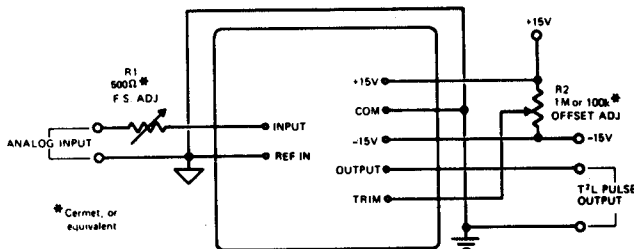
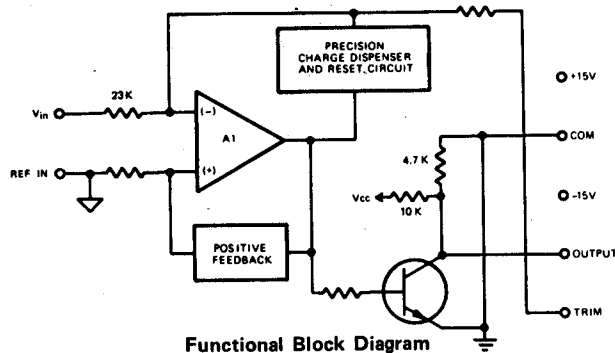


# 10kHz High Performance Voltage to Frequency Converters

The 4701, 4713, and 4725 are high performance, low cost, voltage to frequency converters capable of producing a 10Hz to 10kHz output pulse train from a +10mV to +10V input signal. Twenty percent overrange, up to 13 bit resolution and low noise feedthrough are some of the inherent features of these general purpose devices. They are available to three different guaranteed nonlinearity specifications:  $\pm 0.1\%FS$  (4713),  $\pm 0.05\%FS$  (4705) and  $\pm 0.015\%FS$  plus  $\pm 0.015\%$  signal (4725). Full scale and offset errors,  $\pm 0.75\%FS$  and  $\pm 0.03\%FS$  respectively, are the same for the three units. Applications include FM telemetry, magnetic tape recording and digital to frequency conversion.

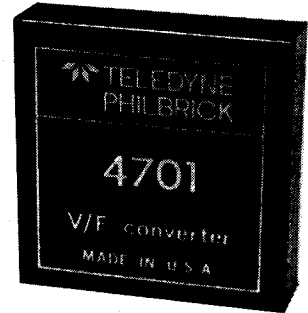
## Applications Information

Precalibrated to meet all published specifications, these devices provide the user with optional trimming for applications requiring greater accuracies (see figure below). Input offset voltage is trimmed by applying a 100mV signal to the input terminal and adjusting R2 for a 100Hz output. Full scale is then trimmed by applying 10V to the input terminals and adjusting R1 for a 10kHz output. Repeat above procedure for precise calibration.



Connections Required for Operation, plus optional Input Offset and Full Scale Adjustments

# 4701 4713 4725



## FEATURES

- $\pm 0.008\%FS$  Nonlinearity
- 20% Overage
- 13 Bit Resolution
- High Noise Rejection
- Low Cost

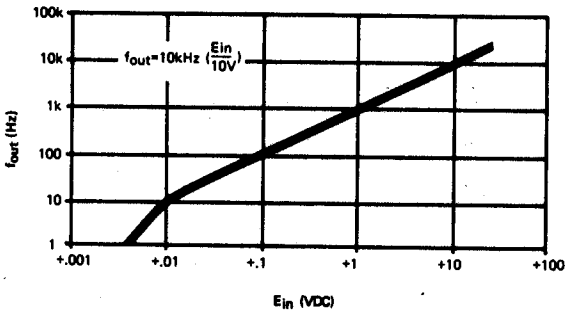
## APPLICATIONS

- FM Telemetry
- Precision Integrators
- Common Mode Voltage Isolation
- Digital to Frequency Conversion

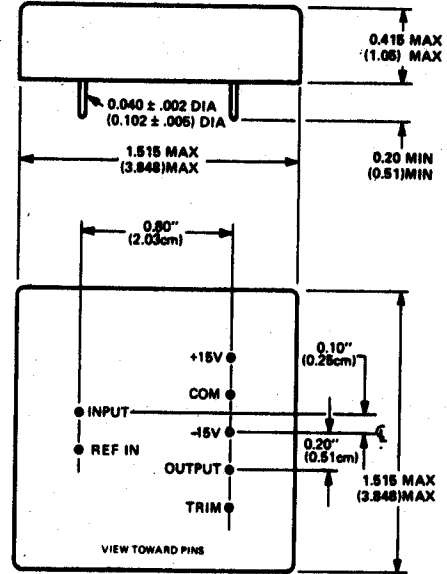
**SPECIFICATIONS** (T<sub>A</sub> = +25°C, ±V<sub>CC</sub> = ±15VDC, unless otherwise indicated)

<b>ANALOG INPUT</b>	
Full Scale	0VDC to +10VDC
Overrange	+20% minimum
Configuration	Single-ended, referred to ground
Offset Voltage (adjustable to zero)	±10mV max., ±3mV typical.
Impedance	23kΩ nominal at V <sub>IN</sub>
Overvoltage Protection	±15V max, input voltage without damage to either input
<b>FREQUENCY OUTPUT</b>	
Full Scale Frequency (f <sub>out</sub> )	10Hz to 10kHz, plus 20% overrange
Linearity (V <sub>IN</sub> = +10mV to +11V) @ +25°C max.	
4713	±0.1% of F.S., 0.04% typ.
4701	±0.05% of F.S., ±0.008% typ.
4725	±0.015% Full Scale plus ±0.015% Signal
@ 0 to +70°C max.	
4713	±0.11% of F.S., 0.05% typ.
4701	±0.08% of F.S., ±0.02% typ.
4725	±0.04% of F.S., plus ±0.04% Signal
Full Scale Factor	9.900V ±0.075V (trimmable to 10.000V for Full Scale Freq.)
Waveform (See Figure)	Train of DTL/T <sup>2</sup> L compatible pulses @ f <sub>out</sub>
<b>Pulse Characteristics</b>	
'1' (HIGH)	+5V ±0.5V (no load); +2.4V min. (+0.4mA load)
'0' (LOW)	+0.20V ±0.20V @ -16mA sink current
WIDTH	20μsec min., 80μsec max.
Output Impedance (In High State)	3kΩ
Fan-out	10 standard T <sup>2</sup> L loads
Short Circuit Protection to Ground	May be short-circuited indefinitely without damage
<b>RESPONSE</b>	
Settling Time to 0.01% for Step Input	1 to 2 cycles of new frequency plus 20μsec
Overload Recovery	2 seconds
<b>STABILITY</b>	
Full Scale (Span)	
Gain T.C. (ppm/°C of F.S.)	
4713	±150ppm max., ±34 typical
4701/4725	±100ppm max., ±24 typical
Drift Per Day 4713	±200ppm
4701/4725	±100ppm
Drift Per Month 4713	±350ppm
4701/4725	±200ppm
Power Supply Sensitivity	±500ppm/%ΔV <sub>CC</sub>
Input Offset	
T.C. (μV/°C)	±30 typical; ±100 maximum
Drift Per Day	±100μV
Drift Per Month	±200μV
Power Supply Sensitivity	±100μV/%ΔV <sub>CC</sub> maximum
Warm Up Time	<1 minute to 0.02%
<b>POWER</b>	
Voltage (V <sub>CC</sub> )	±15V ±5% (±12V to ±18V with derated specs)
Current (I <sub>CC</sub> )	±12mA typical, ±18mA maximum
<b>ENVIRONMENTAL</b>	
Temperature	
Operating	0 to 70°C
Storage	-55 to +85°C
Humidity, Operating & Storage	98% non-condensing

Ⓢ CAUTION: The output of the 4701, 4713 and 4725 are circuit protected for indefinite shorts to ground, and they will tolerate momentary (less than 5 seconds) short circuits to the positive power supply voltage. However, the output will definitely FAIL if it is shorted to the negative power supply voltage.

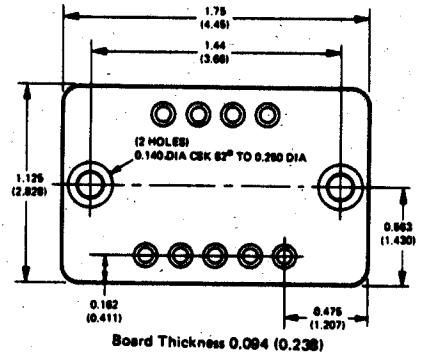


Ideal Transfer Function

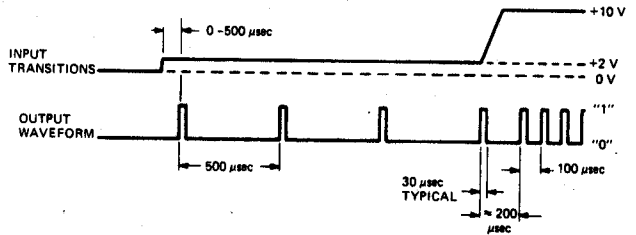


±0.01 Non-cumulative tolerance between pins  
±0.02 Tolerance from case edge to center of pins

DIMENSIONS IN PARENTHESES ARE EXPRESSED IN CENTIMETERS



Optional Socket: Model NSK-20



Typical Waveforms, Showing Timing Relationships

Teledyne Philbrick makes no representation that use of its modules in the circuits described herein, or use of other technical information contained herein will not infringe on existing or future patent rights nor do the descriptions contained herein imply the granting of licenses to make, use, or sell equipment constructed in accordance therewith.