

ENCORE ELECTRONICS INC.
Model FL230
-003, -005, -006, -008, -009, -010, -011,
-013, -015, -016, -018, -023, -024, -026
Voltage to Frequency Converter

Model FL230
-004, -017, -027, -032
Current to Frequency Converter

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DESCRIPTION
Model FL230
Voltage to Frequency Converter

The Model FL230 Voltage to Frequency Converter is well-suited for use together with the Model FL228 Frequency to Voltage Converter. By combining these two units, an analog voltage can be transmitted over a digital link, such as fiber optic, radio, or other isolated signal path. For a combination of Model FL230-003 and Model FL228-005, signals up to 10Hz can be transmitted cleanly; other combinations can be made to pass higher-frequency signals.

SPECIFICATIONS
Model FL230
Voltage to Frequency Converter

The Model FL230-003 is a compact voltage controlled oscillator, with 0-10V input and 0-5kHz output. The Model FL230-004, -017, -027 and -032 versions accept 4-20mA input, with the same output rating. Accuracy is within $\pm 0.25\%$ from 5% fullscale to 110% fullscale input. Power required is 18-30VDC (unregulated) at 25mA. Mechanically, the unit is enclosed in a DIN-rail mounted plastic case, 3.1" wide, 1" tall, and 2.9" deep. Connections are made through five wire-clamp terminals, which accept wire sizes from 12-24 gauge.

The -021, -022, -024, and -027 versions have a 50% duty cycle (square wave) output. Other versions have a pulse output with fixed width, and varying duty cycle.

CALIBRATION PROCEDURE
Model FL230
Voltage to Frequency Converter

Front panel trim pots are provided for offset and span adjustment. Initial factory calibration is done by adjusting the span trim to set the output at fullscale input, and then adjusting the zero trim to set the output at 5% fullscale input. The transfer characteristic (F out vs. V in) is then tested at several data points (5%, 10%, 20%, 50%, 70%, and 100%) and plotted to get a graphic representation of the unit's remaining error.

For the -003 version (0-10V in), this error is simply $(F / (V/2)) - 1$. The -004/-017/-027/-032 version (4-20mA) error is $(F / ((I-4)/3.2)) - 1$. From observing the shape and position of this error curve, final adjustments are made to the zero and span trims. The span adjustment shifts the error curve vertically, while the zero adjustment affects the shape of the low-input end of the curve. A properly trimmed unit will exhibit less than $\pm 0.25\%$ error from 5% to 110% fullscale input.

SPECIAL VERSIONS
Model FL230
Voltage to Frequency Converter

The Model FL230-005 version will accept input signals including 0V. The nominal range for the -005 is 0-3V input, with the actual transfer function being [-0.6V to +3.4V] input yields [0 to 10kHz] output. This version is designed to be used as a set with the Model FL228-007 F/V converter, to transmit 0-3V signals over long distance digital-only links.

The Model FL230-006 version provides a 10kHz fullscale output for a 0-10V input.

The Model FL230-007 version has a quadrature output, with two output channels operating 90 degrees out of phase. This unit can be used to simulate a rotary or linear position encoder, flow meter, or other transducer with a quadrature output.

The Model FL230-008 version accepts an input voltage range of 0-10V, with an output frequency range of 2.5kHz to 5kHz. The unit will actually operate over the range of -10V to +10V, with frequency output of 0-5kHz. Additionally, the frequency output is AC coupled, and swings above and below the output common terminal to simulate a magnetic pickup proximity probe signal.

The Model FL230-009 version provides a 40kHz fullscale output for a 0-10V input.

The Model FL230-010 version provides a 1.1kHz fullscale output for a 0-10V input.

The Model FL230-011 version has a 50% duty cycle output, at 50Hz per volt in; 500Hz fullscale output for 0-10V fullscale input. The output is a FET switch to common, with a 2k pullup resistor and a 5V zener diode clamp, to produce 0-5V pulses.

The Model FL230-013 version has a 50% duty cycle output, at 30Hz per volt in; 300Hz fullscale output for 0-10V fullscale input. The output is a current driver, whose amplitude is controlled by a second 0-10V input signal. 10V in sets $\pm 40\text{mA}$ output drive. Compliance voltage is 12VDC. Operating power is provided by an Encore FL854 power supply.

The Model FL230-017 is identical to the -004, but operates from externally-regulated +15VDC.

The Model FL230-023 version has a 50% duty cycle AC-coupled output, suitable for driving an external isolation transformer. Depending on transformer connection and turns ratio, an output of 60V p-p may be obtained. A terminating resistor on the transformer secondary helps limit pulse overshoot on the output.

The Model FL230-026 version provides a 300Hz fullscale output for a 0-10V input.

SPECIAL VERSIONS
Model FL230
Voltage to Frequency Converter
(continued)

The Model FL230-027 version provides a 5kHz fullscale Squarewave output for a 4-20mA input.

The Model FL230-032 version provides a 65.536kHz fullscale Squarewave output for a 4-20mA input.

The Model FL230-015, -016, and -018 versions have a 50% duty cycle output, at $\pm 14V$ levels. With no input signal, the output is 3600, 7200, or 3240Hz respectively. Applying a control voltage of $\pm 10V$ modulates the output frequency by $\pm 10\%$. The modulation control signal can be from DC to over 200Hz.

An additional testpoint is provided for these modulator versions. With no control voltage applied to the unit, adjust the Offset trimpot for -9.00VDC at the -9V testpoint. Then adjust the Span trimpot for the rated center frequency at the output. Verify proper operation by connecting 10.0VDC to the control input, and checking that the input frequency has increased 10%. Reverse the control voltage to -10.0VDC, and verify the frequency has dropped to 10% below nominal.

RECOMMENDED FL230 - FL228 PAIRINGS

When used for digital transmission of an analog signal, the Model FL230 V/F and Model FL228 F/V should be ordered and calibrated as a pair. The frequency signal from the FL230 can be used to drive an optocoupler or fiber optics, or used as an audio-range signal for radio communication, or with an external driver for a 0-20mA current loop circuit.

FL230-003	FL228-005	(0-10V	to 0-5kHz	to 0-10V)
FL230-004	FL228-005	(4-20mA	to 0-5kHz	to 0-10V)
FL230-005	FL228-007	(-0.6-3.4V	to 0-10kHz	to -0.6-3.4V)