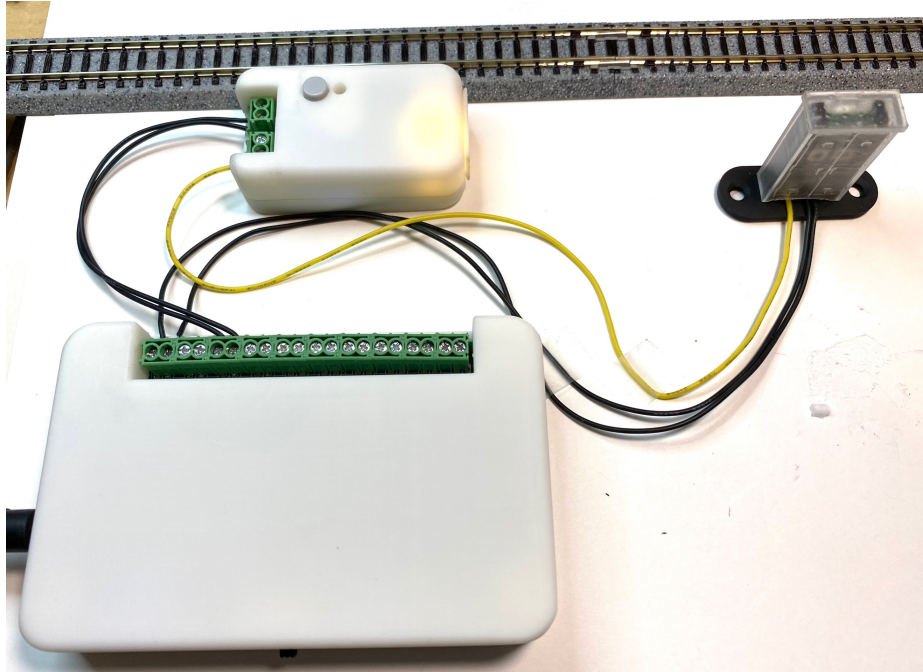# *S-Signal Controller*™

OPERATIONS MANUAL

RGY SEARCHLIGHT

Version 1.3a

INTRODUCTION

The Model Train Technology™ ***S-Signal Controller™*** (Searchlight) provides an extremely simple plug-and-play system for lighting and animating layout SEARCHLIGHT-style block signals that have a single light. This version of the controller is only available in Fiber Cable lighting to match with the fiber searchlight block signal.

After years of running block signaling from the computer via train software, I decided that for my 4x8' demo layout I wanted a very simple system that would give the appearance of a much more sophisticated operation without all the work. And I wanted a lot less wiring.

- No Soldering
- No Computer
- No Programming

Our simplified system will provide great animation in just a few minutes of installation time, not days or years, and at a fraction of the cost of elaborate CTC systems. There is no programming is involved. Very few visitors to your layout will know the difference!

OVERVIEW

Each **MTT S-Signal Controller** ("**Controller"**) is a pair of single light 3-color output controller that stands on its own and is triggered by a sensor, mounted either under or on the side of the track. Our **Precision Detector™** is a great choice since it is not based on typical IR (infrared) and is therefore not impacted by difficult lighting conditions. The **Controller** has an optional magnetic base and can be mounted upside-down under the layout so that the Controller can be removed easily when needed.

The **Controller** also has a built in DCC decoder that will allow your block signals to change automatically when you switch a turnout or route. No software, computer or programming is necessary. And there is no complicated wiring. <u>You don't need DCC to run the Signal Controller</u> but it's there if you need it.

When the **Controller** is tripped by a sensor, it starts a display (aspect) cycle that begins with red. While the sensor shows occupied, the **Controller** will stay red. Once the block (detector) is cleared, the **Controller** will start a change of light sequence based on one of the options shown below. The time between stages can be adjusted on the **Controller.**

The **Controller** has two outputs that are synchronized. You can individually adjust the different colors, and this will affect both outputs. We use a single RGY LED to light both outputs. The colors of the LEDS (Red, Yellow and Green) do not glow at the same brightness with the same voltage. The **Controller** allows you to adjust them to your liking.

The **Controller** allows you to set the speed by which the Aspect (colors) shifts from Red to Yellow to Green after the train has passed and the block is unoccupied. You can make it occur almost immediately, or you can set it up to 30 seconds. Each **Controller** has its own speed adjustment

The **Controller** has three distinct behaviors that are set with the single push button. They are:

- Red, Green
- Red, Yellow, Green
- Red, Yellow, Yellow flash, Green

The time between stages is set with the screwdriver(provided) and trim screw.

BLUE LIGHT TIMEOUT

If set, the BLUE indicator light will go out after 60 seconds of startup or if the Select button is not pushed. Each time you press the Select button, the light will come back on and start its 60 second timeout clock. In Address setting mode, press the SELECT button 12 times to toggle between On and Off. After being set, if the mode is ON, the blue light will flash 10 times. If off, it will flash once.

FADE MODE

The Controller has an option to set the style of change from one color to the next to be either immediate or fade.

The option is a toggle. To change the mode, press the SELECT button 4 times. When the change turns the option ON, the lights will flash 4 times. When the option has been switched OFF the lights will flash once.

STEP MODE

The controller can be set to trigger one aspect at a time using a pushbutton switch. To do so, you connect a SPST switch to the GND and DETECT terminals on the Controller. Then, each

push of the switch changes the aspect from Green, to Red, to Yellow and back to Green.

Push the SELECT button 8 times to activate STEP mode. Press SELECT 8 times again to turn it off. When the change turns the option ON, the lights will flash 4 times. When the option has been switched OFF the lights will flash once.

CONNECTING POWER

Shown on page 12 is our ***MTT Power Module*** and our ***Precision Detector™*** connected to the ***Controller***. Two wires power the ***Controller,*** and a single trigger wire connects the detector to the ***Controller***.

The ***Controller*** for LEDs can operate at voltages: 5V or 12v (12VDC recommended) and the output will closely match the input. There is a roughly 1V loss so that 12V in produces 11V available for the LEDs. The Fiber version can light 2 N, HO or O/S scale block signal using the special 2-core pin. Fiber block signals lights are available in O/S with an G scale version available soon.

LATCHING (Clear-to-Proceed)

While not a true CTC signaling system, there is one feature that will give the appearance of one – without the complexity.

In short, if you connect the Signal wire of the Signal controller from the block ahead to the LATCH terminal of the Signal Controller of the block behind, while the block ahead is occupied the block behind will wait at the last aspect before green. Once the block ahead is clear, the Signal Controller of the block behind is "released" and will turn green.

You can daisy-chain as many latching connections as you like.

Here is the wiring for Latching:

Signal Latching Example
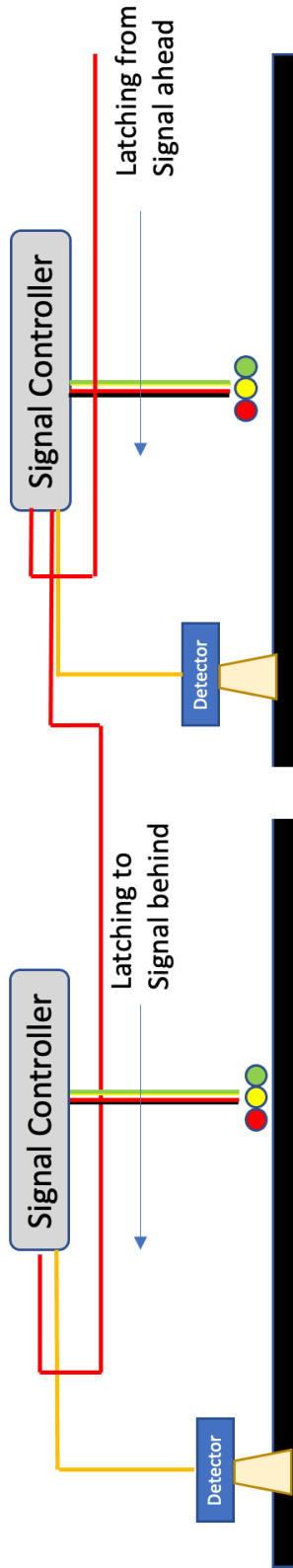
SETUP AND OPERATION

HO Scale: Simply plug the fiber into the Controller Manifold hole (no pin required)

N Scale: Use the included Fiber pin – insert the cable into the pin and insert the pin into the Controller manifold.

When you plug in power the blue internal LED will light. The LED output light will be green.

The Controller setup is simple. Connect to a 12VDC power source (or DCC power) to the topmost white JST terminals as shown above.

Connect your Signal LEDs as shown below.
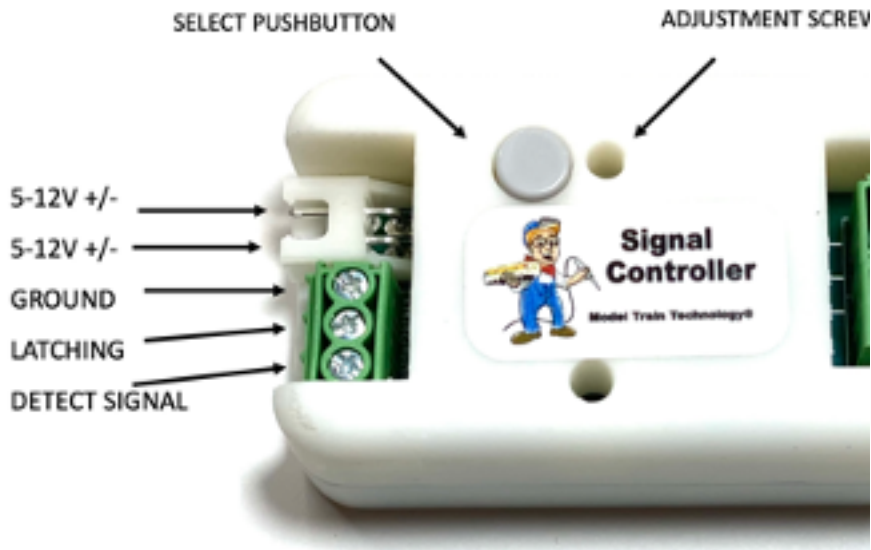
USE ONLY 12VDC (5v has been obsoleted)

The Detect Signal input is an OPEN DRAIN (GROUND) connection. That means that the signal it's looking for is a *digital LOW*.

NOTE: this Open Drain low is NOT the same as a LOW/HIGH from an Arduino. DO NOT connect an Arduino GPIO pin directly to the Signal Controller.

If you use our *MTT Power Module* to power your detectors and the *Controller* you only need the single yellow SIGNAL wire to connect the trigger wire.

If you have another kind of sensor system you can either have them share the same power supply or use the GROUND terminal. You may also "short" the ground and the signal to create the same result. In other words, a simple mechanical SPST switch between SIGNAL and

GROUND will trip the Controller. This is how manual GROUND THROWN turnout switches will be connected. Very simple.

SELECTING A SIGNAL BEHAVIOR (ASPECTS)

You push the Select Pushbutton the number times needed to select an option according to the table below. Once you stop pushing the button the Controller will wait 2 seconds and then all the LEDs will turn off. One second later the green signal LED will blink the number count matching the button pushes.

PUSHES	SIGNAL BEHAVIOR
5	Red, Green
6	Red, Yellow, Green
7	Red, Yellow, Yellow flash, Green

The default setting is 6 (standard 3 aspect).

SELECTING THE ASPECT CHANGE SPEED

The behavior speed adjustment screw is inside the Controller. You access it with the provided 2mm screwdriver. Gently turn the screw inside from zero to about 300 degrees. It does not turn 360 degrees. Left or counterclockwise is faster (less time between stages), right or clockwise increases the time between stages. You can make the adjustment at any time since the Controller reads the setting at the beginning of each detector trip event.

SETTING THE BIGHTNESS (LED OR FIBER)

Setting the brightness for each color is accomplished by selecting that color with the SELECT pushbutton

To adjust each light color, press the button X number of times as follows:

1   GREEN
2   YELLOW
3   RED

For example, to change the brightness of Green, press the SELECT button once. This will light the appropriate color and you can then use the adjustment screw to change the light level. Gently insert the provided screwdriver into the adjustment screw hole and turn the insider screw clockwise or counterclockwise to reach the desired brightness.

When you are happy with the setting, press the select button once. This will save the setting and return the unit to normal operation.

NOTE: after you have adjusted the brightness, remember to RE-SET the adjustment screw to the timeout setting you want. Most of the time when you set the brightness of the LEDs the adjustment screw will be toward the "high" side, meaning all the way clockwise. This is also the LONGER time setting for the aspect changes.

MTT Precision Detector™
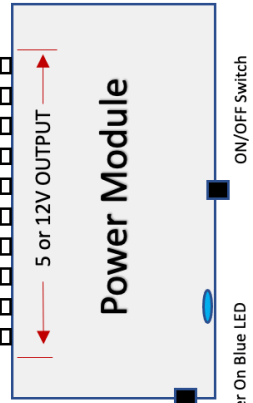## FIBER SIGNAL CONTROLLER HOOKUP

Model Train TECHNOLOGY

Fiber Output Light is WHITE
Block Signal Lens are colored

Select Fiber Pin
Size
(.50,.75,1.00,1.50mm)

Black Wires to Power.
Polarity doesn't
matter.

Yellow Signal Wire

Black Wires to Power.
Polarity doesn't matter.

Signal Controller
Model Train Technology®

Black Wires to Power.
Polarity doesn't
matter.

5 or 12V OUTPUT

Power Module

ON/OFF Switch

Power On Blue LED

DCC OPERATIONS

Detection/Signaling Example

Model Train™
TECHNOLOGY

18V Power Supply

Power Module

Station 1

Station 2

Signal Controller

Signal Controller

Detector

Detector

Detector

Detector
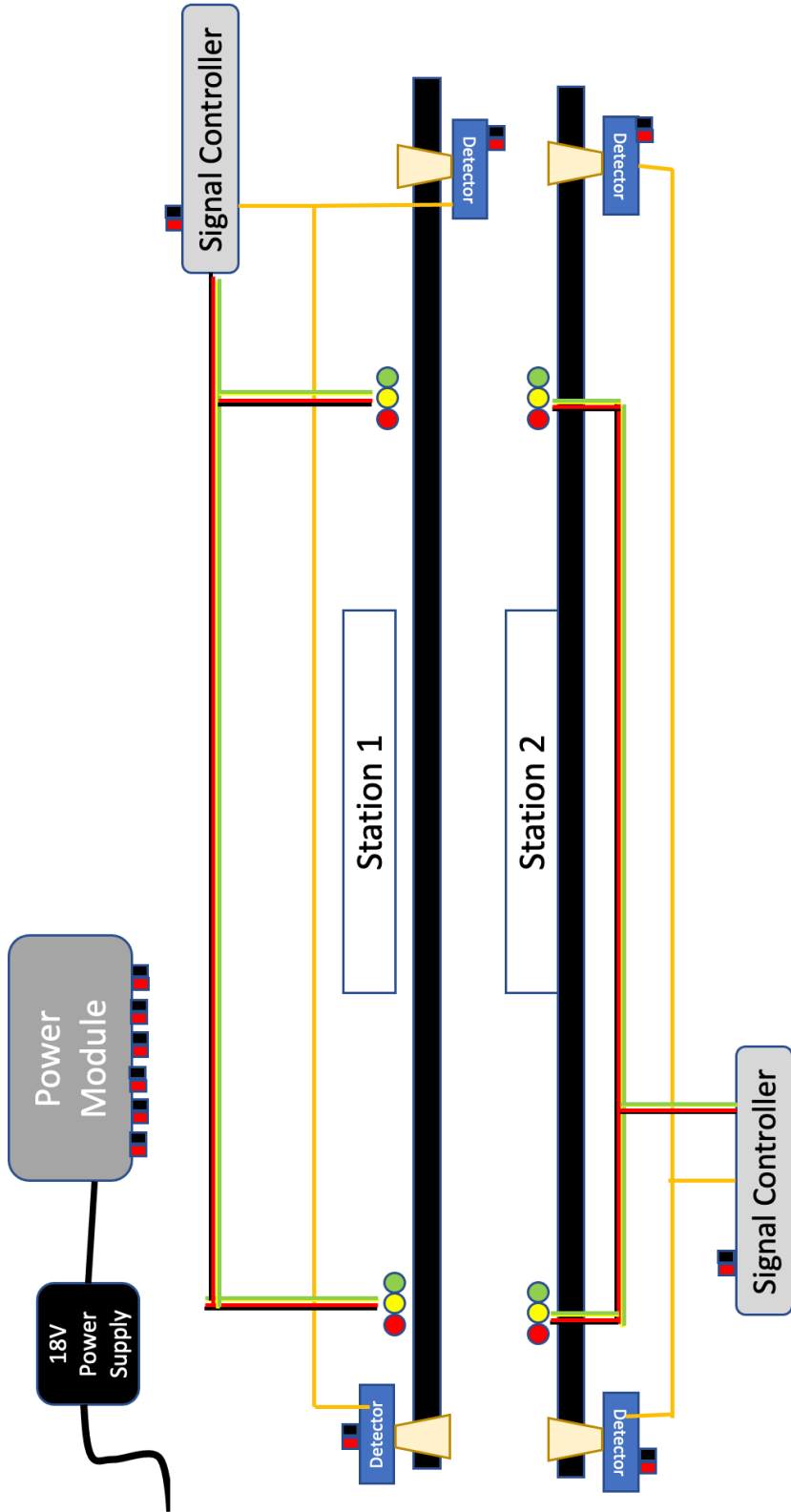
For clarity, power to each component is represented by:

* Includes power supply

The **Controller** can respond DCC Accessory messages just like your turnout controllers. You can set the **Controller** to the SAME address as a turnout so that when you change the turnout, the **Controller** automatically changes the color of the signal. You can also configure several Controllers to the same switch address so that multiple but different signal lights will light according to your layout design. Since **routes** are a combination of turnout commands, the **Controller** can align the signal lights accordingly.

By default, and industry standard, the **Controller** DCC address is set to 3. You can change it to any valid accessory switch address between 1 and 2044. When the **Controller** receives a DCC turnout command (thrown or closed) that matches the **Controller** address, it will activate the trip function of the **Controller** and start the aspect animation.

- Closed means that the siding is closed, and the switch aligns with the Main Line – meaning the switch should be straight.

- Thrown means that the switch is set to divert the train to the siding or wherever else it might go, but not straight.

  The **Controller** uses the THROWN direction as a tripped condition.

  Since there are only two conditions for a turnout, it makes the most sense to set the **Controller** to 2 aspect mode – Red and Green only.

  If you find that the Thrown and Closed states are backward to the way you want to display the signal, simply reverse the wires and/or fiber cable connections to the **Controller.**

To operate the *Controller* with DCC you must power and connect your DCC rails A & B to the *Controller*. For small and medium sized layouts this should not be a problem since the *Controller* and LED require about 30ma each to run. For larger layouts or layouts with a lot of signals connected to you DCC track we suggest you create a separate Booster zone. This way, no current will be taken away from the rails to run the engines.

SETTING THE CONTROLLER ADDRESS

With the Controller in the non-tripped state, press and hold the select button for about 10 seconds. Within 1 second of beginning to press the button, all the signal lights will go out. Usually, it's just the green light that goes out since it's the only one on.

Continue to hold the select button until the light comes back on. Then release the button. The green light and the blue power light will begin to flash on and off. This indicates that the *Controller* is ready to accept a new address.

To set a new address, select the Accessory/Turnout number that you want to use on your DCC hand controller. This can be a number from 1-2044. Using your DCC hand controller, enter the number and then press the appropriate command to set a CLOSED or THROWN switch event. Either closed or thrown will work. This will be slightly different depending on the brand of DCC system that you are using.

To exit setting the address mode WITHOUT changing it, press the select button once. The Controller will return to its ready state.

As soon as you select CLOSED or THROWN, the **Controller** will flash 4 times and the lights will go off. The **Controller** is now set to the new address.

Lastly, the **Controller** will enter the unoccupied/un-triggered state which usually means that the green light will go on.

While DCC is connected and active, DCC commands will override the input signal and latching functions. In other words, you can use detectors OR DCC to trigger the *Controller* but not at the same time.

DCC to non-DCC Controller Linking

When the Signal Controller is operating in DCC mode, as mentioned above, the **Inputs** to Detect and Latching will <u>not</u> activate. However, the Latching terminal will automatically switch to act as a **Trigger Output** in sync with the DCC signals. In other words, if you give a Controller under DCC a Thrown command, it will trip that Controller AND trip that Controllers Latching circuit. You can then connect a wire from the Latch terminal to the Detect of another Controller NOT under DCC control.

Since the two controllers will be on different power supplies (DCC and some other DC power source) you will also need to establish a common GROUND between the Controller. Conveniently, there is a GROUND terminal on all Signal Controllers. Simply run a wire to connect the ground terminals of the two Controllers.

Signal Controller Magnetic Bracket (Available for order)
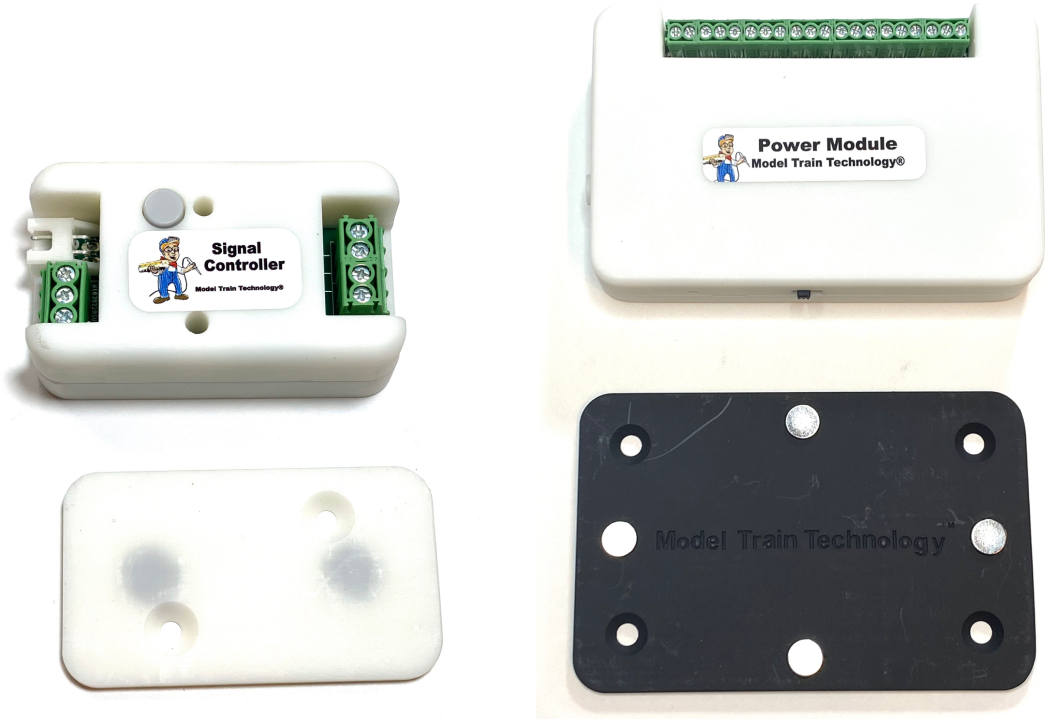
ELECTRONICS AND STATIC ELECTRICITY

The **MTT PRECISION DETECTOR™ - Trackside** circuit board and components are exposed when the cover is off. Electricity can be dangerous. Static electricity can cause component failure. Scuffing along a carpet and then touching one of the component connectors can cause a static spark. These components are fairly rugged – some designed for the automotive industry. Just be mindful of the risk. The current on the board will not harm you if the board is powered and operated as per the instructions.

ONE YEAR **MANUFACTURER WARRANTY**: We warrant this **product** to be free from defects in workmanship and materials, under normal residential use and conditions, for a period of one (1) year for the original invoice date. Shipping and handling fees are to be paid for by the customer.

LIMITATION OF LIABILITY

UNDER NO CIRCUMSTANCE SHALL COMPANY OR ITS AFFILIATES, PARTNERS, SUPPLIERS OR LICENSORS BE LIABLE FOR ANY INDIRECT, INCIDENTAL, CONSEQUENCIAL, SPECIAL OR EXEMPLARY DAMAGES ARRISING OUT OF OR IN CONNECTION WITH YOUR USE, OR INABILITY TO USE THE PRODUCT, WHETHER OR NOT THE DAMAGES WERE FORESEEABLE AND WHETHER OR NOT COMPANY WAS ADVISED OF THE POSSIBLITY OF SUCH DAMAGES. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, COMPANY'S AGGREGATE LIABILITY TO YOU SHALL NOT EXCEED THE AMOUNT OF THE PRODUCT. THE FOREGOING LIMITATION WILL APPLY EVEN IF THE ABOVE STATED REMEDY FAILS OF ITS ESSENTIAL PURPOSE.

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