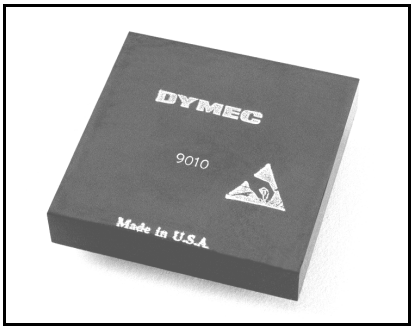
DYMEC Fiber Optic Solutions for Industry

Frequency to Voltage Converters

For Precise Linear Conversion of Periodic Frequency Information into Proportionally Equivalent Analog Output voltage

Models 9110, 9112 -- 0 to 100 kHz
Models 9010, 9012 -- 0 to 10 kHz
Models 9200, 9201, 9202 -- 0 to 1 kHz



Features

- ***Peak Ripple Levels Down to 5 mV Typ.***
- ***± 50 mV Adjustable Offset***
- ***Temperature Coefficients Down to 10 ppm /°C Max.***
- ***Linearity Within 0.01% Max. Over The Entire Frequency Range***
- ***Input Threshold Adjustable to 40 mV***

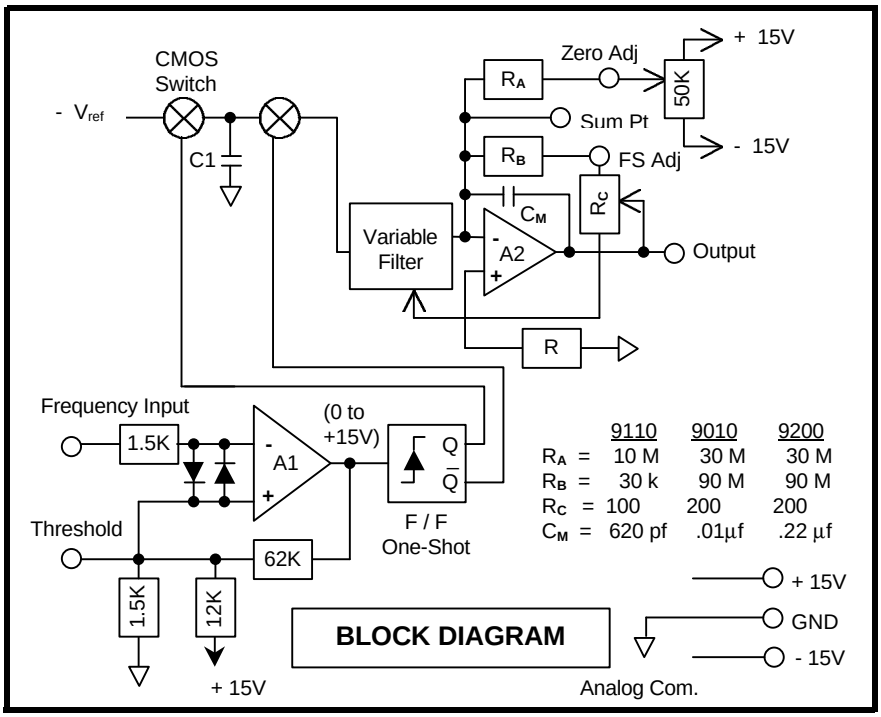
Applications

- ***Frequency Metering***
- ***Feedback Servo Control***
- ***Power Control***
- ***Microprocessor-Based Process Control***
- ***Doppler Sonar and Radar***
- ***Remote Data Transmission***
- ***Phase-Locked Loops***
- ***Tachometer Systems***
- ***Radiation Detectors***
- ***Flow Meters***
- ***Numerical Control***
- ***Broadband Discriminators***

Description

Dymec's Frequency to Voltage Converters are considerably lower in cost and easier to use in complex circuits than conventional Digital to Analog Converters of comparable accuracy. Utmost flexibility is allowed in the form factor of the input frequency waveform, and a special internal timing section makes these Frequency to Voltage Converters insensitive to variations in input wave duty cycle.

Models 9110, 9010, and 9200 are available in three Temperature Compensation ranges. They provide extremely tight linearity, accuracy, and performance levels, and are complementary to **Dymec's** high performance Series 8000 Voltage to Frequency Converters, with no compromise in system performance.



	9110	9010	9200
R_A =	10 M	30 M	30 M
R_B =	30 k	90 M	90 M
R_C =	100	200	200
C_M =	620 pf	.01µf	.22 µf

9000 Series Specifications

(Unless otherwise noted, specifications are at 25 °C; ± 15 V supplies; FULL SCALE ADJ pin shorted to OUTPUT pin.)

	9110			9010			9200			
Parameter	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Units**
INPUT										
Frequency Range	0		110	0		11	0		1.10	K Hz
Impedance, Ref to Gnd		3			3			3		K Ohms
Levels (Note1)										
1 (high)	+ 2		+ 15	+ 2		+ 15	+ 2		+ 15	Volts
0 (low)	- 15		1.2	- 15		1.2	- 15		1.2	Volts
Timing										
Low	1.0			1.0			1.0			µ sec
High	2.5			2.5			2.5			µ sec
OUTPUT										
Voltage Range										
f = 0	- 6		+ 6	- 6		+ 6	- 6		+ 6	m V
f = 100 kHz (9110)	9.97	9.99	9.995							Volts
f = 10 kHz (9010)				9.97	9.99	9.995				Volts
f = 1 kHz (9200)							9.97	9.99	9.995	Volts
Current (Note 2)										
Sink	- 5			- 5			- 5			m A
Source	+ 20			+ 20			+ 20			m A
Impedance		0.005	0.05		0.005	0.05		0.005	0.05	Ohms
Voltage Ripple		5			15			20		m V pk
Voltage Spike		5			5			5		m V
(once / cycle) magnitude										
Voltage Spike Duration		0.5			5			50		µ sec
UNIT STEP RESPONSE										
to ± 0.01% of final value										
9110 - 0 to 100 kHz		1.3								m sec
100 kHz to 1Hz		Note 4								m sec
9010 - 0 to 10 kHz					15					m sec
10 kHz to 1 Hz					Note 4					m sec
9200 - 0 to 1 kHz								150		m sec
1 kHz to 1 Hz								15.0		m sec
NON LINEARITY										
(V out vs F in)										
9110 (10 Hz to 100 kHz)		± .002	± 0.01							% FS
9010 (1 Hz to 10 kHz)					± .002	±0.01				% FS
9200 (1 Hz to 1 kHz								± .002	±0.01	% FS
OFFSET ADJUST RANGE		± 50			± 50			± 50		m v
FULL SCALE ADJUST RANGE		± 15			± 15			± 15		m v
POWER SUPPLY SENSITIVITY										
+ 15 V			15			15			15	ppm
- 15 V			10			10			10	% Vcc
POWER REQUIRED (Note 3**)**										
Rated Accuracy @ ± 15 V			± 5%			± 5%			± 5%	
Operating Range	13		18	13		18	13		18	Volts
Current +15 V / -15 V		24 / 15	27 / 18		24 / 15	27 / 18		24 / 15	27 / 18	m A / m A
TEMPERATURE										
Rated Operating Range	0		+ 70	0		+ 70	0		+ 70	°C
De-rated Operating Range	- 40		+ 85	- 40		+ 85	- 40		+ 85	°C
Gain TC 9110, 9010, 9200			± 30			± 30			± 150	ppm
9201									± 30	of
9112, 9012, 9202			± 10			± 10			± 10	FS / °C

Notes to Specification Chart

1. Input hysteresis is nominally 500 mV. Levels and hysteresis are externally adjustable at REFERENCE INPUT Pin.
2. Short Circuit protected to ± 15 V or ground indefinitely
3. Power supplies may be turned on separately, with no latch-up.
4. Filter time constants under 20 µ sec (9110), 200 µ sec (9010) or 2 m sec (9200) can be obtained, with some compromise of output voltage ripple performance.

Frequency to Voltage Converters

Using the 9000 Series of Frequency Converters

Output/Input Considerations

Without external circuitry these modules accept input signals down to +2 volts peak; sine, triangular or square wave; DTL and TTL Input signals differing from these characteristics may require external pulse shaping and / or level conversion.

In most applications, the factory-trimmed full scale output is adequate, and the **FULL-SCALE ADJUST** Pin should be shorted to the **OUTPUT** Pin.

If desired, full-scale output can be adjusted to exactly 10,000 with an optional 100 gain ohm trim potentiometer connected between the **OUTPUT** and **FULL-SCALE ADJUST** pins.

If a large modification in scale factor is required, an external resistor can be added between the **SUMMING POINT** Pin and the **OUTPUT** Pin. This method will provide full scale output for bandwidths as large as 150 kHz (9110), 11 kHz (9010) or 1.1 kHz (9200) and as low as 1 kHz (9110), 100 Hz (9010) or 10 Hz (9200) with only a very slight effect upon output accuracy. The resistor value is given by:

$$R = \frac{\propto}{\text{Full -scale frequency (Hz)}}$$

$\propto = 3.3 \times 10^9$ (9110)
$\propto = .95 \times 10^9$ (9010)
$\propto = 0.095 \times 10^9$ (9200)

When using this scale factor modification, a potentiometer can be connected in series with the external resistor, if fine-tuning of full scale frequency is desired.

These modules will not operate if the **FULL SCALE ADJUST** Pin is left open, unless a feedback path is provided via an external resistor connected between the **OUTPUT** Pin and either the **FULL SCALE ADJUST** Pin or **the SUMMING POINT** Pin.

Output offset is guaranteed to be less than ± 5 mV without external compensation when the input frequency is zero. For extreme precision, a trim potentiometer can be used to adjust the output to zero.

General Application Notes

These Frequency to Voltage Converters are simple to understand and easy to use. They are the most precise frequency to voltage converters available, and the following provisions will ensure optimum performance.

As is good practice with all precise electronic conversion instruments, it is recommended that supply bypass capacitors be added in close proximity to the module. Tantalum capacitors, 15 µf / 35 V, from both the + 15 V and – 15V pins to analog ground serve the purpose and are especially advisable if the power supplies are some distance away and /or multiple connectors are used.

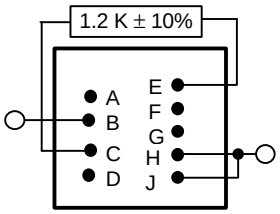
Low TC (100 ppm), 10 to 20 turn trim 100 ohm (9110) or 200 ohm (9010 & 9200) potentiometers are recommended for the gain adjustment potentiometer. A large TC potentiometer will degrade the overall effective TC.

In systems or environments where power supplies may drift significantly with time and temperature variations, it might be well to zener regulate the voltages applied to each end of the $E_{\propto}$ trim potentiometer. This will attenuate the effect of supply drift on output voltage offset.

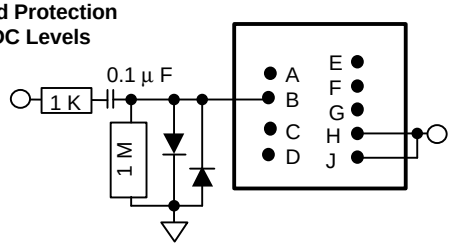
Useful Configurations

For Use with HNIL Input

(High Noise Immunity Logic)

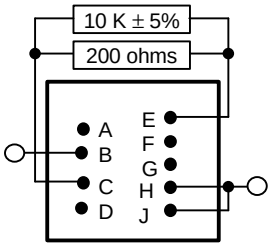


Capacitive Coupling and Protection Network for large DC Levels



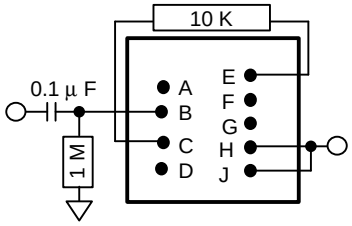
For use with Signals < 2V Peak

(In this configuration, pick-off level is 0 Volts and hysteresis is 40 m V)



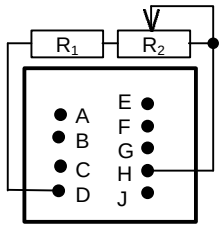
Capacitive Coupling for AC Signals With DC offset

+ 100 V dc plus AC signal



Useful Configurations (cont.)

Changing Full Scale Frequency

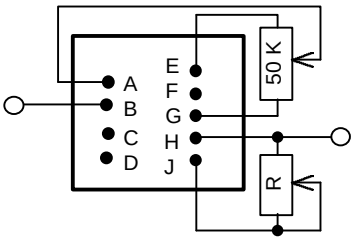


Leaves FS ADJ pin open

$$R = (R_1 + R_2) = \frac{\infty}{\text{Full -scale frequency (Hz)}}$$

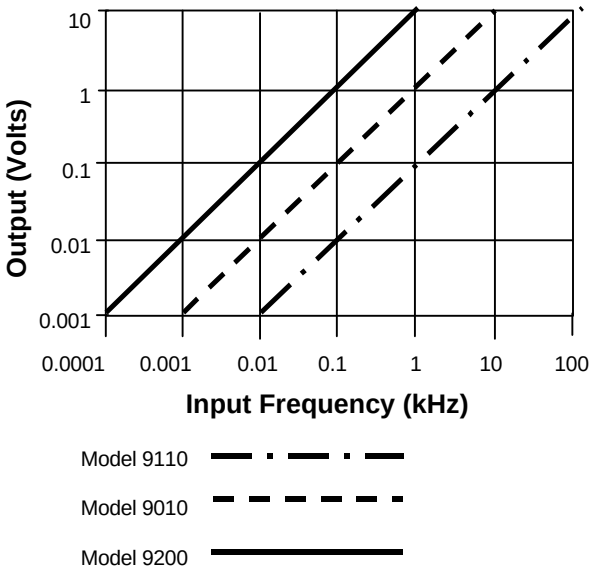
9110 Typical Values
10 kHz (R_1 = 300 K, R_2 = 50 K)
50 kHz (R_1 = 60 K, R_2 = 10 K)
9010 Typical Values
1 kHz (R_1 = 900 K, R_2 = 100 K)
5 kHz (R_1 = 170 K, R_2 = 20 K)
9200 Typical Values
100 kHz (R_1 = 900 K, R_2 = 100 K)
50 kHz (R_1 = 1.7 M, R_2 = 200 K)

Full Scale and E_{os} Adjustment

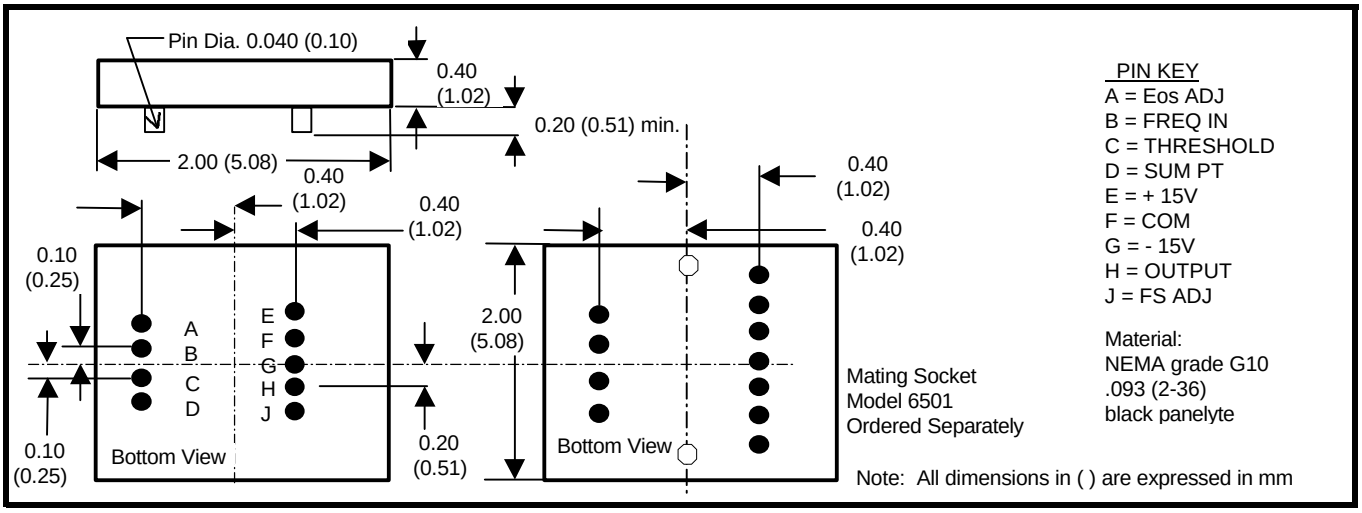


FULL SCALE ADJUST pin must be shorted to Output pin If trim pot is not used

TRANSFER CHARACTERISTICS



Mechanical Dimensions and Pin Key



Ordering Information

Frequency to Voltage Converters	Model	Input Frequency Range	Gain TC
	9110	**0 to 100 kHz**	± 30
	9112	**0 to 100 kHz**	± 10
	9010	**0 to 10 kHz**	± 30
	9012	**0 to 10 kHz**	± 10
	9200	**0 to 1 kHz**	± 150
	9201	**0 to 1 kHz**	± 30
	9202	**0 to 1 kHz**	± 10

Accessories	Model	Description
	6501	Socket

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