

## TENTATIVE DATA

This data sheet should be read in conjunction with  
NORBIT 2 Series

### DESCRIPTION

A trigger circuit internally connected to a non-inverting current amplifying stage which will switch up to 2.5 A<sub>d.c.</sub>

### COLOUR

Black

### ELECTRICAL DATA

#### Power supply

Supply voltage (d.c.), $V_P$		+24 ±25%	V
Supply current to pins 6 and 15	max.	28.5	mA ←

#### Input

#### Signals derived from units in NORBIT 2 range

Loading at pin 1 1 d.u.

A further input can be provided at pin 3 via a 82kΩ resistor, which should be connected directly onto the pin. Wiring to pin 3 must be kept remote from the output circuitry.

#### Signals derived from other sources

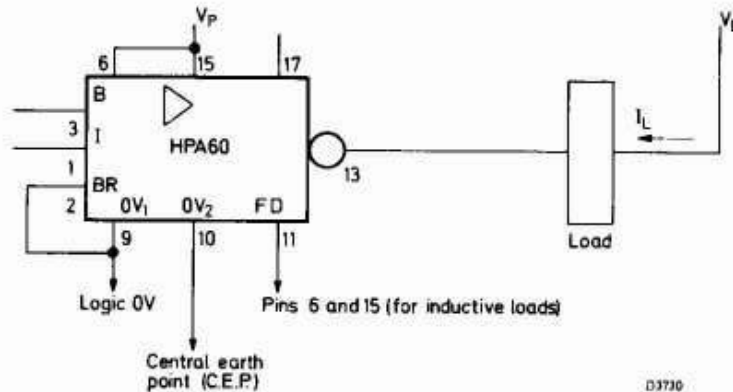
Input connection to	Input for	
	'0' output	'1' output
pin 1, pin 3 not connected	+6 to +100* V	-15* to +1.5V
pin 3, pin 1 not connected	50μA to 20* mA	0 to 15μA

\* Limiting values. These are absolute operating limits, which must not be exceeded under any conditions.

## ELECTRICAL DATA (contd.)

### Output

		at $T_{amb} < 85^{\circ}C$		at $T_{amb} < 45^{\circ}C$	
Load voltage, $V_L$	max.	55	max.	55	V
Load current at $V_P = 30V$	max.	2	max.	2.5	A
Load resistance at $V_L = 30V$	min.	15	min.	12	$\Omega$



A logic '1' at the input energises the load.

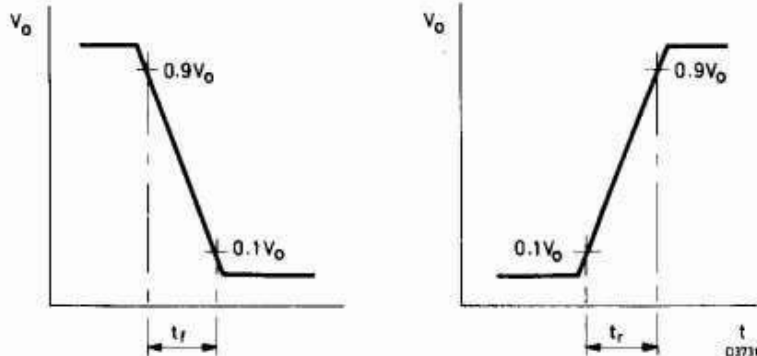
**CAUTION.** A flywheel diode must be used with inductive loads.

The integral flywheel diode can be used by connecting pin 11 to pins 6 and 15 for the following loads.

15Ω,	≤150mH
20Ω,	≤400mH
30Ω,	≤ 10H

When driving filament lamps, series and bleed resistors may have to be used.

### SWITCHING TIMES



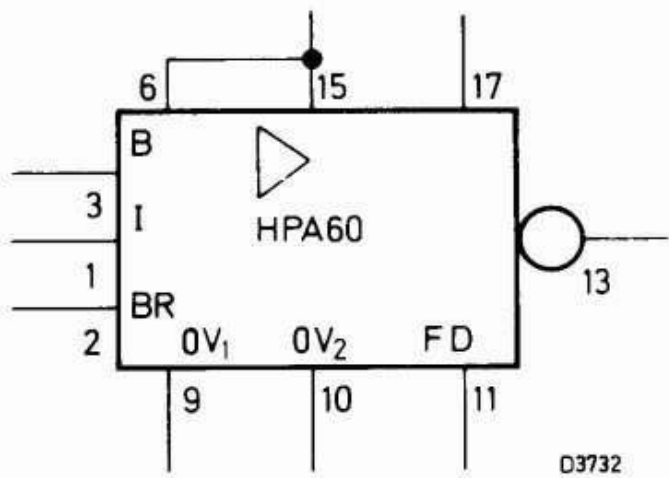
The switching times are specified for a supply voltage of 30V and a resistive load of 15Ω

Rise time, $t_r$	typ.	300	ns
	max.	4.2	$\mu s$
Fall time, $t_f$	typ.	45	ns
	max.	180	ns
Switching delay for 30 $\Omega$ , 10H load		770	ms

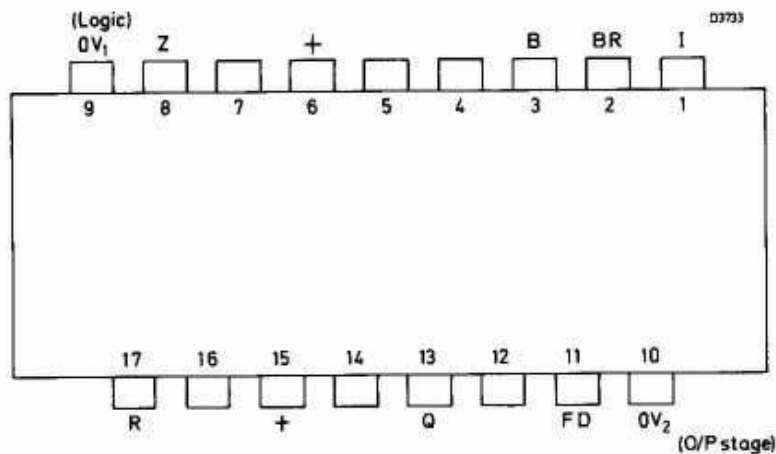
## HYSTERESIS

At pin 3 min. 0.28 V ←

DRAWING SYMBOL



TERMINAL CONNECTIONS

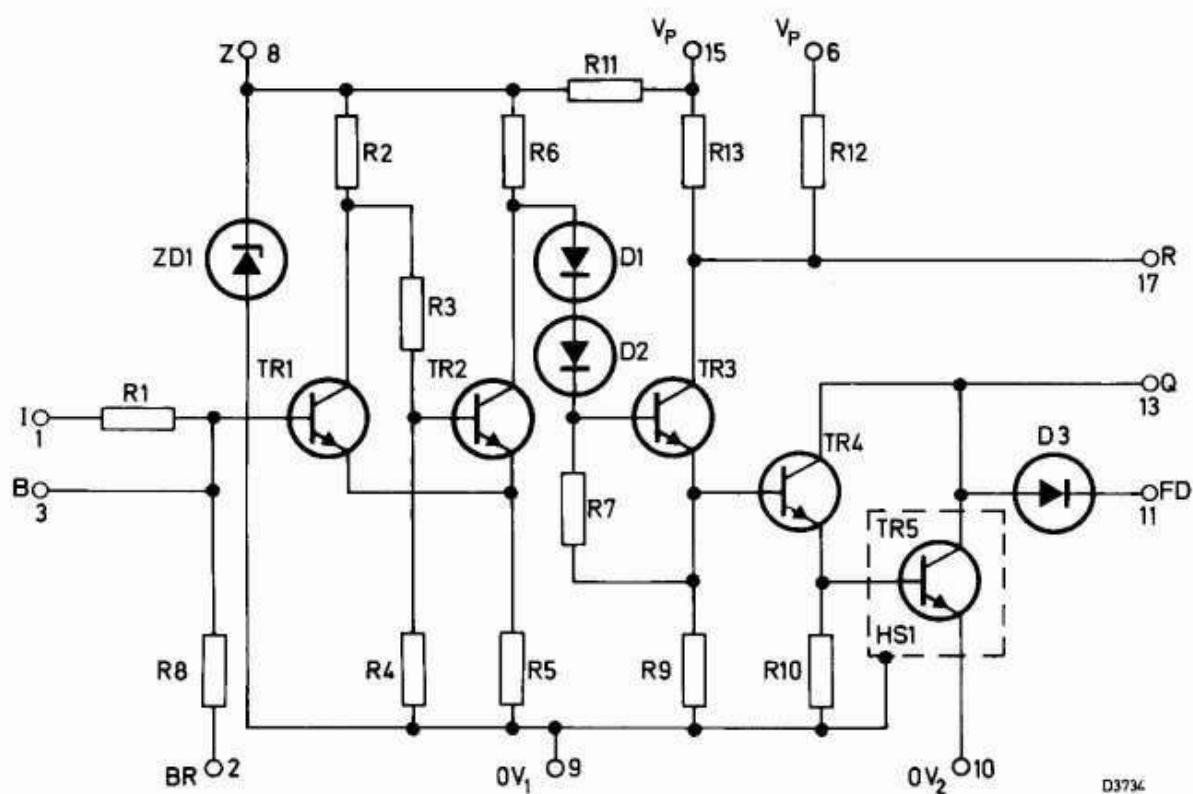


view from underside of module

Terminal number	Connected to	Terminal number	Connected to
1	Input (I)	10	Emitter of output transistor (0V <sub>2</sub> )
2	Base resistor of input transistor (connect to pin 9) (BR)	11	Flywheel diode (FD)
3	Base of input transistor (B)	12	Not connected
4	Not connected	13	Output (Q)
5	Not connected	14	Not connected
6	Positive supply, V <sub>P</sub> (must be connected to pin 15) (+)	15	Positive supply, V <sub>P</sub> (must be connected to pin 6) (+)
7	Not connected*	16	Not connected
8	Zener diode (not normally used) (Z)	17	Collector of TR3 (not normally used) (R)
9	Common supply (0V <sub>1</sub> )		

\*CAUTION When mounted on PCB60, pin 7 is connected to the positive supply (V<sub>P</sub>). Hence, ensure that pins 7 and 8 are not interconnected, otherwise damage to ZD1 will result.

### CIRCUIT DIAGRAM



To avoid disturbances on the logic 0V line, the emitter of the output transistor (pin 10) is brought out separately. It should be connected to the system central earth point. Where a separate load supply is used, pins 6 and 15 must be connected to that supply.

# NORBIT 2 POWER OUTPUT

# PA60

AVAILABLE FOR CURRENT PRODUCTION. FOR NEW DESIGNS REFER TO  
HPA 60, AND UPA 61 (61 SERIES)

This data sheet should be read in conjunction with  
NORBIT 2 SERIES

## DESCRIPTION

A trigger circuit internally connected to a current amplifying stage which will switch a direct current output of up to 1A.

## COLOUR

Blue

## ELECTRICAL DATA

### Power supply

Supply voltage (d.c.), $V_P$	+24 $\pm$ 25%	V
Supply current to pins 6 and 15	28.5	mA ←

### Input

Signals derived from units in NORBIT 2 range

Loading at pin 1 1 d.u.

A further input can be provided at pin 3 via a 82k $\Omega$  resistor, which should be connected directly onto the pin. Wiring to pin 3 must be kept remote from the output circuitry.

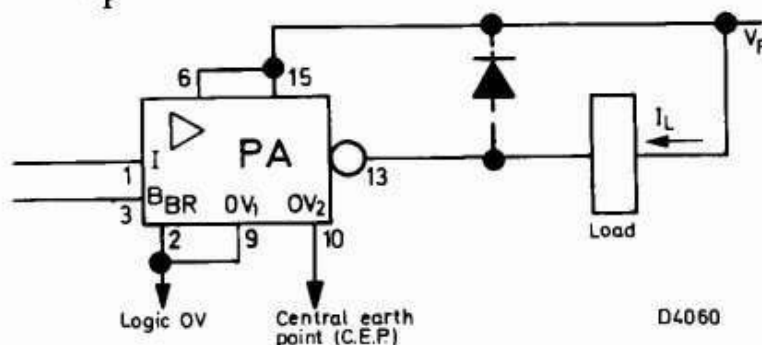
Signals derived from other sources

Input connection to	Input for	
	'0' output	'1' output
pin 1, pin 3 not connected	+6 to +100* V	-15* to +1.5V
pin 3, pin 1 not connected	50 $\mu$ A to 20* mA	0 to 15 $\mu$ A

\*Limiting values. These are absolute operating limits, which must not be exceeded under any conditions.

### Output

Load current at $V_P = 30V$	max. 1	A
Load resistance at $V_P = 30V$	min. 30	$\Omega$

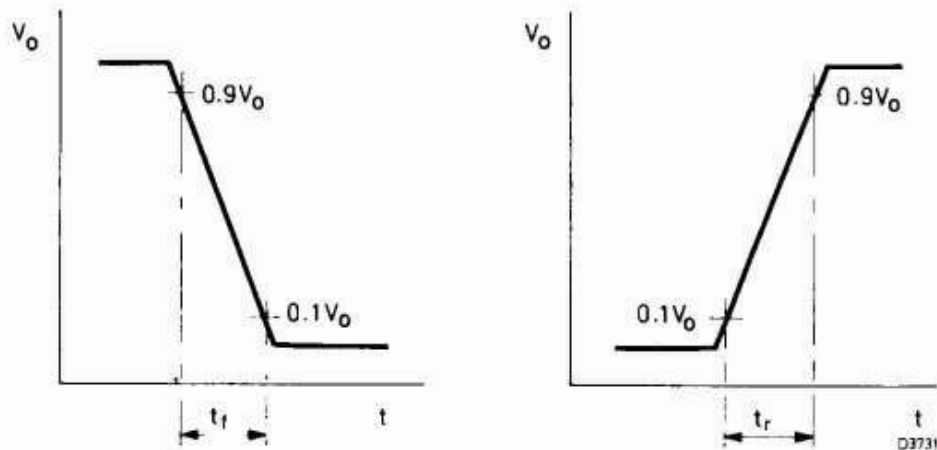


A logic '1' at the input energises the load

# Mullard

**CAUTION:** The diode must be connected for inductive loads. There is no restriction on the use of the diode BAX12 for a load resistance greater than  $75\Omega$ , but for a load resistance of between  $30$  to  $75\Omega$  the maximum inductance is limited at  $10H$  under worst case conditions. Alternatively, diode type BYX30/200 may be used without any restriction. When driving filament lamps, series and bleed resistors may have to be used.

#### SWITCHING TIMES



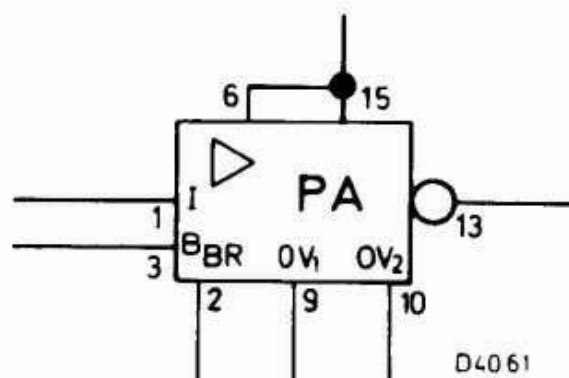
The switching times are specified for a supply voltage of  $30V$  and a resistive load of  $30\Omega$ .

Rise time, $t_r$	max.	5	$\mu s$
Fall time, $t_f$	max.	1	$\mu s$

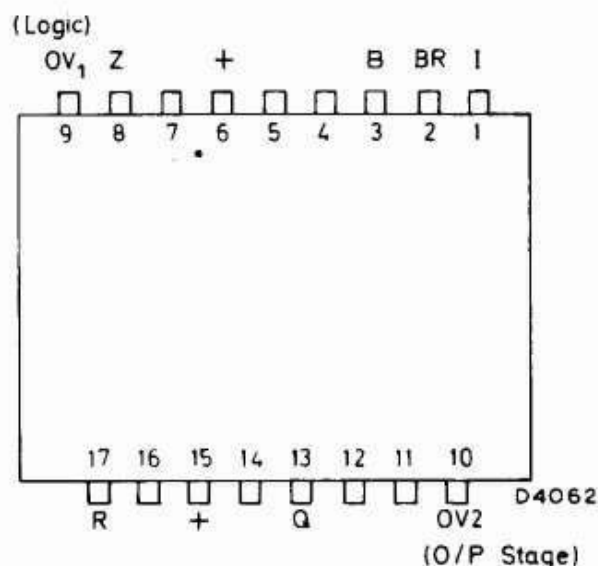
#### HYSTERESIS

At pin 3	min.	0.28	$V \leftarrow$
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#### DRAWING SYMBOL



## TERMINAL CONNECTIONS

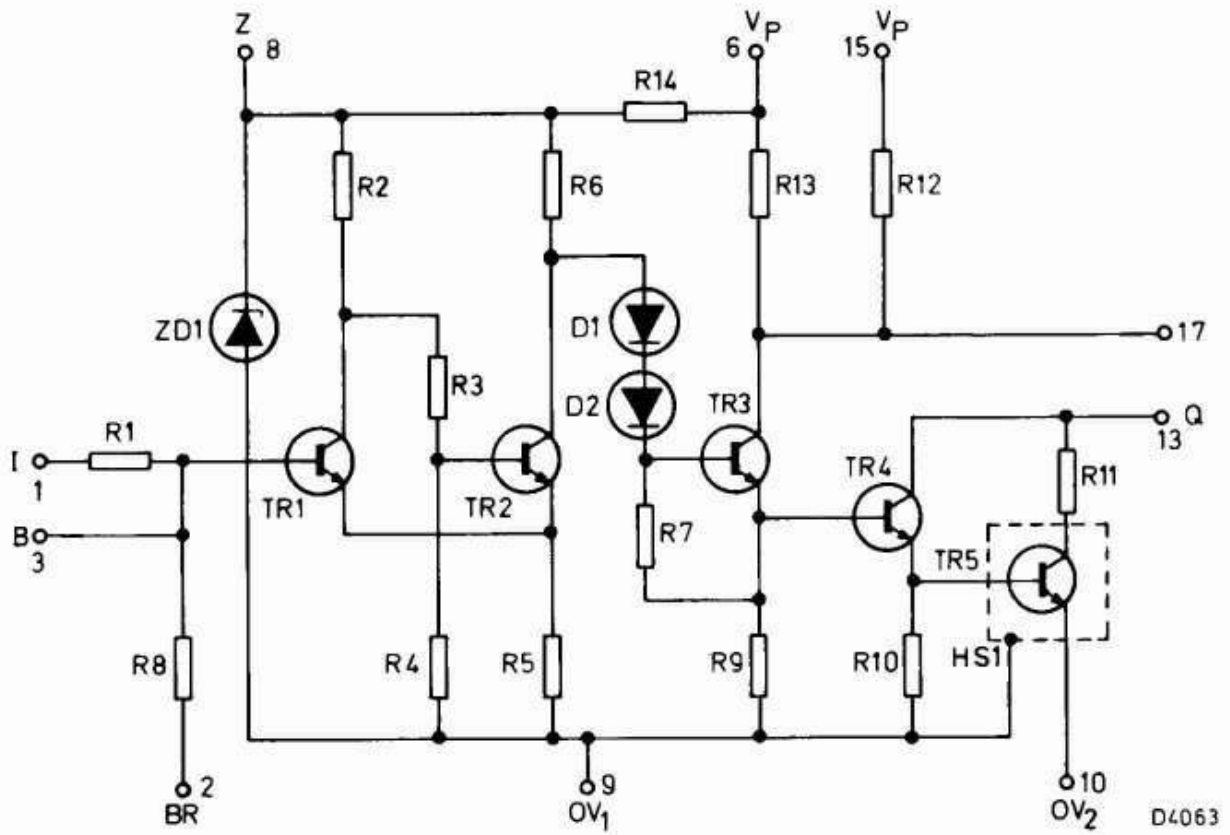


View from underside of module

Terminal number	Connected to	Terminal number	Connected to
1	Input (I)	10	Emitter of output transistor (OV2)
2	Base resistor of input transistor (connect to pin 9) (BR)	11	Not connected
3	Base of input transistor (B)	12	Not connected
4	Not connected	13	Output (Q)
5	Not connected	14	Not connected
6	Positive supply, V <sub>p</sub> (must be connected to pin 15) (+)	15	Positive supply, V <sub>p</sub> (must be connected to pin 6) (+)
7	Not connected*	16	Not connected
8	Zener diode (not normally used) (Z)	17	Collector of TR3 (not normally used) (R)
9	Common supply (OV <sub>1</sub> )		

\*CAUTION When mounted on PCB60, pin 7 is connected to the positive supply (V<sub>p</sub>). Hence, ensure that pins 7 and 8 are not interconnected, otherwise damage to ZD1 will result.

# CIRCUIT DIAGRAM



To avoid disturbances on the logic 0V line, the emitter of the output transistor (pin 10) is brought out separately. It should be connected to the system central earth point. Where a separate load supply is used, pins 6 and 15 must be connected to that supply.



This data sheet should be read in conjunction with  
NORBIT 2 Series

## DESCRIPTION

This unit is intended to fulfil two functions namely:-

1. driving the trigger inputs of the FF90 and 2TG90 units.
2. matching non-standard signals into the NORBIT 2 system.

## COLOUR

Green

## ELECTRICAL DATA

### Power supply

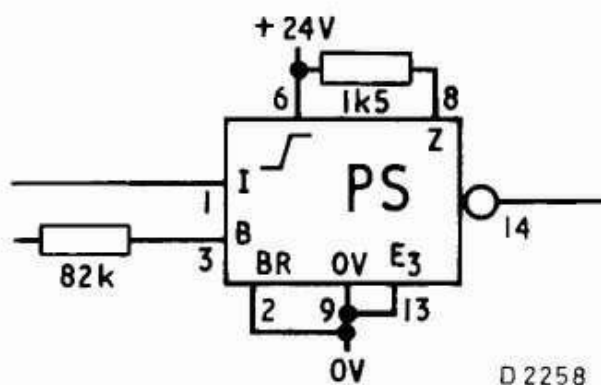
Supply voltage, $V_P$	$+24 \pm 25\%$	$V_{d.c.}$
Supply current to pin 6	max. 21	mA
A $1k5\Omega \pm 10\%$ resistor, maximum dissipation 0.35W must be connected between pins 6 and 15.		

### Input

#### Signals derived from units in NORBIT 2 range

Loading at pin 1	1	d.u.
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A further input can be provided at pin 3 via an  $82k\Omega$  resistor (loading 1 d.u.).  
The circuit then performs as a 2-input NOR function. The resistor should be mounted as close to the unit as possible.



## Input (contd.)

### Signals derived from other sources

	Input for	
	'0' output	'1' output
Pin 1 ( $R_1 = 82k\Omega$ )	+6 to +100*V	-15* to +1.5V
Pin 3 no connection to pin 1	50 $\mu$ A to 20*mA min. 1.6V	0 to 15 $\mu$ A max. 0.58V

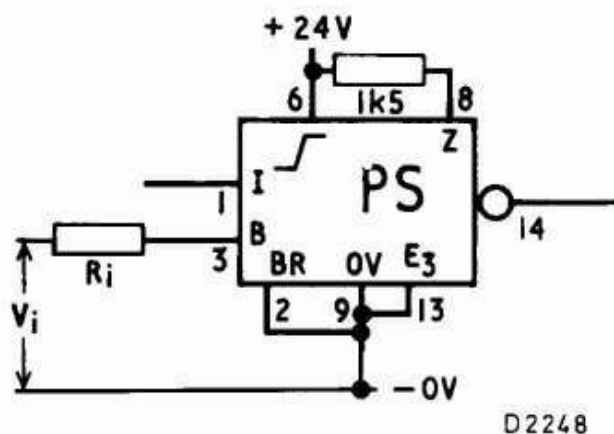
\*Limiting values. These are absolute operating limits, which must not be exceeded under any conditions.

Hysteresis at pin 3,  $\Delta V_i$

$$\text{min. } 0.28 + 0.0016R_i \quad V \leftarrow$$

$$\text{max. } 0.43 + 0.012R_i \quad V \leftarrow$$

where  $R_i$  is in  $k\Omega$



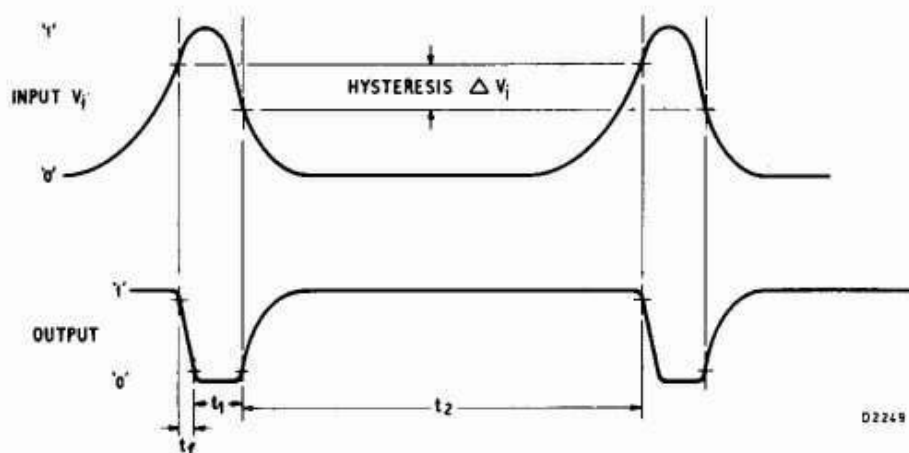
## Output

Loading

6 d.u.  
and 40\* z.u.  $\leftarrow$

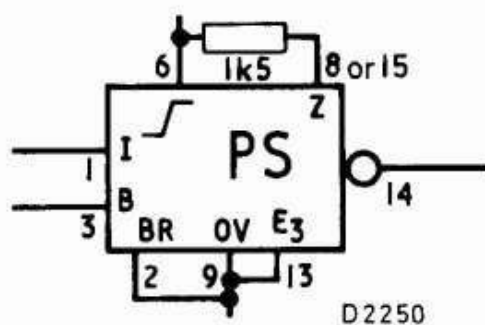
\*Relevant only when used with FF90 and 2TG90

## SWITCHING TIMES AND WAVEFORMS

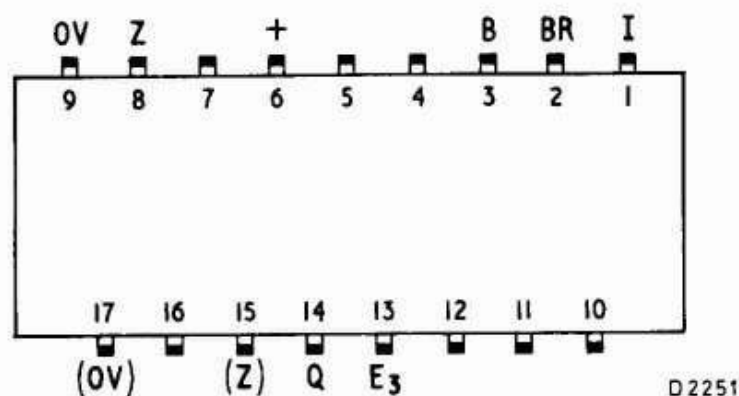


$t_f$        $3\mu\text{s}$  maximum, under full load conditions  
 $\left. \begin{matrix} t_1 \\ t_2 \end{matrix} \right\}$       Depend on input waveforms

## DRAWING SYMBOL



## TERMINAL CONNECTIONS

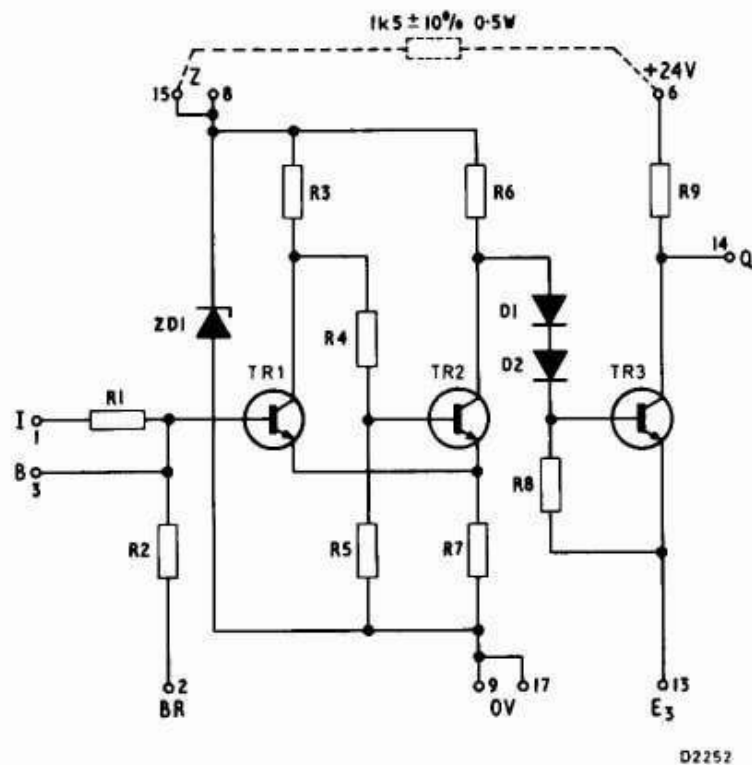


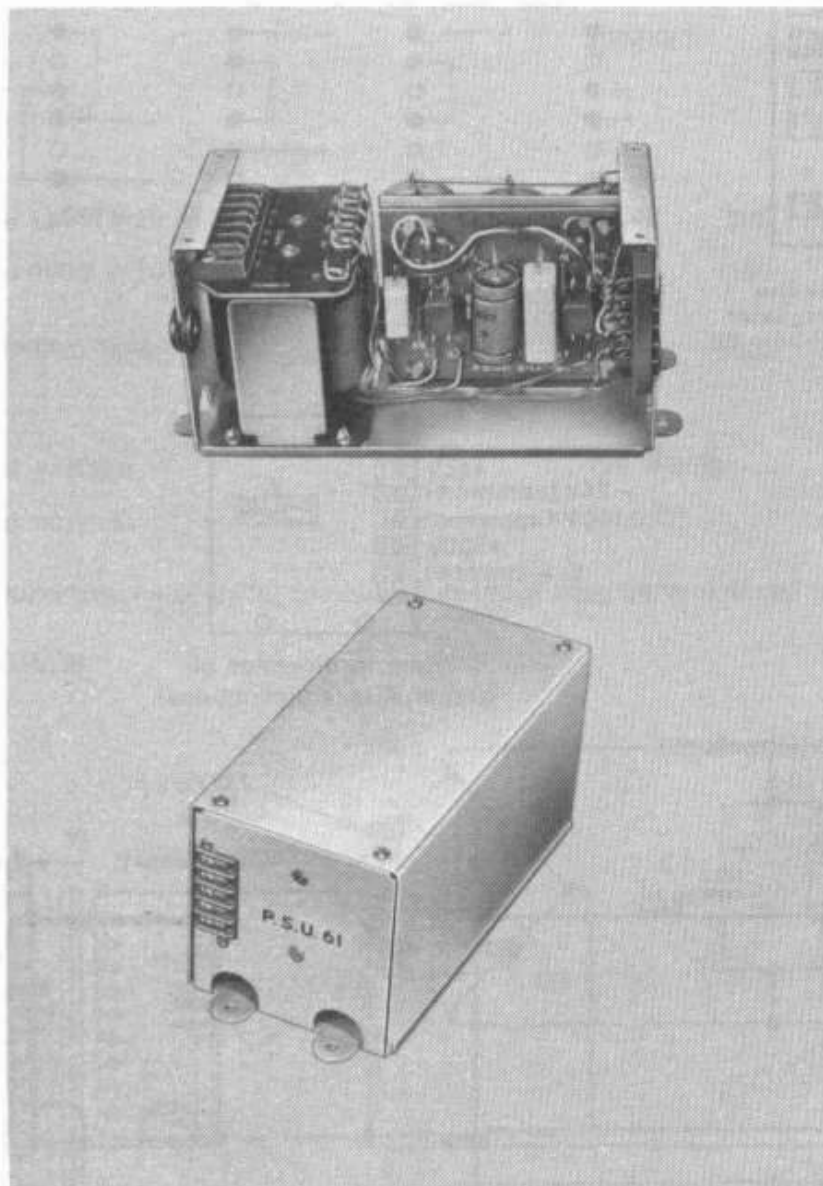
view from underside of module

Terminal number	Connected to	Terminal number	Connected to
1	Input via resistor (I)	10	Not connected
2	Common supply (connect to pins 9 and 13) (BR)	11	Not connected
3	Input direct to base (B)	12	Not connected
4	Not connected	13	Common supply (connect also to pins 2 and 9) (E <sub>3</sub> )
5	Not connected	14	Output (Q)
6	Positive supply, V <sub>P</sub> (connect also to pin 15 via 1k5Ω resistor) (+)	15	Zener diode, internally connected to pin 8* (connect to pin 6 via 1k5Ω resistor) (Z)
7	Not connected*	16	Not connected*
8	Internally connected to pin 15* (Z)	17	Internally connected to pin 9 (0V)
9	Common supply, internally connected to pin 17 (connect also to pins 2 and 13) (0V)		

**\*CAUTION:** When the PS90 is mounted on PCB60, pins 7 and 16 are connected to the positive supply V<sub>P</sub>. Hence, ensure that neither pins 7 and 8, nor pins 15 and 16 are interconnected, otherwise zener diode ZD1 will be damaged.

## CIRCUIT DIAGRAM





**DESCRIPTION**

The unit supplies NORBIT 2 modules with  $24V_{dc}$  and the input switch filter 2SF60 of the NORBIT 2 Series with  $100V_{dc}$ .

**CASING**

Aluminium

**CLIMATIC CATEGORY**

(IEC publication 68)

10/060/56

**TEMPERATURE RANGE**

Operating

-10 to +60

°C ←

Storage

-40 to +85

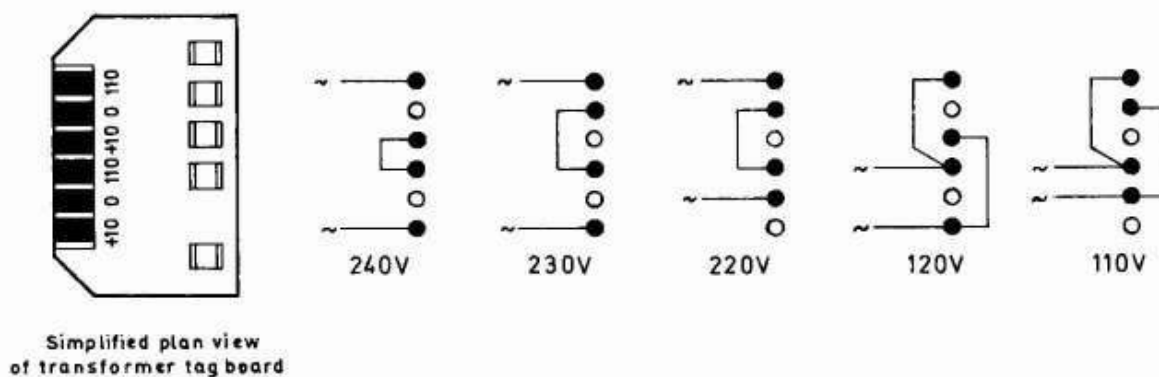
°C

**Mullard**

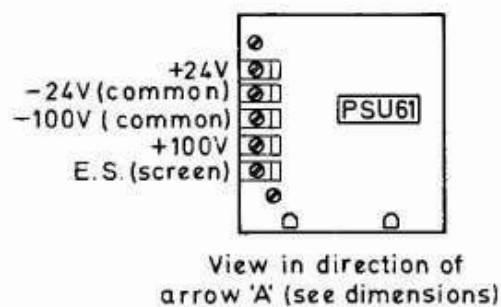
## CONNECTIONS

### Supply

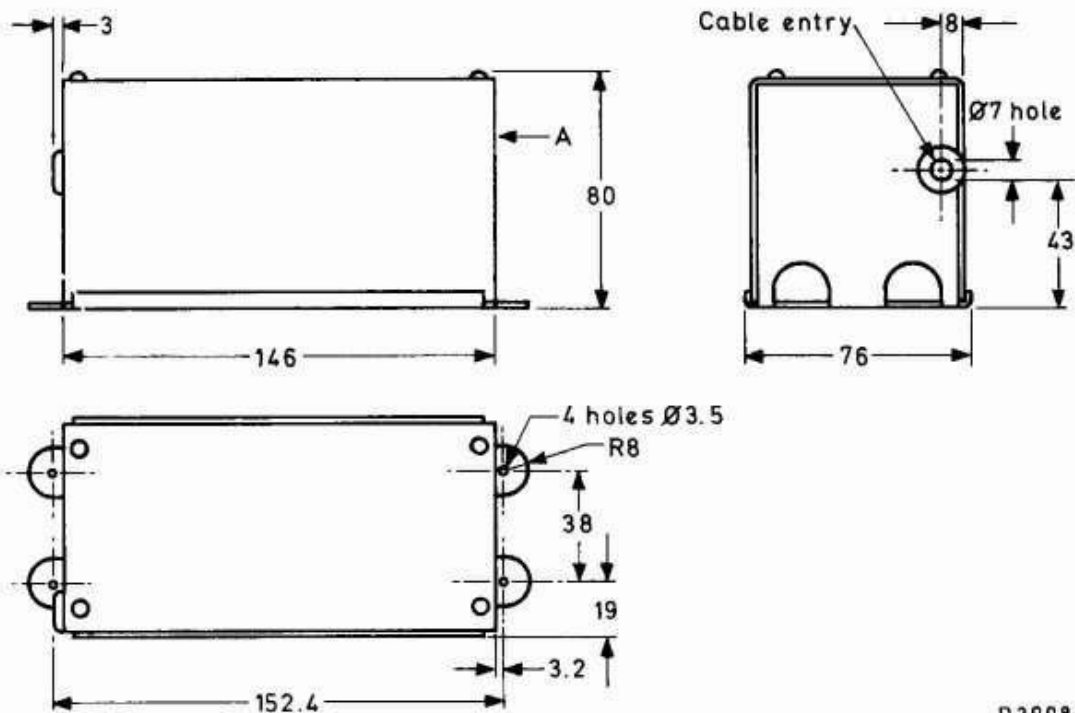
Connections should be made in accordance with the diagrams below:



### Output



## DIMENSIONS (millimetres)



D2008

# NORBIT 2 POWER SUPPLY UNIT

# PSU61

WEIGHT approx. 1.25 kg

## ELECTRICAL DATA

### Supply

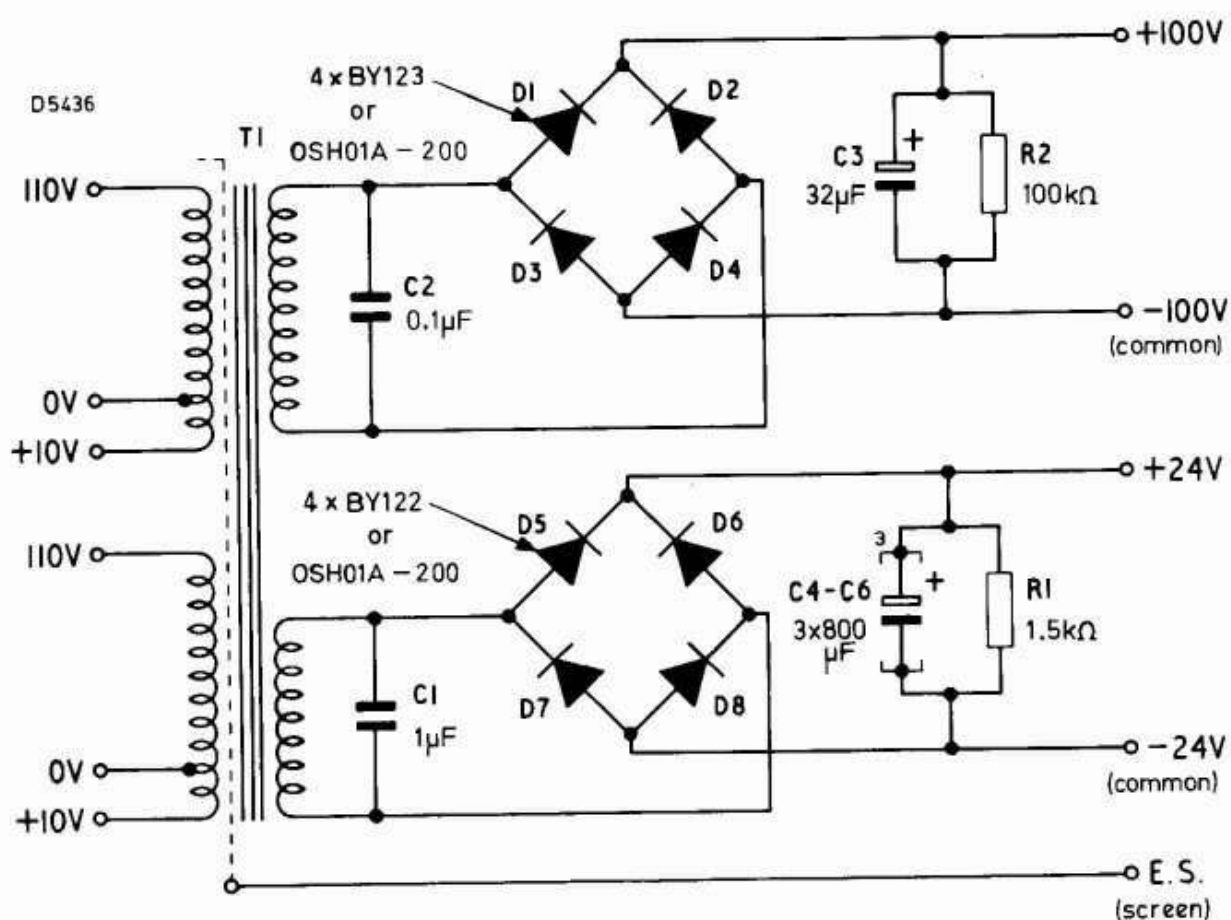
110 to 120V (+10 -15%)	max.	200	mA
220 to 240V (+10 -15%)	max.	140	mA
Frequency range		47 to 440	Hz

### Output

Output voltage		$+24 \pm 25\%$	$+100 \pm 25\%$	$V_{dc}$
Output current	max.	500*	25	mA

\*Up to temperatures of 35°C the output current may be increased to 600mA.

## CIRCUIT DIAGRAM



**Mullard**



This data sheet should be read in conjunction with  
NORBIT 2 Series

## DESCRIPTION

To provide a delay whose duration can be set by means of an external resistor and capacitor.

## COLOUR

Red

## ELECTRICAL DATA

### Power supply

Supply voltage,  $V_P$

+24  $\pm 25\%$

$V_{d.c.}$

Supply current to pin 7

max. 10.5

mA  $\leftarrow$

### Input

Logic '0'

0 to +0.3

V

Logic '1'

$+(0.24V_P + 7.2)$  to  $V_P$

V

Loading

1

d.u.

### Output

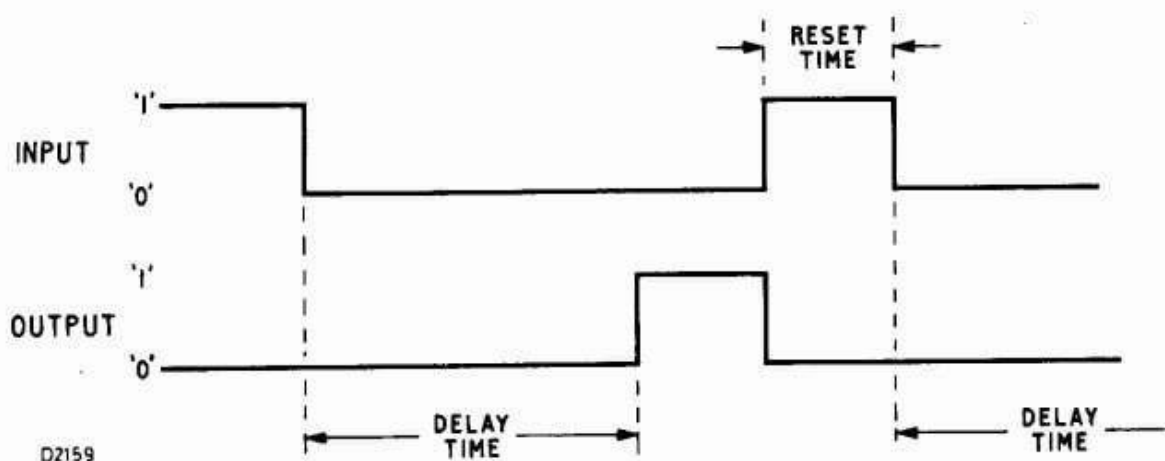
Loading

5

d.u.

## OPERATION

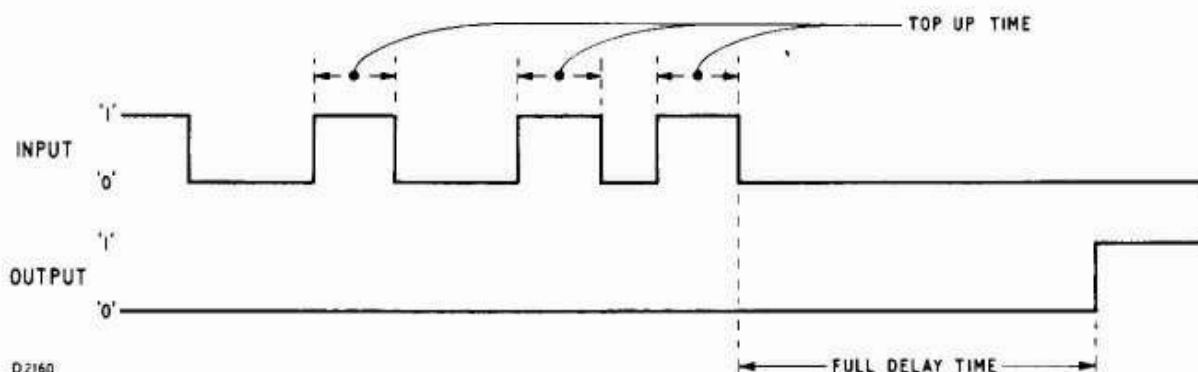
The delay time is determined by an external resistor and capacitor, and the waveform is shown below:



The delay period starts when the input changes from '1' to '0'; the output changes from '0' to '1' at the end of the delay period. The output then remains at '1' until the input is returned to '1', when the output changes from '1' to '0' with no delay.

## OPERATION (contd.)

The time between the end of a delay period and start of the next delay, i.e. the reset time, must be a minimum of  $12.1C$  ms where  $C$  is the value of the external capacitor in  $\mu\text{F}$ . Where it is important to ensure that the delay time is always obtained with accuracy, the reset time must be increased to  $19.3C$  ms. If the input returns to '1' during a delay time period, the timer circuit is 'topped up'. Provided the input stays at '1' for at least  $19.3C$  ms ( $C$  in  $\mu\text{F}$ ), then the full time delay will be obtained after the input switches back to '0'.



To summarise:-

Input reset time for full delay	min.	$19.3C$	ms ←
Top up time	min.	$19.3C$	ms ←
Delay time	approx.	$RC$	s

where  $R$  is the value of the external resistor in  $\text{M}\Omega$

$C$  is the value of the external capacitor in  $\mu\text{F}$

The external components should be mounted as close as possible to the timer unit, and the working voltage of the capacitor must be 25V min.

## CONNECTION OF EXTERNAL COMPONENTS

### Resistor

value	min.	100	$\text{k}\Omega$
	max.	1.1	$\text{M}\Omega$

connections pins 12 and 15

for a 10:1 timing ratio, a  $100\text{k}\Omega$  resistor and a  $1\text{M}\Omega$  potentiometer may be connected in series, with the resistor connected to pin 12.

## Capacitor

The capacitor may be connected in two different ways. The circuit function is not altered.

1. results in close tolerance delays using low leakage capacitors, e.g. polyester, polystyrene, metallised polycarbonate.

value	max.	60	$\mu\text{F}$
connections			pins 4 and 9

2. allows the use of higher leakage capacitors, e.g. electrolytic.

leakage current at 25V	max.	100	$\mu\text{A}$
connections			pins 15 (positive) and 4

STABILITY (for capacitor connection 1 only, and excluding the effect of external components)

change of delay time	max.	-0.14 % per degC
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## SWITCH-ON CONDITIONS

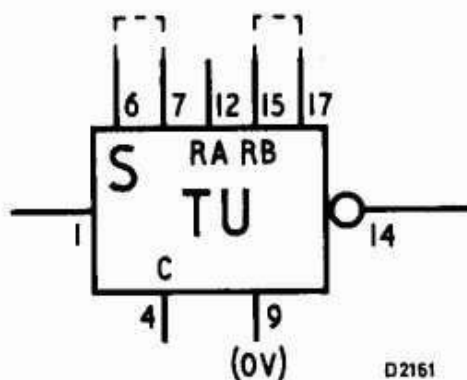
Capacitor connected between pins 4 and 9

Input '1'	Output: will remain at '0'
Input '0'	Output: will only go from '0' to '1' after the ← delay period has elapsed (provided the external capacitor is initially uncharged).

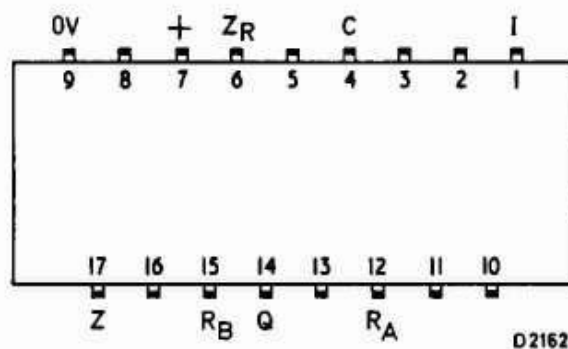
Capacitor connected between pins 15 and 4

Input '1'	Output: will remain at '0'
Input '0'	Output: will remain at '1'

## DRAWING SYMBOL



## TERMINAL CONNECTIONS



view from underside of module

Terminal number	Connected to	Terminal number	Connected to
1	Input (I)	10	Not connected
2	Not connected	11	Not connected
3	Not connected	12	External resistor ( $R_A$ )
4	External capacitor (C)	13	Not connected
5	Not connected	14	Output (Q)
6	Zener diode resistor ( $Z_R$ ) (connect to pin 7)	15	Connect to pin 17 ( $R_B$ )
7	Positive supply, $V_P$ (connect to pin 6) (+)	16	*Not connected
8	Not connected	17	Zener diode (Z) (connect to pin 15)
9	Common supply (0V)		

**\*CAUTION:** When the TU60 is mounted on PCB60, pin 16 is connected to the positive supply,  $V_P$ . Hence, ensure that pins 16 and 17 are not interconnected, otherwise zener diode  $ZD_1$  will be damaged.

## CIRCUIT DIAGRAM

