



9036/7/8

836

**Service Manual
(Incomplete schematics)**

Courtesy of:-

Racal_Dana user group



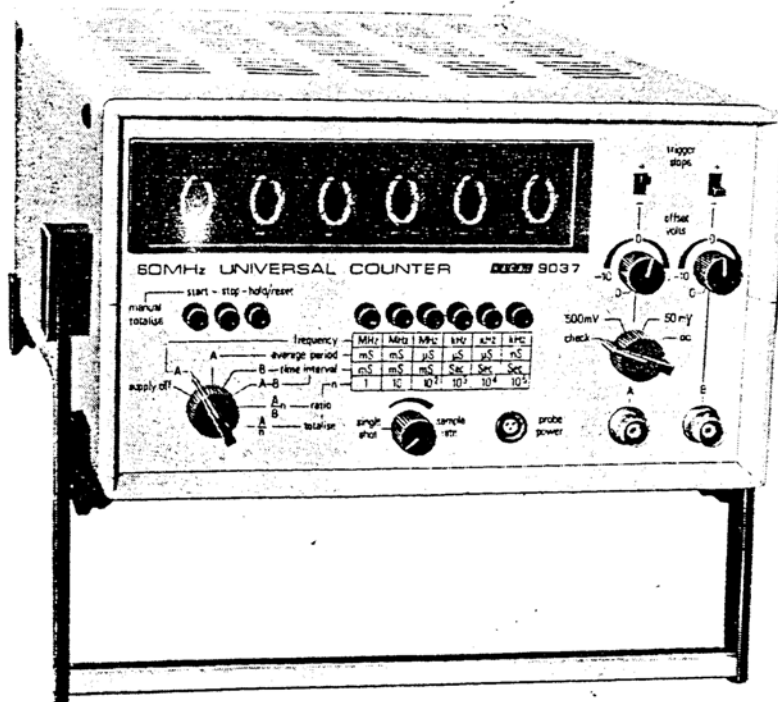
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GORSQ
12 May 2012

9036/7/8

Multi-function Universal Counter
Timer to measure Time, Frequency,
Period and Ratio.



Frequency range to 60 MHz Timing Resolution to $0.1\mu\text{s}$
TTL integrated circuit design Full remote programming

Optional versions include the fully Militerised Model 836
NATO No. 6625-99-522-6578

Full utilization of TTL integrated circuit forms the major design concept of this advanced new range of Racal Universal Counter Timer 9036-9038. The series provide dual input time measurement capability with a resolution of $0.1 \mu\text{s}$, each input channel has positive and negative trigger slope selection in addition to a variable trigger level control covering the range ± 10 volts with an automatic zero position.

These versatile instruments measure frequency, single and multiple period, frequency ratio, time interval—single and double line, in addition to their use as totalizers and scalars. Full remote control of timebase and measurement functions is provided as an optional extra. All have a six digit in-line display and a probe socket is provided for use with the Racal Active Probe model 819 to afford a sensitivity of better than

5 mV throughout the entire frequency range, whilst retaining a high impedance low capacitance input.

The simplest model, the 9036, operates to 32 MHz with an unlatched display. Both models 9037 and 9038 operate up to 60 MHz and have switchable latched displays, with the 9038 being equipped with a higher quality frequency standard having a fast warm-up capability.

For military applications a ruggedized version of the 9036 is available, the Model 836S, NATO No. 6625-99-522-6578 which operates to 32 MHz and incorporates the features of the 9036 plus additional external protection against accidental damage and the ingress of dust and moisture under the most severe operating conditions.

Provisional Technical Specification

MEASURING FUNCTIONS

Frequency
Single Period
Multiple Period
Ratio
Multiple Ratio
Time Interval—single line
Time Interval—double line
Totalizing
Scaling

CHANNEL 'A' INPUT AMPLIFIER

a.c. coupled

Frequency range

10 Hz to 32 MHz (9036).

10 Hz to 60 MHz (9037 and 9038).

Signal range

50 mV to 200 V r.m.s. with attenuator set to 50 mV.

500 mV to 200 V r.m.s. with attenuator set to 500 mV.

Damage overload

250 V r.m.s. below 100 kHz.

Maximum d.c. level

400 V.

Input impedance

1 M Ω in parallel with 20 pF.

d.c. coupled

Frequency range

0 to 20 MHz.

Input impedance

100 k Ω in parallel with 20 pF.

Sensitivity

+ 0.5 V.

Offset

+ 10 V and preset 0 V.

Maximum level

+ 200 V.

Pulse duration

25 ns minimum at trigger points.

CHANNEL 'B' INPUT AMPLIFIER

d.c. coupled

Specification as for 'A' Channel d.c. coupled but without input switch and attenuator.

FREQUENCY MEASUREMENT

Frequency range

0 to 32 MHz (9036).

0 to 60 MHz (9037 and 9038).

Input channel

'A'. a.c. or d.c. coupled

Gate times

100 μs to 10 s in decade steps.

PERIOD MEASUREMENT

Range

1.0 μs to 1 s.

Clock unit

1 μs .

Input channel

'A'. a.c. or d.c. coupled

Periods averaged

1 to 10^5 .

TIME INTERVAL (SINGLE and DOUBLE LINE)

Time range

0.1 μs to 10^4 s (approx. 2.8 hours).

Input channel

'B'. d.c. coupled

Sensitivity

Signal to be measured must have an amplitude in excess of 1 V p-p with a mean d.c. level of less than ± 10 V.

± 10 V with the preset 0 V by front panel control.

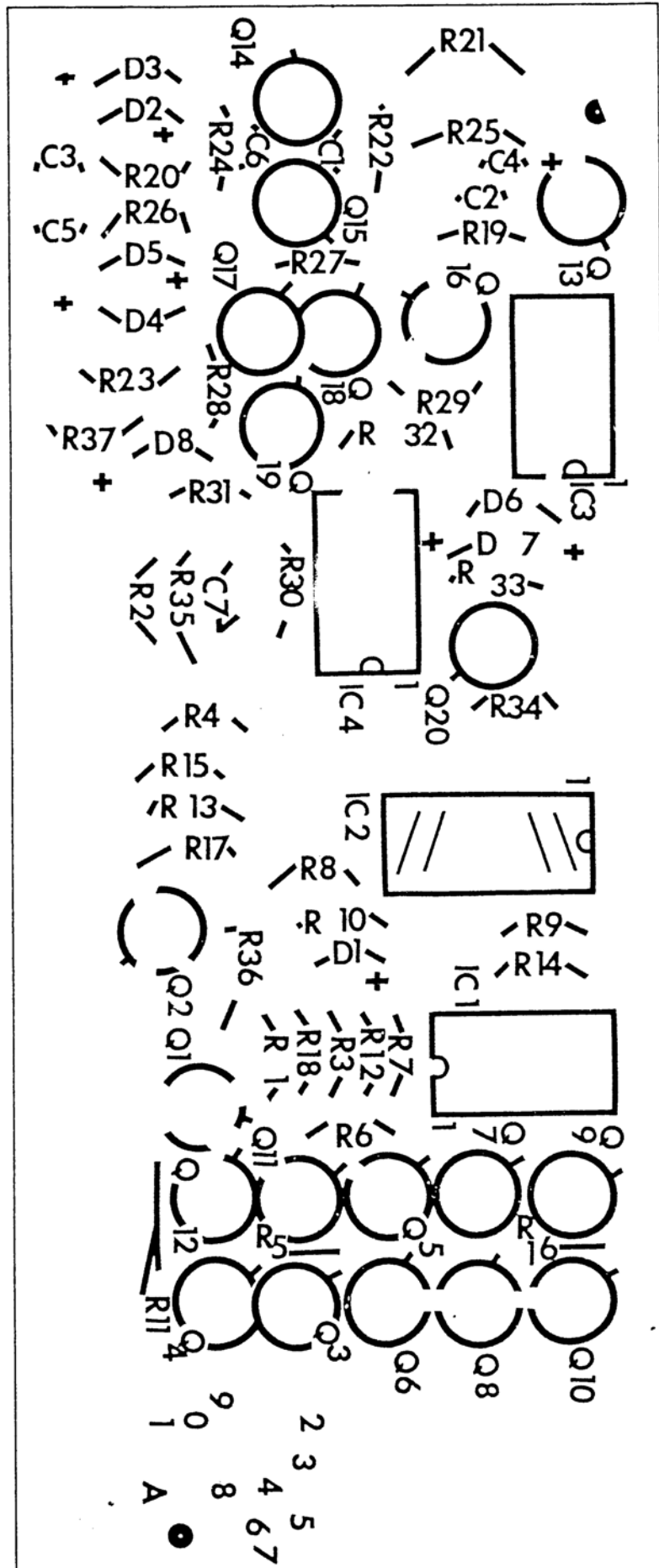
Offset

+ ve or - ve by front panel slide switches.

Trigger slope

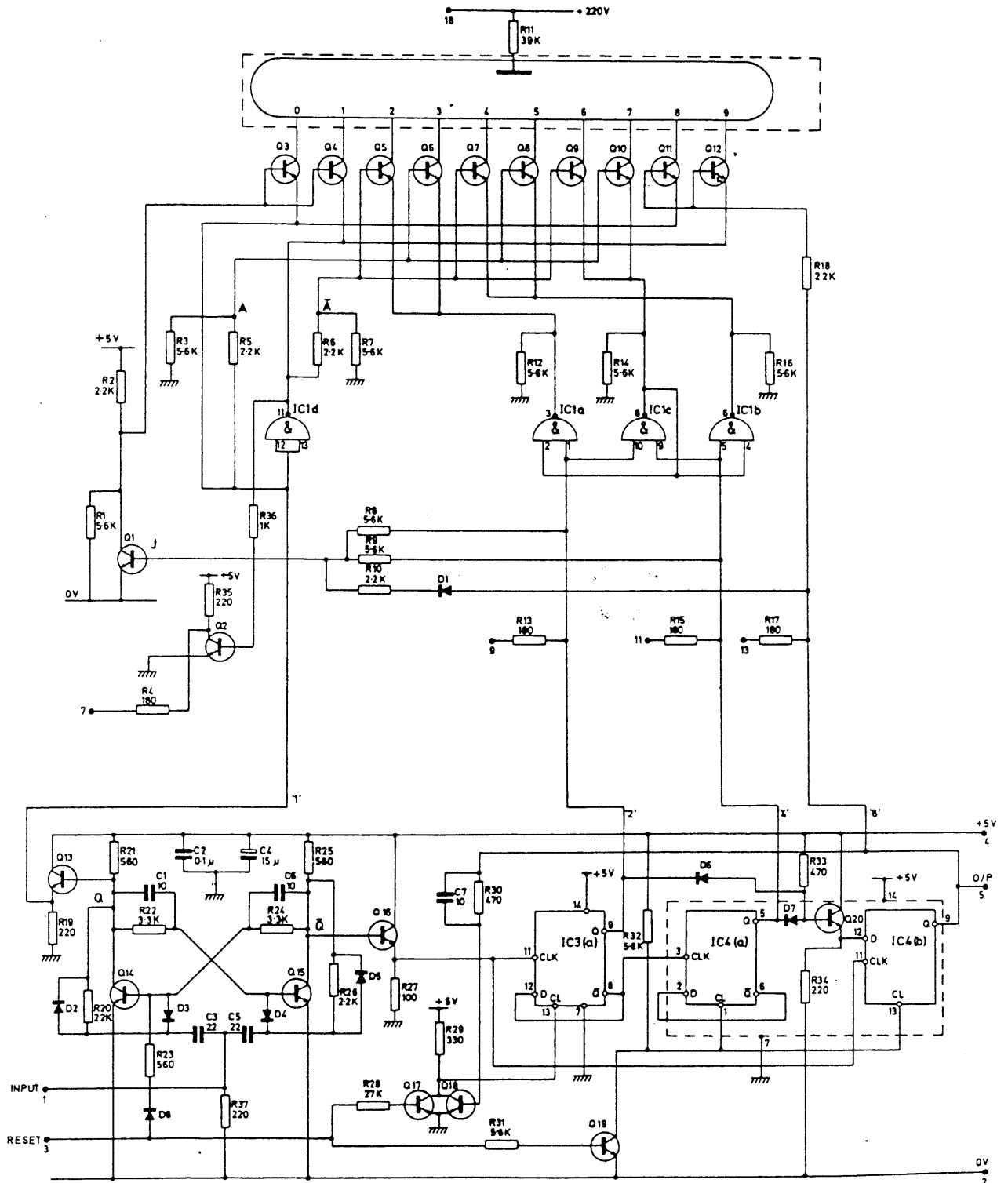
0.1 μs to 10ms always derived from internal frequency standard.

Clock units

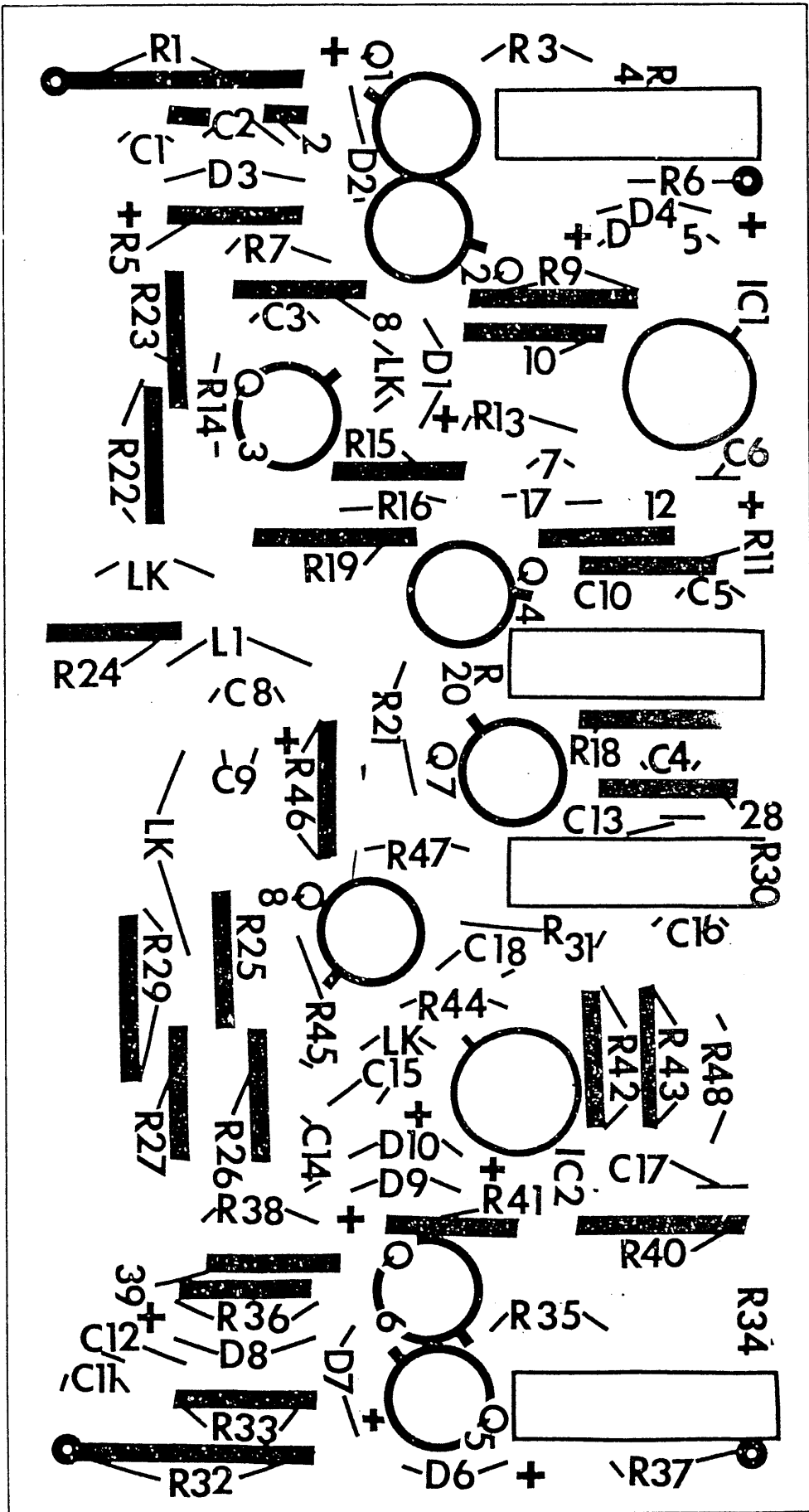


Layout : High Speed Decode Assy.
19-0299

Fig. 4.1



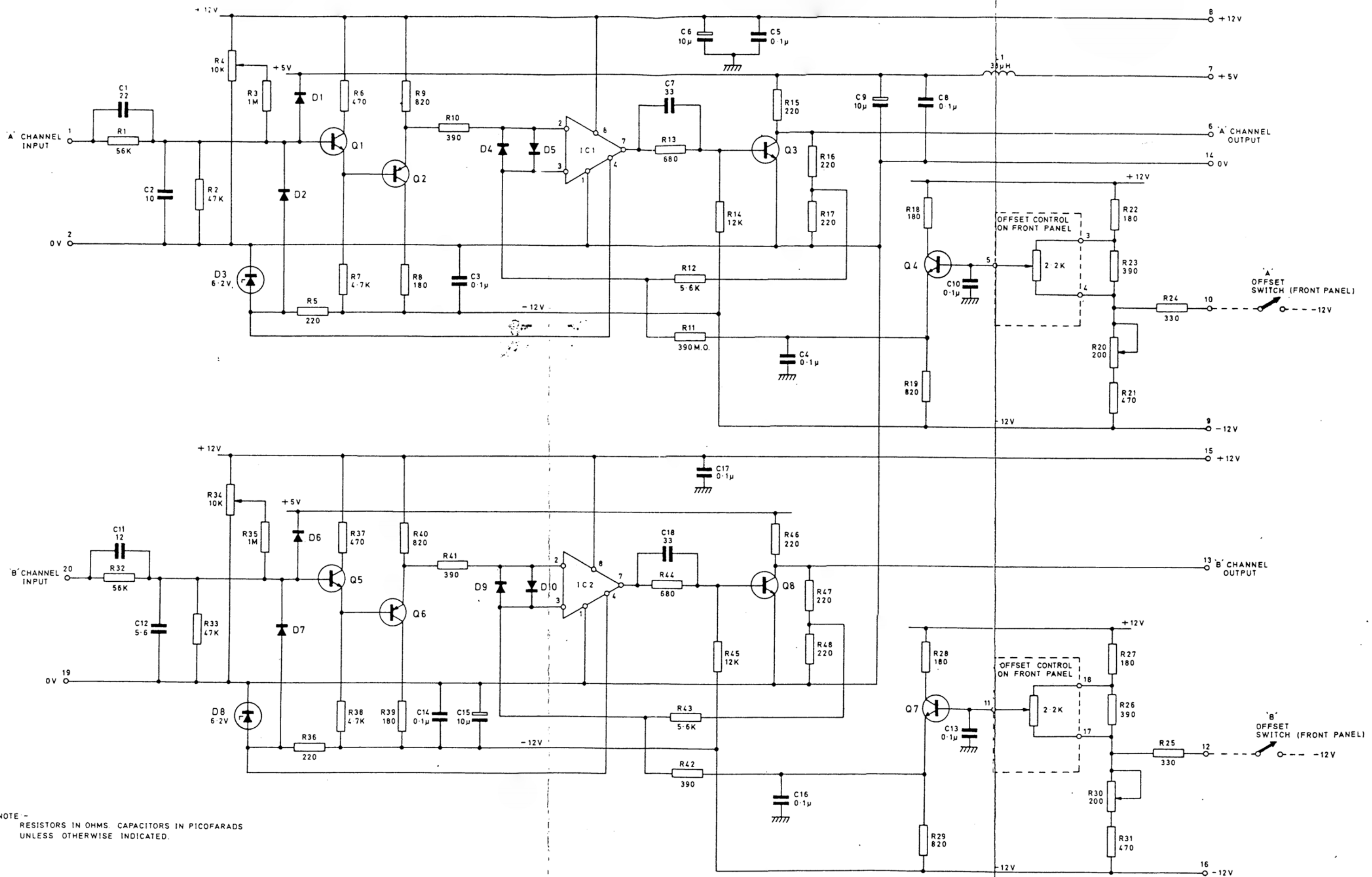
NOTES:
 1. UNLESS OTHERWISE INDICATED:
 RESISTORS IN OHMS CAPACITORS IN PICOFARADS.
 2. CONNECTIONS NUMBER CONSECUTIVELY FROM LEFT
 TO RIGHT FACING COMPONENT SIDE OF ASSY.



WOH 1114
19-0338
1

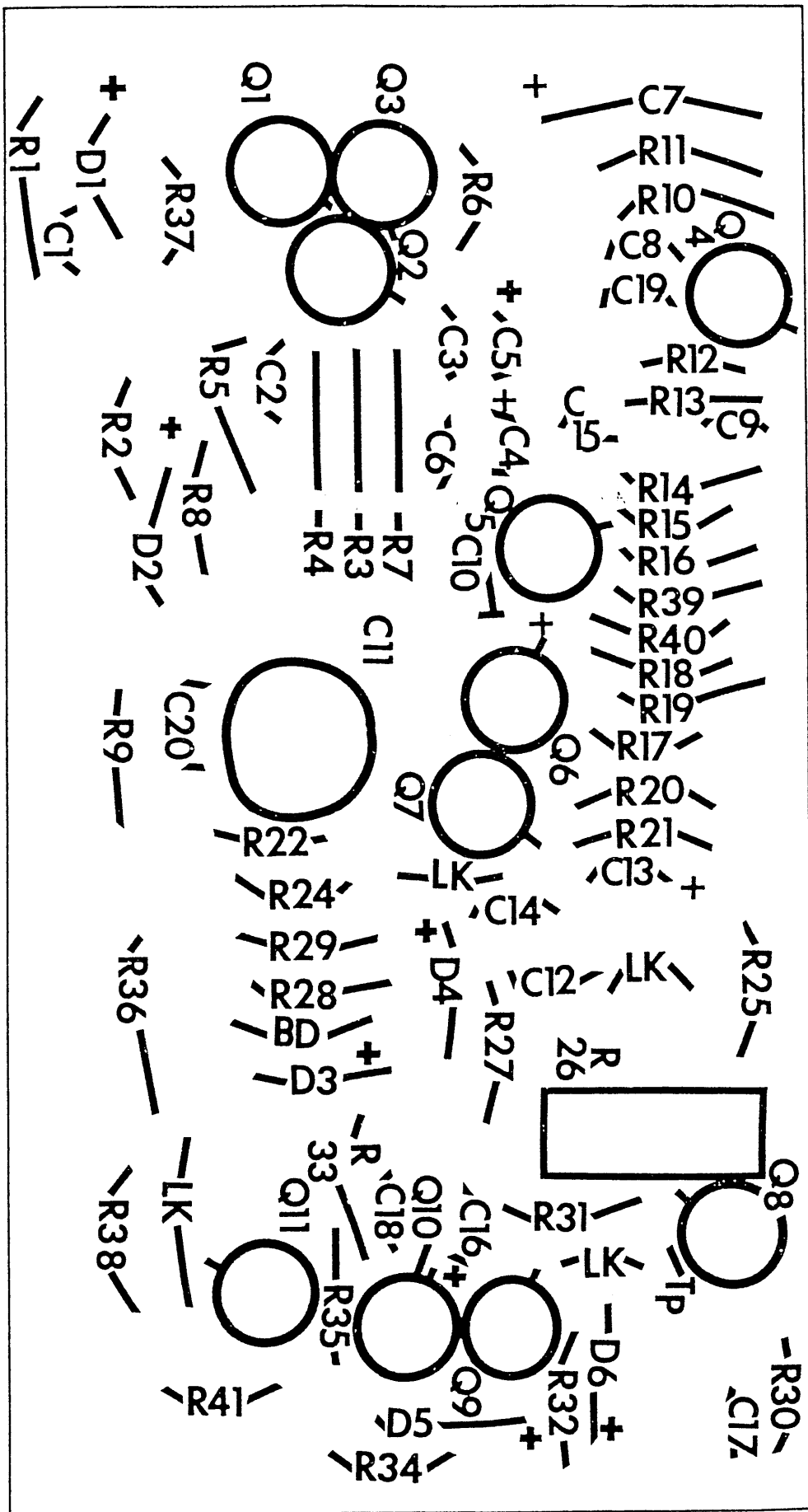
Layout : D. C. Amplifier Assy. 19-0338

Fig. 4.3



NOTE - RESISTORS IN OHMS. CAPACITORS IN PICOFARADS UNLESS OTHERWISE INDICATED.

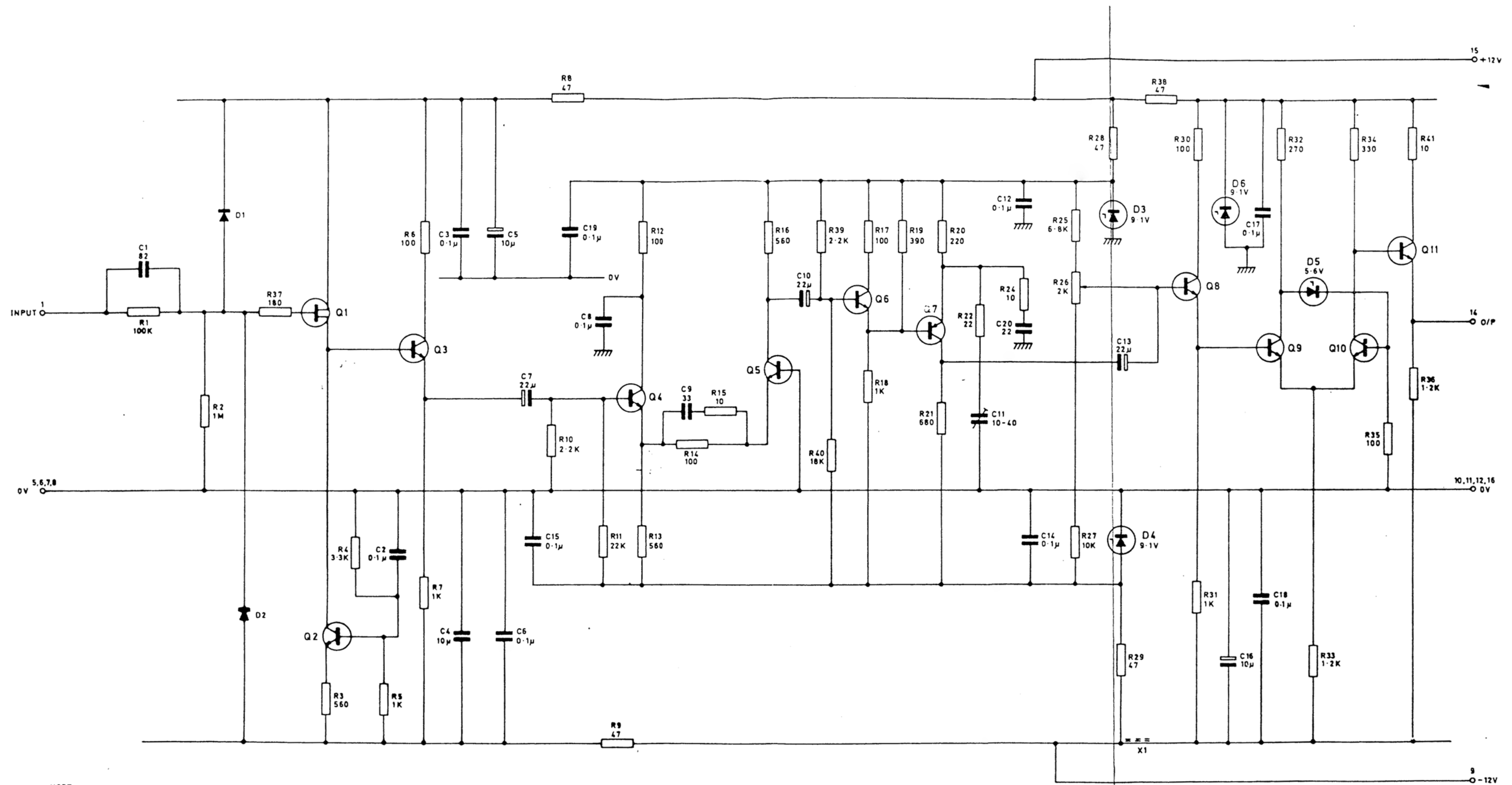
Circuit: D.C. Amplifiers 19-0338



WOH 1114
19 - 0339
1

Layout : A. C. Amplifier Assy. 19-0339

Fig. 4.5

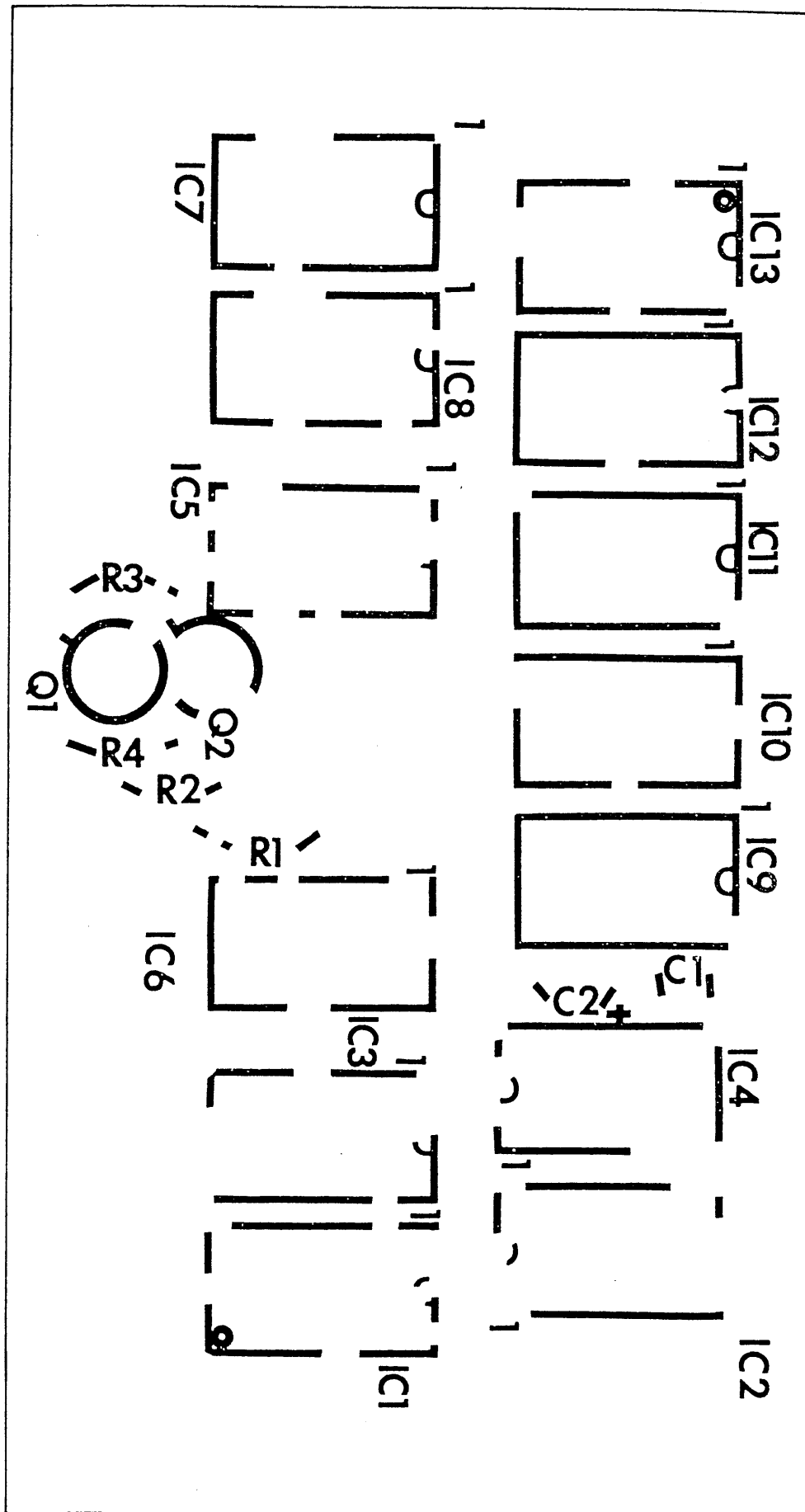


NOTE:-
RESISTORS IN OHMS. CAPACITORS IN PICO FARADS
UNLESS OTHERWISE INDICATED.

Circuit: A.C. Amplifier Assembly 19-0339

19-0339

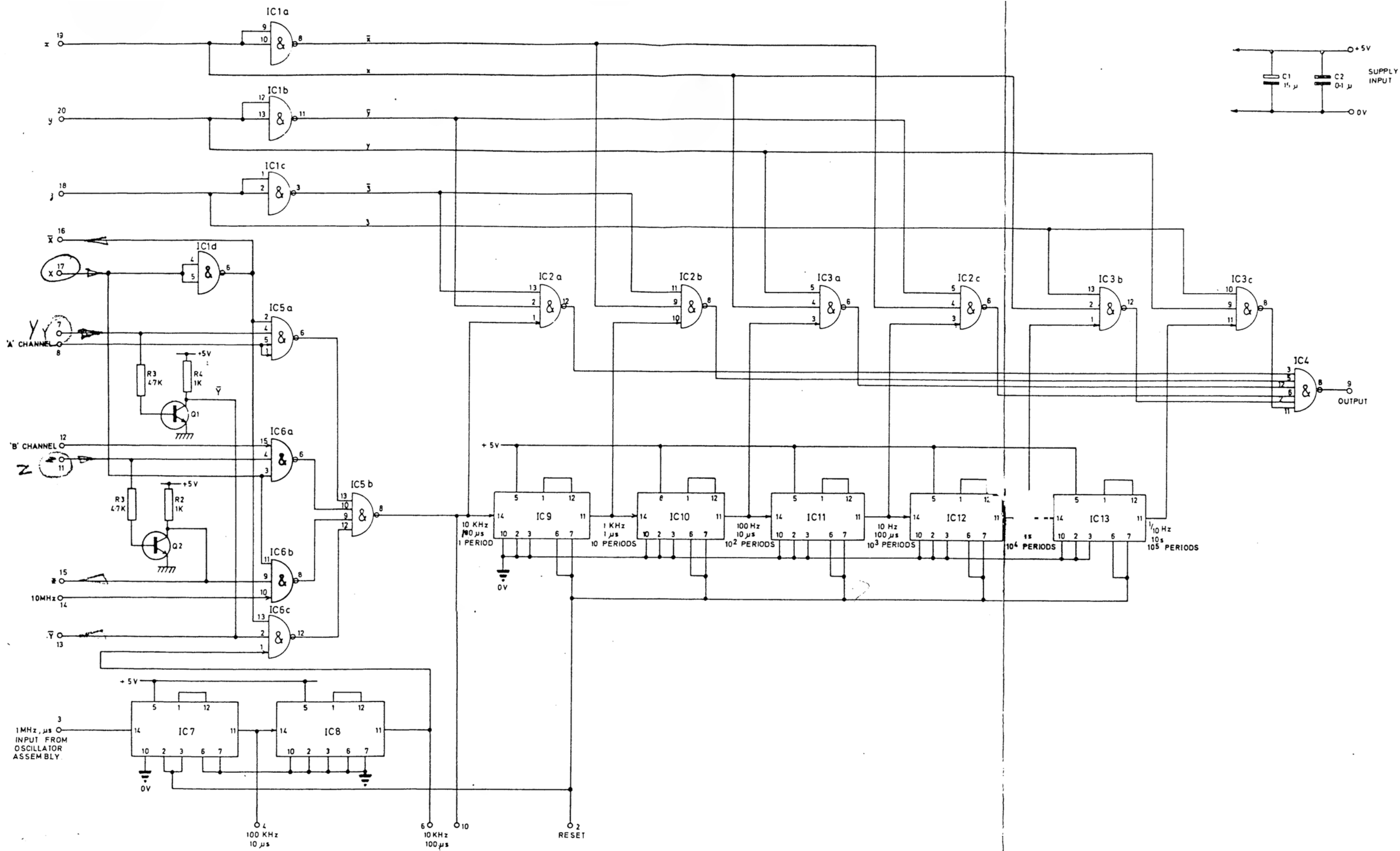
Fig. 4.6



WOH1114	
19-0352	
1	

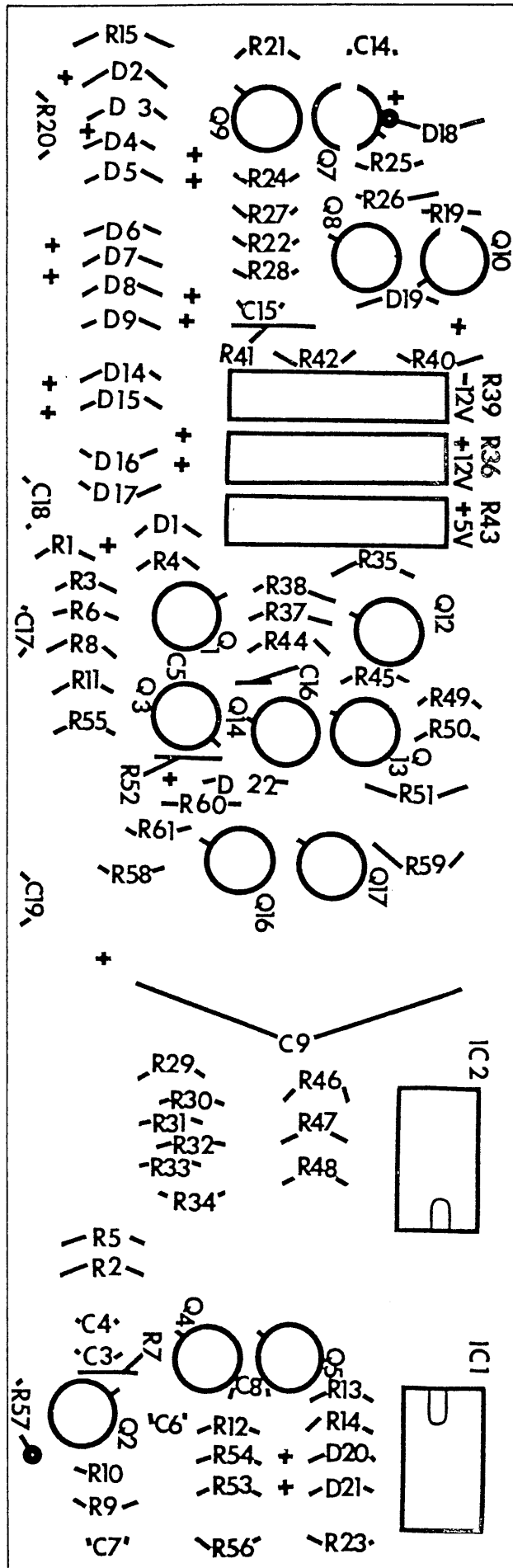
Layout: Time Base Divider Assy. 19-0352

Fig. 4.7



Time - Base Divider Assembly 19-0352

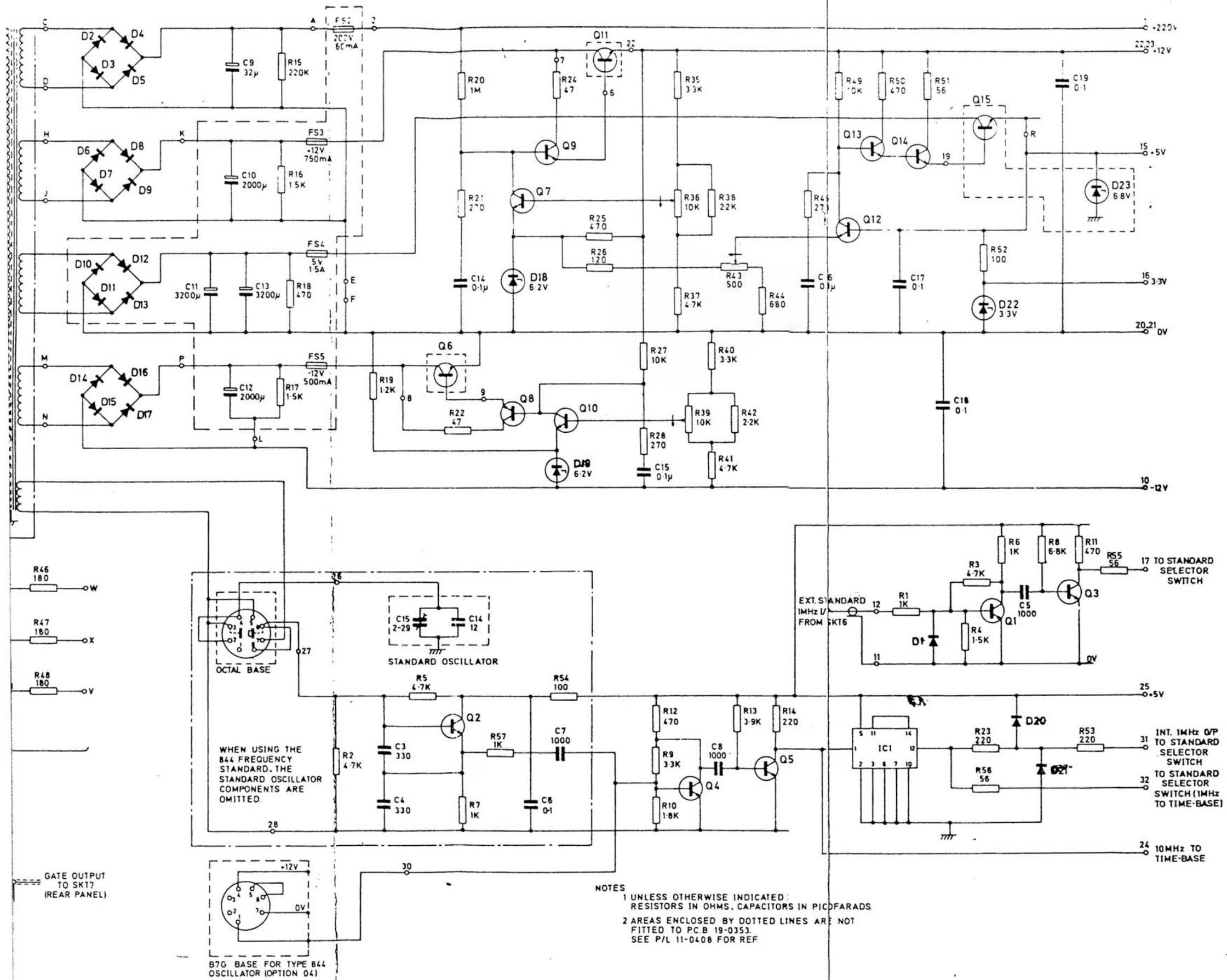
Fig. 4.8



Layout : Power Supply and Oscillator Assy.
19-0353

WOH111C
19-0353
1

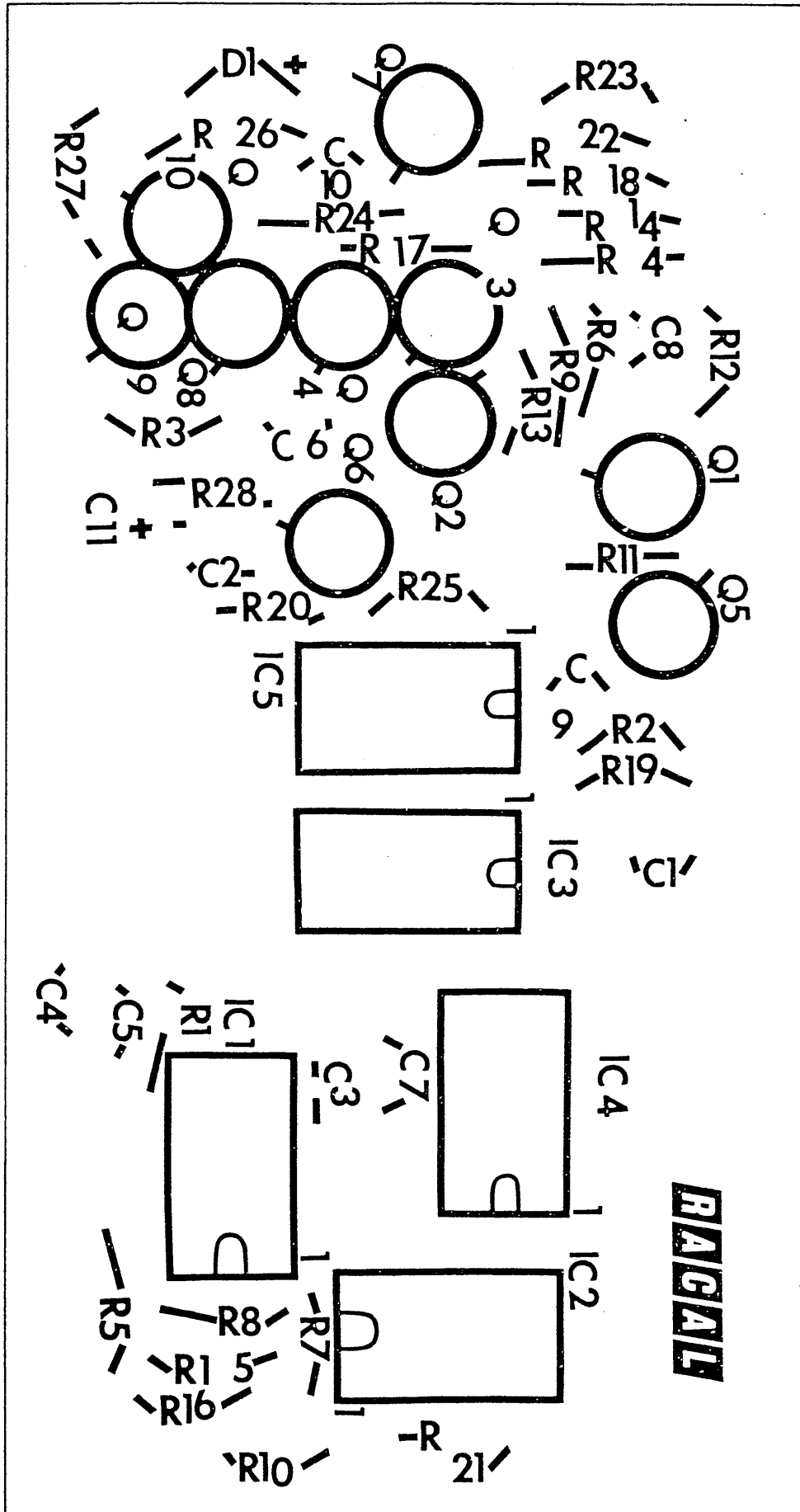
Fig. 4.9



Circuit : Power Supply and Oscillator 19-0353

19-0353

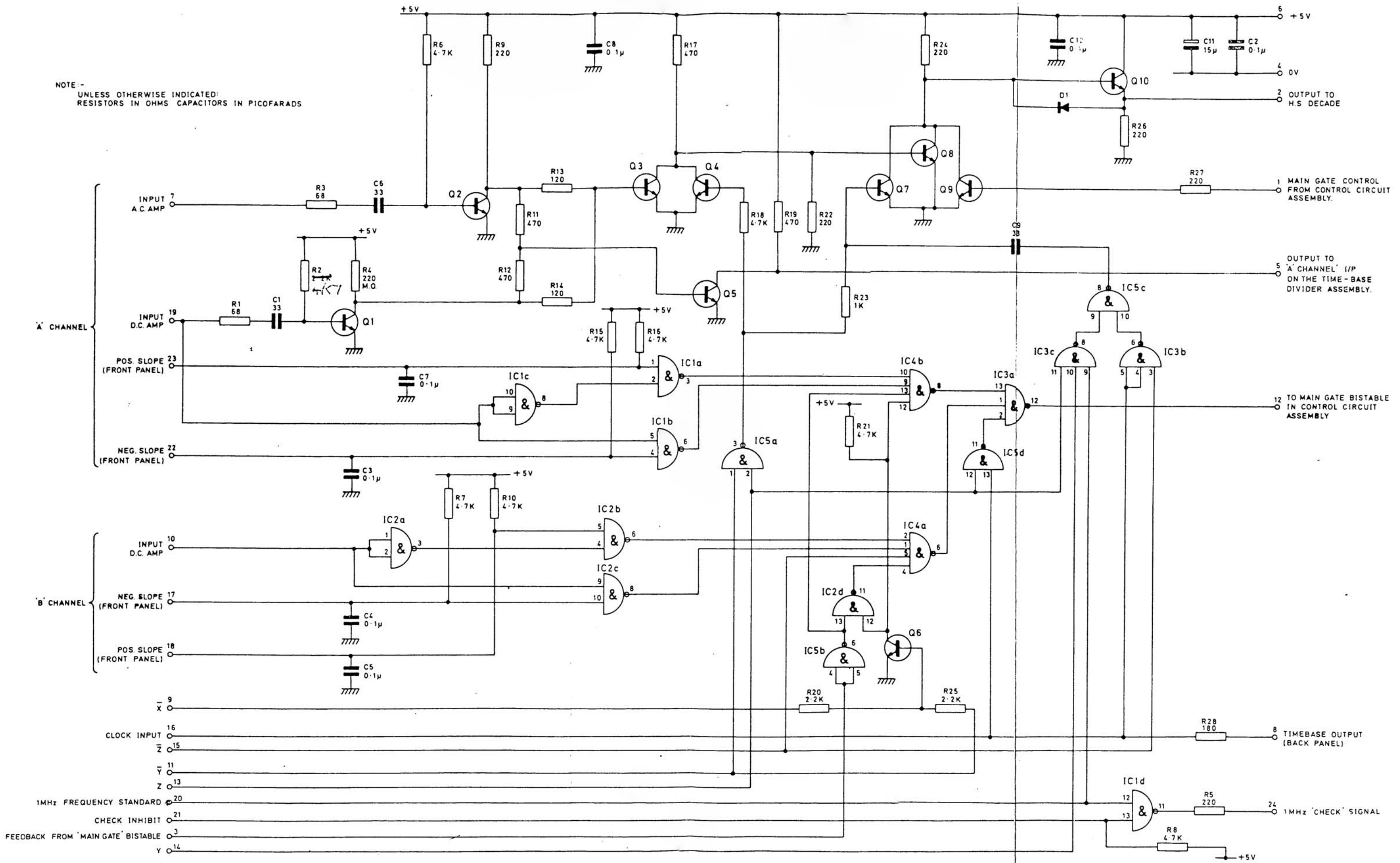
Fig. 4.10



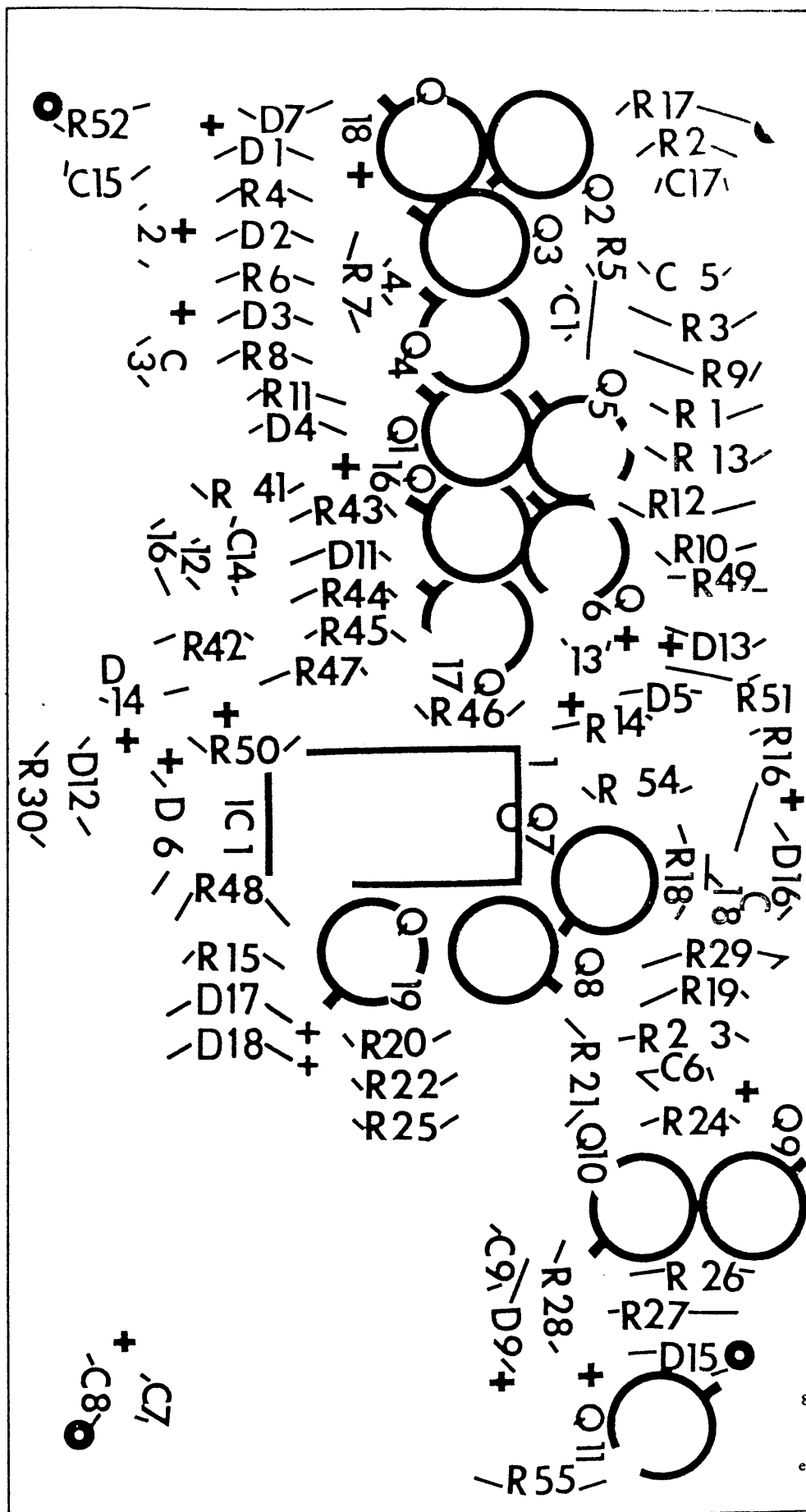
WOH 1114
19-0354
1

Layout : Gating Control Assy. 19-0354

Fig. 4.11



Circuit: Gating Control Assembly 19-0354

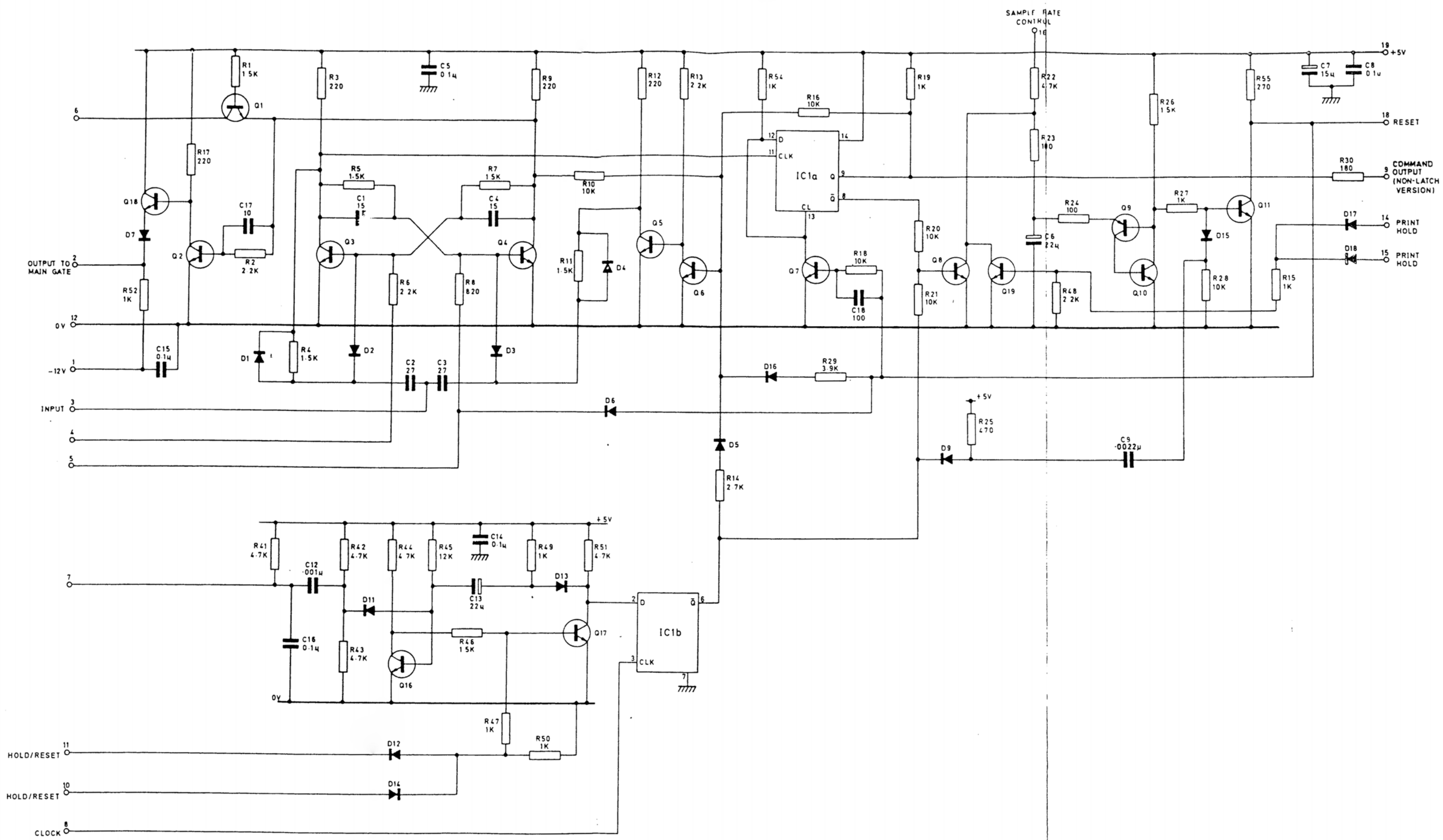


For Service Manuals
 MAURITRON SERVICES
 8 Cherry Tree Road, Chinnor
 Oxfordshire, OX9 4QY.
 Tel (01844) 351694
 Fax (01844) 352554
 email:- sales@mauritron.co.uk

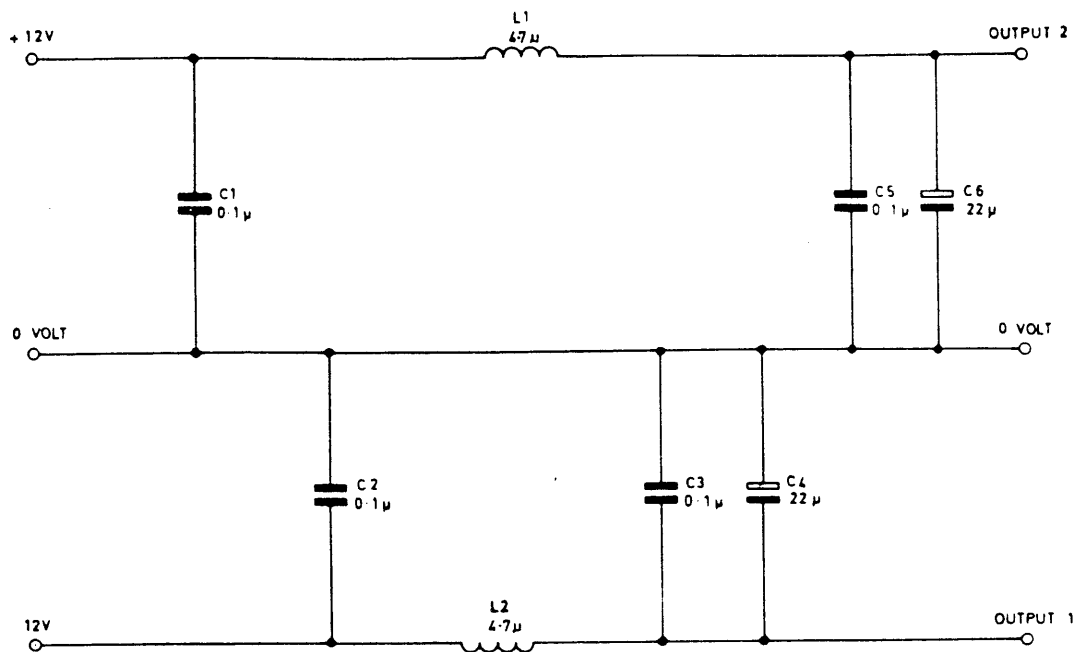
WOH1114	
19-0437	
1	

Layout : Control Circuit Assy.19-0437

Fig. 4.13

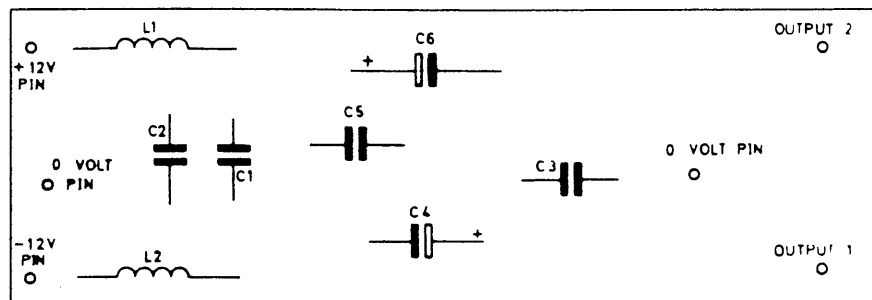


Circuit : Control Circuit Assembly 19-0437



19-0442 (1)	
1	

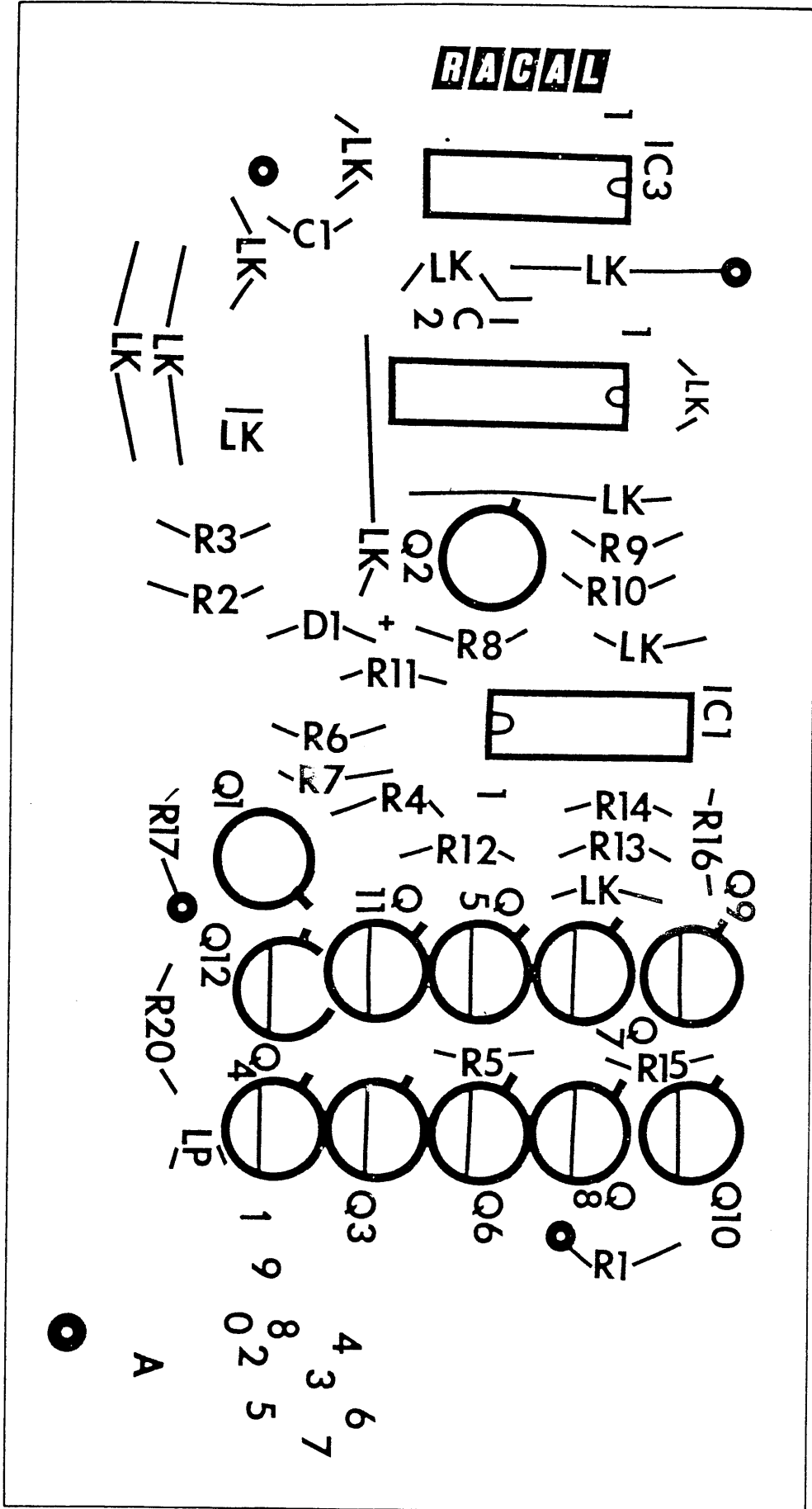
CIRCUIT: PROBE FILTER ASSEMBLY 19-0442



19-0442 (2)	
1	

LAYOUT: PROBE FILTER ASSEMBLY 19-0442

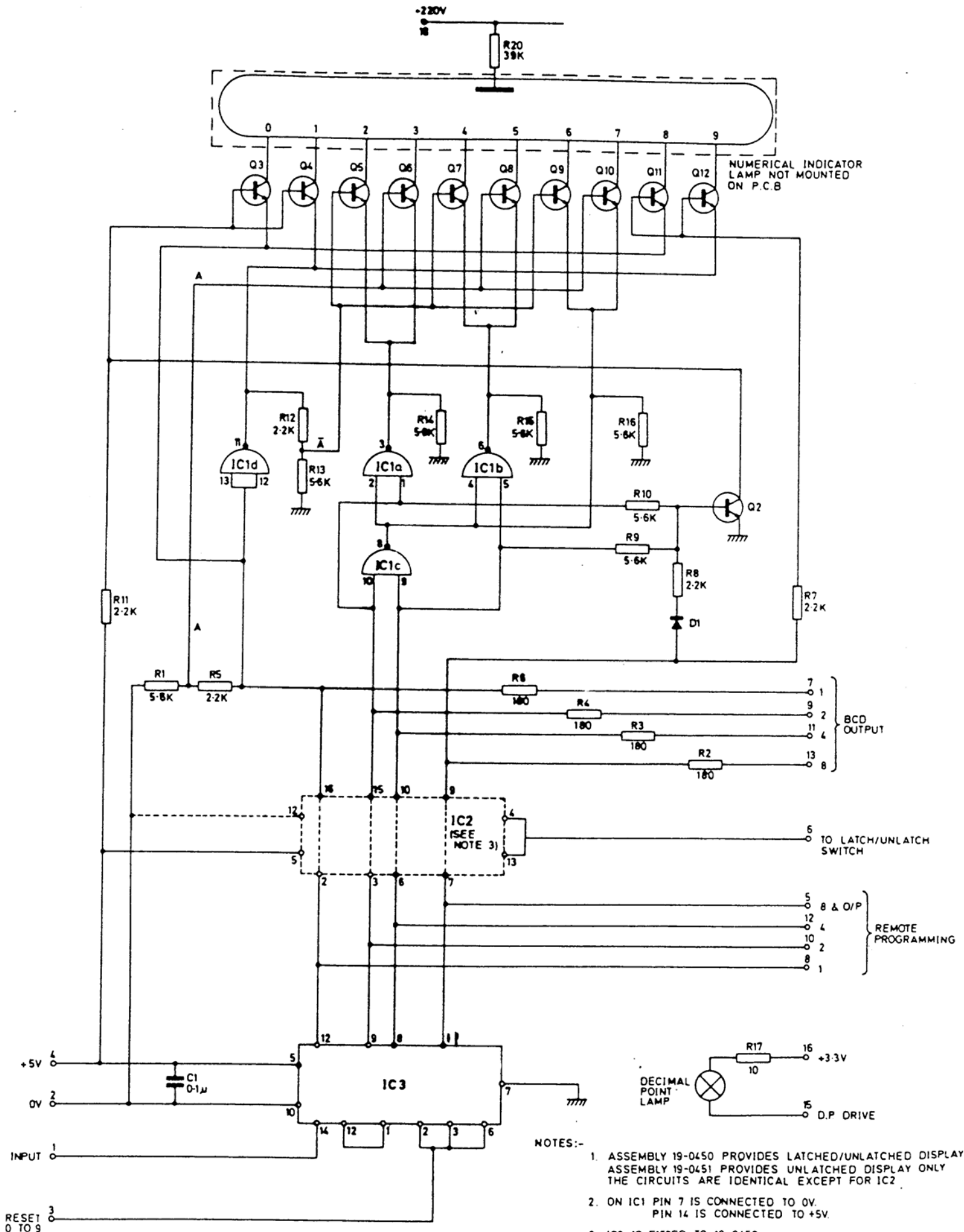
WOH1114



WOH1114	
19-0451	
1	

Layout : Readout Assy.19-0451

Fig. 4.16

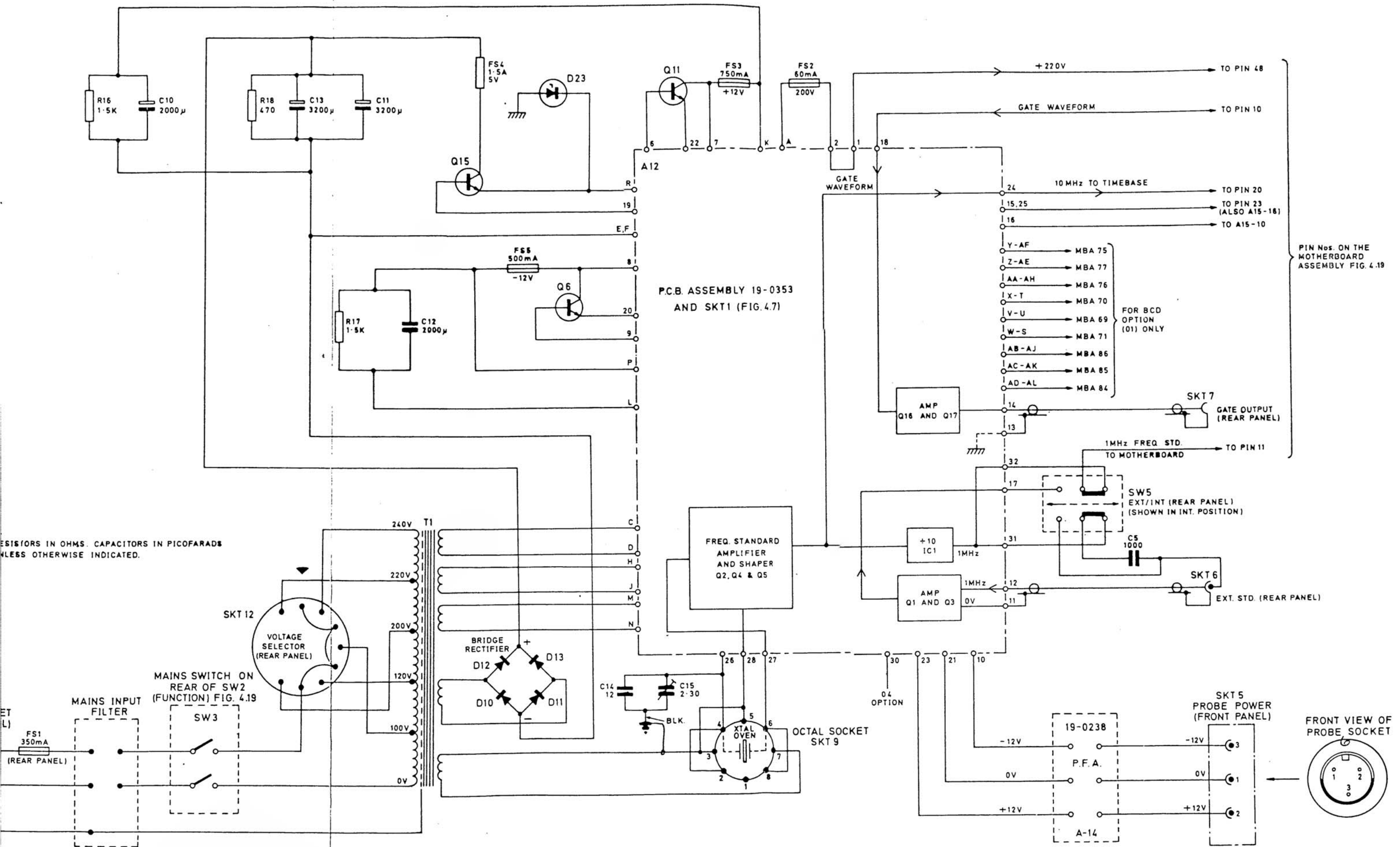


- NOTES:-
1. ASSEMBLY 19-0450 PROVIDES LATCHED/UNLATCHED DISPLAY
ASSEMBLY 19-0451 PROVIDES UNLATCHED DISPLAY ONLY
THE CIRCUITS ARE IDENTICAL EXCEPT FOR IC2
 2. ON IC1 PIN 7 IS CONNECTED TO 0V.
PIN 14 IS CONNECTED TO +5V.
 3. IC2 IS FITTED TO 19-0450
IC2 IS NOT FITTED TO 19-0451 AND CONNECTIONS ARE
THEN LINKED THROUGH.

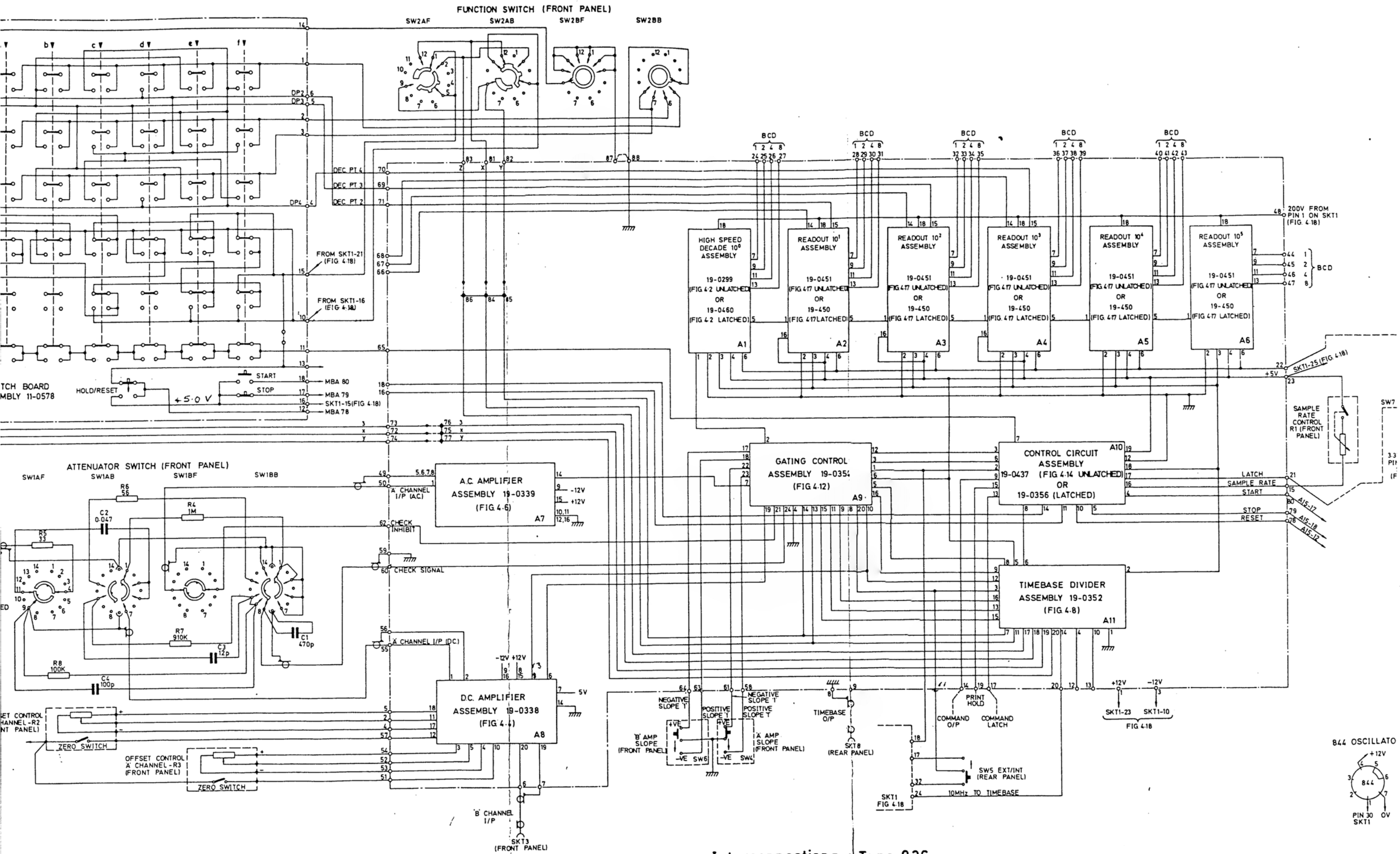
Readout Decade Assemblies Type
19-0450 & 19-0451
 (ONLY 19-0450 IS FITTED WITH LATCHED DISPLAY OPTION)

Fig. 4-17

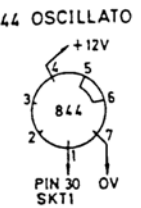
W0HT11Z



Interconnections: Power Supply



Interconnections : Type 836



SINGLE PERIOD MEASUREMENT

Range	0.1 μ s to 10 ⁴ s.
Input channel	'B'. d.c. coupled
Function switch position	Time interval, single line.
Clock units	0.1 μ s to 10 ms.

RATIO MEASUREMENT

Inputs

Higher frequency	Channel 'A'. a.c. or d.c. coupled
Frequency range	0 to 32 MHz (9036). 0 to 60 MHz (9037 and 9038).
Lower frequency	Channel 'B'. d.c. coupled
Frequency	0 to 10 MHz.
Reads	$\frac{\text{Frequency A}}{\text{Frequency B}} \times n$.
Multiplier (n)	1 to 10 ⁵ in decade steps.

TOTALIZING

Input channel	'A'.
Coupling	d.c.
Maximum rate	10 ⁷ events per second.
Pulse width	40 ns minimum at trigger points.
Pulse pair resolution	Not less than 0.1 μ s.
Offset	± 10 V.
Prescaling	Events may be pre-scaled in decade steps from 1 to 10 ⁵ .
Reads	$\frac{\text{No. of input events.}}{n}$
Start/Stop (Electrical)	Input applied to Channel 'B' + ve or - ve slope operation. First pulse starts count, second pulse stops count.
Start/Stop (Manual)	Separate Start and Stop push-buttons.

SCALER

Function	Input frequency prescaled in decade steps from 1 to 10 ⁵ as selected by push-button controls. Output available from rear panel mounted socket.
Input channel	'A'. a.c. or d.c. coupled
Frequency range	0 to 10 MHz.

FREQUENCY STANDARD

Internal Standard for 9036 and 9037 Models

Frequency	10 MHz.
Stability:	
temperature (0—55°C)	± 2 parts in 10 ⁸ per °C.
Ageing	± 2 parts in 10 ⁷ per month average over first year. This ageing rate will decrease with continued use and time.
Warm-up Time	< 10 minutes, from room temperature.
Output	3 V p-p square wave (nominal)

Internal Standard for 9038

Frequency	10 MHz.
Stability:	
temperature (0—55°C)	Better than ± 1 part in 10 ⁸ per °C.
Ageing	Better than ± 1.5 parts in 10 ⁷ per month after 3 months. This ageing rate will decrease with continued use and time.
Warm-up Time	Accuracy better than 1 part in 10 ⁶ in 1 minute from switch-on and better than 1 part in 10 ⁷ in 3 minutes from switch-on.

External Standard

Frequency	1 MHz.
Level	100 mV—10 V r.m.s.
Input impedance	1 k Ω approx. (a.c. coupled).

DISPLAY

No. of digits

Six-in-line numerical indicator tubes with automatically positioned decimal points.

Latched display
(9037 and 9038 only)

Display of previous measurement retained whilst instrument resets and completes new measurement. Instrument automatically updates display at end of each measurement. Slide switch on rear panel selects—latch/non-latch.

Sample rate

Control giving continuously variable display time from 0.1 to 10 seconds with a switched single shot position.

Single shot

Increases display time to infinity and allows single shot by operation of Hold/Reset push-button.

Hold/Reset

Double action push-button switch.

1) Hold—Holds display and maintains gate in closed position.

2) Reset—Automatic or manual.

AUXILIARY OUTPUTS

Level

Gate open—'1' state + 4.5 V to + 3.5 V.

Gate closed—'0' state + 0 V to - 0.8 V.

50 Ω (nominal).

Output impedance

d.c.

Coupling

Typically 100 ns.

System delay

TIMEBASE OUTPUT

Waveform

Approximately rectangular.

Level

'1' state + 2.5 V to 4.5 V.

'0' state 0 V to + 0.5 V.

Coupling

d.c.

Source impedance

Nominally 180 Ω .

Output for functions

Frequency: selected timebase output.

Period: input frequency divided by number of periods averaged.

Time interval: selected clock unit.

Ratio: lower frequency divided by number of periods averaged.

Totalize & Scaling: input events divided by multiplying function 'n'.

POWER SUPPLY

Voltage range

100–250 V with taps.

100–250 V a.c. with taps.

Frequency

45 Hz to 440 Hz

Power consumption

50 VA

ENVIRONMENTAL CONDITIONS

Operating temperature range

0°C to + 55°C.

Storage temperature range

- 40°C to + 70°C.

Humidity

95% at + 40°C.

DIMENSIONS AND WEIGHT

Height

Overall 144 mm (5.7 in)

Width

Overall 248 mm (9.75 in)

Depth

Overall 382 mm (15.1 in)

Weight

7 kg (15.4 lb)

OPTIONS

Option 01

Electrical Data Outputs. 4 line BCD weighted 1248 per display tube with 3 line decimal point position, function and timebase coded outputs.

Data Outputs as described in Option 01 with the addition of Remote Programme Operation.

Option 02

OPTIONAL ACCESSORIES

A1

819 Active Probe to increase sensitivity to 5 mV over the frequency range 100 kHz to 60 MHz.

RACAL INSTRUMENTS LIMITED

Duke Street . Windsor . Berkshire SL4 1SB . England

Tel: Windsor 69811 . Cables Grams RACAL WINDSOR Telex 847013

Printed in England