




Synapse EMB-S2 Controller Installation Guide

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WARNING AND CAUTIONS

- TO AVOID FIRE, SHOCK, OR DEATH; TURN OFF POWER AT CIRCUIT BREAKER OR FUSE AND TEST THAT POWER IS OFF BEFORE INSTALLING!
- PROPER GROUNDING REQUIRED TO AVOID STATIC DISCHARGE WHICH CAN DAMAGE CONTROLLERS DURING INSTALLATION.
- If you are unsure about any part of these instructions, consult an electrician; all work should be performed by qualified personnel.
- Disconnect power at circuit breaker or fuse when servicing, installing or removing fixture or changing lamps.

SPECIFICATIONS

- Dim Control Max Load: 30 mA Source/Sink
- Radio Frequency: 2.4 GHz (IEEE 802.15.4)
- RF Transmission Output Power: +19dBm
- Operating Temperature: -40 to +80 C
- Operating Humidity: 10 to 90%, non-condensing
- Max D4i Drivers: Limited to a maximum of 6 D4i LED Drivers, any D4i LED Drivers >4 will need the power supply disabled.
- Dimensions: 2.25"L x 2.0"W X .3"H (57 X 50.8 X 7.6 mm)

MODELS

- EMB-S2 (Uses external antenna)
- EMB-S2-F (internal antenna)

CAUTION

EMB-S2 controllers must be installed in accordance with national, state, and local electrical codes and requirements

DESIGN CONSIDERATIONS

Below are some recommendations for successful dimming using the EMB-S2. The dimming control wires are referenced as Dim+ and Dim-. The dimming signals have a Maximum voltage of 10V DC.

- Use multi-strand 18 Gauge Wire for noise immunity and current capability
- Do not ground the dimming wire; this is a return signal and is critical for dimming
- Route dimming wires away from AC lines if possible
- Use connections with properly sized connectors
- Eliminate excess wire between fixtures; Line length will cause voltage drop
- Maximum of 4 LED Drivers per controller, consult Synapse Support if a greater ratio is needed.

NEEDED MATERIAL

- u. FL Insertion Tool: Part Number U.FL-LP-IN from Hirose Electric (for EMB-S2 only)
- u. FL Extraction Tool: Part number U.FL-LP-N-2 from Hirose Electric (for EMB-S2 only)
- u. FL Connector and 14mm bulkhead: A cable with a u.FL connector on one end and a female 14mm bulkhead connector on the other end is required to route the signal from the EMB-S2 through the fixture housing to an external antenna.
- Mounting Hardware: (1) #4 and M3 screws and standoff recommended
- Antenna Kit: For available antenna options please refer to our latest documents located on our website.
www.synapsewireless.com/documentation

INSTALLATION INSTRUCTIONS

WARNING: TO AVOID FIRE, SHOCK, OR DEATH: TURN OFF POWER AT CIRCUIT BREAKER OR FUSE AND VERIFY THAT POWER IS OFF BEFORE WIRING!

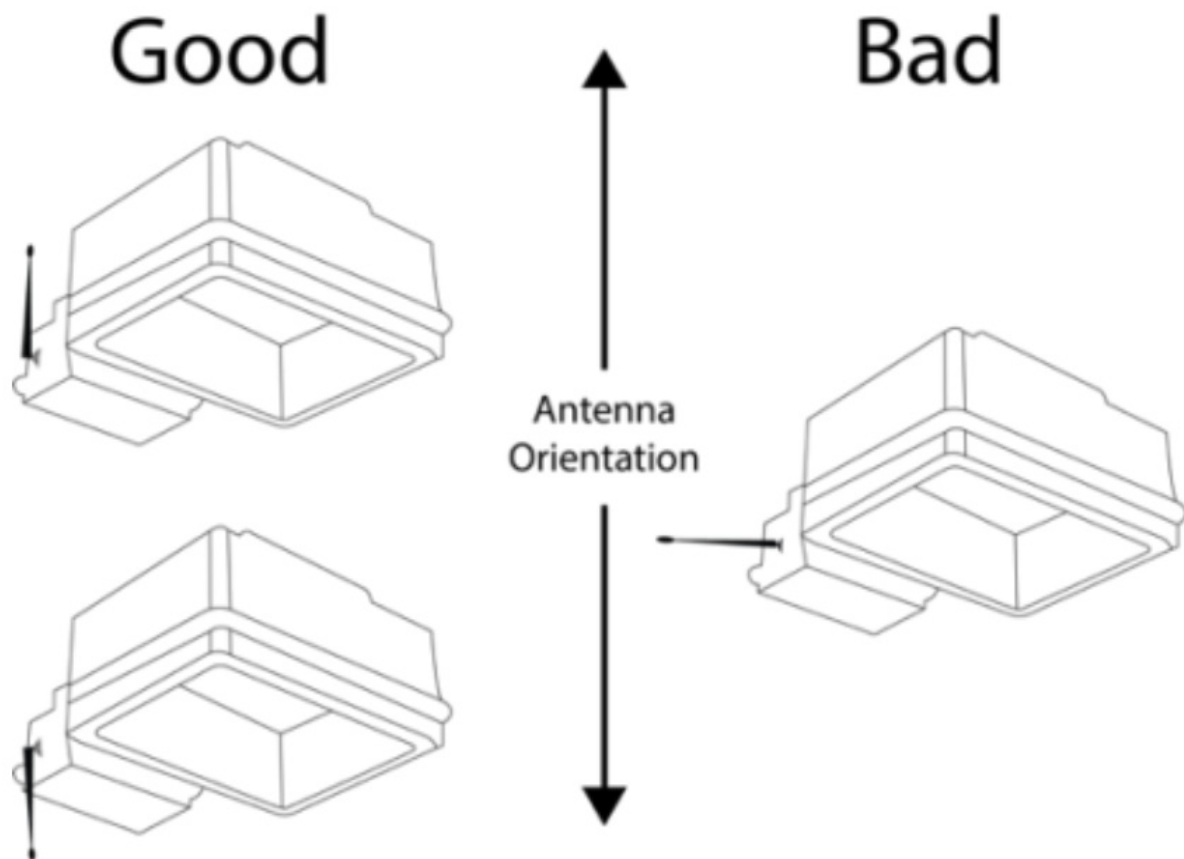
MOUNTING

Secure with 1 #4 screw (max diameter of .312 inches) and standoff.

1. Mounting Options: Mount in an LED Fixture or a Troffer. For the EMB-S2, an external antenna utilizing a u. FL connector must be used to provide RF connectivity to the SNAP mesh network.
2. Place the EMB-S2 in desired location and secure it using #4 sized screw and stand-off using the mounting hole located in the center of the board. Prior to permanently mounting the EMB-S2, make sure the antenna is free of any objects within 3 in. of the internal or external antenna.

Note: When installing the EMB-S2 into an enclosure, consideration of the internal or external antenna position and interference is required in order to provide the most optimum wireless signal strength.

- When installing the EMB-S2 into an enclosure, consideration of the external antenna position and interference is required in order to provide the most optimum wireless signal strength. Prior to permanently mounting it, make sure the antenna points directly upward or downward and is free of any metal objects within 12 in. of the antenna (**Figure 1**).
- **Figure 1 – Proper External Antenna Installation**



INSTALLING THE ANTENNA

To install the antenna:

1. Make sure the power is off.
2. Attach the u. FL cable (Figure 5) to the u. FL terminal **(Figure 4)**.
3. Use the insertion tool, PN U.FL-LP-IN, to mate the connectors. The mating axis of both connectors must be aligned so that the connectors can be mated. The “click” will confirm a fully mated connection. Do not attempt to insert on an extreme angle.
4. Route the antenna cable such that there is no upward tension between the cable and the u. FL connector.
5. To disconnect the connectors, insert the end portion of the Extraction Tool, U.FL-LP-N-2, under the connector flanges and pull off vertically, in the direction of the connector mating axis.

u.FL
Terminal

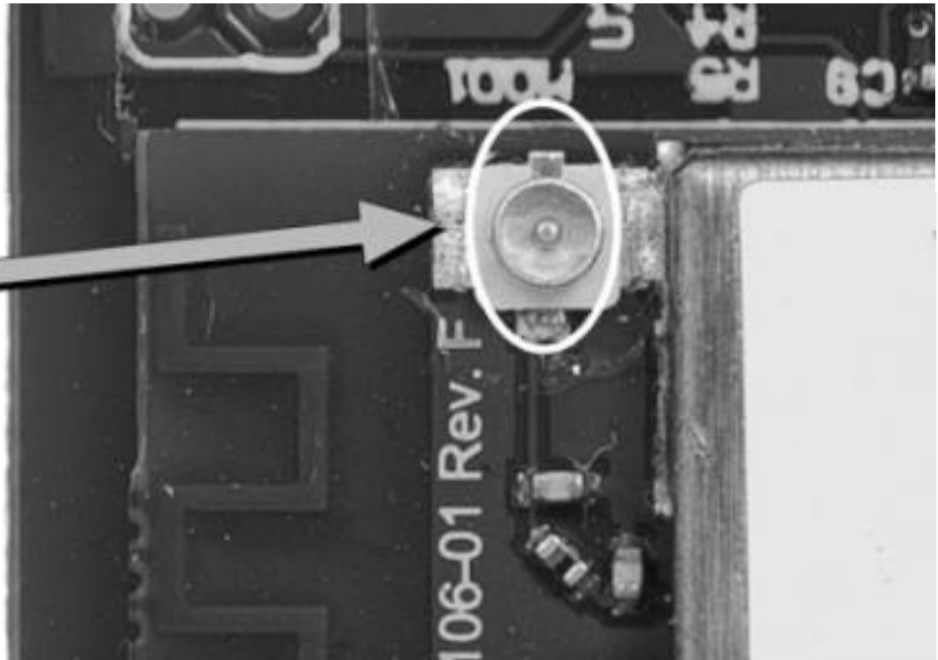


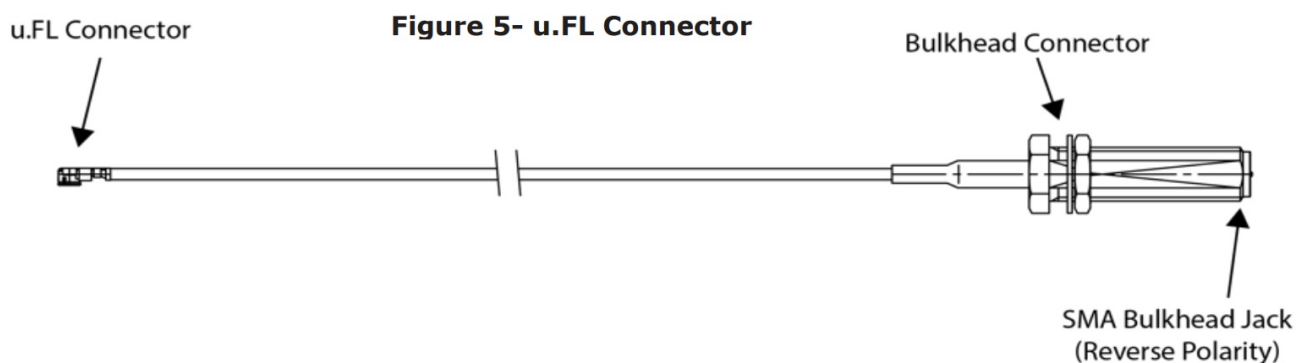
Figure 4- u.FL Terminal

CONNECTING THE u.FL CABLE

An u.FL antenna may be connected to the EMB-S2 in order to get maximum RF connectivity. The recommended antenna kits are:

- KIT-ANTUFL18-01
18" u.FL cable with right angle antenna
- KIT-ANTUFL18-02
18" u.FL cable with straight antenna
- KIT-ANTUFL18-03
18" u.FL cable with right angle stubby antenna
- KIT-ANTUFL18-04
18" u.FL cable with straight stubby antenna

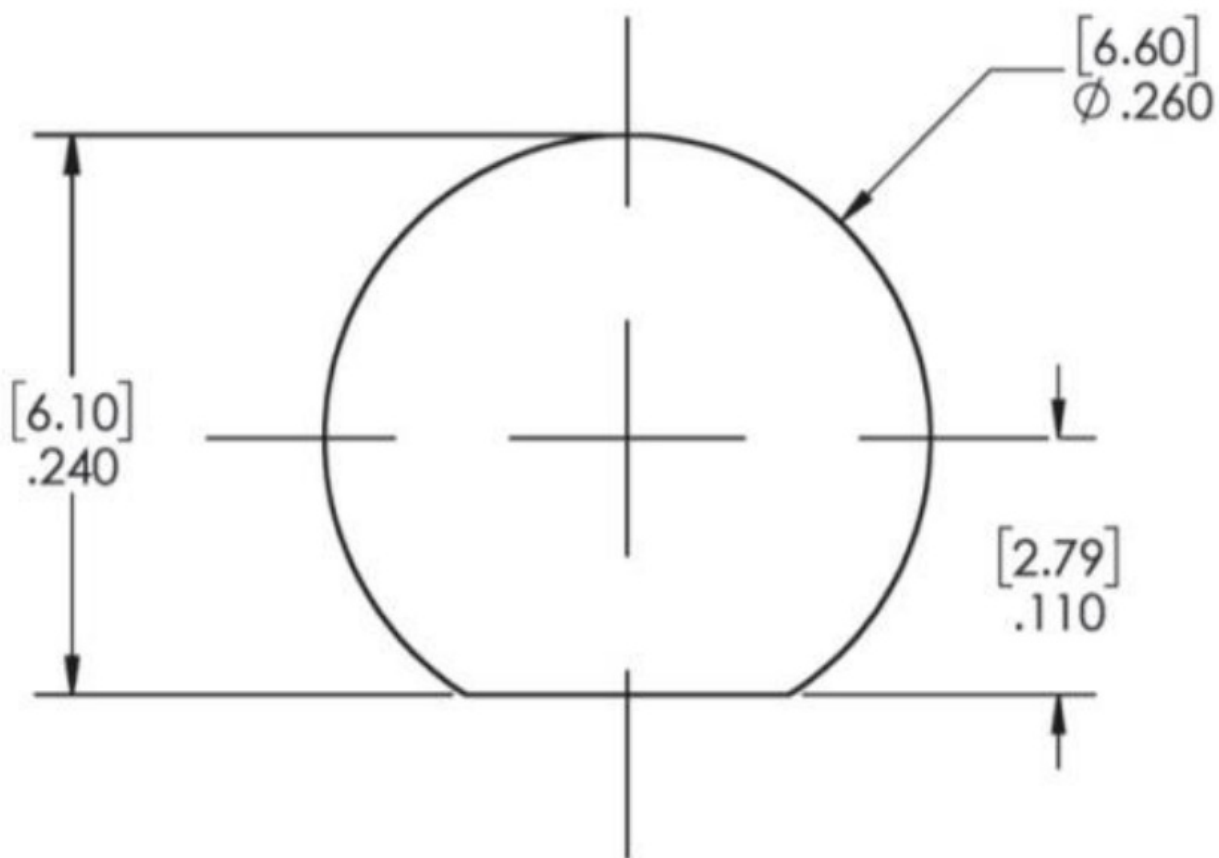
Please see the EMB-S2 cut sheet or contact Synapse sales for more information.



ATTACHING THE ANTENNA

1. Make sure the power is off. When handling the antenna cable, the technician must be grounded with a proper ground strap.
2. Remove red rubber dust cover, the washer, and nut from the antenna connector.
3. Determine best location for external antenna position and create an opening to mount the antenna and bulkhead (See Figure 6 for measurements).
4. Feed the bulkhead through the opening in the fixture. (Note: Recommended max thickness of fixture wall is 6mm or 0.25 inches. This allows enough threads on the outside of the fixture for a good antenna connection.)
5. Place the washer and the nut back on the antenna connector and secure to fixture.
6. Screw on the antenna hand tight. Tighten a 1/4 turn with a pair of needle nose pliers. Do not over tighten or the RF pin in the bulkhead will crack, creating poor RF link quality.

Figure 6 – Recommended mounting hole for 1/4-36UNS-2A threaded antenna with flat



CONNECTING SENSORS

Note: Steps 14-18 are for adding sensors to the EMB-S2 controller; if you are not connecting sensors skip this section.

There are two sensor inputs on the EMB-S2 designed for low powered (24v DC) type sensors.

- The Input A is used to connect sensor A.
- The Input B is used to connect sensor B.

1. Connect the sensor power wire to the AUX out on the LED driver (the LED driver powers the sensor).

2. Connect the sensor common to the COMMON/DALI- or COMMON/DIM- based on the LED driver you have.
3. Connect the sensor CTRL/Control wire to the Input A+ or Input B+ of the EMB-S2 controller.
4. If you are using more than one sensor then duplicate the installation as described above.
5. Sensors must be configured in software before they are functional in a SimplySnap system. **(See Figures 2 and 3)**

WIRING THE EMB-S2 CONTROLLER

Note: Unless specified, the connections to a standard Dim to Off LED driver and the DALI 2 LED driver are the same.

- Connect the 12-24VDC Aux output from LED driver to the EMB-S2.
- Connect the Aux ground from the LED driver to the EMB-S2. **(Figure 2 and Figure 3)**

CONNECTING THE DIMMING CIRCUIT

Note: Steps 21-22 are for connecting up to a Standard Dim to Off LED driver; if you are using a DALI 2 LED driver skip to steps 23-24.

- Connect the DIM- wire on the LED driver to the DIM- output on the EMB-S2.
- Connect the DIM+ wire on the LED driver to the DIM+ output on the EMB-S2. **(See Figure 2)**

Note: Steps 23-24 are for connecting up to a DALI 2 LED driver.

- Connect the DALI- from the EMB-S2 to the DALI- /COMMON wire on the LED driver.
- Connect the DALI+ from the EMB-S2 to the LED driver DALI+. **(See Figure 3)**

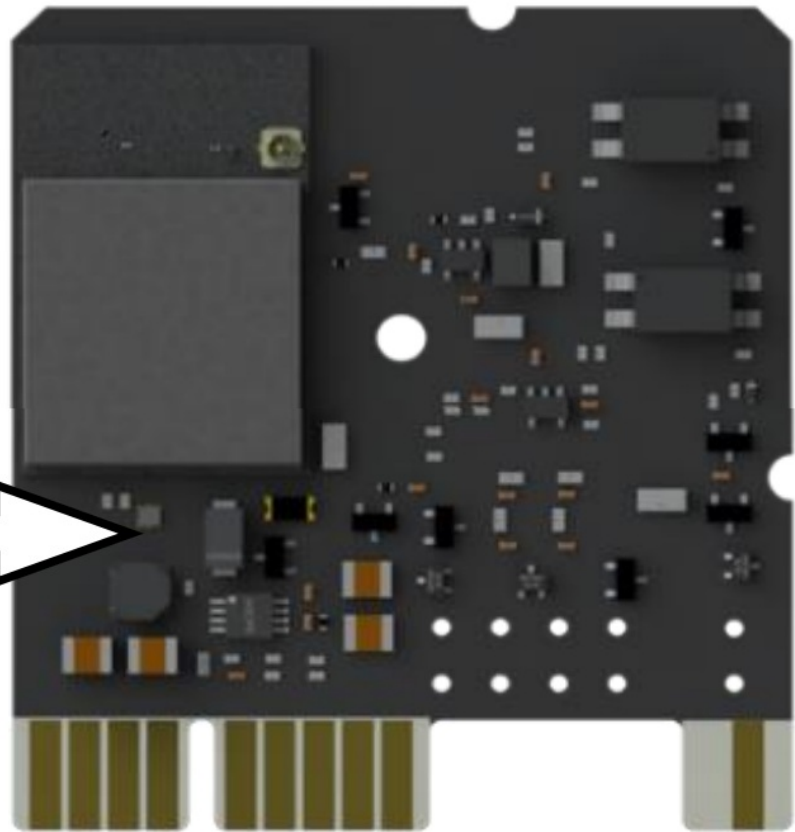
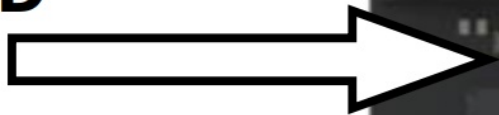
POWERING UP THE FIXTURE AND CONTROLLER

After connecting the Controller to the LED Driver and any sensors, make sure to cap any unused wires. Switch power on to the fixture. The light should turn on.

Note: When switched on, lamps should turn on to full brightness with approximately 10 VDC signal on the DIM+ wire using the DIM- wire as reference.

STATUS LED

STATUS LED

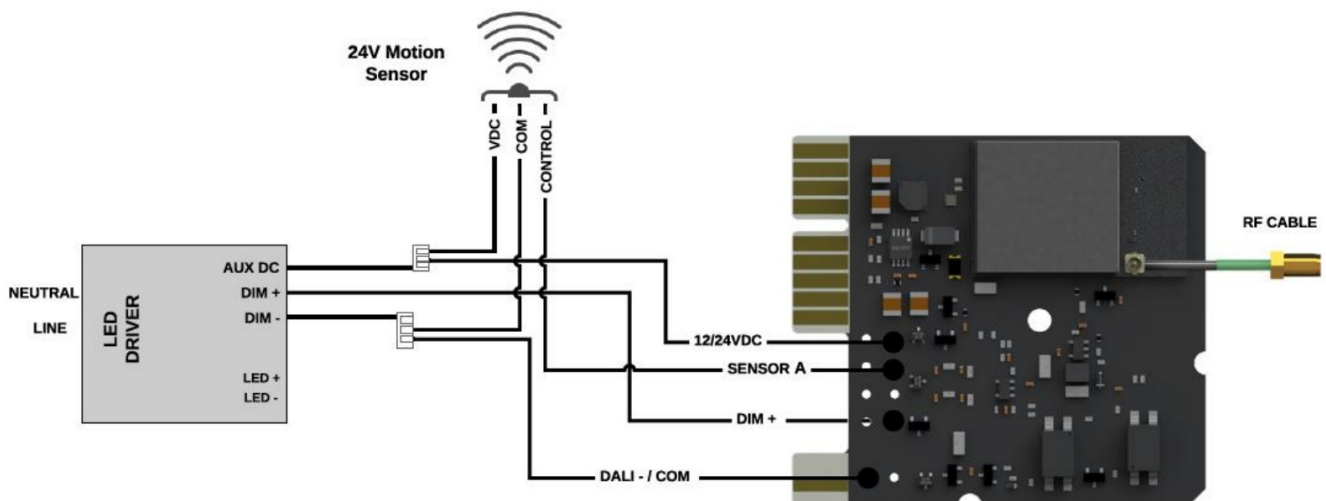


Note: When the controller is powered the following colors indicate the current status.

- **Red** = No Network Found (Communication Lost)
- **Blinking Green** = Network Found, Controller Not Configured (Device not yet added to SimplySnap)
- **Green** = Network Found, Controller Configured (Normal Operation)

NOTE: Refer to the SimplySnap User's Manual for information on provisioning the EMB-S2.

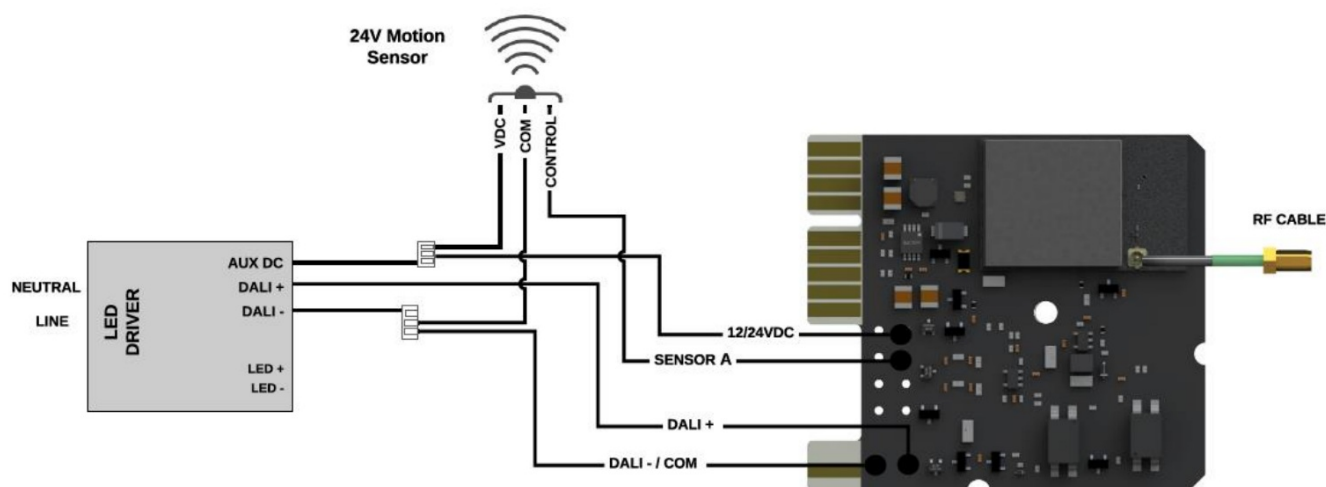
Figure 2 – Dim to OFF Wiring Diagram



WARNING:

- If a single Synapse controller is used to drive the DIM+ input of multiple LED drivers, then all of the DIM- lines from all drivers MUST be directly tied/shorted together to provide a common return/ground to the controller.
- Synapse will not warranty or be liable for designs with any other electronic means of coupling DIM- lines from multiple drivers.

Figure 3 – DALI-2 Wiring Diagram



REGULATORY INFORMATION AND CERTIFICATIONS

RF Exposure Statement: This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada (IC) certifications: This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

FCC certifications and regulatory information (USA only)

FCC Part 15 Class B: This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) These devices may not cause harmful interference, and (2) These devices must accept any interference received, including interference that may cause harmful operation.

RADIO FREQUENCY INTERFERENCE (RFI) (FCC 15.105): This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- (1) Re-orient or relocate the receiving antenna;
- (2) Increase the separation between the equipment and the receiver;
- (3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected;
- (4) Consult the dealer or an experienced radio/TV technician for help.

Declaration of Conformity (FCC 96 -208 & 95 -19):

Synapse Wireless, Inc. declares that the product name "EMB-S2" to which this declaration relates, meet the requirements specified by the Federal Communications

Commission as detailed in the following specifications:

- Part 15, Subpart B, for Class B equipment
- FCC 96 -208 as it applies to Class B personal computers and peripherals
- This product has been tested at an External Test

Laboratory certified per FCC rules and has been found to meet the FCC, Part 15, Emission Limits. Documentation is on file and available from Synapse Wireless, Inc. If the FCC ID for the module inside this product enclosure is not visible when installed inside another device, then the outside of the device into which this product is installed must also display a label referring to the enclosed module FCC ID. Modifications (FCC 15.21): Changes or modifications to this equipment not expressly approved by Synapse Wireless, Inc., may void the user's authority to operate this equipment

CERTIFICATIONS

Model : EMB -S2

Contains FCC ID : U90 -SM 520

Contains IC : 7084A -SM 520

UL File No : E346690

DALI -2 Certified Application Controller

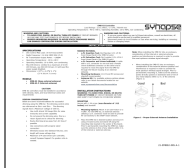
Contact Synapse for Support – (877) 982 -7888

Patented – _virtual marking at

<https://www.synapsewireless.com/about/patents>

SYNAPSE

Documents / Resources



[Synapse EMB-S2 Controller](#) [pdf] Installation Guide
EMB-S2 Controller, Controller, EMB-S2

References

- [Synapse Wireless | Patents](#)