There will be four main types of messages to be used in the communication between the Raspberry Pi and the Arduino: actionable and setting commands from the Pi and the Arduino's response to each of those

Raspberry Pi:

Actionable Commands

name, ID

Actionable commands are commands sent form the Raspberry Pi that require some action and response from the Arduino. Upon sending these messages, the Pi will be immediately expecting an acknowledgement and ultimately a response to verify the success or failure of the command. Each of these responses will be described later in this document.

The variable name will be used to define what command was sent. The command names and their descriptions are listed below. All spelling, characters, and capitalization are critical.

openDoor

This command triggers the garage door but only does so if the door is currently closed.

closeDoor

This command triggers the garage door but only does so if the door is currently open.

checkStatus

This command queries for the current status of the garage door: open or closed. This command can be prompted by the user but will also be used continuously to monitor the status of the door in the event of an external garage door trigger

Raspberry Pi:
Setting Commands

set, ID, variable, value

A setting command is one sent from the Raspberry Pi to set or modify some setting variable in the Arduino code. This will predominately be used in the start-up and calibration of the system but can be used for other setting or troubleshooting purposes.

The word *set* will be used to signal that the information contained in the message is setting data. Variable will correspond to a variable name in the Arduino code and value will be its new value. Each variable and its value type is described below. All spelling, characters, and capitalization are critical.

garageDoorThreshold

The garageDoorThreshold variable dictates the value of the sensor above or below which indicates whether the garage door is open or closed. This variable is unique to the acoustic distance sensor. This will be set in the setup and calibration portion of the install.

The value for this variable will be of the type integer and will have units of centimeters.

garageDelay

garageDelay is the amount of time allotted to allow for the garage door to open or close. Once the garage door is commanded to close or open and once this prescribed time has passed, the system will then check the new status of the garage door to verify that the command was executed successfully. This variable will be set in the setup and calibration portion of the install.

The value for this variable will be of the type integer and will have units of seconds.

sampleCount

This variable is currently unique to the acoustic distance sensor and dictates the amount of measurements to record in order to calculate an average distance to account for any sensor issues.

The value for this variable will be of the type integer and is unit-less.

iterationAttempts

This variable sets the amount of times the system will unsuccessfully try to close or open the garage door before returning a failure response. This will likely not be a variable that will be changed remotely.

The value for this variable will be of the type integer and is unit-less.

Arduino:
Actionable Commands

name, ID, response

As mentioned earlier, the Arduino will send back two messages in response to a, actionable command: an immediate acknowledgement and an ultimate result. The name and ID variables will simply be a repeat of the initial command message. However, the variable response will change according to the situation. All spelling, characters, and capitalization are critical.

ack

This response will be used for the acknowledgment response sent immediately after receiving a command.

success

This response will be used once an action has been completed successfully.

failure

This response will be used if, once all attempts have been completed, a command was unable to be completed.

open

This response will be used in response to the checkStatus command and will indicate that the current garage door status is open.

closed

This response will be used in response to the checkStatus command and will indicate that the current garage door status is closed.

unknown

This response will indicate that the command received from the Raspberry Pi did not match any known commands in the Arduino code.

Arduino:

Setting Commands

set, ID, variable, value

The Arduino's response to setting commands will closely resemble those from the Raspberry Pi. The only difference is that the value will be pulled from the newly set Arduino variable to allow the Pi to verify a correct setting change.

For all the above messages, the variable ID will accompany each command to offer traceability of commands and potential debugging information in the event of errors. The table below outlines what ID series go with which command.

openDoor:	1-series
closeDoor:	2-series
checkStatus:	3-series
set:	4-series

The iteration through ID numbers will work so that the first number of the ID variable corresponds to the series to which the command belongs. The numbers following this first number will increase in value and in characters. For example, the checkStatus commands would be used as shown below:

checkStatus, 30
checkStatus, 31
checkStatus, 32
checkStatus, 33
…
checkStatus, 38
checkStatus, 39
checkStatus, 310
checkStatus, 311
…
checkStatus, 318
checkStatus, 319
checkStatus, 320
checkStatus, 321
…
checkStatus, 398
checkStatus, 399
checkStatus, 3100
checkStatus, 3101

IDs will be incremented in this way for a couple reasons. The first is the simplicity it provides in code implementation. However, it also allows for a larger quantity (theoretically infinite) of command IDs before having to reset and start at the beginning ID.

Because of how many characters each ID could eventually contain, it will be recommended to recycle each ID either on a time-based cycle or once it reaches a certain number of characters. For example, IDs could be reset once they reach five characters or they could be reset on a daily basis. This is especially important with the checkStatus command since it will be called approximately every 10 seconds (8,640 times per day).