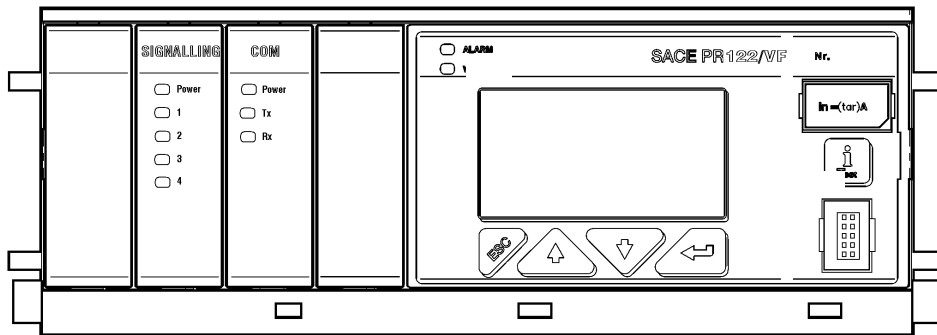


Project
Emax VF

Subproject
PR122/VF

Title
Modbus System Interface



The aim of this document is to show the addresses of all the information available in PR122/VF. Moreover, it explains the procedures to read information and program the parameters of the above mentioned protection units.

| | | | | | | |
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 1/40 |

Index

Page

| | |
|------------------------------------------------------|-----------|
| 1. REVISION HISTORY | 5 |
| 1.1 REV 01, 11/01/2011 | 5 |
| 2. AIM | 5 |
| 3. ACRONYMS AND DEFINITIONS | 5 |
| 3.1 ACRONYMS..... | 5 |
| 4. COMMUNICATION PARAMETERS | 6 |
| 5. UNIT IDENTIFICATION | 6 |
| 6. AVAILABLE MODBUS FUNCTIONS | 6 |
| 6.1 FUNCTION 03 (03H) READ HOLDING REGISTERS | 7 |
| 6.2 FUNCTION 04 (04H) READ INPUT REGISTERS | 7 |
| 6.3 FUNCTION 06 (06H) WRITE SINGLE REGISTER | 7 |
| 6.4 FUNCTION 08 (08H) DIAGNOSTIC..... | 7 |
| 6.5 FUNCTION 16 (10H) WRITE MULTIPLE REGISTERS | 8 |
| 6.6 FUNCTION 17 (11H) REPORT SLAVE ID..... | 8 |
| 6.7 FUNCTION 70 (46H) READ EXTENDED REGISTERS | 8 |
| 6.8 EXCEPTION RESPONSES | 9 |
| 6.8.1 <i>Illegal function</i> | 9 |
| 6.8.2 <i>Illegal data address</i> | 9 |
| 6.8.3 <i>Illegal data value</i> | 9 |
| 6.8.4 <i>Slave device failure</i> | 9 |
| 6.8.5 <i>Slave device busy</i> | 9 |
| 6.8.6 <i>Exception occurrences</i> | 9 |
| 7. MODBUS MAP | 10 |
| 7.1 MEASURES | 10 |
| 7.2 PROTECTIONS | 10 |
| 7.3 REGISTER MAP..... | 11 |
| 7.3.1 <i>SYSTEM BUS MAP</i> | 11 |
| 7.4 DATALOGGER MAP (EXTENDED REGISTERS) | 12 |
| 8. DESCRIPTION OF REGISTERS | 14 |
| 8.1 COMMANDS..... | 14 |
| 8.2 STATISTICAL DATA..... | 15 |
| 8.3 PROGR FAIL ERROR CODE | 15 |
| 8.4 STATE | 17 |
| 8.5 TIME..... | 20 |
| 8.6 RUN-TIME MEASURES | 20 |
| 8.7 INFORMATION | 20 |
| 8.8 PARAMETERS CONFIGURATION 1 | 21 |
| 8.9 PARAMETERS CONFIGURATION 2 | 21 |
| 8.10 PARAMETERS CONFIGURATION 3..... | 22 |
| 8.11 PARAMETERS PROTECTION SET1..... | 23 |
| 8.12 TRIP HISTORY | 24 |
| 8.13 MEASURES HISTORY..... | 25 |
| 8.14 LOG EVENTS | 25 |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------------|-------------------|
| Author Autore | LB-DTEA | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 2/40 |
| | | | | | | |

| | | |
|------------|----------------------------------------------------------------------|-----------|
| 9. | TABLES..... | 26 |
| 10. | CHECK OF PARAMETERS ACCURACY | 27 |
| 11. | OPERATION DESCRIPTION..... | 27 |
| 11.1 | PARAMETER PROGRAMMING | 27 |
| 11.2 | DATALOGGER..... | 28 |
| 11.2.1 | <i>Recorded data.....</i> | 29 |
| 11.2.2 | <i>Trigger state information</i> | 29 |
| 11.2.3 | <i>Datalogger settings</i> | 30 |
| 11.2.4 | <i>Available commands for the datalogger.....</i> | 31 |
| 11.2.5 | <i>Functioning description</i> | 32 |
| 11.3 | MEASURE HISTORY DATA STRUCTURE | 33 |
| 11.4 | RELAY FUNCTIONALITY..... | 34 |
| 11.4.1 | <i>Settings of relay functionality of the signaling module</i> | 35 |
| 11.5 | SIGNALLING MODULE INPUT FUNCTIONALITY | 36 |
| 11.5.1 | <i>Settings of input signalling module.....</i> | 37 |
| 11.6 | CB STATE INFORMATION | 37 |
| 11.7 | STATISTICAL DATA..... | 38 |
| 11.8 | RELAYS YO AND YC | 39 |
| 11.9 | COMAMND EXECUTION CONDITIONS | 40 |
| 11.9.1 | <i>Command execution conditions:.....</i> | 40 |
| 11.10 | MEASURE LIMITS AND REPRESENTATION..... | 40 |
| 11.11 | CONTACT WEAR..... | 40 |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|-------------------|
| Author Autore | LB-DTEA | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 3/40 |
| | | | | | | |

Index of figures

Page

FIGURE 1 PROGRAMMING SESSION CORRECTLY HANDLED27
 FIGURE 2 PROGRAMMING FAILED27
 FIGURE 3 PROGRAMMING ABORTED.....28
 FIGURE 5 THREE SITUATIONS OF RECORDING.....28
 FIGURE 6 RECORDING TIME LOWER THAN MAXIMUM29
 FIGURE 7 EXAMPLE OF STOP DATALOGGER FOR TRIGGER OR FOR STOP COMMAND AND RESTART TRIGGER COMMAND32
 FIGURE 8 RELAY FUNCTIONALITY.....34
 FIGURE 9 EFFECT OF MINIMUM TIME OF RELAY ACTIVATION34
 FIGURE 10 SIGNALLING MODULE INPUT FUNCTIONALITY.....36

Index of tables

Page

TABLE 1 TAB_INPUT_OUTPUT13
 TABLE 2 TAB_TRIP13
 TABLE 3 TAB_ALARM_113
 TABLE 4 TAB_ALARM_213
 TABLE 5 TAB_COMMANDS14
 TABLE 6 TAB_PAR_ERR_CODE16
 TABLE 7 TAB_TRIP_TYPE24
 TABLE 8 TAB_RELAYS_FUNCTION.....26
 TABLE 9 TAB_P_RELE_CONFIG26
 TABLE 10 TAB_CB_TYPE26
 TABLE 11 TAB_LOG_EVENTS26
 TABLE 12 TAB_DLOG_RECORDING TIME.....30
 TABLE 13 COMMAND EXECUTION CONDITIONS.....40

| | | | | | | | |
|------------------|---------|--|--|--|--------------------|----------------------------------------------------------|-----------|
| Author Autore | LB-DTEA | | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. |
| | | | | | | | 4/40 |

1. REVISION HISTORY

1.1 Rev 01, 11/01/2011

First release.

2. AIM

The aim of this document is to indicate the addresses of all the information available with PR122/VF.

Moreover, it explains the procedures to read information and to program the parameters of the above mentioned protection units.

3. ACRONYMS AND DEFINITIONS

3.1 Acronyms

| | |
|---------|---------------------------------------|
| AI | Analog Input |
| AO | Analog Output |
| CB | Circuit Breaker |
| LSb | Least Significant Bit |
| MSb | Most Significant Bit |
| LSB | Least Significant Byte |
| MSB | Most Significant Byte |
| | |
| BOOL | Bit or Boolean (IEC 61131-3) |
| BYTE | Byte (IEC 61131-3) |
| WORD | Word (IEC 61131-3) |
| DWORD | Double word (IEC 61131-3) |
| LWORD | Long Word (IEC 61131-3) |
| SINT | Short Integer (IEC 61131-3) |
| USINT | Unsigned Short Integer (IEC 61131-3) |
| INT | Single Integer (IEC 61131-3) |
| UINT | Unsigned Integer (IEC 61131-3) |
| DINT | Double Integer (IEC 61131-3) |
| UDINT | Unsigned Double Integer (IEC 61131-3) |
| LINT | Long Integer (IEC 61131-3) |
| ULINT | Unsigned Long Integer (IEC 61131-3) |
| STRING | Text String (IEC 61131-3) |
| UNICODE | Unicode (IEC 61131-3) |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|-------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 5/40 |

4. Communication parameters

| Serial type | Baud rate | Address | Addressing type | Physical protocol |
|-------------|------------------|---------|-----------------|------------------------------------------|
| SSI | 500 KHz | 3 | Standard | E, 8, 1 |
| Bus EXT | 9600/19200 bit/s | 1 ÷ 247 | Standard / ABB | E, 8, 1 O, 8, 1 N, 8, 2 N, 8, 1 |
| Bus INT | 19200 bit/s | 3 | Standard | E, 8, 1 |
| Bus Test | 19200 bit/s | 3 | Standard | E, 8, 1 |

5. Unit identification

| Unit | Slave ID |
|----------|----------|
| PR122/VF | 0x11 |

6. Available Modbus functions

| Function Code | | Name | Applicable to |
|---------------|-----------|--------------------------|---------------|
| 03 (03h) | | Read Holding Registers | AO |
| 04 (04h) | | Read Input Registers | AI |
| 06 (06h) | | Write Single Register | AO |
| Funct Code | Subf Code | Name | Applicable to |
| 08 (08h) | 00 (00H) | Diagnostic Loopback | --- |
| Function Code | | Name | Applicable to |
| 16 (10h) | | Write Multiple Registers | AO |
| 17 (11h) | | Report Slave ID | --- |
| 70 (46h) | | Read Extended Registers | Extended Reg |

Nota 1. All queries must respect the limitation of the maximum modbus message length of 256 byte

Legend:

AA = slave address (1 247)

cl = byte low of CRC

ch = byte high of CRC

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|-------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 6/40 |

6.5 Function 16 (10h) Write Multiple Registers

Query

| Addr | Funcnt | Starting addr | | Num of registers | | Byte count | | Reg value | | ... | Reg value | | Crc | |
|------|--------|---------------|-----|------------------|-----|------------|--|-----------|-----|-----|-----------|-----|-----|----|
| Aa | 10h | High | Low | High | Low | Nn | | High | Low | ... | High | Low | ch | cl |

Nota 1. Number of registers ≤ 123

Response

| Addr | Function | Starting address | | Number of register | | Crc | |
|------|----------|------------------|-----|--------------------|-----|-----|----|
| Aa | 10h | High | Low | High | Low | ch | cl |

Nota 2. Number of registers ≤ 123

6.6 Function 17 (11h) Report slave ID

Query

| Addr | Function | Crc | |
|------|----------|-----|----|
| AA | 11h | Ch | cl |

Response

| Addr | Function | Byte count | Slave ID | Run indicator | Sw Version | | Addr event | | Device Ser Nr | Crc | |
|------|----------|------------|----------|---------------|------------|-----|------------|-----|-----------------|-----|----|
| AA | 11h | 16h | ID | 0FFh | High | Low | High | Low | 16 byte (ASCII) | ch | cl |

6.7 Function 70 (46h) Read Extended Registers

Query

| Addr | Function | Byte count | Ref type | File number | | Starting address | | Number of registers | | Crc | |
|------|----------|------------|----------|-------------|-----|------------------|-----|---------------------|-----|-----|----|
| AA | 46h | 07h | 06h | High | Low | High | Low | High | Low | ch | Cl |

Nota 1. File number ≤ 3

Nota 2. Starting address ≤ 65535

Nota 3. Number of registers ≤ 125

Response

| Addr | Funcnt | Byte count | Ref type | Reg value | | ... | Reg value | | Crc | |
|------|--------|------------|----------|-----------|-----|-----|-----------|-----|-----|----|
| AA | 46h | Nn | 06h | High | Low | ... | High | Low | ch | Cl |

| | | | | | | | | | | |
|------------------|---------|--|--|--|--------------------|----------------------------------------------------------|--|--|--|-------------------|
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| ABB | L4618 | | | | Doc. No N. Doc. | 1SDH000922R0001 | | | | Tot. Pag. 8/40 |

6.8 Exception responses

6.8.1 Illegal function

| Addr | Function | Exception code | Crc | |
|------|----------------|----------------|-----|----|
| AA | Function + 80h | 01h | ch | cl |

6.8.2 Illegal data address

| Addr | Function | Exception code | Crc | |
|------|----------------|----------------|-----|----|
| AA | Function + 80h | 02h | ch | cl |

6.8.3 Illegal data value

| Addr | Function | Exception code | Crc | |
|------|----------------|----------------|-----|----|
| AA | Function + 80h | 03h | ch | cl |

6.8.4 Slave device failure

| Addr | Function | Exception code | Crc | |
|------|----------------|----------------|-----|----|
| AA | Function + 80h | 04h | ch | cl |

6.8.5 Slave device busy

| Addr | Function | Exception code | Crc | |
|------|----------------|----------------|-----|----|
| AA | Function + 80h | 06h | ch | cl |

6.8.6 Exception occurrences

| | | EXCEPTIONS | | | | |
|-----------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | 01 Illegal function | 02 Illegal data address | 03 Illegal data value | 04 Slave device failure | 06 Slave device busy |
| QUERY FUNCTIONS | 03 | | <ul style="list-style-type: none"> Starting address not valid | <ul style="list-style-type: none"> Invalid query length Requested no. of register too large Address out of modbus map | | |
| | 04 | | <ul style="list-style-type: none"> Starting address not valid | <ul style="list-style-type: none"> Invalid query length Requested no. Of register too large Address out of modbus map | | <ul style="list-style-type: none"> Reading attempt in flash with flash busy |
| | 06 | | <ul style="list-style-type: none"> Starting address not valid Write of a time information not allowed with this function | <ul style="list-style-type: none"> Invalid query length | | <ul style="list-style-type: none"> Reading from ext bus in local mode Programming session already open on the other bus Programming session not open |
| | 08 | | | <ul style="list-style-type: none"> Subfunction ≠ 00 00 Invalid query length | | |
| | 16 | <ul style="list-style-type: none"> Starting address not valid | <ul style="list-style-type: none"> Invalid query length Requested no. of register too large Address out of modbus map Not provided command Invalid command parameter Wrong time | <ul style="list-style-type: none"> Parameters error check after a stop programming session command | <ul style="list-style-type: none"> Reading from ext bus in local mode Programming session not open Programmings session already open on other bus Command acceptance conditions not verified | |
| | 17 | | | <ul style="list-style-type: none"> Invalid query length | | |
| 70 | <ul style="list-style-type: none"> Starting address not valid | <ul style="list-style-type: none"> Invalid query length No. of registers too large Invalid Address out of map Field Ref Type Invalid Field Byte count | | <ul style="list-style-type: none"> Reading attempt of busy datalogger | | |

| | | | | | | |
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 9/40 |

7. MODBUS MAP

Data format LINT (4 byte = 2 word = 2 registers) is transferred with low significant part at lower modbus address (LOW-HIGH)

| | |
|----------------|---------|
| Register i | LS word |
| Register i + 1 | MS word |

Instead within WORD data the most significant byte is transferred first (as in MODBUS RTU standard)

| | |
|---------|---------|
| MS byte | LS byte |
|---------|---------|

7.1 MEASURES

The following table shows the available measures for each type of device and possible necessary conditions:

| | PR122/VF |
|-------------------|----------|
| Line currents | ✓ |
| Trip history | ✓ |
| Log event history | ✓ |
| Measure history | ✓ |
| Contact wear | ✓ |
| Datalogger | ✓ |

Legend ✓: Available without further conditions

7.2 PROTECTIONS

The following table shows the different available protections for each type of device and possible necessary conditions:

| | PR122/VF |
|----------|------------------|
| L | ✓ |
| I | ✓ |
| OT | ✓ |
| LC | ✓ ⁽¹⁾ |
| Hw prot. | ✓ |

Legend ✓: Available without further conditions

⁽¹⁾: Load control always enabled on state bits but feasible only if present signaling module or output unit on system bus (ex: PR120/K)

| | | | | | | | |
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| | | | | | | | 10/40 |

7.3 REGISTER MAP

7.3.1 SYSTEM BUS MAP

| Ind rel | AI [30001] | AO [40001] | | |
|------------|--------------------------------------|------------------------|-------------|------------|
| | Function 4 (6.2) | Function: | 16 (6.5) | 3 (6.1) |
| 0 | STATISTICAL DATA (8.2) | COMMANDS(8.1) | | |
| 50 | PROGR FAIL ERROR CODE (8.3) | | | |
| 100 | STAT(8.4) | TIME(8.5) (*) | | |
| 200 | RUN TIME MEASURES (8.5) | | | |
| 600 | (8.7) | | | |
| 700 | INFORMATION(8.7) | | | |
| 1000 | PAR. CONFIG1 ACTUAL(8.8) | | | |
| 1020 | PAR. CONFIG2 ACTUAL(8.9) | | | |
| 1050 | PAR. CONFIG3 ACTUAL(8.10) | PAR. CONFIG3 NEW (*) | | |
| 1100 | PAR. PROT. SET1 ACTUAL (8.11) | PAR. PROT SET1 NEW (*) | | |
| 2000 | TRIP HISTORY (8.12) | | | |
| 2500 | MEASURE HISTORY (8.13) | | | |
| 3300 | LOG EVENT (0) | | | |
| 6000 | | | | |



***FLASH** : could be busy (busy exception response)

(*) Parameters that can be written only during an open programming session

Example of table reading:

RUN-TIME MEASURES analog input absolute address: $30001 + \text{offset}(200) = 30201$

The relative address is $\text{offset}(200) = 200$

| | | | | | | |
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. |
| | | | | | | 11/40 |

7.4 DATALOGGER MAP (extended registers)



Addressing type “ABB” cannot be used for these registers, therefore the address field will be always included between 1 and 65536 for all addressing methods.

| File Number | Sample Number | Extended Reg (600000) | | |
|--------------|--------------------------|-----------------------|---------------------|------------------|
| | | Function 70 | | |
| | | Rel. address | Description | Note |
| File 0 (Old) | Samples 0 (Old) | 0 | Current sample I1 | note 1 |
| | | 1 | Current sample I2 | note 1 |
| | | 2 | Current sample I3 | note 1 |
| | | 3 | --- | |
| | | 4 | --- | |
| | | 5 | --- | |
| | | 6 | --- | |
| | | 7 | --- | |
| | | 8 | --- | |
| | | 9 | --- | |
| | | 10 | --- | |
| | | 11 | --- | |
| | | 12 | Input/Output status | TAB INPUT OUTPUT |
| | | 13 | Alarm 1 status | TAB ALARM 1 |
| | | 14 | Alarm 2 status | TAB ALARM 2 |
| | 15 | Trip 1 status | TAB TRIP | |
| | | Samples 1 | 16 ÷ 31 | “ |
| | ... | --- | “ | “ |
| | Samples 4095 (New) | 65519 ÷ 65535 | “ | “ |
| File 1 | Samples 0 ÷ Samples 4095 | 0 ÷ 65535 | “ | “ |
| File 2 | Samples 0 ÷ Samples 4095 | 0 ÷ 65535 | “ | “ |
| File 3 (New) | Samples 0 ÷ Samples 4095 | 0 ÷ 65535 | “ | “ |

note 1: Signal sample with 910 → 1 In

| | | | | | | |
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Table 1 TAB_INPUT_OUTPUT

| Bit | Input type |
|-----|------------------|
| 0 | --- |
| 1 | --- |
| 2 | --- |
| 3 | --- |
| 4 | --- |
| 5 | --- |
| 6 | --- |
| 7 | --- |
| 8 | Relay P1 contact |
| 9 | Relay P2 contact |
| 10 | Relay P3 contact |
| 11 | Relay P4 contact |
| 12 | --- |
| 13 | --- |
| 14 | --- |
| 15 | --- |

Table 2 TAB_TRIP

| Bit | Input type |
|-----|------------|
| 0 | L tripped |
| 1 | -- |
| 2 | -- |
| 3 | I tripped |
| 4 | -- |
| 5 | -- |
| 6 | --- |
| 7 | OT tripped |
| 8 | --- |
| 9 | -- |
| 10 | -- |
| 11 | -- |
| 12 | --- |
| 13 | -- |
| 14 | --- |
| 15 | --- |

Table 3 TAB_ALARM_1

| Bit | Input type |
|-----|-------------------------|
| 0 | --- |
| 1 | Contact Wear Pre-alarm |
| 2 | Contact Wear Alarm |
| 3 | L Pre-alarm |
| 4 | L Timing |
| 5 | --- |
| 6 | --- |
| 7 | --- |
| 8 | --- |
| 9 | --- |
| 10 | --- |
| 11 | OT Pre-alarm |
| 12 | OT Alarm |
| 13 | OT Alarm (Blocked Trip) |
| 14 | --- |
| 15 | --- |

Table 4 TAB_ALARM_2

| Bit | Input type |
|-----|------------|
| 0 | --- |
| 1 | --- |
| 2 | --- |
| 3 | --- |
| 4 | --- |
| 5 | --- |
| 6 | --- |
| 7 | --- |
| 8 | --- |
| 9 | --- |
| 10 | --- |
| 11 | --- |
| 12 | --- |
| 13 | --- |
| 14 | Iw Warning |
| 15 | LC1 Alarm |

| | | | | | | | |
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| ABB | L4618 | | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. |
| | | | | | | | 13/40 |

8. DESCRIPTION OF REGISTERS

8.1 COMMANDS

| Rel addr | # of item | Name | Notes | Bus |
|----------|-----------|-------------------|--------------|------|
| 0 | 1 | COMMAND TYPE | TAB_COMMANDS | SLTI |
| 1 | 1 | COMMAND PARAMETER | TAB_COMMANDS | SLTI |

To execute a command it is requested to write to COMMAND TYPE field the number desired and in the following address the possible parameter related to the command.

To send a command it is requested to use function 16 and write both the command registers and the parameter also if this one is not necessary.

Example 1: to send the command "Trip test", write 19 at the address of the register COMMAND TYPE and each value at the address of the PARAMETER address (parameter not necessary for this command).

Following the command list table with pertinent command parameters.

Table 5 TAB_COMMANDS

| Value | Command type | Parameter |
|-------|--------------------------------|------------|
| 0 | Dummy command | don't care |
| 1 | Trip reset | don't care |
| 2 | Signaling Reset | don't care |
| 3 | Communication statistics reset | don't care |
| 4 | Log event reset | don't care |
| 5 | Start programming session | don't care |
| 6 | Abort programming session | don't care |
| 7 | Stop programming session | don't care |
| 8 | CB Open | don't care |
| 9 | CB Close | don't care |
| 10 | CB Reset | don't care |
| 11 | Wink toggle command | don't care |
| 12 | History measure reset | don't care |
| 13 | --- | don't care |
| 14 | Datalogger trigger restart | don't care |
| 15 | Datalogger stop | don't care |

| | | | | | | | |
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| ABB | L4618 | | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. |
| | | | | | | | 14/40 |

8.2 STATISTICAL DATA

| Rel addr | # of item | Name | Representation | Notes |
|----------|-----------|----------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 0 | 1 | Received message number | 0 ÷ 65535 | Received msg no. = Received msg no. with crc error + Sent msg no. + Received broadcast msg no. |
| 1 | 1 | Received message number with crc error | 0 ÷ 65535 | |
| 2 | 1 | Sent message number | 0 ÷ 65535 | Total exception response number included |
| 3 | 1 | Slave Busy exception number responses | 0 ÷ 65535 | |
| 4 | 1 | Total exception response number | 0 ÷ 65535 | Slave Busy exception number response included |
| 5 | 1 | Contact wear | 0 ÷ 65000 (100% = 65000) CW > 100% → 65000 | |
| 6 | 1 | Total trip protection number | 0 ÷ 65535 | Protection trip fail number included |
| 7 | 1 | Total operation number | 0 ÷ 65535 | Total operation no. = Manual operation no. + protection trip no. + protection trip fail no. + N° trip test no. |
| 8 | 1 | Manual operation number | 0 ÷ 65535 | |
| 9 | 1 | Total trip protection number | 0 ÷ 65535 | Protection trip fail number not included |
| 10 | 1 | Trip protection fail number | 0 ÷ 65535 | |
| 11 | 1 | Trip test number | 0 ÷ 65535 | |



Registers from address 0 to 4 compose the communication statistics, registers from address 6 to 11 compose CB operation statistics.

8.3 PROGR FAIL ERROR CODE

| Rel addr | # of item | Name | Notes |
|----------|-----------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 50 | 1 | Programming Fail Error Code | 0: No error 1 ÷ 999: See table TAB_PAR_ERR_CODE Common: 3001: Error on the change language |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------------|--------------------|
| Author Autore | LB-DTEA | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 15/40 |

Table 6 TAB_PAR_ERR_CODE

| Par error code | | | Parameters |
|----------------|-----|----------|------------|
| < min> | max | Step err | address |
| 0 | 1 | 2 | Not used |
| 3 | 4 | 5 | 1020 |
| 6 | 7 | 8 | 1050 |
| 9 | 10 | 11 | 1301 |
| 12 | 13 | 14 | 1021 |
| 15 | 16 | 17 | 1022 |
| 18 | 19 | 20 | 1023 |
| 21 | 22 | 23 | 1024 |
| 24 | 25 | 26 | 1025 |
| 27 | 28 | 29 | 1026 |
| 30 | 31 | 32 | 1051 |
| 33 | 34 | 35 | 1083 |
| 36 | 37 | 38 | 1302 |
| 39 | 40 | 41 | 1303 |
| 42 | 43 | 44 | 1304 |
| 45 | 46 | 47 | 1305 |
| 48 | 49 | 50 | 1306 |
| 51 | 52 | 53 | 1307 |
| 54 | 55 | 56 | 1308 |
| 57 | 58 | 59 | 1309 |
| 60 | 61 | 62 | 1028 |
| 63 | 64 | 65 | 1029 |
| 66 | 67 | 68 | 1030 |
| 69 | 70 | 71 | 1031 |
| 72 | 73 | 74 | 1095 |
| 75 | 76 | 77 | 1096 |
| 78 | 79 | 80 | 1084 |
| 81 | 82 | 83 | 1085 |
| 84 | 85 | 86 | 1086 |
| 87 | 88 | 89 | 1087 |
| 90 | 91 | 92 | 1088 |
| 93 | 94 | 95 | 1089 |
| 96 | 97 | 98 | 1090 |
| 99 | 100 | 101 | 1091 |
| 102 | 103 | 104 | 1092 |
| 105 | 106 | 107 | 1093 |
| 108 | 109 | 110 | 1027 |
| 111 | 112 | 113 | 1094 |
| 114 | 115 | 116 | 1032 |
| 117 | 118 | 119 | 1097 |
| 120 | 121 | 122 | 1098 |
| 123 | 124 | 125 | 1052 |
| 126 | 127 | 128 | 1067 |
| 129 | 130 | 131 | 1053 |
| 132 | 133 | 134 | 1054 |
| 135 | 136 | 137 | 1055 |
| 138 | 139 | 140 | 1056 |
| 141 | 142 | 143 | 1057 |
| 144 | 145 | 146 | 1058 |
| 147 | 148 | 149 | 1059 |
| 150 | 151 | 152 | 1060 |
| 153 | 154 | 155 | 1061 |
| 156 | 157 | 158 | 1062 |
| 159 | 160 | 161 | 1063 |
| 162 | 163 | 164 | 1064 |
| 165 | 166 | 167 | 1065 |
| 168 | 169 | 170 | 1066 |
| 171 | 172 | 173 | 1068 |
| 174 | 175 | 176 | 1069 |
| 177 | 178 | 179 | 1070 |
| 180 | 181 | 182 | 1071 |


| Par error code | | | Parameters |
|----------------|-----|----------|------------|
| < min> | max | Step err | address |
| 183 | 184 | 185 | 1072 |
| 186 | 187 | 188 | 1073 |
| 189 | 190 | 191 | 1074 |
| 192 | 193 | 194 | 1075 |
| 195 | 196 | 197 | 1076 |
| 198 | 199 | 200 | 1077 |
| 201 | 202 | 203 | 1078 |
| 204 | 205 | 206 | 1079 |
| 207 | 208 | 209 | 1080 |
| 210 | 211 | 212 | 1081 |
| 213 | 214 | 215 | 1082 |
| 216 | 217 | 218 | 1300 |
| 219 | 220 | 221 | 1314 |
| 222 | 223 | 224 | 1310 |
| 225 | 226 | 227 | Not used |
| 228 | 229 | 230 | Not used |
| 231 | 232 | 233 | 1311 |
| 234 | 235 | 236 | 1312 |
| 237 | 238 | 239 | 1313 |
| 240 | 241 | 242 | 1100 |
| 243 | 244 | 245 | 1101 |
| 246 | 247 | 248 | 1102 |
| 249 | 250 | 251 | 1104 |
| 252 | 253 | 254 | 1103 |
| 255 | 256 | 257 | 1105 |
| 258 | 259 | 260 | 1106 |
| 261 | 262 | 263 | 1107 |
| 264 | 265 | 266 | 1108 |
| 267 | 268 | 269 | 1110 |
| 270 | 271 | 272 | 1112 |
| 273 | 274 | 275 | 1109 |
| 276 | 277 | 278 | 1111 |
| 279 | 280 | 281 | 1113 |
| 282 | 283 | 284 | 1114 |
| 285 | 286 | 287 | 1115 |
| 288 | 289 | 290 | 1116 |
| 291 | 292 | 293 | 1118 |
| 294 | 295 | 296 | 1117 |
| 297 | 298 | 299 | 1119 |
| 300 | 301 | 302 | 1120 |
| 303 | 304 | 305 | 1121 |
| 306 | 307 | 308 | 1122 |
| 309 | 310 | 311 | 1125 |
| 312 | 313 | 314 | 1123 |
| 315 | 316 | 317 | 1124 |
| 318 | 319 | 320 | 1126 |
| 321 | 322 | 323 | 1127 |
| 324 | 325 | 326 | 1128 |
| 327 | 328 | 329 | 1129 |
| 330 | 331 | 332 | 1130 |
| 333 | 334 | 335 | 1131 |
| 336 | 337 | 338 | 1132 |
| 339 | 340 | 341 | 1133 |
| 342 | 343 | 344 | 1134 |
| 345 | 346 | 347 | 1136 |
| 348 | 349 | 350 | 1138 |
| 351 | 352 | 353 | 1135 |
| 354 | 355 | 356 | 1137 |
| 357 | 358 | 359 | 1139 |
| 360 | 361 | 362 | 1140 |
| 363 | 364 | 365 | 1141 |

| Par error code | | | Parameters |
|----------------|-----|----------|------------|
| < min> | max | Step err | address |
| 366 | 367 | 368 | 1142 |
| 369 | 370 | 371 | 1143 |
| 372 | 373 | 374 | 1145 |
| 375 | 376 | 377 | 1147 |
| 378 | 379 | 380 | 1144 |
| 381 | 382 | 383 | 1146 |
| 384 | 385 | 386 | 1148 |
| 387 | 388 | 389 | 1149 |
| 390 | 391 | 392 | 1176 |
| 393 | 394 | 395 | 1177 |
| 396 | 397 | 398 | 1178 |
| 399 | 400 | 401 | 1150 |
| 402 | 403 | 404 | 1151 |
| 405 | 406 | 407 | 1152 |
| 408 | 409 | 410 | 1153 |
| 411 | 412 | 413 | 1154 |
| 414 | 415 | 416 | 1155 |
| 417 | 418 | 419 | 1156 |
| 420 | 421 | 422 | 1157 |
| 423 | 424 | 425 | 1158 |
| 426 | 427 | 428 | 1159 |
| 429 | 430 | 431 | 1160 |
| 432 | 433 | 434 | 1161 |
| 435 | 436 | 437 | 1162 |
| 438 | 439 | 440 | 1163 |
| 441 | 442 | 443 | 1164 |
| 444 | 445 | 446 | 1165 |
| 447 | 448 | 449 | 1166 |
| 450 | 451 | 452 | 1167 |
| 453 | 454 | 455 | 1168 |
| 456 | 457 | 458 | 1169 |
| 459 | 460 | 461 | 1170 |
| 462 | 463 | 464 | 1171 |
| 465 | 466 | 467 | 1172 |
| 468 | 469 | 470 | 1173 |
| 471 | 472 | 473 | 1174 |
| 474 | 475 | 476 | 1175 |
| 477 | 478 | 479 | 1179 |
| 480 | 481 | 482 | 1180 |
| 483 | 484 | 485 | 1181 |
| 486 | 487 | 488 | 1200 |
| 489 | 490 | 491 | 1201 |
| 492 | 493 | 494 | 1202 |
| 495 | 496 | 497 | 1204 |
| 498 | 499 | 500 | 1203 |
| 501 | 502 | 503 | 1205 |
| 504 | 505 | 506 | 1206 |
| 507 | 508 | 509 | 1207 |
| 510 | 511 | 512 | 1208 |
| 513 | 514 | 515 | 1210 |
| 516 | 517 | 518 | 1212 |
| 519 | 520 | 521 | 1209 |
| 522 | 523 | 524 | 1211 |
| 525 | 526 | 527 | 1213 |
| 528 | 529 | 530 | 1214 |
| 531 | 532 | 533 | 1215 |
| 534 | 535 | 536 | 1216 |
| 537 | 538 | 539 | 1218 |
| 540 | 541 | 542 | 1217 |
| 543 | 544 | 545 | 1219 |
| 546 | 547 | 548 | 1220 |

| Par error code | | | Parameters |
|----------------|-----|----------|------------|
| < min> | max | Step err | address |
| 549 | 550 | 551 | 1221 |
| 552 | 553 | 554 | 1222 |
| 555 | 556 | 557 | 1225 |
| 558 | 559 | 560 | 1223 |
| 561 | 562 | 563 | 1224 |
| 564 | 565 | 566 | 1226 |
| 567 | 568 | 569 | 1227 |
| 570 | 571 | 572 | 1228 |
| 573 | 574 | 575 | 1229 |
| 576 | 577 | 578 | 1230 |
| 579 | 580 | 581 | 1231 |
| 582 | 583 | 584 | 1232 |
| 585 | 586 | 587 | 1233 |
| 588 | 589 | 590 | 1234 |
| 591 | 592 | 593 | 1236 |
| 594 | 595 | 596 | 1238 |
| 597 | 598 | 599 | 1235 |
| 600 | 601 | 602 | 1237 |
| 603 | 604 | 605 | 1239 |
| 606 | 607 | 608 | 1240 |
| 609 | 610 | 611 | 1241 |
| 612 | 613 | 614 | 1242 |
| 615 | 616 | 617 | 1243 |
| 618 | 619 | 620 | 1245 |
| 621 | 622 | 623 | 1247 |
| 624 | 625 | 626 | 1244 |
| 627 | 628 | 629 | 1246 |
| 630 | 631 | 632 | 1248 |
| 633 | 634 | 635 | 1249 |
| 636 | 637 | 638 | 1276 |
| 639 | 640 | 641 | 1277 |
| 642 | 643 | 644 | 1278 |
| 645 | 646 | 647 | 1250 |
| 648 | 649 | 650 | 1251 |
| 651 | 652 | 653 | 1252 |
| 654 | 655 | 656 | 1253 |
| 657 | 658 | 659 | 1254 |
| 660 | 661 | 662 | 1255 |
| 663 | 664 | 665 | 1256 |
| 666 | 667 | 668 | 1257 |
| 669 | 670 | 671 | 1258 |
| 672 | 673 | 674 | 1259 |
| 675 | 676 | 677 | 1260 |
| 678 | 679 | 680 | 1261 |
| 681 | 682 | 683 | 1262 |
| 684 | 685 | 686 | 1263 |
| 687 | 688 | 689 | 1264 |
| 690 | 691 | 692 | 1265 |
| 693 | 694 | 695 | 1266 |
| 696 | 697 | 698 | 1267 |
| 699 | 700 | 701 | 1268 |
| 702 | 703 | 704 | 1269 |
| 705 | 706 | 707 | 1270 |
| 708 | 709 | 710 | 1271 |
| 711 | 712 | 713 | 1272 |
| 714 | 715 | 716 | 1273 |
| 717 | 718 | 719 | 1274 |
| 720 | 721 | 722 | 1275 |
| 723 | 724 | 725 | 1279 |
| 726 | 727 | 728 | 1280 |
| 729 | 730 | 731 | 1281 |

| | | | | | | | |
|------------------|---------|--|--|--------------------|-----------------------------|--|--------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | | |
| | | | | | | | Tot. Pag. 16/40 |

8.4 STATE

 Symbols (↑) and (↓) marks state bits whose variation are traced in the events log; (↑) means that variation from 0 to 1 is traced, instead (↓) means that variations from 0 to 1 and from 1 to 0 are traced too.

| Rel addr | # of item | Name | Bit | Description | Notes |
|----------|--------------------------------|-----------------------------|------------|----------------------------------|---------------------------------|
| 100 | 1 | STATE 1 GLITCH note 2 | BIT 0 (↑) | Parameter changed | 1 = Parameter(s) changed |
| | | | BIT 1 | Historical Measure Update | 1 = Histor meas updated |
| | | | BIT 2 | --- | --- |
| | | | BIT 3 (↑) | Signalling Reset | 1 = Signalling resetted |
| | | | BIT 4 | Trip Reset | 1 = Trip Reset Command executed |
| | | | BIT 5 | CB Reset | 1 = CB Reset Command executed |
| | | | BIT 6 | Dummy Command | 1 = Dummy Command executed |
| | | | BIT 7 | --- | --- |
| | | | BIT 8 | --- | --- |
| | | | BIT 9 | --- | --- |
| | | | BIT 10 | --- | --- |
| | | | BIT 11 | --- | --- |
| | | | BIT 12 | --- | --- |
| | | | BIT 13 | --- | --- |
| | | | BIT 14 | --- | --- |
| | | | BIT 15 | --- | --- |
| 101 | 1 | STATE 2 FLAGS | BIT 0 | Any Alarm / Timing / Warning | OR of alarms |
| | | | BIT 1 | Any Trip | OR of Trips (latched) |
| | | | BIT 2 | CB tripped | 1 = CB tripped |
| | | | BIT 3 (↑) | CB connected / isolated | 0 = Isolated, 1 = Connected |
| | | | BIT 4 (↓) | CB open/closed | 0 = Open, 1 = Closed |
| | | | BIT 5 (↓) | CB undefined | 1 = Undefined |
| | | | BIT 6 (↓) | No communic on Local Bus | 1 = No communication on LB |
| | | | BIT 7 | Springs charged/discharged | 0 = Discharged, 1 = Charged |
| | | | BIT 8 (↑) | Trip command fail | 1 = Trip command failed |
| | | | BIT 9 (↓) | Local / Remote Operating Mode | 0 = Local, 1 = Remote |
| | | | BIT 10 | Programming OK | 1 = Programming OK |
| | | | BIT 11 | Programming Fail | 1 = Programming Failed |
| | | | BIT 12 | Internal Bus programming session | 1 = Bus SSI session opened |
| | | | BIT 13 | Test Bus programming session | 1 = Bus Test session opened |
| BIT 14 | --- | --- | | | |
| BIT 15 | System Bus programming session | 1 = Bus Ext session opened | | | |
| 102 | 1 | STATE 3 FLAGS | BIT 0 (↓) | Test Session | 1 = Test session opened |
| | | | BIT 1 (↓) | Test Unit connected | 1 = Test unit connected |
| | | | BIT 2 | --- | --- |
| | | | BIT 3 | Signalling module present | 1 = Signalling module present |
| | | | BIT 4 | Dialog unit present | 1 = Dialog unit present |
| | | | BIT 5 | --- | --- |
| | | | BIT 6 | Display Off for high temp | 1 = Display Off |
| | | | BIT 7 | Waiting Trigger | 1 = Waiting trigger |
| | | | BIT 8 | Datalogger Triggered | 1 = Triggered |
| | | | BIT 9 | Datalogger stopped | 1 = Stopped |
| | | | BIT 10 (↓) | --- | --- |
| | | | BIT 11 | Wink ON | 0 = OFF, 1 = ON |
| | | | BIT 12 | Signalling Module Input Status | 0 = Not active, 1 = Active |
| | | | BIT 13 | KK function | 0 = OFF, 1 = ON |
| | | | BIT 14 | --- | --- |
| BIT 15 | Local Bus Digital Input | 0 = OFF, 1 = ON | | | |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 17/40 |

| <i>Rel addr</i> | <i># of item</i> | <i>Name</i> | <i>Bit</i> | <i>Description</i> | <i>Notes</i> |
|-----------------|------------------|---------------|------------|-------------------------|--------------|
| 103 | 1 | STATE 4 ALARM | BIT 0 | Vaux Required | |
| | | | BIT 1 (↓) | Contact Wear Pre-alarm | |
| | | | BIT 2 (↓) | Contact Wear Alarm | |
| | | | BIT 3 (↓) | L Pre-alarm | |
| | | | BIT 4 (↓) | L Timing | |
| | | | BIT 5 (↓) | --- | --- |
| | | | BIT 6 (↓) | --- | --- |
| | | | BIT 7 (↓) | --- | --- |
| | | | BIT 8 (↓) | --- | --- |
| | | | BIT 9 | --- | --- |
| | | | BIT 10 | --- | --- |
| | | | BIT 11 (↓) | OT Pre-alarm | |
| | | | BIT 12 (↓) | OT Alarm | |
| | | | BIT 13 (↓) | OT Alarm (Blocked Trip) | |
| | | | BIT 12 | --- | --- |
| BIT 15 (↓) | --- | --- | | | |
| 104 | 1 | STATE 5 ALARM | BIT 0 (↓) | --- | --- |
| | | | BIT 1 (↓) | --- | --- |
| | | | BIT 2 (↓) | --- | --- |
| | | | BIT 3 (↓) | --- | --- |
| | | | BIT 4 (↓) | --- | --- |
| | | | BIT 5 | --- | --- |
| | | | BIT 6 | --- | --- |
| | | | BIT 7 (↓) | --- | --- |
| | | | BIT 8 (↓) | --- | --- |
| | | | BIT 9 | --- | --- |
| | | | BIT 10 | --- | --- |
| | | | BIT 11 | --- | --- |
| | | | BIT 12 | --- | --- |
| | | | BIT 13 (↓) | --- | --- |
| | | | BIT 14 (↓) | Iw Warning | |
| BIT 15 (↓) | LC1 Alarm | | | | |
| 105 | 1 | STATE 6 ALARM | BIT 0 (↓) | LC2 Alarm | |
| | | | BIT 1 (↓) | --- | --- |
| | | | BIT 2 (↓) | --- | --- |
| | | | BIT 3 (↓) | --- | --- |
| | | | BIT 4 (↓) | --- | --- |
| | | | BIT 5 (↓) | CB Device error | --- |
| | | | BIT 6 (↓) | TC Error | |
| | | | BIT 7 (↓) | Rating Plug Error | |
| | | | BIT 8 (↓) | Key Plug Error | |
| | | | BIT 9 | Internal Error | |
| | | | BIT 10 | --- | --- |
| | | | BIT 11 | --- | --- |
| | | | BIT 12 | Invalid Date | |
| | | | BIT 13 (↓) | Configuration Error | |
| | | | BIT 14 (↓) | CB Status Error | |
| BIT 15 | --- | --- | | | |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 18/40 |

| Rel addr | # of item | Name | Bit | Description | Notes |
|----------|-------------------|-------------------------------|------------|-------------------------------|----------------------|
| 106 | 1 | STATE 7 INPUTS /OUTPUTS | BIT 0 | --- | --- |
| | | | BIT 1 | --- | --- |
| | | | BIT 2 | --- | --- |
| | | | BIT 3 | --- | --- |
| | | | BIT 4 | --- | --- |
| | | | BIT 5 | --- | --- |
| | | | BIT 6 | --- | --- |
| | | | BIT 7 | --- | --- |
| | | | BIT 8 | Relay P1 contact | 0 = open, 1 = closed |
| | | | BIT 9 | Relay P2 contact | 0 = open, 1 = closed |
| | | | BIT 10 | Relay P3 contact | 0 = open, 1 = closed |
| | | | BIT 11 | Relay P4 contact | 0 = open, 1 = closed |
| | | | BIT 12 | --- | --- |
| | | | BIT 13 | --- | --- |
| | | | BIT 14 | --- | --- |
| BIT 15 | --- | --- | | | |
| 107 | 1 | STATE 8 LATCHED note 3 | BIT 0 (↑) | L tripped | 1 = L trip |
| | | | BIT 1 (↑) | --- | --- |
| | | | BIT 2 (↑) | --- | --- |
| | | | BIT 3 (↑) | I tripped | 1 = I trip |
| | | | BIT 4 (↑) | --- | --- |
| | | | BIT 5 (↑) | --- | --- |
| | | | BIT 6 | --- | --- |
| | | | BIT 7 (↑) | OT tripped | 1 = OT trip |
| | | | BIT 8 | --- | --- |
| | | | BIT 9 (↑) | --- | --- |
| | | | BIT 10 (↑) | --- | --- |
| | | | BIT 11 (↑) | --- | --- |
| | | | BIT 12 | --- | --- |
| | | | BIT 13 (↑) | --- | --- |
| | | | BIT 14 | --- | --- |
| BIT 15 | --- | --- | | | |
| 108 | 1 | STATE 9 LATCHED note 3 | BIT 0 (↑) | Electronic Trip Test | --- |
| | | | BIT 1 (↑) | Simulated Trip from Test Unit | --- |
| | | | BIT 2 (↑) | External Input Trip | --- |
| | | | BIT 3 (↑) | Hardware Error Trip | --- |
| | | | BIT 4 | --- | --- |
| | | | BIT 5 | --- | --- |
| | | | BIT 6 | --- | --- |
| | | | BIT 7 | --- | --- |
| | | | BIT 8 | --- | --- |
| | | | BIT 9 | --- | --- |
| | | | BIT 10 | --- | --- |
| | | | BIT 11 | --- | --- |
| | | | BIT 12 | --- | --- |
| | | | BIT 13 | --- | --- |
| | | | BIT 14 | --- | --- |
| BIT 15 | TRIP command fail | 1= TRIP command failed | | | |

note 2: GLITCH registers are automatically cleared after reading.

note 3: LATCHED registers are set when the associated event happens; they are set only by "CB RESET" or "TRIP RESET" commands.

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
| Author Autore | LB-DTEA | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 19/40 |

8.5 TIME

| Rel addr | # of item | Name | Description |
|----------|-----------|---------------|--------------------------------|
| 100 | 1 | Day | Number of days from 31/12/1999 |
| 101 | 1 | Hour & minute | MSB = Hour, LSB = minute |
| 102 | 1 | Second | 0 – 59 |
| 103 | 1 | Millisecond | 0 -999 |



As shown in REGISTER MAP (3.2), the TIME update could be done only using modbus function 16. In order to modify the Time it is necessary to open the programming session, the data come immediately modified and not at the end of the programming session as it happens for the normal parameters, therefore the abandonment (abort) of the programming session do not cancel the carried out modification.

It's recommended to update simultaneously all four TIME registers.

8.6 RUN-TIME MEASURES

The measure limits shown in column "Notes" are depicted in MEASURE LIMITS AND REPRESENTATIONS.

| Rel addr | # of item | Name | Description | Notes |
|----------|-----------|------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------|
| 200 | 2 | Maximum current (rms) | [A] | Not available → $2^{32}-1$ $I < I_{MIN} \rightarrow 0$ $I > I_{MAX} \rightarrow I_{MAX}$ |
| 202 | 1 | Maximum current phase | 0 → Not available, 1 → I1 2 → I2 3 → I3 | Not available → 0 |
| 203 | 2 | I1 phase current (rms) | [A] | Not available → $2^{32}-1$ $I < I_{MIN} \rightarrow 0$ $I > I_{MAX} \rightarrow I_{MAX}$ |
| 205 | 2 | I2 phase current (rms) | | |
| 207 | 2 | I3 phase current (rms) | | |

8.7 INFORMATION

| Rel addr | # of item | Name | Range | Description |
|----------|-----------|-------------------------------|--------------------------------|----------------------------------------------------------------------------------------|
| 700 | 1 | Slave ID | 0x11 | PR122/VF |
| 701 | 1 | SW version | Major + minor | |
| 702 | 1 | Product Standard Reference | 0 | 0 → IEC |
| 703 | 1 | --- | | |
| 704 | 1 | In (nominal current) | 800 ÷ 2500 | [A] |
| 705 | 1 | CB type | TAB CB TYPE | TAB CB TYPE |
| 706 | 8 | CB Serial Number | ASCII format characters | ASCII format characters |
| 714 | 1 | Datalogger max file | 0 ÷ 3 | 0 ÷ 3 |
| 715 | 1 | Datalogger max address | 0 ÷ 65535 | 0 ÷ 65535 |
| 716 | 1 | Datalogger Trigger | 0 ÷ 4 | 0 = None (free running) 1 = Any Alarm 2 = L Timing 3 = Any Trip 4 = Custom |
| 717 | 1 | Day of Dlog trigger | Number of days from 31/12/1999 | |
| 718 | 1 | Hour & minute of Dlog trigger | Hour & minute | MSB = Hour, LSB = minute |
| 719 | 1 | Second of Dlog trigger | Seconds | |
| 720 | 1 | Millisecond of Dlog trigger | Milliseconds | |
| 721 | 2 | --- | --- | --- |
| 723 | 6 | CB name | ASCII format characters | |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
| Author Autore | LB-DTEA | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 20/40 |

8.8 PARAMETERS CONFIGURATION 1

| Rel addr | # of item | Name | Range | Description |
|----------|-----------|---------------------|-------------------------|-------------|
| 1000 | 1 | Product execution | 1 | 0→LI |
| 1001 | 8 | Relay Serial Number | ASCII format characters | --- |

8.9 PARAMETERS CONFIGURATION 2

| Rel addr | # of item | Name | Range | Description | | |
|----------|-----------|----------------------------------------|-----------------------|----------------------------------------------------------|------------------------|-------------------------|
| | | | | Bit | Bit = 0 | Bit = 1 |
| 1020 | 1 | Unit configuration | 0x0000 ÷ 0x003F | 0 | --- | --- |
| | | | | 1 | --- | --- |
| | | | | 2 | --- | --- |
| | | | | 3 | --- | --- |
| | | | | 4 | --- | --- |
| | | | | 5 | --- | --- |
| | | | | 6 | Operating mode = Local | Operating mode = Remote |
| 1021 | 1 | Language | 0 ÷ 4 | 0 = ENG 1 = ITA 2 = FRA 3 = GER 4 = SPA | | |
| 1022 | 1 | Nominal Frequency | 0 ÷ 3 | 0 = 6.6 Hz 1 = 16.6 Hz 2 = 25 Hz 3 = 50 Hz | | |
| 1028 | 1 | Slave Address (external bus only) | 1 ÷ 247 | 1 ÷ 247 | | |
| 1029 | 1 | Addressing Type (external bus only) | 0 ÷ 1 | 0 = standard 1 = ABB | | |
| 1030 | 1 | Baud rate (external bus only) | 0 ÷ 1 | 0 = 9600 1 = 19200 | | |
| 1031 | 1 | Protocol Type (external bus only) | 0 ÷ 3 | 0 = "E,8,1" 1 = "O,8,1" 2 = "N,8,2" 3 = "N,8,1" | | |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
| Author Autore | LB-DTEA | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 21/40 |

8.10 PARAMETERS CONFIGURATION 3

| Rel addr | # of item | Name | Range | Description |
|----------|-----------|--------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 1051 | 1 | Measurement store time | 5 ÷ 120 step 5 [min] | 5 ÷ 120 min |
| 1067 | 1 | P Relays Contact config | TAB P RELE CONFIG | TAB P RELE CONFIG |
| 1068 | 1 | P1 Function | 0 ÷ 65535 | TAB RELAYS FUNCTION |
| 1069 | 1 | P1 Delay | 0.00 ÷ 100.00 step 0.01 [s] | 0 ÷ 10000 [s*10 ⁻²] |
| 1070 | 1 | P2 Function | 0 ÷ 65535 | TAB RELAYS FUNCTION |
| 1071 | 1 | P2 Delay | 0.00 ÷ 100.00 step 0.01 [s] | 0 ÷ 10000 [s*10 ⁻²] |
| 1072 | 1 | P3 Function | 0 ÷ 65535 | TAB RELAYS FUNCTION |
| 1073 | 1 | P3 Delay | 0.00 ÷ 100.00 step 0.01 [s] | 0 ÷ 10000 [s*10 ⁻²] |
| 1074 | 1 | P4 Function | 0 ÷ 65535 | TAB RELAYS FUNCTION |
| 1075 | 1 | P4 Delay | 0.00 ÷ 100.00 step 0.01 [s] | 0 ÷ 10000 [s*10 ⁻²] |
| 1076 | 1 | Programmable Input config | 0x0000 ÷ 0x0001 | 0 = Active low 1 = Active high |
| 1077 | 1 | Programmable Input Function | 0 ÷ 5 | 0 = Generic 1 = External TRIP 2 = Trip reset 3 = --- 4 = Dial Local 5 = Reset Signalling Module |
| 1078 | 1 | Programmable Input Delay | 0.00 ÷ 100.00 step 0.01 [s] | 0 ÷ 10000 [s*10 ⁻²] |
| 1079 | 1 | Data Logger Config | 0x0000 ÷ 0x0001 | 0 = Data Logger = OFF 1 = Data Logger = ON |
| 1080 | 1 | Data Logger Trigger Type | Standard: 0 ÷ 3 Custom 256 ÷ 65535 (see Trigger setting) | Standard: 0 = None (free running) 1 = Any Alarm 2 = L Timing 3 = Any Trip |
| 1081 | 1 | Data Logger Stop Delay | 0.00 ÷ 10.00 step 0.01 [s] | 0 ÷ 1000 [s*10 ⁻²] |
| 1082 | 1 | Data Logger Frequency | 0 ÷ 3 | 0 = 600 Hz 1 = 1200 Hz 2 = 2400 Hz 3 = 4800 Hz |
| 1083 | --- | --- | | |
| 1084 | 5 | CB TAG name | Characters in format ASCII | |
| 1089 | 5 | User data | Characters in format ASCII | |
| 1094 | 1 | --- | | |
| 1095 | 1 | Date of installation CB | Number of days from 31/12/1999 | |
| 1096 | 1 | Date of last maint CB | Number of days from 31/12/1999 | |
| 1097 | 1 | --- | | |
| 1098 | 1 | Startup current activation threshold | 0.10 ÷ 10.00 step 0.10 [In] | 10 ÷ 1000 [In*10 ⁻²] |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 22/40 |

8.11 PARAMETERS PROTECTION SET1

The following table shows parameters included in protections.

| Rel addr | # of item | Name | Range | Description | | |
|----------|-----------|----------------------------|------------------------------------|-----------------------------------|-------------------|------------------|
| | | | | Bit | Bit = 0 | Bit = 1 |
| 1100 | 1 | Prot L configuration | | 0 | --- | --- |
| | | | | 1 | --- | --- |
| | | | | 2 | --- | --- |
| | | | | 3 | --- | --- |
| | | | | 4 | --- | --- |
| 1101 | --- | --- | | | | |
| 1102 | --- | --- | | | | |
| 1103 | --- | --- | | | | |
| 1104 | 1 | Prot L threshold | 0.40 ÷ 1.00 step 0.01 [In] | 40 ÷ 100 [In*10 ⁻²] | | |
| 1105 | 1 | Prot L time | 3 ÷ 102 step 3 [s] | 300 ÷ 10200 [s*10 ⁻²] | | |
| 1128 | 1 | Prot I configuration | | Bit | Bit = 0 | Bit = 1 |
| | | | | 0 | Prot disable | Prot enable |
| | | | | 1 | --- | --- |
| | | | | 2 | Start Up Th = OFF | Start Up Th = ON |
| | | | | 3 | --- | --- |
| 4 | --- | --- | | | | |
| 1129 | 1 | Prot I threshold | 1,5 ÷ 10 step 0.1 [In] | 150 ÷ 1000 [In*10 ⁻²] | | |
| 1130 | 1 | Prot I start up threshold | 1,5 ÷ 10 step 0.1 [In] | 150 ÷ 1000 [In*10 ⁻²] | | |
| 1131 | 1 | Prot I start up time | 0.10 ÷ 30.00 step 0.01 [s] | 10 ÷ 3000 [s*10 ⁻²] | | |
| 1165 | --- | --- | --- | --- | | |
| 1171 | 1 | Prot OT configuration | | Bit | Bit = 0 | Bit = 1 |
| | | | | 0 | --- | --- |
| | | | | 1 | Trip disable | Trip enable |
| | | | | 2 | --- | --- |
| | | | | 3 | --- | --- |
| 4 | --- | --- | | | | |
| 1172 | 1 | Load control configuration | 0x0000 ÷ 0x0007 | Bit | Bit = 0 | Bit = 1 |
| | | | | 0 | Iw Th disabled | Iw Th enabled |
| | | | | 1 | LC1 Th disabled | LC1 Th enabled |
| 1173 | 1 | Warning current Iw | 0.30 ÷ 10.00 step 0.05 [In] | 30 ÷ 1000 [In*10 ⁻²] | | |
| 1174 | 1 | LC1 threshold | 50 ÷ 100 step 1 [%I ₁] | 50 ÷ 100 [%I ₁] | | |
| 1175 | 1 | LC2 threshold | 50 ÷ 100 step 1 [%I ₁] | 50 ÷ 100 [%I ₁] | | |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 23/40 |

8.12 TRIP HISTORY

| Rel addr | # of item | Name | Description | | | |
|----------|-----------|--------------------------|-------------|-------------------------------|-------------------|---|
| 2000 | 19 | Trip history no. 1 (new) | 0 | MARKER (0 = valid) | | |
| | | | 1 | Trip Type TAB TRIP TYPE | | |
| | | | 2 | N° trip | | |
| | | | 3 | Date (day) | | |
| | | | 4 | Date (MSB = hours, LSB = min) | | |
| | | | 5 | Date (seconds) | | |
| | | | 6 | Date (ms) | | |
| | | | 7÷8 | Current I1 | | |
| | | | 9÷10 | Current I2 | | |
| | | | 11÷12 | Current I3 | | |
| | | | 13÷14 | --- | | |
| | | | 15 | Contact wear | | |
| | | | 16 | TAB TRIP TYPE | | |
| | | | 17 | TAB TRIP TYPE | | |
| | | | 18 | TAB TRIP TYPE | | |
| | | | 2019 | 19 | Trip history N° 2 | “ |
| | | | ... | 19 | Trip history N° 3 | “ |
| | | | ... | 19 | Trip history N° 4 | “ |
| ... | 19 | Trip history N° 5 | “ | | | |
| ... | 19 | Trip history N° 6 | “ | | | |
| ... | 19 | Trip history N° 7 | “ | | | |
| ... | 19 | Trip history N° 8 | “ | | | |
| ... | ... | | “ | | | |
| 2361 | 19 | Trip history N° 20 (old) | “ | | | |

Table 7 TAB_TRIP_TYPE

| Trip type | word 1 | word 16 | word 17 | word 18 |
|-----------|--------|-----------------------------------|-----------------------------------|----------------|
| L | 1 | In Active threshold = value / 512 | See addr. 1100 | --- |
| I | 7 | 0x0000 | In Active threshold = value / 512 | See addr. 1128 |
| OT | 10 | Temperature °C = value * 0,073855 | See addr. 705 | See addr. 704 |
| EXT | 18 | See addr. 1078 | See addr. 1076 | See addr. 1077 |
| Hw Trip | 21 | See addr. 105 | See addr. 1401 | See addr. 1500 |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 24/40 |

8.13 MEASURES HISTORY

| Rel addr | # of item | Name | Description | |
|----------|-----------|----------------------------|-------------|-----------------------------------------------------------------------|
| 2500 | 24 | Measure history n° 1 (new) | 0 | MARKER (0 = valid) |
| | | | 1 | History code: 0 = NORMAL_HISTORY 1 = POWER_UP 2 = NEW_PERIOD |
| | | | 2 | Period from last save (minutes) |
| | | | 3 | Number of days from 31/12/1999 |
| | | | 4 | MSB = Hour, LSB = minute |
| | | | 5 | |
| | | | 6 | |
| | | | 7 | |
| | | | 8 | |
| | | | 9 | Phase with max. current (1 = I1, 2 = I2, 3 = I3) |
| | | | 10 | Maximum current LOW |
| | | | 11 | Maximum current HIGH |
| | | | 12 | --- |
| | | | 13 | --- |
| 2524 | 24 | Measure history n°2 | “ | |
| 2548 | 24 | Measure history n°3 | “ | |
| ... | 24 | ... | “ | |
| 3052 | 24 | Measure history n°24 | “ | |
| 3076 | 24 | Measure history n°25 (old) | “ | |

8.14 LOG EVENTS

| Rel addr | # of item | Name | Description |
|----------|-----------|-----------------------|--------------------------------|
| 3300 | 6 | Log event n° 1 (new) | MARKER (0 = valid) |
| | | | Event type TAB_LOG_EVENTS |
| | | | Number of days from 31/12/1999 |
| | | | MSB = Hour, LSB = minute |
| | | | Seconds |
| | | | Milliseconds |
| 3306 | 6 | Log event n° 2 | “ |
| 3312 | 6 | Log event n° 3 | “ |
| ... | 6 | ... | “ |
| 3768 | 6 | Log event n° 79 | “ |
| 3774 | 6 | Log event n° 80 (old) | “ |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 25/40 |

9. TABLES

Table 8 TAB_RELAYS_FUNCTION

| Value | Description |
|-------------|----------------------------------------------------|
| 0 | None |
| 1 | L prealarm |
| 2 | L timing |
| 3 | --- |
| 4 | L trip |
| 5 | --- |
| 6 | I trip |
| 7 | --- |
| 8 | Any trip |
| 9 | Any Alarm |
| 10 | LC1 |
| 11 | LC2 |
| 256 ÷ 65535 | Custom Setting of the activation relay function |

Table 9 TAB_P_RELE_CONFIG

| | Bit = 0 | Bit = 1 |
|-------|----------------------|------------------|
| Bit 0 | Relay P1 not latched | Relay P1 Latched |
| Bit 1 | Relay P2 not latched | Relay P2 Latched |
| Bit 2 | Relay P3 not latched | Relay P3 Latched |
| Bit 3 | Relay P4 not latched | Relay P4 Latched |
| Bit 4 | Contact P1 NO | Contact P1 NC |
| Bit 5 | Contact P2 NO | Contact P2 NC |
| Bit 6 | Contact P3 NO | Contact P3 NC |
| Bit 7 | Contact P4 NO | Contact P4 NC |

Table 10 TAB_CB_TYPE

| CB | Valore |
|----------|--------|
| E2VF800 | 0 |
| | 1 |
| E2VF1000 | 2 |
| | 3 |
| E2VF1250 | 4 |
| | 5 |
| E2VF1600 | 6 |
| | 7 |
| E2VF1600 | 8 |
| | 9 |
| E3VF800 | 10 |
| | 11 |
| E3VF1000 | 12 |
| | 13 |
| E3VF1250 | 14 |
| | 15 |
| E3VF1600 | 16 |
| | 17 |
| E3VF2000 | 18 |
| | 19 |
| E3VF2500 | 20 |
| | 21 |
| E3VF1600 | 22 |
| | 23 |
| E3VF2000 | 24 |
| | 25 |
| E3VF2500 | 26 |
| | 27 |
| E2VF1200 | 28 |
| | 29 |
| E3VF1200 | 30 |
| | 31 |

Table 11 TAB_LOG_EVENTS

| Value | Event type |
|-------|-------------------------------|
| 0 | Parameters changed |
| 1 | Signalling reset |
| 2 | CB isolated |
| 3 | CB connected |
| 4 | CB open |
| 5 | CB closed |
| 6 | CB status defined |
| 7 | CB status undefined |
| 8 | --- |
| 9 | --- |
| 10 | Trip command fail |
| 11 | --- |
| 12 | Remote mode operating mode |
| 13 | Test session closed |
| 14 | Test session opened |
| 15 | Test unit not connected |
| 16 | Test unit connected |
| 17 | --- |
| 18 | --- |
| 19 | --- |
| 20 | --- |
| 21 | Cw Preal OFF |
| 22 | Cw Preal ON |
| 23 | Cw Alarm OFF |
| 24 | Cw Alarm ON |
| 25 | L Preal OFF |
| 26 | L Preal ON |
| 27 | L Timing OFF |
| 28 | L Timing ON |
| 41 | OT Warning OFF |
| 42 | OT Warning ON |
| 43 | OT Alarm OFF |
| 44 | OT Alarm ON |
| 45 | OT Alarm Block OFF |
| 46 | OT Alarm Block ON |
| 79 | Iw Alarm OFF |
| 80 | Iw Alarm ON |
| 81 | Lc1 OFF |
| 82 | Lc1 ON |
| 83 | Lc2 OFF |
| 84 | Lc2 ON |
| 93 | CB Device Alarm OFF |
| 94 | CB Device Alarm ON |
| 95 | TC Alarm OFF |
| 96 | TC Alarm ON |
| 97 | Rating Plug Alarm OFF |
| 98 | Rating Plug Alarm ON |
| 99 | Key Plug error OFF |
| 100 | Key Plug error ON |
| 107 | CB status error OFF |
| 108 | CB status error ON |
| 109 | L tripped |
| 110 | --- |
| 111 | --- |
| 112 | I tripped |
| 113 | --- |
| 114 | --- |
| 115 | --- |
| 116 | OT tripped |
| 125 | Electronic trip test |
| 126 | Simulated trip from test unit |
| 127 | External input trip |
| 128 | Hardware Error Trip |
| 129 | Aux On |
| 130 | Trip Reset Ev |
| 131 | History Trip Reset |
| 132 | History Measure Reset |
| 133 | Energy Reset |
| 134 | Aux Voltage On |
| 135 | Aux Ext On |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | Lxxxx | | | Doc. No N. Doc. | 1SDHxxxxxxxR0001 | Tot. Pag. 26/40 |

10. CHECK OF PARAMETERS ACCURACY

During the programming the accuracy checks of new parameters set are carried out, in particular:

1. All parameter values are in the admitted ranges (also if relevant to protection in off)

In case one of these checks failed the reply of exception 'ILLEGAL DATA ERROR' is done supplying in the 'Programming Fail Error Code' the relevant error code.

11. OPERATION DESCRIPTION

11.1 PARAMETER PROGRAMMING



There is a validity programming session timeout of 5 minutes once the session is aborted; to extend it of 5 minutes more it is sufficient to re-send an open programming session command.



Through the system bus it is allowed to open a programming session only in REMOTE functioning mode.

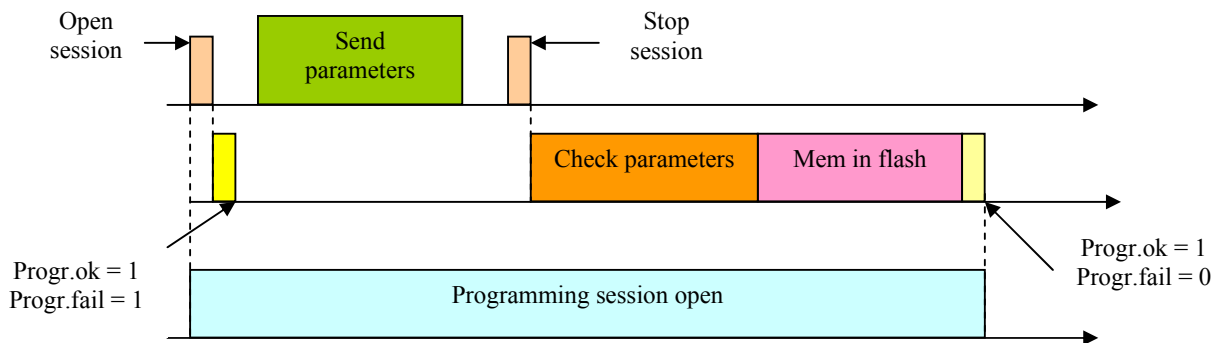


Figure 1 Programming session correctly handled

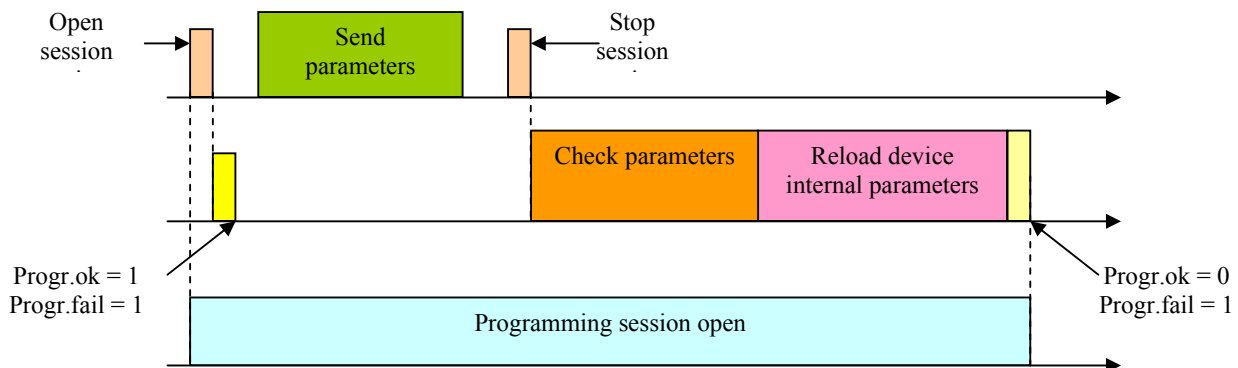


Figure 2 Programming failed

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 27/40 |

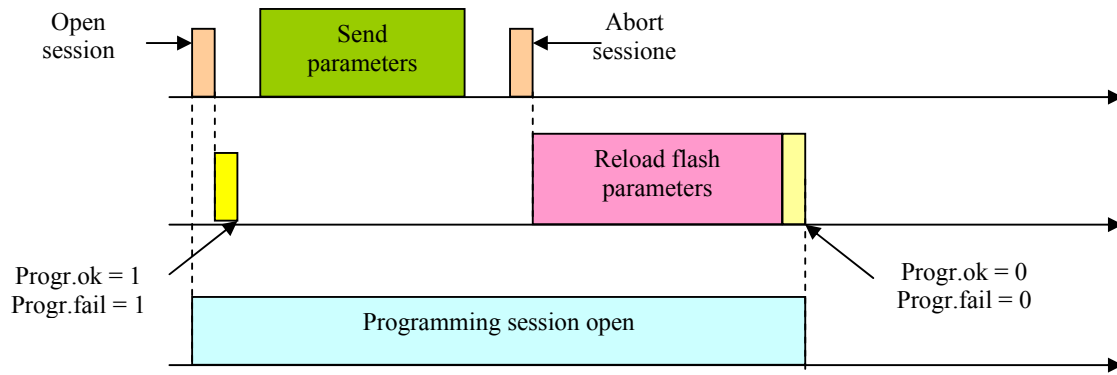


Figure 3 Programming aborted

11.2 DATALOGGER

Through the datalogger functionality is possible to execute the recording of some analogic and digital writings for a temporal window of definable duration and synchronized by a settable event.

The following figure shows in yellow the temporal window, the trigger and the available samples.

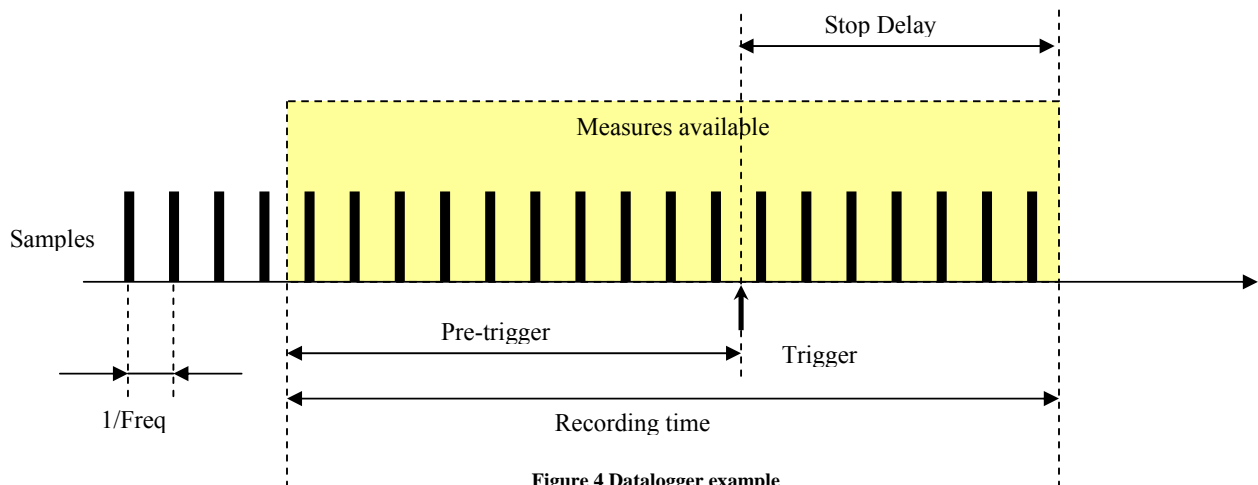


Figure 4 Datalogger example

The user can select the sampling frequency, the trigger event type and the stop delay for obtaining the pre-trigger expected towards the selected event.

According to the stop delay set there will be 3 situations:

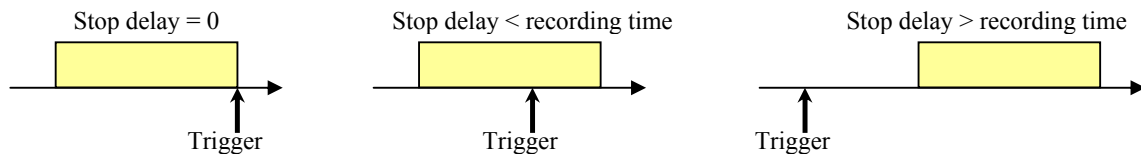


Figure 5 Three situations of recording

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 28/40 |

The maximum length of recording is defined exclusively by the sample frequency set as described in table TAB DLOG RECORDING TIME, in the case the sum of the stop delay and the time elapsed between a restart trigger is lower than the maximum recording time, there will be a recording time lower than the maximum one as shown in the following figure:

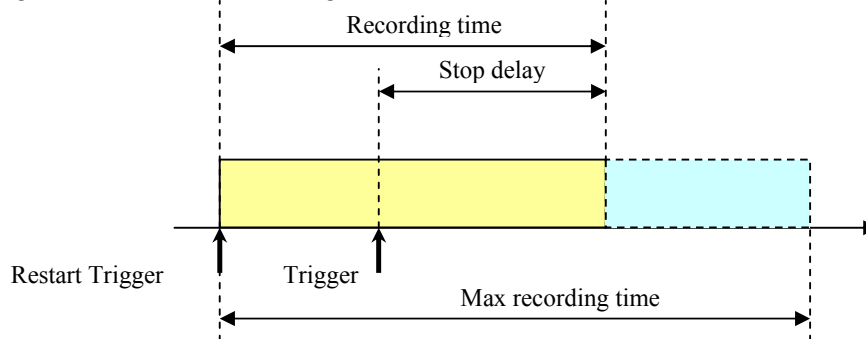


Figure 6 Recording time lower than maximum

11.2.1 Recorded data

When the trigger event happens or at the reception of the stop command, the following data are recorded in the box INFORMATION:

- Datalogger Trigger that shows the trigger type that has caused the datalogger stop.
- Time-stamp of the trigger event (day/hour+minutes/seconds/milliseconds) (4 word)
- Datalogger max file that shows which is the max file with importante data that can be apply by function 70
- Datalogger max address that shows which is the max address with important data that can be apply by function 70

For each sampling period 16 word are recorded with, in order, the following information:

- | | |
|-------------------------------|-----------------------------|
| 1. current sample I1 (1 word) | 13. digital inputs (1 word) |
| 2. current sample I2 (1 word) | 14. alarms1 (1 word) |
| 3. current sample I3 (1 word) | 15. alarms2 (1 word) |
| From 4. to 12. dummy | 16. trip (1 word) |

The data recorded may be read (only when the datalogger is stopped) in the MODBUS MAP.

11.2.2 Trigger state information

In STATE the following information of datalogger state are supplied:

- **Waiting trigger:** shows that the datalogger is suitable and is waiting for the happening of the event chosen as trigger
- **Datalogger triggered:** shows that the trigger event happened and the datalogger is under recording
- **Datalogger stopped:** shows that the recording was completed because it finished or completed or by a stop datalogger command

The datalogger recordings may be read in the MODBUS MAP only when the datalogger is not in phase of recording, that is when the datalogger stopped is signaled.

| | | | | | | | |
|------------------|---------|--|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 29/40 |

11.2.3 Datalogger settings

In PARAMETERS CONFIGURATION the configuration parameters of datalogger, described below, are present.

Note: following any modification of datalogger parameters this is stopped, to restart it is necessary to reset the trigger with the restart trigger

11.2.3.1 Datalogger activation

To function datalogger it is necessary to activate it by HMI or by the system with datalogger config. parameter

11.2.3.2 Datalogger activation

It's necessary to send a command of restart trigger (by HMI or by system) to activate the datalogger

11.2.3.3 Saving frequency setting

Both by HMI and by system it is possible, through the datalogger frequency parameter, the frequency by which the measures among 4 fixed frequencies 600Hz, 1200Hz, 2400Hz or 4800Hz are saved.

The memory used by datalogger is 512Kbyte therefore memorizing 16 word (32 byte) the maximum number (theoretic) of recordings is 16384, therefore, according to the frequency set different recording times are obtained as shown in the following table:

| Frequency | Recording time |
|-----------|----------------|
| 600 Hz | 27,307 s |
| 1200 Hz | 13,653 s |
| 2400 Hz | 6,827 s |
| 4800 Hz | 3,413 s |

Table 12 TAB DLOG RECORDING TIME

11.2.3.4 Trigger setting

11.2.3.4.1 Trigger standard

By HMI it is possible to select, through the datalogger trigger type parameter, one of the following trigger:

0. None (free running)
1. Any alarm
2. L timing
3. Any Trip

In case 1. None (free running) no trigger is setted and the datalogger may be stopped only with a stop command by HMI or by system.

11.2.3.4.2 Trigger custom

Writing in "**Data logger Trigger Type**" (inserted on PARAMETERS CONFIGURATION a value on range 0-3, will set up one of the three standard trigger (0 = None, 1 = Any alarm, 2 = L timing, 3 = Any Trip); writing a value greater than list values, it's possible to configure custom functionality as described in the following table.

| Bit di Datalogger Trigger Type | | | | | | | | | | | | | | | | |
|--------------------------------|----------|----|---------------------------------------------------------|----|----|---|---|---------------------------------------|---|---|---|---|---|---|---|--|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| OR AND | Not Used | | Byte placement (offset from 0x100 address) in the STATE | | | | | Bits mask to be monitored in the byte | | | | | | | | |

Bit 7 ÷ 0: bit mask used by trigger.

Bit 12 ÷ 8: byte offset in the device STATE (numeration starts from 1).

Bit 14 ÷ 13: Not Used.

Bit 15: if 0 means OR function among selected bits (mask), if 1 means AND function.

| | | | | | | | | | | |
|------------------|---------|--|--|--|--------------------|----------------------------------------------------------|--|--|--|--------------------|
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| ABB | L4618 | | | | Doc. No N. Doc. | 1SDH000922R0001 | | | | Tot. Pag. 30/40 |

Example 1:

To configure data logger trigger type to stop when at least one of the listed conditions occur (L tripped, S tripped, I tripped and G tripped) the value to write is:

- Bit 7 ÷ 0 = 00101011 (1 in correspondence of desired bits).
- Bit 14 ÷ 8 = 00001111 = 15 (byte containing conditions is the 15th of STATE).
- Bit 15 = 0 (OR function).

Therefore Data logger Trigger Type = 0x0F2B

Example 2:

To configure data logger trigger type to stop when all the listed conditions occur (UV Timing, RV Timing) the value to write is:

- Bit 7 ÷ 0 = 10000010 (1 in correspondence of desired bits).
- Bit 14 ÷ 8 = 0001001 = 9 (byte containing conditions is the 15th of STATE).
- Bit 15 = 1 (AND function).

Therefore Data logger Trigger Type = 0x8982

11.2.3.5 Stop delay setting

Both by HMI and by the system it is possible to set, through a datalogger stop delay parameter, the stop delay in the range 0.00 [s] at 10.00 [s] with step of 0.01 [s].

11.2.4 Available commands for the datalogger

It is possible to send the following commands to the datalogger activation/disactivation

- **Restart trigger:** after this command the datalogger trigger is reset.
- **Stop acquisition:** after this command the possible recording of the datalogger is stopped

In case there is an opening these commands are not accepted and will be reply exception BUSY

| | | | | | | | |
|------------------|---------|--|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 31/40 |

11.2.5 Functioning description

When the functionality is activate, the measures are continuously recorded and with a frequency set in a FIFO memory.

The recording will end after a stop delay setted according to the trigger event.



The recording will end 10 ms after a trip.

The following recording will be activated after a Restart trigger command.

The recording will end also after a Stop Datalogger command.

If the parameters relevant to the datalogger are changed while it is active, the recording will be cleared and a new recording will start according to the new parameters.

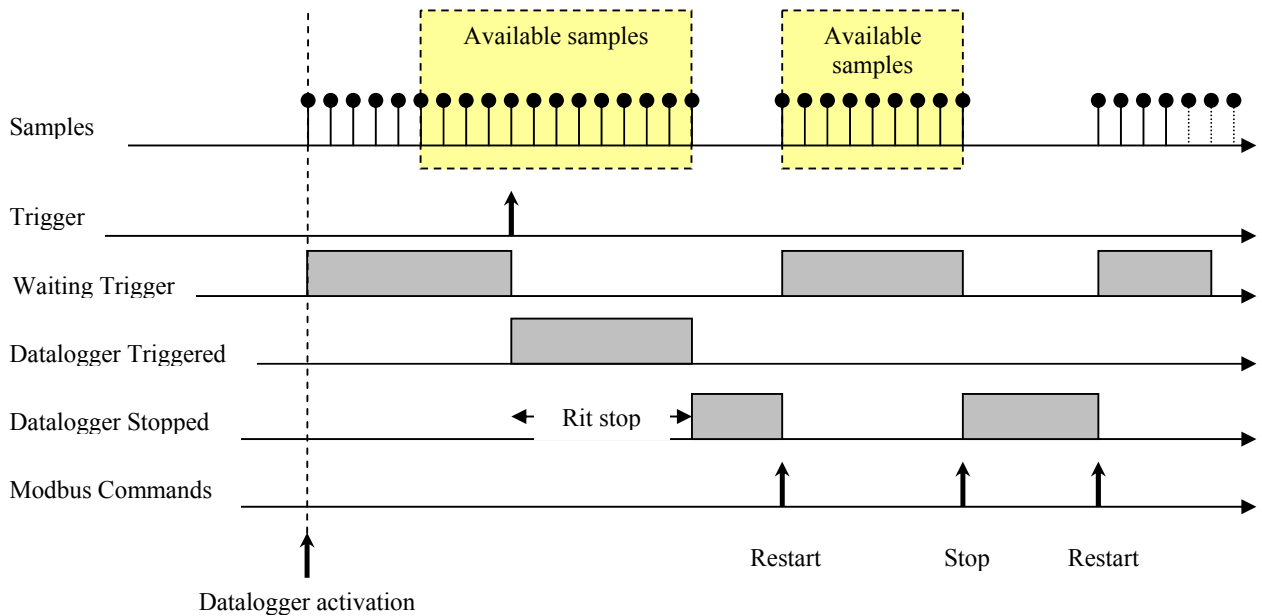


Figure 7 Example of stop datalogger for trigger or for stop command and restart trigger command

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 32/40 |

11.3 MEASURE HISTORY DATA STRUCTURE

The measure history log (8.13) contains the following information:

- Marker
- History code
- Saving period
- Day
- Hour + minute
- Total mean active power
- Maximum current
- Phase of Maximum current (I1, I2, I3)

The Marker (word length) is a general code for all non-volatile memory structure used to distinguish valid data (marker = 0x0000) from not valid data (marker ≠ 0x0000)

The history code has 3 types of recorded data:

- Nr. 0 = Normal record.
- Nr. 1 = First record after a supply power-up.
- Nr. 2 = First record after a saving period change.

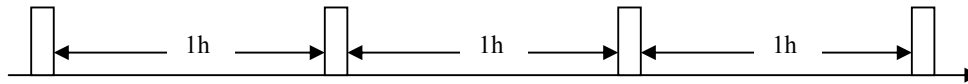
Saving period mean, in the case nr.0 and nr.2, the elapsed time in minutes from previous record.

In case nr.1 an almost empty structure is recorded only to show power supply returns; only Marker and History code have mean.

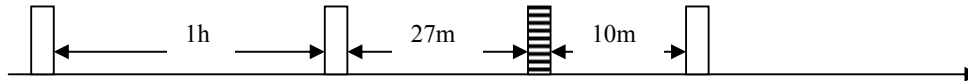
Day, hour and minutes are the time-stamp of structure recording time.

Could take place the following situations:

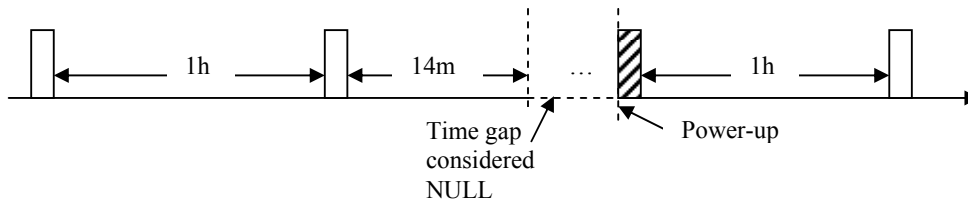
1. Normal situation (history code 0) with saving period = 1hour:



2. For e.g. after 27minutes from last recording time the Saving period is changed to 10minutes (history code 2):



3. For e.g. after 14minutes from last recording time there is an auxiliary power supply failure and then a new power-up (history code 1):



The striped histograms are those that match with historical code different from “normal”

| | | | | | | | |
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| Author Autore | LB-DTEA | | | | Title Titolo | PR122/VF + PR120/D-M | EN |
| ABB | L4618 | | | | Doc. No N. Doc. | 1SDH000922R0001 | |
| | | | | | | | Tot. Pag. 33/40 |

11.4 RELAY FUNCTIONALITY

In PARAMETERS CONFIGURATION some parameters are present that must be opportunely programmed to carry out the activation functions of P1 ÷ P4 relay (PR120/K).

In presence of the contact module (4 relay) the relevant relays can be managed as shown: it is possible an event (a specific state situation) following up to activate with the desired relay, the desired relays in an independent way. Following the functionality is shown.

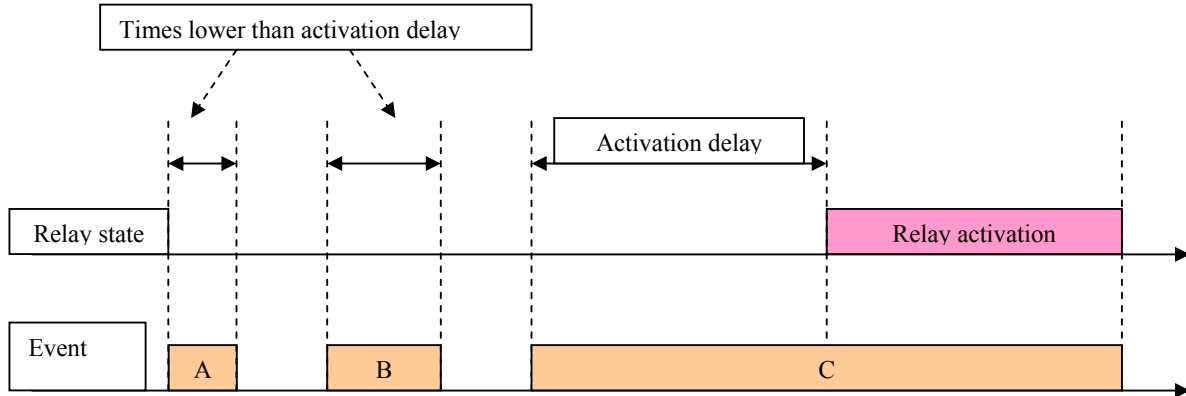


Figure 8 Relay functionality

In figure 3 situations A, B, C are shown with the activation condition occurred, in situations A and B this doesn't last for a time higher than the activation delay, therefore the relay is not activated: in situation C the relay is activated after a delay set and deactivated immediately (with a minimum selectable activation time) at the lacking of the condition of valid activation.

In the following figure the situation of the operation of the minimum time of relay activation is shown when the activation event becomes not checked before the expiring of this time.

Note: the minimum activation time is selectable only for activation functions CUSTOM

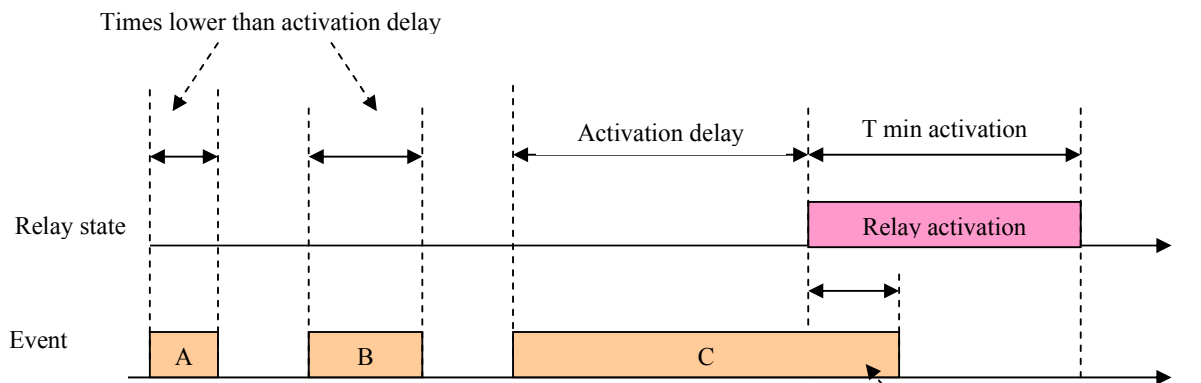


Figure 9 Effect of minimum time of relay activation

Time lower than min. time activation

| | | | | | | |
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| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 34/40 |

11.4.1 Settings of relay functionality of the signaling module

In PARAMETERS CONFIGURATION the configuration parameters, described below, of the relay are present.

11.4.1.1 Settings of the configuration of relay contacts

In PARAMETERS CONFIGURATION in the record P relays Contact Config it is possible to choose for each relay if the contact may be normally open or normally close and if it may have the latched.

11.4.1.2 Setting of the activation relay function

By HMI the relevant activation function for each relay may be programmed choosing it among a list of standard functions while by the system other more complex functions said custom may be programmed.

11.4.1.2.1 Standard function of relay activation

By HMI one of the following standard functions can be programmed:

0. None (no activation)
1. L prealarm
2. L timing
3. L trip
4. I trip
5. Any trip

that clearly define which event determines the relay activation (or the deactivation if the relay is defined as normally close)

11.4.1.2.2 Custom function of relay activation

By the system, it is possible, besides the limits shown above, select the activation function more sophisticated in the following way:

Writing in the record 'namerelay Function' in PARAMETERS CONFIGURATION a value included between 0 and 8, one of the 9 types of the above standard functions will be set, writing a higher value the function will be considered custom type and explained as follows:

| Bit of function relay | | | | | | | | | | | | | | | |
|-----------------------|-------------------------|----|-------------------------|----|----|---|---|------------------------------------------|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OR AND | Minimum activation T | | Byte placement in STATE | | | | | Bits mask to be monitored in the trigger | | | | | | | |

Bit 7 ÷ 0: bit mask used in the activation relay function.

Bit 12 ÷ 8: byte offset in the device STATE (numbering starts from 1).

Bit 14 ÷ 13: minimum activation time of the relay (00 = none, 01 = 50ms, 10 = 100ms, 11 = 200ms).

Bit 15: if 0 it means OR function among the selected bits, if 1 it means AND function among the selected bits.

Example 1:

To configure the activation function in order that the relay will activate when even one of the listed conditions occur : L tripped, S tripped, I tripped e G tripped, the value to write is:

Bit 7 ÷ 0 = 00101011 (1 in correspondence of the desired bit).

Bit 14 ÷ 8 = 00001111 = 15 (byte containing conditions is the 15th of STATE (numbering starts from 1).

Bit 15 = 0 (OR function).

Therefore relay function = 0x0F2B

| | | | | | | | | | | |
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| Author Autore | LB-DTEA | | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | | | | EN |
| ABB | L4618 | | | | Doc. No N. Doc. | 1SDH000922R0001 | | | | Tot. Pag. 35/40 |

Example 2:

To configure the trigger in order that the datalogger will stop when simultaneously the listed conditions occur: UV Timing, RP timing, the value to write is:

- Bit 7 ÷ 0 = 10000010 (1 in correspondence of desired bit).
- Bit 14 ÷ 8 = 0001001 = 9(byte containing conditions is the 9th of STATE (numbering starts from 1).
- Bit 15 = 1 (AND function).

Therefore Datalogger Trigger Type = 0x8982

11.4.1.3 Setting of activation delay

Both by HMI and by system it is possible to set, through parameter ‘namerelay Delay’ the activation delay in range 0.00 [s] to 100.00 [s] with step of 0.01 [s].

11.4.1.4 Reset of signalings

As shown in para. COMMANDS, it is provided the reset signalling command following up the contacts are placed to their rest state (open or closed according to the programming); if the function of the relay activation is still valid, the reset command causes no changes of the same relay state.

11.5 SIGNALLING MODULE INPUT FUNCTIONALITY

In the signalling module there is also the input with configurable functionality.

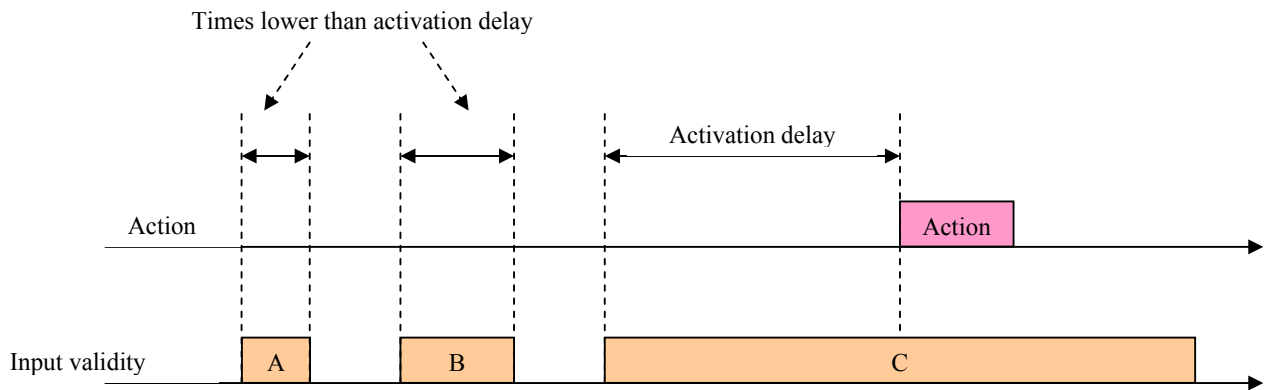


Figure 10 Signalling module input functionality

In figure are shown 3 situations (A, B, C) with the input state valid.

In situations A and B the input is not valid for a time higher than the activation delay therefore the action associated has not occurred; instead in situation C the action begins after the set delay.

| | | | | | | |
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| Author Autore | LB-DTEA | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 36/40 |

11.5.1 Settings of input signalling module

In PARAMETERS CONFIGURATION the parameters configurations of this input are present.

11.5.1.1 Settings of input configuration

In Programmable Input Config of PARAMETERS CONFIGURATION it is possible to select the level at which to consider active the input:

1. low active input
2. high active input

11.5.1.2 Settings of input function (ACTION)

In Programmable Input Function of PARAMETERS CONFIGURATION it is possible to select the action associated to the input, that is the action that after the programmed delay occurs after the activation (high or low) of the input.

It's possible to select one of the following actions:

1. Generic : No specific action is associated to the input that can be read in the state as generic input
2. Trip test: when the input is active for the specified delay a trip test is carried out
3. Trip reset: when the input is active for the specified delay a trip reset is carried out
4. Dial Local: when the input is active for the specified delay the local mode of the dialogue is forced
5. Signalling Module Reset: when the input is active for the specified delay the relay state is reset

11.5.1.3 Setting of input activation delay

It's possible to set, by the parameter 'Programmable Input Delay' the activation delay in the range 0.00 [s] to 100.00 [s] with step of 0.01 [s].

11.6 CB STATE INFORMATION

The device using the following dedicated input reports CB state:

- CB open
- CB close
- CB connected/withdrawn
- Springs charged

The device filters and checks CB state producing the following information:

- CB open/close
- CB state undefined
- CB state error
- CB connected/withdrawn
- Springs charged/discharged

The following table shows the information on CB:

| State | Value | | Notes |
|---------------|---------------------------------------------------------------|-----------------------------------------|----------------------------------------------------------------------------|
| | 0 = Open | 1 = Close | |
| CB open/close | Input CB open = 1 Input CB close = 0 NO flowing current | Input CB open = 0 Input CB close = 1 | The state of inputs open and close has to remain steady for at least 30 ms |

| | | | | | | |
|------------------|---------|--|--|--------------------|----------------------------------------------------------|--------------------|
| Author Autore | LB-DTEA | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 37/40 |

| State | Value | | Notes |
|--------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|
| | 0 = Defined | 1 = Undefined | |
| CB undefined | Input CB open = 1 Input CB close = 0 NO flowing current Or Input CB open = 0 Input CB close = 1 | Input CB open = = Input CB close | The state of inputs open and close has to remain steady for at least 30 ms |

| State | Value | | Notes |
|----------|--------------|------------------------------------------------------------|----------------------------------------------------------------------------|
| | 0 = No error | 1 = CB error | |
| CB error | Other chases | Input CB open = 1 Input CB close = 0 Current flowing | The state of inputs open and close has to remain steady for at least 30 ms |

| State | Value | | Notes |
|-------------------------|------------------------|------------------------|-----------------------------------------------------|
| | 0 = withdrawn | 1 = connected | |
| CB withdrawin/connected | Input CB connected = 0 | Input CB connected = 1 | The input has to remain steady for at least 1000 ms |

| State | Value | | Notes |
|----------------------------|---------------------------|---------------------------|----------------------------------------------------|
| | 0 = discharged springs | 1 = charged springs | |
| Springs charged/discharged | Input charged springs = 0 | Input charged springs = 1 | The input has to remain steady for at least 200 ms |

11.7 STATISTICAL DATA

Devices produces some statistical data relevant to system bus communication and to CB operations, in particular:

1. **communication statistical data**
 - a. received messages nr.
 - b. Received messages ns. with crc error
 - c. Set messages nr.
 - d. Slave Busy exception responses nr.
 - e. Total exception responses nr.

Must be: $a = b + c + \text{nr. Broadcast messages}$

Data described above are NOT updated in self-supply device mode.

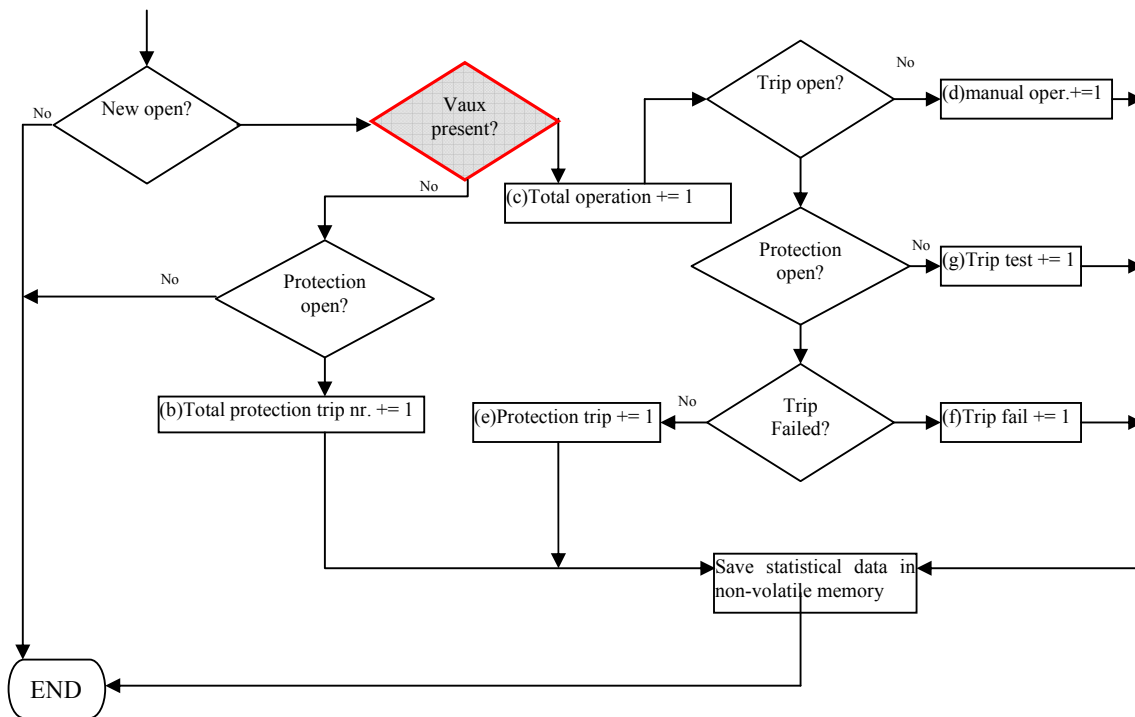


There is a copy of each bus for the statistic communication data in order that the cancelling of the same will not compromise the reading by other bus.

2. **CB operation statistical data**
 - a. Contact wear
 - b. Total protection trip number
3. **CB operation statistical data NOT updated in self-supply device mode**
 - c. Total operation nr.
 - d. Manual operation nr.
 - e. Protection trip nr.
 - f. Protection trip fail nr.
 - g. Trip test nr.

| | | | | | | |
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| Author Autore | LB-DTEA | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 38/40 |

The relationship between them: $c = d + e + f + g$, $b \geq e + f$.
 The following diagram shows the CB statistical data calculation method:



11.8 RELAYS YO AND YC

By proper commands (CB Open and CB Close) it is possible to operate on relays YO and YC present on dialogue unit.

In case of command acceptance, the interested relay is closed for 120 ms. The following table shows the checks carried out for the acceptance of the commands and the relevant activation.

| Command | Acceptance conditions | Relay YO | Relay YC | Notes |
|----------|--------------------------------------------------------------------|--------------------------|--------------------------|-----------------------------------------------------------------------------------------------------|
| CB Open | CB connected Test Unit not connected | It is excited for 120 ms | | In case the acceptance conditions are not verified the exception ILLEGAL FUNCTION will be give back |
| CB Close | CB connected CB <u>not</u> undefined Test Unit not connected | | It is excited for 120 ms | |

The relay YO is controlled also after a back up protection (the CB is closed also after an open command); in this case the relay YO is controlled with an excitation (120 ms)–idle (50 ms) up to the CB is not open.

| | | | | | | |
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| Author Autore | LB-DTEA | | | Title Titolo | PR122/VF + PR120/D-M Modbus™ System Interface | EN |
| ABB | L4618 | | | Doc. No N. Doc. | 1SDH000922R0001 | Tot. Pag. 39/40 |

11.9 COMAMND EXECUTION CONDITIONS

11.9.1 Command execution conditions:

To the condition below reported must be appended:

1. By **external bus** the commands are accepted only in **remote** operation device mode.
2. With Test unit connected only CB OPEN command is accepted

| Command type | Action | Acceptance conditions | Notes |
|--------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Dummy command | No action | Always accepted | |
| CB Open | Active for 200 ms output YO | CB connected and opening or closing not executing | This is the only command accepted when the unit test is connected. |
| CB Close | Active for 200 ms output YC | CB connected, CB open, state CB not undefined and open and close command not executing | |
| Reset CB | Reset trip state bits | Always accepted | |
| Start Autotest Display Led | Carry out display and led tests | Always accepted | |
| Start Autotest Module Contacts | Carry out module contact tests | Always accepted | |
| Trip test | Carry out a trip test | $I > 0,05 I_n$ | |
| Trip reset | Abort trip state bits | Always accepted | |
| Wink toggle command | Commute wink state of the unit (backlight wink) | Always accepted | |
| Reset signalling | Reset the signalling module and unit master on local bus | Always accepted | |

Table 13 COMMAND EXECUTION CONDITIONS

11.10 MEASURE LIMITS AND REPRESENTATION

| Measure | Special value | Description | Modbus | Local Display |
|----------------------|---------------|-----------------------------------------------------------|------------|---------------|
| Currents | Not available | CB state Inaccuracy / current presence | 0xFFFFFFFF | --- |
| | Too low | $I < I_{min}$ | 0 | ... |
| | Saturation | $I > I_{max}$ | I_{max} | $I > xxx A$ |
| Max current polarity | Not available | CB state Inaccuracy / current presence, all $I < I_{min}$ | 0 (listed) | --- |
| Contact wear | Saturation | $CW > 100\%$ | 65000 | 100% |

Legend: $I_{min} = 0,05 I_n$
 $I_{max} = 10 I_n$

Note: It is advisable to use the visualization shown in column "local Display" also on remote visualization devices.

11.11 CONTACT WEAR

The contact wear is calculated as the usury sum owed at every single CB open and it's explicit in % (0 ÷ 100[%]):

I 's available in format 0 ÷ 65000 (0 = 0%, 65000 = 100%), therefore to obtain the percentage is necessary to divide the value for 650.

| | | | | | | | |
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| Author Autore | LB-DTEA | | | | Title Titolo | PR122/VF + PR120/D-M | EN |
| ABB | L4618 | | | | Doc. No N. Doc. | 1SDH000922R0001 | |
| | | | | | | | Tot. Pag. 40/40 |