Kemp Counter-Timer Model 4DS10

Kemp Counter-Timer Model 4DS10

S.N. 363, 240Vac

Made by E.A.Kemp P/L, Sydney. Supplied by Watson Victor Ltd
eBay Jan 2020, $45

Power On/Off switch
Speaker Off-Volume pot
Reset Press switch
Manual Count / Time Off/On
9-pin Noval socket for Input

Parts:

Transformer:	PF2241/4; 3-66		
	240V		
Valve:	12AT7 Mullard 005		
	12AT7 Mullard 005		
	12AU7 Toshiba		
	DK24 x4 , Okaya 5LY ; 5LY ; 5LY ; 6AZ		14-pin loctal
Resistors:	YJ (Japan ?)		
Pot	IRC D6 1 Meg/C CTS45		
Caps:	Ducon 146 ; 075H	Mustard 095H	
PCB	KEMP PU 1	(power supply pcb)	
	IU3 KEMP		
Speaker	8Ω 0.4W JAPAN 28		
Transformer	? ohm to 8 ohm	DCR=680	
Sensor 1	Philips ZP1481 with socket and 50 ohm coax with TNC connectors.		
Sensor 2	Mullard MX147 8504 kJO k4k with 9-pin Noval socket (kJ = MX147; k=? 4 = 1964, 74, 84) Pins 2 to 6, with cap from 2 to 4. Cap is red, black, white – measures about 2pF – likely Philips 2pF 500Vdc.		

Issues:

Corroded PSU pcb. Corroded chassis holes and on chassis top surface. Leaky electrolytics. High DC voltages at power on for cap ratings. High working DC voltage for some Geiger tubes. Hazardous voltages on the front panel Noval socket.

Note:

E.A.Kemp P/L, Punchbowl. Deregistered 1982. ACN: 000 452 620

https://vintage-radio.net/forum/showthread.php?p=856407
http://lampes-et-tubes.info/cd/cd153.php?l=e
Page 652-3, Electronic apparatus
https://ia800205.us.archive.org/15/items/electronicappara00dona/electronicappara00dona.pdf
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Modifications:

- Fitted combo IEC mains socket and fuse – 125mA T IEC.
- Replaced all power supply pcb electro's with sufficiently high voltage rating using series connections and balancing resistors.
- Temporary disconnection of VS1 from input socket, due to hazard.

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- Added 4k7+3k3 PRO2 in series with VS1 to VS2 dropper, and added 2-pin header to connect existing 10k. For 240V mains, this gives:
  - VS1=620V, VS2=469V for header in (10.8mA draw from VS2)
  - VS1=630V, VS2=414V for header out (9.4mA draw from VS2)

Units and Tens cycle fine with a square wave through 33pF, but the Hundreds doesn't progress. A higher coupling capacitance causes rapid cycling of units.

To do:

- Make adaptor for ZP1481.
- Replace 3k3 with 2k2 in VS1 to VS2 dropper to bring VS2 to 480-500V, as recommended for MX147, and 430V VS2 feed for ZP1481.
- Check performance with a reasonable emitter.

Flying connections from front panel to PSU pcb:

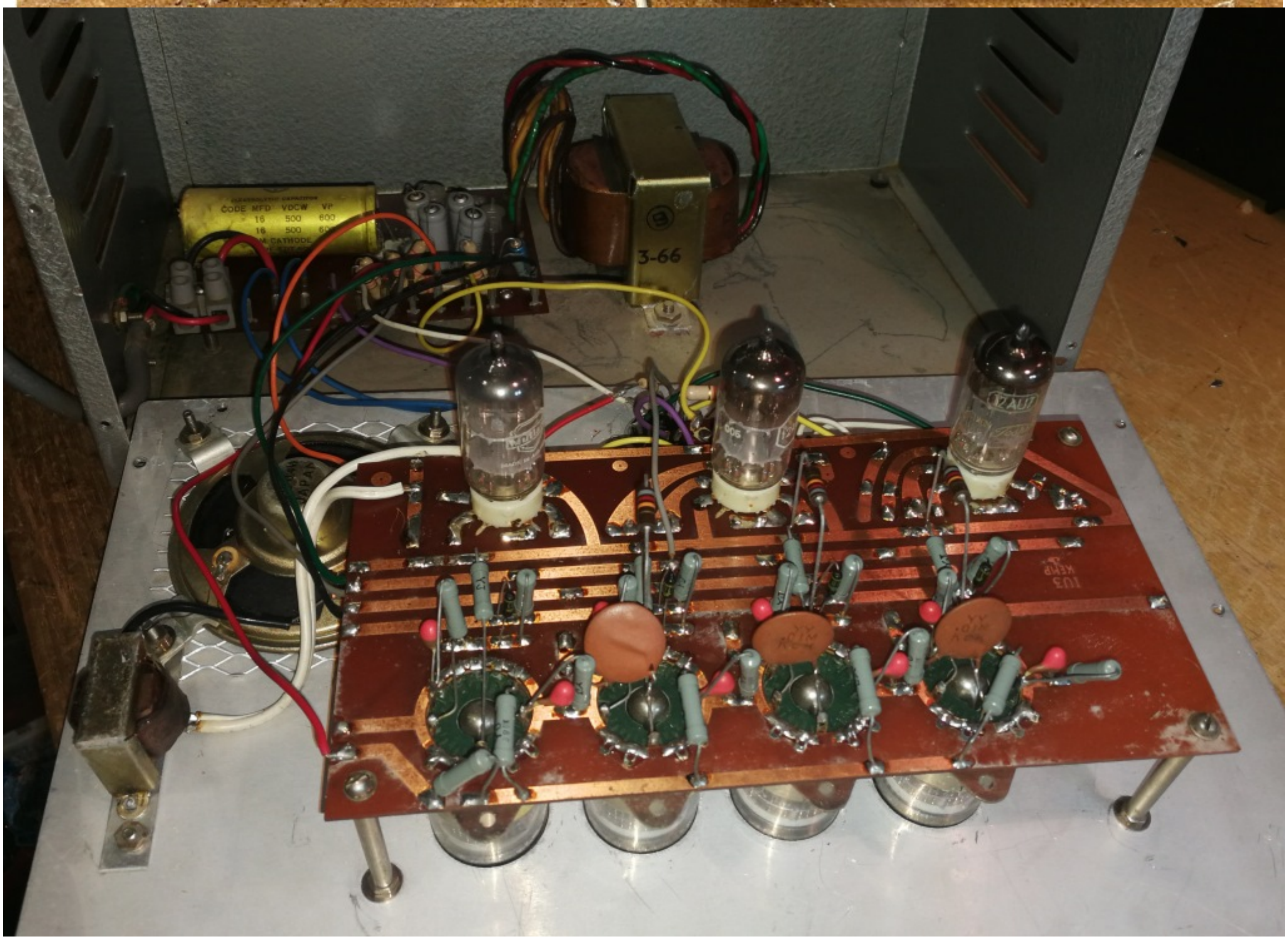
1.	No connection		
2.	Blue	power switch	
3.	Blue	power switch	
4.	Purple	pcb bottom trace	12VAC
5.	White	noval connector pin 1	VS1
6.	Red	pcb top trace	VS2
7.	Grey	pcb bus 2	VS3
8.	Orange	pcb LHS bottom	VS4
9.	Yellow	reset switch	VS5
10.	Green	pcb bus 1	0V
11.	Black	pcb bus 3	VS6

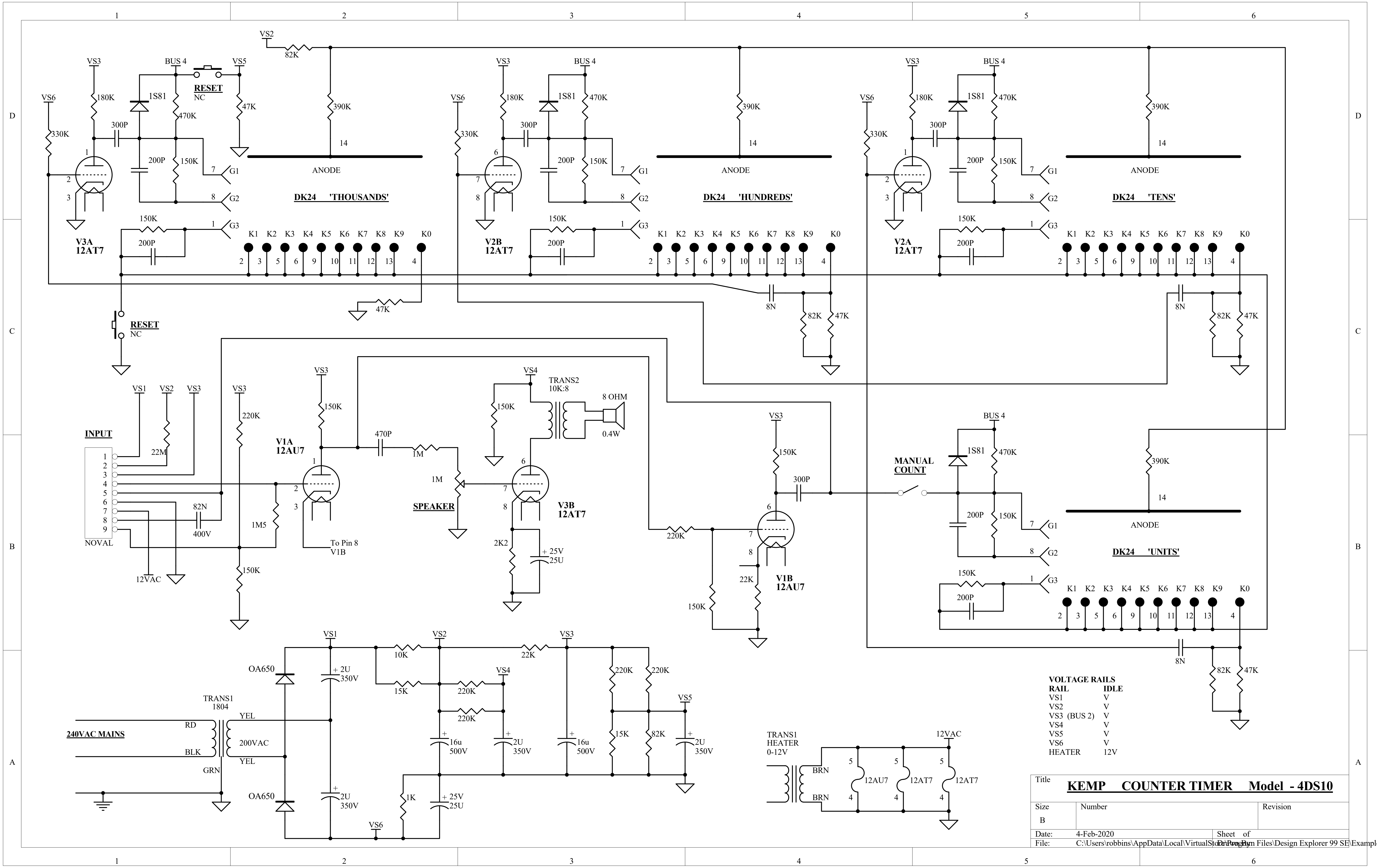
Flying connections from PSU pcb to Tx

1.	Brown	secondary side
2.	Green	primary side
3.	Yellow	secondary side
4.	Yellow	secondary side
5.	Brown	secondary side
6.	Black	primary side
7.	Red	primary side

PT primary and IEC: megger 1 Gig at 1kV; DCR = 167 ohm
PT sec DCR=336
PSUD2 indicates 255V secondary.
Megger tested the cap in the probe at the Noval plug to 500VDC.

Kemp Counter-Timer Model 4DS10





VS2
82K
VS3
BUS 4
VS5
RESET
NC
VS6
180K
1S81
470K
47K
390K
330K
300P
200P
150K
G1
G2
G3
14
ANODE
DK24 'THOUSANDS'
DK24 'HUNDREDS'
DK24 'TENS'
DK24 'UNITS'
V3A
12AT7
V2B
12AT7
V2A
12AT7
K1 K2 K3 K4 K5 K6 K7 K8 K9 K0
8N
82K
47K
INPUT
VS1
22M
220K
NOVAL
12VAC
82N
400V
1M5
V1A
12AU7
To Pin 8
V1B
470P
1M
SPEAKER
VS4
TRANS2
10K:8
8 OHM
0.4W
V3B
12AT7
2K2
25V
25U
MANUAL
COUNT
V1B
12AU7
22K
OA650
2U
350V
TRANS1
1804
YEL
240VAC MAINS
RD
BLK
200VAC
GRN
10K
15K
22K
16u
500V
1K
15K
82K
TRANS1
HEATER
0-12V
BRN
12AU7
12AT7
VOLTAGE RAILS
RAIL IDLE
VS1 V
VS2 V
VS3 (BUS 2) V
VS4 V
VS5 V
VS6 V
HEATER 12V
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KEMP COUNTER TIMER Model - 4DS10
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Revision
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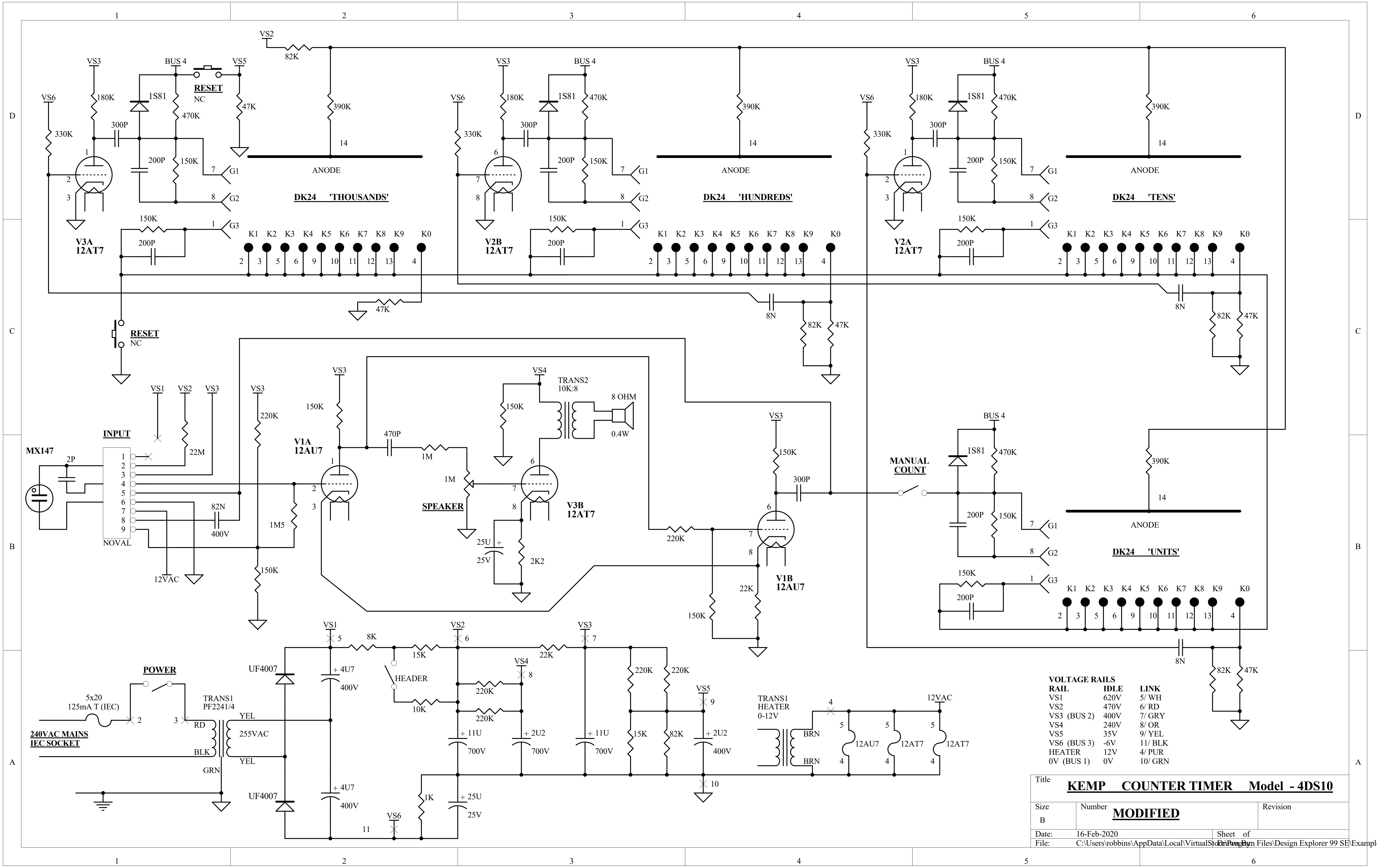

VS2
82K
390K
14
ANODE
DK24 'THOUSANDS'
DK24 'HUNDREDS'
DK24 'TENS'
DK24 'UNITS'
VS3
BUS 4
VS5
VS6
180K
1S81
470K
RESET
NC
47K
330K
300P
200P
150K
G1
G2
G3
V3A
12AT7
V2B
12AT7
V2A
12AT7
K1 K2 K3 K4 K5 K6 K7 K8 K9 K0
2 3 5 6 9 10 11 12 13 4
8N
82K
47K
RESET
NC
VS1
INPUT
MX147
2P
22M
NOVAL
82N
400V
1M5
12VAC
220K
V1A
12AU7
470P
1M
SPEAKER
VS4
TRANS2
10K:8
8 OHM
0.4W
V3B
12AT7
25U
25V
2K2
V1B
12AU7
22K
MANUAL
COUNT
POWER
5x20
125mA T (IEC)
240VAC MAINS
IEC SOCKET
TRANS1
PF2241/4
RD
BLK
YEL
GRN
255VAC
UF4007
4U7
400V
8K
15K
HEADER
10K
220K
22K
11U
700V
2U2
1K
TRANS1
HEATER
0-12V
BRN
12AU7
12AT7
VOLTAGE RAILS
RAIL IDLE LINK
VS1 620V 5/ WH
VS2 470V 6/ RD
VS3 (BUS 2) 400V 7/ GRY
VS4 240V 8/ OR
VS5 35V 9/ YEL
VS6 (BUS 3) -6V 11/ BLK
HEATER 12V 4/ PUR
0V (BUS 1) 0V 10/ GRN
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Number
MODIFIED
Revision
Date: 16-Feb-2020
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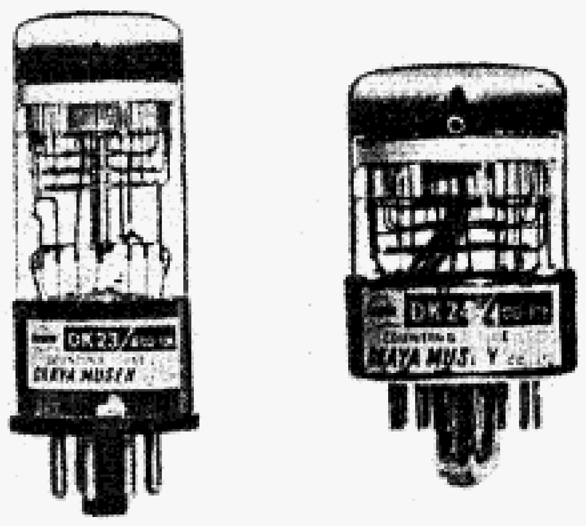
Drawn By:

RODAN OKAYA

OKAYA ELECTRIC INDUSTRIES CO., LTD.
2-46-3 SANGENJAYA, SETAGAYA-KU
TOKYO JAPAN

計数放電管



DK23 DK24 DK26

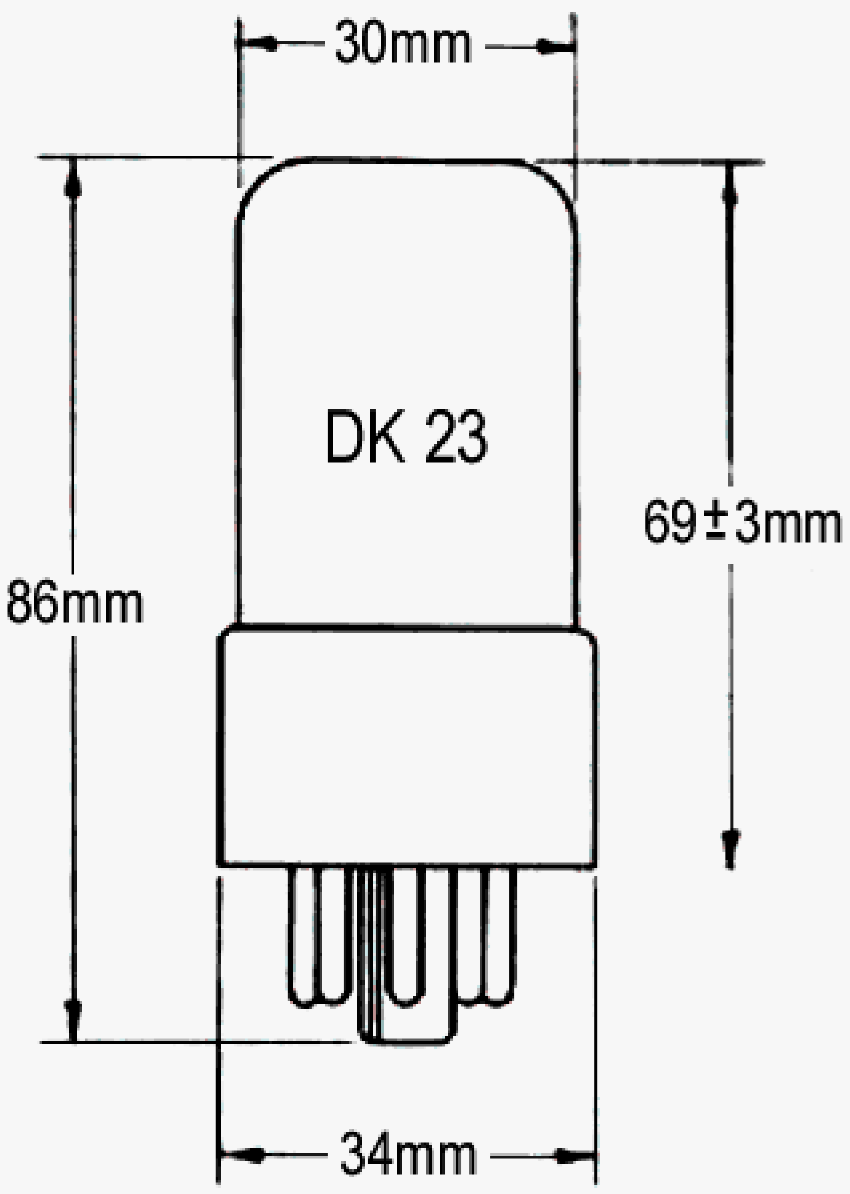
グロー放電を利用したもので，簡単な回路構成によって高速の10進計数が行なえ，その表示はグロー放電の位置で計数値を読取ることが出来ます。計数器以外にも数値制御として利用出来，広範囲の用途を有しています。

形 名	SUPPLY (min) 陽極供給直流電圧	ANODE (typ) 陽極電流	COUNT (max) 繰返し周波数
DK 23	380 Vdc	0.5mAdc	20,000 pps
DK 24	360 Vdc	0.5mAdc	20,000 pps
DK 26	360 Vdc	0.5mAdc	20,000 pps

NOMINAL TUBE DROP (DK 23, Anode-Cathode) . . . 190 Vdc

MECHANICAL DATA (DK 23):

BASE . . . . Intermediate Octal 8-pin
ZERO POSITION . . . . . . Cathode #0, Aligned with Pin-7



Outline Drawing

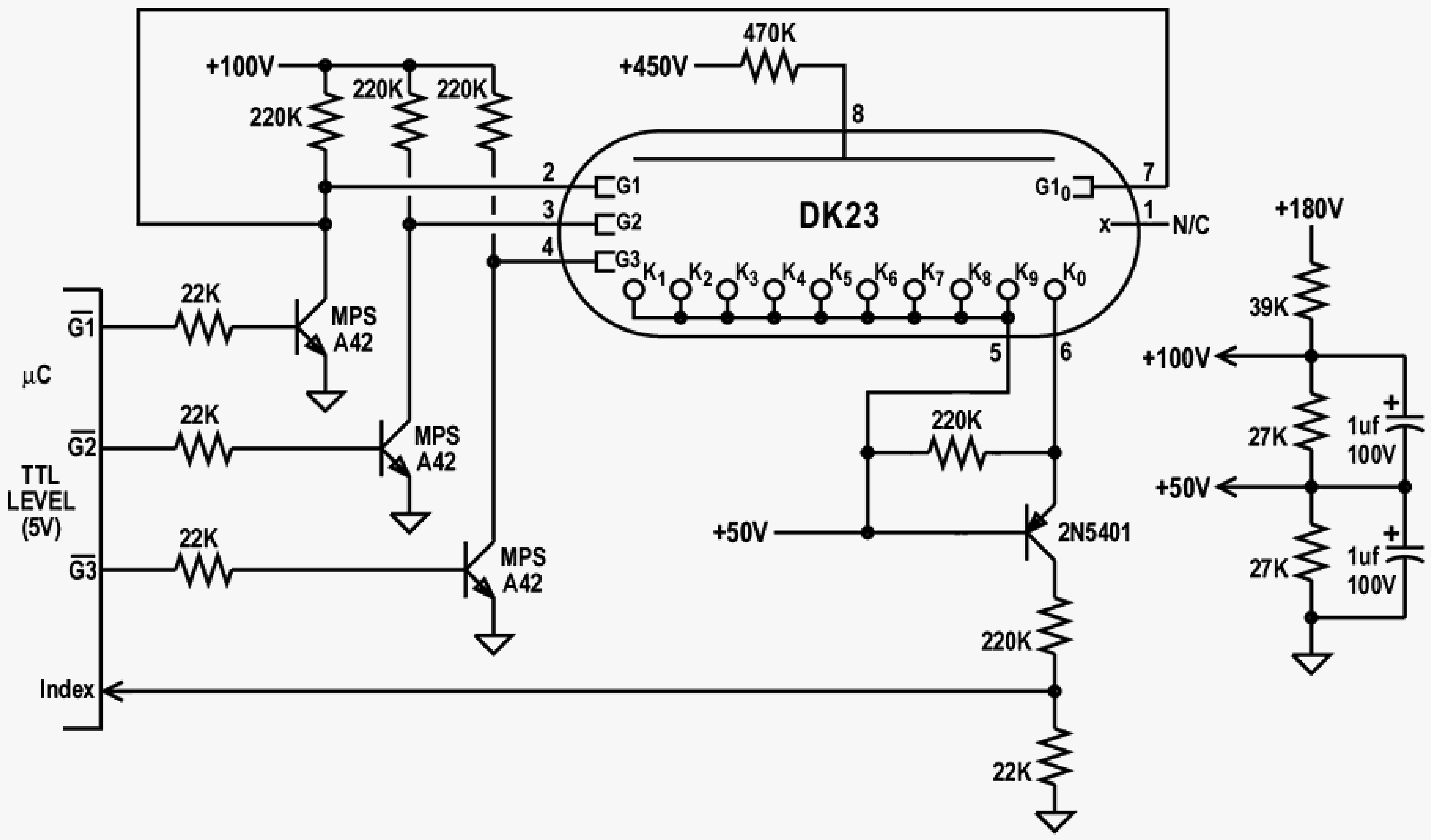
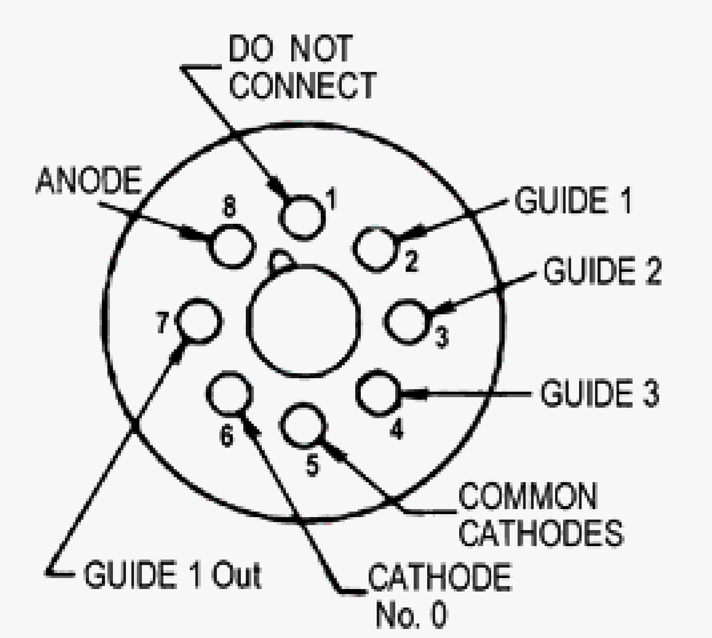


Figure 1 - Microcontroller to DK23 Dekatron Interface



DK23 BASE CONNECTIONS

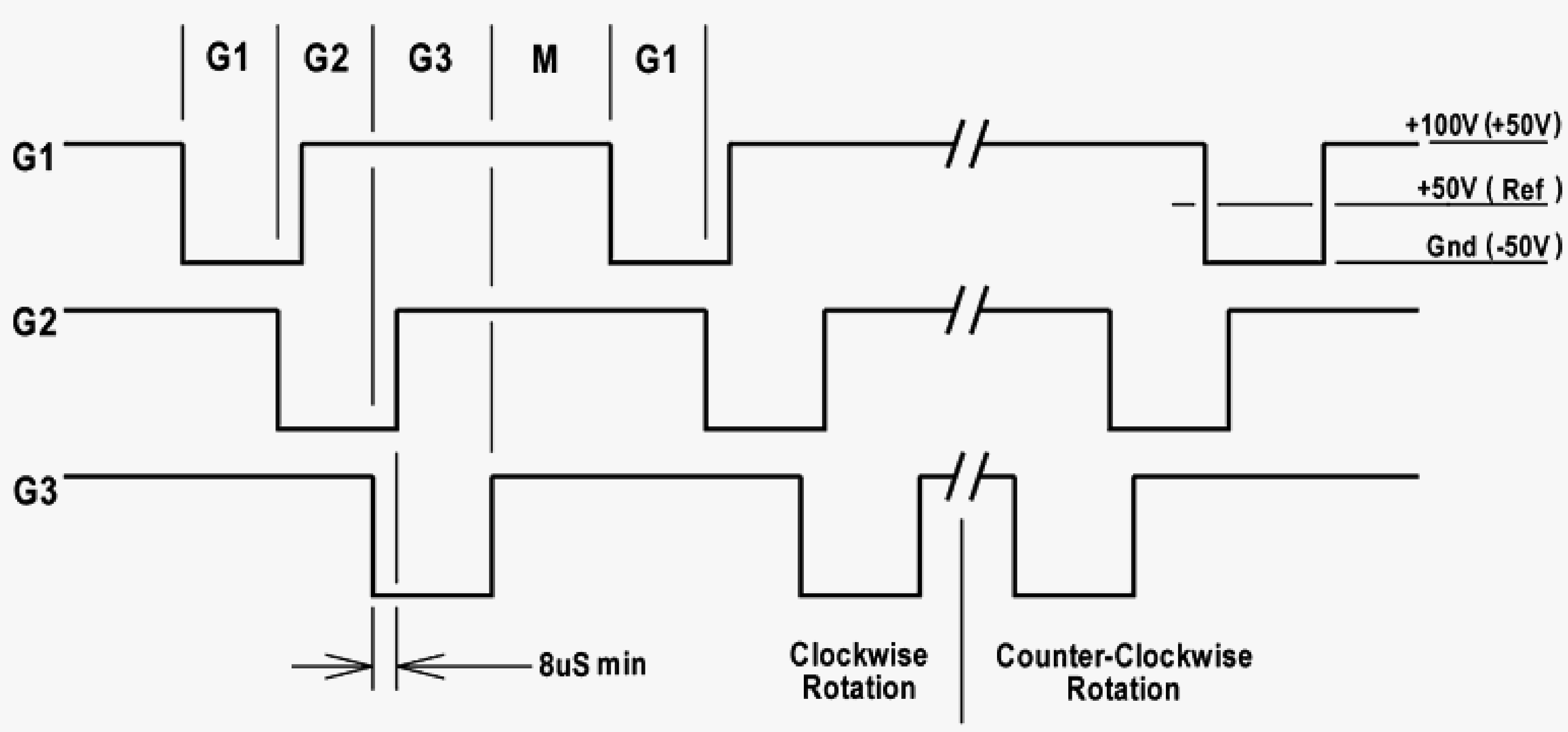
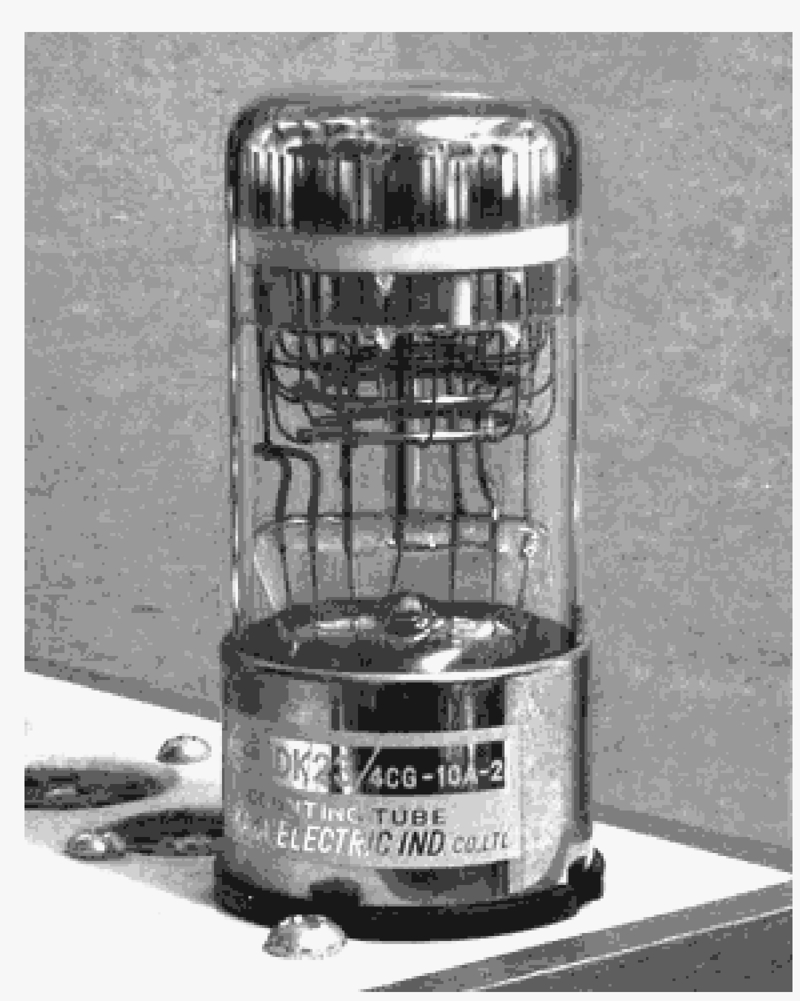


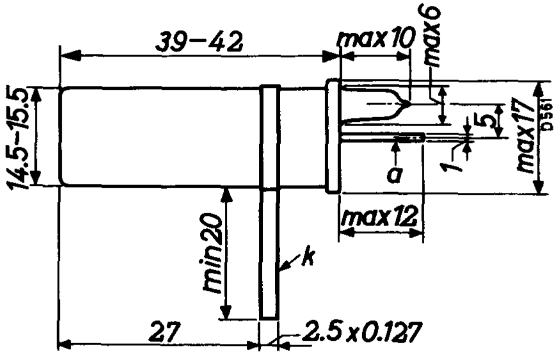
Figure 2 - DK23 Step Timing



GEIGER MÜLLER TUBE MX147

QUICK REFERENCE DATA		
Halogen quenched end window beta and gamma tube		
Recommended working voltage	500	V
Window thickness	2 to 3	mg/cm^2
Window diameter	9	mm

OUTLINE DRAWING



All dimensions in mm

WINDOW

Thickness	2 to 3	mg/cm^2
Effective diameter	9	mm
Material	mica	

CATHODE

Thickness	250	mg/cm^2
Sensitive length	39	mm
Material	Chrome iron (28% chrome)	

FILLING — Neon, argon and halogen

CAPACITANCE

Anode to cathode	2.0	pF

ELECTRICAL CONNECTIONS

Cathode	Strap
Anode	Clip

OPERATING CHARACTERISTICS ($T_{amb} = 25^{o}C$)

measured in circuit of Fig. 1

Max. starting voltage	325	V
Starting voltage temperature coefficient	0.5	V/degC
Max. threshold voltage	400	V
Min. plateau length	200	V
Max. plateau slope	0.03	%/V
Recommended working voltage	500	V
Max. background at 500V shielded with 50mm lead and 3mm aluminium	10	counts/min
Max. dead time at 500V	90	μs

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

Min. anode resistor	4.7	MΩ
Max. anode voltage	600	V
Max. ambient temperature	+75	^{o}C
Min. ambient temperature	-50	^{o}C

TEST INPUT CIRCUIT

R1 = 10MΩ

R2 = 220kΩ

C1 = 1 pF

R1 C1 = R2 C2

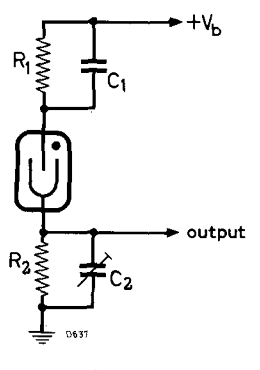
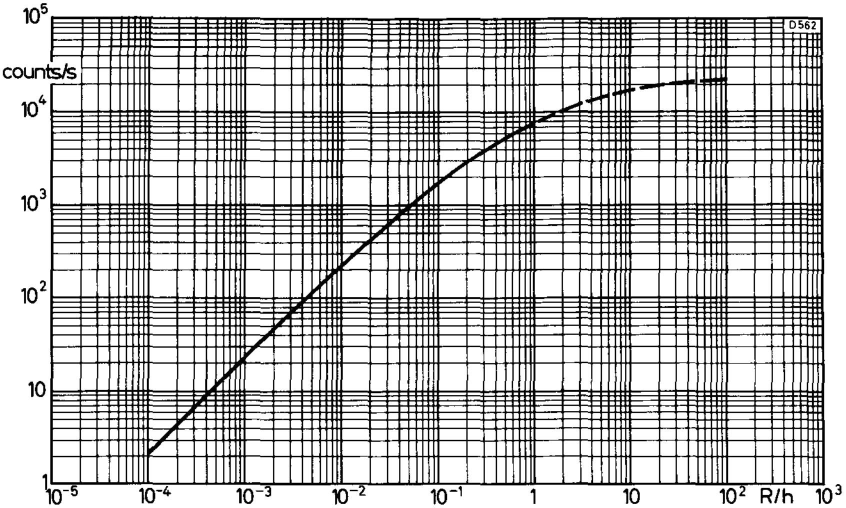
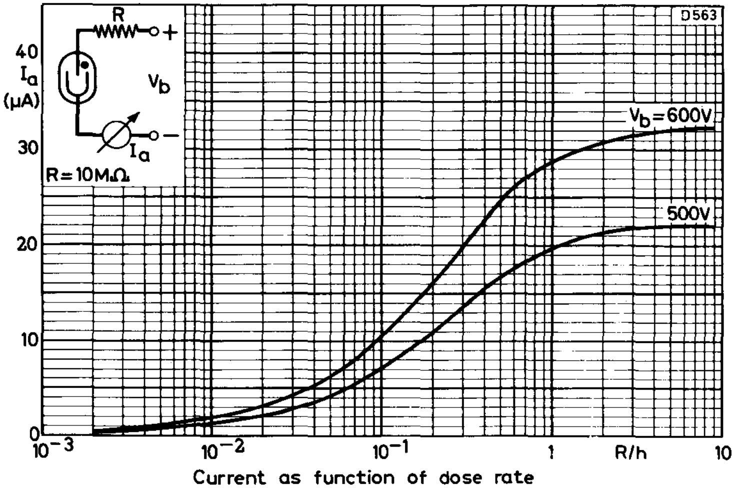


Fig. 1



Count rate as function of dose rate (side response)



Current as function of dose rate

Plateau curve

Dead time curve

Particle and radiation detectors

end window beta G-M tubes

book 2 part 2

Type No.	Window Diameter (mm)	Window Thickness (mg/cm^2)	Recommended Working Voltage (V)	Max.* Background (counts/min)	Dead Time (approx.) (μs)
ZP1400	9	2 to 3	500	10	90
ZP1481	17	2.5 to 3	430	30	120
ZP1480	17	2.5 to 3	430	30	120
ZP1420	17	1.5 to 2	550	15	150
†ZP1440	19.8	1.5 to 2	600	8	65
ZP1410	19.8	1.5 to 2	575	15	175
ZP1470	24.1	1.5 to 2.5	600	25	70
ZP1430	27.8	1.5 to 2.5	575	25	190
†ZP1450	27.8	1.5 to 2	625	18	60
ZP1460	51	3.5 to 4	900	45	45

*Shielded with 50mm lead and 3mm aluminium.
†Small quantities suitable for anticoincidence applications in conjunction with a guard tube may be available on request to Mullard Ltd.

gamma sensitive G-M tubes

Type No.	Gamma Sensitivity (counts/min)	Recommended Working Voltage (V)	Max.* Background (counts/min)	Dead Time (approx.) (μs)
ZP1210	6 800‡	430	40	200
ZP1220	13 000‡	430	75	210

*Unshielded. ‡At 1.0mR/h Radium source.

the Trochotron and the Philips E1 T; they have the advantage of speed, in that count rates of the order of 200,000 per second are possible. The fastest glow tubes can count at about a tenth of this rate.

For biological work the glow-discharge types are usually fast enough and it is not proposed to consider cathode ray counters further. As examples of the former, the Ericcson Dekatrons type GC10 B and GC10 D will be briefly discussed; the only *operational* difference between these two tubes is their upper limiting counting speeds, 4,000 counts per second with the former, 20,000 counts per second with the latter.

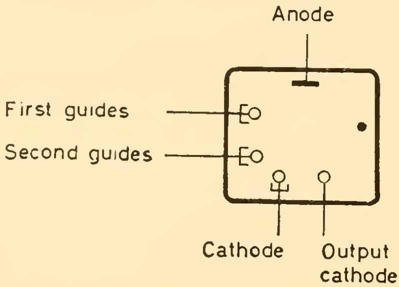


Figure 41.12

The GC 10 B—The GC 10 B comprises a central disc-shaped anode surrounded peripherally by 30 equally spaced rod-like electrodes. Electrodes 1–4–7–10 . . . 25 are connected together internally and brought to an external connection as 'cathodes'. Electrode 28 is brought out separately

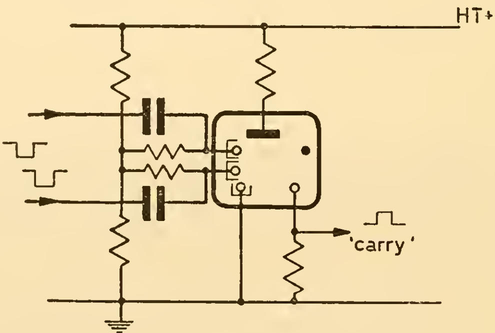


Figure 41.13

as the 'output' or 'carry' cathode. Electrodes 2–5–8 . . . 29 are connected together and brought out as 'first guides' and similarly 3–6–9 . . . 30 as 'second guides'. The gas filling is neon. The circuit diagram is as in *Figure 41.12.* Consider now the circuit in *Figure 41.13.* On applying the HT the glow strikes between the anode and one of the cathodes, the *n*th say. There is no possibility of the glow bridging the anode and one of the guides because the latter are biased such that the potential difference is insufficient. However, if a negative pulse of sufficient magnitude be applied via a capacitor to the first guide, the glow transfers one electrode round the ring: if a fraction of a second later a similar negative pulse is then applied to the second guide, the glow advances a step further. At the conclusion of the second pulse the glow is nearer to the $n+1$th cathode than to the nth, and in consequence moves forward once more, thus accomplishing one count. At the completion of each ten counts the glow passes the output cathode, and a positive pulse is developed across the load resistor by the passage of the glow current through it.

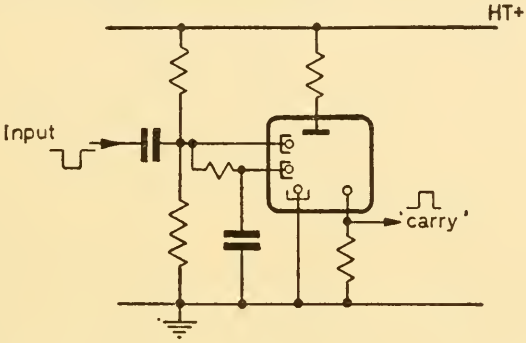


Figure 41.14

The GC 10 B is, for obvious reasons, called a 'double pulse' dekatron, and driving it is seen to be a matter of providing two negative pulses in quick succession. This may be done in a number of ways; in most of them a negative pulse is applied directly to the first guides and via a low-pass filter to the second, as in *Figure 41.14*. With properly chosen values the waveforms are then as sketched in *Figure 41.15*.

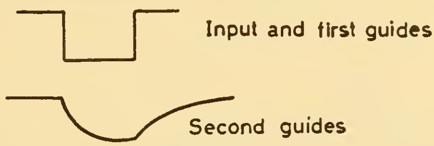


Figure 41.15

The output pulse from one dekatron is in the wrong phase and of insufficient magnitude to drive another. A circuit recommended by the manufacturers which effects the necessary phase reversal, amplification and double pulse production is shown in *Figure 41.16*. It makes use of the high-speed trigger-tetrode type GTE 175M, which is convenient in that no cathode heater power is required. This circuit works up to 500 counts/sec.

The GC 10 D—This high-speed dekatron has 40 electrodes equally spaced around the anode, made up of 10 cathodes and 3 sets of guides. All first guides are brought out together as one connection, and all second guides as another. The third guides are divided, as are the cathodes, into output third guide and all other third guides, and output cathode and all other cathodes: the output third guide, of course, precedes the output cathode. The gas filling appears to be argon. The circuit diagram is as in

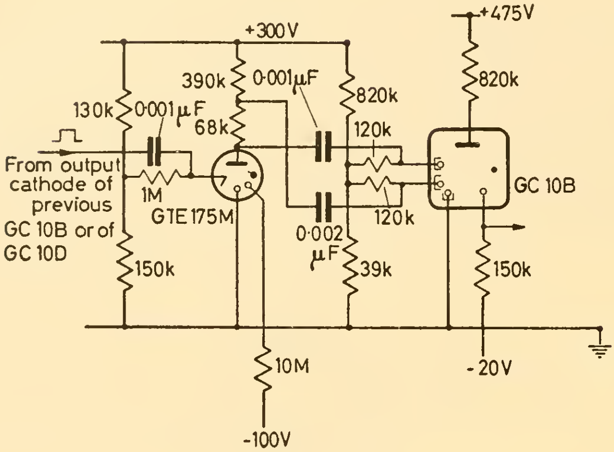


Figure 41.16

Figure 41.17. Glow transfer is achieved in the GC 10 D by applying a single pulse only. This is done by making use of both the leading and trailing edges of the transfer pulse, and by the phenomenon called 'auto transfer', which may be explained as follows:

In *Figure 41.18* we have the anode and two electrodes *A* and *B*, which may be cathodes or guides. If the glow can by some means be caused to alight on electrode *A*, the glow current will charge *C* to a definite potential difference determined by *R*. If by this process *A* becomes sufficiently positive the glow 'auto-transfers' to the more negative electrode *B*. *C* then discharges again through *R*, but the glow will remain at *B*.

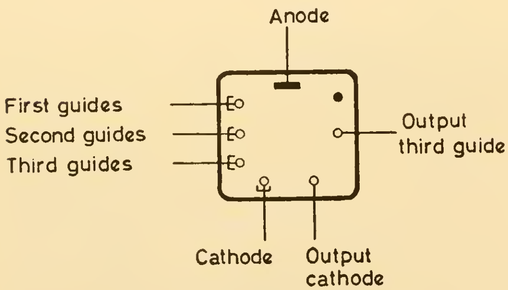


Figure 41.17

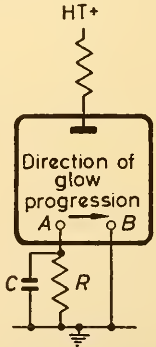


Figure 41.18

Thus a typical GC 10 D drive circuit is shown in *Figure 41.19*. Let the glow be on the *n*th cathode. On the arrival of the leading edge of the transfer pulse the first and second guides are driven sufficiently negative to draw the glow on to the first guide, whereupon it auto-transfers to the second. The back edge of the transfer pulse then comes along, driving the first and second guides positive again. The third guides are now relatively very negative and in consequence the glow moves there, only to be auto-transferred to the $n + 1$th cathode.

It might seem at first sight that the first and third guides might be dispensed with; that the leading edge of the transfer pulse could be used to move the glow from nth cathode to a guide, and the trailing edge would then move it on the $n + 1$th cathode. The difficulty is to prevent its moving back to the nth again. In point of fact single-guide tubes do exist; specially shaped electrodes ensure that transfer occurs in the required direction.

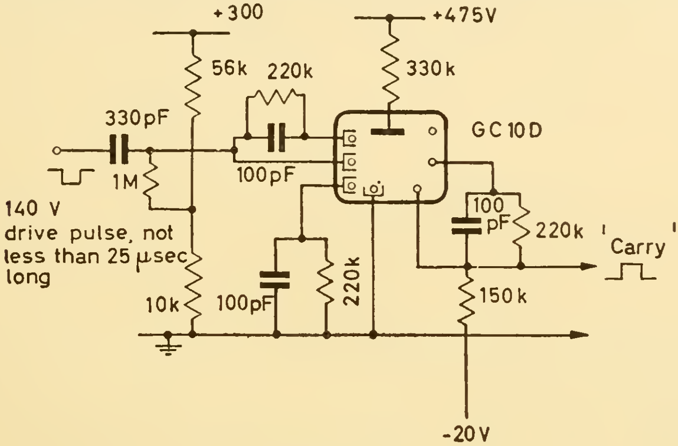


Figure 41.19

A GC 10 D can be driven from another GC 10 D via a GTE 175 M high-speed trigger tetrode at rates up to 1,000/sec. The necessary circuit is shown in *Figure 41.20*, and is reproduced from part of reference 4 in this chapter.

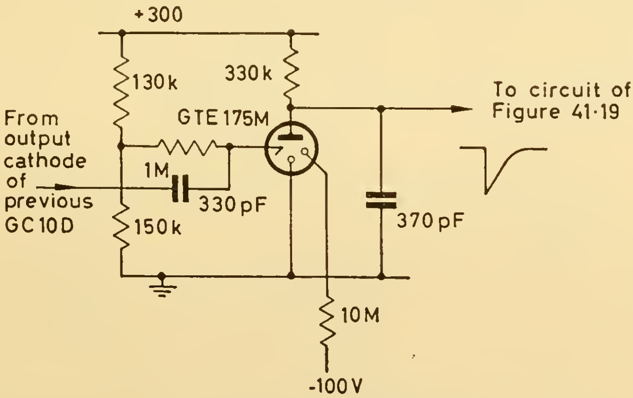


Figure 41.20

A scaler for radioactivity measurements using dekatron counters has been described by Florida and Williamson[12]. Kerkut[13] has given details of a dekatron action-potential counter. The time marker, employing dekatrons, published by Kay has already been mentioned.