

FEATURES

- 14-Bit resolution
- 2.4 Microsecond maximum conversion time
- Low-power, 925 milliwatts
- Three-state output buffers
- Functionally complete
- Small 24-pin DIP



GENERAL DESCRIPTION

DATEL's ADC-914 uses an advanced design to provide a high-speed, functionally complete 14-bit A/D converter in a small 24-pin DIP. The ADC-914 delivers a conversion speed of 2.4 microsecond while consuming only 925 milliwatts of power.

INPUT/OUTPUT CONNECTIONS

PIN	FUNCTION	PIN	FUNCTION
1	BIT 14 OUT (LSB)	13	+5V
2	BIT 13 OUT	14	ENABLE
3	BIT 12 OUT	15	EOC
4	BIT 11 OUT	16	START CONVERT
5	BIT 10 OUT	17	BIT 2 OUT
6	BIT 9 OUT	18	BIT 1 (MSB)
7	BIT 8 OUT	19	ANALOG INPUT
8	BIT 7 OUT	20	BIPOLAR
9	BIT 6 OUT	21	+10V REF
10	BIT 5 OUT	22	+15V
11	BIT 4 OUT	23	GROUND
12	BIT 3 OUT (MSB)	24	-15V

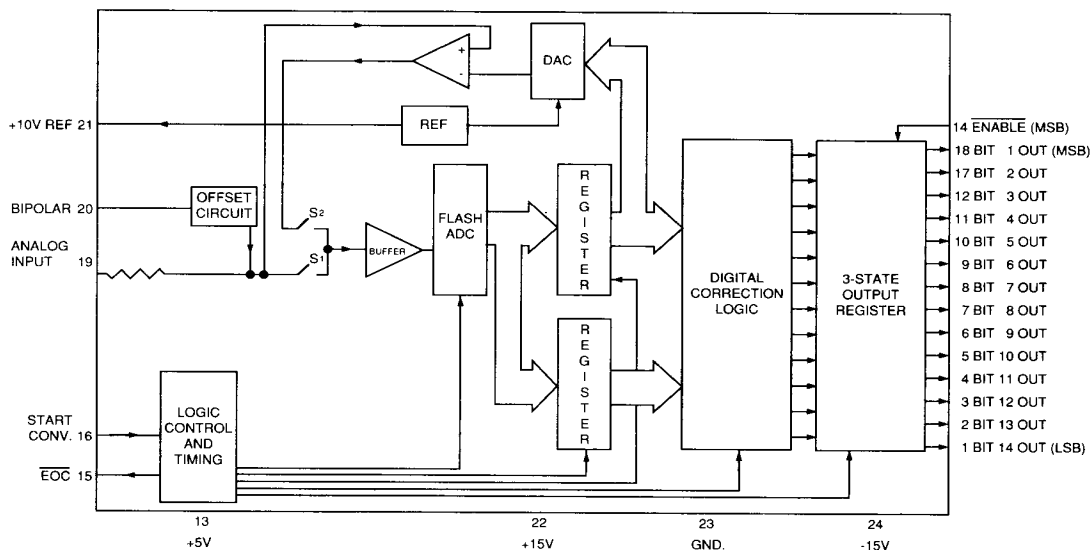


Figure 1. ADC-914 Simplified Block Diagram

ABSOLUTE MAXIMUM RATINGS

PARAMETERS	LIMITS	UNITS
+15V Supply (Pin 22)	0 to +18	Volts dc
-15V Supply (Pin 24)	0 to -18	Volts dc
+5V Supply(Pin 13)	-0.5 to +7	Volts dc
Digital inputs (Pins 14 and 16)	-0.3 to +7	Volts dc
Analog input	-25 to +25	Volts dc
Lead temp. (10 sec.)	300	° C max.

FUNCTIONAL SPECIFICATIONS

Apply over the operating temperature range and at $\pm 15V$ dc and +5V dc unless otherwise specified.

INPUTS	MIN.	TYP.	MAX.	UNITS
Analog Signal Range (See Table 5 also)	—	0 to +10	—	Volts
	—	±5	—	Volts
Input Impedance				
Resistance	2	2.5	—	K Ohms
Capacitance	—	—	50	pF
Logic Levels:				
Logic 1	2.0	—	—	Volts
Logic 0	—	—	0.8	Volts
Logic Loading:				
Logic 1	—	—	2.5	μA
Logic 0	—	—	-100	μA
OUTPUTS				
Resolution	14	—	—	Bits
Logic Levels:				
Logic 1	2.4	—	—	Volts
Logic 0	—	—	0.4	Volts
Logic Loading:				
Logic 1	—	—	-160	μA
Logic 0	—	—	6.4	mA
Internal Reference:				
+Voltage, +25° C	9.98	10	10.02	Volts dc
Tempco	—	±5	±30	ppm/°C
External current	—	—	1.5	mA
Output Coding:	Straight binary/Offset binary			
PERFORMANCE				
Integral Nonlinearity				
+25° C	—	±1/2	±1	LSB
0° C to +70° C	—	±1	±2	LSB
-55° C to +125° C	—	—	±3	LSB
Differential Nonlinearity				
+25° C	—	±1/2	±1	LSB
0° C to +70° C	—	±1	±2	LSB
-55° C to +125° C	—	—	±2.5	LSB
Full-Scale Absolute Accuracy				
+25° C	—	±0.037	±0.074	%FSR
0° C to +70° C	—	±0.074	±0.13	%FSR
-55° C to +125° C	—	±0.12	±0.2	%FSR
Unipolar Zero Error				
+25° C (Tech Note 1)	—	±0.02	±0.031	%FSR
0° C to +70° C	—	—	±0.09	%FSR
-55° C to +125° C	—	—	±0.12	%FSR

PERFORMANCE	MIN.	TYP.	MAX.	UNITS
Bipolar Zero Error				
+25° C (Tech Note 1)	—	± 0.02	± 0.031	%FSR
0° C to +70° C	—	—	± 0.09	%FSR
-55° C to +125° C	—	—	± 0.12	%FSR
Bipolar Offset Error				
+25° C (Tech Note 1)	—	± 0.02	± 0.061	%FSR
0° C to +70° C	—	—	± 0.12	%FSR
-55° C to +125° C	—	—	± 0.15	%FSR
Gain Error				
+25° C (See Tech Note 1)	—	± 0.02	± 0.061	%FSR
0° C to +70° C	—	—	± 0.12	%FSR
-55° C to +125° C	—	—	± 0.15	%FSR
Conversion Time				
+25° C	—	—	2.4	μ Sec.
0° C to +70° C	—	—	2.4	μ Sec.
-55° C to +125° C	—	—	2.4	μ Sec.
No missing codes				
+25° C	14	—	—	Bits
0° C to +70° C	13	—	—	Bits
-55° C to +125° C	12	—	—	Bits

POWER REQUIREMENTS

Power Supply Range				
+15V dc Supply	+14.25	+15	+15.75	Volts dc
-15V dc Supply	-14.25	-15	-15.75	Volts dc
+5V dc Supply	+4.75	+5	+5.25	Volts dc
Supply Current				
+15V Supply	—	+20	+25	mA
-15V Supply	—	-20	-28	mA
+5V Supply ①	—	+65	+75	mA
Power Dissipation	—	925	1200	mW
Supply Rejection	—	—	± 0.01	%FSR/%V

PHYSICAL/ENVIRONMENTAL

Operating Temperature Range				
—MC Models	0	—	+70	° C
—MM Models	-55	—	+125	° C
Storage Temperature Range	-65	—	+150	° C
Package Type	24-pin hermetically sealed ceramic DIP			
Weight	0.42(12)oz.(gram)			

① + 5V power usage at 1 TTL logic loading per data output bit.

TECHNICAL NOTES

- Applications unaffected by endpoint errors or those that remove them through software will use the typical connections shown in Figure 2. The optional external circuitry of Figure 4 removes system errors or helps adjust the small initial errors of the ADC-914 to zero. The external adjustment circuit has no effect on the throughput rate. Table 1 shows how to select the input range.
- Bypass the analog and digital supplies and the +10V reference (pin 21) to ground with a 4.7 μF , 25V tantalum electrolytic capacitor in parallel with a 0.1 μF ceramic capacitor. Bypass the +10V reference (pin 21) to ground (pin 23).

CALIBRATION

1. Apply a pulse 200 nanoseconds minimum to the START CONVERT input (pin 16) at a rate of 250 KHz. That rate is chosen to reduce flicker if LED's are used on the outputs for calibration purposes.

Connect the converter per Figure 2, Figure 4, and Table 1 for the appropriate full scale range (FSR).

2. Zero Adjustments:

Apply a precision voltage reference source between the amplifier's signal input and analog ground. Use a very low-noise signal source for accurate calibration.

Adjust the output of the reference source per Table 4. For unipolar operation, adjust the zero trimming potentiometer so that the output code flickers between 00 0000 0000 0000 and 00 0000 0000 0001. For bipolar operation, adjust the potentiometer such that the code flickers equally between 10 0000 0000 0000 and 10 0000 0000 0001.

3. Full-Scale Adjustment:

Set the output of the voltage reference used in step 2 to the value shown in Table 4. Adjust the gain trimming potentiometer so that the output code flickers between 11 1111 1111 1110 and 11 1111 1111 1111.

To confirm proper operation of the device, vary the precision reference voltage source to obtain the output coding listed in table 6.

Table 1. Input Connections

INPUT RANGE	INPUT PIN	JUMPER THESE PINS:
0 to -10V dc	Pin 19	Pin 20 to GROUND
±5V dc	Pin 19	Pin 20 to Pin 21

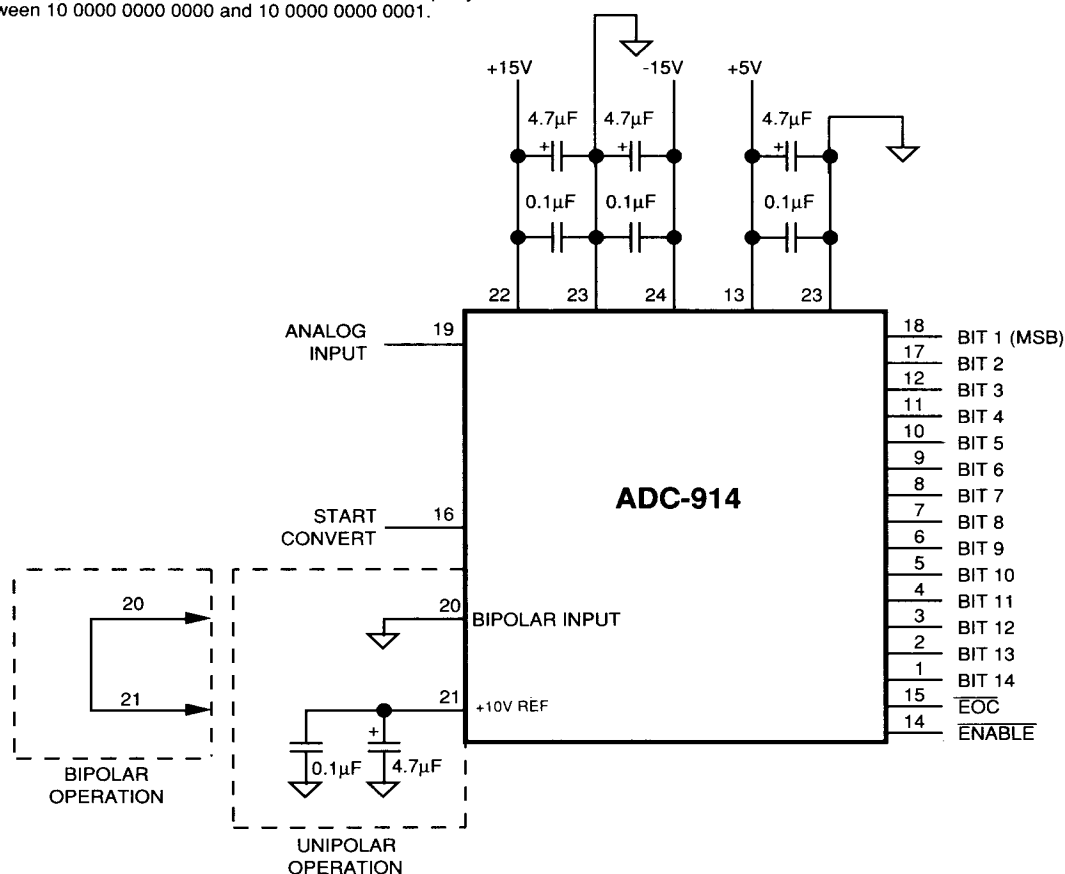
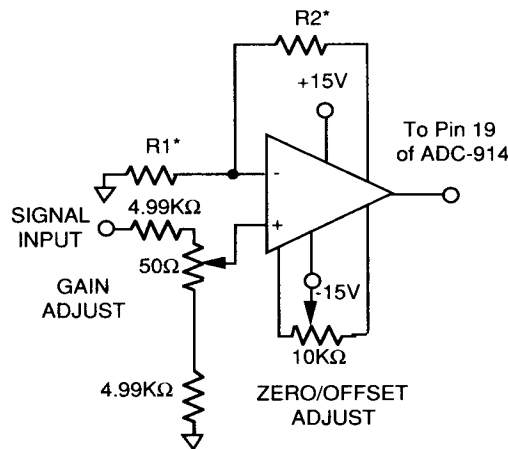


Figure 2. Typical Input Connections for the ADC-914

Optional Calibration Circuit



* See Table 5 for R1 and R2 values.

Figure 4. Optional Calibration Circuit

Table 4. Zero and Gain Adjust

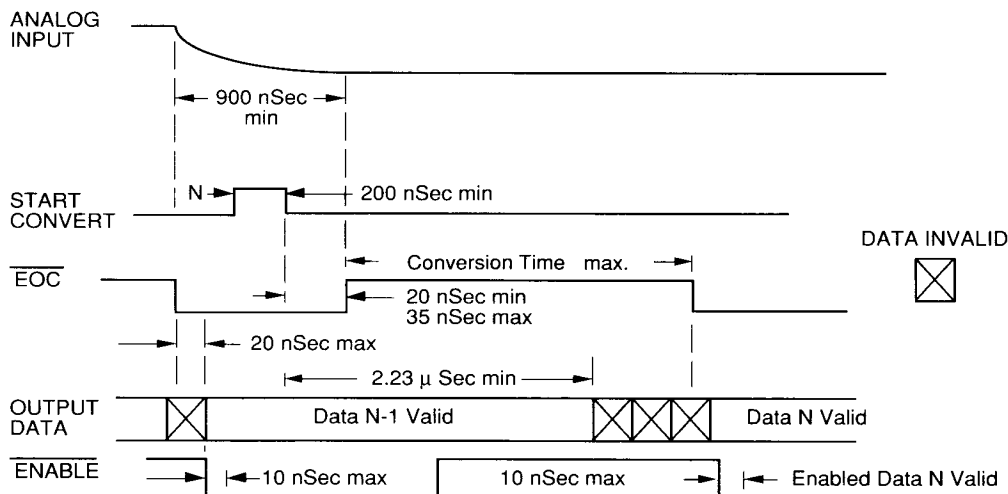
FSR	ZERO ADJUST +1/2 LSB	GAIN ADJUST +FS - 1 1/2 LSB
0 to +10V dc ±5V dc	+305 μV +305 μV	-9.9991V dc -4.9991V dc

Table 5. Input Ranges
(using external calibration)

INPUT RANGE	R1	R2	UNIT
0 to +10V, +5V	2	2	K Ohms
0 to +5V, ±2.5V	1.65	4.99	K Ohms
0 to +2.5V, +1.25V	715	4990	Ohms

TIMING

Figure 3 shows the relationship between the various input signals. The timing shown applies over the operating temperature range and over the operating power supply range. These times are guaranteed by design.



NOTE: NOT DRAWN TO SCALE

Figure 3. ADC-914 Timing Diagram

Table 6. Output Coding

STRAIGHT BIN.					
UNIPOLAR SCALE	INPUT RANGES, V dc	MSB	LSB	INPUT RANGE ±5V	BIPOLAR SCALE
+FS -1 LSB	+9.99939V	1111	1111 1111	+4.99939V	+FS -1 LSB
7/8 FS	+8.7500V	1110	0000 0000	+3.7500V	+3/4 FS
3/4 FS	+7.5000V	1100	0000 0000	+2.5000V	+1/2 FS
1/2 FS	+5.0000V	1000	0000 0000	0.0000V	0
1/4 FS	+2.5000V	0100	0000 0000	-2.5000V	-1/2 FS
1/8 FS	+1.2500V	0010	0000 0000	-3.7500V	-3/4 FS
1 LSB	+0.00061V	0000	0000 0001	-4.99939V	-FS +1 LSB
0	0.0000V	0000	0000 0000	-5.0000V	-FS
OFF. BINARY					

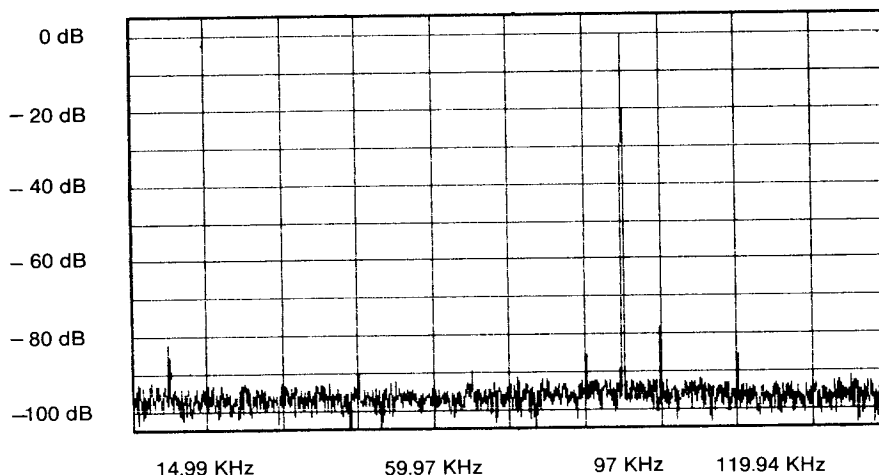
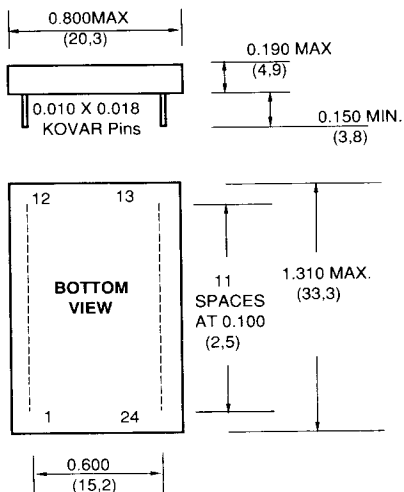


Figure 5. ADC-914 FFT Analysis

**MECHANICAL DIMENSIONS
INCHES (MM)**



NOTE: Pins have a 0.025 inch, ± 0.01 stand-off from case.

ORDERING INFORMATION

MODEL	TEMPERATURE RANGE	SEAL
ADC-914MC	0 °C to +70 °C	Hermetic
ADC-914MM	-55 °C to +125 °C	Hermetic

A receptacle for PC board mounting can be ordered through AMP Incorporated, #3-331272-8 (Component Lead Socket), 24 required.

For availability of MIL-STD-883 Versions, contact DATEL.