VOLUME II

FINAL REPORT

for

A STUDY OF THE EFFECT OF SPACE RADIATION ON SILICON INTEGRATED MICROCIRCUITS

(26 June, 1964 to 26 September, 1965)

Contract No. NAS5-3985

Prepared by

Battelle Memorial Institute
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

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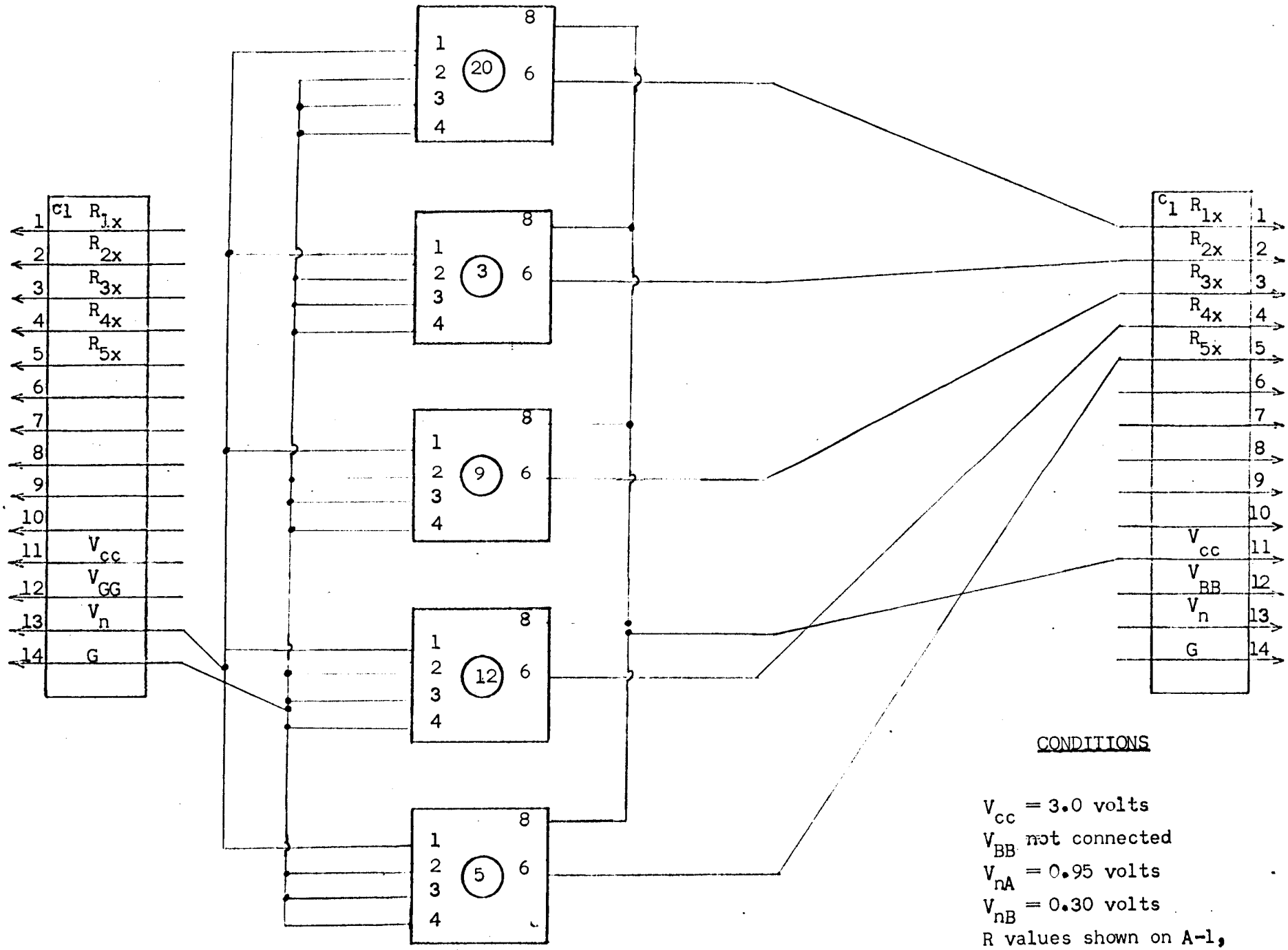
APPENDIX II

MONITORING AND TEST CONFIGURATIONS DURING IRRADIATION

MONITORING AND TEST CONFIGURATIONS DURING IRRADIATION

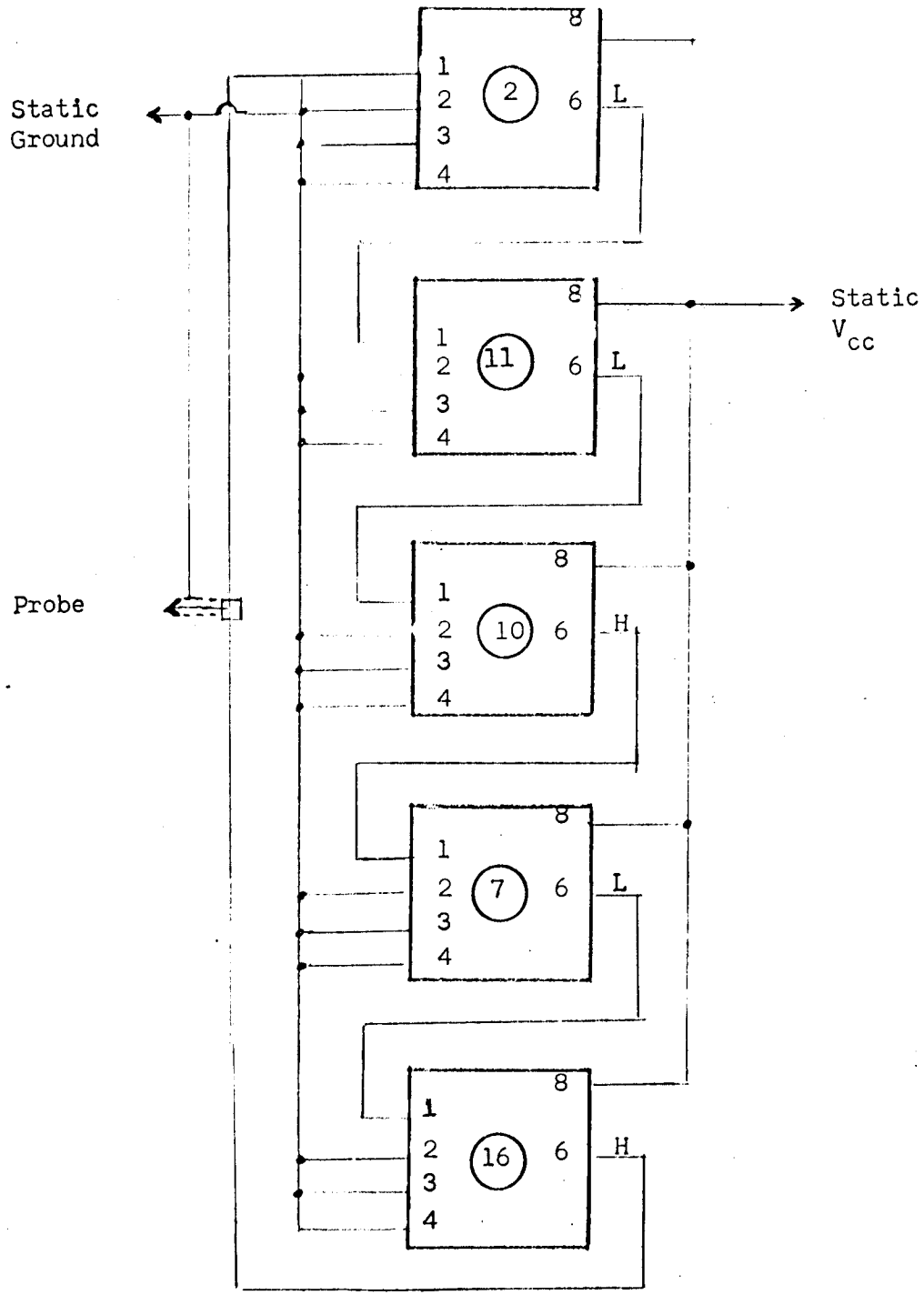
This appendix contains the schematic diagrams and information concerning the procedures used in monitoring the behavior of the circuits during exposure to the electron radiation environment. The information is arranged in the same alpha-numeric order as for Appendix I.



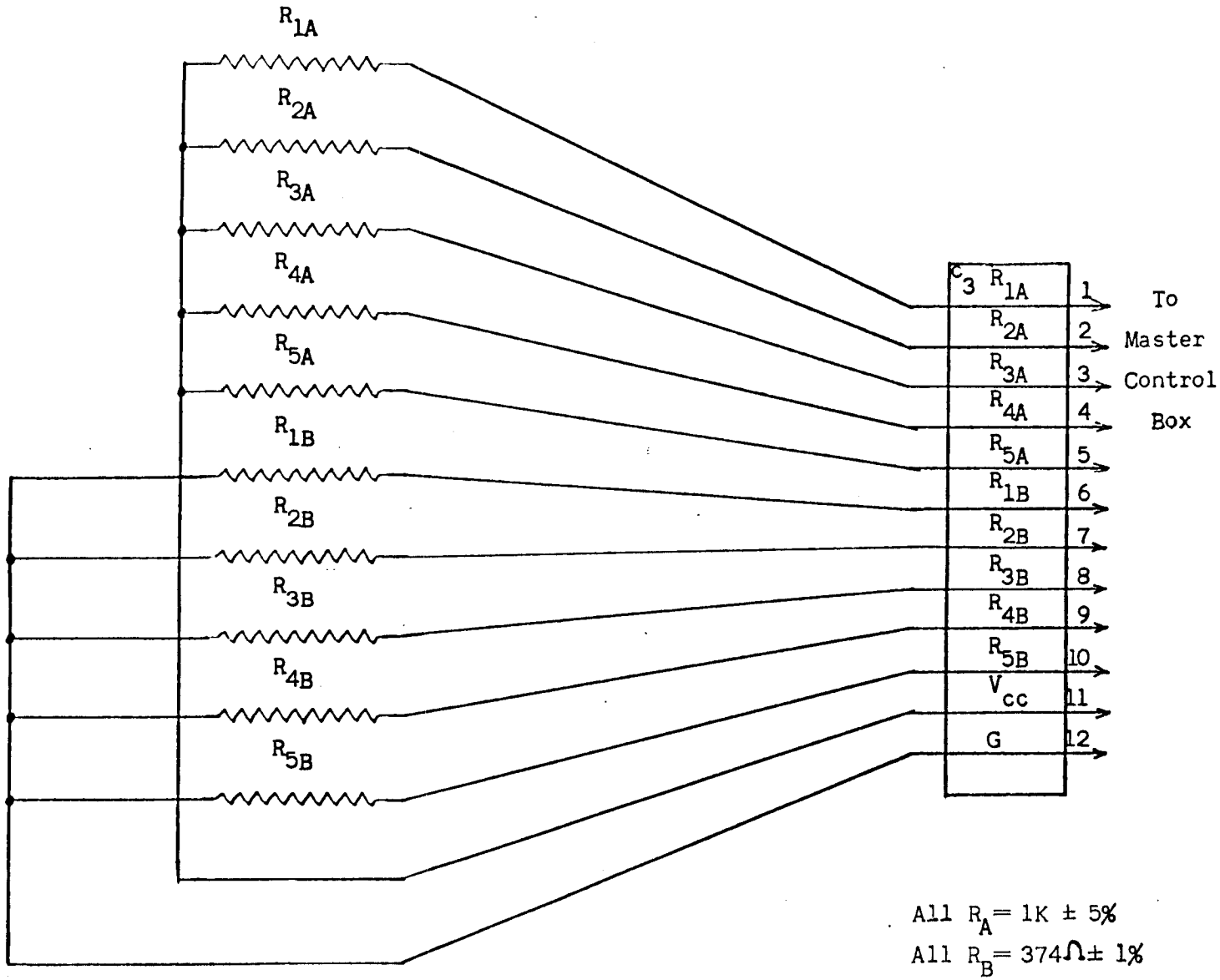
CONDITIONS

V_{cc} = 3.0 volts
V_{BB} not connected
V_{nA} = 0.95 volts
V_{nB} = 0.30 volts
R values shown on A-1, static load box.

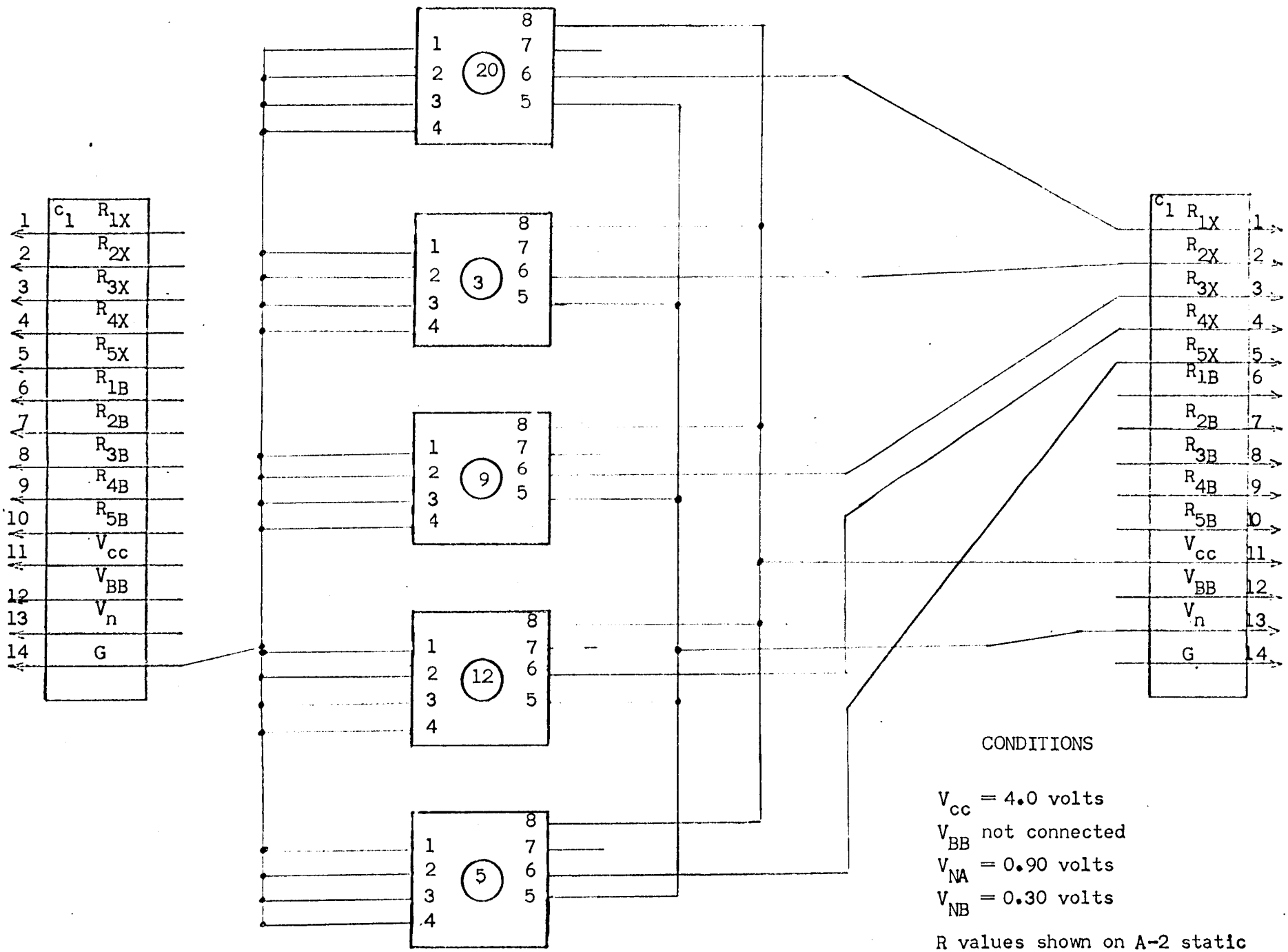
A-1, STATIC RADIATION CIRCUIT



A-1, DYNAMIC RADIATION CIRCUIT



A-1, STATIC LOAD BOX



CONDITIONS

V_{cc} = 4.0 volts

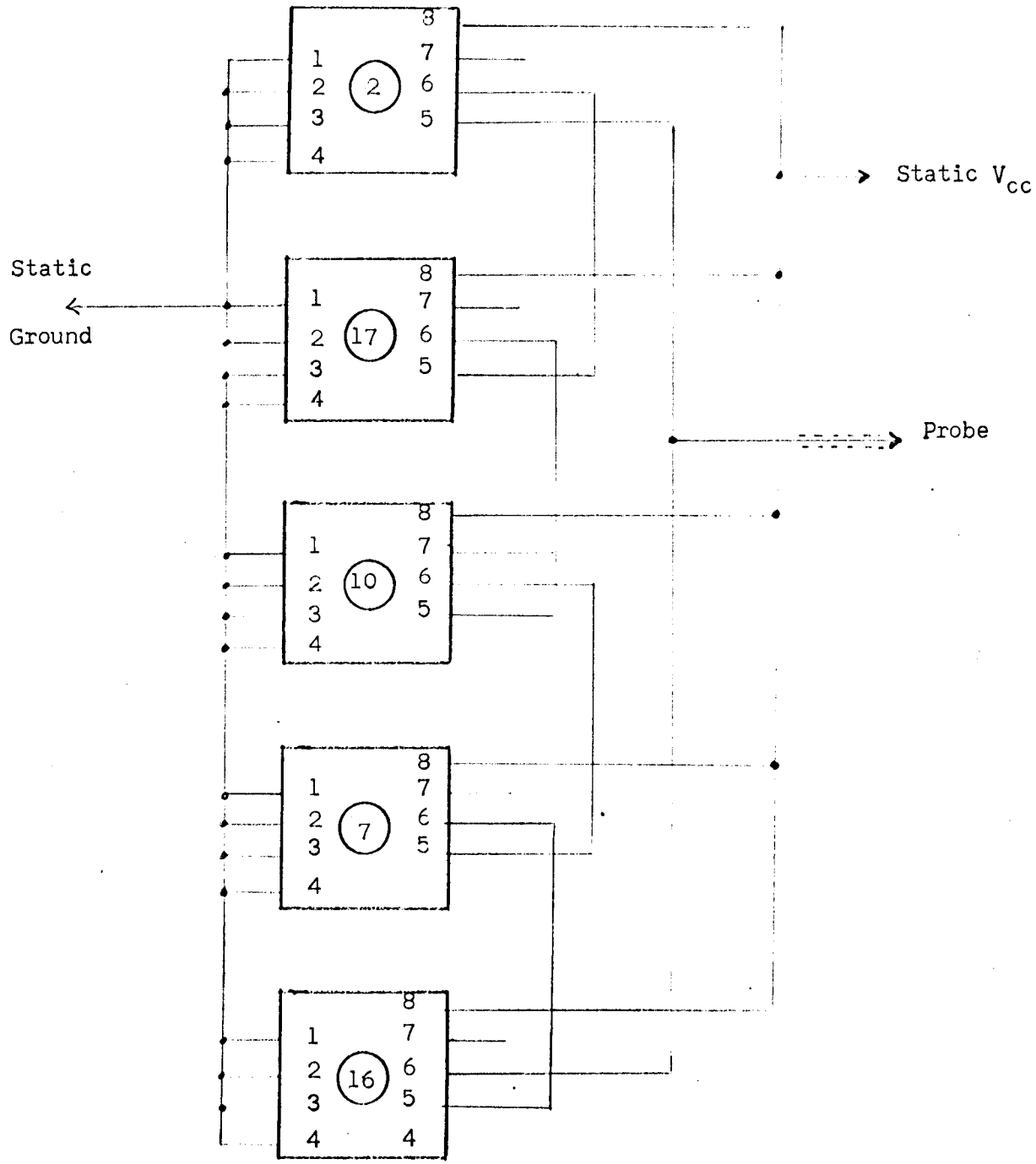
V_{BB} not connected

V_{NA} = 0.90 volts

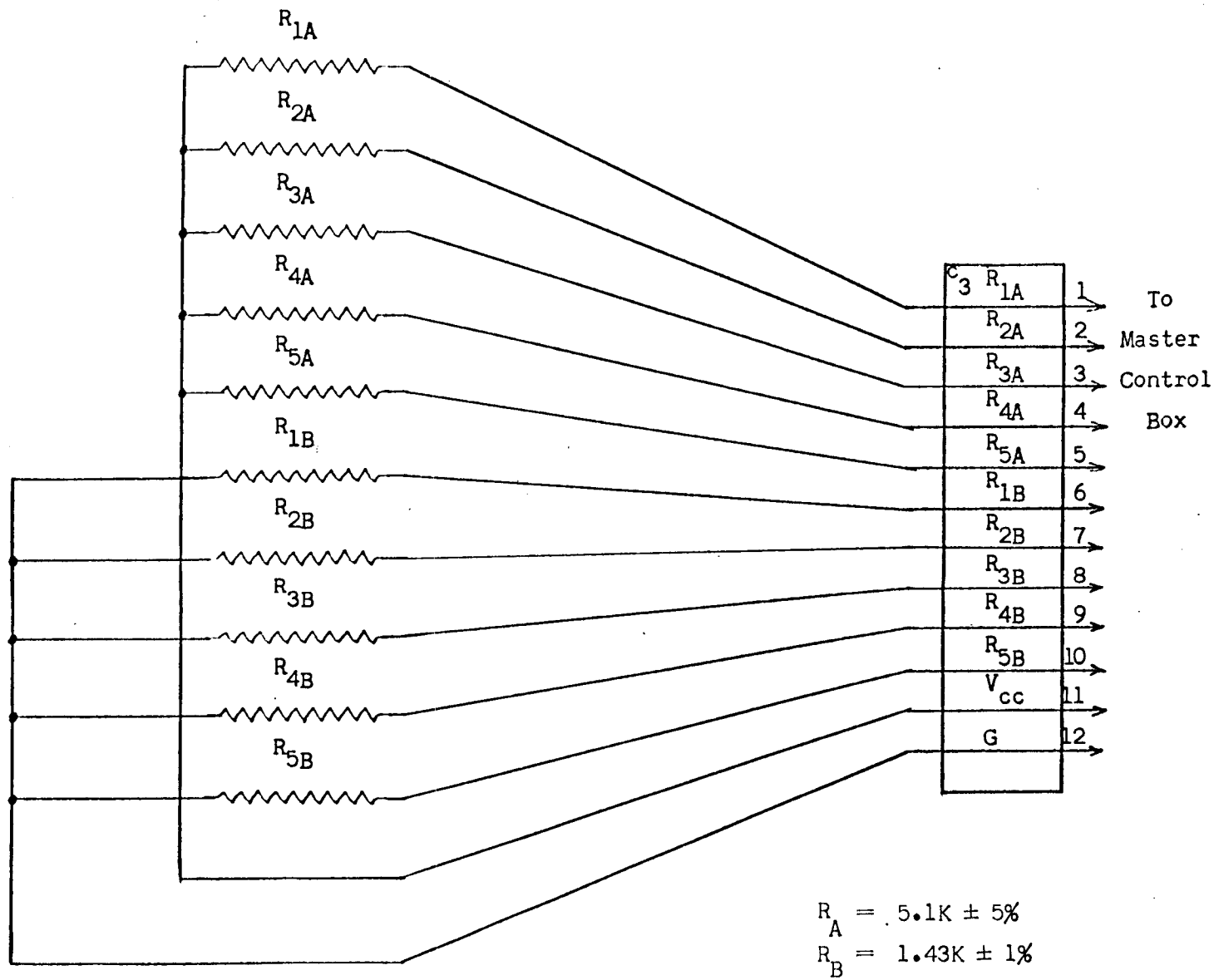
V_{NB} = 0.30 volts

R values shown on A-2 static load box

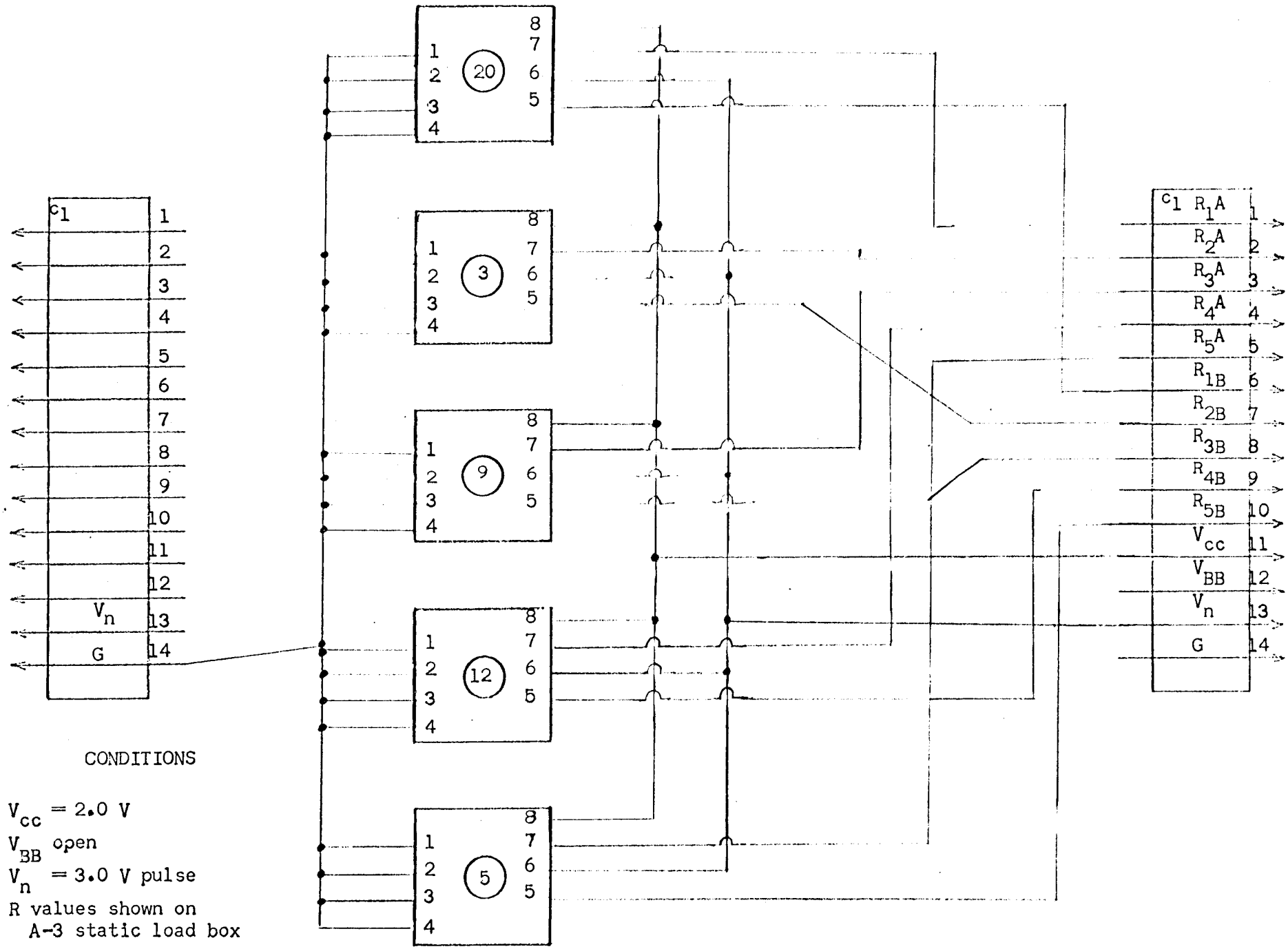
A-2, STATIC RADIATION CIRCUITS



A-2, DYNAMIC RADIATION CIRCUIT



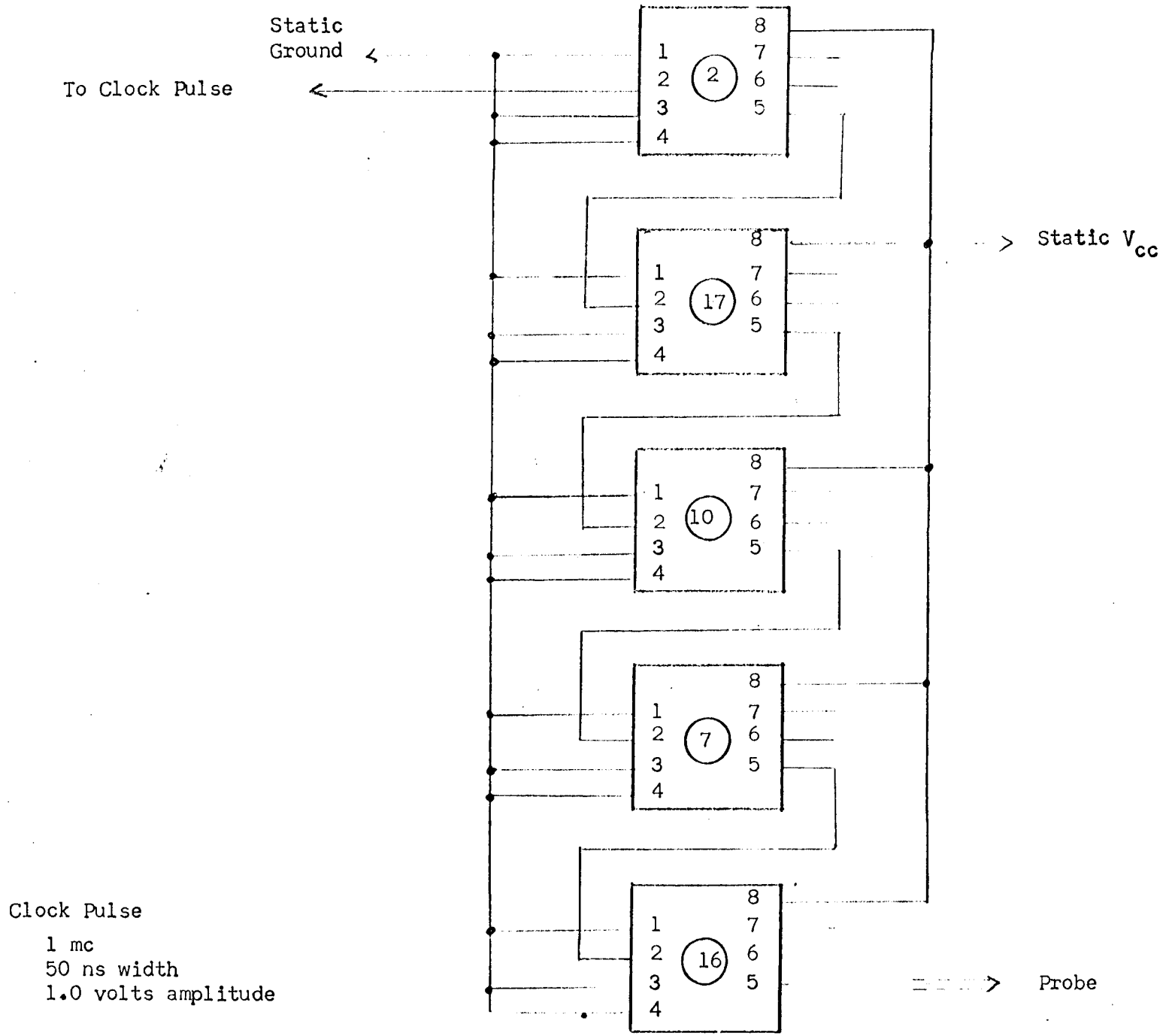
A-2, STATIC LOAD BOX



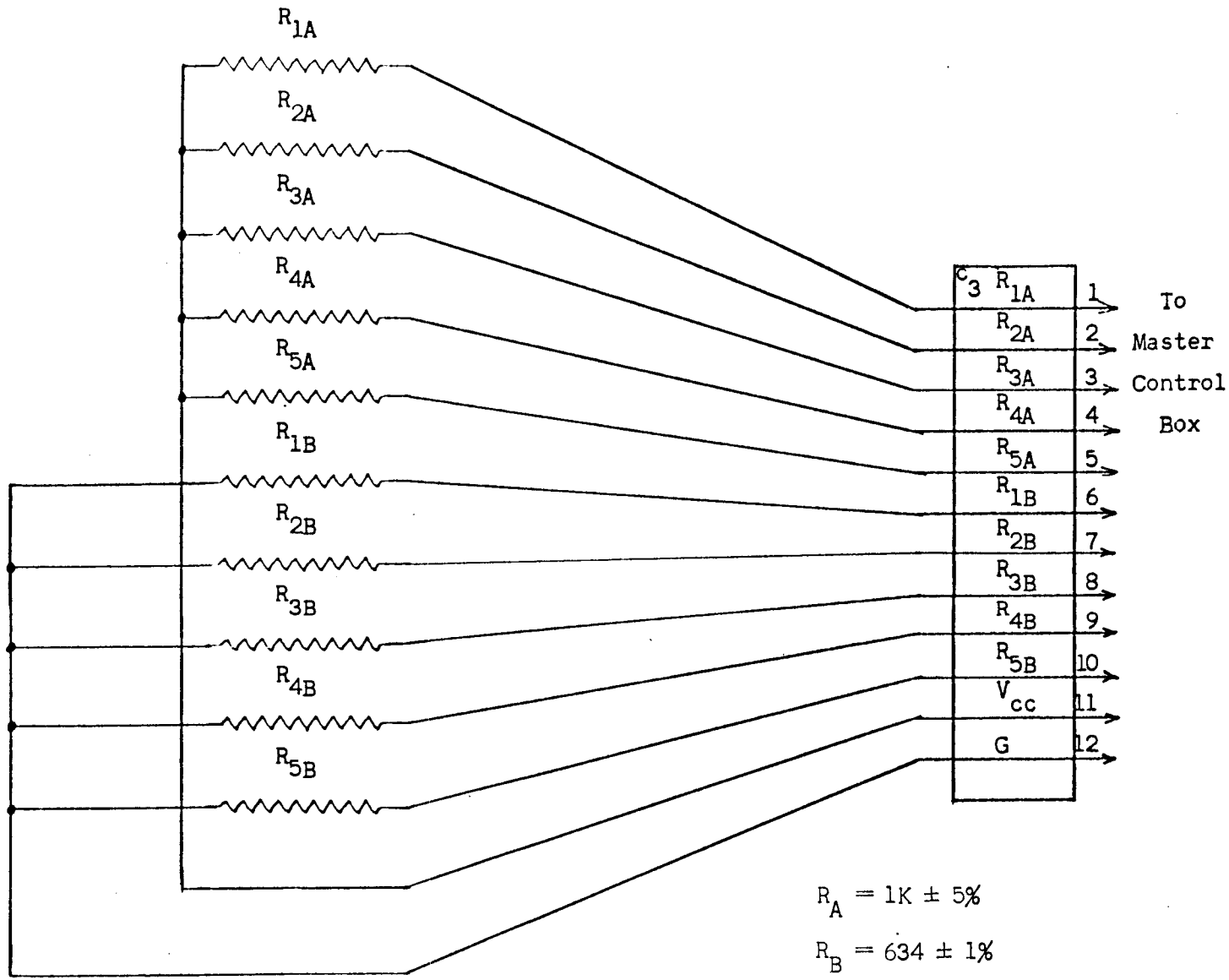
CONDITIONS

V_{cc} = 2.0 V
V_{BB} open
V_n = 3.0 V pulse
R values shown on
A-3 static load box

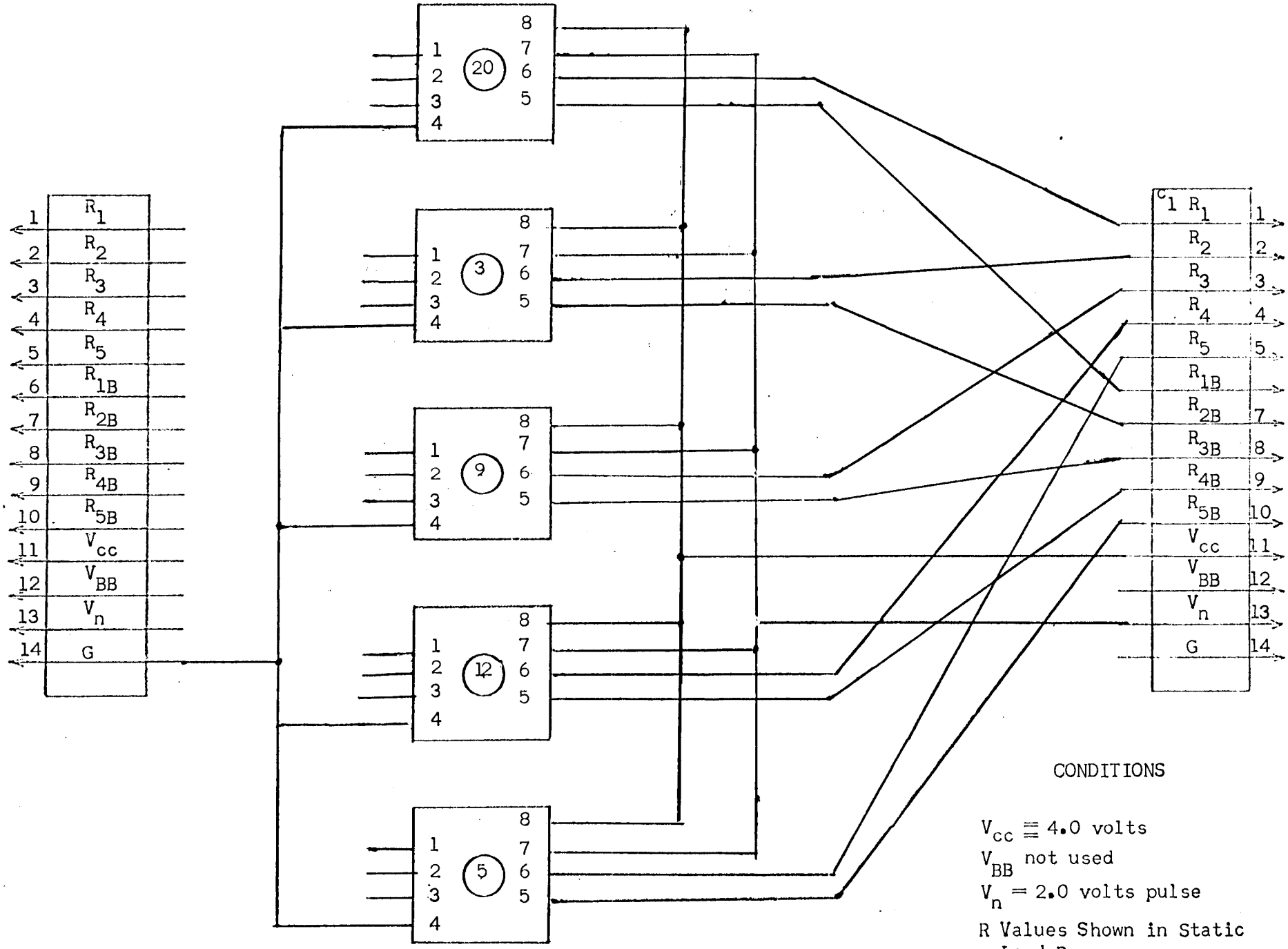
A-3, STATIC TEST CIRCUIT



A-3, DYANMIC RADIATION CIRCUITS



A-3, STATIC LOAD BOX



CONDITIONS

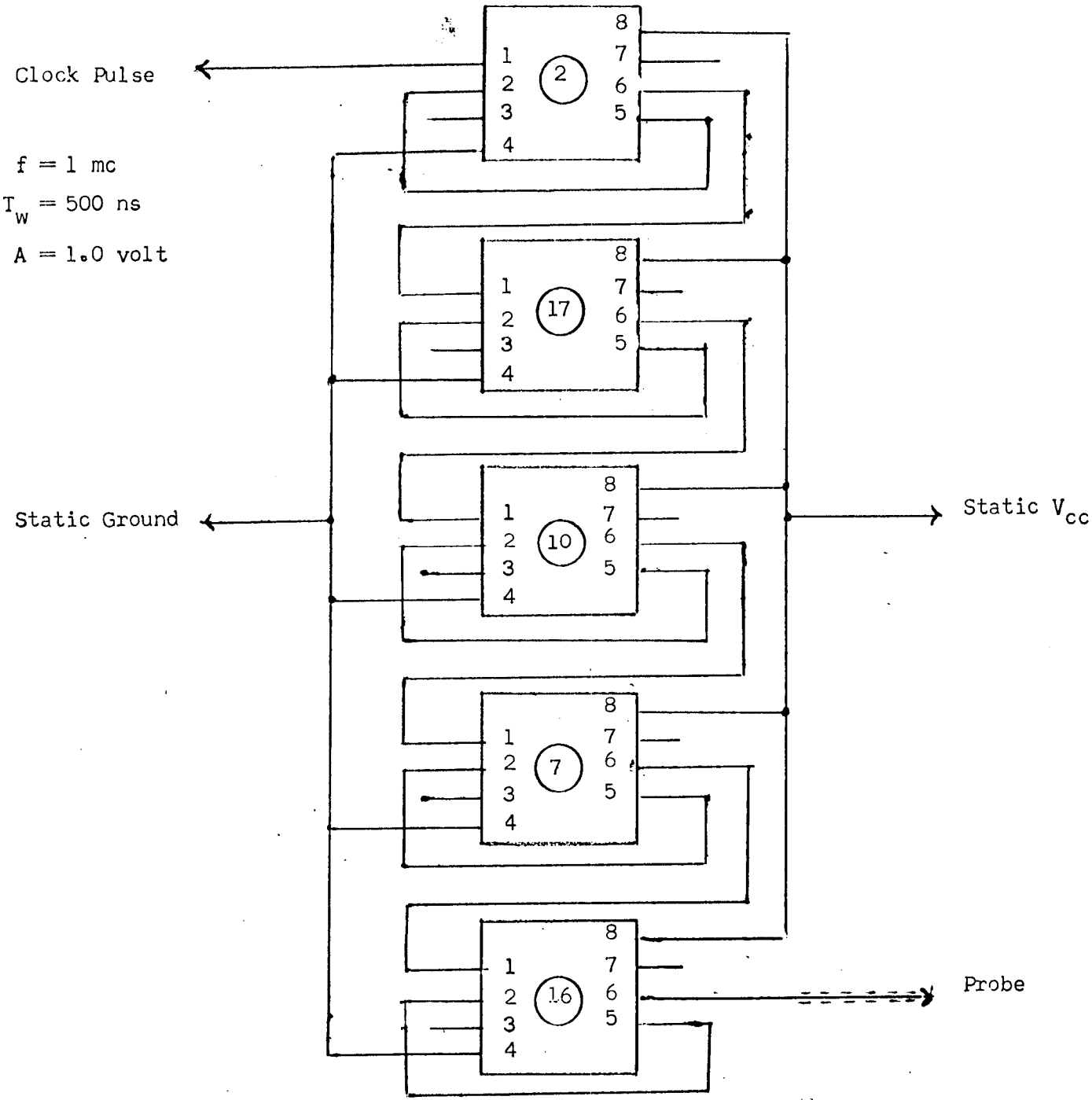
$V_{cc} \equiv 4.0$ volts

V_{BB} not used

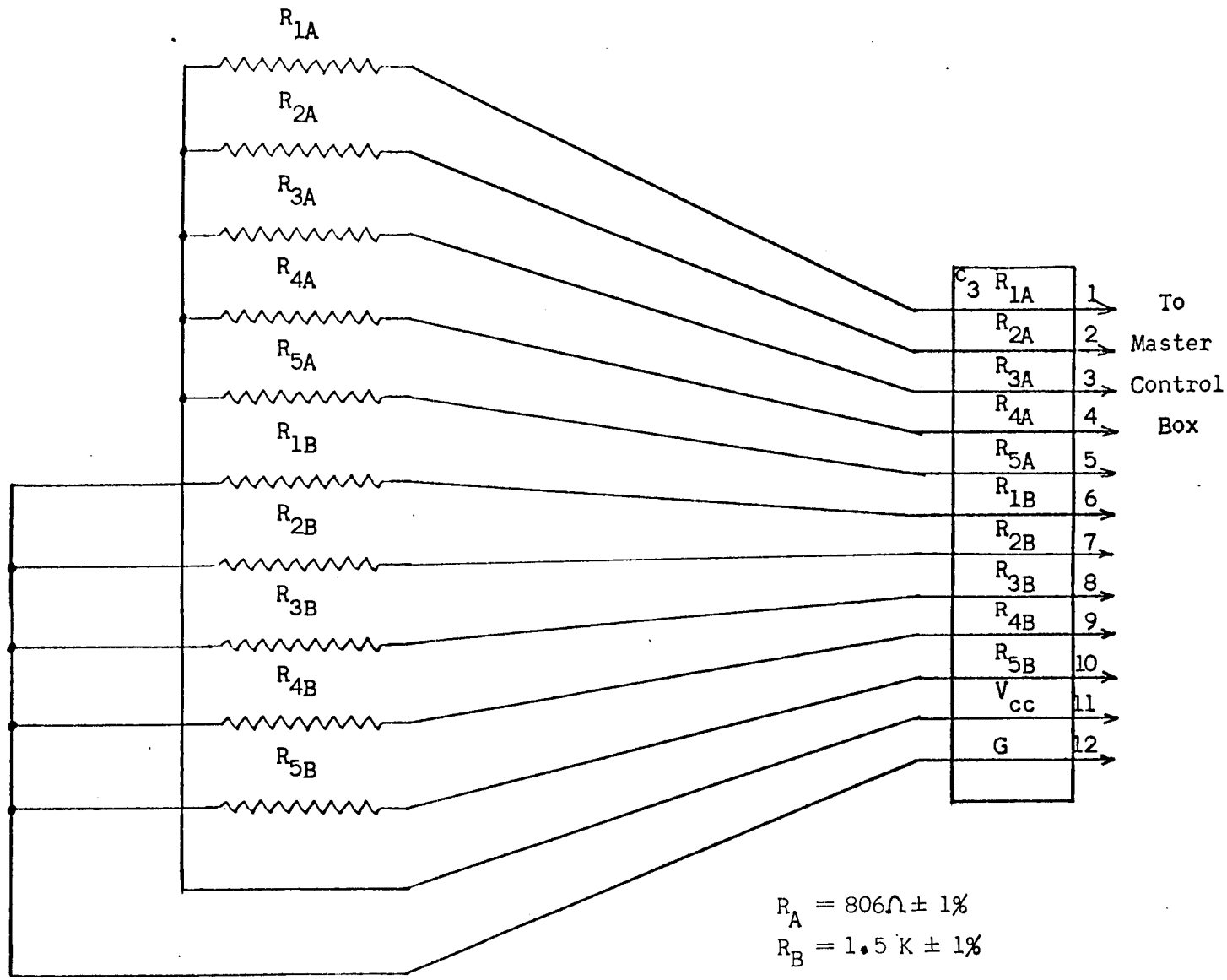
$V_n = 2.0$ volts pulse

R Values Shown in Static Load Box

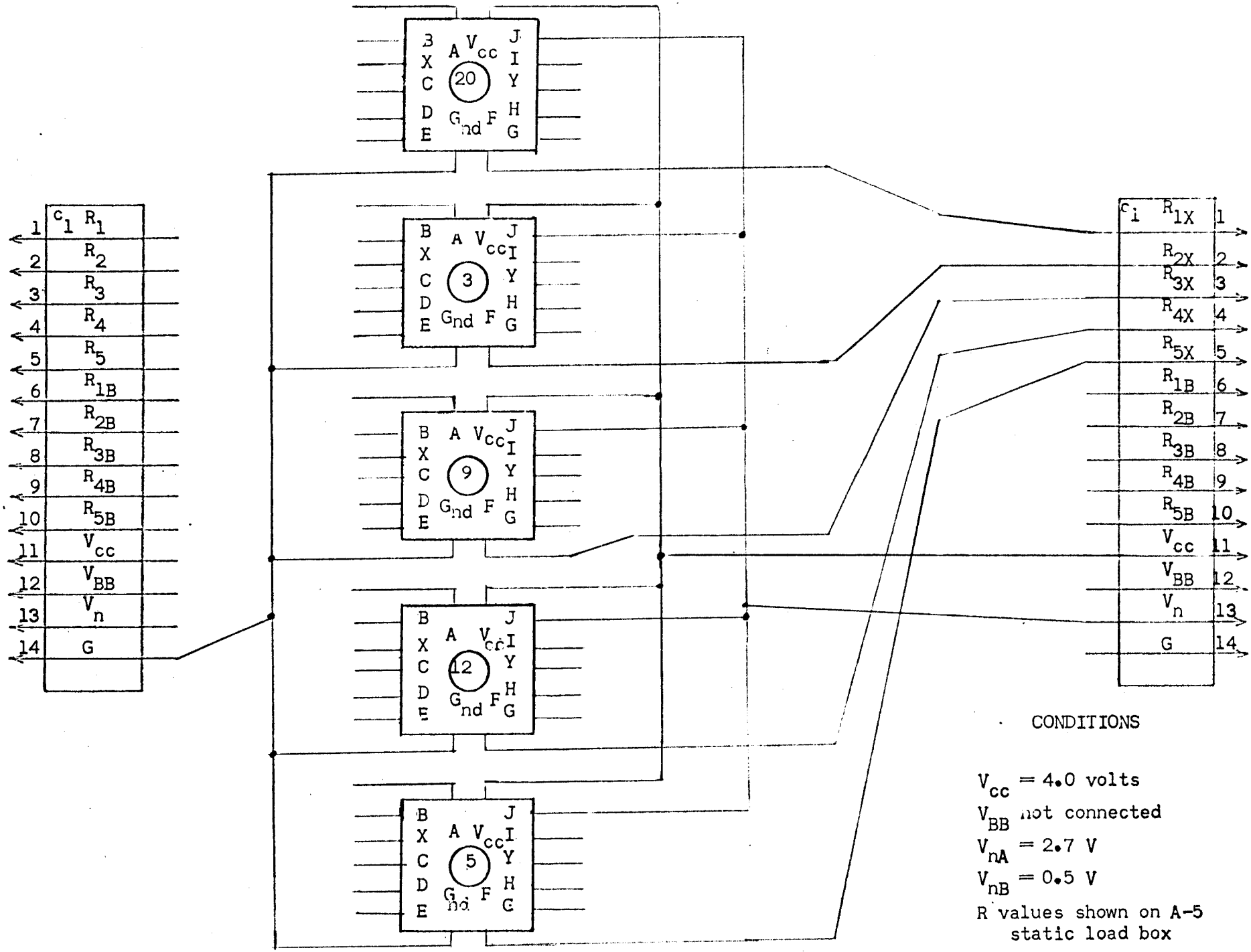
A-4, STATIC RADIATION CIRCUIT



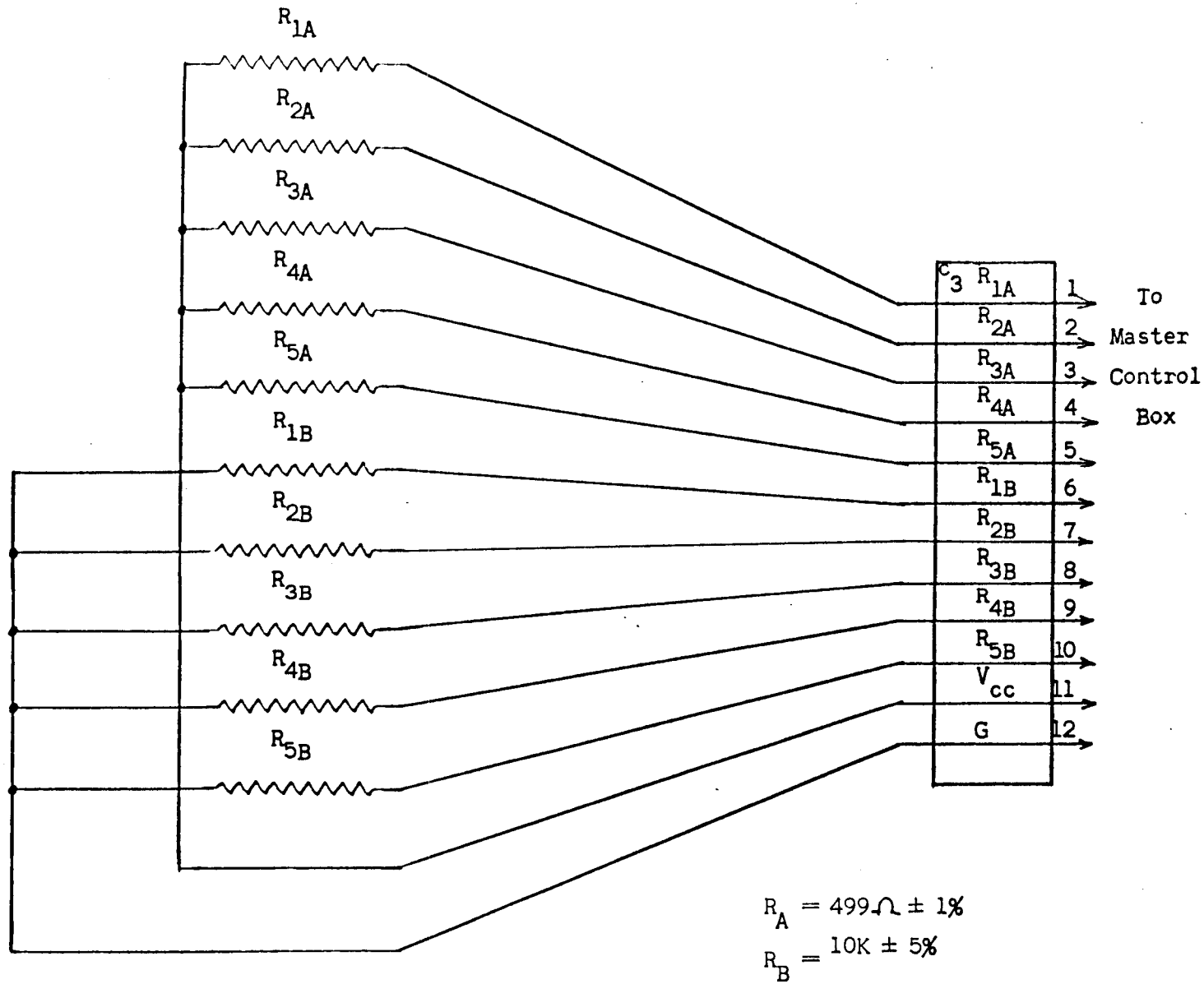
A-4, DYNAMIC RADIATION CIRCUIT



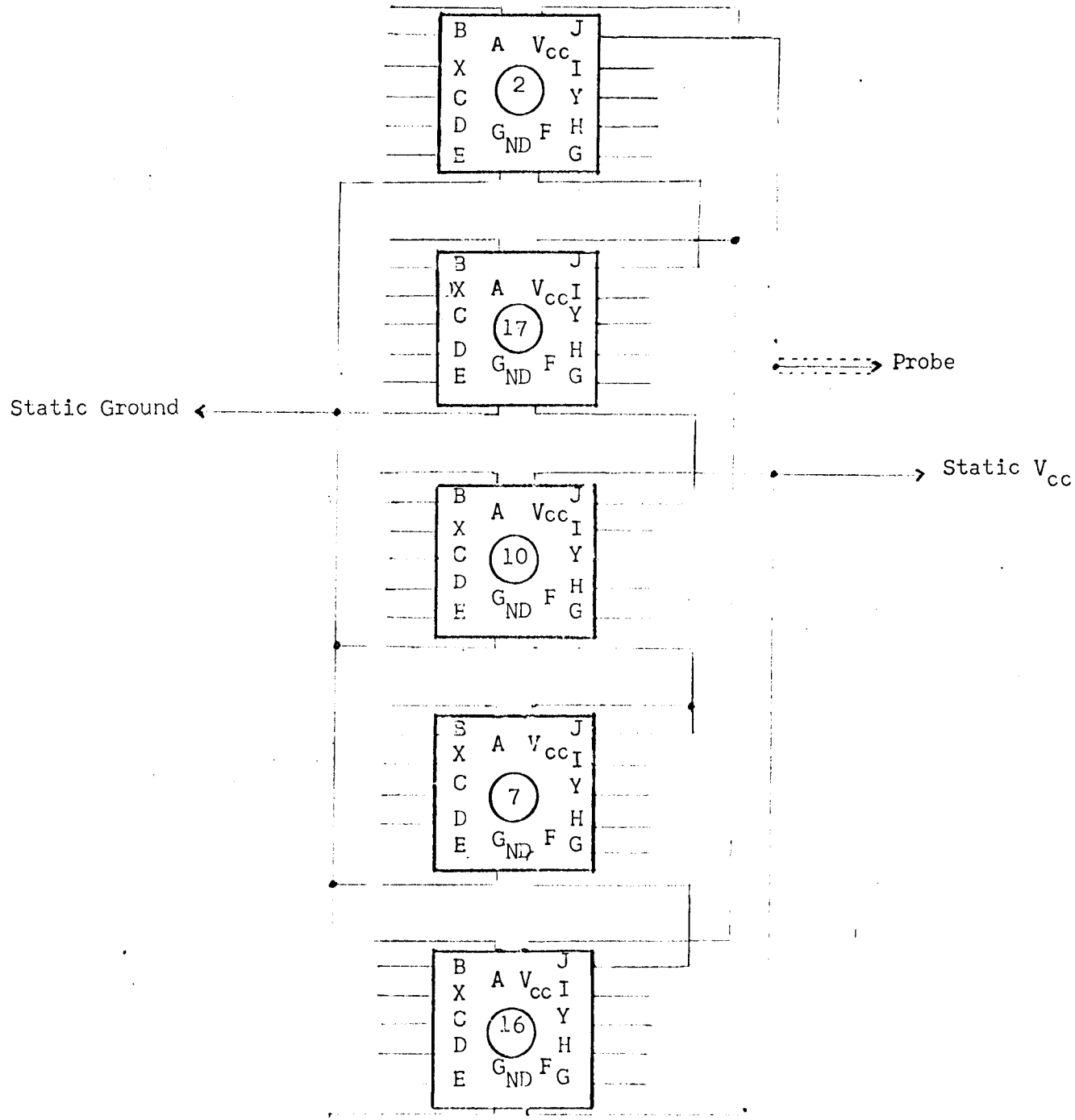
A-4, STATIC LOAD BOX



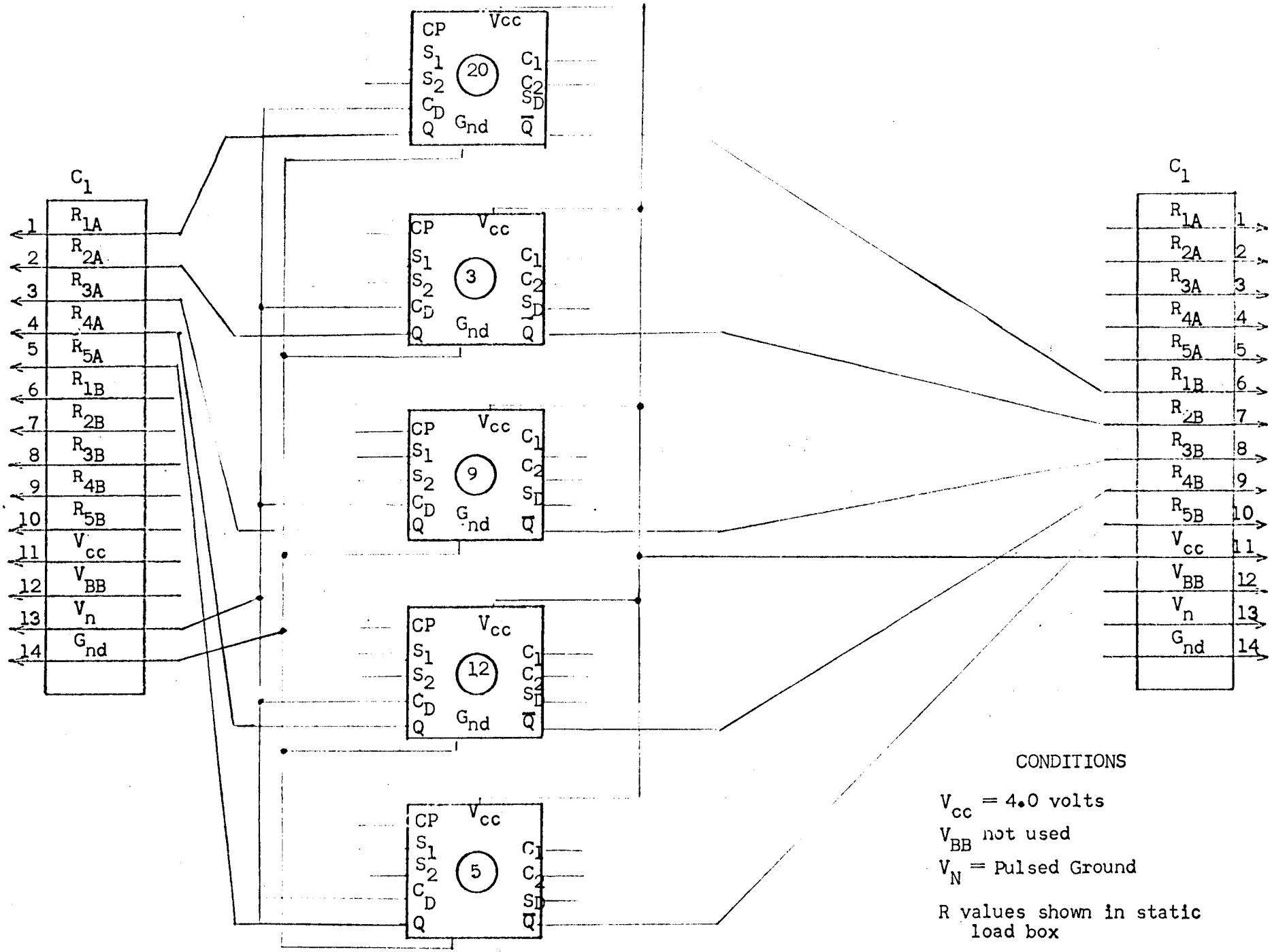
A-5, STATIC RADIATION CIRCUIT



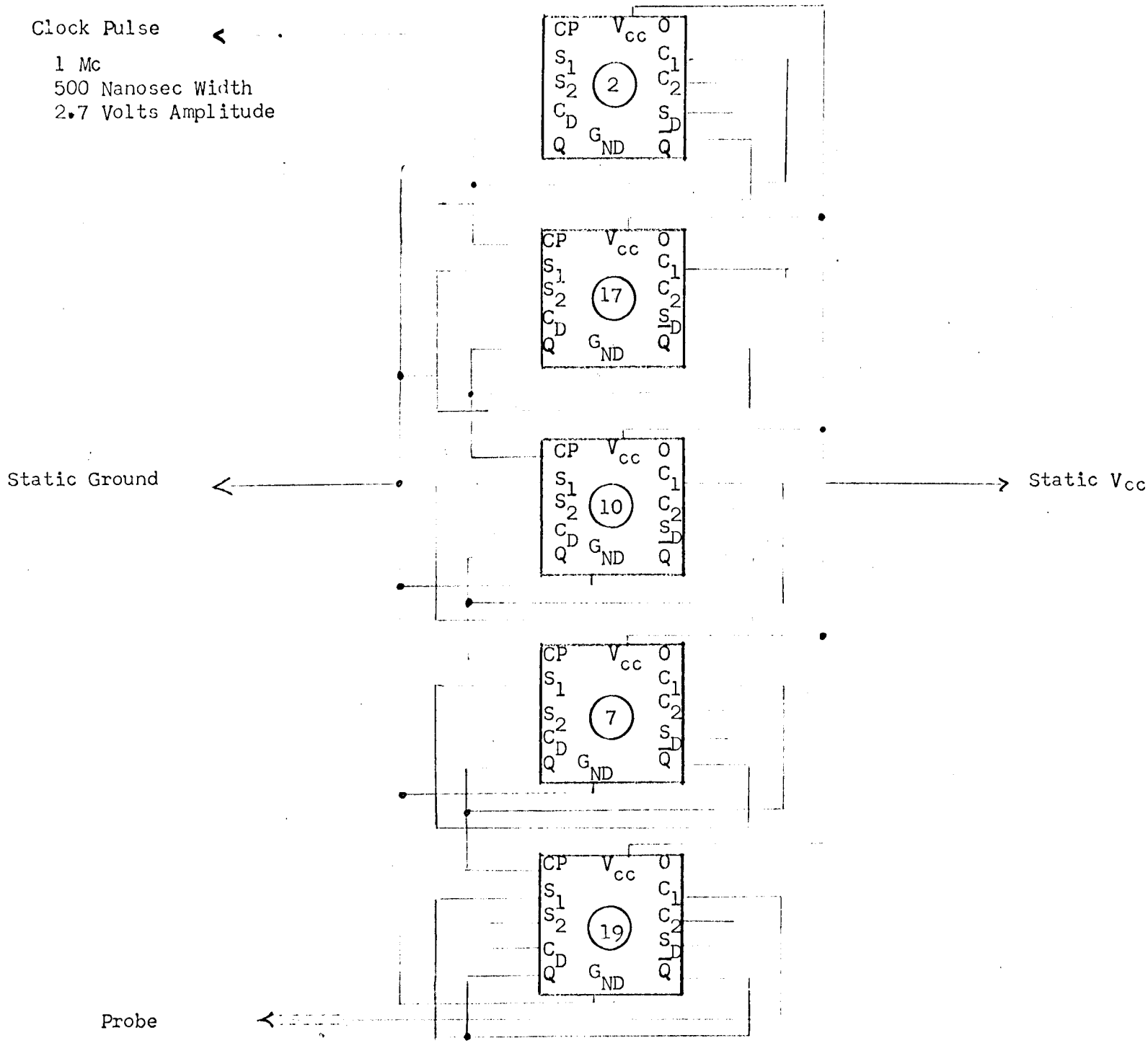
A-5, STATIC LOAD BOX



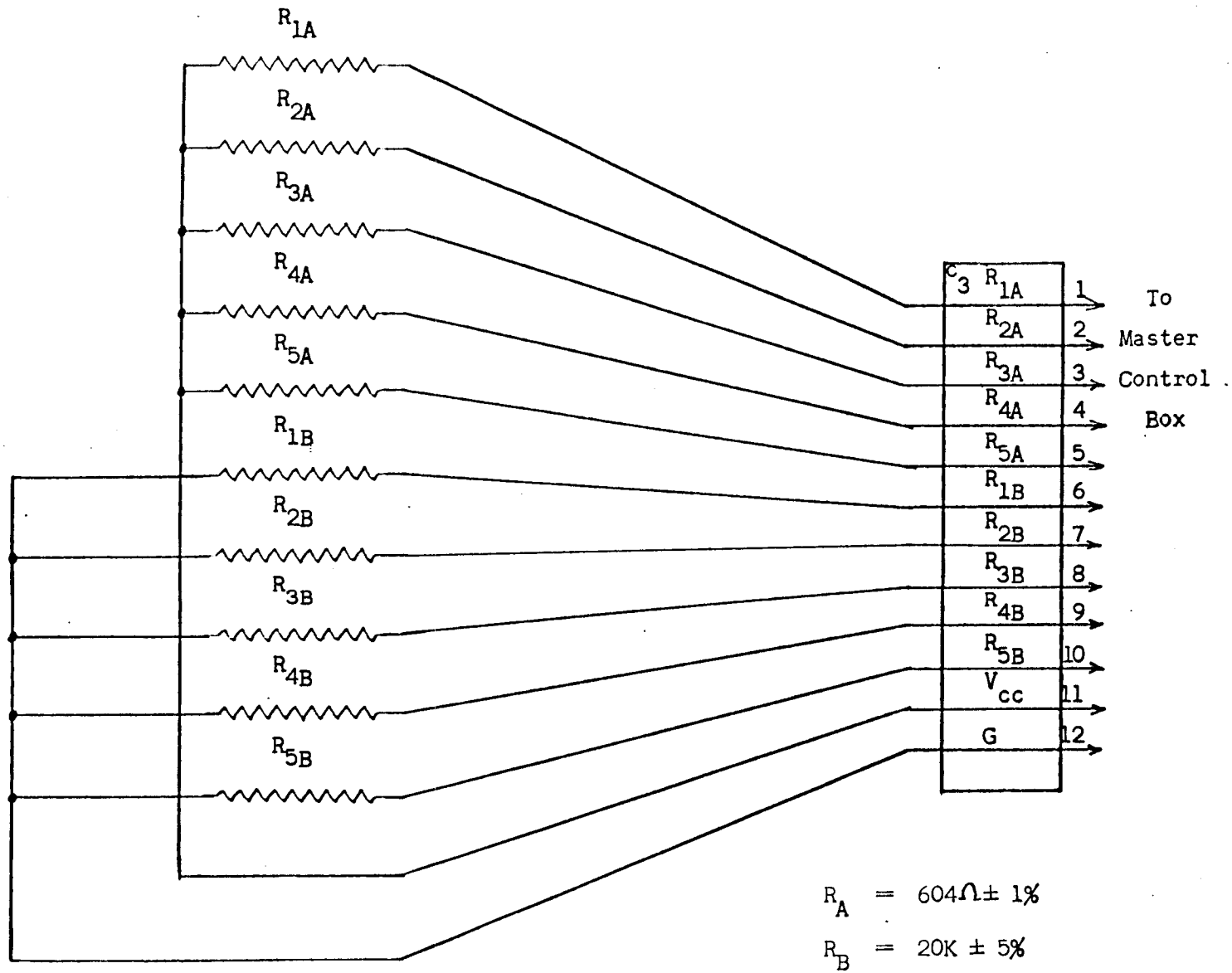
A-5, DYNAMIC RADIATION CIRCUIT



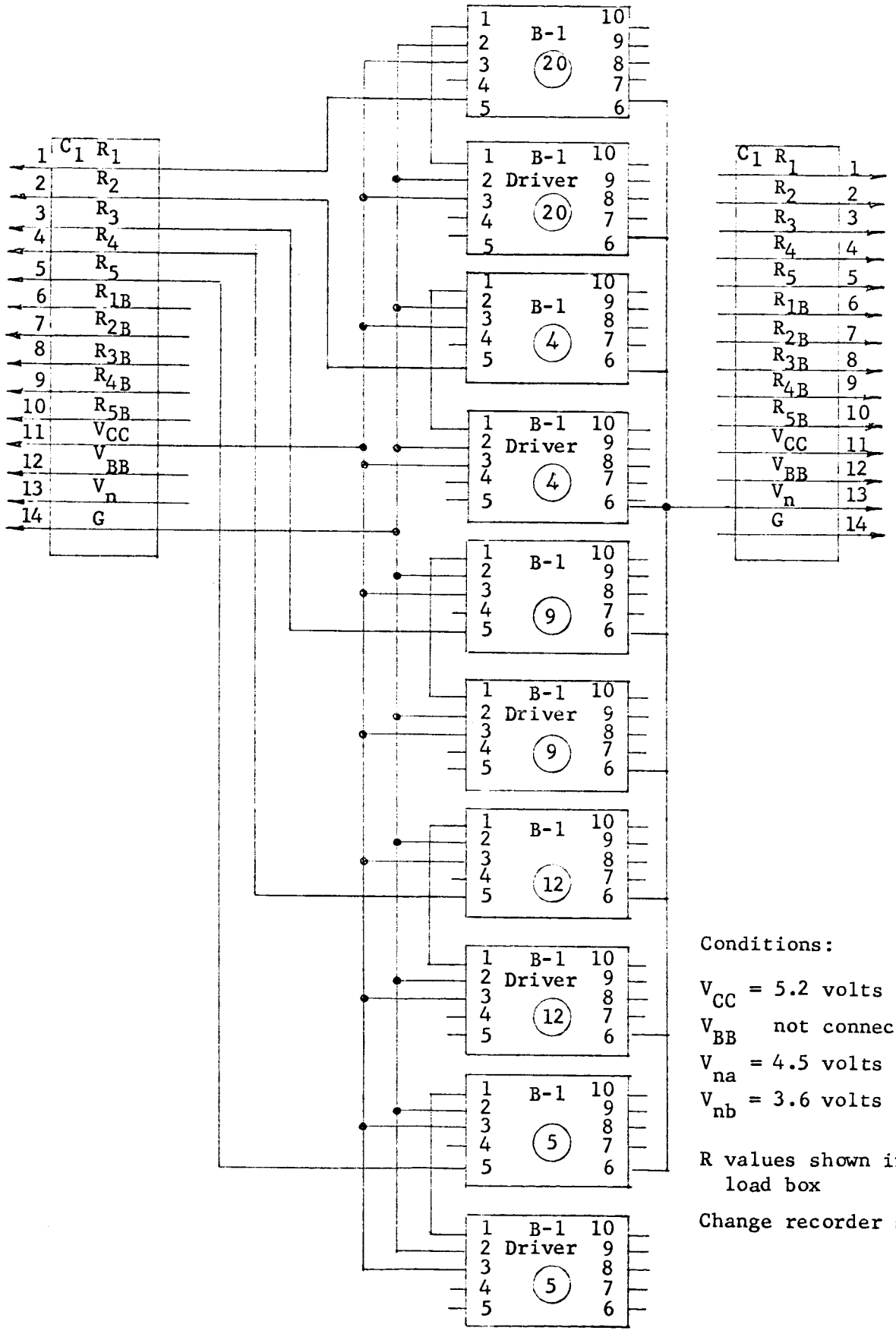
A-6, STATIC RADIATION CIRCUIT



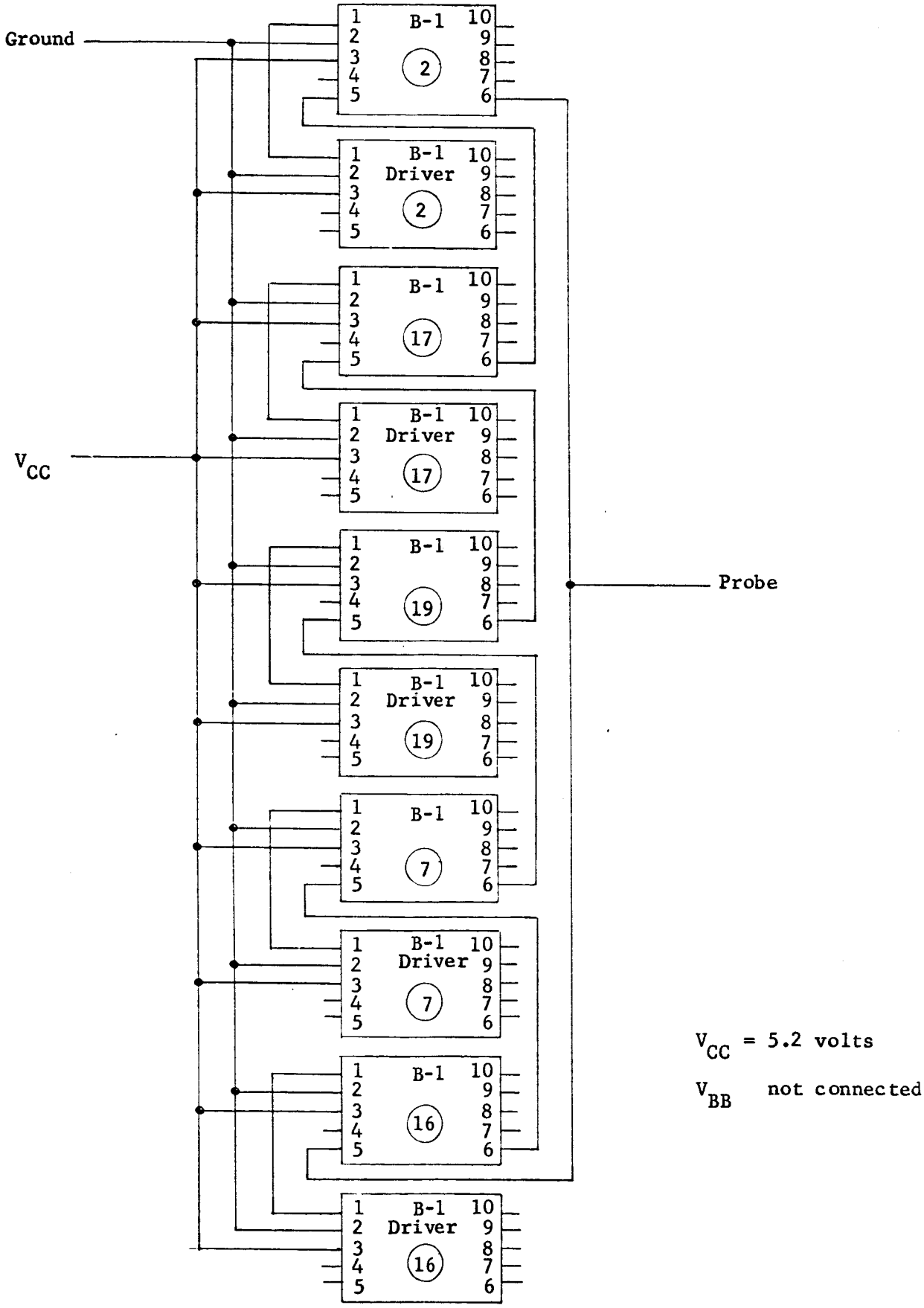
A-6, DYNAMIC RADIATION CIRCUIT



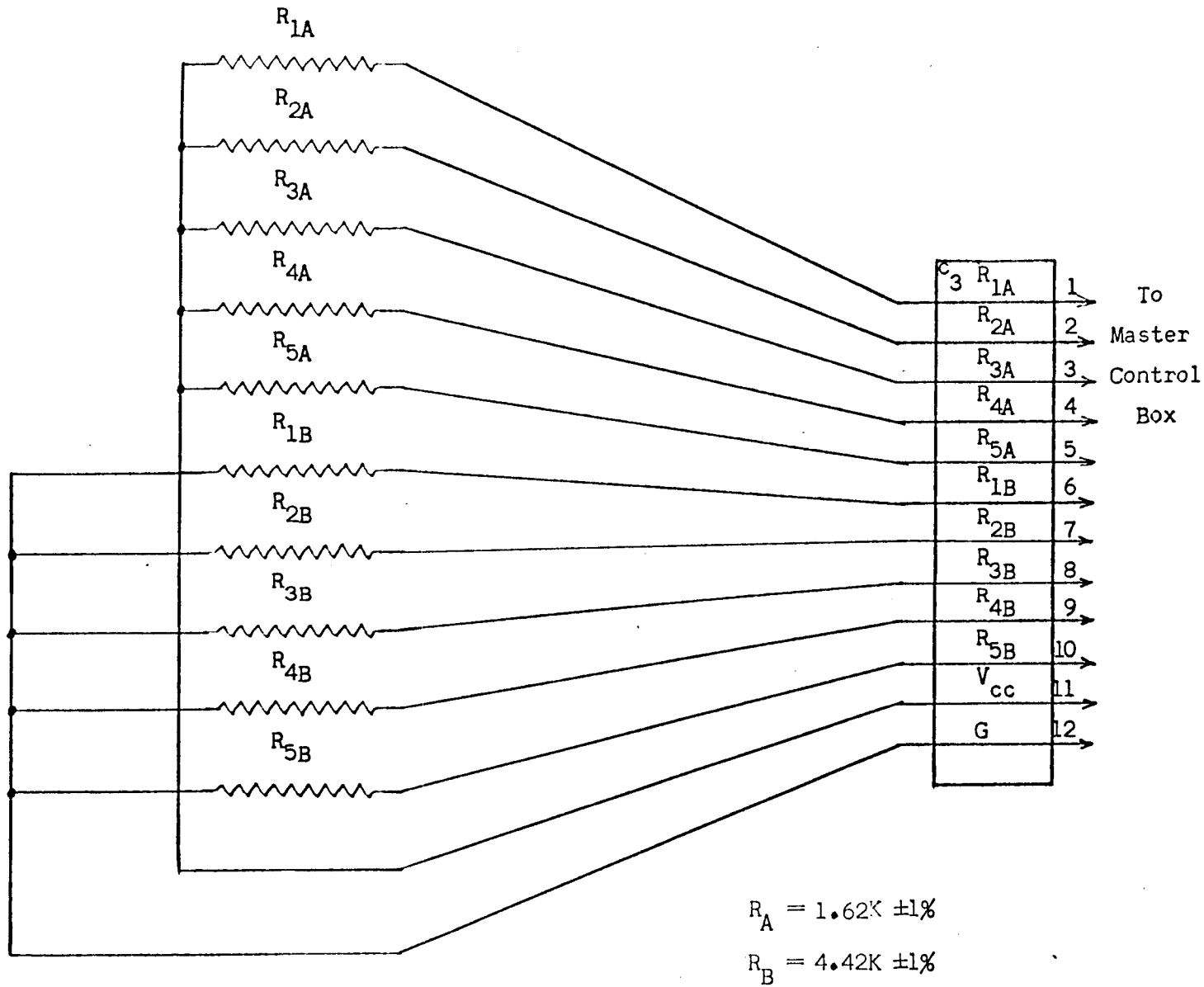
A-6, STATIC LOAD BOX



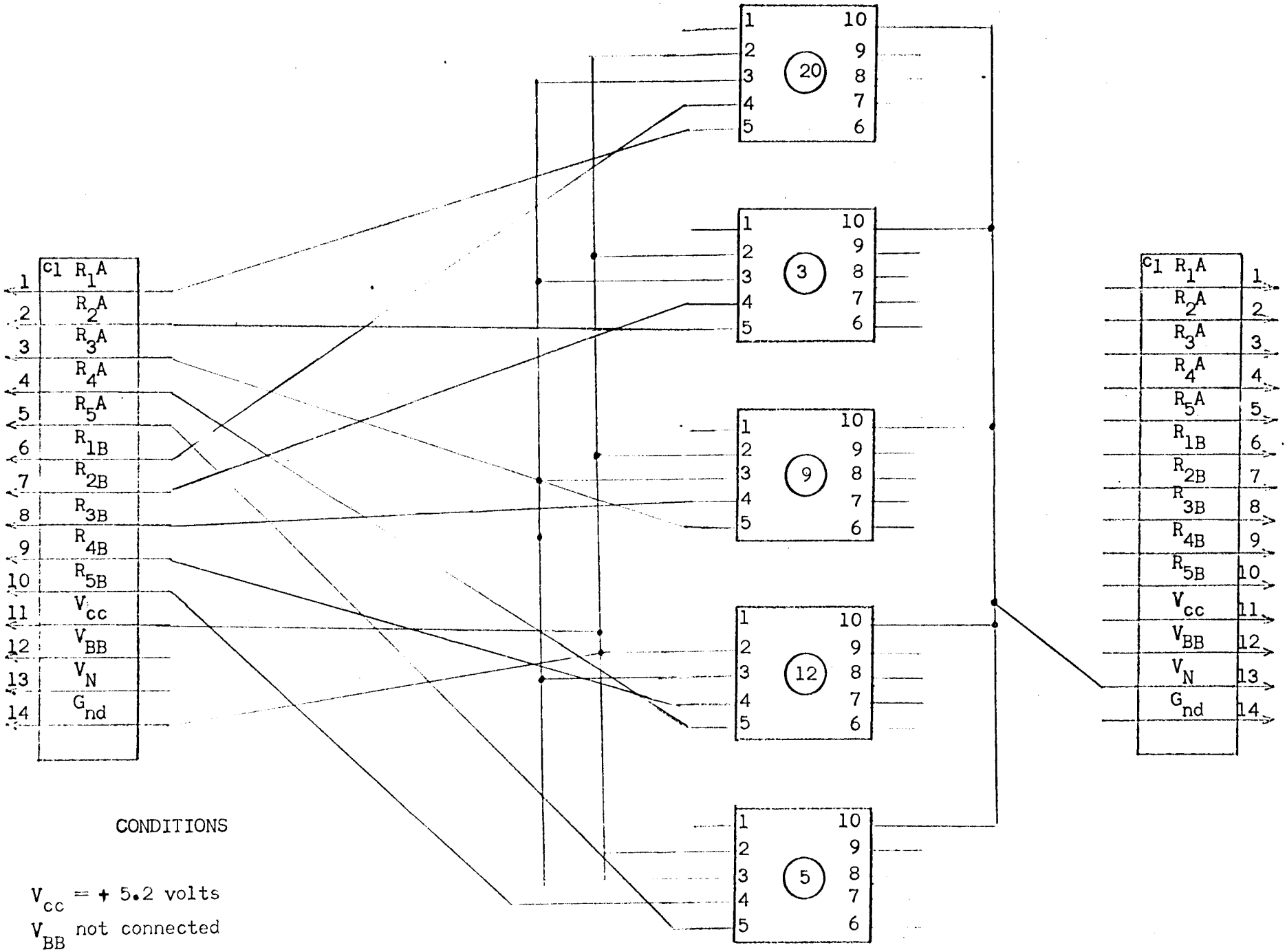
B-1. STATIC RADIATION CIRCUITS



B-1. DYNAMIC RADIATION CIRCUIT



B-1, STATIC LOAD BOX



CONDITIONS

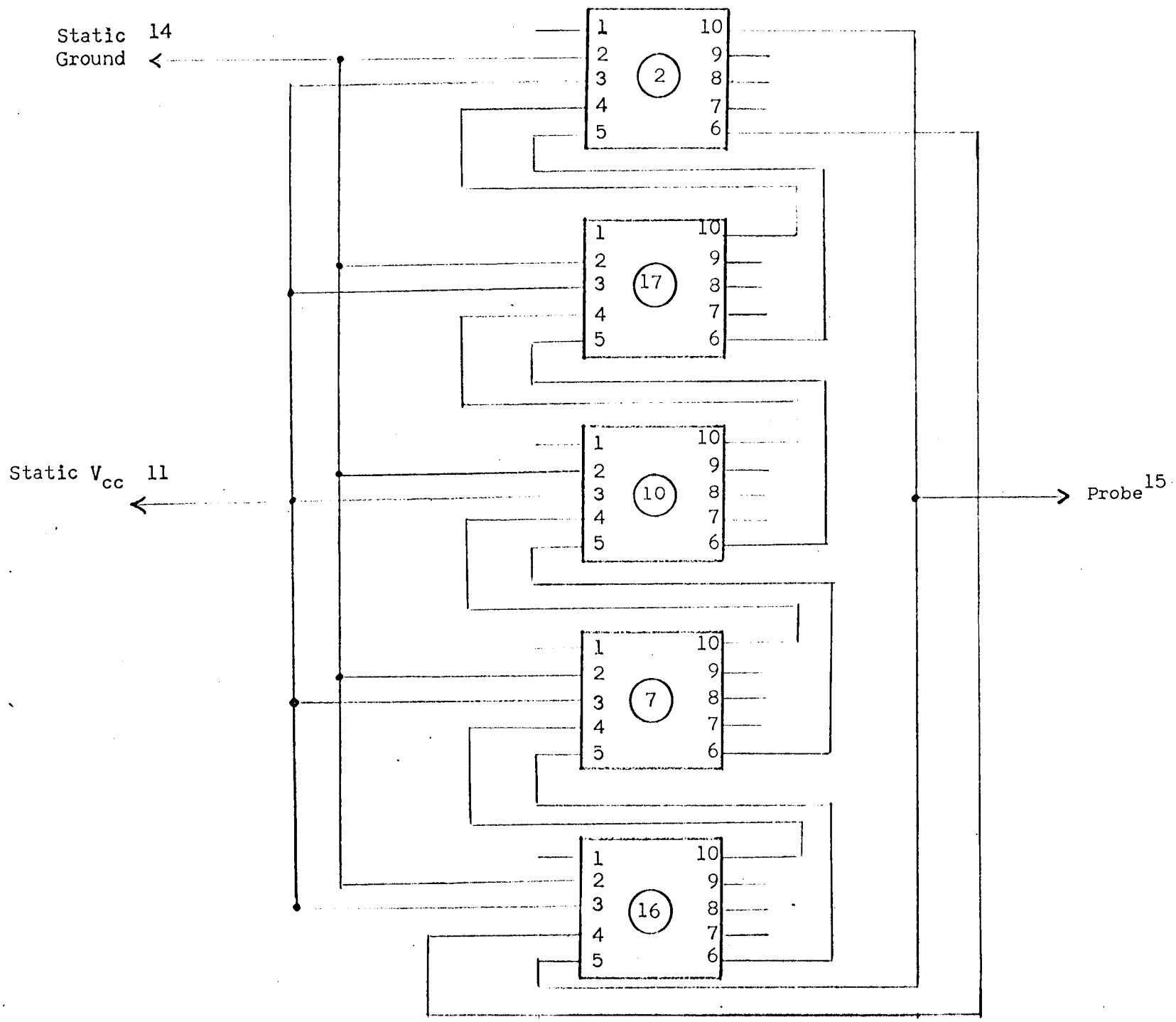
V_{cc} = + 5.2 volts

V_{BB} not connected

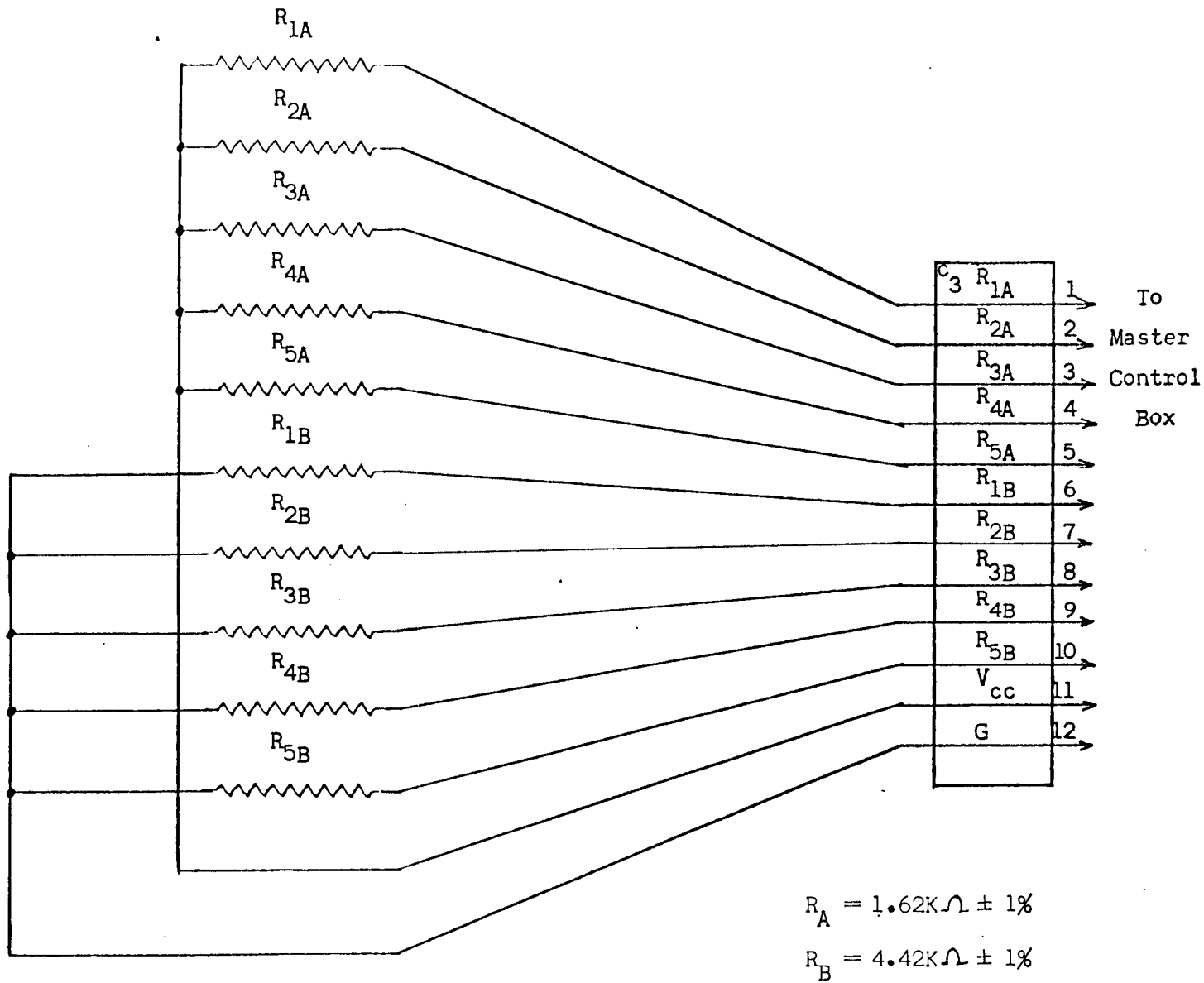
V_n = + 5.2 volt pulse to reset

Resistor values shown on B-2 static load box.

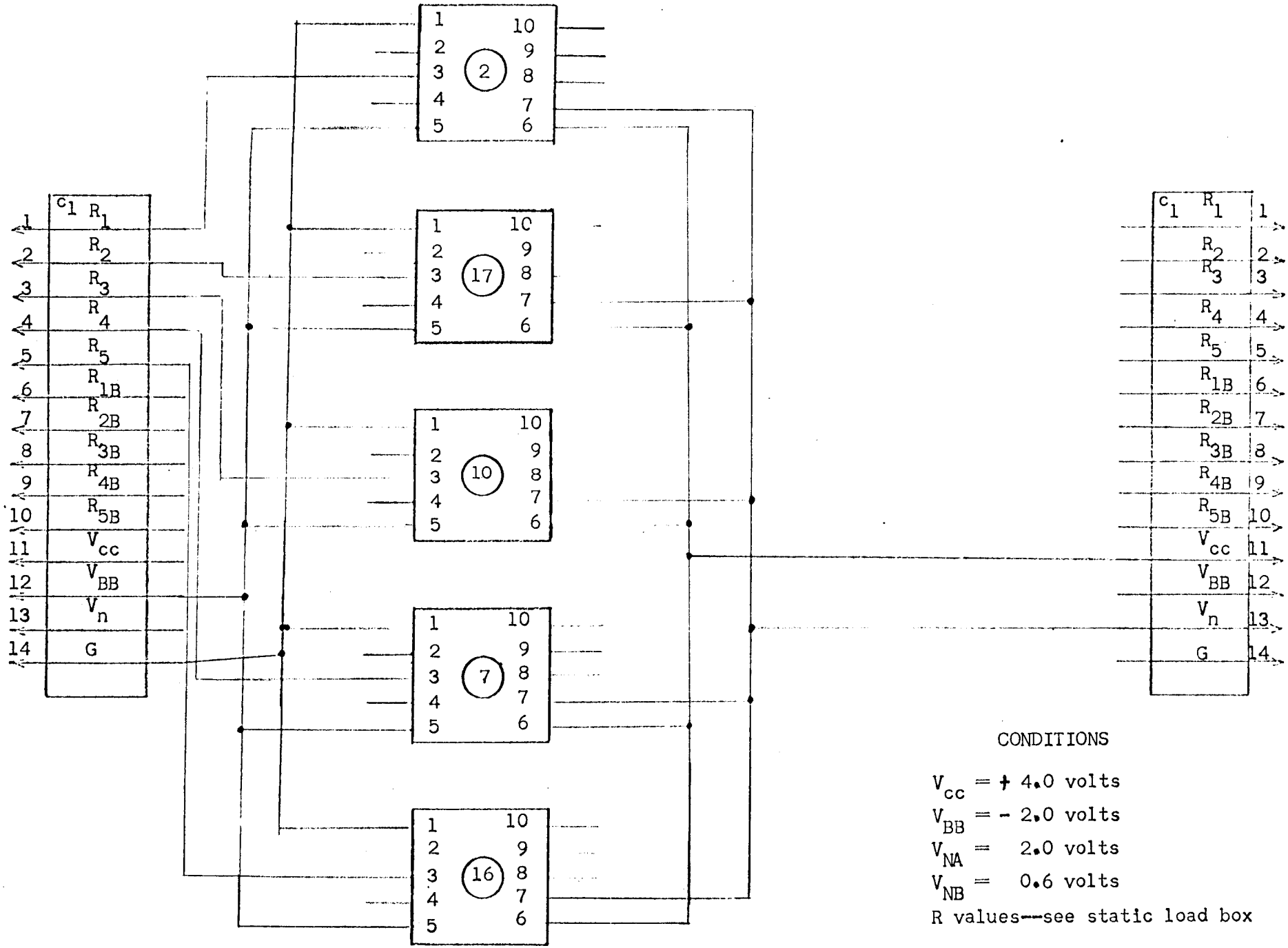
B-2, STATIC RADIATION CIRCUIT



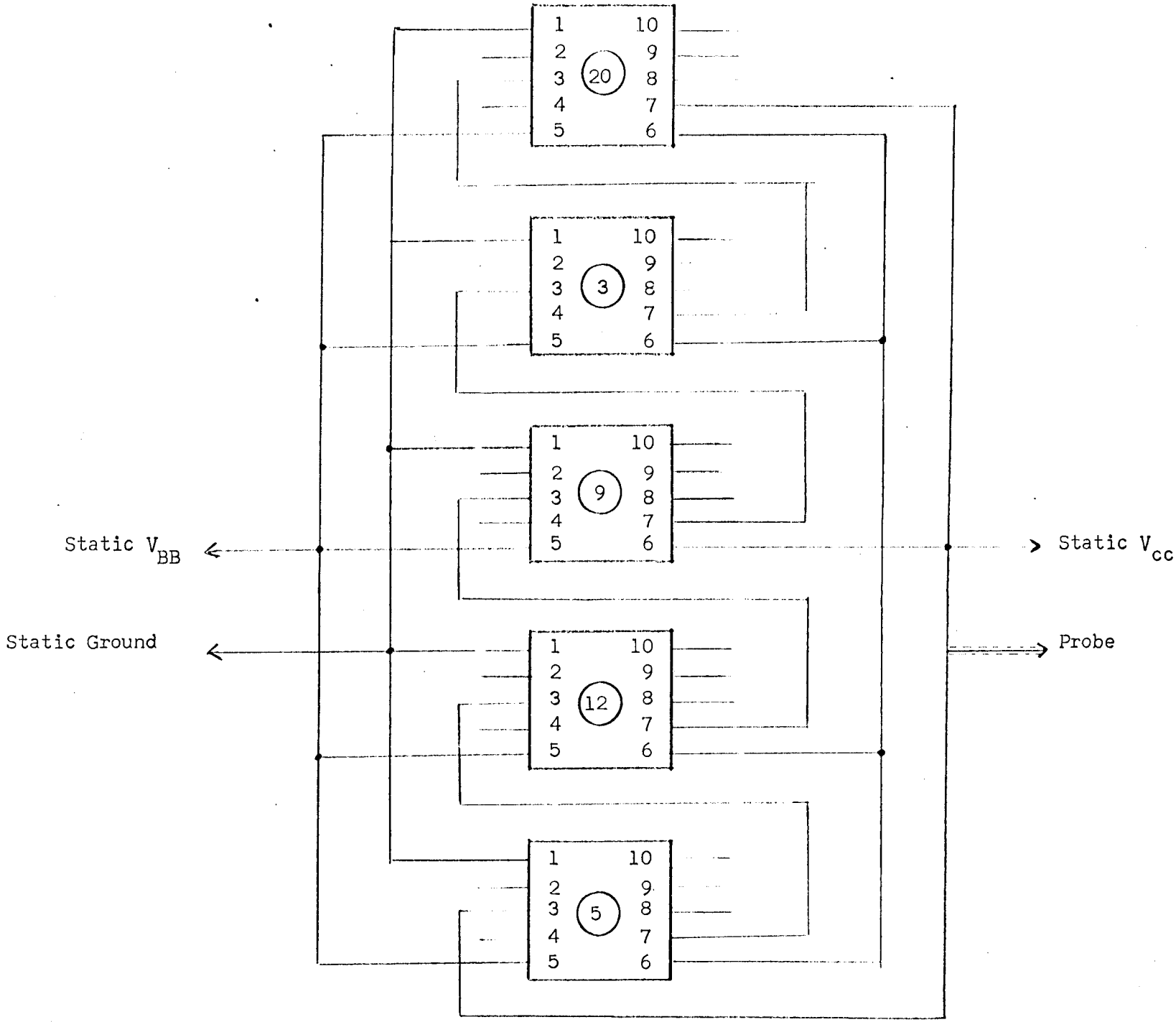
B-2 DYNAMIC RADIATION CIRCUIT (Flop-Flip Ring Oscillator)



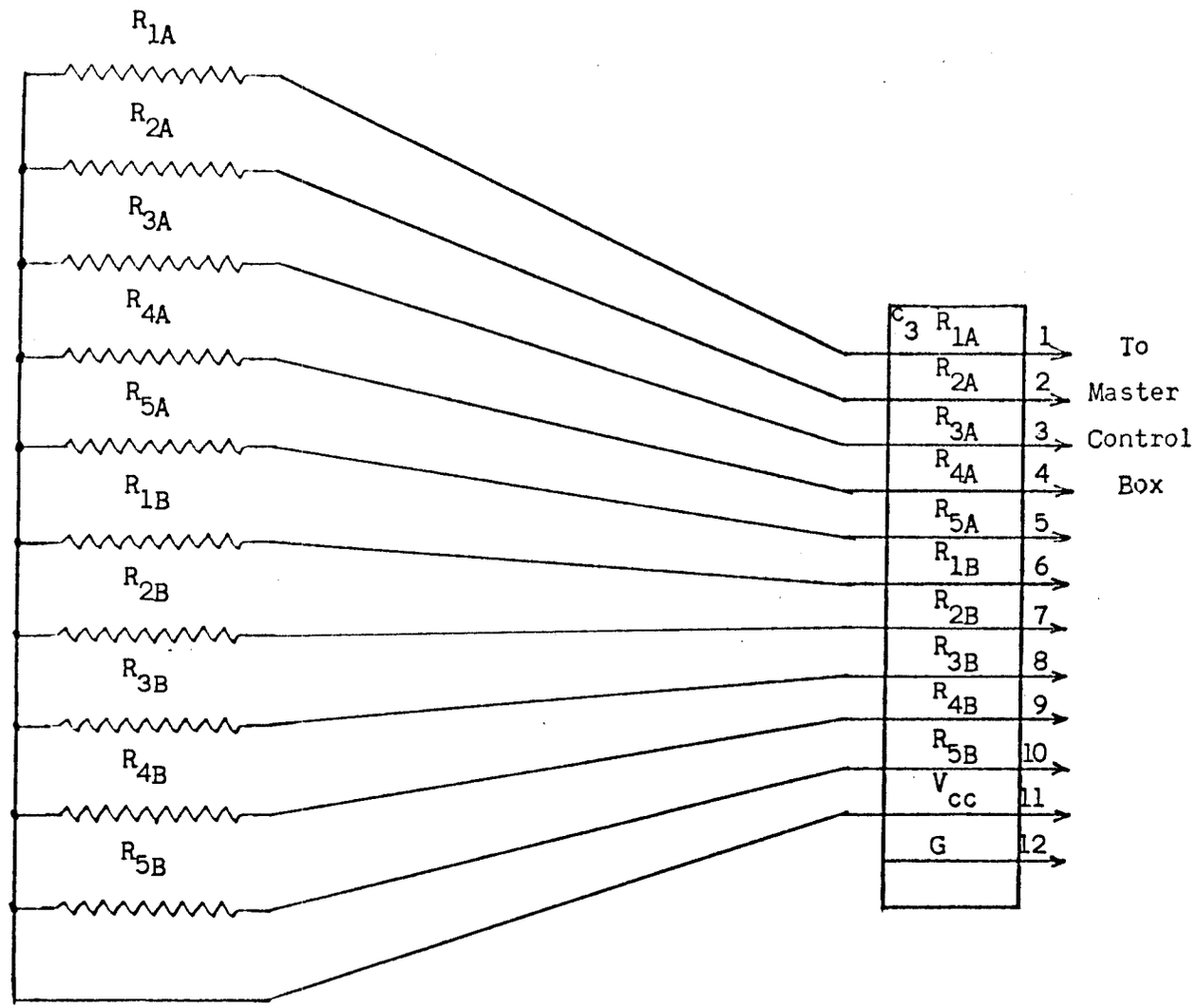
B-2, STATIC LOAD BOX



C-1, STATIC RADIATION CIRCUIT



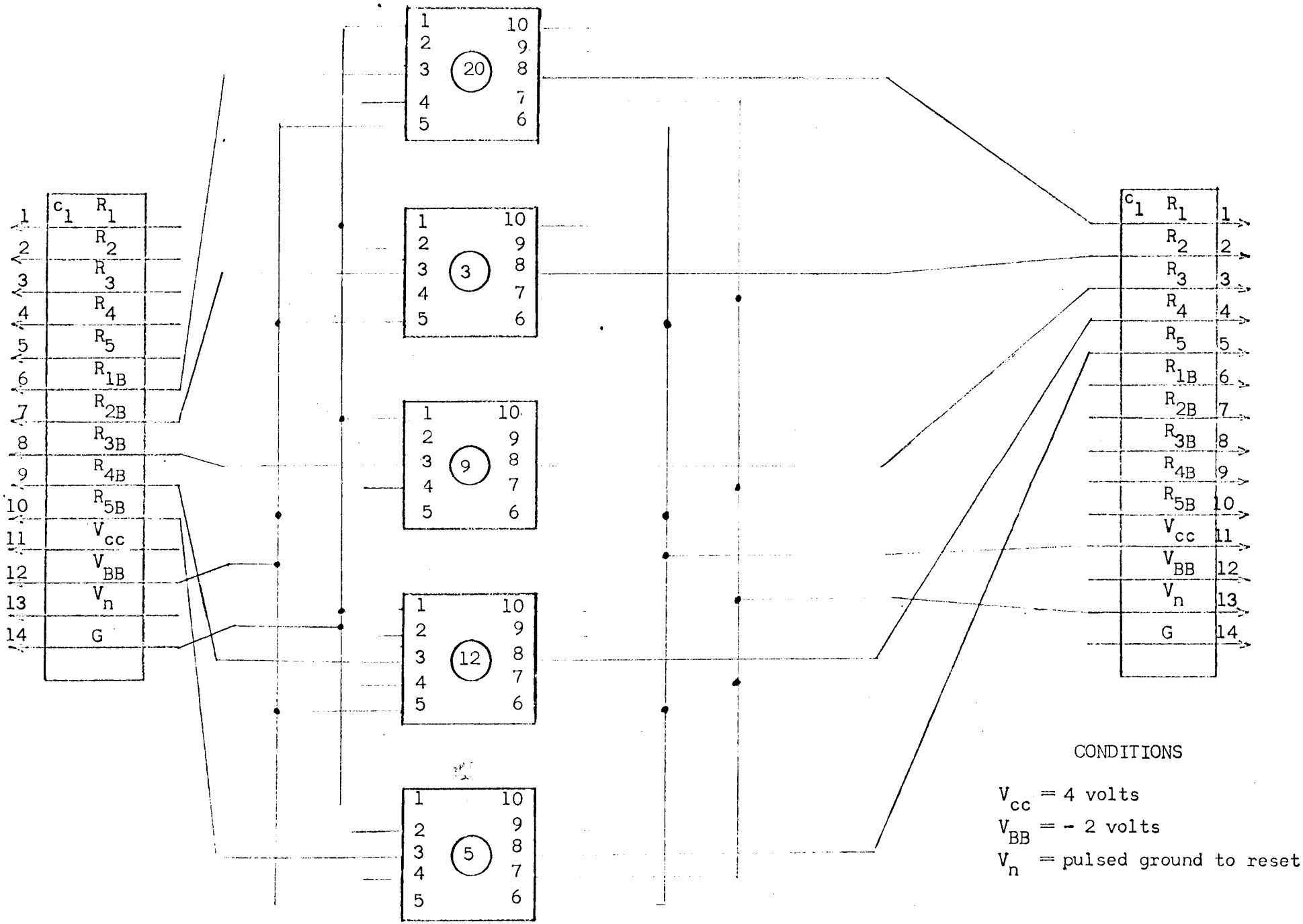
C-1, DYNAMIC RADIATION CIRCUIT



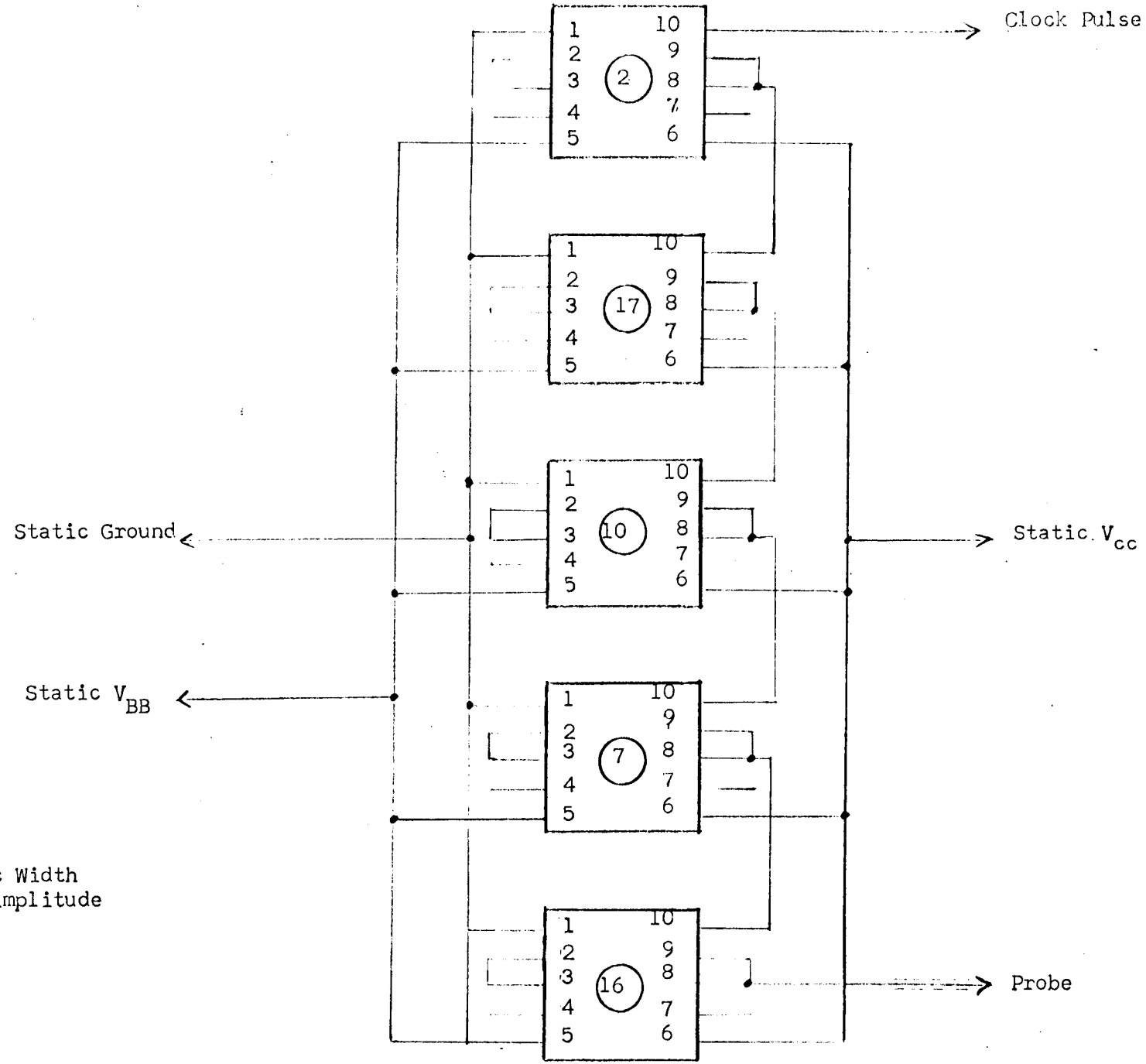
$R_A = 511\,\Omega \pm 1\%$

$R_B = 100K \pm 5\%$

C-1, STATIC LOAD BOX

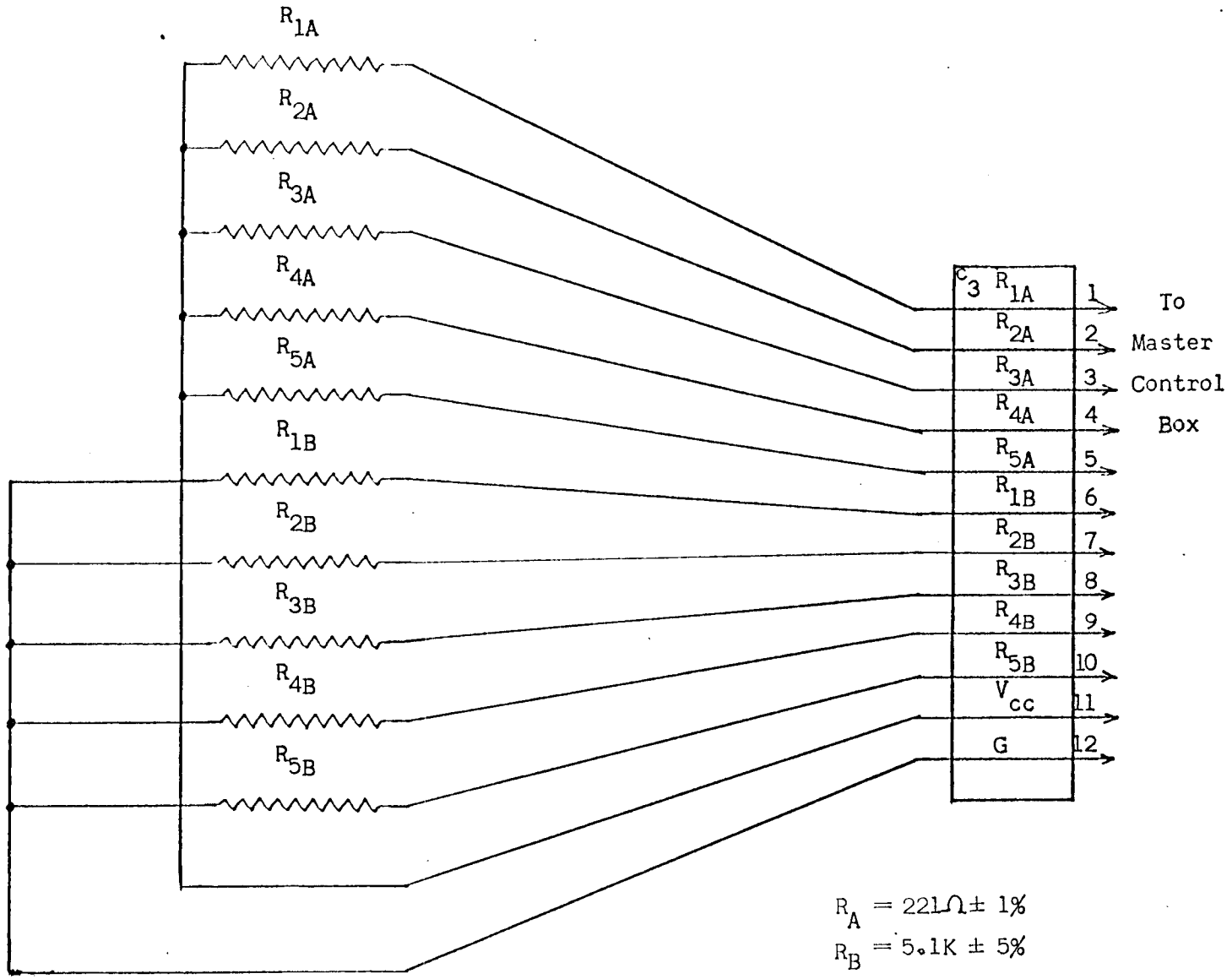


C-2, STATIC RADIATION CIRCUIT

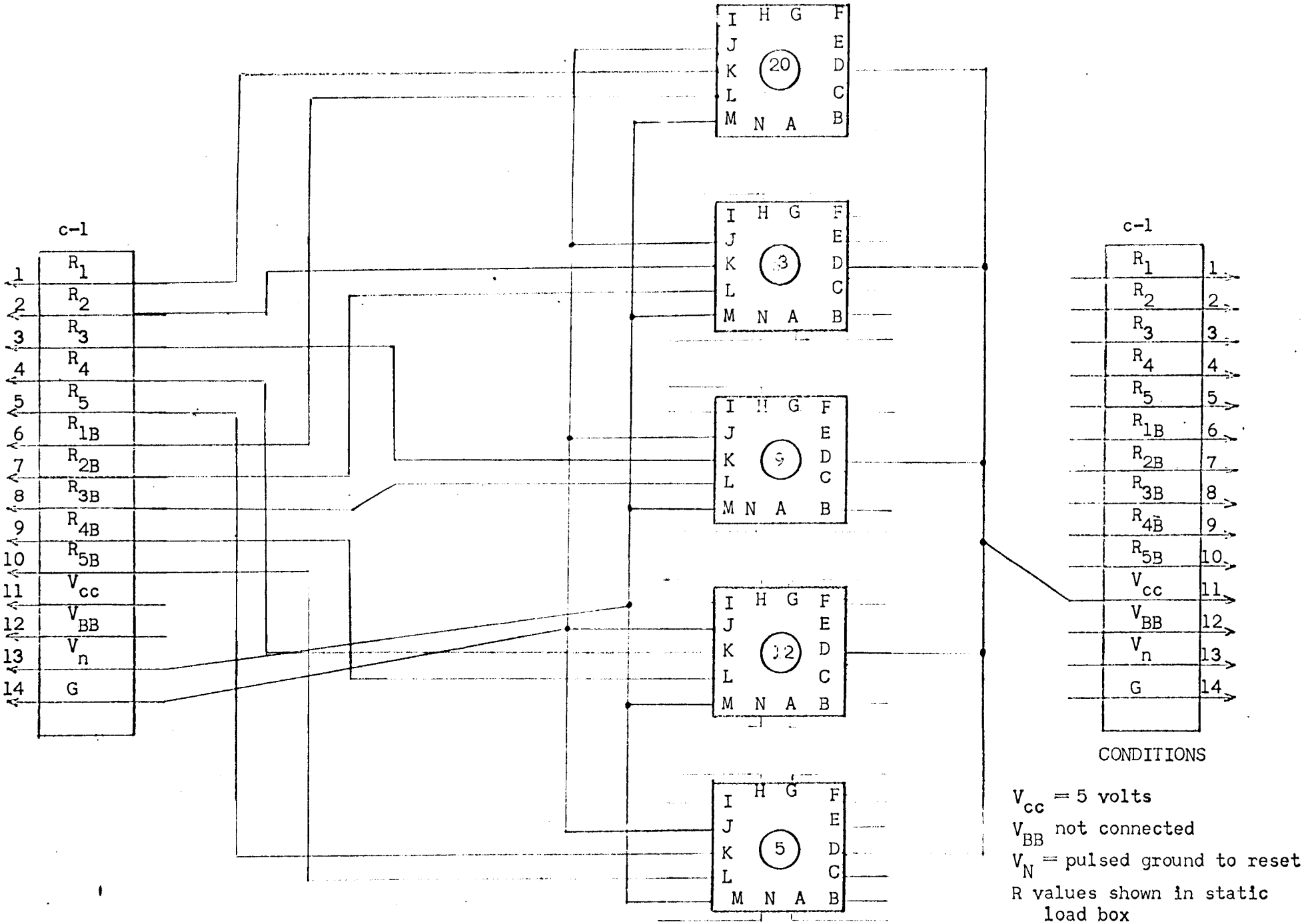


I mc
50 Nanosec Width
2.5 Volts Amplitude

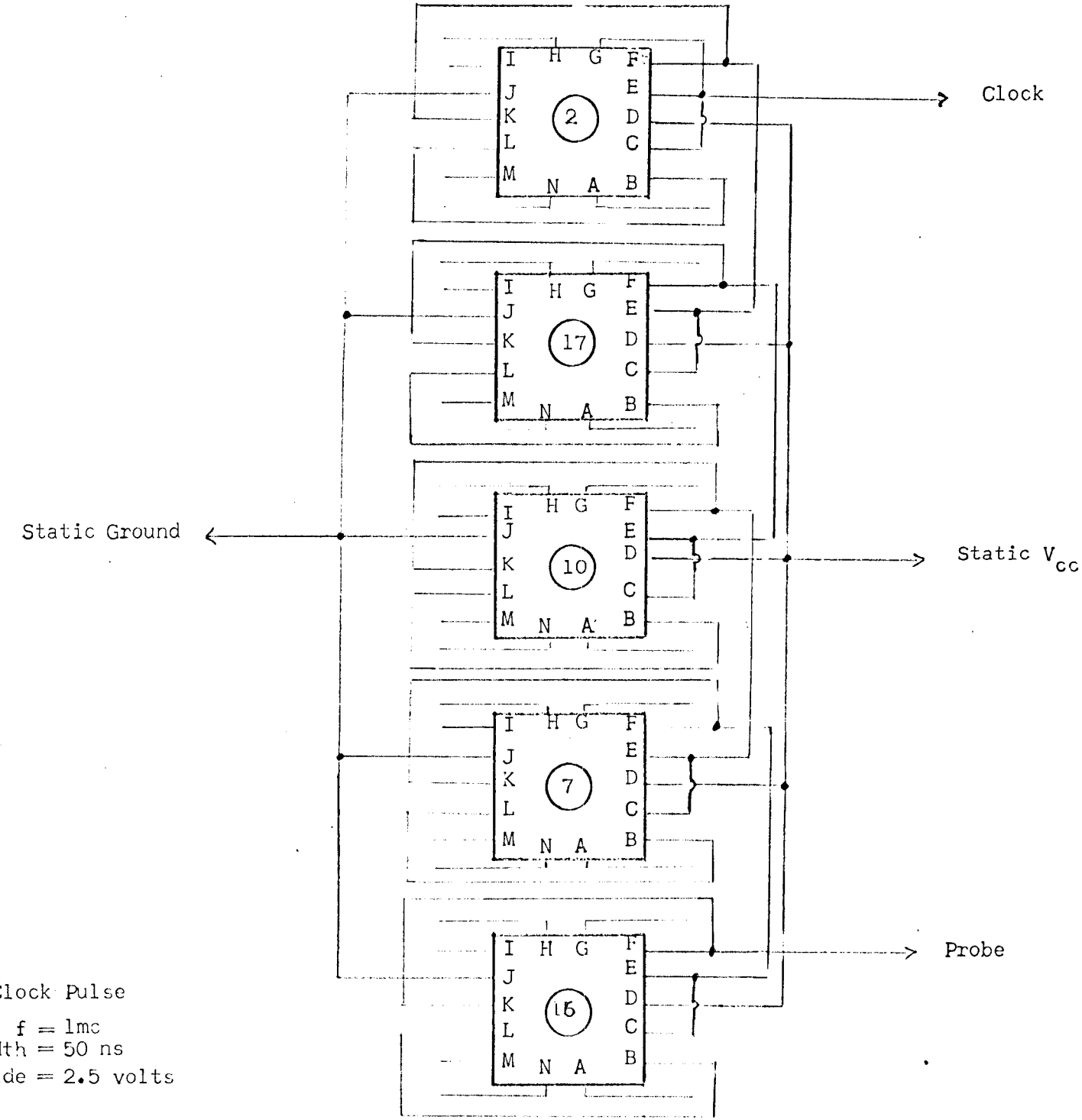
C-2, DYNAMIC RADIATION CIRCUIT



C-2, STATIC LOAD BOX



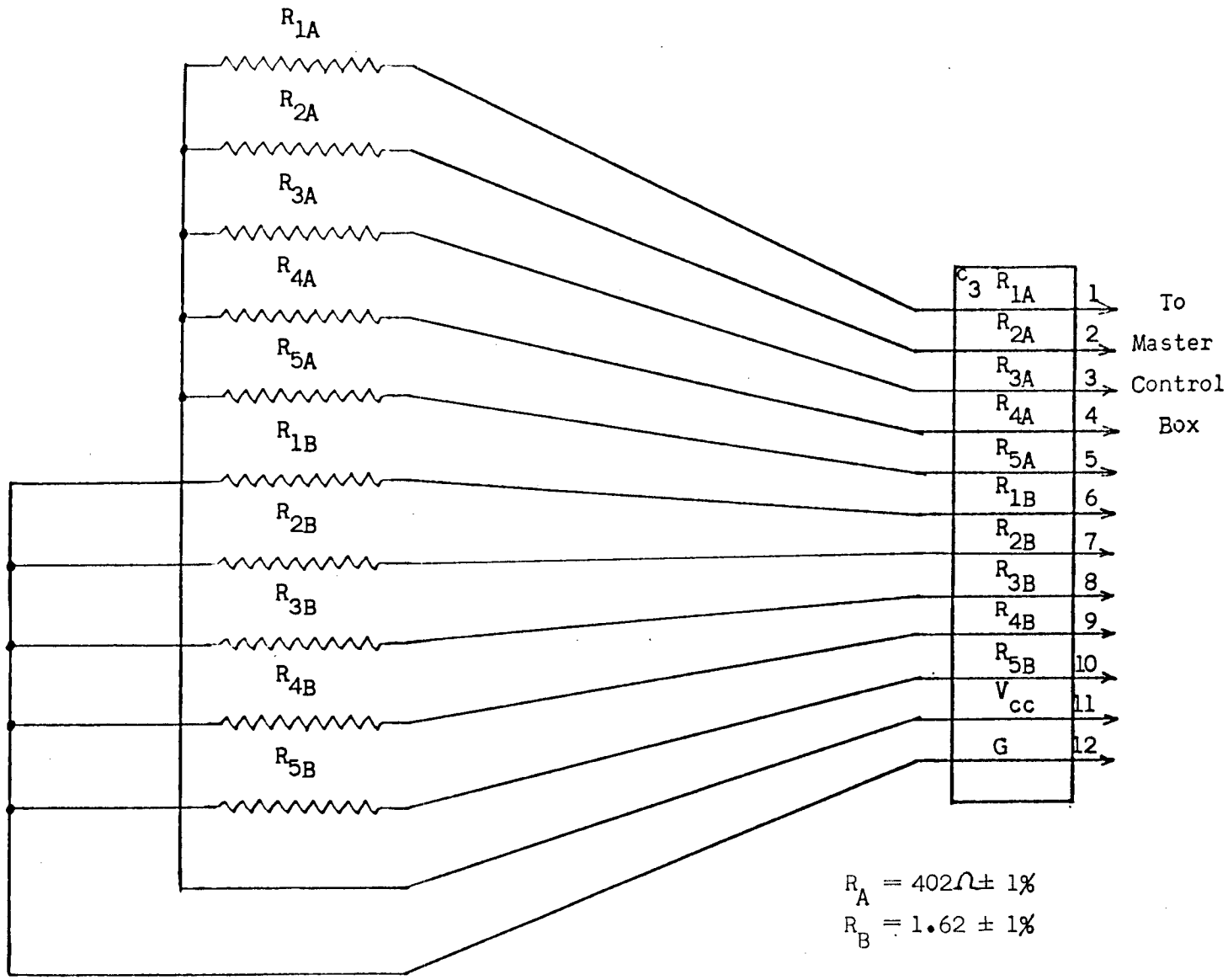
E-4, STATIC RADIATION CIRCUITS



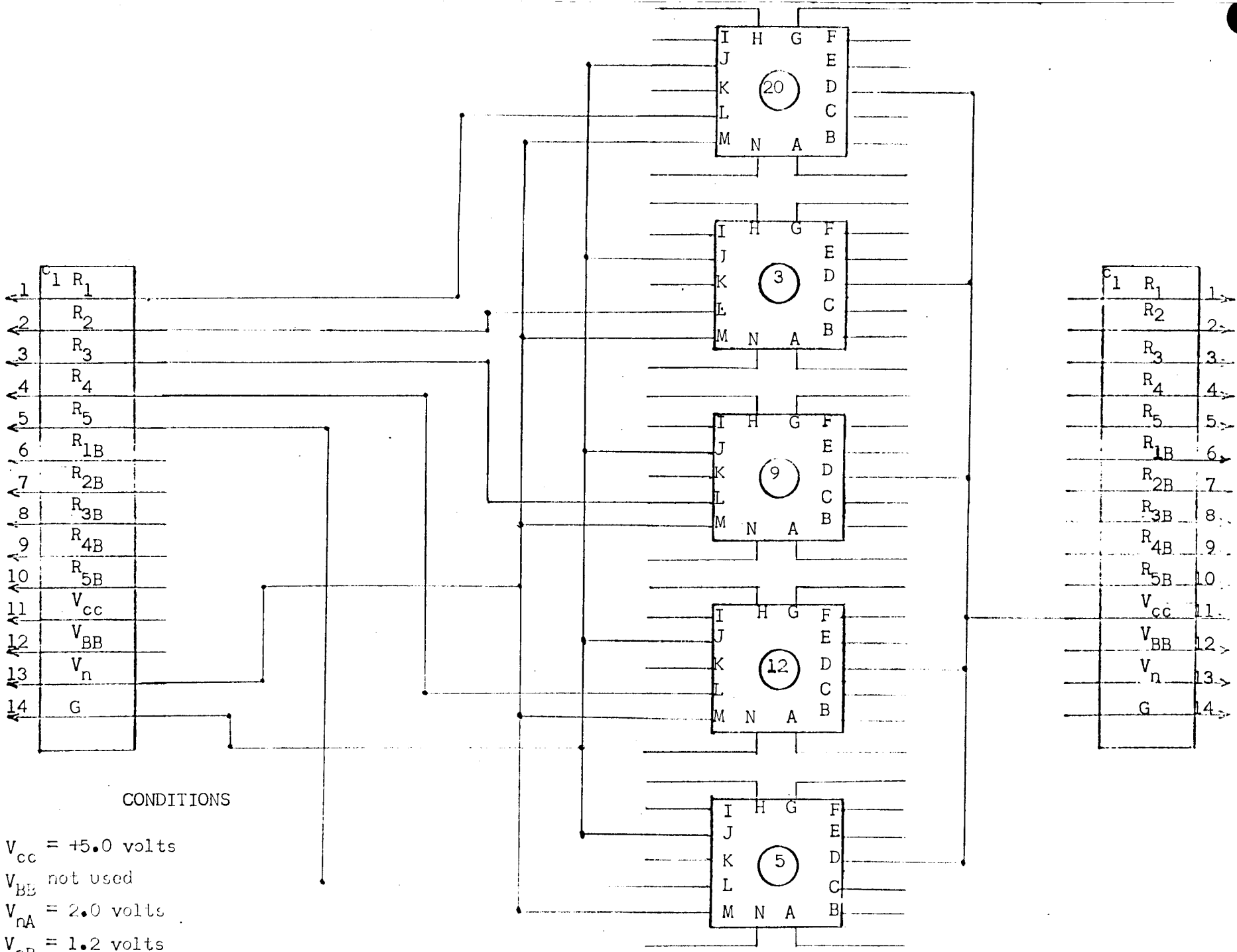
Clock Pulse

f = 1mc
width = 50 ns
Amplitude = 2.5 volts

E-4, DYNAMIC RADIATION CIRCUIT



E-4, STATIC LOAD BOX



CONDITIONS

V_{cc} = +5.0 volts

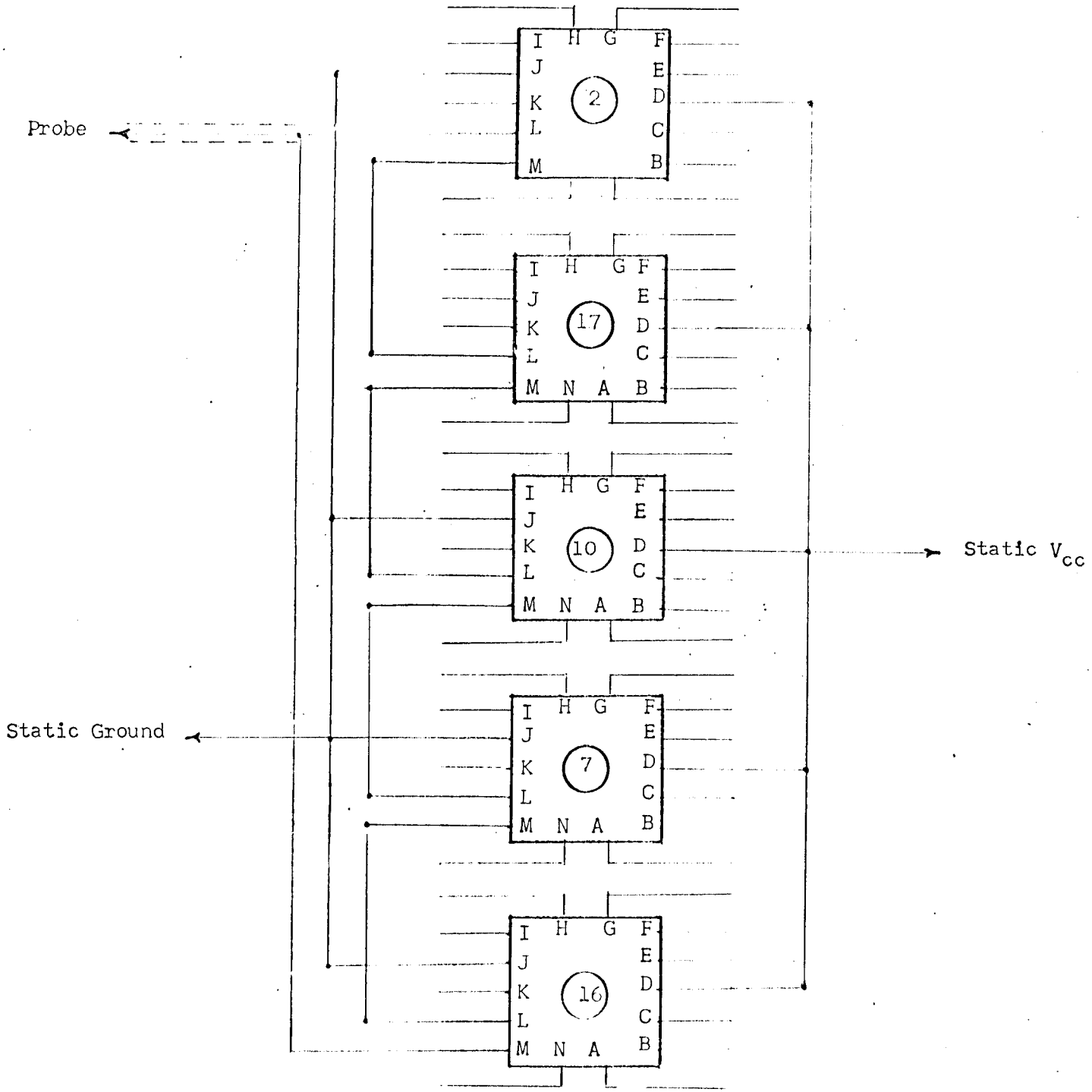
V_{BB} not used

V_{nA} = 2.0 volts

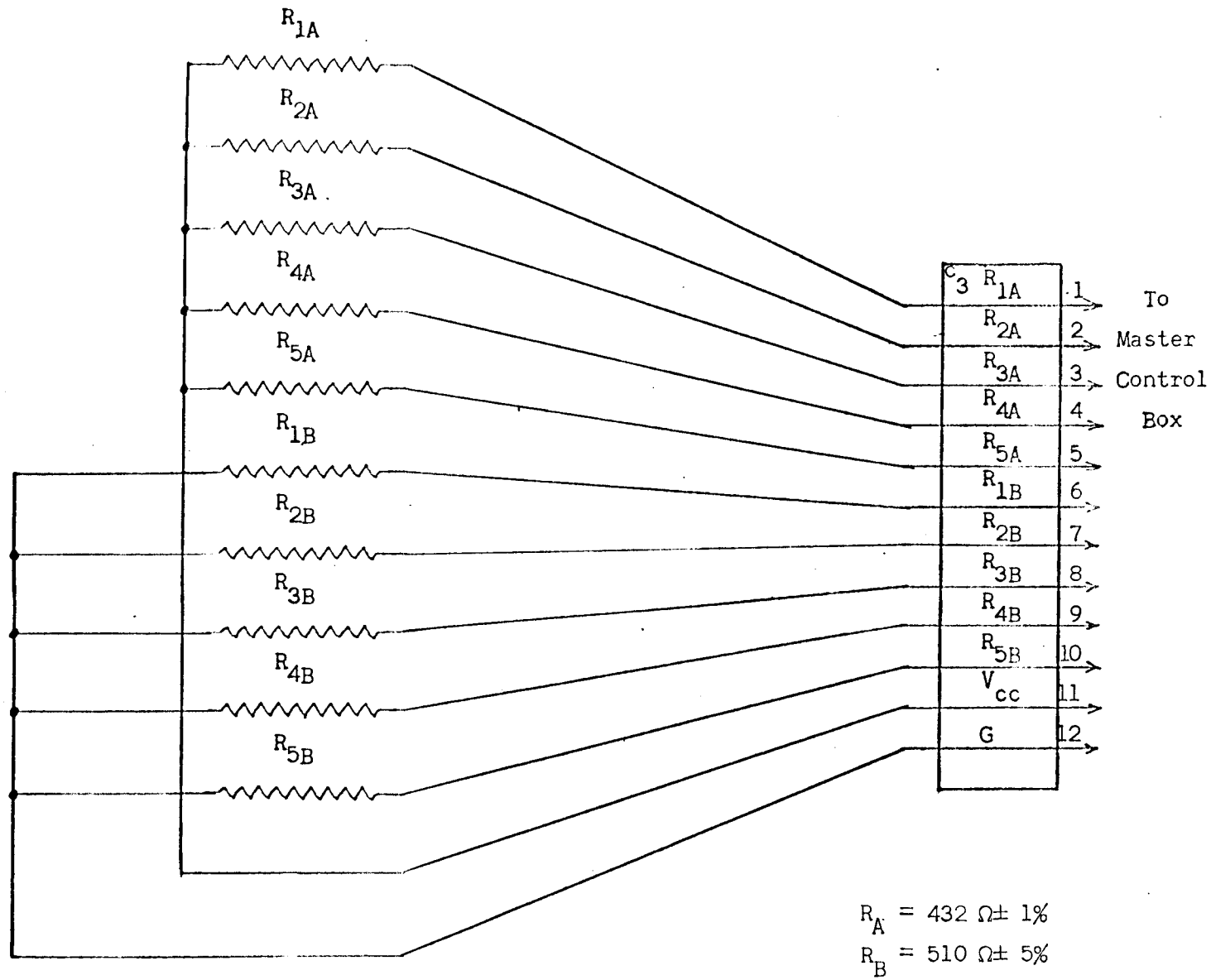
V_{nB} = 1.2 volts

R values shown in static load box

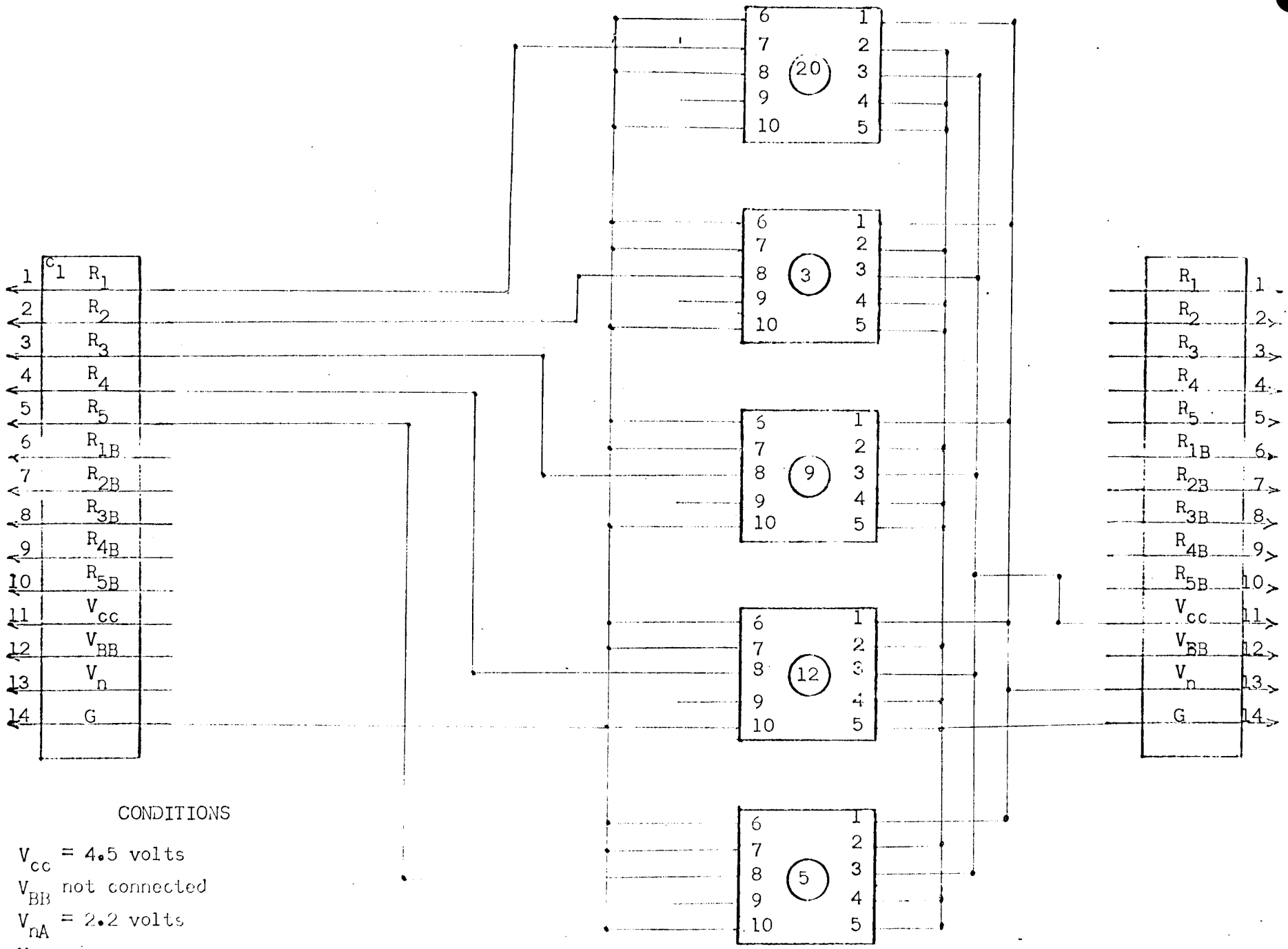
E-5, STATIC RADIATION CIRCUIT



E-5, DYANMIC RADIATION CIRCUIT



E-5, STATIC LOAD BOX



CONDITIONS

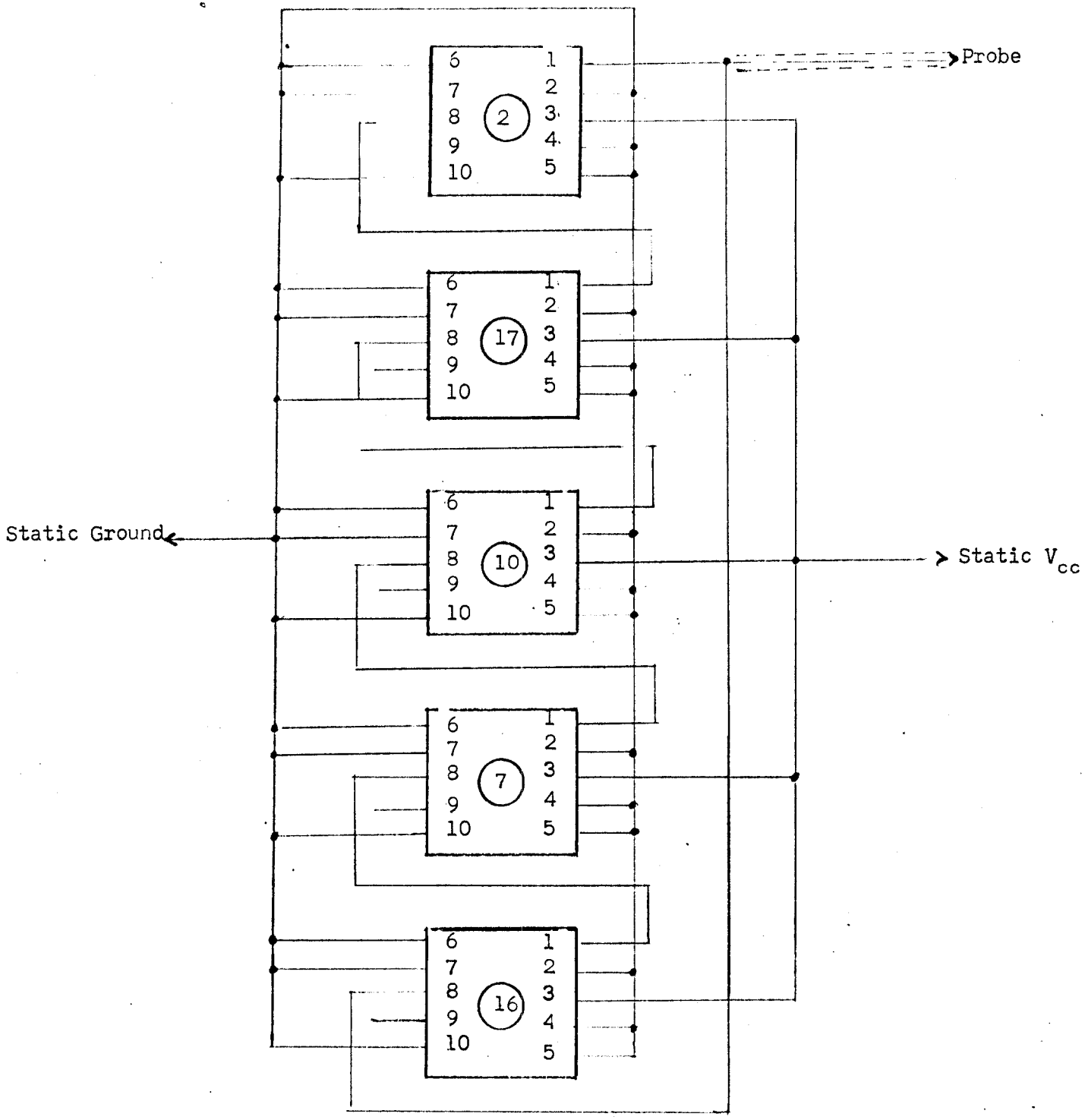
V_{cc} = 4.5 volts

V_{BB} not connected

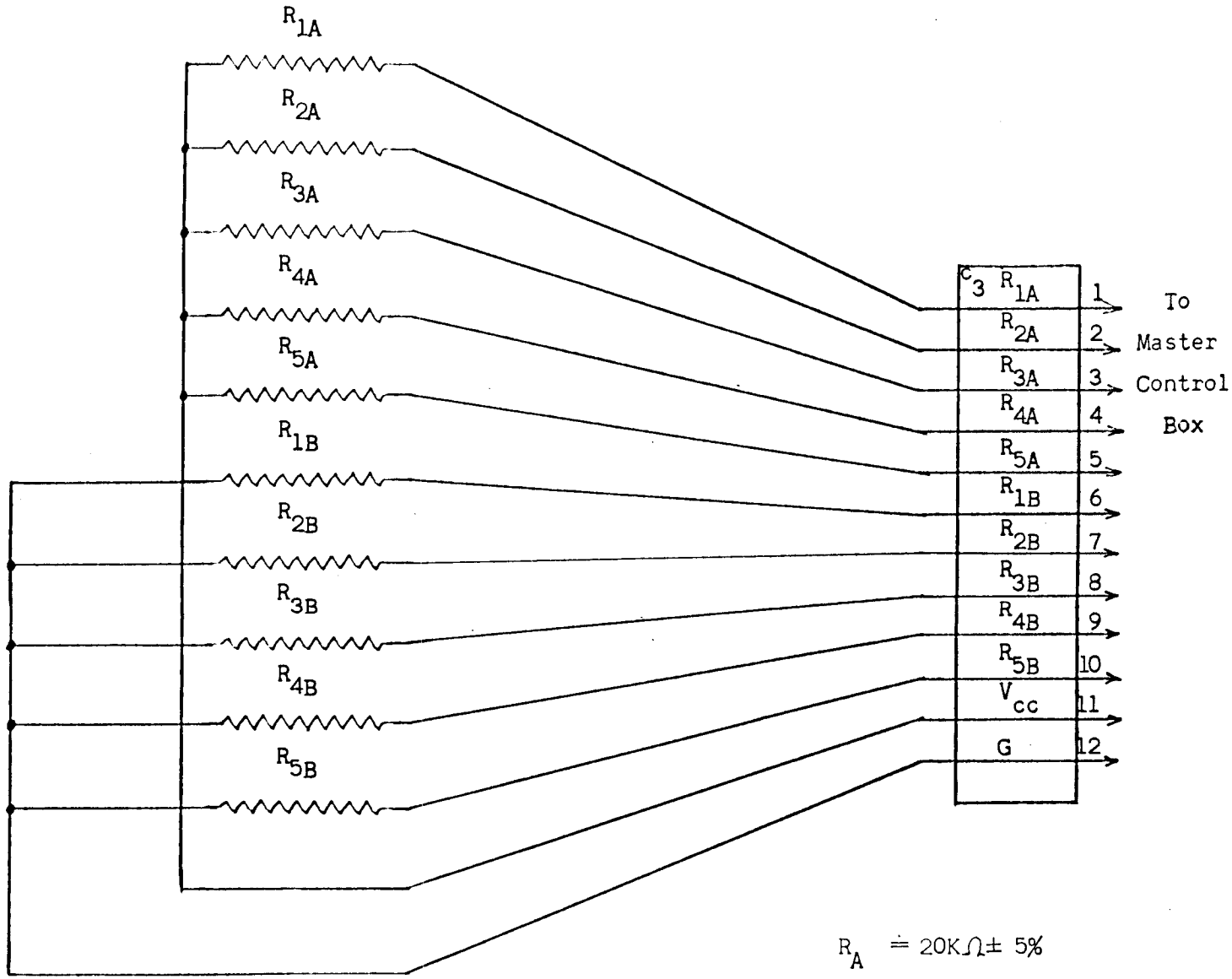
V_{nA} = 2.2 volts

V_{nB} = 0.4 volts

F-1, STATIC RADIATION CIRCUIT



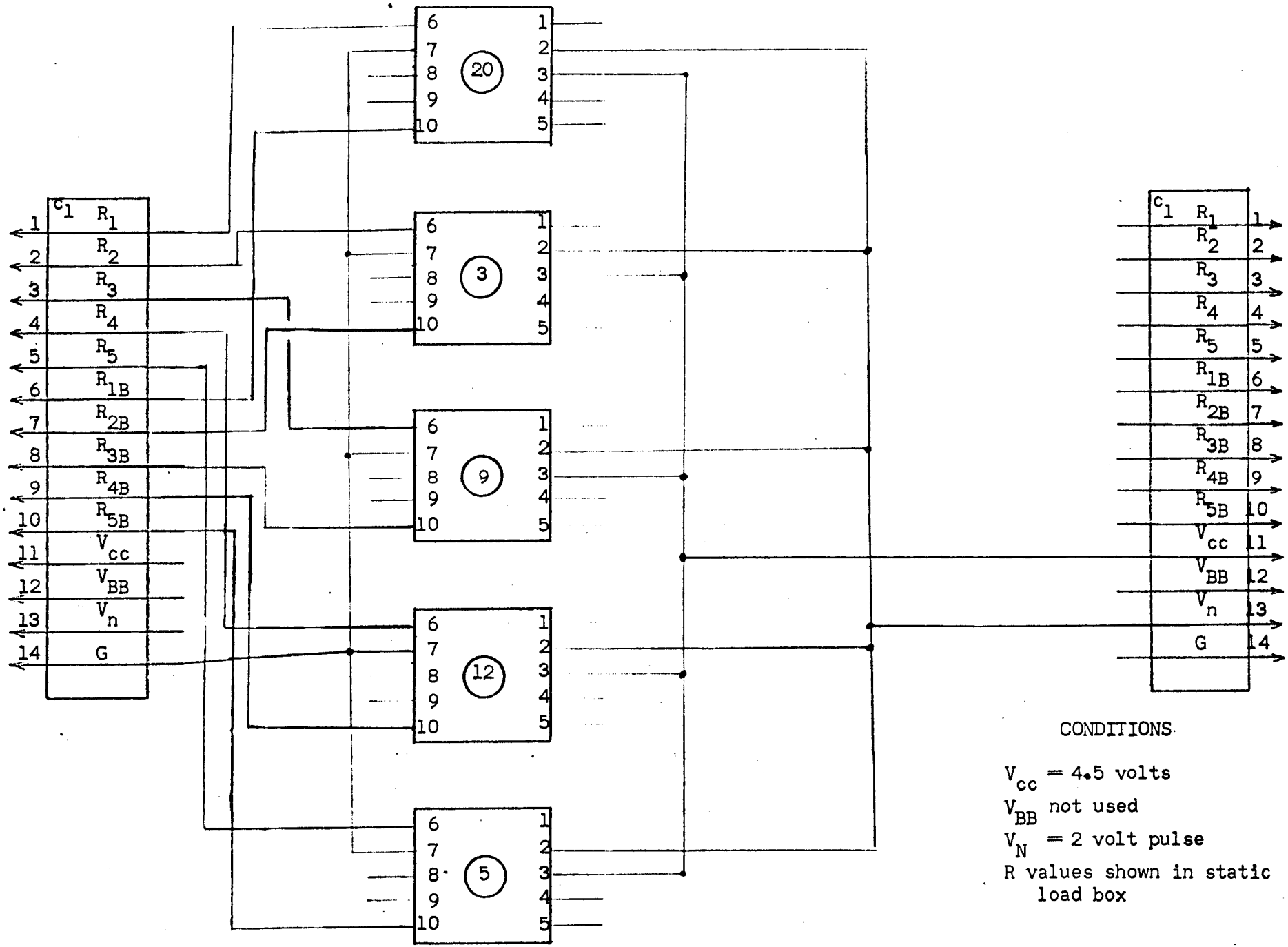
F-1, DYNAMIC RADIATION CIRCUIT



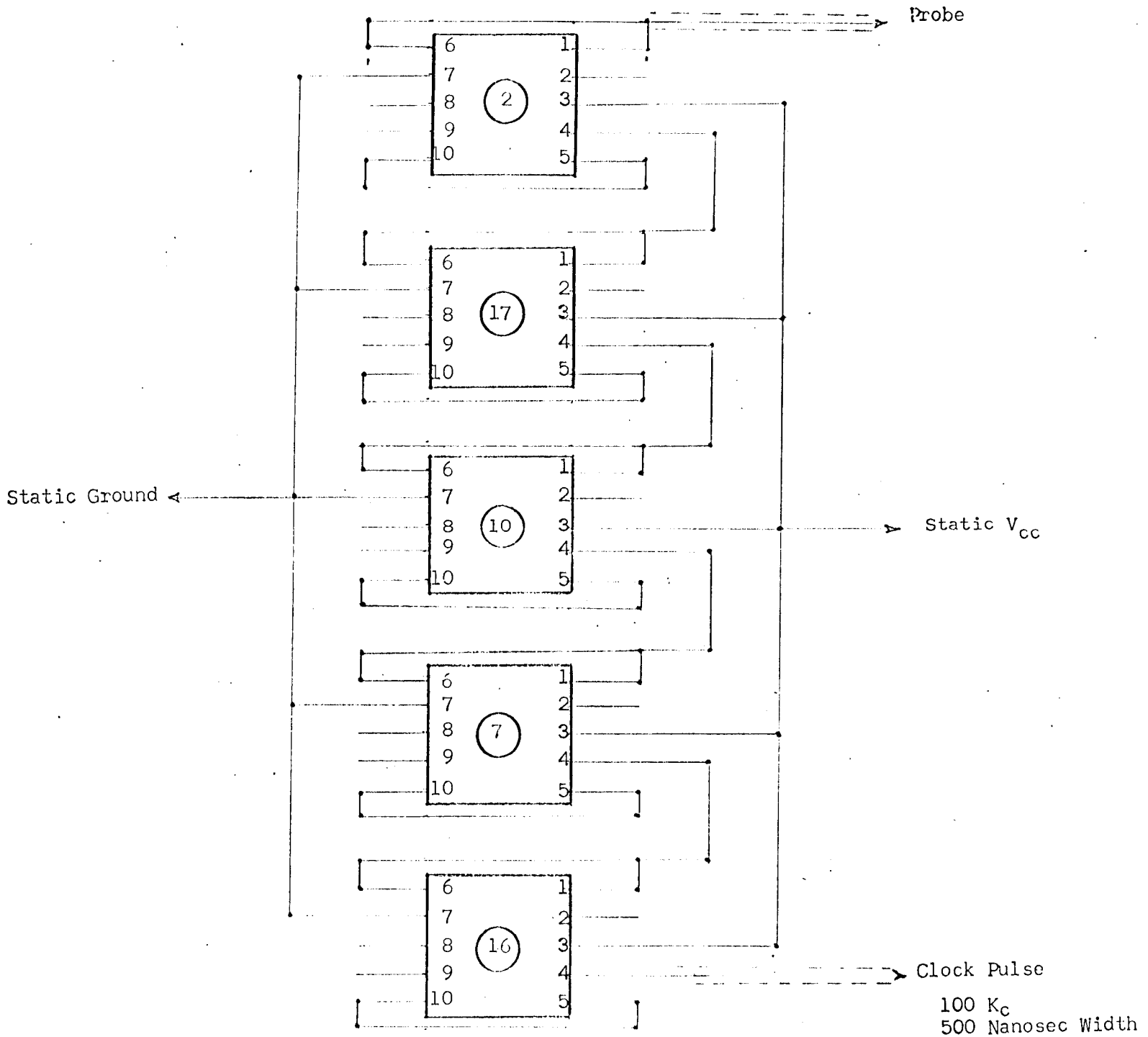
R_A = 20KΩ± 5%

R_B = 4.02KΩ ±1%

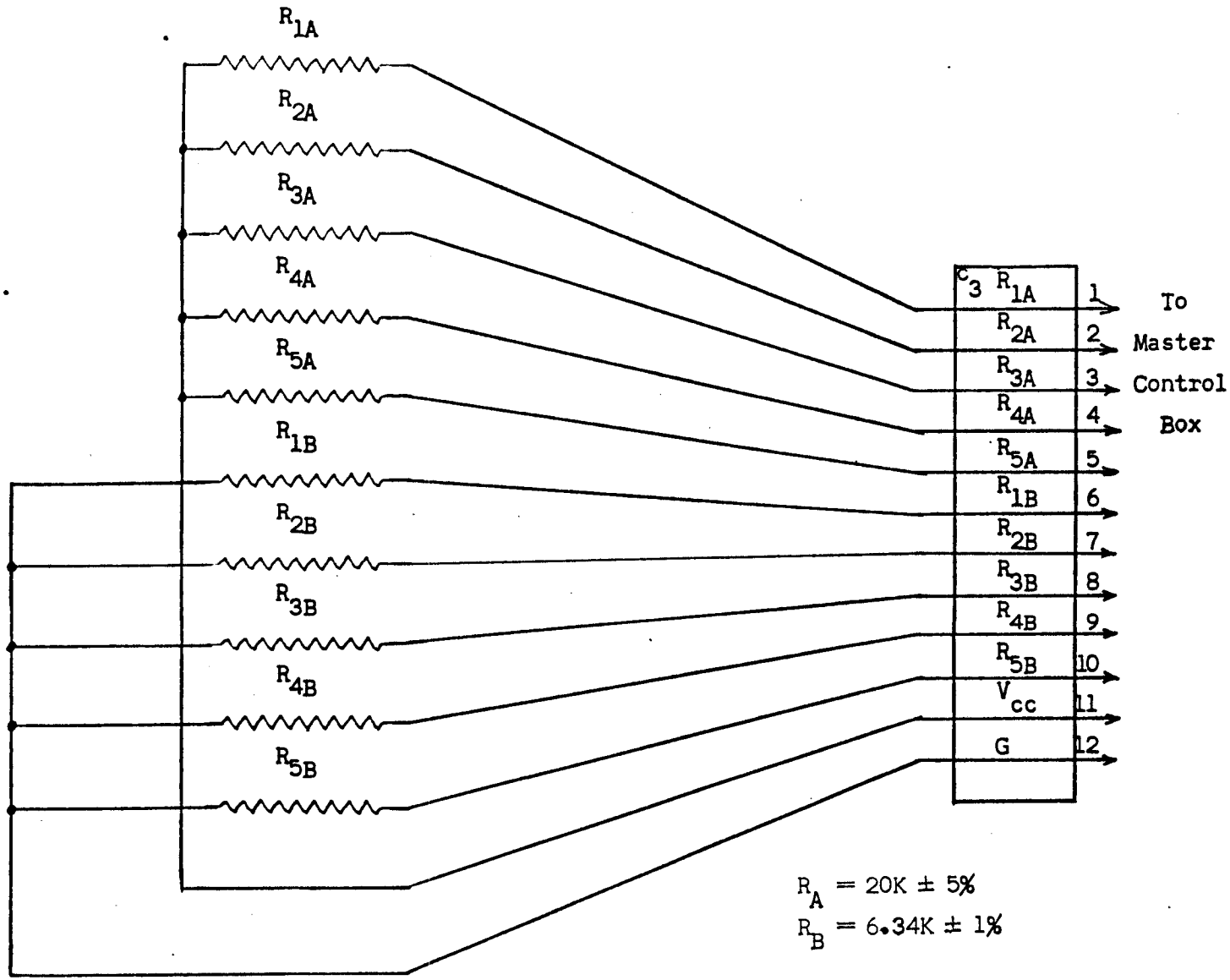
F-1, STATIC LOAD BOX



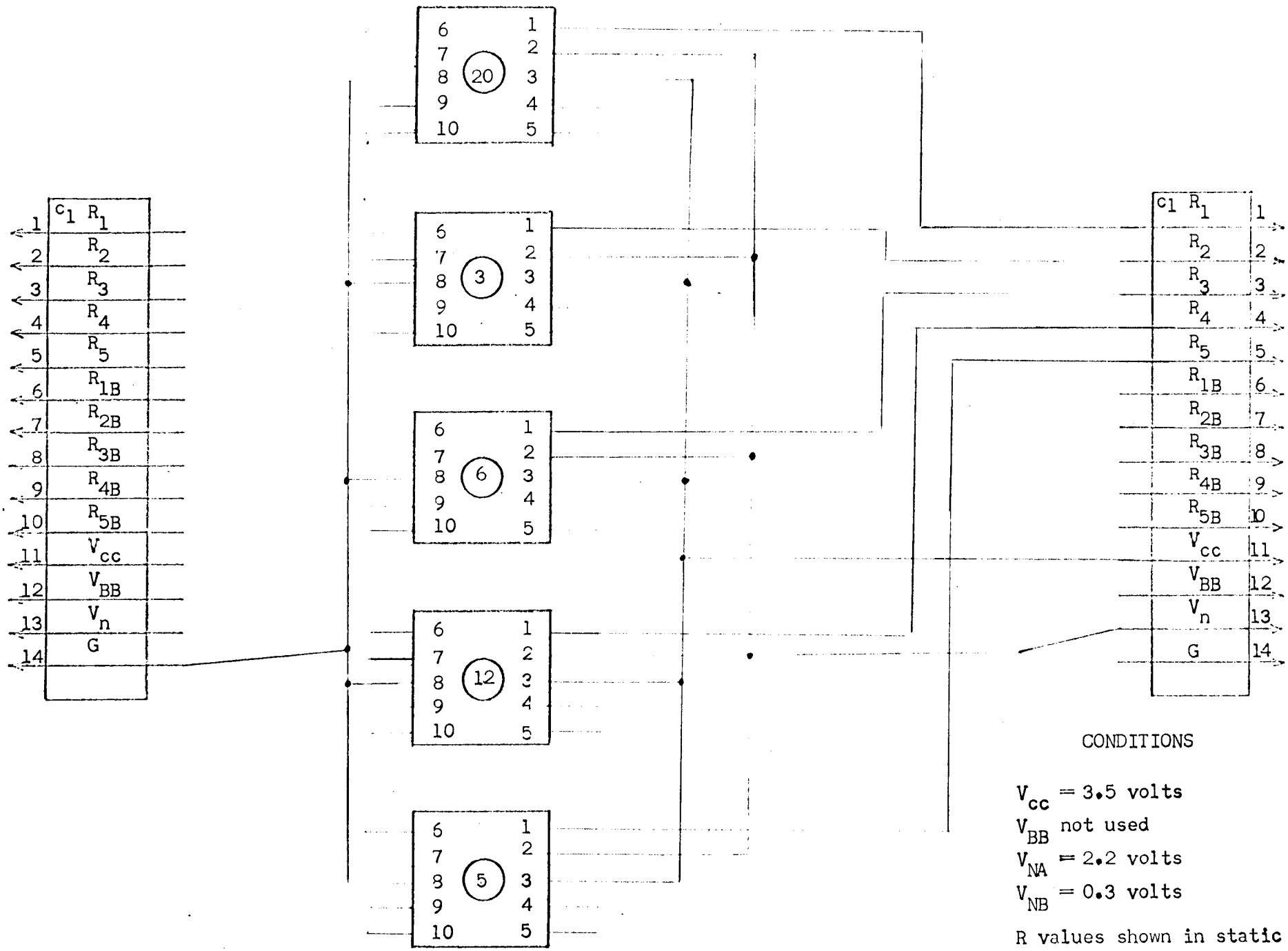
F-2, STATIC RADIATION CIRCUIT



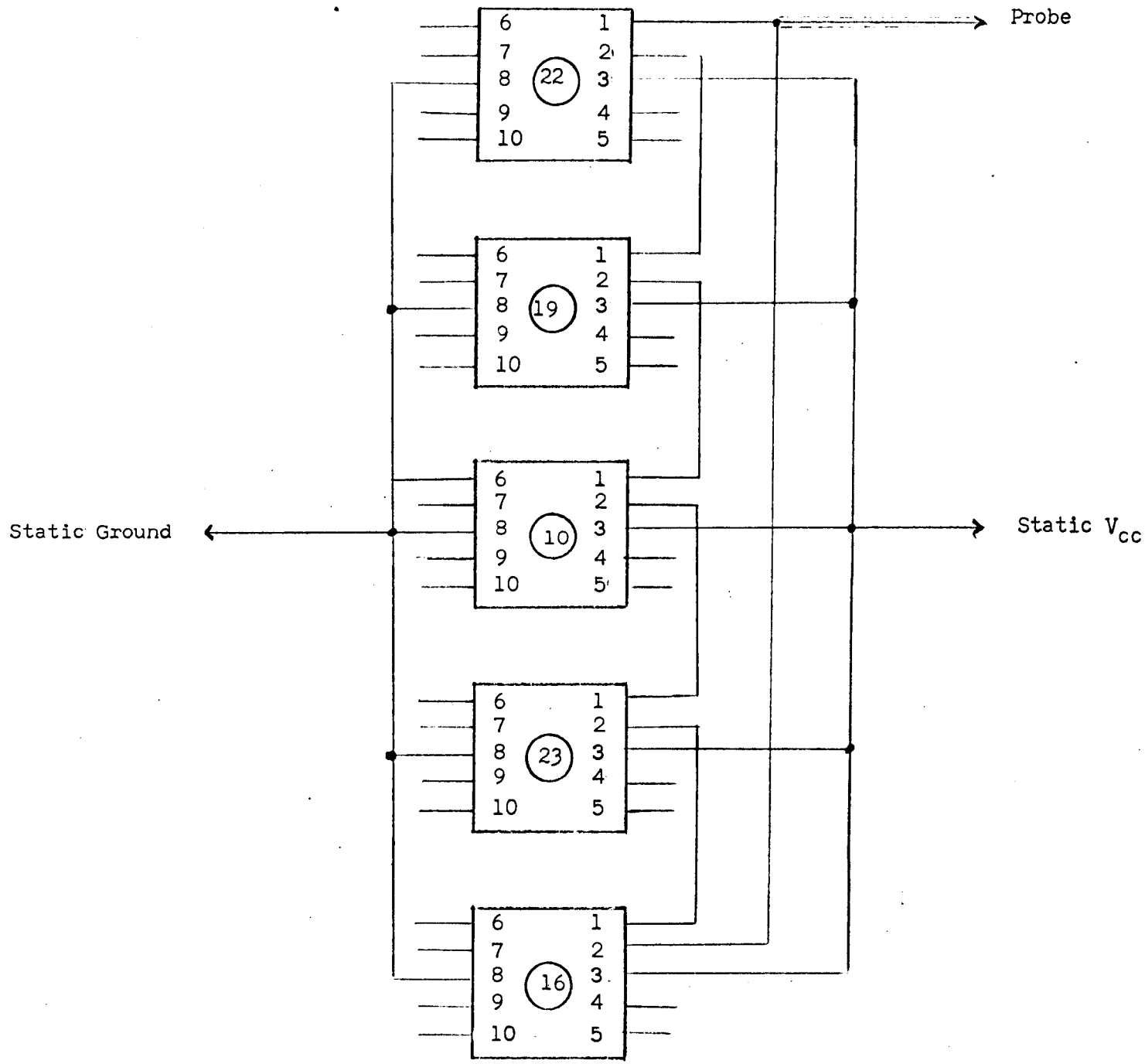
F-2, DYNAMIC RADIATION CIRCUIT



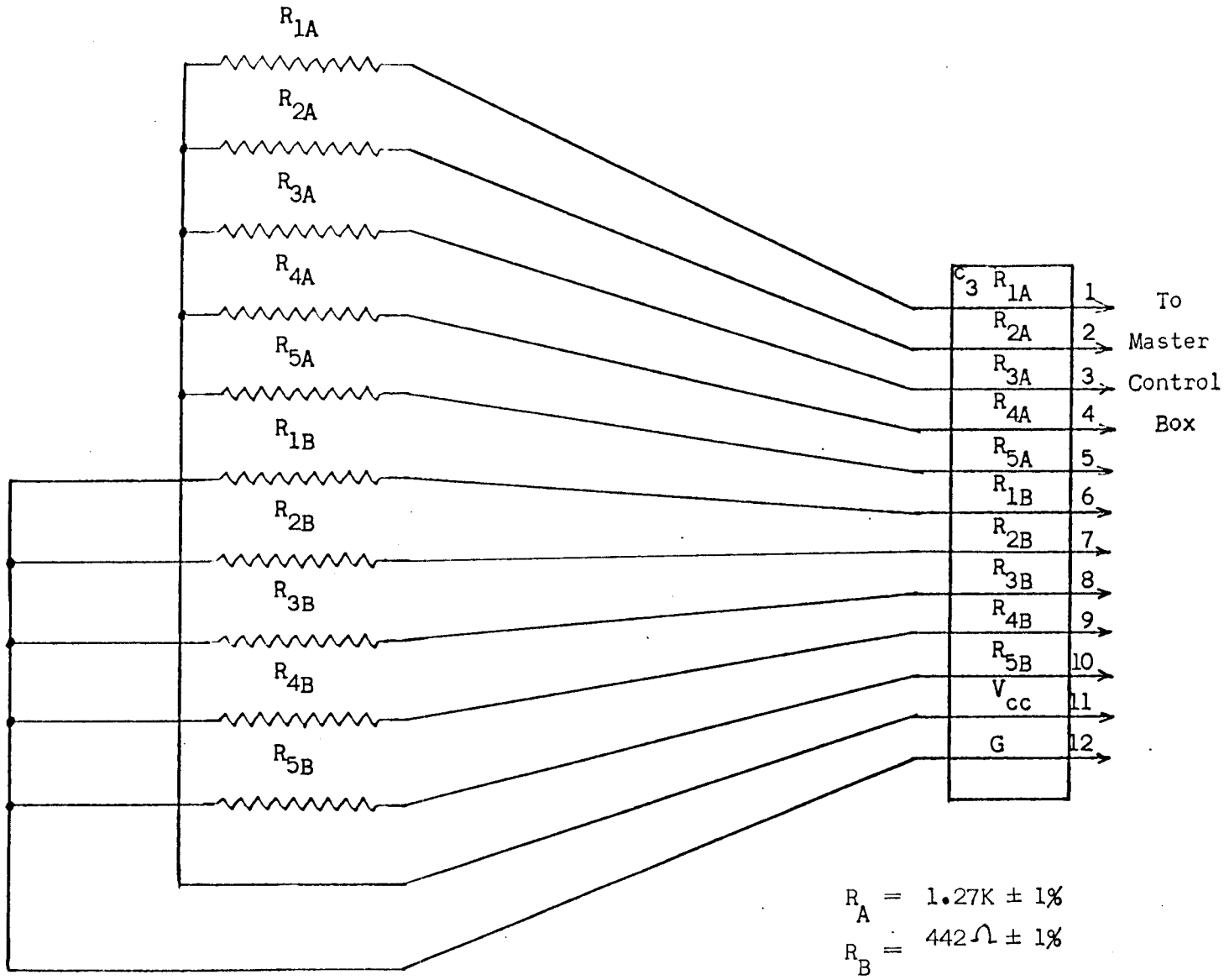
F-2, STATIC LOAD BOX



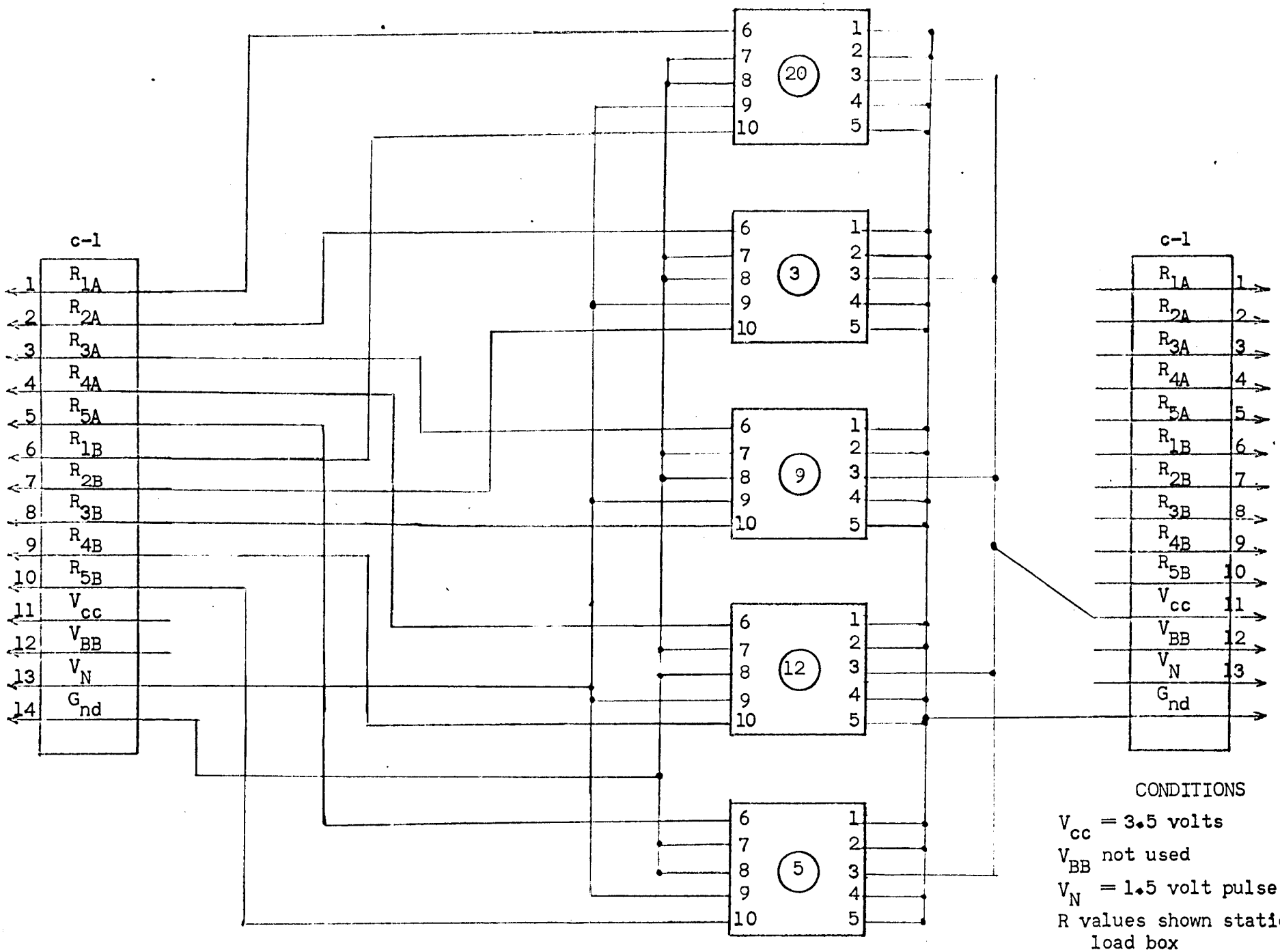
F-3, STATIC RADIATION CIRCUIT



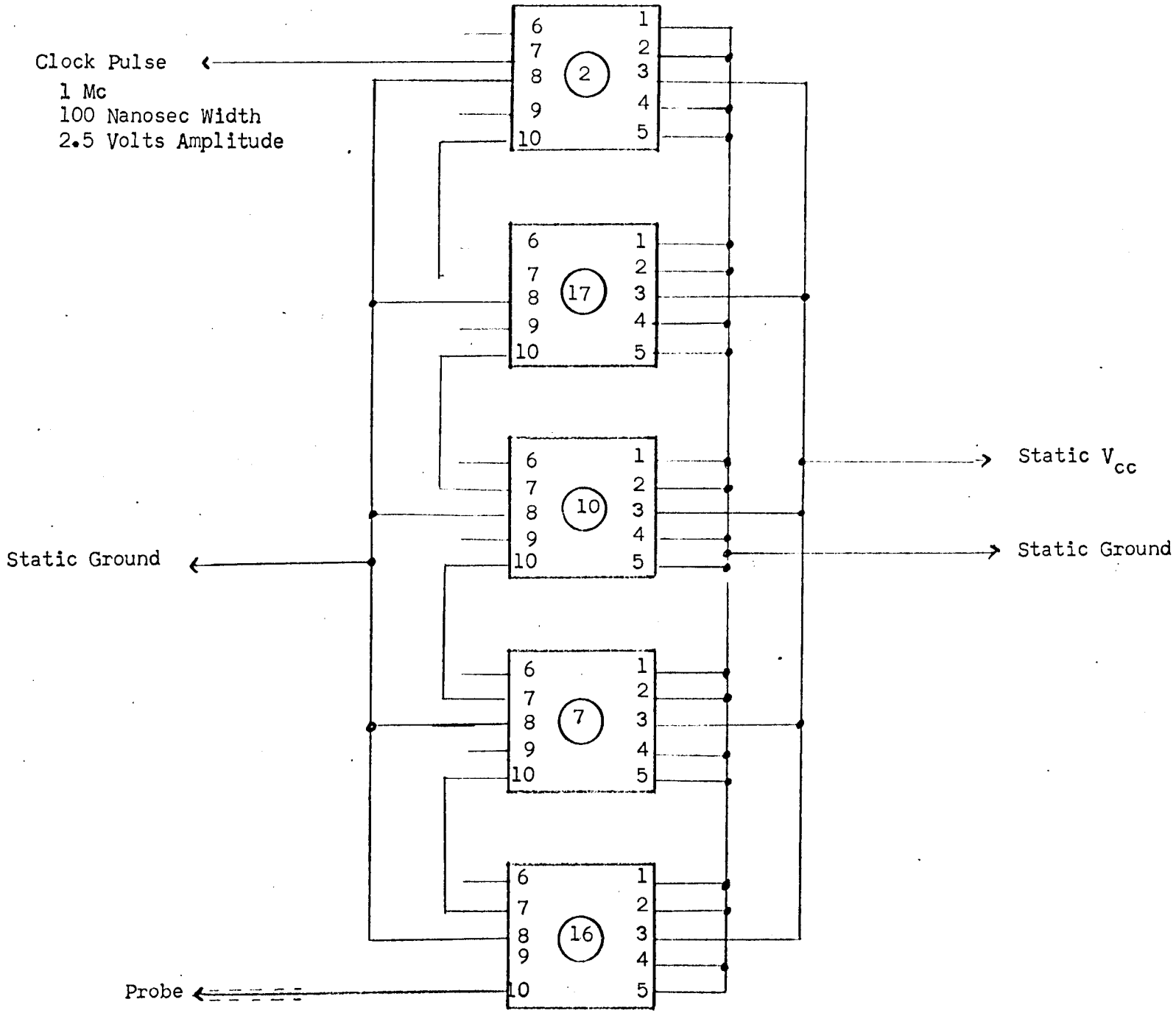
F-3, DYNAMIC RADIATION CIRCUIT



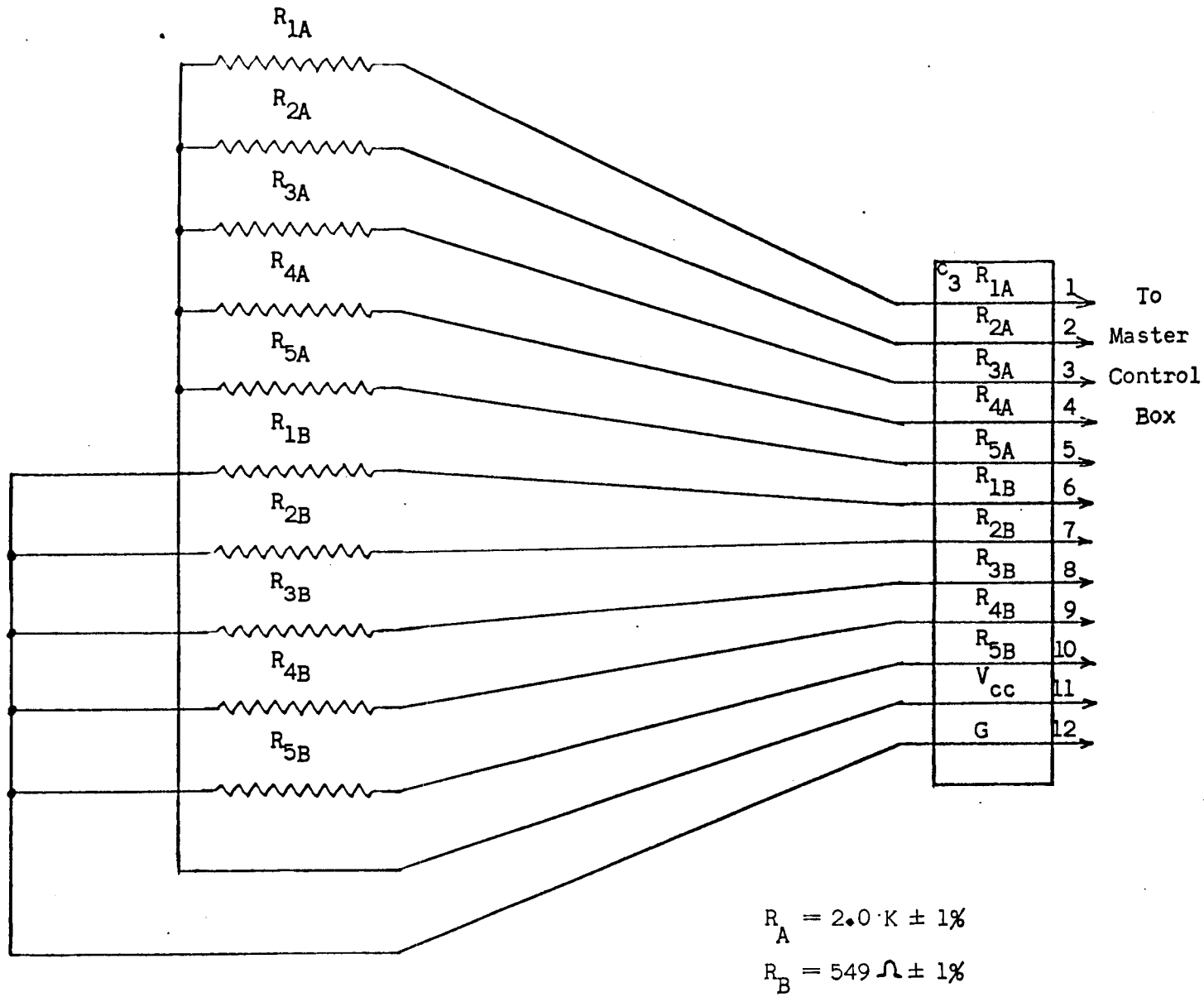
F-3, STATIC LOAD BOX



F-4, STATIC RADIATION CIRCUIT



F-4, DYNAMIC RADIATION CIRCUITS



F-4, STATIC LOAD BOX

APPENDIX III

CHARACTERIZATION AND RADIATION-MONITORING DATA

CHARACTERIZATION AND RADIATION-MONITORING DATA

This appendix contains the pre- and postirradiation measurements that were made following the characterization plans described in Appendix I. Both the pre- and postirradiation data for a specific test and circuit type are recorded on one page.

Also included in this appendix are 32 figures (III-1 through III-32) showing the variation of an output logic level as a function of electron fluence and monitoring curves for dynamically operated devices.

Ordering arrangement of data and figures is alpha-numeric as in Appendix I.

CIRCUIT TYPE: A-1

TEST NUMBER: 1

DATA SHEET

TEST TITLE: Input Voltage Levels ($V_{min\ one}$)

PRE RADIATION

Date: 11/7/64
Temp: 75°F

Volts

MOD	V_{one} (1)	V_{one} (2)	V_{one} (3)	
1	.785	.786	.776	
2	.730	.729	.725	
3	.787	.789	.783	
4	.749	.746	.750	
5	.726	.716	.710	
6	.740	.730	.737	
7	.782	.779	.777	
8		.727	.730	
9	.781	.768	.773	
10	.772	.752	.749	
11	.753	.753	.754	
12	.754	.746	.745	
13	.773	.767	.777	
14	.746	.740	.741	
15	.757	.813	.756	
16	.743	.752	.743	
17	.729	.727	.734	
18	.731	.728	.722	
19	.746	.744	.743	
20	.746	.739	.745	
TECH.			ENGR.	

POST RADIATION

Date: 7-9-65
Temp: 76°

MOD	V_{one} (1)	V_{one} (2)	V_{one} (3)	
1	.862	.861	.856	
2	.773	.779	.773	
3	.872	.892	.882	
4	.746	.747	.750	
5	.769	.758	.751	
6	.791	.779	.790	
7	.846	.859	.857	
8	—	.782	.787	
9	.856	.839	.849	
10	.823	.809	.809	
11	.814	.833	.832	
12	.852	.850	.866	
13	.813	.805	.803	
14	.800	.794	.799	
15	.760	.815	.759	
16	.799	.825	.811	
17	.734	.731	.736	
18	.734	.733	.729	
19	.753	.749	.747	
20	.803	.802	.812	
TECH.			ENGR.	

EQUIPMENT: Digital VM I 55991

COMMENTS: All Voltages maintained To Less Than ±.001 volts except Voltage at pin 6 Mod 15 Test V_{one}(2). during that Test pin 6 voltage was Noisy.
Mods 16-20 Tested 1-8-65 temp 77°F

CIRCUIT TYPE: A-1

TEST NUMBER: 2

DATA SHEET 1 of 2

TEST TITLE: Input Voltage Levels ($V_{max\ zero}$)

PRE RADIATION

Date: 11/8/64
Temp: 78°F

R_L = 1.87K

MOD	$V_{zero(1)}$	$V_{zero(2)}$	$V_{zero(3)}$	
1	.754	.752	.750	
2	.708	.709	.705	
3	.759	.762	.755	
4	.725	.723	.727	
5	.703	.697	.692	
6	.717	.710	.717	
7	.753	.751	.751	
8		.709	.711	
9	.754	.744	.749	
10	.729	.723	.722	
11	.729	.730	.731	
12	.744	.743	.749	
13	.729	.722	.722	
14	.721	.717	.715	
15	.731	.879 *	.731	
16	.719	.727	.719	
17	.707	.706	.710	
18	.704	.703	.699	
19	.723	.720	.719	
20	.721	.716	.723	
TECH. M.W. Elliott		ENGR. [illegible]		

POST RADIATION

Date: 7-9-65
Temp: 75°

R_L = 1.87K

MOD	$V_{zero(1)}$	$V_{zero(2)}$	$V_{zero(3)}$	
1	.805	.804	.800	
2	.741	.743	.740	
3	.819	.826	.820	
4	.726	.724	.727	
5	.735	.726	.721	
6	.749	.741	.749	
7	.795	.803	.796	
8	-	.743	.746	
9	.803	.791	.800	
10	.764	.759	.759	
11	.770	.783	.783	
12	.797	.796	.805	
13	.769	.763	.763	
14	.760	.754	.755	
15	.733	* .797	.735	
16	.759	.775	.763	
17	.711	.709	.714	
18	.711	.709	.703	
19	.726	.724	.723	
20	.762	.759	.765	
TECH. M.W. Elliott			ENGR.	

* unstable

EQUIPMENT: Digital VM I 55991
Decade resistor I 73730

COMMENTS:

* very unstable

CIRCUIT TYPE: A-1

TEST NUMBER: 2

DATA SHEET 2 of 2

TEST TITLE: Input Voltage Levels ($V_{max\ zero}$)

PRE RADIATION

Date: 11/8/64
Temp: 78°F

R_L = 374Ω

MOD	$V_{zero(1)}$	$V_{zero(2)}$	$V_{zero(3)}$	
1	.703	.706	.700	
2	.662	.680	.650	
3	.714	.705	.715	
4	.670	.665	.667	
5	.660	.653	.652	
6	.687	.669	.674	
7	.701	.699	.696	
8		.669	.662	
9	.729	.704	.708	
10	.656	.629	.633	
11	.693	.711	.685	
12	.699	.702	.680	
13	.689	.670	.667	
14	.663	.669	.669	
15	.687	.820*	.688	
16	.677	.683	.677	
17	.665	.664	.666	
18	.660	.659	.657	
19	.680	.679	.677	
20	.675	.672	.679	

TECH. [signature] ENGR. [signature]

POST RADIATION

Date: 7-9-65
Temp: 75°

R_L = 374Ω

MOD	$V_{zero(1)}$	$V_{zero(2)}$	$V_{zero(3)}$	
1	.736	.734	.732	
2	.676	.676	.674	
3	.746	.752	.747	
4	.674	.673	.677	
5	.675	.671	.666	
6	.693	.686	.693	
7	.723	.726	.729	
8		.687	.689	
9	.745	.736	.743	
10	.656	.656	.656	
11	.713	.721	.721	
12	.729	.726	.731	
13	.701	.697	.697	
14	.695	.692	.692	
15	.693	.746	.695	
16	.697	.706	.699	
17	.669	.669	.672	
18	.666	.665	.661	
19	.685	.684	.683	
20	.693	.690	.694	

TECH. [signature] ENGR.

EQUIPMENT: SAME AS Sheet #1

COMMENTS:
* unstable
Mods 16-20 tested 1-8-65
Temp 77°F

CIRCUIT TYPE: A-1

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Input Drive Current Requirement

PRE RADIATION

Date: 1-8-65
Temp: 79°F
1X10⁻³ Amps

MOD	$I_{D(1)}$	$I_{D(2)}$	$I_{D(3)}$	
1	.38	.39	.35	
2	.37	.38	.38	
3	.37	.38	.38	
4	.35	.36	.35	
5	.39	.40	.40	
6	.39	.38	.39	
7	.35	.36	.36	
8	—	—	—	
9	.42	.42	.42	
10	.29	.30	.29	
11	.38	.36	.38	
12	.38	.40	.36	
13	.37	.39	.37	
14	.38	.39	.38	
15	.37	.42	.37	
16	.38	.34	.35	
17	.38	.39	.37	
18	.39	.40	.40	
19	.38	.38	.38	
20	.36	.36	.36	
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 7-9-65
Temp: 75°

MOD	$I_{D(1)}$	$I_{D(2)}$	$I_{D(3)}$	
1	.34	.35	.34	
2	.34	.35	.34	
3	.33	.31	.33	
4	.34	.34	.34	
5	.35	.36	.36	
6	.35	.35	.36	
7	.32	.32	.32	
8	—	—	—	
9	.38	.39	.38	
10	.26	.27	.26	
11	.35	.33	.35	
12	.35	.37	.37	
13	.34	.35	.33	
14	.34	.35	.35	
15	.36	.40	.36	
16	.35	.31	.32	
17	.37	.38	.36	
18	.38	.39	.39	
19	.37	.38	.39	
20	.32	.32	.32	
TECH. [illegible]		ENGR.		

EQUIPMENT: milliammeter I 14196
Digital VM I 55991

COMMENTS:
Mod 8 Could Not be tested due to missing P/N

CIRCUIT TYPE: A-1

TEST NUMBER: 4

DATA SHEET

TEST TITLE: Input Leakage Current

PRE RADIATION

Date: 11/10/64
Temp: 79°F

MOD	I_{L_1}	I_{L_2}	I_{L_3}	
1	$.25\times10^{-7}$	$.34\times10^{-7}$	$.34\times10^{-7}$	
2	$.09\times10^{-7}$	$.13\times10^{-7}$	$.13\times10^{-7}$	
3	$.12\times10^{-7}$	$.17\times10^{-7}$	$.14\times10^{-7}$	
4	$.18\times10^{-7}$	$.18\times10^{-7}$	$.18\times10^{-7}$	
5	$.65\times10^{-8}$	$.09\times10^{-7}$	$.1\times10^{-7}$	
6	$.09\times10^{-7}$	$.1\times10^{-7}$	$.1\times10^{-7}$	
7	$.17\times10^{-7}$	$.17\times10^{-7}$	$.2\times10^{-7}$	
8	~~[illegible]~~	$.12\times10^{-7}$	$.14\times10^{-7}$	
9	$.17\times10^{-7}$	$.18\times10^{-7}$	$.18\times10^{-7}$	
10	$.12\times10^{-6}$	$.15\times10^{-6}$	$.15\times10^{-6}$	
11	$.23\times10^{-7}$	$.27\times10^{-7}$	$.26\times10^{-7}$	
12	$.5\times10^{-7}$	$.73\times10^{-7}$	$.34\times10^{-7}$	
13	$.17\times10^{-7}$	$.18\times10^{-7}$	$.18\times10^{-7}$	
14	$.15\times10^{-7}$	$.18\times10^{-7}$	$.17\times10^{-7}$	
15	$.17\times10^{-6}$	$.17\times10^{-6}$	$.17\times10^{-6}$	
16	$.12\times10^{-7}$	$.12\times10^{-7}$	$.12\times10^{-7}$	
17	$.12\times10^{-7}$	$.12\times10^{-7}$	$.12\times10^{-7}$	
18	$.31\times10^{-7}$	$.31\times10^{-7}$	$.32\times10^{-7}$	
19	$.1\times10^{-7}$	$.1\times10^{-7}$	$.1\times10^{-7}$	
20	$.16\times10^{-7}$	$.17\times10^{-7}$	$.16\times10^{-7}$	
TECH. [illegible]			ENGR. [illegible]	

POST RADIATION

Date: 10-12-65
Temp: 76°

MOD	I_{L_1}	I_{L_2}	I_{L_3}	
1	$.34\times10^{-7}$	$.35\times10^{-7}$	$.35\times10^{-7}$	
2	$.19\times10^{-7}$	$.2\times10^{-7}$	$.2\times10^{-7}$	
3	$.2\times10^{-7}$	$.2\times10^{-7}$	$.2\times10^{-7}$	
4	$.16\times10^{-7}$	$.18\times10^{-7}$	$.18\times10^{-7}$	
5	$.14\times10^{-7}$	$.14\times10^{-7}$	$.14\times10^{-7}$	
6	$.19\times10^{-7}$	$.13\times10^{-7}$	$.21\times10^{-7}$	
7	$.21\times10^{-7}$	$.22\times10^{-7}$	$.23\times10^{-7}$	
8	—	$.8\times10^{-5}$	$.61\times10^{-5}$	
9	$.18\times10^{-7}$	$.19\times10^{-7}$	$.2\times10^{-7}$	
10	$.12\times10^{-7}$	$.12\times10^{-4}$	$.14\times10^{-4}$	
11	$.09\times10^{-5}$	$.1\times10^{-5}$	$.12\times10^{-5}$	
12	$.23\times10^{-6}$	$.23\times10^{-6}$	$.26\times10^{-6}$	
13	$.18\times10^{-7}$	$.18\times10^{-7}$	$.2\times10^{-7}$	
14	$.18\times10^{-7}$	$.2\times10^{-7}$	$.21\times10^{-7}$	
15	$.15\times10^{-6}$	$.15\times10^{-6}$	$.17\times10^{-6}$	
16	$.25\times10^{-7}$	$.25\times10^{-7}$	$.27\times10^{-7}$	
17	$.12\times10^{-7}$	$.12\times10^{-7}$	$.12\times10^{-7}$	
18	$.32\times10^{-7}$	$.33\times10^{-7}$	$.33\times10^{-7}$	
19	$.1\times10^{-7}$	$.1\times10^{-7}$	$.1\times10^{-7}$	
20	$.2\times10^{-7}$	$.2\times10^{-7}$	$.19\times10^{-7}$	
TECH. [illegible]			ENGR.	

EQUIPMENT: Keithley Eletrometer I 52076
with shunt I 52075

COMMENTS:

Mods 16-20 tested 1-11-65
Temp 75°F

CIRCUIT TYPE: A-1

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Output Drive Current Capability and V_{SAT}

PRE RADIATION

Date: 11/9/64 3-16-65
Temp: 79°F 79°

1×10^{-3} Amperes

MOD	I_{DD}	I_{DO}	V_{SAT}	V_{SAT}
1	4.0	4.0	.119	.092
2	3.3	3.2	.083	.061
3	4.1	4.2	.121	.101
4	3.2	3.3	.086	.076
5	3.5	3.6	.079	.063
6	3.8	3.8	.080	.068
7	3.7	3.7	.100	.087
8		3.8		.055
9	4.5	4.5	.082	.069
10	2.8	2.9	.126	.115
11	4.0	4.0	.112	.102
12	3.8	3.9	.113	.087
13	3.6	3.7	.095	.074
14	3.6	3.7	.114	.091
15	3.8	3.8	.097	.074
16	3.8	3.8		.070
17	3.5	3.6		.067
18	3.5	3.6		.073
19	3.8	3.8		.070
20	3.5	3.5		.075

TECH. M.W. Elliott ENGR.

POST RADIATION

Date: 7-9-65
Temp: 75°

MOD	I_{DD}	I_{DO}	V_{SAT}	
1	4.0	4.0	.117	
2	3.3	3.4	.093	
3	4.1	4.1	.133	
4	3.2	3.3	.075	
5	3.5	3.6	.093	
6	3.7	3.8	.096	
7	3.7	3.7	.115	
8	—	3.8	.119	
9	4.4	4.5	.097	
10	2.8	2.8	.134	
11	4.0	4.0	.126	
12	3.8	3.8	.113	
13	3.6	3.7	.110	
14	3.6	3.7	.122	
15	3.8	3.8	.074	
16	3.7	3.8	.097	
17	3.5	3.5	.066	
18	3.5	3.6	.072	
19	3.7	3.8	.069	
20	3.4	3.4	.103	

TECH. M.W. Elliott ENGR.

EQUIPMENT: Digital V.M I 55991
Milliammeter I 14196
Decade resistor I 73730

COMMENTS:

Mods 16-20 tested 1-8-65
Temp 77°F

CIRCUIT TYPE: A-1

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Output Leakage Current

PRE RADIATION

Date: 11/11/64
Temp: 78°F

MOD	I_{Ld}	I_{Ls}		
1	$.29\times10^{-4}$	$.26\times10^{-7}$		
2	$.66\times10^{-4}$	$.13\times10^{-7}$		
3	$.22\times10^{-4}$	$.13\times10^{-7}$		
4	$.45\times10^{-4}$	$.13\times10^{-7}$		
5	$.11\times10^{-3}$	$.08\times10^{-7}$		
6	$.07\times10^{-3}$	$.07\times10^{-7}$		
7	$.25\times10^{-4}$	$.14\times10^{-7}$		
8 *	$.52\times10^{-4}$	$.14\times10^{-7}$		
9	$.4\times10^{-4}$	$.1\times10^{-7}$		
10	$.58\times10^{-4}$	$.12\times10^{-6}$		
11	$.47\times10^{-4}$	$.18\times10^{-7}$		
12	$.38\times10^{-4}$	$.08\times10^{-6}$		
13	$.66\times10^{-4}$	$.1\times10^{-7}$		
14	$.08\times10^{-3}$	$.11\times10^{-7}$		
15	$.32\times10^{-4}$	$.17\times10^{-6}$		
16	$.56\times10^{-4}$	$.75\times10^{-8}$		
17	$.6\times10^{-4}$	$.72\times10^{-8}$		
18	$.1\times10^{-3}$	$.23\times10^{-7}$		
19	$.47\times10^{-4}$	$.56\times10^{-8}$		
20	$.11\times10^{-4}$	$.11\times10^{-7}$		
TECH.			ENGR.	

POST RADIATION

Date: 7-12-65
Temp: 75°

MOD	I_{Ld}	I_{Ls}		
1	$.29\times10^{-4}$	$.22\times10^{-7}$		
2	$.6\times10^{-4}$	$.11\times10^{-7}$		
3	$.2\times10^{-4}$	$.11\times10^{-7}$		
4	$.37\times10^{-4}$	$.1\times10^{-7}$		
5	$.1\times10^{-3}$	$.76\times10^{-8}$		
6	$.61\times10^{-4}$	$.7\times10^{-8}$		
7	$.22\times10^{-4}$	$.12\times10^{-7}$		
8	$.45\times10^{-4}$	$.11\times10^{-7}$		
9	$.33\times10^{-4}$	$.1\times10^{-7}$		
10	$.46\times10^{-4}$	$.27\times10^{-5}$		
11	$.4\times10^{-4}$	$.08\times10^{-5}$		
12	$.3\times10^{-4}$	$.09\times10^{-6}$		
13	$.54\times10^{-4}$	$.1\times10^{-7}$		
14	$.62\times10^{-4}$	$.1\times10^{-7}$		
15	$.29\times10^{-4}$	$.14\times10^{-6}$		
16	$.57\times10^{-4}$	$.15\times10^{-7}$		
17	$.6\times10^{-4}$	$.63\times10^{-8}$		
18	$.09\times10^{-3}$	$.22\times10^{-7}$		
19	$.47\times10^{-4}$	$.54\times10^{-8}$		
20	$.41\times10^{-4}$	$.12\times10^{-7}$		
TECH.			ENGR.	

EQUIPMENT: Keithley Electrometer I 52076
with shunt I 57075
Dry cell used as collector supply

COMMENTS:

* Pin 1 missing

Vcc measured with voltmeter C-1277 1.5V scale
V_{bb} measured with Digital VM I 55591
Mods 16-20 Tested 1-11-65 Temp 76°F

CIRCUIT TYPE: A-1

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 11/7/64
Temp: 77°F

Pulse Generator τ_R 6, τ_F 2.5.
NANOseconds

MOD	τ_S	τ_D	τ_R	τ_F
1	8	8	6	25
2	13	8	6	30
3	11	8	6	24
4	11	8	6	30
5	17	8	6	28
6	13	8	6	30
7	9	8	6	27
8				
9	12	8	6	25
10	10	8	6	38
11	12	8	6	26
12	17	8	6	30
13	9	8	6	29
14	16	8	6	30
15	11	9	7	29
16	12	8	7	24
17	14	8	6	26
18	12	8	6	24
19	13	8	6	25
20	12	8	6	25

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-25-65
Temp: 77°F

Pulse Generator τ_R 6.5, τ_F 2.5.

MOD	τ_S	τ_D	τ_R	τ_F
1	6	8	7	23
2	7	8	7	30
3	6	8.5	7	24
4	11	8	6	30
5	7.5	8	6.5	29
6	6.5	8	7.5	29
7	6.5	8.5	7	28
8	—	—	—	—
9	6.5	8.5	7.5	27
10	7	8.5	6.5	38
11	6.5	8.5	7	26
12	6.5	8.5	7.5	29
13	7	8	7	30
14	7.5	8	6.5	31
15	11	8.5	7	28
16	6.5	8.5	8.5	29
17	14	7.5	6	31
18	11	8	6	27
19	12.5	7.5	6	30
20	6.5	8	6.5	30

TECH. [illegible] ENGR.

EQUIPMENT: Sampling oscilloscope
Digital VM I 55991
TI Pulse gen

COMMENTS:
Mods 16-20 tested 1-5-65
Temp 77°F

CIRCUIT TYPE: A-1

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Pull-Down Resistance

PRE RADIATION				
Date: 11/10/69				
Temp: 78°F				
MOD	R_D			
1	551.5			
2	656.5			
3	534.0			
4	671.8			
5	609.8			
6	579.5			
7	598.5			
8	585.5			
9	490.5			
10	766.5			
11	547.4			
12	569.4			
13	603.4			
14	600.8			
15	577.0			
16	586.0			
17	632.5			
18	622.7			
19	593.3			
20	639.1			
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 7-9-65				
Temp: 75°				
MOD	R_D			
1	552.9			
2	656.8			
3	538.2			
4	670.2			
5	615.2			
6	584.4			
7	603.0			
8	590.9			
9	493.0			
10	768.5			
11	552.3			
12	573.3			
13	606.3			
14	604.3			
15	575.6			
16	589.9			
17	630.9			
18	622.3			
19	591.5			
20	644.1			
TECH. [illegible]		ENGR.		

EQUIPMENT: Wheatstone Bridge I 25-471

COMMENTS:
Mods 16-20 Tested 1-4-65 Temp 76°F

CIRCUIT TYPE: A-1

TEST NUMBER: 9

DATA SHEET 1 of 2

TEST TITLE: Transistor Characteristics

PRE RADIATION

Date: 11/10/64
Temp:

1×10^{-3} Amperes

MOD	$I_{C(1)}$	$I_{C(2)}$	$I_{C(3)}$	
1	13.0	13.0	14.5	
2	21.0	20.5	21.5	
3	11.5	10.5	11.0	
4	17.0	16.5	15.0	
5	20.5	25.5	27.5	
6	17.5	22.0	18.0	
7	11.5	11.5	11.5	
8		22.0	21.0	
9	11.0	13.0	12.0	
10	17.5	17.0	16.5	
11	18.0	17.5	16.5	
12	12.0	12.0	10.5	
13	13.5	15.0	15.0	
14	15.5	17.0	16.5	
15	16.5	3.9 *	15.0	
16	16.4	14.4	16.0	
17	21.0	21.0	17.4	
18	19.4	20.0	21.5	
19	15.8	16.0	15.8	
20	17.2	18.4	16.4	
TECH. K. W. [signature]		ENGR. [signature]		

POST RADIATION

Date: 7-12-65
Temp: 75°

MOD	$I_{C(1)}$	$I_{C(2)}$	$I_{C(3)}$	
1	4.5			
2	8.3			
3	4.2			
4	17.0			
5	8.5			
6	7.5			
7	4.9			
8	—			
9	4.6			
10	7.7			
11	6.7			
12	4.4			
13	5.5			
14	6.3			
15	16.0			
16	6.9			
17	21.0			
18	19.0			
19	15.6			
20	6.8			
TECH. K. W. [signature]		ENGR.		

EQUIPMENT: Tektronix curve tracer I 55783

COMMENTS:

* Base current .4 ma.

Reading good to ±0.5 ma

Mods 16-20 Tested 1-4-65

Temp 76°F

CIRCUIT TYPE: A-1

TEST NUMBER: 9

DATA SHEET 2 of 2

TEST TITLE: Transistor Characteristics (Calculations)

PRE RADIATION				
Date: 11/10/64				
Temp:				
MOD	$H_{FE(1)}$	$H_{FE(2)}$	$H_{FE(3)}$	
1	65	65	72.5	
2	105	102.5	107.5	
3	57.5	52.5	55	
4	85	82.5	75	
5	102.5	127.5	137.5	
6	87.5	110	90	
7	57.5	57.5	57.5	
8		110	105	
9	55	65	60	
10	87.5	95	82.5	
11	90	87.5	82.5	
12	60	60	52.5	
13	67.5	75	75	
14	77.5	85	82.5	
15	82.5	9.7	75	
16	82.0	72	80	
17	105	105	87	
18	97	100	107.5	
19	79	80	79	
20	86	92	82	
TECH. K. W. Elliott		ENGR.		

POST RADIATION				
Date:				
Temp:				
MOD	$H_{FE(1)}$	$H_{FE(2)}$	$H_{FE(3)}$	
1	22.5			
2	41.5			
3	21.0			
4	85.0			
5	42.5			
6	37.5			
7	24.5			
8	—			
9	23.0			
10	38.5			
11	33.5			
12	22.0			
13	27.5			
14	31.5			
15	80.0			
16	34.5			
17	105.0			
18	95.0			
19	78.0			
20	34.0			
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: A-1

TEST NUMBER: 10

DATA SHEET

TEST TITLE: Isolation-Junction Forward Voltage

PRE RADIATION				
Date: 12/10/64				
Temp: 78°F				
MOD	Volts V_F			
1	.607			
2	.580			
3	.591			
4	.583			
5	.602			
6	.598			
7	.594			
8	.608			
9	.578			
10	.562			
11	.569			
12	.568			
13	.581			
14	.574			
15	.567			
16	.594			
17	.579			
18	.586			
19	.597			
20	.577			
TECH. M.W. Elliott		ENGR.		

POST RADIATION				
Date: 7-9-65				
Temp: 75°				
MOD	V_F			
1	.609			
2	.574			
3	.586			
4	.582			
5	.593			
6	.591			
7	.590			
8	.603			
9	.572			
10	.561			
11	.569			
12	.567			
13	.575			
14	.571			
15	.592			
16	.591			
17	.584			
18	.591			
19	.602			
20	.575			
TECH. M.W. Elliott		ENGR.		

EQUIPMENT: Digital VM I 55991
Millivoltmeter I 14196 Decade resistor I 73730

COMMENTS:
mod s 16-20 tested 1-8-65
Temp 77°F

CIRCUIT TYPE: A-1

TEST NUMBER: 11

DATA SHEET

TEST TITLE: Base Region Minority Carrier Lifetime (Calculations)

PRE RADIATION

Date:
Temp:

MOD	$\times 10^{-9}$ τ	$\frac{\Delta t}{\Delta V}$		
1	2.06	$\frac{10 \times 10^{-9}}{125 \times 10^{-3}}$		
2	1.41	$\frac{11 \times 10^{-9}}{200 \times 10^{-3}}$		
3	1.68	$\frac{18 \times 10^{-9}}{275 \times 10^{-3}}$		
4	1.24	$\frac{6 \times 10^{-9}}{125 \times 10^{-3}}$		
5	1.96	$\frac{.23 \times 10^{-9}}{300 \times 10^{-3}}$		
6	2.17	$\frac{19 \times 10^{-9}}{225 \times 10^{-3}}$		
7	1.93	$\frac{15 \times 10^{-9}}{200 \times 10^{-3}}$		
8	1.39	$\frac{15 \times 10^{-9}}{275 \times 10^{-3}}$		
9	1.86	$\frac{18 \times 10^{-9}}{250 \times 10^{-3}}$		
10	1.24	$\frac{12 \times 10^{-9}}{250 \times 10^{-3}}$		
11	1.60	$\frac{14 \times 10^{-9}}{225 \times 10^{-3}}$		
12	1.08	$\frac{18 \times 10^{-9}}{425 \times 10^{-3}}$		
13	1.62	$\frac{19 \times 10^{-9}}{300 \times 10^{-3}}$		
14	1.93	$\frac{15 \times 10^{-9}}{200 \times 10^{-3}}$		
15	1.37	$\frac{4 \times 10^{-9}}{75 \times 10^{-3}}$		
16	1.64	8/.125		
17	2.28	15/.168		
18	1.07	6.3/.150		
19	2.04	6/.075		
20	1.38	5.4/.100		
TECH.	[illegible]		ENGR.	

POST RADIATION

Date:
Temp:

MOD	τ	$\times 10^{-9}$ Δt	25×10^{-3} ΔV	
1	1.28	12.8	10	
2	1.37	13.7	10	
3	1.60	16.0	10	
4	1.51	15.1	10	
5	1.67	16.7	10	
6	1.32	13.2	10	
7	1.38	13.8	10	
8	—	—	—	
9	1.43	14.3	10	
10	1.38	13.8	10	
11	1.47	14.7	10	
12	0.99	9.9	10	
13	1.28	12.8	10	
14	1.43	14.3	10	
15	1.34	13.4	10	
16	1.49	14.9	10	
17	1.74	17.4	10	
18	1.00	10.0	10	
19	1.90	19.0	10	
20	1.40	14.0	10	
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: A-1

TEST NUMBER: 12

DATA SHEET

TEST TITLE: Isolation Diode Lifetime

PRE RADIATION				
Date:				
Temp:				
MOD	$\Delta T / \Delta V$	1×10^{-3} ΔV	γ (ns)	
1	5/.085	1.5 12.5	3.3	
2	4.5/.065	1.8 12.5	3.7	
3	4.5/.070	1.6 12.5	3.8	
4	5/.080	1.6 12.5	3.8	
5	5.5/.090	1.6 12.5	3.4	
6	6/.100	1.5 12.5	4.0	
7	4/.070	1.5 12.5	3.8	
8	4/.070	1.5 12.5	3.4	
9	4.5/.060	1.9 12.5	3.4	
10	5/.070	1.7 12.5	3.8	
11	6/.100	1.5 12.5	3.6	
12	8/.110	1.9 12.5	3.9	
13	4.5/.070	1.6 12.5	4.4	
14	4.5/.060	1.9 12.5	4.4	
15	8/.110	1.9 12.5	3.9	
16	4/.070	1.5 12.5	3.3	
17	3.5/.060	1.5 12.5	3.3	
18	4/.065	1.6 12.5	2.5	
19	4.5/.080	1.4 12.5	3.0	
20	3/.050	1.5 12.5	2.9	
TECH. J.M. Lindsey			ENGR.	

POST RADIATION				
Date:				
Temp:				
MOD		γ (ns)	10×10^{-3} ΔV	
1		2.4	12.5	
2		3.0	12.5	
3		2.7	12.5	
4		3.1	12.5	
5		3.1	12.5	
6		2.8	12.5	
7		2.7	12.5	
8		2.7	12.5	
9		2.9	12.5	
10		3.0	12.5	
11		2.7	12.5	
12		2.7	12.5	
13		2.9	12.5	
14		2.9	12.5	
15		3.0	12.5	
16		2.6	12.5	
17		3.1	12.5	
18		2.4	12.5	
19		2.8	12.5	
20		2.9	12.5	
TECH.			ENGR.	

EQUIPMENT:

COMMENTS: Preirradiation calculation improperly done. Repeated values correct. RS.

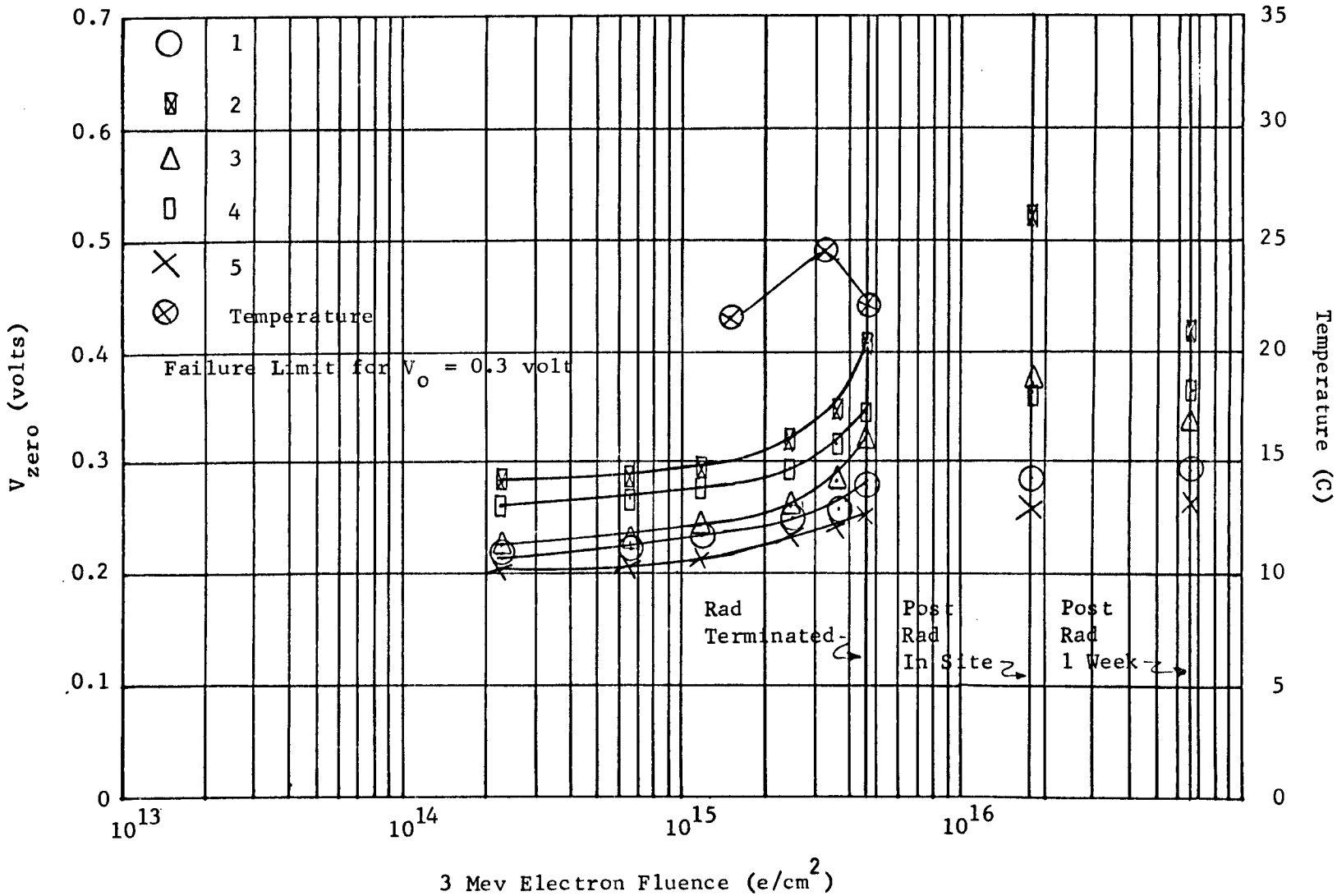
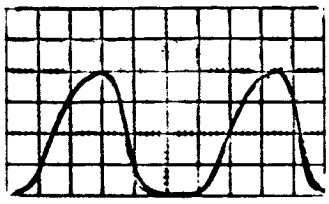
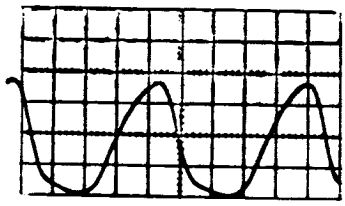


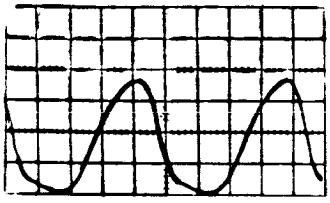
FIGURE III-1. RADIATION RESPONSE OF UNIT A-1



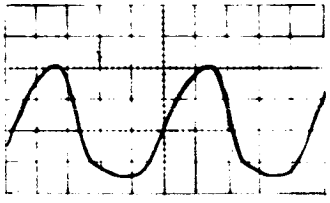
A - Initial



B - Final



C - Post Rad In Site



D - Post Rad 1 Week

Scale: 0.1 volt/cm
0.02 μsec/cm

FIGURE III-2. OUTPUT OF 5-STAGE OSCILLATOR OF A-1 CIRCUITS

CIRCUIT TYPE: A-2

TEST NUMBER: 1

DATA SHEET

TEST TITLE: Input Voltage Levels ($V_{min\ one}$)

PRE RADIATION

Date: Dec 31, 64
Temp: 77

MOD	$V_{one(1)}$	$V_{one(2)}$	$V_{one(3)}$	$V_{one(5)}$
1	.697	.700	.702	.697
2	.653	.660	.659	.659
3	.672	.673	.671	.672
4	.659	.664	.665	.665
5	.681	.680	.681	.685
6	.696	.703	.700	.702
7	.712	.698	.712	.700
8	.677	.674	.677	.677
9	.711	.711	.710	.706
10	.669	.667	.671	.665
11	.700	.699	.699	.699
12	.691	.697	.699	.689
13	.680	.683	.682	.683
14	.715	.717	.713	.716
15	.707	.706	.707	.704
16	.690	.695	.687	.684
17	.692	.691	.694	.694
18	.689	.689	.691	.693
19	.695	.697	.689	.691
20	.681	.669	.682	.681

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date: 4-22-65
Temp: 76°F

MOD	$V_{one(1)}$	$V_{one(2)}$	$V_{one(3)}$	$V_{one(5)}$
1	.757	.757	.764	.753
2	.647	.683	.685	.683
3	.713	.709	.713	.710
4	.657	.656	.657	.659
5	.717	.709	.719	.719
6	.751	.750	.752	.753
7	.770	.752	.772	.750
8	.715	.711	.717	.719
9	.769	.771	.773	.765
10	.712	.709	.717	.705
11	.699	.699	.702	.701
12	.745	.754	.759	.741
13	*	*	*	*
14	.788	.791	.7[illegible]	.791
15	.705	.704	.709	.706
16	.755	.761	.755	.746
17	.761	.755	.764	.756
18	.688	.685	.684	.692
19	.689	.691	.686	.687
20	.735	.714	.741	.742

TECH. [illegible] ENGR.

EQUIPMENT: DVM 1-55991

COMMENTS:

Mods 1-5 Tested
1-11-65 Temp 77° [illegible]

* Mod #13 Not Tested due to open ground as indicated by Test 7 and Test 8

\# No respone on Mod 14 using pin 3 as input

Note. After completion of Test using pin pin #5 Mod 14 ohmeter checks revealed that pin 3 was not open and that difficulty with pin 3 was in pin contact with the holders. Further handling destroyed contacts.

CIRCUIT TYPE: A-2

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Input Voltage Levels ($V_{max\ zero}$)

PRE RADIATION

Date: Dec 31, 1964
Temp: 78
R_L = 5.76 K

MOD	$V_{zero(1)}$	$V_{zero(2)}$	$V_{zero(3)}$	$V_{zero(5)}$
1	.677	.677	.679	.677
2	.632	.639	.639	.639
3	.653	.652	.652	.653
4	.643	.644	.645	.644
5	.662	.660	.661	.665
6	.675	.676	.674	.677
7	.683	.673	.685	.676
8	.655	.654	.657	.659
9	.683	.684	.684	.682
10	.641	.642	.644	.638
11	.674	.675	.675	.675
12	.668	.673	.675	.668
13	.660	.663	.663	.663
14	.691	.694	.691	.693
15	.685	.684	.685	.683
16	.667	.672	.666	.665
17	.671	.667	.670	.672
18	.668	.669	.669	.670
19	.673	.674	.669	.670
20	.659	.649	.662	.665

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date: 4-23-65
Temp: 77°F
R_L = 5.76 K

MOD	$V_{zero(1)}$	$V_{zero(2)}$	$V_{zero(3)}$	$V_{zero(5)}$
1	.717	.716	.719	.716
2	.642	.651	.649	.650
3	.679	.677	.675	.676
4	.640	.639	.639	.639
5	.685	.683	.684	.686
6	.714	.712	.711	.712
7	.726	.810	.726	.703
8	.689	.674	.685	.685
9	.726	.727	.725	.720
10	.673	.671	.674	.664
11	.675	.676	.675	.676
12	.707	.714	.714	.703
13				
14				
15	.685	.686	.686	.684
16	.715	.720	.714	.707
17	.719	.713	.717	.713
18	.664	.664	.664	.670
19	.669	.670	.667	.669
20	.692	.680	.710	.702

TECH. [illegible] ENGR.

EQUIPMENT: DVM I-55991

Mods 13 and 14 inoperative

COMMENTS: mods 1-5 tested
1-11-65 temp 77°

CIRCUIT TYPE: A-2

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Input Voltage Levels ($V_{max\ zero}$)

PRE RADIATION

Date: Dec 31, 1964
Temp: 78 R_L = 1.44 K

MOD	$V_{zero(1)}$	$V_{zero(2)}$	$V_{zero(3)}$	$V_{zero(5)}$
1	.637	.638	.639	.638
2	.586	.593	.593	.593
3	.613	.613	.612	.613
4	.603	.604	.606	.604
5	.627	.625	.627	.629
6	.639	.639	.636	.637
7	.642	.636	.643	.636
8	.624	.632	.624	.625
9	.637	.639	.638	.635
10	.604	.604	.603	.600
11	.629	.629	.628	.629
12	.632	.636	.636	.631
13	.631	.632	.632	.631
14	.656	.659	.653	.657
15	.646	.646	.646	.644
16	.632	.636	.630	.629
17	.632	.629	.630	.632
18	.628	.630	.629	.630
19	.635	.635	.631	.634
20	.625	.615	.624	.627

TECH. Erlenbach ENGR.

POST RADIATION

Date: 4-27-65
Temp: 77°F R_L = 1.44 K

MOD	$V_{zero(1)}$	$V_{zero(2)}$	$V_{zero(3)}$	$V_{zero(5)}$
1	.652	.654	.656	.654
2	.586	.595	.595	.596
3	.620	.620	.620	.622
4	.602	.599	.602	.600
5	.635	.633	.635	.636
6	.656	.655	.654	.656
7	.659	.650	.659	.651
8	.635	.632	.636	.636
9	.649	.652	.651	.649
10	.619	.616	.617	.611
11	.629	.629	.629	.629
12	.649	.653	.653	.646
13				
14				
15	.646	.646	.646	.646
16	.652	.655	.650	.649
17	.652	.649	.650	.651
18	.623	.629	.630	.629
19	.630	.636	.629	.631
20	.641	.627	.642	.642

TECH. [illegible] ENGR.

Mods. 13 + 14 inoperative

EQUIPMENT: DVM I-55991

COMMENTS:
Mods 1-5 Tested
1-11-65 Temp 77°F

CIRCUIT TYPE: A-2

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Input Drive Current Requirement

PRE RADIATION

Date: January 4, 1965
Temp: 76

MOD	$I_{D(1)}$	$I_{D(2)}$	$I_{D(3)}$	$I_{D(5)}$
1	$.14 \cdot 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.15 \times 10^{-3}$
2	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
3	$.14 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
4	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.15 \times 10^{-3}$
5	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$
6	$.16 \cdot 10^{-3}$	$.16 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$
7	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$
8	$.14 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.14 \cdot 10^{-3}$	$.14 \cdot 10^{-3}$
9	$.14 \cdot 10^{-3}$	$.14 \cdot 10^{-3}$	$.14 \cdot 10^{-3}$	$.14 \cdot 10^{-3}$
10	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$
11	$.14 \cdot 10^{-3}$	$.14 \cdot 10^{-3}$	$.13 \cdot 10^{-3}$	$.14 \cdot 10^{-3}$
12	$.16 \cdot 10^{-3}$	$.16 \cdot 10^{-3}$	$.16 \cdot 10^{-3}$	$.16 \cdot 10^{-3}$
13	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$
14	$.15 \cdot 10^{-3}$	$.16 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$
15	$.14 \cdot 10^{-3}$	$.14 \cdot 10^{-3}$	$.13 \cdot 10^{-3}$	$.13 \cdot 10^{-3}$
16	$.15 \cdot 10^{-3}$	$.16 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$
17	$.15 \cdot 10^{-3}$	$.16 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$
18	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$
19	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$
20	$.16 \cdot 10^{-3}$	$.16 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$	$.15 \cdot 10^{-3}$
TECH. Erlenbach			ENGR. [illegible]	

POST RADIATION

Date: 5-5-65
Temp: 77

MOD	$I_{D(1)}$	$I_{D(2)}$	$I_{D(3)}$	$I_{D(5)}$
1	$.14 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
2	$.14 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
3	$.14 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
4	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$
5	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
6	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$
7	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
8	$.13 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
9	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$	$.13 \times 10^{-3}$
10	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$
11	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
12	$.16 \times 10^{-3}$	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$
13	—	—	—	—
14	—	—	—	—
15	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$	$.13 \times 10^{-3}$	$.13 \times 10^{-3}$
16	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
17	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
18	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$
19	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.14 \times 10^{-3}$
20	$.15 \times 10^{-3}$	$.15 \times 10^{-3}$	$.14 \times 10^{-3}$	$.15 \times 10^{-3}$
TECH. M. W. Elliott			ENGR.	

EQUIPMENT: Electrometer I-52076
Shunt I-52075

DVM I 55991

Test set up as shown on instruction sheet

COMMENTS:

mods 1-5 Tested 1-12-65
Temp 76°

CIRCUIT TYPE: A-2

TEST NUMBER: 4

DATA SHEET

TEST TITLE: Output Current Capability and V_{sat}

PRE RADIATION

Date: Jan 5 1965
Temp: 78

MOD	I_{DD}	I_{DO}	V_{sat}	
1	.81 ma	.81 ma	.051	
2	.71	.72	.031	
3	.76	.76	.037	
4	.75	.76	.036	
5	.82	.82	.043	
6	.84	.85	.050	
7	.80	.80	.052	
8	.82	.82	.039	
9	.76	.76	.067	
10	.78	.79	.021	
11	.74	.74	.064	
12	.81	.81	.045	
13	.84	.84	.039	
14	.87	.87	.063	
15	.79	.79	.055	
16	.82	.82	.053	
17	.80	.80	.053	
18	.80	.80	.054	
19	.81	.81	.055	
20	.81	.81	.049	
TECH. Erlenbach			ENGR. [illegible]	

POST RADIATION

Date: 4-24-65
Temp: 77°F

MOD	I_{DD}	I_{DO}	V_{sat}	
1	.81	.81	.076	
2	.72	.73	.050	
3	.76	.76	.059	
4	.75	.76	.036	
5	.82	.82	.065	
6	.85	.84	.070	
7	.80	.80	.073	
8	.82	.82	.065	
9	.75	.75	.053	
10	.79	.79	.041	
11	.75	.75	.064	
12	.81	.81	.069	
13				
14				
15	.79	.79	.055	
16	.81	.81	.075	
17	.80	.80	.075	
18	.79	.80	.054	
19	.80	.80	.055	
20	.80	.81	.069	
TECH. [illegible]			ENGR.	

EQUIPMENT: DVM I 55991
Microammeter C-3124
Decade Resistor I-73730

COMMENTS:
Mods 1-5 tested 1-12-65
Temp 77°

CIRCUIT TYPE: A-2

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Output Leakage Currents

PRE RADIATION

Date: 1-12-65

Temp: 77°

MOD	I_{L1}	I_{L2}	I_{L3}	I_{L5}
1	$.08\times10^{-8}$	$.21\times10^{-8}$	$.1\times10^{-8}$	$.66\times10^{-9}$
2	$.09\times10^{-8}$	$.07\times10^{-7}$	$.7\times10^{-9}$	$.12\times10^{-8}$
3	$.52\times10^{-8}$	$.1\times10^{-7}$	$.8\times10^{-8}$	$.1\times10^{-7}$
4	$.47\times10^{-8}$	[illegible]	$.8\times10^{-9}$	$.09\times10^{-8}$
5	$.8\times10^{-9}$	$.1\times10^{-8}$	$.76\times10^{-9}$	$.1\times10^{-8}$
6	$.1\times10^{-7}$	$.32\times10^{-7}$	$.24\times10^{-7}$	$.23\times10^{-7}$
7	$.7\times10^{-9}$	$.11\times10^{-8}$	$.8\times10^{-9}$	$.1\times10^{-8}$
8	$.08\times10^{-8}$	$.1\times10^{-8}$	$.74\times10^{-9}$	$.1\times10^{-8}$
9	$.11\times10^{-6}$	$.1\times10^{-5}$	$.1\times10^{-6}$	$.15\times10^{-6}$
10	$.23\times10^{-8}$	$.24\times10^{-8}$	$.09\times10^{-8}$	$.28\times10^{-8}$
11	$.26\times10^{-7}$	$.49\times10^{-7}$	$.43\times10^{-7}$	$.16\times10^{-6}$
12	$.1\times10^{-8}$	$.21\times10^{-7}$	$.28\times10^{-8}$	$.15\times10^{-6}$
13	$.09\times10^{-8}$	$.09\times10^{-8}$	$.08\times10^{-8}$	$.8\times10^{-9}$
14	$.32\times10^{-8}$	$.21\times10^{-7}$	$.29\times10^{-8}$	$.8\times10^{-7}$
15	$.09\times10^{-8}$	$.1\times10^{-8}$	$.11\times10^{-8}$	$.1\times10^{-8}$
16	$.14\times10^{-8}$	$.1\times10^{-8}$	$.13\times10^{-8}$	$.32\times10^{-8}$
17	$.31\times10^{-8}$	$.32\times10^{-8}$	$.2\times10^{-8}$	$.18\times10^{-8}$
18	$.13\times10^{-8}$	$.28\times10^{-8}$	$.17\times10^{-8}$	$.11\times10^{-8}$
19	$.16\times10^{-8}$	$.15\times10^{-7}$	$.14\times10^{-8}$	$.14\times10^{-8}$
20	$.12\times10^{-8}$	$.11\times10^{-8}$	$.11\times10^{-8}$	$.14\times10^{-8}$

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 4-24-65

Temp: 74°F

MOD	I_{L2}	I_{L2}	I_{L3}	I_{L5}
1	$.12\times10^{-8}$	$.27\times10^{-8}$	$.15\times10^{-8}$	$.11\times10^{-8}$
2	$.1\times10^{-8}$	$.09\times10^{-8}$	$.78\times10^{-9}$	$.15\times10^{-8}$
3	$.1\times10^{-8}$	$.11\times10^{-8}$	$.66\times10^{-9}$	$.72\times10^{-9}$
4	$.36\times10^{-8}$	$.1\times10^{-8}$	$.09\times10^{-8}$	$.09\times10^{-8}$
5	$.76\times10^{-9}$	$.11\times10^{-8}$	$.71\times10^{-9}$	$.09\times10^{-8}$
6	$.1\times10^{-7}$	$.29\times10^{-7}$	$.22\times10^{-7}$	$.2\times10^{-7}$
7	$.11\times10^{-8}$	$.18\times10^{-8}$	$.12\times10^{-8}$	$.14\times10^{-8}$
8	$.67\times10^{-9}$	$.61\times10^{-9}$	$.62\times10^{-9}$	$.6\times10^{-9}$
9	$.18\times10^{-8}$	$.16\times10^{-8}$	$.14\times10^{-8}$	$.23\times10^{-8}$
10	$.34\times10^{-8}$	$.32\times10^{-8}$	$.17\times10^{-8}$	$.36\times10^{-8}$
11	$.22\times10^{-7}$	$.43\times10^{-7}$	$.42\times10^{-7}$	$.94\times10^{-6}$
12	$.14\times10^{-8}$	$.22\times10^{-7}$	$.29\times10^{-8}$	$.25\times10^{-8}$
13				
14				
15	$.67\times10^{-8}$	$.73\times10^{-9}$	$.09\times10^{-8}$	$.08\times10^{-8}$
16	$.17\times10^{-8}$	$.19\times10^{-8}$	$.16\times10^{-8}$	$.32\times10^{-8}$
17	$.56\times10^{-8}$	$.28\times10^{-8}$	$.32\times10^{-8}$	$.28\times10^{-8}$
18	$.12\times10^{-8}$	$.32\times10^{-8}$	$.13\times10^{-8}$	$.1\times10^{-8}$
19	$.13\times10^{-8}$	$.11\times10^{-7}$	$.1\times10^{-8}$	$.13\times10^{-8}$
20	$.15\times10^{-8}$	$.16\times10^{-8}$	$.11\times10^{-8}$	$.17\times10^{-8}$

TECH. [illegible] ENGR.

EQUIPMENT: DVM I 5998
Electrometer I 52076
with shunt I 52075

COMMENTS:

CIRCUIT TYPE: A-2

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 1-19-65
Temp: 96°

$T_{r\,in}$ 5.5 $T_{F\,in}$ 4
1×10^{-9} secs.

MOD	t_s	T_0	T_r	T_F
1	17	10.5	6.5	100
2	17	9.5	6	100
3	17	10	5.5	95
4	18	9	5.5	95
5	16	9.5	5.5	90
6	18	10.5	7.5	105
7	18	10.5	6	95
8	21	10	5.5	90
9	13	10	6	90
10	22	9.5	7.5	100
11	14	9.5	5.5	95
12	16	10	6	95
13	19	9.5	5.5	90
14	14	10.5	6	90
15	16	10.5	5.5	100
16	15	9.5	5.5	90
17	16	9.5	6	85
18	15	9.5	6	90
19	15	9.5	6	90
20	19	10	6	95

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 4-24-65
Temp: 74°

$T_{r\,in}$ 6 $T_{F\,in}$ 3.5
1×10^{-9} secs.

MOD	t_s	T_d	T_r	T_F
1	12	10.5	7.5	95
2	15	9.5	6.5	100
3	14	10	6.5	100
4	17	9.5	5.5	100
5	13	9.5	6.5	95
6	13	10	7.5	100
7	12	10.5	7.5	100
8	13	10	6.5	95
9	12	10	7.5	100
10	14	10.5	9.0	105
11	13	9.5	5.5	100
12	12	10	7	100
13				
14				
15	16	10.5	5.5	100
16	12	9.5	7	92.5
17	12	9.5	6.5	90
18	15	10	5.5	95
19	15	9.5	5.5	92
20	12	9.5	6.5	97

TECH. [illegible] ENGR.

EQUIPMENT: TI pulser
sampling oscilloscope

COMMENTS:

CIRCUIT TYPE: A-2

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Pull-Down Resistance

PRE RADIATION				
Date: Dec 30, 1964				
Temp: 80				
MOD	R_D			
1	3.675K			
2	3.987			
3	3.872			
4	3.868			
5	3.646			
6	3.914 K			
7	3.714 K			
8	3.441			
9	3.457			
10	[illegible]			
11	4.034			
12	[illegible]			
13	[illegible]			
14	[illegible]			
15	[illegible]			
16	[illegible]			
17	[illegible]			
18	3.479			
19	3.717			
20	3.671			
TECH. Erlenbach		ENGR. [illegible]		

POST RADIATION				
Date: 4-22-65				
Temp: 76°F				
Reading in K Lohms				
MOD	R_D			
1	3.723			
2	4.022			
3	3.925			
4	3.583			
5	3.681			
6	3.582			
7	3.761			
8	3.474			
9	4.027			
10	3.537			
11	4.043			
12	3.722			
13	3.587			
14	3.524			
15	3.860			
16	3.735			
17	3.595			
18	3.489			
19	3.727			
20	3.721			
TECH. M. W. Elliott		ENGR.		

EQUIPMENT: Wheatstone Bridge E 25471

COMMENTS: Mods 1-5 Tested 1-11-65
Temp 77°

CIRCUIT TYPE: A-2

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Isolation-Junction Forward Voltage

PRE RADIATION

Date: Jan 5, 1965
Temp: 78

MOD	V_F			
1	.459			
2	.451			
3	.460			
4	.449			
5	.453			
6	.418			
7	.454			
8	.460			
9	.444			
10	.459			
11	.440			
12	.452			
13	.454			
14	.447			
15	.454			
16	.454			
17	.446			
18	.449			
19	.453			
20	.449			
TECH.		ENGR.		

POST RADIATION

Date: 4-22-65
Temp: 76°F

MOD	V_F			
1	.451			
2	.444			
3	.452			
4	.440			
5	.445			
6	.441			
7	.447			
8	.446			
9	.442			
10	.454			
11	.441			
12	.449			
13	*			
14	.445			
15	.459			
16	.450			
17	.444			
18	.442			
19	.443			
20	.446			
TECH. K.W. Elliott		ENGR.		

Mod #13 indicated an open

EQUIPMENT: Decade Resistor I-73730
Microammeter C-3124

COMMENTS:

Mods 1-5 Tested 1-11-65
Temp 77°

CIRCUIT TYPE: A-2

TEST NUMBER: 9

DATA SHEET

TEST TITLE: Base Region Minority Carrier Lifetime (Calculations)

PRE RADIATION				
Date:				
Temp:				
MOD	τ	ΔT/ΔV		
1	10.73	13.7/.033	11.	
2	9.98	11.2/.029	10.	
3	16.12	22.5/.036	16.	
4	9.80	17.5/.046	10.	
5	18.70	22.5/.031	19.	
6	13.18	11.25/.022	13.	
7	10.68	13.2/.032	10	
8	10.86	13.5/.034	11	
9	17.05	22.5/.034	17	
10	10.44	15/.037	10	
11	9.28	18.7/.052	9.3	
12	10.57	16/.039	11	
13	10.73	16.2/.039	11	
14	11.32	16.2/.037	11	
15	11.32	23.7/.054	11	
16	8.59	15/.045	8.6	
17	9.44	11/.030	9.4	
18	9.57	12.2/.033	9.6	
19	9.21	17.5/.049	9.2	
20	10.06	18.7/.048	10	
TECH. J. M. Lindsay			ENGR.	

POST RADIATION				
Date:				
Temp:				
MOD	τ	ΔT/ΔV		
1	8.7	26.25/.078		
2	8.1	10.75/.034		
3	8.0	7.50/.024		
4	8.8	11.25/.033		
5	8.5	14.50/.044		
6	6.5	16.25/.064		
7	8.7	16.25/.048		
8	8.7	17.50/.052		
9	8.2	15.00/.047		
10	8.2	13.75/.043		
11	9.0	15.00/.043		
12	8.8	13.75/.040		
13	—	—		
14	—	—		
15	9.3	9.00/.025		
16	7.3	21.25/.075		
17	8.6	20.00/.060		
18	9.9	10.00/.026		
19	8.1	11.00/.035		
20	8.4	9.75/.030		
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: A-2

TEST NUMBER: 10

DATA SHEET

TEST TITLE: Isolation-Diode Lifetime (Calculations)

PRE RADIATION

Date:
Temp:

MOD	τ (ns)	ΔT/ΔV		
1	23.4	138/.150		
2	20.6	150/.188		
3	19.2	113/.150		
4	18.0	88/.125		
5	17.0	100/.150		
6	24.0	163/.175		
7	23.6	150/.163		
8	23.4	138/.150		
9	21.3	125/.150		
10	51.4	250/.125		
11	25.7	125/.125		
12	21.3	125/.150		
13	21.3	125/.150		
14	19.3	75/.100		
15	23.1	125/.138		
16	21.0	113/.138		
17	22.1	150/.175		
18	33.4	163/.125		
19	24.4	275/.288		
20	22.6	175/.200		
TECH. J. M. Lindsey			ENGR.	

POST RADIATION

Date:
Temp:

MOD	ΔT/ΔV	$\tau \times 10^{-9}$		
1	38/.043	22		
2	63/.060	26		
3	100/.112	22		
4	150/.163	23		
5	125/.138	23		
6	125/.125	25		
7	350/.345	25		
8	75/.075	25		
9	113/.125	22		
10	38/.038	25		
11	100/.113	22		
12	138/.150	23		
13	—	—		
14	—	—		
15	150/.175	21		
16	125/.138	23		
17	113/.125	22		
18	275/.300	23		
19	163/.188	22		
20	88/.088	25		
TECH. M. Gremillion			ENGR.	

EQUIPMENT:

COMMENTS:

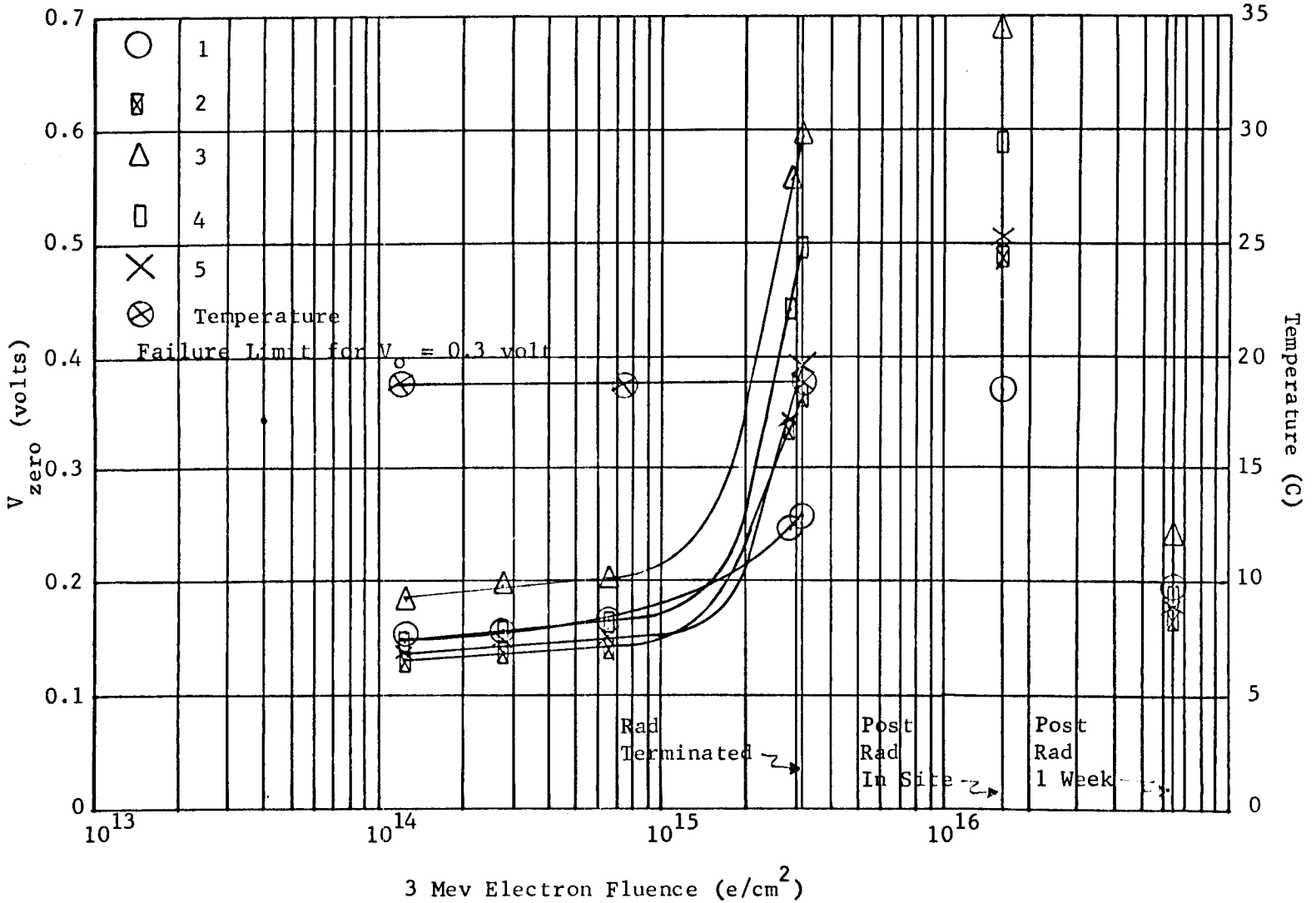
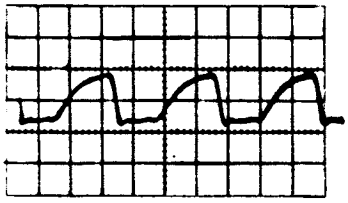
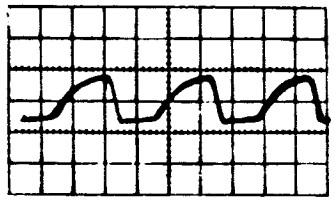


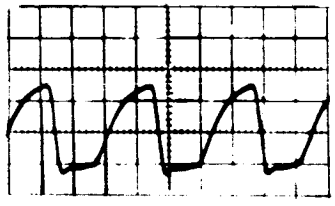
FIGURE III-3. RADIATION RESPONSE OF UNIT A-2



A - Initial



B - Final



D - Post Rad 1 Week*

Scale: 0.2 volt/cm
0.1 μsec/cm

FIGURE III-4. OUTPUT OF 5-STAGE OSCILLATOR OF A-2 CIRCUITS

* Vertical scale 0.1 volt/cm.

CIRCUIT TYPE: A-3

TEST NUMBER: 1

DATA SHEET

TEST TITLE: Preset Input Voltage Levels

PRE RADIATION

Date: 3-12-65
Temp: 78°

MOD	V_{zero}	V_{one}	$V_{zero\,L}$	
1	.685	.720	.648	
2	.666	.694	.626	
3	.699	.732	.656	
4	.691	.723	.654	
5	.699	.737	.656	
6	.671	.700	.631	
7	.701	.734	.665	
8	.657	.690	.624	
9	.726	.769	.639	
10	.629	.673	.581	
11	.682	.710	.643	
12	.689	.719	.659	
13	.707	.744	.665	
14	.676	.705	.634	
15	.677	.705	.633	
16	.667	.697	.622	
17	.682	.712	.646	
18	—	—	—	
19	.677	.711	.646	
20	.683	.719	.636	
TECH. Erlenbach			ENGR. [illegible]	

POST RADIATION

Date: 7-13-65
Temp: 75°

MOD	V_{zero}	V_{one}	$V_{zero\,L}$	
1	—	—	—	
2	.709	.774	.649	
3	.763	.841	.673	
4	.689	.723	.660	
5	.757	.839	.684	
6	.713	.785	.644	
7	.776	.869	.704	
8	.763	.779	.639	
9	.773	.869	.645	
10	.653	.742	.563	
11	.683	.716	.643	
12	.746	.821	.689	
13	.776	.863	.689	
14	.733	.811	.660	
15	.680	.709	.635	
16	.716	.785	.654	
17	.745	.819	.671	
18	—	—	—	
19	.689	.721	.657	
20	.739	.812	.659	
TECH. [illegible]			ENGR.	

21 .707 .742 .653

EQUIPMENT: DVM- I-55991
Decade Resistor I-73736
40v. Harrison Power Supply.

#1 inop.

COMMENTS:

21 - V_{zero} .699 V_{one} .734. $V_{zero\,L}$ .643

CIRCUIT TYPE: A-3

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Preset Input Driving Current

PRE RADIATION				
Date: 1-19-65 3-12-65				
Temp: 76° 75°				
Data in milliamperes				
MOD	I_x			
1	.30			
2	.31			
3	.28			
4	.30			
5	.28			
6	.29			
7	.28			
8	.31			
9	.25			
10	.32			
11	.30			
12	.31			
13	.28			
14	.30			
15	.30			
16	.28			
17	.29			
18	.27			
19	.30			
20	.26			
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 7-13-65				
Temp: 75°				
MOD	I_x			
1	.31			
2	.26			
3	.22			
4	.30			
5	.24			
6	.24			
7	.25			
8	.27			
9	.22			
10	.28			
11	.29			
12	.27			
13	.24			
14	.26			
15	.30			
16	.26			
17	.89			
18	—			
19	.30			
20	.24			
TECH. [illegible]		ENGR.		

EQUIPMENT: Digital VM I 55991 21 .24
Milliameter 0-1279

COMMENTS:
#21. 0.25

CIRCUIT TYPE: A-3

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Preset Leakage Current

PRE RADIATION			
Date:	11/5/64	1-19-65	3-12-65
Temp:	75°F	76°F	75°
MOD	I_L		
1	$.52 \times 10^{-8}$		
2	$.15 \times 10^{-7}$		
3	$.11 \times 10^{-7}$		
4	$.41 \times 10^{-8}$		
5	$.73 \times 10^{-8}$		
6	$.09 \times 10^{-7}$		
7	$.16 \times 10^{-7}$		
8	$.09 \times 10^{-7}$		
9	$.25 \times 10^{-6}$		
10	$.16 \times 10^{-7}$		
11	$.16 \times 10^{-7}$		
12	$.66 \times 10^{-8}$		
13	$.12 \times 10^{-8}$		
14	$.8 \times 10^{-8}$		
15	$.63 \times 10^{-7}$		
16	$.34 \times 10^{-7}$		
17	$.21 \times 10^{-3}$		
18	$.11 \times 10^{-6}$		
19	[illegible] $\times 10^{-7}$		
20	[illegible] $\times 10^{-7}$		
TECH. [illegible]		ENGR. RBT	

POST RADIATION			
Date:	7-12-65		
Temp:	75°		
MOD	I_L		
1	$.67 \times 10^{-8}$		
2	$.39 \times 10^{-7}$		
3	$.12 \times 10^{-7}$		
4	$.58 \times 10^{-8}$		
5	$.5 \times 10^{-8}$		
6	$.09 \times 10^{-7}$		
7	$.14 \times 10^{-7}$		
8	$.1 \times 10^{-7}$		
9	$.25 \times 10^{-6}$		
10	$.3 \times 10^{-7}$		
11	$.2 \times 10^{-7}$		
12	$.52 \times 10^{-8}$		
13	$.13 \times 10^{-8}$		
14	$.18 \times 10^{-8}$		
15	$.15 \times 10^{-7}$		
16	$.14 \times 10^{-7}$		
17	$.65 \times 10^{-3}$		
18	—		
19	$.15 \times 10^{-7}$		
20	$.16 \times 10^{-7}$		
TECH. [illegible]		ENGR.	

21 $.09 \times 10^{-6}$

EQUIPMENT: Digital VM I 55991
Electrometer I-52076 with
Decade Shunt I 52075

COMMENTS:

#21 0.42×10^{-7}

CIRCUIT TYPE: A-3

TEST NUMBER: 4

DATA SHEET

TEST TITLE: Clocked Set-Reset Input Threshold

PRE RADIATION				
Date: 10-2-64				
Temp: 78°F				
	No Load Data in volts		R = 640 Ω	
MOD	V_x	V_y	V_x	V_y
1	.653	.682	.653	.657
2	.627	.663	.621	.640
3	.672	.711	.665	.711
4	.653	.675	.654	.691
5	.654	.676	.655	.661
6	.629	.668	.622	.641
7	.651	.705	.653	.666
8	.595	.654	.590	.630
9	.657	.704	.643	.675
10	.578	.630	.545	.597
11	.661	.671	.650	.644
12	.669	.684	.647	.661
13	.651	.694	.653	.675
14	.637	.686	.633	.647
15	.641	.664	.633	.680
16	.624	.621	.627	.625
17	.650	.645	.670	.651
18	.650	.645		
19	.645	.633	.649	.639
20	[illegible]	.621	.648	.622
TECH. [illegible]			ENGR. [illegible]	
#21	.601	.614	.601	.617

POST RADIATION *				
Date:				
Temp:				
MOD				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TECH.			ENGR.	

EQUIPMENT: V_x, V_y Digital VM I-55991
V_s V_z Heathkit VOM 5V scale
Variable Voltage supplied by Heathkit Mod IP20
COMMENTS: shunted by 100 Ω

.1 MFd Capacitor connected from pin 1 or pin 3 to gnd whenever the voltage at that pin was being varied.

* Test Discontinued In Post Radiation Characterization Because of Measurement Uncertainty. [illegible]

CIRCUIT TYPE: A-3

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Clocked Set-Reset Input Driving Current

PRE RADIATION				
Date: 1-19-64 3-12-65				
Temp: 76 (2) 75°				
Data in Milliampere				
MOD	I_1	I_2		
1	.43	.33		
2	.36	.34		
3	.30	.30		
4	.36	.37		
5	.33	.34		
6	.35	.34		
7	.35	.34		
8	.39	.38		
9	.37	.28		
10	.44	.36		
11	.36	.36		
12	.37	.37		
13	.33	.31		
14	.34	.35		
15	.35	.36		
16	.35	.33		
17	.33	.33		
18	.31	.31		
19	.35	.35		
20	.32	.33		
TECH. [illegible]		ENGR. [illegible]		
#21	.25	.29		

POST RADIATION				
Date: 7-13-65				
Temp: 75°				
MOD	I_1	I_2		
1	.45	.32		
2	.30	.31		
3	.26	.26		
4	.33	.34		
5	.27	.29		
6	.27	.29		
7	.29	.29		
8	.31	.32		
9	.23	.24		
10	.32	.33		
11	.32	.33		
12	.30	.31		
13	.27	.27		
14	.27	.30		
15	.31	.33		
16	.27	.29		
17	.28	.30		
18	—	—		
19	.34	.34		
20	.28	.30		
TECH. [illegible]		ENGR.		
#21	.26	.27		

EQUIPMENT: Digital VM I-55991
Milliameter I-14197 (1.5 ma scale)

COMMENTS:

CIRCUIT TYPE: A-3

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Clocked Set-Reset and Clock Input Leakage Current

PRE RADIATION

Date: 3-18-65
Temp: 79°

MOD	I_1	I_2	I_3	
1	$.19 \times 10^{-10}$	$.20 \times 10^{-10}$	$.21 \times 10^{-10}$	
2	$.12 \times 10^{-6}$	$.44 \times 10^{-7}$	$.21 \times 10^{-5}$	
3	$.17 \times 10^{-4}$	$.80 \times 10^{-7}$	$.36 \times 10^{-7}$	
4	$.67 \times 10^{-7}$	$.09 \times 10^{-6}$	$.57 \times 10^{-7}$	
5	$.11 \times 10^{-6}$	$.18 \times 10^{-6}$	$.33 \times 10^{-7}$	
6	$.63 \times 10^{-7}$	$.25 \times 10^{-7}$	$.65 \times 10^{-7}$	
7	$.19 \times 10^{-6}$	$.18 \times 10^{-6}$	$.16 \times 10^{-6}$	
8	$.14 \times 10^{-6}$	1.45×10^{-3}	$.09 \times 10^{-6}$	
9	$.13 \times 10^{-5}$	$.23 \times 10^{-5}$	$.29 \times 10^{-5}$	
10	$.20 \times 10^{-6}$	$.19 \times 10^{-3}$	$.22 \times 10^{-6}$	
11	$.16 \times 10^{-7}$	$.26 \times 10^{-7}$	$.31 \times 10^{-7}$	
12	$.11 \times 10^{-5}$	$.52 \times 10^{-7}$	$.22 \times 10^{-6}$	
13	$.16 \times 10^{-7}$	$.17 \times 10^{-7}$	$.30 \times 10^{-7}$	
14	$.09 \times 10^{-5}$	$.29 \times 10^{-6}$	$.27 \times 10^{-6}$	
15	$.71 \times 10^{-7}$	$.43 \times 10^{-7}$	$.09 \times 10^{-5}$	
16	$.64 \times 10^{-7}$	$.11 \times 10^{-6}$	$.08 \times 10^{-6}$	
17	$.67 \times 10^{-7}$	$.69 \times 10^{-7}$	$.22 \times 10^{-7}$	
18	—	—	—	
19	$.33 \times 10^{-6}$	$.20 \times 10^{-6}$	$.19 \times 10^{-6}$	
20	$.09 \times 10^{-6}$	$.21 \times 10^{-6}$	$.09 \times 10^{-6}$	
TECH. Erlenbach			ENGR.	

POST RADIATION

Date: 7-13-65
Temp: 75°

MOD	I_1	I_2	I_3	
1	—	—	—	
2	$.3 \times 10^{-7}$	$.28 \times 10^{-7}$	$.16 \times 10^{-5}$	
3	$.45 \times 10^{-5}$	$.69 \times 10^{-7}$	$.19 \times 10^{-7}$	
4	$.46 \times 10^{-7}$	$.77 \times 10^{-7}$	$.39 \times 10^{-7}$	
5	$.09 \times 10^{-6}$	$.14 \times 10^{-6}$	$.23 \times 10^{-7}$	
6	$.5 \times 10^{-7}$	$.15 \times 10^{-7}$	$.45 \times 10^{-7}$	
7	$.16 \times 10^{-6}$	$.15 \times 10^{-6}$	$.13 \times 10^{-6}$	
8	$.1 \times 10^{-6}$	$> .8 \times 10^{-3}$	$.7 \times 10^{-7}$	
9	$.1 \times 10^{-5}$	$.16 \times 10^{-5}$	$.2 \times 10^{-5}$	
10	$.14 \times 10^{-6}$	$.1 \times 10^{-3}$	$.19 \times 10^{-6}$	
11	$.1 \times 10^{-7}$	$.2 \times 10^{-7}$	$.17 \times 10^{-7}$	
12	$.78 \times 10^{-6}$	$.29 \times 10^{-7}$	$.17 \times 10^{-6}$	
13	$.1 \times 10^{-7}$	$.11 \times 10^{-7}$	$.2 \times 10^{-7}$	
14	$.52 \times 10^{-6}$	$.24 \times 10^{-6}$	$.18 \times 10^{-6}$	
15	$.42 \times 10^{-7}$	$.3 \times 10^{-7}$	$.75 \times 10^{-6}$	
16	$.5 \times 10^{-7}$	$.09 \times 10^{-6}$	$.7 \times 10^{-7}$	
17	$.51 \times 10^{-7}$	$.35 \times 10^{-7}$	$.17 \times 10^{-7}$	
18	—	—	—	
19	$.24 \times 10^{-7}$	$.19 \times 10^{-6}$	$.15 \times 10^{-6}$	
20	$.62 \times 10^{-7}$	$.16 \times 10^{-6}$	$.58 \times 10^{-7}$	
TECH. S. W. Elliott			ENGR.	
21	$.8 \times 10^{-6}$	$.61 \times 10^{-6}$	$.09 \times 10^{-5}$	

EQUIPMENT: Digital VM 1-55991
Electrometer 1-52096
Decade Shunt 1-52075

COMMENTS:

21 $.11 \times 10^{-5}$ $.09 \times 10^{-5}$ $.13 \times 10^{-5}$

CIRCUIT TYPE: A-3

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Minimum Pulse Width and Height (Clock Pulse)

PRE RADIATION

Date: 1-19-65
Temp: 78°

MOD	nsec t_w	Volts V_A		
1	26	.78		
2	28	.77		
3	26	.79		
4	26.5	.78		
5	28	.78		
6	29	.80		
7	25	.78		
8	30	.80		
9	33.5	.84		
10	33	.80		
11	25.5	.77		
12	28.5	.78		
13	27	.80		
14	27	.78		
15	26	.78		
16	27	.79		
17	25.5	.78		
18	25.5	.78		
19	25.5	.78		
20	36	.87		
TECH. H.W. Elliott			ENGR.	

#21 25 0.79

EQUIPMENT: TI pulser
sampling oscilloscope

POST RADIATION

Date: 6-18-65
Temp: 78°

MOD	t_w	V_A		
1	—	—		
2	27.5	.79		
3	25	.81		
4	27	.76		
5	26.5	.82		
6	28.5	.81		
7	25.5	.80		
8	31	.81		
9	34	.85		
10	37.5	.83		
11	26.5	.75		
12	26	.81		
13	26	.81		
14	26.5	.79		
15	27	.76		
16	28	.79		
17	24.5	.80		
18	—	—		
19	27	.77		
20	34	.84		
TECH.			ENGR.	

#21 25.5 .76

#1 does not operate

COMMENTS:

CIRCUIT TYPE: A-3

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Output One Voltage for Q and $\overline{Q}$

PRE RADIATION

Date: 9-29-64 3-12-65

Temp: 78°F 78° (21)

MOD	V_5 (volts)	V_7 (volts)		
1	1.366	1.347		
2	1.342	1.340		
3	1.343	1.342		
4	1.350	1.360		
5	1.345	1.336		
6	1.337	1.342		
7	1.349	1.358		
8	1.336	1.336		
9	1.343	1.313		
10	1.127	1.184		
11	1.328	1.339		
12	1.347	1.347		
13	1.343	1.349		
14	1.239	1.342		
15	1.324	1.324		
16	1.333	1.329		
17	1.332	1.342		
18	1.326	1.339		
19	1.340	1.343		
20	1.334	1.329		
TECH. H. W. Elliott			ENGR. RBT	

#21 1.316 1.309

POST RADIATION

Date: 7-13-65

Temp: 75°

MOD	V_5	V_7		
1	—	—		
2	1.350	1.349		
3	1.348	1.355		
4	1.343	1.351		
5	1.353	1.346		
6	1.346	1.356		
7	1.359	1.365		
8	1.345	1.349		
9	1.352	1.320		
10	1.041	1.109		
11	1.325	1.333		
12	1.351	1.355		
13	1.351	1.357		
14	1.224	1.349		
15	1.321	1.315		
16	1.345	1.347		
17	1.353	1.357		
18	—	—		
19	1.342	1.343		
20	1.345	1.340		
TECH. H. W. Elliott			ENGR.	

#21 1.316 1.314

EQUIPMENT: Dig. #1 VM I-55991

COMMENTS:

Mods 16-20 Tested 1-18-65

Temp 76°

CIRCUIT TYPE: A-3

TEST NUMBER: 9

DATA SHEET

TEST TITLE: Clock Input Driving Current

PRE RADIATION				
Date: 1-18-65 3-12-66				
Temp: 76° 75° (21)				
MOD	I_x (1x10⁻³a.)			
1	.44			
2	.47			
3	.41			
4	.46			
5	.42			
6	.44			
7	.43			
8	1.03			
9	.40			
10	.54			
11	.48			
12	.46			
13	.43			
14	.44			
15	.48			
16	.44			
17	.44			
18	.42			
19	.46			
20	.43			
TECH. H.W. Elliott		ENGR.		

POST RADIATION				
Date: 7-13-65				
Temp: 75°				
MOD	I_x			
1	.27			
2	.38			
3	.31			
4	.45			
5	.33			
6	.38			
7	.33			
8	.90			
9	.30			
10	≈ .7			
11	.46			
12	.36			
13	.34			
14	.35			
15	.47			
16	.36			
17	.36			
18	—			
19	.44			
20	.35			
TECH. H.W. Elliott		ENGR.		

EQUIPMENT: mods 16-20 Tested 1-18-65 Temp 76°

#21 .40

COMMENTS: DYM I 55991

#21 0.43

#10 current unstable

CIRCUIT TYPE: A-3

TEST NUMBER: 10

DATA SHEET

TEST TITLE: Driving Current Loaded to Ground for Q and $\bar{Q}$

PRE RADIATION

Date: 9-29-30 1-20-65 3-12-65
Temp: 78°F 78°F 78°F (24)

Milliamperes

MOD	I_5	I_7		
1	2.2	2.2		
2	2.1	2.2		
3	1.95	2.0		
4	2.3	2.4		
5	2.1	2.2		
6	2.0	2.1		
7	2.2	2.4		
8	2.2	2.2		
9	1.7	1.7		
10	1.7	2.0		
11	2.1	2.2		
12	2.3	2.2		
13	2.1	2.2		
14	1.6	2.1		
15	2.0	2.1		
16	2.1	2.0		
17	2.2	2.3		
18	2.0	2.1		
19	2.3	2.3		
20	2.1	2.2		

TECH H. W. Elliott ENGR. [illegible]

#21 1.8 1.9

POST RADIATION

Date: 7-13-65
Temp: 75°

MOD	I_5	I_7		
1	—	—		
2	2.2	2.3		
3	2.0	2.1		
4	2.4	2.6		
5	2.3	2.3		
6	2.1	2.2		
7	2.4	2.5		
8	2.3	2.3		
9	1.8	1.7		
10	1.4	1.8		
11	2.1	2.2		
12	2.5	2.6		
13	2.2	2.3		
14	1.7	2.2		
15	2.0	2.1		
16	2.1	2.2		
17	2.3	2.4		
18	—	—		
19	2.4	2.5		
20	2.2	2.2		

TECH. H. W. Elliott ENGR.

#21 1.9 1.9

EQUIPMENT: Decade Resistance Box I- 73730
+3V Monitored by Digital VM I-55991
Millammeter ser 186020 15 ma scale

COMMENTS:

CIRCUIT TYPE: A-3

TEST NUMBER: 11

DATA SHEET

TEST TITLE: Driving Current Loaded to Positive Supply for Q and $\bar{Q}$

PRE RADIATION

Date: 1-18-65 3-12-65

Temp: 76° 75° (21)

MOD	I_5	I_7		
1	6.3	5.4		
2	7.5	6.4		
3	8.9	7.5		
4	6.1	5.2		
5	7.2	6.5		
6	9.0	8.9		
7	5.2	5.9		
8	8.4	7.2		
9	7.9	8.6		
10	9.2	7.5		
11	7.1	6.4		
12	7.2	6.3		
13	7.9	7.9		
14	8.2	6.2		
15	7.6	7.6		
16	8.8	7.9		
17	7.5	7.1		
18	7.1	5.1		
19	6.9	5.6		
20	8.7	7.2		

TECH. [signature] ENGR. [signature]

#21 6.0 6.5

POST RADIATION

Date: 7-13-65

Temp: 75°

MOD	I_5	I_7		
1	—	—		
2	4.7	4.2		
3	4.5	4.6		
4	6.1	5.3		
5	3.7	4.2		
6	5.0	5.5		
7	2.8	3.6		
8	4.7	4.5		
9	3.9	4.9		
10	5.6	4.9		
11	7.1	6.5		
12	2.8	4.1		
13	2.8	4.3		
14	4.4	3.5		
15	7.6	7.6		
16	5.2	4.6		
17	4.2	4.3		
18	—	—		
19	7.0	5.6		
20	4.9	5.0		

TECH. [signature] ENGR.

#21 5.8 6.4

EQUIPMENT: DVM I 55991

Millimeter C 1279

COMMENTS:

CIRCUIT TYPE: A-3

TEST NUMBER: 12

DATA SHEET (1 of 2 sheets)

TEST TITLE: Time Parameters for Q and $\overline{Q}$

PRE RADIATION

Date: 9-30-64
Temp: 78°F
P.G. τ_r 6 nsec τ_f 2.3 nsec
1×10^{-9} seconds

MOD	τ_{r5}	τ_{d5}	τ_{s5}	τ_{f5}
1	2.5	10.5	18.5	10.5
2	3	11	20	13.5
3	3	11.5	20.5	11
4	3	10.5	18.5	11
5	2.5	10.5	18.5	10.5
6	3	12.5	21	11.5
7	2.5	10	16.5	10.5
8	3	12	20.5	13
9	4	14.5	23	16
10	4	15.5	19.5	35
11	3.5	12	20	10
12	3.5	10.5	17.5	10
13	3	12.5	21	9
14	2.5	12	19.5	11
15	3	12.5	21	12
16	2.5	12	19.5	12
17	2.5	11	18.5	11
18	2.5	11	18	11
19	2.5	11	18	11
20	3.5	14	21.5	16
TECH.	[illegible]		ENGR.	[illegible]
#21	3	12.5	21.5	12

POST RADIATION

Date: 6-18-65
Temp: 78°
P.G. τ_r 7 τ_f 6

MOD	τ_{r5}	τ_{d5}	τ_{s5}	τ_{f5}
1	—	—	—	—
2	3	10.5	15.5	12
3	3.5	10	15	10.5
4	3	12.5	20	10.5
5	3	9.5	14.5	9.5
6	3.5	11	16	11.5
7	3	9.5	14.5	9.5
8	3	10.5	15.5	12
9	5	12	18.5	13.5
10	5.5	12.5	21	33
11	3	13	21.5	11
12	3	9.5	14	9.5
13	3.5	10.5	15.5	10
14	3	10.5	15	10.5
15	3	14	22	11.5
16	3	11	16	11
17	3	9.5	14.5	10
18	—	—	—	—
19	2.5	12.5	20	10.5
20	4	11.5	16.5	13
TECH.			ENGR.	
21	3	14	22.5	12

EQUIPMENT: TI Pulse Generator
sampling oscilloscope

COMMENTS:
Mods 16-20 Tested 1-19-65
78°

CIRCUIT TYPE: A-3

TEST NUMBER: 12

DATA SHEET (2 of 2 sheets)

TEST TITLE: Time Parameters for Q and $\bar{Q}$

PRE RADIATION

Date: 10-1-64
Temp: 78°F

1×10^{-9} seconds

MOD	τ_{r7}	τ_{d7}	τ_{s7}	τ_{f7}
1	3	11.5	21	12.5
2	2.5	12.5	22	14.5
3	3	12	22	13
4	3	11.5	22	12
5	3	11	18.5	12
6	3	13	23	16
7	3	10.5	16.5	13
8	3	12.5	22	13
9	4.5	15.5	24.5	18
10	5	17.5	27	34
11	3	12.5	22	12.5
12	2.5	11	19.5	11
13	3	13	22.5	12.5
14	3	12.5	21	13
15	3	13	22	13.5
16	2.5	11	20	14
17	2.5	11	20	12.5
18	2.5	11	19	13
19	2.5	11	19.5	13
20	3.5	14	22.5	17.5
TECH. H.W. Ellis			ENGR. RAT	
#21	3	12.5	24	14.5

POST RADIATION

Date:
Temp:

MOD	τ_{r7}	τ_{d7}	τ_{s7}	τ_{f7}
1	—	—	—	—
2	3	10.5	15.5	13
3	3.5	10.5	16	12.5
4	3	12.5	22	12.5
5	3	10	15	11.5
6	3.5	11	16.5	14.5
7	3	10	14.5	11
8	3.5	10.5	15.5	13.5
9	7	12.5	17.5	16
10	11	13	18.5	27
11	3.5	13.5	22.5	13.5
12	4	9.5	14.5	11
13	4	10.5	14	11.5
14	3	10.5	15	12.5
15	3	13.5	22	13.5
16	3	11	16	12.5
17	3	10	15.5	11.5
18	—	—	—	—
19	3	12.5	20	12.5
20	4	11.5	16.5	14.5
TECH.			ENGR.	
#21	3	14	24	14

EQUIPMENT: TI Pulse Gen.
Sampling oscilloscope

COMMENTS:
Mods 16-20 Tested 1-19-65
Temp 78°

CIRCUIT TYPE: A-3

TEST NUMBER: 13

DATA SHEET

TEST TITLE: V_{SAT}

PRE RADIATION				
Date: 9-30-64		3-12-65		
Temp: 78°F		78° (21)		
MOD	volts V_{SAT}			
1	.128			
2	.107			
3	.102			
4	.132			
5	.111			
6	.090			
7	.128			
8	.100			
9	.088			
10	.089			
11	.113			
12	.114			
13	.103			
14	.112			
15	.102			
16	.096			
17	.107			
18	.130			
19	.122			
20	.103			
TECH. [illegible]		ENGR. [illegible]		

#21 0.109

POST RADIATION				
Date: 7-13-65				
Temp: 75°				
MOD	V_{SAT}			
1	.076			
2	.143			
3	.143			
4	.132			
5	.147			
6	.129			
7	.163			
8	.136			
9	.129			
10	.124			
11	.113			
12	.151			
13	.147			
14	.150			
15	.102			
16	.134			
17	.147			
18	—			
19	.122			
20	.132			
TECH. [illegible]		ENGR.		

#21 .109

EQUIPMENT: Digital VM I-55991

COMMENTS:
Mods 16-20 tested 1-18-65
Temp 76°

CIRCUIT TYPE: A-3

TEST NUMBER: 14

DATA SHEET

TEST TITLE: Preset Time Parameters

PRE RADIATION

Date: 10-1-64
Temp: 78°F
P_2: τ_r 5 τ_f 2
1×10^{-9} seconds

MOD	τ_{d7}	τ_{r7}	τ_{d5}	τ_{r5}
1	10	8	22	11
2	10	7	22	12
3	11	9	24	12
4	10	7	22	10
5	11	8	21	11
6	10	9	23	12
7	10	8	21	10
8	10	9	22	12
9	12	18	28	17
10	9	6	21	38
11	10	7	22	11
12	10	8	21	10
13	11	11	24	11
14	10	8	22	11
15	10	8	22	11
16	11	7	22	13
17	11	6	22	12
18	11	7	23	13
19	10	7	22	11
20	11	10	26	19
#21	12	11	27	14

TECH. K.W. Elliott ENGR. RBD

POST RADIATION

Date: 6-18-65
Temp: 77°
P_2: τ_r 6.5 τ_f 7

MOD	τ_{d7}	τ_{r7}	τ_{d5}	τ_{r5}
1	—	—	—	—
2	11	16	22	13
3	13	23	23	15
4	11	9	24	10
5	12	20	22	13
6	11	19	22	14
7	11	22	22	13
8	11	16	21	14
9	13	31	26	20
10	9	12	16	30
11	11	10	24	11
12	11	16	21	12
13	12	22	24	15
14	12	18	22	13
15	11	11	24	11
16	11	17	22	14
17	12	18	22	12
18	—	—	—	—
19	11	11	23	12
20	12	22	24	16
#21	12	12	26	13

TECH. K.W. Elliott ENGR.

EQUIPMENT: TI Pulse Generator
Sampling oscilloscope

COMMENTS:
Mods 16-20 Tested 1-20-65
Temp 78°

CIRCUIT TYPE: A-3

TEST NUMBER: 15

DATA SHEET

TEST TITLE: Resistance Measurements

PRE RADIATION

Date: 9-30-64 3-12-65

Temp: 78°F 78° (21)

MOD	ohms R_{58}	volts V_{58}	ohms R_{78}	volts V_{78}
1	273.6	3.373	261.7	3.330
2	289.9	3.426	274.7	3.377
3	269.9	3.360	244.4	3.263
4	269.6	3.361	252.5	3.295
5	283.8	3.407	276.5	3.381
6	299.8	3.456	286.4	3.412
7	283.3	3.406	269.2	3.357
8	282.4	3.403	265.4	3.341
9	295.2	3.442	266.4	3.343
10	207.5	3.101	209.5	3.107
11	275.5	3.379	259.2	3.318
12	274.2	3.374	260.5	3.322
13	258.2	3.316	238.5	3.236
14	274.6	3.374	276.4	3.376
15	277.6	3.384	261.8	3.325
16	297.1	3.444	281.0	3.396
17	283.9	3.403	273.6	3.370
18	288.9	3.420	281.8	3.399
19	276.3	3.379	263.7	3.337
20	266.7	3.349	254.7	3.307
TECH. K. W. Elliott			ENGR. [illegible]	
#21	288.2	3.424	266.3	3.353

POST RADIATION

Date: 7-13-65

Temp: 75°

MOD	R_{58}	V_{58}	R_{78}	V_{78}
1	open		open	
2	292.7	3.581	279.8	3.533
3	275.8	3.525	254.9	3.445
4	266.7	3.494	249.2	3.423
5	288.4	3.565	282.4	3.541
6	302.7	3.608	290.9	3.567
7	286.6	3.559	274.2	3.513
8	285.6	3.554	272.0	3.505
9	310.3	3.629	287.2	3.555
10	200.8	3.207	203.2	3.215
11	272.4	3.510	255.7	3.445
12	276.8	3.525	264.7	3.479
13	267.7	3.493	252.6	3.433
14	277.7	3.529	283.6	3.541
15	274.7	3.519	259.0	3.455
16	302.9	3.607	289.9	3.560
17	288.4	3.562	279.9	3.527
18	—	—	—	—
19	273.5	3.513	260.9	3.462
20	278.0	3.529	270.8	3.496
TECH. K. W. Elliott			ENGR.	
	285.4	3.550	262.9	3.469

EQUIPMENT: Wheatstone Bridge I-25471 #21
Digital Voltmeter I-55991

COMMENTS:

CIRCUIT TYPE: A-3

TEST NUMBER: 16

DATA SHEET

TEST TITLE: Forward Voltage of Isolation Junction

PRE RADIATION				
Date: 1-18-65	3-12-65			
Temp: 76°	78° (21)			
MOD	Volts			
1	.648			
2	.626			
3	.655			
4	.640			
5	.650			
6	.629			
7	.653			
8	.620			
9	.660			
10	.602			
11	.637			
12	.642			
13	.649			
14	.611			
15	.638			
16	.637			
17	.642			
18	.645			
19	.639			
20	.644			
TECH. [illegible]		ENGR. [illegible]		

#21 0.659

POST RADIATION				
Date: 7-13-65				
Temp: 75°				
MOD				
1	.550			
2	.554			
3	.552			
4	.560			
5	.554			
6	.559			
7	.553			
8	.554			
9	.561			
10	.505			
11	.554			
12	.554			
13	.555			
14	.507			
15	.557			
16	.556			
17	.556			
18	—			
19	.561			
20	.557			
TECH. [illegible]		ENGR.		

#21 .559

EQUIPMENT: DVM I 55991
Decade resistor I 73730
Milliammeter C 1279

COMMENTS:

CIRCUIT TYPE: A-3

TEST NUMBER: 17

DATA SHEET

TEST TITLE: Isolation Junction Minority Carrier Lifetime

PRE RADIATION					POST RADIATION				
Date:					Date:				
Temp:					Temp:				
MOD	$\Delta t/\Delta v$	τ (10^{-9})	with $\Delta t/\Delta v$	Device #21 $\tau \cdot 10^{-9}$	MOD	$\Delta t/\Delta v$	τ (10^{-9})	#21 τ (ns)	
1	10/.1400	1.8	5/.070	1.84	1		1.9	1.8	
2	10/.1500	1.7			2		1.7		
3	13/.1550	2.2			3		1.9		
4	10/.1430	1.8			4		1.8		
5	11/.1550	1.8			5		1.7		
6	10/.1400	1.8			6		1.8		
7	12.5/.1770	1.8			7		1.7		
8	10/.1500	1.7			8		1.7		
9	12/.1520	2.0			9		2.0		
10	11/.1490	1.9			10		1.6		
11	12/.1600	1.9			11		1.8		
12	11/.1610	1.8			12		1.6		
13	12/.1540	2.0			13		2.0		
14	10/.1670	1.5			14		1.4		
15	10/.1260	2.0			15		1.8		
16	4/.065	1.6			16		1.5		
17	4/.060	1.7			17		1.6		
18	3/.055	1.4			18		—		
19	4/.060	1.7			19		1.6		
20	4/.065	1.6			20		1.8		
TECH. W.H. Richardson			ENGR. RRD		TECH.			ENGR. R.S.	

21 5/.052 2.48

EQUIPMENT:

COMMENTS:

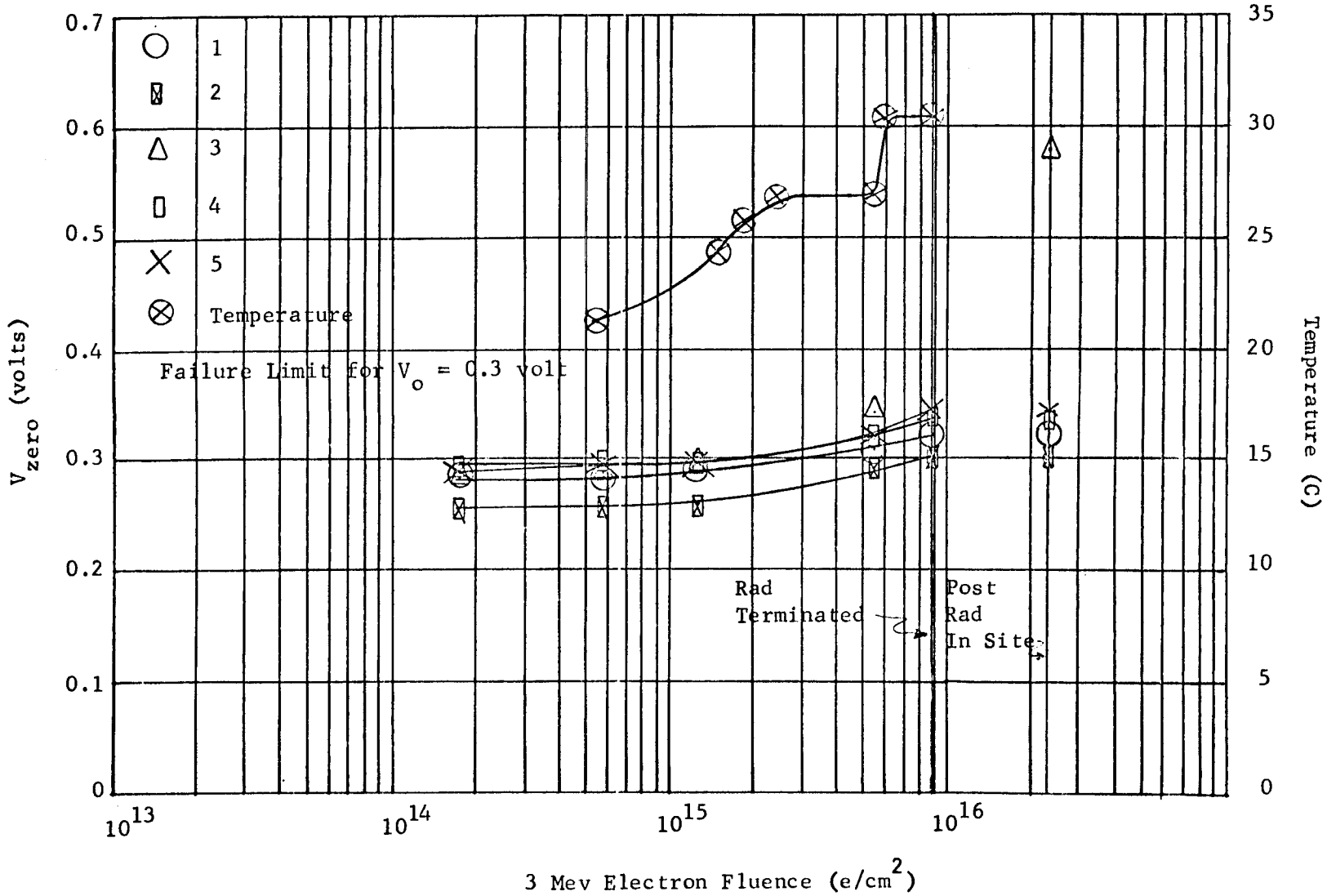
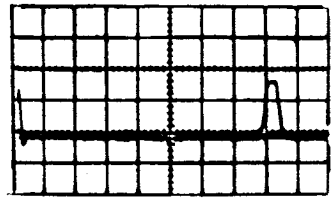
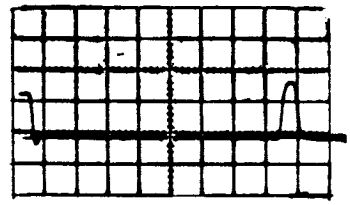


FIGURE III-5. RADIATION RESPONSE OF UNIT A-3

Note: For post rad 1 week all devices will not stay in state without reset.



A - Initial



B - Final

Scale: 0.2 volts/cm
0.1 μsec/cm

FIGURE III-6. MULTISTAGE PROPAGATION DELAY FOR A-3 DEVICES

CIRCUIT TYPE: A-4

TEST NUMBER: 1

DATA SHEET

TEST TITLE: Direct Set-Reset Input Threshold

PRE RADIATION				
Date: 1-26-65				
Temp: 78°F				
MOD	$V_{one}(3)$	$V_{one}(4)$	$V_{one}(5)$	$V_{one}(6)$
1	.672	.675	.721	.669
2	.689	.680	.660	.683
3	.664	.662	.719	.660
4	.672	.657	.721	.662
5	.689	.656	.715	.684
6	.682	.684	.735	.676
7	.685	.688	.651	.677
8	.671	.667	.720	.664
9	.662	.663	.771	.658
10	.693	.691	.660	.685
11	[illegible]	.699	.703	.704
12	.661	.660	.761	.652
13	.683	.679	.720	.673
14	.671	.665	.769	.659
15	.675	.680	.758	.664
16	.651	.657		
17	.689	.680		
18	.691	.688		
19	.688	.690		
20	.656	.657		
TECH. Erlenbach			ENGR. [illegible]	

POST RADIATION				
Date: 5-10-65				
Temp: 76°F				
MOD	$V_{one}(3)$	$V_{one}(4)$		
1	.773	.781		
2	.807	.799		
3	.734	.734		
4	.674	.660		
5	.790	.801		
6	.788	.797		
7	.785	.801		
8	.760	.745		
9	.746	.731		
10	.820	.820		
11	.710	.701		
12	.735	.715		
13	.781	.777		
14	.757	.745		
15	.676	.683		
16	.719	.723		
17	.795	.777		
18	.696	.691		
19	.693	.693		
20	.733	.740		
TECH. [illegible]			ENGR.	

EQUIPMENT: DVM - I-55991
Heath VM.

COMMENTS: Tests for $V_{one}(5)$ and $V_{one}(6)$ deleted because too high current (30-40 ma) drawn through cell by meter.

CIRCUIT TYPE: A-4

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Driving Current Required

PRE RADIATION

Date: 1-26-65
Temp: 78°

MOD	I_7	I_2	I_3	I_1
1	145×10^{-6}	145×10^{-6}	152×10^{-6}	275×10^{-6}
2	140	125	143	260
3	160	153	162	285
4	155	145	155	290
5	150	144	154	280
6	160	155	160	285
7	160	154	162	300
8	155	146	155	285
9	155	150	155	280
10	137	137	135	290
11	158	155	165	305
12	136	133	138	240
13	140	140	140	260
14	133	130	135	240
15	150	137	140	280
16	150	148	152	280
17	170	145	170	305
18	165	158	163	300
19	160	155	158	285
20	155	148	152	285

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-10-65
Temp: 77°F

MOD	* I_7	* I_2	I_3	I_1
1	135	115	137	250
2	130	105	135	240
3	145	120	152	265
4	150	145	152	290
5	140	110	143	250
6	145	120	152	265
7	150	120	155	275
8	145	115	145	265
9	145	120	150	265
10	125	105	127	270
11	130	150	162	305
12	125	120	130	225
13	130	110	135	245
14	120	105	130	220
15	150	115	140	250
16	140	115	143	255
17	155	125	160	275
18	160	135	165	290
19	130	150	155	280
20	145	115	142	260

TECH. [illegible] ENGR.

EQUIPMENT: DVM I 55991
MicroAmmeter C3124

COMMENTS:
I_7, I_2 I_3 250 μa scale
I_1 500 μa scale
I_3 mod 11 changed suddenly from 135 μa to 165 μa.
over

* taken on 500 μa scale see other side for same data on 250 μa scale
I_3 and I_1 measured 5-11-65 temp 76°F

Pre

I_1 mod 2 showed sudden increase to ~ 400 ua and then was stable at 260 ua

Both mod 2 and 3 are repeatable at indicated currents

mods 16-20 tested 2-10-65 temp 79°

Post

Test 2 (cont)

	I_1	I_2
1	137	125
2	135	108
3	150	125
4	153	145
5	140	115
6	150	125
7	155	123
8	145	120
9	145	127
10	130	108
11	155	155
12	130	125
13	135	115
14	125	108
15	150	120
16	143	120
17	158	130
18	163	158
19	133	153
20	140	120

CIRCUIT TYPE: A-4

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Clocked Set Input Threshold

PRE RADIATION

Date: 1-29-65
Temp: 78°F

MOD	V@ th	V@ th		
1	.666	.663		
2	.677	.676		
3	.653	.652		
4	.667	.667		
5	.681	.677		
6	.675	.675		
7	.653	.653		
8	.666	.665		
9	.655	.655		
10	.632	.632		
11	.700	.700		
12	.651	.650		
13	.673	.673		
14	.664	.663		
15	.668	.667		
16	.645	.642		
17	.674	.666		
18	.672	.666		
19	.679	.672		
20	.647	.645		
TECH. Erlenbach		ENGR. [illegible]		

POST RADIATION

Date: 5-11-65
Temp: 76°F

MOD	V@ th	V@ th		
1	.725	.715		
2	.763	.758		
3	.709	.703		
4	.668	.663		
5	.751	.747		
6	.744	.741		
7	.758	.752		
8	.734	.729		
9	.712	.706		
10	.777	.774		
11	.704	.702		
12	.706	.701		
13	.736	.731		
14	.723	.709		
15	.668	.663		
16	.709	.701		
17	.739	.735		
18	.679	.674		
19	.685	.682		
20	.723	.709		
TECH. [illegible]		ENGR.		

EQUIPMENT: DVM - I-55991
Heathkit VM

COMMENTS:

Module 16-20 Tested 2-10-65
Temp 80°

CIRCUIT TYPE: A-4

TEST NUMBER: 4

DATA SHEET

TEST TITLE: Driving Current Available and Output One Voltage

PRE RADIATION

Date: 1-29-65
Temp: 78

$I = 10^{-3}$ amp

MOD	I(5) one	I(6)	I(6) clock	V one Q
1	.740	.725	.720	1.632
2	.720	.690	.690	1.640
3	.770	.770	.760	1.659
4	.745	.755	.755	1.658
5	.765	.755	.755	1.665
6	.790	.805	.800	1.667
7	.820	.820	.820	1.665
8	.780	.760	.755	1.649
9	.755	.760	.750	1.657
10	.765	.735	.735	1.699
11	.850	.865	.860	1.679
12	.660	.660	.655	1.652
13	.725	.720	.710	1.646
14	.650	.665	.655	1.655
15	.780	.840	.830	1.792
16	.690	.690	.690	1.637
17	.840	.830	.820	1.645
18	.810	.820	.820	1.650
19	.790	.800	.800	1.655
20	.730	.720	.720	1.655

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-12-65
Temp: 76°F

$I \times 10^{-3}$ Amp

MOD	I(5) one	I6	I(6) clock	V one Q
1	.730	.710	.720	1.641
2	.700	.460	.680	1.651
3	.765	.760	.755	1.671
4	.735	.745	.750	1.656
5	.670	.605	.750	1.679
6	.550	.240	.800	1.675
7	.720	.590	.810	1.675
8	.775	.750	.750	1.659
9	.740	.750	.750	1.664
10	.755	.730	.735	1.713
11	.840	.860	.860	1.677
12	.645	.650	.650	1.661
13	.680	.560	.710	1.655
14	.645	— *	.650	1.665
15	.775	.830	.820	1.792
16	.680	.680	.680	1.652
17	.830	.770	.820	1.661
18	.800	.810	.810	1.656
19	.780	.800	.800	1.659
20	.710	.720	.720	1.672

TECH. H.W. [illegible] ENGR.

EQUIPMENT: D.M. I-55991
Microammeter C-3124
Decade Resistor I-73730

* Pin 6 will not reach .865 V
max is .207 V

COMMENTS:

Mods 16-20 2-10-65
Temp 81°

CIRCUIT TYPE: A-4

TEST NUMBER: 4

DATA SHEET

TEST TITLE: Driving Current Available and Output On Voltage

PRE RADIATION

Date: 1-29-65
Temp: 72

MOD	$I_{Q\,clock}$	$V_{out\,Q}$		
1	.745	1.699		
2	.725	1.711		
3	.770	1.701		
4	.745	1.692		
5	.770	1.714		
6	.790	1.678		
7	.820	1.701		
8	.780	1.721		
9	.750	1.693		
10	.760	1.746		
11	.850	1.686		
12	.650	1.674		
13	.720	1.705		
14	.660	1.694		
15	.775	1.743		
16	.690	1.669		
17	.840	1.691		
18	.820	1.684		
19	.790	1.686		
20	.720	1.686		

TECH. Erlenbach ENGR.

POST RADIATION

Date: 5-12-65
Temp: 76°F

MOD	$I_{Q\,clock}$	$V_{out\,Q}$		
1	.735	1.704		
2	.720	1.719		
3	.770	1.711		
4	.740	1.687		
5	.760	1.721		
6	.780	1.689		
7	.810	1.715		
8	.780	1.733		
9	.750	1.704		
10	.760	1.760		
11	.850	1.694		
12	.650	1.687		
13	.720	1.714		
14	.650	1.702		
15	.780	1.792		
16	.680	1.684		
17	.830	1.709		
18	.810	1.687		
19	.780	1.692		
20	.720	1.702		

TECH. N. W. Elliott ENGR.

EQUIPMENT: Same

COMMENTS:
Mods 16-20 tested 2-10-65
Temp 81°

CIRCUIT TYPE: A-4

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Driving Current Capability

PRE RADIATION

Date: 2-1-65
Temp: 75

ma.

MOD	I_{6sat}	I_{5sat}		
1	8.2	6.7		
2	7.7	7.2		
3	8.0	9.0		
4	9.5	7.0		
5	7.5	6.5		
6	6.8	6.0		
7	7.3	6.0		
8	8.2	7.2		
9	7.6	5.8		
10	6.5	6.1		
11	5.4	5.4		
12	8.1	6.4		
13	7.4	5.9		
14	7.8	6.6		
15	9.2	9.4		
16	7.9	6.6		
17	7.5	6.4		
18	6.4	5.4		
19	5.6	4.8		
20	8.4	6.7		
TECH. K.W. Elliott		ENGR.		

POST RADIATION

Date: 5-12-65
Temp: 76°F

$I \times 10^{-3}$ amp

MOD	I_{6sat}	I_{5sat}		
1	2.2	2.8		
2	1.9	2.7		
3	3.0	3.7		
4	9.3	6.8		
5	2.1	2.3		
6	1.7	2.3		
7	2.2	2.6		
8	2.2	3.0		
9	3.0	2.9		
10	1.5	2.4		
11	5.2	5.3		
12	3.0	3.0		
13	1.9	2.4		
14	2.2	2.8		
15	9.0	9.2		
16	2.8	3.1		
17	2.3	3.0		
18	6.3	5.4		
19	5.5	4.7		
20	2.8	2.7		
TECH. K.W. Elliott		ENGR.		

EQUIPMENT: DVM I55991
Decade Resistor I73730
Milliammeter C1279

COMMENTS:

Mod 16-20 tested 2-10-65

CIRCUIT TYPE: A-4

TEST NUMBER: 6

DATA SHEET 7

TEST TITLE: Leakage Currents

PRE RADIATION

Date: 2-1-65

Temp: 75°

MOD	$I_{(1)}$	$I_{(2)}$	$I_{(3)}$	$I_{(7)}$ ~~$I_{(5)}$~~
1	$.11\times10^{-8}$	$.5\times10^{-9}$	$.46\times10^{-9}$	$.58\times10^{-9}$
2	$.26\times10^{-8}$	$.14\times10^{-8}$	$.14\times10^{-8}$	$.12\times10^{-8}$
3	$.26\times10^{-8}$	$.13\times10^{-8}$	$.2\times10^{-8}$	$.11\times10^{-8}$
4	$.20\times10^{-8}$	$.22\times10^{-8}$	$.13\times10^{-8}$	$.69\times10^{-9}$
5	$.8\times10^{-8}$	$.72\times10^{-8}$	$.1\times10^{-7}$	$.2\times10^{-8}$
6	$.26\times10^{-8}$	$.09\times10^{-8}$	$.09\times10^{-8}$	$.09\times10^{-9}$
7	$.17\times10^{-8}$	$.59\times10^{-9}$	$.66\times10^{-9}$	$.7\times10^{-9}$
8	$.21\times10^{-8}$	$.1\times10^{-8}$	$.09\times10^{-8}$	$.08\times10^{-8}$
9	$.09\times10^{-7}$	$.17\times10^{-8}$	$.31\times10^{-8}$	$.13\times10^{-8}$
10	$.17\times10^{-7}$	$.2\times10^{-8}$	$.16\times10^{-8}$	$.12\times10^{-8}$
11	$.42\times10^{-8}$	$.15\times10^{-8}$	$.1\times10^{-8}$	$.1\times10^{-8}$
12	$.13\times10^{-8}$	$.28\times10^{-9}$	$.48\times10^{-9}$	$.2\times10^{-9}$
13	$.14\times10^{-8}$	$.48\times10^{-9}$	$.62\times10^{-9}$	$.68\times10^{-9}$
14	$.15\times10^{-8}$	$.18\times10^{-9}$	$.53\times10^{-9}$	$.38\times10^{-9}$
15	$.34\times10^{-8}$	$.21\times10^{-8}$	$.33\times10^{-8}$	$.13\times10^{-8}$
16	$.4\times10^{-8}$	$.12\times10^{-8}$	$.12\times10^{-8}$	$.11\times10^{-8}$
17	$.17\times10^{-8}$	$.8\times10^{-9}$	$.73\times10^{-9}$	$.8\times10^{-9}$
18	$.17\times10^{-8}$	$.46\times10^{-9}$	$.6\times10^{-9}$	$.11\times10^{-8}$
19	$.16\times10^{-8}$	$.7\times10^{-9}$	$.66\times10^{-9}$	$.78\times10^{-9}$
20	$.53\times10^{-8}$	$.13\times10^{-8}$	$.12\times10^{-8}$	$.71\times10^{-9}$
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 5-13-65

Temp: 76°F

MOD	I_1	I_2	I_3	I_7
1	$.13\times10^{-8}$	$.56\times10^{-9}$	$.54\times10^{-9}$	$.63\times10^{-9}$
2	$.23\times10^{-8}$	$.12\times10^{-8}$	$.12\times10^{-8}$	$.12\times10^{-8}$
3	$.26\times10^{-8}$	$.11\times10^{-8}$	$.13\times10^{-8}$	$.11\times10^{-8}$
4	$.24\times10^{-8}$	$.22\times10^{-8}$	$.13\times10^{-8}$	$.64\times10^{-9}$
5	$.34\times10^{-8}$	$.11\times10^{-8}$	$.13\times10^{-8}$	$.15\times10^{-8}$
6	$.41\times10^{-8}$	$.1\times10^{-8}$	$.11\times10^{-8}$	$.12\times10^{-8}$
7	$.22\times10^{-8}$	$.09\times10^{-8}$	$.1\times10^{-8}$	$.09\times10^{-8}$
8	$.21\times10^{-8}$	$.12\times10^{-8}$	$.1\times10^{-8}$	$.1\times10^{-8}$
9	$.7\times10^{-8}$	$.1\times10^{-8}$	$.74\times10^{-9}$	$.1\times10^{-8}$
10	$.14\times10^{-7}$	$.12\times10^{-8}$	$.1\times10^{-8}$	$.1\times10^{-8}$
11	$.43\times10^{-8}$	$.18\times10^{-8}$	$.1\times10^{-8}$	$.11\times10^{-8}$
12	$.42\times10^{-8}$	$.44\times10^{-9}$	$.6\times10^{-9}$	$.35\times10^{-9}$
13	$.18\times10^{-8}$	$.64\times10^{-9}$	$.72\times10^{-9}$	$.7\times10^{-9}$
14	$.2\times10^{-8}$	$.5\times10^{-9}$	$.5\times10^{-9}$	$.52\times10^{-9}$
15	$.34\times10^{-8}$	$.21\times10^{-8}$	$.33\times10^{-8}$	$.14\times10^{-8}$
16	$.4\times10^{-8}$	$.11\times10^{-8}$	$.1\times10^{-8}$	$.11\times10^{-8}$
17	$.18\times10^{-8}$	$.78\times10^{-9}$	$.09\times10^{-8}$	$.79\times10^{-9}$
18	$.14\times10^{-8}$	$.4\times10^{-9}$	$.48\times10^{-9}$	$.1\times10^{-8}$
19	$.14\times10^{-8}$	$.58\times10^{-9}$	$.55\times10^{-9}$	$.62\times10^{-9}$
20	$.6\times10^{-8}$	$.14\times10^{-8}$	$.11\times10^{-8}$	$.72\times10^{-9}$
TECH. [illegible]		ENGR.		

EQUIPMENT: Electrometer I 52076
w.11, shunt I 52075
DVM I 55791

COMMENTS:
I(7) mods 2-15 tested @ 73°
mod 16-20 tested 2-10-65
temp 78°

CIRCUIT TYPE: A-4

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Leakage Current

PRE RADIATION

Date: 2-2-65

Temp: 75°

MOD	I_g			
1	1.0×10^{-6}			
2	1.0×10^{-6}			
3	$.5 \times 10^{-5}$			
4 ≠	$.1 \times 10^{-5}$			
5 ≠	$.7 \times 10^{-6}$			
6	$.9 \times 10^{-6}$			
7	1.0×10^{-6}			
8	1.0×10^{-6}			
9 ≠	$.3 \times 10^{-5}$			
10	1.0×10^{-6}			
11	1.0×10^{-6}			
12	1.0×10^{-6}			
13	1.0×10^{-6}			
14	1.0×10^{-6}			
15	1.0×10^{-6}			
16	1.0×10^{-6}			
17	$.6 \times 10^{-6}$			
18 ≠	$.25 \times 10^{-9}$			
19 ≠	$.6 \times 10^{-6}$			
20 ≠	$.1 \times 10^{-5}$			

TECH. R. W. Elliott ENGR.

POST RADIATION

Date: 5-13-65

Temp: 75°F

MOD	I_g			
1	$.2 \times 10^{-5}$			
2	2.0×10^{-6}			
3	$.4 \times 10^{-5}$			
≠ 4	$.1 \times 10^{-5}$			
5	1.0×10^{-6}			
6	1.0×10^{-6}			
7	1.0×10^{-6}			
8	$.2 \times 10^{-5}$			
9	$.4 \times 10^{-5}$			
10	1.0×10^{-6}			
11	1.0×10^{-6}			
12	1.0×10^{-6}			
13	1.0×10^{-6}			
14	1.0×10^{-6}			
15	1.0×10^{-5}			
16	$.2 \times 10^{-5}$			
17	$.53 \times 10^{-6}$			
18	$.25 \times 10^{-9}$			
19	$.6 \times 10^{-6}$			
20	$.2 \times 10^{-5}$			

TECH. R. W. Elliott ENGR.

EQUIPMENT: DVM 55991
Electrometer I 52076 with
Shunt I 52075

COMMENTS:

Mod marked ≠ Taken on .8 V range all others on 2V range
mods 16-20 tested 2-10-65
temp 79°

CIRCUIT TYPE: A-4

TEST NUMBER: 7

DATA SHEET A

TEST TITLE: Minimum Pulse Width and Height (Clock Pulse)

PRE RADIATION

Date: 1-21-65
Temp: 76°

MOD	1×10^{-9} sec τ_w	Volts T_A		
1	27	.69		
2	26.5	.69		
3	25	.68		
4	26	.68		
5	23	.70		
6	25.5	.70		
7	27	.69		
8	25.5	.69		
9	27	.68		
10	25	.69		
11	27.5	.69		
12	33	.67		
13	31	.70		
14	29	.70		
15	29	.71		
16	27	.67		
17	26	.69		
18	26	.69		
19	27.5	.71		
20	26	.67		
TECH. [illegible]			ENGR. [illegible]	

POST RADIATION

Date: 4-28-65
Temp: 78°F

MOD	1×10^{-9} sec τ_w	T_A		
1	33	.75		
2	34	.76		
3	30.5	.73		
4	26	.67		
5	29.5	.76		
6	32	.76		
7	34	.76		
8	30.5	.71		
9	32.5	.73		
10	30.5	.74		
11	26.5	.68		
12	36.5	.72		
13	36.5	.76		
14	39.5	.77		
15	29	.70		
16	31.5	.71		
17	31	.75		
18	27.5	.69		
19	28.5	.70		
20	30	.73		
TECH.			ENGR.	

EQUIPMENT: Same as sheet B

COMMENTS:

CIRCUIT TYPE: A-4

TEST NUMBER: 7

DATA SHEET B

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 1-21-65
Temp: 76°

Input T_r 7×10^{-9} T_F 3×10^{-9}

MOD	T_s	T_D	T_r	T_F
1	50	30	17.5	80
2	46	28	17	78
3	46	27	17	80
4	49	29.5	18	80
5	40	24.5	16	70
6	42	25.5	16	70
7	45	28.5	17.5	76
8	46	29	18	78
9	48	29.5	17	80
10	45	28.5	16.5	82
11	44	28	18	70
12	66	34	19	90
13	49	30	18	80
14	66	32	19	90
15	47	29	19	80
16	50	29	18	84
17	46	27	17	72
18	50	28	16	68
19	46	27	16.5	70
20	49	29.5	17.5	84

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 4-28-65
Temp: 78°F

MOD	T_s	T_d	T_r	T_F
1	44	27	27	84
2	42	25	28	76
3	47	24	23	76
4	48	30	18	76
5	46	23	24	68
6	37	23.5	26	68
7	40	25	27	74
8	42	26	26	78
9	44	27	24	80
10	42	25.5	30	78
11	44	29	18	68
12	49	30	26	90
13	44	27	30	80
14	47	28	28	90
15	46	29	20	78
16	44	27	25	84
17	39	24	26	70
18	49	29	17	70
19	45	27	17	70
20	43	25	25	80

TECH. [illegible] ENGR.

EQUIPMENT: Sampling oscilloscope, TI Pulser, Voltages ~~[illegible]~~ Monitored with Heathkit VOM 1.5, 5.0 V Scale

COMMENTS: Mod 11-15 Tested 1-30-65 Temp 76°

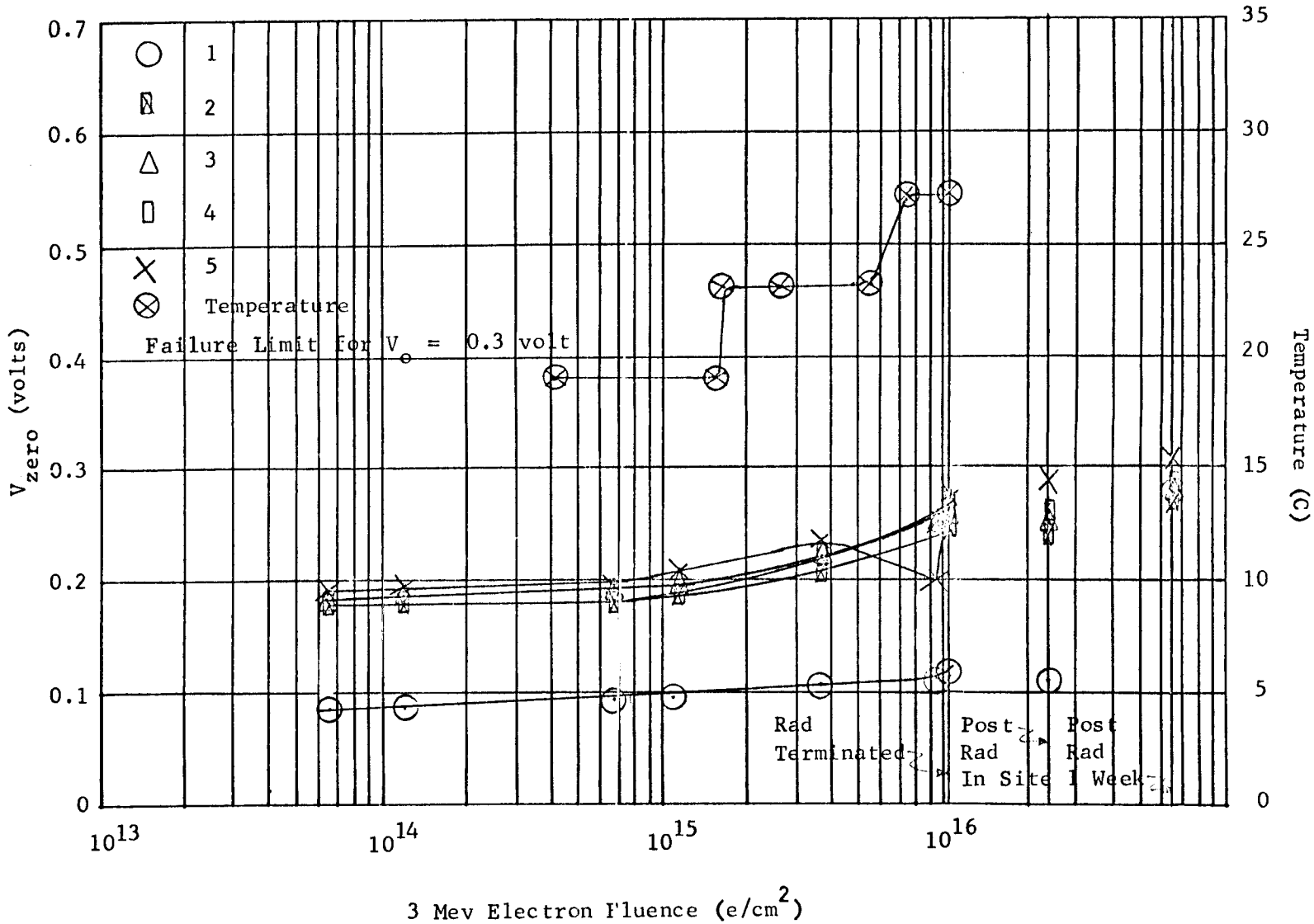
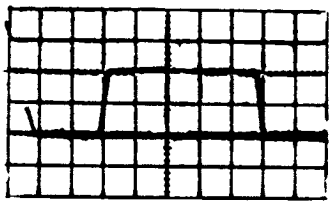
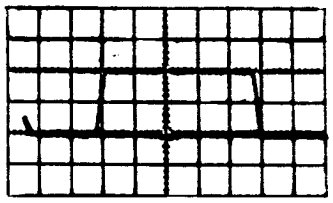


FIGURE III-7. RADIATION RESPONSE OF UNIT A-4



A - Initial



B - Final

Scale: 0.05 volt/cm
0.1 μsec/cm

FIGURE III-8. MULTISTAGE PROPAGATION DELAY FOR A-4 DEVICES

CIRCUIT TYPE: A-5

TEST NUMBER: 1

DATA SHEET

TEST TITLE: Input V min one

PRE RADIATION

Date: Dec 21, 1964 Jan 25, 1965

Temp: 78° 77°

MOD	3.75 K ohms $V_{B\,ONE}$	3.75 K ohms $V_{I\,ONE}$	500 ohms $V_{B\,ONE}$	500 ohms $V_{I\,ONE}$
1	1.439*	1.433	1.545*	1.539
2	1.402	1.397	1.505	1.498
3	1.388	1.390	1.495	1.503
4	1.408	1.412	1.515	1.525
5	1.391	1.390	1.485	1.484
6	1.360	1.324	1.467	1.462
7	1.384	1.386	1.490	1.487
8	1.419	1.404	1.532	1.506
9	1.366	1.390	1.468	1.477
10	1.314	1.321	1.393	1.399
11	1.405	1.404	1.507	1.508
12	1.382	1.375	1.485	1.480
13	1.374	1.376	1.468	1.471
14	1.389	1.415	1.517	1.530
15	1.405	1.404	1.514	1.510
16	1.357	1.351	1.458	1.449
17	1.410	1.419	1.532	1.536
18	1.369	1.368	1.484	1.484
19	1.371	1.371	1.478	1.476
20	1.366	1.367	1.461	1.467

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date: 5-14-65

Temp: 75°F

MOD	3.75 K ohms $V_{B\,ONE}$	3.75 K ohms $V_{I\,ONE}$	* 500 Ω * $V_{B\,ONE}$	* 500 Ω * $V_{I\,ONE}$
1	1.539*	1.544	1.944*	2.027
2	1.484	1.483	.634	.665
3	1.457	1.459	.324	.664
4	1.418	1.429	.243	.372
5	1.456	1.461	.341	.371
6	1.438	1.445	.349	.349
7	1.455	1.451	.323	.321
8	1.521	1.502	1.844	1.560
9	1.455	1.480	.388	.934
10	1.378	1.386	.275	.264
11	1.412	1.421	.214	.218
12	1.456	1.457	.390	.520
13	1.467	1.475	1.097	1.683
14	1.505	1.534	2.125	2.144
15	1.417	1.419	.209	.207
16	1.428	1.429	.363	.359
17	1.508	1.521	1.606	1.613
18	1.387	1.388	.227	.229
19	1.392	1.391	.174	.174
20	1.434	1.444	.312	.372

TECH. K.W. Elliott ENGR.

EQUIPMENT: Decade Resistor I-73730
DVM I-55991
HeathKit VM

* input at 3.5 V Resistor at 500Ω and read voltage at output
See other side

COMMENTS: * Measurement on pin C

This data is $V_{I\,one}$ and V_{Bone} @ 500 Ω at procedure described in the test plan. Units not listed could not be measured according to test procedure.

d	$V_{I\,on}$
1	1.535
5	1.687
6	1.678
7	1.646
10	1.549
11	1.520
15	1.522
16	1.654
15	1.501
19	1.49
20	1.685

Mod	V_{Bone}
3	1.665
4	1.531
5	1.652
6	1.682
7	1.656
9	1.706
10	1.540
11	1.521
12	1.680
15	1.526
16	1.661
18	1.505
19	1.490
20	1.636

CIRCUIT TYPE: A-5

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Input V max zero

PRE RADIATION

Date: Dec 21, 1964 Jan 25, 1965

Temp: 78 77°

MOD	3.75KΩ V_B zero	3.75KΩ V_I zero	500Ω V_B zero	500Ω V_I zero
1	1.393*	1.389	1.464*	1.459
2	1.362	1.357	1.429	1.423
3	1.348	1.345	1.417	1.417
4	1.368	1.370	1.439	1.442
5	1.350	1.349	1.415	1.414
6	1.321	1.325	1.393	1.389
7	1.344	1.345	1.412	1.410
8	1.376	1.364	1.449	1.431
9	1.319	1.351	1.392	1.413
10	1.278	1.295	1.333	1.342
11	1.360	1.365	1.430	1.432
12	1.346	1.336	1.409	1.403
13	1.334	1.338	1.396	1.404
14	1.341	1.373	1.425	1.446
15	1.363	1.360	1.434	1.434
16	1.311	1.310	1.380	1.373
17	1.364	1.376	1.443	1.454
18	1.333	1.324	1.399	1.397
19	1.327	1.325	1.395	1.396
20	1.322	1.327	1.389	1.396

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date:

Temp:

MOD	3.75KΩ V_B zero	3.75KΩ V_I zero	500Ω V_B zero	500Ω V_I zero
1	1.440*	1.439	1.602*	1.666
2	1.402	1.399	1.525	1.525
3	1.379	1.377	1.504	1.503
4	1.379	1.380	1.450	1.474
5	1.383	1.383	1.501	1.503
6	1.355	1.361	1.483	1.484
7	1.378	1.375	1.486	1.487
8	1.426	1.412	1.559	1.561
9	1.367	1.393	1.526	1.528
10	1.308	1.315	1.421	1.418
11	1.365	1.367	1.436	1.436
12	1.377	1.373	1.503	1.503
13	1.378	1.381	1.532	1.533
14	1.404	1.424	1.612	1.612
15	1.366	1.367	1.438	1.437
16	1.347	1.343	1.467	1.469
17	1.414	1.427	1.585	1.585
18	1.334	1.332	1.407	1.407
19	1.338	1.337	1.408	1.407
20	1.357	1.361	1.488	1.487

TECH. [illegible] ENGR.

EQUIPMENT: Decade Resistor I-73130
DVM I-55991
Heathkit VM

COMMENTS: * Measurement on pin C

CIRCUIT TYPE: A-5

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Driving Current Requirement

PRE RADIATION

Date: Dec 21, 1964
Temp: 78

MOD	I_{DB}	I_{DI}		
1	.91 *	.90		
2	.92	.92		
3	.75	.75		
4	.87	.88		
5	.86	.84		
6	.82	.83		
7	.86	.87		
8	.88	.88		
9	.86	.87		
10	.78	.78		
11	.92	.92		
12	.82	.82		
13	.80	.78		
14	.80	.81		
15	.84	.83		
16	.80	.81		
17	.77	.80		
18	.78	.77		
19	.92	.92		
20	.71	.75		

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date: 5-17-65
Temp: 76.5 °F.

MOD	I_{DB} ma.	I_{DI} ma.		
1	.89 *	.89		
2	.90	.90		
3	.73	.74		
4	.86	.88		
5	.84	.83		
6	.81	.82		
7	.84	.85		
8	.87	.87		
9	.84	.85		
10	.76	.76		
11	.91	.90		
12	.80	.79		
13	.78	.76		
14	.78	.79		
15	.83	.82		
16	.78	.80		
17	.76	.78		
18	.77	.77		
19	.92	.92		
20	69	.73		

TECH. D. A. Kaiser ENGR.

EQUIPMENT: Milliameter I-14196
DVM I-55991

COMMENTS: * Measurement on pin C

CIRCUIT TYPE: A-5

TEST NUMBER: 4

DATA SHEET A

TEST TITLE: Input Leakage Current

PRE RADIATION

Date: Dec 22, 1964 Jan 25, 1965

Temp: 78 78°

MOD	I_{LA}	I_{LB}	I_{LC}	I_{LD}
1	Open Bad	Open Bad	Open Bad	Open Bad
2	$.41 \cdot 10^{-8}$	$.41 \cdot 10^{-8}$	$.45 \cdot 10^{-8}$	$.64 \cdot 10^{-8}$
3	$.16 \cdot 10^{-8}$	$1.80 \cdot 10^{-8}$	$19.00 \cdot 10^{-8}$	$.30 \cdot 10^{-8}$
4	$.36 \cdot 10^{-8}$	$.32 \cdot 10^{-8}$	$.44 \cdot 10^{-8}$	$.49 \cdot 10^{-8}$
5	$.18 \cdot 10^{-8}$	$.19 \cdot 10^{-8}$	$.25 \cdot 10^{-8}$	$.22 \cdot 10^{-8}$
6	$.12 \cdot 10^{-8}$	$.14 \cdot 10^{-8}$	$.14 \cdot 10^{-8}$	$.15 \cdot 10^{-8}$
7	$2.30 \cdot 10^{-8}$	$15.00 \cdot 10^{-8}$	$2.90 \cdot 10^{-8}$	$1.80 \cdot 10^{-8}$
8	Open Bad	$.45 \cdot 10^{-8}$	$.51 \cdot 10^{-8}$	$.62 \cdot 10^{-8}$
9	$.50 \cdot 10^{-8}$	$.31 \cdot 10^{-8}$	$.34 \cdot 10^{-8}$	$.47 \cdot 10^{-8}$
10	$.09 \cdot 10^{-8}$	$.10 \cdot 10^{-8}$	$.10 \cdot 10^{-8}$	$.09 \cdot 10^{-8}$
11	$1.10 \cdot 10^{-8}$	$.75 \cdot 10^{-8}$	$2.70 \cdot 10^{-8}$	$.79 \cdot 10^{-8}$
12	$.20 \cdot 10^{-8}$	$.17 \cdot 10^{-8}$	$.18 \cdot 10^{-8}$	$.23 \cdot 10^{-8}$
13	$.31 \cdot 10^{-8}$	$.30 \cdot 10^{-8}$	$.27 \cdot 10^{-8}$	$.27 \cdot 10^{-8}$
14	$.10 \cdot 10^{-8}$	$.90 \cdot 10^{-8}$	$.90 \cdot 10^{-8}$	$.90 \cdot 10^{-8}$
15	$.31 \cdot 10^{-8}$	$.29 \cdot 10^{-8}$	$.29 \cdot 10^{-8}$	$.35 \cdot 10^{-8}$
16	$4.40 \cdot 10^{-8}$	$5.00 \cdot 10^{-8}$	$4.60 \cdot 10^{-8}$	$2.40 \cdot 10^{-8}$
17	$1.60 \cdot 10^{-8}$	$.26 \cdot 10^{-8}$	$.42 \cdot 10^{-8}$	$.49 \cdot 10^{-8}$
18	$180.00 \cdot 10^{-8}$	$24.00 \cdot 10^{-8}$	$7.80 \cdot 10^{-8}$	$38.00 \cdot 10^{-8}$
19	$260.00 \cdot 10^{-8}$	$190.00 \cdot 10^{-8}$	$250.00 \cdot 10^{-8}$	$57.00 \cdot 10^{-8}$
20	$1.75 \cdot 10^{-8}$	$3.60 \cdot 10^{-8}$	$2.10 \cdot 10^{-8}$	$2.40 \cdot 10^{-8}$

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-17-65

Temp: 77° F.

MOD	I_{LA}	I_{LB}	I_{LC}	I_{LD}
1	—	—	—	—
2	2.02×10^{-8}	1.95×10^{-8}	2.05×10^{-8}	2.09×10^{-8}
3	$.84 \times 10^{-8}$	2.80×10^{-8}	2.00×10^{-7}	$.95 \times 10^{-8}$
4	$.60 \times 10^{-8}$	$.51 \times 10^{-8}$	$.56 \times 10^{-8}$	$.66 \times 10^{-8}$
5	$.98 \times 10^{-8}$	1.02×10^{-8}	1.05×10^{-8}	1.04×10^{-8}
6	$.80 \times 10^{-8}$	$.80 \times 10^{-8}$	$.78 \times 10^{-8}$	$.85 \times 10^{-8}$
7	$.31 \times 10^{-7}$	1.6×10^{-7}	$.45 \times 10^{-7}$	$.29 \times 10^{-7}$
8	—	1.95×10^{-8}	2.05×10^{-8}	2.00×10^{-8}
9	$.75 \times 10^{-7}$	1.30×10^{-8}	1.59×10^{-8}	1.51×10^{-8}
10	$.64 \times 10^{-8}$	$.65 \times 10^{-8}$	$.60 \times 10^{-8}$	—
11	$.87 \times 10^{-8}$	$.71 \times 10^{-8}$	$.32 \times 10^{-7}$	$.75 \times 10^{-8}$
12	$.85 \times 10^{-8}$	$.85 \times 10^{-8}$	$.85 \times 10^{-8}$	$.97 \times 10^{-8}$
13	1.20×10^{-8}	1.26×10^{-8}	1.11×10^{-8}	1.14×10^{-8}
14	1.75×10^{-8}	1.55×10^{-8}	1.60×10^{-8}	1.51×10^{-8}
15	$.30 \times 10^{-8}$	$.27 \times 10^{-8}$	$.27 \times 10^{-8}$	$.34 \times 10^{-8}$
16	$.77 \times 10^{-7}$	$.70 \times 10^{-7}$	$.76 \times 10^{-7}$	$.39 \times 10^{-7}$
17	$.25 \times 10^{-7}$	$.17 \times 10^{-8}$	$.35 \times 10^{-8}$	1.62×10^{-8}
18	$.21 \times 10^{-5}$	$.28 \times 10^{-6}$	1.10×10^{-7}	$.50 \times 10^{-7}$
19	$.29 \times 10^{-5}$	$.20 \times 10^{-5}$	$.26 \times 10^{-5}$	$.72 \times 10^{-6}$
20	$.33 \times 10^{-7}$	1.10×10^{-7}	$.43 \times 10^{-7}$	$.47 \times 10^{-7}$

TECH. D. A. Kaiser ENGR.

EQUIPMENT: Electrometer I-52076
DVM I-55991

COMMENTS:

CIRCUIT TYPE: A-5

TEST NUMBER: 4

DATA SHEET B

TEST TITLE: Input Leakage Current

PRE RADIATION

Date: Dec 22, 1964 Jan 25, 1965
Temp: 78 78°

MOD	I_{LJ}	I_{LI}	I_{LH}	I_{LG}
1	$2.70 \cdot 10^{-8}$	$1.60 \cdot 10^{-8}$	$1.65 \cdot 10^{-8}$	$1.65 \cdot 10^{-8}$
2	$2.40 \cdot 10^{-8}$	$1.50 \cdot 10^{-8}$	$1.60 \cdot 10^{-8}$	$1.65 \cdot 10^{-8}$
3	$58.00 \cdot 10^{-8}$	$61.00 \cdot 10^{-8}$	$6.10 \cdot 10^{-8}$	$79.00 \cdot 10^{-8}$
4	$2.20 \cdot 10^{-8}$	$1.40 \cdot 10^{-8}$	$1.35 \cdot 10^{-8}$	$1.40 \cdot 10^{-8}$
5	$1.10 \cdot 10^{-8}$	$.60 \cdot 10^{-8}$	$.60 \cdot 10^{-8}$	$.90 \cdot 10^{-8}$
6	$.35 \cdot 10^{-8}$	$.50 \cdot 10^{-8}$	$.55 \cdot 10^{-8}$	$1.70 \cdot 10^{-8}$
7	$6.20 \cdot 10^{-8}$	$5.70 \cdot 10^{-8}$	$.35 \cdot 10^{-8}$	$2.60 \cdot 10^{-8}$
8	$2.45 \cdot 10^{-8}$	$1.60 \cdot 10^{-8}$	$2.80 \cdot 10^{-8}$	$2.60 \cdot 10^{-8}$
9	$2.20 \cdot 10^{-8}$	$1.10 \cdot 10^{-8}$	$2.30 \cdot 10^{-8}$	$1.10 \cdot 10^{-8}$
10	$.70 \cdot 10^{-8}$	$.40 \cdot 10^{-8}$	$.30 \cdot 10^{-8}$	$.30 \cdot 10^{-8}$
11	$.67 \cdot 10^{-8}$	$.69 \cdot 10^{-8}$	$.71 \cdot 10^{-8}$	$.90 \cdot 10^{-8}$
12	$.19 \cdot 10^{-8}$	$.17 \cdot 10^{-8}$	$.19 \cdot 10^{-8}$	$.26 \cdot 10^{-8}$
13	$.25 \cdot 10^{-8}$	$.24 \cdot 10^{-8}$	$.22 \cdot 10^{-8}$	$900.00 \cdot 10^{-8}$
14	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	$.95 \cdot 10^{-8}$	$.95 \cdot 10^{-8}$
15	$16.00 \cdot 10^{-8}$	$.31 \cdot 10^{-8}$	$.36 \cdot 10^{-8}$	$.30 \cdot 10^{-8}$
16	$28.00 \cdot 10^{-8}$	$7.20 \cdot 10^{-8}$	$6.40 \cdot 10^{-8}$	$6.50 \cdot 10^{-8}$
17	$1.90 \cdot 10^{-8}$	$1.20 \cdot 10^{-8}$	$1.30 \cdot 10^{-8}$	$3.10 \cdot 10^{-8}$
18	$45.00 \cdot 10^{-8}$	$1.25 \cdot 10^{-8}$	$33.00 \cdot 10^{-8}$	$7.05 \cdot 10^{-8}$
19	$90.00 \cdot 10^{-8}$	$70.00 \cdot 10^{-8}$	$300.00 \cdot 10^{-8}$	$36.00 \cdot 10^{-8}$
20	$72.00 \cdot 10^{-8}$	$2.70 \cdot 10^{-8}$	$1.50 \cdot 10^{-8}$	$2.45 \cdot 10^{-8}$

TECH. Eplenbach ENGR.

POST RADIATION

Date: 5-17-65
Temp: 77°F.

MOD	I_{LJ}	I_{LI}	I_{LH}	I_{LG}
1	1.95×10^{-8}	1.66×10^{-8}	1.91×10^{-8}	1.95×10^{-8}
2	1.69×10^{-8}	1.80×10^{-8}	2.00×10^{-8}	1.99×10^{-8}
3	$.60 \times 10^{-7}$	$.69 \times 10^{-6}$	$.65 \times 10^{-7}$	1.35×10^{-6}
4	$.76 \times 10^{-7}$	$.71 \times 10^{-8}$	$.68 \times 10^{-8}$	$.78 \times 10^{-8}$
5	$.85 \times 10^{-8}$	$.85 \times 10^{-8}$	$.88 \times 10^{-8}$	1.66×10^{-8}
6	$.81 \times 10^{-8}$	$.78 \times 10^{-8}$	$.90 \times 10^{-8}$	1.0×10^{-7}
7	1.85×10^{-8}	$.88 \times 10^{-7}$	1.40×10^{-8}	$.35 \times 10^{-7}$
8	1.75×10^{-8}	1.85×10^{-8}	$.32 \times 10^{-7}$	$.31 \times 10^{-7}$
9	1.20×10^{-8}	1.30×10^{-8}	$.23 \times 10^{-7}$	1.40×10^{-8}
10	$.61 \times 10^{-8}$	$.60 \times 10^{-8}$	$.55 \times 10^{-8}$	$.59 \times 10^{-8}$
11	$.66 \times 10^{-8}$	$.65 \times 10^{-8}$	$.70 \times 10^{-8}$	$.80 \times 10^{-8}$
12	$.79 \times 10^{-8}$	$.87 \times 10^{-8}$	$.85 \times 10^{-8}$	$.96 \times 10^{-8}$
13	1.14×10^{-8}	1.10×10^{-8}	1.00×10^{-8}	$.75 \times 10^{-5}$
14	1.65×10^{-8}	1.72×10^{-8}	1.58×10^{-8}	1.62×10^{-8}
15	$.19 \times 10^{-6}$	$.30 \times 10^{-8}$	$.37 \times 10^{-8}$	$.29 \times 10^{-8}$
16	$.22 \times 10^{-6}$	$.93 \times 10^{-7}$	$.90 \times 10^{-7}$	$.35 \times 10^{-7}$
17	1.00×10^{-8}	1.49×10^{-8}	1.54×10^{-8}	$.35 \times 10^{-7}$
18	$.34 \times 10^{-6}$	$.19 \times 10^{-6}$	$.36 \times 10^{-6}$	$.71 \times 10^{-7}$
19	$.82 \times 10^{-6}$	$.11 \times 10^{-5}$	$.44 \times 10^{-5}$	$.40 \times 10^{-6}$
20	1.25×10^{-6}	$.36 \times 10^{-7}$	$.37 \times 10^{-7}$	$.32 \times 10^{-7}$

TECH. D.A. Kaiser ENGR.

EQUIPMENT: Electrometer I-52076
DVM - I-55991

COMMENTS:

CIRCUIT TYPE: A-5

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Output Driving Current Capabilities

PRE RADIATION

Date: 1-26-65
Temp: 78°F

MOD	I_{DE}	I_{DF}	V_{DE}	V_{DF}
1	7.2 ma	7.1 ma	.202	.255
2	7.1	7.1	.269	.255
3	7.3	7.2	.190	.196
4	7.2	7.2	.233	.239
5	7.2	7.2	.213	.211
6	7.3	7.3	.157	.160
7	7.3	7.2	.190	.197
8	7.2	7.2	.239	.229
9	7.3	7.3	.187	.189
10	7.3	7.3	.173	.166
11	7.2	7.2	.204	.207
12	7.2	7.2	.234	.233
13	7.3	7.3	.174	.180
14	7.2	7.2	.234	.222
15	7.2	7.3	.199	.197
16	7.2	7.3	.201	.201
17	7.2	7.2	.224	.219
18	7.2	7.2	.217	.219
19	7.3	7.3	.165	.165
20	7.3	7.3	.173	.175

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date: 5-18-65
Temp: 76°F

MOD	I_{DE} ma	I_{DF} ma	V_{DE} Volt	V_{DF} Volt	
1	4.1	4.0	1.809	1.859	note a
2	6.6	6.6	.461	.462	
3	6.9	6.7	.293	.400	
4	7.0	7.0	.232	.239	
5	6.8	6.8	.323	.336	
6	6.9	6.9	.294	.295	
7	6.9	6.9	.293	.295	
8	4.5	5.0	1.612	1.302	note b
9	6.8	6.1	.331	.726	
10	6.9	7.0	.253	.247	note c
11	7.0	7.0	.204	.207	
12	6.8	6.7	.355	.412	
13	5.8	4.7	.896	1.513	
14	3.8	3.8	1.964	1.979	
15	7.0	7.1	.199	.197	
16	6.8	6.8	.324	.324	
17	4.8	4.8	1.409	1.416	
18	7.0	7.0	.216	.217	
19	7.1	7.1	.164	.165	
20	6.9	6.8	.287	.322	

TECH. D. A. Kaiser ENGR.

EQUIPMENT: DVM I-55991
Ma Meter I-14197
VM I-23962
Decade Resistor I-73730

COMMENTS:

a) inputs A, B, C, & D were left open
b.) input A was left open
c.) input D was left open

See comments for Test 5 & results of Test 4 Post-Radiation measurements.

DAK

CIRCUIT TYPE: A-5

TEST NUMBER: 6

DATA SHEET A

TEST TITLE: Transient Output Parameters

PRE RADIATION

Date: 12-31-64
Temp: 78°F
Input Pulse: τ_R 6.5, τ_F 4.5

MOD	τ_S	τ_D	τ_R	τ_F
1	—	—	—	—
2	10	12.5	14	80
3	14	15.5	18.5	100
4	14.5	15.5	18.5	100
5	10	13	15.5	85
6	16	14.5	17.5	95
7	16	15.5	16.5	95
8	10	13	16.5	85
9	13	13	15	90
10	21	12.5	14	95
11	14	14.5	15.5	95
12	12	12.5	14	95
13	15	15.5	17	100
14	11	14.5	17.5	95
15	11.5	14.5	16.5	95
16	19.5	14.5	17	95
17	12	15.5	18.5	95
18	10	14	18	106
19	16.5	14.5	17.5	95
20	19.5	16.5	18.5	100

TECH. M.W. Elliott ENGR. [illegible]

POST RADIATION

Date:
Temp:
Input Pulse: τ_R 6.5, τ_F 4.0

MOD	τ_S	τ_D	τ_R	τ_F
1	–	–	–	–
2	7.5	13.5	23	82
3	7.5	16.5	26	100
4	10.5	13.5	15.5	80
5	9.5	14.5	20.5	90
6	9.5	16	25	94
7	9.5	16	22.5	94
8	7.5	15	16	86
9	9.5	14.5	25	88
10	11	13	18	92
11	14	14.5	15	96
12	8.5	14	23	88
13	9	17.5	29	92
14	8.5	17	19	94
15	12	15.5	16	92
16	10	15.5	23.5	94
17	7	17	34	96
18	11	15	18.5	100
19	16	15.5	17.5	100
20	10	18	27	98

TECH. M.W. Elliott ENGR.

EQUIPMENT: TI Pulse gen.
Sampling oscilloscope

COMMENTS: Pin B
Mods 11-15 Tested 1-20-65
Temp 78°

CIRCUIT TYPE: A-5

TEST NUMBER: 6

DATA SHEET B

TEST TITLE: Transient Output Parameters

PRE RADIATION

Date: 12-31-64

Temp: 78 °F

Input Pulse: τ_r 6.5 τ_f 4.5

MOD	τ_d	τ_s	τ_r	τ_F
1	10	13.5	16.5	85
2	10	12.5	14	80
3	14.5	16	20	100
4	10	13.5	16.5	85
5	15	13.5	14.5	85
6	17	15	17	100
7	18	16	17	95
8	10	13.5	16.5	85
9	12	14.5	16	85
10	20	13	14	95
11	13.5	16	17	90
12	13	13.5	16	95
13	14	20	25	95
14	11	16.5	19	95
15	11.5	16	17	95
16	20	15	17	90
17	12	16.5	19	95
18	11	14.5	18	95
19	17.5	15.5	17.5	95
20	17.5	17	19	100

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date:

Temp:

Input Pulse: τ_r 6.5, τ_F 3.5

MOD	τ_d	τ_s	τ_r	τ_F
1	7	16.5	37	80
2	7.5	14.5	25	80
3	9.5	18.5	29	96
4	9.5	14.5	16.5	84
5	8.5	15.5	23	88
6	9	16.5	26	96
7	10	17	24	90
8	7.5	15.5	30	80
9	8	16.5	28	88
10	10	14.5	19	90
11	14	16	16.5	90
12	8	16	26	90
13	9	22	43	92
14	7.5	19.5	41	88
15	12	16.5	18	90
16	8.5	16.5	24	92
17	8	19	35	90
18	10.5	15.5	18	92
19	17	16	17	96
20	9	18	18.5	98

TECH. [illegible] ENGR.

EQUIPMENT: Same as shoot A

COMMENTS: Pin F

Mods 11-15 Tested 1-20-65
Temp 78°

CIRCUIT TYPE: A-5

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Resistance R_1 and R_2

PRE RADIATION				
Date: Dec 29, 64 1-26-65				
Temp: 78 78°				
MOD	R_x	R_y		
1	open	2.188 K		
2	2.062 K	2.060		
3	2.249	2.253		
4	2.273	2.261		
5	2.027	2.022		
6	2.074	2.069		
7	2.000	1.976		
8	2.184	2.187		
9	2.046	2.026		
10	2.233	2.224		
11	1.939	1.941		
12	2.308	2.275		
13	2.205	2.090		
14	2.164	2.168		
15	2.062	2.064		
16	2.159	2.137		
17	2.179	2.157		
18	2.250	2.261		
19	1.864	1.869		
20	2.334	2.302		
TECH. Erlenbach			ENGR. [illegible]	

POST RADIATION				
Date: 5-13-65				
Temp: 76°F				
MOD	R_x	R_y		
1	≈ 10 Meg	2.386 K		
2	2.160 K	2.155		
3	2.264	2.270		
4	2.289	2.276		
5	2.113	2.104		
6	2.160	2.154		
7	2.070	2.045		
8	2.313	2.359		
9	2.141	2.116		
10	2.326	2.316		
11	1.951	1.951		
12	2.406	2.371		
13	2.267	2.172		
14	2.274	2.273		
15	2.074	2.074		
16	2.244	2.218		
17	2.289	2.258		
18	2.265	2.280		
19	1.876	1.884		
20	2.430	2.395		
TECH. K. W. Elliott			ENGR.	

EQUIPMENT: Wheatstone Bridge I-25471

COMMENTS:

CIRCUIT TYPE: A-5

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Resistance R_4

PRE RADIATION				
Date: Dec 29, 64 1-26-65				
Temp: 76 78°				
MOD	R_4E	R_4F		
1	5.392 K	5.368 K		
2	5.369	5.388		
3	6.518	6.603		
4	5.745	5.637		
5	5.644	5.801		
6	6.113	6.100		
7	5.727	5.814		
8	5.458	5.542		
9	5.723	5.802		
10	6.404	6.575		
11	5.406	5.473		
12	6.191	6.225		
13	6.273	6.258		
14	6.255	6.247		
15	5.884	5.984		
16	6.262	6.098		
17	6.105	6.219		
18	6.606	6.479		
19	5.398	5.381		
20	7.027	7.003		
TECH. Erlenbach			ENGR. RPD	

POST RADIATION				
Date: 5-14-65				
Temp: 75°F				
MOD	R_4E	R_4F		
1	5.466 K	5.449 K		
2	5.447	5.470		
3	6.624	6.710		
4	5.744	5.640		
5	5.744	5.900		
6	6.194	6.180		
7	5.814	5.890		
8	5.540	5.620		
9	5.830	5.910		
10	6.520	6.670		
11	5.410	5.470		
12	6.300	6.330		
13	6.360	6.350		
14	6.340	6.160		
15	5.884	5.980		
16	6.349	6.160		
17	6.209	6.320		
18	6.604	6.480		
19	5.393	5.380		
20	7.149	7.119		
TECH. K. W. Elliott			ENGR.	

EQUIPMENT: Wheatstone Bridge I-25471

COMMENTS:

CIRCUIT TYPE: A-5

TEST NUMBER: 9

DATA SHEET

TEST TITLE: Forward Voltage of an Input Diode

PRE RADIATION				
Date: Dec 30, 64 1-26-65				
Temp: 79 78°				
MOD	V_{FB}	V_{FT}		
1	open	.741		
2	.726	.726		
3	.724	.726		
4	.730	.731		
5	.724	.722		
6	.710	.709		
7	.724	.724		
8	.728	.730		
9	.724	.724		
10	.702	.700		
11	.730	.728		
12	.720	.723		
13	.714	.713		
14	.734	.732		
15	.730	.729		
16	.707	.711		
17	.740	.735		
18	.710	.714		
19	.712	.715		
20	.715	.714		
TECH. Erlenbach			ENGR.	

POST RADIATION				
Date: 5-18-65				
Temp: 76°C				
MOD	V_{FB}	V_{FT}		
1	—	.751		
2	.736	.737		
3	.731	.734		
4	.732	.733		
5	.732	.731		
6	.719	.718		
7	.732	.732		
8	.737	.738		
9	.734	.734		
10	.711	.709		
11	.732	.730		
12	.729	.731		
13	.725	.724		
14	.744	.741		
15	.731	.731		
16	.716	.721		
17	.751	.746		
18	.714	.716		
19	.715	.717		
20	.725	.723		
TECH. D. A. Kaiser			ENGR.	

EQUIPMENT: DVM I-55991
Ma Meter I-14196

COMMENTS:

CIRCUIT TYPE: A-5

TEST NUMBER: 10

DATA SHEET

TEST TITLE: Minority Carrier Lifetime of Input Diode

PRE RADIATION Date: 1-16-65 Temp: 78°F				
MOD	τ_B (ns)	τ_I (ns)		
1		4.6		
2	4.1	4.2		
3	4.0	3.9		
4	4.2	4.0		
5	4.0	3.6		
6	4.0	3.7		
7	4.0	4.2		
8	4.0	4.0		
9	3.9	3.9		
10	3.8	3.1		
11	4.5	4.0		
12	4.1	3.9		
13	3.9	3.7		
14	4.1	4.0		
15	4.1	4.0		
16	4.0	4.0		
17	4.3	3.5		
18	3.7	2.9		
19	3.7	3.8		
20	3.8	4.0		
TECH.			ENGR. RS	

POST RADIATION Date: 6-3-65 Temp: 75°F				
MOD	τ_B (ns)	τ_I (ns)		
1		3.4		
2	2.2	3.8		
3	3.3	3.0		
4	3.9	3.2		
5	3.1	3.3		
6	2.9	3.1		
7	3.2	3.9		
8	2.7	2.9		
9	2.8	3.1		
10	2.6	2.9		
11	3.4	3.5		
12	3.6	3.3		
13	3.1	3.3		
14	3.3	3.3		
15	3.1	2.8		
16	2.8	3.0		
17	3.3	2.8		
18	3.4	3.2		
19	3.3	3.2		
20	3.4	3.6		
TECH.			ENGR. RS	

EQUIPMENT:

COMMENTS:

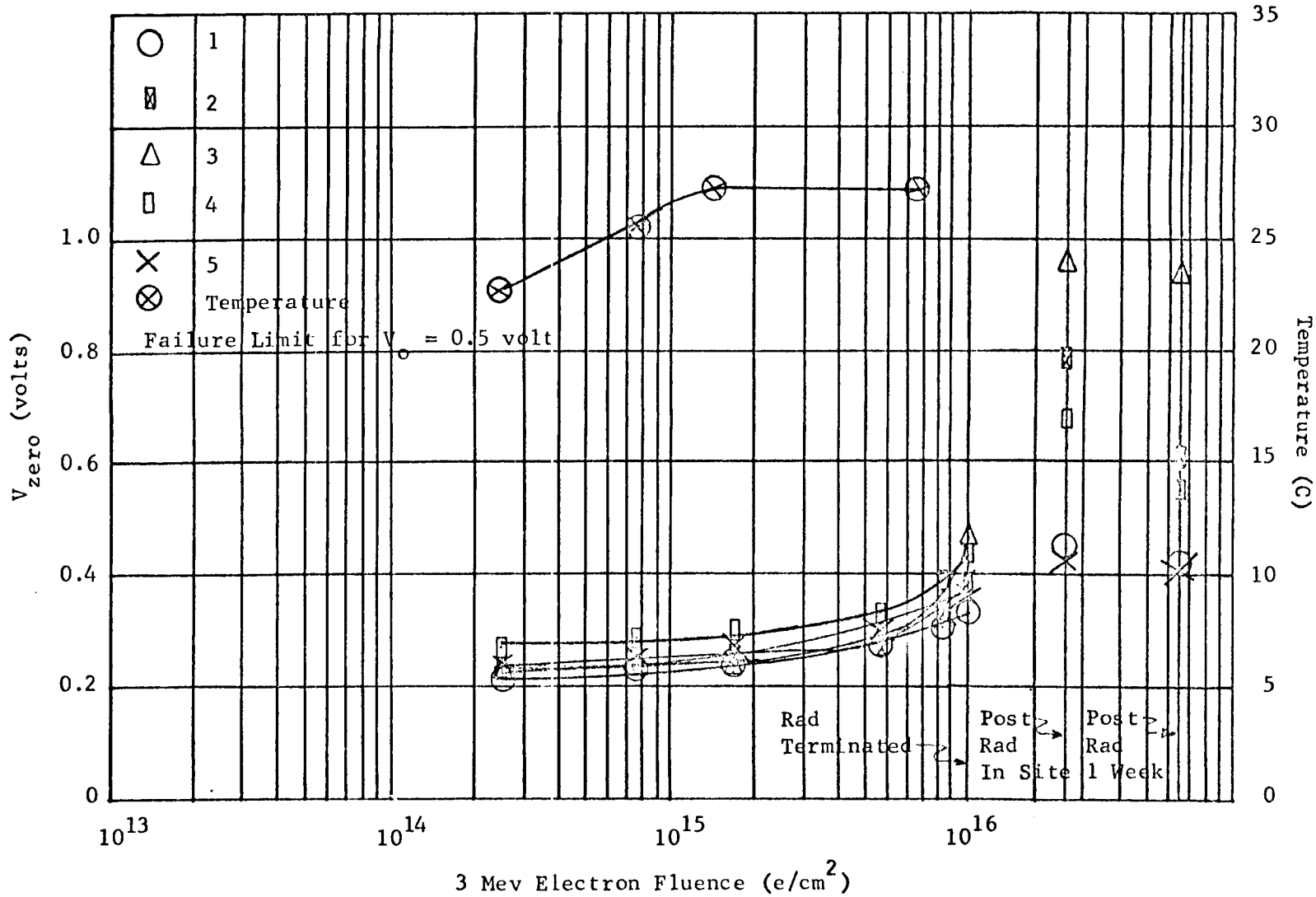
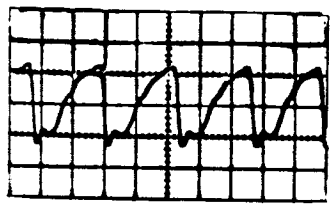
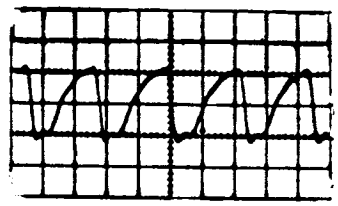


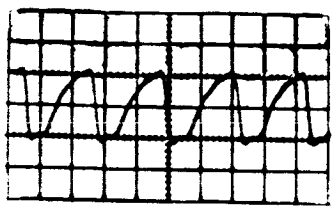
FIGURE III-9. RADIATION RESPONSE OF UNIT A-5



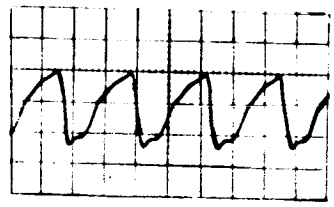
A - Initial



B - Final



C - Post Rad In Site



D - Post Rad 1 Week

Scale: 0.2 volt/cm
0.1 μsec/cm

FIGURE III-10. OUTPUT OF 5-STAGE OSCILLATOR OF A-5 CIRCUITS

CIRCUIT TYPE: A-6

TEST NUMBER: 1

DATA SHEET A

TEST TITLE: Direct Input Characteristics

PRE RADIATION

Date: 2-3-65
Temp: 75°

MOD	3.75K $V_{0\,SD}$	3.75K $V_{1\,SD}$	600Ω $V_{0\,SD}$	600Ω $V_{1\,SD}$
1	1.392	1.435	1.456	1.533
2	1.357	1.393	1.411	1.476
3	1.369	1.409	1.429	1.499
4	1.359	1.396	1.415	1.479
5	1.389	1.429	1.449	1.525
6	1.424	1.476	1.507	1.641
7	1.359	1.399	1.419	1.485
8	1.369	1.406	1.429	1.492
9	1.380	1.421	1.444	1.522
10	1.409	1.459	1.487	1.590
11	1.357	1.399	1.423	1.501
12	1.354	1.397	1.415	1.489
13	1.350	1.391	1.410	1.483
14	1.366	1.409	1.430	1.501
15	1.351	1.394	1.414	1.491
16	1.344	1.387	1.466	1.484
17	1.345	1.384	1.400	1.469
18	1.341	1.382	1.399	1.469
19	1.341	1.386	1.407	1.489
20	1.340	1.382	1.397	1.472

TECH. K. W. Elliott ENGR.

POST RADIATION

Date: 5-27-65
Temp: 77°F

MOD	3.75K $V_{0\,SD}$	3.75K $V_{1\,SD}$	600Ω $V_{0\,SD}$	600Ω $V_{1\,SD}$
1	1.442	1.543	1.605	1.861 at (V_x = 2.145)
2	1.385	1.459	1.495	1.655
3	1.387	1.465	1.497	1.659
4	1.355	1.392	1.403	1.472
5	1.421	1.502	1.544	1.849 at (V_x = .767)
6	1.475	1.593	1.695	1.837 at (V_x = 2.595)
7	1.384	1.452	1.489	1.639
8	1.413	1.504	1.554	1.817 at (V_x = 1.472)
9	1.405	1.480	1.521	1.143
10	1.441	1.529	1.579	1.854 at (V_x = 1.545)
11	1.352	1.394	1.415	1.494
12	1.379	1.453	1.486	1.649
13	1.381	1.466	1.507	1.821 at (V_x = .964)
14	1.396	1.483	1.522	1.845 at (V_x = 1.130)
15	1.346	1.389	1.407	1.484
16	1.346	1.389	1.408	1.487
17	1.376	1.449	1.480	1.633
18	1.342	1.383	1.399	1.469
19	1.376	1.461	1.503	1.850 at (V_x = .854)
20	1.369	1.443	1.476	1.649

TECH. D. A. Kaiser ENGR.

EQUIPMENT: DVM I 55991
Decade resistor I 73730

COMMENTS:
Mods 16-20 tested 2-8-65
Temp 80°

CIRCUIT TYPE: A-6

TEST NUMBER: 1

DATA SHEET B

TEST TITLE: Direct Input Characteristics

PRE RADIATION				
Date: 2-3-65				
Temp: 75°				
	3.75K		600Ω	
MOD	$V_{o\,CD}$	$V_{1\,CD}$	$V_{o\,CD}$	$V_{1\,CD}$
1	1.397	1.437	1.454	1.526
2	1.356	1.393	1.411	1.475
3	1.365	1.400	1.419	1.480
4	1.355	1.393	1.411	1.473
5	1.380	1.419	1.439	1.506
6	1.423	1.479	1.507	1.637
7	1.360	1.400	1.422	1.491
8	1.365	1.403	1.423	1.489
9	1.377	1.417	1.440	1.515
10	1.406	1.459	1.489	1.590
11	1.353	1.395	1.417	1.491
12	1.352	1.393	1.410	1.480
13	1.349	1.387	1.406	1.474
14	1.363	1.407	1.426	1.502
15	1.352	1.393	1.415	1.489
16	1.337	1.382	1.406	1.487
17	1.344	1.384	1.402	1.470
18	1.339	1.382	1.398	1.466
19	1.335	1.381	1.404	1.489
20	1.339	1.382	1.403	1.479
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 5-27-65				
Temp: 77°F				
	3.75KΩ		600Ω	
MOD	$V_{o\,CD}$	$V_{1\,CD}$	$V_{o\,CD}$	$V_{1\,CD}$
1	1.446	1.540	1.599	1.846 at (V_x = 2.072)
2	1.380	1.453	1.490	1.644
3	1.395	1.479	1.520	1.872 at (V_x = .825)
4	1.349	1.387	1.372	1.466
5	1.425	1.525	1.582	1.846 at (V_x = 1.680)
6	1.475	1.599	1.716	1.863 at (V_x = 2.635)
7	1.383	1.452	1.490	1.639
8	1.405	1.499	1.549	1.839 at (V_x = 1.444)
9	1.411	1.501	1.553	1.849 at (V_x = 1.402)
10	1.444	1.535	1.589	1.863 at (V_x = 1.573)
11	1.344	1.389	1.409	1.484
12	1.385	1.474	1.514	1.860 at (V_x = .809)
13	1.379	1.465	1.506	1.823 at (V_x = .92)
14	1.392	1.481	1.520	1.837 at (V_x = 1.047)
15	1.343	1.387	1.406	1.482
16	1.337	1.384	1.406	1.489
17	1.376	1.453	1.489	1.649
18	1.339	1.380	1.397	1.467
19	1.371	1.457	1.563	1.863 at (V_x = .514)
20	1.379	1.472	1.514	1.823 at (V_x = 1.142)
TECH. [illegible]		ENGR.		

EQUIPMENT: Same as sheet A

COMMENTS:
Mods 16-20 tested 2-8-65
Temp 80°

CIRCUIT TYPE: A-6

TEST NUMBER: 1

DATA SHEET C

TEST TITLE: Direct Input Characteristics

PRE RADIATION

Date: 2-4-65
Temp: 75°

MOD	I_{CD} ($\times 10^{-3}$ amp.)	I_{SD} ($\times 10^{-3}$ amp.)		
1	.54	.55		
2	.58	.59		
3	.60	.63		
4	.59	.60		
5	.60	.61		
6	.62	.64		
7	.48	.48		
8	.57	.58		
9	.52	.54		
10	.60	.62		
11	.58	.59		
12	.70	.70		
13	.64	.65		
14	.66	.66		
15	.60	.61		
16	.56	.58		
17	.69	.69		
18	.65	.66		
19	.52	.53		
20	.60	.61		
TECH. N.W. Elliott		ENGR.		

POST RADIATION

Date: 5-27-65
Temp: 77°F

MOD	I_{CD} (ma)	I_{SD} (ma)		
1	.527	.540		
2	.563	.577		
3	.587	.614		
4	.585	.602		
5	.592	.595		
6	.612	.631		
7	.470	.467		
8	.559	.568		
9	.512	.522		
10	.580	.600		
11	.580	.590		
12	.683	.684		
13	.623	.639		
14	.640	.650		
15	.600	.604		
16	.560	.579		
17	.672	.677		
18	.646	.660		
19	.517	.519		
20	.580	.612		
TECH. D.A. Kaiser		ENGR.		

EQUIPMENT: DVM I55991
Millammeter C1279 1.5 ma scale

595
.005
600

COMMENTS:

Mod 16-20 Tested 2-8-65
temp 80°

CIRCUIT TYPE: A-6

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Direct Set Reset Input Leakage Current

PRE RADIATION

Date: 2-6-65
Temp: 76°

MOD	I_{LCD}	I_{LSD}		
1	$.3\times10^{-8}$	$.11\times10^{-7}$		
2	$.14\times10^{-8}$	$.13\times10^{-8}$		
3	$.61\times10^{-8}$	$.41\times10^{-8}$		
4	$.16\times10^{-8}$	$.16\times10^{-8}$		
5	$.21\times10^{-8}$	$.54\times10^{-8}$		
6	$.26\times10^{-6}$	$.16\times10^{-6}$		
7	$.11\times10^{-8}$	$.1\times10^{-8}$		
8	$.31\times10^{-8}$	$.32\times10^{-8}$		
9	$.65\times10^{-9}$	$.67\times10^{-9}$		
10	$.5\times10^{-7}$	$.52\times10^{-7}$		
11	$.55\times10^{-6}$	$.7\times10^{-6}$		
12	$.65\times10^{-6}$	$.19\times10^{-5}$		
13	$.11\times10^{-6}$	$.56\times10^{-6}$		
14	$.62\times10^{-6}$	$.16\times10^{-5}$		
15	$.21\times10^{-5}$	$.62\times10^{-6}$		
16	$.18\times10^{-6}$	$.35\times10^{-6}$		
17	$.1\times10^{-5}$	$.35\times10^{-6}$		
18	$.1\times10^{-5}$	$.29\times10^{-5}$		
19	$.3\times10^{-5}$	$.24\times10^{-6}$		
20	$.3\times10^{-6}$	$.47\times10^{-6}$		
TECH. [illegible]		ENGR.		

POST RADIATION

Date: 5-28-65
Temp: 77°F
Meas. at 50

MOD	I_{LCD}	I_{LSD}		
1	$.11\times10^{-7}$	$.195\times10^{-7}$		
2	$.51\times10^{-8}$	$.515\times10^{-8}$		
3	$.145\times10^{-7}$	$.125\times10^{-7}$		
4	$.165\times10^{-8}$	$.16\times10^{-8}$		
5	$.76\times10^{-8}$	$.105\times10^{-7}$		
6	$.23\times10^{-6}$	$.145\times10^{-6}$		
7	$.46\times10^{-8}$	$.56\times10^{-8}$		
8	$.10\times10^{-7}$	$.698\times10^{-7}$		
9	$.31\times10^{-8}$	$.38\times10^{-8}$		
10	$.43\times10^{-7}$	$.43\times10^{-7}$		
11	$.525\times10^{-6}$	$.70\times10^{-6}$		
12	$.59\times10^{-6}$	$.205\times10^{-5}$		
13	$.20\times10^{-6}$	$.36\times10^{-6}$		
14	$.57\times10^{-6}$	$.165\times10^{-5}$		
15	$.205\times10^{-5}$	$.56\times10^{-6}$		
16	$.188\times10^{-6}$	$.305\times10^{-6}$		
17	$.74\times10^{-6}$	$.325\times10^{-6}$		
18	$.69\times10^{-6}$	$.31\times10^{-5}$		
19	$.39\times10^{-5}$	$.295\times10^{-6}$		
20	$.295\times10^{-6}$	$.48\times10^{-6}$		
TECH. T. A. Kaiser		ENGR.		

EQUIPMENT: DVM I 55991
Electrometer I 52076
with shunt I 52075

COMMENTS:
Both V_x and 2.7 V corrected for Drop across Electrometer

Mod 5 16-20 Tested 2-8-65
Temp 78°

CIRCUIT TYPE: A-6

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Clocked Set Reset Input Threshold

PRE RADIATION

Date: 2-4-65
Temp: 76°

MOD	$V_{C1,2}$	$V_{S1,2}$		
1	1.416	1.433		
2	1.381	1.381		
3	1.376	1.395		
4	1.380	1.390		
5	1.397	1.400		
6	1.423	1.435		
7	1.393	1.401		
8	1.404	1.414		
9	1.415	1.417		
10	1.422	1.441		
11	1.379	1.379		
12	1.366	1.380		
13	1.360	1.390		
14	1.402	1.415		
15	1.370	1.393		
16	1.411	1.405		
17	1.412	1.407		
18	1.418	1.413		
19	1.381	1.411		
20	1.421	1.413		

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-2-65
Temp: 77°F

MOD	$V_{C,1,2}$	$V_{S,1,2}$		
1	1.411	1.362		
2	1.366	1.374		
3	1.366	1.372		
4	1.343	1.329		
5	1.385	1.385		
6	1.389	1.381		
7	1.404	1.394		
8	1.407	1.404		
9	1.418	1.425		
10	1.432	1.402		
11	1.335	1.327		
12	1.348	1.345		
13	1.382	1.351		
14	1.402	1.391		
15	1.351	1.330		
16	1.379	1.345		
17	1.380	1.343		
18	1.369	1.337		
19	1.363	1.436		
20	1.432	1.402		

TECH. [illegible] ENGR.

EQUIPMENT: DVM E55991 for $V_{C1,2}$ and $V_{S1,2}$

COMMENTS:

VOM ON Q
Mods 16-20 Tested 2-9-65 Temp 78°

Variation Mods 1 and 2 + 20MV
2-9-65

CIRCUIT TYPE: A-6

TEST NUMBER: 4

DATA SHEET A

TEST TITLE: Clocked Set Reset Input Driving Current

PRE RADIATION

Date: 2-4-65
Temp: 750

I in ma

MOD	I_{C1}	I_{C2}	I_{CP}	I_{S1}
1	.52	.52	1.8	.50
2	.56	.55	1.9	.54
3	.59	.59	2.0	.58
4	.57	.57	2.0	.55
5	.57	.57	2.0	.58
6	.59	.59	2.0	.58
7	.44	.44	1.6	.45
8	.52	.52	1.9	.53
9	.49	.49	1.7	.48
10	.56	.56	1.9	.55
11	.54	.54	1.9	.54
12	.64	.64	2.3	.64
13	.60	.60	2.1	.59
14	.62	.62	2.2	.60
15	.56	.56	2.0	.57
16	.55	.55	1.9	.54
17	.65	.65	2.3	.64
18	.62	.62	2.2	.61
19	.50	.50	1.7	.48
20	.57	.57	2.0	.56

TECH. W. W. Elliott ENGR. [illegible]

POST RADIATION

Date: 5-27-65
Temp: 77°F

Current, ma.

MOD	I_{C1}	I_{C2}	I_{CP}	I_{S1}
1	.511	.510	1.73	.497
2	.542	.542	1.86	.527
3	.575	.576	2.00	.564
4	.565	.564	1.93	.550
5	.561	.561	1.95	.560
6	.577	.578	1.98	.563
7	.434	.435	1.53	.438
8	.504	.503	1.80	.519
9	.478	.478	1.67	.469
10	.546	.546	1.92	.539
11	.541	.541	1.90	.542
12	.640	.640	2.23	.646
13	.593	.593	2.06	.580
14	.606	.607	2.12	.595
15	.564	.565	1.98	.568
16	.543	.544	1.88	.534
17	.633	.633	2.20	.628
18	.619	.619	2.16	.608
19	.481	.482	1.67	.475
20	.555	.556	1.90	.542

TECH. D. A. Kavin ENGR.

EQUIPMENT: DVM I 55991
Milliammeter C1279

COMMENTS:
Mods 16-20 tested 2-9-65
Temp 78°

CIRCUIT TYPE: A-6

TEST NUMBER: 4

DATA SHEET B

TEST TITLE: Clocked Set Reset Input Driving Current

PRE RADIATION				
Date: 2-4-65				
Temp: 75°				
	Iin mA			
MOD	I_{sz}			
1	.51			
2	.54			
3	.58			
4	.55			
5	.58			
6	.58			
7	.45			
8	.53			
9	.48			
10	.55			
11	.54			
12	.64			
13	.59			
14	.60			
15	.57			
16	.54			
17	.64			
18	.61			
19	.48			
20	.56			
TECH. R.W. Elliott		ENGR.		

POST RADIATION				
Date: 5-25-65				
Temp: 77°F				
	Current, ma.			
MOD	I_{sz}			
1	.499			
2	.527			
3	.564			
4	.551			
5	.560			
6	.563			
7	.438			
8	.520			
9	.470			
10	.539			
11	.542			
12	.647			
13	.580			
14	.596			
15	.567			
16	.534			
17	.628			
18	.608			
19	.476			
20	.541			
TECH. D. A. Kaiser		ENGR.		

EQUIPMENT: same as sheet A

COMMENTS:
mods 16-20 tested 2-9-65
Temp 78°

CIRCUIT TYPE: A-6

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Output One Voltage For Q and $\bar{Q}$

PRE RADIATION

Date: 2-4-65
Temp: 76°

MOD	V_{Q1}	$V_{\bar{Q}0}$	V_{Q0}	$V_{\bar{Q}1}$
1	3.983	.070	.075	3.986
2	3.974	.067	.065	3.983
3	3.942	.072	.081	3.985
4	3.981	.067	.067	3.984
5	3.983	.081	.093	3.987
6	3.985	.157	.155	3.989
7	3.990	.067	.069	3.989
8	3.984	.066	.070	3.990
9	3.983	.062	.066	3.984
10	3.987	.109	.119	3.987
11	3.991	.062	.070	3.989
12	3.987	.059	.070	3.984
13	3.987	.059	.067	3.986
14	3.991	.047	.056	3.991
15	3.992	.051	.057	3.989
16	3.986	.041	.047	3.987
17	3.990	.057	.059	3.982
18	3.983	.049	.051	3.983
19	3.989	.045	.043	3.987
20	3.986	.040	.043	3.983

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-27-65
Temp: 77° F

MOD	V_{Q1}	$V_{\bar{Q}0}$	V_{Q0}	$V_{\bar{Q}1}$
1	3.979	.119	.120	3.983
2	3.972	.097	.096	3.981
3	3.480	.111	.111	3.983
4	3.979	.065	.064	3.983
5	3.981	.125	.126	3.985
6	3.983	.210	.201	3.989
7	3.989	.093	.093	3.987
8	3.983	.109	.111	3.989
9	3.981	.100	.096	3.982
10	3.985	.134	.140	3.985
11	3.989	.059	.062	3.987
12	3.986	.163	.103	3.953
13	3.985	.103	.105	3.984
14	3.989	.089	.093	3.990
15	3.991	.049	.051	3.987
16	3.987	.046	.047	3.987
17	3.991	.096	.099	3.983
18	3.983	.052	.049	3.983
19	3.989	.081	.077	3.988
20	3.986	.081	.080	3.984

TECH. D. A. Kurin ENGR.

EQUIPMENT: DVM I 55991 ON Q $\bar{Q}$
VOM ON CP

COMMENTS:
Moving DVM between Q and $\bar{Q}$ will sometimes cause the device to change states. The device may be placed in the correct state by increasing VA to 2.7 V and then decreasing the voltage to .5 V after the DVM has been connected

(OVER)

CIRCUIT TYPE: A-6

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Driving Current Capability

PRE RADIATION

Date: 2-4-65
Temp: 77°

Im ma

MOD	I_{QG}	$I_{\bar{Q}G}$	I_{Qs}	$I_{\bar{Q}s}$
1	.20	.20	9.9	11.9
2	.20	.21	10.6	11.5
3	.22	.22	9.8	11.8
4	.21	.21	10.7	11.7
5	.22	.22	7.4	9.1
6	.23	.23	2.6	2.6
7	.17	.17	10.2	10.9
8	.20	.20	9.1	10.2
9	.19	.19	9.7	10.5
10	.22	.22	5.3	6.1
11	.21	.21	9.3	10.4
12	.25	.22	10.1	11.5
13	.23	.23	10.4	11.6
14	.23	.24	11.9	13.3
15	.21	.22	11.8	12.9
16	.21	.21	12.1	13.0
17	.25	.25	11.8	12.4
18	.23	.23	12.4	13.8
19	.19	.19	12.9	13.1
20	.21	.22	15.0	17.0

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-27-65 } 1-15 5-28-65 } 16-20
Temp: 78°F 77°F

MOD	I_{QG}	$I_{\bar{Q}G}$	I_{Qs}	$I_{\bar{Q}s}$
1	.190	.192	1.98	2.09
2	.200	.202	5.10	5.38
3	.141	.215	4.72	3.80
4	.208	.212	10.62	11.68
5	.209	.232	2.25	2.40
6	.225	.228	0.66	0.59
7	.165	.164	5.13	5.33
8	.200	.200	2.80	2.79
9	.181	.181	4.41	3.17
10	.211	.213	2.31	2.49
11	.204	.205	9.32	10.4
12	.241	.239	4.90	3.86
13	.224	.225	3.62	3.79
14	.228	.231	3.68	3.87
15	.213	.212	11.75	12.98
16	.202	.204	12.13	12.98
17	.241	.240	5.40	5.40
18	.232	.233	12.26	13.79
19	.180	.181	4.30	4.39
20	.205	.210	5.77	3.80

TECH. D. A. Kaiser ENGR.

EQUIPMENT: DYM I55991
Decade resistor I73730
Milliammeter C-1279

COMMENTS:
Mods 16-20 tested 2-9-65
Temp 77°

The low I_{QG} reading for Module 3 may have been inadvertently caused during testing. The voltages were applied when R_L was set at a low value, <1 K.

CIRCUIT TYPE: A-6

TEST NUMBER: 7

DATA SHEET A

TEST TITLE: Clocked Set Reset Input Leakage Current

PRE RADIATION

Date: 2-5-65
Temp: 78°

MOD	I_{LS1}	I_{LS2}	I_{LC1}	I_{LC2}
1	$.1\times10^{-7}$	$.22\times10^{-8}$	$.21\times10^{-8}$	$.23\times10^{-8}$
2	$.19\times10^{-8}$	$.19\times10^{-8}$	$.18\times10^{-5}$	$.2\times10^{-8}$
3	$.2\times10^{-8}$	$.2\times10^{-8}$	$.2\times10^{-8}$	$.21\times10^{-8}$
4	$.19\times10^{-8}$	$.2\times10^{-8}$	$.18\times10^{-8}$	$.17\times10^{-8}$
5	$.38\times10^{-8}$	$.09\times10^{-7}$	$.18\times10^{-8}$	$.18\times10^{-8}$
6	$.35\times10^{-6}$	$.09\times10^{-5}$	$.13\times10^{-6}$	$.55\times10^{-6}$
7	$.11\times10^{-8}$	$.12\times10^{-8}$	$.11\times10^{-8}$	$.12\times10^{-8}$
8	$.29\times10^{-8}$	$.47\times10^{-8}$	$.28\times10^{-8}$	$.27\times10^{-8}$
9	$.35\times10^{-9}$	$.34\times10^{-9}$	$.5\times10^{-9}$	$.46\times10^{-9}$
10	$.23\times10^{-7}$	$.29\times10^{-6}$	$.75\times10^{-8}$	$.11\times10^{-7}$
11	$.63\times10^{-6}$	$.28\times10^{-6}$	$.1\times10^{-6}$	$.1\times10^{-5}$
12	$.18\times10^{-6}$	$.64\times10^{-7}$	$.44\times10^{-6}$	$.29\times10^{-6}$
13	$.17\times10^{-6}$	$.11\times10^{-6}$	$.62\times10^{-7}$	$.11\times10^{-6}$
14	$.26\times10^{-6}$	$.15\times10^{-6}$	$.49\times10^{-6}$	$.11\times10^{-5}$
15	$.72\times10^{-6}$	$.2\times10^{-6}$	$.34\times10^{-6}$	$.28\times10^{-5}$
16	$.21\times10^{-6}$	$.77\times10^{-7}$	$.16\times10^{-6}$	$.64\times10^{-7}$
17	$.12\times10^{-6}$	$.19\times10^{-5}$	$.14\times10^{-5}$	$.27\times10^{-6}$
18	$.63\times10^{-6}$	$.12\times10^{-6}$	$.6\times10^{-6}$	$.32\times10^{-6}$
19	$.09\times10^{-6}$	$.71\times10^{-6}$	$.15\times10^{-6}$	$.8\times10^{-7}$
20	$.18\times10^{-5}$	$.44\times10^{-6}$	$.17\times10^{-6}$	$.2\times10^{-6}$

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-28-65
Temp: 77°F
meas at 5 V

MOD	I_{LS1}	I_{LS2}	I_{LC1}	I_{LC2}
1	$.185\times10^{-7}$	$.695\times10^{-7}$	$.695\times10^{-7}$	$.10\times10^{-7}$
2	$.65\times10^{-8}$	$.765\times10^{-8}$	$.22\times10^{-4}$	$.675\times10^{-8}$
3	$.695\times10^{-7}$	$.095\times10^{-7}$	$.693\times10^{-7}$	$.090\times10^{-7}$
4	$.18\times10^{-8}$	$.19\times10^{-8}$	$.175\times10^{-8}$	$.165\times10^{-8}$
5	$.10\times10^{-7}$	$.14\times10^{-7}$	$.80\times10^{-8}$	$.79\times10^{-8}$
6	$.37\times10^{-6}$	$.78\times10^{-6}$	$.14\times10^{-6}$	$.59\times10^{-6}$
7	$.64\times10^{-8}$	$.69\times10^{-8}$	$.60\times10^{-8}$	$.73\times10^{-8}$
8	$.085\times10^{-7}$	$.11\times10^{-7}$	$.085\times10^{-7}$	$.088\times10^{-7}$
9	$.345\times10^{-8}$	$.345\times10^{-8}$	$.41\times10^{-8}$	$.465\times10^{-8}$
10	$.235\times10^{-7}$	$.28\times10^{-6}$	$.135\times10^{-7}$	$.61\times10^{-7}$
11	$.64\times10^{-6}$	$.275\times10^{-6}$	$.105\times10^{-6}$	$.11\times10^{-5}$
12	$.195\times10^{-6}$	$.083\times10^{-6}$	$.445\times10^{-6}$	$.275\times10^{-6}$
13	$.185\times10^{-6}$	$.135\times10^{-6}$	$.80\times10^{-7}$	$.125\times10^{-6}$
14	$.30\times10^{-6}$	$.165\times10^{-6}$	$.44\times10^{-6}$	$.11\times10^{-5}$
15	$.76\times10^{-6}$	$.20\times10^{-6}$	$.32\times10^{-6}$	$.27\times10^{-5}$
16	$.26\times10^{-6}$	$.76\times10^{-7}$	$.185\times10^{-6}$	$.65\times10^{-7}$
17	$.12\times10^{-6}$	$.18\times10^{-5}$	$.115\times10^{-5}$	$.31\times10^{-6}$
18	$.63\times10^{-6}$	$.125\times10^{-6}$	$.58\times10^{-6}$	$.30\times10^{-6}$
19	$.10\times10^{-6}$	$.088\times10^{-5}$	$.205\times10^{-6}$	$.64\times10^{-7}$
20	$.182\times10^{-5}$	$.425\times10^{-6}$	$.165\times10^{-6}$	$.20\times10^{-6}$

TECH. D. A. Kacsir ENGR.

EQUIPMENT: DVM I 55991
Keithley Electrometer I 52076
with shunt I 52075

COMMENTS:
mods 16-20 tested 2-6-65 76°

CIRCUIT TYPE: A-6

TEST NUMBER: 7

DATA SHEET B

TEST TITLE: Clocked Set Reset Input Leakage Current

PRE RADIATION

Date: 2-5-65
Temp: 77°

MOD	I_{LCP}			
1	$.45 \times 10^{-9}$			
2	$.19 \times 10^{-10}$			
3	$.21 \times 10^{-9}$			
4	$.31 \times 10^{-10}$			
5	$.32 \times 10^{-9}$			
6	$.28 \times 10^{-7}$			
7	$.15 \times 10^{-10}$			
8	$.27 \times 10^{-9}$			
9	$.12 \times 10^{-9}$			
10	$.16 \times 10^{-7}$			
11	$.46 \times 10^{-7}$			
12	$.47 \times 10^{-7}$			
13	$.51 \times 10^{-8}$			
14	$.32 \times 10^{-7}$			
15	$.41 \times 10^{-7}$			
16	$.1 \times 10^{-7}$			
17	$.46 \times 10^{-7}$			
18	$.73 \times 10^{-7}$			
19	$.9 \times 10^{-7}$			
20	$.33 \times 10^{-7}$			
TECH. K. W. Elliott		ENGR.		

POST RADIATION

Date: 5-28-65
Temp: 77°F

Meas. at 2V

MOD	I_{LCP}			
1	$.575 \times 10^{-9}$			
2	$.75 \times 10^{-10}$			
3	$.31 \times 10^{-9}$			
4	$.20 \times 10^{-10}$			
5	$.38 \times 10^{-9}$			
6	$.21 \times 10^{-7}$			
7	$.12 \times 10^{-9}$			
8	$.35 \times 10^{-9}$			
9	$.18 \times 10^{-9}$			
10	$.165 \times 10^{-7}$			
11	$.56 \times 10^{-7}$			
12	$.48 \times 10^{-7}$			
13	$.55 \times 10^{-8}$			
14	$.31 \times 10^{-7}$			
15	$.445 \times 10^{-7}$			
16	$.095 \times 10^{-7}$			
17	$.485 \times 10^{-7}$			
18	$.77 \times 10^{-7}$			
19	$.82 \times 10^{-8}$			
20	$.38 \times 10^{-7}$			
TECH. D. A. Karin		ENGR.		

EQUIPMENT:
same as sheet A

COMMENTS:
V_{cp} +2 V
Mods 16-20 tested 2-6-65 76°

CIRCUIT TYPE: A-6

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Resistance Measurements

PRE RADIATION

Date: 2-2-65
Temp: 75°

MOD	$R_{\bar{Q}}$	R_Q		
1	6500	6560		
2	6125	6200		
3	5809	5900		
4	5980	6070		
5	5930	5940		
6	5530	5570		
7	7580	7610		
8	6290	6300		
9	6850	6850		
10	5900	5950		
11	6160	6220		
12	5263	5170		
13	5552	5590		
14	5462	5530		
15	6022	6000		
16	6200	6260		
17	5200	5210		
18	5500	5520		
19	6850	6950		
20	5930	6060		
TECH. H.W. [illegible]			ENGR. [illegible]	

POST RADIATION

Date: 5-28-65
Temp: 77°F

MOD	$R_{\bar{Q}}$	R_Q		
1	6607	6656		
2	6227	6307		
3	5898	5376		
4	5984	6068		
5	6026	6049		
6	5610	5639		
7	7691	7703		
8	6394	6397		
9	6965	6948		
10	5987	6625		
11	6162	6217		
12	5361	5273		
13	5648	5682		
14	5557	5626		
15	6015	6000		
16	6198	6259		
17	5295	5304		
18	5500	5520		
19	6984	7093		
20	6054	6188		
TECH. D.A. Kaiser			ENGR.	

EQUIPMENT: Wheatstone Bridge I-25471

COMMENTS:

CIRCUIT TYPE: A-6

TEST NUMBER: 9

DATA SHEET A

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 1-30-65
Temp: 77°

P.G. T_r 2.5×10^{-9} T_F 5×10^{-9}
1×10^{-9} sec

MOD	T_s	T_D	T_R	T_F
1	22	51	15.5	340
2	24	45	13	310
3	23	47	12.5	320
4	21	45	12.5	300
5	24	49	13	300
6	24	46	15	280
7	24	52	15	380
8	24	47	13.5	320
9	24	52	15.5	350
10	23	49	15.5	290
11	27	51	14	310
12	26	48	12.5	270
13	24	48	14	300
14	21	46	15.5	280
15	22	49	15.5	320
16	25	54	16	320
17	24	46	12	260
18	22	45	13	280
19	30	55	19	360
20	23	51	16	320

TECH. H. W. Elliott ENGR.

POST RADIATION

Date: 5-24-65
Temp: 77°F

T_R 7.5 T_F 4.5

MOD	T_s	T_D	T_R	T_F
1	20	50	36	340
2	19	46	20.5	310
3	19	46.5	17.5	310
4	22	46	13.5	280
5	23	49	23	310
6	22	48	18.5	290
7	23	52	22.5	370
8	20	49	27	165
9	21	51	25	380
10	22	52	27	300
11	27	52	14.5	310
12	23	46	19	280
13	20.5	46	24	300
14	17.5	45	27	250
15	22.5	50	15.5	320
16	25.5	55	16.5	315
17	21.5	46.5	19	280
18	22	46.5	14	290
19	26	54	30	380
20	18.5	49.5	24.5	350

TECH. H. W. Elliott ENGR.

EQUIPMENT: TI pulse gen
Sampling oscilloscope

COMMENTS:

Mods 16-20 tested 2-9-65
Temp 78°

CIRCUIT TYPE: A-6

TEST NUMBER: 9

DATA SHEET B

TEST TITLE: Minimum Clock Pulse Width and Height

PRE RADIATION

Date: 1-30-65
Temp: 77

1×10^{-9} sec

MOD	τ_w	Volts P_A		
1	32.5	1.4		
2	23.5	1.35		
3	24.0	1.35		
4	24.5	1.35		
5	22.5	1.4		
6	23.0	1.4		
7	29.0	1.35		
8	28.0	1.4		
9	32.5	1.4		
10	26.5	1.4		
11	24.5	1.35		
12	21.5	1.35		
13	23.0	1.35		
14	28.0	1.35		
15	27.5	1.35		
16	31	1.35		
17	22	1.35		
18	24	1.4		
19	40	1.4		
20	31	1.35		

TECH. K.W. [signature] ENGR. [signature]

POST RADIATION

Date: 5-24-65
Temp: 77° F

MOD	τ_w	Volts P_A		
1	39	1.4		
2	29	1.34		
3	27	1.34		
4	27	1.34		
5	26	1.34		
6	34	1.34		
7	35	1.34		
8	36	1.36		
9	39	1.38		
10	32	1.38		
11	23	1.34		
12	24	1.32		
13	25	1.32		
14	33	1.34		
15	26	1.36		
16	31	1.36		
17	35	1.32		
18	23	1.34		
19	49	1.39		
20	39	1.36	~~3~~	

TECH. K.W. [signature] ENGR.

EQUIPMENT: Same as sheet A

COMMENTS:
Mods 16-20 Tested 2-9-65
Temp 78°

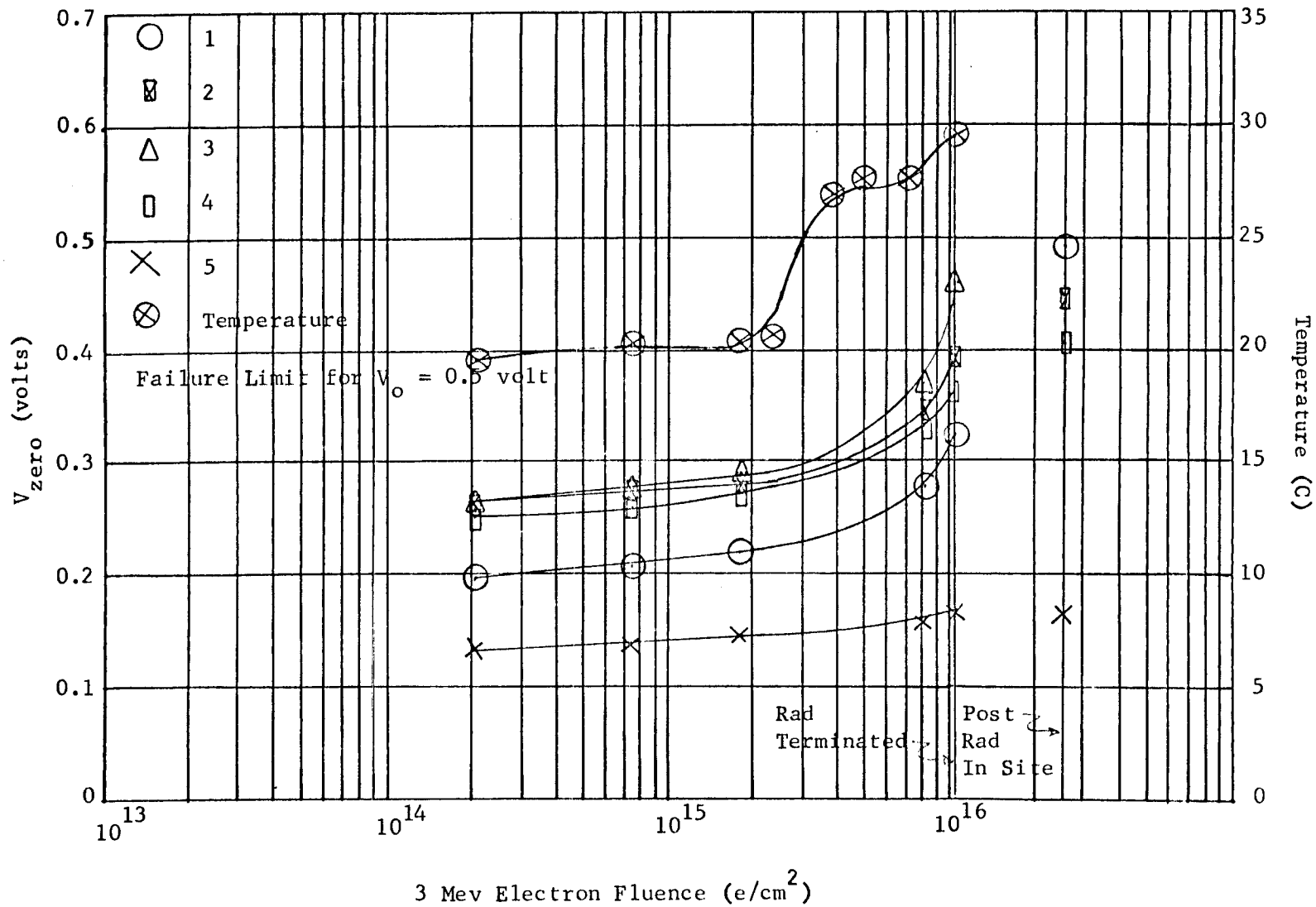
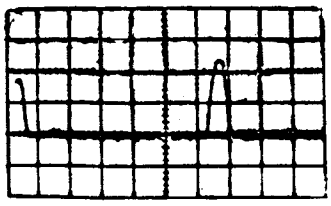
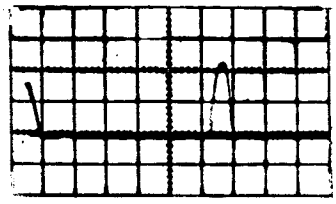


FIGURE III-11. RADIATION RESPONSE OF UNIT A-6

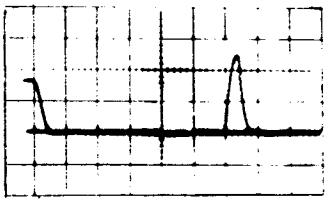
Note: Post rad 1 week cannot be plotted because reset was applied during the full time of operation.



A - Initial



B - Final



D - Post Rad 1 Week

Scale: 0.5 volt/cm
0.1 μsec/cm

FIGURE III-12. MULTISTAGE PROPAGATION DELAY FOR A-6 DEVICES

CIRCUIT TYPE: B-1

TEST NUMBER: 1

DATA SHEET A

TEST TITLE: Logic Levels

PRE RADIATION

Date: 2-15-65 2-18-65
Temp: 76 78°

All Voltages Negative

MOD	V_{zero} (56)	V_{zero} (46)	V_{one} (56)	V_{one} (46)
1	1.219	1.175	1.089	1.053
2	1.187	1.148	1.070	1.039
3	1.207	1.166	1.087	1.051
4	1.209	1.172	1.084	1.063
5	1.199	1.146	1.074	1.037
6	1.213	1.164	1.086	1.042
7	1.199	1.156	1.076	1.040
8	1.196	1.159	1.073	1.039
9	1.197	1.140	1.069	1.010
10	1.191	1.139	1.066	1.017
11	1.195	1.164	1.079	1.056
12	1.203	1.169	1.087	1.054
13	1.203	1.155	1.080	1.039
14	1.193	1.144	1.069	1.026
15	1.183	1.149	1.067	1.039
16	1.221	1.173	1.075	1.057
17	1.209	1.174	1.094	1.067
18	1.209	1.161	1.084	1.049
19	1.197	1.170	1.085	1.061
20	1.199	1.150	1.076	1.032

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date:
Temp:

MOD	V_{zero} (56)	V_{zero} (46)	V_{one} (56)	V_{one} (46)
1	—	1.294	1.153	—
2	-	1.213	1.099	—
3	- - -	- -	- -	- - -
4	-	1.257	1.117	—
5	-	1.235	1.111	—
6	-	1.294	1.153	—
7	-	1.227	1.109	—
8	-	1.257	1.117	—
9		1.221	1.100	—
10	- -	- -	- -	- - -
11	1.192	1.163	1.077	1.055
12	-	1.252	1.119	.764
13	-	1.239	1.113	-
14	-	1.271	1.132	—
15	1.176	1.146	1.063	1.036
16	-	1.283	1.150	—
17	-	1.273	1.137	.990
18	1.200	1.159	1.082	1.044
19	-	1.243	1.114	1.032
20	-	1.249	1.115	—

TECH. ENGR.

EQUIPMENT: DVM - I 55991

COMMENTS: with exception of circuits 3 and 10, blank data entry spaces indicate circuits had degraded to point where measurements could not be taken.

CIRCUIT TYPE: B-1

TEST NUMBER: 1

DATA SHEET B

TEST TITLE: Logic Levels

PRE RADIATION				
Date: 2-15-65		2-18-65		
Temp: 76		78°		
MOD	$V_{(56)B}$	$V_{zero(57)}$	$V_{zero(47)}$	$V_{one(57)}$
1	0.407	1.216	1.175	1.093
2	0.421	1.189	1.151	1.075
3	0.405	1.213	1.171	1.093
4	0.382	1.211	1.174	1.091
5	0.395	1.203	1.149	1.079
6	0.392	1.215	1.160	1.089
7	0.384	1.199	1.155	1.079
8	0.393	1.199	1.157	1.075
9	0.416	1.199	1.140	1.069
10	0.422	1.189	1.139	1.067
11	0.381	1.199	1.167	1.082
12	0.411	1.205	1.169	1.089
13	0.408	1.203	1.156	1.081
14	0.414	1.194	1.145	1.069
15	0.386	1.186	1.150	1.070
16	0.384	1.229	1.178	1.103
17	0.412	1.215	1.179	1.100
18	0.405	1.212	1.164	1.094
19	0.425	1.205	1.175	1.091
20	0.419	1.202	1.151	1.079
TECH. Erlenbach			ENGR. [illegible]	

POST RADIATION				
Date:				
Temp:				
MOD	$V_{(56)B}$	$V_{zero(57)}$	$V_{zero(47)}$	$V_{one(57)}$
1	.380			
2	.357			
3	—	—	—	—
4	.385			
5	.367			
6	.373			
7	.400			
8	.393			
9	.377			
10	—	—	—	—
11	.369			
12	.403			
13	.426			
14	.381			
15	.394			
16	.386			
17	.389			
18	.412			
19	.409			
20	.376			
TECH.			ENGR.	

EQUIPMENT: DVM-1-5599

Post Rad. Data Not Taken on $V_{zero}(57)$, $V_{zero}(47)$, $V_{one}(57)$. RS.

COMMENTS:

CIRCUIT TYPE: B-1

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Input Current Requirement

PRE RADIATION

Date: 2-15-65 2-16-65

Temp: 76° 79°

MOD	$I_{in}(6)$	$I_{in}(7)$	$I_{in}(8)$	
1	47	50	46	
2	28	27	26	
3	32	31	31	
4	23	24	24	
5	42	41	45	
6	42	42	43	
7	30	31	33	
8	39	42	40	
9	68	74	73	
10	54	56	52	
11	21	20	20	
12	24	25	23	
13	49	48	48	
14	46	47	46	
15	24	24	25	
16	41	37	41	
17	24	22	25	
18	32	30	33	
19	18	17	19	
20	49	50	52	
TECH. Erlenbach			ENGR.	

POST RADIATION

Date: 7-2-65

Temp: 75°

MOD	$I_{in}(6)$	$I_{in}(7)$	$I_{in}(8)$	
1	335	335	335	
2	235	285	295	
3	—	—	—	—
4	265	305	315	
5	350	395	410	
6	405	400	400	
7	265	325	330	
8	365	360	360	
9	455	540	530	
10	—	—	—	—
11	20.5	20	20	
12	240	265	265	
13	400	390	395	
14	410	280	410	
15	23.5	29	25	
16	285	345	355	
17	240	280	295	
18	32.0	29	32	
19	205	240	250	
20	360	425	430	
TECH.			ENGR.	

EQUIPMENT: DVM - I-55991
Microammeter C-3124

COMMENTS:

CIRCUIT TYPE: B-1

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Drive Current Capability

PRE RADIATION				
Date: 2-16-65				
Temp: 76°				
MOD	$I_{o(4)}$	$I_{o(5)}$		
1	4.2 ma	4.0 ma		
2	4.9	4.7		
3	4.2	3.8		
4	5.7	5.3		
5	2.6	2.7		
6	3.0	2.6		
7	4.0	4.1		
8	3.9	3.9		
9	1.9	2.1		
10	2.7	2.9		
11	7.3	6.3		
12	5.7	5.5		
13	3.3	3.3		
14	3.1	3.3		
15	5.7	5.9		
16	4.0	3.4		
17	7.1	6.3		
18	4.2	3.8		
19	10.0	9.2		
20	3.0	3.3		
TECH. Erlenbach			ENGR. [illegible]	

POST RADIATION				
Date:				
Temp:				
MOD	$I_{o(4)}$	$I_{o(5)}$		
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11	7.4	+6.4		
12				
13				
14				
15	5.7	5.6		
16				
17				
18	4.0	3.8		
19				
20				
TECH.			ENGR.	

EQUIPMENT: DVM I-55491
Decade Resistor I-73730
Millameter I-14197

ON $I_{o(4)}$ $-.8V < V_{pins} < -.9V$

COMMENTS:

ON $I_{o(5)}$ $-.8V < V_{pins} < -1.0V$

with exception of 3 and 10, ~~blank~~ blank data entry spaces indicate that circuits had degraded to point where measurements could not be taken.

CIRCUIT TYPE: B-1

TEST NUMBER: 4

DATA SHEET A

TEST TITLE: Leakage Currents

PRE RADIATION				
Date: 2-16-65		2-18-65		
Temp: 78		78°		
MOD	I_{6C}	I_{7C}	I_{8C}	V_{SE}
1	$.12 \times 10^{-7}$	$.67 \times 10^{-9}$	$.67 \times 10^{-8}$	.645
2	$.79 \times 10^{-9}$	$.18 \times 10^{-8}$	$.13 \times 10^{-8}$	.662
3	$.21 \times 10^{-9}$	$.25 \times 10^{-9}$	$.27 \times 10^{-9}$	.665
4	$.14 \times 10^{-7}$	$.14 \times 10^{-8}$	$.15 \times 10^{-9}$	.659
5	$.62 \times 10^{-7}$	$.18 \times 10^{-9}$	$.40 \times 10^{-7}$	.665
6	$.21 \times 10^{-7}$	$.11 \times 10^{-8}$	$.40 \times 10^{-9}$	.659
7	$.15 \times 10^{-9}$	$.10 \times 10^{-7}$	$.69 \times 10^{-7}$	.656
8	$.17 \times 10^{-9}$	$.16 \times 10^{-9}$	$.17 \times 10^{-9}$	.643
9	$.23 \times 10^{-9}$	$.32 \times 10^{-9}$	$.25 \times 10^{-9}$	.645
10	$.17 \times 10^{-9}$	$.18 \times 10^{-9}$	$.16 \times 10^{-9}$	.654
11	$.16 \times 10^{-9}$	$.13 \times 10^{-9}$	$.16 \times 10^{-9}$	.663
12	$.14 \times 10^{-9}$	$.15 \times 10^{-9}$	$.14 \times 10^{-9}$	.667
13	$.26 \times 10^{-9}$	$.21 \times 10^{-9}$	$.20 \times 10^{-9}$	.651
14	$.23 \times 10^{-9}$	$.23 \times 10^{-9}$	$.23 \times 10^{-9}$	.643
15	$.13 \times 10^{-9}$	$.15 \times 10^{-9}$	$.15 \times 10^{-9}$	.662
16	$.21 \times 10^{-9}$	$.22 \times 10^{-9}$	$.31 \times 10^{-9}$	.633
17	$.15 \times 10^{-9}$	$.13 \times 10^{-9}$	$.14 \times 10^{-9}$	.655
18	$.30 \times 10^{-8}$	$.20 \times 10^{-7}$	$.18 \times 10^{-8}$	.506
19	$.25 \times 10^{-9}$	$.19 \times 10^{-9}$	$.47 \times 10^{-9}$	.641
20	$.17 \times 10^{-9}$	$.16 \times 10^{-9}$	$.17 \times 10^{-9}$	.646
TECH. Erlenbach		ENGR. [illegible]		

POST RADIATION				
Date:				
Temp:				
MOD	I_{6C}	I_{7C}	I_{8C}	
1	$.11 \times 10^{-8}$			
2	$.2 \times 10^{-8}$			
3	-			
4	$.52 \times 10^{-8}$			
5	$.53 \times 10^{-9}$			
6	$.15 \times 10^{-8}$			
7	$.5 \times 10^{-8}$			
8	$.11 \times 10^{-9}$			
9	$.13 \times 10^{-8}$			
10	-			
11	$.22 \times 10^{-9}$			
12	$.71 \times 10^{-9}$			
13	$.56 \times 10^{-9}$			
14	$.41 \times 10^{-8}$			
15	$.27 \times 10^{-9}$			
16	$.71 \times 10^{-9}$			
17	$.55 \times 10^{-9}$			
18	$.28 \times 10^{-7}$			
19	$.48 \times 10^{-9}$			
20	$.14 \times 10^{-8}$			
TECH.			ENGR.	

EQUIPMENT: DVM. I-55991
Electrometer I-52076
Shunt I-52075
Microammeter C-3129

COMMENTS: V_{SE} & V_{AE} are measured at 100 ma. (100 ma scale on microammeter)
I_{7C}, I_{8C}, V_{SE} Post Rad data not taken. R.S.

CIRCUIT TYPE: B-1

TEST NUMBER: 4

DATA SHEET B

TEST TITLE: Leakage Current

PRE RADIATION				
Date: 2-16-65		2-18-65		
Temp: 78		78°		
MOD	I_{6E}	I_{7E}	I_{8E}	I_{1E}
1	$.12 \times 10^{-7}$	$.67 \times 10^{-9}$	$.69 \times 10^{-8}$	$.18 \times 10^{-9}$
2	$.9 \times 10^{-7}$	$.23 \times 10^{-8}$	$.11 \times 10^{-8}$	$.73 \times 10^{-8}$
3	$.2 \times 10^{-9}$	$.25 \times 10^{-9}$	$.23 \times 10^{-9}$	$.17 \times 10^{-9}$
4	$.21 \times 10^{-7}$	$.14 \times 10^{-8}$	$.15 \times 10^{-9}$	$.33 \times 10^{-9}$
5	$.69 \times 10^{-7}$	$.17 \times 10^{-9}$	$.42 \times 10^{-7}$	$.34 \times 10^{-9}$
6	$.23 \times 10^{-7}$	$.10 \times 10^{-8}$	$.36 \times 10^{-9}$	$.20 \times 10^{-9}$
7	$.14 \times 10^{-9}$	$.10 \times 10^{-7}$	$.80 \times 10^{-7}$	$.28 \times 10^{-9}$
8	$.16 \times 10^{-9}$	$.15 \times 10^{-9}$	$.16 \times 10^{-9}$	$.18 \times 10^{-9}$
9	$.22 \times 10^{-9}$	$.31 \times 10^{-9}$	$.24 \times 10^{-9}$	$.33 \times 10^{-9}$
10	$.16 \times 10^{-9}$	$.19 \times 10^{-9}$	$.16 \times 10^{-9}$	$.18 \times 10^{-9}$
11	$.16 \times 10^{-9}$	$.13 \times 10^{-9}$	$.15 \times 10^{-9}$	$.12 \times 10^{-7}$
12	$.14 \times 10^{-9}$	$.15 \times 10^{-9}$	$.14 \times 10^{-9}$	$.15 \times 10^{-9}$
13	$.25 \times 10^{-9}$	$.19 \times 10^{-9}$	$.20 \times 10^{-9}$	$.21 \times 10^{-9}$
14	$.22 \times 10^{-9}$	$.22 \times 10^{-9}$	$.22 \times 10^{-9}$	$.21 \times 10^{-9}$
15	$.12 \times 10^{-9}$	$.14 \times 10^{-9}$	$.14 \times 10^{-9}$	$.14 \times 10^{-9}$
16	$.22 \times 10^{-9}$	$.22 \times 10^{-9}$	$.32 \times 10^{-9}$	$.29 \times 10^{-8}$
17	$.15 \times 10^{-9}$	$.13 \times 10^{-9}$	$.14 \times 10^{-9}$	$.14 \times 10^{-9}$
18	$.30 \times 10^{-8}$	$.21 \times 10^{-7}$	$.15 \times 10^{-8}$	$.54 \times 10^{-7}$
19	$.25 \times 10^{-9}$	$.20 \times 10^{-9}$	$.47 \times 10^{-9}$	$.67 \times 10^{-9}$
20	$.17 \times 10^{-9}$	$.16 \times 10^{-9}$	$.17 \times 10^{-9}$	$.18 \times 10^{-9}$
TECH. Erlenbach		ENGR. [illegible]		

POST RADIATION				
Date:				
Temp:				
MOD	I_{6E}	I_{7E}	I_{8E}	I_{1E}
1	$.13 \times 10^{-7}$	$.12 \times 10^{-8}$		
2	$.13 \times 10^{-8}$	$.26 \times 10^{-8}$		
3	—	—	—	—
4	$.19 \times 10^{-7}$	$.5 \times 10^{-8}$		
5	$.09 \times 10^{-6}$	$.55 \times 10^{-9}$		
6	$.18 \times 10^{-7}$	$.19 \times 10^{-8}$		
7	$.54 \times 10^{-9}$	$.49 \times 10^{-8}$		
8	$.58 \times 10^{-9}$	$.48 \times 10^{-9}$		
9	$.7 \times 10^{-9}$	$.16 \times 10^{-8}$		
10	—	—	—	—
11	$.33 \times 10^{-9}$	$.24 \times 10^{-9}$		
12	$.7 \times 10^{-9}$	$.7 \times 10^{-9}$		
13	$.75 \times 10^{-9}$	$.58 \times 10^{-9}$		
14	$.09 \times 10^{-7}$	$.37 \times 10^{-8}$		
15	$.28 \times 10^{-9}$	$.26 \times 10^{-9}$		
16	$.75 \times 10^{-9}$	$.77 \times 10^{-9}$		
17	$.6 \times 10^{-9}$	$.58 \times 10^{-9}$		
18	$.32 \times 10^{-8}$	$.29 \times 10^{-7}$		
19	$.7 \times 10^{-9}$	$.51 \times 10^{-9}$		
20	$.58 \times 10^{-9}$	$.15 \times 10^{-8}$		
TECH.			ENGR.	

EQUIPMENT: DVM - I-55991
Electrometer I-52076
Shunt I-52075

Post Rad Data on I_{8E} & I_{1E} not taken

COMMENTS:

CIRCUIT TYPE: B-1

TEST NUMBER: 5

DATA SHEET A

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 2-12-65
Temp: 77°

Clock T_r 7 T_f 2

MOD	T_{sN}	T_{dN}	T_{rN}	T_{fN}
1	4.5	8.5	5.5	5.0
2	4.5	8.5	5.5	5.0
3	5.0	8.5	5.5	5.5
4	4.5	8.5	5.5	5.5
5	5.0	8.5	5.5	5.5
6	4.5	8.5	5.5	5.0
7	4.5	8.5	5.0	4.5
8	4.5	8.5	5.0	4.5
9	4.5	8.5	5.0	4.5
10	4.5	8.5	5.5	4.5
11	4.5	8.5	5.5	5.0
12	5.0	8.5	6.0	5.5
13	4.5	8.5	5.5	5.0
14	4.5	8.5	4.5	4.5
15	4.5	8.5	5.5	5.5
16	4.5	8.5	5.5	5.0
17	5.0	9.0	6.0	6.0
18	4.5	8.5	6.0	5.0
19	5.0	8.5	5.5	4.5
20	4.5	8.5	5.5	4.5

TECH. [signature] ENGR. [signature]

POST RADIATION

Date: 77°
Temp: 6-21-65

MOD	T_{sN}	T_{dN}	T_{rN}	T_{fN}
1	4.5	6.5	6.5	11
2	4.5	7	6.5	11
3	—	—	—	—
4	4.5	7	7	11.5
5	5	7	7.5	11.5
6	5	6.5	7	11.5
7	4.5	7	6.5	11
8	4.5	6.5	6.5	11
9	5	7.5	7	9.5
10	—	—	—	—
11	4.5	8	5.5	6.0
12	5	7.5	7.5	12
13	4.5	7	7	11
14	4.5	6.5	6.5	10.5
15	4.5	8.5	6	11 *
16	5	7	7	11
17	5	7	7.5	12
18	4.5	7.5	6	6
19	4.5	6.5	6	10
20	4.5	7	6.5	10.5

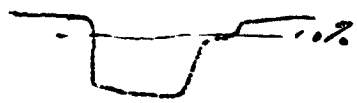
TECH. [signature] ENGR.

EQUIPMENT: TI sampling oscilloscope
TI Pulse Generator
DYM I55991

COMMENTS:

Mods 16-20 Tested 2-27-65
Temp 77°.

* A point of inflection causes the fall time of mod 7, read as indicated. An extension of the trailing edge would show fall time to be ≈ 6 msec



CIRCUIT TYPE: B-1

TEST NUMBER: 5

DATA SHEET B

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 2-12-65

Temp: 79°

MOD	T_{so}	T_{do}	T_{ro}	T_{fo}
1	5.5	6.0	7.0	5.0
2	5.5	6.0	7.5	6.0
3	5.5	6.0	7.0	5.5
4	5.5	5.5	7.5	5.5
5	5.0	6.0	7.0	5.5
6	5.0	5.5	7.5	5.5
7	5.5	5.5	7.5	5.5
8	5.0	5.5	7.5	5.0
9	5.0	5.5	7.5	4.5
10	5.0	5.5	7.5	5.5
11	5.5	5.5	7.0	5.5
12	6.0	6.0	8.0	6.0
13	5.5	5.5	7.5	5.5
14	4.5	5.5	7.0	5.5
15	5.5	5.5	7.5	5.5
16	5.5	6.0	7.5	5.5
17	5.5	6.5	7.5	5.5
18	5.0	6.5	7.5	5.5
19	5.5	6.5	7.5	5.5
20	4.5	6.0	8.0	5.5

TECH. K. W. Elliott ENGR. [illegible]

POST RADIATION

Date: 6-21-65

Temp: 77°

MOD	T_{so}	T_{do}	T_{ro}	T_{fo}
1	5.5	4	7.5	6.5
2	5.5	4	8	6.5
3	—	—	—	—
4	5.5	4	8	6.5
5	5.5	4.5	8.5	6.5
6	5.5	4	8	7
7	5.5	4.5	7.5	6
8	5.5	4.5	8	6.5
9	5	4.5	8	6
10	—	—	—	—
11	6	5	7	6
12	6	4.5	8.5	7
13	5.5	4.5	8.5	6.5
14	5.5	4	7.5	6.5
15	6.0	5.5	7.5	6.0
16	6	4	7.5	6.5
17	6	4.5	8	7
18	5.5	5	7	5.5
19	5.5	4.5	7	6.5
20	5.5	4	7.5	6.5

TECH. K. W. Elliott ENGR.

EQUIPMENT: Same as sheet A

COMMENTS:

Mods 16-20 Tested 2-27-65

Temp 77°

CIRCUIT TYPE: B-1

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Resistance Measurements

PRE RADIATION

Date: 2-12-65 2-16-65
Temp: 79°

MOD	R_{42}	R_{52}	R_{102}	R_{39}
1	1.295 K	1.278 K	707 Ω	283 Ω
2	1.393	1.383	752	295
3	1.388	1.374	763	309
4	1.361	1.345	749	294
5	1.424	1.403	766	306
6	1.348	1.330	733	293
7	1.309	1.296	722	284
8	1.267	1.251	695	276
9	1.192	1.253	696	276
10	1.319	1.323	717	288
11	1.373	1.358	740	285
12	1.446	1.425	774	306
13	1.312	1.300	722	286
14	1.296	1.273	713	277
15	1.385	1.370	752	297
16	1.303	1.287	720	286
17	1.350	1.342	736	293
18	1.368	1.352	739	287
19	1.161	1.147	636	252
20	1.335	1.319	725	291

TECH. Erlenbach ENGR.

POST RADIATION

Date: 7-2-65
Temp: 75°

MOD	R_{42}	R_{52}	R_{102}	R_{39}
1	1.334 K	1.316 K	730 Ω	289.3 Ω
2	1.444	1.433	779.6	305.0
3	—	—		
4	1.413	1.396	779.6	303.0
5	1.483	1.459	799.3	316.5
6	1.400	1.381	765	302.7
7	1.356	1.341	748.9	292.7
8	1.311	1.294	722.0	284.8
9	1.241	1.308	727.0	287.5
10	—	—	—	-
11	1.374	1.358	741	285.3
~~12~~	~~1.376~~	~~1.361~~	~~742.0~~	
12	1.496	1.474	801.0	315.3
13	1.360	1.348	751.0	294.1
14	1.345	1.321	744.0	285.8
15	1.388	1.374	754.0	297.6
16	1.352	1.334	749.0	295.3
18	1.373	1.355	740.0	287.5
19	1.202	1.187	660.0	258.9
20	1.388	1.372	755.0	300.0

TECH. [illegible] ENGR.

EQUIPMENT: Wheatstone Bridge I-25471

#17 1.399 1.390 764.0 302.6

COMMENTS:

CIRCUIT TYPE: B-1

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Lifetime Measurement

PRE RADIATION				
Date:				
Temp:				
MOD	$\Delta T / \Delta V$	$\tau \times 10^{-3}$		
1	.095/.275	8.8		
2	.100/.300	8.5		
3	.135/.400	8.6		
4	.115/.325	9.0		
5	.100/.300	8.5		
6	.095/.275	8.8		
7	.135/.400	8.6		
8	.110/.325	8.6		
9	.105/.325	8.3		
10	.090/.275	8.4		
11	.135/.400	8.6		
12	.140/.425	8.4		
13	.110/.325	8.6		
14	.100/.300	8.5		
15	.100/.300	8.5		
16	.125/.375	8.5		
17	.085/.250	8.7		
18	.105/.300	8.9		
19	.125/.350	9.2		
20	.120/.350	8.8		
TECH. J.M. Lindsey		ENGR. [signature]		

POST RADIATION				
Date:				
Temp:				
MOD				
1	The	curves	do not	
2	appear	to	have	
3	changed	a	sufficient	
4	amount	to	warrent	
5	calculation.			
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: B-1

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Transistor Gain

PRE RADIATION				
Date: 2-18-65	2-22-65			
Temp: 79°	78°			
MOD	Ic 6.5	Ic 61	Ic 7.5	Ic 71
1	.94 ma	1.14 ma	.93 ma	1.11 ma
2	1.87	2.05	1.96	2.15
3	1.59	1.79	1.63	1.85
4	2.11	2.35	2.15	2.40
5	1.22	1.38	1.25	1.41
6	1.30	1.47	1.28	1.44
7	1.79	1.98	1.72	1.91
8	1.44	1.64	1.33	1.52
9	.77	.92	.71	.87
10	1.01	1.18	.92	1.03
11	2.55	2.80	2.63	2.90
12	2.20	2.46	2.07	2.35
13	1.09	1.37	1.08	1.26
14	1.19	1.37	1.16	1.34
15	2.17	2.40	2.20	2.44
16	1.32	1.49	1.52	1.71
17	2.14	2.37	2.37	2.64
18	1.74	1.90	1.90	2.07
19	3.25	3.64	3.58	4.02
20	1.10	1.27	1.13	1.30
TECH. Erlenbach		ENGR. [illegible]		

POST RADIATION				
Date: 7-2-65				
Temp: 75°				
MOD	Ic 6.5	Ic 61		
1	.11	.25		
2	.17	.28		
3	—	—		
4	.13	.26		
5	.085	.21		
6	.085	.21		
7	.13	.27		
8	.115	.26		
9	.075	.22		
10	—	—		
11	2.6	2.85		
12	.17	.32		
13	.095	.23		
14	.095	.23		
15	2.35	2.5		
16	.125	.26		
17	.14	.28		
18	1.75	1.9		
19	.23	.41		
20	.10	.23		
[illegible]			ENGR.	

EQUIPMENT: Transistor Curve Tracer L-55783

COMMENTS: Post Rad Ic 7.5 & Ic 71 Not Taken, R.S.

CIRCUIT TYPE: B-1

TEST NUMBER: 9

DATA SHEET

TEST TITLE: Regulation Characteristics

PRE RADIATION

Date: 2-15-65 2-16-65
Temp: 77° 79°

MOD	V_{BBO}	V_{BBL}		
1	1.144	.481		
2	1.120	.036		
3	1.133	.037		
4	1.141	.038		
5	1.117	.281		
6	1.131	.604		
7	1.121	.027		
8	1.124	.200		
9	1.107	.022		
10	1.103	.019		
11	1.124	.109		
12	1.128	.114		
13	1.120	.019		
14	1.109	.046		
15	1.108	.022		
16	1.134	.286		
17	1.136	.802		
18	1.122	.237		
19	1.130	.287		
20	1.114	.040		

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date: 7-2-65
Temp: 75°

MOD	V_{BBO}	V_{BBL}		
1	1.213	.280		
2	1.164	#		
3	—	—		
4	1.191	#		
5	1.169	.093		
6	1.215	.442		
7	1.174	#		
8	1.182	.043		
9	1.162	#		
10	—	—		
11	1.127	.105		
12	1.182	#		
13	1.177	#		
14	1.289	#		
15	1.108	.022		
16	1.212	.065		
17	1.200	.521		
18	1.119	.114		
19	1.180	.065		
20	1.174	#		

TECH. S.W. Elliott ENGR.

EQUIPMENT: Decade Resistor 21044
Millameter I-14197

# indicates that the module would not conduct 2.5 ma

COMMENTS:

CIRCUIT TYPE: B-1

TEST NUMBER: 1C

DATA SHEET

TEST TITLE: Resistance Measurements and Current

PRE RADIATION

Date: 8-12-65
Temp: 75°

MOD	R_1	R_3	I_{FK}	
1	296.0	1.487 K	1.7 ma	
2	335	1.651	1.4	
3	328	1.630	1.5	
4	337	1.622	1.45	
5	320	1.569	1.5	
6	280	1.101	1.4	
7	332	1.645	1.45	
8	326	1.594	1.5	
9	335	1.654	1.45	
10	329	1.759	1.45	
11	330	1.601	1.45	
12	325	1.602	1.5	
13	354	1.724	1.4	
14	323	1.629	1.5	
15	331	1.651	1.4	
16	335	1.605	1.4	
17	285	1.437	1.6	
18	316	1.555	1.5	
19	320	1.565	1.45	
20	305	1.647	1.55	

TECH. [illegible] ENGR. RRD

POST RADIATION

Date: 7-2-65
Temp: 75°

MOD	R_1	R_3	I_{FK}	
1	292.4	1.527 K	1.6	
2	342.0	1.692	1.4	
4	346.0	1.666	1.4	
5	329.0	1.610	1.4	
6	286.4	1.500	1.5	
7	346.7	1.689	1.4	
8	334.8	1.634	1.4	
9	344.5	1.702	1.3	
10	—	—	—	
11	330	1.609	1.39	
12	334.2	1.646	1.4	
13	363.0	1.767	1.3	
14	341.2	1.674	1.4	
15	332.1	1.658	1.4	
16	341.1	1.645	1.4	
17	292.0	1.472	1.6	
18	316.9	1.591	1.4	
19	329.5	1.605	1.4	
20	313.4	1.692	1.5	

TECH. [illegible] ENGR.

EQUIPMENT: Wheatstone Bridge [illegible] Heath Multimeter
Milliammeter I-14197

COMMENTS: This is an isolation diode on current measurement.

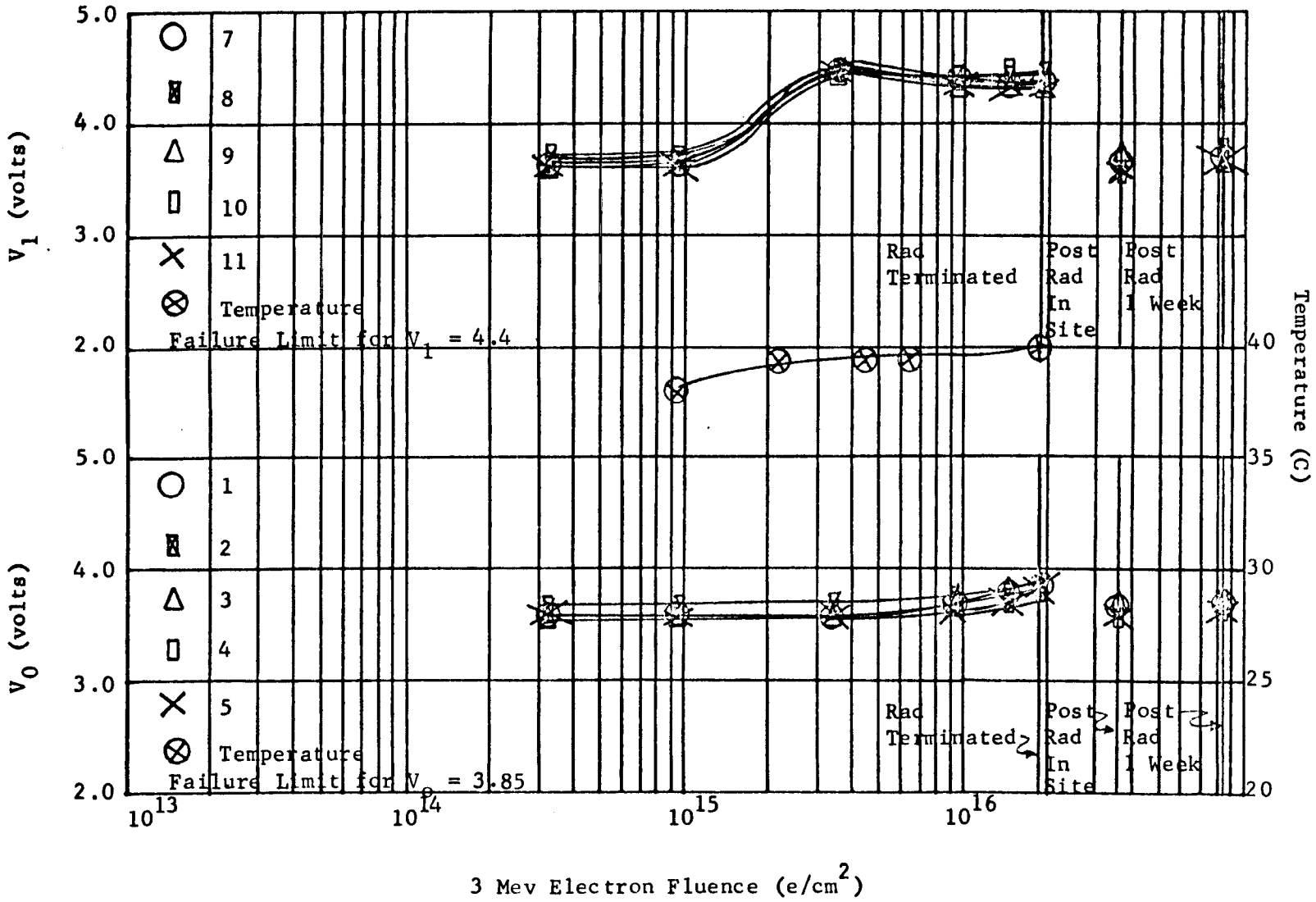
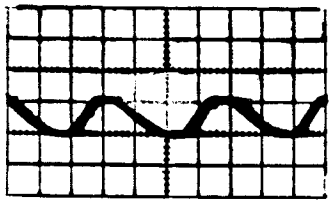
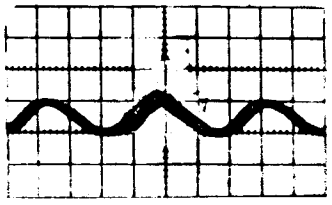


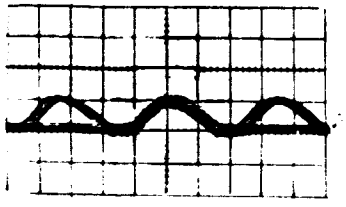
FIGURE III-13. RADIATION RESPONSE OF UNIT B-1



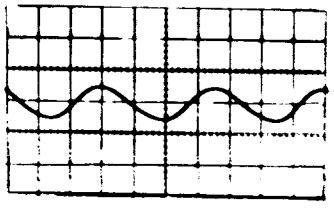
A - Initial



B - Final



C - Post Rad In Site



D - Post Rad 1 Week

Scale: 0.2 volt/cm
0.02 μsec/cm

FIGURE III-14. OUTPUT OF 5-STAGE OSCILLATOR OF B-1 CIRCUITS

CIRCUIT TYPE: B-2

TEST NUMBER: 1

DATA SHEET A

TEST TITLE: Input Threshold and Driving Current

PRE RADIATION				
Date: 2-22-65		2-23-65		
Temp: 76		78		
MOD	V_{10T}	I_{10}	V_{9T}	I_9
1	1.111	23 ma	1.109	24 ma
2	1.110	45	1.102	41
3	1.120	25	1.119	25
4	1.095	22	1.099	21
5	1.127	47	1.127	58
6	1.099	26	1.097	28
7	1.105	20	1.105	21
8	1.114	23	1.131	24
9	1.116	20	1.121	21
10	1.119	45	1.115	45
11	1.129	23	1.135	22
12	1.121	34	1.122	33
13	1.122	18	1.126	19
14	1.114	27	1.129	22
15	1.141	36	1.135	36
16	1.133	22	1.122	23
17	1.119	38	1.119	37
18	1.114	22	1.107	23
19	1.130	26	1.127	32
20	1.117	29	1.114	35
TECH. Erlenbach		ENGR. [illegible]		

POST RADIATION				
Date: 6-29-65				
Temp: 75°				
MOD	V_{10T}	I_{10}	V_{9T}	I_9
1	1.172	230	1.169	230
2	1.175	320	1.176	350
3	1.185	320	1.197	270
4	1.092	22	1.093	21.5
5	1.185	310	1.179	330
6	1.163	320	1.163	270
7	1.169	195	1.166	210
8	1.176	185	1.175	210
9	1.175	245	1.174	240
10	1.175	325	1.170	360
11	1.119	23.5	1.121	22
12	1.171	275	1.169	305
13	1.179	195	1.180	200
14	1.171	235	1.175	230
15	1.115	37	1.113	36
16	1.167	210	1.173	225
17	1.170	240	1.173	270
18	1.103	22	1.101	24
19	1.114	26.5	1.115	34
20	1.163	215	1.159	250
TECH. [illegible]		ENGR.		

EQUIPMENT: DVM - I-55991 Heath Multimeter
Electrometer I-52016
Microammeter C-3124

COMMENTS:

CIRCUIT TYPE: B-2

TEST NUMBER: 1

DATA SHEET B

TEST TITLE: Input Threshold and Driving Current

PRE RADIATION				
Date: 2-22-65		2-23-65		
Temp: 76°		78°		
MOD	V_{6T}	I_6	V_{7T}	I_7
1	1.103	30 ua	1.109	143 ua
2	1.122	40	1.127	37
3	1.112	30	1.114	29
4	1.092	19	1.099	22
5	1.107	47	1.127	60
6	1.086	27	1.104	29
7	1.107	22	1.104	25
8	1.110	23	1.104	28
9	1.097	18	1.111	23
10	1.125	46	1.116	46
11	1.122	23	1.112	24
12	1.116	32	1.122	36
13	1.116	18	1.131	19
14	1.114	22	1.110	22
15	1.121	37	1.119	41
16	1.122	24	1.120	23
17	1.161	31	1.157	35
18	1.126	21	1.116	22
19	1.122	25	1.119	28
20	1.103	31	1.105	35
TECH. Erlenbach			ENGR. [illegible]	

POST RADIATION				
Date: 6-29-65				
Temp: 75°				
MOD	V_{6T}	I_6	V_{7T}	I_7
1	1.149	265 μa	1.143	420
2	1.185	320	1.189	335
3	1.184	305	1.183	305
4	1.089	19	1.091	22
5	1.172	325	1.169	340
6	1.156	280	1.159	280
7	1.164	200	1.164	220
8	1.167	210	1.164	215
9	1.173	255	1.169	265
10	1.183	335	1.179	370
11	1.110	22	1.115	245
12	1.209	320	1.171	320
13	1.174	195	1.174	195
14	1.166	230	1.165	230
15	1.110	37.5	1.102	41
16	1.163	210	1.161	230
17	1.193	230	1.193	260
18	1.115	21.5	1.109	23
19	1.115	26	1.109	29
20	1.150	245	1.145	250
TECH. [illegible]			ENGR.	

EQUIPMENT: DVM- I-55491 Heath Multimeter
Electrometer I-52076
Microammeter C-3124

COMMENTS:

CIRCUIT TYPE: B-2

TEST NUMBER: 2

DATA SHEET A

TEST TITLE: Output Characteristics

PRE RADIATION

Date: 2-22-65 2-23-65
Temp: 77° 78°

MOD	V_{HQ}	$V_{H\bar{Q}}$	I_{O42}	I_{O43}
1	.729	.731	6.0 ma	2.0 ma
2	.747	.746	3.6 ma	2.2
3	.739	.739	4.7	2.1
4	.726	.726	6.6	2.0
5	.744	.749	3.3	2.2
6	.728	.725	5.7	2.2
7	.731	.726	6.6	2.0
8	.736	.732	5.8	2.1
9	.730	.726	5.9	2.0
10	.754	.755	2.6	2.2
11	.736	.732	5.5	2.0
12	.734	.739	4.8	2.2
13	.733	.733	5.6	2.0
14	.735	.731	6.5	2.0
15	.743	.743	4.0	1.8
16	.732	.733	6.2	2.0
17	.735	.767	1.1	0.6
18	.731	.744	4.6	1.9
19	.740	.740	5.1	2.0
20	.741	.741	4.4	2.0

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date: 6-30-65
Temp: 75°

MOD	V_{HQ}	$V_{H\bar{Q}}$	I_{O42}	I_{O43}
1	.803	.801	-	1.7
2	.839	.833	-	1.8
3	.844	.837	—	1.8
4	.726	.728	6.0	1.8
5	.819	.812	—	1.9
6	.823	.816	—	1.8
7	.804	.793	—	1.8
8	.800	.790	—	1.8
9	.819	.810	—	1.8
10	.849	.844	—	1.7
11	.740	.735	5.3	1.9
12	.821	.820	—	1.8
13	.804	.801		1.7
14	.807	.801	—	1.6
15	.743	.742	3.7	1.7
16	.797	.793	—	1.7
17	.813	.813	—	.2
18	.734	.746	4.3	1.7
19	.743	.741	4.8	1.8
20	.806	.802	—	1.7

TECH. [illegible] ENGR.

EQUIPMENT: DVM - I-55991
Differential VM I-74461
Milliameter I-14197
Decade Resistor I-73730

COMMENTS: radiated modules would not reach -.795V for I_{O42}

CIRCUIT TYPE: B-2

TEST NUMBER: 2

DATA SHEET B

TEST TITLE: Output Characteristics

PRE RADIATION				
Date: 2-22-65		2-23-65		
Temp: 77°		78°		
MOD	I_{o53}	I_{o52}		
1	2.0 ma	5.8 ma		
2	2.2	3.6		
3	2.1	4.3		
4	2.0	6.5		
5	2.2	3.5		
6	2.2	5.4		
7	2.1	5.6		
8	2.1	5.2		
9	2.0	5.8		
10	2.3	2.8		
11	2.1	4.9		
12	2.2	5.0		
13	2.0	5.6		
14	2.1	6.3		
15	1.9	4.0		
16	2.1	6.2		
17	2.2	4.9		
18	2.0	5.6		
19	2.0	4.7		
20	2.1	4.6		
TECH. Erlenbach		ENGR. [illegible]		

POST RADIATION				
Date: 6-30-65				
Temp: 75°				
MOD	I_{o53}	I_{o52}		
1	1.8	—		
2	2.0	—		
3	1.8	—		
4	1.9	6.4		
5	2.0	—		
6	2.0	—		
7	1.9	—		
8	1.8	—		
9	1.9	—		
10	2.0	—		
11	2.0	4.7		
12	1.9	—		
13	1.8	—		
14	1.8	—		
15	1.7	3.7		
16	1.8	—		
17	2.0	—		
18	1.8	5.4		
19	1.9	4.4		
20	2.2	—		
TECH. [illegible]		ENGR.		

EQUIPMENT: DVM - I-55991
Differential VM I-74461
Millameter - I-14197
Decade Resistor I-73730

COMMENTS: radiated modules would not reach -.795 V for I_{o52}

CIRCUIT TYPE: B-2

TEST NUMBER: 3

DATA SHEET A

TEST TITLE: Leakage Currents

PRE RADIATION

Date: 2-19-65 2-23-65

Temp: 78° 77°

MOD	I_{L86}	I_{L87}	I_{L89}	I_{L810}
1	$.23 \times 10^{-9}$	$.47 \times 10^{-9}$	$.64 \times 10^{-9}$	$.31 \times 10^{-9}$
2	$.16 \times 10^{-9}$	$.20 \times 10^{-9}$	$.68 \times 10^{-9}$	$.16 \times 10^{-9}$
3	$.20 \times 10^{-9}$	$.72 \times 10^{-9}$	$.17 \times 10^{-7}$	$.22 \times 10^{-9}$
4	$.90 \times 10^{-8}$	$.18 \times 10^{-9}$	$.18 \times 10^{-9}$	$.16 \times 10^{-9}$
5	$.15 \times 10^{-9}$	$.17 \times 10^{-9}$	$.16 \times 10^{-9}$	$.16 \times 10^{-9}$
6	$.17 \times 10^{-9}$	$.20 \times 10^{-9}$	$.19 \times 10^{-9}$	$.22 \times 10^{-9}$
7	$.15 \times 10^{-9}$	$.22 \times 10^{-9}$	$.35 \times 10^{-9}$	$.21 \times 10^{-9}$
8	$.22 \times 10^{-9}$	$.13 \times 10^{-8}$	$.19 \times 10^{-9}$	$.25 \times 10^{-9}$
9	$.13 \times 10^{-9}$	$.28 \times 10^{-9}$	$.15 \times 10^{-9}$	$.14 \times 10^{-9}$
10	$.17 \times 10^{-9}$	$.26 \times 10^{-9}$	$.17 \times 10^{-9}$	$.16 \times 10^{-9}$
11	$.14 \times 10^{-9}$	$.17 \times 10^{-9}$	$.15 \times 10^{-9}$	$.28 \times 10^{-9}$
12	$.22 \times 10^{-9}$	$.54 \times 10^{-9}$	$.14 \times 10^{-9}$	$.15 \times 10^{-9}$
13	$.15 \times 10^{-9}$	$.23 \times 10^{-9}$	$.16 \times 10^{-9}$	$.14 \times 10^{-9}$
14	$.14 \times 10^{-9}$	$.24 \times 10^{-9}$	$.17 \times 10^{-9}$	$.17 \times 10^{-9}$
15	$.12 \times 10^{-9}$	$.14 \times 10^{-9}$	$.11 \times 10^{-9}$	$.11 \times 10^{-9}$
16	$.14 \times 10^{-9}$	$.13 \times 10^{-9}$	$.14 \times 10^{-9}$	$.14 \times 10^{-9}$
17	$.15 \times 10^{-9}$	$.25 \times 10^{-9}$	$.21 \times 10^{-9}$	$.21 \times 10^{-9}$
18	$.71 \times 10^{-9}$	$.17 \times 10^{-9}$	$.14 \times 10^{-9}$	$.15 \times 10^{-9}$
19	$.13 \times 10^{-9}$	$.14 \times 10^{-9}$	$.18 \times 10^{-9}$	$.14 \times 10^{-9}$
20	$.11 \times 10^{-9}$	$.15 \times 10^{-9}$	$.13 \times 10^{-9}$	$.13 \times 10^{-9}$
TECH. Erlenbach		ENGR. RRD		

POST RADIATION

Date: 6-30-65

Temp: 75°

MOD	I_{L86}	I_{L87}	I_{L89}	I_{L810}
1	$.35 \times 10^{-9}$	$.75 \times 10^{-3}$	$.67 \times 10^{-9}$	$.42 \times 10^{-9}$
2	$.36 \times 10^{-9}$	$.36 \times 10^{-9}$	$.78 \times 10^{-9}$	$.35 \times 10^{-9}$
3	$.46 \times 10^{-9}$	$.1 \times 10^{-8}$	$.18 \times 10^{-7}$	$.46 \times 10^{-9}$
4	$.77 \times 10^{-9}$	$.18 \times 10^{-9}$	$.17 \times 10^{-9}$	$.14 \times 10^{-9}$
5	$.37 \times 10^{-9}$	$.4 \times 10^{-9}$	$.38 \times 10^{-9}$	$.4 \times 10^{-9}$
6	$.29 \times 10^{-9}$	$.31 \times 10^{-9}$	$.3 \times 10^{-9}$	$.42 \times 10^{-9}$
7	$.3 \times 10^{-9}$	$.34 \times 10^{-9}$	$.44 \times 10^{-9}$	$.3 \times 10^{-9}$
8	$.25 \times 10^{-9}$	$.38 \times 10^{-9}$	$.28 \times 10^{-9}$	$.27 \times 10^{-9}$
9	$.34 \times 10^{-9}$	$.13 \times 10^{-8}$	$.3 \times 10^{-9}$	$.37 \times 10^{-9}$
10	$.4 \times 10^{-9}$	$.48 \times 10^{-9}$	$.35 \times 10^{-9}$	$.37 \times 10^{-9}$
11	$.16 \times 10^{-9}$	$.17 \times 10^{-9}$	$.16 \times 10^{-9}$	$.32 \times 10^{-9}$
12	$.32 \times 10^{-9}$	$.64 \times 10^{-9}$	$.36 \times 10^{-9}$	$.31 \times 10^{-9}$
13	$.35 \times 10^{-9}$	$.37 \times 10^{-9}$	$.28 \times 10^{-9}$	$.24 \times 10^{-9}$
14	$.26 \times 10^{-9}$	$.3 \times 10^{-9}$	$.29 \times 10^{-9}$	$.27 \times 10^{-9}$
15	$.16 \times 10^{-9}$	$.14 \times 10^{-9}$	$.11 \times 10^{-9}$	$.1 \times 10^{-9}$
16	$.28 \times 10^{-9}$	$.27 \times 10^{-9}$	$.27 \times 10^{-9}$	$.31 \times 10^{-9}$
17	$.42 \times 10^{-9}$	$.45 \times 10^{-9}$	$.38 \times 10^{-9}$	$.58 \times 10^{-9}$
18	$.68 \times 10^{-9}$	$.17 \times 10^{-9}$	$.14 \times 10^{-9}$	$.13 \times 10^{-9}$
19	$.14 \times 10^{-9}$	$.15 \times 10^{-9}$	$.18 \times 10^{-9}$	$.13 \times 10^{-9}$
20	$.34 \times 10^{-9}$	$.37 \times 10^{-9}$	$.31 \times 10^{-9}$	$.39 \times 10^{-9}$
TECH. H. W. [illegible]		ENGR.		

EQUIPMENT: DVM 1-55991
Electrometer 1-52076
Shunt 1 52075

COMMENTS:

CIRCUIT TYPE: B-2

TEST NUMBER: 3

DATA SHEET B

TEST TITLE: Leakage Current

PRE RADIATION				
Date: 2-19-65		2-23-65		
Temp: 78°		77°		
MOD	I_{L110}	I_{L19}		
1	$.34 \times 10^{-9}$	$.64 \times 10^{-9}$		
2	$.17 \times 10^{-9}$	$.69 \times 10^{-9}$		
3	$.22 \times 10^{-9}$	$.17 \times 10^{-9}$		
4	$.16 \times 10^{-9}$	$.18 \times 10^{-9}$		
5	$.17 \times 10^{-9}$	$.17 \times 10^{-9}$		
6	$.21 \times 10^{-9}$	$.19 \times 10^{-9}$		
7	$.21 \times 10^{-9}$	$.37 \times 10^{-9}$		
8	$.25 \times 10^{-9}$	$.18 \times 10^{-9}$		
9	$.14 \times 10^{-9}$	$.16 \times 10^{-9}$		
10	$.16 \times 10^{-9}$	$.18 \times 10^{-9}$		
11	$.25 \times 10^{-9}$	$.16 \times 10^{-9}$		
12	$.15 \times 10^{-9}$	$.15 \times 10^{-9}$		
13	$.14 \times 10^{-9}$	$.16 \times 10^{-9}$		
14	$.17 \times 10^{-9}$	$.17 \times 10^{-9}$		
15	$.11 \times 10^{-9}$	$.12 \times 10^{-9}$		
16	$.15 \times 10^{-9}$	$.14 \times 10^{-9}$		
17	$.22 \times 10^{-9}$	$.21 \times 10^{-9}$		
18	$.14 \times 10^{-9}$	$.15 \times 10^{-9}$		
19	$.14 \times 10^{-9}$	$.19 \times 10^{-9}$		
20	$.13 \times 10^{-9}$	$.13 \times 10^{-9}$		
TECH. Erlenbach		ENGR.		

POST RADIATION				
Date: 6-30-65				
Temp: 75°				
MOD	I_{L110}	I_{L19}		
1	$.46 \times 10^{-9}$	$.68 \times 10^{-9}$		
2	$.37 \times 10^{-9}$	$.8 \times 10^{-9}$		
3	$.49 \times 10^{-9}$	$.18 \times 10^{-9}$		
4	$.15 \times 10^{-9}$	$.18 \times 10^{-9}$		
5	$.42 \times 10^{-9}$	$.38 \times 10^{-9}$		
6	$.44 \times 10^{-9}$	$.3 \times 10^{-9}$		
7	$.31 \times 10^{-9}$	$.44 \times 10^{-9}$		
8	$.28 \times 10^{-9}$	$.28 \times 10^{-9}$		
9	$.39 \times 10^{-9}$	$.3 \times 10^{-9}$		
10	$.39 \times 10^{-9}$	$.37 \times 10^{-9}$		
11	$.35 \times 10^{-9}$	$.15 \times 10^{-9}$		
12	$.33 \times 10^{-9}$	$.36 \times 10^{-9}$		
13	$.26 \times 10^{-9}$	$.27 \times 10^{-9}$		
14	$.3 \times 10^{-9}$	$.28 \times 10^{-9}$		
15	$.12 \times 10^{-9}$	$.11 \times 10^{-9}$		
16	$.33 \times 10^{-9}$	$.27 \times 10^{-9}$		
17	$.61 \times 10^{-9}$	$.4 \times 10^{-9}$		
18	$.14 \times 10^{-9}$	$.14 \times 10^{-9}$		
19	$.14 \times 10^{-9}$	$.18 \times 10^{-9}$		
20	$.41 \times 10^{-9}$	$.32 \times 10^{-9}$		
TECH. M. A. Elliott		ENGR.		

EQUIPMENT: DVM I-55991
Electrometer I-52076
Shunt I-52075

COMMENTS:

CIRCUIT TYPE: B-2

TEST NUMBER: 4

DATA SHEET A

TEST TITLE: Transient Parameters for Q Pin 5

PRE RADIATION

Date: 2-16-65
Temp: 79°

MOD	T_s	T_d	T_r	T_f
1	12	12	13	9
2	12	12	14	9
3	13	12	13	10
4	13	12	13	11
5	12	11	13	9
6	13	12	13	11
7	13	12	14	11
8	13	12	14	10
9	14	12	14	11
10	11	11	14	9
11	13	11	14	11
12	12	12	15	10
13	13	13	15	10
14	12	12	15	10
15	13	12	13	9
16	13	12	14	9
17	12	11	16	10
18	13	12	15	10
19	13	12	13	9
20	13	12	15	10

TECH. K.W. Elliott ENGR. [illegible]

POST RADIATION

Date: 6-19-65
Temp: 76°

MOD	T_s	T_d	T_r	T_f
1	9	5	16.5	9.5
2	9	4.5	16.5	9
3	9.5	4.5	17	9.5
4	10.5	10	13	11.5
5	9	5.5	15.5	9.5
6	9	5	16	9.5
7	9	5.5	17.5	10.5
8	9.5	5	16	10
9	9.5	6	17	10.5
10	8.5	4	16	8.5
11	11	10	12.5	11
12	9	5	15	9
13	9.5	6	18	11
14	9	6	16	9.5
15	11	9.5	12	11
16	9	8	16	9
17	9	6	15	9.5
18	10	10.5	13.5	11.5
19	9.5	10	13	10.5
20	9.5	8.5	14	10

TECH. K.W. Elliott ENGR.

EQUIPMENT: Sampling oscilloscope
TI pulse generator
Heath H.V. power

COMMENTS:
Clock pulse at pin 6 leading 50 ms.
waveform very irregular
mods 12-20 Tested 2-26-65
Temp 77°

CIRCUIT TYPE: B-2

TEST NUMBER: 4

DATA SHEET C

TEST TITLE: Minimum Pulse Width and Amplitude

PRE RADIATION

Date: 2-17-65

Temp: 78°

MOD	P_{w6}	P_{a6}	P_{w10}	P_{a10}
1	<12	.51	<12	.51
2	<12	.49	<12	.50
3	12.5	.51	<12	.51
4	13	.51	<12	.53
5	<12	.48	<12	.50
6	12.5	.52	<12	.52
7	12.5	.51	<12	.52
8	12.5	.50	<12	.52
9	13	.51	<12	.52
10	<12	.50	<12	.51
11	12.5	.50	<12	.50
12	<12	.51	<12	.54
13	12.5	.52	14	.53
14	<12	.51	<12	.53
15	<12	.51	<12	.53
16	<12	.51	<12	.52
17	<12	.47	15	.53
18	<12	.52	15	.54
19	<12	.51	<12	.52
20	<12	.53	<12	.53

TECH. M. W. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-19-65

Temp: 76°

MOD	P_{w6}	P_{a6}	P_{w10}	P_{a10}
1	<12	.38	<12	.39
2	<12	.35	<12	.38
3	<12	.35	<12	.38
4	<12	.50	<12	.47
5	<12	.36	<12	.39
6	<12	.37	<12	.38
7	<12	.38	<12	.41
8	<12	.36	<12	.39
9	<12	.39	<12	.40
10	<12	.35	<12	.38
11	<12	.46	<12	.45
12	<12	.37	<12	.39
13	<12	.38	<12	.40
14	<12	.38	<12	.39
15	<12	.47	<12	.45
16	<12	.37	<12	.39
17	<12	.33	<12	.40
18	<	.47	<12	.48
19	<	.46	<12	.45
20	<12	.4	<12	.40

TECH. M. W. [illegible] ENGR.

EQUIPMENT: Same as sheet A

When setting up transient test the supply voltages were inadvertently applied to modules 11, 15 with reversed polarity

COMMENTS:
mods 12-20 tested 2-26-65
Temp 77°

CIRCUIT TYPE: B-2

TEST NUMBER: 4

DATA SHEET B

TEST TITLE: Transient Parameter for $\bar{Q}$ Pin 4

PRE RADIATION

Date: 2-16-65

Temp: 78°

MOD	T_d	T_s	T_r	T_f
1	11	10	10	13
2	11	9	9	17
3	11	10	11	19
4	11	11	11	14
5	11	10	9	14
6	12	11	11	14
7	11	10	11	14
8	11	11	11	14
9	11	11	11	13
10	11	9	9	18
11	11	11	11	19
12	11	10	9	15
13	12	12	10	15
14	11	10	9	15
15	11	12	9	13
16	11	11	9	15
17	11	12	14	14
18	11	12	10	15
19	11	11	9	13
20	12	11	10	15

TECH. H.W. Elliott ENGR. [illegible]

POST RADIATION

Date: 6-19-65

Temp: 76°

MOD	T_d	T_s	T_r	T_f
1	8.5	5	8	15
2	8	9	7	14.5
3	8	4	7.5	16
4	9	9	8	12
5	8.5	4	7.5	16.5
6	8	6	7.5	14
7	8.5	7.5	9	12.5
8	8	7.5	9.5	12.5
9	8.5	5	8	15.5
10	8	4.5	6.5	13.5
11	8.5	5	8	12.5
12	8	7	8.5	12
13	8.5	8	10	13.5
14	8.5	7	9.5	12.5
15	9	9	10	11
16	8.5	6	8.5	13
17	9	6.5	12.5	13.5
18	9	9	8.5	13.5
19	8.5	9	8	12
20	8.5	5	8	15.5

TECH. H.W. Elliott ENGR.

EQUIPMENT: same as sheet A

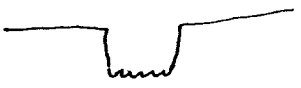
#21 other side

COMMENTS:

Mods 12-20 tested 2-26-65

Temp 77°

Waveform very irregular



CIRCUIT TYPE: B-2

TEST NUMBER: 5

DATA SHEET A

TEST TITLE: Resistance Measurement

PRE RADIATION

Date: 2-18-65 2-22-65
Temp: 79° 78°

MOD	R_{31}	R_{24}	R_{25}	R_{82}
1	80.9 Ω	70.3 Ω	43.9 Ω	551.2 Ω
2	80.5	64.2	36.9	522.1
3	81.6	71.6	45.5	547.4
4	79.0	68.3	41.9	554.5
5	76.1	66.6	39.7	511.2
6	72.6	68.7	42.2	256.8
7	80.9	70.7	44.8	552.3
8	80.3	70.6	44.8	544.1
9	81.3	71.3	44.8	554.1
10	82.0	66.7	39.3	525.3
11	81.2	71.0	44.4	546.2
12	48.2	41.7	38.9	529.6
13	48.0	46.5	42.8	573.3
14	50.0	47.8	44.0	553.2
15	51.5	48.7	44.6	567.0
16	50.7	47.9	44.5	546.5
17	47.5	39.8	37.2	479.7
18	48.8	44.6	41.2	576.1
19	51.7	50.0	46.5	558.4
20	46.3	41.5	38.6	546.6
TECH. Erlenbach		ENGR. [illegible]		

POST RADIATION

Date: 6-30-65
Temp: 75°

MOD	R_{31}	R_{24}	R_{25}	R_{82}
1	79.4	58.8	54.3	568.0
2	75.7	48.6	47.0	542.0
3	77.3	58.3	54.8	574.0
4	50.4	45.7	42.7	555.0
5	72.0	51.2	48.3	526.0
6	65.6	57.4	53.4	267.8
7	74.0	57.4	52.9	573.0
8	75.2	57.5	53.4	574.0
9	82.4	59.5	55.5	561.0
10	80.7	51.6	48.6	546.0
11	51.4	49.2	45.4	547.0
12	52.2	48.9	46.4	548.0
13	75.0	57.5	53.4	590.0
14	81.4	58.2	53.4	570.0
15	51.9	47.7	44.3	567.0
16	71.9	55.4	51.5	567.0
17	69.6	46.3	43.3	494.0
18	49.0	44.1	40.9	576.0
19	51.7	49.3	46.2	559.0
20	69.2	48.4	45.3	564.0
TECH. [illegible]			ENGR.	

EQUIPMENT: Wheatstone Bridge I-25471

COMMENTS: The low values of resistance may be isolation diode and/or transistor diode characteristics.

CIRCUIT TYPE: B-2

TEST NUMBER: 5

DATA SHEET B

TEST TITLE: Resistance Measurement

PRE RADIATION				
Date: 3-17-65				
Temp: 78°				
MOD	R 63			
1	47.3			
2	43.7			
3	49.0			
4	46.2			
5	48.6			
6	46.3			
7	47.2			
8	48.5			
9	47.9			
10	44.2			
11	48.1			
12	43.2			
13	46.3			
14	48.5			
15	48.4			
16	48.0			
17	47.9			
18	45.6			
19	47.8			
20	45.1			
TECH. Erlenbach		ENGR.		

POST RADIATION				
Date: 6-30-65				
Temp: 75°				
MOD	R63			
1	56.6			
2	52.3			
3	57.9			
4	49.3			
5	58.4			
6	54.8			
7	55.4			
8	56.8			
9	56.9			
10	52.5			
11	55.2			
12	52.3			
13	55.0			
14	57.8			
15	51.7			
16	57.2			
17	56.6			
18	48.8			
19	51.4			
20	53.9			
TECH. [illegible]		ENGR.		

EQUIPMENT: Wheatstone Bridge 1-25471

COMMENTS:

CIRCUIT TYPE: B-2

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Base Region Minority Carrier Lifetime

PRE RADIATION				
Date:				
Temp:				
MOD	ΔT/ΔV	γ		
1	262.5/.500	1 3.5		
2	150/.300	1 2.9		
3	175/.360	1 2.5		
4	237.5/.500	1 2.3		
5	187.5/.400	1 2.1		
6	237.5/.450	1 3.6		
7	187.5/.350	1 3.8		
8	275/.600	1 2.8		
9	162.5/.300	1 4.0		
10	362.5/.700	1 3.4		
11	212.5/.375	1 4.6		
12	200/.350	1 4.7		
13	100/.200	1 2.9		
14	150/.250	1 5.5		
15	200/.350	1 4.7		
16	125/.250	1 2.8		
17	150/.300	1 2.8		
18	125/.275	1 2.7		
19	275/.525	1 3.4		
20	100/.250	1 0.3		
TECH. P.M. Lindsey			ENGR.	

POST RADIATION				
Date:				
Temp:				
MOD				
1	The post characterization			
2	values did not change			
3	significantly			
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: B-2

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Transistor Gain

PRE RADIATION

Date: 2-18-65 2-23-65
Temp: 79 76°

MOD	$I_{c\,9.5}$	$I_{c\,9.1}$	$I_{c\,10.5}$	$I_{c\,10.1}$
1	2.25 ma	2.77 ma	2.41 ma	2.95 ma
2	1.42	1.89	1.27	1.75
3	2.20	2.70	2.15	2.65
4	2.46	3.03	2.38	2.94
5	.68	1.16	1.12	1.61
6	2.14	2.78	2.30	2.97
7	2.50	3.04	2.63	3.24
8	2.25	2.76	2.36	2.88
9	2.55	3.14	2.67	3.25
10	1.31	1.76	1.27	1.74
11	2.55	3.05	[illegible]	2.70
12	1.71	2.23	1.65	2.18
13	2.75	3.35	2.94	3.53
14	2.39	2.96	1.97	2.52
15	1.54	2.01	1.49	1.96
16	2.47	3.04	2.48	3.03
17	1.96	2.53	1.95	2.55
18	2.28	2.81	2.46	3.04
19	1.59	2.11	2.15	2.67
20	1.50	2.05	1.88	2.45

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date: 7-1-65
Temp:

MOD	$I_{c\,9.5}$	$I_{c\,9.1}$	$I_{c\,10.5}$	$I_{c\,10.1}$
1	.195	.58	.20	.58
2	.115	.52	.082	.46
3	.145	.52	.042	.4
4	2.45	3.0	2.4	2.9
5	.125	.52	.152	.54
6	.57	1.1	.55	1.08
7	.20	.59	.156	.52
8	.20	.6	.186	.57
9	.153	.58	.176	.56
10	.101	.50	.074	.44
11	2.55	2.505	2.35	2.85
12	.135	.53	.108	.57
13	.23	.61	.23	.60
14	.19	.58	.178	.56
15	1.54	1.96	1.48	1.9
16	.185	.58	.132	.52
17	.37	.80	.33	.66
18	2.25	2.75	2.45	2.95
19	1.6	2.0	2.1	2.6
20	.115	.56	.146	.54

TECH. ENGR.

EQUIPMENT: Transistor Curve Tracer I-55783

COMMENTS:

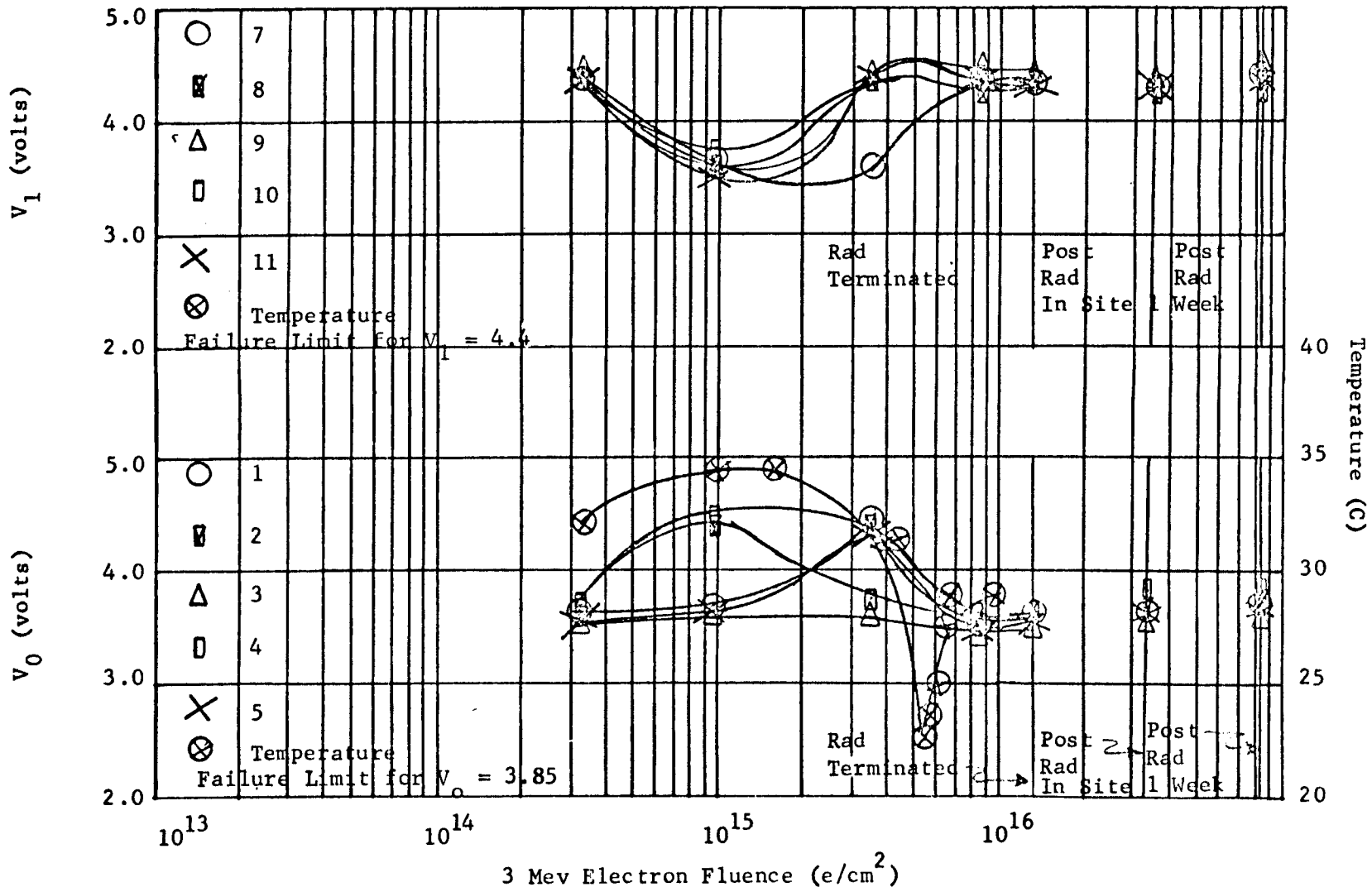
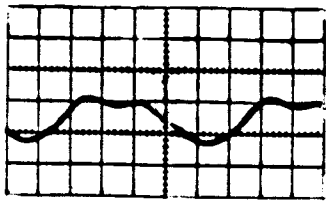
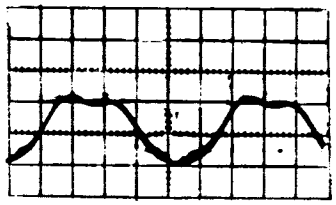


FIGURE III-15. RADIATION RESPONSE OF UNIT B-2

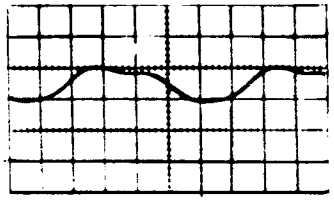
Note: Reset was on during the entire test.



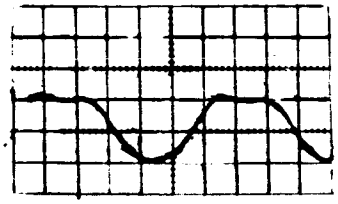
A - Initial*



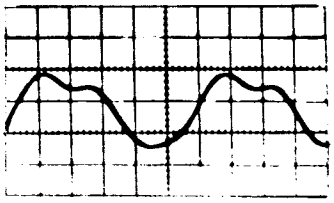
B - Final



D-1 - Post Rad 1 Week*



C - Post Rad In Site



D-2 - Post Rad 1 Week

Scale: 0.1 volt/cm
0.02 μsec/cm

FIGURE III-16. OUTPUT OF 5-STAGE OSCILLATOR OF B-2 CIRCUITS

* Vertical Scale 0.2 volts.

CIRCUIT TYPE: C-1

TEST NUMBER: 1

DATA SHEET

TEST TITLE: Input Voltage Levels

PRE RADIATION

Date: 8-25-64
Temp: 77°F All Data in Volts

MOD	R_L = 2 K V_{one}	R_L = 2 K V_{zero}	R_L = 510 V_{one}	R_L = 510 V_{zero}
1	1.353	1.326	1.441	1.389
2	1.366	1.338	1.465	1.412
3	1.354	1.328	1.447	1.395
4	1.373	1.346	1.474	1.420
5	1.375	1.347	1.475	1.420
6	1.340	1.314	1.427	1.377
7	1.375	1.347	1.476	1.420
8	1.348	1.321	1.439	1.389
9	1.366	1.339	1.463	1.409
10	1.343	1.317	1.425	1.379
11	1.367	1.339	1.468	1.413
12	1.351	1.324	1.447	1.394
13	1.363	1.335	1.461	1.408
14	1.354	1.328	1.451	1.397
15	1.366	1.338	1.465	1.412
16	1.350	1.323	1.439	1.383
17	1.354	1.330	1.449	1.395
18	1.342	1.315	1.427	1.381
19	1.359	1.331	1.451	1.403
20	1.349	1.326	1.439	1.380

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-21-65
Temp: 77°F All DATA IN VOLTS

MOD	R_L = 2 K V_{one}	R_L = 2 K V_{zero}	R_L = 510 V_{one}	R_L = 510 V_{zero}
1	1.442	1.389	5.0(.751)	1.543
2	1.461	1.466	5.0(.776)	1.566
3	1.433	1.384	1.646	1.521
4	1.385	1.357	1.482	1.429
5	1.470	1.417	5.0(.762)	1.575
6	1.439	1.385	5.0(.731)	1.533
7	1.475	1.420	5.0(1.133)	1.589
8	1.447	1.392	5.0(.836)	1.547
9	1.459	1.405	5.0(.795)	1.561
10	1.415	1.367	1.610	1.494
11	1.371	1.345	1.465	1.413
12	1.383	1.316	1.664	1.485
13	1.477	1.417	5.0(1.417)	1.607
14	1.476	1.413	5.0(1.320)	1.596
15	1.375	1.349	1.472	1.420
16	1.446	1.393	5.0(.826)	1.550
17	1.456	1.402	5.0(.764)	1.557
18	1.338	1.314	1.430	1.382
19	1.361	1.335	1.456	1.403
20	1.443	1.391	[illegible]	1.537

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: Digital V.M I-55991
[illegible] Box I 75730

COMMENTS:
The values in parenthesis are the values of voltage at the output when the input is five volts

CIRCUIT TYPE: C-1

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Input Driving Current

PRE RADIATION				
Date: 3 26 64				
Temp: 75°F				
MOD	I_D (milliamperes)			
1	1.6			
2	1.7			
3	1.6			
4	1.6			
5	1.7			
6	1.45			
7	1.6			
8	1.6			
9	1.5			
10	1.6			
11	1.45			
12	1.6			
13	1.5			
14	1.6			
15	1.7			
16	1.5			
17	1.6			
18	1.6			
19	1.6			
20	1.5			
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 5-21-65				
Temp: 77°F				
MOD	I_D (Milliamperes)			
1	1.5			
2	1.6			
3	1.55			
4	1.55			
5	1.45			
6	1.4			
7	1.55			
8	1.5			
9	1.4			
10	1.6			
11	1.4			
12	1.6			
13	1.45			
14	1.55			
15	1.65			
16	1.4			
17	1.55			
18	1.55			
19	1.6			
20	1.5			
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: Milliammeter I-14196
15 MA Scale

COMMENTS:

CIRCUIT TYPE: C-1

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Input Leakage Current

PRE RADIATION

Date: 11/5/64.
Temp: 74°F

DATA IN AMPERES

MOD	I_{L7}	I_{L8}	I_{L9}
1	$.36\times10^{-8}$	$.39\times10^{-8}$	$.4\times10^{-8}$
2	$.36\times10^{-8}$	$.37\times10^{-8}$	$.38\times10^{-8}$
3	$.42\times10^{-8}$	$.42\times10^{-8}$	$.42\times10^{-8}$
4	$.12\times10^{-7}$	$.42\times10^{-8}$	$.125\times10^{-7}$
5	$.11\times10^{-7}$	$.13\times10^{-7}$	$.12\times10^{-7}$
6	$.36\times10^{-8}$	$.41\times10^{-8}$	$.42\times10^{-8}$
7	$.12\times10^{-7}$	$.16\times10^{-7}$	$.13\times10^{-7}$
8	$.37\times10^{-8}$	$.4\times10^{-8}$	$.4\times10^{-8}$
9	$.375\times10^{-8}$	$.38\times10^{-8}$	$.39\times10^{-8}$
10	$.4\times10^{-8}$	$.38\times10^{-8}$	$.41\times10^{-8}$
11	$.35\times10^{-8}$	$.35\times10^{-8}$	$.37\times10^{-8}$
12	$.38\times10^{-8}$	$.57\times10^{-9}$	$.4\times10^{-8}$
13	$.37\times10^{-8}$	$.34\times10^{-8}$	$.37\times10^{-8}$
14	$.36\times10^{-8}$	$.35\times10^{-8}$	$.38\times10^{-8}$
15	$.37\times10^{-8}$	$.34\times10^{-8}$	$.36\times10^{-8}$
16	$.38\times10^{-8}$	$.35\times10^{-8}$	$.36\times10^{-8}$
17	$.42\times10^{-8}$	$.4\times10^{-8}$	$.4\times10^{-8}$
18	$.49\times10^{-8}$	$.44\times10^{-8}$	$.42\times10^{-8}$
19	$.46\times10^{-8}$	$.5\times10^{-8}$	$.44\times10^{-8}$
20	$.42\times10^{-8}$	$.43\times10^{-8}$	$.42\times10^{-8}$

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-21-65
Temp: 77°F

DATA IN AMPERES

MOD	I_{L7}	I_{L8}	I_{L9}
1	$.39\times10^{-8}$	$.395\times10^{-8}$	$.397\times10^{-8}$
2	$.373\times10^{-8}$	$.375\times10^{-8}$	$.375\times10^{-8}$
3	$.415\times10^{-8}$	$.424\times10^{-8}$	$.426\times10^{-8}$
4	$.107\times10^{-7}$	$.11\times10^{-7}$	$.108\times10^{-7}$
5	$.102\times10^{-7}$	$.11\times10^{-7}$	$.103\times10^{-7}$
6	$.415\times10^{-8}$	$.415\times10^{-8}$	$.412\times10^{-8}$
7	1.16×10^{-8}	$.275\times10^{-7}$	$.12\times10^{-7}$
8	$.462\times10^{-8}$	$.464\times10^{-8}$	$.465\times10^{-8}$
9	$.425\times10^{-8}$	$.425\times10^{-8}$	$.425\times10^{-8}$
10	$.44\times10^{-8}$	$.442\times10^{-8}$	$.442\times10^{-8}$
11	$.34\times10^{-8}$	$.34\times10^{-8}$	$.34\times10^{-8}$
12	$.416\times10^{-8}$	$.416\times10^{-8}$	$.418\times10^{-8}$
13	$.391\times10^{-8}$	$.393\times10^{-8}$	$.395\times10^{-8}$
14	$.400\times10^{-8}$	$.403\times10^{-8}$	$.403\times10^{-8}$
15	$.335\times10^{-8}$	$.335\times10^{-8}$	$.335\times10^{-8}$
16	$.426\times10^{-8}$	$.426\times10^{-8}$	$.426\times10^{-8}$
17	$.423\times10^{-8}$	$.423\times10^{-8}$	$.423\times10^{-8}$
18	$.375\times10^{-8}$	$.377\times10^{-8}$	$.24\times10^{-8}$
19	$.38\times10^{-8}$	$.38\times10^{-8}$	$.38\times10^{-8}$
20	$.465\times10^{-8}$	$.465\times10^{-8}$	$.465\times10^{-8}$

TECH. D. A. Kaiser ENGR. [illegible]

EQUIPMENT: Digital VM I 55791
Electrometer I 52076 with
Shunt I 52075

LEAKAGE CURRENT JIG

COMMENTS:
Mods 16-20 Tested 12-23-64 @ 76°F

CIRCUIT TYPE: C-1

TEST NUMBER: 4

DATA SHEET

TEST TITLE: Output Driving Current

PRE RADIATION

Date: 12/3/64
Temp: 75°F

MOD	milliamperes I_{O2}			
1	29			
2	24			
3	28			
4	24			
5	26			
6	33			
7	25			
8	28			
9	26			
10	34			
11	22			
12	28			
13	23			
14	28			
15	24			
16	29			
17	29			
18	32			
19	28			
20	29			

TECH. [illegible] ENGR.

POST RADIATION

Date: 5-21-65
Temp: 77°F

MOD	milliamperes I_D			
1	6.4			
2	6.3			
3	7.9			
4	24			
5	6.4			
6	6.4			
7	5.6			
8	6.2			
9	6.3			
10	5.7			
11	31.5			
12	9.6			
13	5.0			
14	5.1			
15	22.5			
16	6.2			
17	6.4			
18	31			
19	27.5			
20	7.0			

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: Digital VM I 55991
milliammeter I 14196

COMMENTS:

CIRCUIT TYPE: C-1

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Output Leakage Current

PRE RADIATION

Date: 11/7/64
Temp: 75°F

MOD	Ampere I_L			
1	$.27 \times 10^{-7}$			
2	$.26 \times 10^{-7}$			
3	$.28 \times 10^{-7}$			
4	$.23 \times 10^{-7}$			
5	$.38 \times 10^{-7}$			
6	$.23 \times 10^{-7}$			
7	$.23 \times 10^{-7}$			
8	$.29 \times 10^{-7}$			
9	$.23 \times 10^{-7}$			
10	$.3 \times 10^{-7}$			
11	$.22 \times 10^{-7}$			
12	$.26 \times 10^{-7}$			
13	$.21 \times 10^{-7}$			
14	$.22 \times 10^{-7}$			
15	$.26 \times 10^{-7}$			
16	$.29 \times 10^{-7}$			
17	$.28 \times 10^{-7}$			
18	$.26 \times 10^{-7}$			
19	$.26 \times 10^{-7}$			
20	$.26 \times 10^{-7}$			
TECH. K.W. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 5-24-65
Temp: 77°F

MOD	Ampere			
1	$.275 \times 10^{-7}$			
2	$.265 \times 10^{-7}$			
3	$.28 \times 10^{-7}$			
4	$.24 \times 10^{-7}$			
5	$.38 \times 10^{-7}$			
6	$.215 \times 10^{-7}$			
7	$.22 \times 10^{-7}$			
8	$.275 \times 10^{-7}$			
9	$.225 \times 10^{-7}$			
10	$.27 \times 10^{-7}$			
11	$.21 \times 10^{-7}$			
12	$.26 \times 10^{-7}$			
13	$.205 \times 10^{-7}$			
14	$.205 \times 10^{-7}$			
15	$.245 \times 10^{-7}$			
16	$.22 \times 10^{-7}$			
17	$.22 \times 10^{-7}$			
18	$.23 \times 10^{-7}$			
19	$.22 \times 10^{-7}$			
20	$.21 \times 10^{-7}$			
TECH. D. A. Kaiser		ENGR.		

EQUIPMENT: ~~Dr~~ Voltmeter I 23962
Electrometer I 52076 with
Shunt I 52075

COMMENTS:

Mods 16-20 Tested 12-23-64 @ 77°F

CIRCUIT TYPE: C-1

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 10/9/64
Temp: 76°F
DATA IN NANOSECONDS.
Pulse width =
T_r input = 7 m sec
T_F input = 2.5

MOD	T_r	T_F	T_d	T_s
1	25	110	30	18
2	23	110	28	17
3	25	110	30	18
4	26	115	31	18
5	24	115	28	18
6	27	120	31	19
7	26	120	29	15
8	25	115	30	18
9	27	115	30	17
10	24	120	29	19
11	26	110	30	15
12	25	115	30	18
13	25	110	29	14
14	25	120	29	19
15	23	110	28	14
16	23.5	115	30	16
17	23	120	29	14
18	23	120	29	16
19	23	110	29	15
20	23.5	110	29	16

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-19-65
Temp: 77°F
DATA IN NANOSECONDS

MOD	T_r	T_F	T_d	T_s
1	41	100	32	10
2	39	100	31	10
3	37	100	33	10.5
4	28	110	32	11
5	40	105	31	11
6	44	105	35	10
7	45	105	34	10
8	41	100	33	10
9	44	100	35	10
10	35	105	32	10
11	28	105	32	11
12	38	105	33	11
13	46	100	33	10
14				
15	25	105	29	11
16	43	100	32	11
17				
18	26	115	28	11
19	27	115	29	11
20	41	100	32	11

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: Sampling oscilloscope # 14, 17 would not operate, No output

COMMENTS:

CIRCUIT TYPE: C-1

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Resistance Measurements

PRE RADIATION

Date: 8-26-64
Temp: 76°F

MOD	ohms R_{46}	ohms R_{26}		
1	2072	1939		
2	1926	1820		
3	2085	1923		
4	2071	1941		
5	1916	1799		
6	2303	2137		
7	1925	2065		
8	2090	1949		
9	2310	2099		
10	2010	1902		
11	2323	2095		
12	2065	1925		
13	2185	2045		
14	2043	1919		
15	1931	1820		
16	2218	2074		
17	2030	1896		
18	2019	1934		
19	1968	1868		
20	2195	2002		
TECH. R. W. Elliott			ENGR. [illegible]	

POST RADIATION

Date: 5-24-65
Temp: 77°F

MOD	ohms R_{46}	ohms R_{26}		
1	2099	1964		
2	1949	1845		
3	2108	1949		
4	2070	1939		
5	1944	1827		
6	2336	2171		
7	1955	2094		
8	2119	1978		
9	2341	2132		
10	2036	1929		
11	2319	2091		
12	2091	1952		
13	2216	2076		
14	2071	1947		
15	1927	1817		
16	2251	2108		
17	2059	1925		
18	2016	1930		
19	1964	1865		
20	2225	2033		
TECH. D. A. Kauer			ENGR. [illegible]	

EQUIPMENT: Rubicon wheatstone Bridge
I - 25471

COMMENTS:
Pin 6 Negative with respect to
pins 4, 2

Mods 16-20 Tested 12-24-64
Temp 75°F

CIRCUIT TYPE: C-1

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Leakage Current Between the Circuit and the Substrate

PRE RADIATION				
Date: 11/5/64				
Temp: 74°F				
MOD	Amperes I_3			
1	$.26 \times 10^{-7}$			
2	$.255 \times 10^{-7}$			
3	$.28 \times 10^{-7}$			
4	$.21 \times 10^{-7}$			
5	$.34 \times 10^{-7}$			
6	$.22 \times 10^{-7}$			
7	$.22 \times 10^{-7}$			
8	$.28 \times 10^{-7}$			
9	$.23 \times 10^{-7}$			
10	$.28 \times 10^{-7}$			
11	$.21 \times 10^{-7}$			
12	$.26 \times 10^{-7}$			
13	$.26 \times 10^{-7}$			
14	$.22 \times 10^{-7}$			
15	$.25 \times 10^{-7}$			
16	$.24 \times 10^{-7}$			
17	$.24 \times 10^{-7}$			
18	$.24 \times 10^{-7}$			
19	$.23 \times 10^{-7}$			
20	$.25 \times 10^{-7}$			
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 5-24-65				
Temp: 77°F				
MOD	Amperes I_3			
1	$.25 \times 10^{-7}$			
2	$.24 \times 10^{-7}$			
3	$.26 \times 10^{-7}$			
4	$.21 \times 10^{-7}$			
5	$.315 \times 10^{-7}$			
6	$.20 \times 10^{-7}$			
7	$.205 \times 10^{-7}$			
8	$.25 \times 10^{-7}$			
9	$.203 \times 10^{-7}$			
10	$.247 \times 10^{-7}$			
11	$.19 \times 10^{-7}$			
12	$.235 \times 10^{-7}$			
13	$.185 \times 10^{-7}$			
14	$.183 \times 10^{-7}$			
15	$.218 \times 10^{-7}$			
16	$.202 \times 10^{-7}$			
17	$.20 \times 10^{-7}$			
18	$.204 \times 10^{-7}$			
19	$.194 \times 10^{-7}$			
20	$.194 \times 10^{-7}$			
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: Digital VM I 55791
Electrometer I 52076 with
Shunt I 52075

COMMENTS:
Mods 16-20 Tested 12-23-64
Temp 77°F

CIRCUIT TYPE: C-1

TEST NUMBER: 9

DATA SHEET

TEST TITLE: Forward Diode Characteristics

PRE RADIATION

Date: 8-27-64
Temp: 72°F

MOD	Volts V			
1	.772			
2	.773			
3	.771			
4	.769			
5	.769			
6	.770			
7	.769			
8	.770			
9	.769			
10	.769			
11	.775			
12	.768			
13	.775			
14	.770			
15	.769			
16	.769			
17	.765			
18	.762			
19	.765			
20	.766			

TECH. K. W. Elliott ENGR. [illegible]

POST RADIATION

Date: 5-24-65
Temp: 77°F

MOD	VOLTS V			
1	.766			
2	.769			
3	.765			
4	.769			
5	.763			
6	.762			
7	.762			
8	.765			
9	.764			
10	.764			
11	.775			
12	.764			
13	.771			
14	.763			
15	.770			
16	.766			
17	.763			
18	.766			
19	.770			
20	.766			

TECH. D. A. Kaiser ENGR. [illegible]

EQUIPMENT: Data taken with Digital VM I-55991, milliammeter I-14196 Heathkit Mod. IP-20 Power supply used in series with 2000 Ω current limiting resistor

COMMENTS: Mods 16-20 Tested 12-26-64 Temp 75°F

CIRCUIT TYPE: C-1

TEST NUMBER: 10

DATA SHEET

TEST TITLE: Input Diode Minority-Carrier Lifetime

PRE RADIATION					POST RADIATION				
Date:					Date:				
Temp:					Temp:				
MOD	$\Delta t/\Delta v$	$\tau(10^{-9})$	τ		MOD	$\Delta t/\Delta v$	$\tau(10^{-9})$		
1	7.5/.207	0.93	1.8		1		1.9		
2	7.5/.237	0.82	1.8		2		1.8		
3	7.5/.198	0.98	1.85		3		1.8		
4	7.5/.217	0.89	1.75		4		1.7		
5	7.5/.195	0.99	1.8		5		1.8		
6	7.5/.204	0.95	1.75		6		1.7		
7	7.5/.211	0.92	1.8		7		1.85		
8	7.5/.214	0.90	1.75		8		1.8		
9	7.5/.238	0.81	1.7		9		1.85		
10	7.5/.256	0.76	1.7		10		1.75		
11	7.5/.290	0.67	1.65		11		1.85		
12	7.5/.240	0.81	1.7		12		1.85		
13	7.5/.271	0.71	1.7		13		1.85		
14	7.5/.237	0.82	1.7		14		1.8		
15	7.5/.285	0.68	1.75		15		1.8		
16	9/.275	0.80	1.8		16		1.8		
17	10/.350	0.75	1.9		17		1.8		
18	9/.275	0.80	1.9		18		1.8		
19	11/.350	0.77	1.9		19		1.85		
20	14/.450	0.80	1.95		20		1.85		
TECH. WH Richardson			ENGR. RJD		TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: C-1

TEST NUMBER: 11

DATA SHEET

TEST TITLE: Isolation Diode Minority-Carrier Lifetime

PRE RADIATION				
Date:				
Temp:				
MOD	$\Delta t/\Delta v$	$\tau(10^{-9})$		
1	7.5/.555	0.35	.55	
2	7.5/.600	0.32	.5	
3	7.5/.605	0.32	.5	
4	7.5/.700	0.27	.55	
5	7.5/.615	0.31	.55	
6	7.5/.690	0.28	.55	
7	7.5/.615	0.31	.55	
8	7.5/.635	0.30	.5	
9	7.5/.685	0.28	.5	
10	7.5/.603	0.32	.5	
11	7.5/.635	0.30	.5	
12	7.5/.635	0.30	.55	
13	7.5/.675	0.29	.5	
14	7.5/.605	0.32	.55	
15	7.5/.500	0.39	.5	
16	7/.500	0.36	.55	
17	7/.500	0.36	.55	
18	5/.400	0.33	.55	
19	7/.500	0.36	.55	
20	10/.750	0.33	.60	
TECH.		ENGR.		

POST RADIATION				
Date:				
Temp:				
MOD	$\Delta t/\Delta v$	$\tau(10^{-9})$		
1		.5		
2		.5		
3		.5		
4		.5		
5		.5		
6		.5		
7		.5		
8		.5		
9		.5		
10		.5		
11		.45		
12		.5		
13		.45		
14		.5		
15		.5		
16		.5		
17		.5		
18		.55		
19		.5		
20		.55		
TECH.		ENGR.		

EQUIPMENT:

COMMENTS:

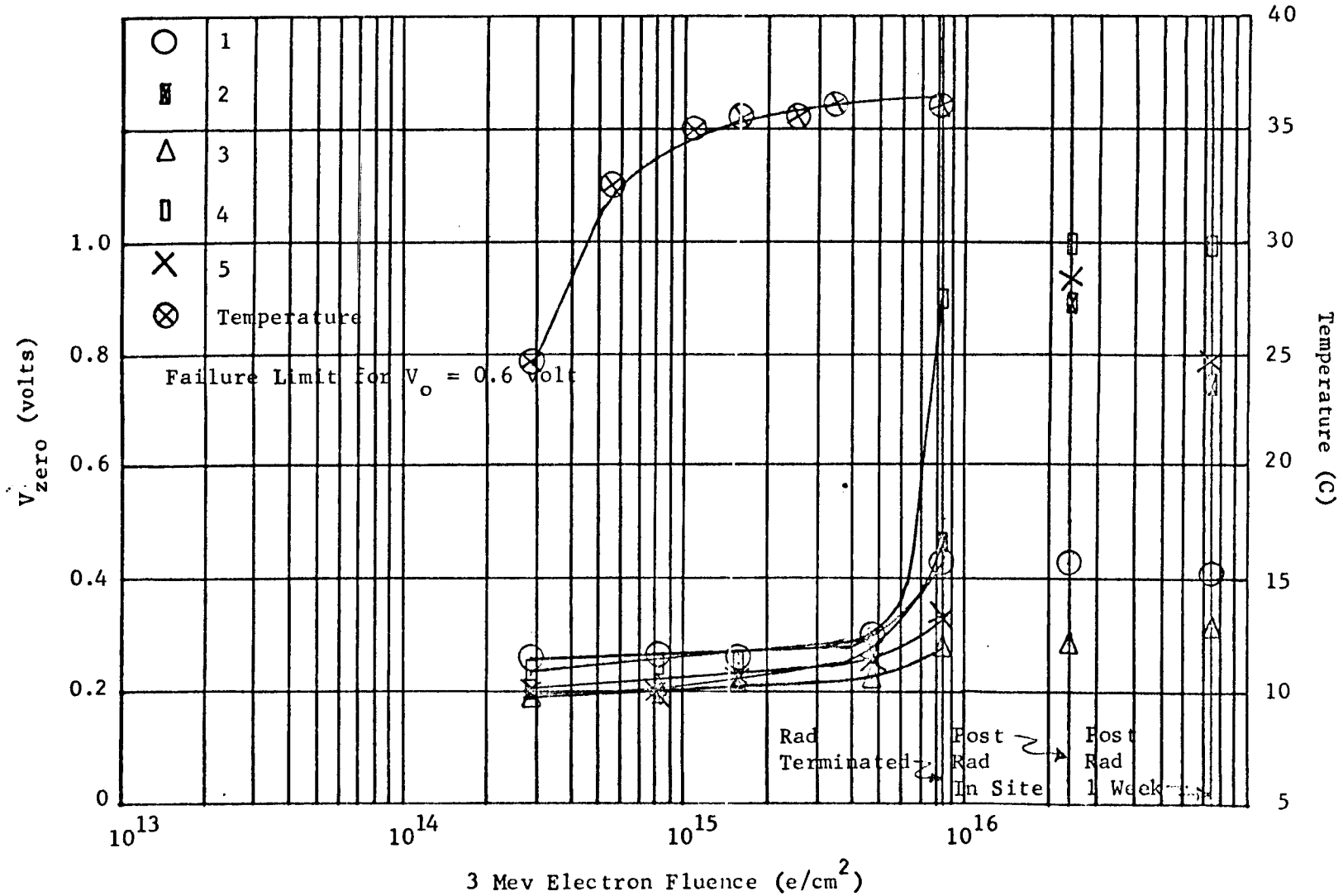
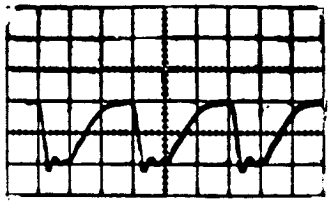
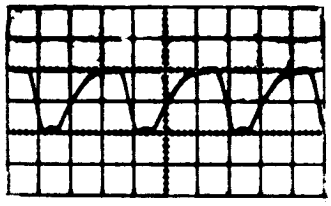


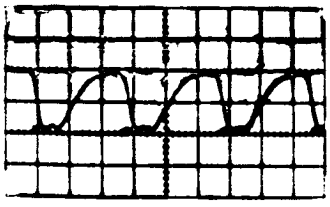
FIGURE III-17. RADIATION RESPONSE OF UNIT C-1



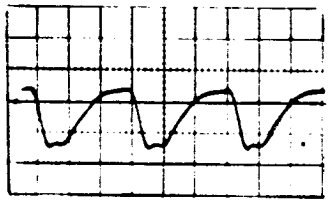
A - Initial



B - Final



C - Post Rad In Site



D - Post Rad 1 Week

Scale: 0.2 volt/cm
0.1 μsec/cm

FIGURE III-18. OUTPUT OF 5-STAGE OSCILLATOR OF C-1 CIRCUITS

CIRCUIT TYPE: C-2

TEST NUMBER: 1

DATA SHEET

TEST TITLE: Input Thresholds on R_o and S_p and Driving Currents

PRE RADIATION

Date: 12-29-64
Temp: 76°F

MOD	MA I_{D4}	VOLT V_{T7}	MA I_{D7}	VOLT V_{T4}
1	1.08	.846	1.09	.840
2	.97	.829	.99	.838
3	1.10	.851	1.02	.839
4	1.03	.834	1.04	.845
5	.96	.837	.97	.843
6	1.03	.840	1.04	.840
7	.92	.832	.93	.836
8	.98	.843	1.00	.851
9	1.00	.825	1.03	.834
10	.95	.832	.96	.829
11	.97	.835	.98	.841
12	.98	.845	1.00	.847
13	1.02	.840	1.04	.846
14	1.04	.853	1.04	.853
15	1.00	.832	1.00	.831
16	.94	.806	.94	.814
17	1.02	.850	1.04	.846
18	.93	.833	.96	.839
19	.94	.805	.95	.820
20	1.01	.838	1.02	.842
TECH. K.W. Elliott			ENGR. [illegible]	

POST RADIATION

Date: 5-24-65 } 1-13 5-25-65 } 14-20
Temp: 77°F } 77°F }

MOD	MA I_{D4}	VOLT V_{T7}	MA I_{D7}	VOLT V_{T4}
1	1.065	.875	1.09	.880
2	.960	.855	.995	.864
3	1.080	.882	1.027	.871
4	1.25	.822	1.05	.833
5	.958	.862	.971	.863
6	1.020	.869	1.041	.874
7	.900	.863	.963	.877
8	.977	.889	1.005	.890
9	.985	.857	1.033	.869
10	.935	.855	.955	.860
11	.964	.820	.992	.831
12	.972	.873	.998	.873
13	1.004	.871	1.040	.881
14	1.045	.889	1.060	.893
15	1.015	.827	1.030	.829
16	.950	.841	.960	.846
17	1.028	.880	1.060	.884
18	.944	.827	.986	.820
19	.961	.800	.980	.803
20	1.018	.866	1.041	.879
TECH. D.A. Kaiser			ENGR. [illegible]	

EQUIPMENT: Digital VM I 55991 HEATHKIT MULTIMETER
Milliammeter I 14196

COMMENTS:

CIRCUIT TYPE: C-2

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Input Leakage Current at R_o and S_p

PRE RADIATION

Date: 11/6/64
Temp: 77°F

MOD	Amperes I_{L7}	Amperes I_{L4}		
1	$.2\times10^{-7}$	$.24\times10^{-7}$		
2	$.18\times10^{-7}$	$.2\times10^{-7}$		
3	$.19\times10^{-7}$	$.35\times10^{-7}$		
4	$.19\times10^{-7}$	$.27\times10^{-7}$		
5	$.2\times10^{-7}$	$.21\times10^{-7}$		
6	$.19\times10^{-7}$	$.24\times10^{-7}$		
7	$.18\times10^{-7}$	$.18\times10^{-9}$		
8	$.21\times10^{-7}$	$.26\times10^{-7}$		
9	$.18\times10^{-7}$	$.31\times10^{-7}$		
10	$.19\times10^{-7}$	$.25\times10^{-7}$		
11	$.19\times10^{-7}$	$.19\times10^{-7}$		
12	$.2\times10^{-7}$	$.2\times10^{-7}$		
13	$.16\times10^{-7}$	$.18\times10^{-7}$		
14	$.2\times10^{-7}$	$.2\times10^{-7}$		
15	$.16\times10^{-7}$	$.26\times10^{-7}$		
16	$.19\times10^{-7}$	$.2\times10^{-7}$		
17	$.19\times10^{-7}$	$.19\times10^{-7}$		
18	$.22\times10^{-7}$	$.22\times10^{-7}$		
19	$.18\times10^{-7}$	$.22\times10^{-7}$		
20	$.2\times10^{-7}$	$.2\times10^{-7}$		

TECH. H.W. [illegible] ENGR. R.K.T.

POST RADIATION

Date: 5-26-65
Temp: 78°F

MOD	Amperes I_{L7}	Amperes I_{L4}		
1	$.167\times10^{-7}$	$.175\times10^{-7}$		
2	$.153\times10^{-7}$	$.155\times10^{-7}$		
3	$.157\times10^{-7}$	$.165\times10^{-7}$		
4	$.161\times10^{-7}$	$.163\times10^{-7}$		
5	$.157\times10^{-7}$	$.152\times10^{-7}$		
6	$.145\times10^{-7}$	$.151\times10^{-7}$		
7	$.142\times10^{-7}$	$.147\times10^{-7}$		
8	$.160\times10^{-7}$	$.170\times10^{-7}$		
9	$.152\times10^{-7}$	$.145\times10^{-7}$		
10	$.154\times10^{-7}$	$.160\times10^{-7}$		
11	$.160\times10^{-7}$	$.165\times10^{-7}$		
12	$.145\times10^{-7}$	$.141\times10^{-7}$		
13	$.134\times10^{-7}$	$.142\times10^{-7}$		
14	$.170\times10^{-7}$	$.165\times10^{-7}$		
15	$.147\times10^{-7}$	$.088\times10^{-6}$	← double checked	
16	$.148\times10^{-7}$	$.145\times10^{-7}$		
17	$.150\times10^{-7}$	$.150\times10^{-7}$		
18	$.170\times10^{-7}$	$.180\times10^{-7}$		
19	$.146\times10^{-7}$	$.186\times10^{-7}$		
20	$.163\times10^{-7}$	$.163\times10^{-7}$		

TECH. D.A. Kaiser ENGR. [illegible]

EQUIPMENT: ~~Digital VM I 55991~~ H.W.E.
Electrometer I 52076 with
Shunt I 52075

Leakage Current jig

COMMENTS: Voltmeter I 23962

CIRCUIT TYPE: C-2

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Input Threshold Levels for R_c and S_p

PRE RADIATION

Date: 2-24-65
Temp: 79°

MOD	ma I_{D2}	VOLT V_{T9}	ma I_{D9}	VOLT V_{T2}
1	1.23	1.199	1.25	1.253
2	1.09	1.231	1.11	1.245
3	1.12	0.993	1.13	1.135
4	1.19	1.129	1.20	1.135
5	1.10	1.156	1.12	1.190
6	1.17	1.113	1.19	1.140
7	1.05	1.145	1.07	1.164
8	1.11	1.209	1.12	1.223
9	1.16	1.131	1.18	1.135
10	1.04	1.129	1.07	1.164
11	1.10	1.173	1.11	1.194
12	1.11	1.129	1.14	1.145
13	1.18	1.199	1.20	1.221
14	1.20	1.246	1.19	1.269
15	1.14	1.132	1.16	1.177
16	1.09	1.133	1.09	1.146
17	1.18	1.152	1.18	1.155
18	1.04	1.216	1.05	1.200
19	1.10	1.143	1.10	1.154
20	1.12	1.189	1.13	1.194

TECH. Erlenbach ENGR. RBT

POST RADIATION

Date: 6-3-65
Temp: 76°

MOD	ma I_{D2}	VOLT V_{T9}	ma I_{D9}	VOLT V_{T2}
1	1.25	1.480	1.26	1.480
2	1.12	1.469	1.12	1.447
3	1.14	1.259	1.14	1.373
4	1.22	1.332	1.22	1.345
5	1.12	1.415	1.12	1.429
6	1.19	1.540	1.20	1.373
7	1.07	1.509	1.08	1.383
8	1.13	1.617	1.14	1.467
9	1.17	1.384	1.20	1.369
10	1.06	1.382	1.08	1.397
11	1.13	1.513	1.13	1.397
12	1.14	1.475	1.14	1.384
13	1.13	1.551	1.22	1.439
14	1.20	1.661	1.20	1.501
15	1.18	1.458	1.18	1.376
16	1.10	1.475	1.10	1.391
17	1.20	1.495	1.19	1.383
18	1.07	1.516	1.10	1.413
19	1.13	1.349	1.12	1.343
20	1.13	1.539	1.14	1.449

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: DVM 1-55991
Milliameter 1-14197
Heath Multimeter

COMMENTS:

CIRCUIT TYPE: C-2

TEST NUMBER: 4

DATA SHEET

TEST TITLE: Output One Voltage at Q and $\bar{Q}$

PRE RADIATION

Date: 8-31-64
Temp: 75 °F

VOLTS

MOD	$\bar{Q}$ (one)	Q (one)		
1	3.963	3.961		
2	3.967	3.965		
3	3.963	3.961		
4	3.965	3.963		
5	3.967	3.964		
6	3.966	3.952		
7	3.969	3.955		
8	3.966	3.951		
9	3.969	3.953		
10	3.972	3.954		
11	3.972	3.953		
12	3.974	3.955		
13	3.970	3.950		
14	3.972	3.952		
15	3.969	3.956		
16	3.967	3.964		
17	3.962	3.959		
18	3.949	3.964		
19	3.940	3.981		
20	3.974	3.953		
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 5-25-65
Temp: 77°F

VOLTS

MOD	$\bar{Q}$ (one)	Q (one)		
1	3.964	3.963		
2	3.967	3.966		
3	3.963	3.962		
4	3.963	3.963		
5	3.965	3.964		
6	3.964	3.964		
7	3.966	3.965		
8	3.963	3.962		
9	3.964	3.964		
10	3.966	3.966		
11	3.964	3.963		
12	3.967	3.967		
13	3.963	3.962		
14	3.964	3.963		
15	3.960	3.959		
16	3.967	3.967		
17	3.963	3.963		
18	3.969	3.969		
19	3.967	3.966		
20	3.969	3.969		
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: Digital VM I-55991

COMMENTS:
Mods 16-20 Tested 12-28-64
Temp 74°F

CIRCUIT TYPE: C-2

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Output Driving Current Loaded to Ground for Q and $\bar{Q}$

PRE RADIATION

Date: 8-31-64
Temp: 76°F

MOD	I_{D8} ma	I_{D3} ma		
1	.54	.54		
2	.48	.47		
3	.49	.50		
4	.52	.51		
5	.48	.47		
6	.52	.50		
7	.46	.45		
8	.48	.48		
9	.50	.50		
10	.46	.46		
11	.48	.47		
12	.49	.48		
13	.52	.51		
14	.51	.51		
15	.49	.50		
16	.47	.47		
17	.49	.52		
18	.46	.45		
19	.48	.47		
20	.50	.49		

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-25-65
Temp: 77°F

MOD	I_{D8}	I_{D3}		
1	.555	.550		
2	.495	.457		
3	.505	.513		
4	.540	.535		
5	.495	.455		
6	.533	.520		
7	.475	.470		
8	.500	.495		
9	.522	.520		
10	.475	.473		
11	.504	.497		
12	.500	.500		
13	.537	.525		
14	.527	.530		
15	.519	.521		
16	.482	.480		
17	.530	.527		
18	.454	.470		
19	.494	.492		
20	.507	.505		

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: Ammeter I-14196 1.5 ma. scale
Digital VM I-55991
Decade resistor I-73730

COMMENTS:

CIRCUIT TYPE: C-2

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Output Driving Current Loaded to Positive Supply for Q and $\overline{Q}$

PRE RADIATION

Date: 12-28-64
Temp: 76°F

MOD	I_{H8}	I_{H3}		
1	31	32		
2	30	33		
3	35	37		
4	32	35		
5	32	32		
6	32	34		
7	32	34		
8	28	30		
9	33	35		
10	33	34		
11	29	30		
12	29	32		
13	34	37		
14	28	30		
15	30	32		
16	33	36		
17	30	32		
18	30	32		
19	34	36		
20	29	31		
TECH. [illegible]			ENGR. [illegible]	

POST RADIATION

Date: 5-25-65
Temp: 77°F

MOD	I_{H8} ma	I_{H3} ma		
1	11.5	11.4		
2	14.7	14.8		
3	15.2	11.65		
4	32	34		
5	15.8	11.0		
6	16.3	10.4		
7	11.8	11.8		
8	9.2	9.4		
9	15.5	10.7		
10	12.8	13.9		
11	28	29		
12	14.1	9.9		
13	16.1	16.1		
14	10.2	10.3		
15	29.5	32		
16	15.8	16.0		
17	12.5	12.9		
18	29	31		
19	33	35		
20	14.1	10.5		
TECH. [illegible]			ENGR.	

EQUIPMENT: Digital VM I 55991
Milliammeter I 14196
Decade resistor I 73730

COMMENTS:

CIRCUIT TYPE: C-2

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Resistance Measurements

PRE RADIATION

Date: 2-24-65
Temp: 79°

MOD	R_{69} Ω	R_{68} Ω	R_{63} Ω	R_{62} Ω
1	3223	3634	3665	3261
2	3664	4102	4177	3722
3	3553	4015	3955	3578
4	3347	3787	3843	3367
5	3630	4098	4165	3678
6	3377	3808	3886	3437
7	3789	4305	4338	3849
8	3597	4038	4117	3639
9	3408	3876	3917	3483
10	3804	4278	4318	3889
11	3649	4086	4150	3660
12	3553	4029	4061	3633
13	3365	3791	3869	3438
14	3394	3843	3836	3371
15	3491	3972	3935	3520
16	3728	4225	4241	3727
17	3407	3836	3854	3398
18	3809	4284	4427	3934
19	3695	4178	4208	3693
20	3587	4012	4029	3635

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date: 5-25-65
Temp: 77°F

MOD	$R_{6,9}$ Ω	$R_{6,8}$ Ω	$R_{6,3}$ Ω	$R_{6,2}$ Ω
1	3263	3687	3722	3308
2	3717	4167	4243	3774
3	3604	4073	4011	3626
4	3348	3789	3842	3369
5	3681	4165	4227	3727
6	3427	3864	3946	3487
7	3847	4368	4405	3965
8	3649	4101	4172	3689
9	3458	3938	3977	3532
10	3860	4344	4381	3946
11	3652	4090	4153	3662
12	3602	4083	4116	3653
13	3412	3842	3921	3484
14	3446	3904	3895	3421
15	3492	3971	3936	3521
16	3756	4290	4305	3778
17	3456	3890	3910	3443
18	3510	4285	4431	3933
19	3694	4181	4210	3694
20	3638	4074	4092	3683

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: Wheatstone Bridge I-25471

COMMENTS:

CIRCUIT TYPE: C-2

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Leakage Current from Circuit to Substrate

PRE RADIATION

Date: 11/5/64
Temp: 74°F

MOD	Amperes I_{L10}			
1	$.11 \times 10^{-7}$			
2	$.11 \times 10^{-7}$			
3	$.12 \times 10^{-7}$			
4	$.11 \times 10^{-7}$			
5	$.12 \times 10^{-7}$			
6	$.12 \times 10^{-7}$			
7	$.24 \times 10^{-7}$			
8	$.14 \times 10^{-7}$			
9	$.12 \times 10^{-7}$			
10	$.13 \times 10^{-7}$			
11	$.13 \times 10^{-7}$			
12	$.12 \times 10^{-7}$			
13	$.11 \times 10^{-7}$			
14	$.14 \times 10^{-7}$			
15	$.13 \times 10^{-7}$			
16	$.15 \times 10^{-7}$			
17	$.11 \times 10^{-7}$			
18	$.15 \times 10^{-7}$			
19	$.12 \times 10^{-7}$			
20	$.16 \times 10^{-7}$			
TECH. N.W. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 5-26-65
Temp: 75°F

MOD	Amperes I_{L10}			
1	$.117 \times 10^{-7}$			
2	$.115 \times 10^{-7}$			
3	$.120 \times 10^{-7}$			
4	$.116 \times 10^{-7}$			
5	$.120 \times 10^{-7}$			
6	$.115 \times 10^{-7}$			
7	$.255 \times 10^{-7}$			
8	$.13 \times 10^{-7}$			
9	$.111 \times 10^{-7}$			
10	$.115 \times 10^{-7}$			
11	$.127 \times 10^{-7}$			
12	$.110 \times 10^{-7}$			
13	$.100 \times 10^{-7}$			
14	$.127 \times 10^{-7}$			
15	$.112 \times 10^{-7}$			
16	$.132 \times 10^{-7}$			
17	$.107 \times 10^{-7}$			
18	$.133 \times 10^{-7}$			
19	$.109 \times 10^{-7}$			
20	$.122 \times 10^{-7}$			
TECH. D. A. Kaiser		ENGR. [illegible]		

EQUIPMENT: Digital VM I 55991
Electrometer I 52076 with
Shunt I 52075

COMMENTS:
Mods 16-20 Tested 12-24-64
Temp 74°F

CIRCUIT TYPE: C-2

TEST NUMBER: 9

DATA SHEET

TEST TITLE:

PRE RADIATION				
Date:				
Temp:				
MOD	$\Delta t/\Delta v$	$\tau(10^{-9})$		
1	7.5/.217	0.89		
2	7.5/.233	0.83		
3	7.5/.198	0.98		
4	7.5/.215	0.90		
5	7.5/.221	0.88		
6	7.5/.240	0.81		
7	7.5/.189	1.0		
8	7.5/.231	0.84		
9	7.5/.235	0.82		
10	7.5/.158	1.2		
11	7.5/.187	1.0		
12	7.5/.183	1.1		
13	7.5/.185	1.0		
14	7.5/.187	1.0		
15	7.5/.198	0.98		
16	4.5/.150	0.77		
17	7.5/.2375	0.81		
18	5.0/.150	0.85		
19	5.5/.1625	0.87		
20	6.0/.175	0.88		
TECH.		ENGR.		

POST RADIATION				
Date:				
Temp:				
MOD	$\Delta t/\Delta v$	$\tau(10^{-9})$		
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: C-2

TEST NUMBER: 10 B

DATA SHEET

TEST TITLE: Input Minimum Pulse Width and Height for Clock Pulse

PRE RADIATION

Date: ~~9-18-64~~ 9-22-64

Temp: 78°F

MOD	T_S	T_D	T_R	T_F
1	270 msec	29 msec	12 msec	250 msec
2	300 msec	30 msec	12 msec	250 msec
3	350 msec	34 msec	14 msec	280 msec
4	270 msec	32 msec	13 msec	220 msec
5	250 msec	31 msec	13 msec	260 msec
6	250 msec	32 msec	13 msec	270 msec
7	270 msec	34 msec	14 msec	230 msec
8	280 msec	31 msec	13 msec	270 msec
9	300 msec	32 msec	14 msec	250 msec
10	300 msec	33 msec	13 msec	260 msec
11	300 msec	31 msec	13 msec	280 msec
12	280 msec	33 msec	13 msec	260 msec
13	260 msec	35 msec	14 msec	250 msec
14	300 msec	30 msec	13 msec	240 msec
15	280 msec	31 msec	13 msec	240 msec
16	320	33	14	280
17	320	33	16	270
18	320	34	16	290
19	280	33	15	260
20	360	32	15	300

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-21-65

Temp: 78°F

MOD	T_S	T_D	T_R	T_F
1	235	33	21	220
2	230	35	19	190
3	220	35	20	215
4	250	33	14	220
5	230	34	18	220
6	240	35	25	210
7	230	37	22	235
8	270	34	24	210
9	210	36	21	230
10	250	36	21	225
11	260	33	13	220
12	230	35	21	220
13	220	37	25	200
14	230	33	21	200
15	240	33	13	230
16	225	35	18	220
17	240	35	21	225
18	280	35	15	220
19	240	33	13	240
20	250	32	19	220

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: Sampling scope
TI pulse gen

COMMENTS: Trigger pulse amplitude measured from flat portion of wave top

The storage time taken in this test contains the fall time which itself has decreased resulting in an apparent decrease in storage time.

CIRCUIT TYPE: C-2

TEST NUMBER: 10 c

DATA SHEET

TEST TITLE: Input Minimum Pulse Width and Height for Clock Pulse and Transient Parameters

PRE RADIATION

Date: 9-23-64
Temp: 78°F

MOD	$\bar{\tau}_S$	$\bar{\tau}_D$	$\bar{\tau}_R$	$\bar{\tau}_F$
1	300 nsec	32 nsec	12 nsec	250 nsec
2	270 nsec	33 nsec	13 nsec	230 nsec
3	340 nsec	35 nsec	14 nsec	270 nsec
4	250 nsec	34 nsec	13 nsec	240 nsec
5	290 nsec	33 nsec	12 nsec	250 nsec
6	250 nsec	33 nsec	13 nsec	240 nsec
7	270 nsec	35 nsec	13 nsec	250 nsec
8	330 nsec	32 nsec	12 nsec	250 nsec
9	270 nsec	34 nsec	13 nsec	230 nsec
10	350 nsec	34 nsec	13 nsec	260 nsec
11	300 nsec	32 nsec	12 nsec	260 nsec
12	280 nsec	34 nsec	13 nsec	260 nsec
13	330 nsec	37 nsec	14 nsec	250 nsec
14	320 nsec	33 nsec	13 nsec	240 nsec
15	280 nsec	32 nsec	13 nsec	260 nsec
16	330	35	15	300
17	320	35	16	280
18	340	36	16	320
19	300	35	15	300
20	320	34	15	300

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-24-65
Temp: 77°F

MOD	$\bar{\tau}_S$	$\bar{\tau}_D$	$\bar{\tau}_R$	$\bar{\tau}_F$
1	200	36	22	210
2	210	37	19	210
3	250	39	24	235
4	250	35	14.5	220
5	240	36	21	230
6	240	37	24	220
7	240	38	22	225
8	235	36	23	215
9	230	37	23	220
10	250	38	21	220
11	250	35	13	250
12	245	38	24	235
13	210	40	24	210
14	200	36	22	190
15	225	32	13	210
16	230	36	18	215
17	225	37	20	215
18	250	36	14	250
19	250	35	13	250
20	250	36	22	210

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: Sampling scope
TI Pulse gen.

COMMENTS:

Trigger pulse amplitude measured from flat portion of waveform top

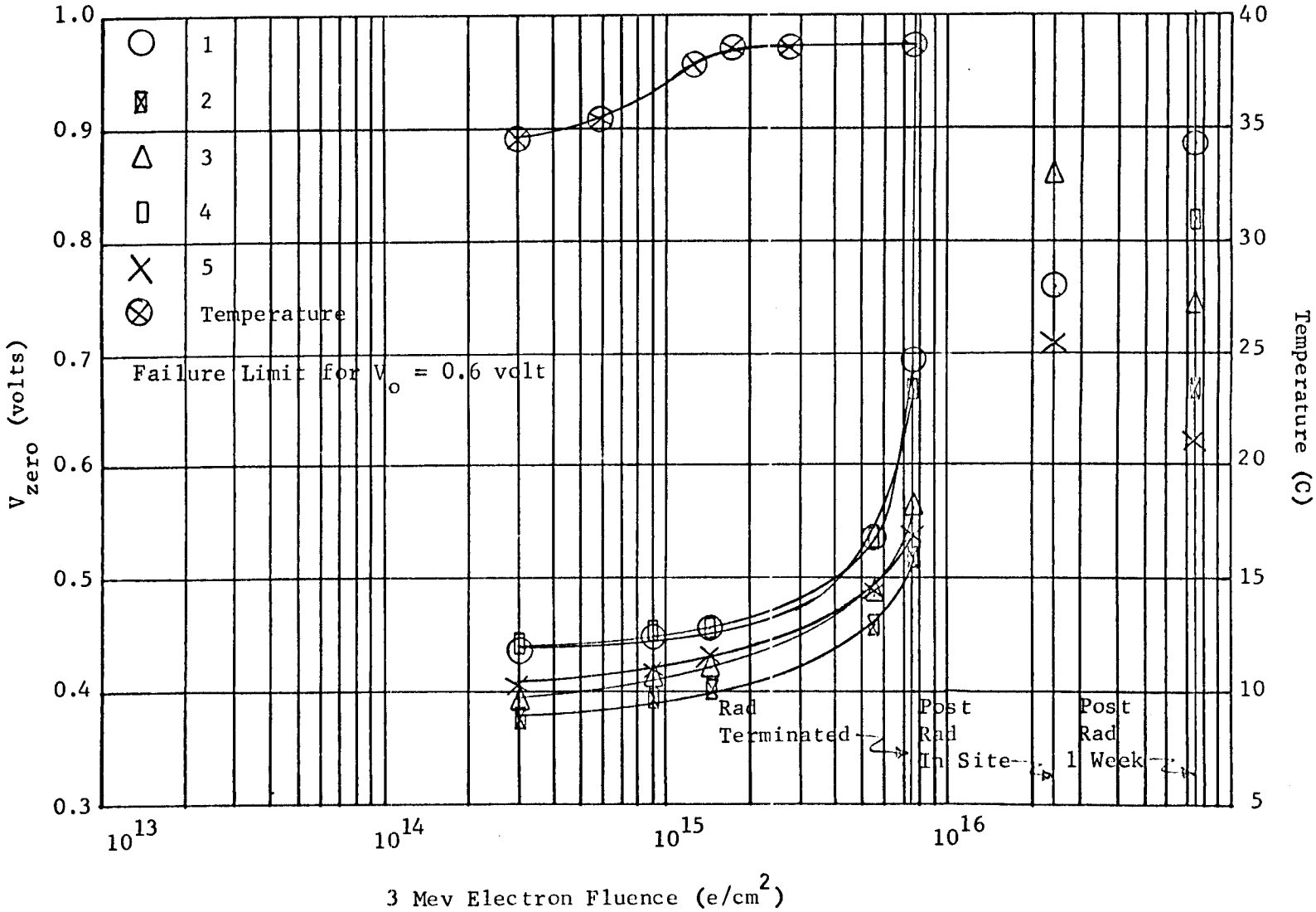
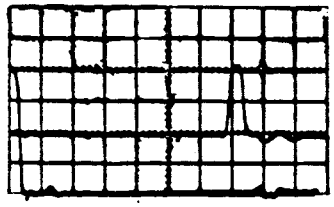
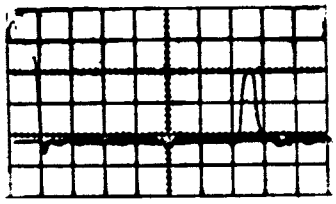


FIGURE III-19. RADIATION RESPONSE OF UNIT C-2

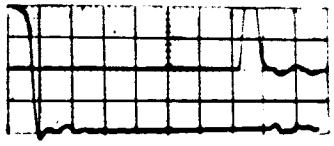
Note: Devices No. 1 and 4 are in the wrong state and values cannot be plotted for post rad in site.



A - Initial



B - Final



D - Post Rad 1 Week

Scale: 0.2 volt/cm
0.1 μsec/cm

FIGURE III-20. MULTISTAGE PROPAGATION DELAY FOR C-2 DEVICES

CIRCUIT TYPE: E-4

TEST NUMBER: 1

DATA SHEET

TEST TITLE: Input Threshold and Drive Current at R_D and S_D

PRE RADIATION

Date: 10-14-64 1-21-65

Temp: 78°F

I = 1 × 10⁻³ ampere

V = Volts

MOD	V_{TI}	I_{DM}	V_{TM}	I_{DI}
1	1.425	1.28	1.446	1.22
2	1.445	1.33	1.467	1.31
3	1.434	.92	1.445	.89
4	1.448	.79	1.471	.79
5	1.474	1.17	1.498	1.31
6	1.473	1.19	1.494	1.20
7	1.424	1.26	1.442	1.24
8	1.547	1.80	1.566	1.37
9	1.435	1.11	1.621	1.17
10	1.384	1.37	1.418	1.36
11	1.439	1.28	1.440	1.25
12	1.444	1.32	1.471	1.30
13	1.440	.86	1.457	.85
14	1.522	1.06	1.584	1.28
15	1.416	.96	1.433	.97
16	1.479	1.22	1.494	1.12
17	1.444	.90	1.464	.86
18	1.516	.93	1.478	1.00
19	1.462	.75	1.489	.77
20	1.503	1.09	1.536	.90

TECH. Elliot Erlenbach ENGR.

POST RADIATION

Date: 6-23-65

Temp: 76°

MOD	V_{TI}	I_{DM}	V_{TM}	I_{DI}
1	1.488	1.24	1.508	1.19
2	1.505	1.29	1.514	1.27
3	1.464	.88	1.496	.86
4	1.496	.79	1.495	.79
5	1.503	1.10	1.560	1.21
6	1.528	1.15	1.533	1.17
7	1.463	1.21	1.485	1.19
8	1.609	1.5	1.582	1.30
9	1.463	1.15	1.731	1.15
10	1.470	1.31	1.492	1.31
11	1.482	1.28	1.464	1.24
12	1.484	1.28	1.505	1.26
13	1.495	.80	1.650	.80
14	1.576	1.04	1.458	1.22
15	1.456	.96	1.535	.96
16	1.509	1.20	1.500	1.08
17	1.480	.86	1.505	.82
18	1.536	.93	1.497	.99
19	1.488	.74	1.511	.76
20	1.500	1.12	1.684	.86

TECH. R.W. Elliott ENGR.

EQUIPMENT: Digital VM 1-55991
Milliameter 1-14196

COMMENTS:

CIRCUIT TYPE: E-4

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Input Leakage Current R_D and S_D

PRE RADIATION

Date: 1-21-65
Temp: 78°F

1 x 10^{-6} ampere

MOD	I_{LE}	I_{LM}		
1	[illegible]	8.0		
2	7.5	10.5		
3	[illegible]	25.5		
4	14.0	17.0		
5	15.0	13.0		
6	13.0	19.0		
7	17.5	18.0		
8	34.0	40.0		
9	4.0	4.5		
10	8.5	13.5		
11	12.0	12.0		
12	8.0	14.0		
13	37.5	36.0		
14	13.5	[illegible]		
15	22.0	27.5		
16	11.0	12.5		
17	7.5	7.5		
18	24.5	7.0		
19	11.0	10.5		
20	10.5	20.0		
TECH. [illegible]			ENGR. [illegible]	

POST RADIATION

Date: 6-23-65
Temp: 76°

MOD	I_{LE}	I_{LM}		
1	2.5	4.5		
2	4.0	6.0		
3	10.0	13.5		
4	13.0	16.0		
5	6.0	5.5		
6	7.0	10.0		
7	9.0	9.0		
8	15.0	18.0		
9	2.0	2.5		
10	4.5	7.0		
11	11.0	10.5		
12	4.5	8.5		
13	15.0	14.5		
14	7.0	5.5		
15	21.0	31.5		
16	7.0	7.5		
17	4.0	4.0		
18	7.0	6.5		
19	10.5	10.0		
20	7.0	5.0		
TECH.			ENGR.	

EQUIPMENT: Digital VM 1-55991
Microammeter C-3124

COMMENTS:

CIRCUIT TYPE: E-4

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Clocked Set and Reset Input Threshold

PRE RADIATION

Date: 10/15/64
Temp: 78°F

MOD	I_{DF}, ma	V_{TB}, Volts	I_{DB}, ma	V_{TF}, Volts
1	.070	1.119	.070	1.104
2	.065	1.105	.065	1.134
3	.085	.682	.080	.969
4	.065	.991	.065	1.100
5	.24	.691	.285	.972
6	.10	.809	.12	.969
7	.055	1.033	.055	1.015
8	.09	.729	.090	1.256
9	.10	1.583	.100	1.535
10	.06	.727	.06	.795
11	.055	1.059	.055	1.185
12	.155	1.042	.060	.943
13	.065	1.073	.070	.756
14	.065	1.130	.435	1.147
15	.060	1.139	.060	1.217
16	.080	1.381	.080	1.412
17	.080	1.411	.080	1.402
18	.100	1.509	.110	1.525
19	.110	1.239	.100	.972
20	.080	1.316	.100	1.159

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date:
Temp:

MOD	I_{DF}	V_{TB}	I_{DB}	V_{TF}
1	.06			
2	.05			
3	.065			
4	.05			
5	.26			
6	.08			
7	.04			
8	.08			
9	.08			
10	.04			
11	.04			
12	.16			
13	.05			
14	.06			
15	.04			
16	.06			
17	.06			
18	.08			
19	.10			
20	.07			

TECH. ENGR.

EQUIPMENT: Digital VM I 55991
Milliammeter I 14196

COMMENTS:
10K Helipot placed in series with Variable Supply
Mods 15-20 Tested 1-27-65
Temp 78°

Data Not Repeatable Due To Defective Helipot used in PRE-RAD CHARACTERIZATION. TEST DISCONTINUED.

CIRCUIT TYPE: E-4

TEST NUMBER: 4

DATA SHEET

TEST TITLE: Output One Voltage for Q and $\overline{Q}$

PRE RADIATION				
Date: 10/15/64	7-21-65			
Temp: 78°F	78°F			
MOD	Q (one)	$\overline{Q}$ (one)		
1	3.822	3.842		
2	3.808	3.992		
3	3.830	3.847		
4	3.799	3.812		
5	3.773	3.784		
6	4.056	3.823		
7	3.813	3.810		
8	3.780	3.779		
9	3.346	3.823		
10	3.843	3.860		
11	3.769	3.802		
12	3.788	3.819		
13	3.782	3.789		
14	4.278	3.647		
15	3.793	3.813		
16	4.163	4.105		
17	3.802	3.810		
18	3.537	3.763		
19	3.756	3.753		
20	3.604	3.742		
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 6-24-65				
Temp: 75°				
MOD	Q(one)	$\overline{Q}$ (one)		
1	3.791	3.783		
2	3.780	3.995		
3	3.789	3.804		
4	3.788	3.796		
5	3.794	3.749		
6	3.747	3.822		
7	4.191	3.776		
8	3.777	3.752		
9	3.755	3.807		
10	3.396	3.831		
11	3.803	3.783		
12	3.763	3.796		
13	3.770	3.770		
14	4.317	3.605		
15	3.783	3.794		
16	4.135	4.301		
17	3.804	3.807		
18	3.573	3.744		
19	3.744	3.732		
20	3.569	3.826		
TECH. [illegible]		ENGR.		

EQUIPMENT: Digital VM I 55991

COMMENTS:

CIRCUIT TYPE: C-2

TEST NUMBER: 10 A

DATA SHEET

TEST TITLE: Input Minimum Pulse Width and Height for Clock Pulse

PRE RADIATION

Date: 9-18-64
Temp: 76 °F
Pulse T_r 10 T_f 2

MOD	A_{MIN}	W_{MIN}		
1	1.15	< 15		
2	1.12	< 15		
3	1.30	< 15		
4	1.20	< 15		
5	1.18	< 15		
6	1.24	< 15		
7	1.20	< 15		
8	1.18	< 15		
9	1.22	< 15		
10	1.20	< 15		
11	1.18	< 15		
12	1.20	< 15		
13	1.14	< 15		
14	1.12	< 15		
15	1.20	< 15		
16	1.14	< 15		
17	1.12	< 15		
18	1.06	< 15		
19	1.14	< 15		
20	1.08	< 15		
TECH. H. W. Elliott		ENGR. [illegible]		

POST RADIATION

Date: 5-21-65
Temp: 77 °F

MOD	A_{MIN}	W_{MIN}		
1	1.06	< 15		
2	1.04	< 15		
3	1.28	< 15		
4	1.12	< 15		
5	1.16	< 15		
6	1.12	< 15		
7	1.08	< 15		
8	1.06	< 15		
9	1.14	< 15		
10	1.14	< 15		
11	1.08	< 15		
12	1.14	< 15		
13	1.06	< 15		
14	1.04	< 15		
15	1.10	< 15		
16	1.10	< 15		
17	1.14	< 15		
18	1.06	< 15		
19	1.12	< 15		
20	1.06	< 15		
TECH. H. W. Elliott		ENGR. [illegible]		

EQUIPMENT: Sampling scope
TI pulse gen.

COMMENTS:
Pulse Amplitude measured on flat portion of Top

CIRCUIT TYPE: E-4

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Driving Current Loaded to Ground for Q and $\overline{Q}$

PRE RADIATION				
Date: 10/15/64	1-21-65			
Temp: 78°F	78°F			
MOD	I_{DK}	I_{DL}		
1	9.5	9.7		
2	9.6	9.3		
3	8.5	8.8		
4	9.4	9.3		
5	5.2	5.3		
6	9.3	9.4		
7	9.7	9.6		
8	11.3	10.8		
9	1.8	6.6		
10	10.2	10.0		
11	9.8	9.6		
12	9.6	10.2		
13	9.0	9.1		
14	3.1	5.5		
15	8.1	8.1		
16	4.5	5.9		
17	7.8	7.7		
18	4.5	4.5		
19	4.4	4.5		
20	4.6	4.1		
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 6-24-65				
Temp: 75°				
MOD	I_{DK}	I_{DL}		
1	3.2	3.6		
2	3.9	3.3		
3	3.0	3.7		
4	9.3	9.2		
5	1.4	1.5		
6	3.8	4.1		
7	4.1	4.2		
8	3.9	3.8		
9	0.68	2.4		
10	5.4	5.1		
11	9.8	9.4		
12	3.3	4.2		
13	2.9	2.9		
14	1.08	1.6		
15	8.0	8.0		
16	2.1	2.7		
17	1.9	1.9		
18	4.3	3.7		
19	4.2	4.1		
20	1.24	1.41		
TECH. [illegible]		ENGR.		

EQUIPMENT: Digital VM I 55991
Milliammeter I 14196
Decade resistor I 73730

COMMENTS:

CIRCUIT TYPE: E-4

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Driving Current Loaded to Positive Supply for Q and $\overline{Q}$

PRE RADIATION

Date: 10/15/64 1-21-65

Temp: 78°F 78°F

MOD	I_{HK}	I_{HL}		
1	17.0	17.5		
2	17.5	17.5		
3	24.0	24.0		
4	31.0	29.0		
5	20.5	19.0		
6	25.0	25.0		
7	22.5	21.0		
8	22.0	16.0		
9	18.5	16.5		
10	17.5	16.0		
11	21.0	21.5		
12	20.5	19.5		
13	32.5	31.5		
14	26.0	24.0		
15	14.0	14.0		
16	28.0	27.0		
17	17.0	16.0		
18	17.5	18.0		
19	15.0	14.5		
20	16.0	17.5		

TECH. H. W. Elliott ENGR. [illegible]

POST RADIATION

Date: 6-24-65

Temp: 75°

MOD	I_{HK}	I_{HL}		
1	10.1	11.3		
2	12.2	12.1		
3	14.8	13.3		
4	29	29.0		
5	10.2	6.7		
6	13.3	13.8		
7	14.8	14.5		
8	9.4	9.3		
9	11.9	9.2		
10	11.7	11.0		
11	20.0	20.0		
12	14.8	12.4		
13	16.0	16.0		
14	6.2	1.22		
15	14.3	14.2		
16	17.0	17.0		
17	10.3	10.0		
18	18.0	18.0		
19	15.0	14.6		
20	9.9	.63		

TECH. H. W. Elliott ENGR.

EQUIPMENT: Digital VM I-55991
Milliammeter I 14196
Decade Resistor I-73730

COMMENTS:

CIRCUIT TYPE: E-4

TEST NUMBER: 7

DATA SHEET A

TEST TITLE: Input Minimum Pulse Width and Height for Clock Pulse and Transient Parameters

PRE RADIATION

Date: 10/16/64
Temp: 78°F

MOD	Volts A_{MIN}	1×10^{-9} Seconds W_{MIN}		
1	1.3	14.5 <		
2	1.28	14.5 <		
3	1.28	14.5 <		
4	1.24	14.5 <		
5	1.62	14.5 <		
6	1.10	14.5 <		
7	1.34	14.5 <		
8	1.22	14.5 <		
9	1.32	14.5 <		
10	1.56	16.5		
11	1.28	14.5 <		
12	1.44	14.5 <		
13	1.32	14.5 <		
14	1.48	14.5 <		
15	1.44	14.5 <		
16	1.24	14.5 <		
17	1.22	14.5 <		
18	1.12	14.5 <		
19	1.12	14.5 <		
20	1.22	14.5 <		
TECH. [illegible]		ENGR. RRD		

POST RADIATION

Date: 5-27-65
Temp: 77°F

MOD	A_{MIN}	W_{MIN}		
1	1.34	< 13.5		
2	1.3	< 13.5		
3	1.26	< 13.5		
4	1.28	< 13.5		
5	1.68	14.5		
6	1.10	< 13.5		
7	1.41	< 13.5		
8	1.3	< 13.5		
9	1.36	< 13.5		
10	1.68	16.5		
11	1.3	< 13.5		
12	1.5	< 13.5		
13	1.3	< 13.5		
14	1.96	< 13.5		
15	1.48	< 13.5		
16	1.24	< 13.5		
17	1.2	< 13.5		
18	1.34	< 13.5		
19	1.16	< 13.5		
20	1.28	< 13.5		
TECH. [illegible]		ENGR.		

EQUIPMENT: TI Pulse gen
Sampling oscilloscope

COMMENTS:

CIRCUIT TYPE: E-4

TEST NUMBER: 7

DATA SHEET B

TEST TITLE:

PRE RADIATION

Date: 10/16/64
Temp: 78°F
Clock T_R = 8
T_F = 2.5

MOD	$\bar{\tau}_S$	$\bar{\tau}_D$	$\bar{\tau}_R$	$\bar{\tau}_F$
1	7.5	20.5	5	11.5
2	7.5	19.5	5	11
3	10	25.5	7	14.5
4	9	25.5	8.5	15
5	10	27	11	15
6	7.5	21.5	7	13
7	8.5	21.5	6	12
8	11	21.5	4.5	11
9	11	21.5	9	12
10	8	20.5	4.5	12
11	8	20	5.5	12
12	7	21.5	6.5	12
13	13.5	27	7	15
14	7	23	6	13
15	8	23	6	16.5
16	6.5	21.5	6	15
17	9	26	7.5	15.5
18	6.5	24	11	13.5
19	8	25.5	9	15.5
20	9	25.5	9.5	15.5

TECH. [illegible] ENGR. RRD

POST RADIATION

Date: 5-27-65
Temp: 77°F
T_R = 9
T_F = 2.5

MOD	$\bar{\tau}_S$	$\bar{\tau}_D$	$\bar{\tau}_R$	$\bar{\tau}_F$
1	6	17	13	17
2	6	22	11.5	16
3	6.5	24	16.5	16.5
4	9	25.5	9.5	14
5	7.5	27	29	50
6	6.0	19.5	16.5	16.5
7	7	19	11.5	17
8	6	15.5	11	16.5
9	5.5	19	22.5	18
10	5.5	16.5	9.5	26
11	6.5	19.5	7	13.5
12	6	19	13.5	15.5
13	6.5	23	15.5	16.5
14	4.5	23.5	64	46
15	9	23	6.5	14.5
16	5.5	19.5	14	16.5
17	7.5	25	18.5	21
18	6	21.5	9	14
19	7	26	14	15
20	5.5	26.5	23	40

TECH. [illegible] ENGR.

EQUIPMENT: TI Pulse Generator
Sampling oscilloscope

COMMENTS:

CIRCUIT TYPE: E-4

TEST NUMBER: 7

DATA SHEET C

TEST TITLE:

PRE RADIATION

Date: 10/16/64
Temp: 79 °F

MOD	τ_S	τ_D	τ_R	τ_F
1	7	21	5.5	12
2	8.5	21	5.5	11.5
3	10	26.5	6.5	15.5
4	9	26.5	6.5	15
5	10.5	28	10	15
6	8	22	6.5	12.5
7	9	21.5	5	12.5
8	10.5	22 *	5 *	12
9	7	21	5.5	12
10	8	21	4	12
11	8	22	5.5	11.5
12	8.5	21	5.5	11.5
13	14.5	28.5	6	14
14	7.5	24	6.5	13
15	7	23	7.5	16.5
16	6.5	21	7	13.5
17	8.5	25.5	8.5	14.5
18	6.5	22.5	9	14
19	7.5	25.5	14	15.5
20	8.5	26	9.5	13.5

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-24-65
Temp: 75°

MOD	τ_S	τ_D	τ_R	τ_F
1	6.5	18	10.5	16
2	6.5	20	9	13
3	7	24	11	18.5
4	9.5	26	6.5	15
5	8.5	26.5	20.5	60 *
6	6.5	20.5	15.5	15
7	7.0	19.5	8.5	15
8	6.5	18	9.5	15
9	6.5	16.5	9	20
10	6.0	17.5	7.5	16
11	7.5	20.5	6.5	12.5
12	7.0	18.5	9	16
13	7.0	24.5	13	17.5
14	5.5	19	23	15.5
15	9	23.5	5.5	15.5
16	6	21	11.5	18.5
17	7.5	26	15.5	20.5
18	7.0	24	11	13.5
19	8.5	26.5	9	15
20	7.5	16.5	18	20

TECH. [illegible] ENGR.

EQUIPMENT: TI Pulse Generator
Sampling oscilloscope

COMMENTS:
* Badly distorted on leading edge

*

Trailing Edge of waveform
other output of the module is similar
see data sheet (15) for time

CIRCUIT TYPE: E-4

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Leakage Current of Isolation Diode

PRE RADIATION

Date: 11/4/64
Temp: 77°F

MOD	I_{LIS}	I_{LL}		
1	$.47 \times 10^{-7}$	$.41 \times 10^{-7}$		
2	$.56 \times 10^{-7}$	$.46 \times 10^{-7}$		
3	$.61 \times 10^{-7}$	$.46 \times 10^{-7}$		
4	$.63 \times 10^{-8}$	$.68 \times 10^{-8}$		
5	$.62 \times 10^{-7}$	$.53 \times 10^{-7}$		
6	$.56 \times 10^{-4}$	$.66 \times 10^{-4}$		
7	$.42 \times 10^{-7}$	$.37 \times 10^{-7}$		
8	$.63 \times 10^{-7}$	$.72 \times 10^{-7}$		
9	$.15 \times 10^{-7}$	$.14 \times 10^{-7}$		
10	$.78 \times 10^{-7}$	$.67 \times 10^{-7}$		
11	$.085 \times 10^{-3}$	$.9 \times 10^{-3}$		
12	$.48 \times 10^{-7}$	$.39 \times 10^{-7}$		
13	$.37 \times 10^{-7}$	$.33 \times 10^{-7}$		
14	$.22 \times 10^{-3}$	$.27 \times 10^{-3}$		
15	$.44 \times 10^{-5}$	$.37 \times 10^{-5}$		
16	$.76 \times 10^{-5}$	$.19 \times 10^{-4}$		
17	$.43 \times 10^{-8}$	$.54 \times 10^{-8}$		
18	$.61 \times 10^{-3}$	$.15 \times 10^{-5}$		
19	$.19 \times 10^{-3}$	$.14 \times 10^{-4}$		
20	$.53 \times 10^{-4}$	$.55 \times 10^{-8}$		
TECH. M. W. Elliott			ENGR. [illegible]	

POST RADIATION

Date: 6-24-65
Temp: 75°

MOD	I_{LIS}	I_{LL}		
1	$.43 \times 10^{-7}$	$.69 \times 10^{-7}$		
2	$.42 \times 10^{-7}$	$.42 \times 10^{-4}$		
3	$.44 \times 10^{-7}$	$.28 \times 10^{-7}$		
4	$.50 \times 10^{-8}$	$.75 \times 10^{-8}$		
5	$.58 \times 10^{-6}$	$.2 \times 10^{-6}$		
6	$.12 \times 10^{-4}$	$.11 \times 10^{-3}$		
7	$.32 \times 10^{-7}$	$.48 \times 10^{-7}$		
8	$.49 \times 10^{-7}$	$.15 \times 10^{-4}$		
9	$.25 \times 10^{-7}$	$.1 \times 10^{-5}$		
10	$.51 \times 10^{-7}$	$.8 \times 10^{-7}$		
11	$.66 \times 10^{-4}$	$.23 \times 10^{-3}$		
12	$.62 \times 10^{-7}$	$.33 \times 10^{-6}$		
13	$.36 \times 10^{-7}$	$.15 \times 10^{-7}$		
14	$.22 \times 10^{-3}$	$.15 \times 10^{-3}$		
15	$.09 \times 10^{-7}$	$.63 \times 10^{-8}$		
16	$.14 \times 10^{-4}$	$.19 \times 10^{-4}$		
17	$.1 \times 10^{-6}$	$.8 \times 10^{-7}$		
18	$.23 \times 10^{-3}$	$.18 \times 10^{-5}$		
19	$.25 \times 10^{-5}$	$.16 \times 10^{-4}$		
20	$.26 \times 10^{-3}$	$.8 \times 10^{-5}$		
TECH. M. W. Elliott			ENGR.	

EQUIPMENT: Digital VM I 55991
Keithley Electrometer I 52076
with Decade shunt I 52075

COMMENTS:
I_{LL} Mod #4 $.63 \times 10^{-8}$
Mod 14 Noisey Both Tests

CIRCUIT TYPE: E-4

TEST NUMBER: 9

DATA SHEET

TEST TITLE: Minority Carrier Lifetime of Isolation Diode

PRE RADIATION				
Date:				
Temp:				
MOD	$\Delta T / \Delta V$	τ_L (ns)	τ_R (ns)	
1	10.5/188	1.4	1.3	
2	13.5/.250	1.4	1.3	
3	7.5/.125	1.5	1.7	
4	7/.125	1.4	1.6	
5	17/.225	1.9	1.6	
6	11/150	1.9	1.9	
7	7.5/150	1.3	1.3	
8	10.5/.200	1.4	1.6	
9	7/.100	1.8	1.7	
10	11/.150	1.9	1.7	
11	6.5/.125	1.3	1.3	
12	10/.225	1.1	1.[illegible]	
13	6/.100	1.5	[illegible]	
14	15/.200	1.9	1.6	
15	7.5/.150	1.3	1.4	
16	9.5/.150	1.6	1.8	
17	8/.138	1.5	1.4	
18	9.5/.125	1.9	1.5	
19	17.5/.200	1.9	1.7	
20	9.5/.175	1.4	1.3	
TECH. J.M. Jindrey			ENGR. [illegible]	

POST RADIATION				
Date:				
Temp:				
MOD	τ_L	τ_R		
1				
2	Inspection	of Curves		
3	Shows	No	Significant	
4	Changes			
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

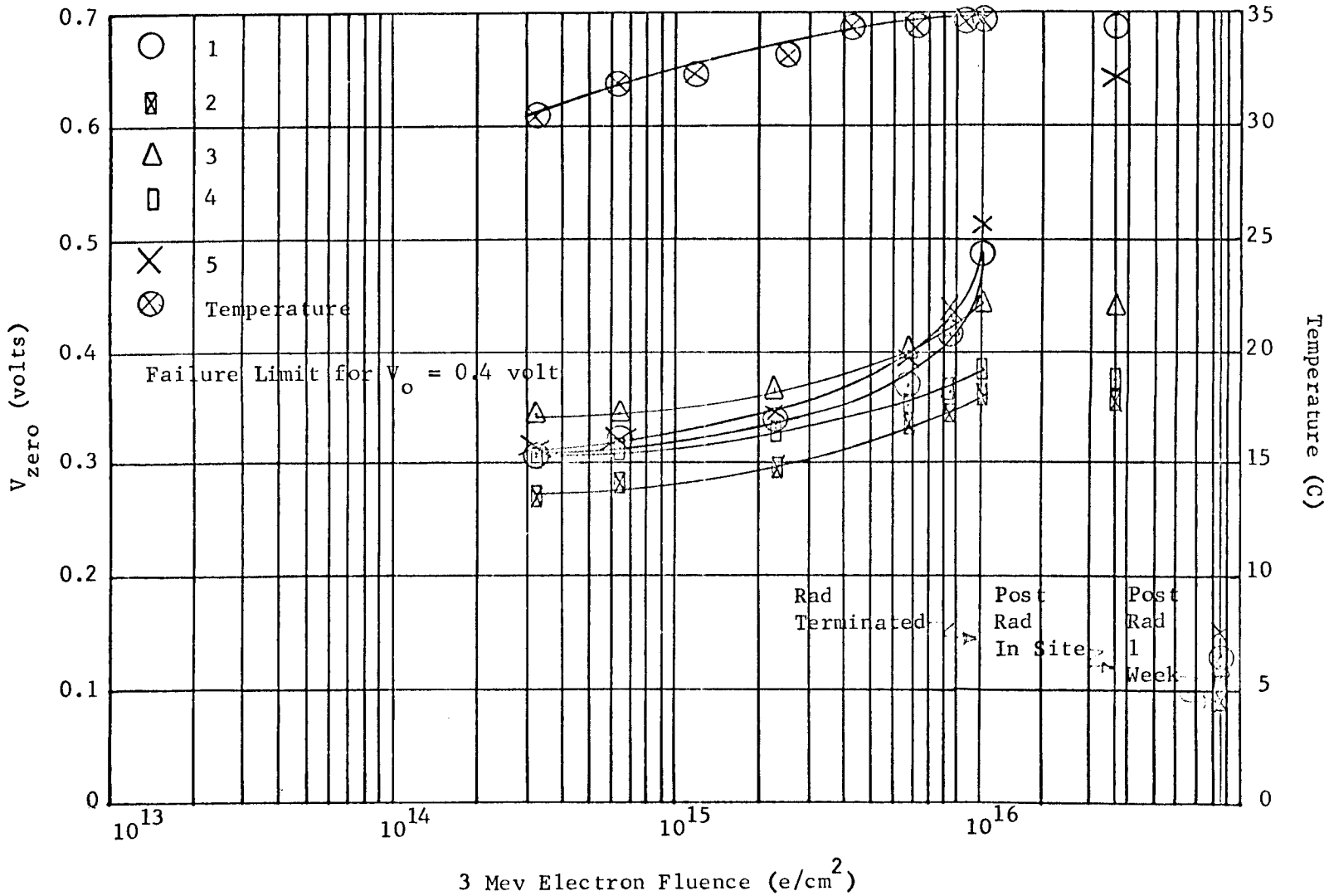
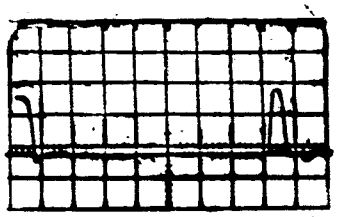
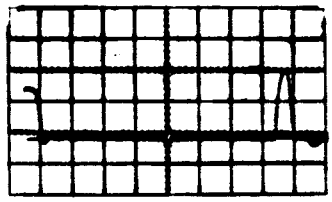


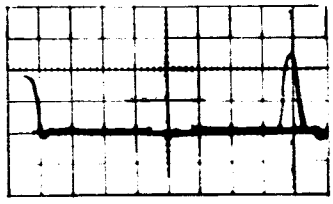
FIGURE III-21. RADIATION RESPONSE OF UNIT E-4



A - Initial



B - Final



D - Post Rad 1 Week

Scale: 0.5 volt/cm
0.1 μsec/cm

FIGURE III-22. MULTISTAGE PROPAGATION DELAY FOR E-4 CIRCUITS

CIRCUIT TYPE: E-5

TEST NUMBER: 1

DATA SHEET A

TEST TITLE: Input Voltage Level

PRE RADIATION

Date: 10/7/64
Temp: 78°F

MOD	5.63 K-ohms: V min ONE Pin K	5.63 K-ohms: V max Zero Pin K	803 ohms: V min ONE Pin K	803 ohms: V max Zero Pin K
1	1.384	1.364	1.463	1.434
2	1.389	1.371	1.389	1.360
3	1.387	1.369	1.459	1.434
4	1.394	1.375	1.459	1.434
5	1.312	1.292	1.472	1.444
6	1.372	1.353	1.441	1.416
7	1.476	1.456	1.560	1.530
8	1.304	1.286	1.370	1.346
9	1.396	1.377	1.473	1.444
10	1.279	1.261	1.349	1.323
11	1.403	1.382	1.489	1.456
12	1.341	1.322	1.411	1.386
13	1.389	1.371	1.459	1.433
14	1.387	1.368	1.457	1.431
15	1.389	1.369	1.469	1.440
16	1.453	1.385	1.508	1.397
17	1.419	1.390	1.487	1.361
18	1.439	1.360	1.480	1.406
19	1.426	1.375	1.474	1.399
20	1.440	1.407	1.454	1.419
TECH.	[illegible]		ENGR.	[illegible]

POST RADIATION

Date: 6-25-65
Temp: 74°

MOD	5.63 K: V min one Pin K	5.63 K: V max Zero Pin K	803 Ω: V min one Pin K	803 Ω: V max zero Pin K
1	1.583	1.489	1.691	1.595
2	1.489	1.406	1.480	1.410
3	1.543	1.467	1.613	1.534
4	1.512	1.461	1.521	1.473
5	1.569	1.493	1.659	1.569
6	1.555	1.473	1.636	1.551
7	1.590	1.503	1.727	1.677
8	1.505	1.414	1.542	1.454
9	1.553	1.469	1.629	1.556
10	1.392	1.329	1.415	1.356
11	1.510	1.467	1.539	1.483
12	1.493	1.421	1.570	1.506
13	1.527	1.489	1.682	1.584
14	1.577	1.489	1.673	1.579
15	1.543	1.469	1.566	1.493
16	1.519	1.439	1.602	1.539
17	1.519	1.451	1.581	1.521
18	1.442	1.369	1.465	1.416
19	1.467	1.415	1.484	1.436
20	1.469	1.412	1.527	1.446
TECH.	[illegible]		ENGR.	

EQUIPMENT: Digital VM I 55991
Decade Box I-73730

Bad Repeatability on control group due to defective Helipot

COMMENTS: 10 K Helipot placed in series with V_x for fine control
Mods 16-20 tested 1-2-65 Temp 74°F

CIRCUIT TYPE: E-5

TEST NUMBER: 1

DATA SHEET B

TEST TITLE:

PRE RADIATION				
Date: 10/7/64				
Temp: 78°F				
	5.63 K-ohms		803 ohms	
MOD	V_{MIN} One Pin (L)	V_{MAX} Zero Pin (L)	V_{MIN} One Pin (L)	V_{MAX} Zero Pin (L)
1	1.394	1.375	1.469	1.442
2	1.307	1.289	1.380	1.353
3	1.382	1.360	1.456	1.431
4				
5	1.384	1.372	1.463	1.434
6	1.385	1.363	1.471	1.438
7	1.392	1.367	1.479	1.449
8	1.310	1.289	1.379	1.355
9	1.397	1.378	1.475	1.446
10	1.301	1.282	1.367	1.343
11	1.404	1.384	1.484	1.454
12	1.336	1.317	1.408	1.383
13	1.389	1.378	1.464	1.437
14	1.374	1.355	1.447	1.421
15	1.402	1.381	1.493	1.459
16	1.462	1.406	1.487	1.429
17	1.505	1.445	1.528	1.473
18	1.484	1.419	1.497	1.431
19	1.480	1.420	1.506	1.449
20	14.45	1.397	1.682	1.408
TECH. H.W. Elliott			ENGR. RRD	

POST RADIATION				
Date: 6-28-65				
Temp: 75°				
	5.63 K-ohms		803 ohms	
MOD	V_{MIN} One Pin (L)	V_{MAX} Zero Pin (L)	V_{MIN} One Pin (L)	V_{MAX} Zero Pin (L)
1	1.584	1.489		
2	1.493	1.407		
3	1.552	1.474		
4	—	—	—	—
5	1.553	1.464		
6	1.577	1.487		
7	1.593	1.497		
8	1.513	1.416		
9	1.554	1.477		
10	1.439	1.376		
11	1.532	1.459		
12	1.531	1.456		
13	1.509	1.429		
14	1.562	1.479		
15	1.559	1.477		
16	1.512	1.434		
17	1.591	1.500		
18	1.500	1.441		
19	1.500	1.433		
20	1.452	1.593		
TECH.			ENGR.	

EQUIPMENT: Digital VM I-55991
Decade resistor I 73730

Bad Repeatibility on Control Group Due to Defective Helipot

COMMENTS:
10 K Helipot placed in series with Y_X for fine control
Mod #9 inoperative on inputs A, B, C, M
Mods 16-20 Tested 1-2-65 Temp 74°F

CIRCUIT TYPE: E-5

TEST NUMBER: 1

DATA SHEET B

TEST TITLE: Input Voltage Level

PRE RADIATION

Date: Mar 29, 1965
Temp: 79° F

432 ohms

MOD	V min one Pin K	V max zero Pin K	V min one Pin L	V max zero Pin L
1	1.557	1.486	1.560	1.487
2	1.491	1.415	1.450	1.384
3	1.570	1.483	1.576	1.484
4	1.559	1.460	–	–
5	1.598	1.517	1.589	1.502
6	1.514	1.432	1.581	1.509
7	1.610	1.579	1.603	1.522
8	1.425	1.361	1.474	1.417
9	1.584	1.492	1.584	1.512
10	1.370	1.250	1.385	1.333
11	1.594	1.523	1.580	1.504
12	1.482	1.385	1.490	1.416
13	1.539	1.473	1.584	1.504
14	1.556	1.479	1.559	1.476
15	1.592	1.513	1.616	1.537
16	1.586	1.494	1.513	1.452
17	1.593	1.492	1.559	1.494
18	1.558	1.479	1.522	1.449
19	1.537	1.459	1.537	1.472
20	1.464	1.412	1.465	1.411

TECH. Erlenbach ENGR.

POST RADIATION

Date: 6-25-65
Temp: 74°

432 Ω

MOD	V min one Pin K	V max zero Pin K	V min one Pin L	V max zero Pin L
1	1.959	1.749	1.879	1.744
2	1.529	1.470	1.535	1.479
3	1.689	1.614	1.701	1.635
4	1.559	1.502	—	—
5	1.755	1.671	1.741	1.666
6	1.34	1.642	*	1.765
7	1.923	1.809	1.803	1.716
8	1.589	1.529	1.652	1.586
9	1.732	1.657	1.771	1.683
10	1.435	1.385	1.495	1.449
11	1.563	1.493	1.583	1.506
12	1.651	1.583	1.689	1.621
13	1.843	1.721	*	1.764
14	1.796	1.690	1.817	1.709
15	1.587	1.513	1.616	1.546
16	1.739	1.653	1.692	1.620
17	1.649	1.596	1.769	1.676
18	1.475	1.432	1.534	1.463
19	1.499	1.444	1.539	1.478
20	1.537	1.467	1.532	1.479

TECH. J.T.W. Ellis ENGR.

EQUIPMENT: Digital VM 1-55991
Decade Resistor 1-73730
Harrison Power Supply.

COMMENTS:

* with + 5 V on pin M pin L Reads + 1.248 V
# 13 pin L

CIRCUIT TYPE: B-5

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Input Driving Current

PRE RADIATION				
Date: 10/7/64				
Temp: 78°F				
MOD	I_{DE}	I_{DM}		
1	1.31	1.30		
2	.83	.73		
3	1.28	1.26		
4	1.22	1.19		
5	1.25	1.22		
6	1.17	1.16		
7	1.36	1.36		
8	.72	.72		
9	1.34	1.40		
10	1.10	.81		
11	1.36	1.32		
12	1.60	1.45		
13	1.23	1.22		
14	1.19	1.20		
15	1.28	1.22		
16	.98	.93		
17	1.11	1.15		
18	.89	.89		
19	.89	.90		
20	.87	.87		
TECH. K.W. [illegible]			ENGR. RGD	

POST RADIATION				
Date: 6-29-65				
Temp: 75°				
MOD	I_{DE}	I_{DM}		
1	1.31	1.30		
2	.81	.81		
3	1.27	1.26		
4	1.22	1.19		
5	1.25	1.23		
6	1.15	1.14		
7	1.34	1.34		
8	.71	.70		
9	1.32	1.37		
10	1.08	.79		
11	1.36	1.32		
12	1.5	1.41		
13	1.21	1.20		
14	1.17	1.18		
15	1.28	1.22		
16	.96	.91		
17	1.10	1.13		
18	.90	.90		
19	.90	.91		
20	.84	.86		
TECH. K.W. [illegible]			ENGR.	

EQUIPMENT: Milliammeter I-14196 1.5 MA scale

COMMENTS:

I_{DE} Mod #12 Measured on 15 MA scale

Mods 16-20 Tested 1-2-65 Temp 74°F

CIRCUIT TYPE: E-5

TEST NUMBER: 3

1

DATA SHEET A

TEST TITLE: Input Leakage Current

PRE RADIATION				
Date: 10/13/64				
Temp: 80°F				
	1×10^{-6} AMPS.			
MOD	I_{LE} E	I_{LM} M	I_{LA} A	I_{LB} B
1	20	21.5	25	27
2	13	22	16	12
3	23	20.5	18	24
4	20	1.5	2	2
5	26	20	16	27
6	24	19	26	26
7	18.5	19	23	22
8	6.5	7	18.5	8
9	20.5	19	25	30.5
10	10	12.5	14.5	13.5
11	9.5	12.5	14.5	13
12	4	2.5	2.5	2.5
13	27	22.5	27	25
14	21	18.5	23	23
15	23.5	20.5	24.5	23.5
16	3.5	3.5	4	4
17	4	6	6	5
18	—	18	33	11
19	5	28	7.5	6
20	15	16	18	18
TECH. H.W. Elliott		ENGR. [illegible]		

POST RADIATION				
Date: 6-25-65				
Temp: 75°				
MOD	I_{LE}	I_{LM}	I_{LA}	I_{LB}
1	4	4.5	5	5.5
2	5.5	5	8	5.5
3	5.5	5	7	6
4	20	0	.5	.5
5	6	4.5	5.5	
6	6	4	5.5	6
7	5	4.5	5.5	5.5
8	2.5	5.5	4.5	4
9	4.5	5	6.5	8
10	5	5.5	6	5.5
11	9	12.5	14	12.5
12	1	1.5	1.5	1.5
13	5.5	4.5	5	5.0
14	5	4	5	5.0
15	23	20	23.5	23
16	1.5	1.5	1.5	1.5
17	1.5	2.5	2	2.0
18	6	11	21	11
19	5	28	7	6
20	5.5	6	7	6.5
TECH. H.W. Elliott		ENGR.		

EQUIPMENT: Microammeter E 3124
Digital VM E 55991

COMMENTS:

All inputs not in use were left open and all tied together.

Mods 16-20 Tested 1-2-65 Temp 74°F
Mod 18 input I shorted

CIRCUIT TYPE: E-5

TEST NUMBER: 3

DATA SHEET A

TEST TITLE: Input Leakage Current

PRE RADIATION

Date: 10/13/64
Temp: 80°F

current in μ ampers

MOD	I_{Lg}	I_{Lf}	I_{Le}	I_{Lc}
1	81	88	68	65
2	52	51	30	27
3	88	94	78	55
4	75	80	60	68
5	90	92	73	83
6	102	106	93	67
7	74	77	57	59
8	26	27	22	30
9	81	97	79	67
10	34	28	20	40
11	44	48	36	35
12	9	10	7	6
13	102	110	77	67
14	102	101	80	71
15	93	98	72	62
16	14	21	11.5	11
17	18.5	25	18	16
18	19	27.5	18	51.5
19	17.5	20.5	20	14
20	56	65	51	52

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-28-65
Temp: 75°

MOD	I_{Lg}	I_{Lf}	I_{Le}	I_{Lc}
1	10	11	9	9
2	16	16	10	10
3	15	16	15	11
4	75	79	60	67
5	15	15	12	14
6	16	16	12	11
7	13	15	11	11
8	8	8	6	18
9	13	15	14	14
10	11	9	7	13
11	44	47	35	35
12	3	4	3	3
13	13	15	10	9
14	17	14	12	11
15	92	97	72	62
16	4	3	3	3
17	5	7	6	5
18	19	27	18	26
19	17	20	20	14
20	15	18	16	15

TECH. [illegible] ENGR.

EQUIPMENT: Digital VM I 55991
Microammeter C 3124

COMMENTS:
Inputs not under test grounded
Mods 16-20 Tested 1-2-65 Temp 74°F

CIRCUIT TYPE: E-5

TEST NUMBER: 3

1

DATA SHEET B

TEST TITLE: Input Leakage Current

PRE RADIATION

Date: 10/13/64
Temp: 80°F

1×10^{-6} amps

MOD	I_{Lc}	I_{Le}	I_{Lf}	I_{Lg}
1	22	23.5	28	24
2	9	11	15.5	15
3	21	29	29.5	28
4	2	20.5	24	21
5	27	26.5	29	28
6	22.5	25	32.5	30
7	20	20	24	20.5
8	12.5	8	8.5	8
9	25	27	29	27
10	14.5	8	9	11
11	11.5	12	14.5	13
12	2	2.5	3	2.5
13	23.5	25.5	34	30
14	23.5	26.5	30	31
15	21	25.5	29	28
16	3.5	4.5	3	4
17	5	5	6	4.5
18	20.5	7	20	6.5
19	5	7	6.5	6
20	18	16	16	14

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-28-65
Temp: 75°

MOD	I_{Lc}	I_{Le}	I_{Lf}	I_{Lg}
1	4.5	4.5	5.5	4.5
2	4.0	4.5	6.5	6.0
3	5.0	7.0	7.0	6.5
4	.5	20.5	23.5	21
5	6.5	6.0	6.5	6.5
6	5.0	6.0	8.0	7.5
7	5.0	5.0	6.0	5.5
8	10.5	3.0	3.5	4
9	6.5	6.5	6.5	6.5
10	6.0	3.5	4.0	4.5
11	11.5	11.5	14	12.5
12	1.5	1.5	1.5	1.5
13	5.0	5.0	6.5	6.0
14	5.5	6.0	7.0	7.0
15	20.5	25	28.5	27.5
16	1.5	1.5	1.5	1.5
17	2	2	2.5	2
18	10.5	7	9.5	6.5
19	5.0	7	6.5	5.5
20	7.0	6.5	6.0	5.5

TECH. [illegible] ENGR.

EQUIPMENT: Same equipment as sheet A,

COMMENTS:

Mods 16-20 Tested 1-2-65 Temp 74°F Same comments as sheet A.

CIRCUIT TYPE: E-5

TEST NUMBER: 3

DATA SHEET B

TEST TITLE: Input Leakage Current

PRE RADIATION				
Date: 10/13/64				
Temp: 80°F				
	Current in μ amps			
MOD	I_{LB}	I_{La}	I_{Lm}	I_{LE}
1	85	84	63	61
2	42	58	34	36
3	79	88	61	66
4	84	87	57	61
5	96	93	64	83
6	88	91	61	72
7	74	81	61	59
8	28	29	21	37
9	105	80	60	67
10	45	46	33	23
11	41	50	41	32
12	7.5	6.5	9	7
13	84	86	69	80
14	80	80	60	64
15	77	85	66	68
16	14.5	16	11	11
17	22	25	20	13.5
18	34	54	31	—
19	39	26	63	14
20	64	66	45	42
TECH. [illegible]			ENGR. [illegible]	

POST RADIATION				
Date: 6-28-65				
Temp: 75°F				
MOD	I_{LB}	I_{La}	I_{Lm}	I_{LE}
1	10	10	9	9
2	14	13	13	12
3	15	15	11	13
4	84	87	47	61
5	14	13	10	15
6	12	12	9	13
7	13	14	11	11
8	9	10	12	6
9	18	14	11	12
10	14	15	12	10
11	41	49	40	32
12	3	3	6	3
13	10	11	9	11
14	11	10	9	11
15	77	85	65	68
16	4	4	3	3
17	6	7	6	4
18	34	54	31	15
19	19	26	61	14
20	18	19	14	13
TECH. [illegible]			ENGR.	

EQUIPMENT:

Same equipt. and comments as sheet A

COMMENTS:

Mods 16-20 tested 1-2-65 temp 74°F
Mod 18 input I shorted

CIRCUIT TYPE: E-5

TEST NUMBER: 4

DATA SHEET

TEST TITLE: Output Driving Current

PRE RADIATION

Date: 10/9/64
Temp: 76°F

current in ma.

MOD	I_{DK}	I_{DL}		
1	29	29		
2	20	22		
3	32	30		
4	29	Note 1		
5	28	27		
6	35	24		
7	24	24		
8	27	26		
9	28	27		
10	24	27		
11	26	28		
12	27	26		
13	33	29		
14	33	30		
15	27	23		
16	22	23		
17	23	21		
18	25	26		
19	28	24		
20	27	26		

TECH. W. W. Elliott ENGR. [illegible]

POST RADIATION

Date: 6-29-65
Temp: 75°

MOD	I_{DK}	I_{DL}		
1	8.7	8.6		
2	13.5	15.0		
3	15.0	14.1		
4	30	—		
5	13.1	12.6		
6	12.8	8.4		
7	9.0	11.8		
8	13.0	11.0		
9	13.6	12.2		
10	15.0	16.0		
11	26	29		
12	14.2	13.3		
13	9.6	8.0		
14	10.4	10.2		
15	27	23		
16	10.0	11.8		
17	12.7	11.5		
18	24	25		
19	28	24		
20	16.0	16.0		

TECH. W. W. Elliott ENGR.

EQUIPMENT: Digital VM I 55991
Decade resistor I 73730
Milliammeter I 14196

COMMENTS:
Note zero current for mod 4
mods 16-20 tested 1-2-65 Temp 74°F

CIRCUIT TYPE: E-5

TEST NUMBER: 5

DATA SHEET

TEST TITLE:

PRE RADIATION

Date: 10/9/64
Temp: 76°F

1×10^{-3} Amperes

MOD	I_{LK}	I_{LL}		
1	6.7	7.3		
2	6.1	5.8		
3	7.8	7.8		
4	6.2	7.9		
5	8.1	7.8		
6	8.2	8.6		
7	5.5	5.8		
8	1.8	4.7		
9	6.4	5.8		
10	3.6	6.1		
11	4.2	6.5		
12	6.2	6.9		
13	7.0	8.0		
14	8.6	6.5		
15	6.6	5.8		
16	5.8	7.1		
17	5.0	5.3		
18	9.8	8.1		
19	5.7	6.0		
20	10.0	9.7		
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 6-29-65
Temp: 75°

MOD	I_{LK}	I_{LL}		
1	1.6	1.6		
2	5.1	4.9		
3	2.0	2.1		
4	2.9	2.9		
5	2.0	2.0		
6	1.9	1.9		
7	1.5	1.7		
8	1.2	3.6		
9	1.6	1.4		
10	1.5	5.1		
11	4.1	6.3		
12	1.7	1.8		
13	1.5	1.7		
14	1.8	1.6		
15	6.4	5.6		
16	1.7	1.9		
17	1.6	1.8		
18	9.5	7.6		
19	5.4	5.7		
20	3.6	3.1		
TECH. [illegible]		ENGR.		

EQUIPMENT: Digital VM I 55991
Milliammeter I 14196

COMMENTS:
Voltages must be monitored with care
Mods 16-20 tested 1-2-65 Temp 74°F

CIRCUIT TYPE: E-5

TEST NUMBER: 6

DATA SHEET A

TEST TITLE:

PRE RADIATION

Date: 10/8/64
Temp: 78°F
Input { τ_{RE} 5, τ_{FE} 3 } 1×10^{-9} seconds

MOD	τ_{SK}	τ_{DK}	τ_{RK}	τ_{FK}
1	13	14	9	13
2	7	18	8	17
3	17	14	9	12
4	14	15	9	13
5	13	15	9	13
6	15	15	9	14
7	9	17	11	44
8	10	21	9	130
9	14	14	8	14
10	13	14	7	78
11	12	15	10	16
12	7	9	6	15
13	15	15	9	14
14	14	15	9	13
15	13	14	9	14
16	9	16	12	17.5
17	10	14	8.5	15
18	7	21.5	12.5	20
19	9	21	11	20
20	12.5	20	13.5	19

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-26-65
Temp: 77°F
Input { τ_{RE} 5, τ_{FE} 4 }

MOD	τ_{SK}	τ_{DK}	τ_{RK}	τ_{FK}
1	6.5	16.5	22.5	120
2	6	19.5	13	70
3	6	16.5	15.5	110
4	13.5	16.5	10	14
5	6	18.5	17.5	110
6	5.5	18.5	19	105
7	6	21.5	23	125
8	6.5	20.5	18.5	125
9	6.5	15.5	16.5	120
10	7	14.5	10.5	130
11	11.5	16	11	17.5
12	5.5	11	12	105
13	5.5	18	21.5	115
14	5.5	17.5	21	110
15	11.5	15.5	9.5	15
16	6.5	15	20	120
17	5.5	13.5	14.5	120
18	7	21.5	13	20
19	8.5	21	11.5	20.5
20	6	20	15.5	60

TECH. [illegible] ENGR.

EQUIPMENT: sampling oscilloscope
TI Pulse Generator

COMMENTS:

CIRCUIT TYPE: E-5

TEST NUMBER: 6

DATA SHEET B

TEST TITLE:

PRE RADIATION

Date: 10/8/64
Temp: 78°F

τ_{RM} 5
τ_{FM} 3 1×10^{-9} seconds

MOD	τ_{SL}	τ_{DL}	τ_{RL}	τ_{FL}
1	13	14	8	14
2	7	18	7	22
3	15	15	8	11
4				
5	13	15	8	14
6	11	16	9	12
7	14	15	8	16
8	8	22	9	23
9	14	13	8	14
10	8	18	8	22
11	20	16	9	14
12	7	12	7	16
13	13	16	9	14
14	13	15	8	14
15	11	16	9	15
16	10	19	11	15
17	8	17	8	16
18	7	19.5	11	18
19	8.5	21	9.5	20
20	12	19	12	16.5

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-26-65
Temp: 77°F

τ_{RM} 5
τ_{FM} 4

MOD	τ_{SL}	τ_{DL}	τ_{RL}	τ_{FL}
1	5	14.5	20.5	125
2	6	21	11	92
3	6	18	15	105
4				
5	6	18.5	15.5	115
6	5.5	20	22.5	105
7	6.5	17	16	120
8	6.5	26.5	17.5	110
9	6.5	17.5	16.5	125
10	6.5	21.5	12	95
11	22	16.5	10	14.5
12	6.5	13	13	110
13	6.5	20	21.5	115
14	6.5	19	19	115
15	10	16.5	9.5	14.5
16	6	18	18.5	80
17	6.5	18	15	110
18	7.5	19.5	11.5	18
19	8.5	20.5	10	20
20	6	20.5	13	105

TECH. [illegible] ENGR.

EQUIPMENT: Sampling oscilloscope
TI Pulse Generator

COMMENTS:
Mod 4 inoperative

CIRCUIT TYPE: E-5

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Isolation Diode Minority Carrier Lifetime

PRE RADIATION					POST RADIATION				
Date:					Date:				
Temp:					Temp:				
	77°F		78°F						
MOD	$\frac{\Delta t}{\Delta V}$	τ_K (10^{-9})	$\frac{\Delta t}{\Delta V}$	τ_L (10^{-9})	MOD	$\frac{\Delta t}{\Delta V}$	τ_K	$\frac{\Delta t}{\Delta V}$	τ_L
1	12.5/.2125	1.5	12.5/.1780	1.8	1	No	Significant		
2	14.5/.2125	1.8	12/.2370	1.3	2	Change			
3	12/.1800	1.7	14/.2050	1.8	3				
4	13/.1830	1.8	12.5/.1820	1.8	4				
5	15/.2450	1.6	13/.1970	1.7	5				
6	15/.2375	1.6	14/.2330	1.6	6				
7	10/.1730	1.5	10/.1540	1.7	7				
8	10/.2250	1.1	10/.2125	1.2	8				
9	10/.1600	1.6	12/.1875	1.7	9				
10	12.5/.2350	1.4	12/.2520	1.2	10				
11	10/.1650	1.6	13/.2120	1.6	11				
12	10/.1980	1.3	12.5/.2375	1.4	12				
13	12.5/.1920	1.7	12.5/.2040	1.6	13				
14	13/.1980	1.7	10/.1540	1.7	14				
15	10/.1670	1.5	12.7/.1950	1.7	15				
16	11/.175	1.5	10/.150	1.7	16				
17	8/.163	1.3	9/.200	1.2	17				
18	13/.225	1.5	8/.150	1.4	18				
19	5/.100	1.3	10/.175	1.5	19				
20	10/.200	1.3	11/.175	1.6	20				
TECH. [illegible]			ENGR. [illegible]		TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: E-5

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Forward Voltage in Isolation Diode

PRE RADIATION

Date: 10/8/64
Temp: 78°F

MOD	V_K (VOLTS)	V_L (VOLTS)		
1	.633	.633		
2	.638	.637		
3	.633	.631		
4	.632	.631		
5	.632	.632		
6	.630	.629		
7	.635	.631		
8	.666	.663		
9	.633	.633		
10	.647	.643		
11	.636	.636		
12	.625	.625		
13	.634	.633		
14	.632	.631		
15	.632	.633		
16	.631	.632		
17	.665	.665		
18	.628	.629		
19	.624	.632		
20	.699	.703		
TECH. [illegible]			ENGR. [illegible]	

POST RADIATION

Date: 6-29-65
Temp: 75°

MOD	V_K	V_L		
1	.625	.625		
2	.638	.639		
3	.625	.626		
4	.636	.635		
5	.623	.623		
6	.623	.623		
7	.626	.627		
8	.669	.664		
9	.627	.627		
10	.647	.646		
11	.639	.640		
12	.624	.624		
13	.624	.624		
14	.623	.623		
15	.635	.636		
16	.624	.626		
17	.661	.660		
18	.633	.633		
19	.630	.636		
20	.705	.709		
TECH. [illegible]			ENGR.	

EQUIPMENT: Digital VM I-55991
Decade resistor I-73730
Milliammeter I-14196 1.5 ma scale

COMMENTS:

Mod 16-20 tested 1-2-65
Temp 74°F

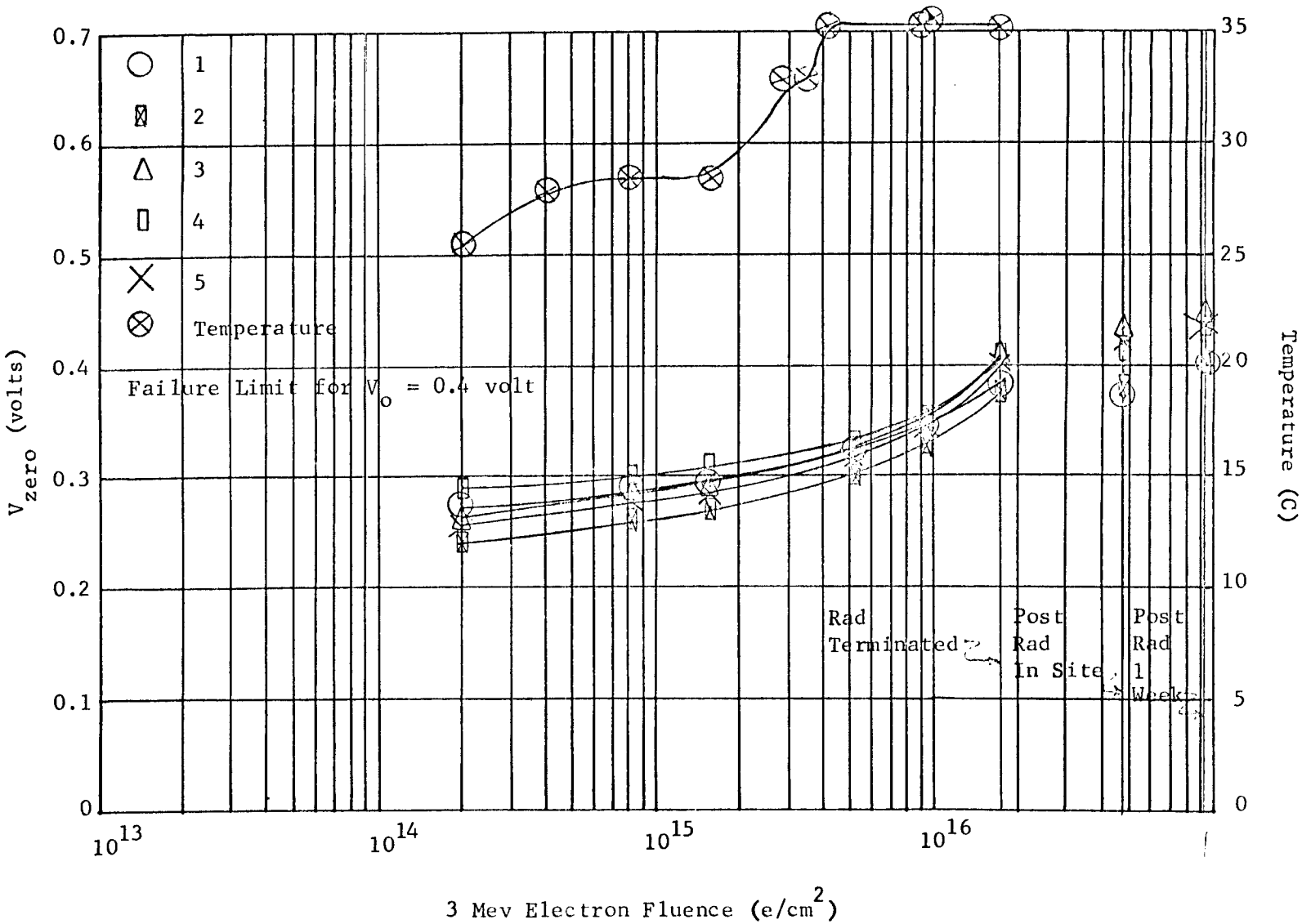
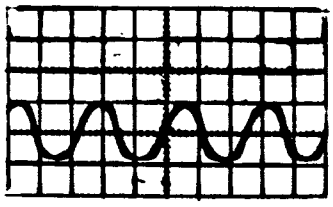
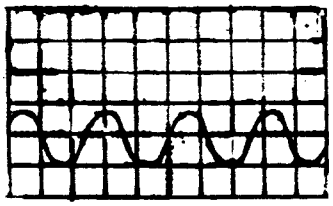


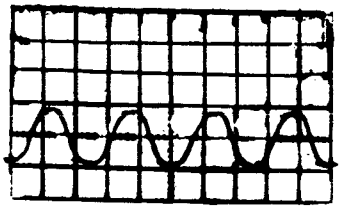
FIGURE III-23. RADIATION RESPONSE OF UNIT E-5



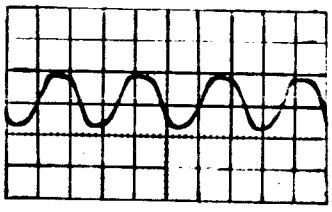
A - Initial



B - Final



C - Post Rad In Site



D - Post Rad 1 Week

Scale: 0.5 volt/cm
0.04 μsec/cm

FIGURE III-24. OUTPUT OF 5-STAGE OSCILLATOR OF E-5 CIRCUITS

CIRCUIT TYPE: F-1

TEST NUMBER: 1

DATA SHEET A

TEST TITLE: Input Voltage Levels ($V_{min\ one}$) R_L = 20K

PRE RADIATION

Date: 11/13/64 3-5-65

Temp: 78°F 78°

MOD	V_{one} (1)	V_{one} (2)	V_{one} (4)	V_{one} (5)
1	.842	.840	.843	
2	.959	.950	.800	
3	1.014	1.017	1.010	
4	.893	.932	.940	
5	.926	.913	.924	
6	.959	.962	.950	
7	.960	.946	.954	
8	.850	.899	.887	
9	.952	.953	.959	
10	.829	.874	.889	
11	.984	.876	.985	
12	.842	.826	.853	
13	.889	.771	.764	
14	.847	.853	.857	
15	.920	.970	.811	
16	.780	.786	.909	
17	.829	.840	.830	
18	.695	.693	.692	
19	.694	.689	.701	
20	.746	.759	.742	

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 4/26/65 & 4/27/65

Temp: 74°F

MOD	V_{one} (1)	V_{one} (2)	V_{one} (4)	V_{one} (5)
1	1.457	1.434	1.454	
2	1.592	1.640	1.399	
3	1.957	2.076	1.980	
4	.897	.939	.945	
5	1.597	1.612	1.602	
6	1.649	1.673	1.607	
7	1.792	1.879	1.879	
8	1.561	1.671	1.601	
9	2.084	2.235	2.300	
10	1.309	1.490	1.496	
11	.926	.885	.996	
12	1.493	1.490	1.610	
13	1.769	1.672	1.639	
14	1.635	1.652	1.673	
15	.930	.982	.819	
16	1.263	1.274	1.493	
17	1.443	1.487	1.487	
18	.701	.703	.699	
19	.700	.693	.709	
20	1.134	1.150	1.171	

TECH. D. A. Kavell ENGR. [illegible]

EQUIPMENT: Digital VM I 55991
Decade resistor I 73730

COMMENTS:

CIRCUIT TYPE: F-1

TEST NUMBER: 1

DATA SHEET B

TEST TITLE: Input Voltage Levels ($V_{min\ one}$) R_L = 4K

PRE RADIATION

Date: 11/13/64
Temp: 78°F

Measurements in Volts

MOD	V_{one} (1)	V_{one} (2)	V_{one} (4)	V_{one} (5)
1	.824	.822	.825	
2	.932	.924	.785	
3	.989	.991	.985	
4	.873	.909	.915	
5	.894	.887	.896	
6	.927	.928	.922	
7	.935	.923	.927	
8	.833	.877	.833	
9	.936	.931	.928	
10	.806	.849	.864	
11	.960	.859	.895	
12	.820	.807	.832	
13	.866	.760	.751	
14	.829	.834	.839	
15	.894	.944	.795	
16	.769	.775	.892	
17	.813	.826	.814	
18	.690	.687	.684	
19	.685	.681	.692	
20	.734	.747	.730	
TECH. [illegible]			ENGR. [illegible]	

POST RADIATION

Date: 4-26-65 & 4-27-65
Temp: 75°F

Measurements in Volts.

MOD	V_{one} (1)	V_{one} (2)	V_{one} (4)	V_{one} (5)
1	1.397	1.379	1.400	
2	1.532	1.575	1.349	
3	1.885	1.999	1.909	
4	.880	.917	.923	
5	1.527	1.539	1.544	
6	1.579	1.591	1.531	
7	1.723	1.796	1.799	
8	1.517	1.617	1.546	
9	2.046	2.196	2.269	
10	1.253	1.416	1.420	
11	.966	.869	.972	
12	1.430	1.421	1.531	
13	1.721	1.619	1.570	
14	1.590	1.591	1.593	
15	.906	.956	.962	
16	1.219	1.243	1.445	
17	1.386	1.434	1.435	
18	.692	.695	.691	
19	.690	.685	.699	
20	1.039	1.109	1.131	
TECH. [illegible]			ENGR. [illegible]	

EQUIPMENT: Digital VM I 55991
Decade resistor I 73730

COMMENTS:

CIRCUIT TYPE: F-1

TEST NUMBER: 1

DATA SHEET C

TEST TITLE: Input Voltage Levels ($V_{min\ one}$) No Load

PRE RADIATION

Date: 11/16/64
Temp: 77°F

Measurement in Volts

MOD	$V_{one}(1)$	$V_{one}(2)$	$V_{one}(4)$	
1	.844	.843	.846	
2	.969	.959	.805	
3	1.029	1.029	1.019	
4	.894	.933	.939	
5	.935	.923	.932	
6	.969	.972	.961	
7	.972	.957	.963	
8	.856	.906	.893	
9	.964	.965	.969	
10	.836	.882	.902	
11	.927	.884	.996	
12	.849	.834	.862	
13	.897	.776	.896	
14	.852	.857	.860	
15	.929	.985	.819	
16	.780	.789	.924	
17	.829	.844	.833	
18	.696	.701	.696	
19	.695	.690	.705	
20	.750	.763	.748	
TECH. K. W. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 4-26 & 4-27/65
Temp: 75°F

Measurement in Volts

MOD	$V_{one}(1)$	$V_{one}(2)$	$V_{one}(4)$	
1	1.480	1.459	1.481	
2	1.617	1.674	1.421	
3	1.995	2.131	2.037	
4	.904	.944	.951	
5	1.659	1.676	1.665	
6	1.701	1.709	1.640	
7	1.823	1.912	1.912	
8	1.610	1.739	1.644	
9	2.110	2.272	2.349	
10	1.330	1.515	1.521	
11	.931	.889	1.602	
12	1.513	1.506	1.626	
13	1.810	1.694	1.650	
14	1.672	1.675	1.689	
15	.934	.989	.822	
16	1.271	1.299	1.525	
17	1.454	1.515	1.516	
18	.702	.706	.701	
19	.700	.695	.710	
20	1.145	1.172	1.189	
TECH. D. A. Kacey		ENGR. [illegible]		

EQUIPMENT: Digital VM I55991

COMMENTS:

CIRCUIT TYPE: F-1

TEST NUMBER: 2

DATA SHEET A

TEST TITLE: Input Voltage Levels (max zero) No Load

PRE RADIATION

Date: 11/13/64 3-5-65

Temp: 79 °F 78°

Measurement in Volts

MOD	$V_{ZERO}^{(1)}$ 1	$V_{ZERO}^{(2)}$ 2	$V_{ZERO}^{(4)}$ 4	
1	.749	.748	.749	
2	.814	.807	.717	
3	.859	.862	.855	
4	.779	.802	.805	
5	.792	.786	.794	
6	.810	.810	.806	
7	.821	.812	.815	
8	.752	.779	.752	
9	.805	.806	.809	
10	.733	.761	.769	
11	.797	.773	.841	
12	.749	.739	.754	
13	.772	.703	.696	
14	.757	.756	.752	
15	.795	.832	.795	
16	.710	.716	.793	
17	.737	.746	.739	
18	.647	.649	.646	
19	.649	.646	.655	
20	.682	.693	.682	
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 4-27-65 & 4-28-65

Temp: 78°F

Measurement in Volts.

MOD	$V_{ZERO}^{(1)}$	$V_{ZERO}^{(2)}$	$V_{ZERO}^{(4)}$	
1	1.136	1.127	1.139	
2	1.220	1.243	1.654	
3	1.456	1.543	1.472	
4	.782	.805	.809	
5	1.217	1.244	1.236	
6	1.246	1.249	1.211	4-27-65 [illegible]
7	1.353	1.389	1.389	
8	1.268	1.283	1.227	
9	1.479	1.573	1.629	
10	1.036	1.147	1.142	
11	.805	.786	.850	
12	1.174	1.159	1.254	
13	1.376	1.336	1.295	
14	1.305	1.315	1.319	
15	.797	.833	.724	4-28-65 [illegible]
16	1.010	1.009	1.146	
17	1.125	1.152	1.152	
18	.649	.651	.647	
19	.650	.647	.657	
20	.923	.931	.947	
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: Digital VM I55991

COMMENTS:

CIRCUIT TYPE: F-1

TEST NUMBER: 2

DATA SHEET B

TEST TITLE: Input Voltage Levels ($V_{max\ zero}$) $R_L = 4K$

PRE RADIATION

Date: 11/18/64 3-5-65

Temp: 77°F 78°

Measurement in Volts

MOD	$V_{zero}(1)$	$V_{zero}(2)$	$V_{zero}(4)$	
1	.723	.723	.724	
2	.779	.772	.696	
3	.821	.824	.819	
4	.764	.783	.789	
5	.754	.745	.750	
6	.775	.770	.765	
7	.785	.781	.781	
8	.727	.749	.751	
9	.776	.779	.781	
10	.702	.724	.731	
11	.767	.749	.807	
12	.720	.711	.724	
13	.742	.685	.679	
14	.725	.727	.728	
15	.760	.793	.699	
16	.693	.699	.763	
17	.713	.722	.715	
18	.630	.633	.631	
19	.633	.631	.641	
20	.669	.675	.663	

TECH. K.W. Elliott ENGR. [signature]

POST RADIATION

Date: 4-27-65 & 4-28-65

Temp: 78°F

Measurement in Volts

MOD	$V_{zero}(1)$	$V_{zero}(2)$	$V_{zero}(4)$	
1	1.042	1.035	1.045	
2	1.121	1.139	1.008	
3	1.339	1.403	1.339	
4	.752	.772	.775	
5	1.082	1.106	1.101	
6	1.115	1.122	1.091	4-27-65 78°F
7	1.232	1.255	1.254	
8	1.110	1.170	1.126	
9	1.410	1.497	1.551	
10	.945	1.033	1.024	
11	.773	.753	.813	
12	1.074	1.053	1.117	
13	1.255	1.229	1.193	
14	1.191	1.202	1.199	
15	.761	.793	.699	4-28-65 78°F
16	.950	.949	1.063	
17	1.043	1.066	1.065	
18	.635	.637	.634	
19	.635	.633	.641	
20	.857	.861	.876	

TECH. D.A. Kaiser ENGR. [signature]

EQUIPMENT: Digital VM I 55991
Decade resistor I 73730

COMMENTS:

CIRCUIT TYPE: F-1

TEST NUMBER: 2

DATA SHEET C'

TEST TITLE: Input Voltage Levels ($V_{max\ zero}$) R_L = 20K

PRE RADIATION				
Date: 3-16-65				
Temp: 79°				
MOD	V_{zero} (1)	V_{zero} (2)	V_{zero} (4)	
1	.650	.644	.643	
2	.681	.676	.633	
3	.727	.728	.719	
4	.677	.686	.685	
5	.614	.611	.613	
6	.643	.641	.639	
7	.689	.682	.682	
8	.651	.656	.667	
9	.706	.701	.703	
10	.598	.602	.604	
11	.691	.677	.711	
12	.631	.625	.631	
13	.664	.632	.626	
14	.632	.640	.640	
15	.656	.681	.625	
16	.644	.645	.683	
17	.652	.654	.650	
18	.593	.591	.589	
19	.583	.580	.584	
20	.599	.600	.592	
TECH. Erlenbach			ENGR.	

POST RADIATION				
Date: 4-27-65 & 4-28-65				
Temp: 78° F				
MOD				
1	.796	.792	.799	
2	.870	.871	.802	
3	1.069	1.065	1.070	
4	.679	.691	.692	
5	.655	.693	.695	
6	.771	.774	.764	4-27-65 78°F
7	.922	.922	.921	
8	.853	.881	.859	
9	1.329	1.466	1.457	
10	.659	.687	.679	
11	.699	.689	.724	
12	.782	.766	.793	
13	.963	.959	.940	
14	.877	.883	.876	
15	.669	.686	.631	4-28-65 78°F
16	.860	.793	.857	
17	.839	.849	.845	
18	.596	.597	.595	
19	.585	.585	.590	
20	.656	.653	.664	
TECH. D. A. Kauer			ENGR. [illegible]	

EQUIPMENT: Same as sheet B

COMMENTS: This data with 1.8 volts

CIRCUIT TYPE: F-1

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Input Driving Current

PRE RADIATION

Date: 11/16/64 3-8-65
Temp: 77°F 78°

1×10^{-6} Amps.

MOD	I_{D1}	I_{D2}	I_{D4}	
1	80	82	77	
2	68	68	66	
3	69	69	69	
4	67	68	66	
5	64	65	67	
6	55	54	60	
7	64	65	65	
8	66	64	66	
9	88	85	82	
10	66	67	65	
11	87	89	85	
12	74	76	70	
13	85	88	78	
14	98	96	92	
15	75	75	78	
16	68	68	67	
17	65	65	65	
18	72	72	73	
19	88	88	82	
20	67	66	68	

TECH. K.W. [illegible] ENGR. [illegible]

POST RADIATION

Date: 4-28-65
Temp: 79°F

1×10^{-6} Amp.

MOD	I_{D1}	I_{D2}	I_{D4}	
1	76	76	74	
2	65	66	64	
3	65	66	66	
4	66	68	66	
5	60	62	64	
6	52	52	58	
7	60	62	63	
8	64	62	64	
9	82	81	78	
10	62	64	62	
11	86	89	85	
12	70	72	67	
13	81	84	75	
14	94	92	88	
15	74	74	77	
16	66	67	66	
17	64	64	64	
18	75	75	76	
19	93	92	86	
20	66	66	68	

TECH. D. A. Kawer ENGR. [illegible]

EQUIPMENT: Digital VM I55991

~~[illegible]~~: MicroAmmeter C 3124

COMMENTS:

CIRCUIT TYPE: F-1

TEST NUMBER: 4

DATA SHEET

TEST TITLE: Input Leakage Current

PRE RADIATION

Date: 3-8-65

Temp: 78°F 79°

11/17/64 11/18/64

MOD	INSTANT $I_{C(2)}$	2 MINUTES $I_{C(2)}$	6-15 hrs $I_{C(2)}$	
1	$.11\times10^{-8}$	$.65\times10^{-9}$	$.34\times10^{-9}$	
2	$.18\times10^{-8}$	$.12\times10^{-8}$	$.66\times10^{-9}$	
3	$.48\times10^{-6}$	$.46\times10^{-6}$	$.47\times10^{-6}$	
4	$.11\times10^{-8}$	$.08\times10^{-8}$	$.32\times10^{-9}$	
5	$.14\times10^{-8}$	$.78\times10^{-9}$	$.44\times10^{-9}$	
6	$.1\times10^{-8}$	$.61\times10^{-9}$	$.32\times10^{-9}$	
7	$.14\times10^{-8}$	$.1\times10^{-8}$	$.26\times10^{-9}$	
8	$.33\times10^{-5}$	$.33\times10^{-5}$	$.3\times10^{-5}$	
9	$.26\times10^{-8}$	$.18\times10^{-8}$	$.14\times10^{-8}$	
10	$.7\times10^{-9}$	$.65\times10^{-9}$	$.4\times10^{-9}$	
11	$.28\times10^{-8}$	$.72\times10^{-9}$	$.4\times10^{-9}$	
12	$.2\times10^{-6}$	$.14\times10^{-7}$	$.1\times10^{-6}$	
13	$.3\times10^{-7}$	$.28\times10^{-7}$	$.25\times10^{-7}$	
14	$.48\times10^{-8}$	$.43\times10^{-8}$	$.42\times10^{-8}$	
* 15	$.3\times10^{-8}$	$.16\times10^{-8}$	$.12\times10^{-8}$	
16	$.55\times10^{-9}$			
17	$.38\times10^{-9}$			
18	$.27\times10^{-9}$			
19	$.19\times10^{-9}$			
20	$.13\times10^{-9}$			
TECH. K. W. [signature] Erlenbach		ENGR. [signature]		

POST RADIATION

Date: 4-30-65

Temp: 78°F

MOD	INSTANT $I_{C(2)}$	2 MINUTES $I_{C(2)}$		
1	$.44\times10^{-8}$	$.44\times10^{-8}$		
2	$.605\times10^{-8}$	$.59\times10^{-8}$		
3	$.60\times10^{-6}$	$.60\times10^{-6}$		
4	$.14\times10^{-8}$	$.086\times10^{-8}$		
5	$.53\times10^{-8}$	$.52\times10^{-8}$		
6	$.37\times10^{-8}$	$.356\times10^{-8}$		
7	$.44\times10^{-8}$	$.413\times10^{-8}$		
8	$.125\times10^{-6}$	$.12\times10^{-6}$		
9	$.68\times10^{-8}$	$.66\times10^{-8}$		
10	$.56\times10^{-8}$	$.54\times10^{-8}$		
11	$.54\times10^{-9}$	$.45\times10^{-9}$		
12	$.705\times10^{-8}$	$.68\times10^{-8}$		
13	$.13\times10^{-7}$	$.13\times10^{-7}$		
14	$.64\times10^{-8}$	$.615\times10^{-8}$		
15	$.4\times10^{-8}$	$.11\times10^{-8}$		
16	$.095\times10^{-7}$	$.095\times10^{-7}$		
17	$.65\times10^{-8}$	$.63\times10^{-8}$		
18	$.3\times10^{-8}$	$.18\times10^{-8}$		
19	$.4\times10^{-8}$	$.25\times10^{-8}$		
20	$.63\times10^{-8}$	$.59\times10^{-8}$		
TECH. D. A. Kaiser		ENGR. [signature]		

EQUIPMENT:

210 ELECTROMETER I 52076
2008 DECADE SHUNT I 52075
481 DIGITAL VOLTMETER I 55991

COMMENTS:

* Mod 15 subjected to 6V reverse Bias on pins(1) and (8) for ≅ 15 hrs prior to This test

** This modules were in the test condition for ~15½ hours

INSTANT READINGS OF CONTROL SPECIMENS DURING POST-RADIATION MEASUREMENTS WERE DIFFICULT TO MAKE: CURRENT WAS DECAYING QUITE RAPIDLY. DAK

CIRCUIT TYPE: F-1

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Output Driving Current Capability

PRE RADIATION

Date: 11/16/64 3-8-65

Temp: 78°F 79°

MOD	1×10^{-3} amp I_{DD}	1×10^{-3} amp I_{DO}	Volts $V_{(SAT)}$	
1	.51	.52	.051	
2	.53	.55	.044	
3	.58	.60	.071	
4	.57	.58	.065	
5	.43	.44	.059	
6	.46	.48	.052	
7	.54	.55	.063	
8	.52	.54	.049	
9	.63	.65	.056	
10	.43	.45	.054	
11	.58	.59	.057	
12	.47	.49	.055	
13	.54	.57	.044	
14	.49	.51	.044	
15	.50	.53	.045	
16	.60	.62	.042	
17	.59	.59	.052	
18	.50	.55	.034	
19	.46	.49	.030	
20	.46	.48	.037	
TECH.			ENGR.	

POST RADIATION

Date: 4-29-65

Temp: 78°F

MOD	1×10^{-3} amp I_{DD}	1×10^{-3} amps I_{DO}	Volts $V_{(SAT)}$	
1	.51	.52	.066	
2	.54	.55	.061	
3	.58	.59	.086	
4	.55	.60	.057	
5	.43	.44	.072	
6	.47	.48	.069	
7	.54	.55	.079	
8	.52	.54	.066	
9	1.16 1.15	1.17 1.16	.090 .090	bad reading
10	.43	.44	.068	
11	.60	.61	.049	
12	.47	.48	.070	
13	.54	.56	.061	
14	.49	.50	.064	
15	.51	.54	.039	
16	.57	.59	.061	
17	.54	.56	.071	
18	.49	.55	.034	
19	.45	.49	.030	
20	.44	.46	.056	
TECH.			ENGR.	

EQUIPMENT: Digital VM I 55991
Millimeter I 14196
Decade resistor I 93730

COMMENTS:

CIRCUIT TYPE: F-1

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 11/21/64

Temp: 76°F Pulse: τ_R 8 ; τ_F 4

1×10^{-9} sec

MOD	τ_S	τ_D	τ_R	τ_F
1	80	12	34	800
2	70	12	32	760
3	60	12	32	720
4	68	12	34	720
5	84	12	30	840
6	80	12	33	840
7	64	12	34	760
8	76	12	29	820
9	48	11	33	840
10	86	12	42	840
11	72	12	31	760
12	82	12	33	840
13	70	12	34	780
14	84	12	32	840
15	80	12	36	840
16	70	10	37	840
17	64	11	39	860
18	75	11	38	900
19	86	11	33	1000
20	76	10	33	1000

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 2-26-65

Temp: 78°F

τ_r 7.5 τ_f 4

1×10^{-9} sec

MOD	τ_S	τ_D	τ_R	τ_F
1	72	11	36	1000
2	68	11	30	850
3	60	11	33	760
4	62	11	33	720
5	80	11	39	1030
6	80	11	32	1160
7	66	11	31	840
8	66	11	31	940
9	32	11	31	600
10	76	11	39	1100
11	68	11	30	820
12	76	11	35	1050
13	66	11	35	900
14	72	11	36	1000
15	78	11	35	940
16	60	11	37	840
17	64	11	41	900
18	72	11	36	830
19	76	11	33	980
20	68	11	35	980

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: Sampling oscilloscope TI Pulse EEN

COMMENTS: The fall Times and Storage times are difficult to read due to the relatively long fall time

3-10-65 Temp 78°

Mod	τ_s	τ_d	τ_R	τ_F
1	76	11	34	950
2	66	11	29	840

CIRCUIT TYPE: F-1

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Pull -down Resistor

PRE RADIATION				
Date: 11/13/64 3-8-65				
Temp: 78°F 79°				
MOD	R_{38} (ohms)			
1	4402			
2	4232			
3	3856			
4	3973			
5	5181			
6	4774			
7	4184			
8	4300			
9	1060			
10	5130			
11	3863			
12	4709			
13	4064			
14	4534			
15	4390			
16	3735			
17	3957			
18	4259			
19	4764			
20	4854			
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 4-30-65				
Temp: 78°F				
MOD	R_{38} (ohms)		$\Delta R(\Omega)$	
1	4564		162	
2	4299		67	
3	3997		141	
4	3939		-34	
5	5373		192	
6	4912		138	
7	4317		163	
8	4349		49	
9	1295		235	
10	5366		236	
11	3851		-12	
12	4893		184	
13	4206		142	
14	4691		155	
15	4353		-37	
16	3963		228	
17	4185		228	
18	4279		50	
19	4774		10	
20	5115		261	
TECH. D. A. Kania		ENGR. [illegible]		

EQUIPMENT: Wheatstone Bridge I-25471

COMMENTS:

CIRCUIT TYPE: F-1

TEST NUMBER: 9

DATA SHEET A

TEST TITLE: Transistor Parameters

PRE RADIATION

Date: 11/16/64
Temp: 78°F

MOD	$I_{c(1)}$	$I_{c(2)}$	$I_{c(4)}$	
1	6.7	6.7	6.9	
2	5.0	5.0	9.6	
3	4.6	4.6	4.6	
4	5.7	5.7	5.6	
5	4.6	4.7	4.6	
6	5.1	5.2	4.8	
7	5.2	5.2	5.2	
8	7.9	7.2	7.2	
9	4.5	4.6	4.7	
10	6.5	5.5	5.2	
11	4.9	5.9	4.1	
12	6.3	6.7	6.3	
13	5.0	8.9	10.4	
14	4.9	4.9	5.0	
15	5.2	4.4	7.5	
16	12.9	13.0	6.3	
17	9.0	9.0	9.0	
18	15.0	15.2	16.4	
19	14.6	15.6	14.8	
20	12.7	12.2	12.0	

TECH. H.W. Ellett ENGR. [illegible]

POST RADIATION

Date: 5-5-65
Temp: 78°F

MOD	$I_{c(1)}$	$I_{c(2)}$	$I_{c(4)}$	
1	1.5	1.52	1.52	
2	1.64	1.48	2.7	
3	1.16	1.0	1.08	
4	6.9	5.7	5.7	
5	1.34	1.24	1.2	
6	1.62	1.64	1.54	
7	1.4	1.2	1.2	
8	1.64	1.48	1.56	
9	1.64	1.48	1.42	
10	2.1	1.52	1.54	
11	4.9	5.9	4.1	
12	1.5	1.46	1.36	
13	1.0	1.08	1.32	
14	.86	.86	.90	
15	5.2	4.5	7.5	
16	3.1	2.75	1.92	
17	2.2	1.92	1.92	
18	15.0	15.0	15.0	
19	15.0	15.1	15.0	
20	3.05	2.75	2.65	

TECH. H.W. Ellett ENGR. [illegible]

EQUIPMENT: Transistor Curve Tracer I 55783

Mods 18 and 19
V_c sweep 0-7V

COMMENTS:

CIRCUIT TYPE: F-1

TEST NUMBER: 9

DATA SHEET B

TEST TITLE: Transistor Characteristics

PRE RADIATION				
Date:				
Temp:				
MOD	$h_{FE}(1)$	$h_{FE}(2)$	$h_{FE}(3)$	
1	114	114	117	
2	85	85	163	
3	78	78	78	
4	97	97	95	
5	78	79	78	
6	86.6	88.6	81.6	
7	88.6	88.6	88.6	
8	134	122	122	
9	76.5	78	80	
10	110.5	93.5	88.6	
11	83	100	69.5	
12	107	114	107	
13	55	151	177	
14	83.3	83.3	85	
15	88.6	74.6	127	
16	219	221	107	
17	153	153	153	
18	254	258	279	
19	248	264	251	
20	216	208	203	
TECH.			ENGR.	

POST RADIATION				
Date:				
Temp:				
MOD	$h_{FE}(1)$	$h_{FE}(2)$	$h_{FE}(3)$	
1	25.4	25.8	25.8	
2	27.6	25.1	35.6	
3	19.6	17	18.3	
4	117	97	97	
5	22.8	21	20.3	
6	27.5	27.9	27.2	
7	23.7	20.3	20.3	
8	27.9	25.1	26.4	
9	27.8	25.1	24.	
10	35.6	25.8	26.2	
11	83	100	69.5	
12	25.4	24.7	23.	
13	17	18.3	22.4	
14	14.5	14.5	15.3	
15	88.4	76.4	127	
16	52.6	46.7	32.6	
17	37.2	32.6	32.6	
18	254	254	254	
19	254	256	254	
20	51.8	45.7	45.	
TECH.			ENGR.	

EQUIPMENT:

COMMENTS: Due to the high value of base resistance a correction factor of $\frac{.060}{.055}$ was applied to these entries

CIRCUIT TYPE: F-1

TEST NUMBER: 10

DATA SHEET

TEST TITLE: Isolation Junction Forward Voltage

PRE RADIATION				
Date: 3-8-65				
Temp: 79°				
MOD	VOLTS V_F			
1	.583			
2	.575			
3	.581			
4	.575			
5	.576			
6	.579			
7	.574			
8	.579			
9	.572			
10	.577			
11	.574			
12	.575			
13	.574			
14	.582			
15	.575			
16	.575			
17	.576			
18	.579			
19	.583			
20	.580			
TECH. Erlenbach		ENGR.		

POST RADIATION				
Date: 4-30-65				
Temp: 78°F				
MOD	VOLTS V_F			
1	.549			
2	.544			
3	.547			
4	.575			
5	.545			
6	.550			
7	.546			
8	.547			
9	.544			
10	.548			
11	.575			
12	.548			
13	.547			
14	.555			
15	.576			
16	.545			
17	.550			
18	.583			
19	.587			
20	.553			
TECH. D. A. Kavic		ENGR.		

EQUIPMENT: DIGITAL VOLTMETER I 55991
MILLIAMMETER I 14196

COMMENTS:

CIRCUIT TYPE: F-1

TEST NUMBER: 11

DATA SHEET

TEST TITLE: Isolation-diode Lifetime

PRE RADIATION

Date:
Temp:

MOD	Δt/ΔV	x10⁻⁹ τ		
1	600/.110	141		
2	700/.120	151		
3	400/.600	172		
4	200/.300	165		
5	200/.300	172		
6	300/.500	155		
7	500/.800	161		
8	850/.130	168		
9	450/.700	165		
10	650/.100	168		
11	400/.700	147		
12	500/.800	161		
13	550/.900	157		
14	350/.600	150		
15	750/.122	158		
16	700/.100	180		
17	510/.102	129		
18	600/.082	188		
19	850/.096	228		
20	725/.067	278		

TECH. P M Tinsley ENGR. [illegible]

POST RADIATION

Date:
Temp:

MOD	Δt/ΔV	x10⁻⁹ τ		
1	355/.173	52		
2	280/.135	53		
3	365/.160	58		
4	425/.070	156		
5	385/.145	68		
6	390/.185	54		
7	420/.175	61		
8	295/.155	48		
9	345/.150	59		
10	435/.190	58		
11	700/.115	156		
12	310/.145	54		
13	415/.190	56		
14	360/.170	54		
15	700/.120	149		
16	235/.125	48		
17	270/.158	43		
18	800/.118	174		
19	665/.084	203		
20	345/.160	55		

TECH. M. Gremillion ENGR. [illegible]

EQUIPMENT:

COMMENTS:

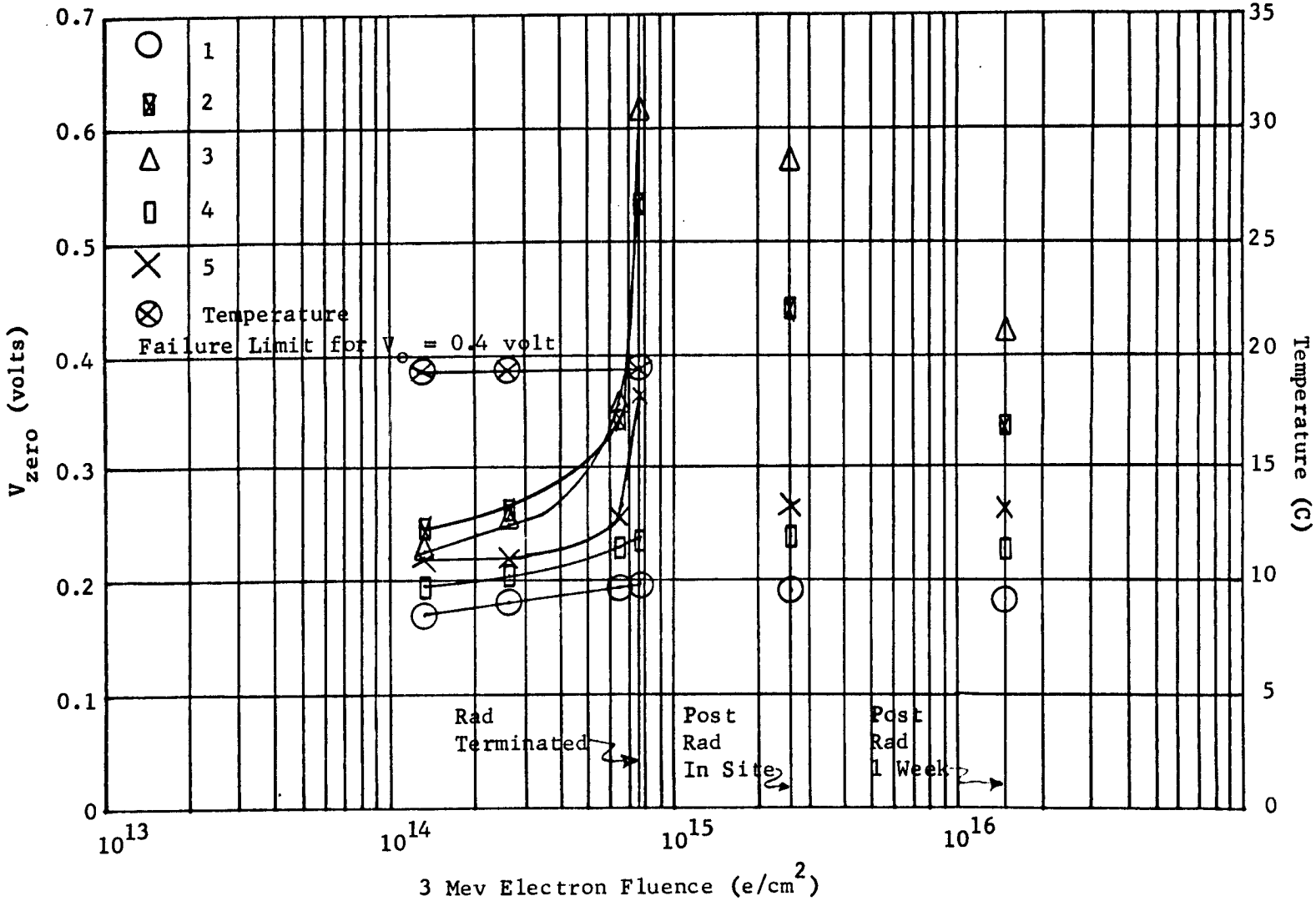
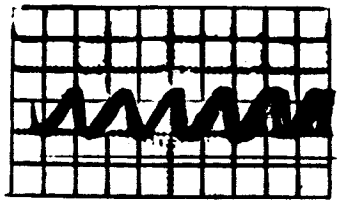
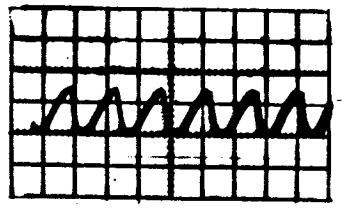


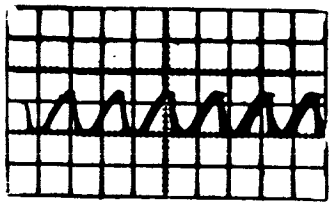
FIGURE III-25. RADIATION RESPONSE OF UNIT F-1



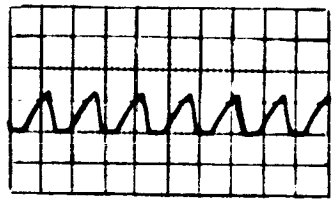
A - Initial



B - Final



C - Post Rad In Site



D - Post Rad 1 Week

Scale: 0.5 volt/cm
1.0 μsec/cm

FIGURE III-26. OUTPUT OF 5-STAGE OSCILLATOR OF F-1 CIRCUITS

CIRCUIT TYPE: F-2

TEST NUMBER: 1

DATA SHEET

TEST TITLE: Direct Set Input Threshold and Current Levels

PRE RADIATION

Date: 11/30/64 1/6/65
Temp: 77°F 77

MOD	1×10^{-6} Amp. I_{L2}	V_2 *	1×10^{-6} Amp I_{O2}	VOLTS V_Z
1	480	.878	71	.912
2	800	.783	86	.801
3	700	.768	76	.800
4	770	.635	74	.670
5	660	.891	72	.928
6	800	.750	80	.779
7	440	.982	84	.999
8	910	.643	73	.684
9	810	.716	85	.754
10	640	.518	90	.546
11	700	.866	83	.909
12	700	.746	68	.765
13	830	.774	84	.823
14	980	.611	78	.654
15	760	.882	85	.920
16	930		76	.662
17	550		75	.790
18	910		77	.646
19	910		88	.683
20	1150		88	.673

TECH. N.W. Elliott ENGR. [illegible]

POST RADIATION

Date: 5-6-65
Temp: 77°

MOD	1×10^{-6} amps I_{L2}	VOLTS V_2	1×10^{-6} amps I_{O2}	
1	810	1.285	68	
2	980	1.343	82	
3	910	1.270	71	
4	770	.672	75	
5	840	1.680	69	
6	—	—	—	
7	950	1.520	79	
8	850	1.189	69	
9	830	1.122	71	
10	980	2.047	44	
11	700	.882	84	
12	870	1.266	64	
13	900	—	—	
14	900	1.049	74	
15	760	.921	85	
16	860	1.014	72	
17	830	1.327	72	
18	910	.652	77	
19	910	.685	88	
20	940	.974	84	

TECH. N.W. Elliott ENGR. [illegible]

EQUIPMENT: Digital VM I55991
Heathkit VOM
Microammeter C-3124 Milliameter C-0904

See other side
#6 inoperative - appears as a mechanical defect.
Pins 5 and 10 missing on Mod 13

COMMENTS:

* At V_A of 1.0 volt

Post radiation ~~taken~~ I_{L2} for modules 1-5 taken with 4.5V measured directly on Pin 3 and without voltimeter on pin 6. Post radiation I_{L2} for modules 16 - 20 taken with 4.5 volts measured at power supply and with Heathkit VOM on 5 volt range connected to pin 6.

CIRCUIT TYPE: F-2

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Clocked Set-Reset Input Threshold and Driving Control

PRE RADIATION

Date: 12/2/64
Temp: 78°F

MOD	1×10^{-6} amps I_{D5}	VOLTS V_1	1×10^{-6} amps I_{D1}	VOLTS V_5
1	2.5	1.154	3.5	1.191
2	3.5	1.149	3.5	1.165
3	2.5	1.147	2.5	1.135
4	2.0	1.055	2.0	1.089
5	3.0	1.202	3.5	1.195
6	3.0	1.150	3.0	1.182
7	3.0	1.235	3.5	1.284
8	3.0	1.240	2.5	1.078
9	3.0	1.145	3.0	1.182
10	3.5	1.152	3.5	1.198
11	3.5	1.175	4	1.202
12	3.0	1.168	2.5	1.198
13	3.0	1.128	3.5	1.172
14	3.0	1.026	2.5	1.037
15	4	1.151	4	1.137
16	3.0	1.042	3.0	1.018
17	3.5	1.153	3.0	1.191
18	3.0	1.031	3.5	1.097
19	3.0	1.033	3.0	1.025
20	3.0	1.021	3.0	1.006

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-7-65
Temp: 78°F

MOD	1×10^{-6} amps I_{D5}	VOLTS V_1	1×10^{-6} amps I_{D1}	VOLTS V_5
1	6.0	1.110	6.0	1.149
2	7.5	1.122	7.5	1.099
3	6.5	1.195	6.0	1.044
4	2.5	1.074	2.0	1.076
5	7.0	1.202	7.0	1.135
6	—	—	—	—
7	7.5	1.221	8.0	1.222
8	6.5	.999	6.0	.949
9	8.0	1.122	7.0	1.079
10	8.0	1.111	8.0	1.116
11	3.0	1.195	3.5	1.173
12	7.0	1.123	5.5	1.121
13	—	—	—	—
14	6.5	.923	6.0	.892
15	3.5	1.173	3.5	1.157
16	6.5	.945	6.0	.894
17	6.0	1.091	6.0	1.119
18	3.0	1.050	3.0	1.063
19	3.0	1.039	2.5	1.039
20	6.5	.922	6.5	.881

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: TI Pulse generator
Digital VM E 55991
Microammeter C 3121

COMMENTS:
Allow 30 seconds stabilization
V_5 Noisy
Pulse gen amp critical for V_1, V_5
Mod 16-20 tested 1-15-65 Temp 75°

CIRCUIT TYPE: F-2

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Clocked Set-Reset Input Leakage Current

PRE RADIATION

Date: 12/3/64
Temp: 78°F

MOD	Amps I_{L_1}	Amps I_{L_5}		
1	$.74\times10^{-4}$	$.75\times10^{-4}$		
2	$.1\times10^{-3}$	$.09\times10^{-3}$		
3	$.08\times10^{-3}$	$.08\times10^{-3}$		
4	$.75\times10^{-4}$	$.77\times10^{-4}$		
5	$.79\times10^{-4}$	$.08\times10^{-3}$		
6	$.09\times10^{-3}$	$.09\times10^{-3}$		
7	$.1\times10^{-3}$	$.085\times10^{-3}$		
8	$.8\times10^{-4}$	$.09\times10^{-3}$		
9	$.09\times10^{-3}$	$.1\times10^{-3}$		
10	$.1\times10^{-3}$	$.1\times10^{-3}$		
11	$.09\times10^{-3}$	$.09\times10^{-3}$		
12	$.74\times10^{-4}$	$.09\times10^{-3}$		
13	$.09\times10^{-3}$	$.08\times10^{-3}$		
14	$.08\times10^{-3}$	$.09\times10^{-3}$		
15	$.09\times10^{-3}$	$.09\times10^{-3}$		
16	$.08\times10^{-3}$	$.09\times10^{-3}$		
17	$.78\times10^{-4}$	$.74\times10^{-3}$		
18	$.8\times10^{-4}$	$.08\times10^{-3}$		
19	$.1\times10^{-3}$	$.1\times10^{-3}$		
20	$.09\times10^{-3}$	$.09\times10^{-3}$		
TECH.		ENGR.		

POST RADIATION

Date: 5-7-65
Temp: 78°F

MOD	Amps I_{L_1}	Amps. I_{L_5}		
1	$.75\times10^{-4}$	$.08\times10^{-3}$		
2	$.1\times10^{-3}$	$.1\times10^{-3}$		
3	$.78\times10^{-4}$	$.09\times10^{-3}$		
4	$.75\times10^{-4}$	$.09\times10^{-3}$		
5	$.08\times10^{-3}$	$.09\times10^{-3}$		
6	—	—		
7	$.1\times10^{-3}$	$.09\times10^{-3}$		
8	$.08\times10^{-3}$	$.09\times10^{-3}$		
9	$.09\times10^{-3}$	$.1\times10^{-3}$		
10	$.1\times10^{-3}$	$.1\times10^{-3}$		
11	$.1\times10^{-3}$	$.09\times10^{-3}$		
12	$.08\times10^{-3}$	$.09\times10^{-3}$		
13	—	—		
14	$.09\times10^{-3}$	$.09\times10^{-3}$		
15	$.1\times10^{-3}$	$.1\times10^{-3}$		
16	$.08\times10^{-3}$	$.09\times10^{-3}$		
17	$.08\times10^{-3}$	$.08\times10^{-3}$		
18	$.09\times10^{-3}$	$.09\times10^{-3}$		
19	$.1\times10^{-3}$	$.1\times10^{-3}$		
20	$.1\times10^{-3}$	$.09\times10^{-3}$		
TECH.		ENGR.		

EQUIPMENT: SRL Pulse generator
Keithley electrometer I 52076
w.th Shunt I 52075

COMMENTS:
Mods 16-20 Tested 1-14-65 Temp 78°

CIRCUIT TYPE: F-2

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Clocked Set-Reset Input Leakage Current

PRE RADIATION

Date: 12/3/64
Temp: 78°F

MOD	Amps I_{L_1}	Amps I_{L_5}		
1	$.74\times10^{-4}$	$.75\times10^{-4}$		
2	$.1\times10^{-3}$	$.09\times10^{-3}$		
3	$.08\times10^{-3}$	$.08\times10^{-3}$		
4	$.75\times10^{-4}$	$.77\times10^{-4}$		
5	$.79\times10^{-4}$	$.08\times10^{-3}$		
6	$.09\times10^{-3}$	$.09\times10^{-3}$		
7	$.1\times10^{-3}$	$.085\times10^{-3}$		
8	$.8\times10^{-4}$	$.09\times10^{-3}$		
9	$.09\times10^{-3}$	$.1\times10^{-3}$		
10	$.1\times10^{-3}$	$.1\times10^{-3}$		
11	$.09\times10^{-3}$	$.09\times10^{-3}$		
12	$.74\times10^{-4}$	$.09\times10^{-3}$		
13	$.09\times10^{-3}$	$.08\times10^{-3}$		
14	$.08\times10^{-3}$	$.09\times10^{-3}$		
15	$.09\times10^{-3}$	$.09\times10^{-3}$		
16	$.08\times10^{-3}$	$.09\times10^{-3}$		
17	$.78\times10^{-4}$	$.74\times10^{-3}$		
18	$.8\times10^{-4}$	$.08\times10^{-3}$		
19	$.1\times10^{-3}$	$.1\times10^{-3}$		
20	$.09\times10^{-3}$	$.09\times10^{-3}$		

TECH. [signature] ENGR. [signature]

POST RADIATION

Date: 5-7-65
Temp: 78°F

MOD	Amps I_{L_1}	Amps. I_{L_5}		
1	$.75\times10^{-4}$	$.08\times10^{-3}$		
2	$.1\times10^{-3}$	$.1\times10^{-3}$		
3	$.78\times10^{-4}$	$.09\times10^{-3}$		
4	$.75\times10^{-4}$	$.09\times10^{-3}$		
5	$.08\times10^{-3}$	$.09\times10^{-3}$		
6	—	—		
7	$.1\times10^{-3}$	$.09\times10^{-3}$		
8	$.08\times10^{-3}$	$.09\times10^{-3}$		
9	$.09\times10^{-3}$	$.1\times10^{-3}$		
10	$.1\times10^{-3}$	$.1\times10^{-3}$		
11	$.1\times10^{-3}$	$.09\times10^{-3}$		
12	$.08\times10^{-3}$	$.09\times10^{-3}$		
13	—	—		
14	$.09\times10^{-3}$	$.09\times10^{-3}$		
15	$.1\times10^{-3}$	$.1\times10^{-3}$		
16	$.08\times10^{-3}$	$.09\times10^{-3}$		
17	$.08\times10^{-3}$	$.08\times10^{-3}$		
18	$.09\times10^{-3}$	$.09\times10^{-3}$		
19	$.1\times10^{-3}$	$.1\times10^{-3}$		
20	$.1\times10^{-3}$	$.09\times10^{-3}$		

TECH. [signature] ENGR. [signature]

EQUIPMENT: SKL Pulse generator
Keithley electrometer I52076
with shunt I52075

COMMENTS:

Mods 16-20 Tested 1-14-65 Temp 78°

CIRCUIT TYPE: F-2

TEST NUMBER: 4

DATA SHEET A

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 12/18/64
Temp: 78°F

Time in nanosecs
Amplitude in Volts

MOD	W min	A min		
1	33	.84		
2	29	.80		
3	31	.82		
4	34	.82		
5	30	.80		
6	30	.80		
7	32	.80		
8	34	.83		
9	29	.80		
10	31	.80		
11	29	.81		
12	29	.80		
13	30	.81		
14	37	.84		
15	26	.80		
16	37	.84		
17	31	.80		
18	35	.82		
19	34	.82		
20	38	.88		
TECH. K. W. Elliott			ENGR. [illegible]	

POST RADIATION

Date: 4-26-65
Temp: 78°F

nanoseconds VOLTS

MOD	W min	A min		
1	29	.91		
2	26	.89		
3	30	.94		
4	32	.81		
5	28	.91		
6	*			
7	26	.87		
8	36	1.01		
9	28	.90		
10	29	.90		
11	28	.50		
12	27	.90		
13	—	—		
14	41	1.06		
15	25	.80		
16	42	1.04		
17	28	.90		
18	33	.82		
19	32	.82		
20	41	1.04		
TECH. K. W. Elliott			ENGR. [illegible]	

EQUIPMENT: Sampling oscilloscope
TL Pulse generator
Digital Voltmeter 991

#6 will not operate
#13 has pins 1 and 10 missing

COMMENTS:

CIRCUIT TYPE: F-2

TEST NUMBER: 4

DATA SHEET B

TEST TITLE: Transient Parameters

PRE RADIATION Date: 12/21/64 Temp: 78°F				
MOD	$\times 10^{-9}$ τ_S	$\times 10^{-9}$ τ_D	$\times 10^{-9}$ τ_R	$\times 10^{-6}$ τ_F
1	70	170	160	1.2
2	50	150	130	1.1
3	60	160	130	1.0
4	70	160	150	1.1
5	60	160	150	.85
6	70	140	130	1.1
7	60	150	120	1.0
8	60	170	140	.95
9	80	190	140	1.35
10	60	150	110	.95
11	70	170	130	1.0
12	70	160	140	1.0
13	80	170	140	1.0
14	60	160	140	.95
15	70	200	170	1.0
16	70	160	150	1.0
17	60	180	150	1.1
18	70	160	150	1.0
19	70	190	160	1.1
20	50	180	130	.95
TECH. H.W. Elliott		ENGR. [illegible]		

POST RADIATION Date: 4-27-65 Temp: 80°F				
MOD	$\times 10^{-9}$ τ_S	$\times 10^{-9}$ τ_D	$\times 10^{-9}$ τ_R	$\times 10^{-6}$ τ_F
1	80	190	280	1.3
2	60	160	190	.960
3	70	170	190	1.05
4	70	170	155	1.1
5	60	190	340	.960
6	—	—	—	—
7	65	150	210	1.0
8	70	170	210	1.0
9	80	200	220	1.2
10	60	160	190	.98
11	60	170	135	1.05
12	70	170	210	1.1
13	—	—	—	—
14	70	180	200	1.0
15	70	200	170	1.05
16	70	180	190	1.0
17	70	190	230	1.15
18	60	165	150	1.0
19	70	190	160	1.05
20	60	160	170	.96
TECH. H.W. Elliott		ENGR. [illegible]		

EQUIPMENT: SAME AS sheet A

#6 inspection
Pins 1, 10 missing on Mod 13

COMMENTS:

CIRCUIT TYPE: F-2

TEST NUMBER: 4

DATA SHEET C

TEST TITLE: Transient Parameters

PRE RADIATION Date: 12-21-64 Temp: 78°F				
MOD	$\times 10^{-9}$ $\bar{\tau}_S$	$\times 10^{-9}$ $\bar{\tau}_D$	$\times 10^{-9}$ $\bar{\tau}_R$	$\times 10^{-6}$ $\bar{\tau}_F$
1	70	180	170	1.1
2	60	150	130	.7
3	70	150	140	.8
4	50	160	150	.95
5	70	120	120	.95
6	70	170	130	.9
7	70	150	130	1.0
8	70	160	140	.95
9	80	190	150	1.1
10	60	140	120	.9
11	70	150	120	.9
12	70	160	130	.95
13	70	160	140	.95
14	60	160	140	.90
15	70	170	150	1.0
16	60	160	140	.90
17	70	170	150	1.0
18	70	160	140	.95
19	70	180	170	.95
20	70	180	160	1
TECH. K. W. Elliott		ENGR. [illegible]		

POST RADIATION Date: 4-27-65 Temp: 80°F				
MOD	$\times 10^{-9}$ $\bar{\tau}_S$	$\times 10^{-9}$ $\bar{\tau}_D$	$\times 10^{-9}$ $\bar{\tau}_R$	$\times 10^{-6}$ $\bar{\tau}_F$
1	80	190	320	1.1
2	60	150	190	.90
3	70	160	210	.960
4	70	170	155	1.0
5	70	140	240	1.0
6	—	—	—	—
7	70	140	240	.960
8	70	170	210	.98
9	80	210	260	1.15
10	60	150	190	.9
11	70	150	120	.94
12	70	170	210	1.05
13	—	—	—	—
14	60	165	200	.94
15	70	170	150	1.05
16	60	170	190	.96
17	70	170	230	1.05
18	60	160	150	.96
19	70	190	170	1.0
20	60	155	180	.88
TECH. K. W. Elliott		ENGR. [illegible]		

EQUIPMENT: Same as sheet A'

6 inoperative
Pins 1, 10 missing on mod 13

COMMENTS:

CIRCUIT TYPE: F-2

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Output One Voltage for Q and $\overline{Q}$

PRE RADIATION				
Date: 12/1/64				
Temp: 78°F				
MOD	V_6	V_{10}		
1	3.843	3.816		
2	3.826	3.786		
3	3.844	3.826		
4	3.814	3.801		
5	3.906	3.739		
6	3.819	3.793		
7	3.851	3.819		
8	3.738	3.734		
9	3.622	3.621		
10	3.779	3.759		
11	3.799	3.814		
12	3.767	3.780		
13	3.827	3.802		
14	3.807	3.777		
15	3.756	3.669		
16	3.801	3.799		
17	3.876	3.854		
18	3.825	3.811		
19	3.686	3.594		
20	3.843	3.837		
TECH. M. W. Elliott			ENGR. [illegible]	

POST RADIATION				
Date: 5-7-65				
Temp: 76°F				
MOD	V_6	V_{10}		
1	3.844	3.815		
2	3.826	3.755		
3	3.844	3.821		
4	3.814	3.803		
5	3.907	3.765		
6	-	-		
7	3.871	3.825		
8	3.756	3.734		
9	3.621	3.621		
10	3.784	3.760		
11	3.820	3.817		
12	3.764	3.774		
13	—	—		
14	3.809	3.774		
15	3.758	3.671		
16	3.796	3.798		
17	3.875	3.846		
18	3.807	3.820		
19	3.681	3.589		
20	3.839	3.830		
TECH. M. W. Elliott			ENGR. [illegible]	

EQUIPMENT: Dig. tal VM I55991

COMMENTS:

mods 16-20 - tested 1-15-65

Temp 76°

CIRCUIT TYPE: F-2

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Driving Current Load to Ground for Q and $\overline{Q}$

PRE RADIATION

Date: 12/2/64
Temp: 78°F

MOD	1×10^{-6} amp I_{D6}	1×10^{-6} amp I_{D10}		
1	430	420		
2	510	510		
3	490	470		
4	410	400		
5	570	430		
6	510	500		
7	520	500		
8	440	430		
9	390	390		
10	500	500		
11	490	480		
12	440	450		
13	470	460		
14	480	460		
15	460	400		
16	450	450		
17	430	440		
18	420	430		
19	400	400		
20	510	500		

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date:
Temp:

MOD	$\times 10^{-6}$ amp I_{D6}	$\times 10^{-6}$ amp I_{D10}		
1	* 360	350		
2	460	460		
3	440	430		
4	400	400		
5	470 *	330 #		
6	—	—		
7	430 *	440		
8	390	350		
9	370	340		
10	460	460		
11	470	460		
12	400	400		
13	—	—		
14	430	410		
15	440	380		
16	410	400		
17	420	400		
18	430	420		
19	390	370		
20	470	460		

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: TI Pulse generator
Digital VM I55991
Microammeter C-3124

COMMENTS:

Mods 16-20 tested 1-15-65
Temp 76°

* I_{D6} mod 1 when v D decreases below ≈ 2.270 the voltage drops to ≈ 1.930 reading taken @ 2.270

* unable to get 1.2 on mod. 5' output switches from 22.313 to ≈ 2.005' current from 470 to 410 I_{D6}
mod 5 I_{D10} V = 2.389 I = 330
V = 1.902 I = 270

In post radiation measurements mod #7
I_{D6} @ 2.230 v = 420×10^{-6} amp.

CIRCUIT TYPE: F-2

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Resistance

PRE RADIATION				
Date: 11/30/64				
Temp: 75°F				
	Resistance in ohms			
MOD	R_{310}	R_{36}		
1	4041	4063		
2	3365	3378		
3	3583	3580		
4	4099	4151		
5	3900	3202		
6	3398	3402		
7	3429	3380		
8	3839	3876		
9	4058	4099		
10	3282	3317		
11	3567	3543		
12	3664	3786		
13	3708	3696		
14	3635	3629		
15	3975	3897		
16	3790	3730		
17	3939	3816		
18	3949	3844		
19	4002	3907		
20	3940	3386		
TECH. K. W. Elliott			ENGR. [illegible]	

POST RADIATION				
Date: 5-10-65				
Temp: 76°F				
	Resistance in Ohms			
MOD	R_{310}	R_{36}		
1	4330	4297		
2	3600	3569		
3	3900	3820		
4	4120	4114		
5	4190	3385		
6	—	—		
7	3766	3635		
8	4210	4145		
9	4350	4300		
10	3561	3522		
11	3569	3516		
12	3969	4056		
13	—	3904		
14	3949	3861		
15	4004	3665		
16	4024	3958		
17	4190	4068		
18	3921	3830		
19	3981	3900		
20	3631	3610		
TECH. K. W. Elliott			ENGR. [illegible]	

EQUIPMENT: Wheatstone Bridge I 25471

COMMENTS:

Mod 16-20 Tested 1-15-65
Temp 76°

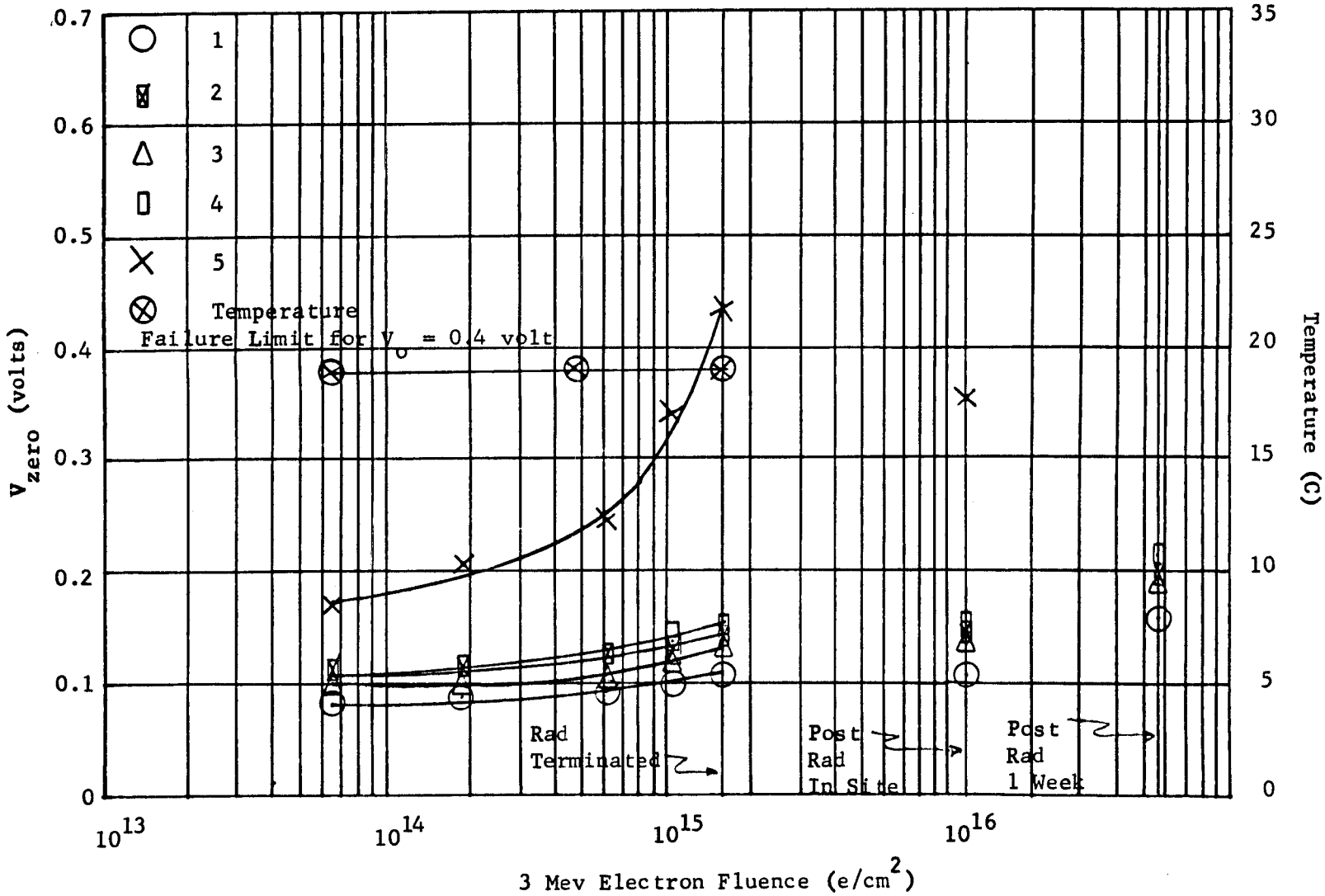
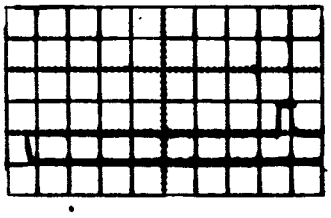
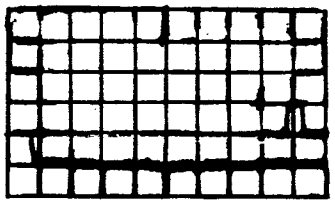


FIGURE III-27. RADIATION RESPONSE OF UNIT F-2

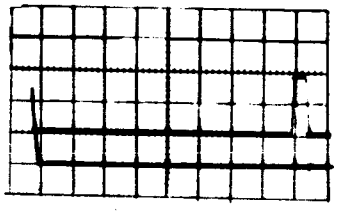
Note: For post rad 1 week Device No. 5 will not stay in proper state when reset is off.



A - Initial



B - Final



D - Post Rad 1 Week*

Scale: 0.2 volt/cm
1.0 μsec/cm

FIGURE III-28. MULTISTAGE PROPAGATION DELAY FOR F-2 CIRCUITS

* Vertical scale 0.1 volt/cm.

CIRCUIT TYPE: F-3

TEST NUMBER: 2

DATA SHEET A

TEST TITLE: Input Driving Current

PRE RADIATION

Date: 1-22-65
Temp: 77°F

current in ma

MOD	I_{2D}			
1				
2				
3	.083			
4	.082			
5	.080			
6	.082			
7				
8	.070			
9	.140			
10	.085			
11	.062			
12	.099			
13	.172			
14	~~.[illegible]~~			
15	.082			
16	.135			
17	.120			
18	.125			
19	.074			
20	.088			

TECH. Erlenbach ENGR. [illegible]

POST RADIATION

Date: 5-18-65
Temp: 76°F

MOD	I_{2D}, ma			
1				
2				
3	.735			
4	.081			
5	.985	(1.060)		
6	.945	(1.015)		
7				
8	1.00	(1.000)		
9	1.345			
10	.650			
11	.060			
12	1.150			
13	1.560			
14				
15	.081			
16	1.080			
17	.168			
18	.111			
19	1.100			
20	.970	(1.050)		

TECH. E. G. Kaiser ENGR. [illegible]

EQUIPMENT: Digital VM - I-55991
Microammeter C-3124

Digital Voltmeter I-55991
Microammeter C-3124
Milliammeter I-14197

COMMENTS: over for 21-22 23
Devices 1, 2, 7 and 14 were destroyed during the first test.

CIRCUIT TYPE: F-3

TEST NUMBER: 2

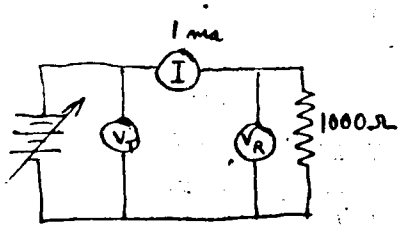
DATA SHEET B

TEST TITLE: Input Driving Current

PRE RADIATION		
Date: 2-11-65		
Temp: 78°F		
MOD	I_{2D}	
21	.077	
22	.165	
23	.097	
24	.128	

POST RADIATION		
Date: 5-18-65		
Temp: 76°F		
	I_{2D}, ma	
21	1.155	
22	1.095	
23	1.105	
24	1.205	

The range of the microammeter (C-3124) is 0 to 1000 μ amp. Since 9 of the 20 specimens exceeded 1.000 ma, milliammeter (I-14197) was used as the indicator for these measurements. Additionally, modules 5, 6, 8 & 20 were measured using both meters; the bracketed reading is from the milliammeter.



In order to give a comparison of the two meters, a series circuit was setup using a variable power supply, a resistance box set at 1000 Ω and each meter in succession. It was determined that the microammeter had a resistance of 188 Ω on the 1000 μ amp range and the milliammeter had a resistance of 24 Ω on the 1.5 ma. range. The Digital VM was used for voltage readings.

milliammeter

$V_T = 1.018$

$V_R = .994$

$V_M = .024$

$R = \frac{V}{I} = \frac{.024}{.001} = 24\,\Omega$

Microammeter

$V_T = 1.182$

$V_R = .994$

$V_M = .188$

$R = \frac{.188}{.001} = 188\,\Omega$

CIRCUIT TYPE: F-3

TEST NUMBER: 3

DATA SHEET 1 of 3 A

TEST TITLE: Leakage Current

PRE RADIATION				
Date: 11/2/64 1-22-65				
Temp: 76°F 78°F				
MOD	I_{2e}	I_{4e}	I_{5e}	I_{9e}
1	~~$.13\times10^{-10}$~~	~~$.3\times10^{-10}$~~	~~$.46\times10^{-8}$~~	~~$.08\times10^{-10}$~~
2	~~$.48\times10^{-10}$~~	~~$.5\times10^{-11}$~~	~~$.21\times10^{-6}$~~	~~$.39\times10^{-11}$~~
3	$.18\times10^{-10}$	$.32\times10^{-10}$	$.22\times10^{-10}$	$.68\times10^{-9}$
4	$.78\times10^{-10}$	$.4\times10^{-10}$	$.28\times10^{-9}$	$.58\times10^{-10}$
5	$.34\times10^{-10}$	$.66\times10^{-11}$	$.21\times10^{-10}$	$.1\times10^{-10}$
6	$.09\times10^{-9}$	$.3\times10^{-9}$	$.38\times10^{-8}$	$.61\times10^{-11}$
7	~~$.72\times10^{-9}$~~	~~$.74\times10^{-10}$~~	~~$.11\times10^{-8}$~~	~~$.62\times10^{-11}$~~
8	$.14\times10^{-9}$	$.34\times10^{-11}$	$.12\times10^{-6}$	$.38\times10^{-11}$
9	$.1\times10^{-7}$	$.16\times10^{-10}$	$.3\times10^{-9}$	$.17\times10^{-10}$
10	$.25\times10^{-6}$	$.47\times10^{-10}$	$.29\times10^{-10}$	$.72\times10^{-9}$
11	$.285\times10^{-10}$	$.38\times10^{-10}$	$.36\times10^{-10}$	$.55\times10^{-10}$
12	$.21\times10^{-6}$	$.21\times10^{-10}$	$.11\times10^{-8}$	$.6\times10^{-11}$
13	$.345\times10^{-6}$	$.105\times10^{-9}$	$.29\times10^{-9}$	$.44\times10^{-9}$
14	~~$.135\times10^{-9}$~~	~~$.11\times10^{-10}$~~	~~$.3\times10^{-8}$~~	~~$.16\times10^{-10}$~~
15	$.59\times10^{-10}$	$.37\times10^{-10}$	$.48\times10^{-10}$	$.34\times10^{-8}$
16	$.67\times10^{-7}$	$.10\times10^{-8}$	$.20\times10^{-8}$	$.49\times10^{-10}$
17	$.23\times10^{-5}$	$.49\times10^{-8}$	$.19\times10^{-5}$	$.31\times10^{-10}$
18	$.26\times10^{-6}$	$.60\times10^{-10}$	$.67\times10^{-7}$	$.33\times10^{-10}$
19	$.53\times10^{-10}$	$.51\times10^{-10}$	$.37\times10^{-10}$	$.29\times10^{-10}$
20	$.30\times10^{-8}$	$.59\times10^{-10}$	$.18\times10^{-8}$	$.31\times10^{-10}$
TECH. W.W.Ellwell			ENGR. [illegible]	

POST RADIATION				
Date: 5-19-65				
Temp: 75.5°F				
MOD	I_{2e}	I_{4e}	I_{5e}	I_{9e}
1				
2				
3	$.285\times10^{-8}$	$.805\times10^{-9}$	$.235\times10^{-7}$	$.48\times10^{-7}$
4	$.82\times10^{-10}$	$.36\times10^{-10}$	$.295\times10^{-10}$	$.615\times10^{-10}$
5	$.16\times10^{-8}$	$.55\times10^{-9}$	$.12\times10^{-8}$	$.69\times10^{-9}$
6	$.09\times10^{-8}$	$.505\times10^{-9}$	$.095\times10^{-8}$	$.64\times10^{-9}$
7				
8	$.785\times10^{-9}$	$.407\times10^{-9}$	$.51\times10^{-8}$	$.54\times10^{-9}$
9	$.087\times10^{-7}$	$.725\times10^{-9}$	$.105\times10^{-8}$	$.095\times10^{-8}$
10	$.122\times10^{-6}$	$.643\times10^{-9}$	$.195\times10^{-8}$	$.295\times10^{-8}$
11	$.32\times10^{-10}$	$.45\times10^{-10}$	$.36\times10^{-10}$	$.57\times10^{-10}$
12	$.64\times10^{-7}$	$.445\times10^{-9}$	$.10\times10^{-8}$	$.63\times10^{-9}$
13	$.23\times10^{-6}$	$.133\times10^{-8}$	$.555\times10^{-8}$	$.194\times10^{-8}$
14				
15	$.59\times10^{-10}$	$.46\times10^{-10}$	$.51\times10^{-10}$	$.346\times10^{-8}$
16	$.215\times10^{-8}$	$.665\times10^{-9}$	$.10\times10^{-8}$	$.095\times10^{-8}$
17	$.22\times10^{-5}$	$.455\times10^{-8}$	$.192\times10^{-5}$	$.062\times10^{-10}$
18	$.22\times10^{-6}$	1.65×10^{-10}	$.645\times10^{-7}$	$.165\times10^{-10}$
19	$.103\times10^{-8}$	$.525\times10^{-9}$	$.775\times10^{-9}$	$.70\times10^{-9}$
20	$.102\times10^{-8}$	$.562\times10^{-9}$	$.096\times10^{-8}$	$.61\times10^{-9}$
TECH. D. A. Kurer			ENGR. [illegible]	

EQUIPMENT: leakage Current Jig
Digital VM I 55991
Electometer I 52076 with shunt I 52075

COMMENTS: Mod 6 I_{5e} varying $\pm .02\times10^{-8}$

\# 24 measured 2-11-65 78°

Devices 1, 2, 7 and 19 destroyed on test #1.

CIRCUIT TYPE: E-3

TEST NUMBER: 3

DATA SHEET 1 of 3B

TEST TITLE: Leakage Current

PRE RADIATION				
Date:				
Temp:				
MOD	I_{2e}	I_{4e}	I_{5e}	I_{9e}
21	.009 x 10	.30 x 10^{-8}	.15 x 10^{-8}	.33 x 10^{-10}
22	.017 x 10^{-9}	.30 x 10^{-8}	.17 x 10^{-9}	.42 x 10^{-10}
23	.039 x 10^{-9}	.66 x 10^{-10}	.14 x 10^{-9}	.41 x 10^{-10}
24	.009 x 10^{-9}	.22 x 10^{-10}	.11 x 10^{-9}	.33 x 10^{-9}
TECH.			ENGR.	

POST RADIATION				
Date:				
Temp:				
MOD	I_{2e}	I_{4e}	I_{5e}	I_{9e}
21	.105 x 10^{-8}	.618 x 10^{-9}	.097 x 10^{-8}	.086 x 10^{-5}
22	.133 x 10^{-8}	.64 x 10^{-9}	.204 x 10^{-5}	.71 x 10^{-9}
23	.122 x 10^{-8}	.095 x 10^{-5}	.12 x 10^{-8}	.093 x 10^{-5}
24	.10 x 10^{-8}	.567 x 10^{-9}	.90 x 10^{-8}	.10 x 10^{-5}
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: F-3

TEST NUMBER: 3

DATA SHEET 2 of 3 A

TEST TITLE: Leakage Current

PRE RADIATION				
Date: 11/3/64	1-22-65			
Temp: 76°F	78°F			
MOD	I_{10e}	I_{1c}	I_{2c}	I_{4c}
1	~~$.12\times10^{-10}$~~	~~$.17\times10^{-10}$~~	~~$.15\times10^{-10}$~~	~~$.32\times10^{-10}$~~
2	~~$.42\times10^{-11}$~~	~~$.1\times10^{-10}$~~	~~$.5\times10^{-10}$~~	~~$.64\times10^{-11}$~~
3	$.27\times10^{-10}$	$.14\times10^{-10}$	$.22\times10^{-10}$	$.35\times10^{-10}$
4	$.24\times10^{-10}$	$.16\times10^{-10}$	$.09\times10^{-9}$	$.43\times10^{-10}$
5	$.13\times10^{-10}$	$.16\times10^{-10}$	$.37\times10^{-10}$	$.085\times10^{-10}$
6	$.6\times10^{-11}$	$.37\times10^{-12}$	$.09\times10^{-9}$	$.31\times10^{-9}$
7	~~$.64\times10^{-11}$~~	~~$.12\times10^{-10}$~~	~~$.65\times10^{-9}$~~	~~$.8\times10^{-10}$~~
8	$.58\times10^{-11}$	$.09\times10^{-10}$	$.14\times10^{-9}$	$.53\times10^{-11}$
9	$.17\times10^{-10}$	$.36\times10^{-10}$	$.1\times10^{-9}$	$.17\times10^{-10}$
10	$.13\times10^{-6}$	$.2\times10^{-10}$	$.26\times10^{-6}$	$.56\times10^{-10}$
11	$.72\times10^{-10}$	$.19\times10^{-10}$	$.33\times10^{-10}$	$.52\times10^{-10}$
12	$.52\times10^{-11}$	$.22\times10^{-10}$	$.21\times10^{-6}$	$.26\times10^{-10}$
13	$.38\times10^{-9}$	$.08\times10^{-9}$	$.37\times10^{-6}$	$.76\times10^{-10}$
14	~~$.47\times10^{-10}$~~	~~$.1\times10^{-10}$~~	~~$.14\times10^{-9}$~~	~~$.12\times10^{-10}$~~
15	$.13\times10^{-6}$	$.13\times10^{-10}$	$.62\times10^{-10}$	$.41\times10^{-10}$
16	$.29\times10^{-10}$	$.55\times10^{-10}$	$.67\times10^{-7}$	$.095\times10^{-8}$
17	$.20\times10^{-7}$	$.59\times10^{-10}$	$.23\times10^{-5}$	$.48\times10^{-8}$
18	$.27\times10^{-10}$	$.43\times10^{-10}$	$.31\times10^{-6}$	$.46\times10^{-10}$
19	$.24\times10^{-10}$	$.34\times10^{-10}$	$.45\times10^{-10}$	$.40\times10^{-10}$
20	$.35\times10^{-10}$	$.41\times10^{-10}$	$.29\times10^{-8}$	$.46\times10^{-10}$
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 5-19-65				
Temp: 75.5°F				
MOD	I_{10e}	I_{1c}	I_{2c}	I_{4c}
1				
2				
3	$.34\times10^{-9}$	$.33\times10^{-9}$	$.28\times10^{-8}$	$.765\times10^{-9}$
4	$.27\times10^{-10}$	$.16\times10^{-10}$	$.685\times10^{-9}$	$.46\times10^{-10}$
5	$.69\times10^{-8}$	$.795\times10^{-9}$	$.695\times10^{-8}$	$.525\times10^{-9}$
6	$.79\times10^{-9}$	$.685\times10^{-8}$	$.687\times10^{-8}$	$.56\times10^{-9}$
7				
8	$.717\times10^{-9}$	$.655\times10^{-9}$	$.687\times10^{-8}$	$.415\times10^{-9}$
9	$.104\times10^{-8}$	$.133\times10^{-8}$	$.087\times10^{-7}$	$.68\times10^{-9}$
10	$.227\times10^{-7}$	$.764\times10^{-9}$	$.126\times10^{-6}$	$.62\times10^{-9}$
11	$.74\times10^{-10}$	$.20\times10^{-10}$	$.30\times10^{-10}$	$.44\times10^{-10}$
12	$.714\times10^{-9}$	$.102\times10^{-8}$	$.60\times10^{-7}$	$.44\times10^{-9}$
13	$.20\times10^{-8}$	$.142\times10^{-8}$	$.23\times10^{-6}$	$.115\times10^{-8}$
14				
15	$.138\times10^{-6}$	$.15\times10^{-10}$	$.575\times10^{-10}$	$.39\times10^{-10}$
16	$.795\times10^{-9}$	$.097\times10^{-8}$	$.267\times10^{-8}$	$.65\times10^{-7}$
17	$.195\times10^{-7}$	$.32\times10^{-10}$	$.215\times10^{-5}$	$.44\times10^{-8}$
18	$.28\times10^{-10}$	$.11\times10^{-10}$	$.21\times10^{-6}$	$.11\times10^{-10}$
19	$.685\times10^{-8}$	$.75\times10^{-9}$	$.16\times10^{-8}$	$.515\times10^{-9}$
20	$.795\times10^{-9}$	$.51\times10^{-9}$	$.16\times10^{-8}$	$.49\times10^{-9}$
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: Same as sheet #1

COMMENTS:

Devices 1, 2, 7 and 14 destroyed during test #1

CIRCUIT TYPE: F-3

TEST NUMBER: 3

DATA SHEET 2 of 3 B

TEST TITLE: Leakage Current

PRE RADIATION				
Date:				
Temp:				
MOD	I_{10C}	I_{1C}	I_{2C}	I_{4C}
21	$.028 \times 10^{-10}$	$.09 \times 10^{-9}$	$.79 \times 10^{-10}$	$.13 \times 10^{-9}$
22	$.54 \times 10^{-10}$	$.57 \times 10^{-10}$	$.16 \times 10^{-9}$	$.52 \times 10^{-5}$
23	$.43 \times 10^{-10}$	$.59 \times 10^{-10}$	$.09 \times 10^{-9}$	$.59 \times 10^{-10}$
24	$.20 \times 10^{-10}$	$.18 \times 10^{-10}$	$.29 \times 10^{-10}$	$.23 \times 10^{-10}$
TECH.			ENGR.	

POST RADIATION				
Date:				
Temp:				
MOD	I_{10C}	I_{1C}	I_{2C}	I_{4C}
21	$.097 \times 10^{-8}$	$.087 \times 10^{-8}$	$.103 \times 10^{-8}$	$.60 \times 10^{-9}$
22	$.096 \times 10^{-8}$	$.785 \times 10^{-9}$	$.127 \times 10^{-8}$	$.609 \times 10^{-9}$
23	$.12 \times 10^{-8}$	$.098 \times 10^{-8}$	$.12 \times 10^{-8}$	$.087 \times 10^{-8}$
24	$.094 \times 10^{-8}$	$.675 \times 10^{-9}$	$.10 \times 10^{-8}$	$.56 \times 10^{-9}$
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: F-3

TEST NUMBER: 3

DATA SHEET 3 of 3 A

TEST TITLE: Leakage Current

PRE RADIATION			
Date: 11/3/64	1-22-65		
Temp: 76°F	78°F		
MOD	I_{5c}	I_{9c}	I_{10c}
1	~~.44×10⁻⁸~~	~~.1×10⁻¹⁰~~	~~.15×10⁻¹⁰~~
2	~~.22×10⁻⁸~~	~~.95×10⁻¹¹~~	~~.59×10⁻¹¹~~
3	$.25\times10^{-10}$	$.7\times10^{-9}$	$.32\times10^{-10}$
4	$.3\times10^{-9}$	$.61\times10^{-10}$	$.28\times10^{-10}$
5	$.25\times10^{-10}$	$.12\times10^{-10}$	$.14\times10^{-10}$
6	$.4\times10^{-8}$	$.65\times10^{-11}$	$.68\times10^{-11}$
7	~~.11×10⁻⁸~~	~~.62×10⁻¹¹~~	~~.7×10⁻¹¹~~
8	$.13\times10^{-6}$	$.42\times10^{-11}$	$.63\times10^{-11}$
9	$.31\times10^{-9}$	$.16\times10^{-10}$	$.18\times10^{-10}$
10	$.36\times10^{-10}$	$.62\times10^{-9}$	$.16\times10^{-6}$
11	$.47\times10^{-10}$	$.58\times10^{-10}$	$.78\times10^{-10}$
12	$.12\times10^{-8}$	$.640\times10^{-11}$	$.56\times10^{-11}$
13	$.26\times10^{-9}$	$.33\times10^{-9}$	$.25\times10^{-9}$
14	~~.33×10⁻⁹~~	~~.16×10⁻¹⁰~~	~~.48×10⁻¹⁰~~
15	$.57\times10^{-10}$	$.4\times10^{-8}$	$.14\times10^{-6}$
16	$.30\times10^{-8}$	$.49\times10^{-10}$	$.28\times10^{-10}$
17	$.19\times10^{-5}$	$.30\times10^{-10}$	$.20\times10^{-7}$
18	$.65\times10^{-7}$	$.36\times10^{-10}$	$.47\times10^{-10}$
19	$.37\times10^{-10}$	$.29\times10^{-10}$	$.25\times10^{-10}$
20	$.17\times10^{-8}$	$.29\times10^{-10}$	$.23\times10^{-10}$
TECH. [illegible]		ENGR. [illegible]	

POST RADIATION			
Date: 5-19-65			
Temp: 75.5°F			
MOD	I_{5c}	I_{9c}	I_{10c}
1			
2			
3	$.23\times10^{-7}$	$.47\times10^{-7}$	$.33\times10^{-9}$
4	$.3\times10^{-9}$	$.61\times10^{-10}$	$.25\times10^{-10}$
5	$.115\times10^{-8}$	$.67\times10^{-9}$	$.09\times10^{-8}$
6	$.90\times10^{-8}$	$.63\times10^{-9}$	$.75\times10^{-9}$
7			
8	$.51\times10^{-8}$	$.553\times10^{-9}$	$.73\times10^{-9}$
9	$.162\times10^{-8}$	$.097\times10^{-8}$	$.101\times10^{-8}$
10	$.195\times10^{-8}$	$.29\times10^{-8}$	$.220\times10^{-7}$
11	$.36\times10^{-10}$	$.55\times10^{-10}$	$.72\times10^{-10}$
12	$.096\times10^{-8}$	$.62\times10^{-9}$	$.71\times10^{-9}$
13	$.545\times10^{-8}$	$.166\times10^{-8}$	$.173\times10^{-8}$
14			
15	$.565\times10^{-10}$	$.407\times10^{-8}$	$.14\times10^{-6}$
16	$.097\times10^{-8}$	$.693\times10^{-8}$	$.756\times10^{-9}$
17	$.19\times10^{-5}$	$.61\times10^{-11}$	$.20\times10^{-7}$
18	$.63\times10^{-7}$	$.10\times10^{-10}$	$.215\times10^{-10}$
19	$.758\times10^{-9}$	$.70\times10^{-9}$	$.682\times10^{-8}$
20	$.694\times10^{-8}$	$.60\times10^{-9}$	$.745\times10^{-9}$
TECH. [illegible]		ENGR. [illegible]	

EQUIPMENT:

SAME AS sheet #1

COMMENTS:

Devices 1, 2, 7, and 14 were destroyed during test number 1.

CIRCUIT TYPE: F-3

TEST NUMBER: 3

DATA SHEET 3 of 3B

TEST TITLE: Leakage Current

PRE RADIATION				
Date:				
Temp:				
MOD	I_{5C}	I_{9C}	I_{10C}	
21	$.15 \times 10^{-8}$	$.33 \times 10^{-10}$	$.25 \times 10^{-10}$	
22	$.17 \times 10^{-7}$	$.41 \times 10^{-10}$	$.43 \times 10^{-10}$	
23	$.14 \times 10^{-9}$	$.40 \times 10^{-10}$	$.39 \times 10^{-10}$	
24	$.19 \times 10^{-10}$	$.32 \times 10^{-9}$	$.16 \times 10^{-9}$	
TECH.			ENGR.	

POST RADIATION				
Date:				
Temp:				
MOD	I_{5C}	I_{9C}	I_{10C}	
1	$.070 \times 10^{-8}$	$.055 \times 10^{-5}$	$.093 \times 10^{-8}$	
2	$.20 \times 10^{-8}$	$.680 \times 10^{-9}$	$.094 \times 10^{-8}$	
3	$.117 \times 10^{-8}$	$.086 \times 10^{-5}$	$.115 \times 10^{-8}$	
4	$.088 \times 10^{-8}$	$.10 \times 10^{-5}$	$.096 \times 10^{-8}$	
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: F-3

TEST NUMBER: 4

DATA SHEET A

TEST TITLE: Output Driving Current

PRE RADIATION				
Date: 10/26/64				
Temp: 75°F				
1×10^{-3} Amperes				
MOD	I_{AS}	I_{AL}		
1	~~7~~	~~14~~		
2	~~5.1~~	~~9.75~~		
3	7.6	13		
4	7.95	13		
5	5.75	10.5		
6	6.4	12		
7	~~6.9~~	~~12~~		
8	7.55	12.75		
9	6.3	10.5		
10	7.4	10.5		
11	7.8	14		
12	6.	10		
13	6.8	10		
14	~~7.05~~	~~14.5~~		
15	7.	14		
16	7.4	10.2		
17	6.6	10.0		
18	6.8	13.2		
19	6.0	10.0		
20	6.2	11.4		
TECH. [illegible]			ENGR. [illegible]	

POST RADIATION				
Date: 5-20-65				
Temp: 78°F				
MOD	I_{AS}	I_{AL}		
1				
2				
3	4.6	2.95		
4	8.1	12.7		
5	3.5	3.1		
6	3.7	3.35		
7				
8	3.45	3.5		
9	3.1	2.7		
10	4.9	3.7		
11	8.0	13.2		
12	3.0	3.3		
13	4.65	3.2		
14				
15	7.3	13.3		
16	4.1	3.25		
17	6.5	11.1		
18	6.8	13.2		
19	3.55	3.55		
20	3.7	3.4		
TECH. [illegible]			ENGR. [illegible]	

EQUIPMENT: Digital VM I 55991
Decade resistor I 70730
Milliammeter I 14196

COMMENTS:

over for 21 22 23 24

Devices 1, 2, 7, and 14 destroyed during test number 1.

CIRCUIT TYPE: F-3

TEST NUMBER: 4

DATA SHEET B

TEST TITLE: Output Driving Current

PRE RADIATION Date: 2-11-65 Temp: 78°F				
MOD	I_{AS}	I_{AL}		
21	6.8	13.8		
22	7.5	13.4		
23	6.9	10.9		
24	6.4	14.9		
TECH.			ENGR.	

POST RADIATION Date: Temp:				
MOD	I_{AS}	I_{AL}		
21	3.8	3.85		
22	4.75	4.45		
23	4.05	3.5		
24	4.45	4.0		
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: F-3

TEST NUMBER: 5

DATA SHEET A

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 12/29/64
Temp: 77°F

Pulse Gen: τ_R = 10 , τ_F = 16 .
measurements in 10^{-9} seconds

MOD	τ_S	τ_D	τ_R	τ_F
1	~~12~~	~~15~~	~~15~~	~~16~~
2	~~11.5~~	~~16~~	~~17.5~~	~~13.5~~
3	20.5	8	16.5	13
4	23.5	7.5	11	14.5
5	13.5	15	16	16
6	15.5	15	15	15
7	~~14.5~~	~~16.5~~	~~17~~	~~15~~
8	15	16.5	17	18
9	11.5	15.5	16	14
10	20.5	8	17	14
11	15.5	8	14.5	17
12	11.5	16.5	16.5	14
13	11.5	13	12.5	14
14	~~15.5~~	~~15~~	~~15.5~~	~~17~~
15	19.5	8	13	15
16	13.5	15.5	17.5	12.5
17	12.	15.5	17	13
18	13	13.5	13	13.5
19	12.5	14.5	16	12.5
20	14	14.5	15	13

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 5-18-65
Temp: 76°F

Pulse Gen: τ_R = 11.5 , τ_F = 9.5 .
measurements in 10^{-9} seconds

MOD	τ_S	τ_D	τ_R	τ_F
1				
2				
3	10	20	46	13
4	23	7.5	12	13
5	7	25	28	14
6	9	25	27	14
7				
8	9	27	29	15
9	7	26	37	13
10	11	21	45	13
11	13	8	15	15
12	7	27	34	13
13	7	23	29	11
14				
15	17	8	14.5	13
16	7	24	32	16
17	12	17.5	17	13
18	12.5	14.5	12	15
19	7	25	26	14
20	7	25	27	14

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: TI Pulse gen
Sampling oscilloscope

COMMENTS:

Devices 1, 2, 7 and 19 destroyed during test number 4.

CIRCUIT TYPE: F-3

TEST NUMBER: 5

DATA SHEET B

TEST TITLE: Transient Parameters

PRE RADIATION				
Date:				
Temp:				
MOD	T_S	T_D	T_R	T_F
21	17.5	16	17	18
22	13.5	15.5	14.5	18.5
23	14	16.	15.5	17
24	16.5	14	14	15
TECH.			ENGR.	

POST RADIATION				
Date:				
Temp:				
MOD	T_S	T_D	T_R	T_F
21	8	25	29	15
22	8	25	28	13
23	9	25	28	14
24	10	25	27	14
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

Pronounced ringing exists on the trailing edge of the clock pluse. Due to the ringing 3 nanoseconds would probably be a more realistic figure for the clock pulse fall time.

CIRCUIT TYPE: F-3

TEST NUMBER: 6

DATA SHEET A

TEST TITLE: Resistance Measurement

PRE RADIATION				
Date: 10/26/64 1-25-65				
Temp: 75°F 76°F				
	Resistance in ohms.			
MOD	R_{36}			
1	~~1572~~			
2	~~1809~~			
3	1739			
4	1736			
5	1708			
6	1833			
7	~~1609~~			
8	1944			
9	1578			
10	1820			
11	1906			
12	1673			
13	1365			
14	~~1650~~			
15	1683			
16	1598			
17	1593			
18	1463			
19	1766			
20	1715			
TECH. N. W. Elliott		ENGR. [illegible]		

POST RADIATION				
Date: 5-26-65				
Temp: 79°F				
	Resistance in ohms			
MOD	R_{36}			
1				
2				
3	1761			
4	1739			
5	1722			
6	1857			
7				
8	1969			
9	1597			
10	1842			
11	1908			
12	1693			
13	1381			
14				
15	1655			
16	1621			
17	1598			
18	1464			
19	1791			
20	1738			
TECH. [illegible] Kaiser		ENGR. [illegible]		

EQUIPMENT: Wheatstone Br. type I 25471

COMMENTS:
Devices 1, 2, 7, and 14 destroy during test number 1.

CIRCUIT TYPE: F-3

TEST NUMBER: 6

DATA SHEET B

TEST TITLE: Resistance Measurement

PRE RADIATION Date: 2-11-65 Temp: 78°F				
MOD	R_{36}			
21	1659			
22	1634			
23	1695			
24	1786			
TECH.			ENGR.	

POST RADIATION Date: Temp:				
MOD	R_{36}			
21	1630			
22	1657			
23	1627			
24	1811			
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: F-3

TEST NUMBER: 7

DATA SHEET A

TEST TITLE: Transistor Characteristics (Beta)

PRE RADIATION

Date: 1-23-65
Temp: 77°

MOD	ma I_C	H_{FE}		
1	2.6	8.6		
2	2.75	9.2		
3	2.4	8.0		
4	2.4	8.0		
5	2.75	9.2		
6	2.5	8.3		
7	2.55	8.5		
8	2.6	8.6		
9	2.4	8.0		
10	2.25	7.5		
11	2.5	8.3		
12	2.55	8.5		
13	2.4	8.0		
14	2.45	8.2		
15	2.5	8.2		
16	2.6	8.6		
17	2.6	8.6		
18	2.75	9.2		
19	2.9	9.3		
20	2.65	8.8		
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 5-20-65
Temp: 78° F

MOD	ma I_C	H_{FE}		
1				
2				
3	.335	1.12		
4	2.46	8.2		
5	.125	0.42		
6	.115	0.38		
7				
8	.090	0.30		
9	.098	0.33		
10	.339	1.13		
11	2.53	8.4		
12	.099	0.33		
13	.086	0.27		
14				
15	2.59	8.6		
16	.094	0.31		
17	2.59	8.6		
18	2.74	9.1		
19	.100	0.33		
20	.130	0.43		
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: Tektronix 575 I-55783

COMMENTS:

Devices 1, 2, 3, and 14 destroyed during test number 1.

CIRCUIT TYPE: F-3

TEST NUMBER: 7

DATA SHEET B

TEST TITLE: Transistor Characteristics (Beta)

PRE RADIATION				
Date:				
Temp:				
MOD	ma I_C	H_{FE}		
21	2.85	9.5		
22	2.35	7.8		
23	2.65	8.8		
24	2.30	7.7		
TECH.			ENGR.	

POST RADIATION				
Date:				
Temp:				
MOD	ma I_C	H_{FE}		
21	.07	0.36		
22	.121	0.44		
23	.124	0.41		
24	.075	0.25		
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: F-3

TEST NUMBER: 8

DATA SHEET A

TEST TITLE: Transistor Characteristics (Breakdown Voltage)

PRE RADIATION

Date: 10/28/64 1-25-65
Temp: 75°F 76°F

MOD	BV_{EBO}	BV_{CBO}		
1	~~7.328~~	~~7.974~~		
2	~~Bv 720~~	~~Bv 720~~		
3	8.467	9.520		
4	8.759	9.790		
5	7.434	8.060		
6	7.677	8.324		
7	~~7.295~~	~~7.948~~		
8	8.024	8.665		
9	7.085	7.717		
10	8.544	9.575		
11	9.023	10.08		
12	7.721	8.375		
13	6.687	7.332		
14	~~7.161~~	~~7.798~~		
15	8.632	9.682		
16	8.046	9.146		
17	8.033	8.688		
18	7.272	7.923		
19	8.760	9.430		
20	8.576	9.224		
TECH. H.W. Elliott			ENGR. [illegible]	

POST RADIATION

Date: 5-20-65
Temp: 78°F

MOD	BV_{EBO}	BV_{CBO}		
1				
2				
3	8.497	9.540		
4	8.162	9.796		
5	7.478	8.125		
6	7.719	8.352		
7				
8	8.807	8.730		
9	7.128	7.757		
10	8.564	9.630		
11	9.021	10.09		
12	7.742	8.391		
13	6.719	7.345		
14				
15	8.633	9.685		
16	8.078	9.201		
17	8.042	8.696		
18	7.297	7.930		
19	8.778	9.443		
20	8.616	9.253		
TECH. D. A. Kaiser			ENGR. [illegible]	

EQUIPMENT: Digital VM I 55991
Microammeter C 3124
Decade resistor I 73730

COMMENTS:

Devices 1, 2, 7, and 14 were destroyed during test number 4.

CIRCUIT TYPE: F-3

TEST NUMBER: 8

DATA SHEET B

TEST TITLE: Transistor Characteristics (Breakdown Voltage)

PRE RADIATION

Date: 2-11-65
Temp: 78°F

MOD	BV_{EBO}	BV_{CBO}		
21	7.395	8.047		
22	7.896	8.546		
23	7.338	7.974		
24	7.511	8.151		

TECH. ENGR.

POST RADIATION

Date:
Temp:

MOD	BV_{EBO}	BV_{CBO}		
21	7.455	8.092		
22	7.955	8.588		
23	7.358	7.998		
24	7.358	8.204		

TECH. ENGR.

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: F-3

TEST NUMBER: 9

DATA SHEET A

TEST TITLE: Transistor Characteristics (Forward Voltage)

PRE RADIATION

Date: 10/27/64 1-25-65

Temp: 78°F 77°F

Volts

MOD	V_{F1}	V_{F2}	V_{F3}	
1	~~.688~~	~~.573~~	~~.871~~	
2	~~.687~~	~~.578~~	~~.878~~	
3	.688	.602	.807	
4	.689	.601	.829	
5	.685	.574	.867	
6	.689	.573	.866	
7	~~.683~~	~~.571~~	~~.848~~	
8	.687	.574	.850	
9	.689	.574	.870	
10	.689	.604	.827	
11	.689	.602	.817	
12	.690	.574	.871	
13	.688	.569	.879	
14	~~.684~~	~~.571~~	~~.862~~	
15	.684	.604	.808	
16	.680	.575	.874	
17	.691	.572	.873	
18	.681	.570	.846	
19	.686	.572	.863	
20	.678	.573	.857	
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 5-20-65

Temp: 78°F

MOD	V_{F1}	V_{F2}	V_{F3}	
1				
2				
3	.663	.577	1.205	
4	.689	.601	.828	
5	.671	.534	1.229	
6	.675	.533	1.276	
7				
8	.671	.553	1.301	
9	.671	.535	1.180	
10	.664	.576	1.221	
11	.688	.603	.816	
12	.675	.536	1.210	
13	.668	.532	1.168	
14				
15	.684	.604	.807	
16	.668	.534	1.221	
17	.689	.573	.874	
18	.681	.572	.847	
19	.677	.534	1.273	
20	.672	.534	1.237	
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: Digital VM I 55991
Decade res's for I 73730
Milliammeter I 14197

COMMENTS:
Devices 1, 2, 7, and 14 were destroyed during test number 1.

CIRCUIT TYPE: F-3

TEST NUMBER: 9

DATA SHEET B

TEST TITLE: Transistor Characteristics (Forward Voltage)

PRE RADIATION Date: Temp:				
MOD	V_{F1}	V_{F2}	V_{F3}	
21	.651	.574	.856	
22	.651	.574	.886	
23	.682	.579	.848	
24	.693	.571	.872	
TECH.			ENGR.	

POST RADIATION Date: Temp:				
MOD	V_{F1}	V_{F2}	V_{F3}	
21	.669	.535	1.226	
22	.670	.534	1.204	
23	.672	.535	1.222	
24	.673	.533	1.260	
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: F-3

TEST NUMBER: 10

DATA SHEET A

TEST TITLE: Lifetime Measurement

PRE RADIATION Date: Temp:				
MOD	τ x 10-9	sec.		
1				
2				
3	206			
4	166			
5	296			
6	300			
7				
8	293			
9	291			
10	168			
11	179			
12	279			
13	296			
14				
15	191			
16	290			
17	263			
18	308			
19	288			
20	291			
TECH.			ENGR.	

POST RADIATION Date: Temp:				
MOD	τ x 10-9	sec.		
1				
2				
3	26			
4	156			
5	55			
6	20			
7				
8	26			
9	31			
10	20			
11	178			
12	47			
13	32			
14				
15	186			
16	27			
17	247			
18	296			
19	25			
20	55			
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

CIRCUIT TYPE: F-3

TEST NUMBER: 10

DATA SHEET B

TEST TITLE: Lifetime Measurement

PRE RADIATION				
Date:				
Temp:				
MOD		$\tau \times 10^{-9}$ sec.		
21		296		
22		294		
23		304		
24		279		
TECH.			ENGR.	

POST RADIATION				
Date:				
Temp:				
MOD	$\tau \times 10^{-9}$ sec.			
21	52			
22	60			
23	24			
24	25			
TECH.			ENGR.	

EQUIPMENT:

COMMENTS:

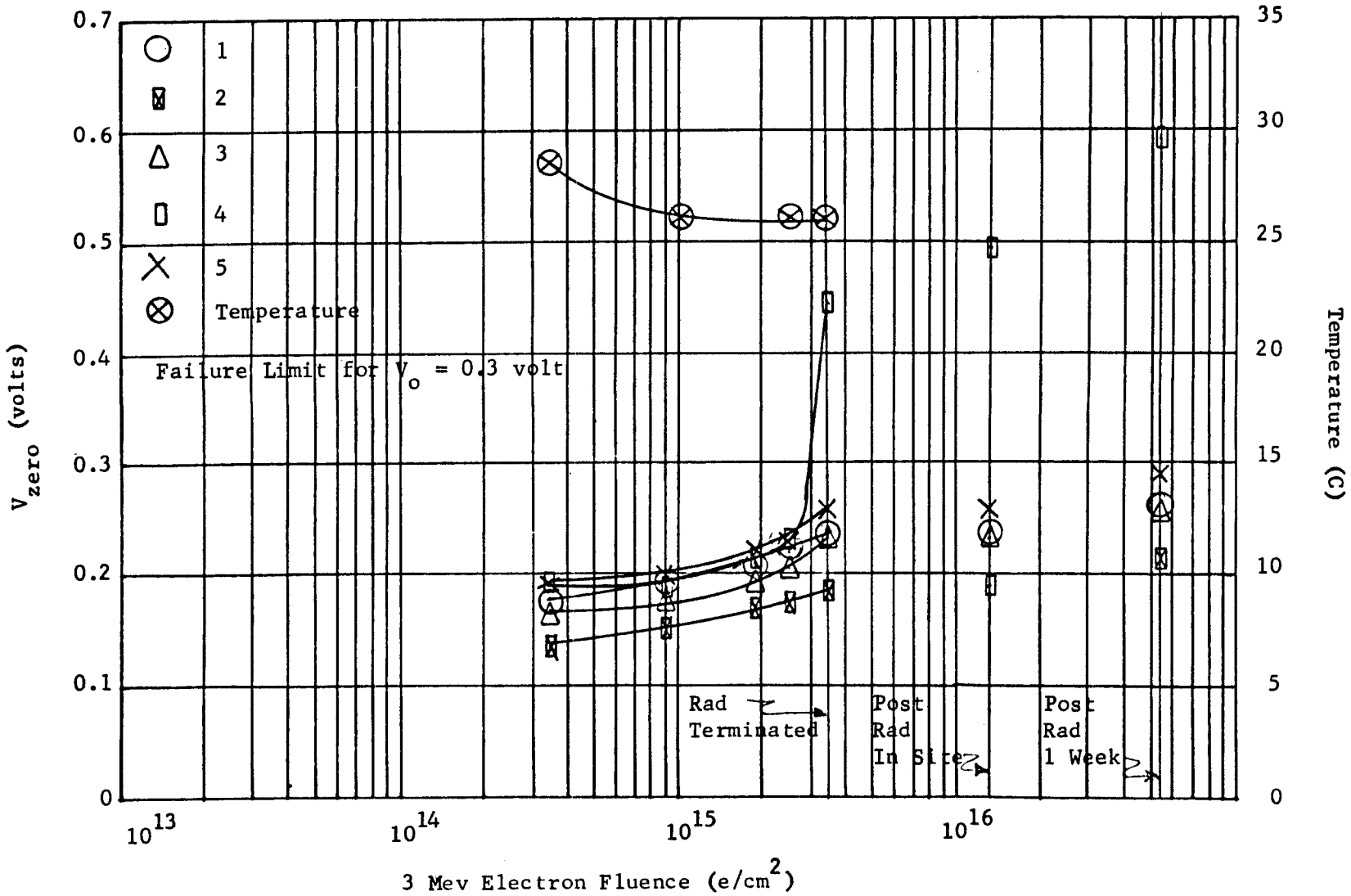
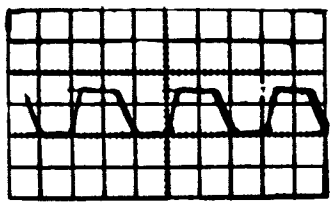
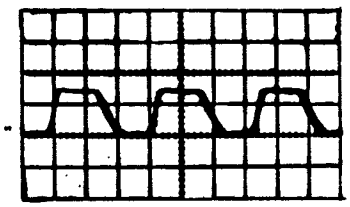


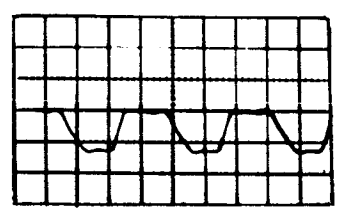
FIGURE III-29. RADIATION RESPONSE OF UNIT F-3



A - Initial



B - Final



D - Post Rad 1 Week

Scale: 0.5 volt/cm
0.1 μsec/cm

FIGURE III-30. OUTPUT OF 5-STAGE OSCILLATOR OF F-3 CIRCUITS

CIRCUIT TYPE: F-4

TEST NUMBER: 1

DATA SHEET

TEST TITLE: Preset Input Voltage Levels

PRE RADIATION

Date: 12/9/61
Temp: 78°F

MOD	V_{zero}	V_{one}	$V_{zero}L$	$V_{one}L$
1	.690	1.204	.695	1.210
2	.717	1.096	.770	1.262
3	.698	1.599	.711	1.376
4	.731	1.077	.761	1.653
5	.706	.889	.744	.985
6	.711	1.106	.745	1.153
7	.703	.980	.736	1.114
8	.719	1.013	.744	1.043
9	.715	1.015	.736	1.222
10	.722	1.019	.753	1.065
11	.717	1.136	.744	1.136
12	.710	.911	.740	1.039
13	.698	1.093	.707	1.230
14	.736	1.200	.778	1.400
15	.706	.965	.705	1.484
16	.737		.769	
17	.706	1.034	.717	1.049
18	.732	1.013	.759	1.099
19	.724	1.029	.744	1.032
20	.710	1.026	.730	1.052

TECH. H. W. Elliott ENGR. [illegible]

POST RADIATION

Date: 6-23-65
Temp: 76°

MOD	V_{zero}	V_{one}	$V_{zero}L$	$V_{one}L$
1	3.157	✓	3.164	✓
2	✓	✓	✓	✓
3	2.137	✓	1.834	✓
4	.767	1.020	.792	1.109
5	3.475	✓	3.499	✓
6	✓	✓	✓	✓
7	✓	✓	✓	✓
8	3.200	✓	3.253	✓
9	✓	✓	✓	✓
10	1.325	✓	2.150	✓
11	.743	.967	.759	1.094
12	2.929	✓	2.481	✓
13	1.522	✓	1.574	✓
14	✓	✓	✓	✓
15	.730	.886	.743	.981
16	3.274	✓	2.992	✓
17	1.938	✓		
18	.744	.913	.765	.992
19	.740	.917	.752	.996
20	3.344	✓	1.343	✓

TECH. H. W. Elliott ENGR. [illegible]

EQUIPMENT: VA = Heathkit VOM
VX = Digital VM I 55991
320Ω = Decade resistor C 2785

COMMENTS: 1.5 KΩ = Decade resistor I 73730
Mods 16-20 Tested 1-7-65
Temp 76°F

Vone on mod 16 would not reach 2.2 V

Check mark indicates that the module would not reach the specified output voltage

CIRCUIT TYPE: F-4

TEST NUMBER: 2

DATA SHEET

TEST TITLE: Preset Input Driving Current

PRE RADIATION				
Date: 12/9/64				
Temp: 78°F				
MOD	$\times 10^{-3}$ Amp. I_X			
1	.18			
2	.18			
3	.16			
4	.19			
5	.18			
6	.16			
7	.18			
8	.19			
9	.15			
10	.20			
11	.19			
12	.17			
13	.17			
14	.16			
15	.17			
16	.18			
17	.18			
18	.17			
19	.22			
20	.18			
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date:				
Temp:				
MOD	$\times 10^{-3}$ I_X			
1	.18			
2	.18			
3	.16			
4	.18			
5	.18			
6	.16			
7	.18			
8	.20			
9	.16			
10	.21			
11	.19			
12	.17			
13	.17			
14	.16			
15	.17			
16	.20			
17	.20			
18	.18			
19	.23			
20	.21			
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: milliammeter I 14196
Digital VM I 55991

COMMENTS:
Mods 16-20 tested 1-7-65
with microammeter C 3124

CIRCUIT TYPE: F-4

TEST NUMBER: 3

DATA SHEET

TEST TITLE: Clocked Set-Reset Input Threshold

PRE RADIATION

Date: 12/10/64
Temp: 78°F

Measurement in volts

MOD	V_5	V_1	V_4	V_2
1	.727	.715	.776	.773
2	.744	.707	.865	.890
3	.715	.717	.753	.765
4	.762	.787	.865	.851
5	.757	.757	.885	.890
6	.759	.750	.847	.880
7	.771	.746	.839	.854
8	.749	.750	.822	.818
9	.727	.732	.796	.810
10	.777	.770	.836	.840
11	.750	.752	.802	.812
12	.740	.747	.799	.823
13	.700	.725	.744	.785
14	.810	.770	.745	.779
15	.750	.758	.822	.840
16	.792	.750	.823	.845
17	.731	.730	.784	.809
18	.768	.784	.803	.823
19	.755	.742	.820	.826
20	.745	.750	.799	.801

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-22-65
Temp: 77°

Measurement in volts

MOD	V_5	V_1	V_4	V_2
1	1.127	1.156	1.167	1.229
2	1.312	1.213	1.724	1.665
3	1.085	1.106	.987	.994
4	.766	.792	.865	.867
5	1.287	1.253	1.561	2.085
6	1.304	1.281	1.447	1.535
7	1.373	1.220	1.461	1.587
8	1.279	1.309	1.363	1.266
9	1.159	1.251	1.313	1.266
10	1.361	1.365	1.353	1.474
11	.746	.781	.801	.794
12	1.217	2.935	1.244	1.621
13	1.009	1.194	1.041	1.179
14	—	—	—	—
15	.759	.782	.816	.883
16	1.292	1.166	1.355	1.267
17	1.089	2.552	1.149	1.259
18	.752	.759	.780	.813
19	.752	.753	.804	.813
20	1.193	1.196	1.261	1.392

TECH. [illegible] ENGR. [illegible]

#14 will not go high at V_4

EQUIPMENT: Digital VMI-55991
TI pulse generator.

COMMENTS:
Mods 16-20 Tested 1-15-65
Temp 76°

CIRCUIT TYPE: F-4

TEST NUMBER: 4

DATA SHEET B

TEST TITLE: Clocked Set-Reset Input Driving Current

PRE RADIATION

Date: 12/11/64
Temp: 78°F

MOD	AMPS I_{D5}	AMPS I_{D1}	AMPS 1×10^{-3} I_{D2}	AMPS 1×10^{-3} I_{D4}
1	$.2\times10^{-3}$	$.19\times10^{-3}$	.36	.34
2	$.2\times10^{-3}$	$.22\times10^{-3}$	.38	.34
3	$.17\times10^{-3}$	$.19\times10^{-3}$	.34	.30
4	$.2\times10^{-3}$	$.21\times10^{-3}$	.38	.35
5	1.7×10^{-3}	$.2\times10^{-3}$	.37	.32
6	1.7×10^{-3}	$.18\times10^{-3}$	.32	.30
7	$.18\times10^{-3}$	$.19\times10^{-3}$	.34	.31
8	$.22\times10^{-3}$	$.22\times10^{-3}$	.40	.38
9	$.16\times10^{-3}$	$.18\times10^{-3}$	.30	.30
10	$.22\times10^{-3}$	$.22\times10^{-3}$	.40	.40
11	$.2\times10^{-3}$	$.2\times10^{-3}$	.38	.38
12	$.18\times10^{-3}$	$.18\times10^{-3}$	.34	.32
13	$.2\times10^{-3}$	$.21\times10^{-3}$	.37	.34
14	$.2\times10^{-3}$	$.18\times10^{-3}$	.32	.32
15	$.18\times10^{-3}$	$.2\times10^{-3}$	.35	.32
16	$.20\times10^{-3}$	$.18\times10^{-3}$	.37	.34
17	$.18\times10^{-3}$	$.19\times10^{-3}$	.37	.35
18	$.19\times10^{-3}$	$.20\times10^{-3}$	.41	.38
19	$.23\times10^{-3}$	$.22\times10^{-3}$	.47	.47
20	$.21\times10^{-3}$	$.20\times10^{-3}$	.43	.41

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-22-65
Temp: 76°

MOD	1×10^{-3} amps I_{D5}	1×10^{-3} amps I_{D1}	1×10^{-3} amps I_{D2}	1×10^{-3} amps I_{D4}
1	.24	.18	.34	.34
2	.25	.21	.37	.34
3	.23	.18	.32	.29
4	.19	.20	.38	.36
5	.23	.19	.35	.31
6	.21	.17	.32	.30
7	.21	.18	.34	.32
8	.20	.21	.40	.38
9	.16	.16	.30	.30
10	.21	.20	.40	.40
11	.20	.20	.37	.38
12	.17	.18	.32	.32
13	.18	.16	.32	.32
14	.19	*	.38	.35
15	.18	.20	.36	.32
16	.22	.20	.38	.34
17	.20	.21	.38	.35
18	.21	.22	.41	.39
19	.27	.25	.47	.49
20	.24	.22	.43	.43

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: SAME AS Sheet 1 A

* reading too low to measure with the arrangement used for this test ($I \ll .01\times10^{-3}$)

COMMENTS:

CIRCUIT TYPE: F-4

TEST NUMBER: 5

DATA SHEET

TEST TITLE: Minimum Pulse Width and Pulse Height

PRE RADIATION				
Date: 12/10/64				
Temp: 78°F				
MOD	1×10^{-9} sec t_w	VOLTS V_A		
1	$\tau_w < 13$	.68		
2	$\tau_w < 13$	.66		
3	$\tau_w < 13$	.69		
4	$\tau_w < 13$	.67		
5	$\tau_w < 13$	.67		
6	$\tau_w < 13$	.66		
7	$\tau_w < 13$	.66		
8	$\tau_w < 13$	.67		
9	$\tau_w < 13$	.65		
10	$\tau_w < 13$	.67		
11	$\tau_w < 13$	.66		
12	$\tau_w < 13$	.65		
13	$\tau_w < 13$	.68		
14	$\tau_w < 13$	.65		
15	$\tau_w < 13$	.65		
16	$\tau_w < 13$	.65		
17	$\tau_w < 13$	.64		
18	$\tau_w < 13$	.66		
19	$\tau_w < 13$	.66		
20	$\tau_w < 13$	.66		
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 6-14-65				
Temp: 76°				
MOD	1×10^{-9} sec t_w	VOLTS V_A		
1	< 13	.46		
2	< 13	.48		
3	< 13	.51		
4	< 13	.68		
5	< 13	.47		
6	< 13	.41		
7	< 13	.45		
8	< 13	.43		
9	< 13	.49		
10	< 13	.47		
11	< 13	.69		
12	< 13	.46		
13	< 13	.53		
14	*	.22		
15	< 13	.67		
16	< 13	.46		
17	< 13	.50		
18	< 13	.71		
19	< 13	.71		
20	< 13	.48		
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: TI pulse gen.
Sampling oscilloscope
Digital VM I 65591

COMMENTS:

* #14 operates as a one shot

V_A #14 min pulse for operation as a one shot

CIRCUIT TYPE: F-4

TEST NUMBER: 6

DATA SHEET

TEST TITLE: Output One Voltage For Q and $\overline{Q}$

PRE RADIATION

Date: 12/14/64
Temp: 78°F

measurement in volts

MOD	V_{10}	V_6		
1	2.795	2.795		
2	2.749	2.766		
3	2.796	2.797		
4	2.762	2.756		
5	2.766	2.770		
6	2.771	2.775		
7	2.769	2.780		
8	2.764	2.753		
9	2.796	2.793		
10	2.749	2.745		
11	2.769	2.776		
12	2.784	2.780		
13	2.755	2.759		
14	2.803	2.796		
15	2.776	2.782		
16	2.775	2.760		
17	2.798	2.776		
18	2.769	2.761		
19	2.775	2.768		
20	2.778	2.781		
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION

Date: 6-23-65
Temp: 76°

measurement in volts

MOD	V_{10}	V_6		
1	2.716	2.704		
2	2.651	2.689		
3	2.735	2.720		
4	2.758	2.752		
5	2.693	2.693		
6	2.679	2.734		
7	2.683	2.712		
8	2.668	2.657		
9	2.723	2.719		
10	2.665	2.673		
11	2.766	2.769		
12	2.718	2.698		
13	2.743	2.720		
14	*.610	2.636		
15	2.774	2.776		
16	2.713	2.696		
17	2.744	2.709		
18	2.770	2.765		
19	2.770	2.766		
20	2.712	2.700		
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: Digital VM I 55991

COMMENTS:

#14 reads 2.635 at pin 10 while 3V is applied to pin 9. When the 3V is removed the voltage at pin 10 falls to the indicated value.

CIRCUIT TYPE: F-4

TEST NUMBER: 7

DATA SHEET

TEST TITLE: Driving Current Loaded to Ground for Q and $\bar{Q}$

PRE RADIATION

Date: 12/14/64
Temp: 78°F

MOD	1×10^{-3} amp I_{d10}	1×10^{-3} amps I_{d6}		
1	7.1	7.1		
2	6.7	6.9		
3	7.0	7.0		
4	6.7	6.6		
5	6.5	6.9		
6	6.8	6.8		
7	6.8	6.9		
8	6.6	6.4		
9	7.0	7.0		
10	6.7	6.1		
11	6.3	6.9		
12	7.0	6.9		
13	6.8	6.7		
14	7.0	7.2		
15	7.0	7.0		
16	7.1	7.0		
17	7.3	7.1		
18	7.0	7.0		
19	7.2	7.2		
20	7.2	7.2		

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-23-65
Temp: 76°

Measurement in milliamps

MOD	I_{d10}	I_{d6}		
1	2.6	5.0		
2	0.6	5.0		
3	2.8	5.0		
4	6.7	6.8		
5	0.8	5.0		
6	1.2	4.5		
7	0.6	5.2		
8	0.8	4.6		
9	0.5	5.0		
10	2.4	5.1		
11	6.8	7.0		
12	2.6	4.8		
13	3.0	5.0		
14	0.6	4.2		
15	7.0	7.0		
16	2.6	5.3		
17	3.0	5.3		
18	7.0	6.9		
19	7.0	7.1		
20	2.6	5.1		

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: milliammeter I 14196
1.5K = Decade resistor I 73730
320Ω = " " C 2785

COMMENTS:
Mods 16-20 Tested 1-8-65
Temp 78°F

CIRCUIT TYPE: F-4

TEST NUMBER: 8

DATA SHEET

TEST TITLE: Driving Current Loaded to and Supply for Q and $\bar{Q}$

PRE RADIATION				
Date: 12/14/64				
Temp: 78°F				
	1×10^{-3} amps			
MOD	I_{D6}	I_{D10}		
1	2.0	2.0		
2	1.9	1.9		
3	2.0	2.0		
4	2.0	1.9		
5	1.9	1.9		
6	1.9	1.9		
7	2.0	2.0		
8	2.0	2.0		
9	2.0	2.0		
10	1.9	1.9		
11	2.0	2.0		
12	1.9	1.9		
13	1.9	1.9		
14	2.0	2.0		
15	2.0	2.0		
16	1.8	1.8		
17	1.9	1.9		
18	1.9	1.9		
19	1.9	1.9		
20	1.9	1.9		
TECH. [illegible]		ENGR. [illegible]		

POST RADIATION				
Date: 6-23-65				
Temp: 76°				
	1×10^{-3} amps			
MOD	I_{D6}	I_{D10}		
1	0.9	0.8		
2	0.4	0.4		
3	1.1	0.9		
4	1.8	1.8		
5	0.8	0.1		
6	0.2	0.3		
7	0.8	0.8		
8	0.3	0.5		
9	1.0	0.7		
10	1.1	1.2		
11	1.9	1.9		
12	1.0	0.5		
13	1.0	1.2		
14	0.1	0.1		
15	1.9	1.9		
16	1.2	1.1		
17	1.3	1.2		
18	1.8	1.8		
19	1.8	1.8		
20	1.2	0.8		
TECH. [illegible]		ENGR. [illegible]		

EQUIPMENT: millivoltmeter I 14196
1.5K : Decade resistor I 13730
320 Ω " " C 2785

COMMENTS:

16-20 Tested 1-8-65
Temp 76°F

CIRCUIT TYPE: F-4

TEST NUMBER: 9

DATA SHEET A

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 12/10/64
Temp: 78°F

1×10^{-9} secs

MOD	τ_{r10}	τ_{d10}	τ_{s10}	τ_{f10}
1	12	13	24	26
2	25	13	19	25
3	11	13	24	27
4	24	13	19	26
5	25	13	18	25
6	23	12	18	25
7	22	13	19	24
8	25	13	19	25
9	11	12	19	24
10	26	13	19	25
11	22	13	21	24
12	22	13	20	25
13	25	13	18	25
14	12	12	21	24
15	22	13	30	25
16	29	14	34	24
17	27	13	36	23
18	26	14	38	29
19	27	13	34	22
20	25	13	37	23

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-14-65
Temp: 76°

1×10^{-9} seconds

MOD	τ_{r10}	τ_{d10}	τ_{s10}	τ_{f10}
1	28	12	24	39
2	33	14	16	54
3	30	13.5	16	39
4	15.5	13	33	25
5	25	13.5	18	46
6	21	13.5	23	40
7	29	14	23	42
8	31	13.5	22	43
9	25	13.5	24	41
10	22	13.5	24	40
11	13	14	37	26
12	22	13.5	23	40
13	26	13	26	36
14	-	-	-	-
15	12	12.5	32	25
16	22	14	25	37
17	24	13	27	30
18	16.5	15.5	41	27
19	23.5	14.5	37	21
20	23	13	25	33

TECH. [illegible] ENGR. [illegible]

#14 operates as a one shot will not remain in the one state

EQUIPMENT: TI pulse gen
Sampling oscilloscope

COMMENTS:
Pulse gen T_r 12 T_s 8

CIRCUIT TYPE: F-4

TEST NUMBER: 9

DATA SHEET B

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 12/15/69
Temp: 78°F

1×10^{-9} seconds

MOD	τ_{r6}	τ_{d6}	τ_{s6}	τ_{f6}
1	10	12	25	25
2	25	13	17	27
3	10	12	27	29
4	25	13	19	26
5	14	13	18	23
6	23	12	18	22
7	14	13	19	22
8	25	13	20	24
9	12	12	21	27
10	25	13	21	25
11	13	13	21	26
12	23	13	20	23
13	25	13	19	28
14	11	12	29	27
15	13	12	19	24
16	29	13	35	25
17	26	13	34	23
18	27	14	36	29
19	28	14	34	24
20	26	13	34	22

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 76°
Temp: 6-15-65

1×10^{-9} seconds.

MOD	τ_{r6}	τ_{d6}	τ_{s6}	τ_{f6}
1	35	14	24	39
2	24	13.5	20	43
3	34	14	26	45
4	14	14	33	25
5	25	13.5	22	41
6	28	13.5	16	60
7	25	13.5	22	41
8	27	14	23	52
9	26	13.5	22	41
10	23	14	24	40
11	12	13.5	33	23
12	21	13.5	22	50
13	29	14	22	38
14	-			
15	11.5	13	35	23
16	23	14.5	27	35
17	23	13.5	25	35
18	13.5	14.5	38	28
19	24	14	36	24
20	23	13.5	24	37

TECH. [illegible] ENGR. [illegible]

#14 does not operate properly

EQUIPMENT: Same as sheet A

COMMENTS:

CIRCUIT TYPE: F-4

TEST NUMBER: 9

DATA SHEET -C

TEST TITLE: Transient Parameters

PRE RADIATION

Date: 12/15/64
Temp: 78°F

Time in 10^{-9} seconds

MOD	15% $T_{r\,10}$	15% $T_{r\,6}$		
1	9	7		
2	10	14		
3	8	7		
4	10	11		
5	10	9		
6	10	8		
7	10	9		
8	9	10		
9	9	8		
10	10	9		
11	10	9		
12	9	9		
13	11	11		
14	9	8		
15	9	9		
16	12	16		
17	10	12		
18	12	11		
19	12	11		
20	10	10		

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-15-65
Temp: 76°

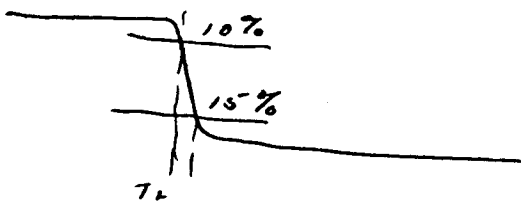
Time in 10^{-9} seconds.

MOD	$T_{r\,10}$	$T_{r\,6}$		
1	27	35		
2	23	19		
3	27	25		
4	9	9.5		
5	15	21		
6	19	21		
7	18	19		
8	23	20		
9	18	19		
10	18	18		
11	9	9		
12	18	18		
13	18	21		
14	—	—		
15	8.5	8.5		
16	17	19		
17	18	17		
18	11	11		
19	13.5	11.5		
20	17	17		

TECH. [illegible] ENGR. [illegible]

EQUIPMENT:

COMMENTS:



CIRCUIT TYPE: F-4

TEST NUMBER: 10

DATA SHEET

TEST TITLE: Clock Input Driving Current

PRE RADIATION

Date: 12/14/64
Temp: 78°F

MOD	1x10⁻³ Amp I_{D7}	1x10⁻³ Amp I_{L7}		
1	1.4	.19		
2	1.4	.17		
3	1.2	.24		
4	1.4	.19		
5	1.3	.14		
6	1.2	.14		
7	1.3	.14		
8	1.5	.14		
9	1.1	.14		
10	1.5	.17		
11	1.5	.19		
12	1.5	.12		
13	1.3	.18		
14	1.3	.15		
15	1.3	.15		
16	1.5	.41		
17	1.5	.19		
18	1.4	.15		
19	1.8	.23		
20	1.6	.19		
TECH.		ENGR.		

POST RADIATION

Date: 6-23-65
Temp: 76°

MOD	1x10⁻³ amp I_{D7}	1x10⁻³ amp I_{L7}		
1	1.28	4.2		
2	1.31	4.2		
3	1.12	3.1		
4	1.37	.18		
5	1.24	3.9		
6	1.18	4.2		
7	1.24	4.1		
8	1.34	4.3		
9	1.06	3.5		
10	1.41	4.0		
11	1.44	.18		
12	1.17	3.4		
13	1.18	3.9		
14	*1.3	*4.6		
15	1.29	.14		
16	1.46	3.9		
17	1.44	3.8		
18	1.41	.14		
19	1.7	.22		
20	1.5	3.6		
TECH.		ENGR.		

*#14 will not hold a logic one on pin 10

EQUIPMENT: Digital VM I 55991
Milliammeter I 14196

COMMENTS:

CIRCUIT TYPE: F-4

TEST NUMBER: 11

DATA SHEET

TEST TITLE: Preset Propagation Delay

PRE RADIATION

Date: 12/15/64
Temp: 78°F
Pulse P_1: C_r 7 ; 6

MOD	τ_{d10}	τ_{r10}	τ_{d6}	τ_{f6}
1	27	30	39	23
2	23	35	49	22
3	29	33	49	23
4	25	34	46	24
5	23	30	49	21
6	21	29	51	21
7	23	30	48	22
8	25	36	46	23
9	27	31	43	21
10	25	31	47	22
11	26	31	43	21
12	25	29	47	21
13	25	35	44	24
14	28	30	42	21
15	24	30	49	21
16	26	29	41	25
17	29	29	44	21
18	30	35	36	25
19	27	29	43	23
20	27	26	44	22

TECH. M. W. Elliott ENGR. [illegible]

POST RADIATION

Date: 5-15-65
Temp: 76°
Pulse P_1: C_r 7 ; C_f 6

MOD	τ_{d10}	τ_{r10}	τ_{d6}	τ_{f6}
1	16	42	36	41
2	15	62	30	39
3	21	44	37	43
4	26	34	38	26
5	13	49	27	34
6	14	58	28	44
7	15	52	29	39
8	15	52	31	39
9	17	47	28	38
10	17	52	30	41
11	34	27	43	23
12	14	43	29	34
13	19	41	35	36
14	-		-	-
15	25	32	38	22
16	20	40	34	30
17	17	41	33	36
18	31	36	49	25
19	28	30	42	24
20	15	38	29	32

TECH. M. W. Elliott ENGR. [illegible]

EQUIPMENT: TI Pulse generator
Sampling oscilloscope

COMMENTS:

CIRCUIT TYPE: F-4

TEST NUMBER: 12

DATA SHEET

TEST TITLE: Time to Set a Logic One State

PRE RADIATION

Date: 12/14/64
Temp: 78°F
Input pulse 1 τ_r 8 τ_f 6
Input pulse 2 τ_r 11 τ_f 11

MOD	t_{S11}	τ_{S15}		
1	27	22		
2	23	22		
3	26	22		
4	22	19		
5	21	17		
6	21	18		
7	22	18		
8	24	20		
9	21	18		
10	23	20		
11	25	22		
12	22	21		
13	23	22		
14	23	21		
15	21	19		
16	25	19		
17	22	21		
18	29	26		
19	24	21		
20	24	21		

TECH. [illegible] ENGR. [illegible]

POST RADIATION

Date: 6-17-65
Temp: 78°
Input P1 τ_r 8 τ_f 9
Input P2 τ_r 12 τ_f 12

MOD	t_{S11}	t_{S12}		
1	14.5	12		
2	10	6.5		
3	17.5	15.5		
4	22	20		
5	3.5	8		
6	8.5	7.5		
7	10	9.5		
8	10.5	9.5		
9	11.5	9.5		
10	11.5	10.5		
11	24	22		
12	9	12		
13	13.5	14		
14	—	—		
15	20	20		
16	12.5	11		
17	11.5	12.5		
18	28	28.5		
19	23	23.5		
20	9.5	10.5		

TECH. [illegible] ENGR. [illegible]

EQUIPMENT: T.I. pulse gen
Sampling oscilloscope
Digital Voltmeter I 55991

COMMENTS:

The measurement of τ_{S12} and τ_{S14} will not be taken because our pulse generator has such a fast rise time that the value of this measurement is ≈3 nanoseconds and too short to measure accurately (at least with respect to the other parameter values in the test). [illegible]

CIRCUIT TYPE: F-4

TEST NUMBER: 13

DATA SHEET

TEST TITLE: Time to Set a Logic Zero State

PRE RADIATION Measurement in 10^{-9} sec

Date: 12/16/64

Temp: 78°F Input P_1 τ_r 8 ; τ_f 6

Input P_2 τ_r 12 ; τ_f 11

MOD	t_{so2}	t_{so4}	t_{so1}	t_{so5}
1	11	9	48	53
2	8	5	55	62
3	11	8	48	55
4	8	5	54	59
5	5	4	54	59
6	8	7	56	60
7	5	4	55	59
8	7	6	46	52
9	7	4	57	50
10	7	6	45	54
11	7	7	53	55
12	7	6	55	62
13	6	5	55	49
14	7	12	51	62
15	7	5	50	57
16	10	5	42	54
17	7	8	44	50
18	10	11	51	55
19	7	7	41	46
20	8	7	36	44

TECH. [illegible] ENGR. [illegible]

POST RADIATION Measurements in 10^{-9} sec

Date: 6-16-65

Temp: 76° Input P_1 τ_r 8 ; τ_f 9

Input P_2 τ_r 12 ; τ_f 12

MOD	t_{so2}	t_{so4}	t_{so1}	t_{so5}
1	.5	0	18	24
2	-9	-13	25	31
3	4	7	23	21
4	7	4	33	53
5	-14	-11	53	27
6	-9	-9	27	26
7	-6	-8	21	27
8	-4	-7	21	24
9	.5	-5	21	29
10	-4	-5	19	22
11	9	7	52	52
12	-7	-.5	29	22
13	1	3.5	18	23
14	25.5	—	—	—
15	6	5	51	55
16	-1.5	-5	19	24
17	-1.5	0	21	23
18	10	9	50	51
19	9	6	39	41
20	3.5	-3	19	18

TECH. [illegible] ENGR. [illegible]

#14 Failed (will not hold a one state)

Minus signs indicate that switching occurs before the 10% points are reached

EQUIPMENT: Sampling oscillascope
TI Pulse gen
Digital VM IS5991

COMMENTS:

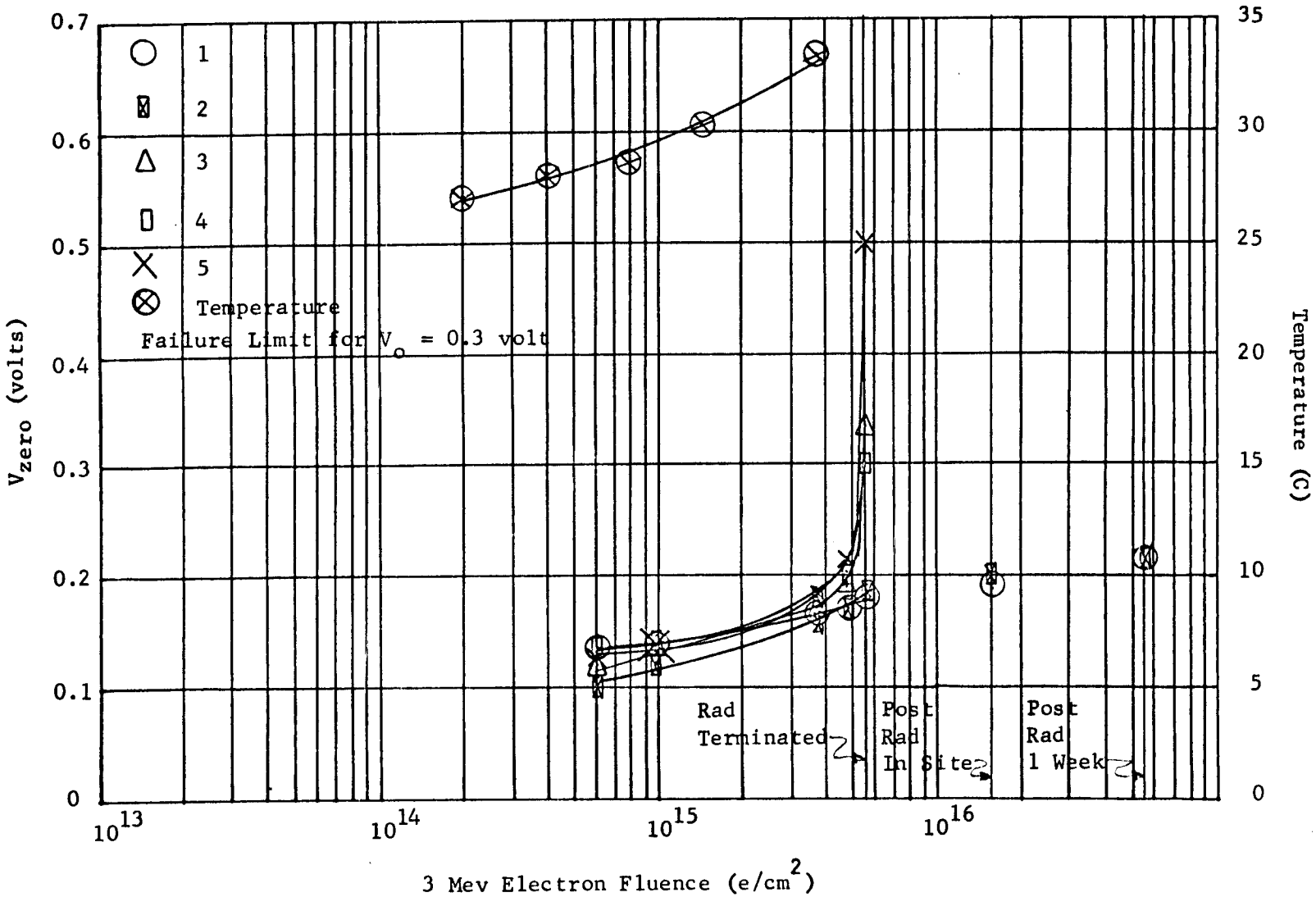
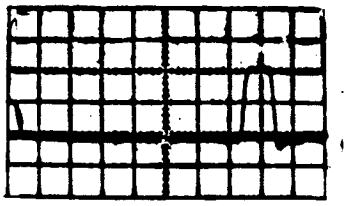
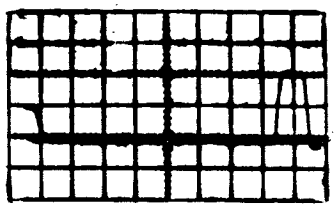


FIGURE III-32. RADIATION RESPONSE OF UNIT F-4

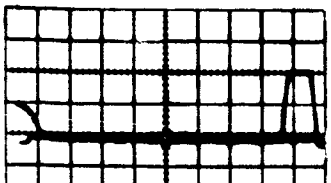
Note: For post rad in site and post rad 1 week devices 5, 4, 3, will not stay in state without reset.



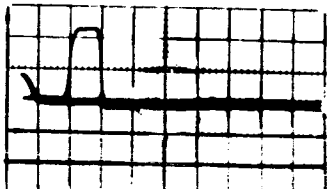
A - Initial



B - Final



C - Post Rad In Site



D - Post Rad 1 Week

Scale: 0.5 volt/cm
0.1 μsec/cm

FIGURE III-32. MULTISTAGE PROPAGATION DELAY FOR F-4 DEVICES