

**DIM10-281-21 Lighting Controller**  
**0-10V CONTROL, 2 ANALOG INPUTS**

Load Ratings: 5A @ 100-277VAC (+/- 10%), 50/60 Hz

Operating Temperature: -40 to +70 C / Operating Humidity: 10 to 90%, non-condensing



**WARNING AND CAUTIONS:**

- **TO AVOID FIRE, SHOCK, OR DEATH; TURN OFF POWER AT CIRCUIT BREAKER OR FUSE AND TEST THAT POWER IS OFF BEFORE WIRING!**
- **Risk of Electric Shock** - More than one disconnect switch may be required to de-energize the equipment before servicing.
- To be installed and/or used in accordance with appropriate electrical codes and regulations.
- If you are unsure about any part of these instructions, consult an electrician.
- Use this device with copper or copper clad wire only.
- Switched output is energized by default at power up

**WARNINGS AND CAUTIONS:**

- Disconnect power at circuit breaker or fuse when servicing, installing or removing fixture or changing lamps.
- **Mounting:** It is critical to the performance of this device that the antenna be oriented vertically. It must point straight up or down for proper operation.
- **Wiring Connectors:** All existing wiring connectors must be replaced with new UL listed wiring connectors. All wiring connectors must be correctly sized for the application and the number and the size of the electrical conductors.
- Metal conduit connector must be grounded.

**INSTALLATION GUIDE**

**SPECIFICATIONS**

- Relay Max Switched Circuit: Zero Cross, 5A
- Dim Control Max Load: 20 mA Source/50 mA Sink
- Radio Frequency: 2.4 GHz (IEEE 802.15.4)
- RF Transmission Output Power: +20dBm
- Operating Temperature: -40 to +70C
- Operating Humidity: 10 to 90%, non-condensing
- Configuration/Programming: Stored in non-volatile memory
- Dimensions: 6.7" L x 2.1" W X 0.7" H (170 X 54 X 18 mm)

**CAUTION**

- DIM10-281-21 controllers must be installed in accordance with national, state, and local electrical codes and requirements
- All work must be performed by qualified personnel
- Disconnect all power before installation or service
- Metal conduit connector must be grounded
- The switched output (LOAD) is energized by default at power up

**NEEDED MATERIALS**

- **u.FL Insertion Tool:** Part Number U.FL-LP-IN from Hirose Electric
- **u.FL Extraction Tool:** Part Number U.FL-LP-N-2 from Hirose Electric
- **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 DIM10-281-21 through the fixture housing to an external antenna. Synapse has kits available for these cables as part numbers:
  - KIT-ANTUFL18-01
  - KIT-ANTUFL18-02
  - KIT-ANTUFL18-03
  - KIT-ANTUFL18-04

Contact Synapse for further information.

Make sure the power is off. Attach the 50 OHM Terminator to the RP-SMA bulkhead hand tight before attaching the u.FL cable to the u.FL terminal. Keep the 50 OHM Terminator on the cable until mounting the bulkhead in the fixture or attaching an antenna for testing. Use the insertion tool, PN U.FL-LP-IN, to mate the connectors. The mating axes of both connectors must be aligned so that the connectors can be mated. The "click" will confirm the fully mated connection. Do not attempt to insert on an extreme angle. Route the antenna cable such that there is no upward tension between the cable and the u.FL connector.

To disconnect 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.

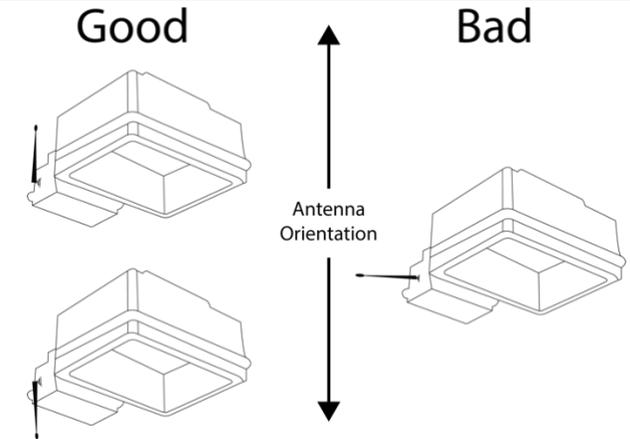
**ATTACHING THE BULKHEAD**

Keep the 50 OHM Terminator on the bulkhead at all times, until the antenna replaces the 50 OHM Terminator. When installing the bulkhead, the technician must be grounded with a proper ground strap. After installing the bulkhead in the fixture, replace the 50 OHM Terminator.

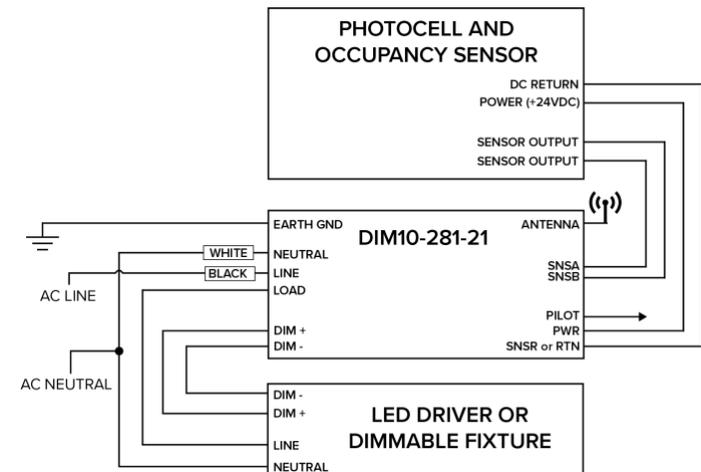
**ATTACHING THE ANTENNA**

When it is time to attach the antenna, touch a grounded surface, remove the 50 OHM Terminator and screw on the antenna hand tight. Tighten a 1/4 turn with a pair of needle nose pliers. Do not overtighten or the RF pin in the bulkhead will crack, creating poor RF link quality.

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



**Figure 1-Antenna Orientation**



**Figure 2-Wiring Diagram**

## MOUNTING

It is critical to the performance of this device that the antenna be oriented vertically. It must point straight up or down for proper operation. When installing the DIM10-281-21 in an enclosure, antenna position must be considered in order to provide optimum wireless signal strength. For best transmission, all antenna should be oriented vertically.

For a standard installation, place the light controller in the desired location inside the fixture and secure it using (4) #4 machine screws. Make sure the head of the screw does not extend outside the silk-screened circular pattern on the printed circuit board at each hole location. Use a nylon standoff at least 1/4" in length between the board and the mounting surface to prevent shorts.

Before permanently installing it, verify the antenna can be mounted external to the fixture and allows adequate room for connecting the coax cable from the DIM10-281-21 to the antenna. Also, make sure the antenna can be oriented vertically and is free from blockage by any surrounding metal. (Figure 1)

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

## INSTALLATION INSTRUCTIONS

1. Connect the electrical service **black** wire (hot) to the **LINE** input on the DIM10-281-21.
2. Connect the **black** wire of the LED fixture to the **LOAD** output on the DIM10-281-21.
3. Connect the electrical service **white** wire (neutral) to the **NEUTRAL** input on the DIM10-281-21 and the **NEUTRAL** input on the fixture

**Note: Steps 4-6 are for Class 1/2 Dimming Control**

4. Connect the **DIM-** wire from the fixture LED driver to the **DIM-** input on the DIM10-281-21.
5. Connect the **DIM+** wire from the fixture LED driver to the **DIM+** input on the DIM10-281-21.
6. Switch power on to the fixture. The light should turn on.

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

**Note: Steps 7 - 10 are for attaching sensors.**

The label for the terminal blocks are offset on the board. Refer to figure 3 to see how the labels correlate with the terminal block.

7. Connect the DIM10-281-21 SNSA input to the first sensor output and SNSB to the second sensor output (if applicable).
8. Connect the DIM10-281-21 SNSR signal to the Common (ground) connection on the sensor(s).
9. Connect the DIM10-281-21 PWR output to the power input on the sensor(s).
10. Connect the DIM10-281-21 RTN input to the Common (ground) signal on the sensor(s).

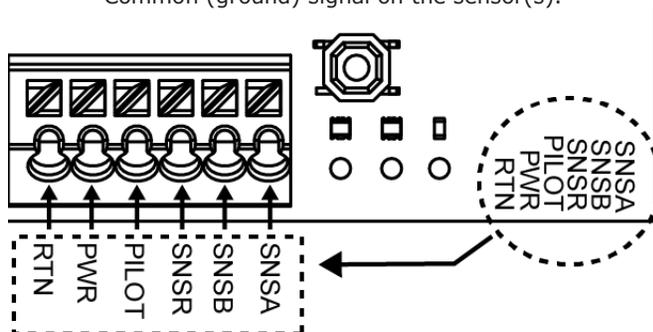


Figure 3- Terminal Block Identifiers

**Note: Steps 11 - 12 are for using the auxiliary output.** The auxiliary output is a "sink-only" output that can be used to activate an external switch or relay. It can sink up to 40mA at 24V\* max. It tracks the state of the internal relay.

11. Connect the auxiliary output to one side of the low-voltage coil (relay example).
12. Connect the other side of the low-voltage coil to the PWR output on the DIM10-281-21.

## DIMMING

- Below are some recommendations for successful dimming using the DIM10-281-21. 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.

- When possible, route dimming wires away from AC lines
- Use connections with properly sized connectors.
- Eliminate excess wire between fixtures. Line length will cause voltage drop.
- Number of fixtures that can be daisy-chained depends on the following factors: dimming current, current requirements for driver, length of wire, quality of connection, and gauge of wire
- Verify dimming capability via a "test bed" with the number of actual fixtures, wire length, connectors, and wire gauge

## USING THE AC CAGE CLAMP

Synapse's AC terminal blocks use a secure locking mechanism for the AC connections that is called a cage clamp. To securely attach the AC wires to the DIM10-250 follow the directions below.

1. Strip 1/3" of the conductor wire.
2. Insert a small bladed screw driver inside the **square** hole release mechanism to open the cage clamp. (Figure 4)
3. Insert the wire into the **round** hole to the cage clamp.

**NOTE: The conductor wire should fall into the hole with no force when the clamp is properly opened.**

4. Hold the wire in place as you remove the small screw driver from the **square** hole.
5. Tug on the conductor to verify it is snugly clamped. If it is not snug, go back to step 2 and repeat.

Insert small bladed screwdriver into square slot before inserting the wire in the corresponding circular hole

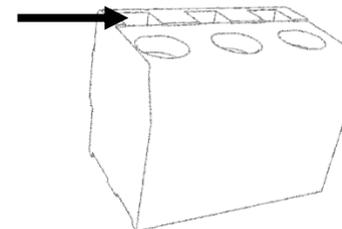
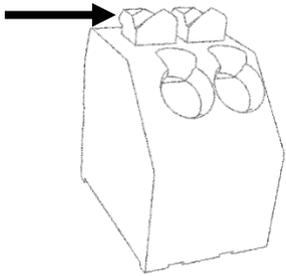


Figure 4 - Insert a small bladed screwdriver before inserting the conductor wire.

### USING THE DC CAGE CLAMPS

For the DC Cage Clamps, use a small flat head screwdriver to push the release button (Figure 5) before inserting the wire.

Use small bladed screwdriver to press release button before inserting wire in the corresponding circular hole



**Figure 5 - Use a small bladed screwdriver to press the clamp release before inserting the wire.**

## 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.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

### 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 "DIM10-281-21" 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

<b>Model</b>	: 200366-01
<b>Contains FCC ID</b>	: U90-SM220
<b>Contains IC</b>	: 7084A-SM220
<b>UL File No</b>	: E346690

**Contact Synapse for Support- (877) 982-7888**