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› Rakstore US-016 Analog Ultrasonic Ranging Sensor Module Instruction Manual

Rakstore US-016

Rakstore US-016 Analog Ultrasonic Ranging Sensor Module

Instruction Manual

1. INTRODUCTION

The Rakstore US-016 is an analog ultrasonic ranging sensor module designed for non-contact distance measurement. It provides a stable and accurate distance reading by converting the measured distance into a proportional analog voltage output. This module is suitable for various applications requiring precise distance sensing within a range of 2 cm to 300 cm.



Figure 1: Angled view of the US-016 module, showing the two ultrasonic transducers.

2. SAFETY INFORMATION

- Ensure the power supply voltage does not exceed the specified operating voltage (DC 5V) to prevent damage to the module.
- Avoid touching the electronic components on the module while it is powered to prevent electric shock or damage from static discharge.
- Do not expose the module to extreme temperatures, humidity, or corrosive environments.
- Handle the module with care to avoid physical damage to the transducers or circuit board.

3. PACKAGE CONTENTS

Each package should contain the following items:

- US-016 Analog Ultrasonic Ranging Sensor Module (Quantity as purchased, typically 2 Pcs)

4. SPECIFICATIONS

Parameter	Value
Operating Voltage	DC 5V
Operating Current	3.8mA
Analog Output Voltage	0 ~ Vcc (proportional to distance)
Detection Range	2cm - 300cm
Detection Accuracy	0.3cm + 1%
Resolution	1mm
Induction Angle	Less than 15 degrees

Physical Dimensions

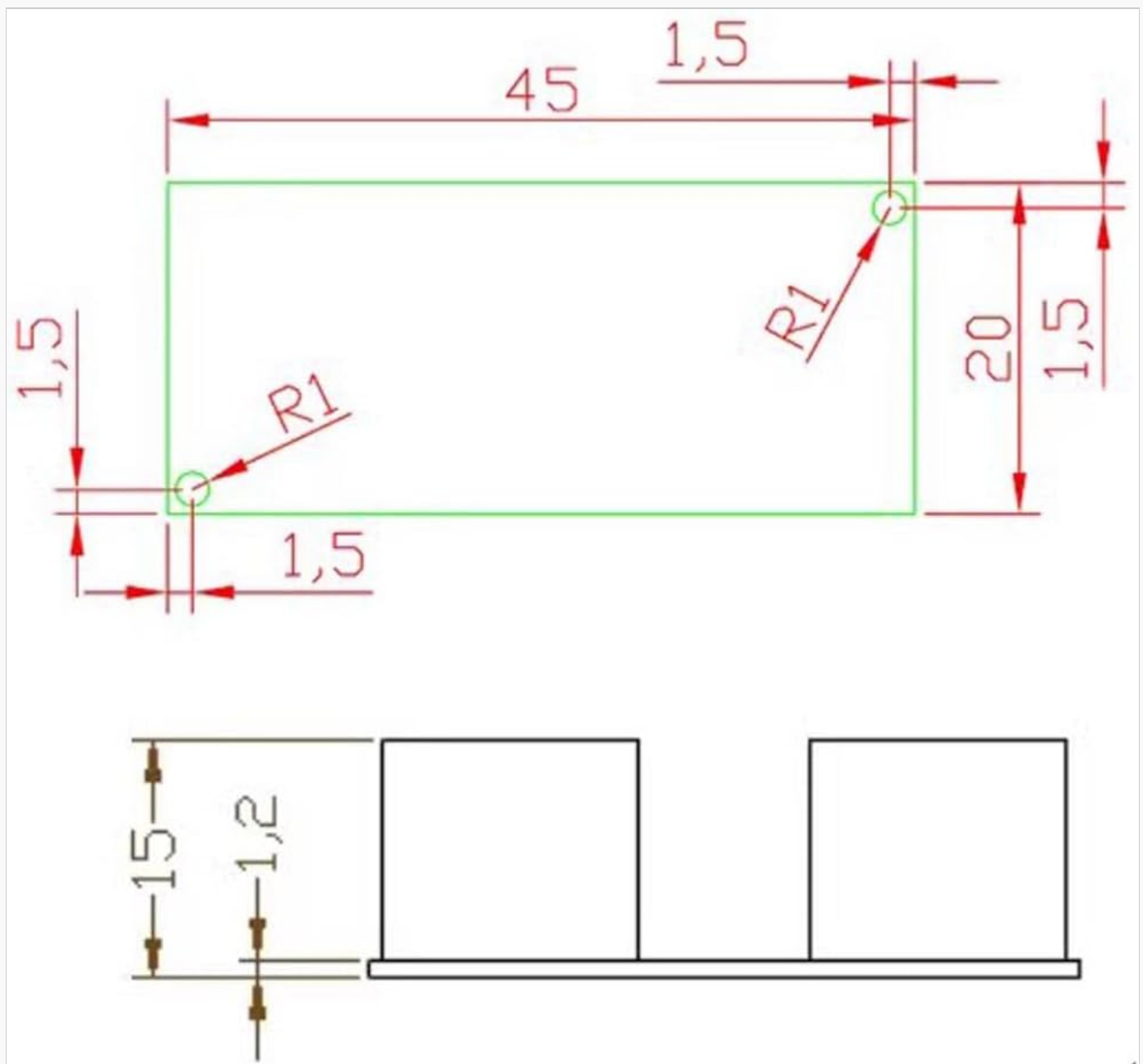


Figure 2: Dimensional drawing of the US-016 module. All measurements are in millimeters.

5. MODULE OVERVIEW AND PINOUT

The US-016 module features two ultrasonic transducers and a set of pins for power, ground, and analog output. Understanding the pinout is crucial for proper connection.

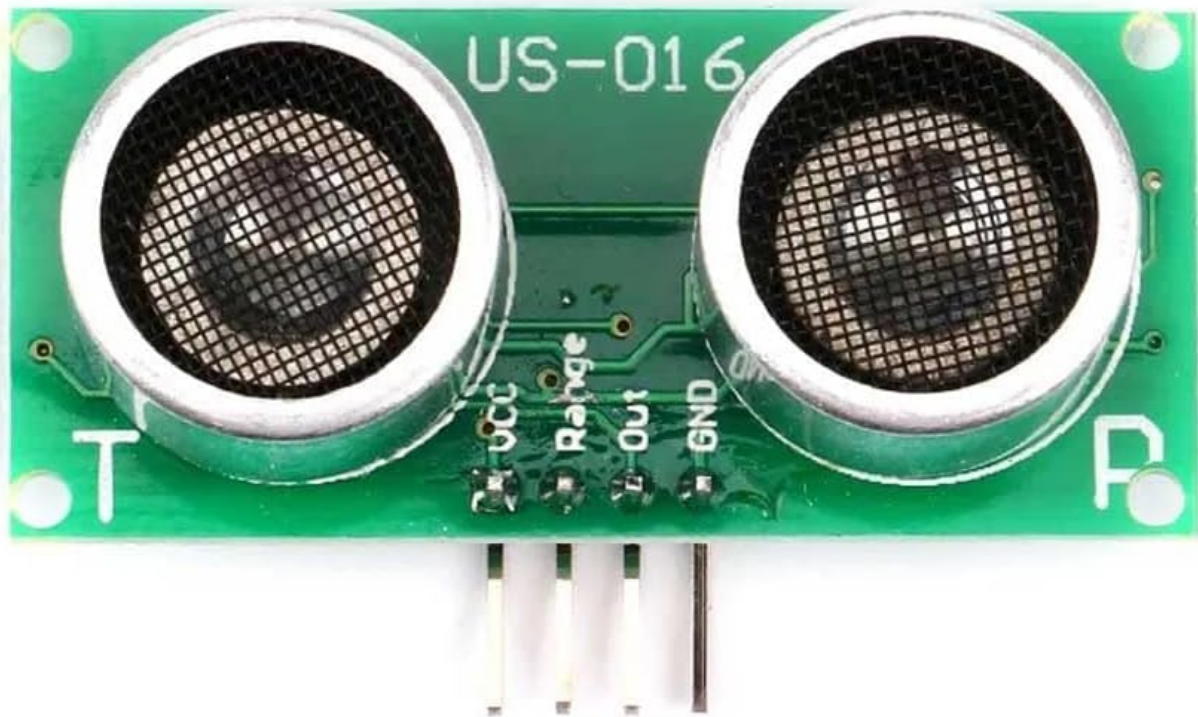


Figure 3: Top view of the US-016 module, highlighting the pin labels.

- **VCC:** Power supply pin (DC 5V).
- **Range:** This pin is typically used for mode selection or calibration in some ultrasonic modules. For the US-016, it's often connected to VCC or left floating depending on the specific implementation for analog output. Refer to specific microcontroller library documentation if available.
- **Out:** Analog voltage output pin. The voltage on this pin is proportional to the measured distance.
- **GND:** Ground pin.

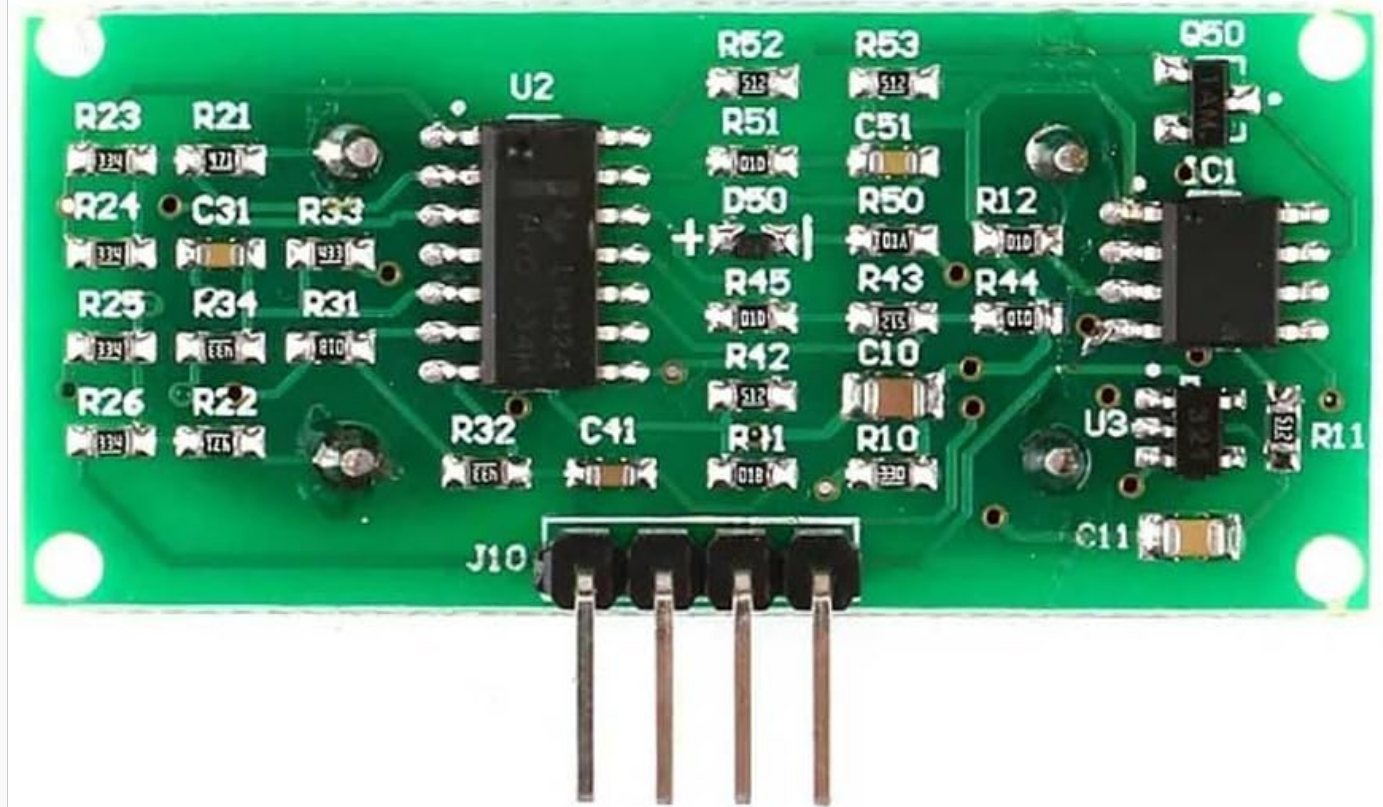


Figure 4: Bottom view of the US-016 module, showing the integrated circuits and passive components.

6. SETUP AND CONNECTION

To use the US-016 module, connect it to a microcontroller (e.g., Arduino, ESP32) or another system capable of reading analog voltage inputs.

Wiring Diagram (Example with Arduino)

1. Connect the **VCC** pin of the US-016 module to the **5V** pin on your microcontroller.
2. Connect the **GND** pin of the US-016 module to the **GND** pin on your microcontroller.
3. Connect the **Out** pin of the US-016 module to an **Analog Input Pin** (e.g., A0) on your microcontroller.
4. The **Range** pin can typically be left unconnected or connected to VCC if a specific mode is required, but for basic analog output, its state might not be critical. Consult specific application notes if issues arise.

Ensure all connections are secure and correctly polarized before applying power.

7. OPERATING PRINCIPLES

The US-016 module operates on the principle of ultrasonic sound waves. One transducer emits a high-frequency sound pulse, which travels through the air and reflects off an object. The other transducer acts as a receiver, detecting the reflected sound wave (echo).

The module internally calculates the time taken for the sound to travel to the object and return. Since the speed of sound in air is known (approximately 343 meters per second at 20°C), this time difference can be used to determine the distance to the object. The US-016 then converts this calculated distance into an analog voltage, which is outputted on the 'Out' pin. The output voltage is directly proportional to the measured distance.

For example, if the module is designed to output 0V for 0cm and 5V for 300cm, then 2.5V would correspond to 150cm. The exact voltage-to-distance ratio may vary slightly and can be calibrated if high precision is required.

8. OPERATION AND USAGE

Once connected, the module continuously measures distance and outputs an analog voltage. Your microcontroller needs to read this analog voltage and convert it back into a distance value.

Reading Analog Output (Example with Arduino)

The analog input pins on microcontrollers typically have an Analog-to-Digital Converter (ADC). For an Arduino, the ADC converts an analog voltage (0-5V) into a digital value (0-1023 for a 10-bit ADC).

To convert the analog reading to distance:

1. Read the analog value from the connected pin (e.g., `analogRead(A0)`).
2. Convert this digital value back to voltage. For a 5V system with a 10-bit ADC: $\text{voltage} = (\text{analog_reading} / 1023.0) * 5.0$;
3. Determine the conversion factor from voltage to distance. This factor can be found through calibration or by using the module's specifications. For example, if 5V corresponds to 300cm, then $\text{distance_cm} = (\text{voltage} / 5.0) * 300.0$;

It is recommended to perform a simple calibration by measuring known distances and correlating them with the output voltage to achieve the most accurate results for your specific setup.

9. MAINTENANCE

- Keep the module clean and free from dust and debris, especially the ultrasonic transducers, to ensure optimal performance.
- Store the module in a dry, cool environment when not in use.
- Avoid exposing the module to direct sunlight for extended periods.
- Regularly check connections for any signs of corrosion or looseness.

10. TROUBLESHOOTING

No Output or Incorrect Readings

- **Check Power Supply:** Ensure the module is receiving a stable 5V DC power supply and that GND is correctly connected.
- **Verify Wiring:** Double-check all connections according to the wiring diagram. Ensure the 'Out' pin is connected to an analog input.
- **Obstruction:** Ensure there are no obstructions directly in front of the transducers that could interfere with sound wave emission or reception.
- **Target Surface:** Highly absorbent surfaces (e.g., soft fabrics) or very small/thin objects may not reflect sound waves effectively, leading to inaccurate readings or no detection.
- **Range Limits:** Confirm the object is within the 2cm to 300cm detection range. Objects too close or too far will not be accurately detected.
- **Environmental Factors:** Strong air currents, extreme temperature changes, or other ultrasonic noise sources can affect performance.

Fluctuating Readings

- **Power Supply Noise:** Ensure your 5V power supply is clean and stable. Add a small capacitor (e.g., 0.1uF) across VCC and GND near the module if noise is suspected.
- **Ambient Noise:** Other ultrasonic devices or loud high-frequency sounds in the environment can cause interference.

- **Vibrations:** Mechanical vibrations of the module or target object can affect readings.

11. WARRANTY AND SUPPORT

This product is typically covered by a standard manufacturer's warranty against defects in materials and workmanship for a period of 30 days from the date of purchase. Please retain your proof of purchase for warranty claims.

For technical support, troubleshooting assistance, or warranty inquiries, please contact your retailer or the manufacturer, Rakstore, through their official support channels. Refer to the product packaging or the retailer's website for specific contact information.

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