

EncoderCas

INSTALLATION + COMMISSIONING GUIDE

Casambi rotary encoder with one shared dry-contact I/O
Hardware reference: EncoderCas PCB Rev. A0

Project:
Profile:
Contact:



PRODUCT ROLE EncoderCas converts a conventional quadrature rotary encoder and center switch into Casambi dimming and on/off commands. One additional terminal can act as a passive dry-contact input or a low-current electronic contact output.

At a glance	Design / installation value
Power	12 VDC nominal, Class 2; allowable range requires engineering confirmation
Encoder	A, B, and center-switch contacts with common Ground (-)
Dry I/O	One shared input-sense / low-side contact terminal
Radio	Fanstel BT840E shown in Rev. A0 BOM; production antenna variant to confirm

DRAFT 0.1 - ENGINEERING REVIEW COPY - NOT FOR FIELD ISSUE

1 Product overview

EncoderCas is a Bluetooth Low Energy, Casambi-enabled interface for a field-mounted quadrature rotary encoder. Turning the knob sends a proportional Casambi level; pressing the center switch toggles the controlled function using configurable level memory. A separate shared dry-contact point can report a passive closure or emulate a low-current contact closure under Casambi control.

SIGNALING CIRCUITS ONLY Use X2 only with passive encoder contacts and compatible low-current contact-sense circuits. EncoderCas is not a DMX output, 0-10 V output, relay driver, motor control, or power source.

1.1 Technical data

Item	Rating / description
Supply	12 VDC nominal at X1; allowable tolerance/range requires engineering confirmation
Input protection	Resettable 0.125 A PTC, surge suppressor, and series polarity diode on Rev. A0
Encoder interface	A, B, and center-switch contact inputs; external pull-ups and RC filtering on Rev. A0
Dry-contact I/O	1 shared input-sense / low-side NFET output terminal; production current rating TBD
Control electronics	Onboard digital controller with stored vendor parameters and field-update support
Radio	Fanstel BT840E, 2.4 GHz Bluetooth Low Energy; antenna configuration TBD
Firmware	EncoderCas 1.0, build 0; bootloadable project
PCB	Rev. A0; 52.3 x 26.7 mm (2.06 x 1.05 in), 0.79 mm (0.031 in) FR-4
Connectors	X1: 2-position 5.08 mm; X2: 5-position 5.08 mm
Environment	Open-board installation limits and certification ratings require engineering confirmation

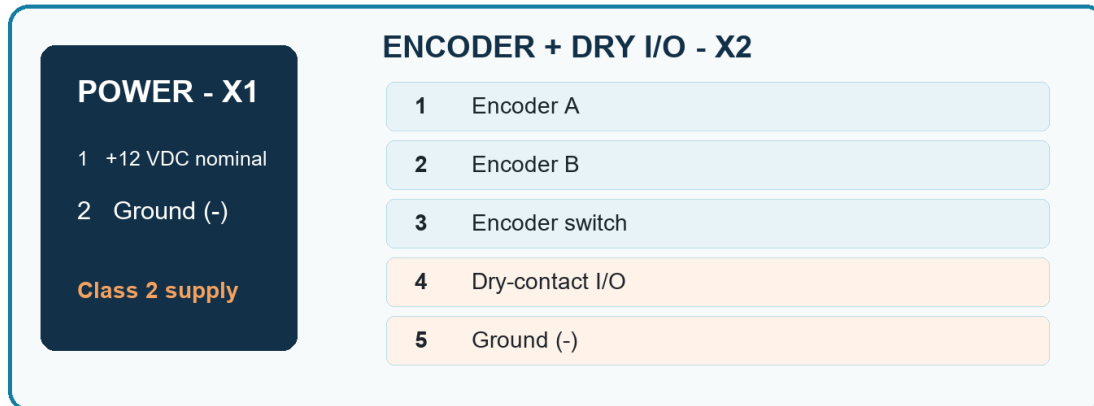
1.2 Intended applications

- Wall-station rotary dimmers using a dry-contact quadrature encoder.
- Casambi dimming control where the knob must report absolute 0-255 level updates.
- Multi-location control using the same NED multiswitch Gang value on compatible devices.
- One auxiliary maintained switch, momentary pushbutton, or compatible low-current equipment contact input/output.

OPEN DESIGN ITEMS Do not remove DRAFT markings until supply range, dry-output current rating, environmental limits, production radio/antenna, fixture ID/profile name, product image, and controlled label artwork are approved.

2 Terminals and installation

EncoderCas REV. A - FIELD TERMINALS



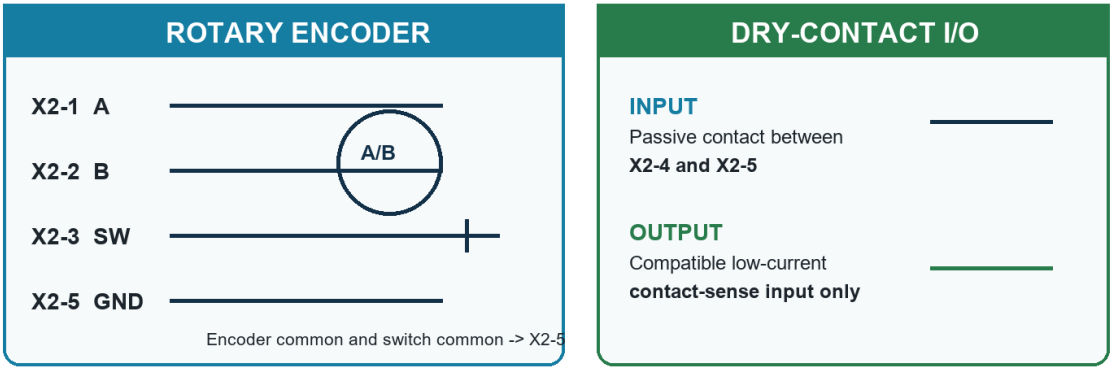
All X2 contacts reference X2-5 Ground (-). X2-4 is a signaling point, not a load output.

2.1 Terminal mapping

Terminal	Label	Function
X1-1	+12 VDC	Nominal Class 2 supply positive through onboard protection
X1-2	Ground (-)	Supply return and circuit common
X2-1	Encoder A	Quadrature phase A contact input
X2-2	Encoder B	Quadrature phase B contact input
X2-3	Encoder SW	Center-switch contact input
X2-4	Dry-contact I/O	Shared input/output signaling point
X2-5	Ground (-)	Common for encoder contacts and dry-contact I/O

2.2 Typical connections

TYPICAL FIELD WIRING



DO NOT connect X2-4 to a powered load, relay coil, lamp, motor, or mains circuit.

Function	Field connection	Casambi behavior
Encoder A/B	Encoder phase contacts to X2-1 and X2-2; encoder common to X2-5	Rotation / dim level
Encoder switch	Normally-open center switch between X2-3 and X2-5	On/off with level memory
Dry input	Passive contact between X2-4 and X2-5	PushButton Element 1
Dry output	Compatible equipment contact-sense input to X2-4; sense common to X2-5	Casambi output channel

ONE SHARED DRY I/O POINT X2-4 contains both the input-sense path and the low-side output path. The fixture profile determines which control is exposed. Never connect X2-4 to a source or load unless the receiving circuit has been approved as a compatible contact-sense input.

2.3 Installation procedure

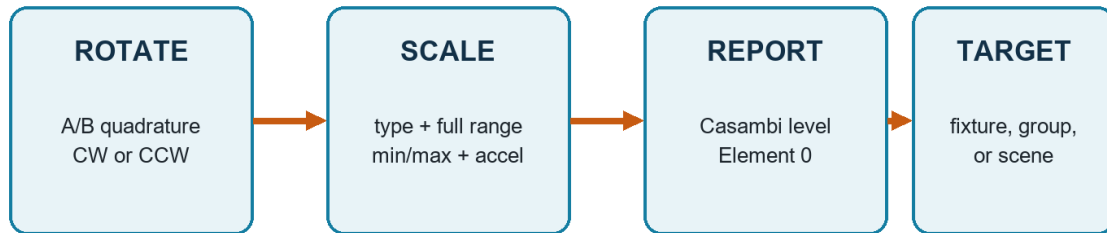
1. **Select a location.** Use an approved indoor enclosure and preserve the radio antenna clearance. Do not place the antenna behind grounded metal unless the production antenna arrangement specifically permits it.
2. **Leave power off.** Verify the Class 2 supply is de-energized. Confirm X1 polarity and the intended nominal 12 V supply before landing conductors.
3. **Wire the encoder.** Connect phase A to X2-1, phase B to X2-2, the center switch to X2-3, and the encoder contact common to X2-5.
4. **Wire the dry I/O if used.** For an input, connect a passive contact from X2-4 to X2-5. For an output, connect only an approved low-current contact-sense circuit.
5. **Connect power.** Connect positive to X1-1 and return to X1-2. Do not use a constant-current LED driver or an unregulated source outside the approved range.
6. **Inspect and energize.** Check loose strands, shorts, reversed polarity, unintended voltage on X2, antenna placement, and connector orientation before applying power.

Installer pre-power checklist

- Supply is Class 2, nominal 12 VDC, and polarity is correct.
- Encoder contacts are passive and share X2-5 Ground (-).
- X2-4 is connected only to a passive contact or approved contact-sense circuit.
- No X2 terminal is connected to mains, 0-10 V, DMX, a relay coil, or another load.
- Production profile, antenna arrangement, and dry-output rating have been confirmed for the installation.

3 Encoder and dry-I/O behavior

ENCODER CONTROL PATH



PUSH toggles OFF/ON using maximum, last-level, or fixed-level memory

GANG shares absolute level and direction with compatible NED gang members

3.1 Rotary encoder

Operation	Firmware behavior
Rotate clockwise	Raises level by default; direction can be reversed
Rotate counter-clockwise	Lowers level by default; while OFF, downward motion remains OFF
Rotate while OFF	Upward motion starts at the configured minimum; button memory is not restored
Press center switch	Toggles OFF/ON; ON level follows the configured memory mode
Fast rotation	Optional acceleration multiplies detent steps while preserving min/max limits
Radio update	First change is immediate; subsequent rapid changes are throttled to 50 ms

MINIMUM-LEVEL BEHAVIOR The knob stops at Minimum Level. Set Minimum Level to 0 only when turning the knob fully down should switch the Casambi level off. The center pushbutton can always command OFF.

3.2 Casambi elements and channel order

App object	Physical function	Use
Element 0	Encoder level	Rotation and center-switch commands
Element 1	Dry-contact input	X2-4 input action and input mode
Output channel 1	Dry-contact output	X2-4 low-side electronic contact

3.3 Multiswitch Gang behavior

Encoder Action and Dry Input Action values 2 through 11 correspond to Gang 1 through Gang 10. A local operation transmits an absolute level, dim direction, and source-channel byte. Compatible powered NED products assigned to the same Gang adopt the level; the EncoderCas encoder also reports its own Element 0 level to the mapped Casambi target.

Gang field	Behavior
Gang ID	2-11 in the parameter list, representing Gang 1-10
Level	Absolute 0-255 Casambi level; not a relative step
Direction	Up/down state used to synchronize alternating dim operation
Encoder source	Channel byte 0xFF; receivers must synchronize by Gang ID
Dry-input source	Channel byte 0 for the single dry-I/O input

COMMISSION THE WHOLE GANG Test every participating station from ON, OFF, and intermediate levels. Confirm dim direction, power recovery, network recovery, and behavior after profile or parameter changes.

4 Add EncoderCas to the Casambi app



4.1 Pair and identify

1. **Power EncoderCas.** Confirm the green activity LED toggles and the device appears in the Casambi app's nearby-device view while the phone is within Bluetooth range.
2. **Choose the approved fixture profile.** Use the EncoderCas production profile and fixture ID. The exact released identifier is an engineering confirmation item.
3. **Add it to the project network.** Use the authorized network and credentials. A device can belong to only one Casambi network.
4. **Name the controls.** Use room and function identifiers that match the project schedule. Identify the encoder and auxiliary dry I/O separately.
5. **Set vendor parameters.** Configure encoder type, direction, range, memory, and dry-I/O behavior before scene programming.
6. **Test and record.** Verify the full encoder range, push-to-toggle, dry input/output, scenes, automations, and any Gang members.

4.2 Radio placement

Bluetooth mesh performance depends on enclosure metal, antenna type, antenna orientation, walls, equipment, and neighboring nodes. Test control from representative occupied locations with the enclosure closed. Follow the final production antenna keep-out and mounting instructions when released.

ANTENNA VARIANT NOT YET CONTROLLED The Rev. A0 schematic/BOM identifies BT840E and notes module-height/antenna alternatives. Confirm the exact production radio module, u.FL cable, and antenna before field issue.

5 Vendor parameters

EncoderCas firmware consumes 12 vendor-parameter indices. The numeric order is part of the firmware interface and must match the released fixture definition. Defaults below come from the firmware's defaultInfo structure.

Index	Suggested label	Purpose	Default
0	Encoder Action	Standalone/inversion label or Gang 1-10	0
1	Encoder Type	Quadrature edges per detent	0
2	Encoder Full Range	16-bit detents from minimum to maximum	24
3	Encoder Direction	Clockwise-up or counter-clockwise-up	0
4	Encoder Acceleration	Off or increasing fast-spin multiplier	0
5	Encoder Minimum Level	Lower knob limit, percent	1
6	Encoder Maximum Level	Upper knob limit, percent	100
7	On/Off Memory	Maximum, last level, or fixed level	1
8	Fixed On Level	Fixed turn-on level, percent	100
9	Dry Input Action	Normal, inverted, or Gang 1-10	0
10	Dry Input Mode	Follow, toggle, hold, or double-tap	0
11	Dry Output Polarity	Normal or inverted electronic contact	0

5.1 Encoder parameter values

Value	Encoder Action	Behavior
0	Standalone - Normal	No gang packet; ordinary encoder action
1	Standalone - Inverted	Fixture label exists; firmware effect requires engineering confirmation
2	Gang 1	Synchronizes with compatible members assigned to Gang 1
3	Gang 2	Synchronizes with compatible members assigned to Gang 2
4	Gang 3	Synchronizes with compatible members assigned to Gang 3
5	Gang 4	Synchronizes with compatible members assigned to Gang 4
6	Gang 5	Synchronizes with compatible members assigned to Gang 5
7	Gang 6	Synchronizes with compatible members assigned to Gang 6
8	Gang 7	Synchronizes with compatible members assigned to Gang 7
9	Gang 8	Synchronizes with compatible members assigned to Gang 8
10	Gang 9	Synchronizes with compatible members assigned to Gang 9
11	Gang 10	Synchronizes with compatible members assigned to Gang 10

Encoder Type

Value	Selection	Use
0	4 edges/detent	Bourns PEC11R/PEC12R/PEC16, Alps EC12, CTS 288 class
1	2 edges/detent	Alps EC11 15 PPR / 30 detent class
2	1 edge/detent	Half-step encoder
3	Smooth / optical	Every quadrature edge counts

Range, direction, acceleration, and memory

Parameter/value	Selection	Behavior
Full Range	4-1000 detents; 24 default	Number of detents from minimum to maximum
Direction 0	Clockwise brighter	Default
Direction 1	Counter-clockwise brighter	Reverses rotation sense
Acceleration 0	Off	One position step per decoded detent
Acceleration 1-4	Increasing	Fast spin multiplies position steps
Minimum	0-100%; 1% default	Knob lower limit; 0 permits knob-off
Maximum	0-100%; 100% default	Knob upper limit
Memory 0	Always maximum	Button turns on to Maximum Level
Memory 1	Last level	Button restores the last non-zero level; default
Memory 2	Fixed level	Button uses Fixed On Level
Fixed On	1-100%; 100% default	Used only by fixed-level memory

VALIDATE LIMITS Firmware clamps Full Range to 4-1000. Minimum and Maximum revert to the full 0-100% span when their ordering is invalid; test the released fixture-definition limits against this behavior.

5.2 Dry-contact input and output values

Value	Dry Input Mode	Behavior
0	On / Off (follow contact)	Maintained switch; closed = ON in Normal action
1	Toggle (each press)	Momentary button; leading edge toggles
2	Hold to brighten	Level increases while held
3	Hold to dim	Level decreases while held
4	Hold alternating	Each press reverses ramp direction
5	Double-tap to full	Hold brightens; double-tap reaches maximum
6	Double-tap to off	Hold dims; double-tap reaches off
7	Double-tap to ends	Alternating hold; double-tap reaches selected endpoint

Dry Input Action and Output Polarity

Value	Selection	Electrical / network result
Input Action 0	Standalone - Normal	Closed contact reports ON
Input Action 1	Standalone - Inverted	Closed contact reports OFF
Input Action 2-11	Gang 1-10	Shares level/direction with matching compatible members
Output Polarity 0	Normal	Casambi ON turns the X2-4 sink on
Output Polarity 1	Inverted	Casambi ON releases the X2-4 sink

SAFE-STATE TEST After changing output polarity, verify the receiving equipment at Casambi ON, OFF, power-up, network loss, and EncoderCas power loss. Normal/inverted describes the electronic contact state, not necessarily the machine action.

6 Startup, acceptance testing, and troubleshooting

Check	Acceptance requirement
Power	Unit remains powered; green activity LED toggles; no abnormal heating
Profile	Released EncoderCas profile and displayed objects match the field schedule
Encoder A/B	Full rotation is stable, correct direction, and reaches configured limits
Center switch	Each press toggles once and restores the intended level
Dry input	Passive contact reports the intended mode without chatter
Dry output	Approved receiving input operates correctly within the released rating
Gang	Every intended member follows absolute level and dim direction
Mesh	Control succeeds from representative occupied locations with enclosure closed
Record	Profile, firmware, parameters, antenna variant, and connected equipment are documented

6.1 Troubleshooting

Symptom	Likely cause	Corrective action
Not visible nearby	No/incorrect power; out of range; already paired	Measure X1; move phone closer; check network ownership
Direction reversed	Encoder A/B swapped or Direction parameter wrong	Correct field wiring or change Encoder Direction
Skips / moves too fast	Wrong Encoder Type, Full Range, or acceleration	Match edges/detent; adjust range; reduce acceleration
Button appears stuck	X2-3 wiring/common error	Verify normally-open contact from X2-3 to X2-5
Dry input never changes	No X2-5 return; external voltage; wrong profile	Remove source; wire passive contact; confirm input object
Dry output fails	Wrong common/polarity; incompatible target	Confirm approved contact-sense circuit and polarity
Gang unexpected	Gang mismatch or incompatible member	Assign the same Gang and retest every member
Short radio range	Metal enclosure, antenna issue, or obstruction	Correct antenna installation and re-test mesh

6.2 Before leaving site

- Exercise clockwise/counter-clockwise travel, center-switch toggle, dry I/O, scene, automation, and every Gang member.
- Record all 12 vendor-parameter values and the released fixture/profile identifier.
- Label X1, X2, the encoder wiring, dry-I/O wiring, and power source consistently with the closeout record.
- Confirm the enclosure, antenna, and controlled product label match the released production configuration.

7 Closeout record

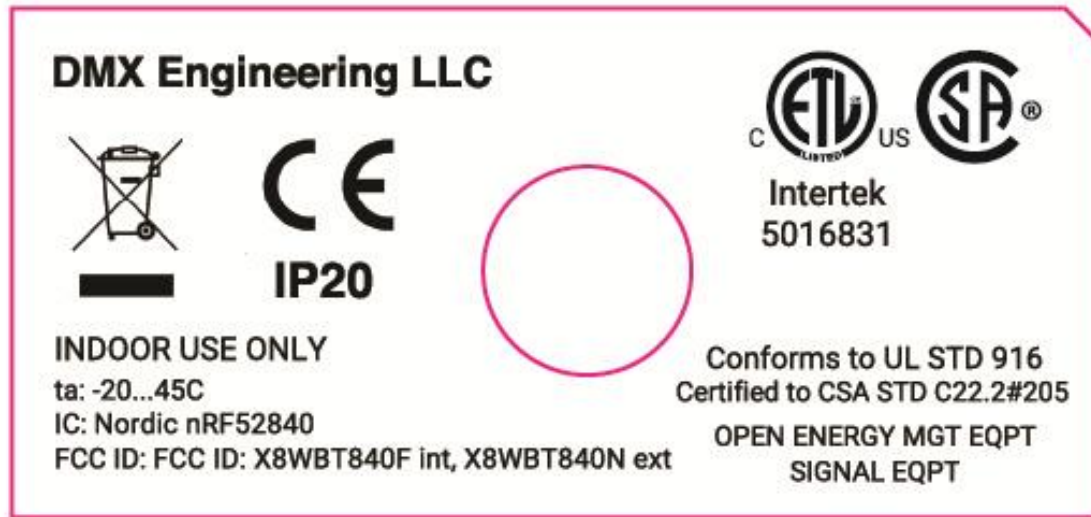
Field	Record
Project / area	
EncoderCas identifier	
Casambi network	
Fixture profile / ID	
Firmware version	
Supply voltage measured	
Radio / antenna variant	
Commissioned by / date	

7.1 Vendor-parameter record

Index	Parameter	As commissioned
0	Encoder Action	
1	Encoder Type	
2	Encoder Full Range	
3	Encoder Direction	
4	Encoder Acceleration	
5	Encoder Minimum Level	
6	Encoder Maximum Level	
7	On/Off Memory	
8	Fixed On Level	
9	Dry Input Action	
10	Dry Input Mode	
11	Dry Output Polarity	

7.2 Product identification and certification label

The cover uses the white-background EncoderCas enclosure rendering and supplied face-label artwork. The bottom-label image below is borrowed from the related product documentation only as a placement and formatting reference. It is not approved EncoderCas artwork and must not be used for production labeling.



REFERENCE PLACEHOLDER Replace the image above with controlled EncoderCas bottom-label artwork before field issue. Do not copy its model name, certification marks, file/control numbers, radio identifiers, or electrical ratings unless each item is specifically approved for EncoderCas.

LABEL CONTROL Confirm that the released label matches the production enclosure, fitted radio and antenna, supply ratings, environmental limits, certification file, model/revision, and production traceability fields. Do not redraw or substitute certification marks.

Artwork item	Status	Release requirement
Product photograph	Required	Show final enclosure, connectors, and terminal legend
Ratings label	Required	Supply range/current, environment, temperature, and model/revision
Radio identifiers	Required	Match the installed BT840 variant and antenna configuration
Certification marks	Required if applicable	Use only marks and file/control numbers approved for EncoderCas
Traceability	Required	Serial/date/lot or other production identification

Appendix A Engineering pin mapping

This mapping is for hardware/firmware review and service documentation. Field wiring uses X1 and X2 only.

Function	Field terminal	Controller pin / signal
Encoder A	X2-1	P0.0 / A
Encoder B	X2-2	P0.1 / B
Encoder switch	X2-3	P0.7 / ENC_SW_IN
Dry-contact input	X2-4	P0.3 / DRY_IN
Dry-contact output	X2-4	P0.2 / DRY_OUT
Common	X2-5	Ground (-)

Internal functions

Internal function	Controller pin	Hardware note
Casambi UART RX	P4.0	BT840E P11/BUTTON -> controller
Casambi UART TX	P4.1	Controller -> BT840E P100_SWO
Activity LED	P1.1	Green LED2
Error LED	P1.0	Red LED1/R3 are not installed on Rev. A0
Supply sense	P2.6	VSENSE ADC input
SWDIO	P3.2	J2-4 debug/programming
SWDCK	P3.3	J2-3 debug/programming
XRES	P1.7	J2-2 debug/programming