

Service Bulletin N° 67

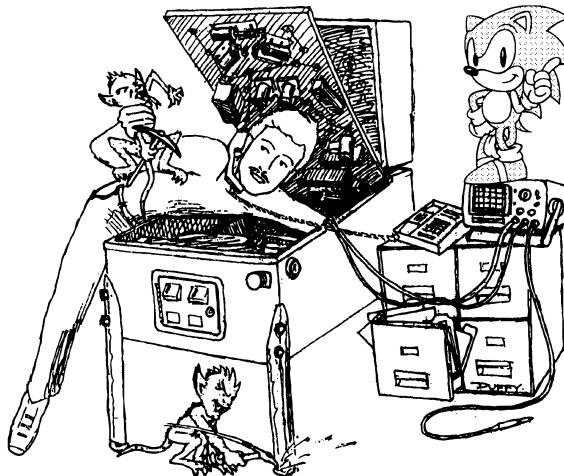


1990 Janice Avenue
Melrose Park, IL 60160

• ☎ Tel 708-345-7700 •

Technical Support

- 1-800-KICKERS (800-542-5377) •
- Fax 708-345-7889 •



Joe Blackwell
Technical Support Manager

Eric Winston
Technical Support Engineer

Ted Kilpin
Technical Support Engineer

Jay Alfer
Tech. Doc. Administrator

TO: Parts & Service Managers

DATE: January 19, 1995

RE:



OPTO's ➡ A TECHNICAL OVERVIEW

We have designed our OPTO's to operate as closely to the action of a switch as possible and even more importantly the troubleshooting procedure used to diagnosis a problem is very similiar to that of a mechanical switch.

Switch Test:

Blocking the light beam causes the OPTO to respond like a closed switch, the same as actuating a mechanical switch.

Troubleshooting:

- ① Enter diagnostics; Switch test.
- ② Block beam; does it respond in test? **YES = OK NO = CONTINUE**
- ③ Visually inspect transmitter; is it glowing red? **YES = OK NO = Check 2 pin connector for 5vdc.**

Note: We use Ultra-bright visible red light L.E.D.'s so that no specialized tools are required for troubleshooting. They also have a narrower bandwith when used as a receiver so that ambient light has little to no affect on them, unlike infrared L.E.D.'s which have a wider bandwidth.

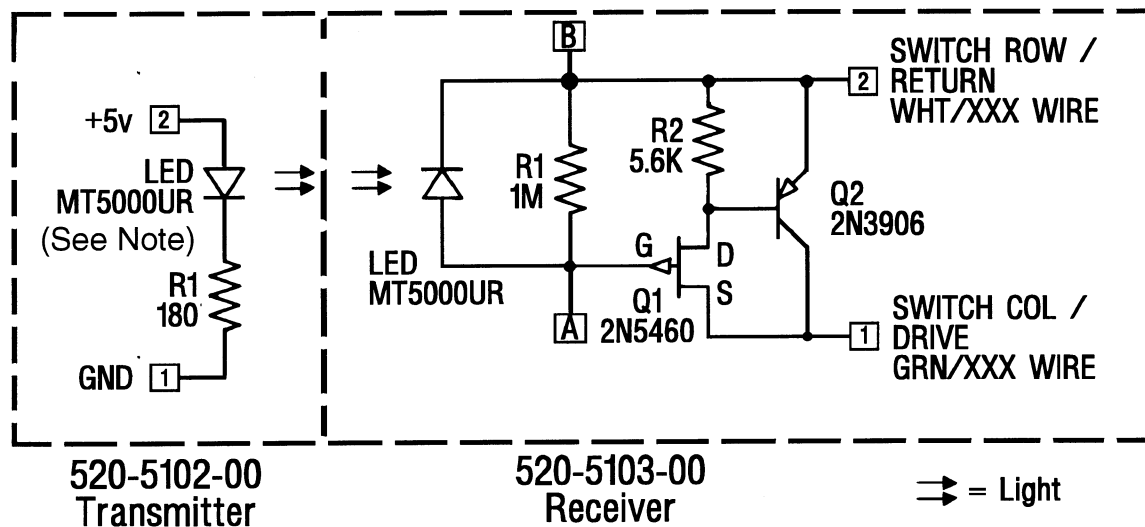
- ④ Visually inspect the Receiver Bd. for damage or loose connections. Remove the 2-Pin Connector with the green and white wire. Using a jumper wire, short the two wires together. Does the display indicate a switch closure? **YES = SUSPECT BAD RECEIVER OR REC./XMTR. MISALIGNMENT.**
NO = SUSPECT OPEN IN SWITCH MATRIX WIRING.

Remember, the transmitter is acting as nothing more than a flashlight... if it's on, then it is working. If shorting the Switch Drive / Return lines on the receiver side together indicates a switch closure, then, like a bad microswitch, your Receiver Bd. is bad or misaligned. The cost is approximately the same as a microswitch... only the board is repairable.

Short-Hop OPTO GaAlAs 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.

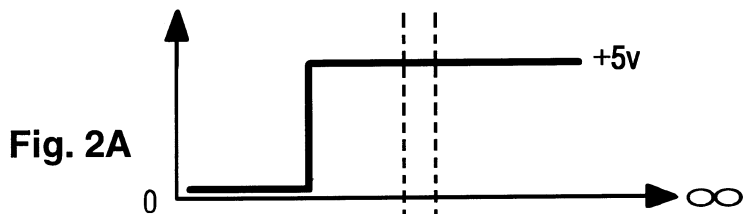
Troubleshooting (The following tests indicate normal operating conditions)

1. Volt Meter Test:

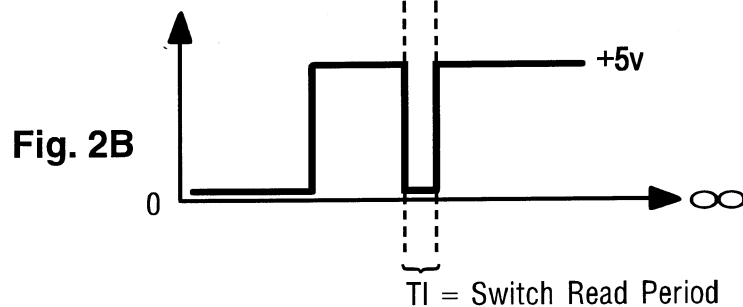
- A. **OPEN OPTO** (Light Falling on LED) = *SWITCH OPEN*. Place meter leads across points **A** and **B** (Refer to Schematic Drawing Fig. 1 above). It should read approximately 0.8 - 1.2v DC.
- B. **CLOSED OPTO** (Light Blocked) = *SWITCH CLOSED*. Place meter leads across points **A** and **B** (Refer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

Short-Hop OPTO GaAlAs 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 *UN-BLOCKING* 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

