MISSION BRIEF: Bugged & Brilliant Secret Light Code

By Deann Poleon

What students are learning:

Circuitry and Hardware Concepts: How electricity flows in a closed loop, how components like LED lights have polarity (positive and negative sides), how switches/paper folds complete or interrupt a path and how parallel/branch circuits work.

Data Encoding and Optical Communication: How information can be represented, sent, and decoded visually using light, patterns, colors, or sequences.

Debugging and Troubleshooting: Testing when a system fails (battery, tape, connections, contact)

Design thinking and Engineering: Combining hands-on technology and storytelling to solve a communication problem.

Standards

Grades 1-2

- CSTA
  - **1A-CS-02:** *Predict how computational or physical tools will behave based on inputs.*
  - **1A-AP-09:** *Model daily processes by creating and following algorithms (sets of step-by-step instructions) to accomplish tasks.*
- NGSS
  - **1-PS4-2:** *Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.*
  - **1-PS4-4:** *Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*

Grades 3-4

- **CSTA**
  - **1B-AP-09:** *Create programs that use variables to store and modify data.*
  - **1B-CS-01:** *Describe how internal and external parts of computing devices function.*
  - **1B-AP-15:** *Test and debug (identify and fix errors) an algorithm or program to ensure it runs as intended.*
- NGSS
  - **4-PS3-2:** *Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.*

Grade 5

- **CSTA**
  - **1B-NI-04:** *Model how information is broken down into smaller pieces, transmitted as packets through multiple devices, and reassembled.*
  - **1B-CS-02:** *Model how computer hardware and software work together as a system to accomplish tasks.*
- NGSS
  - **3-5-ETS1-3:** *Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.*

Grades 1 & 2

Template for art and circuitry work

Your Mission

A big storm hit the enchanted forest! A mudslide trapped our animal friends, and the phones do not work!

Dee the Firefly needs your help! Use secret light signals to help save the day!

Step 1: Color Your Scene

Color your forest and animal friends!

Step 2: Build Your Circuit

- Use your template to lay down the special tape.
- Add your Launchpad LED but keep the lights off for now!
- Add your battery last when you are ready to send your message.

Step 3: Flash Your Secret Message!

- Put your battery on one circuit to make it light up!
- Turn to a neighbor and flash your light.
- Ask them: **"Can you guess my secret message?"**
- Now, move your battery to test your second circuit and share a new message with another friend!

Step 4: Think About It!

- Did your friend guess your secret message?
- How could you add more lights to tell a bigger story?
- Did your light turn on right away? If not, how did you fix it?
- What was your favorite part—the picture, building the circuit, or sharing messages?
- Where else in the real world do people use lights or codes to talk to each other?

Materials Needed:

1 Launchpad battery

1 Launchpad LED

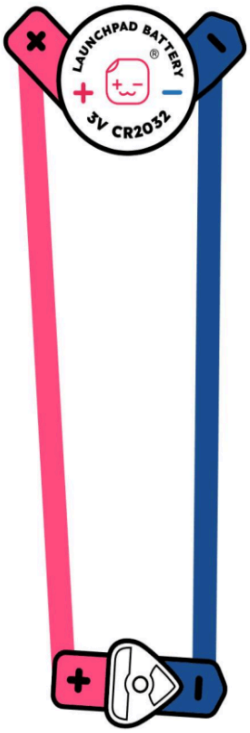
Conductive fabric tape

2 Clips (to attach battery)

Simple Circuit

Use the template to complete your simple circuits.

Messages
Yellow: I am here and ready to dig!
Red: Watch out for falling twigs!


LAUNCHPAD BATTERY
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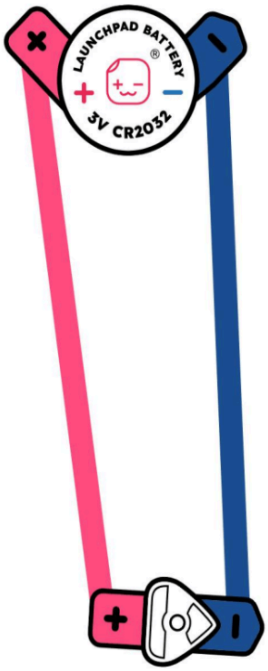
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Grades 3 & 4

Template for art and circuitry work

Your Mission: A big storm hit the enchanted forest! A huge mudslide trapped our animal friends, and the phones do not work!

Dee the Firefly needs your help! Put secret light stickers to flash messages across the dark forest and save the day!

Step 1: Color Your Scene

Color your forest and animal friends!

Step 2: Build Your Cut-and-Fold Switch Circuit

- Use your template to lay down your special tape.
- Place your lights and batteries on your paper circuit.
- Cut on the lines and fold your paper on the dotted line.
- Keep the lights off until you are ready to send your message!

Step 3: Share Your Secret Message!

- Push down on the folded paper flap to turn on your circuit and make it light up!
- Flash your light toward a classmate.
- Ask your neighbor: **"Can you guess my secret message?"**

Step 4: Think About It!

- When your neighbor tested your circuit, did they guess your secret message?
- How could you add another light or message to tell a bigger story?
- Did your light turn on right away? If not, how did you fix it?
- Which part was your favorite—drawing and coloring, building the circuit, or sharing messages with classmates?
- Where else in the real world do people use light signals, codes, or switches to talk to each other?

Materials Needed:

2 Launchpad batteries

2 Launchpad LEDs (green and blue)

Conductive fabric tape

4 Clips (to attach battery)

Scissors

Cut and Fold Switch Template

Cut on the solid line and fold on the dotted line.

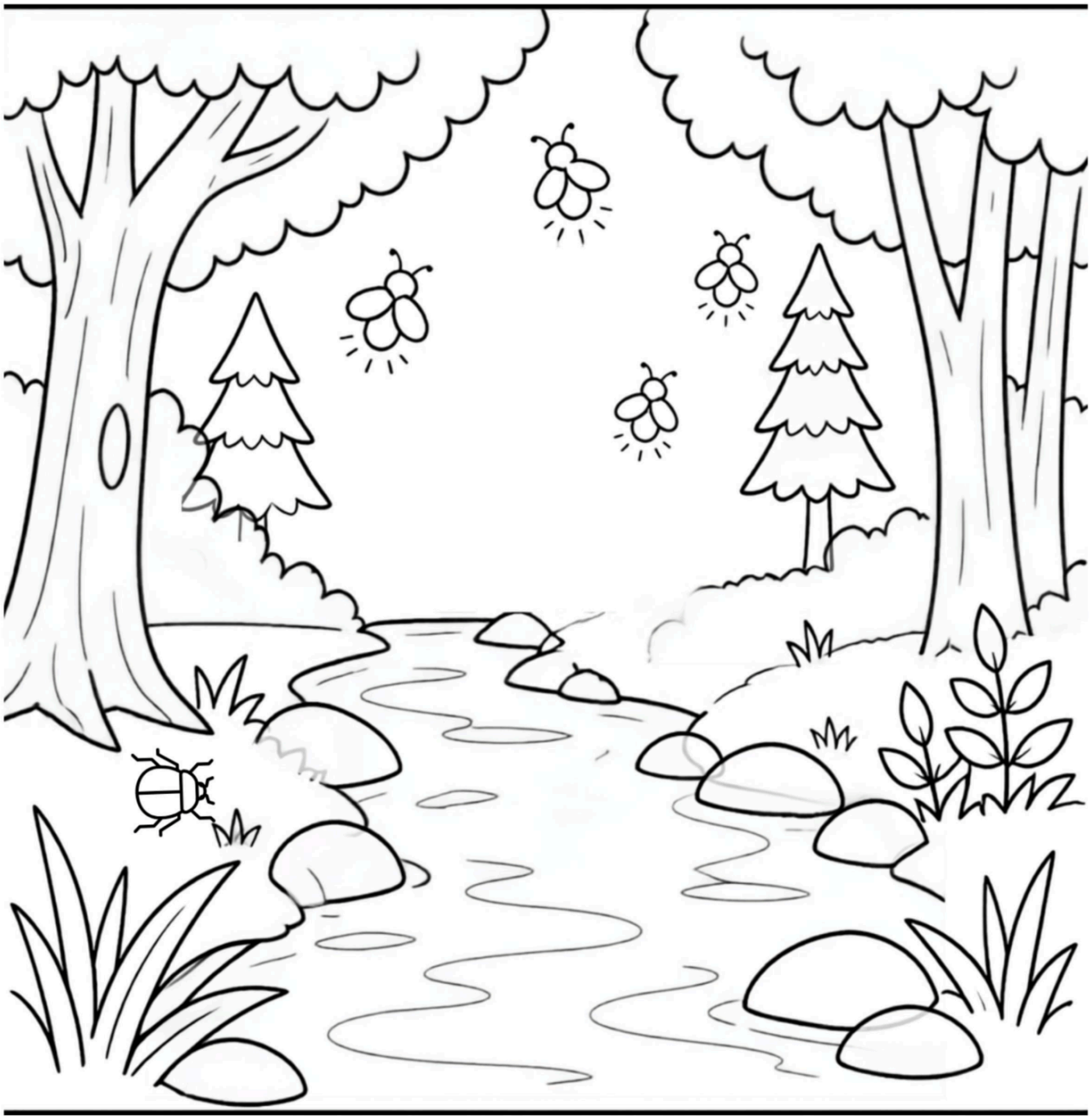
Be sure to add tape to the flap!

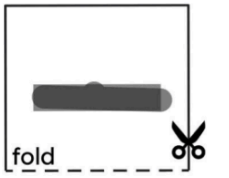
Messages

Green: Found a lost baby beetle, sending a map!

Blue: The stream is rising; need a twig bridge built!

Two quick flashes: More flashlights needed in the hollow log.

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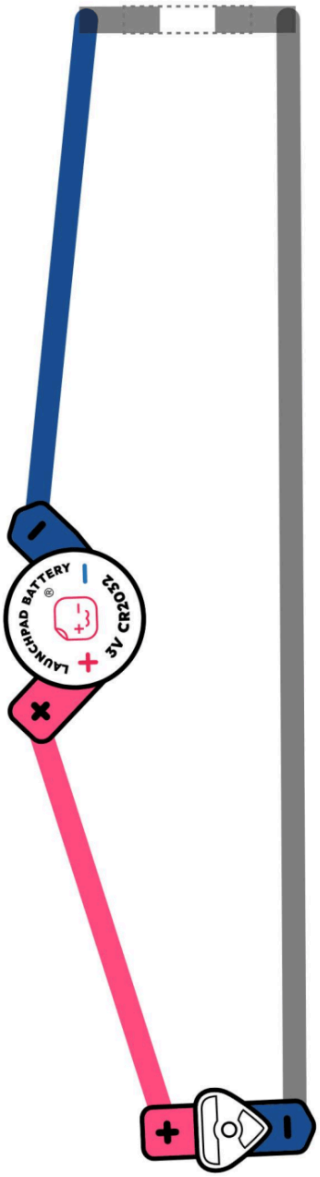
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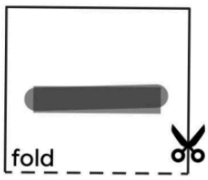
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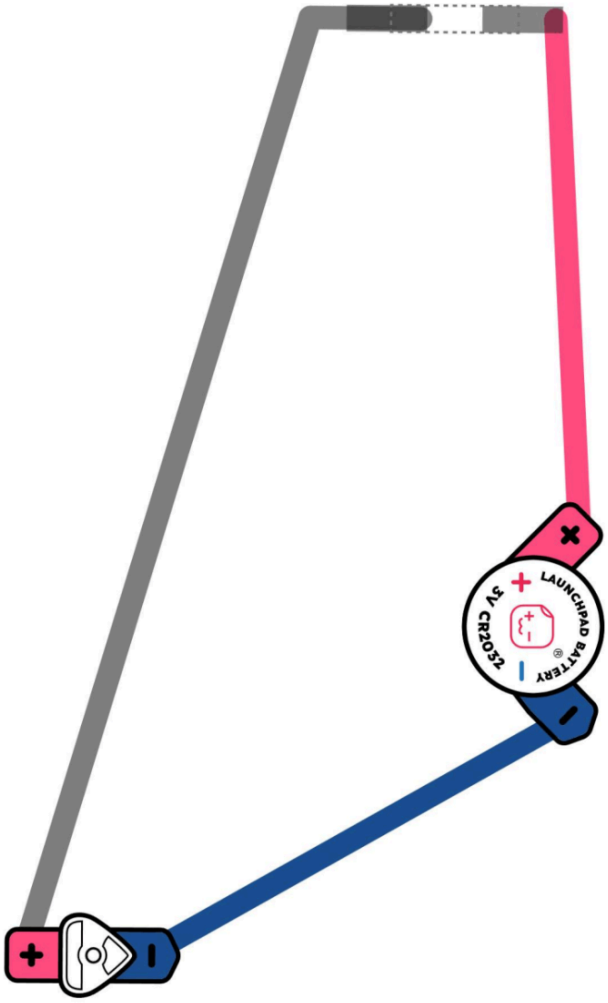
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Grades 5

Template for art and circuitry work

Your Mission

A heavy storm has swept through the enchanted forest, causing a massive mudslide that blocked the entrance to the ant colony and trapped some forest friends! The local Wi-Fi and cell signals are down. Dee the Firefly needs an elite team of tech-savvy lightning bugs to set up an emergency optical communication system. By wiring custom circuit stickers, you can flash vital messages across the dark forest to coordinate the rescue mission!

Step 1: Color Your Scene

Color and design your forest landscape and animal friends!

Step 2: Make Your Branch Switch Circuit

- Use your template to lay down the circuit tape.
- Place your lights and batteries onto the circuit.
- Keep the lights off for now until you are ready to send your message!
- Hint: You can control which lights flash by touching the bottom of the paper under each light, or both lights at the same time.

Step 3: Share the Message

- Push down on your folded paper switch to complete the circuit and turn on your light.
- Flash your light to a classmate and ask them: **"Can you decode my secret message?"**

Step 4: Reflection

- When your neighbor tested your circuit, did they decode your message as expected?
- How could you expand this scene with an additional light or message to tell a bigger story?
- Did your light turn on immediately? If not, what went wrong and how did you fix it?
- Which part of the process did you enjoy most—designing/coloring the artwork, building the circuit, or sharing messages with classmates?
- Where else in daily life do people use light signals, codes, or simple electronic switches to communicate?

Materials Needed:

1 Launchpad battery

2 Launchpad LED

Conductive fabric tape

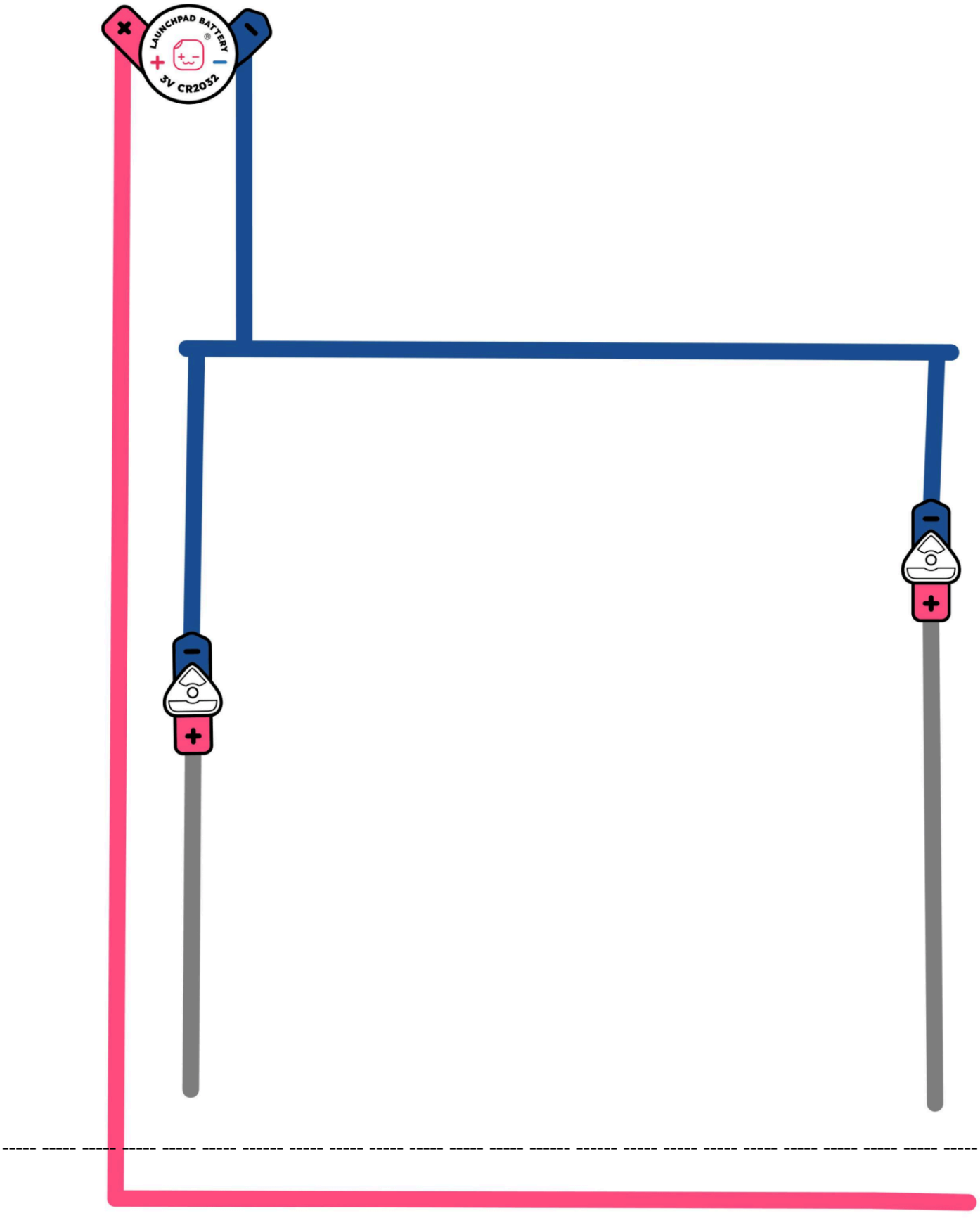
2 Clips (to attach battery)

Branch Switch

Fold at the dotted line and touch to turn lights on!

Messages

Red LED + 1 Long Hold: Heavy rock blocking path.
White LED + 3 Quick Taps: Path clear, moving to next zone.
Both Lights Blinking: Emergency! Sector flooding, evacuate!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