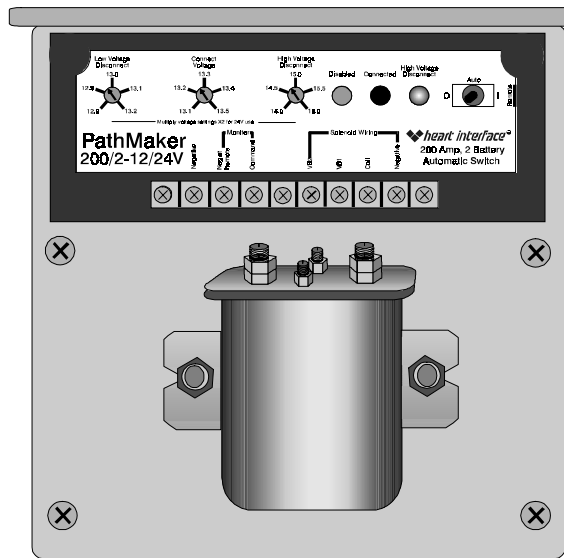


THE PathMaker™



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Introduction 3

The PathMaker controls solenoid(s) [high current relays] to provide automatic battery switching in a wide range of environments and applications including; marine, recreational vehicles, renewable energy, military, and mobile audio. The PathMaker has two primary functions; first it automatically parallels (connects together) multiple batteries (combining them) when charging sources are available, and secondly, it automatically disconnects the starting battery from the system loads when there are no active charging sources. This insures that the engine starting battery is always full. Additionally, when used with the optional Remote Control Switch, the batteries may be paralleled for emergency starting.

Physical Description

The PathMaker consists of the following major components:

A control module that provides user adjustable set points, operator indicators, and a local control switch. Additionally, a telephone jack on the right hand side of the module allows the user to plug in the optional remote control panel.

A terminal strip is fitted under the control module. This terminal strip is where the user connects a wire to system negative (system ground), and makes optional connections. All other connections are pre-wired at the factory and require no changes.

The PathMaker Solenoid(s) are mounted below the terminal strip. They provide the connection for the path of battery current flow when enabled by the control module.

Remote Control Panel (optional) that connects to the PathMaker via a telephone cable is available. Use of this optional panel is strongly recommended, as the PathMaker may be mounted where access to the local control switch may not be convenient.

2 Specifications

Electrical:

Input Voltage Range: 7 - 33 Volts (24V operation assumed if turned on >18.0V)
Low Voltage Disconnect Range: 12.8 - 13.2V (X2 for 24V) (13.0V Fixed on 70 A units)
Connect Voltage Range: 13.1 - 13.5 V (X2 for 24V)
High Voltage Disconnect Range: 14 - 16 V (X2 for 24V) (Fixed at 15.0V on 70 A units)

Current Ratings: 70A units, 70A continuous, 120A peak
100A units, 100A continuous, 400A peak
200A units, 200A continuous, 600 A peak
Idle Power Consumed: 0.2 - 0.35 W @ 12 V, 0.4 - 0.7 W @ 24V
Connected Power: 70A/2 = 1.5 W @ 12V, 1.9 W @ 24V
100A/2 = 5.4 W @ 12V, 5.8 W @ 24 V
100A/3 = 10.4 W @ 12V, 10.8 W @ 24V
200A/2 = 4.3 W @ 12V, 4.7 W @ 24V
200A/3 = 8.2 W @ 12V, 8.6 W @ 24V

Indicator Lights: Disabled: Yellow, Connected: Green; HV Disconnect: Red

Remote Control: Optional Remote Control Panel available
External Control: User supplied momentary on/off switch
Remote Panel: Flush mount, 2.25" H x 3.65" W x 0.75" D (3" W X 1.625 H " cut out)

Environmental: Splashproof front, 25' cable included
Not approved for explosive environments!

Operating Temp Range: -40 to +85C
May be mounted in any position
Size: 70A: 5.0" H x 7.4" W x 1.8" D
100A: 6.3" H x 7.4" W x 3.6" D
200A: 7.6" H x 7.4" W x 3.2" D

4 Wiring Notices

The terms "battery" and "bank" are used interchangeably. A "bank" means a group of batteries that are connected, in series or parallel, to create a higher capacity, or higher voltage, "battery".

Connect the wire to system negative (ground) to the PathMaker terminal strip last.

All wiring to PathMaker solenoid terminals must be sufficiently sized. Starter current of several hundred amps may pass through these wires. If in doubt, please consult a professional.

Battery cables must be properly strain relieved. PathMakers are not approved for explosive environments.

Caution!! If B+(Battery Positive) is shorted to the NEGATIVE terminal the Control Module, COIL NEGATIVE, the electronics may be destroyed. (This is a Non-Warranty failure - use caution!)

Fuses, Battery Switches, and Protective Terminal Caps

To simplify installation diagrams we have not included fusing or optional on/off battery switches. Check the latest ABYC (American Boat and Yacht Council) and NEC (National Electrical Code) for fusing requirements for your installation. Install protective terminal caps as needed to protect against shorting of terminals.

Alternator Protection

An alternator may be damaged if operated with no battery (or load) attached. For this reason, we recommend the use of a Heart Interface ZapStop™ to protect an alternator that experiences a brief open output condition. Zapstop's prevent momentary over voltage.

70 A Units

Disconnect Voltage is fixed at 13V on all 70 Amp units. High Voltage (HV) Disconnect fixed at 15 V.

Do not over torque connections: Tighten sufficiently but not excessively.

Battery Connections 5

When wiring to the solenoid(s), remove the supplied voltage sense leads and place your heavy battery wiring on the terminal post first. Then replace the supplied voltage sense wire **on top** of the heavy battery wires. This eliminates voltage sensing errors under high current conditions. The drawings below indicate the terminal designations for each model. Connections on 70 A units are tagged.

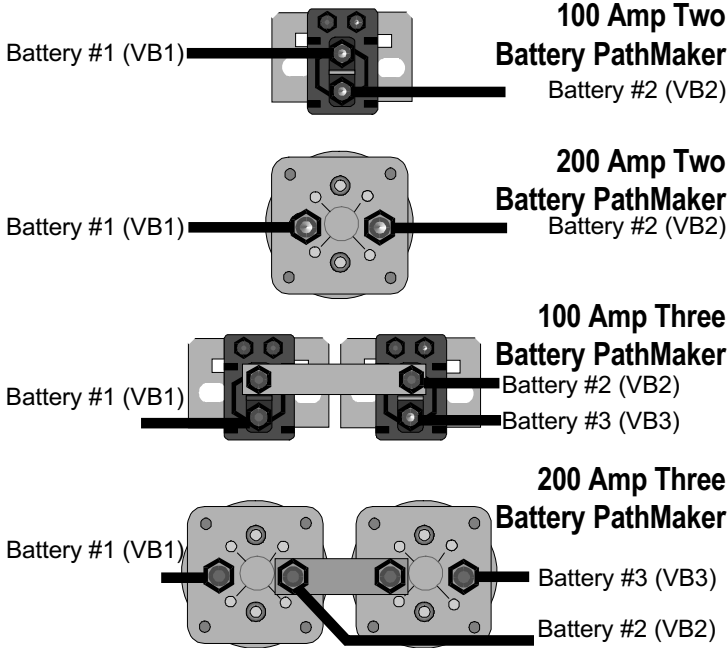


Diagram Table 7

Many configurations are possible with a PathMaker. This table is a guide to help select the correct diagram for your installation:

If you are installing:	Use Diagram	Page
Marine, 1 engine, 2 bank	Diagram 2	9
Marine, 1 engine, 3 bank	Diagram 3	10
Marine, 2 engine, 2 bank	Diagram 4	11
Marine, 2 engine, 3 bank	Diagram 5	12
RV, 1 engine, 2 bank	Diagram 2	9
RV, 1 engine, 3 bank	Diagram 3	10
Renewable Energy, 2 bank	Diagram 2	9
Car audio, 1 engine, 2 bank	Diagram 2	9

Sources such as battery chargers, solar panels, wind generators, or alternators may be wired to any battery. When a battery's voltage rises above the Connect Voltage all batteries are paralleled and charged by the source. If there are multiple sources connected, the source with the highest voltage will charge the batteries to that level. Alternators will not "fight" against each other, the batteries will simply be at the voltage of the highest alternator.

Trouble-shooting

The PathMaker is internally protected against most faults. If the Green light does not come on when the switch on the unit is held in the ON position you must disconnect the wire connected to the system negative terminal, wait one minute and reconnect it.

Caution!! If B+ is shorted to a NEGATIVE terminal (a dead short), the Control Module may be destroyed. (Non-Warranty failure)

6 Set Up and Operation

Adjustments*

Default settings are @12 o'clock position. (Only one adjustment on 70 A units).

Low Voltage Disconnect*

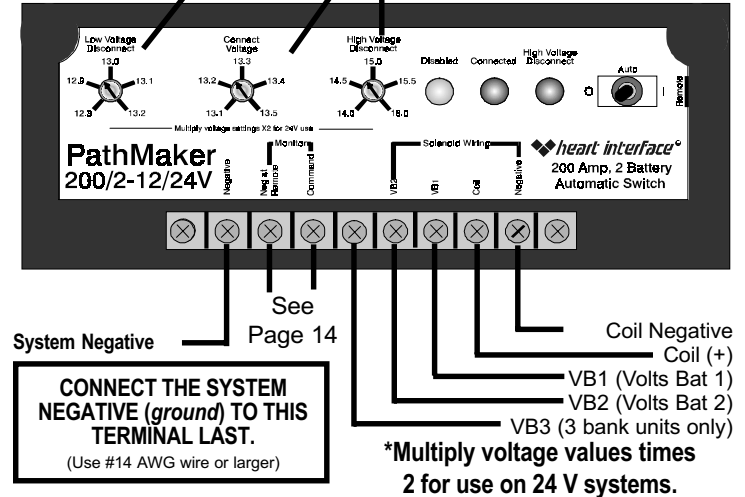
Below this voltage, the PathMaker solenoid(s) are disabled (the batteries are not connected together). The default voltage is set at 13.0V. The yellow "disabled" light will be lit.

Connect Voltage*

Above this voltage the PathMaker solenoid(s) are enabled, thus the batteries are in parallel for charging. The default voltage setting is 13.3V. The green "connected" light on in this mode. (Light may flicker below 12.6V.)

High Voltage Disconnect*

Above this voltage, the solenoid(s) are disabled. The default voltage setting is 15.0V. The red "HV Disconnect" light on when active.



8 Diagram 1 (2 Banks)

This drawing shows a typical marine system with 2 battery banks and a battery switch. The PathMaker is installed between the positive terminals of the two battery banks. For normal operation, leave the battery switch in the House position at all times. With the PathMaker depowered, the battery switch can force connection.

Although this installation is easy and requires no rewiring it does have disadvantages: 1) Turning the battery switch to OFF while the engine is running can harm the alternator. 2) Electronics sensitive to low voltage may "reset" during engine starting.

Note: Install system negative (ground) to PathMaker last.

Fusing, breakers, and optional battery switches that may be required by ABYC or NEC not shown for simplicity.

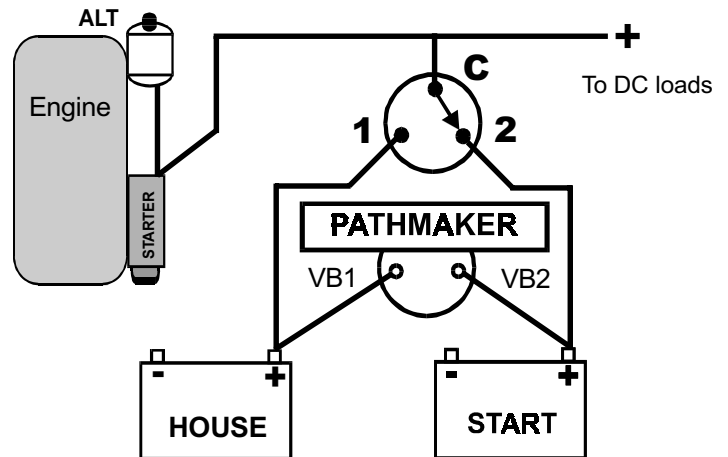
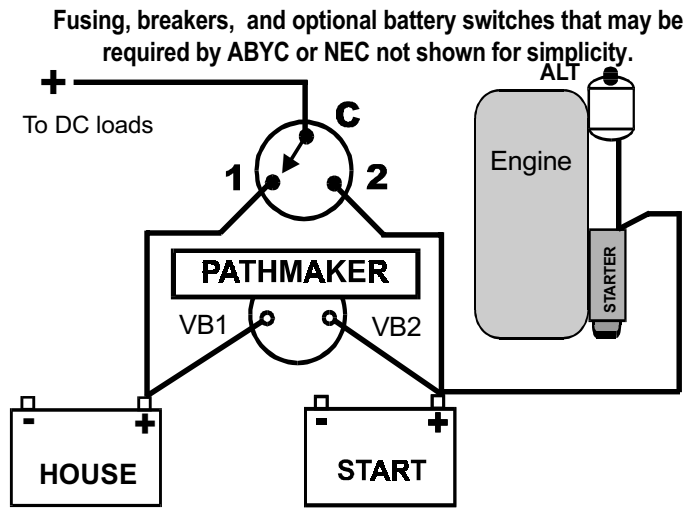


Diagram 2 (2 Banks) 9

This is the recommended installation method. In this diagram the starter is wired directly to the starting battery. This avoids both problems associated with Diagram 1. The battery switch always stays in the #1 position, the house battery supplies the DC loads. The engine starting battery always supplies starting. The PathMaker connects the batteries in parallel when a charging source is present and disconnects them when there is no charging source present.

The battery switch shown is *not required* but may be left installed as a redundant switch if desired.

Note: Install system negative (*ground*) to PathMaker last.



10 Diagram 3 (3 Banks)

This diagram shows an installation with one engine starting battery and two house banks. This type of installation uses a three bank version of the PathMaker.

Note: Install system negative (*ground*) to PathMaker last.

Fusing, breakers, and optional battery switches that may be required by ABYC or NEC not shown for simplicity.

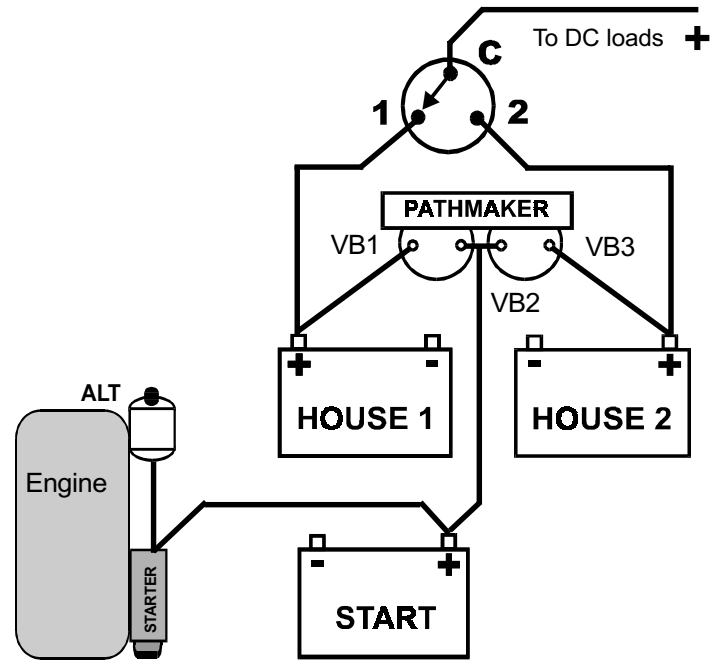
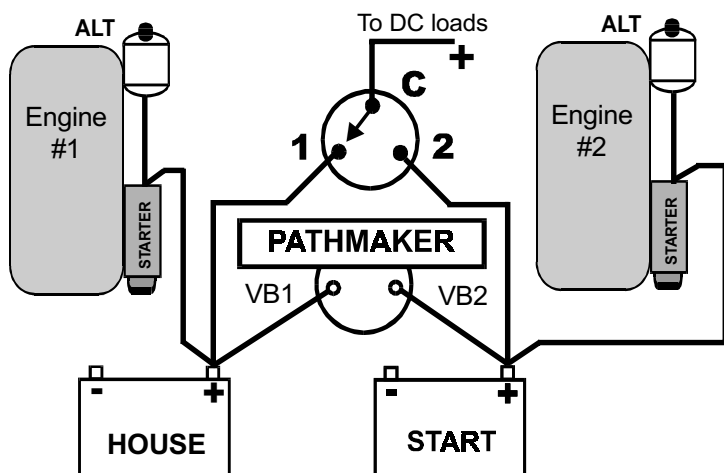


Diagram 4 (2 Banks) 11

Small to medium size power boats with twin engines may use this diagram. One of the engines, usually equipped with a high output alternator and multiple stage regulator, feeds a large house battery (bank). To avoid a dip in system voltage on the house system, start the #2 engine first. Once the voltage rises due to its alternator output the PathMaker will parallel the house battery, now start the #1 engine. For emergency starting of either engine, force the PathMaker to "connect" with the local or *optional* Remote Switch.

Note: Install system negative (*ground*) to PathMaker last.

Fusing, breakers, and optional battery switches that may be required by ABYC or NEC not shown for simplicity.

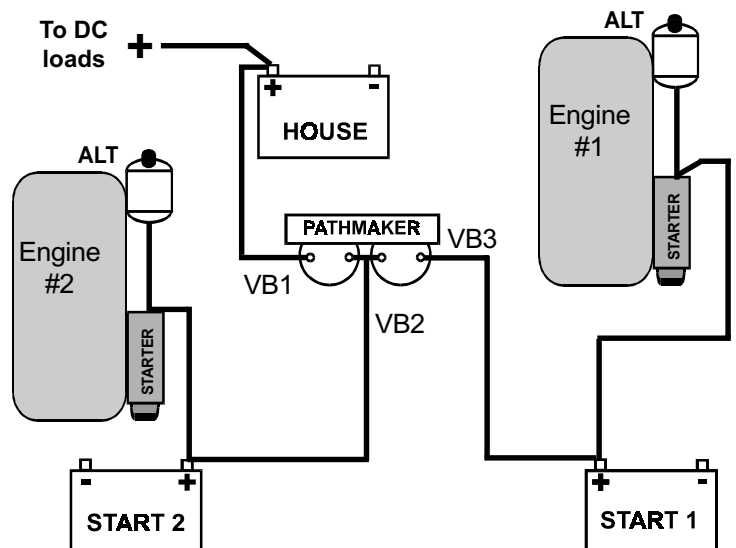


12 Diagram 5 (3 Banks)

In this twin engine, three battery bank installation, each engine has a dedicated starting battery. All batteries are charged when either of the engines is running, or when there is any charging source on the system. In an emergency all batteries may be tied together using the optional Remote Switch. Note this diagram is shown without any battery switches, with a PathMaker battery switches are optional.

Note: Install system negative (*ground*) to PathMaker last.

Fusing, breakers, and optional battery switches that may be required by ABYC or NEC not shown for simplicity.



Optional Remote Switch 13

We highly recommend using the *optional* Remote Control Switch to supply clear indication of the PathMaker status and to simplify emergency starting. Please contact your dealer to purchase the Remote Control Switch panel.

Emergency Starting

If you cannot start any engine, momentarily press the Manual On switch. The PathMaker then connects all batteries together (for 5 minutes) for give you maximum starting power.

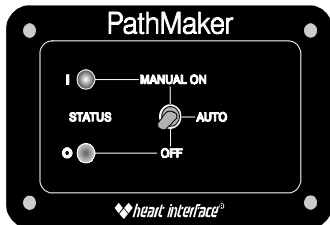
Using the PathMaker Remote Control Panel

The PathMaker Remote switch is normally left in the **AUTO** position. In this position the solenoids are energized (connecting the batteries together) when the "Connect" voltage is reached, and de-energized below the "Disconnect" voltage.

To **disable** the PathMaker place the switch in the "O" [OFF] position. In this position the battery banks are separated. The yellow "Disabled" light is ON.

To **manually** energize the PathMaker solenoid(s), press and hold the switch to the "I" [ON] position until the green ON light is lit (about one second). This connects the batteries for 5 minutes or until the switch is again moved momentarily to the ON position.

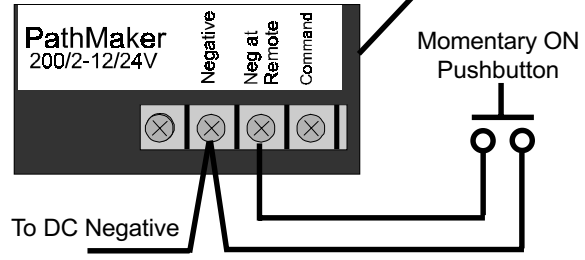
Hold switch in up position to energize PathMaker solenoid(s).



To disable PathMaker switch to off position.

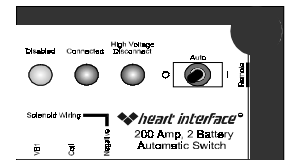
14 Using Other Switches

You may use a momentary pushbutton switch installed between the terminal labeled (Negative) and (Neg at Remote) to manually energize the PathMaker solenoid(s). Hold the pushbutton down for about 1 second to energize the PathMaker solenoids. They will stay energized for 5 minutes. Pressing the pushbutton again will de-energize the solenoids.



The Control Module Switch

The switch on the Control Module should normally be in the **Auto** position. If it is in the **O (Disabled)** position the batteries will never be connected. To test the PathMaker hold the switch in the **I (ON)** position. You should hear the solenoid(s) click. The green "Connected" light will turn on. Remember: The local switch on the PathMaker must be in the "AUTO" position for the remote switch to work.



Warranty

15

Manufactured by Cruising Equipment Company for Heart Interface. Cruising Equipment Co. (CECO) warrants, to the original purchaser only, for 18 months from the date of purchase, that the **PATHMAKER** will be in good working order when properly installed and operated as described in this Manual.

If your **PATHMAKER** fails to perform or becomes defective under normal use and service, CECO, will, without charge, at CECO's place of business, within a reasonable time after delivery, repair, or at CECO's option, replace with a new or factory reconditioned **PATHMAKER** any **PATHMAKER** found defective.

In order to avail yourself of the warranty you must:

1. Contact & Obtain warranty return authorization from CECO.
2. Ship the **PATHMAKER**, charges prepaid, with proof of purchase within 18 months of its sale to you. Cruising Equipment, 5245 Shilshole Ave NW, Seattle, WA 98107.

This warranty is void and will not apply if:

1. Your **PATHMAKER** has been modified without written authorization from CECO;
2. The identification markings on your **PATHMAKER** have been altered or removed;
3. Your **PATHMAKER** has been damaged through abuse, neglect, lightning strikes, high voltage, accident, or voltage reversal;
4. Your **PATHMAKER** was not installed and operated according to the owner's manual or was operated under conditions more severe than those specified in the owners manual.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, INCLUDING THE WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY, EXPRESS OR IMPLIED, AND OF ALL OBLIGATIONS OR LIABILITIES ON THE PART OF CECO FOR DAMAGES, INCLUDING, BUT NOT LIMITED TO LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS OR CONSEQUENTIAL DAMAGES, WHICH MAY ARISE OUT OF, OR IN CONNECTION WITH, THE USE OR PERFORMANCE OF THE PATHMAKER.

Some states do not allow the exclusion or limitation of incidental or consequential damages, and some states do not allow limitations on how long an implied warranty lasts, so if the law of that state applies, the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights and you may also have others which vary from state to state.

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The Easy to Install Automatic Battery Switch!

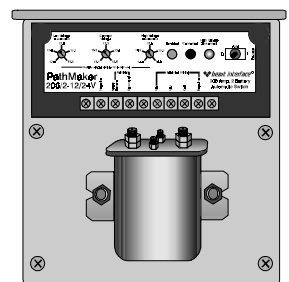
NEW!

For Marine, RV, Alternative Energy and Car Audio use.

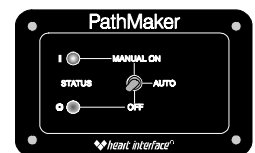
Pick the unit that's right for your installation:

- 70 Amps - 2 Battery Banks
- 100 Amps - 2 Battery Banks
- 100 Amps - 3 Battery Banks
- 200 Amps - 2 Battery Banks
- 200 Amps - 3 Battery Banks

Just mount and connect a negative wire and 2 or 3 battery cables: Done!



Optional Remote Switch
Place PathMaker controls at your fingertips. Comes with 25' of connecting cable.



heart interface
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