Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

AUTOMATION

User manual

UM EN FL SWITCH LM

Order No.: 2888851

Hardware and software for Lean Managed Switches

PHOENIX CONTACT
INSPIRING INNOVATIONS

AUTOMATION

User manual

Hardware and software for Lean Managed Switches

2011-09-01

Designation: UM EN FL SWITCH LM

Revision: 05

Order No.: 2888848

This user manual is valid for:

Designation	Oder No.
FL SWITCH LM 8TX / FL SWITCH LM 8TX-E	2832632 / 2891466
FL SWITCH LM 4TX/2FX / FL SWITCH LM 4TX/2FX-E	2832658 / 2891660
FL SWITCH LM 4TX/2FX SM / FL SWITCH LM 4TX/2FX SM-E	2891916 / 2891864
FL SWITCH LM 5TX/FL SWITCH LM 5TX-E	2989527 / 2989336
FL SWITCH LM 4TX/2FX ST/FL SWITCH LM 4TX/2FX ST-E	2989132 / 2989831
FL SWITCH LM 4TX/2FX SM ST/FL SWITCH LM 4TX/2FX SM ST-E	2989239 / 2989938
FL SWITCH LM 4TX/1FX/FL SWITCH LM 4TX/1FX-E	2989624 / 2989433
FL SWITCH LM 4TX/1FX ST/FL SWITCH LM 4TX/1FX ST-E	2989721 / 2989530
FL SWITCH LM 4TX/1FX SM/FL SWITCH LM 4TX/1FX SM-E	2989828 / 2989637
FL SWITCH LM 4TX/1FX SM ST/FL SWITCH LM 4TX/1FX SM ST-E	2989925 / 2989734

Please observe the following notes

In order to ensure the safe use of the product described, you have to read and understand this manual. The following notes provide information on how to use this manual.

User group of this manual

The use of products described in this manual is oriented exclusively to qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.

Phoenix Contact accepts no liability for erroneous handling or damage to products from Phoenix Contact or third-party products resulting from disregard of information contained in this manual.

Explanation of symbols used and signal words

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

The following types of messages provide information about possible property damage and general information concerning proper operation and ease-of-use.

NOTE
This symbol and the accompanying text alerts the reader to a situation which may cause damage or malfunction to the device, either hardware or software, or surrounding property.

This symbol and the accompanying text provides additional information to the reader. It is also used as a reference to other sources of information (manuals, data sheets, literature) on the subject matter, product, etc.

General terms and conditions of use for technical documentation

Phoenix Contact reserves the right to alter, correct, and/or improve the technical documentation and the products described in the technical documentation at its own discretion and without giving prior notice, insofar as this is reasonable for the user. The same applies to any technical changes that serve the purpose of technical progress.

The receipt of technical documentation (in particular data sheets, installation instructions, manuals, etc.) does not constitute any further duty on the part of Phoenix Contact to furnish information on alterations to products and/or technical documentation. Any other agreement shall only apply if expressly confirmed in writing by Phoenix Contact. Please note that the supplied documentation is product-specific documentation only and that you are responsible for checking the suitability and intended use of the products in your specific application, in particular with regard to observing the applicable standards and regulations. Although Phoenix Contact makes every effort to ensure that the information content is accurate, up-to-date, and state-of-the-art, technical inaccuracies and/or printing errors in the information cannot be ruled out. Phoenix Contact does not offer any guarantees as to the reliability, accuracy or completeness of the information. All information made available in the technical data is supplied without any accompanying guarantee, whether expressly mentioned, implied or tacitly assumed. This information does not include any guarantees regarding quality, does not describe any fair marketable quality, and does not make any claims as to quality guarantees or guarantees regarding the suitability for a special purpose.

Phoenix Contact accepts no liability or responsibility for errors or omissions in the content of the technical documentation (in particular data sheets, installation instructions, manuals, etc.).

The aforementioned limitations of liability and exemptions from liability do not apply, in so far as liability must be assumed, e.g., according to product liability law, in cases of premeditation, gross negligence, on account of loss of life, physical injury or damage to health or on account of the violation of important contractual obligations. Claims for damages for the violation of important contractual obligations are, however, limited to contract-typical, predictable damages, provided there is no premeditation or gross negligence, or that liability is assumed on account of loss of life, physical injury or damage to health. This ruling does not imply a change in the burden of proof to the detriment of the user.

Statement of legal authority

How to contact us

Internet

Up-to-date information on Phoenix Contact products and our Terms and Conditions can be found on the Internet at:

www.phoenixcontact.com.

Make sure you always use the latest documentation.
It can be downloaded at:

www.phoenixcontact.net/catalog.

Subsidiaries

If there are any problems that cannot be solved using the documentation, please contact your Phoenix Contact subsidiary.
Subsidiary contact information is available at www.phoenixcontact.com.

Published by

PHOENIX CONTACT GmbH & Co. KG
Flachsmarktstraße 8
32825 Blomberg
GERMANY
Phone +49 - (0) 52 35 - 3-00
Fax +49 - (0) 52 35 - 3-4 12 00

PHOENIX CONTACT
P.O. Box 4100
Harrisburg, PA 17111-0100
USA
Phone +1-717-944-1300

Should you have any suggestions or recommendations for improvement of the contents and layout of our manuals, please send your comments to

tecdoc@phoenixcontact.com.

Table of contents

1 Lean Managed Switch

1.1 Properties

The **L**ean **M**anaged **S**witch (**LMS**) is an Ethernet switch, which is suitable for industrial use. The LMS has five, six or eight ports and is available in various versions:

- FL SWITCH LM 5TX(-E) with five RJ45 ports
- FL SWITCH LM 8TX(-E) with eight RJ45 ports
- FL SWITCH LM 4TX/FX(-E) with four RJ45 ports and one FX port (multi-mode)
- FL SWITCH LM 4TX/FX ST(-E) with four RJ45 ports and one FX port (multi-mode) in ST format
- FL SWITCH LM 4TX/FX SM(-E) with four RJ45 ports and one FX port (single-mode)
- FL SWITCH LM 4TX/FX ST SM(-E) with four RJ45 ports and one FX port (single-mode) in ST format
- FL SWITCH LM 4TX/2FX ST(-E) with four RJ45 ports and two FX ports (multi-mode) in ST format
- FL SWITCH LM 4TX/2FX(-E) with four RJ45 ports and two FX ports (multi-mode)
- FL SWITCH LM 4TX/2FX SM(-E) with four RJ45 ports and two FX ports (single-mode)
- FL SWITCH LM 4TX/2FX SM ST(-E) with four RJ45 ports and two FX ports (single-mode) in ST format

Figure 1-1 Some versions of the Lean Managed Switch

Future-proof networks for the highest possible requirements

Maximum availability

Maximum network availability
A device design that does not use a fan, the redundant power supply, and conformance with all relevant industrial standards in terms of EMC, climate, mechanical load, etc. ensure the highest possible level of availability.

Redundancy can also be created with standards: the Rapid Spanning Tree Protocol ensures the safe operation of the entire network regardless of topology, even in the event of a cable interrupt.

All information

Clear information
Two LEDs per port ensure that you always have sufficient local information. A web server and an SNMP agent are provided for diagnostics, maintenance, and configuration via the network. A terminal access point can be used for local operation.

Features and fields of application of the LMS

– Increased network performance by filtering data traffic:
  - Local data traffic remains local.
  - The data volume in the network segments is reduced.
– Easy network expansion and network configuration.
– Coupling segments with different transmission speeds.
  Automatic detection of 10 Mbps or 100 Mbps data transmission speed for the RJ45 ports.
– Increased availability through the use of redundant transmission paths in various topologies and meshed structures as a result of RSTP.
– The switch can be configured using web-based management, SNMP or locally via an RS-232 interface.

1.1.1 Front view/operating elements/ slots of the LMS

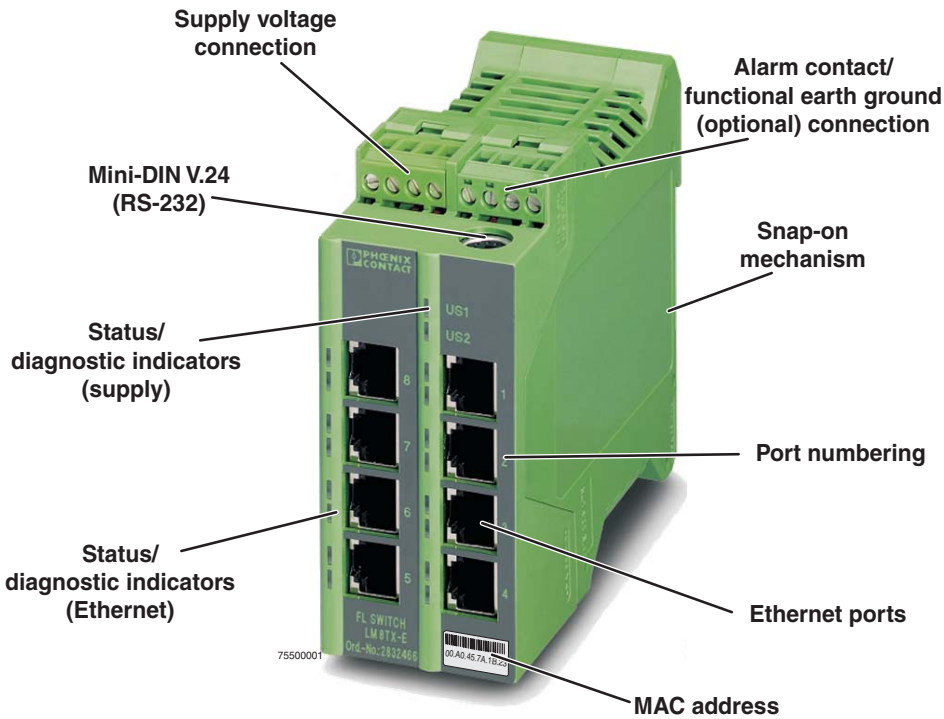


Figure 1-2 Front view/operating elements/slots of the LMS

– Diagnostic/status indicators
  Important information is displayed directly on the device. Each port has two LEDs. The top LED always indicates "LNK/ACT", the bottom LED indicates the data transmission speed.
– Diagnostic and status LEDs
  Two status and diagnostic LEDs are available for the supply voltage and for each port.
– Mini-DIN RS-232
  RS-232 interface in Mini-DIN format for local configuration via the serial interface.
– Alarm contact/functional earth ground
  The floating alarm contact and the optional functional earth ground can be connected here via the COMBICON connector.
– Supply voltage connection
  The supply voltage can also be connected redundantly via the 4-pos. COMBICON connector as an option.

1.1.2 Dimensions of the LMS

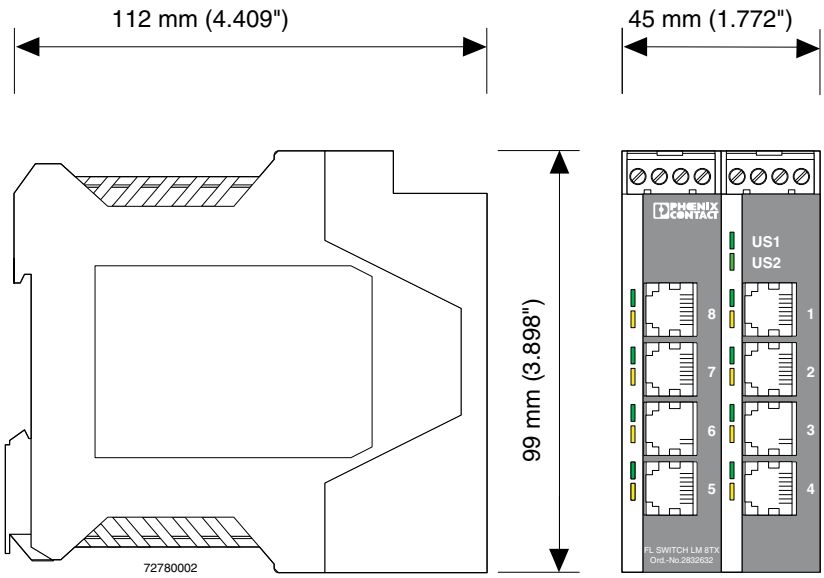


Figure 1-3 Housing dimensions of the LMS in millimeters (inches)

1.1.3 Status and diagnostic indicators

Des.	Color	Status	Meaning
US1	Green	ON	Supply voltage US1 in the tolerance range
		OFF	Supply voltage US1 less than 18 V DC
US2	Green	ON	Supply voltage US2 in the tolerance range
		OFF	Supply voltage US2 less than 18 V DC
LNK	Green	ON	Link active
		OFF	Link not active
		Flashing	Transmitting/receiving
100	Yellow	ON	Full duplex mode
		OFF	Half duplex mode
		Flashing	Collision detected

1.1.4 Firmware versions and their functions

1.1.4.1 For the following switch versions (LM)

– FL SWITCH LM 8TX
– FL SWITCH LM 4TX/2FX
– FL SWITCH LM 4TX/2FX SM

Firmware Version 1.04 provides the standard switch functions.

Firmware 2.02 offers the following additional functions:

– Multicast filter mechanisms
– IGMP snooping and querier function
– Port mirroring
– Port statistics
– Link status via alarm contact
– MAC address clearing

Firmware 2.13 offers the following additional functions:

– Optimized IGMP function, query port is not entered in GDA
– Optimized Rapid Spanning Tree Protocol (RSTP), RSTP function optimized in connection with fiberglass FX port

Firmware 3.03 offers the following additional functions:

– Optimized Rapid Spanning Tree Protocol (RSTP)
– Optimized IGMP snooping and querier function
– RSTP extension: Fast ring detection
– RSTP extension: Large tree support
– BootP and IP parameter storage optimized
– Ping requests > 1500 bytes are answered

Firmware 3.10 offers the following additional functions:

The following versions are supported:
FL SWITCH LM 5TX
FL SWITCH LM 4TX/1FX
FL SWITCH LM 4TX/1FX ST
FL SWITCH LM 4TX/1FX SM
FL SWITCH LM 4TX/1FX SM ST
FL SWITCH LM 4TX/2FX ST
FL SWITCH LM 4TX/2FX SM ST

Firmware 3.40 offers the following additional functions:

– Saving and loading configurations
– Port mirroring/link mirroring
– DHCP server
– Extended multicast filtering

1.1.4.2 For the following switch versions (LM-E)

Firmware 1.11 supports the following versions:

– FL SWITCH LM 8TX-E
– FL SWITCH LM 4TX/2FX-E
– FL SWITCH LM 4TX/2FX SM-E

Firmware 3.40 additionally supports the following versions:

– 2989336 FL SWITCH LM 5TX-E
– 2989433 FL SWITCH LM 4TX/1FX-E
– 2989530 FL SWITCH LM 4TX/1FX ST-E
– 2989637 FL SWITCH LM 4TX/1FX SM-E
– 2989734 FL SWITCH LM 4TX/1FX SM ST-E
– 2989831 FL SWITCH LM 4TX/2FX ST-E
– 2989938 FL SWITCH LM 4TX/2FX SM ST-E

1.2 Mounting/removal

1.2.1 Mounting and removing the LMS

Mount the LMS on a clean DIN rail according to DIN EN 50 022 (e.g., NS 35 ... from Phoenix Contact). To avoid contact resistance only use clean, corrosion-free DIN rails. Before mounting the modules, an end clamp (E/NS 35N, Order No. 0800886) should be mounted on the left-hand side next to the LMS to stop the modules from slipping on the DIN rail. The end clamp should only be mounted on the right-hand side once the LMS has been mounted.

1.2.2 Mounting

1. Place the module onto the DIN rail from above (A). The upper holding keyway must be hooked onto the top edge of the DIN rail. Push the module from the front towards the mounting surface (B).

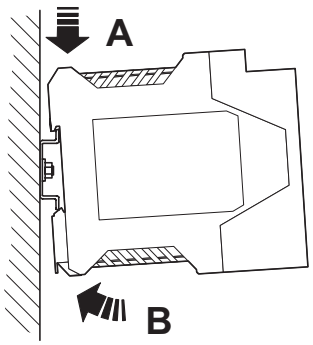


Figure 1-4 Snapping the LMS onto the DIN rail

2. Once the module has been snapped on properly, check that it is fixed securely on the DIN rail. Check whether the positive latches are facing upwards, i.e., snapped on correctly.

1.2.3 Removal

1. Remove all plug-in connections.
2. Pull down the positive latches using a suitable tool (e.g., screwdriver). Both positive latches remain snapped out. Then swivel the bottom of the module away from the DIN rail slightly (A). Next, lift the module upwards away from the DIN rail (B).

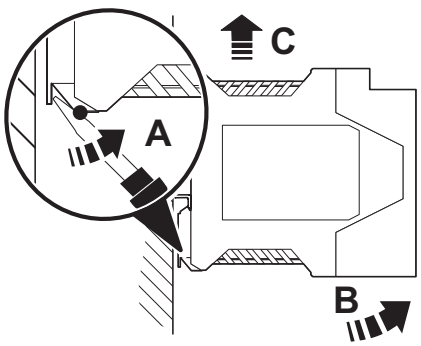


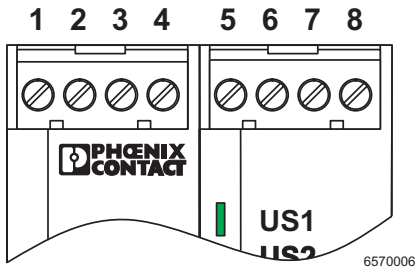
Figure 1-5 Removing the LMS

1.3 Installing the Lean Managed Switch

1.3.1 Connecting the supply voltage

1.3.1.1 Assignment of the COMBICON connector

Terminal block	Meaning
1	Supply voltage +US1
2	GND US1
3	Supply voltage +US2
4	GND US2
5 and 6	Floating alarm contact
7	Functional earth ground (optional)
8	Not used



NOTE: The switch is designed for SELV/PELV operation at +24 V DC according to IEC 60950-1/VDE 0805. Only SELV/PELV according to the defined standards may be used for supply purposes.

24 V DC

The LMS is operated with a 24 V DC voltage that can be supplied redundantly, if required (see Figure 1-6 version 2).

If redundant power supply monitoring is active (default setting), an error is indicated if only one voltage is applied. A bridge between US1 and US2 prevents this error message. However, it is also possible to deactivate monitoring in web-based management.

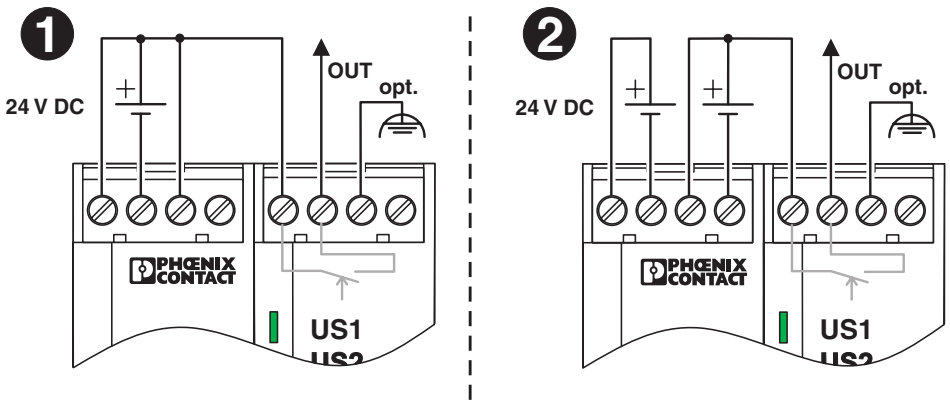


Figure 1-6 LMS supply

1.3.2 Alarm contact

The switch has a floating alarm contact. An error is indicated when the contact is opened.

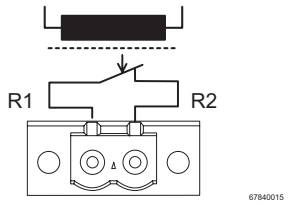


Figure 1-7 Basic circuit diagram for the alarm contact

In the event of non-redundant power supply, the switch indicates a supply voltage failure by opening the alarm contact. This error message can be prevented by connecting the supply voltage to both terminals blocks in parallel, as shown in Figure 1-6, or by deactivating redundant power supply monitoring in web-based management.

1.3.3 RS-232 interface for external management

The 6-pos. Mini-DIN female connector provides a serial interface to connect a local management station. Use the "PRG CAB MINI DIN" programming cable (Order No. 2730611). It can be used to connect a VT100 terminal or a PC with corresponding terminal emulation to the management interface (for an appropriate cable, please refer to "Ordering data" on page 7-3). Set the following transmission parameters:

Bits per second	38400
Data bits	8
Parity	None
Stop bits	1
Flow control	None

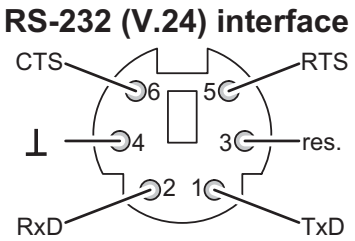


Figure 1-8 Transmission parameters and assignment of the RS-232 interface

1.3.4 Grounding

Grounding protects people and machines against hazardous voltages. To avoid these dangers, correct installation, taking the local conditions into account, is vital.

All Factoryline devices must be grounded so that any possible interference is shielded from the data telegram and discharged to ground potential.

A conductor of at least 2.5 mm^2 must be used for grounding. When mounting on a DIN rail, the DIN rail must be connected to protective earth ground using grounding terminal blocks. The module is connected to protective earth ground via a metal clip on the rear of the housing.

Option: In an environment particularly prone to EMI, noise immunity can be increased by an additional low-impedance connection to functional earth ground via terminal block 7 (Section "Assignment of the COMBICON connector" on page 1-7).

2 Startup and functions

NOTE: The IGMP snooping function is activated by default upon delivery for "**E**" versions. For other versions, it can be activated as necessary in WBM.

2.1 Basic settings

The basic Ethernet functions do not have to be configured and are available when the supply voltage is switched on.

2.1.1 Default upon delivery/default settings

By default upon delivery or after the system is reset to the default settings, the following functions and properties are available:

– The password is "private".
– All IP parameters are deleted. The switch has **no** valid IP parameters:
  IP address: 0.0.0.0
  Subnet mask: 0.0.0.0
  Gateway: 0.0.0.0
– BootP is activated as the addressing mechanism.
– All available ports are activated with the following parameters:
  - Auto negotiation and autocrossing for RJ45 ports.
  - 100 Mbps - full duplex for FX ports.
– All information collected by the SNMP agent is deleted.
– The web server, SNMP agent, and RS-232 interface are active.
– The "Rapid Spanning Tree" WBM configuration page is activated.
– The alarm contact only opens in the event of non-redundant power supply.
– The aging time is set to 48 seconds.

2.1.2 Assigning IP parameters

When the supply voltage is switched on, the switch sends requests (BootP requests) to assign IP parameters.

The "BootP" function can be deactivated via the management. By default upon delivery, the "BootP" function is activated.

The assignment of valid IP parameters is vital to the management function of the switch.

Options for assigning IP parameters:

– Configuration via the BootP protocol (default upon delivery)
– Static configuration via the management interfaces

The assignment of IP parameters with Factory Manager 2.1 is described on page 3-1.

2.1.2.1 Valid IP parameters

IP parameters comprise the following three elements: "IP address", "subnet mask", and "default gateway/router".

Valid IP addresses are:
000.000.000.001 to 126.255.255.255
128.000.000.000 to 223.255.255.255

Valid multicast addresses are:
224.000.000.001 to 239.255.255.255

Valid subnet masks are:
255.000.000.000 to 255.255.255.252

Default gateway/router:
The IP address of the gateway/router must be in the same subnetwork as the IP address of the switch.

2.1.2.2 Assigning IP addresses

The IP address is a 32-bit address, which consists of a network part and a user part. The network part consists of the network class and the network address.
There are currently five defined network classes; Classes A, B, and C are used in modern applications, while Classes D and E are hardly ever used. It is therefore usually sufficient if a network device only "recognizes" Classes A, B, and C.

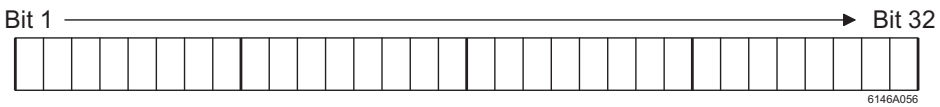


Figure 2-1 Location of the bits within the IP address

With binary representation of the IP address the network class is represented by the first bits. The key factor is the number of “ones” before the first “zero.” The assignment of classes is shown in the table below. The empty cells in the table are not relevant to the network class and are already used for the network address.

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5
Class A	0				
Class B	1	0			
Class C	1	1	0		
Class D	1	1	1	0	
Class E	1	1	1	1	0

The bits for the network class are followed by those for the network address and the user address. Depending on the network class, a different number of bits are available, both for the network address (network ID) and the user address (host ID).

	Network ID	Host ID
Class A	7 bits	24 bits
Class B	14 bits	16 bits
Class C	21 bits	8 bits
Class D	28-bit multicast identifier	
Class E	27 bits (reserved)	

IP addresses can be represented in decimal or hexadecimal form. In decimal notation, bytes are separated by dots (dotted decimal notation) to show the logical grouping of the individual bytes.

The decimal points do not divide the address into a network and user address. Only the value of the first bits (before the first “zero”) specifies the network class and the number of remaining bits in the address.

Possible address combinations

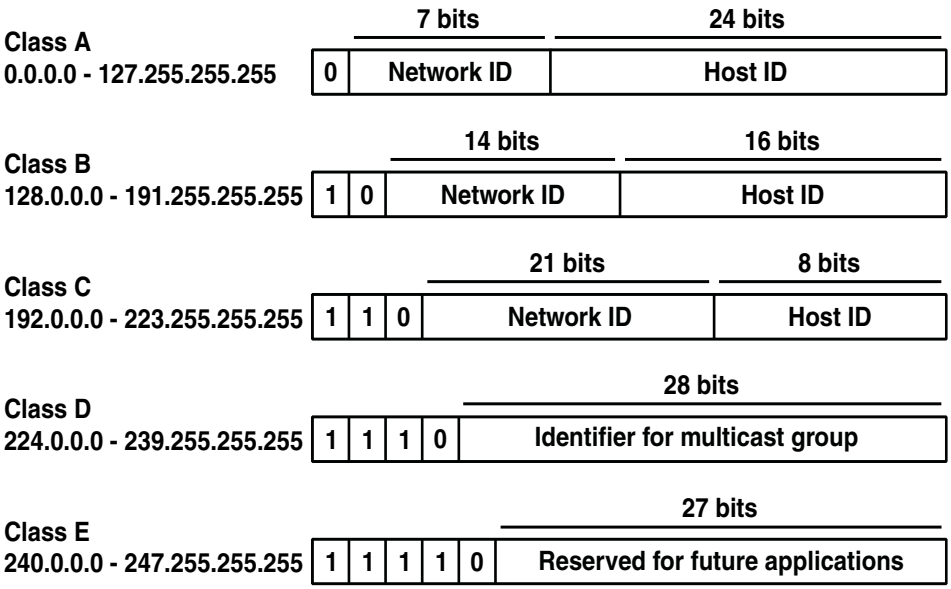


Figure 2-2 Structure of IP addresses

2.1.2.3 Special IP addresses for special applications

Certain IP addresses are reserved for special functions. The following addresses should not be used as standard IP addresses.

127.x.x.x addresses

The Class A network address "127" is reserved for a loopback function on all computers, regardless of the network class. This loopback function may only be used on networked computers for internal test purposes.

If a telegram is addressed to a computer with the value 127 in the first byte, the receiver immediately sends the telegram back to the transmitter.

The correct installation and configuration of the TCP/IP software, for example, can be checked in this way.

As Layers 1 and 2 of the ISO/OSI reference model are not included in the test they should be tested separately using the ping function.

Value 255 in the byte

Value 255 is defined as a broadcast address. The telegram is sent to all the computers that are in the same part of the network. Examples: 004.255.255.255, 198.2.7.255 or 255.255.255.255 (all the computers in all the networks). If the network is divided into subnetworks, the subnet masks must be observed during calculation, otherwise some devices may be omitted. In other words, the last address of an area is reserved as the broadcast address.

0.x.x.x addresses

Value 0 is the ID of the specific network. If the IP address starts with a zero, the receiver is in the same network. Example: 0.2.1.1, refers to device 2.1.1 in this network.

The zero previously signified the broadcast address. If older devices are used, unauthorized broadcast and complete overload of the entire network (broadcast storm) may occur when using IP address 0.x.x.x.

2.1.2.4 Subnet masks

Routers and gateways divide large networks into several subnetworks. The subnet mask is used to assign the IP addresses of individual devices to specific subnetworks. The **network part** of an IP address is **not** modified by the subnet mask. An extended IP address is generated from the user address and subnet mask. Because the masked subnetwork is only recognized by the local computers, this extended IP address appears as a standard IP address to all the other devices.

Structure of the subnet mask

The subnet mask always contains the same number of bits as an IP address. The subnet mask has the same number of bits (in the same position) set to "one", which is reflected in the IP address for the network class.

Example: A Class A IP address contains a 1-byte network address and a 3-byte computer address. Therefore, the first byte of the subnet mask may only contain "ones".

The remaining bits (three bytes) then contain the address of the subnetwork and the computer. The extended IP address is created when the bits of the IP address and the bits of the subnet mask are ANDed. Because the subnetwork is only recognized by local devices, the corresponding IP address appears as a "normal" IP address to all the other devices.

Application

If the ANDing of the address bits gives the local network address and the local subnetwork address, the device is located in the local network. If the ANDing gives a different result, the data telegram is sent to the subnetwork router.

Example for a Class B subnet mask:

Decimal representation: 255.255.192.0

Binary representation: 1111 1111.1111 1111.1100 0000.0000 0000

Using this subnet mask, the TCP/IP protocol software differentiates between the devices that are connected to the local subnetwork and the devices that are located in other subnetworks.

Example: Device 1 wants to establish a connection with device 2 using the above subnet mask. Device 2 has IP address 59.EA.55.32.

Representation of the IP address for device 2:

Hexadecimal representation: 59.EA.55.32

Decimal representation: 0101 1001.1110 1010.0101 0101.0011 0010
61462011

The individual subnet mask and the IP address for device 2 are then ANDed bit-by-bit by the software to determine whether device 2 is located in the local subnetwork.

ANDing the subnet mask and IP address for device 2:

Subnet mask:		1111 1111.1111 1111.1100 0000.0000 0000
	AND	
IP address:		0101 1001.1110 1010.0101 0101.0011 0010
Result:		0101 1001.1110 1010.0100 0000.0000 0000

61462012

Subnetwork

After ANDing, the software determines that the relevant subnetwork (01) does not correspond to the local subnetwork (11) and forwards the data telegram to a subnetwork router.

2.1.3 Flowchart after a restart

2.1.3.1 Loading the configuration data

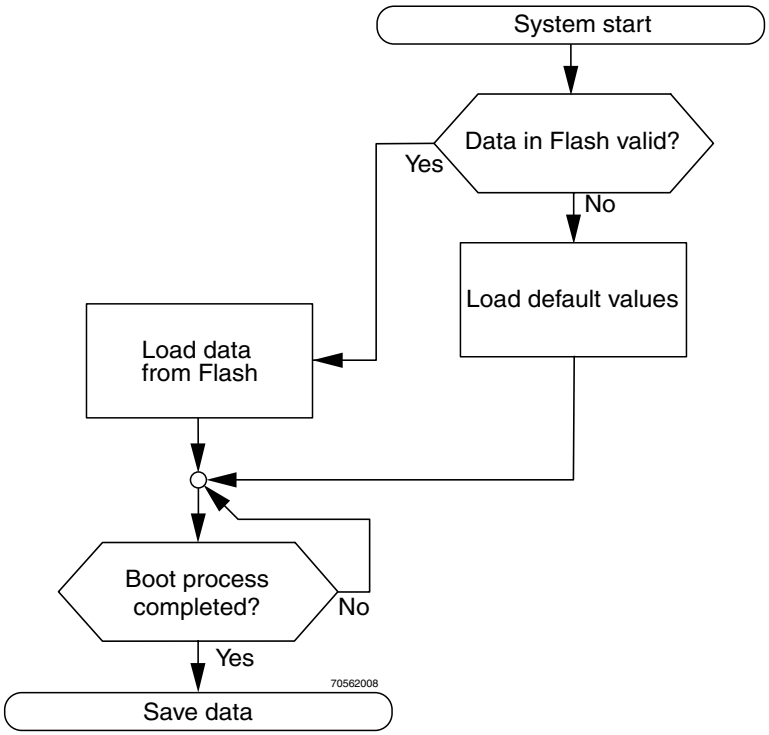


Figure 2-3 Flowchart: Loading the configuration data

2.1.3.2 Assigning IP parameters

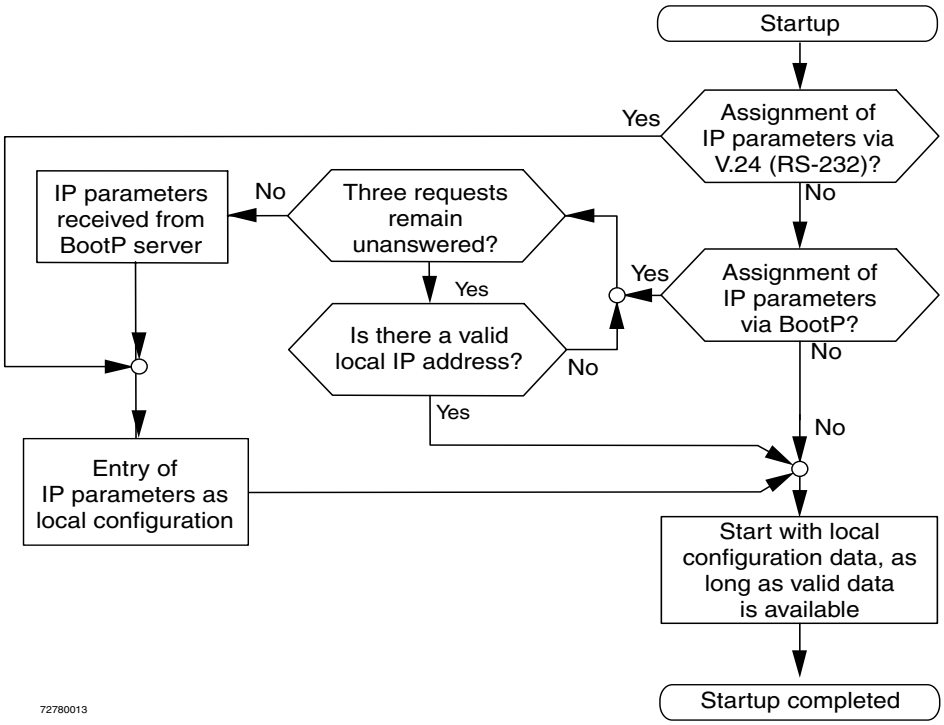


Figure 2-4 Flowchart: Assigning IP parameters