APPLICATION NOTE 5:
APPLYING THE ADC100

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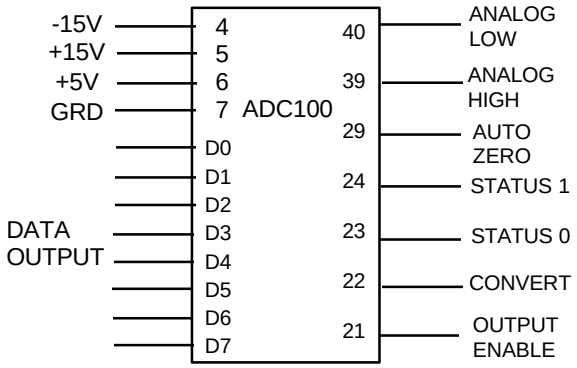

FIGURE 1.CONNECTIONS

1. POWER SUPPLIES

+15, -15 AND +5 volts are required. Connect to pins 4,5 and 6 as shown in connection diagram in Fig.1.

2. GROUND

There is one ground (not separate analog and digital grounds as in many A/D converters). This is on pin 7. Analog common on pin 40 is not a ground per se, it is only a return line for the analog input. This will be discussed in more detail when analog inputs are covered.

3. DIGITAL INPUTS

While discussing digital connections, references can be made to the function table in Fig. 2 for the ADC100 to help clarify digital input-output relationships.

AUTO ZERO: When not being used, this line should be high. To auto zero, pulse this line low (CONVERT must be high whenever auto zero is activated).

CONVERT: When not being used, this line should be high. To start a conversion, pulse this line low (AUTO ZERO must always be high whenever convert is active and during the entire convert process).

The first pulse on the convert line starts the conversion. After the conversion, the most significant byte is in the output register ready to be read.

Then the convert line is pulsed again. At this time, the middle byte is in the output register ready to be read.

Then the convert line is pulsed again. This time the least significant byte is in the output register ready to be read, and the A/D converter is in its initial state ready to accept either another conversion or an auto zero.

OUTPUT ENABLE: This line has no effect on converter operation. It can be high or low without affecting the converter. Taking this line low activates the 8-bit data output bus. Taking this line high puts the output bus in tri-state, or high impedance mode.

In bus interfacing, OUTPUT ENABLE will be used to activate the output lines when it is desired to read the ADC.

In applications where the ADC is not connected to a bus, this line can be permanently tied low.

4. ANALOG INPUTS

ANALOG INPUTS AND ANALOG COMMON: The use of these lines should be obvious. The ADC100 is set up for only one analog input range: -10.48 to +10.48. This covers the most common likely levels of input measurements. These two lines may be used as a differential type of input, but differences of potential between ANALOG COMMON and GROUND of over 100mV can create increased errors due to the limited common mode rejection.

5. DIGITAL OUTPUTS

STATUS LINES: These lines indicate the ADC state. If both lines are high, the ADC will accept either type of command, CONVERSION or AUTO ZERO. If both status lines are low, no command of any sort should be given, this indicates the converter is in the process of doing a conversion. In any state, the only recommended command is to pulse the conversion line. These are intermediate read steps.

DATA OUTPUTS: 8-bit data bus. Straight-binary logic (high=true). D0 is least significant bit, D7 is most significant bit.

CONDITION	INPUTS			STATUS		FUNCTION	OUTPUT
#	AZ	CONV.	OE	S1	S0		
1	1	1	X	1	1	IDLE-READY	N/A
2	0	1	X	0	0	AUTO-ZERO	N/A
3	1	1	X	1	1	A/Z COMPLETE-READY	N/A
4	1	0	X	0	0	CONVERSION IN PROGRESS*	N/A
5	1	1	X	0	1	CONVERSION COMPLETE	N/A
6	1	1	1	0	1	READ OUTPUT	1st BYTE (MSB)
7	1	0	X	0	0	UPDATE OUTPUT	N/A
8	1	1	1	1	0	READ OUTPUT	2nd BYTE
9	1	0	X	0	0	UPDATE OUTPUT	N/A
10	1	1	1	1	1	READ OUTPUT	3rd BYTE (LSB)
11	0	0	X	X	X	NOT ALLOWED!	

FIGURE 2. FUNCTION TABLE X = DON'T CARE N/A NOT APPLICABLE

*When a conversion is in progress (indicated by S1 and S0 both low) do not apply any other inputs except to return convert to its high state. The ADC is busy and shouldn't be bothered.

OPERATION OF THE ADC100

The following is a discussion of a typical sequence of events when using the ADC100. After connecting all power supplies and input-output lines and powering up the ADC100, the first event should normally be an AUTO-ZERO command to both initialize the ADC and set the autozero.

• Pulse auto-zero (and only auto zero) low then high again.

• Wait for S_o and S_1 to return to high.

• Pulse convert (and only convert) low then high again.

• So and S_1 both go low - take no action while both are low (about 320 msec.).

• When So goes high, S_1 will be low, conversion is complete.

• Output enable taken low will output the MSB.

• Pulse convert low then high again.

• S_1 will be high, S_0 will be low, 2nd byte is ready.

• Output enable taken low will output the 2nd byte.

• Pulse convert low then high again.

• S_0 and S_1 will both be high, LSB is ready.

• Output enable taken low will output the LSB.

•ADC is in initial state.

(While steps are specifically shown for taking OUTPUT ENABLE low, if the ADC is not connected to a bus and does not need tri-state output capability, then output enable can be permanently tied low. Data will always be coming out of the ADC, but is only guaranteed to be valid after conversion.

MOST COMMON PROBLEMS OBSERVED IN USE OF ADC100.

1. Taking both convert and auto-zero low at the same time.

2. Noise on convert or auto-zero causing false triggering.

3. ±15 volt power supplies must be free of high frequency noise if DC-DC converter supplies are used, adequate high-frequency filtering must be provided.

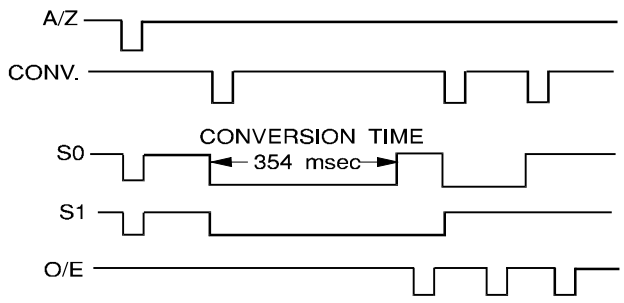

FIGURE 3. TYPICAL OPERATION TIMING DIAGRAM. SEE ADC100 DATA SHEET FOR DETAILED TIMING INFORMATION