Traffic Controller sX

Overview of basic controller 1g V1.0
A001

Intelligent Traffic Systems

SIEMENS

Content

List of figures

Preface

Notes on safety and environmental protection

Safety notice

The devices/systems are only to be employed for their intended use in accordance with the product documentation; the warning labels and product documentation are to be adhered to. The installation and initial startup of the devices may only be performed by authorized professional personnel (electrically qualified persons with the appropriate training for these devices/systems through the Siemens Academy, Traffic Systems Segment).

If not sufficiently trained personnel are working on the devices, substantial bodily damage and property damage can come as a consequence.

The devices/systems are to be tested regularly by authorized professional personnel. The test intervals and the checks to be performed can be found in the specifications of the product standards. If there are no product standards with information about regular checks for the devices, then the tests are to be performed in accordance with the standards IEC 60364-6, EN 50110 Row, HD 60364-6: 2007 article 62 and EN 50556 table 2.

Occupational safety, environmental protection

It goes without saying that all legal regulations regarding occupational safety and environmental protection are to be complied with during the course of production. We design our products (parts, devices, systems) in such a way that these present no health hazards to the user or hazards the environment according to the current state of information if properly and predictably used.

Recycling, disposal

The information above makes it possible to assess to a large extent the possible potential for hazards to people and the environment, even at the end of the product's life cycle. The regulations for recycling and disposal procedures must be observed here.

All information has been given to the best of our knowledge and belief. It is in accordance with the current state of the art. The information does not constitute a guarantee in the legal sense of a warranty.

1. Introduction

This operating manual describes the basic controller of the Sitraffic sX and gives instructions for start-up and installation.
Details on operating it can be found in the integrated online help for the device.

1.1. Reference to Sitraffic sX documentation

This document complements the documentation for Sitraffic sX. In order to have a fundamental understanding of the technology involved and be able to carry out the required actions it is therefore necessary that the reader or user have read and understood the Sitraffic sX documentation.

1.2. Target/user group

This document is aimed at trained specialists. It is therefore mandatory that the reader or user is already familiar with Sitraffic technology.

Moreover, the user must be familiar with UNIX® operating systems, e. g. LINUX®.

1.3. Notational conventions used in this document

Key concepts are shown in bold face, for example "... is intended for trained specialists. It is ...".

On-screen texts, i.e. inputs and outputs, are marked by a particular typeface, e. g. "... in the line FSCKFIX=no the parameter value ...".

 Information
This symbol indicates additional information on a topic

 Notices and warnings
This symbol indicates a warning

2. Technical concept

2.1. Sitraffic sX variants

The following Sitraffic sX variants are currently available:

Name	Explanation
sX-H/HX	230V version without PI operation for up to 32/64 controllers

2.2. Design of Sitraffic sX

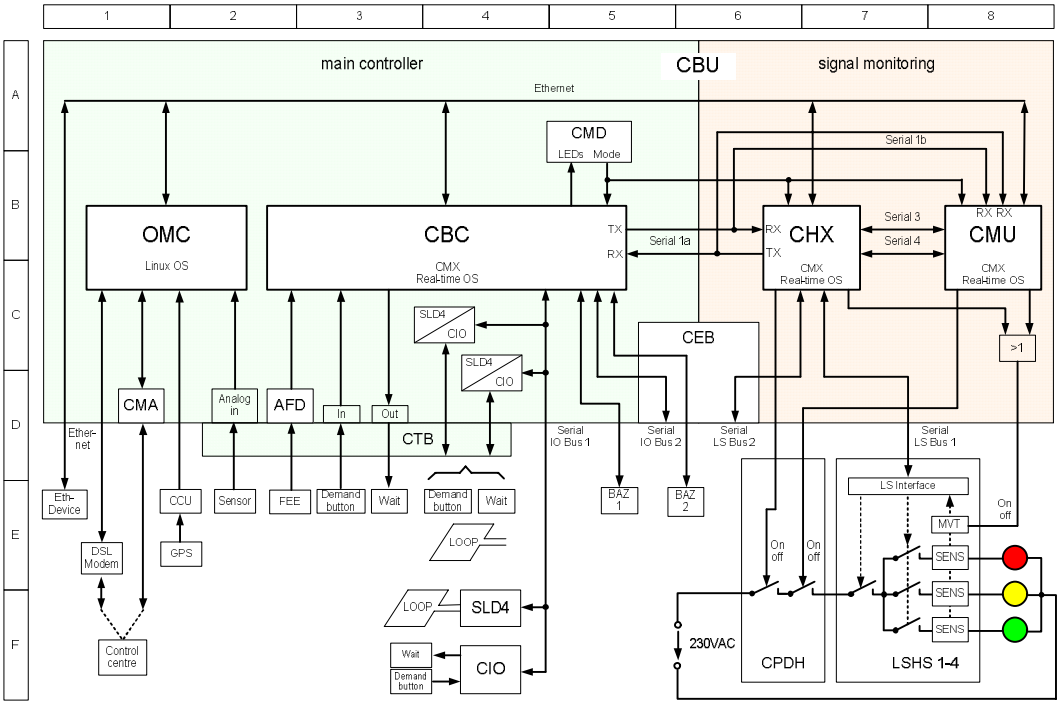


Fig. 1: Block diagram of the CBU

For the CBU a control unit and a signal monitoring unit of an intersection controller are built in onto one module. In the figure, the area of the control unit is marked green and that of the signal monitoring unit red. Assemblies and modules that are to be plugged into the CBU are highlighted white.

Name	Description	Position in block diagram
AFD	Module for evaluating request signals from PT	D3
BAZ 1	First command unit	E5
BAZ 2	Second command unit	E6
CBC	Processor module with real-time processing system for the processing of time-critical tasks of the controller	B4
CCU	GPS receiver for time synchronization	E2
CEB	Expansion module necessary for second BAZ, second I/O bus and second lamp switch bus	C6
CHX	Signal monitoring processor 1 for the activation and monitoring of the signal sensors.	B7
CIO	I/O module with 8 inputs and 8 outputs.	C4, F4
CMA	Analog modem for control center connections (PPP)	D1
CMD	Module for setting the operating mode of CBC, CHX and CMU	B1
CMU	Signal monitoring processor 2 for monitoring the functioning of signal monitoring processor 1.	B8
Control centre	Traffic control computer (control center)	F1
CPDH	Energy distribution unit for up to four 230V LSHS lamp switches.	F6
CTB	Backplane with spring terminals for connecting the interfaces	D3
Demand button	Demand button (8-piece connectable)	E3, E4, F3
DSL modem	Digital modem for control center connections (TCP/IP)	E1
Eth. device	Local device with ethernet connection (e.g. detector)	E1
FEE	Radio receiver for request signals from PT	E2
GPS	GPS receiver with antenna	E2
In	8 parallel inputs (e.g. can be used for demand buttons)	D3
LOOP	Loop	E4, F4
LSHS	230V lamp switch	F8
MVT	Changeover switch for the sensors for test mode of CHX and CMU, can be activated independently of one another.	E8

Name	Description	Position in block diagram
OMC	Control module for Linux operating system	B1
OUT	8 parallel outputs (e.g. can be used for confirmation lamps)	D3
SENS	Sensors for lamp voltage and lamp current	F8
Sensor	Environment sensor, 2 inputs are provided (e.g. for temperature and humidity)	E2
SLD4	Loop detector for 4 loops	C4, D4, F4
Wait	Confirmation lamp (8-piece connectable)	E4, F4

Tab. 1: explanations for block diagram of the CBU (see Fig. 1)

3. sX core components

This section gives an overview of the main components of the sX controllers in order to become better acquainted with the operating and display units necessary for the following sections. A more detailed description can be found in the device manual.

3.1. CBU motherboard

The CBU motherboard has:

- Internal interfaces for receiving the processor units of the signal monitoring system
- Internal interfaces for receiving the processor units of the basic controller
- External interfaces for the connection of peripheral units (detectors, GPS receivers, modem, etc.)
- The control elements are led through by a separate CMD module

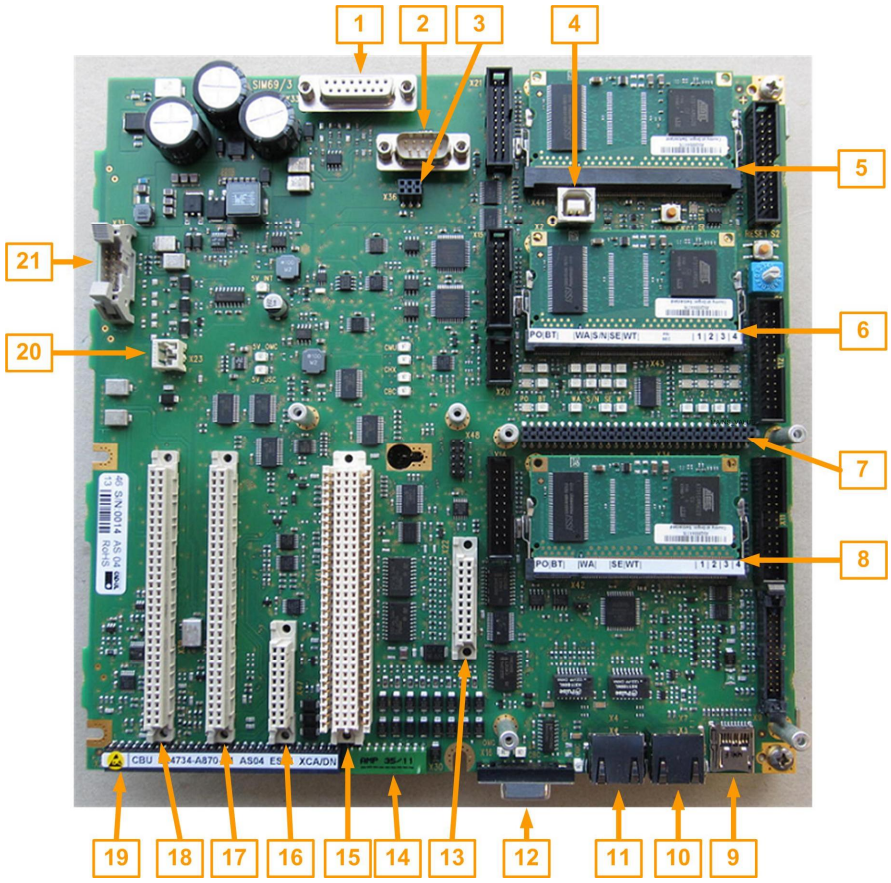


Fig. 2: Plug connector of the CBU

No.	Ref.	Plug name	Description
1	X33	BAZ1	Connection for first BAZ controller
2	X35	CMA data	RS232 connection for CMA modem module
3	X36	CMA-SV	Power supply connection for CMA modem module
4	X2	USB device	USB device plug
5	X44	CMU	Slot for processor module CMU (SIMO)
6	X43	CHX	Slot for processor module CHX (SIMO)
7	X34	CEB	Slot for interface expansion CEB for second controller BAZ2, second IO bus and second LS bus.
8	X42	CBC	Slot for processor module CBC (controls)
9	X9	MicroSD card	MicroSD card holder
10	X7	Ethernet Internal	Ethernet for device-internal accessories (e.g. detectors)
11	X4	Ethernet Control center	Control center connection (e.g. DSL modem)
12	X16	Debug_SIMO	Service PC connection for CHX Troubleshooting for SIMO through service PC
13	X22	AFD	Slot for AFD Evaluation module for request telegrams from PT
14	X30	CTB2	Second plug connection for CTB
15	X41	OMC	Control module OMC
16	X47	CMD	Module for operating the CBU
17	X40	Serial IO 2	Plug 2 for an I/O expansion card (SLD4, CIO)
18	X39	Serial IO 1	Plug 1 for an I/O expansion card (SLD4, CIO)
19	X29	CTB1	First plug connection for CTB
20	X23	SV-In	24V power supply connection of the CBU
21	X31	CCU	Drop cable connection for GPS clock CCU

Tab. 2: description of the plug connector of the CBU (see Fig. 2)

The control and diagnostics elements are marked in the figure below.

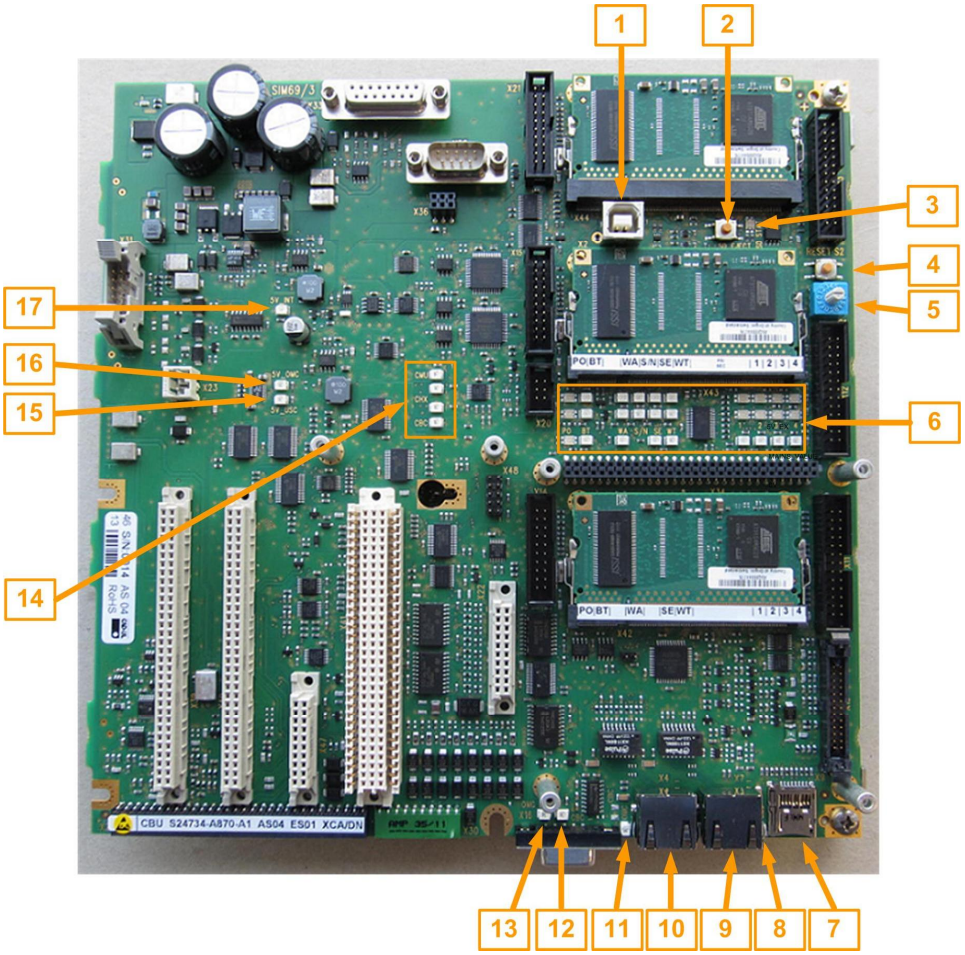


Fig. 3: Display and control elements of the CBU

No.	Ref.	Description
1	X2	USB device plug
2	S3	Eject button for MicroSD card holder
3	H25	Eject LED for MicroSD card holder
4	S2	Reset button of the CBU
5	S1	Mode selector switch for CBU (CBC, CHX and CMU) Must be in position "0" if a CMD is plugged in.
6	--	LED array for CBC, CHX and CMU (see Fig. 4: LED array of the CBU)
7	X9	MicroSD card holder
8	H16	Power indicator for device-internal LAN
9	X7	Ethernet for device-internal accessories (e.g. detectors)
10	X4	Control center connection (e.g. DSL modem)

No.	Ref.	Description
11	H6	Link/activity LED for Ethernet for control center connection
12	H3	Link/activity LED: CBC → OMC
13	H8	Link/activity LED: OMC → CBC
14	H14 H10 H12 H2	Link/activity LEDs for CBU-internal LAN connections CMU → CHX CHX → CMU CHX → CBC CBC → CHX
15	H48	LED "USV_OK" 5V operating voltage of USC for OMC is okay
16	H1	LED "CBU_5V_OK" 5V operating voltage of CBU for OMC is okay
17	H47	LED "CPD_Relay_Driver_OK" 5V operating voltage for components of the CBU is okay

Tab. 3: description of the display and control elements of the CBU (see Fig. 3)

3.1.1. LED array of the CBU

In this area of the CBU there are status indicators of the two signal monitoring units CHX and CMU as well as of CBC.

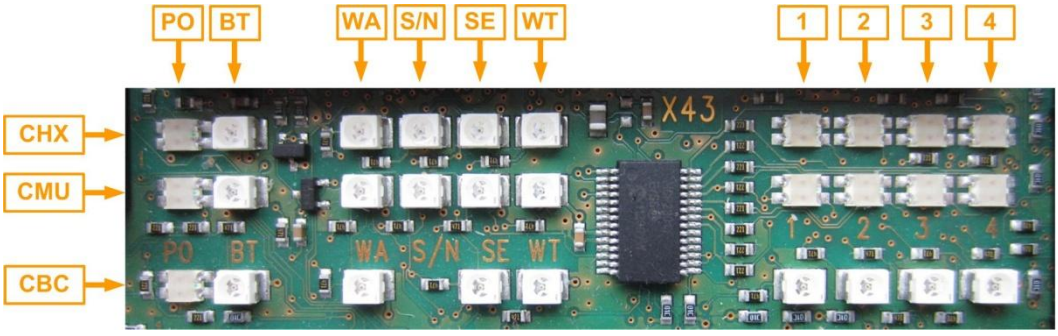


Fig. 4: LED array of the CBU

The following table describes the characteristics

LED	CHX	CMU	CBC
PO	Power	Power	Power
BT	Boot	Boot	Boot
--	--	--	--
WA	Watchdog alarm	Watchdog alarm	Watchdog alarm

LED	CHX	CMU	CBC
S/N	New signal pattern	New 100ms Slot	--
SE	System error	System error	System error
WT	Watchdog Trigger	Watchdog Trigger	Watchdog Trigger
--	--	--	--
1	Primary Alarm PI1	Secondary Alarm PI1	TBD
2	Primary Alarm PI2	Secondary Alarm PI2	Fail-safe ready
3	Primary Alarm PI3	Secondary Alarm PI3	--
4	Primary Alarm PI4	Secondary Alarm PI4	--

Tab. 4: Identification of the LEDs of the processors CBC, CHX and CMU

LED	LED function	LED state	Meaning
PO	Power	Green Red Black	Operating voltage is okay Operating voltage is too low Operating voltage is off
BT	Boot	Red	Firmware is booting
WA	Watchdog alarm	Red	Watchdog error
S/N of CHX	New signal pattern	flashes green	A new signal pattern was detected by the lamp switches.
S/N of CMU	New 100ms Slot	flashes green	A new signal pattern is transmitted from the controls (CBC) to the signal monitoring (CHX, CMU).
SE	System error	Red	The firmware has identified a malfunction (hardware-internal or firmware-internal).
WT	Watchdog Trigger	flashes green	Watchdog is triggered

Tab. 5: Meaning of the LEDs of the processors CBC, CHX and CMU

Primary Alarm LEDs PI 1-4		Partial intersection characteristics	
Color	Status	Status / outdoor system	SIMO
Black	Off	Not present	--------
Green	On	Active, OMC controls the signal pattern	Live
Green	1Hz	Active, fail-safe mode, CBC controls the signal pattern	Live
Red+green	On	OMC switches ON or OFF (on/off pattern proceeds)	Not live
Red+green	1Hz	OFF, fault-free (flashing, off, etc.)	Not live
Red+green	2Hz	OFF with network fault (fault flashing)	Not live
Red	On	switches off ("all yellow" pattern proceeds)	Not live
Red	1Hz	Faulty (fault flashing)	Not live
Red	2Hz	Faulty, system fault (off)	Not live

Tab. 6: Meaning of the LEDs for primary alarm

Secondary Alarm LEDs PI 1-4		Partial intersection characteristics	
Color	Status	Status / outdoor system	SIMO
Black	Off	No secondary alarm	No effect
Red+green	On	Secondary Alarm	No effect

Tab. 7: Meaning of the LEDs for secondary alarm

3.2. sX basic controls

The OMC is a rack unit of the CBU and assumes control of the process. All the firmware and the archived data are on the CompactFlash® card. This can be replaced if necessary at the appropriate interface.

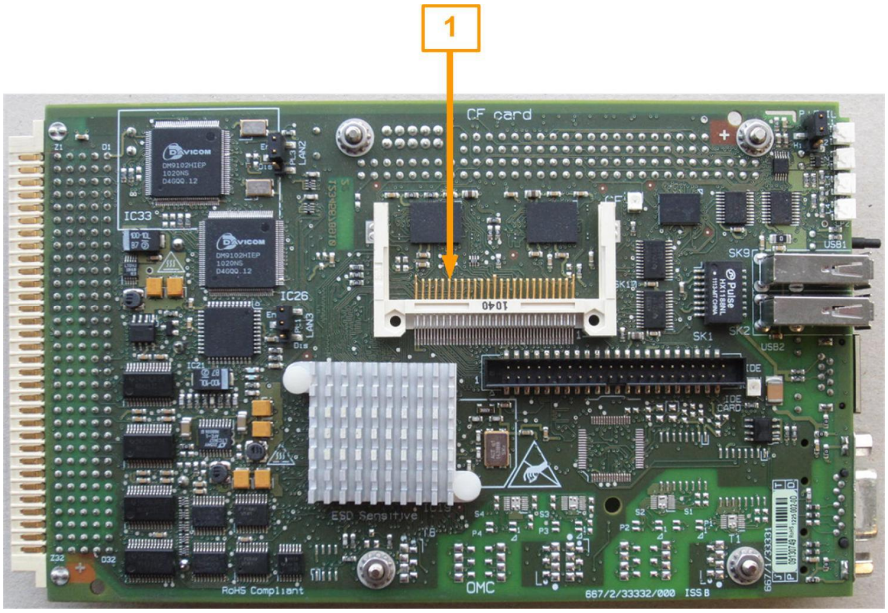


Fig. 5: OMC-U top side

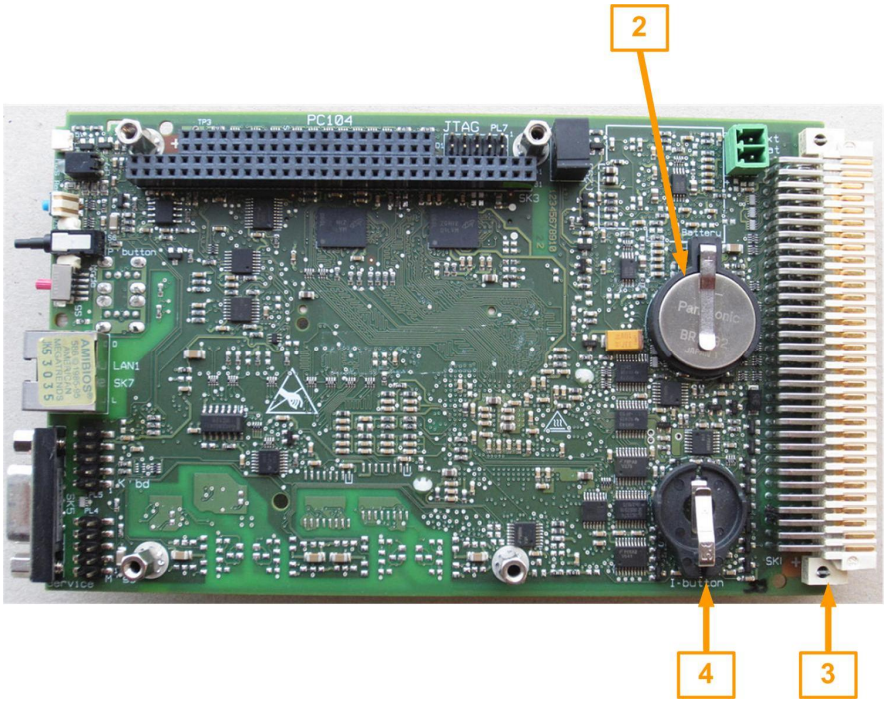


Fig. 6: OMC-U bottom side

No.	Ref.	Description
1	SK10	Slot for compact flash
2	B1	Coin battery in its retainer (plus pole up)
3	SK8	Basic multipole connector
4	SK6	Retainer for dongle

Tab. 8: Description of OMC-U bottom side (see Fig. 6: OMC-U bottom side)

The control and diagnostics elements are marked in the front view.

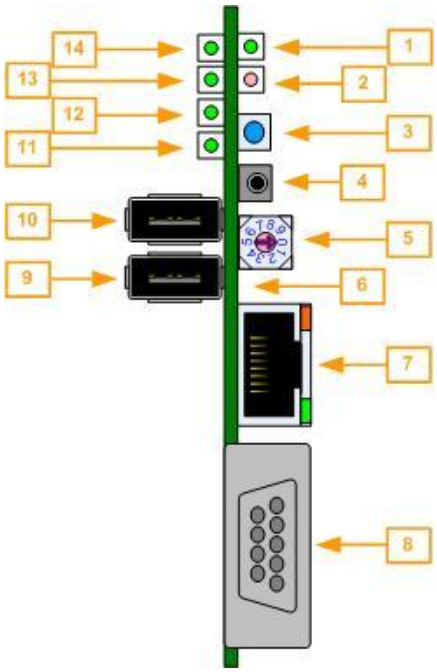


Fig. 7: OMC-U front side

No.	Ref.	Description
1	LP8	Status LED for logic voltage 5VDC
2	LP7	Status LED for reset
3	S7	Reset button
4	S6	Button, used by software
5	S5	Operating mode switch
6	--	Module slot
7	SK7	LAN RJ45 10/100MBit with diagnostics LEDs Data (orange) and link (green)
8	SK5	RS232 interface for service (COM1)
9	SK2	USB host plug 2

No.	Ref.	Description
10	SK9	USB host plug 1
11	L1 / LP6	Diagnostics for LED L4, controlled by software
12	L2 / LP5	Diagnostics for LED L3, controlled by software
13	L3 / LP4	Diagnostics for LED L2, controlled by software
14	L4 / LP2	Diagnostics for LED L1, controlled by software

Tab. 9: Description of OMC-U front side (see Fig. 7)

3.2.1. LEDs on the OMC

During normal operation (with firmware installed) the LEDs L1-4 have the following meaning:

LED	Meaning
L1	1 Hz flashing = basic function of OMC active
L2	Off = firmware not started 1 Hz flashing = firmware initialized On = firmware is active
L3	---
L4	---

Tab. 10: Meaning of the OMC LEDs

3.3. Dongle

The dongle serves to enable particular software features and is a storage device for certificates. The dongle must be installed during operation of the OMC.

For the OMC the dongle takes the form of an iButton®. Its design and handling are the same as those of a coin battery.

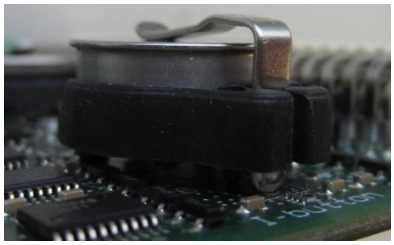


Fig. 8: Placing the dongle in the retainer of the OMC

The dongle is to be placed in such a way that the broad circumferential edge faces upward (see figure).

3.3.1. Licensing of the software features

The dongle is made available with a suitable configuration corresponding to the software features desired in the sX Order Configurator.

Operation with dongle
Four different features of the controller are currently activated with the dongle. Note that the respective software module will not run without the relevant dongle.

License feature	Behavior with missing license
> 8Controllers	■ The control system remains in "off" status ■ License error is displayed on the GUI
TA Siemens *	■ The traffic-actuated logic is not started up ■ License error is displayed on the GUI
TA external *	■ The traffic-actuated logic is not started up ■ License error is displayed on the GUI
Control center	■ Control center adapter is not started up ■ Connection to the control center is not initiated ■ License error is displayed on the GUI

Tab. 11: Behavior with missing license

*) The sLX (TA) standard process integrated in the C10 does not need licensing

3.3.2. Certificates

The certificate for operating a Canto® connection is also stored on the dongle. The certificate is not connected to the OMC hardware. Thus the certificate can remain intact during exchange with the OMC module.

4. Installation and startup

4.1. Hardware installation

Requirements:

- Sitraffic sX is shut down and protected against reactivation.
- The OCM to be replaced has been removed.

4.1.1. Installing or replacing the dongle for activating software

For general information on the dongle, see section Dongle.

Proceed as follows:

- The dongle is to be placed in such a way that the broad circumferential edge faces upward.

Positioning the dongle for installation.

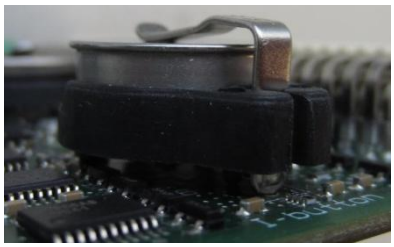


Fig. 9: Dongle in installed position

- Check that the dongle is functioning properly on the GUI after restart

4.1.2. Put in place or replace CompactFlash

All the firmware and the archived data are on the CompactFlash® card. In the case of damage or modification to the controller, the CompactFlash® card can be replaced separately.

Usable CompactFlash memory cards
Use only CompactFlash® memory cards that have been approved for use by Siemens. Contact Siemens Service for more information.

Handling CompactFlash memory cards
Under no circumstances, remove the CompactFlash® memory card during operation. This will result in malfunctions.

Proceed as follows:

- Put the CompactFlash® card in place as demonstrated in the figure

- Install the firmware (see section Installation of the basic controller with USB stick) or if necessary check that the pre-installed firmware is functioning properly on the GUI.

4.1.3. Put in place or replace basic control module

Proceed as follows:

- Remove the discharge protection at the buffer battery
- Insert the dongle into the retainer intended for it and check that the dongle fits properly (see Installing or replacing dongle for software activation)
- Put the CompactFlash® card in place and check that the card fits properly (see Put in place or replace CompactFlash)
- Slide the OMC into the slot of the CBU intended for it and check that proper contact is made in the slot (s. figure in section 4.1.2).

4.2. Set up communication for service purposes

You can communicate with the sX in the following ways:

- Local/Ethernet via a LAN connection with LAN cable
- Console (only for experts or new installations)

The PC has to be configured for DHCP for local access over the LAN. It is then assigned an appropriate IP address automatically by the device.

Recommended tools

PC tools can be used for higher-grade TCP/IP services for the different local TCP/IP based accesses. The following tools are recommended for this purpose.
TotalCommander for file transfer via FTP or SFTP
Putty for ssh (secure shell) connections

Access via the console is only required in the event of serious problems and is only recommended for experts. A serial connection is required here via a 1:1 cable. The console interface is operated on the PC via a suitable terminal program.

Operation at firewalls
With central/Ethernet access via a control center connection, it must be noted that the transfer of supply data via FTP may be blocked by a firewall function and therefore may not be possible.

4.2.1. Setting up a service connection

Communication between the PC and OMC can also take place directly via a standard or crosslink Ethernet cable. The Ethernet interface of the PC must be set here to DHCP (automatic address assignment via DHCP server) as is typical with CAT or Argus clients. An IP address is then assigned automatically by the OMC to the PC once the cable is connected. The assigned IP address can be established via the detailed information for the network icon in the Windows system tray.

Operation of the service PCs on the internal network
Only the Ethernet interface (ETH0) of the OMC is intended for direct local communication via Ethernet. By default, for this interface a DHCP server, which assigns an IP address to the PC, runs on the OMC. Simultaneous operation of the PC in the internal network can lead to problems and is therefore not recommended.

4.2.2. Setting up a console connection

The sX is designed in such a way that all start-up and operating scenarios can be handled without the use the console interface. In very particular cases it may however be helpful to use such a connection.

For this, a terminal program such as "Putty" must be installed on the service PC and configured with the following settings for a serial connection:

- 115200 bits per second
- 8 data bits
- No parity
- 1 stop bit
- No flow control

A 1:1 cable with a 9-pin, Sub-D connector in required for connecting to the PC.

4.3. Configure control center communication

The connection of the sX to a control center must be parameterized in accordance with the transmission technology used. This parameterization can be performed via the web interface of the sX.

> **Usable browsers**
>
> For the use of the functions of the web interface a HTML5-capable Browser is necessary. Mozilla Firefox and Google Chrome are recommended.

The web interface of the sX can be accessed via any TCP/IP connection to the device by entering the IP address of the device in a standard browser.

> **Default settings of the service interface**
>
> The web interface can be accessed via the following address in the default setting: http://192.168.128.3 or http://service.eth0

You can find details on the web interface in the documentation for the corresponding online help.

4.4. Software installation

4.4.1. Installation of the basic controller with a USB stick

If software has not yet been installed on the OMC module or if a complete reinstallation is required, the following procedure is recommended:

Requirements:

- The OMC module is built in (also see Put in place or replace basic control module (OMC))
- Sitraffic sX is sufficiently protected for this operating scenario without configuration.

The following table represents the elements important for the installation procedure.

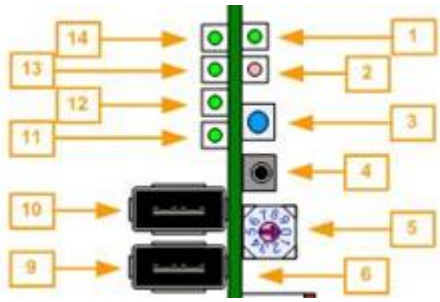
	No.	Name
	3	Reset button
	4	S6 button for starting the update
	9/10	Port for USB stick
	14	LED L1
	13	LED L2
	12	LED L3
	11	LED L4

Fig. 10: Relevant control and display elements of the OMC

Procedure:

- Connect USB stick containing software for installation to the USB port of the OMC

Prepared USB stick
the storage devices for the installation software (USB stick) must be prepared as described in section Prepare USB storage ("USB stick") on the PC

- Press reset button of the OMC module
- After startup, with its "On" status LED L1 indicates that the OMC is ready
- Press the S6 button to activate the installation
- The beginning of the installation is acknowledged by LED L1 switching to "flashing" status

The CompactFlash storage of the OMC is to be partitioned and formatted. The installation archives are then decompressed into the designated partitions (system partition and user partition) and a new job kernel is installed in the kernel memory.

- Monitoring the installation progress

LEDs 4 - 8 are used in order to ensure that the installation progress can also be monitored without having a system console connection.

LED	Installation step
L1	Mount USB stick
L2	The storage of the OMC is to be partitioned and formatted
L3	Installation of the software packages
L4	Finishing the Installation

Meaning of the LEDs for displaying the installation progress

- The relevant LEDs are off when the installation begins.
- An additional LED is switched on, starting with LED L1, with each subsequent installation step.
- If there is an installation error, LEDs L1-4 flash at a quick 200ms rhythm
- Once the installation has been successfully completed, LEDs L1-4 are on.

The installation progress is shown in plain text when the system console is connected. Successfully completed steps are acknowledged with an "OK". If there were errors, "FAILED" is displayed

With each subsequent installation step, the status is displayed as described above by the flashing of LEDs L1-4.

- Remove the USB stick

Rotary switch position

Make sure that the rotary switch is set to the Normal operation switch position.

- Press the "Reset" button on the OMC.

The installed firmware is now started.

Protection of the system partition

During operation, the system partition is integrated into the system with read-only rights and is therefore protected against changes.

- Configure the field device parameters with the web interface

See also Configuration of the sX basic controller

4.4.2. Installation of previously installed OMC modules

Previously installed modules can be reinstalled at any time via a USB stick using the approach described above.

4.4.3. Performing a firmware update

Updates of the firmware are available as full versions and sometimes as "service packs".

If a new firmware version is made available and has to be upgraded, you have to proceed as follows:

- Navigate in LiveLink to the directory where the current firmware versions of the sX are provided. The new firmware is available there as a zipped software package.
- Extract the zipped software package to a local directory.
- Open the web interface of the desired field device in your browser.

Additionally, the web interface has the menu item "System update" in the main folder "Maintenance".

Interruption of traffic control

For the execution of an update, interruption of traffic control may be necessary. Relevant references can be found in the information included in the updates.

You will find details in the documentation for the web interface.

- Navigate to the relevant web interface menu item and perform the menu-guided steps there

Power failure during the update

If there is a power failure during this installation process, the software is most likely damaged with the result that the module generally has to be fully reinstalled.

In rare cases it may be necessary to execute the configuration type for follow-on versions differently to the previous configuration. Moreover, new configuration parameters may be added. Previous configuration settings can no longer (fully) be used in this case.

Consult version information

Please, make sure to consider the information provided for the relevant software versions.

- Check your configuration settings via the web interface (http://<IP address>) and correct any inconsistencies.

4.4.4. Configuration of the sX basic controller

New sX modules are normally shipped with the firmware that is up to date at the time of shipping. There is usually no need to install any software for this.

The configuration parameters are preset in this case with default values and must therefore be supplied with the real system parameters.

The individual configuration is performed via the web interface. You will find details of the configuration in the documentation for the web interface.

Default settings of the service interface

The web interface can be accessed via the following address in the default setting: http://192.168.128.3 or http://service.eth0

4.4.5. Preparing the USB memory (memory stick) on the PC

The USB stick technology is unfortunately subject to a high revision frequency, meaning that proper functioning of all USB sticks cannot be guaranteed.

For this reason we recommend using only USB sticks tested by ITS RCM.

	Use of USB sticks
Only use USB memories that have been approved for use by Siemens. A list of tested USB sticks is made available by ITS RCM. Contact Siemens Service for more information.	

You can tell if there are compatibility problems if the USB memory is not correctly detected by the system or not detected at all.

Precondition:

- The USB memory is formatted (FAT16 file system) and empty.
- The USB stick has been made bootable (see Making USB stick bootable).

Proceed as follows:

- Navigate in LiveLink to the directory where the current firmware versions of the Sitraffic sX are provided. The new firmware is available there as a zipped software package.
- Unpack the installation archive on the PC into the root directory of the USB memory.
- The USB stick is now prepared for installation. The individual configuration will be performed later on via the web interface.

4.4.5.1. Making USB stick bootable

Requirement of performing this step
This step is only to be performed once for a USB stick

- Run the free program "syslinux" on your PC (download: https://www.kernel.org/pub/linux/utils/boot/syslinux/).
- Open a Windows console on your service PC (administrator rights needed)
- Navigate to the corresponding folder of the Syslinux installation on your PC. The directory to be selected depends on the version of Windows installed (on Windows7 64Bit PC the directory is called syslinux<version>\bios\win64\)
- Plug the USB stick into your PC and determine the letter of the drive assigned to the USB stick (e.g. E:/, F:/, etc.)
- Specify the syslinux<>.exe found in the folder with the option *-maf*. As another parameter, the letter of the drive followed by a colon is to be submitted,
  for example: *.\syslinux-6.02\bios\win64\syslinux64.exe -maf F:*

5. Operation

5.1. Operating concept

5.1.1. Operators and priorities

5.1.1.1. Operators and control levels

Operators are different sources from which operating requests/switching requests are generated. It is permitted for an operator to fill more than one control level with switching requests. These sources can be summarized as control levels

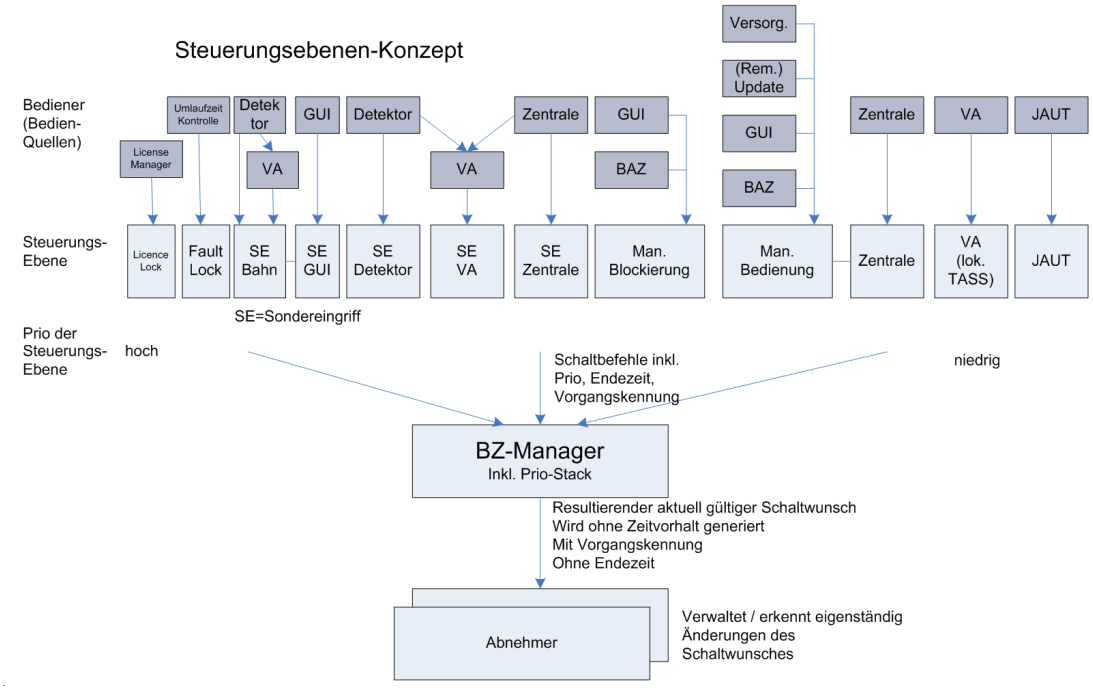


Fig. 11: Detailed representation of the control levels

German	English
Steuerungsebenen-Konzept	Control level concept
Bediener (Bedienquellen)	Operators (operation sources)
Steuerungsebene	Control level
Prio der Steuerungsebene	Priority of the control level
hoch	high
niedrig	low
License Manager	License Manager

License Lock	License Lock
Umlaufzeit Kontrolle	Cycle time check
Fault lock	Fault lock
Detektor	Detector
VA	TA
SE Bahn	SE path
GUI	GUI
SE GUI	SE GUI
SE Detektor	SE Detector
SE VA	SE TA
Zentrale	Control center
SE Zentrale	SE control center
BAZ	BAZ
Man. Blockierung	Man. suppression
Versorg.	Power supply
(Rem.) Update	(Rem.) Update
Man. Bedienung	Man. operation
VA (lok. TASS)	TA (loc. TASS)
JAUT	JAUT (scheduler)
SE = Sondereingriff	SE = special intervention
Schaltbefehle inkl. Prio, Endezeit, Vorgangskennung	Switch command incl. priority, end time, operation identifier
BZ Manager inkl. Prio-Stack	BZ Manager incl. priority stack
Resultierender aktuell gültiger Schaltwunsch Wird ohne Zeitvorhalt generiert Mit Vorgangskennung Ohne Endezeit	Resulting currently valid switch request Generated without delay With operation identifier Without end time
Abnehmer	Consumer
Verwaltet / erkennt eigenständig Änderungen des Schaltwunsches	Independently manages / recognizes Changes to the switch request

Possible control levels are:

- Manual operator
- Control center

- TA
- JAUT (scheduler)
- Special interventions
- Besides these systemic operators or control levels, internal statuses and events can also become operation sources (e.g fault suppression).

5.1.1.2. Priority

Each control level has a clear, permanently assigned priority. A higher value of the priority also means a higher priority. According to this priority the operator with the highest priority receives the right to perform its requested operational intervention.

5.1.1.3. Time-based validity

Each operational intervention (writing of operating states) is marked with an end time. The starting time is always implicitly accepted as "now". One or more switch requests for the future (cf. OCIT: Next) do not exist.

Each operator is to be selected as responsible for this for the end time reasonable / fitting for the relevant operation.

This is generally already included when conveyed for the control level "Control center"

The operating request is created as permanent when performing manual operation via the BAZ.

5.1.1.4. Operation number (SysJobId)

The operator must assign a unique operation number to each operational intervention.
The operation number here preferably receives the operator (if defined in OCIT-O) as the cause identifier.

During manual operation via the BAZ the operation number is created automatically.

5.1.2. Operating modes and states

The following operating modes can be set:

- Off-dark
- Off-Flashing
- Off all-yellow flashing
- Control center mode / JAUT
- Local mode
- Cyclical manual mode (with advance point switching)
- Traffic-actuation logic (TA on) / Reduced traffic-actuation logic (TA reduced) or TA off
- In addition, the superimposable operating state can also be selected.

In this document, only the setup options at the BAZ are described in the following. Corresponding operations are also, of course, possible with the web interface. Details can be found in the relevant online help

5.1.2.1. Off-dark

The controller continues running within the active signal program until a predefined point and then switches via the switch-off patterns to the Off-dark state for the entire intersection.

In general, the relevant LED will continue flashing until the Off-dark state is finally reached.

The behavior of the controller after pressing the Off-dark key is dependent on the previously active operating state:

If the device is already in an Off-dark state, pressing the key a second time does not result in a status change (see below).

A controller in the operating mode Off-flashing immediately switches to Off-dark.

In local mode, the regular switch-off operation is first taken into consideration with processing of the active signal plan up to the switching off point and execution of the switch-off patterns. Afterwards, the controller switches to Off-dark.

If control center mode or operation via the automatic twelve-month switching routine (JAUT) is active, the process operates as for local mode via the switch-off point and the switch-off patterns.
If the device is switching on in control center mode, the switch-on patterns are processed first and then the switch-off pattern is executed for the relevant patterns before the device switches to Off-dark.

- If the device is switching off, it has to end the process before switching to Off-dark.
  The relevant LED will continue to flash until the Off-dark state is finally reached.

- Cyclical manual mode: Manual mode is terminated, the controller continues running up to the switch-off point and it switches to the OFF-dark state via the switch-off patterns provided.

In a fault flashing state (following the signal monitor response), Off-dark is brought about immediately. Here, the fault is also reset at the same time.

Revoking the operating state Off-dark is only possible by selecting a new operating mode.

5.1.2.2. Off flashing

The controller continues running within the active signal program until a predefined point and then switches via the switch-off patterns to the Off-flashing state for the entire intersection.

Further actions during the switch to this operating mode take place analogously to Off-dark with the difference that signals can also flash here. This is defined in the configurator.

5.1.2.3. All-yellow flashing

The controller continues running within the active signal program until a predefined point and then switches via the switch-off patterns to the all-yellow flashing state for the entire intersection.

Further actions during the switch to this operating mode take place analogously to Off-dark with the difference that main direction signals can also flash here. This is defined in the configurator.

5.1.2.4. Control center mode

Once the control center mode key has been pressed, the controller processes the incoming control commands via the control center interface (e.g. CANTO, OCIT) and sets the required state.

Control center mode is possible from any operating mode

If the control center mode key is pressed, the corresponding LED flashes until the selected status is reached.

If the control center interface is inactive (e.g. when connection is interrupted) or if no valid switch request from the control center is present ('local approval'), control takes places automatically according to the 12 month automatic switching routine, JAUT.

The 12-month automatic switching routine (JAUT) may no longer be able to be activated directly in the sX due to the newly introduced priority concept, e.g. it only works as a fallback level if no switch requests are present from the higher operational priorities.

Termination of the operating mode control center mode takes place be selecting one of the new operating modes on the command unit or by switching the operator.

5.1.2.5. Local mode

After pressing the "Local mode" key, the controller processes in local mode the signal plan determined in accordance with operational priorities.

If, e.g. during initial supply, no plan has previously run, the first signal plan (entity 1) of the configuration data supplied is selected by default. The selected signal plan starts at the switch-on point once the switch-on patterns have been processed.

A controller in the off-flashing or all-yellow flashing state acts analogously to the off-dark state.

If the controller is already in local mode, the status does not change.

If the controller is in cyclical manual mode, no change takes place.

If the controller is currently engaged in the switch-on process, no change takes place. The target operating mode is local mode.

A controller that is switching off first processes the switch-off patterns fully and then starts the switch-on patterns. The target operating mode is local mode.

The LED display on the local mode key continues to flash as long as the selected status has not yet been reached. Local mode can also be activated by directly selecting a signal program number.
Revocation of this operating state is only possible by selecting a new operating mode or results from the occurrence of a fault or suppression.

5.1.2.6. Cyclical manual mode

This mode is terminated by pressing the manual mode key.
If the device is already in manual mode, this operating mode can only be terminated by pressing the manual mode key again or by pressing one of the off keys.

With cyclical manual mode, every local signal plan provided with at least one manual hold point can run in manual mode. The manual hold points are taken into account in this operating mode.

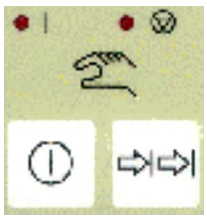
The behavior of the controller after the manual mode key has been pressed depends here too on the previous operating state:

- If the device is in the off state, the manual plan provided by default is activated. It absolutely must contain at least one manual hold point.
- A device in the switch-on pattern processes all switch-on patterns until reaching the target plan. Further progress is identical to behavior in local mode, OFF state or in control center mode.
- In the switch-off pattern, the controller processes the patterns fully and then switches on again via the switch-on patterns and switches to manual mode.
- If the controller is in the local mode state (local permanent), the currently running signal plan, if it has provided manual hold points, is maintained and processed according to the manual hold points provided. Otherwise, a switchover into the manual plan provided takes place. The switchover into the manual signal plan is made by the switching procedure provided (usually GSP) and the system begins with the manual hold steps only after reaching the target plan.
- A controller in central control mode or JAUT mode always first switches over to the manual signal plan provided via the defined switchover/switch-on procedure before it begins with the manual hold steps.
- If the device is in manual mode, this is disabled and the last active state is started

Manual mode with current operating mode: Control center mode

First a mode change to local mode (local permanent) takes place, where the manual signal plan provided is activated.

5.1.2.6.1. Activation and process

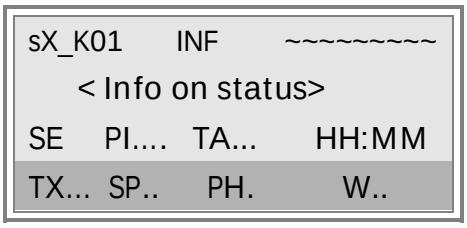


The operating mode is switched via the left key.
The left LED indicates the activation of the operating mode "Manual mode"
Advancement of the manual hold points is performed with the right key.
The right LED is designated in the following as "Manual stop" and is used to show the progress of the manual controls

- The LED for manual mode "On" flashes until that state is reached. The LED is lights up permanently if the manual signal plan is activated.
- The LED, which indicates the signal plan number, likewise flashes until the manual plan is activated; (the LED remains on afterwards).
- The "Manual stop" LED flashes if signal times are being processed. If the manual hold point is reached, the "Manual stop" LED lights up permanently and thus indicates that the controller is in the manual hold point and waits for advance point switching.

5.1.2.6.2. Indicator in the BAZ display

The status indicator on the BAZ switches over to the operating mode "Manual mode" as shown in the following:

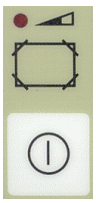


The operator is always in the manual mode "Special intervention"

The following indicators in line 4 in this case are different from the standard indicator:

Current manual phase	PH	Indicates the manual hold point reached
Waiting time	W	Duration for which the current signal pattern is displayed

5.1.2.7. Traffic-actuation logic



With the button  switching one by one between the following states can be performed:

- TA on (LED illuminated),
- TA reduced (LED flashing) and
- TA off

- TA on

In this operating mode the traffic-actuated control logic operates with the influence of individual traffic and that of public transport.

Functionality is determined by the logic itself because the incoming information is processed there and used accordingly.

Pressing the button  again puts the traffic-actuated control into reduced mode.

- TA reduced

In this operating mode the traffic-actuated control logic operates without the influence of individual traffic and that of public transport.

Functionality is determined by the logic itself because the incoming information is processed there and used accordingly.
If operating state TA reduced mode is active, the LED on the keypad flashes.

By pressing the  key again, traffic-actuated control is switched off.

- TA OFF

No traffic-actuated control logic is active.

By pressing the  key again, traffic-actuated control can be re-activated.

5.2. Archiving concept

Sitraffic sX provides two different kinds of archives:

- Standard archives:
  Archiving of measured values and operating states that are needed for historical display on the web interface or for the transmission of historical values to a control center.

- Detailed state archive:
  On the web interface there is a vast number of detailed state values available. These values incl. their attachments are archived in the detailed state archive.

5.2.1. Standard archives

5.2.1.1. Concept

Archiving takes place in two steps: The data are first written into files in the SRAM area and in a second step make their way into the flash area of the file system.

Archiving takes place on a delta basis, i.e. the smaller a change in relation to the previous value turns out, the smaller the storage requirement.

Archiving is based on the round robin procedure, i.e. as soon as the storage area reserved for a specific archive is exhausted, the oldest data are overwritten with the new data.

Archives remain intact on the OMC beyond restarts and power failures and are only deleted in the event of a cold start or corresponding manual intervention.

5.2.1.2. Available standard archives

The following archives are available (with continued development of the product more archives can be added):

- ActualStatus
  Basic actual states of the control system such as intersection on/off, signal plan, TA on/off, etc.

- CommonStates
  General status information of the Canto interface
- SignalIndications
  States of the signal groups
- StandardMessage
  Canto/Ocit operating messages
- LampFaultStates
  Fault states of the lamps
- DeviceValues
  AP values and other generic values
- DetectorStates
  Fault states of the detectors
- DetectorValues
  Measured values of the detectors
- DetectorAggregation
  Aggregated measured values of the detectors

5.2.1.3. Configuration

The configuration of the memory depth of archives is pre-configured and optimized for standard use. Usually no adjustments should be necessary here.
Should this however be necessary in exceptional cases, the configuration of the archive sizes can be modified.
Both the storage space available for all archiving as well as the storage space available for specific archives can however be affected by this.

You can find details in the online help on the web interface.

5.2.1.4. Archiving depth

For a standard intersection (for example 13 controllers, 12 detectors, 10 Jaut switches per day, etc.) with a defaults archive configuration the following values for the available storage depth can be assumed:

Archive	Storage depth in days (approximate values)
Current status	592
CommonStates	15
Signaling	30
StandardMessage	571
LampStates	418
DeviceValues	1453
DetectorAggregation	42
DetectorStatus	39
Detector values	7

5.2.2. Detailed state archive

5.2.2.1. Concept

Archiving takes place by creating and modifying files in the flash area of the file system.

Archiving is based on the round robin procedure, i.e. as soon as the storage area reserved is exhausted, the oldest data are overwritten with the new data.

Archives remain intact on the OMC beyond restarts and power failures and are only deleted in the event of a cold start or corresponding manual intervention.

5.2.2.2. Configuration

For detailed state archives no change to the configuration is possible. For the detailed state archive an available storage space of a maximum of 10 files of 300KB each is permanently set.

5.3. Fail-safe operation

The purpose of fail-safe operation is to maintain system operation even in the presence of special situations via a variant of the control system reduced to the minimum in order to guarantee proper traffic signaling of the external system.

5.3.1. Functional description

The signal plan selected for activation in each case or an explicitly configured signal plan are transmitted to the CBU as a fail-safe plan upon startup or signal program switchovers.

It can switch over if necessary to the fail-safe plan. Convenient points for switching to the fail-safe plan (e.g. GSP) are conveyed to the CBU in order to be able to perform a smooth transition—that is acceptable for traffic—into this plan. If need be the CBU switches to the received fail-safe plan at a GSP and keeps it active until:

- The CBU is to be restarted (e.g. also in the case of power failure)
- The fail-safe mode is terminated explicitly by the OMC or by the user
- The OMC re-assumes control (e.g. in case of the firmware update)

5.3.2. Configuration of the fail-safe mode

In the configuration, it can be determined whether the fail-safe is generally to be activated.

Two operating modes can be activated:

- the dynamic mode, with which the relevant running SP is used as the fail-safe plan
- the static mode, with which a permanently defined signal plan is specified as the fail-safe plan.

Suitable planning for the use of the functionality
To use this functionality the planner must ensure that suitable switchover time points (STPs) are present in the relevant plans. In particular, with a permanently defined signal plan the signal patters in the respective STP must correspond to each other.

You can find configuration details in the help of the configuration tools used.

5.3.3. Activating fail-safe mode

The fail-safe mode can only take action if the system is in the commanding mode. By its nature no transition into the fail-safe mode can take place in one of the possible "off" states or, for example, in switch-on and switch-off patterns.

Visualization of the possible fail-safe mode
LED 3 of the CBC (see fig. 4 in the LED array of the CBU), when in the "on" state, shows the option of entering fail-safe mode

The activation of the fail-safe mode can take place via two scenarios:

- Activation requested for the update of the OMC
- Automatic activation via lacking control of the OMC

The active fail-safe mode is displayed with the relevant LED arrays of the CBU (see table 6 in LED array of the CBU).

5.3.4. Terminating the fail-safe mode

As long as signaling had not already been interrupted beforehand for other reasons (e.g. signal monitoring was triggered), the OMC can re-assume control upon startup.

For this, terminating the fail-safe mode is initiated by a corresponding notification to the CBU. Afterwards, the CBC waits after reaching the next

GSP for signal activation by the OMC. The OMC independently calculates the transition from the currently activated pattern in the GSP to the requested target pattern.

5.3.4.1. Cancellation of the fail-safe after reaching the maximum number of signal protection messages

The fail-safe mode can be canceled if a max. number of signal protection messages is reached. As in this case a proper operation is no longer taken for granted the fail-safe mode is terminated as a precaution. The system then shifts over to fault flashing via an "all-yellow" pattern.

5.3.4.2. Cancellation of the fail-safe by the user

The fail-safe mode can be canceled by the user by pressing an off button on the BAZ. The system then shifts over to fault flashing via an "all-yellow" pattern.

5.4. Display and command unit BAZ

With the BAZ the basic version of each device has a display for all key information.

The BAZ fulfills the requirements of VDE 0832. It is accessible from the outside via a separately lockable door, which should preferably be installed in the cabinet sides. It can also be installed in the device door however.

The BAZ can be installed permanently in the controller (accessible via the police door) or used as an external command unit.

5.4.1. Design

The control element has a membrane keypad with an LED display for each key and for additional function displays. Further information is indicated by an illuminated LCD display with 4 lines of 20 characters each.

The keys are not lockable. The selected operating state can be canceled again with the keys Manual mode and TA reduced by pressing the key a second time. The operating modes Control center mode, Local mode, Off-flashing, Off-all-flashing and Off-dark trigger each other.

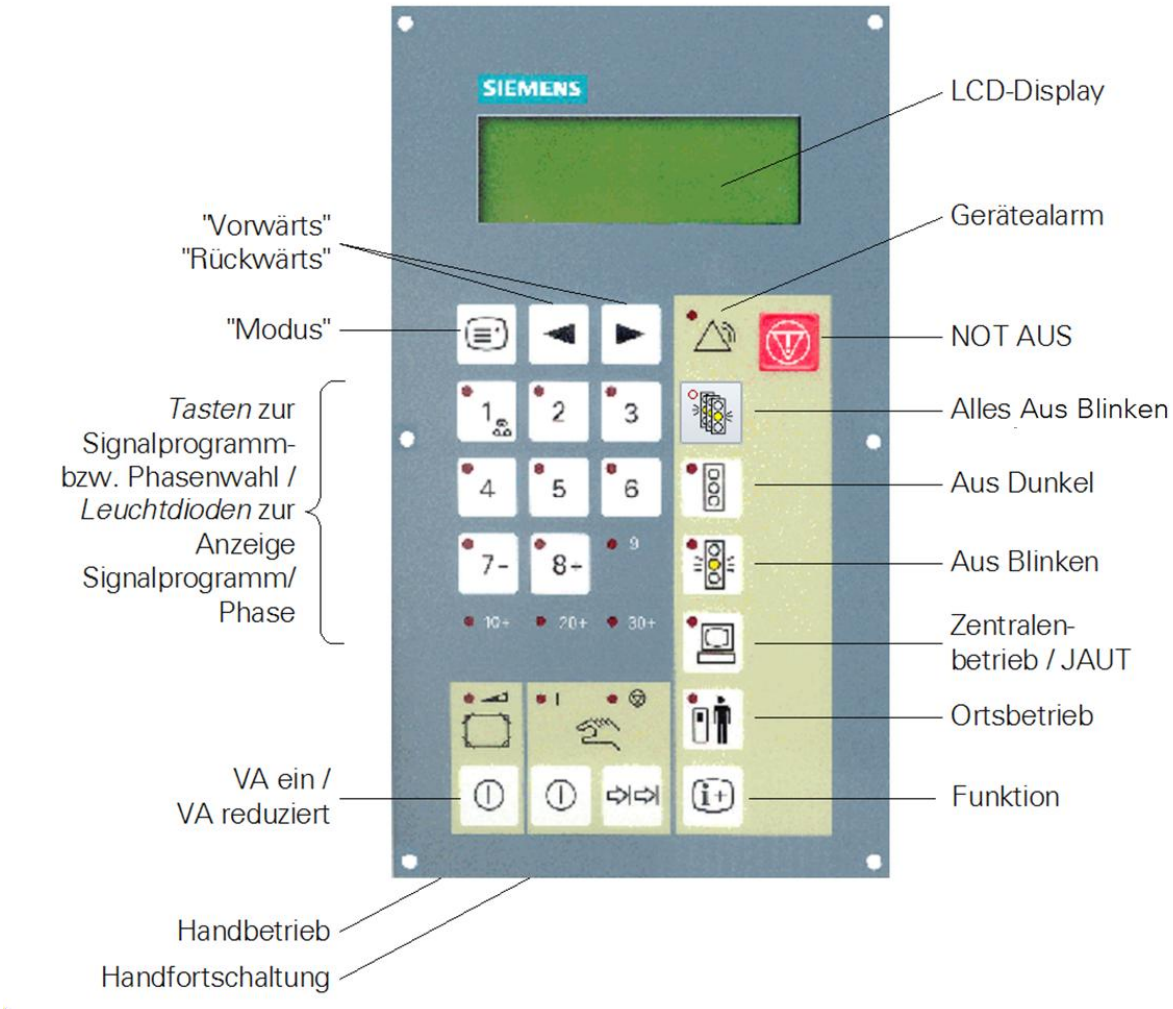
All keys and functions have LEDs which display the operating state and the number of the current signal program (or the number of the current phase).

When an operating action is initiated, the relevant LED flashes until the desired change is complete.

5.4.2. Connection in the system

The control element has a hardware connection to the CBU module. If the system has fully started, the BAZ is controlled by the OMC. This is described in the following as routine operation. If the OMC has not yet assumed control of the BAZ or the OMC cannot control the BAZ (e.g. in case of fault or fail-safe mode), the CBU module assumes control of the displays of the BAZ. Depending on the system, only drastically restricted display is possible. This is described in more detail in the section Basic display.

The other pages describe routine operation and the associated display and command options.



German	English
LCD-Display	LCD Display
"Vorwärts"	"Forward"
"Rückwärts"	"Backwards"
"Modus"	"Mode"
Tasten zur Signalprogramm- bzw. Phasenwahl / Leuchtdioden zur Anzeige Signalprogramm/Phase	Keys for signal program selection and phase selection / LEDs for displaying signal program/phase
VA ein / VA reduziert	TA on / TA reduced
Handbetrieb	Manual mode
Handfortschaltung	Manual advancement
Funktion	Function
Ortsbetrieb	Local mode

German	English
Zentralenbetrieb / JAUT	Control center / JAUT (12-month automatic routine)
Aus Blinken	Off-Flashing
Aus Dunkel	Off-dark
Alles Aus Blinken	All-off-flashing
NOT AUS	EMERGENCY OFF
Gerätealarm	Device alarm

The current signal plan can be identified from the LEDs:

- The LEDs light up on keys 1 through 8 in signal plans 1 through 8.
- LED 9 lights up in signal plan 9.
- From signal plan 10, LEDs 10+, 20+ or 30+ light up in addition to LEDs 1-9. If signal plan 24 is selected for example, LEDs 4 and 20+ light up.

Keys 1 through 8 are used to select a signal program of numbers 1 through 8 in local mode or a phase in acyclical manual mode.

If selecting a signal program whose number is above 8, proceed as follows:

- by pressing the key  signal plan selection can be changed in the menu.
- If the function key  is pressed and held, the keys 7 and 8 mean minus (-) and plus (+).
- Pressing the + or - key increments or decrements the desired signal plan number. The starting point for the count is the currently active plan.
- If, with the status of the last configured signal plan, the "+" key is pressed again, the count begins again at signal plan 1. Conversely, the signal plan with the highest number can be selected by pressing the "–" key from signal plan 1.
- Once you have selected the desired signal plan with +/-, release the function key and thereby accept the selected signal plan number as valid. This mode of changing into the new signal plan takes place based on the supply.

The right, colored area of the operator panel contains the Emergency OFF switch in the top line and the illuminated display for the device alarm. The operating states can be selected using the remaining keys in the right and lower area of the panel.

The active operating mode is canceled automatically with some special operating modes when the device door is closed. The device switches to the previously valid status. (e.g. manual mode)

The operating software saves the last active operating state for recovery in the case of power failures or status changes.

5.4.3. Display

The BAZ display shows the current operating state including any status changes.

- Next to the operating state indicator

four displays are available:

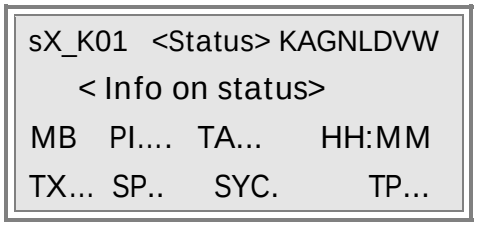
- Signal plan selection
- Lamp fault diagnostics
- Detector fault diagnostics
- Language selection for BAZ texts

It is possible to switch between display modes by pressing the  key.

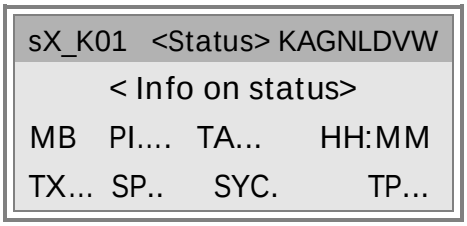
It is possible to browse within a mode using the keys forward  and backwards  .

5.4.3.1. Operating state display

The following information is output on the display during routine operation:



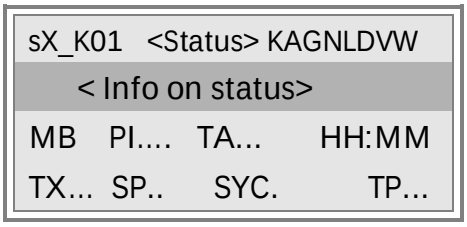
Line 1 Contains intersection designation and status displays



Display		Description
sX_K01		Intersection designation according to configuration (max. 5 places)
<Status>		Resulting system status (ascending order) with the following meaning: OK = system error free INF = important info WAR = warning present ERR = error present
Flags	Group	Fault flags according to group Flags are set if a status in the group reached at least the level WAR
	K	Communication
	A	TSS (system)
	G	Device
	N	Power supply (grid power)
	L	Lamps
	D	Detectors
	V	Traffic system
	W	Maintenance

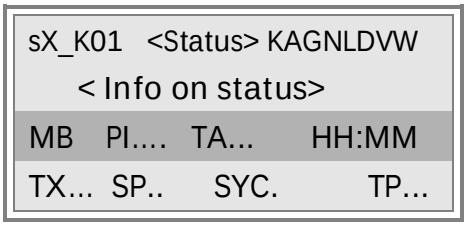
Tab. 12: Display of line 1

Line 2 Shows the detailed information on the current overall status



The detail status that is most important according to the categorization is shown here.

Line 3 Additional information (depends on current operating status)

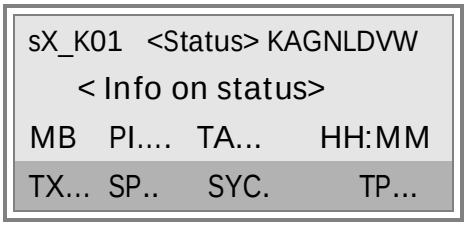


Operator	JT	JAUT (12-month automatic routine) or master control clock	
	MB	Manual operator (also manual suppression)	
	ZE	Traffic control computer	
	JT	Jaut scheduler	
	SE	Special intervention	
	TA	Traffic actuated control	
	ST	Fault suppression	
	BL	Suppression	
	IN	Internal control or suppression	
	--	Unknown	
Partial intersection (1 symbol per partial intersection, max. 4)	PI	↑↑↑↑	On
		●●●●	Off
		⯭ ⯭ ⯭ ⯭	Activation
		⯯ ⯯ ⯯ ⯯	Deactivation
		⯰ ⯰ ⯰ ⯰	Fault

Status of traffic-actuated control	TA	↑↑	On (IT / PT on)
		●●	Reduced operation
		↑●	IT on
		●↑	PT on
		??	Unknown
		--	Off
Current time	HH:MM		

Tab. 13: Display of line 3

Line 4 Status bar



The following information is displayed depending on the current operating status:

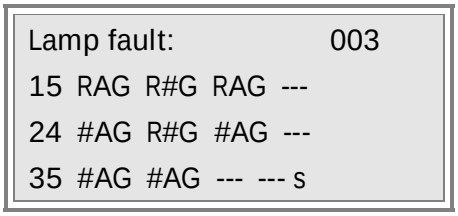
Duration	Stage duration
TX...	Cycle time second
SP...	Signal plan
SYC.	●TX synchronized to the reference time < TX lagging behind reference time > TX ahead of the reference time
TP...	Day plan

Tab. 14: Display of line 1

5.4.3.2. Diagnostics mode

The hardware status can be queried here. The forward and backwards keys allow you to see the submenus Lamp status and Detector status.

Lamps



In line 1 next to the heading the total number of registered lines with lamp faults is indicated. The following lines show lamp faults based on signal group

Column 1	Logical signal group
Column 2-5	For every sensor (max. 4) the faulty lamps are shown. For details see table below
Column 6	Determined via residual current for lamps reported to be faulty

Tab. 15: Display of line 1

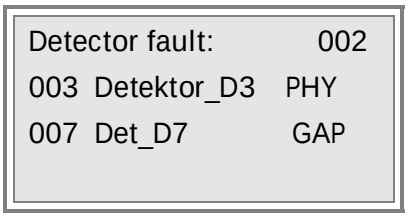
Symbol	Meaning
R	Red lamp OK
A	Yellow lamp OK
G	Green lamp OK
#	Lamp faulty
-	Lamp not present

Tab. 16: Symbols for lamp status

Browsing with lamp faults

Up to 3 lamp errors can be displayed. Other lamps that may be faulty can be displayed by scrolling with the arrow keys.

Detectors



In line 1 next to the heading the total number of registered lines with detector faults is indicated. The following lines indicate the detector faults

Column 1	Logical detector number
Column 2	Identifier of the detector
Column 3	Fault category (see table Detector faults)

Tab. 17: Display of detector fault

Symbol	Meaning
PER	No data from peripheral devices
INT	Internal fault
KFG	Configuration error
LCK	Permanent gap
BEL	Permanent occupancy
FLT	Flutter error

Tab. 18: Detector fault

Browsing with detector faults
Up to 3 detector faults can be displayed. Other detectors that may be faulty can be displayed by scrolling with the arrow keys.

5.4.4. Basic display

If the OMC has not yet assumed control of the BAZ or the OMC cannot control the BAZ (e.g. in case of fault or fail-safe mode), the CBU module assumes control of the displays of the BAZ.

In this case the operating status of the CBU is displayed:

Text	Stage	Explanation
"Initializing...(x)"	Startup of CBU	The CBU is being initialized
"Signal monitoring waiting for controller!"	CBU is waiting for OMC	Initialization of the CBU was completed successfully. The OMC is not ready yet
"emergency operation is active ..."	Fail-safe operation	CBU assumed control in the fail-safe mode
"Cancelling emergency operation"	Fail-safe mode is canceled	Fail-safe mode is interrupted

During BAZ display via the CBU the following fault states can be reported.

Text	Explanation
" Mains fault"	Mains voltage error
" Rebooting..."	CBU is being rebooted
" Config invalid "	CBU contains an invalid configuration
" Check configuration "	CBU configuration is not suitable for OMC
" System error "	System error
"Emergency switch off"	Emergency OFF

Indicators in fail-safe mode
For details on fail-safe mode and the relevant indicators see Fail-safe mode

5.4.5. Basic functions

5.4.5.1. EMERGENCY OFF

When the EMERGENCY OFF key is pressed, the entire device is immediately switched to zero potential by triggering the fault current circuit breaker, i.e. galvanically isolated. Even the traffic-actuated controller that appears first in the priority list of operators cannot intervene here.

5.4.5.2. Device alarm

The device alarm LED next to the EMERGENCY OFF key is used to display specific fault states of the controller.
When the device is operating normally, i.e. fault-free operation or following successful error recovery, the LED is off.

According to the categorization of an occurring problem or a fault, an overall status for the controller is ascertained.

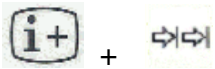
Here, the status can of the type of OK, info, warning or fault or severe fault. The last four are also visualized via the display with the LED.

LED off: For overall status of the device, OK up through Warnings is available

LED flashes at 1Hz: Overall status of the device reports faults

LED is continuously illuminated: Overall status of the device reports severe faults.

5.4.5.3. Other operating actions

Residual current initialization	 +

By using this key combination, learning of the connected lamp loads is activated. Thus it is ensured that the residual current calculation can be performed correctly.

5.5. Reset the system

In certain operating scenarios it is helpful or necessary to restore the system partly or completely to its factory settings.

5.5.1. Terms and definitions

The following definitions are intended to describe the terms and their underlying actions:

5.5.1.1. Warm start

As extensive as possible a restoration of the operating status prior to restart of the firmware or device

Warm start actions

- Delete caches
- Restore last operating status.

5.5.1.2. Cold start

Clearing out old, no longer relevant data while maintaining the overall configuration. Operating statuses and users are restored to the default

Cold start actions

- Delete archive contents
- Delete stored operating status information
- Maintain configuration
- All previously named warm start actions

5.5.1.3. Factory setting (factory default)

Restoration to status of the system upon delivery. All parameters including the network settings are restored to the factory default.

Factory default actions

- Activate factory configuration with default parameters
- All previously named cold start actions

5.5.2. Execution

The warm start is performed by default via the startup of the application (e.g. with power supply on).

A cold start is necessary if the operation of the system has been modified in such a way that the current persistences and archives in the previous form cannot be resumed. This is necessary for large-scale interventions in the configuration (usually these are changes relevant to signal monitoring). If this is necessary, the user is explicitly informed of this situation and the actions are performed automatically.

Alternatively, performing a cold start manually is possible with the web interface. Details can be found in the relevant online help.

Restoration to factory settings is only possible via the web interface. Details can be found in the relevant online help.

6. Characteristics of the Sitraffic sX

Software features	
Basic functions	
Signal groups	Up to 64 signal groups (maximum 256 outputs) can be distributed on one partial intersection.
Signal plans	Up to 39 signal plans configurable. Fixed time signal plans are deposited in the device via the supply and can be selected via different operating modes. Synchronization per signal plan can be configured
Additional signal plan trays	---
System cycle	Standard system cycle: 1 sec.
Inputs and outputs	In all, up to 250 logical inputs and outputs can be used
Device control via different operators with different priority	■ TA (traffic-actuation logic) ■ Manual operator (web interface with virtual BAZ or BAZ) ■ Control center (operation via control center interface) ■ JAUT (operation as per locally defined automatic twelve-month switching routine)
Signaling, intergreen, transition and minimum times, offsets	
Intergreen time matrices	A common minimum intergreen time matrix for control and signal monitoring.
Offset time matrices	No offset monitoring in the controller, sCore takes the Hessian decree into consideration in the generation of transitions.
Minimum time lists	1 standard list, 1 additional list each per signal plan. "Minimum times are referenced for each signal group and signal plan. There is only a minimum stage duration during stage control.
Freely definable transition lists	1 standard list, 1 additional list each per signal plan. Transitions can be configured for each signal

Software features	
	group and for each signal plan.
Color assignment	Color assignment takes place via configuration of the permitted color conditions (OCIT color code) for each signal group. For each color it is specified whether it concerns an approval color or prohibition color.
Flashing signals	1 Hz and 2 Hz, light and dark with a customized start for each signal group is possible
Twin flasher	Flashing in synchronous with the controller (the system's standard flashing pattern)
Intergreen and minimum time monitoring for On/Off patterns	Monitoring commences as soon as the device is in a "live" (monitored) state. Separate monitoring in the controller and in the signal monitor
Different On/Off pattern sequences	Valid sequences are referenced via the signal plan
Off states	Three different Off states switchable. Selectable by software from off-flashing, off-all-yellow-flashing and off-dark. Fault flashing and all-yellow-pattern is activated automatically by the signal monitor.
On / Off switching partial intersections	Partial intersection mode is currently not supported
Changeover method	
■ GSP	Standard switchover method, switching is performed at a fixed time (GSP) in the cycle.
Detector polling and measurement processing	
Resolution and detection	Detector acquisition at a 10-ms resolution, raw values always available for the last two seconds) Forwarding and processing of raw measurement values every 100 ms, derived and smoothed values every second
Error detection	Error detection via hardware and additionally via detector plausibility (monitoring for permanent occupancy / permanent gaps, fluttering signal sequence) For each loop, the hardware error or the missing SLD4 communication is recorded.
Detector plausibilities	Detector plausibility varies with time (can be adjusted with JAUT)

Software features	
Aggregation interval	(type 60 or 90 sec.)
Transmission to control center	CANTO: All detectors in aggregated form or as raw values can be requested by the control center.
additional detector information	Evaluation uses a specially configured detector, e.g. vehicle type or speed violation (no speed value)
Simulation of detector values	Via web interface. Function works on raw value level so that all derived values can be generated completely.
Outputs	
Acknowledgment lamps	Pedestrian acknowledgements on the free outputs of a signal group and misc. Outputs possible. Standard "Please wait" or "Please press" function can be specified in each controller's supply data. Assignment of input and signal group with automatic control via acknowledgement lamp function.
Digital outputs	Mode analogous to signaling = On | Off | 1 Hz flashing | 2 Hz flashing (light/dark starting)
System events	Outputs can be set for certain system events.
Timing	
Regulation	Automated selection of the best available time reference source according to their quality (receipt, delay, etc.). Automatic summer/winter time changeover
Time reference sources	
■ Real-time clock (battery-buffered quartz)	Time source for startup after power interruption
■ GPS	Time balancing via serial reception of a time telegram from the GPS recipient
■ Time server	Time balancing via synchronization with a time server (ntp)
Public holidays, special days and vacations etc. are dealt with on the basis of an annual calendar (JAUT)	As per supply via assigned day plans.
Back calculation method and synchronization	
■ UTC	Reference time is 1.1.1980 0:00 (GMT) Summer time is not considered here.
■ 1.1.1980	Reference time is 1.1.1980 0:00. Summer time

Software features	
	is not considered here.
■ 1.1. current year	The reference point is 1 Jan. 0:00 for the current year. Summertime is considered here, i.e. the seconds of the skipped hour are considered as lapsed.
■ Midnight of the current day	Reference time is 0:00 for the current day. Summertime is considered here, i.e. the seconds of the skipped hour are considered as lapsed.
Reference time register	Reference time counters are kept for the active signal plan and for the desired signal plan. Here, the device-global offset is considered.
Synchronization of the cycle	JAUT operation and central operation are synchronized operating modes. Locally determined is not synchronized. As soon as a deviation from the reference time is detected in synchronized operating modes, the synchronization process is initiated.
■ Synchronization in GSP	By waiting or also limited by skipping seconds (max. 1 sec.) in GSP
Synchronization offset	Global and signal plan-related offset possible for each configuration
Coordinated switch-on	based on the reference time (REFLI) during switch-on in synchronized operating mode is possible.
Storage, data backup and archives:	
Archiving	Currently pre-configured as unmodifiable. Data is overwritten cyclically on the flash drive once the maximum size has been reached, deleting the oldest data. All archives are compressed and stored in a format that is not immediately readable.
■ Status archive	Status changes in operating states and signal monitoring events are archived. Manual saving via web interface is possible.
■ Signal monitoring archive	for all configured signal groups, inputs and outputs
Operator function	
■ Web interface	The Web interface is the primary operation and diagnostics unit. This has display options

Software features	
	adapted to different end devices (e.g. smartphone, laptop). For the manual command unit there are expanded operating and diagnostics options available (for details see relevant documentation or online help) Expanded operating options are: ■ Signal plan time editor ■ Jaut configurator ■ Startup wizard ■ Plug &Play for control center ■ Signal monitor test ■ Expanded operating mode
Manual command unit	
■ Switching of Off-patterns	Off-flashing, Off-all-flashing and Off-dark
■ Signal plan selection	Local mode with selection of up to 39 signal plans, 1-8 directly, other signal plans via menu
■ Setting the operating mode	Control center operation (automatic 7-day switching routine as fallback level) Local mode via JAUT (JAUT operation) Local mode fixed
■ Manual control	cyclical with advance point switching through stage selection of up to eight manual stages, stage transitions via definable stage transitions or intergreen time and offset
■ TA mode	Switching between TA on / TA off / TA reduced is possible = fixed time + archives + measured value acquisition / TA allowed
■ All red	Not supported
■ Special functions	■ Signal monitor - relearn residual current ■ Language switching command unit
■ Display switchover	Switching of screen modes via Mode button Scrolling within a mode via arrow keys Existing modes: ■ Operating state (default) ■ Signal plan selection ■ Display of lamp faults ■ Display of detector fault ■ Language selection
Other operating functions	
Rotary switch for OMC	Switch position 0 = normal mode

Software features

Rotary switch for CBU	Switch position 1 = cold start Switch position 2-9 = reserved Switch position 0 = normal mode Switch position 1 = simulation start Switch position 2 = operation without external installation Switch position 3 = reserved Switch position 4 = signal monitor test Switch position 5 = load configuration Switch position 6 = firmware update mode Switch position 7-15 = reserved
12 month automatic routine	On, Off, signal plan change, TA, controlling outputs, switching over detector plausibility monitoring
Control center	On, off, signal plan changeover, local mode, TA (incl. PT/IT), partial intersections, modifications, reset fault
TA	On, off, signal plan changeover, interventions in accordance with TA processes
Diagnostics and testing	
Web interface diagnostics	
■ Detailed status	Display of the system status with detailed information. Display weighted and grouped. Log entries for events, Display of the signal program switchovers
■ Intersection information	Important information on the intersection and its key data
■ Time	Display of the device time
■ Checksums	Display of checksums of most important configuration objects
Visualization of traffic engineering data	
■ Online visualization of signal groups	Graphical signal plan visualization
■ Online visualization of detectors and inputs	Graphical and numeric
■ Intersection topology	Intersection pattern with signal groups and detectors (automatically generated, 8 arms max.) with dynamic creation of primary signal groups
■ Traffic engineering visualization	Signal time visualization with detectors, outputs and AP variables (max. 96 lines)
■ Statuses of the outputs	Visualization of the outputs

Software features	
■ Signal plans	Visualization of the configured signal plans in graphical and numeric form
■ Operating state	Modification via corresponding menu option and BAZ simulation is possible
■ Control levels	Active control levels or users with indicator of the affected states
Archives	
■ Access to all archive memories	Archiving of signal groups, detectors and AP variables Storage of archives to the offline evaluation Displays the fill level and size of the archive
■ Complete backup of supply data	Supply data is backed up with plug & play function to the central device. Last .sX (zipped total supply) in the device as backup
■ Measured value statistics	Configurable archiving jobs for signal groups, detectors, AP values and outputs
■ Internal system status indicators	Operating system values, version data, diagnostics at operating system level
BAZ diagnostics	
■ Operating state	Intersection short name, faults, operating state, operating mode, PI state, TA state, time, TX, signal plan, synchronization status, day plan
■ Diagnostics modes	■ Display of lamp faults ■ Display of detector faults
Web interface test functions	
■ Simulation of detector occupancies	Loading of detector occupancies (static and dynamic)
■ Setting of outputs	on, off, 1Hz flashing, 2Hz flashing
■ Signal monitor test	Tool for automatically checking and acceptance of the signal monitor
Additional functions	
■ Modem connection	for remote selection of a device with a GPRS router
■ Language switching	English and German Depending on the project, other languages may also be possible
Connection to the control center	
Centralized control via CANTO (Scala)	
Connection via	Profile 2 via Ethernet with VPN tunnel Profile 3 via GPRS with VPN tunnel

Software features

Configuration and installation	
■ Configuration	The configuration covers several components, which optionally can all be transferred to the device in a resulting sX archive. The transmission of individual components requires that a valid configuration is activated in the device. Components in the sX: ■ Basic supply and SiMo supply are compressed. sLX parameters are included in the basic data supply. ■ System configuration (e.g. network parameters) ■ Project-specific components (optional) Maximum size of uncompressed configuration data is limited to 12 MB.
■ Initial configuration	■ covers at least a valid basic supply
■ Settings and changes to settings	■ Configuration generation and configuration changes with Sitraffic sCore or Sitraffic Office. Some configuration settings can be changed via the web interface
■ Transmission	Configuration is transmitted as a *.sX file. Transmission with integrated call from Sitraffic sCore or directly with prepared *.sX files via web interface is possible)
■ Installation and update of the firmware	The firmware is distributed in packaged form (RPM packages). An update or installation of individual packages is possible here. The following actions are possible with this: ■ Complete update of the firmware ■ Installation of service packs ■ Installation of project-specific components It is possible to perform updates through the menu in the web interface. Display of the installed packages with the web interface
■ Initial installation	Initial installation takes place ex works, but it can be performed any time via USB stick
Traffic-actuation logic	

Software features	
■ sLX	Integrated traffic-actuated logic (TA) for simple controls—easy to parametrize via Sitraffic Core; usable without license

7. Reference to open source software

The product contains, among other things, Open Source Software, licensed under an Open Source Software License and developed by third parties. These Open Source Software files are protected by copyright. Your rights to use the OpenSource Software beyond the mere execution of Siemens´ program, is governed by the relevant Open Source Software license conditions. Your compliance with those license conditions will entitle you to use the Open Source Software as foreseen in the relevant license. In the event of conflicts between Siemens license conditions and the Open Source Software license conditions, the Open Source Software conditions shall prevail with respect to the Open Source Software portions of the software. The Open Source Software is licensed royalty-free (i.e., no fees are charged for exercising the licensed rights, whereas fees may be charged for reimbursement of costs incurred by SIEMENS).

Please refer to the detailed list of used packages and relevant licenses and terms, by reading accordingly references contained in the help menu of the web configuration tool.

If programs contained in this product are licensed under GNU General Public License (GPL), GNU Lesser General Public License (LGPL) and this software is not already delivered in source code form together with the product, you can request the corresponding source code from SIEMENS by paying a fee of 5,- Euro for the physical act of transferring the copy. Please send your specific request, together with a receipt indicating the date of purchase, within three years of your purchase and the software release number to:

Siemens AG
IC MOL RCM ITS
Otto-Hahn-Ring 6

81739 Munich, Germany

Warranty regarding further use of the Open Source Software:

SIEMENS provides no warranty for the Open Source Software programs contained in this device, if such programs are used in any manner other

than the program execution intended by SIEMENS. The licenses listed below define the warranty, if any, from the authors or licensors of the Open Source Software. SIEMENS specifically disclaims any warranties for defects caused by altering any Open Source Software program or the product's configuration. You have no warranty claims against SIEMENS in the event that the Open Source Software infringes the intellectual property rights of a third party. Technical support, if any, will only be provided for unmodified software.

8. Index

W

Further information
is provided by:

Siemens AG
Infrastructure and Cities Sector
Mobility and Logistics Division
Road and City Mobility

Otto - Hahn - Ring 6
D-81739 München

The information in this manual contains descriptions and features which can change due to the development of products. The desired features are only binding if they were agreed upon conclusion of the contract.

Order no. A24730-A890-B007

Siemens Aktiengesellschaft

www.siemens.de/traffic