLY: Emission Control | SUB ASSEMBLY: Mother Board | SCHEMATIC NO: 151-552

(Relays)

1 CIRCUIT REFERENCE DESIGNATION	2 TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	CONTACT LOAD: RATED 4 VOLTAGE V	RATED 5 CURRENT A	ACTUAL 6 VOLTAGE STEADY STATE V	ACTUAL 7 VOLTAGE PEAK V	ACTUAL 8 CURRENT STEADY STATE A	ACTUAL 9 CURRENT SURGE A	10 TYPE OF LOAD	NUMBER OF POLES 11 TOTAL	12 ACTIVE	RELAY COIL 13 POWER MAX. RATED	14 POWER ACTUAL	15 VOLTAGE MAX. PULL IN	16 VOLTAGE MIN. OPER.	17 RATE OF OPERATIONS PER HOUR OR SECOND	18 REQ'D LIFE OPERATIONS	19 MISCELLANEOUS REMARKS	20 BASIC FAILURE RATE (%/1000 HRS)	21 SOURCE OF F.R. (SEE BELOW)	22 F.R. MODIFIER	23 TOTAL FAILURE RATE (%/1000 HOURS)
K1	151-345-01 BR17A-E1-V3	Babcock	28	2	45 80	47 84	250 250			2	2									A		.0002
K2	151-345-01 BR17A-E1-V3	Babcock	28	2	300	300	u	u	R	2	2									A		.0002
K3	151-345-01 BR17A-E1-V3	Babcock	28	2	300	300	u	u	R	2	2									A		.0002
K4																						
K5																						
K6	151-345-01 BR17A-E1-V3	Babcock	28	2	300	300	U	u	R	2	2									A		.0002

24 DEVICE AVERAGE AMBIENT TEMPERATURE °C

23 FAILURE RATE SOURCES (FOR COLUMN NO. 21)
A MLHB 217A B
C D

29 CALCULATED MTBF _____ HOURS

27 TOTAL FAILURE RATE .0012 %/1000 HRS

BS-321 A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

PROJECT: LMS — 2.2.1 APPENDIX B — DATE: 9 March 1972

ASSEMBLY: Emission Control — SUB ASSEMBLY: Mother Board — SCHEMATIC NO: 151-552

(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 B)	14 RISE (AIR 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	25 BASIC FAILURE RATE (λb/1000 HRS) @ Tc = °C	26 SOURCE (SEE BELOW)	27 TOTAL FAILURE RATE (λ/1000 HRS)
																									REL. DEPT USE ONLY		
T1	151-319-01	Leightner	C	20	30	V			10E		60			70				27.5	7	4-6	5				A		.002
					16															7-8	2.5						
					22															11-13	3						
					16															9-10	2.5						
					36															14-15	20						
					36															16-17	90						
					32															18-20	13						
T2	151-320-02	Leightner	C	18	32	V	.015				60			5	65	1.5	3	2.5	1	1-2	10						.001
T3	151-320-01	Leightner	C	18	32	V	.015				60			5	65	1.5	3	2.5	1	1-2	10						.001
T4	151-321-01	Leightner	C	18	32	V	.001				60			2	62	1.5	3	2.5	1	3-4	5						.001
T5	151-320-01	Leightner	C	18	32	V	.015				60			5	65	1.5	3	2.5	1	1-2	10						.001
T6	151-320-02	Leightner	C	18	32	V	.015				60			5	65	1.5	3	2.5	1	1-2	10						.001
T7	151-321-01	Leightner	C	18	32	V	.001				60			2	62	1.5	3	2.5	1	3-4	5						.001
L1	151-322-01		C	24	---		.05	150			60			5	65												.0003

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

29 FAILURE RATE SOURCES (FOR COLUMN #26)
A. MLHB 217 A B.
C. D.

30 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .0083 %/1000 HRS

DD FORM 9248

BxA 321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LMS
ASSEMBLY: Emission Control
2.2.1 APPENDIX B
SUB ASSEMBLY: Mother Board
DATE: 9 March 1972
SCHEMATIC NO: 151-552

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A	JUNCTION ACTUAL	JUNCTION RATED T_J	CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (watts): RATED AT 25°C AMBIENT	RATED AT 25°C CASE	ACTUAL AMBIENT T_A	ACTUAL CASE T_C	ACTUAL	POWER RATIO: ACTUAL/RATED	ACTUAL T_J / RATED T_J	MAXIMUM VOLTAGES: V_{CBO} RATED V	V_{CB} ACTUAL V	V_{CEO} RATED V	V_{CE} ACTUAL V	DIODE PIV: RATED V	ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL RATE (%/1000 HRS)	TOTAL PER TYPE	COUNT	TOTAL FAILURE RATE (%/1000 HRS)
Z1	151-347 LED					63																							
	MCT-1 DET	Mon	60	100			200	200	91	91	0	<.1	<.1			30							A						.0018
Z2	151-347 LED					63																							
	MCT-1 DET	Mon.	60	100			200	200	91	91	0	<.1	<.1			30													.0018
Z3	151-347 LED					63																							
	MCT-1 DET	Mon.	60	100			200	200	91	91	1	<.1	<.1			30													.0018
Z4	151-347 LED		60	100	63																								
	MCT-1 SENS	Mon.	60				200	200	91	91	2	<.1	<.1			30													.0018
Z5			60	100	63		200	200	91	91	2	<.1	<.1			30													.0018
Z6			60	100	63		200	200	91	91	2	<.1	<.1			30													.0018
Z7	151-347 LED MCT-1 SENS	Mon.	60	100	63		200	200	91	91	2	<.1	<.1			30													.0018
Z8	See Addendum Sheets Page ----------																												
Z9	See Addendum Sheets Page ----------																												

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

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

24 TOTAL FAILURE RATE .0126 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS SUMMARY

ATM 966 Rev. B

2.2.2. Appendix B

PROJECT: LMS

DATE: 9 March 72

ASSEMBLY: Emission Control

SUB ASSEMBLY: EC-1

SCHEMATIC NO: 151-552

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	2	.00034	
RESISTORS	11	.00027	
DIODES	5	.00289	
TRANSISTORS	5	.00842	
RELAYS			
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .01192 %/1000 HOURS

MEAN-TIME-TO-FAILURE 8.4×10^6 HOURS

MISSION SUCCESS PROBABILITY .9979

PARTS APPLICATION ANALYSIS

CAPACITORS

2.2.2 APPENDIX B

PROJECT: LMS **DATE:** 9 March 1972

ASSEMBLY: Emission Control **SUBASSEMBLY:** EC-1 Module 1 **SCHEMATIC NO:** 151-552

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE μμf	TOLERANCE %	5 MANUFACTURER'S RATED VOLTAGE	6 OPERATING VOLTAGE DC	OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	12 CIRCUIT FUNCTION OR APPLICATION	13 BASIC FAILURE RATE λb (%/1000 HRS)	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)
	Module 1												A					
C1	CSR13G105K	- 2836	1.0		50	13	.26	100	60			.0172	A	.01				.000172
C2	CSR13G105K	2836	1.0		50	13	.26	100	60			.0172	A	.01				.000172

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 _____ % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

2.2.2 APPENDIX B

PROJECT: LMS DATE: 9 March 1972

ASSEMBLY: Emission Control SUB ASSEMBLY: EC-1 Module 1 SCHEMATIC NO: 151-552

(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)	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) @ 40°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	RCR07G102JS	39008	1K		250	*100	.4	*50	60		.0365	A		.001			.0000365
R2	RCR07G102JS	39008	1K		250	*100	.4	*50	60		.0365			.001			.0000365
R3	RCR07G103JS	39008	10K		250	17	.1	*50	60		.022			.001			.000022
R4	RCR07G103JS	39008	10K		250	17	.1	*50	60		.022			.001			.000022
R5	RCR07G682JS	39008	6.8K		250	5	.1	**	60		.022			.001			.000022
R6	RCR07G183JS	39008	18K		250	11.5	.1	**	60		.022			.001			.000022
R7	RCR07G473JS	39008	47K		250	1	.1	**	60		.022			.001			.000022
R8	RCR07G183JS	39008	18K		250	11.5	.1	**	60		.022			.001			.000022
R9	RCR07G682JS	39008	6.8K		250	5	.1	**	60		.022			.001			.000022
R10	RCR07G103JS	39008	10K		250	17	.1	**	60		.022			.001			.000022
R11	RCR07G103JS	39008	10K		250	17	.1	**	60		.022			.001			.000022

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 = .0002710 %/1000 HRS

FORM 0251
BS-321A

* Only one operating at given time
** Only during command initiation

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.2.2 APPENDIX B

PROJECT: LMS
ASSEMBLY: Emission Control
SUB ASSEMBLY: EC-1 Module 1
DATE: 9 March 1972
SCHEMATIC NO: 151-552

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A	MAX. TEMP °C: 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	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED (Amb. or case)	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRON-MENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE MULTIPLIER	FINAL RATE (%/1000 HRS)	TOTAL	COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Q1	S2N2222A	T1	60	175	60	500	1.8w	383	1.38w	*4	.1	.1	60		30					.066		A					.00121
Q2	S2N2222A	T1	60	175	60	500	1.8w	383	1.38w	*4	.1	.1	60		30					.066							.00121
Q3	PNP S2N2907A	M T1	60	200	60	400	1800	320	1440	**12	.1	.1	60		60												.002
Q4	S2N2907A	M T1	60	200	60	400	1800	320	1440	**12	.1	.1	60		60												.002
Q5	S2N2907A	M T1	60	200	60	400	1800	320	1440	**12	.1	.1	60		60												.002
CR1	S1N914	T1	60	175	60	250	250	191	191	1								75									.00063
CR2	S1N914	T1	60	175	60	250	250	191	191	1								75									.00063
CR3	S1N914	T1	60	175	60	250	250	191	191	1								75									.00063
CR4 CR5	151-364-01 1N4942		60	175	60	750	750	720	720	1								200				.0005				2	.001

FAILURE RATE SOURCE (See Column 21)
A ATM-605
B
C
D

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

TOTAL FAILURE RATE .01131 %/1000 HRS.

BS-321A

* When (1) operates (2) is off and vise-versa
** Only applies when commanding change of filaments

PARTS APPLICATION ANALYSIS SUMMARY

ATM 966 Rev.

2.2.3 APPENDIX B

PROJECT: LMS

DATE: 9 March 1972

ASSEMBLY: Emission Control

SUB ASSEMBLY: EC-2

SCHEMATIC NO:

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	9	.00021	
RESISTORS	8	.00061	
DIODES	7	.01117	
TRANSISTORS			
~~RELAYS~~ Microcircuit	2	.00340	
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .01539 %/1000 HOURS

MEAN-TIME-TO-FAILURE 6.498×10^6 HOURS

MISSION SUCCESS PROBABILITY .9974

PARTS APPLICATION ANALYSIS

CAPACITORS

2.2.3 APPENDIX B

PROJECT: LMS **DATE:** 9 March 1972

ASSEMBLY: Emission Control **SUBASSEMBLY:** EC-2 Module 2 **SCHEMATIC NO:** 151-552

(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 λb (%/1000 HRS)	13 SOURCE (USE LETTER)	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
	Module 2												A					
C1	CSR13G105K	M39003/1C -2836	1.0	10	50	13	.26	100	60			.0170		.01				.000172
C2	CKR12BX470K	-0307	47p	10	100	13	.13	100	60			.005		.01				.00005
C3	CKR12BX220K	-0303	22p	10	100	13	.13	100	60			.005		.01				.00005
C4	CKR12BX103K	-0346	.01	10	100	10	.1	100	60			.005		.01				.00005
C5	CKR13BX104K	-0153	.1	10	100	6.8	.1	100	60			.005		.01				.00005
C6	CKR13BX104K	-0153	.1	10	100	1	.1	100	60			.005		.01				.00005
C7	CKR12BX220K	-0303	22p	10	100	13	.13	100	60			.005		.01				.00005
C8	CKR12BX470K	-0307	47p	10	100	13	.13	100	60			.005		.01				.00005
C9	M39014105-	-0346	.01	10	100	10	.1	100	60			.005		.01				.00005

FOR USE OF RELIABILITY THEORY

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

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .00021 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

2.2.3 APPENDIX B

(Resistors)

PROJECT: LMS DATE: 9 March 1972

ASSEMBLY: Emission Control SUB ASSEMBLY: Module 2 SCHEMATIC NO: 151-552

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 (SOURCE SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DESCRIBE)	15 FAILURE RATE MULTIPLIER	16 TOTAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR07GXXXJS	39008	*	5	.250	1	.1	100	60		.022	A		.001			.000022
R2	RCR07G243JS	39008	24	5	.250	12	.1	100	60		.022			.001			.000022
R3	RNR55XXXXFS	55182	*	1	.1	1	.1	100	60		.168			.001			.000168
R4	RNR55C100IFS	55182	*	1	.1	1	.1	100	60		.168			.001			.000168
R5	RNR55CXXXXFS	55182	1K	1	.1	1	.1	100	60		.168			.001			.000168
R6	RCR07G102JS	39008	*	5	.250	1	.1	100	60		.022			.001			.000022
R7	RCR07G102JS	39008	1K	5	.250	25	.1	100	60		.022			.001			.000022
R8	RCR07G243JS	39008	24K	5	.250	25	.1	100	60		.022			.001			.000022

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 A B

C D

20 *Select on Test

CALCULATED MTBF HRS

21 TOTAL FAILURE RATE = .00061 %/1000 HRS

FORM 9251

BS-321A

* Select in final test.

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.2.3 APPENDIX B

PROJECT: LMS

ASSEMBLY: Emission Control

SUB ASSEMBLY: Module 2

DATE: 9 March 1972

SCHEMATIC NO: 151-552

1 CKT SYM NO.	2 TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	3 MANUFACTURER	4 MAX. TEMP °C: AMBIENT ACTUAL T_A	5 MAX. TEMP °C: RATED JUNCTION T_J	6 MAX. TEMP °C: ACTUAL CASE HOT SPOT T_C	7 AVG PWR DISSIPATION (mw) RATED AT 25°C: AMBIENT	8 AVG PWR DISSIPATION (mw) RATED AT 25°C: CASE	9 AVG PWR DISSIPATION (mw) RATED AT ACTUAL AMBIENT T_A	10 AVG PWR DISSIPATION (mw) RATED AT ACTUAL CASE T_C	11 AVG PWR DISSIPATION (mw): ACTUAL	12 POWER RATIO: ACTUAL / RATED 25°C (Amb or case)	13 POWER RATIO: ACTUAL / RATED T_A or T_C	14 MAXIMUM VOLTAGES: V_{CEO} RATED V	15 MAXIMUM VOLTAGES: V_{CB} ACTUAL V	16 MAXIMUM VOLTAGES: V_{CEO} RATED V	17 MAXIMUM VOLTAGES: V_{CB} ACTUAL V	18 DIODE PIV: RATED V	19 DIODE PIV: ACTUAL V	20 CIRCUIT FUNCTION or APPLICATION	21 PART SPECIAL ENVIRONMENT (Define)	22 RATE (%/1000 HRS)	23 SOURCE (See below)	24 FAIL. RATE MULTIPLIER	25 FINAL FAIL. RATE (%/1000 HRS)	26 TOTAL COUNT PER TYPE	27 TOTAL FAILURE RATE (%/1000 HRS)
CR1	S1N914	T1	60	175	60	250	250	191	191	1	.1	.1					75			.066		A				.00063
CR2	S1N914	T1	60	175	60	250	250	191	191	1	.1	.1					75									.00063
CR3	S1N914	T1	60	175	60	250	250	191	191	1	.1	.1					75									.00063
CR4	S1N914	T1	60	175	60	250	250	191	191	1	.1	.1					75									.00063
CR5 & CR7	151-358 TZ1N4099		60	200	80	250	250	172	172	28	.16	.16					.33									.00802
CR6	S1N914	TI	60	175	60	250	250	191	191	1	1	.1					75									.00063

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: .01117 %/1000 HRS.

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

2.2.3 APPENDIX B

PROJECT: LMS

ASSEMBLY: Emission Control

SUB ASSEMBLY: Module 2

DATE: 9 March 1972

SCHEMATIC NO: 151-552

(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 bottom)	FAILURE RATE MULTIPLIER	TOTAL PART 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
Z1	151-344-01 NH 0001	NAT	OPA	60	125	72	20	13					16			50 mw	.0017	A			.0017
Z2	151-344-01 NH 0001	NAT	OPA	60	125	62.5	20	13					15			10 mw	.0017	A			.00017

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 .0034 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS SUMMARY

ATM 966 Rev. B

2.2.4 Appendix B

PROJECT: LMS

DATE: 9 March 72

ASSEMBLY: Emission Control

SUB ASSEMBLY: EC-3

SCHEMATIC NO: 151-552

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	5	.00104	
RESISTORS			
DIODES	14	.007	
TRANSISTORS			
RELAYS			
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .00804 %/1000 HOURS

MEAN-TIME-TO-FAILURE 12.4×10^6 HOURS

MISSION SUCCESS PROBABILITY .9986

PARTS APPLICATION ANALYSIS

CAPACITORS

2.2.4 APPENDIX B

PROJECT: LMS **DATE:** 9 March 1972

ASSEMBLY: Emission Control **SUBASSEMBLY:** Module 3 **SCHEMATIC NO:** 151-552

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (REL. or ER) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	8 OPERATING VOLTAGE PEAK AC	9 VOLTAGE RATIO, OP/RATED	10 MAXIMUM DUTY CYCLE	11 HOT SPOT AIR TEMPERATURE (°C)	12 CIRCUIT FUNCTION OR APPLICATION	13 BASIC FAILURE RATE (%/1000 HRS)	14 SOURCE CODE (SEE BELOW)	15 SPECIAL ENVIRONMENT (SEE TABLE)	16 FAILURE RATE MULTIPLIER	17 FINAL FAILURE RATE	18 TOTAL CAPACITOR COUNT PER TYPE	19 TOTAL FAILURE RATE (%/1000 HRS)
	Module 3																	
C1	CSR13G105KR	M 39003/1C -2836	1.0	10	50	3	< .1	100	60			.007	A	.01				.00007
C2	CSR13J584KR	M39003/1C -2941	.47	10	100	45	.45	100	60			.033		.01				.00033
C3	CKR13BX104KR	-0153	.1	10	100	80	.8	100	60			.0295		.01				.000295
C4	CSR13G105KR	M39003/1C -2836	1.0	10	50	13	.26	100	60			.0172		.01				.000172
C5	CSR13G105KR	M39003/1C -2836	1.0	10	50	13	.26	100	60			.0172		.01				.000172

FOR USE OF RELIABILITY PREDICTION

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 A B

C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .001039 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

(Semiconductors)

PROJECT: LMS

2.2.4. APPENDIX B

ASSEMBLY: EMISSION CONTROL

SUB ASSEMBLY: MODULE 3

DATE: 9 March 1972

SCHEMATIC NO: 151-552

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 V (14)	MAXIMUM VOLTAGES: V_{CB} Actual V (15)	MAXIMUM VOLTAGES: V_{CEO} Rated V (16)	MAXIMUM VOLTAGES: V_{CE} Actual V (17)	DIODE PIV: Rated V (18)	DIODE PIV: Actual V (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 CR2	151-364 S1N4942	SEM	60	175	66	750	750	682	682	35	<.1	<.1					200	12			.0005	A			2	.0010
CR3 thru CR6	151-364 S1N4942	SEM	60	175	60	750	750	720	720	< 1	<.1	<.1					200	45			.0005				4	.0020
CR7 thru CR10	151-364 S1N4942	SEM	60	175	60	750	750	720	720	< 1	<.1	<.1					200	80			.0005				4	.0020
CR11 thru CR14	151-364 S1N4942	SEM	60	175	60	750	750	720	720	1	<.1	<.1					200	26			.0005				4	.0020

(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 .007 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS SUMMARY

2.3.1 APPENDIX B

PROJECT: LMS **DATE:** 10 Feb 1971

ASSEMBLY: PreAmp/Disc **SUB ASSEMBLY:** Cal-Osc **SCHEMATIC NO:** 151-660

(One per system)

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	4	.000200	
RESISTORS	6	.000132	
DIODES	3	.001890	
TRANSISTORS	2	.002530	
CRYSTAL	1	.006000	
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			
MICROCIRCUITS	2	.003000	

TOTAL ASSEMBLY FAILURE RATE .013652 **%/1000 HOURS**

MEAN-TIME-TO-FAILURE 7.35×10^6 **HOURS**

MISSION SUCCESS PROBABILITY .997611

PARTS APPLICATION ANALYSIS

CAPACITORS

2.3.1 APPENDIX B

(Capacitors)

PROJECT: LMS **DATE:** 10 February 1971

ASSEMBLY: PRE AMP/DISCRIMINATOR **SUBASSEMBLY:** Calibration Oscillator **SCHEMATIC NO:** 151-660

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value uf	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	Operating Voltage Peak AC	8 Voltage Ratio Operated/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	12 Circuit Function or Application	13 Basic Failure Rate (%/1000 Hrs) at	Source (See Below)	FOR USE OF RELIABILITY DEPT.	15 Special Environment (Defined)	16 Failure Rate Multiplier	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 Hrs)
C1	CKR06BX103K	M39014/02 -0298	.01	10	200	5		<.1	100	65		.005	A			.01			.00005
C2	CKR05BX820K	M0298 39014/01	.82pf	10	200	5		<.1	100	65		.005				.01			.00005
C3	CKR06BX104K	M39014/02 -0310	.1	10	100	5		<.1	100	65		.005				.01			.00005
C4	CKR05BX470K	-0294 39014/01	47pf	10	200	5		<.1	100	65		.005				.01			.00005

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM-605 A B ______

C ______ D ______

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .00020 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

2.3.1 APPENDIX B

(Resistors)

PROJECT: LMS DATE: 10 February 1971

ASSEMBLY: Pre Amp/Discriminator SUB ASSEMBLY: Calibration Oscillator SCHEMATIC NO: 151-660

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 ΔT °C	13 Source (See Below)	14 Special Environments (Derive)	15 Failure Rate Multiplier	16 Final Failure Rate (%/1000 Hrs)	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 Hrs)
R1	RCR07G103JS	39008	10K	5	.25	.001	<.1	100	65		.022	A		.001			.000022
R2	RCR07G103JS	39008	10K	5	.25	.001	<.1	100	65		.022			.001			.000022
R3	RCR07G472JS	39008	4700	5	250	5	<.1	100	65		.022			.001			.000022
R4	RCR07G472JS	39008	4700	5	250	5	<.1	100	65		.022			.001			.000022
R5	RCR07G101JS	39008	100	5	250	2	<.1	100	65		.022			.001			.000022
R6	RCR07G473JS	39008	47K	5	250	1	<.1	100	65		.022			.001			.000022

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 .000132 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.3.1 APPENDIX B

PROJECT: LMS

ASSEMBLY: Pre Amp/Discriminator

SUB ASSEMBLY: Calibration - Oscillator

DATE: 10 February 1971

SCHEMATIC NO: 151-660

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A	MAX. TEMP °C: ACTUAL T_A	MAX. TEMP °C: RATED JUNCTION T_J	MAX. TEMP °C: ACTUAL HOT SPOT T_C	MAX. TEMP °C: ACTUAL CASE T_C	AVG PWR DISSIPATION (watts): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (watts): RATED AT 25°C: CASS	AVG PWR DISSIPATION (watts): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (watts): ACTUAL CASE T_C	AVG PWR DISSIPATION (watts): ACTUAL	POWER RATIO: ACTUAL/RATED (Ambient or case)	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: SOURCE (See below)	FOR RELIABILITY USE ONLY: FAIL RATE	FOR RELIABILITY USE ONLY: MULTIPLIER	FOR RELIABILITY USE ONLY: FINAL FAIL RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: TOTAL COUNT	FOR RELIABILITY USE ONLY: COUNT PER TYPE	FOR RELIABILITY USE ONLY: TOTAL FAILURE RATE (%/1000 HRS)
Q1	NPN S2N2222A	TI	60	175	61	500	1.8w	360	1.378		<.1	<.1	60	6	30	6			.08			A						.00132
Q2	NPN S2N2222A	TI	60	175	60	500	1.8w	383	1.38	1	<.1	<.1	60	5	30	5			.066			A	1			1		.00121
CR1	S1N914	TI	60	175	60	250	250	191	191	.3	<.1	<.1					75	0	.066			A						.00063
CR2	S1N914	TI	60	175	60	250	250	191	191	.3	<.1	<.1					75	1	.066			A						.00063
CR3	S1N914	TI	60	175	60	250	250	191	191	.3	<.1	<.1					75	0	.066			A						.00063

FAILURE RATE SOURCE (See Column 22)

A ATM-605 A C

B D

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

TOTAL FAILURE RATE .00442 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

2.3.1 APPENDIX B

PROJECT: LMS

ASSEMBLY: Pre Amp/Discriminator

SUB ASSEMBLY: Calibration Oscillator

DATE: 10 February 1971

SCHEMATIC NO: 151-660

(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	FAILURE RATE MULTIPLIER	TOTAL QUANTITY PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
21	SM54L00F-1	TI	TTL	60	125	60	5.3	5.0	4.7			30				QUAD 2 Input NAND	.0015	A			.0015
22	151-340-01 SN54121S-01	TI	TTL	60	125	60	5.3	5.0	4.7			20				Mono-stable Mult.	.0015	A			.0015

FAILURE RATE SOURCE (See Column 16)

A ATM-605A C

B D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .0030 %/1000 HRS

DxA 679

PARTS APPLICATION ANALYSIS

(MISC. PARTS)

2.3.1 APPENDIX B

PROJECT: LMS DATE: 10 February 1971

ASSEMBLY: Pre Amp/Discriminator SUB ASSEMBLY: Calibration Osc. SCHEMATIC NO: 151-660

(Misc. Parts)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (CSC, MIL OR MFR) and CONSTRUCTION	3 MANUFACTURER	TEMPERATURE RANGE 4 MAX	5 MIN	ELECTRICAL STRESS 6 RATED	7 USE	8 PERCENT DUTY CYCLE	9 MAJOR CHARACTERISTICS and APPLICATION	FOR RELIABILITY USE ONLY 10 BASIC FAILURE RATE (%/1000 HOURS) at ___°C	11 SOURCE (SEE BELOW)	12 PART SPECIAL ENVIRONMENT (DEFINE)	13 FAILURE RATE MULTIPLIER	14 TOTAL FAILURE RATE (%/1000 HOURS)
XTL	151-361-01 CR-19/U	Monitor	125	.55	2mw	6mw	10% ;	4 MHZ Crystal		A			.006

15 FAILURE RATE SOURCES (FOR COLUMN 11)
A. ATM 904 B. _____
C. _____ D. MIL Std 217 Chart 2NV

16 CALCULATED MTBF _____ HOURS

17 TOTAL FAILURE RATE .006 %/1000 HOURS

DD Form 1926

BS-321A

PARTS APPLICATION ANALYSIS SUMMARY

Rev. B

2.3.2 Appendix B

PROJECT: LMS DATE: 10 Feb 1971

ASSEMBLY: PreAmp/Disc SUB ASSEMBLY: Pre Amp/Disc # SCHEMATIC NO: 151-660

(3 used per system)

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	20	.000908	
RESISTORS	34	.001337	
DIODES	3	.002760	
TRANSISTORS	6	.010115	
MICROCIRCUITS	2	.002700	
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .017820 %/1000 HOURS

MEAN-TIME-TO-FAILURE 5.6×10^6 HOURS

MISSION SUCCESS PROBABILITY .996883

PARTS APPLICATION ANALYSIS

CAPACITORS

2.3.2 Appendix B

PROJECT: LMS
DATE: 10 February 1971
ASSEMBLY: Pre Amp/Discriminator
SUBASSEMBLY: Pre-Amp/Discriminator - 703 #1
SCHEMATIC NO: 151-660

(Capacitors)

Circuit Symbol Number	Type Designation (MIL or Mfr) and Construction	Manufacturer	Capacitance Value	Tolerance %	Manufacturer's Rated Voltage	Operating Voltage DC	Operating Voltage Peak AC	Voltage Ratio Operated/Rated	Maximum Duty Cycle	Bulk Air Temperature (°C)	Circuit Function or Application	Basic Failure Rate (%/1000 hrs) at °C	Source (See Below)	For Use of Reliability Dept.	Special Environment (Define)	Failure Rate Multiplier	Final Failure Rate	Total Capacitor Count per Type	Total Failure Rate (%/1000 hrs)
C1	ECY101ROC5	MSFC400A	1 pf	5	500	5	1	<.1	100	60		.0004	A			.01			.000004
C2	CKR06BX104K-0310	39014	.1	10	200	3.6	<.1	<.1	100	60		.005				.01			.00005
C3	ECY1013ROC5	MSFC 400A	3.0 pf	5	500	.1	5	<.1	100	60		.0004				.01			.000004
C4	CKRO6BX104K-0310	39014	.1	10	100	11.7	<.1	.1	100	60		.005				.01			.00005
C5	CKRO6BX104K-0310	39014	.1	10	100	6	<.1	<.1	100	60		.005				.01			.00005
C6	CKRO6BX104K-0310	39014	.1	10	100	3	<.1	<.1	100	60		.005				.01			.00005
C7	CKRO6BX104K-0310	39014	.1	10	100	0	<.1	<.1	100	60		.005				.01			.00005
C8	CKRO5BX471K-0293	39014	470pf	10	200	4.3	.5	<.1	100	60		.005				.01			.00005
C9	CKRO6BX104K-0310	39014	.1	10	100	4.9	<.1	<.1	100	60		.005				01			00005
C10	CKRO6BX104K-0310	39014	.1	10	100	4.9	<.1	<.1	100	60		.005				.01			.00005
C11	CKRO6BX104K-0310	39014	.1	10	100	.4	<.1	<.1	100	60		.005				.01			00005

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

CALCULATED MTBF ____ HRS

TOTAL FAILURE RATE .000458 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

2.3.2 Appendix B

PROJECT: LMS
ASSEMBLY: Pre Amp/Discriminator
SUBASSEMBLY: Pre Amp/Discriminator - 703 #1
DATE: 10 February 1971
SCHEMATIC NO: 151-660

(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 Rated/ Voltage Operating Rated	9 Maximum Duty Cycle	10 Bulb Air Temperature (°C)	11	12 Circuit Function or Application	13 Basic Failure Rate (%/1000 Hrs)	13 Source	14 Environment (See Below)	15 Special Environment (See Below)	15 Failure Rate Multiplier	16 Final Failure Rate	17 Total Capacitor Count Per Type	18 Total Failure Rate (%/1000 Hrs)	19
C12	CKR06BX103K-0298	39014/02	.01	10	100	5		< .1	100	60			.005	A		.01				.00005	
C13	CKR06BX104K-0310	39014/02	.1	10	100	6		< .1	100	60			.005			.01				.00005	
C14	CKR06BX104K-0310	39014/02	.1	10	100	12		.12	100	60			.005			.01				.00005	
C15	CKR06BX104K-0310	39014/02	.1	10	100	12		.12	100	60			.005			.01				.00005	
C16	CKR06BX104K-0310	39014/02	.1	10	100	7		< .1	100	60			.005			.01				.00005	
C17	CKR05BX121K-0310	39014/01	*	10	200	5		< .1	100	60			.005			.01				.00005	
C18	CKR06BX104K-0310	39014/02	.1	10	200	5		< .1	100	60			.005			.01				.00005	
C19	CKR05BX151K-0302	39014/01	1501	10	100	5		< .1	100	60			.005			.01				.00005	
C20	CKR06BX K-	39014/02	*	10	200	5		.1	100	60			.005			.01				.00005	

FOR USE OF RELIABILITY DEPT.

20 *Select in Test

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

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .00045 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

2.3.2 APPENDIX B

(Resistors)

PROJECT: LMS DATE: 10 February 1971

ASSEMBLY: Pre Amp/Disc. SUB ASSEMBLY: Pre-Amp / Disc. #1 SCHEMATIC NO: 151-660

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 AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C SOURCE (SEE BELOW)	13	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	RCR07G822JS	39008	8.2K	5	250	< 1	< .1	100	60		.022	A		.001			.000022
R2	RNR55C51R1FS	55182	51.1	1	100	< 1	< .1	100	60		.168			.001			.000168
R3	RCR07G101JS	39008	100	5	250	1	< .1	100	60		.022			.001			.000022
R4	RCR07G182JS	39008	1.8K	5	250	< 1	< .1	100	60		.022			.001			000022
R5	RNR55C1821FS	55182	1.82K	1	100	< 1	< .1	100	60		.168			.001			.000168
R6	RNR55C3572FS	55182	35.7K	1	100	< 1	< .1	100	60		.168			.001			.000168
R7	RCR07G101JS	39008	100	5	250	< 1	< .1	100	60		.022			.001			.000022
R8	RNR55C7491FS	55182	6.49K	1	100	< 1	< .1	100	60		.168			.001			.000168
R9	RCR07G272JS	39008	2.7K	5	250	< 1	< .1	100	60		.022			.001			.000022
R10	RCR07G272JS	39008	2.7K	5	250	< 1	< .1	100	60		.022			.001			.000022
R11	RCR07G271JS	39008	270	5	250	< 1	< .1	100	60		.022			.001			.000022
R12	RCR070471JS	39008	470	5	250	< 1	< .1	100	60		.022			.001			.000022
R13	RCR07G123JS	39008	12K	5	250	< 1	< .1	100	60		.022			.001			.000022
R14	RCR070471JS	39008	470	5	250>	< 1	< .1	100	60		.022			.001			.000022
R15	RCR07G JS	39008	*	5	250	< 1	< .1	100	60		.022			.001			.000022
R16	RCR07G33JS	39008	3.3K	5	250	< 1	< .1	100	60		.022			.001			.000022
R17	RCR07G392KS	39008	3.9K	5	250	< 1	< .1	100	60		.022			.001			.000022
R18	RCR07G392JS	39008	3.9K	5	250	2	< .1	100	60		022			001			000022

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #12)
A ATM 605A B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000980 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

2.3.2 APPENDIX B

PROJECT: LMS DATE: 10 February 1971

ASSEMBLY: Pre Amp/Disc SUB ASSEMBLY: Pre-Amp/Disc - 703 #1 SCHEMATIC NO: 151 660

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL SPEC) 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 BULB AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS)	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (METHOD)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL JUNCTION COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R19	RCR07G470JS	39008	47	5	250	1	.1	100	60		.022	A		.001			.000022
R20	RCR7G180JS	39008	18	5	250	< 1	< .1	100	60		.022			.001			.000022
R21	RCR07G22JS	39008	2.2K	5	250	4.1	< .1	100	60		.022			.001			.000022
R22	RCR07G122JS	39008	1.2K	5	250	< 1	< .1	100	60		.022			.001			.000022
R23	RCR07681JS	39008	680	5	250	4.8	< .1	100	60		.022			.001			.000022
R24	RCR07G102JS	39008	1.0K	5	250	.016	< .1	100	60		.022			.001			.000022
R25	RCR070470JS	39008	47	5	250	< .1	< .1	100	60		.022			.001			.000022
R26	RCR07G332JS	39008	3.3K	5	250	9	< .1	100	60		.022			.001			.000022
R27	RCR07G332JS	39008	3.3K	5	250	9	< .1	100	60		.022			.001			.000022
R28	RCR07G JS	39008	*	5	250	1	< .1	100	60		.022			.001			.000022
R29	RCR07G511JS	39008	510	5	250	1	< .1	100	60		.022			.001			.000022
R30	RCR20G102JS	39008	1K	5	250	36	.15	100	60		.022			.001			.000022
R31	RCR07G821JS	39008	820	5	250	< 1	< .1	100	60		.022			.001			.000022
R32	RCR070470JS	39008	47	5	250	< .1	< .1	100	60		.022			.001			.000022
R33	RCR070472JS	39008	4.7K	5	250	5	< .1	100	60		.022			.001			.000022
R34	RCR07G101JS	39008	100	5	250	< 1	< .1	100	60		.022			.001			.000022

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #13)
A ATM 605 A B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000357 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.3.2 APPENDIX B

(Semiconductors)

PROJECT: LMS
DATE: 10 February 1971
ASSEMBLY: Pre Amp/Discriminator
SUB ASSEMBLY: Pre Amp/Discriminator - 703 / #1
SCHEMATIC NO: 151-660

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 V	MAXIMUM VOLTAGES: 15 V_{CB} ACTUAL V	MAXIMUM VOLTAGES: 16 V_{CEO} RATED V	MAXIMUM VOLTAGES: 17 V_{CE} ACTUAL V	DIODE PIV: 18 RATED V	DIODE PIV: 19 ACTUAL V	20 CIRCUIT FUNCTION OF APPLICATION	21 PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: 22 RATE (%/1000 HRS)	23 SOURCE (See below)	24 FAIL. RATE MULTIPLIER	25 FINAL FAIL RATE (%/1000 HRS)	26 TOTAL COUNT PER TYPE	27 TOTAL FAILURE RATE (%/1000 HRS)
Q1	Nch 151-355 TX 2N 3823	TI	60	175	65	300	-	220	--	9.0	<.1	<.1	30	7	30	5	-	-	.133			A				.001565
Q2	NPN S2N2222A	TI	60	175	60	500	1.8w	383	1.38	1.8	<.1	<.1	60	9	30	10			.273	.08						.00121
Q3	PNP S2N2907A	MO TI	60	200	64	400	1.8w	320	1.44	9.7	<.1	<.1	60	5	60	6			.051							.00246
Q4	NPN S2N2222A	TI	60	175	60	500	1.8w	383	1.38	5.2	<.1	<.1	60	3	30	4			.294	.08						.00121
Q5	PNP S2N2907A	MO TI	60	200	63	400	1.8w	320	1.44	6.5	<.1	<.1	60	10	60	11			.051							.00246
Q6	NPN S2N2222A	MO TI	60	175	64	500	1.8w	320	1.44	8.3	.09	.02	60	10	60	11			.051							.00121
CR1	S1N914	TI	60	175	60	250	250	191	191	0	<.1	<.1					75	5	.066							.00063
CR2	S1N914	TI	60	175	60	250	250	191	191	0	<.1	<.1					75	5								.00063
CR3	Ref. Diode S1N827 A	M	60	175	72	400	400	340	340	36	<.1	<.1														.0015

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 .012875 %/1000 HRS.

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LMS — 2.3.2 Appendix B — DATE: 10 February 1971

ASSEMBLY: Pre Amp/Discriminator — SUB ASSEMBLY: Pre Amp/Discriminator-703 #1 — SCHEMATIC NO: 151-660

(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	FOR RELIABILITY USE ONLY: FAIL RATE	FOR RELIABILITY USE ONLY: MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
21	151-349 QL3F7710	Fair		60	125	60	21	18					10			Diff Compar	.0012	A				.0012
22	151-340 SN 54121S-01	TI	TTL	60	125	60	5.25	5	4.75				10			Mono-stable Mult.	.0015	A				.0015

FAILURE RATE SOURCE (See Columns 10)
A ATM 605 A — C —
B — D —

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5\,(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5\,(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .0027 % 1000 HRS

BxA 579

PARTS APPLICATION ANALYSIS SUMMARY

2.3.3 APPENDIX B

PROJECT: LMS DATE: 10 Feb. 1971

ASSEMBLY: PreAmp/Disc SUB ASSEMBLY: Pre-Amp/Disc #2 SCHEMATIC NO: 151-660

(3 used per system)

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	20	.000908	
RESISTORS	34	.001337	
DIODES	3	.002760	
TRANSISTORS	6	.010115	
MICROCIRCUITS	2	.002700	
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .017820 %/1000 HOURS

MEAN-TIME-TO-FAILURE 5.61×10^6 HOURS

MISSION SUCCESS PROBABILITY .996883

PARTS APPLICATION ANALYSIS

CAPACITORS

2.3.3 APPENDIX B

PROJECT: LMS
ASSEMBLY: Pre Amp/Discriminator
SUBASSEMBLY: Pre-Amp/Discriminator - 703 #2
DATE: 10 February 1971
SCHEMATIC NO: 151-660

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE and	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 HOT AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% C.L.	13 SOURCE	14 NEW DESIGN	15 SPECIAL ENVIRONMENT (DESIGN) FAILURE RATE MULTIPLIER	16	17 FINAL FAILURE RATE	18 TOTAL CAPACITOR COUNT FOR TYPE	19 TOTAL FAILURE RATE (%/1000 HRS)
C1	ECY101ROC5	MSFC400A	1 pf	5	500	5	1	<.1	100	60		.0004	A		.01				.000004
C2	CKRO6BX104-0310	39014	.1	10	200	3.6	2.1	<.1	100	60		.005			.01				.00005
C3	ECY1013ROC5	MSFC400A	3.0pf	5	500	.1	5	<.1	100	60		.0004			.01				.000004
C4	CKRO6BX104K-0310	39014	.1	10	100	11.7	6.1	.1	100	60		.005			.01				.00005
C5	CKRO6BX104K-0310	39014	.1	10	100	6	6.1	<.1	100	60		.005			.01				.00005
C6	CKRO6BX104K-0310	39014	.1	10	100	3	6.1	<.1	100	60		.005			.01				.00005
C7	CKRO6BX104K-0310	39014	.1	10	100	0	6.1	<.1	100	60		.005			.01				.00005
C8	CKRO5BX471K-02B	39014	470pf	10	200	4.3	.5	<.1	100	60		.005			.01				.00005
C9	CKRO6BX104K-0310	39014	.1	10	100	4.9	6.1	<.1	100	60		.005			.01				.00005
C10	CKRO6BX104K-0310	39014	.1	10	100	4.9	6.1	<.1	100	60		.005			.01				.00005
C11	CKRO6BX104K-0310	39014	.1	10	100	.4	6.1	<.1	100	60		.005			.01				.0005

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

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .000458 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

2.3.3 APPENDIX B

(Capacitors)

PROJECT: LMS **DATE:** 10 February 1971

ASSEMBLY: PreAmp/Discriminator **SUBASSEMBLY:** PreAmp/Discriminator - 703 #2 **SCHEMATIC NO:** 151-660

1 Circuit Symbol Number	2 Type Designation (MIL or Mfg) and Construction	3 Manufacturer	4 Capacitance Value mfd	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 (%/1000 hrs) at	14 Source	For Use of Reliability Dept	15 Special Environment (Rating)	16 Failure Rate Multiplier	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 hrs)
C12	CKRO6BX103K-0298	39014/02	.01	10	100	5		<.1	100	60		.005	A			.01			.00005
C13	CKRO6BX104K-0310	39014/02	.01	10	100	6		<.1	100	60		.005				.01			.00005
C14	CKRO6BX104K-0310	39014/02	.1	10	100	12		.12	100	60		.005				.01			.00005
C15	CKRO6BX104K-0310	39014/02	.1	10	100	12		.12	100	60		.005				.01			.00005
C16	CKRO6BX104K-0310	39014/02	.1	10	100	7		<.1	100	60		.005				.01			.00005
C17	CKRO5BX121K-0310	39014/01	*	10	200	5		<.1	100	60		.005				.01			.00005
C18	CKRO6BX104K-0310	39014/02	.1	10	200	5		<.1	100	60		.005				.01			.00005
C19	CKRO5BX151K-0302	39014/01	150p	10	100	5		<.1	100	60		.005				.01			.00005
C20	CKRO6BX K-	39014/02	*	10	200	5		.1	100	60		.005				.01			.00005

20 * Select in Test

FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM-605 A B ______

C ______ D ______

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .00045 %/1000 HRS

PARTS APPLICATION ANALYSIS

RESISTORS

2.3.2 APPENDIX B

(Resistors)

PROJECT: LMS DATE: 10 February 1971

ASSEMBLY: Pre Amp/Disc. SUB ASSEMBLY: Pre-Amp/Discriminator-703 #2 SCHEMATIC NO: 151-660

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 HOUSE AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% C.L.	13 SOURCE (SEE BELOW)	FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DEFINED)	15 FAILURE RATE MULTIPLIER	16 TOTAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR07G822JS	39008	8.2K	5	250	< 1	< .1	100	60		.022	A			001			.000022
R2	RNR55C51R1FS	55182	51.1	1	100	< 1	< .1	100	60		.168				.001			.000168
R3	RCR07G101JS	39008	100	5	250	1	< .1	100	60		.022				.001			.000022
R4	RCR07G182JS	39008	1.8K	5	250	< 1	< .1	100	60		.022				.001			000022
R5	RNR55C1821FS	55182	1.82K	1	100	< 1	< .1	100	60		.168				.001			.000168
R6	RNR55C3572FS	55182	35.7K	1	100	< 1	< .1	100	60		.168				.001			.000168
R7	RCR07G101JS	39008	100	5	250	< 1	< .1	100	60		.022				.001			.000022
R8	RNR55C7491FS	55182	6.49K	1	100	< 1	< .1	100	60		.168				.001			.000168
R9	RCR07G272JS	39008	2.7K	5	250	< 1	< .1	100	60		.022				.001			.000022
R10	RCR07G272JS	39008	2.7K	5	250	< 1	< .1	100	60		.022				.001			.000022
R11	RCR07G271JS	39008	270	5	250	< 1	< .1	100	60		.022				.001			.000022
R12	RCR070471JS	39008	470	5	250	< 1	< .1	100	60		.022				.001			.000022
R13	RCR07G123JS	39008	12K	5	250	< 1	< .1	100	60		.022				.001			.000022
R14	RCR070471JS	39008	470	5	250>	< 1	< .1	100	60		.022				.001			.000022
R15	RCR07G JS	39008	*	5	250	< 1	< .1	100	60		.022				.001			.000022
R16	RCR07G33JS	39008	3.3K	5	250	< 1	< .1	100	60		.022				.001			.000022
R17	RCR07G392KS	39008	3.9K	5	250	< 1	< .1	100	60		.022				.001			.000022
R18	RCR07G392JS	39008	3.9K	5	250	2	< .1	100	60		.022				.001			000022

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

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000980 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

2.3.3 APPENDIX B

(Resistors)

PROJECT: LMS
ASSEMBLY: Pre Amp/Diac
SUB ASSEMBLY: Pre-Amp/Diac - 703 #2
DATE: 10 February 1971
SCHEMATIC NO: 151-660

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) @ 40°C (SOURCE SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DETAIL)	15 FAILURE RATE MULTIPLIER	16 TOTAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R19	RCR07G470JS	39008	47	5	250	1	.1	100	60		.022	A		.001			.000022
R20	RCR7G180JS	39008	18	5	250	<1	<.1	100	60		.022			.001			.000022
R21	RCR07G22JS	39008	2.2K	5	250	4.1	<.1	100	60		.022			.001			.000022
R22	RCR07G122JS	39008	1.2K	5	250	<1	<.1	100	60		.022			.001			.000022
R23	RCR07681JS	39008	680	5	250	4.8	<.1	100	60		.022			.001			.000022
R24	RCR07G102JS	39008	1.0K	5	250	.016	<.1	100	60		.022			.001			.000022
R25	RCR070470JS	39008	47	5	250	<.1	<.1	100	60		.022			.001			.000022
R26	RCR07G332JS	39008	3.3K	5	.250	9	<.1	100	60		.022			.001			.000022
R27	RCR07G332JS	39008	3.3K	5	.250	9	<.1	100	60		.022			.001			.000022
R28	RCR07G JS	39008	*	5	.250	1	<.1	100	60		.022			.001			.000022
R29	RCR07G511JS	39008	510	5	.250	1	<.1	100	60		.022			.001			.000022
R30	RCR20G102JS	39008	1K	5	.250	36	.15	100	60		.022			.001			.000022
R31	RCR07G821JS	39008	820	5	.250	<1	<.1	100	60		.022			.001			.000022
R32	RCR070470JS	39008	47	5	.250	<.1	<.1	100	60		.022			.001			.000022
R33	RCR070472JS	39008	4.7K	5	.250	5	<.1	100	60		.022			.001			.000022
R34	RCR07G101JS	39008	100	5	.250	<1	<.1	100	60		.022			.001			.000022

19 FAILURE RATE SOURCES (FOR COLUMN #16)
A ATM-605 A B
C D

20 CALCULATED MTBF _____ HRS

21 TOTAL FAILURE RATE .000357 %/1000 HRS

BS-321A

*Select in Test.

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.3.3 APPENDIX B

PROJECT: LMS
DATE: 10 February 1971
ASSEMBLY: Pre Amp/Disc
SUB ASSEMBLY: Pre Amp/Discriminator - 703 #2
SCHEMATIC NO: 151-6660

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	AVG PWR DISSIPATION: RATED AT 25°C CASE	AVG PWR DISSIPATION: ACTUAL AMBIENT T_A	AVG PWR DISSIPATION: ACTUAL CASE T_C	AVG PWR DISSIPATION: ACTUAL	POWER RATIO: ACTUAL/RATED @ 25°C (Amb. or case)	POWER RATIO: ACTUAL/RATED @ T_A & T_C	MAXIMUM VOLTAGES: V_{CBO} RATED	MAXIMUM VOLTAGES: V_{CB} ACTUAL	MAXIMUM VOLTAGES: V_{CEO} RATED	MAXIMUM VOLTAGES: V_{CE} ACTUAL	DIODE PIV: RATED	DIODE PIV: ACTUAL	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL RATE (%/1000 HRS)	TOTAL PER TYPE	COUNT	TOTAL FAILURE RATE (%/1000 HRS)
Q1	Nch 151-355 TX 2N 3823	TI	60	175	65	300	-	220	--	9.0	<.1	<.1	30	37	30	5	-	-		.133		A						001565
Q2	NPN S2N2222A	TI	60	175	60	500	1.8w	383	1.38	1.8	<.1	<.1	60	9	30	10				.273	.08							00121
Q3	PNP S2N2907A	MO TI	60	200	64	400	1.8w	320	1.44	9.7	<.1	<.1	60	5	60	6				.051								00246
Q4	NPN S2N2222A	TI	60	175	60	500	1.8w	383	1.38	5.2	<.1	<.1	60	3	30	4				.294	.08							00121
Q5	PNP S2N2907A	MO TI	60	200	63	400	1.8w	320	1.44	5.5	<.1	<.1	60	10	60	11				.051								00246
Q6	NPN S2N2222A	MO TI	60	175	64	500	1.8w	320	1.44	3.3	.09	.02	60	10	60	11				.051								00121
CR1	S1N914	TI	60	175	60	250	250	191	191	0	<.1	<.1					75	5		.066								00063
CR2	S1N014	TI	60	175	60	250	250	191	191	0	<.1	<.1					75	5										00063
CR3	Ref. Diode S1N827A	M	60	175	72	400	400	340	340	36	<.1	<.1																0015

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

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

TOTAL FAILURE RATE .012875 %/1000 HRS.

BS-321A

(Semiconductors)

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LMS — 2.3.3 APPENDIX B — DATE: 10 February 1971

ASSEMBLY: Pre Amp/Discriminator — SUB ASSEMBLY: Pre Amp/Discrim. - 703 82 — SCHEMATIC NO: 151-660

(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	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Z1	151-349 QL3F7710	Fair		60	125	60	21	18					10			Diff Compar	.0012	A			.0012
Z2	151-340 SN 5412IS-01	TI	TTL	60	125	60	5.25	5	4.75				10			Monostab Mult.	.0015	A			.0015

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE _____ %/1000 HRS

BAA 679

PARTS APPLICATION ANALYSIS SUMMARY

2.3.4 Appendix B

PROJECT: LMS DATE: 10 Feb 1971

ASSEMBLY: PreAmp/Disc SUB ASSEMBLY: Pre Amp/Disc#3 SCHEMATIC NO: 151-660

(3 used per system)

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	20	.000908	
RESISTORS	34	.001337	
DIODES	3	.002760	
TRANSISTORS	6	.010115	
MICROCIRCUITS	2	.002700	
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .017820 %/1000 HOURS

MEAN-TIME-TO-FAILURE 5.6×10^6 HOURS

MISSION SUCCESS PROBABILITY .996883

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: LMS

2.3.4 Appendix B

DATE: 10 February 1971

ASSEMBLY: Pre Amp/Discriminator

SUBASSEMBLY: Pre-Amp/Discriminator - 703 #3

SCHEMATIC NO: 151-660

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE (uf)	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 SOLDER AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% STRESS (SEE BELOW)	13 SPECIAL ENVIRONMENT (SEE TBL) FAILURE RATE MULTIPLIER	14 FINAL FAILURE RATE	15 TOTAL CAPACITOR COUNT PER TYPE	16 TOTAL FAILURE RATE (%/1000 HRS)
C1	ECY101ROC5	MSFC400A	1 pf	5	500	5	1	< .1	100	60		.0004 A	.01			.000004
C2	CKR06BX104K-0310	39014	.1	10	200	3.6	< .1	< .1	100	60		.005	.01			.00005
C3	ECY1013ROC5	MSFC400A	3.0 pf	5	500	.1	5	< .1	100	60		.0004	.01			.000004
C4	CKR06BX104K-0310	39014	.1	10	100	11.7	< .1	.1	100	60		.005	.01			.00005
C5	CKR06BX104K-0310	39014	.1	10	100	6	< .1	< .1	100	60		.005	.01			.00005
C6	CKR06BX104K-0310	39014	.1	10	100	3	< .1	< .1	100	60		.005	.01			.00005
C7	CKR06BX104K-0310	39014	.1	10	100	0	< .1	< .1	100	60		.005	.01			.00005
C8	CKR05BX471K-0293	39014	470pf	10	200	4.3	.5	< .1	100	60		.005	.01			.00005
C9	CKR06BX104K-0310	39014	.1	10	100	4.9	< .1	< .1	100	60		.005	01			00005
C10	CKR06BX104K-0310	39014	.1	10	100	4.9	< .1	< .1	100	60		.005	.01			.00005
C11	CKR06BX104K-0310	39014	.1	10	100	.4	< .1	< .1	100	60		.005	.01			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 .000458 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

2.3.4 Appendix B

PROJECT: LMS
ASSEMBLY: Pre Amp/Discriminator
SUBASSEMBLY: Pre Amp/Discriminator - 703 #3
DATE: 10 February 1971
SCHEMATIC NO: 151-660

(Capacitors)

Circuit Symbol Number	Type Designation (Mil or Mfr) and Construction	Manufacturer	Capacitance Value mfd	Tolerance %	Manufacturer's Rated Voltage	Operating Voltage DC	Operating Voltage Peak AC	Voltage Ratio, Operating/Rated	Maximum Duty Cycle	Bulk Air Temperature (°C)	Circuit Function or Application	Basic Failure Rate (%/1000 hrs) at	Source (See Below)	For Use of Reliability Dept	Special Environment (Define)	Failure Rate Multiplier	Final Failure Rate	Total Capacitor Count per Type	Total Failure Rate (%/1000 hrs)
C12	CKR06BX103K-0298	39014/02	.01	10	100	5		<.1	100	60		.005	A			.01			.00005
C13	CKR06BX104K-0310	39014/02	.1	10	100	6		<.1	100	60		.005				.01			.00005
C14	CKR06BX104K-0310	39014/02	.1	10	100	12		.12	100	60		.005				.01			.00005
C15	CKR06 BX104K-0310	39014/02	.1	10	100	12		.12	100	60		.005				.01			.00005
C16	CKR06BX104K-0310	39014/02	.1	10	100	7		<.1	100	60		.005				.01			.00005
C17	CKR05BX121K-0310	39014/01	*	10	200	5		<.1	100	60		.005				.01			.00005
C18	CKR06BX104K-0310	39014/02	.1	10	200	5		<.1	100	60		.005				.01			.00005
C19	CKR05BX151K-0302	39014/01	1501	10	100	5		<.1	100	60		.005				.01			.00005
C20	CKR06BX K-	39014/02	*	10	200	5		.1	100	60		.005				.01			.00005

FOR USE OF RELIABILITY DEPT

*Select in Test

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

CALCULATED MTBF ______ HRS

TOTAL FAILURE RATE .00045 % 1000 HRS

PARTS APPLICATION ANALYSIS

RESISTORS

2.3.4 APPENDIX B

PROJECT: LMS

ASSEMBLY: Pre Amp/Disc.

SUB ASSEMBLY: Pre Amp/Disc - 703 #3

DATE: 10 February 1971

SCHEMATIC NO: 151-660

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or ASTM) 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 SOLE AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% C.L.	13 SOURCE (SEE BELOW)	FOR USE OF RELIABILITY DATA	14 SPECIAL ENVIRONMENTS (DEFINED)	15 FAILURE RATE MULTIPLIER	16 TOTAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR07G822JS	39008	8.2K	5	250	<1	<.1	100	60		.022	A			.001			.000022
R2	RNR55C51R1FS	55182	51.1	1	100	<1	<.1	100	60		.168				.001			.000168
R3	RCR07G101JS	39008	100	5	250	1	<.1	100	60		.022				.001			.000022
R4	RCR07G182JS	39008	1.8K	5	250	<1	<.1	100	60		.022				.001			.000022
R5	RNR55C1821FS	55182	1.82K	1	100	<1	<.1	100	60		.168				.001			.000168
R6	RNR55C3572FS	55182	35.7K	1	100	<1	<.1	100	60		.168				.001			.000168
R7	RCR07G101JS	39008	100	5	250	<1	<.1	100	60		.022				.001			.000022
R8	RNR55C7491FS	55182	6.49K	1	100	<1	<.1	100	60		.168				.001			.000168
R9	RCR07G272JS	39008	2.7K	5	250	<1	<.1	100	60		.022				.001			.000022
R10	RCR07G272JS	39008	2.7K	5	250	<1	<.1	100	60		.022				.001			.000022
R11	RCR07G271JS	39008	270	5	250	<1	<.1	100	60		.022				.001			.000022
R12	RCR070471JS	39008	470	5	250	<1	<.1	100	60		.022				.001			.000022
R13	RCR07G123JS	39008	12K	5	250	<1	<.1	100	60		.022				.001			.000022
R14	RCR070471JS	39008	470	5	250	<1	<.1	100	60		.022				.001			.000022
R15	RCR07G JS	39008	*	5	250	<1	<.1	100	60		.022				.001			.000022
R16	RCR07G33JS	39008	3.3K	5	250	<1	<.1	100	60		.022				.001			.000022
R17	RCR07G392KS	39008	3.9K	5	250	<1	<.1	100	60		.022				.001			.000022
R18	RCR07G392JS	39008	3.9K	5	250	2	<.1	100	60		.022				.001			.000022

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

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000980 %/1000 HRS

BS-321A

*Select in Test.

PARTS APPLICATION ANALYSIS

RESISTORS

2.3.4 APPENDIX B

PROJECT: LMS DATE: 10 February 1971

ASSEMBLY: Pre Amp/Disc SUB ASSEMBLY: Pre-Amp/Disc - 703 #3 SCHEMATIC NO: 151660

(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)	8 POWER RATIO (OPERATING/RATED)	9 MAXIMUM DUTY CYCLE	10 FULL LIFE TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT FULL RATED STRESS (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT.	14 SPECIAL ENVIRONMENTS (OUTER)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R19	RCR07G470JS	39008	47	5	250	1	.1	100	60		.022	A		.001			.000022
R20	RCR7G180JS	39008	18	5	250	< 1	< .1	100	60		.022			.001			.000022
R21	RCR07G22JS	39008	2.2K	5	250	4.1	< .1	100	60		.022			.001			.000022
R22	RCR07G122JS	39008	1.2K	5	250	< 1	< .1	100	60		022			.001			.000022
R23	RCR07681JS	39008	680	5	250	4.8	< .1	100	60		.022			.001			.000022
R24	RCR07G102JS	39008	1.0K	5	250	.016	< .1	100	60		022			.001			.000022
R25	RCR070470JS	39008	47	5	250	< .1	< .1	100	60		.022			.001			.000022
R26	RCR07G332JS	39008	3.3K	5	250	9	< .1	100	60		.022			.001			.000022
R27	RCR07G332JS	39008	3.3K	5	250	9	< .1	100	60		.022			.001			.000022
R28	RCR07G JS	39008	*	5	250	1	< .1	100	60		.022			.001			.000022
R29	RCR07G511JS	39008	510	5	250	1	< .1	100	60		.022			.001			.000022
R30	RCR20G102JS	39008	1K	5	250	36	.15	100	60		.022			.001			.000022
R31	RCR07G821JS	39008	820	5	250	< 1	< .1	100	60		.022			.001			.000022
R32	RCR070470JS	39008	47	5	250	< .1	< .1	100	60		.022			.001			.000022
R33	RCR070472JS	39008	4.7K	5	250	5	< .1	100	60		.022			.001			.000022
R34	RCR07G101JS	39008	100	5	250	< 1	< .1	100	60		.022			.001			.000022

19 FAILURE RATE SOURCES (FOR COLUMN #12)

A ATM 605 A B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000357 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.3.4 APPENDIX B

PROJECT: LMS DATE: 10 February 1971

ASSEMBLY: Pre Amp/Discriminator SUB ASSEMBLY: Pre Amp/Discriminator - 703 SCHEMATIC NO: 151-660

(Semiconductors)

#3

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (watts): RATED AT 25°C: AMBIENT	RATED AT 25°C: CASE	ACTUAL: AMBIENT T_A	ACTUAL: CASE T_C	ACTUAL	POWER RATIO: ACTUAL/RATED (Amb. or case)	ACTUAL/RATED T_C or T_A	MAXIMUM VOLTAGES: V_{CBO} RATED V	V_{CB} ACTUAL V	V_{CEO} RATED V	V_{CE} ACTUAL V	DIODE PIV: RATED V	ACTUAL V	CIRCUIT FUNCTION OR APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Q1	Nch 151-355 TX 2N 3823	TI	60	175	65	300	-	220	--	9.0	<.1	<.1	30	7	30	5			.133			A					.001565
Q2	NPN S2N2222A	TI	60	175	60	500	1.8w	383	1.38	1.8	<.1	<.1	60	9	30	10			.273	.08							.00121
Q3	PNP S2N2907A	MO TI	60	200	64	400	1.8w	320	1.44	9.7	<.1	<.1	60	5	60	6			.051								.00246
Q4	NPN S2N2222A	TI	60	175	60	500	1.8w	383	1.38	5.2	<.1	<.1	60	3	30	4			.294	.08							.00121
Q5	PNP S2N2907A	MO TI	60	200	63	400	1.8w	320	1.44	6.5	<.1	<.1	60	10	60	11			.051								.00246
Q6	NPN S2N2222A	MO TI	60	175	64	500	1.8w	320	1.44	8.3	.09	.02	60	10	60	11			.051								.00121
CR1	S1N914	TI	60	175	60	250	250	191	191	0	<.1	<.1					75	5	.066	"							.00063
CR2	S1N914	TI	60	175	60	250	250	191	191	0	<.1	<.1					75	5									.00063
CR3	Ref. Diode S1N827 A	M	60	175	72	400	400	340	340	36	<.1	<.1															.0015

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

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

TOTAL FAILURE RATE .012875 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

(Microcircuits)

PROJECT: LMS
ASSEMBLY: Pre Amp/Discriminator

2.3.4 Appendix B
SUB ASSEMBLY: Pre Amp/Discriminator-703 #3

DATE: 10 February 1971
SCHEMATIC NO: 151-660

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	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	FOR RELIABILITY USE ONLY: FAIL RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TC TOTAL PER TYPE	FOR RELIABILITY USE ONLY: TOTAL FAILURE RATE (%/1000 HRS)
21	151-349 QL3F7710	Fair		60	125	60	21	18					10			Diff Compar	.0012	A			.0012
22	151-340 SN 54121S-01	TI	TTL	60	125	60	5.25	5	4.75				10			Mono-stable Mult.	.0015	A			.0015

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .0027 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS SUMMARY

2.4.1 APPENDIX B

PROJECT: LMS
ASSEMBLY: Sweep H.V. Power Supply **SUB ASSEMBLY:** Motherboard
DATE: 10 February 1971
SCHEMATIC NO: 151-686

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	8	.00040	
RESISTORS	10	.003536	
DIODES	4	.00299	
TRANSISTORS			
RELAYS			
TRANSFORMERS	1	.002	
CONNECTORS			
MICROCIRCUITS	38	.07182	

TOTAL ASSEMBLY FAILURE RATE .080746 **%/1000 HOURS**

MEAN-TIME-TO-FAILURE 1.24×10^6 **HOURS**

MISSION SUCCESS PROBABILITY .985949

PARTS APPLICATION ANALYSIS

CAPACITORS

2.4.1 APPENDIX B

(Capacitors)

PROJECT: LMS
DATE: 10 February 1971
ASSEMBLY: Sweep H.V. Power Supply SUBASSEMBLY: Motherboard
SCHEMATIC NO: 151-686

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	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	12 Circuit Function or Application	13 Basic Failure Rate (%/1000 Hrs) at °C	14 Source (See Below)	For Use of Reliability Dept.	15 Special Environment (Define)	16 Failure Rate Multiplier	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 Hrs)
C1	CKR06BX104KR	39014	.1		100	5		<.1				.005	A			.01			.00005
C2	CKR12BX101KR	39014	100p		100	5		<.1				.005				.01			.00005
C3	CKR06BX103KR	39014	.01		100	5		<.1				.005				.01			.00005
C4	CKR06BX104KR	39014	.1		100	5		<.1				.005				.01			.00005
C5	CKR06BX104KR	39014	.1		100	25		.25				.005				.01			.00005
C6	CKR06BX104KR	39014	.1		100	5		.15				.005				.01			.00005
C7	CKR06BX104KR	39014	.1		100	5		<.1				.005				.01			.00005
C8	CKR06BX103KR	39014	.01		100	2		<.1				.005				.01			.00005

20 FAILURE RATE SOURCES (FOR COLUMN 14)
A ATM605A B ____
C ____ D ____

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .00040 % 1000 HRS

PARTS APPLICATION ANALYSIS

RESISTORS

2.4.1 APPENDIX B

(Resistors)

PROJECT: LMS

DATE: 10 February 1971

ASSEMBLY: Sweep H.V. Power Supply SUB ASSEMBLY: Motherboard SCHEMATIC NO: 151-686

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 0.5 STRESS (SEE BELOW)	13 FOR USE OF ALTERNATE SOURCE	14 SPECIAL ENVIRONMENTS (SEE BELOW)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL # RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	151-351-02 PME-75	Pyrofilm	50m		1.0	22	<.1	100	60		.168	A		.01			.00168
R2	151-351-02 PME-75	Pyrofilm	50m		1.0	22	<.1	100	60		.168			.01			.00168
R3	RCR07104JS	39008	10K	5	.250	<1	<.1	100	60		.022			.001			.000022
R4	RCR07154JS	39008	15K	5	.250	<1	<.1	100	60		.022			.001			.000022
R5	RCR07222JS	39008	2.2K	5	.250	<1	<.1	100	60		.022			.001			.000022
R6	RCR07103JS	39008	1K	5	.250	4	<.1	100	60		.022			.001			.000022
R7	RCR07103JS	39008	1K	5	.250	4	<.1	100	60		.022			.001			.000022
R8	RCR07103JS	39008	1K	5	.250	4	<.1	100	60		.022			.001			.000022
R9	RCR07103JS	39008	1K	5	.250	4	<.1	100	60		.022			.001			.000022
R10	RCR07106JS	39008	1m	5	.250	<1	<.1	100	60		.022			.001			.000022

19 FAILURE RATE SOURCES (FOR COLUMN #16)
A ATM 605A B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .003536 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.4.1 APPENDIX B

PROJECT: LMS

ASSEMBLY: Sweep H.V. Power Supply SUB ASSEMBLY: Motherboard

DATE: 10 February 1971

SCHEMATIC NO: 151-686

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A	MAX. TEMP °C: ACTUAL JUNCTION T_J	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	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL T_C or T_A (Ambient case)	POWER RATIO: ACTUAL / RATED T_C or T_A	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: SOURCE (See Below)	FOR RELIABILITY USE ONLY: FAIL RATE	FOR RELIABILITY USE ONLY: MULTIPLIER	FOR RELIABILITY USE ONLY: FINAL RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	FOR RELIABILITY USE ONLY: COUNT	TOTAL FAILURE RATE (%/1000 HRS)
CR1	S1N914	T1	60	175		250		154		10		<.1						75	30	.07			A						.00081
CR2	S1N914	T1	60	175		250		154		10		<.1						75	30	.07			A						.00081
CR3	S1N914	T1	60	175		250		154		10		<.1						75	30	.07			A						.00081
CR4	S1N914	T1	60	175		250		154		--		<.1						75	.5	--			A						.00056

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

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

TOTAL FAILURE RATE .00299 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

2.4.1 APPENDIX B

PROJECT: LMS

ASSEMBLY: Sweep H.V. Power Supply

SUB ASSEMBLY: Motherboard

DATE: 10 February 1971

SCHEMATIC NO: 151-686

(Inductors & Transformers)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	CONSTRUCTION 4 TYPE OF CASE (SEE BELOW)	5 PRIM. SEC. PRIMARY	6 PRIM. SEC. SECONDARY	7 REGULATION CLASS	8 VA RATING	9 INDUCTANCE AT RATED CUR.	9 SPECIFIED FREQ	10 MISCELLANEOUS	11 OPERATING AMBIENT (HOT SPOT SURFACE)	TEMPERATURE (°C) 12 RISE (GR METHOD)	13 RISE EST. ACTUAL	14 OPERATING TEMP MAX.	15 ACTUAL	16 RATED	PRIMARY CURRENT 17 PRIMARY VOLTAGE	18 NO. WINDINGS	SECONDARY 19 WINDING NO.	20 VOLTAGE	21 WINDINGS	22 VOLTS	HIPOT READING 23 BASIC FAILURE RATE (λb/1000 HRS)	24 SOURCE (SEE BELOW)	25 TOTAL FAILURE RATE (λ/1000 HRS)
																							REL. DEPT USE ONLY		
TI	151-323	Leightner	D	28	36	V		120		60		5		65			1	4-8	890				A	.002

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

29 FAILURE RATE SOURCES (FOR COLUMN #23)
A. MLHB 217A B.
C. D.

30 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .002 %/1000 HRS

BxA 321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)
2.4.1 APPENDIX B

PROJECT: LMS

ASSEMBLY: Sweep H.V. Power Supply SUB ASSEMBLY: Motherboard

DATE: 10 February 1971

SCHEMATIC NO: 151-686

(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	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Z10 Z30	SN54L20S	TI	TTL		125	60	5.15	5	4.85			20		<.1	<.1	Quad 4 Input NAND	.0015	A		2	.0030
Z26 Z8	SN54L51S	TI	TTL		125	60	5.15	5.0	4.85			10		<.1		Dual 2 Input NAND	.0015			2	.0030
Z20 Z21 Z22	151-341 UD4037	Sprague			125	60	.40	24					40			Buffer	.0033			3	.0099
Z27	151-342 UD4036	"			125	60	60	20					33			Ladder Switch	.0033			1	.0033
Z28 Z29	151-343 UD4001	"			125	60	60	20					33			Ladder Switch	.0033			2	.0066
Z34 Z35 Z36	151-353 UT1000	"			125	60	50	15					15			Ladder Network	.0033			3	.0099
Z11	1/2 SN54L73S	TI	TTL		125	60	5.15	5.0	4.85			10		<.1		J-K Flip-Flop	.00075			1	.00075
Z1	3/4 SN54L00S	TI	TTL		125	60	5.15	5.0	4.85			10		<.1		Quad 2 Input NAND	.00112			1	.00112
Z25	5/6 SN54L04S	TI	TTL		125	60	5.15	5.0	4.85			50		<.1		Hex INV.	.00125			1	.00125

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE 03882 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)
2.4.1 APPENDIX B

PROJECT: LMS
ASSEMBLY: Sweep H.V. Power Supply
SUB ASSEMBLY: Motherboard
DATE: 10 February 1971
SCHEMATIC NO: 151-686

(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	FAIL RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Z14 Z15 Z16 Z17	SN54L73S	TI	TTL		125	60	5.15	5	4.85			40		<.1	<.1	J-K FF Counter	.0015	A		4	.0060
Z23	SN54L73S	TI	TTL		125	60	5.15	5	4.85			40		<.1	<.1	J-K FF Counter	.0015			1	.0015
Z12 Z13 Z18	SN54L73S	TI	TTL		125	60	5.15	5	4.85			40		<.1	<.1	J-K FF Counter	.0015			3	.0045
Z2, Z3 Z4 Z24 Z32	SN54L71S	TI	TTL		125	60	5.15	5	4.85			30		<.1	<.1	R-S FF	.0015			5	.0075
Z38	151-340 SN54121S	TI	TTL		125	60	5.15	5	4.85			60		<.1	<.1	MULTVIB	.0015			1	.0015
Z5 Z6 Z9	SN54L30S	TI	TTL		125	60	5.15	5	4.85			20		<.1	<.1	8 Input NAND	.0015			3	.0045
Z37	SN54L10	TI	TTL		125	60	5.15	5	4.85			40		<.1	<.1	Triple 3 Input NAND	.0015			1	.0015
Z19 Z31	SN54L00S	TI	TTL		125	60	5.15	5	4.85			10		<.1	<.1	Quad 2 Input NAND	.0015			2	.0030
Z7 Z33	SN54L04S	TI	TTL		125	60	5.15	5	4.85			50		<.1	<.1	Hex INV.	.0015			2	.0030

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .0330 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS
SUMMARY
2.4.2 APPENDIX B

PROJECT: LMS
ASSEMBLY: Sweep H. V. Power Supply SUB ASSEMBLY: Module 1
DATE: 10 February 1971
SCHEMATIC NO:

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	3	.00015	
RESISTORS	6	.000132	
DIODES			
TRANSISTORS	2	.00350	
RELAYS			
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES	1	.0003	
		.004082	

TOTAL ASSEMBLY FAILURE RATE .0004082 %/1000 HOURS

MEAN-TIME-TO-FAILURE 24.5×10^6 HOURS

MISSION SUCCESS PROBABILITY .999285

(Capacitors)

PARTS APPLICATION ANALYSIS

CAPACITORS

2.4.2 APPENDIX B

PROJECT: LMS

ASSEMBLY: Sweep H.V. Power Supply SUBASSEMBLY: Module 1

DATE: 10 February 1971

SCHEMATIC NO: 151-686

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	9 Maximum Duty Cycle	10 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	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 hrs)
	Module 1																		
C1	CKR 12 BX561K-0326	39014/05	560 pf		100	0	3	<.1	20		By-pass	.005	A			.01			.00005
C2	CKR 12BX561K-0326	39014/05	560 pf		100	0	3	<.1	20		By-pass	.005	A			.01			.00005
C3	CKR 12BX103K-0346	39014/05	.01		50	4	25	<.1	100		By-pass	.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 .00015 %/1000 HRS

PARTS APPLICATION ANALYSIS

RESISTORS

2.4.2 APPENDIX B

(Resistors)

PROJECT: LMS

ASSEMBLY: Sweep H.V. Power Supply SUB ASSEMBLY: Module 1

DATE: 10 February 1971

SCHEMATIC NO: 151-686

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 AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	13 SOURCE (SEE BELOW)	FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (OMITTED)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
	Module 1																	
R1	RCR07G222JS	39008	2.2K	5	.25	2	<.1	100	60		022	A			.001			.000022
R2	RCR07G150JS	39008	15	5	.25	3	<.1	100	60		022				.001			.000022
R3	RCR07G150JS	39008	15	5	.25	3	<.1	100	60		022				.001			.000022
R4	RCR07G222JS	39008	2.2K	5	.125	2	<.1	100	60		022				.001			.000022
R5	RCR07G223JS	39008	22K	5	.25	2	<.1	100	60		022				.001			.000022
R6	RCR07G332JS	39008	3.3K	5	.250	.8	<.1	100	60		022				.001			.000022

19 FAILURE RATE SOURCES (FOR COLUMN #12)

A ATM 605A B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000132 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.4.2 APPENDIX B

PROJECT: LMS

ASSEMBLY: Sweep H.V. Power Supply SUB ASSEMBLY: Module 1

DATE: 10 February 1971

SCHEMATIC NO: 151-686

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A	MAX. TEMP °C: 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 T	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED @ 25°C Ambient case	POWER RATIO: ACTUAL/RATED @ T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION OR APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
	Module 1																											
Q1	SIL-NPN S2N2102	RCA	60	200	65		1W	5W	800	4.0	150	.18	.04	120	30	65	30			.114			A					.00175
Q2	NPN S2N2102	RCA	60	200	65		1W	5W	800	4.0	150	.18	.04	120	30	65	30			.114			A					.00175

FAILURE RATE SOURCE (See Column 23)

A ATM 605A C

B D

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

TOTAL FAILURE RATE .00350 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

2.4.2 APPENDIX B

PROJECT: LMS
ASSEMBLY: Sweep H.V. Power Supply
SUB ASSEMBLY: Module 1
DATE: 10 February 1971
SCHEMATIC NO: 151-686

(Inductors & Transformers)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	Construction: 4 Type of Case (See Below)	Construction: 5 Wire Size Primary	Construction: 6 Wire Size, Secondary	Construction: 7 Insulation Class	8 VA Rating	9 Inductance at Rated Cur.	10 Specified Freq	11 Miscellaneous	Temperature (°C): 12 Operating Ambient	Temperature (°C): 13 Hot Spot (Surface)	Temperature (°C): 14 Rise (ΔR Method)	Temperature (°C): 15 Eff. Actual Rise	Temperature (°C): 16 Operating Temp Max.	Primary Current: 17 Actual	Primary Current: 18 Rated	19 Primary Voltage	Secondary: 20 No. Windings	Secondary: 21 Winding No.	Secondary: 22 Voltage	Hipot Reading: 23 Windings	Hipot Reading: 24 Volts	25 Basic Failure Rate (%/1000 hrs) — at ___ °C (Rel. Dept Use Only)	26 Source (See Below) (Rel. Dept Use Only)	27 Total Failure Rate (%/1000 hrs) (Rel. Dept Use Only)
	Module 1																									
L1	151-348	Deleven	B				680																		A	.0003

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

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

30 CALCULATED MTBF ______ HRS

31 TOTAL FAILURE RATE ______ %/1000 HRS

BxA 321A

PARTS APPLICATION ANALYSIS SUMMARY

2.4.3 APPENDIX B

PROJECT: LMS
ASSEMBLY: Sweep H.V. Power Supply SUB ASSEMBLY: Module 2
DATE: 10 February 1971
SCHEMATIC NO: _____

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	7	.00035	
RESISTORS	8	.003492	
DIODES	1	.00066	
TRANSISTORS	1	.00132	
RELAYS			
TRANSFORMERS			
CONNECTORS			
MICROCIRCUITS	1	.0058	
		.011622	

TOTAL ASSEMBLY FAILURE RATE .011622 %/1000 HOURS

MEAN-TIME-TO-FAILURE 8.60×10^6 HOURS

MISSION SUCCESS PROBABILITY .997972

(Capacitors)

PARTS APPLICATION ANALYSIS

CAPACITORS

2.4.3 APPENDIX B

PROJECT: LMS

DATE: 10 February 1971

ASSEMBLY: Sweep H.V. Power Supply

SUBASSEMBLY: Module 2

SCHEMATIC NO: 151-686

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value µfd	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operated Voltage DC	Operated Voltage Peak AC	8 Voltage Ratio Operated/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 For Use of Reliability Dept.	15 Special Environment (Factor)	16 Failure Rate Multiplier	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 hrs)
	Module 2																		
C1	CKR06BX104K-0310	39014/02	.1		100	5		<.1				.005	A			.01			.00005
C2	CKR06BX104K-0310	39014/02	.1		100	12		.12				.005				.01			.00005
C3	CKR12BX103K-0346	39014/05	.01		50	0	25	<.1	100		By-pass	.005				.01			.00005
C4	CKR05BX271K-0307	39014/01	270pf		100	1	0	<.1	100		Temp. Comp.	.005				.01			.00005
C5	CKR12BX103K-0345	39014/05	.01		50	9	0	.2	100		Temp. Comp.	.005				.01			.00005
C6	CKR06BX104K-0310	39014/02	.1		100	12		.12				.005				.01			.00005
C7	CKR12BX101K-0314	39014/05	100pf		100	10		.1				.005				.01			.00005

20 FAILURE RATE SOURCES (FOR COLUMN #13)
A ATM 605A B ______
C ______ D ______

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .00035 % 1000 HRS

PARTS APPLICATION ANALYSIS

RESISTORS

2.4.3 APPENDIX B

(Resistors)

PROJECT: LMS DATE: 10 February 1971

ASSEMBLY: Sweep H.V. Power Supply SUB ASSEMBLY: Module 2 SCHEMATIC NO: 151-686

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 (Derating)	15 Failure Rate Multiplier	16 Final Failure Rate (%/1000 hrs)	17 Total Resistor Count per Type	18 Total Failure Rate (%/1000 hrs)
	Module 2																	
R1	RCR07G471JS	39008	470	5	.25	10	<.1	100	60		022	A			.001			.000022
R2	RCR07G103JS	39008	10K	5	.25	5	<.1	100	60		022				.001			.000022
R3	RCR07G680JS	39008	68	5	.250	<1	<.1	100	60		.022				.001			.000022
R4	RCR07G135JS	39008	1.3m	5	.25	<1	<.1	100	60		.022				.001			.000022
R5	RCR07GxxxJS	39008	select	5	.250	<1	<.1	100	60		.022				.001			.000022
R6	RCR07GxxxJS	39008	select	5	.250	<1	<.1	100	60		.022				.001			.000022
R7	151-351-01 PME 60	Pyrofilm	6.5m	1	.125	<1	<.1	100	60		.168				.01			.00168
R8	151-351-01 PMR 60	Pyrofilm	1.2m	1	.125	<1	<.1	100	60		.168				.01			.00168

19 FAILURE RATE SOURCES (FOR COLUMN #12)

A ATM 605A B ______

C ______ D ______

20 CALCULATED MTBF ______ HRS

21 TOTAL FAILURE RATE .003492 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.4.3 APPENDIX B

PROJECT: LMS DATE: 10 February 1971

ASSEMBLY: Sweep H.V. Power Supply SUB ASSEMBLY: Module 2 SCHEMATIC NO: 151-686

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A ACTUAL	MAX. TEMP °C: JUNCTION T_J RATED	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): 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	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See Below)	FAIL RATE	MULTIPLIER	FINAL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
	Module 2																											
Q1	S2N2222A	TI	60	175	61	500	1.8w	380	1.31	20	<.1	.05	60	5	30	5			.08			A					.00132
CR1	S1N914	TI	60	175	60	250	250	250	250	.8	<.1	<.1					75	5	.32			A					.00066

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

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

TOTAL FAILURE RATE .00198 %/1000 HRS.

Form BS-321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

2.4.3 APPENDIX B

PROJECT: LMS

ASSEMBLY: Sweep H.V. Power Supply

SUB ASSEMBLY: Module 2

DATE: 10 February 1971

SCHEMATIC NO: 151-686

(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 Notes)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
	Module 2 151-346																				
Z1	2404BG	Amelco		60	125	69	18	12									.0058	A			.0058

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

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .0058 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS
SUMMARY
2.4.4 APPENDIX B

PROJECT: LMS
DATE: 10 February 1971
ASSEMBLY: Sweep H.V. Power Supply SUB ASSEMBLY: Module 3
SCHEMATIC NO: 151-686

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	5	.00027	
RESISTORS	9	.002732	
DIODES	3	.00189	
TRANSISTORS			
RELAYS			
TRANSFORMERS			
CONNECTORS			
MICROCIRCUITS	1	.0015	
		.006392	

TOTAL ASSEMBLY FAILURE RATE .006392 %/1000 HOURS

MEAN-TIME-TO-FAILURE 20.49×10^6 HOURS

MISSION SUCCESS PROBABILITY .999145

PARTS APPLICATION ANALYSIS

CAPACITORS

(Capacitors)

PROJECT: LMS | 2.4.4 APPENDIX B | DATE: 10 February 1971

ASSEMBLY: Sweep H. V. Power Supply | SUBASSEMBLY: Module 3 | SCHEMATIC NO:

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	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 __°C	13 Source (See Below)	14 For Use of Reliability Dept.	15 Special Environment (Define)	16 Failure Rate Multiplier	17 Final Failure Rate	18 Total Capacitor Count per Type	19 Total Failure Rate (%/1000 hrs)
	Module 3																		
C1	CKR12BX561K-0326	39014/05	560pf		100	10		.1				.005	A			.01			.00005
C2	CKR12BX222K-0338	39014/05	330pf		100	10		<.1				.005				.01			.00005
C3	CKR12BX331K-0321	39014/05	.0022		100	5		<.1				.005				.01			.00005
C4	CKR12BX101K-314	39014/05	100pf		100	12		<.1				.005				.01			.00005
C5	CKR13G105K-2836		1.0		50	5		<.1				.007				.01			.00007

20 FAILURE RATE SOURCES (FOR COLUMN 14)

A. ATM 605A B. ______

C. ______ D. ______

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .00027 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

2.4.4 APPENDIX B

PROJECT: LMS
ASSEMBLY: Sweep H. V. Power Supply SUB ASSEMBLY: Module 3 DATE: 10 February 1971
SCHEMATIC NO: 151-686

(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)	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 1/2 RATED POWER	13 SOURCE (A, B, C, D BELOW)	FOR USE OF RELIABILITY PREDICTION ONLY	14 SPECIAL ENVIRONMENTS (DESIRED)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
	Module 3																	
R1	151-351-01 PME 60	Pyrofilm	500K	1	.125	< 1	< .1	100	60		.168	A			1.01			.00168
R2	RCR07G226JS	39008	22m	5	.25	< 1	< .1	100	60		.022				1.001			.000022
R3	RCR07G331JS	39008	330	5	.125	< 1	< .1	100	60		.022				1.001			.000022
R4	RNR55C1001FS	55182	1K	1	.1	< 1	< .1	100	60		.168				1.001			.000168
R5	RNR55C1003FS	55182	100K	1	.1	< 1	< .1	100	60		.168				1.001			.000168
R6	RNR55C6192FS	55182	61.9K	1	.1	< 1	< .1	100	60		.168				1.001			.000168
R7	RNR55C1003FS	55182	100K	1	.1	< 1	< .1	100	60		.168				1.001			.000168
R8	RNR55C1003FS	55182	100K	1	.1	< 1	< .1	100	60		.168				1.001			.000168
R9	151-351-01 PME 60	Pyrofilm	1m	1	.125	< 1	< .1	100	60		.168	A			1.001			.000168

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

20 CALCULATED MTBF _____ HRS

21 TOTAL FAILURE RATE .001220 %/1000 HRS

Form 0704
BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.4.4 APPENDIX B

PROJECT: LMS
ASSEMBLY: Sweep H. V. Power Supply
SUB ASSEMBLY: Module 3
DATE: 10 February 1971
SCHEMATIC NO: 151-686

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (watts): RATED AT 25°C AMBIENT	AVG PWR DISSIPATION (watts): RATED AT 25°C CASE	AVG PWR DISSIPATION (watts): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (watts): ACTUAL CASE T_C	AVG PWR DISSIPATION (watts): ACTUAL	POWER RATIO: ACTUAL PWR DISS / RATED (Amb. or case)	POWER RATIO: ACTUAL T_C or T_A / RATED	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRON MENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
	MODULE 3																											
CR1	S1N914	TI	60	175	60	250	250	191	191	3	< .1	< .1					75	5	.066		A							.00063
CR2	S1N914	TI	60	175	60	250	250	250	250	5	< .1	< .1					75	10	.32		—							.00063
CR3	S1N914	TI	60	175	60	250	250	191	191	< 1	< .1	< .1					75	20	.066		A							.00063

FAILURE RATE SOURCE (See Column 22)
A ATM605A C
B D

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

TOTAL FAILURE RATE _____ %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

2.4.4 APPENDIX B

PROJECT: LMS

ASSEMBLY: Sweep H.V. Power Supply

SUB ASSEMBLY: Module 3

DATE: 10 February 1971

SCHEMATIC NO: 151-686

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	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	FOR RELIABILITY USE ONLY: FAILURE RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	FOR RELIABILITY USE ONLY: TOTAL FAILURE RATE (%/1000 HRS)
	MODULE 3 151-354 LM108F	Nat		60	150	67	20	12									.0015	A			.0015

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

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

TOTAL FAILURE RATE _____ %/1000 HRS

SxA 679

PARTS APPLICATION ANALYSIS SUMMARY

PROJECT: LMS
ASSEMBLY: Sweep H. V. Power Supply SUB ASSEMBLY: Module 4
DATE: 10 February 1971
SCHEMATIC NO: _____

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS		.001228	
RESISTORS	1	.000022	
DIODES	4	.00264	
TRANSISTORS			
RELAYS			
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .003890 %/1000 HOURS

MEAN-TIME-TO-FAILURE 25.7×10^6 HOURS

MISSION SUCCESS PROBABILITY .999318

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: LMS 2.4.5 APPENDIX B DATE: 10 February 1971

ASSEMBLY: Sweep H.V. Power Supply SUBASSEMBLY: Module 4 SCHEMATIC NO: 151-686

(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 BULB AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 85°C AMBIENT (SEE BELOW)	13	14 SPECIAL ENVIRONMENT (SEE BELOW)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C1	151-360 DD 30-101	Centralab	100pf		3000	1200		.4				.016	A		.01			.00016
C2	151-360 DD 30-101	Centralab	100pf		3000	400		.13				.005			.01			.00005
C3	151-360 DD 30-470	Centralab	47pf		3000	400		.13				.005			.01			.00005
C4	151-360 DD 30-101	Centralab	100pf		3000	800		.26				.006			.01			.000068
C5	151-360 DD 30-101	Centralab	100pf		3000	1500		.50				.03			.01			.0003
C6	151-360 DD 30-101	Centralab	100pf		3000	1500		.5	20		By-pass	.03			.01			.0003
C7	151-360 DD 30-100	Centralab	10pf		3000	1500		.50				.03			.01			.0003

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #16)
A ATM605A B
C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

2.4.5 APPENDIX B

(Resistors)

PROJECT: LMS
ASSEMBLY: Sweep H.V. Power Supply
SUB ASSEMBLY: Module 4
DATE: 10 February 1971
SCHEMATIC NO: 151-686

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL # 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 25°C SOURCE (SEE BELOW)	FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (SEE ITEM)	15 FAILURE RATE MULTIPLIER	16 TOTAL FAILURE RATE (%/1000 HRS)	17 TOTAL NUMBER COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
	Module 4																
R1	RCR076225JS	39008	2.2m	5	.25	1	< .1	100	60		.022	A		.001			.000022

19 FAILURE RATE SOURCES (FOR COLUMN #12)
A ATM605A B
C D

20 CALCULATED MTBF _____ HRS

21 TOTAL FAILURE RATE _____ %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.4.5..APPENDIX B

PROJECT: LMS DATE: 10 February 1971

ASSEMBLY: Sweep H.V. Power Supply SUB ASSEMBLY: Module 4 SCHEMATIC NO: 151-686

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	JUNCTION RATED T_J	CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (watts): RATED AT 25°C AMBIENT	RATED AT 25°C CASE	ACTUAL AMBIENT T_A	ACTUAL CASE T_C	ACTUAL	POWER RATIO: DESIGN (Amb. or case)	ACTUAL T_A or T_C DESIGN	MAXIMUM VOLTAGES: V_{CBO} RATED V	V_{CB} ACTUAL V	V_{CEO} RATED V	V_{CE} ACTUAL V	DIODE PIV: RATED V	ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE CWLV: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL FAIL. RATE (%/1000 HRS)	COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
	MODULE 4																										
CR1	151-359 S030G	SEM	60	150	60	250	250	180	180	< 1	< .1	< .1					3000	710	.08			A					.00066
CR2	151-359 S030G	SEM	60	150	60	250	250	180	180	< 1	< .1	< .1					3000	710	.08			A					.00066
CR3	151-359 S030G	SEM	60	150	60	250	250	180	180	< 1	< .1	< .1					3000	710	.08			A					.00066
CR4	151-359 S030G	SEM	60	150	60	250	250	180	180	< 1	< .1	< .1					3000	710	.08			A					.00066

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

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

TOTAL FAILURE RATE .00264 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS
SUMMARY
2.4.6 APPENDIX B

PROJECT: LMS

DATE: 10 February 1971

ASSEMBLY: Sweep H. V. Power Supply SUB ASSEMBLY: Module 5

SCHEMATIC NO: 151-686

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	2	.000472	
RESISTORS	1	.000022	
DIODES	1	.001500	
TRANSISTORS			
RELAYS			
TRANSFORMERS			
CONNECTORS		.001800	
MICRO CIRCUITS		.003794	

TOTAL ASSEMBLY FAILURE RATE .003794 %/1000 HOURS

MEAN-TIME-TO-FAILURE 26.4×10^6 HOURS

MISSION SUCCESS PROBABILITY .999335

PARTS APPLICATION ANALYSIS

CAPACITORS

2.4.6 APPENDIX B

PROJECT: LMS

ASSEMBLY: Sweep H. V. Power Supply

SUBASSEMBLY: Module 5

DATE: 10 February 1971

SCHEMATIC NO: 151-686

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value (µf)	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	Operating Voltage Peak AC	8 Voltage Ratio Operated/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	13 Base Failure Rate (F/1000 Hrs) At ___°C	14 Source (See Below)	For Use of Reliability Dept.	15 Special Environment (Define)	16 Failure Rate Multiplier	17 Final Failure Rate	18 Total Capacitor Count Per Type	19 Total Failure Rate (F/1000 Hrs)
	Module 5																		
C1	CSR13G106K-2854	39003/01	10		75	29	25	.4	100		Filter	.0236	A			.01			000236
C1	CSR13G106K-2854	39003/01	10		75	29	25	.4	100		Filter	.0236	A			.01			000236

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

21 CALCULATED MTBF ______ HRS

22 TOTAL FAILURE RATE .000472 F/1000 HRS

(Resistors)

PARTS APPLICATION ANALYSIS

RESISTORS

2.4.6 APPENDIX B

PROJECT: LMS
ASSEMBLY: Sweep H.V. Power Supply
SUB ASSEMBLY: Module 5
DATE: 10 February 1971
SCHEMATIC NO: 151-686

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 °C	13 Source (See Below)	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)
	Module 5																	
R1	RCR 07G682JS	39008	6.8K	5	.25	45	.2	100	60		.022	A			.001			.000022

19 FAILURE RATE SOURCES (FOR COLUMN #13)
A. ATM 605A B. ______
C. ______ D. ______

20 CALCULATED MTBF ______ HRS

21 TOTAL FAILURE RATE .000022 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

2.4.6 APPENDIX B

PROJECT: LMS

ASSEMBLY: Sweep H.V. Power Supply

SUB ASSEMBLY: Module 5

DATE: 10 February 1971

SCHEMATIC NO: 151-686

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A ACTUAL	MAX. TEMP °C: AMBIENT T_A RATED	MAX. TEMP °C: JUNCTION T_J ACTUAL HOT SPOT T_C	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (watts): RATED AT 25°C: AMBIENT T	AVG PWR DISSIPATION (watts): RATED AT 25°C: CASE	AVG PWR DISSIPATION (watts): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (watts): ACTUAL CASE T_C	AVG PWR DISSIPATION (watts): ACTUAL	POWER RATIO: ACTUAL/RATED 25°C Amb.or case	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION OR APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
	Module 5						@50	@50																				
CR 1	SIN963B	M	60	175	73		400	400	327	327	42	.129	.129							00			A					.0015
	151-347																											
Z1	MCT-1 LED	Mon	60	100	63		150	150	74	74	4.8	.07	.07							.213			A					.0009
	DET		60	100	66		200	200	91	91	16	.17	.17							.293			A					.0009

FAILURE RATE SOURCE (See Column 19)

A ATM 605A C

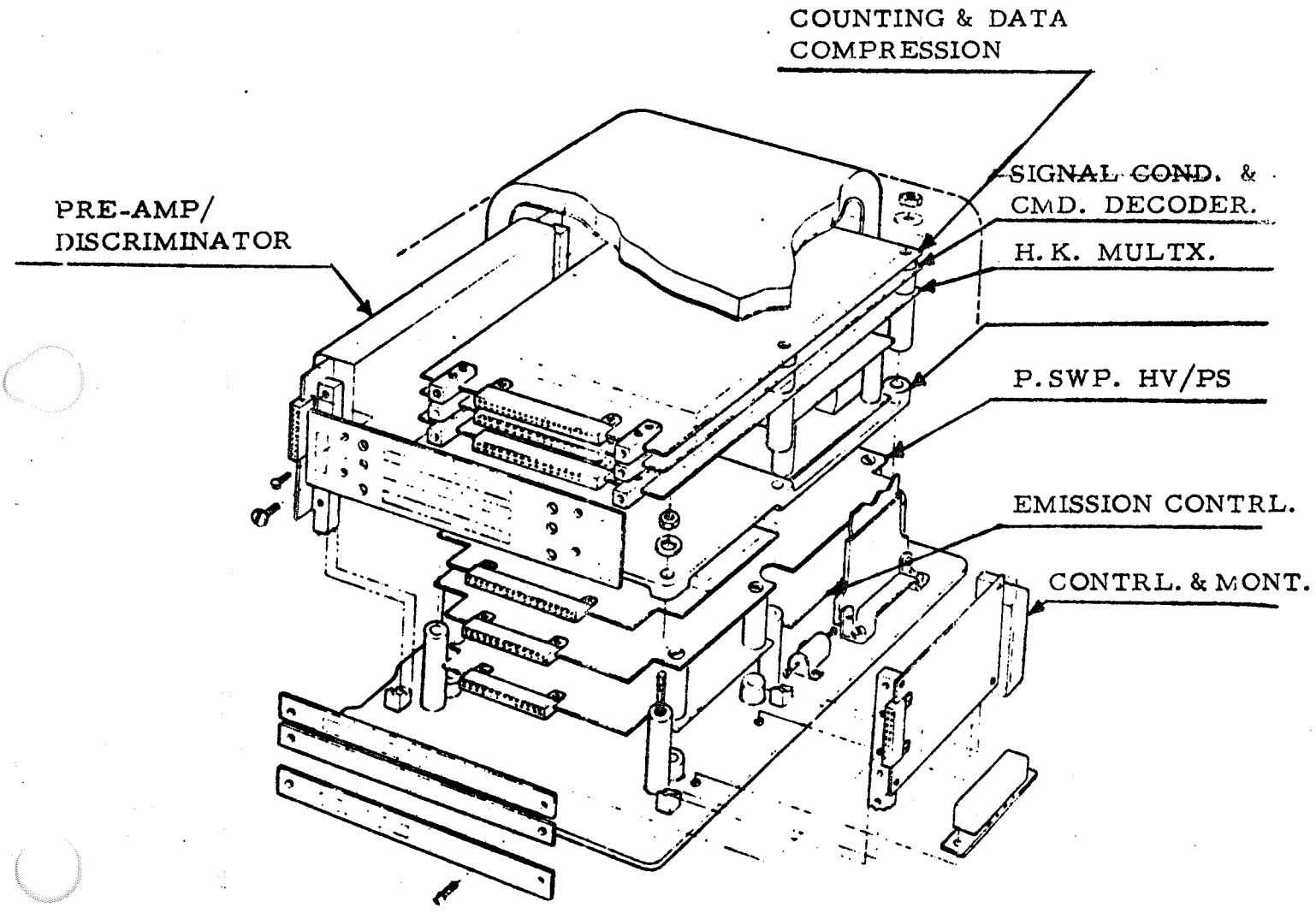
B D

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

TOTAL FAILURE RATE .00033 %/1000 HRS.

BS-321A

FIGURE 1
LMS ELECTRONICS



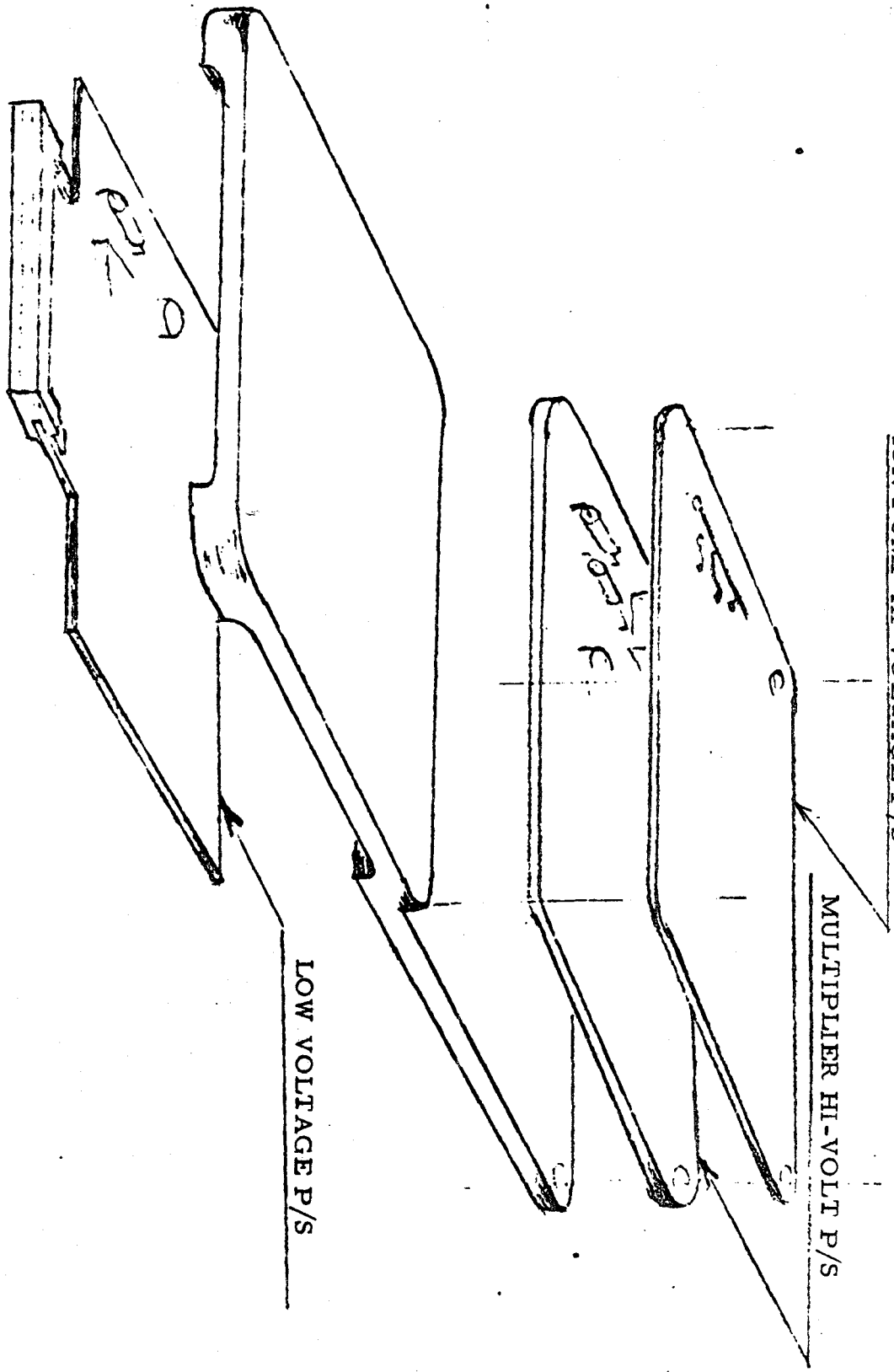


FIGURE 2
POWER SUPPLY MODULE

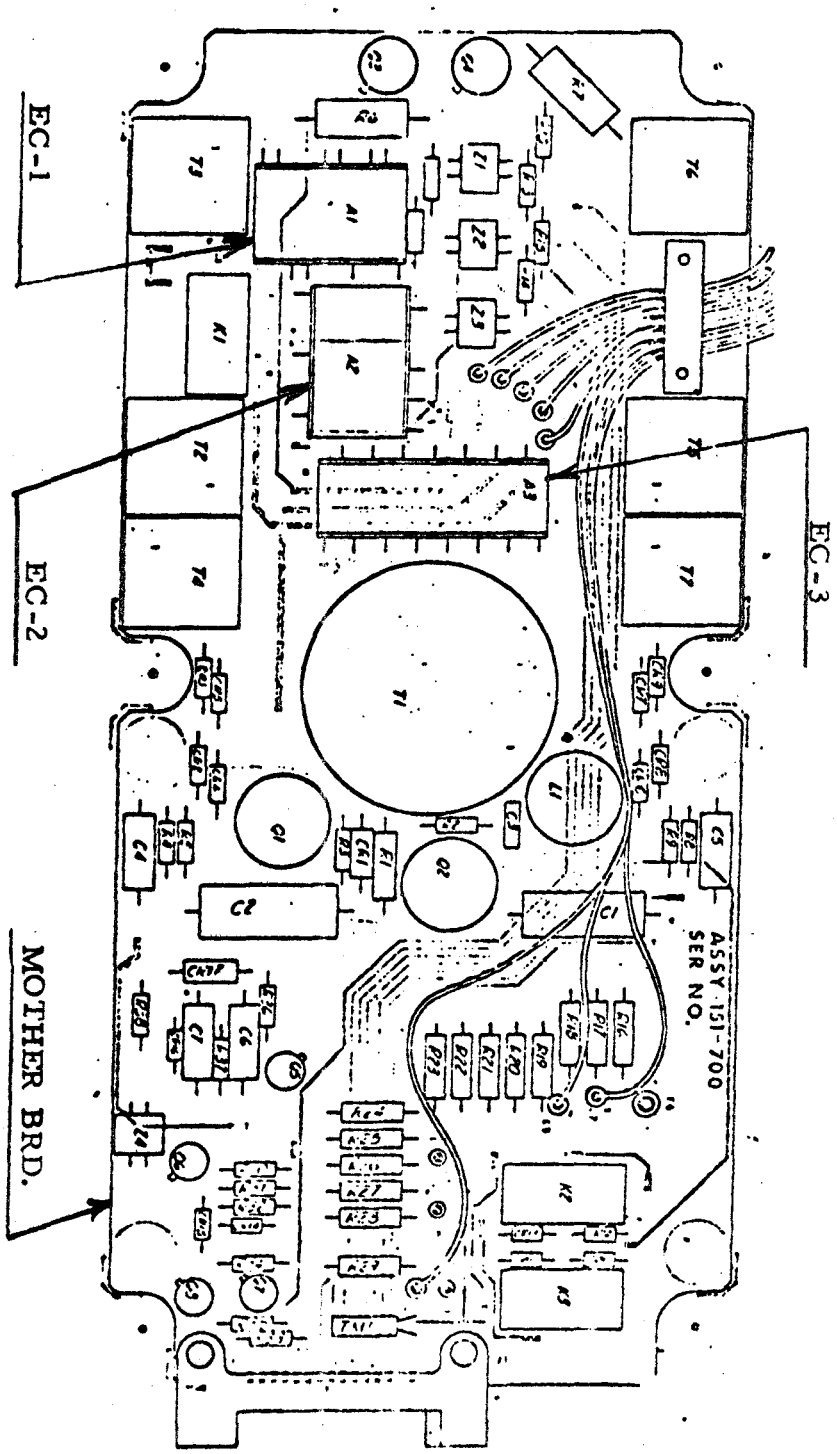


FIGURE 3
EMISSION CONTROL

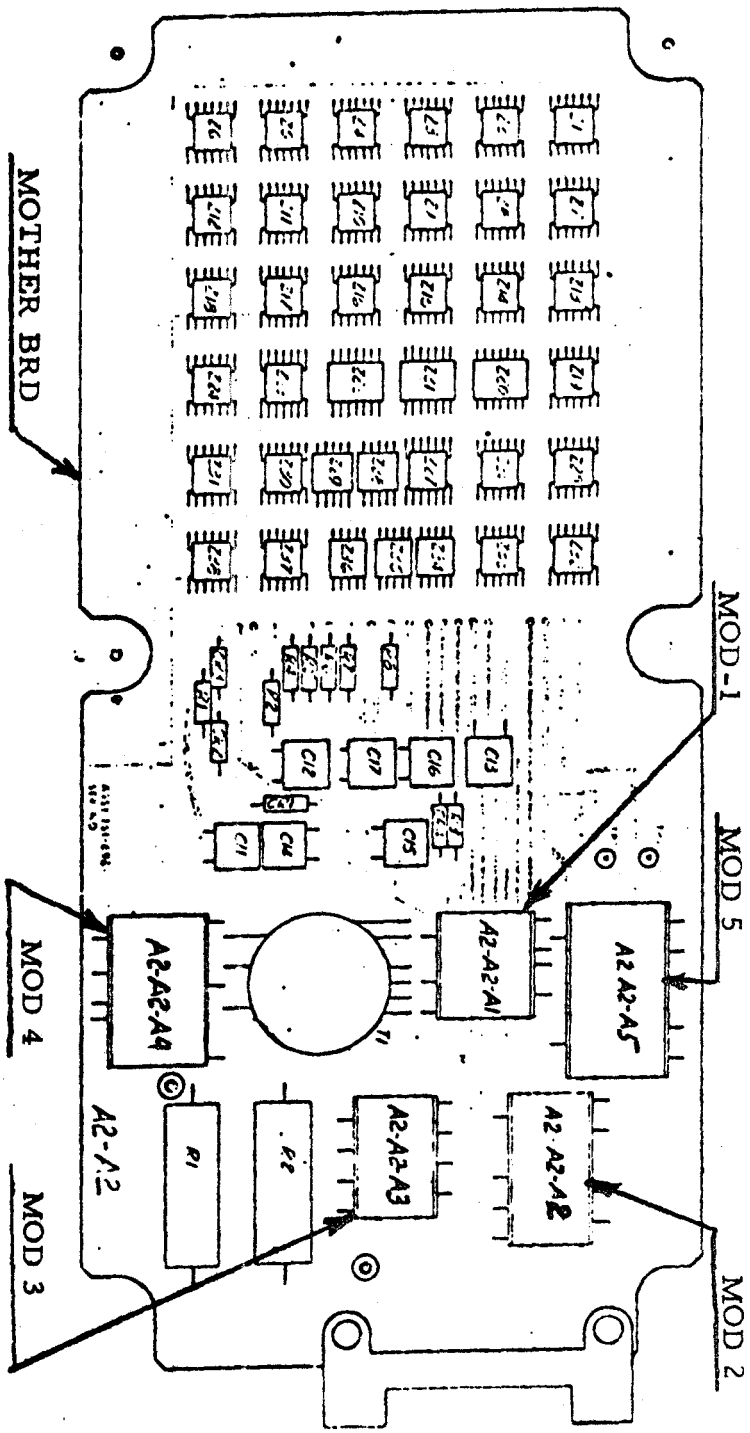


FIGURE 4
PROGRAMMED SWEEP HI-VOLTAGE POWER SUPPLY

FIGURE 5
ANALYZER

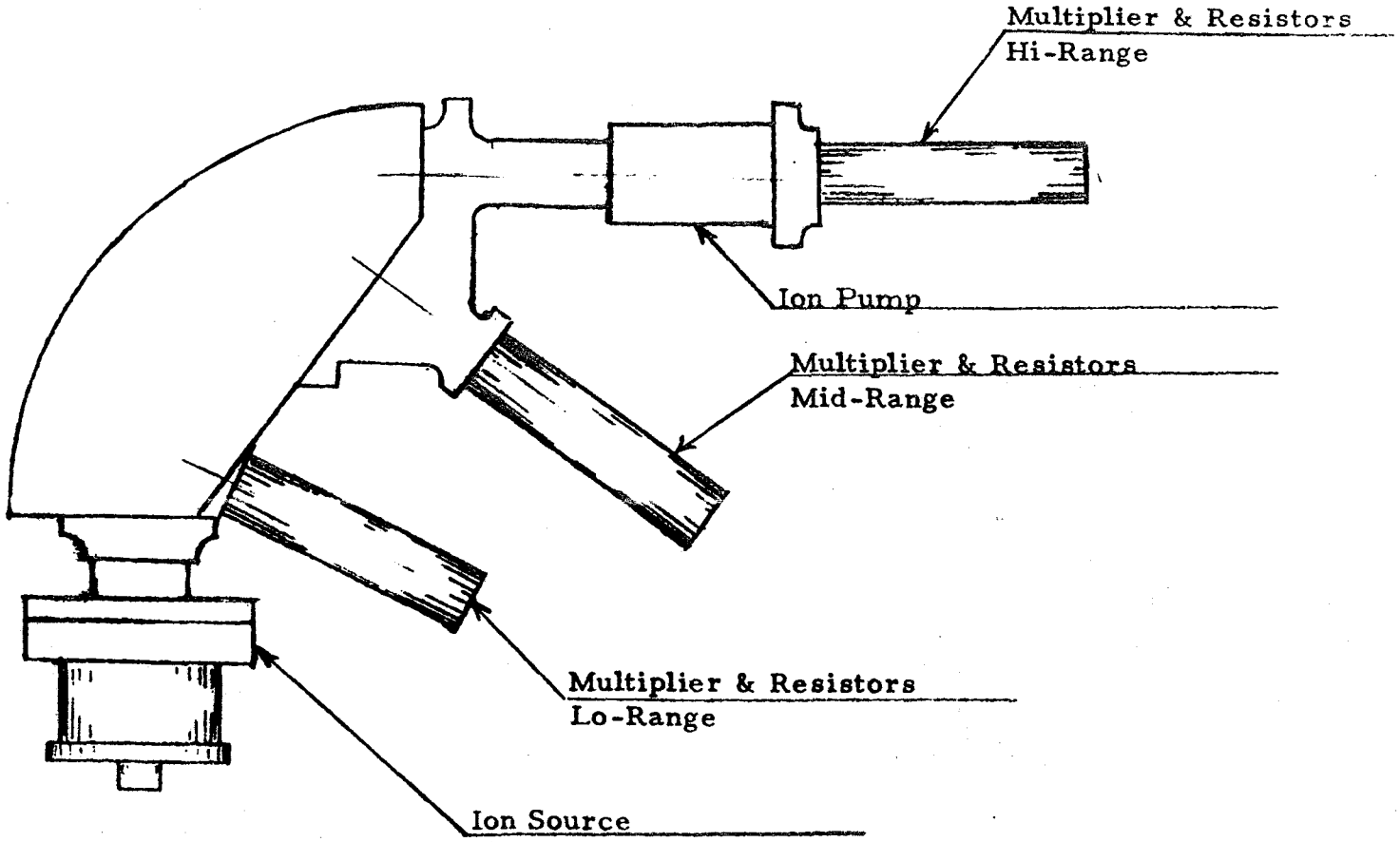


FIGURE 6

PRE-AMP/DISCRIMINATOR SUBASSEMBLY

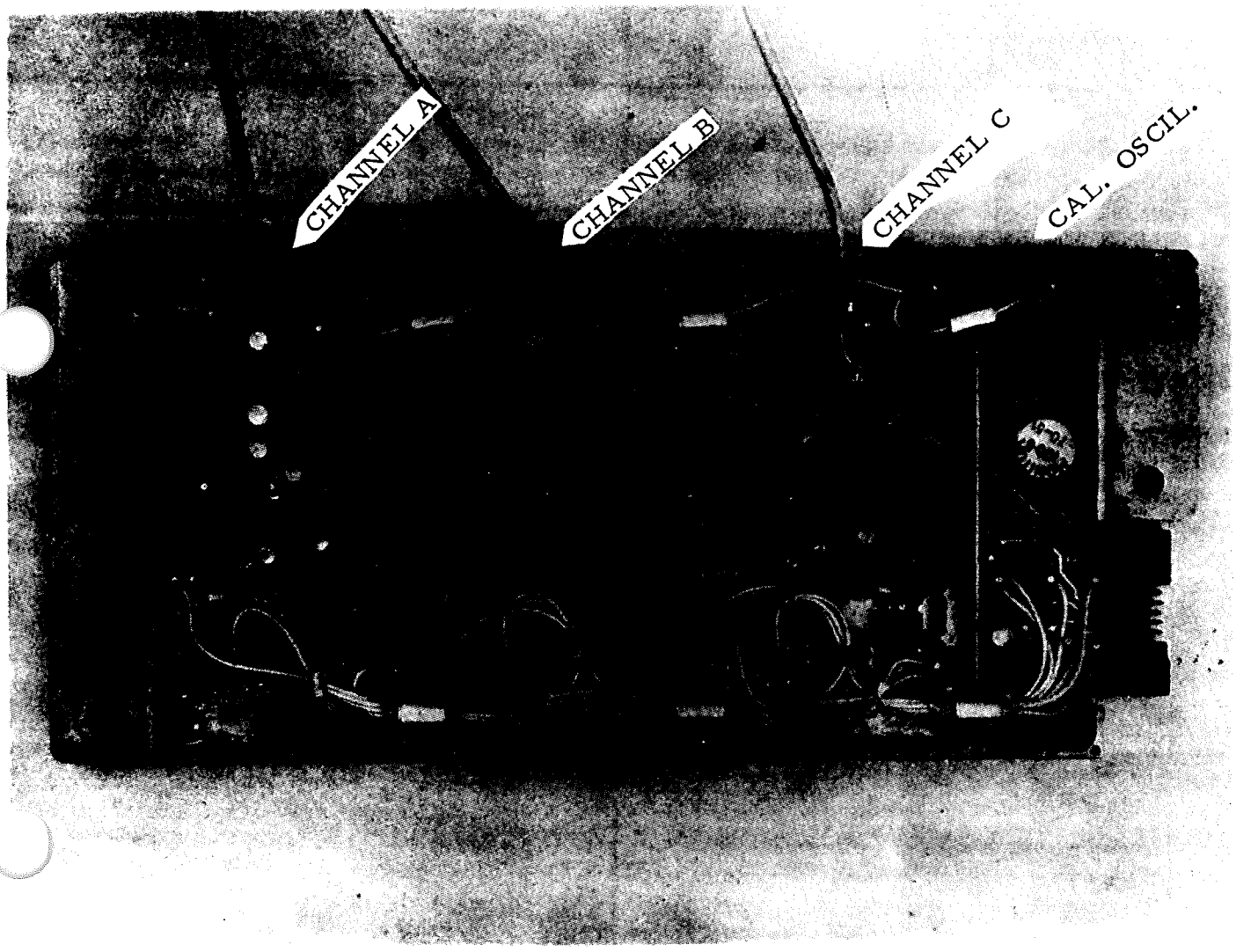


FIGURE 7

PRE-AMP/DISCRIMINATOR ASSEMBLY

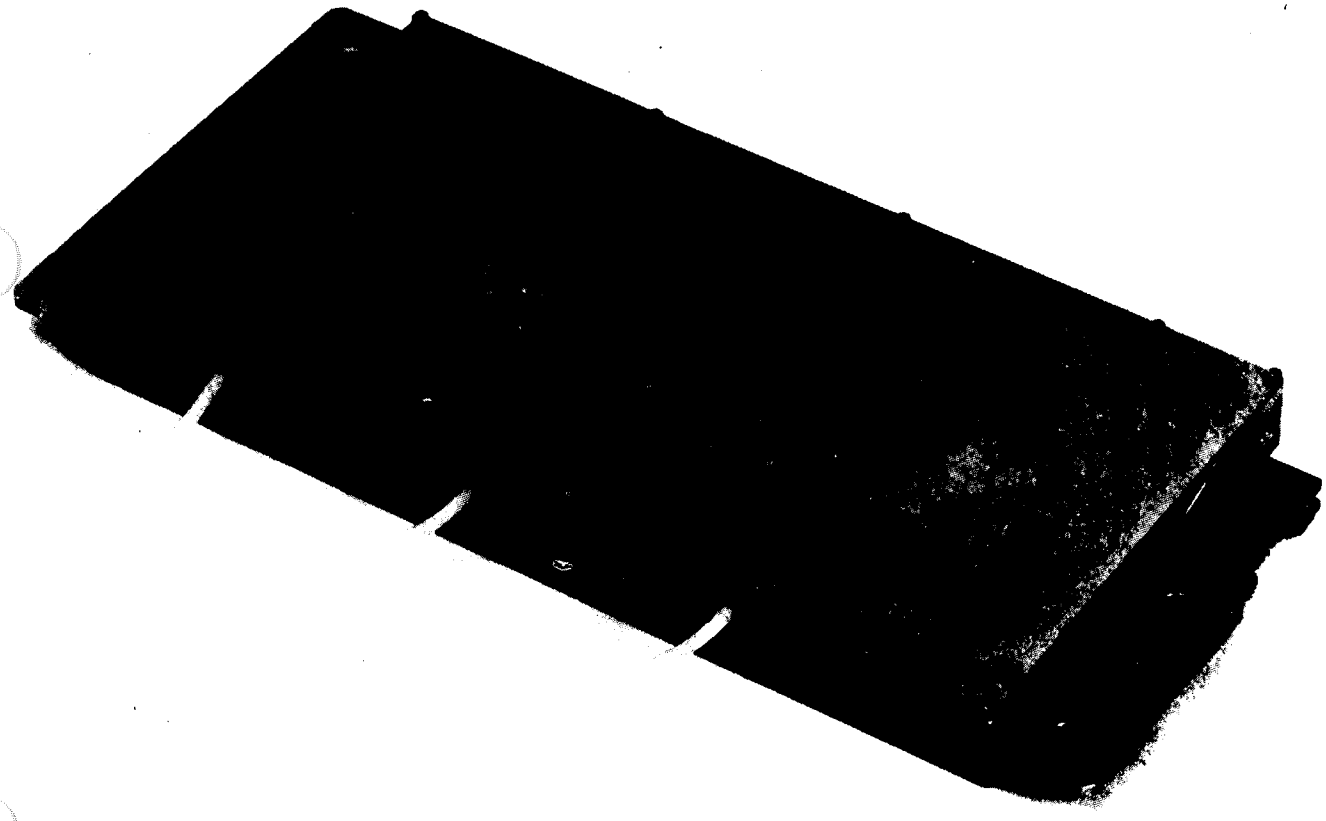


FIGURE 8

EMISSION CONTROL

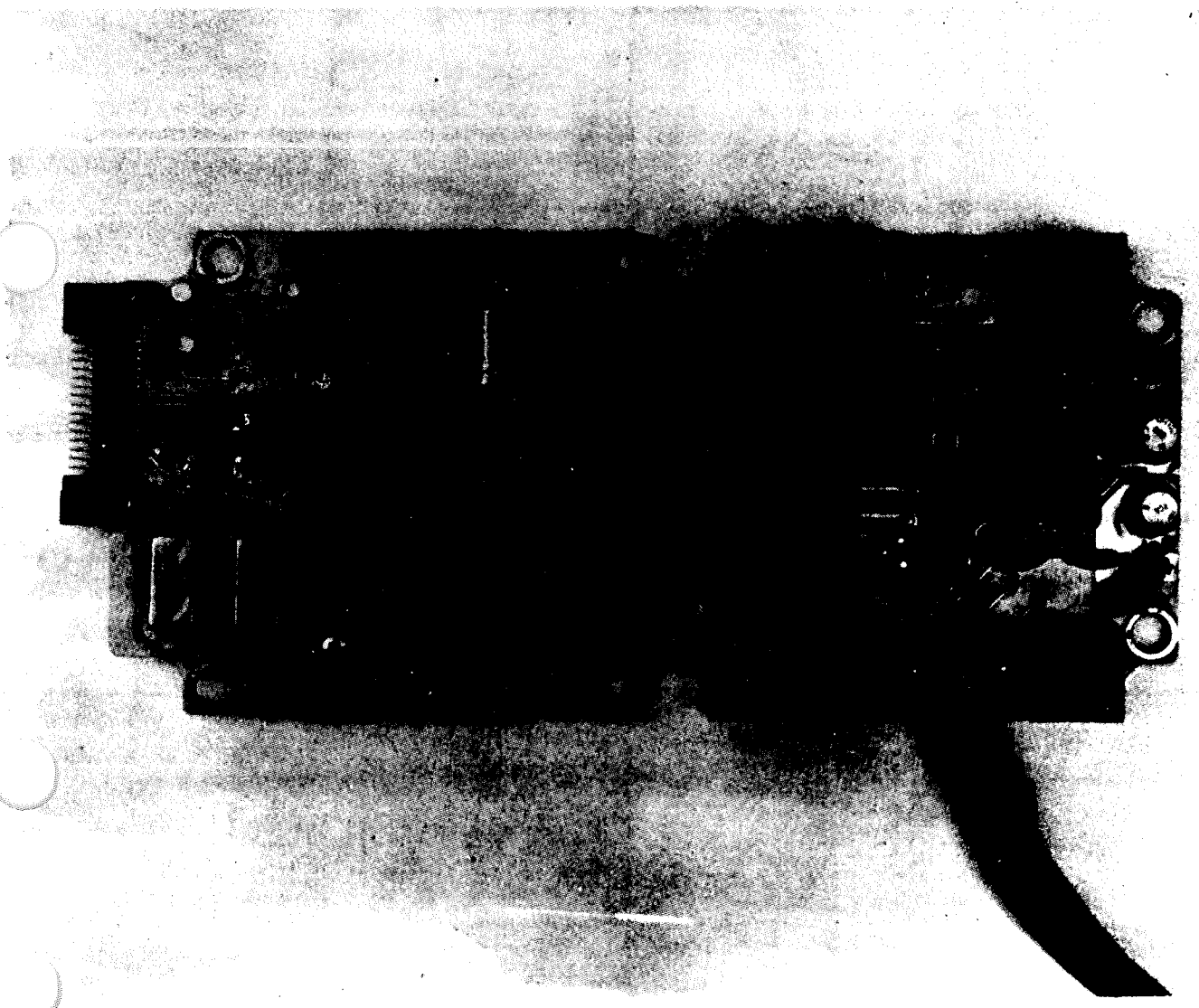


FIGURE 9

SWEEP HI VOLTAGE POWER SUPPLY
(BOTTOM VIEW)

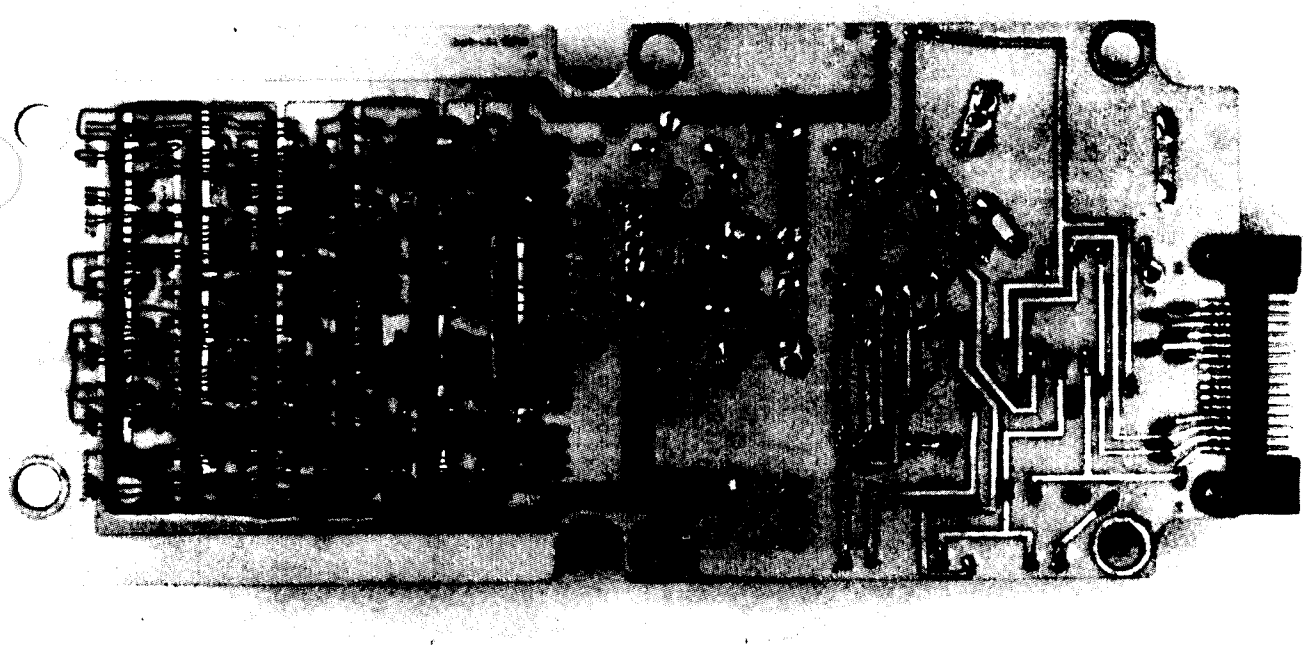


FIGURE 10

SWEEP HI VOLTAGE POWER SUPPLY
(TOP VIEW)

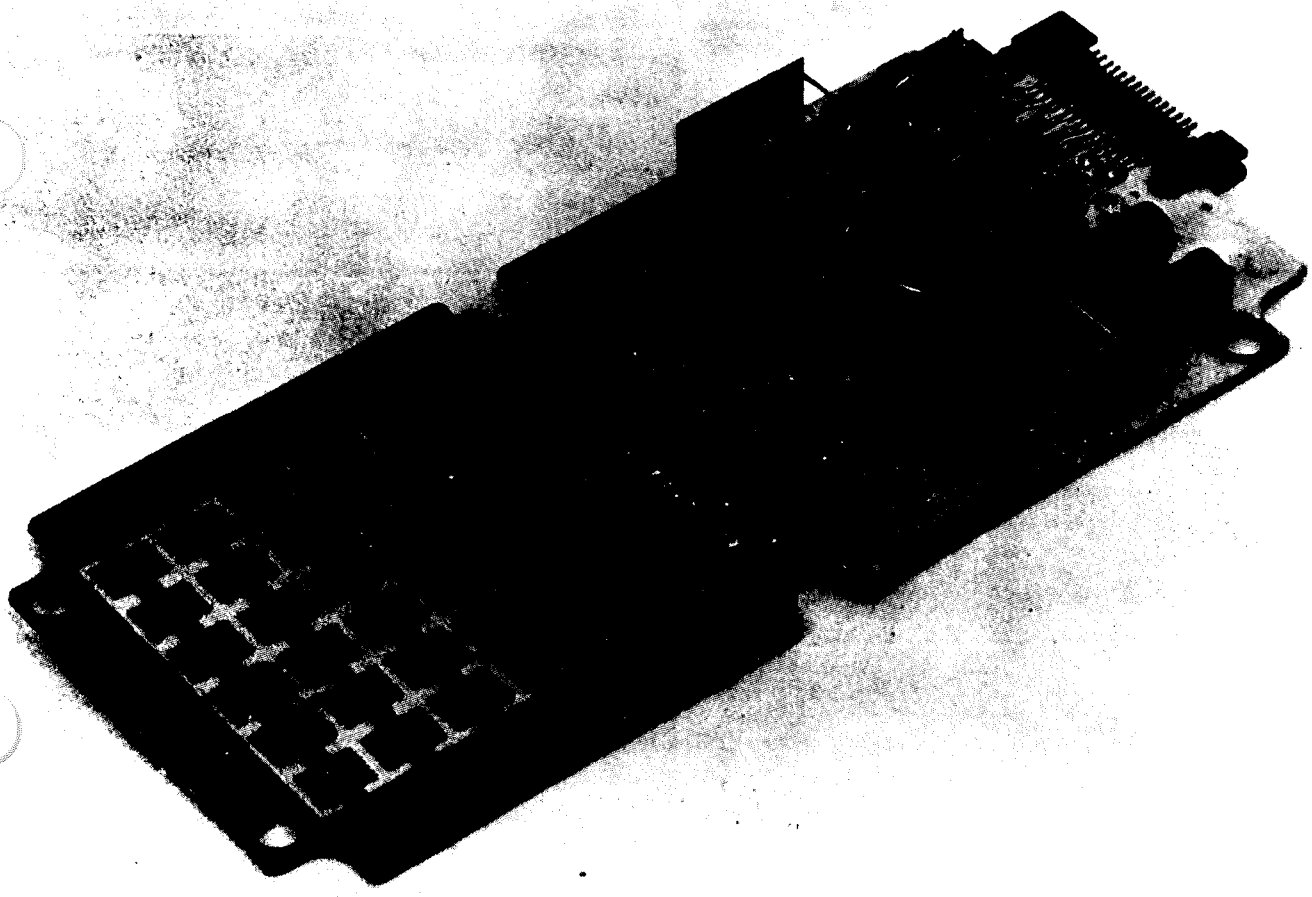


FIGURE 11

EMISSION CONTROL AND SWEEP HV/PS ASSEMBLY
(TOP VIEW)

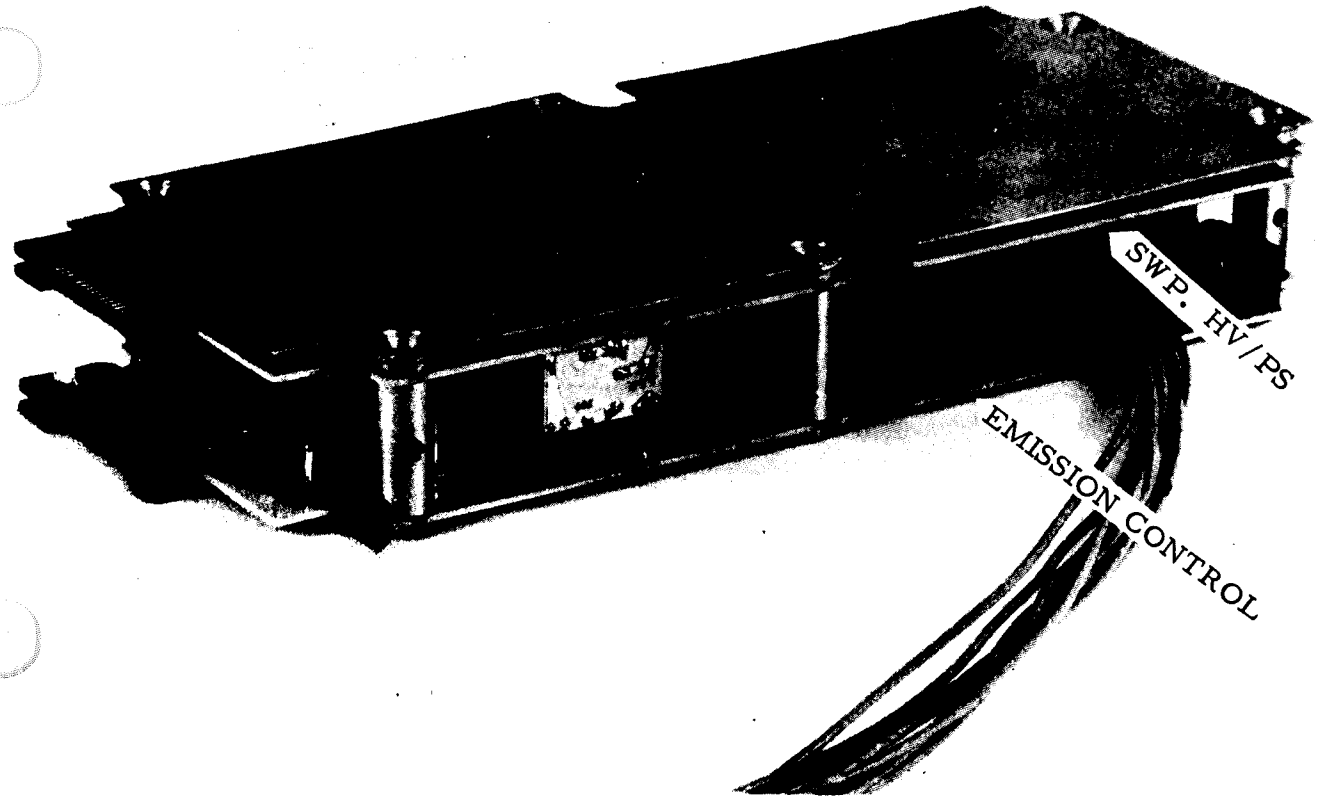
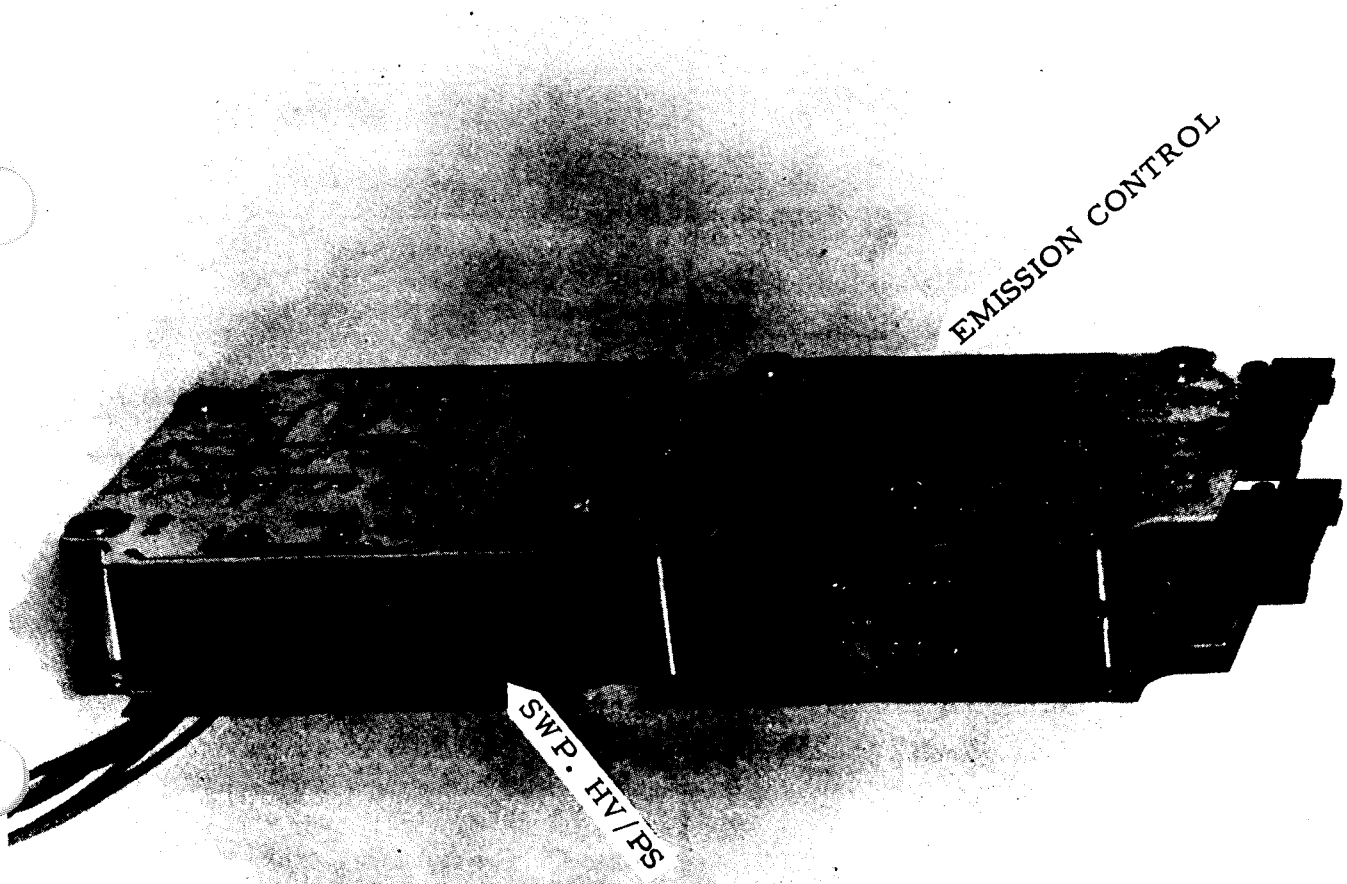


FIGURE 12

EMISSION CONTROL AND SWEEP HV/PS ASSEMBLY
(BOTTOM VIEW)

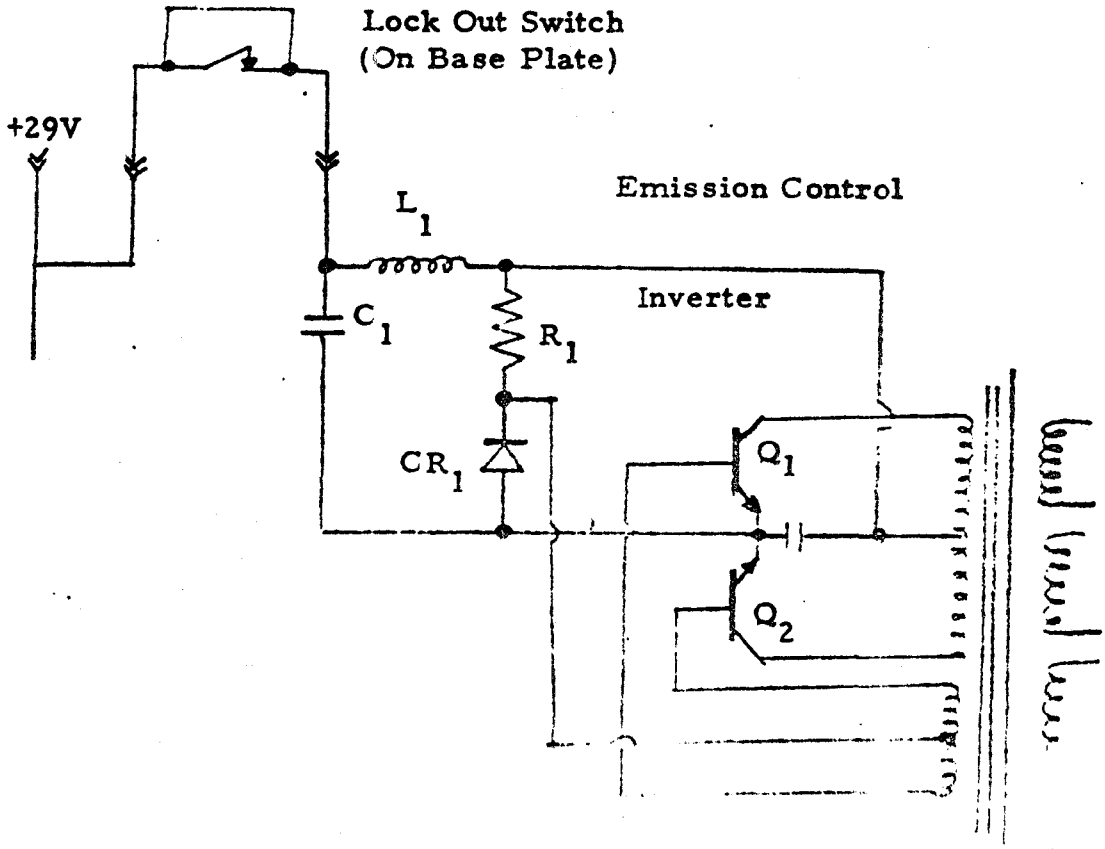


4.1 Lock Out Switch

This switch was added to prevent accidental turn on of the ion source filaments (numbers 1 or 2) during ground test when the chamber is back filled with argon. The switch is mounted on the base plate and is a normally closed switch. The switch, when activated, will open the +29 volt supply to the emission control inverter circuit. The switch is activated by a pin inserted through the base plate from outside the LMS. The pin is "flaged" DO NOT FLY and will be removed after final test. The switch will also be hard wired for a short circuit prior to flight.

For the reason that the switch is to be hard wired and shorted out before flight, the reliability of this switch will not effect the reliability of the LMS.

The switch is controlled by BxA SCD number 2346242-1. The Emission Control Schematic number is 151-702. The circuit is shown below.



PARTS APPLICATION ANALYSIS SUMMARY

ATM 966
Rev. B

2.2.5 APPENDIX B

PROJECT: LMS
ASSEMBLY: Emission Control
SUB ASSEMBLY: EC - 4
DATE: 9 March 1972
SCHEMATIC NO: 151-552

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	6	.00030	
RESISTORS	12	.00026	
DIODES	6	.01700	
TRANSISTORS	4	.00800	
~~TTL/MSI~~ Microcircuits	2	.00275	
TRANSFORMERS			
CONNECTORS			
COILS & CHOKES			

TOTAL ASSEMBLY FAILURE RATE .02831 %/1000 HOURS

MEAN-TIME-TO-FAILURE 3.53×10^6 HOURS

MISSION SUCCESS PROBABILITY .9950

PARTS APPLICATION ANALYSIS

RESISTORS

2.2.5 APPENDIX B Rev. B ATM 966

PROJECT: LMS

ASSEMBLY: EMISSION CONTROL SUB ASSEMBLY: EC - 4 DATE: Feb. 25, 72

SCHEMATIC NO: 151-552

(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)	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 SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DESIRED)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C1	M39003/01-2836		1.0	10	75	5	<.1	100	60		.020 <			.01			.0005
C2	M39003/01-2836		1.0	10	75	5	<.1	100	60		.020			.01			.0005
C3	M39014/06-153		0.1	10	100	5	<.1	100	60		.005			.01			.00005
C5	M39014/06-153		0.1	10	100	5	<.1	100	60		.005			.01			.00005
C4	-XXX		⚠	10	100	5	<.1	100	60		.005			.01			.00005
C6	-XXX		⚠	10	100	5	<.1	100	60		.005			.01			.00005

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 6054 B _____

C _____ D _____

20 CALCULATED MTBF _____ HRS

21 TOTAL FAILURE RATE .00030 %/1000 HRS

BS-321A ⚠1 to be selected

PARTS APPLICATION ANALYSIS

RESISTORS

Rev. B ATM 966

PROJECT: LMS DATE: Feb. 25, 72

ASSEMBLY: EMISSION CONTROL SUB ASSEMBLY: EC - 4 SCHEMATIC NO: 151-552

(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)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 HOT AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY GROUP	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	RCR07G103JS		10K	5	.25	7.1	7.1	100	60		.022 A				.001		.000022
R3																	
R5																	
R7																	
R9																	
R10																	
R11																	
R12	RCR07G103JS		10K														
R2	RCR07G183JS		18K														
R4			18K														
R6			18K														
R8	RCR07G183JS		18K	5	.25	7.1	7.1	100	60		.022 A				.001		.000022

19 FAILURE RATE SOURCES (FOR COLUMN #16)
A ATM 605A B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .00026 %/1000 HRS

FORM 9284

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

Rev. B

ATM 966

PROJECT: LMS

ASSEMBLY: EMISSION CONTROL **SUB ASSEMBLY:** EC - 4

DATE: Feb. 25, 1972

SCHEMATIC NO: 151-552

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A	MAX. TEMP °C: 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	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: D.C. BIAS ACTUAL/RATED (Amb. or case)	POWER RATIO: ACTUAL T_A or T_C / RATED	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See footnote)	FAIL. RATE	MULTIPLIER	FINAL FAIL. RATE (%/1000 HRS)	TOTAL PER TYPE	COUNT	TOTAL FAILURE RATE (%/1000 HRS)
Q thru Q4	52N2907A	M / TI	60	200	64	400	1.8	320	1.44	10	<.1	<.1	60	30	60	30							A			4	.00210
CR1 thru CR4	SM1N963B		60	200	64	750	750	720	720	<1	<.1	<.1											A			4	.00400
CR 5,8,6	151-364-01 IN4942	SEM	60	175	60	710	710	720	720	<1	<.1	<.1											A			2	.00050

FAILURE RATE SOURCE (See Column 23)

A ATM 609A C

B D

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

TOTAL FAILURE RATE .02500 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

Rev. B

ATM 966

PROJECT: LMS

ASSEMBLY: EMISSION CONTROL

SUB ASSEMBLY: MOTHER BOARD

DATE: Feb. 25, 1972

SCHEMATIC NO: 151-552

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED @ 25°C (Amb. or case)	POWER RATIO: ACTUAL T_C or T_A / RATED	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL FAIL. RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Z9/5	SN54L10	TI	TTL	60	125	60	5.3	5.0	4.7	NA	NA	10	10														.00050
Z9/13	SN54L10											10	10														.00050
Z9/3	SN54L10											10	10														.00050
Z8/6	SN54L04											30	30														.00025
Z8/2												20	20														.00025
Z8/14												25	25														.00025
Z8/12												25	25														.00025
Z8/10	SN54L04	TI	TTL	60	125	60	5.3	5.0	4.7	N/A	NA	25	25														.00025

FAILURE RATE SOURCE (See Column 23)

A ATM 605A C

B D

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

TOTAL FAILURE RATE .00275 %/1000 HRS.

BS-321A

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