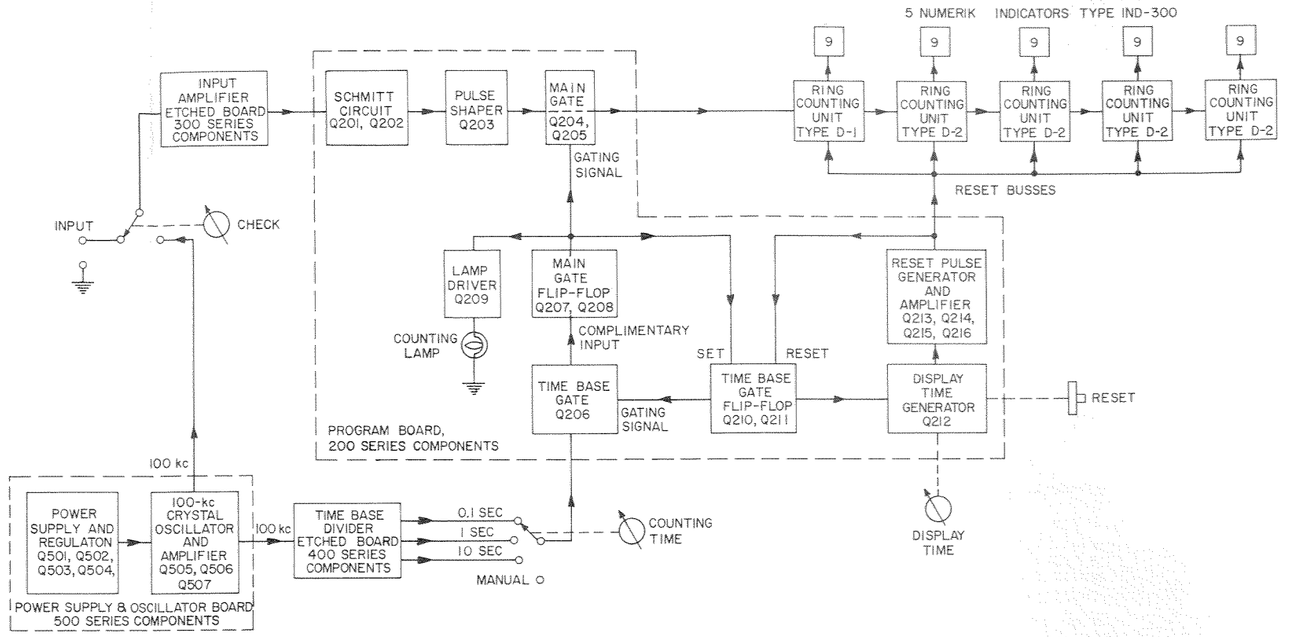


Figure 4-2. Block diagram of the Type 1150-A Digital Frequency Meter.

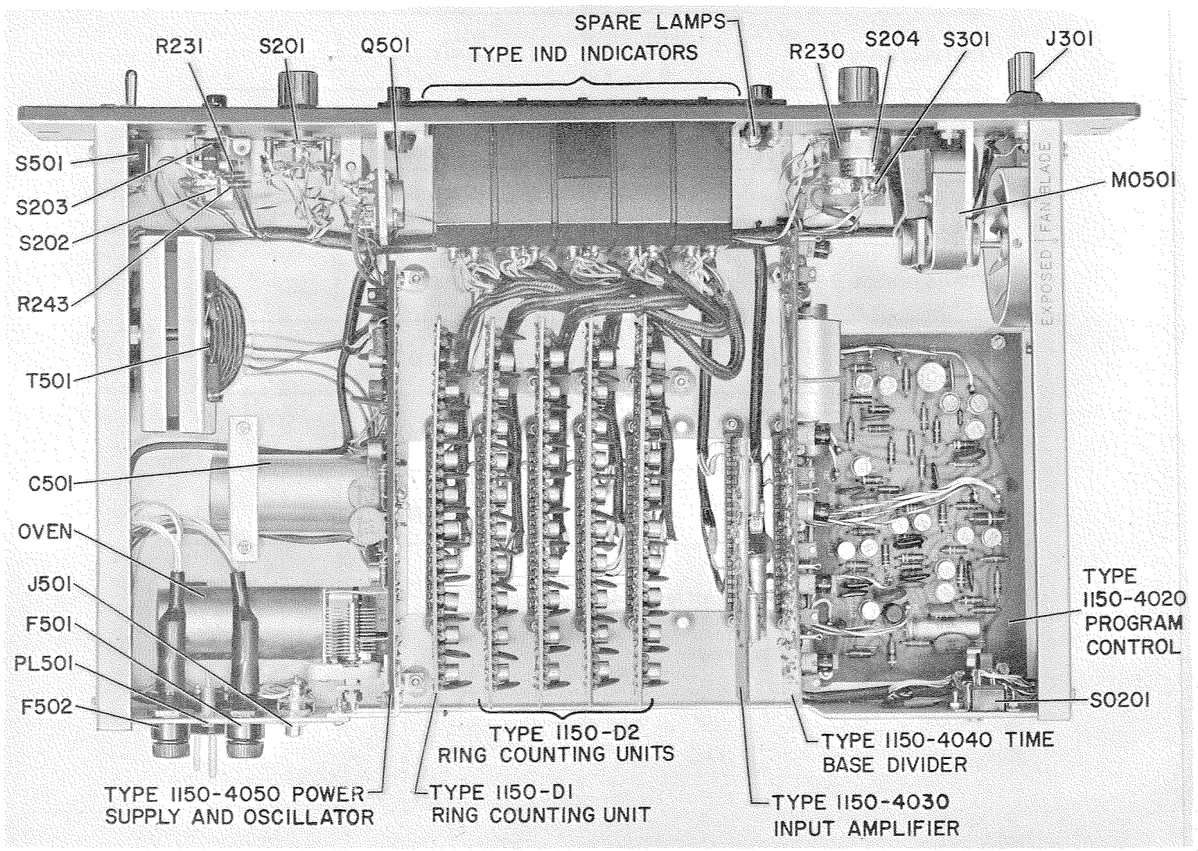
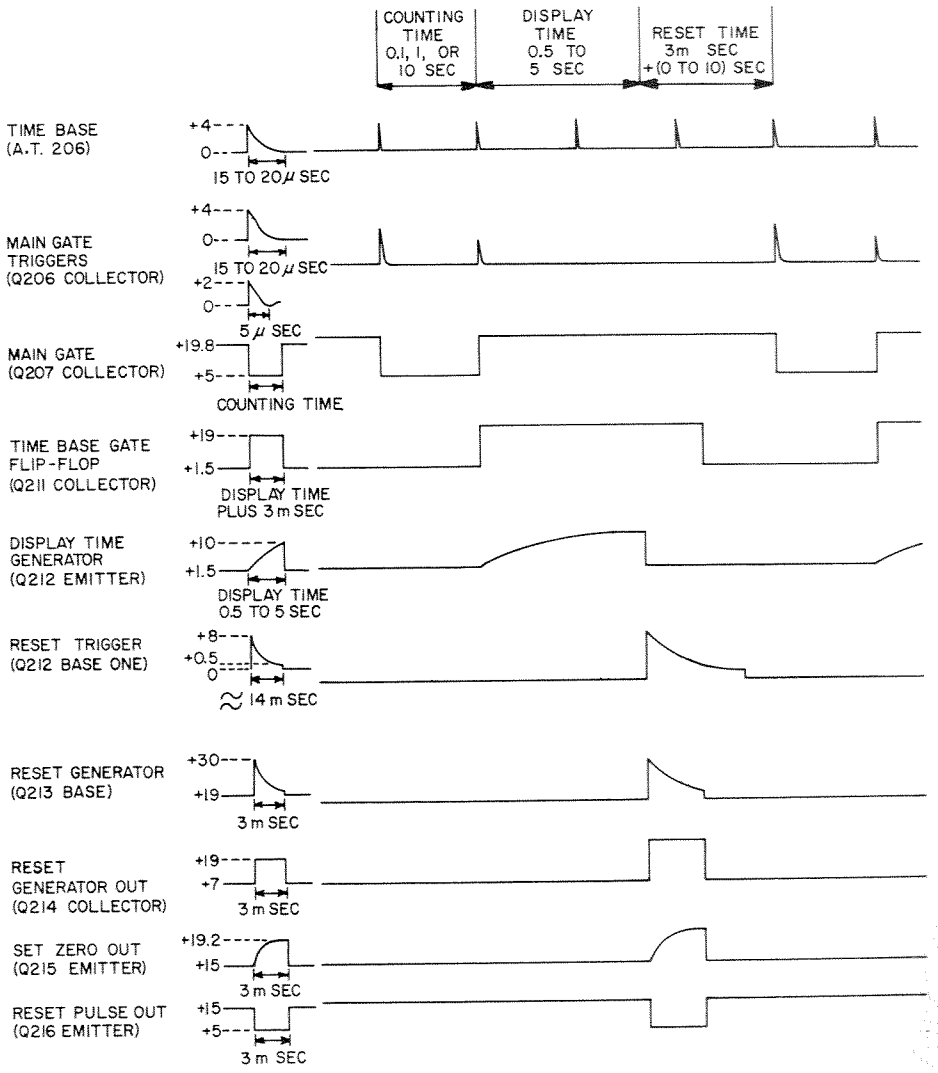
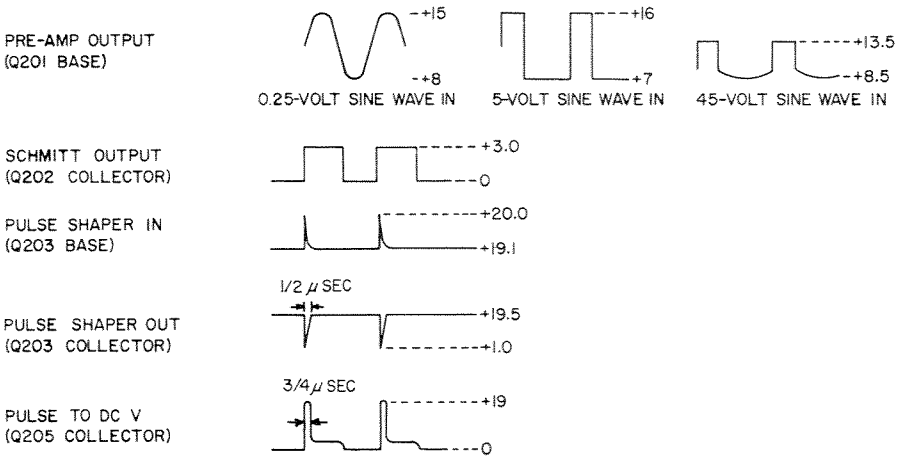


Figure 4-3. Top interior view of the Type 1150-A.


COUNTING TIME 0.1, 1, OR 10 SEC
DISPLAY TIME 0.5 TO 5 SEC
RESET TIME 3m SEC +(0 TO 10) SEC
TIME BASE (A.T. 206)
+4
0
15 TO 20μ SEC
MAIN GATE TRIGGERS (Q206 COLLECTOR)
+4
0
15 TO 20μ SEC
+2
0
5μ SEC
MAIN GATE (Q207 COLLECTOR)
+19.8
+5
COUNTING TIME
TIME BASE GATE FLIP-FLOP (Q211 COLLECTOR)
+19
+1.5
DISPLAY TIME PLUS 3 m SEC
DISPLAY TIME GENERATOR (Q212 EMITTER)
+10
+1.5
DISPLAY TIME 0.5 TO 5 SEC
RESET TRIGGER (Q212 BASE ONE)
+8
+0.5
0
≈ 14 m SEC
RESET GENERATOR (Q213 BASE)
+30
+19
3 m SEC
RESET GENERATOR OUT (Q214 COLLECTOR)
+19
+7
3 m SEC
SET ZERO OUT (Q215 EMITTER)
+19.2
+15
3 m SEC
RESET PULSE OUT (Q216 EMITTER)
+15
+5
3 m SEC



Transistor (Type)	Terminal	Dc Volts to Ground	Transistor (Type)	Terminal	Dc Volts to Ground
Q201 (TR-19/2N1303)	E	6.0	Q209 (TR-18/2N1302)	E	18.9
	B	11.8		B	19.0
	C	5.5		C	20.0
Q202 (TR-19/2N1303)	E	12.5	Q210 (TR-8/2N1372)	E	19.2
	B	13.0		B	19.0
	C	0		C	19.0
Q203 (TR-27/2N1499A)	E	19.3	Q211 (TR-8/2N1372)	E	19.2
	B	19.2		B	19.8
	C	19.2		C	1.5
Q204 (TR-19/2N1303)	E	19.2	Q212 (TR-26/2N1671B)	E	1.5
	B	18.9		B1	0
	C	19.1		B2	20.0
Q205 (TR-19/2N1303)	E	19.1	Q213 (TR-8/2N1372)	E	19.2
	B	19.2		B	19.0
	C	0		C	19.0
Q206 (TR-19/2N1303)	E	0	Q214 (TR-8/2N1372)	E	19.2
	B	1.5		B	19.9
	C	0		C	7.0
Q207 (TR-8/2N1372)	E	19.2	Q215 (TR-8/2N1372)	E	15.0
	B	19.6		B	14.5
	C	5.0		C	14.9
Q208 (TR-8/2N1372)	E	19.2	Q216 (TR-8/2N1372)	E	14.9
	B	19.0		B	19.0
	C	19.0		C	0

Conditions of Measurement:

COUNTING TIME control set to MANUAL.
CHECK switch in position closer to the panel.
START-STOP switch in position farther out from the panel.
Operate RESET switch to give a display of 00000.

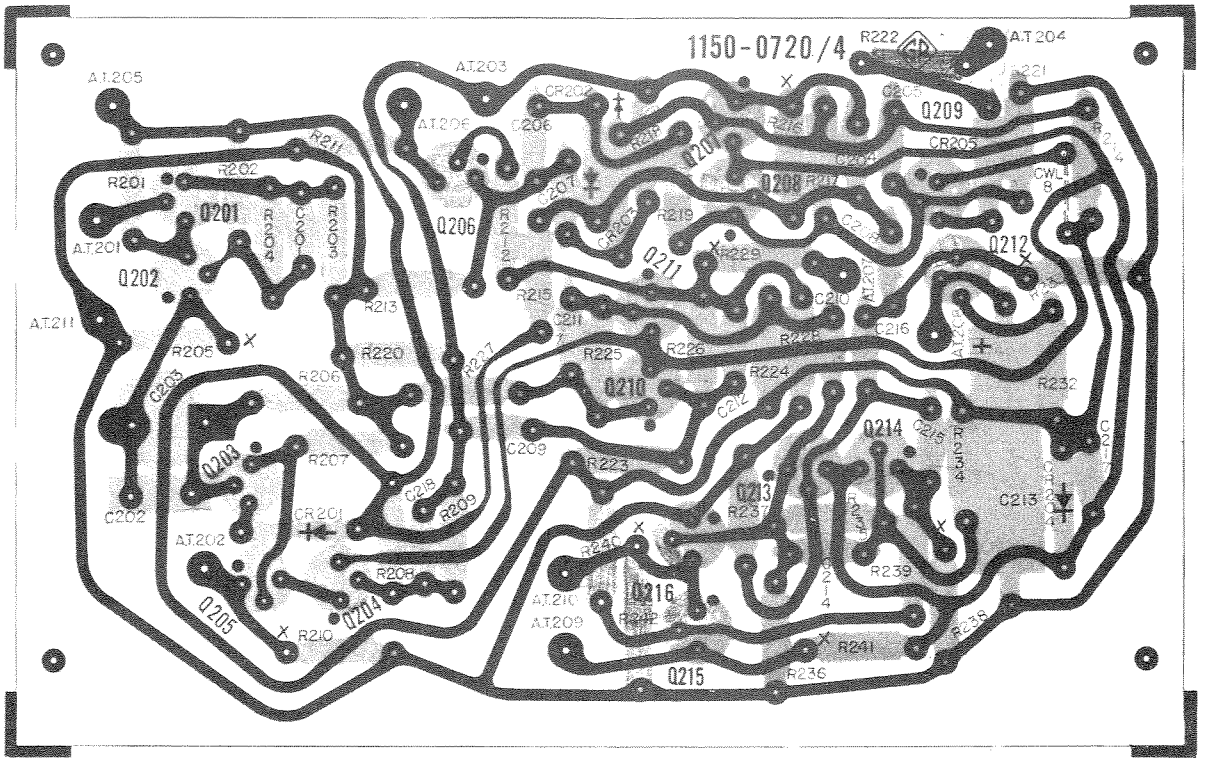


Figure 4-5. Program control etched board.

RESISTORS

R201	2.4 k	±5%	1/2 w	REC-20BF(242B)
R202	2.2 k	±5%	1/2 w	REC-20BF(222B)
R203	820 Ω	±5%	1/2 w	REC-20BF(821B)
R204	2.4 k	±5%	1/2 w	REC-20BF(242B)
R205	820 Ω	±5%	1/2 w	REC-20BF(821B)
R206	51 k	±5%	1/2 w	REC-20BF(513B)
R207	5.1 k	±5%	1/2 w	REC-20BF(512B)
R208	3.9 k	±5%	1/2 w	REC-20BF(392B)
R209	4.7 k	±5%	1/2 w	REC-20BF(472B)
R210	510 Ω	±5%	1/2 w	REC-20BF(511B)
R211	1 k	±5%	1/2 w	REC-20BF(102B)
R212	4.7 k	±5%	1/2 w	REC-20BF(472B)
R213	1 k	±5%	1/2 w	REC-20BF(102B)
R214	2.2 k	±5%	1/2 w	REC-20BF(222B)
R215	2.2 k	±5%	1/2 w	REC-20BF(222B)
R216	13 k	±5%	1/2 w	REC-20BF(133B)
R217	13 k	±5%	1/2 w	REC-20BF(133B)
R218	1 k	±5%	1/2 w	REC-20BF(102B)
R219	1 k	±5%	1/2 w	REC-20BF(102B)
R220	1.5 k	±5%	1/2 w	REC-20BF(152B)
R221	2.2 k	±5%	1/2 w	REC-20BF(222B)
R222	200 Ω	±5%	1/2 w	REC-20BF(201B)
R223	4.3 k	±5%	1/2 w	REC-20BF(432B)
R224	4.3 k	±5%	1/2 w	REC-20BF(432B)
R225	24 k	±5%	1/2 w	REC-20BF(243B)
R226	24 k	±5%	1/2 w	REC-20BF(243B)
R227	1.5 k	±5%	1/2 w	REC-20BF(152B)
R228	2.7 k	±5%	1/2 w	REC-20BF(272B)
R229	6.8 k	±5%	1/2 w	REC-20BF(682B)
R230	100 k	±20%		1150-0400
R231	2.7 k	±5%	1/2 w	REC-20BF(272B)
R232	510 Ω	±5%	1/2 w	REC-20BF(511B)
R233	47 Ω	±5%	1/2 w	REC-20BF(470B)
R234	4.3 k	±5%	1/2 w	REC-20BF(432B)
R235	24 k	±5%	1/2 w	REC-20BF(243B)
R236	1.5 k	±5%	1/2 w	REC-20BF(152B)
R237	24 k	±5%	1/2 w	REC-20BF(243B)
R238	2.2 k	±5%	1/2 w	REC-20BF(222B)
R239	2.4 k	±5%	1/2 w	REC-20BF(242B)
R240	2.7 k	±5%	1/2 w	REC-20BF(272B)
R241	75 Ω	±5%	1/2 w	REC-20BF(750B)
R242	150 Ω	±5%	2 w	REW-3C(151B)
R243	300 Ω	±5%	1/2 w	REC-20BF(301B)
R244	1 k	±5%	1/2 w	REC-20BF(102B)

CAPACITORS

C201	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C202	68 pf	±5%	500 dcwv	COM-22D(680B)
C203	8-50 pf			COT-29-4
C204	820 pf	±10%	500 dcwv	COC-62(821C)
C205	820 pf	±10%	500 dcwv	COC-62(821C)
C206	0.0033 µf	±10%	500 dcwv	COC-62(332C)
C207	0.0033 µf	±10%	500 dcwv	COC-62(332C)
C208	470 pf	±10%	500 dcwv	COC-62(471C)
C209	820 pf	±10%	500 dcwv	COC-62(821C)
C210	820 pf	±10%	500 dcwv	COC-62(821C)
C211	820 pf	±10%	500 dcwv	COC-62(821C)
C212	820 pf	±10%	500 dcwv	COC-62(821C)
C213	60 µf	+100-10%	25 dcwv	COE-47
C214	820 pf	±10%	500 dcwv	COC-62(821C)
C215	0.22 µf	±20%	25 dcwv	COC-4(224D)
C216	0.0033 µf	±10%	500 dcwv	COC-62(332C)
C217	0.1 µf	±20%	25 dcwv	COC-4(104D)
C218	470 pf	±10%	500 dcwv	COC-62(471C)

DIODES

CR201	2RED1016/1N645
CR202, CR203	2RED1006/1N118A
CR204	2RED1016/1N645
CR205	2REZ1006/1N753A

TRANSISTORS

Q201	TR-19/2N1303	Q209	TR-18/2N1302
Q202	TR-19/2N1303	Q210	TR-8/2N1372
Q203	TR-27/2N1499A	Q211	TR-8/2N1372
Q204	TR-19/2N1303	Q212	TR-26/2N1671B
Q205	TR-19/2N1303	Q213	TR-8/2N1372
Q206	TR-19/2N1303	Q214	TR-8/2N1372
Q207	TR-8/2N1372	Q215	TR-8/2N1372
Q208	TR-8/2N1372	Q216	TR-8/2N1372

MISCELLANEOUS

P201	Pilot Light	2LAP-10
S201	Switch	SWRW-3120
S202	Switch	SWP-22
S203	Switch	SWP-23

TYPE 1150-4020 PROGRAM CONTROL CIRCUIT

COUNTING TIME SEC
10 10
0.1 MANUAL
S201

WH BR-BK → A.T.203 (ZERO SET)
WH-BL-BK → A.T. 208 (DISPLAY DELAY)
WH-GN-BR → J 303, 1 (+20V)
BK → J 303, GND (FRAME)
WH. GN-BK → CARRY S0105, S15
WH-BL-BK → S201, 104R
REMOTE START-STOP

○ = KNOB CONTROL
⊘ = SCREWDRIVER CONTROL
= TEST POINT

BOTTOM VIEW

Q212: BASE 2, EM, BASE 1
Q201 THRU Q211, Q213 THRU Q216: EM, BASE, COLL, BASE 2, BASE 1

WH-GN-BR
A.T.205
+20V

(INPUT SIGNAL FROM Q302)
TO S0301, V18
A.T.201
WH-RD-BR

R201 2.4K
R202 2.2K
Q201
Q202
C201 0.0022
R204 2.4K
C202 68
C203 8-50
PULSE SHAPER
CR201
R208 3.9K
MAIN GATE
Q203
Q204
R218 470
R209 4.7K
Q205
R203 820
R205 820
R206 51K
R207 5.1K
R210 510
INPUT SCHMITT

A.T.202
POS. PULSE TO FIRST DECADE
WH-RD-BK
TO S0101, U1,7

MANUAL GATING SWITCH
R244 1K
STOP-1
S202 START-OB
R243 300
R245 10
S201
102R
104R
S202, 4
A.T.2
C219 0.1
TO S0201 #5
A.T.203

TIM. BASE DIVIDER PULSE (POSITIVE)
10. SEC WH-VT-BR
1.0 SEC WH-VT-BK
0.1 SEC WH-GY-RD
S801
101F
103F
105F
Q206
WH-GY-BK
A.T.206
R211 1K
R212 4.7K
R213 1K
TIME BASE GATE

R214 2.2K
R215 2.2K
C208 100
Q207
Q208
Q209
R216 13K
R217 13K
C204 820
CR202
C205 820
CR203
CR205
R218 1K
R219 1K
C206 0.0033
C207 0.0033
R220 1.5K
MAIN GATE FLIP-FLOP
R221 2.2K
A.T.204
COUNTING LAMP
P201

R223 4.3K
R224 4.3K
C209 820
C210 820
Q210
Q211
R225 24K
R226 24K
C211 820
C218 820
TIME BASE GATE FLIP-FLOP
R227 1.5K
R228 2.2K

RESET
NC
NO
S203
OC
S204
CCW
A.T.207
R229 4.8K
R230 100K
DISPLAY TIME
R231 1K
DISPLAY DELAY GEN
R232 510
Q212
A.T.208
C213 60 μF
R233 47

R234 4.3K
R240 2.7K
C217 0.1
CR 204
Q213
Q214
R241 75
R235 24K
C215 0.22
R239 2.4K
C214 820
Q215
Q216
R236 1.5K
RESET PULSE GEN
RESET PULSE AMP
R237 24K
R238 2.2K
C220 5μF
R242 150 2W
A.T.209
WH-BR-BK → TO S0105, C8 SET ZERO PULSE OUT 15 V
A.T.210
WH-GN-BL → TO S0105, D4 RESET PULSE OUT
A.T.211
BK → S0301, A1
C216 0.0033

Figure 4-4. Schematic diagram of the program control circuit.

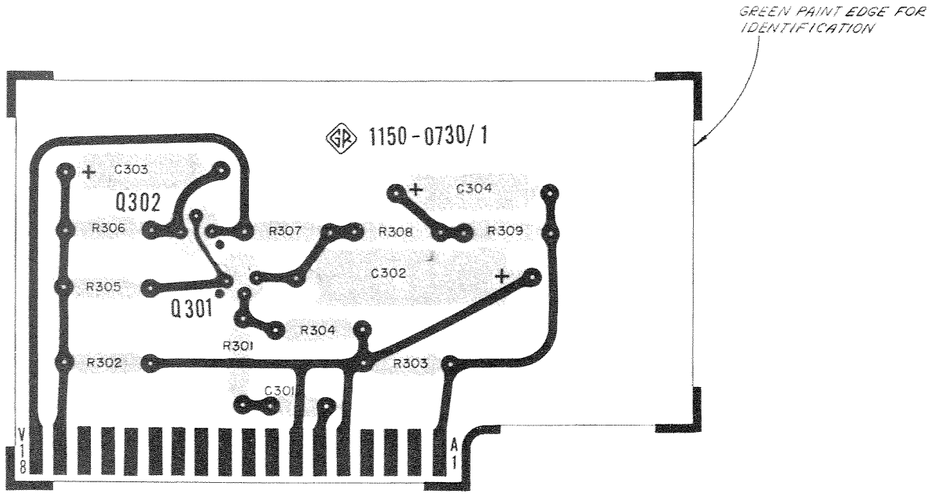


Figure 4-7. Input amplifier etched board.

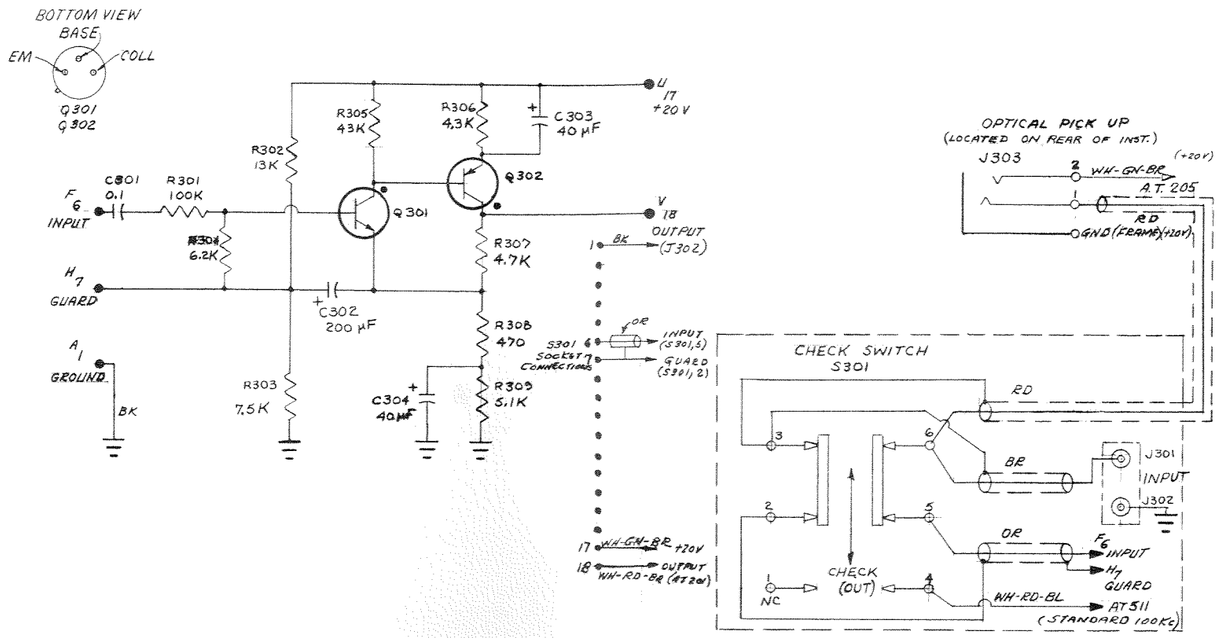


Figure 4-6. Schematic diagram of the input amplifier.

RESISTORS

R301	100 k	±5%	1/2 w	REC-20BF(104B)
R302	13 k	±5%	1/2 w	REC-20BF(133B)
R303	7.5 k	±5%	1/2 w	REC-20BF(752B)
R304	6.2 k	±5%	1/2 w	REC-20BF(622B)
R305	43 k	±5%	1/2 w	REC-20BF(433B)
R306	4.3 k	±5%	1/2 w	REC-20BF(432B)
R307	4.7 k	±5%	1/2 w	REC-20BF(472B)
R308	470 Ω	±5%	1/2 w	REC-20BF(471B)
R309	5.1 k	±5%	1/2 w	REC-20BF(512B)

CAPACITORS

C301	0.1 µf	+80-20%	50 dcwv	COC-63-3
C302	200 µf		6 dcwv	COE-44
C303	40 µf		6 dcwv	COE-54
C304	40 µf		6 dcwv	COE-54

TRANSISTORS

Q301 TR-21/2N338 ‖ Q302 TR-23/2N520A

MISCELLANEOUS

J301	Jack	BP-10, 1
J302	Jack	BP-10, 13/32
J303	Jack	CDSJ-20
S301	Switch	SWP-22
SO301	Socket	CDMS-38, 18

Transistor (Type)	Terminal	Dc Volts to Ground
Q301 (TR-21/2N338)	E	6.7
	B	6.9
	C	15.4
Q302 (TR-23/2N520A)	E	15.5
	B	15.4
	C	11.8

Conditions of Measurement:

No input signal.

Figure 4-6. Schematic diagram of the input amplifier.

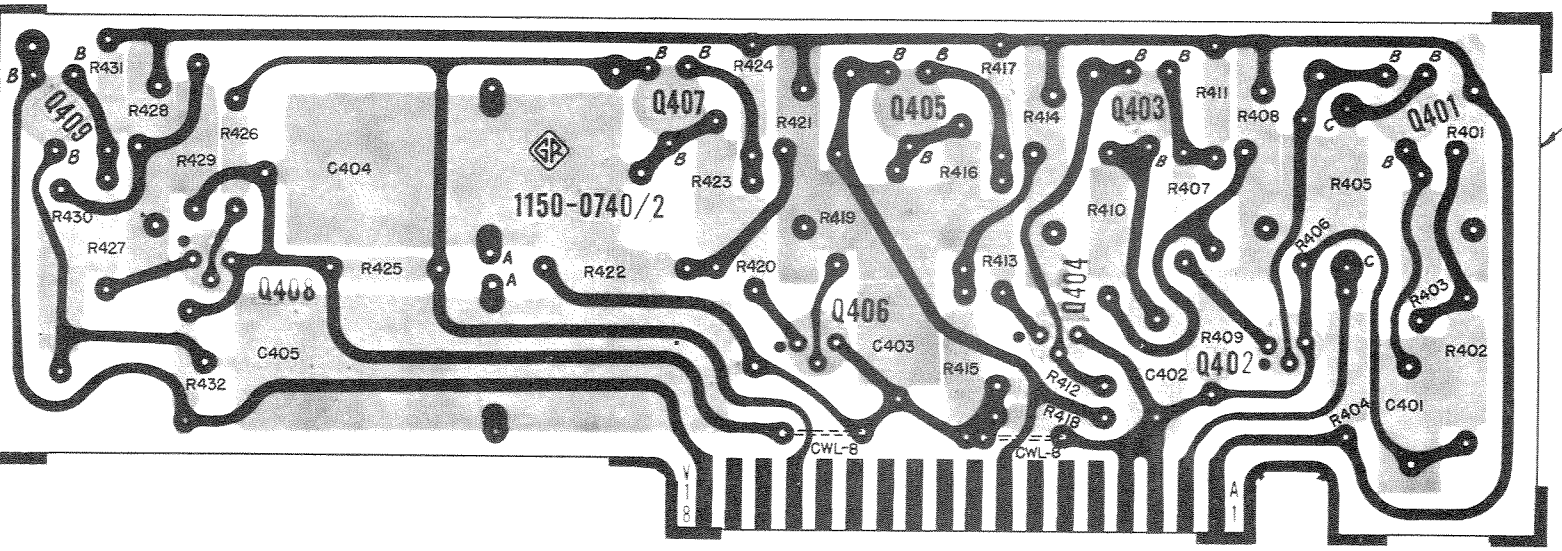


Figure 4-9. Time-base divider etched board.

RESISTORS

R401	5 k	±10%		POSW-7(502C)
R402	18.2 k	±1%	0.3 w	REPR-22(1822A)
R403	18.2 k	±1%	0.3 w	REPR-22(1822A)
R404	47 Ω	±10%	2 w	REW-3C(470C)
R405	Selected	±10%	2 w	REW-3C
R406	22 Ω	±10%	2 w	REW-3C(220C)
R407	2.4 k	±5%	1/2 w	REC-20BF(242B)
R408	5 k	±10%		POSW-7
R409	10 k	±1%	0.3 w	REPR-22(103A)
R410	475 k	±1%	1/4 w	REF-6-2(4753A)
R411	47 Ω	±5%	1/2 w	REC-20BF(470B)
R412	20 Ω	±5%	1/2 w	REC-20BF(200B)
R413	1 k	±5%	1/2 w	REC-20BF(102B)
R414	5 k	±10%		POSW-7(502C)
R415	10 k	±1%	0.3 w	REPR-22(103A)
R416	432 k	±1%	1/4 w	REF-65(4323A)
R417	47 Ω	±5%	1/2 w	REC-20BF(470B)
R418	20 Ω	±5%	1/2 w	REC-20BF(200B)
R419	100 Ω	±5%	1/2 w	REC-20BF(101B)
R420	1 k	±5%	1/2 w	REC-20BF(102B)
R421	5 k	±10%		POSW-7(502C)
R422	10 k	±1%	0.3 w	REPR-22(103A)
R423	432 k	±1%	1/4 w	REF-65(4323A)
R424	47 Ω	±5%	1/2 w	REC-20BF(470B)
R425	10 Ω	±5%	1/2 w	REC-20BF(100B)
R426	100 Ω	±5%	1/2 w	REC-20BF(101B)

RESISTORS (Cont)

R427	1 k	±5%	1/2 w	REC-20BF(102B)
R428	5 k	±10%		POSW-7(502C)
R429	10 k	±1%	0.3 w	REPR-22(103A)
R430	953 k	±1%	1/2 w	REF-70(9533A)
R431	47 Ω	±5%	1/2 w	REC-20BF(470B)
R432	4.7 Ω	±5%	1/2 w	REC-20BF(047B)

CAPACITORS

C401	0.02 µf	±1%	300 dcwv	1150-0410
C402	0.02 µf	±1%	300 dcwv	1150-0410
C403	0.22 µf	±10%	100 dcwv	COP-24(224C)
C404	2.2 µf	±10%	100 dcwv	COP-24(225C)
C405	10 µf	±10%	150 dcwv	1150-0420

TRANSISTORS

Q401	TR-26/2N1671B	Q406	TR-4/2N1304
Q402	TR-4/2N1304	Q407	TR-26/2N1671B
Q403	TR-26/2N1671B	Q408	TR-4/2N1304
Q404	TR-4/2N1304	Q409	TR-26/2N1671B
Q405	TR-26/2N1671B		

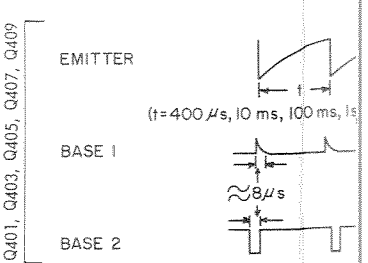
MISCELLANEOUS

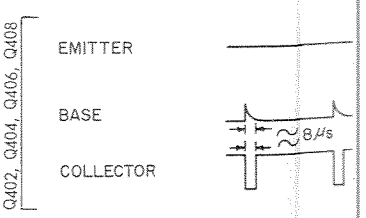
SO401	Socket	CDMS-34, 18

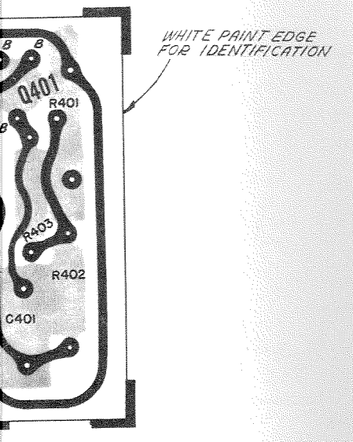
Transistor (Type)	Termir
Q401, Q403, Q405, Q407, Q409 (TR-26/2N1671B)	E B1 B2
Q402, Q404, Q406, Q408 (TR-4/2N1304)	E B C

Conditions of Measureme

TIME BASE switch



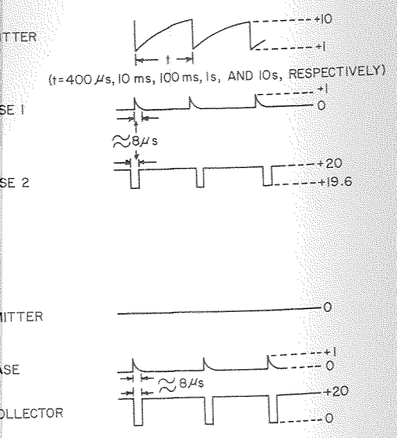




Transistor (Type)	Terminal	Dc Volts to Ground
Q401, Q403, Q405, Q407, Q409 (TR-26/2N1671B)	E	7.0
	B1	0
	B2	20.0
Q402, Q404, Q406, Q408 (TR-4/2N1304)	E	0
	B	0
	C	19.5

Conditions of Measurement:

TIME BASE switch set to INT.



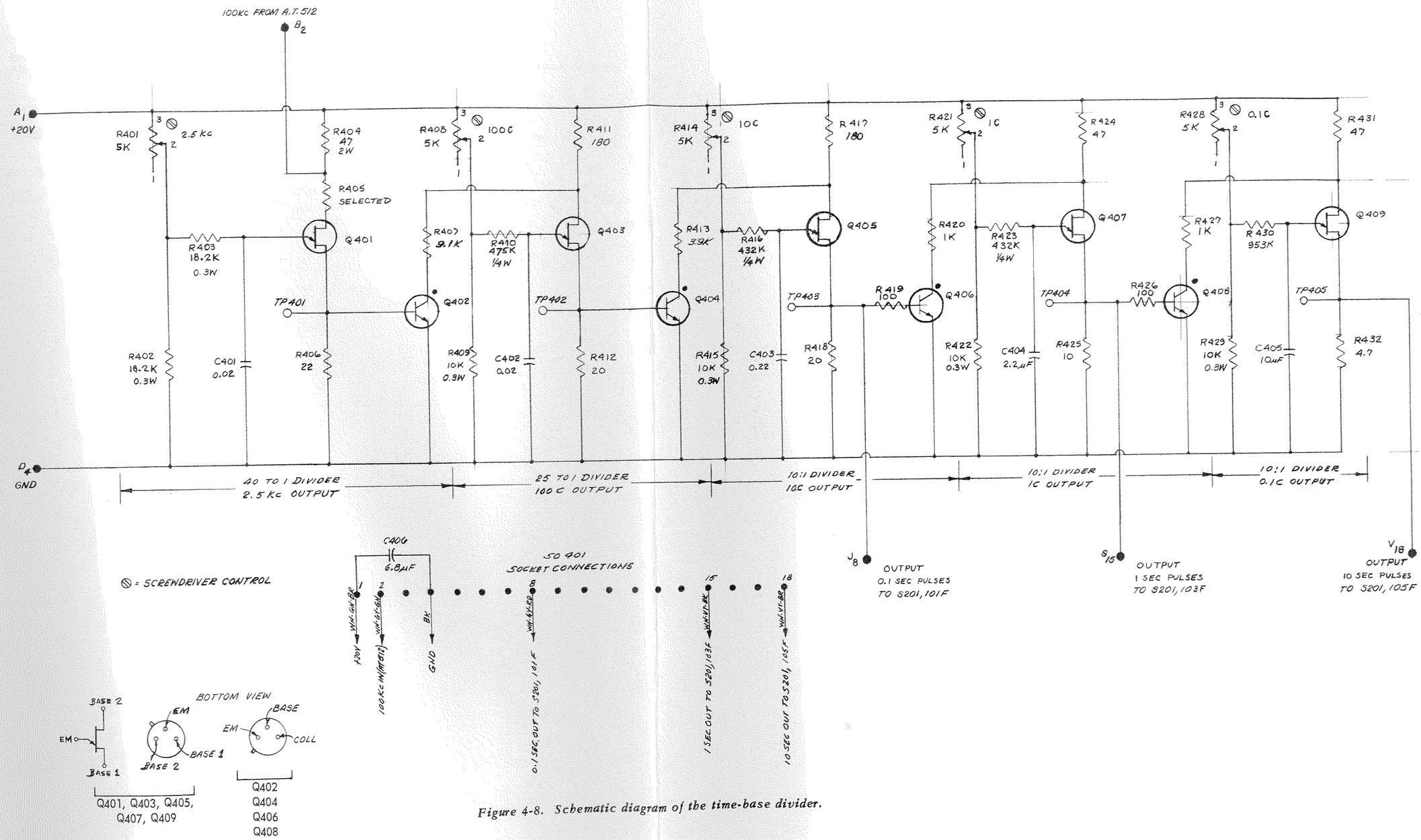
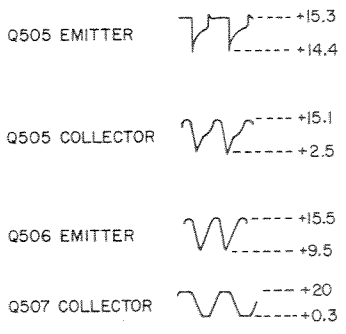


Figure 4-8. Schematic diagram of the time-base divider.

Transistor (Type)	Terminal	Dc Volts to Ground
Q501 (TR-22/2N1907)	E	26.5
	B	26.4
	C	20.0
Q502 (TR-25/2N1991)	E	26.4
	B	25.6
	C	20.0
Q503 (TR-4/2N1304)	E	11.9
	B	12.0
	C	25.6
Q504 (TR-4/2N1304)	E	11.9
	B	12.1
	C	20.0
Q505 (TR-5/2N1305)	E	15.0
	B	15.1
	C	11.0
Q506 (TR-4/2N1304)	E	12.5
	B	11.0
	C	15.0
Q507 (TR-24/2N1308)	E	0
	B	0.05
	C	11.0

Conditions of Measurement:

TIME BASE switch set to INT.
COUNTING TIME control set to MANUAL.
CHECK switch to position closer to the panel.
START-STOP switch to position farther out from panel.
Operate RESET switch to give a display of 00000.



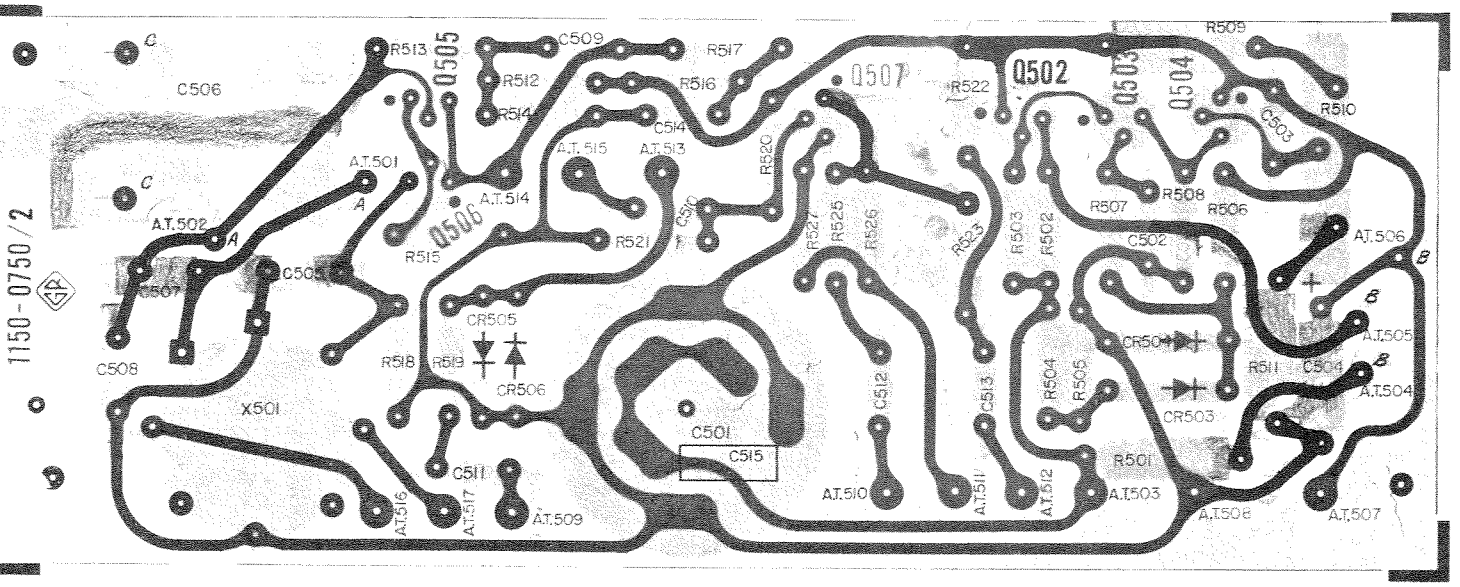
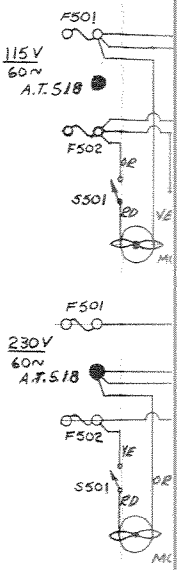


Figure 4-11. Power supply and oscillator etched board.



POWER TRAN
CONNECTION

NOTES: RE.
RES

CAP
LES

RESISTORS

R501	0.47 Ω	±10%	2 w	REW-3C(0047C)
R502	200 Ω	±5%	1/2 w	REC-20BF(201B)
R503	1 k	±5%	1/2 w	REC-20BF(102B)
R504	4.7 k	±5%	1/2 w	REC-20BF(472B)
R505	2.2 k	±5%	1/2 w	REC-20BF(222B)
R506	1.2 k	±5%	1/2 w	REC-20BF(122B)
R507	1 k	±5%	1/2 w	REC-20BF(102B)
R508	3.9 k	±5%	1/2 w	REC-20BF(392B)
R509	1 k	±1%	0.3 w	REPR-22(102A)
R510	2 k	±10%		POSW-7(202C)
R511	1.5 k	±1%	0.3 w	REPR-22(152A)
R512	2.7 k	±5%	1/2 w	REC-20BF(272B)
R513	3.3 k	±5%	1/2 w	REC-20BF(332B)
R514	7.5 k	±5%	1/2 w	REC-20BF(752B)
R515	24 k	±5%	1/2 w	REC-20BF(243B)
R516	2.2 k	±5%	1/2 w	REC-20BF(222B)
R517	3.3 k	±5%	1/2 w	REC-20BF(332B)
R518	24 k	±5%	1/2 w	REC-20BF(243B)
R519	1 k	±5%	1/2 w	REC-20BF(102B)
R520	330 k	±5%	1/2 w	REC-20BF(334B)
R521	1 k	±5%	1/2 w	REC-20BF(102B)
R522	1 k	±5%	1/2 w	REC-20BF(102B)
R523	2.2 k	±5%	1/2 w	REC-20BF(222B)
R525	100 k	±5%	1/2 w	REC-20BF(104B)
R526	470	±5%	1/2 w	REC-20BF(471B)
R527	100 k	±5%	1/2 w	REC-20BF(104B)

CAPACITORS

C501	3000 µf	+100-10%	30 dcwv	1150-0440
C502	0.01 µf	±20%	500 dcwv	COC-62(103D)
C503	0.01 µf	±20%	500 dcwv	COC-62(103D)
C504	6.8 µf	±20%	35 dcwv	COE-61(685D)
C505	487 pf	±2%	500 dcwv	COM-5E(4870A1)
C506	6-100 pf			COA-4-2

CAPACITORS (Cont)

C507	27 pf	±5%	500 dcwv	COM-22D(270B)
C508	0.001 µf	±2%	500 dcwv	COM-5E(102A1)
C509	0.1 µf	+80-20%	50 dcwv	COC-63-3(104D)
C510	0.1 µf	+80-20%	50 dcwv	COC-63-3(104D)
C511	0.01 µf	±20%	500 dcwv	COC-62(103D)
C512	0.01 µf	±20%	500 dcwv	COC-62(103D)
C513	1 µf	±20%	25 dcwv	COC-4(105D)
C514	0.1 µf	+80-20%	50 dcwv	COC-63-3(104D)

DIODES

CR501, CR502	2RE1005/1N3660
CR503	2RED1016/1N645
CR504	2REZ1013/1N941
CR505, CR506	2RED1006/1N118A

TRANSISTORS

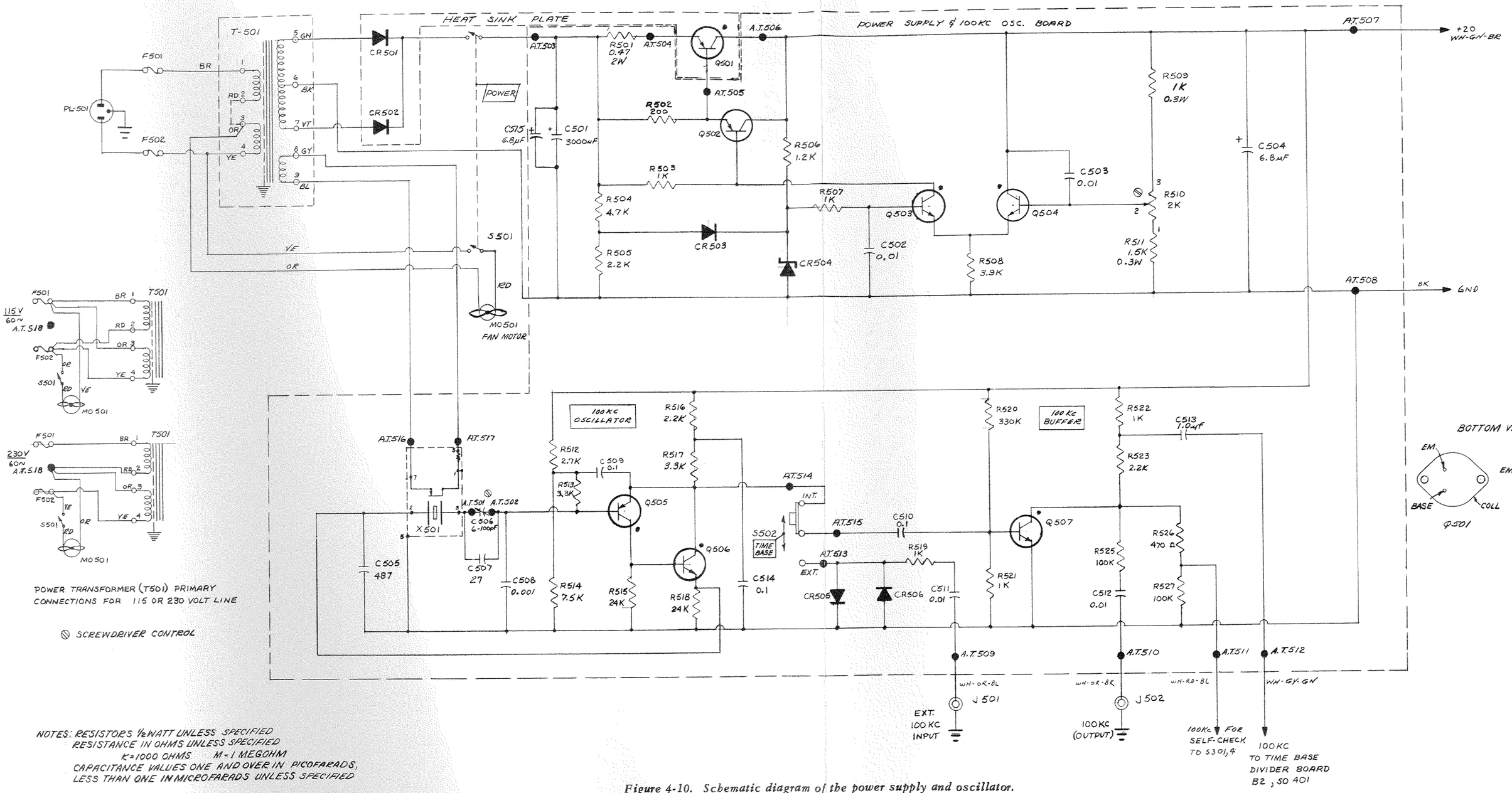
Q501	TR-22/2N1907	Q505	TR-5/2N1305
Q502	TR-25/2N1991	Q506	TR-4/2N1304
Q503	TR-4/2N1304	Q507	TR-24/2N1308
Q504	TR-4/2N1304		

FUSES

115 v:			230 v:		
F501	0.6 a	FUF-1	F501	0.3 a	FUF-1
F502	0.6 a	FUF-1	F502	0.3 a	FUF-1

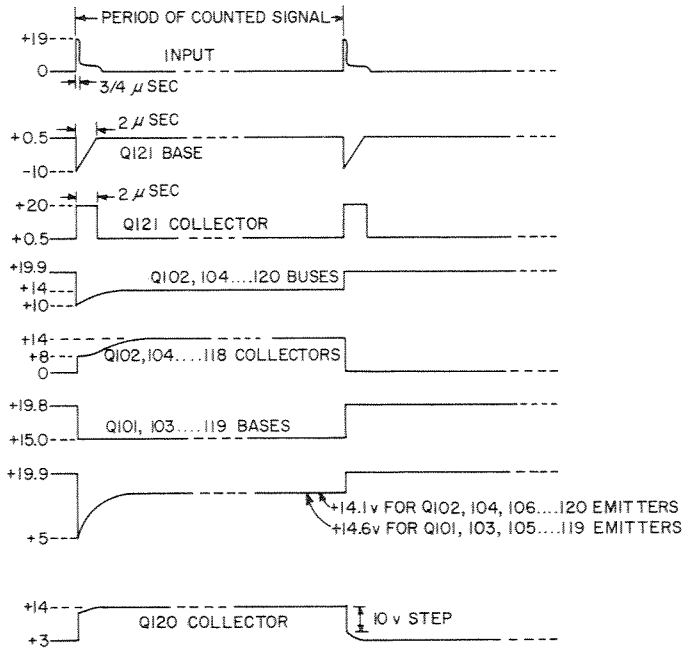
MISCELLANEOUS

J501	Jack	CDSJ-24	S501	Switch	SWT-333
J502	Jack	CDSJ-24	S502	Switch	SWT-16
M501	Motor	MOD-23	T501	Transformer	0485-4013
PL501	Plug	CDPP-10	X501	Crystal and Oven	1150-0430



NOTES: RESISTORS ½ WATT UNLESS SPECIFIED
RESISTANCE IN OHMS UNLESS SPECIFIED
K=1000 OHMS M=1 MEGOHM
CAPACITANCE VALUES ONE AND OVER IN PICOFARADS,
LESS THAN ONE IN MICROFARADS UNLESS SPECIFIED

Figure 4-10. Schematic diagram of the power supply and oscillator.



Transistor (Type)	Terminal	Dc Volts to Ground
Q101 (TR-19/2N1303)	E	14.6
	B	15.0
	C	14.0
Q102 (TR-19/2N1303)	E	14.1
	B	14.0
	C	14.0
Q103, Q105, Q107, Q109, Q111, Q113, Q115, Q117, Q119 (TR-19/2N1303)	E	19.9
	B	19.8
	C	19.9
Q104, Q106, Q108, Q110, Q112, Q114, Q116, Q118 (TR-19/2N1303)	E	19.9
	B	19.9
	C	0
Q120 (TR-19/2N1303)	E	19.9
	B	19.9
	C	3.0
Q121 (TR-28/MM-487)	E	0
	B	0.5
	C	0

Conditions of Measurement:

No input signal.
Operate RESET switch to give a display of "O".

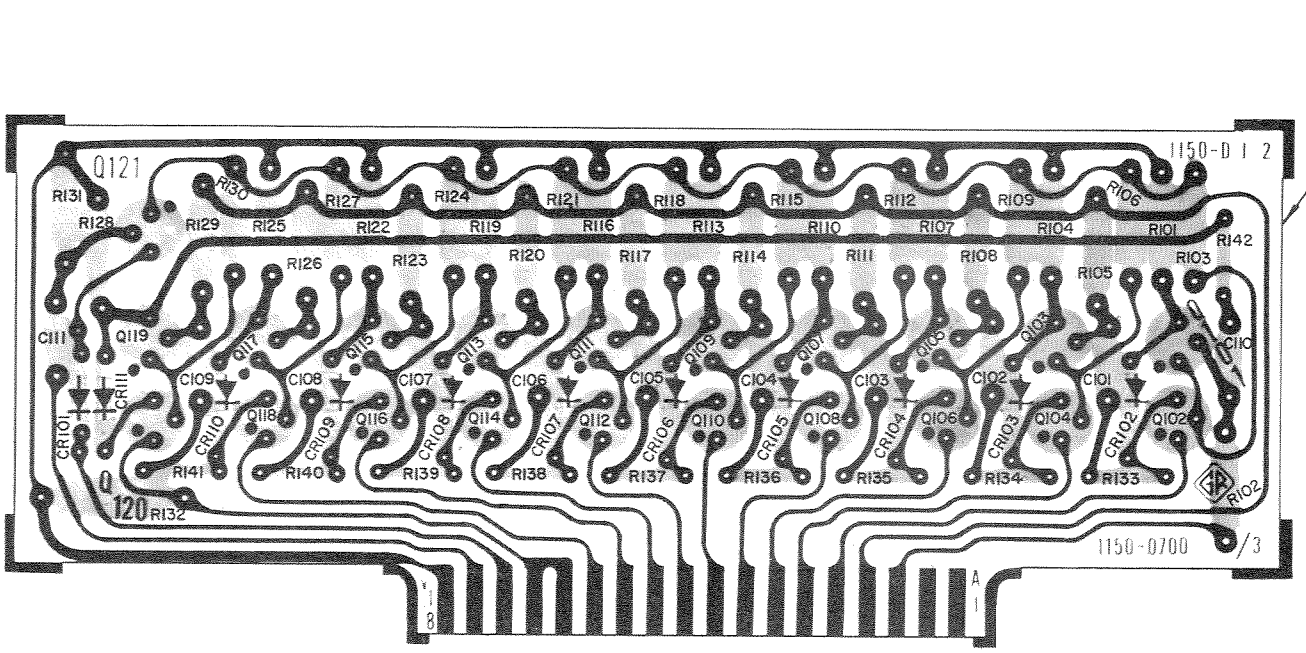


Figure 4-13. 220-kc ring counting unit etched board.

RESISTORS

R101	68Ω	±5%	1/2 w	REC-20BF(680B)
R102	4.3 k	±5%	1/2 w	REC-20BF(432B)
R103	2.7 k	±5%	1/2 w	REC-20BF(272B)
R104	68Ω	±5%	1/2 w	REC-20BF(680B)
R105	4.3 k	±5%	1/2 w	REC-20BF(432B)
R106	2.7 k	±5%	1/2 w	REC-20BF(272B)
R107	68Ω	±5%	1/2 w	REC-20BF(680B)
R108	4.3 k	±5%	1/2 w	REC-20BF(432B)
R109	2.7 k	±5%	1/2 w	REC-20BF(272B)
R110	68Ω	±5%	1/2 w	REC-20BF(680B)
R111	4.3 k	±5%	1/2 w	REC-20BF(432B)
R112	2.7 k	±5%	1/2 w	REC-20BF(272B)
R113	68Ω	±5%	1/2 w	REC-20BF(680B)
R114	4.3 k	±5%	1/2 w	REC-20BF(432B)
R115	2.7 k	±5%	1/2 w	REC-20BF(272B)
R116	68Ω	±5%	1/2 w	REC-20BF(680B)
R117	4.3 k	±5%	1/2 w	REC-20BF(432B)
R118	2.7 k	±5%	1/2 w	REC-20BF(272B)
R119	68Ω	±5%	1/2 w	REC-20BF(680B)
R120	4.3 k	±5%	1/2 w	REC-20BF(432B)
R121	2.7 k	±5%	1/2 w	REC-20BF(272B)
R122	68Ω	±5%	1/2 w	REC-20BF(680B)
R123	4.3 k	±5%	1/2 w	REC-20BF(432B)
R124	2.7 k	±5%	1/2 w	REC-20BF(272B)
R125	68Ω	±5%	1/2 w	REC-20BF(680B)
R126	4.3 k	±5%	1/2 w	REC-20BF(432B)
R127	2.7 k	±5%	1/2 w	REC-20BF(272B)
R128	82Ω	±5%	1/2 w	REC-20BF(820B)
R129	4.3 k	±5%	1/2 w	REC-20BF(432B)
R130	2.7 k	±5%	1/2 w	REC-20BF(272B)
R131	5.1 k	±5%	1/2 w	REC-20BF(512B)
R132	560Ω	±10%	1 w	REC-30BF(561C)
R133	330Ω	±10%	1/4 w	REC-9BF(331C)
R134	330Ω	±10%	1/4 w	REC-9BF(331C)
R135	330Ω	±10%	1/4 w	REC-9BF(331C)
R136	330Ω	±10%	1/4 w	REC-9BF(331C)
R137	330Ω	±10%	1/4 w	REC-9BF(331C)
R138	330Ω	±10%	1/4 w	REC-9BF(331C)
R139	330Ω	±10%	1/4 w	REC-9BF(331C)
R140	330Ω	±10%	1/4 w	REC-9BF(331C)
R141	330Ω	±10%	1/4 w	REC-9BF(331C)
R142	330Ω	±10%	1/4 w	REC-9BF(331C)

CAPACITORS

C101	0.001 μf	±10%	500 dcwv	COC-62(102C)
C102	0.001 μf	±10%	500 dcwv	COC-62(102C)
C103	0.001 μf	±10%	500 dcwv	COC-62(102C)
C104	0.001 μf	±10%	500 dcwv	COC-62(102C)
C105	0.001 μf	±10%	500 dcwv	COC-62(102C)
C106	0.001 μf	±10%	500 dcwv	COC-62(102C)
C107	0.001 μf	±10%	500 dcwv	COC-62(102C)
C108	0.001 μf	±10%	500 dcwv	COC-62(102C)
C109	0.001 μf	±10%	500 dcwv	COC-62(102C)
C110	0.001 μf	±10%	500 dcwv	COC-62(102C)
C111	820	±10%	500 dcwv	COC-62(821C)

DIODES

CR101	2RED1006/1N118A
CR102, CR103, CR104, CR105, CR106, CR107, CR108, CR109, CR110, CR111	2RED1016/1N645

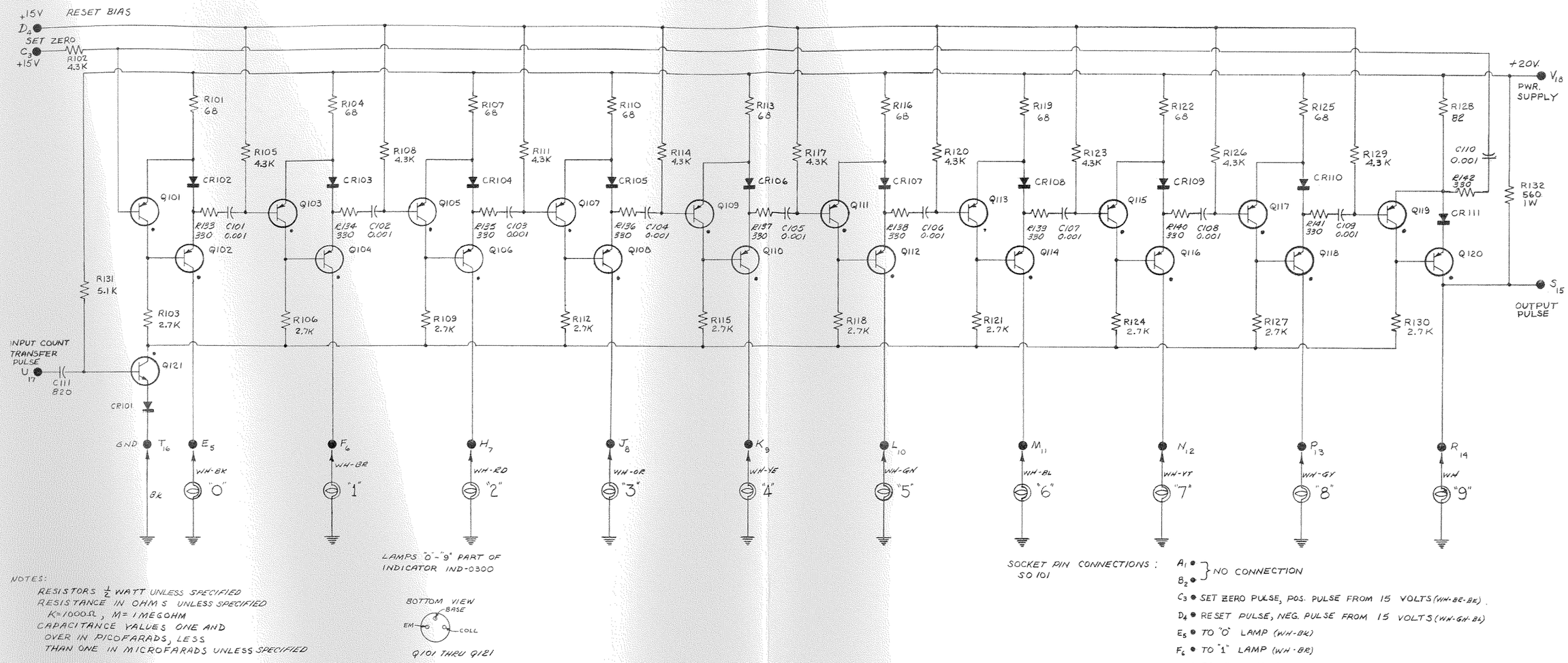
TRANSISTORS

Q101	TR-19/2N1303	Q112	TR-19/2N1303
Q102	TR-19/2N1303	Q113	TR-19/2N1303
Q103	TR-19/2N1303	Q114	TR-19/2N1303
Q104	TR-19/2N1303	Q115	TR-19/2N1303
Q105	TR-19/2N1303	Q116	TR-19/2N1303
Q106	TR-19/2N1303	Q117	TR-19/2N1303
Q107	TR-19/2N1303	Q118	TR-19/2N1303
Q108	TR-19/2N1303	Q119	TR-19/2N1303
Q109	TR-19/2N1303	Q120	TR-19/2N1303
Q110	TR-19/2N1303	Q121	TR-28/MM-487
Q111	TR-19/2N1303		

MISCELLANEOUS

SO101	Socket	CDMS-38	18

YELLOW PAINT EDGE FOR IDENTIFICATION



LAMPS "0"-"9" PART OF INDICATOR IND-0300

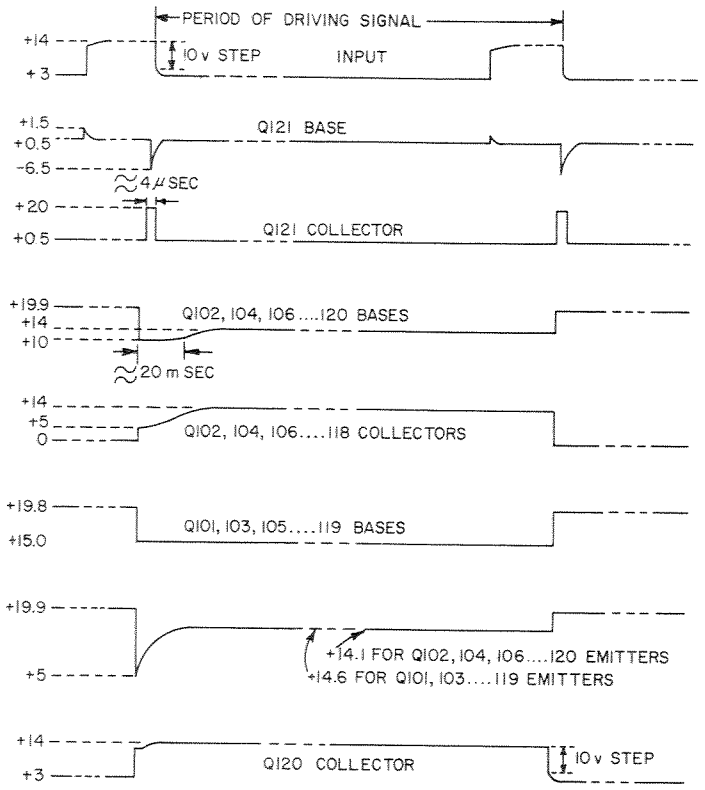
BOTTOM VIEW
BASE
EM
COLL
Q101 THRU Q121

NOTES:
RESISTORS ½ WATT UNLESS SPECIFIED
RESISTANCE IN OHMS UNLESS SPECIFIED
K=1000Ω, M=1 MEGOHM
CAPACITANCE VALUES ONE AND OVER IN PICOFARADS, LESS THAN ONE IN MICROFARADS UNLESS SPECIFIED

Figure 4-12. Schematic diagram for the 220-kc ring counting unit.

SOCKET PIN CONNECTIONS: SO 101

A_1, B_2 } NO CONNECTION
C_3 SET ZERO PULSE, POS. PULSE FROM 15 VOLTS (WH-BR-BK)
D_4 RESET PULSE, NEG. PULSE FROM 15 VOLTS (WH-GN-BL)
E_5 TO "0" LAMP (WH-BK)
F_6 TO "1" LAMP (WH-BR)
H_7 TO "2" LAMP (WH-RD)
J_8 TO "3" LAMP (WH-OR)
K_9 TO "4" LAMP (WH-YE)
L_{10} TO "5" LAMP (WH-GN)
M_{11} TO "6" LAMP (WH-BL)
N_{12} TO "7" LAMP (WH-VT)
P_{13} TO "8" LAMP (WH-GY)
R_{14} TO "9" LAMP (WH)
S_{15} OUTPUT PULSE
T_{16} GND. (BK)
U_{17} INPUT COUNT TRANSFER PULSE (WH-RD-BK)
V_{18} +20 VOLT SUPPLY (WH-GN-BR)



Transistor (Type)	Terminal	Dc Volts to Ground
Q101 (TR-19/2N1303)	E	14.6
	B	15.0
	C	14.0
Q102 (TR-19/2N1303)	E	14.1
	B	14.0
	C	14.0
Q103, Q105, Q107, Q109, Q111, Q113, Q115, Q117, Q119 (TR-19/2N1303)	E	19.9
	B	19.8
	C	19.9
Q104, Q106, Q108, Q110, Q112, Q114, Q116, Q118 (TR-19/2N1303)	E	19.9
	B	19.9
	C	0
Q120 (TR-19/2N1303)	E	19.9
	B	19.9
	C	3.0
Q121 (TR-18/2N1302)	E	0
	B	0.5
	C	0

Conditions of Measurement:

No input signal.
Operate RESET switch to give a display of "0"

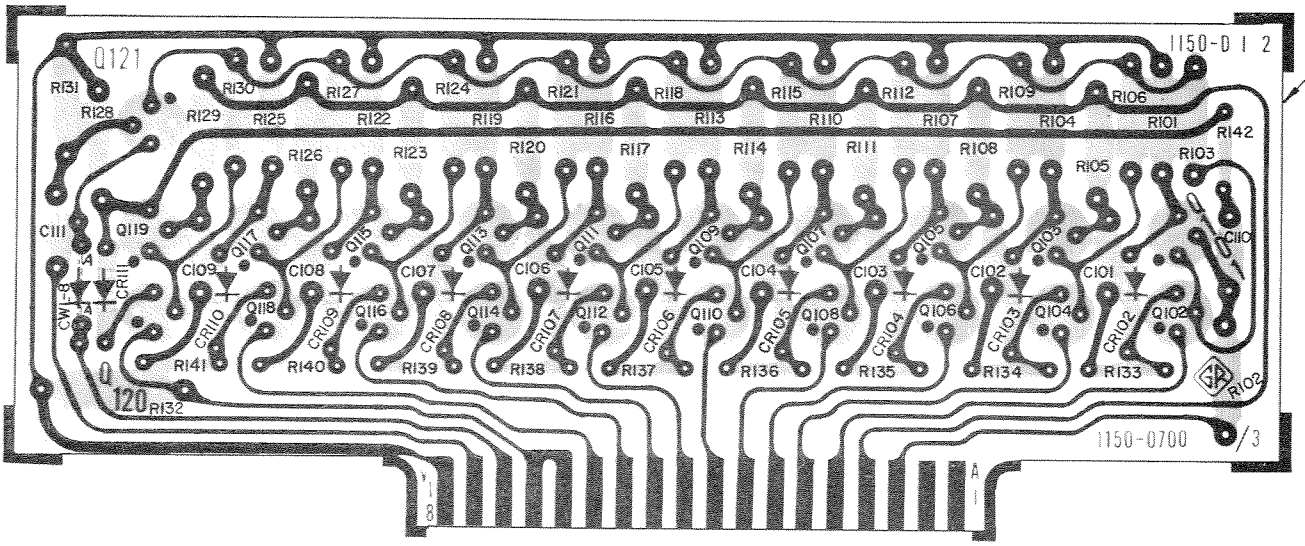


Figure 4-15. 30-kc ring counting unit etched board.

RESISTORS

R101	68 Ω	±5%	1/2 w	REC-20BF(680B)
R102	4.3 k	±5%	1/2 w	REC-20BF(432B)
R103	3.3 k	±5%	1/2 w	REC-20BF(332B)
R104	68 Ω	±5%	1/2 w	REC-20BF(680B)
R105	4.3 k	±5%	1/2 w	REC-20BF(432B)
R106	3.3 k	±5%	1/2 w	REC-20BF(332B)
R107	68 Ω	±5%	1/2 w	REC-20BF(680B)
R108	4.3 k	±5%	1/2 w	REC-20BF(432B)
R109	3.3 k	±5%	1/2 w	REC-20BF(332B)
R110	68 Ω	±5%	1/2 w	REC-20BF(680B)
R111	4.3 k	±5%	1/2 w	REC-20BF(432B)
R112	3.3 k	±5%	1/2 w	REC-20BF(332B)
R113	68 Ω	±5%	1/2 w	REC-20BF(680B)
R114	4.3 k	±5%	1/2 w	REC-20BF(432B)
R115	3.3 k	±5%	1/2 w	REC-20BF(332B)
R116	68 Ω	±5%	1/2 w	REC-20BF(680B)
R117	4.3 k	±5%	1/2 w	REC-20BF(432B)
R118	3.3 k	±5%	1/2 w	REC-20BF(332B)
R119	68 Ω	±5%	1/2 w	REC-20BF(680B)
R120	4.3 k	±5%	1/2 w	REC-20BF(432B)
R121	3.3 k	±5%	1/2 w	REC-20BF(332B)
R122	68 Ω	±5%	1/2 w	REC-20BF(680B)
R123	4.3 k	±5%	1/2 w	REC-20BF(432B)
R124	3.3 k	±5%	1/2 w	REC-20BF(332B)
R125	68 Ω	±5%	1/2 w	REC-20BF(680B)
R126	4.3 k	±5%	1/2 w	REC-20BF(432B)
R127	3.3 k	±5%	1/2 w	REC-20BF(332B)
R128	82 Ω	±5%	1/2 w	REC-20BF(820B)
R129	4.3 k	±5%	1/2 w	REC-20BF(432B)
R130	3.3 k	±5%	1/2 w	REC-20BF(332B)
R131	5.1 k	±5%	1/2 w	REC-20BF(512B)
R132	560 Ω	±10%	1 w	REC-30BF(561C)
R133	330 Ω	±10%	1/4 w	REC-9BF(331C)
R134	330 Ω	±10%	1/4 w	REC-9BF(331C)
R135	330 Ω	±10%	1/4 w	REC-9BF(331C)
R136	330 Ω	±10%	1/4 w	REC-9BF(331C)
R137	330 Ω	±10%	1/4 w	REC-9BF(331C)
R138	330 Ω	±10%	1/4 w	REC-9BF(331C)
R139	330 Ω	±10%	1/4 w	REC-9BF(331C)
R140	330 Ω	±10%	1/4 w	REC-9BF(331C)
R141	330 Ω	±10%	1/4 w	REC-9BF(331C)
R142	330 Ω	±10%	1/4 w	REC-9BF(331C)

CAPACITORS

C101	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C102	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C103	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C104	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C105	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C106	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C107	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C108	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C109	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C110	0.0022 µf	±10%	500 dcwv	COC-62(222C)
C111	0.0033 µf	±10%	500 dcwv	COC-62(332C)

DIODE

CR102 thru CR111	2RED1016/1N645

TRANSISTORS

Q101	TR-19/2N1303	Q112	TR-19/2N1303
Q102	TR-19/2N1303	Q113	TR-19/2N1303
Q103	TR-19/2N1303	Q114	TR-19/2N1303
Q104	TR-19/2N1303	Q115	TR-19/2N1303
Q105	TR-19/2N1303	Q116	TR-19/2N1303
Q106	TR-19/2N1303	Q117	TR-19/2N1303
Q107	TR-19/2N1303	Q118	TR-19/2N1303
Q108	TR-19/2N1303	Q119	TR-19/2N1303
Q109	TR-19/2N1303	Q120	TR-19/2N1303
Q110	TR-19/2N1303	Q121	TR-18/2N1302
Q111	TR-19/2N1303		

MISCELLANEOUS

SO102	Socket	CDMS-38, 18
SO103	Socket	CDMS-38, 18
SO104	Socket	CDMS-38, 18
SO105	Socket	CDMS-38, 18

RED PAINT EDGE FOR IDENTIFICATION

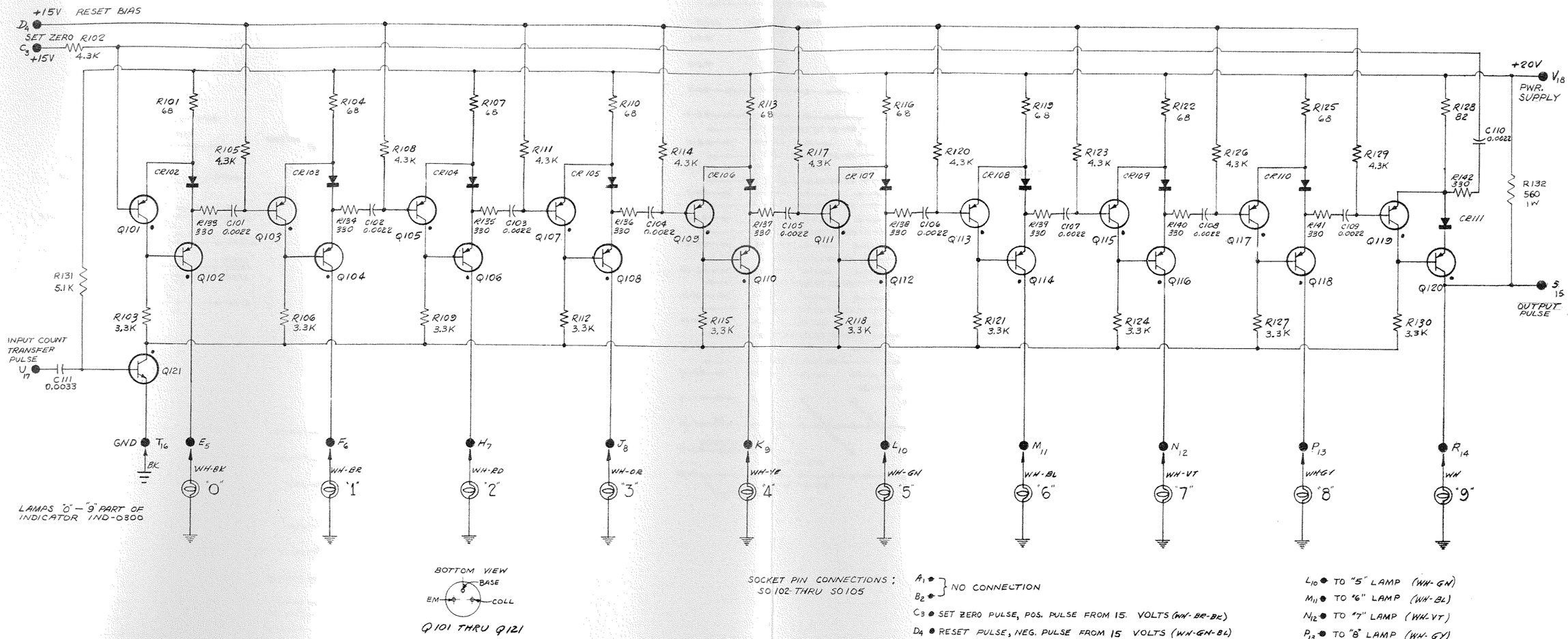


Figure 4-14. Schematic diagram of the 30-kc ring counting unit.

TYPE 1150-A INTERCONNECTION DIAGRAM

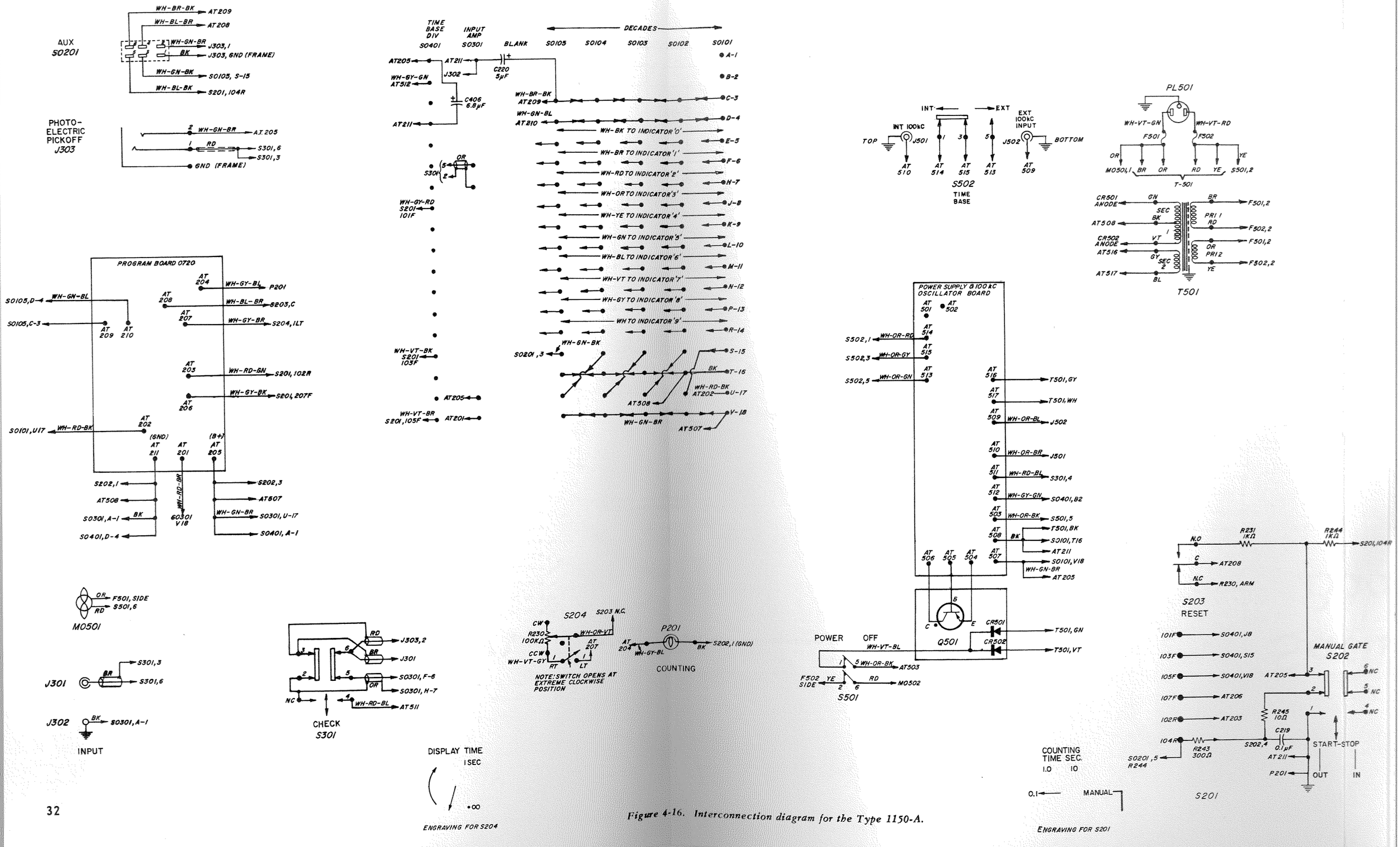


Figure 4-16. Interconnection diagram for the Type 1150-A.