

# Weldon Model 7000

## Electronic School Bus Flasher



## Operation and Installation Guidelines

*Version 00*

Notice.....	2
Introduction.....	2
Installation .....	2
Specifications .....	3
Electrical Hook-Up.....	4
Master Override Switch (Pin 1).....	4
Master Switch (Pin 2).....	4
Right Amber Output (Pin 3) .....	4
Right Red Output (Pin 4) .....	4
Stop Arm Output (Pin 5) .....	4
Left Red Output (Pin 6).....	5
Left Amber Output (Pin 7).....	5
Start Switch Input (Pin 8) .....	5
Sequential Flash Door Switch Input (Pin 9).....	5
Non-Sequential Flash Door Switch Input (Pin 10) .....	5
Flasher Ground (Pin 11) .....	5
Eight-Lamp Sequential Installation with Master Override.....	6
Four-Lamp Sequential Installation with Master Override.....	7
Troubleshooting.....	8

## Notice

To ensure proper and reliable function, this product must be installed according to the direction of this manual. The Weldon Model 7000 flasher conforms to applicable SAE guidelines for operation and durability. It is the responsibility of the installer to ensure that this component is integrated into the vehicle's warning lamp system according to Federal, State, and Local requirements.

## Introduction

The Weldon Model 7000 flasher is designed specifically for the school bus warning lamp application. The 7000 has become the industry standard in 8-lamp flashers; offering the durability of solid-state switching and the precision of microprocessor control. The 7000 flasher allows the operation of eight 80W warning lamps, stop arm, and the stop arm lamps. The "start" button and passenger door switch interface directly to the flasher for sequential and non-sequential operation.

The flasher is designed to provide long-term, maintenance-free reliability. The flasher's electronics are fully encapsulated in a specially formulated epoxy to enhance durability and thermal performance. The epoxy fully isolates the electronic components allowing the assembly to withstand extreme levels of vibration and shock, and seals them from harmful fluids. The trademarked yellow enclosure is injection molded from a high-impact polymer and hot stamped to ensure the terminal labels will be legible for years.

The output channels of the flasher are over-current protected to prevent damage to the flasher or the wiring should a short occur or should inappropriate loading be applied.

## Installation

1. Locate the Flasher in the Vehicle - The flasher should be mounted in the vehicle's electrical compartment or some location that provides convenient access to fused power, ground, and lamp wiring. The mounting area should be removed from corrosive environments such as salt/road spray, engine fluids, degreasing sprays, fuels, etc. Although the flasher is fully encapsulated, the wire terminals are exposed and susceptible to corrosion. As with any electronic device on the vehicle, the flasher should not be exposed to high temperature sources such as engine exhaust or electric/hot water heaters.
2. Secure the Flasher in the Vehicle - The flasher is to be securely mounted to a flat, rigid surface via the two mounting locations provided in the flasher case. **Under no circumstance should additional holes be drilled into the flasher. Any modifications to the flasher may damage it causing erratic and unsafe operation or failure and will void the warranty.**
3. Wire the Flasher – Harnessing for the warning lamps, stop arm, and other devices should be run per the circuit diagrams shown in Figures 2 or 3. Connect the harness to the flasher in order from Pin 11 to Pin 1 (Ground first). The terminals are to be wired per their individual requirements discussed in the next section. The wire harness connected to the flasher should be secured to prevent fracture of the wires or terminals from road shock and vibration. The harness should be supported with strapping secured to the vehicle. **Do not use the flasher's connections to support the weight of the harness.** Power to the flasher must be fused. The fuse should be as close to the battery side of the power circuit as possible. It is not necessary to fuse the lamp output leads from the flasher to the lamps, as the flasher will protect from shorts or over-current conditions on the outputs. The fuse must be sized appropriately such that the fuse trips before damage can occur to the wire harness. Keep in mind that the inrush current on a cold bulb filament can be 10X its normal operating current. The wiring gauge and fusing must be sized to protect the system and be large enough to prevent false tripping due to normally occurring inrush currents or voltage variations. **The flasher must be grounded.** The flasher will not be capable of reliable operation without a good ground on Pin 11. **The ground wire (Pin 11) must be connected first during installation.**

## Specifications

Flasher is certified to SAE J1054 SEP94.

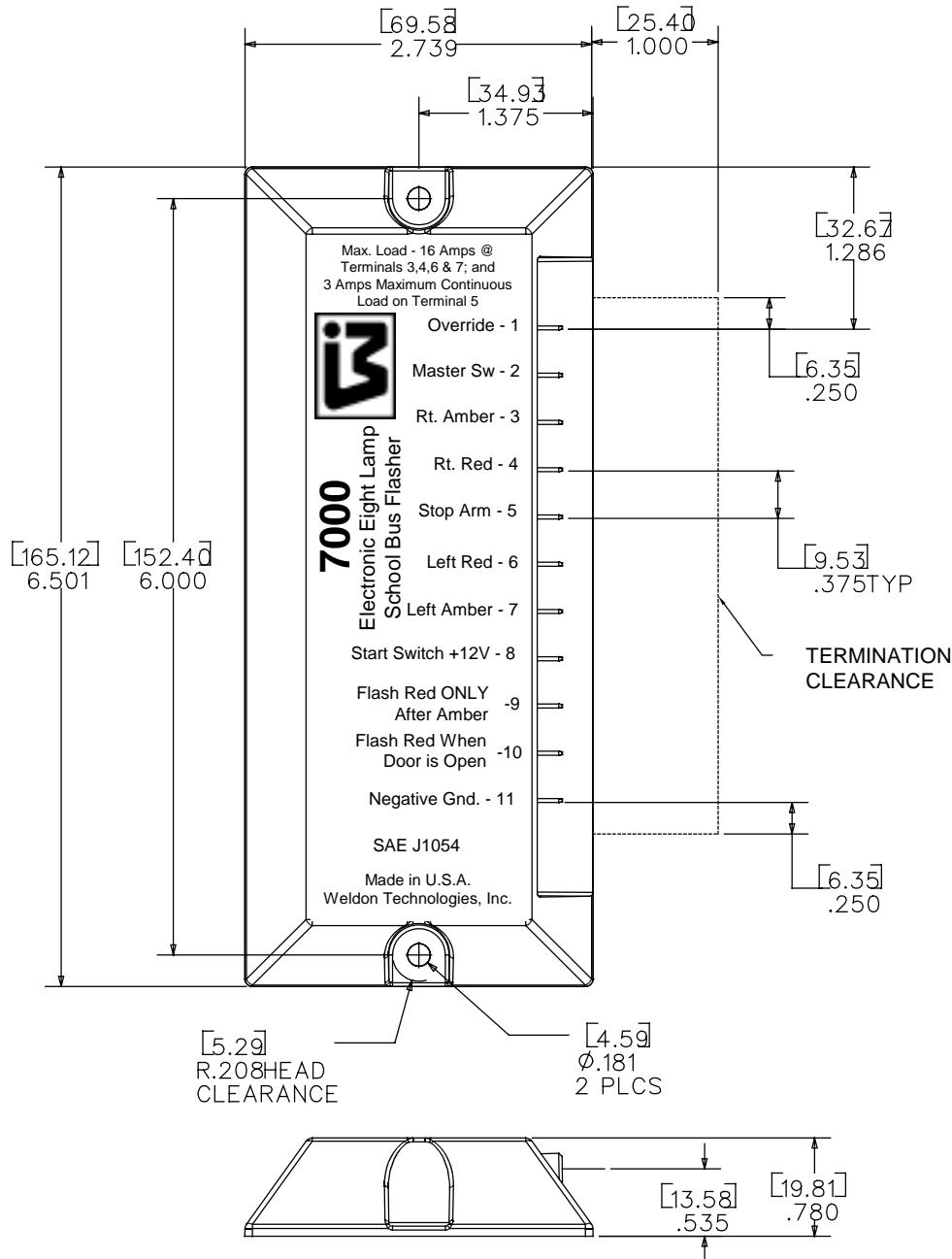


Figure 1 – Flasher Installation Drawing

Operating Voltage:	10 – 16VDC	Current Rating (Pins 3, 4, 6, 7):	16 Amps Continuous
Operating Temperature:	-40 to +55°C	Output Over-Current Trip Point:	$40 \pm 10$ Amps
Storage Temperature:	-40 to +85°C	+12V Input Sensitivity (Pin 8):	> +7V
Weight:	6.7oz [0.21kg]	Gnd Input Sensitivity (Pins 9,10):	< +0.5V

## Electrical Hook-Up

The **flasher connections must be made in 11 – 1 order**. That is, start with the ground connection first, then work your way up to power. When removing the flasher, make sure the ground pin is removed last.

### Master Override Switch (Pin 1)

The flasher can be wired with a master override switch that is used to force the flasher into red warning mode whenever the override switch is activated. This function is useful for activation of the red warning lamps and stop arm without having to push the start switch or open the passenger door. The override function will also provide a safe mode of operation should the door switch fail.

The master override switch is a double-pole, single-throw switch (a single switch that has two electrical circuits). One of the circuits is used to provide +12V power to the flasher (Pin 1). The other provides a ground to Pin 10 (Flash Reds Whenever Door is Open). The override switch effectively forces the flasher into non-sequential operation in a condition where the door is perceived as "open."

### Master Switch (Pin 2)

The master switch provides warning lamp system power. This must be a high-current switch because it is providing all of the current through the flasher to the warning lamps and stop arm control. It is recommended that the power to the flasher be supplied through a high current automotive relay or solenoid that is activated by an operator-controlled switch. If several devices are powered by the master switch relay, a separate fuse must be installed for the flasher between the master switch relay and the flasher power input.

### Right Amber Output (Pin 3)

The "Rt. Amber" output provides power to the amber warning lamps on the right front and rear of the vehicle. The output is activated when power and ground are applied to the flasher and a +12V momentary pulse is applied to the "Start Sw." input (Pin 8). When active, the output is flashed at 75 flashes per minute (FPM) with a 50% duty cycle. The "Rt. Amber" output alternates with the "Left Amber" output. The output is over-current protected and will shut down if the line is shorted or if too large an electrical load is applied. The output will not reset until flasher power is cycled.

### Right Red Output (Pin 4)

The "Rt. Red" output provides power to the red warning lamps on the right front and rear of the vehicle and to one of the lamps on the stop arm(s). The output is activated when power and ground are applied to the flasher and the door is opened in sequential or non-sequential modes or the master override switch is enabled. When active, the output is flashed at 75 FPM with a 50% duty cycle. The "Rt. Red" output alternates with the "Left Red" output. The output is over-current protected and will shut down if the line is shorted or if too large an electrical load is applied. The output will not reset until flasher power is cycled.

### Stop Arm Output (Pin 5)

The stop arm output (Pin 5) provides power to the stop arm and/or cross gate relay or valve causing it to extend when the red lamps are active. The stop arm output is dependent upon the red lamp outputs (internally the left and right red outputs are diode "or'd" together to create a steady output when the reds are active). Should the stop arm load be greater than the rated pin capacity there is a possibility that one or both of the red circuits will trip the current limit and be disabled. In the case of one red circuit being disabled, the arm will "bounce" in and out in harmony with the remaining red lamp circuit. Similarly, if one of the red circuits is overloaded, the arm will bounce.

The stop arm output is designed as a logic control pin. The stop arm control should be wired based on the following:

1. If the RMS current draw of connected loads does not exceed 3Amps, the stop arm devices may be powered directly off of flasher pin.
2. If the RMS current draw of connected loads exceeds 3Amps or is not known, power the devices through a relay as shown in Figure 2.
3. If using this flasher on a 4-way warning lamp system, the unit can be operated in sequential mode by controlling the stop arm through a relay - as shown in Figure 3.

### **Left Red Output (Pin 6)**

The "Left Red" output provides power to the red warning lamps on the left front and rear of the vehicle and to one of the lamps on the stop arm(s). The output is activated when power and ground are applied to the flasher and the door is opened in sequential or non-sequential modes or the master override switch is enabled. When active, the output is flashed at 75 FPM with a 50% duty cycle. The "Rt. Red" output alternates with the "Left Red" output. The output is over-current protected and will shut down if the line is shorted or if too large an electrical load is applied. The output will not reset until flasher power is cycled.

### **Left Amber Output (Pin 7)**

The "Left Amber" output provides power to the amber warning lamps on the left front and rear of the vehicle. The output is activated when power and ground are applied to the flasher and a +12V momentary pulse is applied to the "Start Sw." input (Pin 8). When active, the output is flashed at 75 FPM with a 50% duty cycle. The "Rt. Amber" output alternates with the "Left Amber" output. The output is over-current protected and will shut down if the line is shorted or if too large an electrical load is applied. The output will not reset until flasher power is cycled.

### **Start Switch Input (Pin 8)**

The start switch is a positive voltage (+12V) momentary signal to the flasher that initiates the amber flash cycle. The duration of the momentary signal must be longer than 50ms or the flasher will reject the signal as electrical noise.

### **Sequential Flash Door Switch Input (Pin 9)**

Sequential flash operation has the red cycle initiating only following an amber cycle. That is, the start button must be pressed before the reds will turn on. The passenger door switch sequential flash door switch input (Pin 9 – Flash Red ONLY After Amber) is connected to this input to operate the flasher in sequential mode. When the door is open, the input should be switched to ground. When the door is closed, the input switch must be open or floating.

### **Non-Sequential Flash Door Switch Input (Pin 10)**

In this mode, the start button will initiate the ambers and opening the door will stop the ambers and start the reds - just like the sequential mode. However, non-sequential operation has the red cycle initiating any time the passenger door is opened. As with Pin 9, the door switch must complete a ground circuit to Pin 10 when the door is opened.

### **Flasher Ground (Pin 11)**

The flasher has a logic ground connect at Pin 11. It is imperative that the flasher have a good ground as this will set the logic low level for referencing the input switches and for determining over-current conditions on the outputs. Without ground at Pin 11, the flasher's operation is not guaranteed and damage may be caused to the flasher or the vehicle wiring.

## Eight-Lamp Sequential Installation with Master Override

A typical 8-lamp warning system installation is shown in Figure 2 below. With this setup, the flasher will alternately flash the amber lamps after the Start switch is depressed. The ambers will continue to flash until the passenger door or the master override switch is closed. Once a "door open" condition is detected, the ambers will shut down and the reds will begin to flash for as long as the "door open" condition exists. Once the door is "closed," the reds will finish cycling and the flasher will await the next operational condition.

For non-sequential operation, simply connect the door switch to Pin 10 and leave Pin 9 disconnected.

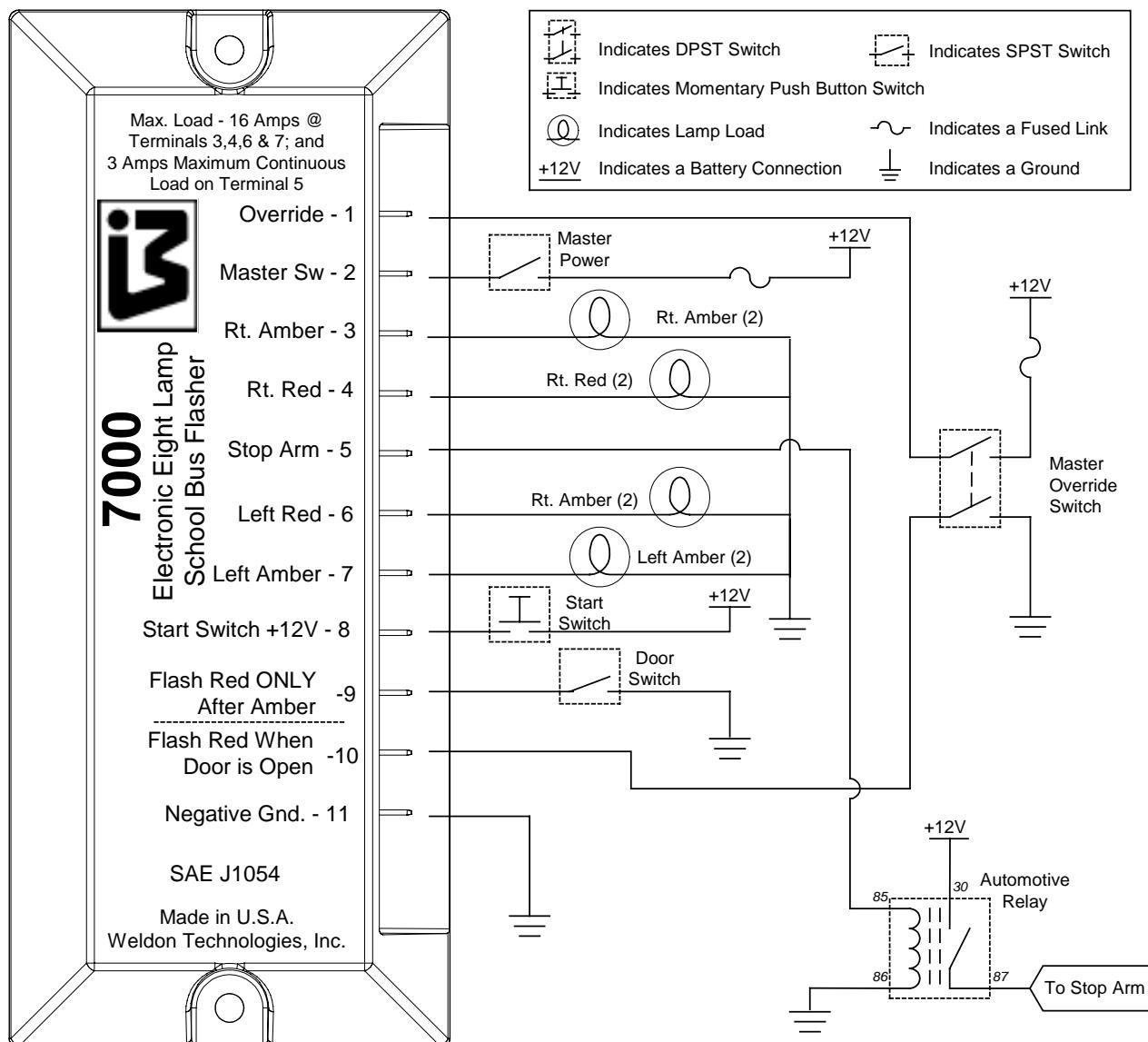


Figure 2 – Eight-Lamp Sequential Flasher Wiring Diagram with Master Override Switch

## Four-Lamp Sequential Installation with Master Override

A typical 4-lamp warning system installation is shown in Figure 3 below. With this setup, the flasher will alternately flash the red lamps after the Start switch is depressed. When a "door open" condition is detected the stop arm will be activated and the reds will continue to flash. When the door is "closed" the reds will finish cycling and the stop arm will return to the side of the vehicle.

In this 4-lamp wiring, the master override switch only activates the red lamps. The passenger door must be opened to deploy the stop arm.

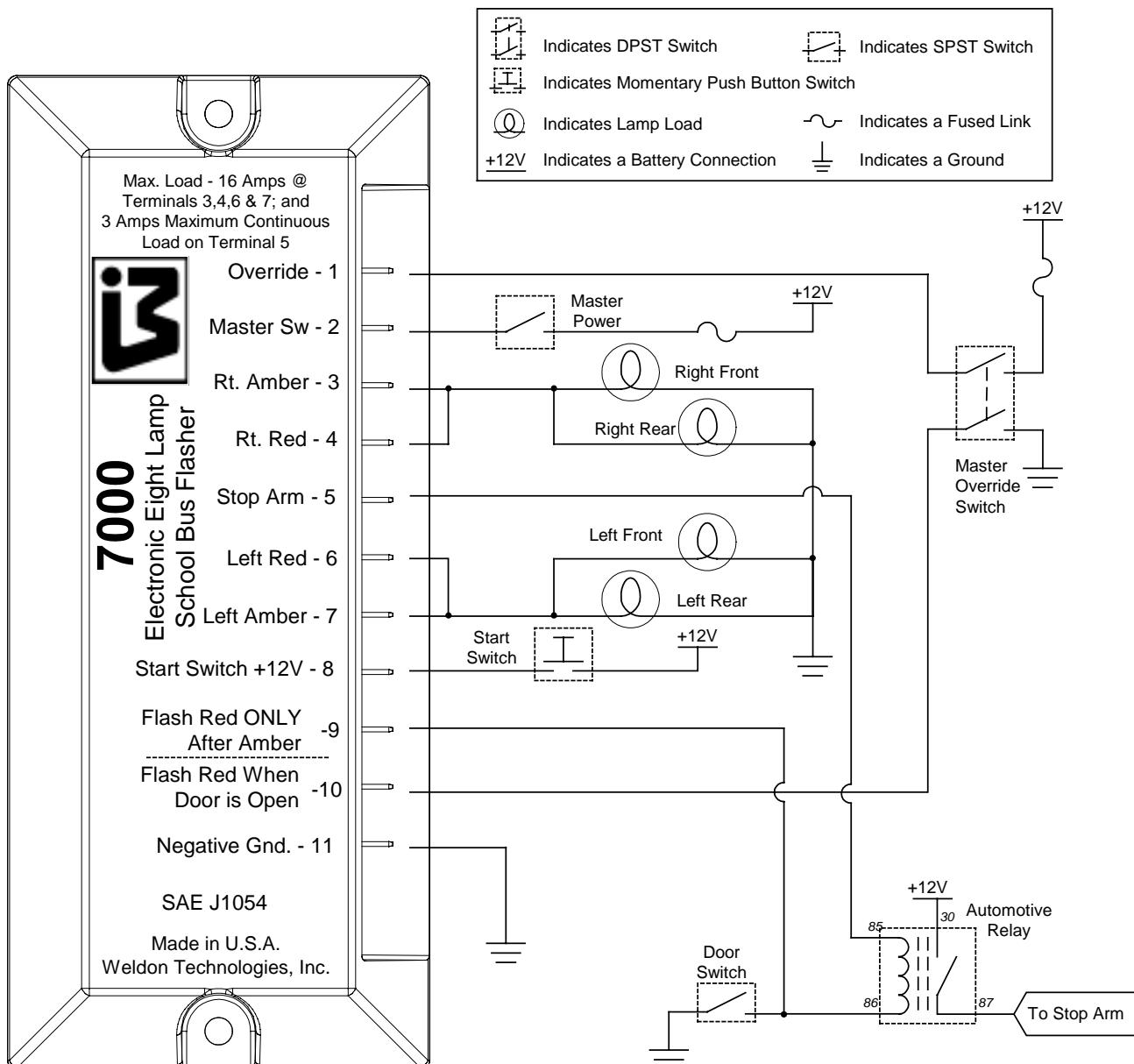


Figure 3 – Four-Lamp Sequential Flasher Wiring Diagram with Master Override Switch

## Troubleshooting

Problem	Action
Flasher Does Not Function	<p>Check that there is +12V to Pin 1 or 2 and that there is ground on Pin 11. It is best to use a test lamp.</p> <p>Once the flasher has power and ground, check that the lamps and stop arm are operational by individually removing the lamp output terminals and applying +12V to each lead wire. The lamps will illuminate and the stop arm will extend accordingly. If not, you will need to service the wiring or lamps.</p> <p>Once you have determined that the flasher has power and the lamps are operational, make sure the inputs are working correctly. First, check the operation of the red cycle by grounding a test lead to Pin 10. As long as the flasher is powered, the reds should immediately start flashing when ground is applied to Pin 10. If the ground is removed from Pin 10, the lamps will shut off.</p> <p>If the reds work correctly, confirm the Start Switch is correctly wired to test the ambers. First, disconnect the harness lead from Pin 8. Hook a test lamp up to the lead from the start switch. When the start switch is pressed it should provide +12V to the test lamp as long as the switch is pushed. Leaving the harness lead disconnected, use a jumper wire and apply +12V to Pin 8. This will start the amber lamps flashing. They will continue to flash until a ground is applied to Pins 9 or 10.</p>
Ambers Start Flashing and Will Not Switch to Reds	<p>This is likely due to a bad door switch. To test, start the ambers flashing and apply a grounded test wire directly to Pin 9. Grounding Pin 9 will make the flasher think the door is open, and the reds should start flashing if the ambers were running first. If the test lead works, then the door switch needs to be adjusted or replaced. Use a test lamp to confirm the door switch is grounding when the door is open.</p>
The Master Override Switch is Not Working	<p>First, make sure the switch is providing a ground circuit to Pin 10 of the flasher. If the master switch is off, the override switch will need to switch power to Pin 1 as well as ground to Pin 10. The override switch is typically a double-pole, single-throw, heavy-duty switch.</p>
The Stop Arm "Bounces" In and Out When the Reds are Active	<p>If the stop arm "bounces," it is because one of the red channels has shut down or failed. To test, disconnect the leads from Pins 4 &amp; 6 and recycle the flasher power. Test operation with Pins 4 &amp; 6 disconnected – the stop arm should operate correctly. Next, disconnect Pin 5 and reconnect Pins 4 &amp; 6. The stop arm will return, and the red lamps will flash. If the red lamps on one side of the bus are not flashing, then that circuit has a short or an over-current condition (too large of a current load). Check for shorts or over-current with an amp meter. If both red sides are flashing properly, reconnect Pin 5. If either of the reds quits flashing, the load has exceeded the current limit on the flasher. The stop arm equipment must be run through a relay as shown in Figure 2. If both left and right reds continue to flash correctly but the arm "bounces," then the flasher has a bad diode and the flasher must be replaced.</p>
The flasher "buzzes" when the ambers or red lamps first cycle	<p>The flasher is not actually buzzing. On the first flash of each lamp cycle, the flasher runs a warm-up cycle that reduces the inrush current created by the cold bulb filaments. The warm-up cycle helps to extend bulb life and reduce system loading. The noise is likely an electrical switching noise that may be induced onto audio or electro/mechanical equipment on the bus. In most cases, the buzzing is never noticed, but it can be pronounced if a lamp monitor with reed-switches is used.</p>