Erickson

Engineering Reference Memorandum

TYPE 701 ELECTRONIC DATA PROCESSING MACHINES

#16

December 15, 1953

SUBJECT: Voltage Adjustments-Type 706

PURPOSE: To provide information for adjusting the Electrostatic Storage Unit, Type 706.

INFORMATION:

+40 Volt Power Supply

Adjust the "+40 V Adjust" potentiometer (Fig. 2) so that the output voltage measures 40 volts at the test terminal which is labeled +30 V.

-150 Volt Supply

Adjust the potentiometer so that the output voltage measures 150 volts at the test terminal, Figure 2.

+400 Volt Supply

1. Adjust the "+450 Adjust" potentiometer so that the output voltage measures +400 volts at the test terminal labeled +400 V. (Fig. 2).

2. Adjust the 75 ohm Adjustable Resistor potentiometer in the +400 volt supply (Fig. 1) for 2.5 volts measured at the test terminals labeled I_k and +450(Fig. 1.)

+270 Volt Supply (Horizontal Deflection)

Adjust the potentiometer (Fig. 2) for +270 volts output measured at the test terminal.

+270 Volt Supply (Vertical Deflection)

Adjust the potentiometer for +270 volts output at the test terminal. (Fig. 2)

Astigmatism Voltage (+217 Volts) Supply

1. With machine in Regeneration using a DC voltmeter (1000 ohms/volt or better) measure the DC voltage on all 4 deflection lines (U, D, R, L) at TB22. (Fig. 1)

(over)

2. The average value of these 4 voltages gives the optimum setting for the astigmatism voltage. This is not necessarily 217 volts but around 200 Volts. The voltages should vary no more than 2 Volts from each other.

3. The astigmatism voltage adjustment potentiometer and the test terminal are located on the gate in the memory frame. See Figure 2.

-2300 Volt Supply

1. Place the -2300 volt monitor in the OUT position.

2. Turn off the high voltage in memory by means of the high voltage switch.

3. Connect the meter leads to the test jacks. Use the Weston Model (0-0.15 ma. scale) 931 milliammeter; full scale will now equal 3000 volts since the resistors in the machine act as the multiplying resistors.

CAUTION:

Do not connect or disconnect the meter leads while the high voltage is turned on, under any circumstances. If only the -2300 volt lead is connected, and the circuit is "hot", the meter leads and the case will be at high potential. This condition will exist until the ground lead is connected to ground. Therefore, always turn off the high voltage when connecting or disconnecting the leads to measure the -2300 volts.

4. Turn on the high voltage.

5. Adjust the voltage adjust potentiometer for 2300 volts. (0.115 ma)

6. Turn off the high voltage.

7. Remove the meter leads.

8. Turn on the high voltage.

9. Adjust the balance potentiometer for zero volts between the plates, pins 1 and 6, of the 12 AX 7 (Fig. 2). (V34) (Voltage across 807 must be 300 to 350 volts-vary Sola Taps)

(cont'd)

10. Place the-2450 volt monitor in the IN position.

-150 Volt (CRT Bias) Supply

1. Place the -2450 volt monitor in the OUT position.

2. Turn off the high voltage in memory by means of the HV switch.

3. Connect the meter leads to the test jacks. Use the Weston Model 931 milliammeter's full scale will now equal 300 volts.

CAUTION: Do not touch the tests leads while measuring this voltage. As soon as the HV is turned on, both of the test leads and the meter are at high potential at ALL times. If it is necessary to rearrange the meter or the test leads, FIRST turn off the high voltage.

4. Turn on the HV.

5. Adjust the voltage adjust potentiometer for 150 volts.

6. Adjust the balance potentiometer for minimum voltage between the plates, pins 1 and 6, of the 12AX7. (V56) (Fig. 2)

7. Turn off the HV.

8. Disconnect the meter leads.

9. Turn on the HV.

10. Place the -2450 volt monitor in the IN position.

Memory Drawer Adjustments

See Engineering Reference Memorandum #5 for these adjustments.

Focus Margin

Normally the switch is in the OUT position. This grounds the high voltage bleeders in all drawers (the focusing anodes are fed from a tap on these bleeders) and makes the focus margin circuit inoperative. When in use, a voltmeter is connected across the test jacks. The voltmeter measures the amount of focusing bias applied for machine testing.

(over)

Bit Sweep Adjustments

1. Make sure that the dash pulse is adjusted correctly. See Main Frame Adjustments. The dash should begin at 10.5 and should be 2.9 micro-seconds duration.

2. Adjust the timing of the bit sweep start by means of the .45 micro-second delay line located at MF3-A33. The bit sweep should start 0.1 micro-seconds after the dash pulse starts, i. e. at 10.6 time.

3. Stop all deflections other than the bit sweep by turning off the HV, and by placing the machine in use time (I or E time). Do this by means of the cycle time manual control switch located in the Main Frame Panel 1.

4. Measure the bit sweep voltage on either horizontal deflection line. The left and right bit sweep voltages are of approximately equal amplitude and opposite polarity. Adjust the bit sweep adjust potentiometer (Fig. 2) so that the voltage is one volt at the end of dash time.

Pulse Timings

The following pulse timings and amplitudes are measured at the Memory Frame.

Pulse	Approximate Starting Time	Amplitude
1. MV Trg. Turn Off	3.0	40V
2. Bit Sweep Start	10.6	40V
3. Lt. Sample	7.2	35V
4. Rt. Sample	9.7	35V
5. Sample RI	9.5	(-20 to +40) V
6. Dash	10.5	(-30 to + 5) V Approx.
7. Dot	6.5 or 9.0	(-30 to +15) V Approx.
8. Control Lines	2	(-30 to +10)

Pulses 1 through 4 above are very critical and the amplitudes given are the absolute minimums which can be tolerated for reliable operation.

The Address Control Line (8 above) is normally 5 to 10 volts more positive than the Operation Control Line which drives it.

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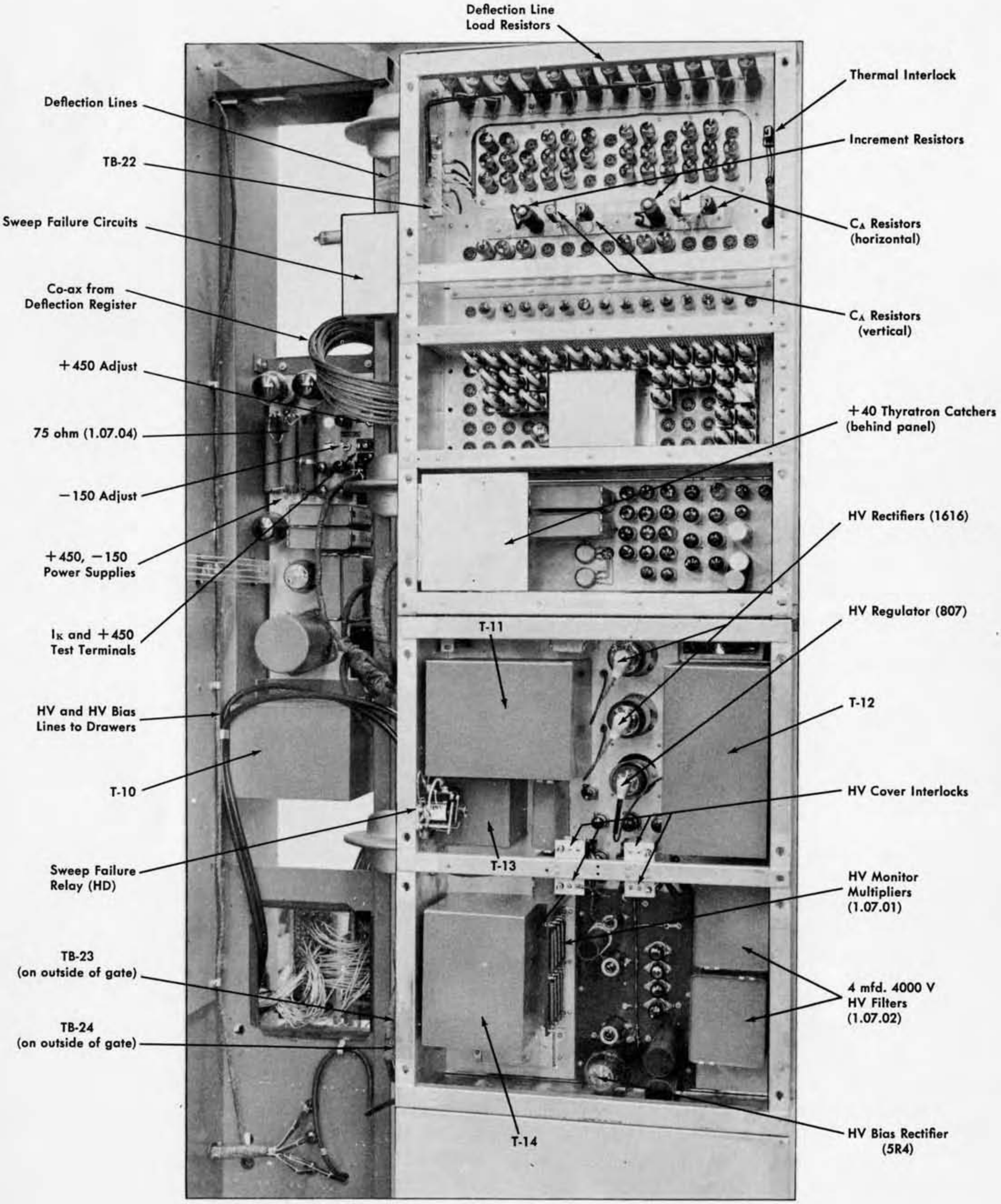

Figure 1 Front of ESM Gate

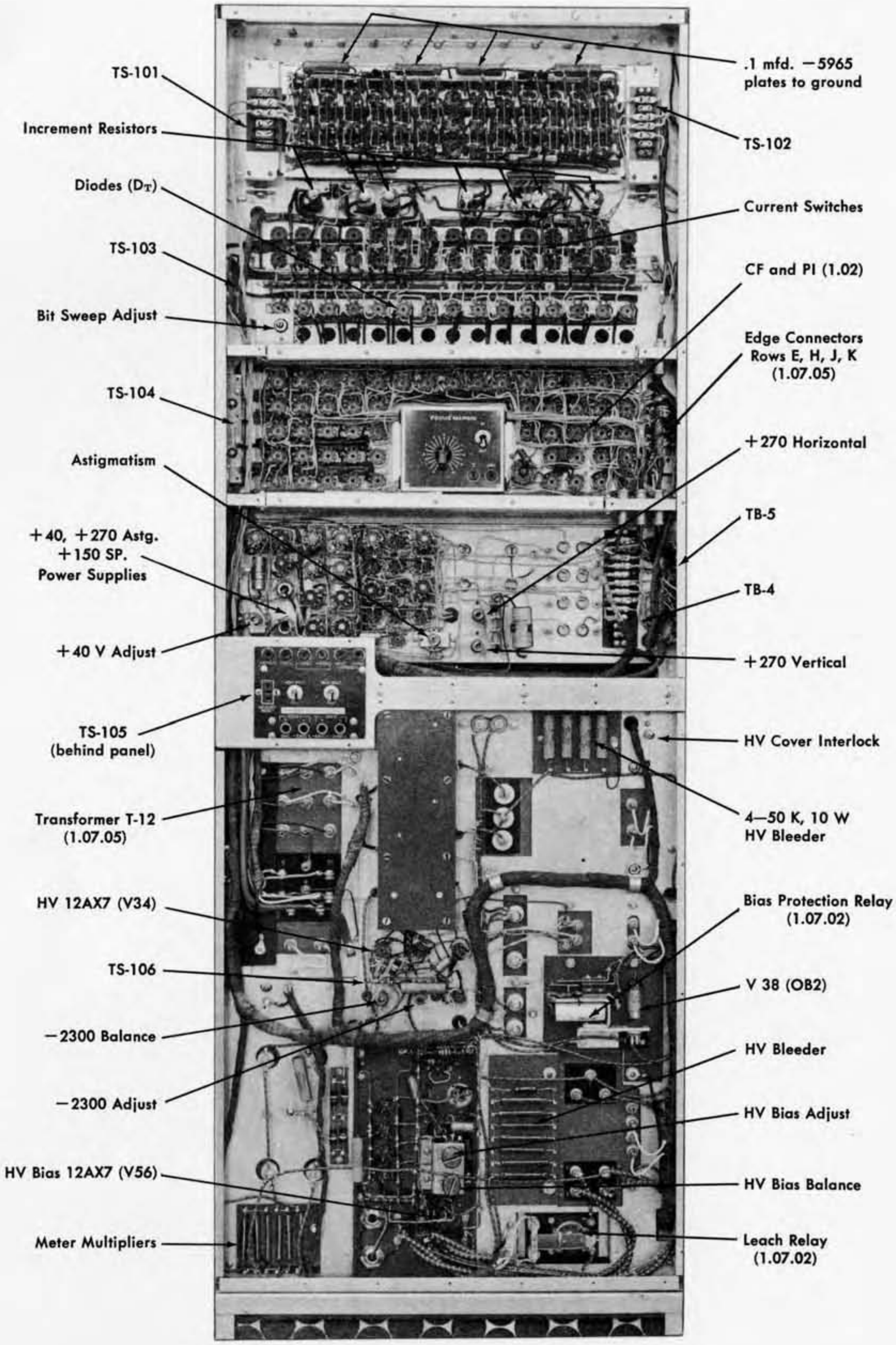

Figure 2 Rear of ESM Gate

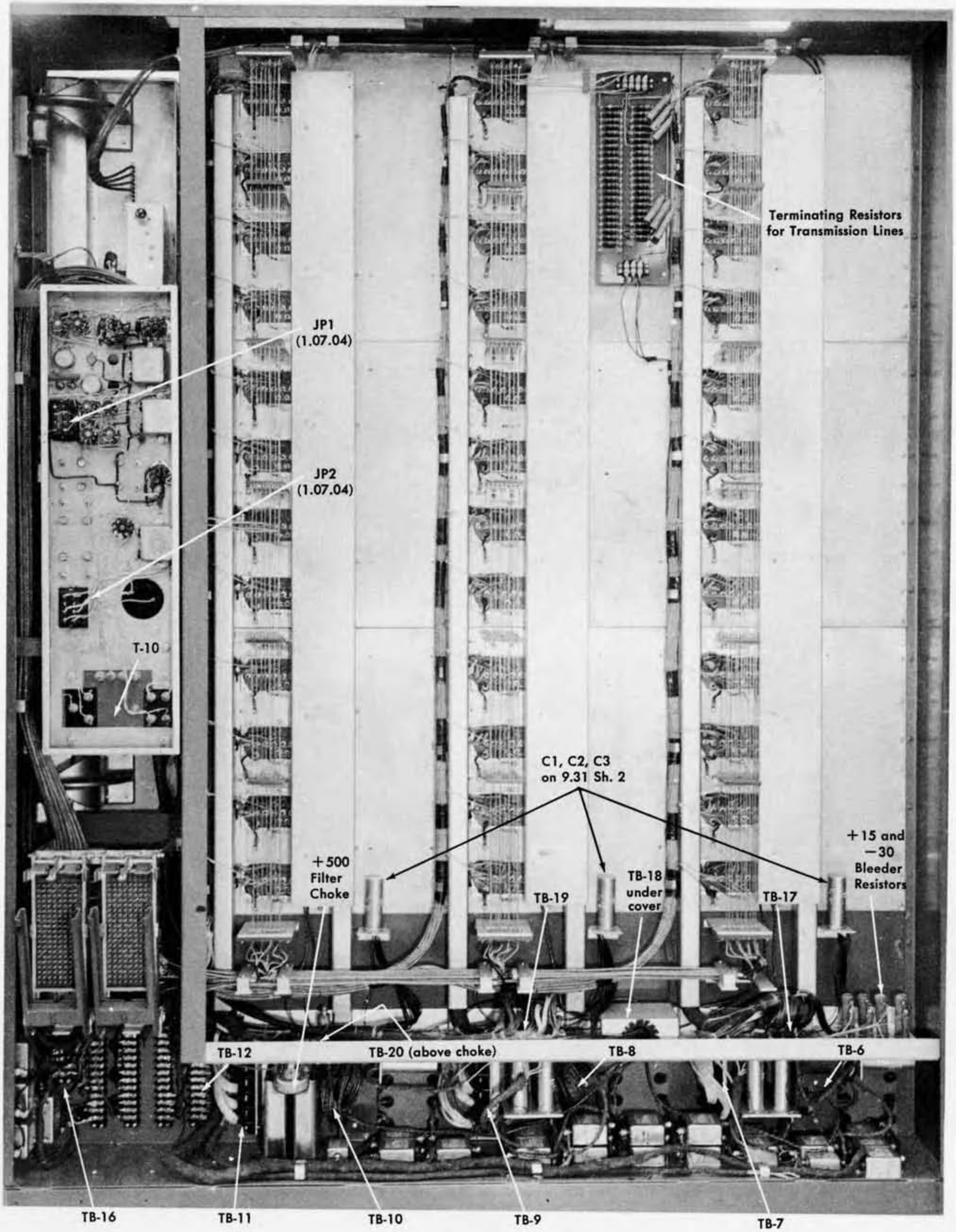

Figure 3 Rear of ESM Frame

Engineering Reference Memorandum
TYPE 701 ELECTRONIC DATA PROCESSING MACHINES

December 31, 1953

#20

SUBJECT: General Service Technique and Information-Type 706

PURPOSE: To inform the field of the latest service techniques and also problems which have been encountered at other installations.

INFORMATION:

1. Repair of Memory Drawers

Increasing video amplifier gain causes an increase in the effects of spill in the following manner:

Consider a typical dot signal as viewed at the video amplifier sixth stage. (See Fig. 1.) As the "potential well" of the dot is filled by the collection of secondary electrons from surrounding areas in the cathode ray tube, the negative swing of the dot will go in a positive direction (refer to Curve A). As long as this swing stays negative, increasing the amplifier gain will have no effect on the changing of this dot to a dash. However, when the spill becomes sufficient to cause this swing to go positive, (refer to Curve B), it is possible to increase the amplifier gain to the point where the positive dot will go above the clipping level enough to appear as a dash signal.

The more frequent causes for spill other than the cathode ray tube in the order of most troublesome to least troublesome are:

(a) Noisy video amplifier
(b) Excessive gain setting of the drawer
(c) Marginal trigger tubes
(d) Marginal circuitry associated with the trigger
(e) Weak diodes in the unblanking circuit
(f) Weak sample pulse
(g) Noise in the deflection circuit due to microphonic tubes or noisy increment resistors

It has been pointed out that although items "f" and "g" pertain to the memory frame, a failure in a single drawer (which is actually good) sometimes results.

Other than standard tests you might try tap testing for microphonic tubes and thorough bias checking of the storage trigger circuitry.

(over)

The phenomenon of spill cannot be observed by looking at some particular point in a memory drawer with an oscilloscope while the drawer is being operated. This is because the signals observed with an oscilloscope in a drawer are composite signals representing information from all the bits on the cathode ray tube. It would, therefore, be impossible to observe the "spilling" of a particular bit on a tube while running a program because the identity of a particular signal would be obscured by the presence of other signals.

A dot signal viewed at the Output of the Video Amplifier

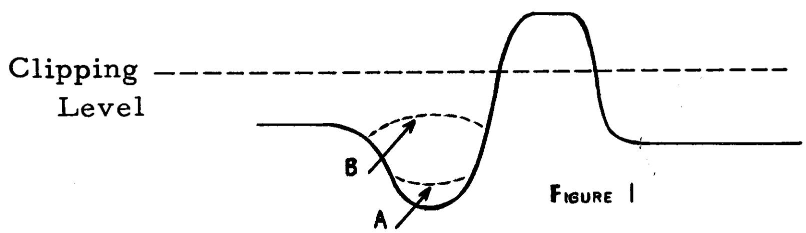

FIGURE 1

2. To observe noise on the deflection lines:

(a) Turn off the high and bias voltages.
(b) Remove the bit sweep trigger.
(c) Set instruction counter to 7777.
(d) Lock in 1 time (switch on Panel 1) to kill deflection.
(e) With scope observe horizontal deflection lines while tapping all switch and deflection CF tubes on deflection gate. Noise spikes generated by tapping will appear as differentiated square waves. All tubes can be caused to generate spikes, however, some are more sensitive than others and should be replaced. The average noise level on the deflection lines should be approximately 70 millivolts.
(f) While checking for noise, look for any indication of sixty cycle hum which indicates a low impedance between cathode and heater. These tubes should be replaced.
(g) Repeat observing vertical deflection lines.
(h) Set instruction counter to 0000 for opposite deflection operation.
(i) Repeat horizontal and vertical tapping test.

3. To check for loose connections or microphonic tubes in Memory: While running forget or dropout:
(1) Tap individual drawers.
(2) Tap tubes on gate.
(3) If error occurs, machine will stop with error indicated on operators panel.

4. A method of examining the CRT for a bad spot follows. Repeated failure of a CRT at the same address may be due to a bad spot on the face of the tube at that address.

   (a) Set the instruction-Store the error address in keyboard.
   (b) Put machine in continuous memory Read IN
   (c) Observe the output of the faulty drawer. The normal output of both tubes during regeneration time will appear on the scope; in addition to this the output from the suspected bad spot will appear during "use" time. (6.5 to 7.7 time).
   (d) A bad spot will appear as low output, 20% less than normal.

5. Memory Drawer Unit P/N 319112-On some occasions machine time does not permit the complete analysis of a memory drawer problem. If a condition on a given unit cannot be located on the tester and troubles still persist, we suggest that the drawer be returned to Poughkeepsie for a complete check. We will advise you the outcome of the analysis. Every effort should be made to maintain the spare memory units at good operating level.

6. Removing Memory Drawers-The D.C. Voltage should be turned off when removing a Memory Drawer. Reason for this being that the contacts in the memory drawer do not make and break in a sequential manner, thus the possibility exists of diode deterioration due to large back EMF's without benefit of clamp voltages. It has also been noted that the back plugs will blacken due to arcing from removal of drawers with D.C. ON. It is suggested that a spare memory drawer receptacle be in the spare parts stock. This is P/N 319126-Memory Unit Receptacle.

7. Method to detect bad clamp diodes in memory drawers-

   (a) Machine in regeneration
   (b) Connect meter to read +40 volt supply
   (c) Raise +40 volt supply to +44 volts
   (d) While watching meter, reset memory from 1's to 0's continuously
   (e) No deflection of meter should exist
   (f) If meter fluctuates (even a fraction of a volt) the memory drawers should be pulled until the trouble is located.
   (g) A deflection of as little as 3/4 volt has been known to be caused by one defective clamp diode in a memory drawer.

(over)

8. BIAS CHECKING UNBLANK VOLTAGE-

A new program ES #010 (PKS-012) which is a combination of ES-003 and ES-004 writes and checks "1's" and "0's" alternately. This is very useful when used while varying the unblank voltage (+40V). This test should operate correctly while varying the +40 volts from +37 to +44 volts.

The program will stop with the error address in MQ in the form of —R Add (error address). Contents of the accumulator register will show the drawer in error.

If this line is raised above 46 volts, the "catcher" thyratron will fire, necessitating a DC off.

9. RIPPLE CONTENT-Type 706 Voltages

+400 Volt Supply-The ripple on the output should be less than 15 millivolts peak-to-peak as measured with an oscilloscope.

-150 Volt Supply-The ripple should be less than 15 millivolts measured with an oscilloscope

+30 Volt Supply-The ripple should be less than 40 millivolts peak-to-peak

+270 Volt Supply-(Horizontal)-The ripple voltage should be less than 5 millivolts peak-to-peak

Bias Supply-The output ripple should be less than 50 millivolts peak-to-peak as measured with an oscilloscope.

Hi-Voltage Supply-Ripple should not exceed 0.5 volts peak-to-peak. CAUTION must be exercised when measuring the ripple voltage. The following procedure is recommended:

> Be sure the high voltage switch is OFF, then connect a 1.0 MFD or larger capacitor of the oil filled type rated for at least 2500 volts in series with a 1 meg ohm resistor. This combination is then connected across the output of the supply with the resistor connected to ground. Connect an oscilloscope across the resistor and observe ripple. Do not have the oscilloscope connected when the supply is turned ON or OFF. Turn on the supply and wait a sufficient length of time to insure the capacitor is fully charged.

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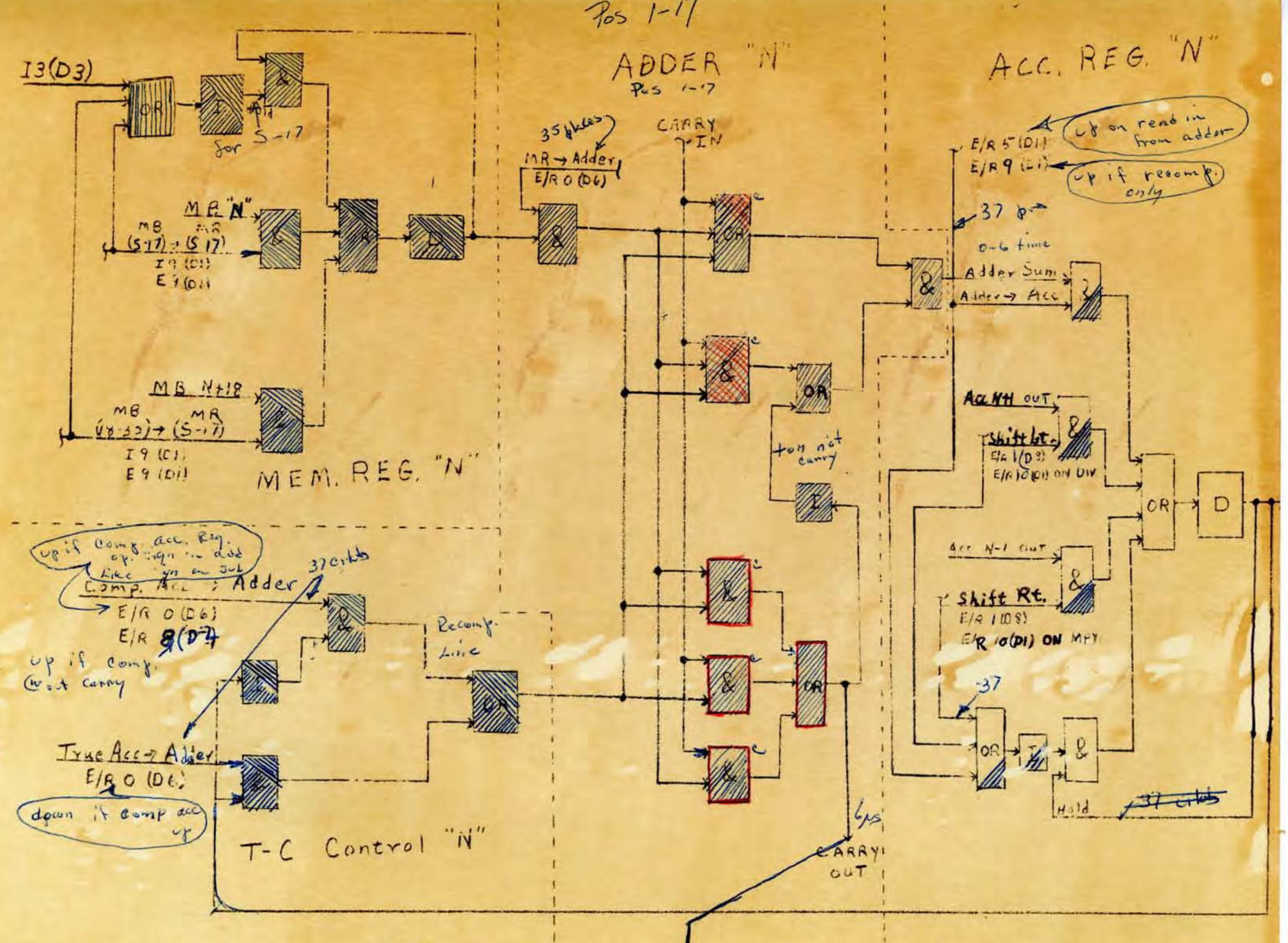
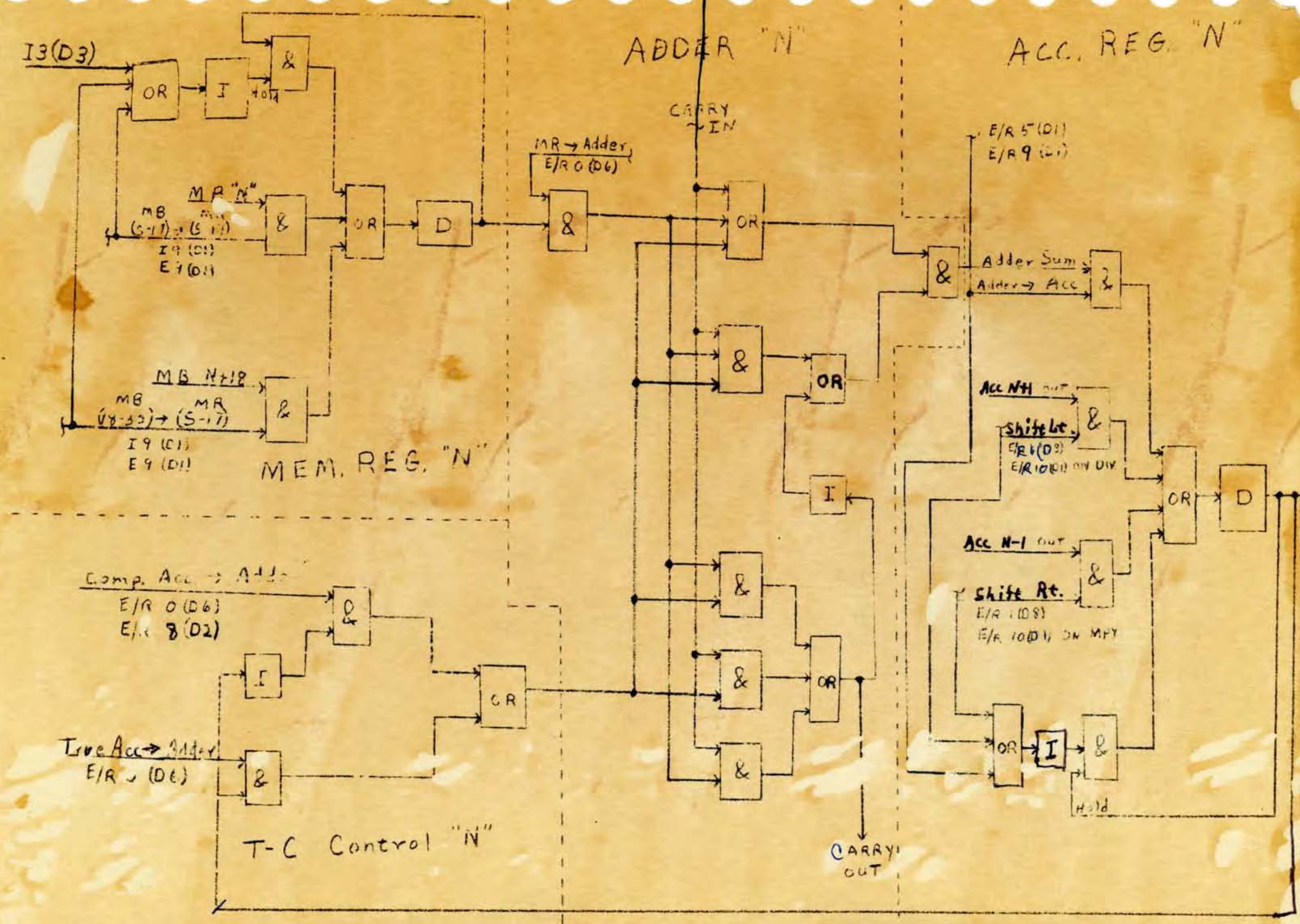
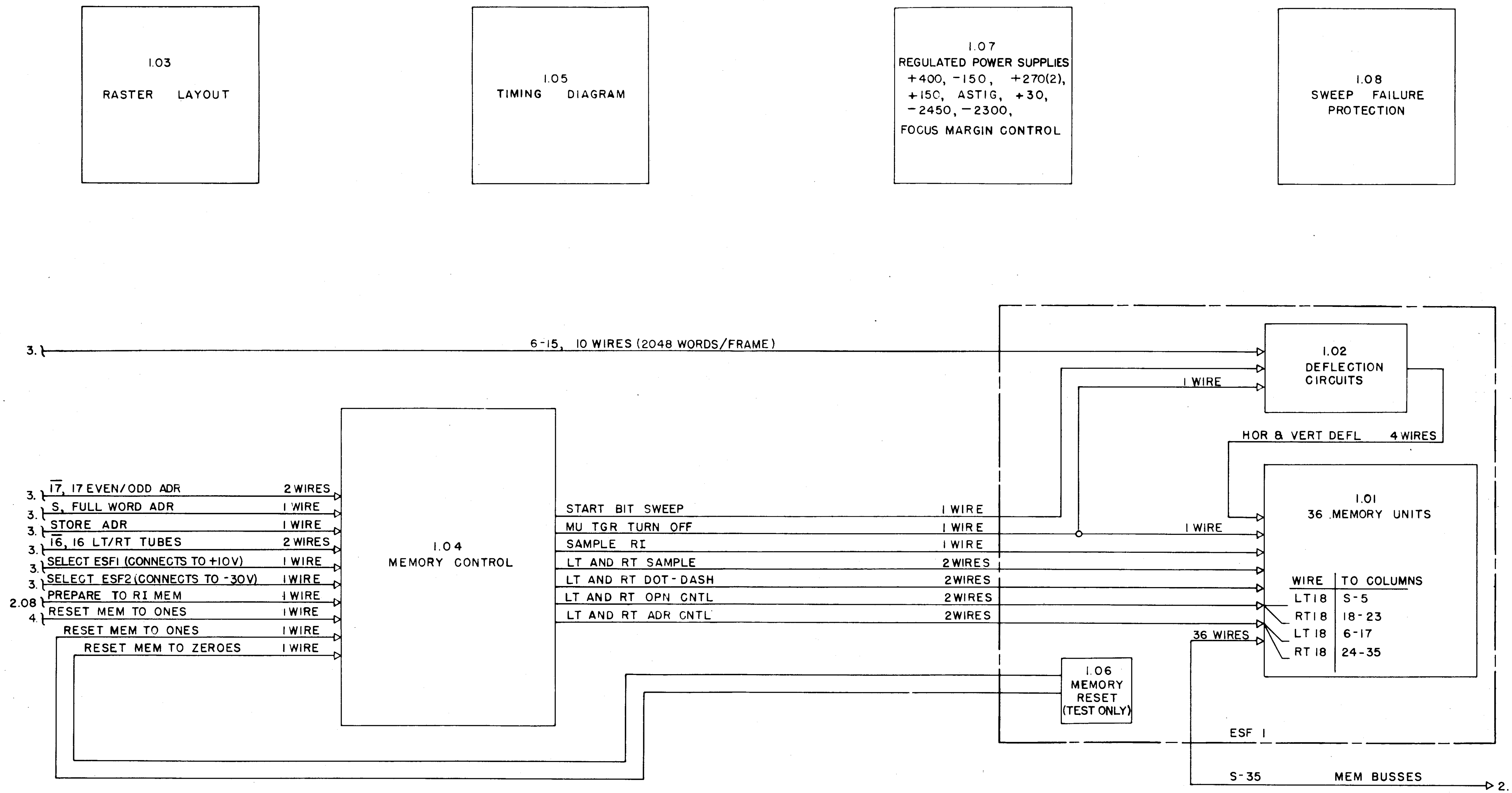


Pos 1-17
I3(D3)
OR
for S-17
MB "N"
MB (S-17) → MR (S-17)
I9 (D1)
E9 (D1)
MB N+18
MB → MR (S-17)
I9 (C1)
E9 (D1)
MEM. REG. "N"
ADDER "N"
Pos 1-17
35
MR → Adder
E/R 0 (D6)
CARRY IN
OR
&
turn not carry
CARRY OUT
6 μs
ACC. REG. "N"
E/R 5 (D1)
E/R 9
up on read in from adder
up if recomp. only
37
0-6 time
Adder Sum
Adder → Acc
Acc N+1 OUT
Shift Lt.
E/R 1 (D8)
E/R 10 (D1) ON DIV
OR
D
Acc N-1 OUT
Shift Rt.
E/R 1 (D8)
E/R 10 (D1) ON MPY
-37
Hold
~~37 ckts~~
up if comp. acc. reg. op. sign on add like sign on sub
Comp. Acc → Adder
37 ckts
E/R 0 (D6)
E/R 8 (D7)
up if comp. w/out carry
Recomp. Line
True Acc → Adder
E/R 0 (D6)
down if comp acc up
T-C Control "N"

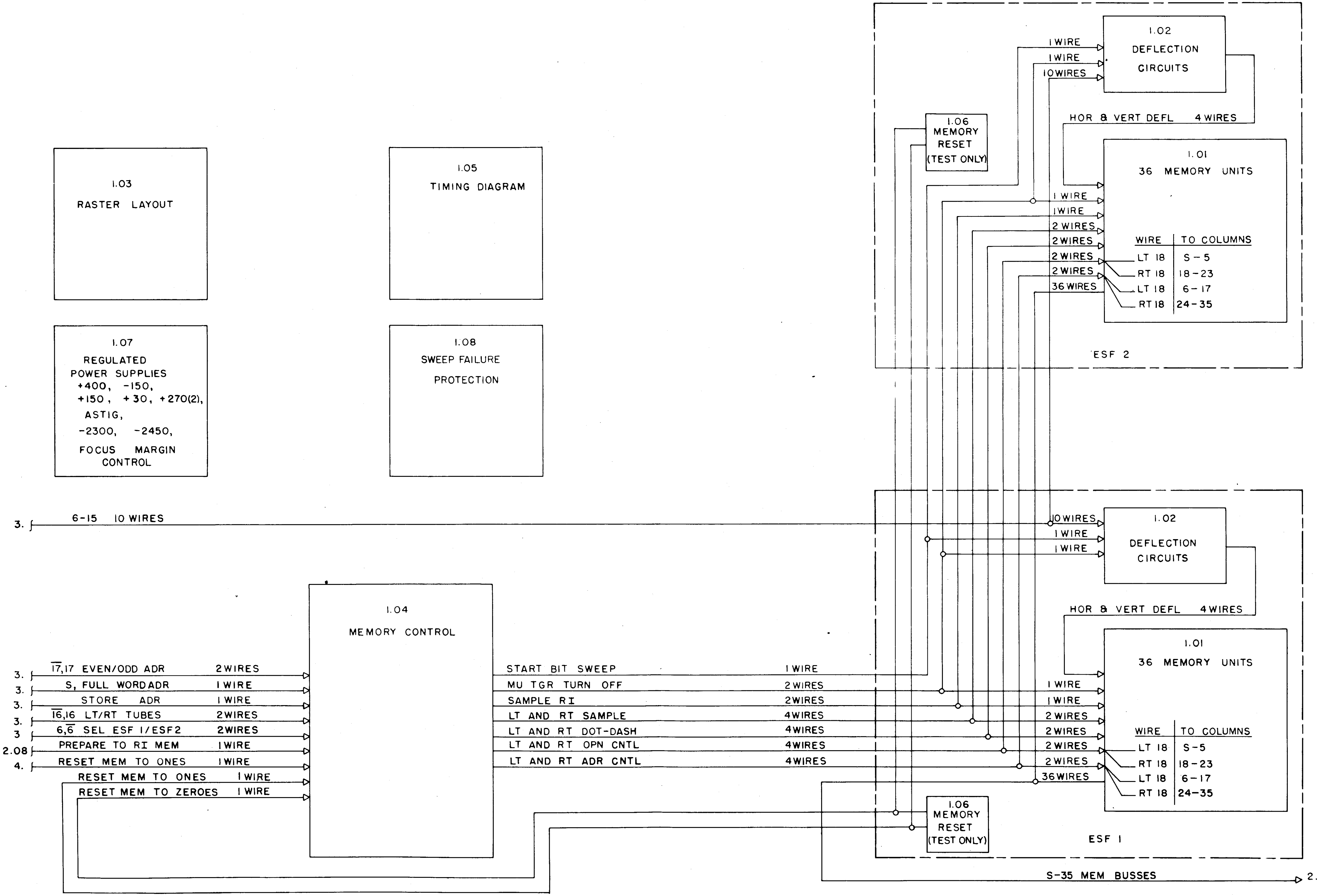

ADDER "N"
ACC. REG. "N"
MEM. REG. "N"
T-C Control "N"
I3(D3)
OR
I
Hold
&
MR "N"
MB (S-17) → (S-17)
I9 (D1)
E9 (D1)
MB N+18
MB (18-35) → MR (S-17)
I9 (D1)
E9 (D1)
D
MR → Adder
E/R 0 (D6)
CARRY IN
E/R 5 (D1)
E/R 9 (D1)
Adder Sum
Adder → Acc
Acc N+1 OUT
Shift Lt.
E/R 10 (D1) ON DIV
Acc N-1 OUT
Shift Rt.
E/R 10 (D1) ON MPY
Comp. Acc → Adder
E/R 0 (D6)
E/R 8 (D2)
True Acc → Adder
CARRY OUT

MEMORY (ONE FRAME)
2048 WORDS/FRAME



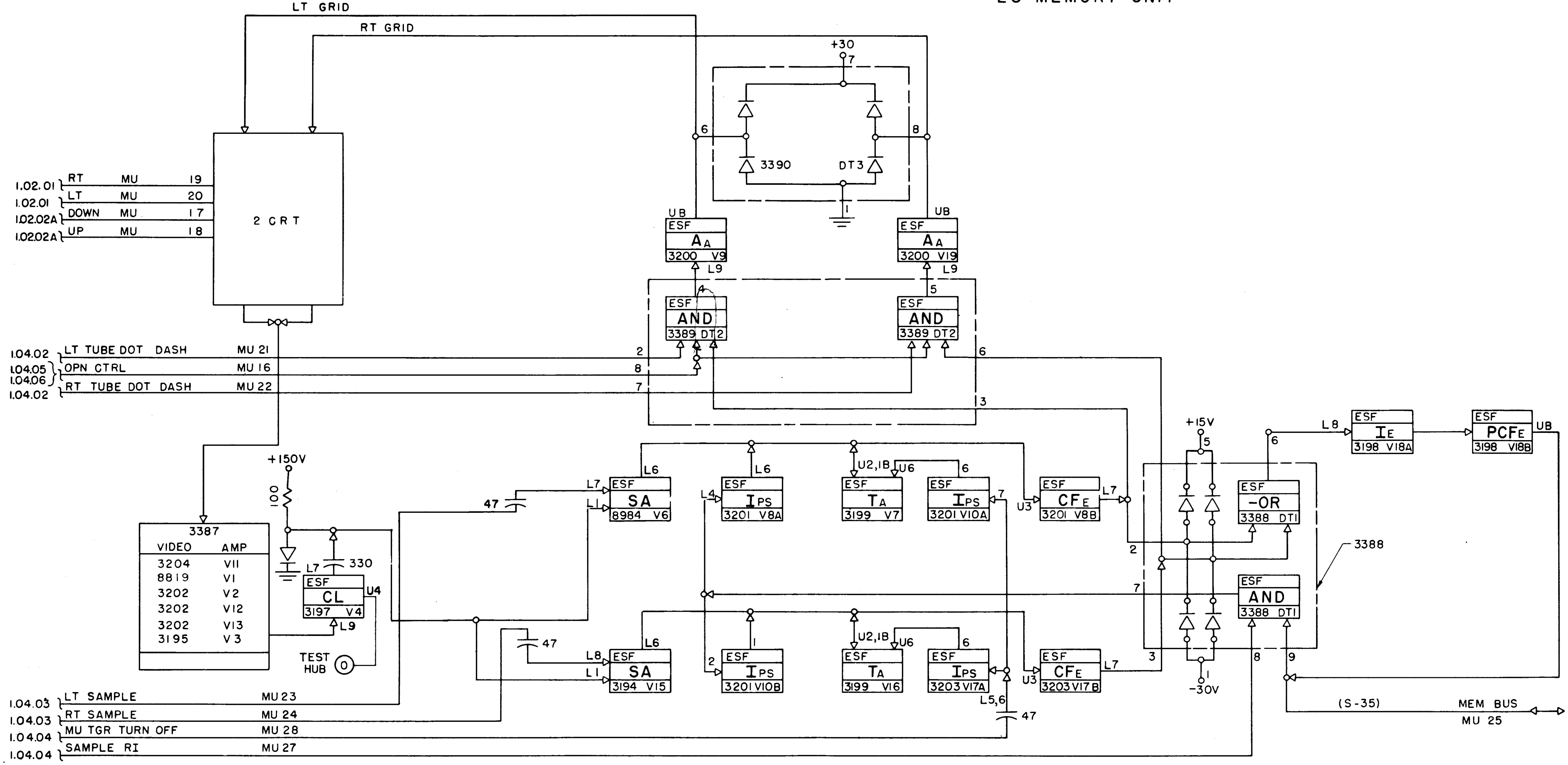
323018 EC 50403

MEMORY (TWO FRAMES)

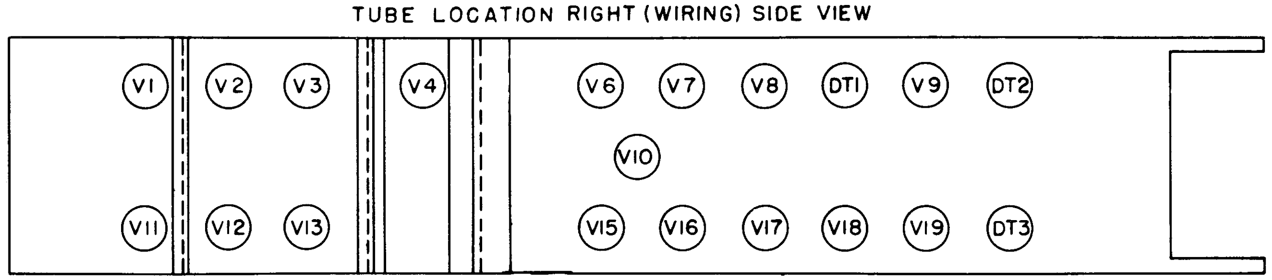


323018 EC 50403

ES MEMORY UNIT



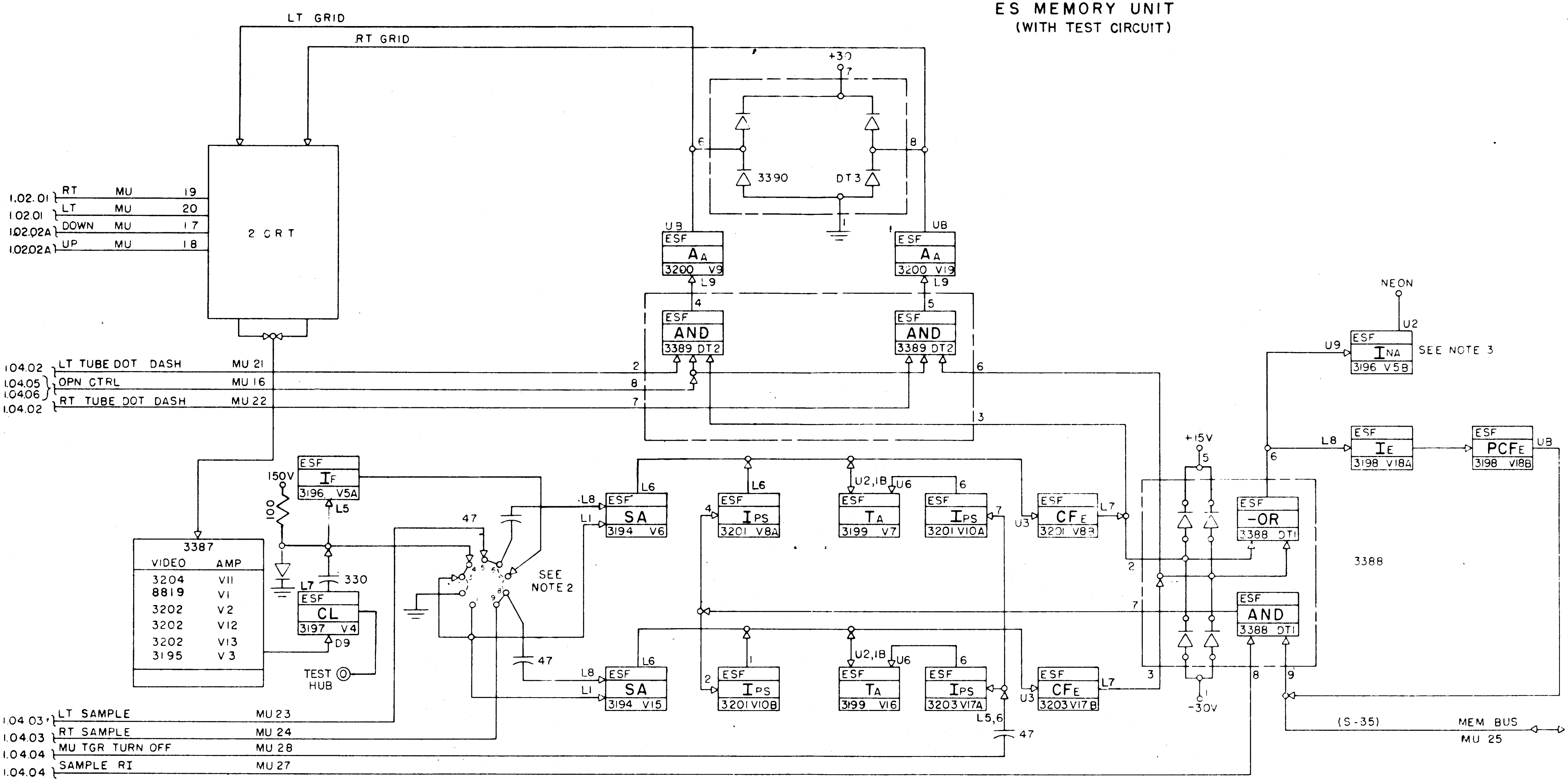
TUBE LOCATION RIGHT (WIRING) SIDE VIEW



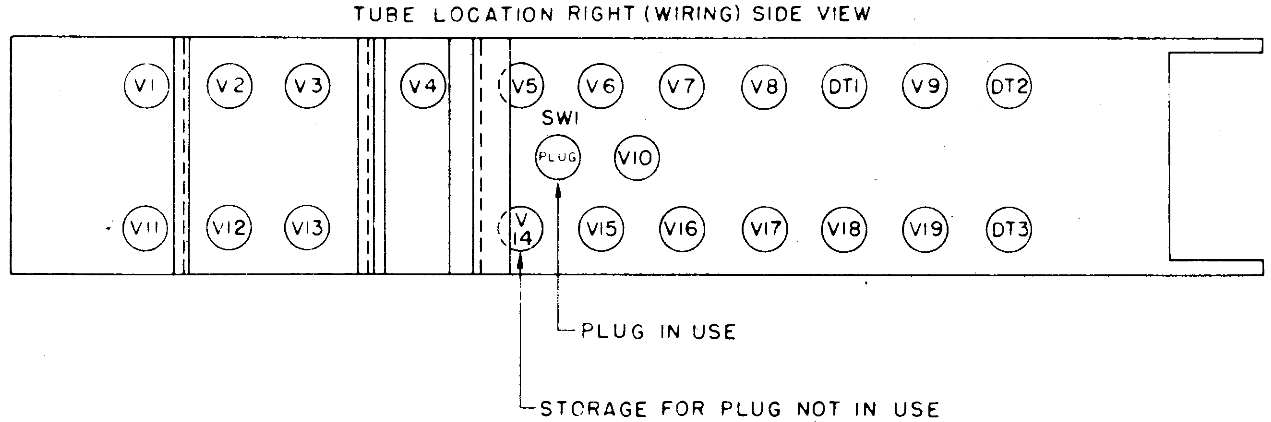
NOTES:

1. MU 30 MEANS "THIS LINE GOES TO PIN 30 ON MU PLUG FOR LAYOUT OF THIS PLUG SEE DWG 1.01.02"
2. JUNCTION NOTATION "U" MEANS UPPER "L" MEANS LOWER.

ES MEMORY UNIT
(WITH TEST CIRCUIT)

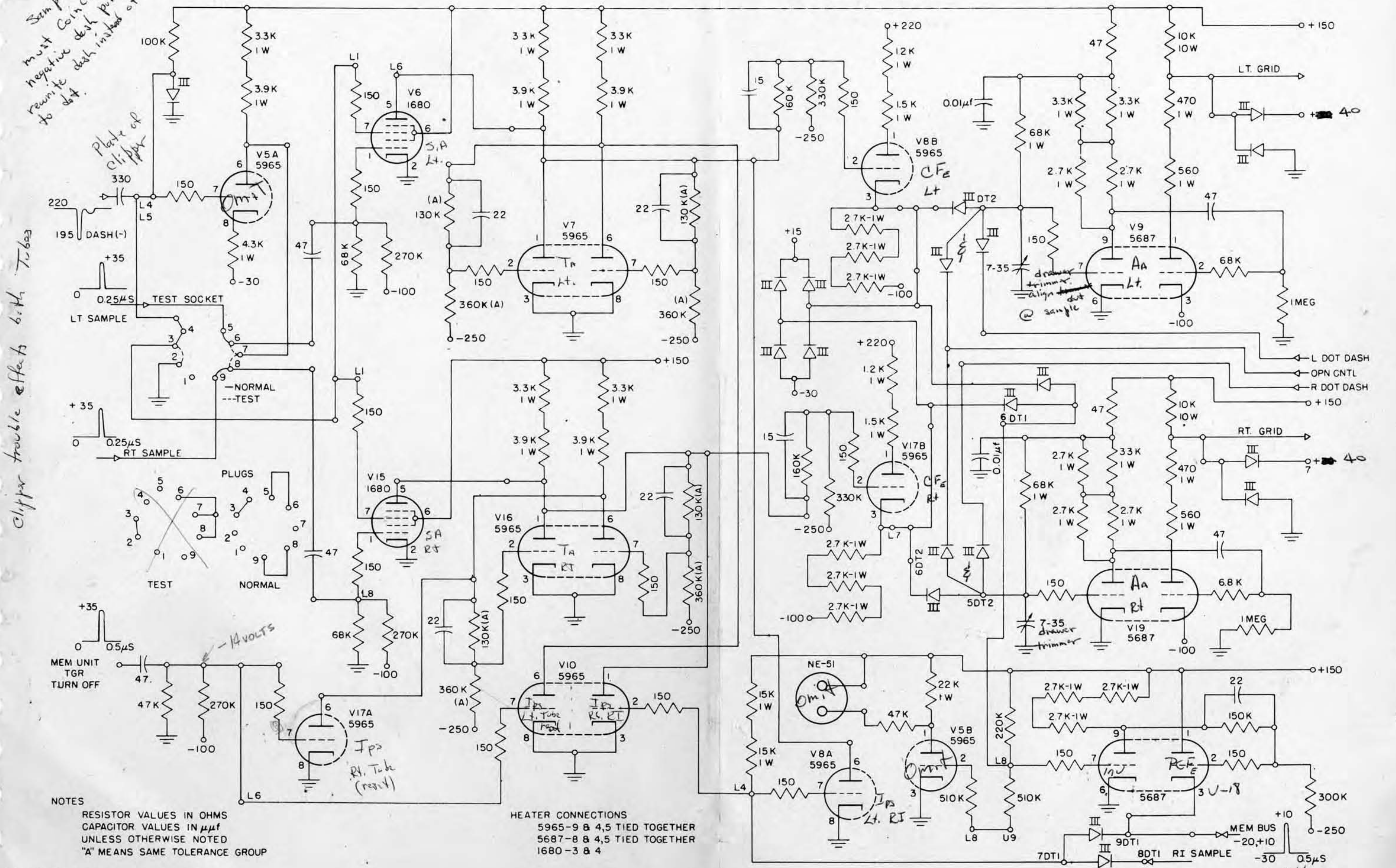


TUBE LOCATION RIGHT (WIRING) SIDE VIEW



NOTES:
1. MU 30 MEANS "THIS LINE GOES TO PIN 30 ON MU PLUG FOR LAYOUT OF THIS PLUG SEE DWG 1.01.02"
2. SOLID LINES INDICATE NORMAL OPERATION DASHED LINES INDICATE TEST OPERATION
3. TUBE 5 AND NEON ARE PLUGGED IN ONLY FOR NOISE TEST
4. JUNCTION NOTATION: "U" MEANS UPPER, "L" MEANS LOWER

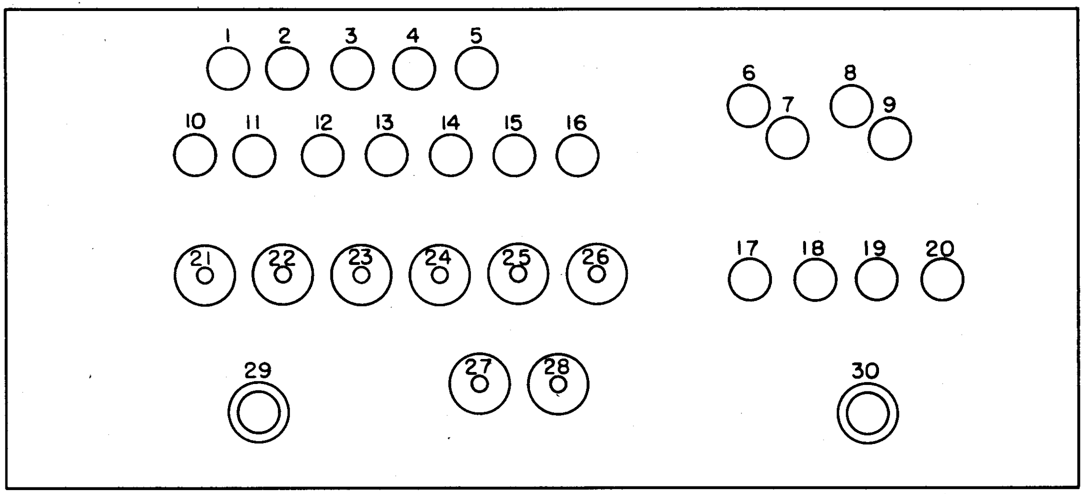
SCHEMATIC OF E S M UNBLANK CIRCUITS
(WITH TEST CIRCUIT)



NOTES
RESISTOR VALUES IN OHMS
CAPACITOR VALUES IN µµf
UNLESS OTHERWISE NOTED
"A" MEANS SAME TOLERANCE GROUP

HEATER CONNECTIONS
5965-9 & 4,5 TIED TOGETHER
5687-8 & 4,5 TIED TOGETHER
1680-3 & 4

MEMORY UNIT CONNECTOR

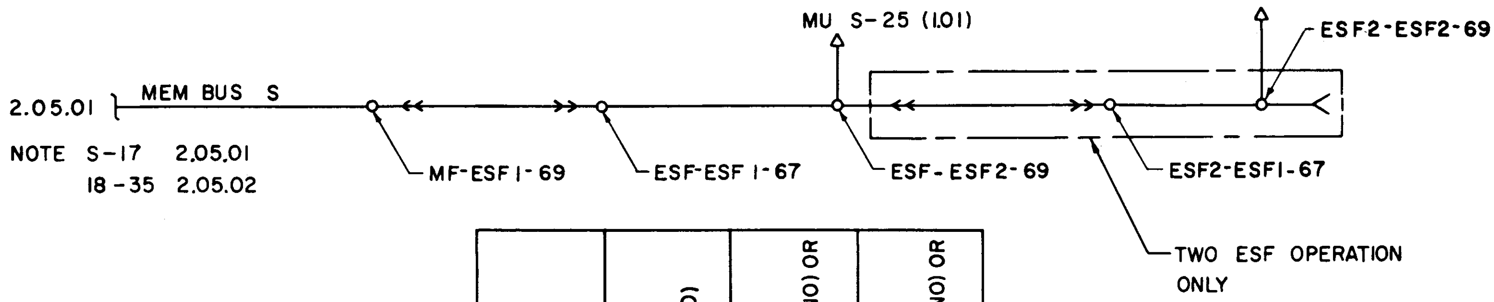


VIEW LOOKING AT REAR OF
MEM UNIT OR AT REAR OF FRAME

1	+220	16	CONTROL
2	+150	17	DOWN } DEFLECTION
3	−100	18	UP } DEFLECTION
4	−250	19	LEFT } DEFLECTION
5	ASTIG +200	20	RIGHT } DEFLECTION
6	HI-VOLTAGE-2300	21	LT DOT & DASH TL*
7	HI-VOLTAGE-2450	22	RT DOT & DASH TL
8	H V FILS } 6.3v −2300	23	LT SAMPLE TL
9	H V FILS } 6.3v −2300	24	RT SAMPLE TL
10	L V FILS	25	MEMORY IN/OUT COAX
11	L V FILS	26	SPARE
12	−30	27	SAMPLE RI TL
13	+30	28	RESET (MU TGR TURN OFF) TL
14	+15	29	GND LOCATING PIN
15	FOCUS	30	GND LOCATING PIN

* TL OPEN WIRE TRANSMISSION LINE

CABLE CONNECTIONS FOR MEMORY BUSSES

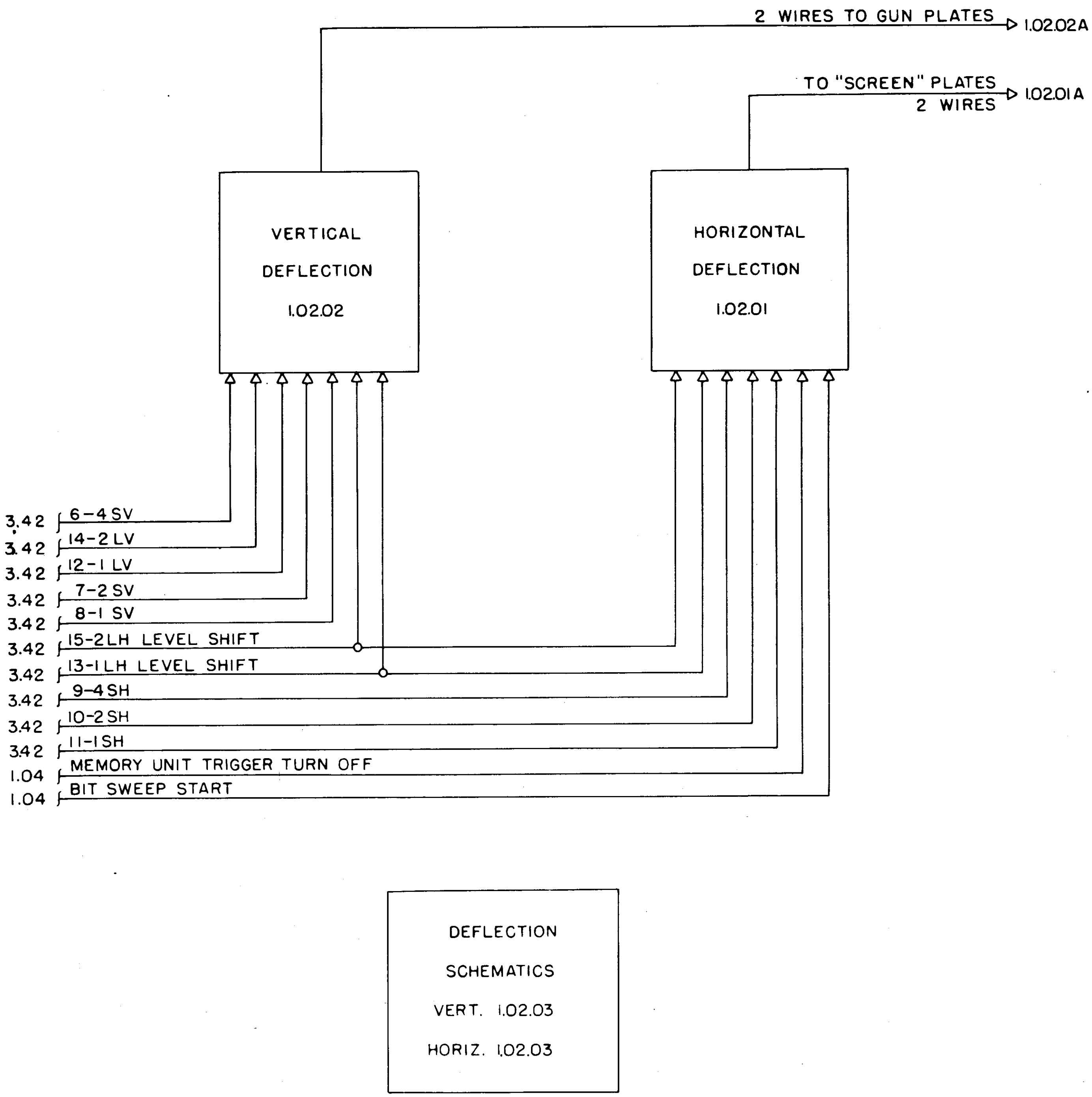


MEMORY BUS	CONNECTOR RECEPTACLE MF-ESF1 (PIN NO)	CONNECTOR RECEPTACLE ESF-ESF1 (PIN NO) OR ESF 2 - ESF 1	CONNECTOR RECEPTACLE ESF-ESF 2 (PIN NO) OR ESF 2 - ESF 2
S	69	67	69
1	85	83	85
2	101	99	101
3	117	115	117
4	133	131	133
5	149	147	149
6	78	76	78
7	94	92	94
8	110	108	110
9	126	124	126
10	142	140	142
11	119	113	119
12	67	69	67
13	83	85	83
14	99	101	99
15	115	117	115
16	131	133	131
17	147	149	147
18	76	78	76
19	92	94	92
20	108	110	108
21	124	126	124
22	140	142	140
23	128	122	128
24	65	71	65
25	81	87	81
26	97	103	97
27	113	119	113
28	129	135	129
29	144	138	144
30	74	80	74
31	90	96	90
32	106	112	106
33	122	128	122
34	138	144	138
35	135	129	135

S	12	24	
1	13	25	
2	14	26	
3	15	27	
4	16	28	
5	17	29	GATE
6	18	30	
7	19	31	
8	20	32	
9	21	33	
10	22	34	
11	23	35	

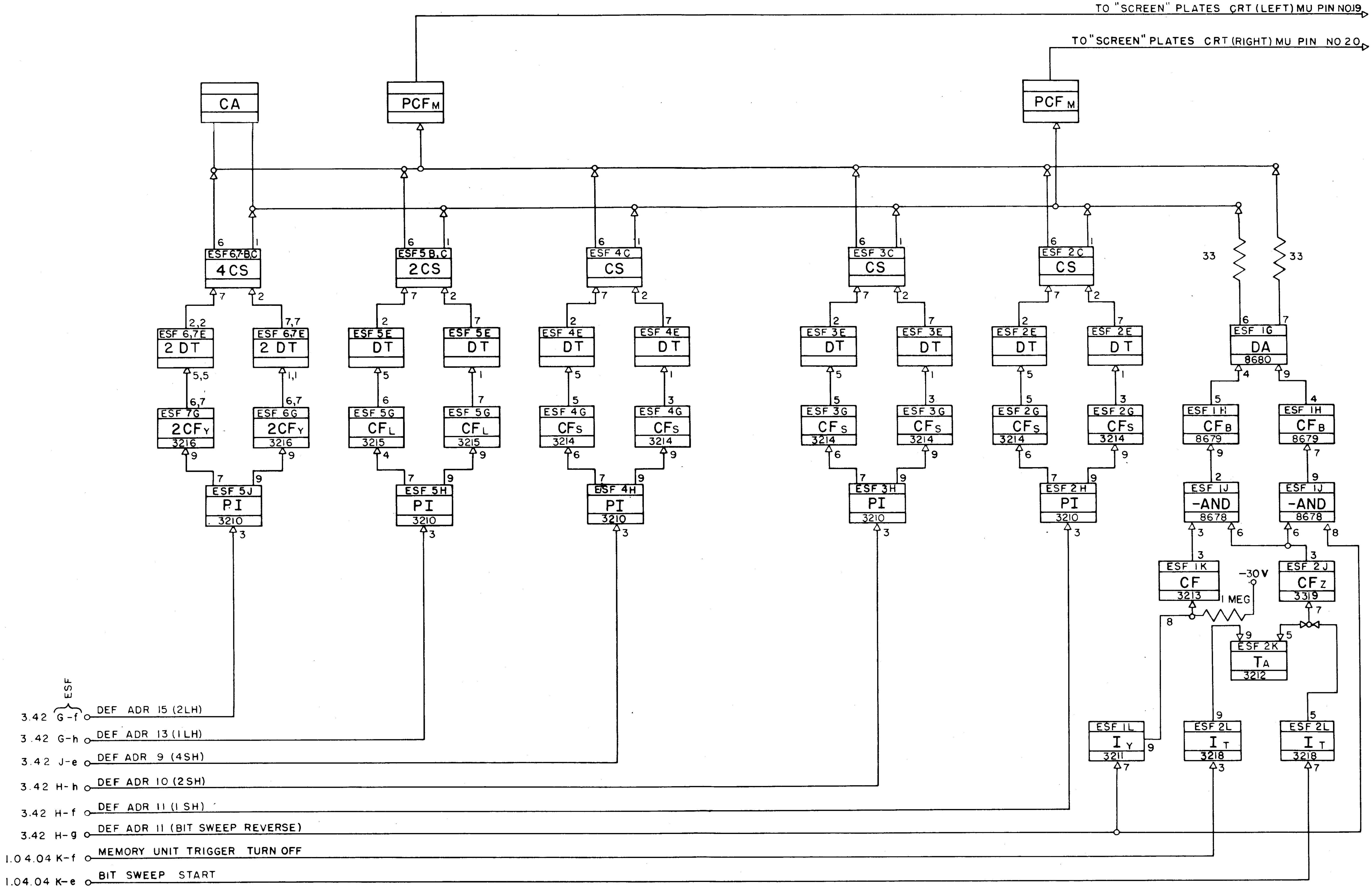
FRONT VIEW

DEFLECTION (BLOCK DIAGRAM)
2048 WORDS/FRAME ; 1 OR 2 FRAMES



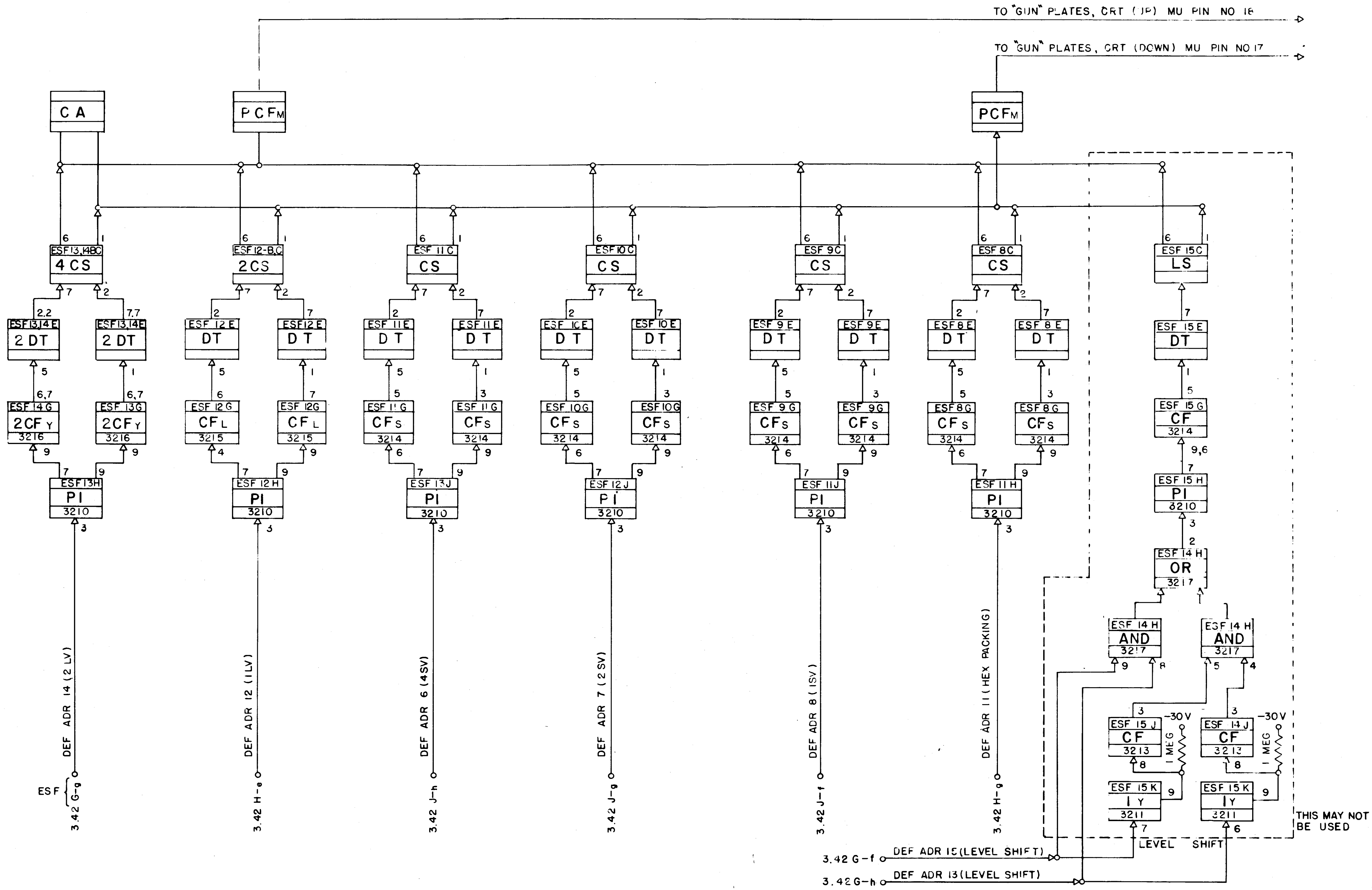
BLOCK DIAGRAM OF DEFLECTION CIRCUITS

(HORIZONTAL)
2048 WORDS/FRAME, 1 OR 2 FRAMES



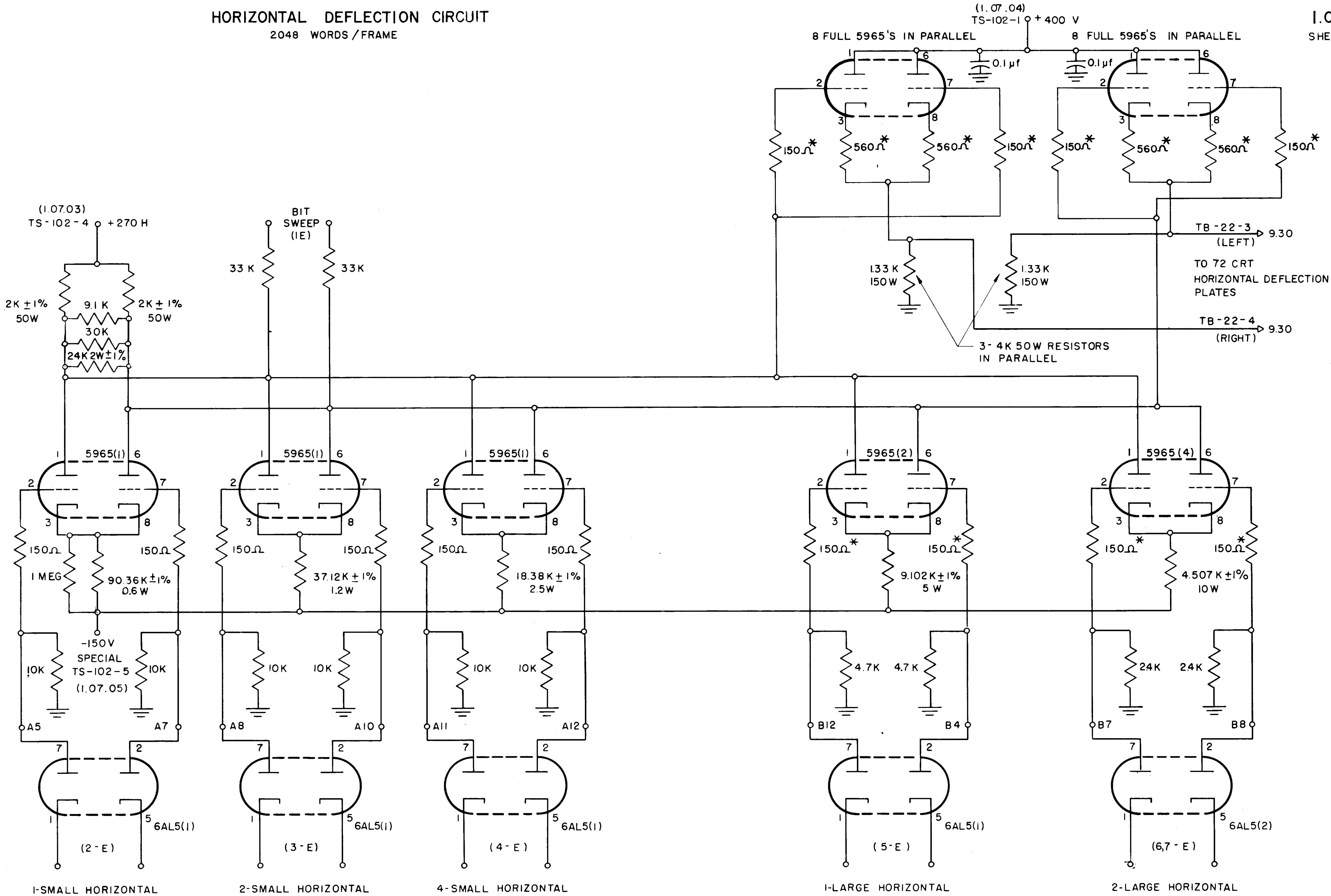
323025 EC 50403

BLOCK DIAGRAM OF DEFLECTION CIRCUITS
(VERTICAL)
2048 WORDS / FRAME, 1 OR 2 FRAMES



HORIZONTAL DEFLECTION CIRCUIT

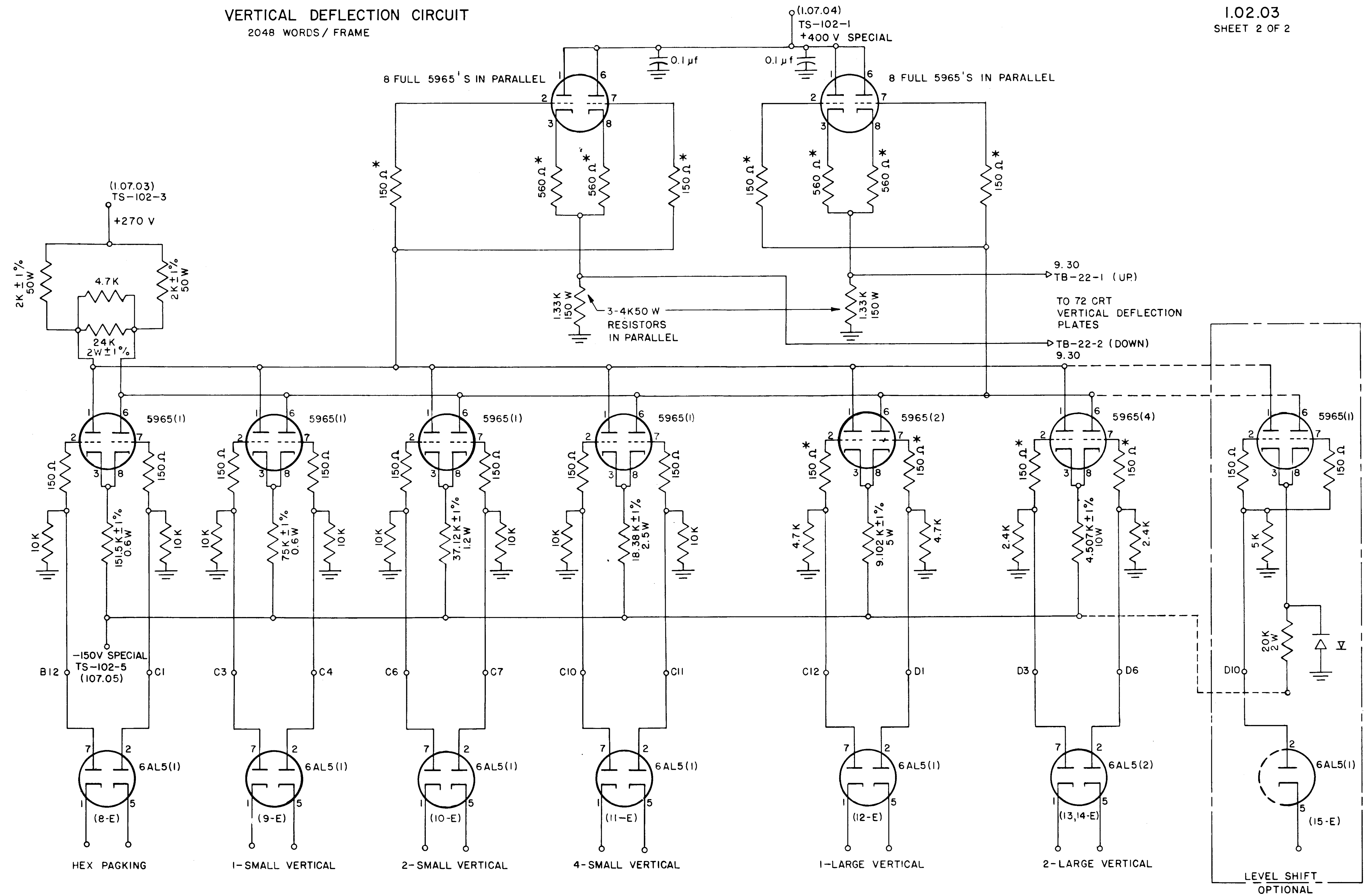
2048 WORDS / FRAME



* 1- SUCH COMPONENT FOR EACH TUBE HALF CONNECTED IN PARALLEL

323027 EC 50950

VERTICAL DEFLECTION CIRCUIT
2048 WORDS / FRAME



323027 EC 50950

*1-SUCH COMPONENT FOR EACH TUBE HALF CONNECTED IN PARRALLEL.

RASTER LAYOUT (DECIMAL)

2048 WORDS / FRAME (SEE NOTE X)

		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
0	0	0	64	128	192	256	320	384	448	16	80	144	208	272	336	400	464
1	1	512	576	640	704	768	832	896	960	528	592	656	720	784	848	912	976
2	2	1024	1088	1152	1216	1280	1344	1408	1472	1040	1104	1168	1232	1296	1360	1424	1488
3	3	1536	1600	1664	1728	1792	1856	1920	1984	1552	1616	1680	1744	1808	1872	1936	2000
4	4	2048	2112	2176	2240	2304	2368	2432	2496	2064	2128	2192	2256	2320	2384	2448	2512
5	5	2560	2624	2688	2752	2816	2880	2944	3008	2576	2640	2704	2768	2832	2896	2960	3024
6	6	3072	3136	3200	3264	3328	3392	3456	3520	3088	3152	3216	3280	3344	3408	3472	3536
7	7	3584	3648	3712	3776	3840	3904	3968	4032	3600	3664	3728	3792	3856	3920	3984	4048
8	0	32	96	160	224	288	352	416	480	48	112	176	240	304	368	432	496
9	1	544	608	672	736	800	864	928	992	560	624	688	752	816	880	944	1008
10	2	1056	1120	1184	1248	1312	1376	1440	1504	1072	1136	1200	1264	1328	1392	1456	1520
11	3	1568	1632	1696	1760	1824	1888	1952	2016	1584	1648	1712	1776	1840	1904	1968	2032
12	4	2080	2144	2208	2272	2336	2400	2464	2528	2096	2160	2224	2288	2352	2416	2480	2544
13	5	2592	2656	2720	2784	2848	2912	2976	3040	2608	2672	2736	2800	2864	2928	2992	3056
14	6	3104	3168	3232	3296	3360	3424	3488	3552	3120	3184	3248	3312	3376	3440	3504	3568
15	7	3616	3680	3744	3808	3872	3936	4000	4064	3632	3696	3760	3824	3888	3952	4016	4080
16	0	8	72	136	200	264	328	392	456	24	88	152	216	280	344	408	472
17	1	520	584	648	712	776	840	904	968	536	600	664	728	792	856	920	984
18	2	1032	1096	1160	1224	1288	1352	1416	1480	1048	1112	1176	1240	1304	1368	1432	1496
19	3	1544	1608	1672	1736	1800	1864	1928	1992	1560	1624	1688	1752	1816	1880	1944	2008
20	4	2056	2120	2184	2248	2312	2376	2440	2504	2072	2136	2200	2264	2328	2392	2456	2520
21	5	2568	2632	2696	2760	2824	2888	2952	3016	2584	2648	2712	2776	2840	2904	2968	3032
22	6	3080	3144	3208	3272	3336	3400	3464	3528	3096	3160	3224	3288	3352	3416	3480	3544
23	7	3592	3656	3720	3784	3848	3912	3976	4040	3608	3672	3736	3800	3864	3928	3992	4056
24	0	40	104	168	232	296	360	424	488	56	120	184	248	312	376	440	504
25	1	552	616	680	744	808	872	936	1000	568	632	696	760	824	888	952	1016
26	2	1064	1128	1192	1256	1320	1384	1448	1512	1080	1144	1208	1272	1336	1400	1464	1528
27	3	1576	1640	1704	1768	1832	1896	1960	2024	1592	1656	1720	1784	1848	1912	1976	2040
28	4	2088	2152	2216	2280	2344	2408	2472	2536	2104	2168	2232	2296	2360	2424	2488	2552
29	5	2600	2664	2728	2792	2856	2920	2984	3048	2616	2680	2744	2808	2872	2936	3000	3064
30	6	3112	3176	3240	3304	3368	3432	3496	3560	3128	3192	3256	3320	3384	3448	3512	3576
31	7	3624	3688	3752	3816	3880	3944	4008	4072	3640	3704	3768	3832	3896	3960	4024	4088

		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
		0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
0	0	4	68	132	196	260	324	388	452	20	84	148	212	276	340	404	468
1	1	516	580	644	708	772	836	900	964	532	596	660	724	788	852	916	980
2	2	1028	1092	1156	1220	1284	1348	1412	1476	1044	1108	1172	1236	1300	1364	1428	1492
3	3	1540	1604	1668	1732	1796	1860	1924	1988	1556	1620	1684	1748	1812	1876	1940	2004
4	4	2052	2116	2180	2244	2308	2372	2436	2500	2068	2132	2196	2260	2324	2388	2452	2516
5	5	2564	2628	2692	2756	2820	2884	2948	3012	2580	2644	2708	2772	2836	2900	2964	3028
6	6	3076	3140	3204	3268	3332	3396	3460	3524	3092	3156	3220	3284	3348	3412	3476	3540
7	7	3588	3652	3716	3780	3844	3908	3972	4036	3604	3668	3732	3796	3860	3924	3988	4052
8	0	36	100	164	228	292	356	420	484	52	116	180	244	308	372	436	500
9	1	548	612	676	740	804	868	932	996	564	628	692	756	820	884	948	1012
10	2	1060	1124	1188	1252	1316	1380	1444	1508	1076	1140	1204	1268	1332	1396	1460	1524
11	3	1572	1636	1700	1764	1828	1892	1956	2020	1588	1652	1716	1780	1844	1908	1972	2036
12	4	2084	2148	2212	2276	2340	2404	2468	2532	2100	2164	2228	2292	2356	2420	2484	2548
13	5	2596	2660	2724	2788	2852	2916	2980	3044	2612	2676	2740	2804	2868	2932	2996	3060
14	6	3108	3172	3236	3300	3364	3428	3492	3556	3124	3188	3252	3316	3380	3444	3508	3572
15	7	3620	3684	3748	3812	3876	3940	4004	4068	3636	3700	3764	3828	3892	3956	4020	4084
16	0	12	76	140	204	268	332	396	460	28	92	156	220	284	348	412	476
17	1	524	588	652	716	780	844	908	972	540	604	668	732	746	860	924	988
18	2	1036	1100	1164	1228	1292	1356	1420	1484	1052	1116	1180	1244	1308	1372	1436	1500
19	3	1548	1612	1676	1740	1804	1868	1932	1996	1564	1628	1692	1756	1820	1884	1948	2012
20	4	2060	2124	2188	2252	2316	2380	2444	2508	2076	2140	2204	2268	2332	2396	2460	2524
21	5	2572	2636	2700	2764	2828	2892	2956	3020	2588	2652	2716	2780	2844	2908	2972	3036
22	6	3084	3148	3212	3276	3340	3404	3468	3532	3100	3164	3228	3292	3356	3420	3484	3548
23	7	3596	3660	3724	3788	3852	3916	3980	4044	3612	3676	3740	3804	3868	3932	3996	4060
24	0	44	108	172	236	300	364	428	492	60	124	188	252	316	380	444	508
25	1	556	620	684	748	812	876	940	1004	572	636	700	764	828	892	956	1020
26	2	1068	1132	1196	1260	1324	1388	1452	1516	1084	1148	1212	1276	1340	1404	1468	1532
27	3	1580	1644	1708	1772	1836	1900	1964	2028	1596	1660	1724	1788	1852	1916	1980	2044
28	4	2092	2156	2220	2284	2348	2412	2476	2540	2108	2172	2236	2300	2364	2428	2492	2556
29	5	2604	2668	2732	2796	2860	2924	2988	3052	2620	2684	2748	2812	2876	2940	3004	3068
30	6	3116	3180	3244	3308	3372	3436	3500	3564	3132	3196	3260	3324	3388	3452	3516	3580
31	7	3628	3692	3756	3820	3884	3948	4012	4076	3644	3708	3772	3836	3900	3964	4028	4092

NOTES

X THIS LAYOUT IS FOR EVEN ADDRESSES, LT TUBES
FOR OTHER ADDRESSES, ADD TO ABOVE ADDRESSES:
(1) FOR ODD ADR, LT TUBES
(2) FOR EVEN ADR, RT TUBES
(3) FOR ODD ADR, RT TUBES

RASTER LAYOUT (OCTONARY)

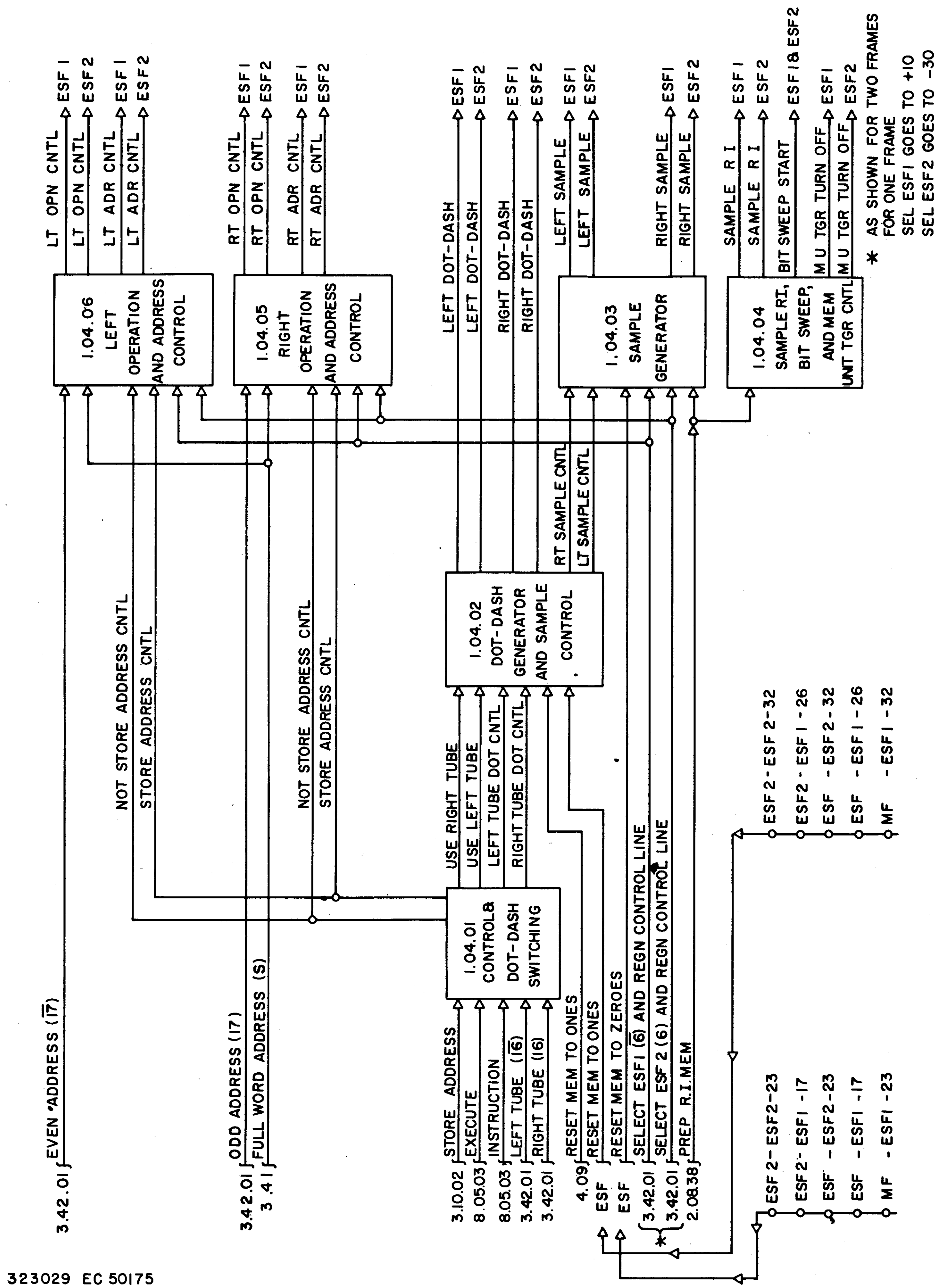
2048 WORDS / FRAME (SEE NOTE X)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
0 0	0	100	200	300	400	500	600	700	20	120	220	320	420	520	620	720
1 1	1000	1100	1200	1300	1400	1500	1600	1700	1020	1120	1220	1320	1420	1520	1620	1720
2 2	2000	2100	2200	2300	2400	2500	2600	2700	2020	2120	2220	2320	2420	2520	2620	2720
3 3	3000	3100	3200	3300	3400	3500	3600	3700	3020	3120	3220	3320	3420	3520	3620	3720
4 4	4000	4100	4200	4300	4400	4500	4600	4700	4020	4120	4220	4320	4420	4520	4620	4720
5 5	5000	5100	5200	5300	5400	5500	5600	5700	5020	5120	5220	5320	5420	5520	5620	5720
6 6	6000	6100	6200	6300	6400	6500	6600	6700	6020	6120	6220	6320	6420	6520	6620	6720
7 7	7000	7100	7200	7300	7400	7500	7600	7700	7020	7120	7220	7320	7420	7520	7620	7720
8 0	40	140	240	340	440	540	640	740	60	160	260	360	460	560	660	760
9 1	1040	1140	1240	1340	1440	1540	1640	1740	1060	1160	1260	1360	1460	1560	1660	1760
10 2	2040	2140	2240	2340	2440	2540	2640	2740	2060	2160	2260	2360	2460	2560	2660	2760
11 3	3040	3140	3240	3340	3440	3540	3640	3740	3060	3160	3260	3360	3460	3560	3660	3760
12 4	4040	4140	4240	4340	4440	4540	4640	4740	4060	4160	4260	4360	4460	4560	4660	4760
13 5	5040	5140	5240	5340	5440	5540	5640	5740	5060	5160	5260	5360	5460	5560	5660	5760
14 6	6040	6140	6240	6340	6440	6540	6640	6740	6060	6160	6260	6360	6460	6560	6660	6760
15 7	7040	7140	7240	7340	7440	7540	7640	7740	7060	7160	7260	7360	7460	7560	7660	7760
16 0	10	110	210	310	410	510	610	710	30	130	230	330	430	530	630	730
17 1	1010	1110	1210	1310	1410	1510	1610	1710	1030	1130	1230	1330	1430	1530	1630	1730
18 2	2010	2110	2210	2310	2410	2510	2610	2710	2030	2130	2230	2330	2430	2530	2630	2730
19 3	3010	3110	3210	3310	3410	3510	3610	3710	3030	3130	3230	3330	3430	3530	3630	3730
20 4	4010	4110	4210	4310	4410	4510	4610	4710	4030	4130	4230	4330	4430	4530	4630	4730
21 5	5010	5110	5210	5310	5410	5510	5610	5710	5030	5130	5230	5330	5430	5530	5630	5730
22 6	6010	6110	6210	6310	6410	6510	6610	6710	6030	6130	6230	6330	6430	6530	6630	6730
23 7	7010	7110	7210	7310	7410	7510	7610	7710	7030	7130	7230	7330	7430	7530	7630	7730
24 0	50	150	250	350	450	550	650	750	70	170	270	370	470	570	670	770
25 1	1050	1150	1250	1350	1450	1550	1650	1750	1070	1170	1270	1370	1470	1570	1670	1770
26 2	2050	2150	2250	2350	2450	2550	2650	2750	2070	2170	2270	2370	2470	2570	2670	2770
27 3	3050	3150	3250	3350	3450	3550	3650	3750	3070	3170	3270	3370	3470	3570	3670	3770
28 4	4050	4150	4250	4350	4450	4550	4650	4750	4070	4170	4270	4370	4470	4570	4670	4770
29 5	5050	5150	5250	5350	5450	5550	5650	5750	5070	5170	5270	5370	5470	5570	5670	5770
30 6	6050	6150	6250	6350	6450	6550	6650	6750	6070	6170	6270	6370	6470	6570	6670	6770
31 7	7050	7150	7250	7350	7450	7550	7650	7750	7070	7170	7270	7370	7470	7570	7670	7770

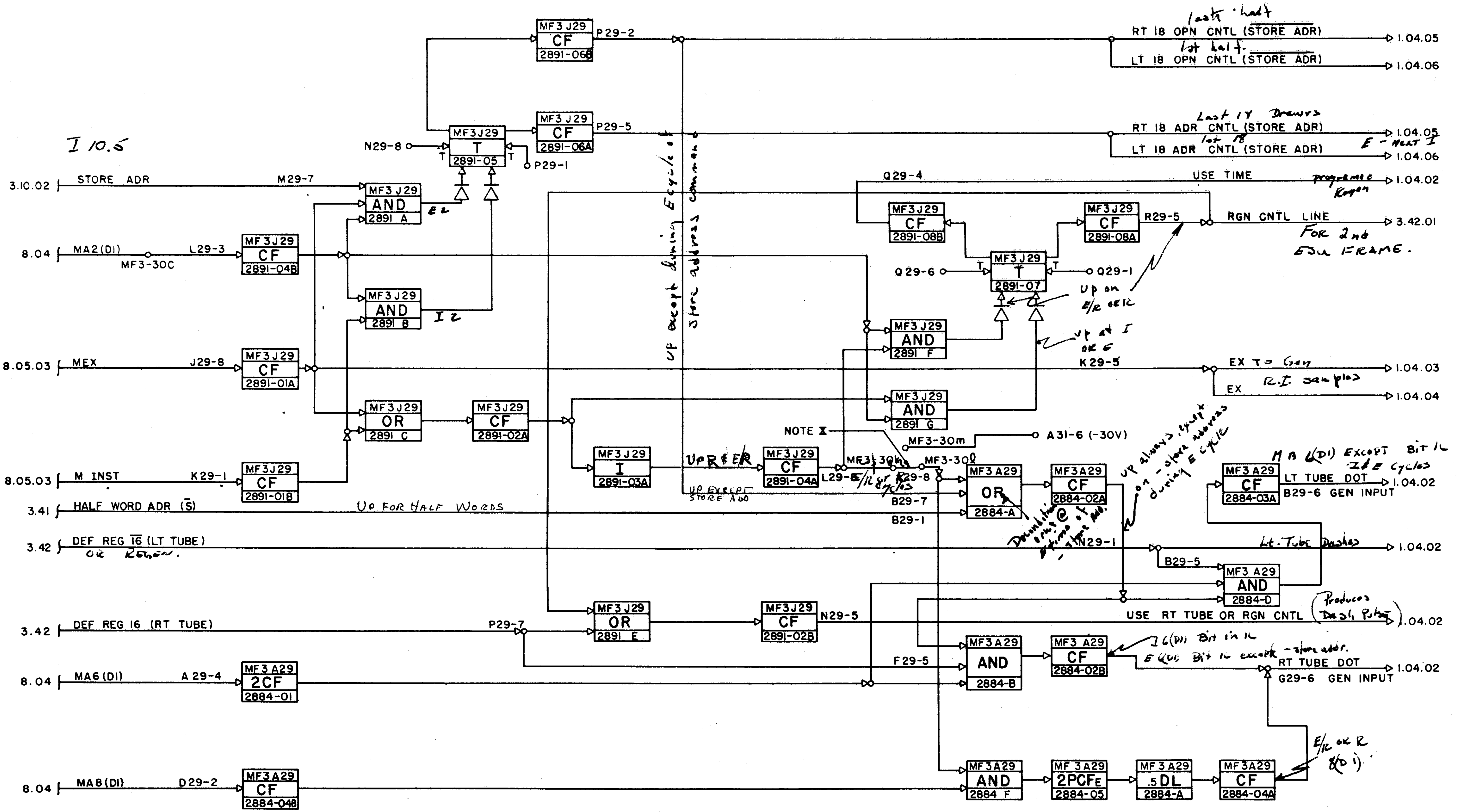
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
0 0	4	104	204	304	404	504	604	704	24	124	224	324	424	524	624	724
1 1	1004	1104	1204	1304	1404	1504	1604	1704	1024	1124	1224	1324	1424	1524	1624	1724
2 2	2004	2104	2204	2304	2404	2504	2604	2704	2024	2124	2224	2324	2424	2524	2624	2724
3 3	3004	3104	3204	3304	3404	3504	3604	3704	3024	3124	3224	3324	3424	3524	3624	3724
4 4	4004	4104	4204	4304	4404	4504	4604	4704	4024	4124	4224	4324	4424	4524	4624	4724
5 5	5004	5104	5204	5304	5404	5504	5604	5704	5024	5124	5224	5324	5424	5524	5624	5724
6 6	6004	6104	6204	6304	6404	6504	6604	6704	6024	6124	6224	6324	6424	6524	6624	6724
7 7	7004	7104	7204	7304	7404	7504	7604	7704	7024	7124	7224	7324	7424	7524	7624	7724
8 0	44	144	244	344	444	544	644	744	64	164	264	364	464	564	664	764
9 1	1044	1144	1244	1344	1444	1544	1644	1744	1064	1164	1264	1364	1464	1564	1664	1764
10 2	2044	2144	2244	2344	2444	2544	2644	2744	2064	2164	2264	2364	2464	2564	2664	2764
11 3	3044	3144	3244	3344	3444	3544	3644	3744	3064	3164	3264	3364	3464	3564	3664	3764
12 4	4044	4144	4244	4344	4444	4544	4644	4744	4064	4164	4264	4364	4464	4564	4664	4764
13 5	5044	5144	5244	5344	5444	5544	5644	5744	5064	5164	5264	5364	5464	5564	5664	5764
14 6	6044	6144	6244	6344	6444	6544	6644	6744	6064	6164	6264	6364	6464	6564	6664	6764
15 7	7044	7144	7244	7344	7444	7544	7644	7744	7064	7164	7264	7364	7464	7564	7664	7764
16 0	14	114	214	314	414	514	614	714	34	134	234	334	434	534	634	734
17 1	1014	1114	1214	1314	1414	1514	1614	1714	1034	1134	1234	1334	1434	1534	1634	1734
18 2	2014	2114	2214	2314	2414	2514	2614	2714	2034	2134	2234	2334	2434	2534	2634	2734
19 3	3014	3114	3214	3314	3414	3514	3614	3714	3034	3134	3234	3334	3434	3534	3634	3734
20 4	4014	4114	4214	4314	4414	4514	4614	4714	4034	4134	4234	4334	4434	4534	4634	4734
21 5	5014	5114	5214	5314	5414	5514	5614	5714	5034	5134	5234	5334	5434	5534	5634	5734
22 6	6014	6114	6214	6314	6414	6514	6614	6714	6034	6134	6234	6334	6434	6534	6634	6734
23 7	7014	7114	7214	7314	7414	7514	7614	7714	7034	7134	7234	7334	7434	7534	7634	7734
24 0	54	154	254	354	454	554	654	754	74	174	274	374	474	574	674	774
25 1	1054	1154	1254	1354	1454	1554	1654	1754	1074	1174	1274	1374	1474	1574	1674	1774
26 2	2054	2154	2254	2354	2454	2554	2654	2754	2074	2174	2274	2374	2474	2574	2674	2774
27 3	3054	3154	3254	3354	3454	3554	3654	3754	3074	3174	3274	3374	3474	3574	3674	3774
28 4	4054	4154	4254	4354	4454	4554	4654	4754	4074	4174	4274	4374	4474	4574	4674	4774
29 5	5054	5154	5254	5354	5454	5554	5654	5754	5074	5174	5274	5374	5474	5574	5674	5774
30 6	6050	6154	6254	6354	6454	6554	6654	6754	6074	6174	6274	6374	6474	6574	6674	6774
31 7	7054	7154	7254	7354	7454	7554	7654	7754	7074	7174	7274	7374	7474	7574	7674	7774

NOTES

X THIS LAYOUT IS FOR EVEN ADDRESSES, L T TUBES
FOR OTHER ADDRESSES, ADD TO ABOVE ADDRESSES
(1) FOR ODD ADR, LT TUBES
(2) FOR EVEN ADR, RT TUBES
(3) FOR ODD ADR, RT TUBES

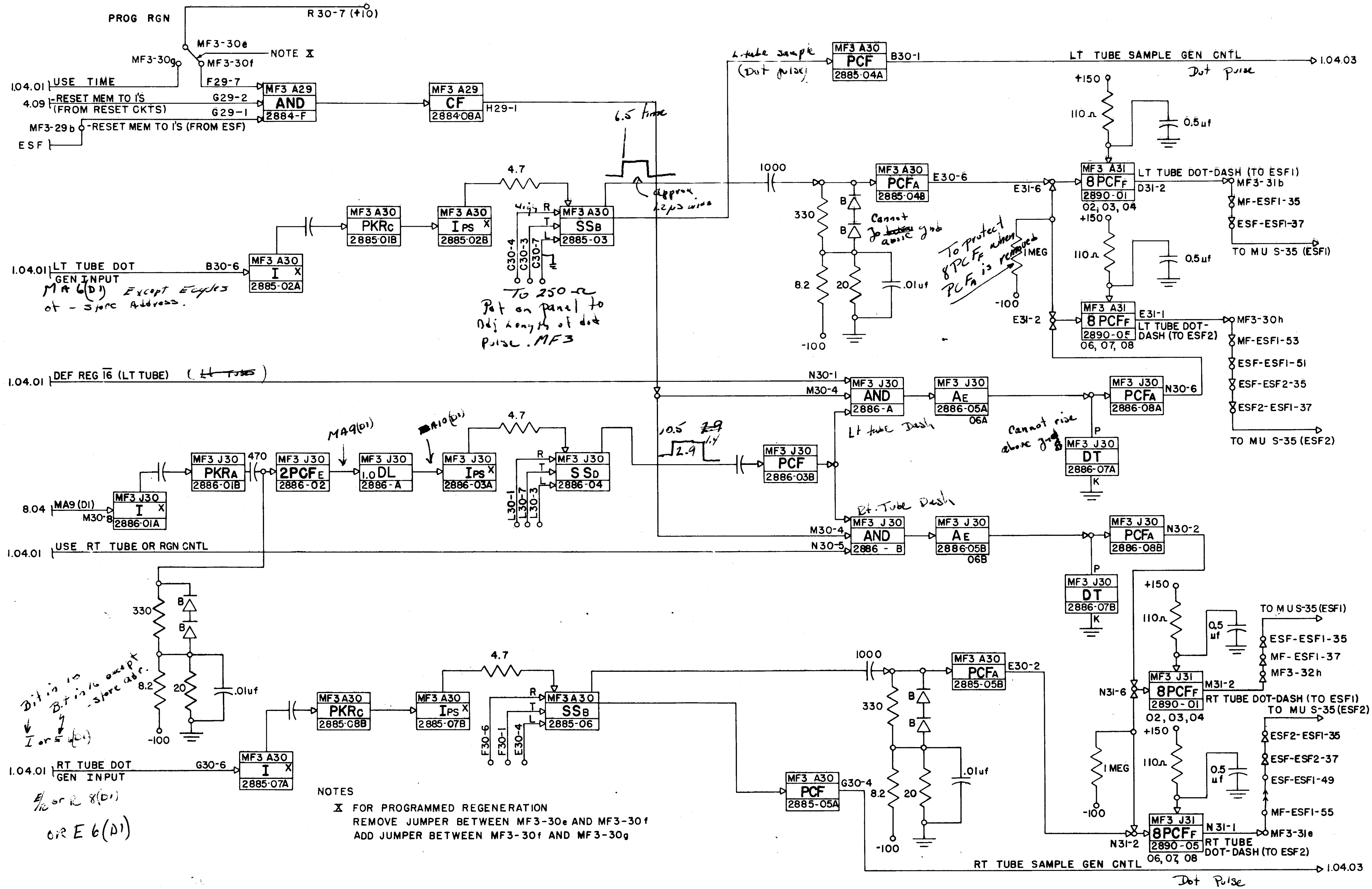


323029 EC 50175



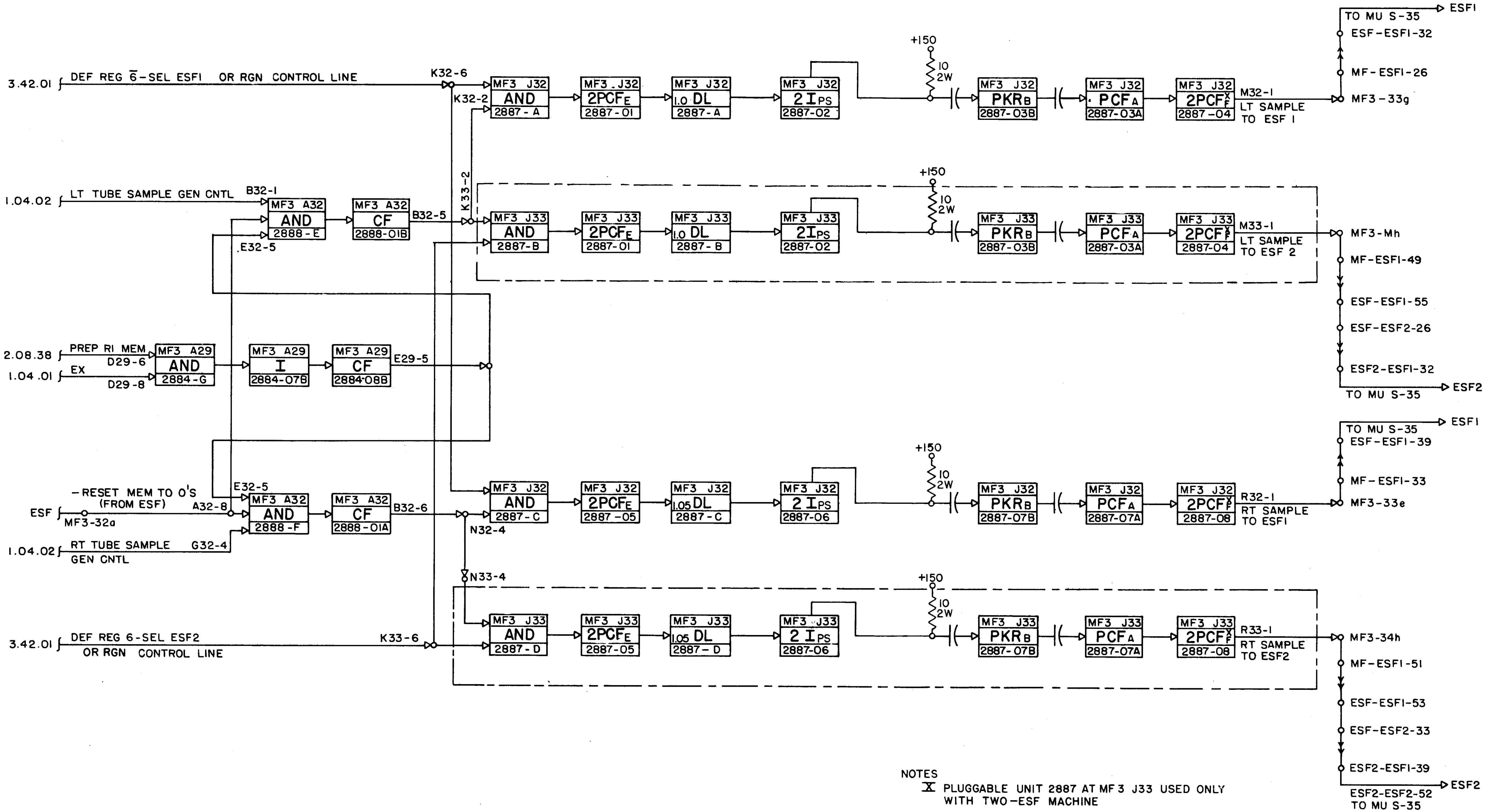
NOTES

I FOR PROGRAMMED REGENERATION
REMOVE JUMPER BETWEEN MF3-30k AND MF3-30ℓ
ADD JUMPER BETWEEN MF3-30ℓ AND MF3 30m



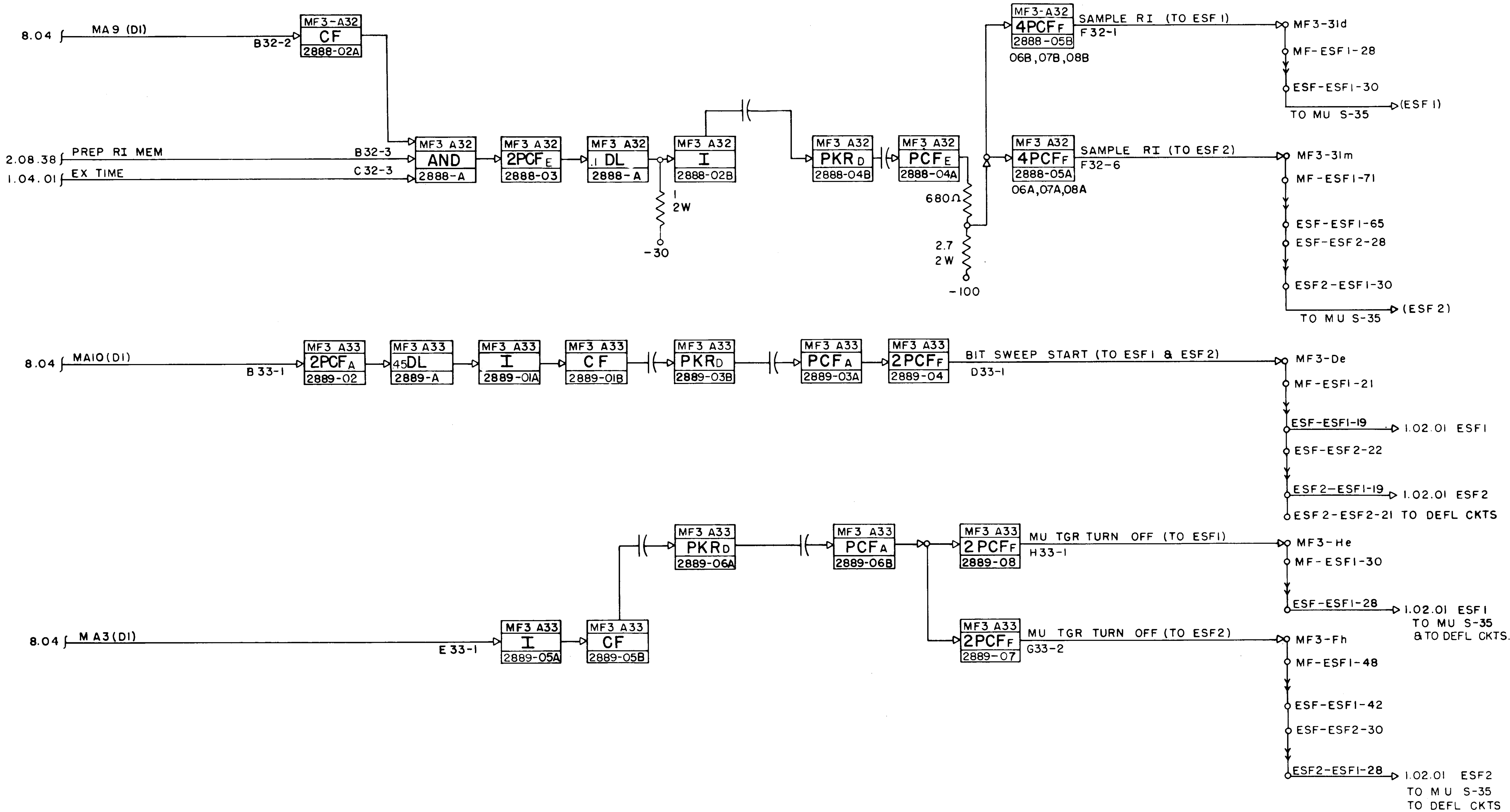
NOTES

X FOR PROGRAMMED REGENERATION
REMOVE JUMPER BETWEEN MF3-30e AND MF3-30f
ADD JUMPER BETWEEN MF3-30f AND MF3-30g

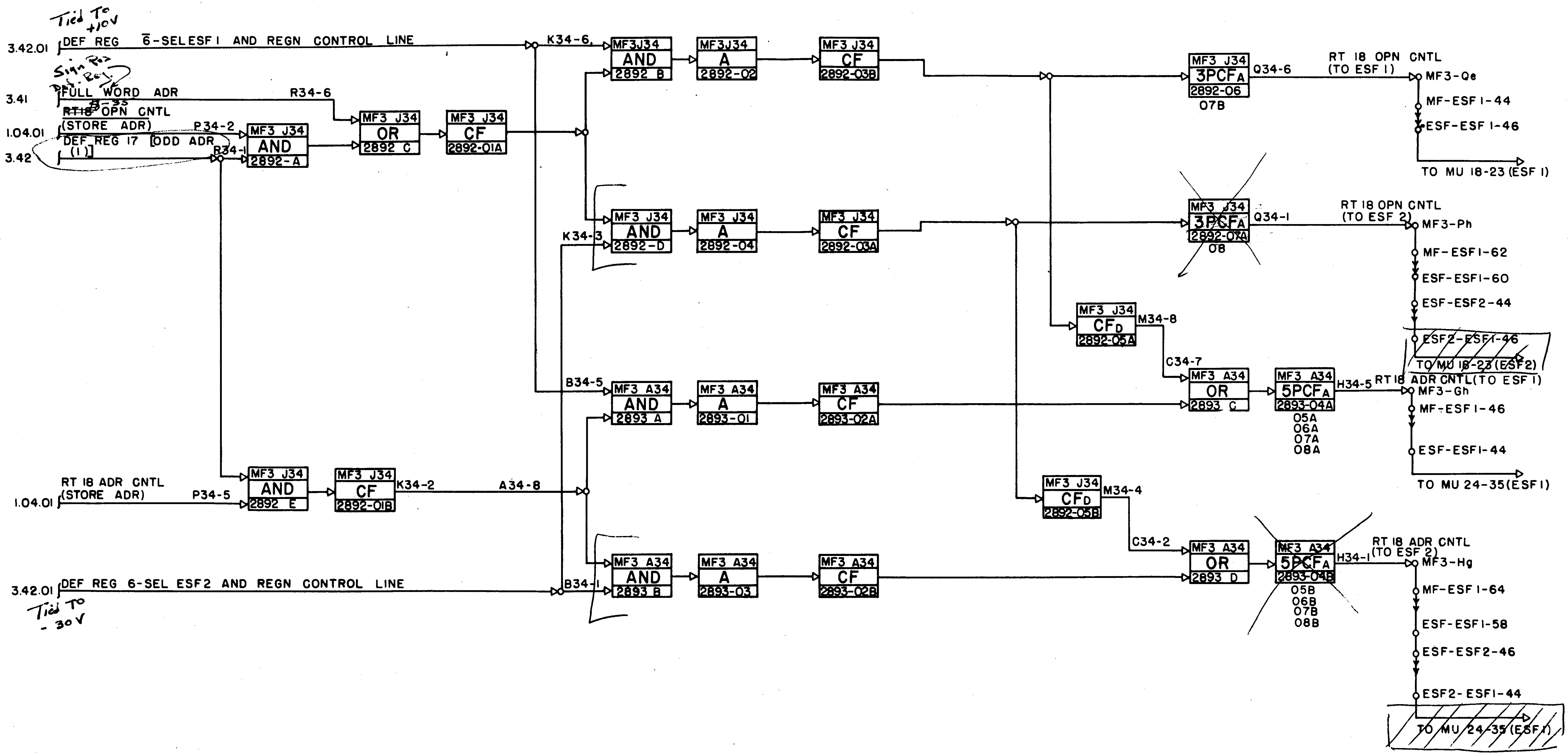


NOTES
X PLUGGABLE UNIT 2887 AT MF 3 J33 USED ONLY WITH TWO-ESF MACHINE

SAMPLE RI GEN, BIT SWEEP START GEN AND MU TGR TURN OFF

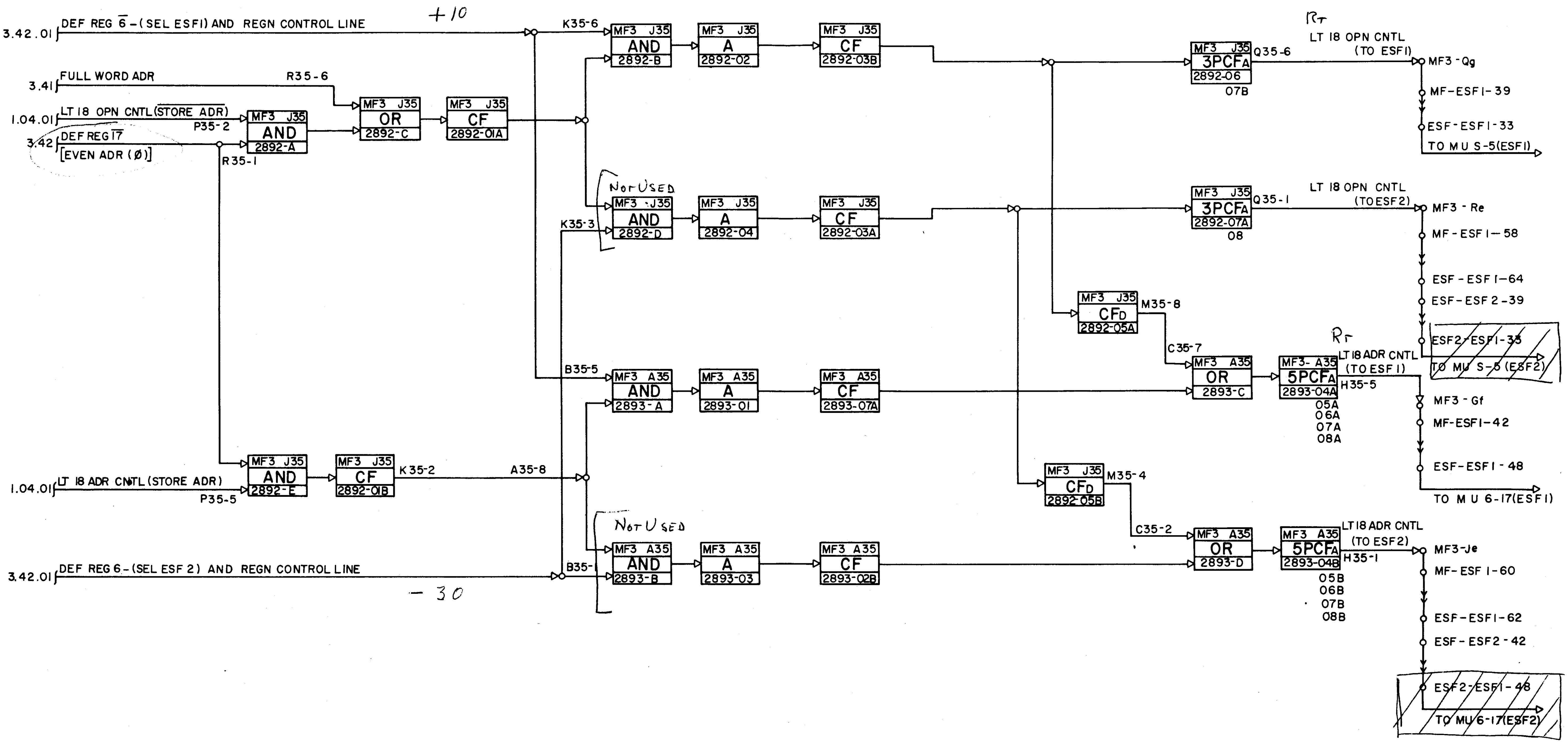


323033 EC 50950

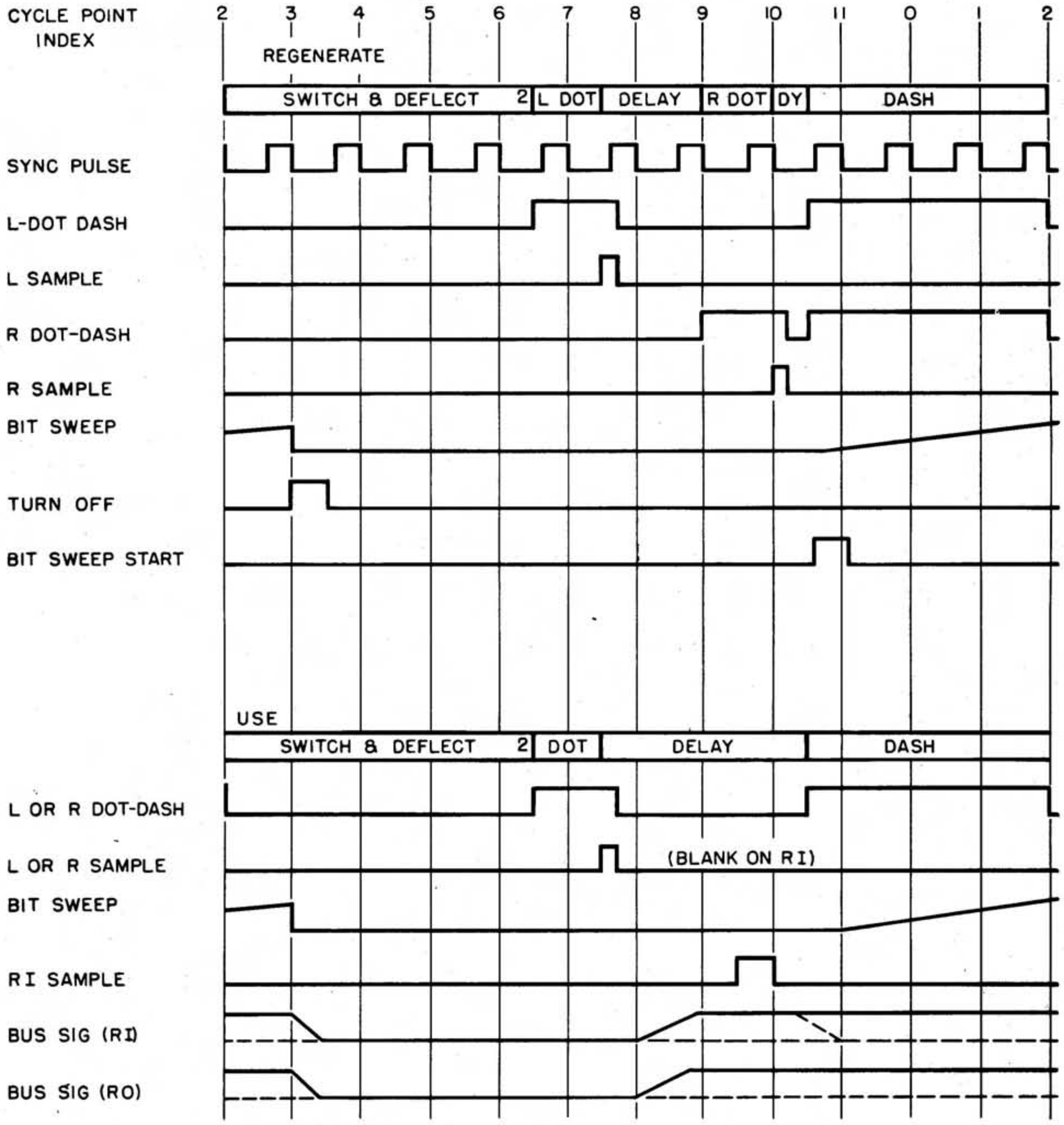

Tied To +10V
3.42.01 DEF REG 6-SEL ESF I AND REGN CONTROL LINE
K34-6
Sign Pos Def. Reg
3.41 FULL WORD ADR
R34-6
RT18 OPN CNTL (STORE ADR)
B-35
1.04.01
P34-2
DEF REG 17 [ODD ADR (1)]
3.42
B34-1
MF3 J34 AND 2892-A
MF3 J34 OR 2892 C
MF3 J34 CF 2892-01A
MF3J34 AND 2892 B
MF3J34 A 2892-02
MF3 J34 CF 2892-03B
MF3 J34 3PCFA 2892-06
07B
Q34-6
RT 18 OPN CNTL (TO ESF 1)
MF3-Qe
MF-ESF 1-44
ESF-ESF 1-46
TO MU 18-23 (ESF 1)
MF3 J34 AND 2892-D
K34-3
MF3 J34 A 2892-04
MF3 J34 CF 2892-03A
MF3 J34 3PCFA 2892-07A
08
Q34-1
RT 18 OPN CNTL (TO ESF 2)
MF3-Ph
MF-ESF1-62
ESF-ESF1-60
ESF-ESF2-44
ESF2-ESF1-46
TO MU 18-23 (ESF2)
MF3 J34 CFD 2892-05A
M34-8
C34-7
MF3 A34 OR 2893 C
MF3 A34 5PCFA 2893-04A
05A 06A 07A 08A
H34-5
RT 18 ADR CNTL (TO ESF 1)
MF3-Gh
MF-ESF 1-46
ESF-ESF1-44
TO MU 24-35 (ESF 1)
B34-5
MF3 A34 AND 2893 A
MF3 A34 A 2893-01
MF3 A34 CF 2893-02A
RT 18 ADR CNTL (STORE ADR)
1.04.01
P34-5
MF3 J34 AND 2892 E
MF3 J34 CF 2892-01B
K34-2
A34-8
MF3 J34 CFD 2892-05B
M34-4
C34-2
MF3 A34 OR 2893 D
MF3 A34 5PCFA 2893-04B
05B 06B 07B 08B
H34-1
RT 18 ADR CNTL (TO ESF 2)
MF3-Hg
MF-ESF 1-64
ESF-ESF1-58
ESF-ESF2-46
ESF2-ESF1-44
TO MU 24-35 (ESF 1)
3.42.01 DEF REG 6-SEL ESF2 AND REGN CONTROL LINE
Tied To -30V
B34-1
MF3 A34 AND 2893 B
MF3 A34 A 2893-03
MF3 A34 CF 2893-02B

LT 18 OPN AND ADR CNTL
First Half Memory

S-18



323035 EC50175

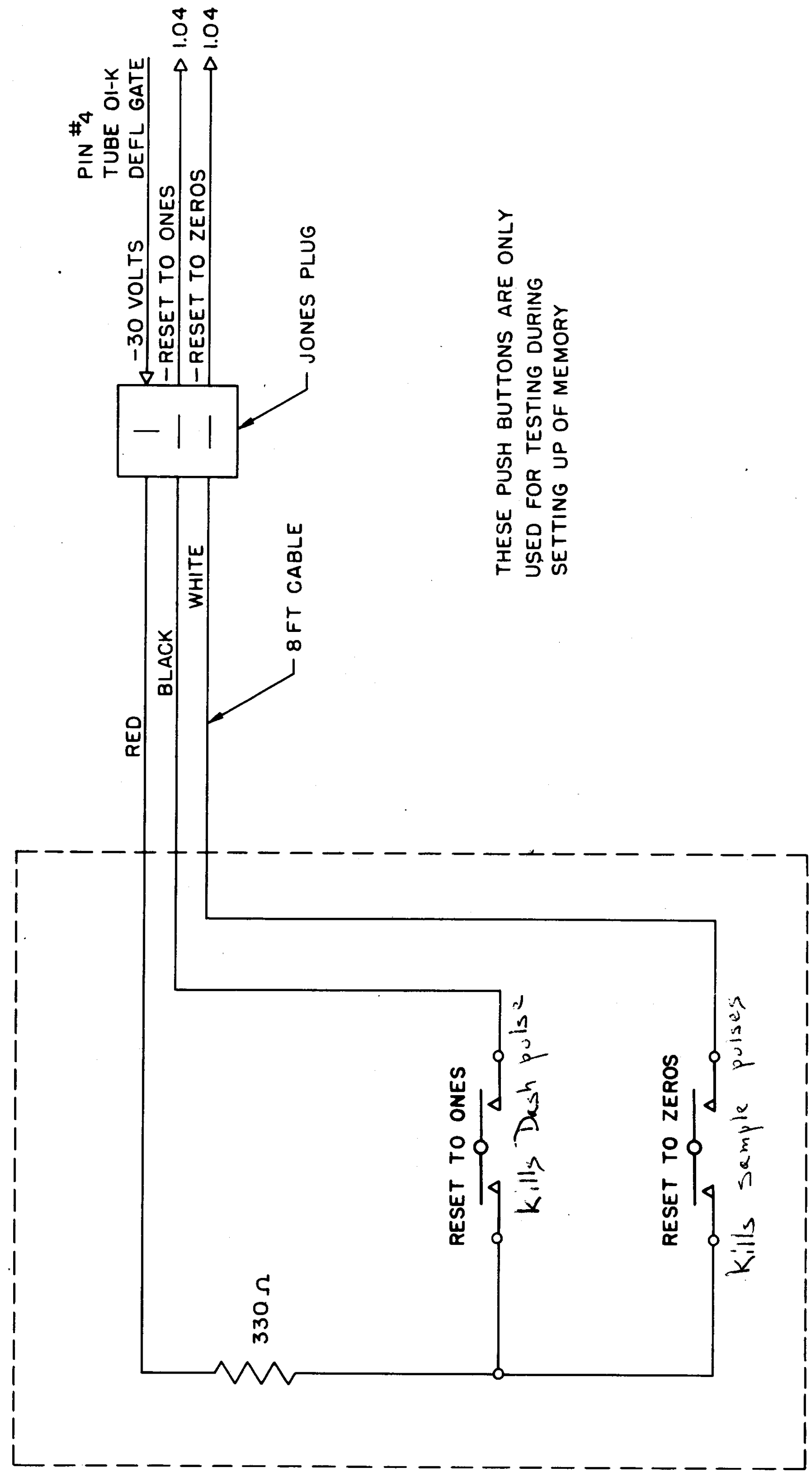


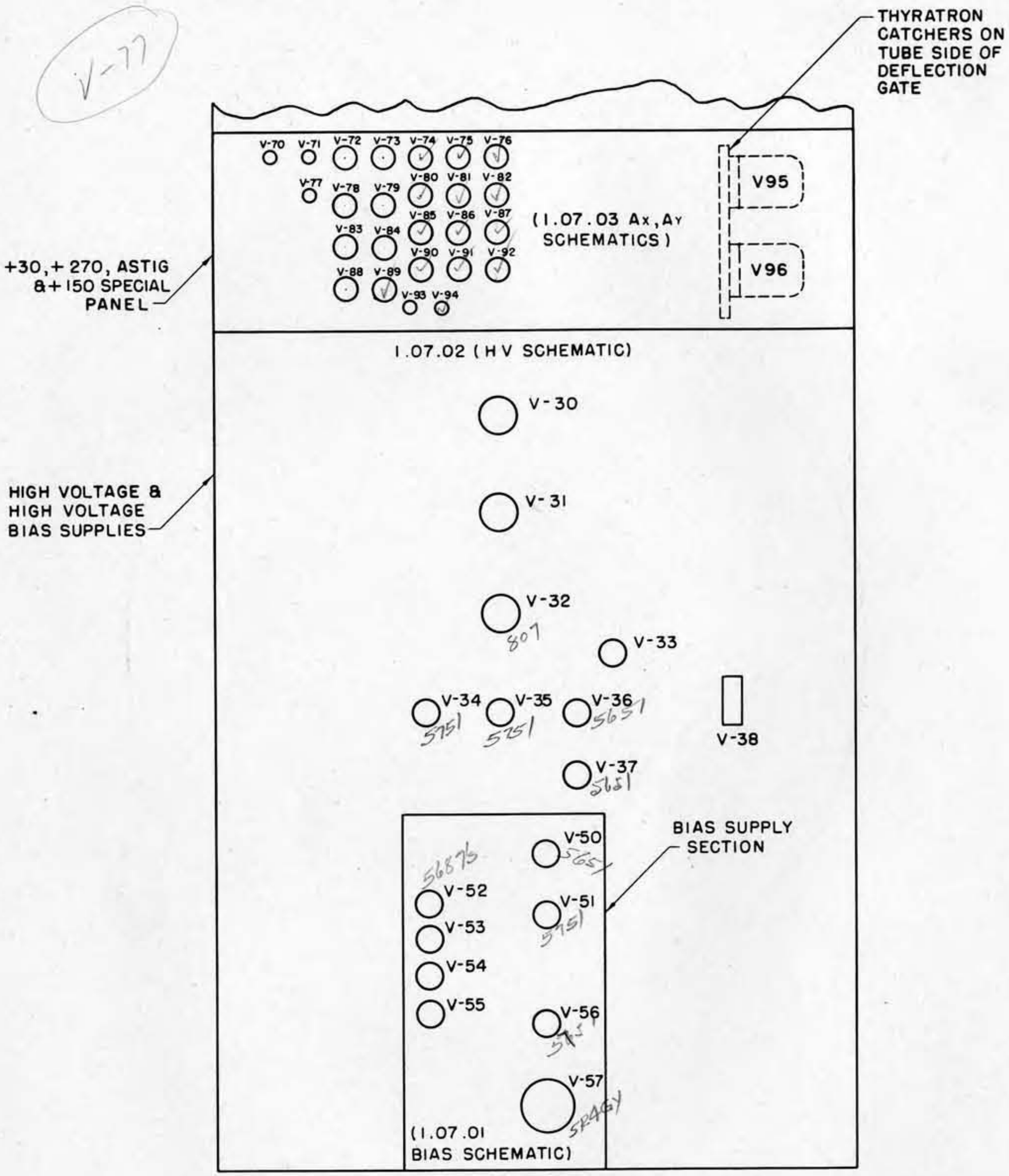
NOTE 1: BUS SIGNALS ARE PLUS EQUAL ONE (DOT)
MINUS EQUAL ZERO (DASH)

NOTE 2: SWITCH & DEFLECT TIME INCLUDES TIME FOR SETTING INFORMATION INTO DEFLECTION REGISTER

NOTE 3: WHEN A ONE (DOT) IS READ IN, THE BUS SIGNAL IS HELD UP BY MEMORY UNIT AFTER 10.5 TIME. WITHOUT MEMORY UNIT, BUS SIGNAL RETURNS TO −30 V AS SHOWN BY DOTTED LINE

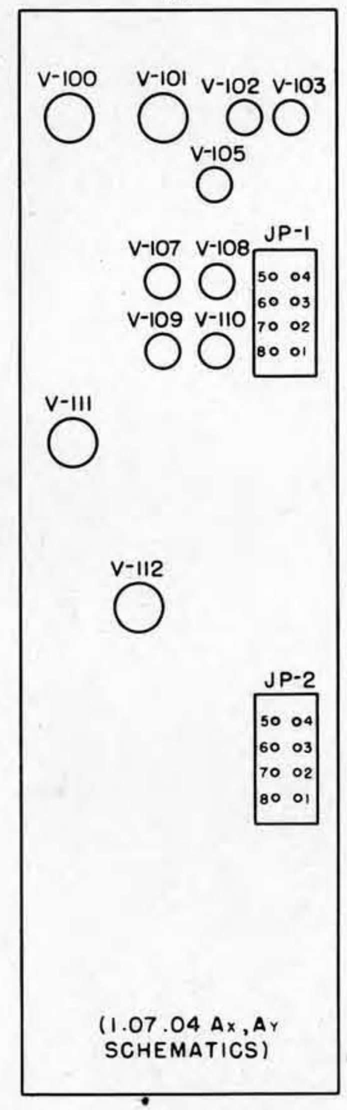
NOTE 4: ON BUS SIGNAL (RI), DASHED LINE INDICATES CONDITION FOR A ZERO (DASH) READ IN.


PIN #4
TUBE 01-K
DEFL GATE
1.04
1.04
-30 VOLTS
-RESET TO ONES
-RESET TO ZEROS
JONES PLUG
RED
BLACK
WHITE
8 FT CABLE
THESE PUSH BUTTONS ARE ONLY
USED FOR TESTING DURING
SETTING UP OF MEMORY
RESET TO ONES
Kills Dash pulse
RESET TO ZEROS
Kills sample pulses
330 Ω



POWER SUPPLY SECTION OF THE
LOWER DEFLECTION GATE
VIEWED FROM WIRING SIDE

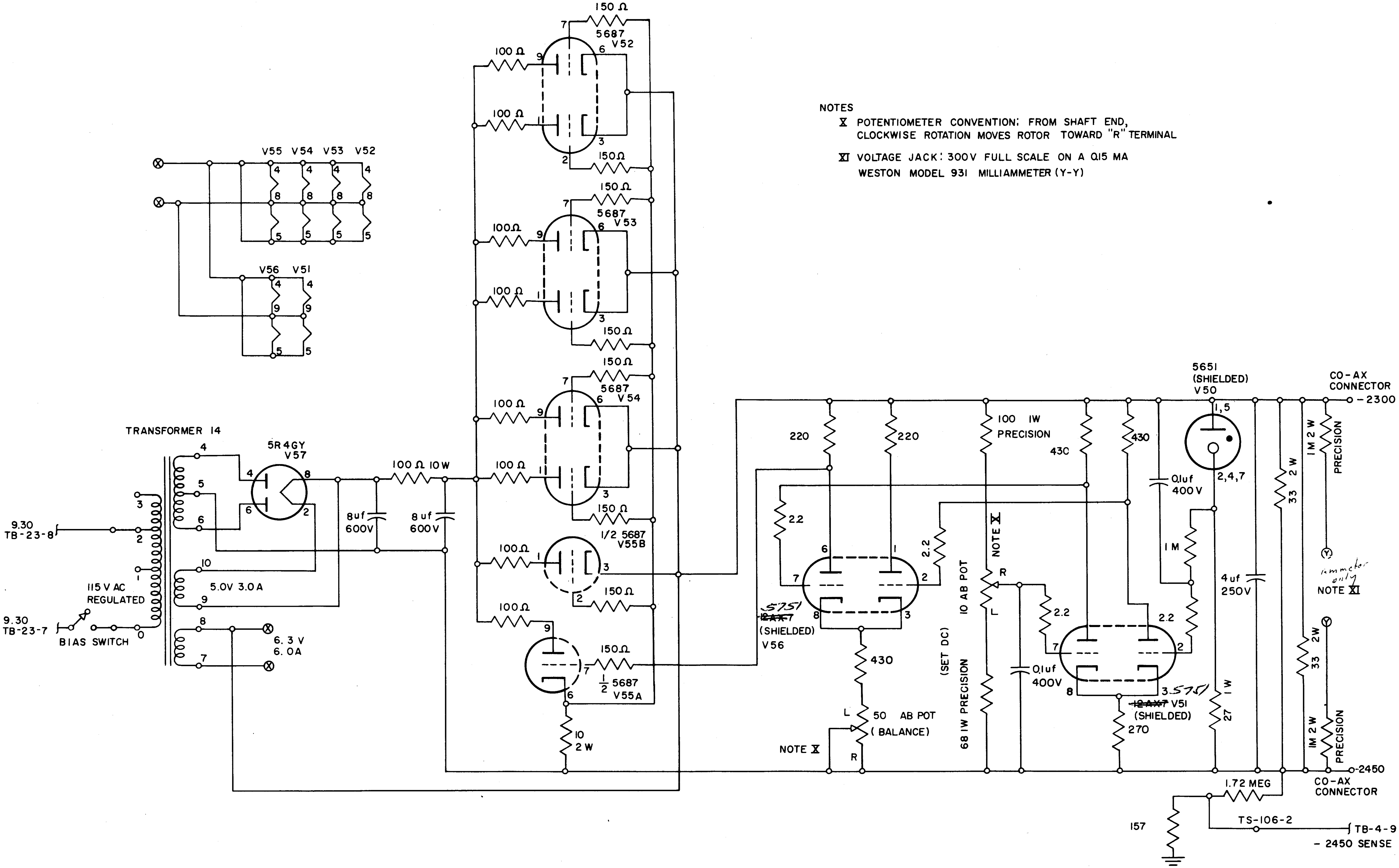
+450 & -150 SUPPLY CHASSIS TOP



VIEW FROM FRONT
OF THE MACHINE
(TUBE SIDE OF CHASSIS)

1.07.05
TUBE LOCATION
AND DEFLECTION
GATE CABLE CONNECTION

323038 EC 50175

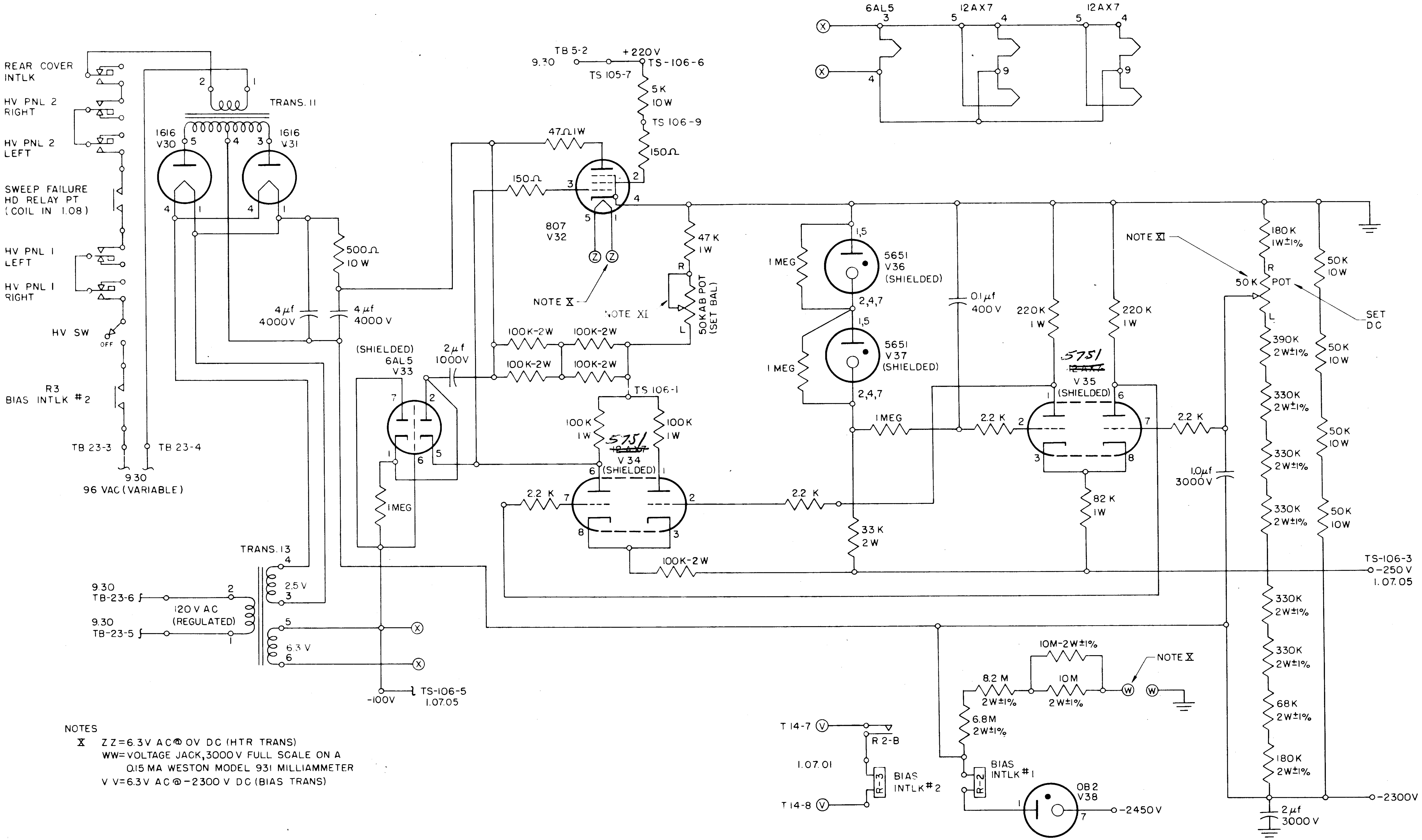


NOTES

X POTENTIOMETER CONVENTION: FROM SHAFT END, CLOCKWISE ROTATION MOVES ROTOR TOWARD "R" TERMINAL

XI VOLTAGE JACK: 300V FULL SCALE ON A 0.15 MA WESTON MODEL 931 MILLIAMMETER (Y-Y)

CRT HIGH VOLTAGE SUPPLY



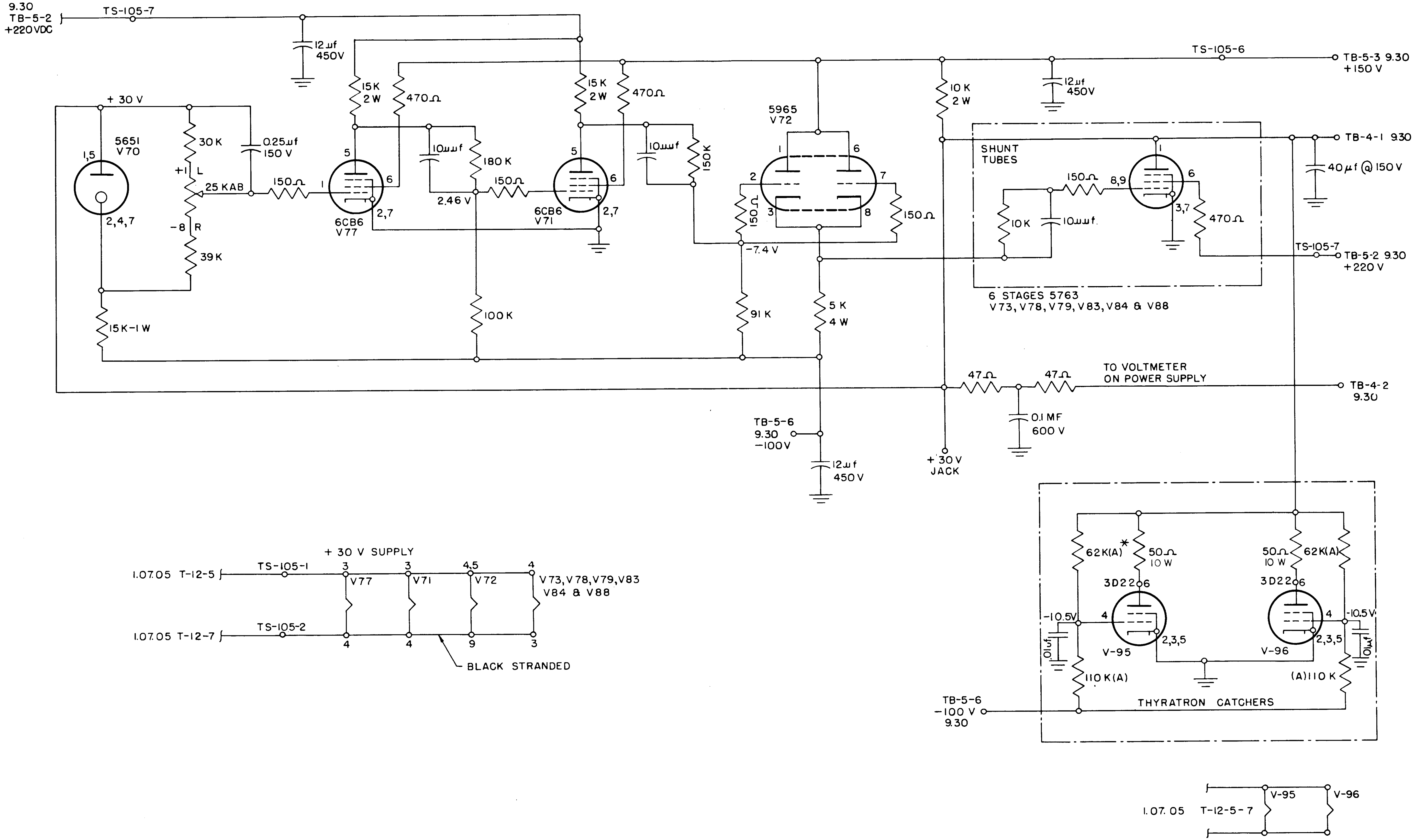
NOTES

X ZZ=6.3V AC @ 0V DC (HTR TRANS)
WW=VOLTAGE JACK, 3000V FULL SCALE ON A 0.15 MA WESTON MODEL 931 MILLIAMMETER
VV=6.3V AC @ -2300 V DC (BIAS TRANS)

XI POTENTIOMETER CONVENTION FROM SHAFT END CLOCKWISE ROTATION MOVES ROTOR TOWARD "R" TERMINAL

323040 EC 50880

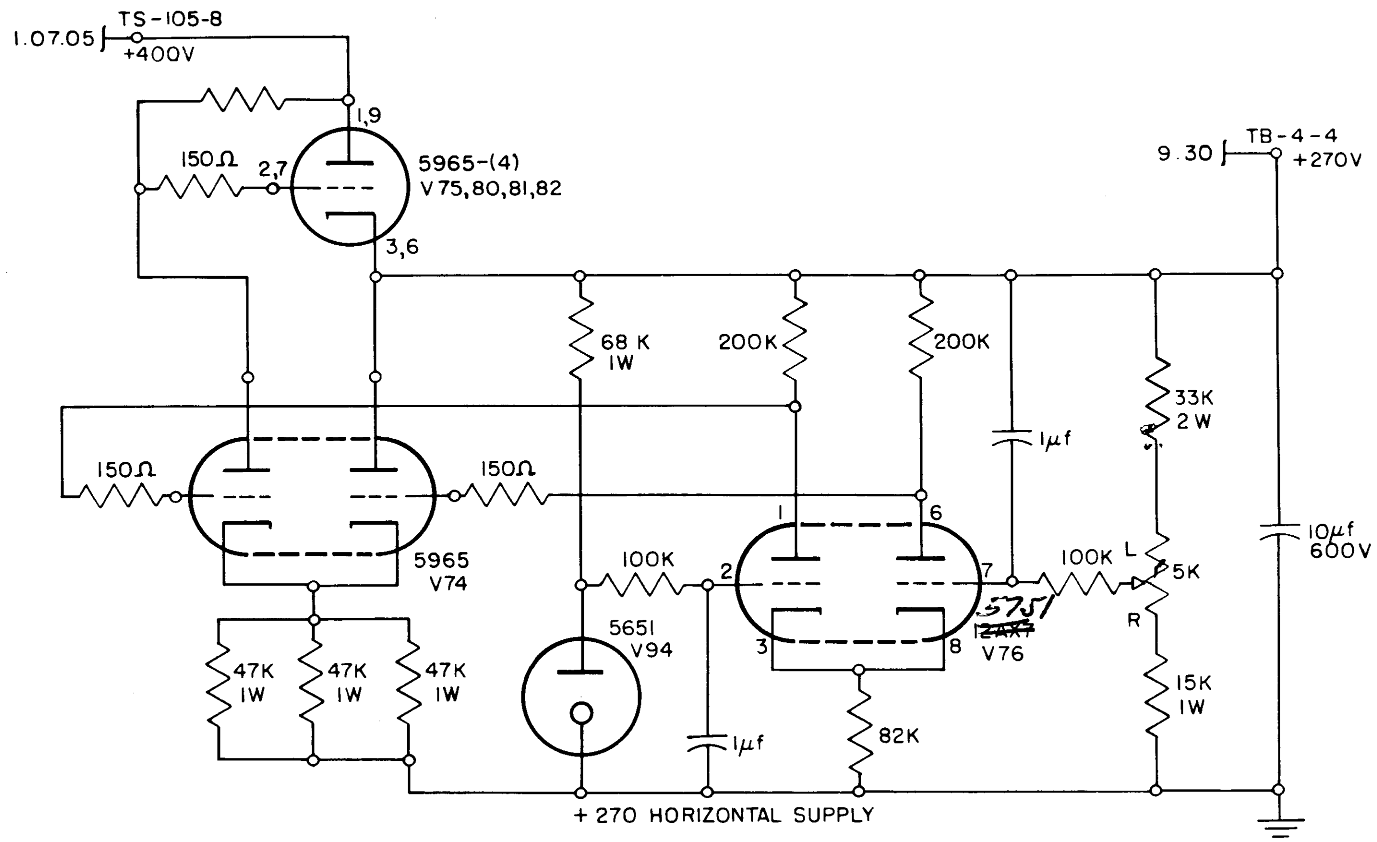
+30V POWER SUPPLY

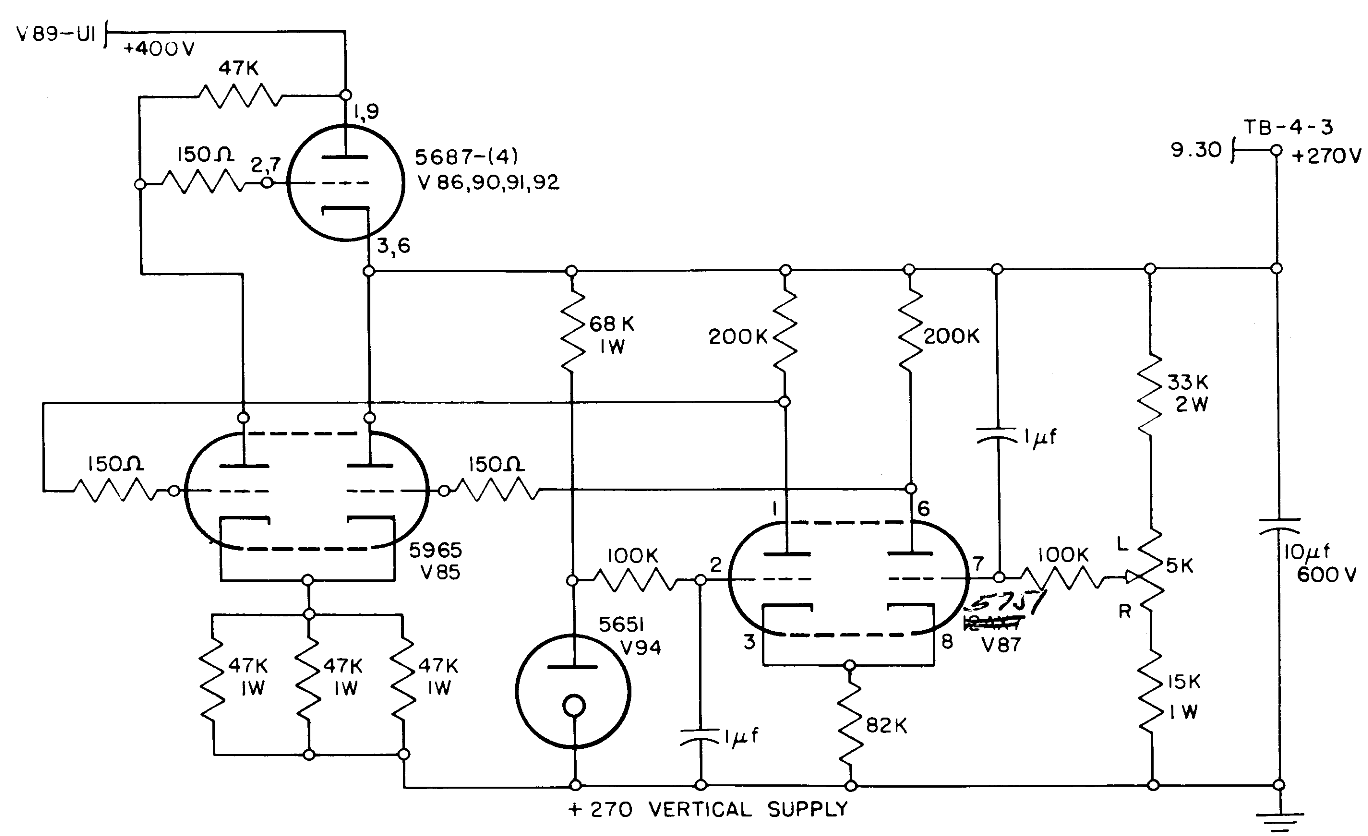


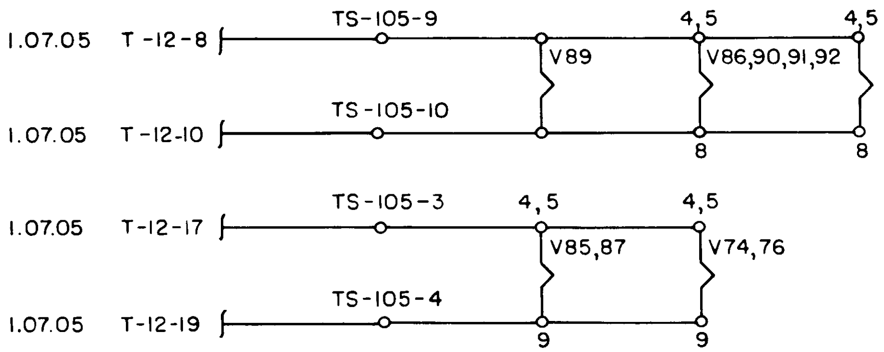
* (A)-RESISTORS MARKED (A) ARE FROM SAME TOLERANCE GROUP

323041 EC 50967

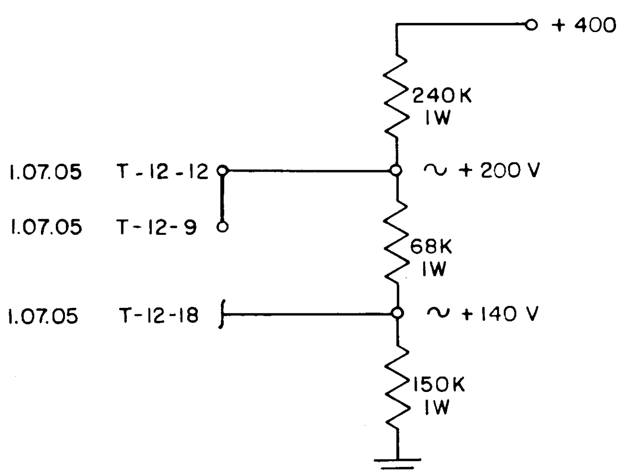
+270V (VERT AND HORIZ), ASTIGMATISM AND +150 VOLT SUPPLIES

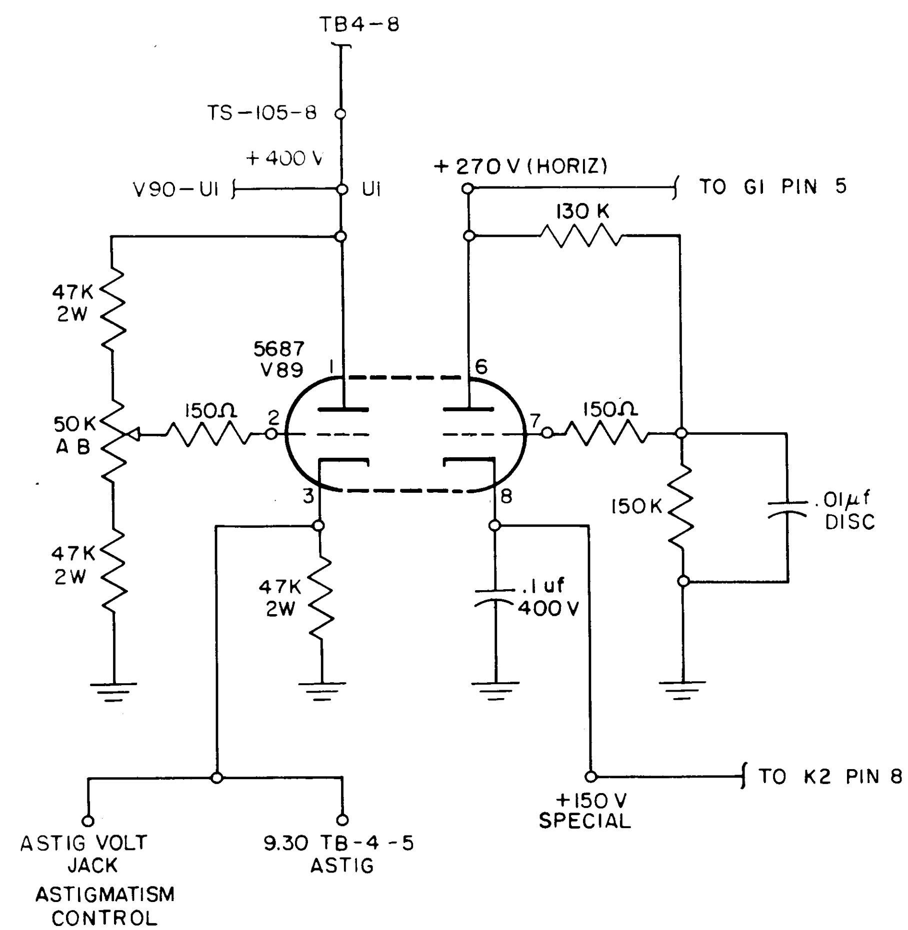




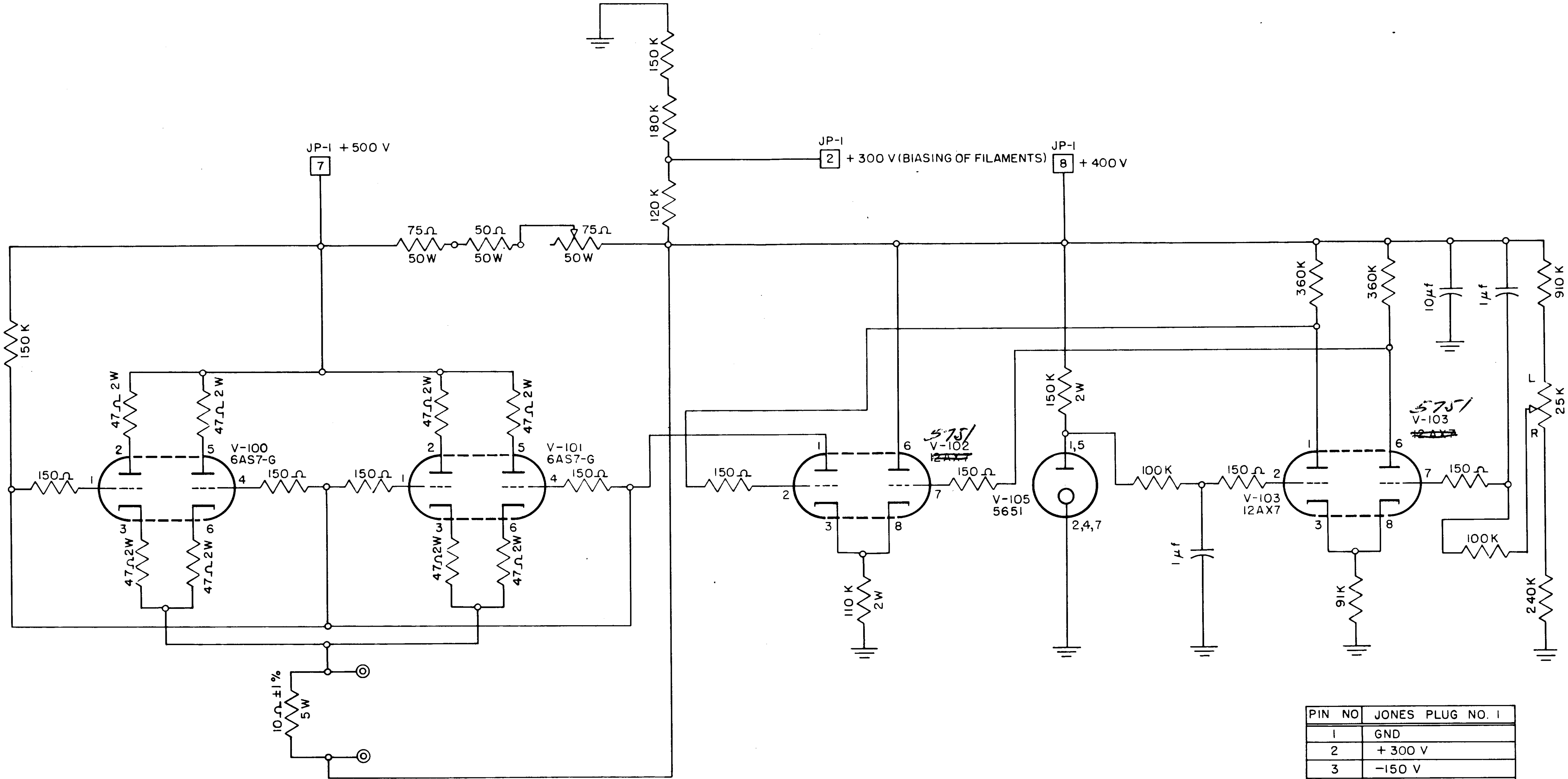


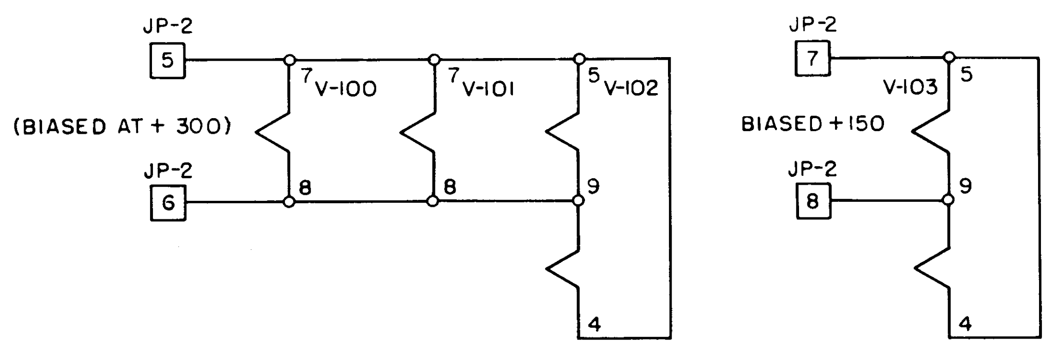
ON TURRET OF V70

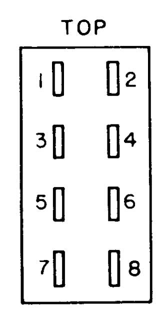




+400 VOLT REGULATOR





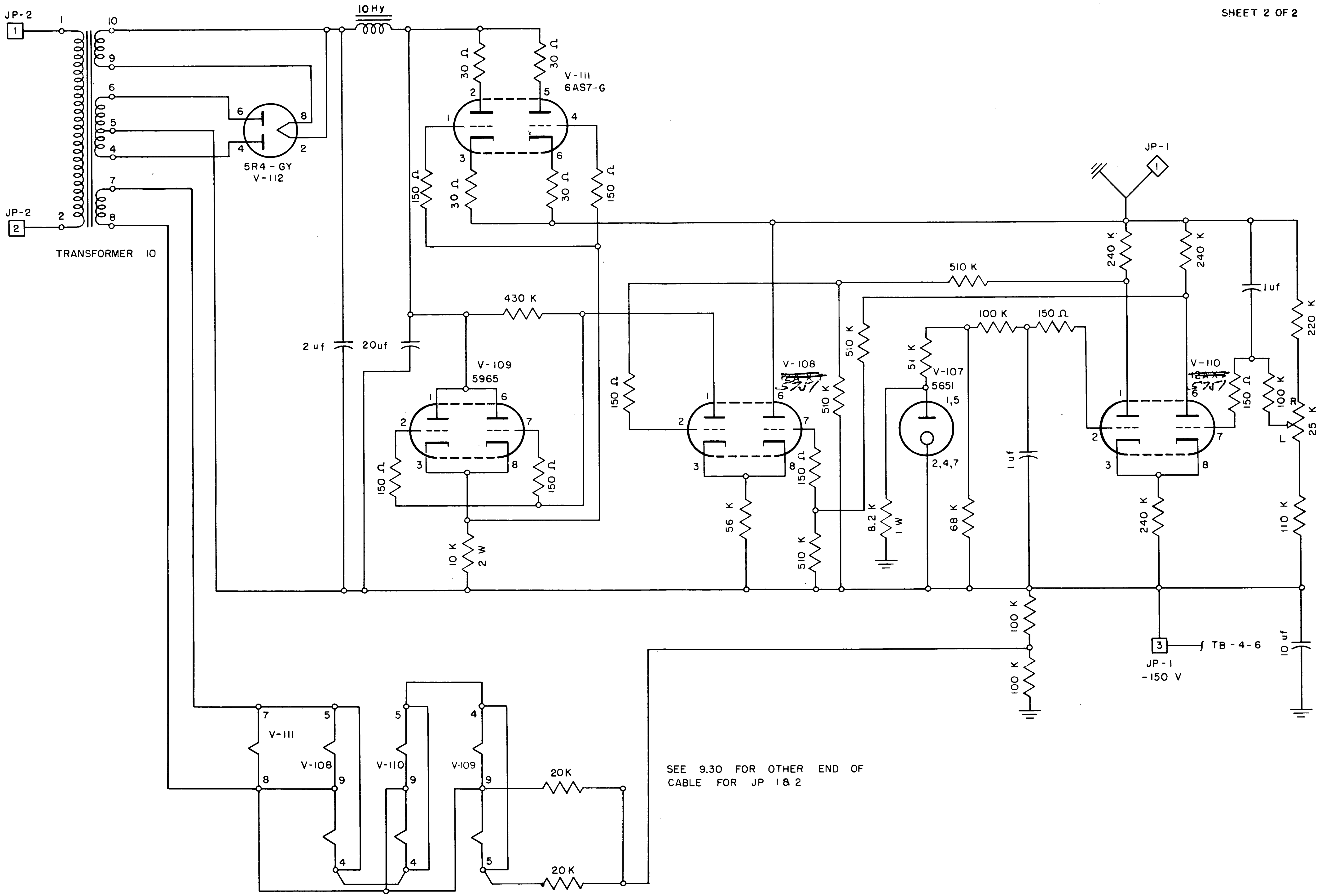


JONES PLUG CONNECTIONS (VIEWED FROM WIRING SIDE)

NOTE
SEE 9.30 FOR THE OTHER END OF CABLE FOR JP1 & 2

PIN NO	JONES PLUG NO. 1
1	GND
2	+ 300 V
3	−150 V
4	
5	SPARE
6	
7	+ 500 V
8	+ 400 V
	JONES PLUG NO. 2
1	NEUTRAL
2	110 V AC
3	
4	
5	6.3 V AC (+300 V)
6	6.3 V AC (+300 V)
7	6.3 V AC (+150 V)
8	6.3 V AC (+150 V)

-150 VOLT SPECIAL SUPPLY



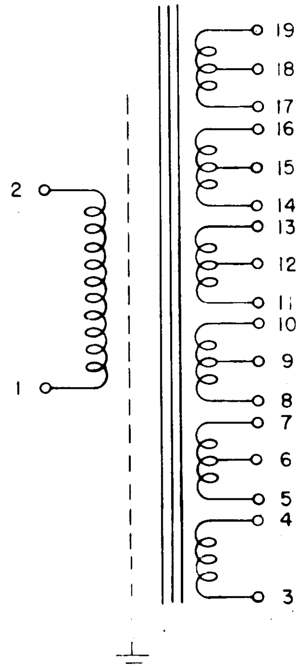
323042 EC 50967

DEFLECTION GATE LOCATION CHART *

5965 LAYOUT
L - LEFT
R - RIGHT
U - UP
D - DOWN
X - BLANK POSITION

L	L	L	R	R	R	X	U	U	U	D	D	D
L	L	L	R	R	R	X	U	U	U	D	D	D
X	L	L	X	R	R	X	X	U	U	X	D	D

VIEWED FROM WIRING SIDE

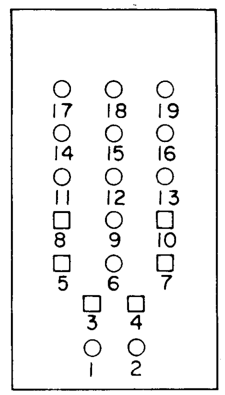


T-12

	TS 101		TS 102		TS 103		TS 104		TS 105		TS 106	
1	6.3 AC	T-12-8	+ 400	TB-4-8	6.3 AC	T-12-5	6.3 AC	T-12-3	6.3 AC	T-12-5		
2	6.3 AC	T-12-10			6.3 AC	T-12-7	6.3 AC	T-12-4	6.3 AC	T-12-7	-2450 SENSE	TB-4-9
3			+ 270.	TB-4-3					6.3 AC	T-12-17	- 250	TB-5-7
4			+ 270H	TB-4-4					6.3 AC	T-12-19		
5			- 150	TB-4-6					-100	TB-5-7	- 100	TB-5-6
6									+150	TB-5-3	+220	TS105-7
7									+220	TB-5-2		
8									+ 400	TB-4-8		
9									6.3 AC	T-12-11		
10									6.3 AC	T-12-13		

T-12
DEFLECTION GATE
HEATER TRANSFORMER

(TOP)



T - 12 CONNECTIONS		
1	T-B-23-1	A C REG
2	TB-23-2	NEUT
3	TS-104-1	6.3 AC
4	TS-104-2	6.3 (GND)
5	TS-103-1	6.3 AC
6	GND	CT GND
7	TS-103-2	6.3 AC
8	TS-101-1	6.3 AC
9		CT @ 200V
10	TS-101-2	6.3 AC
11	TS-105	6.3 AC
12		CT @ 200V
13	TS-105-10	6.3 AC
14	TB-24-1	(6.3-400 REG)
15	TB-4-7	CT @ + 300V
16	TB-24-2	(6.3-400 REG)
17	TS-105-3	6.3 AC
18		CT @ +140V
19	TS-105-4	6.3 AC

TERMINAL BLOCK PINS	LOCATION OF COAXIAL CABLE IN HOLDER	WIRE
G - f	1	DEFL ADR 15
G - g	8	DEFL ADR 14
G - h	2	DEFL ADR 13
H - e	9	DEFL ADR 12
H - f	3	DEFL ADR 11
H - h	10	DEFL ADR 10
J - e	4	DEFL ADR 9
J - f	11	DEFL ADR 8
J - g	5	DEFL ADR 7
J - h	12	DEFL ADR 6
K - e	6	B S START
K - f	13	MU TGR TURN OFF
K - g		RESET TO "1'S"
K - h	14	RESET TO "0'S"

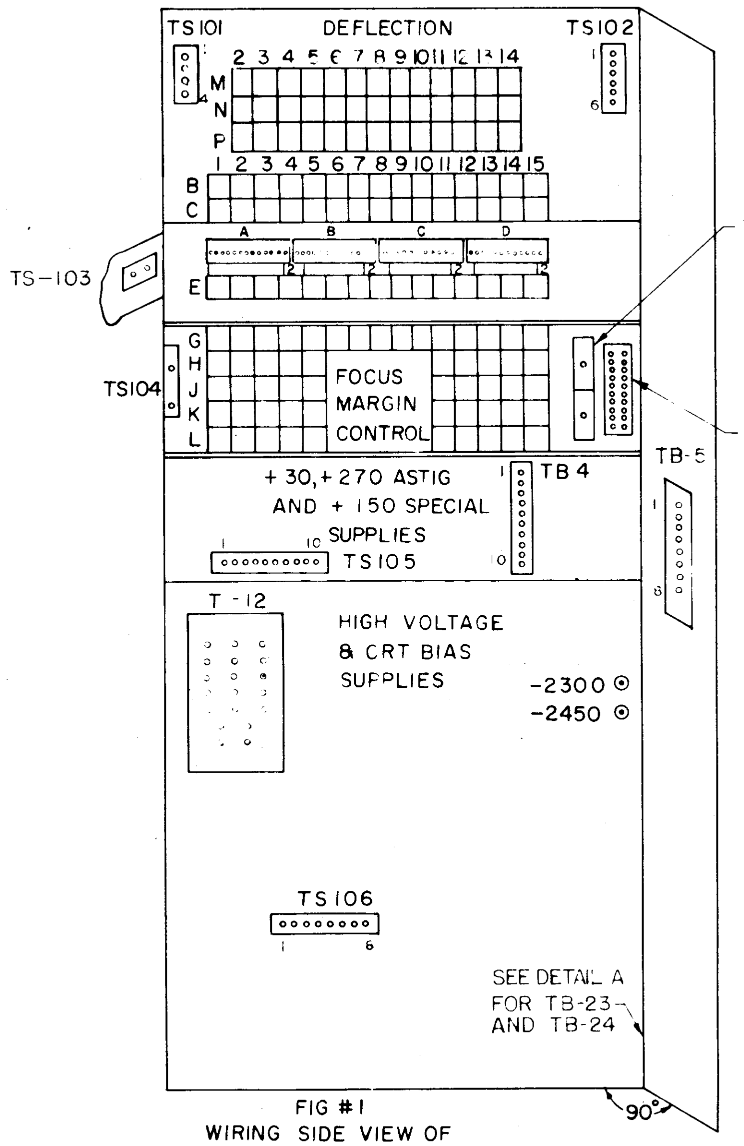


FIG #1
WIRING SIDE VIEW OF
DEFLECTION GATE
*-FOR OTHER TERMINAL BOARD
LOCATIONS SEE 9.30

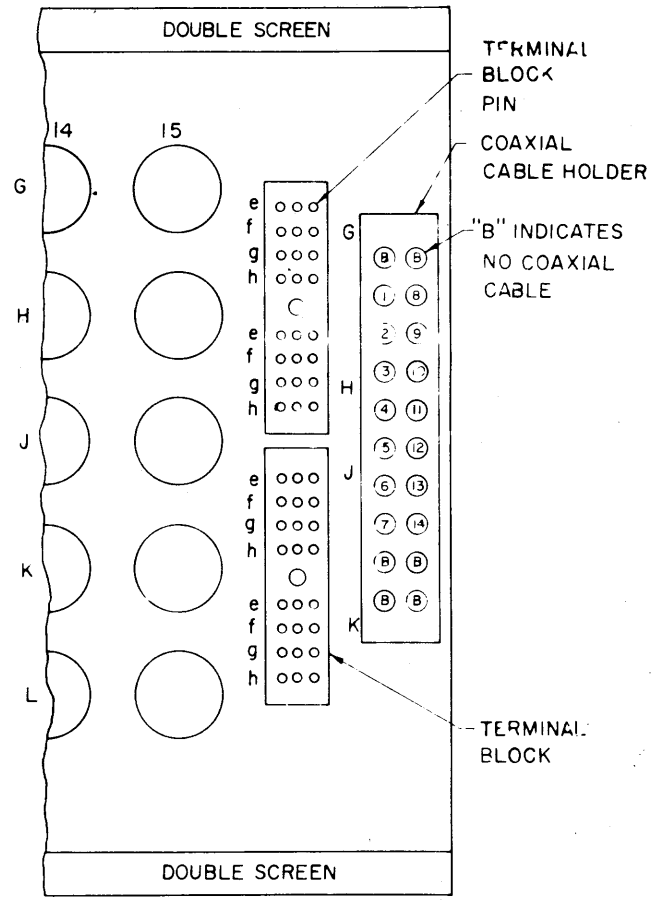
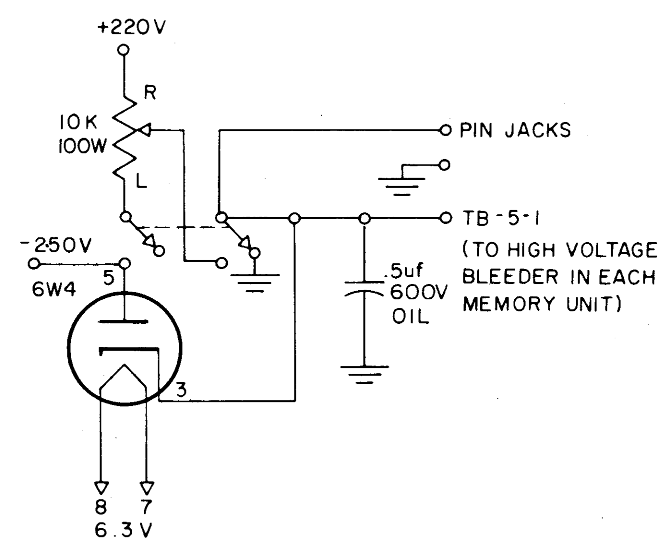
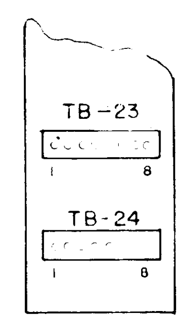


FIG. #2
WIRING SIDE VIEW OF TERMINAL
BLOCKS & COAXIAL CABLE
HOLDER IN DEFLECTION GATE

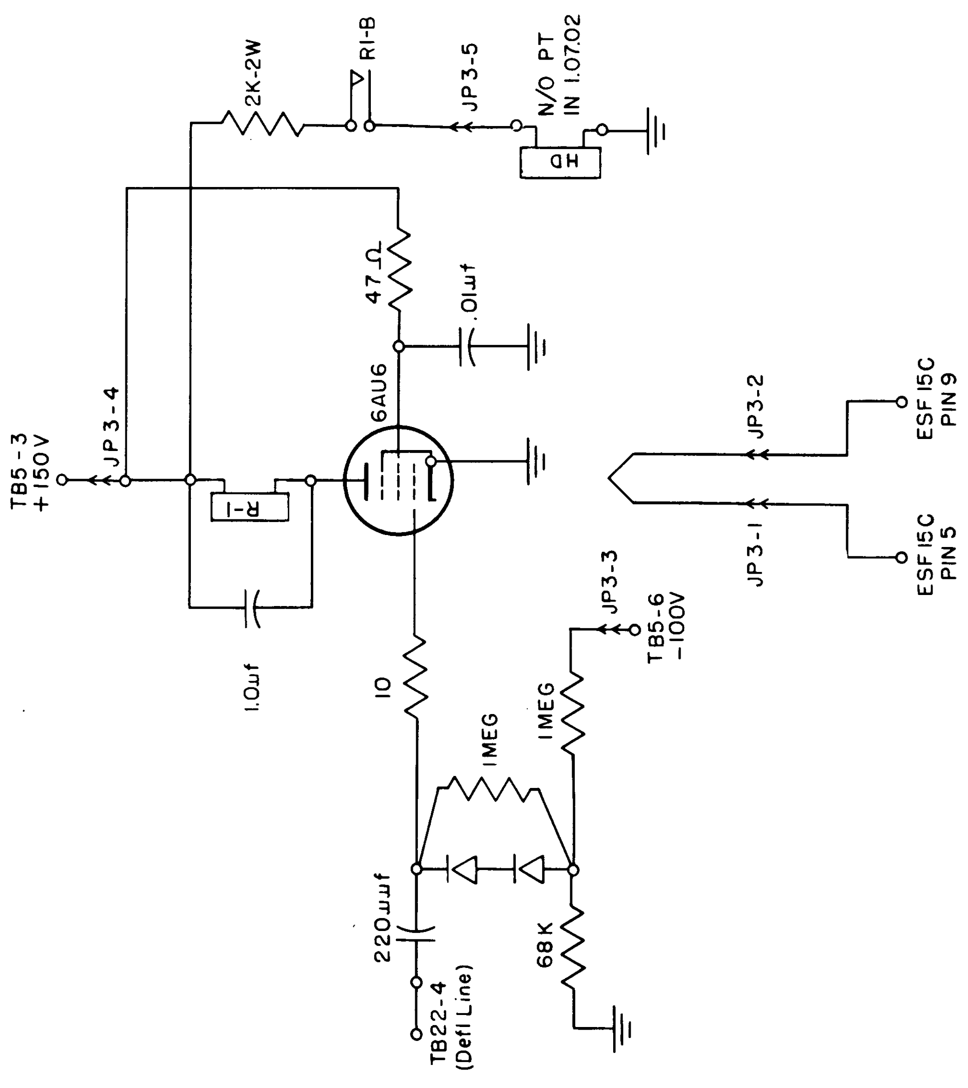


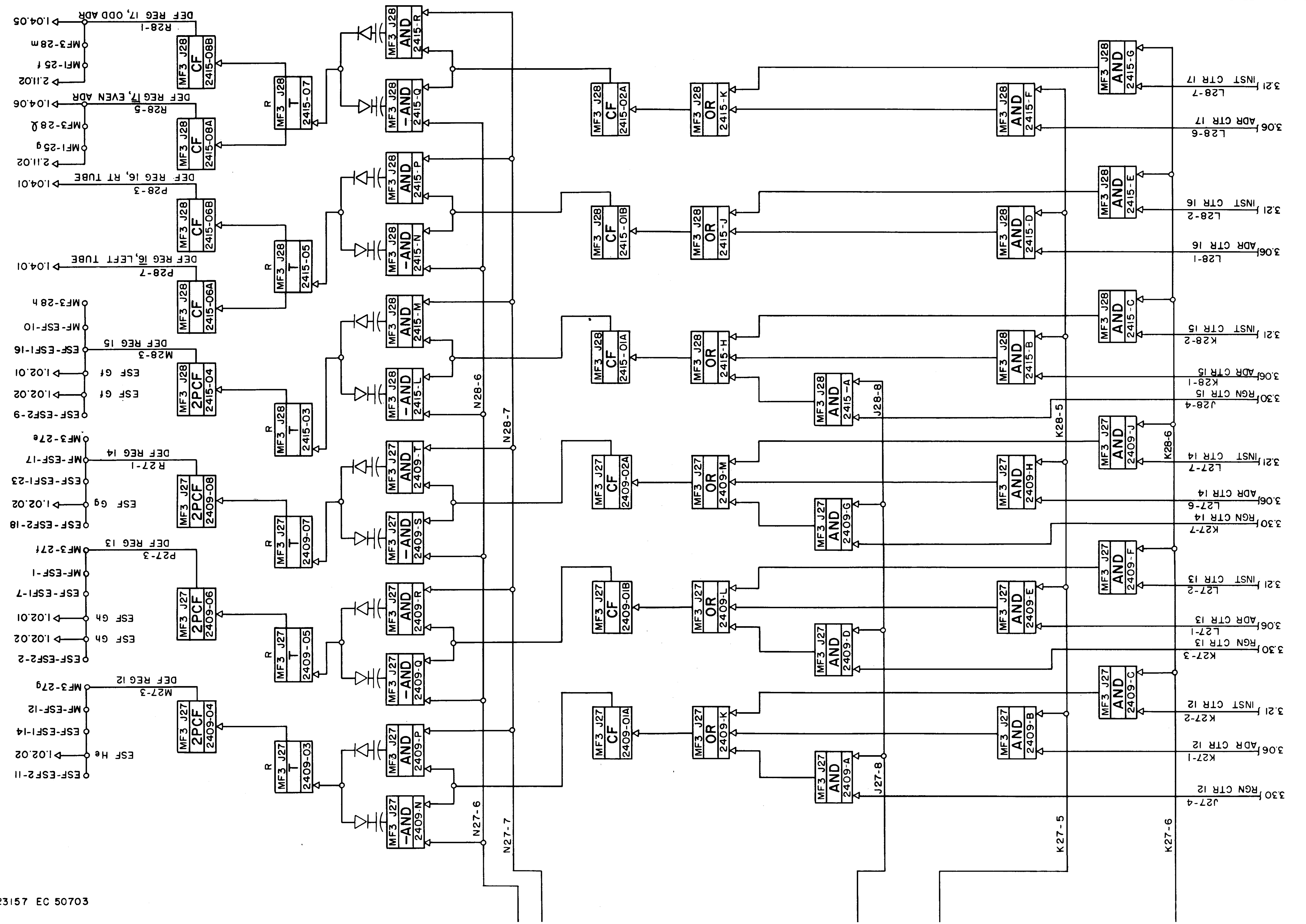
FOCUS MARGIN CONTROL

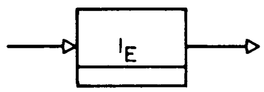


BOTTOM CORNER
HINGE SIDE
DETAIL A

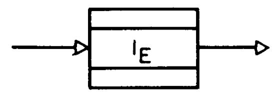
323043 EC 50880


TB5-3
+150V
JP 3-4
R-1
1.0μf
2K-2W
R1-B
JP 3-5
N/O PT
IN 1.07.02
HD
47Ω
.01μf
6AU6
10
IMEG
IMEG
JP3-3
TB5-6
-100V
220μμf
TB22-4
(Defl Line)
68K
JP3-2
JP3-1
ESF 15C
PIN 9
ESF 15C
PIN 5

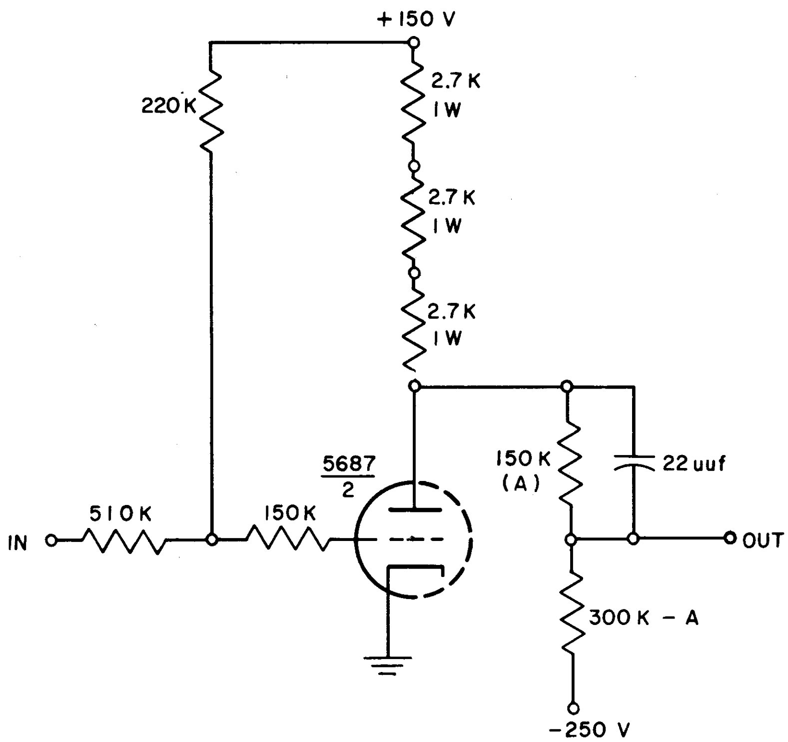




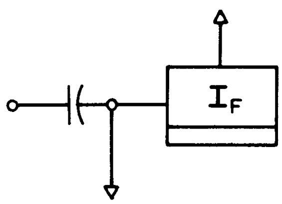
I_E
PLUGGABLE UNIT



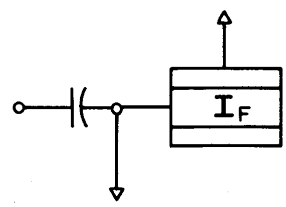
I_E
SYSTEM



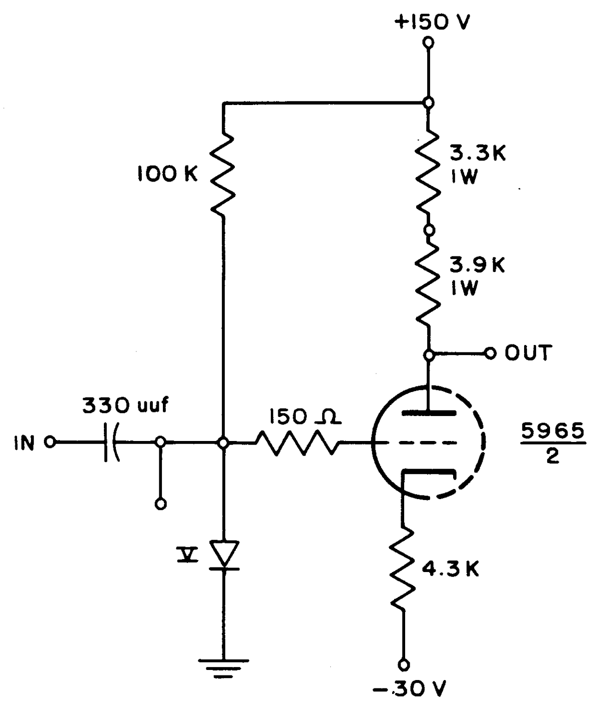
+150 V
220K
2.7K
1W
2.7K
1W
2.7K
1W
5687
2
150K
(A)
22uuf
IN
510K
150K
OUT
300K - A
-250 V



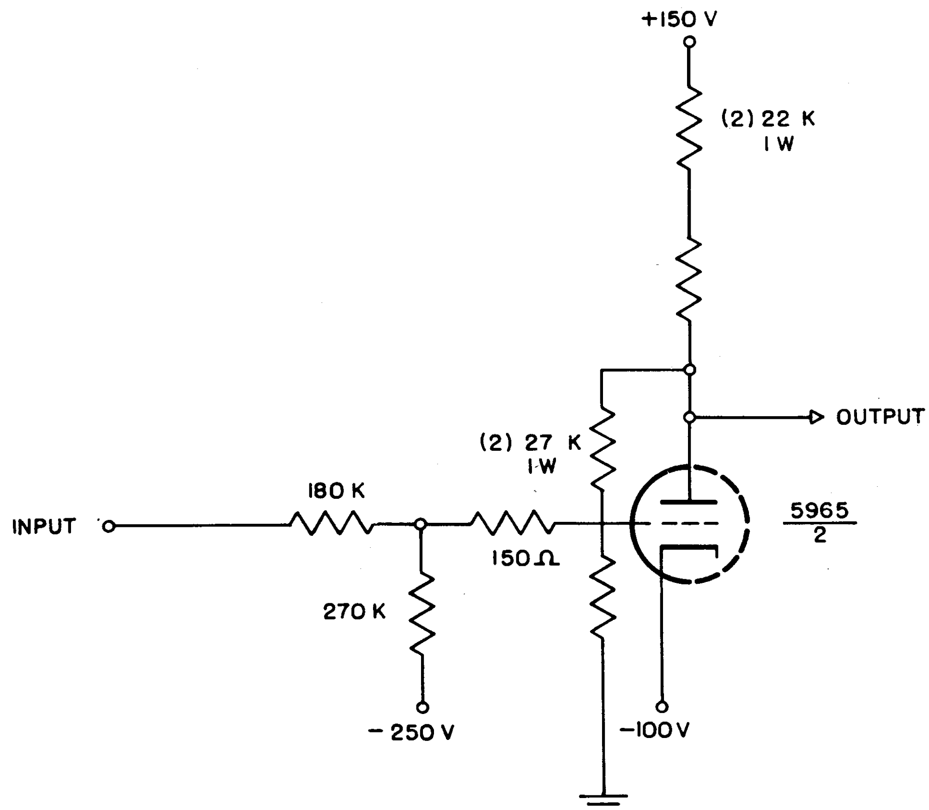
PLUGGABLE UNIT



SYSTEM

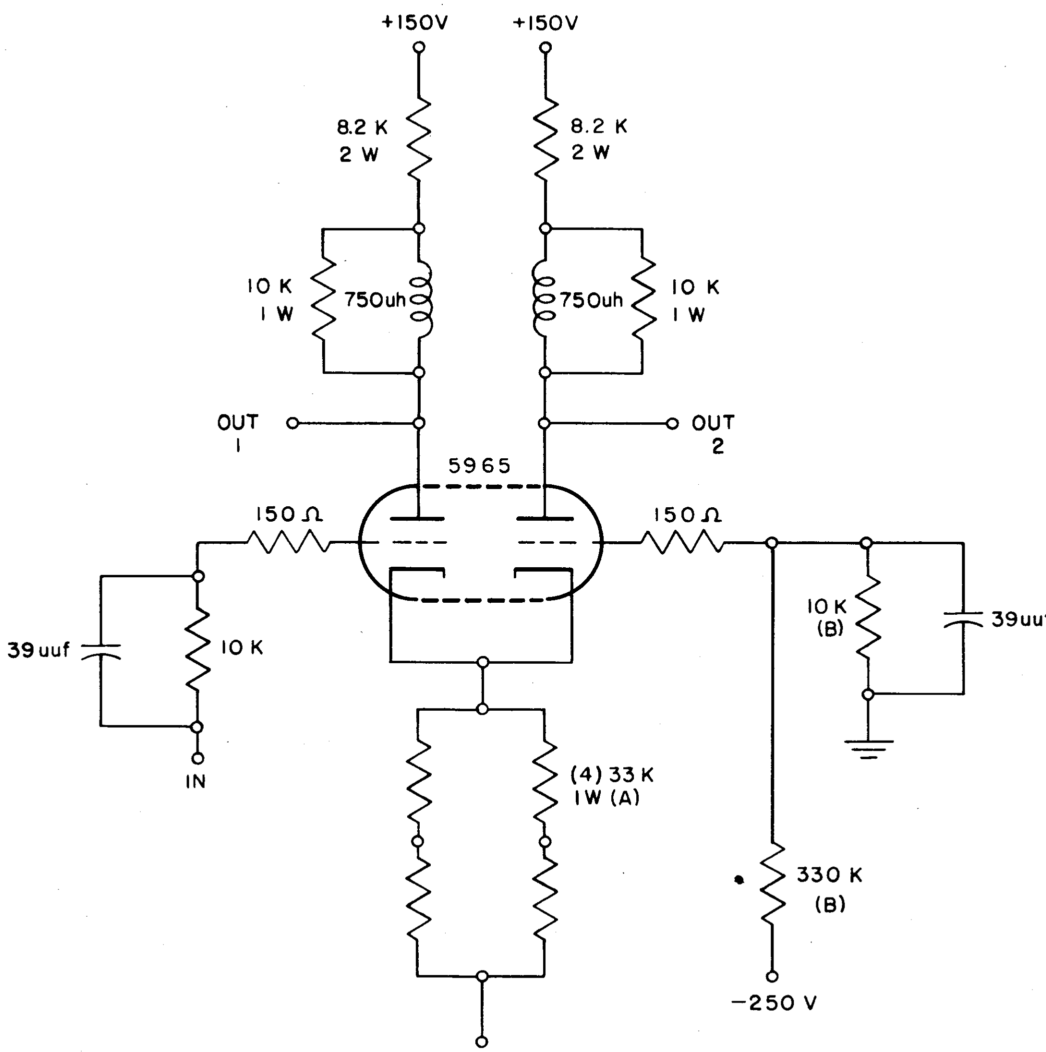


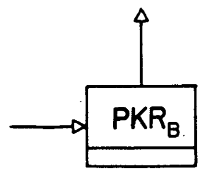
PLUGGABLE UNIT SYSTEM

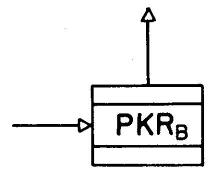


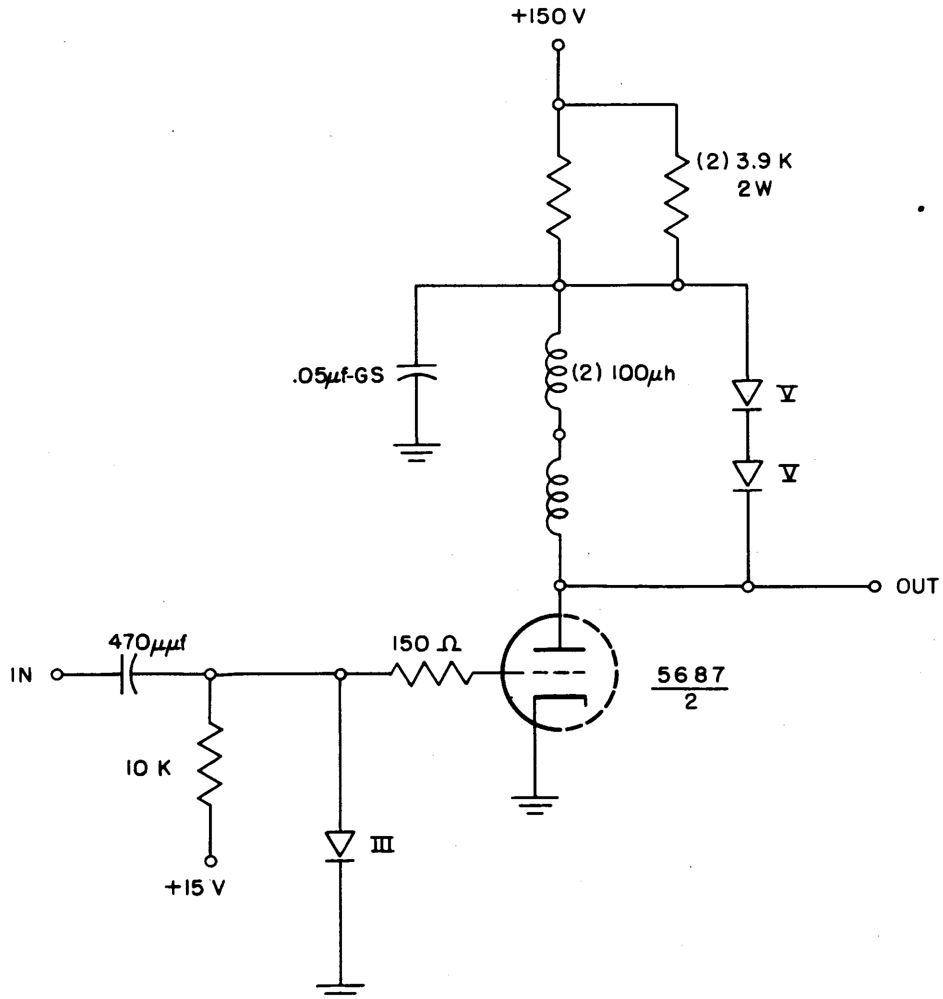
NOTE
X FILAMENT CENTER TAP
BIASED AT -50 V.

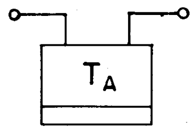
PLUGGABLE UNIT SYSTEM




PKR$_B$
PLUGGABLE UNIT


PKR$_B$
SYSTEM


+150 V
(2) 3.9 K
2 W
.05μf-GS
(2) 100μh
V
V
OUT
IN
470μμf
150 Ω
5687
2
10 K
+15 V
III



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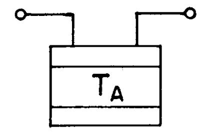
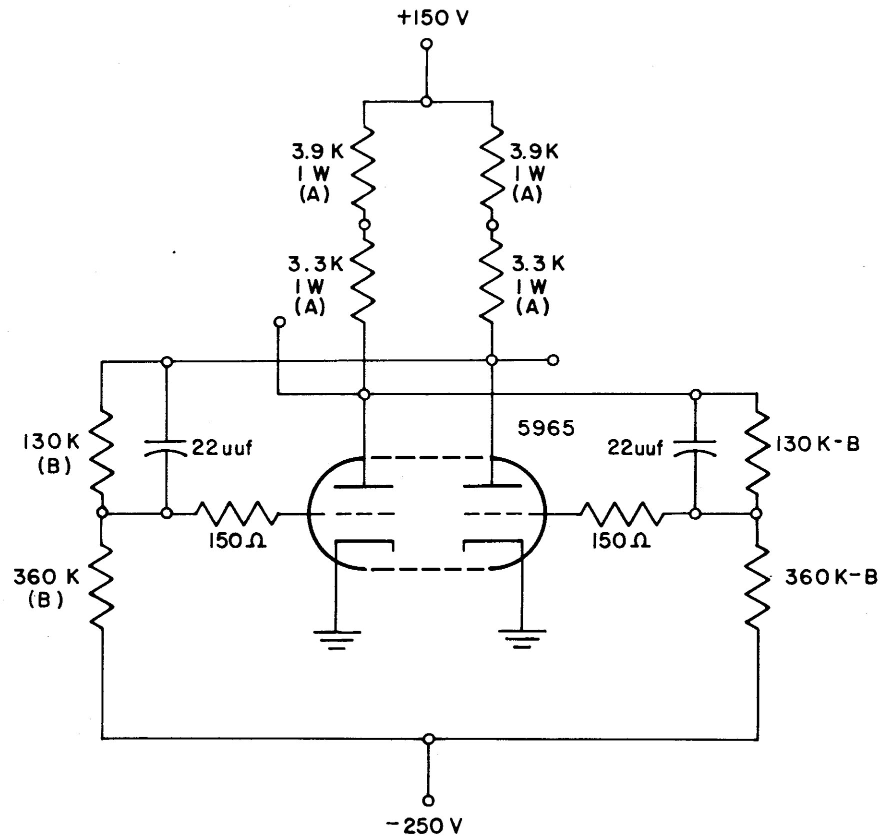
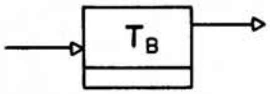


SYSTEM





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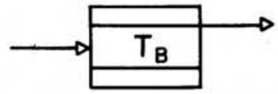
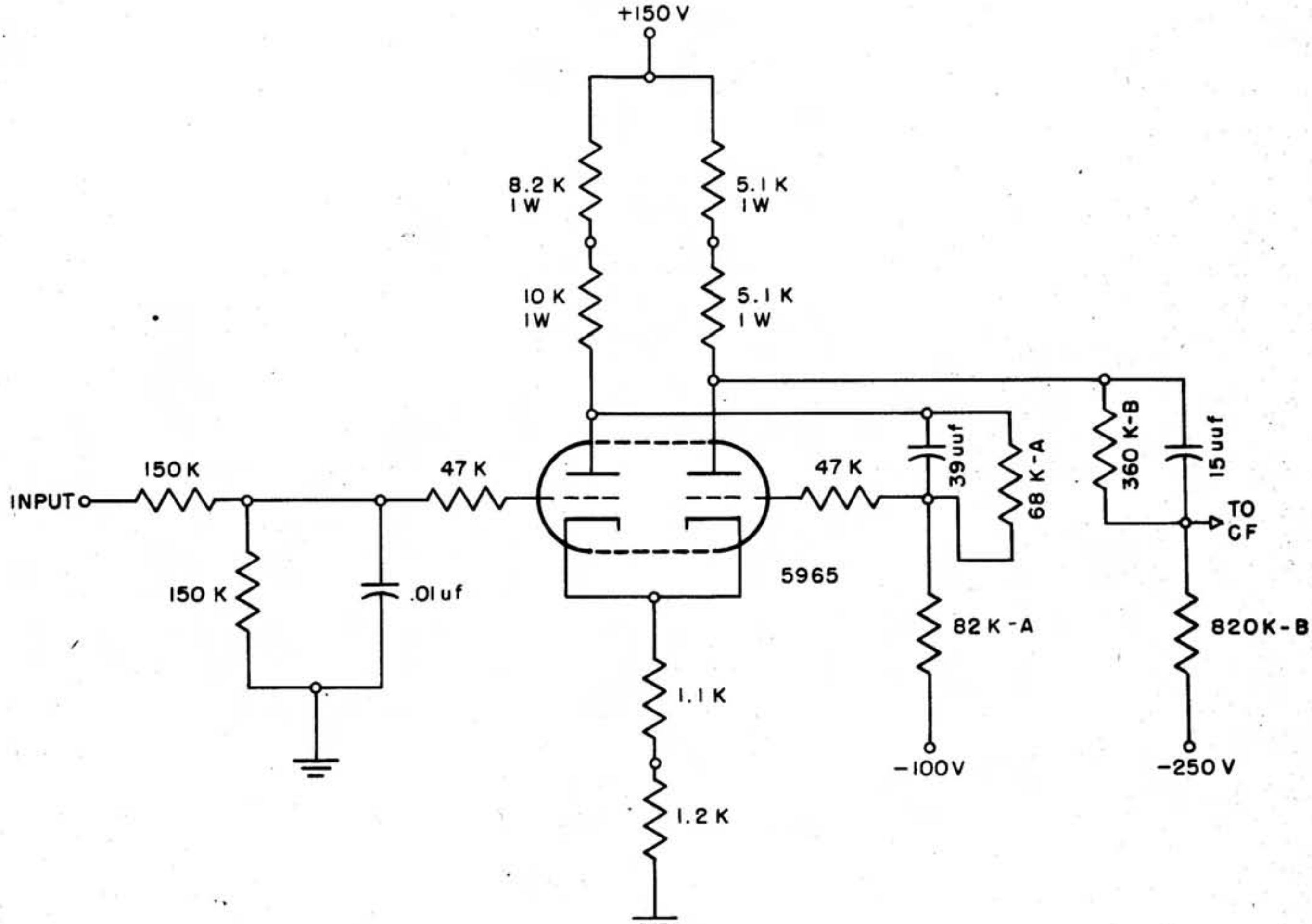
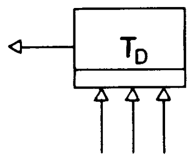
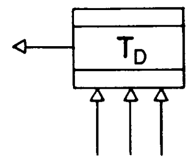


SYSTEM

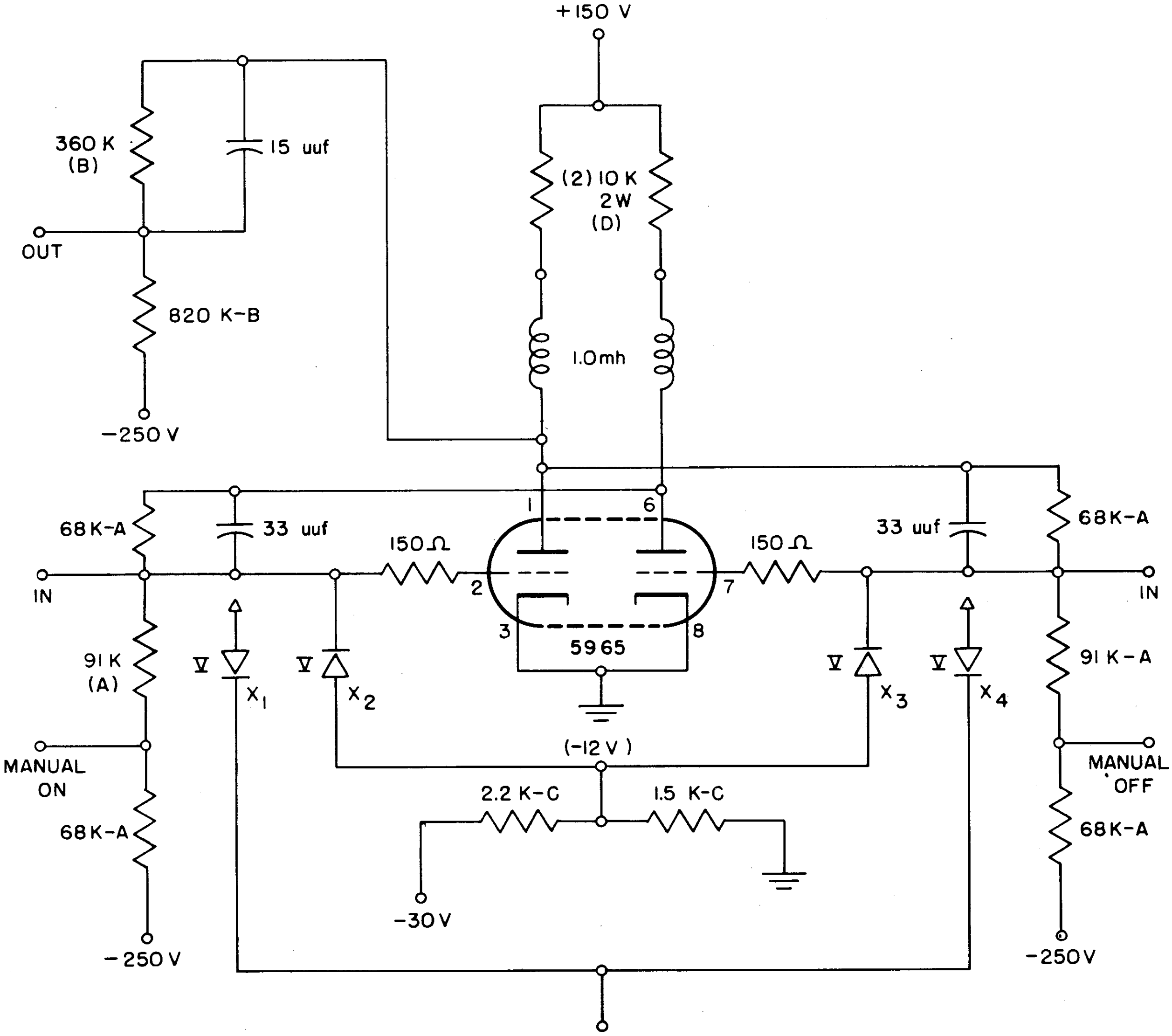


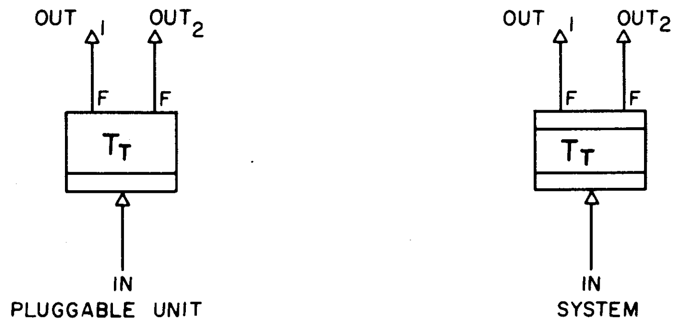


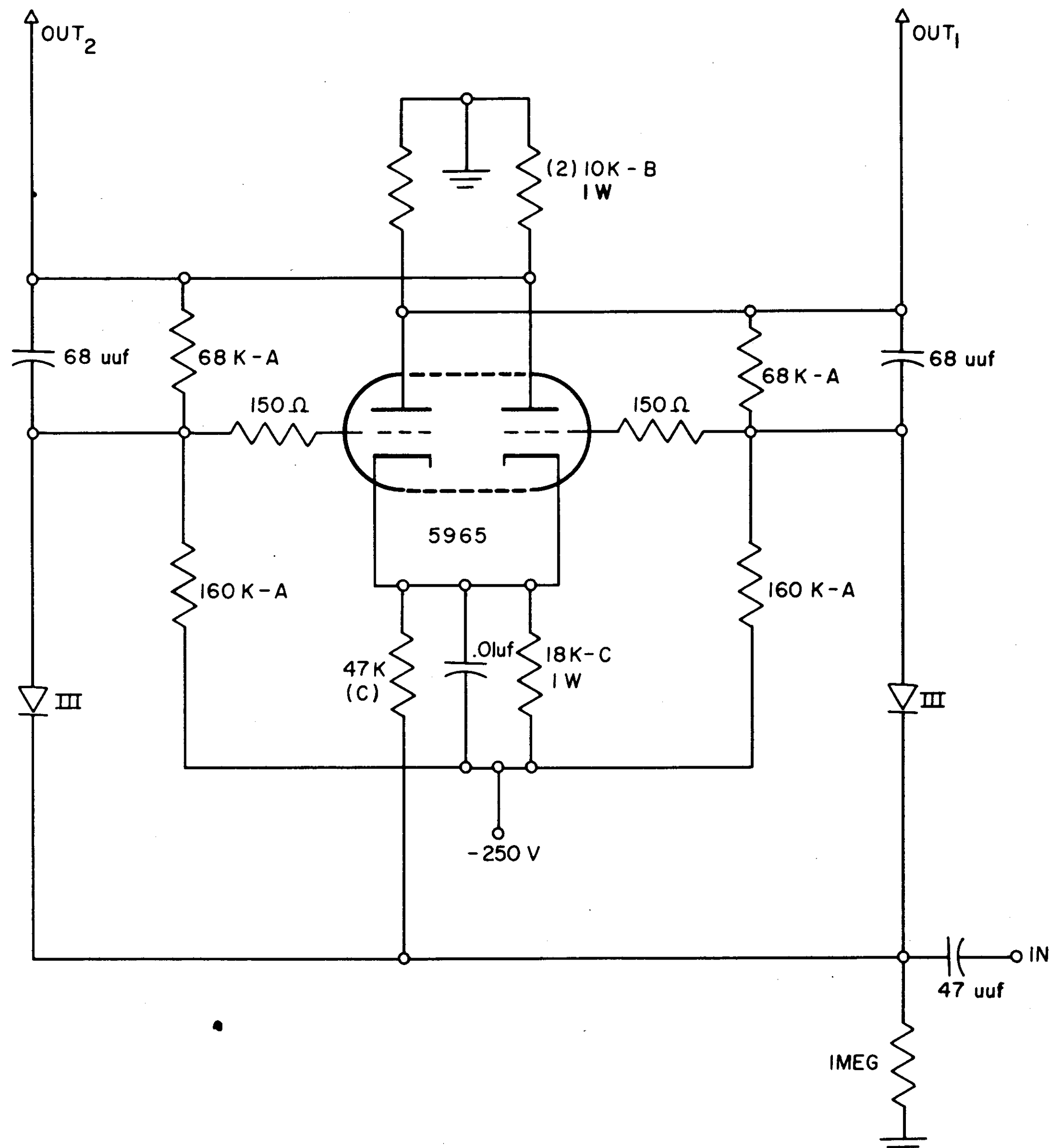
PLUGGABLE UNIT



SYSTEM

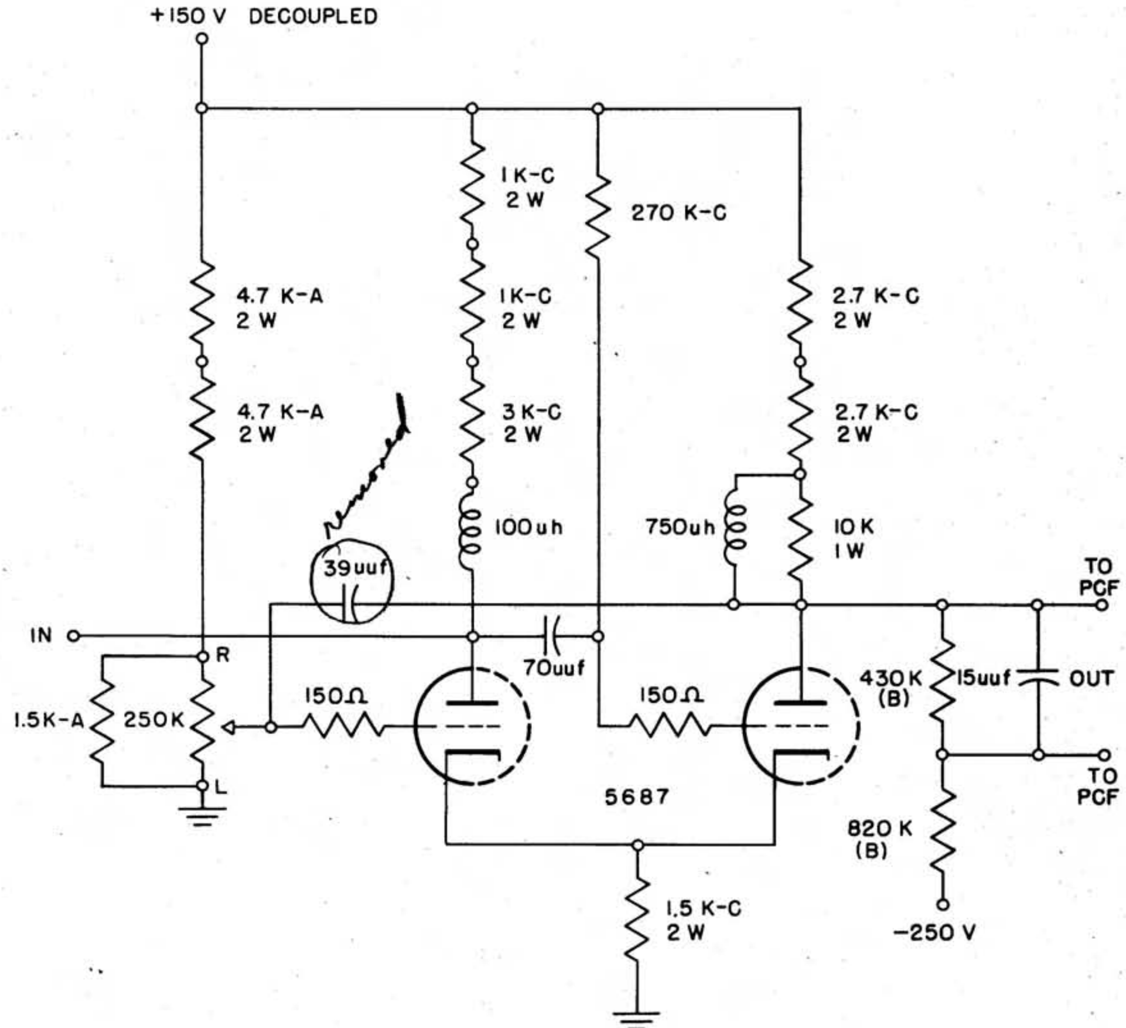



OUT 1
OUT 2
F
F
T_T
IN
PLUGGABLE UNIT
OUT 1
OUT 2
F
F
T_T
IN
SYSTEM

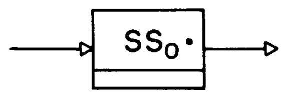

OUT 2
OUT 1
(2) 10K - B
1 W
68 uuf
68 K - A
150 Ω
150 Ω
68 K - A
68 uuf
5965
160 K - A
160 K - A
47 K
(C)
.01uf
18 K - C
1 W
III
III
-250 V
IN
47 uuf
IMEG

used to generate dot pulse

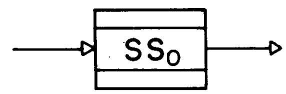
PLUGGABLE UNIT   SYSTEM



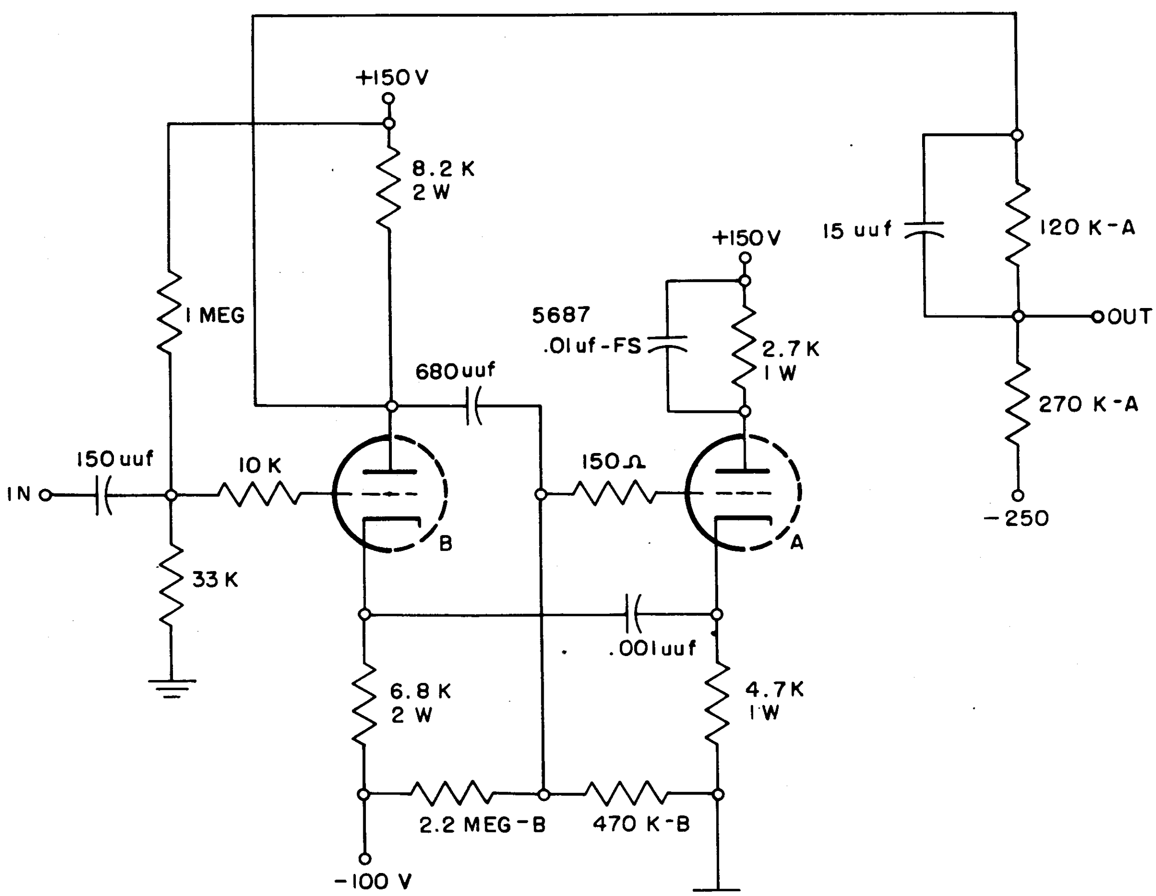
POTENTIOMETER CONVENTION:
FROM SHAFT END, CLOCKWISE ROTATION MOVES ROTOR TOWARD "R" TERMINAL

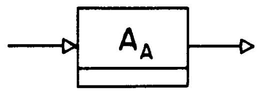


PLUGGABLE UNIT

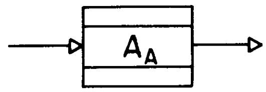


SYSTEM

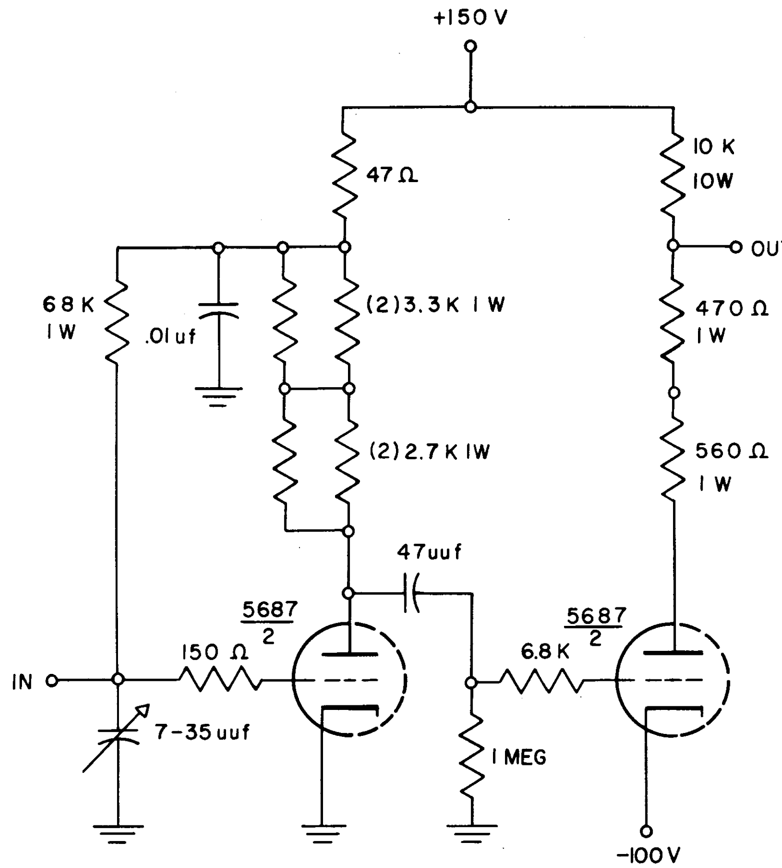




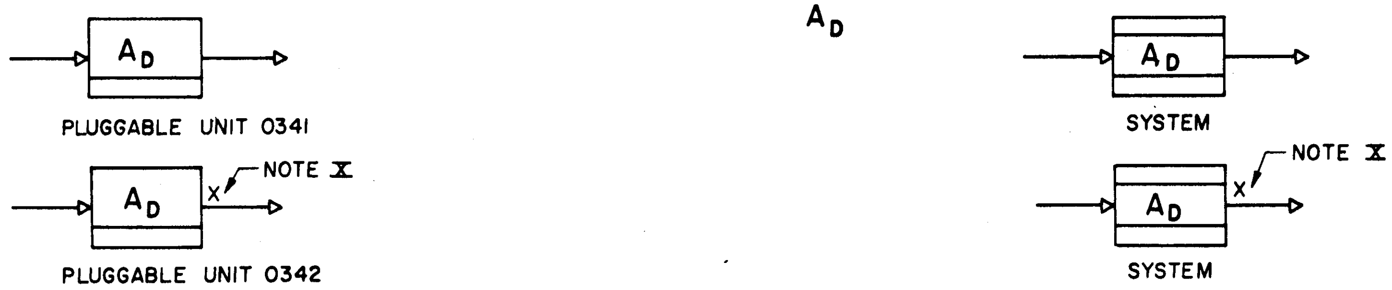
PLUGGABLE UNIT

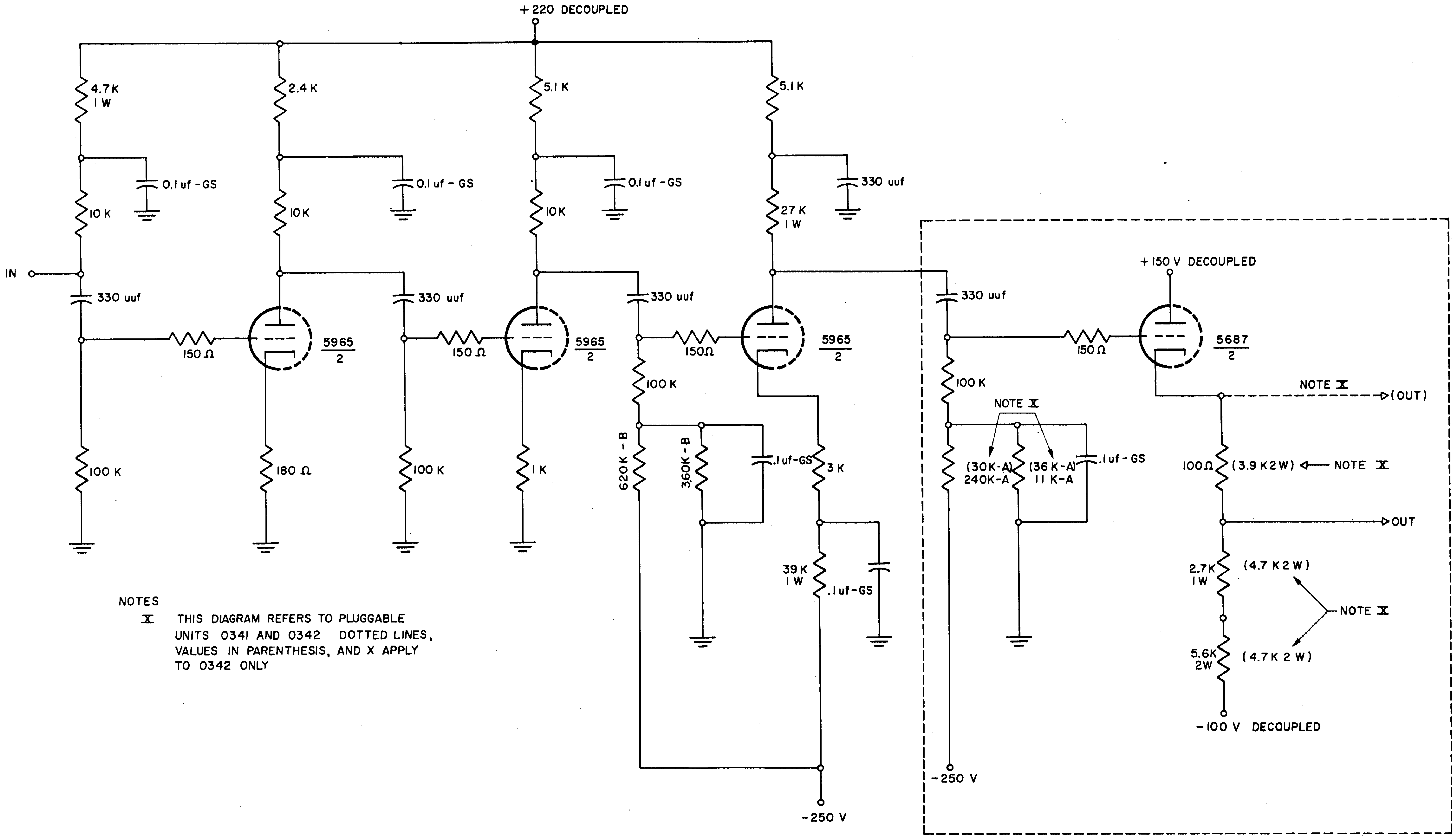


SYSTEM



A_D

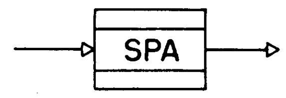




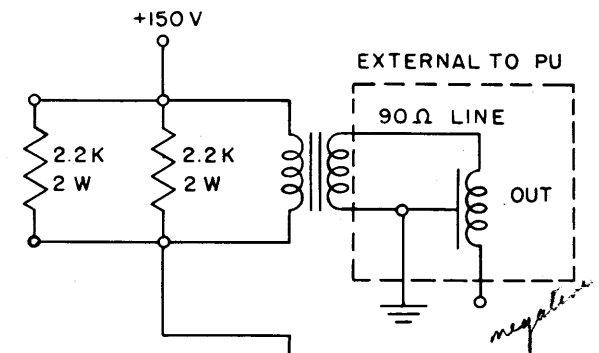
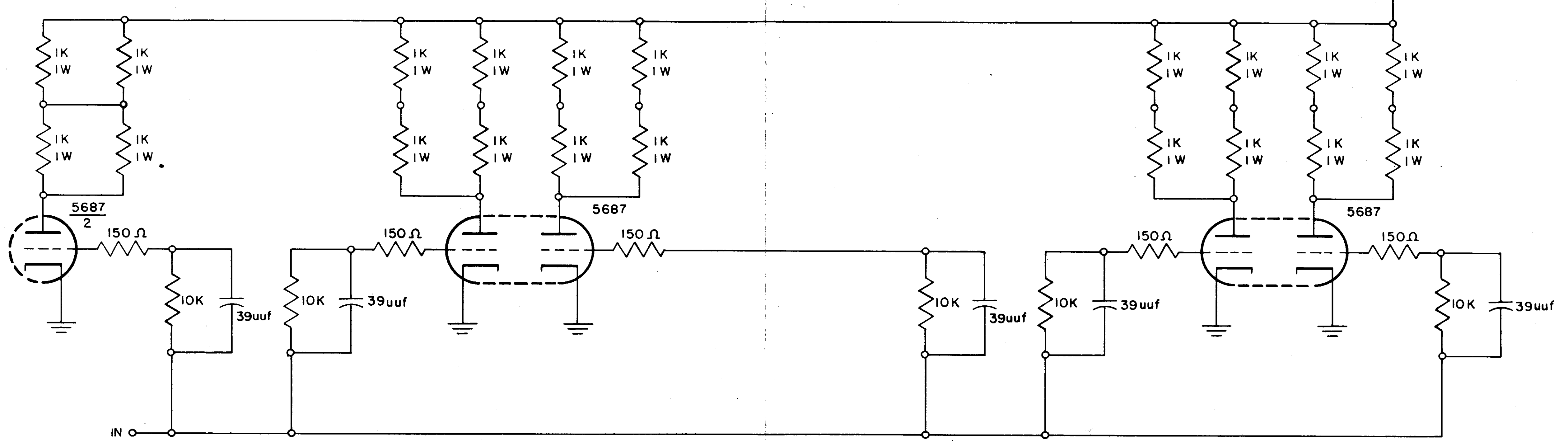
NOTES

X THIS DIAGRAM REFERS TO PLUGGABLE UNITS 0341 AND 0342 DOTTED LINES, VALUES IN PARENTHESIS, AND X APPLY TO 0342 ONLY

PLUGGABLE UNIT

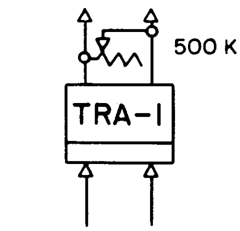


SYSTEM

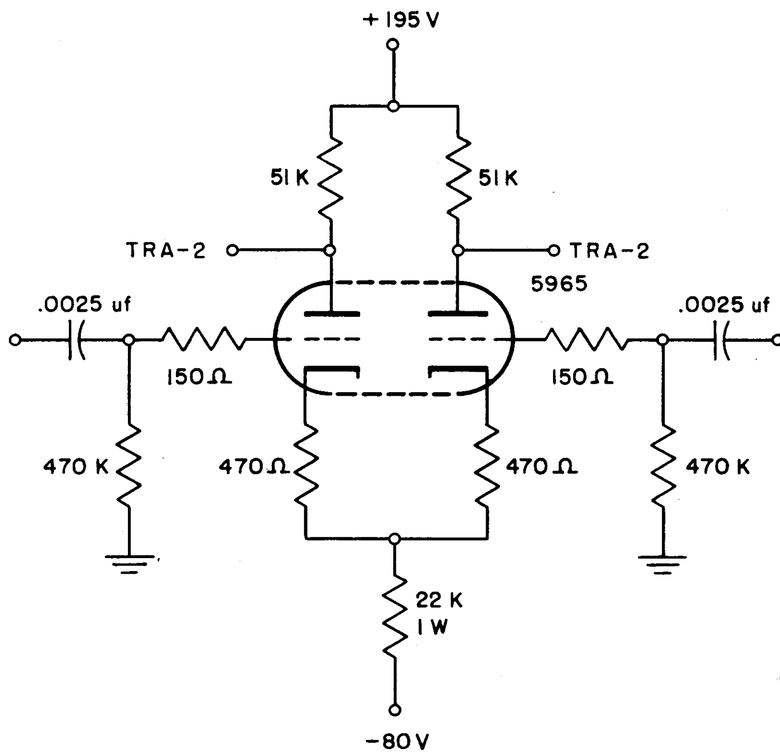
negative sine pulses

323395 EC 50175



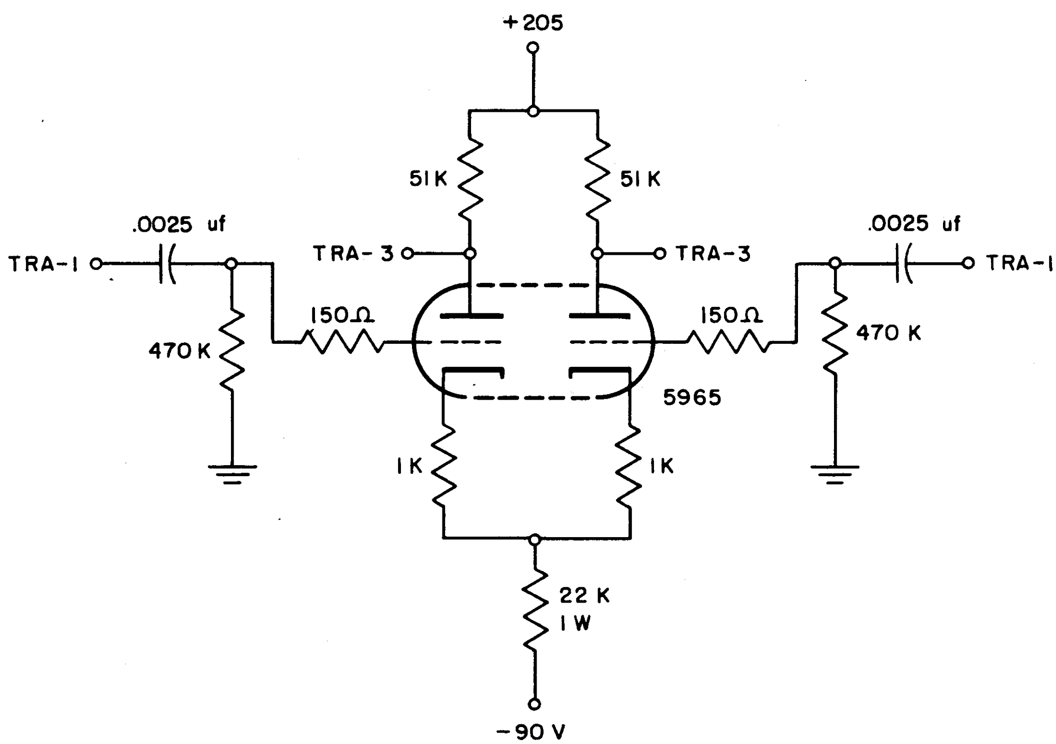
PLUGGABLE UNIT

SYSTEM

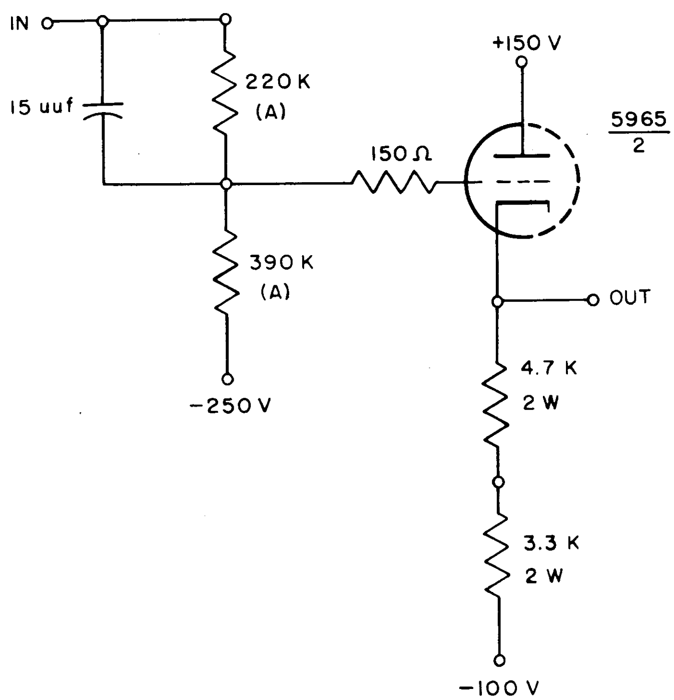


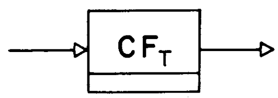
tape read head as inputs


TRA-2
PLUGGABLE UNIT
TRA-2
SYSTEM

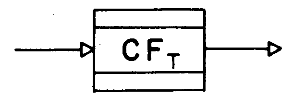

+205
51 K
51 K
.0025 uf
.0025 uf
TRA-1
TRA-3
TRA-3
TRA-1
150Ω
150Ω
470 K
470 K
5965
1 K
1 K
22 K
1 W
-90 V


CF L
PLUGGABLE UNIT
CF L
SYSTEM

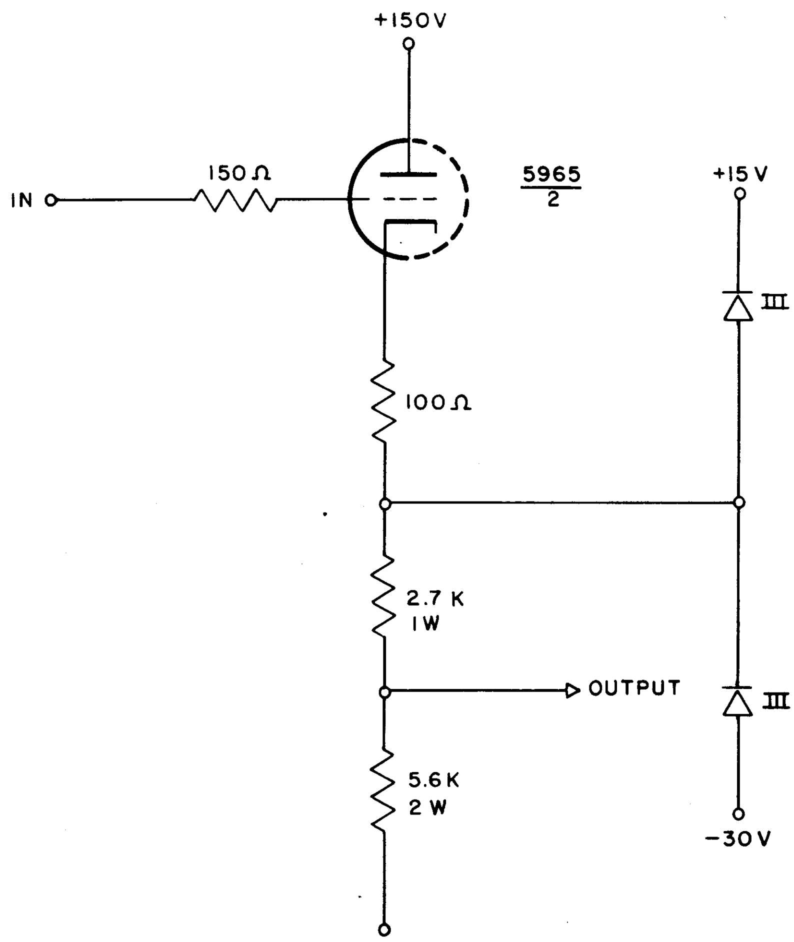

IN
15 uuf
220 K
(A)
390 K
(A)
-250 V
150 Ω
+150 V
5965
2
OUT
4.7 K
2 W
3.3 K
2 W
-100 V

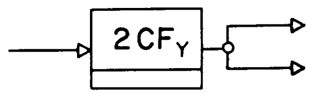


PLUGGABLE UNIT

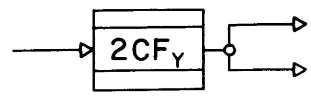


SYSTEM

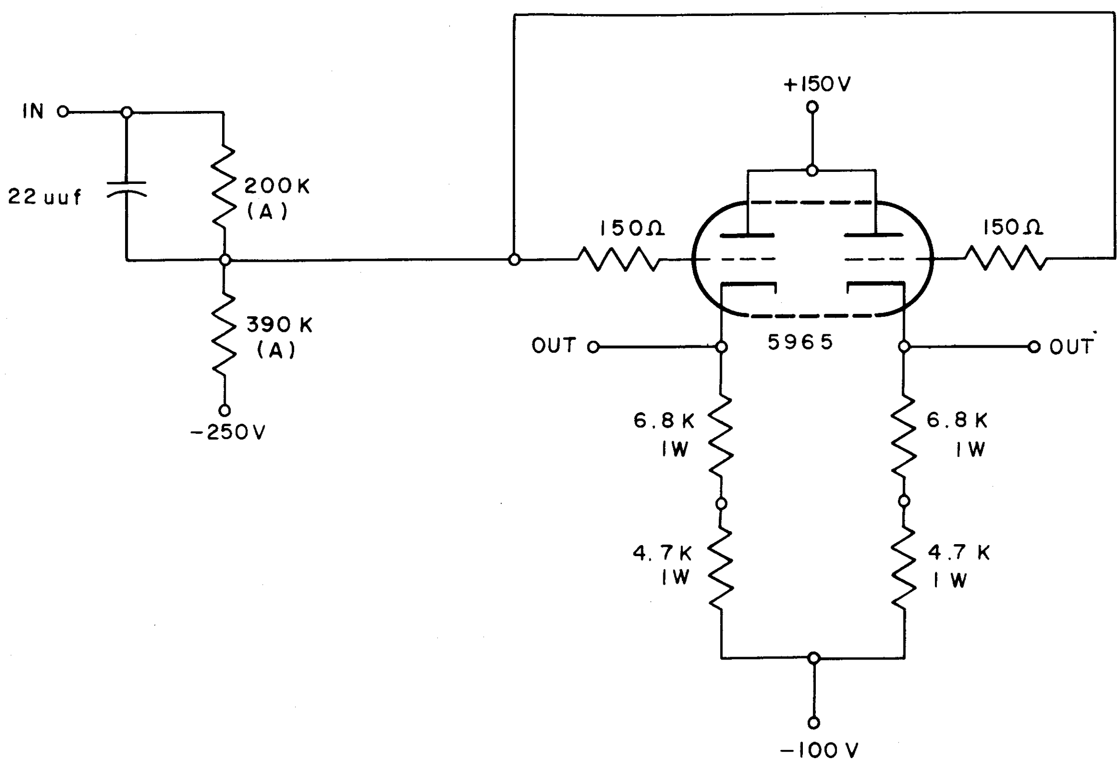


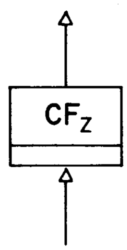


PLUGGABLE UNIT

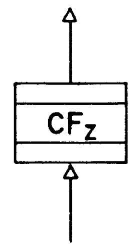


SYSTEM

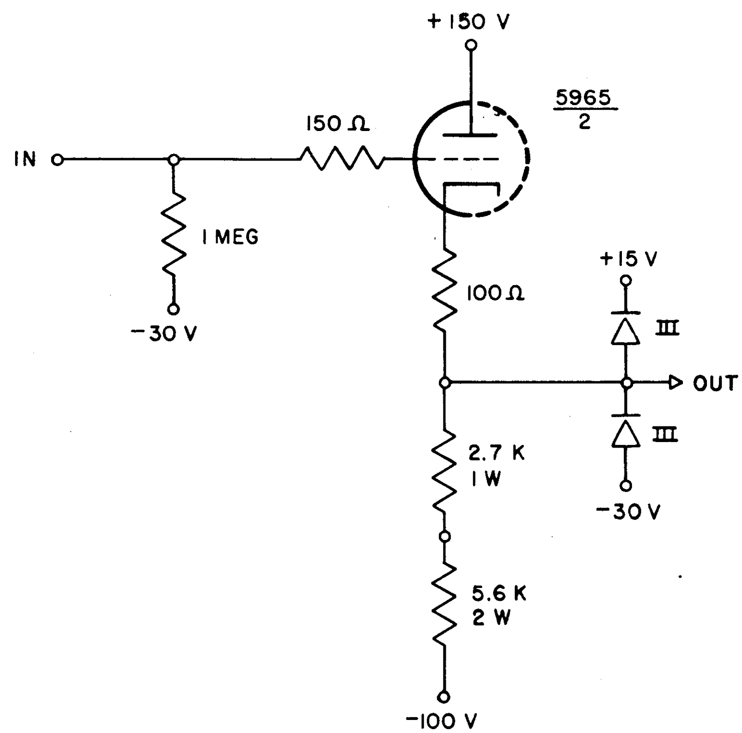




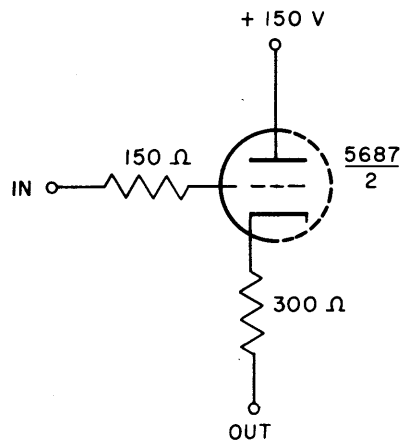
PLUGGABLE UNIT



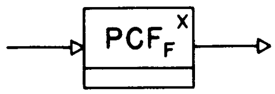
SYSTEM



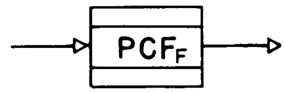
PCF_E
PLUGGABLE UNIT
PCF_E
SYSTEM



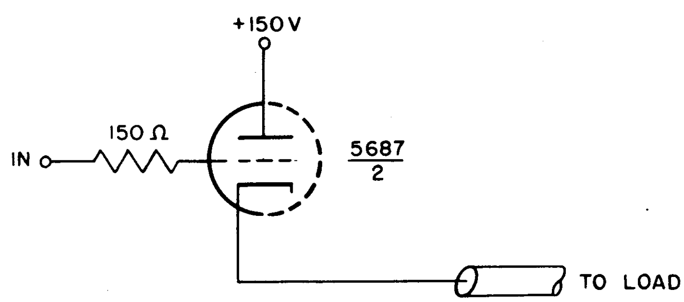
+ 150 V
150 Ω
IN
5687
2
300 Ω
OUT



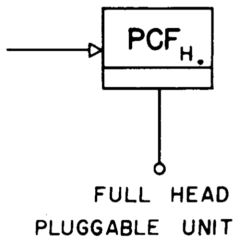
PLUGGABLE UNIT



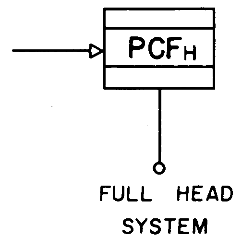
SYSTEM



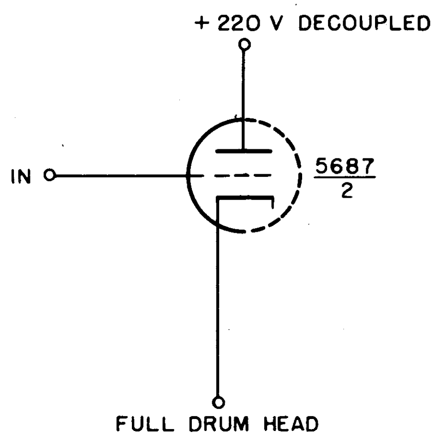
X-INDICATES 220 V
PLATE SUPPLY



$PCF_{H.}$
FULL HEAD
PLUGGABLE UNIT

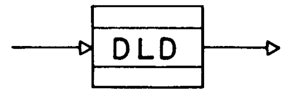


PCF_H
FULL HEAD
SYSTEM

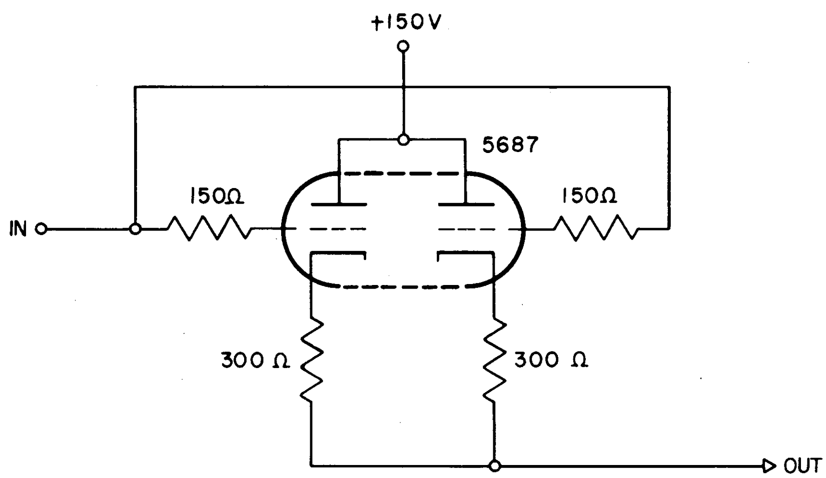


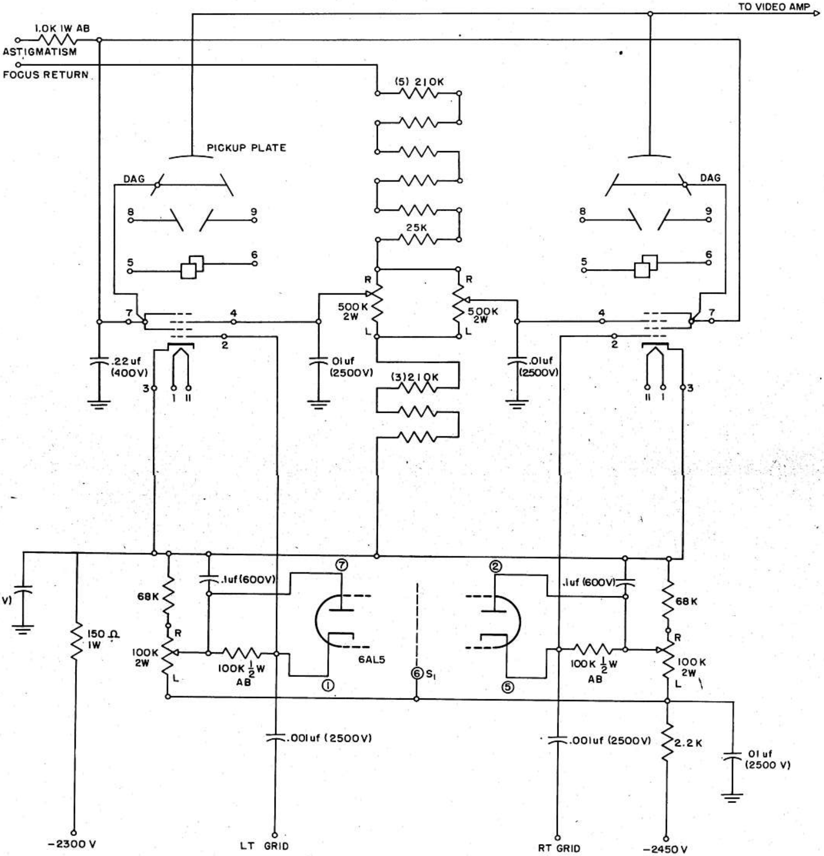
+ 220 V DECOUPLED
IN
5687
2
FULL DRUM HEAD

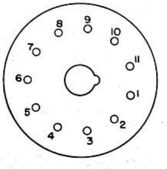
PLUGGABLE UNIT



SYSTEM



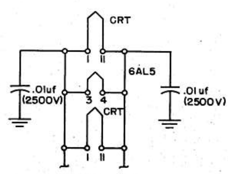



BASE PINS

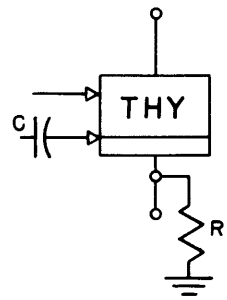
NOTE:
ALL RESISTORS 1WATT 1%
DEPOSITED CARBON, EXCEPT
AS MARKED

POTENTIOMETER CONVENTION:
FROM SHAFT END, CLOCKWISE ROTATION
MOVES ROTOR TOWARD "R" TERMINAL

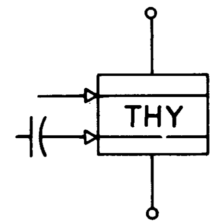
DEFLECTION PLATES:
TUBE PIN 5 - UP → MU CONNECTOR PIN 18
TUBE PIN 6 - DOWN → MU CONNECTOR PIN 17
TUBE PIN 8 - LEFT → MU CONNECTOR PIN 19
TUBE PIN 9 - RIGHT → MU CONNECTOR PIN 20



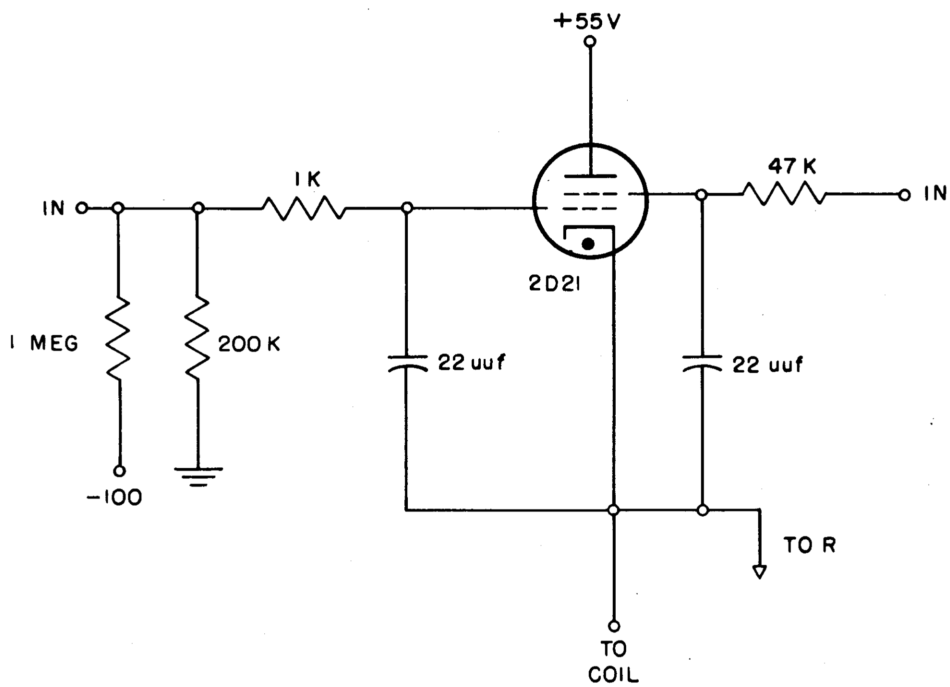
HV HEATERS



PLUGGABLE UNIT



SYSTEM



+ 55V THROUGH CAM CONTACTS

DATA FOR MAIN FRAME ADJUSTMENTS

PULSE	LOCATION SYSTEMS	PHYSICAL	START	DURATION	AMPLITUDE
MU Tgr TU	1.04.04	MF3 A33	3.0	Peaked	40v
BIT Sweep Start	1.04.04	MF3 A33	10.6	Peaked	40v
LEFT SAMPLE	1.04.03	MF3 J32	7.2	Peaked	35v
Right Sample	1.04.03	MF3 J32	9.7	Peaked	35v
SAMPLE RI	1.04.04	MF3 A32	9.5	Peaked	-20 to +40v
DASH	✓ 1.04.02	MF3 J30-00	10.5	2.9usec	-30 to 5v
Left Dot	✓ 1.04.02	MF3 A30-03	6.5	1.2usec	-30 to 15v
Right Dot	✓ 1.04.02	MF3 A30-06 A29-00	9.0	1.2usec	-30 to 15v
Conlt Line	1.04.05	MF3 J34	2.0	12 usec	-30 to 10v

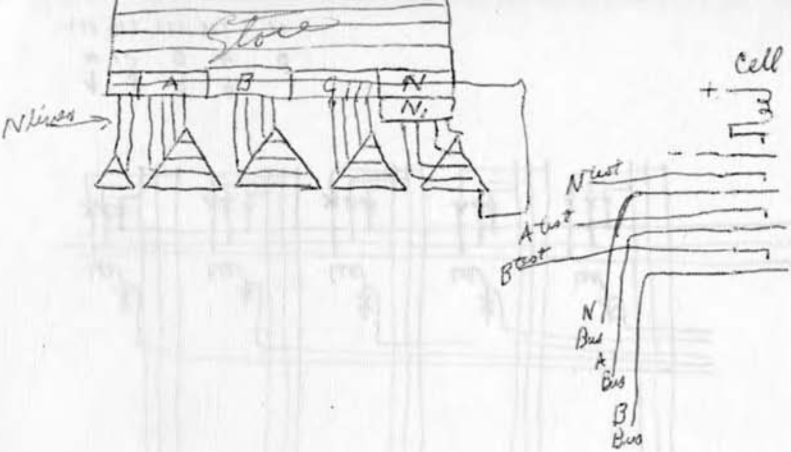
very critical

Start from Delay line duration adj by pot

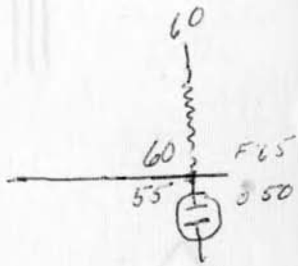
NOTES:

1. The first four pulses above are very critical in timing and aplitudes given are absolute minimums for satisfactory operation.
2. All pulses are measured in ESM Frame as near as possible to drawer connector.
3. Left and Right dots are initiated by 6D1 and 8D1 respectively. Inherent circuit delays account for 0.5usec delay and a lumped constant delay of 0.5usec is added to the Right Dot circuit. The Dash pulse is initiated by a 9D1 and has 0.5usec inherent delay and 1.0usec lumped constant delay line.
4. Sample Pulse adjustments are outlined further in ERM #12
5. Clock line delay and Master Oscillator adjustments are outlined in ERM #6 and 7.

6. The Left and Right Sample pulses are timed at the factory to coincide with the timing of the clipper output. The clipper timing outputs of all drawers for any one machine are centered with their trimmers and the average timing is used. This value should not require adjustment under normal field conditions.



Store
A
B
Q
N
N lines
Cell
+
-
N test
A test
B test
N Bus
A Bus
B Bus



60
60
55

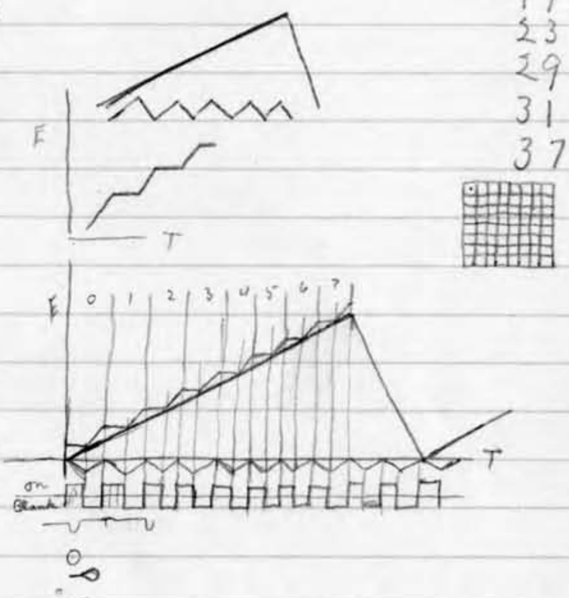
3	8	9
0	1	1
0	0	0
1	0	0
1	0	1

0011	1000	1001	
	101		
0001	0100	0100	1
	101	101	
0000	1010	0010	0

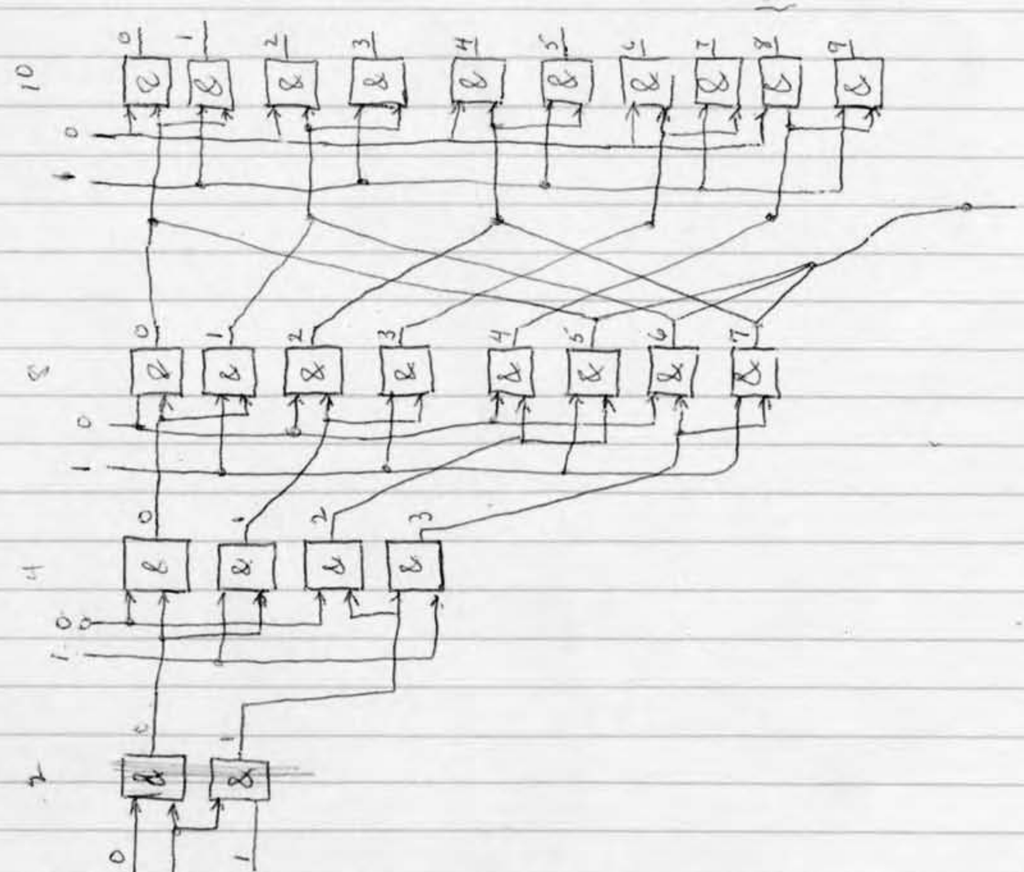
1
3
5
7
11
13
17
19
23
29
31
37

12
14
16
18
20
22
24

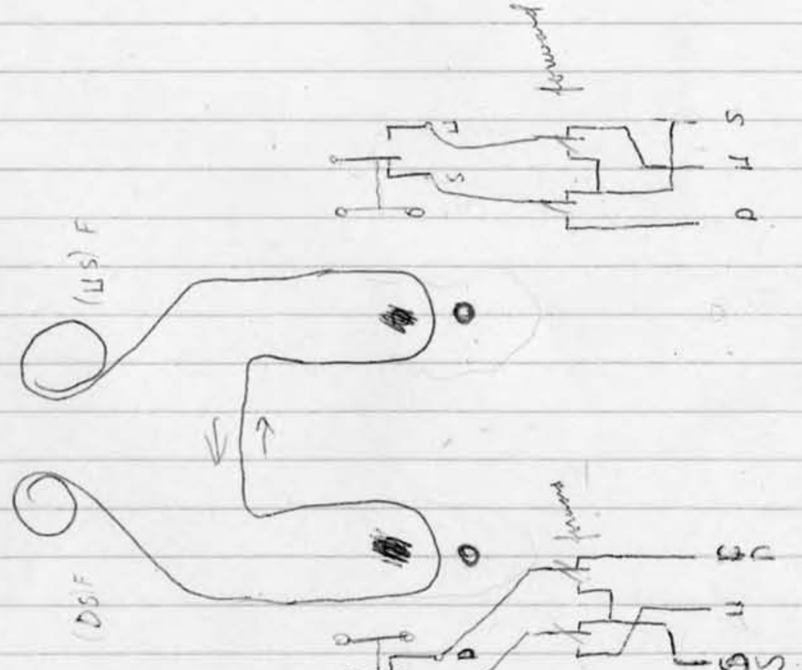
36
38
40



①②③45⑥7⑧9 1011 12



xyz



12

1110 0010

1110 0010 1110 0010 1110 0010 1110 0010 1110 0010 1110 0010

0 | 0
10 | 10

01 2 2 2 1
101101

110001
13624 $\boxed{9}$
12 $\boxed{4}$

110001

100011
124875
1 1
1 3

35

101
101
101
100011

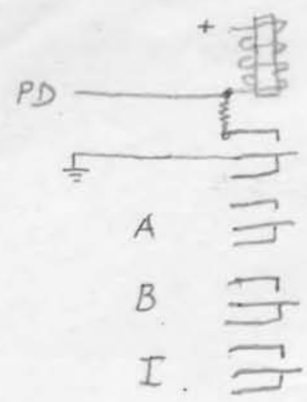
101
111
111
100011

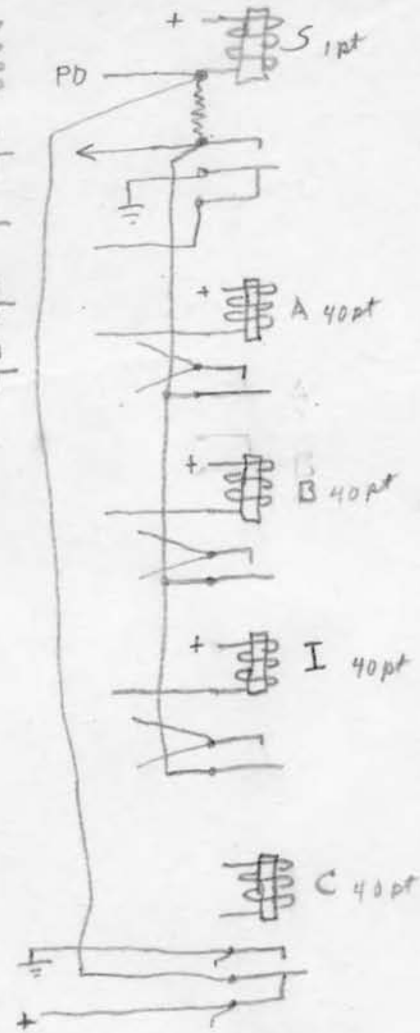
1001001
1001001
1001001
1001001

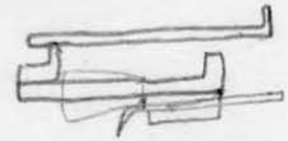
5x1
5x2
5x4

5(4+1)
5(8+2)
5(16+4)

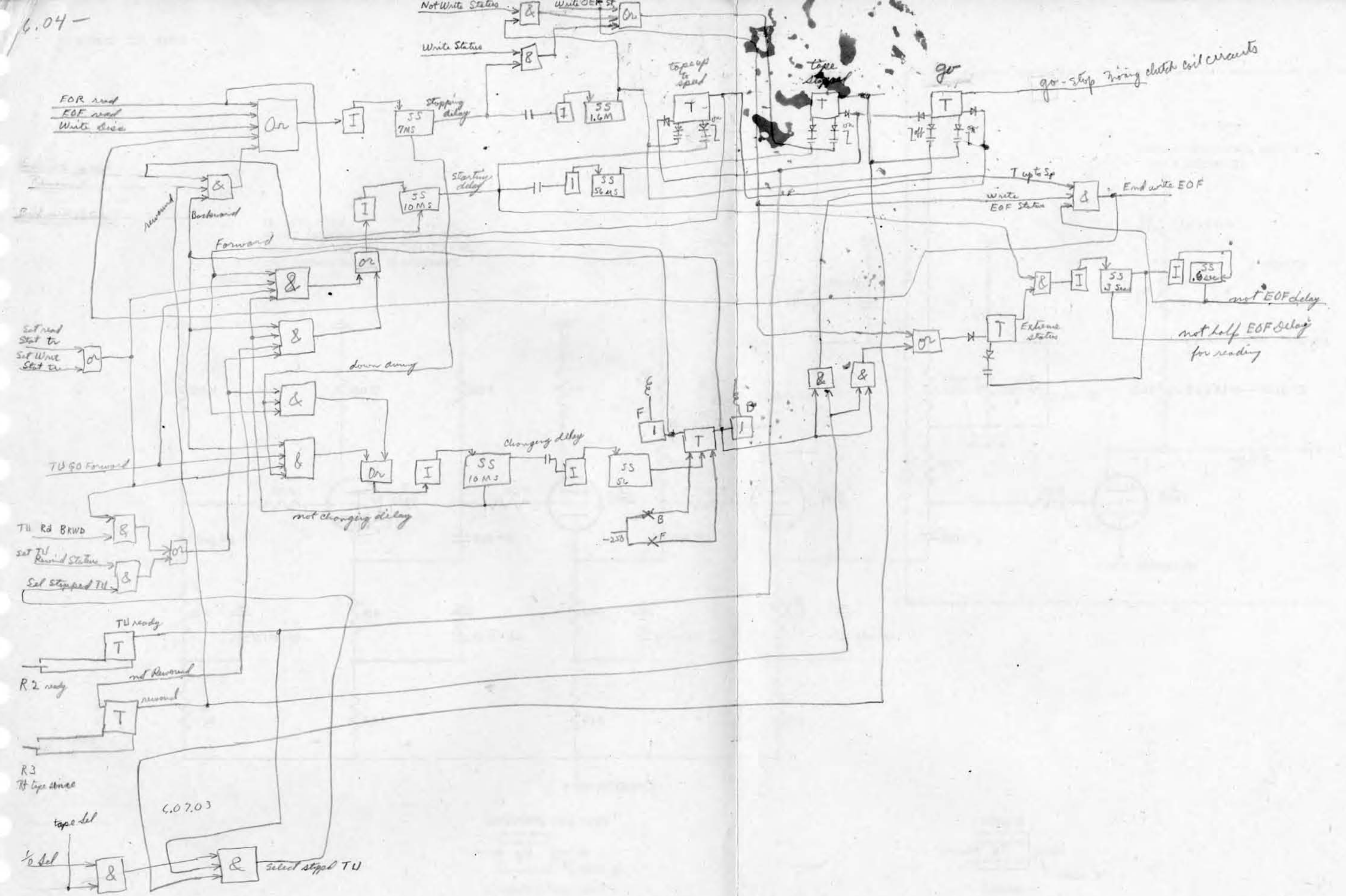
16·1
8·1
4·2
2·1
2·1


+
PD
A
B
I

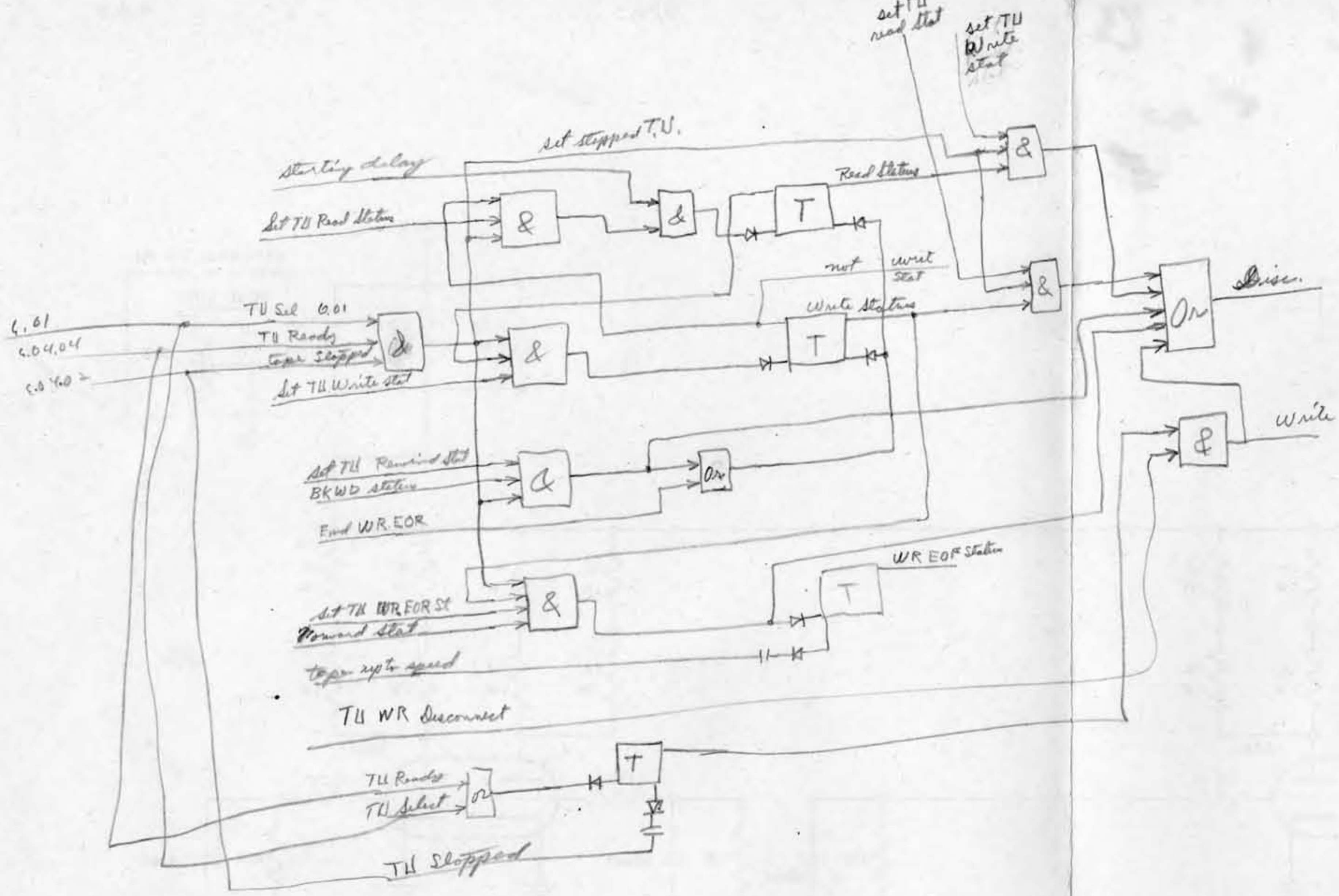

+
S 1pt
PD
+
A 40pt
+
B 40pt
+
I 40pt
C 40pt
+

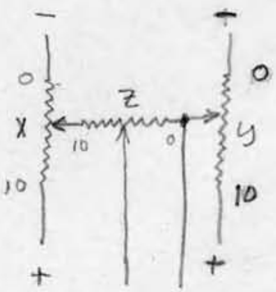


6.04 —



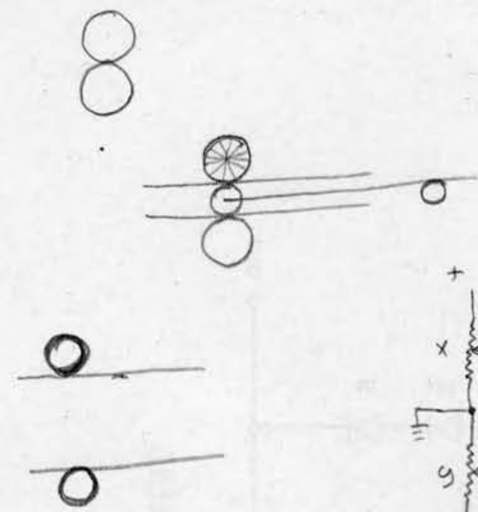
Not Write Status
Write EOF St
Or
Write Status
EOR read
EOF read
Stopping delay
SS 7MS
SS 1.6M
tape up to speed
tape stopped
go
go-stop giving clutch coil circuits
Starting delay
SS 10MS
SS 56MS
T up to Sp
Write EOF Status
End write EOF
rewound
Backward
Forward
Set read Stat tr
Set Write Stat tr
Changing delay
SS 10MS
SS 56
TU GO Forward
not changing delay
Extreme status
not EOF delay
not half EOF delay for reading
TU Rd BKWD
Set TU Rewind Status
Sel Stopped TU
TU ready
not Rewound
rewound
R2 ready
R3
Rt tape sense
6.07.03
tape Sel
I/O Sel
select stopped TU
-250

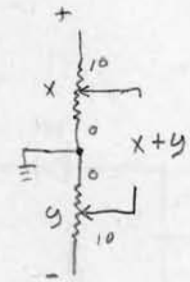

set TU read stat
set TU Write stat
set stopped T.U.
Starting delay
Read Status
Set TU Read Status
not writ stat
Write Status
Disc.
TU Sel G.01
TU Ready
tape Stopped
Set TU Write stat
Write Disc
Set TU Rewind Stat
BKWD status
End WR EOR
WR EOF Status
Set TU WR EOR St
Forward Stat
tape up to speed
TU WR Disconnect
TU Ready
TU Select
TU Stopped

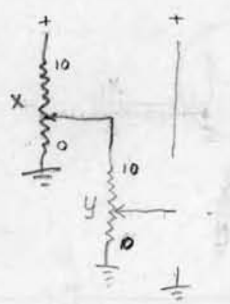


$\frac{x-y}{z}$

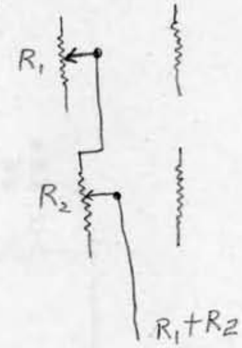
$\frac{x\,y}{x+y}$

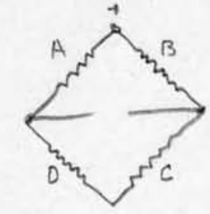




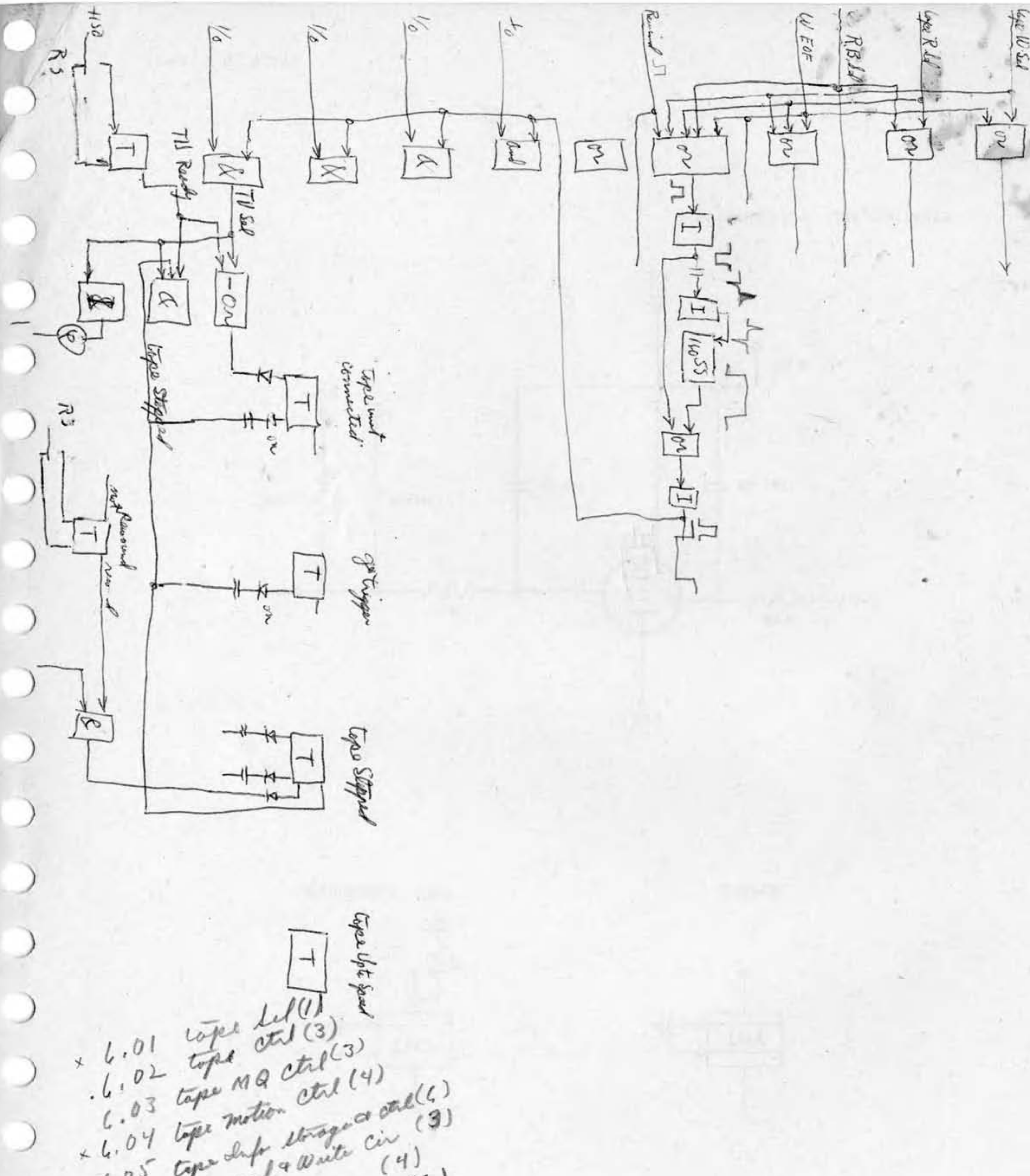


$= \left(\frac{R_1}{R_1+R_2}\right) R_2$

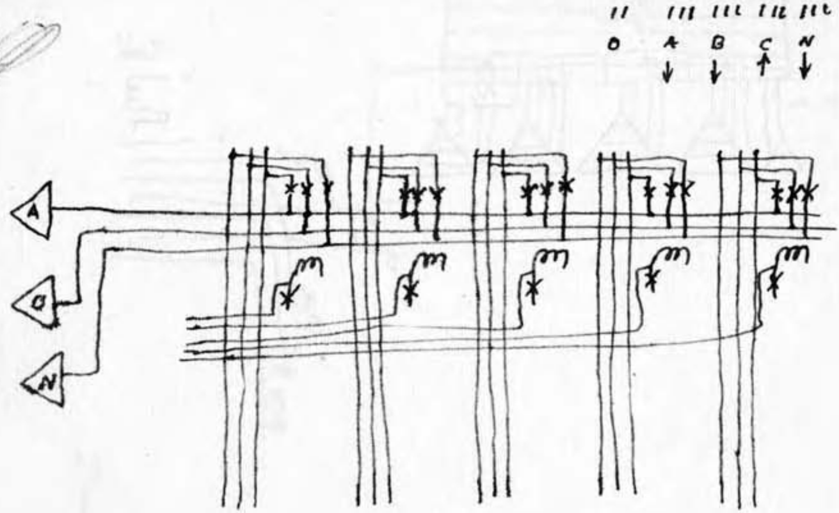


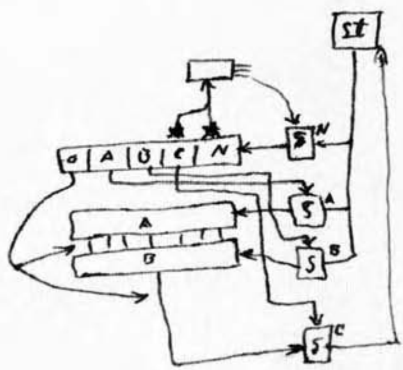


$\frac{A}{C} = \frac{D}{B}$

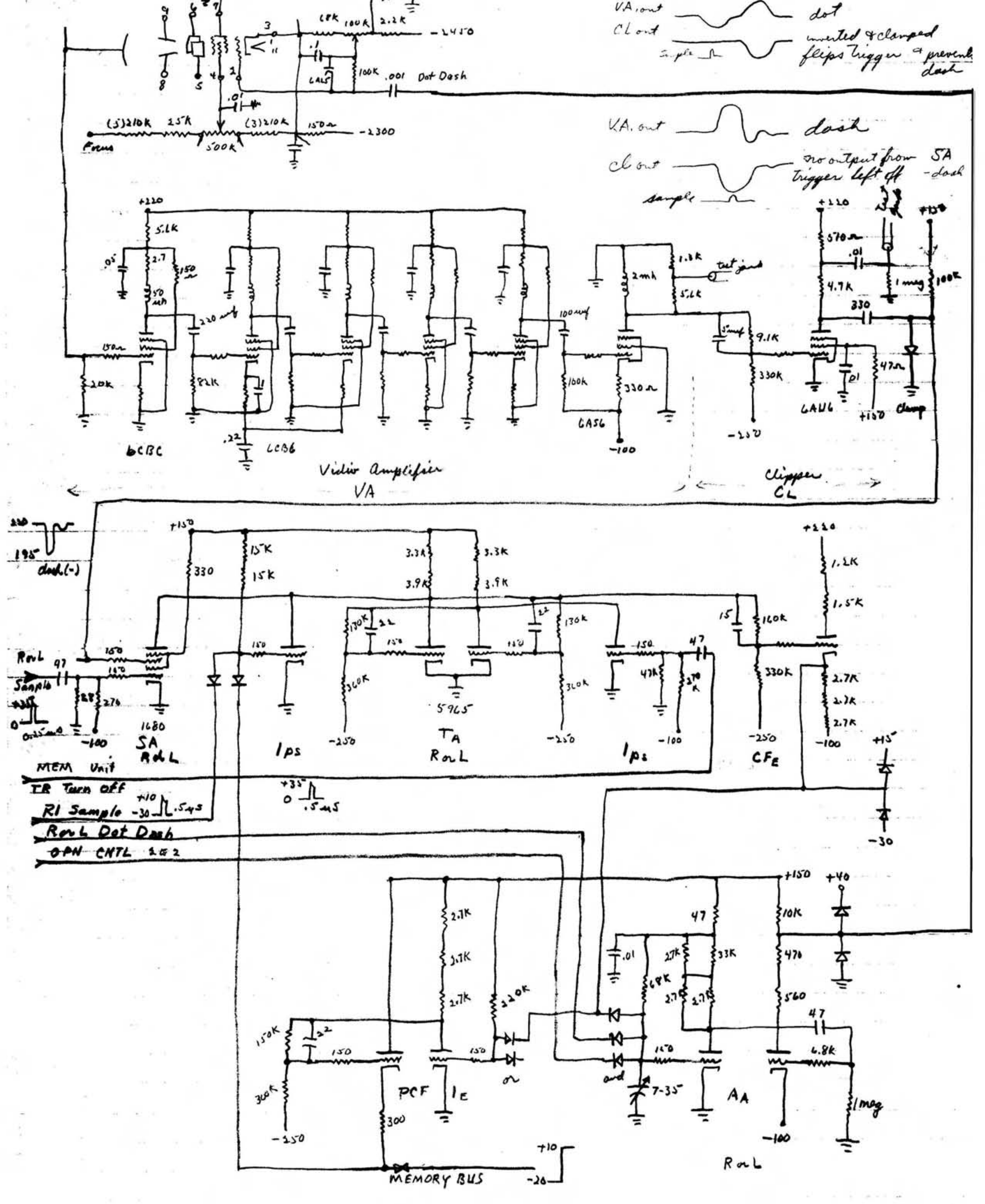


× 6.01 tape sel (1)
.6.02 tape ctrl (3)
6.03 tape MQ ctrl (3)
× 6.04 tape motion ctrl (4)
6.05 tape info storage ctrl (6)
6.06 tape read & write cir (3)
× 6.07 ctrl Busses (4)
× 6.08 magnetic clutch ctrl (2)

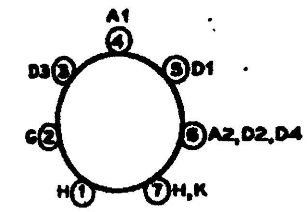

II III III III III
O A B C N
A
O
N
m


St
S N
O A B C N
S A
A
B
S B
S C

MEMORY DRAWER



TYPE	BASE CONN'S	HEATER VOLTS	HEATER AMP.	DEFLECTION	SCREEN DIA. INCHES	USED AS	FOCUSING ANODE Nº1 VOLTS	ANODE Nº2 VOLTS	GRID Nº1 CUTOFF VOLTS	GRID Nº2	MAX. PEAK VOLTS BETWEEN ANODE Nº2 & ANY DEFLECTION PLATE	MAXIMUM FLUORESCENT SCREEN INPUT POWER PER SQ CENTIMETER MILLIWATTS (MOVING PATTERN)	DEFLECTION SENSITIVITY MM/VOLTS D.C. D_1 & D_2	DEFLECTION SENSITIVITY MM/VOLTS D.C. D_3 & D_4	PEAK TO PEAK SIGNAL SWING VOLTS	① SCREEN MATERIAL
2AP1/1814-P1	17	6.3	0.6	ELECTRO-STATIC	2	OSCILLOSCOPE	125 250	500 1000	-30 -60	—	660	—	0.22 0.11	0.26 0.13	—	P1
3AP1/906-P1	1	2.5	2.1	ELECTRO-STATIC	3	OSCILLOSCOPE	125 170 230 285 345 475	400 600 800 1000 1200 1500	— -20 — -34 — -50	—	600	10	0.61 0.55 0.41 0.33 0.27 0.22	0.67 0.58 0.44 0.35 0.29 0.23	—	P1
3AP4/906-P4	1	2.5	2.1	ELECTRO-STATIC	3	PICTURE TUBE	FOR OTHER CHARACTERISTICS, REFER TO TYPE 3AP1/906-P1									P4
3AP5/906-P5	1	2.5	2.1	ELECTRO-STATIC	3	OSCILLOSCOPE	FOR OTHER CHARACTERISTICS, REFER TO TYPE 3AP1/906-P1									P5
3BP1	18	6.3	0.6	ELECTRO-STATIC	3	OSCILLOSCOPE	430 575	1500 2000	-45 -60	—	550	—	0.153 0.115	0.207 0.155	—	P1
3DP1	18	6.3	0.6	ELECTRO-STATIC	3	OSCILLOSCOPE	431	1500	-45	—	550	—	0.17	—	—	P1
3EP1/1806-P1	2	6.3	0.6	ELECTRO-STATIC	3	OSCILLOSCOPE	431	1500	-45	—	550	—	0.153	0.205	—	P1
3FP7	20	6.3	0.6	ELECTRO-STATIC	3	OSCILLOSCOPE	575	ANODE #2 2000 ANODE #3 4000 (5)	-60		550	—	0.101	0.141	—	P7
3GP1	19	6.3	0.6	ELECTRO-STATIC	3	OSCILLOSCOPE	234 350	1000 1500	-33 -50	—	500	—	0.32 0.211	0.36 0.241	—	P1
3GP4	19	6.3	0.6	ELECTRO-STATIC	3	OSCILLOSCOPE	FOR OTHER CHARACTERISTICS, REFER TO TYPE 3GP1									P4
3GP5	19	6.3	0.6	ELECTRO-STATIC	3	OSCILLOSCOPE	FOR OTHER CHARACTERISTICS, REFER TO TYPE 3GP1									P5
3HP7	21	6.3	0.6	ELECTRO-MAGNETIC	3	OSCILLOSCOPE	—	4000	-27	150	FOCUSING, 398 AMPERE TURNS				—	P7
5AP1/1805-P1	2	6.3	0.6	ELECTRO-STATIC	5	OSCILLOSCOPE	432 575	1500 2000	-27 -35	—	500	10	0.23 0.17	0.28 0.21	15 20	P1
5AP4/1800-P1	2	6.3	0.6	ELECTRO-STATIC	5	PICTURE TUBE	FOR OTHER CHARACTERISTICS, REFER TO TYPE 5AP1/1805-P1									P4
5BP1/1802-P1	2	6.3	0.6	ELECTRO-STATIC	5	OSCILLOSCOPE	250 310 425	1200 1500 2000	— -21 -35	—	500	10	0.50 0.40 0.30	0.55 0.44 0.33	—	P1
5BP2	2	6.3	0.6	ELECTRO-STATIC	5	OSCILLOSCOPE	FOR OTHER CHARACTERISTICS, REFER TO TYPE 5BP1/1802-P1									P2
5BP4/1802-P4	2	6.3	0.6	ELECTRO-STATIC	5	PICTURE TUBE	FOR OTHER CHARACTERISTICS, REFER TO TYPE 5BP1/1802-P1									P4
5BP5	2	6.3	0.6	ELECTRO-STATIC	5	OSCILLOSCOPE	FOR OTHER CHARACTERISTICS, REFER TO TYPE 5BP1/1802-P1									P5
5CP1	20	6.3	0.6	ELECTRO-STATIC	5	PICTURE TUBE	430	ANODE #2 1500 ANODE #3 3000 (5)	-45	—	550	—	0.37	0.45	—	P1



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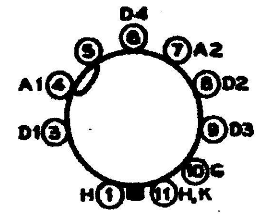

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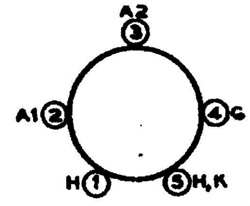

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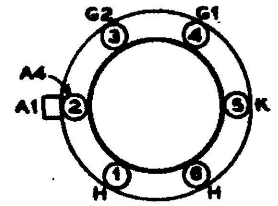

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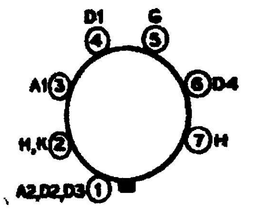

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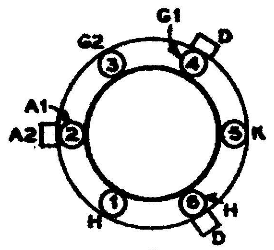

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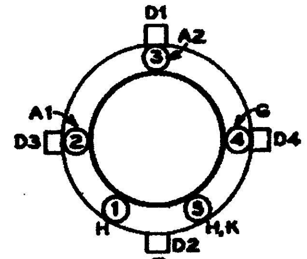

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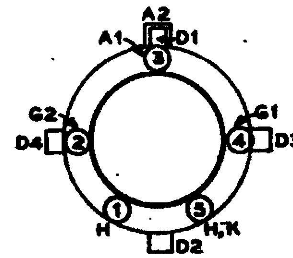

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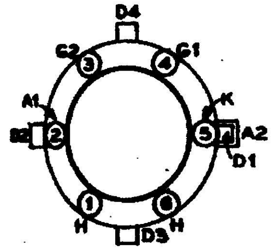

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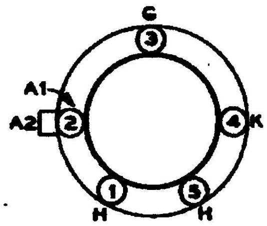

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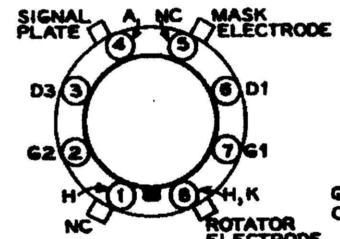

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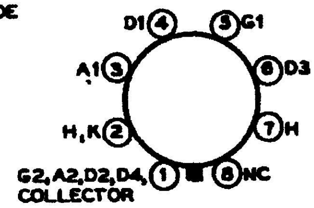

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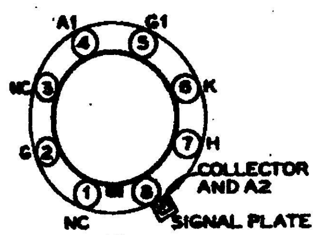

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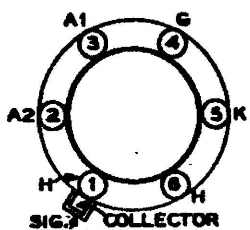

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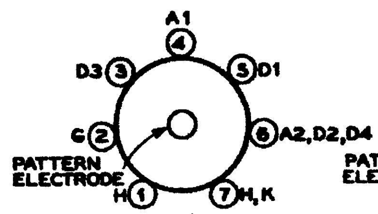

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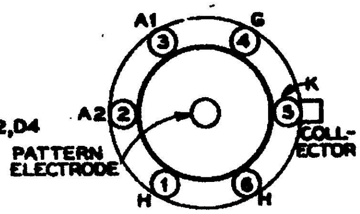

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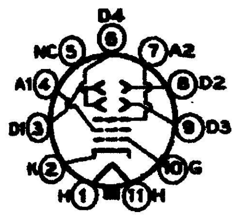

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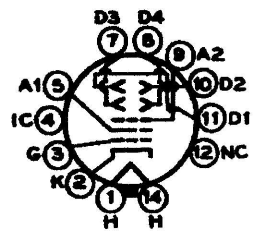

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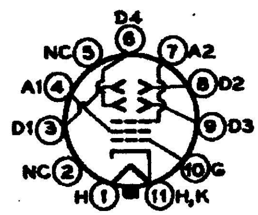

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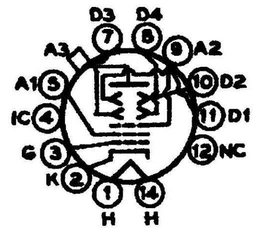

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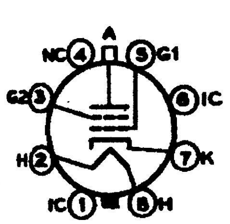

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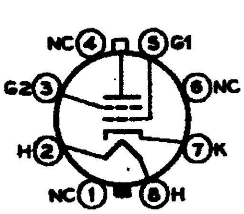

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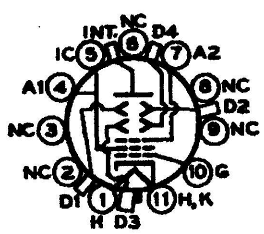

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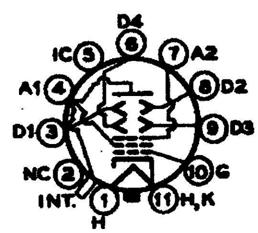

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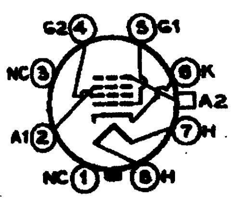

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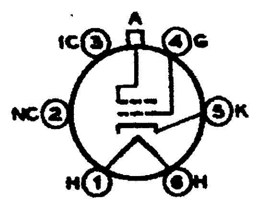

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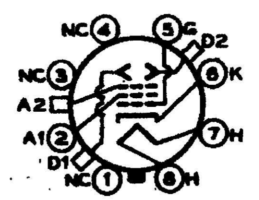

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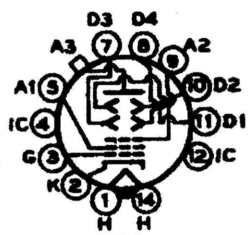

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