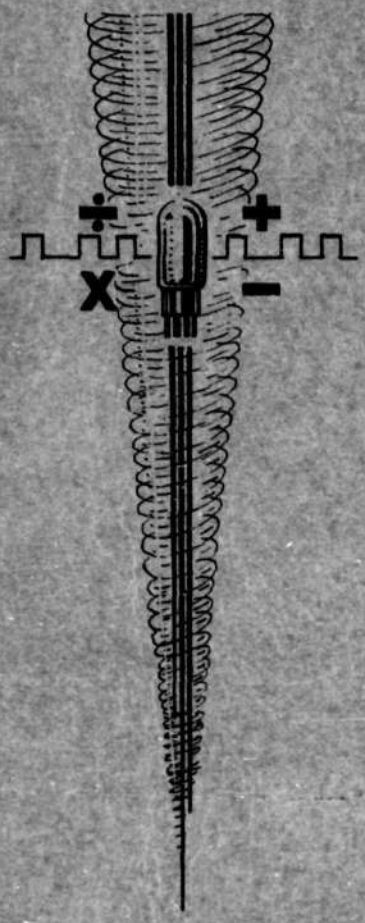


PROJECT WHIRLWIND

Contract N5ori60

SUMMARY REPORT NO. 2

VOLUME 13

SYSTEM DRAWINGS

SERVOMECHANISMS LABORATORY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Copy 30

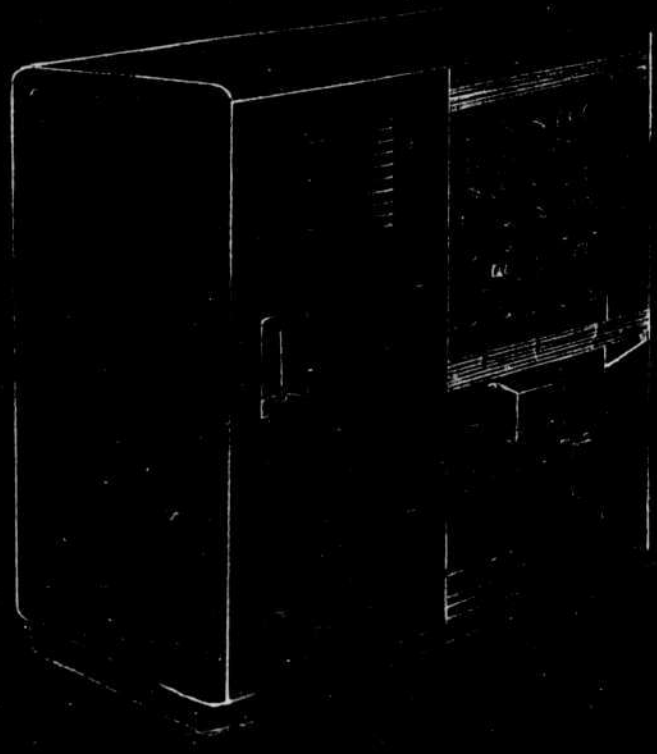
SPECIAL DEVICES CENTER

PROJECT WHIRLWIND
Summary Report No. 2
November, 1947

SYSTEM DRAWINGS

Volume 13 of 22 Volumes

Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts



WHIRLWIND I

CONTENTS

INTRODUCTION

Volumes 5 and 6 of this report describe the Whirlwind I computer in block diagram form and indicate the operations which must be performed in the computer. Volumes 15 through 19 describe the development of components and circuits necessary to the performance of these operations. This volume of photographs, circuit schematics, layouts, and mechanical drawings shows the progress which has so far been made in the synthesis of components and circuits into a working electronic system which will satisfy the demands of the block diagram.

To help in relating the circuits to the block diagrams, the drawing lists include, in addition to the drawing title and number, the number which describes the pertinent part of the system in the block diagrams. Consistent with this, the system drawings are presented in five groups headed respectively: System, Control, Storage, Arithmetic Element, and Registers, a sixth group being drawings of test equipment designed and built by this laboratory. The test equipment is described in Vol. 19, E-48, and E-52.

The correspondence between block diagrams and system drawings is not complete, because the requirements of video cabling and construction methods dictate a physical arrangement somewhat different from that indicated by the purely functional block diagrams. Differences will become apparent from a comparison of the block diagram drawings C-37070 and C-37071 in the System group, with the video cabling drawing E-30805 of E-68. All units in the latter bear the same reference numbers as are used in the block diagrams but the arrangement is different. In the block diagrams we find, in general, that a register is treated as a unit, whereas construction follows a digit-by-digit pattern, and one digit of each of several registers may be located on a panel. Assembly drawing R-30797 in the Register group, carries a digit of the program counter, block diagram reference 102, a digit of the program register 103, and a digit of the check register 601.

The System group of drawings includes a block diagram list, two block diagrams and reference to two drawings which appear as a part of the following engineering memorandum. E-68 is a discussion of preliminary Whirlwind I cabling and a proposed physical arrangement of the whole system. E-53 is an estimate of power consumption of the system but is not based on the latest tube estimate given in Vol. 16, M-132.

In the Control group are given, among other things, the block schematics, circuit schematics, and assembly drawings of the program

counter, 102, and the program register, 103. These two assemblies are part of the register panel for which a Panel and Cable Plan, drawing R-30797 is given in the Register group.

The Storage drawings describe the test storage consisting of toggle switches and flip-flops, but do not include anything on electrostatic storage described in Vols. 9 and 10. The addition of electrostatic storage and its attendant circuits to the system, entails only modification of the storage switch and control matrix. A photograph of a storage switch is included in the drawings.

The drawings and photographs headed Arithmetic Element are descriptive of the five-digit multiplier now in operation. This was initially operated at a 100 kc pulse repetition frequency on October 28, 1947, and is now operating at 2 megacycles. Photographs of the multiplier and its controls are typical of the type of construction which will be used in Whirlwind I. The frontispiece of this volume indicates the type of cabinets to be used. The Whirlwind I arithmetic element will be a redesign of this multiplier based on experience gained from it. There will be a considerable extension of the arithmetic element control beyond the somewhat limited capabilities of the multiplier control.

The elements whose status is given in the following summary are subject to certain modifications and revisions not specifically mentioned in the summary. The change from the 6AS6 gate tube to the SR-1030 described in Vol. 16 may eliminate some tubes with attendant revisions of circuits and layouts. Pulse width and resultant duty factor may be modified and call for a revision in the value of some of the circuit components. Checking methods not yet fully investigated may require the addition of some gate tubes, control lines, and bus connections not now included in the system, see Vol. 7, M-127. References are to further descriptions of the various elements. For a time schedule, see Vol. 1, drawing B-31202.

101	Master Clock	- All components constructed and in use in 5-digit multiplier. Not packaged in one unit for WWI. Vol. 19, E-48, E-52.
102	Program Counter	- Preliminary model constructed. Vol. 19, E-55, M-105.
103	Program Register	- Preliminary model constructed. Vol. 19, E-55, M-105.
104	Control Switch	- Preliminary model constructed and nearly satisfactory in operation. Vol. 17, R-123.
105	Operation Matrix	- Design data available based on 104 above. Not yet laid out.

106	Time Pulse Distributor	- Constructed by Sylvania and operating satisfactorily.
107	Operation Timing Matrix	- Design data available based on 104 above. Not yet laid out.
108	Program Timing Matrix	- Design data available based on 104 above. Not yet laid out.
200	Storage Arrangement	- Block and Circuit schematics complete. Details below.
201	Storage Switch	- Same as control switch, 104.
203	Flip-flop Storage	- Under construction, Vol. 19, E-63.
301	A Register)	
302	Accumulator)	- Operating in 5-digit multiplier.
303	B Register)	
305	Step Counter	- Operating in 5-digit multiplier. Expand from 3 to 5 stages for WWI. Vol. 19, E-126.
601	Check Register	- Preliminary model constructed. Vol. 19, E-55, M-105.

REFERENCE INDEX

M Series Memorandums

REF.	VOL.	REF.	VOL.	REF.	VOL.
M-32	8	M-95	8	M-133	18
M-46	9	M-96	9	M-134	7
M-56	9	M-99	15	M-135	7
M-58	15	M-100	8	M-136	7
M-61	8	M-101	11	M-137	7
M-62	4	M-103	16	M-138	15
M-63	4	M-105	19	M-140	4
M-64	4	M-106	11	M-141	7
M-65	14	M-107	19	M-142	8
M-66	4	M-109	16	M-143	9
M-68	15	M-110	15	M-144	10
M-69	4	M-111	7	M-145	11
M-71	8	M-112	9	M-146	12
M-72	16	M-113	7	M-147	13
M-74	14	M-114	19	M-148	14
M-76	4	M-116	16	M-149	15
M-77	15	M-117	7	M-150	16
M-78	8	M-118	16	M-151	17
M-80	16	M-119	16	M-152	18
M-81	16	M-121	9	M-153	19
M-82	16	M-123	7	M-154	20
M-83	16	M-124	8	M-155	21
M-85	14	M-127	7	M-156	22
M-89	11	M-128	16	M-157	11
M-91	15	M-129	7	M-158	7
M-92	15	M-130	9	M-159	9
M-94	8	M-131	16	M-160	8
		M-132	16	M-161	7

REFERENCE INDEX

E Series Memorandums

C Series Memorandum

REF.	VOL.	REF.	VOL.
E-7	14	E-52	19
E-24	7	E-53	13
E-31	10	E-54	19
E-32	10	E-55	19
E-33	19	E-56	15
E-37	15	E-57	15
E-38	19	E-58	19
E-39	15	E-59	19
E-41	15	E-60	19
E-42	15	E-61	16
E-44	19	E-63	19
E-45	19	E-64	15
E-47	15	E-68	13
E-48	19	E-69	15
E-49	19	E-71	19
E-50	16	E-73	16
C-15	14		

REFERENCE INDEX

R Series Memorandums

REF.	VOL.	REF.	VOL.
R-36	14	R-115	4
R-49	14	R-116	4
R-63	14	R-117	16
R-64	3	R-118	16
R-89	19	R-120	10
R-90	4	R-121	19
R-94	14	R-122	18
R-98	14	R-123	17
R-100	14	R-124	11
R-103	14	R-125	14
R-104	16	R-126	19
R-106	15	R-127	5
R-108	15	R-127	6
R-109	19	R-128	10
R-110	9	R-129	12
R-111	15	R-130	9
R-113	15	R-131	10
R-114	8	R-132	10

SYSTEM DRAWING LIST

Summary List of Block Diagrams	B-37079
System Block Diagram	C-37071
Bus Connections	B-37070

Following drawings for reference only. They are included in E-68.

Preliminary Video Cable and Panel Arrangement	E-30905
Proposed Arrangement Whirlwind I Installation	D-31016

B-37079-1

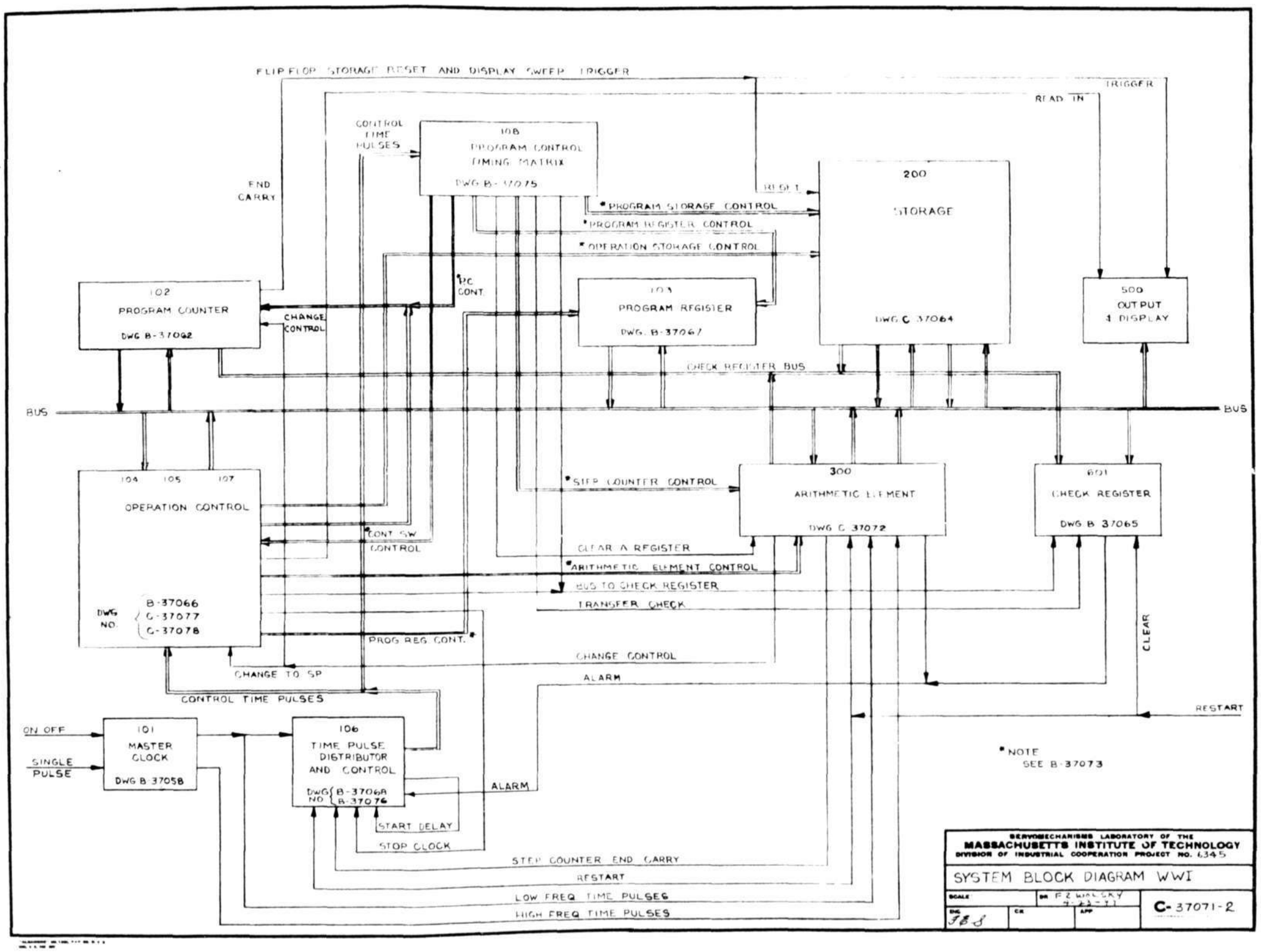
	TITLE	DWG. NO.			CODE NO.	TITLE	DWG. NO.		
	System Block Diagram	C-37071-1			101	Master Clock	B-37058-1		
	Bus Connections	B-37070-1			102	Program Counter	B-37062		
	Control Functions	B-37073-1			103	Program Register	B-37067		
	Control	B-37098			104	Control Switch	B-37066		
	Timing Diagram Operation ad	B-37080			105	Operation Matrix Part I General	C-37077		
	Timing Diagram Operation ca	B-37081			105	Operation Matrix Part II Arithmetic Element	C-37078		
	Timing Diagram Operation su	B-37082			106	Time Pulse Distributor and Control	B-37076 B-37068		
	Timing Diagram Operation cs	B-37083			107	Operation Timing Matrix Part I	C-37077		
	Timing Diagram Operation mr	B-37084			107	Operation Timing Matrix Part II	C-37078		
	Timing Diagram Operation mh	B-37085			108	Program Timing Matrix	B-37075		
	Timing Diagram Operation ts	B-37086			109	Repeat Switch - (Removed from System)	B-37059		
	Timing Diagram Operation ad	B-37087			200	Storage Chassis Arrangement	C-37064-1		
	Timing Diagram Operation sr	B-37088			201	Storage Switch	B-37066		
	Timing Diagram Operation sl	B-37089			203	Flip-Flop Storage Section	B-37057		
	Timing Diagram Operation sp	B-37090			203	Storage Output Section	B-37060		
	Timing Diagram Operation cp	B-37091			203	Flip-Flop Storage Control	B-37061-1		
	Timing Diagram Operation td	B-37092			300	Arithmetic Element	C-37072-1		
	Timing Diagram Operation sa	B-37093			301	Section of A-Register	B-37056		
	Timing Diagram Operation dv	B-37094			302	Accumulator Sections	C-37096 C-37063		
					303	B-Register Sections	B-37097-1 B-37069		
	Summary List of Block Diagrams	B-37079-1			305	Step Counter	B-37074-1		
	Parallel Digit Computer Codes	B-37001-1			601	Check Register	B-37065		

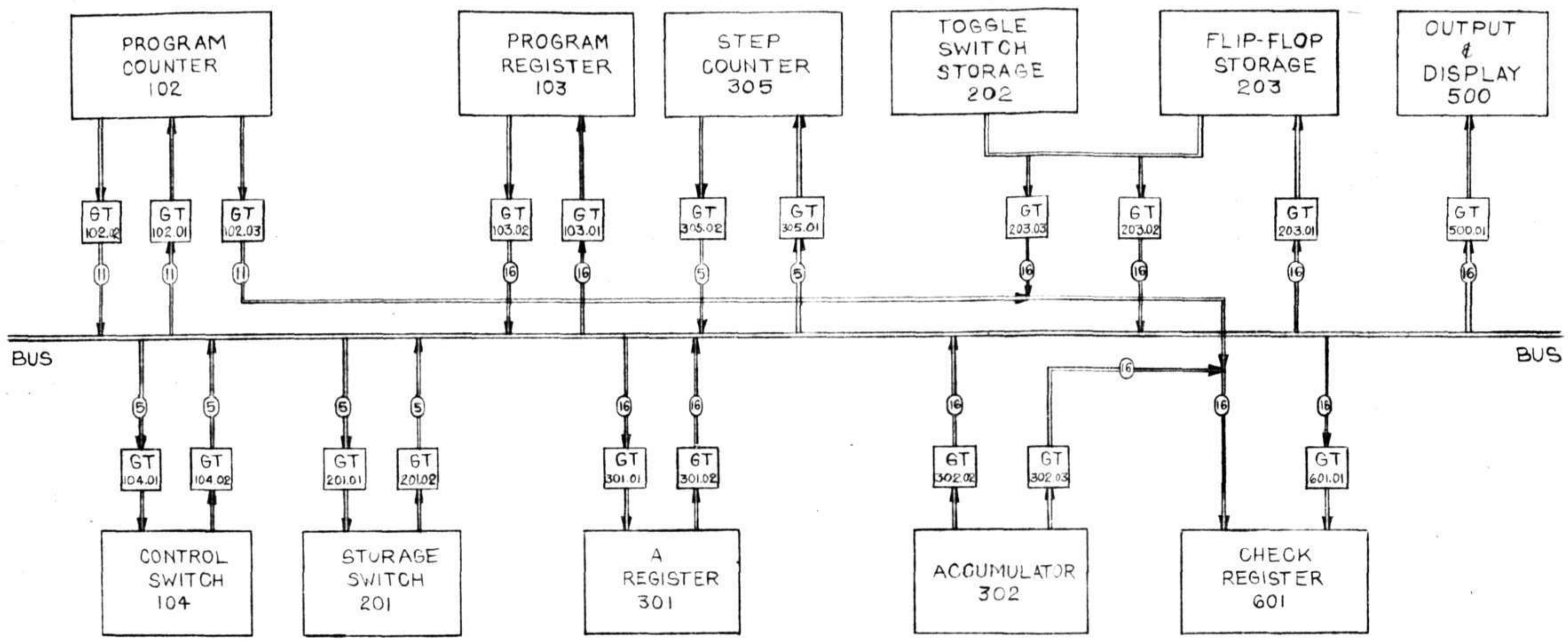
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO 6345

SUMMARY LIST OF BLOCK DIAGRAMS WWI

SCALE	DR FES 4/18/47	B-37079-2
J.A. 9/23/47	CK	APP

C-37071-2





SERVOMECHANISMS LABORATORY OF THE
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DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

BUS CONNECTIONS WW I

SCALE:	DR. Walsky 3-31-49	B-37070-2
ENG.	CK.	APP.

"ALBANENE" NO. 185L K&E CO. N.Y.
REG. U.S. PAT. OFF.

Project Whirlwind
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: WHIRLWIND I CABLING AND INSTALLATION

To: 6345 Engineers, Sylvania (3)

From: H. Wahnestock

Date: October 10, 1947

Furnished herewith are two drawings: one, a Preliminary Video Cable and Panel Arrangement, the other a Proposed Arrangement Whirlwind I Installation. It is to be clearly understood that these are for information purposes only to assist you in visualizing the complete computer and to act as a guide in making plans and designs. It is not expected that revisions or alternates will be widely or frequently distributed except to those immediately concerned with certain aspects of the design. It has been decided that Whirlwind I should be so packaged that every component and connection should be available for test without shutting down any part of the computer. The result is a much larger package than would otherwise be the case.

DRAWING NO. E-30906 - This drawing is intended primarily to show the approximate number of units in the computer and to give an idea of the interconnecting cables involved. No attempt has been made to make the number of cables very accurate and they will be subject to change as the control functions develop. No detailed work has been done on electrostatic storage control so these connections are omitted entirely. Input and Output Registers are grouped in one box. Their number or size is not yet determined. They may be attached to the register panels or they may become a separate row of panels. Film Readers and Writers and Binary to Decimal Converters are similarly grouped in a box on the diagram. They will require control lines not shown and will probably be large boxes of equipment rather than rows of panels.

Three rows of panels are shown together with tentative dimensions. The 26" width has been decided on. The vertical dimension for the panel contents as shown is probably within 30% of final design. The driver panels will probably be the same size as the digit panels. No layout has been done on the control panels but some of them, in particular the matrices, will be considerably larger than the other panels. No design has been done on the Operator's Console and this drawing merely indicates connections and what may go in it.

DRAWING NO. D-31016 - This proposed arrangement of Whirlwind I is to be interpreted as one of many ways in which the panels shown on the previous drawing might be fitted into the available space with reasonable cabling symmetry. A double floor is assumed. Air ducts run transversely and feed each cabinet individually. Signal and check busses run fore and aft under the floor; control lines run transversely under the floor between the two sections of a register. In general in the register, each cabinet holds a single digit of each of several registers. The ninth cabinet from the right-hand side holds the control gate drivers. The space assigned to Input and Output Registers is very nebulous. They may be included in the Register Panels. The possible addition of some registers under consideration may require another full row of cabinets. Space for the Control, including the Timing Matrices is a rather rough estimate.

Harris Fahnestock

H. Fahnestock

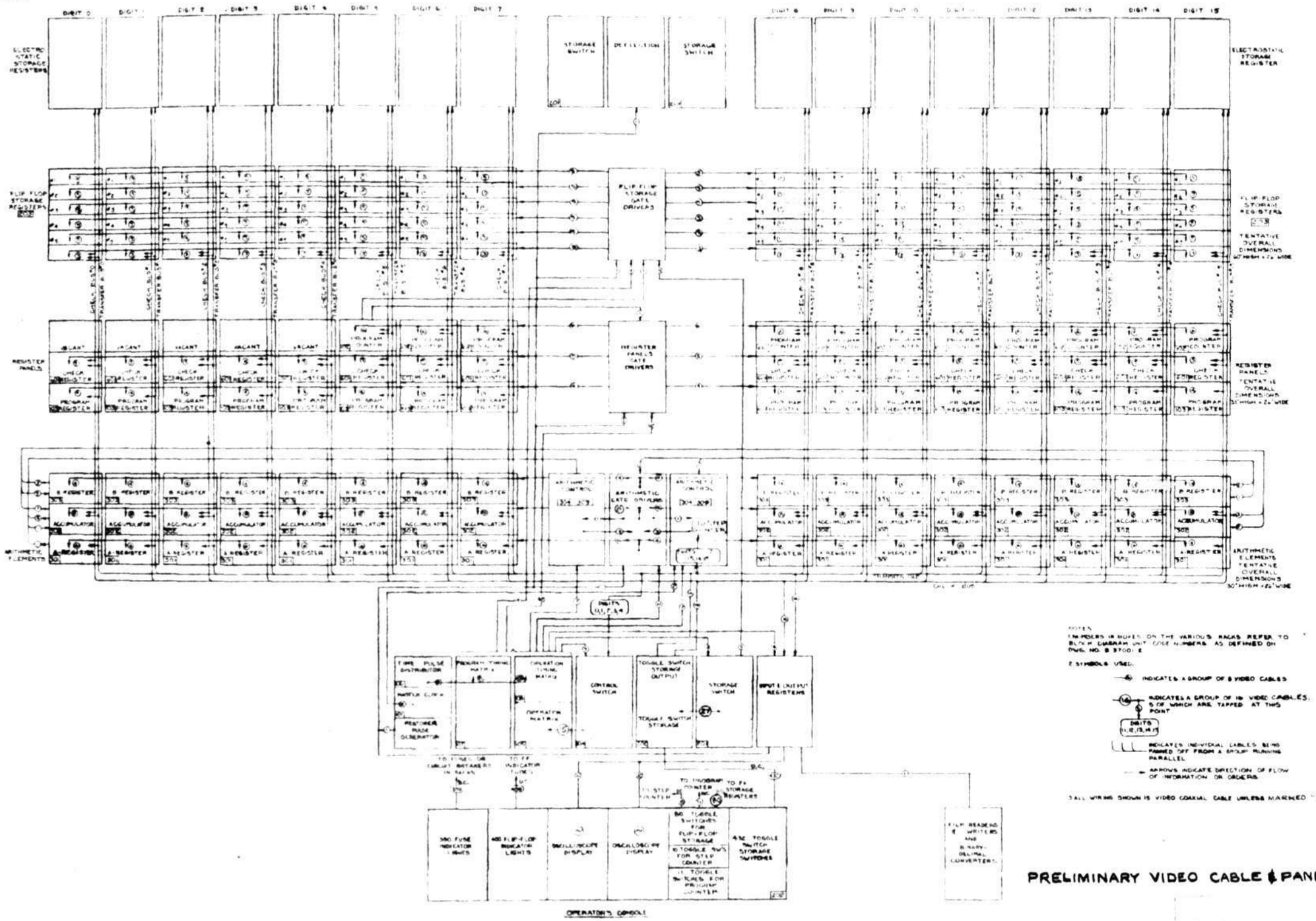
LIST OF DRAWINGS:

E-30905

D-31016

HF:has

E-30905



NOTES

1 NUMBERS IN BOXES ON THE VARIOUS RACKS REFER TO BLOCK DIAGRAM UNIT CODE NUMBERS AS DEFINED ON DWG. NO. B 37001 E

2 SYMBOLS USED.

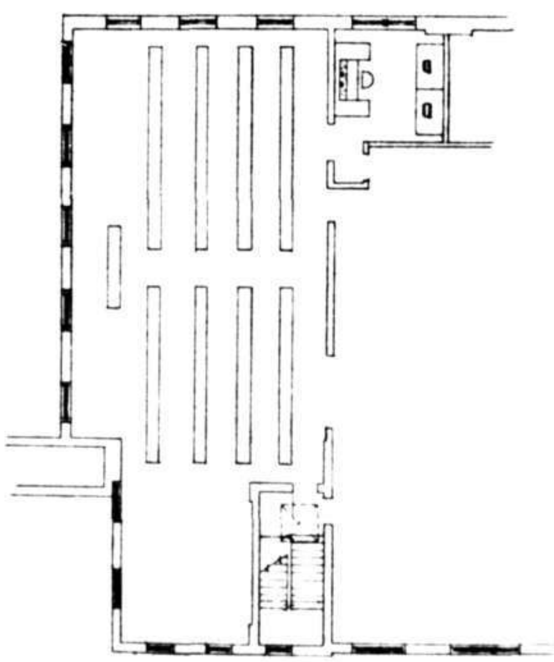
- 8 — INDICATES A GROUP OF 8 VIDEO CABLES
- 16 — INDICATES A GROUP OF 16 VIDEO CABLES, 5 OF WHICH ARE TAPPED AT THIS POINT
- DIGITS 0,1,2,3,4,7 — INDICATES INDIVIDUAL CABLES BEING TAPPED OFF FROM A GROUP RUNNING PARALLEL
- ARROWS INDICATE DIRECTION OF FLOW OF INFORMATION OR ORDERS

3 ALL WIRING SHOWN IS VIDEO COAXIAL CABLE UNLESS MARKED "DC"

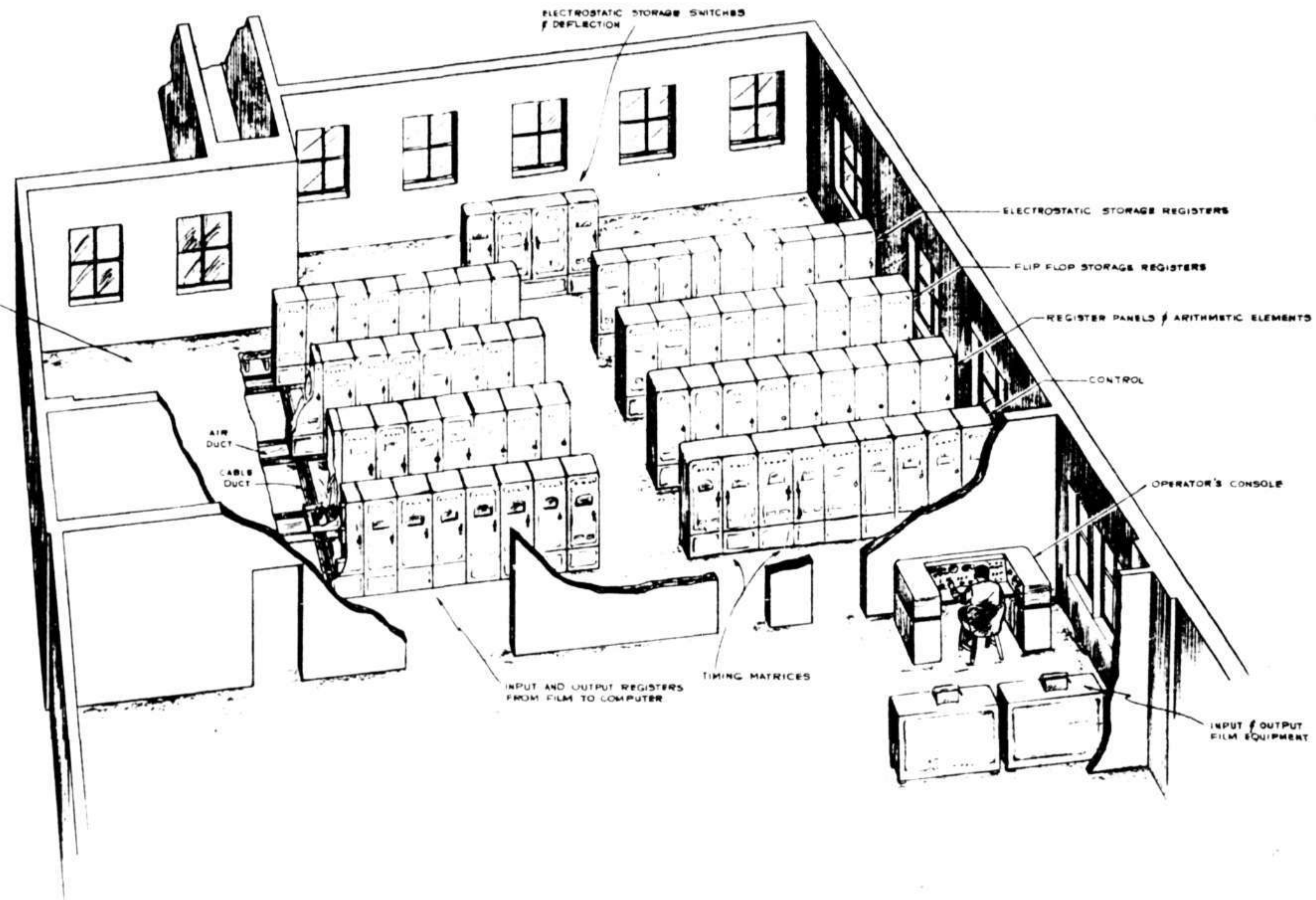
PRELIMINARY VIDEO CABLE & PANEL ARRANGEMENT

6345	F. WOLSKY 10/9/47	C.W.W. 10-9-47
C.W.W. 10-9-47	E-30905 B REDUCTION	

D-31016



SECOND FLOOR LAYOUT



PROPOSED ARRANGEMENT
WHIRLWIND I INSTALLATION

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
6345
D-31016
B REDUCTION

ENGINEERING NOTES NO. E-53

TO: Engineers of Project 6345

FROM: Harris Fahnestock

SUBJECT: WWI Power Estimates

DATE: August 8, 1947

A power estimate has been made for WWI and is summarized in the table below and itemized thereafter. No account has been taken of input and output devices. Filament transformer losses are included in each unit. Other power supplies and their losses are not included. Estimates are based on current circuit schematics and block schematics. Estimates for electro static storage are less accurate than others so they are shown separately in the summary.

SUMMARY

UNIT	NO. REQ	UNIT POWER	TOTAL
Arith. El,) CR, PR, PC)	16	370	5900
FF storage	16	168	2700
Register Drivers	1	779	800
Control	1	2000	2000
WWI loss in., out, E.S. stor -----			11400
E.S. Stor. Reg.	16	500	8000
Deflection	1	5000	5000
E.S. storage - - - - - - - -			13000
WWI loss input and output		25 KW	

Estimates include filament transformer losses of 20% of filament power. The power estimates are conservative with respect to duty cycle.

1	FF :	2-6AG7's	15 watts
1	TT :	1-6AG7	5
1	GT :	1-6A36	2
1	BA :	1-6AG7	6
1	BA :	1-823	15

Arithmetic element	½ digit	241 watts
CR, PR, PC	1 digit	119
5 FF registers	1 digit	168
Register drivers		386
Arithmetic element drivers		393
2 32 position switches		1002
Time pulse distributor		405
Timing matrix		158
Clock		85
Step counter		116
Control contingencies		234

H Fahnestock

Harris Fahnestock

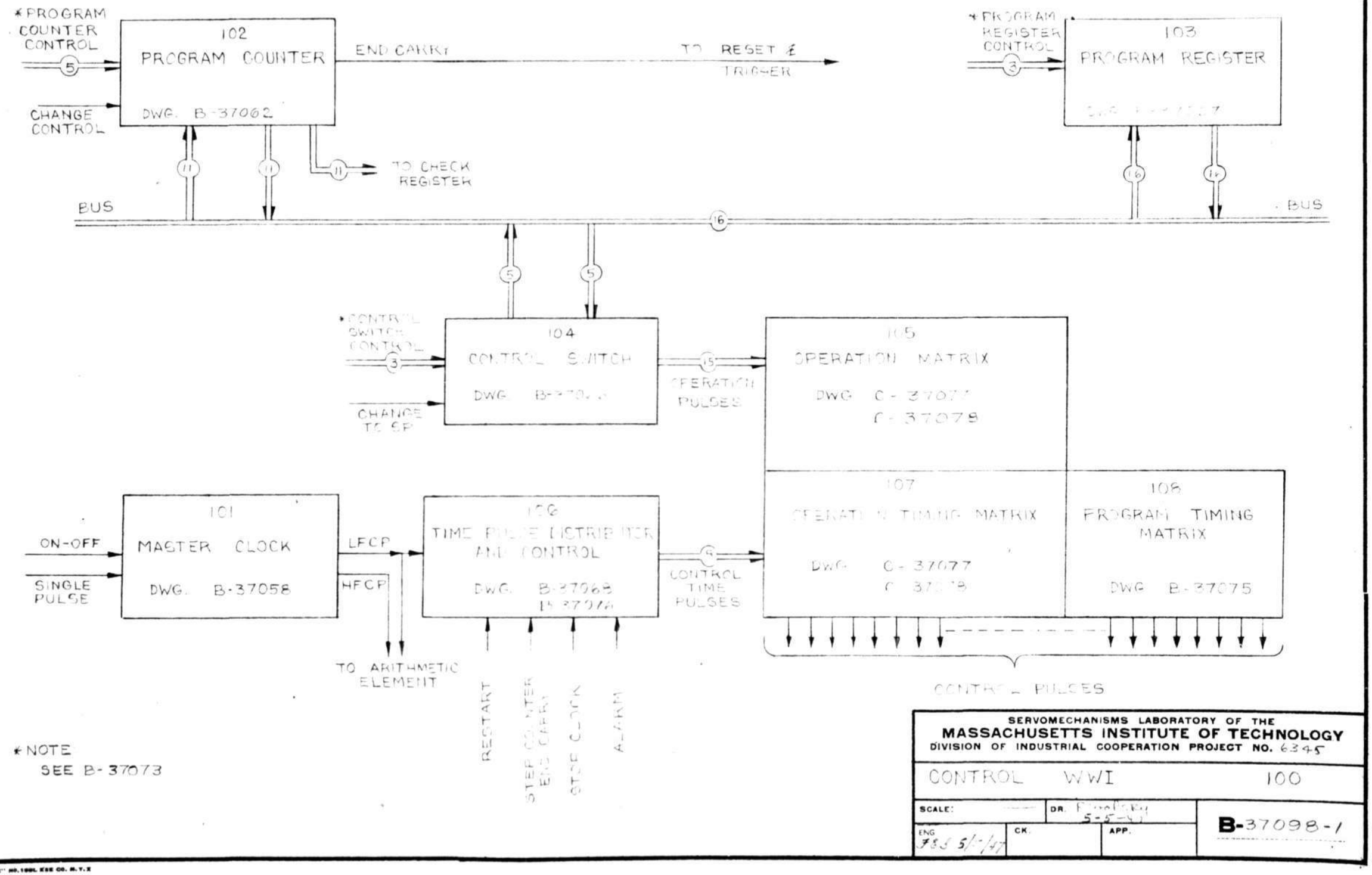
HF:maf

CONTROL DRAWING LIST

(Block Diagram Reference 100)

Block Diagram	B-37098
102 Program Counter	
Block Schematic	SB-39291
Circuit Schematic	SD-39284
Assembly	D-30800
103 Program Register	
Block Schematic	SB-39289
Circuit Schematic	SD-39283
Assembly	D-30799
104 Control Switch	
Block Schematic	D-30672
Photograph	FB-279
106 Time Pulse Distributor	SB-39447

B-37098-1



*NOTE
SEE B-37073

SERVOMECHANISMS LABORATORY OF THE
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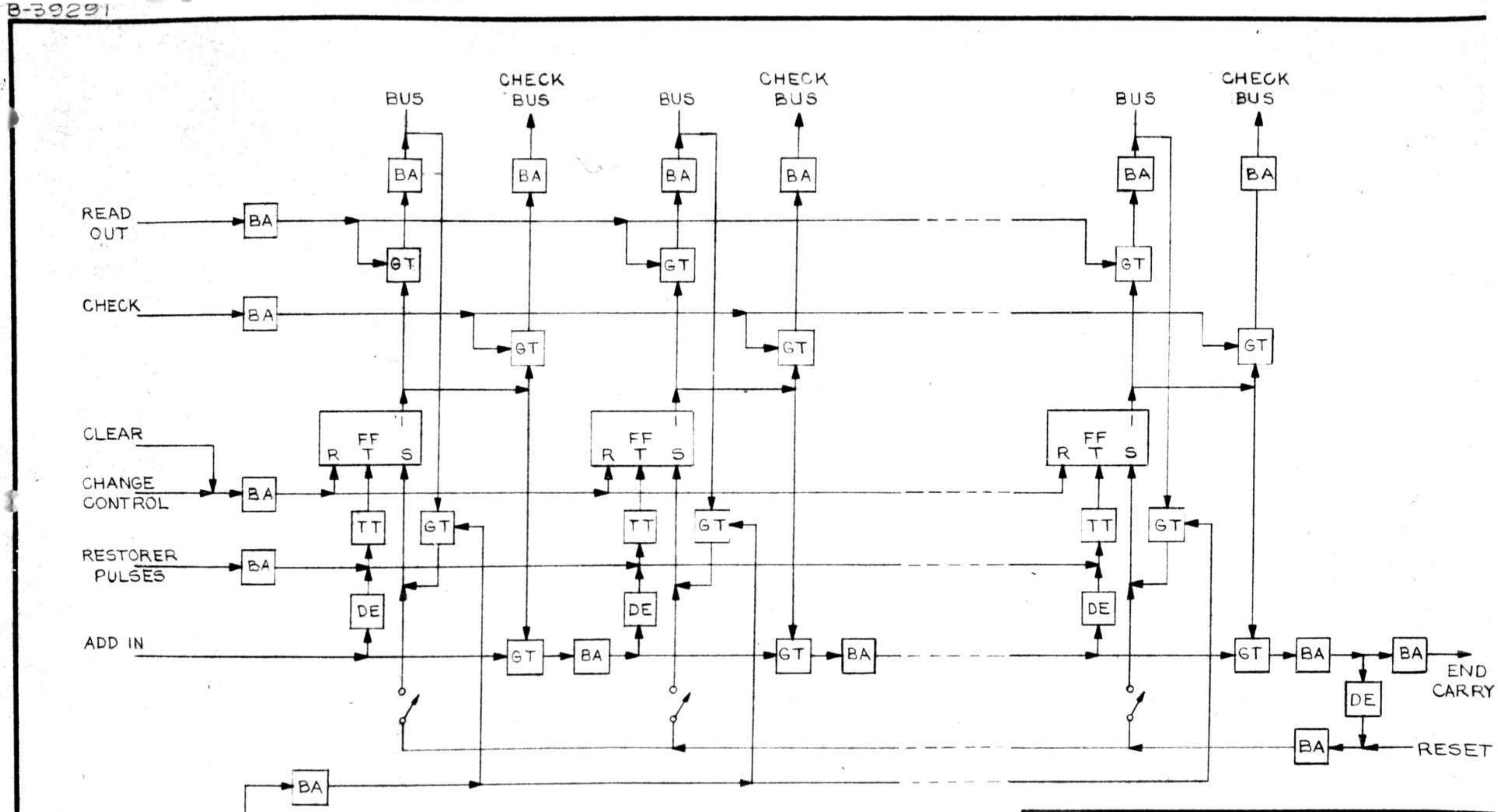
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

CONTROL WWI		100
SCALE:	DR. [illegible] 5-5-47	B-37098-1
ENG. [illegible] 5/5/47	CK.	APP.

B-39291



SERVOMECHANISMS LABORATORY OF THE
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DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

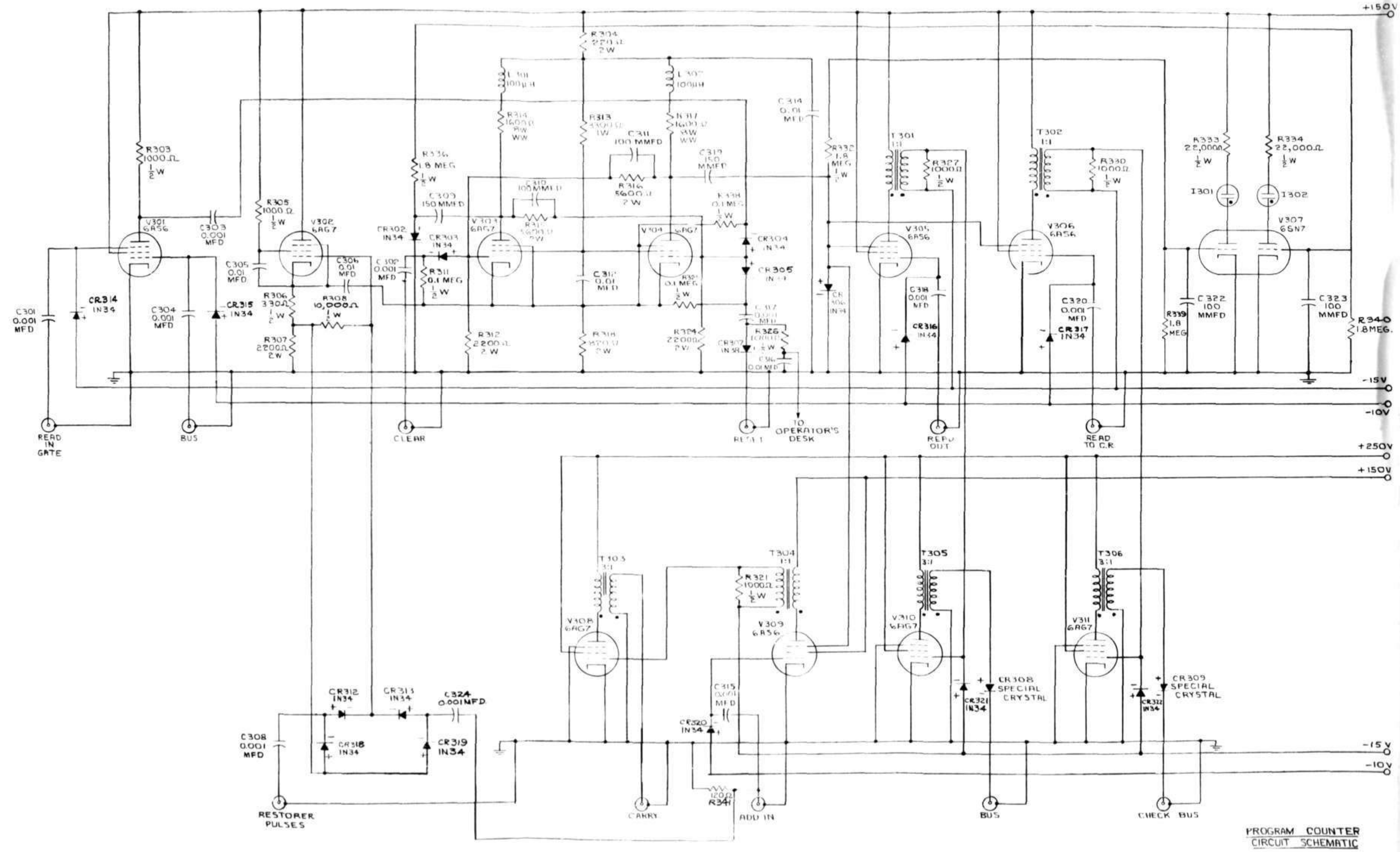
PROGRAM COUNTER BLOCK SCHEMATIC

SCALE: DR. F WOLSKY 10-27-47
ENG. L.R.E. CK. APP.

B- 39291

APPROVED FOR PUBLIC RELEASE. CASE 06-1104.

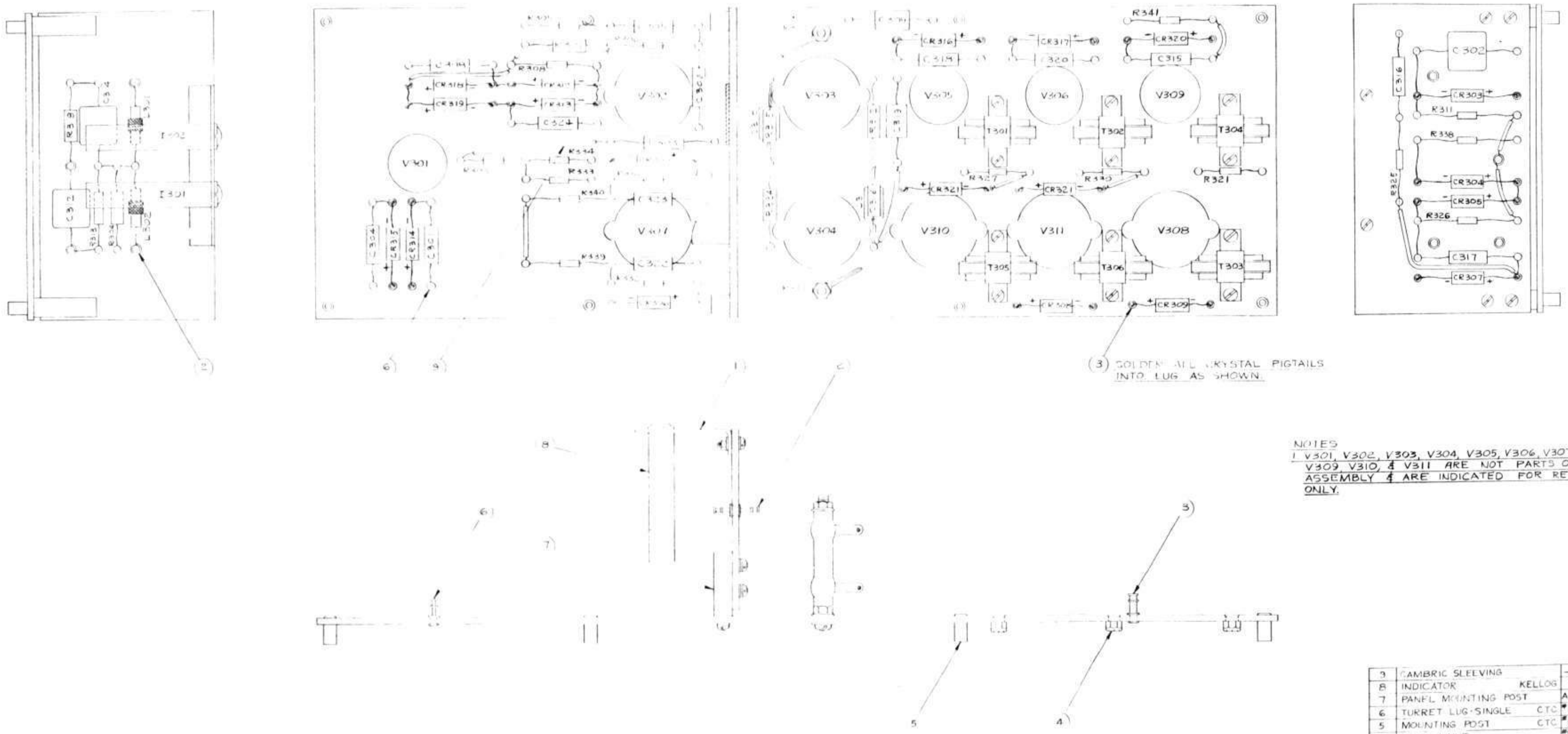
SD-39284-3



PROGRAM COUNTER
CIRCUIT SCHEMATIC

6395 | 8-31-51 | SD-39284-3

D-39800-1
SD-39284



NOTES
1 V301, V302, V303, V304, V305, V306, V307, V308, V309, V310, & V311 ARE NOT PARTS OF THIS ASSEMBLY & ARE INDICATED FOR REFERENCE ONLY.

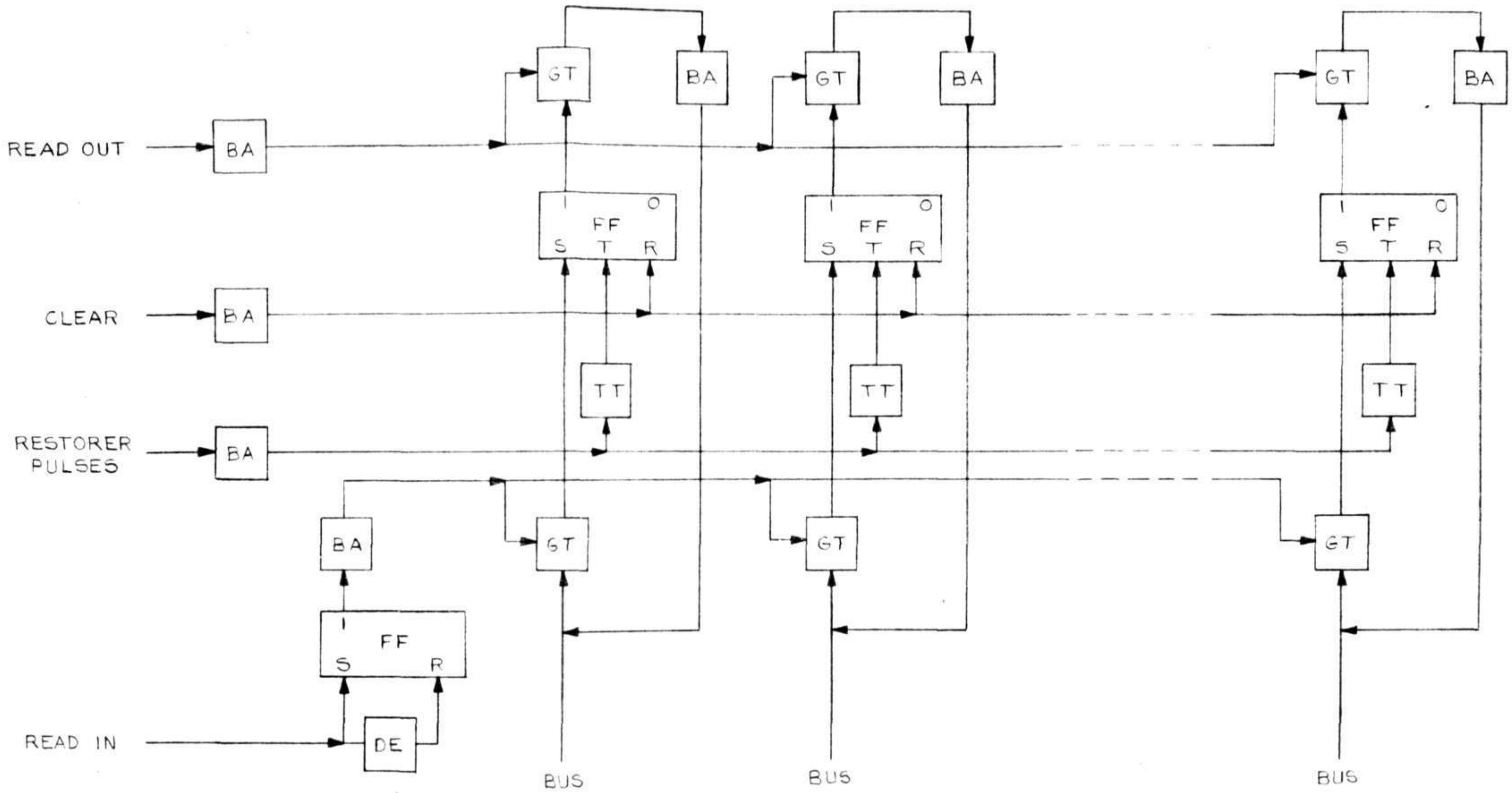
ITEM	DESCRIPTION		PART NO.	QUAN.
9	CAMBRIC SLEEVING		———	AS REQ'D
8	INDICATOR	KELLOG	#49	2
7	PANEL MOUNTING POST		A-30754	2
6	TURRET LUG-SINGLE	CTC	#1724D	78
5	MOUNTING POST	CTC	#1246D	8
4	CLINCH NUT		#22C562	12
3	TURRET LUG HOLLOW	CTC	#1558D	38
2	TURRET LUG DOUBLE	CTC	#1081A	4
1	INDICATOR MTG PLATE		A-30752	1

SERVOMECHANISMS LABORATORY OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT 6345

PROGRAM CENTER ASSY

D-39800-1

B-39289

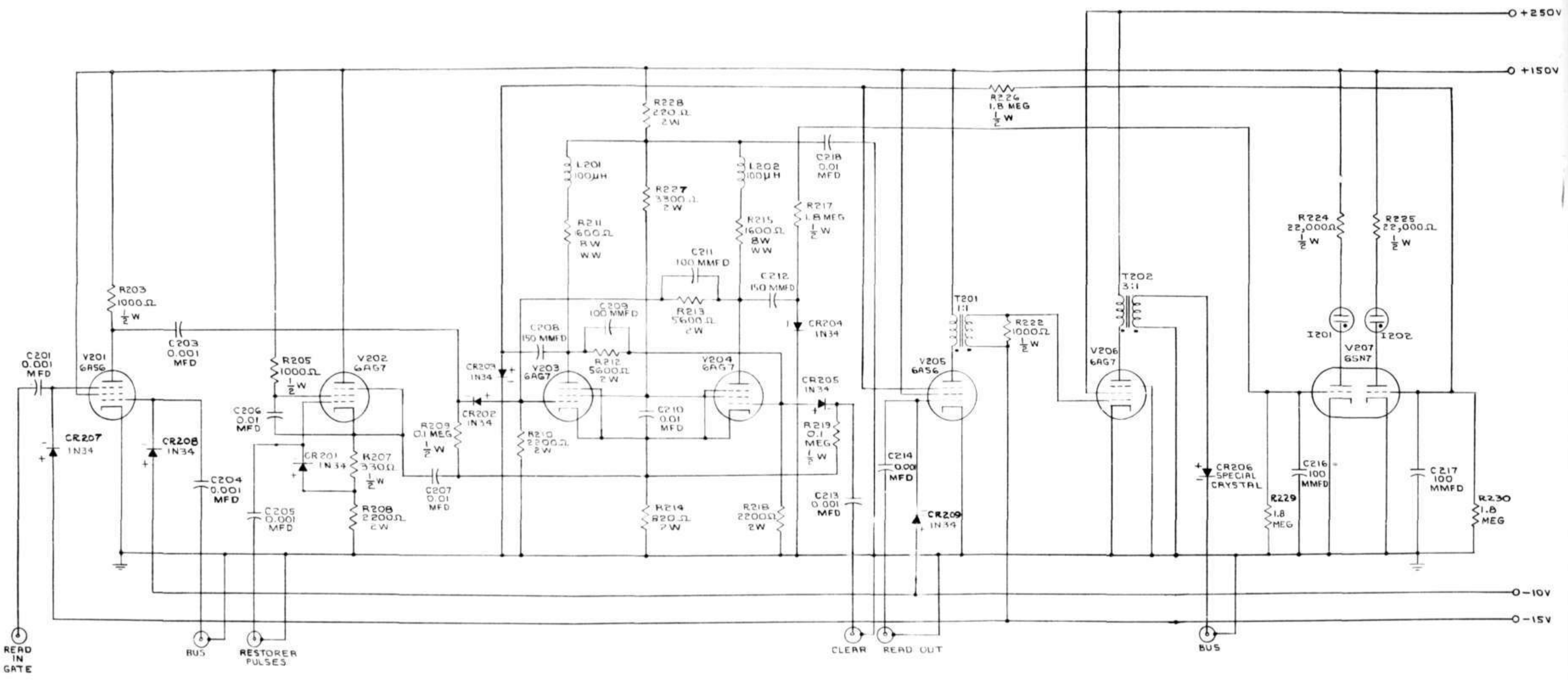


SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

PROGRAM REGISTER BLOCK SCHEMATIC

SCALE:	DR. F. WOLSKY 10-22-47	B-39289
ENG.	CK.	APP.

SD-39283-3

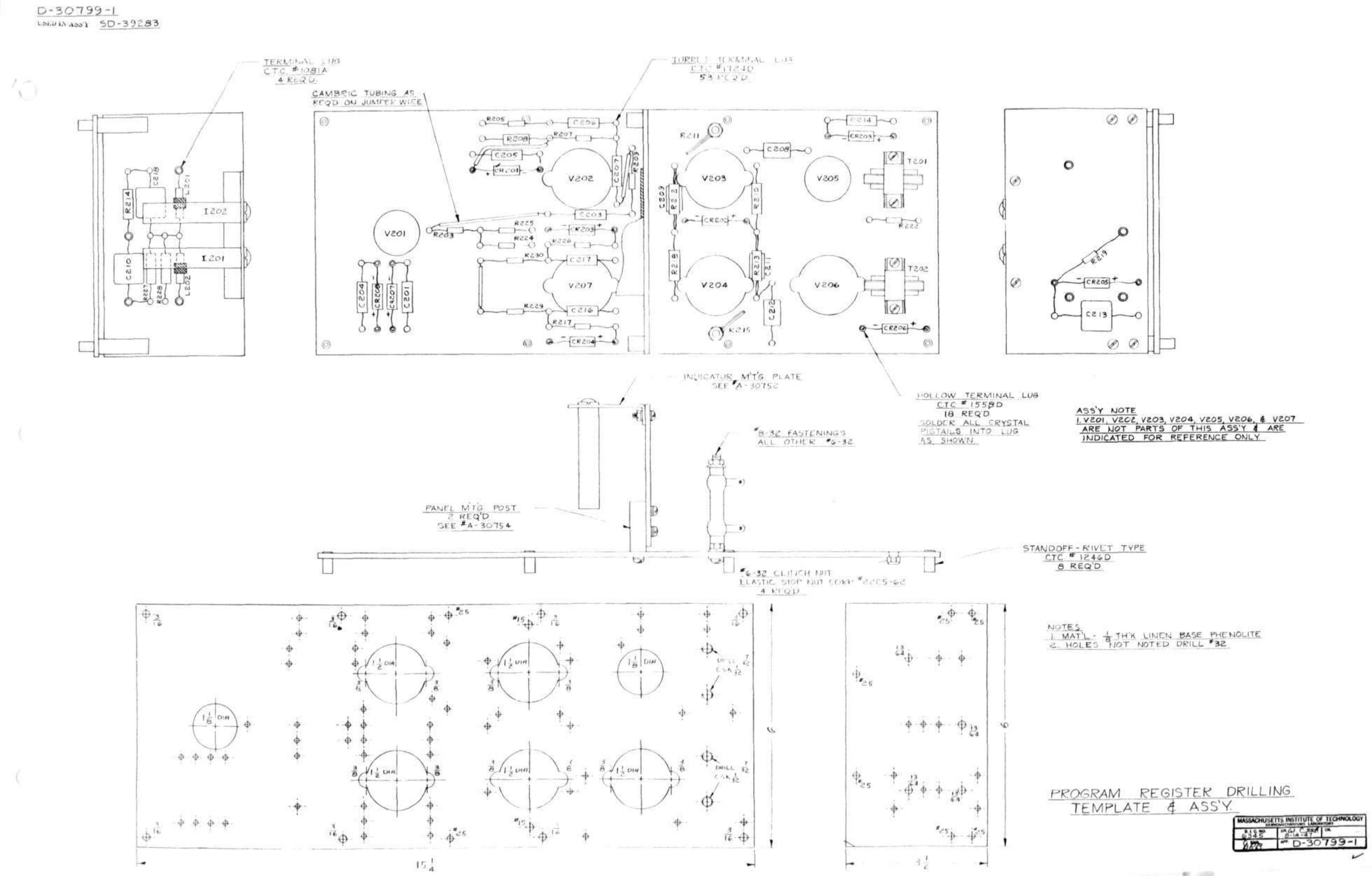


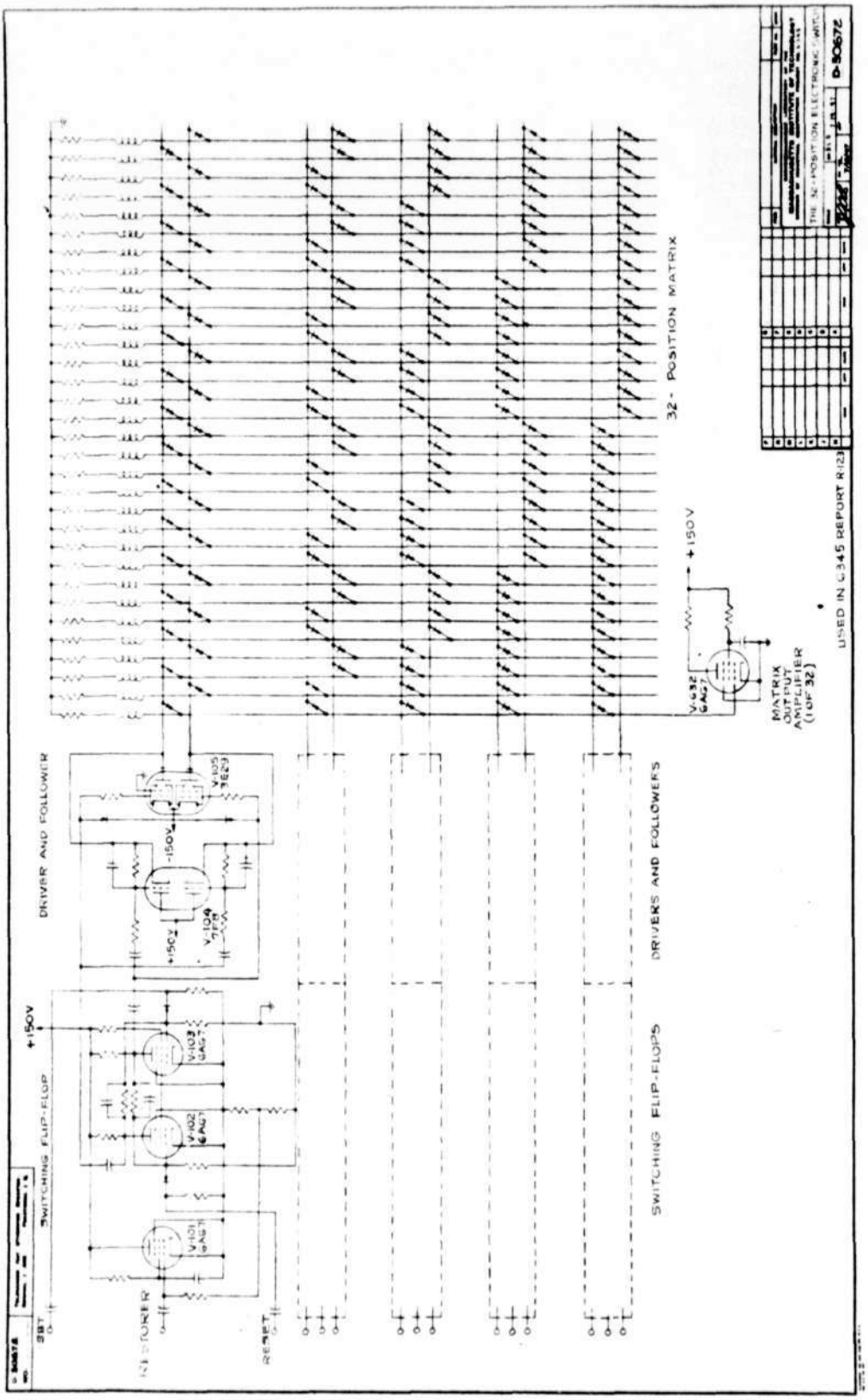
PROGRAM REGISTER
CIRCUIT SCHEMATIC

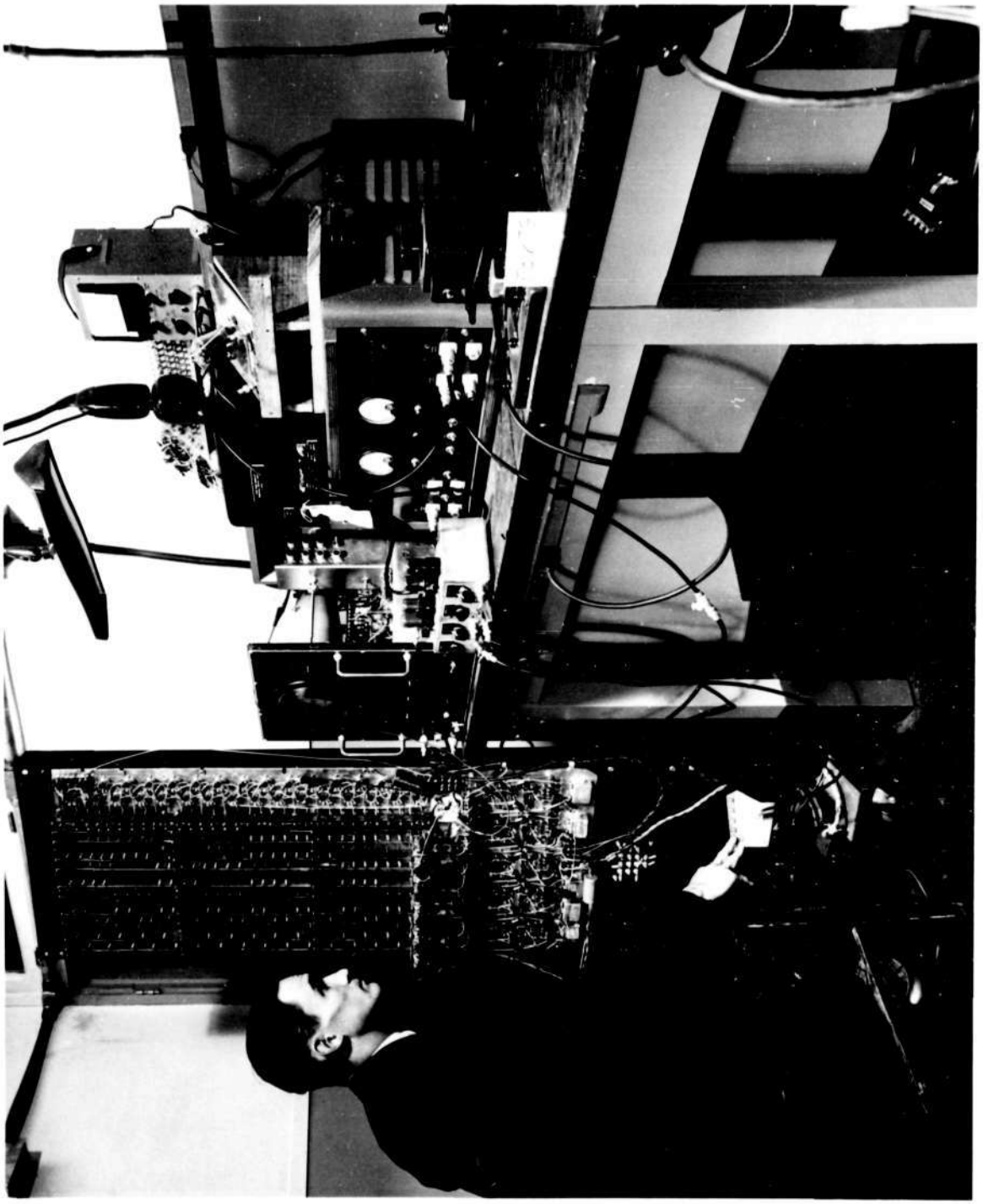
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

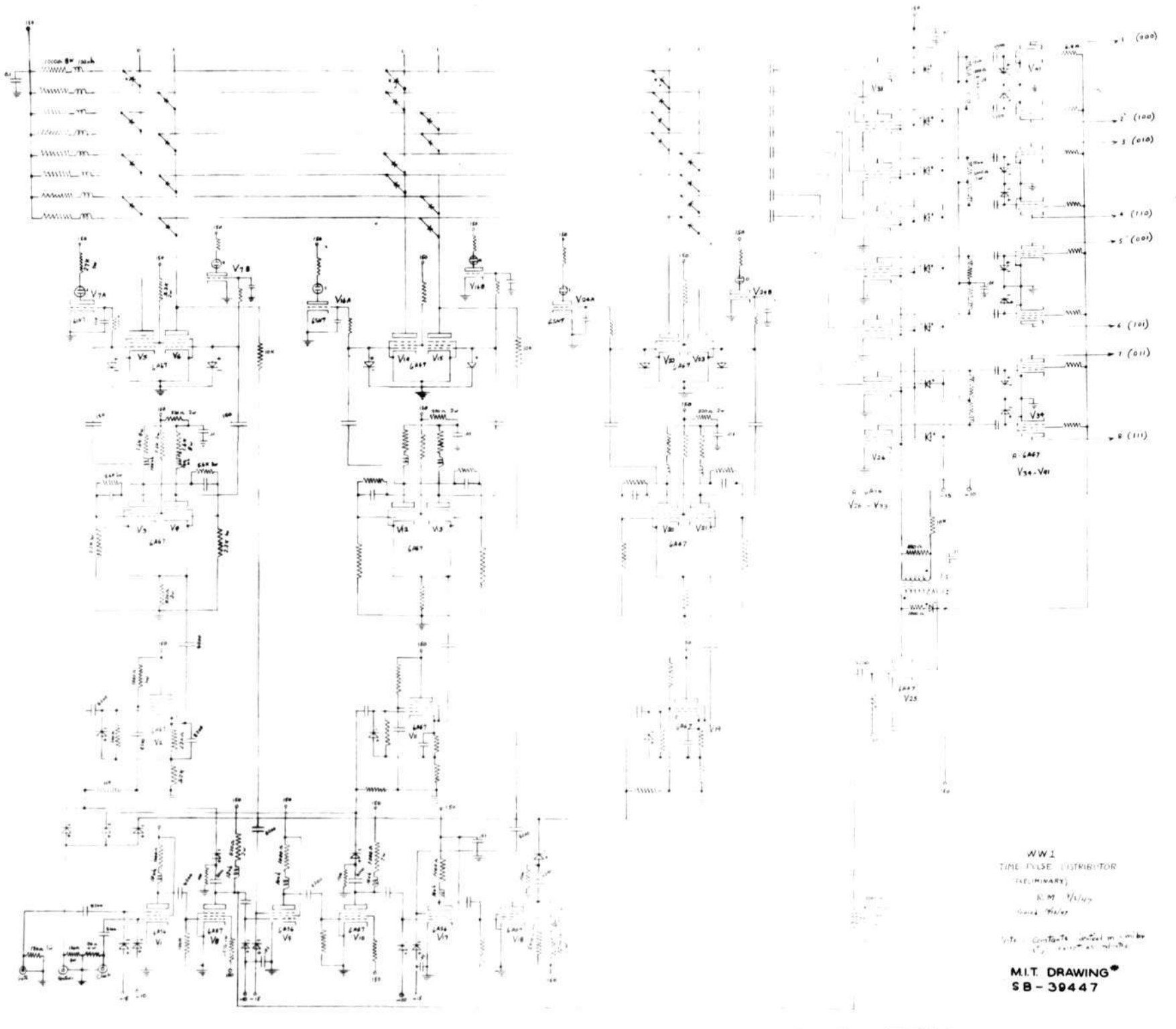
8-14-47

SD-39283-3


D-30799-1
USED IN ASSY SD-39283
TERMINAL LUG CTC #1081A 4 REQ'D
TURRET TERMINAL LUG CTC #1724D 53 REQ'D
CAMBRIC TUBING AS REQ'D ON JUMPER WIRE
INDICATOR M'T'G PLATE SEE #A-30752
HOLLOW TERMINAL LUG CTC #1558D 18 REQ'D SOLDER ALL CRYSTAL PIGTAILS INTO LUG AS SHOWN
#8-32 FASTENINGS ALL OTHER #6-32
PANEL M'T'G POST 2 REQ'D SEE #A-30754
STANDOFF - RIVET TYPE CTC #1246D 8 REQ'D
#6-32 CLINCH NUT ELASTIC STOP NUT CORP #2205-62 4 REQ'D
ASS'Y NOTE
1. V201, V202, V203, V204, V205, V206, & V207 ARE NOT PARTS OF THIS ASS'Y & ARE INDICATED FOR REFERENCE ONLY
NOTES
1. MAT'L - 1/8 TH'K LINEN BASE PHENOLITE
2. HOLES NOT NOTED DRILL #32
PROGRAM REGISTER DRILLING TEMPLATE & ASS'Y
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
D-30799-1





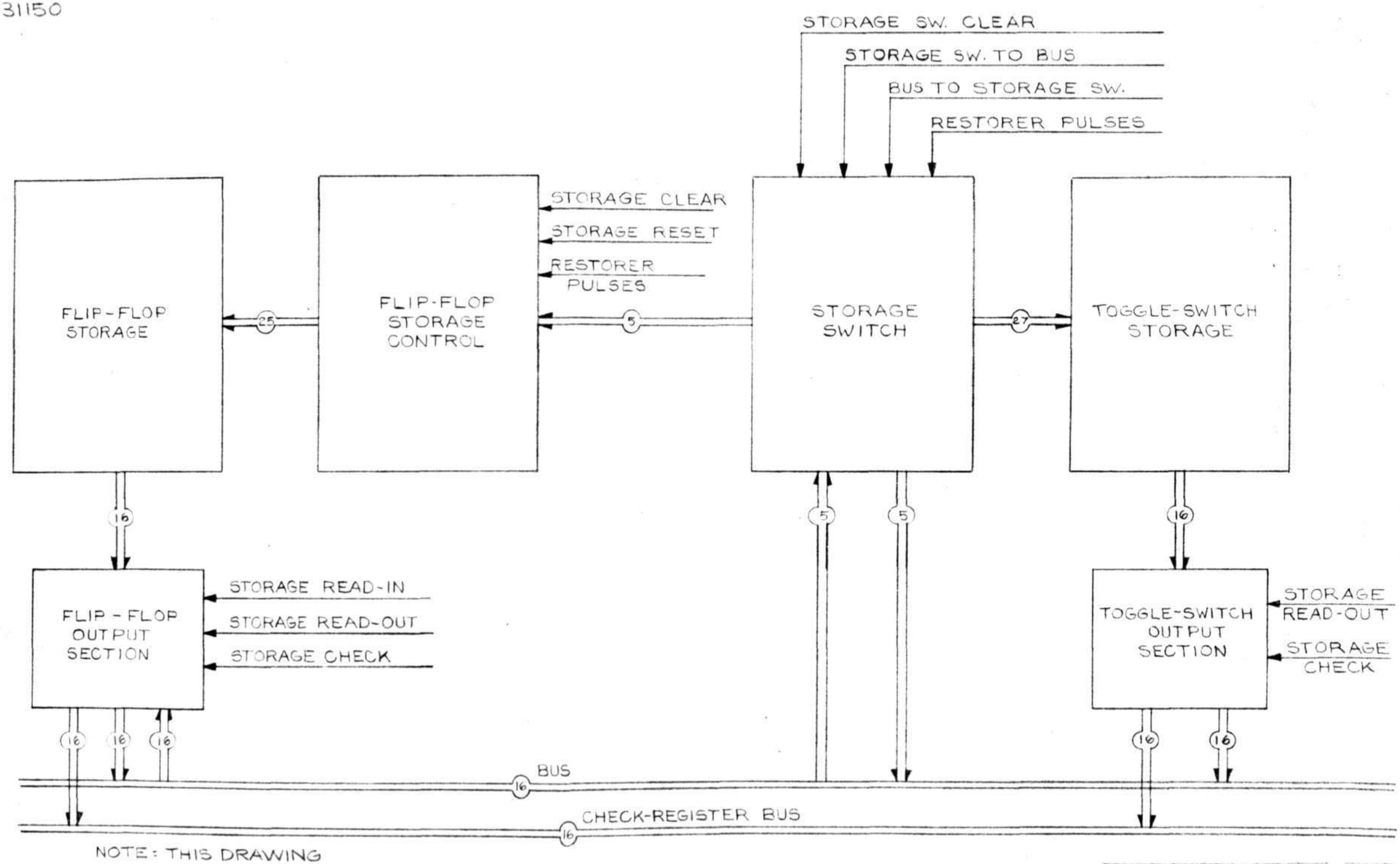


STORAGE DRAWING LIST

(Block Diagram Reference 200)

200	Storage - General Arrangement	B-31150
201	32-position Switch - Block Schematic	C-31153
201	32-position Switch - Circuit Schematic	D-30672
201	32-position Switch - Photograph	A-30694
202	Toggle Switch Storage - Block Schematic	B-31151
203	Flip-flop Storage - Block Schematic	SD-39278
203	Flip-flop Storage - Circuit Schematic	SD-39285
203	Flip-flop Storage Output - Circuit Schematic	SD-39286
203	Flip-flop Register Panel Assembly	E-30900
203	Flip-flop Register Assembly	D-30872
203	Flip-flop Storage Output Assembly	D-30879

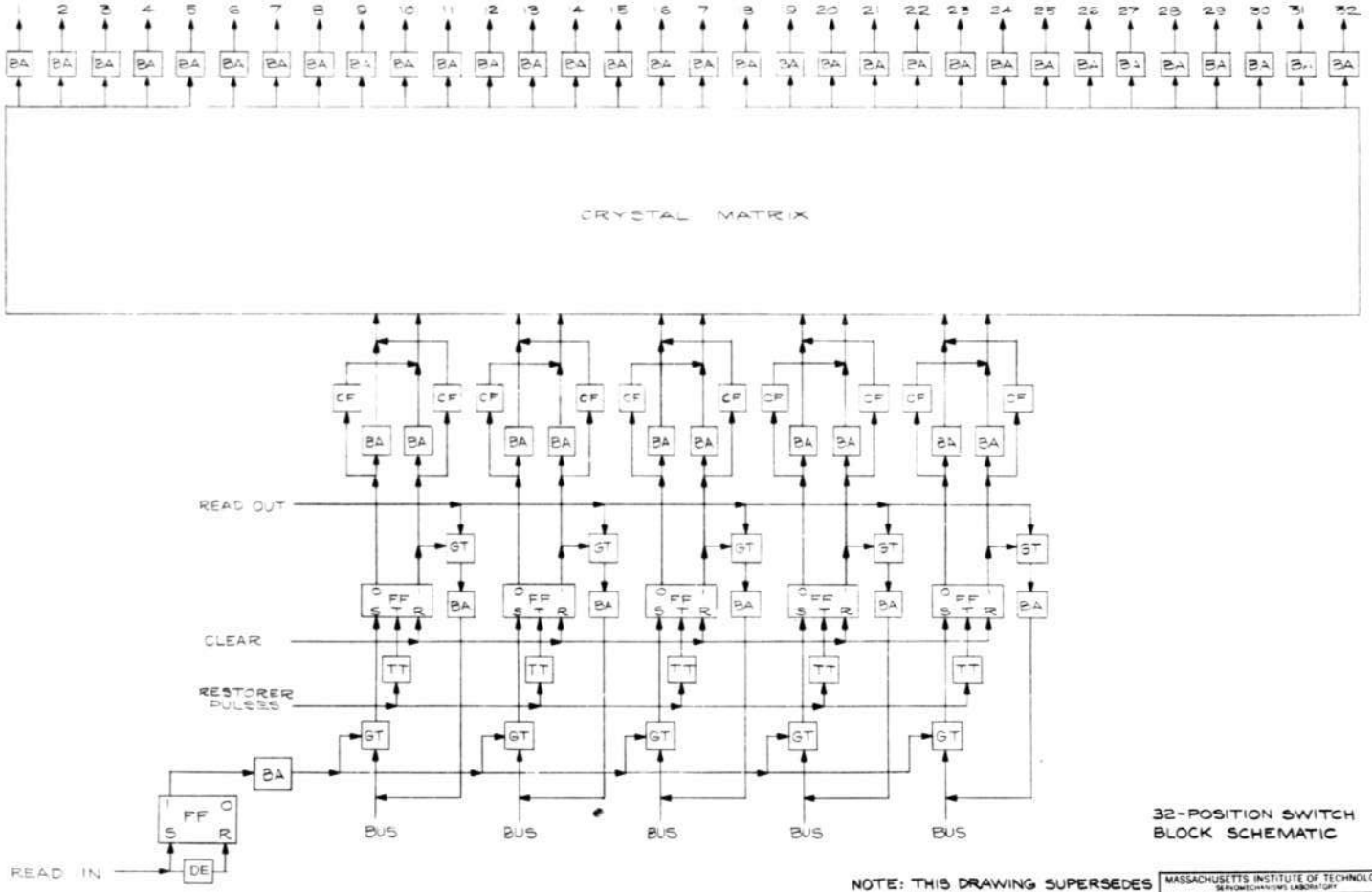
B-31150



NOTE: THIS DRAWING SUPERSEDES SD-39277-1, 11/4/47.

STORAGE - GENERAL ARRANGEMENT

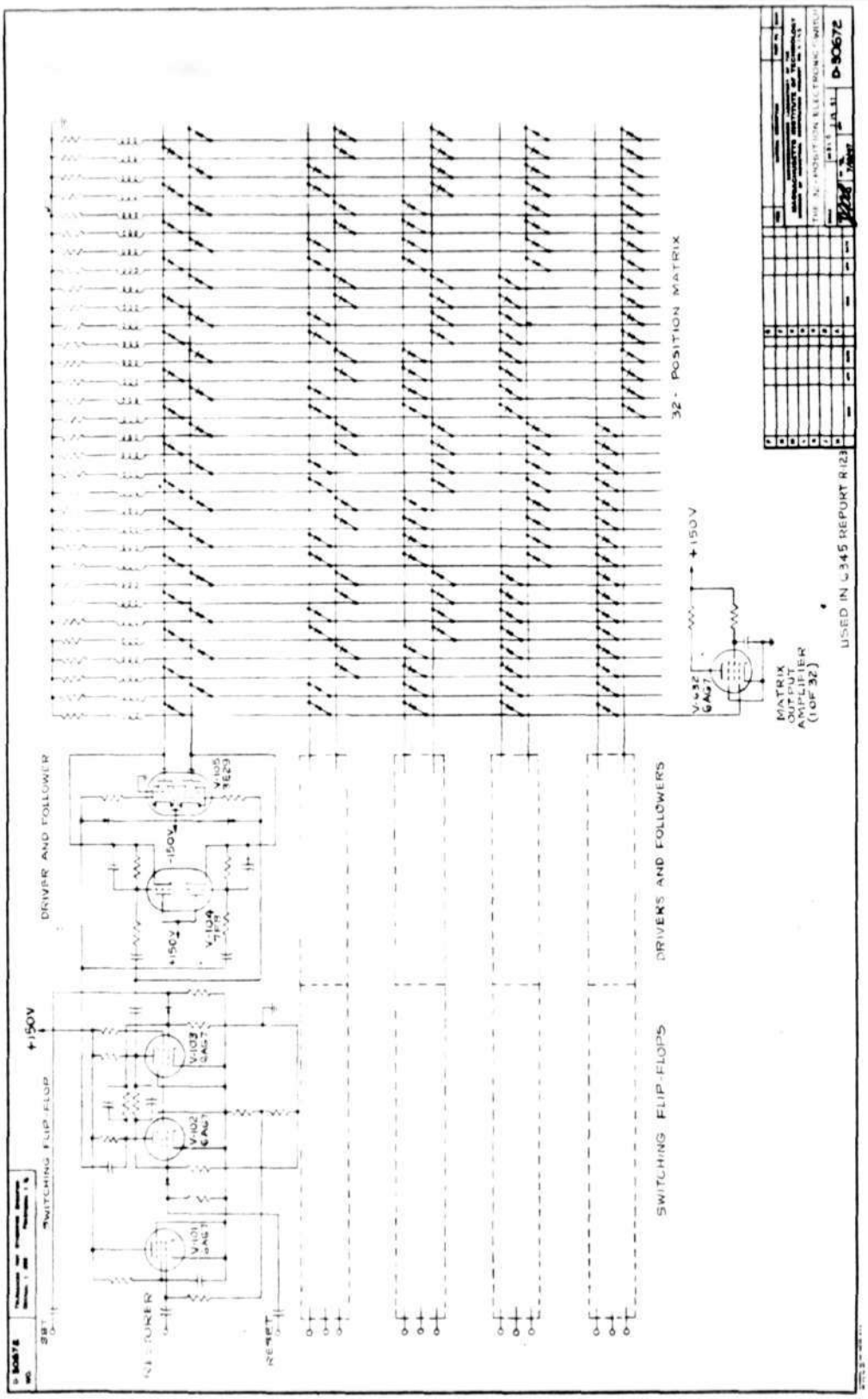
MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
6345	F.Z. WOLSKY 10/28/47
A.R.B.	B-31150



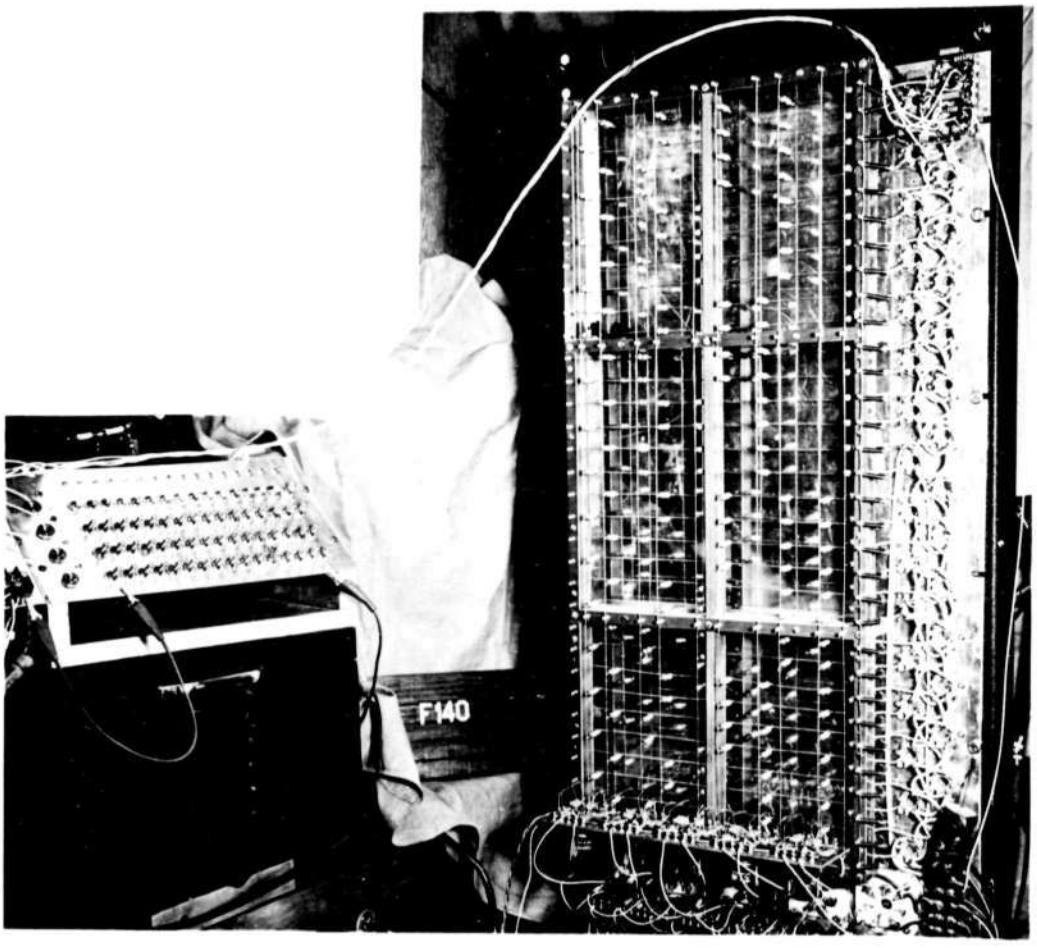
32-POSITION SWITCH
BLOCK SCHEMATIC

NOTE: THIS DRAWING SUPERSEDES SD-39275, 11/4/47.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY SERVOMECHANISMS LABORATORY		
D.C. NO. 6345	DR. McHugh 10/23/47	CK.
E.F.G.	APP.	C-31152



MASSACHUSETTS INSTITUTE OF TECHNOLOGY SERVOMECHANISMS LABORATORY		
D. I. C. NO. 6345	DR.	CK.
ENG. J.A.O'B	APP.	A-30694

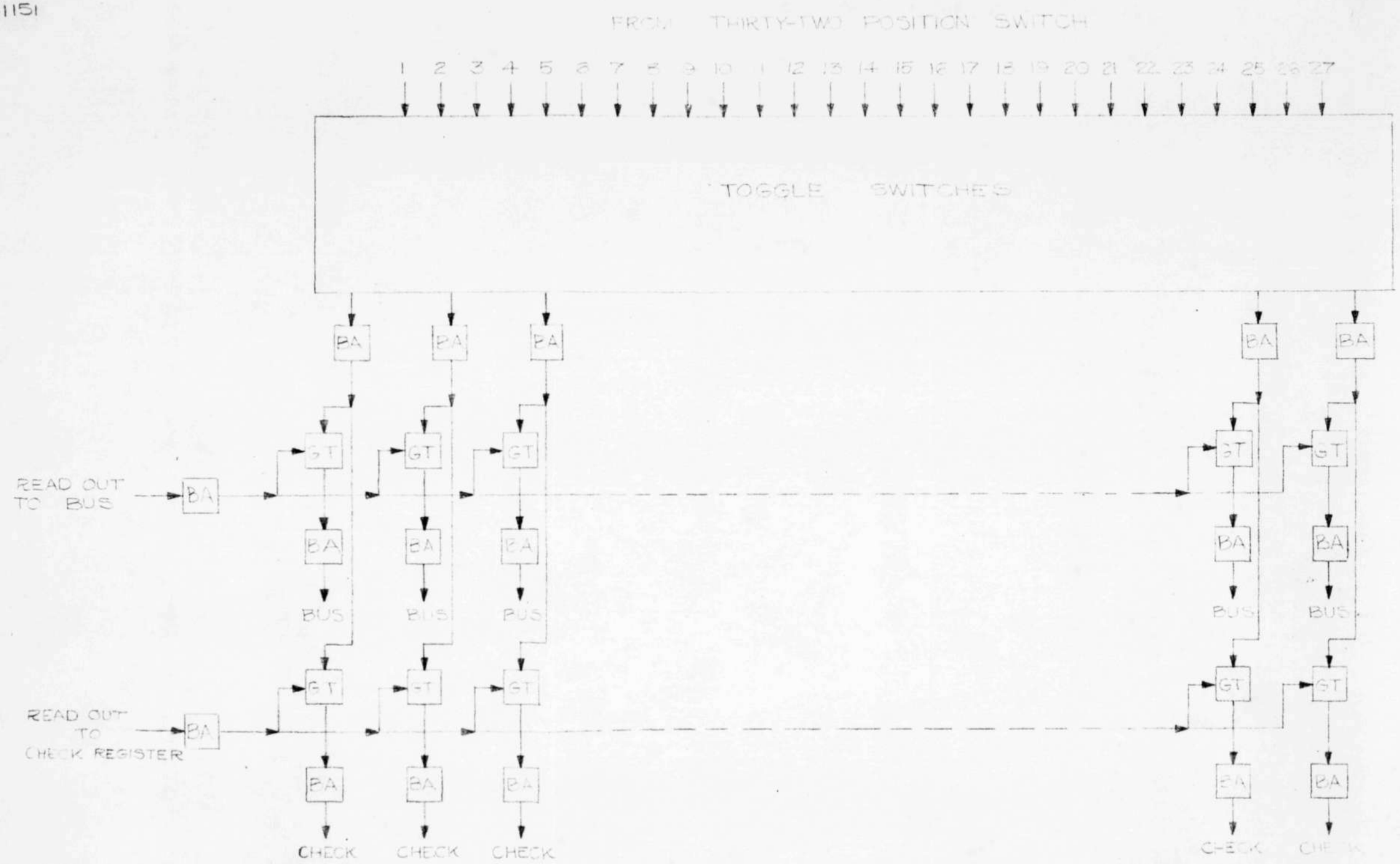


CRYSTAL MATRIX AND TOGGLE SWITCH STORAGE
USED IN THE 32 POSITION SWITCH

A-30694

USED IN 6345 REPORT R-123

B-31151

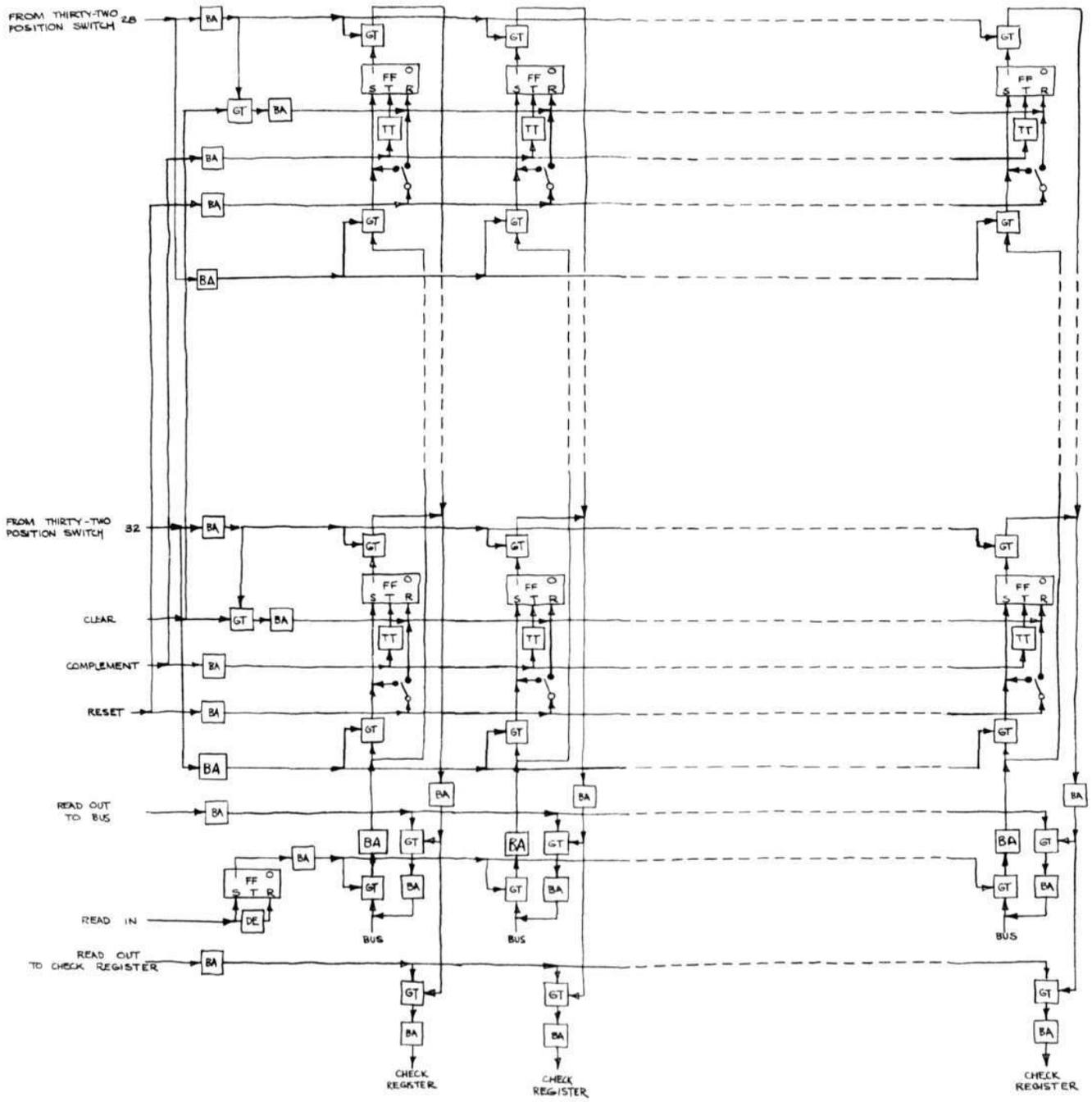


NOTE: THIS DRAWING SUPERSEDES SD-39276, 11/4/47.

TOGGLE-SWITCH STORAGE BLOCK SCHEMATIC

MASSACHUSETTS INSTITUTE OF TECHNOLOGY LABORATORY	
6345	McHugh 10/30/47
W.R.B.	B-31151

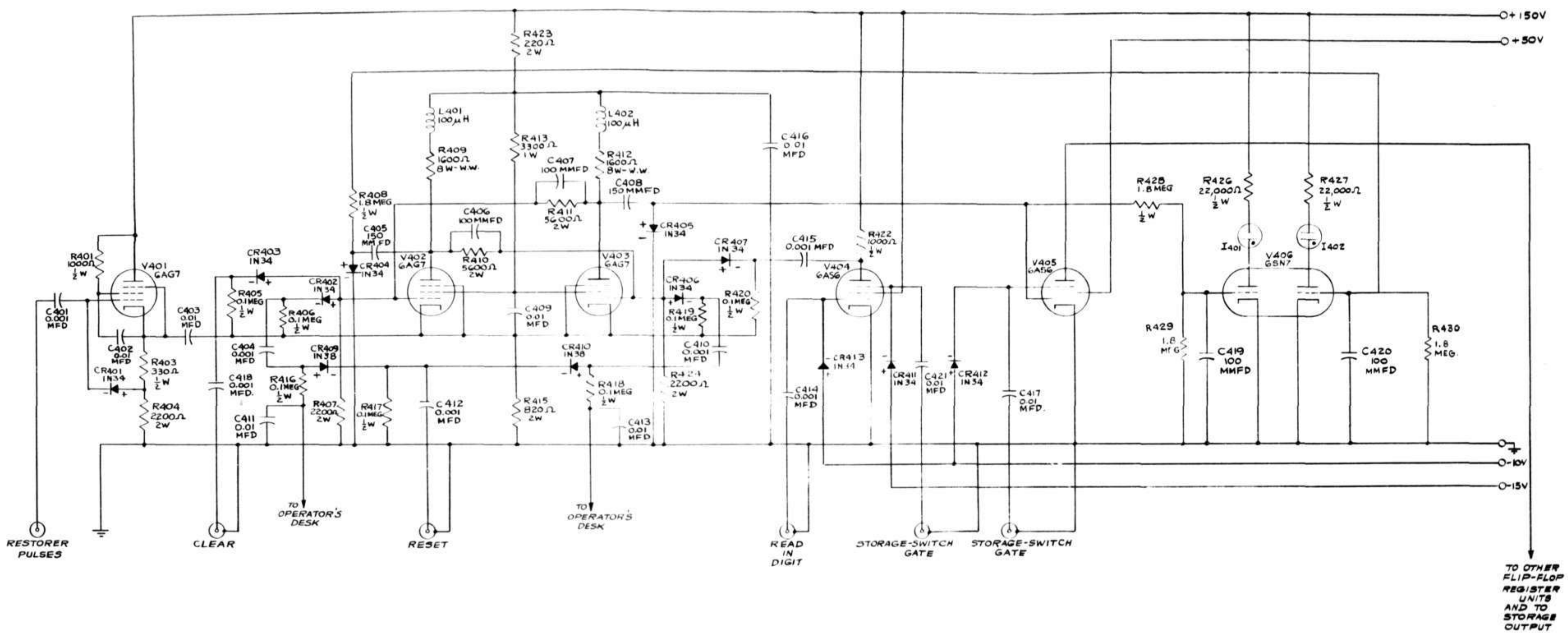
SD-39278-1



FLIP-FLOP STORAGE
BLOCK SCHEMATIC
D.R.B. JUNE 27, 1947

SD-39278-1

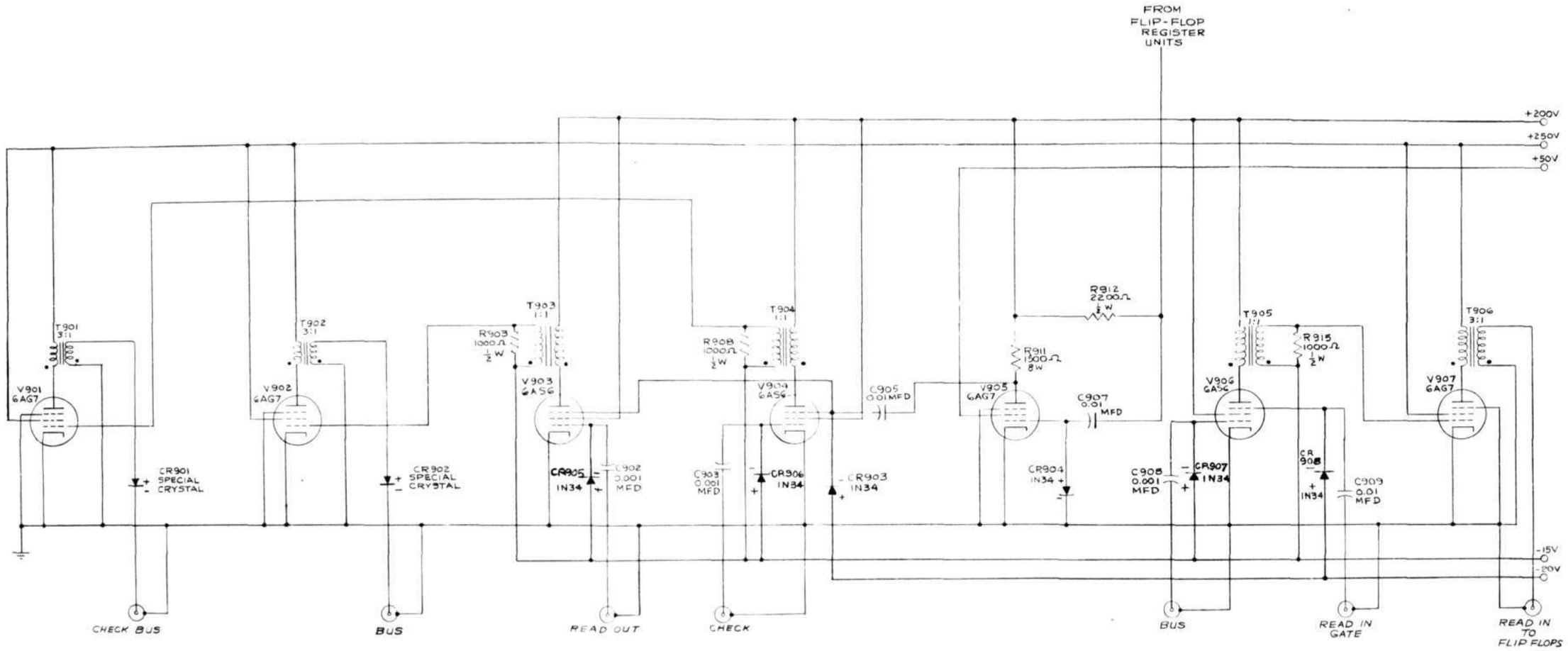
SD-39285 3



FLIP-FLOP REGISTER
CIRCUIT SCHEMATIC

SD-39285-3

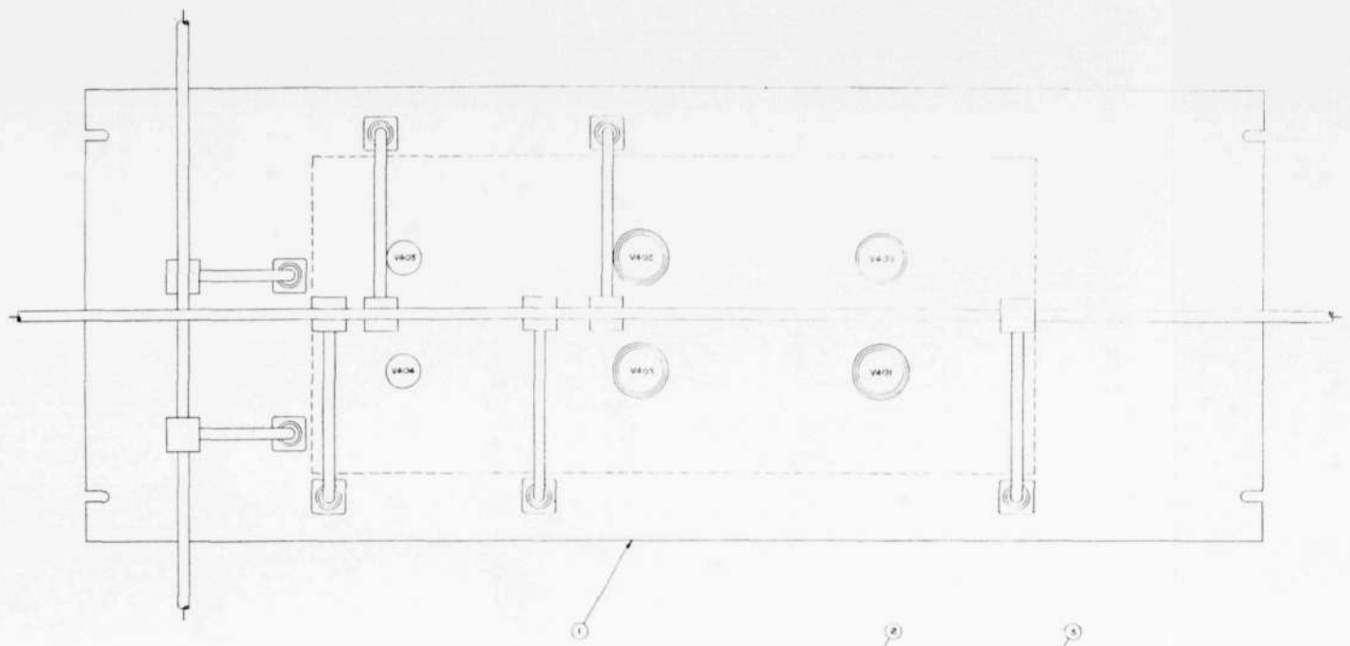
SD-39286-3

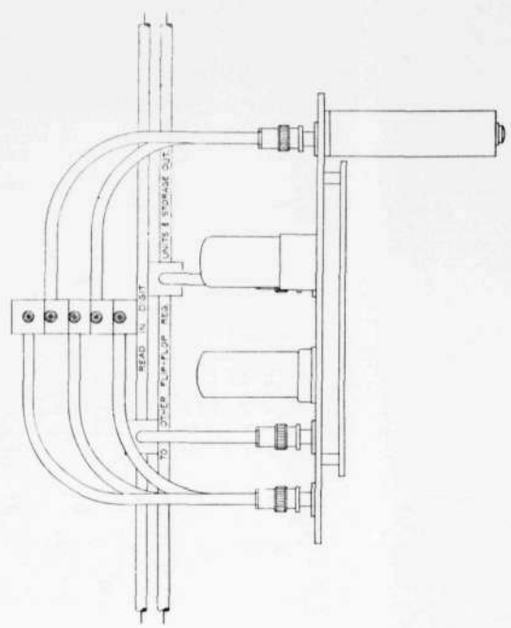


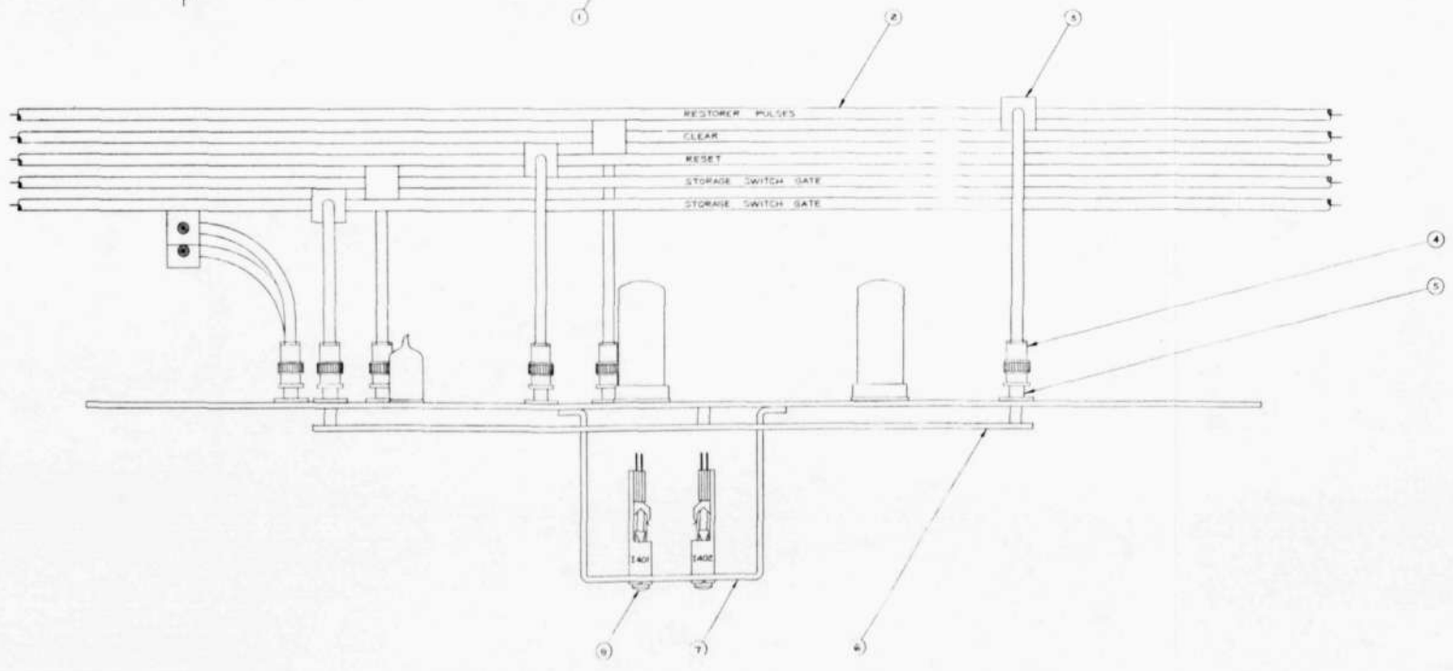
FLIP-FLOP STORAGE
OUTPUT CIRCUIT SCHEMATIC

SD-39286-3

E-30900
SD-30895







8	INDICATOR	KELLOG	#49	
7	INDICATOR MTG. BRACKET		E-30902	1
6	FLIP-FLOP REGISTER ASS'Y		E-30832	1
5	RECEPTACLE	IND. PRODUCTS	240-4	7
4	PILER	IND. PRODUCTS	240-M	7
3	CABLE SPLICE "TEE"	IND. PROD.	———	7
2	CO-AXIAL CABLE		RG-62A/U	As Req'd
1	PANEL .064 x 10 x 26 ALUMINUM		E-30900	1

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIGITAL COMPUTER LABORATORY

FLIP-FLOP REGISTER PANEL ASSY

FULL

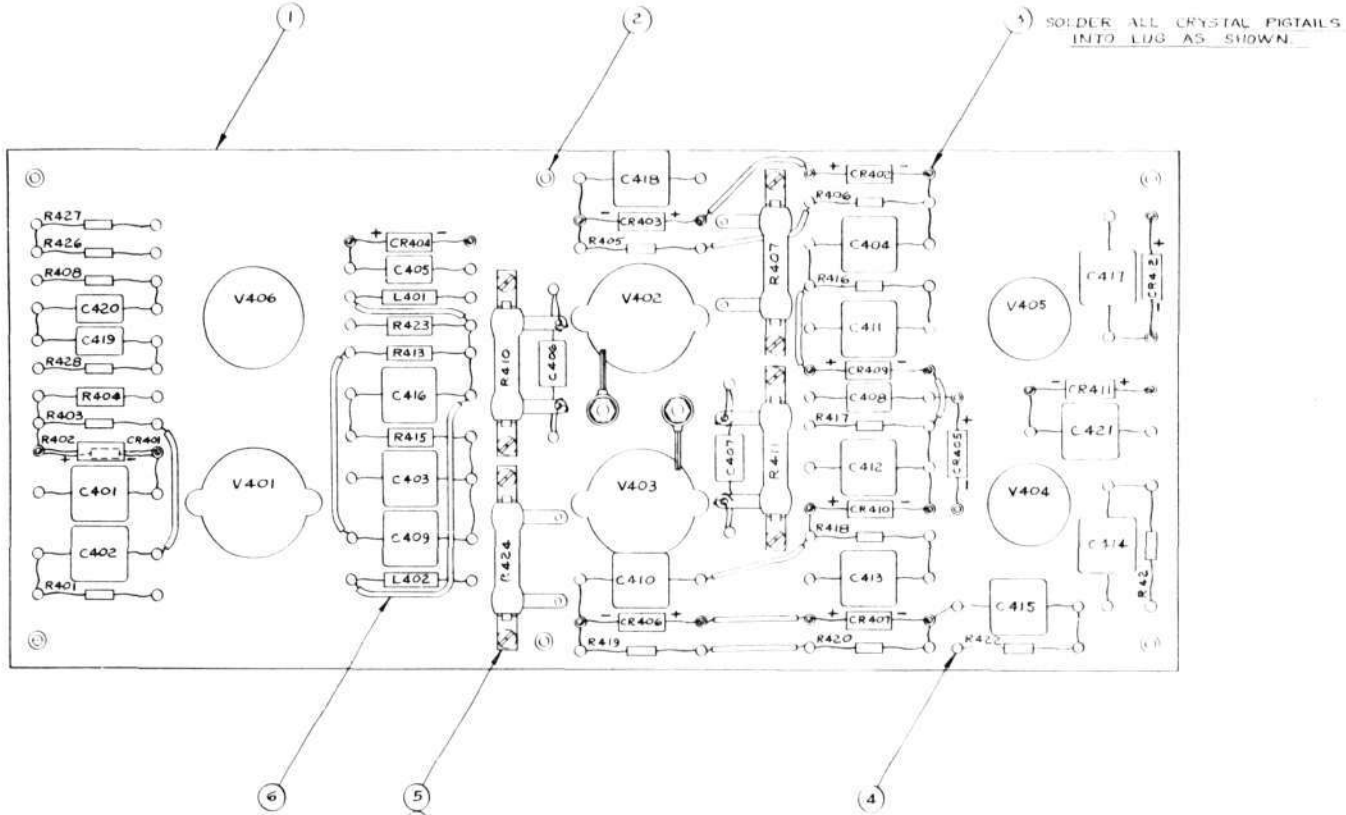
E-30900

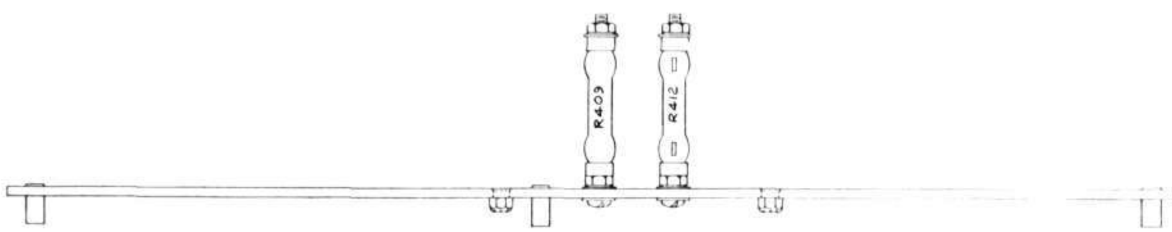
APPROVED FOR PUBLIC RELEASE. CASE 06-1104.

D-30872
WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y SD-39285





NOTES
1 R407, R410, R411, & R424 ARE AS IDENTIFIED ON SD-39285 EXCEPT THAT RATING IS INCREASED TO 8 WATTS.
2 V401, V402, V403, V404, V405, & V406 ARE NOT PARTS OF THIS ASS'Y & ARE INDICATED FOR REFERENCE USE ONLY

ITEM	MATERIAL - DESCRIPTION		PART NO.	QUAN.
7	CLINCH NUT	ELASTIC STOP NUT CORP	22C5-62	8
6	CAMBRIC SLEEVING		——	AS REQ'D
5	RESISTOR MTG FOR 116B RESISTOR	ITE	——	8
4	TURRET LUG SINGLE	CTC	1724D	86
3	TURRET LUG HOLLOW	CTC	1558D	22
2	MOUNTING POST	CTC	1246D	6
1	RESISTOR BOARD		D-30872	1

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

FLIP-FLOP REGISTER ASS'Y

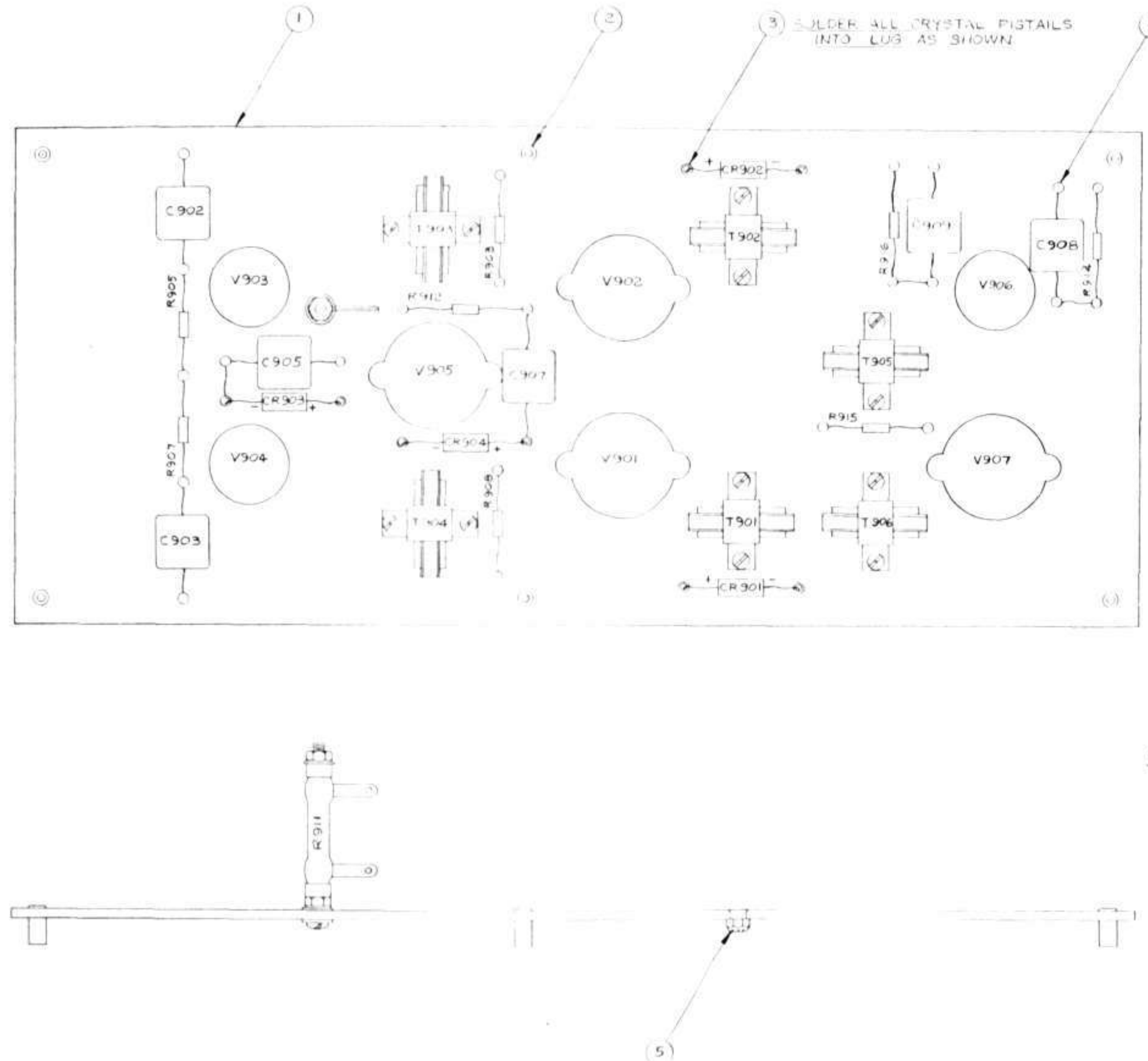
SCALE FULL
DR ~~W.C~~ 5-6-47
TR BRB
CK
APP
D-30872

	WAS	APP	DATE		WAS	APP	DATE
P				G			
N				F			
M				E			
L				D			
K				C			
J				B			
H				A			

D-30879
WO-

TOLERANCES NOT OTHERWISE SPECIFIED: DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y SD-39286



NOTE: V901, V902, V903, V904, V905, V906 & V907 ARE NOT PARTS OF THIS ASS'Y & ARE INDICATED FOR REFERENCE USE ONLY.

ITEM	MATERIAL - DESCRIPTION		PART NO.	QUAN.
5	CLINCH NUT	ELASTIC STOP NUT CORP.	#22C5-62	12
4	TURRET LUG SINGLE	CTC	#1724D	23
3	TURRET LUG HOLLOW	CTC	#1558D	8
2	MOUNTING POST	CTC	#1246D	6
1	RESISTOR BOARD		D-30879	1

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

FLIP-FLOP STORAGE OUTPUT ASS'Y.

SCALE FULL — DR. W. Cook 3-11-47 — TR. BRB — CK. — APP.

D-30879

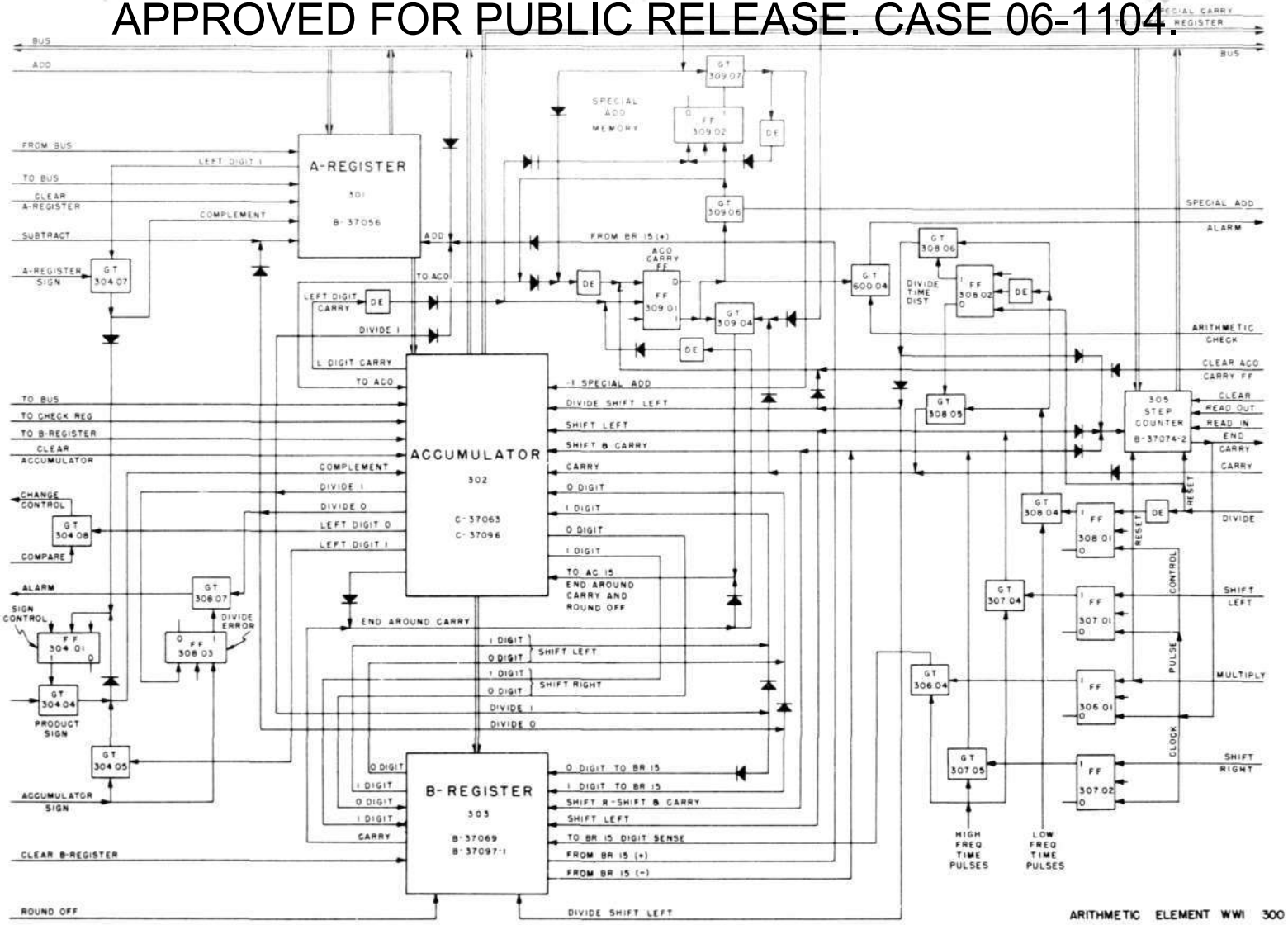
ARITHMETIC ELEMENT DRAWING LIST

(Block Diagram Reference 300)

300	Arithmetic Element, Whirlwind I	C-37072
	5-digit Multiplier, Photograph	FB-265
	Multiplier Digit, Photograph	FB-267
	Circuit Schematic	D-30369
301	A Register	SD-39335
303	B Register	SD-39333
306	Multiplier Control	
	Photograph	FB-231
	Photograph	FB-232
	Block Schematic	C-30906
	Circuit Schematic	SD-39318
	Power Control	SB-39328
	Power Control	SB-39334
300	Multiplier Assembly and Details	R-37511 D-37512 D-37513 D-37514 D-37515 D-37516 D-37517 D-37518 C-37521 C-37522
300	Multiplier Color Code	A-30631

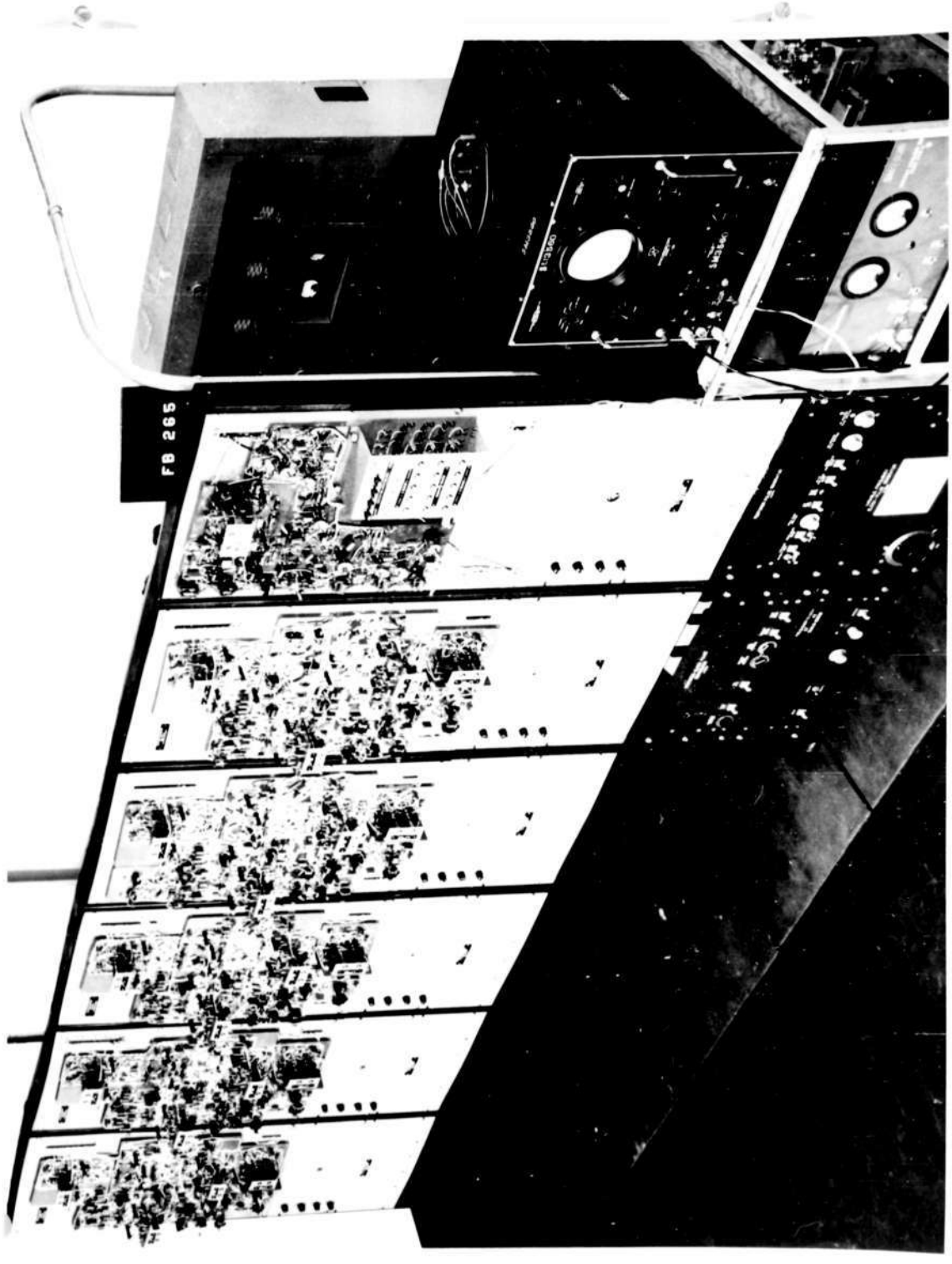
Arithmetic Element Drawing List (Continued)

300	Multiplier Cables	SA-39321 SA-39322 SB-39323 SB-39324 SB-39325 SB-39326 SB-39327
305	Step Counter	
	Photograph	FB-270
	Circuit Schematic	E-30884
	Panel Assembly	D-30878
	Sub Assemblies	D-30875 D-30849 C-30866 A-30865 A-30840 D-30847 C-30867 D-30848 C-30868

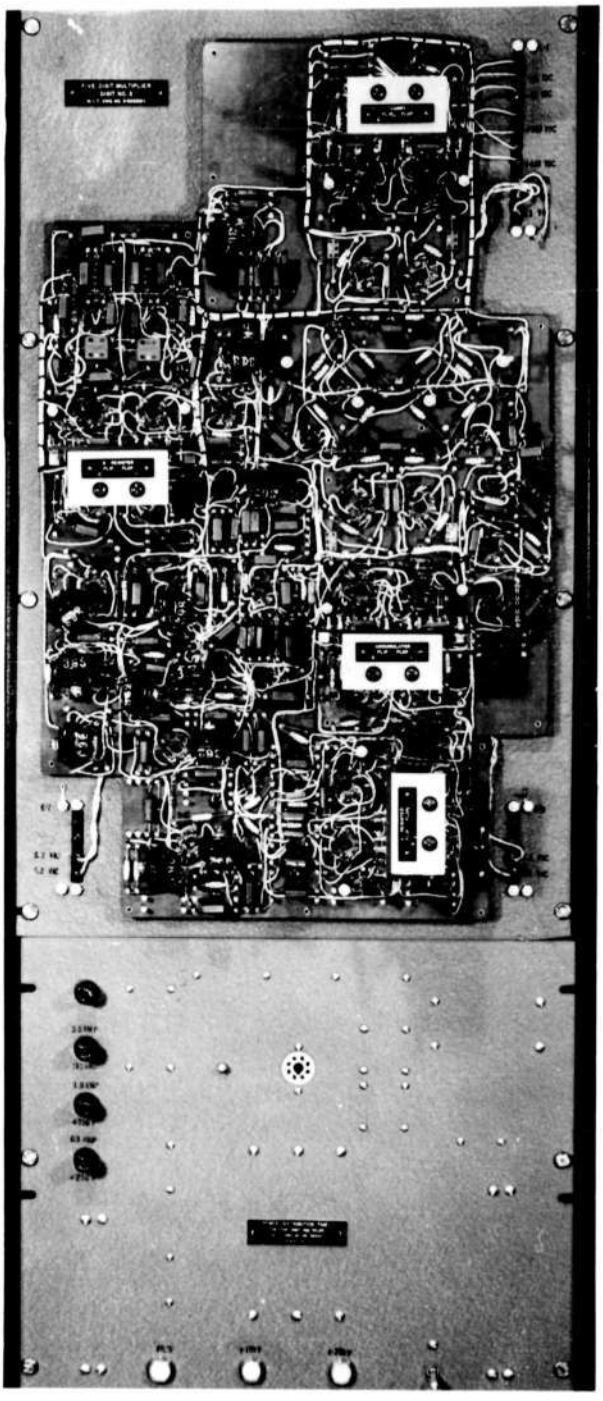


ARITHMETIC ELEMENT WWI 300

C-37072-3

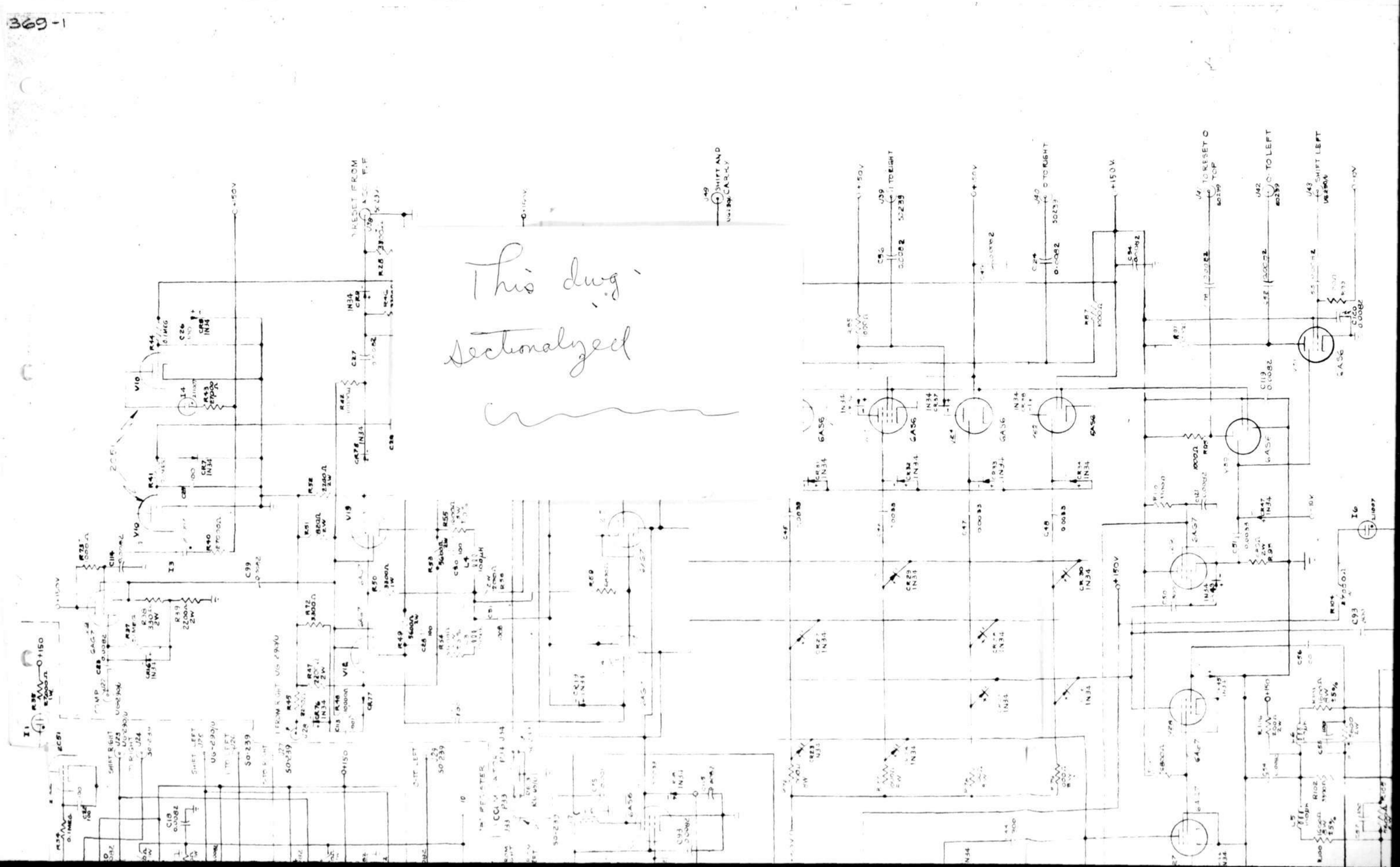


FB 267

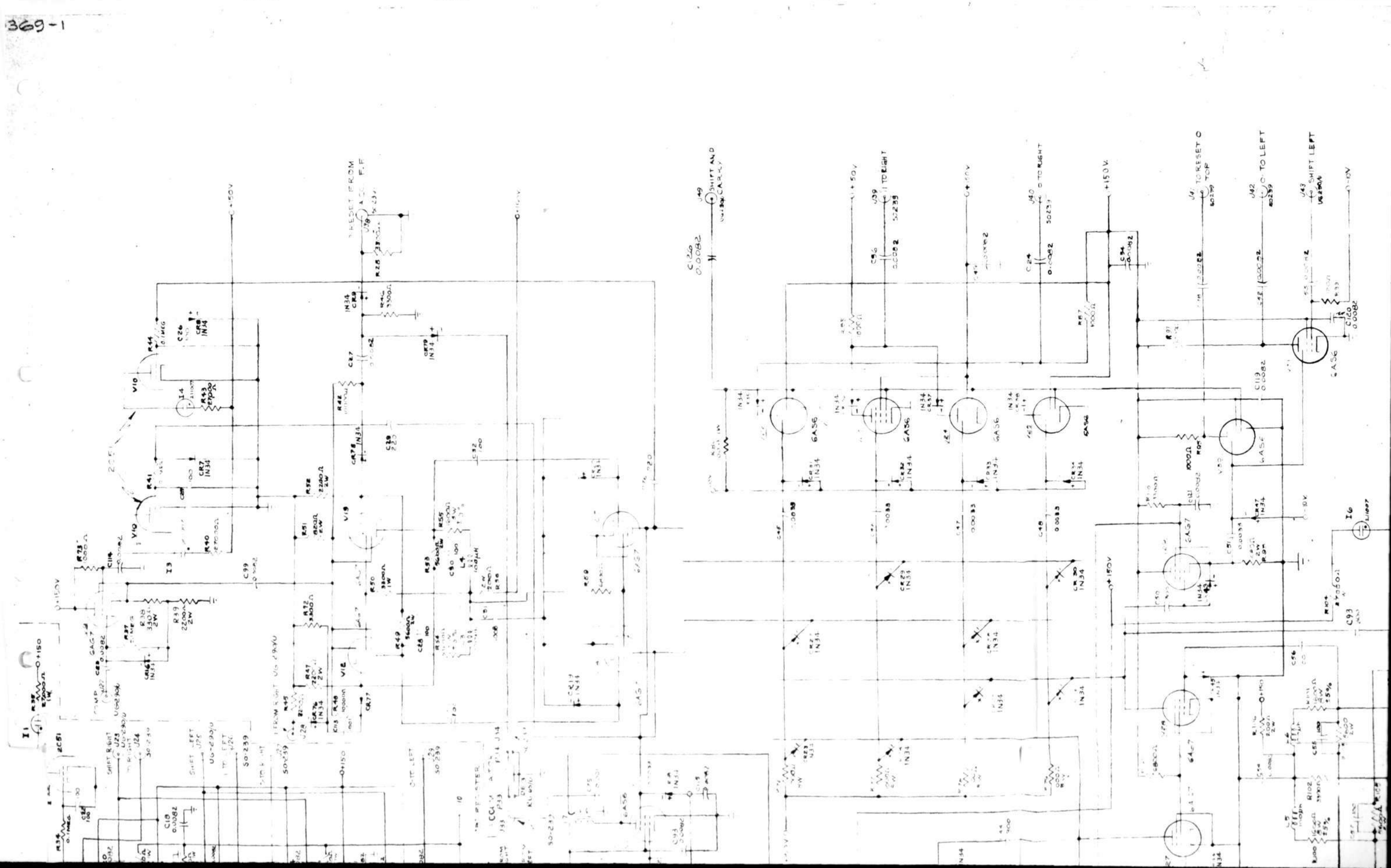


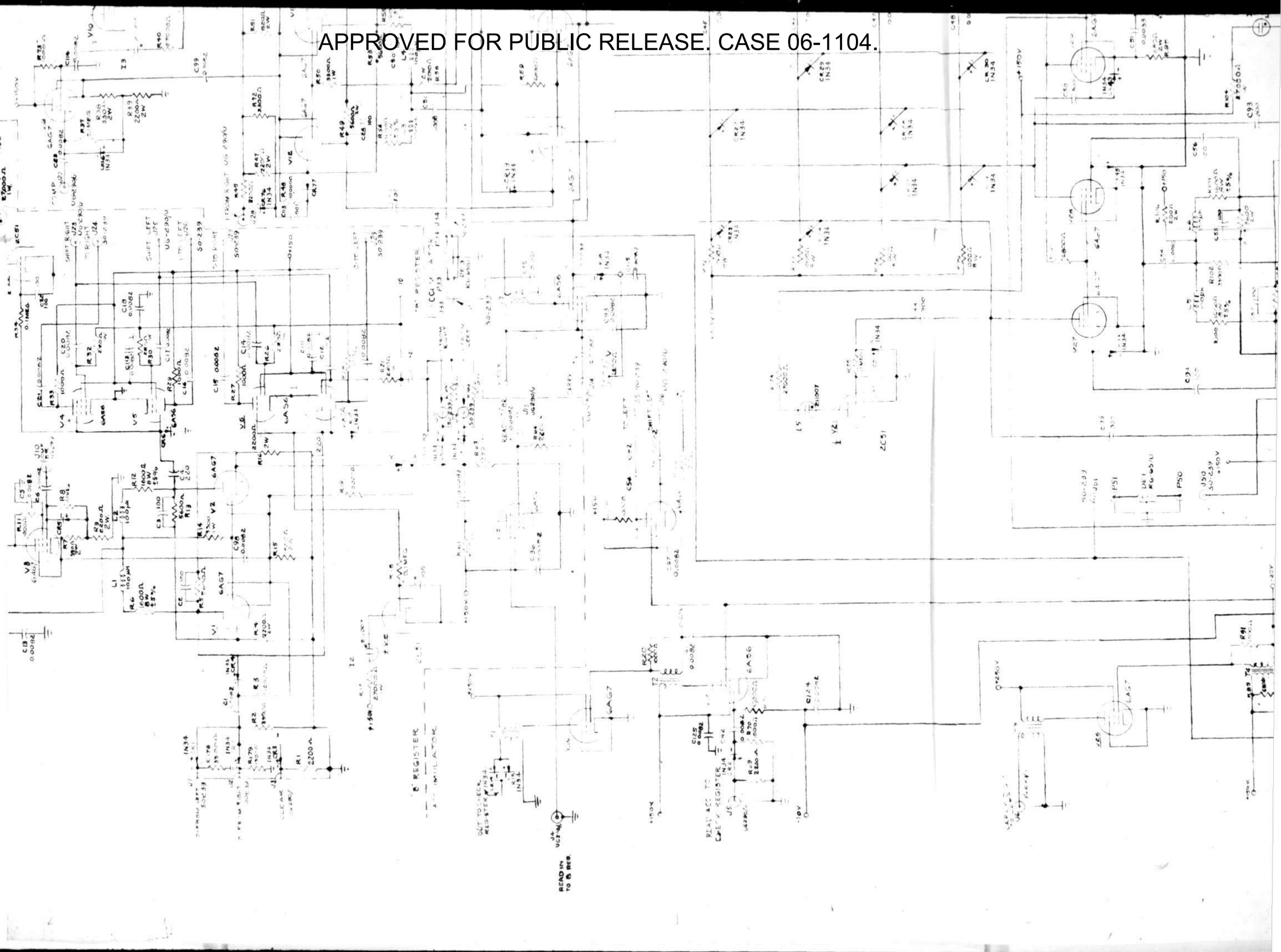
369-1

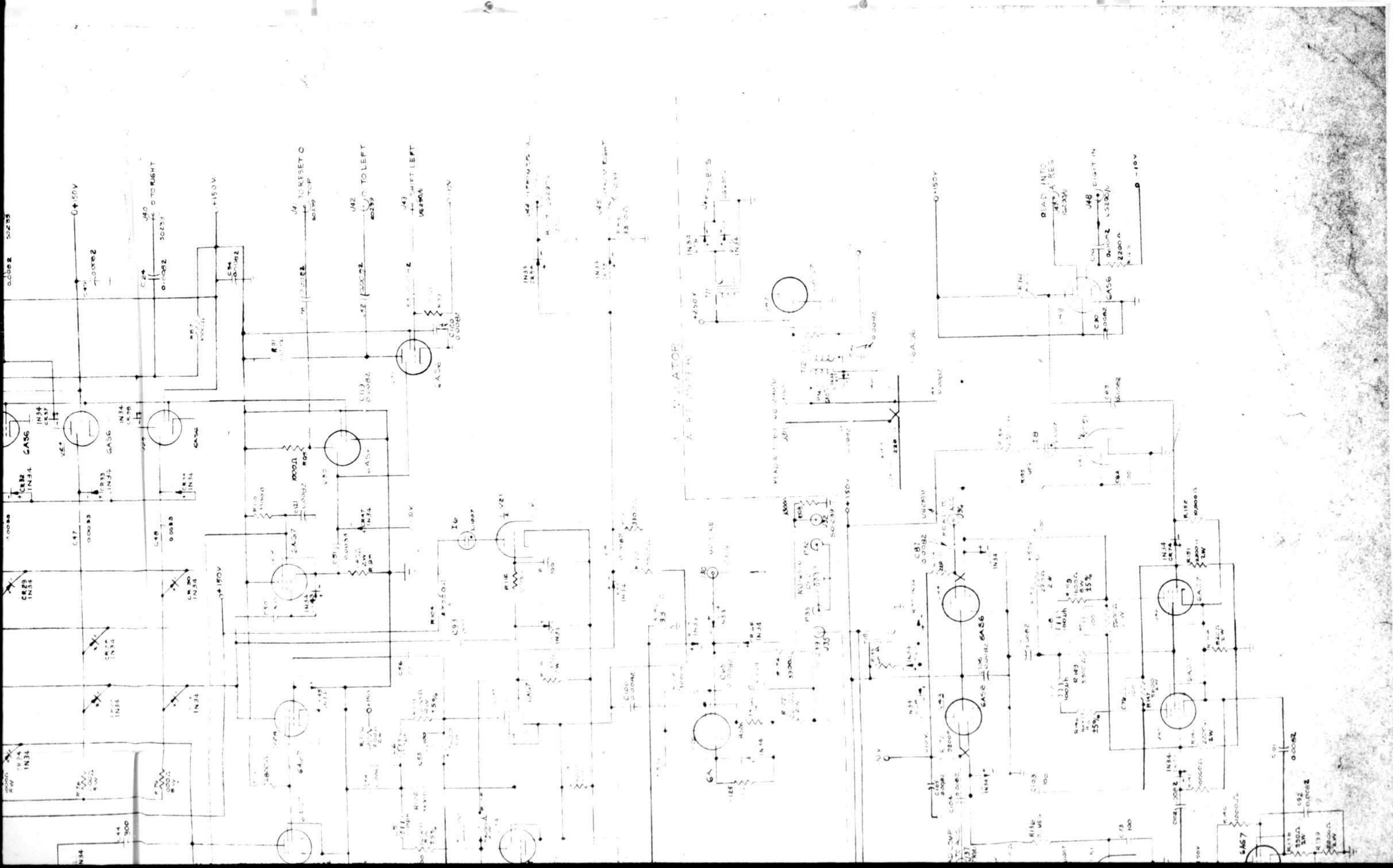
This dwg sectionalized



369-1







NOTE. ALL RESISTORS ½ WATT EXCEPT WHERE NOTED
FOR PANEL DRILLING TEMPLATE SEE R-37511

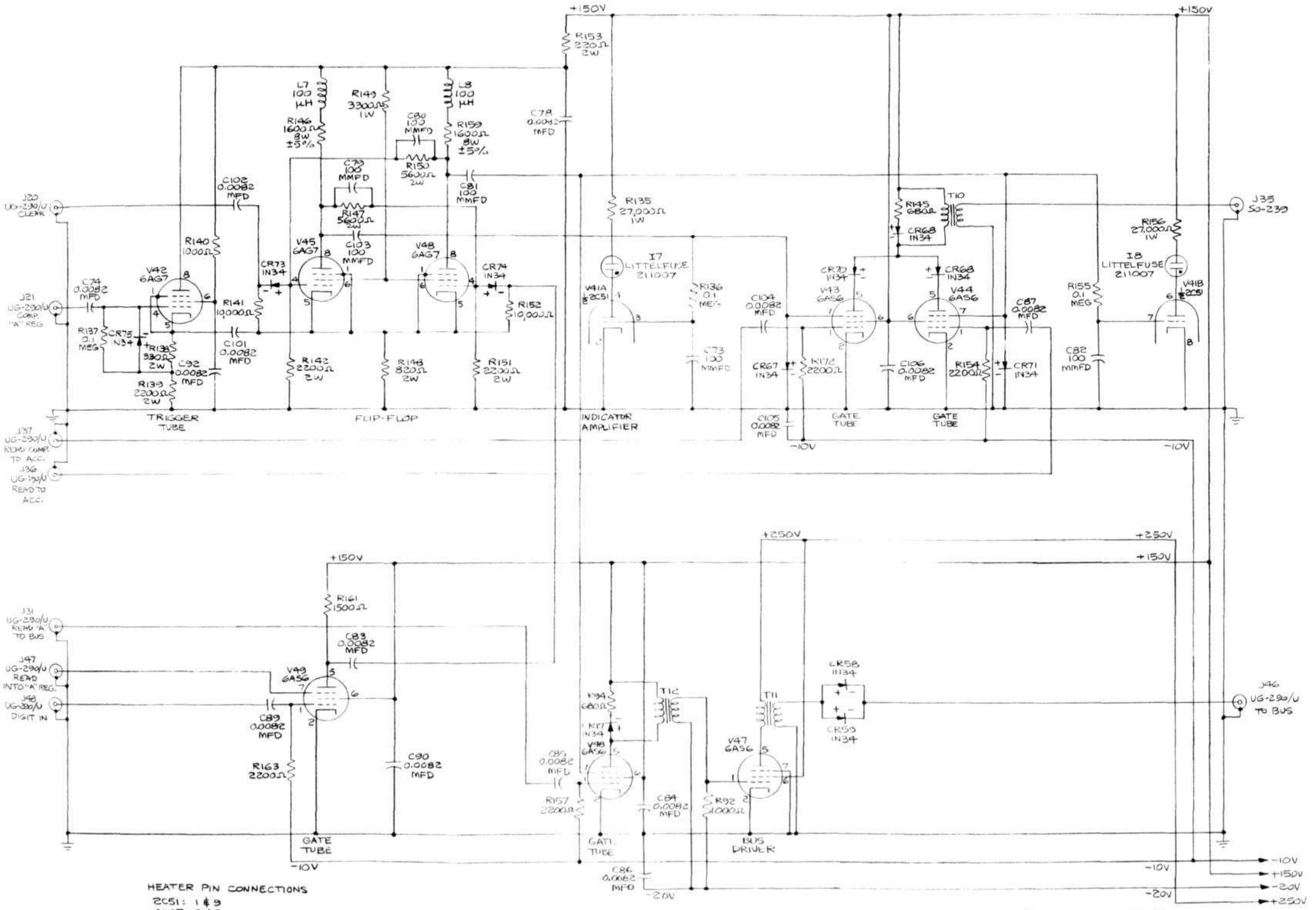
SINGLE DIGIT OF MULTIPLIER SCHEMATIC

THE ELECTRICAL SYMBOLS ON THIS DRAWING ARE NOT DRAWN TO STANDARD SIZE AND MAY BE DRAWN THUS ONLY BY SPECIAL PERMISSION.

FOR PANEL DRILLING TEMPLATE SEE R-37511.

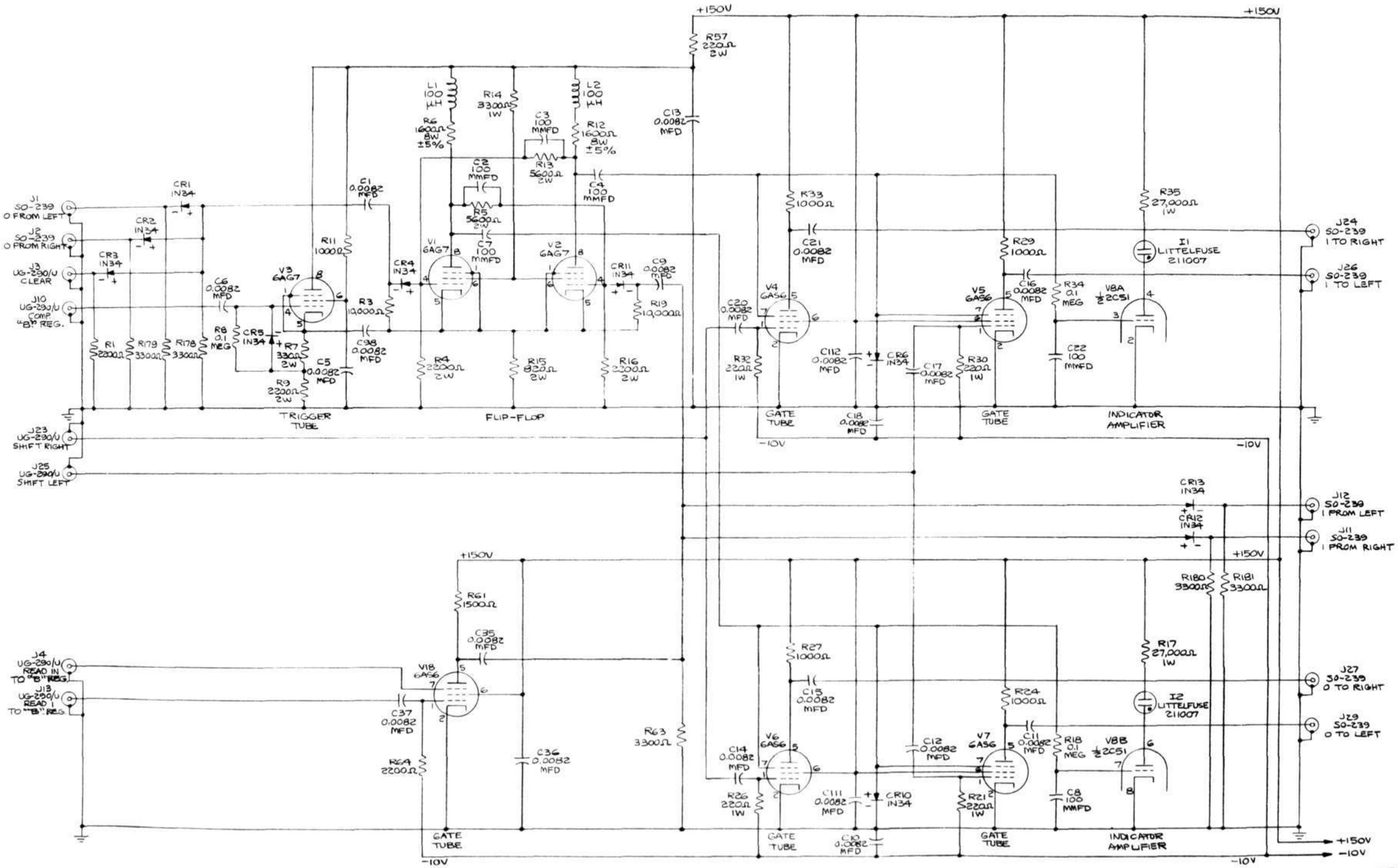
6345 — 7-18-47

D-30369-1



HEATER PIN CONNECTIONS
2C51: 1 & 9
6AG7: 2 & 7
6AS6: 3 & 4
NOTE: INTER-UNIT SHIELD, PIN 5 OF 2C51, IS GROUNDED.

MULTIPLIER "A" REGISTER SCHEMATIC 6345 1 Th 3/17/47 SD-39335



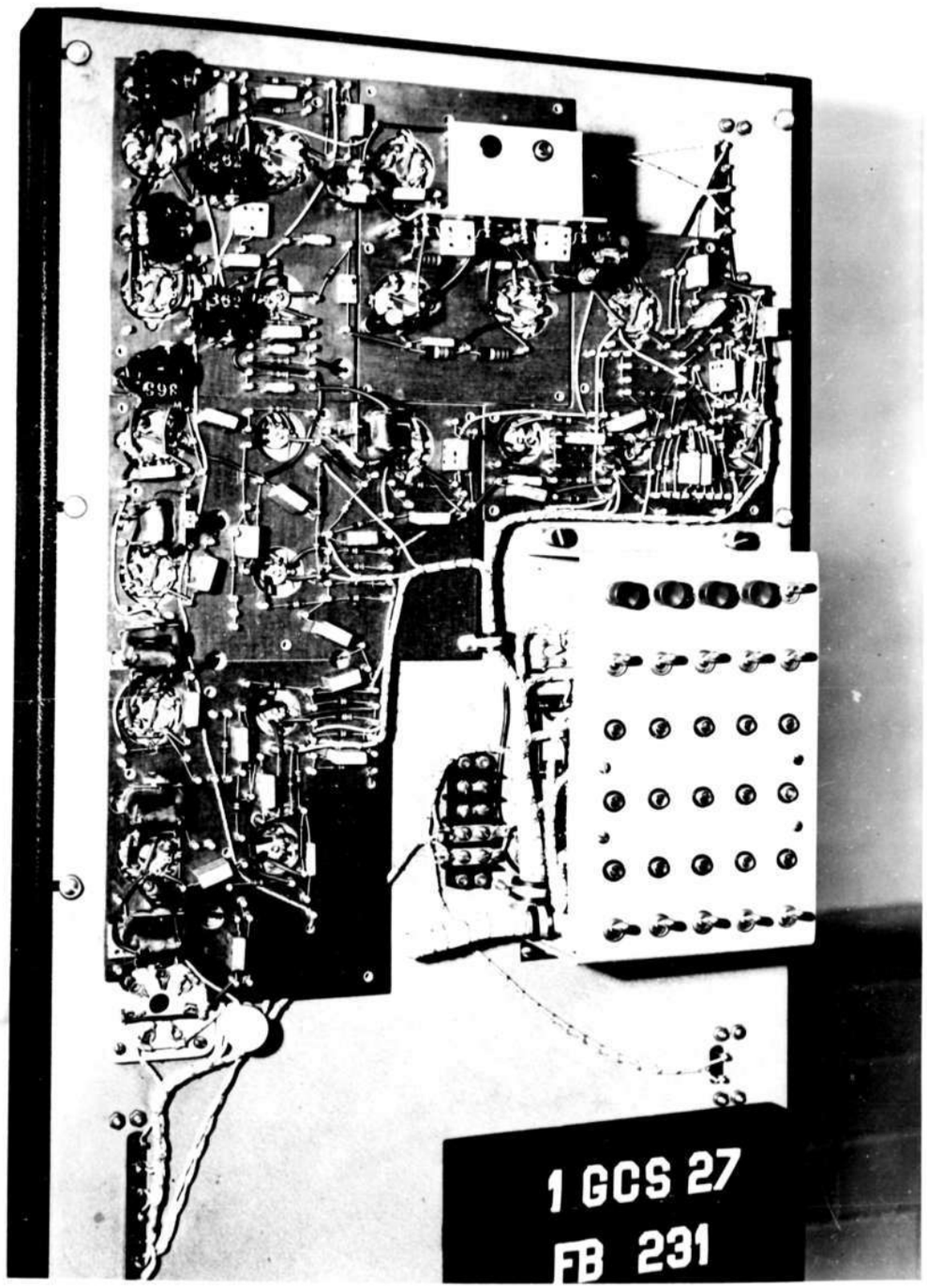
HEATER PIN CONNECTIONS
2C51: 1 & 9
6AG7: 2 & 7
6AS6: 3 & 4
NOTE: INTER-UNIT SHIELD, PIN 5 OF 2C51, IS GROUNDED.

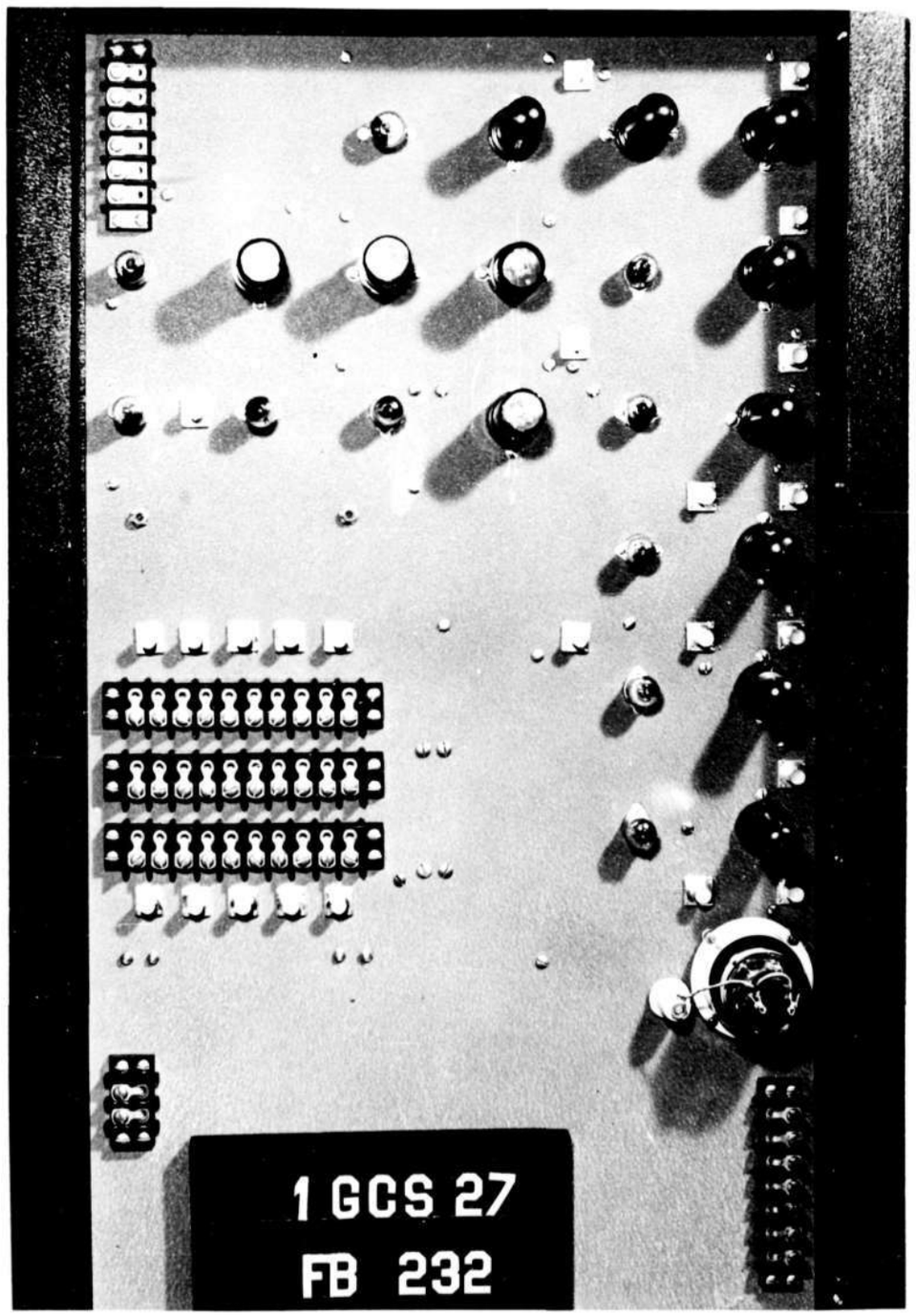
MULTIPLIER "B" REGISTER SCHEMATIC

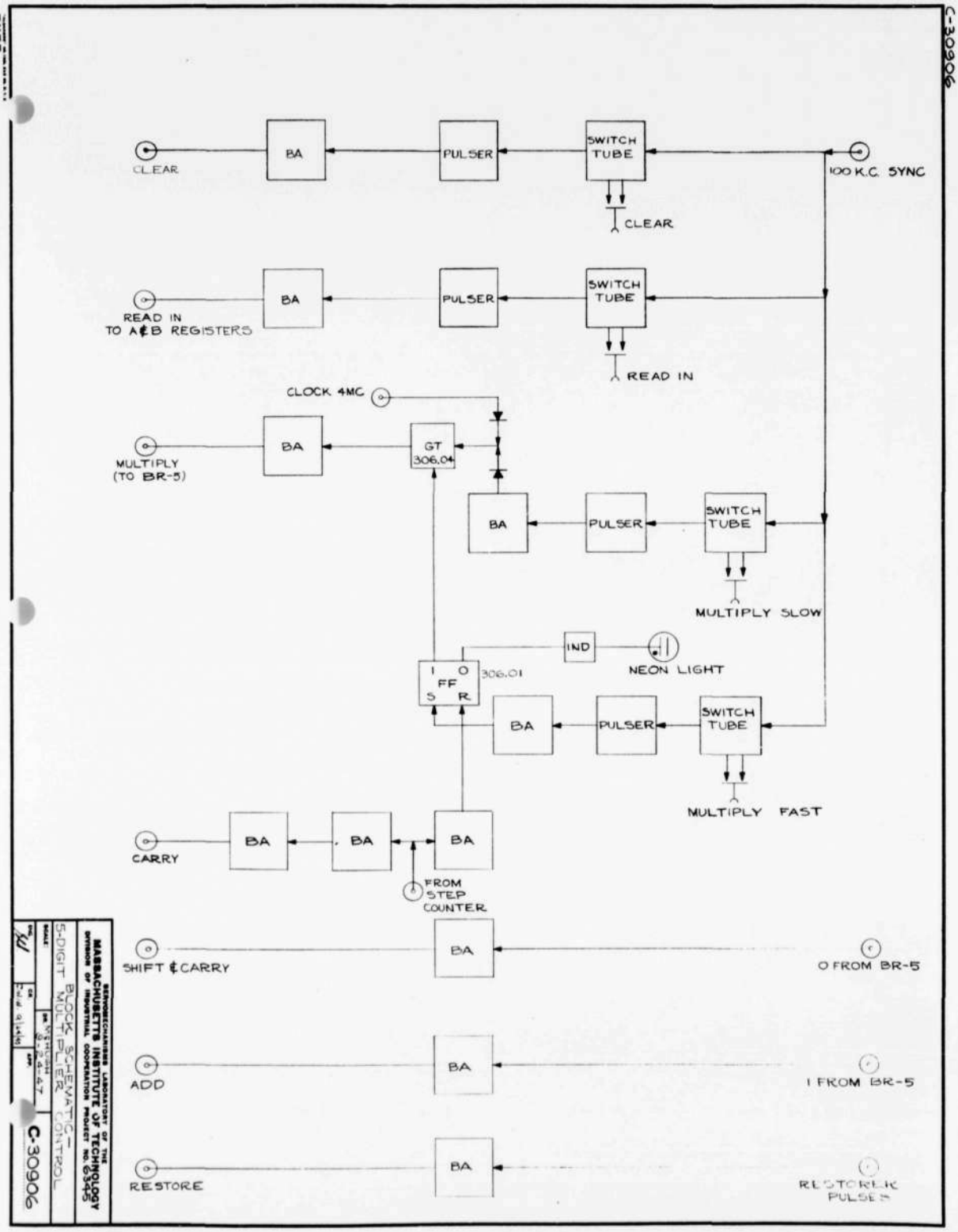
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

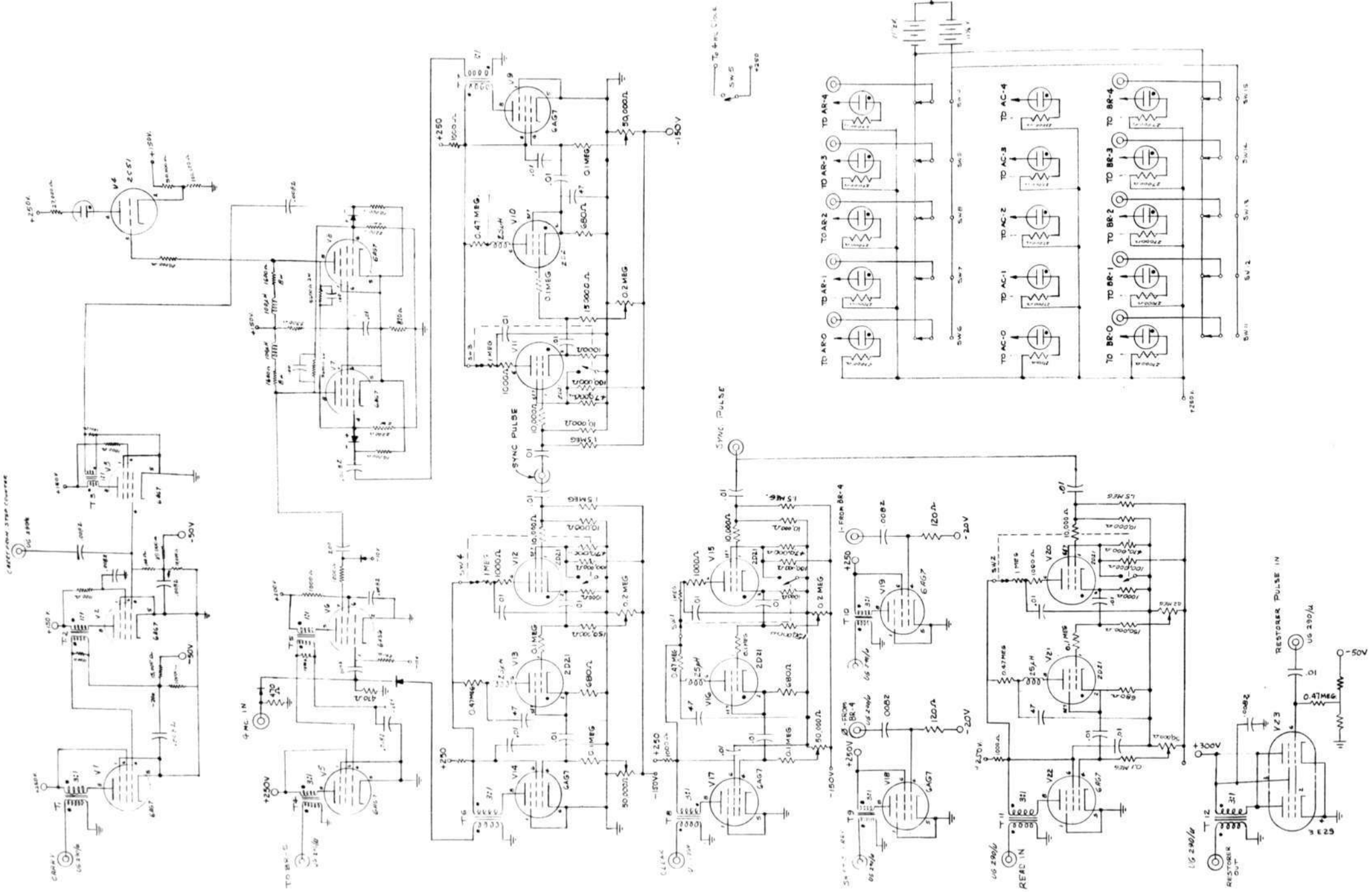
6345	T.L. 2/5/47

SD-39333

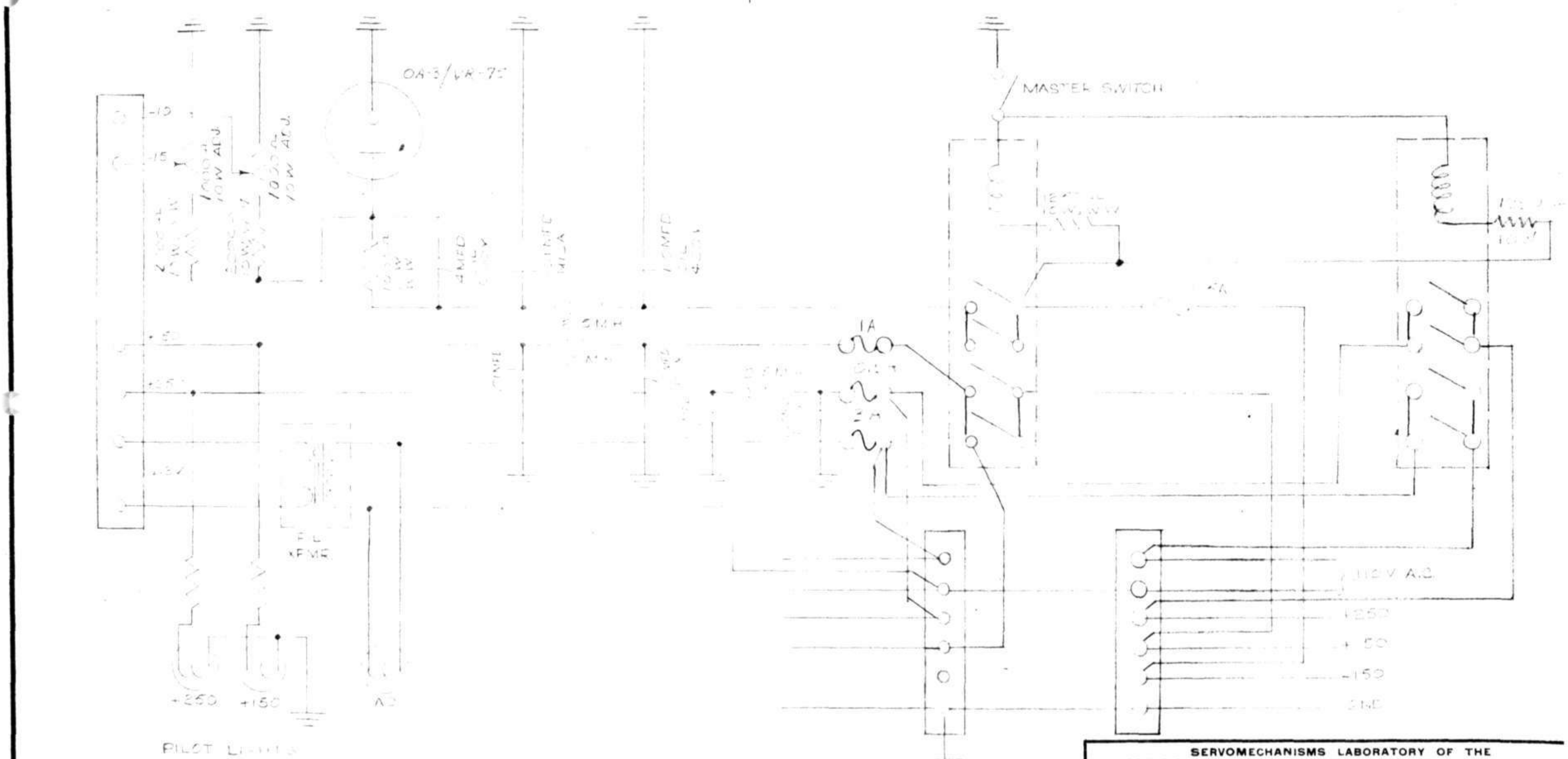








SB-39328-1



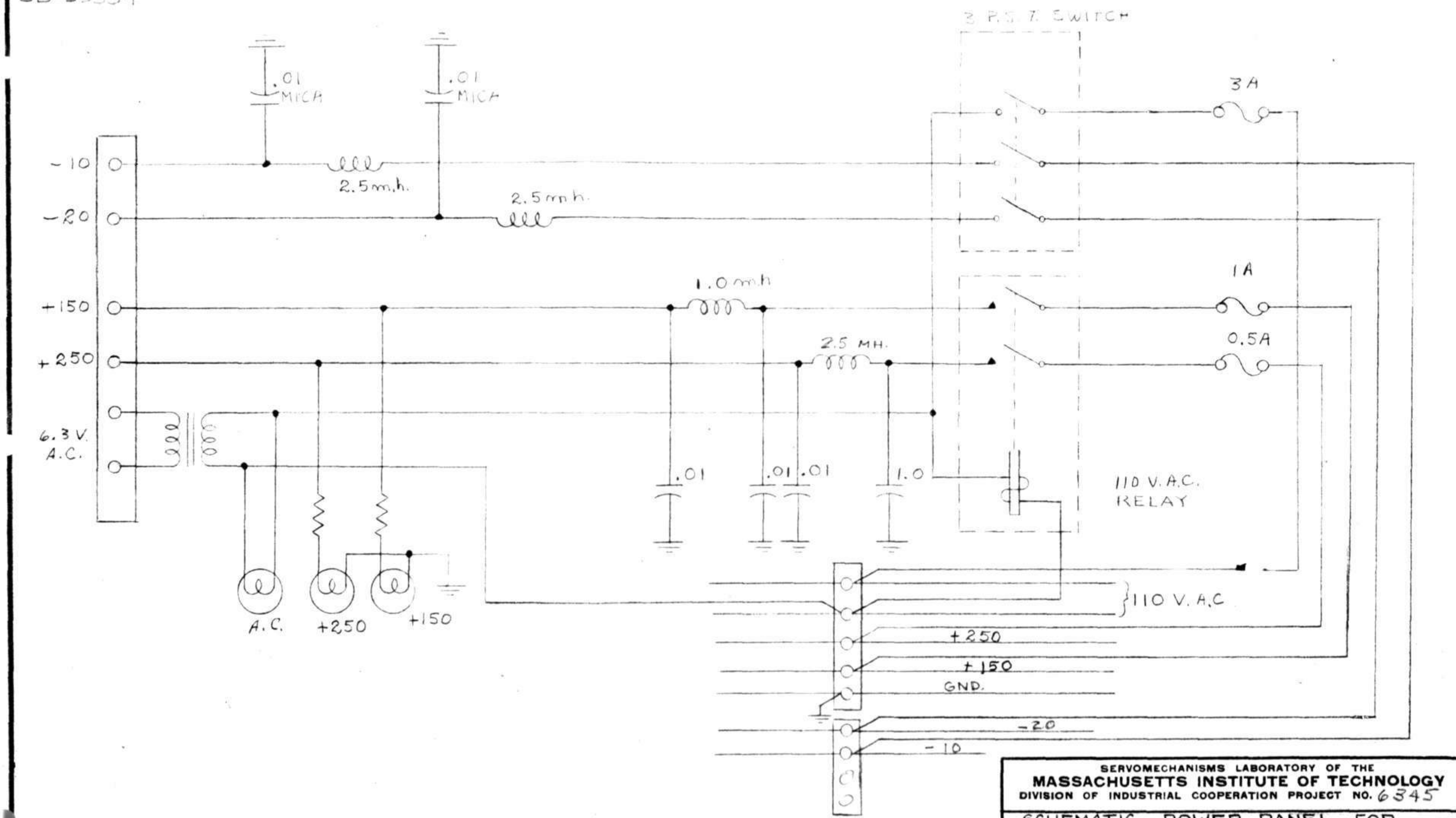
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

SCHEMATIC - POWER PANEL FOR 5-DIGIT MULTIPLIER CONTROL RACKS

SCALE:	DR.		SB-39328-
ENG. C.W.W.	CK.	APP.	

"ALBANENE" NO. 199L K&E CO. N.Y.
REG. U.S. PAT. OFF.

SB-39334



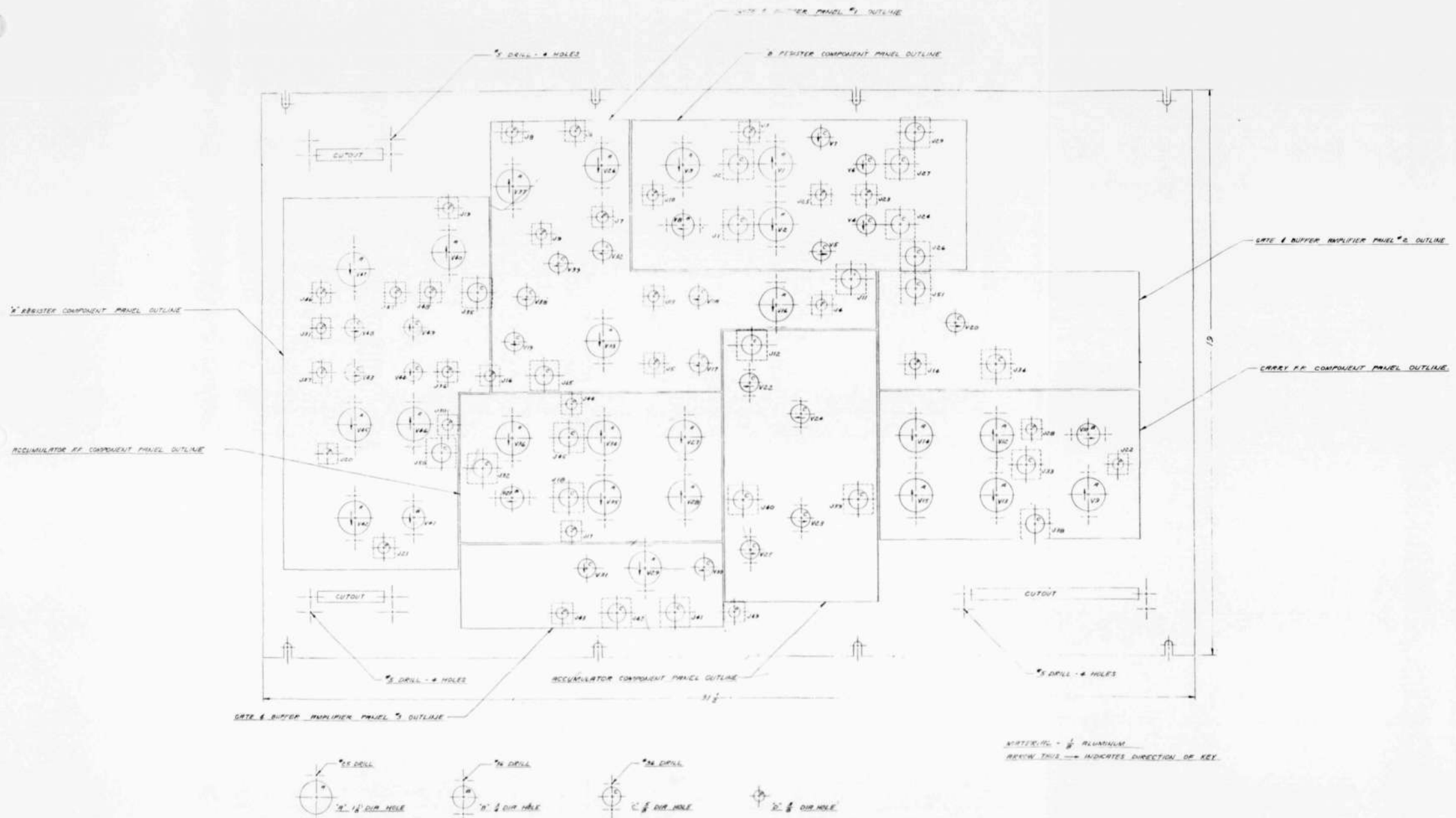
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

SCHEMATIC - POWER PANEL FOR 5 DIGIT MULTIPLIER DIGIT RACKS.

SCALE: —	DR. WOLSKY	SB-39334
ENG. C.W. 9-10-47	CK.	APP.

"ALBANENE" NO. 196L K&E CO. N.Y.
REG. U.S. PAT. OFF.

R-37511

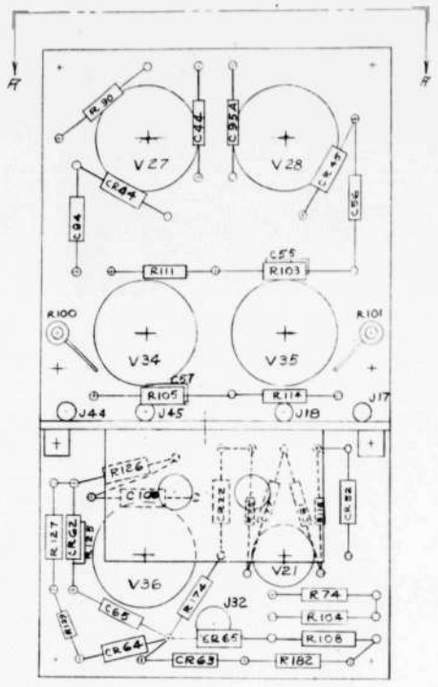


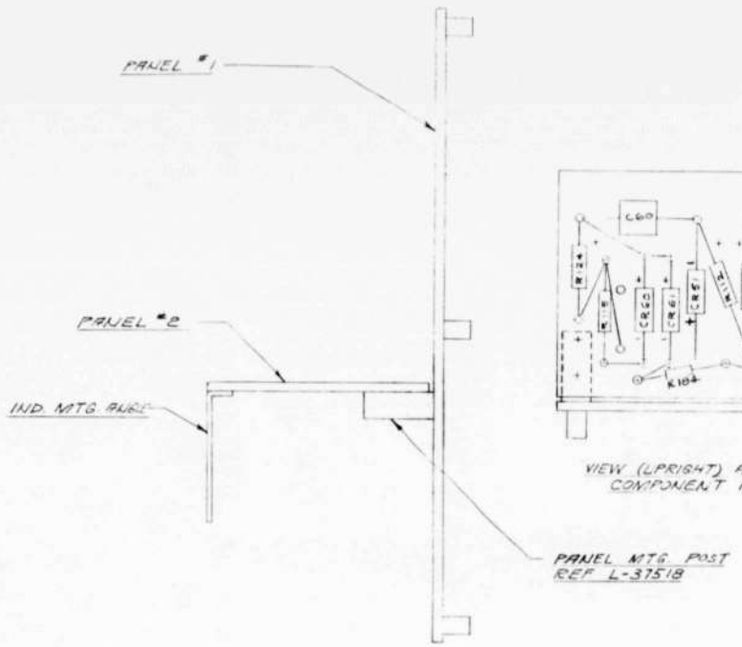
MATERIAL - ½ ALUMINUM
ARROW THUS ⟶ INDICATES DIRECTION OF KEY

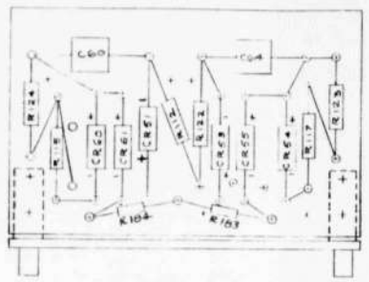
V

MULTIPLIER CHIEFS DRILLING TEMPLATE
R-37511

D-37512



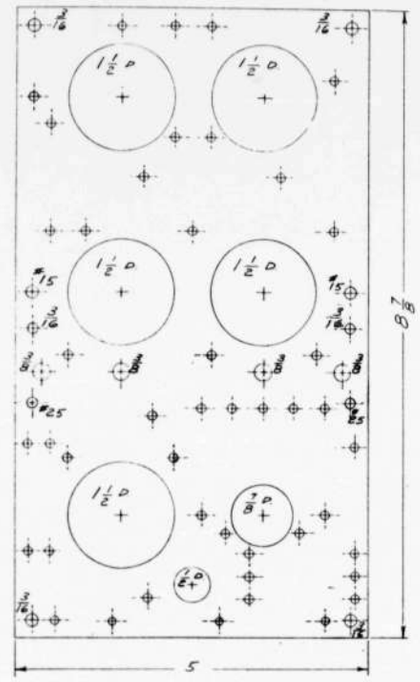




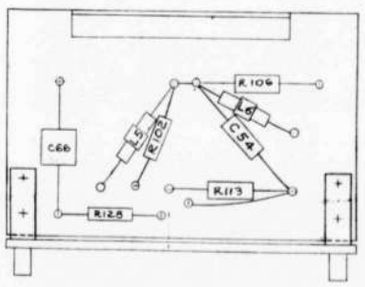
VIEW (UPRIGHT) A-A SHOWING COMPONENT ASS'Y PLAN.

DRILLING TEMPLATES
HOLES NOT NOTED DRILL #33

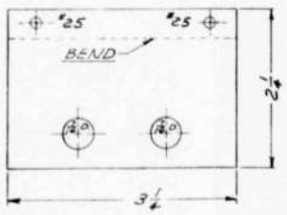
PANEL #1 - 1/8 TH'K PHENOLITE OR EQUAL



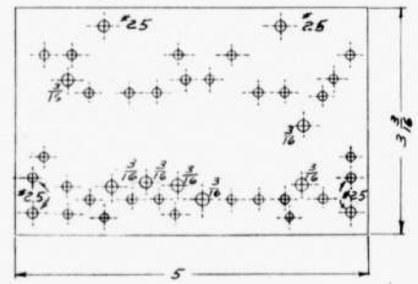
NOTE - "V" & "J" NUMBERS ARE FOR REFERENCE ONLY.

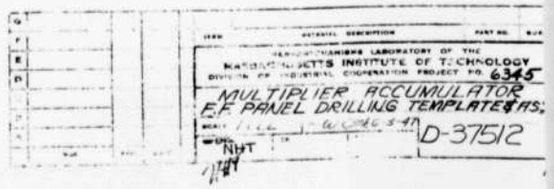


INDICATOR MTG. ANGLE
1/16 TH'K ALUM. - 1 REQ'D

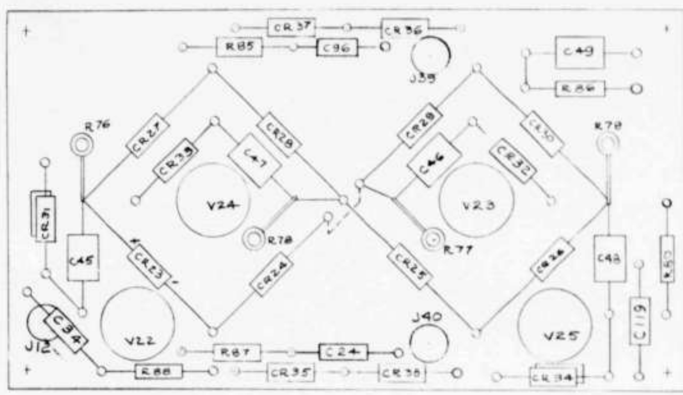


PANEL #2 - 1/8 TH'K PHENOLITE OR EQUAL



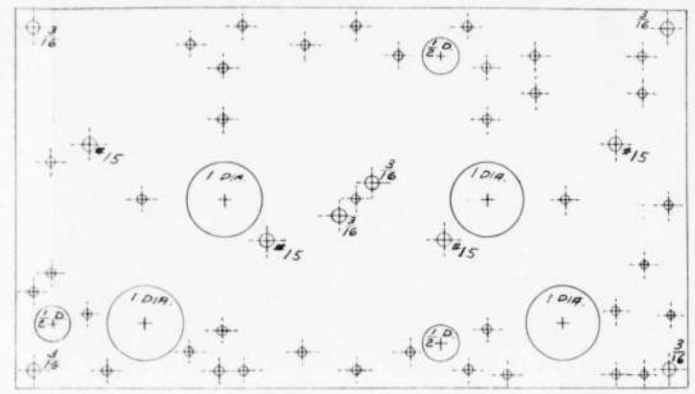


D-37513



NOTE: V & J NUMBERS FOR REFERENCE ONLY

DRILLING TEMPLATE



MAT'L - 1/8 THK PHENOLITE OR EQUAL
HOLES NOT NOTED DRILL #33

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.

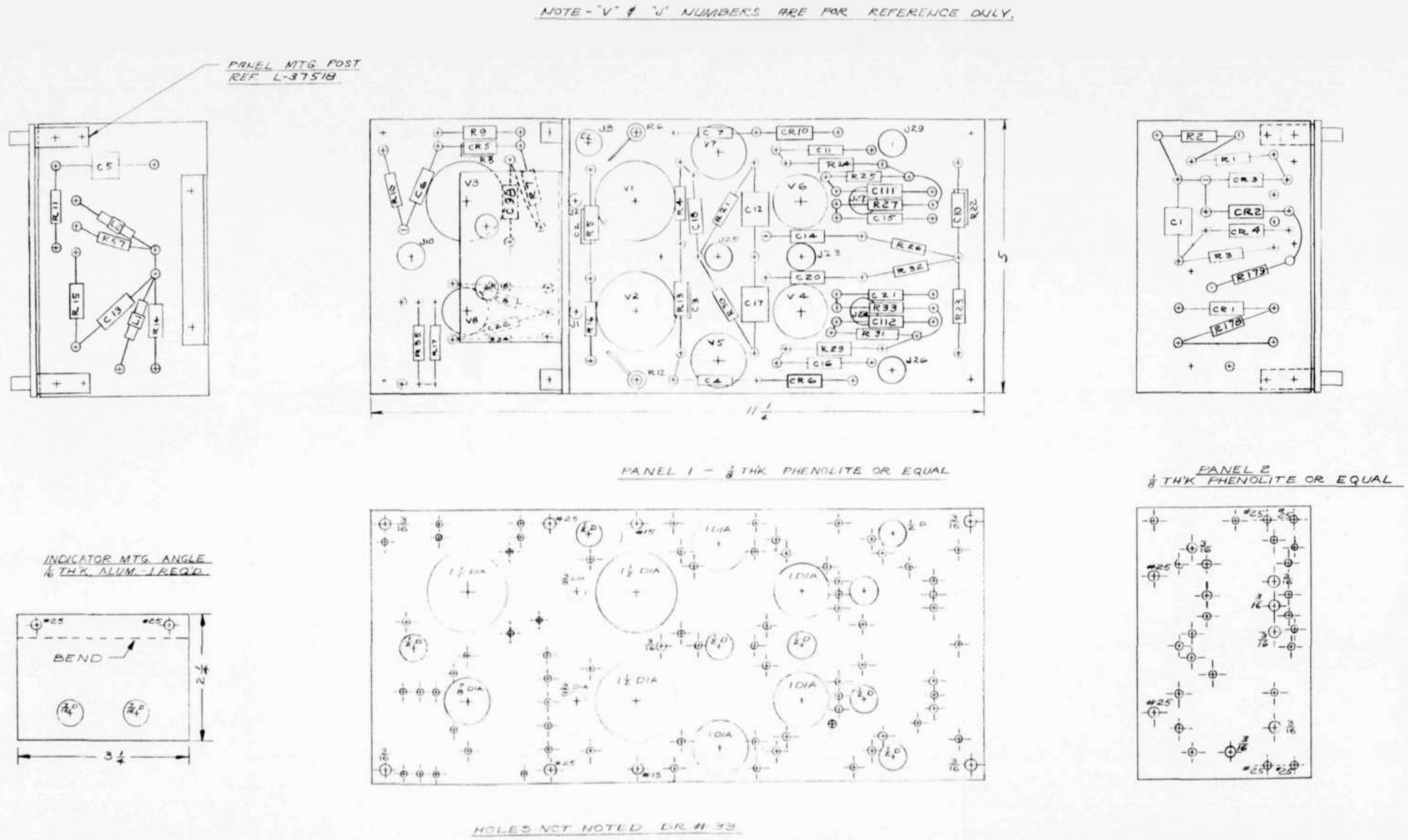
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

MULTIPLIER ACCUMULATOR
PANEL DRILLING TEMPLATE & ASS'Y

FULL | 6-2-47

NHT

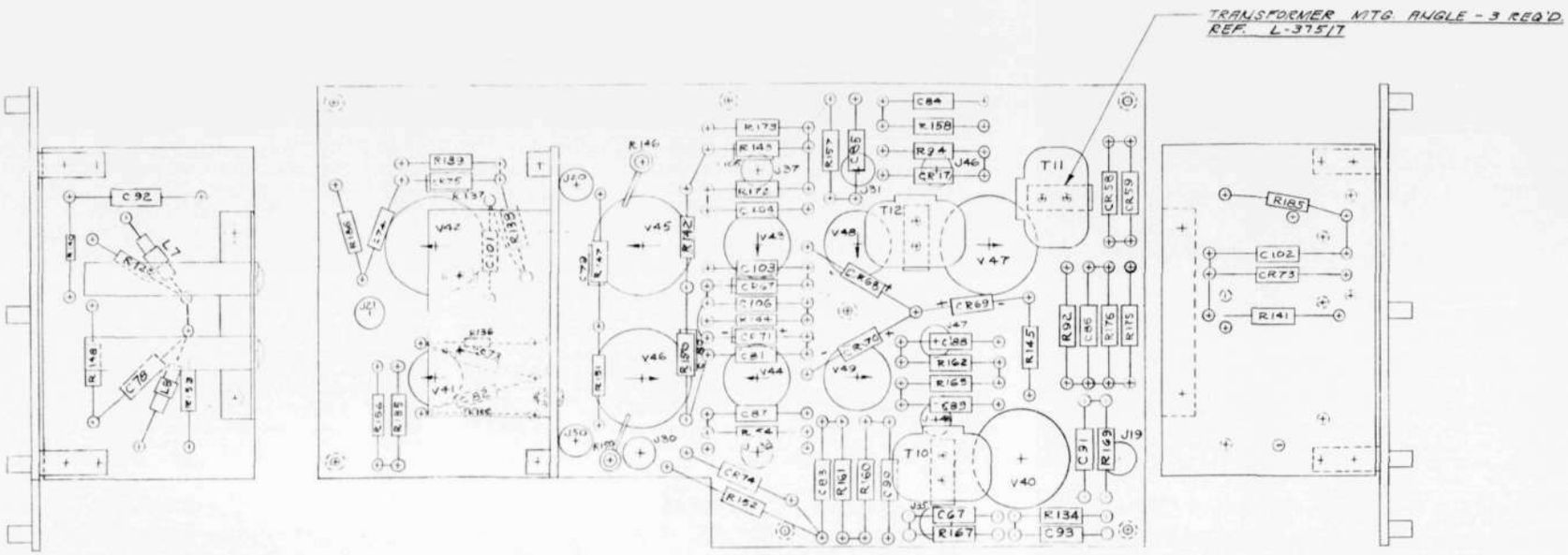
D-37513



MULTIPLIER "B" REGISTER PANEL DRILLING TEMPLATE & ASS'Y.

D-37514

D-37515



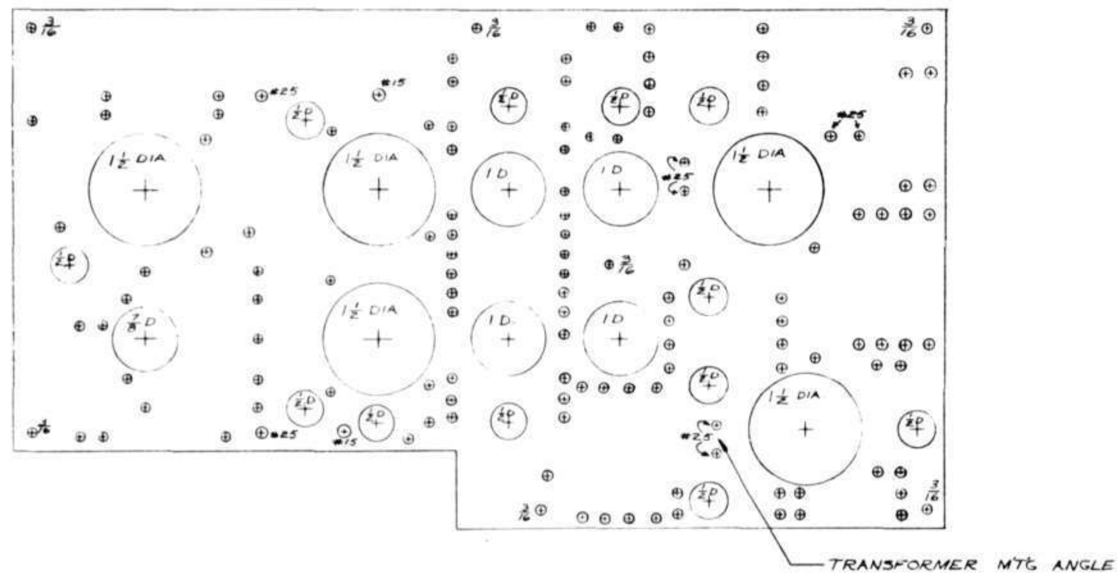
NOTE: V & J NUMBERS FOR REFERENCE ONLY

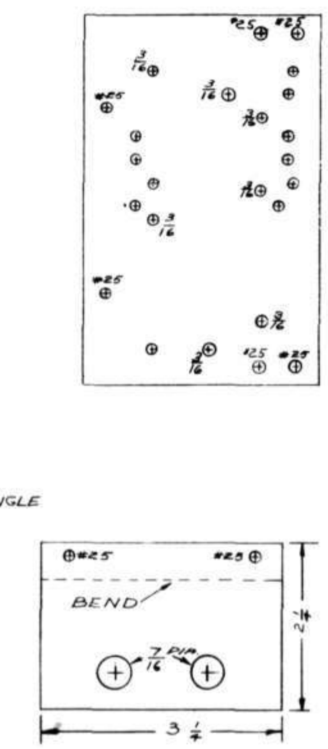
MULTIPLIER "A" REGISTER COMPONENT ASS'Y.

PANEL TEMPLATE REF. L-37516

6345 NHT - D-37515

D-37516





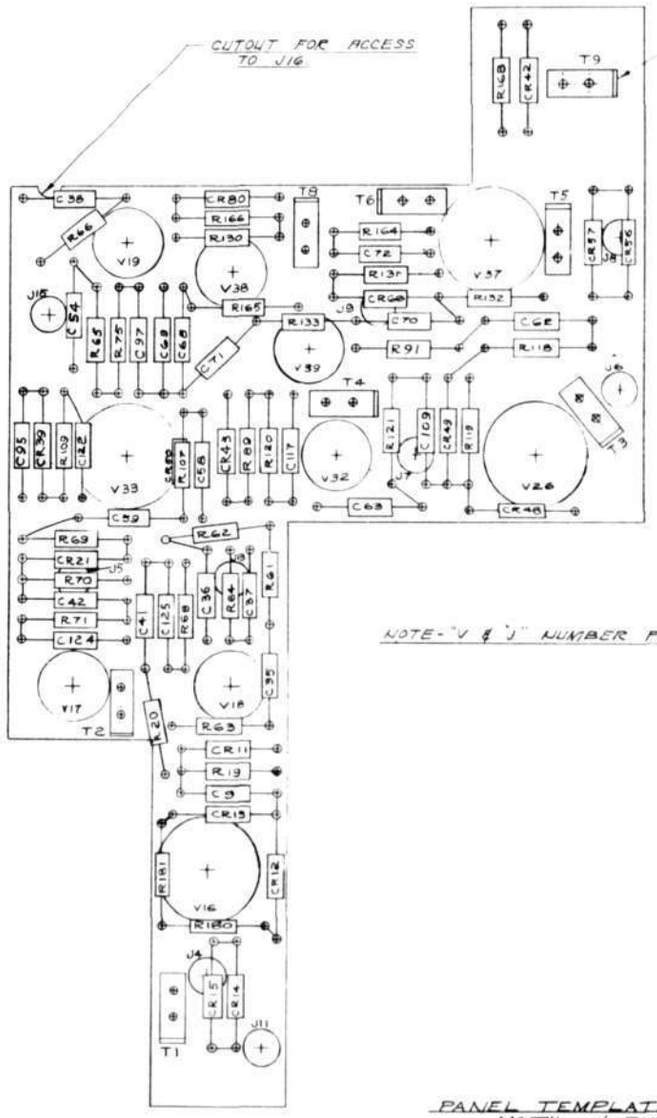
HOLES NOT NOTED DR. # 33

MATERIAL - 1/8 PHENOLITE OR EQUAL

MULTIPLIER "A" REGISTER PANEL TEMPLATE

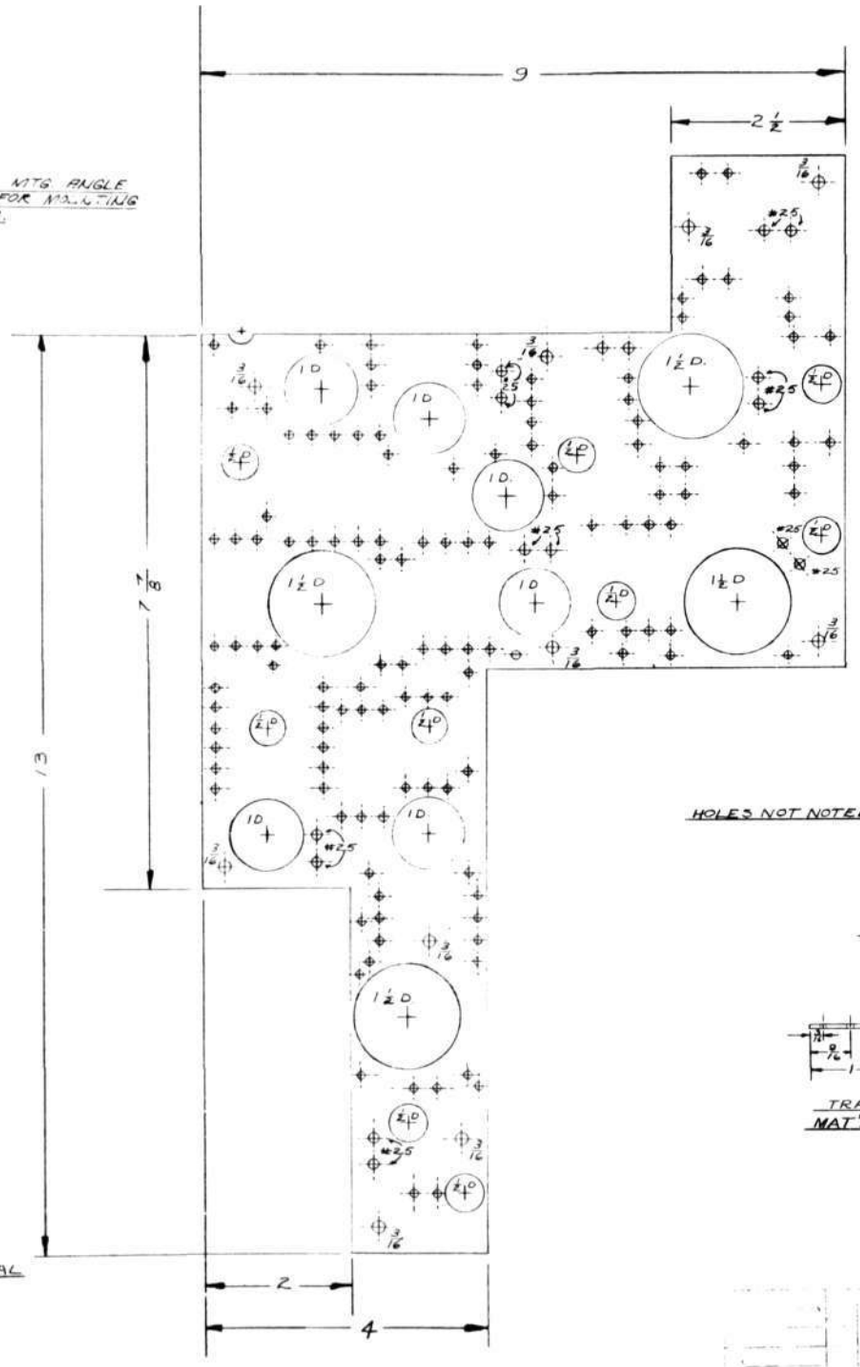
D-37516

D-37517

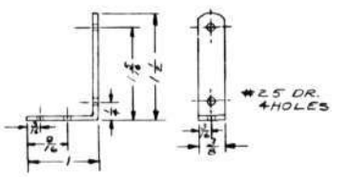


NOTE- "V & J" NUMBER FOR REF ONLY

PANEL TEMPLATE
MAT'L - 1/8 PHENOLITE OR EQUAL



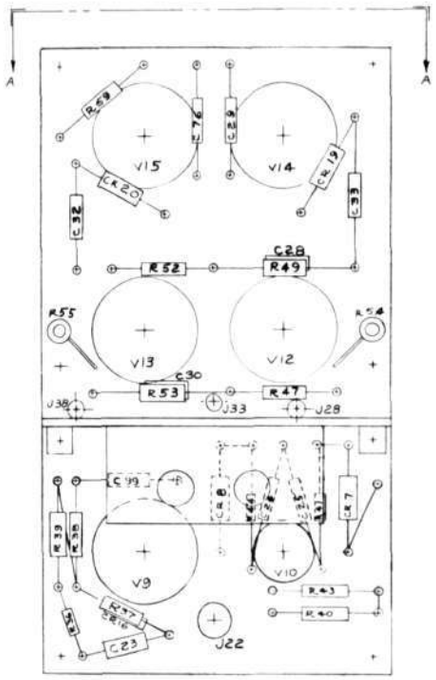
HOLES NOT NOTED DR. # 33

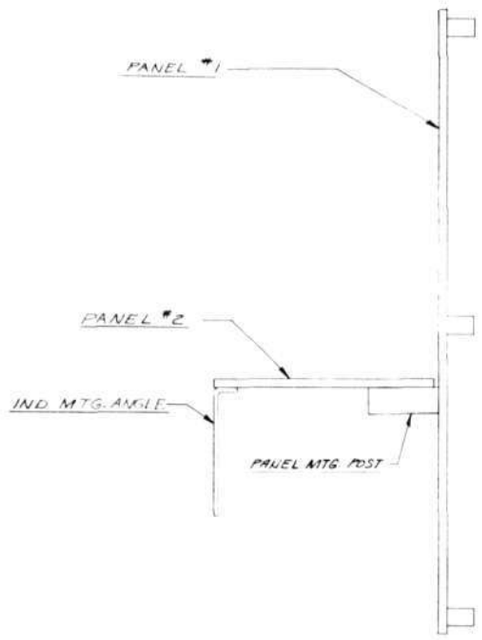


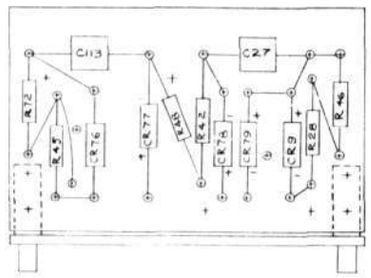
TRANSFORMER MTG ANGLE - 7 REQ'D.
MAT'L - 1/16 STAIN. ST'L. OR EQUAL

6345
GATE AND BUFFER PANEL NO. 1
DRILLING TEMPLATE & ASSY.
FULL
7-3-47
D-37517

D-37518-1





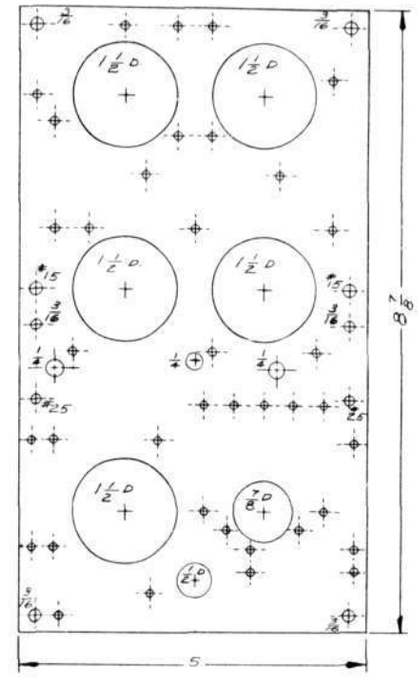


VIEW (UPRIGHT) A-A SHOWING COMPONENT ASS'Y PLAN

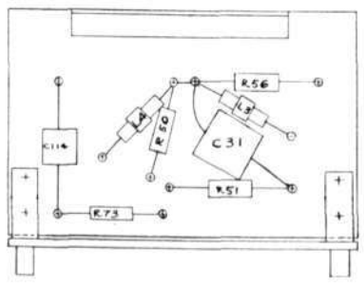
DRILLING TEMPLATES

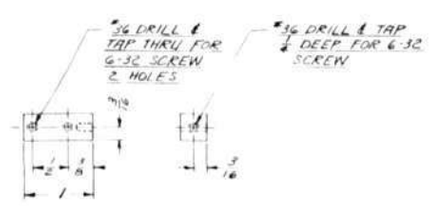
HOLES NOT NOTED DRILL #33

PANEL #1 - 1/8 THK PHENOLITE OR EQUAL



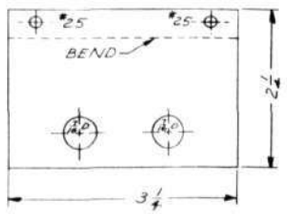
NOTE - "J" & "V" NUMBERS ARE FOR REFERENCE ONLY



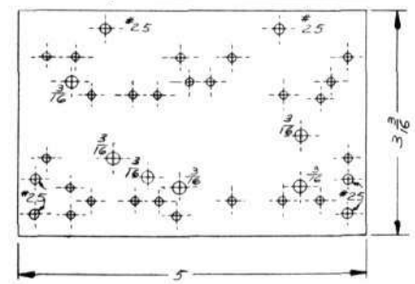


PANEL MTG POST - 2 REQ'D
MATL - 1/8 SQ BRASS STOCK

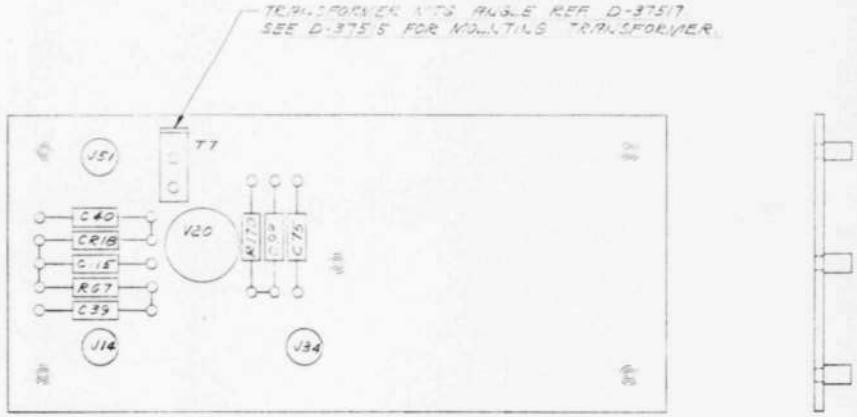
INDICATOR MTG ANGLE
1/16 THK ALUM. - 1 REQD



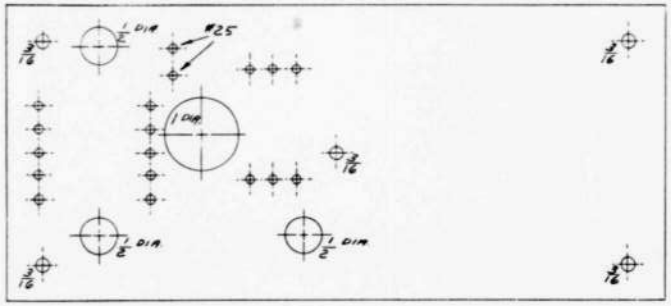
PANEL #2 - 1/8 THK PHENOLITE OR EQUAL



C-37521



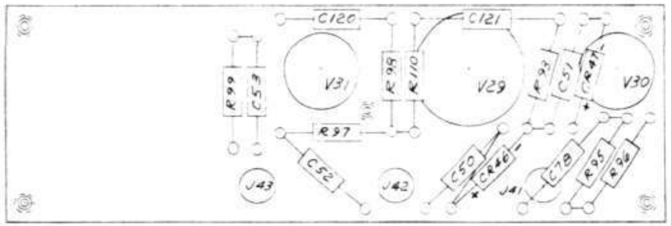
NOTE - 'V' & 'J' NUMBERS FOR REF ONLY



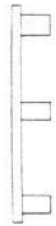
NOTE - MAT'L: 1/8 TH'K LINEN BASE PHENOLITE
HOLES NOT NOTED DRILL #33

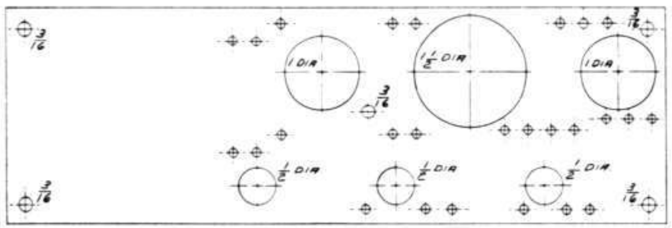
GATE & BUFFER AMPLIFIER PANEL #2
DRILLING TEMPLATE & ASS'Y.

C-37522



NOTE - "V" & "J" NUMBERS FOR REF ONLY





NOTES - MAT'L: 1/8 TH'K LINEN BASE PHENOLITE
HOLES NOT NOTED DRILL #33

GATE & BUFFER AMPLIFIER PANEL #3
DRILLING TEMPLATE & ASS'Y.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY SERVOMECHANISMS LABORATORY	
6345	W. C. 7-15-47
M.H.T.	C-37522

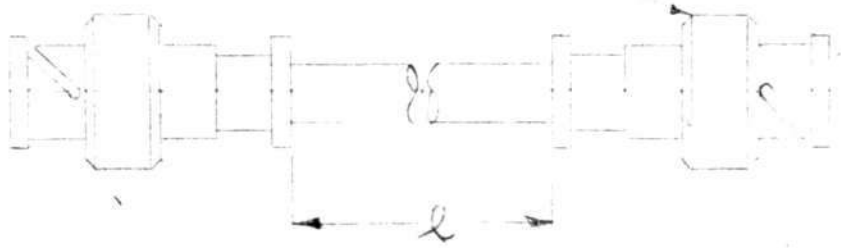
MULTIPLIER COLOR CODE

+250 V.	WHITE	WITH	RED	TRACER	#20
+150 V.	"	"	YELLOW	"	"
GROUND	"	"	BLACK	"	"
-50 V.	"	"	BLUE	"	"
GRID LEADS	"	"	GREEN	"	"
MISC. JUMPERS	"	"	NO	"	"
FILAMENTS	"	"	BROWN	"	#16 & #20
-20 V.	"	"	VIOLET	"	#20
-10 V.	"	"	GRAY	"	"

A-30681-1

SA-39-21

CONNECTOR UG-260-U



CABLE RG-62U

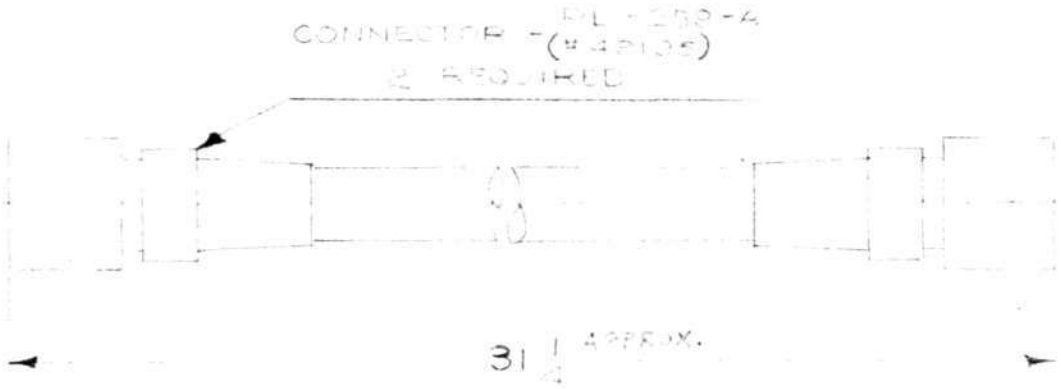
No.	CABLE DESIGNATION	LABEL END #1	LABEL END #2	LENGTH "ℓ"	NO. REQ.
A	CARRY DIGIT	PL19	PL28	33"	4
B	HI-SPEED CARRY	PL6	PL7	28"	4
C	MULTIPLI	BR5, PL23	MULTIPLY	38"	1
D	TO RT BR4-5	BR4, PL27	BR5, PL1		1
E	TO RT BR4-5	BR4, PL21	BR5, PL12		1
F	AC5 TO BRO	AC5, PL30	BRO, PL12		1
G	AC5 TO BRO	AC5, PL19	BRO, PL1		1
H					
I					

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

SINGLE VIDEO CABLES

SCALE: —	DR.	SA-39321
ENG.	CK.	APP.

SA-39322



CABLE - RG-58U
CABLE LENGTH -
CUT TO 30" BEFORE ASSEMBLY
NO. REQUIRED - 1

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

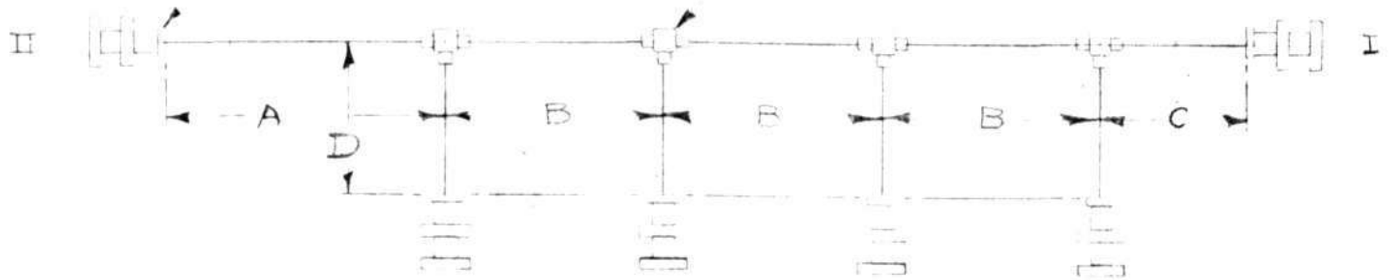
DELAY CABLE

SCALE: —	DR.	SA-39322
ENG.	CK.	APP.

SB-39323

CONNECTOR
US-260-U
6 REQ

TEE SPLICE CONNECTOR
4 REQ



CABLE - RG-62-U

NO.	NAME	LABEL END I	LABEL END II	LABEL EACH END	LENGTH A	LENGTH B	LENGTH C	LENGTH D	NO. REQ
X	CARRY ORDER BUS	CARRY	PL14	PL14	30	20	16	11	1
Y	ADD ORDER BUS	ADD	PL26	PL26	30	20	16	11	1

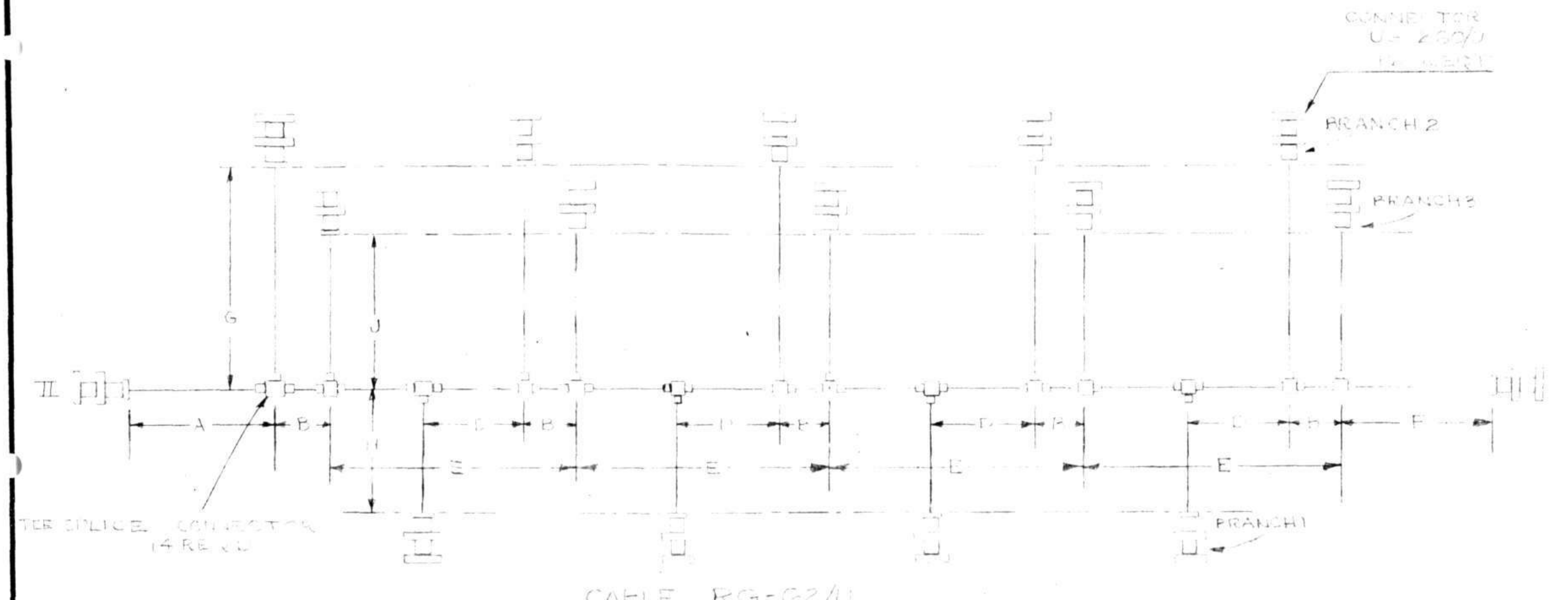
FOR 5-DIGIT MULTIPLIER ONLY

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

ADD AND CARRY ORDER BUSES

SCALE:	DR.	SB-39323
ENG.	CK.	APP.

SB-39324



NOTE: ALL BRANCHES OF EQUAL LENGTH HAVE SAME BRANCH NO.

NAME	LABEL					LENGTH									NO. REQ'D
	END 1	END 2	BRANCH 1	BRANCH 2	BRANCH 3	A	B	C	D	E	F	G	H	J	
CLEAR ORDER BUS	CLEAR	PL-3	PL-3	PL-20	PL-17	15	2 5/8	23 1/2	10 1/2	20	21	15	2 1/4	5	1

FOR 5-DIGIT MULTIPLIER ONLY

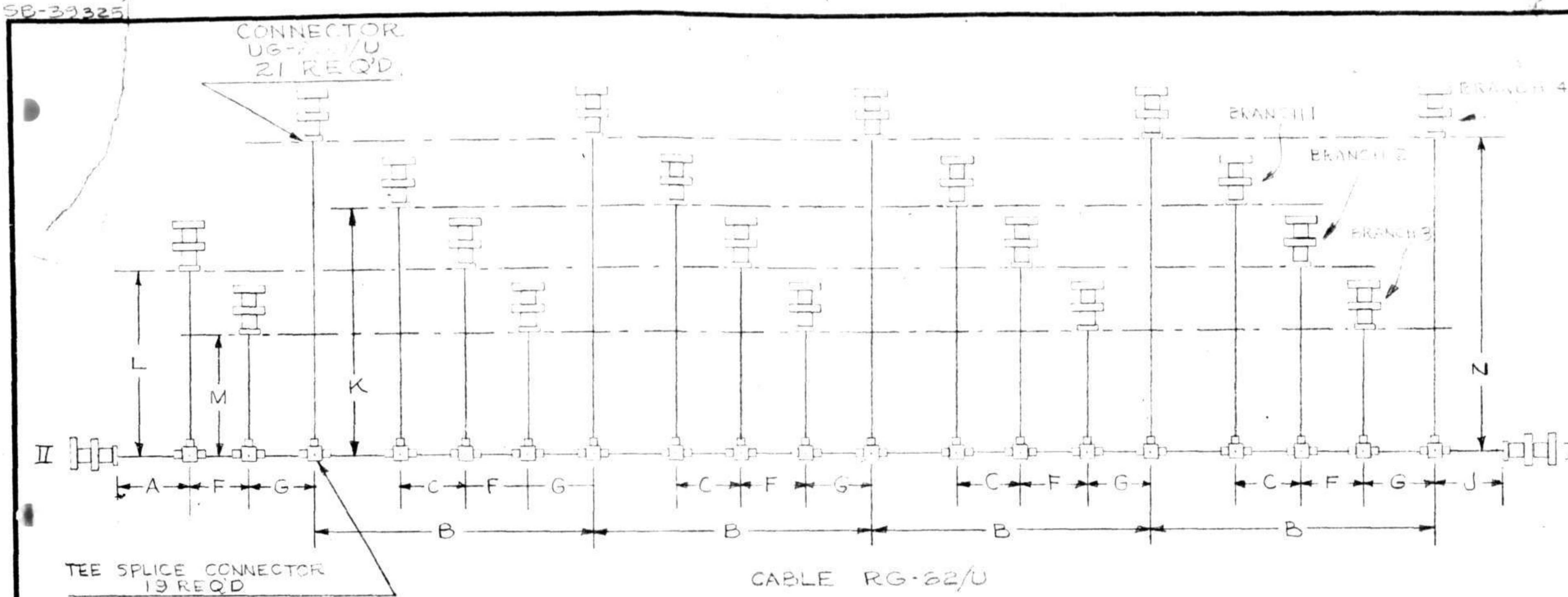
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

CLEAR ORDER BUS

SCALE: — DR. — CK. APP. ENG. C.W.W. 8/28/47

SB-39324

SB-39325



NOTE: BRANCHES OF EQUAL LENGTH HAVE SAME BRANCH NO.

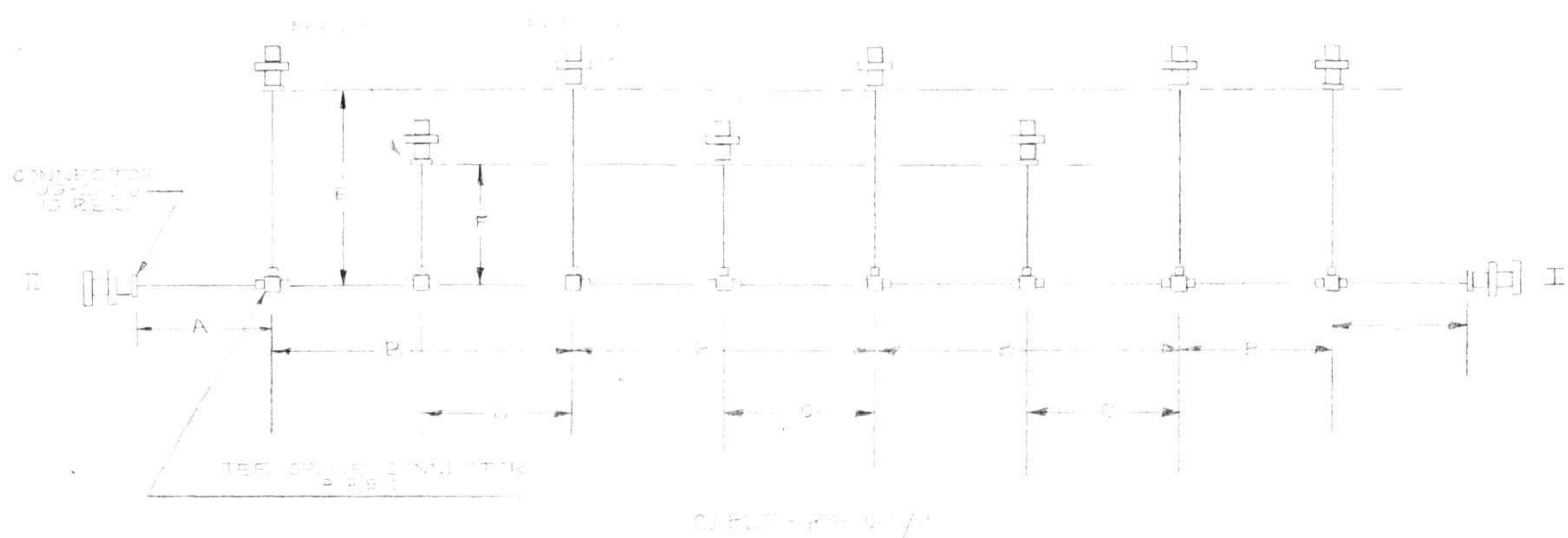
NAME	LABEL						LENGTH										NO. REQ'D
	END I	END II	BRANCH-1	BRANCH-2	BRANCH-3	BRANCH-4	A	B	C	F	G	J	K	L	M	N	
RESTORE ORDER BUS	RESTORE	PL-10	PL-10	PL-30	PL-21	PL-22	$21\frac{1}{2}$	20	8	$4\frac{1}{4}$	$2\frac{1}{4}$	15	16	8	7	37	1

FOR 5-DIGIT MULTIPLIER ONLY

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

RESTORE-ORDER BUS

SCALE:	DR. McHUGH 8-27-47	SB-39325
ENG. C.W.W. 8/28/47	CK.	APP.



NAME	LABEL				LENGTH						NO. REQ.
	END I	END II	[illegible]	[illegible]	A	B	C	D	E	F	
SHIFT & CARRY [illegible]	SHIFT & CARRY [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	14 [illegible]	13 1/2	5	9	1

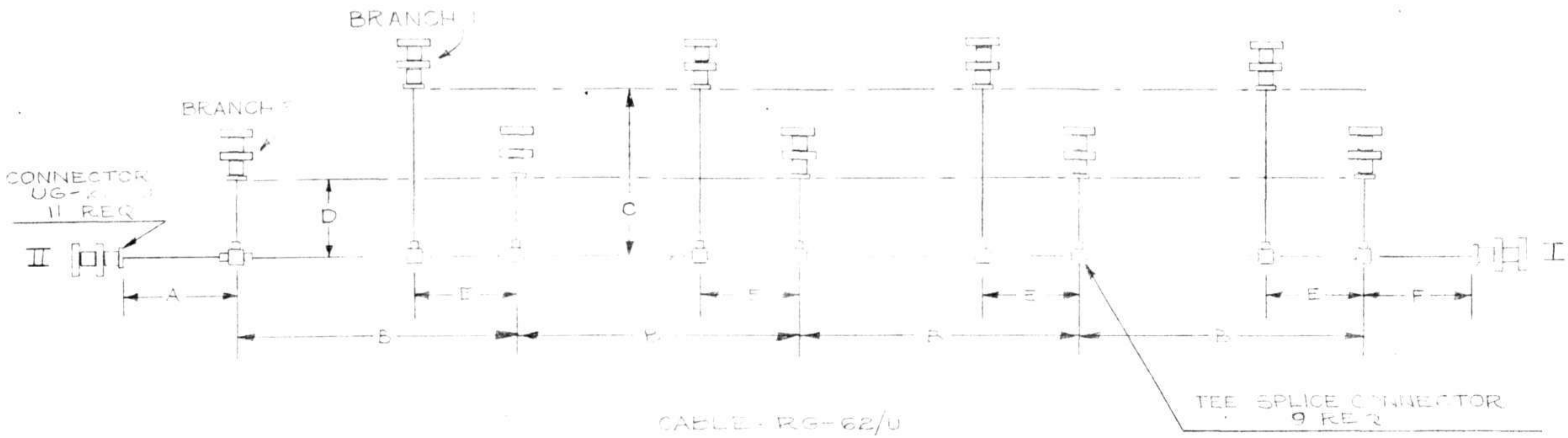
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

SHIFT AND CARRY [illegible] BUS

SCALE: | DR. [illegible]
ENG C.W.W. [illegible] | CK. | APP.

SB-39326

SB-39327



NOTE: BRANCHES OF [illegible] LENGTH [illegible] SAME BRANCH NO.

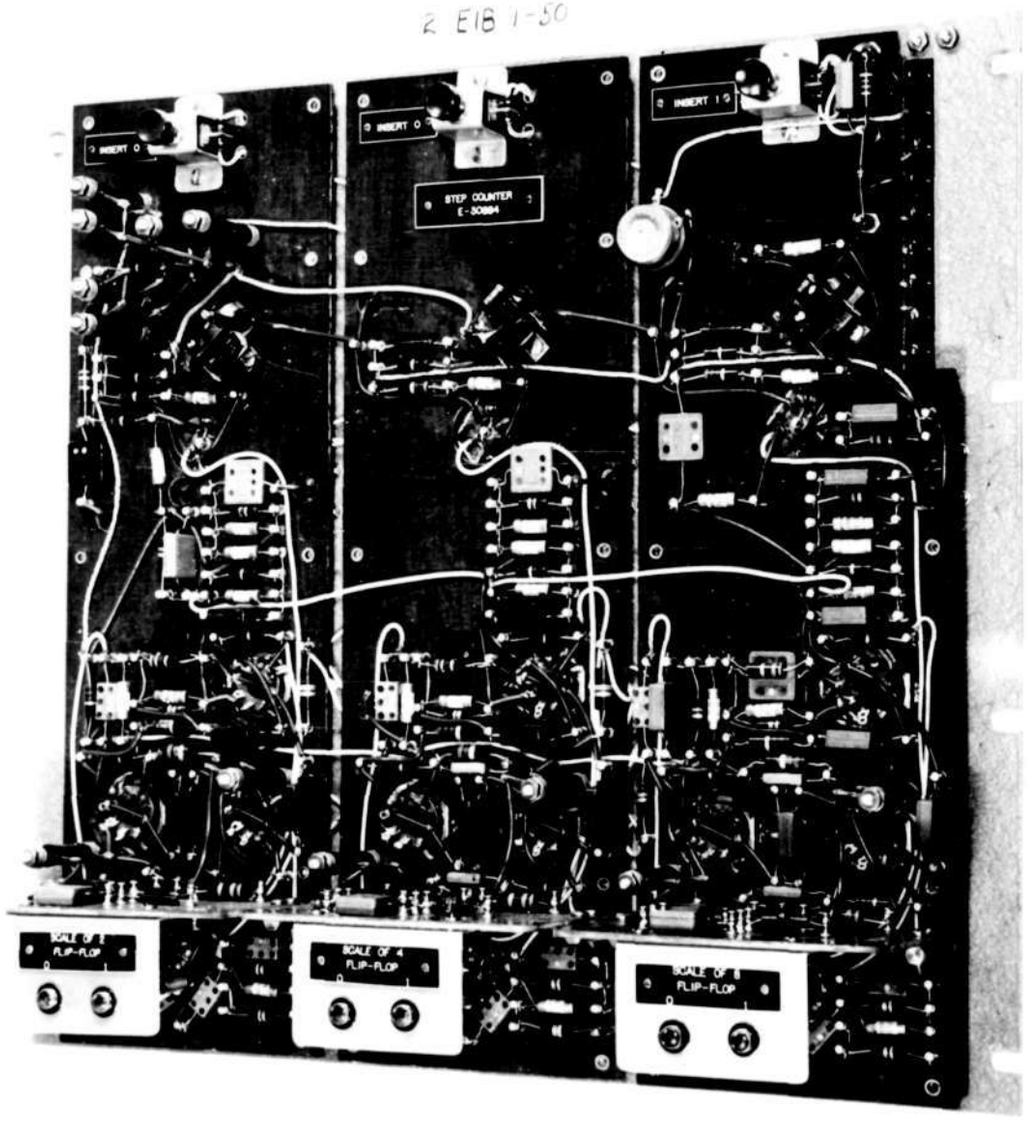
NAME	LABEL				LENGTH						NO REQ
	END I	END II	BRANCH	BRANCH 2	A	B	C	D	E	F	
READ IN BUS	READ IN	PL-13	F-13	PL-47	18	23	14	5	[illegible]	27	1

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. [illegible]

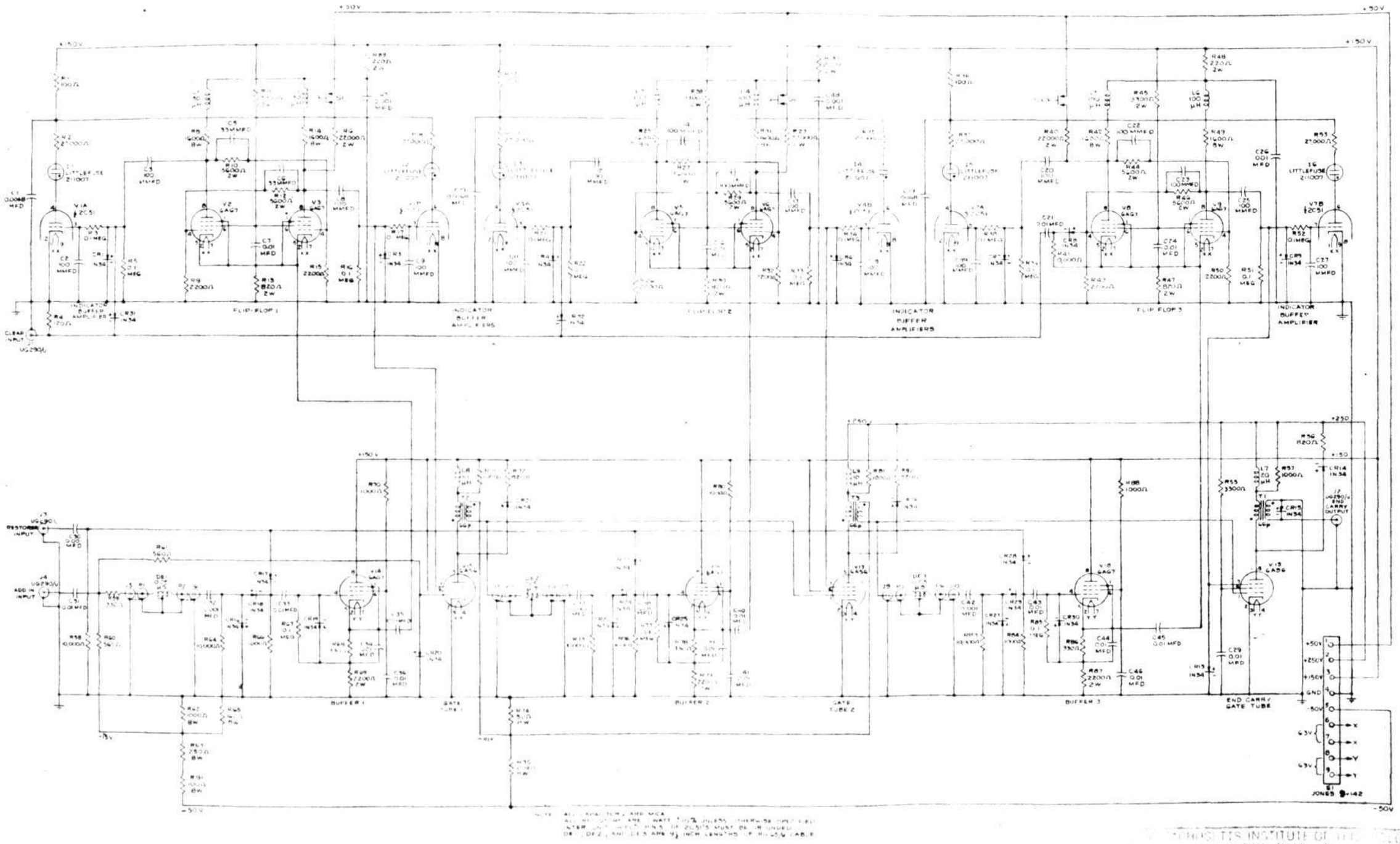
READ IN BUS

SCALE: —	DR. [illegible]	SB-39327
ENG CWW 3/1/4	CK	APP.

FB 270
2 EIB 1-50



E-30884-1



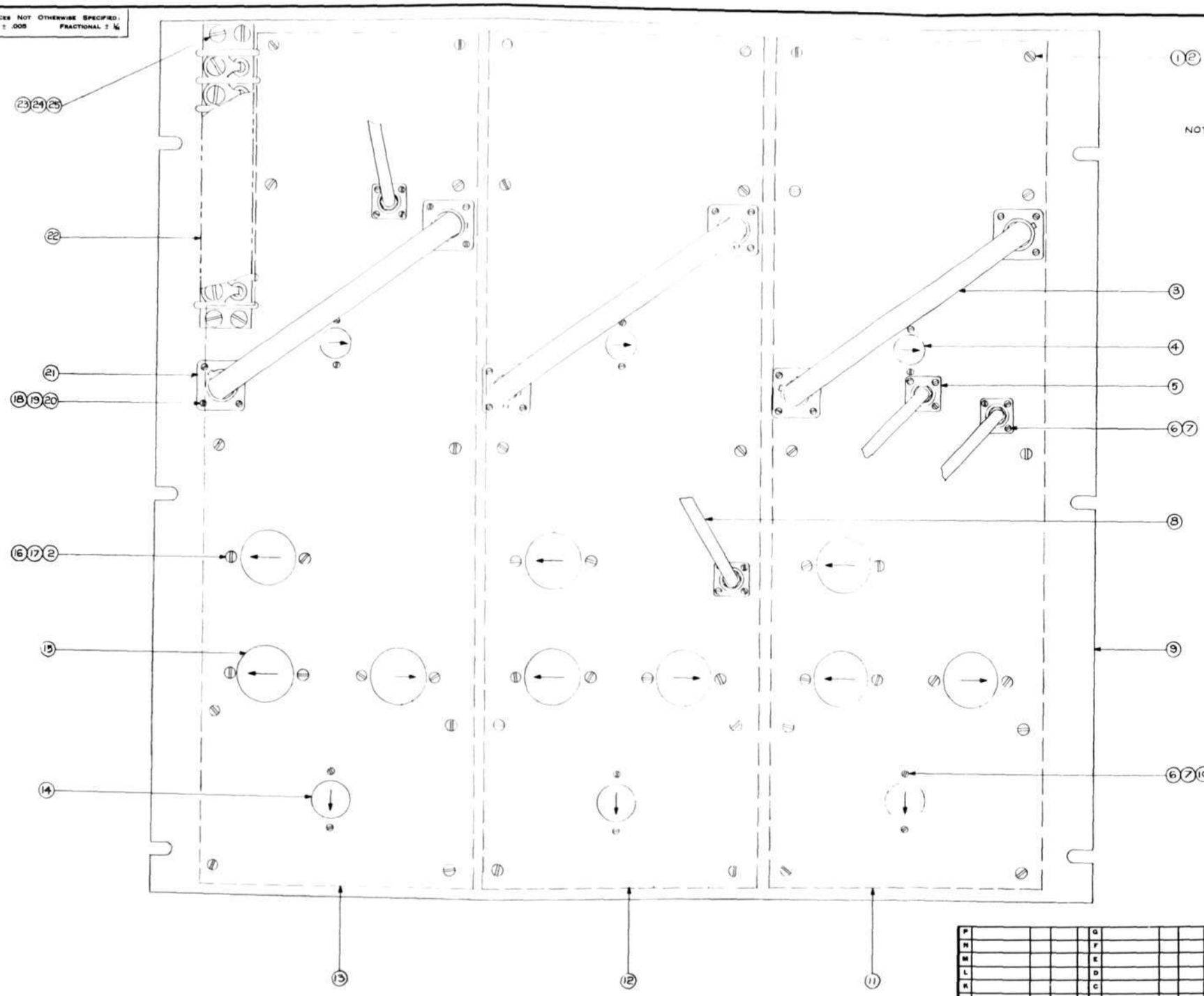
USED IN 6345 REPORT R-126

STEP COUNTER CIRCUIT SCHEMATIC II.

6345 F.B. 10/2/47
E.I.B E-30884-1

D-30878-1
WO.

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64



NOTES: 1. THE EXACT LENGHT OF RG/62B75 CABLE WILL BE DETERMINED BY ENGINEER.
2. ARROWS INDICATE DIRECTION OF SOCKET KEY.

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
25	HEX NUT #8-32		4
24	LOCKWASHER #8 SHAKEPROOF	#1708	4
23	RD. HD. SCREW #8-32		4
22	JONES STRIP	#42-3	1
21	DELAY LINE CONNECTORS	PL259A	6
20	HEX NUT #4-40		24
19	LOCKWASHER #4 SHAKEPROOF	#1704	24
18	RD. HD. SCREW #4-40 3/8 LG		24
17	HEX NUT #6-32		18
16	RD. HD. SCREW #6-32 1/4 LG		18
15	TUBE SOCKET (6AG7) CINCH	#9661	9
14	TUBE SOCKET (2C51) CINCH	#8259A	3
13	SUB PANEL #3	C-30868	1
12	SUB PANEL #2	C-30867	1
11	SUB PANEL #1	C-30866	1
10	HEX NUTS #3-56		12
9	MAIN PANEL	D-30875	1
8	INPUT AND OUTPUT CABLES	RG/62B75	NOTE 1
7	LOCKWASHER #3 SHAKEPROOF	#1703	28
6	RH. SCREW #3-56 1/4 LG		28
5	CABLE CONNECTORS CARO	UG/260	4
4	TUBE SOCKET (6A5G) CINCH	#9335	3
3	DELAY LINE CABLE 9 1/2" LG.	RG/65U	3
2	LOCKWASHER #6 SHAKEPROOF	#1706	48
1	BH. HD SCREW #6-32 3/8 LG.		30

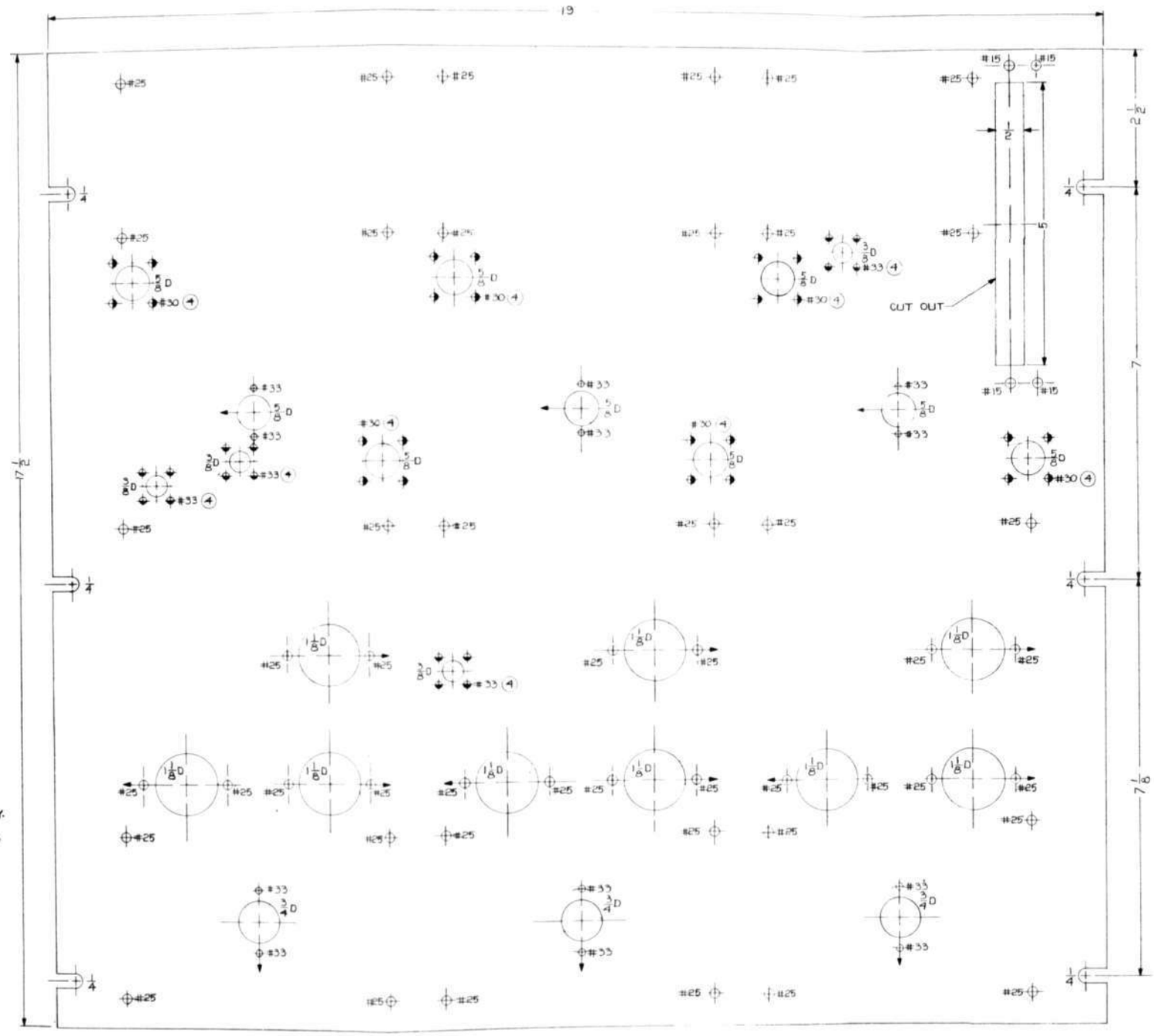
P				G			
N				F			
M				E			
L				D			
K				C			
J				B			
H				A			
	WAS	APP.	DATE		WAS	APP.	DATE

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO.

FRONT VIEW OF MAIN PANEL OF STEP-COUNTER

SCALE: FULL | DR. RVWeston 6-11-47 | TR. | CK. | APP.

D-30878-1



NOTE : ARROW HEADS INDICATE DIRECTION OF SOCKET KEY.

PANEL MOUNTING SLOTS ARE 1/2" DEEP.

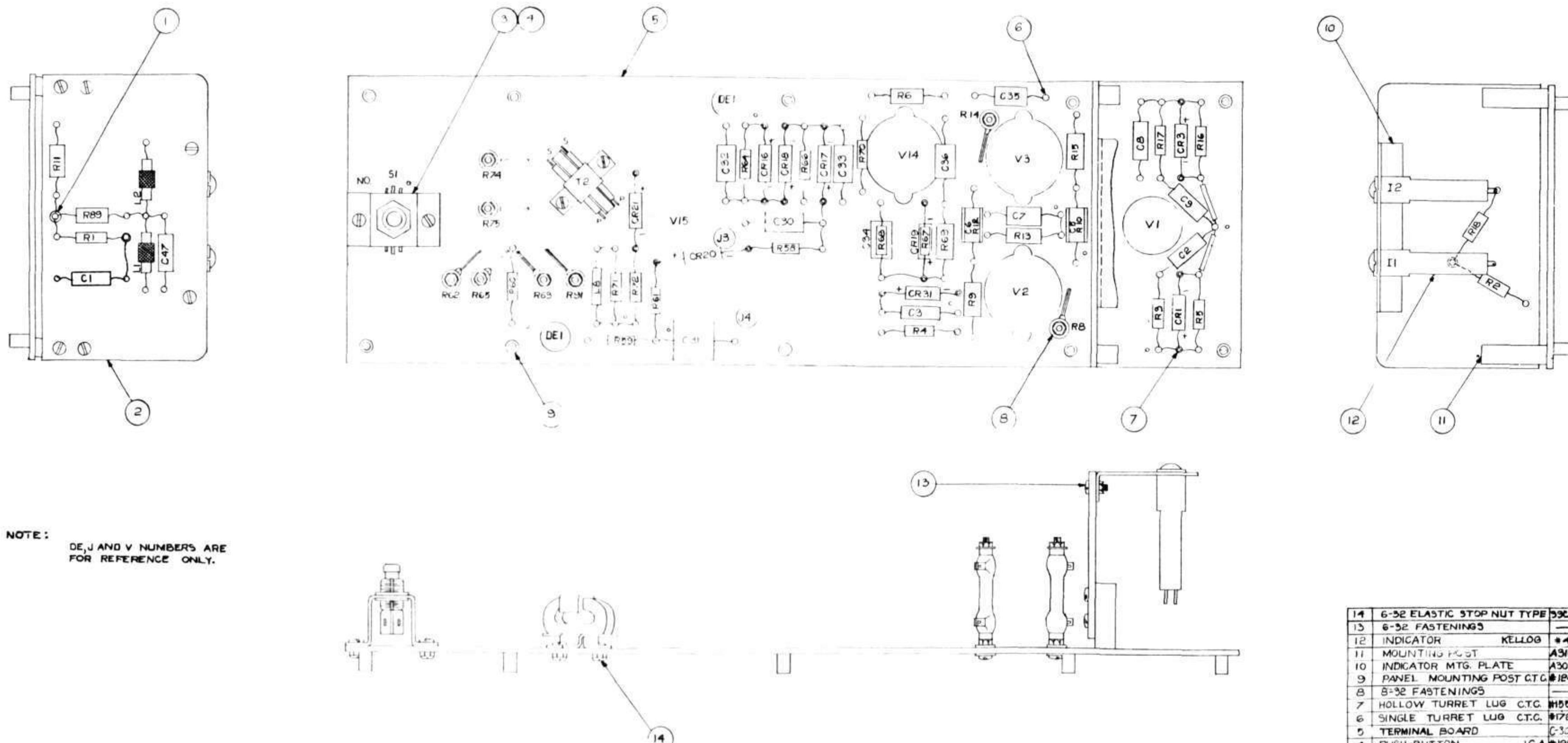
MATERIAL : 1/8" ALUMINUM-CRACKLE FINISH.

DRILLING TEMPLATE OF STEP-COUNTER

FUJI R.Weston 8/9/91 D-30875

D- 30849-1
WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .008 FRACTIONAL ± 1/64



NOTE:
DE, J AND V NUMBERS ARE FOR REFERENCE ONLY.

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
14	6-32 ELASTIC STOP NUT TYPE	99C5-62	4
13	6-32 FASTENINGS	——	2
12	INDICATOR KELLOG	#49	2
11	MOUNTING POST	A31013	2
10	INDICATOR MTG. PLATE	A30752	1
9	PANEL MOUNTING POST C.T.C.	#1246D	10
8	8-32 FASTENINGS	——	8
7	HOLLOW TURRET LUG C.T.C.	#1558L	18
6	SINGLE TURRET LUG C.T.C.	#1724D	68
5	TERMINAL BOARD	C-30866	1
4	PUSH-BUTTON I.C.A.	#1282	1
3	PUSH-BUTTON MTG. BRKT.	A30840	1
2	TERMINAL BOARD	A30865	1
1	DOUBLE TURRET LUG C.T.C.	#1081A	2

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO.

PANEL 1 OF STEP-COUNTER ASS'Y

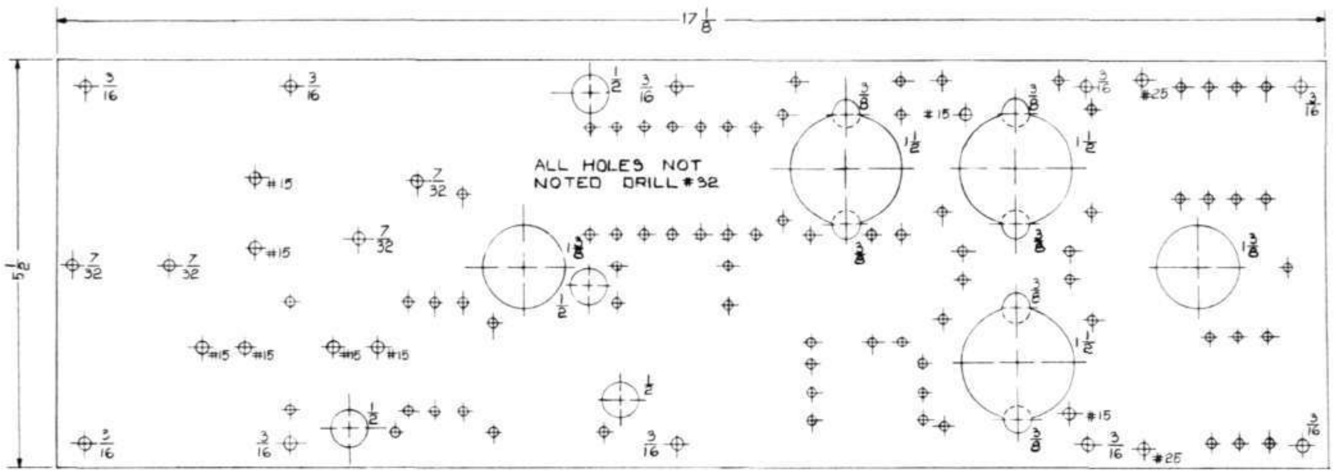
SCALE: FULL | DR. RV Weston 9/4/47 | TR. | CH. E.I.B. | APP.

D- 30849-1

C-30866

APPROVED FOR PUBLIC RELEASE. CASE 06-1104.

USED IN ASS'Y D-30849

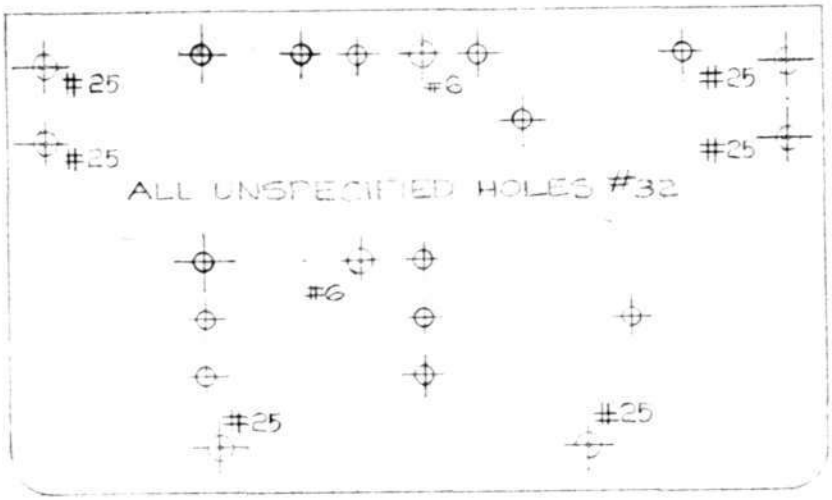


NOTES:
MATERIAL - 1/8 THICK GRADE LE BLUE-LINE LINEN-BASE BAKELITE.

SERVOMECHANISMS LABORATORY OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345			
DRILLING TEMPLATE OF STEP-COUNTER PANEL I			
SCALE: FULL	DR. R.Westn 9/9/47		C-30866-1
3A3	CH.	APP.	

A-30865-1

D-30847-B-50



NOTES:

MATERIAL - $\frac{1}{8}$ THICK GRADE LE
LINEN BASE BLUE-LINE BAKELITE

ROUND OFF INDICATED
EDGES APPROXIMATLY $\frac{1}{4}$ R.

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

DRILLING TEMP. - STEP COUNTER VERT. BOARD

SCALE: FULL	DR R.W. Upton 9/8/47	A-30865-1
ENG. E.A.B.	CK.	APP.

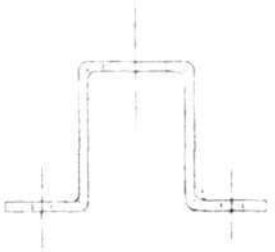
A-30840-1

B-30847, 48, AND 49

NOTES:

MATERIAL — 1/16" ALUMINUM.

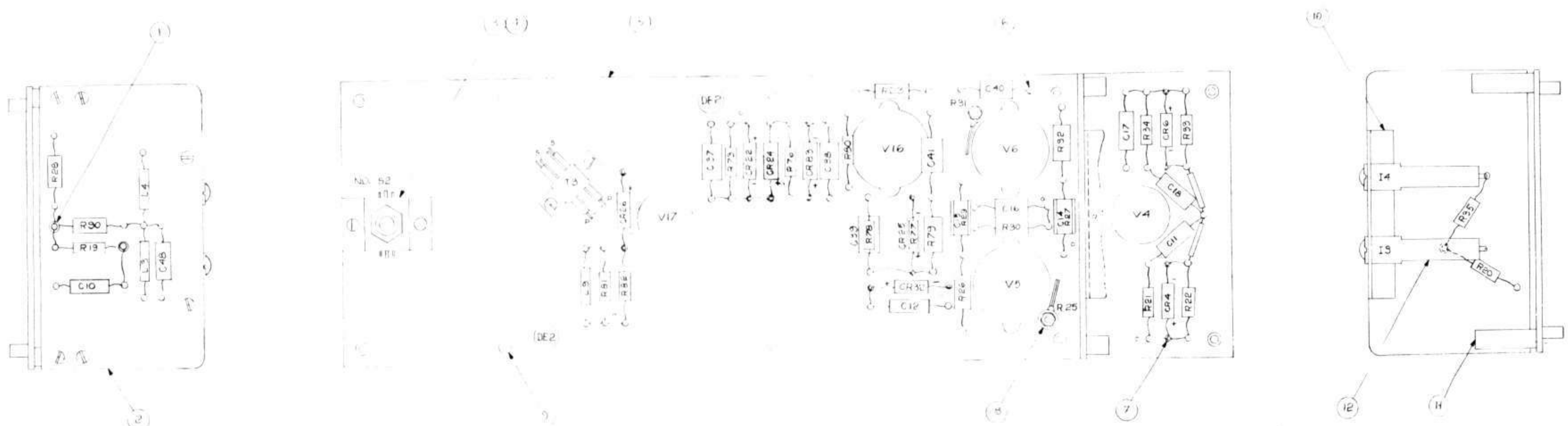
BEND ALL BENDS 90°



SERVOMECHANISMS LABORATORY OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345			
PUSH-BUTTON MTG. BRKT.			
SCALE: FULL	DR. R.W.ESTON 9-24-47		A-30840-1
ENG. EAB	CK.	APP.	

D-30847-1
WO:

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64



NOTES:
DE, J AND V NUMBERS ARE FOR REFERENCE ONLY.

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
14	6-32 ELASTICSTOP NUT TYPE	99C5-62	4
13	6-32 FASTENINGS	——	2
12	INDICATOR KELLOG	#49	2
11	MOUNTING POST	A31013	2
10	INDICATOR MTG PLATE	A30752	1
9	PANEL MOUNTING POST CTC	#1246D	10
8	8-32 FASTENINGS	——	2
7	HOLLOW TURRET LUG CTC	#1558D	18
6	SINGLE TURRET LUG CTC	#1724D	61
5	TERMINAL BOARD	C-30867	1
4	PUSH BUTTON ICA	#1282	1
3	PUSH-BUTTON MTG. BRKT.	A30840	1
2	TERMINAL BOARD	A30866	1
1	DOUBLE TURRET LUG CTC	#1081A	2

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

PANEL 2 OF STEP-COUNTER ASS'Y

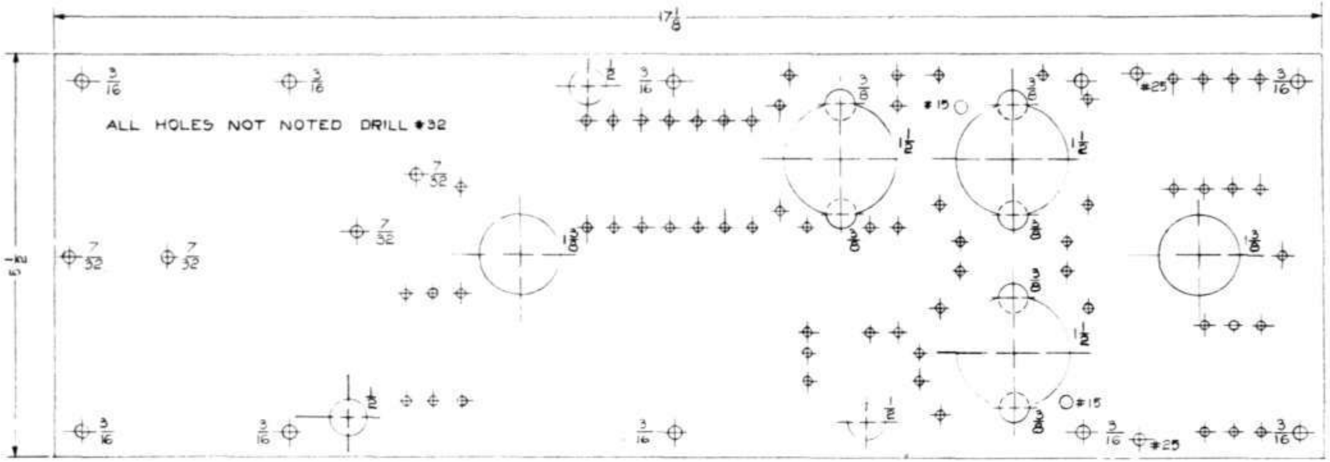
SCALE: FULL DR: RV WESTON 3-4-4[illegible] TR: E.L.B. CK: APP:

D-30847-1

	MAR	APP	DATE		MAR	APP	DATE
P				G			
N				F			
M				E			
L				D			
K				C			
J				B			
H				A			

C-30867-1

USED IN ASS'Y D-30847



NOTES:
MATERIAL - $\frac{1}{8}$ THICK GRADE LE BLUE-LINE LINEN-BASE BAKELITE.

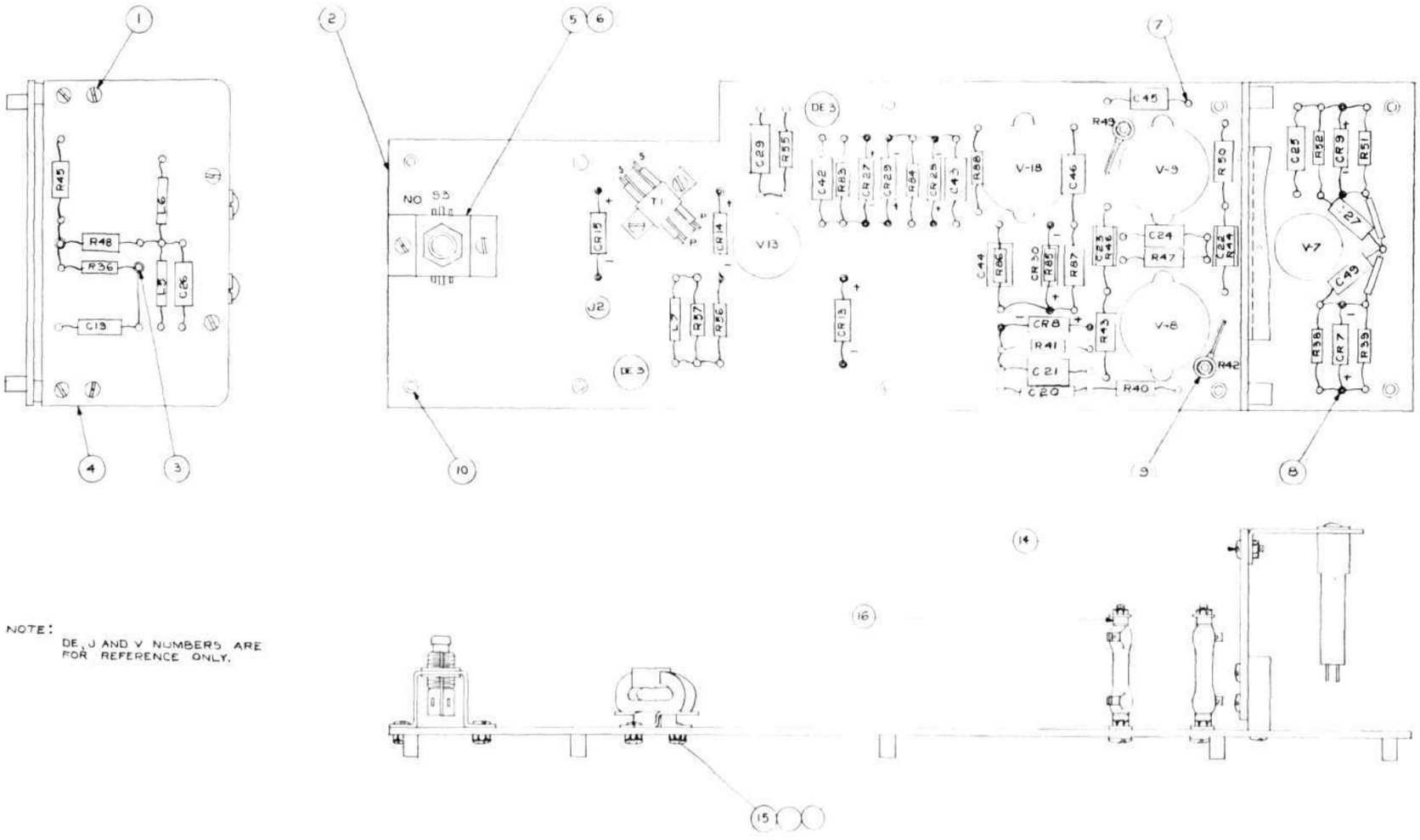
SERVOMECHANISMS LABORATORY OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

DRILLING TEMPLATE OF STEP-COUNTER PANEL 2

SCALE FULL	DR R.Weltu...	C-30867-1
ENG. EJC	CK	APP

D-30848-1
WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64



NOTE:
DE, J AND V NUMBERS ARE FOR REFERENCE ONLY.

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
15	6-32 ELASTIC STOP NUT	3905-62	4
14	6-32 FASTENINGS	——	2
13	INDICATOR KELLOG	*49	2
12	PANEL MTG. POST	A31013	2
11	INDICATOR MTG. PLATE	A30752	1
10	MOUNTING POST C.T.C	*1246D	10
9	8-32 FASTENINGS	——	2
8	HOLLOW TURRET LUG C.T.C.	*1558D	18
7	SINGLE TURRET LUG C.T.C.	*1724D	69
6	PUSH BUTTON MTG. BRKT.	A30840	1
5	PUSH BUTTON I.C.A.	*1282	1
4	TERMINAL BOARD	C-30868	1
3	DOUBLE TURRET LUG C.T.C	*1081A	2
2	TERMINAL BOARD	A-30865	1
1	BINDER HEAD SCREWS 6-32		12

P					G				
N					F				
M					E				
L					D				
K					C				
J					B				
H					A				
	WAB	APP	DATE			WAB	APP	DATE	

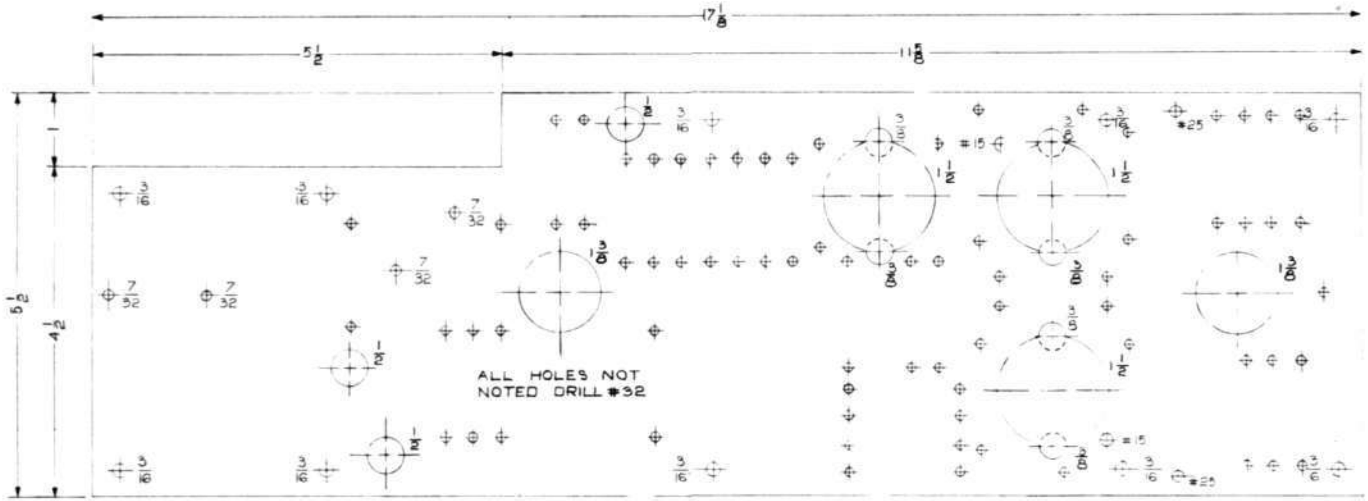
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

PANEL 3 OF STEP-COUNTER ASS'Y

SCALE FULL | DR RVW 3-2-47 | TR EAB | CK | APP | D-30848-1

C-30868-1

USED IN ASS'Y



NOTES:
MATERIAL - 1/8 THICK GRADE LE BLUE-LINE
LINEN-BASE BAKELITE.

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

DRILLING TEMPLATE [illegible] PANEL 3

SCALE FULL	DR. [illegible]	C-30868-1
ENG. 5 AB	CK.	APP.

REGISTER DRAWING LIST

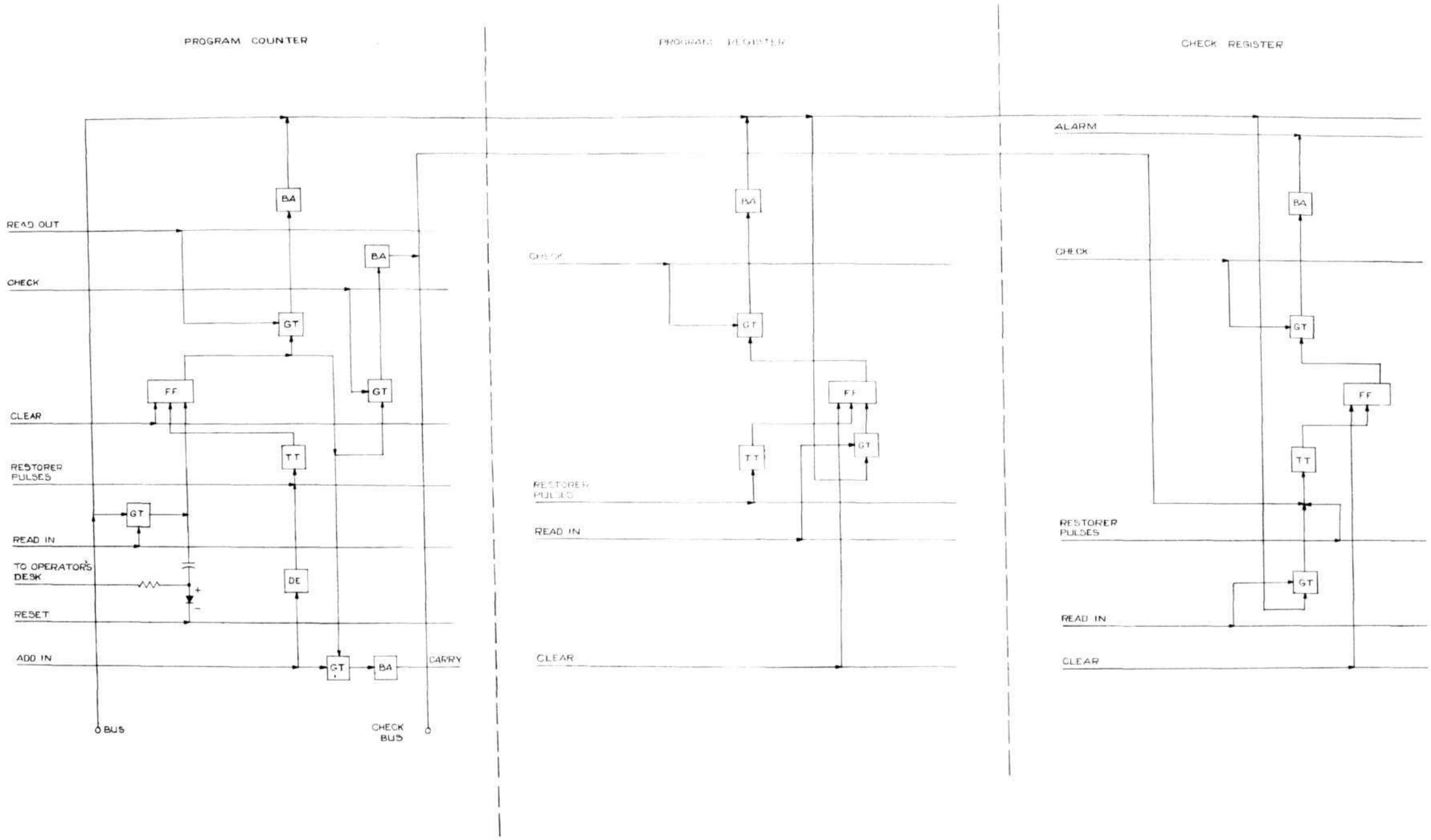
(Block Diagram Reference 102, 103, 601)

Drawing List	SA-39293
Block Schematic	D-30773
Panel and Cable Plan	R-30797
601 Check Register	
Block Schematic	SB-39288
Circuit Schematic	SD-39282
Assembly	D-30798

REGISTER PANEL

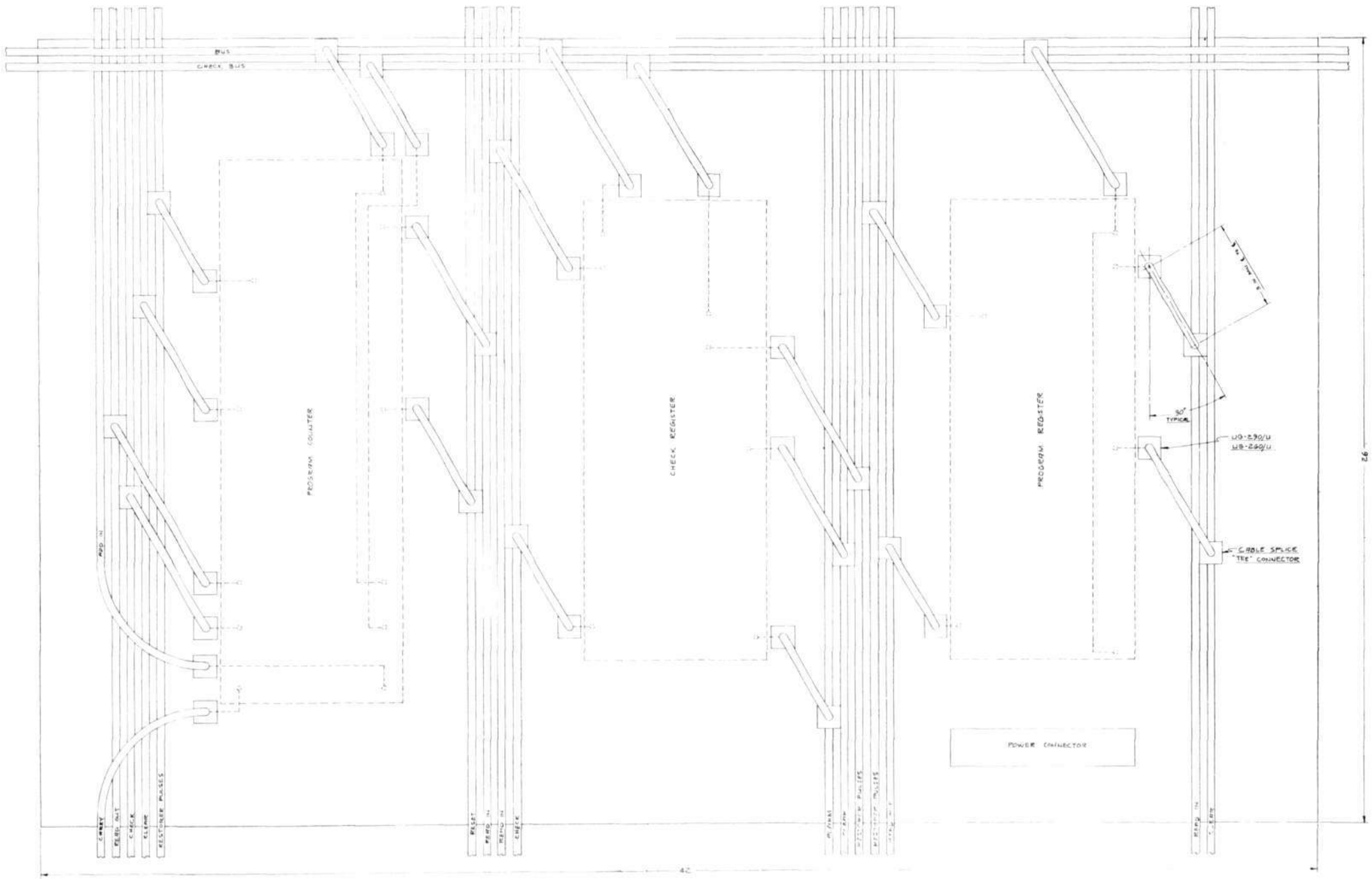
LIST OF DRAWINGS

REGISTER PANEL	
BLOCK SCHEMATIC	D-30773
MAIN PANEL & CABLE PLAN LAYOUT	R-30797
CHECK REGISTER	
BLOCK SCHEMATIC	B-39288
CIRCUIT SCHEMATIC	SD-39282-2
DRILLING TEMPLATE & ASS'Y	D-30798
PROGRAM REGISTER	
BLOCK SCHEMATIC	B-39289
CIRCUIT SCHEMATIC	SD-39283-2
DRILLING TEMPLATE & ASS'Y	D-30799
PROGRAM COUNTER	
BLOCK SCHEMATIC	B-39291
CIRCUIT SCHEMATIC	SD-39284-2
ASSEMBLY	D-30800



REGISTER PANEL BLOCK SCHEMATIC

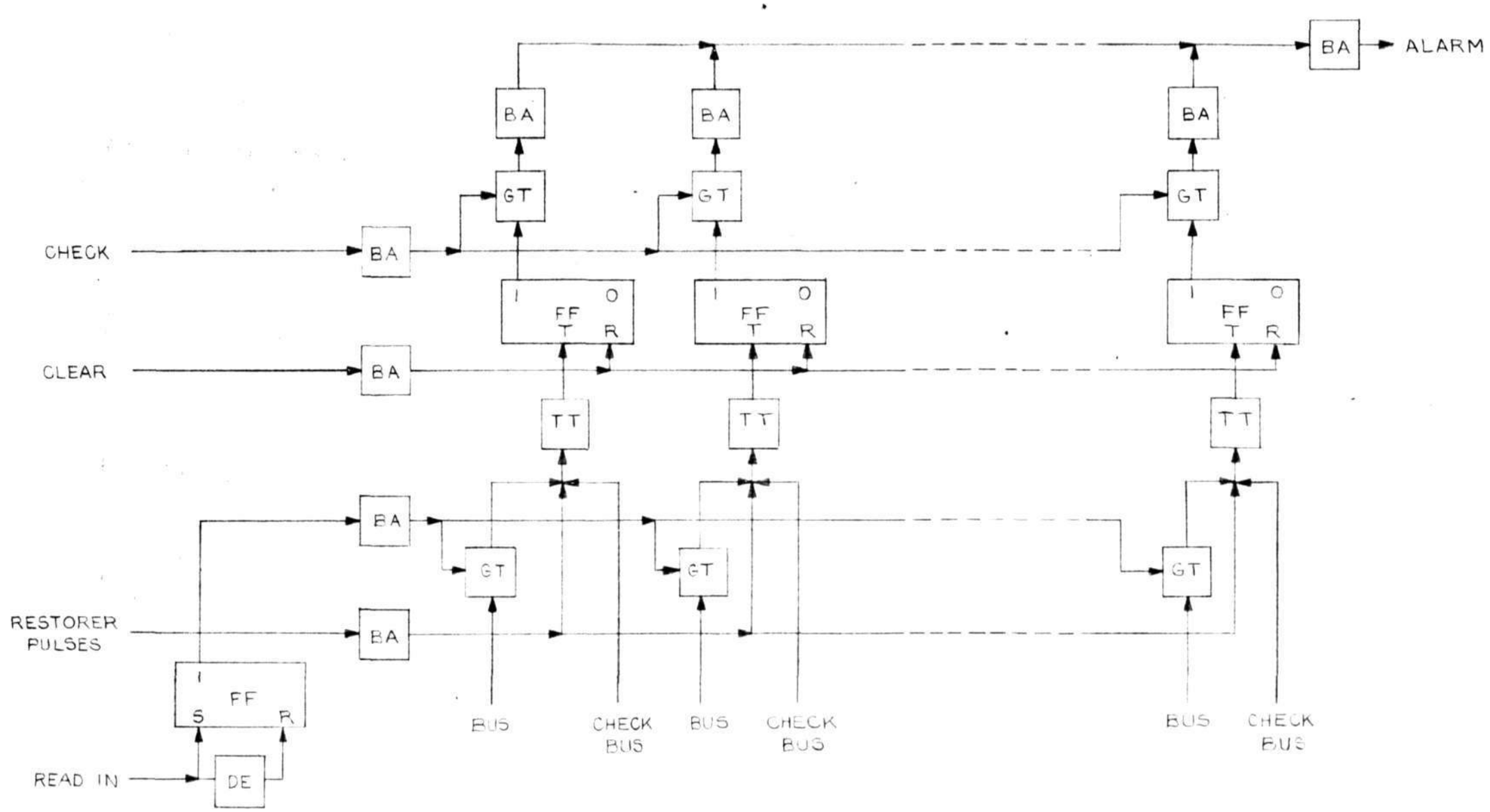
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
D-30773



REGISTER MAIN PANEL & CABLE PLAN

	R-30737

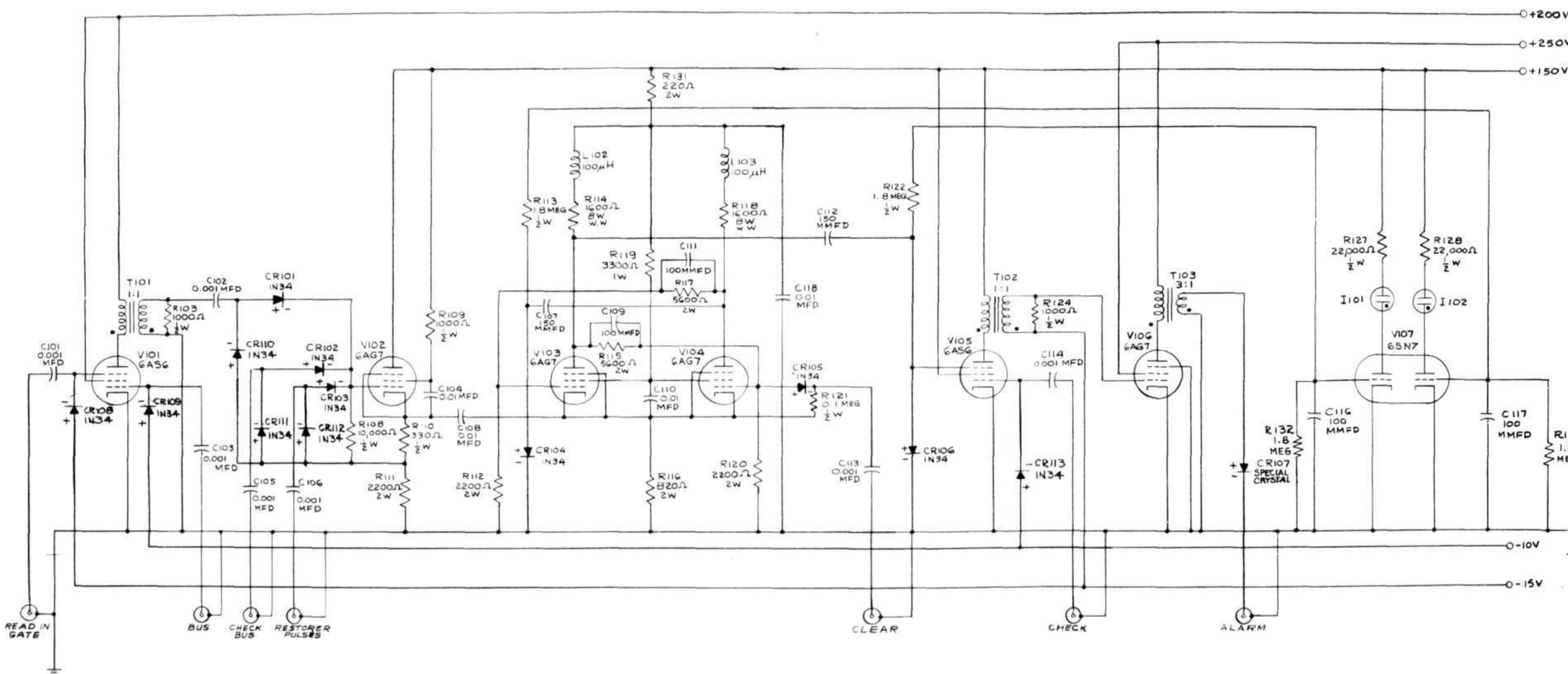
B-39288



CHECK REGISTER BLOCK SCHEMATIC

B-39288

SD-39282-3

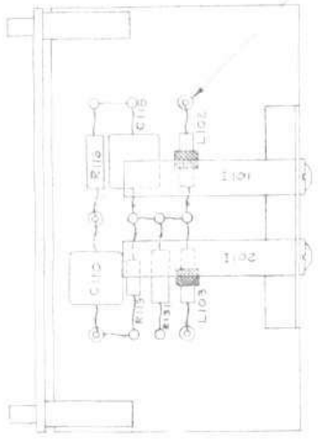


CHECK REGISTER
CIRCUIT SCHEMATIC

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
SD-39282-3

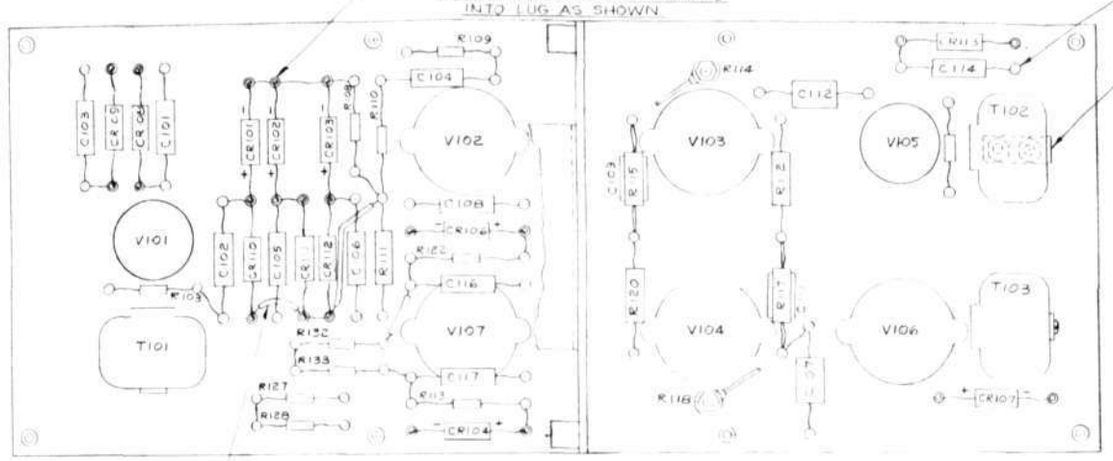
D-30795-1

USED IN ASS'Y SD-39282



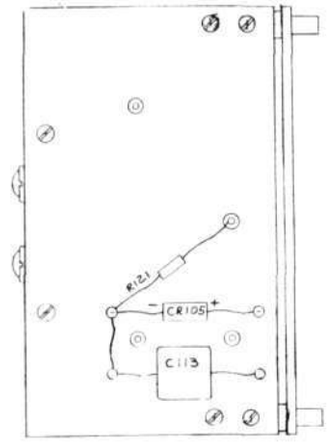
TERMINAL LUG
#1081A - CAMBRIDGE THERMIONIC CORP
4 REQ'D

HOLLOW TERMINAL LUG
CTC #1558D
22 REQ'D
SOLDER ALL CRYSTAL PIGTAILS INTO LUG AS SHOWN



TURRET TERMINAL LUG
#1724D - CAMBRIDGE THERMIONIC CORP.
62 REQ'D

TRANSFORMER MTG ANGLE
3 REQ'D
SEE A-30753

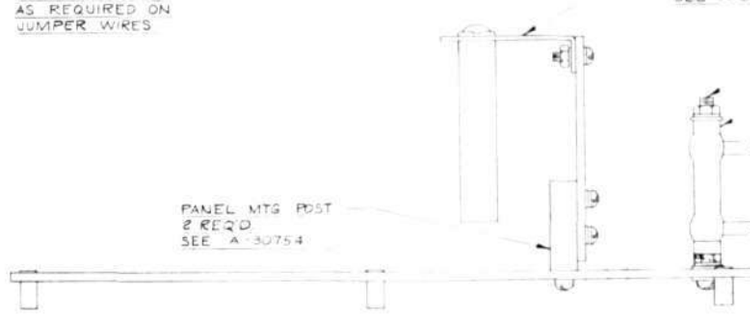


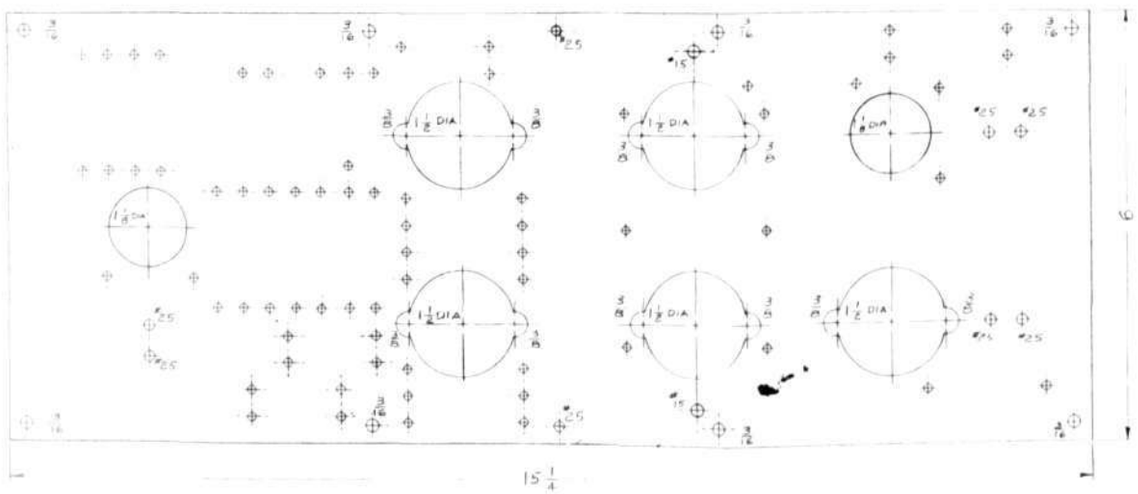
CAMBRIC TUBING
AS REQUIRED ON
JUMPER WIRES

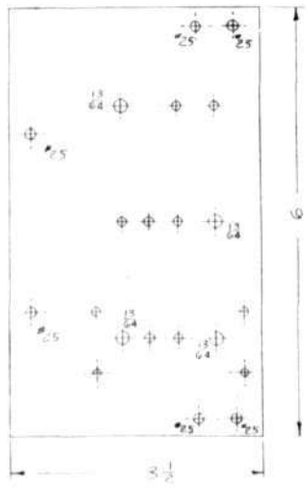
INDICATOR MTG PLATE
SEE A-30752

#6-32 FASTENINGS
ALL OTHER #6-32

ASS'Y NOTE
1 V101, V102, V103, V104, V105, V106, & V107 ARE NOT PARTS OF THIS ASS'Y & ARE INDICATE FOR REFERENCE ONLY







NOTES
1 MATL - 1/8 THK LINEN BASE PHENOLITE
2 HOLES NOT NOTED DRILL #33

CHECK REGISTER DRILLING TEMPLATE & ASS'Y

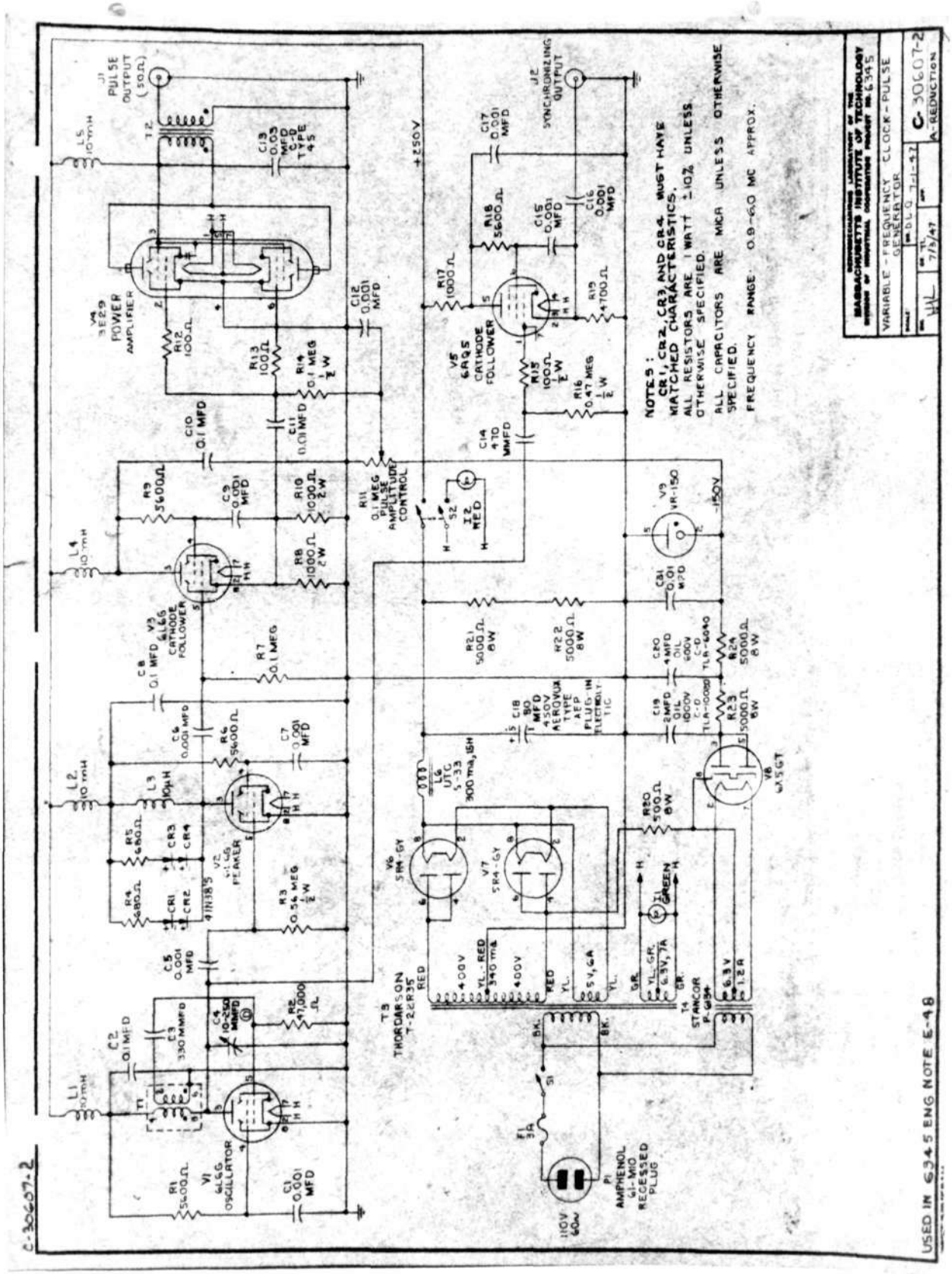
D-30798-

TEST EQUIPMENT DRAWING LIST

Variable Frequency Clock Pulse Generator, Vol. 19, E-43

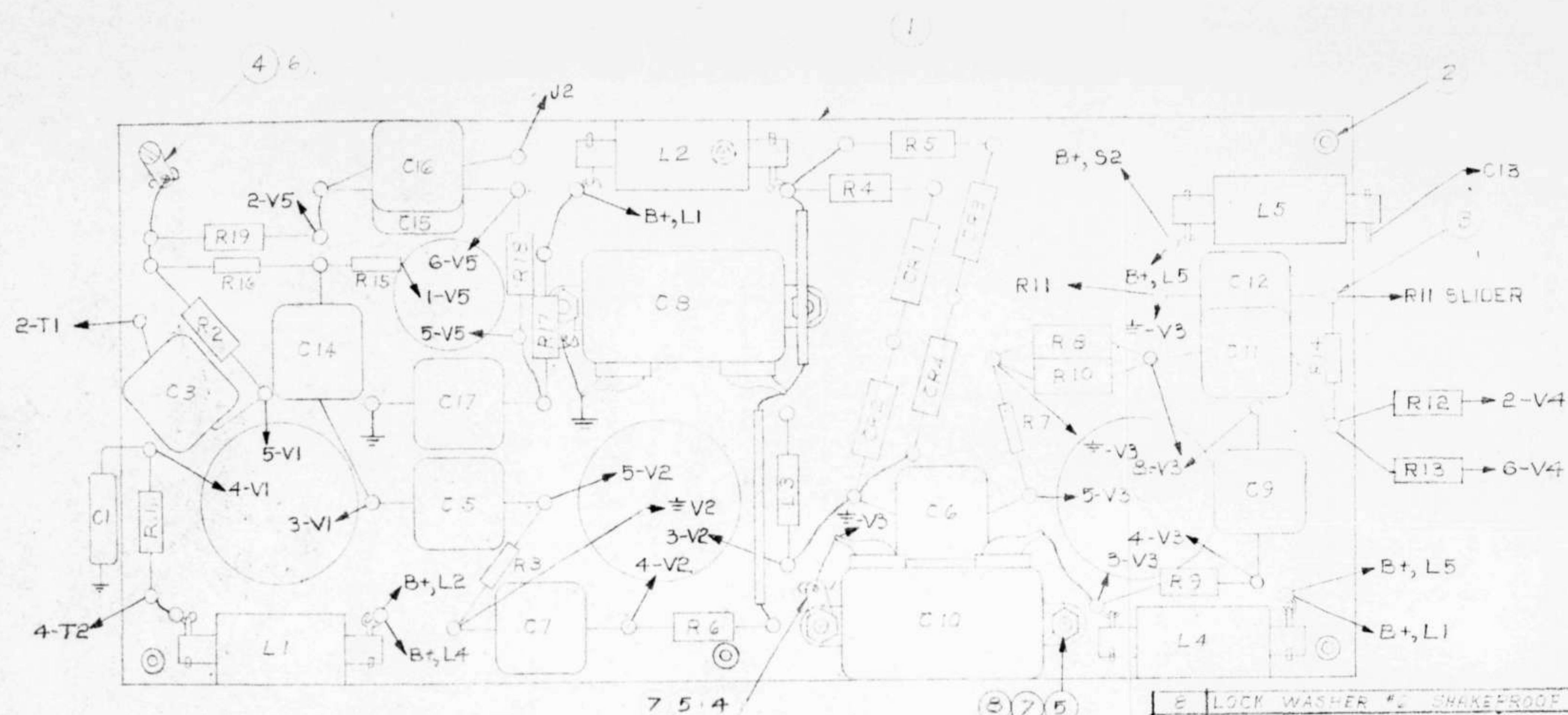
C-30607
B-30821
B-30820
A-30822
A-30814
A-30823
A-30813
A-30815
A-30816
A-30817
A-30818
A-30819
A-30846
B-30824
A-30750

A-30749
A-30843
A-30810
A-30827
A-30748
A-30811
A-30845
B-30825
A-30842
A-30844
B-30826
A-30841
E-30618
C-30620
A-31090
A-38250



B-30821

USED IN ASS'Y B-31021



ELECTRICAL PARTS LIST

SERIAL NO.	VALUE	SERIAL NO.	VALUE	SERIAL NO.	VALUE
R12, R13	100 Ω 1W				
R1	5600 Ω 1W	R15	100 Ω ½W	C10	0.1 MFD, OIL
R2	47,000 Ω 1W	R16	0.47 MEG. ½W	C11	0.01 MFD, MICA
R3	0.56 MEG ½W	R17	1000 Ω 1W	C12	0.001 MFD, MICA
R4, R5	680 Ω 1W	R18	5600 Ω 1W	C14	470 MMFD, MICA
R6	5600 Ω 1W	R19	4700 Ω 1W	C15, C16, C17	0.001 MFD, MICA
R7	0.1 MEG 1W	C1	0.001 MFD, MICA	L1, L2	10 mH
R8	1000 Ω 2W	C3	330 MMFD, MICA	L3	10 mH
R9	5600 Ω 1W	C5, C6, C7	0.001 MFD, MICA	L4, L5	10 mH
R10	1000 Ω 2W	C8	0.1 MFD, OIL	CR1, CR2	1N38
R14	0.1 MEG ½W	C9	0.001 MFD, MICA	CR3, CR4	1N38

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
8	LOCK WASHER #6 SHAKEPROOF		2
7	HEX NUT 6 32 NC-2		4
6	B'D. H'D. MACH. SCR. 6-32 NC-2 ¼ LG.		1
5	B'D. H'D. MACH. SCR. 6-32 NC-2 ⅜ LG.		4
4	SHAKEPROOF LUG #6	2101-6	3
3	TURRET LUG CTC	1724-D	44
2	MOUNTING POST CTC ⅜	X-1246-D	6
1	TERMINAL BOARD	B-30820	1

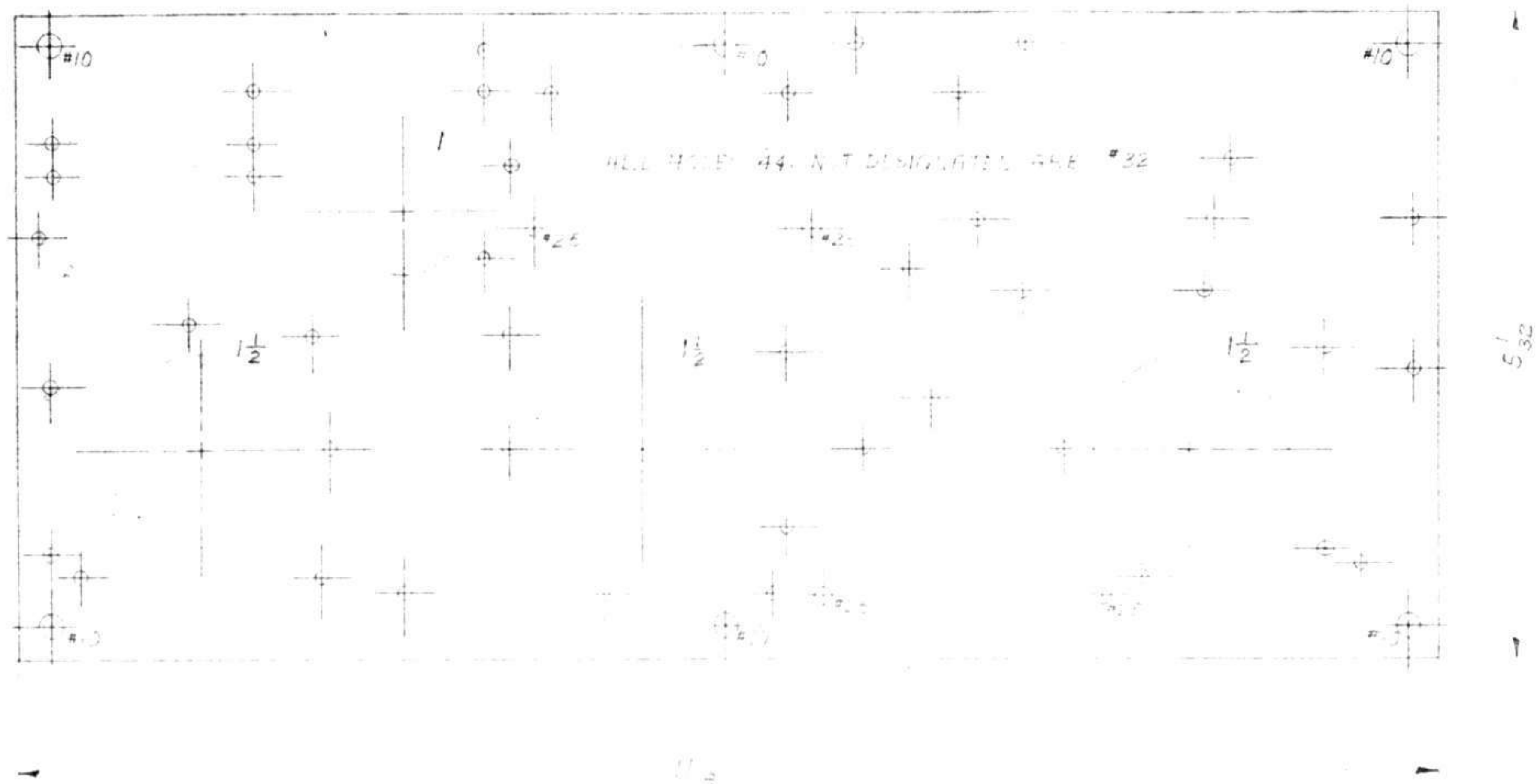
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

TERMINAL BOARD ASSEMBLY FOR VARIABLE FREQUENCY CLOCK-PULSE GENERATOR

SCALE:	DR. R.McG 8-?-47		B-30821
ENG. HK	CK. RBM 10/14/47	APP.	

B-30820

USED IN ASS'Y B-30821



$\frac{1}{8}$ LINEN BAKELITE

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO.

TERMINAL BOARD DRILLING TEMPLATE FOR VARIABLE FREQ CLOCK-PULSE GEN.

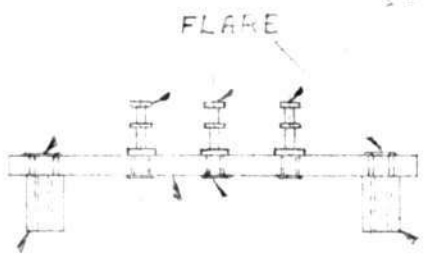
SCALE: 1 : 1	DR.		**B-30820**
ENG. HK	CK. RKM 10/14/47	APP.	

A- 308-3

WO-

TOLERANCES NOT OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

ASSEMBLY B-31021



ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
3	TURRET LUG CTC.	#1724-D	3
2	MOUNTING POST CTC	#X-1246-D	2
1	TERMINAL STRIP	A-30814	1

P				G				
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M				E				
L				D				
K				C				
J				B				
H				A				
	WAS	APP.	DATE		WAS	APP.	DATE	

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

3-TERMINAL STRIP ASS'Y

SCALE: 1 : 1 | DR. P.W.G 8-23-47 | TR. HK | CK P.K.M. 10/4/47 | APP.

A-30822

A-30814

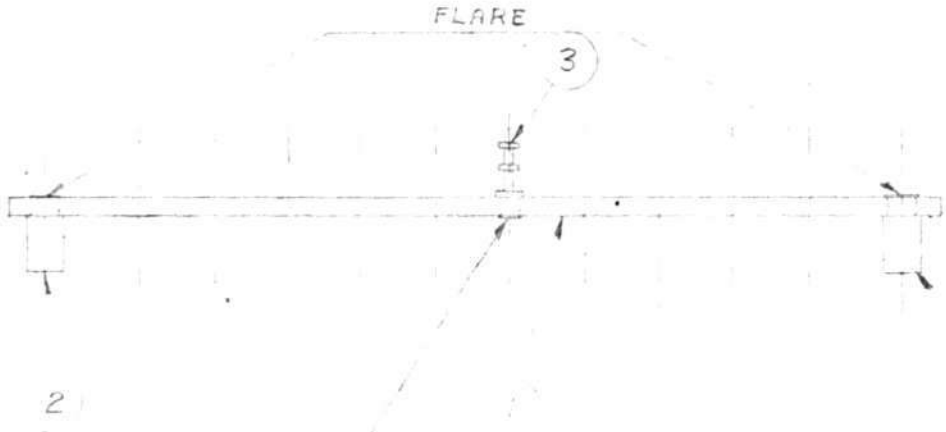
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO.

SCALE	DR		A-30814
	CK	APP.	

A- 3082
WO-

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y B-31021



2 — FLARE (10 LUGS)

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
3	TURRET LUG C.TC	#1724-D	10
2	MOUNTING POST CTC	#1-1246-D	2
1	TERMINAL STRIP	A-30813	1

P					G				
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J					B				
H					A				
	WAS	APP	DATE			WAS	APP	DATE	

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

10 - TERMINAL STRIP ASS'Y

SCALE: 1 : 1 DR. P.M.G. 8-27-47
TR. HK CK. R.R.M. 10/4/47 APP.

A-30823

A-30813

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO.

SCALE:

DR

ENG.

CK

APP.

A-30813

A- 30815

WO-

TOLERANCES NOT OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED ON ASSY B-31021

P					G						
N					F				ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN
M					E					1/4 BRASS ROD		
L					D							
K					C							
J					B							
H					A							
	WAS	APP	DATE			WAS	APP	DATE				

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

SPACER

SCALE [illegible] DR. [illegible]

TR. HK CK RBM 10/14/41 APP.

A-30815

A-30816

WO-

TOLERANCES UNLESS OTHERWISE SPECIFIED: DECIMAL ± .005 FRACTIONAL ± 1/64

B-31021

P				G					5/16 BRASS ROD		
N				F				ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
M				E							
L				D							
K				C							
J				B							
H				A							
	WAS	APP.	DATE		WAS	APP.	DATE				

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

SPACER

SCALE:	DR.	A-30816
TR. HK	CK. RHM 10/14/47	APP.

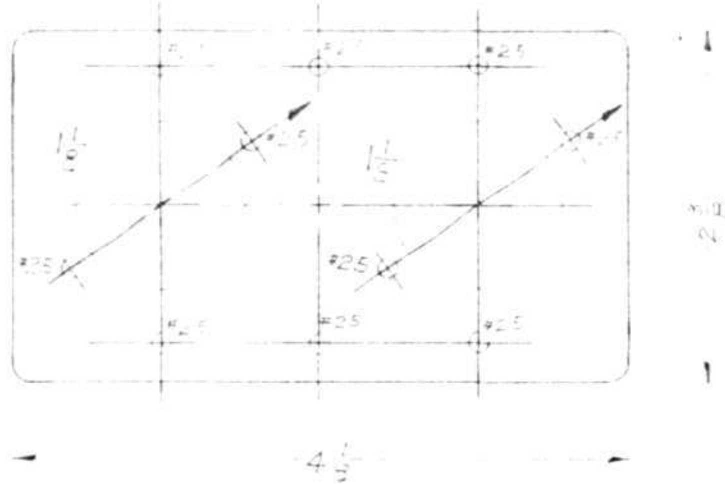
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 345

FREQUENCY

SCALE	DR	
ENG H.L.	CK R.M.C.	APP

A-30817

A-30818



MATERIAL [illegible] ALUMINUM

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

COIL MTG. PLATE FOR VARIABLE FREQUENCY [illegible] - PULSE GEN.

SCALE: [illegible]	DR. [illegible]		A-30818
ENG. HK	CK. [illegible] 10/14/47	APP.	

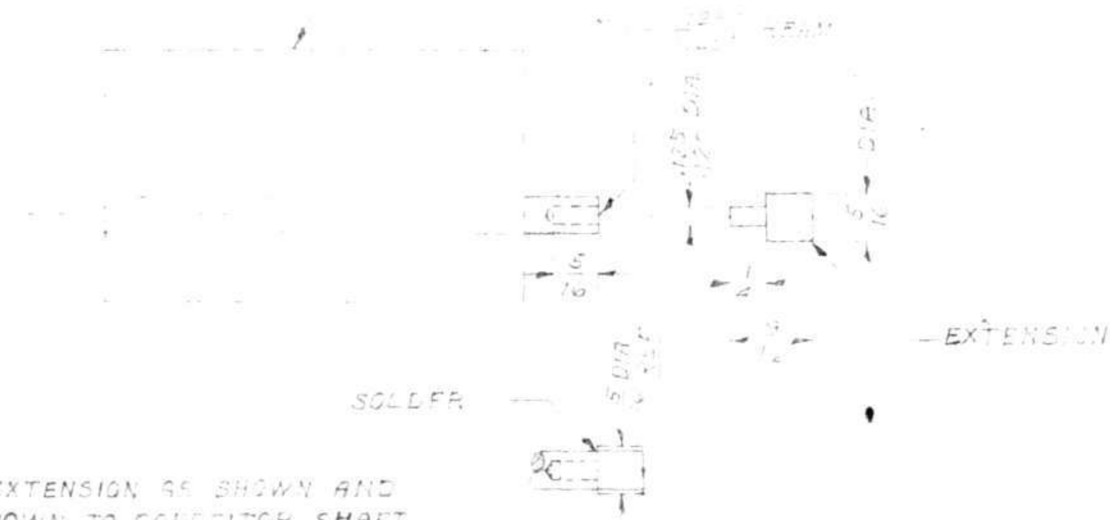
A- 30819

WO-

TOLERANCES NOT OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y B-31021

CAPACITOR [illegible] MC-[illegible]



MAKE EXTENSION AS SHOWN AND TURN DOWN TO CAPACITOR SHAFT DIA. AFTER SOLDERING AS INDICATED

P				G			
N				F			
M				E			
L				D			
K				C			
J				B			
H				A			
	WAS	APP	DATE		WAS	APP	DATE

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
	5/16 BRASS ROD		

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO.

TUNING [illegible] SHAFT EXTENSION
FOR [illegible] GEN

SCALE: DR

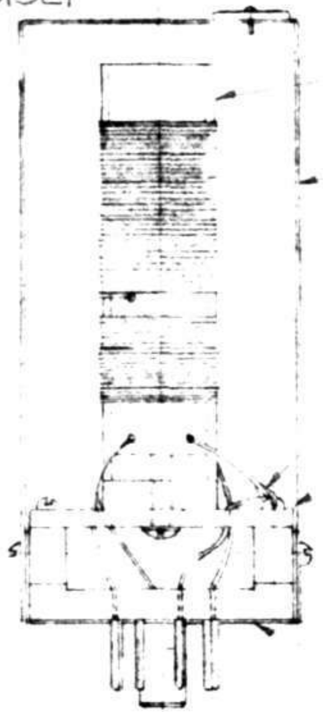
TR. HK CK R [illegible] 10/14/47 APP.

A- 30819

A-30846-1
WO-

TOLERANCES NOT OTHERWISE SPECIFIED: DECIMAL ± .005 FRACTIONAL ± 1/64

COIL ASSY B-31021



ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
9	LUG	#2300	1
8	LOCKWASHER - SHAKEPROOF #4	1704	2
7	LOCKWASHER - SHAKEPROOF #6	1706	1
6	RD HD SCREW #4 40 × 1/4 LG		2
5	FILLISTER HD SCR. #6-32 × 1/2 LG.		1
4	SHIELD CAN BOTTOM	A30811	1
3	MOUNTING PLATE	A30748	1
2	NAMEPLATE ASS'Y (HIGH FREQ)	A30843	1
1	COIL WINDING ASS'Y (HIGH FREQ)	B30824	1

	WAS	APP.	DATE		WAS	APP.	DATE
P				G			
N				F			
M				E			
L				D			
K				C			
J				B			
H				A			

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

HIGH FREQ. COIL ASS'Y

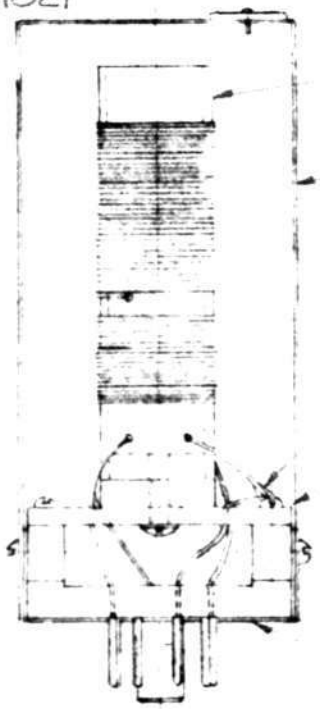
SCALE: [illegible]
DR. [illegible] 6-4-47
TR. [illegible]
CK. [illegible]
APP.

A-30846-1

A- 30176-1
WO-

DIMENSIONS NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

MFG'S ASS'Y B-31021



ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
9	LUG	#2300	1
8	LOCKWASHER - SHAKEPROOF #4	1704	2
7	LOCKWASHER - SHAKEPROOF #6	1706	1
6	RD HD SCREW #4 40 x 1/4 LG		2
5	BINDER HD SCR. #6-32 x 1/2 LG		1
4	SHIELD CAN BOTTOM	A30811	1
3	MOUNTING PLATE	A30748	1
2	NAMEPLATE ASS'Y (HIGH FREQ)	A30843	1
1	COIL WINDING ASS'Y (HIGH FREQ)	B30824	1

P					G				
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M					E				
L					D				
K					C				
J					B				
H					A				
	WAS	APP.	DATE			WAS	APP.	DATE	

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

HIGH FREQ. COIL ASS'Y

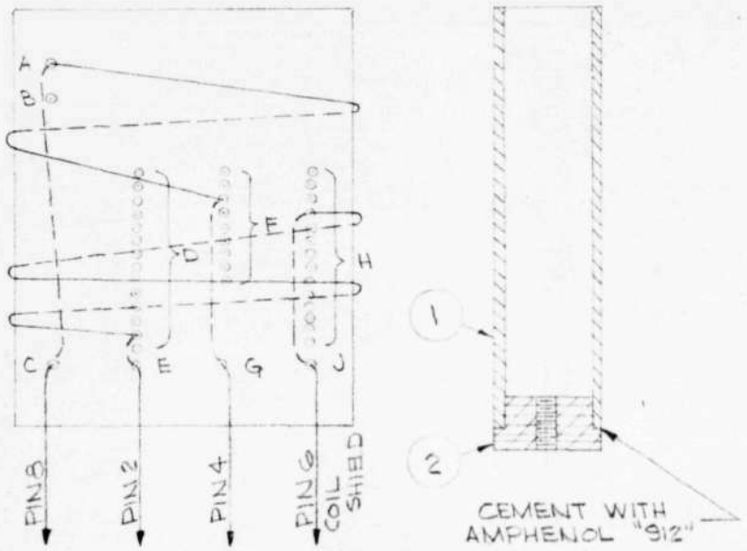
SCALE: DR. 7/4/47
TR. CK. APP.

A-30846-1

B- 30824-1
WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASSY - A 30846



COIL DEVELOPMENT *A-30750

HIGH FREQUENCY COIL INSTRUCTIONS

Use #20 formex magnet wire

(1) Plate Winding: Feed wire in through hole A and draw down inside of tube and out hole C leaving a 4" lead. Start winding from hole A and wind a single layer close wound coil of 35 turns ending last turn by feeding wire in through nearest hole or group F draw wire down inside of tube and out through hole G leaving a 4" lead.

(2) Feed Back Winding: Feed wire in through a hole in group H so that there is 1/8" spacing between the Plate winding and the feedback winding. Draw the wire down inside of tube and out hole J leaving 4" lead. Wind on a single layer close wound coil of 17 turns making sure that 1/8" spacing has been left between plate winding and feed back winding. End last turn by feeding through nearest hole in group D draw down inside of tube and out hole E leaving 4" lead.

(3) Cement windings with Amphenol 912 coil dope.

(4) Cement coil mounting plug (A-30749) in place with Amphenol 912 coil dope.

(5) Let coil dry for at least an hour.

	WAS	APP	DATE			WAS	APP.	DATE
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M					E			
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K					C			
J					B			
H					A			

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
2	MOUNTING PLUG	A30749	1
1	OSCILLATOR COIL FORM	A30750	1

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

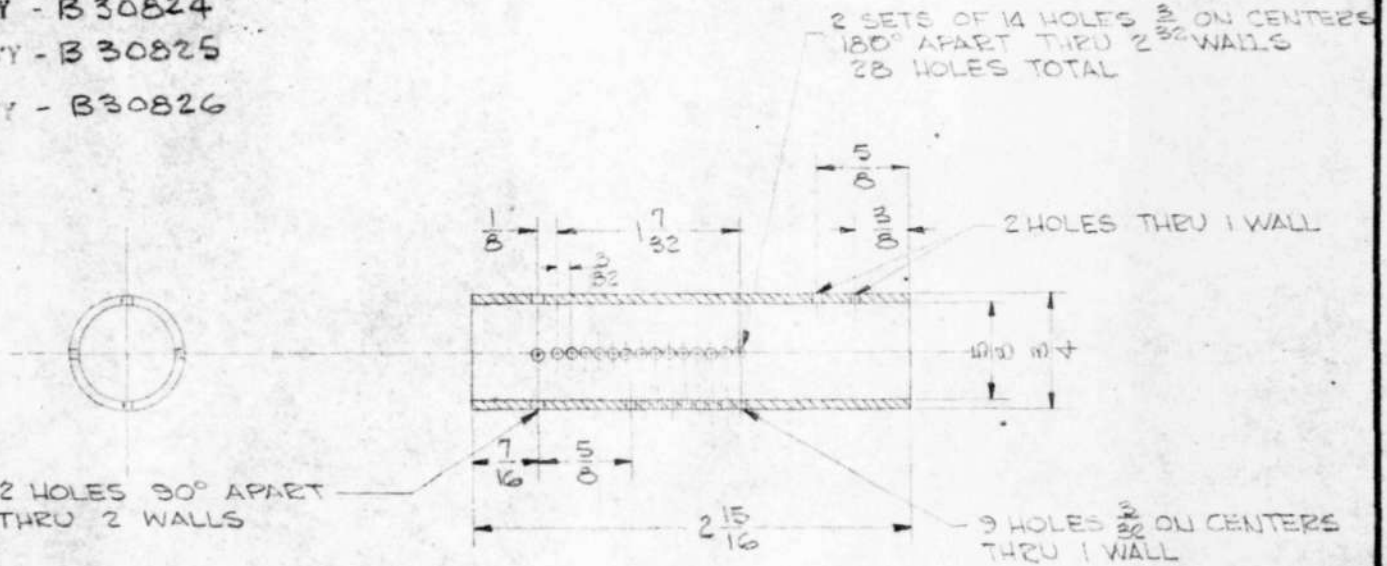
COIL WINDING ASS'Y (HIGH FREQ.)

SCALE: FULL | DR. R Kelley 8/20/47 | TR. | CK. RHM 9/10/47 | APP. | B- 30824-1

A- 30750
WO-

TOLERANCES NOT OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y - B 30824
USED IN ASS'Y - B 30825
USED IN ASS'Y - B 30826



NOTE:-
ALL HOLES ARE #55 DRILL (.052)

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
	LINEN BAKELITE		

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. C345

OSCILLATOR COIL FORM

SCALE: FULL | DR. R.K. 8/20/47 | TR. HC | CK. RHT 9/10/47 | APP. | A-30750-1

	WAS	APP.	DATE
P			
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	WAS	APP.	DATE
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F			
E			
D			
C			
B			
A			

A- 30749
WO-

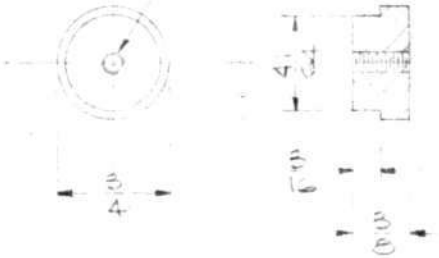
TOLERANCES NOT OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y - B30824

USED IN ASS'Y - B30825

USED IN ASS'Y - B30826

#36 DRILL (.106)
6-32 N.C.2.



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J					B				
H					A				
	WAS	APP.	DATE			WAS	APP	DATE	

	LINEN BAKELITE		
ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

MOUNTING PLUG

SCALE: FULL DR. [illegible] 9/12/47

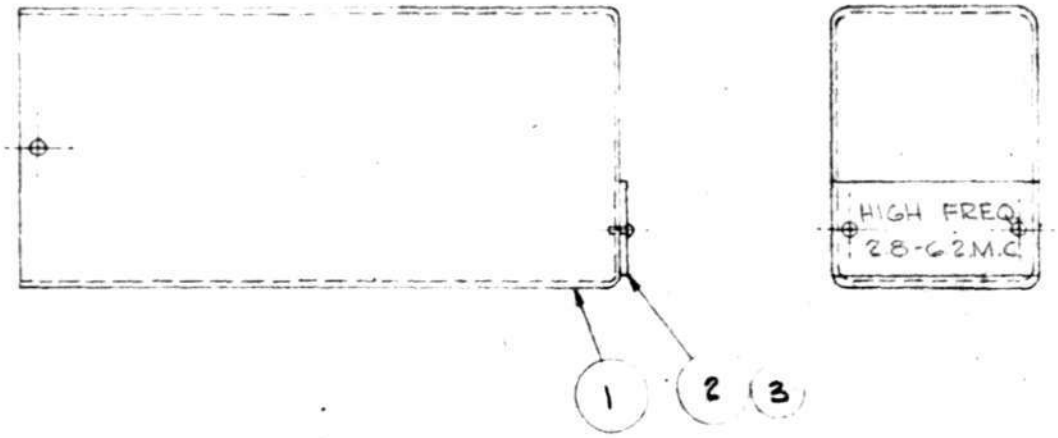
TR. H1C CK. RHM 9/10/47 APP.

A- 30749

A- 302 3
WO-

UNLESS OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y A - 308 46



ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
3	DRIVE SCREW - PARKER KALON	400	2
2	SHIELD NAMEPLATE	A30827C	1
1	SHIELD CAN	A30810	1

P					Q						
N					F						
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L					D						
K					C						
J					B						
H					A						
	WAS	APP.	DATE			WAS	APP.	DATE			

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

NAMEPLATE ASS'Y (HIGH FREQ)

SCALE: FULL | DR. RKelley 8/25/47 | TR. 171 C | CK. 9/10/47 | APP. | A-30843

A- 30...
WO-.....

UNLESS OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y - A30841
USED IN ASS'Y - A30842
USED IN ASS'Y - A30843

P					G						
N					F					ITEM	MATERIAL - DESCRIPTION
M					E						SERVOMECHANISMS LABORATORY OF THE
L					D						MASSACHUSETTS INSTITUTE OF TECHNOLOGY
K					C						DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345
J					B						SHIELD CAN
H					A					SCALE: FULL	DR P.K. 8/20/47
	WAS	APP.	DATE			WAS	APP.	DATE		TR. IAC	CK. 9/10/47 APP.

ALTER SHIELD CAN J MILLEN CO. | 74100 | PART NO. | QUAN.

A- 30810

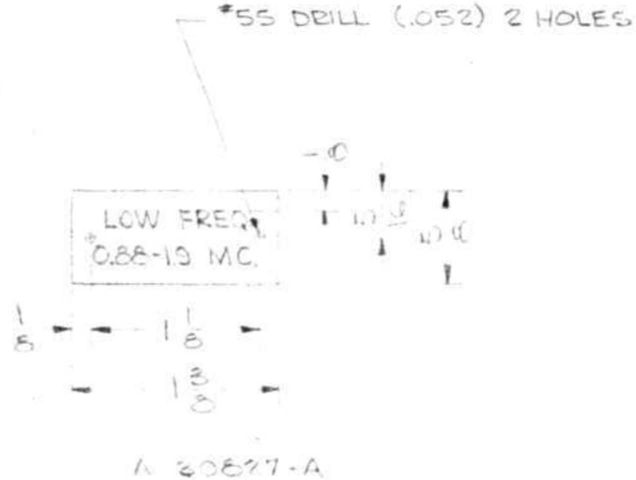
A- 30827

WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y - A 30841
USED IN ASS'Y - A 30842
USED IN ASS'Y - A 30843

1/8 LETTERING



ITEM	ENGRAVING
A	LOW FREQ. 0.88-1.9 M.C.
B	MED. FREQ. 1.8-3.9 M.C.
C	HIGH FREQ. 3.8-6.2 M.C.

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
	1/16 LAMICOID		

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M				E			
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J				B			
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SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

SHIELD NAMEPLATE

SCALE: FULL
DR. R. Kelley 8/25/47
TR. HMC
CK. H.M. 9/10/47
APP.

A- 30827-1

A- 307[illegible]

WO-.....

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y - A 30844

USED IN ASS'Y - A 30845

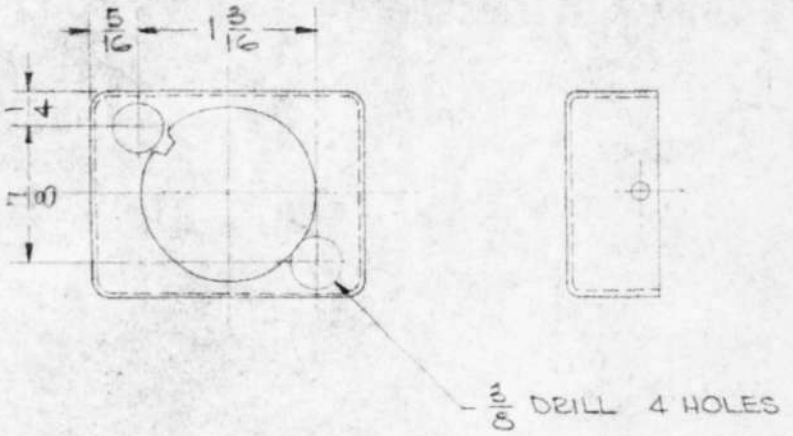
USED IN ASS'Y - A 30846

P					G						LINEN BAKELITE			
N					F					ITEM	MATERIAL - DESCRIPTION		PART NO.	QUAN.
M					E						SERVOMECHANISMS LABORATORY OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345			
L					D						MOUNTING PLATE			
K					C					SCALE: [illegible]	DR. [illegible] 8/20/47		A- 30748	
J					B					TR. HC	CK. [illegible]	APP.		
H					A									
	WAS	APP	DATE			WAS	APP	DATE						

A- 308
WO-

TOLERANCES NOT OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y - A 30844
USED IN ASS'Y - A 30845
USED IN ASS'Y - A 30846



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K					C				
J					B				
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	WAS	APP.	DATE			WAS	APP.	DATE	

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
	ALTER CAN BOTT. J. MILLEN CO.	*74400	

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

SHIELD CAN BOTTOM

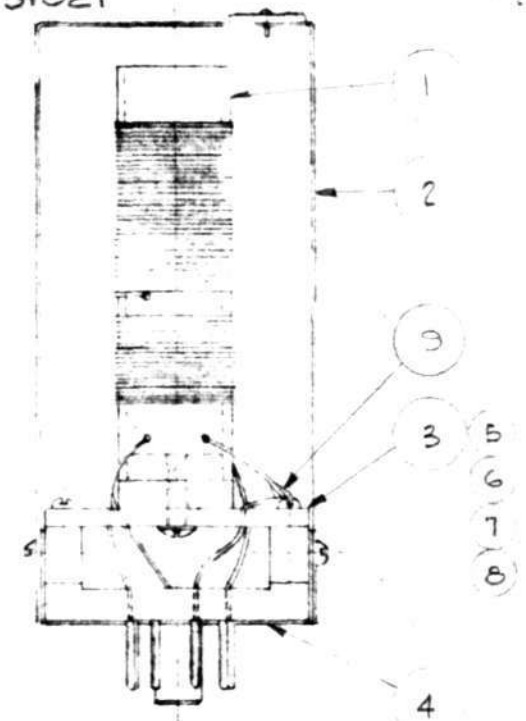
SCALE: FULL
DR. [illegible] 3/20/47
TR. HC
CK. [illegible] 3/10/47
APP.

A- 30811

A- 30[illegible]-1
WO-

Tolerances Not Otherwise Specified:
DECIMAL ± .005 FRACTIONAL ± 1/64

B-31021



ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
9	LUG	#2300	1
8	LOCKWASHER - SHAKEPROOF #4	1704	2
7	LOCKWASHER - SHAKEPROOF #6	1706	1
6	RD. HD. SCREW #4-40 x 1/4 LG		2
5	BINDER HD. SCR. #6-32 x 1/2 LG.		1
4	SHIELD CAN BOTTOM	A30811	1
3	MOUNTING PLATE	A30748	1
2	NAMEPLATE ASS'Y (MED. FREQ)	A30842	1
1	COIL WINDING ASS'Y (MED. FREQ)	B30825	1

P					G				
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L					D				
K					C				
J					B				
H					A				
	WAS	APP.	DATE			WAS	APP.	DATE	

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

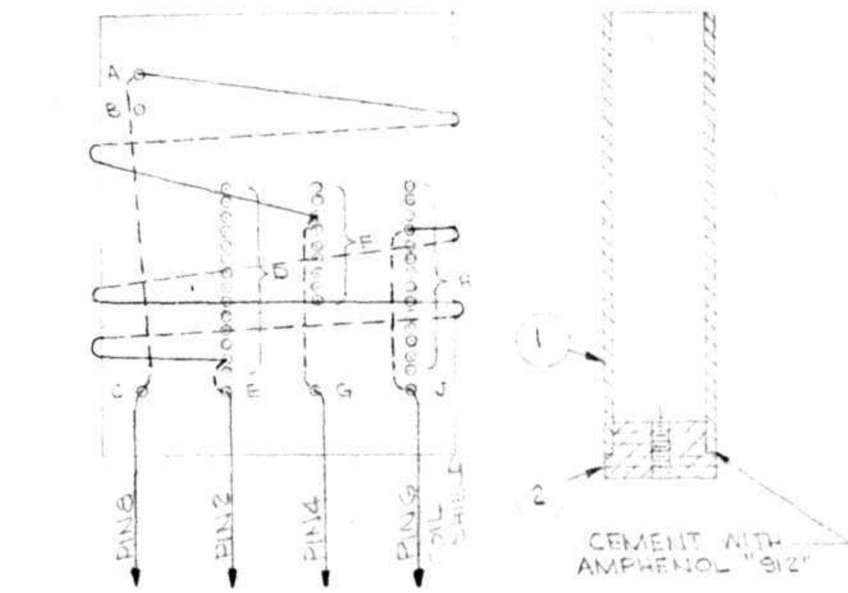
MED. FREQ. COIL ASS'Y

SCALE: FULL | DR. R.L.Kelley 9/3/47 | TR. HK | CK. [illegible] 9/10/47 | APP.

A-30845-1

B- 30825-1 WO-	TOLERANCES NOT OTHERWISE SPECIFIED: DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y A - 30845



COIL DEVELOPMENT *A-30750

MEDIUM FREQUENCY COIL INSTRUCTIONS

Use #24 formex magnet wire

(1) Plate Winding: Feed wire in through hole A and draw down inside of tube and out hole C leaving a 4" lead. Start winding from hole A and wind a single layer close wound coil of 60 turns ending last turn by feeding wire in through nearest hole of group F draw wire down inside of tube and out through hole G leaving a 4" lead.

(2) Feed Back Winding: Feed wire in through a hole in group H so that there is 1/8" spacing between the Plate winding and the feedback winding. Draw the wire down inside of tube and out hole J leaving 4" lead. Wind on a single layer close wound coil of 30 turns making sure that 1/8" spacing has been left between Plate winding and feed back winding. End last turn by feeding through nearest hole in group D draw down inside of tube and out hole E leaving 4" lead.

(3) Cement windings with Amphenol 912 coil dope.

(4) Cement coil mounting plug (A-30749) in place with Amphenol 912 coil dope.

(5) Let coil dry for at least an hour.

ITEM	MATERIAL DESCRIPTION	PART NO.	QUAN
2	MOUNTING PLUG	A30749	1
1	OSCILLATOR COIL FORM	A30750	1

SERVOMECHANISMS LABORATORY OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

COIL WINDING ASS'Y (M.C. 1889)

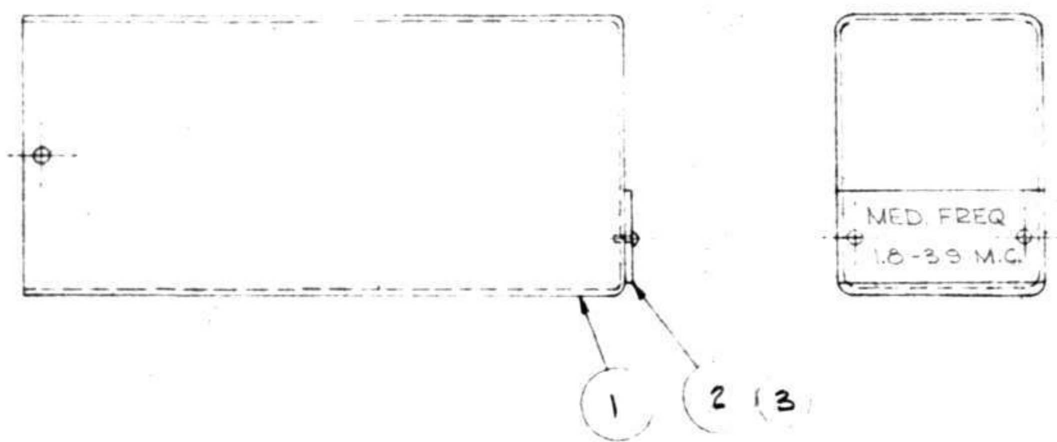
SCALE Full DR. 3/7/47 TR. KLC CK. RMD 3/10/47 APP.

B-30825-1

A-3[illegible]42
WO-

TOLERANCES NOT OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

[illegible] ASS'Y A-30845



ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
3	DRIVE SCREW - PARKER-KALON	#00	2
2	SHIELD NAMEPLATE	A30827B	1
1	SHIELD CAN	A30810	1

	WAS	APP.	DATE			WAS	APP.	DATE
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M					E			
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K					C			
J					B			
H					A			

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

NAMEPLATE ASS'Y (MED. FREQ)

SCALE: FULL
DR. R. Kelly 8/26/47
TR. H K
CK. R K[illegible] 9/1/47
APP.

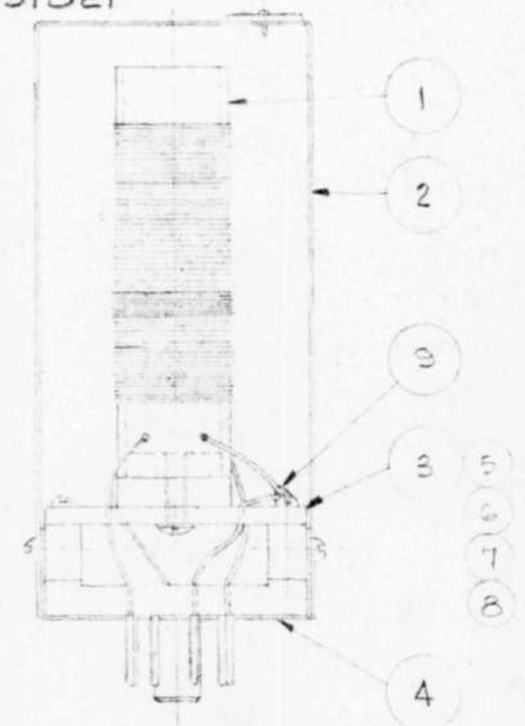
A-30842

"ALBANENE" NO. 1006, K&E CO., N.Y.

A- 308
WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y B-31021



ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
9	LUG	#2300	1
8	LOCKWASHER - SHAKEPROOF #4	1704	2
7	LOCKWASHER - SHAKEPROOF #6	1706	1
6	RD. HD. SCREW #4-40 × 1/4 LG		2
5	BINDER HD. SCR. #6-32 × 1/2 LG		1
4	SHIELD CAN BOTTOM	A30811	1
3	MOUNTING PLATE	A30748	1
2	NAMEPLATE ASS'Y (LOW FREQ)	A30841	1
1	COIL WINDING ASS'Y (LOW FREQ)	B30826	1

	WAS	APP.	DATE		WAS	APP.	DATE
P				G			
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M				E			
L				D			
K				C			
J				B			
H				A			

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

LOW FREQ. COIL ASS'Y

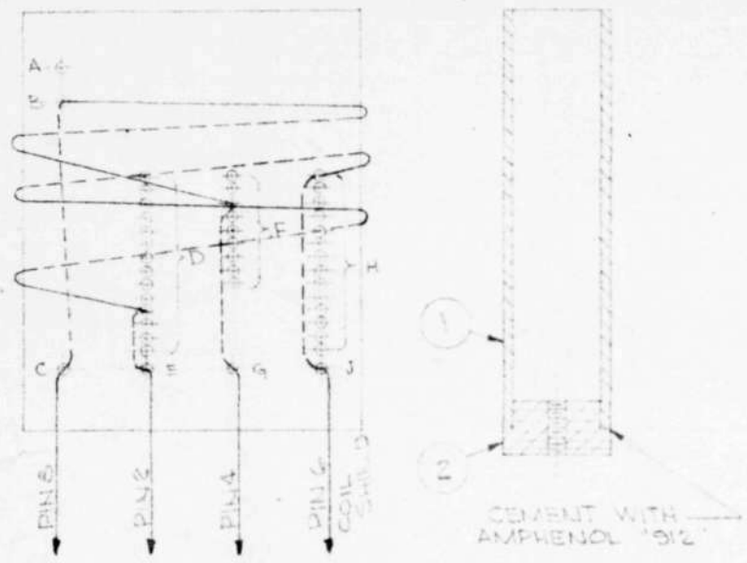
SCALE: FULL DR. R. Kelley 9/3/47
TR. V.K. CK. RKM 9/10/47 APP.

A-30844-1

B-30826-1
WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y A-30844



COIL DEVELOPMENT A-30750

LOW FREQUENCY COIL INSTRUCTIONS

Use #32 formex magnet wire

(1) Plate Winding Feed wire in through hole B draw down inside of tube and out hole C., leaving a 4" lead. Winding of coil is now started from hole B. Wind on a single layer close wound coil of 110 turns ending the last turn by feeding wire through the nearest hole in group F. Draw the wire down inside of tube & out hole G. leaving a 4" lead

(2) Wind two turns of .001" polystyrene tape over the lower end of the winding just completed, letting the tape cover 3/8" of the winding.

(3) Feed Back Winding: Feed wire through hole in group H nearest the plate winding and draw down inside tube and out hole J leaving a 4" lead. Winding is now started from hole H by laying wire up onto the lower end of the plate winding 1/8" and winding back over the lead so that 1/8" of the feed back winding overlaps the plate winding. The winding is now continued to make a total of 50 turns (all turns close wound)and ended by feeding through the nearest hole in group D,drawing down inside tube and out hole E, leaving 4" lead.

(4) Cement coil with Amphenol 912 coil dope.

(5) Cement coil mounting plug (A-30749) in place with Amphenol 912 coil dope.

(6) Let coil dope dry for at least an hour.

ITEM	MATERIAL-DESCRIPTION	PART NO.	QUAN.
2	MOUNTING PLUG	A30749	1
1	OSCILLATOR COIL FORM	A30750	1

	WAS	APP	DATE			WAS	APP	DATE
P					G			
N					F			
M					E			
L					D			
K					C			
J					B			
H					A			

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 5345

COIL WINDING ASS'Y (LOW FREQ)

SCALE FULL | DR [illegible] 8/20/47 | TR 1710 | CK [illegible] 9/10/47 | APP.

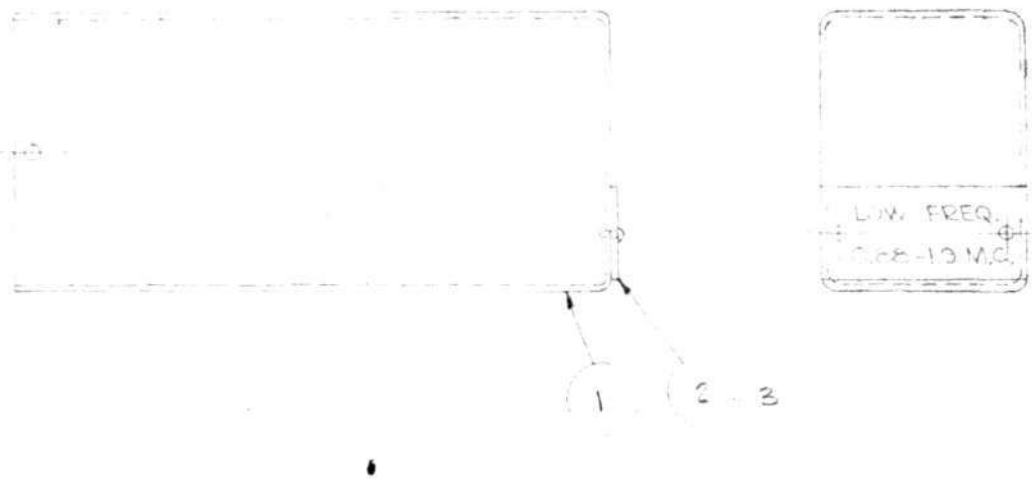
B-30826-1

A- 30841

WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y - A 30844



3	DRIVE SCREW - PARKER-KALON	#00	2
2	SHIELD NAMEPLATE	A 30827A	1
1	SHIELD CAN	A 30810	1
ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.

P					G				
N					F				
M					E				
L					D				
K					C				
J					B				
H					A				
	WAS	APP	DATE			WAS	APP	DATE	

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

NAMEPLATE ASS'Y (LOW FREQ)

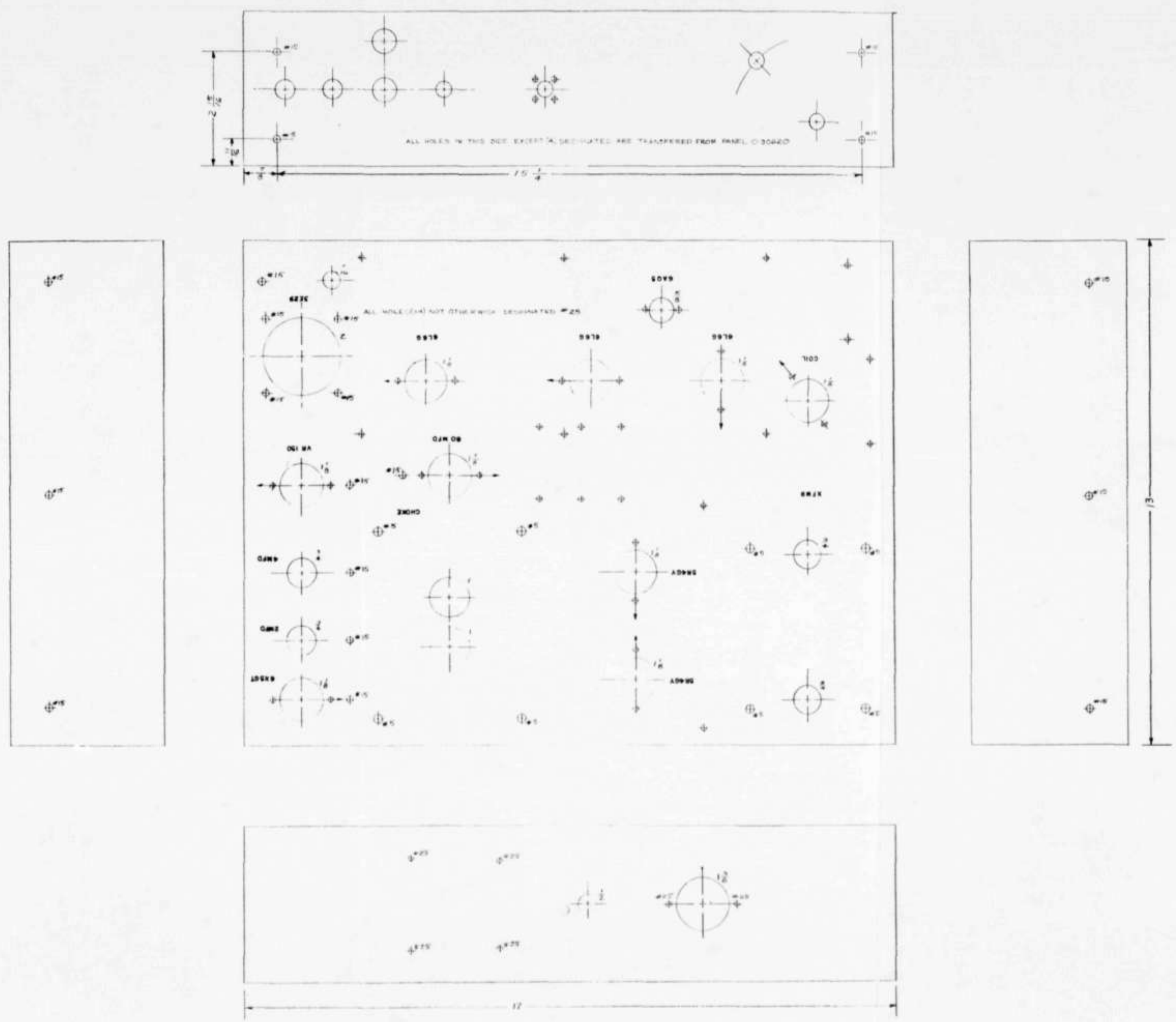
SCALE: FULL DR [illegible] 8/25/47

TR. [illegible] CK. [illegible] 9/10/47 APP.

A- 30841

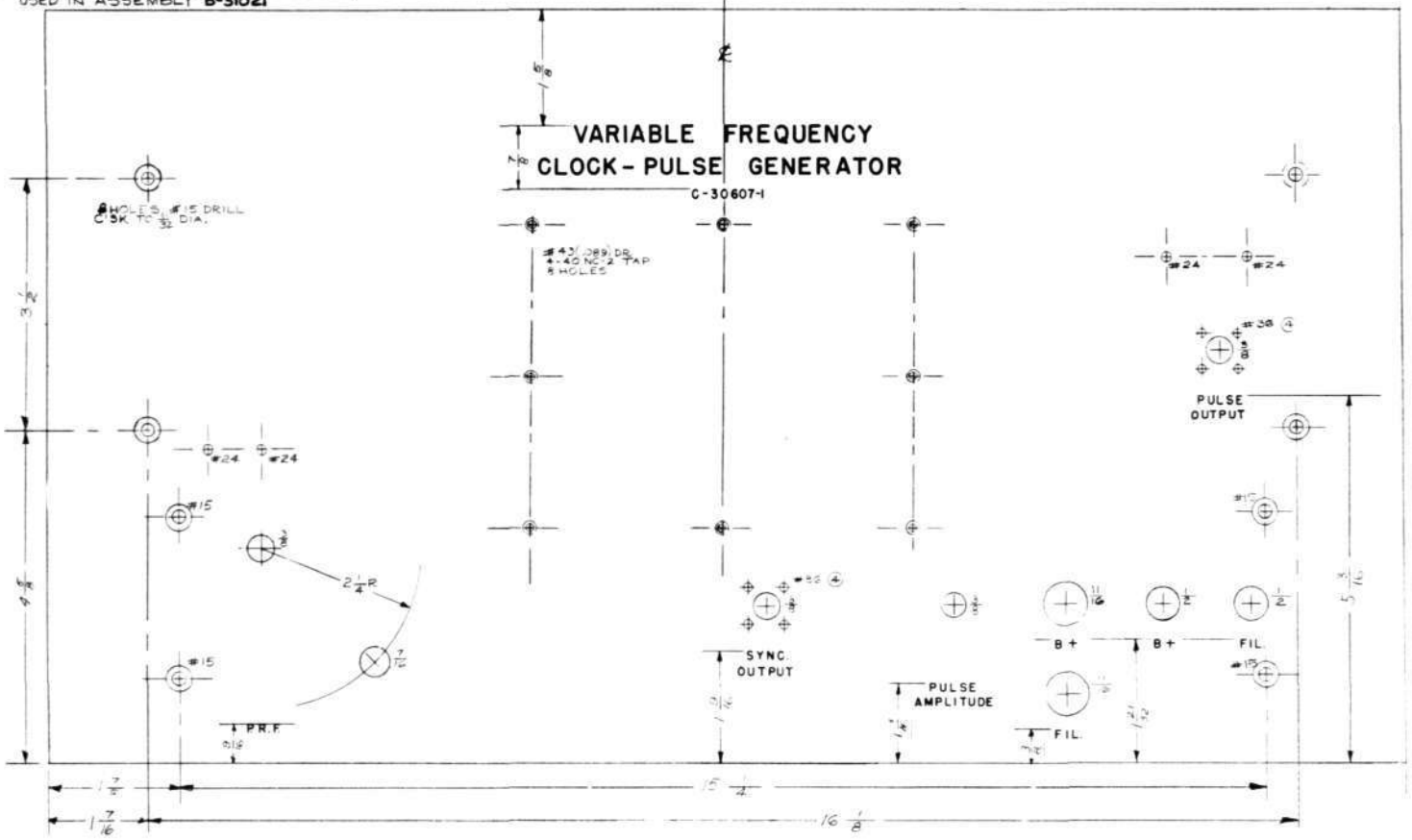
APPROVED FOR PUBLIC RELEASE. CASE 06-1104.

E-30618-2



6345
CHASSIS DRILLING TEMPLATE FOR VARIABLE FREQUENCY CLOCK-PULSE GEN.
FULL
E-30618-2

C-30620-2
WO.
USED IN ASSEMBLY B-31021



NOTE: ALL ENGRAVING NOT SPECIFIED OTHERWISE TO BE 1/8 HIGH.

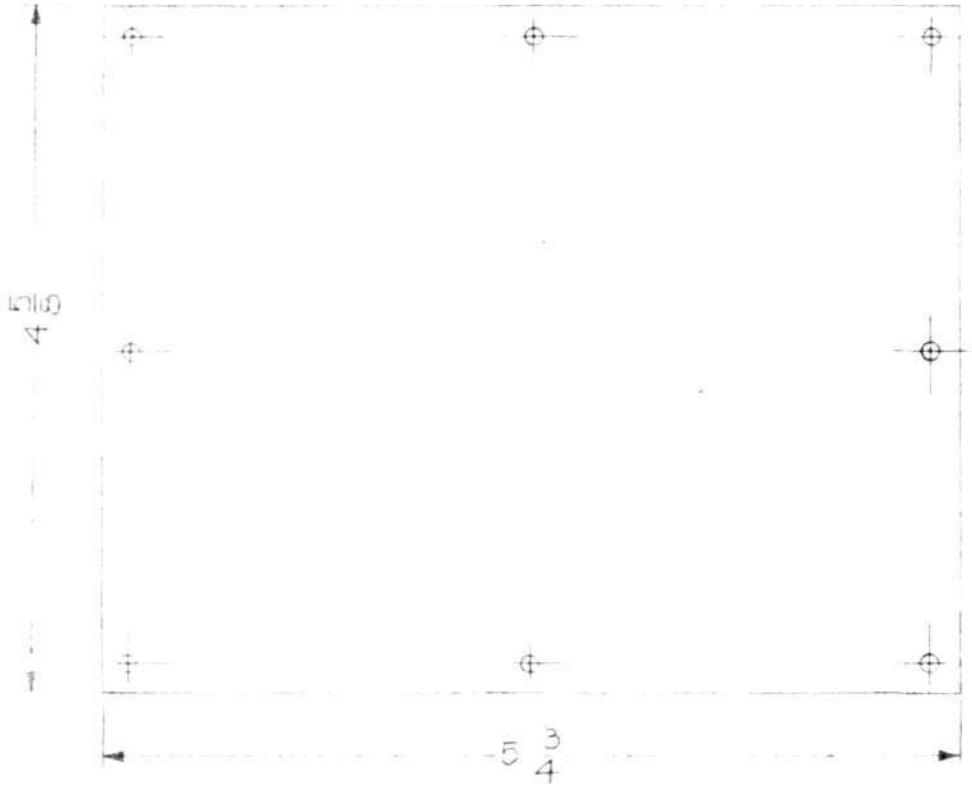
ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
	BUC HOUSE STANDARD		

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

PANEL ENGRAVING PLATE FOR VARIABLE FREQUENCY CLOCK PULSE GEN.

SCALE: FULL | DR. [illegible] | TR. HK | CK. RTM 10/14/47 | APP. | C-30620-2

A-31090

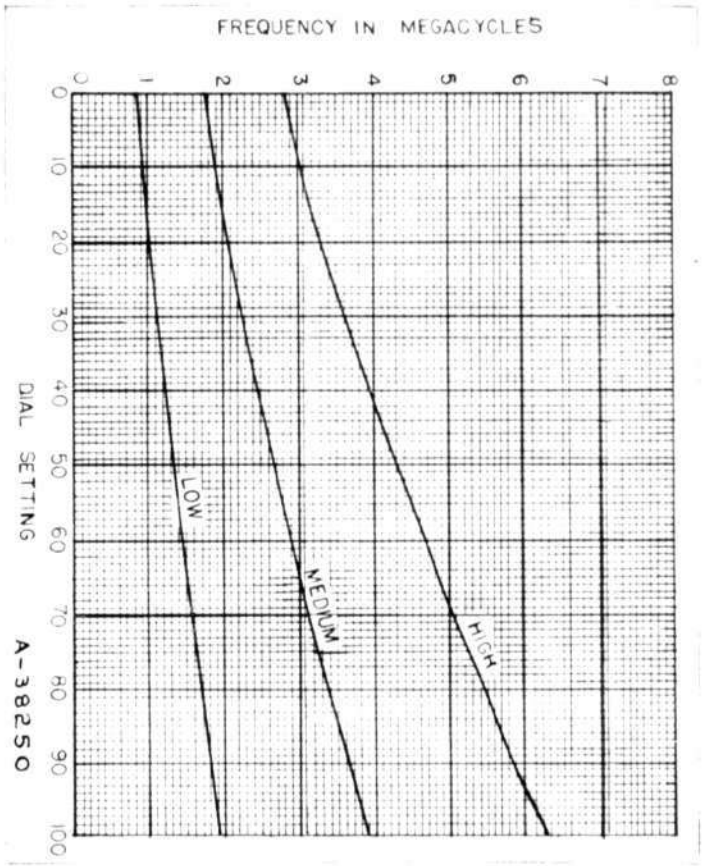


MATERIAL- 1/16 THICK, PLEXIGLASS (ROHM AND HAAS CO.)

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

CHART FACING

SCALE FULL	DR R.V.W 10/4/47	A-31090
TR	CH R.A.M. 10/7/47	APP



6345

D.L.O.
7-4-47
A-38250-G

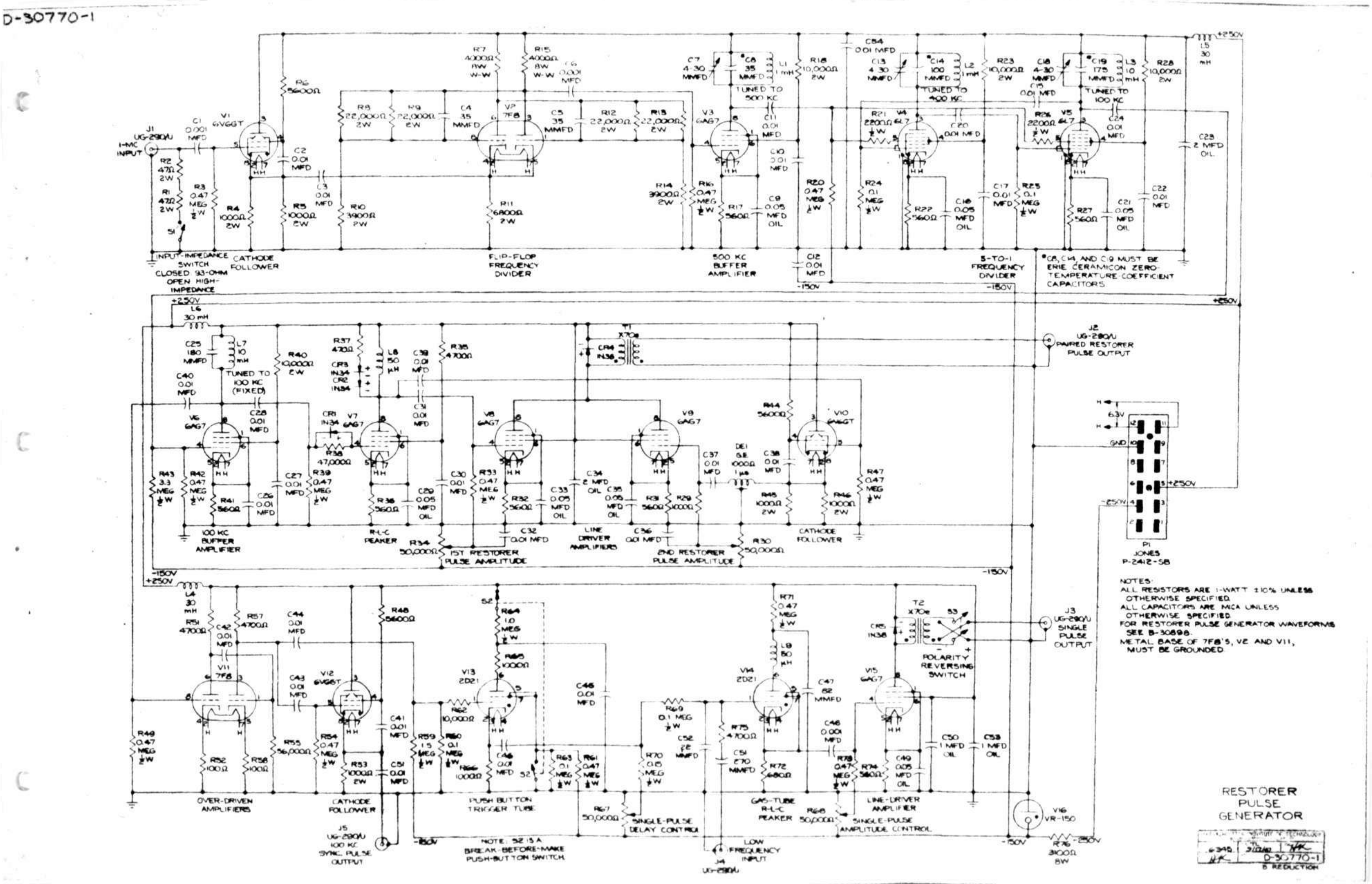
TEST EQUIPMENT DRAWING LIST

Restorer Pulse Generator, Vol. 19, E-52

D-30770	A-30779
B-30784	A-30785
A-30777	A-30778
A-30776	A-30789
A-30791	A-30782
B-30788	A-30790
A-30781	A-30783
B-30787	E-30774
A-30780	C-30775
B-30786	B-30898

APPROVED FOR PUBLIC RELEASE. CASE 06-1104.

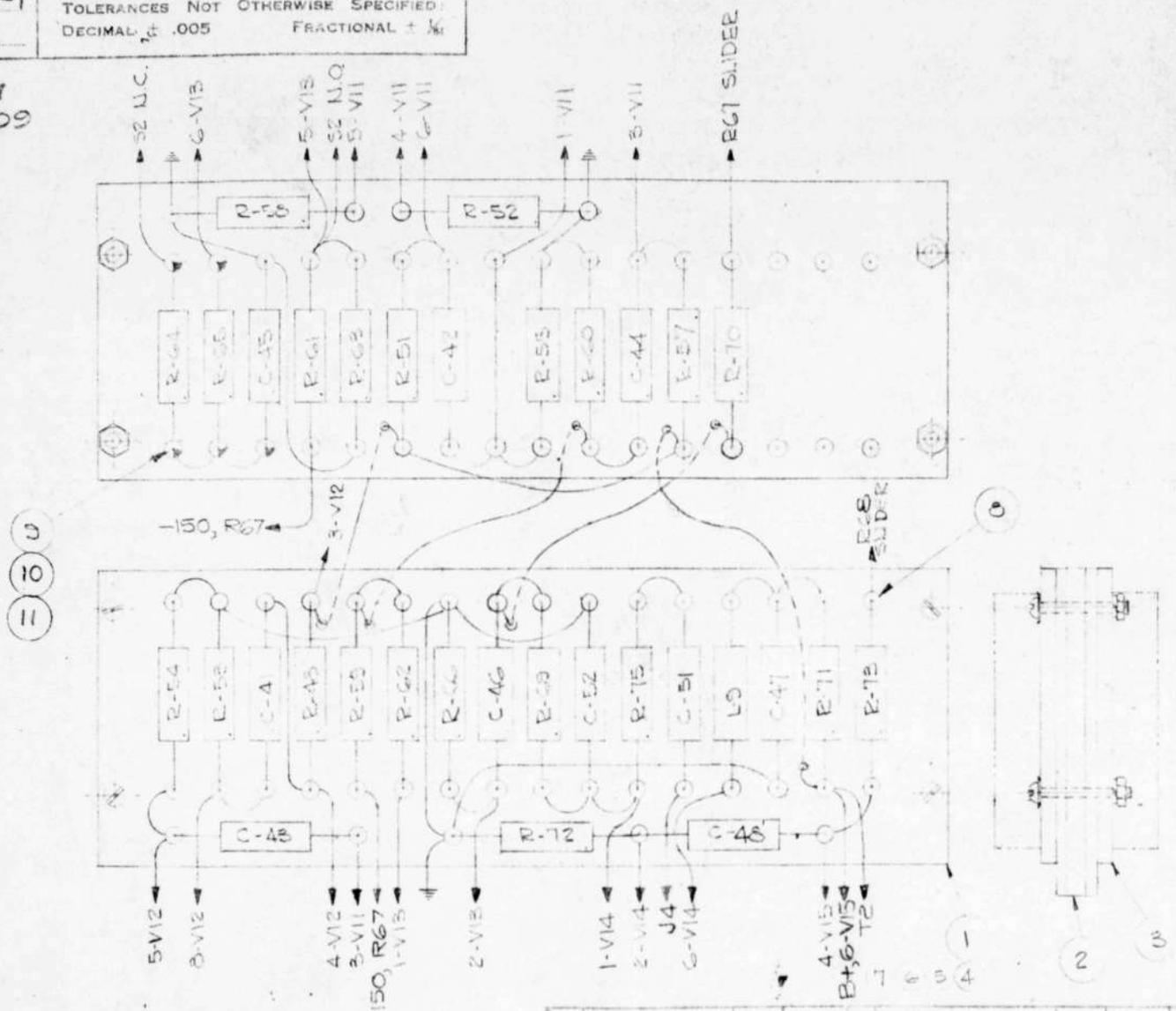
D-30770-1


INPUT-IMPEDANCE SWITCH CLOSED 93-OHM OPEN HIGH-IMPEDANCE
CATHODE FOLLOWER
FLIP-FLOP FREQUENCY DIVIDER
500 KC BUFFER AMPLIFIER
5-TO-1 FREQUENCY DIVIDER
*C8, C14, AND C19 MUST BE ERIE CERAMICON ZERO-TEMPERATURE-COEFFICIENT CAPACITORS
100 KC BUFFER AMPLIFIER
R-L-C PEAKER
1ST RESTORER PULSE AMPLITUDE
LINE DRIVER AMPLIFIERS
2ND RESTORER PULSE AMPLITUDE
CATHODE FOLLOWER
J2 UG-290/U PAIRED RESTORER PULSE OUTPUT
P1 JONES P-2412-SB
OVER-DRIVEN AMPLIFIERS
CATHODE FOLLOWER
J5 UG-290/U 100 KC SYNC PULSE OUTPUT
NOTE: S2 IS A BREAK-BEFORE-MAKE PUSH-BUTTON SWITCH.
PUSH BUTTON TRIGGER TUBE
SINGLE-PULSE DELAY CONTROL
LOW FREQUENCY INPUT
GAS-TUBE R-L-C PEAKER
LINE-DRIVER AMPLIFIER
SINGLE-PULSE AMPLITUDE CONTROL
POLARITY REVERSING SWITCH
J3 UG-290/U SINGLE PULSE OUTPUT
NOTES:
ALL RESISTORS ARE 1-WATT ±10% UNLESS OTHERWISE SPECIFIED.
ALL CAPACITORS ARE MICA UNLESS OTHERWISE SPECIFIED.
FOR RESTORER PULSE GENERATOR WAVEFORMS SEE B-30898.
METAL BASE OF 7F8'S, V2 AND V11, MUST BE GROUNDED.
RESTORER PULSE GENERATOR
D-30770-1
B REDUCTION

B-30784-1
WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y B-30809



ELECTRICAL PARTS LIST

SERIAL NO.	VALUE	SERIAL NO.	VALUE
R48	5600Ω 1W	R70	0.15 MEG ½W
R51	4700Ω 1W	R71	0.47 MEG ½W
R52	100 Ω 1W	R72	680Ω 1W
R53	1000 Ω 1W	R73	0.47 MEG ½W
R54	0.47 MEG ½W	R75	4700 Ω 1W
R55	56,000Ω 1W	C41	0.01 MFD, MICA
R57	4700Ω 1W	C42	0.001 MFD, MICA
R58	100Ω 1W	C43	0.01 MFD, MICA
R59	1.5 MEG ½W	C44	0.001 MFD, MICA
R60	0.1 MEG ½W	C45	0.01 MFD, MICA
R61	0.47 MEG ½W	C46	0.01 MFD, MICA
R62	10,000Ω 1W	C47	82 MMFD, MICA
R63	0.1 MEG ½W	C48	0.01 MFD, MICA
R64	1.0 MEG ½W	C51	220 MMFD, MICA
R65, R66	1000Ω 1W	C52	22 MMFD. CERAMIC
R69	0.1 MEG ½W	L9	50 μH

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
11	LOCK WASHER I.T. SHAKEPROOF	1706	5
10	HEX NUT 6-32 X 5/16		5
9	TERMINAL LUG C.T.C.	X1581-B	5
8	TERMINAL LUG C.T.C.	1724-D	66
7	HEX. NUT #4-40		4
6	LOCKWASHER - KANTLINK #4		4
5	LOCKWASHER - SHAKEPROOF #4	1704	4
4	RD. HD. MACH SCR. #4-40 x 3/4 LONG		4
3	TERMINAL BOARD	A30776	1
2	MOUNTING POST	A30791	2
1	TERMINAL BOARD	A30777-1	1

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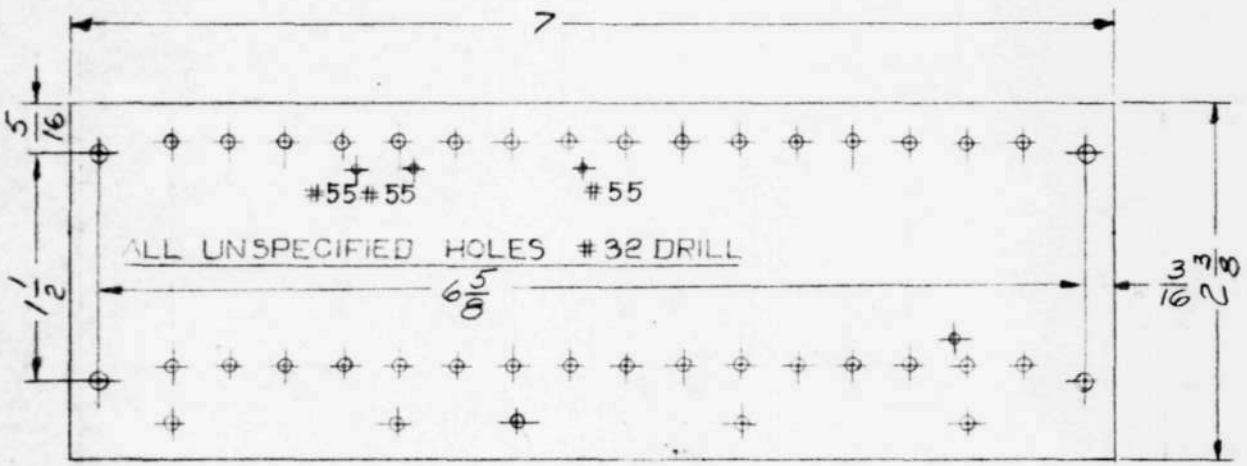
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

TERMINAL BOARD ASS'Y

SCALE: FULL | DR. [illegible] 8/15/47 | TR. HK | CK R.H.M. & TL 8/19/47 | APP. | B-30784-1

A-30777-3

USED IN ASS'Y B-30784

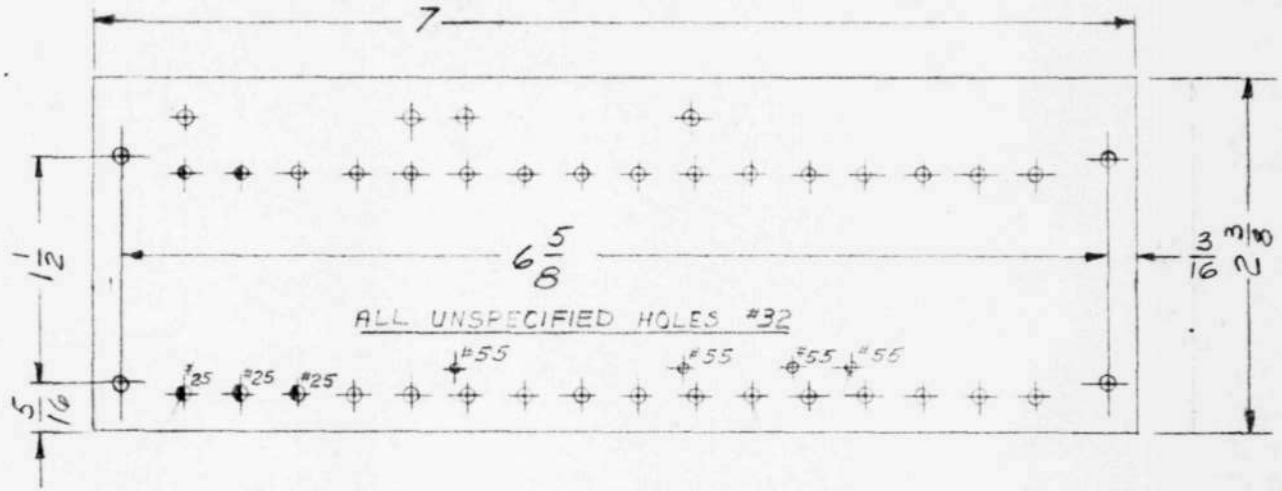


1/8 LINEN BAKELITE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
SER. DIGITAL COMPUTER LABORATORY
DIG. NO. 6345
CTS 8-11-47
A-30777-3
CK RBM
ENG LLK

A-307[illegible]-3

USED IN ASSY B-30784



1/8 LINEN BAKELITE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY SERVOMECHANISMS LABORATORY D.C. NO. 6345	DR CTS 8-11-47 A-30776-3
CK RMM	ENG [illegible]

APPROVED FOR PUBLIC RELEASE. CASE 06-1104.

A-

WO-

TOLERANCES NOT OTHERWISE SPECIFIED: DECIMAL ± .005 FRACTIONAL ± 1/64

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ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO.

MOUNTING POST

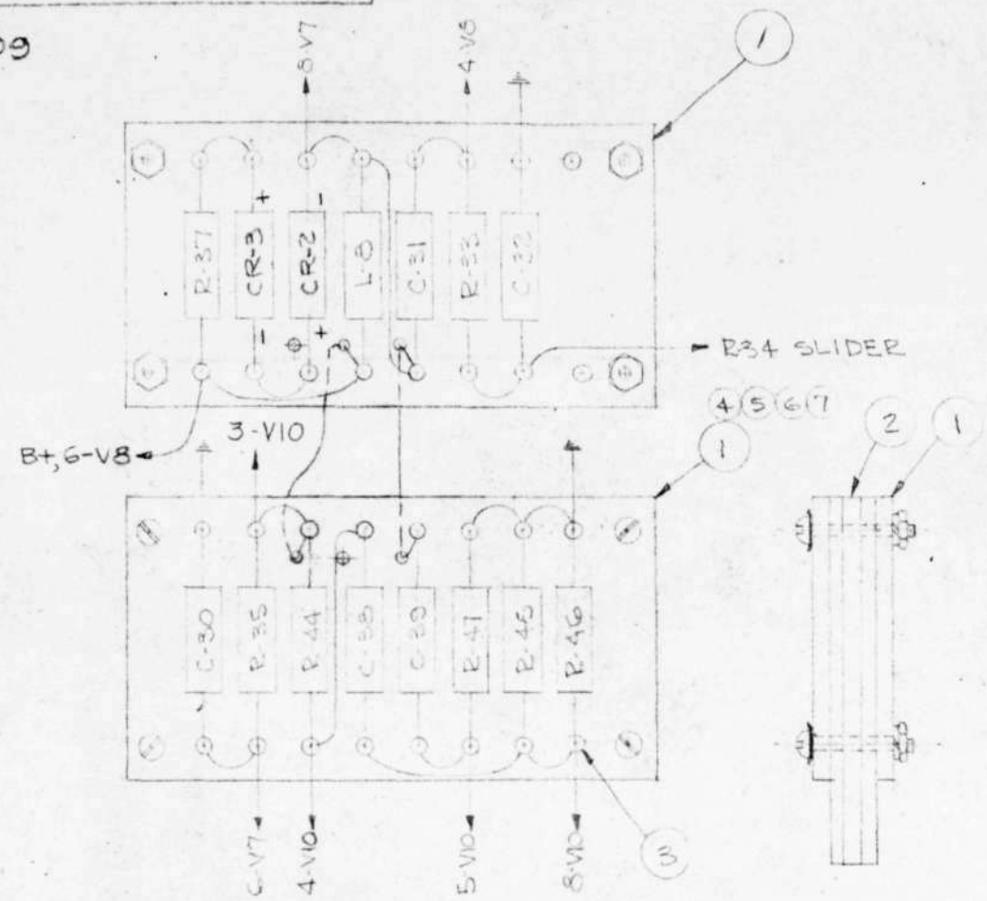
SCALE: | DR. | A-

TR | CK | APP

B- 30788-2
WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y B-30809



ELECTRICAL PARTS LISTS			
SERIAL NO.	VALUE	SERIAL NO.	VALUE
R33	0.47MEG ½W	C31	0.01 MFD, MICA
R35	4700Ω 1W	C-32	0.01 MFD, MICA
R37	470Ω 1W	C38	0.01 MFD, MICA
R44	5600Ω 1W	C39	0.01 MFD, MICA
R45,R46	1000Ω 2W	L8	50 μH
R47	0.47MEG ½W	CR2,CR3	IN34
C30	0.01 MFD, MICA		

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ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
7	HEX NUT #4-40		4
6	LOCKWASHER - KANTLINK #4		4
5	LOCKWASHER - SHAKEPROOF #4	1704	4
4	RD HD MACH SCR #4-40 x 3/16 LG.		4
3	TERMINAL LUG CTC.	1724-D	30
2	MOUNTING POST	A30791	2
1	TERMINAL BOARD	A30751	2

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 2845

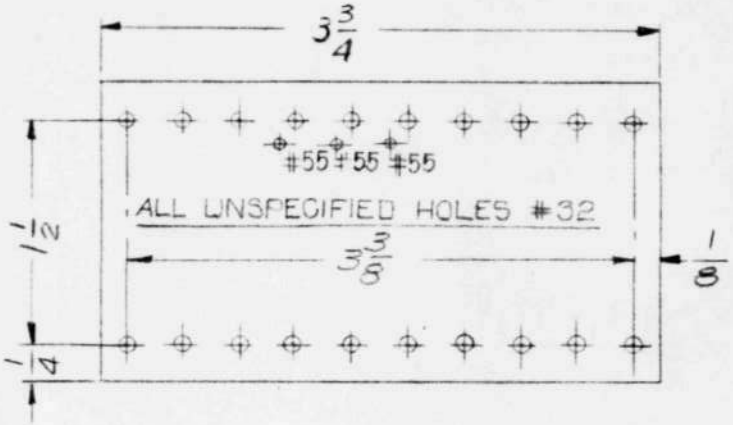
TERMINAL BOARD ASS'Y

SCALE FULL DR [illegible] 8/18/47
TR HK CK R.H.M. & TL 8/19/47 APP.

B- 30788-2 ✓

A-30781-1

USED IN ASSY B-30788



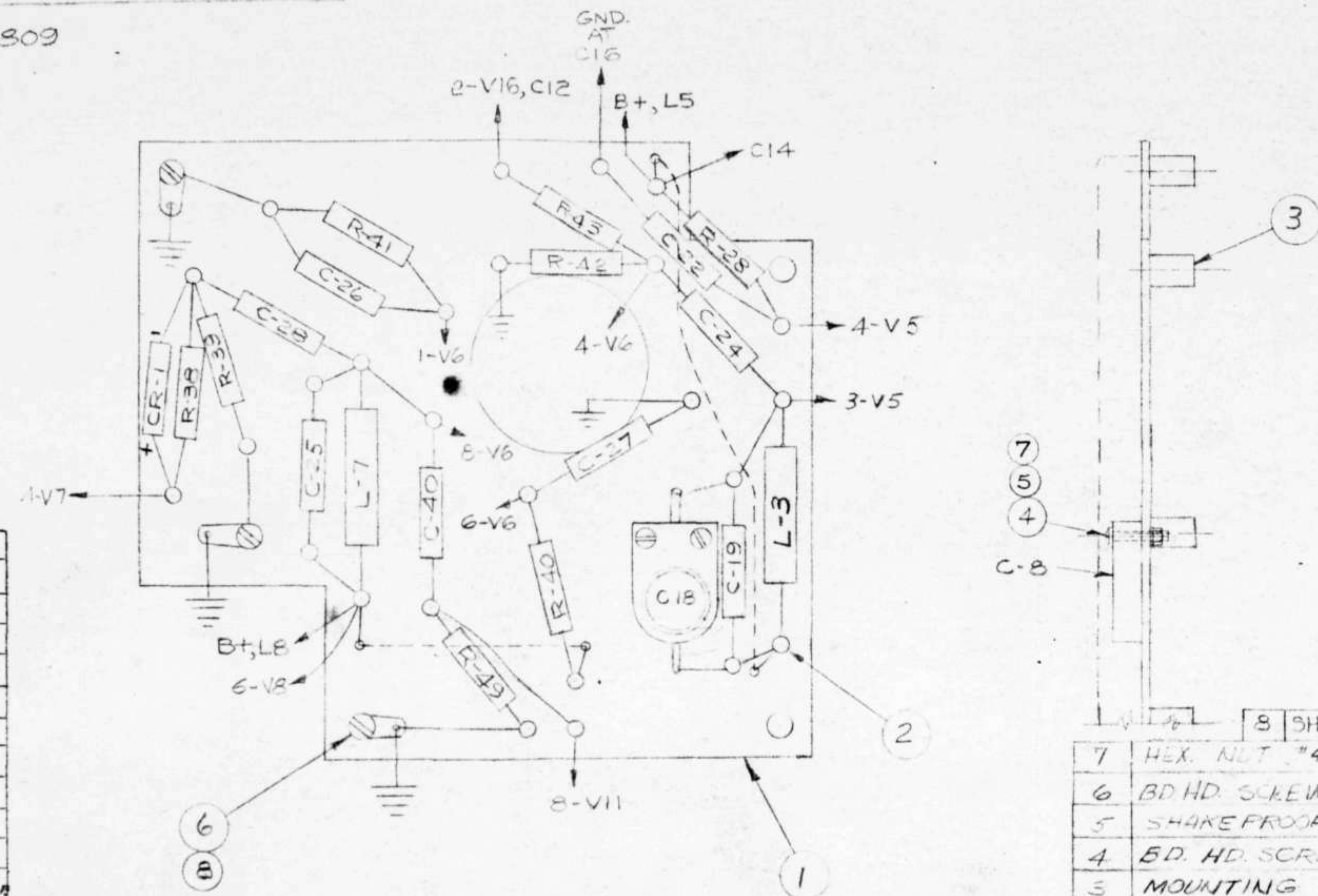
2" TURRET BOARD

MASSACHUSETTS INSTITUTE OF TECHNOLOGY SERVOMECHANISMS LABORATORY DWG. NO. 6345	DR CTS 8-1147 A-30781-1
CK RKM	ENG IW

B-30787-5
WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y B-30809



ELECTRICAL PARTS	
SERIAL NO.	VALUE
R28	10,000 Ω, 2W
R38	47,000 Ω, 1W
R39	0.47 MEG. ½ W
R40	10,000 Ω 2W
R41	560 Ω, 1W
R42	0.47 MEG ½ W
R43	3.3 MEG ½ W
R49	0.47 MEG ½ W
C18	4-30 MMFD ERIE N500
C19	175 MMFD CERAMIC ZERO TEMP. COEF.
C22	0.01 MFD MICA
C24	0.01 MFD MICA
C25	180 MMFD MICA
C26	0.01 MFD MICA
C27	0.01 MFD MICA
C28	0.01 MFD MICA
C40	0.01 MFD MICA
L3	10 mH
L7	10 mH
CR1	1N34

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ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN
8	SHAKEPROOF LUG	2102-6	3
7	HEX. NUT #4-40		2
6	BD HD. SCREW #6-32 - 1/4 LG.		3
5	SHAKEPROOF LOCKWASHER #4	1704	2
4	BD. HD. SCREW #4-40 1/2 LG		2
3	MOUNTING POST C.T.C. 3/8"	#X1246D	5
2	TERMINAL LUG C.T.C.	#1724 D	24
1	TERMINAL BOARD	A-30780-2	1

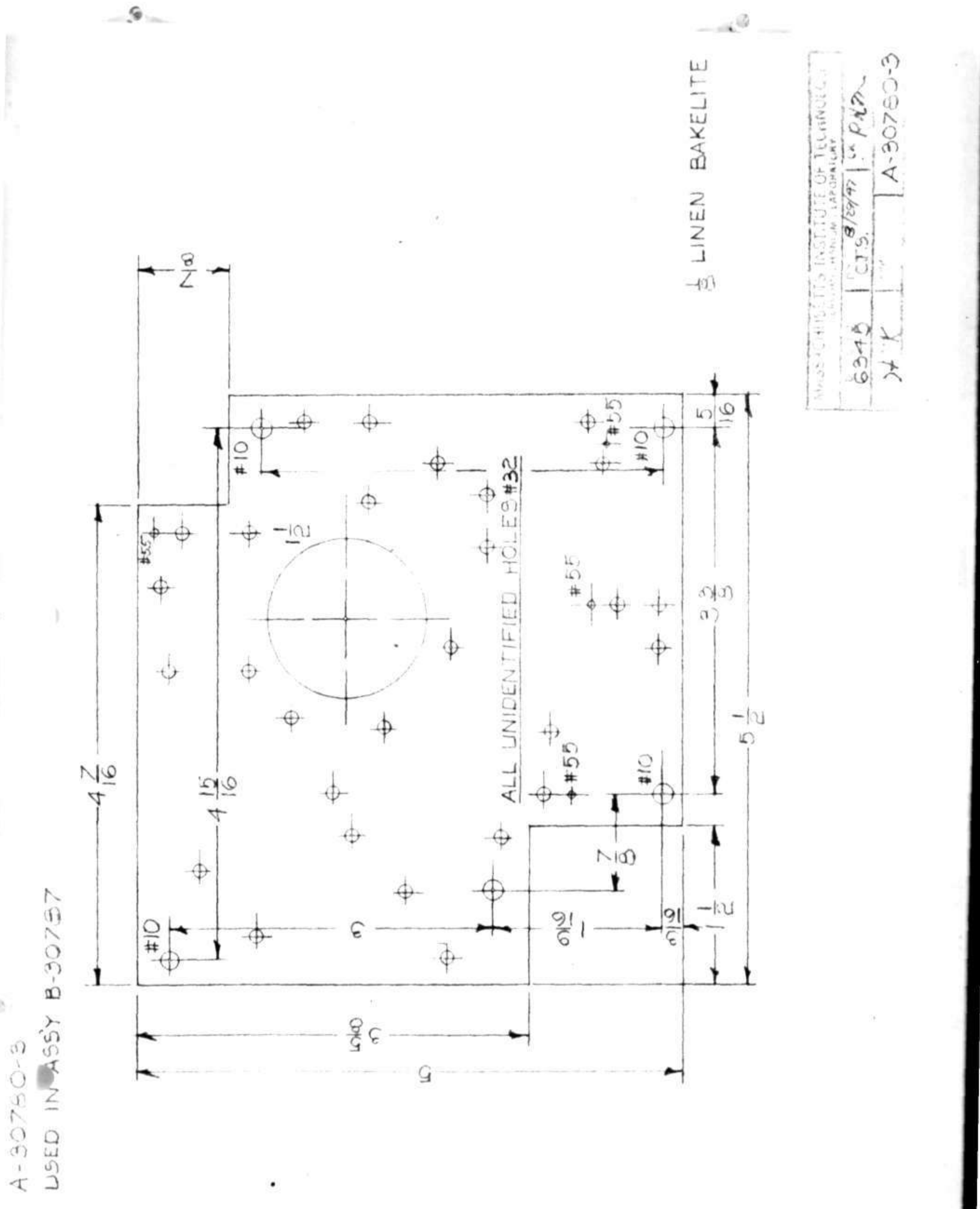
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

TERMINAL BOARD ASS'Y.

SCALE 1:1 DR [illegible] 8-1-47
TR HK CK R.H.M.E TL 8/15/47 APP

B-30787-5

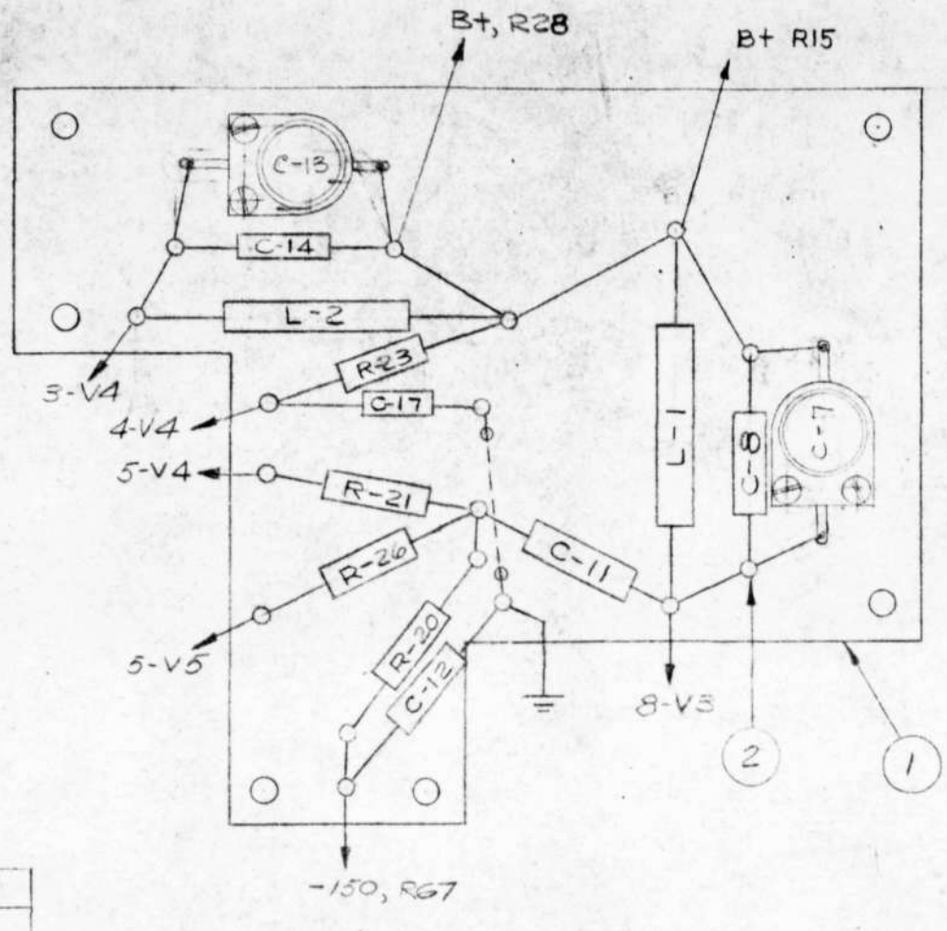
APPROVED FOR PUBLIC RELEASE. CASE 06-1104.

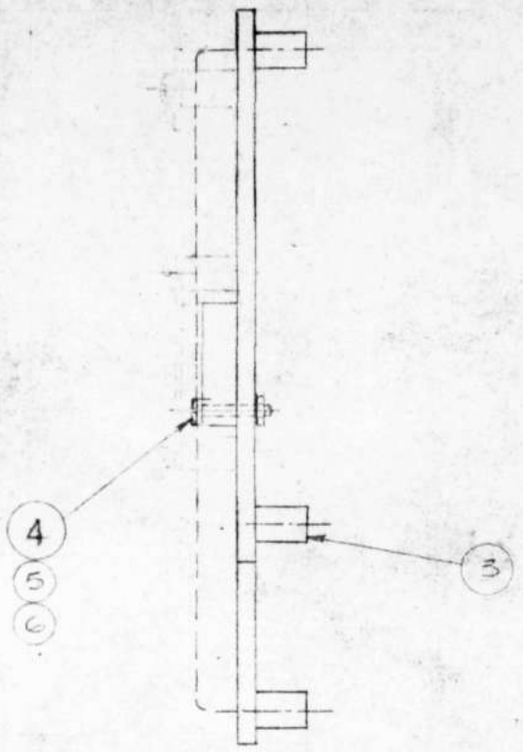


B-30786-3
WO-

TOLERANCES NOT OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y B-30809





ELECTRICAL PARTS LIST	
SERIAL NO.	VALUE
R20	0.47 MEG ½W
R21	2200 Ω ½W
R23	10,000 Ω 2W
R26	2200 Ω ½W
C7	4-30 MMFD, ERIE 11500
C8	35 MMFD, CERAMIC ZERO TEMP. COEFF.
C11	0.001 MFD, MICA
C12	0.01 MFD, MICA
C13	4-30 MMFD, ERIE N500
C14	100 MMFD, CERAMIC ZERO TEMP. COEFF.
C17	0.01 MFD, MICA
L1, L2	1 mH

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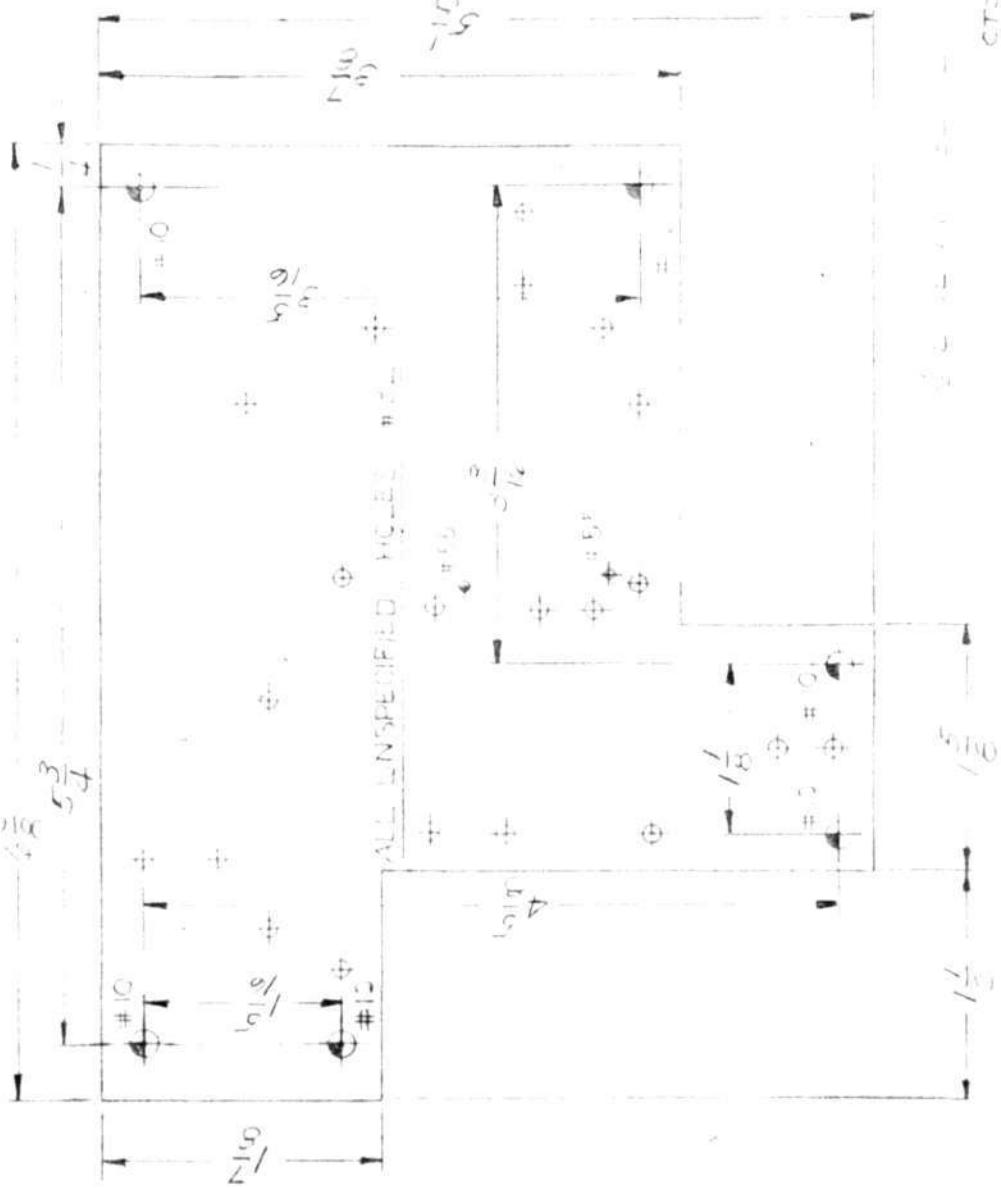
ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
6	HEX. NUT #4-40		4
5	SHAKEPROOF-LOCKWASHER #4	1704	4
4	BD. HD. SCREW #4-40 x 1/2 LG.		4
3	MOUNTING POST 3/8" C.T.C.	X1246-D	6
2	TERMINAL LUG C.T.C.	1724-D	17
1	TERMINAL BOARD	A-30779	1

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

TERMINAL BOARD ASS'Y

SCALE 1/1 DR. [illegible] 3-9-49
TR. HK CK. R.H.M.E. 3/19/47 APP.

B-30786-3



A- 30785-3
WO-

TOLERANCES UNLESS OTHERWISE SPECIFIED: DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y B-30809

ELECTRICAL PARTS LIST

SERIAL NO.		SERIAL NO.	
[illegible]	[illegible]	[illegible]	3900 Ω 2W
[illegible]	[illegible]	[illegible]	0.47 MEG ½ W
[illegible]	22000 [illegible]	R19	[illegible] 2W
[illegible]	3900 Ω [illegible]	[illegible]	[illegible] CERAMIC
[illegible]	[illegible]	[illegible]	0.0[illegible]
		C54	0.01MFD, MICA

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
[illegible]	[illegible]	[illegible]	2
[illegible]	[illegible]		4
[illegible]	[illegible]		4
[illegible]	[illegible]	[illegible]	4
4	[illegible] 5/8 [illegible]		4
[illegible]	TERMINAL [illegible]	[illegible]	28
[illegible]	[illegible]	[illegible]	2
1	[illegible]	[illegible]	1

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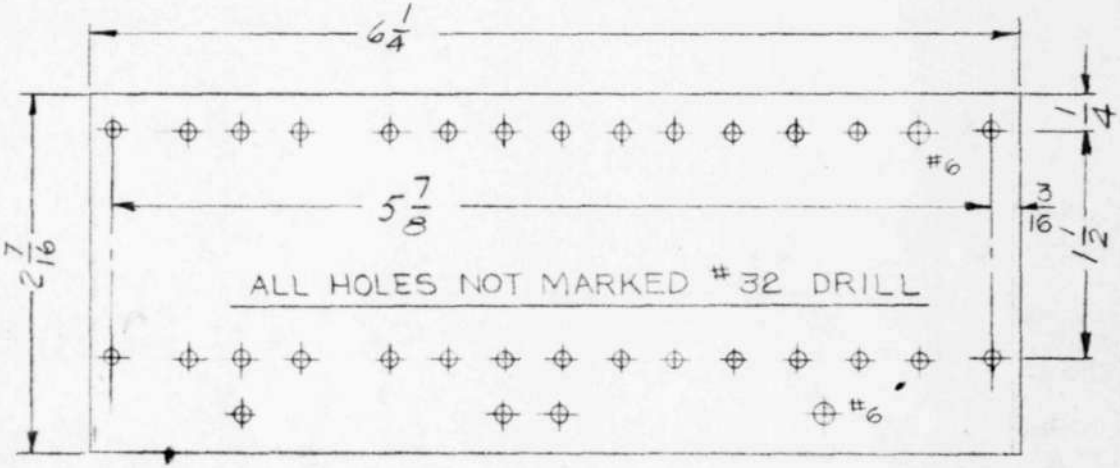
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

SCALE 1 | DR | TR HK | CK | APP

A- 30785-3

A-30778-2

USED IN ASS'Y A-38785



1/8 LINEN BAKELITE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY SERVOMECHANISMS LABORATORY DWG NO. 6345	DR. CTS 8-8-47 A-30778-2
CK RBM	ENG HK

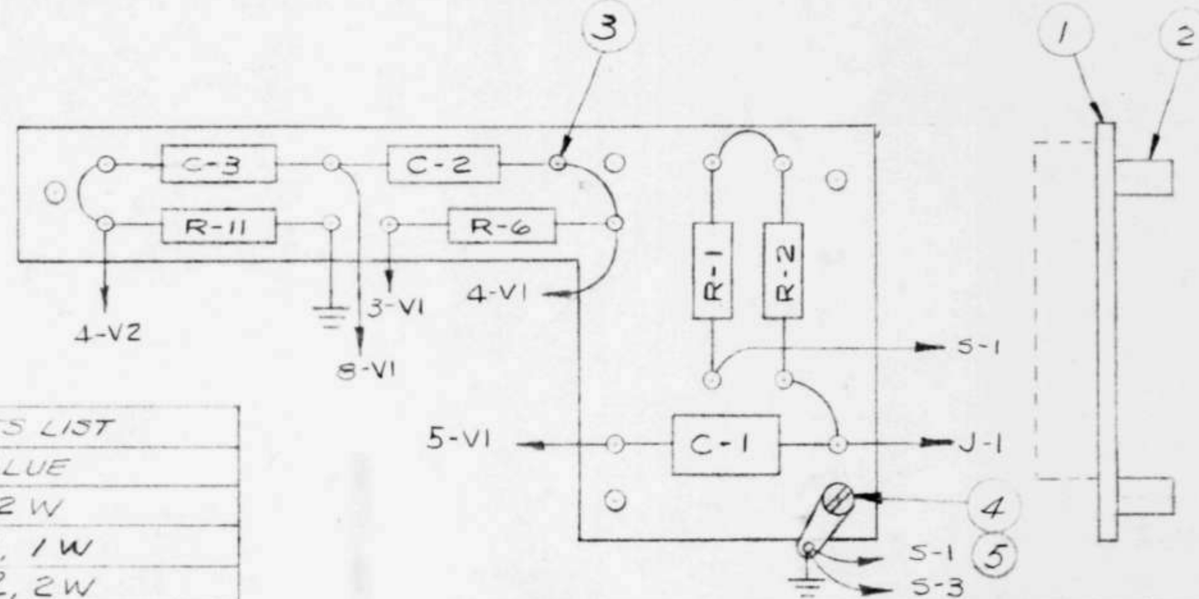
APPROVED FOR PUBLIC RELEASE. CASE 06-1104.

A- 30789-
WO-

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

5	RD. HD. SCREW 6-32 x 1/4 LG.		1
4	SHAKEPROOF LUG	#2102-6	1

USED IN ASS'Y B-30809



ELECTRIC PARTS LIST

SERIAL NO.	VALUE
R1, R2	47Ω, 2 W
R6	5600 Ω, 1 W
R11	6800 Ω, 2 W
C1	0.001 MFD, MICA
C2, C3	0.01 MFD, MICA

ITEM	MATERIAL - DESCRIPTION		PART NO.	QUAN.
3	TERMINAL LUG	C.T.C.	1724-D	13
2	MOUNTING POST 3/8"	C.T.C.	X-1246-D	5
1	TERMINAL BOARD		A-30782-1	1

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SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

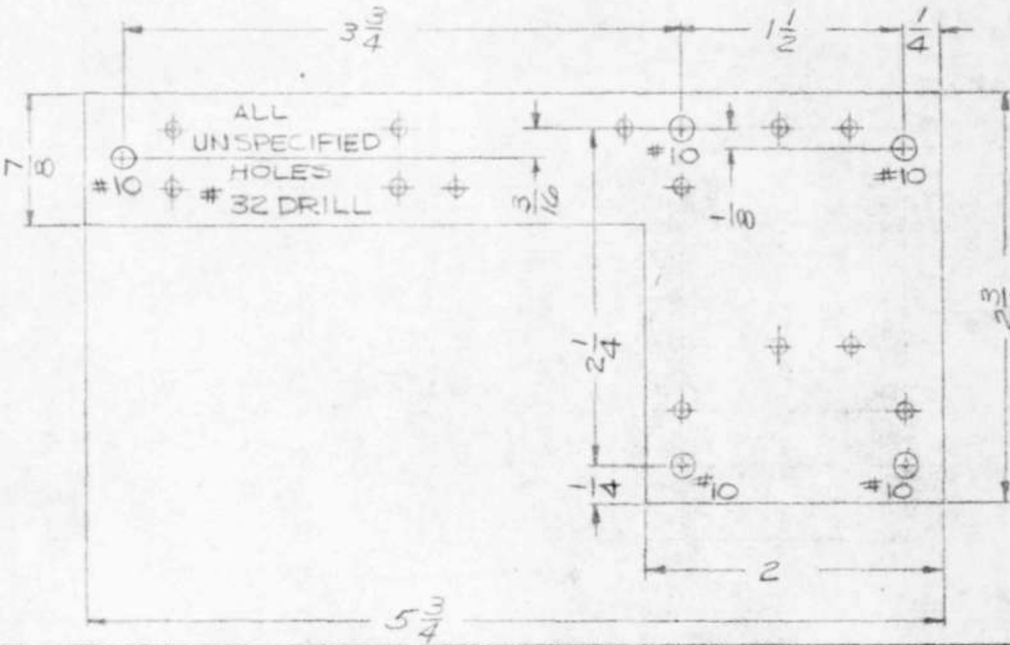
TERMINAL BOARD ASS'Y

SCALE: 1 : 1 DR. [illegible] 9/3/47
TR. HK CK. RHM APP.

A-30789-2

A-30782
WO-
TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASSY A-30789



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	WAS	APP.	DATE		WAS	APP.	DATE

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
	1/8 LINEN BAKELITE		

SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

TERMINAL BOARD DETAIL

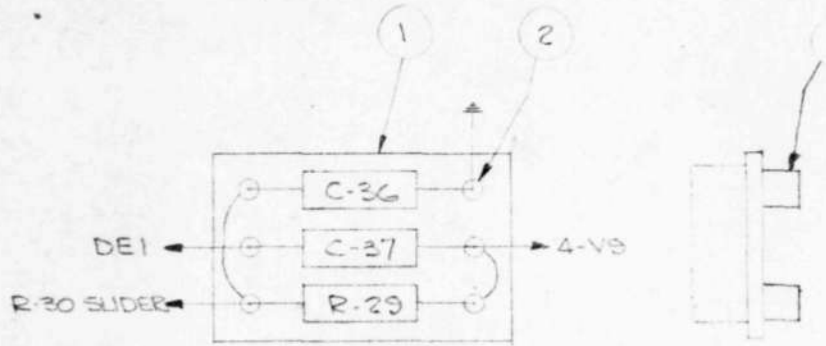
SCALE: 1:1 | DR. [illegible] 9/2/47
TR. HK | CK. RHM | APP.

A-30782-2

A- 30790-2
WO-

TOLERANCES NOT OTHERWISE SPECIFIED
DECIMAL ± .005 FRACTIONAL ± 1/64

USED IN ASS'Y B-30809



ELECTRICAL PARTS LIST	
SERIAL NO.	VALUE
R 29	1000 Ω 1W
C36, C37	0.01 MFD., MICA

ITEM	MATERIAL - DESCRIPTION		PART NO.	QUAN.
3	MOUNTING POST 1/4"	C.T.C.	X1246-D	2
2	TERMINAL LUG	C.T.C.	1724-D	6
1	TERMINAL BOARD		A 30783	1

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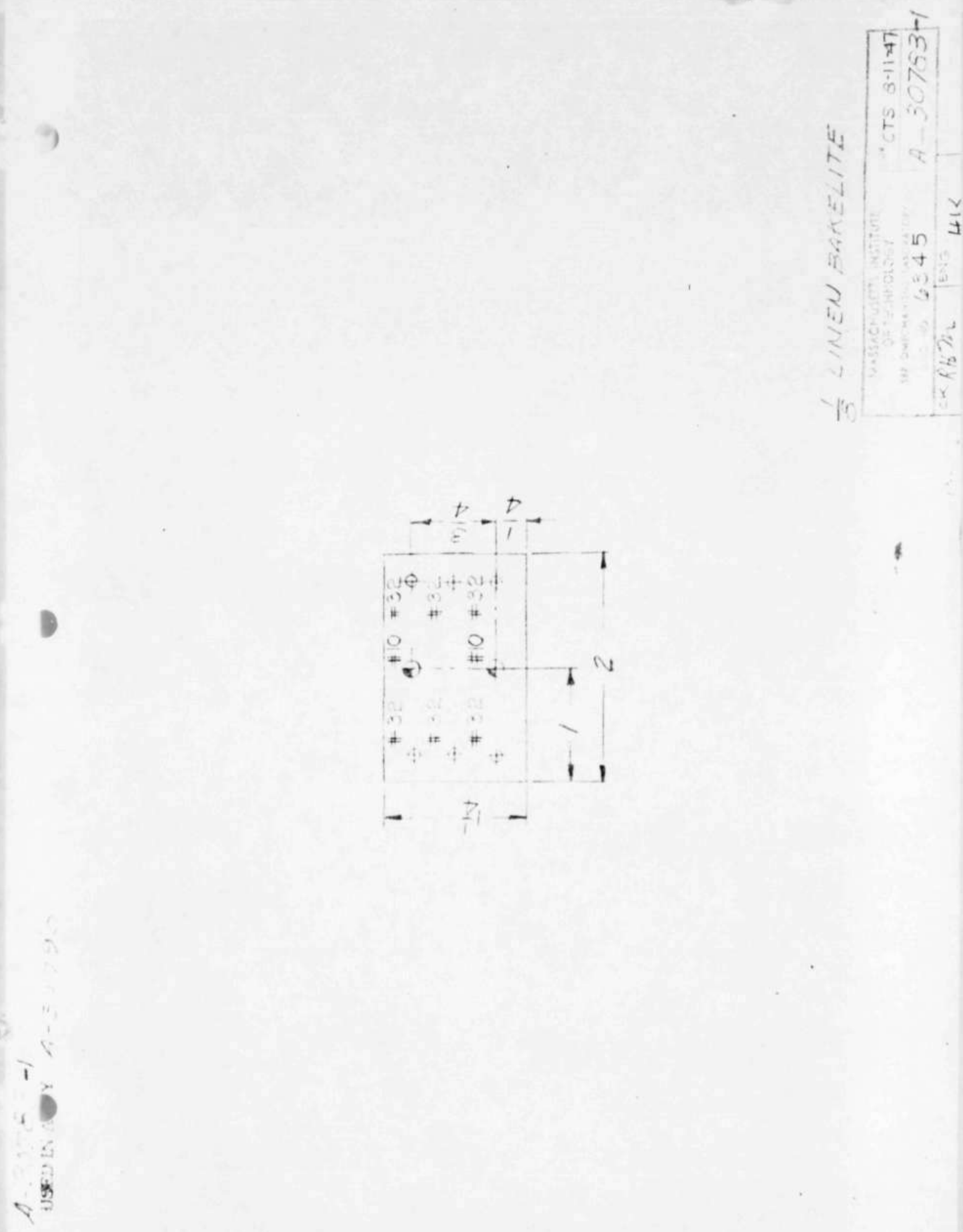
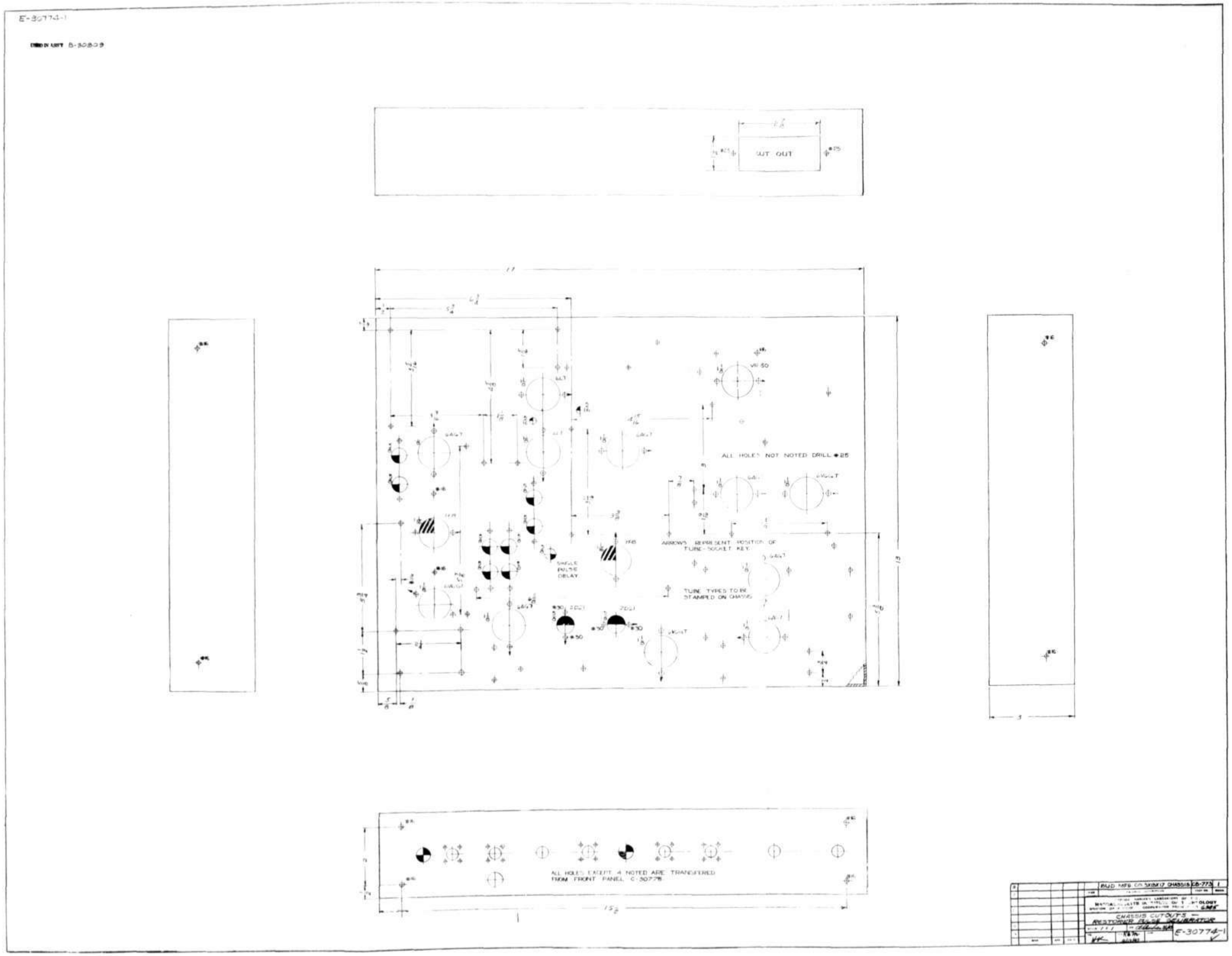
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO.

TERMINAL BOARD ASSY

SCALE: FULL
DR. [illegible] 8/13/46
TR. HK
CK. R.H.M. & T2 8/1947
APP.

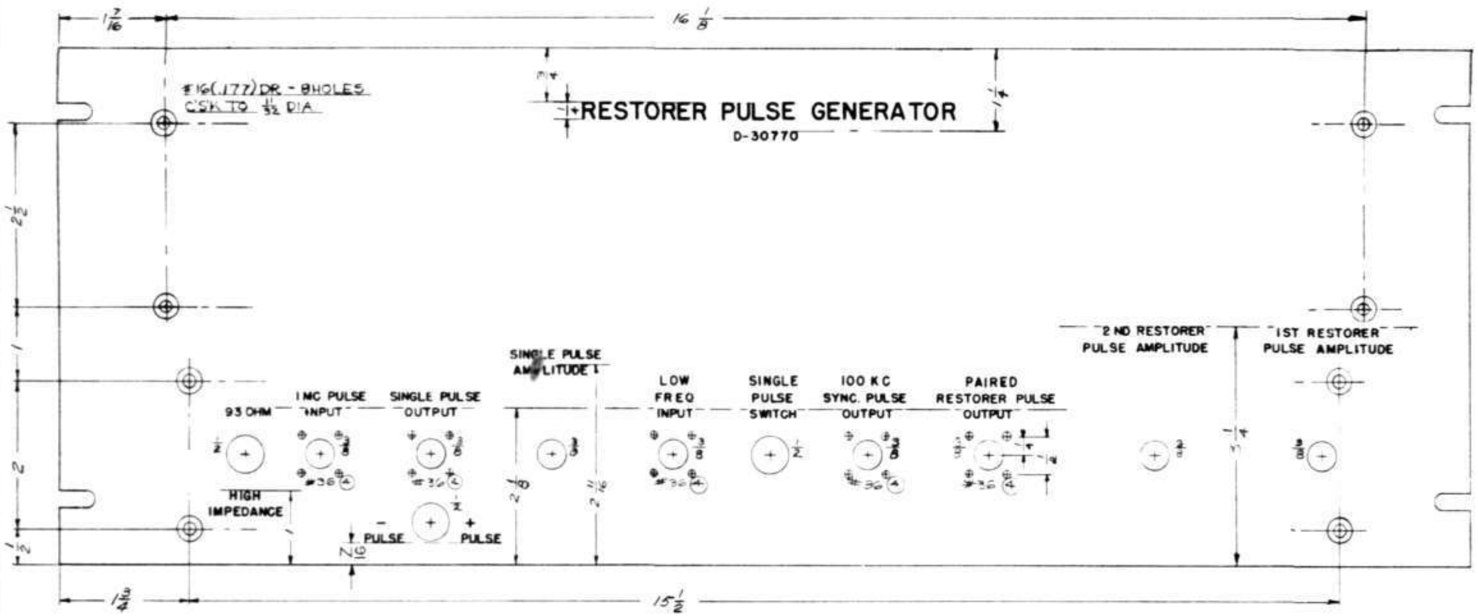
A- 30790-2





C-30775
WO-
TOLERANCES NOT OTHERWISE SPECIFIED

USED IN ASS'Y B-30809



NOTE: LETTERING TO BE 1/8 HIGH UNLESS OTHERWISE NOTED

ITEM	MATERIAL - DESCRIPTION	PART NO.	QUAN.
	7 X 19 X 1/8 PANEL, BUD MFG. CO.	PA-1104	1

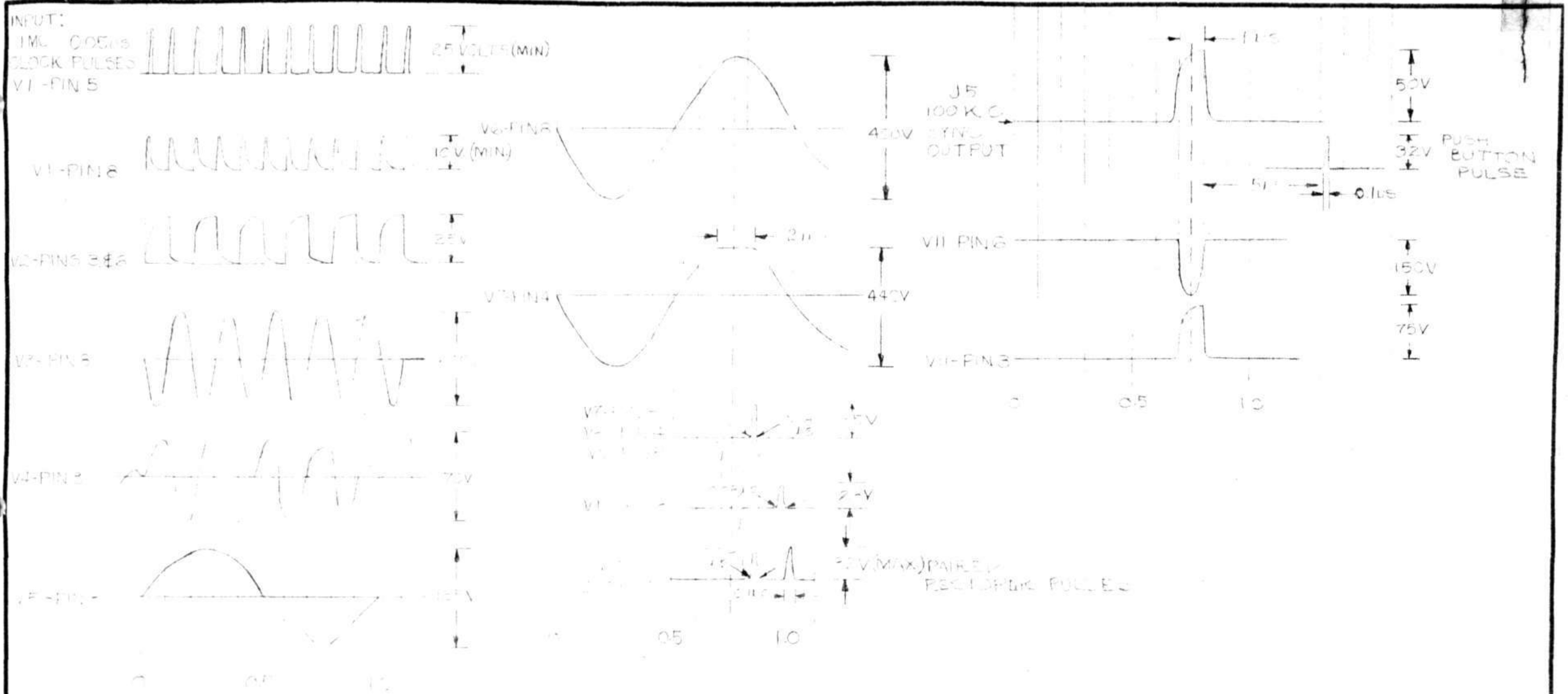
SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

FRONT PANEL LAYOUT
RESTORER PULSE GEN.

SCALE 1:1 | DR. [illegible] 3-22-47 | TR. HK | CK. RHM 3/23/47 | APP.

C-30775-1

B-30898



SERVOMECHANISMS LABORATORY OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIVISION OF INDUSTRIAL COOPERATION PROJECT NO. 6345

TIMING DIAGRAM OF
RESTORER PULSE GENERATOR

SCALE: —	DR. McHUGH 3-28-47		B-30898
ENG. H/L	CK.	APP.	