



Wiring and Power Guidelines

Revision I

Overview

The wiring of a *HomeWorks* QS system has been made simpler through a reduction in the number of link types and a higher capacity of device addresses on each link compared to previous *HomeWorks* systems. The purpose of this document is to provide guidelines for how to wire and power *HomeWorks* QS devices.

Processor / Network Link:

Each *HomeWorks* QS processor has two RJ-45 Ethernet ports connected by an internal network switch. The Ethernet ports are used to connect processors together in a multi-Processor project, to connect Processors to the home network or other systems for integration, and to connect Processors to the *HomeWorks* QS software utility for activation, transfer and diagnostics. In a multi-Processor project, each Processor must be connected to the same local area network (LAN) for proper system operation. To provide for the most flexibility in network architecture, Ethernet cable should be run:

1. Between each processor and the home LAN or router.
2. Between each processor location in the home.

Having this Ethernet wiring in place will allow the Processor / Network Link to be connected in a variety of possible configurations, as described in the *Residential Systems Networking Guide*. Each network configuration has different benefits, but wiring in this method provides the most flexibility, especially since the home's networking hardware and software configurations may change over time. Please refer to the [*Residential Systems Networking Guide*](#) for more information.

Configurable Links:

Each *HomeWorks* QS Processor has two RS-485 configurable links that can be individually defined to be one of five types:

- *HomeWorks* Power Panel Link (16 MI addresses / 256 zones)
 - Module Interfaces (MI) and Remote Power Modules (RPM)
- *HomeWorks* QS RF Link (100 devices / 100 zones)
 - Dynamic Keypad, Maestro® style Dimmers/Switches, Lamp Dimmers and Plug-in Devices, RF seeTouch® Keypads, RF Sensors – Occupancy / Vacancy and Temperature, Sivoia® QS Wireless Shades, seeTouch Tabletop Keypads, GRAFIK Eye® QS Main Units, Wallbox Power Modules, GRAFIK T dimmers, switches and Hybrid keypads
- *HomeWorks* QS Wired Device Link (100 devices / 500 zones)
 - Control Interfaces, Dynamic Keypad, wired seeTouch Keypads, GRAFIK Eye QS Main Units, Sivoia QS shades, Wallbox Power Modules, Palladiom keypads
- *HomeWorks* Wired Maestro/QED Shade (H48/Q96) Link (4 H48/Q96 Interfaces / 192 Wired Maestro devices/256 Wired QED Shades)
 - HWI-H48 Wired Maestro Interfaces and Wired Maestro Dimmers, Switches, and Fan Controls
 - Legacy QED shades
- *HomeWorks* Legacy Keypad Link (32 devices)
 - Keypads, HWI CCO Interfaces, HWI CCI Interfaces

The link capacities shown above are the number of logical link addresses or devices that can be controlled on the link. In addition, you must be sure that the power requirements of the devices on each link are planned.

HomeWorks Power Panel Link:

HomeWorks / *HomeWorks* QS Power Panels, Module Interfaces and Remote Power Modules are powered by line-voltage feeds, and therefore do not get powered from the link. Module Interfaces are connected to the Processor on either link when configured as a Power Panel Link. The same standard Lutron 4-conductor cable (GRX-CBL-346S) that has been used in previous versions of *HomeWorks* can be used. This cable has one pair of 18-gauge and one pair of 22-gauge twisted/shielded conductors. Pin 2 should not be connected to the processor or Module Interfaces, as the power is supplied to the MI from a separate 24V~ transformer included with the MI. The Power Panel Link wiring can be daisy-chained from one MI to the next and has a limit of 1000 feet of total wire length. For links configured as “HWQS Power Panel”, LT-1a link terminators must be installed across terminals 3 and 4 at both ends of the daisy chain link when the total wiring exceeds 50 feet. Refer to the HomeWorks Power Panel Link example on page 13.

HomeWorks QS RF Link:

HomeWorks QS RF Link devices are often powered by line-voltage, as is the case with dimmers; by a local power supply, as is the case with *Sivoia* QS Wireless Shades or RF Dynamic Keypads; by batteries, as is the case with Radio Powr Savr sensors and Pico Wireless Controls. These devices do not get wired to the RF link.

Hybrid Repeaters are required to enable RF communication in *HomeWorks* QS, and at least one Hybrid Repeater must be wired to each RF Link configured on the processor. Each additional Hybrid Repeater (up to 4 total Hybrid Repeaters per link) can be wired to the Processor RF Link, placed within 60 feet of another Hybrid Repeater (wireless), or wired to the RF Link on another Hybrid Repeater. Each Hybrid Repeater can be powered by the RF link on the processor (24VDC) or by a 9VDC plug-in transformer. The three main power and wiring options are:

1. Wired to RF Link for power and communication
2. Wired to RF Link for communication, locally powered
3. RF communication, locally powered

Refer to the HomeWorks QS RF Link example on page 14.

Lutron standard 4-conductor cable (GRX-CBL-346S) can be used with a maximum length of 1000 ft per wire run.

Sivoia QS Wireless shades are most often powered locally by individual plug-in (QSPS-P1-1-35V) or junction-box (QSPS-J-1-50) power supplies. *Sivoia* QS Wireless shades can also be powered by the ten-output smart power panel (QSPSY-10PNL), if the wiring is practical. Each *Sivoia* QS Wireless shade requires its own RF Receiver, regardless of how the shade is powered.

Radio Powr Savr Sensors and Pico Wireless Controls are battery powered and do not require any wiring. Tabletop Keypads can also run on battery power or be powered locally with a 9VDC plug-in transformer.

HomeWorks QS Wired QS Device Link:

HomeWorks QS Wired QS Device Links consist mainly of devices that are powered by the QS Wired Link or dedicated power supplies and therefore the wiring and power requirements must be planned carefully. The power draw of each device is represented in Power Draw Units, or “PDUs.” The table at the end of this document defines the PDU count for the various wired devices. Refer to page 15 for the *HomeWorks* QS Wired QS Device Link example.

Wired *seeTouch* Keypads, wired Dynamic Keypads, and interface devices all draw power from the QS Wired Link.

Lutron standard 4-conductor cable (GRX-CBL-346S) can be used to wire these devices. The QS Wired Link can be wired in daisy-chain, T-Tap, or star configurations, with a maximum wire length of 2000 feet per link. For ease of wiring, Wire Landing Boards (QS-WLB) can be used to land wire in the processor enclosure or a separate enclosure. Additionally, QS Smart Panels (QSPS-10PNL) can be used to distribute power and provide multiple wire connections.

Pin 2 should not be connected to GRAFIK Eye QS main units and Wallbox Power Modules, as these devices source their own power and do not require power from the QS Link.

Sivoia QS Wired shades can be powered locally by individual plug-in (QSPS-P1-1-35V) or junction-box (QSPS-J-1-50) power supplies, or from the ten-output smart power panel (QSPS-10PNL). Powering one shade per output of the chosen power supply is a fail-safe wiring method. Each of these power supplies provides one or more 4-conductor terminals to be connected to the devices requiring power and communication, and an additional 3-conductor terminal block for landing the communication wiring (Common, MUX, MUX) from the processor.

Shades may require larger gauge power conductors to achieve the necessary wire run length. See the tables at <http://www.lutron.com/TechnicalDocumentLibrary/369405%20pdu%20spec%20submittal.pdf> for details. For example, one QS shade, powered by a QSPS-10PNL, with 16AWG power conductors (QSH-CBL-M-500) can have a maximum wire run of 200 ft.

In some cases, depending on the size of the shade, the QSPS-10PNL power panel outputs can power two or three shades per output. This can save wire and labor and is useful on dual shade applications in cases where the shades are not large. Consult the Lutron Sivoia Shade PDU Guidelines (<http://www.lutron.com/TechnicalDocumentLibrary/3684280.pdf>) for details and shade sizes where this is practical.

H48/Q96 Wired Maestro/QED Shade Link:

The H48 Dimmer Interface (HWI-H48) acts as the point of communication between a processor and local controls which utilize the H48 link. The Q96 Shade Interface (HWI-Q96) acts as an interface between a processor and wired QED shades. Each link supports any combination of up to four H48 or Q96 interfaces.

Each H48 Interface is powered by a separate 12 VAC power supply mounted in the low voltage enclosure and the Q96 interfaces are powered from QED shade power supplies.

Additional H48 Dimmer Interfaces or Q96 Shade Interfaces must be daisy-chained with a maximum of 1000 feet of wire. If any of the HWI-H48s or HWI-Q96s are located more than 50 feet from the processor, the last interface on the chain and the processor must utilize a link terminator across terminals 3 and 4. It is also required to utilize a Link Translator (HQ-HWI-LX) between the Processors and interfaces on any wire runs longer than 50 feet between the Processor and interfaces.

Each H48 Dimmer Interface allows the *HomeWorks* QS processor to provide control of up to 48 local Maestro-style controls across the six communication buses (max of 8 local controls per bus). Each bus utilizes non-polarized two wire communication over a maximum of 1000 feet of wire per bus, 500 feet per control, and connects to the grey and violet leads of each local control. The recommended wiring between the bus and controls is 18 to 22 AWG, twisted and shielded, and may be in a daisy-chain, star, or t-tap configuration.

The Q96 Shade Interface has two terminal block connections: one for communication to the *HomeWorks* QS processor (H48/Q96 link) and another for communication to the QED shades (*Sivoia* QED communication link). Each Q96 Shade Interface allows the HomeWorks processor to provide control of up to 96 QED shades on the *Sivoia* QED communication link. Use of the Q96 and QED shades in HWQS requires the purchase of a license per link. Refer to [*Application Note 586 – Design and Programming for HWI to HWQS Upgrades*](#) for more information.

HomeWorks Illumination Legacy Keypad Link:

HomeWorks Illumination (HWI) Legacy Keypad Link allows for connectivity between a *HomeWorks QS* processor and existing HomeWorks Illumination keypads/wired contact closure interfaces. It is required to utilize a Link Translator (HQ-HWI-LX) between the Processors and HWI keypads/contact closure interfaces on this link. Use of the HWI legacy keypads in HWQS requires the purchase of a license per link. Refer to [Application Note 586 – Design and Programming for HWI to HWQS Upgrades](#) for more information.

From the Link Translator, the existing keypad wiring architecture can remain (daisy-chain, star, T-tap). Total wire length cannot exceed 4000 feet. A single wire run cannot exceed a length of 1000 feet nor contain more than 10 keypads/interfaces.

HOMEWORKS ILLUMINATION KEYPADS AND CONTACT CLOSURE INTERFACES MUST BE RUN AT THE SPECIFIED 15 VDC INPUT VOLTAGE. ATTEMPTING TO RUN THESE DEVICES USING THE 24 VDC HWQS POWER SUPPLIES WILL RESULT IN DAMAGE TO THE DEVICE.

Lutron has the following 15 VDC power supplies available that can be used to replace the on-board power supply used with a previously installed HWI processor. Any additional 15 VDC power supplies already installed to power the HWI keypads should continue to be used to power those keypads in the upgraded system.

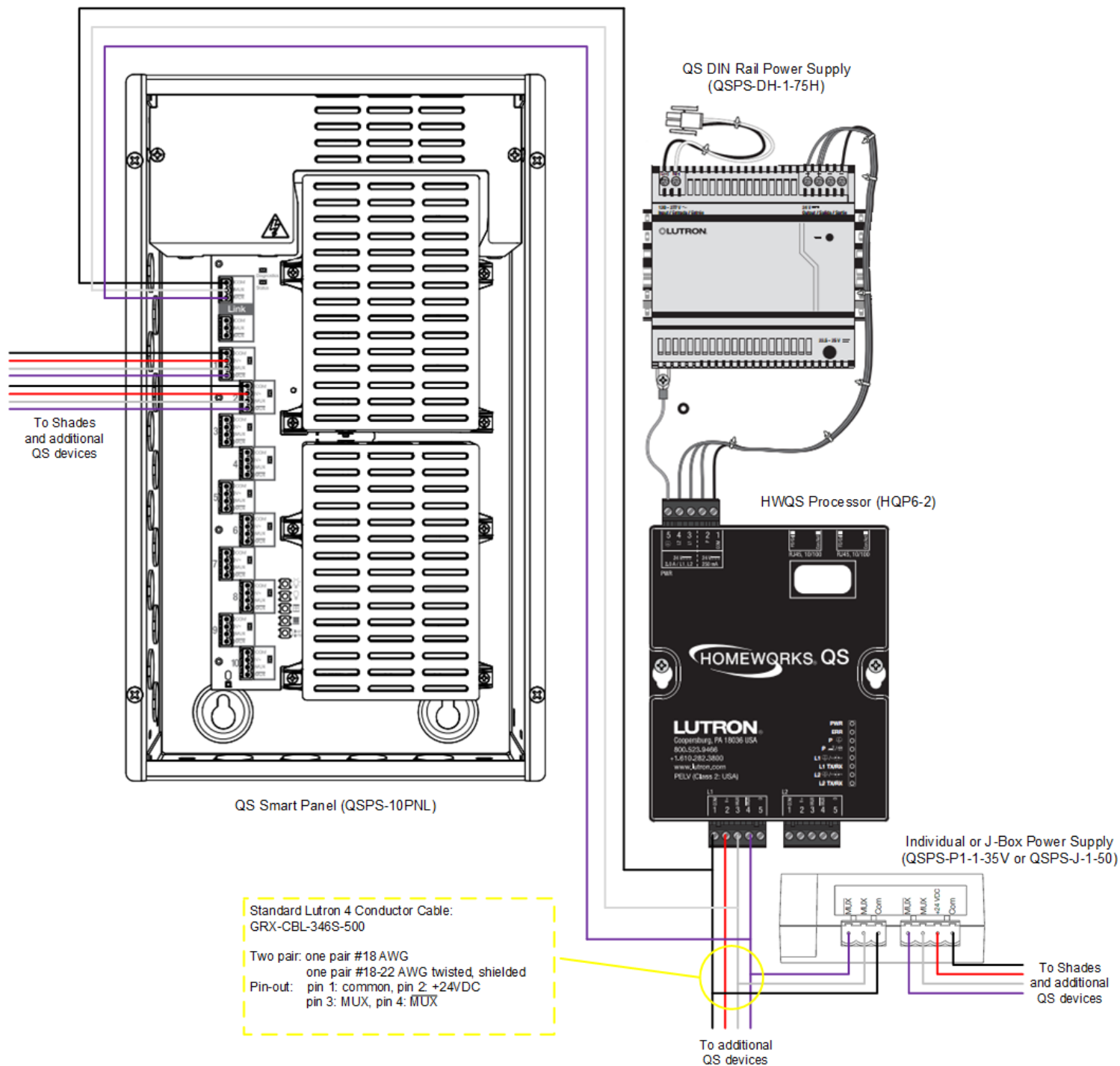
Power Supply Model Numbers	Wall-Mount or Plug-In?	Input Voltage (V) ~	MAX# LEDs Powered
PPS1-120-15DC-3A	Wall-mount	120	500
T120-15DC-9-BL	Plug-in	120	150
PPS1-230-15DC-3A	Wall-mount	230	500
TE240-15DC-9-BL	Plug-in	230	150
TU240-15DC-9-BL	Plug-in	230	150

Additional 15 VDC power supplies are also available through other manufacturers. If a non-Lutron manufactured power supply is used, it should be rated for 15 V- (+/- .5 V), 2.5 A or greater, and mounted externally from the panel. Lutron does not guarantee the performance or compatibility of any non-Lutron manufactured product and assumes no responsibility or liability with respect to such products. Lutron does not endorse or recommend the use of any non-Lutron manufactured power supply.

Powering the QS Link:

In planning how to assign devices to your QS Wired Link(s), it is helpful to consider the power requirements of the devices and power supplies you will use to power your devices. A table of Power Supply PDU outputs and device PDU requirements is shown below. All QS Wired Link devices are powered from 24VDC. Because the QS Wired Link can support as many as 100 devices, multiple power supplies will sometimes be necessary. It is common to power shades with dedicated power supplies, rather than from the QS Wired Link. Refer to page 9 for the HomeWorks QS Power Supply example. The chart on page 11 shows the Power Draw Units (PDUs) supplied by each power supply and consumed by each device.

HomeWorks QS Power Supply Example:



HomeWorks QS Power Supply Breaker Feed:

HomeWorks QS Din Rail Power Supplies (QSPS-DH-1-60 and QSPS-DH-1-75-H) have a large capacitive inrush when first powered. A dedicated breaker feed with no more than the indicated number of power supplies (listed below) is required to avoid nuisance tripping.

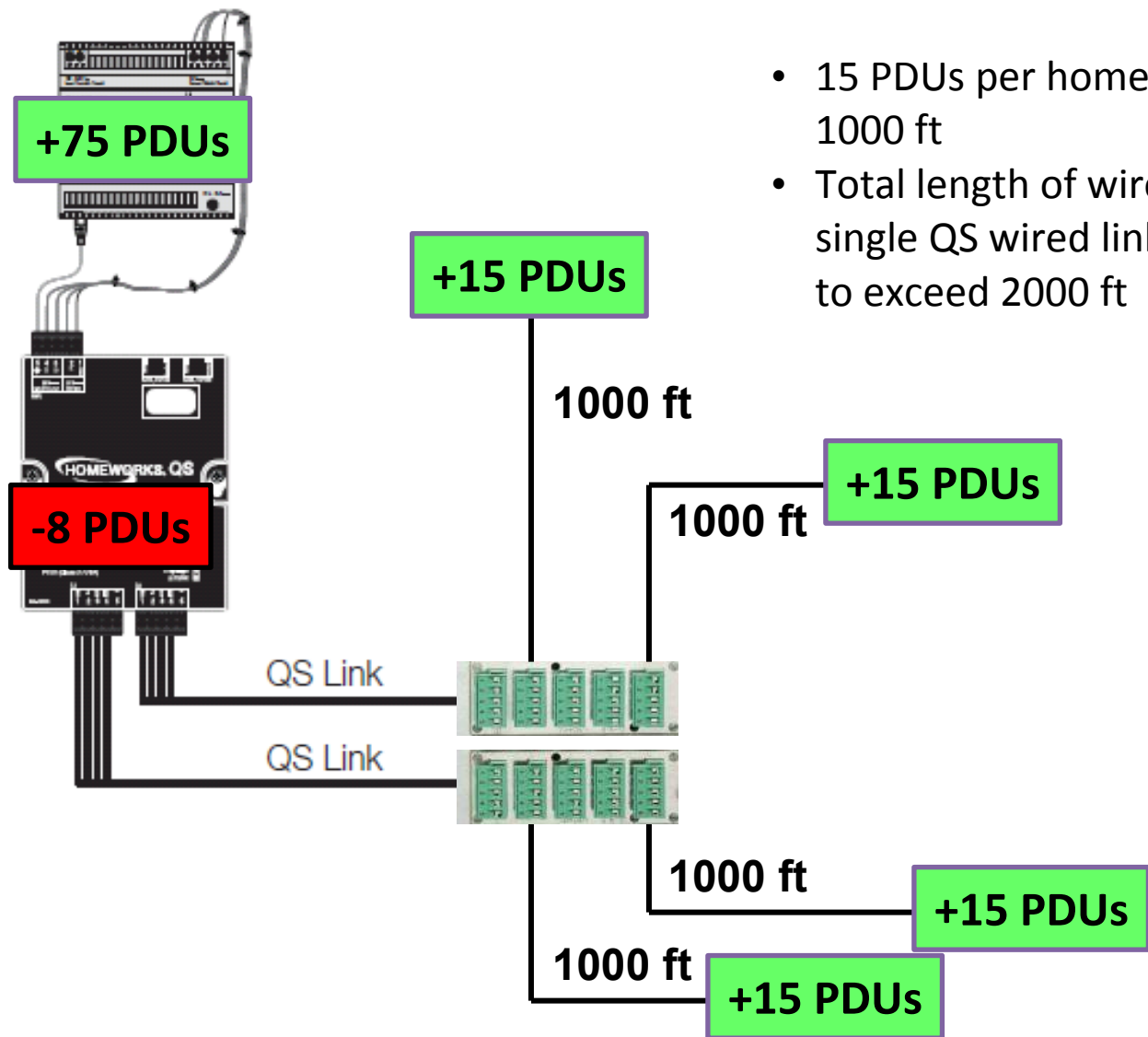
Voltage (VAC)	Breaker Size/Type	Max. # of QSPS-DH-1-60 or QSPS-DH-1-75-H power supplies
100 ~ 127	15 A standard trip curve	13
	20 A standard trip curve	15

Table of Power Draw Units – PDUs

Power Supplies	Model Number	PDU Output
QS din-rail power supply (1 output)	QSPS-DH-1-60 QSPS-DH-1-75-H	75
QS smart panel power supply (10 output)	QSPS-10PNL QSPSY-10PNL	8 per output
QS plug-in power supply (1 output)	QSPS-P1-1-35V	8
QS J-box power supply (1 output)	QSPS-J-1-50	8

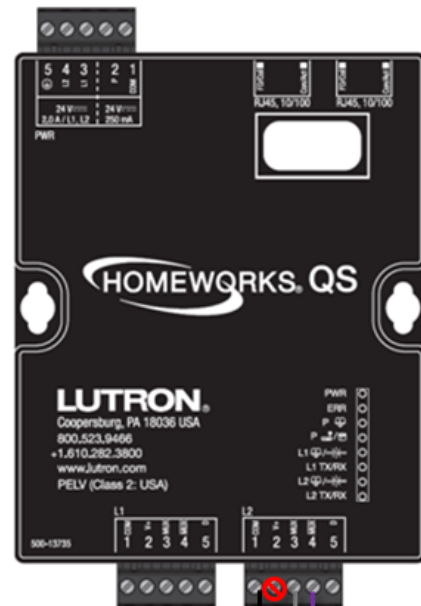
QS Devices	Model Number	PDUs Required
HomeWorks QS Processor	HQP6-2-120	8
HWQS Hybrid Repeater (w/o plug-in)	HQR-REP-120	3
HWQS Hybrid Repeater (using plug-in)	HQR-REP-120	0
HWQS seeTouch, Architrave, Sig Series Keypad, Palladiom (one column of buttons)	Various	1
HWQS Dynamic Keypad	HQ-J-DK420-	6
HWQS CCI/CCO Interface and Wallbox Closure Interface	QSE-IO QSE-CI-WCI	3
HWQS Sensor Module (QSM)	QSM2-xW-C	2*
HWQS DMX Interface	QSE-CI-DMX	2
GRAFIK Eye QS Main Unit	Various	0
HWQS Wallbox Power Module	HQRJ-WPM-6D-120 LQRJ-WPM-6P	0
Sivoia QS Wired Shade	See Sivoia QS Power Supply Guidelines	
Sivoia QS Wireless Shade		

* Each wired LOS-series occupancy/vacancy sensor connected to QSM requires 2 PDU's

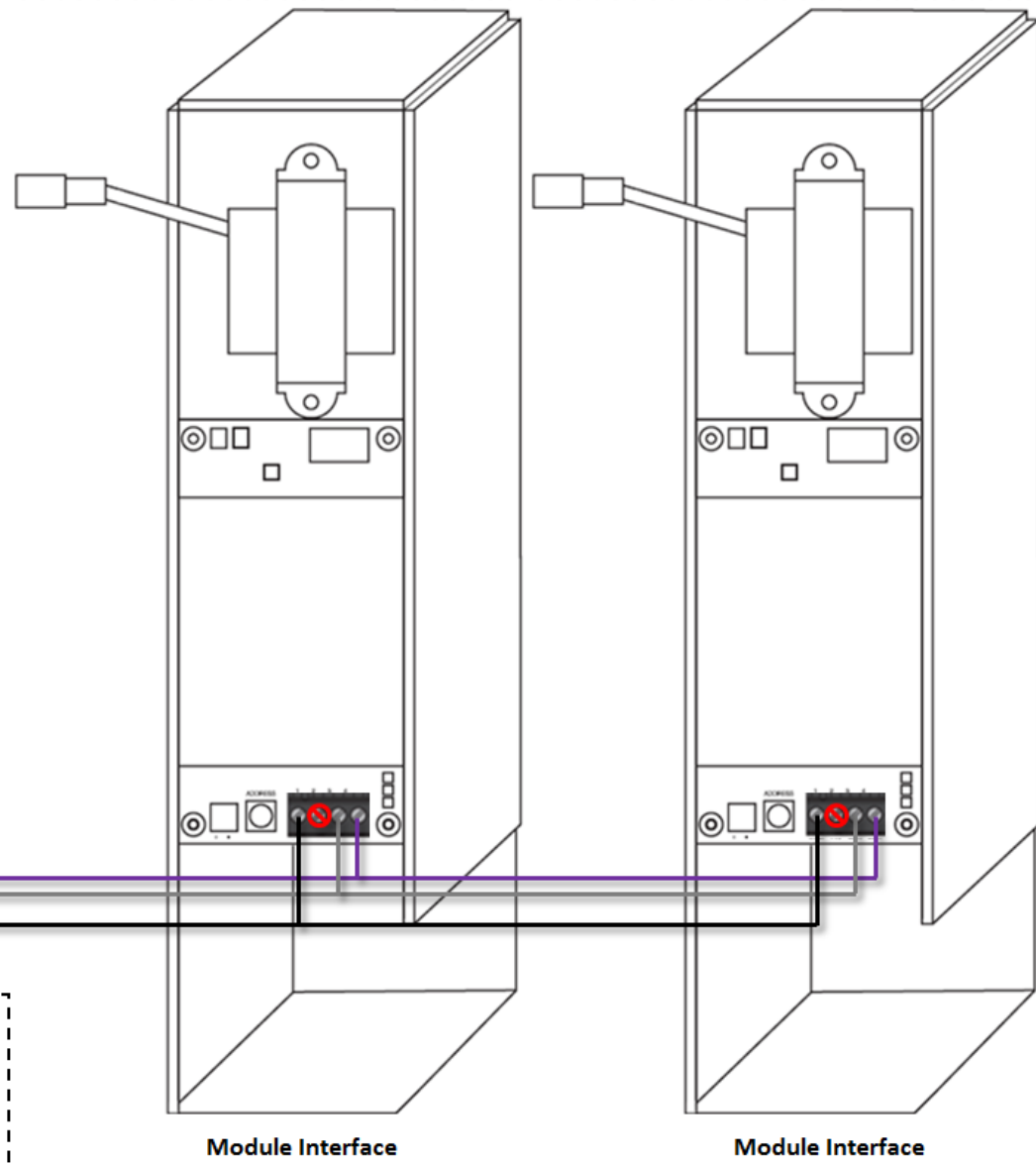


- 15 PDUs per home run of 1000 ft
- Total length of wire on a single QS wired link is not to exceed 2000 ft

HomeWorks Power Panel Link Example:



**HWQS Processor w/
Link 2 Configured for
Power Panels**



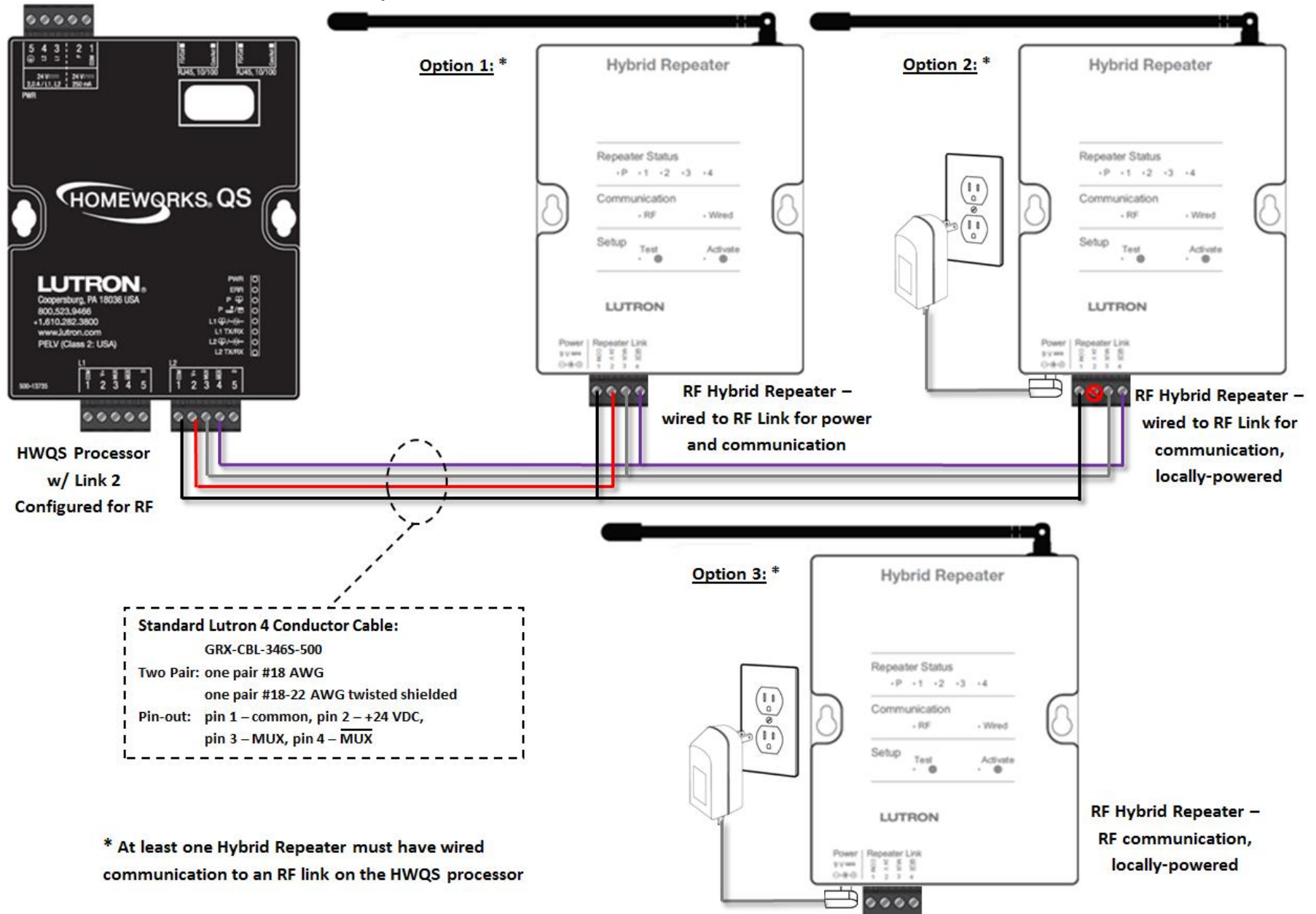
Standard Lutron 4 Conductor Cable:

GRX-CBL-3465-500

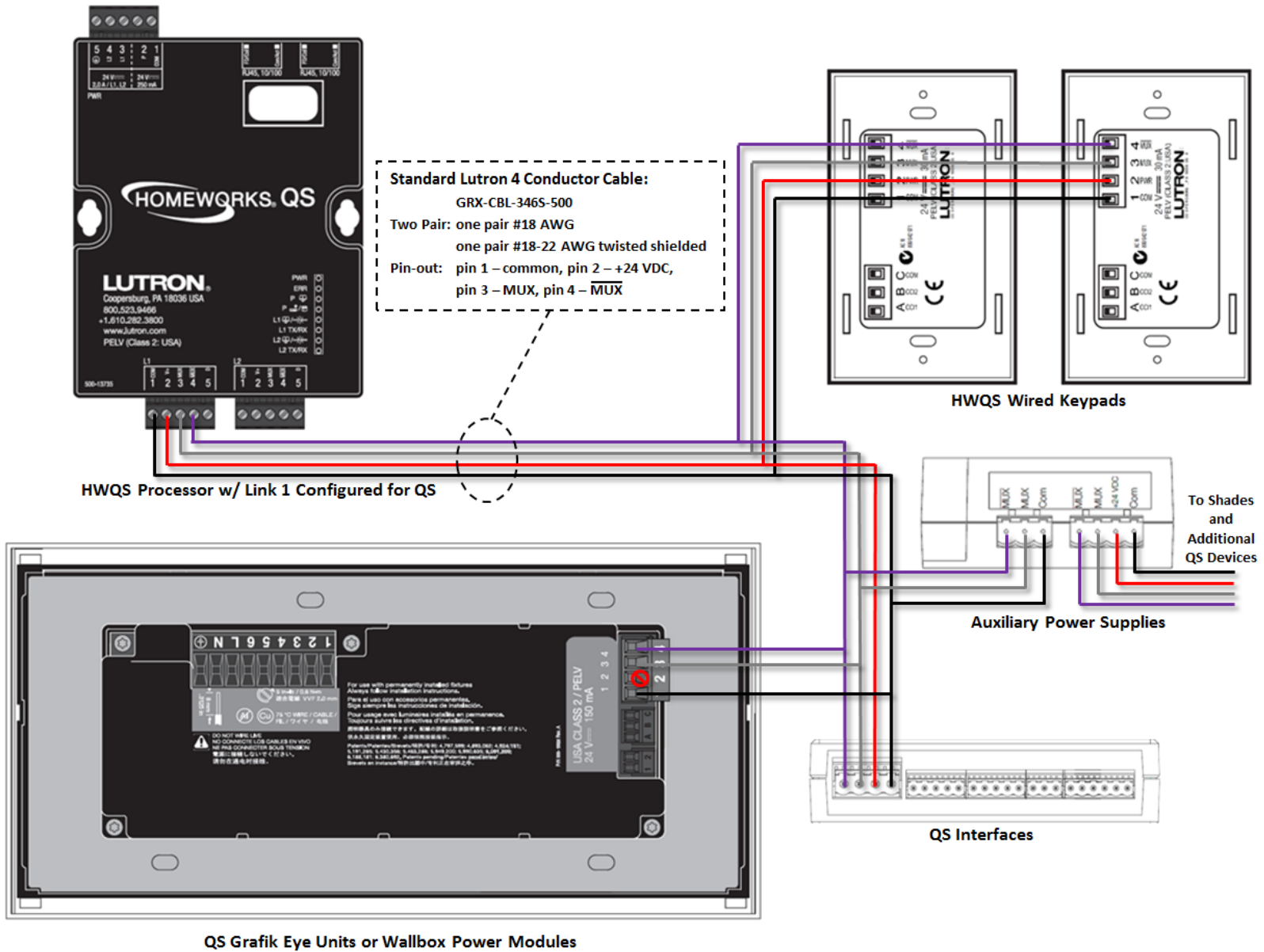
Two Pair: one pair #18 AWG
one pair #18-22 AWG twisted shielded

Pin-out: pin 1 – common, pin 2 – No Connect,
pin 3 – MUX, pin 4 – MUX

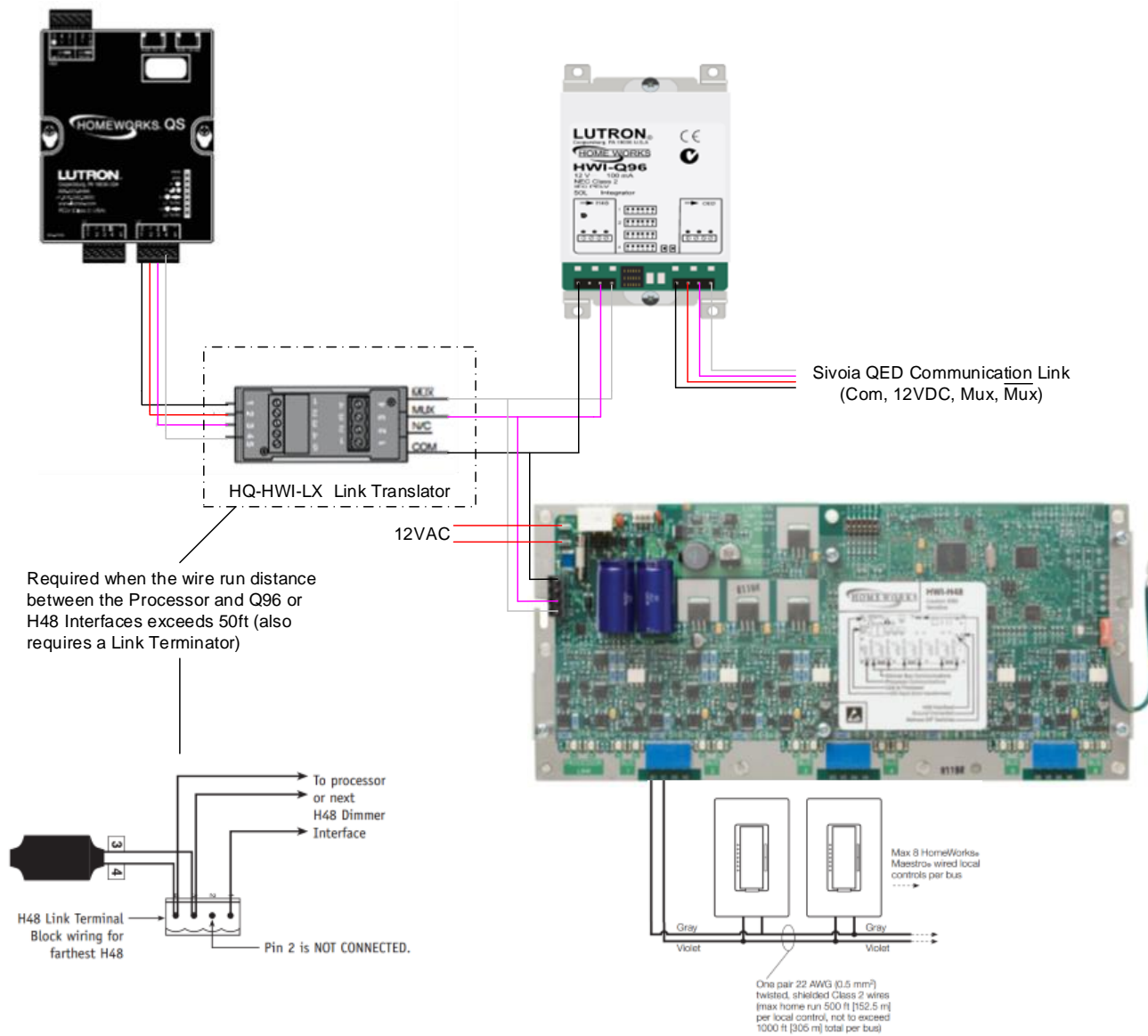
HomeWorks QS RF Link Example:



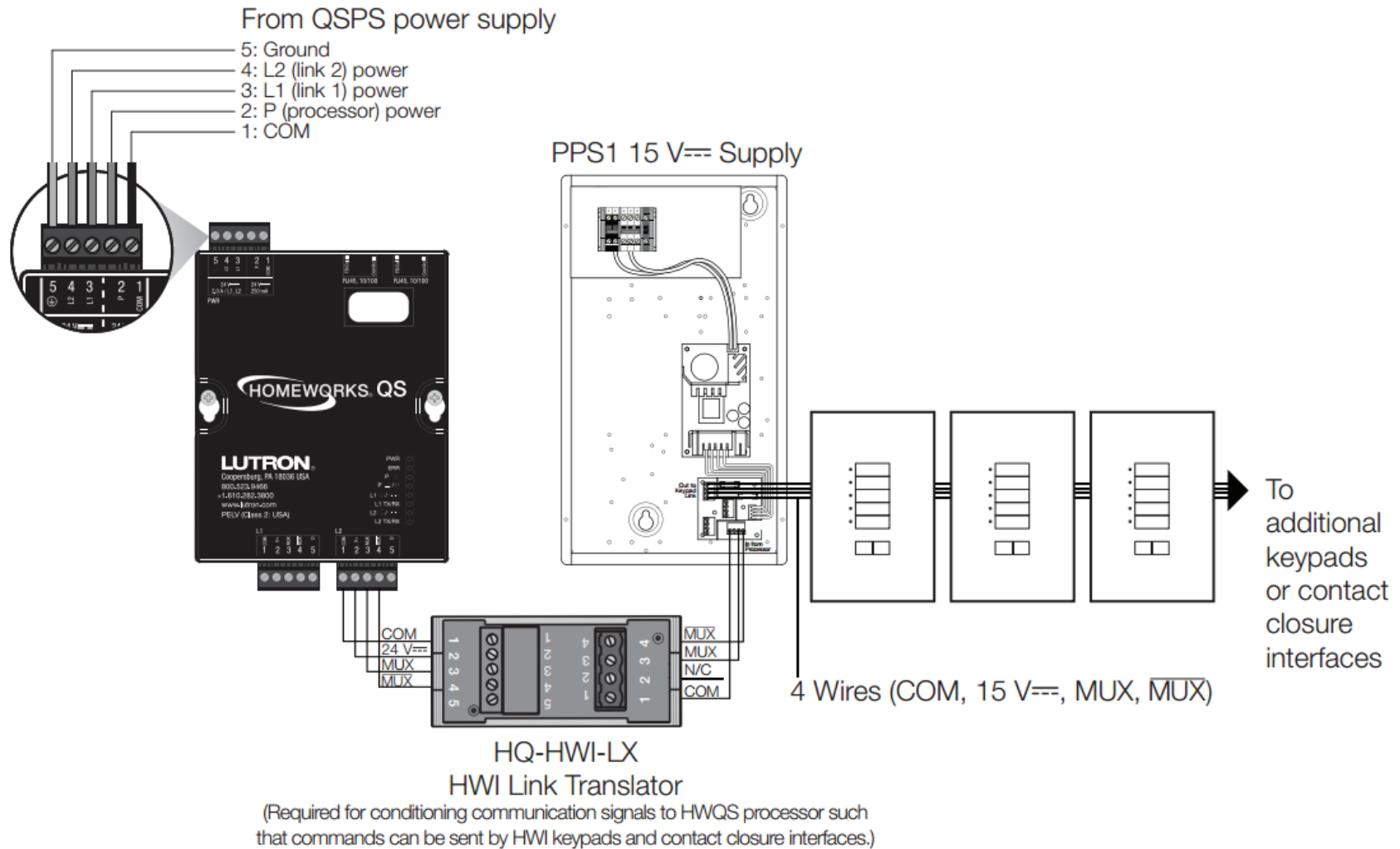
HomeWorks QS Wired QS Device Link Example



H48/Q96 Wired Maestro/QED Shades Link Example:



HomeWorks Legacy Keypad Link Example A:



HomeWorks Legacy Keypad Link Example B:

