PXL-250: Network Wiring

Application Note

PXL-250

This document provides the network wiring requirements for a PXL-250 access control network.

Network Requirements

The PXL-250 uses a half-duplex, RS-485 communication bus. Per the RS-485 specification, the access network communication bus is guaranteed to communicate with a total network cable length of up to 4,000 feet and with the controllers connected in a single, continuous daisy chain.

However, Keri Systems has identified specific extended network configurations that could be used to wire a controller network communication bus (subject to certain limitations defined on page 2). These configurations include a "star" pattern network communication bus, a spur cable length of up to 5,000 feet, and a total network cable length of up to 16,000 feet. Lab tested extended network configurations are presented beginning on page 2.

Cable Requirements

The RS-485 network should be wired using a cable with the following characteristics: twisted, shielded pair of stranded AWG 24 conductors (such as Belden 9501 or a larger gauge).

Earth Ground Requirements

A quality earth ground connection to the master controller is required to ensure the best possible operating conditions. Without a quality earth ground connection, an access control network may appear to operate correctly, but will be extremely susceptible to transients and electromagnetic interference. An earth ground brings all electrically neutral lines to the earth's surface potential (essentially a zero potential) providing three benefits.

1. An earth ground protects the network from electrical transients such as power surges and lightning strikes (also providing a degree of safety for an operator).
2. An earth ground provides a path to ground for electrical interference, minimizing data and communication problems for the reader data and network communication lines.
3. Through a feature on the PXL-250 controller, the shield for the entire RS-485 network is automatically grounded at the master controller minimizing communication problems.

Possible earth ground sources:

1. copper shrouded ground rod
2. cold water pipe (must be a metal pipe – not PVC)
3. steel building frame member (if the building's frame is embedded in the earth)
4. electrical system ground (at the breaker/fuse box)
5. telephone system ground

NOTE: Communication buses such as RS-485 often appear to work when installed incorrectly, but can have intermittent communication problems. This intermittence can make diagnosing a problem difficult. Failure to properly install an RS-485 network can result in network communication errors and can cause the access control system to lock up.

PXL-250: Network Wiring

Lab Tested Extended Network Configurations

Specific extended network wiring configurations have been lab tested to be compatible with the PXL-250 controller. The extended network configurations described in this section have been verified in the lab to provide proper, reliable communication between all controllers in an access control network.

Extended Network Guidelines
There are several guidelines for installing an extended network.

1. The network uses a "star" pattern communication bus. Keri Systems defines a star pattern as a communication network with sets of daisy chained controllers all connected to the master controller at the center of the star.
2. Any daisy chain off the star can have a maximum cable length of 5,000 feet.
3. The total cable length of all daisy chains can be no more than 16,000 feet.
4. Any number of daisy chains can be installed as long as the cabling for these daisy chains meets the above guidelines.
5. Any number of controllers can be installed in any daisy chain (up to the 128-controller limit for the entire network).

The Master Controller
For the best operating conditions the master controller for the access control network should be at center of the star.

If an existing network is being upgraded to an extended network or when installing a new extended network, the master controller printed circuit board must be at level –002 Rev. A or greater to ensure proper network termination. The printed circuit board level information is at the lower right corner of the board (see Figure 1).

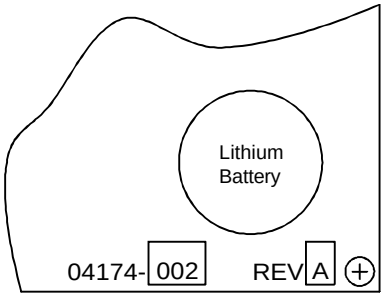

Figure 1 – Location of Printed Circuit Board Level

NOTE: Keri Systems has tested the functionality and data integrity of the extended network configurations presented in this document under lab conditions. Because of the nature of extended networks, the operation of extended networks in the field is strongly dependent upon the quality of the installation.

Generic Extended Network Wiring Diagram

Figure 2 is a generic drawing for an extended network, meeting the guidelines listed above.

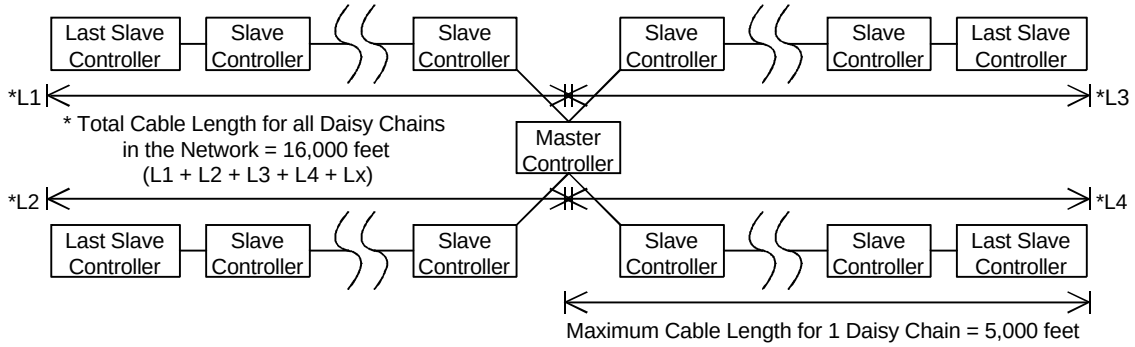

Figure 2 – Generic Extended Network Diagram

Using Jumper Blocks to Attach Multiple Spurs to a Master Controller

The individual wiring locations on the terminal blocks on the PXL-250 controller can reliably hold a small number of wires. Certain star networks may have more spurs to be wired than can be held by the wiring locations. External jumper blocks can be used to make these connections. Perform the following steps to make an external jumper block.

1. Count how many spurs have been run to the master controller.
2. Provide jumper blocks with enough connector points to support three times the number of spurs (each spur has three wires: Tx-, Tx+, and Shield). This can be individual jumper blocks with three connectors for each spur or one large jumper block with enough connectors to handle all 3 sets of wires from all spurs (see Figure 3).

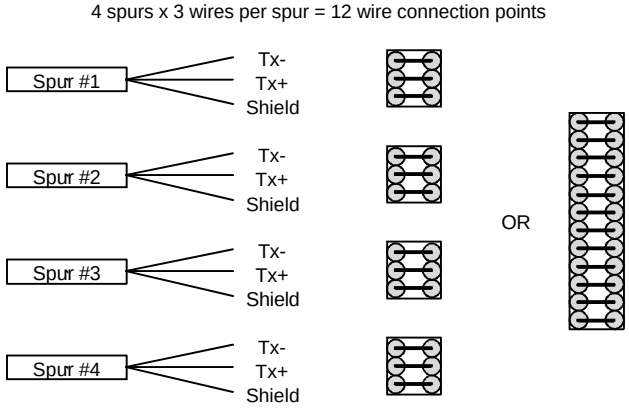

Figure 3 – Determining the Number of Jumper Block Connector Points

NOTE: The remaining figures assume one large jumper block with enough connectors to handle all 3 sets of wires from all spurs has been provided for connecting wires.

3. On one side of the jumper block connect all three wires from each spur (see Figure 4).

PXL-250: Network Wiring

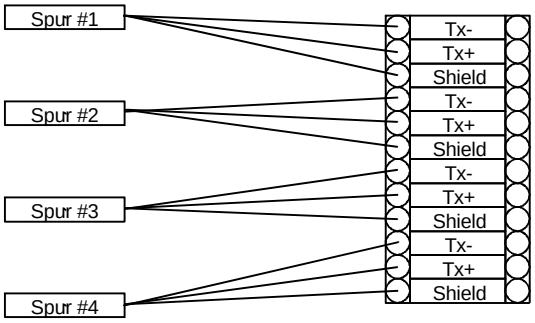

Figure 4 – Connecting the Spur Wires to One Side of the Jumper Block

4. On the other side of the jumper block connect jumper wires between each of the Tx- connectors (see Figure 5).
5. Connect jumper wires between each of the Tx+ connectors.
6. Connect jumper wires between each of the Shield connectors.

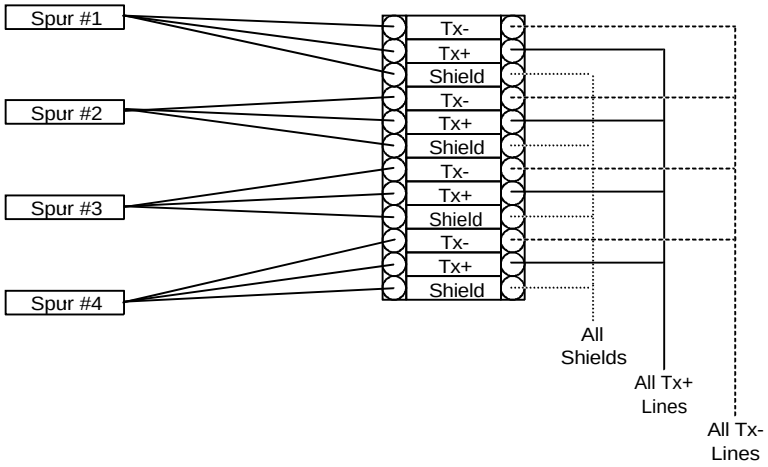

Figure 5 –Jumpering Like Wires Together

7. Connect a single line from one of the Tx- connectors to TB-1/Pin-1 on the master controller (see Figure 6).
8. Connect a single line from one of the Tx+ connectors to TB-1/Pin-2 on the master controller.
9. Connect a single line from one of the Shield connectors to TB-1/Pin-3 on the master controller.

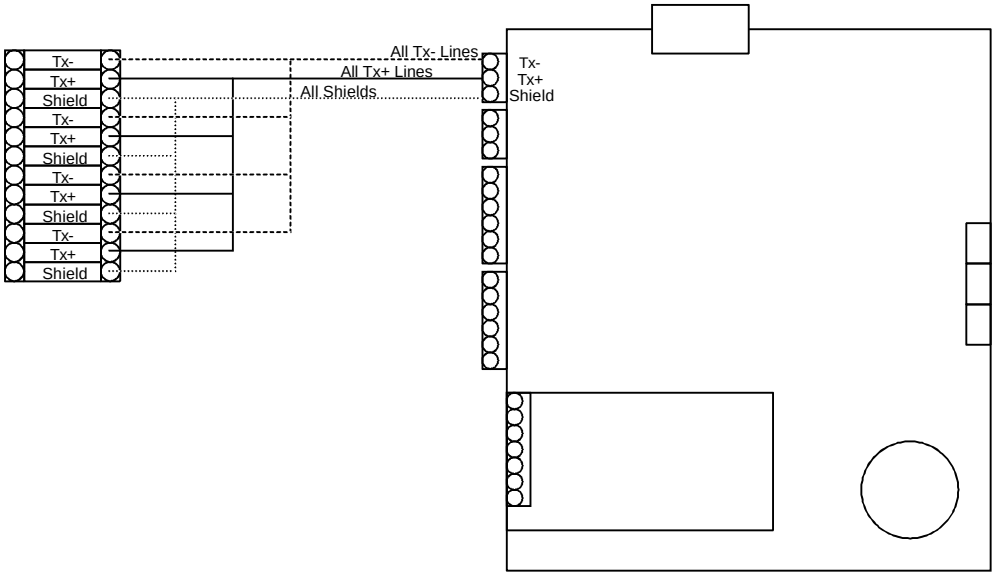

Figure 6 – Connecting Jumpered Wires to the Controller

The completed star network wiring should look similar to Figure 7.

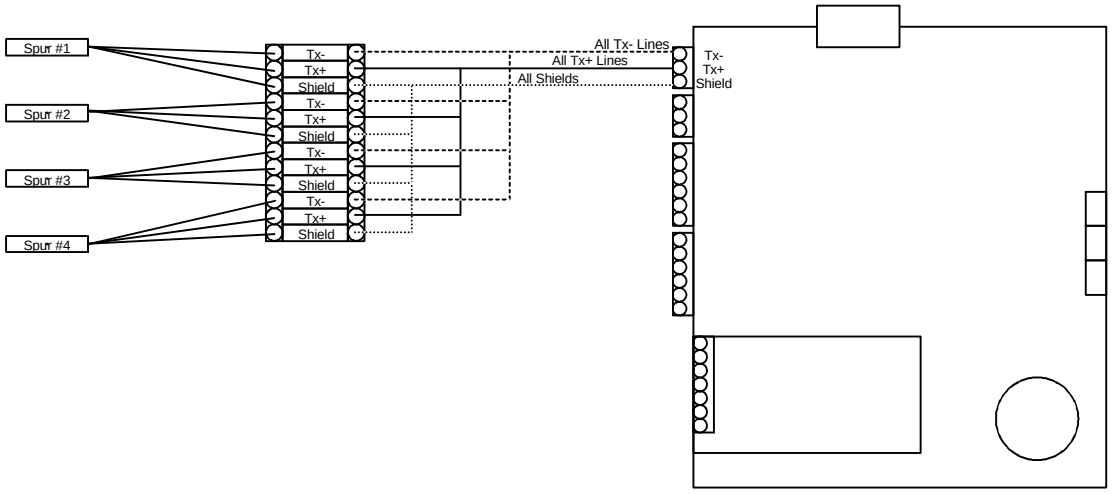

Figure 7 – Multiple Star Spurs Attached to a Master Controller

Once the network has been wired, all controllers have been addressed, and the network has been auto-configured by the *Doors32* software, the network communication error rate can be viewed from the diagnostics routine in the master controller. Instructions are provided in the Troubleshooting and Diagnostics reference document (p/n 01841-001, Rev. E or greater).

This page is intentionally left blank.