ABSOLUTE MAXIMUM RATINGS	
Positive Supply, pin 12	+16V dc
Negative Supply, pin 4	−16V dc
Logic Supply, pin 17	+7V dc
Logic Inputs	+7V dc
Analog Inputs	± Twice selected analog input range

FUNCTIONAL SPECIFICATIONS

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

INPUTS		
Analog Input Ranges	unipolar[1]	0 to −5V, 0 to −10V, 0 to −20V
	bipolar	±2.5V, ±5V, ±10V
	reference	−9.5V to −10.5V
Input Impedance[2]	5V range	312Ω
	10V range	625Ω
	20V range	1.25 KΩ
	bipolar input	1 KΩ
	reference (pin 5)	2 KΩ
Start Conversion		2V min. to 5.5V max. positive pulse with duration of 25 nsec. min. Rise and fall times typical 10 nsec. Logic "1" resets converter. Logic "0" initiates conversion. Loading: 1 TTL load.

OUTPUTS		
Parallel Output Data		11 Parallel lines of data (10 binary bits + $\overline{\text{MSB}}$) held until next conversion command. V_{OUT} ("0") ≤ +0.4V. V_{OUT} ("1") ≥ +2.4V. Loading: 2 TTL loads
Coding[3], unipolar		Straight Binary
bipolar[4]		Offset Binary, Two's Complement
Serial Output Data		NRZ successive decision pulses out, MSB first, at internal clock frequency Loading: 4 TTL loads.
End of Conversion ($\overline{\text{EOC}}$)		Conversion Status Signal. Output is logic high during reset and conversion, low when conversion is complete. Loading: 4 TTL loads.
Clock Output		Train of positive going, 0 to +5V, 30 nsec. pulses.
Clock Frequency	ADC-816MC/MM	14.6 MHz
	ADC-826MC/MM	8.1 MHz
Reference Output,	Voltage	−10.00V ±0.02V
	Current	0 to +20 mA (sink only)
	Impedance	10Ω max. f_O ≤ 10 MHz

PERFORMANCE		
Resolution		10 bits
Conversion Time[5],	ADC-816MC	800 nsec. max.
	ADC-826MC/MM	1.4 μsec. max.
Nonlinearity		±½ LSB max.
Differential Nonlinearity[6]		±½ LSB max.
Gain Error[7], before adjustment,	unipolar	±0.3% of FSR max.[8]
	bipolar	±0.2% of FSR max.
Zero Error, before adjustment,	unipolar	±0.2% of FSR max.
Offset Error, before adjustment,	bipolar	±0.1% of FSR max.
Gain Tempco[9],	unipolar	±37 ppm/°C max.
	bipolar	±28 ppm/°C max.
Zero Tempco,	unipolar	±12 ppm/°C max.
	bipolar	±23 ppm/°C max.
Conversion Time Tempco		±0.1%/°C
Reference Output Tempco		±20 ppm/°C max.
Power Supply Rejection		±0.008%/% supply
No missing codes		Over operating Temp. Range

POWER REQUIREMENTS	
Analog Supply, pin 12	+15V dc ±1V dc at 106 mA max.
pin 4	−15V dc ±1V dc at 60 mA max.
Reference Supply, pin 3	−15V dc ±0.5V dc at 34 mA max.
Logic Supply, pin 17	+5V dc ±0.25V dc at 80 mA max.
Power Dissipation	1.7 watts typical, 2.9 watts max.

PHYSICAL/ENVIRONMENTAL	
Operating Temp. Range Suffix C	0°C to +70°C
Suffix M	−55°C to +125°C
Storage Temperature Range	−65°C to +150°C
Package Type	32-pin hermetically sealed Ceramic DIP
Pins	0.010 x 0.018 inch gold plated Kovar
Weight	0.8 ounces (23 grams)

FOOTNOTES:

1. Bipolar input must be tied to ground.
2. Resistance tolerance is −30%, +50%, ±50 ppm/°C.
3. All coding is inverted analog.
4. Two's Complement Binary available for parallel output only.
5. Maximum conversion time is specified at full rated operating temperature. The ADC-816MM has a maximum conversion time of 900 nanoseconds at full rated operating temperature. See Technical note 3 for 25°C conversion time.
6. Tested over full rated operating temperature range.
7. Includes Zero Error.
8. FSR is Full-Scale Range.
9. Includes internal reference Tempco. Given as a maximum for 5V FSR, these values improve by 10% for 10V FSR, and by 20% for 20V FSR.

TECHNICAL NOTES

1. Use of good high frequency circuit board layout techniques is required for rated performance. The power common (pin 1), comparator common (pin 7), and signal common (pin 6) are not connected internally, and therefore must be connected externally as directly as possible, through a low resistance, low inductance path. The extensive use of a ground plane for all common connections is highly recommended. Also, it is recommended that the analog and digital supplies, although they are internally bypassed with 0.033 μF capacitors, be additionally bypassed externally at the supply pins with 1 μF electrolytic capacitors.
2. The digital outputs are not buffered from their internal application and so are sensitive to unusual loading or long lines. Terminate these outputs with normal TTL inputs not more than 3 inches from the data output pin. Analog inputs must be non-reactive such that leads should be short and purely resistive. The reactive component of any analog input source, as seen at the analog input pin, should be less than 0.3% of the analog input resistance at that pin, for frequencies below 20 MHz.
3. Conversion time is measured from the rising edge of a 40 nanosecond start input pulse to the falling edge of the $\overline{\text{EOC}}$ output. The conversion time is factory set at +25°C for the ADC-816MC/MM at 750 nanoseconds and 1.25 microseconds for the ADC-826MC/MM. The worst case conversion time at the maximum rated operating temperature is given as a maximum specification.
4. To use the internal reference, the reference supply pin (pin 3) must be connected to the −15V supply. If the reference supply pin (pin 3) is disconnected or grounded, the internal reference will be disabled at a power saving of approximately 200 mW.

5. Serial output data is available in NRZ format successive decision pulses, MSB first, in straight binary or offset binary coding. Synchronization of the serial output data is achieved through the use of the clock output (pin 30). This same clock output also controls the output register such that at the rising edge of the output clock the previous data bit may be clocked out. However, there will be no clock edge to clock out the LSB. A Serial DATA Recovery circuit is diagrammed on the applications page that will correct this.
6. These converters have a case-to-ambient thermal resistance of 22°C per watt. At temperatures above +70°C, an air flow of at least 400 linear feet per minute is recommended. To operate at elevated temperatures it is recommended that the converter be mounted directly to the circuit board (without the use of a mounting socket) and that good thermal contact be established between the case bottom and the circuit board ground plane by use of a silicone thermal joint compound such as Wakefield Type 120 or equivalent.
7. Applications of these converters that require the use of a sample-hold may be satisfied by DATEL's model SHM-HU, an ultra-fast hybrid unit featuring 25 nanoseconds acquisition time and a ±2.5V input range.

APPLICATIONS

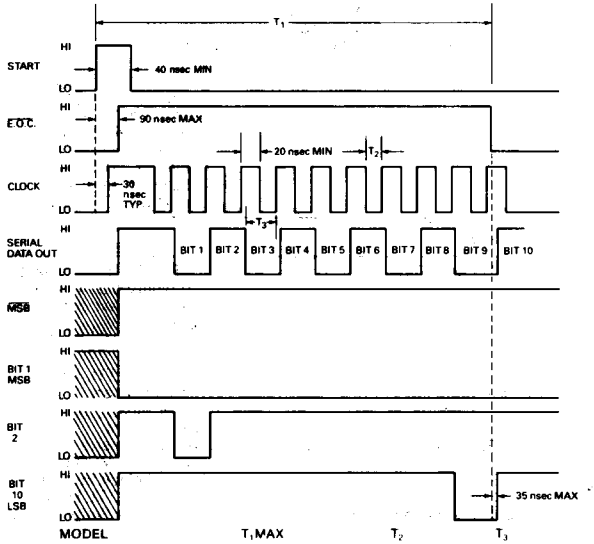
CALIBRATION PROCEDURE

1. Connect the converter as shown in the applicable connections diagram. A trigger pulse of between 40 nanoseconds and 100 nanoseconds is applied to the start conversion input (pin 31) at the rate of 200 kHz.
2. **Zero and Offset Adjustments**
   Apply a precision voltage reference source between the appropriate input for the selected full scale range and ground. Adjust the output of the reference source to the value shown in the Calibration Table for the unipolar zero adjustment (0 – ½ LSB) or the bipolar offset adjustment (+FS – ½ LSB). Adjust the appropriate timing potentiometer so that the output code flickers equally between X0000 00000 and X0000 00001. The MSB indicated by X will be 0 for straight binary and offset binary coding or 1 for two's complement output coding.
3. **Full Scale Adjustment**
   Set the output of the voltage reference source used in step 2 to the value shown in the Calibration Table for the unipolar or bipolar gain adjustment (–FS + 1½ LSB). Adjust the gain trimming potentiometer so that the output code flickers equally between X1111 11111 and X1111 11110. The MSB indicated by X, will be 1 for straight binary and offset binary coding or coding or 0 for two's complement output coding.

UNIPOLAR RANGE	ADJUST.	INPUT VOLTAGE
0 To –5V	Zero	–2.4 mV
	Gain	–4.9927V
0 To –10V	Zero	–4.9 mV
	Gain	–9.9854V
0 To –20V	Zero	–9.8 mV
	Gain	–19.9707V

BIPOLAR RANGE	ADJUST.	INPUT VOLTAGE
±2.5V	Offset	±2.4975V
	Gain	–2.4927V
±5V	Offset	±4.9951V
	Gain	–4.9854V
±10V	Offset	±9.9902V
	Gain	–9.9707V

TIMING DIAGRAM FOR ADC-816, ADC-826



MODEL	T_1 MAX	T_2	T_3
ADC-816MC/MM	800 n sec	44 n sec	23-64 n sec
ADC-826MC/MM	1.4 μ sec	100 n sec	79-114 n sec

CODING TABLES

UNIPOLAR OPERATION

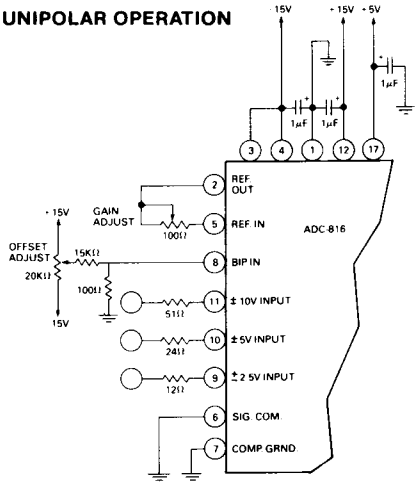
INPUT RANGE			STRAIGHT BINARY		
0 to –20V	0 to –10V	0 to –5V	MSB		LSB
–19.9805	–9.9902V	–4.9951	1111	11	1111
–17.5000	–8.7500	–4.3750	1110	00	0000
–15.0000	–7.5000	–3.7500	1100	00	0000
–10.0000	–5.0000	–2.5000	1000	00	0000
–5.0000	–2.5000	–1.2500	0100	00	0000
–2.5000	–1.2500	–0.6250	0010	00	0000
–0.0198	–0.0098	–0.0049	0000	00	0001
0.0000	0.0000	0.0000	0000	00	0000

BINARY OPERATION

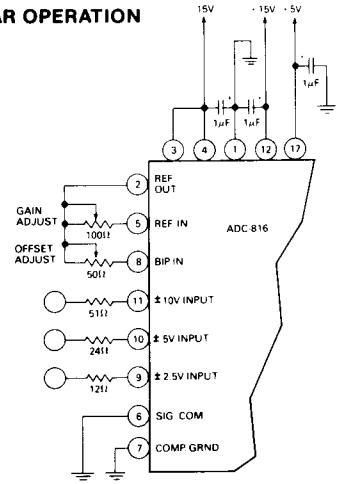
INPUT RANGE			OFFSET BINARY			TWO'S COMPLEMENT		
±10V	±5V	±2.5V	MSB		LSB	MSB		LSB
–9.9805	–4.9902	–2.4951	1111	11	1111	0111	11	1111
–7.5000	–3.7500	–1.8750	1110	00	0000	0110	00	0000
–5.0000	–2.5000	–1.2500	1100	00	0000	0100	00	0000
0.0000	0.0000	0.0000	1000	00	0000	0000	00	0000
+5.0000	+2.5000	+1.2500	0100	00	0000	1100	00	0000
+7.5000	+3.7500	+1.8750	0010	00	0000	1010	00	0000
+9.9805	+4.9902	+2.4951	0000	00	0001	1000	00	0001
+10.0000	+5.0000	+2.5000	0000	00	0000	1000	00	0000

1

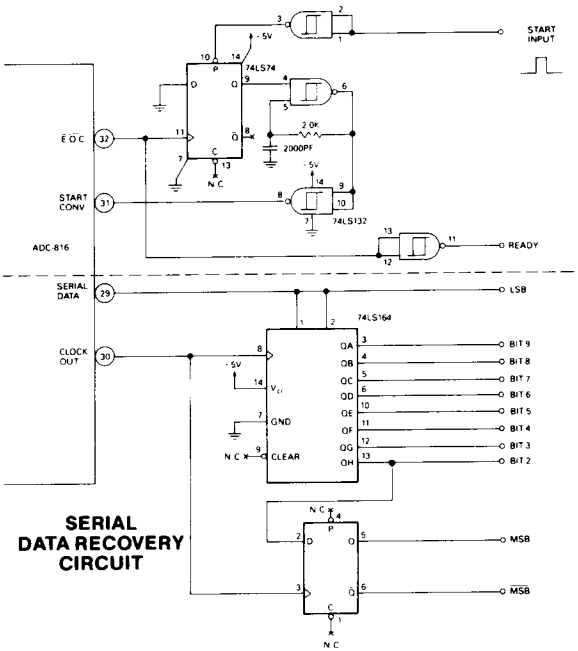
UNIPOLAR OPERATION



BIPOLAR OPERATION

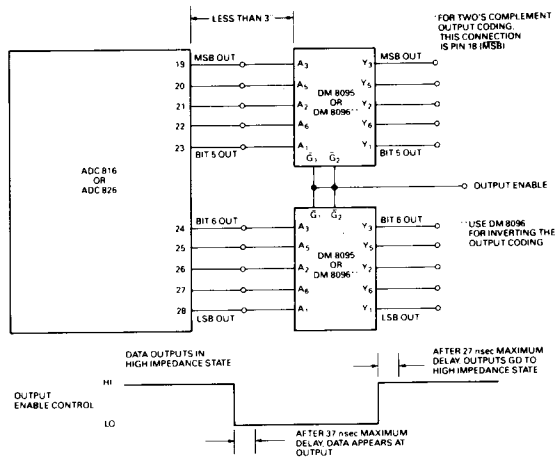


UNCONDITIONAL/START CIRCUIT



SERIAL DATA RECOVERY CIRCUIT

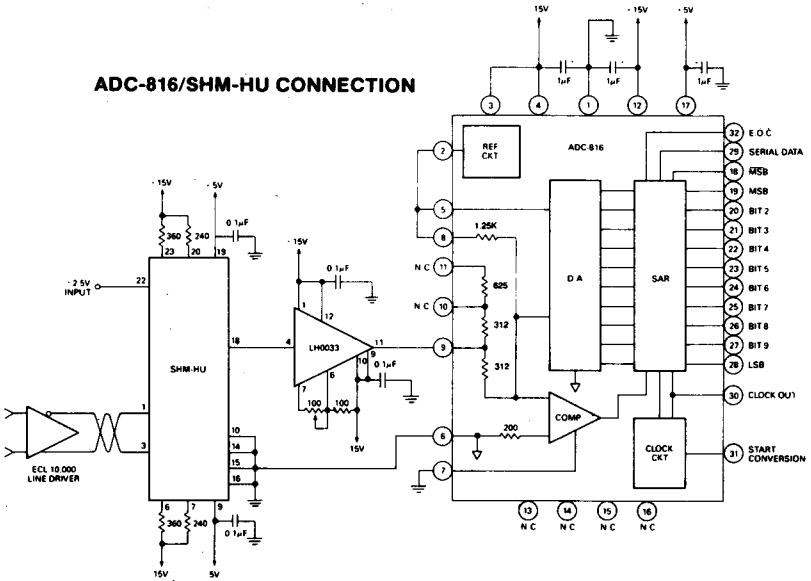
HIGH SPEED THREE-STATE OUTPUT BUFFER GROUND PLANE LAYOUT



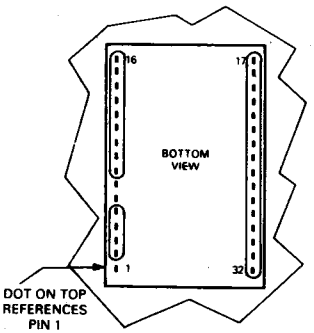
The Unconditional Start Circuit, shown for the ADC-816/826 insures the initiation of a conversion cycle upon the application of one start pulse of 40 nanoseconds minimum pulse width regardless of converter status.

The serial data output of the ADC-816/826 is converted into parallel form, with the addition of an $\overline{\text{MSB}}$ output, by the Serial Data Recovery circuit. Users should refer to technical note No. 2 on the loading of the ADC-816/826 digital outputs when using these circuits.

ADC-816/SHM-HU CONNECTION



GROUND PLANE LAYOUT



When the ADC-816 or ADC-826 is configured as shown here with DATEL's SHM-HU hybrid sample-hold, a ±2.5V input step can be acquired to 0.1% accuracy in 30 nanoseconds and held to within 40 μV while the A/D conversion takes place. Use of the SHM-HU reduces the time over which the input signal is averaged to a few nanoseconds (an A/D converter without a sample-hold averages the analog input signal over the total conversion time of the A/D).

ORDERING INFORMATION

MODEL NO.	OPERATING TEMP. RANGE
ADC-816MC	0°C To +70°C
ADC-816MM	-55°C To +125°C
ADC-826MC	-0°C To +70°C
ADC-826MM	-55°C To +125°C

ACCESSORIES

Part Number	Description
DILS-2	Mating Socket (2 per converter)
TP20K, TP100, TP50	Trimming Potentiometers

For military devices compliant to MIL-STD-883, consult DATEL.