

Protection Relay REX 521

Operator's Manual



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1. About this manual

1.1. This manual

The purpose of this manual is to provide the user with basic information on the protection relay REX 521 Revision G, and to especially focus on explaining the use of the human-machine interface (HMI).

For information about the new features of the relay, refer to REX 521 Technical Reference Manual, General (see “Related documents” on page 7).

1.2. Use of symbols

This publication includes the following icons that point out safety-related conditions or other important information:



The electrical warning icon indicates the presence of a hazard which could result in electrical shock.



The caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.



The information icon alerts the reader to relevant facts and conditions.

Although warning hazards are related to personal injury, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

1.3. Related documents

Manuals for REX 521

- Technical Reference Manual, General 1MRS751108-MUM
- Technical Reference Manual, Standard Configurations 1MRS751802-MUM
- Installation Manual 1MRS750526-MUM
- Technical Descriptions of Functions (CD-ROM) 1MRS750889-MCD
- Modbus Remote Communication Protocol for REX 521, Technical Description 1MRS755017
- DNP 3.0 Remote Communication Protocol for REF 54_, RET 54_ and REX 521, Technical Description 1MRS755260

Parameter and event lists for REX 521

- Parameter List for REX 521 1MRS751999-RTI
- Event List for REX 521 1MRS752000-RTI
- General Parameters for REX 521 1MRS752156-RTI
- Interoperability List for REX 521 1MRS752157-RTI

Tool-specific manuals

- CAP505 Installation and Commissioning Manual 1MRS751901-MEN
- CAP505 User's Guide 1MRS752292-MEN
- CAP505 Protocol Mapping Tool Operator's Manual 1MRS755277
- Tools for Relays and Terminals, User's Guide 1MRS752008-MUM
- CAP 501 Installation and Commissioning Manual 1MRS751899-MEN
- CAP 501 User's Guide 1MRS751900-MUM

1.4.

Document revisions

Version	Date	History
D	25.03.2004	Document layout changed
E	04.06.2004	Pictures updated in tables, chapter 4.3.1. Changes in tables, chapters 4.5.1. and 4.5.4. Warning text added, chapter 5.1.
F	17.2.2006	Relay face plate updated CB close delay added Language change shortcut added

2. Safety information



Dangerous voltages can occur on the connectors, even though the auxiliary voltage has been disconnected.

Non-observance can result in death, personal injury or substantial property damage.

Only a competent electrician is allowed to carry out the electrical installation.

National and local electrical safety regulations must always be followed.

The frame of the device has to be carefully earthed.



The device contains components which are sensitive to electrostatic discharge. Unnecessary touching of electronic components must therefore be avoided.

Breaking the sealing tape on the rear panel of the device will result in loss of warranty and proper operation will no longer be guaranteed.

3. Introduction

3.1. REX 521 protection relay

The protection relay REX 521 is designed for protection, control, measuring and supervision in medium voltage networks. Typical applications include incoming and outgoing feeders as well as substation protection. The protection relay is provided with energizing inputs for conventional current and voltage transformers. Also a hardware version with inputs for current and voltage sensors is available.

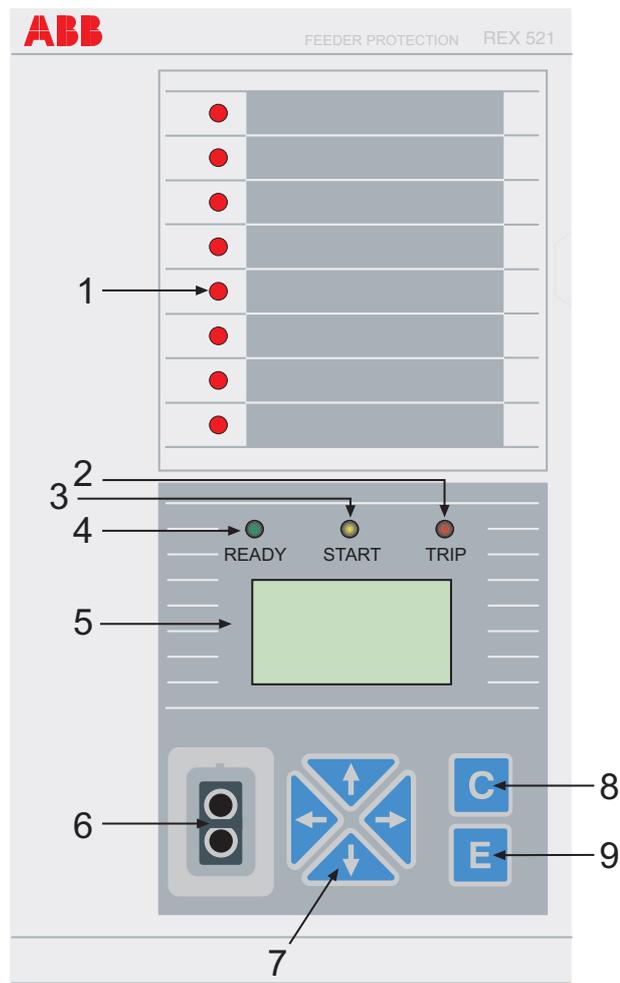
The protection relay is based on a multiprocessor environment. The HMI including an LCD (liquid crystal display) with different views makes the local use easy and informs the user via indication messages. Modern technology is applied both in hardware and software solutions.

The REX 521 is part of the substation automation concept for distribution automation and extends the functionality and flexibility of the concept.

4. Instructions

4.1. HMI features

- Push-buttons for navigating, [C] Clear/Cancel and [E] Enter
- Language selection
- Setting values are protected by passwords
- Display backlight
- Adjustable display contrast
- Display test
- Selection of primary values
- Optically isolated serial communication port
- Three LED indicators
- Eight programmable alarm LEDs



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Fig. 4.1.-1 HMI front view

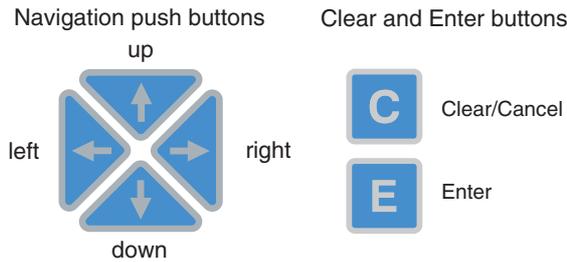
1. Alarm LEDs
2. LED indicator: Trip, CBFP
3. LED indicator: Start, Block
4. LED indicator: Ready, IRF, Test mode
5. LCD
6. Optical PC connector
7. Navigation buttons
8. Clear/Cancel
9. Enter

4.2. Push-button functions

The HMI includes push-buttons for operating the protection relay.

A quick touch on the arrow button up [↑] or down [↓] is interpreted as one step upwards or downwards in a menu or as the minimum step up or down in setting mode of a parameter.

- The cursor stops at the first and last rows in a menu; pressing the [↑] button at the first row or [↓] button in the last row is ignored.
- If the [↑] or [↓] button is kept pressed, the menus are automatically scrolled faster than with single button pressings.



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Fig. 4.2.-1 Push-buttons

The table below gives a short explanation of the push-buttons and their functions.

Table 4.2.-1 Push-button functions

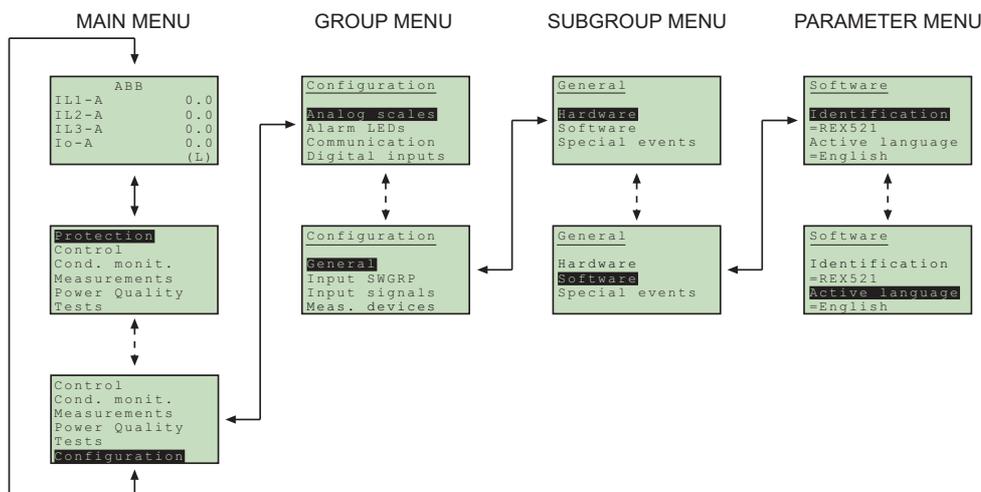
Up/Down		These buttons are used for: <ul style="list-style-type: none"> • moving up and down in menus • scrolling active digits of a parameter when entering a new setting value
Left /Right		These buttons are used for: <ul style="list-style-type: none"> • moving left and right in menus • changing the active digit of a parameter when entering a new setting value
Clear/Cancel		This button is used for: <ul style="list-style-type: none"> • leaving the setting mode without saving the values • returning to the main view from submenus • clearing indication messages • clearing events when the event view is selected (press 2 s) • clearing alarm LEDs when the main view is selected (press 2 s) • resetting latched output relays (press 5 s)
Enter		This button is used: <ul style="list-style-type: none"> • for entering the setting mode of a parameter • for confirming a new value of a setting parameter • in combination with the [↑] or [↓] button for adjusting the display contrast

Table 4.2.-1 Push-button functions (Continued)

Clear/Cancel & Enter		The buttons are pressed simultaneously for 5 s for: <ul style="list-style-type: none"> • resetting latched output relays, events and all the registered values of those function blocks that are in use • clearing the disturbance recorder data
Left & Enter		The buttons are pressed simultaneously for 5 s for: <ul style="list-style-type: none"> • changing the HMI language from English to the additional language or vice versa.

4.2.1.

Selecting language



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Fig. 4.2.1.-1 Selecting language

1. Select Configuration in the main menu with the [↓] and [→] buttons , General in the group menu, Software in the subgroup menu and Active language in the parameter menu.
2. Press the [E] button until the second row of the display starts flashing. Then select the desired language with the [↓] and [↑] buttons.
3. Confirm the selection by pressing the [E] button once more or cancel the selection by pressing the [C] button.

After altering the language, the display menus are shown in the new language and the selection is restored after a disconnection of the power supply.

4.2.1.1.

Changing language by using button combination

Simultaneously press and hold the [←] and [E] buttons for 5 seconds in order to change language from English to the additional language or vice versa. This button combination can be used anywhere in the HMI menu structure. The selected language is restored after a relay reset or a disconnection of the power supply.

4.2.2. Selecting function block naming

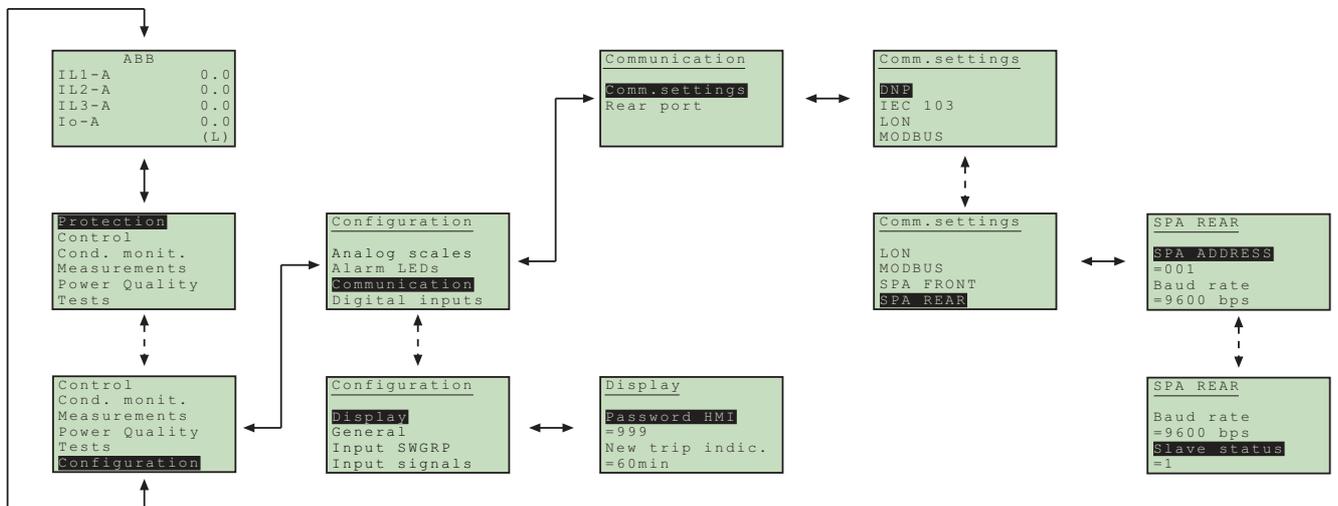
The user can select the function block naming convention. Two alternatives are available: ANSI and IEC. ANSI follows the ANSI standard and IEC follows the IEC standard function block naming.

Navigate to Configuration\Display\FB naming conv. and select ANSI or IEC. The change will be effective immediately.



When Chinese is selected, some of the IEC FB names are translated into Chinese.

4.2.3. Passwords



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Fig. 4.2.3.-1 Password menus

Setting values are protected by passwords. There are two different passwords, one for protecting the HMI setting values and another for protecting settings through serial communication.

- The default value of the serial communication password is 001 and of the HMI password 999.
- The HMI password is not active until it has been changed from the default value. After changing it, the relay prompts for password whenever the [E] button is pressed in the setting value menu. Once the right password has been given, it stays active until the display is returned to idle state by time-out. To disable the HMI password, change it back to the default value 999.
- In case a password is forgotten, the HMI password can be viewed and changed via serial communication.

4.2.4. Display backlight

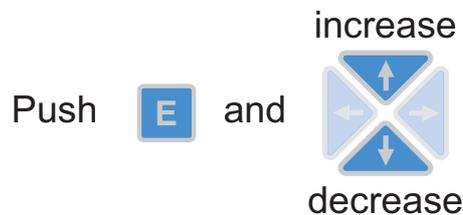
The backlight of the display is normally off. When a button on the HMI is pressed, the backlight turns on automatically and the panel is ready for further operations.

- At power up, the backlight is also turned on during the display test.
- After a time-out period (5 min), the backlight is automatically switched off if there has not been any activity on the panel.
- When changing between Local/Remote mode by a digital input, the backlight is turned on for 10 seconds.

4.2.5. Display contrast

The display contrast is temperature compensated, which means that the contrast automatically adjusts itself with temperature to preserve readability.

- To obtain optimal readability, the contrast of the display can be adjusted. Simultaneously pressing the [E] button and [↑] or [↓] button increases or decreases the contrast.



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Fig. 4.2.5.-1 Adjusting display contrast

- The display contrast may be adjusted anywhere in the menu structure except in the setting menus where the [E] button is used for entering the setting mode.
- The selected contrast value is stored in a non-volatile memory and thus, after an auxiliary power failure, the contrast is restored automatically.

4.2.6. Display test

Upon auxiliary voltage connection, the backlight is turned on and a short display test is run. This display test includes all the LEDs and the LCD. The LEDs are tested by turning them on simultaneously while the LCD shows two patterns so that all the pixels are activated. After the test, the display returns to normal state.

- The display test can also be started manually by navigating to `Configuration\Display\Test display` and then selecting `Test display` (refer to section “Menu chart” on page 20).

4.2.7. Selecting primary values

The setting values, input data and recorded values that are relative to some quantity can be obtained directly in amperes and volts. For the relay to know how to convert between primary and per unit values, the setting values describing the measurement devices (CT, VT, VD, RS) need to be properly set.

1. Navigate to Configuration\Display\Primary values and select Primary values instead of the default Per unit values.
2. Navigate to Configuration\Meas. devices and enter the data for all the CTs and VTs, VDs and RSs that are in use in that particular hardware. For information about setting the rated values for the protected unit and about the technical data of the measuring devices, refer to Technical Reference Manual, General (see “Related documents” on page 7).

4.2.8. Optically isolated serial communication port

The front panel of the protection relay is provided with an optical serial communication connector. The connector is used for programming the relay with a PC via a RS-232 cable, type 1MKC950001-2.

4.3. Menu chart

The contents of the menu chart depend on the configuration of the relay. However, the main menu structure is always preserved.

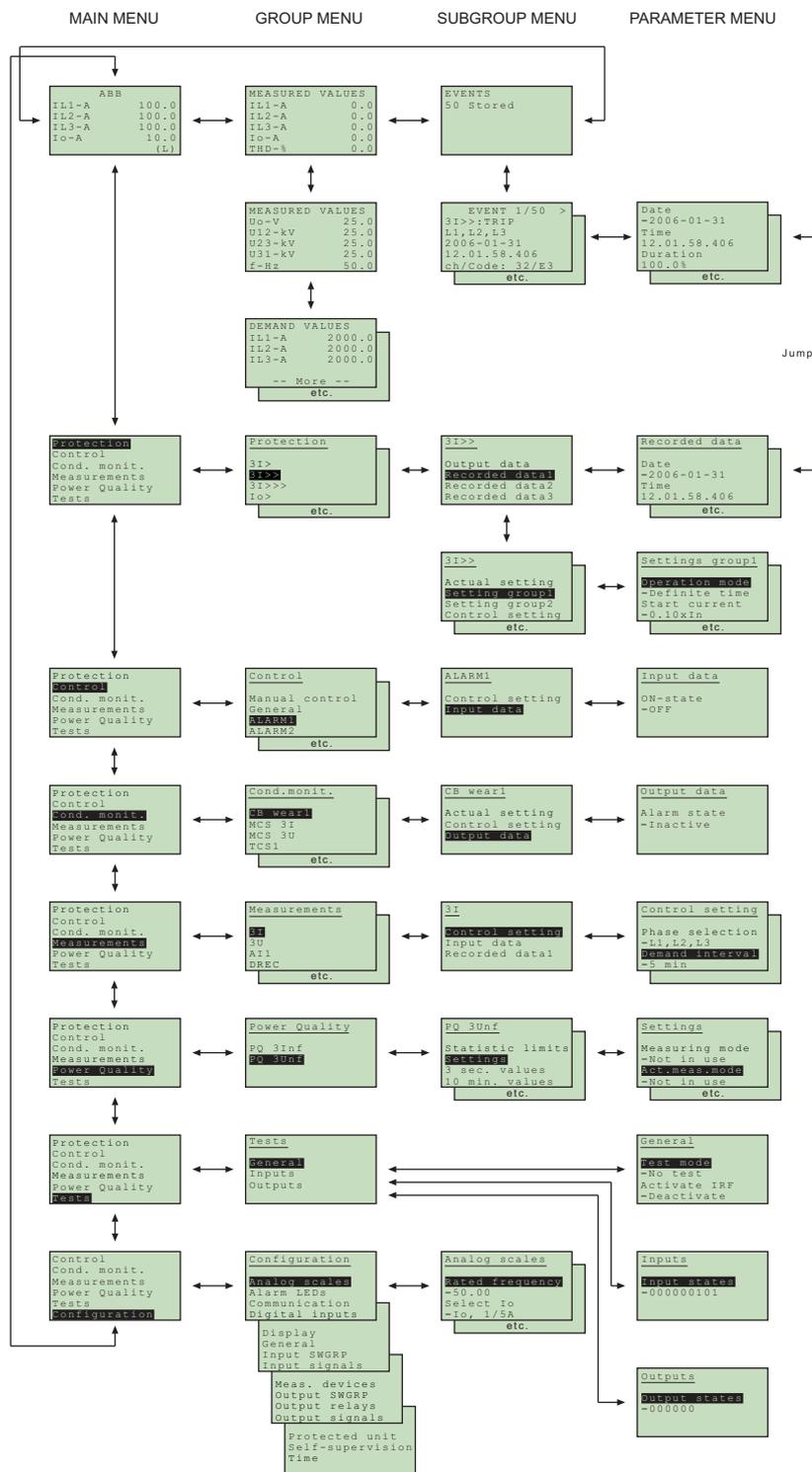


Fig. 4.3.-1 Example of a menu chart structure

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4.3.1. Measurement menu

The contents of the measurement menu depend on the relay configuration.

If a measurement view is selected, it remains active after the time-out period. The same is true with the manual control view. From other views, the display reverts to idle mode at the same time as the backlight is switched off.

- If energy measurements are present, accumulated values can be reset by pressing the [C] button for 2 s.

Table 4.3.1-1 Measurement view

Function block	Measurand	View
3I Io	IL1 (A) IL2 (A) IL3 (A) Io (A)	<pre> MEASURED VALUES IL1-A 25.0 IL2-A 25.0 IL3-A 25.0 Io-A 5.0 THD-% 0.0 DEMAND VALUES IL1-A 25.0 IL2-A 25.0 IL3-A 25.0 -- More -- </pre>
Uo 3U 3U_B f	Uo (V) U1 (kV) U2 (kV) U3 (kV) U12 (kV) U23 (kV) U31 (kV) U12s (kV) U23s (kV) U31s (kV) f (Hz)	<pre> MEASURED VALUES Uo-V 0 U12-kV 0.50 U23-kV 0.50 U31-kV 0.50 f-Hz 50.00 MEASURED VALUES Uo-V 0 U1-kV 0.50 U2-kV 0.50 U3-kV 0.50 f-Hz 50.00 MEASURED VALUES U3-kV 0 U12s-kV 0.50 U23s-kV 0.50 U31s-kV 0.50 f-Hz 50.00 </pre>

Table 4.3.1-1 Measurement view (Continued)

Function block	Measurand	View
PQE	P (kW) Q (kVAr) E (kWh, kvarh)	<pre> POWER P-kW +0 Q-kvar +0 PF cosφ +0.00 P demand +0 Q demand +0 ENERGY kWh 0 kvarh 0 REVERSE ENERGY kWh 0 kvarh 0 </pre>
The following measurements are shown in configurations H07 and H51 only.		
TOL3Dev	s %	<pre> Time to restart s 0 Thermal level % 40 </pre>

"Thermal level" = The calculated thermal level of the device. Maximums from the stator and the rotor.

4.3.2.

Event menu

The event menu (Main menu\Measured values\Events) contains the function block name and the event in the same manner as the indication messages (See "Indication messages" on page 27.). The first view of the event menu shows the amount of events (maximum 50). The most recent event is stored on top of the list.

When a certain event is selected, date and time of the event in question can be read by moving one step right with the [→] button. If the event in question is a trip event and its data in the recorded data menu (Main menu\Protection\...\Recorded data1\...3\) has not been overwritten, it is possible to move directly to the associated recorded data by moving right [→] again in the date and time view. This possibility is indicated with a ">" (greater-than sign) on the first row of the event.¹ Return to the event view with the [C] button or with the [←] button, like in normal menu navigation. When viewing recorded data, the return is directed to the event summary view (Main menu\Measured values\Events) if

- the recorded data is overwritten, or
- the original event is overwritten in the event list, or
- the event list is cleared.

These events are stored in the non-volatile memory, which means that they can also be seen after a disconnection of the power supply. When displayed, the event list can be cleared by pressing the [C] button for 2 seconds.

1. Not valid when Chinese is selected

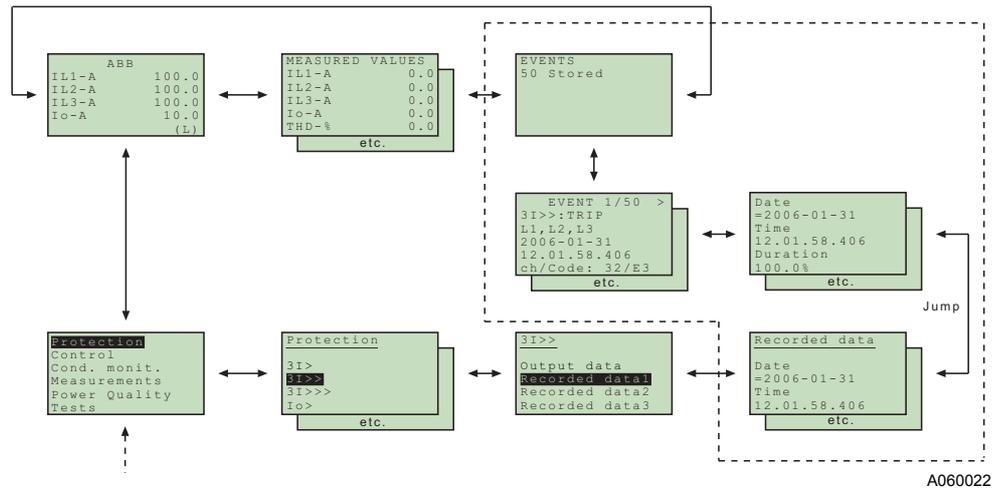


Fig. 4.3.2.-1 Event view

4.3.3. Manual control

4.3.3.1. Local/Remote position selection

The control position can be changed in Control\Manual control\Local/Remote.

- The control mode can be selected by pressing the [E] button and using the [↑] and [↓] buttons.
- The [E] button confirms the selected mode and the [C] button cancels the selection and keeps the current mode.

For password handling, refer to section “Passwords” on page 17.

Table 4.3.3.1-1 Control positions

Control position	Description
Control off	Local and remote operations are inhibited. The current state of the object is shown in the control menu.
Local	Object can be controlled from the HMI and the digital inputs. Remote control is inhibited.
Remote	Object can be controlled via remote communication. Control from the HMI and digital inputs is inhibited and the object state is shown in the control menu.
External input	The digital input programmed for selector Local/Remote is used for selecting between the local and remote modes. When selected the mode will be displayed as Local (ext.) or Remote (ext.) depending on the digital input state.

The selected control position remains the same during auxiliary power-off.

When the local mode is selected, the character “L” is shown in the bottom-right corner of the HMI main view. However, if the language in the relay is other than English, the character that is shown in the display depends on the selected language.

4.3.3.2.**Controlling breaker**

The object control menu is in `Control\Manual control\Control CB`. Only the current position of the breaker is shown and no control is possible in remote or control off mode. In local mode the state of the breaker is shown and the possible target states can be scrolled with `[→]` and `[←]` buttons. Possible target states are open and closed. When the desired target state is selected the object can be selected by using the `[E]` button.

The message `=Preparing...` can be briefly shown before the text `=Are you sure?` is displayed. The operation can then be confirmed with the `[E]` button and cancelled with the `[C]` button. If the operation is cancelled the text `=Aborted` is displayed for three seconds and then the current state of the breaker is shown. The same happens if the `=Are you sure?` has been displayed for 30 seconds.

Notice that an adjustable timeout in `Control\General>Select timeout` restricts the time between the object selection and the control request. If the timeout is shorter than 30 seconds and it elapses before the operation is confirmed, controlling the object will not be possible before the object is selected again. If the operation is confirmed, the appropriate transition text (`=Opening...` or `=Closing...`) is shown for at least four seconds after which the current state of the object is shown.

The current state of the interlocking of the object can prevent the select or execute requests. In that case the text `=Interlocked` is displayed for three seconds. The attempted operation is cancelled and after the three seconds the current state of the object is displayed.

Delayed closing of circuit breaker

When closing a circuit breaker from the local HMI, it may be required to delay the actual close operation for safety reasons. By delaying the operation, the operator has got time to step back, thus avoiding the risk of injury in case of a serious fault. The delay is optional and adjustable. The parameter `Control/General/CB close delay` is used to adjust the delay. The settable range is 0...30 seconds. The value zero, which is the default value of the parameter, means that the delay function is disabled.

Only close operations are affected by the delay; open operations are always performed immediately. The delay is not in use when the control position is set to REMOTE.

If the close delay is active and set to 15 s, the countdown texts `Closing in 15s`, `Closing in 14s`, ..., `Closing in 1s` will be displayed instead of the text `Closing...`. When the delay has elapsed, the breaker will be closed and the text `=Closed`. `E=Open` will be displayed.

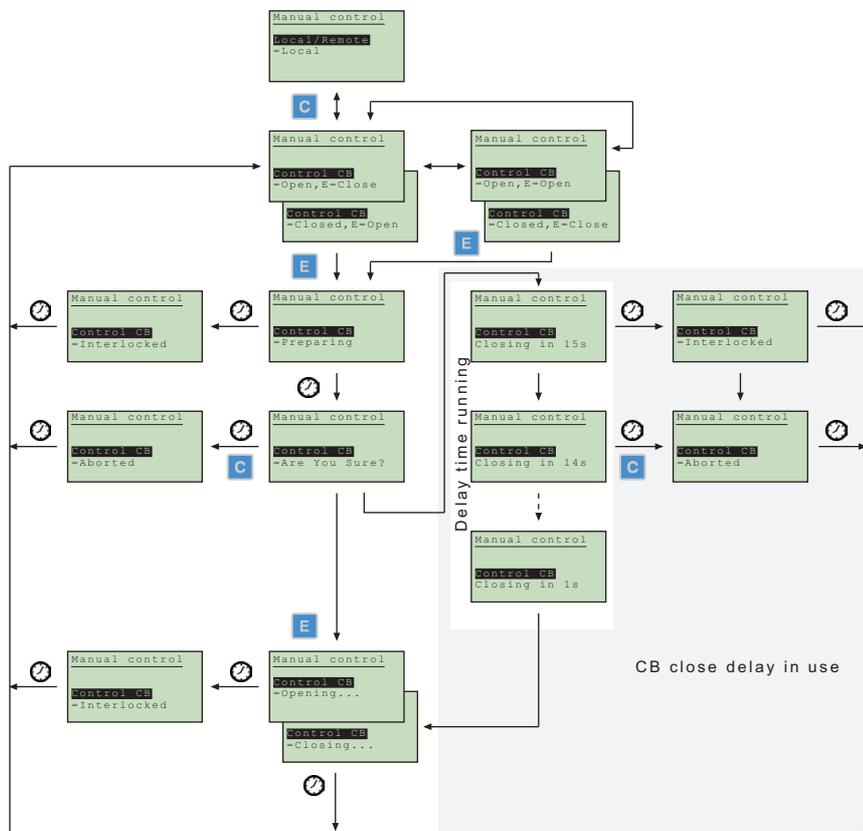
If the closing fails due to interlocking or other reasons, the control sequence will be interrupted and the reason for the failure will be displayed on the LCD until cleared. After this message, the text `=Open`. `E=Close` will be shown again.

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The delayed close operation is cancelled either by pressing any key during the delay countdown or by changing the control position (when control position is LOGIC). In both these cases, the text =Aborted is shown on the LCD. =Aborted is also shown if the [C] button is pressed when the text Are you sure? is displayed.



The Select timeout setting is by default 30 s. This timeout commences when the text Are you sure? is displayed on the LCD. The CB close delay time commences when Are you sure? is shown on the LCD and the [E] button is pressed. At the same moment as the [E] button is pressed, the relay checks that the remaining time of the Select timeout is longer than the set CB close delay time. If this is not the case, the text =Failed is shown on the LCD when the [E] button is pressed.



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Fig. 4.3.3.-1 Manual control

Table 4.3.3-1 Manual control messages

Message	Meaning
Aborted	The current operation was aborted either by user or state change in object status or timeout.
Are you sure?	Waiting for confirmation for the selected operation. [E] accepts it and [C] cancels it.
Closed	Object state is closed. Control is not possible due to remote or control off state.
Closed. E=Close	Object state is closed. [E] will close it.
Closed. E=Open	Object state is closed. [E] will open it.
Closing...	Object is being closed.

Table 4.3.3-1 Manual control messages (Continued)

Message	Meaning
Closing in ...s	CB Close delay time remaining in seconds.
External change	Local/remote state controlled by digital inputs has changed. Only in external input mode. Cancels current operation if any.
Failed	Executing the control request failed. The reason was not interlocking.
Interlocked	Selecting the object or executing the control request failed due to interlocking.
Not allowed	Selecting the object failed. The reason was not interlocking.
Not local	Attempted to control the object in remote or control off state.
Open	Object state is open. Control is not possible due to remote or control off state.
Open. E=Close	Object state is open. [E] will close it.
Open. E=Open	Object state is open. [E] will open it.
Opening...	Object is being opened.
Preparing...	Object is being selected.
Undefined	Object state is undefined. Control is not possible.
Unresolved	Object state is unknown.

4.3.4.

Setting parameters

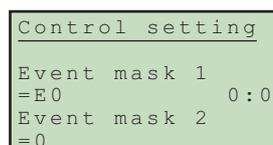
The setting parameters are listed in the CD-ROM Technical Descriptions of Functions (see “Related documents” on page 7).

1. Navigate to the right parameter using the buttons [↑], [↓] and [→], [←] and the menu chart structure as reference.
2. Activate setting mode by pressing the [E] button.
3. If the default HMI password has been changed, it is now prompted. To enter the valid password, change the active digit by pressing the buttons [←] and [→], then set the digit value by pressing the buttons [↑] and [↓].
4. Once the password has been entered, press the [E] button to confirm. Now the selected setting value starts flashing.
5. Enter the new setting value using the buttons [↑], [↓] and [→], [←].
6. Press the [E] button to confirm.
7. If the new value is within the allowed limits, it is now stored in the non-volatile memory and restored after disconnection of power supply.
8. If an illegal setting value is confirmed, a message in the display tells the user that the setting is out of range by showing the message Invalid value, and the previous parameter value remains unchanged.

4.3.5.

Setting bit masks

Event masks and switchgroups are presented as bit masks with a checksum. Most of the events can be included in or excluded from the event reporting by altering the bits of the event masks. Switchgroups are used for changing the connections of inputs and outputs to the relay function blocks.



A060024

Fig. 4.3.5.-1 Bit mask in setting mode

When navigating in menus containing bit masks, only the checksum is shown. If setting mode is entered, the single bit presentation (bit 0, value 1, in the example above) appears in the rightmost lower corner of the display. The contents of the bit mask may be altered by entering single bit values. However, the new values are not valid until setting mode has been exited by pressing the [E] button.

1. Navigate to the right parameter using the buttons [↑], [↓] and [→], [←] and the menu chart structure as reference.
2. Activate setting mode by pressing the [E] button.
3. If the default HMI password has been changed, it is now prompted. To enter the valid password, change the active digit by pressing the buttons [←] and [→], then set the digit value by pressing the buttons [↑] and [↓].
4. Once the password has been entered, press the [E] button to confirm. Now the selected setting value starts flashing.
5. Enter the new setting value using the buttons [↑], [↓] and [→], [←].
6. Press the [E] button to confirm.

When entering single bit values, the bit to be edited may be shifted by pressing the [→] button when the cursor is located in the rightmost corner of the display. In that way, the cursor does not have to be moved back and forth between the bit number and the value during the setting period, thus simplifying the procedure.

For information about the meaning of each event, refer to Event List for REX 521 on the CD-ROM Technical Descriptions of Functions (see “Related documents” on page 7).

4.4.

Indication messages

There are two different kinds of indication messages:

- A text message together with a LED indication.
This type of messages are related to information from the protection functions and information concerning the condition of the protection relay (self-supervision).
- A text message without a LED indication.
This type of messages are related to condition monitoring, alarms and warnings or help texts appearing when certain display operations are performed.

Indication messages have a certain priority. If different types of indications occur simultaneously, the message with the highest priority appears on the display.

Priority order of the messages:

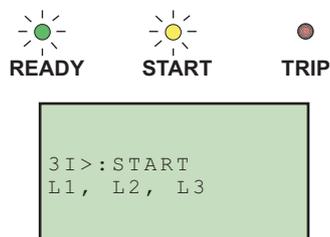
1. Internal fault, CBFP
2. Trip
3. Start, Block
4. Help messages

Indication messages may be cleared with the [C] button, until the display reverts to the menu active before the events.

Help messages are displayed when certain operations are done. For example, when resetting output relays, events and registered values by pressing the [C] and [E] buttons for 5 s, a help text describing the operation is displayed at the same time.

4.4.1. Protection indications

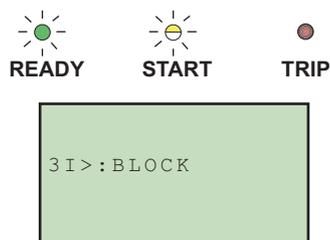
When a protection function starts, the symbol of the protection function and the text START are displayed. The corresponding yellow LED indicator is also lit. In case of three-phase or two-phase protection functions, the faulted phases are displayed as well.



A060025

Fig. 4.4.1.-1 Indication of start

If a started protection function is blocked, the name of the function and the text BLOCK are displayed. Now, the yellow LED indicator is blinking.

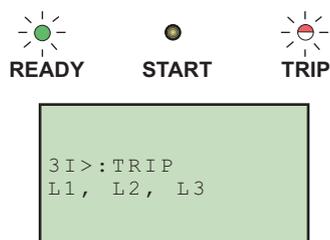


A060026

Fig. 4.4.1.-2 Indication of blocking

If a protection function trips, the name of the function and the text TRIP appear on the display. The red LED indicator is lit. The faulted phases are displayed in this case.

Should the protection function deliver a delayed trip for circuit-breaker failure protection (CBFP), the red indicator starts blinking.



A060027

Fig. 4.4.1.-3 Indication of trip

4.4.2. Self-supervision

The protection relay is provided with an extensive self-supervision system. The self-supervision system handles run-time fault situations and informs the user about existing faults over the display and the serial communication.

When a fault has been detected, the green READY indicator starts blinking. At the same time, the self-supervision (IRF) output relay is activated.

Additionally, a fault indication text `INTERNAL FAULT` appears on the display and an event is generated.



A060028

Fig. 4.4.2.-1 Indication of fault

The fault indication has the highest priority and no other indication can overrun it. The fault indication text is displayed until it is cleared by pressing the [C] button.

The green READY indicator continues blinking as long as the fault is present.

Should the fault disappear after a reset, the indicator stops blinking and an event is generated over the serial communication. The self-supervision (IRF) output relay is returned to its normal state.

4.4.3.

Condition monitoring indication

If the relay configuration includes condition monitoring functions that are not directly related to any protection function or to the internal relay condition, indication messages with the message `SUPERV` and an explanatory text appear if faults are found.



A060029

Fig. 4.4.3.-1 Condition monitoring indication

4.5. LED indicators

4.5.1. Green indication LED (READY)

<p>Non-active LED: OFF</p>  <p>READY START TRIP</p>	<p>Auxiliary supply voltage has been disconnected. Check that the auxiliary voltage is disconnected before taking any further action.</p>
<p>Steady LED: READY</p>  <p>READY START TRIP</p>	<p>Normal operation.</p>
<p>Blinking LED: IRF or TEST MODE</p>  <p>READY START TRIP</p>	<p>Internal relay fault (IRF) has occurred or the relay is in test mode^{*)}. Internal faults are accompanied by an indication message, provided the HMI panel is operative. ^{*)} - Relay - Function block</p>

4.5.2. Yellow indication LED (START)

<p>Non-active LED: OFF</p>  <p>READY START TRIP</p>	<p>Normal operation mode. No function has started.</p>
<p>Steady LED: START</p>  <p>READY START TRIP</p>	<p>A protection function has started and an indication message is displayed. The start indication can be selected to be of latching/ non-latching type. Non-latching means that the indicator is deactivated when the fault disappears while latching means that the indicator remains lit until cleared by pressing the [C] button. Should several protection functions start within a short time, the last start is indicated on the display.</p>
<p>Blinking LED: BLOCK</p>  <p>READY START TRIP</p>	<p>A protection function is blocked. The blocking indication disappears when the blocking is removed or when the protection function is reset. A message indicating which function has been blocked appears on the display. Should several protection functions be blocked within a short time, the last blocked function is indicated on the display. Blocking indications have higher priority than start indications.</p>

4.5.3. Red indication LED (TRIP)

<p>Non-active LED: OFF</p>  <p>READY START TRIP</p>	<p>Normal operation mode. No function has tripped.</p>
<p>Steady LED: TRIP</p>  <p>READY START TRIP</p>	<p>A protection function has tripped and an indication message is displayed. The trip indication is latching, that is, it must be reset by pressing the [C] button or via the serial communication. If several protection functions trip within a short time, the indication of the first tripping remains on the display until the time determined by the "new trip indication" setting value has expired. After this, a new trip indication overwrites the old one. This setting value can be set to indefinite (999); in this case, the first trip indication remains on the display until reset.</p>
<p>Blinking LED: TRIP (CBFP)</p>  <p>READY START TRIP</p>	<p>Trip with CBFP (circuit-breaker failure protection). The indication is reset by pressing the [C] button.</p>

4.5.4. Alarm LED 1-8

<p>Non-active LED: OFF</p> 	<p>Normal operation. All the alarms are OFF.</p>
<p>Steady LED</p> 	<p>Non-latched mode: alarm is still ON. ^{ab}</p>
	<p>Latched mode: alarm is still ON or it is OFF but has not been acknowledged. ^a</p>
	<p>Latched blinking mode: alarm is still ON but has been acknowledged. ^{ab}</p>
<p>Blinking LED</p> 	<p>Latched blinking mode: alarm is ON and has not been acknowledged. ^b</p>

- a. Valid only if the LED is not activated by the parameter Alarm LED States.
- b. The alarm can also be OFF if an auxiliary supply break has occurred. The state of the LED is then preserved and has to be acknowledged (cleared) from the main view.

5. Test mode

Digital inputs, output relays and IRF relay may be tested by setting the parameter `Test mode` to `Testing` in the menu `Main menu\Tests\General`.

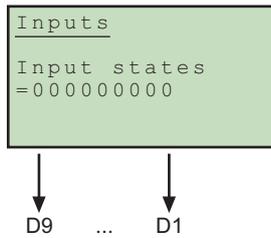
When test mode is activated, the green READY indicator is blinking. For more information, refer to Technical Reference Manual, General (see “Related documents” on page 7).

Test mode can be cancelled by setting the parameter to `No test` or by disconnecting the power supply.

If the user does not cancel the test mode, it remains active and the Ready LED remains blinking.

5.1. I/O test

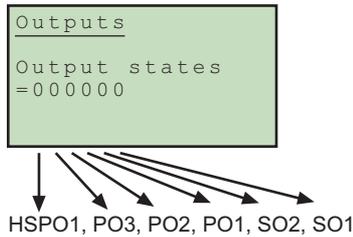
The picture below shows the menu used for digital input testing (`Tests\Inputs`) in the hardware variant with nine digital inputs. The digits correspond to the inputs DI1...DI9, starting from the right side.



A060030

Fig. 5.1.-1 Digital input testing

The following picture shows the menu used for output relay testing `Tests\Outputs`. Observe that the self-supervision relay is activated in another menu and is thus not included in this menu. The relays are activated in the order: SO, PO and HSPO, starting from the right side.



A060031

Fig. 5.1.-2 Output relay testing



If the user forgets to cancel the test mode, it remains on and the Ready LED indicator remains flashing.

5.2. IRF test

The IRF relay may be tested by activating the IRF relay in the menu
Main menu\Tests\General\Activate IRF.

5.3. Function block test

The outputs (Start and Trip) of a function block can be activated locally via the HMI or externally via serial communication. This is possible without setting the relay in test mode as described in “Test mode” on page 33. The outputs are activated by using control parameters of the function. For more information about the functions, refer to the CD-ROM Technical Descriptions of Functions (see “Related documents” on page 7).

6. Abbreviations

CBFP	Circuit-breaker failure protection
CT	Current transformer
HMI	Human-machine interface
HSPO	High-speed power output
IRF	Internal relay fault
LCD	Liquid crystal display
PO	Power output
RS	Rogowski sensor
SO	Signalling output
VD	Voltage divider
VT	Voltage transformer

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