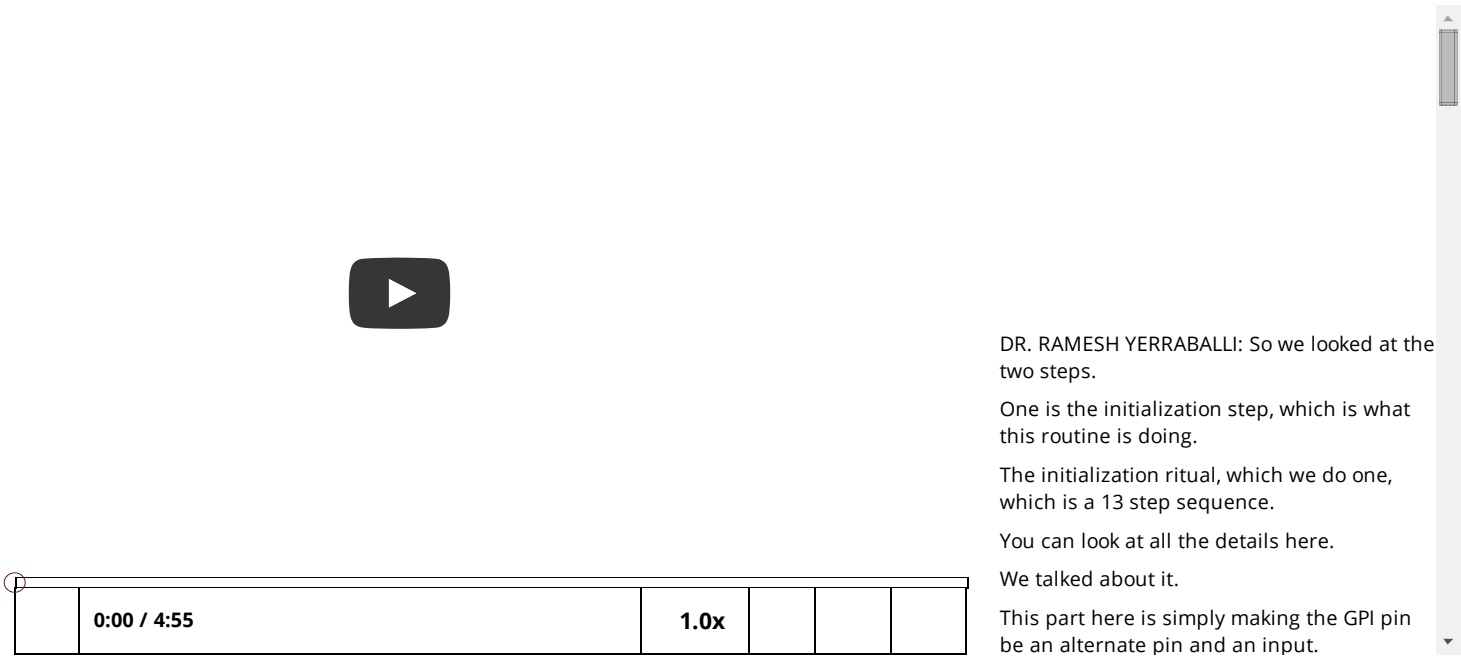
In the next video we will show the software to initialize and sample the ADC.

CAPTURING A SAMPLE



Program 14.2 gives a function that performs an ADC conversion. There are four steps required to perform a software-start conversion. The range is 0 to 3.3V. If the analog input is 0, the digital output will be 0, and if the analog input is 3.3V, the digital output will be 4095.

Digital Sample = (Analog Input (volts) • 4095) / 3.3V(volts)

Step 1. The ADC is started using the software trigger. The channel to sample was specified earlier in the initialization.
Step 2. The function waits for the ADC to complete by polling the RIS register bit 3.
Step 3. The 12-bit digital sample is read out of sequencer 3.
Step 4. The RIS bit is cleared by writing to the ISC register.

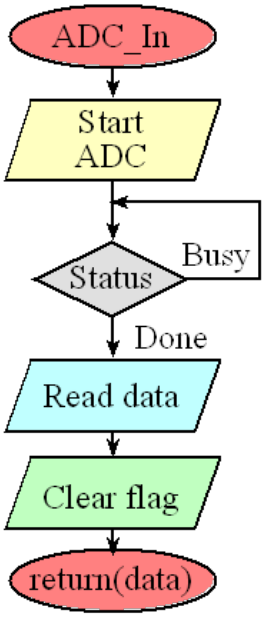


Figure 14.3. The four steps of analog to digital conversion: 1) initiate conversion, 2) wait for the ADC to finish, 3) read the digital result, and 4) clear the completion flag.

```
//------------ADC_InSeq3------------
// Busy-wait analog to digital conversion
// Input: none
// Output: 12-bit result of ADC conversion
unsigned long ADC0_InSeq3(void){  unsigned long result;
  ADC0_PSSI_R = 0x0008;            // 1) initiate SS3
  while((ADC0_RIS_R&0x08)==0){};   // 2) wait for conversion done
  result = ADC0_SSFIFO3_R&0xFFF;   // 3) read result
  ADC0_ISC_R = 0x0008;             // 4) acknowledge completion
  return result;
}
```

Program 14.2. ADC sampling using software start and busy-wait (C14_ADCSWTrigger).

There is software in the book Embedded Systems: Real-Time Interfacing to ARM® Cortex™-M Microcontrollers showing you how to configure the ADC to sample a single channel at a periodic rate using a timer trigger. The most accurate sampling method is timer-triggered sampling (**EM3**=0x5). An example of timer-triggered ADC sampling can be found at the software download site for the book, ADCT0ATrigger_4F120.zip (http://users.ece.utexas.edu/~valvano/arm/ADCT0ATrigger_4F120.zip).

Unfortunately, the TExaS simulator does not simulate this important sampling mode, so you will not be able to use it for Lab 14. For Lab 14 you must use software triggered ADC sampling with sequencer 3.

CHECKPOINT 14.1

If the input voltage is 1.5V, what value will the TM4C 12-bit ADC return?

Hide Answer

Approximating the 12-bit ADC is linear, either Dout = 4096*Vin/3.3 or 4095*Vin/3.3 = 1862.

CHECKPOINT 14.2

Help

If the input voltage is 0.5V, what value will the TM4C 12-bit ADC return?

Hide Answer

Approximating the 12-bit ADC is linear, either Dout = 4096*Vin/3.3 or 4095*Vin/3.3 = 621.