



DaliPRO[®]
A Triad[®] Brand

DaliPRO[®] Digital Dimming
Technical Product Information

DaliPRO® System Features

DALI (**D**igital **A**dressable **L**ighting **I**nterface) is a non-proprietary interface standard used specifically for lighting control as defined in the technical standard IEC 62386. DALI simplifies control wiring and allows individual control and monitoring of lighting systems.

Features:

- **Powerful two-way communication:** DALI is a digital two-way communication protocol. A DALI system allows the user to talk to the ballast and the ballast to talk back via DALI controllers—computers equipped with appropriate software or building management systems (BMS).
- **Easy system set-up:** All components in a DALI system control loop are connected in parallel to two control wires. Even though all the ballasts share the same data bus, they can be addressed either individually or in groups.
- **Programmable groups:** DALI allows the user to subdivide the loop into 16 groups (light sources grouped together for simultaneous control) through programming after the system installation.
- **Programmable Scenes:** DALI allows the user to program up to 16 recallable pre-set lighting scenarios called scenes.
- **Easy system reconfiguration:** An existing DALI system with functioning groups and scenes can be reconfigured through programming without any hardware changes.
- **Non-polarized control wires:** The non-polarized control wires simplify initial installation.
- **Easier troubleshooting:** DALI's talkback feature simplifies system parameter monitoring and troubleshooting.
- **Programmable fade time:** Programmable time duration for transitioning to new lighting scenes.

DALI Parameters:

- Each DALI loop can control systems of up to 64 devices. If more devices are needed, additional DALI loops can be used.
- Maximum number of groups (components/ballasts/fixtures that are controlled together) is 16 in each DALI loop.
- Maximum number of scenes is 16.

DaliPRO® Ballasts:

- DaliPro digital dimmable ballasts are designed for use with DALI-compatible controls.
- Universal Lighting offers a wide variety of DaliPro ballasts for CFL, T5, T8, T5 & T5HO lamps.
- Universal input voltage (108–305 volts) for installation flexibility.
- Dimming range down to 1% for linear lamps and 3% for compact fluorescent lamps.
- Control input protected against inadvertent connection to line voltage.
- End-of-lamp-life protection.
- Programmed rapid start.

Installation Guidelines

Ballast control wiring consists of a two-wire, non-polarized circuit. Since programming assigns ballasts to specific groups, all ballasts can be connected to the same control wires and power circuit. DaliPro ballasts are listed for either Class 1 or Class 2 control circuit wiring, but the selected method must be compatible with the ratings of the selected control devices. Please refer to the specific installation instructions provided by the control device manufacturers for this information. Attention must also be paid to the proper class wiring between the power supply and DALI controller, as this may be different from the rest of the control loop for specific control manufacturers.

DaliPRO® System Wiring

Caution! Before installing or troubleshooting any DaliPro components, turn off AC power to prevent possible unit damage

Features:

- Both DaliPRO ballasts and light fixtures must be properly grounded.
- When grounding fixtures, remove the paint from the ground point if necessary to assure proper grounding.
- Make the required connections and cap off the unused wires (if any) with approved wire connectors.
- Make sure that no control devices, including the DALI power supply, are connected to the DALI loop.
- After applying power, carefully check that no high voltage line power is present on the DALI loop: Measure between the two DALI wires, from each DALI wire to Neutral and from each DALI wire to Line. It is normal to read a low, induced voltage on the DALI bus. If line voltage is found, do not go onto the next step until the source of the problem is found and eliminated.
- Remove power from all ballasts, controls and power supplies on the DALI system then measure the resistance between the two DALI control wires. You should read an open ($M\Omega$ or ∞) or a very high resistance.
- Remove power from all ballasts, controls and power supplies on the DALI system then measure the resistance from each DALI control wire to ground. You should read an open ($M\Omega$ or ∞).
- Connect the DALI control wires to the DALI power supply and control device(s).

Control Wiring

- Do not connect the control wires to power (See Figure 1).
- Never ground any of the control wires.
- Keep control leads and lamp leads separate (do not bundle).

Lamp Wiring

- Keep the lead length **AS SHORT AS POSSIBLE** and do not bundle.
- To avoid uneven light levels, wire all fixtures in a room with consistent lead lengths and use the same type of lamps throughout the room.
- Burn lamps at full bright for at least 12 hours before dimming the first time.
- Never use shunted or instant start lamp sockets with DaliPRO ballasts (See Figure 2).
- Always use correctly rated lamp sockets.

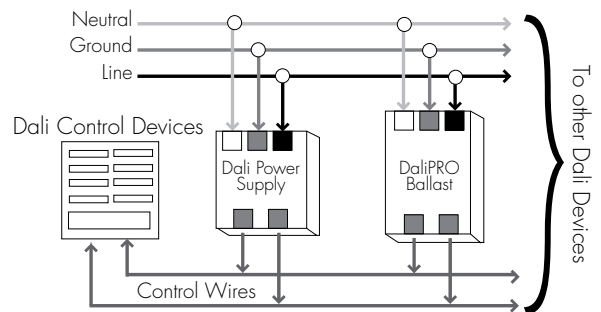


Fig. 1 DaliPRO Wiring Diagram

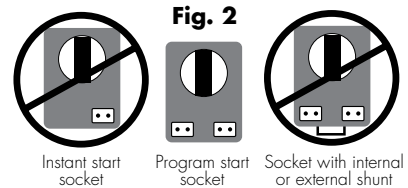


Fig. 2

Installations resulting in twisted, folded or bundled lamp wires, and applications routing lamp wires in very narrow channels, should be validated by test. This test should be conducted at the target input voltage, and at both the maximum and minimum intensity levels. Test criteria should include acceptable starting performance with cold lamps as well as steady and uniform illumination during and after stabilization of the lamp temperature.

DALI System Verification

DaliPro systems should be checked before completing the installation job and turning it over to programming. Three levels of verification are:

- Ballast validation, including power and lamp wiring
- DALI power supply validation
- System control wire validation

Use the following steps for system verification:

1) Ballast Validation

After connecting power wires to the luminaires, but before making any control circuit connections to the DALI power supply or DALI control device, apply power to the lighting circuit. All the lamps should ignite and provide full light output.

2) DALI Power Supply Validation

- With the DALI control leads still disconnected from the power supply, provide line voltage to the power supply.
- Measure the output control voltage from the power supply. It should be between 13 and 16 volts DC.

3) System Control Wire Validation

- Disconnect the line voltage.
- Connect the control wires to the DALI power supply and connect the DALI control devices to the power supply or DALI loop. (Follow control manufacturer's instructions.)
- Reapply line voltage to the ballasts and power supply, and verify that all ballasts ignite the lamps and provide full light output.
- Use a voltmeter to verify that there is no line voltage on the control wires (the DALI loop).
- Measure the voltage between the two control wires. It should be between 13 and 16 volts DC. If it is near zero, look for:
 - a. Inadvertent short circuits on the DALI loop
 - b. Failed components

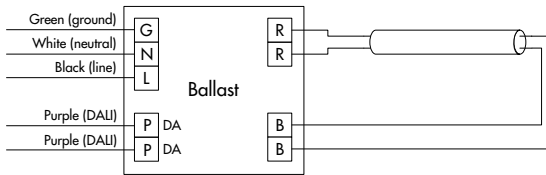
Mounting

- DaliPro ballasts and modules must be mounted properly against a flat metal piece, which acts as a heat sink for the unit.
- DaliPro ballasts are not intended for remote mounting. Maximum lead lengths must be limited according to the specification.
- The fixtures used to mount DaliPro ballasts must have an internal ambient temperature of less than 40°C.
- Fluorescent fixtures should not be mounted in drafty areas (causes dimming due to airflow).
- Fixtures must be grounded.
- Lamp to ground plane fixture spacing must conform to ANSI standards.
- Lamps must not touch any grounded metal.
- Lamp support brackets (if any) must not be metal.

DaliPRO® Digital Dimming Ballasts

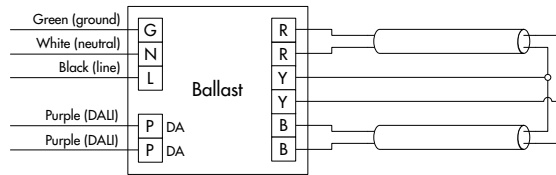
Lamp Application		DaliPRO Ballast Catalog Number	Line Current (Amps)		Input Current (Amps)		Ballast Factor (Max)	Case Style	Wiring Diagram
Lamp Type	Qty		120V	277V	120V	277V			
T8 (100% to 1%)									
F32T8	1	B132PUNVDV1	.31	.13	37	36	1.0/0.1	FIG 1	WD 1
	2	B232PUNVDV1	.61	.26	73	70	1.0/0.1	FIG 1	WD 2
T5 & T5HO Linear (100% to 1%)									
F14T5	1	B114PUNVDV1	.15	.07	18	18	1.0/0.1	FIG 1	WD 1
	2	B214PUNVDV1	.28	.13	35	35	1.0/0.1	FIG 1	WD 2
F28T5	1	B128PUNVDV1	.27	.11	32	31	1.0/0.1	FIG 1	WD 1
	2	B228PUNVDV1	.55	.23	66	63	1.0/0.1	FIG 1	WD 2
F54T5HO	1	B154PUNVDV1	.52	.22	62	60	1.0/0.1	FIG 1	WD 1
	2	B254PUNVDV1	1.05	.44	123	121	1.0/0.1	FIG 1	WD 2
Long Twin T5 (100% to 3%)									
FT40W/ 2G11	1	C140PUNVDV3	.31	.13	37	36	1.0/0.1	FIG 1	WD 3
	2	C240PUNVDV3	.61	.26	73	70	1.0/0.1	FIG 1	WD 4
T4 CFL (100% to 3%)									
CFQ/ TR18W	1	C118PUNVDV3	.19	.10	21	20	1.0/0.3	FIG 2	WD 5
	2	C218PUNVDV3	.34	.16	39	38	1.0/0.3	FIG 2	WD 6
CFQ/ TR18W	1	C126PUNVDV3	.28	.12	28	27	1.0/0.3	FIG 2	WD 5
	2	C226PUNVDV3	.50	.23	54	53	1.0/0.3	FIG 2	WD 6
CFQ/ TR18W	1	C132PUNVDV3	.34	.15	38	37	1.0/0.3	FIG 2	WD 5
	2	C232PUNVDV3	.58	.26	71	70	1.0/0.3	FIG 2	WD 6
CFQ/ TR18W	1	C142PUNVDV3	.43	.19	47	45	1.0/0.3	FIG 2	WD 5
	2	C242PUNVDV3	.82	.36	92	91	1.0/0.3	FIG 2	WD 6

Wiring Diagrams



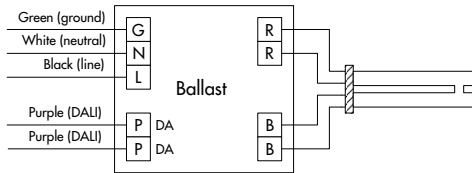
WD 1

If yellow terminals are present, do not connect wires to them

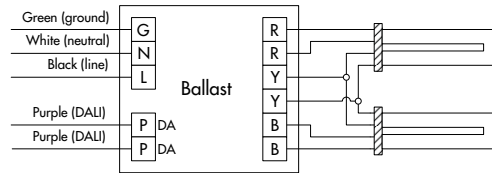


WD 2

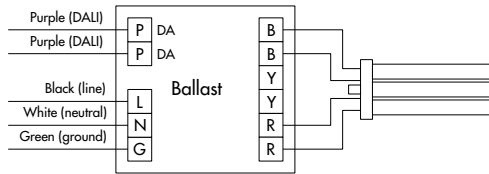
If yellow terminals are present, do not connect wires to them



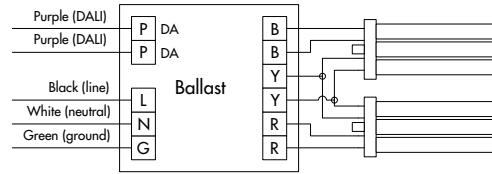
WD 3



WD 4

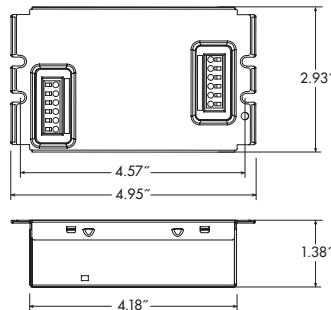
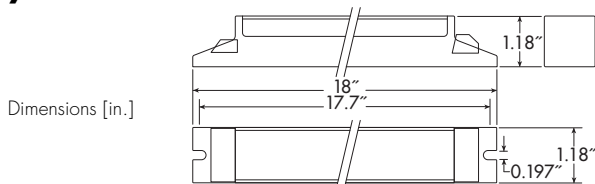


WD 5



WD 6

Case Styles



DaliPRO® System Programming Overview

Plan and plot the lighting layout before programming. Also record all programming information for future use.

Groups: A number of light sources grouped together for simultaneous control. Each DALI loop can be programmed with up to 16 groups.

Scenes: Scenes are recallable pre-set lighting levels. Each DALI loop can be programmed with up to 16 scenes.

Fade Time: This is the transition time to obtain the desired scene.

Note: Different controls may limit the number of groups and scenes possible for a system. Check control specifications for these details.

Programming requirements:

- DALI system with at least one DaliPro ballast.
- A DALI-compatible control device and the corresponding power supply unit.

Programming Plan:

- Assign short addresses for each ballast in the DALI loop.
- Define the desired groups (See Figure 1).
- Adjust the light levels of the groups.
- Store the scenes.
- Test the system

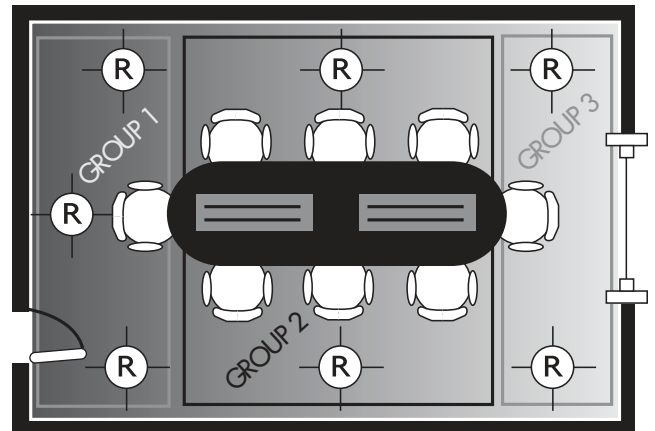


Fig. 1 DaliPro Conference Room

For more information, please check the following application notes at www.unvlt.com:

- DP06—DALI conference room example
- DP07—DALI example with the Watt Stopper control and DaliPro ballasts
- DP08—DALI example with Leviton control and DaliPro ballast

DaliPRO® Troubleshooting Guidelines

Note: All wiring must be completed in compliance with national and local electrical codes. **Caution!! Disconnect power before servicing ballasts, fixtures or other system components.**

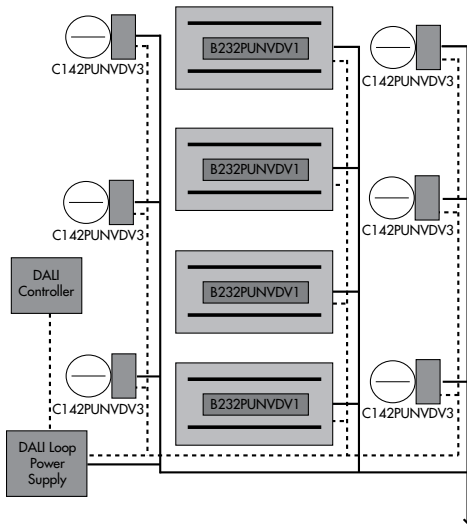
Symptom	Possible Reason	Action
Lamps never turn ON, or lamps flash and then turn OFF	Lamps never turn ON, or lamps	
	Ballast not properly grounded.	Fixture must be properly grounded, and ballast housing must have good electrical contact with metallic fixture chassis. Use of a star washer or other paint penetrating device is recommended for ballast mounting. Some ballasts provide a ground terminal as an alternative means to make this connection.
	Incorrect lamps.	Ensure lamp selection matches ballast capabilities.
	Lamp-ballast wiring error.	Ensure connections between ballast and lamps are exactly as shown on ballast label.
	Shunted sockets. DaliPro ballasts require non-shunted sockets, also known as rapid-start or program-start sockets.	Inspect or test lamp holders (sockets). With lamp removed and ballast disconnected, a shunted socket will always present a short circuit (zero ohms) between connections. Non-shunted sockets do not provide a connection (internal or external) between the blades.
	Poor starting aid. (not applicable to CFL models)	Ensure that a grounded metallic surface is within proper distance of the lamps. Spacing between the lamp wall and the grounded metallic surface should be between 0.125 and 0.500 in. for the entire length of the fluorescent tube. This requirement applies to linear fluorescents only.
	Defective lamps. Defective ballast.	Try lamp replacement. Try ballast replacement.
Some or all fixtures stuck at minimum or maximum intensity	Control wires at line potential.	Carefully inspect all connections. Control circuit must not be connected to power conductors.
	DALI Power Supply not powered.	Without a powered DALI Power Supply, DaliPro ballasts will operate at maximum intensity. Check line, neutral and ground connections to the DALI PS.
	Short circuit between control wires.	Inspect control wiring for improper connections or damage resulting in a short-circuit condition.
	Control wires disconnected.	Inspect control wiring for improper connections or damage resulting in an open-circuit condition.
Ballasts do not respond to controller	Wrong controller type.	Check control specification. Use only DALI compliant controls and power supplies.
	Controller not connected, or DALI power supply not powered.	Check line, neutral and ground connections to power supply. Ensure controlled is connected according to manufacturer requirements.
	Control wires disconnected.	Inspect control wiring for improper connections or damage resulting in an open-circuit condition.
	Short circuit between control wires.	Inspect control wiring for improper connections or damage resulting in a short-circuit condition.
Lamps flicker or strobe	Lamp-ballast wiring error.	Ensure connections between ballast and lamps are exactly as shown on ballast label.
	Shunted sockets. DaliPro ballasts require non-shunted sockets, also known as rapid-start or program-start sockets.	Inspect or test lamp holders (sockets). With lamp removed and ballast disconnected, a shunted socket will always present a short circuit (zero ohms) between connections. Non-shunted sockets do not provide a connection (internal or external) between the blades.
	Poor starting aid. (not applicable to CFL models)	Ensure that a grounded metallic surface is within proper distance of the lamps. Spacing between the lamp wall and the grounded metallic surface should be between 0.125 and 0.500 in. for the entire length of the fluorescent tube. This requirement applies to linear fluorescents only.
	Incorrect lamps.	Ensure lamp selection matches ballast capabilities.
	Excessive lead lengths.	Lamp leads must not exceed their specified lengths and, when practical, excess length should be removed. Lamp leads should not be bunched, bundled or tightly dressed by wire ties or other means.
	Ballast not properly grounded.	Fixture must be properly grounded, and ballast housing must have good electrical contact with metallic fixture chassis. Use of a star washer or other paint penetrating device is recommended for ballast mounting. Some ballasts provide a ground terminal as an alternative means to make this connection.
	Cold lamps New lamps	Ensure ambient temperature meets or exceeds the ballast's minimum starting temperature and is also suitable for the selected lamps. Some lamp manufacturers recommend burning lamps at full intensity for at least 12 hours before dimming.
Intermittent or unpredictable operation	Loose connection.	Check power wiring, luminaire disconnect, circuit breaker, etc. Check control circuit for intermittent connections.
	Ballast not properly grounded.	Fixture must be properly grounded, and ballast housing must have good electrical contact with metallic fixture chassis. Use of a star washer or other paint penetrating device is recommended for ballast mounting. Some ballasts provide a ground terminal as an alternative means to make this connection.
	Shunted sockets. DaliPro ballasts require non-shunted sockets, also known as rapid-start or program-start sockets.	Inspect or test lamp holders (sockets). With lamp removed and ballast disconnected, a shunted socket will always present a short circuit (zero ohms) between connections. Non-shunted sockets do not provide a connection (internal or external) between the blades.
	Poor starting aid. (not applicable to CFL models)	Ensure that a grounded metallic surface is within proper distance of the lamps. Spacing between the lamp wall and the grounded metallic surface should be between 0.125 and 0.500 in. for the entire length of the fluorescent tube. This requirement applies to linear fluorescents only.
Lamps ends turn black and/or frequent lamp failures	Shunted sockets. DaliPro ballasts require non-shunted sockets, also known as rapid-start or program-start sockets.	Inspect or test lamp holders (sockets). With lamp removed and ballast disconnected, a shunted socket will always present a short circuit (zero ohms) between connections. Non-shunted sockets do not provide a connection (internal or external) between the blades.
	Lamp-ballast wiring error.	Ensure connections between ballast and lamps are exactly as shown on ballast label.
	Incorrect lamps.	Ensure lamp selection matches ballast capabilities.

Additional Troubleshooting Techniques

In some cases, the troubleshooting methods outlined above may not lead to a quick detection and resolution of the problem. In this case, it is often beneficial to perform one or more of the following methods.

Method	Explanation
System division	When a large system of DaliPro ballasts has an apparent malfunction, but the specific component or location of the malfunctions is unknown, the system can be divided near the center of the control circuit. If the malfunction persists on one side, but not the other, the scope of the troubleshooting effort is reduced. Further separations may be used, of course, to help find the actual trouble site. Note: a DALI PS must be connected to any section undergoing tests.
Bypass installed control wires and do step-wise system reconstruction	When the cause of a malfunction cannot be assigned to a ballast or to the control wires, ballasts can be individually tested using a known good controller connected by external control wires. The system can then be reconstructed in steps, using only a few ballasts and short sections of the installed control wiring at one time. If a problem is encountered during this process, the cause can often be attributed to the ballast or control wires added in the last step.

Conference Room Installation



The room is designed with four 2x32T8 troffers down the center and six 42-watt CFL lamps along the side of the room.

Materials:

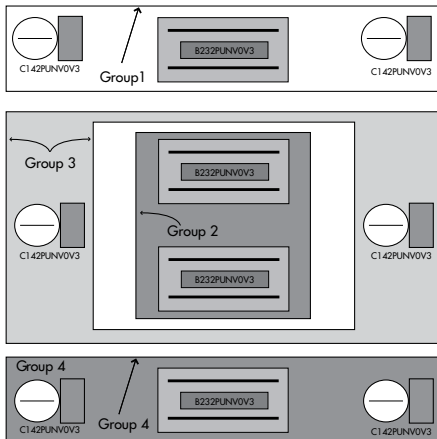
4-B232PUNVDV1
6-C214PUNVDV3

1-DALI Controller
1-DALI Power Supply

There are a number of DALI-compatible controls and power supplies available that can be used with this example.

----- DALI control bus; two-wire, non-polarized
 _____ Power circuit; three-wire; line, neutral & ground
 Shown here as a derived from single branch circuit

Programming Design



The system will then be programmed to:

Assign the fixtures into groups as show in Programming Design illustration (left)

Create lighting scenes shown in table below.

Scene No.	Scene Name	Description
1	Maintenance	All ON, full bright
2	Presentation	Groups 2 and 4 OFF; Groups 1 & 3 ON at about 1/2 bright
3	Meeting	Groups 1, 3 and 4 OFF; Group 2 ON full bright
4	Daylight	Group 1 OFF; Groups 2 & 3 ON at about 1/2 bright; Group 4 ON full bright

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