LCOS LX 7.00

Addendum

10/2024

LANCOM SYSTEMS

Contents

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LANCOM Systems GmbH

A Rohde & Schwarz Company

Adenauerstr. 20/B2

52146 Würselen, Germany

Germany

www.lancom-systems.com

1 Addendum to LCOS LX version 7.00

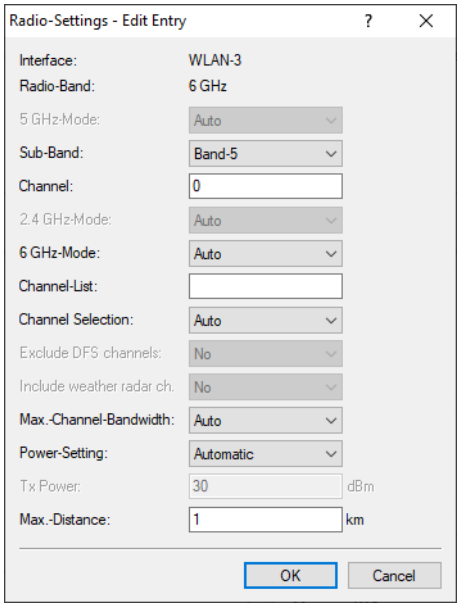
This document describes the changes and enhancements in LCOS LX version 7.00 since the previous version.

2 Support for Wi-Fi 7 / IEEE 802.11be

As of LCOS LX 7.00, Wi-Fi 7 resp. IEEE 802.11be is supported. For this purpose, the configuration has been extended by the options described below.

Radio settings

The radio mode per band has been expanded to include selection options for IEEE 802.11be. The settings can be found under **Wireless LAN** > **WLAN networks** > **Radio settings**.



5-GHz mode

Here you configure the mode used for 5-GHz radio operation. This directly affects the available data rates. If a restriction is set here, a client attempting to login triggers a check to see whether the modes used by the client match with those configured here. Depending on this, the login is allowed or denied. The following modes are available:

Auto

All modes supported by the device are used.

11an-mixed

The modes 802.11a and 802.11n are used.

11anac-mixed

The modes 802.11a, 802.11n and 802.11ac are used.

11nac-mixed

The modes 802.11n and 802.11ac are used.

11ac-only

Only the 802.11ac mode is used.

11anacax-mixed

The modes 802.11a, 802.11n, 802.11ac and 802.11ax (Wi-Fi 6) are used.

11anacaxbe-mixed

The modes 802.11a, 802.11n, 802.11ac, 802.11ax (Wi-Fi 6) and 802.11be (Wi-Fi 7) are used.

Maximum compatibility and performance is available by setting the mode to **Auto**.

6-GHz mode

Here you configure the mode used for 6-GHz radio operation. The following modes are available:

Auto

All modes supported by the device are used.

802.11ax

The mode used is 802.11ax (Wi-Fi 6E).

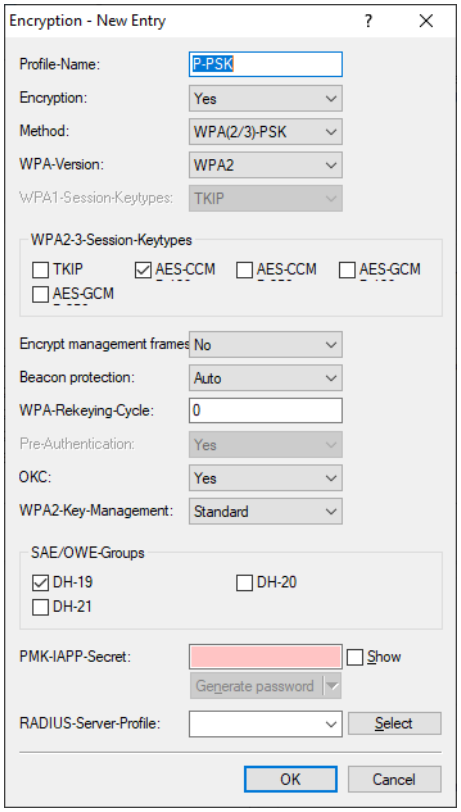
11axbe-mixed

The modes 802.11ax (Wi-Fi 6) and 802.11be (Wi-Fi 7) are used.

Maximum compatibility and performance is available by setting the mode to **Auto**.

WPA Session Key Types

The WPA session key types can now be customized. You can find the settings under **Wireless-LAN** > **WLAN-Networks** > **Encryption**.



WPA2/3-Session-Keytypes

Configure here which session key type should be offered for WPA version 2 or 3. This also influences the encryption method used. The following types are available for selection:

TKIP

TKIP encryption is offered.

AES-CCMP-128

This procedure of the Advanced Encryption Standard (AES) is offered.

AES-CCMP-256

This procedure of the Advanced Encryption Standard (AES) is offered.

AES-GCMP-128

This procedure of the Advanced Encryption Standard (AES) is offered.

AES-GCMP-256

This procedure of the Advanced Encryption Standard (AES) is offered.

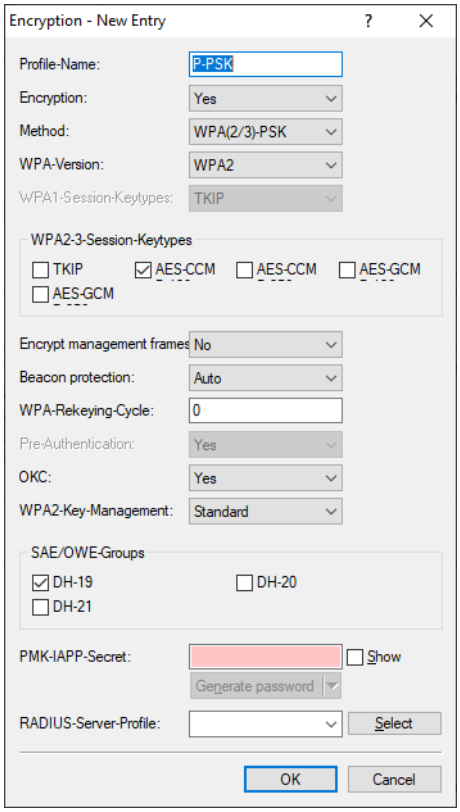
For maximum compatibility with legacy clients, the sole setting AES-CCMP-128 should be used. Please note that IEEE 802.11be standard-compliant operation requires the use of AES-GCMP-256. Based on experience, current Wi-Fi 7 clients also support other encryption methods, such as AES-CCMP-128, or combinations thereof. This is especially important when operating mixed SSIDs for Wi-Fi 7 and older clients, which generally only support AES-CCMP-128. If in doubt, use a separate SSID for Wi-Fi 7 with the appropriate encryption settings.

Employing TKIP is only recommended for operating older WLAN clients which do not support AES.

If a WLAN network uses only WEP or WPA with TKIP for encryption, the WLAN clients connected to it achieve a maximum gross data rate of 54 Mbps.

Beacon Protection

The IEEE 802.11be (Wi-Fi 7) standard stipulates the use of beacon protection. The settings can be found under **Wireless-LAN** > **WLAN-Networks** > **Encryption**.



Beacon Protection

The IEEE 802.11be (Wi-Fi 7) standard stipulates the use of beacon protection. This can be configured here.

The preset “Auto” mode automatically switches Beacon Protection on for all radios that support IEEE 802.11be. To increase compatibility with legacy clients, it may be necessary to switch off Beacon Protection.

2.1 Additions to the Setup menu

2.1.1 5GHz-Mode

Here you configure the mode used for 5-GHz radio operation. This directly affects the available data rates. If a restriction is set here, a client attempting to login triggers a check to see whether the modes used by the client match with those configured here. Depending on this, the login is allowed or denied. The following modes are available:

Maximum compatibility and performance is available by setting the mode to **Auto**.

SNMP ID:

2.20.8.3

Console path:

Setup > **WLAN** > **Radio-Settings**

Possible values:

11an-mixed

The modes 802.11a and 802.11n are used.

11anac-mixed

The modes 802.11a, 802.11n and 802.11ac are used.

11nac-mixed

The modes 802.11n and 802.11ac are used.

11ac-only

Only the 802.11ac mode is used.

11anacax-mixed

The modes 802.11a, 802.11n, 802.11ac and 802.11ax (Wi-Fi 6) are used.

11anacaxbe-mixed

The modes 802.11a, 802.11n, 802.11ac, 802.11ax (Wi-Fi 6) and 802.11be (Wi-Fi 7) are used.

Auto

All modes supported by the device are used.

2.1.2 6GHz-Mode

Here you configure the mode used for 5-GHz radio operation. This directly affects the available data rates. If a restriction is set here, a client attempting to login triggers a check to see whether the modes used by the client match with those configured here. Depending on this, the login is allowed or denied. The following modes are available:

Maximum compatibility and performance is available by setting the mode to **Auto**.

SNMP ID:

2.20.8.19

Console path:

Setup > **WLAN** > **Radio-Settings**

Possible values:

11ax

The mode 802.11ax (Wi-Fi 6) is used.

11axbe-mixed

The modes 802.11ax (Wi-Fi 6) and 802.11be (Wi-Fi 7) are used.

Auto

All modes supported by the device are used.

2.1.3 WPA2-3-Session-Keytypes

Configure here which session key type should be offered for WPA version 2 or 3. This also influences the encryption method used.

Operating TKIP is only recommended when using older WLAN clients which do not support AES.

If a WLAN network uses only WEP or WPA with TKIP for encryption, the WLAN clients connected to it achieve a maximum gross data rate of 54 Mbps.

For maximum compatibility with legacy clients, the sole setting “AES-CCMP-128” should be used. Please note that IEEE 802.11be standard-compliant operation requires the use of AES-GCMP-256. Based on experience, current Wi-Fi 7 clients also support other encryption methods, such as AES-CCMP-128, or combinations thereof. This is especially important when operating mixed SSIDs for Wi-Fi 7 and older clients, which generally only support AES-CCMP-128. If in doubt, use a separate SSID for Wi-Fi 7 with the appropriate encryption settings.

SNMP ID:

2.20.3.13

Console path:

Setup > **WLAN** > **Encryption**

Possible values:

TKIP

TKIP encryption is offered.

AES-CCMP-128

This procedure of the Advanced Encryption Standard (AES) is offered.

AES-CCMP-256

This procedure of the Advanced Encryption Standard (AES) is offered.

AES-GCMP-128

This procedure of the Advanced Encryption Standard (AES) is offered.

AES-GCMP-256

This procedure of the Advanced Encryption Standard (AES) is offered.

Default:

AES-CCMP-128

2.1.4 Prot.-Beacons

The IEEE 802.11be (Wi-Fi 7) standard stipulates the use of beacon protection. This can be configured here.

SNMP ID:

2.20.3.15

Console path:

Setup > **WLAN** > **Encryption**

Possible values:

No

Beacon Protection switched off.

Yes

Beacon Protection switched on.

Auto

This mode automatically switches on Beacon Protection for all radios that support IEEE 802.11be. To increase compatibility with legacy clients, it may be necessary to switch off Beacon Protection.

Default:

Auto

3 Spanning Tree Protocol

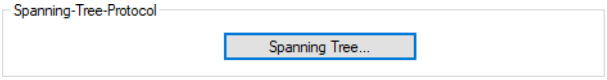
In networks with multiple switches and bridges, there can be multiple physical connections between two connected network participants. These redundant data paths are desirable, as they provide alternative routes to the destination if individual network segments fail. On the other hand, these multiple connections can lead to undesirable loops or duplicate frame reception. Both effects disrupt the smooth flow of data in the network.

In particular, when using LANCOM LX-7500 access points for hitless failover, the use of the (Rapid) Spanning Tree Protocol ((R)STP) is essential to ensure redundancy not only in power supply but also in data transmission and to prevent the formation of a loop.

Alternatively, LACP can also be used in conjunction with hitless failover. Depending on the access point model, link speed and switching speed should be considered.

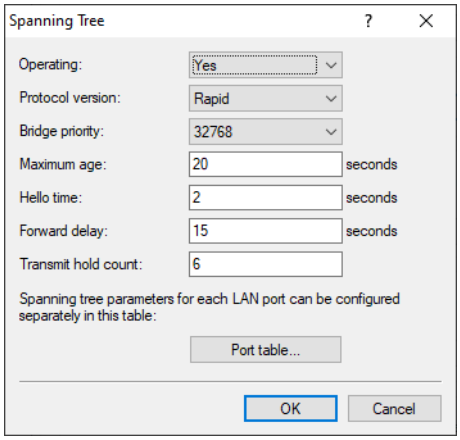
By default, RSTP is enabled on the LANCOM LX-7500 to allow out-of-the-box operation with both Ethernet connections. In general, the Spanning Tree Protocol is supported by all access points with at least two Ethernet ports.

LANconfig: **Interfaces** > **Port Config** > **Spanning Tree Protocol**



3.1 Configuring the Spanning Tree Protocol

Use **Spanning Tree** to configure the Spanning Tree Protocol.



Operating

When Spanning Tree is disabled, a device does not send Spanning Tree packets and forwards any received Spanning Tree packets instead of processing them itself.

Protocol version

Classic

Uses the classic STP procedures for determining network topology.

Rapid

Uses the RSTP procedures for determining network topology.

RSTP is compatible with STP. If components in the network only support classic STP, STP procedures will be used even when RSTP is enabled.

Bridge priority

Sets the priority of the bridge in the LAN. This can influence which bridge is preferred as the root bridge by the Spanning Tree Protocol.

For compatibility with RSTP, this value should only be changed in increments of 4096, as RSTP uses the lower 12 bits of this 16-bit value for other purposes.

Maximum age

This value determines the time (in seconds) after which a bridge discards messages received via Spanning Tree as "stale". This parameter defines how quickly the Spanning Tree algorithm responds to changes, e.g., due to bridge failures.

Modifying this time value is recommended only with a thorough understanding of the Spanning Tree Protocol. Adjustments may be useful to optimize response times to topology changes or to ensure stable operation in networks with many "bridge hops".

Hello time

This parameter (in seconds) specifies the intervals at which a device selected as the root bridge sends Spanning Tree information to the LAN.

Modifying this time value is recommended only with a thorough understanding of the Spanning Tree Protocol. Adjustments may be useful to optimize response times to topology changes or to ensure stable operation in networks with many "bridge hops".

Forward delay

This time (in seconds) specifies the minimum time that must pass before a Spanning Tree port is allowed to change state (Listening, Learning, Forwarding).

When using RSTP, the forwarding delay often has no effect, as RSTP has built-in mechanisms to trigger a fast transition to the forwarding state.

Modifying this time value is recommended only with a thorough understanding of the Spanning Tree Protocol. Adjustments may be useful to optimize response times to topology changes or to ensure stable operation in networks with many "bridge hops".

Transmit hold count

Number of BPDUs that can be sent with RSTP before a one-second pause is enforced.

When using classic STP, the transmit delay has no effect.

Port table

The following values can be configured separately in the port table for all available ports (LAN, Wireless LAN, point-to-point links).

Priority

Sets the priority of the port. If there are multiple possible network paths with the same path cost, the priority determines which port is used. If the priorities are equal, the port that appears higher in the list is selected.

For compatibility with RSTP, this value should only be changed in increments of 16, as RSTP uses only the upper 4 bits of this 16-bit value.

Edge-Port

Marks the port as an edge port, to which no additional bridge is connected, only end devices like workstations or servers. Edge ports immediately switch to the forwarding state.

Edge ports are still monitored by RSTP. If BPDUs are detected on such a port, the port loses its status as an edge port.

Path-Cost-Override

This parameter controls the priority of equivalent paths. The value set here is used in place of the calculated path cost for selection. The default value of 0 disables path cost override.

3.2 Additions to the Setup menu

3.2.1 Spanning-Tree

This menu contains the settings for the Spanning Tree Protocol.

SNMP ID:

2.62.3

Console path:

Setup > **LAN**

3.2.1.1 Operating

Here you can enable or disable support for Spanning Tree. When Spanning Tree is disabled, the router does not send Spanning Tree packets and forwards any received Spanning Tree packets instead of processing them itself.

SNMP ID:

2.62.3.1

Console path:

Setup > **LAN** > **Spanning-Tree**

Possible values:

No
Yes

3.2.1.2 Port-Data

In this table, additional Spanning Tree parameters can be configured per port.

SNMP ID:

2.62.3.2

Console path:

Setup > **LAN** > **Spanning-Tree**

Port-Data

The name of the LAN interface.

SNMP ID:

2.62.3.2.1

Console path:

Setup > **LAN** > **Spanning-Tree** > **Port-Data**

Possible values:

Max. 64 characters from LAN port `ETHx|LANx`

Priority

Sets the priority of the port. If there are multiple possible network paths with the same path cost, the priority determines which port is used. If the priorities are equal, the port with the smaller number is selected.

For compatibility with RSTP, this value should only be changed in increments of 16, as RSTP uses only the upper 4 bits of this 16-bit value. Lower values yield higher priority.

SNMP ID:

2.62.3.2.2

Console path:

Setup > **LAN** > **Spanning-Tree** > **Port-Data**

Possible values:

0
16
32
48
64
80
96
112
128
144
160
176
192
208
224
240

Default:

128

Edge-Port

Marks the port as an edge port, to which no additional bridge is connected, only end devices like workstations or servers. Edge ports immediately switch to the forwarding state.

Edge ports are still monitored by RSTP. If BPDUs are detected on such a port, the port loses its status as an edge port.

SNMP ID:

2.62.3.2.3

Console path:

Setup > **LAN** > **Spanning-Tree** > **Port-Data**

Possible values:

No
Yes

Default:

No

Path-Cost-Override

This parameter controls the priority of equivalent paths. The value set here is used in place of the calculated path cost for selection.

SNMP ID:

2.62.3.2.4

Console path:

Setup > **LAN** > **Spanning-Tree** > **Port-Data**

Possible values:

0 … 4294967295

Special values:

0

This value disables path cost influence.

3.2.1.3 Bridge-Priority

Sets the priority of the bridge in the LAN. This can influence which bridge is preferred as the root bridge by the Spanning Tree Protocol.

For compatibility with RSTP, this value should only be changed in increments of 4096, as RSTP uses the lower 12 bits of this 16-bit value for other purposes.

SNMP ID:

2.62.3.3

Console path:

Setup > **LAN** > **Spanning-Tree**

Possible values:

0
4096
8192
12288
16384
20480
24576
28672
32768
36864
40960
45056
49152
53248
57344
61440

Default:

32768

3.2.1.4 Protocol-Version

The protocol can be selected here. Depending on the selection, either the Classic or Rapid protocol will be used, as defined in IEEE 802.1D-1998 chapter 8 or IEEE 802.1D-2004 chapter 17, respectively.

SNMP ID:

2.62.3.4

Console path:

Setup > **LAN** > **Spanning-Tree**

Possible values:

Classic

Uses the classic STP procedures for determining network topology.

Rapid

Uses the RSTP procedures for determining network topology.

RSTP is compatible with STP. If components in the network only support classic STP, STP procedures will be used even when RSTP is enabled.

3.2.1.5 Forward-Delay

This time (in seconds) specifies the minimum time that must pass before a Spanning Tree port is allowed to change state (Listening, Learning, Forwarding).

When using RSTP, the forwarding delay often has no effect, as RSTP has built-in mechanisms to trigger a fast transition to the forwarding state.

Modifying this time value is recommended only with a thorough understanding of the Spanning Tree Protocol. Adjustments may be useful to optimize response times to topology changes or to ensure stable operation in networks with many “bridge hops”.

SNMP ID:

2.62.3.5

Console path:

Setup > **LAN** > **Spanning-Tree**

Possible values:

Max. 3 characters from `[0-9]`

Default:

15

3.2.1.6 Hello-Time

This parameter (in seconds) specifies the intervals at which a device selected as the root bridge sends Spanning Tree information to the LAN.

Modifying this time value is recommended only with a thorough understanding of the Spanning Tree Protocol. Adjustments may be useful to optimize response times to topology changes or to ensure stable operation in networks with many “bridge hops”.

SNMP ID:

2.62.3.6

Console path:

Setup > **LAN** > **Spanning-Tree**

Possible values:

Max. 3 characters from `[0–9]`

Default:

2

3.2.1.7 Max-Age

This value determines the time (in seconds) after which a bridge discards messages received via Spanning Tree as “stale”. This parameter defines how quickly the Spanning Tree algorithm responds to changes, e.g., due to bridge failures.

Modifying this time value is recommended only with a thorough understanding of the Spanning Tree Protocol. Adjustments may be useful to optimize response times to topology changes or to ensure stable operation in networks with many “bridge hops”.

SNMP ID:

2.62.3.7

Console path:

Setup > **LAN** > **Spanning-Tree**

Possible values:

Max. 3 characters from `[0–9]`

Default:

20

3.2.1.8 Transmit-Hold-Count

Number of BPDUs that can be sent with RSTP before a one-second pause is enforced.

When using classic STP, the transmit delay has no effect.

SNMP ID:

2.62.3.8

Console path:

Setup > **LAN** > **Spanning-Tree**

Possible values:

Max. 3 characters from `[0-9]`

Default:

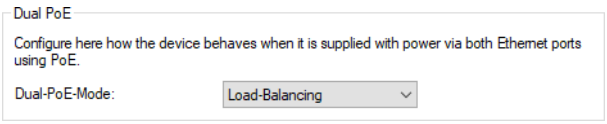
6

4 Dual PoE

Set the operating mode of the access point if it supports Dual PoE. With Dual PoE, both Ethernet ports can be used as PoE input.

The LANCOM LX-7500 access point supports Dual PoE—both Ethernet ports can be used as PoE input. In its factory settings, the LX-7500 is preconfigured for load balancing.

LANconfig: **Interfaces** > **Port config** > **Dual PoE** > **Dual-PoE Mode**



Hitless Failover

Allows uninterrupted operation of the access point if the PoE supply fails on one of the two Ethernet ports. The access point will not restart. This mode requires that the same PoE power is provided on both Ethernet ports.

In the case of the LX-7500, IEEE 802.3bt (Class 6 / 51W) is required for full operation.

Load Balancing

The access point draws power simultaneously via PoE from both Ethernet ports. Usually, the power drawn from both ports is similar, but ultimately this is influenced by the applied voltage and is therefore dependent on the specific circumstances.

This enables full operation of the LANCOM LX-7500 with 2x IEEE 802.3at (Class 4 / 25.5W).

Monitoring on the CLI

You can view the settings or the current status via the CLI under **Status** > **Hardware-Info** > **Power** > **Failover-Status** (1.47.42.10). The following statuses are possible:

Disabled

The access point is not configured for Hitless Failover, but for Load Balancing.

Ready

The access point is configured for Hitless Failover, and PoE is provided through both ports. The failover event has not occurred.

Engaged

The access point is configured for Hitless Failover, but one of the ports has lost its PoE supply. The failover event has occurred.

4.1 Additions to the Setup menu

4.1.1 Power

In this menu you will find settings for power management.

SNMP ID:

2.60

Console path:

Setup

4.1.1.1 Dual-PoE-Mode

Set the operating mode of the access point if it supports Dual PoE. With Dual PoE, both Ethernet ports can be used as PoE input.

SNMP ID:

2.60

Console path:

Setup > **Power**

Possible values:

Hitless-Failover

Allows uninterrupted operation of the access point in the event that the PoE supply on one of the Ethernet ports fails. The access point will not restart. This mode requires that the same PoE power is supplied on both Ethernet ports.

For the LX-7500, IEEE 802.3bt (Class 6/51W) is required for full operation.

Load-Balancing

The access point draws power simultaneously via PoE from both Ethernet ports. Typically, the power drawn from both ports is similar, but this is ultimately influenced by the applied voltage and depends on the switch/PoE injector and/or cabling.

This enables the full operation of the LX-7500 with 2x IEEE 802.3at (Class 4/25.5W).

5 PoE Status Information

From LCOS LX 7.00, detailed monitoring of PoE power supply is available for the LANCOM LX-7300 and LANCOM LX-7500 access point models.

To do this, the access point reports the respective status via the CLI under **Status** > **Hardware Info** > **Power**, using several values. These can also be displayed in LANmonitor under the system information and interfaces of the access point.

PoE-Type (1.47.42.1)

Displays the connected PoE power source in a single line, rather than per port as in the "Ports" table. If two PoE power sources are connected, a string like "802.3bt-Type-3 + 802.3bt-Type-3" is displayed.

Ports (1.47.42.6)

The following information is displayed for each port of the access point:

PoE-in-Type

Indicates the type of power supply: 802.3af-Type-1-or-802.3at-Type-2, 802.3bt-Type-3, 802.3af-Type-1, 802.3at-Type-2, or no-PoE.

The IEEE 802.3af Type 1 and IEEE 802.3at Type 2 types cannot be clearly distinguished and are therefore displayed as a single value.

PoE-in-Class

The class precisely specifies how much power (in watts) is available to the device. The following classes are possible: Class-0, Class-1, Class-2, Class-3, Class-4, Class-5, Class-6, Class-7, and Class-8. The class "None" is displayed when no PoE signal is present.

LLDP-Power-Negotiation

In addition to class-based negotiation, LLDP negotiation is also available at a higher level. This allows the PD (the access point) and the PSE (Power Source Equipment, the switch) to negotiate power in watts more granularly. This is optional and is not performed by all switches. If used, the expected behavior is that the switch initially activates only PoE in IEEE 802.3af Class-0 or similar (i.e., very low power), and higher power is activated only through LLDP negotiation with the access point. In this case, type and class will remain at a low level, but the actual negotiated power can be seen in "PoE-Power-Allocated-W".

Please note that "PoE-Power-Allocated-W" always shows the maximum of class-based and LLDP-based negotiation. Therefore, if LLDP is absent but Class-6 was negotiated, 51W will be shown.

Device-Functions (1.47.42.7)

WLAN-Streams-2.4GHz

Indicates the possible WLAN streams in the 2.4 GHz band: Off, One, Two, Three, or Four.

WLAN-Streams-5GHz

Indicates the possible WLAN streams in the 5 GHz band: Off, One, Two, Three, or Four.

WLAN-Streams-6GHz

Indicates the possible WLAN streams in the 6 GHz band: Off, One, Two, Three, or Four.

WLAN-Scan-Radio

Indicates whether the scan radio is active.

USB-Port

Indicates whether the USB port is active.

Failover-Status (1.47.42.10)

The following statuses are possible:

Ready

If both PoE sources are active according to IEEE 802.3bt, it waits for a failover condition to occur, such as power loss on one of the two cables.

Engaged

A failover condition has been met, and the access point is now in failover status.

Disabled

Failover function has been disabled in settings, as "Load-Sharing" is configured instead of "Failover".

Power-Status (1.47.42.11)

Indicates whether the access point has enough power to enable all functions, such as all WiFi radios, USB, etc. ("Fully operational"). If insufficient power is available, the value "Reduced function set" is displayed. You can check the "Device-Functions" table to see which functions are specifically disabled.

Dual-PoE-Mode (1.47.42.12)

The configured mode.

Hitless Failover

Allows uninterrupted operation of the access point if the PoE supply fails on one of the two Ethernet ports. The access point will not restart. This mode requires that the same PoE power is provided on both Ethernet ports.

In the case of the LX-7500, IEEE 802.3bt (Class 6 / 51W) is required for full operation.

Load Balancing

The access point draws power simultaneously via PoE from both Ethernet ports. Usually, the power drawn from both ports is similar, but ultimately this is influenced by the applied voltage and is therefore dependent on the specific circumstances.

This enables full operation of the LANCOM LX-7500 with 2x IEEE 802.3at (Class 4 / 25.5W).

6 Monitoring of Access Point Position and Mounting Angle

This feature is used to monitor the mounting angle of an access point equipped with the appropriate sensor. Models like the LANCOM LX-7500 and the LANCOM LX-7300 are primarily optimized for ceiling mounting, although wall mounting is also possible. This sensor allows compliance with proper mounting to be verified without an on-site inspection.

The access point reports the general mounting orientation Ceiling / Wall / Floor. “Floor” refers to a mounting with antennas / top side facing upwards. Additionally, the angle or tilt of the access point is reported.

The reported values can be read via the CLI under **Status** > **Hardware Info** > **Mounting Type** (1.47.11) or **Status** > **Hardware Info** > **Mounting Angle** (1.47.12). **Mounting Type** can return the values Unknown, Ceiling, Wall, and Floor. **Mounting Angle** contains a degree value.

The status information is displayed in LANmonitor under the system information of the access point.

Supported devices with this sensor are the LANCOM LX-7300 and the LANCOM LX-7500.