

### FEATURES

- Suitable for most small and medium power thyatrons.
- Available with either optical trigger input or low level electrical trigger input.

### DESCRIPTION

MA2438B and MA2440B are trigger modules producing a nominal 1 kV pulse for control grid (G2) triggering of thyatrons. MA2440B is triggered from a low voltage electrical signal; MA2438B from an optical input.

Both units need power from an auxiliary transformer, supplied either with a 110/120 V AC input or a 6.3 V AC input. Both provide a fixed control grid (G2) bias of  $-140$  V and a DC supply of  $+140$  V for DC auxiliary grid (G1) pre-ionisation.

The external trigger input is designed to operate from a nominal  $1 \mu\text{s}$  pulse up to a maximum frequency of 10 kHz. Connection to the optically triggered systems is by an SMA style connector. Connection to the electrically triggered systems is by a BNC style connector.

Operation is from a 200 V AC centre-tapped supply. Two transformers capable of providing this supply are available from e2v technologies.

### GENERAL DATA

#### Electrical

Input voltage (AC rms) (see note 1) . . . . . 200 V

#### Mechanical

Length . . . . . 172 mm (6.8 in)

Width . . . . . 122 mm (4.8 in)

Height:

excluding connectors . . . . . 105 mm (4.2 in)

including connectors . . . . . 140 mm (5.5 in)

Net weight . . . . . 1.1 kg (2.4 lb)

#### Environmental

Operating temperature range . . . . .  $0$  to  $+50$  °C

Storage temperature . . . . .  $-30$  to  $+50$  °C

Shock and vibration . . . . . see note 2

Cooling . . . . . natural convection

### MINIMUM AND MAXIMUM RATINGS

	Min	Max
Input voltage (see note 1)	-	200 V
Frequency	47	63 Hz
Power consumption	-	100 VA
Trigger input:		
MA2438B		see note 3
MA2440B (see note 4)	5	30 V
Trigger input frequency (see note 5)	-	10 kHz
Trigger input pulse duration	1	100 $\mu\text{s}$
Grid 1 series resistor (see note 6)	320	- $\Omega$
Grid 2 series resistor (see note 6)	47	- $\Omega$
Grid 1 output current (see note 6)	-	430 mA

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MA2440B ▲

### CHARACTERISTICS

Pulse output voltage:	
into open circuit	1000 V min
into $47 \Omega$ load	250 V min
Pulse output impedance	120 $\Omega$
Pulse length (nominal)	0.5 $\mu\text{s}$
Pulse delay (see notes 7 and 8)	300 ns
Pulse jitter (see notes 7 and 8)	1 ns max
Bias voltage (see note 9)	$-140$ V
Auxiliary grid voltage (see note 10)	$+140$ V
Trigger input impedance, MA2440B (see note 11)	470 $\Omega$ min

## NOTES

1. The power input to both units takes the form of a 200 V AC supply, tapped at 100 V. Two transformers capable of providing such a supply are available from e2v technologies:

- MA2443A for 6.3 V AC input.
- MA2444A for 110/220 V AC input.

2. The unit has not been tested to known levels of shock and vibration, but is of a generally rugged construction. It should not be subjected to undue shock and vibration.

3. The optical input pulse is via the 9 mm FSMA style connector - receiver type HFBR-2404. Transmitter type HFBR-1404 is used for driving and testing. To achieve the best performance, the rise time of the input pulse should be as short as possible; a suitable driver is shown in Fig. 3.

4. The trigger system will work with any input pulse voltage in the range specified. For optimum performance the input amplitude should be at least 10 V and the leading edge should have a rise time of less than 0.1  $\mu$ s. If the input voltage is less than 5 V no damage will occur but trigger pulses may not be generated. If the input voltage exceeds 30 V DC, the board will be damaged.

5. This is the maximum frequency which the trigger system will accept. If this frequency is exceeded some trigger pulses will be ignored but no damage will result.

6. Recommended resistors are 11 W vitreous enamelled wirewound WELWYN W24 series or similar. **The grid 1 resistors must be set so that the grid 1 current does not exceed the maximum for the particular thyratron being triggered. There is no on-board resistance from the grid 1 supply.**

7. For the MA2438B, the jitter and the pulse delay are measured at the output with respect to the drive to the optic transmitter (see Fig. 3) under the following conditions:

Frequency . . . . .	1 kHz
Output load . . . . .	47 $\Omega$
Optic fibre length . . . . .	2 m

8. For the MA2440B, the jitter and the pulse delay are measured at the output with respect to the voltage at the input socket under the following conditions:

Frequency . . . . .	1 kHz
Output load . . . . .	47 $\Omega$
Input pulse amplitude . . . . .	10 V
Input pulse rise time . . . . .	0.1 $\mu$ s

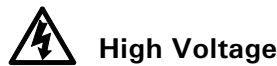
9. This is the open-circuit DC voltage present on the grid 2 output pin relative to cathode. The internal resistance of the supply is 4.7 k $\Omega$ .

10. This is the open-circuit DC voltage present on the grid 1 output pin relative to cathode.

11. The trigger input circuit contains non-linear devices but the effective input impedance will never be less than the minimum specified.

## HEALTH AND SAFETY HAZARDS

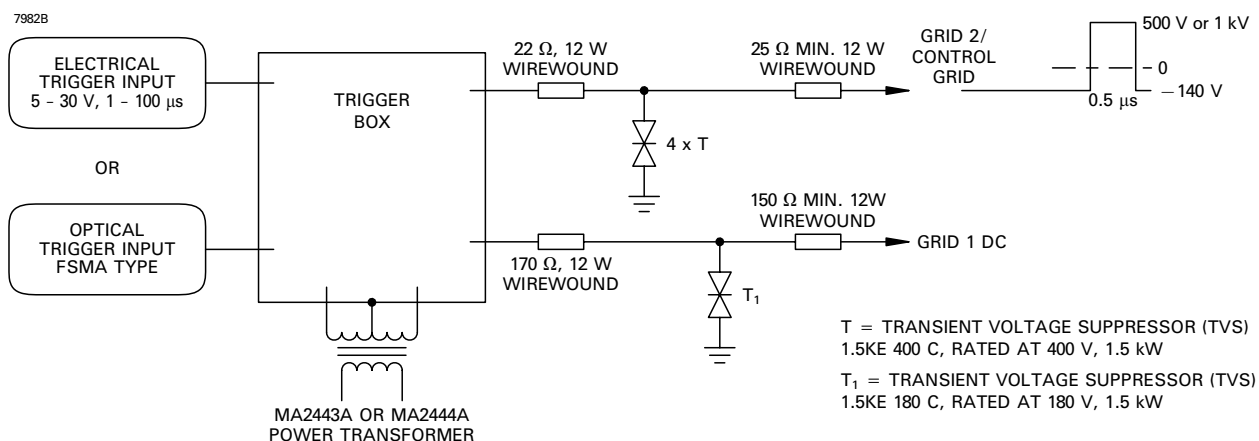
e2v technologies electronic devices are safe to handle and operate provided that the relevant precautions stated herein are observed. e2v technologies does not accept responsibility for damage or injury resulting from the use of electronic devices it produces. Equipment manufacturers and users must ensure that adequate precautions are taken. Appropriate warning labels and notices must be provided on equipment incorporating e2v technologies devices and in operating manuals.



### High Voltage

Equipment must be designed so that personnel cannot come into contact with high voltage circuits. All high voltage circuits and terminals must be enclosed and fail-safe interlock switches must be fitted to disconnect the primary power supply and discharge all high voltage capacitors and other stored charges before allowing access. Interlock switches must not be bypassed to allow operation with access doors open.

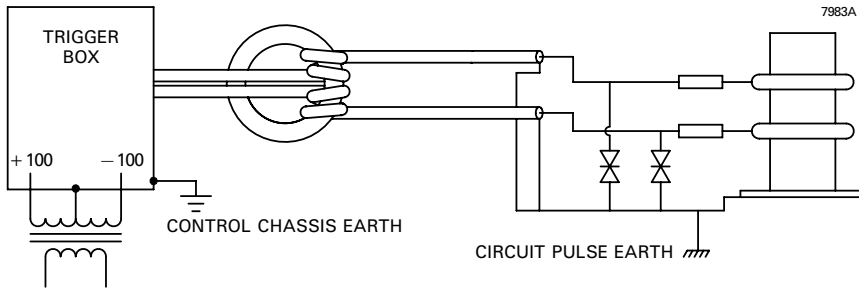
## CONNECTION SCHEMATIC



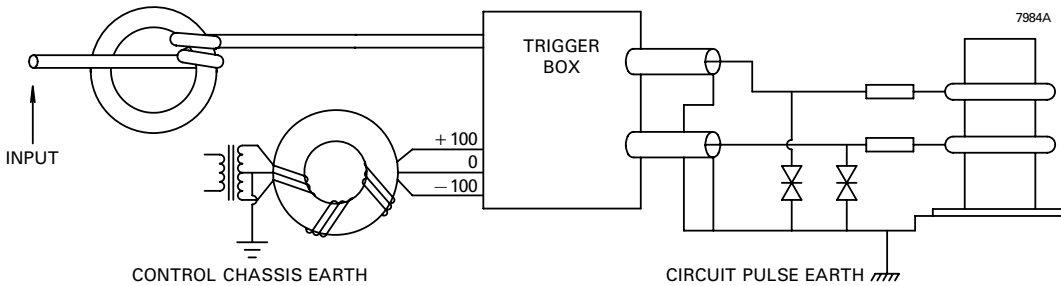
**Note** Power transformers, output resistors and TVS devices are not supplied with the trigger system.

## GRID SPIKE PROTECTION

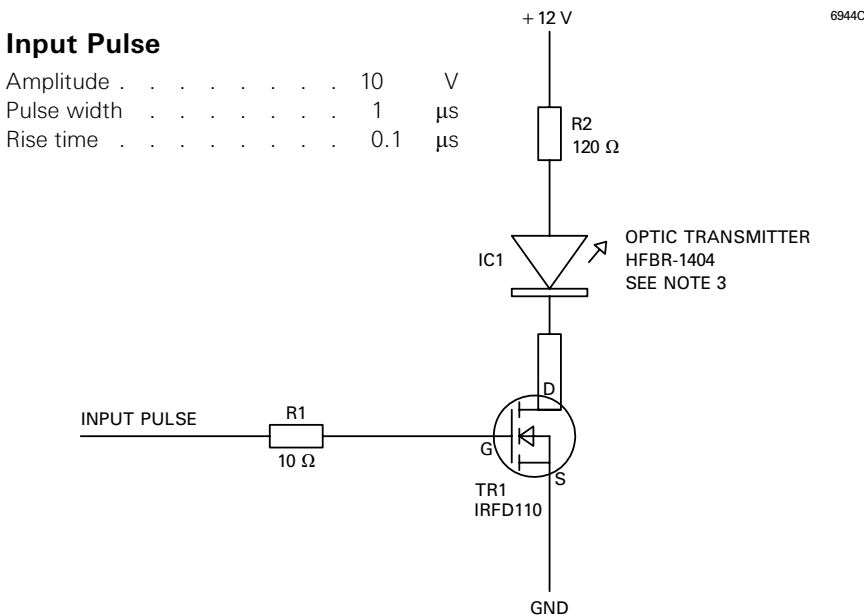
It is recommended that Transient Voltage Suppressor (TVS) protection of the trigger system against high grid and voltage spikes be used as outlined in Figs. 1 and 2 below. High grid spikes arise towards the end of thyatron cathode life and when the thyatron prefires. Other high voltage spikes can arise from high di/dt pulse circuits and if good earthing practice is not followed.



**Fig. 1 Trigger system remote from the thyatron discharge circuit**



**Fig. 2 Trigger system mounted close to the thyatron discharge circuit**



**Fig. 3 Drive circuit for optic transmitter**

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