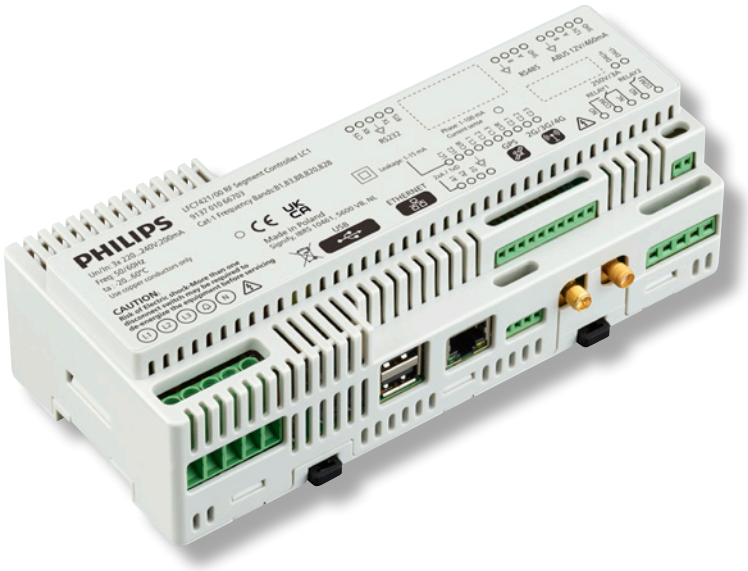
PHILIPS

RF Segment Controller



Specification Sheet

LFC7420, LFC7421, LFC7422, LFC7423, LFC7424

RF Segment Controller

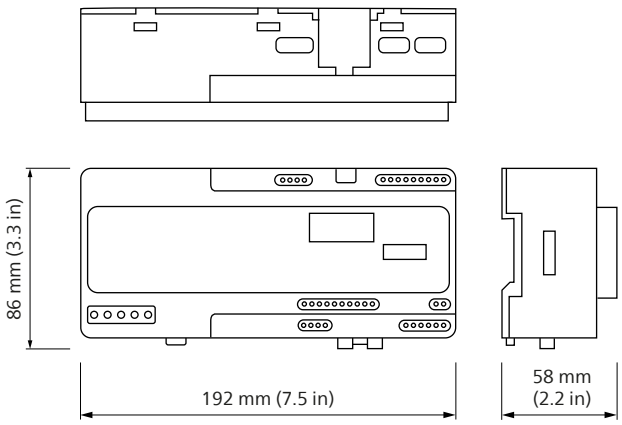
The RF Segment Controller is designed to control, monitor and report the status of the RF Nodes individually to the light management system.

The RF Segment Controller is equipped with a powerful ARM Cortex A7 (1.3 GHz) processor and a Linux Operating system. It supports 2G, 3G and 4G modems for communicating with light management system.

LFC7420, LFC7421, LFC7422, LFC7423, LFC7424

The RF Segment Controller serves as a communication device and data concentrator module. Two-way communication with the central server takes place via Ethernet, GPRS (3G/2G/4G). The module can automatically switch between different available communications carriers to provide stable and reliable communication.
Data is either delivered to the server immediately or stored locally in the built-in flash or external SD card memory of the RF Segment Controller until scheduled delivery. Software and configurations are updated remotely from the server and stored on the RF Segment Controller enabling it to autonomously execute tasks, for example, control the streetlights, monitor and report the status readings based on the set up by the user.
If the module is installed together with a Battery module, the RF Segment Controller will be supplied with backup power via the A Bus in the event of power failure. This enables the RF Segment Controller to store data and send a main power failure alarm to the central server before it shuts down safely.
For more detailed information, see the specific module manuals and guides.

Dimensional drawing



Applications

The RF Segment Controller is designed to control and monitor streetlights with the help of RF Nodes and report the status of the streetlights back to the management and light control software. It is designed for use in residential, streets and road applications, including parking lots, ports, and train stations. The design of the Segment Controller is optimized for installation in electrical cabinets; either existing cabinets next to the road or mounted in a separate cabinet on a (light) pole or a wall. Depending on the application, up to 1,000 RF Nodes can be connected to one Segment Controller in a network. The Philips RF Segment controller is released and authorized to solely interact with Philips Gen1 and Gen2 RF Nodes.

For remote connectivity, a 2G/3G/4G network can be used or Ethernet connectivity (depending on application, firmware, and security).

Benefits and advantages

The major benefits and advantages of using the RF Mesh system are:

- Improve safety by detecting, reporting, and reducing night blackouts.
- Reduce energy consumption through dimming and switching.
- Save costs on maintenance through reduced lamp scouting and improved predictive maintenance.
- Reduce light nuisance so that the light levels are in harmony with their surroundings and dim-up on-demand when required.

Functional specifications

Primary

Power	L1, L2, L3, 🔔, N
Three mains rated phase (line) inputs	L1/L2/L3
Mains-related alarm monitor input or cabinet door alarm	1 🔔 Hardware ready.
One mains-neutral input	N

The RF Segment Controller can be mains powered by one, two, or three phases plus neutral.
Before connecting the power supply to RF Segment Controller, connect the LFC7590 Surge Guard to the power supply to safeguard the controller.

If a fault occurs on one or two phases, the RF Segment Controller will still be powered by the remaining phase(s).

Interfaces

USB	2x USB 2.0 host port for additional devices.
Analog (A1, A2)	2x Low voltage measurement inputs analog input 1 and analog input 2 (positive voltage with respect to GND).
Digital (D1)	1x Low voltage input digital input (positive voltage with respect to GND).
Ethernet	RJ-45 connector, 100/10 Mbps, half and full duplex, functional insulated from the secondary connections.
GPS	Hardware ready. SMA connector for external GPS antenna. Insert the GPS antenna in the antenna socket (SMA connector) of the RF Segment Controller and tighten it gently with your fingers. Do not use tools.
2G/3G/4G	Insert the antenna in the antenna socket (SMA connector) of the RF Segment Controller and tighten it gently with your fingers. Do not use tools. .
SIM card	LFC7420 Micro SIM card built-in. LFC7421, LFC7422, LFC7423, LFC7424 inserted on the top part of the Segment Controller.
A-Bus	A-Bus is used for the controller power outage notification (last gasp) with LFC7530.
RS485	Hardware ready.
DALI	Hardware ready.
RS232 interface	Hardware ready.
Status LEDs	All ON: Power up Green: Connectivity (APN and Open VPN) Red: Mains power.

Reliability and Maintainability

Software upgrade/ installation	The software on the RF Segment Controller can be updated remotely from the central server. New software is transferred without interrupting the normal functionality of the Segment Controller. When the software has been transferred, the integrity of the software is checked, and then software is installed for operations.
Multi-layer system	Various internal processes ensure that the system is up and always running.
System health	In case a process has failed, it is restarted without disturbing other processes.

RF Segment controller Inputs and Peripherals

RF Segment controller configured with below inputs for different peripherals.
A1 – UPS Power loss detection
A2 – UPS Low battery detection
D1 – Light sensor

Pin Status	Low	High
A1	AC Mains powered	AC Mains loss
A2	Battery voltage normal	Battery voltage low
D1	Dark	Light

Installation

The RF Segment Controller should be protected from dust and water, preferably by enclosing the system in a metal IP class 65 (NEMA type 4) outdoor cabinet.

Connections on the primary side

Keep wiring short from the mains circuit breaker towards the mains power input.

When using a surge protection module, the wires between the surge protection module and the RF Segment Controller may not exceed 0.15 m.

Signify recommends using a surge protection module for outdoor applications.

Caution
Disconnect the power supply of the cabinet before any work on wiring connections or during maintenance of the lighting system.

Connections on the secondary side

All cables on secondary side should preferably be shielded, with the shield connected to GND (pin5 for the A-Bus)

EU directives	Use shielded twisted pair (2x2) cable. The RF Segment Controller can be connected to any client module for example RS485 module or Switch module. Double connections on the A-Bus makes daisy-chaining of the signals easy. For detailed information, see wiring diagrams.
A-Bus cable	cable length < 3 m
Analog/Digital Input	cable length < 3 m
USB	cable length < 3 m
Ethernet	cable length < 3 m
Mains Input	cable length < 1.5 m

Connections

Mains power connector	0.82 to 1.5 mm^2 (18 to 14 AWG) solid/stranded; copper conductors only, wire rating 65 °C (149 °F) min.; wire strip length: 8 to 9 mm (0.31 to 0.35 in); tightening torque: 0.40 to 0.50 Nm (0.30 to 0.37 ft-lb).
Analog/Digital input, A-Bus, RS485, RS232, Current sensing connectors	0.14 to 0.5 mm^2 (26 to 20 AWG) solid/stranded; wire strip length: 5 mm (0.2 in); tightening torque: 0.20 to 0.24 Nm.
DALI connectors	0.14 to 0.5 mm^2 (26 to 20 AWG) solid/stranded; wire strip length: 5 mm (0.2 in); tightening torque: 0.15 to 0.20 Nm.
Relay connector	0.82 to 1.5 mm^2 (18 to 14 AWG) solid/stranded; wire strip length: 6 mm (0.24 in); tightening torque: 0.40 to 0.44 Nm.
Ethernet	Tab-Down RJ-45 meets IEEE 802.3 Standard with minimum of 1,500 Vrms isolation.
USB	USB 2.0 Type-A Receptable.
2G/3G/4G	Antenna SMA female; Impedance 50 Ω, Tightening torque: max 0.5 Nm (0.37 ft-lb).

Technical specifications

Mechanical

Top part	Polycarbonate Light Gray (RAL 7035)
Base part	Polycarbonate Light Gray (RAL 7035)
Coating	PCBA with Permanent coating
Mounting	DIN-rail (EN50022)
Weight	385 g (13.6 oz)
Dimension (l x w x h)	192 x 86 x 58 mm (7.56 x 3.39 x 2.28 in)

Envirionmental conditions

Operating temperature (T_a)	-20 to 60 ˚C
Storage temperature	-40 to 85 ˚C
Humidity	20 to 90% non-condensing

Power Supply

Rated Input Voltage	220 – 240 Vac (3P + N)
Nominal voltage	230 Vac
Operational input range	120 – 277 Vac
Frequency	50 to 60 Hz
Relay Endurance on given maximum 100.000 operations COM1, NO 1 750 VA COM1, NC 1 750 VA COM2, NO 2 750 VA	Max switching voltage: Rated 250 V; Performance Range: 120 to 277 V. Max switching current: 3A (resistive load), 0.75 A (inductive load, such as contactor).
Power consumption	< 3 W, RF Segment Controller only, no load on A-Bus and USB.
Nominal power consumption	< 5.5 W, RF Segment Controller with one Battery module.
Maximum system power consumtion	< 18 W, RF Segment Controller and 460 mA on A-Bus and each 250 mA on 2x USB.
USB	maximum 250 mA, 5V
Current consumption (powered via A-Bus)	Typical 100 mA, Max 300 mA at 12V

Robustness and reliability

Operational lifetime	70,000 hrs
Lifetime failure rate	10.0%

Measurement characteristics

Input mains	Accuracy within 120 - 277 Vac range: ± 5% FSD (Full Scale Deflection).
Analog input (A1, A2)	ADC input range 0-10 V, 4-20 mA (0-20 mA): Impedance = 510 Ω (DC) Accuracy = ± 2% FSD at 25 °C. Resolution: 12-bit ADC When used as digital Input Voltage range, logic HIGH= > 2.5V and < 10V, logic LOW= < 2.5V: Threshold of approximately 1 V. Absolute maximum input voltage = 12 V (A-Bus voltage can be used.).
Digital input (D1)	Dry contact Internal 100 KΩ resistor: 1 MΩ pull-up resistor. Connect the ACTIVE LOW signal (Internal 3.3V pull-up) terminal to GND for a digital low. Make sure that the terminal to GND resistance is below 1 KΩ (current internally limited to 3 µA). Keep wires connected to this high-impedance input away from disturbing networks.

GSM/GPRS/EDGE

Bands	E-GSM 900, DCS 1800
Conducted Transmit Max output power	E-GSM 900: • 31-34 dBm; GMSK mode (Class 4; 2 W, 33 dBm). • 24.5-29.5dBm; 8PSK mode (Class E2; 0.5 W, 27 dBm). DCS 1800: • 28-31 dBm; GMSK mode (Class 1; 1 W, 30 dBm). • 23.5-28.5dBm; 8 PSK mode (Class E2; 0.4 W, 26 dBm).

GPRS	• DTM (simple class A) operation. • GPRS Multislot class 10 (no backoff) – Four Rx slots (maximum), two Tx slots (maximum), five active slots total. • Coding schemes CS1, CS2, CS3 and CS4. • GEA1, GEA2 and GEA3. • Ciphering. WCDMA/GERAN system selection.
EDGE	• E2 power class for 8 PSK. DTM (simple Class A), Multislot class 12. • EGPRS – Multislot class 12 (with backoff). • BEP reporting. • SRB loopback and test modes A and B. • 8-bit and 11-bit RACH. Support PBCCH. • One-phase/two-phase access procedures. • Link adaptation and IR. NACC, extended UL TBF. Support PFC/PFI (Packet Flow context/Packet Flow identifier). • GPRS/EDGE MSC 12-EDA – permits allocation of more than two uplink timeslots for GPRS/EDGE. • Enh DL RLC/MAC. • Segmentation – permits reception of MAC control messages that exceed one radio block capacity in length. • Enhanced Ext UL TBF – dummy block transmission is punctured for current saving purposes. • 2G PS handover – packet- switched equivalent of CS handover to ensure faster cell change and improved throughput.
SIM card	Support Micro SIM card. Micro SIM card is inserted on top part of the RF Segment Controller.
SD Card	Micro SD card is inserted with 16GB in the Segment Control Unit.

WCDMA

Bands	• LFC7420 and LFC7421 (WP7607-1): B1, B8 • LFC7422 (WP7608-1): B1, B8 • LFC7423 (WP7609): B1, B5, B8
Conducted Maximum Transmit power	• LFC7420 and LFC7421 (WP7607-1): 21.5-24 dBm; Power Class 3 bis • LFC7422 (WP7608-1): 22-25 dBm; Power class 3. • LFC7423 (WP7609): 21.5-24dBm; Power class3 bis.
WCDMA R99	All modes and data rates for WCDMA FDD. PS data rates of 384 kbps DL and 384 kbps UL.
WCDMA R8 HSDPA	• PS data speeds up to 42 Mbps (UE category 24) on the downlink. • HS-DSCH (HS-SCCH, HS- PDSCH and HS-DPCCH). • Maximum of 15 HS-PDSCH channels, both QPSK and 16 QAM modulation. • Support for 3GPP-defined features. • Switching between HS-PDSCH and DPCH channel resources, as directed by the network. • STTD on both associated DPCH and HS-DSCH • Simultaneously. • CLTD mode 1 on the DPCH when the HS-PDSCH is active. • STTD on HS-SCCH when STTD or CLTD mode 1 are configured on the associated DPCH. Support SCH-IC. Support HS-DSCH DRX.
WCDMA R6 HSUPA	• E-DCH data rates of up to 5.76 MB/s for 2 ms TTI (UE category 6) uplink. • Support for 3GPP-defined features. • STTD on all HSUPA downlink channels. • CLTD mode 1 on HS-PDSCH and DPCH along with HSUPA channels. • Switch between HSUPA channels and DPCH channel resources, as directed by network. • Handover using compressed mode with simultaneous E-DCH and HS-DSCH interactive, background and streaming. • QoS classes. • Support DPCCH DTX.

LTE

Conducted Tx Max output power	20.3 – 24 dBm; Power class 3 at all bands
LTE R13	eDRX (Extended Discontinuous Reception) to extend battery life in devices that do not require frequent network access.

LTE R10	Release 10 mandatory LTE Features
	• Date rates: Cat1 FDD (up to 10 Mbps downlink, 5 Mbps uplink); Cat4 FDD (up to 150 Mbps downlink, 50 Mbps uplink) 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz RF bandwidth.
	• IPv6, QoS.
	• Inter-RAT capabilities with HSPA+ (WP7609 only).
	• NAS & PPC standalone security
	• Commercial Mobile Alert System (CMAS).
	• ETWS (Earthquake Tsunami Warning System) notification.
	• Inter-frequency/bandwidth mobility.
	• DRX cycle while in Connected mode/ Idle mode.
	• UE IART support for Self Organizing Networks and Automatic Neighbor Relation (SON AR).
	• Mode reselections: LTE ↔ GERAN Idle mode mobility (cell reselection); LTE ↔ UMTS Idle mode mobility (cell reselection).
	Mode redirections:
	  • UMTS to LTE redirections;
	  • GERAN to LTE redirections;
	  • LTE to UMTS redirections.
	• LTE to UMTS PS Handover.
	• LTE/GW Data Silent Redial for InterRAT.
	• Attach/detach PS during Voice Call or SMS
	• WCDMA fallback (WP7609 only)

LTE System Determination	• Frequency Scan and System Selection within LTE
	  • LTE BPLMN support
	  • LTE Connected mode OOS
	• System selection across RATs, Standalone Security, Dedicated EPS Bearer Management and Dormancy.
	• System selection across LTE, UMTS (WP7609 only), Green 256 UPLMN nad 256 OPLMN entries in UIM support Carrier Specific BSR Requirements.

LTE Data	• Data call throttling. • Default IPv4 bearer activation at attach/IPv4 data call. • NW and UE initiated QoS. • Dual IP and IPv4/IPv6 continuity. • IPv4/IPv6 session continuity. • W/G IP Session continuity. • Emergency services- LTE NAS Support for Control Plane LTE Positioning Protocol.

LTE bands

LFC7420/00 (Global Signify SIM)	Cat1: B1, B3, B7, B8, B20, B28
LFC7421/00	Cat1: B1, B3, B7, B8, B20, B28
LFC7422/00	Cat1: B1, B3, B5, B8, B40, B41
LFC7423/00	Cat4: B1, B3, B5, B8, B40, B41

Safety and EMC

The product is classified as Information Technology Equipment.

Safety

IEC62368-1	(Safety) Audio/video, information and communication technology equipment
AS/NZS 62368-1:2022	Audio/video, information, and communication technology equipment – Part 1: Safety requirements

EMC (Immunity and Emission)	
CISPR 32 (EMI - Emission)	Electromagnetic compatibility of multimedia equipment – Emission requirements
CISPR 35 (EMS – Immunity)	Electromagnetic compatibility of multimedia equipment - Immunity requirements.
EN IEC 61000-6-1 (2019)	Electromagnetic compatibility (EMC). Part 6-1: Generic standards. Immunity standard for residential, commercial and light-industrial environments
EN IEC 61000-6-2 (2019)	Electromagnetic compatibility (EMC). Part 6-2: Generic standards. Immunity standard for industrial environments
EN IEC 61000-6-3 (2019)	Electromagnetic compatibility (EMC). Part 6-3: Generic standards. Emission standard for equipment in residential environments
EN IEC 61000-6-4 (2019)	Electromagnetic compatibility (EMC). Part 6-4: Generic standards. Emission standard for industrial environments
RF Exposure	EN IEC 62311 AS/NZS 2772.2:2016+A1:2018
RED	
ETSI EN 301489-1 V2.2.3	Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part1: common technical requirements; Harmonized Standard for Electro Magnetic Compatibility
ETSI EN 301489-19 V2.2.0	Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications and GNSS receivers operating in the RNSS band (ROGNSS) providing positioning, navigation, and timing data; Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
ETSI EN 301489-52 V1.1.2	Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part52: Specific conditions for Cellular Communication Mobile and portable (UE) radio and ancillary equipment; Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
ETSI EN 301511 V12.5.1	Global System for Mobile communication (GSM); Mobile Stations (MS) equipment; Harmonized Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
ETSI EN 301908-1 V13.1.1	IMT cellular networks; Harmonized Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 1: Introduction and common requirements
ETSI EN 301908-2 V13.1.1	IMT cellular networks; Harmonized Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 2: CDMA Direct Spread (UTRA FDD) User Equipment (UE)
ETSI EN 301908-13 V13.1.1	IMT cellular networks; Harmonized Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU; Part13: Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE)
ETSI EN 303413 V1.1.1	Satellite Earth Stations and Systems (SES); Global Navigation Satellite System (GNSS) receivers; Radio equipment operating in the 1 164 MHz to 1 300 MHz and 1 559 MHz to 1 610 MHz frequency bands; Harmonized Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

Sustainability

RoHS directive	2011/65/EC
Hazardous substances	RoHS Directive 2011/65/EU, as amended by Directive (EU)2017/2102 of November 2017
Chemical substances	REACH Directive 2006/1907/EC
Electronic waste	WEEE Directive 2012/19/EU

Note
RF Segment Controllers are only orderable as part of kits. See the LFC742x RF Segment Controller Kit specification sheet for ordering details.

Ordering Data

Type	MOQ	Ordering number
LFC7420/00 RF Segment Controller GC	1	9137 010 66603
LFC7421/00 RF Segment Controller LC1	1	9137 010 66703
LFC7422/00 RF Segment Controller LC2	1	9137 010 67703
LFC7423/00 RF Segment Controller LC3	1	9137 010 67803
LFC7424/00 RF Segment Controller	1	9137 010 67903

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