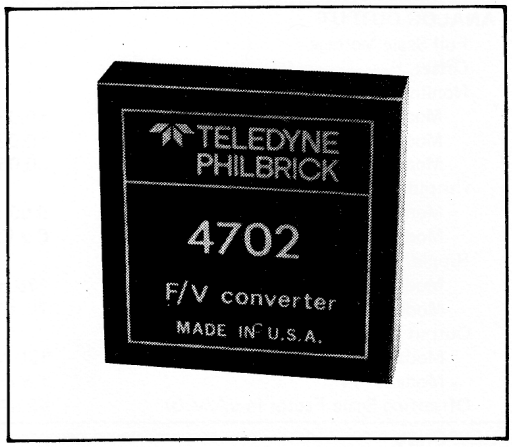
TELEDYNE PHILBRICK

10kHz, 100kHz, 10kHz General Purpose Frequency to Voltage Converters

4702
4704
4714

The 4702, 4704, and 4714 are general purpose frequency to voltage converters specifically designed for applications requiring high performance at a low cost. With ±0.005%FS nonlinearity (4704) and ±1%FS gain error, these devices provide the user with a 0 to +10V output range that is a linear function of the input frequency regardless of its waveshape or amplitude. Other features include thirty percent overrange as well as low full scale and zero offset drifts.



Applications Information

Output offset voltage is guaranteed to be less than ±10mV (0.1%FS) when the input frequency is zero. For applications requiring greater precision, this offset can be trimmed with a 10kΩ to 1MΩ trim potentiometer (TCR ±100ppm/°C or less, see Figure 1). By utilizing offset techniques, a ±5V output range can be obtained. Full scale is typically 9.9V ±0.1V. A 500Ω trim potentiometer is recommended for acheiving a precise ±10.000V output.

Output Filtering

The outputs of these devices are filtered through a lowpass RC filter consisting of a 24kΩ resistor in parallel with a 0.001μF (4704) or 0.01μF (4702/4714) capacitor (Figure 1). The addition of an external capacitor between the output and the summing junction will further reduce the output ripple at the expense of increasing the circuits' time constant and slowing its response time (Figures 2 & 3).

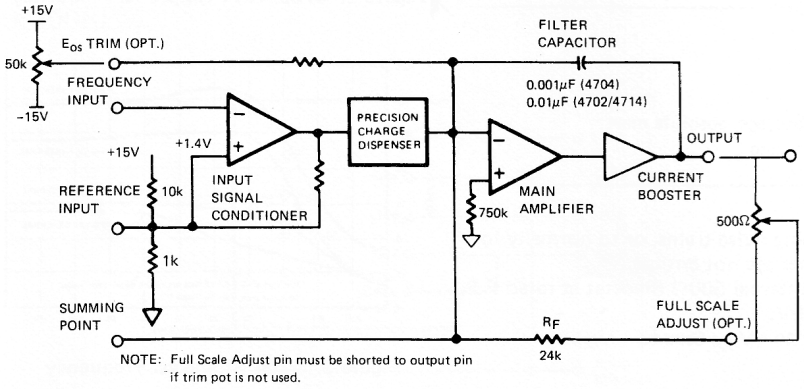


Figure 1. Block Diagram

FEATURES

- ±0.008%FS Nonlinearity (4702/4714)
- ±50μV/°C Zero Offset Drift
- Thirty Percent Overrange
- High Noise Immunity

APPLICATIONS

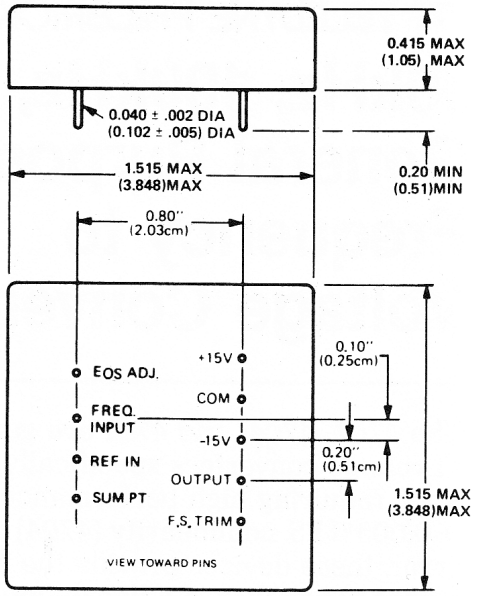
- FM Demodulation
- RPM Measurement from Magnetic and Optical Sensors
- Wide Frequency Range Monitors
- Data Transmission

TELEDYNE PHILBRICK Allied Drive @ Rte. 128, Dedham, Massachusetts 02026
Tel: (617) 329-1600, TWX: (710) 348-6726, Tlx: 92-4439

SPECIFICATIONS Typical at +25°C, V_{cc} = ±15 V. Rated waveform: sine, square, or triangle wave or pulse-train; with Full Scale Adjust Pin connected to Output, unless otherwise indicated.

FREQUENCY INPUT	
Full Scale Frequency	
4702, 4714	10 Hz to 10 kHz
4704	100 Hz to 100 kHz
Overrange	+10% min., 30% typical
Configuration	Differential, Referred to the Ref Input Pin
Input Levels ①	−12 V to +0.8 V = Low +2.0 V to +12 V = High (±15 V Fault)
Loading	⩽1 TTL Load
Input Pulse Width	
4702, 4714	20 µsec min. for rated accuracy ②
4704	2.5 µsec min. for rated accuracy ②
Input Impedance	1 MΩ ‖ 8 pF
ANALOG OUTPUT	
Full Scale Voltage	0 V to +9.9 V ± 0.1 V ③
Offset, E_{os}	±10 mV max. @ f = 0 Hz
Nonlinearity, (1 Hz to 11 kHz) % FS	
Model 4702, 20 µsec pulse width	±0.03% max., ±0.008% typical
Model 4714, 20 µsec pulse width	±0.09% max., ± 0.008% typical
Model 4704, 2.5 µsec pulse width	±0.05% max., ± 0.005% typical
Output Impedance	
Model 4702	0.05 Ω max., < 0.005 Ω typical
Model 4714/4704	0.2 Ω, < 0.01 Ω typical
Ripple	
Model 4702/4714	170 mV rms @ f = 10 kHz, 25 mV p-p @ f = 1.0 Hz
Model 4704	70 mV rms @ f = 100 kHz, 50 mV p-p @ f = 10 Hz
Output Current ④	
Model 4702/4704	+20 mA, −5 mA
Model 4714	± 5 mA
Offsetting Scale Factor in µA/V ⑤	42 µA/V nom., 48 µA/V max., 37 µA/V min.
RESPONSE	
Filter Time Constant	
Model 4702/4714	240 µsec
Model 4704	24 µsec (will be increased by external capacitor)
STABILITY	
$\triangle E_{os}$ vs. Temp. max.	
Model 4702/4704	± 50 µV/°C (± 5 ppm/°C)
Model 4714	± 100 µV/°C (± 10 ppm/°C)
$\triangle E_{os} / \triangle V_{cc}$ max.	
Model 4702/4704	±50 µV/% (±5 ppm/%)
Model 4714	100 µV/% (± 10 ppm/%)
$\triangle E_{os}$ / Time	30 µV/day, 100 µV/month
$\triangle V_{fs}$ vs. Temp., max.	
Model 4702	±100 ppm/°C
Model 4714/4704	±150 ppm/°C
$\triangle V_{fs} / \triangle V_{cc}$	±500 ppm/%
$\triangle V_{fs}$ / Time	10 ppm per day, 30 ppm per month
POWER	
Voltage (V_{cc})	±15 V, ± 5% (±14 V to 16 V with derated specs)
Quiescent Current	
Model 4702/4714	±18 mA
Model 4704	±22 mA
Recommended Philbrick Supply	2211
ENVIRONMENT	
Temperature	
Model 4702/4714	−40 to +70°C
Model 4704	−40 to +85°C
	−55 to +85°C Storage, absolute max.
Humidity	98% non-condensing
MTBF	> 400,000 hours

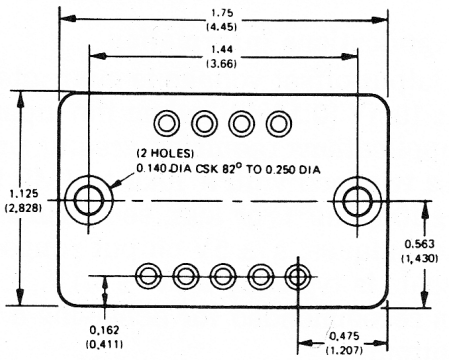
① Hysteresis: 400mV p-p, nominal
② Applies to both normally high dc levels with negative-going pulse trains, or to normally low dc levels with positive-going pulses. The rise and fall times are not critical.
③ At 2kΩ Rated Load. Trimmable to +10.000V with an external 500Ω rheostat at rated F.S. input frequency. By offsetting, output voltage can be ±5V.
④ Output short circuit protection: indefinite to ground or to $+V_{cc}$; 5sec to $-V_{cc}$.
⑤ Current into summing point to offset output.



±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



Board Thickness 0.094 (0.238)

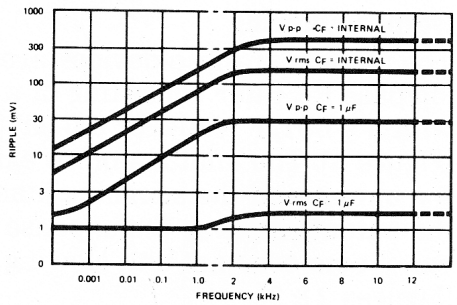


Figure 2. 4702/4714 Ripple vs. Frequency

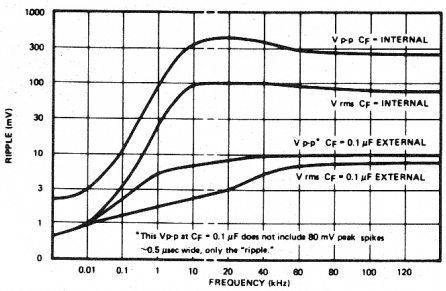


Figure 3. 4704 Ripple vs. Frequency

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