



Redwood System Installation Guide

Redwood version 2.1
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1 Redwood System Installation Guide

This System Installation Guide provides general overview instructions for installing the following components of the Redwood lighting system:

- Redwood Director
- Redwood Engine
- Redwood Sensors, Gateways, and Adapters
- Redwood Wall Switches
- Redwood compatible fixtures
- Electrical wiring (to Redwood Engines)
- Low-voltage cabling (to Redwood compatible fixtures)

For information on the Redwood Manager or help in commissioning light fixtures, see the Redwood User & Commissioning Guide.

For detailed product-specific installation instructions, see the respective Installation Guides.

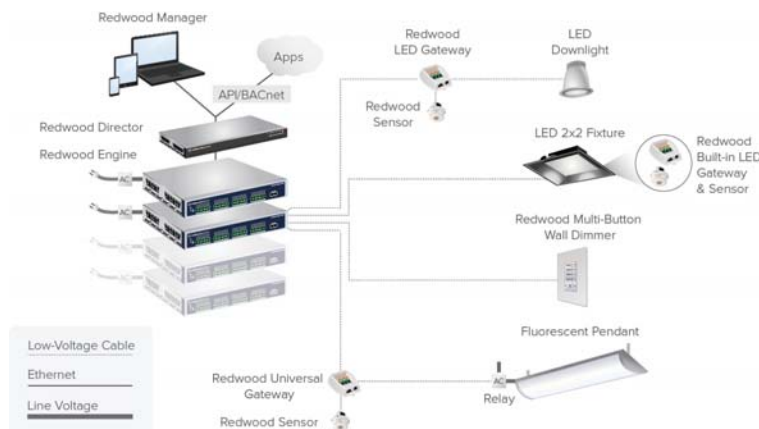
⚠
IMPORTANT NOTE
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The Redwood Engine, Director, Sensors and Gateways are designed for commercial use only and are not for household use.

1.1 Installation Preparation

The following sections provide an overview of Redwood’s structural design, architecture and components. It will also discuss the requirements and recommendations for the installation process.

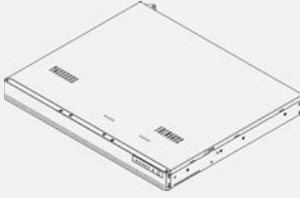

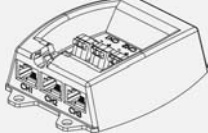
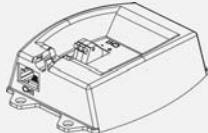
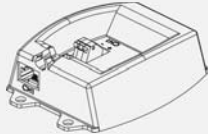
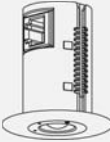

1.2 High-Level Architecture



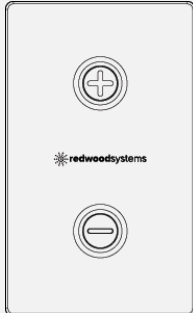


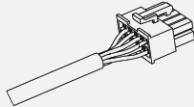




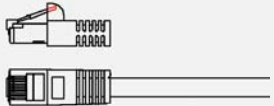


Redwood Building-Performance Lighting Platform

1.3 Components

Redwood components are described briefly below. For more details on each component, refer to the specifications in the second half of this document.

Component	Image	Location	Function
<p>Redwood Director is a 1U rack mountable Linux-Powered appliance that manages a cluster of Redwood Engine</p>		<p>Wiring closet or central office</p>	<p>It provides unified management, control and reporting on a cluster of more than 8 Redwood Engines. Hosts the Redwood Open Application Framework, which provides two-way communication and systems integration between the data collected by the Redwood Platform and other external applications or systems.</p>
<p>Redwood Engine a 2U rack or wall mount LED power and control platform</p>		<p>Wiring closet or central office</p>	<p>Manages policies, communicates to Redwood Gateways, distributes low-voltage DC power to all fixtures, and collects sensor data.</p>
<p>Redwood LED Gateway connects to Sensor, Fixture and Engine</p>		<p>Installed above ceiling or surface mounted next to each fixture</p>	<p>Profiles fixtures, aggregates sensor data, sends sensor data to the engine, and manages power connections between engines and fixtures.</p>
<p>Redwood Universal Gateway connects to Sensor, Relay and Engine</p>		<p>Installed above ceiling or surface mounted next to each fixture</p>	<p>Turns on and off any light fixture type (e.g. fluorescent, CFL, HID, LED, etc.) and provides output signals to control one or two external dry contact relays.</p>
<p>Redwood Universal Gateway — Outage Relay connects to a dry contact relay and Engine</p>		<p>Installed near the load, the engine, or in a centralized location</p>	<p>Designed for applications that require a load to be switched on during a loss of normal power or an engine failure, the relay can activate a system in the specific area(s) served by the Engine.</p>
<p>Redwood Sensor connects to Gateway and provides data for lighting control and building intelligence</p>		<p>Installed in ceiling tile and/or alongside each fixture or group of fixtures</p>	<p>Collects data on light levels, occupancy and temperature. The Sensor communicates with a Redwood Gateway via pre-terminated cabling and RJ25 connectors to send information to the Redwood Engine.</p>
<p>Redwood Adapter integrated Sensor and Gateway</p>		<p>Installed alongside each fixture</p>	<p>Connects the Engine to each fixture and communicates data about light levels, motion detection, and environmental conditions.</p>

Component	Location	Function
<p>Redwood Sensor & Adapter Enclosure</p>		<p>Installed over Redwood Adapter or Sensor</p> <p>Sites without a drop ceiling may utilize this Enclosure to be placed around the standard Adapter Card or Sensor.</p>
<p>Redwood Manager control software</p>		<p>Accessible via web browsers that can connect to the Redwood subnet</p> <p>Enables commissioning, the management of lighting policies, reporting, and maintenance tracking.</p>
<p>Redwood Dimmer Wall switch with sensing capabilities</p>		<p>Wall-mounted</p> <p>Allows for manual light manipulation and can sense motion, ambient light and ambient temperature.</p>
<p>Redwood Scene Control Wall switch with scene selection and sensing capabilities</p>		<p>Wall-mounted</p> <p>Allows for selecting a scene and manual light manipulation and can sense ambient temperature.</p>
<p>Redwood Wall Mount Kit for mounting the Engine against a wall</p>		<p>Wiring closet or central office</p> <p>The Redwood Engine can be installed flush against a wall using the Redwood Wall Mount Kit.</p>
<p>Redwood Universal Gateway Wiring Harness to the dry contact relay</p>		<p>Installed above ceiling</p> <p>Connect the Dry Contact Relay for the fixture to the Universal Gateway using the provided Redwood Universal Gateway wiring harness.</p>
<p>Redwood Patch Cord with RJ45 connector for connecting engines and patch panels</p>		<p>Located on rack units where Engines are installed</p> <p>Connects Engine outputs to standard RJ45 patch panels for category cabling installs.</p>

Component		Location	Function
Redwood Patch Cord without RJ45 for connecting engines to punch down panels		Located on rack units where Engines are installed	Connects Engine outputs to standard punch down panels for category cabling installs.
Category cable <i>(not provided)</i>		Connects Engines to adapters, gateways, and wall switches	Transmits data and low-voltage power to Redwood compatible fixtures, Redwood Gateways and Redwood wall switches.
AWG 18, Class II low-voltage, or 2/4/6 conductor pairs wiring <i>(not provided)</i>		Connects Redwood Engines to adapters, gateways, and wall switches	Transmits data and low-voltage power to Redwood-compatible fixtures and Redwood wall switches.
Redwood LED Fixture extension cables		Connects fixture whip to Redwood gateway	Extends a standard fixture whip when the gateway is further than 24" (60cm) from the fixture.
Redwood compatible fixture <i>(not provided)</i>		Installed inside the building	Light source

1.4 Redwood Communication Point Options

The Redwood Engines can communicate to loads, fixtures and Sensors via the following mechanisms.

1. The **Redwood LED and Universal Gateway** is a two component, structured cabling-friendly option that works with the Redwood Sensor. This option was designed for greater flexibility during installation: there are connector options for category or 18AWG cabling, which connect to a separate sensor for installation in different spaces.
2. The **Redwood Universal Gateway – Outage Relay** is used in conjunction with a dry contact relay to communicate the system health of a Redwood Engine. Designed for applications that require a load to be switched on during a loss of normal power or an engine failure, the relay can activate a system in the specific area(s) served by the Engine.
3. The **Redwood Adapter**, which integrates the sensor and gateway into one component. Ideal when a separate gateway and sensor are not required.

These are described in this document.

2 Power Requirements and Recommendations

2.1 Low-Voltage Cabling Requirements

An LED Gateway or Adapter connected to a fixture requires 1, 2, or 3 ports from the Engine to power the fixture, depending on the power requirement specifications of the fixture. A port can be connected with either standard category cabling, or with 18 AWG low-voltage wiring, comprised of stranded or solid wire.

In the case of **category cable**, all four twisted pairs will be used to form one port connection to the engine.

For **18 AWG wiring**, the cable may be shielded or unshielded. For both cases, the wiring or cable must be UL listed, such as types CL2 or CM, and suitably rated for its intended installation environment (e.g. – P if the cabling is routed through plenums).

To minimize voltage loss in the cable, the following maximum run-lengths should be observed:

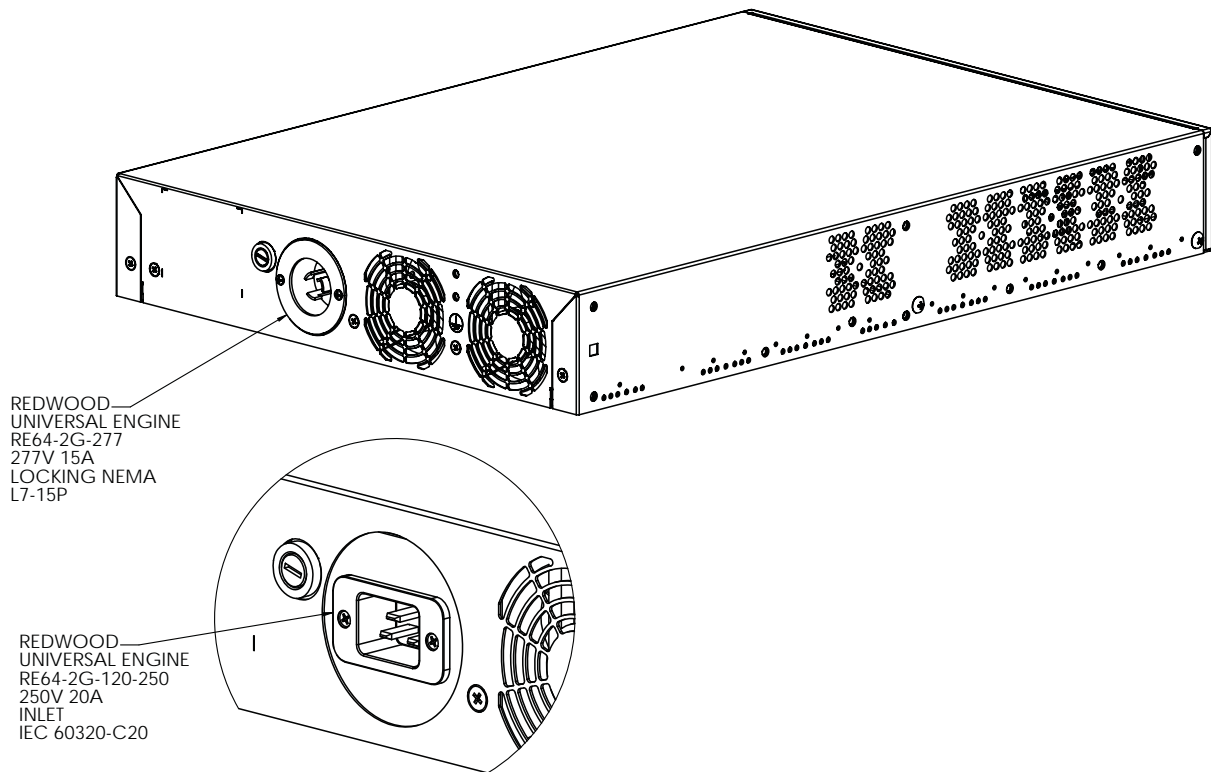
Low-voltage wire type	Max Length (ft)	Max Length (m)
Category Cable (5e, 6/6a)	328*	100*
18 AWG	328	100

* The 328ft/100M length can only be achieved when all four twisted pairs will be used to form one port connection to the engine; otherwise the length is limited to 75ft/23 meters.

2.2 Redwood Engine Power Requirements

The Redwood Engine is available in two versions: a 277V AC power input version and a 120V - 250V AC power input version.



A dedicated branch circuit for each Engine is recommended. However, you can have two 277V engines on a single 20Amp circuit provided these are the only equipment on the circuit. This will ensure that no other loads on the same circuit draw too much current from the branch circuit and thereby not allow the Engine or Engines to operate continuously.



Note: Minimum branch circuit is required for a single engine, given the standard 80% de-rating.

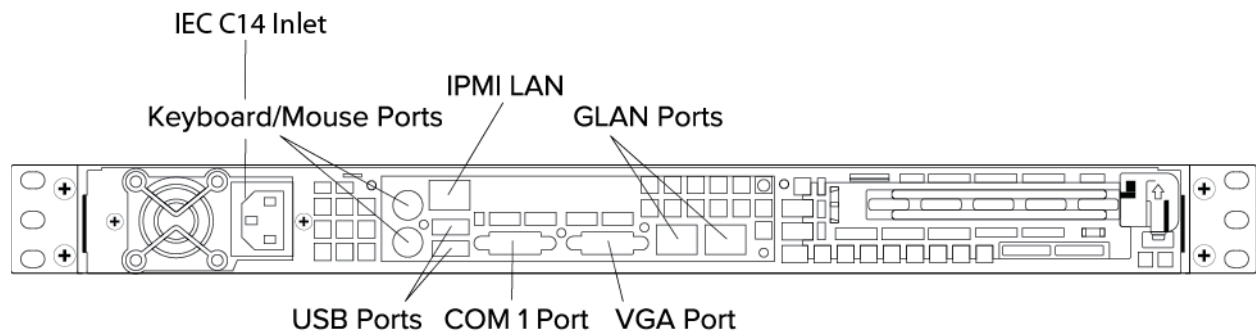
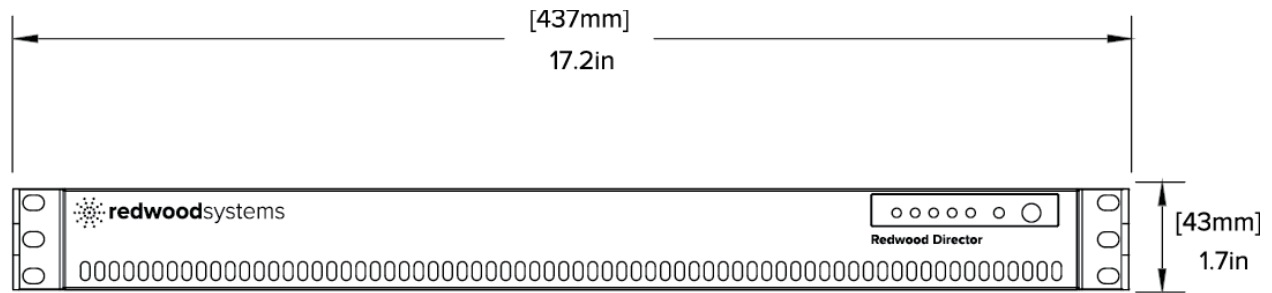
Model Number	Operating Voltage	Current Required	Minimum Branch Circuit Required	Max Power Consumption
RE64-2G-277	277 VAC, 50-60Hz	7A	10A	1580W
RE64-2G-120-250	120 VAC, 50-60Hz	16A	20A	1580W
	200 – 250 VAC, 50-60Hz	10A	20A	1580W

The Engine also ships with power cords that are specific to geographic location and voltage. It is important to specify country and voltage requirement when ordering.

 IMPORTANT NOTES 
<ul style="list-style-type: none"> • <i>The internal components are not field-serviceable.</i> • <i>If any internal fuses require replacement, return the equipment to the manufacturer.</i>

2.2.1 Redwood Director Power Requirements

The Redwood Director requires a 100V–240V AC power input, 50–60Hz. Specifications are listed below.



Model Number	Operating Voltage	Max Power Consumption
DIR-1G	100-200 VAC, 50-60 Hz, 4/2-1.8A	350W

3 Redwood Platform Installation

This section describes the installation of the components of the Redwood Building-Performance Lighting Platform.

3.1 Redwood Director & Engine Location

Redwood Director is used when there is a cluster of more than 8 Redwood Engines or if the Redwood Open Application Framework, which provides two-way communication and integration with other external systems, will be used as part of the deployment.

Determine location for Redwood Director and all Redwood Engines. Director is a 1U, while the Engine is a 2U rack mountable system and can each be installed in a standard server rack via supplied rack-mounting brackets. The Engine can also be mounted to the wall with a Redwood Systems Wall Mount Kit.

For detailed instructions, see the installation guides for Redwood Director and Redwood Engine.

3.2 Route Network and Power Cables

It is recommended that all fixtures and Redwood components be installed with power and network connectivity turned off. Low-voltage cables can be unconnected and reconnected without danger of electric shock or equipment damage, but it is recommended that the initial installations and connections be performed with an un-powered system.

3.3 Lay Out Low-Voltage Cabling

Each fixture and wall switch requires a homerun cable connection to the Redwood Engine – the Redwood Platform will use this cable for power and is able to communicate over the same line.

For Category Cable

- Lay out category cable from the Engine to each installed fixture and Redwood wall switch (either model).
- If using the RJ45 connector, it can be wired as T568A or T568B, which are straight through, or crossover arrangements.

For AWG 18 low-voltage wiring

- Lay out 18 AWG wiring from the Engine to each installed fixture and Redwood wall switch.
- Strip wire ends to ¼" (0.6cm) on each end.

**IMPORTANT NOTE**

It is up to the electrical contractor to design the EMERGENCY LIGHTING solution. See the section on Emergency Lighting in this document to learn more about the Universal Gateway – Outage Relay.

4 Install Components

Once the cabling has been laid out you are ready to begin the overall installation. Detailed installation instructions are available for each of the Redwood components. A short summary is included below.

4.1 Installing Gateways, Sensors & Adaptors in Air-handling Spaces

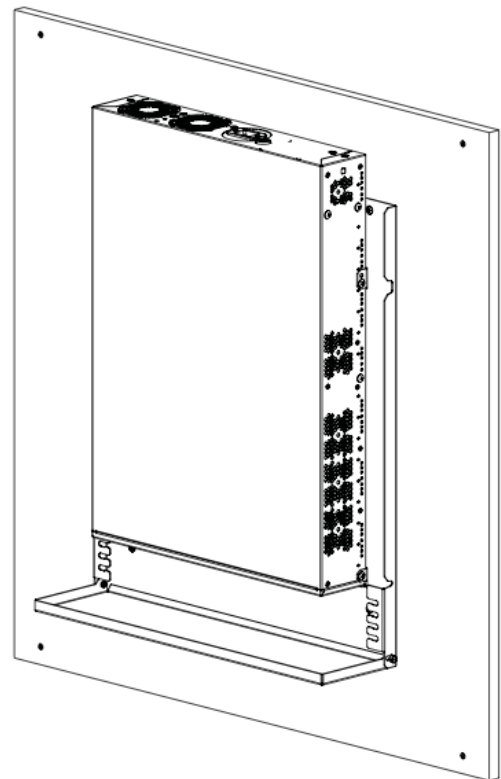
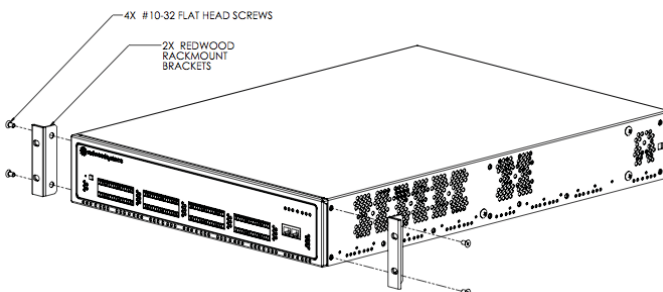
The Redwood Gateways, Sensors and Adaptors have been tested by UL to UL2043 that ensures low smoke-emitting characteristics and suitable fire resistance for equipment that may be installed in environmental air handling spaces, as described in Article 300.22(c) of the NEC (2011).

When the product is installed in air-handling spaces, such as above some suspended ceilings, the cabling employed should be suitable under NEC (2011) Article 800.154 and marked accordingly for use in plenums and air-handling spaces with regard to smoke propagation, such as CMP. The products and wiring means should be installed in accordance with all applicable local regulations and practices.

4.2 Install Redwood Engine(s)

Depending on the location and number of engines you are installing, the Engine is a 2U rack mountable system and can be installed in a standard server rack via supplied rack-mounting brackets or to the wall with a Redwood Systems Wall Mount Kit.

See detailed instructions in the corresponding Redwood Engine Installation Guide.



Engine can be rack mounted or secured to a wall using the Wall Mount Kit



IMPORTANT NOTES



- *The Engine requires 6 inches or more clearance for the fans to operate properly.*
- *Ensure that air vents are not blocked and that the conditions support the maximum ambient operation temperature listed in the Engine Specification Sheet.*

4.3 Install Redwood Director

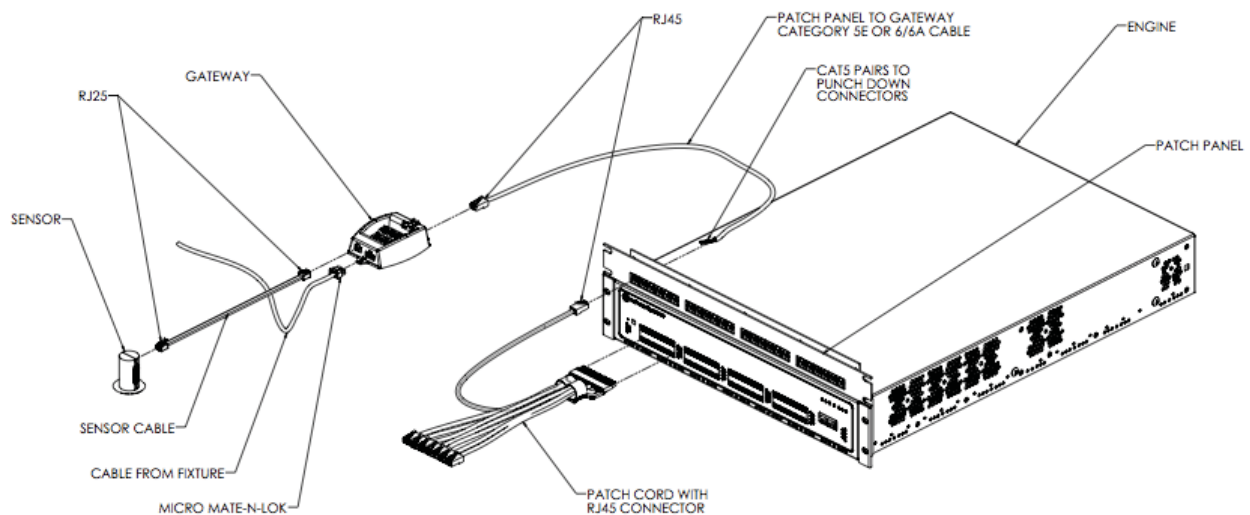
Director is a 1U rack mountable system and can be installed in a standard server rack via supplied rack-mounting brackets. A Redwood Director is required when you have a cluster of between 8 and 128 Engines. It connects to the network and manages the cluster via Ethernet.

4.4 Connect Redwood Low-Voltage Cabling (Category Cabling Option)

Category 5e or 6/6a cabling can be used to connect Redwood Engines to Redwood Gateways. Use the Redwood Patch Cord to make the connection from the Engine to the patch panel; category cable is then run from the patch to the gateway.

Each Redwood Patch Cord should be connected from a bank on the front of the Engine to a patch panel, which is connected to respective Redwood Gateways and Wall Switches. Each Redwood Patch Cord will provide connection for up to 8 ports/channels.

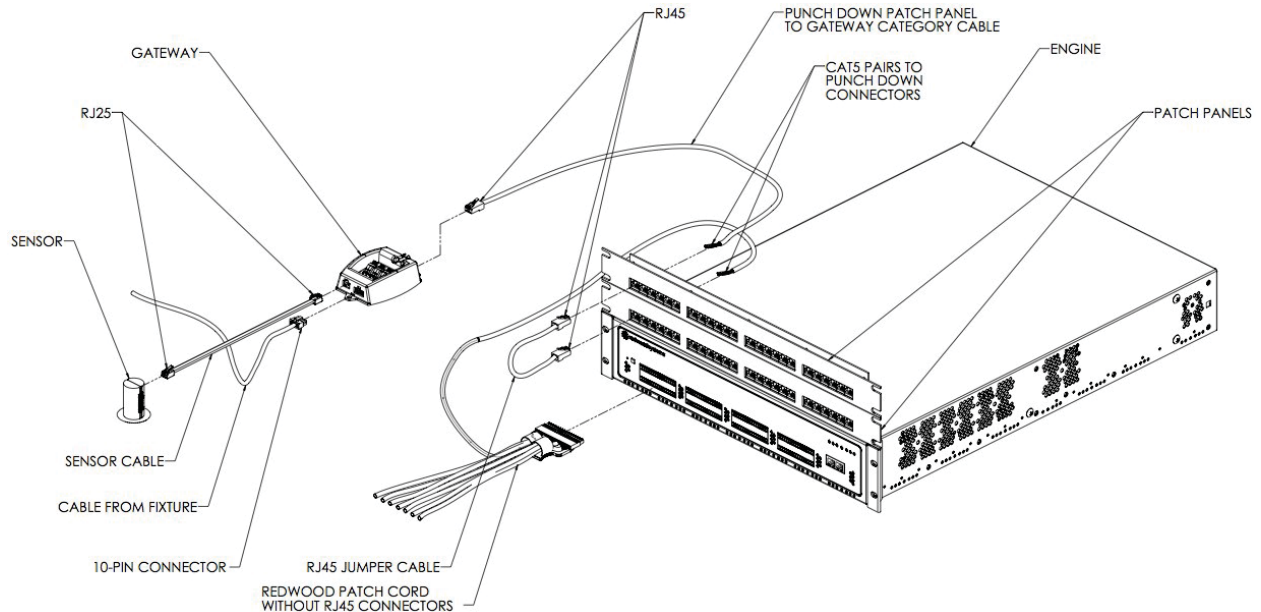
An example is depicted below, showing the punch down of Category 5 cable at the back of a patch panel that connects to the LED Gateway.



Example connecting Redwood Engine to Patch Panel using the Redwood RJ45 Patch Cable

4.4.1 Using the Redwood Patch Cord without RJ-45 for punch down

Connect the cables from gateways, sensors, and wall switches to Engine channels by removing the jacket and “punching down” the wires.



Connect Redwood Engine to Patch Panel using the Redwood Patch Cord without RJ45 connectors



IMPORTANT NOTES & RECOMMENDATIONS



- *The category cable should be punched down at the patch panels according to T568A or T568B standards, which are straight through or cross over arrangements*
- *If a fixture requires more than one channel for power, use additional wiring (see each fixture’s specification for requirements). Note that all additional channels for a 2 or 3 channel fixture must be connected to the same Engine. Wiring for an individual fixture cannot be spread across multiple Engines.*
- *For one Engine in a group of co-located Engines, it is recommended that one detachable bank of eight ports be left unused. This facilitates future expansion of the system and also provides a best practice when repair work is necessary.*
- *It is also recommended that the fixtures in a single space be interleaved across Engines. This will ensure some light still remains in a space in the event of an electrical failure affecting an Engine; only a portion of the lights in a room would turn off.*

4.5 Connect Redwood Low-Voltage Cabling (Low-Voltage Wiring Option)

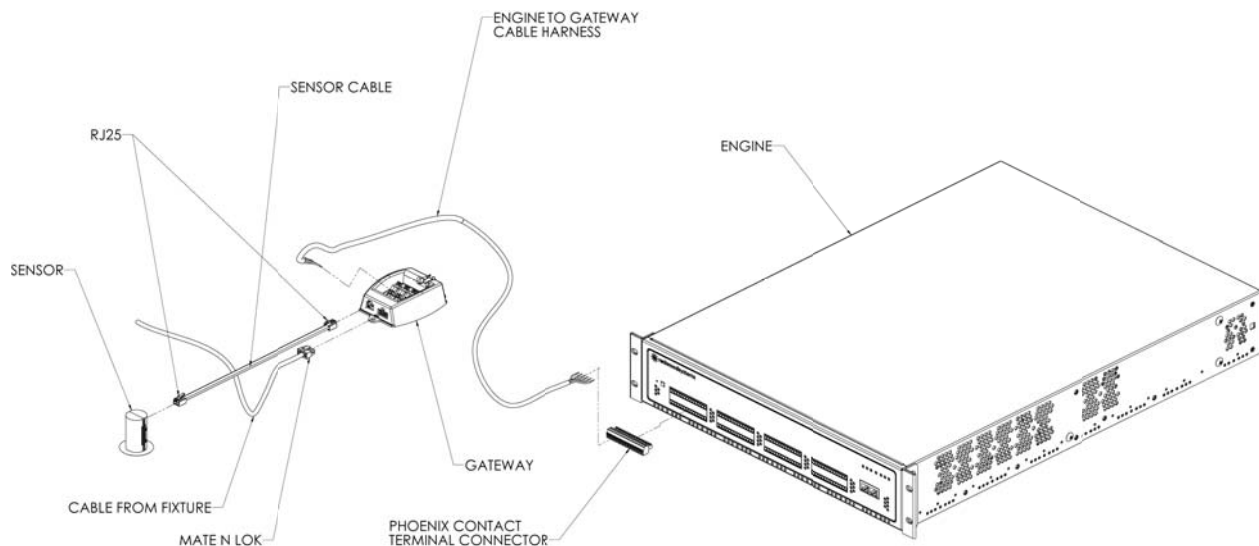
Low-voltage wiring (18 AWG) can be used to connect Redwood Engines to Gateways, Sensors, and Wall Switches. When connecting to the Engine you can use the Redwood Patch Cord without RJ-45 for punch down or 18AWG via the included Phoenix Connectors.

4.5.1 Using the Phoenix Connectors

Connect the cables from Gateways, Sensors, and Wall Switches to Engine channels by inserting the stripped cable end into the screw terminal of the removable connector blocks. (8 Phoenix connectors are included - see picture below.)

Insert the connector blocks into the mating connector on the front of the Engine and tighten the screw terminal to a torque of 2-4 in-lbf (0.22-0.25 Nm). Bare conductors should not be exposed after installation is complete.

See the Redwood Engine Installation Guide for more information.

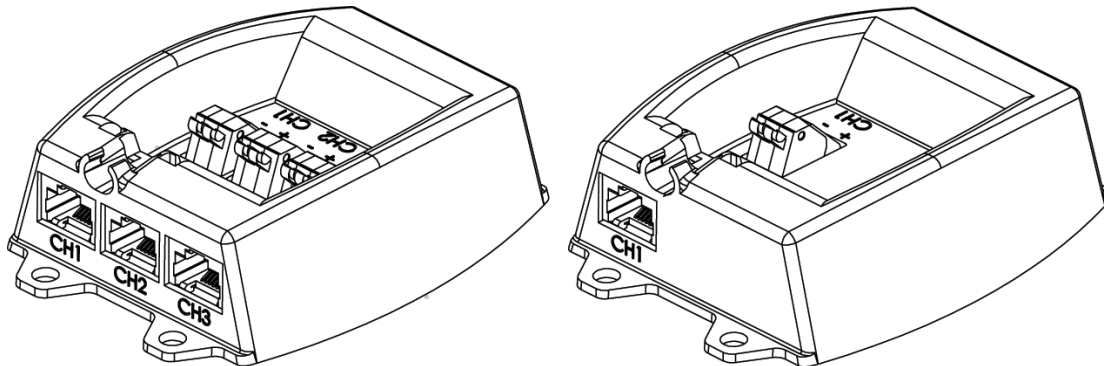


Example connecting 18AWG to Redwood Engine using the Phoenix Connectors

4.6 Install Redwood Compatible Fixtures

Install third-party light fixtures according to the vendor's installation instructions.



4.7 Install Redwood Universal Gateways



Redwood LED Gateway for LED fixtures and Universal Gateway for fluorescent, CFL, HID, LED, etc. fixtures

Redwood LED Gateways and Universal Gateways are installed next to each fixture. LED Gateways and are designed to work specifically with Redwood Ready LED fixtures. The Universal Gateways turn on and off any light fixture type (e.g. fluorescent, CFL, HID, LED, etc.) and provides output signals to control one or two external dry contact relays.

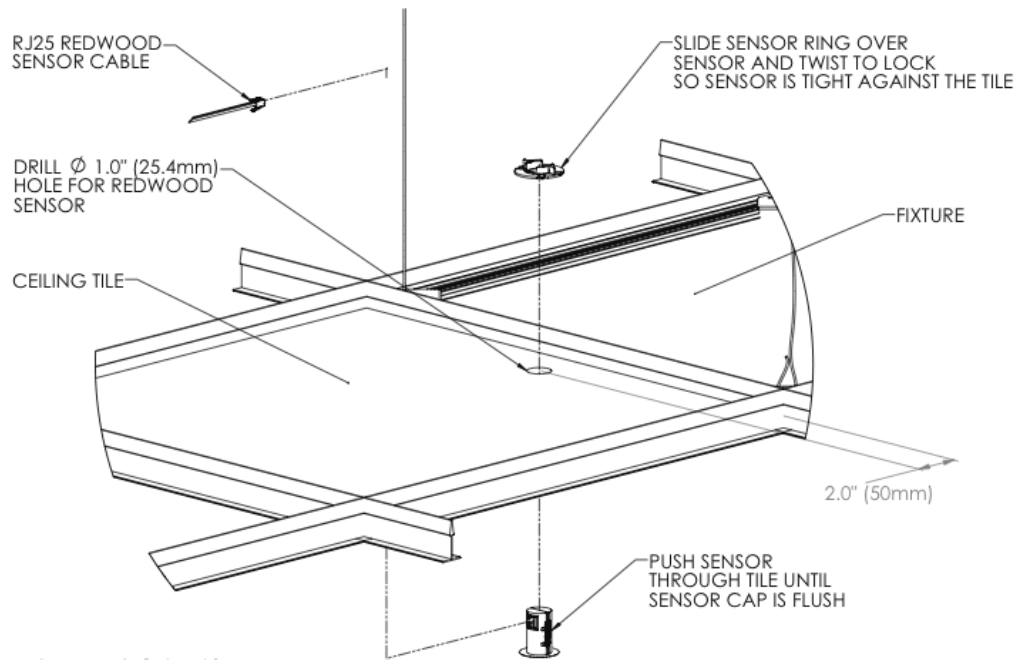
Each Gateway stores fixture-specific information that assists in installation and commissioning.

 IMPORTANT NOTES 
<ul style="list-style-type: none"> • <i>The Redwood LED gateway must be within 6 feet (1.8m) of Redwood Sensor.</i> • <i>Make sure Gateways are connected to the paired fixture counterpart. For example, an LED Gateway ships paired with a specific fixture type and must be installed with the matching fixture type otherwise it may not operate as expected, at all, or even be damaged due to the incorrect current level.</i> • <i>Redwood enabled fixtures often come with connection whips that are 24 inches (60cm). If placing the Gateways more than 12 inches (30cm) from the edge of a fixture, a Redwood extender cable will be required to be used with the installation.</i>

For more information, see the Redwood Gateway Installation Guide.

4.8 Install Redwood Sensors

The Redwood Sensor must be installed within 6 feet (1.8m) of each fixture. Determine where in the ceiling tile the Redwood Sensor needs to be installed.



For more details, see the Redwood Sensor Installation Instruction manual.

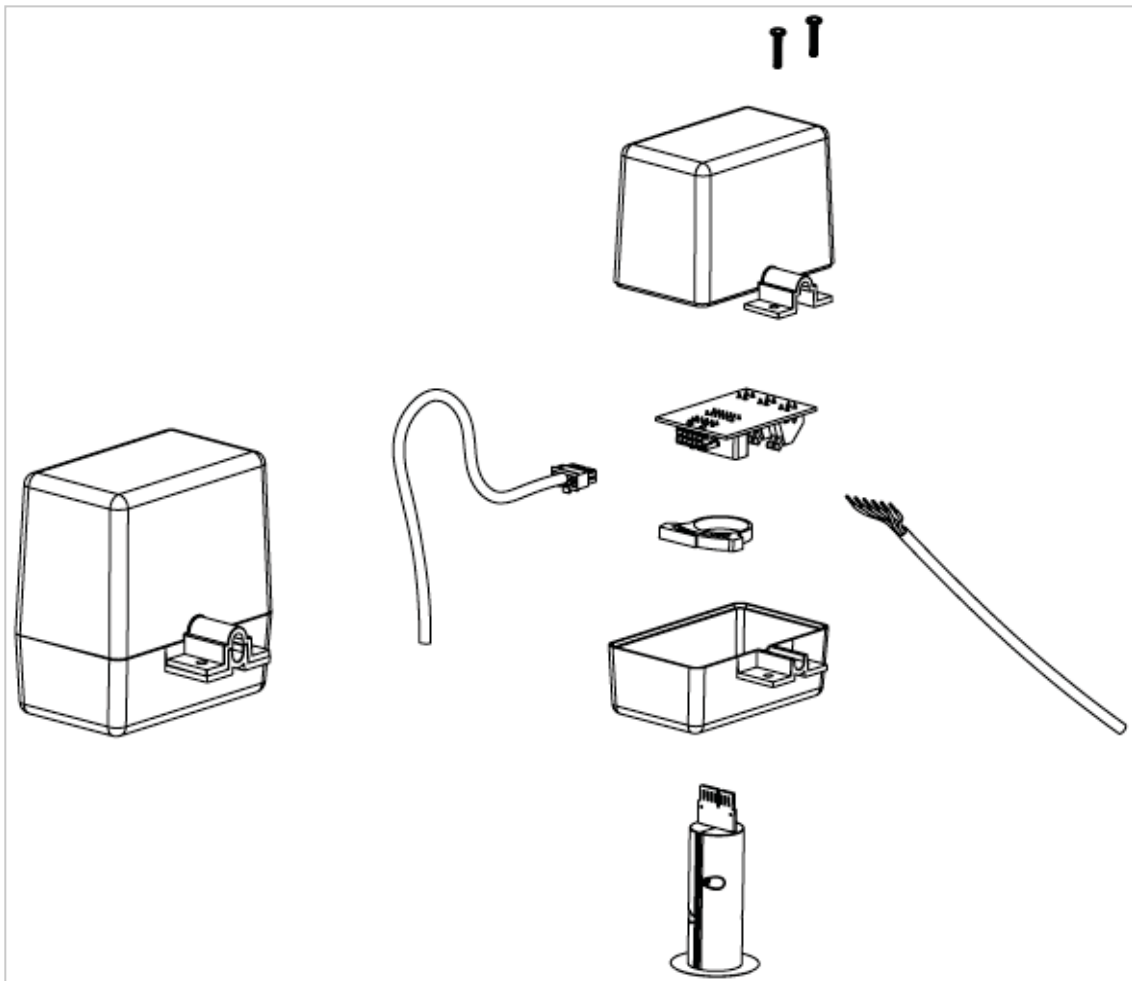
4.9 Install Redwood Adapters

The Redwood Adapters have an integrated sensor and card and do not require a separate Gateway. They are typically installed about 2 inches from the fixture, but with a Redwood LED Fixture extension cable, can be up to 2 feet away from the fixture. Determine where in the ceiling tile the Redwood Adapters need to be installed or use the enclosed adaptor option.

4.10 The Redwood Sensor & Adapter Enclosure Box

Sites without a drop ceiling may require the Redwood Sensor & Adapter Enclosure to be placed around the standard Redwood Adapter or Sensor. The closed box and an exploded view with the installed Adapter are shown in the adjacent figure.

4.10.1 Installing the Redwood Adapter in the Enclosure Box



To install, the Adapter is first slid into the large hole in the Adapter enclosure. The clamp is secured with the Adapter cap flush to the enclosure's bottom. Then the Adapter Card is plugged in with the Engine and fixture wires attached. Wiring from the Adapter Card is trailed through the small exit channel on the enclosure's side. Care must be taken that the Engine and fixture wires are not pinched in this process. The top half of the box is closed and the two halves are secured together with two 6-32 screws (provided).

The Redwood Adapter Enclosure should be mounted at two points to prevent rotation. When mounting is complete, the Adapter must be pointed to the ground. Note that the fixture wire must be able to reach the Adapter card within the mounted enclosure.

4.10.2 Installing the Redwood Sensor in the Enclosure Box

When installing the Redwood Sensor in the Enclosure box, be sure to use the clamp that ships with the enclosure box and not the sensor ring as this will not fit inside the enclosure. Follow the instructions in the prior section.

4.11 Install Redwood Wall Switches

A Redwood Wall Switch is an optional component. The Redwood Dimmer Wall Switch allows users to adjust light levels. The Redwood Scene Control Wall Switch allows users to select preconfigured scenes and override light levels.

The switch does not physically connect to a fixture, but you should place it near the lights that it controls. The fixtures that each switch controls are determined during the commissioning phase. Wiring from the Engine to the Redwood Wall Switch must comply with NEC Class 2 requirements.

- Cut or use an existing standard-sized wall-plate opening for a NEMA standard, OTS switch box.
- Remove the front plate from the Redwood Wall Switch by gently pulling it from the housing. You can do this without tools.
- If you are using 18 AWG cable, strip the end of the 18 AWG cable by ¼" (0.6cm). Insert the end of the wire into the wall switch's screw terminal, and tighten to a torque of 2.5 in-lbf (0.28 Nm). The adjacent images show the positive terminal location for each switch. **Note:** this option is available for both the Dimmer Wall Switch and the Scene Control Wall Switch.
- If you are using T568A or T568B straight through or crossover cable, connect the RJ45 connector. **Note:** this option is only available for the Scene Control Wall Switch.
- Screw the Redwood Wall Switch back plate into the switch box, and snap on the switch's front plate.



Dimmer switch
(back)



Scene Control
switch (back)

For detailed instructions, see the respective installation guide for the Redwood Dimmer Wall Switch or Redwood Scene Control Wall Switch.

4.12 Install Redwood Universal Gateway – Outage Relay

The Redwood Universal Gateway — Outage Relay can be used in conjunction with a dry contact relay to communicate the system health of a Redwood Engine. Designed for applications that require a load to be switched on during a loss of normal power or an Engine failure, the relay can activate a system in the specific area(s) served by the Engine.

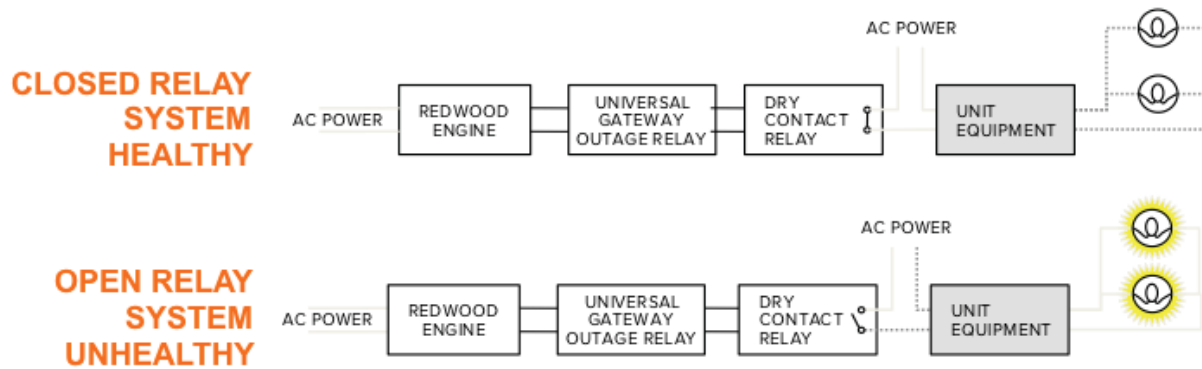
Once you have determined the location for all load devices and Redwood Engines, the dry contact relays and Universal Gateways can be installed near the load, near the Engine, or a centralized location such as the electrical room, near the breaker panel.

See detailed instructions in the corresponding Redwood Universal Gateway – Outage Relay Installation Guide.

5 Emergency Lighting System

This is an example of how the Redwood Universal Gateway — Outage Relay can be used in conjunction with a dry contact relay to communicate the system health of a Redwood Engine.

The following diagram illustrates how an emergency light can be switched on in the event of or an Engine failure or during a loss of normal power to the Engine or to the circuit that supplies power to the emergency lights.



The dry contact relay is used to signal the status of the Engine. A closed relay signifies a powered up and properly functioning Engine, while an open relay signifies loss of power or some other problem with the Engine.

For more information, see the Redwood Universal Gateway – Outage Relay Installation Guide.

6 Power Up & Connect Engines

Only after all the low-voltage cabling connections listed below are complete, connect each Engine to AC power and turn on AC power at the breaker. Confirm that the Engine's power light comes on.

6.1 Default Configurations

The Redwood Engines will be addressable by their IP addresses or by the Engine's name as defined by an IT administrator. See the Redwood User & Commissioning Guide for information on connecting the Engines to the network and changing the default password.

After connecting the Engines, the next step is to move to the commissioning phase.



If you have any questions concerning the operation or installation of any Redwood System's products, call, or email, the Redwood Support Team at the numbers below.

1 800 840 0709 (USA) Option 2
1 510 270 5360 (International) Option 2

Fax: 510 270 5364

email: support@redwoodsystems.com
www.redwoodsystems.com

Redwood Systems
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