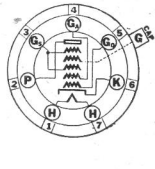
Sylvania

TYPE 2A7

PENTAGRID CONVERTER



CHARACTERISTICS

Heater Voltage AC or DC	2.5 Volts
Heater Current	0.8 Ampere

Direct Interelectrode Capacitances:

Grid G to Plate (with tube shield)	0.30 $\mu\mu$f
Grid G to Grid Ga (with tube shield)	0.20 $\mu\mu$f
Grid G to Grid Go (with tube shield)	0.15 $\mu\mu$f
Grid Go to Grid Ga	1.0 $\mu\mu$f
Grid G to all other Electrodes (R-F Input)	8.5 $\mu\mu$f
Grid Ga to all other Electrodes (Osc. Output)	5.5 $\mu\mu$f
Grid Go to all other Electrodes (Osc. Input)	7.0 $\mu\mu$f
Plate to all other Electrodes (Mixer Output)	9.0 $\mu\mu$f

Maximum Over-all Length	$4\frac{13}{32}$"
Maximum Diameter	$1\frac{9}{16}$"
Bulb	ST-12
Cap	Small Metal
Base—Small 7-Pin	7-C

Operating Conditions and Characteristics:

Heater Voltage	2.5	2.5 Volts
Plate Voltage	100	250 Volts Max.
Control Grid Voltage (Grid G)	−1.5	−3 Volts Min.
Screen Voltage (Grid Gs)	50	100 Volts Max.
Anode Grid Voltage (Grid Ga)	100*	250* Volts
Oscillator Grid Resistor (Grid Go)	50000	50000 Ohms
Plate Current	1.3	3.0 Ma.
Screen Grid Current	1.3	3.0 Ma.
Anode Grid Current	1.4	4.0 Ma.
Oscillator Grid Current	0.25	0.7 Ma.
Cathode Resistor	300	300 Ohms
Plate Resistance	0.5	0.36 Megohm
Conversion Conductance	350	520 μmhos
Control Grid Voltage (2 μmhos Conv. Cond.)	−20	−45 Volts

*Applied through 20000 ohm dropping resistor.

CIRCUIT APPLICATION

Sylvania 2A7 is an electron coupled pentagrid converter designed especially for detector-oscillator service in a-c operated superheterodyne receivers. It is identical to Type 6A7 of the 6.3 volt group except in heater rating which is 0.8 ampere at 2.5 volts.

Improved Oscillator-Modulator Systems

The superheterodyne is primarily a frequency translating device wherein the desired radio signals are received at their proper frequency and converted to a new frequency. The main selectivity and amplification are obtained at this new intermediate frequency, the value of which is a definite constant depending on the circuit design.

Heretofore, the general method provided for the application of the incoming signal and also the local frequency to the grid of the first detector tube. The local frequency is furnished either by a separate tube or within the detector tube itself, there being reactive couplings between the detector and oscillator circuits.

The design of the 2A7 and 6A7 offers an oscillator-modulator system that involves only one physical tube structure (single

cathode structure) which possesses all of the advantages of a two tube system and provides, in addition, several important improvements in performance. These include:

(1) A higher translation gain.

(2) An oscillator system which is independent of the radio frequency system.

(3) The application of a bias voltage that can be used to satisfactorily control volume.

(4) The possibility of a.v.c. with a minimum number of tubes.

Instead of employing either capacitance or inductive means to provide for coupling the oscillator and detector circuits, the 2A7 and 6A7 permit electron coupling. This method eliminates undesirable inter-coupling effects, it simplifies circuits, and establishes greater oscillator stability.

The electrons from the cathode are accelerated through the oscillator grid (Go) by the positive anode-grid (Ga) and screen grid (Gs). The anode-grid really consists of a pair of side rods; no grid wires are strung on these rods. Most of the electrons approaching the anode-grid possess high velocities so that they shoot past (Ga) and for the most part through the screen grid (Gs) and approach the modulator grid (G). This grid has a negative potential which therefore retards the oncoming electron stream.

The cloud of retarded electrons between grids (Gs) and (G) constitutes the virtual cathode for the modulator section of the tube.

Electrons may be drawn away from this source in a manner analogous to that by which they were originally accelerated away from the cathode element. Elements (G), (Gs) and (P) together with the virtual cathode provide a tetrode modulator tube. The r-f signal is applied to grid (G) and the intermediate frequency output circuit is connected to the plate.

If the oscillator grid (Go) is only slightly negative, or even somewhat positive, then the virtual cathode has an ample electron supply for the modulator unit. Whenever the oscillator grid swings to more negative values, the number of electrons arriving at the modulator plate is temporarily reduced, or possibly cut off. Thus, the oscillator can modulate the signal in the modulator section and produce the i-f beat note in the plate circuit.

The current necessary to have sustained oscillations is controlled by the oscillator grid and not by the modulator grid, the latter being incapable of producing cut-off in the oscillator section. Thus, the gain of the modulator can be controlled over a considerable range by a variable negative bias on the grid (G) without substantially affecting the oscillator unit. The modulator grid (G) shows a gradual and extended cut-off action, somewhat comparable with a Type 58, but the conversion gain is higher. The screen grids provide the requisite shielding; they increase the output impedance of the tube, thereby enhancing the gain; and the one nearest the cathode serves also to reduce the local frequency radiation.

A complete discussion of the application of the 2A7 will be found under Type 6A7.