

ELECTRONIC TUBE REFERENCE

18FX6

Voltage - Radio Detector Converter electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
HEPTODE

Miniature dual-control heptode converter for combined mixer and local-oscillator service in superheterodyne receivers. Its multi-grid structure provides useful isolation between RF input, oscillator, and converted-signal circuits in low-current series-heater radio designs.

GENERAL CHARACTERISTICS

BASE DESIGNATION	7CH	BASE PINS	7
NOMINAL HEATER	18 V / 100 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

7CH - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – G1	A	G1 – Control Grid	CONNECTED
PIN2 – G5	A	G5 – Fifth Grid	CONNECTED
PIN2 – K	A	K – Cathode	CONNECTED
PIN3 – H	–	H – Heater	CONNECTED
PIN4 – H	–	H – Heater	CONNECTED
PIN5 – P	A	P – Plate (Anode)	CONNECTED
PIN6 – G2	A	G2 – Screen Grid	CONNECTED
PIN6 – G4	A	G4 – Fourth Grid	CONNECTED
PIN7 – G3	A	G3 – Suppressor Grid	CONNECTED

SECTION RATINGS

SECTION1 Heptode	
PLATE RESISTANCE	400000 Ω
TRANSCONDUCTANCE	0.007 S
AMPLIFICATION FACTOR	22
MAXIMUM PLATE VOLTAGE	150 V
MAXIMUM SCREEN VOLTAGE	110 V
MAXIMUM PLATE DISSIPATION	1 W
MAXIMUM SCREEN DISSIPATION	1.2 W
Heptode converter/oscillator. Plate resistance is published for converter service; amplification factor and 0.007 A/V transconductance are published oscillator characteristics. Additional conditioned values remain in TUBE_SECTION_PARAMETER.	

18FX6 — Dual Control Pentagrid Amplifier

The **18FX6** is a miniature heptode designed for combined mixer and oscillator functions, operating as a pentagrid converter. It is primarily intended for converter applications in line-operated AC/DC superheterodyne radio receivers utilizing series-connected heater strings.

Mechanical Construction and Pinout

The 18FX6 is constructed with a T-5 1/2 glass envelope and a miniature button 7-pin base (EIA designation 7CH or E7-1). It features a coated unipotential cathode and can be mounted in any position.

The physical dimensions of the tube are as follows:

- **Maximum Diameter:** 3/4 inch
- **Maximum Overall Length:** 2 1/8 inches
- **Maximum Seated Height:** 1 7/8 inches

The bottom-view pin connections (EIA 7CH) are assigned as follows:

Pin Number	Electrode Connection
Pin 1	Grid Number 1 (Oscillator Grid)
Pin 2	Cathode & Grid Number 5
Pin 3	Heater
Pin 4	Heater
Pin 5	Plate
Pin 6	Grid Number 2 & Grid Number 4 (Screen Grid)

Pin Number	Electrode Connection
Pin 7	Grid Number 3 (Mixer Grid)

Heater Ratings and Interelectrode Capacitances

The heater is designed for series-string operation in AC/DC receivers, drawing a low current to match standard line-operated configurations.

- **Heater Voltage:** 18 Volts (AC or DC) with a $\pm 10\%$ operating tolerance
- **Heater Current:** 0.10 Amp (100 mA)

Direct Interelectrode Capacitances

The capacitances of the 18FX6 vary depending on whether an external shield is used. The values below compare measurements taken with Shield EIA 316 connected to Pin 2 (cathode) against measurements taken without a shield:

Capacitance Parameter	With Shield	Without Shield	Unit
Grid 3 to Plate (Max.)	0.25	0.30	$\mu\mu\text{F}$
Grid 3 to Grid 1 (Max.)	0.15	0.15	$\mu\mu\text{F}$
Grid 3 Input: g3 to (h+k+g1+g2,4+g5+p)	7.0	7.0	$\mu\mu\text{F}$
Grid 1 Input: g1 to (h+k+g2,4+g3+g5+p)	5.5	5.5	$\mu\mu\text{F}$
Mixer Output: p to (h+k+g1+g2,4+g3+g5)	13.0	8.0	$\mu\mu\text{F}$
Grid 1 to Cathode	3.0	3.0	$\mu\mu\text{F}$
Cathode to all electrodes except Grid 1	20.0	15.0	$\mu\mu\text{F}$
Grid 1 to Plate	0.05	0.10	$\mu\mu\text{F}$

Design-Maximum Ratings

The ratings of the 18FX6 are established under the Design-Maximum System. Operating the tube beyond these limits may impair its performance and longevity.

- **Maximum Plate Voltage:** 150 Volts
- **Maximum Grid #2 & Grid #4 Supply Voltage:** 150 Volts
- **Maximum Grid #2 & Grid #4 Voltage:** 110 Volts
- **Maximum Plate Dissipation:** 1.0 Watt
- **Maximum Grid #2 & Grid #4 Dissipation:** 1.2 Watts
- **Maximum Heater-Cathode Voltage:** 100 Volts (Heater positive or negative with respect to cathode)

Typical Operating Conditions and Characteristics

The 18FX6 can be operated with separate excitation in converter service, or analyzed in a non-oscillating state to determine the characteristics of its oscillator section.

Converter Service (Separate Excitation)

Under typical operating conditions in an EIA conversion conductance test configuration, the tube exhibits the following characteristics:

- **Plate Voltage:** 100 Volts
- **Grid #2 & Grid #4 (Screen) Voltage:** 100 Volts
- **Grid #3 (Mixer Grid) Voltage:** -1.5 Volts
- **Grid #1 (Oscillator Grid) Resistance:** 20,000 Ohms
- **Grid #1 Current:** 0.5 mA
- **Plate Current:** 2.3 mA
- **Grid #2 & Grid #4 Current:** 6.2 mA
- **Cathode Current:** 9.0 mA
- **Conversion Transconductance:** 480 μ mhos
- **Plate Resistance (Approx.):** 0.4 Megohm
- **Grid #3 Voltage for $G_c = 10 \mu$ mhos (Approx.):** -21 Volts

Oscillator Section (Non-Oscillating)

When evaluating the oscillator portion of the structure without active oscillation, the screen grids (Grid #2 and Grid #4) are tied directly to the plate to form a triode-connected configuration:

- **Grid #3 Voltage:** 0 Volts
- **Grid #1 Voltage:** 0 Volts
- **Grid #2 & Grid #4 Connected to Plate:** 100 Volts
- **Cathode Current:** 24 mA
- **Transconductance (between Grid #1 and Grids #2 & #4 connected to plate):** 7000 μ mhos
- **Amplification Factor (between Grid #1 and Grids #2 & #4 connected to plate):** 22
- **Grid #1 Voltage for $I_b = 20 \mu$ A (Approx.):** -9.2 Volts

Analysis of Characteristic Curves

The behavior of the 18FX6 under varying electrical potentials is characterized by several distinct operational curves:

- **Average Plate Characteristics (Triode Connection):** When Grid #2 and Grid #4 are connected to the plate and Grid #3 is held at 0 V, the tube behaves like a triode. The relationship of plate and grid current versus plate voltage (from 0 to 500 V) shows classic triode-like curves across a range of Grid #1 bias voltages from +4.0 V down to -26 V.
- **Average Transfer Characteristics:** The conversion transconductance (G_c) peaks near 500 μmhos when Grid #3 is at 0 V and falls off smoothly to near zero as the Grid #3 bias is swept down to -20 V. Throughout this sweep, the screen current (I_{c2+4}) remains relatively stable, hovering around 10 mA.
- **Average Characteristics vs. Plate Voltage:** When Grid #3 is biased at -1.5 V, the conversion transconductance (G_c), plate current (I_b), and screen current (I_{c2+4}) vary with plate voltage from 0 to 200 V. The conversion transconductance rises sharply as plate voltage increases up to 50 V, after which it levels off near 500 μmhos . Similarly, the plate current remains flat at approximately 2.3 mA for plate potentials above 50 V.

Technical Summary

The **18FX6** is a versatile, 7-pin miniature pentagrid converter designed for line-operated superheterodyne receivers. Featuring an 18 V, 100 mA heater, it is optimized for series-string heater circuits. With a maximum plate rating of 150 V and a conversion transconductance of 480 μmhos under typical 100 V operating conditions, the 18FX6 combines the functions of an oscillator and a mixer into a single, compact glass envelope.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Tung Sol

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1961 TUNG SOL

Section 1 · Heptode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Conversion Transconductance	480 μ S	—
OscillatorModeTransconductance	7000 μ S	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1966 Tung Sol Electronic Tubes 3 of 4

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1966 TUNG SOL ELECTRONIC TUBES 3 OF 4

Section 1 · Heptode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid 3-to-plate capacitance	0.25 pF	WholeTube
Grid 3-to-grid 1 capacitance	0.15 pF	WholeTube
Input capacitance	7 pF	WholeTube
Output capacitance	13 pF	WholeTube

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum plate voltage	150 V	WholeTube
Maximum grids 2 and 4 voltage	110 V	WholeTube
Maximum plate dissipation	1 W	WholeTube

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum grids 2 and 4 dissipation	1.2 W	WholeTube
Plate voltage	200 V	TypicalOperation
Grid 2 voltage	100 V	TypicalOperation
Grid 3 voltage	-1.5 V	TypicalOperation
Plate current	2.3 mA	TypicalOperation
Grid 2 current	6.2 mA	TypicalOperation
Conversion transconductance	450 μ S	TypicalOperation
Plate resistance	400000 ohm	TypicalOperation
Triode-connected transconductance	7000 μ S	TypicalOperation
Triode-connected amplification factor	22	TypicalOperation



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1968 General Electric Co

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1968 GENERAL ELECTRIC CO Section 1 · Heptode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid3 To Plate Capacitance With Shield	0.25 pF	—
Grid3 To Plate Capacitance Without Shield	0.3 pF	—
RF Input Capacitance	7 pF	—
Oscillator Input Capacitance	5.5 pF	—
Mixer Output Capacitance With Shield	13 pF	—
Mixer Output Capacitance Without Shield	8 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Converter Plate Voltage	100 V	ConverterService
Converter Screen Voltage	100 V	ConverterService
Converter Grid3 Voltage	-1.5 V	ConverterService

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Converter Plate Resistance	400000 ohm	ConverterService
Conversion Transconductance	480 uS	ConverterService
Converter Plate Current	2.3 mA	ConverterService
Converter Screen Current	6.2 mA	ConverterService
Converter Grid1 Current	0.5 mA	ConverterService
Converter Cathode Current	9 mA	ConverterService
Oscillator Amplification Factor	22	NotOscillating
Oscillator Transconductance	7000 uS	NotOscillating
Oscillator Cathode Current	24 mA	NotOscillating

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