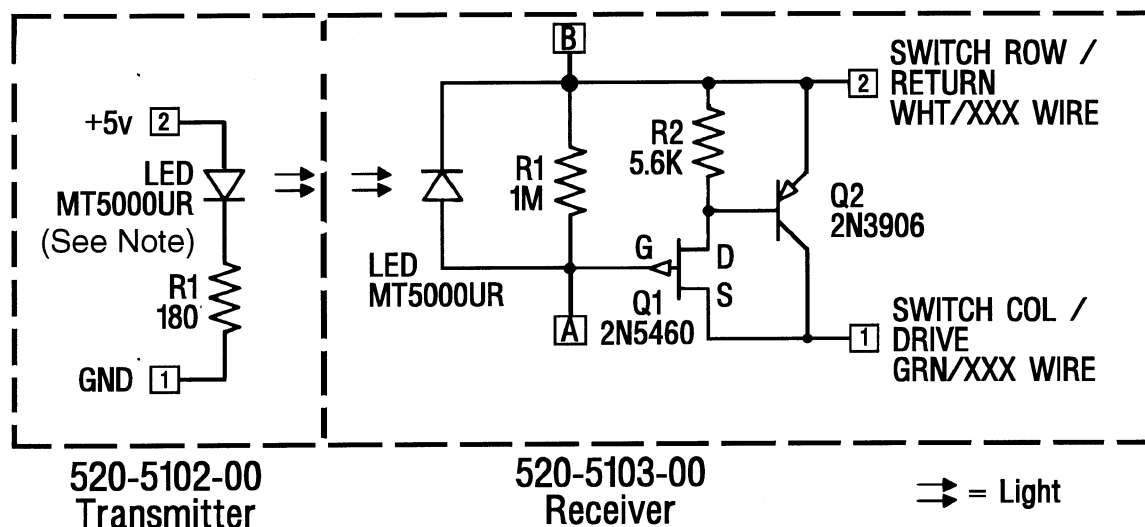


Short-Hop OPTO GaAIAs Ultra-Bright Visible Red Light LED Board. Theory of Operation

As light from the Transmitter falls on the Receiver LED, it generates a Positive Bias Voltage (0.7v to 1.5v) which is applied to the gate of **Q1**, turning **Q1** off. When **Q1** is held off, no current flows through **Q2**'s Base, the transistor is off acting as an *OPEN SWITCH*. When the light is interrupted (*BLOCKED*) **R1** bleeds the gate voltage off of **Q1** allowing it to conduct, switching **Q2** on, which acts as a *CLOSED SWITCH*.

Fig. 1



Note: The RADIO SHACK part number for the LED MT5000UR is 276-087.

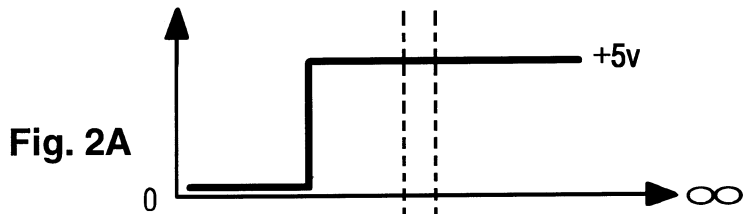
Troubleshooting (The following tests indicate normal operating conditions)

1. Volt Meter Test:

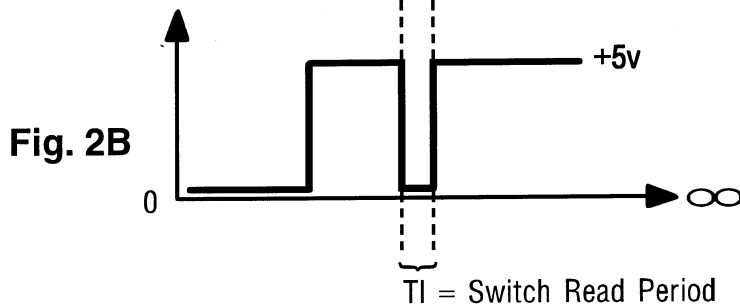
- A. **OPEN OPTO** (Light Falling on LED) = *SWITCH OPEN*. Place meter leads across points **A** and **B** (Refer to Schematic Drawing Fig. 1 above). It should read approximately 0.8 - 1.2v DC.
- B. **CLOSED OPTO** (Light Blocked) = *SWITCH CLOSED*. Place meter leads across points **A** and **B** (Refer to Schematic Drawing Fig. 1 above). It should read approximately 0.0 - 0.1v DC.

Short-Hop OPTO GaAIAs Ultra-Bright Visible Red Light LED Board. Troubleshooting Continued

2. Oscilloscope Test:



A. **OPEN OPTO** (Light Falling on LED) = *SWITCH OPEN*. Place Scope lead at **Pin-2** of OPTO Rec. Bd. with Scope Grounded. (See Fig. 1). The Scope should display a **STEADY +5v** as shown in Fig. 2A, Wave Form Diagram.



B. **CLOSED OPTO** (Light Blocked) = *SWITCH CLOSED*. Place Scope lead at **Pin-2** of OPTO Rec. Bd. with Scope Grounded. (See Fig. 1). The Scope should display a **PULSE STREAM** indicating **Q2** has switched "On" as shown in Fig. 2B, Wave Form Diagram. This is your Switch Drive Pulse.

3. Bench Test (See Fig. 3 Below):

Disconnect the OPTO Transmitter / Receiver Board from the circuit. Connect one side of a 560Ω Pull-up Resistor to **Pin-2** of the OPTO Receiver Bd. and the other side of the resistor to a 5v DC source. Connect **Pin-1** to Ground. Connect a +5v DC source to **Pin-2** of the Transmitter and GND to **Pin-1**. Align with the Receiver OPTO approximately 3" distance. Using your Volt-Meter or an Oscilloscope, monitor **Pin-2** while *BLOCKING* and *UNBLOCKING* the **BEAM** from the Transmitter. The output will be approximately +5v DC when the **BEAM** is *not* **BLOCKED** and approximately 0 volts when the **BEAM** is **BLOCKED**.

Fig. 3

