

FALCON User's Manual

SYSTEM OVERVIEW

ECO Parking Technologies' FALCON product can be free-standing or integrated into the ECO FLEX-Tech LED lighting fixture (or other applicable luminaires) to provide cost effective parking guidance, enhanced operation's management, and increased safety and security via the on-board vision-based technology. Through a series of vision-based sensors connected via a dedicated hybrid private wireless mesh network, the FALCON system provides data acquisition and processing.

FALCON captures images and processes the number of available parking spaces, presence of pedestrians, local lighting environment, and other defined parameters; utilizing object detection, proprietary on-board machine learning algorithms, and Edge computing.

Individual FALCON units communicate (over a closed, secure, private wireless mesh network) the status of their assigned spaces to the appropriate zonal RGB visual indicators and gateway via wireless access points (APs). The FALCON units may speak directly to the gateway, via area APs, or mesh through other local FALCONS to provide data and status updates.

The gateway communicates space availability to related signage and wayfinding, as is it also capable of analyzing and transmitting other specified information to approved recipients via cellular, Ethernet, or a fiber connection.

When integrated into the ECO FLEX-Tech LED light fixture, the FALCON communicates both ambient light levels and motion detection to the gateway to allow for localized lighting control. The lighting control parameters, i.e. minimum FC and motion detection response, are set in the field during system commissioning. Lighting control is accomplished on a zonal basis wherein fixtures within a user defined field respond in unison to control prompts - raising and lowering light levels as a group within the defined zones. This approach avoids the *popcorn affect* associated with individually controlled lights and illuminates the entire volume within the defined zone for greater safety, security, and customer sense of wellbeing. Lighting zone sizes and minimum FC responses can be set differently depending upon areas of activities, i.e. entry/exit, ramps, drive lanes, pedestrian access points, etc.

The FALCON is designed as an *open protocol* system thus allowing it to communicate, via approved APIs (Application Programming Interfaces), with other ECO vetted operating systems, either directly or via the Cloud.

On-board processing allows the FALCON to function independent of any other operating systems and utilizes the Cloud only for managing data transmission and exchange, all system processing is Edge based.

As the ECO VPN is Azure-based, connecting with Partner Azure-based servers through this Cloud is easily accomplished for both dashboard and event driven transactions. FALCON also has the ability to exchange information through other cloud providers, i.e. AWS, Google, etc. - upon Client request.

FALCON SYSTEM COMPONENT OPERATING PARAMETERS

The FALCON system is a fully integrated parking garage guidance, lighting, data acquisition, and processing device housed in a single unit which is typically installed at the location of the traditional parking garage light. The FALCON vision sensor is offered as an option for existing or new parking lighting systems. The FALCON vision sensor can also be deployed as a free-standing Vision-Based Parking Guidance and/or Count System for both garage and surface lot applications. The System's major equipment components consist of the FALCON Sensor, Gateway, Access Points and optional Custom Signage. Other ancillary equipment may include additional signage for quantitative attributes and wayfinding, PARCS (Parking Access Revenue Controls System) integration, and utilization of ECO's private wireless network. *These parameters and components are subject to change without notice, please verify each design with ECO Parking Technologies.*

Once a FALCON sensor is deployed and power is applied, it will automatically search for the defined garage network, connect, and begin functioning/sending data to the system gateway; this process is automated once power is applied to the unit.

• FALCON – Vision-Based Guidance Sensor Characteristics

Camera:	Single or Dual Camera
LED Indicator(s):	Single or Dual Indicators
Mounting:	Either integrated into ECO light fixture or free-standing
Power Consumption:	6W Maximum per sensor
Power Input:	If integrated into parking light fixture then 100-277VAC, 60Hz line power to grounded 22-28VDC (24VDC) on-board driver. If free- standing unit then either 100-277VAC, 60Hz line power to grounded 22-28VDC (24VDC) on-board driver, or separate grounded 22-28VDC (24VDC) low voltage power source to unit.
Operating Environment:	-40 to +65C, 0-95% Relative Humidity (non-condensing)
UL Listed:	Damp Location
Firmware Version:	1.0.0.1
FCC Regulation Reference:	FCC Part 15.247



• Parking Garage or Area Light

Mounting:

Per photometrics and ECO lighting design layout

Power Consumption:

Dependent upon selected ECO luminaire, nominally 40-100W for parking garage and 100-300W for surface lot application

Power Input:

Grounded 100-277VAC, 60Hz

Operating Environment:

-40 to +65C
0-95% Relative Humidity (non-condensing)

UL Listed:

Damp Location or IP65






ECO FlexTech Parking Garage Luminaire

Product Features: The ECO FlexTech LED parking garage fixture is the most versatile, flexible, up-gradable and energy efficient lighting fixture of its kind. The ECO FlexTech is equipped with a double-refracted lens providing low glare without sacrificing uplighting, while still maintaining tested performance exceeding 120 lumens per watt.

Housing
Cast aluminum two-piece construction with secure latching and set screw locking device.

Reflector
Flat one-piece aluminum painted with high gloss, high heat resistant white TGIC polyester powder over 90% reflectance

Driver
Mean Well electronic, dimming ballast with input voltage of 120-277V

Lens
Acrylic refractor mounted with stainless steel screws

Mounting
Standard surface quick mount, pendant mount option available

Warranty
Five year limited warranty. See warranty terms at www.ecolightsolutions.com

Finish
Chip resistant electrostatic TGIC powder polyester coating, electrostatic applied and baked. Standard white color finish. Additional finishes available, contact factory for options.

Listings
UL cUL listed for wet location
DLC (Qualified Models in table, page 2)
-See DLC QPL for details
(www.designlights.org/QPL)
Title 24 compliant with occupancy sensor

Electrical
- Suitable for operation with line voltage of 120 to 277V +/- 10% VAC.
- High brightness LED module, available in cool white (5000K) or neutral white (4000K)
- Optional Wattstopper for both occupancy and daylight harvesting controls.
- Falcon Vision™ - Integrated, wireless enterprise secured, Guidance, Controls & More

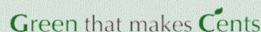
LED Module
Cree LED Modules available in High Efficiency XPG or Ultra Efficiency XPL installations.

ex: FT-GL-60M-U-50-24L-W-CM

Model	Driver (M=Mean Well, P=Programmable)	Voltage	Color Temp.	LED Module	Controls	Mounting
FT-GL	45M or 45P=45 watt	U= Universal 120/277V	50=5000K	24L=XPL Type V lens	Blank or X= No controls	CM=Ceiling mount
	60M or 60P=60 watt		40=4000K	24G=XPG Type V lens	D=Dimming	PR=Pendant ready
	80M or 80P=80 watt			32L=XPL Type II lens	W=Wattstopper	PM=Pendant mount
	100M or 100P=100 watt				FH=Falcon Controls (#=Qty. of Camera)	

Note: Additional customizations available, contact factory for details.





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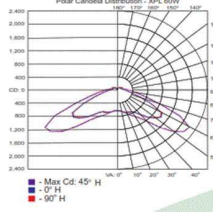
Luminaire Data*

LED Module	System Watts	Initial Lumens	BUG Rating	LPW
45W - 24L	43.5	5,570	B2-U3-G2	128
60W - 24L	57.4	7,026	B3-U3-G2	122
80W - 24L	79.04	8,955	B3-U4-G2	113
100W - 24L	101.41	10,876	B3-U4-G3	108
45W - 24G	45.2	4,881	B3-U3-G2	108
60W - 24G	58.82	5,992	B3-U3-G2	102
80W - 32L	75.7	9,050	B3-U3-G3	119
100W - 32L	100.00	12,312	B4-U4-G4	123

*Luminaire data measured for 5000K color temperature

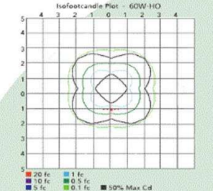
Photometry:

Polar Candela Distribution - XPL 60W



■ Max Cd: 45° H
■ 0° H
■ 90° H

Isocandela Plot - 60W-HO

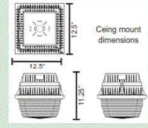


Zonal Lumen Summary - XPL 60W -

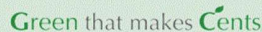
Zone	% Luminaire
0-30	9.2%
0-40	18.1%
0-60	57.2%
60-90	34.6%
90-120	6.0%
0-90	91.9%
90-180	8.1%
0-180	100%

DLC Qualified Items Include:

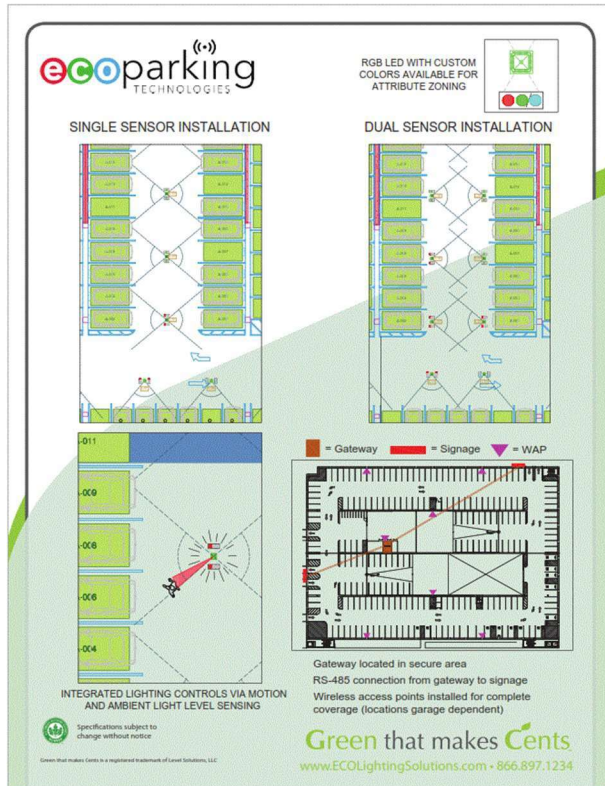
FT-GL-45M-U-50-24G-D, -W, -X
 FT-GL-45M-U-50-24L-D, -W, -X
 FT-GL-60M-U-50-24G-D, -X
 FT-GL-60M-U-50-24L-D, -W, -X
 FT-GL-80M-U-50-24L-D, -W, -X
 FT-GL-80M-U-50-32L-D, -f, -W, -X
 FT-GL-100M-U-50-24L-D, -W, -X
 FT-GL-100M-U-50-32L-D, -f, -W, -X
 * = 4 or 5







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Lighting Controls:

Lighting output from the ECO luminaires are managed in one of three ways:

- * Garage Ingress/Egress – no controls provided so as to address IESNA transitional lighting requirements
- * Garage Ramps & Decks – FALCON luminaires are controlled by the ECO FALCON vision-based sensors to detect motion and ambient light levels. These lights are assigned to User defined groups, allowing the entire luminaire's group output to raise/lower in unison based upon motion and ambient light. User groups can be redefined, as can their responses be tailored to the specific tasks and areas assigned within the garage
- * All other non-FALCON luminaires will be controlled via individual IR sensors

Sensor Indications:



• Gateway (GW)

Mounting: Variable including parking office, IT room, electrical room, secure wall mounted cabinet, etc.

Power Consumption: 24W nominal (Includes Cellular Modem and POE Injector)

Power Input: Grounded 100-277VAC, 60Hz

Communication Connection: One CAT6 Shielded Twisted Pair

(STP)

cable from GW POE switch to designated first Access Point, maximum run 100M.
One CAT6 Shielded Twisted Pair cable from GW USB/RS-485 signage interface to first monument sign, maximum run 650M.

Operating Environment: -40 to +60C
0-95% Relative Humidity (non-condensing)

UL Listed: Wet Location



- **Access Point (AP): UniFi UAP-AC-M-PRO**

Mounting:

Typically two (2) per drive lane, mounted as directed by ECO, facing inward, and in line-of-sight with one another. Mounting height approximately 12" below bottom of "T" and on designated column line. Ensure AP is not obstructed by piping, garage infrastructure or other physical barriers blocking the AP's line-of-sight.



Communication Connection:

APs may be connected to one another either wired or wirelessly, depending upon their duty and System operating criteria.

When a wired connection is defined use CAT6 Shielded Twisted Pair (STP) cable between APs, maximum run 100M. At least one (1) AP per level, typically located on the drive ramp, will be designated as the "Switch" AP and wired to the Switch AP on the level below. The "Switch" AP enclosure will house a POE Switch, and any other wired AP on that level will be hard wired back to this Switch AP, per ECO layout. Maximum individual run of CAT6 STP between APs not to exceed 100M.



All non-wired APs communication is via ECO private wireless MESH network, albeit these APs still require house power.

Power Consumption:

9W Maximum

Power Input:

Wireless Communication (various options)

- 1) 100-120VAC, 60 Hz to POE Injector
- 2) 100-277VAC, 60Hz to grounded 24VDC on-board driver, thence to POE Injector

Wired Communication

- POE AP - CAT6 STP to AP
- Non-POE AP - CAT6 STP to AP, and 1) 100-120VAC, 60Hz to POE Injector or 2) 100-277VAC, 60Hz to grounded 24VDC on-board driver, thence to POE Injector

Power to AP/POE Injector may be from dedicated circuit, parking garage light, or other trusted protected sources.

Operating Environment:

-40 to +65C
0-95% Relative Humidity (non-condensing)

UL Listed:

Wet Location

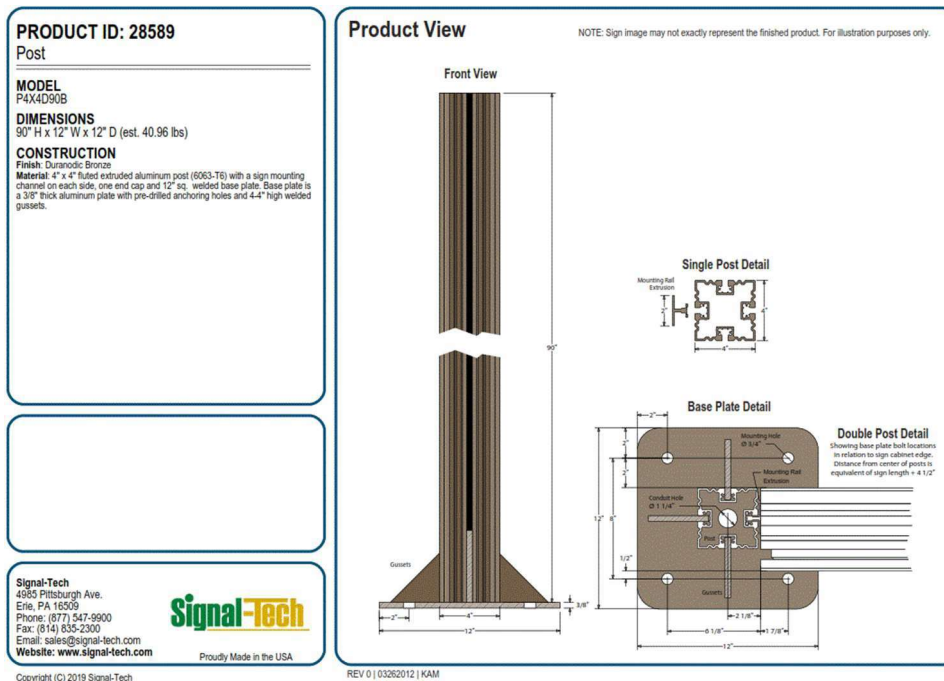
- **Signage (Monument entry signage only)**

Mounting:	Parking facility main entry point, mounting system as defined
Power Consumption:	TBD based upon signage specifics
Power Input:	Grounded 100-277VAC, 60Hz
Communication Connection:	CAT6 Shielded Twisted Pair connection to GW
Operating Environment:	-40 to +65C
UL Listed:	Wet Location



SIGNAGE POST INSTALLATION

For the 90 inch 4x4 post, see Manufacturer's instructions below.



SIGNAGE COMM WIRING & START-UP

The display modules inside the Sign Cabinet will already be wired in **series** (internally daisy-chained), and do not require further attention. However, since each display module has two RS-485 ports there will be an extra (empty) port on both the top and bottom sign modules that do not have wiring connected. See below for internal signage port locations.

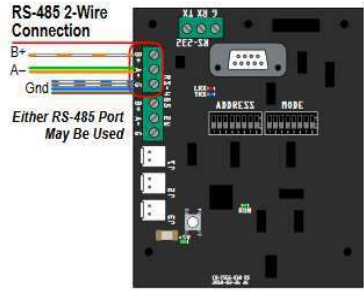
Communications Wiring

Communications are to be provided to the sign via RS-485 2-wire (plus GND connection). Note that there are two RS-485 connections and either one may be used for this connection. They are electrically connected on the circuit board. Using the GND connection is necessary to ensure data integrity. Observe proper daisy-chain protocols for wiring multiple devices to an RS-485 network. In signs with multiple displays, the RS-485 communications have been daisy-chained together at the factory. All serial data is to be configured with parity set to none, 8 data bits, and 1 stop bit, at 9600bps.

Alternatively, RS-232 may be used following the wiring below.

See Fig. 3 for RS-485 2-Wire Communications Wiring
See Fig. 4 for RS-232 Communications Wiring
See Fig. 5 for RS-232 DB9 Communications Wiring

Fig. 3: RS-485 2-Wire Communications Wiring



RS-485 2-Wire Connection

B+
A-
Gnd

Either RS-485 Port May Be Used

Connection of the CAT6 Shielded Twisted Pair (STP) cabling (COMM) between the Gateway and Sign should be made in the Sign to the extra (empty) port on the bottom sign module. This connection will be made via the Signage Bus (inside sign, see **RED box** in image above),

Since CAT6 STP is an EIGHT (8) wire system, and there are only 3 terminals on both the Signage and Gateway terminal blocks, the CAT6 STP cabling must be connected to the proper terminal in twisted pairs as follows:

A(-)	Orange + Green
B(+)	White/Orange + White/Green
GND	Brown + White/Brown + Blue + White/Blue



Gateway COMM connection is via Serial/USB connector located inside the Gateway (see adjacent photo), to which the CAT6 STP from the sign must be connected.

Once the COMM wiring is completed and wiring blocks re-connected to their ports in the Sign and Gateway, the next step is to determine the address for each display panel. The address is controlled by the DIP Switches (see image above for “ADDRESS” switch location to right of **RED box**), which should be Factory configured. Please take a photo of each panel’s DIP Switch setting and forward to ECO, starting with the bottom display panel and moving up in sequence.

Once the DIP Switch information is recorded from the back of the Sign, please verify each panel’s unique address on the front, as follows. Upon powering-up the Sign this unique address will be displayed on the front of each display panel for the first few seconds, before going into its normal operation mode. By power-cycling the Sign and taking a photo of the front of the display panels at start-up, these unique addresses can be verified. Upon providing photos of the DIP Switch positioning and the unique codes displayed on the front of the Sign to ECO, we will then be able to complete the balance of the mapping/configuration in the Gateway remotely.

DIP SWITCH SETTINGS (Alternate)

Should the front of the Sign display “read” all the same unique codes when initially powered, please contact ECO immediately as the DIP Switches within the Sign will need to be re-set. Since these are on a binary basis, a typical five (5) level sign will require the following DIP Switch settings:

	Switch #1	2	3	4	5	6	7	8
Level 1	O N	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Level 2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
Level 3	O N	ON	OFF	OFF	OFF	OFF	OFF	OFF
Level 4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
Level 5 (Top Deck)	O N	OFF	ON	OFF	OFF	OFF	OFF	OFF

When complete, take photographs of the DIP Switch settings inside the Sign, thence power cycled the Sign and photograph the display on the front of the Sign for validation purposes. Please sent such photos to ECO for address confirmation and subsequent commissioning.

Federal Communication Interference Statement

Changes or modifications not expressly approved by Eco Parking Technologies could void the user's authority to operate the equipment

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.²

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.