DATEL

ADC-868
Ultra High Speed, 12-Bit Modular A/D Converter

T-51-10-12

1

FEATURES

- 12-Bit resolution
- 500 Nanoseconds (maximum) conversion time
- 3-State output
- ±½ LSB linearity
- On board offset & gain adjustments
- No missing codes guaranteed

GENERAL DESCRIPTION

DATEL's ADC-868 is an ultra high speed, 12-bit, modular A/D converter. Providing a maximum conversion time of 500 nanoseconds, this converter guarantees no missing codes over the 0°C to +70°C temperature range.

Standard input ranges are 0V to +5V for unipolar operation and ±2.5V for bipolar operation. Extended input ranges of 0V to +10V and ±5V can be implemented by the addition of 2 external resistors. A low input impedance of 1K allows for maximum speed applications with low impedance sources such as a sample and hold amplifier.

Output data is available through a 3-state output register, as 12 parallel lines with 2 enable inputs providing accurate data transferal. Data is coded as straight binary for unipolar operation and offset binary for bipolar operation.

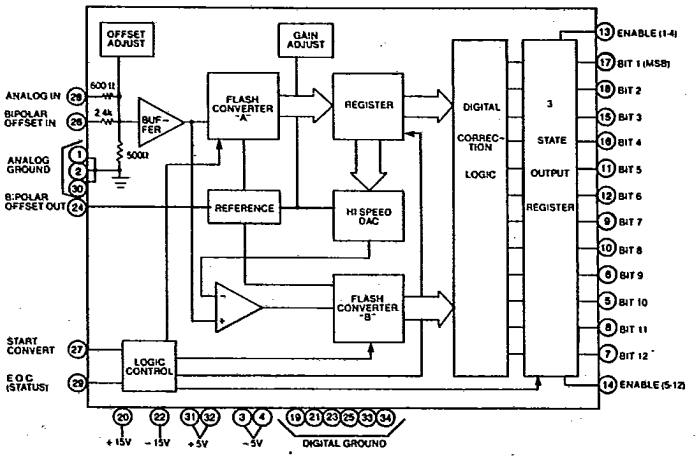
The ADC-868 is comprised of a fast settling precision input buffer, flash converter, high-speed DAC, high-speed comparator, precision voltage reference, clock generator and control logic circuits. Complete with on-board offset and gain adjustments, no external components are required.

Excellent specifications include a maximum gain tempco of 30 ppm/°C, and ±½ LSB maximum differential nonlinearity.

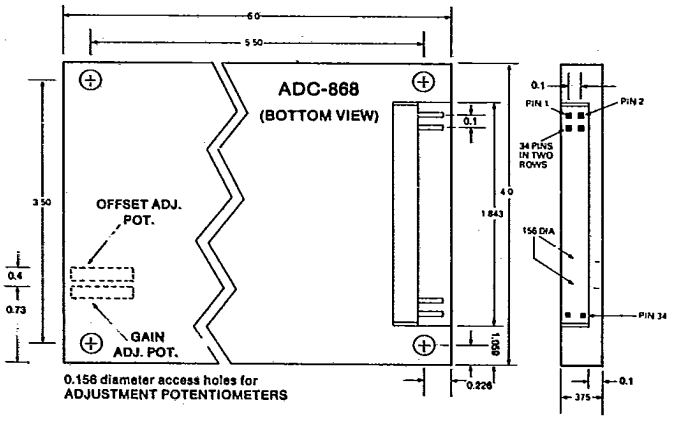
The combined use of a high-speed A/D with "state-of-the-art" flash conversion techniques, makes the ADC-868 an ideal selection for high speed data acquisition, real time waveform analysis, radar signal processing and analytic instrumentation.

This module is packaged in a 4 x 6 x 0.375 inch black enameled CR steel case with a 34 pin male connector located at one end.

Power requirements are ±15V dc and ±5V dc with a total current drain of 1070 mA, maximum.



MECHANICAL DIMENSIONS



INPUT/OUTPUT CONNECTIONS

PIN	FUNCTION
1	ANALOG GROUND
2	ANALOG GROUND
3	-5V dc
4	-5V dc
5	BIT 10
6	BIT 9
7	BIT 12 (LSB)
8	BIT 11
9	BIT 7
10	BIT 8

PIN	FUNCTION
11	BIT 5
12	BIT 6
13	ENABLE BITS 1-4
14	ENABLE BITS 5-12
15	BIT 3
16	BIT 4
17	BIT 1 (MSB)
18	BIT 2
19	DIGITAL GROUND

PIN	FUNCTION
20	+15V dc
21	DIGITAL GROUND
22	-15V dc
23	DIGITAL GROUND
24	BIPOLAR OFFSET OUT
25	DIGITAL GROUND
26	BIPOLAR OFFSET IN

PIN	FUNCTION
27	START CONVERT
28	ANALOG IN
29	E.O.C. (STATUS)
30	ANALOG GROUND
31	+5V dc
32	+5V dc
33	DIGITAL GROUND
34	DIGITAL GROUND

ABSOLUTE MAXIMUM RATINGS	
Positive Supply	+16V dc
Negative Supply	−16V dc
Logic Supply	±7V dc
Logic Inputs	+5.5V
Analog Inputs	±6.25V

FUNCTIONAL SPECIFICATIONS

Typical at 25°C, ±15V and ±5V supplies, unless otherwise noted.

DESCRIPTION	MINIMUM	TYPICAL	MAXIMUM
ANALOG INPUTS (See Technical Note #2 for extended input ranges.)			
Unipolar	—	0V to +5V	—
Bipolar	—	±2.5V	—
Impedance, Unipolar (with Pin 26 grounded)	—	1KΩ	1.01KΩ
DIGITAL INPUTS			
Start Conversion	A 2V (minimum to 5V (maximum) positive pulse with a 50 nsec. (minimum) duration. Positive going edge initiates conversion		
Loading	2 TTL Loads		
Enable 1-4	Logic low "0" enables bits 1 (MSB) thru 4		
Enable 5-12	Logic low "0" enables bits 5 thru 12 (LSB)		
Loading	1 TTL Load		
OUTPUTS			
Unipolar Coding	Straight Binary		
Bipolar Coding	Offset Binary		
Output Data	12 Parallel lines		
End of Conversion	2V (minimum) to 5V (maximum) positive going pulse, 500 nsec. (maximum) width. Negative going edge indicates conversion complete.		
Loading	10 TTL Loads		
Output Logic Levels (enable lines low)			
V_{out} "0"	—	+0.25V	+0.4V
V_{out} "1"	+2.4V	+3.1V	—
Loading	7 TTL Loads		
PERFORMANCE			
Resolution	—	—	12 bits
Conversion Time	—	450 nsec.	500 nsec.
Differential Linearity Error	—	±¼ LSB	±½ LSB
Integral Linearity Error	—	±½ LSB	±1 LSB
No Missing Codes	—	0°C to +70°C	
Gain Tempco	—	±20 ppm/°C	±30 ppm/°C
Zero Drift	—	±15 ppm/°C	±20 ppm/°C
Offset Tempco	—	±10 ppm/°C	±20 ppm/°C
Long Term Stability	—		±0.25%/year
Output Enable Delay	—	20 nsec.	28 nsec.
POWER SUPPLY SENSITIVITY, %/% Supply			
±15V dc	—	—	±0.03
±5V dc	—	—	±0.01
POWER REQUIREMENTS			
Supply Voltage: Analog	±14.5V dc	±15V dc	±15.5V dc
Logic	±4.75V dc	±5V dc	±5.25V dc
Supply Current: +15V	—	150 mA	200 mA
-15V	—	100 mA	120 mA
+5V	—	450 mA	500 mA
-5V	—	225 mA	250 mA
Power Dissipation	—	7.1 watts	8.6 watts
PHYSICAL/ENVIRONMENTAL			
Operating Temperature	0°C to +70°C		
Storage Temperature	-25°C to +85°C		
M.T.B.F.	125,000 hrs.		
Package Type	4 x 6 x 0.375 inch black enameled 25 gauge CR steel, with a 34 pin male connector at one end.		

TECHNICAL NOTES

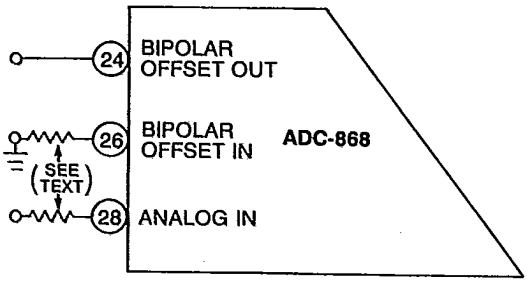
1. Configuration for unipolar or bipolar operation is as follows:
   Unipolar operation—ground pin 26 leaving pin 24 open.
   Bipolar operation—strap pin 24 to pin 26.
2. Analog input ranges may be extended to 0V to +10V unipolar and ±5V bipolar by the addition of two precision resistors. See Extended Input Configuration.
3. The high operating speed of these converters requires that good high frequency board layout techniques be used.

   Analog input leads should be as short and direct as possible. The use of shielded cable as an analog input lead will ensure isolation of analog signals from environmental interference and digital crosstalk.
4. Applications of these converters that require the use of a sample-hold may be satisfied by DATEL's model SHM-4860, a high-speed hybrid unit featuring 200 nanoseconds acquisition time to 0.01% accuracy. See Sample-Hold Diagram.
5. These converters have a maximum power dissipation of 8.6W. The case-to-ambient thermal resistance for this package is approximately 40°C maximum.
6. For TTL operation, tie both enable inputs to digital ground.
7. Logic and analog supply lines are internally bypassed so that external bypass capacitors are not necessary.

EXTENDED INPUT CONFIGURATION

Unipolar

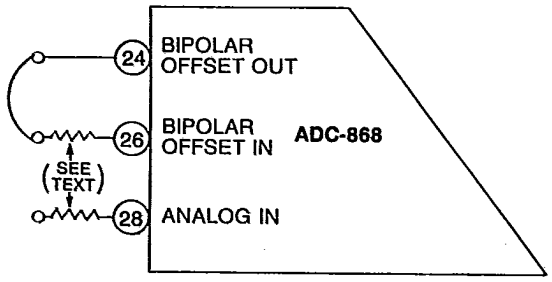
An extended unipolar input range of 0 to 10V can be achieved by the termination of the bipolar OFFSET IN (pin 26) to ground through a 1.02 kΩ, .1% resistor and connecting a 1.10 kΩ, .1% resistor in series with the ANALOG IN (pin 28).



Extended Input, Unipolar Configuration

Bipolar

An extended bipolar input range of ±5V can be attained by strapping the bipolar OFFSET OUT (pin 24) to the bipolar OFFSET in (pin 26) through a 1.02 kΩ, .1% resistor and connecting a 1.10 kΩ, 1% resistor in series with the ANALOG IN (pin 28).



Extended Input, Bipolar Configuration

GAIN AND OFFSET ADJUSTMENTS

Unipolar Operation

For extended input range operation, see Extended Input Configuration.

1. Apply start convert pulses to pin 27. (Pin 26 grounded)
2. Connect a precision voltage reference of +½ LSB (+0.61 mV or +1.22 mV for extended input range operation) to the analog input. Adjust the offset potentiometer so that the LSB is flickering at 0000 0000 000X.
3. Connect a precision voltage reference of +full-scale −1½ LSB (+4.9982V or +6.34V for extended range input operation) to the analog input. Adjust the gain potentiometer so that the LSB is flickering at 1111 1111 111X.

Bipolar Operation

For extended input range operation, see Extended Input Configuration.

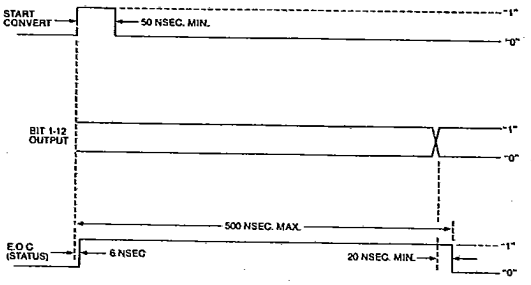
1. Apply START CONVERT PULSES to Pin 27. (Pin 26 connected to Pin 24.)
2. Connect a precision voltage reference of −full-scale +½ LSB (−2.4994V or −4.9988V for extended input range operation) to the analog input. Adjust the offset potentiometer so that the LSB is flickering at 0000 0000 000X.
3. Connect a precision voltage reference of +F.S.−1½ LSB (+2.4982V or +4.9963V for extended input range operation) to the analog input. Adjust the gain potentiometer so that the LSB is flickering at 1111 1111 111X.

1

OUTPUT CODING

UNIPOLAR SCALE	10V RANGE	5V RANGE	STRAIGHT BINARY
+F.S. − 1 LSB	+9.9976V	+4.9988V	1111 1111 1111
+⅞ F.S.	+8.7500V	+4.3750V	1110 0000 0000
+¾ F.S.	+7.5000V	+3.7500V	1100 0000 0000
+½ F.S.	+5.0000V	+2.5000V	1000 0000 0000
+¼ F.S.	+2.5000V	+1.2500V	0100 0000 0000
+1 LSB	+0.0024V	+0.0012V	0000 0000 0001
0	0.0000V	0.0000V	0000 0000 0000

BIPOLAR SCALE	±5V RANGE	±2.5V RANGE	OFFSET BINARY
+F.S. − 1 LSB	+4.9976V	+2.4988V	1111 1111 1111
+¾ F.S.	+3.7500V	+1.8750V	1110 0000 0000
+½ F.S.	+2.5000V	+1.2500V	1100 0000 0000
0	0.0000V	0.0000V	1000 0000 0000
−½ F.S.	−2.5000V	−1.2500V	0100 0000 0000
−¾ F.S.	−3.7500V	−1.8750V	0010 0000 0000
−F.S. + 1 LSB	−4.9976V	−2.4988V	0000 0000 0001
−F.S.	−5.0000V	−2.5000V	0000 0000 0000



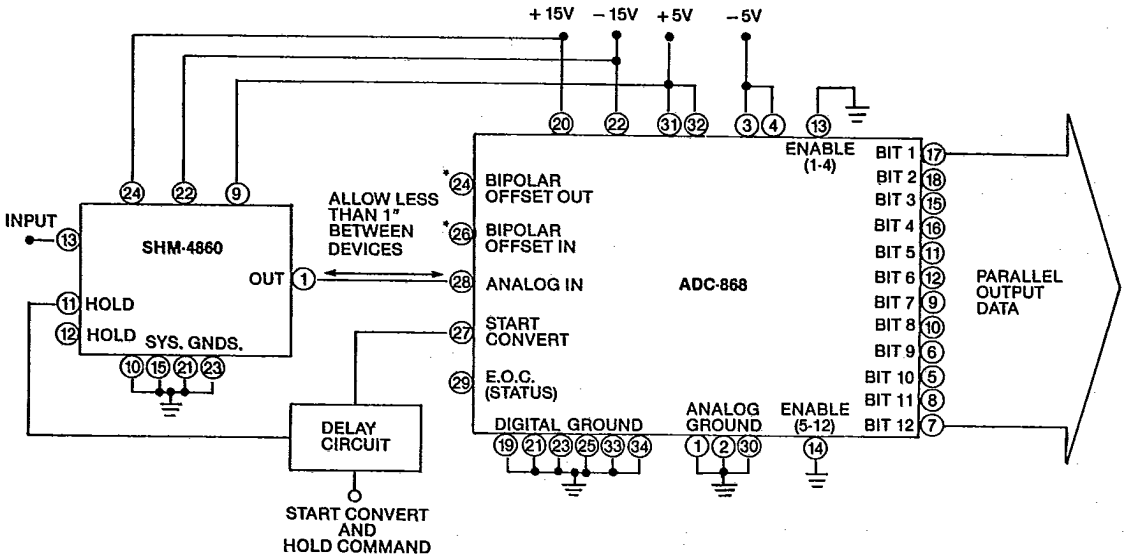
ADC-868 TIMING DIAGRAM

ADC-868

DATEL

T-51-10-12

ULTRA HIGH SPEED A/D WITH SAMPLE/HOLD



When DATEL's ultra-high speed ADC-868 is used in conjunction with a high speed sample-hold amplifier, such as DATEL's SHM-4860, a throughput rate of 1.25 MHz can be achieved.

*See Technical Notes for configuration.

ORDERING INFORMATION

MODEL	DESCRIPTION
ADC-868	500 nanoseconds, 12-bit A/D Converter
Mating Connector	34-Pin AMP #1-86063-3