Vertical Traffic Lights (E-25C): Enhanced Assembly Manual

Introduction

This enhanced manual provides comprehensive, clear, and safe instructions for assembling your Vertical Traffic Lights (E-25C) project. Traffic signal lights are essential for directing traffic flow, using a universally recognized system of red, yellow, and green lights to indicate stop, caution, and go, respectively. This project will not only guide you through building a functional traffic light model but also help you understand the basic principles of its operation and circuit connections.

Required Tools and Materials

Before beginning assembly, please ensure you have all the necessary tools and materials. Some items are provided in the kit, while others need to be self-supplied.

Category	Item	Description
Provided Tools	Small Pair of Scissors	For cutting wires and cable ties.
	Small Screwdriver	For tightening screws.
	Lighter	For shrinking heat-shrinkable tubes (use with caution).
Self-Supplied	Pair of AA Batteries	Power source for the traffic light circuit.
	Cable Ties	For organizing and securing wires.
	Wire with Heat Shrink Tube	For insulating electrical connections.

Safety Precautions

Your safety is paramount. Please adhere to the following precautions during assembly:

- **Material Handling:** Exercise caution when opening the material package to prevent the loss of small components, which are crucial for the successful completion of your project.
- **Adult Supervision:** Children should always assemble this project under the direct supervision of a parent or teacher. Assembling alone may pose risks.
- **Instruction Adherence:** Carefully read and follow all instructions. If any step is unclear, do not hesitate to ask for assistance from an adult. Learning by asking is encouraged.
- **Lighter Usage:** When using a lighter for heat-shrinkable tubes, proceed with extreme caution to avoid burns. Adult supervision is highly recommended for this step.
- **LED Insertion:** Be careful when inserting the Light-Emitting Diodes (LEDs) to prevent injury to yourself or damage to the components.

Assembly Instructions

Follow these steps meticulously to construct your Vertical Traffic Lights model.

Step 1: Material Preparation

Begin by laying out and identifying all the small production materials. Organize them to ensure easy access during assembly.

Step 2: Assembling Boards ①, ②, and ③

Refer to the provided diagram to assemble boards ① and ②. Once assembled, carefully install them onto board ③. Pay close attention to the correct orientation and direction of board ③ during installation to ensure proper alignment.

Step 3: Securing Boards ② and ④ to Board ③

Using two 4mm coarse-grained screws, securely fix board ② onto board ③. Subsequently, install board ④ onto board ③. Ensure all connections are firm.

Step 4: Installing Plate ⑤

Utilize two 4mm coarse-grained screws to install plate ⑤ onto both board ③ and board ④. This step further reinforces the structure.

Step 5: Connecting Terminal Wires to Plate ⑤

Refer to the diagram for guidance. Insert the three terminal wires into the designated holes on plate ⑤. Ensure the black wire is positioned to the left and the red wire to the right for correct polarity.

Step 6: Inserting Red Wire Core into Base

Following the numerical sequence indicated, insert the metal core of the red wire into the small round hole located on the base of the traffic light.

Step 7: Securing with Claw Nails

Insert the claw nails into the small holes and screw them in firmly. This step helps to secure the components in place.

Step 8: Wiring the Battery Box Resistor

Twist the red core wire from the battery box into a spiral. Then, connect the resistor to this spiraled red core. This connection is vital for regulating the current to the LEDs.

Step 9: Insulating with Heat-Shrinkable Tube (Black Wire)

Place the black heat-shrinkable tube over the exposed wiring part. Carefully apply heat with a lighter to the tube. The heat will cause the tube to shrink and tightly insulate the connection. (Refer to safety precautions for lighter use).

Step 10: Preparing Alligator Clips

First, thread a red rubber sleeve through the resistor pins. Insert the pins into the small holes of the alligator clip. Then, slide the rubber sleeve back over the alligator clip to secure the resistor pins. Any excess pin length protruding from the alligator clip can be trimmed with scissors.

Step 11: Insulating Battery Box Connections

Begin by placing a heat-shrinkable tube onto the black wire of the battery box. Twist the three black terminal cores together. Connect this combined terminal core to the black core of the battery box. Finally, cover the wire core connection with the heat-shrinkable tube and apply heat with a lighter to shrink it. Remember to exercise caution to avoid burns during this process.

Step 12: Fixing Battery Box and Organizing Wires

Secure the battery box onto board ③ using two 4mm coarse-grained screws. Use two cable ties to neatly arrange and secure all the wires, then trim any excess cable tie material.

Step 13: Inserting Light-Emitting Diodes (LEDs)

Insert the LEDs into their corresponding terminal holes. Ensure the **long pin** of each LED is inserted into the **red wire end** and the **short pin** into the **black wire end**. Incorrect insertion will prevent the LED from lighting up. After insertion, gently bend the pins up and down to secure them. **Always be careful when inserting LEDs to prevent injury!**

Step 14: Final Connection and Testing

Congratulations, your traffic signal light is now assembled! Clip the alligator clip to any horn nail. The corresponding signal light should illuminate, indicating a successful build.

Scientific Knowledge: Understanding Traffic Lights

Traffic signal lights are universally recognized devices designed to manage the flow of traffic and enhance road safety. They typically consist of three colors: red, yellow, and green, each conveying a specific instruction to drivers and pedestrians.

- **Red Light:** Signifies **stop**. Vehicles must halt before the intersection stop line or pedestrian crossing line. Turning right may be permitted if it does not impede pedestrians or other vehicles.
- **Green Light:** Signifies **go**. Vehicles are permitted to proceed straight or turn, provided the path is clear.
- **Yellow Light:** Serves as a **warning** or caution signal. Vehicles should prepare to stop if safe to do so, or proceed with caution if already in the intersection. A flashing yellow light indicates a need for increased awareness and caution.

Modern traffic lights are often intelligently controlled, adjusting their timing based on real-time traffic conditions to optimize flow and reduce congestion.

Troubleshooting Guide

If your traffic signal light does not illuminate after assembly, please check the following common issues:

1. **Battery Level:** Verify that the AA batteries are sufficiently charged. It is recommended to replace them with new batteries for testing purposes.
2. **LED Polarity:** Confirm that the Light-Emitting Diodes (LEDs) are inserted correctly. The **long pin** must connect to the **red wire port**, and the **short pin** to the **black wire port**.
3. **Loose Connections:** Inspect all wire connections for looseness. Reconnect any parts that appear to be poorly attached to ensure a secure electrical circuit.