

7. ADC Conversion Flowchart

Here is the complete workflow for using the ADC on the ATmega328p:

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The flowchart above illustrates the **ADC reading process on the ATmega328p in single conversion mode using the polling method**, with the following configuration:

1. **Conversion Mode:** The ADC operates in **single conversion mode**, meaning each conversion starts manually by setting the **ADSC = 1** bit.
2. **Synchronization Method:** The conversion completion status is checked using **polling** of the **ADIF** bit in the **ADCSRA** register, instead of using interrupts.
3. **Auto Trigger:** This flowchart assumes **ADATE = 0**, so conversions **do not run automatically** and must be restarted by the program each time a reading is taken.
4. **ADC Interrupt:** This flowchart does not use ADC interrupts, so **ADIE = 0**.
5. **Input Channel:** The configuration example in the flowchart uses **ADC0 (pin A0 / PC0)** as the analog input channel.
6. **Reference Voltage:** This flowchart follows an assembly program example that uses the **internal reference voltage** via the configuration of the **REFS1:REFS0** bits in the **ADMUX** register.
7. **Conversion Data Format:** The ADC result is stored in **right-justified** format (**ADLAR = 0**), so the full 10-bit value is read through two registers:
 - **ADCL** as the low-byte
 - **ADCH** as the high-byte
8. **Data Register Reading Order:** The **ADCL register must be read first**, followed by **ADCH**, to ensure the conversion data remains consistent.
9. **ADC Prescaler:** This example uses a **CLK/128 prescaler (ADPS2:ADPS0 = 111)**. If the system clock is **16 MHz**, the ADC clock becomes:

image

This value is within the recommended ADC operating range.

Summary of Configuration Used

- **ADC Mode:** Single Conversion
 - **Trigger Mode:** Manual (`ADSC = 1`)
 - **Polling / Interrupt:** Polling (`ADIF`)
 - **Auto Trigger:** Disabled (`ADATE = 0`)
 - **Interrupt ADC:** Disabled (`ADIE = 0`)
 - **Channel:** ADC0 / A0 / PC0
 - **Data Alignment:** Right-justified (`ADLAR = 0`)
 - **Prescaler:** CLK/128
 - **ADC Clock:** 125 kHz (if `F_CPU = 16 MHz`)
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