egr 3X4

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Team 202 Microcontroller Selection

1. Determine your project-specific requirements		**3. Look up specifications in the PIC datasheet**		
Design Considerations	**Team Project-Specific Requirements** from Problem Definition and Block Diagram	PIC16F15256-E/STX	PIC18F05Q41-I/SL	PIC24FJ64GA702-I/SO
How many GPIO Pins?[1]	2 I2C, 4 UART, 6 GPIO	26	12	22
Built-in Analog to Digital Converter? How many?	None	17	11	10
Built-in Hardware PWM? How many?	None	2	3	3
Built-in I2C? SPI? How many?	>=1 I2C	1 MSSP	2 SPI/1 I2C	1 SPI, 2 I2C
Built-in UART? How many?	2 UART (ESP32, and debug)	1	2	2
Other Required Built-In Features? *(optional)*				
Additional considerations specific to your project specifications *(optional)*	Amount of program memory	28k	32k	64k

[1] No PIC16F887, PIC16F917, PIC18F47Q10, or dsPICs allowed

2. Find 3 microcontrollers that meet your team project-specific requirements and find information on each		4. Look up part details in the PIC datasheet		
Microcontroller Considerations	**Instructions**	**PIC Option 1**	**PIC Option 2**	**PIC Option 3**
Part Number[2]	*Include the entire part number (leave off any letters at the end that specify the package type)*	**PIC16F15256**	**PIC18F05Q41**	**PIC24FJ64GA702**
Link (URL) to product page	*Do not paste links directly into the table. Instead, link them like this.*	Microchip	Microchip	Microchip
Links (URL) to Data Sheets		Datasheet	Datasheet	Datasheet
Links (URL) to Application Notes	*Often provided by manufacturers to give you specific examples of how to use their products. Search for them in the search bar on the Microchip's website.*	Microchip	Microchip	Microchip
Links (URL) to Code Examples		Microchip	Microchip	Microchip
Links (URL) to External Resources	*Search on Google and YouTube for other resources for each specific microcontroller.*	Video	Forum post	Forum posts
Production Unit Cost	*Find in the Microchip online store, or Digikey*	$1.39	$1.41	$1.90
Supply Voltage Range	*Find in the microcontroller datasheet*	1.8-5.5v	1.8-5.5v	2-3.6v

[2] General Purpose Input/Output Pins - calculate based on your block diagram and include at least 20% more than you need. Avoid using In-System Programming (ISP) pins for GPIO.

Absolute Maximum Current for entire IC	*Find in the microcontroller datasheet*	>=300mA	>=350mA	200mA
Maximum GPIO Pin Current (Source/Sink)	*Find in the microcontroller datasheet*	25mA	50mA	25mA
8-bit or 16-bit Architecture	*Find in the microcontroller datasheet*	8 bit	8 bit	16 bit
Available IC Packages / Footprints	*Find in the microcontroller datasheet. Choose a microcontroller with both surface mount and DIP/through-hole packages available. See Most Common Mistakes below for requirements to improve manufacturing reliability.*	SPDIP28, SOIC28, SSOP28, VQFN28	SOIC28, PDIP28, QFN28, SSOP28	SOIC28, SSOP28, QFN28, UQFN28
Supports External Interrupts?	*Find in the microcontroller datasheet*	1 external	3 external	5 external
In-System Programming Capability and Type	*Allows for programming the microcontroller without removing it from the PCB. Find in the microcontroller datasheet.*	ICSP, 2 pins	ICSP, 2 pins	ICSP, 2 pins
Programming Hardware, Cost, and URL	*Find on the microcontroller product page*	PICkit 4, $77	PICkit 4, $77	PICkit 4, $77
Works with MPLAB® X Integrated Development Environment (IDE)?	*Required. See Microchip Development Tools*	Yes	Yes	Yes

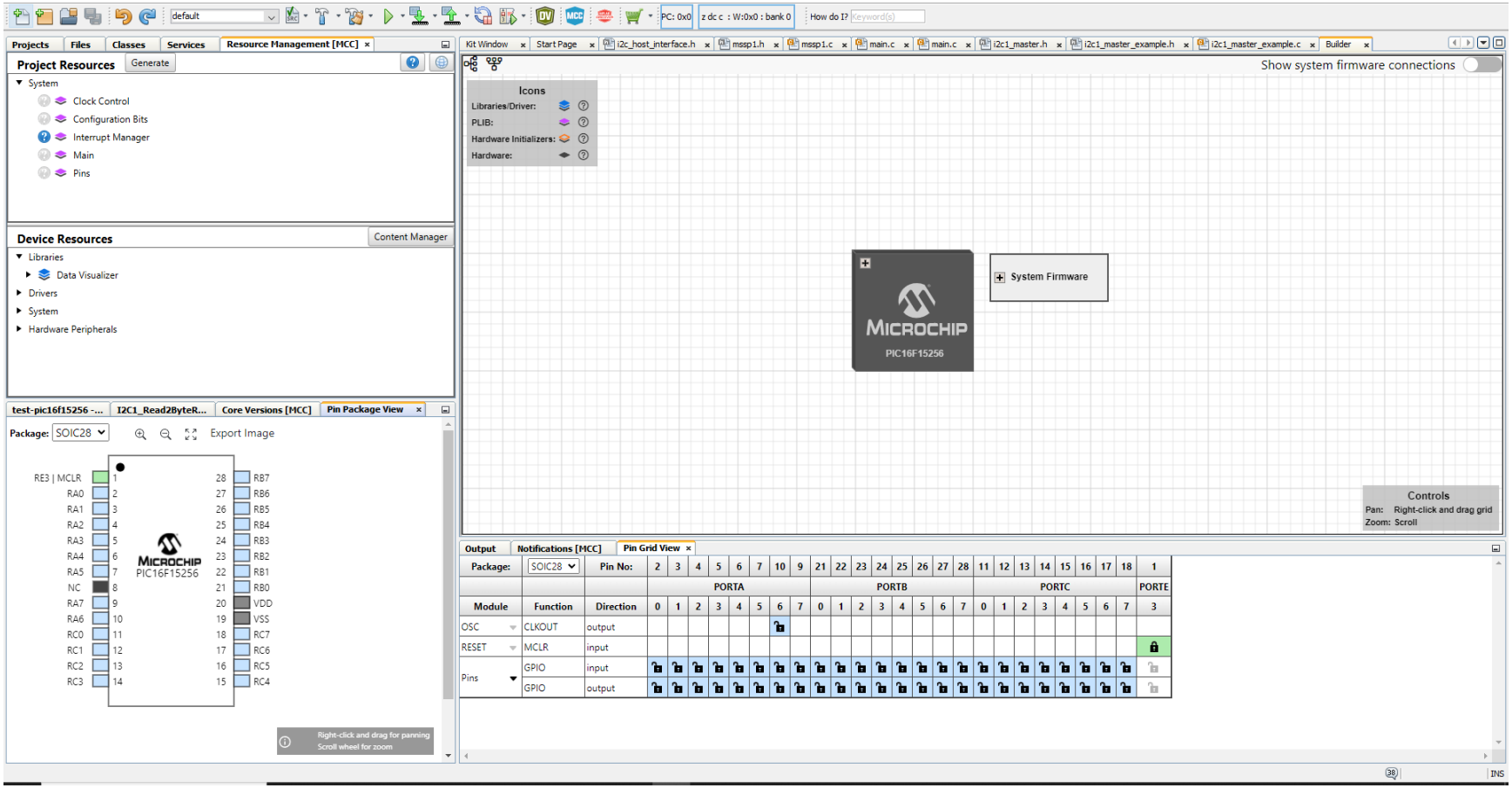
Works with Microchip Code Configurator?	*Required. Go to the MCC website, click the "Manual Downloads" tab, scroll to the device library that goes with the PIC you chose (likely "MCC 8-bit PIC") and read the release notes to make sure your microcontroller is in the list of supported devices.*	Yes	Yes	Yes, currently only in classic

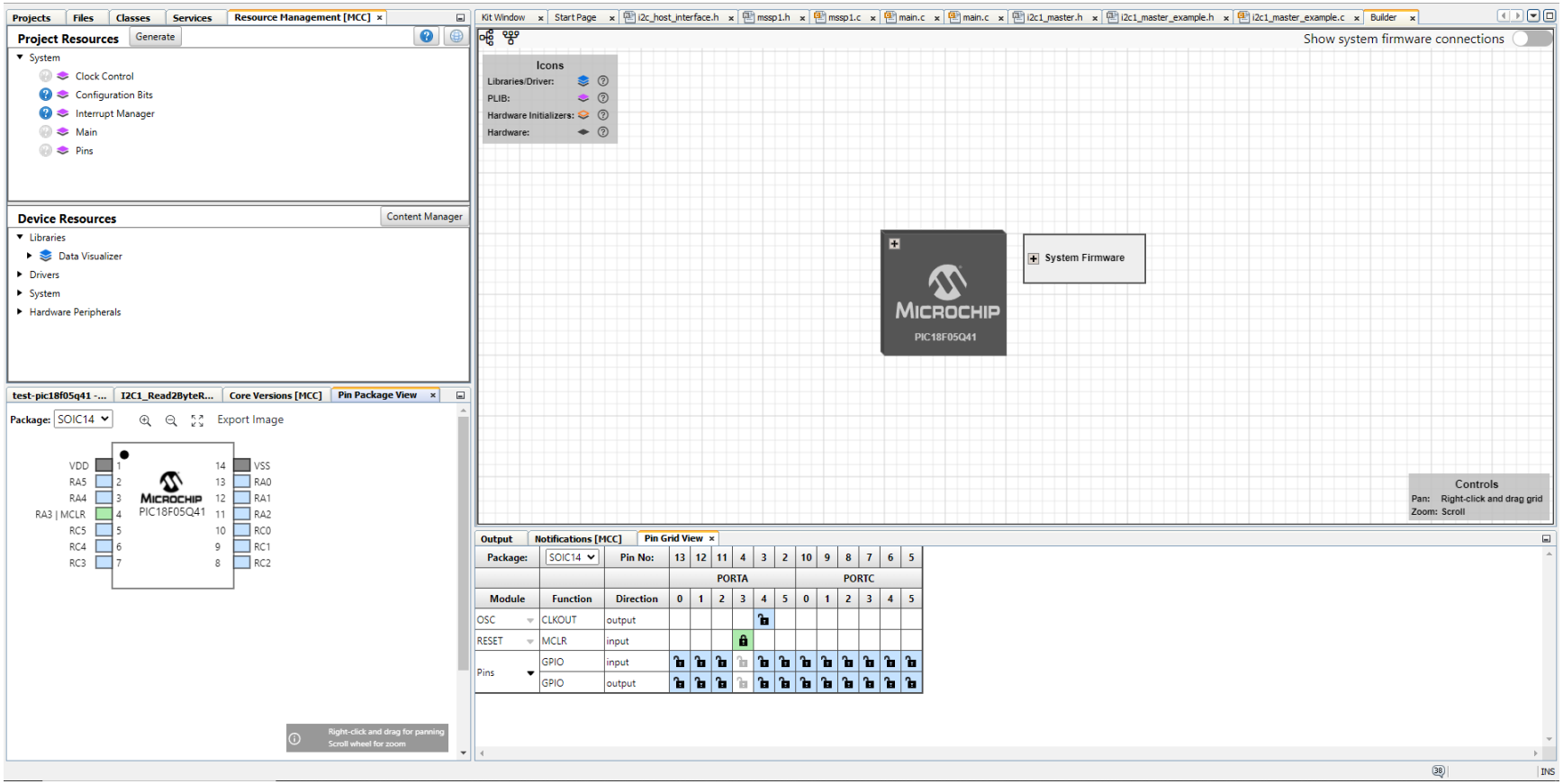
5. Write overall pros, cons, and rankings for the chosen microcontrollers				
Overall Pros	*Write at least 2 for each microcontroller*	• **High max current rating** • **Supports in circuit programming**	• **Sufficient number of USARTs** • **3 external interrupts** • **Full Classic and Melody MCC support**	• **Sufficient number of USARTs** • **5 external interrupts** • **Multiple I2C peripherals**
Overall Cons	*Write at least 2 for each microcontroller*	• **Low program memory size** • **Insufficient number of USARTs**	• **Only 12 GPIO pins** • **Only 1 I2C peripheral**	• **Low max current rating** • **Not supported in MCC Melody**
Ranking	*1 = first, 2 = second, 3 = third*	**3**	**2**	**1**

6. Final Microcontroller Choice: PIC24FJ64GA702-I/SO (28-SOIC package)

Rationale: This PIC has the largest program memory of the models evaluated and has multiple EUSART peripherals to support debugging, while keeping a small footprint and low power usage. Having multiple I2C peripherals will enable separation between sensors, if needed.

PIC16F15256





PIC24FJ64GA702