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: ±0.1%FS (4713), ±0.05%FS (4705) and ±0.015%FS plus ±0.015% signal (4725). Full scale and offset errors, ±0.75%FS and ±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.

FEATURES
- ±0.008%FS Nonlinearity
- 20% Overrange
- 13 Bit Resolution
- High Noise Rejection
- Low Cost

APPLICATIONS
- FM Telemetry
- Precision Integrators
- Common Mode Voltage Isolation
- Digital to Frequency Conversion
SPECIFICATIONS (TA = +25°C, ±VCC, ±15VDC, unless otherwise indicated)

ANALOG INPUT
- Full Scale
- Overrange: +20% minimum
- Configuration: Single-ended, referred to ground
- Offset Voltage (adjustable to zero): ±10mV max., ±3mV typical
- Impedance: 23kΩ nominal at V(IN)
- Overvoltage Protection: ±15V max. input voltage without damage to either input

FREQUENCY OUTPUT
- Full Scale Frequency (f(out))
- Linearity (V(out) = +10mV to +11V)
- @ +25°C max.
- @ 0 to +70°C max.
- 0.1% of F.S., 0.04% typ.
- 0.06% of F.S., ±0.006% typ.
- ±0.016% Full Scale plus ±0.015% Signal
- ±0.11% of F.S., 0.06% typ.
- ±0.08% of F.S., ±0.02% typ.
- ±0.04% of F.S., ±0.04% Signal
- Full Scale Factor: 9.900V ±0.075V (trimmable to 10.000V for Full Scale Freq.)
- Waveform (See Figure): Train of DTL/TTL compatible pulses @ f(out)
- Pulse Characteristics:
  - ‘1’ (HIGH): +5V ±0.5V (no load); +2.4V min. (+0.4mA load)
  - ‘0’ (LOW): -0.2V ±0.2V @ -16mA sink current
- Width: 20µsec min., 80µsec max.
- Output Impedance (In High State): 3kΩ
- Fan-out: 10 standard TTL loads
- Short Circuit Protection to Ground: May be short-circuited indefinitely without damage

RESPONSE
- Settling Time to 0.01% for Step Input: 1 to 2 cycles of new frequency plus 20µsec
- Overload Recovery: 2 seconds

STABILITY
- Full Scale (Span)
- Gain T.C. (ppm/°C of F.S.)
- 4713
- 4701/4725
- Drift Per Day 4713
- 4701/4725
- Drift Per Month 4713
- Drift Per Month 4725
- Power Supply Sensitivity
- Input Offset
  - T.C. (μV/°C)
    - ±30 typical, ±100 maximum
  - Drift Per Day
    - ±100μV
  - Drift Per Month
    - ±200μV
  - Power Supply Sensitivity
    - ±100V/V/%VCC, maximum
  - Warm Up Time: <1 minute to 0.02%

POWER
- Voltage (VCC): ±15V ±5% (±12V to ±18V with derated specs)
- Current (Icc): ±12mA typical, ±18mA maximum

ENVIRONMENTAL
- Temperature
  - Operating: 0 to 70°C
  - Storage: -55 to +85°C
- Humidity, Operating & Storage: 88% 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 8 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

Typical Waveforms, Showing Timing Relationships