

# TROUBLE-FREE LX-BUS™

## & KEYPAD BUS WIRING

### *Application Note*

## INTRODUCTION

There are many factors that contribute to a good installation, including wire type, wire length, noise sources, number of devices, and good connections. Due to these factors, there is not one set of rules that can guarantee a proper installation in every environment. However, following the practices in this application note allows the equipment to operate to its full potential.

- Review the site blueprints and perform a thorough walk-through of the site before running any wire.
- Use the proper wire type and gauge (18/4 or 22/4 unshielded wire).
- Be sure that the voltage does not drop more than 2.0 VDC between the power source and the device.
- Add power supplies and 710 Bus Splitter Repeater Modules for long runs with devices below 11.8 VDC.
- Avoid running wires in noisy environments, such as high electrical areas, motor rooms, or elevator shafts.
- Use 708 Modules to increase bus performance for long wire runs and noisy environments.
- Properly ground the system.

## PROPER INSTALLATION TECHNIQUES

A proper installation begins with proper planning. Examine the application before beginning to run wire or install any devices. Discuss possible wire runs with the entire staff of installers.

### *Drawings and Schematics*

Site drawings and schematics help ensure that the proper devices are brought to the site. Drawings can also help you identify possible problems with the installation. For example, you may learn that the panel's location is too close to a source of noise before the installation has actually occurred.

### *Walk-Through*

After examining the drawings and schematics, perform a thorough walk-through. A walk-through can help you spot things that may be possible problems not shown on the drawings.

During the walk-through, look for sources of noise, such as those listed in the Noise Contributors section of this application note. Also look for the location of the electrical main and other power sources to avoid.

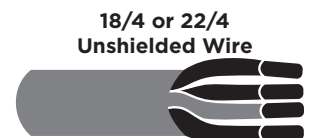
## WIRE SPECIFICATIONS

The characteristics of the wire, such as wire type and gauge, greatly affect the performance of the DMP LX-Bus™ and keypad bus. Use the following specifications when selecting and running wire for a DMP system.

### *Wire Type*

It is recommended to use 22 or 18 AWG 4-conductor unshielded wire to ensure the best installation. Some recommended brands of wire are Belden Model 5502UE and Genesis Model WG-110311.

For installations where both switched devices, such as smoke detectors, and unswitched devices are installed, 6-conductor unshielded wire can be used. This allows devices, such as smoke detectors to be reset using a separate fifth wire connected to the panel sensor reset, while other devices remain operational. Additionally, when using 6-conductor wire, two wires may be tied together to form one larger ground wire GND.

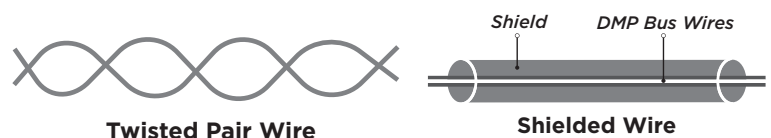


**Figure 1: Correct Wire Type for DMP Bus**

### *Wire Restrictions*

Do not use twisted pair wire for LX-Bus and keypad bus installations. When using the 708 Bus Extender Modules you may use twisted pair wire between the two 708 modules. As needed, refer to the 708 Installation Guide (LT-0585).

Do not use shielded wire except for noisy areas. If you need to use shielded wire for a run past a noisy area, use short wire runs of less than 100 feet. You may use shielded wire between two 708 Bus Extender Modules. Additionally, shielded wire may be used to connect readers to the keypad Wiegand interface or to a 734 Access Control Module when recommended by the reader manufacturer. Only connect the shield to the reader. Leave the shield floating at the keypad or 734.



**Figure 2: Incorrect Wire Types for DMP Bus**

# INSTALLATION SPECIFICATIONS

When planning an LX-Bus and keypad bus installation, keep in mind if these Installation Specifications are not met, the DMP bus may not perform to its full potential. Factors such as capacitance (because of too many devices) round the data waveform on the wire and impair communication. A wire run that is too long may not perform correctly because the long wire adds too much resistance and decreases the signal strength. Also, because of wire resistance and the number of devices, power input voltages at the device may be lower than an appropriate level to operate properly. As wire distance from the panel increases, DC voltage on the wire decreases.

Several factors must be considered to provide optimum bus operation:

- Length of wire used
- Number of devices connected
- Voltage at each device

## Length of Wire

The maximum cumulative distance for wiring one LX-Bus/keypad bus circuit is 2,500 feet, regardless of the wire gauge. This distance can be in the form of one long wire run or multiple branches with all wiring totaling no more than 2,500 feet. See Figure 3.

For longer circuits, add a 710 Bus Splitter Repeater Module. When using multiple 710 Modules, the maximum total distance is 15,000 feet. See the 710 Installation Sheet (LT-0310) for more information.

Exceeding the maximum length of wire or adding too many devices to one run causes the voltage to drop. To increase the voltage, add a power supply. See Device Voltage. If a run is too long, data lines cannot carry the necessary information to a device. In this case, you would need to add a 710 Module to improve data performance.

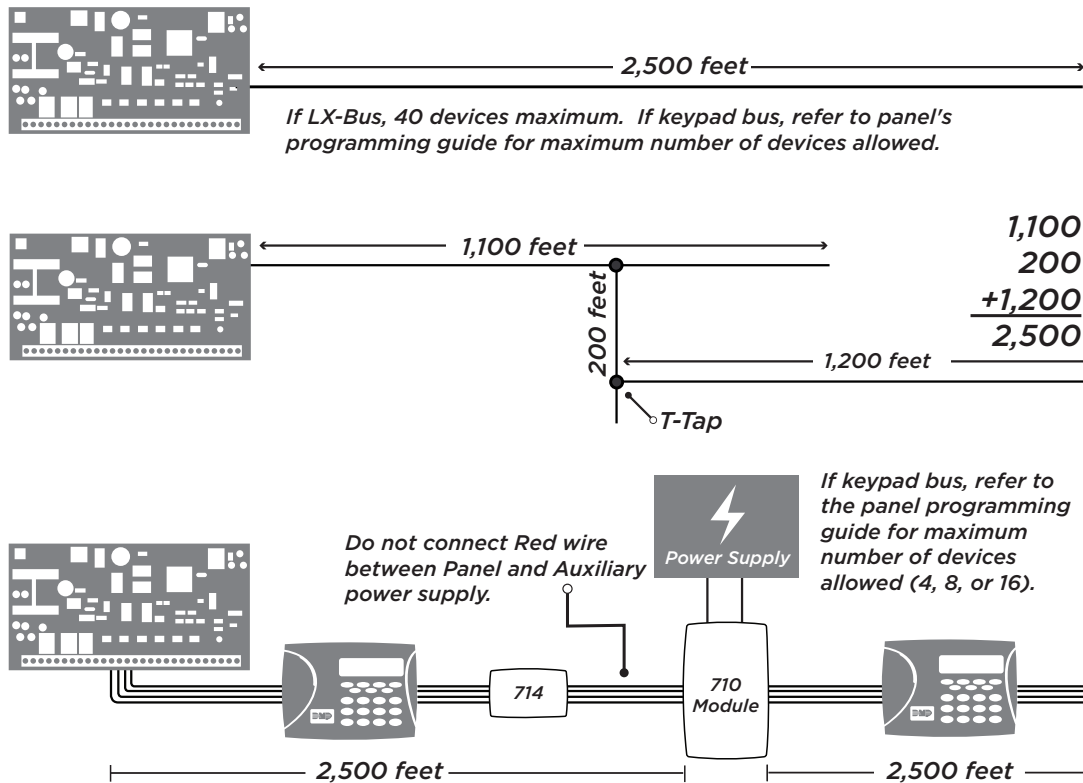


Figure 3: 2,500 ft Maximum

## Number of Devices

The maximum number of devices per 2,500 feet LX-Bus circuit is 40 if the voltage does not drop below 11.8 VDC at any device. The more devices on a run or the longer the wire, the more likely the voltage will drop below 11.8 VDC. Be sure to add power supplies to runs with any device that has a voltage less than 11.8 VDC. Other devices may be attached after the first 710 Module. Refer to the 710 Installation Sheet (LT-0310) and XR550 Series Installation Guide (LT-1233).

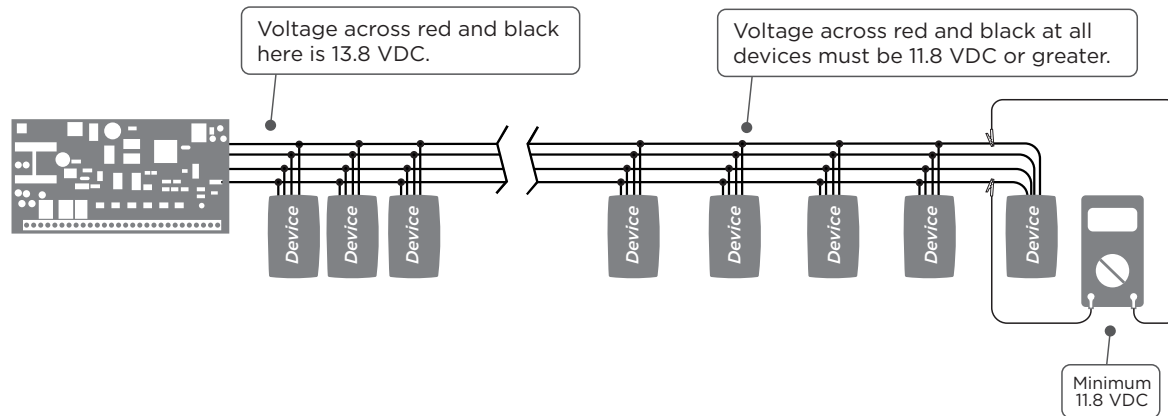
## Device Voltage

2.0 VDC is the maximum allowable voltage drop between the panel and any device connected to the bus. For example, if the voltage across the red and black wires at the panel is 13.8 VDC the voltage measured at each device must be equal to or greater than 11.8 VDC.

If the voltage at any device is less than the required level, an auxiliary power supply should be added to the circuit. Increasing the gauge of wire used on the circuit can also reduce the voltage drop. The maximum voltage drop rule applies to all DMP LX-Bus and keypad bus circuits.

**Note:** To troubleshoot voltage drop, read the voltage of the last device on the LX-Bus or keypad bus. Measure the last device on each leg if the wire run is T-tapped.

### DMP Bus without a Power Supply



### DMP Bus with a Power Supply

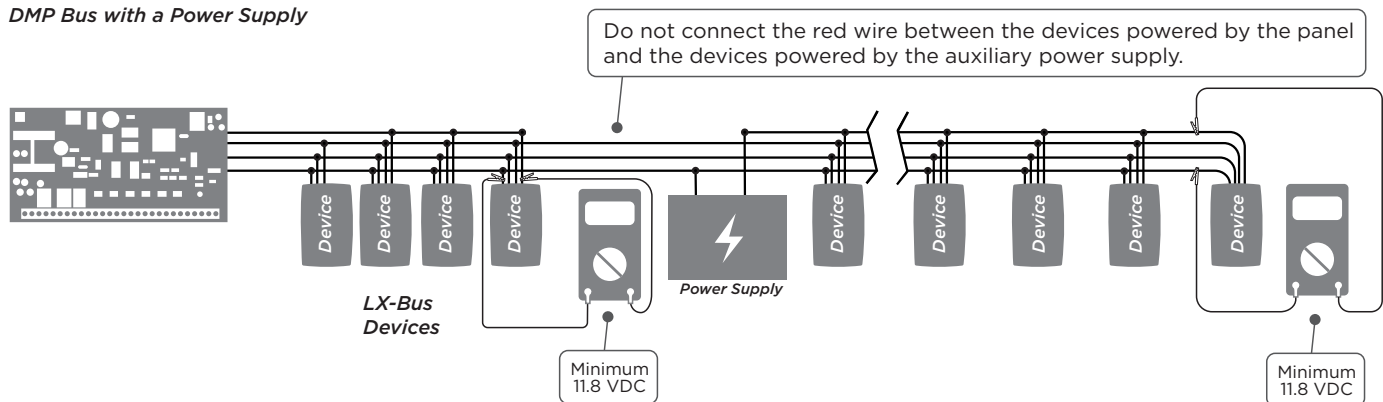


Figure 4: Maximum Voltage Drop 2.0 VDC

## Wiring Examples

- You can install an individual keypad at the end of a 500 ft 22-gauge wire run or up to 1,000 ft 18-gauge wire without a 710 Module or power supply.
- You can install 40 Model 711 Zone Expanders on an LX-Bus without any 710 Modules as long as each 711 is provided with at least 11.8 Volts and the total length of wire does not exceed 2,500 feet.
- You can install up to 25 LX-Bus devices on the first 2,500 ft circuit on XR550 Series panels, when using the on-board LX-Bus (J22). Refer to the XR550 Series Installation Guide (LT-O681), J22 LX-Bus Expansion Connector section.
- You can T-Tap a bus to create multiple buses if the total cumulative length of wire does not exceed 2,500 ft.
- You can use a 710 Module to create a T-Tap that allows three new bus circuits that can each be 2,500 ft long.

## System Grounding

Connect a 14 AWG or larger wire from the panel terminal 4 to a good Earth Ground. DMP recommends connecting to a cold water pipe ground or a ground rod. Do not connect to an electrical ground, conduit, sprinkler or gas pipes, or to building ground or a telephone company ground.

## NOISE CONTRIBUTORS

Electric noise is electricity that is transferred from a source to other wires simply because of the close proximity of the two. For example, wires close to an electric motor become noisy because the noise of the motor is induced onto the wires.

DMP bus devices are resilient to electric noise induced onto the bus, but if the electric voltage of noise exceeds the data voltage of the wires, the bus and its devices will not perform properly. For example, a device on the bus may occasionally show an open condition at the panel when a nearby motor starts. Also, as the voltage at a device decreases because of a long wire run, the chance of induced noise affecting the data increases.

Use the following techniques to minimize the chance that noise will be induced onto the data bus wires.

### Underground

DMP does not recommend running LX-Bus or keypad bus wires underground due to the possibility of high voltage damage from lightning strikes.

### Conduit

The DMP bus does not require using conduit for wire runs. If you do use conduit, do not share conduit with other wires that can induce noise. If sharing conduit is unavoidable, DMP Model 708 Bus Extender Modules can minimize the possibility of noise induction at each end of the conduit. See the [708 Bus Extender Installation Guide \(LT-0585\)](#) for details and Figure 5.

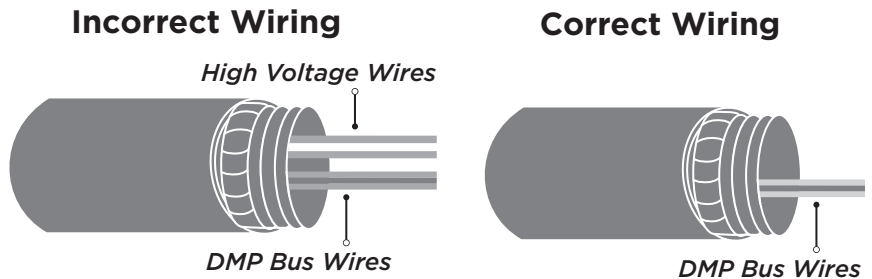


Figure 5: Incorrect and Correct Conduit Wiring

### Tie Wrapping

Do not tie wrap DMP bus wires to the exterior of conduit. It is possible that the noise from the wires inside the conduit can negatively affect the performance of the DMP bus. Fasten DMP bus wires to objects that will not induce noise, such as I-beams or water pipes. Refer to Figure 6.

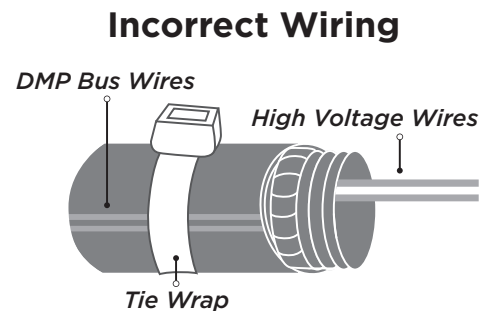


Figure 6: Incorrect Tie Wrap

### Floor Openings

Do not run wire through a floor opening with other non-DMP alarm system wires. See Figure 7.

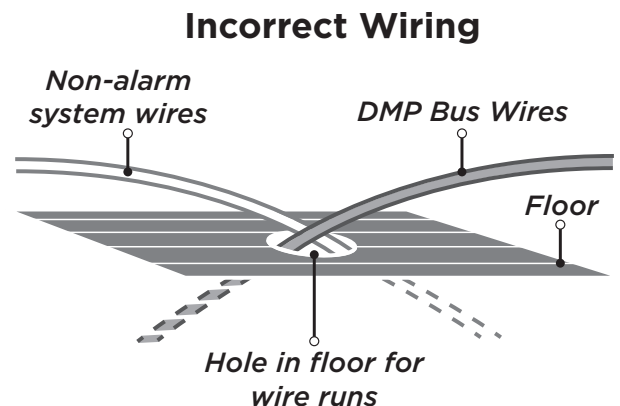
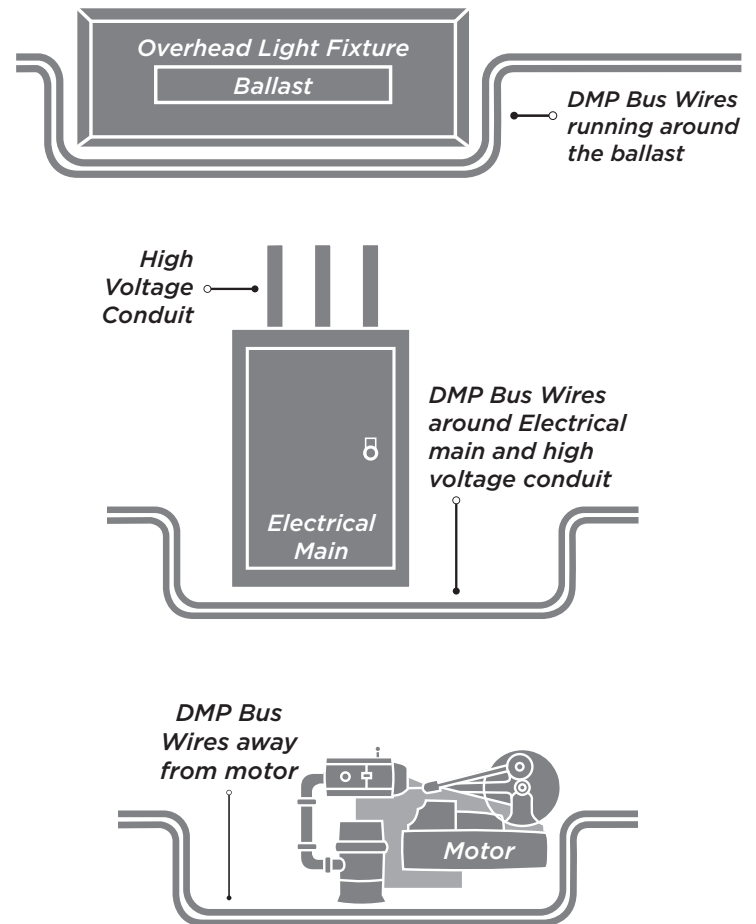


Figure 7: Incorrect Floor Wire Runs

## NOISE EXAMPLES

The following items are examples of items that may induce noise upon the DMP bus. To ensure proper operation, do not run an LX-Bus or keypad bus near sources of noise such as: High Voltage Lines, Ballasts, Pumps, Electrical Mains, Motors, Welders, and Elevator Shafts.



**Figure 8: Correct Wire Runs for Light Ballasts, Electrical Main/High Voltage Conduit, and Motors**

## SUMMARY

This Application Note has pointed out some tips to ensure a proper installation of DMP LX-Bus and Keypad Bus. A properly completed installation allows the equipment to operate to its full potential.

A proper bus installation begins with planning; Review the site blueprints and perform a thorough walk-through of the site before running any wire. After properly planning the installation, use the tips explained in this document.

- Use 18/4 or 22/4 unshielded wire.
- Be sure the voltage at each device is above 11.8 VDC.
- Properly ground the system.
- Avoid running wires in noisy environments and underground.
- Add power supplies and 710 Modules for long runs and multiple devices.
- Use 708 Modules to increase bus performance on long line runs or in noisy environments.

On keypad bus circuits, to maintain auxiliary power integrity when using 22 AWG wire, do not exceed 500 feet. When using 18 AWG do not exceed 1,000 feet. Maximum number of LX-Bus devices per 2,500 ft circuit is 40.

## REFERENCE INFORMATION

Refer to the [710 Module Installation Sheet \(LT-0310\)](#), [708 Modules Installation Sheet \(LT-0585\)](#), and all panel and device Installation Guides for complete information.

All wiring must be in accordance with NEC, ANSI, and NFPA 70. It is recommended that strain reliefs be used in all locations where wires exit an enclosure and conduit is not used.



Designed, engineered, and  
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using U.S. and global components.

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