Portable Sensor Bay

ETC 423 – Microprocessor Interfacing
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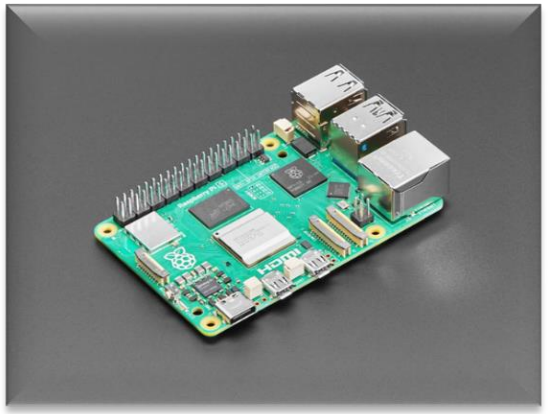
Introduction

- Portable, modular sensor bay built with Raspberry Pi 5 + 7” touchscreen
- Easy Swappable Sensor Port
- Real-time data visualization for technicians in the field
- Reduces tool load by allowing for multiple sensors on one platform
- Designed for predictive maintenance in industrial environments (e.g., Amazon fulfillment centers)
- Scalable → supports future sensors and applications

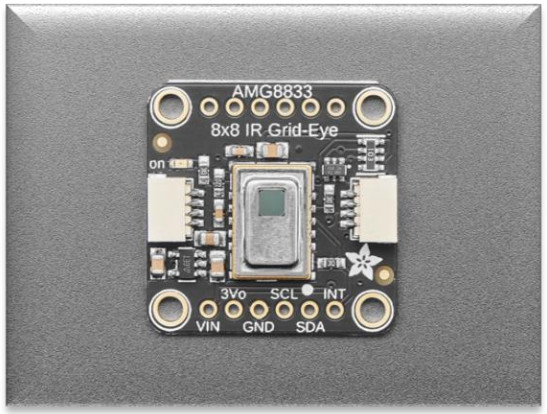
Key Features

Pi Foundation Display - 7" Touchscreen Display for Raspberry Pi

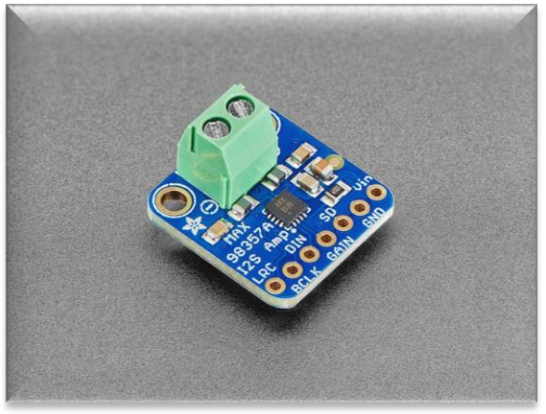


Raspberry Pi 5 - 16 GB RAM

Speaker - 40mm Diameter - 4 Ohm 5 Watt



AMG8833 IR Thermal Camera



Adafruit I2S 3W Class D Amplifier Breakout - MAX98357A

Budget Overview

Item	Qty	Total
Adafruit I2S 3W Class D Amplifier Breakout - MAX98357A	1	$5.95
Speaker - 40mm Diameter - 4 Ohm 5 Watt (PID: 3968)	1	$4.95
AMG8833 88 IR Thermal Camera Sensor	1	$35.59
Mini Keyboard with Touchpad	1	$22.99
Raspberry Pi 5 - 16 GB RAM (PID: 6125)	1	$132.00
Official Raspberry Pi 27W PD Power Supply 5.1V 5A with USB C PID: 5814	1	$14.04
Official Raspberry Pi 5 Active Cooler PID: 5815	1	$13.50
Pi Foundation Display - 7" Touchscreen Display for Raspberry Pi (PID: 2718)	1	$79.95
Total	-	**$308.97**

Table 1: Project Components and Costs

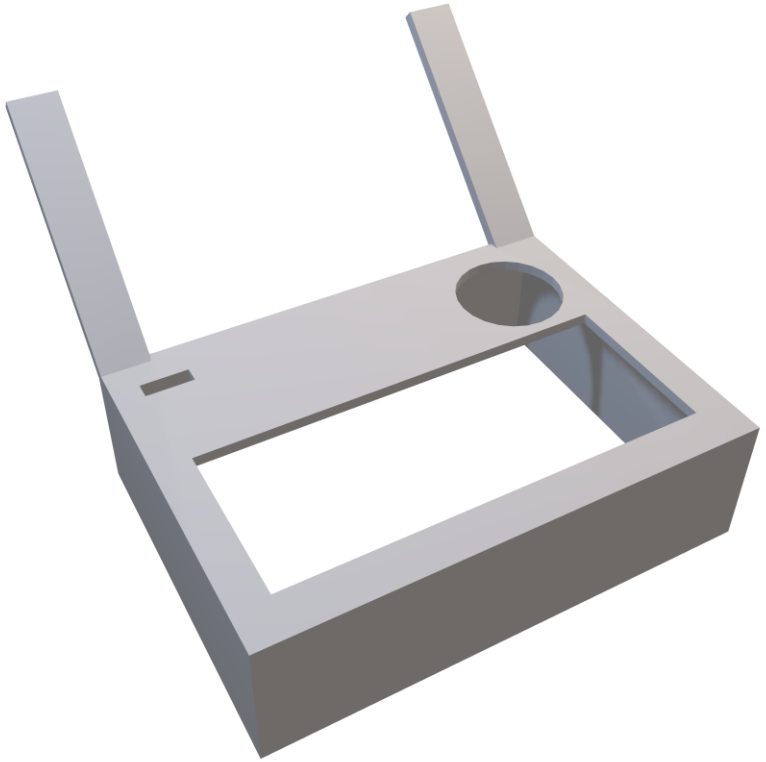
Purpose

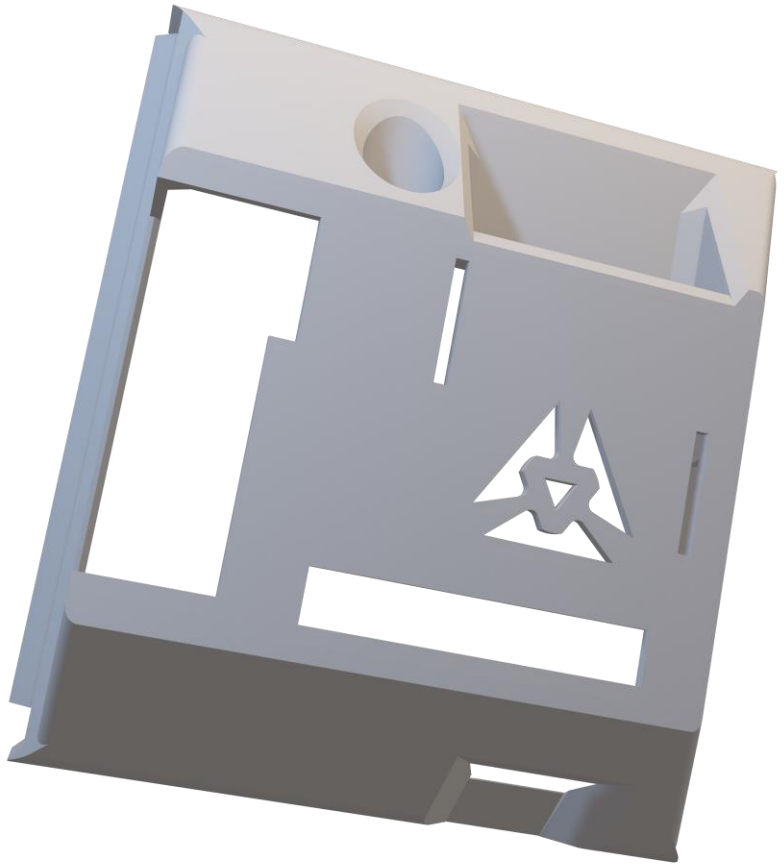
To build a platform for easy sensor testing

To act as a portable workstation that can be used on a production floor

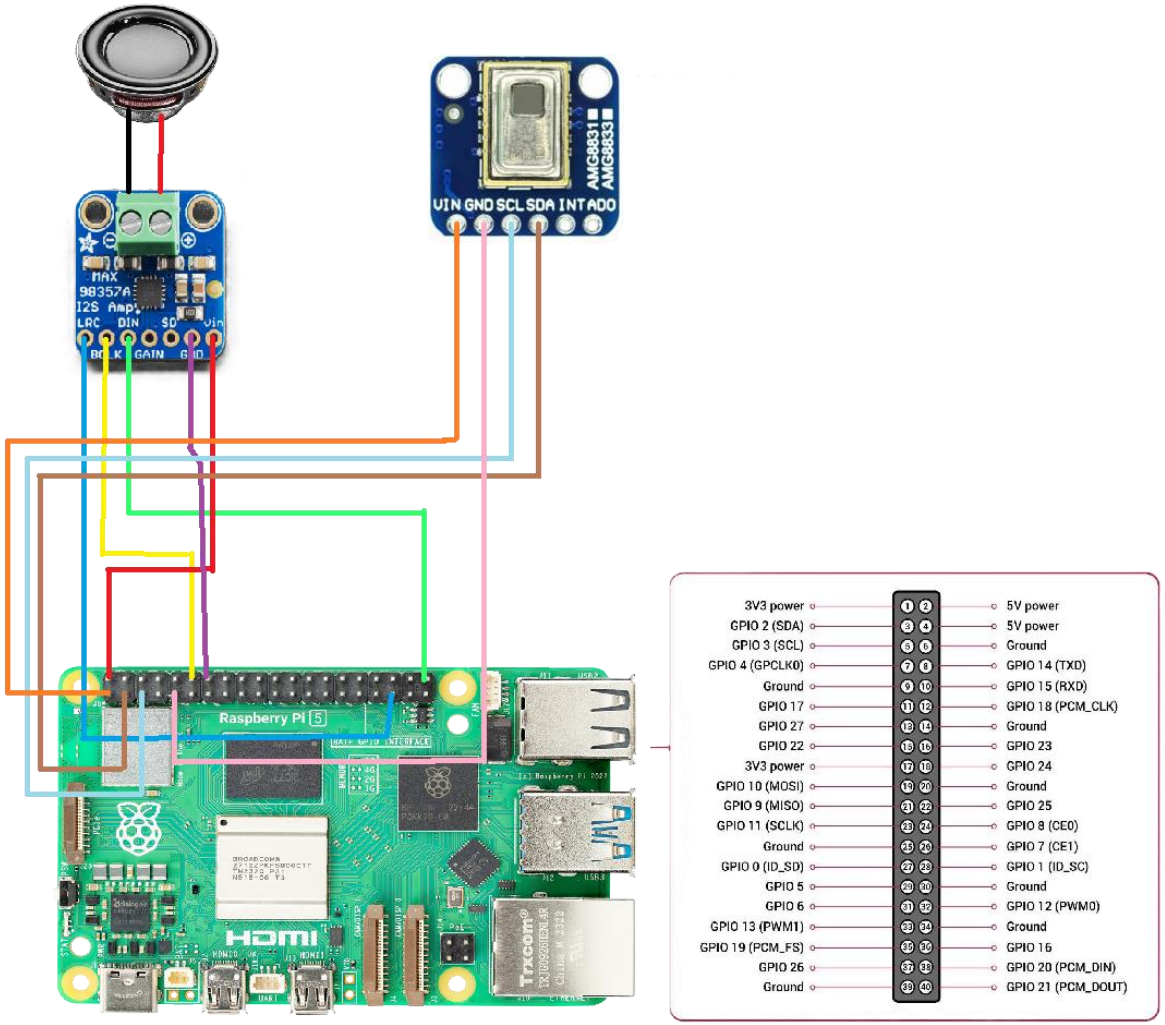
To act as a multi-tool for troubleshooting

Schematics and Designs





Schematics and Designs cont.



Max98357 (I2S)	Connect To
VIN	5V
GND	Ground
DIN	I2S Data
BCLK	I2S Bit Clock
LRC	I2S Left/Right Clock
SPK+	Speaker +
SPK-	Speaker -

Sensor Pin	Connect To
VDD	3.3v or 5v
SDA	SDA pin
GND	Ground
SCL	SCL pin

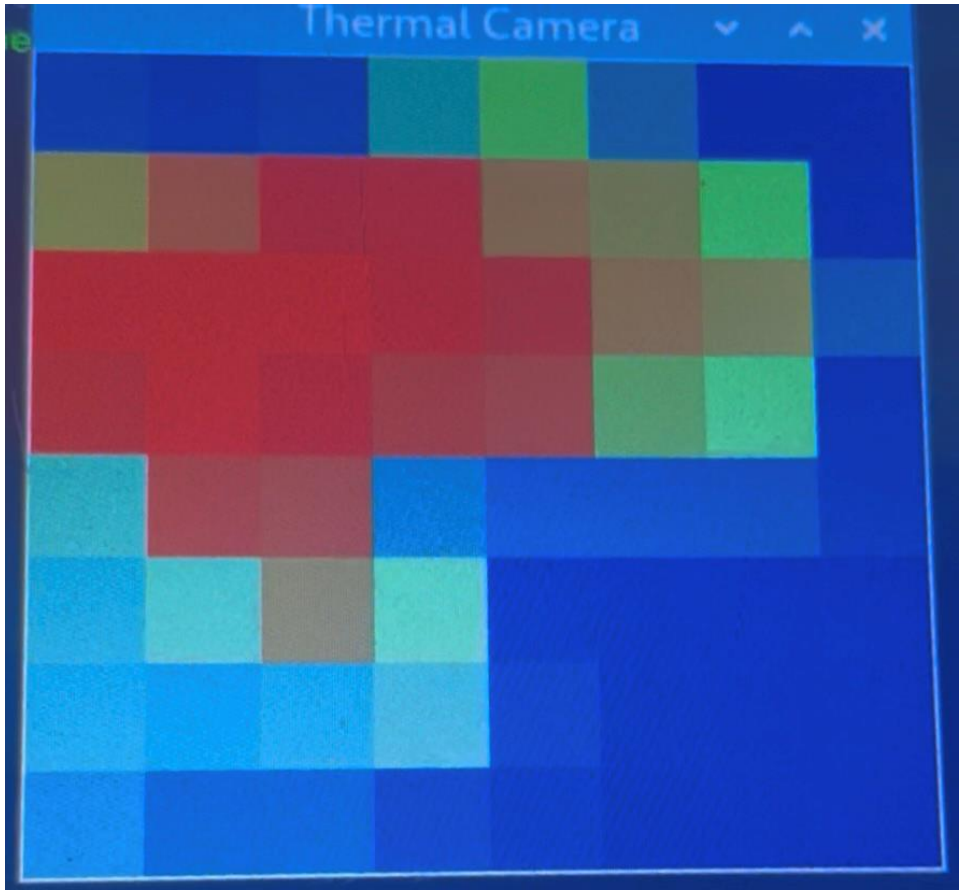
Coding for the AMG8833 IR Thermal Camera

Initialization

- Defining the color map
- Generating the window

Read From Sensor

- 8×8 Thermal Pixel Array
- Determine the Temperature Bounds



Future Improvements

- Redesign Enclosure with TPU for better durability and shock resistance and utilize more robust connectors.
- Add More Sensor Types such as ultrasonic and vibration modules.
- Enhance User Interface with improved graphs and customizable display options.
- Enable Wireless Data Logging for cloud storage and remote monitoring.

Conclusion

We Made it!

From concept to deployment, a modular sensor bay built for real-world applications.

Any Questions?