ETC Reference Guide
F-Drive RX Wiring

Introduction

This guide covers wiring considerations for the F-Drive RX with compatible ETC luminaires and other loads, and with optional B-Box4 and S-Box.

Output wiring requirements and methods vary depending on the luminaires or loads and the chosen wire type. For more information on compatible products, see the resources at *Documentation for Compatible Products on page 14*.

Load Types and Configurations

F-Drive RX has modular output cards to drive a variety of loads. Determining compatibility between loads and the F-Drive RX output card is an important step toward ensuring the success of a project. Search the LED Dimming Compatibility Database (etcconnect.com/compatibility) to see if your load is compatible. If your load is not in the compatibility database, follow the instructions at the link above to contact the ETC Applications Engineering department to arrange for compatibility testing.

This document covers the following load types and configurations:

- *Connect Constant-Voltage Loads on page 4*
  - Constant-voltage loads by other manufacturers such as RGBW LED tape
- *Use a B-Box4 or S-Box to Connect Constant-Current Loads on page 6*
  - Constant-current loads by other manufacturers
  - Compatible ETC luminaires with RJ45 input
  - ArcSystem Pro One-Cell family luminaires with Molex input

CAUTION: ***Do not coil excess Category-type cable.***

Note: *See NFPA 70 2020 National Electrical Code table 725.144 for cable bundling limitations that apply to all F-Drive RX Class 2 output cables, such as the maximum number of four-pair cables in a bundle.*

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F-Drive RX Output Card Limits

CAUTION: ***Setting the driver card to output more current than the manufacturer's recommended fixture driver current may reduce the lifetime of the fixtures or cause damage to the fixtures.***

CAUTION: ***Do not exceed any Class 2 limits stated by the manufacturer of the load.***

The F-Drive RX CC 8 Card is capable of driving constant-current loads up to 56 VDC and 200–700 mA, 32.5 W per channel, 240 W total per output card. See *Configure the CC 8 Card on page 13*.

The F-Drive RX FTW 8 Card is capable of driving ArcSystem Navis 100 Fade to Warm or ArcSystem Navis 50 Fade to Warm luminaires up to 56 VDC, 32.5 W per channel, 240 W total per output card. See *Configure the FTW 8 Card on page 13*.

The F-Drive RX C24V Card is capable of driving constant-voltage loads up to 24 VDC, 65 W per channel, 240 W total per output card. See *Voltage Drop on page 2*.

Note: *Do not bus/bridge channels to attempt to exceed the individual channel limits.*

Voltage Drop

Voltage drop along load wiring is a consideration for constant-voltage loads. Voltage drop calculations vary by project and are based on the type, length, and gauge of wire. The C24V Card has an adjustable dial on the front of the output card to set the 24–27 VDC (+/-5%) output. Measure the voltage at the load and adjust the dial to achieve 24 VDC at the load. Contact a qualified electrician and see the *F-Drive RX Installation Manual* for additional information.

Compatible ETC Luminaires

F-Drive RX Output Card	Compatible Accessories	Supported Luminaires
CC 8 Card	FD-BBOX-4R or FD-SBOX-R (optional)	• Navis 50 White
CC 8 Card	FD-BBOX-4R (optional)	• Navis 100 White • Irideon FPZ for F-Drive or Irideon FPZ Plus for F-Drive • Irideon WLZ for F-Drive or Irideon WLZ Plus for F-Drive • Source Four Mini LED for F-Drive or Source Four Mini LED Plus for F-Drive
CC 8 Card	FD-BBOX-4M (required)	• ArcSystem Pro One-Cell Micro White • ArcSystem Pro One-Cell Small White or Fade to Warm • ArcSystem Pro One-Cell White or Fade to Warm
FTW 8 Card	FD-BBOX-4R or FD-SBOX-R (optional)	• Navis 50 Fade to Warm
FTW 8 Card	FD-BBOX-4R (optional)	• Navis 100 Fade to Warm

Note: *The CC 8 Card cannot provide enough current to power ArcSystem Pro One-Cell* ***High Output*** *luminaires at their maximum capability.*

Note: *Due to performance differences, ETC recommends that you do not mix Navis 100 Fade to Warm and Navis 50 Fade to Warm luminaires in the same wiring run.*

Note: *Fade to Warm performance may vary between Navis 50 Fade to Warm luminaires connected directly to an FTW 8 Card and Navis 50 Fade to Warm luminaires connected through S-Boxes. Plan your installation with all Navis 50 Fade to Warm luminaires directly connected to an FTW 8 Card or all Navis 50 Fade to Warm luminaires connected through S-Boxes for best performance.*

Connect Constant-Voltage Loads

Connect constant-voltage luminaires or loads to the four-channel C24V Card using the F-Drive RX RJ45/Terminal 4 - CV Adapter (ETC part number 7148K1035, included in the C24V Card kit, ETC part number 7148K1033). The adapter has eight output terminals that accept 1–2.5 mm^2 (18–12 AWG) wires. Two pins are needed per channel.

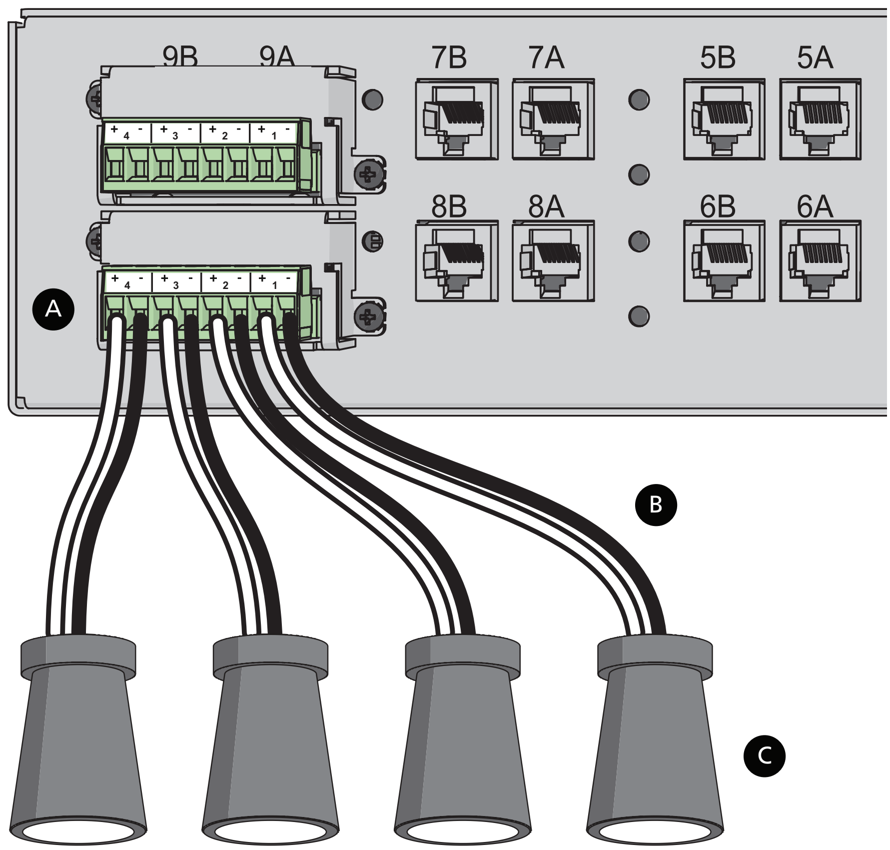

Figure 1. Detail view of the back panel of an F-Drive RX with constant-voltage loads connected to the C24V Card in slot 10 via its adapter. See Table 1 for item descriptions.

A	F-Drive RX with C24V Card and F-Drive RX RJ45/Terminal 4 - CV Adapter in slot 10.
B	1–2.5 mm^2 (18–12 AWG) wire. See *Voltage Drop on page 2*.
C	Constant-voltage loads.

Table 1. Descriptions of the labeled items in Figure 1.

Connect RGBW LED Tape

You can use the four output channels of a C24V Card to control four channels of 24 volt LED tape. *Figure 2* details using RGBW tape. Single-channel, dual-channel, and three-channel tapes are also supported.

CAUTION: ***In order to meet Class 2 LVLE requirements, follow the instructions below when using the four channels of a C24V Card to control a single load:***

- ***Do not bus together +24 V outputs at the C24V Card.***
- ***Do not exceed 65 W per channel or per wire pair.***
- ***Do not exceed 240 W total per output card.***

CAUTION: ***Do not exceed any Class 2 limits stated by the manufacturer of the load.***

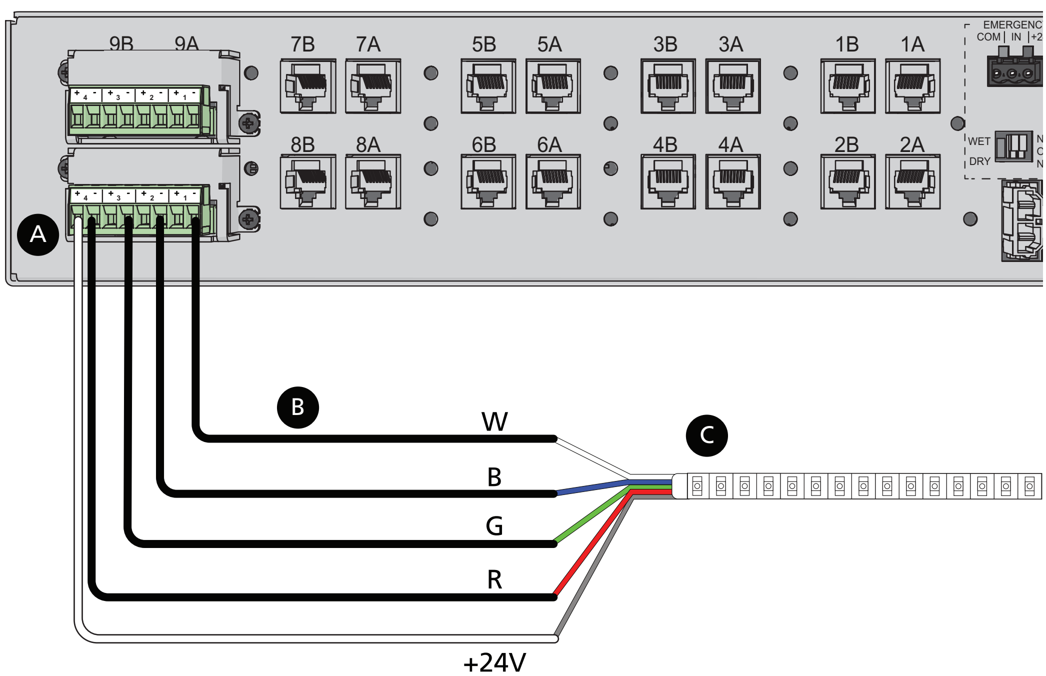

Figure 2. Detail view of the back panel of an F-Drive RX with RGBW LED tape connected to the C24V Card in slot 10 via its adapter. See Table 2 for item descriptions.

A	F-Drive RX with C24V Card and F-Drive RX RJ45/Terminal 4 - CV Adapter in slot 10.
B	1–2.5 mm^2 (18–12 AWG) wire. See *Voltage Drop on page 2*.
C	24 VDC RGBW LED tape.

Table 2. Descriptions of the labeled items in Figure 2.

Use a B-Box4 or S-Box to Connect Constant-Current Loads

B-Box4 takes a single four-channel RJ45 output from an F-Drive family output card or driver and provides four separated output channels to support a variety of constant-current loads, compatible ETC luminaires, and ETC S-Boxes in star topology. See the *F-Drive B-Box4 Installation Guide* for more information.

S-Box takes one channel from an F-Drive family output card or driver and provides three separate outputs. This allows you to connect multiple loads to the same control channel, increasing the overall fixture capacity. The three outputs support a variety of constant-current loads, including ETC ArcSystem Navis 50 White and Fade to Warm luminaires. The thru port allows you to daisy-chain up to four compatible devices, including other S-Boxes and compatible ETC luminaires with RJ45 input. When using S-Boxes with a fully-populated F-Drive RX enclosure, you can drive up to 240 ETC ArcSystem Navis 50 luminaires controlled in 80 groups of three as opposed to 80 individually-controlled ArcSystem Navis 50 luminaires without S-Boxes. See the *F-Drive S-Box Installation Guide* for more information.

An Example System with B-Box4 and F-Drive RX

Each four-channel output of an F-Drive RX CC 8 Card or FTW 8 Card can be used with one B-Box4 to support star topology with compatible ETC luminaires, ETC S-Boxes, or constant-current loads by other manufacturers.

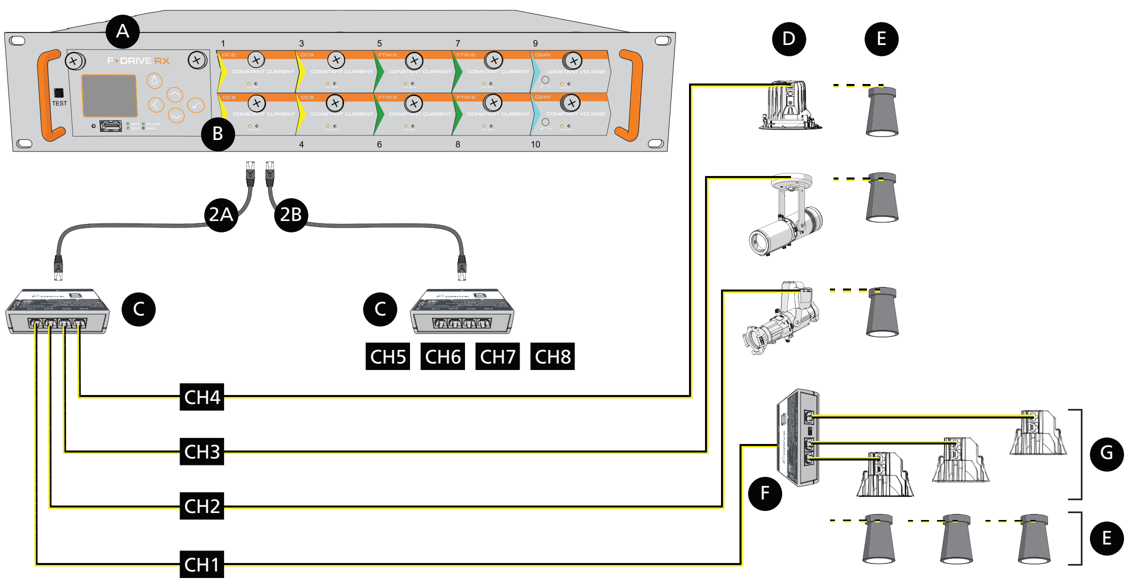

Figure 3. F-Drive RX and B-Boxes with constant-current loads. See Table 3 for item descriptions.

A	F-Drive RX	F	S-Box
B	CC 8 Card in slot 2	G	ArcSystem Navis 50 luminaires
C	Two B-Box4	2A	Channels 1–4 from the output card in slot 2
D	Compatible ETC luminaires	2B	Channels 5–8 from the output card in slot 2
E	Alternative: Constant-current loads		
Note: The illustration is not drawn to scale. Dashed lines indicate alternative luminaires or loads. For clarity, the illustration only shows luminaires or loads connected to channels 1–4 of one output card. F-Drive RX supports up to 10 eight-channel output cards.			

Table 3. Descriptions of items from Figure 3.

F-Drive RX (*A* in *Figure 3 on page 6*): The F-Drive RX is shown with four CC 8 Cards in slots 1–4 and four FTW 8 cards in slots 5–8. The two C24V Cards in slots 9–10 are not compatible with B-Box4.

Output card (*B* in *Figure 3 on page 6*): Figure 1 shows a CC 8 Card installed in slot 2 of the F-Drive RX. As an alternative, you can connect Navis 50 Fade to Warm or Navis 100 Fade to Warm luminaires to an FTW 8 Card.

B-Box4 (*C* in *Figure 3 on page 6*):

- Choose FD-BBOX-4T to connect constant-current loads by other manufacturers.
- Choose FD-BBOX-4R to connect compatible ETC luminaires or S-Boxes.
- Choose FD-BBOX-4M to connect ArcSystem Pro One-Cell family luminaires.

Compatible ETC luminaires (*D* in *Figure 3 on page 6*): See *Compatible ETC Luminaires on page 3*.

Constant-current loads by other manufacturers (*E* in *Figure 3 on page 6*): As an alternative, connect constant-current loads by other manufacturers.

S-Box (*F* in *Figure 3 on page 6*):

- Choose FD-SBOX-R for Navis 50 luminaires.
- Choose FD-SBOX-T for constant-current loads by other manufacturers.

Note that all luminaires or loads connected to the S-Box are on the same channel (*CH1* in *Figure 3 on page 6*).

Output card output channels (*2A* and *2B* in *Figure 3 on page 6*): Channels 1–4 are available on RJ45 output "2A" from the back of the F-Drive RX enclosure. Channels 5–8 are available on RJ45 output "2B" from the back of the F-Drive RX enclosure. You must use 0.25 mm^2 (23 AWG) or larger conductors in Category-type cable. Not all Category-type cables meet this requirement.

An Example System with S-Boxes and F-Drive RX

The eight channels of an F-Drive RX CC 8 Card or FTW 8 Card can be used with up to eight S-Boxes to support 24 constant-current loads controlled in groups of three as shown below.

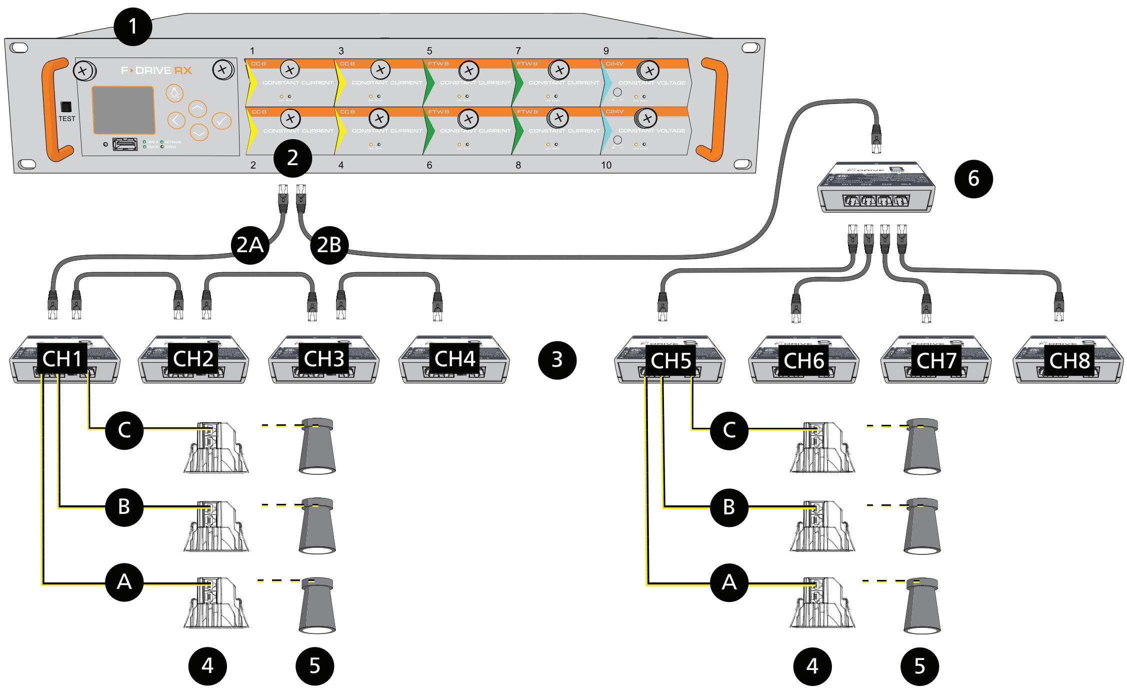

Figure 4. F-Drive RX and S-Boxes with constant-current loads. See Table 4 for item descriptions.

1	F-Drive RX	4	Navis 50 luminaires
2	CC 8 Card in slot 2	5	Alternative: Constant-current loads
2A	Channels 1–4 from the output card in slot 2	6	FD-BBOX-4R (optional)
2B	Channels 5–8 from the output card in slot 2	A, B, and C	S-Box outputs "A", "B", and "C"
3	Eight S-Boxes		
Note: The illustration is not drawn to scale. Dashed lines indicate alternative luminaires or loads. For clarity, the illustration only shows luminaires or loads connected to channel 1 and channel 5 of one output card. F-Drive RX supports up to 10 eight-channel output cards.			

Table 4. Descriptions of items from Figure 4.

F-Drive RX (*1* in *Figure 4 on page 8*): The F-Drive RX is shown with four CC 8 Cards in slots 1–4 and four FTW 8 cards in slots 5–8. The two C24V Cards in slots 9–10 are not compatible with S-Box.

Output card (*2* in *Figure 4 on page 8*):

- Choose a CC 8 Card to connect to constant-current loads by other manufacturers and most compatible ETC luminaires.
- Choose an FTW 8 Card to connect to Navis 100 Fade to Warm and Navis 50 Fade to Warm luminaires.

Output card output channels (*2A* and *2B* in *Figure 4 on page 8*): Channels 1–4 are available on RJ45 output "2A" from the back of the F-Drive RX enclosure. Channels 5–8 are available on RJ45 output "2B" from the back of the F-Drive RX enclosure. You must use 0.25 mm^2 (23 AWG) or larger conductors in Category-type cable. Not all Category-type cables meet this requirement.

S-Boxes (*3* in *Figure 4 on page 8*):

- Choose FD-SBOX-T to connect constant-current loads by other manufacturers.
- Choose FD-SBOX-R to connect Navis 50 luminaires.

Note that all luminaires or loads connected to the "CH1" S-Box are on the same channel (*CH1* in *Figure 4 on page 8*), and all luminaires or loads connected to the "CH5" S-Box are on the same channel (*CH5* in *Figure 4 on page 8*).

S-Box outputs "A", "B", and "C" (*A*, *B*, and *C* in *Figure 4 on page 8*):

- Outputs "A", "B", and "C" from the same S-Box respond to the same channel.
- Output "C" is optional. See "Set the C OFF/C ON Switch" in the *F-Drive S-Box Installation Guide* for details.
- One category-type cable per FD-SBOX-R output. You must use 0.25 mm^2 (23 AWG) or larger conductors in Category-type cable. Not all Category-type cables meet this requirement.
- One Class 2 wire pair per FD-SBOX-T output.

Navis 50 luminaires (*4* in *Figure 4 on page 8*): See *Compatible ETC Luminaires on page 3*.

Constant-current loads by other manufacturers (*5* in *Figure 4 on page 8*): As an alternative, connect constant-current loads by other manufacturers.

FD-BBOX-4R (*6* in *Figure 4 on page 8*): The optional FD-BBOX-4R can connect four S-Boxes (or compatible ETC luminaires) to the output card. Note that the S-Boxes on channels 5, 6, 7, and 8 are not daisy-chained together.

An Example System with Daisy Chains of F-Drive-Compatible Luminaires and S-Boxes

Compatible ETC luminaires with RJ45 input and S-Boxes can be daisy-chained together using their RJ45 In and Out (or Thru) ports.

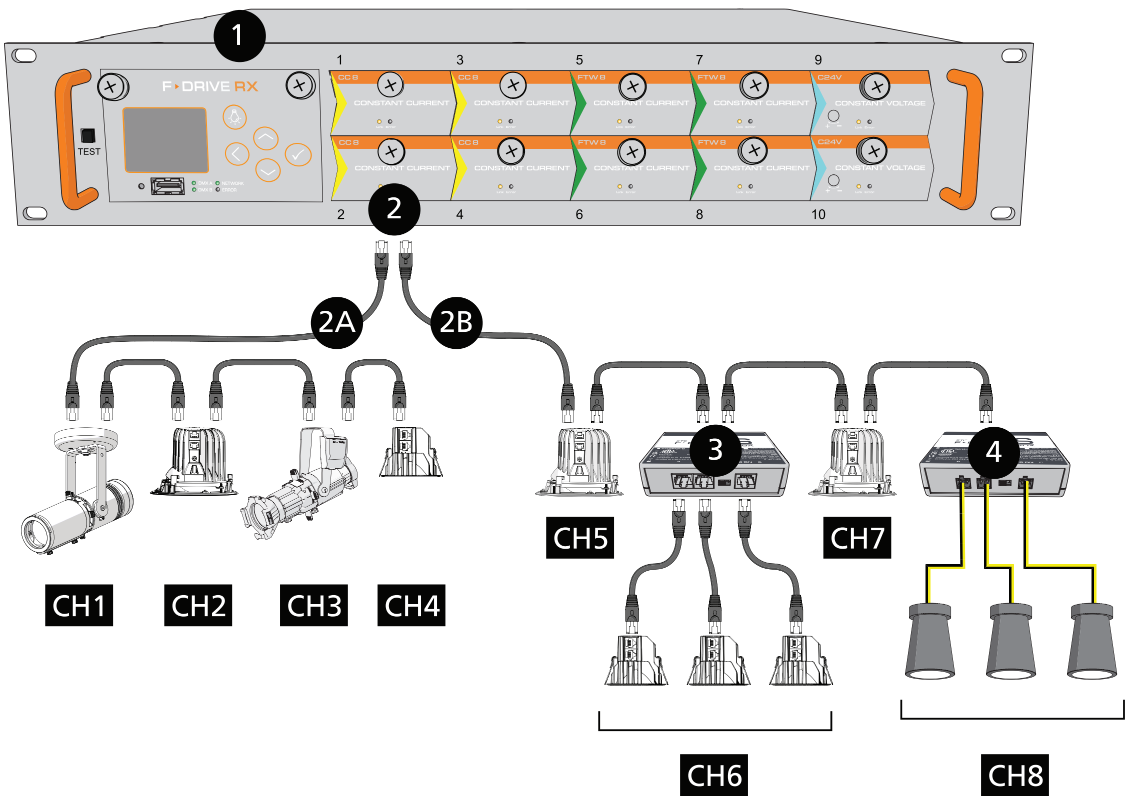

Figure 5. F-Drive RX and F-Drive-compatible luminaires with RJ45 input. See Table 5 for item descriptions.

1	F-Drive RX	4	FD-SBOX-T
2	CC 8 Card in slot 2	CH1, CH2, CH3, CH4, CH5, and CH7	Compatible ETC luminaires
2A	Channels 1–4 from the output card in slot 2	CH6	Navis 50 luminaires
2B	Channels 5–8 from the output card in slot 2	CH8	Constant-current loads by another manufacturer
3	FD-SBOX-R		
Note: The illustration is not drawn to scale. For clarity, the illustration only shows loads connected to an output card in slot 2. F-Drive RX supports up to 10 output cards with 8 channels each.			

Table 5. Descriptions of items from Figure 5.

F-Drive RX (*1* in *Figure 5 on page 10*): Figure 5 shows CC 8 Cards in slots 1–4 and FTW 8 Cards in slots 5–8. The C24V Cards shown in slots 9–10 are not compatible with the luminaires and S-Boxes discussed in this section.

Output card (*2* in *Figure 5 on page 10*):

- Choose a CC 8 Card to connect to constant-current loads by other manufacturers and most compatible ETC luminaires.
- Choose an FTW 8 Card to connect to Navis 100 Fade to Warm and Navis 50 Fade to Warm luminaires.

Output card output channels (*2A* and *2B* in *Figure 5 on page 10*): Channels 1–4 are available on RJ45 output "2A" from the back of the F-Drive RX enclosure. Channels 5–8 are available on RJ45 output "2B" from the back of the F-Drive RX enclosure. You must use 0.25 mm^2 (23 AWG) or larger conductors in Category-type cable. Not all Category-type cables meet this requirement.

FD-SBOX-R (*3* in *Figure 5 on page 10*): The three Navis 50 luminaires connected to the FD-SBOX-R are all on channel 6 (CH6).

FD-SBOX-T (*4* in *Figure 5 on page 10*): The three constant-current loads connected to the FD-SBOX-T are all on channel 8 (CH8).

CH1, CH2, CH3, and CH4 in *Figure 5 on page 10*: These are four compatible ETC luminaires with RJ45 input in a daisy chain. Each luminaire responds to its own output channel from the output card. You must use 0.25 mm^2 (23 AWG) or larger conductors in Category-type cable. Not all Category-type cables meet this requirement. See *Compatible ETC Luminaires on page 3* for luminaire options and their compatible output cards.

CH5, CH6, CH7, and CH8 in *Figure 5 on page 10*: This daisy chain consists of two compatible ETC luminaires and two S-Boxes.

- **CH5 and CH7**: Any compatible ETC luminaires. You must use 0.25 mm^2 (23 AWG) or larger conductors in Category-type cable. Not all Category-type cables meet this requirement. See *Compatible ETC Luminaires on page 3* for luminaire options and their compatible output cards.
- **CH6**: Three Navis 50 luminaires connected to the daisy chain through an FD-SBOX-R. You must use 0.25 mm^2 (23 AWG) or larger conductors in Category-type cable. Not all Category-type cables meet this requirement. See *Compatible ETC Luminaires on page 3* for luminaire options and their compatible output cards.
- **CH8**: Three constant-current loads from another manufacturer connected to the daisy chain through an FD-SBOX-T. Follow Class 2 wiring methods between the FD-SBOX-T and the loads.

Category-Type Cable Requirements

Compatible ETC luminaires with RJ45 input connect to the F-Drive RX output card via Category-type cable terminated to RJ45 connectors. If you are installing a B-Box4 or S-Box between the driver and the luminaire, install Category-type cable between the driver and B-Box4 or S-Box and between the B-Box4 or S-Box and the luminaire.

Compatible ETC luminaires require:

- 0.25 mm^2 (23 AWG) or larger conductors in Category-type cable
- 100 m (328 ft) maximum wire run length (including twice the stem length of the pendant accessory if you are installing a pendant)
- 2400 mA maximum per cable

CAUTION: ***Do not coil excess Category-type cable.***

Cable Bundling

Note: *F-Drive RX is a global product and proper cabling is the responsibility of the installer. Always defer to the Authority Having Jurisdiction (AHJ) for compliance with local codes and requirements.*

See NFPA 70 2020 National Electrical Code table 725.144 for cable bundling limitations that apply to all F-Drive Class 2 output cables, such as the maximum number of four-pair cables in a bundle.

The conductors in category-type cable have a maximum current that they can carry before exceeding the temperature rating of the cable. This limit restricts the number of cables that can be bundled together.

Limits for 75°C Rated Cable

The limits below are for cable with 0.25 mm^2 (23 AWG) conductors rated to 75°C.

Luminaire	Four-Pair Cables per Bundle
Navis 100 White Navis 50 White or Fade to Warm Irideon FPZ Plus for F-Drive Irideon WLZ Plus for F-Drive	91 four-pair cables per bundle if all cables go to any combination of these luminaires and the lower-power luminaires listed in the row below
Navis 100 Fade to Warm Source Four Mini LED for F-Drive Source Four Mini LED Plus for F-Drive Irideon FPZ for F-Drive Irideon WLZ for F-Drive	192 four-pair cables per bundle if all cables go to these lower-power luminaires

Patching Requirements

If you are using a patch panel between the F-Drive RX output card and compatible ETC luminaires, pins must be rated for more than 1 A.

Configure the CC 8 Card

CAUTION: ***Setting the driver card to output more current than the manufacturer's recommended fixture driver current may reduce the lifetime of the fixtures or cause damage to the fixtures.***

The F-Drive RX CC 8 Card can output 200–700 mA. Configure the output current using the F-Drive RX user interface or use ETC Concert to configure the output current for each output channel. Default output current is 200 mA.

ETC Luminaire	Driver Output Current Setting
ArcSystem Navis 50 White	700 mA
ArcSystem Navis 100 White	600 mA
ArcSystem Pro One-Cell Micro White	200 mA
ArcSystem Pro One-Cell Small White or Fade to Warm	600 mA
ArcSystem Pro One-Cell White or Fade to Warm	600 mA
Irideon FPZ for F-Drive or Irideon WLZ for F-Drive	450 mA
Irideon FPZ Plus for F-Drive or Irideon WLZ Plus for F-Drive	700 mA (see note)
Source Four Mini LED for F-Drive	350 mA
Source Four Mini LED Plus for F-Drive	450 mA

Note: *Choose the maximum setting (700 mA) for each output of an F-Drive RX CC 8 Card for best performance with Irideon FPZ Plus or Irideon WLZ Plus luminaires.*

Configure the FTW 8 Card

CAUTION: ***Setting the driver card to output more current than the manufacturer's recommended fixture driver current may reduce the lifetime of the fixtures or cause damage to the fixtures.***

The F-Drive RX FTW 8 Card has two output current settings: Navis 100 FTW (450 mA) or Navis 50 FTW (700 mA). Configure the output current using the F-Drive RX user interface or use ETC Concert to configure the output current for each output channel. Default output current is Navis 100 FTW (450 mA).

ETC Luminaire	Driver Output Current Setting
ArcSystem Navis 50 Fade to Warm	Navis 50 FTW (700 mA)
ArcSystem Navis 100 Fade to Warm	Navis 100 FTW (450 mA)

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LED Dimming Compatibility Database

The LED Dimming Compatibility Database (etcconnect.com/compatibility) is a searchable list of devices that ETC has tested for compatibility with ETC dimming and control systems.

Documentation for Compatible Products

The following documents are available at the F-Drive RX documentation page (etcconnect.com/F-DriveRX/Documentation):

- *F-Drive B-Box4 Installation Guide*
- *F-Drive S-Box Installation Guide*
- *F-Drive RX Installation Manual*
- *F-Drive RX Configuration Manual*
- *F-Drive Power Supply Installation Guide*

The following documents are available at the ETC Architectural Luminaires page (etcconnect.com/Products/Architectural-Fixtures):

- *ArcSystem Navis 100 Installation Guide*
- *ArcSystem Navis 50 White and Fade to Warm Installation Guide*
- *Source Four Mini LED (F-Drive) User Manual*
- *Irideon WLZ (F-Drive) User Manual*
- *Irideon FPZ (F-Drive) User Manual*
- *ArcSystem Pro D1 and D2 Series Drivers Installation Guide* for information about ArcSystem Pro One-Cell luminaires

ETC Concert software and documentation is available at the ETC Concert web page (etcconnect.com/concert).