Treedix DSO138

Treedix DSO138 Oscilloscope DIY Kit Instruction Manual

Model: DSO138

1. Introduction

The Treedix DSO138 is a DIY (Do-It-Yourself) digital oscilloscope kit designed for educational purposes and hobbyists. This kit allows users to assemble a functional handheld digital oscilloscope, providing insight into its structure and principles. It features an ARM Cortex-M3 processor (STM32F103C8) and a 2.4-inch color TFT display, offering a 1Msps real-time sampling rate for observing and measuring signal waveforms.

This manual provides detailed instructions for assembling, operating, maintaining, and troubleshooting your DSO138 oscilloscope kit.

Figure 1.1: Assembled Treedix DSO138 Oscilloscope DIY Kit

2. Safety Information

Please read and understand all safety precautions before beginning assembly or operation of the DSO138 kit. Improper handling can result in injury or damage to the device.

- **Soldering Safety:** Always work in a well-ventilated area. Use appropriate eye protection to shield against solder splashes and fumes. Ensure your soldering iron is properly grounded and handle it with care to avoid burns.
- **Electrical Safety:** Only use a stable 9V DC power supply. Do not connect the oscilloscope to voltages exceeding its specified input range. Avoid touching live circuits.
- **Component Handling:** Some electronic components are sensitive to electrostatic discharge (ESD). Handle components by their edges and consider using an anti-static wrist strap.
- **Tool Usage:** Use appropriate tools for assembly. Ensure tools are in good condition and used correctly to prevent damage to components or injury.

3. Component Identification

Before starting assembly, familiarize yourself with all the components included in the kit. Carefully check the component list against the physical parts to ensure everything is present and undamaged. Identifying components correctly is crucial for

successful assembly.

Figure 3.1: Kit Components Overview

The kit typically includes:

- Main PCB (Printed Circuit Board)
- 2.4-inch TFT LCD Display module
- Various resistors, capacitors (ceramic, electrolytic), diodes
- Integrated Circuits (ICs) and transistors
- Buttons, switches, and connectors (e.g., BNC connector, DC power jack)
- Test probe (BNC to alligator clips)
- Mounting hardware (standoffs, screws)

Refer to the silk screen markings on the PCB and component values (color codes for resistors, markings for capacitors and diodes) for accurate identification.

4. Assembly Instructions

Assembly of the DSO138 kit requires soldering. Follow these steps carefully to ensure proper functionality.

Figure 4.1: Example of Soldering Work

4.1. Prepare Your Workspace

- Ensure your workspace is clean, well-lit, and well-ventilated.
- Gather all necessary tools: soldering iron, solder, desoldering wick/pump, wire cutters, needle-nose pliers, multimeter, magnifying glass, and safety glasses.
- Organize components to prevent mix-ups.

Figure 4.2: Recommended Soldering Fume Extractor

4.2. Solder Resistors and Diodes

Start with the smallest components first. Solder all resistors and diodes onto the PCB according to their designated positions and values. Pay close attention to the polarity of diodes (band indicates cathode).

4.3. Solder Capacitors and Transistors

Next, solder the ceramic and electrolytic capacitors. Ensure correct polarity for electrolytic capacitors (longer lead is positive, stripe indicates negative). Solder the transistors, matching their pinouts to the PCB pads.

4.4. Solder Integrated Circuits and Connectors

Install IC sockets first if provided, then insert the ICs, ensuring correct orientation (notch or dot aligns with PCB marking). Solder the BNC connector, DC power jack, and other pin headers or connectors.

4.5. Install Display and Buttons

Carefully connect the 2.4-inch TFT LCD display module to its header pins. Solder the push buttons and switches into their respective positions.

Figure 4.3: Power Input and Control Buttons

4.6. Final Checks

Before applying power, thoroughly inspect all solder joints for bridges, cold joints, or missing connections. Verify component placement and polarity. Use a multimeter to check for any short circuits, especially around the power input.

5. Operating Instructions

Once assembled and checked, you can begin using your DSO138 oscilloscope.

5.1. Powering On

- Connect a stable 9V DC power supply to the DC input jack.
- The device should power on, and the TFT display will illuminate, showing the oscilloscope interface.

5.2. Connecting Probes

- Connect the provided BNC to alligator clip test probe to the BNC input connector on the oscilloscope.
- Connect the alligator clips to the circuit you wish to measure. The black clip is typically ground, and the red clip is for

the signal input.

Figure 5.1: BNC to Alligator Clip Test Probe

Figure 5.2: Oscilloscope with Probe Connected

5.3. Basic Controls

The DSO138 features several buttons and switches for adjusting measurement parameters:

- **Vertical Sensitivity (V/DIV):** Adjusts the voltage scale per division on the vertical axis. Use this to fit the waveform within the screen.
- **Horizontal Time Base (S/DIV):** Adjusts the time scale per division on the horizontal axis. Use this to view more or less of the waveform over time.
- **Trigger Mode/Level:** Controls when the oscilloscope starts acquiring data. Adjust the trigger level to stabilize a repeating waveform. Common modes include Auto, Normal, and Single.
- **Input Coupling (AC/DC):** Selects how the input signal is coupled. **DC coupling** shows the entire signal, including its DC component. **AC coupling** blocks the DC component, showing only the AC variations.

5.4. Display Interpretation

The 2.4-inch TFT display shows the waveform graphically and provides key measurement parameters.

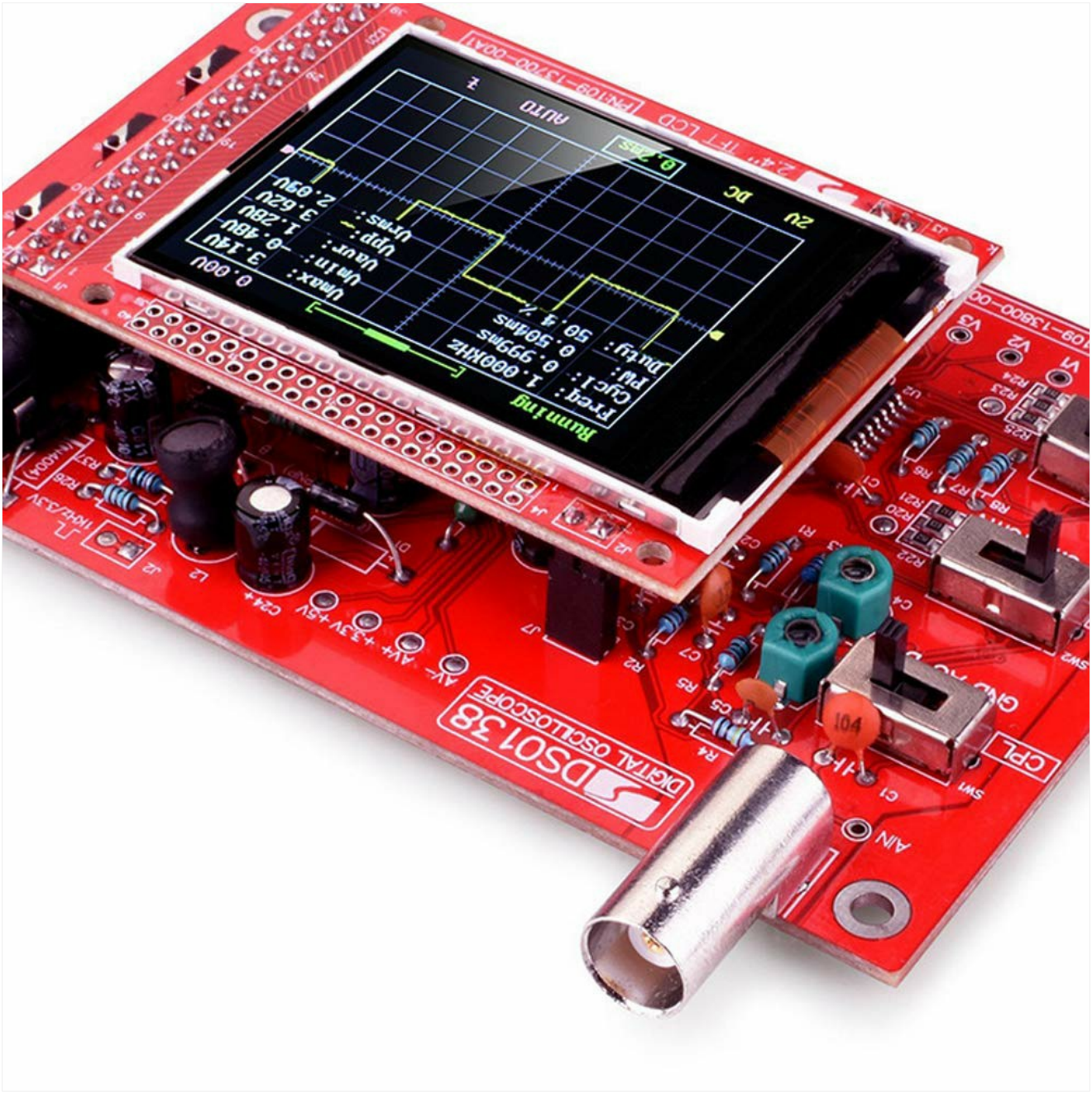

Figure 5.3: Oscilloscope Display with Waveform and Parameters

- **Waveform Grid:** The grid helps in visually estimating voltage and time values based on the V/DIV and S/DIV settings.
- **Measurement Parameters:** The display typically shows numerical values for parameters such as Peak-to-Peak Voltage (Vpp), Maximum Voltage (Vmax), Minimum Voltage (Vmin), Frequency (Freq), and Duty Cycle (Duty).

6. Maintenance

Proper maintenance ensures the longevity and reliable operation of your DSO138 oscilloscope.

- **Cleaning:** Use a soft, dry cloth to clean the device. For stubborn dirt, a slightly damp cloth can be used, but ensure no moisture enters the device. Do not use harsh chemicals or abrasive cleaners.
- **Storage:** Store the oscilloscope in a dry, dust-free environment away from direct sunlight and extreme temperatures.
- **Handling:** Avoid dropping or subjecting the device to physical shock, as this can damage internal components or the display.
- **Power Supply:** Always use the recommended 9V DC power supply. Using an incorrect voltage can damage the circuitry.

7. Troubleshooting

If you encounter issues with your DSO138 oscilloscope, refer to the following troubleshooting guide:

- **Device Does Not Power On:**
  - Verify the 9V DC power supply is connected correctly and functioning.
  - Check all solder joints related to the power input and power regulation circuit for cold joints or shorts.
  - Ensure the power switch (if present) is in the ON position.
- **No Waveform Displayed:**
  - Confirm the test probe is securely connected to both the oscilloscope and the signal source.
  - Check if the input signal is within the oscilloscope's voltage range. Adjust V/DIV settings.
  - Adjust the trigger level and mode. Try