

RELAND SUN AD630

Reland Sun AD630 2-Channel Balanced Modulator/Demodulator Lock-in Amplifier Module User Manual

Model: AD630

1. INTRODUCTION

The Reland Sun AD630 module is a specialized 2-channel balanced modulator/demodulator designed for weak signal detection. It integrates a chopper amplifier, filter module, high-precision phase shift module, and DDS module to effectively detect and extract weak signals. The AD630 is a high-precision balanced modulator featuring a flexible commutation structure and laser wafer-adjusted thin film resistors for excellent accuracy and temperature stability. It supports various signal processing applications including balanced modulation and demodulation, synchronous detection, phase detection, quadrature detection, phase-sensitive detection, lock-in amplification, and square wave multiplication.

2. KEY FEATURES

- Designed for weak signal detection and extraction.
- Integrated chopper amplifier, filter, phase shift, and DDS modules.
- Supports balanced modulation/demodulation, synchronous detection, phase detection, and lock-in amplification.
- High precision with 0.05% closed-loop gain accuracy (AD630B).
- Pin-programmable closed-loop gains of ± 1 and ± 2 .
- Channel bandwidth: 2 MHz.
- Slew rate: 45V/ μ s.
- Crosstalk: -120 dB (at 1 kHz).
- Channel Offset Voltage: 100 μ V (AD630BD).
- 350 kHz Full Power Bandwidth.
- Capable of recovering signals from 100 dB noise.

3. SETUP AND CONNECTIONS

This section details the physical setup and connections for the AD630 module.

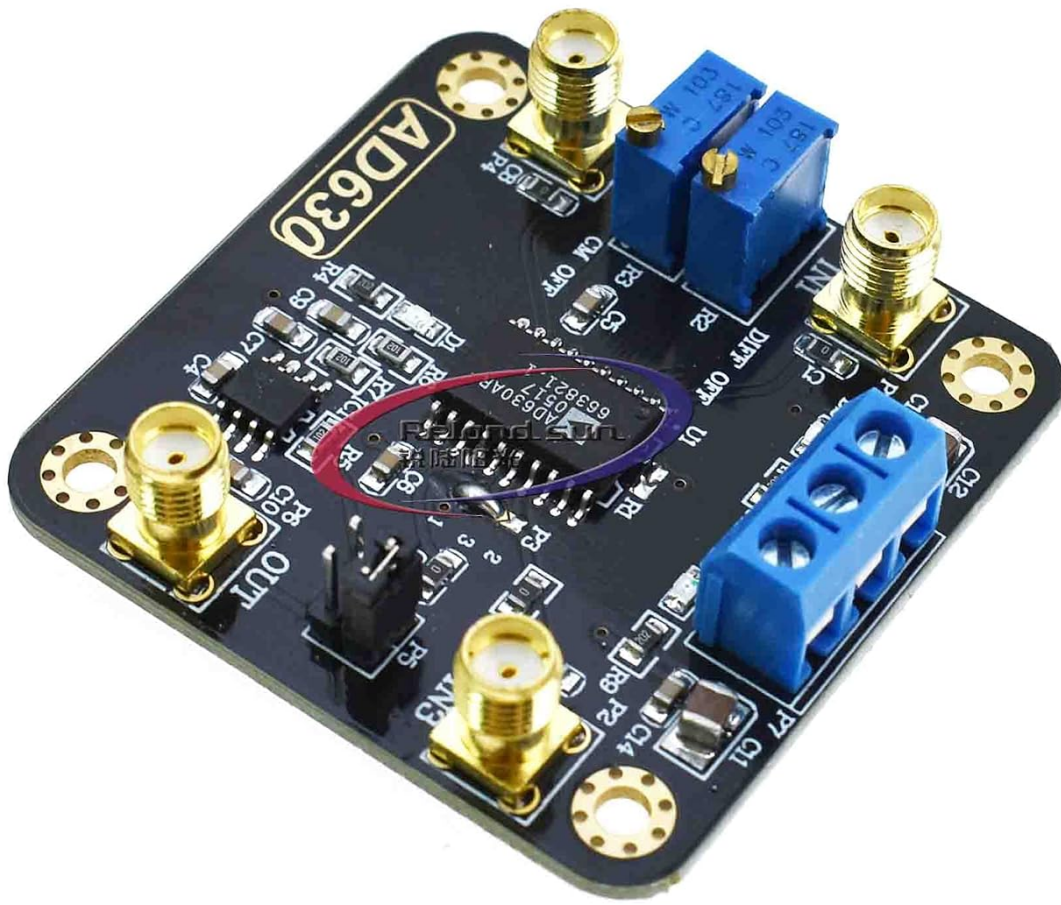


Figure 3.1: Top view of the AD630 module. This image displays the layout of the module, including the AD630 chip, input (IN1, IN2) and output (OUT) connectors, and adjustment potentiometers.

3.1 Power Supply

The module requires a $\pm 5V$ supply voltage. Ensure the power supply is stable and within the specified range to prevent damage to the module and ensure optimal performance.

3.2 Signal Inputs and Outputs

- **IN1:** This is the primary input for the signal to be detected. Connect your weak signal source here.
- **IN2:** This input is for the synchronization signal. This signal is crucial for the lock-in amplifier's operation, providing the reference phase for demodulation.
- **OUT:** This is the output terminal where the processed and amplified signal will be available.

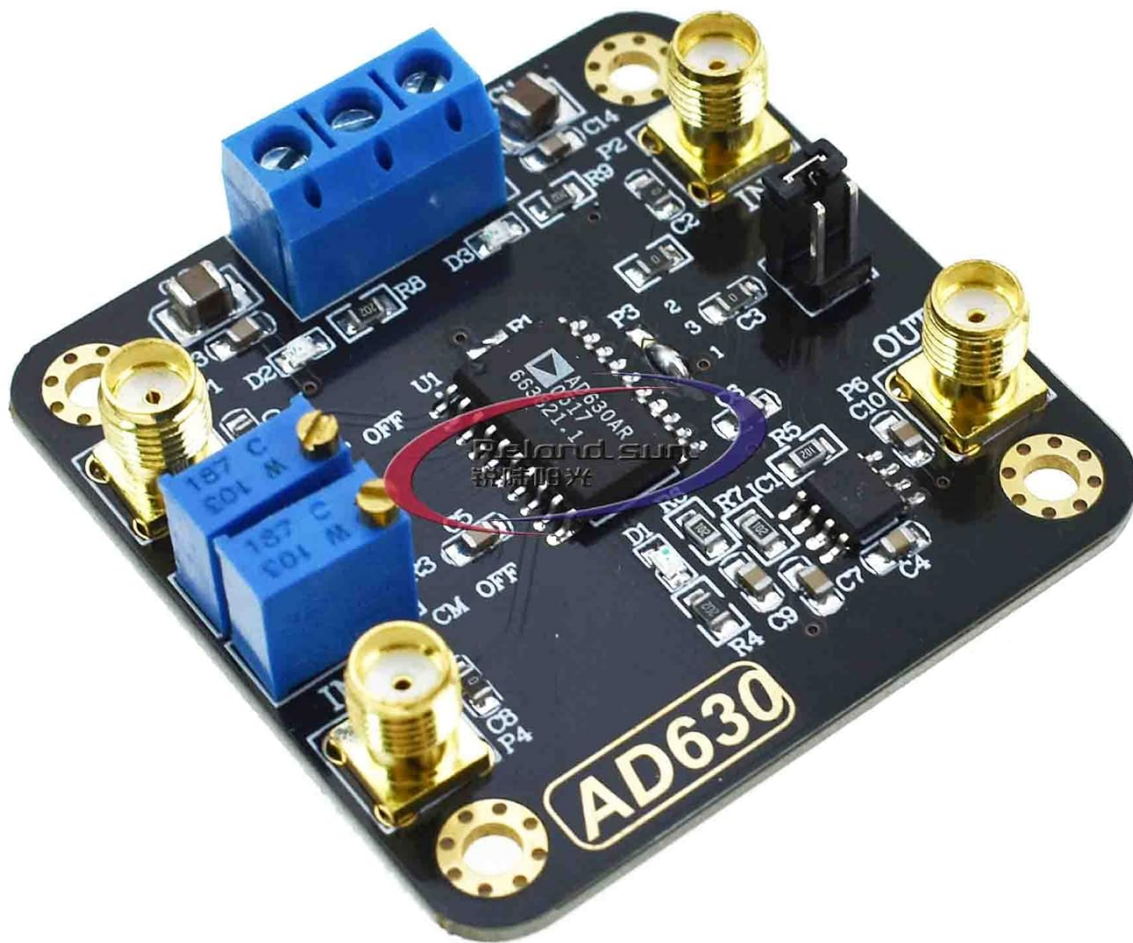


Figure 3.2: Angled view of the AD630 module. This perspective provides a clearer view of the various connectors and the onboard low-pass filter jumper cap location.

3.3 Low-Pass Filter Configuration

The module includes an onboard low-pass filter. This filter needs to be configured by the user before use. It can be switched on or off using a jumper cap. Refer to the module's silkscreen markings for the exact location of the jumper cap for the low-pass filter.

4. OPERATING INSTRUCTIONS

The AD630 module operates with a default phase lock function. Follow these steps for basic operation:

1. **Connect Power:** Apply a stable $\pm 5V$ power supply to the module.
2. **Connect Signal Input (IN1):** Connect the weak signal you wish to detect to the IN1 terminal.
3. **Connect Synchronization Signal (IN2):** Connect the reference or synchronization signal to the IN2 terminal. This signal should be phase-locked or coherent with the signal of interest in IN1 for effective lock-in detection.
4. **Configure Low-Pass Filter:** If required for your application, configure the onboard low-pass filter using the jumper cap. This filter helps in removing high-frequency noise components from the demodulated signal.

- 5. **Monitor Output (OUT):** Observe the processed signal at the OUT terminal. This output will represent the demodulated and amplified weak signal.
- 6. **Adjust Potentiometers (if present):** If the module includes adjustable potentiometers, these may be used for fine-tuning gain, offset, or other parameters. Refer to specific circuit diagrams or application notes for detailed adjustment procedures.

The AD630's internal resistor network provides precision closed-loop gains of ± 1 and ± 2 . External feedback can also be used for higher gains or complex switching feedback topologies, depending on your application requirements.

5. SPECIFICATIONS

Parameter	Value
Model Number	AD630
Supply Voltage Range	$\pm 5V$
Number of Channels	2
Channel Bandwidth	2 MHz
Slew Rate	45V/ μs
Crosstalk	-120 dB (1 kHz)
Closed-Loop Gain Accuracy	0.05% (AD630B)
Channel Offset Voltage	100 μV (AD630BD)
Full Power Bandwidth	350 kHz
Manufacturer	Reland Sun
Mounting Type	Surface Mount

6. MAINTENANCE

To ensure the longevity and optimal performance of your Reland Sun AD630 module, follow these maintenance guidelines:

- **Cleanliness:** Keep the module free from dust, dirt, and moisture. Use a soft, dry cloth for cleaning. Avoid using solvents or abrasive cleaners.
- **Handling:** Handle the module with care to prevent physical damage to components or connectors. Avoid static discharge by using appropriate ESD precautions.
- **Storage:** Store the module in a dry, cool environment when not in use, away from direct sunlight and extreme temperatures.
- **Connections:** Periodically check all connections to ensure they are secure and free from corrosion.

7. TROUBLESHOOTING

If you encounter issues with your AD630 module, consider the following troubleshooting steps:

- **No Output Signal:**
 - Verify that the $\pm 5V$ power supply is correctly connected and providing the specified voltage.
 - Ensure that both IN1 (signal to be detected) and IN2 (synchronization signal) are properly connected and active.

- Check all cable connections for integrity.

- **Noisy Output:**

- Ensure proper grounding of the module and connected equipment.
- Verify the quality of the input signals (IN1 and IN2) for excessive noise.
- Check the configuration of the onboard low-pass filter. Activating it may reduce high-frequency noise.
- Ensure the synchronization signal (IN2) is stable and coherent with IN1.

- **Incorrect Signal Detection:**

- Confirm that the synchronization signal (IN2) is correctly phased and frequency-matched with the signal of interest in IN1.
- Review the application circuit and ensure it aligns with the AD630's operational principles for your specific use case.

8. WARRANTY AND SUPPORT

For warranty information and technical support, please refer to the documentation provided with your purchase or contact your vendor. Keep your purchase receipt as proof of purchase.