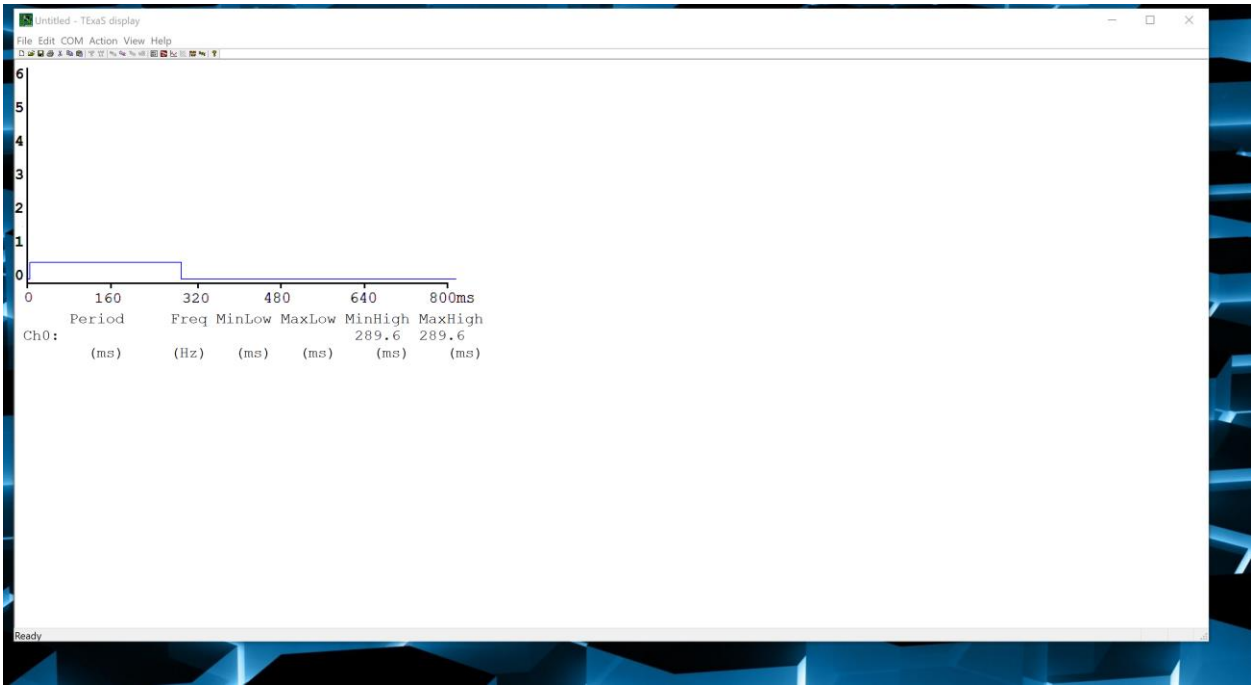
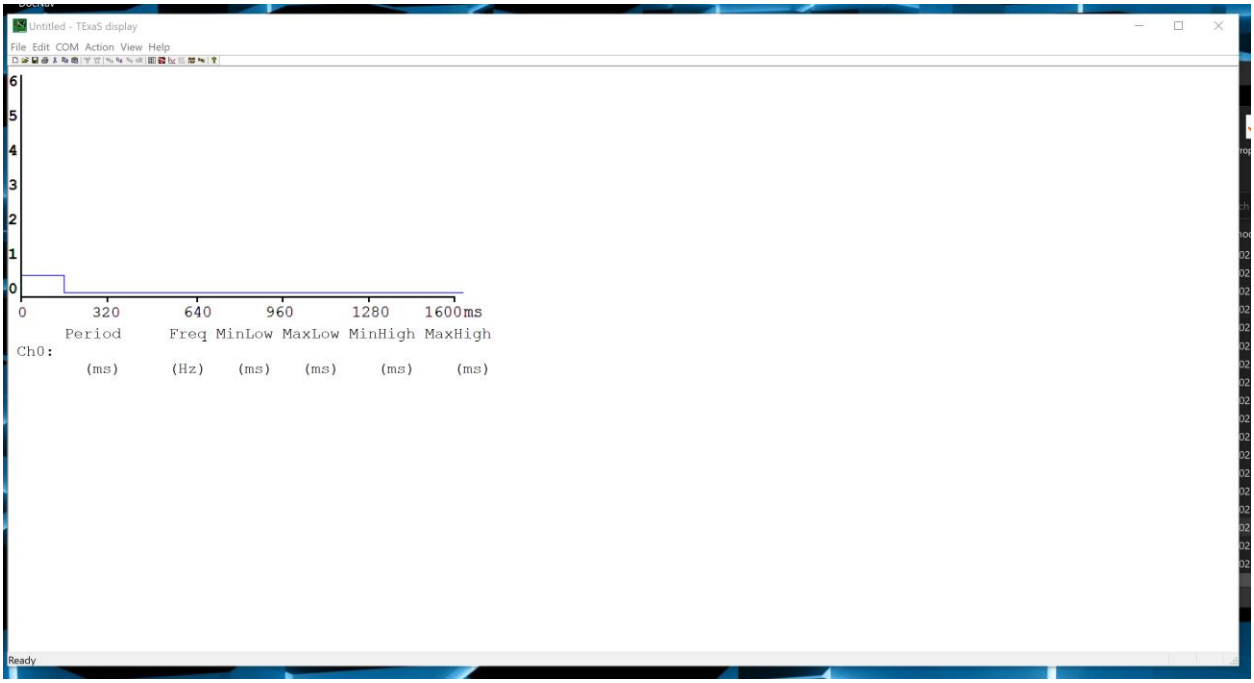
Alex Meyers – Lab 1

Black – about 280ish (320 zoomed in)

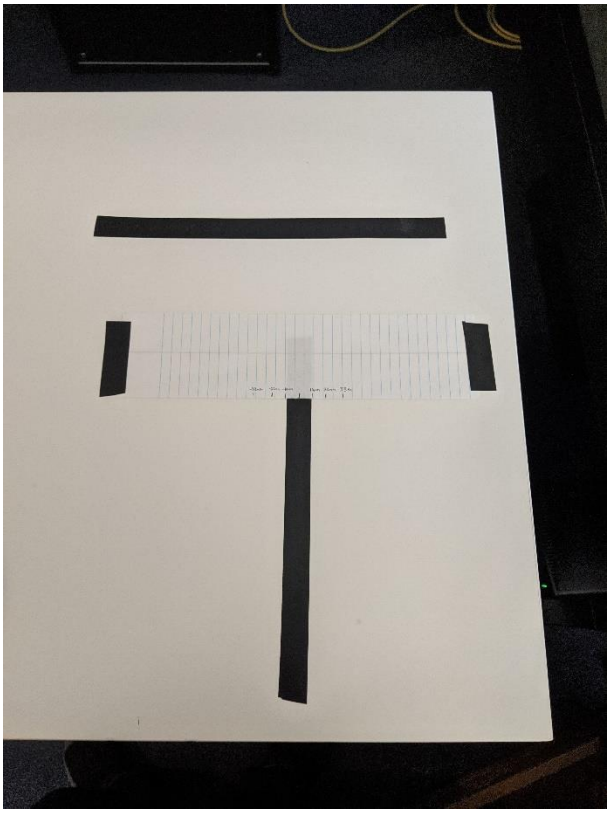
White – about 80ish. Needed to put the bottom end on 320 to be able to catch it w/ the screenshot (120 zoomed in)



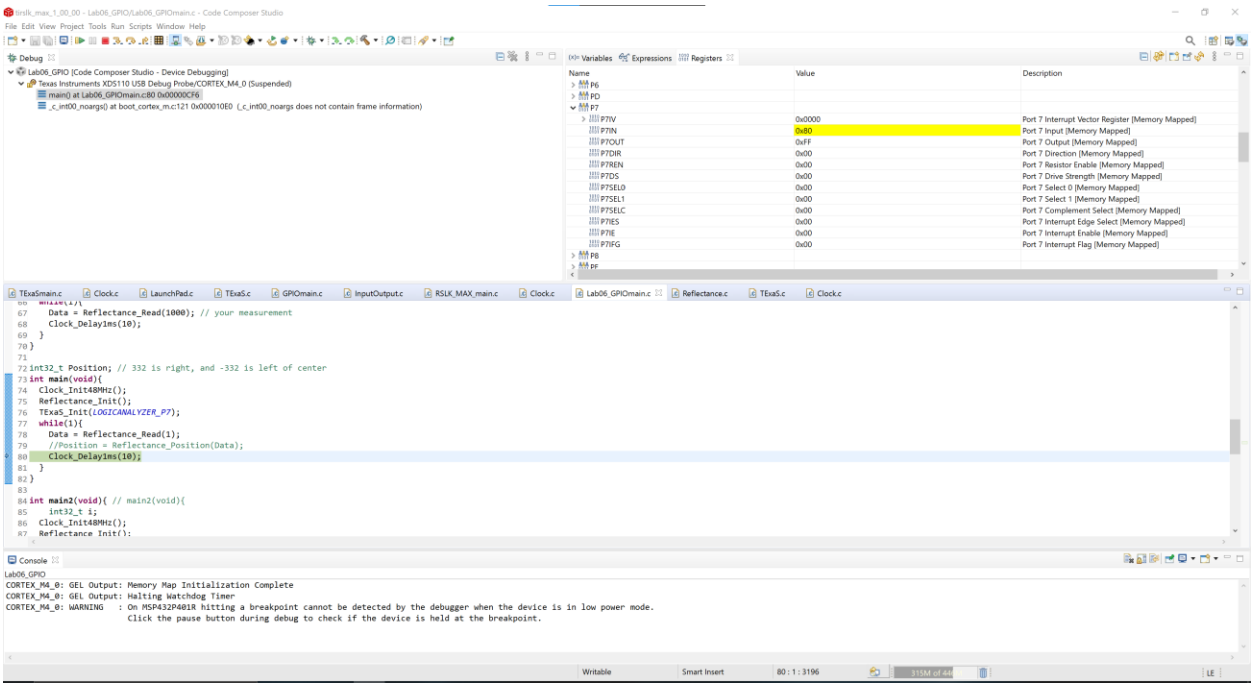


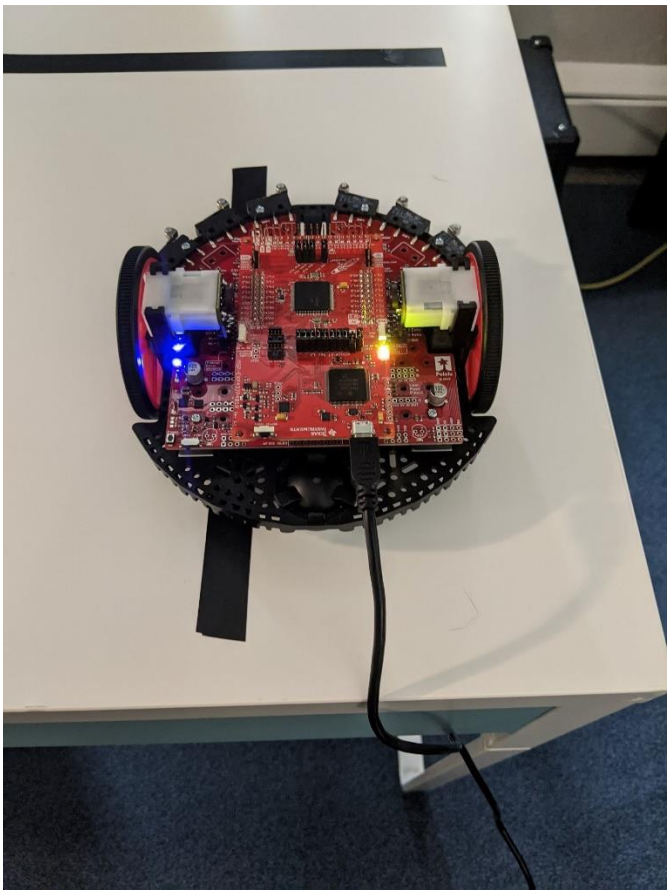
This was my initial reading before I had the battery power feeding to the sensor. After I had the battery power feeding, I ran a the regular main function to get an idea of the white/black ratio.

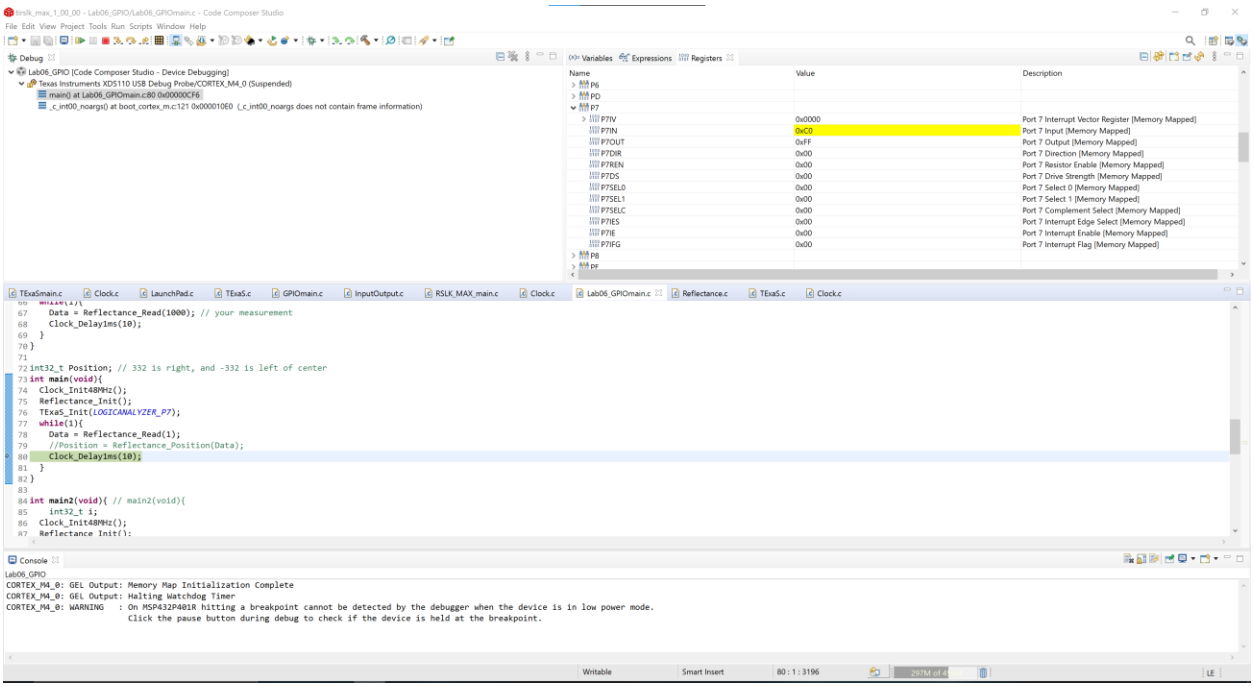
From this, I used 1ms as my value for white.



This photo was taken at the end of the experiment. Initially, it was just the vertical and horizontal pieces of tape, but at the end when I was doing the measurements, I added the piece of paper with a center line and 10, 20, and 33.4 measurements in both directions.


rslk_max_1_00_00 - Lab06_GPIO/Lab06_GPIOmain.c - Code Composer Studio
File Edit View Project Tools Run Scripts Window Help
Debug
Lab06_GPIO [Code Composer Studio - Device Debugging]
Texas Instruments XDS110 USB Debug Probe/CORTEX_M4_0 (Suspended)
main() at Lab06_GPIOmain.c:80 0x00000CF6
_c_int00_noargs() at boot_cortex_m.c:121 0x000010E0 (_c_int00_noargs does not contain frame information)
Variables
Expressions
Registers
Name
Value
Description
P6
PD
P7
P7IV
0x0000
Port 7 Interrupt Vector Register [Memory Mapped]
P7IN
0x80
Port 7 Input [Memory Mapped]
P7OUT
0xFF
Port 7 Output [Memory Mapped]
P7DIR
0x00
Port 7 Direction [Memory Mapped]
P7REN
0x00
Port 7 Resistor Enable [Memory Mapped]
P7DS
0x00
Port 7 Drive Strength [Memory Mapped]
P7SEL0
0x00
Port 7 Select 0 [Memory Mapped]
P7SEL1
0x00
Port 7 Select 1 [Memory Mapped]
P7SELC
0x00
Port 7 Complement Select [Memory Mapped]
P7IES
0x00
Port 7 Interrupt Edge Select [Memory Mapped]
P7IE
0x00
Port 7 Interrupt Enable [Memory Mapped]
P7IFG
0x00
Port 7 Interrupt Flag [Memory Mapped]
P8
PF
TExaSmain.c
Clock.c
LaunchPad.c
TExaS.c
GPIOmain.c
InputOutput.c
RSLK_MAX_main.c
Clock.c
Lab06_GPIOmain.c
Reflectance.c
TExaS.c
Clock.c
Data = Reflectance_Read(1000); // your measurement
Clock_Delay1ms(10);
}
}
int32_t Position; // 332 is right, and -332 is left of center
int main(void){
Clock_Init48MHz();
Reflectance_Init();
TExaS_Init(LOGICANALYZER_P7);
while(1){
Data = Reflectance_Read(1);
//Position = Reflectance_Position(Data);
Clock_Delay1ms(10);
}
}
int main2(void){ // main2(void){
int32_t i;
Clock_Init48MHz();
Reflectance_Init();
Console
Lab06_GPIO
CORTEX_M4_0: GEL Output: Memory Map Initialization Complete
CORTEX_M4_0: GEL Output: Halting Watchdog Timer
CORTEX_M4_0: WARNING : On MSP432P401R hitting a breakpoint cannot be detected by the debugger when the device is in low power mode.
Click the pause button during debug to check if the device is held at the breakpoint.
Writable
Smart Insert
80 : 1 : 3196




RSLK_MAX_1_00_00 - Lab06_GPIO/Lab06_GPIOmain.c - Code Composer Studio
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Expressions
Registers
Name
Value
Description
P6
PD
P7
P7IV
0x0000
Port 7 Interrupt Vector Register [Memory Mapped]
P7IN
0xC0
Port 7 Input [Memory Mapped]
P7OUT
0xFF
Port 7 Output [Memory Mapped]
P7DIR
0x00
Port 7 Direction [Memory Mapped]
P7REN
0x00
Port 7 Resistor Enable [Memory Mapped]
P7DS
0x00
Port 7 Drive Strength [Memory Mapped]
P7SEL0
0x00
Port 7 Select 0 [Memory Mapped]
P7SEL1
0x00
Port 7 Select 1 [Memory Mapped]
P7SELC
0x00
Port 7 Complement Select [Memory Mapped]
P7IES
0x00
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P7IE
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Port 7 Interrupt Enable [Memory Mapped]
P7IFG
0x00
Port 7 Interrupt Flag [Memory Mapped]
P8
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int main(void){
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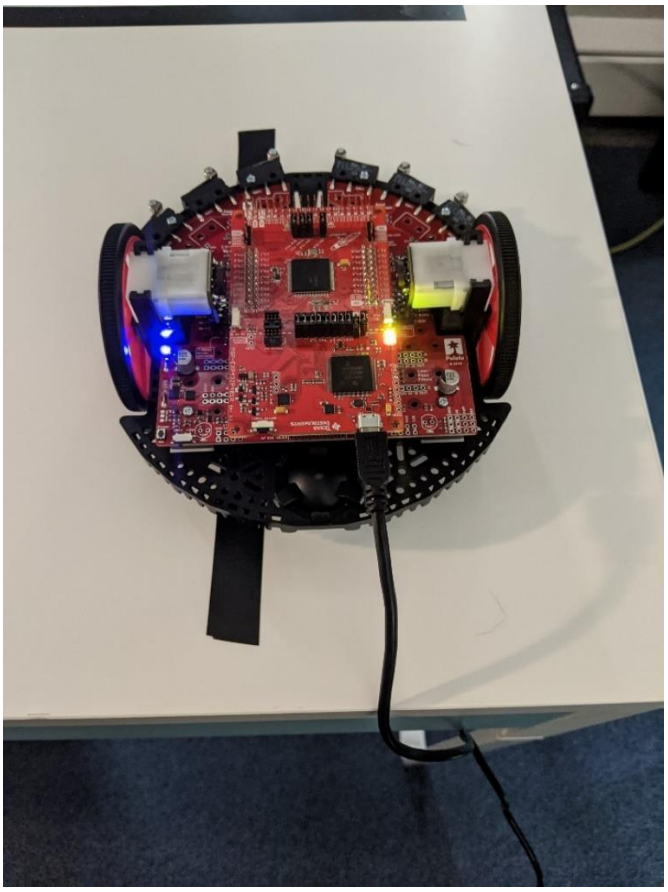

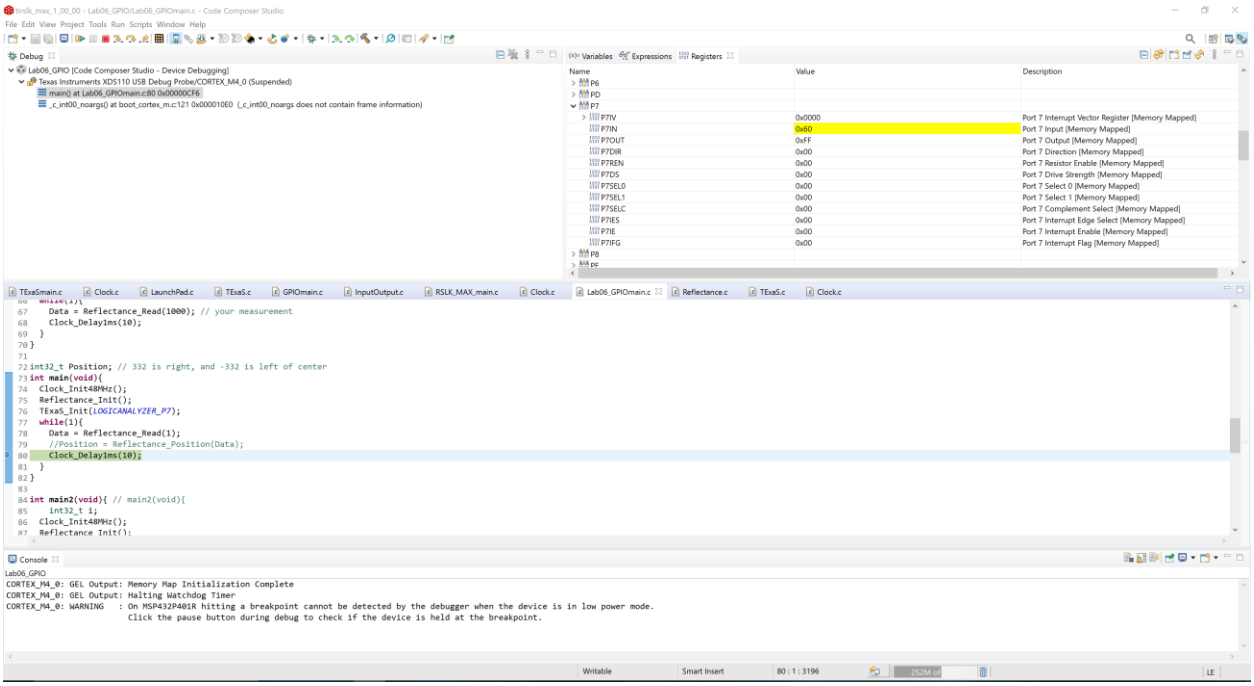
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Variables
Expressions
Registers
Name
Value
Description
P6
P0
P7
P7IV 0x0000 Port 7 Interrupt Vector Register [Memory Mapped]
P7IN 0x60 Port 7 Input [Memory Mapped]
P7OUT 0xFF Port 7 Output [Memory Mapped]
P7DIR 0x00 Port 7 Direction [Memory Mapped]
P7REN 0x00 Port 7 Resistor Enable [Memory Mapped]
P7DS 0x00 Port 7 Drive Strength [Memory Mapped]
P7SEL0 0x00 Port 7 Select 0 [Memory Mapped]
P7SEL1 0x00 Port 7 Select 1 [Memory Mapped]
P7SELC 0x00 Port 7 Complement Select [Memory Mapped]
P7IES 0x00 Port 7 Interrupt Edge Select [Memory Mapped]
P7IE 0x00 Port 7 Interrupt Enable [Memory Mapped]
P7IFG 0x00 Port 7 Interrupt Flag [Memory Mapped]
P8
PF
TExaSmain.c
Clock.c
LaunchPad.c
TExaS.c
GPIOmain.c
InputOutput.c
RSLK_MAX_main.c
Clock.c
Lab06_GPIOmain.c
Reflectance.c
TExaS.c
Clock.c
Data = Reflectance_Read(1000); // your measurement
Clock_Delay1ms(10);
}
}
int32_t Position; // 332 is right, and -332 is left of center
int main(void){
Clock_Init48MHz();
Reflectance_Init();
TExaS_Init(LOGICANALYZER_P7);
while(1){
Data = Reflectance_Read(1);
//Position = Reflectance_Position(Data);
Clock_Delay1ms(10);
}
}
int main2(void){ // main2(void){
int32_t i;
Clock_Init48MHz();
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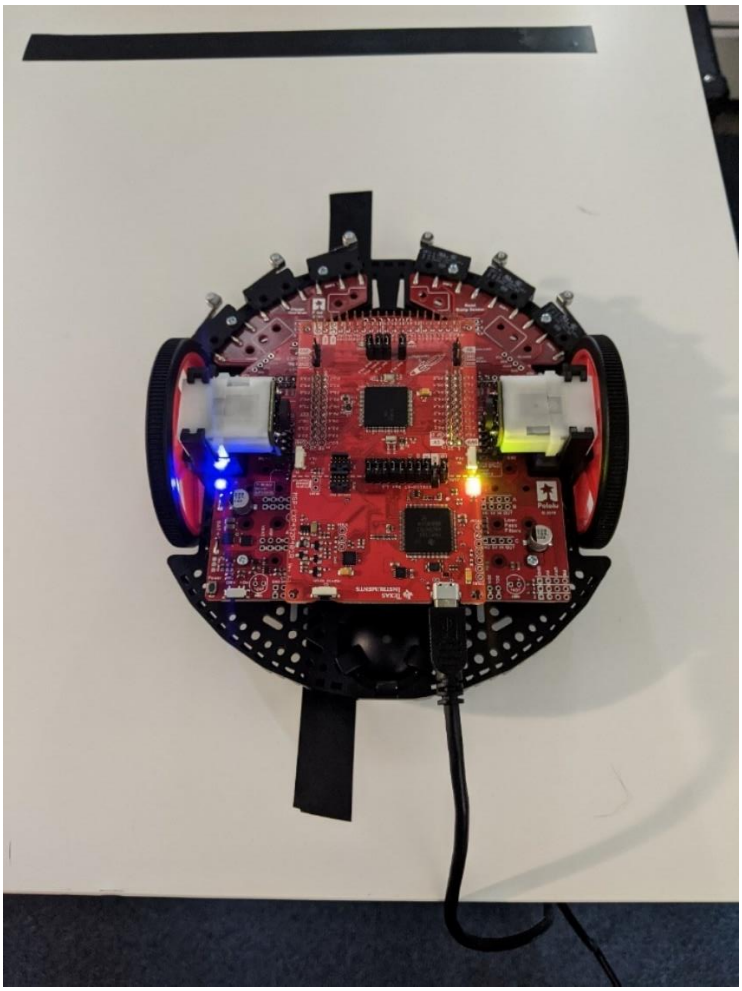

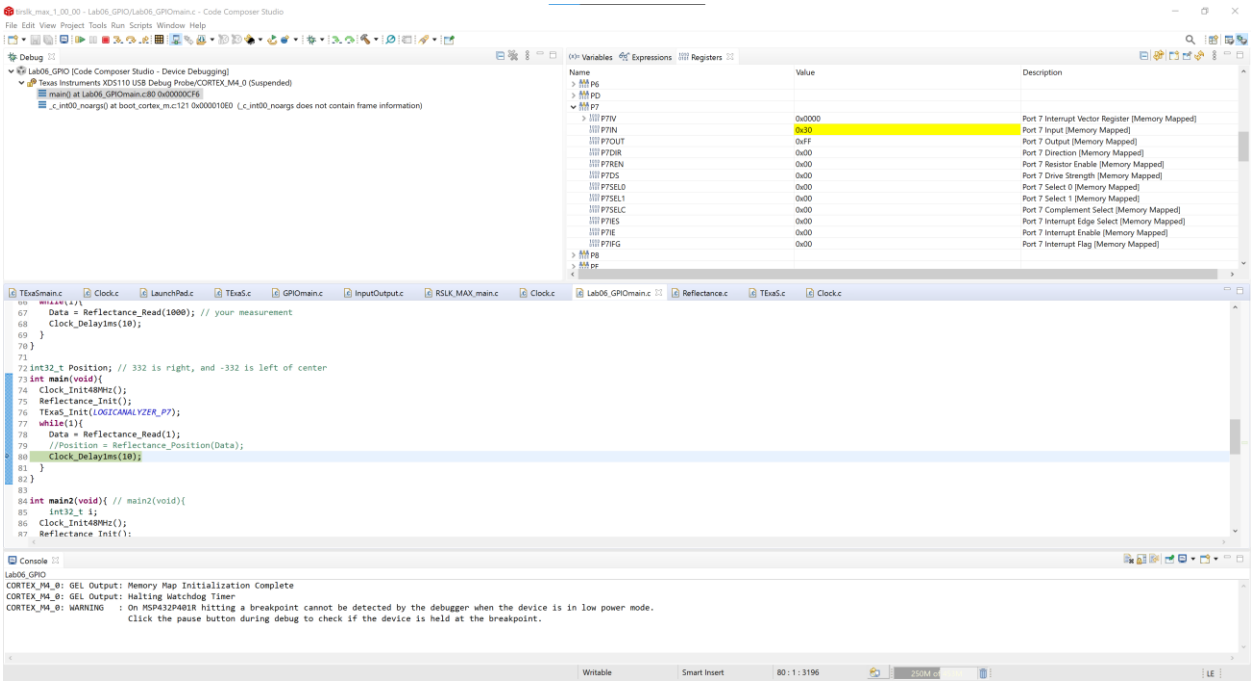
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Name
Value
Description
P6
PD
P7
P7IV
0x0000
Port 7 Interrupt Vector Register [Memory Mapped]
P7IN
0x30
Port 7 Input [Memory Mapped]
P7OUT
0xFF
Port 7 Output [Memory Mapped]
P7DIR
0x00
Port 7 Direction [Memory Mapped]
P7REN
0x00
Port 7 Resistor Enable [Memory Mapped]
P7DS
0x00
Port 7 Drive Strength [Memory Mapped]
P7SEL0
0x00
Port 7 Select 0 [Memory Mapped]
P7SEL1
0x00
Port 7 Select 1 [Memory Mapped]
P7SELC
0x00
Port 7 Complement Select [Memory Mapped]
P7IES
0x00
Port 7 Interrupt Edge Select [Memory Mapped]
P7IE
0x00
Port 7 Interrupt Enable [Memory Mapped]
P7IFG
0x00
Port 7 Interrupt Flag [Memory Mapped]
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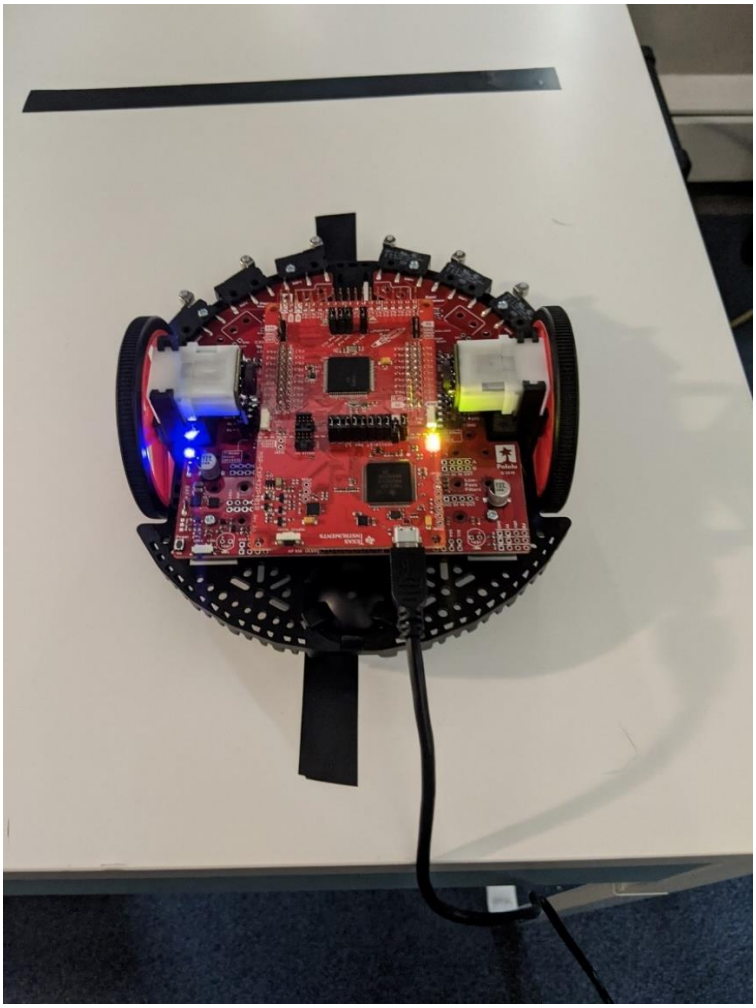

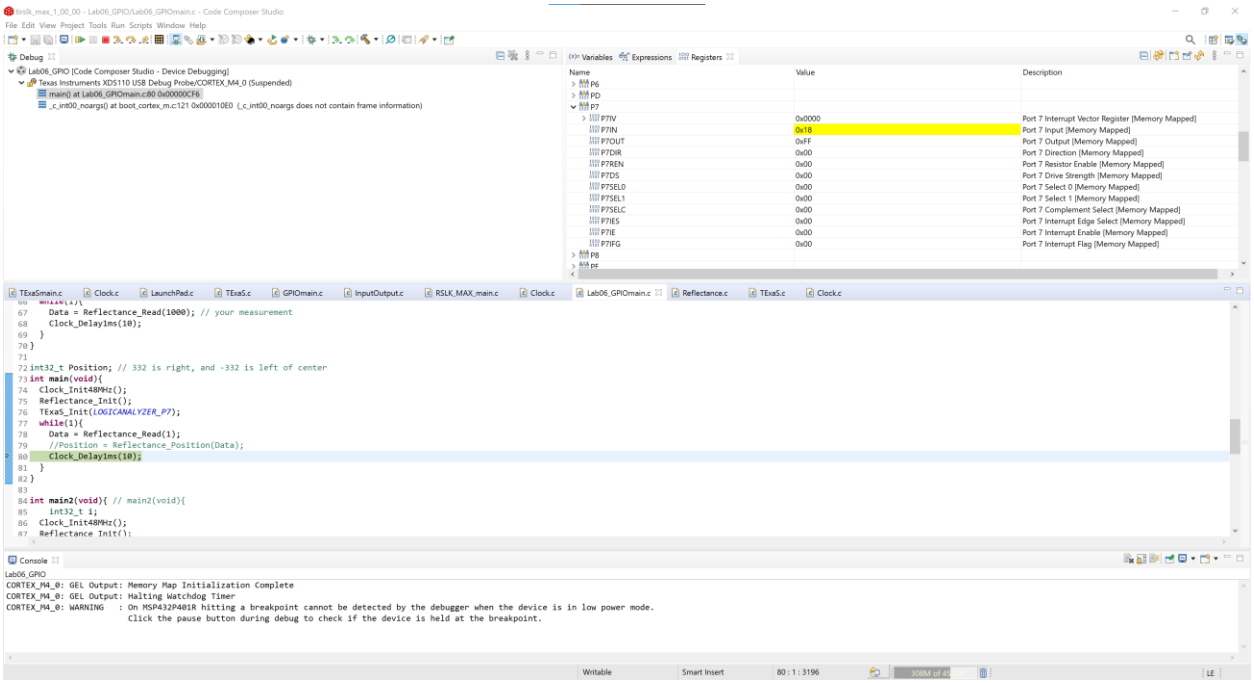
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Texas Instruments XDS110 USB Debug Probe/CORTEX_M4_0 (Suspended)
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Variables
Expressions
Registers
Name
Value
Description
P6
PD
P7
P7IV 0x0000 Port 7 Interrupt Vector Register [Memory Mapped]
P7IN 0x18 Port 7 Input [Memory Mapped]
P7OUT 0xFF Port 7 Output [Memory Mapped]
P7DIR 0x00 Port 7 Direction [Memory Mapped]
P7REN 0x00 Port 7 Resistor Enable [Memory Mapped]
P7DS 0x00 Port 7 Drive Strength [Memory Mapped]
P7SEL0 0x00 Port 7 Select 0 [Memory Mapped]
P7SEL1 0x00 Port 7 Select 1 [Memory Mapped]
P7SELC 0x00 Port 7 Complement Select [Memory Mapped]
P7IES 0x00 Port 7 Interrupt Edge Select [Memory Mapped]
P7IE 0x00 Port 7 Interrupt Enable [Memory Mapped]
P7IFG 0x00 Port 7 Interrupt Flag [Memory Mapped]
P8
PF
TExaSmain.c
Clock.c
LaunchPad.c
TExaS.c
GPIOmain.c
InputOutput.c
RSLK_MAX_main.c
Clock.c
Lab06_GPIOmain.c
Reflectance.c
TExaS.c
Clock.c
Data = Reflectance_Read(1000); // your measurement
Clock_Delay1ms(10);
}
}
int32_t Position; // 332 is right, and -332 is left of center
int main(void){
Clock_Init48MHz();
Reflectance_Init();
TExaS_Init(LOGICANALYZER_P7);
while(1){
Data = Reflectance_Read(1);
//Position = Reflectance_Position(Data);
Clock_Delay1ms(10);
}
}
int main2(void){ // main2(void){
int32_t i;
Clock_Init48MHz();
Reflectance_Init();
Console
Lab06_GPIO
CORTEX_M4_0: GEL Output: Memory Map Initialization Complete
CORTEX_M4_0: GEL Output: Halting Watchdog Timer
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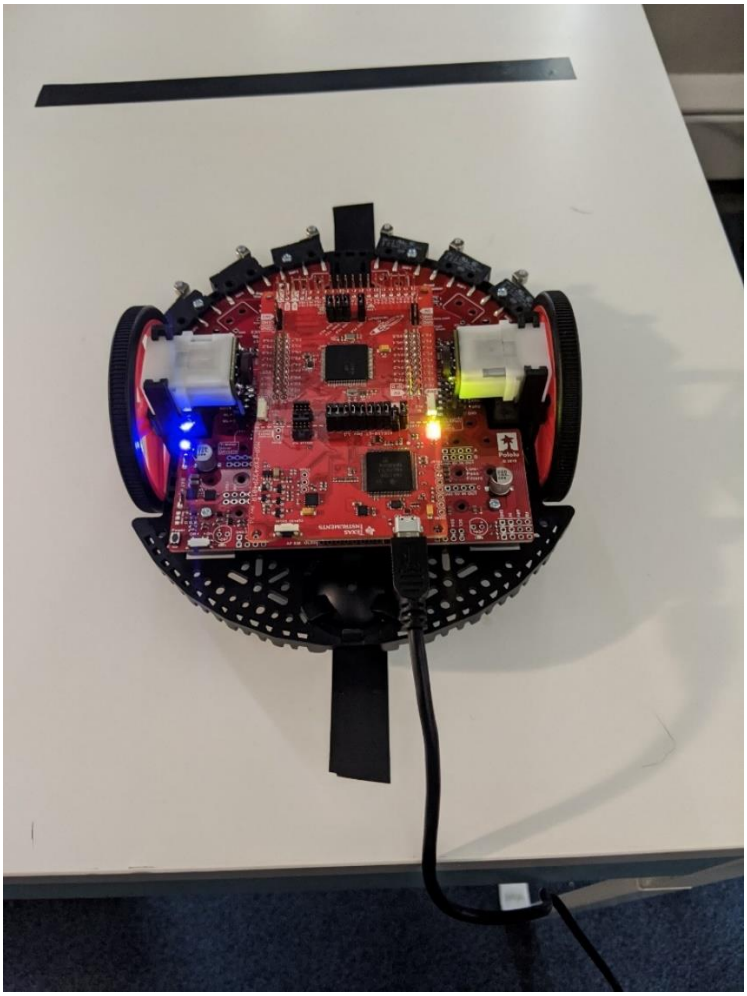

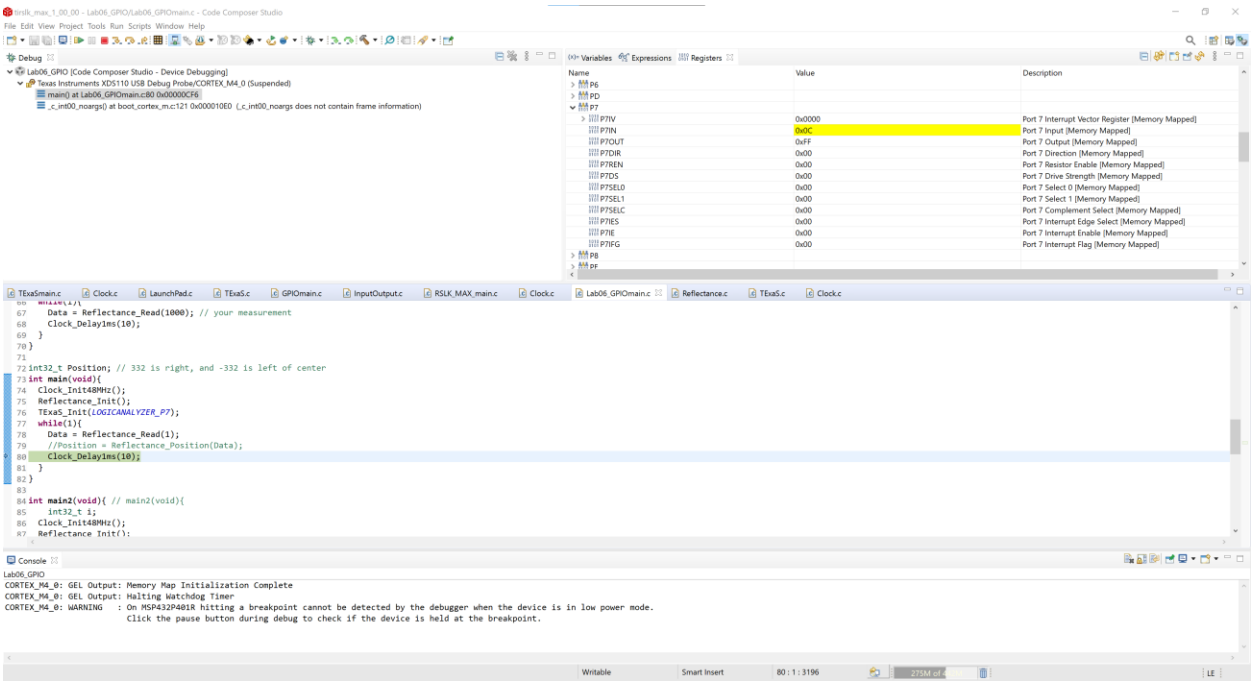
rslk_max_1_00_00 - Lab06_GPIO/Lab06_GPIOmain.c - Code Composer Studio
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Variables
Expressions
Registers
Name
Value
Description
P6
P0
P7
P71V
0x0000
Port 7 Interrupt Vector Register [Memory Mapped]
P71N
0x0C
Port 7 Input [Memory Mapped]
P7OUT
0xFF
Port 7 Output [Memory Mapped]
P7DIR
0x00
Port 7 Direction [Memory Mapped]
P7REN
0x00
Port 7 Resistor Enable [Memory Mapped]
P7DS
0x00
Port 7 Drive Strength [Memory Mapped]
P7SEL0
0x00
Port 7 Select 0 [Memory Mapped]
P7SEL1
0x00
Port 7 Select 1 [Memory Mapped]
P7SELC
0x00
Port 7 Complement Select [Memory Mapped]
P7IES
0x00
Port 7 Interrupt Edge Select [Memory Mapped]
P7IE
0x00
Port 7 Interrupt Enable [Memory Mapped]
P7IFG
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Port 7 Interrupt Flag [Memory Mapped]
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TExaSmain.c
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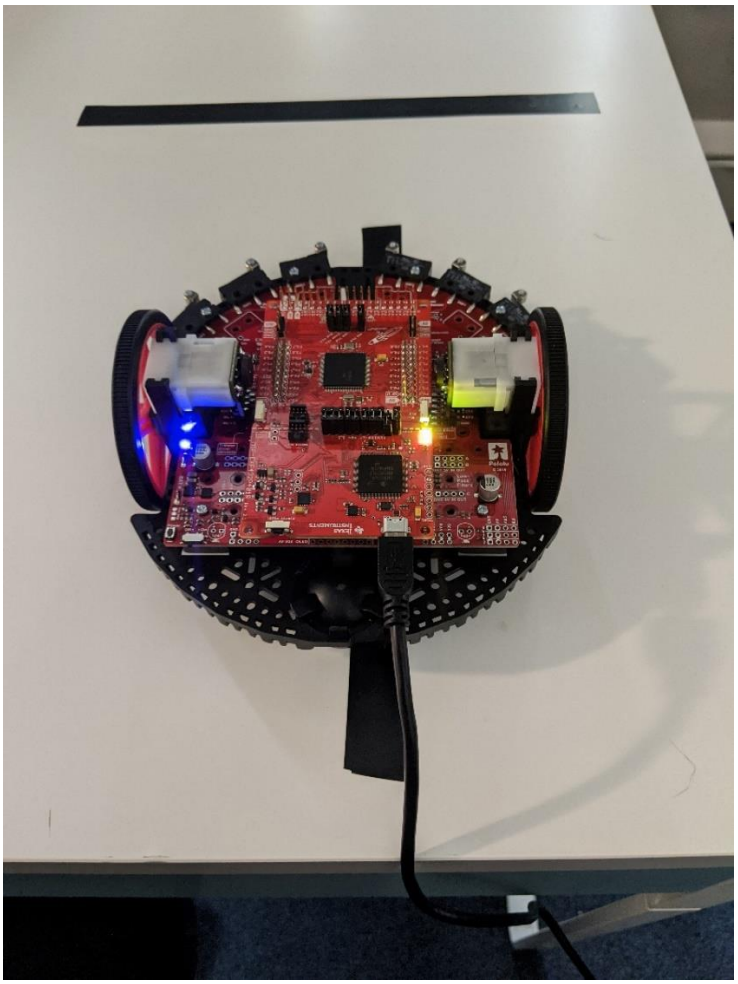

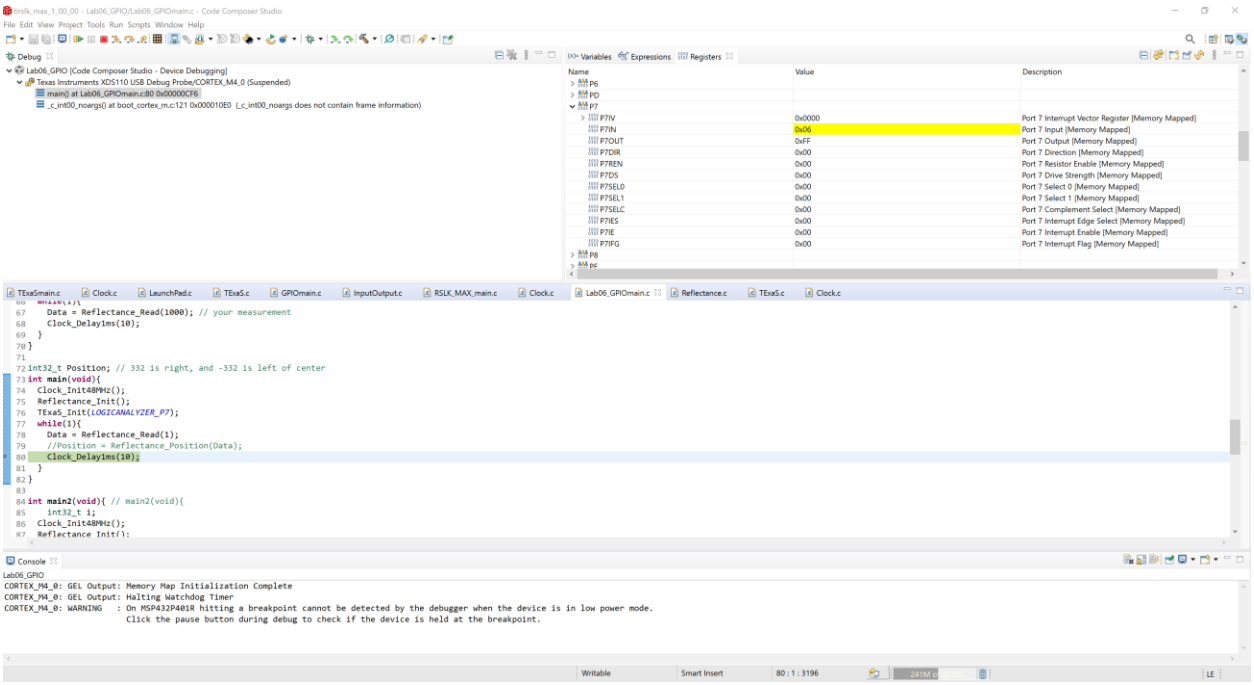
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Lab06_GPIO [Code Composer Studio - Device Debugging]
Texas Instruments XDS110 USB Debug Probe/CORTEX_M4_0 (Suspended)
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_c_int00_noargs() at boot_cortex_m.c:121 0x000010E0
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Expressions
Registers
Name
Value
Description
P7IV 0x0000 Port 7 Interrupt Vector Register [Memory Mapped]
P7IN 0x06 Port 7 Input [Memory Mapped]
P7OUT 0xFF Port 7 Output [Memory Mapped]
P7DIR 0x00 Port 7 Direction [Memory Mapped]
P7REN 0x00 Port 7 Resistor Enable [Memory Mapped]
P7DS 0x00 Port 7 Drive Strength [Memory Mapped]
P7SEL0 0x00 Port 7 Select 0 [Memory Mapped]
P7SEL1 0x00 Port 7 Select 1 [Memory Mapped]
P7SELC 0x00 Port 7 Complement Select [Memory Mapped]
P7IES 0x00 Port 7 Interrupt Edge Select [Memory Mapped]
P7IE 0x00 Port 7 Interrupt Enable [Memory Mapped]
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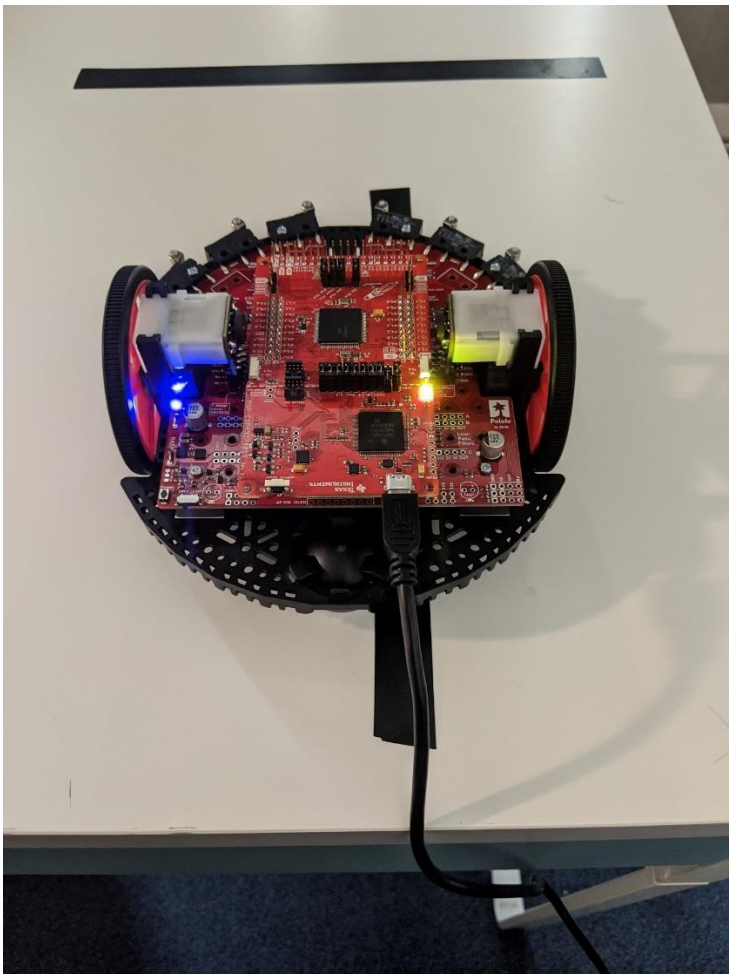
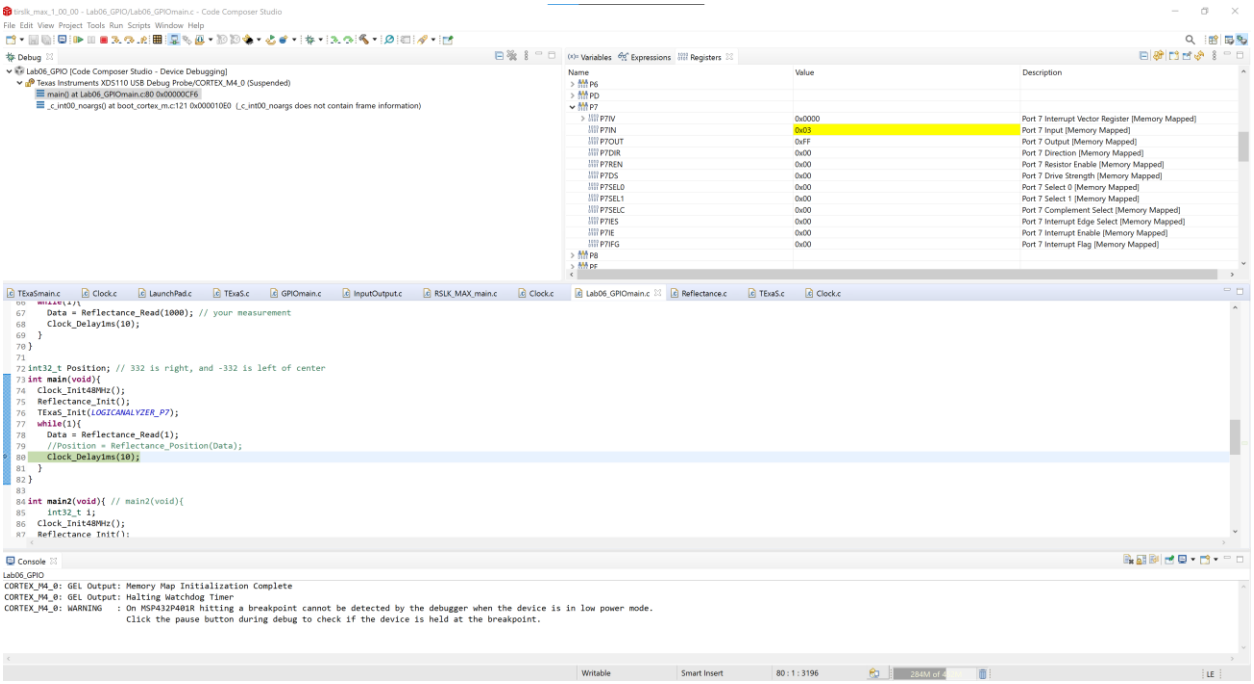
Lab06_GPIO
CORTEX_M4_0: GEL Output: Memory Map Initialization Complete
CORTEX_M4_0: GEL Output: Halting Watchdog Timer
CORTEX_M4_0: WARNING : On MSP432P401R hitting a breakpoint cannot be detected by the debugger when the device is in low power mode.
Click the pause button during debug to check if the device is held at the breakpoint.
Writable
Smart Insert
80 : 1 : 3196




Debug
Lab06_GPIO [Code Composer Studio - Device Debugging]
Texas Instruments XDS110 USB Debug Probe/CORTEX_M4_0 (Suspended)
main() at Lab06_GPIOmain.c:80 0x00000CF6
_c_int00_noargs() at boot_cortex_m.c:121 0x000010E0
Variables
Expressions
Registers
Name
Value
Description
P7IV
0x0000
Port 7 Interrupt Vector Register [Memory Mapped]
P7IN
0x03
Port 7 Input [Memory Mapped]
P7OUT
0xFF
Port 7 Output [Memory Mapped]
P7DIR
0x00
Port 7 Direction [Memory Mapped]
P7REN
0x00
Port 7 Resistor Enable [Memory Mapped]
P7DS
0x00
Port 7 Drive Strength [Memory Mapped]
P7SEL0
0x00
Port 7 Select 0 [Memory Mapped]
P7SEL1
0x00
Port 7 Select 1 [Memory Mapped]
P7SELC
0x00
Port 7 Complement Select [Memory Mapped]
P7IES
0x00
Port 7 Interrupt Edge Select [Memory Mapped]
P7IE
0x00
Port 7 Interrupt Enable [Memory Mapped]
P7IFG
0x00
Port 7 Interrupt Flag [Memory Mapped]
TExaSmain.c
Clock.c
LaunchPad.c
TExaS.c
GPIOmain.c
InputOutput.c
RSLK_MAX_main.c
Clock.c
Lab06_GPIOmain.c
Reflectance.c
TExaS.c
Clock.c
Data = Reflectance_Read(1000); // your measurement
Clock_Delay1ms(10);
}
}
int32_t Position; // 332 is right, and -332 is left of center
int main(void){
Clock_Init48MHz();
Reflectance_Init();
TExaS_Init(LOGICANALYZER_P7);
while(1){
Data = Reflectance_Read(1);
//Position = Reflectance_Position(Data);
Clock_Delay1ms(10);
}
}
int main2(void){ // main2(void){
int32_t i;
Clock_Init48MHz();
Reflectance_Init();
Console
Lab06_GPIO
CORTEX_M4_0: GEL Output: Memory Map Initialization Complete
CORTEX_M4_0: GEL Output: Halting Watchdog Timer
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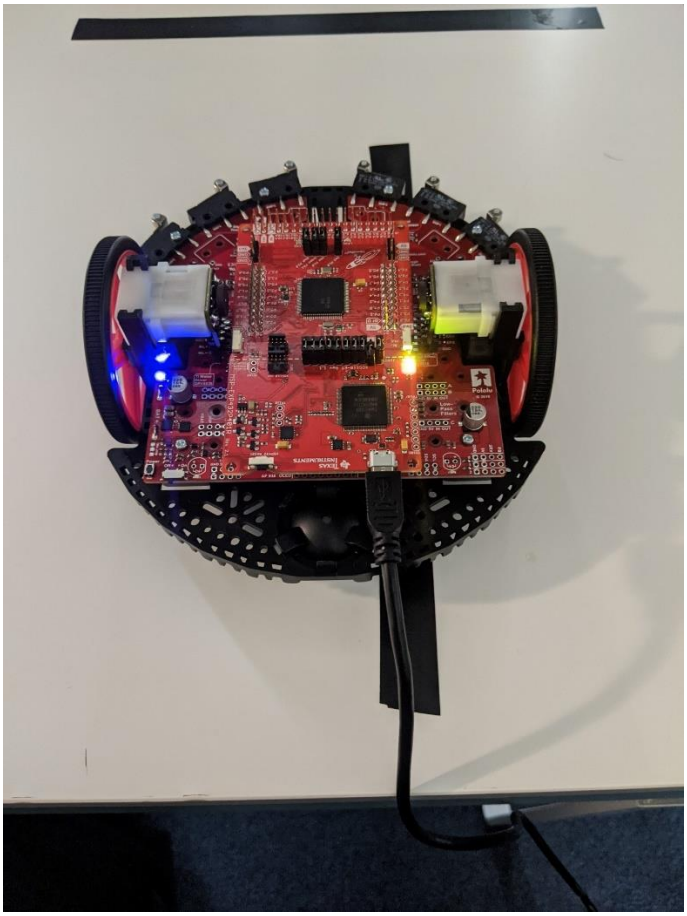

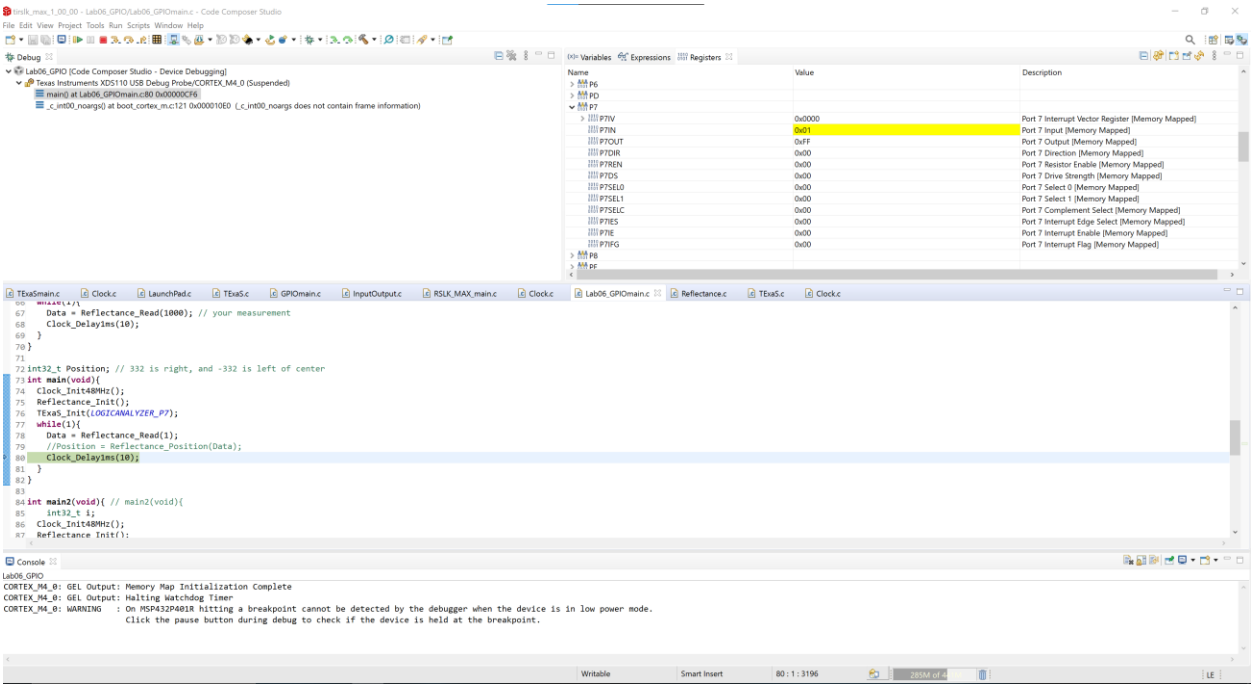
slsllk_max_1_00_00 - Lab06_GPIO/Lab06_GPIOmain.c - Code Composer Studio
File Edit View Project Tools Run Scripts Window Help
Debug
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Texas Instruments XDS110 USB Debug Probe/CORTEX_M4_0 (Suspended)
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Expressions
Registers
Name
Value
Description
P6
P0
P7
P7IV
0x0000
Port 7 Interrupt Vector Register [Memory Mapped]
P7IN
0x01
Port 7 Input [Memory Mapped]
P7OUT
0xFF
Port 7 Output [Memory Mapped]
P7DIR
0x00
Port 7 Direction [Memory Mapped]
P7REN
0x00
Port 7 Resistor Enable [Memory Mapped]
P7DS
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Port 7 Drive Strength [Memory Mapped]
P7SEL0
0x00
Port 7 Select 0 [Memory Mapped]
P7SEL1
0x00
Port 7 Select 1 [Memory Mapped]
P7SELC
0x00
Port 7 Complement Select [Memory Mapped]
P7IES
0x00
Port 7 Interrupt Edge Select [Memory Mapped]
P7IE
0x00
Port 7 Interrupt Enable [Memory Mapped]
P7IFG
0x00
Port 7 Interrupt Flag [Memory Mapped]
P8
PF
TExaSmain.c
Clock.c
LaunchPad.c
TExaS.c
GPIOmain.c
InputOutput.c
RSLK_MAX_main.c
Clock.c
Lab06_GPIOmain.c
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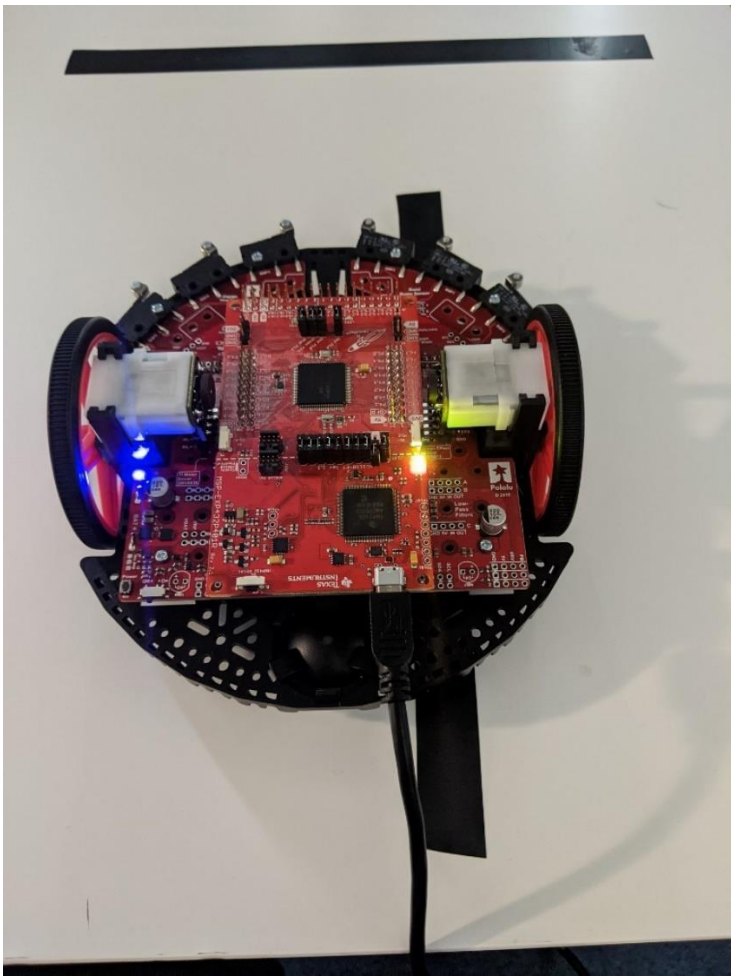

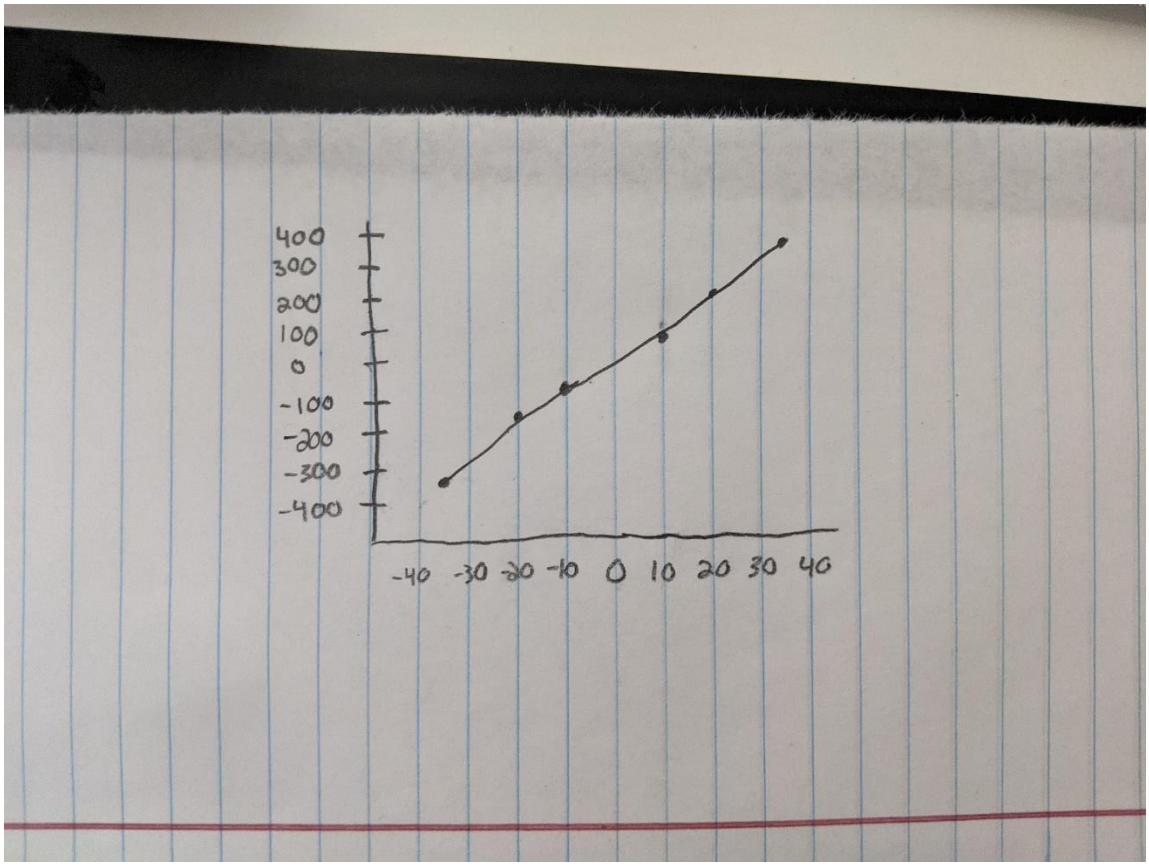

The response is monotonic, and this is important for this sensor because if it was not monotonic, as we make the adjustments to get closer to the middle, it would not respond as we want it to. The stabilization would cause hard turns and over compensation, followed by harder ones until it was thrown so far off track that it couldn't find the line again.

In my experiment, it did not seem like there was any regions of noise, but it was obvious that the sensor was rounding to its data points and not giving perfectly accurate data. This was seen when I measured 10 and 20mm from the center and was getting 9.5 and 19.0 respectively. Whenever I tried at different angles, it seemed to pick up on 2 or 3 sensors, but that will be able to be adjusted when we are driving the motors. The reason that I feel that this should be tackled later, is because if we are traveling at a hard angle, the next reading to the sensor will be further out and we will have more data points to verify that it is going a direction that is not perpendicular to the line. It is much easier to tell this with 2 data sets than just 1.