# Marconi Applied Technologies
# CX1140L
# Hydrogen Thyratron

The data to be read in conjunction with the Hydrogen Thyratron Preamble.

## ABRIDGED DATA

Hydrogen-filled, fast recovery, tetrode thyratron, specifically designed for operation under medical linac conditions. A reservoir operating from the cathode heater supply is incorporated.

| | | |
|---|---|---|
| Peak forward anode voltage | 25 | kV max |
| Peak anode current | 1000 | A max |
| Average anode current: | | |
| continuous operation | 1.25 | A max |
| intermittent operation | 2.2 | A max |

## GENERAL

### Electrical

| | | |
|---|---|---|
| Cathode (connected internally to mid-point of heater) | oxide coated | |
| Heater voltage | 6.3 ± 5% | V |
| Heater current | 22 | A |
| Tube heating time (minimum) | 5.0 | min |
| Inter-electrode capacitances (approximate): | | |
| anode to grid 2 (grid 1 and cathode not connected) | 13 | pF |
| anode to grid 1 (grid 2 and cathode not connected) | 7.5 | pF |
| anode to cathode (grid 1 and grid 2 not connected) | 26 | pF |

### Mechanical

| | |
|---|---|
| Overall length | 317.5 mm (12.500 inches) max |
| Overall diameter | 84.12 mm (3.312 inches) max |
| Net weight | 0.7 kg ($1\,^1/_2$ pounds) approx |
| Mounting position (see note 1) | any |
| Base | pin spacing as B5F; metal shell with micalex insert |
| Top cap (see note 2) | BS448-CT3 |

**Cooling** natural

## PULSE MODULATOR SERVICE MAXIMUM AND MINIMUM RATINGS
### (Absolute values)

| | Min | Max | |
|---|---|---|---|
| **Anode** | | | |
| Peak forward anode voltage (see note 3) | – | 25 | kV |
| Peak inverse anode voltage (see note 4) | – | 25 | kV |
| Peak anode current | – | 1000 | A |
| Peak anode current (pulse repetition rate limited to 60 pps max) | – | 2000 | A |
| Average anode current: | | | |
| continuous operation | – | 1.25 | A |
| intermittent operation | – | 2.2 | A |
| Rate of rise of anode current (see note 5) | – | 5000 | A/μs |

### Grid 2

| | | | |
|---|---|---|---|
| Unloaded grid 2 drive pulse voltage (see note 6) | 300 | 1000 | V |
| Grid 2 pulse duration | 1.0 | – | μs |
| Rate of rise of grid 2 pulse (see note 5) | 1.0 | – | kV/μs |
| Grid 2 pulse delay | 0.5 | 3.0 | μs |
| Peak inverse grid 2 voltage | – | 450 | V |
| Loaded grid 2 bias voltage | 0 | –150 | V |
| Grid 2 drive impedance | 50 | 500 | Ω |
| Grid 2 bias impedance | 30 | 50 | kΩ |

### Grid 1 – DC Primed (See note 7)

| | | | |
|---|---|---|---|
| DC grid 1 unloaded priming voltage | 75 | 150 | V |
| DC grid 1 priming current | 50 | 100 | mA |

Marconi Applied Technologies Limited, Waterhouse Lane, Chelmsford, Essex CM1 2QU England Telephone: +44 (0)1245 493493 Facsimile: +44 (0)1245 492492
e-mail: info@eev.com Internet: www.marconitech.com Holding Company: Marconi p.l.c.

Marconi Applied Technologies Inc. 4 Westchester Plaza, PO Box 1482, Elmsford, NY10523-1482 USA Telephone: (914) 592-6050 Facsimile: (914) 592-5148 e-mail: info@eevinc.com

©2000 Marconi Applied Technologies Limited

| | Min | Max | |
|---|---|---|---|
| **Grid 1 – Pulsed** | | | |
| Unloaded grid 1 drive pulse voltage (see note 6) | 300 | 1000 | V |
| Grid 1 pulse duration | 2.0 | – | μs |
| Rate of rise of grid 1 pulse (see note 5) | 1.0 | – | kV/μs |
| Peak inverse grid 1 voltage | – | 450 | V |
| Loaded grid 1 bias voltage | see note 8 | | |
| Peak grid 1 drive current | 0.3 | 1.0 | A |
| **Cathode** | | | |
| Heater voltage | 6.3 ± 5% | | V |
| Tube heating time | 5.0 | – | min |
| **Environmental** | | | |
| Ambient temperature | −50 | +90 | °C |
| Altitude | – | 3 | km |
| | – | 10 000 | ft |

## CHARACTERISTICS

| | Min | Typical | Max | |
|---|---|---|---|---|
| Critical DC anode voltage for conduction (see note 9) | – | 0.5 | 2.0 | kV |
| Anode delay time (see notes 9 and 10) | – | 0.15 | 0.25 | μs |
| Anode delay time drift (see notes 9, 11 and 12) | – | 20 | 50 | ns |
| Time jitter (see notes 9 and 12) | – | 1.0 | 5.0 | ns |
| Recovery time | see note 13 and curves | | | |
| Heater current (at 6.3 V) | 18 | 22 | 25 | A |

## RATINGS FOR FAULT CONDITIONS, SINGLE SHOT OR CROWBAR SERVICE (See note 7)

| | | |
|---|---|---|
| DC forward anode voltage | 25 | kV max |
| Peak anode current | 10 000 | A max |
| Product of peak current and pulse duration | 0.6 | A.s max |
| Repetition frequency | 1 pulse per 10s max | |

## NOTES

1. Clamping is only permissible by the base.
2. A large area anode connector, Marconi Applied Technologies type MA360, is recommended.
3. The maximum permissible peak forward voltage for instantaneous starting is 25 kV and there must be no overshoot.
4. The peak inverse voltage must not exceed 10 kV for the first 25 μs after the anode pulse.
5. This rate of rise refers to that part of the leading edge of the pulse between 25% and 75% of the pulse amplitude.
6. Measured with respect to cathode. In certain cases the maximum drive pulse voltage may be exceeded without damage to the tube; a maximum value of 2.5 kV is then recommended. When grid 1 is pulse driven, the last 0.25 μs of the top of the grid 1 pulse must overlap the corresponding first 0.25 μs of the top of the delayed grid 2 pulse.
7. DC priming is recommended for crowbar service.
8. DC negative bias voltages must not be applied to grid 1. When grid 1 is pulse driven, the potential of grid 1 may vary between −10 and +5 V with respect to cathode potential during the period between the completion of recovery and the commencement of the succeeding grid pulse.
9. Typical figures are obtained on test using conditions of minimum grid drive. Improved performance can be expected by increasing the grid drive.
10. The time interval between the instant at which the rising unloaded grid 2 pulse reaches 25% of its pulse amplitude and the instant when anode conduction takes place.
11. The drift in delay time over a period from 10 seconds to 10 minutes after reaching full voltage.
12. For equipment where jitter and anode delay time drift are not important, the tube may be triggered by applying a single pulse to grid 2 and connecting grid 1 to grid 2 via a 1000 pF capacitor shunted by a 0.1 MΩ resistor. These components are incorporated in adaptor assemblies MA92 and MA179 (see below).
13. The recovery characteristics are controlled on a sampling basis.

## ADAPTOR ASSEMBLIES

In addition to standard top cap connectors and base sockets, a number of adaptor assemblies are available from Marconi Applied Technologies. They assist in the replacement of other types of thyratron by CX1140L, as indicated below.

**MA91** For replacing GHT3/CV5721

A five-contact socket fitted with flexible leads and terminal tags, and mounted on an insulating base plate. It provides a conversion from base to flange type mounting.

**MA92** For replacing 1754/5948 (CV3518)

Similar to MA91 but incorporates an RC network and is designed for use with CX1140L where a single pulse drive and flying lead connections are required. Where CX1140L and MA92 replace 1754/5948 (CV3518), it should be noted that no lead is provided for a hydrogen reservoir connection as the CX1140L does not require a separate supply.

**MA179** For replacing 1754/5948 and with tube clamping

A five-contact socket with flexible leads and terminal tags, mounted on an insulating base plate; it is fitted with a base clamp. It incorporates an RC network and is designed for use with CX1140L where a single pulse drive and flying lead connections are required.

See page 3 for conversion of 5949/1907 or 5949A socket to use CX1140L.

**Further information is contained in the leaflet 'Accessories for Hydrogen Thyratrons'.**


©2000 Marconi Applied Technologies

## HEALTH AND SAFETY HAZARDS

Marconi Applied Technologies hydrogen thyratrons are safe to handle and operate, provided that the relevant precautions stated herein are observed. Marconi Applied 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 equipments incorporating Marconi Applied 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.

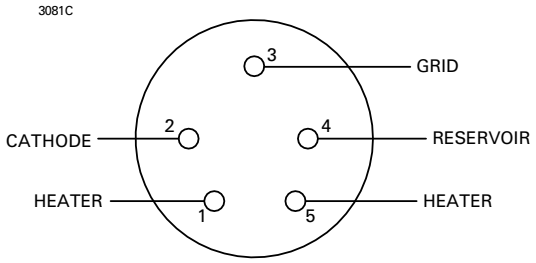
### X-Ray Radiation

All high voltage devices produce X-rays during operation and may require shielding. The X-ray radiation from hydrogen thyratrons is usually reduced to a safe level by enclosing the equipment or shielding the thyratron with at least 1.6 mm ($^{1}/_{16}$ inch) thick steel panels.

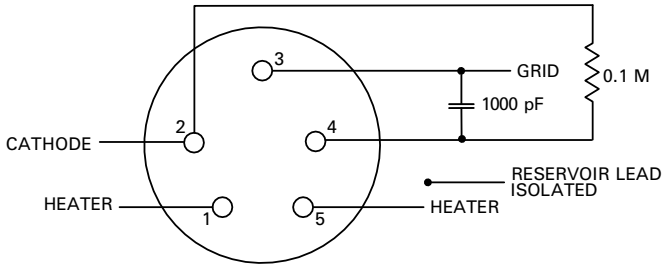
Users and equipment manufacturers must check the radiation level under their maximum operating conditions.

### Conversion of 5949/1907 or 5949A socket to use CX1140L

1) View of 5949/1907 or 5949A socket from underneath




2) View of 5949/1907 or 5949A socket modified to use CX1140L

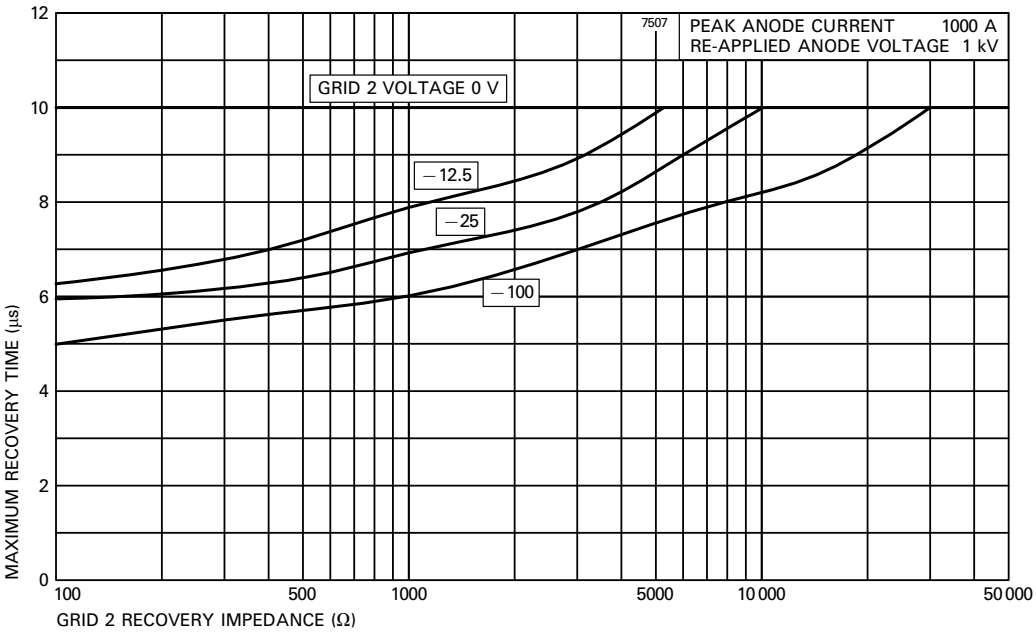



3) Conversion Procedure

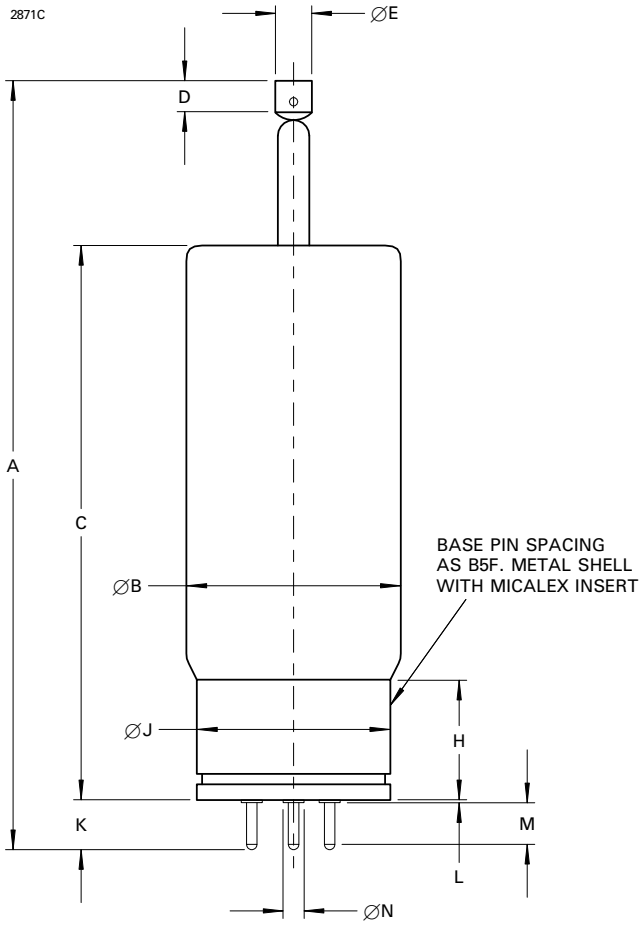
The following components are required; they should be rated to withstand the existing grid drive power.
One 0.1 MΩ resistor.
One 1000 pF mica capacitor.

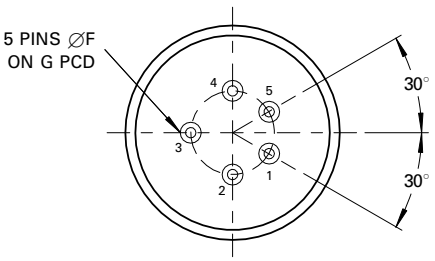
a) Remove reservoir lead from pin 4 and isolate.
b) Connect the 0.1 MΩ resistor and 1000 pF capacitor as shown.
c) Plug in CX1140L.

## MAXIMUM RECOVERY CHARACTERISTICS



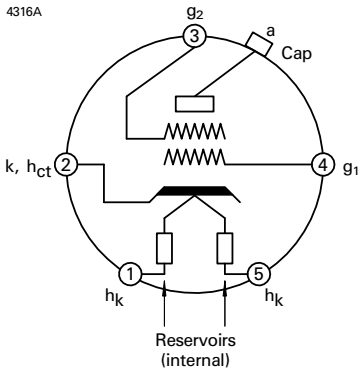
## OUTLINE
### (All dimensions without limits are nominal)




| Ref | Millimetres | Inches |
|---|---|---|
| A | 304.8 ± 12.7 | 12.000 ± 0.500 |
| B | 84.12 max | 3.312 max |
| C | 215.9 ± 12.7 | 8.500 ± 0.500 |
| D | 12.7 min | 0.500 min |
| E | 14.38 ± 0.18 | 0.566 ± 0.007 |
| F | 4.750 ± 0.076 | 0.187 ± 0.003 |
| G | 31.75 | 1.250 |
| H | 49.2 | 1.937 |
| J | 77.77 ± 1.57 | 3.062 ± 0.062 |
| K | 19.56 max | 0.770 max |
| L | 1.85 max | 0.073 max |
| M | 14.6 min | 0.575 min |
| N | 6.6 max | 0.260 max |

Inch dimensions have been derived from millimetres.




| Pin | Element |
|---|---|
| 1 | Heater |
| 2 | Cathode, connected internally to heater mid-point |
| 3 | Grid 2 |
| 4 | Grid 1 |
| 5 | Heater |
| Top cap | Anode |

Whilst Marconi Applied Technologies has taken care to ensure the accuracy of the information contained herein it accepts no responsibility for the consequences of any use thereof and also reserves the right to change the specification of goods without notice. Marconi Applied Technologies accepts no liability beyond that set out in its standard conditions of sale in respect of infringement of third party patents arising from the use of tubes or other devices in accordance with information contained herein.

 ©2000 Marconi Applied Technologies