

**INSTALLATION INSTRUCTIONS FOR THE BUILDING CONTROLLER (BC1) KIT (LB-10129,  
 17M12) USED WITH L CONNECTION NETWORK**

**Shipping and Packing List**

**Package 1 of 1 contains:**

- 1- BC1-1 controller
- 1- Bag assembly containing:
  - 4-#6 - 32X1/2" TFS screws
  - 3-Fuses
- 1- Field wiring sticker

An optional NEMA 1 box is ordered and shipped separately. Refer to part numbers in the L Connection Engineering Handbook or selection guide.

*IMPORTANT - Make sure any sensors used are compatible with the L Connection® network. Refer to L Connection engineering handbook for part numbers.*

**Application**

The BC Building Controller, used with the L Connection Network, controls lights, vent hoods, exhaust fans, sprinklers, security and fire systems, and other building equipment. Operation of building equipment can be scheduled using a Network Control Panel. Additional inputs may be used to override and/or control the building equipment. The BC is compatible with the Network Control Panel (NCP) versions 1.13 or later (Service Pack 5), Unit Controller (UC) software versions 2.03 or later, and NCP PC software version 2.03 or later.

**⚠ WARNING**

**Personal injury, loss of life, or damage to property!  
 Installation and service must be performed by a qualified installer or service agency.  
 Improper installation, adjustment, alteration, service or maintenance can cause personal injury, loss of life, or damage to property.**

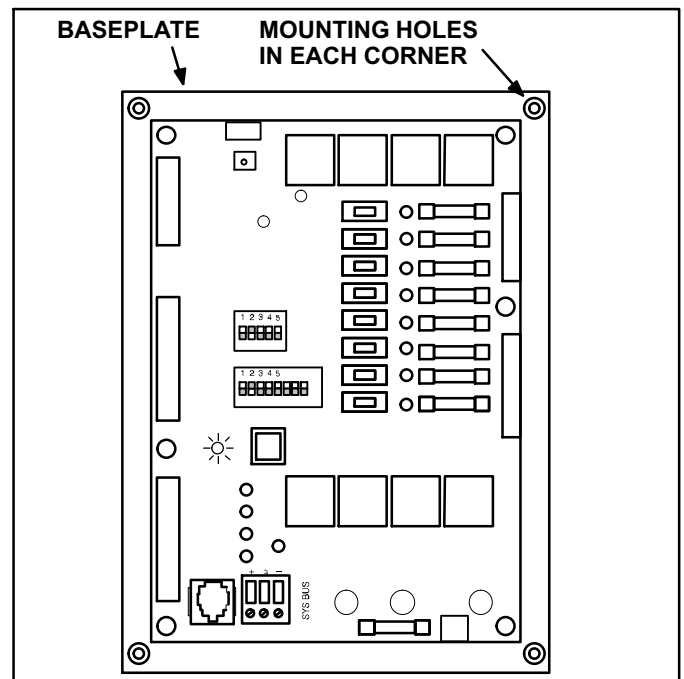
**⚠ CAUTION**

**Danger of sharp metallic edges.  
 Can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.**

**Installation**

Install the BC indoors in the optional NEMA 1 box. Installation site must be dry and free of harmful vapors and gases. Make sure there is space for the wiring and that controller is accessible for servicing.

1. Install the BC in the NEMA 1 box and secure with four screws provided. See figure 1.  
*IMPORTANT - Do not remove the BC baseplate.*
2. Affix field wiring sticker, provided in kit, to inside of NEMA 1 enclosure.



**Figure 1. BC1 Building Controller**



## Building Control Components

### Heartbeat LED

The heartbeat LED will blink green (approximately 1 second on, 1 second off) when BC is powered. See figure 4 for LED location.

### Pushbutton

A short push of the pushbutton will by-pass on/off delays. To reset the BC, press and hold the pushbutton until the heartbeat LED flashes red.

### Manual Output Test Switches

Manual switches may be used to energize each output. Switches have three positions: **on**, **off**, and **auto**. Place switches in the **auto** position for normal unit operation. Place switch in the **off** position to disable the output and in the **on** position to test unit function. See figure 3.

### Address DIP Switches

Assign a different address to each controller on the net-

work. Individual switches on the DIP address switch are labeled 1, 2, 4, 8, or 16. See figure 4. The address is the sum of the switches set to the ON position. See figure 2.

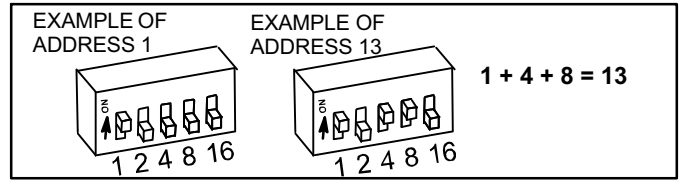


Figure 2. Address DIP Switches

### Configuration DIP Switches

These switches are presently not used and should be set to the off position.

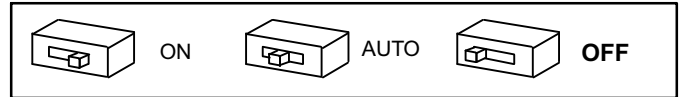


Figure 3. Manual Output Test Switches

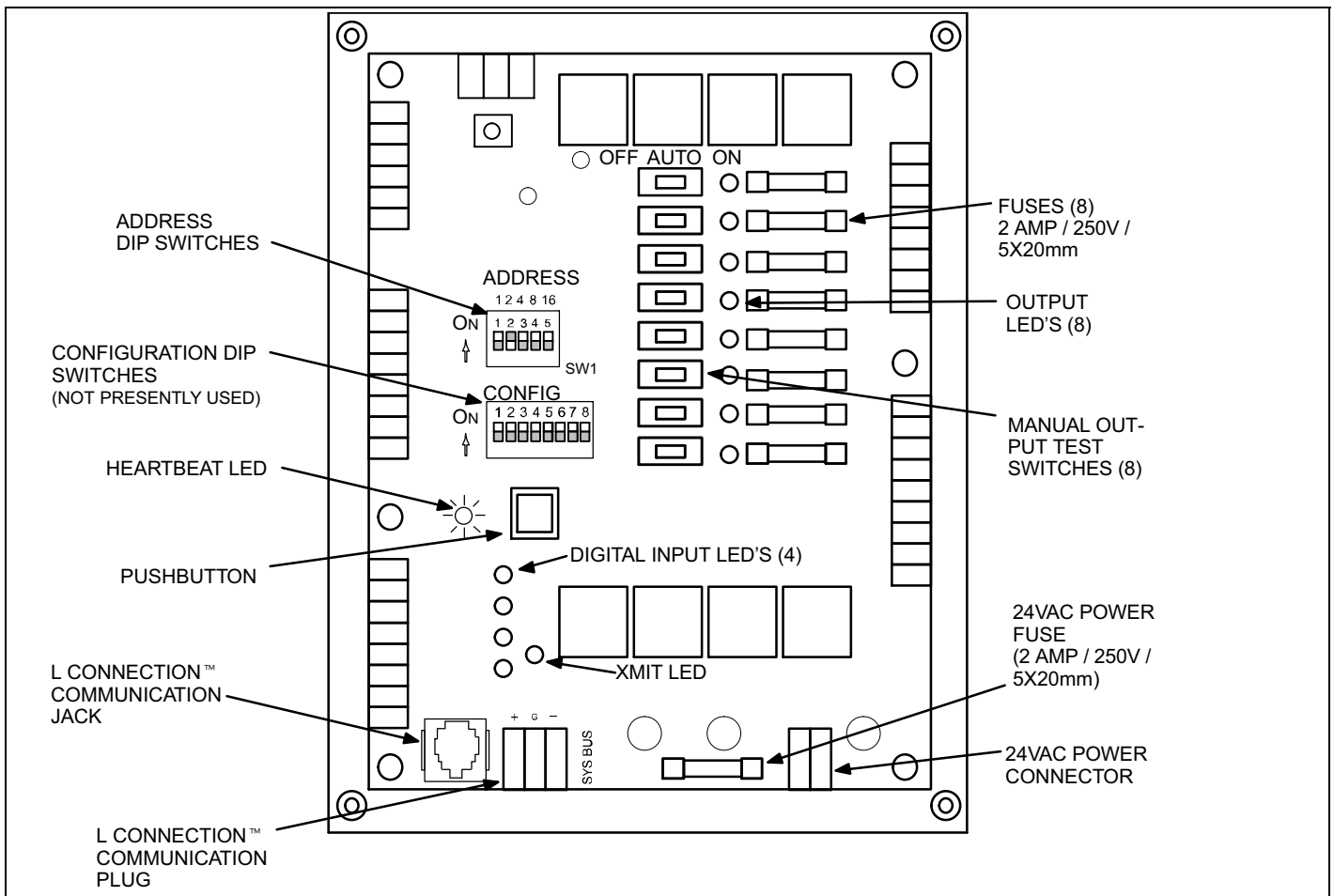


Figure 4. BC1-1 Building Controller

## Digital Inputs - P186

Digital inputs are wired to P186 using standard 18AWG thermostat wire. Each input is isolated and requires a separate common. Inputs are rated for 24VAC. See field wiring in figure 7.

Using UC software, digital inputs can be configured to:

- Override selected outputs ON.
- Override selected outputs OFF.

Using UC software, digital inputs can override NCP programs to operate the HVAC unit in the following modes:

- Untimed override.
- Setpoint shift.
- Stand-by.

Digital inputs D1 and D2 can be configured with optional on and off delays.

Digital inputs D3 and D4 can be configured to set alarms.

Digital inputs have a 3-second delay which can be reduced to less than 1 second.

## Temperature Inputs - P187

Sensors are wired to P187 using shielded communication cable. Connect the shield drain wire to the input common as shown in figure 7.

*IMPORTANT - Make sure any sensors used are compatible with the L Connection network products. Refer to the L Connection engineering handbook or selection guide for part numbers.*

The operating range of each input is -40°F to 130°F (-22°C to 54°C).

°F	Resistance
-40	335,671
-20	164,959
0	85,323
20	46,218
30	34,566
40	26,106
50	19,904
60	15,313
70	11,884
80	9,298
90	7,332
100	5,826
120	3,756
130	3,047

All values are +/- 2%.

Temperature inputs can be configured to override NCP scheduled outputs and to set alarms based on over or under temperature conditions. Refer to UC PC software.

## Analog Inputs - P188

Analog inputs are wired to P188 using shielded communication cable. Connect the shield drain wire to the input common as shown in figure 7.

The operating range of each input is 0-10VDC. The inputs are high impedance (10K Ohm).

Analog inputs can be configured to override NCP scheduled outputs and to set alarms based on over or under temperature conditions. Refer to UC PC software.

## Digital Outputs - P189 and P190

Each output is a fused, dry contact and is rated for 24VAC, 2 amp maximum. Output #8 has both a normally closed and a normally open output. See figure 7.

Digital outputs can be scheduled by the NCP to turn ON or OFF based on time or the light sensor input (P191). The NCP can also control a digital output when a selected unit is in the occupied mode.

Using UC software, the NCP scheduled outputs can be overridden ON or OFF based on digital inputs (P186), temperature inputs (P187), or general analog inputs (P188).

The outputs can also be manually overridden using the switches on the BC Controller or using the NCP.

The manual switches on the BC board will take precedence over any other means of digital output override. The precedence which controls each BC output, from highest to lowest, is:

1. Manual switch on the BC board.
2. NCP manual overrides or output override modes.
3. Digital input D1
4. Digital input D2
5. Digital input D3
6. Digital input D4
7. Analog input or temperature event (input over/under selected threshold).
8. HVAC unit occupied status.
9. NCP programmed time of day or BC light sensor.

## Ambient Light Sensor Input - P191

### Wiring

Use butt splices to make wire connections as shown in figure 7. P191-1 is the 12VDC power out, P191-2 is the 0-10VDC signal in, and P191-3 is the common. See figure 7. Use 20 or 22 gauge stranded, shielded communication cable. The sensor requires 3 conductors; use 2 cables when 27M19 cable is used. The sensor cable length should not exceed 500 ft. (152m). For cable exposed to excessive electrical noise, route cable in conduit.

### Install Sensor

Optional ambient light sensor, 34M67, is used to control lights or other equipment based on ambient light. Install the sensor on or near the rooftop unit in a horizontal position, facing north, with the hooded side upward. See figure 5. Make sure the sensor is exposed to full daylight: do not locate sensor in heavily shaded areas or areas exposed to bright lights illuminated at night. Insert the threaded portion of the sensor into a standard 1/2" conduit fitting or 1/2" knock-out. Secure with nut provided with sensor.

### Schedule

The light sensor and the NCP time schedule can be used to control a user-selected output. Refer to BC Day Schedules in NCP User's and Software manuals.

## Input Delay

The light sensor input has a non-adjustable 2-minute time delay. This prevents a shadow or other temporary light interruption from affecting the selected output unless the interruption lasts longer than 2 minutes. Press the BC board pushbutton to by-pass this delay. The delay can also be disabled by the UC Software. Refer to the Inputs tab in the NCP Program Overrides and Setup section. When the delay is disabled, the output response time is dependent on communication delays between the BC and the NCP.

## Lighter/Darker Setting

The recommended setting for the light sensor R6 potentiometer is 4. To turn ON the output earlier (when it's darker outside), adjust the potentiometer to 3 or lower. To turn ON the output later (when it's light outside), adjust the potentiometer to 5 or higher.

The LED next to the potentiometer on the BC board will be energized when the ambient light is lower or darker than the potentiometer setting.

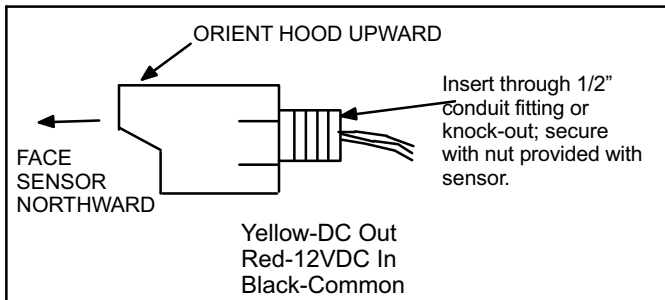


Figure 5. Light Sensor Orientation

## Check-Out Procedure

### Unit Operation

1. Make sure the heartbeat LED is green, energized ON for one second and OFF for one second.
2. Make sure the yellow XMIT transmit light is blinking. This indicates that the BC is transmitting to the NCP. If the transmit light is not blinking, make sure communication wiring is correct and that all connections are secure.
3. Make sure power is supplied to the NCP.

*NOTE - The transmit LED blinking rate depends on the number of Controllers connected to the L Connection network. The blink rate can be as slow as once every 30 seconds.*

### Output Operation

1. Turn the manual switches on the BC board to the ON position to simulate an output. Confirm proper operation.

*Moving the switch to the ON position closes the output relay (dry contact); moving the switch to OFF will open the relay, and moving the switch to AUTO will allow the BC/NCP to control the output.*

2. When testing is completed, set all switches to the AUTO position. **Switches must be in the AUTO position to allow the BC/NCP to control the outputs.**

## NCP Programming Summary

Use the NCP to schedule a program for each of the 8 BC outputs. Each output can have up to four time changes each day. Each time change can do one of 3 things:

1. Turn an output ON.
2. Turn an output OFF.
3. Turn an output ON when the light sensor indicates "dark" and turn an output OFF when the light sensor indicates "light".

The program assigned to each output can have a different day schedule for each day of the week and holidays.

The NCP allows up to 4 time changes per day, 8 day schedules per program (7 days and 1 holiday), and 1 program per BC output (8 outputs).

*NOTE - If communication to the NCP is interrupted, the BC will control to the setpoints and overrides assigned at the loss of communication.*

## UC Programming Summary

Use the Unit Controller (UC) PC software to setup, diagnose, and monitor Building Controllers on the network. UC Software version 2.03 or later and a PC converter are required to access the network.

Use "NCP Program Overrides and Setup" on the status screen to override NCP programs. The UC software allows the following overrides:

1. Use digital inputs to override outputs ON or OFF.
2. Use temperature and/or analog inputs to override outputs ON or OFF
3. Use temperature and/or analog inputs to issue user selected alarms.
4. Use occupied status of HVAC unit to override outputs ON or OFF.
5. Use digital inputs to operate units at override setpoints.
6. Use digital inputs to change HVAC unit operation to standby (off).
7. Use digital inputs to operate HVAC units at shifted setpoints.

## Reset BC Parameters To Default

Manually clear any programmed overrides and setups that have been configured using the UC PC software as follows:

1. Move all DIP switches on the Unit Address DIP switch to **OFF**.
2. Move all switches on the Configuration DIP switch, except for switch 7, to **OFF**.
3. Press and hold down the pushbutton; the heartbeat LED will **display** red, green, and off.
4. Press the pushbutton again. The LED will flash red and off until the ECTO transfer is complete. Once completed, the LED will flash red, green, and off.
5. Turn DIP Configuration DIP switch 7 to OFF.
6. Return the Address DIP switch to the previous position.
7. Hold the pushbutton to reset control to normal operation.

## Wiring

All wiring must comply with local electrical code.

### 24VAC

Connect 24VAC power to P185-1 and 2 from a class 2 (10VA minimum) transformer using standard 18AWG thermostat cable. P185-2 (common) must be connected to earth ground.

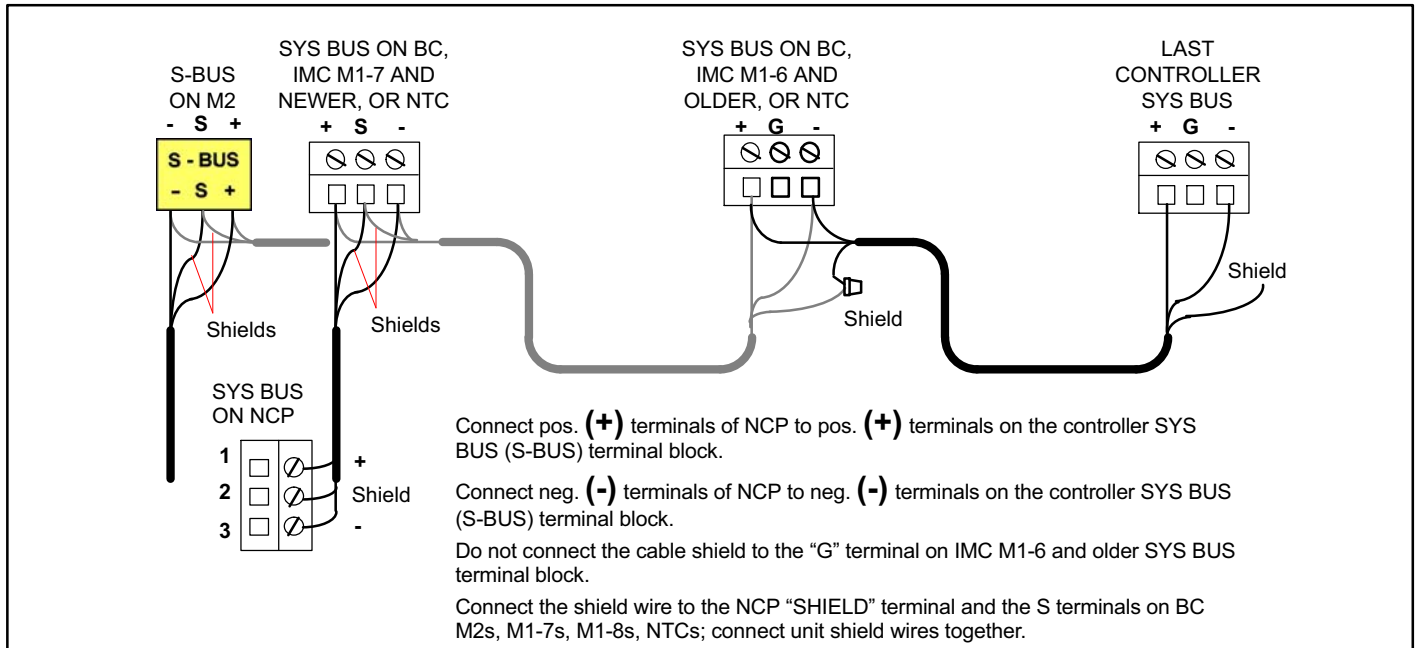
*NOTE - 24VAC power is polarity sensitive; the BC will not communicate if 24VAC and Common are reversed.*

## Communication Wiring

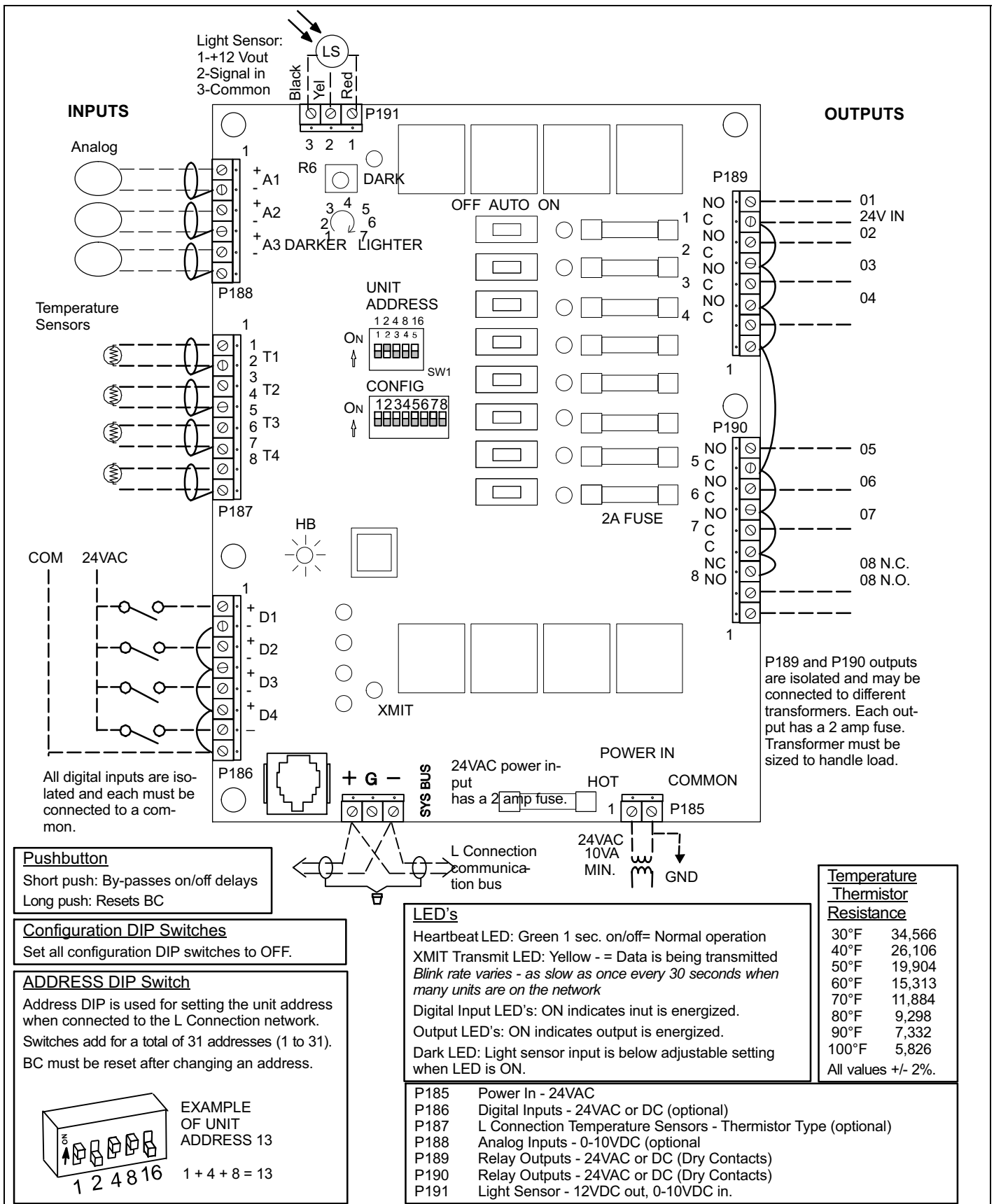
Daisy chain the communications cable between each L Connection device as shown in figure 6. Do not connect the shield drain wire to the BC, M2, IMC, or NTC controller "G"; connect the shield drain wire to terminal 2 on the NCP

Use cable type: Lennox P/N 27M19, Belden type 88761 or equivalent. (22AWG stranded, twisted pair, 100% aluminum shield with drain wire, Teflon jacket).

*Note - Make sure the total run of communications wiring does not exceed 4000 feet (1219 m).*



**Figure 6. L Connection™ Network Daisy-chain Communication Wiring**



**Figure 7. Typical BC1-1 Field Wiring**