

Contents	Page
1 MENU TREE	2
1.1 General.....	2
1.2 Disturbance report.....	2
1.2.1 Information on recorded disturbances.....	2
1.2.2 Recalculation of distance to fault.....	4
1.2.3 Manual triggering of a disturbance recording.....	4
1.2.4 Clearing of the disturbance report memory	4
1.3 Service report	4
1.3.1 Mean values	5
1.3.2 Differential values.....	5
1.3.3 Phasors	5
1.3.4 Synchronising values	5
1.3.5 Apparatus control.....	5
1.3.6 Interlocking	5
1.3.7 Logical signals	5
1.3.8 Binary inputs	6
1.3.9 Communication channel for the line differential protection function	6
1.3.10 Counters within the autoreclosing function	6
1.3.11 Directionality	6
1.3.12 Disturbance report unit.....	6
1.3.13 Active group.....	6
1.3.14 Internal time	6
1.4 Settings	7
1.4.1 Functions.....	7
1.4.2 Changing of an active setting group	7
1.4.3 Disturbance reporting unit	7
1.4.4 Internal time	7
1.5 Terminal status.....	8
1.5.1 Self supervision - report.....	8
1.5.2 Identity of a terminal.....	8
1.6 Configuration	8
1.6.1 Function inputs.....	9
1.6.2 Binary outputs	9
1.6.3 Binary inputs	9
1.6.4 Apparatus control.....	9
1.6.5 Interlocking	9
1.6.6 Identifiers	9
1.6.7 Frequency	9
1.6.8 Transformers	9
1.6.9 I/O modules.....	10
1.6.10 Time synchronisation source	10
1.6.11 Built-in man machine interface (MMI).....	10
1.6.12 SPA communication	10
1.6.13 Differential	10
1.6.14 On-line control	10
1.7 Test	11
1.8 Front communication	11

1 MENU TREE

1.1 General

Fig. 1 presents the main body of a menu tree. It is divided into the eight following larger menus:

- Disturbance report
- Service report
- Settings
- Terminal status
- Configuration
- On-line control
- Test
- Front communication

1.2 Disturbance report

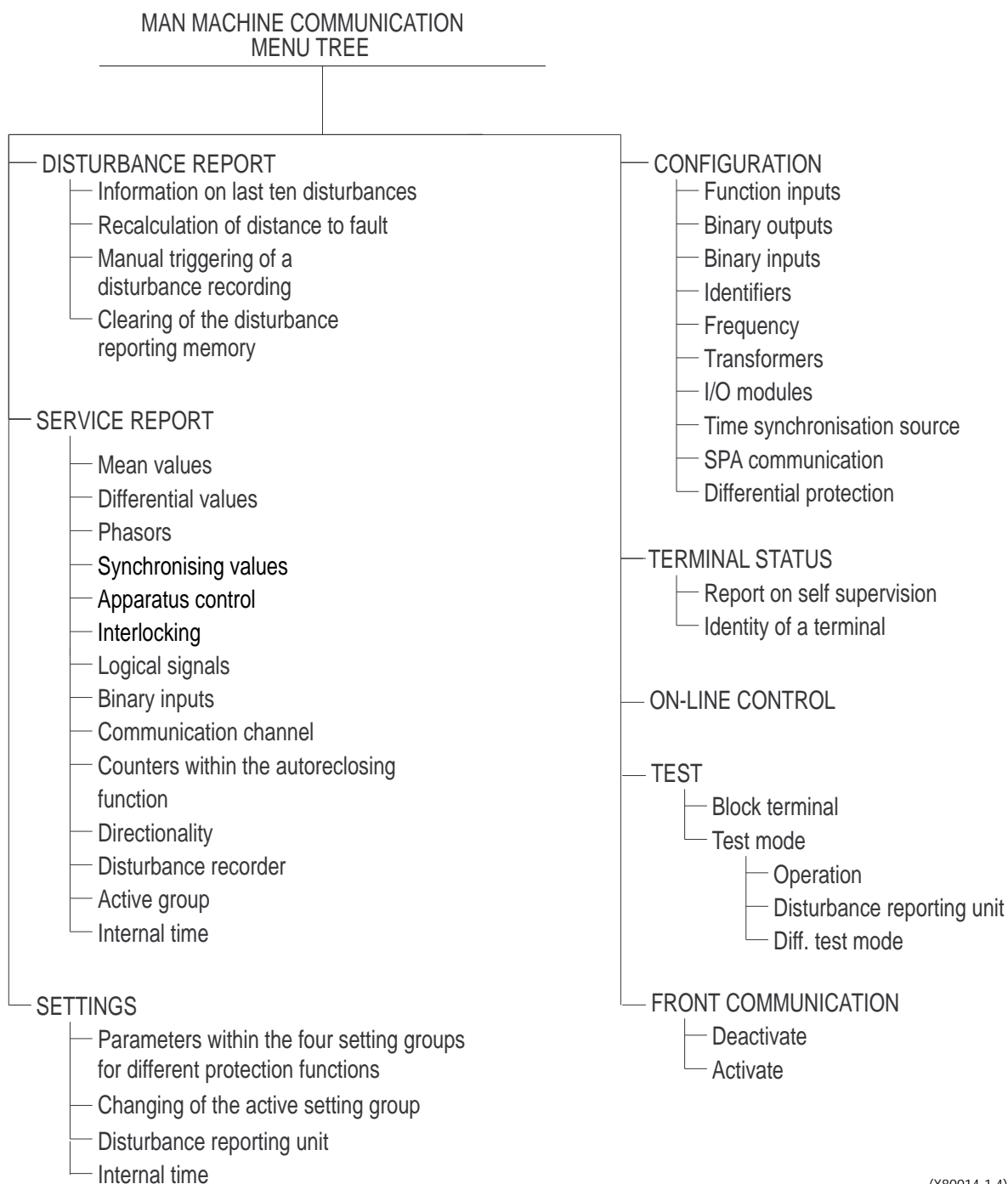
The disturbance report menu gives the user all information recorded by the terminal for the last ten disturbances after the last clearing of the disturbance recorder memory. The complete menu consists of the following four branches:

- Information on the up to ten last recorded disturbances
- Recalculation of distance to fault (when the function “Fault locator” is included)
- Manual triggering of the disturbance reporting unit
- Clearing of the memory belonging to the disturbance reporting unit

1.2.1 Information on recorded disturbances

Each of the recorded disturbances informs the user on:

- **The time of disturbance**, which is presented as an internal terminal date and time at the instant when the first of the triggering signals starts the disturbance recording.
- **Trig signal**, that has started the recording of a disturbance
- **Indications** that appeared during the recorded disturbances, for each disturbance record separately. Indications that can be recorded by the disturbance reporting unit are selectable during the configuration procedure.
- **The fault location**, if a “Fault locator” option is built into the line protection terminal. The user gets information on the distance to the fault together with the fault loop that was used for calculation.
- **Trip values**, available to the user if a “Fault locator” option is built into the line protection terminal. Trip values are presented as phasors (RMS value and phase angle) of the currents and voltages, before and during the fault.



(X80014-1.4)

Fig. 1 Menu tree.

1.2.2 Recalculation of distance to fault

This function will be active only when the option “Fault locator” is built into the line protection terminal. Since trip values are available for each disturbance that has caused a phase selective trip of a distance protection function, a recalculation of the distance to fault is possible. It can be done for a different fault loop or for different values of fault locator setting parameters.

1.2.3 Manual triggering of a disturbance recording

The manual triggering of a disturbance recording, a so-called “snapshot”, is possible under this submenu.

1.2.4 Clearing of the disturbance report memory

The disturbance reporting unit in a terminal has a dedicated memory facility, sufficient for saving the up to ten latest disturbances. All these memory units can be cleared and the unit prepared for a completely new set of records. The memorising of disturbances in the terminal follows the so-called FIFO (first in - first out) principle. This means that the oldest disturbance will disappear automatically from the terminal memory when a new disturbance occurs, in case ten disturbances are already stored in the terminal memory.

1.3 Service report

Information on the operating conditions in question, for protected objects in the power system, as well as information on the terminal itself is available in the “Service report” menu. The complete information consists of the following subgroups:

- Mean values
- Differential values (for line differential protection terminals only)
- Phasors
- Synchronising values (for bay control terminals REC 5xx only)
- Apparatus control (for bay control terminals REC 5xx only)
- Interlocking (for bay control terminals REC 5xx only)
- Logical signals
- Binary inputs
- Counters within the autoreclosing function
- Communication channel (for line differential protection terminals only)
- Directionality
- Disturbance report unit
- Active group
- Internal time

1.3.1 Mean values

Mean values of the measured current, voltage, active and reactive power, as well as of the frequency, are available to the user in line distance protection terminals. The amount of this information in other types of terminals depends on the built-in optional functions.

1.3.2 Differential values

The values of the differential and bias currents are available to the user for each phase separately in line differential protection terminals with built-in line differential protection function.

1.3.3 Phasors

The appearance of the phasors of analogue input quantities as they enter the terminal depends on the type of terminal itself and on the built-in options.

The line protection terminals will display primary and secondary phasors of measured currents and voltages only if they have a built-in optional fault location function.

Other terminals of the REx 5xx series have this function built-in as an option, which also depends on the number of built-in current and voltage inputs and their role within the terminals.

Primary as well as secondary values of the phasors are available.

1.3.4 Synchronising values

The actual measured values of phase angle, voltage and frequency differences are available to the user of the control terminals with a built-in synchro-check option.

1.3.5 Apparatus control

The status of the output signals from different control logical blocks (BAYCON_x, COMCON, SWICON_y and BLKCON_z) used for control purposes within different bays is available to the user under the corresponding submenus. Their presentation and appearance depends on the type of built-in control function. These signals are available only in bay control terminals (for instance REC 561).

1.3.6 Interlocking

The status of output signals from different interlocking logical blocks, such as AB_TRAFO, ABC_LINE, DB_BUS_A, etc., is available to the user under the corresponding submenus. Their presentation and appearance depends on the corresponding submenus and on the type of built-in interlocking blocks. These signals are available only in bay control terminals (for instance REC 561)

1.3.7 Logical signals

The current values of all internal logical signals, except those related to the apparatus control and interlocking function blocks, are always available to the user under the “Logical signals” submenu.

1.3.8 Binary inputs

The current logical values of all binary inputs of a terminal are always available to the user under the “Binary inputs” submenu.

1.3.9 Communication channel for the line differential protection function

The information available under this submenu consists of two parts:

- actual transmission time delay of a communication channel
- the number of short, medium and long communication interruptions calculated by built-in counters. These counters can also be cleared to the initial 0 value.

1.3.10 Counters within the autoreclosing function

Various types of autoreclosing programmes are available for different types of terminals as an option. They also comprise different counters and their actual values are available to the user under this submenu. The resetting of counters to the initial value 0 is also feasible under this submenu.

1.3.11 Directionality

This submenu is available when a distance protection function is built into the terminal. The function enables testing of the directionality of the distance protection function during the commissioning period as well as after some work in the secondary circuits between the current and voltage instrument transformers and terminal.

1.3.12 Disturbance report

The service report on the disturbance report unit comprises the following information:

- percentage of the used dedicated memory capacity for purposes of the disturbance recording function when it is built into the terminal
- the sequence number that the next recorded disturbance will receive can be read and set here
- the status in question of built-in analogue triggers that can start operation of the disturbance recorder

1.3.13 Active group

The current active setting group will be present to the user under this submenu.

1.3.14 Internal time

The internal terminal time in question can be checked under this submenu. The data comprises information on the date as well as on the time down to 1 second.

1.4 Settings

This menu serves for the setting of different parameters within the built-in protection and automation functions, as well as for those in the disturbance reporting unit, when it is built into the terminal.

1.4.1 Functions

Different setting parameters of the basic and optional protection and automation functions that are built into the terminal are settable independent of each other, within four separate setting groups.

1.4.2 Changing of an active setting group

The user can select the active setting group in a dialogue window, using command with confirmation.

1.4.3 Disturbance reporting unit

The following parameters are available for setting purposes in the “Disturbance report” submenu:

- The user can determine whether the disturbance reporting unit is to be active or not, by setting the operation equal to On or Off.
- Different recording times, e.g. pre-fault, post-fault and limit time, are settable in this submenu.
- Up to 48 binary signals can be selected from the signal list, as well as from the binary inputs, and programmed to the disturbance reporting unit. The programming of their triggering functionality and their masking for the purposes of a local man machine communication is possible as well.
- It is feasible to select up to ten analogue signals that will be recorded by the disturbance recorder (when included into the terminal), equip them with the user-defined names, and select their triggering mode (overfunction, underfunction and Off-mode), when necessary.
- For the fault locator function, when built into the terminal, the user must define the unit in which a distance to fault will be presented, as well as the duration of the filtering time, which depends on the speed of the circuit breakers used.

1.4.4 Internal time

The internal time (year, month, day, hour, minute, second) of a terminal is settable and readable under this submenu.

1.5 Terminal status

This menu gives the user some of the most important information on the terminal itself. This information consists of the following two parts:

- Self supervision - report
- Identity of terminal

1.5.1 Self supervision - report

The terminals of the REx 500 series have built-in extensive self supervision facilities, which informs the user about faults detected in the terminal itself or within any of the built-in protection functions.

In case of a fault detected in the terminal, a general warning signal will appear, together with the information about the faulty unit in the terminal. In addition, a self-supervision function also informs the user about the status of time synchronisation, the status of communication for the line differential protection (when built-in), etc.

1.5.2 Identity of a terminal

The identity of a terminal consists of information on the terminal's serial number, ordering number and software and hardware versions of different software functions and hardware modules.

In addition to this, information on different modules can be entered into a terminal by the user after the changes, if any, have been performed.

1.6 Configuration

This menu serves for the user-specific configuration of a terminal. The following submenus are available and configurable by the user:

- Function inputs
- Binary outputs
- Binary inputs
- Apparatus control (only for the bay control terminals)
- Interlocking (only for the bay control terminals)
- Identifiers
- Frequency
- Transformers
- I/O modules
- Time synchronisation source
- Built in MMI
- SPA communication
- Differential protection (line differential protection terminals only)

1.6.1 Function inputs

All basic and optional functions have defined functional inputs that can be connected (programmed) to any of the predefined output signals of other built-in basic and optional functions, as well as to any of the binary inputs on different I/O modules. This configuration takes place under the “Function inputs” submenu.

The configuration of internal additional logical functions if any (AND, OR, timers, etc.) takes place under this submenu as well.

1.6.2 Binary outputs

Binary outputs within the terminal are freely programmable to any of the output signals as defined for different basic and optional functions, as well as to any of the binary inputs on different I/O modules. Furthermore, they may have a user-defined name, consisting of up to 13 characters.

1.6.3 Binary inputs

The user can enter his own names for signals connected to the different binary inputs as strings with up to 13 characters. Later on, these names will appear automatically in all recorded disturbance reports.

1.6.4 Apparatus control

Settings of different timers within the apparatus control modules are accessible through this submenu. The user can define also the number of bays with more than 8 apparatuses. The user has to enter, additionally to this, the information on whether the internal or external synchro-check function will be used during the switching procedures. Configuration of the functional inputs for the apparatus control modules is possible only by the aid of a personal computer.

1.6.5 Interlocking

A corresponding type of interlocking module is selectable under this submenu together with some conditional functions for the check of synchronism during the switching operations.

1.6.6 Identifiers

The user can program the terminal parameters that define the position of a terminal within the power system. The parameters can be either strings or numerical values. Some typical parameters (specific for the line protection terminals) are:

- The station name and number
- The name and serial number of a protected object
- The name of the unit and its number

1.6.7 Frequency

The nominal system frequency is the parameter that has to be specified under this submenu (50 Hz or 60 Hz).

1.6.8 Transformers

The transmission ratios of the used instrument voltage and current transformers, and the position of the earthing point for the latter is the information to be edited under this submenu.

1.6.9 I/O modules

This submenu informs the user on the built-in I/O modules and enables the configuration of these modules according to the needs and situation. It is possible to exclude the faulty module from operation as well as to automatically detect a new module and configure it into the terminal structure.

1.6.10 Time synchronisation source

The internal time of the terminal can be synchronised with some external units via the SPA bus communication (option “Remote communication”) or by means of minute pulse synchronisation via a programmable binary input.

1.6.11 Built-in man machine interface (MMI)

It is possible to select, whether the setting restriction function, which restricts the changes of setting values and active groups via the built-in man machine interface (MMI), will be active or not.

1.6.12 SPA communication

Different parameters for SPA communication must be specified for each communication port (two on the rear plane). The communication speed, as well as access level to the terminal itself, is selectable for each communication channel separately.

1.6.13 Differential

This submenu is available only in the terminals that comprise a phase-segregated line differential protection function.

The parametrisation of terminals used on lines within the complex network configurations (multicircuit lines) is possible under this submenu.

The adaptation of communication parameters to the existing communication equipment used by the differential protection function, takes place under this submenu as well.

1.6.14 On-line control

The activation of up to 400 output control signals (dependent on the configuration of the terminal) is possible under this submenu in the bay control terminals only. The user can also monitor the status of all controlled elements.

1.7 Test

This menu serves for testing purposes so as to make secondary injection testing of the terminal as easy as possible. The user can block all binary outputs to prevent unwanted tripping of the circuit breaker, as well as the sending of alarm signals to the control room and the control centre during the testing activities.

In a similar way, it is possible to block the operation of the disturbance reporting unit so as not to overload the memory with operations caused by the secondary injection testing. Use of the automatic testing logic is also possible under this submenu.

1.8 Front communication

Present only with the option “Remote communication”. Within this sub menu user can activate or de-activate the optical communication port on the local MMI unit, that serves to the purposes of local communication by the aid of a personal computer.