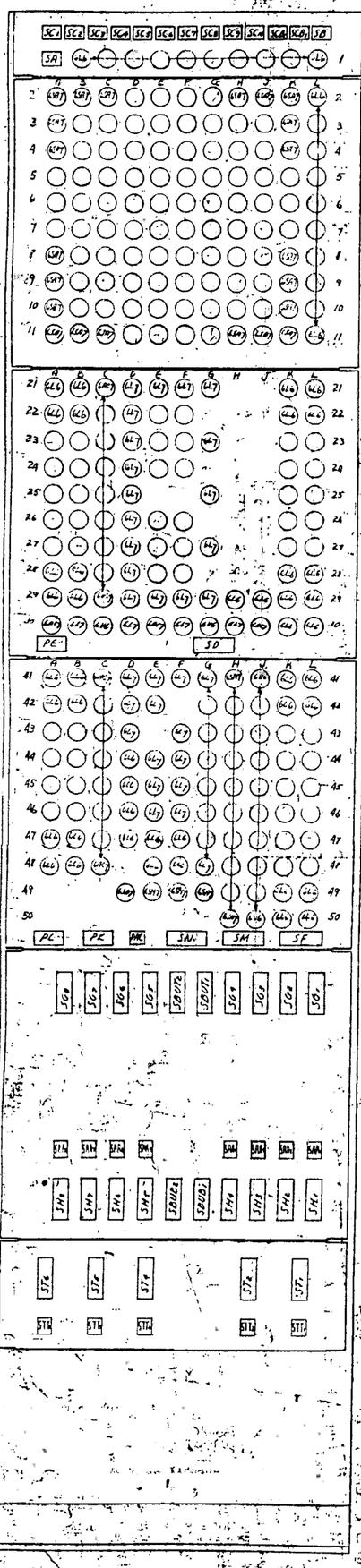
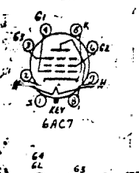
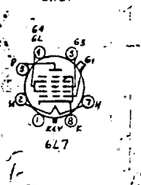
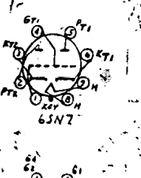
REVISIONS
Pins on Ceramic D50, G48 [illegible] 43 Now 47-D43, G49 [illegible] Retention Left was 6L7 Now 6L6
[illegible]

PANEL #1




6AC7


6L7


6SN7

6SA7

6L6, 6V6

Programming Instructions for the Dynamic Testing of the Multiplier

The following program should be set up on the multiplier and its associated accumulators. The multiplier should be programmed to perform a 10 place multiplication and clear both the multiplier and multiplicand accumulators, with all other switches set to suppr - except as indicated otherwise in the text. In the same time the multiplier and multiplicand accumulators should be programmed to receive the numbers indicated in the notes. The same program [illegible] the 0 pulse since it occurs in the 0th addition time of the multiplication) should be used to stimulate an otherwise unused accumulator repeat program control [illegible] (or series of two such controls) so as to provide a program pulse at any addition time desired for sweeping or sublenging the oscilloscope. The output pulse from the multiplier program control should be fed to an accumulator repeat program control and thence to the input of the multiplier program control. This a ring is set up so that the multiplier is programmed repeatedly with an interval of at least one addition time between multiplications so as to allow various circuits to become quiescent.

The program pulses referred to in the sweep, rise and fall columns are numbered as follows. The program pulses used to stimulate the multiplier program control and the multiplier and multiplicand accumulators is called the 0th pulse, as it comes near the end of the 0th addition time. The program pulse coming near the end of the first addition time is referred to as the number 1 program pulse, etc.

A single number, or set of such numbers separated by commas, appearing in the sweep column, refers to the program pulses. Thus 1,15 means that the oscilloscope should be swept with the number 1 program pulse (to see the rise of the gate) and with the number 15 program pulse (to see the fall of the gate). Two numbers separated by a dash are used to refer to a pulse time within an addition time. Thus 12-19 means the sweep is inaugurated by the 19th pulse following the number 12 program pulse (thus the number 13 program pulse coming at 12-20 or 13-0 may be seen). Actually the sweep is stimulated every pulse time by the 19th pulse (got from the sync pointing unit PX-2-108) and the oscilloscope unblanked by the number 12 program pulse and blanked by the number 19 program pulse. The word "to" is used in its inclusive sense; thus, 2 to 10 means sweep with 9 different program pulses.

The rise, duration, and fall columns specify the time characteristics of the signal to be viewed. In the case of a gate the time specified in the rise column is the time by which it should rise, and the time specified in the fall column the time by which it should fall. Thus 12-100 means that it should rise (or fall) within 100 microseconds following the number 12 program pulse. 8-20 means that it should rise (or fall) within 20 microseconds after the pulse indicated in the sweep column. In the case of a pulse the rise time, duration, and fall time are specified in microseconds.

The amplitude is specified in volts, and is computed on the basis of a new "minimum" tube, i.e., on the basis of the PX-standards specified in PX-1-103. It is the signal to be expected from the driving tube, and does, in many cases, exceed that required (including safety factors) to drive the driven tube.

Tube	Terminal	Sweep	Amplitude	Rise	Duration	Fall	Notes
A to K, P to 11	8	1,15	+40	1-100	---	15-100	Multiplier varies as follows: A 10 to K 10 11111 11111; A 9 to K 9 22222 22222; ... A 2 to K 2 99999 99999; A 1 to K 1 0000000000
(Multiplier Selector Gates)	5 (only on one row)	K 2 to 5; K 11	+16	3-20	---	5+1-20	
	3	2 to 11	-25	3-20	---	5+1-20	
L-21 to 50 (Multiplication Table Drivers)	5	L21=10, L22=9, L23=8	4100	8-20	---	5+1-20	Multiplier = 12345 67890
	3	L30=2	-160	3-20	---	5+1-20	
M21 to 29, M1 to M3; N21 to 29, N1 to N6; P21 to 29, P1 to P6; Q21 to 29, Q1 to Q6 (Table Output Gates)	5	2 to 10	-9	8-20	---	8-1-20	Multiplier = 12345 67890
	3		-6				Signal appears only in some cases - see Table I
F47, E47; D46, D44 (Pulse Amplifiers)	5	0-3 to 0-11	+45				F 47 - 1 Pulse; X 47 - 2 Pulses; D 46 - 2 Pulses; D 44 - 4 Pulses
	3		+15				
M21 to 29, M1 to M6; N21 to 29, N1 to N6 (Table Output Gate Buffers)	5	0-3 to 0-11	+28				See Table II for list of pulses which appear
	3		-50				
H41 to 50 (Retransmitted program pulse tubes)	1	19-19	-14				Set all multiplier accumulator function switches to: for H,K50; for H,K49; e for H,K46. Set all multiplicand accumulator function switches to: for H,K45; for H,K44; e for H,K41
	4		+30				
	5		+75				
K41 to 50 (Retransmitted program pulse tubes)	5		+43				
	6		+30				
D49 (Flip-flop set gate)	6	12,13	+95	12-100	---	13-100	
	5		+40				
	3	12-19	-40				
G49 (Flip-flop reset gate)	6	13	+40	12-50	---	13-50	
	3	13-19	-55				
	5		+20				
F49 (Flip-flop tube)	1		-23				
	4		-25				
	2		+20				
	5		+30				
A29, J, S0 (Clear Inverters)	4	13,14	-12	13-70	---	14-70	Set the accumulator clear switches of all programs according to the following chart.
	6		+25	14-70	---	14-70	
B,D,Y,H 30 (Clear Gates)	5	13-19	+25				
	3		-40				
M,J 29 (Clear Buffers)	5		+55				
	3		-70				

Tubes tested:	H29 A,B,K30	D,Y,F30	J29 M,J,S0
Multiplier acc. clear switches set to	0	0	0
Multiplicand acc. clear switches set to	0	0	0

TABLE I

Tube	2	3	4	5	6	7	8	9	10	Pulses transmitted from terminal 5 when negative gate does not appear: 14	
Crosses indicate sweeps on which negative gate appears											
Q46	x	x	x	x						x	1
Q47	x	x	x				x	x	x	x	1
R46	x	x	x	x	x	x				x	1
Q46	x	x			x	x	x			x	1
R46	x	x	x	x						x	2
Q45	x			x	x			x	x	x	1
P45	x	x	x	x		x				x	2
Q45	x	x	x		x		x			x	2+
R44	x			x			x	x		x	1
P43	x	x	x		x					x	2
Q44	x	x	x	x		x				x	2+
Q43	x		x	x		x	x			x	1
P43	x	x				x	x	x		x	2
Q43	x	x	x	x	x					x	1
Q42	x		x		x	x		x		x	1
P42	x	x			x	x	x			x	2+
Q42	x	x	x	x						x	1
Q41	x						x		x	x	1
R41	x	x		x	x			x		x	2
S41	x	x	x		x		x			x	2+
Q41	x	x	x	x		x				x	1
U29		x		x		x		x		x	1
S29	x		x		x		x			x	2
S30	x	x			x	x				x	2+
U29	x	x	x	x						x	1
U26		x			x					x	1
V26	x	x			x			x		x	2
U26	x			x	x	x				x	1
Q37	x		x		x		x			x	1
P37		x					x	x	x	x	2
R37	x			x			x	x		x	2+
Q37	x			x	x		x			x	1
P36				x	x				x	x	2
V36			x		x			x		x	2+
Q36	x		x		x	x		x		x	1
Q35		x		x		x		x		x	1
R35		x		x		x		x		x	1
P34	x				x	x			x	x	2
R34		x			x		x		x	x	2+
Q34		x		x	x		x			x	1
Q33				x		x		x		x	1
P33	x							x		x	2
Q33			x			x		x		x	1
Q32					x			x	x	x	2
P32		x	x		x	x				x	2
Q32			x	x	x				x	x	1
Q31		x			x		x	x		x	2+
P27			x	x	x		x		x	x	2
Q31				x		x		x	x	x	2+

TABLE II
Crosses indicate which pulses appear

Tube	1P	2P	-2+P	4P
Q21	x	x	x	x
Q22		x	x	x
Q23	x	x	x	x
Q24		x	x	x
Q25	x			x
Q26	x	x	x	x
Q27	x	x	x	x
Q28		x	x	x
Q29	x	x	x	x
Q30		x	x	x
Q41	x	x	x	x
Q42	x	x	x	x
Q43	x	x	x	x
Q44	x	x	x	x
Q45	x	x	x	x
Q46	x	x	x	x
Q47	x	x	x	x
Q48	x	x	x	x

MOORE SCHOOL OF ELECTRICAL ENGINEERING
UNIVERSITY OF PENNSYLVANIA

MULTIPLIER TESTING CHART - PROJECT Y - DYNAMICS

MATERIAL | FINISH | SCALE

Drawn by: [illegible] 1945
Checked by: [illegible]
Approved by: [illegible]

PX-9-123