**user manual**
last change on: 07.04.2017

Crate Controller 2x Series

Controller module for use with MMS compatible ECH crate series and MMS compatible modules

- Ethernet and WiFi (opt.) connectivity
- Master (CC24) / Slave (CC23) versions available
- Embedded Linux-Server with iCS control system (Master version)
- Two independent CAN extension ports (for Slave connection)
- Controls crate and module functions
- Digital I/O: Free configurable INHIBIT, INTERLOCK
- Preconfigured services: EPICS, SNMP, HTTP, SOAP, Websocket
- Webbrowser based control and configuration system
- Easy configuration and firmware updates of connected hardware
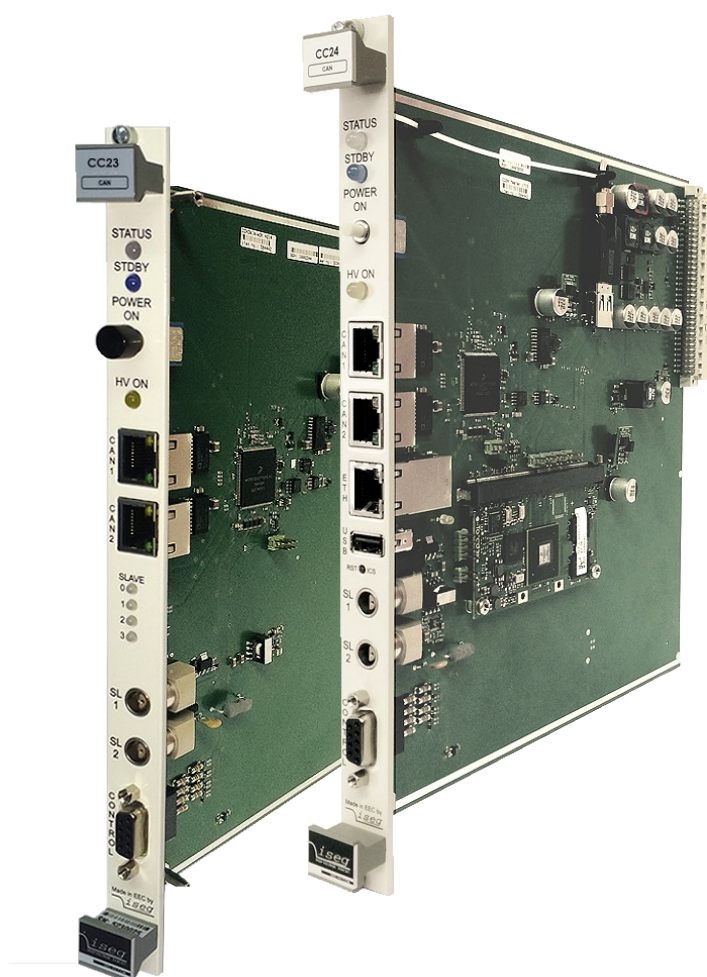
Document history

Version	Date	Major changes
1.0	29.1.2016	Initial release
1.1	29.1.2016	Corrected item codes
1.2	19.4.2016	Text and format revisions, Safety-Loop text changes
1.3	03.8.2016	Add Appendix
1.4	07.04.2017	ICS2.1 update

Disclaimer / Copyright

Important security information

Please read all security warnings and notices carefully. iseg declines responsibility for any kind of damage, injuries or other consequences that are caused by improper use or negligence, whether or not under conditional intent.

WARNING advices in text indicate attention to hazards, that could lead to injuries or death.

CAUTION notes in text indicate information to avoid damages to the equipment.

INFO notes in text show important information and resources.

SAFETY ADVICE
⚠️ WARNING   This device generates high voltages or is part of or attached to high voltage supplying systems. High voltages are dangerous and may be fatal. USE CAUTION WHILE WORKING WITH THIS EQUIPMENT. BE AWARE OF ELECTRICAL HAZARDS. Always follow at the minimum these provisions: • High voltages must always be grounded • Do not touch wiring or connectors without securing • Never remove covers or equipment • Always observe humidity conditions • Service must be done by qualified personnel only

WARNING
⚠️ WARNING   **RAMP DOWN VOLTAGES !** Before insertion or removal of crate controller, please make sure, that all voltages are ramped down, crates are switched off and power cord is disconnected.

ATTENTION
⚠️ CAUTION   **CHECK COMPATIBILITY** Please use this device only in compatible MMS crates. Check compatibility list first.

Warranty information

This product is shipped with a warranty of 36 months, starting with issue of invoice. Within this period iseg will repair or replace in case of defective under proper use.

Table of Contents

1 General information

The iseg CC 24/23 series is an intelligent embedded Linux-Server system with preinstalled iseg Communication Server (iCS). The iCS comes with a large set of preconfigured services as EPICS, Web-Control, SNMP[1], SOAP, Websocket, OPC/UA[1], isegHAL and HTTP-API. The iCS also delivers two main web based user applications. iCS**control** provides a quick and smart control interface of the connected hardware by using web-browser without software installation. iCS**config** is used for hardware and service configuration and firmware upgrades. Both can also be run on mobile devices like tablets or smartphones.
For native application control several software solutions are available:

• iseg SNMP Control

• iseg**Control** (Linux, Windows, Mac)[2]

• isegHalRemote-Library

2 Package contents / Accessories

Hardware	included	optional
CC24 Master controller	CC24 controller (item code: CC24) WiFi USB adapter (item code: Z520175) Bitrate 125 kBit/s Dongle (item code: Z516581)	USB surveillance cam (item code: Z520158)
CC23 Slave controller	CC23 controller (item code: CC23) Bitrate 125 kBit/s Dongle (item code: Z516581)	

3 Compatibility

The CC2x crate controller series is compatible to the following MMS crates:

Crate	Slots	CC24	CC23	Required controller firmware	Notes
ECH 4xA (starting mid 2015)	10	X	X		
ECH 4xA-LV	10	X	-		Low voltage crate option is only available in Master-Crate
ECH 242	2	X	X		
ECH 244	4	X	X		
ECH 224	4	-	-		As legacy slave client (CAN)
ECH 238	8	-	-	ECH238_212 ECH238_310	As legacy slave client (CAN)
ECH 44A (2013 – mid 2015)	10	X	X		Controller must be changed, i**CS**intern must be removed
ECH 43A (end 2013)	10	X	X	ECH4XA_409	CC43 and CC23 are similar

The CC2x crate series is compatible to the following MMS modules:

Module series	Required Firmware	Notes
EHS	E08C0_240 E08F0_244 E08F2_428 E16C1_118 E08C2_453 E08F2_655 E08C1_215	Serialnumber (6 digits) 73xxx0/1 Serialnumber (6 digits) 74xxx0/1 Serialnumber (6 digits) 72xxx0/1 Serialnumber (6 digits) 79xxx0/1 Serialnumber (7 digits) 73xxxxx and 78xxxxx Serialnumber (7 digits) 72xxxxx and 74xxxxx Serialnumber (7 digits) 79xxxxx

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1   Expected available middle of 2016
2   Update to Version 2 is expected available middle of 2016

EDS	E16D0_443 E16D1_443 E24D1_552	Serialnumber (6 digits) 71xxx0/1 Serialnumber (6 digits) 71xxx0/1 Serialnumber (6 digits) 71xxx0/1
EBS	E08B0_211	Serialnumber (6 digits) 77xxx0/1
ESS	ESS01C_120	Serialnumber (7 digits) 77xxxxx

4 Technical data

System		
System	MMS – Eurocassette 6U	
Connectivity		
System connector	96pin backplane	
USB - front	1x USB-A	
USB - board	1x USB-A	For manufacturer specific WiFi adapter
Ethernet (10/100/1000 MBit)	1x RJ-45	
CAN	2x RJ-45	Two seperate lines (green and yellow indication)
Control connector	1x D-SUB-9 female	Custom specific configurable, refer to page 11
Server hardware		
CPU	Freescale iMX6 Quad-Core 996 MHz	
RAM	1 GB DDR3 onboard	
Flash Memory	4 GB onboard	
Operating system		
ICS2	Manufacturer specific Linux distribution	
Services	iCSservice (Websocket, HTTP, SOAP), SNMP, EPICS, HALservice	
Native control software	isegControl (Win 7/8/10 – 32/64bit, Linux, OS X 10.9 and higher)	
Web browser based control / config software	iCSconfig / iCScontrol: All plattforms: Mozilla Firefox (version > 41), Google Chrome (version > 45), iOS (Safari): version > 7	
Environmental conditions		
Operating temperature range	10 – 40 °C	
Storage temperature range	-20 – 85 °C	
Humidity	30 – 70 % (non condensating)	
Compliance		
	RoHS, CE, UL-94, Conflict Mineral, REACH	

5 Hardware setup and topology

An ECH crate which is equipped with a CC24 Host Controller can be extended with up to 2 x 4 CC23 slave controllers using the green and the yellow daisy chain CAN lines. Legacy CAN controlled crates can be connected at the end of each of these lines.

All CC2x controllers provide two independent CAN lines, that are separated by color coding, indicated by the LED of the CAN connector. The upper CAN connector connects the YELLOW CAN LINE, the lower to the GREEN CAN LINE.

The address IDs of the connected crates are configured automatically, depending on the position in the chain following this pattern:

	LINE-ID	DEVICE-ADDRESS
Yellow line IDs	1-5	
Green line IDs	8-12	
Controller 2x series		1000
Controller legacy crate series		2000 ...
Modules		0-999

Illustration 1: Topology of CC24/23 series

ATTENTION

⚠ Before insertion or removal of crate controller, please make sure, all voltages are ramped down, crates are switched off and power cord is disconnected.

CAN connector LEDs

	CC24 (master)	CC23 (slave)
Slave is not connected to master or previous slave	CAN connector indicates line (yellow or green LED at the connector)	All LEDs are off
Slave is connected to master or previous slave		CAN LED indicates the color of the master line, the slave is connected to The number LEDs indicate the slave´s order number (note: not the address – see topology)

Connection and Termination

Both CAN connectors are internally terminated by a 120 Ohm resistor. If two CC2x controllers are directly connected by a direct assigned (no crossover) FTP Cat. 6 patch cable, no further termination is needed.

ATTENTION

⚠️

CAUTION

Do not connect both CAN connectors of a CC2x controller in any way, neither direct nor by building CAN ring bus topology.

Connecting legacy crates (ECH238, 224 etc.)

CC2x controllers are able to connect legacy CAN-only driven iseg crates. So it is possible to extend existing hardware setups with a new MMS series crate (ECH44A, ECH242, ECH244) and CC2x crate controller to access complete hardware by Ethernet or WiFi with all major advantages of the integrated server hardware.

Legacy crates don't automatically configure their address. The address of the backplane (bank address) must be selected by a rotary selector switch of the legacy's crate controller. Please note:

- Please pay attention that every legacy crate is configured to a unique address within a CAN line.
- Modules labeled with a six digit serial number allocate one or two addresses dependent on the serial number.

  If there is one module in a legacy crate that's six digit serial number has a one at the last digit, only equal bank addresses are allowed.

- Crate controllers of legacy crates must be configured to a CAN-Bitrate of 250 kBit/s

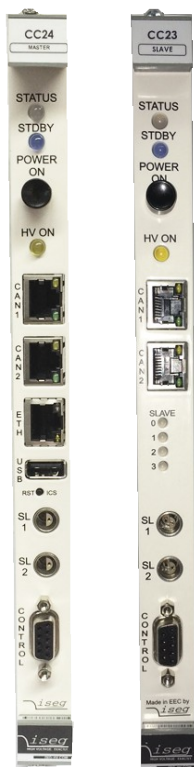Each of the Master´s CAN-Lines can address up to 64 modules in legacy crates.

6 Front panel

Fig. 1: Front panel of CC24

Fig. 2: Front panel of CC23

LED STATUS	System state: • LED off: Crate is switched off / Standby mode • LED green: Crate is running without error • LED red: Error occurred (Crate Status bit Sum Error is set)
LED STDBY	Standby mode: • LED blue: Crate is connected to mains, remote controllable, WiFi and Ethernet connections are active
Pushbutton POWER ON	Switches the crate on or off by pressing the button for one second ON: All modules will be supplied with power by crate and can be controlled The fan speed is regulated according to the maximum temperature within the crate OFF: All modules will be switched off. The fans run at minimal speed.
LED HV ON	HIGH VOLTAGE is active LED yellow: At least one channel in crate generates high voltage or is measuring an output voltage of more than 60 Volt
CAN1	RJ-45 CAN – connector for slave controller connection
CAN2	RJ-45 CAN – connector for slave controller connection
ETH (CC24 only)	RJ-45 Ethernet network connector (10/100/1000MBit)
USB (CC24 only)	USB 2.0 connector, for external WiFi, camera, firmware upgrade, flash memory
LED SLAVE 0-3 (CC23 only)	Indicate the slave position in the yellow or green CAN line
SL 1	Safety-Loop-Connector 1
SL 2	Safety-Loop-Connector 2
CONTROL	D-SUB-9 connector with configurable digital I/O

The voltage supply of the crates backplane and the crate connected modules is switched on by the POWER ON pushbutton or REMOTELY.

Normal front panel operation

Hold the POWER ON pushbutton for one second. The power supply will be switched on. LED STATUS turns to GREEN. By holding the POWER ON pushbutton again for one second, the power supply will be switched off. The LED STATUS goes OFF.

INFORMATION	
⚠ **i** NOTE	If the POWER ON pushbutton will be hold for five seconds, the crate enters the configuration mode (see pg. 12)!

Front panel operation with errors

If an error occurs while trying to switch the Crate on, the LED STATUS lights RED for 5 seconds. After that the crate controller shuts down the operation and the LED STATUS goes OFF. If an error occurs during operation, the crate remains powered on and the LED STATUS is permanent RED.

All possible errors are described in the Crate Status register description (see CAN EDCP programmers guide – page Fehler: Referenz nicht gefunden).

7 Safety-Loop connector

The SL1 and SL2 connectors serve as current source for the safety loop. The current flow through a safety loop enables the high voltage generation within the modules. When the safety loop is interrupted, the high voltage generation stops immediately.

INFORMATION	
⚠ **i** NOTE	The safety loop feature has to be activated by removing of a jumper on the backside of the modules also, see specific module manual for more information.

SL1

Potential-free current source (8 to 10 mA) to supply a safety loop for up to 10 modules. The safety loop is routed through the modules SL connectors by a series connection. Start- and end point of the safety loop is SL1. For modules with a Redel connector, the associated SL pins have to be bridged. Additional potential-free contacts to open the safety loop through external signals can also be inserted.

SL2

A current source on crate GND potential for modules with option SLP (internal supplied safety loop). The SL2 connector pins can be bridged by a short-circuit plug or an external potential-free switch. In this case the modules are supplied with the loop current via the crate's backplane.

To enable a module its SL connector (and, if applicable, the SL pins on the Redel connector) must be bridged. All modules are supplied with the loop current in parallel, i.e. opening the SL connector on a module will only deactivate this one module.
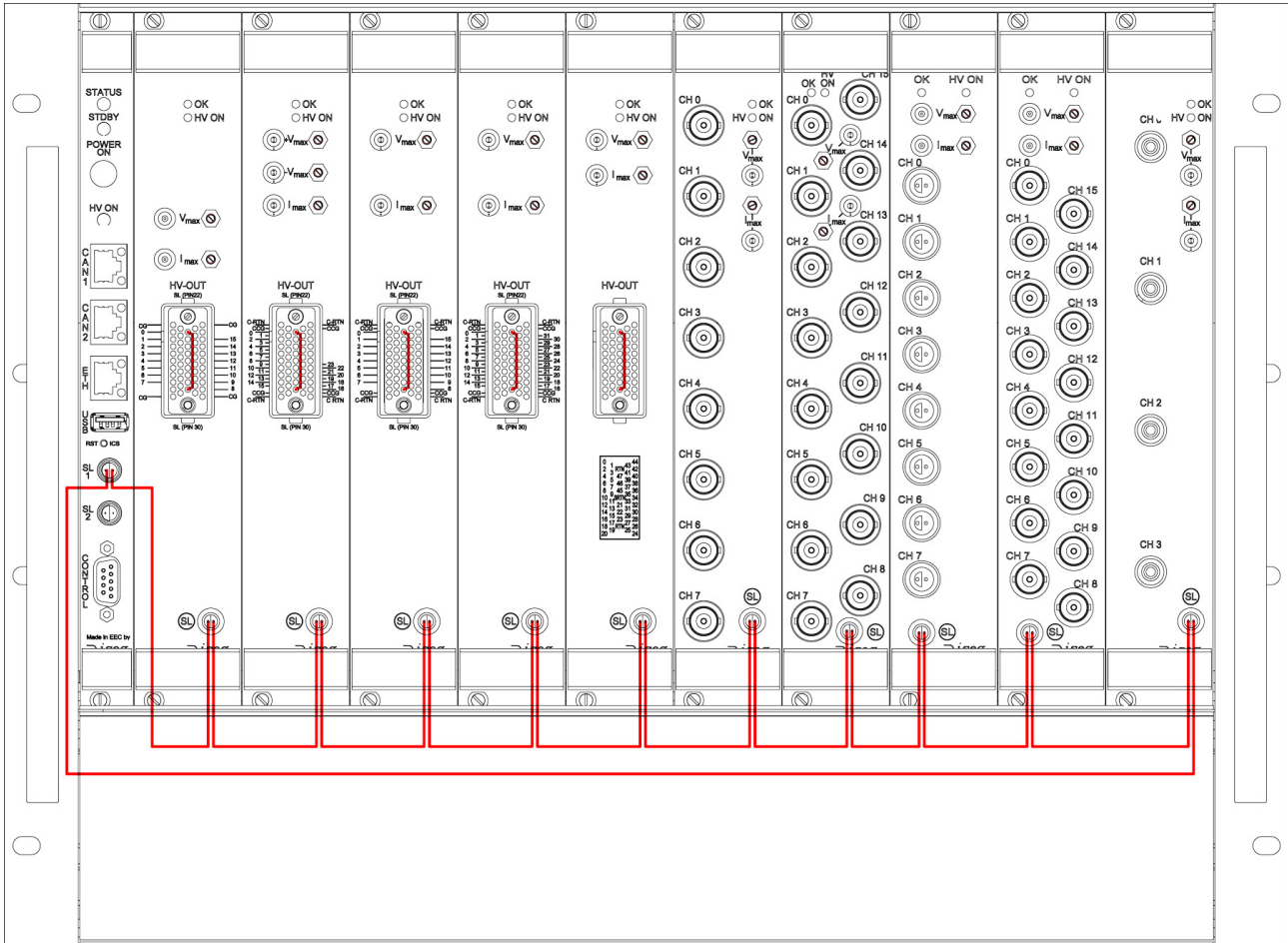

Figure 3: Safety loop 1 - wiring example

8 Control connector

<table>
<tr><td colspan="2">INFORMATION</td></tr>
<tr><td>⚠
NOTE</td><td>This function requires crate controller firmware release 4.08 or higher.</td></tr>
</table>

The CONTROL D-SUB-9 female connector provides digital input and output functions.

To use all control connector functions, it may be necessary to perform firmware updates for all modules in the crate first (see pg. 5).

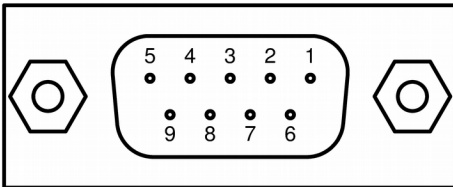The high level is +5 Volt, low level is ground potential.

Illustration 2: Pin assignment of CONTROL connector

Pin	Direction	Name	Description
1	Input	Crate Enable	This function must be activated by setting the Crate Enable Active bit in the Control register to one. This setting is permanent and restored after Power On. • When pulled high, the Crate Status bit Crate Enabled is set and high voltage can be turned on. • When open or pulled low, the Crate Status bit Crate Enabled is cleared and no high voltage can be turned on.
2	Input	Crate Fast Off	When pulled high, the Crate Status bit Crate Fast Off is set to one and all high voltages will be shut down without ramp.
3	Input	Reserved	
4	Input	Reserved	
5	--	Ground	Always low, can be used to pull down input pins
6	Output	High Voltage On	High when the Crate Status bit High Voltage On is set
7	Output	Reserved	
8	Output	Reserved	
9	Output	Logic High	Always high, can be used to pull up input pins

The following module firmware versions are required to use the Crate Enable and Crate Fast Off functions:

Module	Firmware	Required firmware release
EBS 8/16 channel	E08B0 1.xx	1.11 (or higher)
EHS	E08C0 2.xx	2.40 (or higher)
EHS	E08C2 1.xx	1.24 (or higher)
EHS	E08C2 3.xx	3.02 (or higher)
EHS	E08C2 4.xx	4.51 (or higher)
EHS	E08F0 2.xx	2.44 (or higher)

EHS	E08F2 4.xx	4.28 (or higher)
EHS	E08F2 6.xx	6.51 (or higher)
EHS	E08F7 1.xx	1.00 (or higher)
EHS	E16C1 1.xx	1.19 (or higher)
EHS	E16C1 2.xx	2.13 (or higher)
EDS	E16D0 4.xx	4.43 (or higher)
EDS	E16D1 4.xx	4.43 (or higher)
EDS	E24D1 5.xx	5.52 (or higher)

9 WiFi

The CC24 Master crate controller is optionally equipped with a removable WiFi access point.

In case this feature is unwanted, you can switch it off by software configuration (see iCSconfig) or remove the USB-hardware part from the controller board or front panel USB port.

For more information of WiFi configuration and use, refer to the iCS section (see page 18)

10 Module Bitrate Configuration

INFORMATION	
⚠ NOTE	All modules must be configured to a CAN bitrate of 250 kBit/s for operation with CC2x controller series.
	If modules are configured to a CAN bitrate of 125 kBit/s, they can be re-configured by the crate controller in a special regime. In this regime, the LED STATUS blinks green.

Please follow these steps to prepare modules for use with CC 2x crate controller series:

1. Please read all steps before starting the process!
2. Crate is connected to mains, the crate is turned off, no module is plugged into a slot
3. No connector is plugged into the CONTROL socket of CC 2x crate controller
4. Press and hold the button POWER-ON for about five seconds
5. The LED STATUS blinks slowly GREEN
6. If a module is recognized now, the controller switches into normal operation mode
    ◦ If no module is recognized, the controller enters CONFIGURATION MODE
7. The LED STATUS blinks quickly, the controller scans for a module at both bitrates
8. Insert exactly one module which bitrate should be adapted (by hot plugging).
    ◦ If the module is recognized on the wrong bitrate (i.e.125kBit/s), it will programmed to the correct bitrate (250kBit/s) and restarted afterwards
9. If the module is (now) recognized at the correct bitrate, the LED STATUS blinks slowly
10. The module can be plugged out now and another module can be plugged in to repeat the configuration process from step 5
11. Press the button POWER-ON for about one second to turn off the crate and exit the CONFIGURATION MODE

INFORMATION	
NOTE	In case of the need of reconfiguration to 125 kBit/s, the provided Bitrate Configuration dongle (shortens Pin 2 and Pin 9) must be connected to the CONTROL connector before starting the configuration. The LED STATUS blinks red instead of green in this case. You can contact iseg customer support for purchase accessory parts (see page 13)

11 AC line power fail

Crate without Option UPS (Uninterruptible Power Supply)

If a power fail is detected by the crate controller, which is connected to a crate without option UPS, the controller shuts down all high voltages with a very fast ramp (1,000 percent / tenfold of nominal voltage per second), to avoid uncontrolled floating high voltages.

If the AC line goes bad, the crate status bit Power Fail and it's corresponding Crate Event Status bit is set and the crate controllers STATUS LED lights red.

Crate with Option UPS (Uninterruptible Power Supply)

The function UPS offers protection against AC line power fails. This protection is provided by a power supply with integrated batteries. The battery backup time is long enough to safely ramp down all high voltages before power loss.

| ATTENTION	
CAUTION	Please make sure that the extra fuse for UPS use is applied to the crate´s power supply.

The high voltage modules and the crate controller are supplied from the internal battery while the AC line is bad.

After ten seconds of line power fail, all modules begin to ramp down the high voltage with a ramp speed of two percent of nominal voltage per second, which takes approx. 50 seconds when starting at maximum voltage.

Additional status and measurement values with UPS:

- The Crate Status bits Low +24 Battery and High +24 Battery are set when the measured battery voltage exceeds the limits.
- The measured battery voltage can be read out by Crate Supply Measurement channel 8.
- The Crate Status bit High +24 Battery is also a hint for an open battery fuse.

12 iCS2 – iseg Communication Server 2
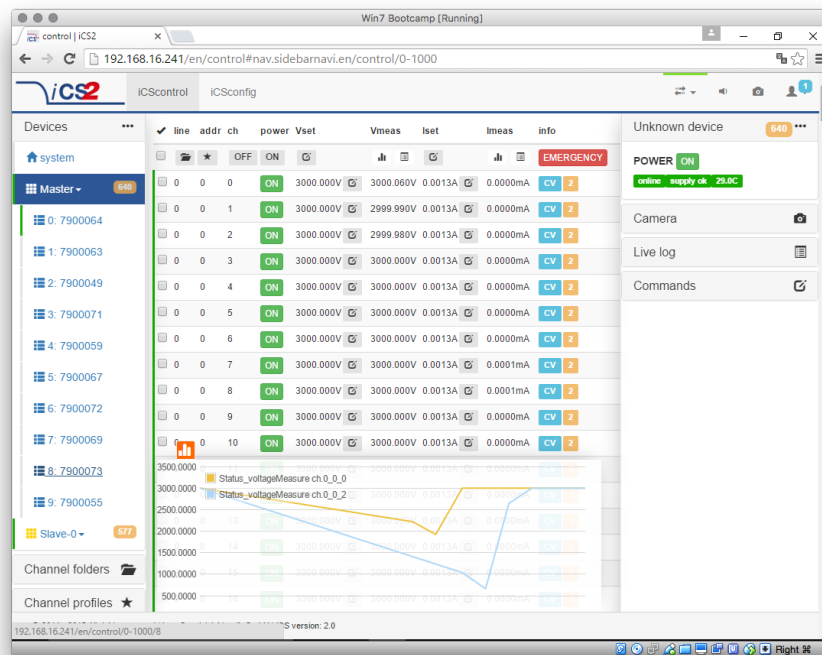
System description

The iseg Communication Server iCS is a software solution to control iseg high voltage hardware from multiple devices over wired or wireless network. iCS is a manufacturer specific Linux OS, which runs on iseg hardware, like iCSmini2 or CC2x crate controller series.

The iCS front end is based on browser technology to keep installation and maintenance effort low, to enable a quick start for configuration independently from the user's software platform, even on mobile devices.

iCS is equipped with an integrated role and user management, and delivers important software services right out of the box, like EPICS IOC, OPC server, SNMP interface, HTTP, SOAP and Webservices to give a quick access to iseg hardware.

iCS also delivers configuration utilities and straight forwarded tools for firmware upgrading process.

iCS software components	Description	Port / Protocol
iCSconfig	Configuration section for iCS software services, restorable hardware configurations, and firmware updates, documentation access and more…	TCP 80 / HTTP
iCScontrol	Multi-user browser based device control, surveillance cam support	TCP 80 / HTTP
iCSservice	Internal websocket based server, JSON notated payload objects, with clients	TCP 8080 / Websocket TCP 80 / HTTP API
isegHALservice	iseg hardware abstraction layer service, simple hardware access	TCP 1454 / isegHAL Socket
EPICS IOC	EPICS Input / Output controller, autoconfiguring to hardware setup, customizable by file upload	EPICS Base R3.14.12.4 TCP/UDP 5064,5065

OPC/UAservice	OPC / UA server – *coming soon*	coming soon
SOAPservice	Simple Object Access Protocol, JSON notated payload objects	TCP 80
SNMPservice	Simple Network Managament Protocol	

How to connect via WiFi

1. Make sure to have the WiFi adapter onboard or external installed, all modules are plugged in and CAN connections if used attached. Start the crate or device.
2. Use your mobile device or computer to search for existing WiFi networks and select „iseg-iCS_XXXX" (serial). Enter the factory default password (password) .
3. Open a recommended web-browser[3] and enter the factory default IP address (192.168.1.1)
4. Enter the factory default username (admin) and password (password)

How to connect via Ethernet

For Ethernet connections with the use of factory defaults, it is necessary to know the IP address of the iCS server first.

By default the iCS is configured to obtain the IP automatically by DHCP. To discover the IP address of the iCS, a small software application iCSfinder can be used. It scans the local network for running iCS services.

iCS also provides UPnP and Zeroconf/Bonjour messages, which can be discovered, e.g. in Windows using „Network" environment.

INFORMATION	
⚠ NOTE	To discover iCS installations on the local network, a small utility iCSfinder can be used
	It can be downloaded here:
	http://download.iseg-hv.com/SOFTWARE/iCS/iCSfinder/iCSfinder-1.0_win.zip
	http://download.iseg-hv.com/SOFTWARE/iCS/iCSfinder/iCSfinder-1.0_mac.zip
	http://download.iseg-hv.com/SOFTWARE/iCS/iCSfinder/iCSfinder-1.0_linux.zip
	Note: If you wish to set a fixed address without preconnecting via DHCP, please use a (temporarily) WiFi connection to setup OR follow the instructions of (re)setting the ethernet settings (see chapter ethernet configuration)
	Hint: If you experience problems using iCSfinder, please try using free software tools like "IP SCANNER" / MAC or "ADVANCED IP SCANNER" (Windows)

1. Make sure to have the network cable, all modules plugged in and all CAN connections if used attached. Start the crate.
2. Open a recommended web-browser and enter the current IP address (see preparations before)
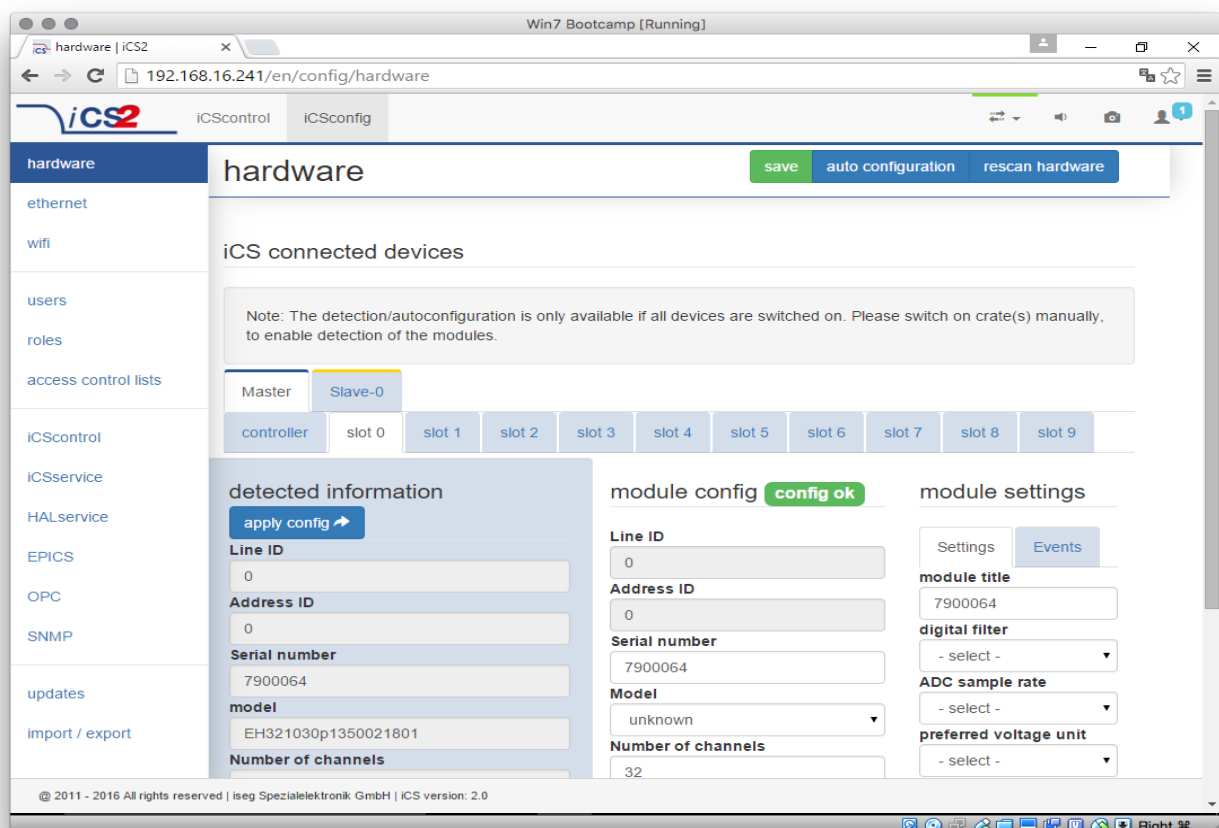3. Enter the factory default username (admin) and password (password)

iCSconfig: manage hardware, service and preferences

iCS has a comprehensive set of configurable properties. All of them are stored in a XML file, to keep configuration flexible. This enables the possibility to have multiple configuration setups stored and restored using the import / export utility.

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3   see technical specs – page 6

iCS config sections	
Hardware	Manage connected hardware, set configurations, auto configure, start firmware updates
Ethernet	Manage Ethernet port settings of the iCS
Wifi	Manage wireless access point of the iCS
users	Create / edit / delete iCS users
roles	Create / edit / delete iCS roles
access lists	Grant / deny rights on user / group / channel / item base
iCScontrol	Manage preferences of iCS web control application
iCSservice	Configure iCSservice API / HTTP API
EPICSservice	Configure the embedded EPICS Input/Output controller (IOC)
OPCservice	Configure the embedded OPC server
SNMP	Configure the embedded SNMP server
Updates	Download updates (System, Product database, firmware) from internet
Import / Export	Save and restore complete iCS configuration to backup hardware setup

Hardware

In the hardware section, all iCS connected devices like connected crates, controllers and modules are listed and configurable. Each device is represented by a tab, modules and controllers are nested into their responding crates. The CAN lines of the crates are presented with a yellow or green upper tab border (corresponding to yellow or green CAN line), master crates and modules in legacy crates with a blue upper tab border.

The configuration is stored independently from the current hardware setup or connected states. This gives the opportunity to detect misconfigurations and recent hardware setups can easily be restored.

To apply the complete detected hardware state into the configuration use the „auto configuration" button after triggering a rescan using the „rescan hardware" button.

To apply the detected config of just one device (controller or module) use the „apply config" button under each single tab.

The devices information is stored with the information of „module/device config" column. Here the line and address ID are shown and a serial number can be entered (or applied by using auto configuration / apply). If the model of the hardware device could be detected automatically, a model is selected in the dropdown list, otherwise it should be selected manually.

HARDWARE TYPES	
Device	Standalone High Voltage Power Supply
Crate	Case / Bin for a modular HV-supply (module), which supplies power
Controller	Special controller card used in a crate to control, monitors and manages nested modules and Crate functions, like switch ON/OFF of Crate power supply, monitor temperatures, fans, UPS and more
Module	Modular High Voltage Power Supply, plugged in a slot of a crate, supplied by a CRATE, communication and management by CRATE CONTROLLER, no own POWER ON feature

Information in the row „module settings /device settings" are module / device specific settings and are stored into the XML configuration file. These settings will get lost when using auto-configuration or apply config functionality.

Ethernet configuration

The ethernet settings of the iCS server hardware (CC2x Crate Controller, iCSmini) can be changed under the ethernet tab. By turning DHCP Client to enabled the iCS will try to obtain an IP address from the local networks DHCP server. Otherwise the IP can be set fixed. Therefore DHCP client must be disabled and IP v4.0 settings can be entered manually.

ETHERNET FACTORY DEFAULTS	
IP	DHCP
GATEWAY	empty
NAMESERVER	empty
DNS	empty
TIMESERVER	empty

(Re)set / ethernet configuration

You can reset the ethernet configuration and also set to fixed IP adress e.g. cause of problems with DHCP IP relay using the following procedure:

1. Shut down all modules/devices and turn off the iCS System by unplugging mains.
2. Create an empty file called "RESET_NET.txt" on a USB flash drive (FAT32 format)
3. Now edit the file. It should contain the following entries, separated by new lines.

CONTENT OF RESET_NET.txt			
LINE	PARAMETER	EXAMPLE	DEFAULT-VALUE
0	IP adress / DHCP	192.168.2.10	DHCP
1	NET MASK	255.255.255.0	255.255.255.0
2	GATEWAY	192.168.2.1	192.168.16.1
3	NAMESERVER	192.168.2.1	192.168.16.1

4. Plug USB flash drive into the USB slot at the front panel of the Crate-Controller / one USB slot of iCSmini2
5. Plug in mains

6. Please wait about 20 seconds until iCS has started completely

7. optional: Plug off the USB flash drive and check on a computer if the file created on point 2 is still there.
    Check if RESET_NET.txt was renamed into RESET_NET.txt.done on success.

WiFi configuration

The WiFi configuration can change configuration of the wireless network provided by the iCS hardware access point (optional). Generally the WiFi function can be disabled using the WiFi support switch. The IP address of the WiFi is fixed, so once connected with a iCS WiFi the IP stays always the same.

WIFI FACTORY DEFAULTS	
IP (fixed)	192.168.1.1
SSID	iseg-iCS2_[HARDWARE SERIAL-NUMBER]
Channel	5
Password	password

Users / roles configuration

Users of iCScontrol can be added, edited and removed in the users section. Users of iCScontrol can be added, edited and removed in the users section. Users can be assigned roles, such like admin, user etc. One or more users can be selected by editing a role.

USER DEFAULTS	
User	admin
Password	password
Role	admin

Access control lists (ACL)

With the access control list rights to grant or forbid control on special objects for principals (roles or users) is managed. This gives a powerful tool for very detailled right mechanism.

INFORMATION	
⚠ NOTE	Note: Users, roles and ACL are only applied for user authentication for applications and services, which are based on iCSservice. These are iCScontrol, iCSconfig, isegControl, SOAP and HTTP API. isegHAL based services should implement own security mechanisms .

SSH access

The ICS2 Linux host system can be fully accessed as root user using a encrypted SSH shell access over port 22.

This enables user to install own services or freely configure, e.g.EPICS plugins etc.

INFORMATION	
⚠	The local filesystem is divided into a system and a user data partition. To make changes on the readonly

NOTE	mounted system part use the following command: **mount / -o remount,rw**

(Re)set SSH access

INFORMATION	
NOTE	**To protect your iCS system we strongly advice to change the standard factory password into a new userdefined one. Keep this password secret!**

For security reasons this is only possible with direct hardware access using the following procedure:

1. Create a file RESET_SSH.txt with your new Root Passwort as content in the first line and save it to an USB flash memory (FAT32 format). Note: if the file is emtpy, the iCS root password will be reset to factory default

2. Plug the stick into iCS hardware and resboot iCS.

3. The iCS changes the password during the boot process. In case of success the file will be renamed into RESET_SSH.txt.done.

iCS Factory Reset Invocation

In case the user has forgotten his password or simply wants to get back to factory default configuration, it is possible to invoke a factory reset. For factory reset a USB flash drive (USB stick) with a FAT32/FAT16 partition is needed.

| ATTENTION	
CAUTION	After factory reset all hardware configurations will get lost!

Instructions

1. Shut down all modules / devices and turn off the iCS System by unplugging mains.

2. On the USB flash drive create an empty file called "RESET_ICS.txt"

3. Plug USB flash drive into the USB slot at the front panel of the Crate-Controller

4. Plug in mains

5. Please wait about 20 seconds until iCS has started completely

6. optional: Plug off the USB flash drive and check on a computer if the file created on point 2 is still there.
   If not, the factory reset was succesful.

iCSservice configuration
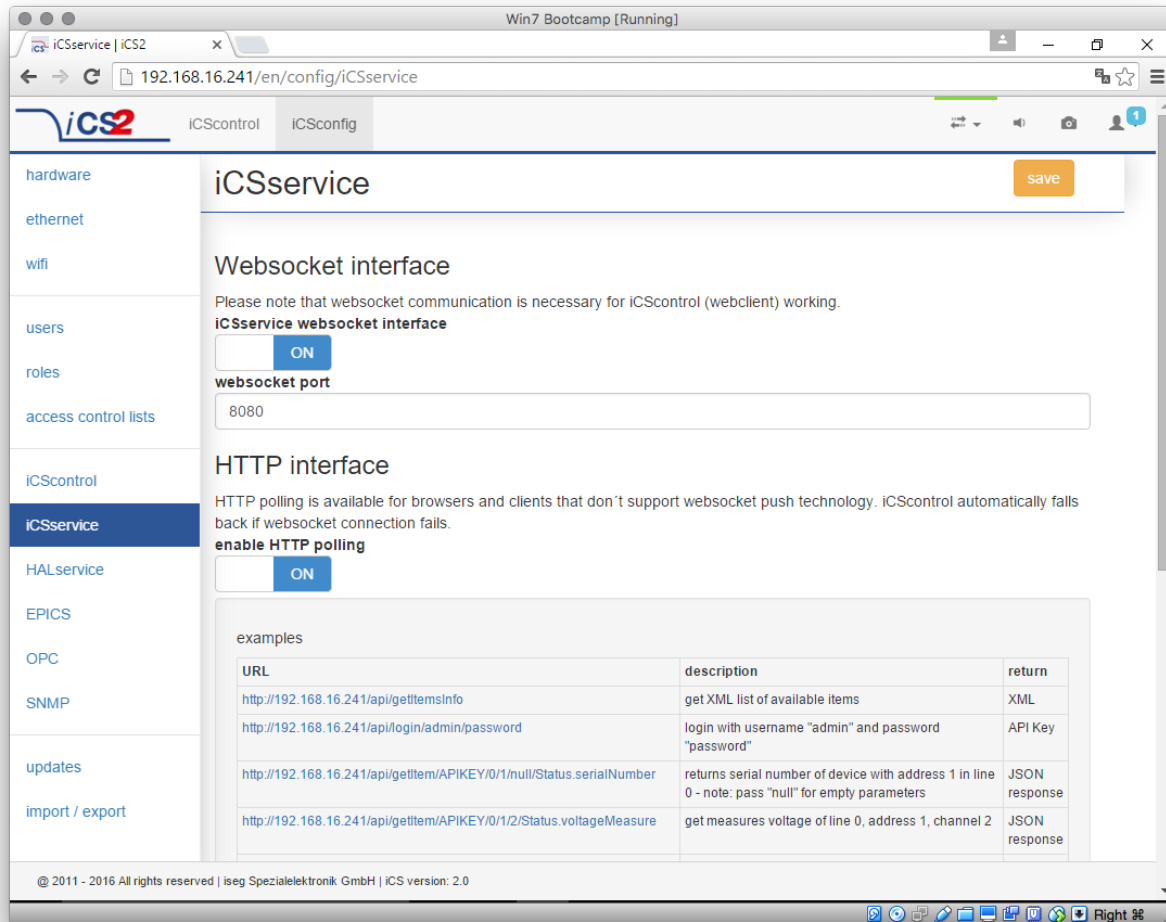
The iCSservice running on crate controller or iCSmini hardware provide two interfaces, a websocket push technology interface and a HTTP polling interface, which is fallback for browsers and clients, that do not support websocket technology. Both of them can be disabled, whereas at least one of them is necessary for the correct operation of iCScontrol.

iCSservice DEFAULTS	
Websocket Port	8080
HTTP port	80
HTTP URL BASE	<IP-of-iCSmini>/api/

HTTP interface

This interface gives quick access to iCSservice by simple HTTP queries.

iCSservice HTTP functions		
URL, Parameters with leading $, params not mandatory [$param]	**Response**	**Description**
http://<IP-of-iCSmini>/api/IgetItemsInfo	XML	XML with item object information
http://<IP-of-iCSmini>/api/login/$username/$password	API Key	Returns API Key to be identified for session

http://<IP-of-iCSmini>/api/logout/$session-ID	TRUE / FALSE	
http://<IP-of-iCSmini>/api/getItem/$apikey/$line/$address/$channel/$item	JSON Object	Returns state of a specific item of a hardware path $line, $address, $channel and $item can be set by wildcard '*'
http://<IP-of-iCSmini>/api/setItem/$apikey/$line/$address/$channel/$item/ $value/[$unit]	TRUE / FALSE	Sets state of a specific item of a hardware path $line, $address, $channel can be set by wildcard '*'
http://<IP-of-iCSmini>/api/getUpdate/$apikey/	JSON Object	returns all changes collected by iCSservice since last getUpdate call for this client session

Use "*" as wildcard, e.g. to set or get items on multiple channels at once. **Use "null" as empty set identifier, e.g. to obtain module specific objects without channel declaration.**	
EXAMPLES	
http://192.168.1.1/api/getItem/123456-321/0/1/0/Status.voltageMeasure	**Returns voltage value, unit and timestamp of channel 0 of module with address 1 of line 0**
http://192.168.1.1/api/setItem/123456-321/0/1/*/Control.voltageSet/1/kV	**Set set voltages of all channels of module 1 in line 0 to 1,000 Volt**
http://192.168.1.1/api/setItem/123456-321/0/null/null/Control.power/1	**Switch controller of line 0 (master) on**

EPICS

For the use of iseg hardware with Experimental Physics and Industrial Control System (EPICS) the iCS comes with a preinstalled integrated Input-Output-Controller (IOC). This service can be enabled or disabled using the switch „enable EPICS input / output controller". To keep things straight-forward the iCS can generate IOC configuration files (.db and .sub), using the current hardware configuration. Both files can be downloaded to the local computer, be edited manually, e.g. with a text editor and be uploaded again. This gives a quick start to run an IOC out of the box. To get an overview on all available process variables (PV), which are generated at the start of IOC, the PV list can be downloaded using the respective button. The IOC script combines a process variable definition file (.db) with a substitution file (.sub), which contains hardware setup information and placeholders to create all accessable process-variables at runtime.

File	Description	Sample content (extraction)

iseg_epics.db	Database file with definitions of PV	`###############################`
		`# ### Crate item values ### #`
		`###############################`
		
		`record( mbbiDirect, "ISEG:${CONTROLLER_SN}:${CAN_LINE}:${DEVICE_ID}:StatusLow" ) {`
		`  field( DESC, "Lower 16 bit of module status register" )`
		`  field( DTYP, "isegHAL" )`
		`  field( INP,  "@${CAN_LINE}.${DEVICE_ID}.Status" )`
		`  field( NOBT, "16" )`
		`  field( SHFT, "0" )`
		`  field( TSE,  "-2" )`
		`}`
		`...`

iseg_epics.sub	Substitution file contains a pattern that will be substituted by the following lines for each corresponding channel	`{CONTROLLER_SN,CAN_LINE,DEVICE_ID,MODULE_ID,CHANNEL_ID}`
		`{5230003,0,1000,0,0}`
		`{5230003,0,1000,0,1}`
		`{5230003,0,1000,0,2}`
		`...`

iseg_epics.pv	Text file with list of process variables generated	`ISEG:5230003:0:0:0:CurrentMeasure` `ISEG:5230003:0:0:0:CurrentNominal`

		ISEG:5230003:0:0:0:VoltageMeasure
		ISEG:5230003:0:0:0:VoltageNominal
		...

For more detailed information on EPICS, please visit: http://www.aps.anl.gov/epics/, for sample libraries and test scripts, please contact support@iseg-hv.de.

isegHALService

The isegHALservice provides a secure sockets encrypted end-to-endpoint access to iseg Hardware layer running on crate Controller / iCSmini hardware. The isegHALservice API is similar to isegHALapi with some specific extension. Please refer Appendix "isegHAL" for details. For an easy start a simple example program isegHalRemoteExample demonstrates the remote access. There are virtual instruments (VIs) which are based on the library "isegHAL-remote" in order to control iseg hardware via LabVIEW[4].

SNMPservice

For backward compatbility of the iCS2 to SNMP controlled systems like WIENER mPOD iCS2 is able to communicate using the SNMP service.

 The service can be enabled or disabled using the switch „enable SNMP interface".

Using the current iCS2 hardware configuration a SNMP configuration can be automatically generated. To create a new SNMP configuration, which is compatible to WIENER Configuration file (.mib) please use button "generate configuration" under the SNMP tab in iCSconfig.

For user specific changes of configuration, the .mib (vendor specific definition of datapoints) and .sub (substition information with list of hardware channels) files can be downloaded, locally modified and reuploaded.

Please note: local modifications will overwritten every time the "generate configuration" function will be used.
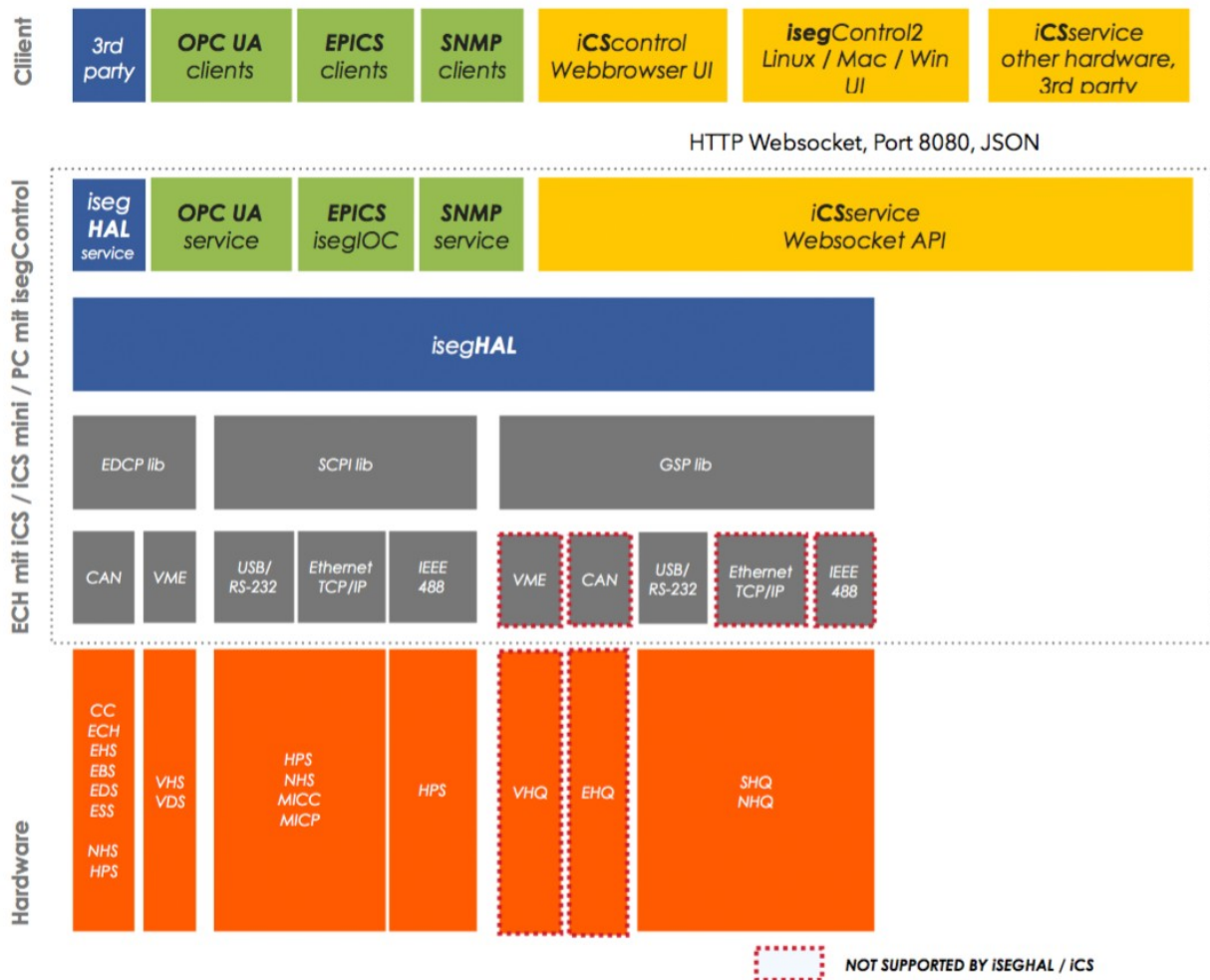
Software architecture of the iCS2 system

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4   Copyright National Instruments

Figure: iCS2 software architecture / supported hardware

Updates

The following types of updates can be managed with iCS:

Type	Description
base	product database with information about iseg hardware specifications
system	update image of the iCS server operating system (CC, iCSmini)
firmware	firmware update files for iseg devices (like HV modules, crate controllers etc.)

All update files can be downloaded from iseg web repository using the check online for updates or using the update upload function to send a file from local computer to iCS server.

Once an update file is available on the iCS it can be installed using install or removed by using delete Buttons. After using install, follow the instructions shown on the screen.

Firmware files can be unzipped using extract. After extraction the available firmware files are shown in a list. By clicking install the iCS tries to apply the selected firmware to all connected devices, that are qualified for (matching item code, online, lower firmware version installed).
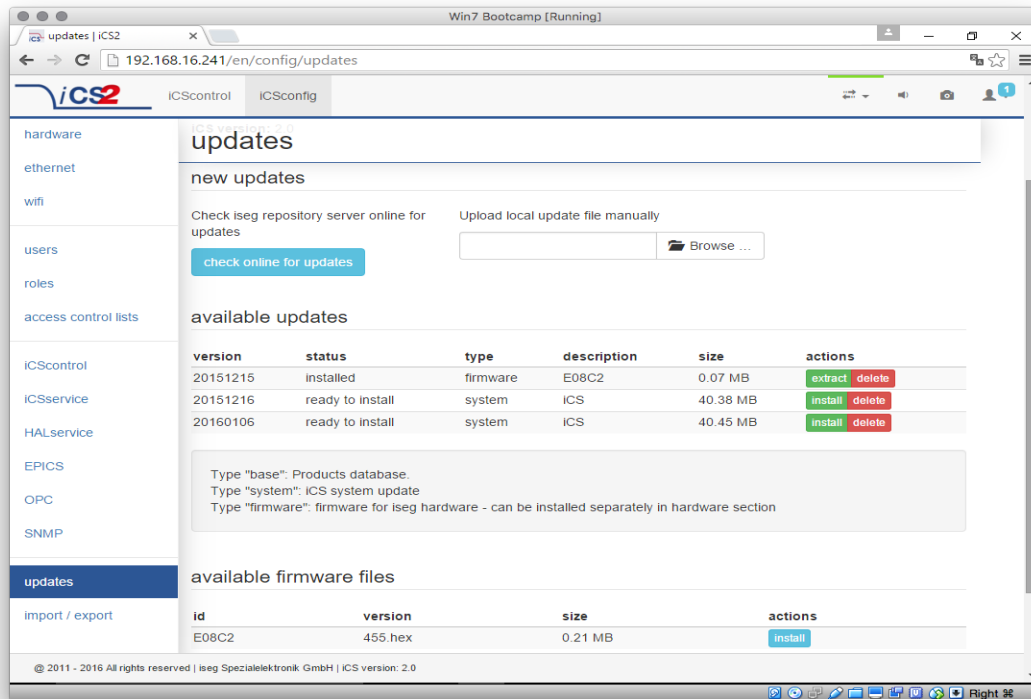
To update specific hardware devices please extract the firmware package first and then navigate in the hardware section to the corresponding device and use firmware update functionality individually.

INFORMATION

NOTE

Using the "Check online for updates" feature the iCS directly connects to iseg online software repository. All update files can also be downloaded from iseg website (http://iseg-hv.com/en/support/downloads) or directly on http://download.iseg-hv.com/

iCScontrol – control and monitor web application

The user interface of iCScontrol software is divided into three bars.

Left bar: Hardware Explorer

The left column shows the configured hardware.

If connected with iseg CAN line management slaves are shown in yellow or green background, corresponding to the CAN line they are connected with. Every device has a colored left border showing the running state.

Crate/Device running states	
grey	one of the nested modules is ramping to the desired voltage
yellow	one channel of one of the nested channels is ramping to the desired voltage
red	the crate / device (or one of the nested modules/channels) has one or more errors (refer to the error/event badges)
green	the crate / device (and all of the nested modules) are in a good condition, at least one channel of a nested module is running high voltage

Module running states	
grey	not present, not connected or switched off

yellow	one channel of the module is ramping to the desired voltage
red	the module has one or more errors (refer to the error/event badges)
green	the device/module is in a good condition, at least one channel is running high voltage

Channel running states	
blurred / faded out	Module is not detected (propably switched off)
grey	not present (configured module to current module mismatch), or switched off
yellow	channel is ramping to the desired set voltage
red	channel has at least one error (please inspect error counter badge)
green	channel is in good condition and switched on

Left bar: Channel folders

Channel folders are shown in the section "channel folders" below the hardware section in the left application bar. Channel folders can be created and extended by selecting a set of channels and clicking the folders icon on top of the channel list.

Existing folders can be selected or removed in the folders section of the left bar.

Left bar: Channel profiles

Channel profiles store information about set values, On/off states, and Kill-Properties of channels. They can be created by selecting the channels that should be restored in the channel list and clicking the star-icon. Existing profiles can be selected, applied and removed in the channel profiles section of the left bar. A new option with the custom given title appears in the Select Box. By selecting a Channel profile and clicking the apply button the stored state of the channel will be adjusted.

Center bar: Channel list

Once a device or channel folder has been selected, the channel list will update and show only the corresponding channels, with

- The topological location (line, address, channel),
- The running state,
- Set and measured values,
- Channel infos, events and errors (displayed as clickable badges)

The list header has an action row, where all channels can be selected with one click for more actions.

Each action in this row is located in top of its respective column.

Some examples:

- To create a new channel folder of specific channels, select these channels and click the folder-icon.
- To store the current setup of the specific channels (running state, set-values, kill enable etc.), select them and click on the star-icon. To enable or disable all selected channels, click the ON / OFF icons.
- Change the set voltages of all selected channels, click the edit-icon which is located in the Vset column.
- To display a graph of measured voltages of all selected channels, click on the graph-icon located in the Vmeas column.
- To show a live log of measured voltages of all selected channels, click on the logtable-icon located in the Vmeas column.

Center bar: Chart

At the bottom of the center bar a floating chart window can be shown over the channel list by clicking the toggle button with the chart icon on the upper left of the chart bar. To show only specific channel information, please select the channels to display and select the Chart-Icon on top of the respective column of the action row, e.g. to display the voltages of the selected channels, select them and click on the Chart-Icon on top of Vmeas column. To show plots of all channels select or deselect all channels, and disable/re-enable the chart by clicking the chart icon twice.

Right bar: Device information

The device section gives information on the currently selected hardware device of the device explorer. Depending on the device type, hardware status information are given (temperature, error, safety loop states), the device can be enabled / disabled. Device specific parameters can be set (ramps, kill parameters ...). To get a quick help, hardware documentation can be downloaded directly.

Right bar: Camera

The camera tab shows the captured image of the configured camera. It can be directly connected with the iCS hardware or an IP-Cam URL, configured in hardware / iCScontrol section.

Right bar: Live log

The live log collects information of the current session. The log data is only available until a reload of the iCScontrol webpage occurs. The live log can be filtered to specific channels or value types, by selecting channels and clicking the corresponding log icon in the action row on top of the channel list. The log list shows the last value of an item. By clicking on it, previsios log items are displayed.

All session log data can be exported as CSV file for ongoing work with Spreadsheet applications, eg. Microsoft® Excel.

Right bar: Commands

Commands can be send directly to connected devices. Quick commands are mass operations that can be sent to more devices at one time. The commands tab prefills the input fields according to the selected hardware device (device explorer).

13 Appendix

For more information please use the following download link:s

CAN EDCP Programmers-Guide
http://download.iseg-hv.com/documentation/SYSTEMS/Manuals/English/MMS/CAN_EDCP_Programmers-Guide.pdf

14 Manufacturer´s contact

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