

Fixture Lead Identification and Driver Wiring

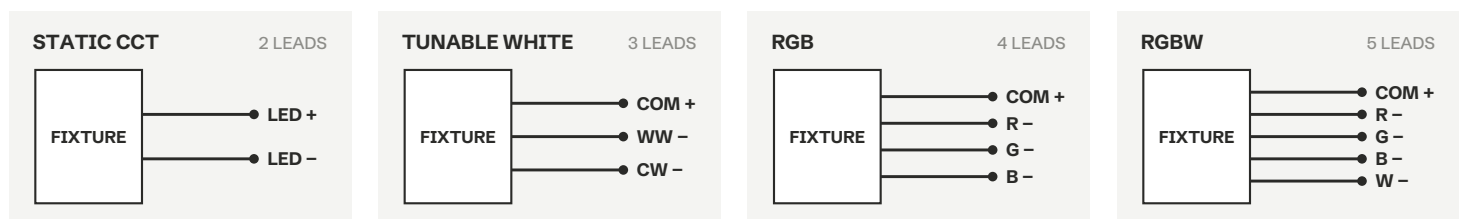
INSTALLATION NOTE

Every Nuordic LED fixture leaves the factory with a short low voltage lead. The number of conductors on that lead identifies the build: **two** for static CCT, **three** for tunable white, **four** for RGB, **five** for RGBW. Count the conductors first, then terminate. Line voltage (120V) only ever lands on the driver input, never on a fixture lead. Page 2 covers remote drivers and page 3 covers tethered drivers, each into an IC housing and into a retrofit fixture. Pages 4 and 5 cover wire size and maximum run length.

Conductors by Build

BUILD	LEADS	CONDUCTOR FUNCTIONS	RUN FROM DRIVER	TYPICAL CONTROL
Static CCT	2	LED + LED -	2 conductor low voltage cable	Phase dimmer on the 120V feed, or 0-10V, DALI-2 or Casambi at the driver
Tunable White	3	Common + Warm white - Cool white -	3 conductor low voltage cable	DALI-2 DT8 or Casambi, at the driver
RGB	4	Common + Red - Green - Blue -	4 conductor low voltage cable	DMX, DALI-2 DT8 or Casambi, at the driver or controller
RGBW	5	Common + Red - Green - Blue - White -	5 conductor low voltage cable	DMX, DALI-2 DT8 or Casambi, at the driver or controller

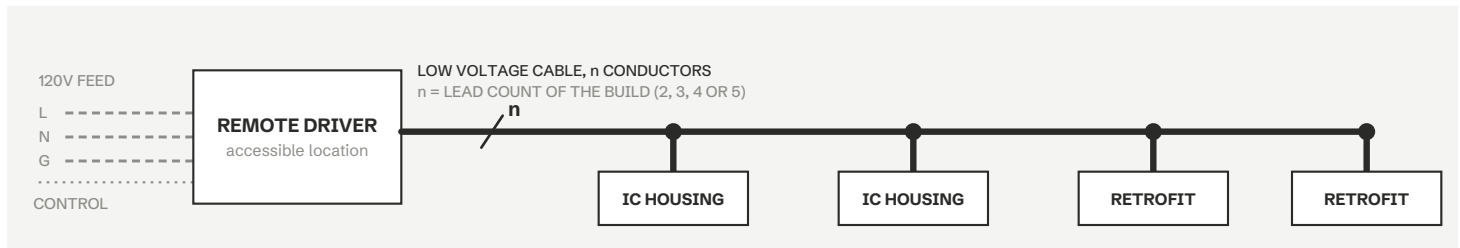
Fixture Leads



Before You Terminate

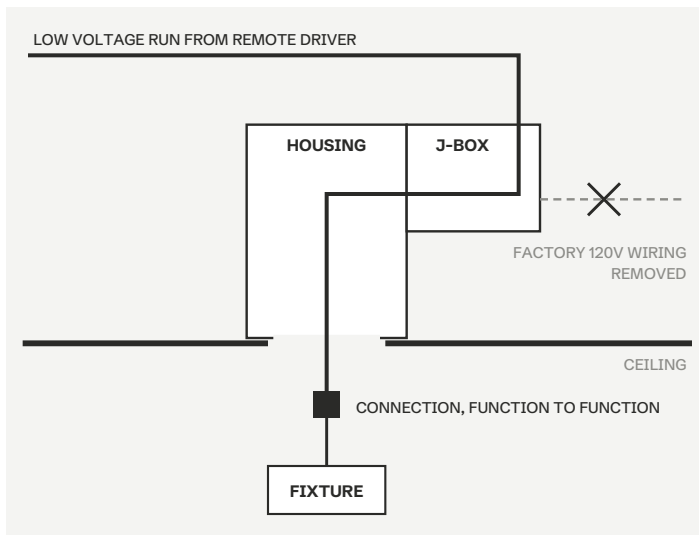
1. Never connect a fixture lead to 120V. Line voltage lands on the driver input only.
2. Count the conductors and confirm the build matches the fixture schedule before making any connection.
3. Observe polarity. LED engines are polarity sensitive and will not light if reversed.
4. Match multi-channel conductors by function at every connection: common to common, channel to channel.
5. Fixtures sharing a driver wire in parallel. Do not mix builds on one driver output.
6. Constant current driver output must match the connected fixture count. If you add or remove a fixture, reset the driver current.
7. Control conductors (0-10V, DALI, DMX) land on the driver or controller, never on the fixture lead.
8. Keep Class 2 low voltage conductors separated from line voltage conductors.
9. Size the low voltage cable from the tables on pages 4 and 5. Undersized conductors dim the far end of a run.
10. If a lead marking is unclear or the count does not match the schedule, stop and call us before terminating.

Remote Driver



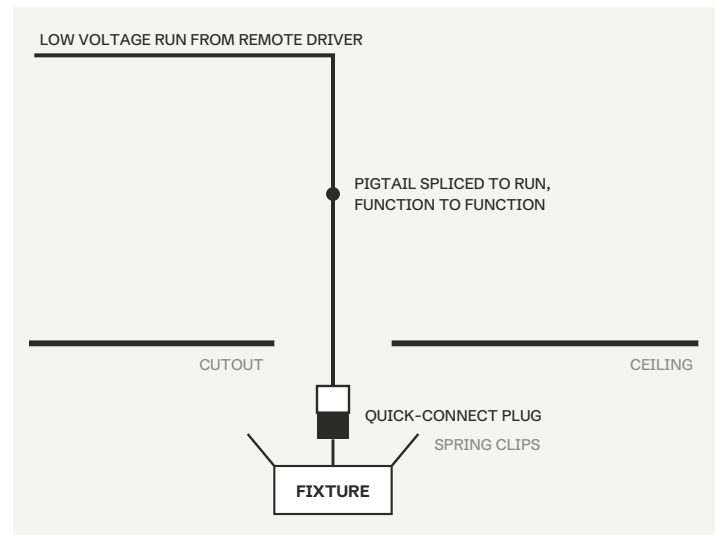
Mount the driver (supplied with its enclosure) where the drawings show it, with permanent access. Land the 120V feed and any control wiring on the driver input side. From the output, run one low voltage cable per zone and connect the fixtures in parallel, each conductor function to the same function at every fixture, as a daisy chain or as home runs (page 4). Every fixture on one driver output must be the same build. These methods assume a Class 2 driver output. Size the cable from pages 4 and 5 unless the drawings call for heavier conductors.

A Into an IC Housing



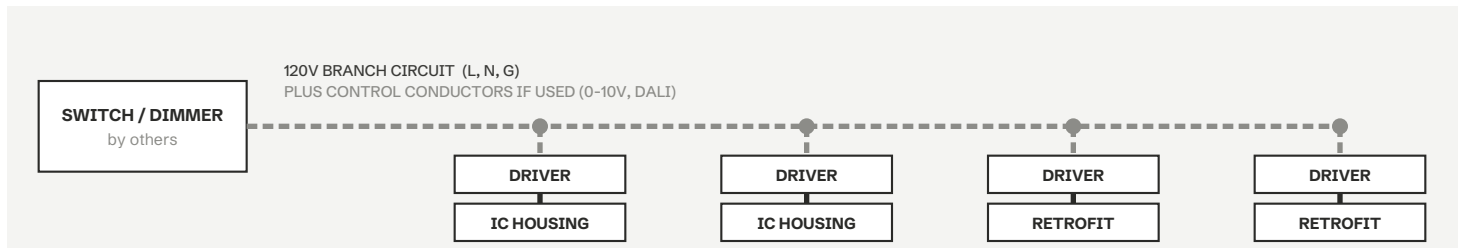
1. Remove the housing's factory line voltage wiring and any driver from the junction box. With a remote driver, no 120V is connected at the housing.
2. Bring the low voltage cable from the remote driver into the junction box.
3. Pass the cable through the box into the housing cavity and out through the aperture. Clear the path so nothing obstructs the fixture.
4. Below the ceiling, connect the cable to the fixture lead, matching conductor functions.
5. Push the connection up into the housing cavity and install the fixture.

B Retrofit Fixture, No Housing



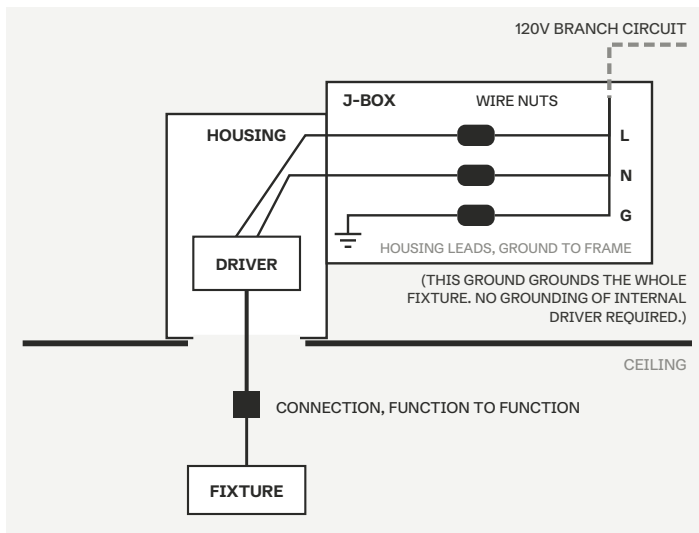
1. Route the low voltage cable from the remote driver to the cutout location.
2. Splice the mating quick-connect pigtail to the cable, matching conductor functions, using connectors approved for the conductor size.
3. Bring the plug down through the cutout and connect it to the fixture lead until it seats fully.
4. Push the connection above the ceiling, fold the spring clips and press the fixture into the cutout.

Tethered Driver



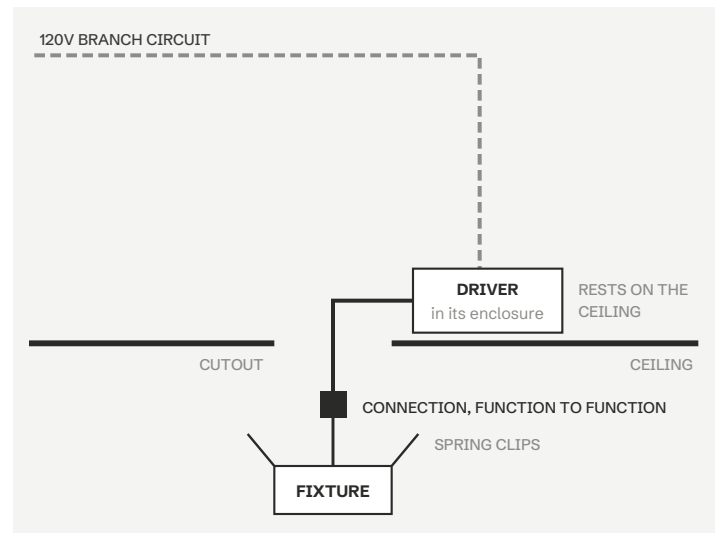
Each fixture has its own driver at the fixture location. The 120V branch circuit runs to every fixture location and lands on the driver input. Phase dimming happens on the 120V circuit at the wall; 0-10V or DALI control conductors, if used, also run to each driver, installed per local code and kept separated from line voltage. The lead between driver and fixture is sized at the factory. If it has to be extended, size the extension from page 4. Dashed: 120V line voltage. Solid: low voltage fixture lead.

A Into an IC Housing



1. Bring the 120V branch circuit, and any control conductors, into the housing junction box.
2. In the junction box, join the incoming circuit to the housing leads with wire nuts: line to line, neutral to neutral, ground to ground. (This ground grounds the whole fixture. No grounding of the internal driver is required.)
3. Connect the housing leads to the driver input. Land 0-10V or DALI conductors on the driver, if used.
4. Below the ceiling, connect the driver output to the fixture lead, matching conductor functions.
5. Set the driver inside the housing cavity, push the connections up and install the fixture.

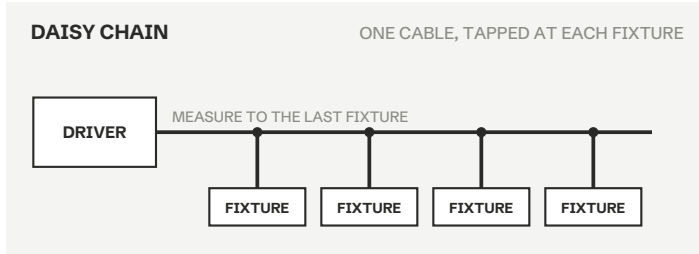
B Retrofit Fixture, No Housing



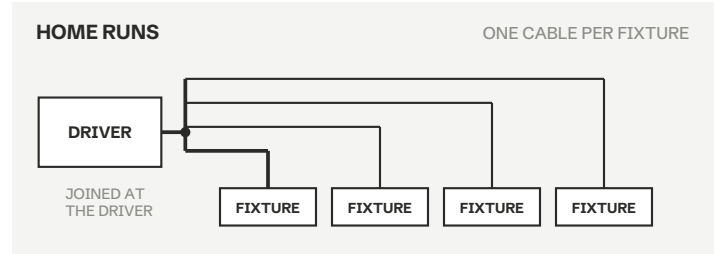
1. Bring the 120V cable, and any control conductors, to the cutout location.
2. Land line, neutral and ground on the driver input inside its enclosure. Secure the cable clamp and close the cover.
3. Connect the driver output to the fixture lead, matching conductor functions.
4. Pass the driver through the cutout and rest it on the ceiling beside the opening, then fold the spring clips and press the fixture into the cutout.

Wire Sizing

Low voltage circuits carry more current for the same power than 120V circuits, so conductor size matters more. Every foot of cable adds resistance, and the voltage it loses never reaches the light. On a constant voltage run the far end dims. On a constant current zone wired in parallel, the far fixtures draw less than their share and the near ones draw more, which shows as uneven brightness. The tables give the longest run each conductor size can carry. Measure along the cable route from the driver to the farthest fixture, including drops and rises, not straight across the plan.



One cable leaves the driver and is tapped at each fixture. Fewest conductors and the simplest rough-in. Size the whole cable for the full driver current and read the table to the last fixture.



A separate cable runs to each fixture and the runs are joined at the driver output. Each cable carries one fixture's current, so runs can be longer. On constant current, keep the home runs similar in length so the fixtures share current evenly.

How to Size a Run

- 1. Identify the system.** Our 36V constant current (CC) downlights use Table A. Constant voltage (CV) systems use Table B: 24V CV downlights, 24V and 48V tape, and 24V and 48V magnetic track. The driver label states CC (an output in mA) or CV (an output in V).
- 2. Find the current on the cable.** CC: fixture current × fixture count, which is also the driver set current. CV: connected load in watts ÷ driver voltage. On tunable white, RGB and RGBW, use the total for all channels. The common conductor carries every channel at once.
- 3. Measure the run** from the driver to the farthest fixture along the cable route.
- 4. Choose the gauge** whose length equals or exceeds the run. Use that gauge for every conductor in the cable, common included.

Table A Constant Current

CURRENT ON CABLE	EXAMPLE, 36V FIXTURES	18 AWG	16 AWG	14 AWG
350 mA	1 fixture at 350 mA	110 ft (34 m)	175 ft (54 m)	280 ft (86 m)
500 mA	2 fixtures at 250 mA	75 ft (23 m)	120 ft (37 m)	195 ft (60 m)
700 mA	2 fixtures at 350 mA	55 ft (17 m)	85 ft (27 m)	140 ft (43 m)
1000 mA	4 fixtures at 250 mA	35 ft (11 m)	60 ft (18 m)	95 ft (30 m)
1400 mA	5 fixtures at 280 mA	25 ft (8 m)	40 ft (13 m)	70 ft (21 m)
1750 mA	5 fixtures at 350 mA	20 ft (6 m)	35 ft (10 m)	55 ft (17 m)

Maximum run, driver to farthest fixture. Basis: 0.5V total drop (about 1.4 percent at 36V) (out and back), copper at 68°F (20°C), full driver current carried over the whole run, rounded down to the nearest 5 ft. A daisy chain with fixtures spread along it has more margin than shown.

Constant Current Notes

- 16 AWG is our standard for constant current zones. 18 AWG is acceptable only where the run sits inside its column.
- If a run is longer than the 14 AWG length, move the driver closer or split the zone across two drivers.
- The driver must reach the fixture voltage plus the cable drop. Confirm the total sits inside the driver's output voltage range on its spec sheet.
- If the fixture count on a driver changes, reset the driver current (page 1, item 6).

Table B Constant Voltage

VOLTAGE	LOAD	CURRENT	18 AWG	16 AWG	14 AWG	12 AWG
24V	24W	1.0 A	55 ft (17 m)	85 ft (27 m)	140 ft (43 m)	225 ft (69 m)
24V	48W	2.0 A	25 ft (8 m)	40 ft (13 m)	70 ft (21 m)	110 ft (34 m)
24V	60W	2.5 A	20 ft (6 m)	35 ft (10 m)	55 ft (17 m)	90 ft (27 m)
24V	96W	4.0 A	10 ft (4 m)	20 ft (6 m)	35 ft (10 m)	55 ft (17 m)
48V	24W	0.5 A	225 ft (68 m)	355 ft (109 m)	565 ft (173 m)	905 ft (276 m)
48V	48W	1.0 A	110 ft (34 m)	175 ft (54 m)	280 ft (86 m)	450 ft (138 m)
48V	72W	1.5 A	75 ft (22 m)	115 ft (36 m)	185 ft (57 m)	300 ft (92 m)
48V	96W	2.0 A	55 ft (17 m)	85 ft (27 m)	140 ft (43 m)	225 ft (69 m)

Maximum run, driver to the feed point of the tape, fixture or track. Basis: 3 percent drop (0.72V at 24V, 1.44V at 48V), copper at 68°F (20°C), rounded down to the nearest 5 ft.

Constant Voltage Notes

1. The table covers the cable from the driver to its feed point: where it lands on the tape, the fixture, or the magnetic track power feed. The maximum length of tape from a single feed is on the tape spec sheet and is a separate limit. Feed longer tape runs at both ends or from the center.
2. Where one driver feeds several runs, size each cable on its own load.
3. A Class 2 output is limited to 100W, about 4 A at 24V and 2 A at 48V. For long runs of high output tape or heavily loaded track, place the driver close to the load.

Cable Type and Rating

Every low voltage run in this note is Class 2. Use cable listed for the space it passes through: CL2 for walls and ceilings, CL2R for vertical runs between floors, and CL2P in plenum (air handling) spaces. CL3 types may substitute for the matching CL2 type. Outdoors, underground or in wet locations, use cable rated for that location. Match the conductor count to the build on page 1. Stranded copper terminates more reliably in quick-connects; use connectors listed for the conductor size.

Control Wiring

DALI: two conductors, polarity free, 2V maximum drop on the bus. 18 AWG to 500 ft (150 m) from the bus power supply to the farthest device, 16 AWG to the DALI maximum of 984 ft (300 m).

0-10V: 18 AWG is typical. Install to the circuit class the driver instructions require.

DMX: shielded twisted pair data cable (120 Ω), daisy chained device to device, with a 120 Ω terminator on the last device.

Casambi: wireless, no control wiring.

Working It Out

$$\text{Maximum run (ft)} = \text{allowed drop (V)} \times 1000 \div (2 \times \text{current (A)} \times \text{conductor resistance } (\Omega \text{ per } 1000 \text{ ft}))$$

The 2 accounts for the conductor out and the conductor back. Copper resistance at 68°F (20°C):

18 AWG 6.39 Ω 16 AWG 4.02 Ω 14 AWG 2.53 Ω 12 AWG 1.59 Ω per 1000 ft

Example. A 24V, 48W tape run carries 2.0 A. On 16 AWG at 3 percent (0.72V): $0.72 \times 1000 \div (2 \times 2.0 \times 4.02) = 44.8$ ft, listed as 40 ft.

Hot spaces. Conductor resistance rises with temperature. In attics and other hot spaces, take about 20 percent off the table lengths.