

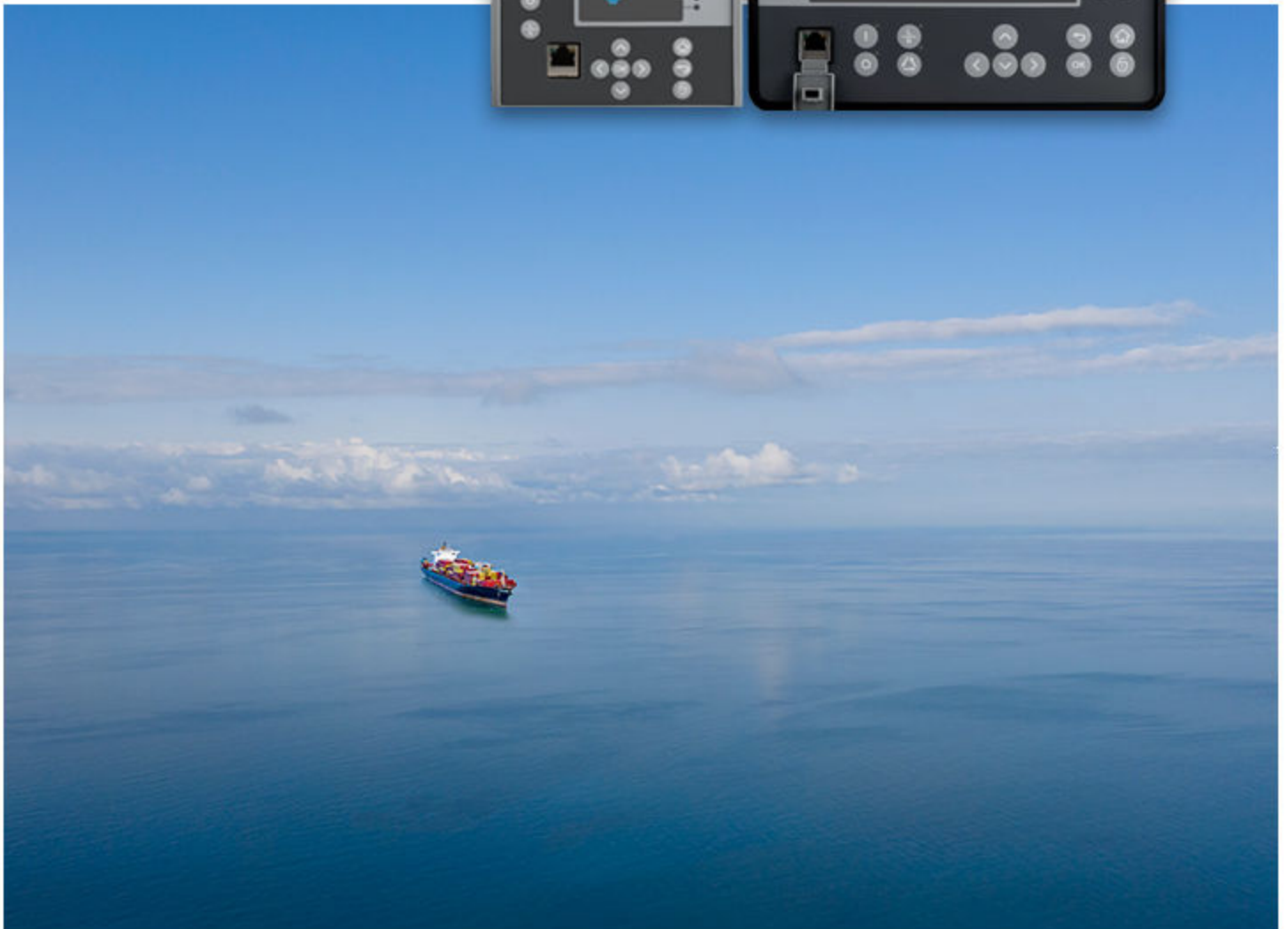
MVR-200 series

Medium voltage relay

Operator's manual



Improve
Tomorrow



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1. Introduction

1.1 About the Operator's manual

1.1.1 Intended users of the Operator's manual

This is the operator's manual for DEIF's Medium Voltage Relay MVR-200. The manual is for the operator who uses the controller display unit. The manual includes an introduction to the display unit (LEDs, push-buttons and screen).



More information

See the **Designer's handbook** for detailed function information and descriptions.



DANGER!

Read this manual before you operate the system. Failure to do this could result in personal injury and damage to the equipment.

1.1.2 Abbreviations

CT – Current transformer

IED – Intelligent electronic device

IO – Input output

LED – Light emitting diode

MVR-21x – MVR-F201, MVR-F205, MVR-F210, MVR-F215, MVR-M210, MVR-M215, MVR-G215, MVR-T215, MVR-T216, MVR-V211

MVR-25x – MVR-F255, MVR-M255, MVR-M257, MVR-G257, MVR-T256, MVR-T257

NC – Normally closed

NO – Normally open

RMS – Root mean square

TRMS – True root mean square

SW – Software

1.1.3 Technical support

You can read about service and support options on the DEIF website, www.deif.com. You can also find contact details on the DEIF website.

You have the following options if you need technical support:

- Help: The display unit includes context-sensitive help.
- Technical documentation: Download all the product technical documentation from the DEIF website: www.deif.com/documentation
- Training: DEIF regularly offers training courses at the DEIF offices worldwide.
- Support: DEIF offers 24-hour support. See www.deif.com for contact details. There may be a DEIF subsidiary located near you. You can also e-mail support@deif.com.
- Service: DEIF engineers can help with design, commissioning, operating and optimisation.

1.2 Warnings and safety

1.2.1 Warnings



Read the documentation carefully before use, and retain for future reference. Documentation is available at <http://www.deif.com/documentation>

It is the responsibility of the user to ensure that the equipment is installed, operated and used for its intended function in the manner specified by DEIF. If this is not the case, then the safety protection provided by the equipment may be impaired.

1.2.2 Hazard markings



General warning



Electricity warning

DANGER

A high-risk hazard which will result in death or serious injury (if not avoided).

WARNING

A medium-risk hazard which could result in death or serious injury (if not avoided).

CAUTION

A low-risk hazard which could result in moderate or minor injury (if not avoided).



DANGER!



Electrical shock and arc flash

Risk of burns and electrical shock from high voltage.

Short all current transformer secondaries before breaking any current transformer connections to the controller.



WARNING



Electrical shock

Hazardous live currents and voltages.

Do not touch any terminals, especially the AC measurement inputs and the relay terminals. Only skilled personnel, who understand the risks involved in working with electrical equipment, may do the installation. Comply with local regulations.

1.3 Legal information

1.3.1 Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

1.3.2 Copyright

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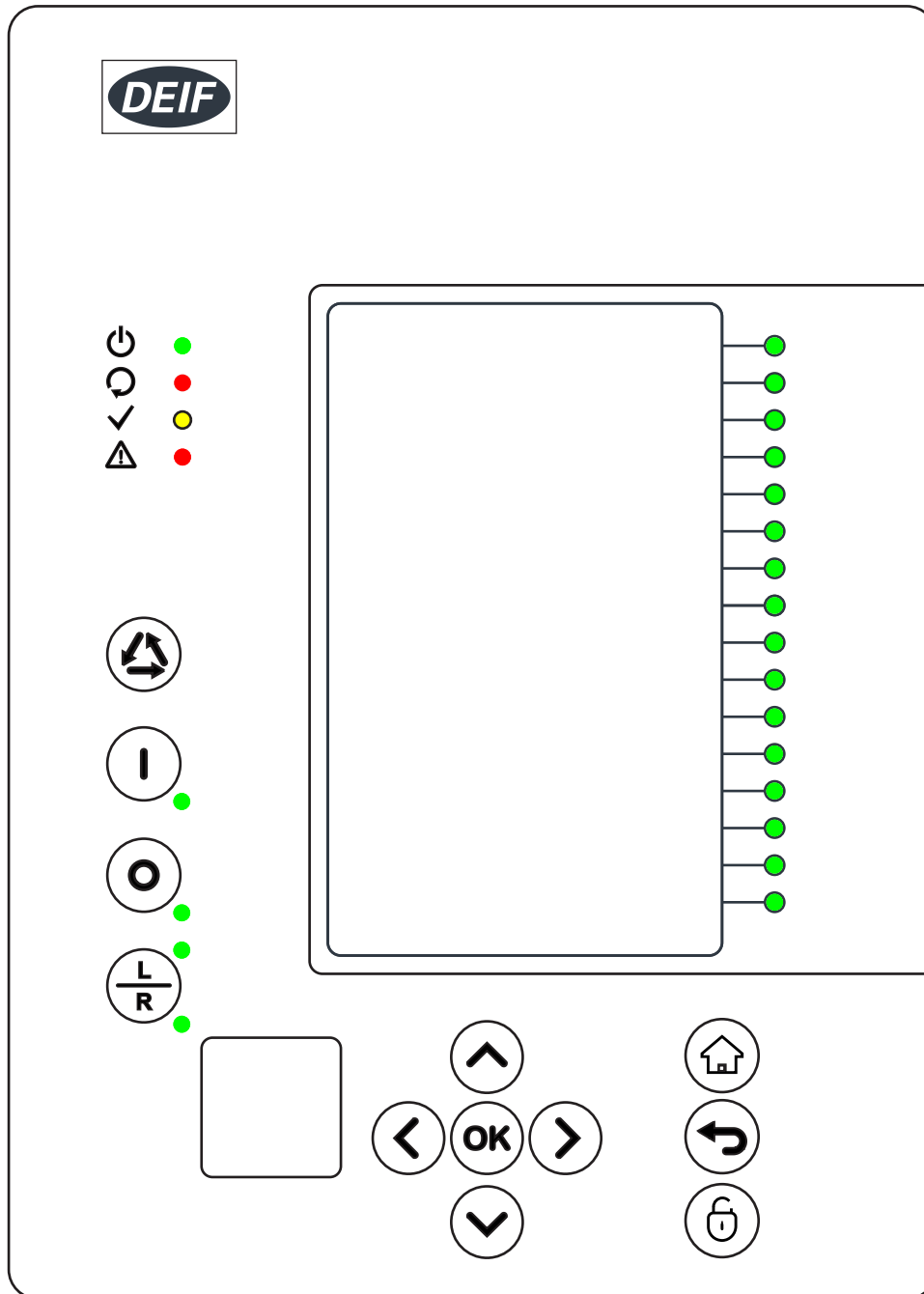
2. MVR-2xx overview

2.1 User interface

2.1.1 MVR-21x local panel structure

An MVR-21x has multiple LEDs, control buttons and local RJ-45 Ethernet port for configuration on front as a default. At the back, each unit is equipped with RS-485 serial interface and RJ-45 Ethernet interface options as a standard. See the list below.

Figure 2.1 Local panel structure



- 4 default LEDs: Power, Error, Start (configurable) and Trip (configurable).
- 16 freely configurable LEDs with programmable legend texts.
- 3 object control buttons: Choose the controllable object with Ctrl -button, control breaker with O- and I push-buttons.

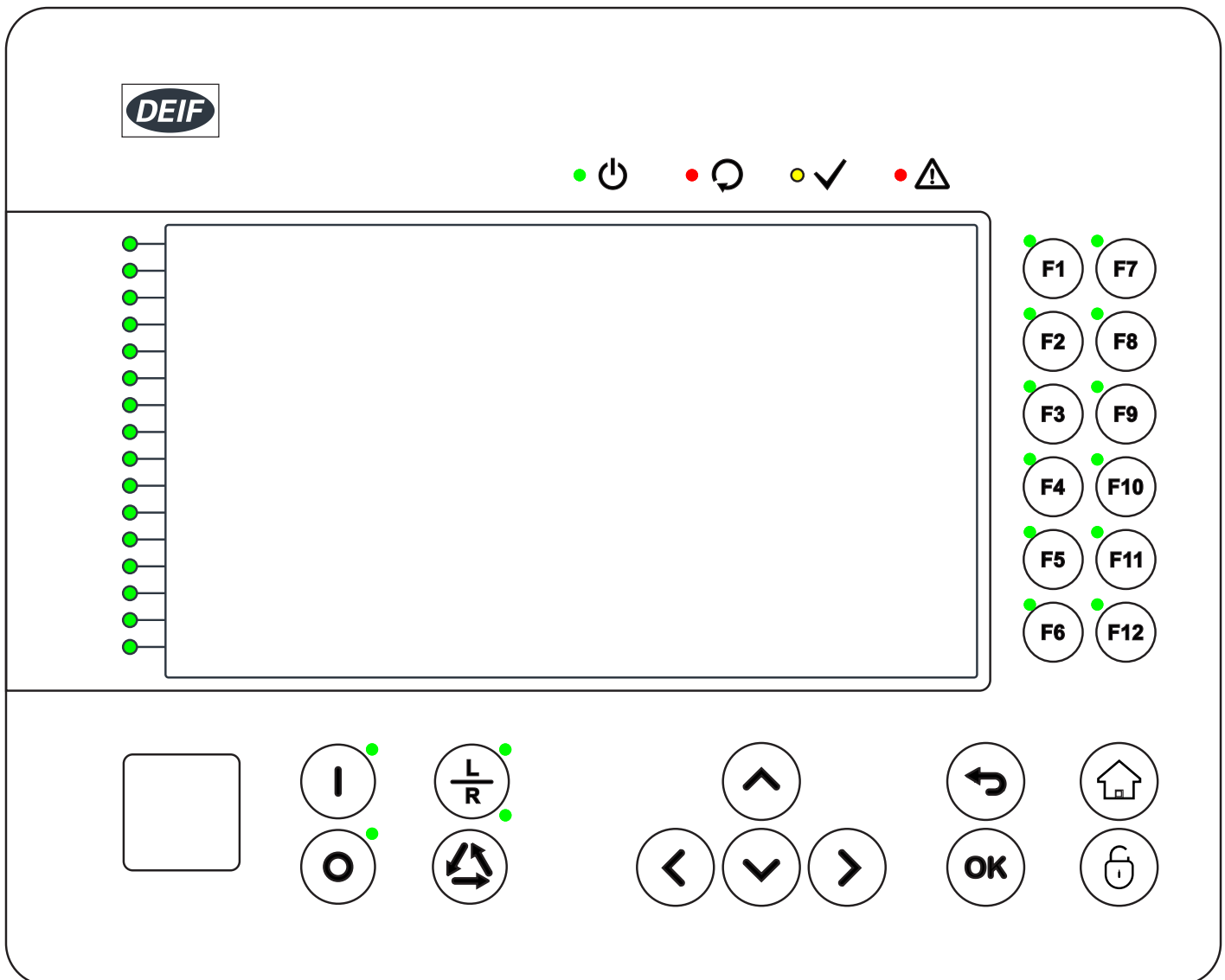
- L/R push-button for switching between local and remote control modes.
- 7 navigation buttons for IED local programming and a button for password activation.
- RJ-45 Ethernet port for IED configuration.

Power LED is lit (green) when the unit is powered on. The Error LED is lit (red) when relay has an internal error that affects the operation of the unit. This can be either a hardware or software error. The Start LED (yellow) and Trip LED (red) activation is user settable. The activation and color (green/yellow) of the 16 LEDs on the right side of the display are user settable.

2.1.2 MVR-25x local panel structure

An MVR-25x has multiple LEDs, control buttons, function buttons and local RJ-45 Ethernet port for configuration on front as a default. On rear each unit is equipped with RS-485 serial interface and RJ-45 Ethernet interface options as a standard. See list below.

Figure 2.2 Local panel structure



- 4 default LEDs for free configuration: Power, Error, Start and Trip.
- 16 freely configurable LEDs with programmable legend texts.
- 3 object control buttons: Choose the controllable object with Ctrl –button, control breaker with 0- and I push buttons.
- L/R push button for local remote control.
- 7 navigation buttons for IED local programming and a button for password activation.

- 12 freely configurable function buttons.
- RJ-45 Ethernet port for IED configuration.



Used views are freely configurable with buttons for changing settings groups or controlling the relays logic in general. Object status (Circuit breaker/Disconnecter) can be displayed on the screen. All measured and calculated values (currents, voltages, power, energy, frequency etc.) can be shown in the screen.

3. Using the MVR

3.1 Alarms and trips



3.1.1 Alarm and trip indications

MVR-21x

The **Trip LED** ( ) is lit whenever a protection activates a breaker trip.

For each trip, the trip name is given at the bottom of the display screen, to show the cause of the trip.

MVR-25x

The **Trip LED** ( ) is lit whenever a protection activates a breaker trip.

For each trip, the trip name is given at the bottom of the display screen, to show the cause of the trip.

If an LED is configured to show the trip, the LED colours are as follows:

Alarm state	Details	LED colour
OK	There is no alarm.	Green
Warning	There is an alert for the operator, but no alarm action.	Yellow-Orange
Trip or Fault	The controller has sent a trip signal the breaker.	Red

3.2 Access control

3.2.1 User level password configuration

As a factory default IEDs do not have any user levels locked behind passwords. In order to activate different user levels click the IED HMI lock button and set the desired passwords for different user levels.

NOTE: Passwords can be set only at local HMI.

In the HMI the user level currently in use is indicated in the upper right corner with stars.

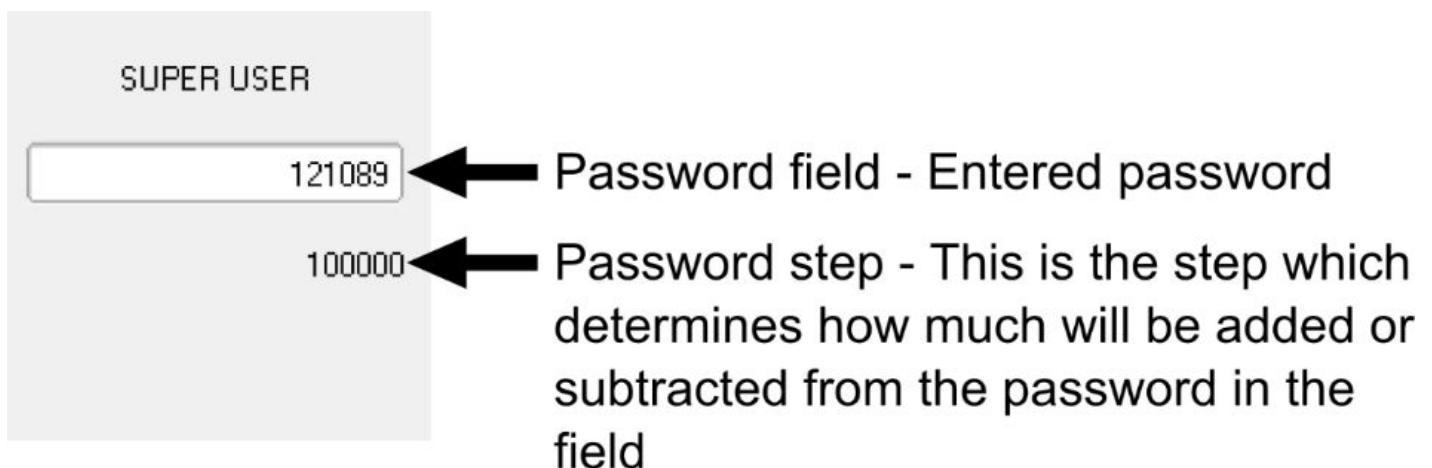
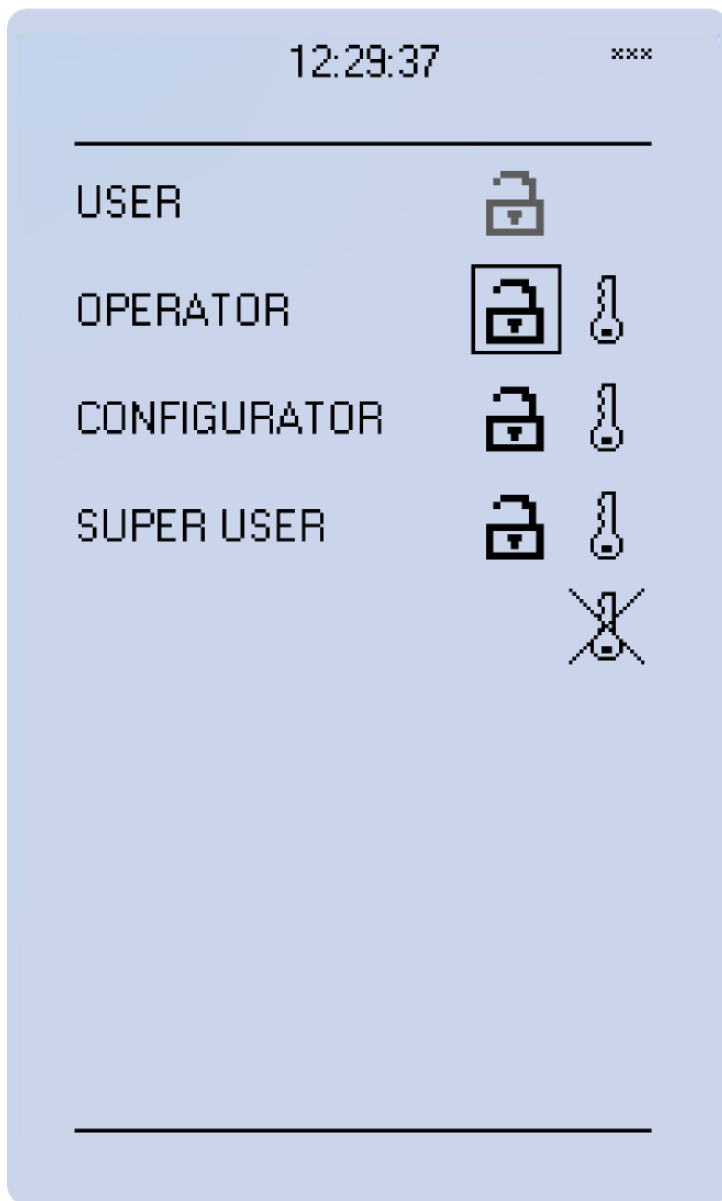
Different user levels and the indicators are:

SUPERUSER (*)** = full access including configurations

CONFIGURATOR ()** = access to all settings

OPERATOR (*) = access to limited settings and control

USER (-) = view only



You can set a new password for the user level by selecting the key icon next to the user level. After this you can lock the user level by pressing return key while the lock is selected. If you need to change the password you can select the key icon again and give a new password. Please note that in order to do this the user level must be unlocked.

The required access level required to change a parameter is indicated with star (*) symbol if such is required. As a general rule the access levels are divided as follows:

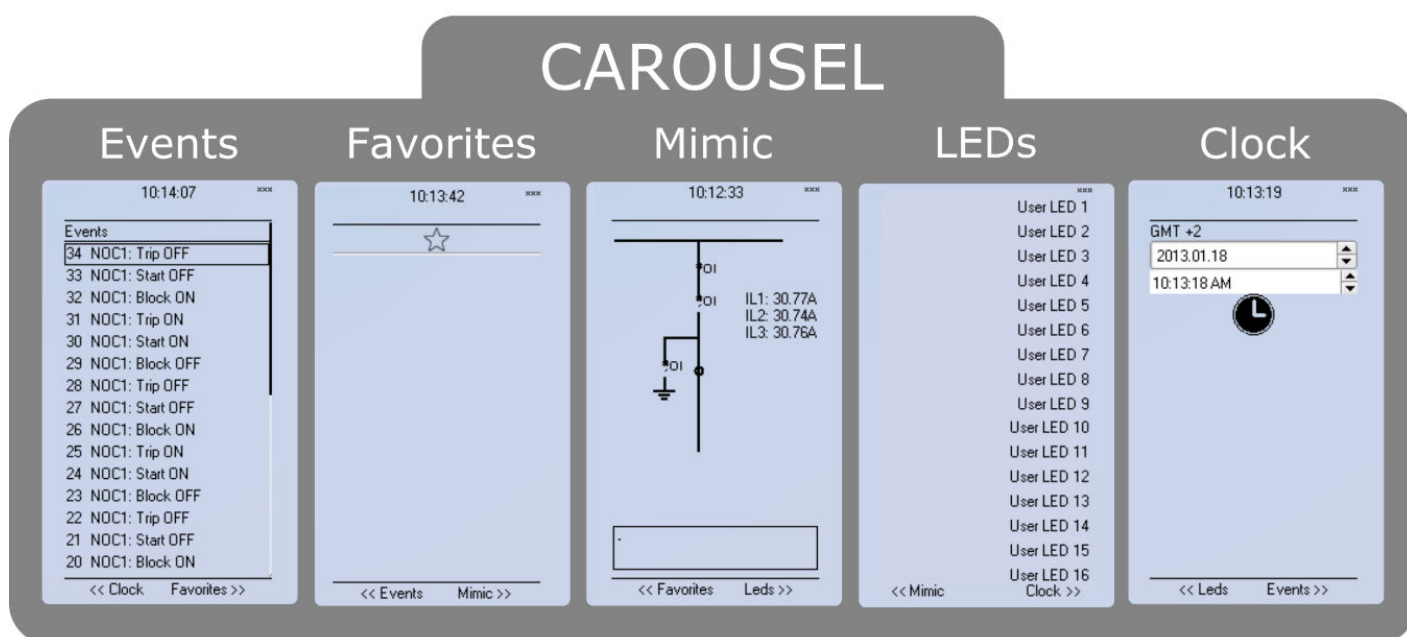
- *User*: Can view any menus and settings but cannot change any settings nor operate breakers or other equipment.
- *Operator*: Can view any menus and settings but cannot change any settings BUT can operate breakers or other equipment.
- *Configurator*: Can change most settings like basic protection pick-up levels or time delays, breaker control functions, signal descriptions etc. Can operate breakers or other equipment.
- *Super user*: Access to change any setting and can operate breakers or other equipment.

3.3 Basic navigation for MVR-21x

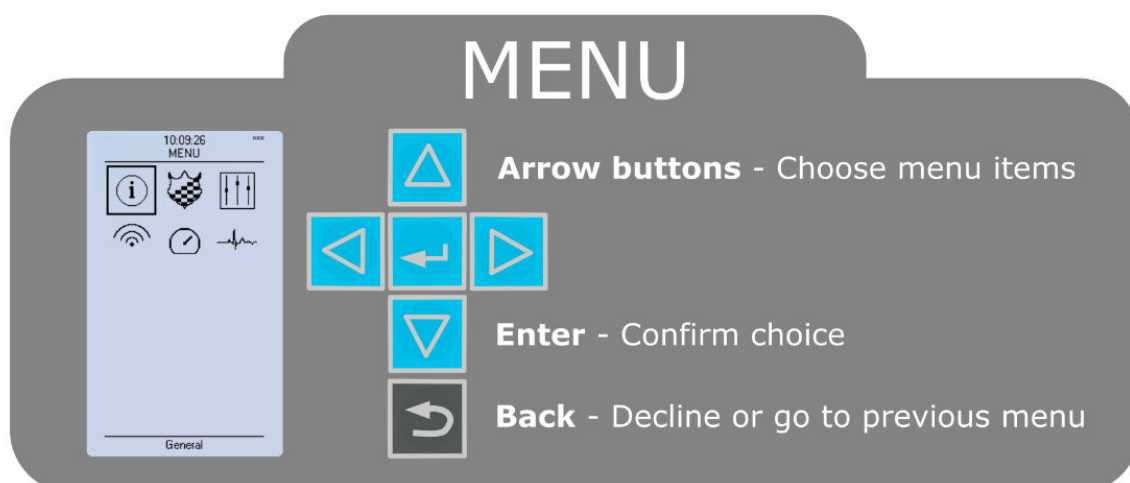
3.3.1 Basic configuration

IED user interface is divided into 5 quick displays. The displays are Events, Favorites, Mimic, LEDs and Clock. Default quick display is the mimic view and it is possible to glance through these menus by pressing arrows left and right. Please note that the available quick display carousel views might be different if user has changed it with MVR Utility Software setting tools Carousel Designer. Home button transfers the user between quick display carousel and main configuration menus. Main configuration menus are General, Protection, Control, Communication, Measurements and Monitoring. Available menus vary depending on IED type. You can choose the main menu by using the four arrow keys and press enter.

Figure 3.1 Basic navigation



Home - Switch between MENU and CAROUSEL view

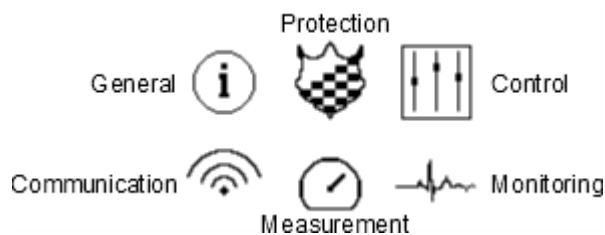


- Cancel/Back key takes you one step back or holding it down for 3 seconds takes you back to general –menu. Cancel key is also used for resetting user alarm LEDs.
- Padlock button takes user to password menu where it is possible to enter different user levels (user, operator, configurator and super user).

3.3.2 Navigation in main configuration menus

All the settings in this IED type have been divided into main configuration menus. Main configuration menus are presented below. Available menus may vary according to IED type.

Figure 3.2 Main configuration menus

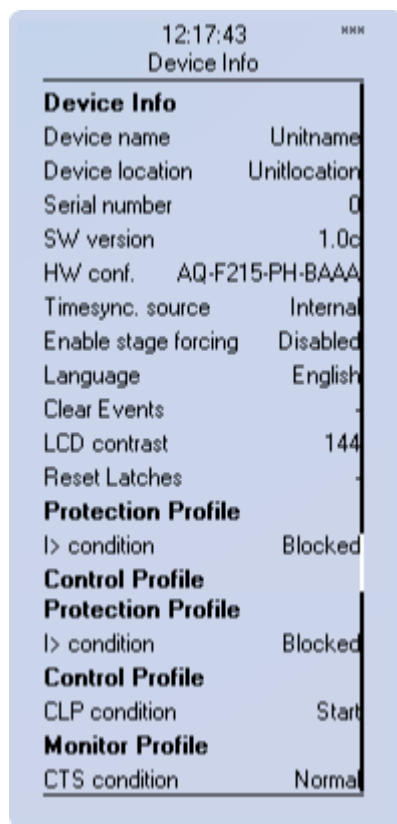


3.4 Menus for MVR-21x

3.4.1 General menu overview

Device info

Figure 3.3 Device Info sub-menu



- Set name and location of the device.
- Serial number and SW version of the IED.
- Hardware configuration (order code).
- Source for time synchronization, Internal or External (internal as default).
- Enable stage forcing (disabled / enabled). When forcing is disabled after using every forced output will restore. Forcing is done individually in info menu of each stage.
- Language selection, all available languages here (English as default).
- Clear devices events.
- LCD contrast level and setting 0 to 255 (120 as default).
- Reset latched signals
- Protection/Control/Monitor profile: Displays the status of enabled functions.

3.4.2 General menu

General-menu consists of basic settings and indications of the IED. In addition to this protection, control and monitor profile displays activated functions and their status.

Table 3.1 Parameters and indications in General-menu

Name	Description	Range	Step	Default
Device name	When loading the aqs configuration file from the MVR-200 unit the file name uses these fields.	-	-	Unitname
Device location		-	-	Unitlocation
Timesync. source	If external clock time synchronization source is available, the type is defined with this parameter. In internal mode there is no external Timesync source. IRIG-B requires serial fiber communication option card.	0:Internal 1:External NTP 2:External Serial 3:IRIG-B	-	0:Internal
Enable stage forcing	When this parameter is enabled it is possible for the user to force protection, control and monitoring functions to different statuses like START/TRIP. This is done in the function's info-page with Status force to parameter.	0:Disabled 1:Enabled	-	0:Disabled
System phase rotating order	Allows the user to switch the expected order in which the phase measurements are wired to the unit.	0:A-B-C 1:A-C-B	-	0:A-B-C
Language	Changes the parameter description languages in the HMI.	0:User defined 1:English 2:Suomi 3:Svenska 4:Español 5:Français	-	1:English
Clear events	Clears the event history recorded in the MVR-200 IED.	0:- 1:Clear	-	0:-
LCD Contrast	Changes the contrast of the LCD display.	0...255	1	120
Display brightness	Changes the display brightness.	0...8	1	4
Return to default view	If user navigates to a menu and gives no input after a period of time defined with this parameter the unit will return to default view automatically. If time is set to 0s this feature is not in use.	0...3600s	10s	0s
Reset latches	Resets latched signals in the logic and matrix. When reset command is given the parameter will return back to “-” automatically.	0:- 1:Reset	-	0:-
Measurement recorder	Enables Measurement recorder tool. Measurement recorder is configured in <i>Tools</i> → <i>Misc</i> → <i>Measurement recorder</i> .	0:Disabled 1:Enabled	-	0:Disabled
MIMIC reconfigure	Reload the mimic to the unit.	0:- 1:Reconfigure	-	0:-
Application	Enables Railway protection specific stages at <i>Protection</i> → <i>Stage activation</i> . Full description on the effects of this parameter are detailed in <i>Railway protection module</i> chapter.	0: Standard 3 phase 50/60Hz 1: Railroad 16,67Hz	-	0: Standard 3 phase 50/60Hz
Alarm screen type	Changes the type of alarm view if such is added to carousel view.	0:Dynamic screen 1:Fixed screen	0:Dynamic screen	0:Dynamic screen

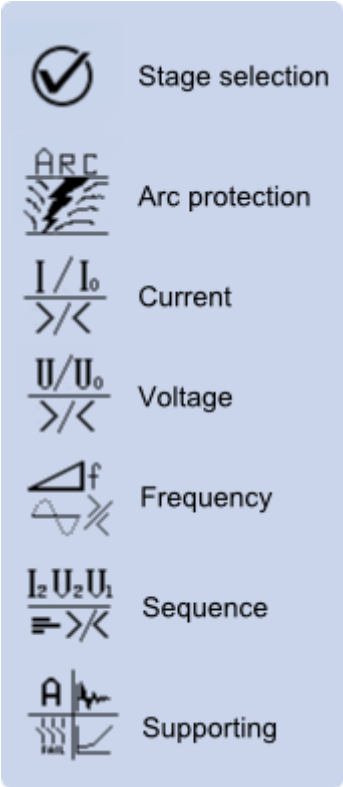
Table 3.2 General-menu indications

Name	Description
Serial number	Unique serial number identification of the unit.
SW version	Units firmware software version.
HW conf.	Units order code identification.
UTC time	UTC time value which IED clock uses.

3.4.3 Protection menu

Protection menu includes Stage activation sub-menu and sub-menus for different protection functions like Overcurrent, Earthfault, Seq. and balance and Supporting. Valid protection functions vary according IED type.

Figure 3.4 Protection menu view. Protection stages vary according IED type.



STAGE ACTIVATION

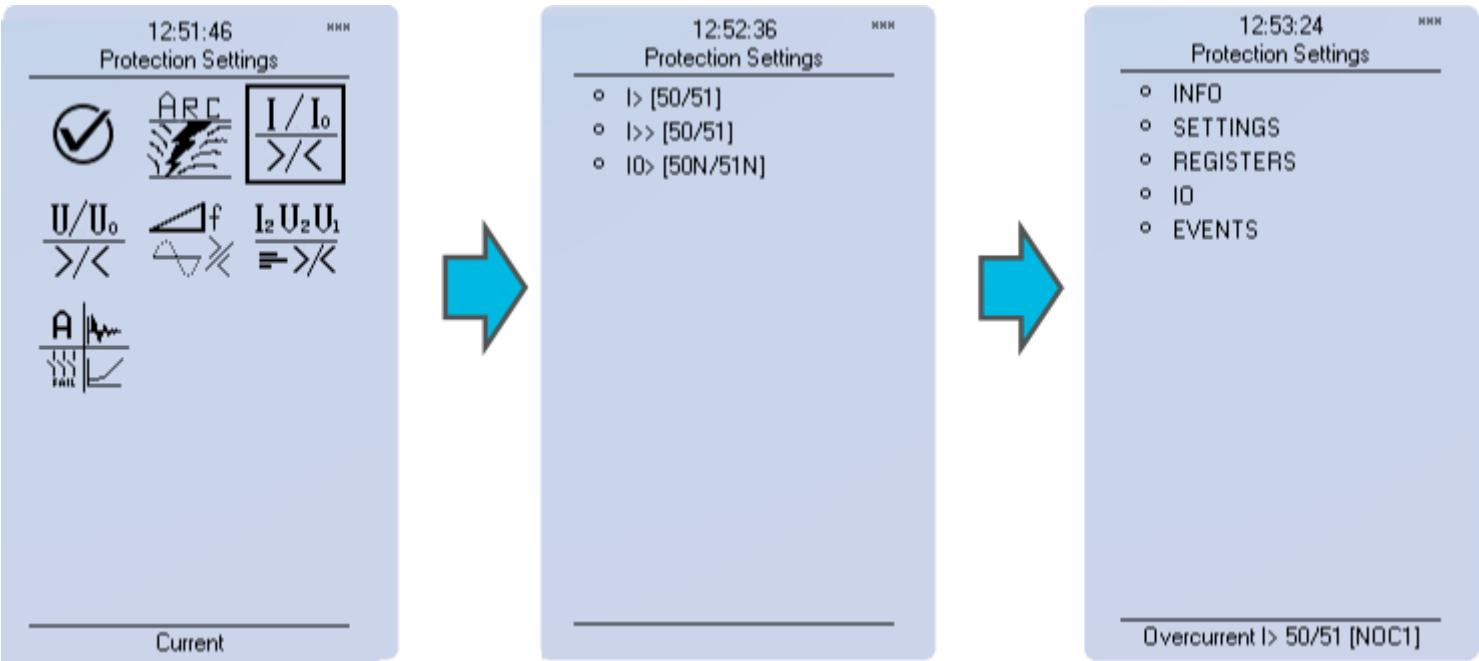
Figure 3.5 Stage activation sub-menu.

13:02:30	
Stage activation	
Voltage stages	
U> mode	Activated
U>> mode	Disabled
U>>> mode	Disabled
U>>>> mode	Disabled
U< mode	Disabled
U<< mode	Disabled
U<<< mode	Disabled
U<<<< mode	Disabled
U0> mode	Disabled
U0>> mode	Disabled
U0>>> mode	Disabled
U0>>>> mode	Disabled
Frequency stages	
f</> mode	Activated

- Activation of different protection stages is done in Stage activation –sub menu. Each protection stage and supporting function is disabled as standard.
- Activated menus will appear below the stage specific sub-menu for example I> appears below Current –module, U< appears below Voltage-module etc.

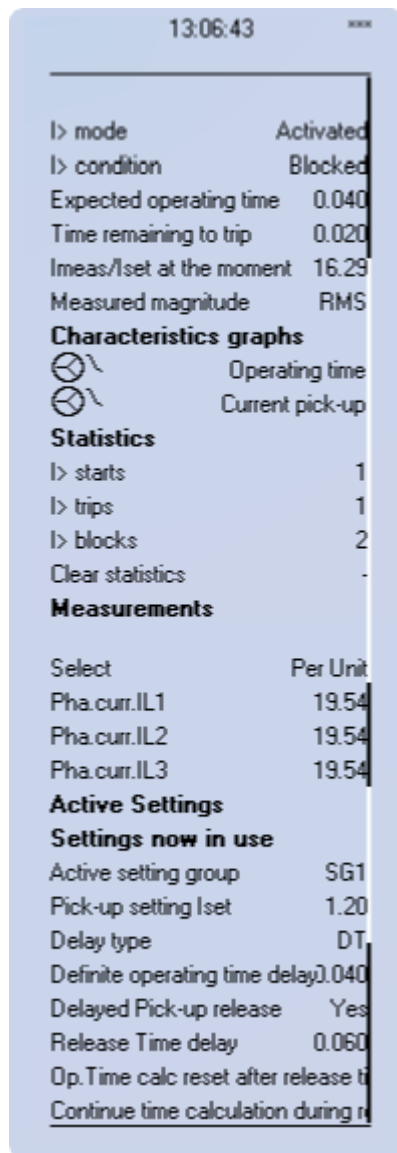
EXAMPLE PROTECTION STAGE

Figure 3.6 Stage navigation and modification.



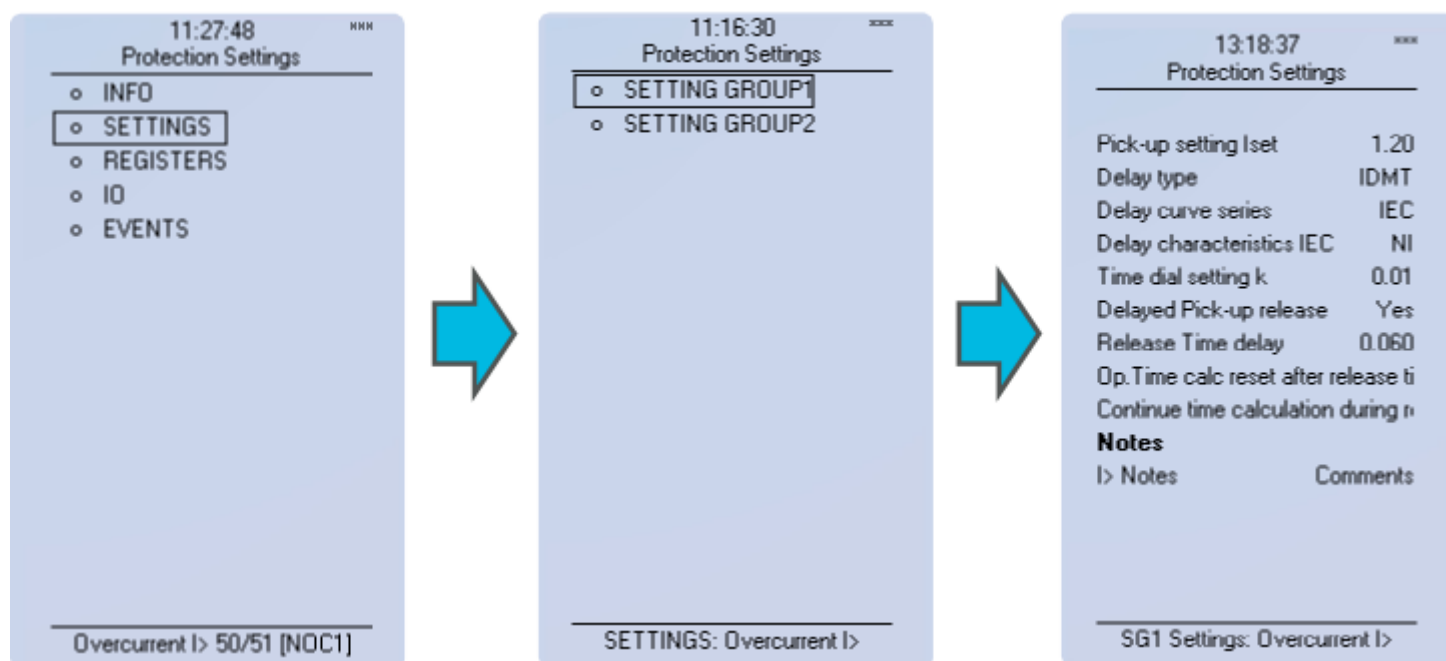
Each protection stage and supportive function has five stage menus Info, Settings, Registers, IO and Events.

Figure 3.7 Info menu indicates all the details listed below certain protection stage or function.



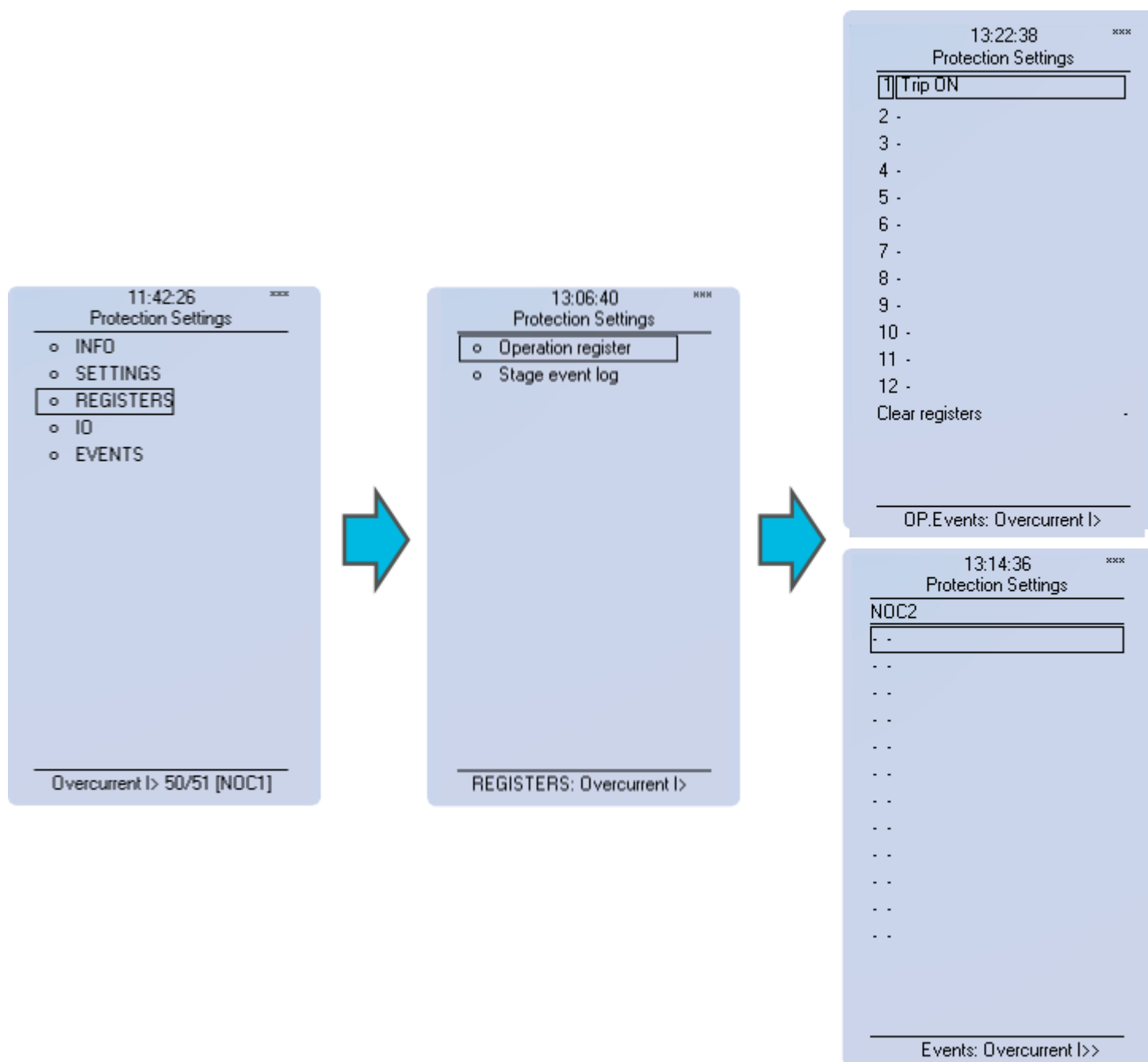
- Function is activated and disabled in Stage activation menu. It is possible to disable function in Info menu as well.
- Function condition indicates whether the stages condition is Normal, Start or Trip.
- Measured amplitude can be Peak-to-peak, TRMS or RMS. As a default it is set as RMS.
- Under Characteristic graphs-title you can open graphs related to the protection function.
- Info view has calculator for function starts, trips and blockings. It is possible to clear calculators by choosing Clear statistics and Clear.
- Measurements are visible in Info menu.
- Active setting group and its settings are all visible in Info menu.

Figure 3.8 All group specific settings are done individually in Settings menu.



Stage settings vary according different protection functions. With factory settings only one group of eight is activated. To enable more groups go to Control menu and select Setting Groups.

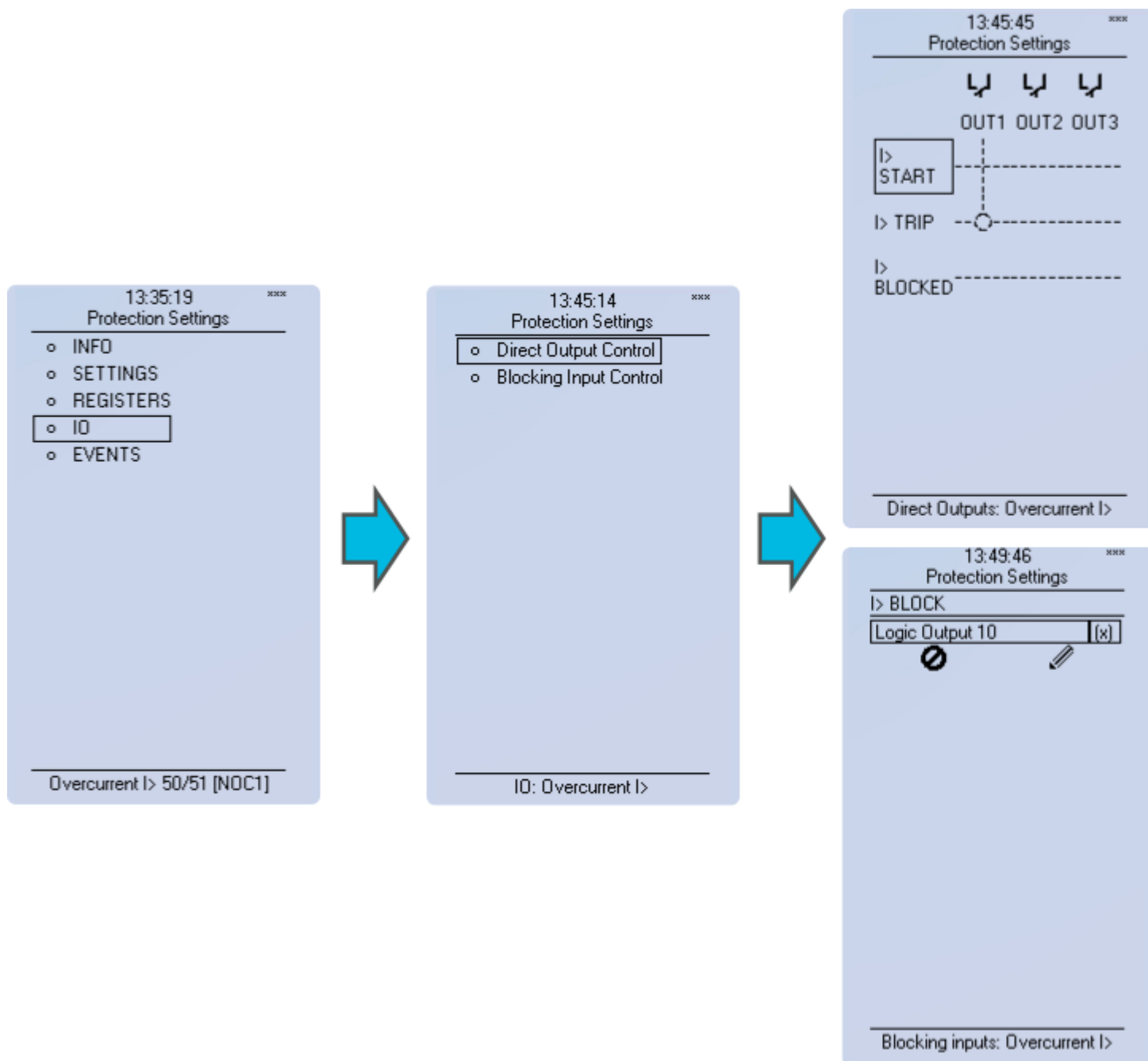
Figure 3.9 Stage information is divided into two sections.



Specific fault data of IEDs is stored in operation log under the register. Each of these 12 logs includes pre-fault current, fault current, time stamp and active group during the triggering. Operation log can be cleared by choosing *Clear registers* → *Clear*.

Events generated by the specific stage can be checked by going to Stage event register. General events cannot be cleared.

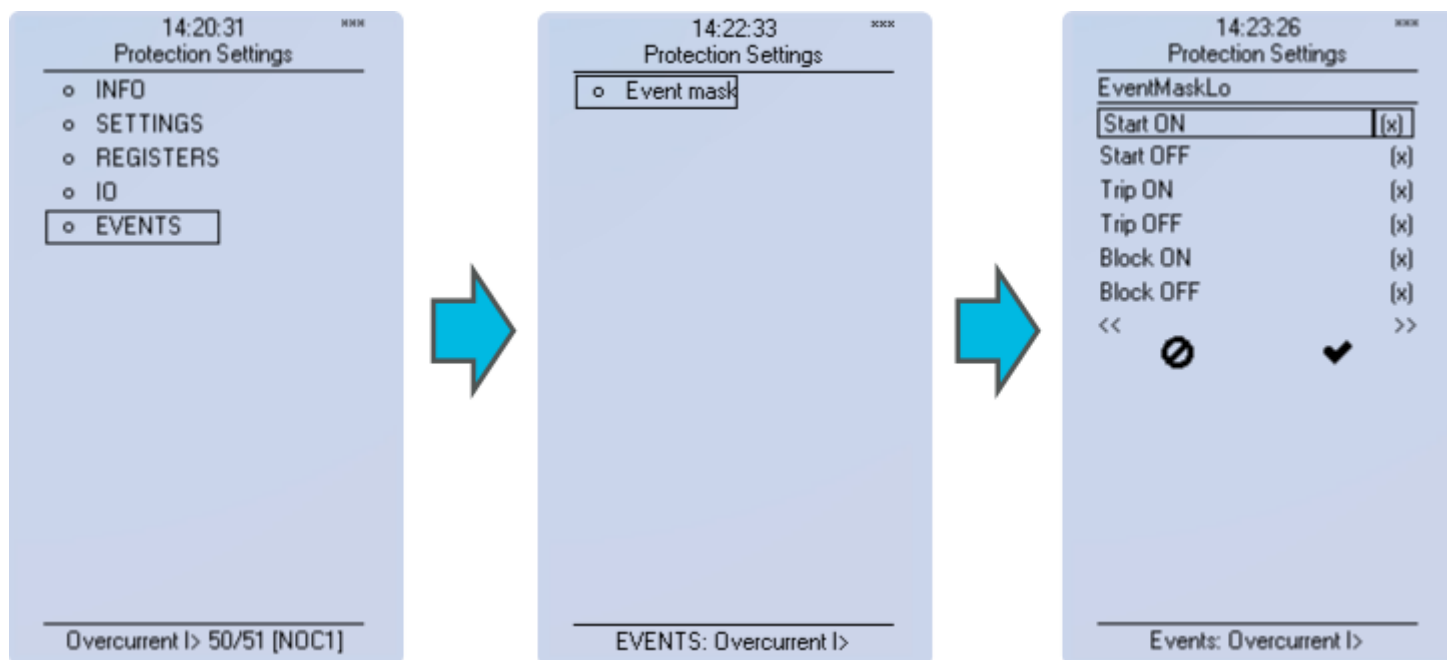
Figure 3.10 Stage information is divided into two sections.



Starting and tripping signals of protection stages are connected to physical outputs in Direct Output Control menu. It is possible to connect to output relay or to start- trip- or user configurable LED. In case when stage is internally blocked (DI or other signal) it is possible to configure an output to indicate that stage is blocked. Connection to outputs can be either latched $|x|$ or non-latched x.

Stage blocking is done in Blocking Input Control menu. Blocking can be done by using digital inputs, logical inputs or outputs, stage start- trip- or blocked information or by using object status information.

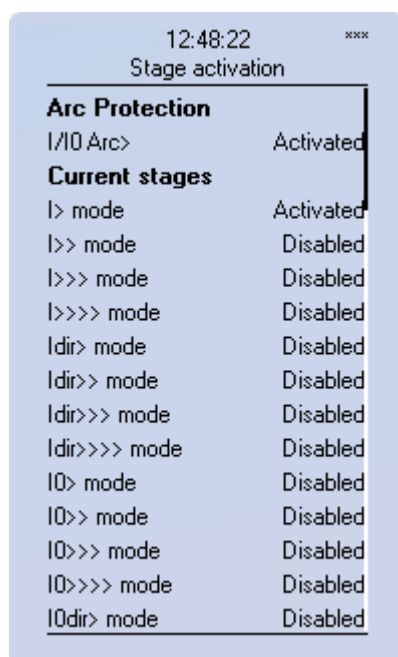
Figure 3.11 Protection stage related events are masked on and off individually under *Events* → *Event mask*.



Events are masked off as default. It is possible to activate desired events by masking them $|x|$. Only masked events appear to event list. Events cannot be cleared.

Stage activation

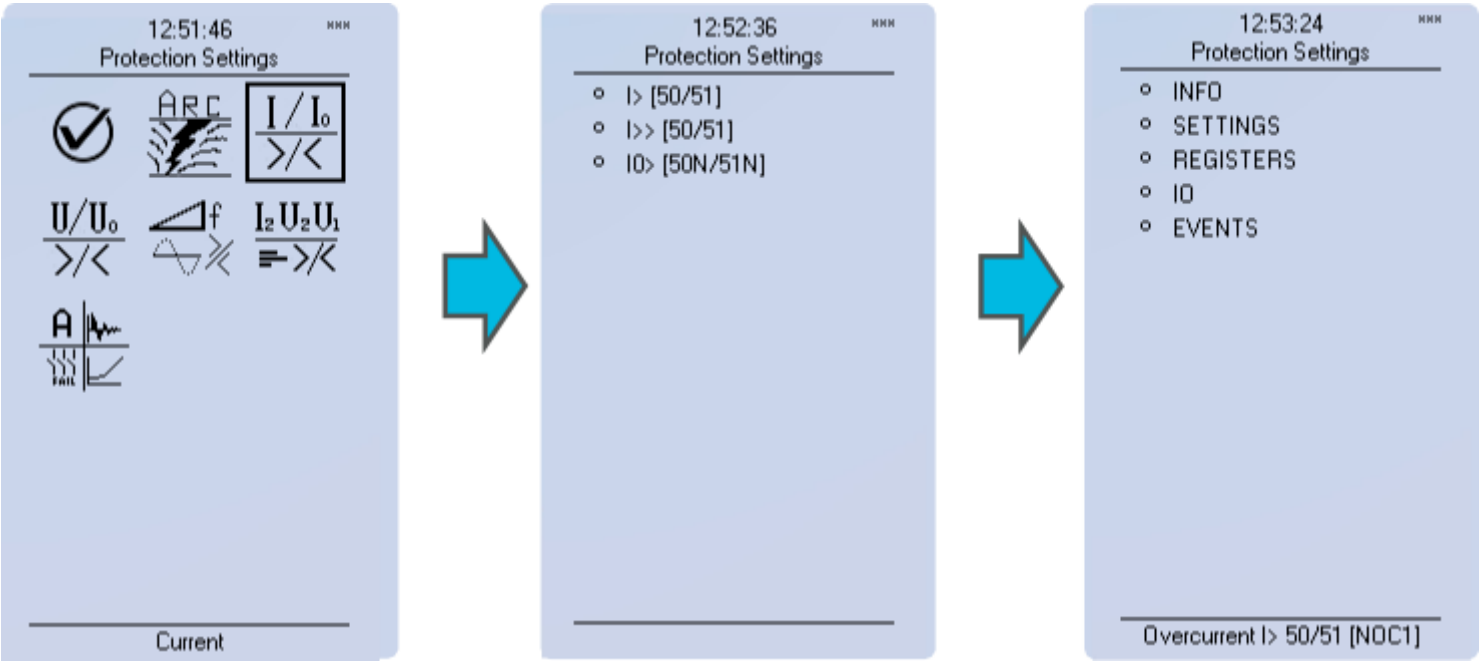
Figure 3.12 Stage activation sub-menu.



- *Activation* of different protection stages is done in *Stage activation* –sub menu. Each protection stage and supporting function is disabled as standard.
- Activated menus will appear below the stage specific sub-menu for example I> appears below Current –module, U< appears below Voltage-module etc.

Example protection stage

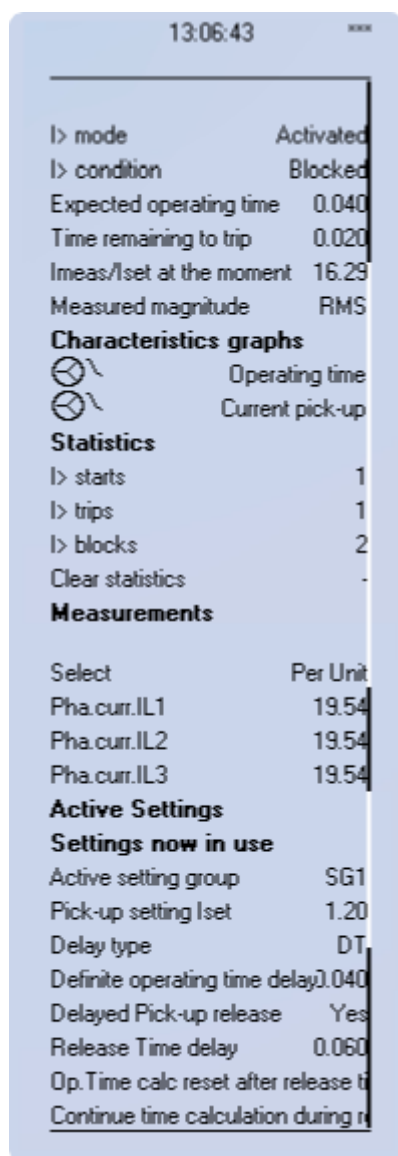
Figure 3.13 Stage navigation and modification.



Each protection stage and supportive function has five stage menus *Info*, *Settings*, *Registers*, *IO* and *Events*.

Info-menu

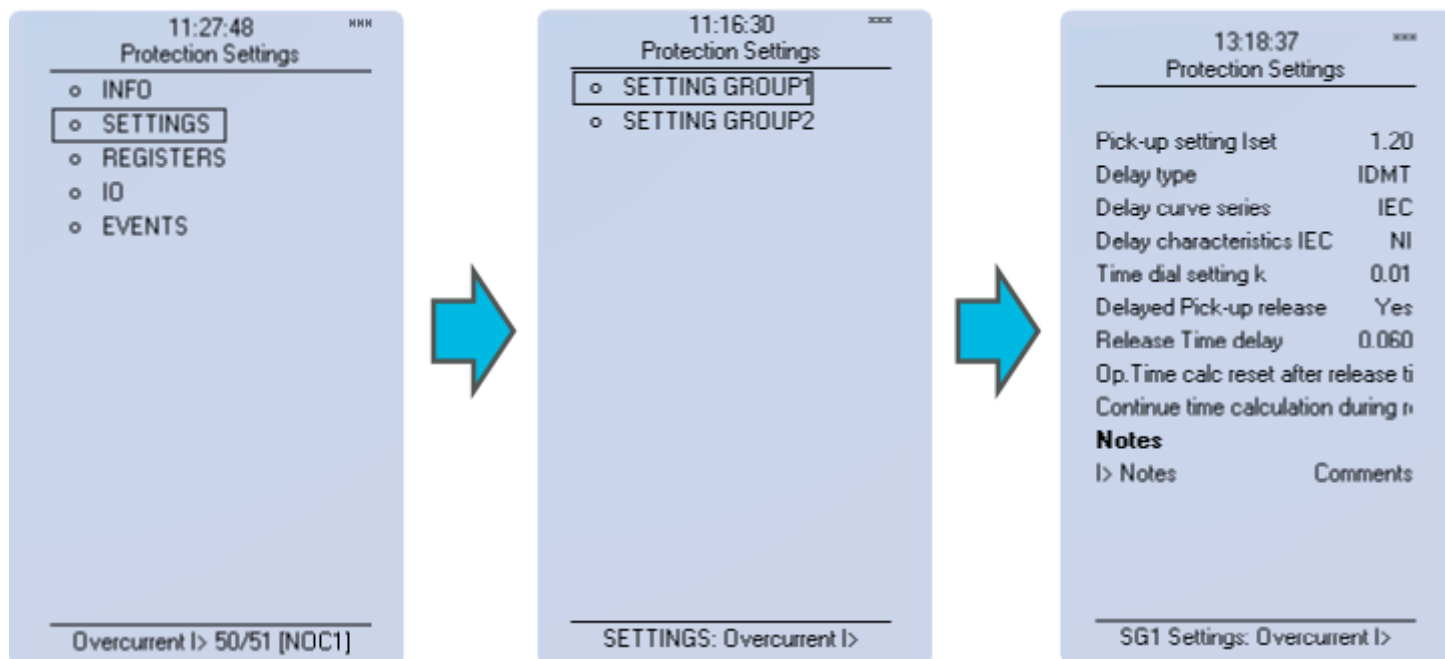
Figure 3.14 Info menu indicates all the details listed below certain protection stage or function.



- Function is activated and disabled in *Stage activation* menu. It is possible to disable function in Info menu as well.
- *Function condition* indicates whether the stages condition is Normal, Start or Trip.
- *Measured amplitude* can be Peak-to-peak, TRMS or RMS. As a default it is set as RMS. Available measured amplitudes vary.
- Under *Characteristic graphs*-title you can open graphs related to the protection function.
- Info view has calculator for function starts, trips and blockings. It is possible to clear calculators by choosing Clear statistics and Clear.
- *Measurements* are visible in Info menu.
- *Active setting group* and its settings are all visible in Info menu. Other setting groups can be set in the *Settings*-menu.

Settings-menu

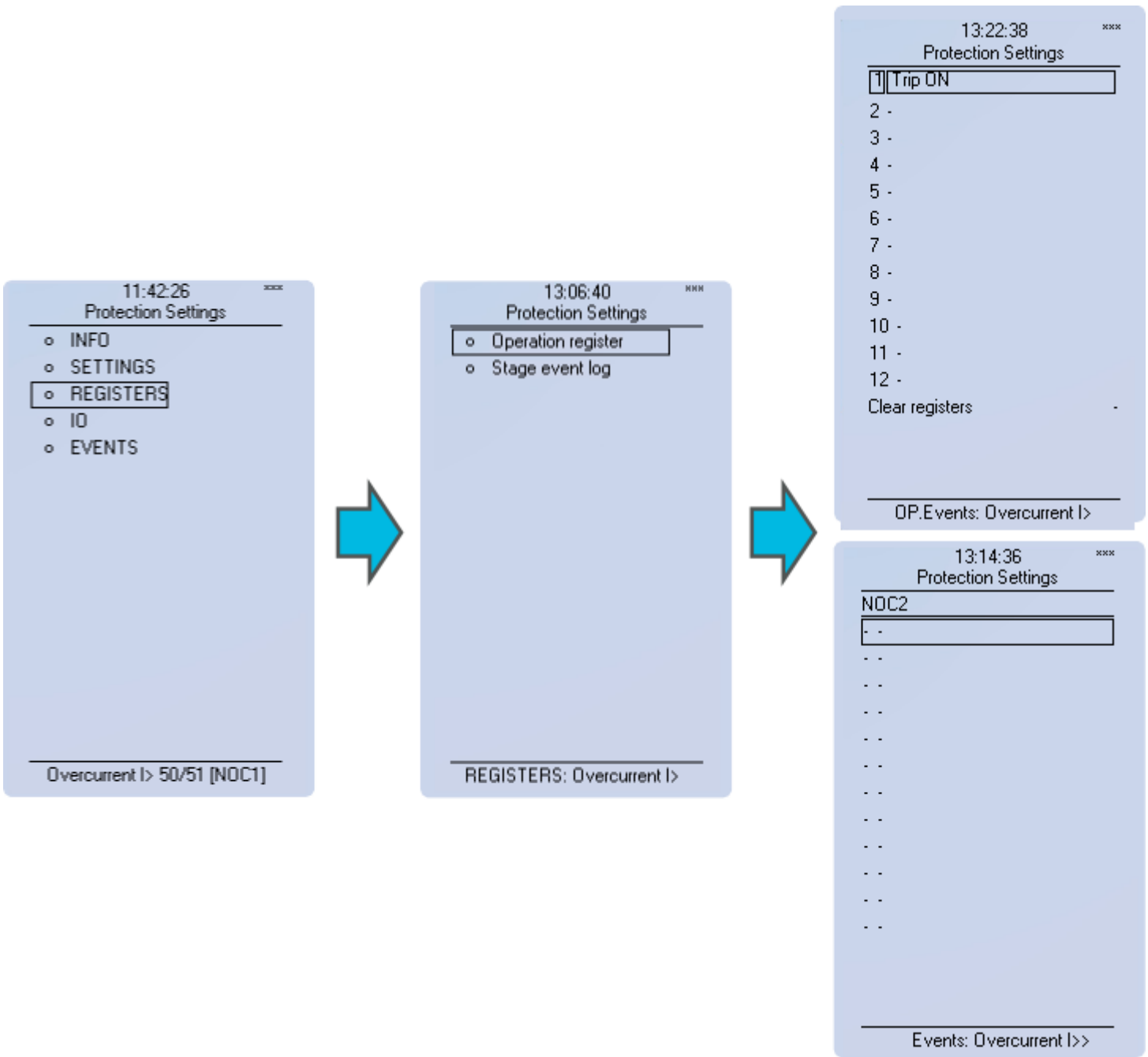
Figure 3.15 All group specific settings are done individually in Settings menu.



Stage settings vary according different protection functions. With factory settings only one group of eight is activated. To enable more groups go to Control menu and select Setting Groups.

Registers-menu

Figure 3.16 Stage information is divided into two sections.

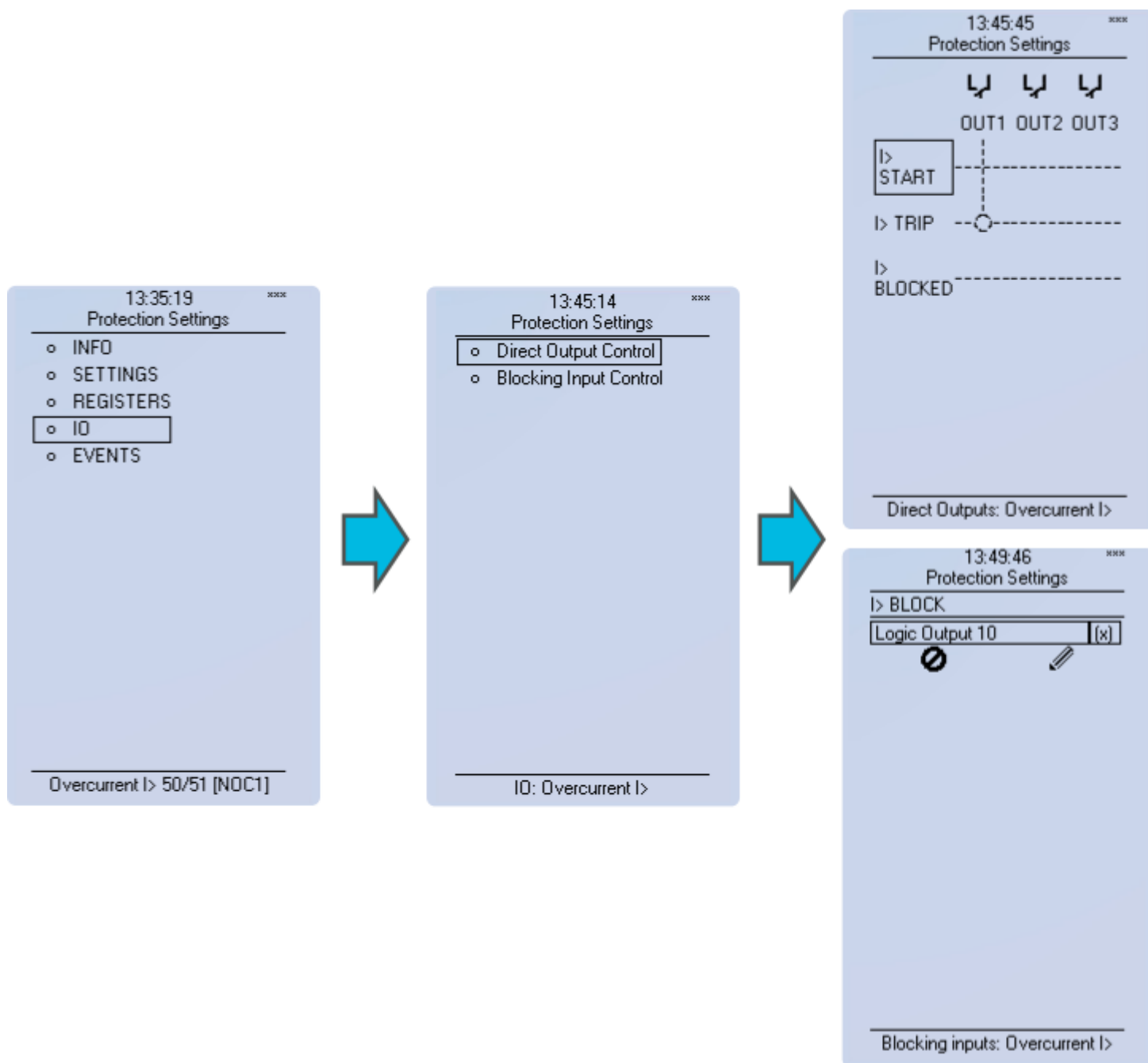


Specific fault data of IEDs is stored in operation log under the register. Each of these 12 logs includes pre-fault current, fault current, time stamp and active group during the triggering. Operation log can be cleared by choosing *Clear registers* → *Clear*.

Events generated by the specific stage can be checked by going to Stage event register. General events cannot be cleared.

IO-menu

Figure 3.17 Series IED stage information is divided into two sections.

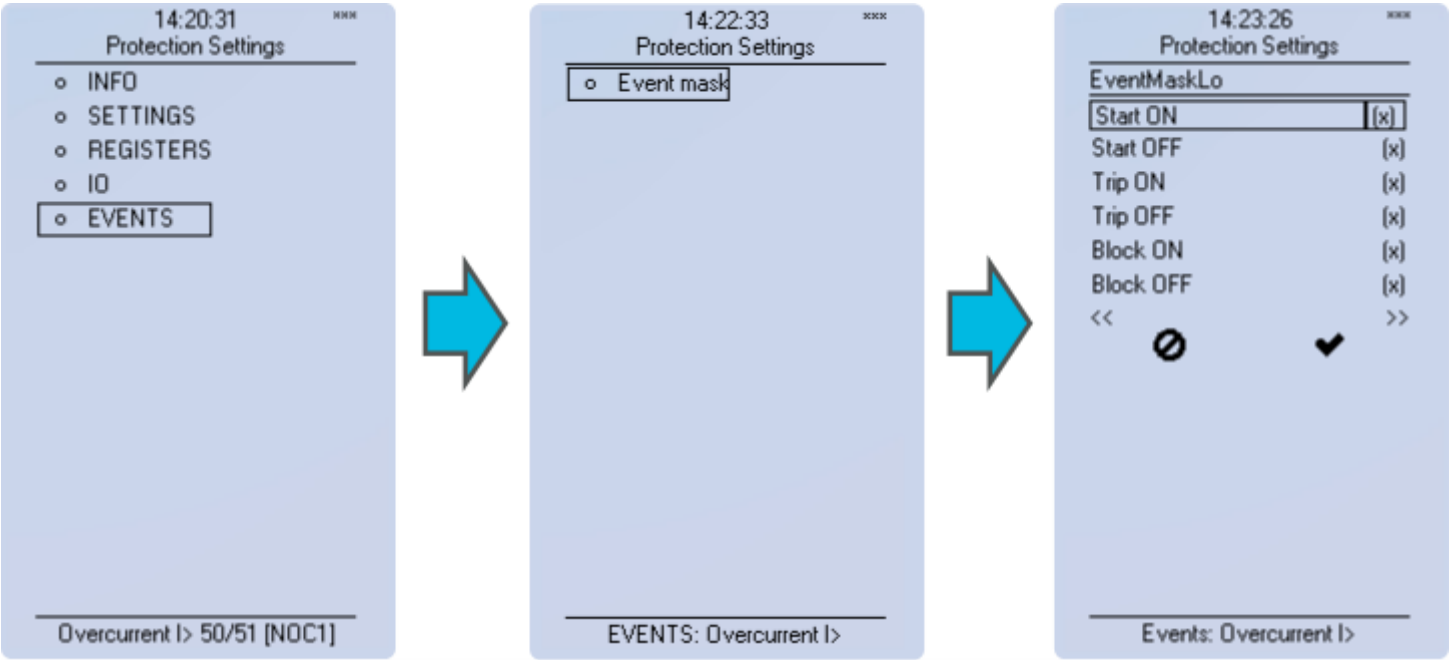


Starting and tripping signals of protection stages are connected to physical outputs in Direct Output Control menu. It is possible to connect to output relay or to start- trip- or user configurable LED. In case when stage is internally blocked (DI or other signal) it is possible to configure an output to indicate that stage is blocked. Connection to outputs can be either latched $|x|$ or non-latched x.

Stage blocking is done in *Blocking Input Control* menu. Blocking can be done by using digital inputs, logical inputs or outputs, stage start- trip- or blocked information or by using object status information.

Events-mask

Figure 3.18 Protection stage related events are masked on and off individually under Events → Event mask.

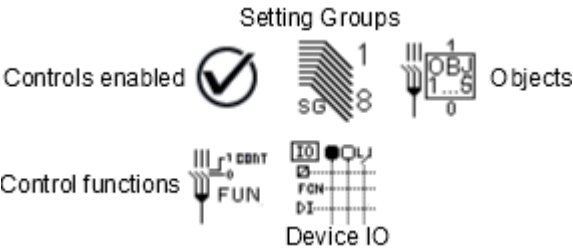


Events are masked off as default. It is possible to activate desired events by masking them [x]. Only masked events appear to event list. Events cannot be cleared.

3.4.4 Control menu

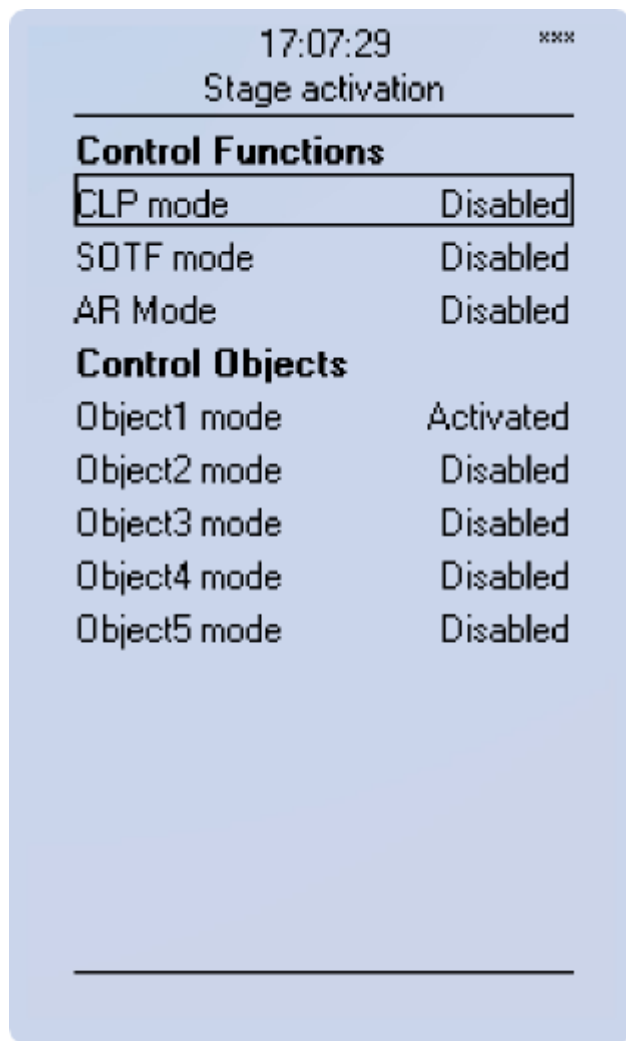
Control menu includes Controls Enabled sub-menu and sub-menus for different control functions like Setting Groups, Objects, Control Functions and Device IO. Valid control functions vary according IED type.

Figure 3.19 Control menu view. Functions vary according IED type.



Controls enabled

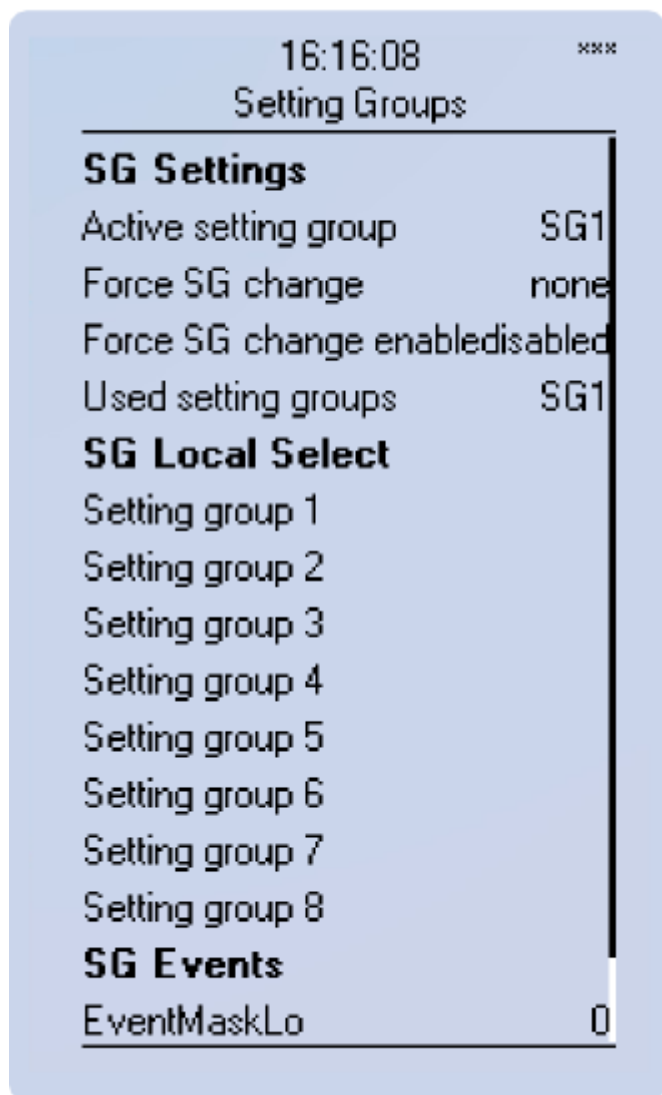
Figure 3.20 Controls Enabled sub- menu.



- *Activation* of different control functions is done in Controls Enabled –sub menu. Each control function is disabled as standard. Active functions will appear below Control Functions –sub menu.
- *Activated objects* will appear below *Objects*–sub menu. Each object is disabled as standard.

Setting groups

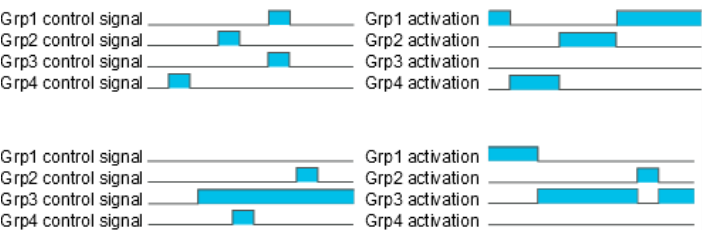
Figure 3.21 Setting Groups menu displays all the information related to group changing.



- *Active setting group* displays the current active setting group 1...8.
- It is possible to activate desired setting group by setting *Force SG*. While doing this Force SG change has to be enabled.
- In *Used setting groups* menus it is possible to activate setting groups between 1 and 1...8 (default only 1 group is active).
- Select local control for different setting groups from *SG Local Select*. Digital inputs, Logical inputs or outputs, stage starting- tripping- or blocking, RTDs and object status information can be used.
- Event masking for setting groups (masks are off as default). Only masked events appear to event list. Events cannot be cleared.

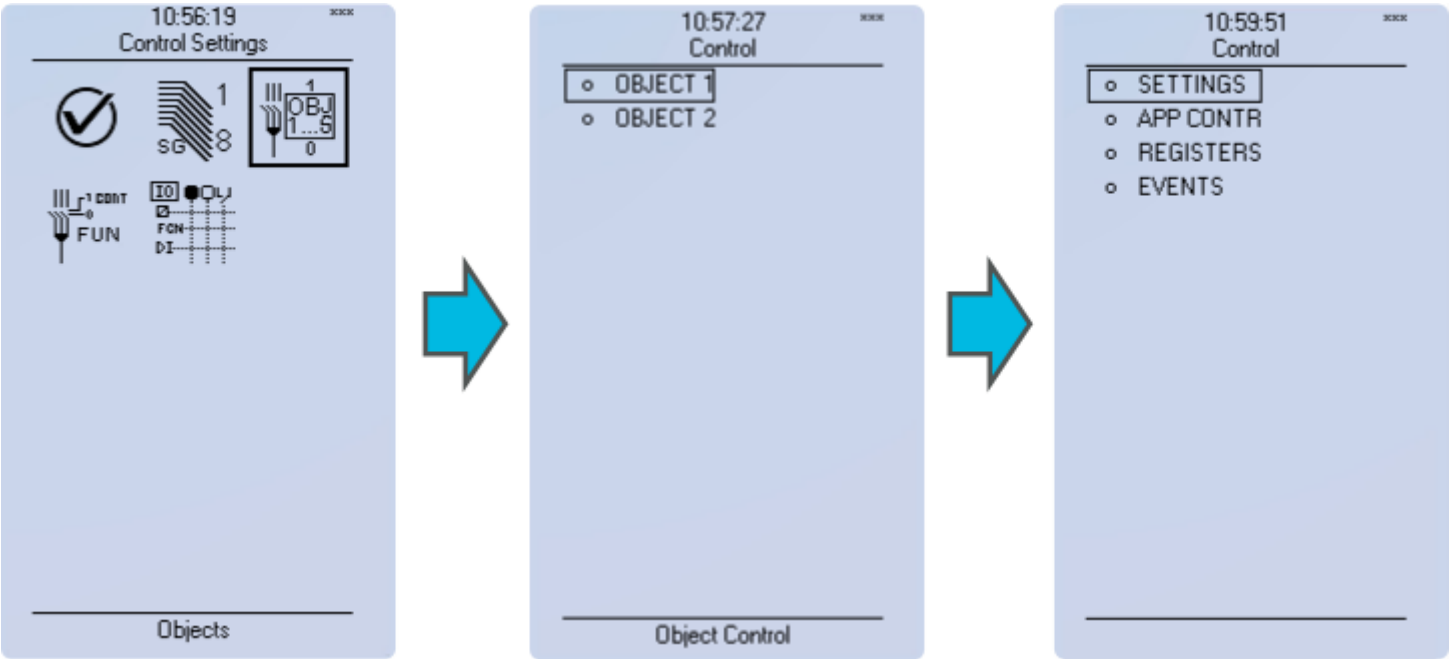
Setting group 1 has the highest and group 8 the lowest priority. Setting groups can be controlled with steady signal or pulses.

Figure 3.22 Group changing with pulse control only or with pulses and static signal.



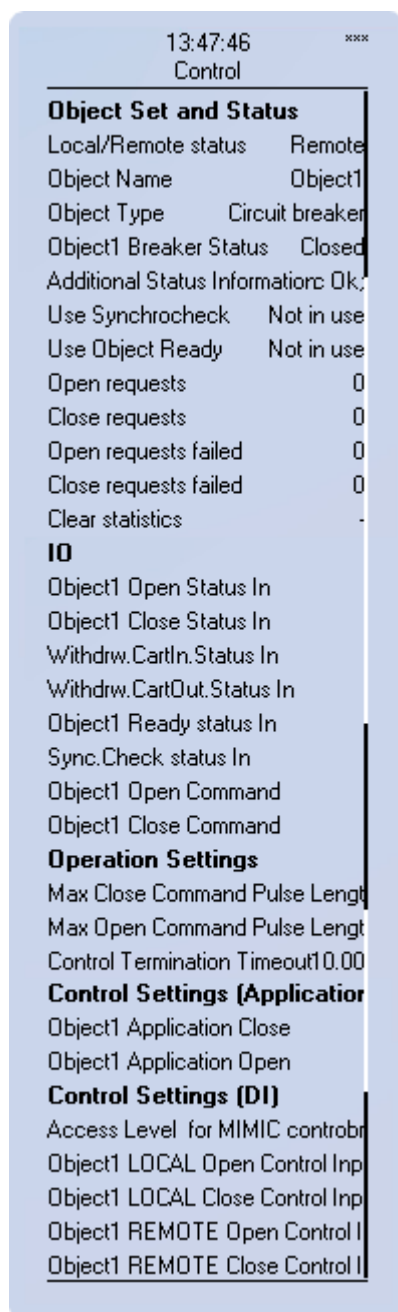
Objects

Figure 3.23 Object controlling.



Each activated object is visible in *Objects*-menu. As default all objects are disabled. Each active object has four setting menus, settings, application control, registers and events.

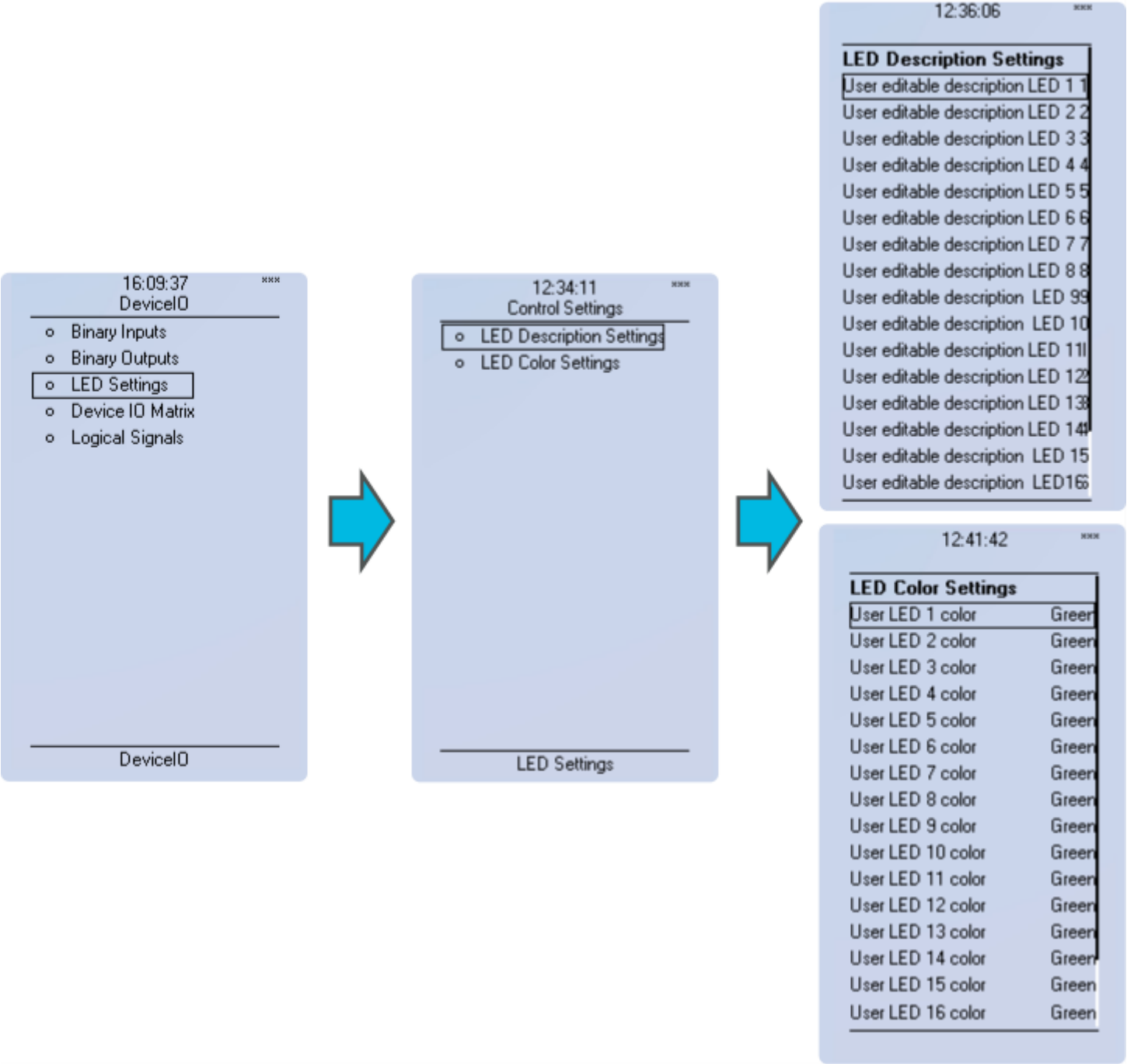
Figure 3.24 Info menu indicates all the details listed below certain protection stage or function.



- Control access may be set to Local- or Remote control (local as default). When local control is enabled it is not possible to control object through bus and vice versa.
- Type name of the object. As default objects are named as Object1...5.
- Select *type of the object* between grounding disconnector, motor controlled disconnector, circuit breaker, and withdrawable circuit breaker (circuit breaker as default).
- *Object status* can be between Bad, Closed, Open and Intermediate. Intermediate is the phase between open and closed where both status inputs are equal to zero (0). When both status inputs of the object are one (1) the status of the object is Bad.
- *Object withdraw status* could be Bad, Cart In, Cart Out or Intermediate. Intermediate is the phase between open and closed where both status inputs are equal to zero (0). When both status inputs of the cart are one (1) the withdrawn status is Bad.
- *Additional status information* gives feedback from the object whether the opening and closing is allowed or blocked, whether the object is ready or the synchronization status is ok.
- *Activate Use Synchrocheck or Use Object Ready*. Closing the object is forbidden if sides are out of sync or object is not ready to be closed.

- *Settings*-menu also includes statistics for open- and closed requests. Stats can be cleared by choosing *Clear statistics* → *Clear*.
- Object has Open- and Close inputs and withdrawable object has In- and Out inputs. Object Ready- and external Synchrocheck permission have status inputs as well. Digital inputs, Logical inputs or outputs, stage starting- tripping- or blocking, RTDs and object status information can be used to indicate the status.
- Object open- and close signals of an object are connected to physical output relays.
- Separate timeouts for objects are set in Settings menu. Synchronization wait- and Object Ready wait timeouts are settable between 0.02...500.00 s (default 200ms, step 20ms). If time expires the controlling of object fails. Same time settings apply with Maximum close- and open command pulse lengths. Control Termination Timeout is set to 10 seconds as default. After the set delay if the controlled object does not respond accordingly the procedure is terminated and there will be fail message.
- Access level for MIMIC control is selected between User, Operator, Configurator and Super user. To control MIMIC the terms of user access level (password) has to be fulfilled. As default the access level is set to Configurator.
- For object local and remote controlling digital inputs can be used. Remote controlling via bus is configured in protocol level.

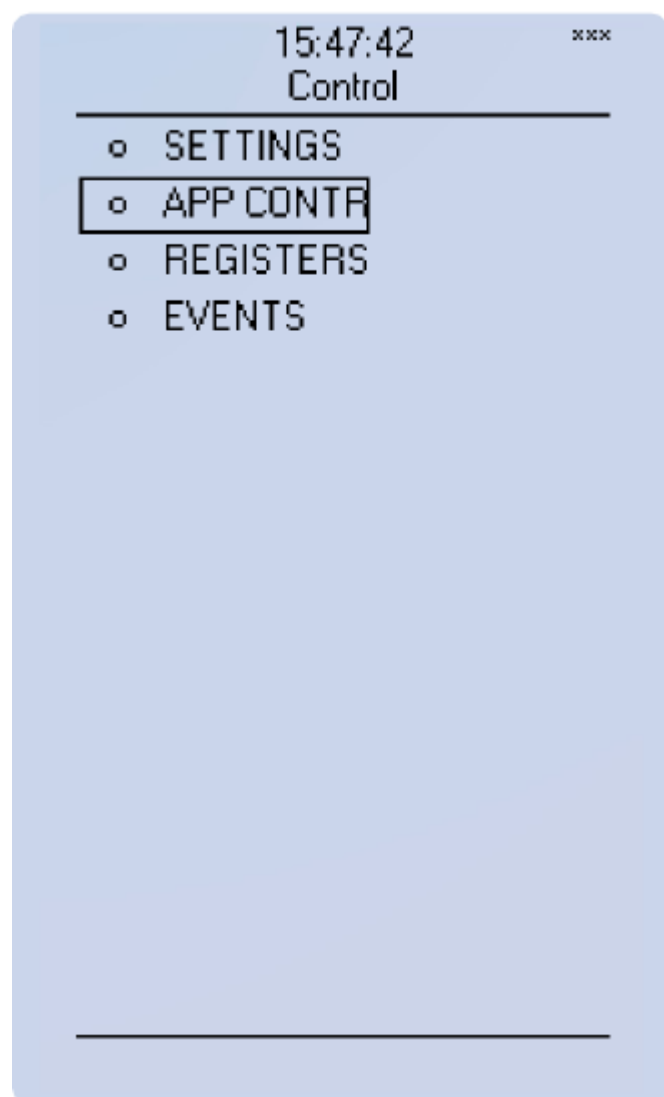
Figure 3.25 Object output- and block signal setting.



Object statuses can be connected directly to physical outputs in Signal Connections menu which is sub-menu to APP CONTR menu. It is possible to connect to output relay or to start- trip- or user configurable LED. Connection to outputs can be either latched |x| or non-latched x.

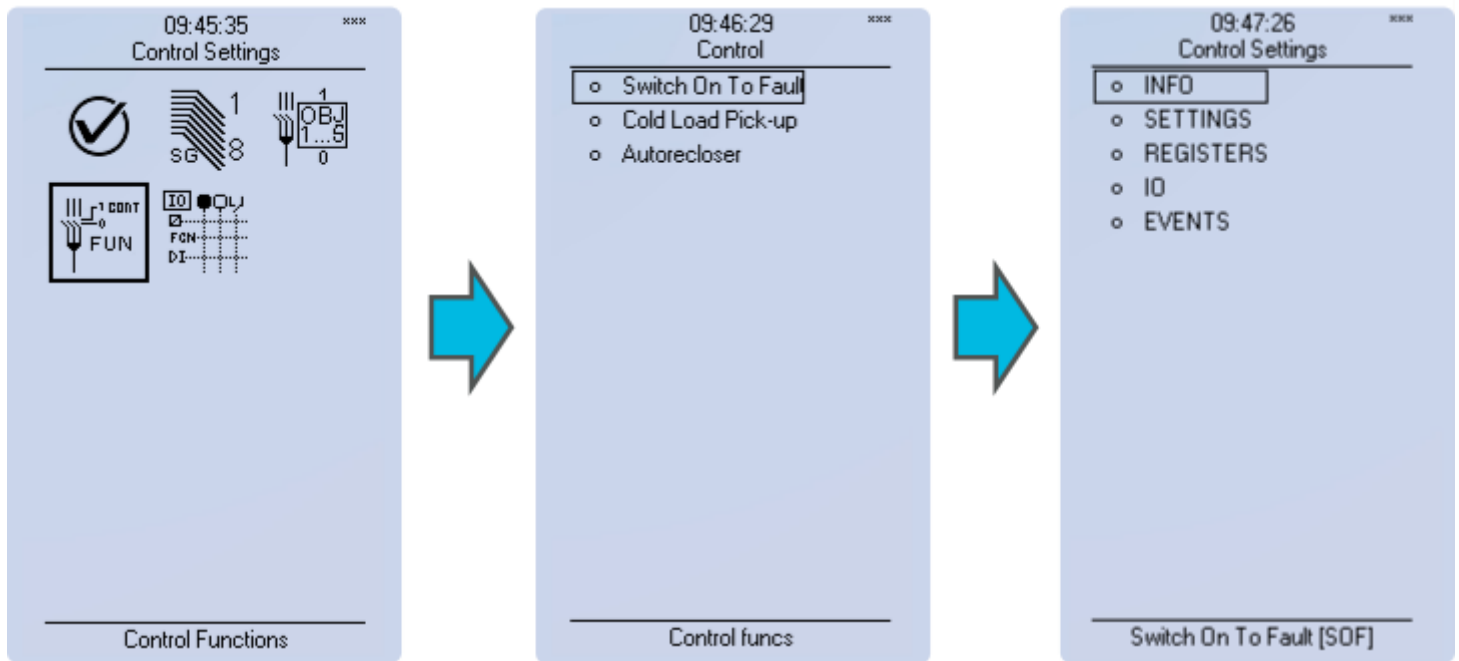
Object blocking is done in Blocking Input Control menu. Blocking can be done by using digital inputs, logical inputs or outputs, stage start- trip- or blocked information or by using object status information.

Figure 3.26 Object registers and events.



Control functions

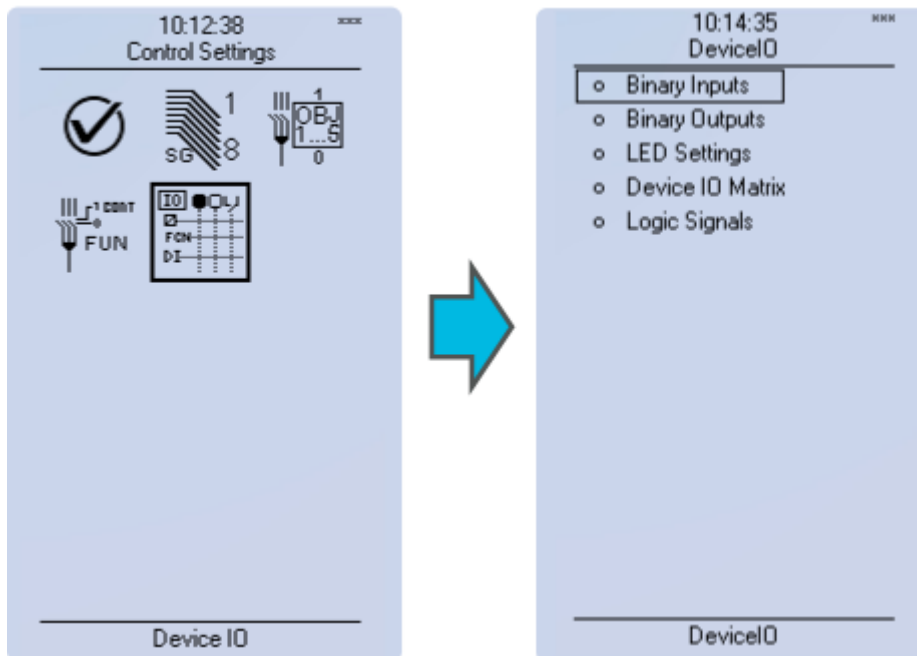
Figure 3.27 Stage navigation and modification.



Each enabled control function is listed below Control Functions menu. Every function includes same sub-menus as protections stages including Info, Settings, Registers, IO and Events.

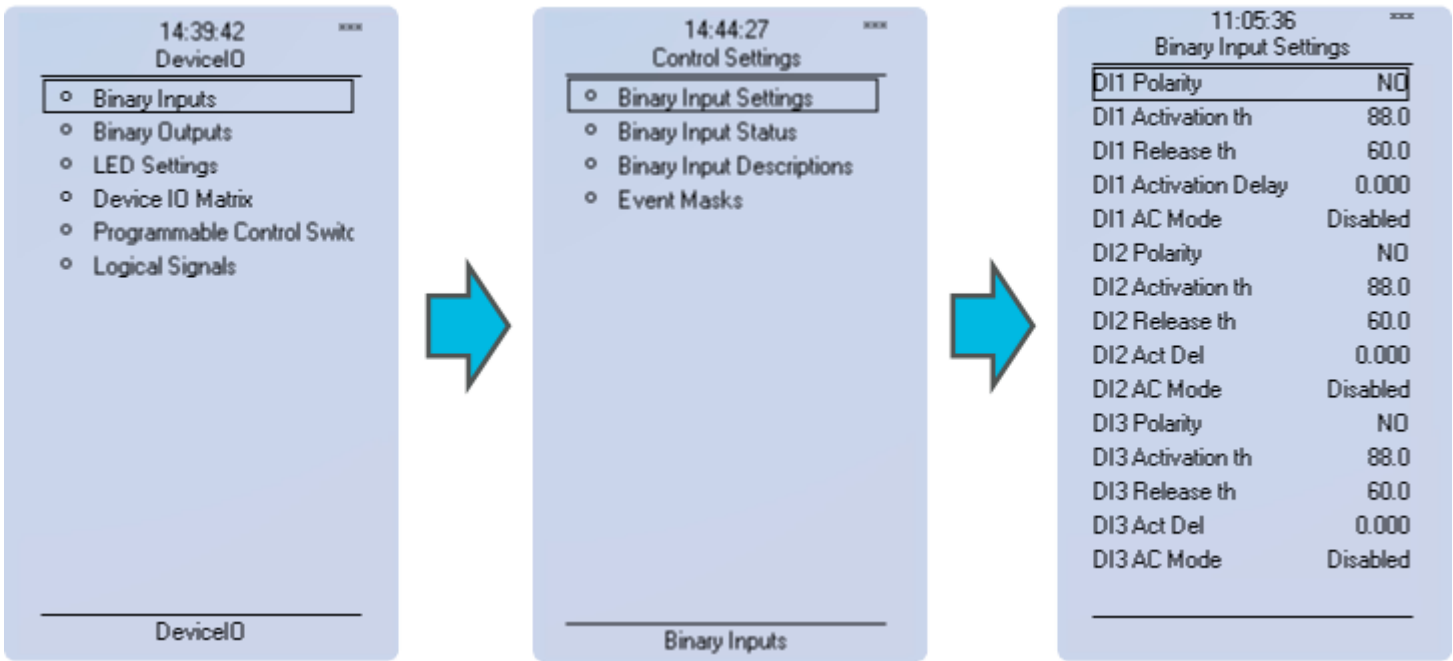
Device IO

Figure 3.28 Device IO menu.



- Device IO menu has sub-menus for Binary Inputs, Binary Outputs, LEDs, Logic signals and for general Device IO matrix.
- Binary inputs, Logic Outputs, protection stage status signals (start, trip & blocked etc.) and object status signals can be connected to output relay or to start- trip- or user configurable LEDs in Device IO matrix.

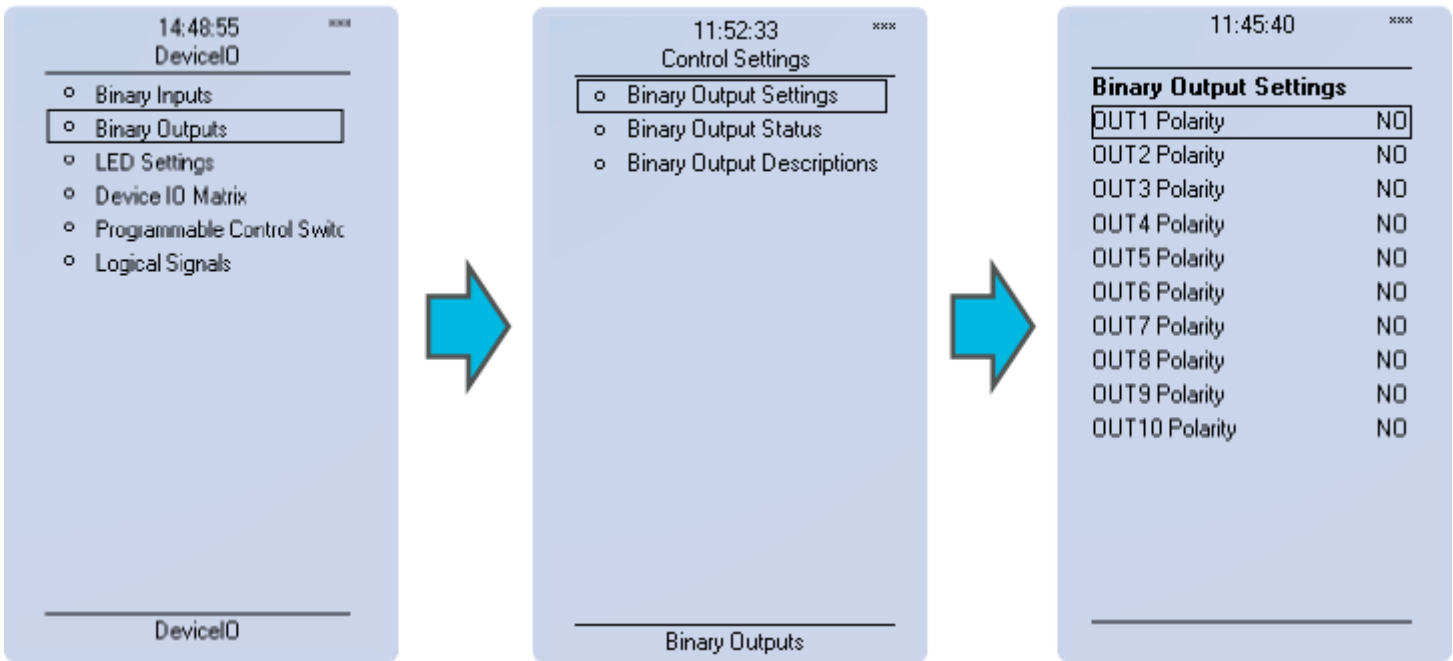
Figure 3.29 IED Binary Inputs menu.



All settings related to binary inputs can be found under the Binary Inputs menu. Binary inputs Settings menu includes polarity selection for the input (normal open or normal closed), activation (16...200 V_{AC/DC}, step 0.1V) and release (10...200 V_{AC/DC}, step 0.1V) threshold voltage for each available input and activation delay (0...1800 s, step 1ms). Binary input statuses can be check from corresponding menu.

Digital input activation and release threshold follows the measured peak value. Activation time of input is between 5-10 milliseconds. Activation delay is configurable. Release time with DC is between 5-10 milliseconds. Release time with AC is less than 25 milliseconds.

Figure 3.30 Binary Outputs menu.

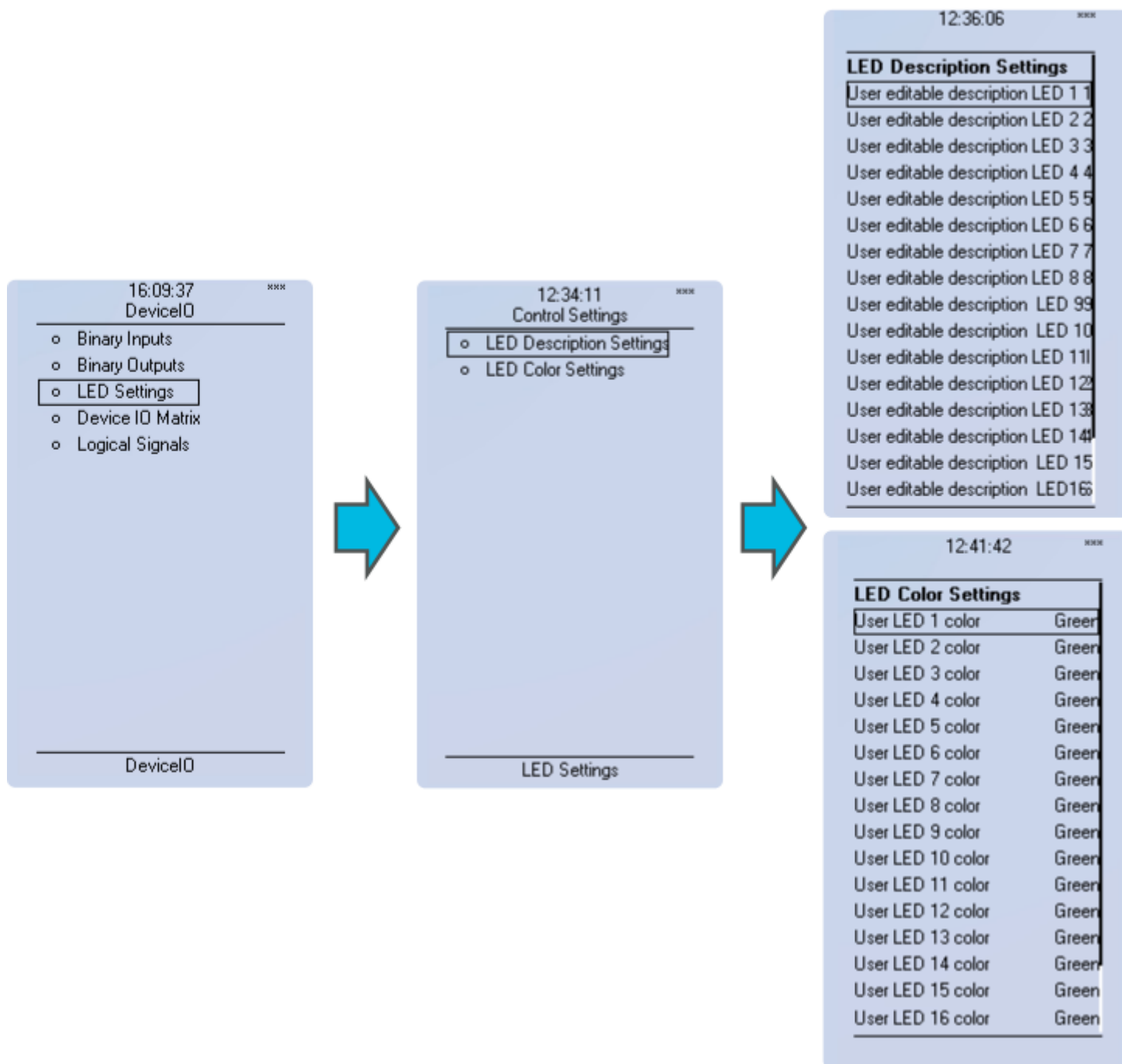


Polarity of binary outputs is configured between normal open (NO) and normal closed (NC) in Binary Outputs menu. As default polarity is normal open. Operation delay of output contact is around 5 milliseconds.

Description text for Binary output is configured in Binary Output Descriptions menu. Name change affects to Matrixes and input –or output selection lists. Names have to be configured online or updated to the IED via setting file.

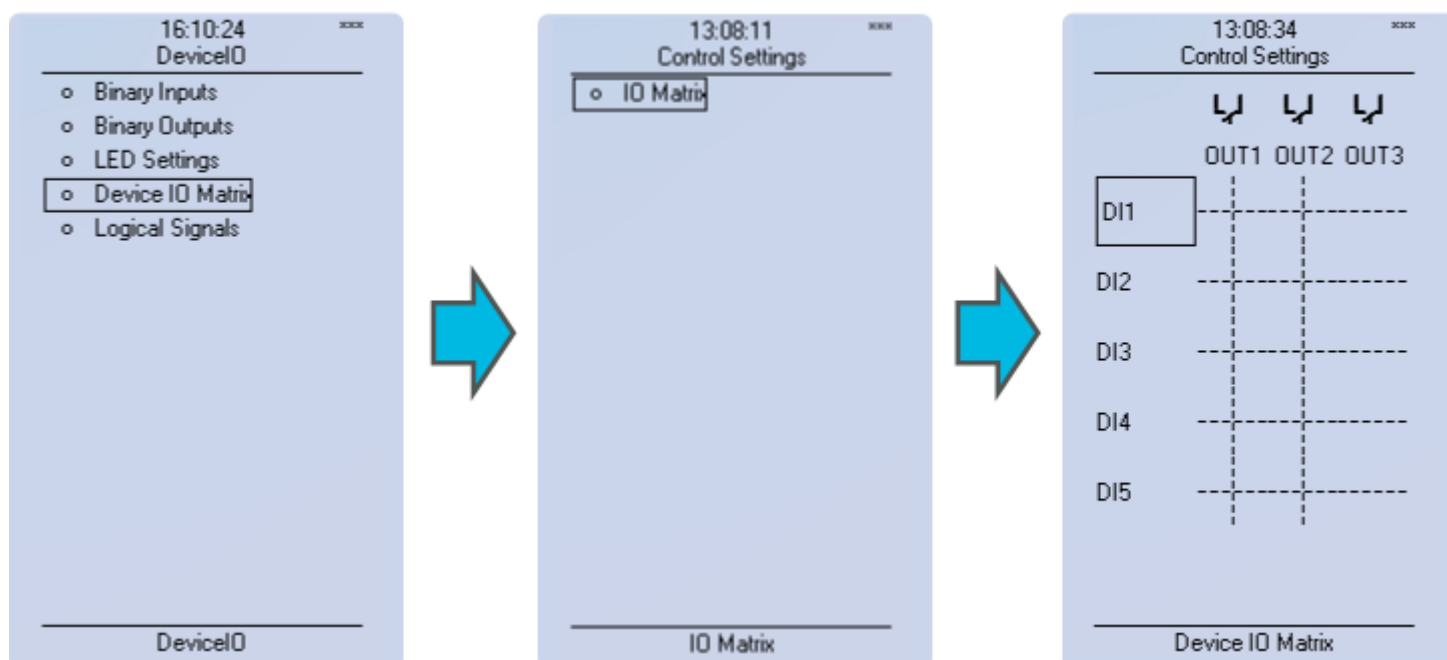
NOTE! Normal closed signal goes to default position (normal open) in case the relay loses the auxiliary voltage or during System full reset. Normally closed output signal does not open during Communication- or protections reset.

Figure 3.31 Led settings



LED Settings menu has two sub-menus LED Description Settings and LED Color Settings. In LED Description Settings menu the label text of the LED can be modified. This label is visible in LEDs quick displays and matrixes. LED color can be chosen between green and yellow in LED Color Settings menu. As default the color is green.

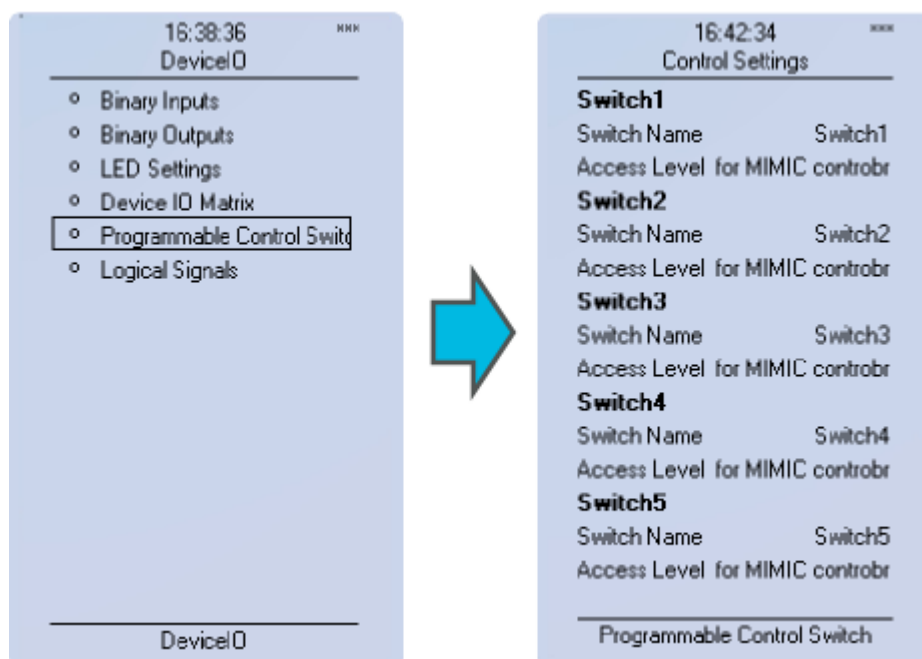
Figure 3.32 Binary Outputs menu.



Binary inputs, Logic Outputs, protection stage status signals (start, trip & blocked etc.) and object status signals can be connected to output relay or to start- trip- or user configurable LEDs in *Device IO matrix* → *IO Matrix*. Connections can be made as latched |x| or non-latched x. Non-latched output is dis-activated immediately when triggering signal is disabled. Latched signal stays active until the triggering signal dis-activates and latched function is cleared.

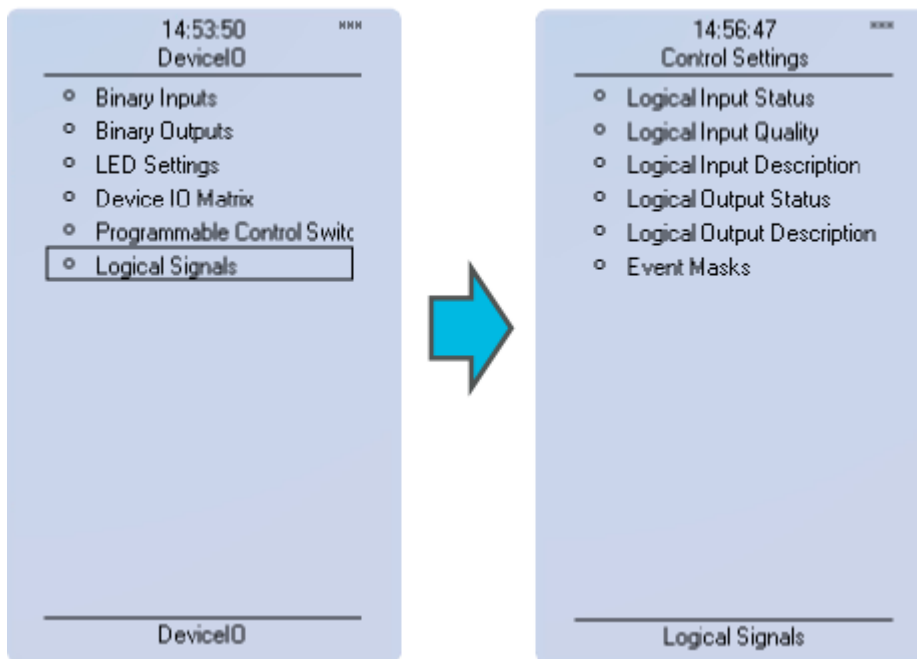
Clearing latched signals is committed at the mimic display by pressing cancel/back key.

Figure 3.33 Programmable Control Switch.



- Programmable control switches (PCS) are switches that can be used to control signals in mimic view. These signals can be used in various situations (controlling logic program, function blocking etc.)
- You can give each switch a name and set access level to determine who can control the switch.

Figure 3.34 IED Logical signals.



- 32 logical input signal status bits. Status is either 0 or 1.
- 32 quality bits of logical input signals (GOOSE). Status is either 0 or 1. 1 stands for bad/invalid quality.
- 32 logical output signal status bits. Status is either 0 or 1.

Logical signals are mainly used for control purposes via IEC-61850 and GOOSE or other protocols with similar purpose. Logical Inputs Quality bit checks the condition of logical input. Logical Outputs can be used when building programmable logic. Activating logic gate won't make event but when logical output is connected to the logic gate it is possible to create an event of the gate activation. Logical inputs and outputs have on and off events those can be masked on (off as default).

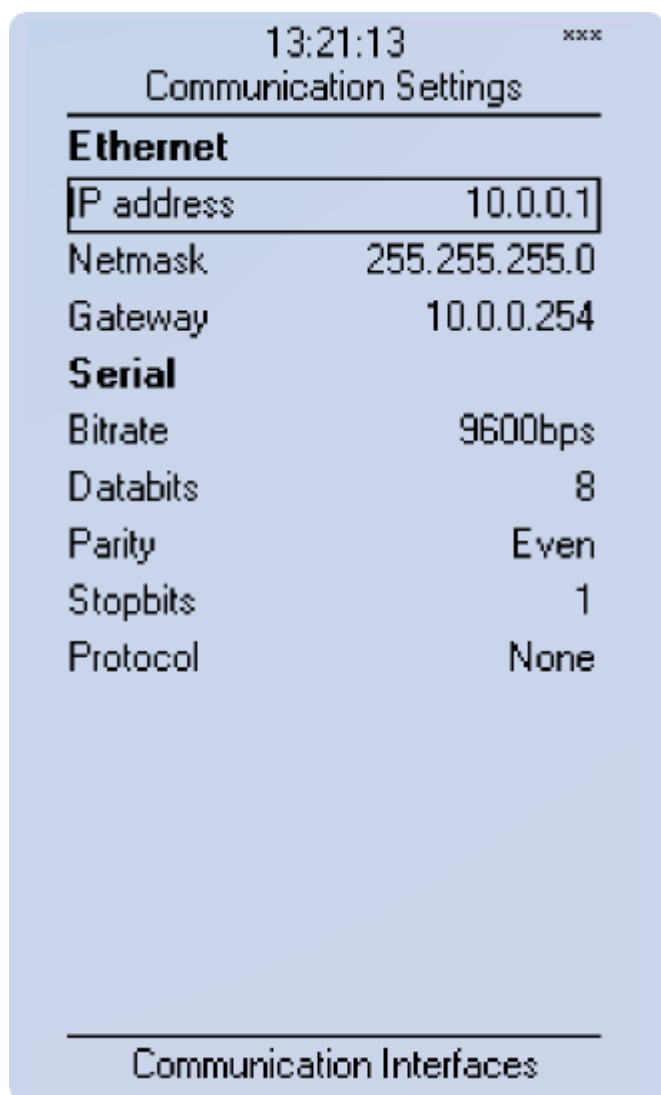
NOTE! System integration chapter gives more details of use of the logical signals.

3.4.5 Communication menu

Communication menu includes *Connections* and *Protocols* sub-menus. IEDs can be configured through rear Ethernet by using the MVR Utility Software. IP address of the IED can be checked from the Connections menu. IEDs support following communication protocols: SNTP, IEC61850, ModbusTCP, ModbusRTU, IEC103, IEC101/104, SPA and ModbusIO as a standard. It is also possible to have additional protocols with special extra communication interface modules.

Connections-menu

Figure 3.35 Connections-menu.



The screenshot shows a menu titled 'Communication Settings' with a timestamp '13:21:13' and 'xxx' in the top right. It is divided into two sections: 'Ethernet' and 'Serial'. The 'Ethernet' section includes fields for 'IP address' (10.0.0.1), 'Netmask' (255.255.255.0), and 'Gateway' (10.0.0.254). The 'Serial' section includes fields for 'Btrate' (9600bps), 'Databits' (8), 'Parity' (Even), 'Stopbits' (1), and 'Protocol' (None). A horizontal line separates the settings from the 'Communication Interfaces' section at the bottom.

Communication Settings	
Ethernet	
IP address	10.0.0.1
Netmask	255.255.255.0
Gateway	10.0.0.254
Serial	
Btrate	9600bps
Databits	8
Parity	Even
Stopbits	1
Protocol	None

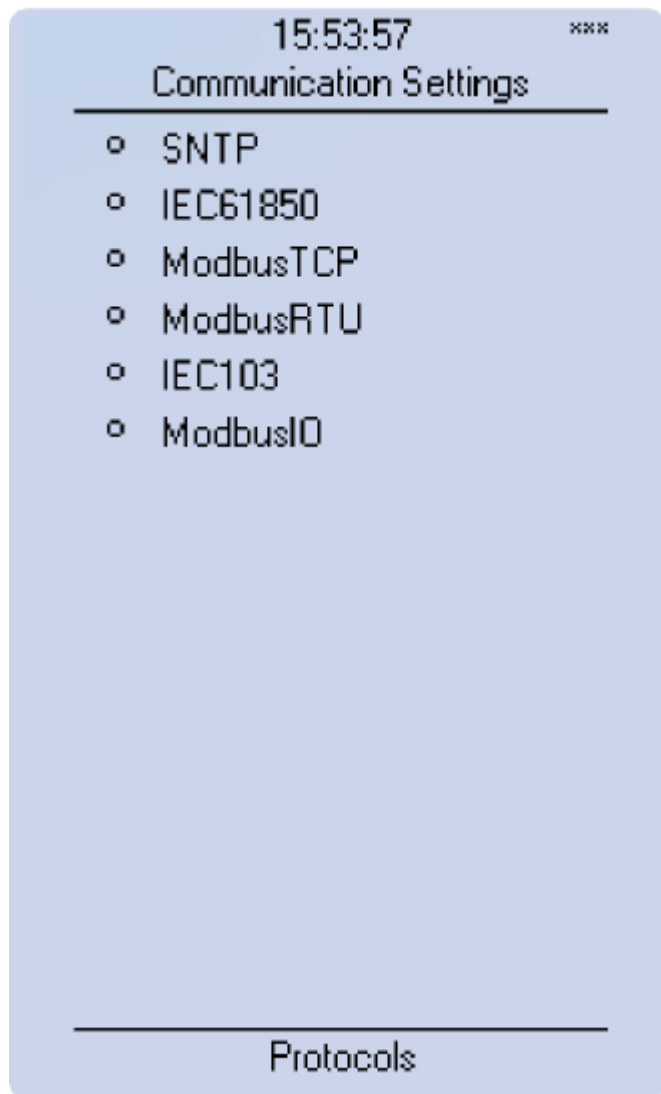
Communication Interfaces

- *IP address* of the IED is user settable. Default IP-address varies from device to another.
- *Network subnet mask* is entered here.
- *Gateway* is configured only when communicating with IEDs in separate subnet.
- *Btrate* of the RS-485 serial communication interface is 9600 bps as standard but can be changed to 19200 or 38400 bps in case the external device supports faster speed.
- *Databits*, parity and stopbits can be set according the connected external devices.
- As default the IED does not have any serial *protocol* activated (None) but IEC103, ModbusIO and Modbus RTU can be used for communication.

Note! When communicating with IED via front Ethernet port the IP address is always 192.168.66.9.

Protocols-menu

Figure 3.36 Protocols-menu.



- *SNTP* protocol is used for time synchronization over Ethernet. It can be used at the same time with *ModbusTCP* and *IEC61850* protocols.
- *ModbusTCP* can be used at the same time with other Ethernet based protocols like *SNTP* and *IEC61850*.
- *ModbusRTU / IEC103 / ModbusIO* configuration menus. *ModbusRTU* like other serial protocols can be used only one at the time over one physical serial communication interface.

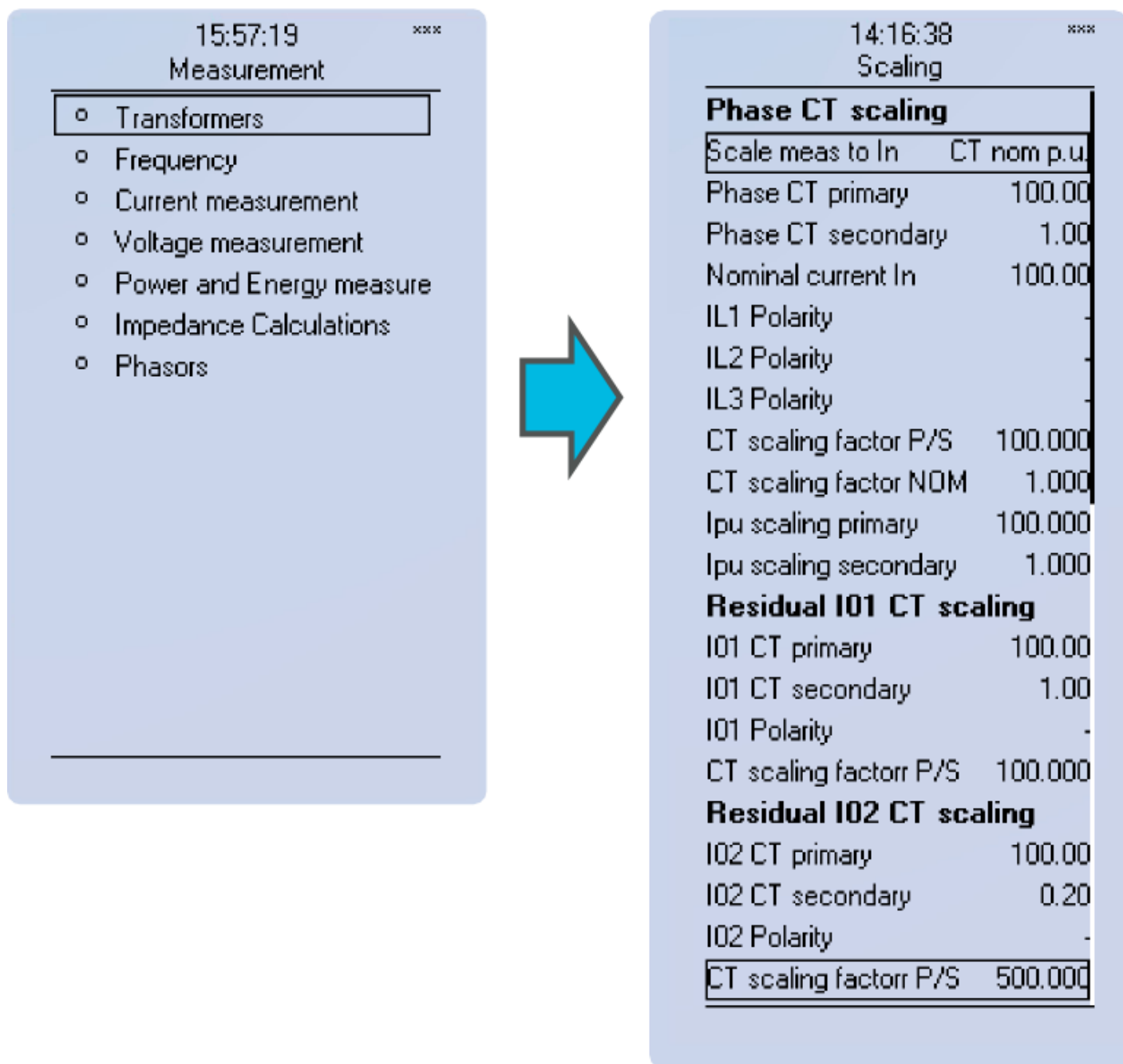
See more detailed information about communications options in chapter System integration.

3.4.6 Measurement menu (for all except V211)

Measurement menu includes sub-menus for Transformers, Frequency, Current Measurement, Voltage measurement and Phasors depending of the IED type. Ratio of used current and voltage transformers is defined in Transformers sub-menu. System nominal frequency is specified in Frequency sub-menu. Other sub-menus menus under Measurement menu are mainly for monitoring purposes.

TRANSFORMERS

Figure 3.37 Current- and voltage transformer ratio is set in Transformers sub-menu

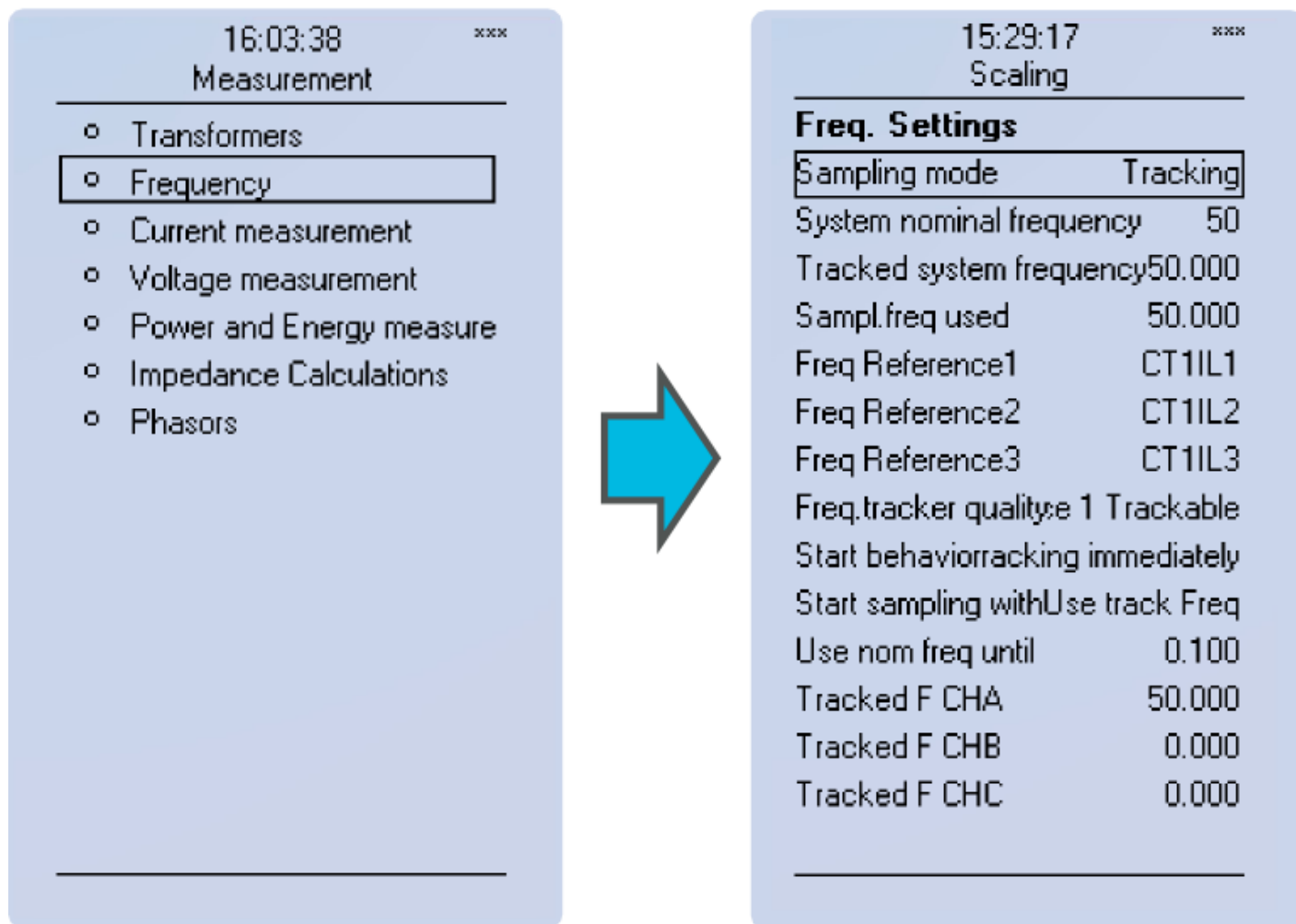


- *Phase CT scaling*, Residual I01- and Residual I02 CT scaling determines the ratio of used transformers.
- According to IED type it is possible to have voltage transformer scaling and other similar in transformers menu.

Among ratio settings the nominal values are determined in Transformers menu as well. Sometimes it is possible that due wiring the polarity has to be changed because of mistake or other similar reason. It is possible to individually invert polarity of each phase current. Transformers menu also displays more information like scaling factors for CTs and per unit values.

FREQUENCY

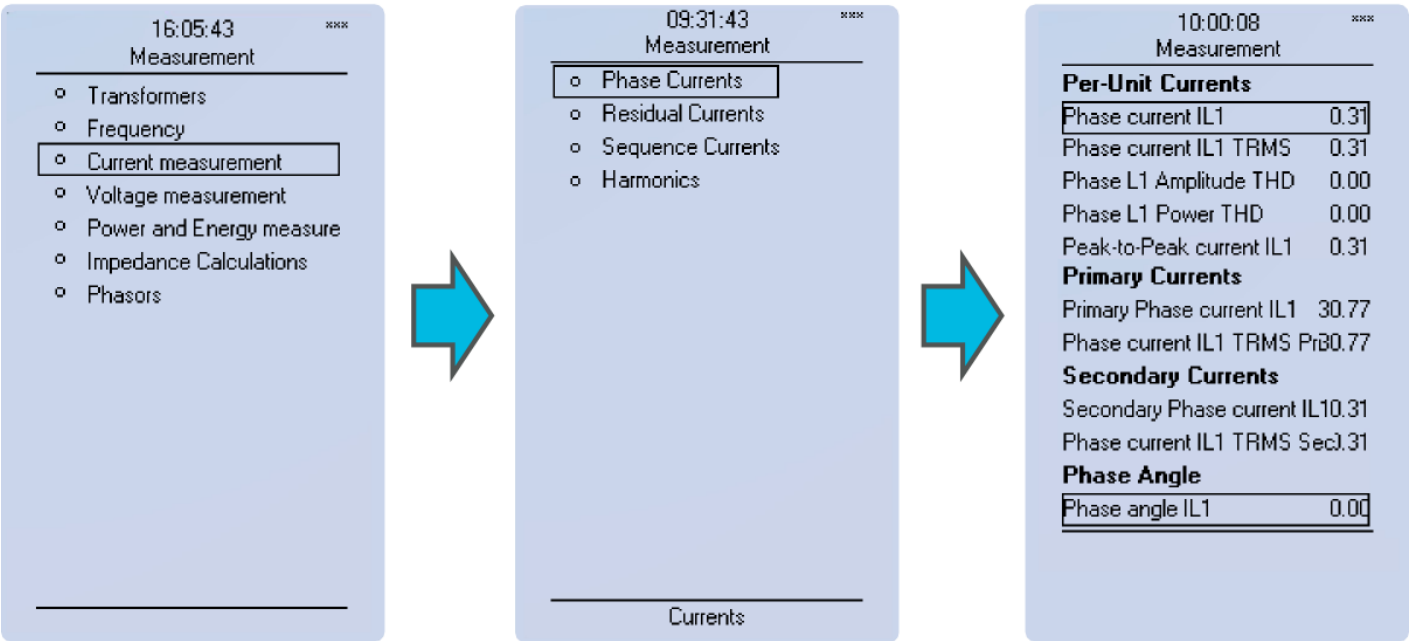
Figure 3.38 Frequency settings menu



- Sampling mode is fixed as standard and System nominal frequency should be set to desired level. In case the Sampling mode is set as tracking the IED will use measured frequency value as system nominal frequency.
- Frequency has three reference measuring points. The order of reference point can be changed.

CURRENT AND VOLTAGE MEASUREMENT

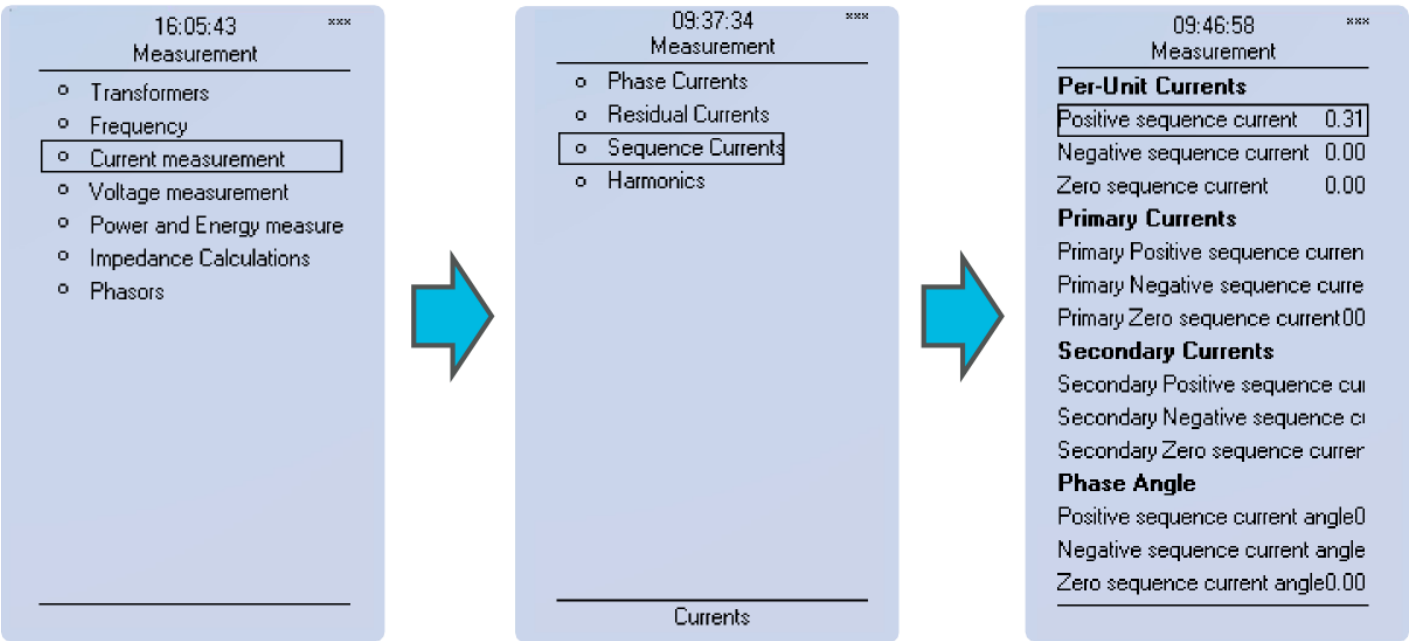
Figure 3.39 Measurement menu



Measurement menu includes sub-menus for different Current- and Voltage measurements. Individual measurements can be found for each phase- or phase- to phase measurement. Sub-menus are divided into four groups which are Per-Unit, Primary, Secondary and Phase Angle.

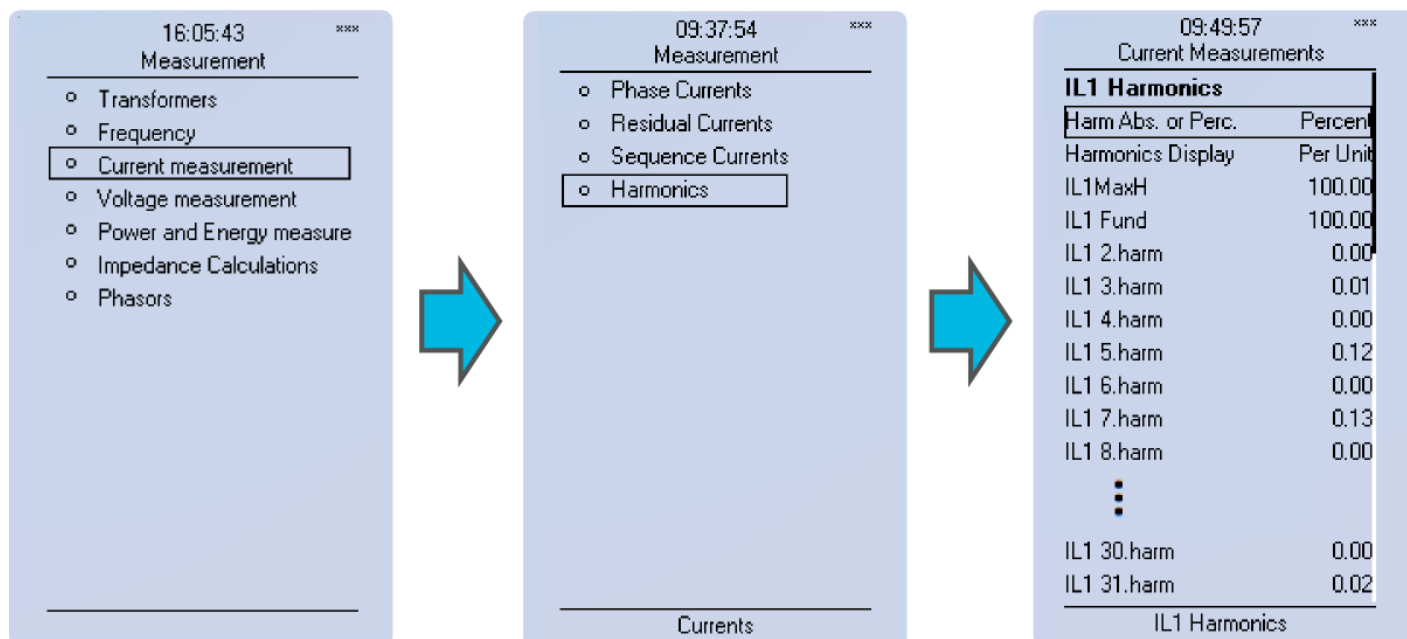
Per-unit group has values for fundamental component, TRMS, amplitude- and power THD and peak- to peak values. Primary group has values for fundamental component and TRMS and same applies with Secondary group. Phase Angle group displays the angle of each measured component.

Figure 3.40 Sequence components



Sequence components including positive, negative and neutral components are calculated for both voltage and current. Sequence sub-menu is divided into four groups which are Per-Unit, Primary, Secondary and Phase Angle. Each group has calculation for positive, negative and neutral sequence components.

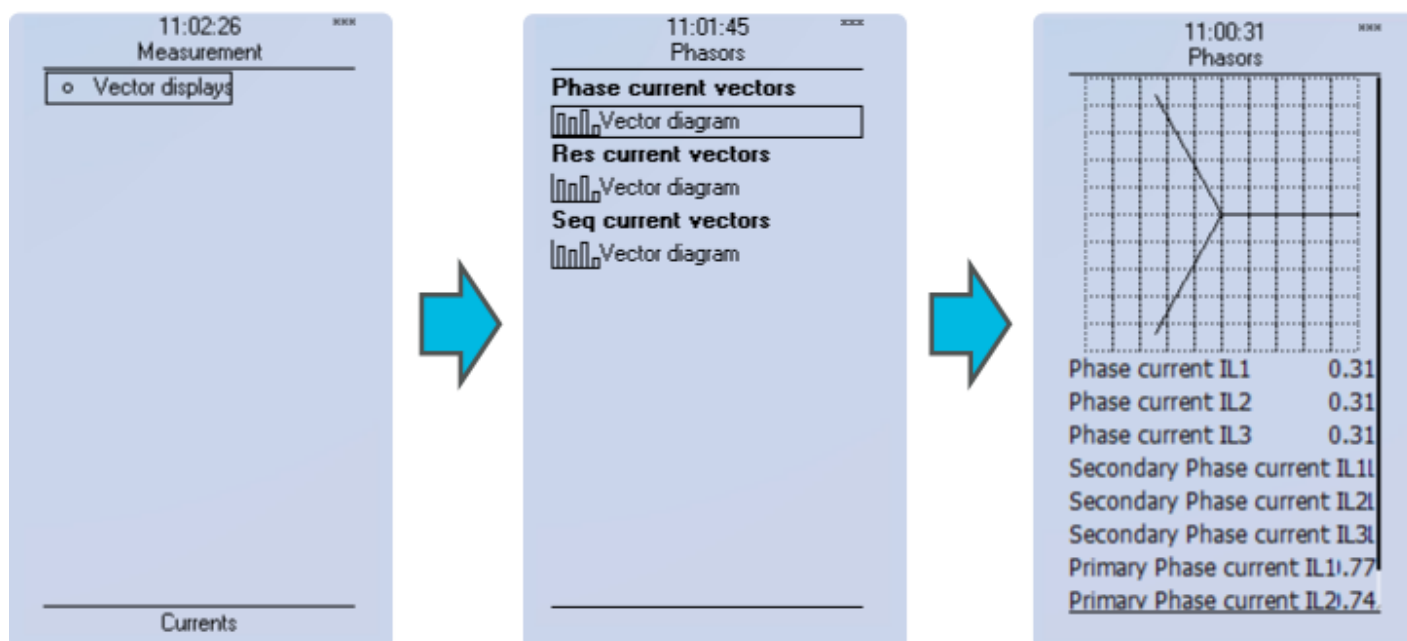
Figure 3.41 Harmonics view



Harmonics menu displays voltage and current harmonics from fundamental component up to 31th harmonic. It is possible to select whether each component is displayed as Absolute- or Percentage and as primary or secondary amps or per unit values.

PHASORS

Figure 3.42 Phasors sub-menu



Measurement → *Phasors* have vector displays for voltage and currents. Also calculated components have own vector displays. Vectors can be seen in own display and additionally per unit values of measured or calculated components along with secondary and primary amplitudes are shown. Phasors are handy when it comes to solving incorrect wiring issues.

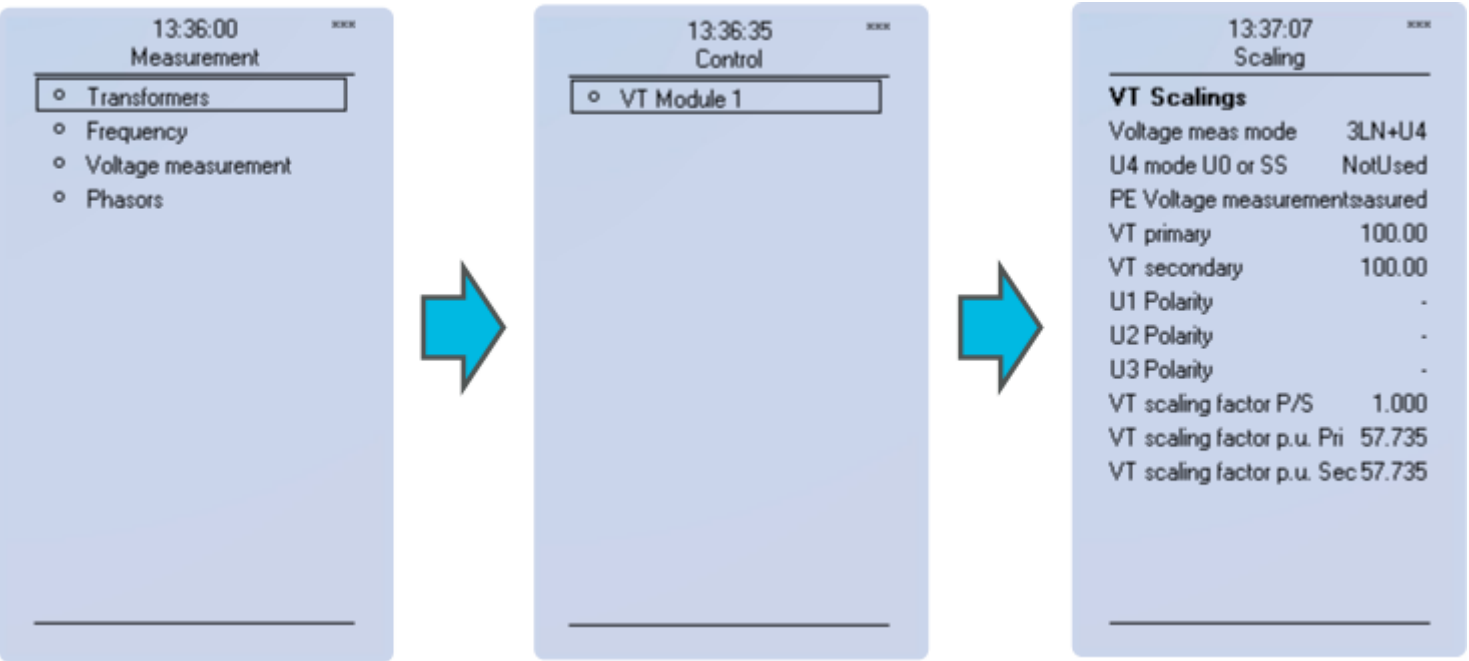
3.4.7 Measurement menu (MVR-V211)

Measurement menu includes sub-menus for Transformers, Frequency, Current Measurement, Voltage measurement and Phasors depending of the IED type. Ratio of used current and voltage transformers is defined in Transformers sub-menu.

System nominal frequency is specified in Frequency sub-menu. Other sub-menus menus under Measurement menu are mainly for monitoring purposes.

TRANSFORMERS

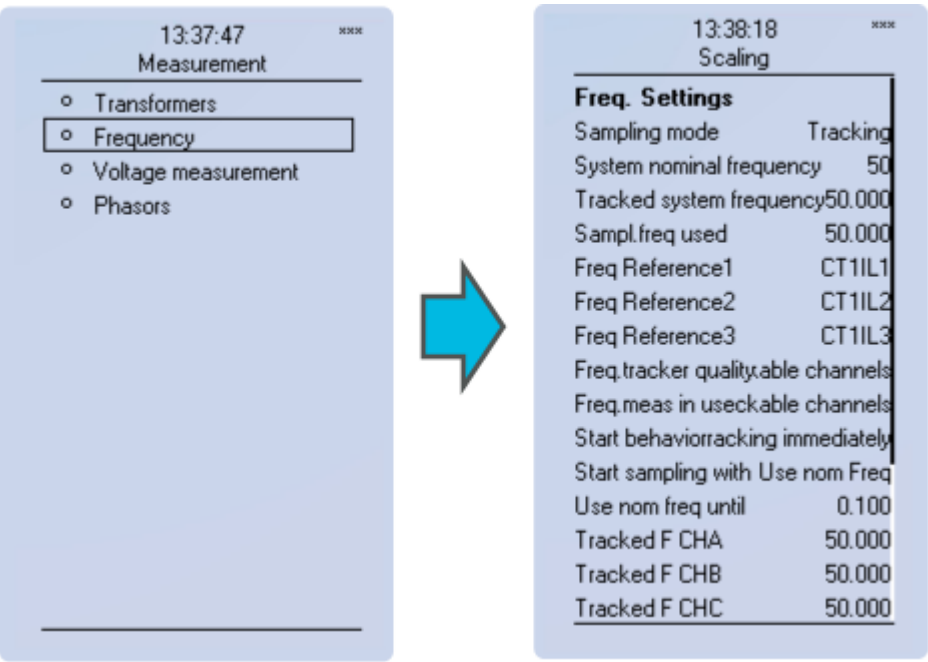
Figure 3.43 Voltage transformer ratio is set in Transformers sub-menu



Among ratio settings the nominal values are determined in Transformers menu as well. Sometimes it is possible that due wiring the polarity has to be changed because of mistake or other similar reason. It is possible to individually invert polarity of each phase voltage. Transformers menu also displays more information like scaling factors for VTs and per unit values.

FREQUENCY

Figure 3.44 Frequency settings menu

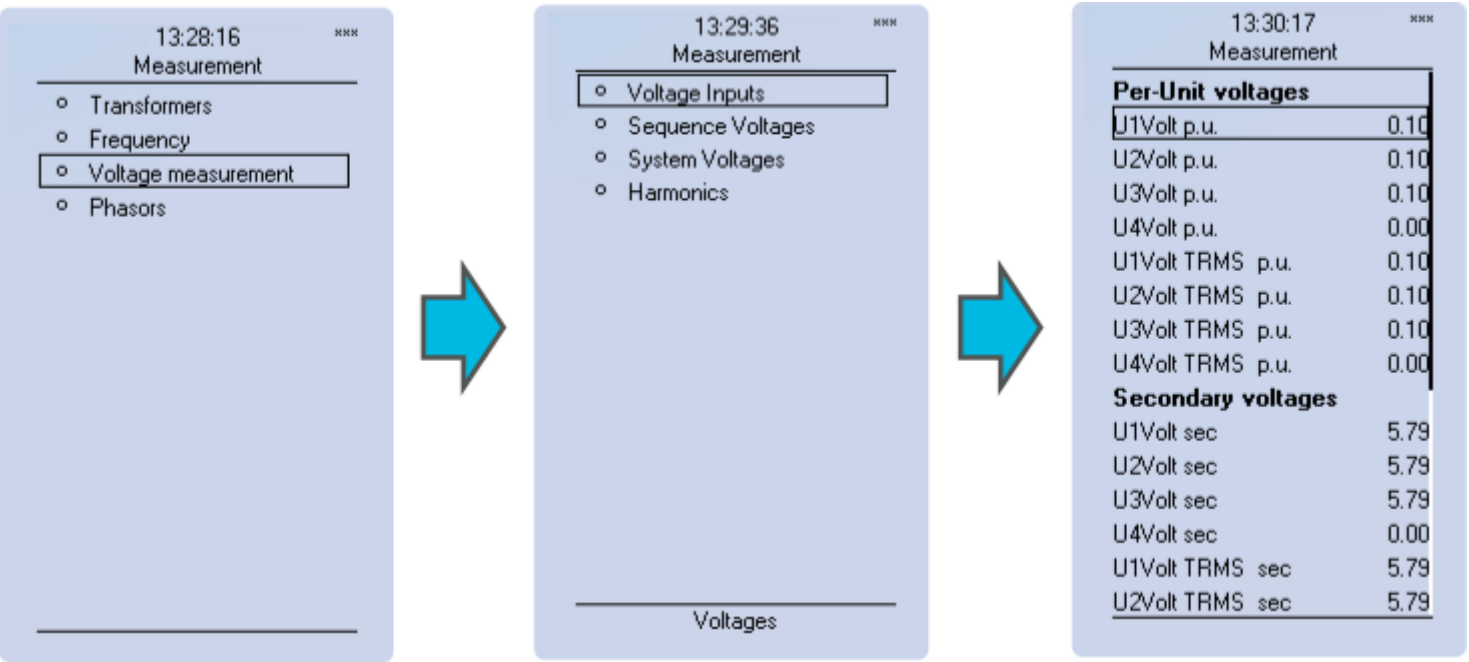


- Sampling mode is fixed as standard and System nominal frequency should be set to desired level. In case the Sampling mode is set as tracking the IED will use measured frequency value as system nominal frequency.

- Frequency has three reference measuring points. The order of reference point can be changed.

VOLTAGE MEASUREMENT

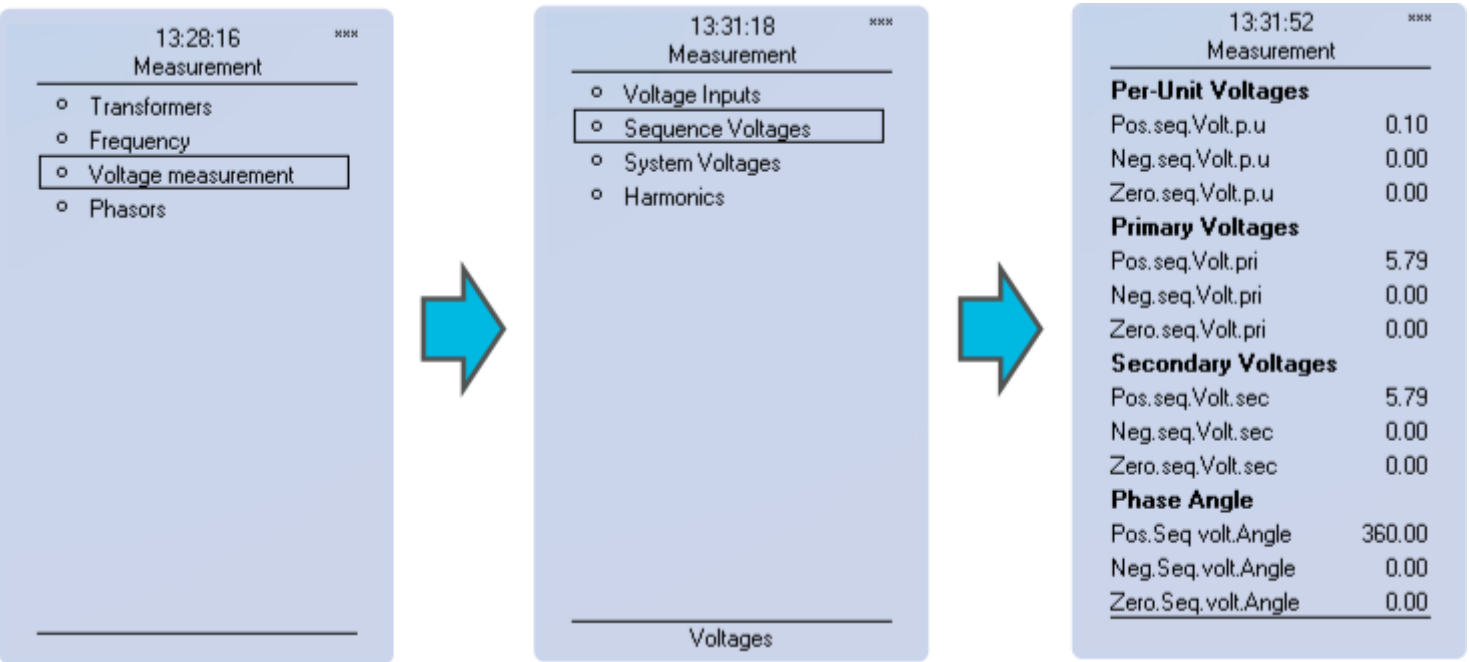
Figure 3.45 Measurement menu



Measurement menu includes sub-menus for different measurements. Individual measurements can be found for each phase- or phase- to phase measurement. Sub-menus are divided into four groups which are Per-Unit, Primary, Secondary and Phase Angle.

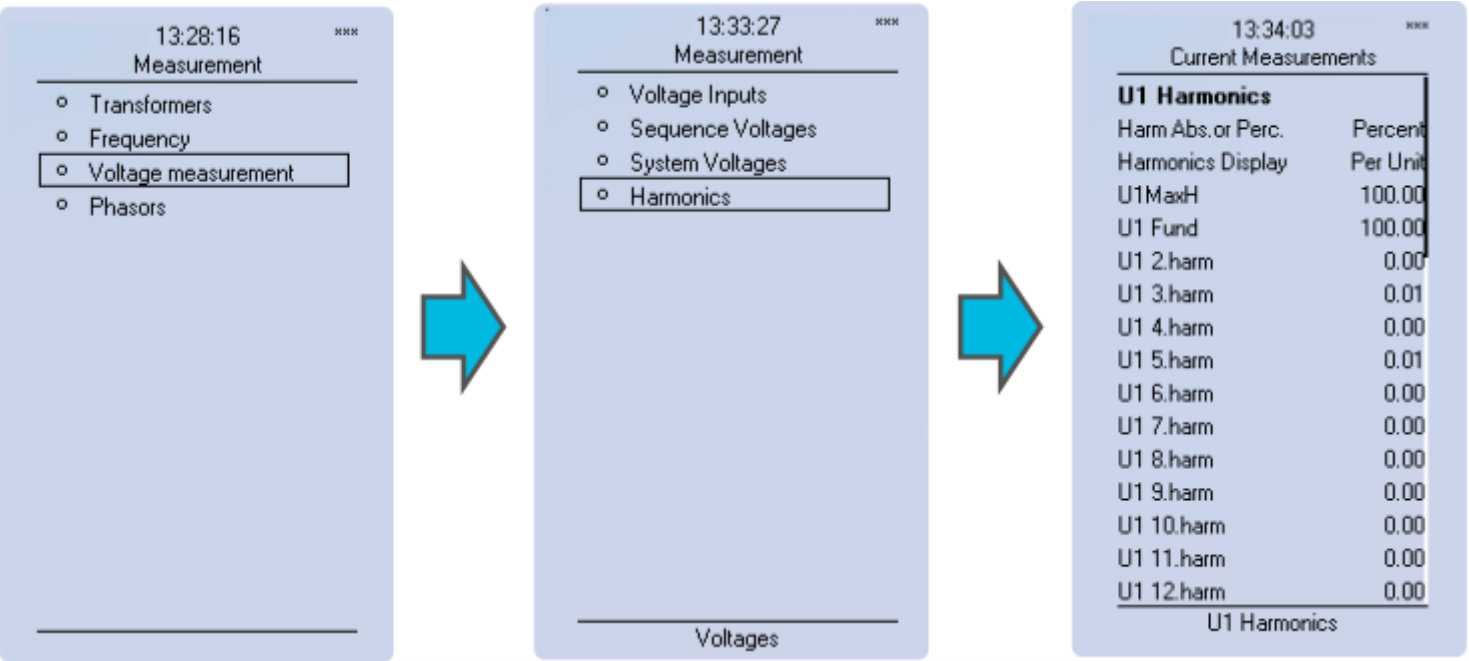
Per-unit group has values for fundamental component, TRMS, amplitude- and power THD and peak- to peak values. Primary group has values for fundamental component and TRMS and same applies with Secondary group. Phase Angle group displays the angle of each measured component.

Figure 3.46 Sequence components



Sequence components including positive, negative and neutral components are calculated. Sequence sub-menu is divided into four groups which are Per-Unit, Primary, Secondary and Phase Angle. Each group has calculation for positive, negative and neutral sequence components.

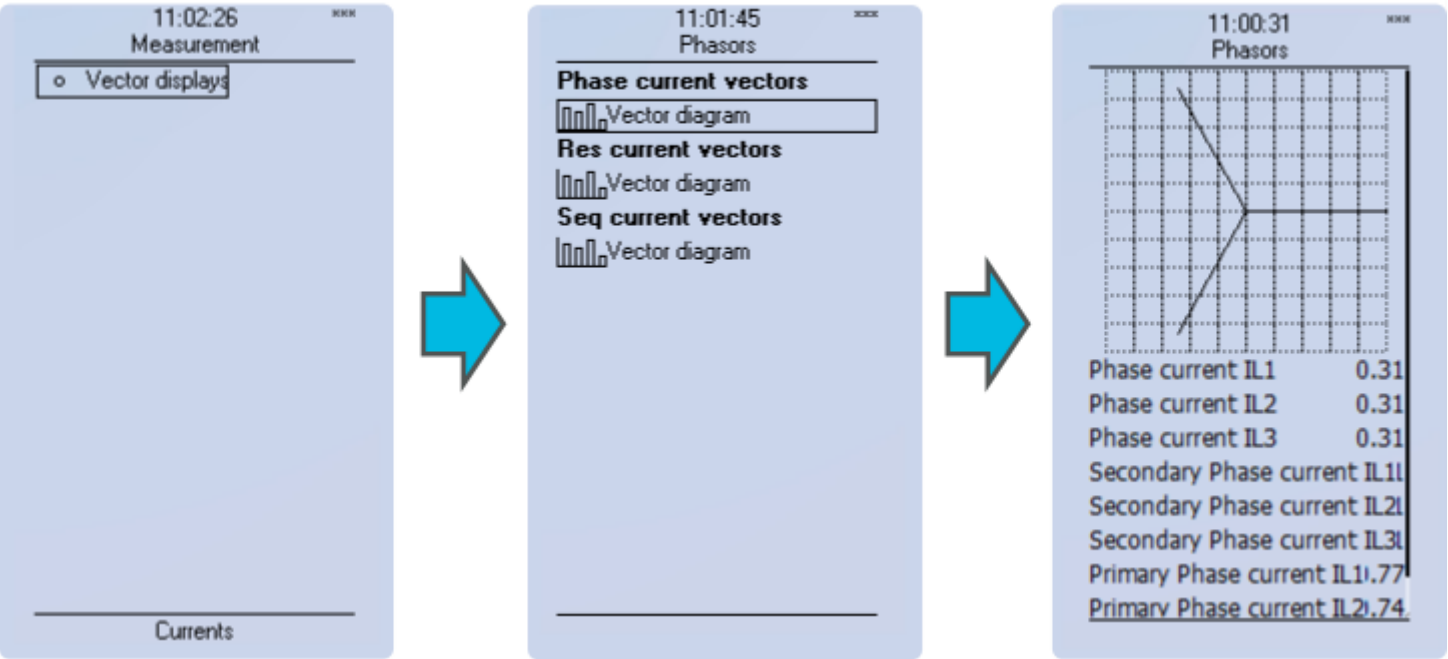
Figure 3.47 Harmonics view



Harmonics menu displays voltage harmonics from fundamental component up to 31th harmonic. It is possible to select whether each component is displayed as Absolute- or Percentage and as primary or secondary amps or per unit values.

PHASORS

Figure 3.48 Phasors sub-menu

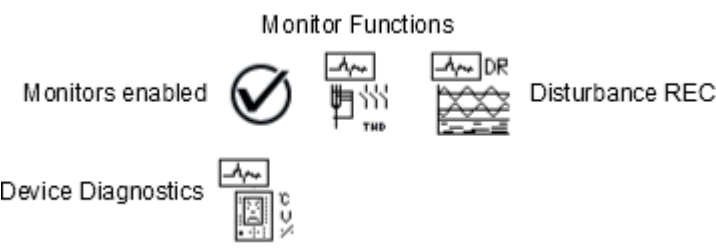


Measurement → Phasors have vector displays for voltages. Also calculated components have own vector displays. Vectors can be seen in own display and additionally per unit values of measured or calculated components along with secondary and primary amplitudes are shown. Phasors are handy when it comes to solving incorrect wiring issues.

3.4.8 Monitoring menu

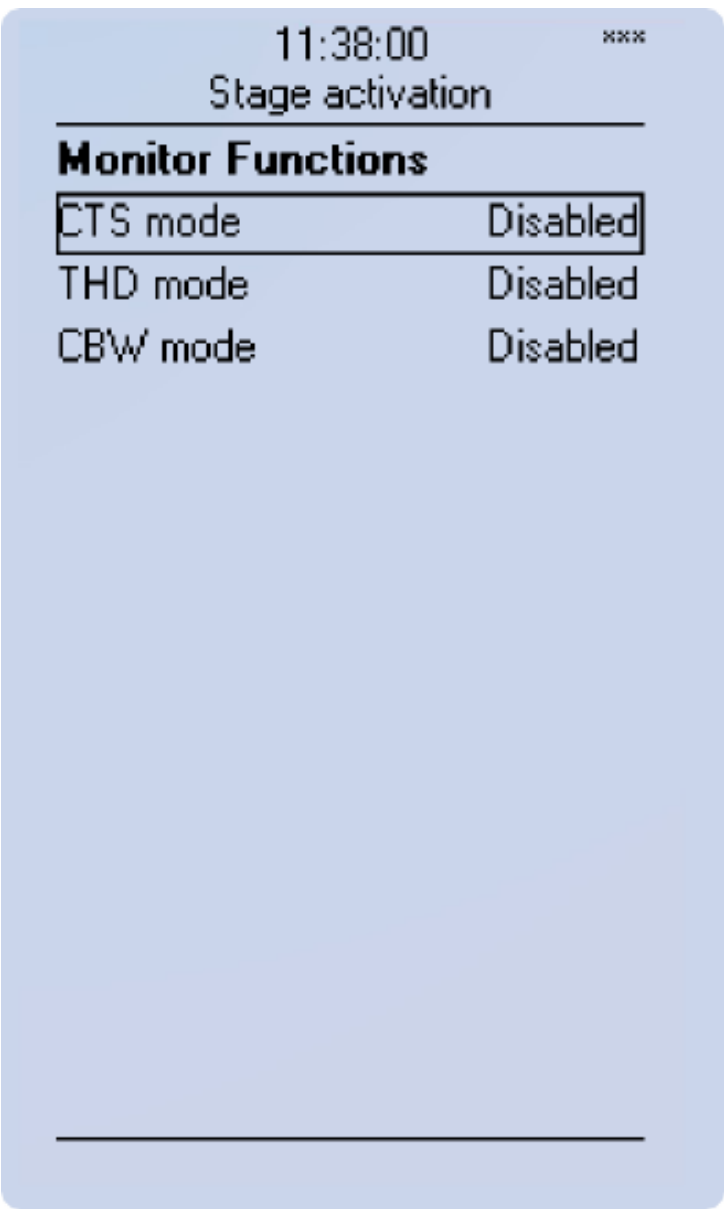
Monitoring menu includes Monitoring Enabled, Monitoring Functions, Disturbance REC and Device Diagnostics sub-menus. Valid Monitor functions vary according IED type.

Figure 3.49 Monitoring menu view. Monitor functions vary according IED type.



MONITORS ENABLED

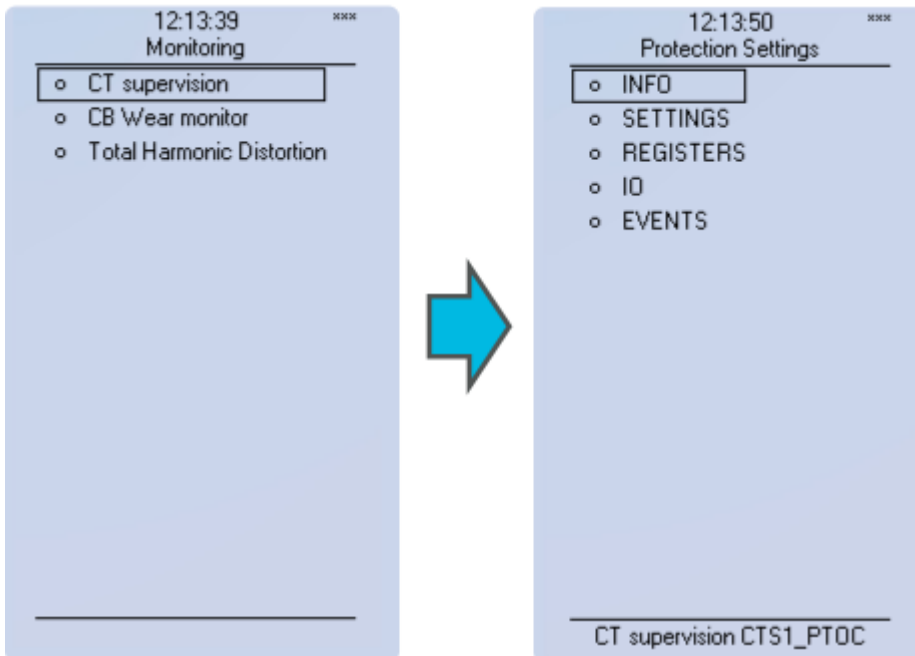
Figure 3.50 IED Monitors Enabled sub- menu.



- Activation of different monitor functions is done in *Monitors Enabled* sub-menu. Each Monitoring function is disabled as standard.
- Activated menus will appear in the *Monitor functions* sub-menu.

MONITOR FUNCTIONS

Figure 3.51 IED function modification.



Configuring monitor functions is very similar to configuring protection stages.

DISTURBANCE REC

Figure 3.52 Setting disturbance recorder.

12:27:51 xxx

Disturbance recorder

Recorder Control

Manual Trigger

Clear all records

Clear newest record

Clear oldest record

Max amount of recordings 0

Max lenght of recording 0.000

Recordings in memory 0

Recorder Trigger Set

Recorder Trigger

Recorder Settings

Recording length 1.000

Recording mode FIFO

Analog channel samples 64s/c

Digital channel samples 5ms

Pre triggering time 20.0

Analog Recording CH1 IL1

Analog Recording CH2 IL2

Analog Recording CH3 IL3

Analog Recording CH4 IO1

Analog Recording CH5 IO2

Analog Recording CH6 none

Analog Recording CH7 none

Analog Recording CH8 none

Analog Recording CH9 none

Auto. get recordings Disabled

Rec.Digital Channels

- Manual Trigger triggers the recording instantly once when used.
- It is possible to clear the latest, oldest or every stored recording at once.
- Maximum length of recording depends of the amount chosen channels and sample rate. Maximum amount of recording depend of amount of channels, sample rate and length of the file.
- Amount of recording in memory can be checked.
- Nothing is triggering the recorder as standard. It is possible to choose binary input, logical input or output, start-, trip- or block signal of stage, object position and many other signals to trigger the recorder.
- Recording length is settable between 0.1...1800 seconds.
- Recording mode is either First in First out or Keep Olds. Sample rate of analogue channels is 8/16/32/62 samples per cycle. Digital channel sample rate is fixed 5 ms. Pre triggering time is selectable between 5...95%.

IED is capable to record nine analogue channels. Every measured current or voltage signal can be selected to be recorded.

Auto. Get recordings uploads recordings automatically to FTP folder. Due this any FTP client can read recordings from the IED memory.

Digital channels include primary and secondary amplitudes and currents, calculated signals, TRMS values, sequence components, inputs and outputs and much more.

DEVICE DIAGNOSTICS

Figure 3.53 Device diagnostics menu

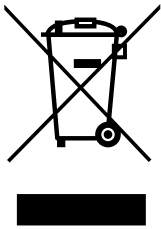
13:12:08	
Device Diagnostics	
Device Diagnostics	
Diagnostic alarm status	-
Clear diagnostic alarm	-
Internal temperature	0.0
Internal voltage 24V	0.0
System full reset	-
Protections reset	-
Reset is pending	0.0
Protection system work load	2.0
Baseboard card revision	0
Baseboard card serial number	0
CPU serial number	0
Slot A card type	none
Slot A card revision	0
Slot A card serial number	0
Slot B card type	none
Slot B card revision	0
Slot B card serial number	0
Slot C card type	none
Slot C card revision	0
Slot C card serial number	0
Slot D card type	none
Slot D card revision	0
Slot D card serial number	0
Slot E card type	none
Slot E card revision	0
Slot E card serial number	0
Slot F card type	none
Slot F card revision	0
Slot F card serial number	0
Internal Relay Fault status	-
Clear Fault status	-
Option card health status	0

- Device Diagnostics gives detailed feedback of the IED condition generally and whether option cards are installed correctly without problems.
- In case anything abnormal is noticed in Device diagnostics menu and it cannot be reset please contact closest representative or manufacturer.

3.5 End-of-life

3.5.1 Disposal of waste electrical and electronic equipment

WEEE symbol



All products that are marked with the crossed-out wheeled bin (the WEEE symbol) are electrical and electronic equipment (EEE). EEE contains materials, components and substances that can be dangerous and harmful to people's health and to the environment. Waste electrical and electronic equipment (WEEE) must therefore be disposed of properly. In Europe, the disposal of WEEE is governed by the WEEE directive issued by the European Parliament. DEIF complies with this directive.

You must not dispose of WEEE as unsorted municipal waste. Instead, WEEE must be collected separately, to minimise the load on the environment, and to improve the opportunities to recycle, reuse and/or recover the WEEE. In Europe, local governments are responsible for facilities to receive WEEE. If you need more information on how to dispose of DEIF WEEE, please contact DEIF.