Preventative Maintenance

for PowerPact H-, J-, and L-Frame Circuit Breakers with Micrologic 5 or 6 Trip Units

Instruction Bulletin

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Retain for future use.

SQUARE D™

by Schneider Electric

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Section 1—Introduction

Maintenance Using Trip Units

Micrologic™ 5 and 6 electronic trip units offers monitoring of alarms, quality indicators and maintenance indicators. This makes it possible to:

- Identify overloaded equipment
- Perform predictive maintenance
  - — TIme-stamped historical logs allow analysis of system operation
  - — Pre-alarms allow early detection of potential events
  - — Local or remote alarm of events allow quick analysis and action
- Preventative maintenance
  - — Log of maintenance operations, including contact wear, operating hours, and load profiles

Maintenance Indicators

Micrologic A and E trip units have indicators for, among others, the number of operating cycles, contact wear and operating times (operating hours counter) of the PowerPact H-, J-, and L-frame circuit breakers.

It is possible to assign an alarm to the operating cycle counter to plan maintenance. The various indicators can be used together with the trip histories to analyze the level of stresses the device has been subjected to. The information provided by the indicators cannot be displayed on the Micrologic trip unit LCD. It is displayed on the PC through the communication network.

When the Micrologic trip unit, with or without a front display module, is connected to a communication network, all information can be accessed using a PC with the appropriate software installed.

Two types of time-stamped event tables

- Protection settings
- Minimums / maximums

Display of alarms and tables

The time-stamped history and event tables may be displayed on a PC through the communication network.

Embedded memory

Micrologic A and E trip units have a non-volatile memory that saves all data on alarms, histories, event tables, counters and maintenance indicators even if power is lost.

Management of Installed Devices

Each circuit breaker equipped with a Micrologic 5 or 6 trip unit can be identified using the communication network:

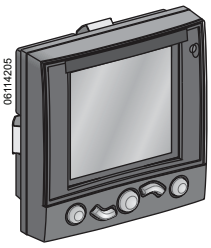
- serial number
- firmware version
- hardware version
- device name assigned by the user.

This information together with that previously described provides a clear view of the state of the installed devices.

- Contact wear
  Each time PowerPact H-, J-, and L-frame circuit breakers open, the Micrologic 5 / 6 trip unit measures the interrupted current and increments the contact-wear indicator as a function of the interrupted current, according to test results stored in memory. Breaking under normal load conditions results in a very slight increment. The indicator value may be read on the front display module. It provides an estimation of contact wear calculated on the basis of the cumulative forces affecting the circuit breaker. When the indicator reaches 80%, it is advised to replace the circuit breaker to ensure the availability of the protected equipment.
- Circuit breaker load profile
  Micrologic 5 / 6 trip units calculate the load profile of the circuit breaker protecting a load circuit. The profile indicates the percentage of the total operating time at four current levels (% of I_n):
  - 0 to 49% I_n
  - 50 to 79% I_n
  - 80 to 89% I_n
  - ≥ 90% I_n
  - This information can be used to optimize use of the protected devices or to plan ahead for expansion.

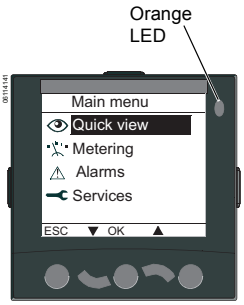
Section 2—Display Options

Front Display Module Functions (FDM121)



The front display module (FDM121) can be integrated in the PowerPact H-, J-, and L-frame circuit breaker system. It uses the sensors and processing capacity of the Micrologic trip unit to display measurements, demand, power quality and maximum/minimum values along with alarms, histories, and maintenance indicators.

Display of Micrologic Trip Unit Measurements and Alarms



The FDM121 is intended to display Micrologic 5 / 6 trip unit measurements, alarms and operating information. It cannot be used to modify the protection settings. Measurements may be easily accessed through a menu.

All user-defined alarms are automatically displayed. The display mode depends on the priority level selected during alarm set-up:

- high priority: a pop-up window displays the time-stamped description of the alarm and the orange LED flashes
- medium priority: the orange Alarm LED goes steady on I
- low priority: no display on the screen.

All faults resulting in a trip automatically produce a high-priority alarm, without any special settings required. In all cases, the alarm history is updated.

If power to the FDM121 fails, all information is stored in the Micrologic trip unit non-volatile memory. The data can be consulted using the communication network when power is restored.

Status Indications and Remote Control

When the circuit breaker is equipped with the BSCM module, the FDM121 display can also be used to view circuit breaker status conditions:

- Auxiliary switch (OF): ON/OFF
- Alarm switch (SD): trip indication
- Overcurrent trip switch (SDE): fault-trip indication (overload, short-circuit, ground fault)

Screens

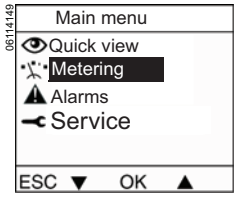
Main menu

When powered up, the FDM121 screen automatically displays the ON/OFF status of the device.

When not in use, the screen is not backlit. Backlighting can be activated by pressing one of the buttons. It goes off after 3 minutes.

Quick view	Provides access to five screens that display a summary of essential operating information (I, U, f, P, E, THD, circuit breaker On / Off).
Metering	Used to display the measurement data (I, U-V, f, P, Q, S, E, THD, PF) with the corresponding min/max values.
Alarms	Displays active alarms and the alarm history
Services	Provides access to the operation counters, energy and maximum reset function, maintenance indicators, identification of modules connected to the internal bus and FDM121 internal settings (language, contrast, etc.)

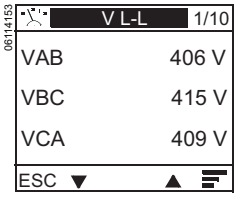
Fast access to essential information



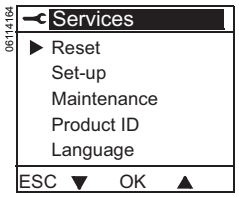
Quick View

- “Quick view” provides access to five screens that display a summary of essential operating information (I, V, f, P, E, THD, circuit breaker On / Off).

Access to detailed information



Metering Sub-Menu



Services

- “Metering” can be used to display the measurement data (I, U-V, f, P, Q, S, E, THD, PF) with the corresponding min/max values.
- Alarms displays active alarms and the alarm history
- Services provides access to the operation counters, energy and maximum reset function, maintenance indicators, identification of modules connected to the internal bus and FDM121 internal settings (language, contrast, etc.)

Alarm Indication

Alarms display on the FDM121 according to their order of occurrence. The last active alarm to occur replaces the previous alarm, even if it is still active or has not been acknowledged.

Alarms are recorded in the alarm history.

Alarm indication on the display depends on their priority level.

Table 1: Alarm Indication Priority Level

Priority	Real-Time Indication	History	Alarm Clearance from the Display
High	• LED blinking • Pop-up screen	Yes	Press the Clear key to stop the LED blinking and clear the pop-up screen.
Medium	• LED steady ON	Yes	View the alarm history to turn the LED off.
Low	—	Yes	—
None	—	No	—

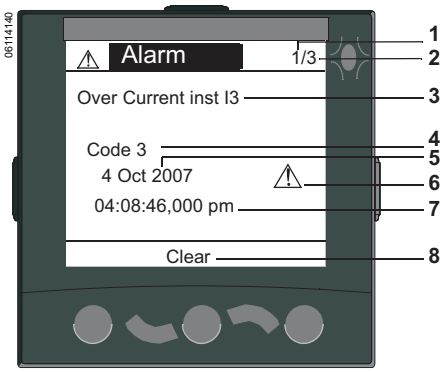
NOTE: Clear the indication of successive high-priority alarms by pressing the Clear key a number of times in succession (the number of times corresponds to the number of active alarms) in reverse chronological order

of their occurrence.
View the alarm history to clear the indication of all medium-priority alarms.

Alarm Pop-up Screen

An **Alarm** pop-up screen appears when a high-priority alarm occurs.

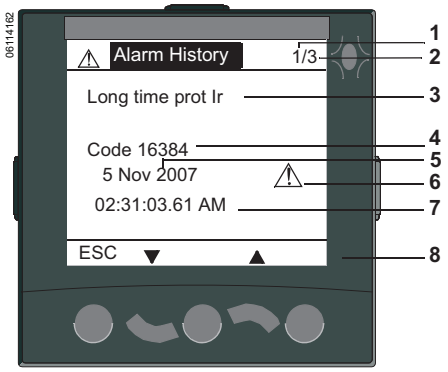
Figure 1: Alarm Pop-Up Screen Example



1. Alarm number in order of occurrence
2. Number of alarms recorded in the FDM121
3. Alarm name
4. Alarm code
5. Date of occurrence of the alarm
6. Symbol for occurrence of the alarm
7. Alarm occurrence time, in hours, minutes, seconds, and milliseconds
8. Clear key for clearing the alarm pop-up screen displayed

Alarm History Screen

Figure 2: Alarm History Screen Example



1. Screen number
2. Total number of screens in the alarm history
3. Alarm name
4. Alarm code
5. Event date
6. Event type
   - Occurrence of the alarm
   - Completion of the alarm
7. Event time, in hours, minutes, seconds, and milliseconds
8. Navigation keys

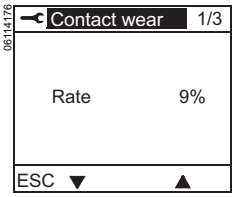
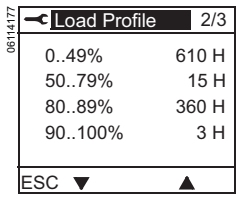
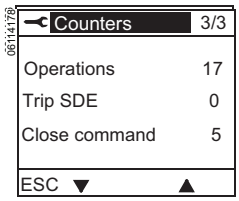
Services Menu

The Services menu provides access to the:

- Reset energy meters and measurement minimum and maximum values mode
- FDM121 contrast and brightness setting
- Maintenance indicators (operation counters, load profile, and so on.)
- Intelligent functional unit product identification information
- Language selection for the FDM121 screens

Maintenance Submenu Screens

Table 2: Maintenance Screens Available

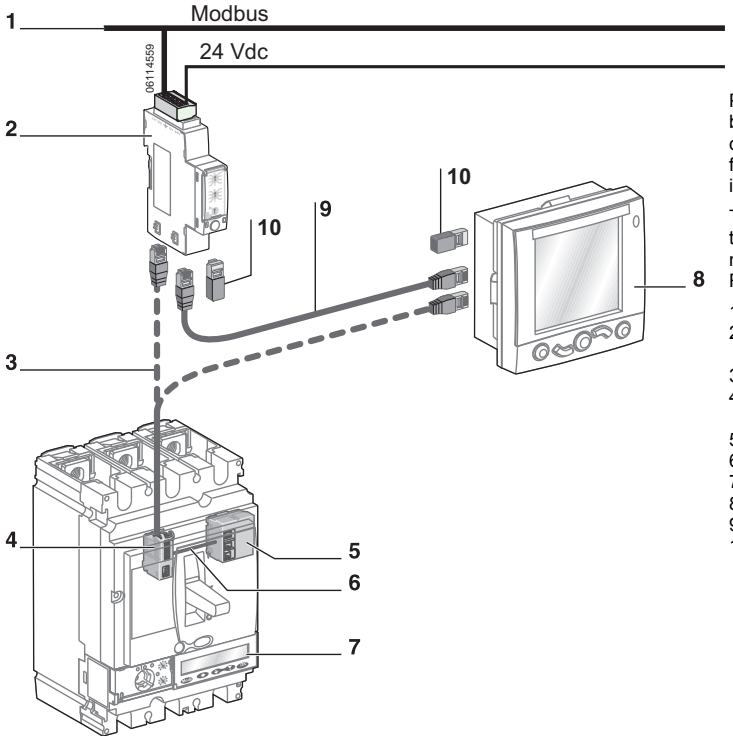
Display	Description
	Screen 1 **Contact wear** displays the amount of wear on the circuit breaker contacts. Pressing the ▼ key switches to screen 2. Pressing the ESC key returns to the **Maintenance Info.** submenu.
	Screen 2 **Load Profile** displays four circuit breaker operating hours counters for four loading sections. Pressing the ▼ key switches to screen 3. Pressing the ESC key returns to the **Maintenance Info.** submenu.
	Screen 3 **Counters** display the values for the: • OF operations counter • SDE fault counter • Close command counter (communicating motor mechanism) Pressing the ESC key returns to the **Maintenance Info.** submenu.

Section 3—Circuit Breaker Communication Network Options

All PowerPact H-, J-, and L-frame circuit breakers devices can be equipped with the communication function using a pre-wired connection system and a Modbus communication interface module. The interface module can be connected directly or through the front display module (FDM121).

The PowerPact H-, J-, and L-frame circuit breakers can be integrated in a Modbus communication network. Four functional levels can be used separately or combined to adapt to all supervision requirements.

Level	Function
Communication of status indications	Compatible with PowerPact H-, J- and L-frame circuit breakers and automatic switches. Use the BSCM module to access the following information: • ON/OFF position • trip indication • fault-trip indication
Communication of commands	Available on all circuit breakers and automatic switches with communicating motor operators, the remote control can be used to: • open • closed • reset
Communication of measurements with Micrologic 5 / 6 A or E trip unit	This level provides access to: • instantaneous and demand values • maximums/minimums • energy metering • demand current and power • power quality
Communication of operating assistance with Micrologic 5 / 6 A or E trip unit	This level also provides access to: • protection and alarm settings • time-stamped histories and event tables • maintenance indicators



PowerPact H-, J-, or L-frame circuit breaker is connected to the Modbus communication interface module (IFM) or front display module (FDM121) through the internal terminal block for the NSX cord.

The front display module is connected to the Modbus communication interface module by a communication cable with RJ45 connectors on both ends.

1. Modbus network
2. Modbus communication interface module
3. NSX cord
4. Internal terminal block for communication using the NSX cord
5. BSCM module
6. Prefabricated wiring
7. Micrologic trip unit
8. FDM121 display
9. RJ45 cable
10. Line terminator (for unused connectors, if applicable)

Circuit Breaker Communication

PowerPact™ H-, J, and L-frame circuit breakers with Micrologic™ trip units can be integrated into a communication network created using Modbus™ protocol. Use data transmitted by the communication network to provide supervision and monitoring for an installation.

This communication network offers the options of:

- Reading remotely:
  - The circuit breaker status
  - Measurements
  - Operating assistance information
- Controlling the circuit breaker remotely

For more information about the Modbus communication network, refer to the specific circuit breaker user manual.

For more information about the communication network, refer to the *ULP System—User Guide*.

Remote Readout of the Circuit Breaker Status

Remote readout of the circuit breaker status is accessible by all circuit breakers equipped with a BSCM. The following data is available using the communication network:

- Open/closed position (OF)
- Trip indicator (SD)
- Electrical fault indicator (SDE)

For more information, refer to the bulletin shipped with the circuit breaker.

Remote Readout of the Measurements

Access the measurement readout with Micrologic 5 and 6 trip units. For more information about measurements, see “Metering Function” on page 60.

Remote Readout of the Operating Assistance Information

Access the operating assistance readout with Micrologic 5 and 6 trip units. The following operating assistance information is available:

- Protection and alarm settings (see “Remote Setting Utility (RSU) Software” on page 91)
- History and tables of time-stamped events (see “History and Time-Stamped Information” on page 12)
- Maintenance indicators (see “Maintenance Indicators” on page 11)

Circuit Breaker Remote Control

The circuit breaker remote control is accessible by any circuit breaker with a Micrologic trip unit, a BSCM, and a communicating motor mechanism. The following commands are available using the communication network:

- Circuit breaker opening
- Circuit breaker closing
- Circuit breaker reset

For more information, refer to the bulletin shipped with the circuit breaker.

Maintenance Indicators

BSCM Counters

The counters embedded in the BSCM generate information relating to the number of volt-free contact operations. These volt-free contacts qualify:

- The number of open/close operations (OF contact) and open on fault operations (SD and SDE contacts) on the PowerPact H-, J-, or L-frame circuit breaker
- The number of close, open, and reset operations on the motor mechanism

Micrologic Trip Unit Counters

Access the maintenance counters embedded in the Micrologic trip unit with the communication option.

- Counters are assigned to each type of protection:
  - Long time protection
  - Short-time protection
  - Ground-fault protection
  - Jam motor protection
  - Phase unbalance protection
  - Long start motor protection
  - Underload motor protection
- Ten counters are assigned to the alarms associated with measurements. These counters reset if the alarm is reconfigured.
- One counter indicates the number of operating hours. This counter is updated every 24 hours.
- Four counters are assigned to the load profile: Each counts the number of operating hours per loading section (for example, one counter indicates the number of operating hours for the loading section 50–79% of I_n). Six counters are assigned to the temperature profile. Each counts the number of operating hours per temperature section (for example, one counter indicates the number of operating hours for the temperature section 60–74°C).
- Use maintenance counters to enter quantitative information about operations performed on the Micrologic trip unit (such as the number of push to trip tests) or the status of the Micrologic trip units (such as the number of Err screens or protection setting lock/unlock operations).
- One counter indicates the amount of wear on the circuit breaker contacts as a percentage. When this figure reaches 100%, the contacts must be changed.

History and Time-Stamped Information

History

Micrologic trip units generate three types of history:

- History of alarms associated with measurements (the last ten alarms are recorded)
- History of trips (the last 18 trips are recorded)
- History of maintenance operations (the last ten operations are recorded)

Time-Stamped Information

Time-stamped information displays dates for important information such as previous protection settings and minimum/maximum current, voltage, and network frequency values.

The table of time-stamped information describes:

- The previous protection configurations and corresponding dates
- The minimum and maximum voltage measurement values and corresponding dates
- The maximum current measurement values and corresponding dates
- The minimum and maximum network frequencies and corresponding dates

The time when the minimum and maximum values were reset is also available.

Section 4—Alarms

Alarms Associated with Measurements

Micrologic™ 5 and 6 trip units monitor measurements using:

- One or two pre-alarms (depending on the type of trip unit) assigned to:
  - — Long-time protection (PAL I_r) for the Micrologic 5 trip unit
  - — Long-time protection (PAL I_r) and ground-fault protection (PAL I_g) for the Micrologic 6 trip unit

  By default, these alarms are active.
- Ten alarms defined by the user as required. The user assigns each of these alarms to a measurement.

  By default, these alarms are not active.

All the alarms associated with measurements are accessible:

- Using the communication network
- On the Front Display Module (FDM121)

The alarms associated with measurements can be assigned to an SDx Module output.

Alarm Setup

Select user-defined alarms and set their functions using the RSU software under the Alarms tab.

Alarm setup consists of:

- Selecting the alarm priority level
- Setting the alarm activation thresholds and time delays

The alarm description tables indicate for each of the alarms:

- The setting range (thresholds and time delays)
- The default setting values.

Alarm Priority Level

Each alarm is assigned a priority level:

- High priority
- Medium priority
- Low priority
- No priority

Alarm indication on the Front Display Module FDM121) depends on the alarm priority level.

The user sets the priority level of each alarm, according to the urgency of the action required.

By default, alarms are medium priority, except for alarms associated with operating indicators which are low priority.

Alarm Activation Conditions

An alarm associated with a measurement is activated when:

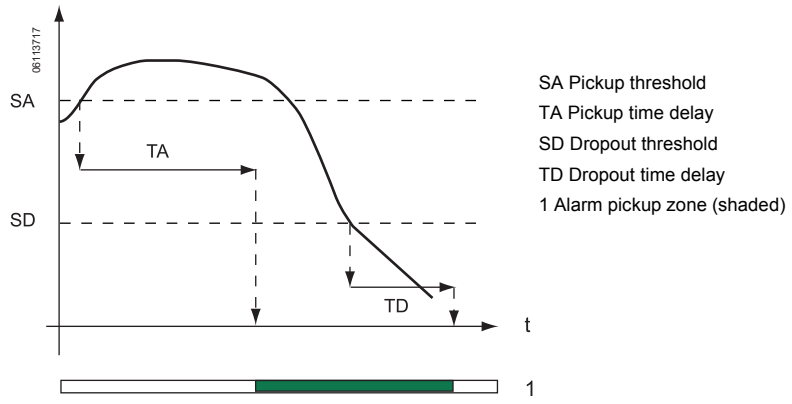
- Values rise above the measurement pickup threshold for overvalue conditions
- Values drop below the measurement pickup threshold for undervalue conditions
- Values equal to the measurement pickup threshold for equality conditions

The RSU software predetermines the type of monitoring.

Overvalue Condition

Activation of the alarm on an overvalue condition is determined using two thresholds and two time delays.

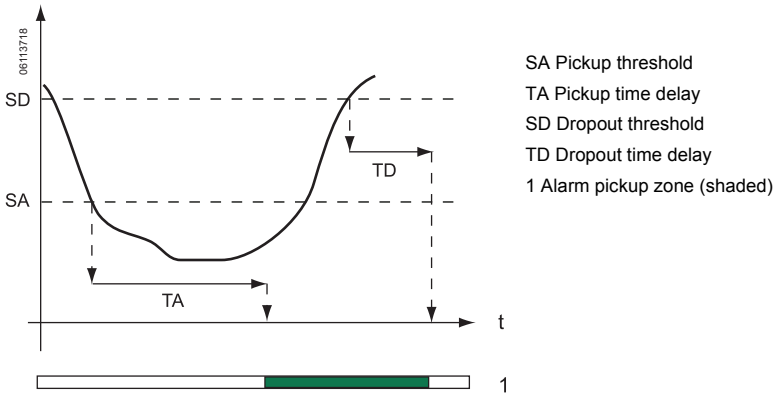
Figure 1: Activation of an Alarm on an Overvalue Condition



Undervalue Condition

Activation of the alarm on an undervalue condition is determined using two thresholds and two time delays.

Figure 2: Activation of an Alarm on an Undervalue Condition



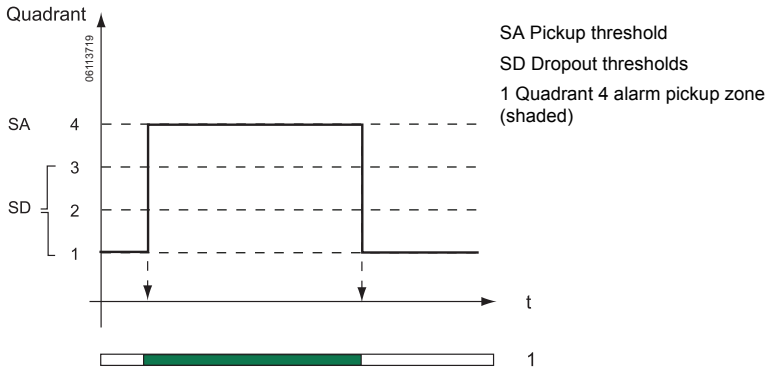
Equality Condition

The alarm is activated when the associated monitored quantity equals the pickup threshold.

The alarm is deactivated when the associated monitored quantity is different from the pickup threshold.

Alarm activation is determined using the pickup/drop-out thresholds.

Figure 3: Activation of an Alarm on an Equality Condition (Monitoring of Quadrant 4)



Management of Time Delays (Overvalue or Undervalue Conditions)

The alarm time delays are managed by two counters that are normally at 0.

For the pickup threshold, the time delay counter is:

- Incremented when the activation condition is fulfilled.
- Decremented if the activation condition is no longer fulfilled (before the end of the pickup time delay). If the deactivation condition is reached, the pickup time delay counter is reset and the dropout time delay counter is incremented.

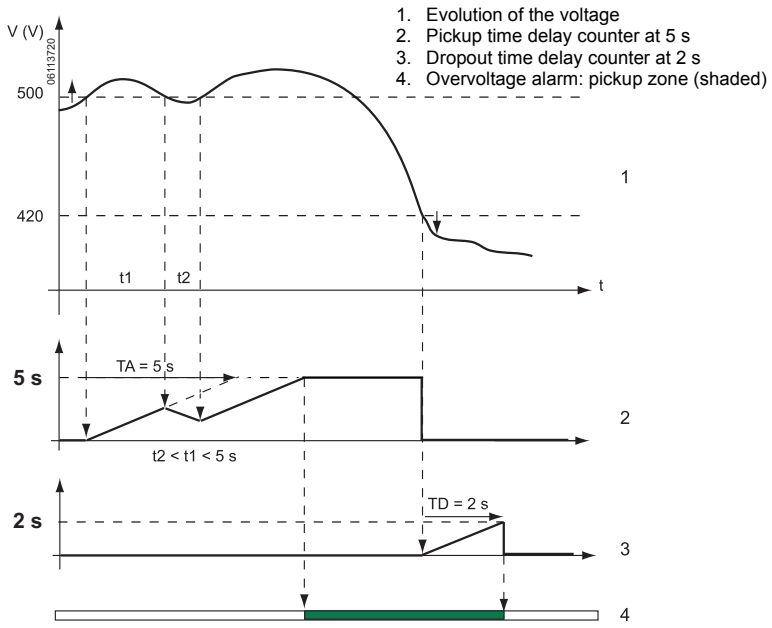
For the dropout threshold, the same principle is used.

The example curve shows management of the time delay on an overvoltage alarm (code 79, see “Tables of Alarms” on page 17)

The alarm pickup time delay counter trips when the voltage crosses the 500 V threshold. It is incremented or decremented according to the value of the voltage in relation to the threshold.

The alarm dropout time delay counter trips when the voltage drops back below the 420 V threshold.

Figure 4: Time Delay on an Overvoltage Alarm



Alarms on a Trip, Failure, and Maintenance Event

Alarms on a trip, failure, and maintenance event are always active. They can be accessed:

- Using the communication network
- On the Front Display Module (FDM121) (see “Front Display Module (FDM121)” on page 108)

Certain alarms can be assigned to an SDx Module output using the system software.

Alarm Setup

The functions of alarms on a trip and failure event are fixed and cannot be modified.

Modify the functions of the two maintenance alarms (OF operation overrun counter threshold and Close command overrun threshold) using the RSU software under the Breaker I/O tab.

Alarm Priority Level

Assign each alarm a priority level:

- High priority
- Medium priority

For more details on the use of priority levels, see “Alarm Processing” on page 113.

Tables of Alarms

Table 1: Pre-Alarms

Label	Code	Default Setting	Default Priority	Setting Range		Default Setting			
				Thresholds (Pickup or Drop-Out)	Time Delay	Thresholds		Time Delay	
						Pickup	Drop-Out	Pickup	Drop-Out
Pre Alarm I_r (PAL I_r)	1013	Active	Medium	40–100% I_r	1 s	90% I_r	85% I_r	1 s	1 s
Pre Alarm I_g (PAL I_g) (Micrologic 6 trip unit)	1014	Active	Medium	40–100% I_g	1 s	90% I_g	85% I_g	1 s	1 s

Table 2: Micrologic A User-Defined Alarms

Label	Code	Default Setting	Default Priority	Setting Range		Default Setting		
				Thresholds (Pickup or Drop-Out)	Time Delay	Thresholds	Time Delay	
							Pickup	Drop-Out
Over Current Inst I_A	1	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	40 s	10 s
Over Current Inst I_B	2	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	40 s	10 s
Over Current Inst I_C	3	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	40 s	10 s
Over Current Inst I_N	4	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	40 s	10 s
Ground-Fault Alarm (Micrologic 6 Trip Unit)	5	Not Active	Medium	10–100% I_g	1–3000 s	40% I_g	40 s	10 s
Under Current Inst I_A	6	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	40 s	10 s
Under Current Inst I_B	7	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	40 s	10 s
Under Current Inst I_C	8	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	40 s	10 s
Over Current I_{avg}	55	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	60 s	15 s
Over I max (A, B,C)	56	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	60 s	15 s
Under Current I_N	57	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	40 s	10 s
Under Current I_{avg}	60	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	60 s	15 s
Under I min (A, B, C)	65	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	60 s	15 s

Table 3: Micrologic E User-Defined Alarms

Label	Code	Default Setting	Default Priority	Setting Range		Default Setting		
				Thresholds (Pickup or Drop-Out)	Time Delay	Thresholds	Time Delay	
							Pickup	Drop-Out
Over Current Inst I_A	1	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	40 s	10 s
Over Current Inst I_B	2	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	40 s	10 s
Over Current Inst I_C	3	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	40 s	10 s
Over Current Inst I_N	4	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	40 s	10 s
Ground-Fault Alarm (Micrologic 6 Trip Unit)	5	Not Active	Medium	10–100% I_g	1–3000 s	40% I_g	40 s	10 s
Under Current Inst I_A	6	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	40 s	10 s
Under Current Inst I_B	7	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	40 s	10 s
Under Current inst I_C	8	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	40 s	10 s
Over I_{unbal} phase A	9	Not Active	Medium	5–60% I_{avg}	1–3000 s	25%	40 s	10 s
Over I_{unbal} phase B	10	Not Active	Medium	5–60% I_{avg}	1–3000 s	25%	40 s	10 s
Over I_{unbal} phase C	11	Not Active	Medium	5–60% I_{avg}	1–3000 s	25%	40 s	10 s
Over Voltage V_{AN}	12	Not Active	Medium	100–1100 V	1–3000 s	300 V	40 s	10 s
Over Voltage V_{BN}	13	Not Active	Medium	100–1100 V	1–3000 s	300 V	40 s	10 s
Over Voltage V_{CN}	14	Not Active	Medium	100–1100 V	1–3000 s	300 V	40 s	10 s
Under Voltage V_{AN}	15	Not Active	Medium	100–1100 V	1–3000 s	180 V	40 s	10 s
Under Voltage V_{BN}	16	Not Active	Medium	100–1100 V	1–3000 s	180 V	40 s	10 s
Under Voltage V_{CN}	17	Not Active	Medium	100–1100 V	1–3000 s	180 V	40 s	10 s
Over V_{unbal} V_{AN}	18	Not Active	Medium	2%–30% V_{avg}	1–3000 s	10%	40 s	10 s
Over V_{unbal} V_{BN}	19	Not Active	Medium	2%–30% V_{avg}	1–3000 s	10%	40 s	10 s
Over V_{unbal} V_{CN}	20	Not Active	Medium	2%–30% V_{avg}	1–3000 s	10%	40 s	10 s
Over total KVA	21	Not Active	Medium	1–1000 kVA	1–3000 s	100 kVA	40 s	10 s
Over direct KW	22	Not Active	Medium	1–1000 kW	1–3000 s	100 kW	40 s	10 s
Reverse power KW	23	Not Active	Medium	1–1000 kW	1–3000 s	100 kW	40 s	10 s
Over direct KVAr	24	Not Active	Medium	1–1000 kva	1–3000 s	100 kvar	40 s	10 s
Reverse power KVAr	25	Not Active	Medium	1–1000 kvar	1–3000 s	100 kvar	40 s	10 s
Under total KVA	26	Not Active	Medium	1–1000 kVA	1–3000 s	100 kVA	40 s	10 s
Under direct KW	27	Not Active	Medium	1–1000 kW	1–3000 s	100 kW	40 s	10 s
Under direct KVAr	29	Not Active	Medium	1–1000 kva	1–3000 s	100 kvar	40 s	10 s
Leading PF (IEEE)[1]	31	Not Active	Medium	0–0.99	1–3000 s	0.80	40 s	10 s
Lead or Lag PF(IEC)[1]	33	Not Active	Medium	0–0.99	1–3000 s	0.80	40 s	10 s
Lagging PF (IEEE)[1]	34	Not Active	Medium	-0.99–0	1–3000 s	-0.80	40 s	10 s
Over THD Current I_A	35	Not Active	Medium	0–500%	1–3000 s	15%	40 s	10 s
Over THD Current I_B	36	Not Active	Medium	0–500%	1–3000 s	15%	40 s	10 s
Over THD Current I_C	37	Not Active	Medium	0–500%	1–3000 s	15%	40 s	10 s
Over THD V_{AN}	38	Not Active	Medium	0–500%	1–3000 s	5%	40 s	10 s
Over THD V_{BN}	39	Not Active	Medium	0–500%	1–3000 s	5%	40 s	10 s
Over THD V_{CN}	40	Not Active	Medium	0–500%	1–3000 s	5%	40 s	10 s
Over THD V_{AB}	41	Not Active	Medium	0–500%	1–3000 s	5%	40 s	10 s
Over THD V_{BC}	42	Not Active	Medium	0–500%	1–3000 s	5%	40 s	10 s
Over THD V_{CA}	43	Not Active	Medium	0–500%	1–3000 s	5%	40 s	10 s
Over Current I_{avg}	55	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	60 s	15 s
Over I max (A, B, C)	56	Not Active	Medium	0.2–10 I_n	1–3000 s	I_n	60 s	15 s
Under Current I_N	57	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	40 s	10 s
Under Current I_{avg}	60	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	60 s	15 s
Over I_A Demand	61	Not Active	Medium	0.2–10.5 I_n	1–3000 s	0.2 I_n	60 s	15 s
Over I_B Demand	62	Not Active	Medium	0.2–10.5 I_n	1–3000 s	0.2 I_n	60 s	15 s

Continued on next page

Table 3: Micrologic E User-Defined Alarms *(continued)*

Label	Code	Default Setting	Default Priority	Setting Range		Default Setting		
				Thresholds (Pickup or Drop-Out)	Time Delay	Thresholds	Time Delay	
							Pickup	Drop-Out
Over I_C Demand	63	Not Active	Medium	0.2–10.5 I_n	1–3000 s	0.2 I_n	60 s	15 s
Over I_N Demand	64	Not Active	Medium	0.2–10.5 I_n	1–3000 s	0.2 I_n	60 s	15 s
Under I min (A, B, C)	65	Not Active	Medium	0.2–10 I_n	1–3000 s	0.2 I_n	60 s	5 s
Under I_A Demand	66	Not Active	Medium	0.2–10.5 I_n	1–3000 s	0.2 I_n	60 s	15 s
Under I_B Demand	67	Not Active	Medium	0.2–10.5 I_n	1–3000 s	0.2 I_n	60 s	15 s
Under I_C Demand	68	Not Active	Medium	0.2–10.5 I_n	1–3000 s	0.2 I_n	60 s	15 s
Under I_N Demand	69	Not Active	Medium	0.2–10.5 I_n	1–3000 s	0.2 I_n	60 s	15 s
Over I_{unbal} max	70	Not Active	Medium	5–60% I_{avg}	1–3000 s	25%	40 s	10 s
Over Voltage V_{AB}	71	Not Active	Medium	100–1100 V	1–3000 s	500 V	40 s	10 s
Over Voltage V_{BC}	72	Not Active	Medium	100–1100 V	1–3000 s	500 V	40 s	10 s
Over Voltage V_{CA}	73	Not Active	Medium	100–1100 V	1–3000 s	500 V	40 s	10 s
Over Volt V_{avg} L-N	75	Not Active	Medium	100–1100 V	1–3000 s	300 V	5 s	2 s
Under Voltage V_{AB}	76	Not Active	Medium	100–1100 V	1–3000 s	320 V	40 s	10 s
Under Voltage V_{BC}	77	Not Active	Medium	100–1100 V	1–3000 s	320 V	40 s	10 s
Under Voltage V_{CA}	78	Not Active	Medium	100–1100 V	1–3000 s	320 V	40 s	10 s
Over V max L-L	79	Not Active	Medium	100–1100 V	1–3000 s	300 V	5 s	2 s
Under Volt V_{avg} L-N	80	Not Active	Medium	100–1100 V	1–3000 s	180 V	5 s	2 s
Under V min L-L	81	Not Active	Medium	100–1100 V	1–3000 s	180 V	5 s	2 s
Over Vunb max L-N	82	Not Active	Medium	2%–30% V_{avg}	1–3000 s	10%	40 s	10 s
Over V_{unbal} V_{AB}	86	Not Active	Medium	2%–30% V_{avg}	1–3000 s	10%	40 s	10 s
Over V_{unbal} V_{2B}	87	Not Active	Medium	2%–30% V_{avg}	1–3000 s	10%	40 s	10 s
Over V_{unbal} V_{CA}	88	Not Active	Medium	2%–30% V_{avg}	1–3000 s	10%	40 s	10 s
Over Vunb max L-L	89	Not Active	Medium	2%–30% V_{avg}	1–3000 s	10%	40 s	10 s
Phase sequence	90	Not Active	Medium	0.1	N/A	0	N/A	N/A
Under Frequency	92	Not Active	Medium	45–65 Hz	1–3000 s	45 Hz	5 s	2 s
Over Frequency	93	Not Active	Medium	45–65 Hz	1–3000 s	65 Hz	5 s	2 s
Over KW Power dmd	99	Not Active	Medium	1–.1000 kW	1–3000 s	100 kW	40 s	10 s
Leading cos φ (IEEE) [1]	121	Not Active	Medium	0–0.99	1–3000 s	0.80	40 s	10 s
Lead, Lag cos φ (IEC)[1]	123	Not Active	Medium	0–0.99	1–3000 s	0.80	40 s	10 s
Lagging cos φ (IEEE) [1]	124	Not Active	Medium	-0.99–0	1–3000 s	-0.80	40 s	10 s
Over T° image motor (Micrologic 6 E-M trip unit)	125	Not Active	Medium	0.2–10.5 I_n	1–3000 s	I_n	60 s	15 s
Under T° image motor (Micrologic 6 E-M trip unit)	126	Not Active	Medium	0.2–10.5 I_n	1–3000 s	I_n	60 s	15 s
Over I_A Peak Demand	141	Not Active	Medium	0.2–10.5 I_n	1–3000 s	I_n	60 s	15 s
Over I_B Peak Demand	142	Not Active	Medium	0.2–10.5 I_n	1–3000 s	I_n	60 s	15 s
Over I_C Peak Demand	143	Not Active	Medium	0.2–10.5 I_n	1–3000 s	I_n	60 s	15 s
Over I_N Peak Demand	144	Not Active	Low	0.2–10.5 I_n	1–3000 s	I_n	60 s	15 s
Lead	145	Not Active	Low	0.0	1–3000 s	0	40 s	10 s
Lag	146	Not Active	Low	1.1	1–3000 s	1	40 s	10 s
Quadrant 1	147	Not Active	Low	1.1	1–3000 s	1	40 s	10 s
Quadrant 2	148	Not Active	Low	2.2	1–3000 s	2	40 s	10 s
Quadrant 3	149	Not Active	Low	3.3	1–3000 s	3	40 s	10 s
Quadrant 4	150	Not Active	Low	4.4	1–3000 s	4	40 s	10 s

[1] The type of alarms associated with monitoring the cos φ and PF indicators must always be consistent with the sign convention (IEEE or IEC) for the PF indicator.

Table 4: Event Alarms

Alarm Type	Label	Code	SDx Output	Priority
Alarms on a Trip Event	Long-time prot I_r	16384	Yes	High
	Short-time prot I_{sd}	16385	Yes	High
	Instant prot I_i	16386	Yes	High
	Ground fault I_g	16387	Yes	High
	Integ instant prot	16390	No	High
	Trip unit fail (Stop)	16391	Yes	High
	Instant vigi prot	16392	No	High
	Reflex tripping	16393	No	High
	Phase unbalance	16640	Yes	High
	Jam motor prot	16641	Yes	High
	Under load mtr prot	16642	Yes	High
	Under load mtr prot	16642	Yes	High
	Long start mtr prot	16643	Yes	High
	Trip indicator SD	1905	Yes	Medium
Alarms on a Failure Event	BSCM failure (Stop)	1912	Yes	High
	BSCM failure (Err)	1914	Yes	Medium
Alarms on a Maintenance Event	OF operation overrun	1916	Yes	Medium
	Close command overrun	1919	Yes	Medium

Operation of SDx and SDTAM Module Outputs Assigned to Alarms

Two alarms can be assigned to the two SDx Module outputs.

Set up the two outputs using the RSU software (Outputs tab). They are activated (or deactivated) by the occurrence (or completion) of:

- An alarm associated with a measurement (see “Alarms Associated with Measurements” on page 13)
- An alarm on a trip, failure, and maintenance event (see“Alarms on a Trip, Failure, and Maintenance Event” on page 16)

The two outputs on the SDTAM Module (Micrologic M) cannot be configured:

- Output 1 is assigned to motor thermal fault indication
- Output 2 is used to open the contactor

For more details on the SDx and SDTAM Modules, see the *PowerPact™ H-, J-, and L-Frame Circuit Breaker—User Guide*.

SDx Module Output Operating Modes

Set the operating mode for the SDx Module outputs as:

- Non-latching mode

  The output (S) position follows the associated alarm (A) transitions.

- Latching mode

  The position of the output (S) follows the active transition of the associated alarm (A) and remains latched irrespective of the alarm state.

- Time-delayed non-latching mode

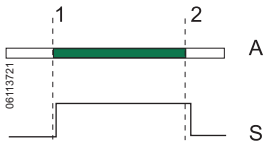
  The output (S) follows the activation transition for the associated alarm (A). The output returns to the deactivated position after a time delay irrespective of the alarm state.

  The setting range for the time delay (using the RSU software) is 1–360 s. The default time delay setting is 5 seconds.

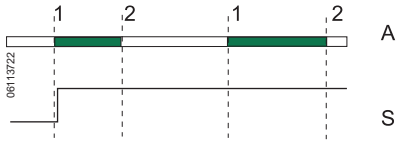
- Open or closed forced mode
  - — In open forced mode, the output remains in the deactivated position irrespective of the alarm state.
  - — In closed forced mode, the output remains in the activated position irrespective of the alarm state.

  NOTE: Both these modes can be used for debugging or checking an electrical installation.

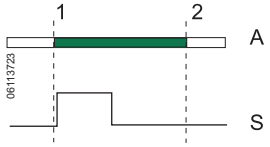
Operation in Non-Latching Mode



Operation in Latching Mode



Operation in Time-Delayed Non-Latching Mode



A Alarm:
Shaded when activated
White when deactivated

S Output:
High position = activated
Low position = deactivated

1 Alarm activation transition

2 Alarm deactivation transition

Acknowledgment of Latching Mode

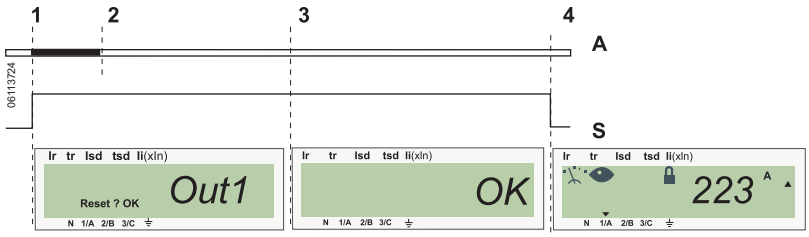
Acknowledge the Latching Mode using the Micrologic trip unit keypad by pressing the Special Features of Latching Mode

If the acknowledge request is made when the alarm is still active:

- Acknowledgment of the output active position has no effect.
- Keypad navigation is possible.
- The screensaver returns to the Out1 message.

If two alarms associated with two outputs in latching mode are active:

- The first alarm message Out1 (or Out2) is displayed on the screen until the alarm is acknowledged (the output's active position is acknowledged after the alarm is deactivated).
- After acknowledgment of the first alarm, the screen displays the second alarm message Out2 (or Out1) until the second alarm is acknowledged.
- After both acknowledgments, the display returns to the screensaver.



A Alarm:
Green when activated
White when deactivated

S Output:

High position = activated
Low position = deactivated

Step	Event/Action	Display Information
1	Alarm activation	“Out1” is displayed.
2	Alarm deactivation	“Out1” is still displayed.
3	Confirm active position of the output (press the key twice to confirm)	“OK” is displayed.
4	–	The screensaver is displayed.

Section 5—Remote Setting Utility (RSU) Software

Function Setting

The Remote Setting Utility (RSU) software works with Micrologic™ trip units to:

- Check and configure:
  - Metering functions
  - Alarms
  - Assignment of the SDx Module outputs
  - BSCM functions
  - Modbus™ Interface Module
- Modify passwords
- Save configurations
- Edit configurations
- Display trip curves
- Download the firmware

In the context of this manual, only the functions relating to setup of the Micrologic trip unit and the SDx and SDTAM Modules are described. For more information about functions, in particular configuring the BSCM option, the Modbus communication interface option, and passwords, see the *RSU Software Online Help*.

Using the RSU Software

The RSU software can be used:

- In standalone mode, directly on the Micrologic trip unit using the test port, a standard computer, and the UTA tester.
- Using the communication network

For more details, see the *RSU Software Online Help*.

User Profiles

Two different user profiles are available in the RSU software: Commissioning and Schneider Service.

- The Commissioning profile is the default profile when you start the RSU software. This profile does not need a password.
- The Schneider Service profile allows the same access as the Commissioning profile plus the firmware updates, and password resets. Download firmware from www.schneider-electric.com.

To download RSU test software (LV4ST100):

- go to www.schneider-electric.com and do a search for LV4ST100.
- Click on LV4ST100, then click Software/Firmware under Downloads menu, then download.

Offline Mode

Use offline mode to configure the protection, metering, and alarm functions of the Micrologic trip unit in the RSU software.

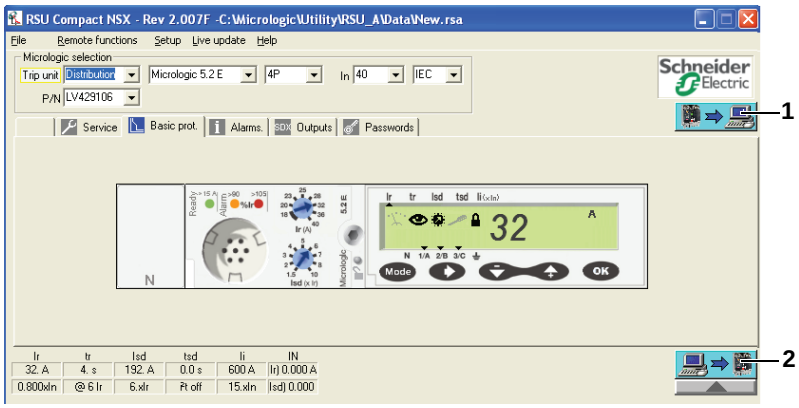
For more details on offline mode, see the *RSU Software Online Help*.

Online Mode

Use online mode to:

- Perform the same configurations as offline mode
- Download information from or to the Micrologic trip unit

For more details on online mode, see the *RSU Software Online Help*.



Two buttons located on the right of the screen activate the data transfer.

1. Button for downloading information from the trip unit to the computer
2. Button for downloading information from the computer to the trip unit

Software Configuration Tabs

Access the RSU software configuration functions using different tabs.

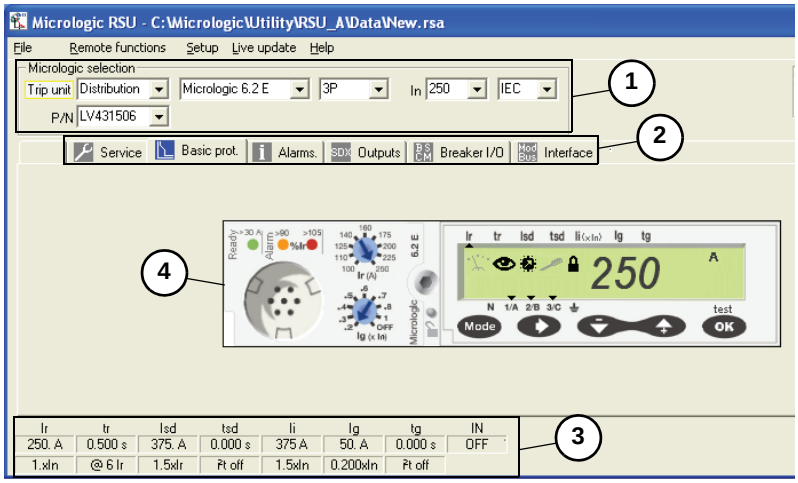
Tab	Description	Functions
Service	Metering	Configuring the metering functions (Micrologic E)
Basic prot	Basic Protection	Setting the Protection Functions
Alarms.	Alarm	Configuring pre-alarms and the ten user-defined alarms
SDx Outputs	SDx Outputs	Assignment of the two SDx outputs
Passwords	Passwords	Configuring four password levels of the BSCM
BSCM BreakerI/O	BSCM Option	• Counters for OF operations and actions on SD and SDE faults • Alarm threshold associated with the OF counter • Communicating motor mechanism: Close command counter • Communicating motor mechanism: Configuring the motor reset command • Communicating motor mechanism: Alarm threshold associated with the close command counter
Mod Bus Interface	Modbus Interface Option	• Reading Modbus addresses • Communication functions setup

The **Basic prot.** tab is the default display when the user starts RSU.

A blue pictogram indicates which tab is active.

For example, this pictogram  indicates that the **Basic prot.** tab is the active tab.

In the figure below, the user has manually selected a Micrologic 6.2.E trip unit (offline mode). The Basic Protection screen displays a reproduction of the front face of the Micrologic trip unit and its protection settings.

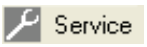


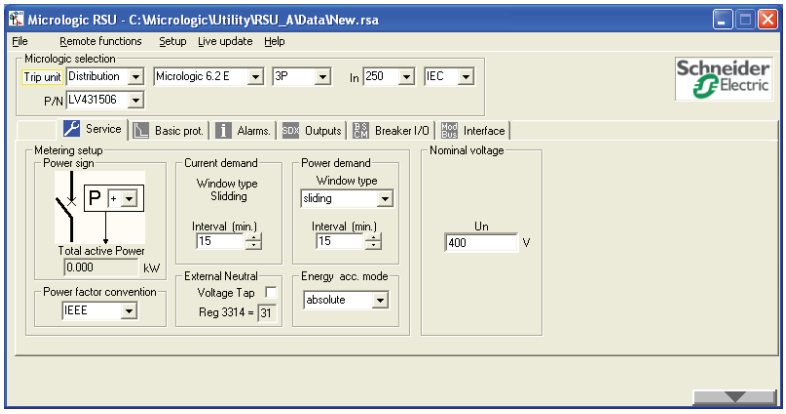
1. Micrologic selection windows
2. Accessible function tabs
3. Protection settings
4. Reproduction of the front face of the Micrologic trip unit

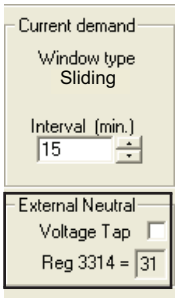
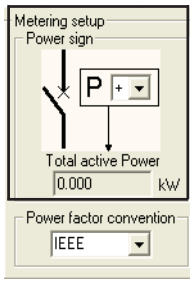
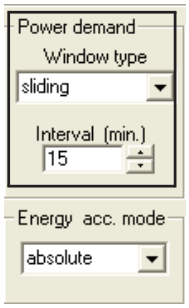
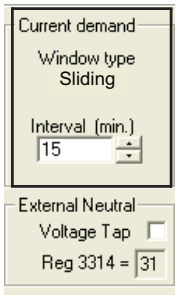
Saving and Printing

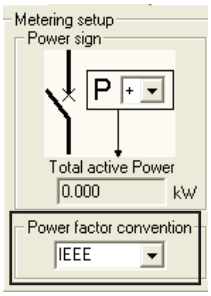
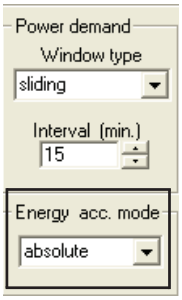
The different settings and data can be saved and printed.

Metering Setup

Access the metering setup settings using the RSU software under the  tab.

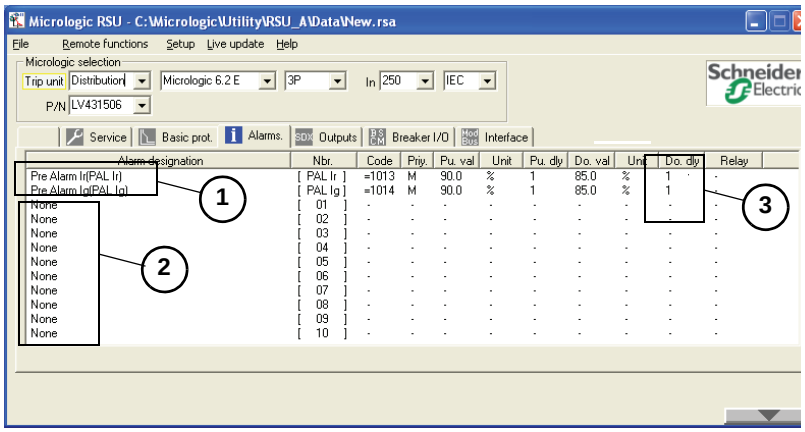


Description	Screen	Action
ENVT Option Setup (Screen Action Device)		Check the declaration box for the ENVT option in the Metering setup/External Neutral Voltage Tap window. For a description of the content of Modbus 3314 register, see the *Modbus PowerPact™ H-, J-, and L-Frame Circuit Breaker User Manual*. **NOTE:** Set the ENCT option directly on the Micrologic trip unit screen or using the RSU software under the Basic prot tab.
Power Setup Provides the choice of power sign in the Services tab:		In the Metering setup/Power sign window, select the power sign: • + The power running through the circuit breaker from top to bottom is counted positively. • - The power running through the circuit breaker from bottom to top is counted negatively. The default value of the powersign is +.
Demand Values Setup		Use the two drop-down menus to set the functions for calculating the power demand value in the Power demand window: • Select the type of calculation window in the Window type drop-down menu: fixed window, sliding window, synchronized window. • Indicate the duration of the calculation window using the scroll bars in the Interval drop-down menu. The duration can be 5 to 60 minutes in increments of 1 minute.
Current Demand Setup		In the Current demand/Interval window indicate the duration of the calculation window using the scroll bars in the Interval drop-down menu: the duration can be from 5 to 60 minutes in increments of 1 minute. The calculation window type must be sliding window.

Quality Indicator		Sets the cos φ and power factor (PF) indicators in the Setup Services tab: Select the sign convention in the Power factor sign window. The default setting for the sign convention is the IEEE convention.
Energy Accumulation Mode Setup		To set up the energy accumulation mode in the Services tab: Select the energy accumulation mode in the Energy Accu Mode window. • Absolute energy: The energies supplied and consumed are counted positively. • Signed energy: The energy supplied is valued negatively, the energy consumed is valued positively. The default setting for the energy accumulation mode is absolute energy mode.

Alarm Setup

Access the alarm selection and setup using the RSU software under the Alarms. tab.



1. Alarm already activated and set up
2. List of possible alarm assignments
3. Alarm functions

Activating an Alarm

1. Select none for a free assignment, for example the first available line on the Alarms tab screen.
2. Double-click none; the Alarm setup selection and setting screen appears:
3. Select the alarm to activate from the drop-down menu in the Alarm setup screen.
4. Once the alarm has been selected:
   —If the default setting is correct, click OK (the alarm is activated in the drop-down menu of assignments with the default functions)

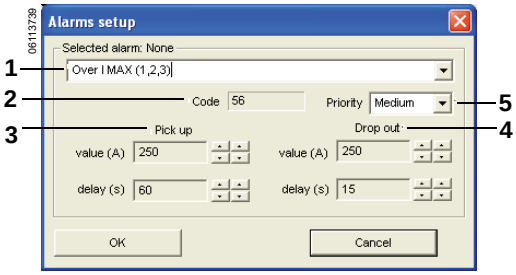
   —To modify the default setting, set the alarm functions.

Setting Alarm Functions

For more details on the list of alarms, the setting ranges and default settings, see “Tables of Alarms” on page 85.

1. Set the priority level in the Priority window using the scroll bar (four options).
2. Set the pickup threshold value and time delay (if present) in the Pick up/value and Pick up/delay windows using the scroll bars.
3. Set the dropout threshold value and time delay (if present) in the Drop out/value and Drop out/delay windows using the scroll bars.
4. Confirm the setting by clicking OK. The alarm is activated in the drop-down menu of assignments with its priority level and the values of its activation and deactivation functions)

Alarm Setup Screen



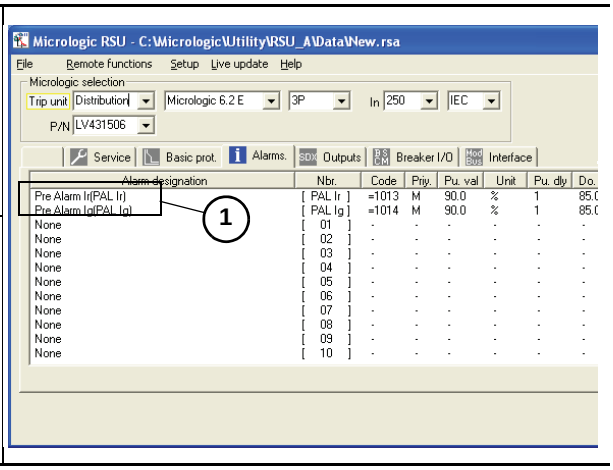
1. Alarm Name
2. Alarm Code
3. Activation functions (pickup and time delay)
4. Deactivation functions (drop-out and time delay)
5. Priority Level

For functions with a wide setting range, there are two scroll bars:

- Left scroll bar for presetting
- Right scroll bar for fine-tuning

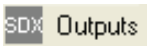
Unless set, functions remain at their default value (except when the RSU software must modify the value to avoid a setting conflict).

The RSU software monitors the setting ranges and prohibits setting conflicts (for example, if the pickup threshold is set below the dropout threshold for an alarm with an overvalue condition, the software sets the thresholds to the same value).

Modifying an Alarm	1. Double-click the alarm in the list in the Alarms tab (1). 2. Modify the functions in the drop-down menu in the Alarm setup screen. 3. Set the dropout threshold value and time delay (if present) in the Drop out/value and Drop out/delay windows using the scroll bars. 4. Confirm by clicking OK (the new alarm functions appear in the right side of the drop-down menu).	
Deleting an Alarm	1. Double-click the alarm in the Alarms tab. 2. Select none from the drop-down menu in the Alarm setup screen. 3. Confirm by clicking OK (none appears in place of the alarm in the drop-down menu).	

Setting the SDx Module Output Functions

All alarms on a trip, failure, and maintenance event and all alarms associated with a measurement, previously activated in the Alarms tab, can be assigned to an SDx Module output.

Access the SDx Module output settings using the RSU software under the Output tab 

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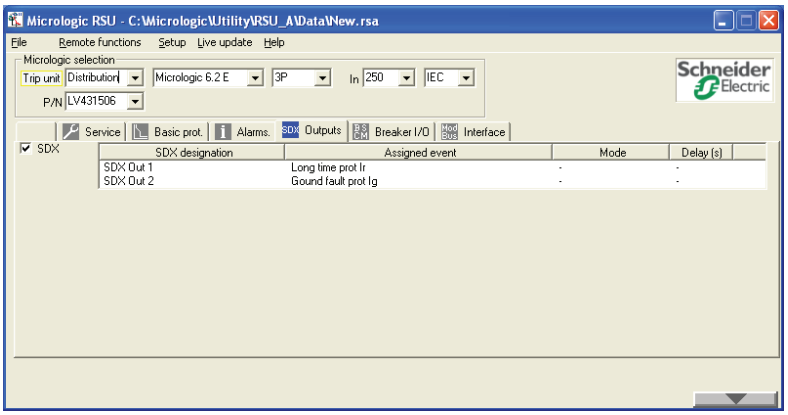
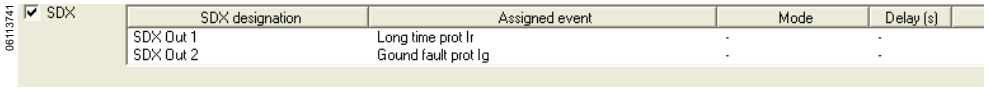


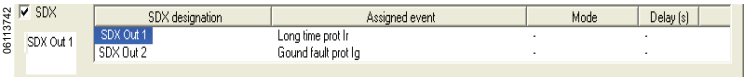
Default Assignment of the SDx Module Outputs

Outputs Tab for Micrologic 6 Trip Unit

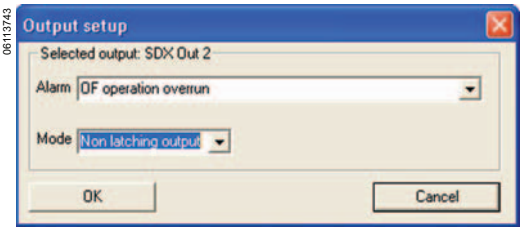


- Micrologic 5 trip unit:
  — Output 1 is the thermal fault indication (SDT).
  — Output 2 is the long-time pre-alarm (PAL I_r).
- Micrologic 6 trip unit:
  — Output 1 is the thermal fault indication (SDT) for electrical distribution applications.
  — Output 1 is None for motor-feeder applications.
  — Output 2 is the ground-fault indication (SDG).

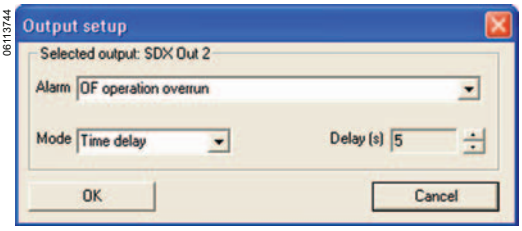
Assignment of an Alarm to an SDx Module



1. Select Output Setup Window
   Double-click the output (Out1 or Out2) to be assigned. An Output setup window appears.



2. **Select Alarm**
   Select the alarm to assign to the output from the Alarm drop-down menu in the Output setup window. The drop-down menu contains all the alarms on a trip, failure, and maintenance event and the alarms associated with measurements activated in the Alarms tab (see “Alarm Setup” on page 28.).



3. **Select Operating Mode**
   If necessary, select the output operating mode from the Mode drop-down menu.
   If necessary, set the time delay.

Conclusion

Micrologic 5/6 trip units combine maintenance indicators with trip history to analyze the level of stress upon each device and allow users to plan maintenance cycles. These features also reduce event troubleshooting and resolution times by allowing the setting of pre-set action plans based on event type.

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