FACTORY AUTOMATION

# Manual

## VBG-CCL-G4F

**AS-Interface/CC-Link Gateway IP67**

**in acc. to specification 2.1**


PEPPERL+FUCHS

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# 1 Declaration of Conformity

The AS-iCC-Link gateway VBG-CCL-G4F has been developed and produced in accordance with the applicable European standards and directives.

Note

*The corresponding of conformity can be requested from the manufacturer.*

The manufacturer of the product, Pepperl+Fuchs Group in D-68301 Mannheim, possesses a certified quality assurance system in accordance with ISO 9001.

CE

ISO**9001**

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## 2 The Symbols Used


Warning

*This symbol warns the user of possible danger. Failure to heed this warning can lead to personal injury or death and/or damage to equipment.*

Attention

*This symbol warns the user of a possible failure. Failure to heed this warning can lead to total failure of the equipment or any other connected equipment.*

Note

*This symbol gives the user important hints.*

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# 3 Safety

## 3.1 Intended Use


Warning

*The protection of operating personnel and the system against possible danger is not guaranteed if the control interface unit is not operated in accordance with its intended use.*
*The device may only be operated by appropriately qualified personnel in accordance with this operating manual.*

## 3.2 General Safety Information


Warning

*Safety and correct functioning of the device cannot be guaranteed if any operation other than that described in this operation manual is performed.*
*The connecting of the equipment and any maintenance work to be carried out with voltage applied to the equipment must only be performed by appropriately qualified electrotechnical personnel.*
*In the case that a failure cannot be repaired, the device must be taken out of operation and kept from inadvertently put back into operation.*
*Repair work is to be carried out by the manufacturer only. Additions or modifications to the equipment are not allowed and void the warranty.*

Note

*The operator is responsible for the observance of local safety standards.*

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# 4 General Information

This operating instruction is for use with the following device of the Pepperl+Fuchs GmbH:

- VBG-CCL-G4F

The AS-i/CC-Link Gateways serve to connect the Actuator-Sensor-Interface to the CC-Link. A gateway represents the master for the AS-Interface and the slave for the CC-Link.

All AS-Interface functions can be called via the CC-Link. The high protection category IP 65 makes the device suitable for applications in the extreme industrial environments frequently encountered in the field. AS-Interface is connected using the penetration technique of EMS (Electromechanical Interface). CC-Link is connected with heavy gauge terminals and screw terminal blocks.

As with all Masters of Pepperl+Fuchs GmbH, commissioning, debugging and setting up of the AS-i parameters can be accomplished with the use of two push-buttons, the display and the LEDs directly on the device.

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# 5 Connections, Displays and Operating Keys

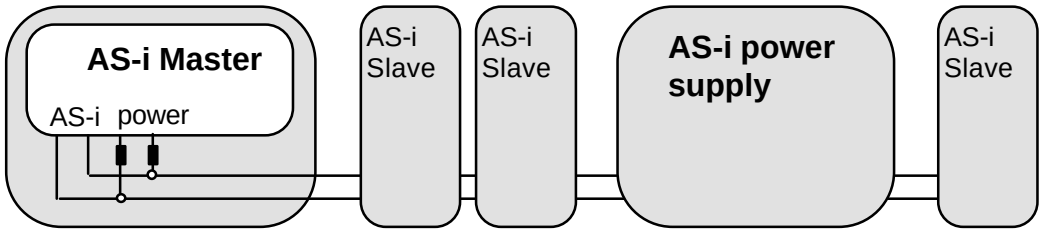
Devices in IP65:


The devices in IP65 have the terminals for CC-Link (screw terminals) and the push buttons under the top of the housing to prevent liquids from entering. The AS-interface is connected with the electromechanical interface with penetration technique developed for AS-i at the bottom of the housing.

## 5.1 Power Supply Concepts and AS-i Connection Techniques

An AS-i power supply has to be used which also supplies the AS-i master with power and can be connected to the AS-i cable like all the other AS-i components at any place.

### 5.1.1 Single Masters in IP65




Every AS-i master and all the AS-i gateways in IP65 come with power supply A. The AS-i master is connected to AS-i using the penetration technique of the electromechanical interface which is common with AS-i slaves as well.

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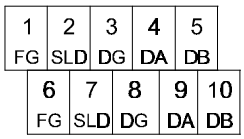
## 5.2 The CC-Link Interface

CC-Link gateway in IP65 can be connected to CC-Link with screw terminals inside of the device. For that purpose the top of the housing has to be screwed off.

connection of CC-Link interface on screw terminal block and arrangement on circuit board:

| | |
|---|---|
| 1 | FG |
| 2 | SLD |
| 3 | DG |
| 4 | DA |
| 5 | DB |
| 6 | FG |
| 7 | SLD |
| 8 | DG |
| 9 | DA |
| 10 | DB |




Termination resistor:
To be removed if module is not at the end of line

The device in IP65 is powered out of the AS-i line to which it is connected by the electromechanical interface (penetration technique as it is used with AS-i slaves).

## 5.3 Display and Operating Elements

On the front panel of the AS-i/CC-Link gateway are ten light-emitting diodes, a two-digit display and two push buttons.

With the devices in IP65 the push buttons are situated inside of the housing to avoid liquids from entering. The top of the housing has to be screwed off to operate these push buttons.

### 5.3.1 LEDs of the Single Masters

| | |
|---|---|
| PW | The master's power supply is sufficient. |
| L RUN | CC-Link Run LED<br>CC-Link interface communication active via the CC-Link interface. |
| L ERR | CC-Link Error LED<br>A communication error occurs. |
| SD | CC-Link Send Data LED<br>The CC-Link interface sends data. |
| RD | CC-Link Receive Data LED<br>The CC-Link interface receives data. |
| CONF. ERR | Configuration error<br>At least one configured slave is missing, or at least one detected slave is not projected or for at least one projected and detected slave the actual configuration data does not match the nominal configuration data. |
| AS-i | The AS-i circuit is sufficiently powered. |
| AS-I ACTIVE | Normal operation active. |

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PRG ENABLE Automatic address programming enabled.
Exactly one slave is missing in protected operating mode. The slave can be replaced by another slave of the same type with address zero. The master addresses the new slave to the faulty address and thus eliminates the configuration error.

PRG MODE The AS-i master is in configuration mode.

### 5.3.2 Push-Buttons

The push-buttons cause following:

mode Switching between the configuration mode and the protected operating mode and saving the actual AS-i configuration as the nominal configuration.

set Selection and assigning the address to a slave.

The detailled description is described in chapter 6.

By IP65 devices the push-buttons under the top of the housing to prevent liquids from entering. For operation of the device the top of the housing is to be screwed off.

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# 6 Operating the AS-i/CC-Link Gateway

## 6.1 Master Start-Up

After powering on, all segments of the figure display and all LEDs light up for approximately one second (self-test). Afterwards, the LEDs display the condition of their respective flags. The figure display shows the condition of the master:

40 Off-line Phase
The AS-i master initializes - there is no data communication on the AS-i.


***If the AS-i circuit is insufficiently powered ("U AS-i" does not light up)*** *or there is no communication relationship between the CC-Link master and the CC-Link gateway,* ***the master remains in the off-line phase.***

In configuration mode automatically the device can leave the off-line phase.
In protected mode, if the CC-Link communication is interrupted, the AS-i master switches to the off-line phase after the watchdog time of the CC-Link has expired and was started automatically.

41 Detection Phase
Start of the start-up phase, where the system looks for slaves located on the AS-i. The master remains in the detection phase until it finds at least one slave.

42[1] Activation Phase
Condition at the end of the start-up operation where the parameters are transmitted to all connected and recognized slaves. This enables access to the AS-i slaves' data connections.

43[2] Start of Normal Operation
In normal operation the AS-i master can exchange data with all active slaves. It transmits management messages and looks for and activates newly connected slaves. During normal operation, the system keeps the maximum cycle time of 5 milliseconds.

## 6.2 Configuration Mode

The configuration mode serves to configure the AS-i circuit.


*In the configuration mode, all recognized slaves are activated even when the desired and actual configurations do not match.*

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1. Activation phase and the start of normal operation maybe so short that the numbers can not be seen in the display.
2. Activation phase and the start of normal operation maybe so short that the numbers can not be seen in the display.

Pressing the “mode” button for at least five seconds switches the gateway to configuration mode. While in configuration mode, the yellow “prj mode” LED lights up.

The system then displays one after the other all detected slaves at a speed of two per second. First all "A" slaves and afterwards all "B" slaves. If a "B" slave is displayed, the "AS-i active" LED blinks. If the display is empty, no slaves were detached on the AS-i circuit.

In configuration mode, all recognized slaves are activated except of slave zero. The AS-i master is in normal operation. There is data exchange between the AS-i master and all AS-i slaves detected by the master regardless of whether the detected AS-i slaves were projected before.


*When delivered the device is in configuration mode.*

## 6.3 Protected Operating Mode


*In contrast with the configuration mode in the protected mode there is only data exchange between the AS-i master and the projected AS-i slaves.*

### 6.3.1 Switching to Protected Operating Mode

The configuration mode can be left by pressing the “mode” button.

Pressing the button shortly:
Exits the configuration mode without projecting the current AS-i configuration.

Pressing the button for more than five seconds:
Exits the configuration mode and projects the actual AS-i configuration. Simultaneously the actual AS-i configuration is stored as nominal configuration in the EEPROM.


*If the system detects an AS-i slave with address zero on the AS-i, it can not leave the configuration mode.*

In the protected operating mode, only AS-i slaves that are projected and whose actual configurations match the nominal configurations will be activated.

### 6.3.2 Configuration Errors in Protected Operating Mode

As long as there is no configuration error, the numeric display is turned off while in protected operating mode. Otherwise, the address with a faulty assignment is displayed. A faulty assignment occurs when a slave has been recognized or projected but cannot be activated.

If there are more than one faulty assignments the one that was first detected is displayed. Pressing the “set” button shortly displays the next higher faulty address.

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Shortly appearing configuration errors are stored in the device (advanced AS-i diagnosis). The last error that occurred can be displayed by pressing the set button. If a short AS-i power failure is responsible for the configuration error the display shows a “39”.

## 6.4 Assigning an AS-i Address in Configuration Mode

To assign a slave with address unequal zero to another address unequal zero, you have to follow the instructions first in chapter 6.4.2 and then chapter 6.4.1 one after the other.

### 6.4.1 Assigning a Slave Address

(assigning an available address to a slave with address zero)

In configuration mode, the addresses of all detected slaves are displayed one after the other. To display the next higher available operating address, press the “set” button shortly. Each time you press the “set” button, the next available address is displayed.

Choose the displayed address as your target address by pressing the “set” button for more than five seconds. The address display blinks. The master is ready for programming; pressing the “set” button again addresses the connected slave with address zero to the target (blinking address).

Any errors will be displayed by their error codes according to chapter 11. Otherwise, the detected slaves are displayed again as described in chapter 6.2..

Note

*Only slaves with address 0 can get a new address by the master.*

Attention

*There must not be two AS-i slaves with the same adrress on the AS-i circuit.*

### 6.4.2 Erasing the Slave Address

(assigning address zero to a detected slave)

In configuration mode, the addresses of all recognized slaves are displayed one after the other. By pressing and releasing the “set” button, the master displays the next available address. If you press the button for more than five seconds while the address of a detected slave is displayed, this slave will get the address zero and the display shows “00”.

When you release the button, the display continues to display the detected slaves.

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## 6.5 Programming the Address in Case of Configuration Errors

### 6.5.1 Automatic Address Assignment


*One of AS-i's great advantages is the automatic address assignment. If a slave fails, it can be replaced by one of the same type with address zero. The master will detect the replacement and automatically addresses the new slave with the address of the faulty one.*

For automatic programming to work, some requirements must be met:

1. The AS-i master must be in the protected operating mode.
2. The "Auto_Address_Assign"[1] release flag must be set.
3. Only one of the projected slaves may not be detected.

If these requirements are met, the AS-i master's "**prg enable**" LED lights up and a slave with address zero will be automatically assigned to the operating address of the missing slave. The "Automatic Address Assignment" can be activated and deactivated via the software "AS-i Control Tools". .


*If the two slaves have different configuration data, i.e. are not of the same type as far as AS-i is concerned, the automatic address assignment will not be carried out.*


*Only slaves with address 0 can get a new address by the master.*

### 6.5.2 Manual Address Assignment


*If several slaves fail, they cannot be replaced automatically by the AS-i master. Then these addresses have to be set manually. If this should not be done via the host interface or with a hand held addressing device, the slave addresses can also be changed with the help of the push buttons and the figure display of the device.*

In protected operating mode, wrong assignments are displayed as errors (see chapter 6.3). By pressing the "set" button, you can display all faulty assignments one after the other. By pressing the "set" button for more than five seconds, you can select the currently displayed address as a potential target address, and the display starts to blink.

If the faulty slave was previously replaced by a slave with address zero, the new slave can now be programmed for the blinking address by pressing the "set" key again. As a requirement, the new slave's configuration data must match the configuration data for the blinking address.

1. By deletion of flag "Auto_prog" the user can close "automatic addressing".

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After the address has been successfully set, the next faulty assignment is displayed and the address assignment can begin from the start. Otherwise, the system displays an error code (chapter 11). When all faulty assignments are eliminated the display is empty.

## 6.6 Setting the CC-Link Station Number and the Baudrate

### 6.6.1 Station Number

The addressing of the AS-i/CC-Link-Gateway as a CC-Link Remote Device can be done locally on the gateway. To change the station number both the "set" button and the "mode" button have to be pushed simultaneously for at least 5 seconds until the current station number is shown on the LED display. With every pushing of the "set" button, the station number can now be increased by 1.

Once the desired station number is shown on the display, it will be stored non-volatile in the EEPROM by pushing the ”mode” button.

On the AS-i/CC-Link-Gateway, station numbers from 1 to 62 can be selected. When delivered the station address is set to 1.

### 6.6.2 Baudrate

After the station address has been set, the code for the baudrate (see table) will be displayed.

| Code | Baudrate |
|---|---|
| 0 | 156 kbps |
| 1 | 625 kbps |
| 2 | 2.5 Mbps |
| 3 | 3 Mbps |
| 4 | 10 Mbps |

The baudrate can be changed with the button "set" and be stored with the button "mode".

After the setting of station address and baudrate is finished, the normal display appears again and the AS-i master is ready to operate.

When delivered the baudrate is set to 156kbps.

## 6.7 Error Messages


*The system displays error codes for error messages that do not point to faulty assignments on the AS-i circuit. The code numbers are larger than 50 and are therefore outside the slave address range. These codes are described in the appendix, chapter 11.*

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# 7 Advanced Diagnostics for AS-i Masters

The advanced AS-i diagnostics serve to locate occasionally occurring errors and to judge the quality of data transmission on AS-i without additional diagnostics tools.

## 7.1 List of Corrupted AS-i Slaves (*LCS*)

To locate occasionally occurring short-time configuration errors the AS-i masters with advanced diagnostics manage beside the list of projected slaves (*LPS*), the list of detected slaves (*LDS*) and the list of activated slaves (*LAS*) a forth list, the **list of corrupted slaves (*LCS*)**. This list contains entries of all AS-i slaves which were responsible for at least one configuration error since powering up the AS-i master or reading the list. Short-time AS-i power failures are represented in the *LCS* at the position of AS-i slave with address 0.

Note

*With every read access the LCS will be deleted.*

Note

*The last short-time configuration error can also be displayed on the AS-i master:*
*Pressing the “set” button of the AS-i master shows the AS-i slave which was responsible for the last short-time configuration error. If there was a short-time AS-i power failure the display shows “39” after pressing the “set” button.*
*This function is only available if device is in the normal operation mode of the protected mode (display empty) or in the off-line-phase.*

## 7.2 Protocol Analysis: Counters of Corrupted Data Telegrams

The AS-i master with advanced diagnostics has a counter of telegram repetitions for each AS-i slave, which is increased everytime there is a corrupted data telegram. This makes possible to judge the quality of the AS-i network, even if only a few corrupted telegrams occured and the AS-i slave did not cause any configuration errors.

Note

*The counter values can be read via the host interface and will be deleted with every read access. The counter value is limited to 254. 255 means counter overflow.*

## 7.3 Off-line Phase on Configuration Errors (LOS)

The AS-i master with advanced diagnostics offer the possibility to put themselves into the off-line Phase when a configuration error on the AS-Interface occurs. In this way the security of the application can be ensured. The reaction to a configuration error is very fast and the host can be relieved from this task. If there are any problems on the AS-i network, the AS-interface can be switched to a secure state.

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There are two different ways to parameterize the AS-i master for this feature:

- Every configuration error during normal operation in protected mode releases the off-line phase.
- For each slave address can be chosen whether a configuration error on this address will release the off-line phase or not. This information is stored in the List of Off-line Slaves (*LOS*).
  The user himself can decide how the system reacts to a configuration error on the AS-Interface. The AS-i master can release the off-line phase in critical situations, i. e. only with certain slave addresses, while in less critical situations (if one of the other AS-i slaves have a configuration error) only the error message configuration error is sent to the host, but AS-i is still running.

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# 8 CC-Link User Interface

The AS-i/CC-Link Gateway occupies 3 stations.

The CC-Link Master and the AS-i/CC-Link Gateway exchange data by Remote Word Registers and RX/RY.

| **Remote → Master** | |
|---|---|
| **Device No.** | **Description** |
| RXn0 | Reserved |
| RXn1 | Reserved |
| RXn2 | Reserved |
| RXn3 | Reserved |
| RXn4 | 0: RW use as Input and Output data image<br>1: RW use as mailbox |
| RXn5 | 0: RW enabled, use RW as selected in RXn4<br>1: RW disabled |
| RX(n+5) 0 … RX(n+5) 9 | Reserved |
| RX(n+5) A | Error Status Flag |
| RX(n+5) B | Remote READY |
| RX(n+5) C … RX(n+5) F | Reserved |

| **Master → Remote** | | |
|---|---|---|
| **Device No.** | **Name** | **Description** |
| RYn0 | Offline | 1: the device is set into the offline-phase |
| RYn1 | Auto_Address_Enable | 1: disabling of the automatic slave addressing |
| RYn2 | Configuration mode | changing this bit from 0 to 1 sets the device to configuration mode |
| RYn3 | Protected Mode | changing this bit from 0 to 1 sets the device to protected mode |
| RYn4 | Select | 0: Request for use RW as Input and Output data image<br>1:Request for use RW as mailbox |
| RYn5 | Select | 0: Request for enable RW, use RW as selected in RYn4<br>1:Request for disable RW |
| RYn5 ... RY(n+4) F | Unused | |

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| Master → Remote | | |
|---|---|---|
| **Device No.** | **Name** | **Description** |
| RY(n+5) 0 … RY(n+5) 9 | Reserved | |
| RY(n+5) A | Error Reset Request Flag | |
| RY(n+5) B | Vacancy | |
| RY(n+5) C … RY(n+5) F | Reserved | |

The memory map is as follows:

RWwm: Remote Word write at address m
RWrn: Remote Word read at address n

If RXn4 = 0:

Master → Remote: RW shows single, A and part of B slaves.

| Master → Remote | | Remote → Master | |
|---|---|---|---|
| **Address** | **Description** | **Address** | **Description** |
| RWwm | Output data to AS-i slave 1/1A … 3/3A | RWrn | Input data from AS-i slave 1/1A … 3/3A and part of execution control (ec) flags |
| RWwm+1 | Output data to AS-i slave 4/4A … 7/7A | RWrn+1 | Input data from AS-i slave 4/4A … 7/7A |
| RWwm+2 | Output data to AS-i slave 8/8A … 11/11A | RWrn+2 | Input data from AS-i slave 8/8A … 11/11A |
| RWwm+3 | Output data to AS-i slave 12/12A … 15/15A | RWrn+3 | Input data from AS-i slave 12/12A … 15/15A |
| RWwm+4 | Output data to AS-i slave 16/16A … 19/19A | RWrn+4 | Input data from AS-i slave 16/16A … 19/19A |
| RWwm+5 | Output data to AS-i slave 20/20A … 23/23A | RWrn+5 | Input data from AS-i slave 20/20A … 23/23A |
| RWwm+6 | Output data to AS-i slave 24/24A … 27/27A | RWrn+6 | Input data from AS-i slave 24/24A … 27/27A |
| RWwm+7 | Output data to AS-i slave 28/28A … 31/31A | RWrn+7 | Input data to AS-i slave 28/28A … 31/31A |
| RWwm+8 | Output data to slave 1B … 3B | RWrn+8 | Input data form slave 1B … 3B |
| RWwm+9 | Output data to slave 4B … 7B | RWrn+9 | Input data form slave 4B … 7B and part of execution control (ec) flags |
| RWwm+10 | Output data to slave 8B … 11B | RWrn+10 | Input data form slave 8B … 11B |
| RWwm+11 | Output data to slave 12B … 15B | RWrn+11 | Input data form slave 12B … 15B |

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If RXn4 = 1:

Remote → Master: RW shows mailbox.

| Master → Remote | | Remote → Master | |
|---|---|---|---|
| **Address** | **Description** | **Address** | **Description** |
| RWwm | RWwm command/circuit | RWrn | command/result |
| RWwm+1 | RWwm Req. param byte 1 + 2 | RWrn+1 | Resp. param byte 1 + 2 |
| RWwm+2 | RWwm Req. param byte 3 + 4 | RWrn+2 | Resp. param byte 3 + 4 |
| RWwm+3 | RWwm Req. param byte 5 + 6 | RWrn+3 | Resp. param byte 5 + 6 |
| RWwm+4 | RWwm Req. param byte 7 + 8 | RWrn+4 | Resp. param byte 7 + 8 |
| RWwm+5 | RWwm Req. param byte 9 + 10 | RWrn+5 | Resp. param byte 9 + 10 |
| RWwm+6 | RWwm Req. param byte 11 + 12 | RWrn+6 | Resp. param byte 11 + 12 |
| RWwm+7 | RWwm Req. param byte 13 + 14 | RWrn+7 | Resp. param byte 13 + 14 |
| RWwm+8 | RWwm Req. param byte 15 + 16 | RWrn+8 | Resp. param byte 15 + 16 |
| RWwm+9 | RWwm Req. param byte 17 + 18 | RWrn+9 | Resp. param byte 17 + 18 |
| RWwm+10 | RWwm Req. param byte 19 + 20 | RWrn+10 | Resp. param byte 19 + 20 |
| RWwm+11 | RWwm Req. param byte 21 + 22 | RWrn+11 | Resp. param byte 21 + 22 |

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Description of the individual addresses

RWwm

| Bit | Description |
|---|---|
| 0 | 1: sets the AS-i into the offline-phase |
| 1 | 0: enables automatic slave addressing,<br>1: disables automatic slave addressing |
| 2 | changing this bit from 0 to 1 set the AS-i Master to configuration mode |
| 3 | changing this bit from 0 to 1 set the AS-i Master to protected mode |
| 4 | Output 0, AS-i Slave 1 |
| 5 | Output 1, AS-i Slave 1 |
| 6 | Output 2, AS-i Slave 1 |
| 7 | Output 3, AS-i Slave 1 |
| 8 | Output 0, AS-i Slave 2 |
| 9 | Output 1, AS-i Slave 2 |
| 10 | Output 2, AS-i Slave 2 |
| 11 | Output 3, AS-i Slave 2 |
| 12 | Output 0, AS-i Slave 3 |
| 12 | Output 1, AS-i Slave 3 |
| 14 | Output 2, AS-i Slave 3 |
| 15 | Output 3, AS-i Slave 3 |

RWwm+1

| Bit | Description |
|---|---|
| 0 | Output 0, AS-i Slave 4 |
| ... | ... |
| 15 | Output 3, AS-i Slave 7 |

RWwm+7

| Bit | Description |
|---|---|
| 0 | Output 0, AS-i Slave 28 |
| ... | ... |
| 15 | Output 3, AS-i Slave 31 |

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RWrn

| Bit | Description |
|---|---|
| 0 | 0: AS-i configuration OK,<br>1: AS-i configuration error |
| 1 | 0: AS-i power OK,<br>1: AS-i power fail: the AS-i voltage is insufficient |
| 2 | 0: normal operation of AS-i,<br>1: AS-i is not in normal operation |
| 3 | 0: device is in protected mode,<br>1: device is in configuration mode |
| 4 | Input 0, AS-i Slave 1 |
| 5 | Input 1, AS-i Slave 1 |
| 6 | Input 2, AS-i Slave 1 |
| 7 | Input 3, AS-i Slave 1 |
| 8 | Input 0, AS-i Slave 2 |
| 9 | Input 1, AS-i Slave 2 |
| 10 | Input 2, AS-i Slave 2 |
| 11 | Input 3, AS-i Slave 2 |
| 12 | Input 0, AS-i Slave 3 |
| 12 | Input 1, AS-i Slave 3 |
| 14 | Input 2, AS-i Slave 3 |
| 15 | Input 3, AS-i Slave 3 |

RWrn+1

| Bit | Description |
|---|---|
| 0 | Input 0, AS-i Slave 4 |
| ... | |
| 15 | Input 3, AS-i Slave 7 |

Rwrn+8

| Bit | Description |
|---|---|
| 0 | 0: device is in protected mode,<br>1: device is in configuration mode |
| 1 | 0: normal operation of AS-i,<br>1: AS-i is not in normal operation |
| 2 | 0: AS-i power OK,<br>1: AS-i power fail: the AS-i voltage is insufficient |
| 3 | 1: the device is in the off-line phase. |

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RWrn+11

| Bit | Description |
|---|---|
| 0 | Input 0, AS-i Slave 12B |
| ... | |
| 15 | Input 3, AS-i Slave 15B |

## 8.1 Switching between the Mailbox and the Data Images

The default value for RYn4 and RYn5 is 0.

So the input data image and the output data image are shown at the RW.

## 8.2 Switching to the IO Data Images

1. Set RYn5. The gateway will recognize this and not use the RW as output and input data for the ASi slaves. The output data will be the last data before RYn5 was set. The gateway will set RXn5.
2. After RXn5 was set by the gateway the user can select the way he wants to use the RW memory, using RYn4. In this case RYn4 will be set to 0 (IO data images).
3. Wait until the gateway confirms this by setting RXn4 to the same value as RYn4.
4. Write the correct data to the RW memory. RXn4 = 0 (IO data image): set output data for the AS-i slaves
5. After the data was written, reset RYn5. The gateway will reset RXn5 and use the RW memory in the way RXn4 shows.

## 8.3 Switching to the Mailbox:

1. Set RYn5. The gateway will recognize this bit and not use the RW as mailbox. Then the gateway set RXn5.
2. After RXn5 was set by the gateway the user can select the way he wants to use the RW memory, using RYn4. In this case RYn4 will be set to 1 (mailbox).
3. Wait until the gateway confirms this by setting RXn4 to the same value as RYn4.
4. Write the correct data to the RW memory: RXn4 = 1 (mailbox): write mailbox data to RW
5. After the data was written, reset RYn5. The gateway will reset RXn5 and use the RW memory in the way RXn4 shows.

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# 9 Mailbox

This chapter contains all the necessary information to operate in a Mailbox.

## 9.1 Mailbox

### 9.1.1 Construction

If an AS-i slave is addressed in a command or in a response, the address is structured as shown below:

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | command | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | request parameter byte 1 | | | | | | | |
| … | … | | | | | | | |
| 24 | request parameter byte 22 | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | command | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | response parameter byte 1 | | | | | | | |
| … | … | | | | | | | |
| 24 | response parameter byte 22 | | | | | | | |

Command byte and T-bit are always part of the response. The T-bit is necessary to operate the mailbox. In that way the same mailbox command can be used two times directly one command after the other with different parameters.

The execution of a mailbox is declined, if the mailbox is too small.

Circuit = 0 If AS-i gateway with one AS-i master or the master 1 of an AS-i gateway with 2 masters is choosen.

Circuit = 1 If AS-i gateway with 2 masters and the master 2 is choosen.

The commands for reading and writinig exist in 2 variants. By the first variant the bits in the slave lists are arranged, so that the data for slave with lower address appear in the lower bits. The second variant is compatible to Siemens masters, by which the sequence of the bits in the slave lists bytes are inverse.

Between the 2 variants can be changed with bit $2^6$ in byte 2 of the request. For Siemens compatibility bit $2^6$ should not be deleted.

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The coding of requests for commands to reading and writing is following therefore:

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | command | | | | | | | |
| 2 | T | 0 | circuit | | | | | |
| 3 | Request parameter byte 1 | | | | | | | |
| … | … | | | | | | | |

#### 9.1.1.1 Values for command

| Values for command | | | | |
|---|---|---|---|---|
| **command** | **value** | **meaning** | **Req Len** | **Res Len** |
| IDLE | $00_{16}$ | No order | 2 | 2 |
| READ_IDI | $41_{16}$ | Read IDI | 2 | 24 |
| WRITE_ODI | $42_{16}$ | Write_ODI | 24 | 2 |
| SET_PP | $43_{16}$ | Set_Permanent_Parameter | 4 | 2 |
| GET_PP | $01_{16}$ | Get_Permanent_Parameter | 3 | 3 |
| WRITE_P | $02_{16}$ | Write_Parameter | 4 | 3 |
| READ_PI | $03_{16}$ | Read_Parameter | 3 | 3 |
| STORE_PI | $04_{16}$ | Store_Actual_Parameter | 2 | 2 |
| SET_PCD | $25_{16}$ | Set_Permanent_Config | 5 | 2 |
| GET_PCD | $26_{16}$ | Get_Permanent_Config | 3 | 4 |
| STORE_CDI | $07_{16}$ | Store_Actual_Configuration | 2 | 2 |
| READ_CDI | $28_{16}$ | Read_Actual_Configuration | 3 | 4 |
| SET_LPS | $29_{16}$ | SET_LPS | 11 | 2 |
| GET_LPS | $44_{16}$ | Get_LPS | 2 | 10 |
| GET_LAS | $45_{16}$ | Get_LAS | 2 | 10 |
| GET_LDS | $46_{16}$ | Get_LDS | 2 | 10 |
| GET_FLAGS | $47_{16}$ | Get_Flags | 2 | 5 |
| SET_OP_MODE | $0C_{16}$ | Set_Operation_Mode | 3 | 2 |
| SET_OFFLINE | $0A_{16}$ | Set_Offline_Mode | 3 | 2 |
| SET_DATA_EX | $48_{16}$ | Set_Data_Exchange_Active | 3 | 2 |
| SLAVE_ADDR | $0D_{16}$ | Change_Slave_Address | 4 | 2 |
| SET_AAE | $0B_{16}$ | Set_Auto_Adress_Enable | 3 | 2 |
| GET_LPF | $3E_{16}$ | Get_LPF | 2 | 10 |
| WRITE_XID1 | $3F_{16}$ | Write_Extended_ID-Code_1 | 3 | 2 |
| RD_7X_IN | $50_{16}$ | Read 1 7.3-slave in.data | 3 | 10 |

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| Values for command | | | | |
|---|---|---|---|---|
| **command** | **value** | **meaning** | **Req Len** | **Res Len** |
| WR_7X_OUT | $51_{16}$ | Write 1 7.3-slave out.data | 11 | 2 |
| RD_7X_OUT | $52_{16}$ | Read 1 7.3-slave out.data | 3 | 10 |
| RD_7X_IN_X | $53_{16}$ | Read 4 7.3-slaves in.data | 3 | 24 |
| WR_7X_OUT_X | $54_{16}$ | Write 4 7.3-slaves out.data | 24 | 2 |
| RD_7X_OUT_X | $55_{16}$ | Read 4 7.3-slaves out.data | 3 | 24 |
| READ_ODI | $56_{16}$ | Read ODI | 2 | 24 |
| GET_DELTA | $57_{16}$ | Get list of config. diff. | 2 | 10 |
| WR_74_PARAM | $5A_{16}$ | Write S-7.4-slave parameter | ≥6 | 2 |
| RD_74_PARAM | $5B_{16}$ | Read S-7.4-slave parameter | 4 | ≥3 |
| RD_74_ID | $5C_{16}$ | Read S-7.4-slave ID string | 4 | ≥3 |
| RD_74_DIAG | $5D_{16}$ | Read S-7.4-slave diagnosis string | 4 | ≥3 |
| GET_LISTS | $30_{16}$ | Get LDS, LAS, LPS, Flags | 2 | 24 |
| GET_LCS | $60_{16}$ | Get LCS | 2 | 10 |
| GET_LOS | $61_{16}$ | GET_LOS | 2 | 10 |
| SET_LOS | $62_{16}$ | SET_LOS | 10 | 2 |
| GET_TECA | $63_{16}$ | Get transm.err.counters | 2 | 24 |
| GET_TECB | $64_{16}$ | Get transm.err.counters | 2 | 24 |
| GET_TEC_X | $66_{16}$ | Get transm.err.counters | 4 | ≥3 |
| BUTTONS | $75_{16}$ | Disable pushbuttons | 3 | 2 |
| INVERTER | $7C_{16}$ | Configure Inverter Slaves | 12 | 4 |
| FP_PARAM | $7D_{16}$ | „Functional Profile“ Param. | ≥3 | ≥2 |
| FP_DATA | $7E_{16}$ | „Functional Profile“ Data | ≥3 | ≥2 |
| READ_IDI_X | $88_{16}$ | READ_IDI_X | 4 | ≥3 |
| READ_ODI_X | $89_{16}$ | READ_ODI_X | 4 | ≥3 |
| WRITE_ODI_X | $8A_{16}$ | WRITE_ODI_X | ≥5 | 2 |

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#### 9.1.1.2 Values for results

| Values for result | | | |
|---|---|---|---|
| | value | place | meaning |
| OK | $00_{16}$ | – | execution without fault |
| HI_NG | $11_{16}$ | HI | general fault |
| HI_OPCODE | $12_{16}$ | HI | illegal value in command |
| HI_LENGTH | $13_{16}$ | HI | length of the mailbox is too short |
| HI_ACCESS | $14_{16}$ | HI | no access right |
| EC_NG | $21_{16}$ | EC | general fault |
| EC_SND | $22_{16}$ | EC | „slave (source addr) not detected“ |
| EC_SD0 | $23_{16}$ | EC | „slave 0 detected“ |
| EC_SD2 | $24_{16}$ | EC | „slave (target addr) not decteced“ |
| EC_DE | $25_{16}$ | EC | „delete error“ |
| EC_SE | $26_{16}$ | EC | „set error“ |
| EC_AT | $27_{16}$ | EC | „address temporary“ |
| EC_ET | $28_{16}$ | EC | „extended ID1 temporary“ |
| EC_RE | $29_{16}$ | EC | „read (extended ID1) error“ |

### 9.1.2 Mailbox commands

#### 9.1.2.1 IDLE

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $00_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $00_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

#### 9.1.2.2 READ_IDI

With this call the input data values of all AS-i slaves are read out of the AS-i/CC-Link Gateway in addition to the cyclic data exchange. Though the mailbox command READ_IDI transmits all Execution-Control-Flags (byte 3 and byte 4).

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| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $41_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $41_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | | | | Pok |
| 4 | OR | APF | NA | CA | AAv | AAs | s0 | Cok |
| 5 | – | | | | slave 1A | | | |
| 6 | slave 2A | | | | slave 3A | | | |
| … | … | | | | | | | |
| 24 | slave 6B | | | | slave 7B | | | |

Pok Periphery_Ok
S0 LDS.0
AAs Auto_Address_Assign
AAv Auto_Address_Available
CA Configuration_Active
NA Normal_Operation_Active
APF APF
OR Offline_Ready
Cok Config_Ok

#### 9.1.2.3 WRITE_ODI

With this call the output data values of all AS-i slaves are written in additon to the cyclic data exchange.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $42_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | | | slave 1A | | | |
| 4 | slave 2A | | | | slave 3A | | | |
| … | … | | | | | | | |
| 24 | slave 10B | | | | slave 11B | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $42_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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### 9.1.2.4 Set_Permanent_Parameter (SET_PP)

With this call, a parameter value for the specified AS-i slave is configured on the AS-i/CC-Link Gateway. The value is stored permanently in the EEPROM of the Gateway.

The configured parameter is not transferred immediately by the AS-i/CC-Link Gateway to the AS-i slave. The configured parameter value is only transferred when the AS-i slave is activated after turning on the power supply on the AS-i/CC-Link Gateway.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $43_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | B | slave address | | | | |
| 4 | – | | | | PP | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $43_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

### 9.1.2.5 Get_Permanent_Parameter (GET_PP)

With this call, a slave-specific parameter value stored on the EEPROM of the AS-i/CC-Link Gateway is read.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $01_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | B | slave address | | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $01_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | PP | | | |

### 9.1.2.6 Write Parameter (WRITE_P)

The AS-i slave parameter value transferred with the command is passed on to the addressed AS-i slave.

The parameter is stored on the AS-i/CC-Link Gateway only temporarily and is not entered as a configured parameter in the EEPROM!

The AS-i slave transfers its current parameter value in the response (parameter echo). This can deviate from the value that has just been written according to the

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AS-i master specification. The AS-i slave response is returned as a parameter echo in the response data.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $02_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | B | slave address | | | | |
| 4 | – | | | | parameter | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $02_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | slave response | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

### 9.1.2.7 Read Parameter (READ_PI)

This call returns the current parameter value (actual parameter) of an AS-i slave sent by the AS-i/CC-Link Gateway.

This value must not be confused with the parameter echo that is supplied by the AS-i slave as a response to the write_parameter job.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $03_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | B | slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $03_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | PI | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

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### 9.1.2.8 Store Actual Parameters (STORE_PI)

With this call, the configured parameters stored on the EEPROM are overwritten with the current, permanently stored (actual) parameters; in other words, the parameters of all the AS-i slaves are configured.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $04_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $04_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

### 9.1.2.9 Set Permanent Configuration (SET_PCD)

This call sets the following configuration data for the addressed AS-i slave:

- I/O configuration
- ID code
- Extended ID1 code
- Extended ID2 code

The configuration data are stored permanently on the EEPROM of the AS-i/ CC-Link Gateway and are used as the expected configuration by the AS-i master in the protected mode. The configuration data are specified by the manufacturer of the AS-i slave.

If the addressed AS-i slave does not support an extended ID code 1/2, the value $F_{hex}$ must be specified.

When this command is executed, the AS-i master changes to the offline phase and then changes back to the normal mode (warm restart on the AS-i master).

This command can only be executed in the configuration mode.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $25_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | B | slave address | | | | |
| 4 | xID2 | | | | xID1 | | | |
| 5 | ID | | | | I0 | | | |

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| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $25_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

### 9.1.2.10 Get Extended Permanent Configuration (GET_PCD)

This call reads the following configuration data (configured data) of an addressed AS-i slave stored on the EEPROM of the AS-i master:

- I/O configuration
- ID code
- Extended ID1 code
- Extended ID2 code

The configuration data are specified by the manufacturer of the AS-i slave.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $26_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | B | slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $26_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | xID2 | | | | xID1 | | | |
| 4 | ID | | | | I0 | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

### 9.1.2.11 Store Actual Configuration (STORE_CDI)

With this call, the (actual) configuration data (I/O configuration, ID code, extended ID1 code and extended ID2 code) of all AS-i slaves are stored permanently in the EEPROM as the (expected) configuration data. The list of activated AS-i slaves (LAS) is adopted in the list of permanent AS-i slaves (LPS).

When this command is executed, the AS-i master changes to the offline phase and then changes back to the normal mode (warm restart on the AS-i master).

This command can only be executed in the configuration mode.

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| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $07_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $07_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

### 9.1.2.12 Read Actual Configuration (READ_CDI)

With this call, the following configuration data of an addressed AS-i slave obtained by the AS-i master on the AS-Interface are read.

- I/O configuration
- ID code
- Extended ID1 code
- Extended ID2 code

The configuration data are specified by the manufacturer of the AS-i slave.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $28_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | B | slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $28_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | xID2 | | | | xID1 | | | |
| 4 | ID | | | | I0 | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave
B = 1 B-slave

### 9.1.2.13 SET_LPS

With this call, the list of configured AS-i slaves is transferred for permanent storage in the EEPROM of the master.

When this command is executed, the AS-i master changes to the offline phase and then changes back to the normal mode (warm restart on the AS-i master).

This command can only be executed in the configuration mode.

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| Request (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $29_{16}$ | | | | | | | |
| 2 | T | 0 | circuit | | | | | |
| 3 | $00_{16}$ | | | | | | | |
| 4 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | – |
| … | … | | | | | | | |
| 11 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

| Request (if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $29_{16}$ | | | | | | | |
| 2 | T | 1 | circuit | | | | | |
| 3 | $00_{16}$ | | | | | | | |
| 4 | – | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | … | | | | | | | |
| 11 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $29_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

### 9.1.2.14 GET_LPS

With this call, the following entry is read out of the AS-i/CC-Link Gateway: The list of projected AS-i slaves (LPS).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $44_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |

| Response (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $44_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

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| Response (if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $44_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 0A | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | … | | | | | | | |
| 10 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |

### 9.1.2.15 GET_LAS

With this call, the following entry is read out of the AS-i/CC-Link Gateway: The list of activated slaves (LAS).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $45_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |

| Response (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $45_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

| Response (if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $45_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 0A | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | … | | | | | | | |
| 10 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |

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### 9.1.2.16 GET_LDS

With this call, the following entry is read out of the AS-i/CC-Link Gateway: The list of detected AS-i slaves (LDS).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $46_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |

| Response (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $46_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

| Response (if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $46_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 0A | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | … | | | | | | | |
| 10 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |

### 9.1.2.17 GET_FLAGS

With this call, the following entry is read out of the AS-i/CC-Link Gateway: The flags according to the AS-i slave specification.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $47_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $47_{16}$ | | | | | | | |
| 2 | T | response | | | | | | |
| 3 | – | | | | | | | Pok |
| 4 | OR | APF | NA | CA | AAv | AAs | S0 | Cok |
| 5 | – | | | | | AAe | OL | DX |

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Pok Periphery_Ok
This flag is set when no AS-i slave is signaling a peripheral fault.

S0 LDS.0
This flag is set when an AS-i slave exists with address 0.

AAs Auto_Address_Assign
This flag is set when the automatic address programming is possible (in other words, AUTO_ADDR_ENABLE = 1 and there is no “incorrect” slave connected to the AS-i Interface).

AAv Auto_Address_Available
This flag is set when the automatic address programming can be executed (in other words, exactly one AS-i slave is currently out of operation).

CA Configuration_Active
The flag is set in the configuration mode and reset in the protected mode.

NA Normal_Operation_Active
This flag is set when the AS-i master is in normal operation.

APF APF
This flag is set when the voltage on the AS-i cable is too low.

OR Offline_Ready
The flag is set when the offline phase is active.

Cok Config_Ok
This flag is set when the desired (configured) and actual configuration match.

AAe Auto_Address_Enable
This flag indicates whether the automatic address programming is enabled (bit = 1) or disabled (bit = 0) by the user.

OL Off-line
This flag is set when the mode is to changed to OFFLINE or this mode has already been adopted.

DX Data_Exchange_Active
If the "Data_Exchnge_Active" flag is set, the the data exchage between AS-i master and slaves is available in the dataexchange phase. If this bit is not set the data exchange is not available. The read ID telgegrams are transmitted to the slave.
The bit is set if the AS-i master entries the offline phase.

### 9.1.2.18 SET_OP_MODE

This call changes the module between the configuration mode and the protected mode.

In the protected mode, only AS-i slaves are activated that are entered in the LPS and whose expected and actual configurations match, in other words, when the I/O configuration and ID codes of the detected AS-i slaves are identical to the configured values.

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In the configuration mode, all detected AS-i slaves (except for AS-i slave "0") are activated. This also applies to AS-i slaves in which there are differences between the expected and actual configuration.

The “OPERATION MODE” bit is stored permanently; in other words, it is retained following a cold/warm restart.

When you change from the configuration mode to the protected mode, there is a warm restart on the AS-i master (change to the offline phase followed by a change to the online mode).

Note

*If an AS-i slave with address "0" is entered in the LDS, the AS-i/CC-Link Gateway cannot change from the configuration mode to the protected mode.*

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0C_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | operation mode | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0C_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

Meaning of bit operation mode:

0 = protected mode
1 = configuration mode

### 9.1.2.19 SET_OFFLINE

This call switches between the online and offline mode.

The online mode is the normal operating situation for the AS-i master. Here, the following jobs are processed cyclically:

- During the data exchange phase, the fields of the output data are transferred to the slave outputs for all AS-i slaves in the LAS. The addressed AS-i slaves transfer the values of the slave inputs to the master when the transfer was free of errors.
- This is followed by the inclusion phase in which there is a search for the existing AS-i slaves and newly added AS-i slaves are entered in the LDS or LAS.
- In the management phase, jobs from the user such as writing parameters are executed.

In the offline mode, the AS-i/CC-Link Gateway only processes jobs from the user. (Jobs that involve the immediate addressing of an AS-i slave are rejected with an error.) There is no cyclic data exchange with the AS-i slaves.

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The OFFLINE = TRUE bit is not permanently stored; in other words, following a cold/warm restart, the AS-i/CC-Link Gateway is once again in the online mode.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0A_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | Off-Line | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0A_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

The master changes to the Offline phase, if there is a 1 written in byte 3.

The master will change to online mode if there is a 0 written in byte 3.

### 9.1.2.20 SET_DATA_EX

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $48_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | Data_Exchange_Active | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $48_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

### 9.1.2.21 Change Slave Address (SLAVE_ADDR)

With this call, the AS-i address of an AS-i slave can be modified.

This call is mainly used to add a new AS-i slave with the default address "0" to the AS-Interface. In this case, the address is changed from "AS-i slave address old" = 0 to "AS-i slave address new”.

This change can only be made when the following conditions are fulfilled:

1. An AS-i slave with “AS-i slave address old” exists.
2. If the old AS-i slave address is not equal to 0, then an AS-i slave with address "0" cannot be connected at the same time.
3. The "AS-i slave address new" must have a valid value.
4. An AS-i slave with "AS-i slave address new" must not exist.

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Note

*When the AS-i slave address is changed, the AS-i slave is not reset, in other words, the output data of the AS-i slave are retained until new data are received at the new address.*

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0D_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | B | source address | | | | |
| 4 | – | | B | target address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0D_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

### 9.1.2.22 Set Auto Address Enable (SET_AAE)

This call can enable or disable the "automatic address programming" function.

The AUTO_ADDR_ENABLE bit is stored permanently; in other words, it is retained after a warm/hot restart on the AS-i master.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0B_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | Auto_Address_Enable | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0B_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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### 9.1.2.23 GET_LPF

With this call, the list of peripheral faults (LPF) signaled by the AS-i slaves is read out from the AS-i master. The LPF is updated cyclically by the AS-i master. Whether an when an AS-i slave signals faults of the attached peripherals (for example wire break) can be found in the description of the AS-i slave.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $3E_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |

| **Response (if O ≡ 0)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $3E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

| **Response (if O ≡ 1)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $3E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 0A | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | … | | | | | | | |
| 10 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |

### 9.1.2.24 Write AS-i Slave Extended ID1 (WRITE_XID1)

With this call, the extended ID1 code of an AS-i slave with address "0" can be written directly over the AS-i cable. The call is intended for diagnostic purposes and is not required in the normal master mode.

The AS-i master passes on the extended ID1 code to the AS-i slave without any plausibility check.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $3F_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | | | xID1 | | | |

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| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $3F_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

### 9.1.2.25 RD_7X_IN

With this command the four 16 bit channels of an AS-i input slave according to the slave profile 7.3 can be read.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $50_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | 0 | slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $50_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | channel 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 10 | channel 4, low byte | | | | | | | |

### 9.1.2.26 WR_7X_OUT

With this command the four 16 bit channels of an AS-i output slave according to the slave profile 7.3 can be written.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $51_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | 0 | slave address | | | | |
| 4 | channel 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 11 | channel 4, low byte | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $51_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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### 9.1.2.27 RD_7X_OUT

With this command the four 16 bit channels of an AS-i output slave according to the slave profile 7.3 can be read out of the AS-i/CC-Link Gateway.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $52_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | 0 | slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $52_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | channel 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 10 | channel 4, low byte | | | | | | | |

### 9.1.2.28 RD_7X_IN_X

With this command the four 16 bit channels of 4 AS-i input slaves with succesive addresses according to the slave profile 7.3 can be read.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $53_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | 0 | 1st slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $53_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 1st slave, channell 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 24 | 3rd slave, channel 3, low byte | | | | | | | |

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### 9.1.2.29 WR_7X_OUT_X

With this command the four 16 bit channels of 4 AS-i output slaves with succesive addresses according to the slave profile 7.3 can be written.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $54_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | 0 | 1st slave address | | | | |
| 4 | 1st slave, channel 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 24 | 3rd slave, channel 3, high byte | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $54_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

### 9.1.2.30 RD_7X_OUT_X

With this command the four 16 bit channels of 4 AS-i output slaves with succesive addresses according to the slave profile 7.3 can be read.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $55_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | 0 | 1st slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $55_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 1st slave, channel 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 24 | 3rd slave, channel 3, low byte | | | | | | | |

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### 9.1.2.31 READ_ODI

With this call the output data values of all AS-i slaves is read out of the AS-i/CC-Link Gateway.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $56_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $56_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | slave 1A | | | |
| | slave 2A | | | | slave 3A | | | |
| … | … | | | | | | | |
| 24 | slave 10B | | | | slave 11B | | | |

### 9.1.2.32 GET_DELTA

The Delta list contents the list of slave addresse with configuration errors.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $57_{16}$ | | | | | | | |
| 2 | T | 0 | circuit | | | | | |

| Response (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $57_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | – |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

| Response (if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $57_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 0 | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | … | | | | | | | |
| 10 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |

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### 9.1.2.33 WR_74_PARAM

With this function the parameter string of a slave according to profile S-7.4 is written. Because it is possible, that the string is longer than the maibox, first it will be written into the buffer in parts and then it will be transfered to the slave.

n is the length of the part of the string, that should be written into the buffer from index i.

If i ≡ 0, then the string is transfered to the slave.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $5A_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | slave address | | | | | | | |
| 4 | i | | | | | | | |
| 5 | n | | | | | | | |
| 6 | buffer btye i | | | | | | | |
| … | … | | | | | | | |
| n+5 | buffer byte i+n-1 | | | | | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $5A_{16}$ | | | | | | | |
| 2 | T | results | | | | | | |

### 9.1.2.34 RD_74_PARAM

With this function the parameter string according to profile S-7.4 is read. Because the string can be longer as the mailbox, it is written into the buffer. The content of the buffer can read in parts from index i.

The first byte of the bufferis the length of the read string.

If i ≡ 0, then the string is read from the slave, otherwise the function responses out of the memory, trough which the data can be read consistently.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $5B_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | slave address | | | | | | | |
| 4 | i | | | | | | | |

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| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $5B_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| | buffer byte i | | | | | | | |
| … | … | | | | | | | |
| n+2 | buffer byte i+n-1 | | | | | | | |

### 9.1.2.35 RD_74_ID

With this function the ID string of a slave according to profile S-7.4 is read. Because the string can be longer as the mailbox, it is written into the buffer. The content of the buffer can read in parts from index i.

The first byte of the bufferis the length of the read string.

If i ≡ 0, then the string is read from the slave, otherwise the function responses out of the memory, trough which the data can be read consistently.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $5C_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | slave address | | | | | | | |
| 4 | i | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $5C_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| | buffer byte i | | | | | | | |
| … | … | | | | | | | |
| n+2 | buffer byte i+n-1 | | | | | | | |

### 9.1.2.36 RD_74_DIAG

With this function the diagnosis string of a slave according to profile S-7.4 is read. Because the string can be longer as the mailbox, it is written into the buffer. The content of the buffer can read in parts from index i.

The first byte of the bufferis the length of the read string.

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If i ≡ 0, then the string is read from the slave, otherwise the function responses out of the memory, trough which the data can be read consistently.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $5D_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | slave address | | | | | | | |
| 4 | i | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $5D_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| | buffer byte i | | | | | | | |
| … | … | | | | | | | |
| n+2 | buffer byte i+n-1 | | | | | | | |

### 9.1.2.37 Get_LPS, Get_LAS, Get_LDS, Get_Flags (GET_LISTS)

With this call, the following entries are read out of the AS-i/CC-Link Gateway:

- The list of active AS-i slaves (LAS)
- The list of detected AS-i slaves (LDS)
- The list of projected AS-i slaves (LPS)
- The flags according to the AS-i slave specification

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $30_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |

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| Response (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $30_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | LAS | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |
| 11 | 7A | 6As | 5A | 4A | 3A | 2A | 1A | 0A |
| … | LDS | | | | | | | |
| 19 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |
| 20 | 7A | 6As | 5A | 4A | 3A | 2A | 1A | 0A |
| … | LPS | | | | | | | |
| 24 | 23B | 22B | 21B | 20B | 19B | 18B | 17B | 16B |

| Response (if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $30_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 0A | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | LAS | | | | | | | |
| 10 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |
| 11 | 0A | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | LDS | | | | | | | |
| 19 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |
| 20 | 0A | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | LPS | | | | | | | |
| 24 | 16B | 17B | 18B | 19B | 20B | 21B | 22B | 23B |

Pok Periphery_Ok
S0 LDS.0
AAs Auto_Address_Assign
AAv Auto_Address_Available
CA Configuration_Active
NA Normal_Operation_Active
APF APF
OR Offline_Ready
Cok Config_Ok
AAe Auto_Address_Enable
OL Off-line
DX Data_Exchange_Active

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### 9.1.2.38 GET_LCS

With this call, the List of Corrupted Slaves (*LCS*) is read out of the AS-i/CC-Link Gateway.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $60_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |

| **Response (if O ≡ 0)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $60_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

| **Response (if O ≡ 1)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $60_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 0A | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | … | | | | | | | |
| 10 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |

### 9.1.2.39 GET_LOS

With this call, the List of Offline Slaves (*LOS*) is read out of the AS-i/CC-Link Gateway (see chapter 7).

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $61_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |

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| Response (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $61_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

| Response (if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $61_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 0A | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | … | | | | | | | |
| 10 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |

### 9.1.2.40 SET_LOS

With this call, the List of Offline Slaves is written to the AS-i/CC-Link Gateway (see chapter 7).

| Request (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $62_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

| Request (if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $62_{16}$ | | | | | | | |
| 2 | T | 1 | circuit | | | | | |
| 3 | 0A | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | … | | | | | | | |
| 10 | 24B | 25B | 26B | 27B | 28B | 29B | 30B | 31B |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $62_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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### 9.1.2.41 GET_TECA

With this call the error counters of all single slaves/A-slaves can be read (see chapter 7).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $63_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $63_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | APF | | | | | | | |
| 4 | slave 1A | | | | | | | |
| … | … | | | | | | | |
| 24 | slave 21A | | | | | | | |

### 9.1.2.42 GET_TECB

With this call the counts of the error counters for B-slaves are read out (see chapter 7).

With every read out of the counts the error counters are restarted.

The counts are read out via the correspondending host interface and will be deleted with every read access. The counter value is limited to 254. 255 means counter overflow.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $64_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $64_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | APF | | | | | | | |
| 4 | slave 1B | | | | | | | |
| … | … | | | | | | | |
| 24 | slave 21B | | | | | | | |

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### 9.1.2.43 GET_TEC_X

With this call beginning by a definite slave address the counts of the n error counters are read out (see chapter 7).

With every read out of the counts the error counters are restarted.

The counts are read out via the correspondending host interface and will be deleted with every read access. The counter value is limited to 254. 255 means counter overflow.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $66_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | 1. slave address | | | | | | | |
| 4 | number of counters | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $66_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | counter 1 | | | | | | | |
| … | … | | | | | | | |
| n | counter n - 2 | | | | | | | |

### 9.1.2.44 BUTTONS

With this call, the use of the buttons can be enabled/disabled.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $75_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | ButtonsDisabled | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $75_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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### 9.1.2.45 INVERTER

With that call an AS-i slave for frequency inverters is switched to the mode to get four 16 bit values via the AS-i analog profile 7.3 and afterwards switched to the selcted destination parameter.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7C_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | slave address | | | | | | | |
| 4 | destination parameter | | | | | | | |
| 5 | value 1, high byte | | | | | | | |
| 6 | value 1, low byte | | | | | | | |
| 7 | value 2, high byte | | | | | | | |
| 8 | value 2, low byte | | | | | | | |
| 9 | value 3, high byte | | | | | | | |
| 10 | value 3, low byte | | | | | | | |
| 11 | value 4, high byte | | | | | | | |
| 12 | value 4, low byte | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7C_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

### 9.1.2.46 FP_PARAM

This command is used for parametrization of "functional profiles".

The content of the request and response bytes is depending of the called function (see chapter 9.1.3).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7D_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | function | | | | | | | |
| 4 | request byte 1 | | | | | | | |
| … | … | | | | | | | |
| n | request byte n-3 | | | | | | | |

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| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7D_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | response byte 1 | | | | | | | |
| … | … | | | | | | | |
| n | response byte n-2 | | | | | | | |

### 9.1.2.47 FP_DATA

This command is used for data exchange with "functional profiles".

The content of the request and response bytes is depending of the called function (see chapter 9.1.3).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | function | | | | | | | |
| 4 | request byte 1 | | | | | | | |
| … | … | | | | | | | |
| n | request byte n-3 | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | reponse byte 1 | | | | | | | |
| … | … | | | | | | | |
| n | response byte n-2 | | | | | | | |

### 9.1.2.48 READ_IDI_X

With this call the input data values of all AS-i slaves are read out of the AS-i/CC-Link Gateway in addition to the cyclic data exchange.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $88_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | – | | B | 1st slave address | | | | |
| 4 | – | | number of slaves | | | | | |

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| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $88_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | | | | Pok |
| 4 | OR | APF | NA | CA | AAv | AAs | s0 | Cok |
| 5 | 1st slave | | | | 2nd slave | | | |
| … | … | | | | | | | |
| 24 | 39th slave | | | | 40th slave | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave
B = 1 B-slave

### 9.1.2.49 READ_ODI_X

With this call the output data values of all AS-i slaves is read out of the AS-i/CC-Link Gateway.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $89_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | B | | 1st slave address | | | | | |
| 4 | – | | number of slaves | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $89_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 1st slave | | | | 2nd slave | | | |
| … | … | | | | | | | |
| 24 | 43th slave | | | | 44th slave | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave
B = 1 B-slave

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### 9.1.2.50 WRITE_ODI_X

With this call the output data values of all AS-i slaves are written in additon to the cyclic data exchange.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $8A_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | - | | B | 1st slave address | | | | |
| 4 | – | | number of slaves | | | | | |
| 5 | 1st slave | | | | 2nd slave | | | |
| … | … | | | | | | | |
| 24 | 39nd slave | | | | 40th slave | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $8A_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

## 9.1.3 Functional profiles

### 9.1.3.1 „Safety at Work“ List 1

Function: $00_{16}$

List of "safety-directed input slaves" ("AS-i Safety at Work"), by which the dafety function is released.

In this list are entered that slaves according to profile S-7.B or S-0.B, by which are deleted all 4 bits in the IDI. Therefore slaves with 2 contacts are entered only then, if both contacts are released.

Because the safety function of a safety-directed input slave can be released, if the slave does exchange no data with the AS-i master, the list may be utilized only in combination with the ec-flags.

For the building of this list CDI and IDI are utilized only. Safety-directed slaves, which are projected but not existing, and slaves, which are existing but sending a wrong code, are entered therfore not here.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |
| 3 | $00_{16}$ | | | | | | | |

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| Response (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | | | | Pok |
| 4 | OR | APF | NA | CA | AAv | AAs | S0 | Cok |
| 5 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | - |
| … | … | | | | | | | |
| 8 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 25 |

| Response (if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | | | | Pok |
| 4 | OR | APF | NA | CA | AAv | AAs | S0 | Cok |
| 5 | - | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| … | … | | | | | | | |
| 8 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |

Cok Config_Ok
S0 LDS.0
AAs Auto_Address_Assign
AAv Auto_Address_Available
CA Configuration_Active
NA Normal_Operation_Active
APF APF
OR Offline_Ready
Pok Periphery_Ok

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### 9.1.3.2 „Safety at Work“ Monitor Diagnosis

Function: $02_{16}$

Because the „Safety at Work“ monitor can make more than 32 Byte diagnosis data, these must be read with several mailbox calls. The second request byte declares the start index in the field of the daignosis data.

If the start index ist 0, new data is fetched from the monitor, otherwise the function responses out of the memory, through which the data can be read consistently.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | – | circuit | | | | | |
| 3 | $02_{16}$ | | | | | | | |
| 4 | slave address | | | | | | | |
| 5 | index | | | | | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | diagnosis byte #index+0 | | | | | | | |
| 4 | diagnosis byte #index+1 | | | | | | | |
| … | … | | | | | | | |
| n | diagnosis byte #index+n-3 | | | | | | | |

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The diagnosis data field of the safety monitor has following structure:

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 0 | $00_{16}$ | | | | | | | |
| 1 | monitor state | | | | | | | |
| 2 | state circuit 1 | | | | | | | |
| 3 | state circuit 2 | | | | | | | |
| 4 | number circuit 1 | | | | | | | |
| 5 | number circuit 2 | | | | | | | |
| 6 | device index 32, circuit 1 | | | | | | | |
| 7 | device color, circuit 1 | | | | | | | |
| 8 | device index 33, circuit 1 | | | | | | | |
| 9 | device color, circuit 1 | | | | | | | |
| … | … | | | | | | | |
| 68 | device index 63, circuit 1 | | | | | | | |
| 69 | device color, circuit 1 | | | | | | | |
| 70 | device index 32, circuit 2 | | | | | | | |
| 71 | device color, circuit 2 | | | | | | | |
| … | … | | | | | | | |
| 132 | device index 63, circuit 2 | | | | | | | |
| 133 | device color, circuit 2 | | | | | | | |

### 9.1.3.3 Integrated AS-i Sensors: Warnings

Function: $03_{16}$

List of integrated AS-i sensors according to profile S-1.1 (without advanced addressing) or profile S-3.A.1(with advanced addressing), by which the input data bit D1 ("Warning") is deleted.

For building of this list CDI and IDI are utilized only. Integrated AS-i slaves, which are projected but not existing, are entered therfore not here.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |
| 3 | $03_{16}$ | | | | | | | |

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| Response (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0 |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

| Response if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 0 | 1A | 2A | 3A | 4A | 5A | 6A | 7A |
| … | … | | | | | | | |
| 10 | 24A | 25A | 26A | 27A | 28A | 29A | 30A | 31A |

### 9.1.3.4 Integrated AS-i Sensors: Availability

Function: $04_{16}$

List of the integrated slaves according to profile S-1.1, by which the input data bit D2 ("Availability") is deleted.

For building of this list CDI and IDI are utilized only. Integrated AS-i slaves, which are projected but not existing, are entered therfore not here.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | O | circuit | | | | | |
| 3 | $04_{16}$ | | | | | | | |

| Response (if O ≡ 0) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| … | … | | | | | | | |
| 6 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 |

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| Resonse (if O ≡ 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| … | … | | | | | | | |
| 6 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |

### 9.1.4 Mailbox example

Command RD_7X_IN: Reading of analog input values

Used ID/module in the GSD file: 12 bytes management

Meaning of the bytes:

| Request: RD_7X_IN | |
|---|---|
| Byte 1 | $50_{hex}$ (RD_7X_IN) |
| Byte 2 | $00_{hex}$ (master 1, single master) |
| Byte 3 | $1D_{hex}$ (slave address 29) |
| Byte 4 | $00_{hex}$ |
| … | … |
| Byte 12 | $00_{hex}$ |

| Response | |
|---|---|
| Byte 1 | $00_{hex}$ |
| Byte 2 | $00_{hex}$ |
| Byte 3 | $00_{hex}$ |
| Byte 4 | $00_{hex}$ |
| … | … |
| Byte 12 | $00_{hex}$ |

The mailbox call has not been anwsered with the valid values, beause the toggle bit has not been set.

Set of Toggle bit:

| Request | |
|---|---|
| Byte 1 | $50_{hex}$ |
| Byte 2 | $80_{hex}$ (Toggle bit, master 1, single master) |
| Byte 3 | $1D_{hex}$ (slave address 29) |
| Byte 4 | $00_{hex}$ |
| … | … |
| Byte 12 | $00_{hex}$ |

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| Response | |
|---|---|
| Byte 1 | $50_{hex}$ |
| Byte 2 | $80_{hex}$ (Toggle bit, master1) |
| Byte 3 | analog channel 1 high $byte_{hex}$ |
| Byte 4 | analog channel 1 low $byte_{hex}$ |
| Byte 5 | analog channel 2 high $byte_{hex}$ |
| Byte 6 | analog channel 2 low $byte_{hex}$ |
| Byte 7 | analog channel 3 high $byte_{hex}$ |
| Byte 8 | analog channel 3 low $byte_{hex}$ |
| Byte 9 | analog channel 4 high $byte_{hex}$ |
| Byte 10 | analog channel 4 low $byte_{hex}$ |
| Byte 11 | $00_{hex}$ not usedt |
| Byte 12 | $00_{hex}$ not usedt |

To get the input data again, the T-bit has to be reset aso.

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# 10 Appendix: The First Commissioning of AS-i

Note

*In this chapter an example is given of how to put an AS-i network into operation quickly and easily and without the need for external devices. The addressing of the components connected to the AS-i network can be performed directly on the AS-i master. It is of course more comfortable to do the addressing with a hand-held programming device or with the Windows software AS-i Control Tools. However, it is possible to configure even complex networks using only the AS-i master.*

| **What to do ?** | **How to go about it?** |
|---|---|
| See to it that the AS-i master is properly supplied with power. | Connect the AS-i power supply unit to the terminals AS-i + and AS-i - of the master, connect the ground terminal. Turn on the power supply. |
| After the self-test: the LEDs “power”, “config err”, ”U ASI” and “prj mode” are on. The figure display shows “40”: the AS-i master is in the off-line phase. Shortly after that a “41” will be displayed: the AS-i master stays in the detection phase. | |
| Switch the device to the projecting mode, if the yellow LED does not light up. | Press the “modeMODE”-button for approx. five seconds. |
| The yellow LED “prj mode” lights up. The device is now in projecting mode. | |
| Add a slave with the address 0 to the AS-i line. | Connect the slave's terminals with the terminals AS-i +/- of the master. |
| The green LED “ASI active” lights up. The figure display shows “0”. This means the AS-i master has detected the slave. | |
| Change the slave address to address 1. | Select address 1 by pressing the “set” button shortly, if necessary repeatedly, whereby after each operation the next in each case free address is indicated. When a “1” appears on the display press the “set” button for approx. five seconds until the display blinks. Press again shortly the “set” button to assign the new address to the slave. |
| The AS-i master detects the slave with address 1 and displays “1”. | |
| Connect another slave with address 0 to the AS-i line and allocate the address 2 to it. | Connect the slave to the AS-i line. The addressing is the same as for the previous slave. |
| The addresses of all slaves detected are now displayed sequentially. | |
| Change to the protected operating mode and store the AS-i configuration. | Leave the configuration mode by pressing the “mode” button for at least five seconds until the “prj mode” LED goes out. |

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| What to do ? | How to go about it? |
|---|---|
| The configuration of the AS-i master is now finished.<br>Now the hierarchically higher fieldbus system can be put into operation.<br>**The gateway stays in the off-line phase (the display shows “40”, the LED “config err” lights up), until the hierarchically higher fieldbus system operates properly.** | |

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# 11 Appendix: Displaying the Figure Display

In the basic state of the configuration mode, the display shows one after the other the addresses of all detected slaves at a rate of two per second. A blank display means that the *LDS* is empty, i.e. no slaves were detected.

In the basic state of the protected operating mode, the display is either blank or displays the address of a faulty assignment (see chapter 6.3.2).

During manual address programming, the slave address display has a different meaning (see chapter 6.4 and 6.5).

All displayed numbers that are bigger than 31 and therefore can not be interpreted as a slave address are status or error messages of the master. They have the following meanings:

| | |
|---|---|
| 39 | Advanced AS-i diagnostics: If a 39 appears on the display after pressing the ’set’-button a short-time AS-i power failure occured. |
| 40 | The AS-i master is in off-line phase. |
| 41 | The AS-i master is in detection phase. |
| 42 | The AS-i master is in activation phase. |
| 43 | The AS-i master starts the normal operating mode. |
| 51 | CC-Link ASIC not ready. |
| 70 | Hardware error: The AS-i master’s EEPROM cannot be written to. |
| 72 | Hardware error: The PIC processor does not respond. |
| 73 | Hardware error: The PIC processor does not respond. |
| 74 | Checksum error in the EEPROM. |
| 75 | Error in the external RAM. |
| 76 | Error in the external RAM. |
| 80 | Error while attempting to exit the configuration mode: A slave with address zero exists. |
| 81 | General error while changing a slave address. |
| 82 | The front panel operation is blocked. Until the next power-up of the AS-i master the accessing to the device only from the host via the interface. |
| 83 | Program reset of the AS-i Control programm: The AS-i Control programm is just read out of EEPROM and copied into the RAM. |
| 88 | Display test while starting up the AS-i master |
| 90 | Error while changing a slave address in protected operating mode: No slave with address 0 existing. |
| 91 | Error while changing slave address: Target address is already occupied. |
| 92 | Error while changing slave address: New address could not be set. |
| 93 | Error while changing slave address: New address could only be stored volatile in the slave. |
| 94 | Error while changing slave address in protected operating mode: Slave has wrong configuration data. |

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| | |
|---|---|
| 95 | Error while changing slave address in protected operating mode: The configuration error was caused by one slave too many (instead of one missing slave). |

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