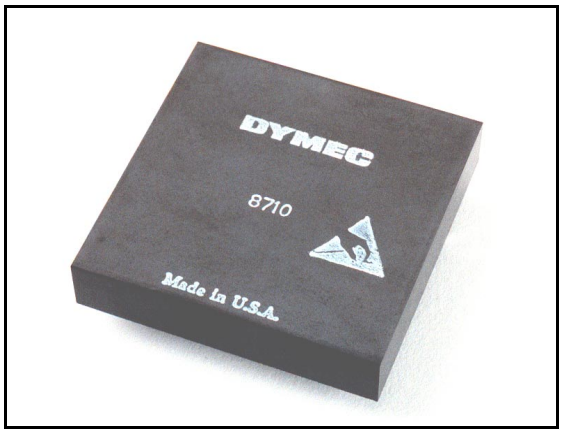
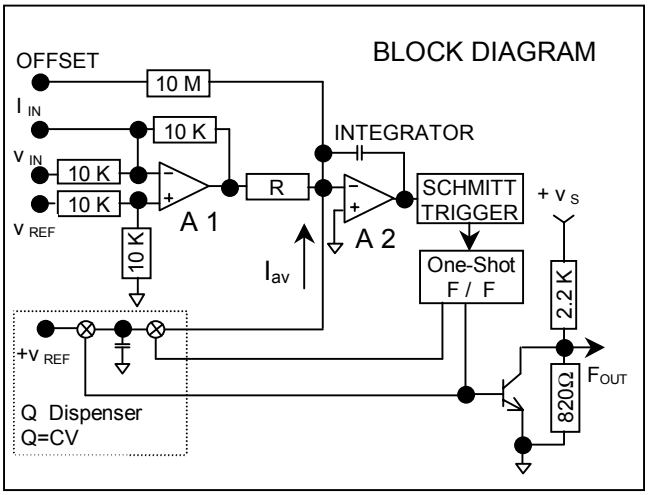
DYMEC Fiber Optic Solutions for Industry

10 MHz Voltage to Frequency Converters

Models 8710





Features:

Guaranteed Minimum / Maximum Specifications

- ***Wide Dynamic Range***
  - ***> 10,000,000:1 > 140 dB***
- ***Excellent Linearity***
  - ***0.05% FS***
  - ***± 0.05% of input***
- ***Excellent Stability***
  - ***10 µV / °C offset***
  - ***60 ppm / °C gain***
- ***Buffered Frequency Output***
  - ***10 TTL loads***
- ***Self-contained Subsystem***
  - ***2"x 2"x 0.4" module***
- ***Low Power***
  - ***< 1.34 W***

Applications:

- ***Analytical Instrumentation***
- ***Medical Instrumentation***
- ***Telemetry***
- ***Data Recording***
- ***Weighing Systems***

Description

The **8700 Series** is a high performance, precision 10 MHz full scale Voltage-to-Frequency Converter intended for applications which require high resolution and a six decade dynamic range. The differential input of the **8700 Series** accepts both a positive or negative 10 µV to 10 V full scale analog input signal with a 5% over-range capability. The input signal, with common-mode signals attenuated by 60 dB minimum, is converted to an output signal proportional to the full scale frequency, within 0.05% linearity utilizing the long-proven charge balance technique. A buffered TTL compatible frequency output with a 10 TTL load fan-out is provided that will drive up to 50 pF capacitive loads.

Stability of the **8700 Series** over temperature is excellent, with a 10µV / °C typical, 50 µV / °C maximum offset and 60 ppm / °C typical, 100 ppm / °C maximum gain tempco. Warm-up time to 0.1% accuracy is less than two (2) minutes.

In applications that require slightly different specifications, **custom frequencies** and/or **custom trimming** can be easily accommodated. Other variations such as ratio-metric operation, FET input op-amp, or extended temperature range can also be accommodated. Please contact the factory to discuss your specific requirements.

The **8700 Series** is packaged in a 2.00"x 2.00" x 0.40" modular package. Power dissipation is less than 1.34 W maximum, and operation to rated performance is over the 0 °C to + 70 °C temperature range.

8700 Series Specifications

(Unless otherwise noted, specifications are at 25° C and are subject to change without notification)

Analog Input

Input Range ± 10 µV to ± 10 V
Current Range + 1 nA to +1 mA
Overrange 5% minimum
Configuration Differential
Common-Mode Voltage Range ± 10 V minimum
Common-Mode Rejection Ratio 60 dB minimum
66 dB typical
(See Note 1)
Offset Voltage ± 3 mV typical
± 10 mV maximum
adjustable to zero
Impedance ($+V_{in}$) 10 KΩ, ± 1%
Impedance (Differential) 40 KΩ, ± 1%
Overvoltage Protection (I_{in} Terminal) ± V_S without damage
Overvoltage Protection (V_{ref} Terminal) ± 2 V_S without damage

Transfer Characteristics

Full Scale Frequency Output (F_{out}) 10 MHz + 5% over-range
Transfer Characteristics 10 MHz (V_{in} / 10 V)
Full Scale Factor 1 mA ± 0.1%, or 10 V trimmable to 10 MHz
Non-Linearity ± 0.05% FS, ± 0.05% of input maximum
not specified under over-range conditions
Full Scale Step Response (to 0.01%) 2 cycles of new frequency plus 2 µs
Overload Recovery 12 cycles of new frequency

Power Requirements

($+V_s$) + 15V, ±5% 60 mA maximum
($-V_s$) - 15V, ±5% 25 mA maximum
Power Dissipation 1.34 W maximum

Note 1: CMRR specification given assumes zero (0) ohms for GAIN ADJUST potentiometer. With GAIN ADJUST potentiometer at 200 Ω, CMRR is 34 dB.

Stability

Gain - Tempco
8710 60 ppm FS / °C typical – 100 ppm FS / °C maximum
Gain - PS Sensitivity 200 ppm / 1% change in supply voltage
Gain - Drift Per Day ± 150 ppm FS maximum
Gain - Drift Per Month ± 300 ppm FS maximum
Offset – Tempco ± 10 µV typical - ± 50 µV maximum
Offset - PS Sensitivity 20 µV / 1% change in supply voltage
Offset - Drift Per Day ± 10 µV typical
Offset - Drift Per Month ± 20 µV typical
Warm-up Time ≤ 2 minutes to 0.01% accuracy

Output

Pulse Polarity Positive
Pulse Width 60ns ± 20ns
Logic Levels (V_{cc} = + 5 V)
Logic "1" (High) + 4.0 V ± 0.5 V
Logic "0" (Low) < 0.4 V @ 16 mA sink
Load ≤ 50 pF for rated performance
Fanout 10 TTL loads
Short Circuit Protection Indefinite to ground without damage

Environmental And Mechanical

Operating Temperature (to Rated Performance) 0° C to +70° C
Operating Temperature
(to 50% De-rated TC, Linearity, and Fanout) - 25° C to + 85° C
Storage Temperature - 55° C to + 125° C
Humidity 0 - 85%, non-condensing up to 40° C
Dimensions 2.00"x 2.00" x 0.40"
(50.8 x 50.8 x 10.16 mm)

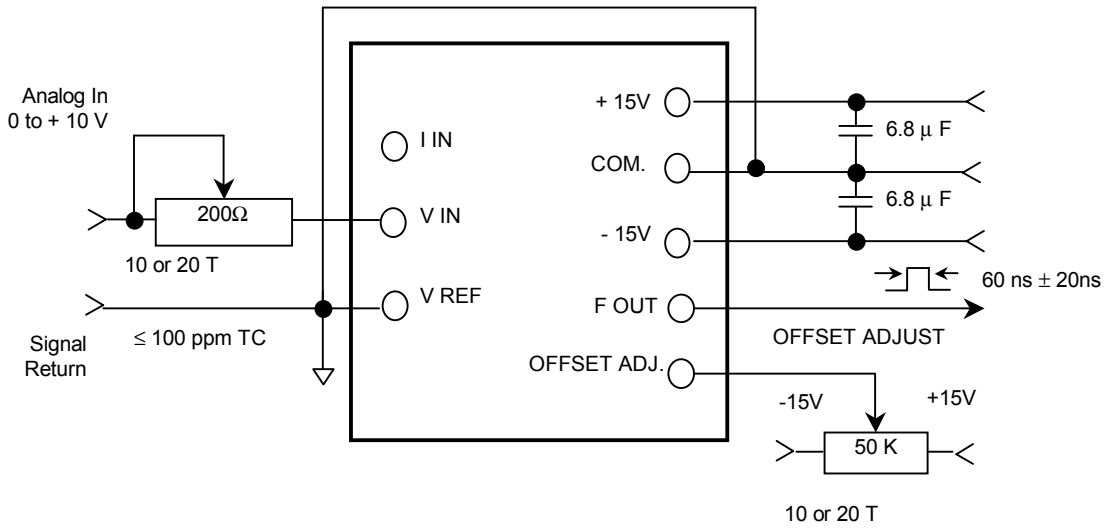


Fig. 1. Normal 8700 Series Input Configuration

Voltage to Frequency Converters

Using The 8700 Series of V/F Converter

General Considerations

Figure 1 depicts a typical circuit configuration for the **8700 Series**. The layout should be clean, with output pulses routed as far away from the input analog signals as possible. For maximum performance, bypass capacitors, as shown in Figure 1, should be mounted right at the appropriate pins of the **8700 Series**. For positive input signals, use the connections as shown. For negative input voltages, V_{in} should be grounded and the negative going voltage should be connected to the V_{ref} input.

Grounding

The Analog and Digital grounds are internally separate in the **8700 Series**. The use of a ground plane is not necessary for proper operation; however, a ground plane is recommended with any analog signal conditioning circuitry that may be used in front of the V/F, especially if this circuitry involves high gains. Any amplifiers used in front of the **8700 Series** should be de-coupled to eliminate potential problems with the high frequency output of the V/F.

Input Considerations

Single-ended Inputs

The V_{in} pin accepts a 0 V to +10 V analog input, and has an impedance of 10 KΩ. Figure 2 provides a recommended configuration for expanded or contracted input ranges.

Differential Inputs

The input can be configured as a differential input as shown in Figure 3. Differential input impedance is 40 KΩ. Maximum common-mode voltage is ± 10 V.

Offset and Gain Calibration

Offset Calibration

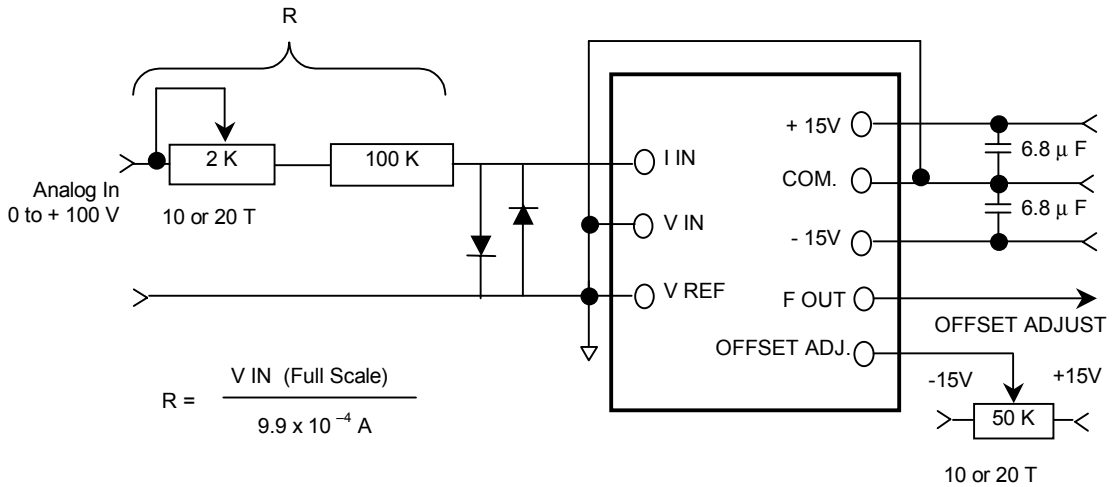
Offset calibration should be performed prior to gain calibration. With a + 1 mV analog signal at the input of the **8700 Series**, adjust the OFFSET potentiometer until a frequency of 1.000 kHz is observed on the output pin.

Gain Calibration

With a full scale analog input voltage of + 10.00 V, adjust the GAIN potentiometer until full scale frequency of 10.000 MHz is observed on the output pin.

Offset and Gain Trimming

The OFFSET adjustment potentiometer should be a 50 KΩ, 10-turn unit. With this pot in the circuit, initial offsets of up to ± 10 mV may be trimmed to zero. The GAIN adjustment potentiometer should be a 200 KΩ, 10-turn unit. To insure that the temperature coefficient of the potentiometer does not become significant relative to the overall gain tempco specification, a 100 ppm or better potentiometer is recommended. With this pot in the circuit, initial gain errors of up to ± 2% may be trimmed to zero.



Note: This configuration is also useful for adding or subtracting currents, off-setting the input for a bipolar signal, or presetting a minimum frequency output.

Fig. 2. Expanded Input Range

Useful Configurations (cont.)

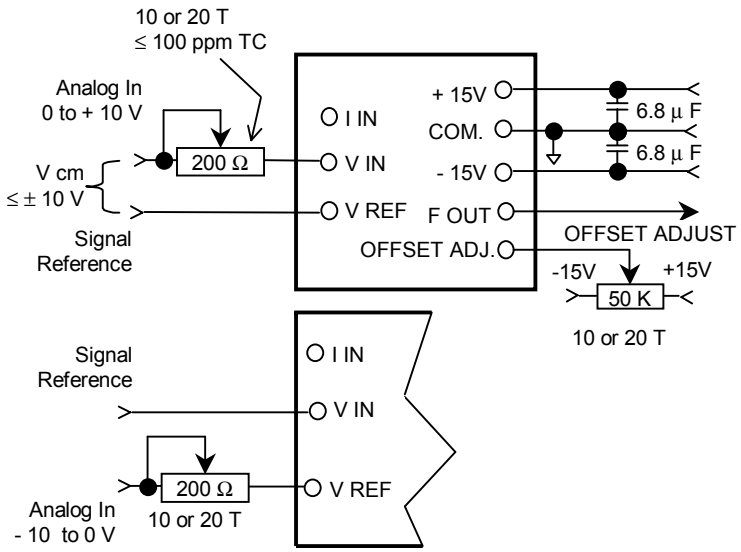
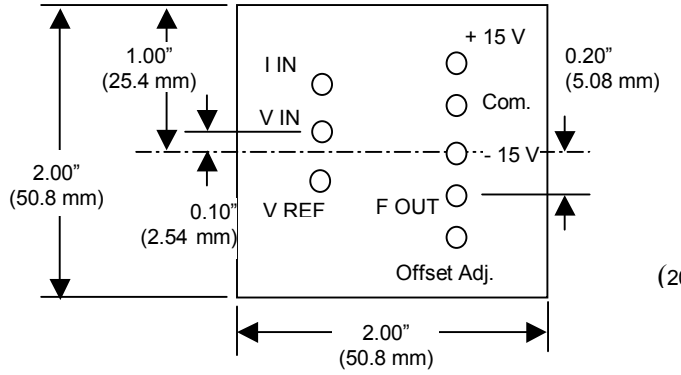
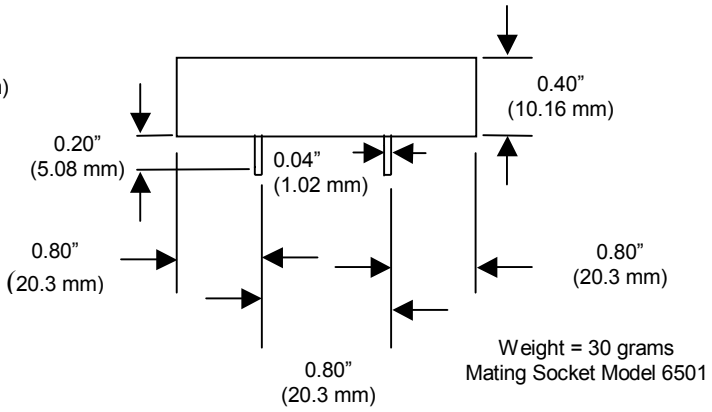


Fig. 3. Differential Inputs

Mechanical Dimensions and Pin Key



Bottom View



Side View

Ordering Information

Voltage to Frequency Converters	Model	Input	Input Frequency Range
	8710	**Differential**	**300 ppm FS / °C maximum Gain Drift**

Accessories	Model	Description
	6501	**Socket**

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