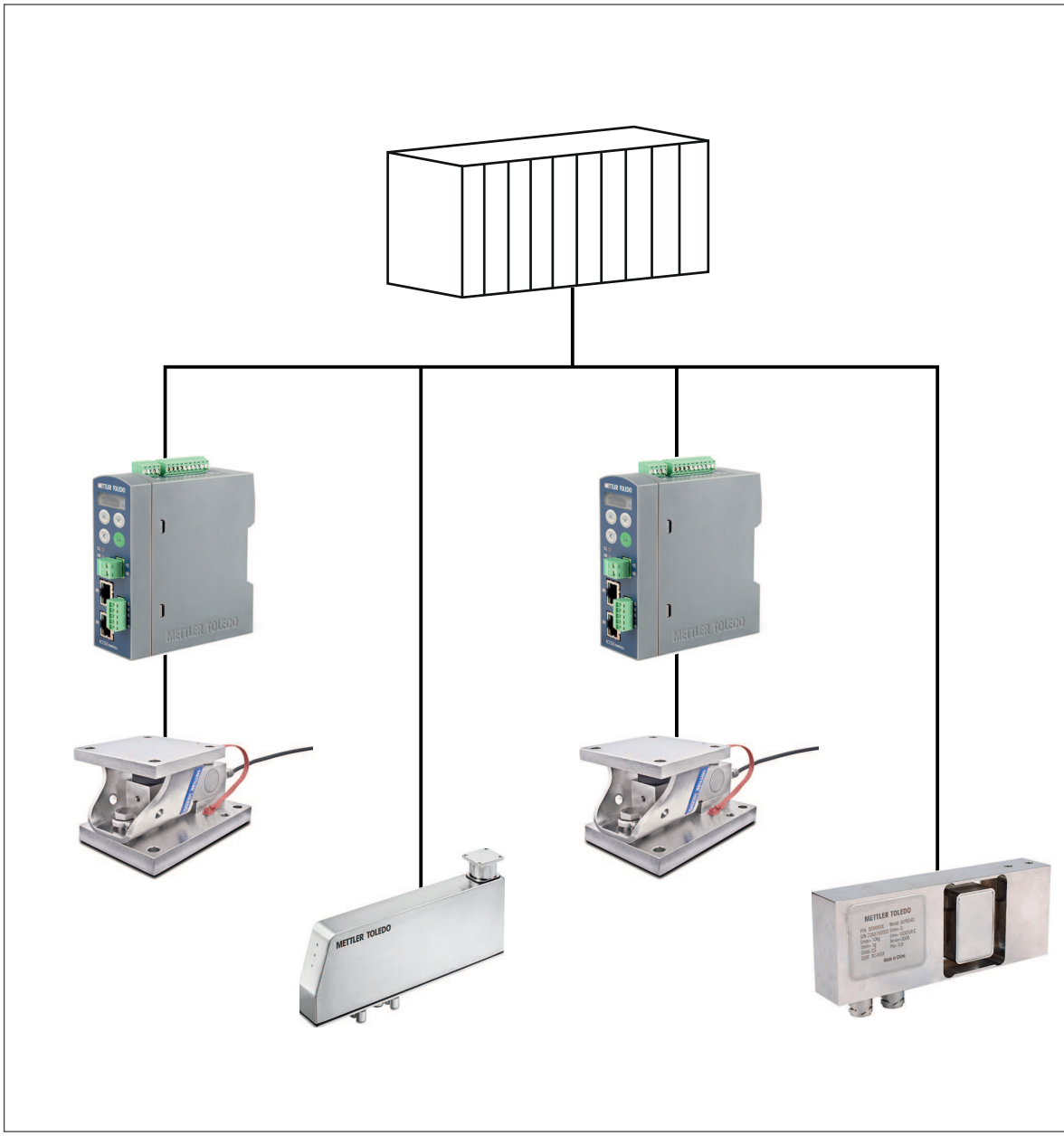
Reference Manual

SAI

Standard Automation Interface



METTLER TOLEDO

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1 Version History

Index	Date	Description
A	03/2016	Initial version Contents for WMF weigh module created
B	12/2016	Contents for SLP85xD load cell added
C	10/2017	Contents for ACT350 transmitter added

2 Overview

The Standard Automation Interface (SAI) is a protocol designed to exchange data between METTLER TOLEDO devices and third-party automation systems. This interface provides the following:

- A common data layout for load cells, terminals and other devices regardless of the physical interface or automation network used.
- A single protocol for the convenience of automation integrators, control system programmers and our automation customers.
- A flexible protocol for diverse devices.

Data types

The protocol has two primary modes of operation.

- cyclic data
- acyclic data

Note

Acyclic data is also referred to as asynchronous data or explicit messaging.

2.1 Cyclic data

Cyclic data is broken up into sections of data. Each section represents a block. Each block of data contains four words of 16 bits each.

The data within these words can express numeric values, string values or individual bits which represent state or command depending on the type of block specified.

Several fixed format divided into blocks (1 block, 2 blocks, 4 blocks etc.) are available for SAI devices depending on the product. The default format for weigh modules is the two block format with eight words in and eight words out. The number of input words (data sent from the device to the process controller) and output words (data sent from the process controller to the device) always match. This limits the number of configurations to a reasonable amount.

There are two basic types of cyclic blocks supported on the SAI device:

- Measuring block (floating point data)
  - Used for numeric values such measurement data
  - Decimal point and sign are included and do not require special data handling.
- Status block
  - Used for bit level values
  - Status block data is grouped together in 16 bit words to conserve space.

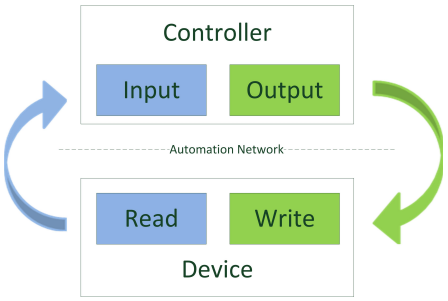
2.2 Acyclic data

With acyclic messages, the variable can be accessed directly through a unique name or number defined by the control system's acyclic message block.

3 Cyclic Data Layout

Block format	Write data (Control system to device)		Read data (Device to control system)
1 Block format	**Floating Point Block**		**Floating Point Block**
	Word 0	Floating point value (32 bit), optionally used with command	Requested floating point value (32 bit)
	Word 1		
	Word 2	16 bit Channel Mask	16 bit device status
	Word 3	Command	Response
2 Block format	**Floating Point Block**		**Floating Point Block**
	Word 0	Floating point value (32 bit), optionally used with command	Requested floating point value (32 bit)
	Word 1		
	Word 2	16 bit Channel Mask	16 bit device status
	Word 3	Command	Response
	Status Block		**Status Block**
	Word 4	Reserved or optional Status Word selection	Status Group 1
	Word 5	Reserved or optional Status Word selection	Status Group 2
	Word 6	Reserved or optional Status Word selection	Status Group 3
	Word 7	Command	Response

Communication between device and control system



There is bidirectional communication between device and control system:

- Device to control system
  The read commands are used.
- Control system to device
  The write commands are used.

3.1 Measuring block

Measuring blocks are used to exchange numeric data such as weight and its associated scale status. The measuring block consists of a 32 bit floating point value and two 16 bit words. The use of this block depends on the source of data.

Device to control system operation:

The measuring block contains the floating point value requested by the control system.

The block is mapped as follows:

Measuring block (read)		**Description**
2 Words	MB Measuring value Requested, 32 bit floating point value	Floating point value depending on the used command (e.g. gross weight).
1 Word	MB Device status 16 Bit	To provide status bit information based on the command (e.g. scale status such as motion or center of zero).
1 Word	MB Response 16 Bit	Additional information about the contents of the floating point value (e.g. gross weight of scale 1).

Control system to device operation:

The measuring block is used to issue commands to the device. These commands can be as simple as the request for specific data to be reported in the read command.

The block is mapped as follows:

Measuring block (write)		Description
2 Words	MB Command value Optionally used with command, 32 bit floating point value	Optional parameter (32 bit floating point) for issued command (see command word) (e.g. set pre-tare value).
1 Word	MB Channel mask 16 Bit	Addressing different channels if more than one channel (e.g. load cell) are connected to the device.
1 Word	MB Command 16 Bit	Contains the command value to instruct the device what command is issued.

Communication between read and write

Both types of measuring blocks have a similar structure for their response and command words. The measuring block (write) of the control system sends its commands and the measuring block (read) of the device responds with the same value if the command was successful.

See also

- Parameters of measuring block (read) ▸ Page 7
- Parameters of measuring block (write) ▸ Page 12

3.2 Status block

Status blocks are used to provide data about the device state (1-bit boolean data, on/off) e.g. alarms, physical I/O, target control, comparator state or application specific states. The status blocks are structured to support three sets of status words.

Device to control system operation:

The status data sent by the device to the control system is a bit set similar to the status information provided in the measuring block.

The block is mapped as follows:

Status block (read)		Description
1 Word	SB Status group 1	These status bits are sent as part of the default status block when a status block command 0 is sent. If the control system does not place any data in the command word (write), the device will send this data in status group
1 Word	SB Status group 2	
1 Word	SB Status group 3	
1 Word	SB Response	

Control system to device operation:

The command data sent by the control system to the device requires less space. Words 1-3 are currently reserved until they are needed to provide information from the control system.

The block is mapped as follows:

Status block (write)	
1 Word	SB Reserved 1
1 Word	SB Reserved 2
1 Word	SB Reserved 3
1 Word	SB Command

See also

- Parameters of status block (read) ▸ Page 8
- Parameters of status block (write) ▸ Page 12

3.3 Device to control system operation

Data produced by the device to be consumed by the control system.

3.3.1 Parameters of measuring block (read)

MB Measuring value

- Word 0 and 1

The floating point value is single precision and the order of the data is based on the type of automation interface used.

MB Device status

- Word 2

The device status is a composite status word that contains individual bits to indicate the state of various scale or device specific binary values. The 16 bits inform on the following:

Bit	Device specific value	Description
0	Sequence bit 0	Used as sequence toggle bits. When commands are sent by the control system, the device changes the value of the sequence bits as an indication that the command has been seen and acted on. Sequence bits are used during a sequence of commands to ensure that there have been no sequencing errors in the request and the response of data. They are updated on every new command.
1	Sequence bit 1	
2	Heart beat	Toggles between 0 and 1 (1 sec.) to ensure that the device is operational and updating data in Words 0, 1 and 2.
3	Data OK	Indicates that the data being reported is OK. 0 = Device is still operational but has a critical error and the value being reported can not be guaranteed to be valid (e.g. over capacity).
4	Alarm condition	The alarm condition indicates a system error. The nature of the error can be determined using a field value command. 1 = Application fault; predictive diagnostics alarm or command received cannot be executed as requested.
5	Center of zero	1 = Gross weight value is at a value of zero +/- one quarter of a weight and measures verification interval denoted as "e".
6	Motion	1 = Weight is unstable.
7	Net Mode	1 = Net weight instead of gross weight is reported.
8	Alternate weight unit	1 = An alternate weight unit, other than the primary unit is in use.
9	Device specific bit 1	These bits are used to provide device specific status information e.g. I/O or application status.
10	Device specific bit 2	
11	Device specific bit 3	
12	Device specific bit 4	
13	Device specific bit 5	
14	Device specific bit 6	
15	Device specific bit 7	

MB Response word

- Word 3

The response word provides feedback on the state of the command issued in the floating point block (write).

Depending on the command sent, the response can indicate the following:

- Command failed.
- Command succeeded.
- Command was seen, the data requested is being sent in the floating point value.

The structure of the response word is identical to the structure of the command word. It consists of two sets of bits:

Bit	Description
0 - 10	Used to indicate the response value.
11 - 14	Used to indicate the channel value.
15	Used to indicate an error condition if the device can not provide the desired data or complies with the requested command. 1 = An error is indicated. All possible error codes are listed in [SAI Measuring Block Command List ▶ Page 34]

See also

SAI Measuring Block Command List ▶ Page 34

3.3.2 Parameters of status block (read)

SB Status group 1 - RedAlert alarm

Default settings for the status group 1 is to provide RedAlert alarms.

- Word 4

The critical alarm status bits are sent as part of the default status block when a status block command 0 is sent. If the control system does not place any data in the command word (write), the device will send the data of RedAlert group. The 16 bits inform on the following:

Bit	RedAlert	Description
0	Calibration error	1 = Weight data can no longer be trusted due to loss of calibration data or an algorithm running in the product to detect weighing irregularities.
1	Out of A/D range over/under	1 = Weight data can no longer be trusted due to loss of data or mechanical damage of the weigh module.
2	Checksum failure	1 = A checksum analysis of memory does not yield the expected result.
3	Weight blocked	1 = Weight data does not change appreciably over a defined period of time.
4	Single sensor communication failure	Applicable only for products with more than one sensor connected to the device. 1 = One or more of the connected sensors are not working properly.
5	Customer defined overload	1 = Weight is equal to or greater than the maximum load allowed. Although overload is a conditional limit, it can lead to bigger errors such as mechanical breakage or personal injury.
6	Customer defined underload	1 = Weight is equal or less than the minimum load allowed. Although overload is a conditional limit, it can lead to bigger errors such as mechanical breakage or personal injury.
7	Network failure (all cells)	Applicable only on multi-cell networks. 1 = Failure of the entire network. No cells are responding.
8	Zero out of range	1 = A control system attempted a zero command but the device did not accept the command because the weight is outside the specified limits or the weights and measure limits.
9	Symmetry errors	Applicable only for products with TraxDSP function which detects significant errors between load cells and their peers. 1 = A symmetry error has been detected.

Bit	RedAlert	Description
10	Temperature errors	1 = Sensor is outside of the allowed temperature range. The weight value can be affected or the components can prematurely fail.
11	Weights and measures failure	1 = The product is no longer in compliance with weights and measure regulations.
12	Foreign device detected	1 = A foreign device is attached to the system or any similar algorithm limits.
13	Test mode	1 = Device is in a mode in which live data is being replaced with special test data.
14	Open	0 = Unused at this time.
15	Open	0 = Unused at this time.

SB Status group 2 - Scale group 2

Default settings for the status group 2 is to provide Scale group 2 information.

- Word 5

These status bits are sent as part of the default status block when a status block command 0 is sent. If the control system does not place any data in the command word (write), the device will send this data in scale status group.

The 16 bits inform on the following:

Bit	Scale status group	Description
0	Unit bit 1	Unit bits are used to indicate the weight unit. See table below.
1	Unit bit 2	
2	Unit bit 3	
3	Unit bit 4	
4	MinWeigh Error	1 = Scale is below acceptable minimum weighing range.
5	Range bit 1	Range bits are used to indicate weight range or interval based on the values shown. See table below.
6	Range bit 2	
7	In Set Up	1 = Sensor is in setup mode.
8	Power Up Zero Failure	1 = Scale has not been able to complete its power-up restore / reset of zero.
9	GWP out of Tolerance	1 = Scale has a GWP out of tolerance error.
10	Selected Scale	For multi-scale devices only: 1 = Scale is selected and therefore in focus or seen on the device display.
11	Open	0 = Unused at this time.
12	Open	0 = Unused at this time.
13	Open	0 = Unused at this time.
14	Open	0 = Unused at this time.
15	Open	0 = Unused at this time.

Unit bits

Unit bit 1	Unit bit 2	Unit bit 3	Unit bit 4	Value
0	0	0	0	g
0	0	0	1	kg
0	0	1	0	lb
0	0	1	1	t
0	1	0	0	ton
0 / 1	1	0	1	reserved

Unit bit 1	Unit bit 2	Unit bit 3	Unit bit 4	Value
0	1	1	0	reserved
0	1	1	1	custom
1000 - 1111				unused

Range bits

Range bit 1	Range bit 2	Value
0	0	Range/Interval 1
0	1	Range/Interval 2
1	0	Range/Interval 3
1	1	Reserved

SB Status group 2 - Alarm

The application alarm status bits are set if the status block command "21" is sent. Otherwise, scale status group 2 information will be displayed.

- Word 5

The 16 bits inform on the following:

Bit	RedAlert	Description
0	Rate of change	Not supported.
1	Communication errors	1 = The communication of a device which is connected to a sensor is not working according to specification.
2	Over and under voltage (s)	1 = A device which supports dynamic measurements of system power has over or under voltage.
3	Weight drift	1 = A strain gage sensor has either a broken bridge or is damaged by water or lightning.
4	Breach	1 = The enclosure of the sensor has been compromised and is therefore vulnerable to environmental influences, e.g. moisture or water. In most cases, a failure will occur if the breach is not corrected or if the sensor is not replaced.
5	Calibration expired	1 = The maximum number of transactions or a time limit before a preventative service or recalibration has been reached. The alarm will toggle on N+1 weighing transactions.
6	Application defined 0	0 = Unused at this time.
7	Application defined 1	0 = Unused at this time.
8	Application defined 2	0 = Unused at this time.
9	Application defined 3	1 = PCBA temperature error: temperature on the PCB is too high. No weight response possible anymore.
10	Application defined 4	0 = Unused at this time.
11	Application defined 5	0 = Unused at this time.
12	Application defined 6	1= PCBA temperature warning: temperature on the PCB reached a critical level. Weighing is still possible.
13	Application defined 7	0 = Unused at this time.
14	Application defined 8	0 = Unused at this time.
15	Application defined 9	0 = Unused at this time.

SB Status group 3 - I/O group 1

Default settings for the status group 3 is to provide I/O status group.

- Word 6

On devices which support physical I/O, the status groups contain a combination of input and output status bits for I/O.

Devices which do not support physical I/O, may have variables and logic to virtually represent inputs and outputs within the device. If the device does not support I/O groups, an invalid command response is sent to command for any unsupported I/O groups. The status bits for group 2 are sent as part of the default I/O status group.

More detail about the supported I/O groups are listed in the product specific installation manual.

The input and output status bits reflect the state of the associated input and outputs, 1 = on , 0 = off.

Bit	Data
0	In 1
1	In 2
2	In 3
3	In 4
4	In 5
5	In 6
6	In 7
7	In 8
8	Out 1
9	Out 2
10	Out 3
11	Out 4
12	Out 5
13	Out 6
14	Out 7
15	Out 8

SB Response word

- Word 7

The response word provides feedback on the state of the command issued in the floating point block (write).

Depending on the command sent, the response can indicate the following:

- Command failed.
- Command succeeded.
- Command was seen, the data requested is being sent in the floating point value.

The structure of the response word is identical to the structure of the command word. It consists of two sets of bits:

Bit	Description
0 - 10	Used to indicate the response value.
11 - 14	Used to indicate the channel value.
15	Used to indicate an error condition if the device can not provide the desired data or complies with the requested command. 1 = An error is indicated. All possible error codes are listed in [SAI Measuring Block Command List ▸ Page 34]

See also

SAI Measuring Block Command List ▸ Page 34

3.4 Control system to device operation

Data produced by the control system to be consumed by the device

3.4.1 Parameters of measuring block (write)

MB Command value

- Word 0 and 1

The command value is an optional floating point value and depends on the command.

MB Channel mask

- Word 2

For single devices, the channel mask is always 0.

MB Command word

- Word 3

The command word identifies the data requested by the control system.

See also

SAI Measuring Block Command List ▸ Page 34

3.4.2 Parameters of status block (write)

SB Reserved

- Word 4, 5 and 6

The status block (write) only needs the command word to request data for the status block (read). Words 4, 5 and 6 have been reserved and are set to 0.

SB Command word

- Word 7

The command word identifies the data requested by the control system.

See also

SAI Status Block Command List ▸ Page 57

4 Byte and Word Order of Data

Device data order is configurable as part of the PLC interface setup parameters provided in data format type selection. The default data format selection is "Automatic". With the selection as automatic, the byte and word order defaults to a known default based on fieldbus type. The data format selection allows selection of Little Endian and Big Endian data format selections. These selections must be made prior to communication operation between the control system and the device. The Byte Swap and Word Swap selections determine the data order expected during the communication exchange.

For example, the device may be sending a 4 byte (2 Word) hex data message to the control system, represented numerically as 0A0B0C0D.

Little Endian (Byte Swap = No / Word Swap = No)

4 byte hex value …
0A 0B 0C 0D
MSD … … LSD

Memory/ register order	**Data**
n	0D
n+1	0C
n+2	0B
n+3	0A

Word 0	Byte 2 = 0C	Byte 1 = 0D
Word 1	Byte 4 = 0A	Byte 3 = 0B

Word 0	Byte 2 = 0A	Byte 1 = 0B
Word 1	Byte 4 = 0C	Byte 3 = 0D

Big Endian (Byte Swap = Yes / Word Swap = Yes)

4 byte hex value …
0A 0B 0C 0D
MSD … … LSD

Memory/ register order	**Data**
n	0A
n+1	0B
n+2	0C
n+3	0D

Word 0	Byte 2 = 0B	Byte 1 = 0A
Word 1	Byte 4 = 0D	Byte 3 = 0C

The default setting for the Byte Swap and Word Swap parameters is automation interface type specific.

	Memory Address (A = MSB)					
SAI Name	**M+3**	**M+2**	**M+1**	**M+0**	**Native Control System**	**Fieldbus**
Little endian	A	B	C	D	Rockwell	Ethernet/IP
Big endian	D	C	B	A	Siemens	PROFINET, PROFIBUS

The Byte / Word Swap configuration step is used to support differences in control system hardware. This selection allows the device to switch the order of words and bytes within each word so that it can match the order expected by the control system. There are three possible choices:

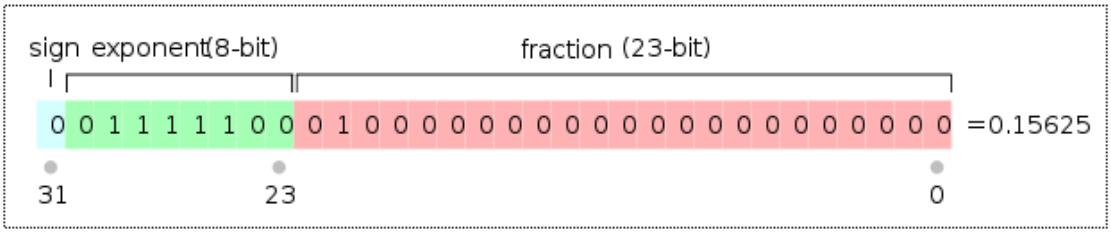
- Automatic

- No swap
- Byte & Word Swap

The Automatic selection is the default. When Automatic is selected, the byte and word order is determined by two possible methods – first, each fieldbus type has a known default that is used until the test command is sent from the control system and second, a test command can be sent from the control system to put the device into a test state which checks for a specific floating point value and determines the order based on the way the data is received. The current state of the byte order is shown as the Current Order.

Floating point numbers

The floating point numbers exchanged by the floating point blocks follow the IEEE 784 -1985 convention for single precision (32 bit) floating point values.



Word 0	0 0 0 0 0 0 0 0.....0 0 0 0 0 0 0 0
Word 1	0 0 1 1 1 1 1 0.....0 0 1 0 0 0 0 0

The order of the bytes / words may be affected by the setting of the Byte Swap / Word Swap parameters. Integers (whole numbers) sent through the floating point blocks should always have zeroes to the right of the decimal point location (5.00000, for example).

5 Test Mode

If the device is put in the automatic byte / word swap mode, a special floating point command can be sent from the control system to test the communications and make sure the byte and word order are set to match what it expects. This special command contains data that is byte and word order independent (the same in every byte).

The control system must place the value 2.76 (0x4030a3d7) in the floating point write value and send 80h in all four bytes of Word 2 and Word 3:

Word 0	FP value = 2.76	
Word 1		
Word 2	Byte 2 = 80	Byte 1 = 80
Word 3	Byte 4 = 80	Byte 3 = 80

The device will see the special command and then read the data in the floating point bytes to determine which byte order the control system is using. Once it has determined the order, it changes its configuration to match and should then respond to the command in same order as the command data. The response will include the sent value (2.76) so that the control system can verify that the device is sending data in the expected order.

This test mode can also be used to confirm that the device is communicating with the control system even when other parts of the device may not be configured or operational (for example, the scale not yet calibrated). If the device is not in the automatic mode when the test command is sent, it will use the order specified in its configuration.

The test mode bit (13) of the RedAlert status bits will turn on when the device is in test mode. In this state, the device will also accept the other test commands and respond with pre-defined test data instead of normal operational data. For example, when in test mode, the device will respond with an expected fixed weight value instead of the actual weight so that test scripts can be written against these known values. This also provides methods for the control system to force status bits to a specific state for the same reason.

Until the device is told to exit test mode or power is cycled on the device, it will remain in test mode (Test Mode = 1) and indicate that data is invalid (Data OK = 0). Once the command to exit test mode is received or the device`s power is cycled, it will revert to sending operational data instead of test data. To exit test mode, the control system must send the Exit Test Mode command by sending 88h in both bytes of Word 3. If the Custom Format is used and there is no Floating Point Block, the Test Command can be sent through the Write Status Block. If both block types are present, only one command in one of the blocks is required to place the device in or out of test mode.

Word 3	Byte 2 = 88	Byte 1 = 88

Floating point test commands for "Report" values

If the control system sends a floating point command to report a value when in test mode, the device will respond with fixed data instead of valid data (it may be unable to provide valid data during the test). A simple formula will be used to calculate what this fixed value should be:

5000.11 + Command Value = Reported data value for command

For example, if the command to report gross weight is sent after the device is placed in test mode, the device should provide the proper response value and its floating point value for gross weight should be 5000.11 (5000.11 + 0 = 5000.11). If Net weight is requested, the device should send 5003.11 (5000.11 + 3 = 5003.11).

Floating point test commands for scale status bits

Special test commands are available to turn on and off the scale status bits provided in the floating point blocks when the device has been placed in test mode. Refer to the list provided in this document. The responses for these commands will also follow the formula above – if a trigger command of "1" is sent, the response value in the floating point will be "5001.11". If the command value "0" is sent the response value will be "5000.11".

Status block test commands

Special test commands are available to turn on and off the status bits provided in the status blocks when the device has been placed in test mode. A special error response is provided when a test command is sent for status bits that have not been requested. Refer to the list provided in section [Commands ▸ Page 19].

Test variables for acyclic and variable block test commands

Acyclic and variable block test commands do not require the device to be in test mode. To test the acyclic Direct Access Level 1 variables, a reserved index or class/instance/attribute is used for each type of variable, see section [Commands ▸ Page 19]). Each read variable always returns the same value and does not permit a new value to be written to it. Each write variable expects a specific value to be sent and will return an error state if any other value is sent. No special test command is assigned for Direct Access Level 2 variables.

For Indirect Access and Variable Block tests, two reserved variable names are assigned (refer to the section [Commands ▸ Page 19]). These variables have no other functional purpose except to respond to test read and test write commands. Each read variable always returns the same value and does not permit a new value to be written to it. Each write variable expects a specific value to be sent and will return an error state if any other value is sent.

Performance test commands

The floating point data block provides a special command to permit performance testing of device`s data update through the fieldbus interface. This command (1912) switches the device into a special mode to send a timer count at the rate specified by the value in the floating point write (0 = at A/D rate, 1 = at 1 msec rate, n = n msec rate). If the device is generally not capable of providing this data, or of providing data at a particular speed, it will return a response of 'invalid command.' It is also possible that the device will be unable to reach the desired speed due to other system activity.

Once in this mode, the device will report the updated count value in the floating point read block at the specified rate.

6 Asynchronous Format (Acyclic Mode)

SAI Asynchronous Format is for one-time read or write data that occurs outside of the normal scan cycle. This is typically used for setup data before the operation "starts" or other special information that is not needed as frequently. Acyclic messaging is typically not used for "real-time" activities and is generally used for non-repetitive or low repetition requests, from a control system; simply stated, the control system sends a request and the device responds to the request.

Asynchronous Format provides no cyclic data. However, a device can support this format along with one or more of the cyclic data formats in this specification.

This format uses special message instructions in the control system to immediate execute the command specified within its configuration. These messages and their instructions are control system dependent. Within the configuration of the instruction, several parameters are used to define: 1) the command type, 2) the device variable that the command applies to, and 3) the control system memory space or variable used with the instruction (for write value or read response).

There are two methods of sending/receiving data through acyclic messages: 1) direct access to the variable through a unique name or number defined by the control system's acyclic message block and 2) indirect access through a variable name provided in the data structure of two generic message blocks reserved for this purpose (one for read, one for write). Within the Asynchronous Format, the specification covers two levels of direct access and one level of indirect access. When the Asynchronous Format is supported by a device, it must support Direct Access Level 1. All other methods are optional and not interdependent so a device can choose to provide Direct Level 1 only; Direct Level 1 and Indirect Access, but not Direct Level 2; Direct Level 1 and Level 2 but not Indirect; or all three. Variable names are exclusive within the Direct Access Levels – meaning that a variable in Level 1 will not be renamed in Level 2. However variables available in the Direct Access Levels may also be found in Indirect Access method.

Direct Access Level 1

This group uses the acyclic parameter access method provided through the automation interface to read and write specific internal variables. Each variable is assigned its own unique parameter; either an index number, or class/instance/attribute which will differ depending on the automation bus type. This group would likely include weight data but not application-specific data; for example, it would not include counting variables like average piece weight or count.

In the Direct Levels, the control system variable's memory space shares a similar structure with the variable block data only since it does not require the words reserved for the command and variable name. Its space is reserved based on the type of data requested and the type of command used:

Figure 1—26: Asynchronous Direct Command / Response

Word 0	Byte 2	Byte 1
Word 1	Byte 4	Byte 3
Word 2	Byte 6	Byte 5
Word 3	Byte 8	Byte 7
...		
Word n	Byte (2n + 2)	Byte (2n + 1)

Figure 1—27: Asynchronous Indirect Command / Response

Word 0	Read Length	
Word 1	Variable Group	
Word 2	Variable Subgroup	
Word 3	Variable Item	
Word 4	Byte 2	Byte 1
Word 5	Byte 4	Byte 3
Word 6	Byte 6	Byte 5
Word 7	Byte 8	Byte 7
…		
Word n	Byte (2n + 2)	Byte (2n + 1)

Control system parameters for Direct Access

Because control systems use different methods for providing acyclic messages, the parameter used in the message block may also differ and is based on their requirements.

Profibus/ProfiNet acyclic messages

For most control systems using Profibus or ProfiNet networks, there are two types of commands that can be used to execute acyclic messages: RDREC (SFB52) and WRREC (SFB53). The index and length parameters within these blocks are used to specify what variable (for Direct Access) or what command (for Indirect Access) is required. To read a variable, a combination of RDREC and WRREC commands are used. To write a value to a variable, the WRREC command is used. Index numbers used are interface dependent due to the restrictions of the particular network type.

EIP/ControlNet/DeviceNet acyclic messages

For control systems using EthernetIP, ControlNet or DeviceNet networks, there are two types of commands that can be used to execute asynchronous messages: CIP Generic Message Instruction for Get Attribute Single ("e") or CIP Generic Message Instruction for Set Attribute Single ("10"). These commands use parameters called class code, instance number, attribute number and length to be configured in the message block in order to specify what variable for Direct Access) or what command (for Indirect Access) is required.

7 Commands

7.1 Command sequences

The commands available to use for the control system in measuring and status blocks (write) are grouped according to block type and command type.

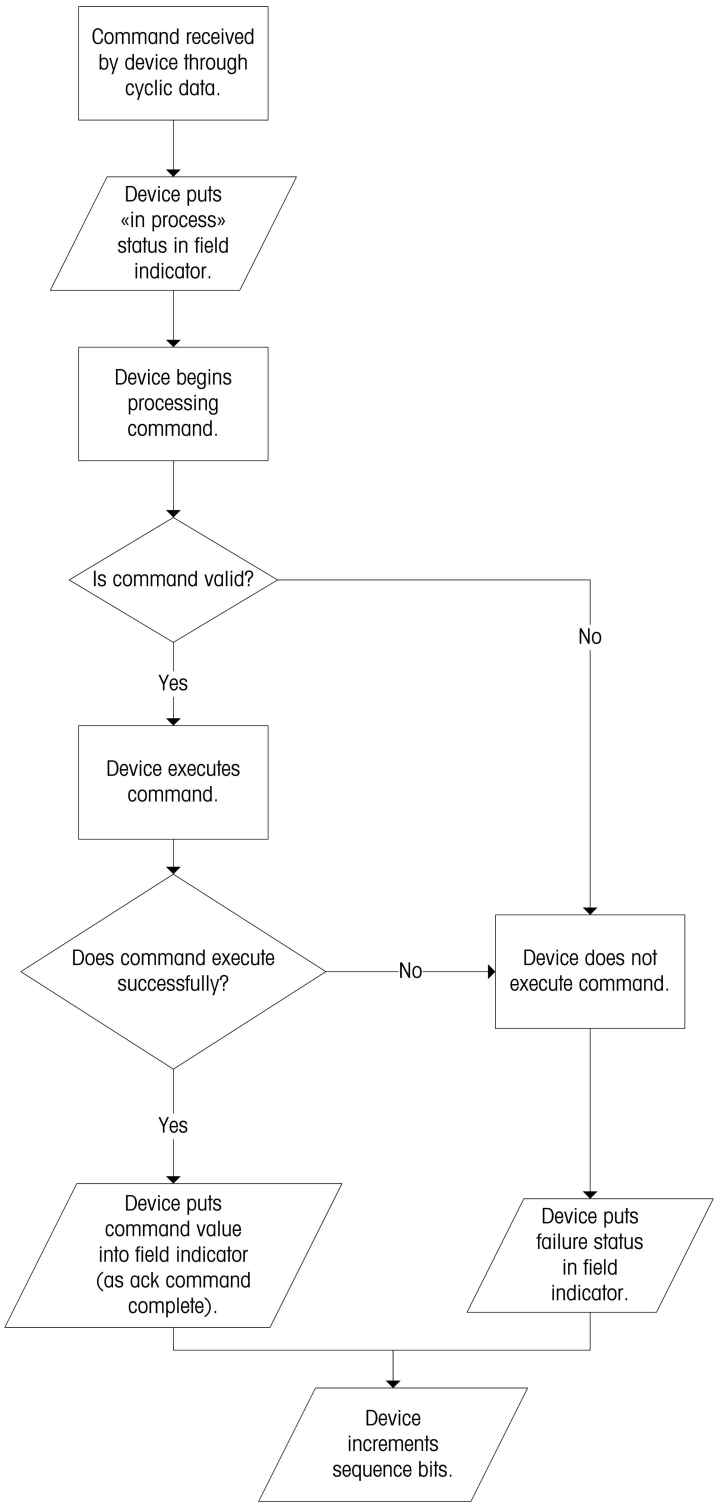
Every command is triggered only once. However, it can remain in the command word for multiple scans until another command is sent. In order to permit a command twice in a row, a NOOP command (2000) has to be executed in between.

Only one command per block is permitted. The only exception is a cancel operation command to abort the previously sent command. All other commands to this block will be ignored until its active command is completed. Commands sent before completion are not stored to be acted upon completion of the prior command.

When multiple block commands are sent, the order of completion is lowest word block to highest word block. The control system has to make sure command conflicts do not exist when multiple blocks are assigned to the same channel.

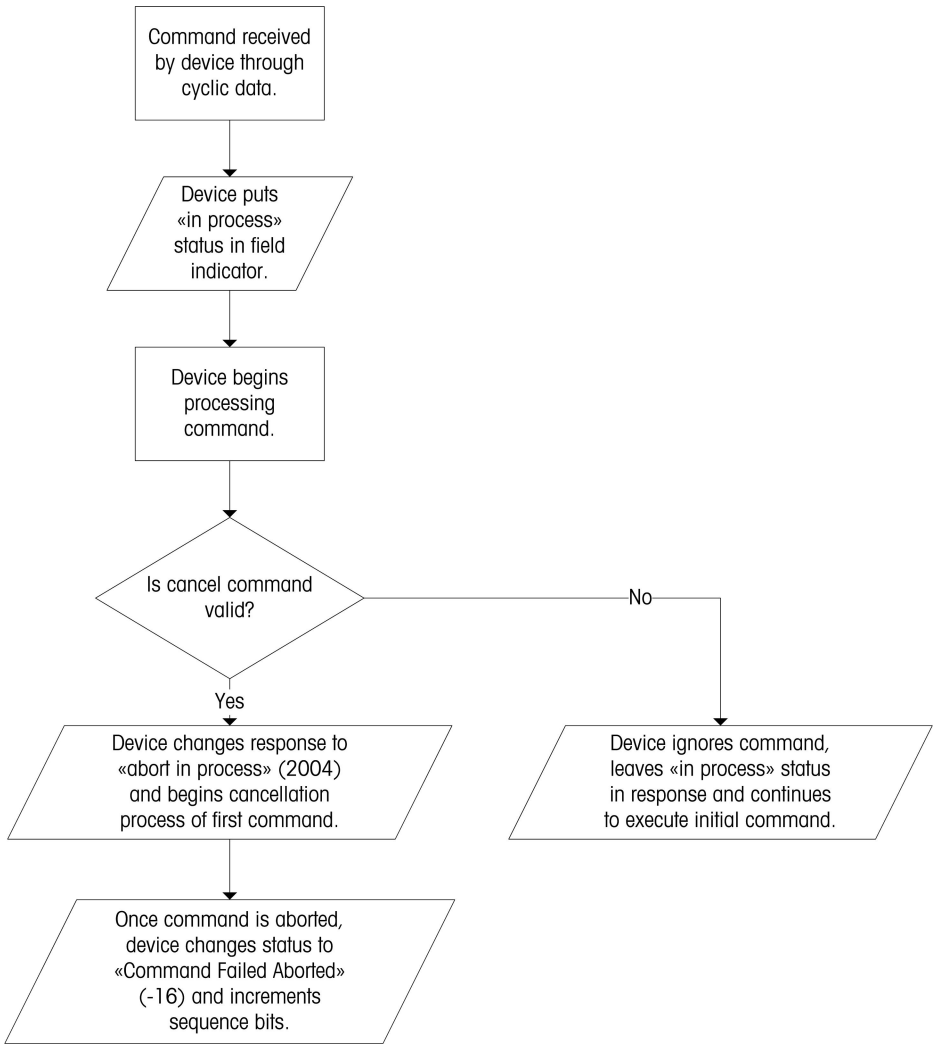
Receiving and excecuting a command

All responses to commands for the cyclic data blocks are provided through the response word value. During the process of receiving and executing the operation required for a command, the device will follow a defined sequence.



Aborted command

If a command is aborted, following sequence applies:



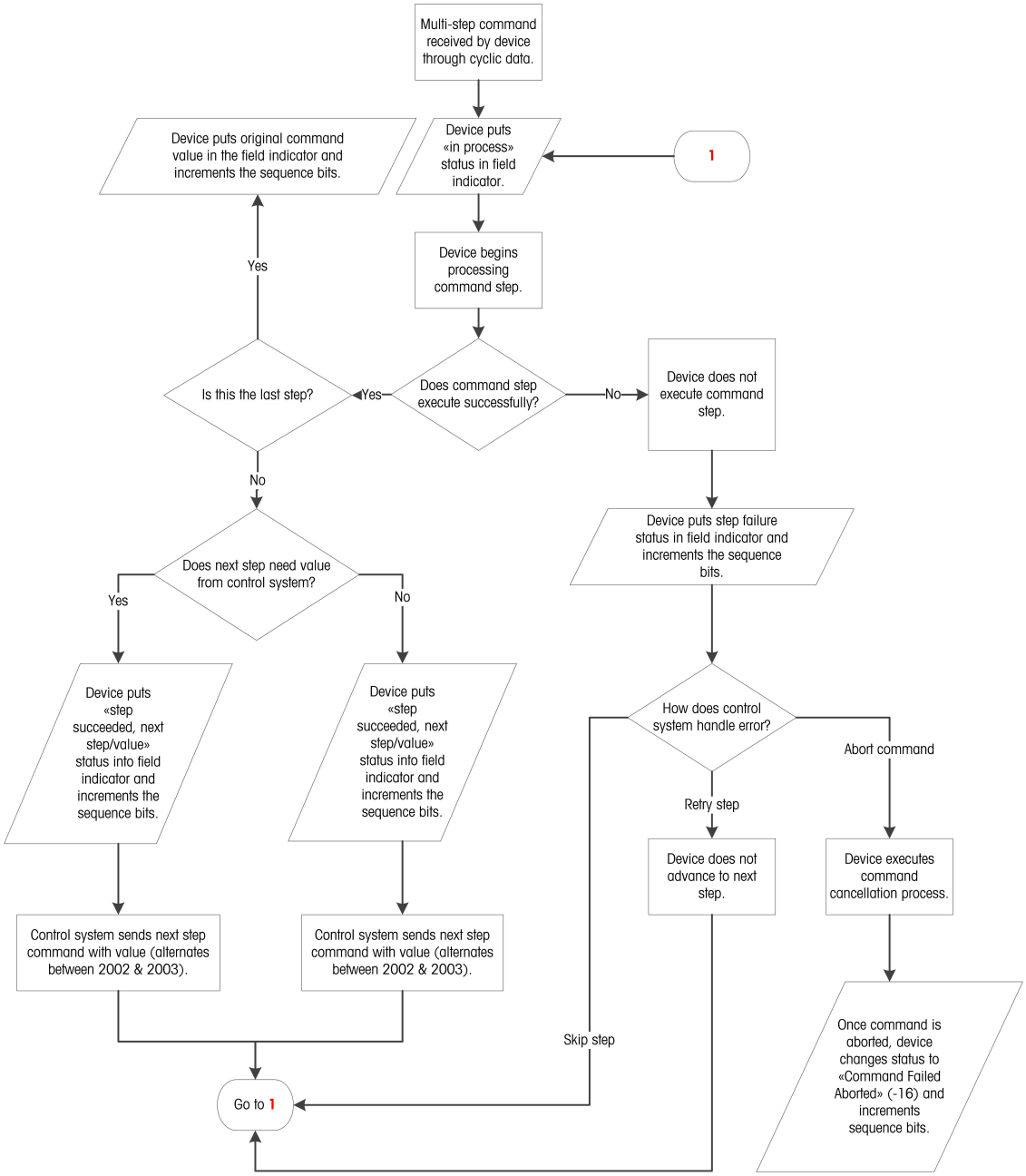
Multi-step command

For multi-step commands, special commands are used for the following:

- advance to the next step
- retry a failed step
- abort the entire process

Corresponding status values indicate whether the device is ready to execute the next step or whether the step has failed.

During a multi-step command, the commands follow the following sequence:



7.2 Measuring block commands

There are different types of measuring block commands:

- Measuring block report commands
- Measuring block write commands
- Measuring block operation commands

Each type is based on the command use and the expected response from the device.

See also

SAI Measuring Block Command List ▸ Page 34

7.2.1 Measuring block report commands

Measuring block report commands request the data which is sent by the device in its measuring block (read). Measuring block report commands are used for data which is updated continuously, e.g. gross weight, net weight, raw wate, rate or other application numeric data values which are time-sensitive.

Example

Command	Description	Value
Report default value.	Reports gross weight data in displayed resolution.	0
Report rounded tare weight.	Reports tare weight data in displayed resolution.	2
Report rounded net weight.	Reports net weight data in displayed resolution.	3

Valid command response

1 The device receives a valid measuring block report command and reacts as follows:
   ⇨ It places the "in process" response in field indicator value and begins to process the command.
   ⇨ It reports the requested data in the floating point value of the measuring block.
   ⇨ It updates the response word to indicate what data is present in the floating point value. This matches the command & channel value of the command request of the measuring block (read).
   ⇨ It increments and updates the sequence bits in the status word.
2 The device continues to update the floating point value and status bits until another command is received.

Timeout and invalid command data responses appear in report commands. No data will be sent and any data provided will be ignored.

7.2.2 Measuring block write commands

Measuring block write commands write a value provided by the measuring block (write) to some device functions. Measuring block write commands are used to set common process values, e.g. tare, target, tolerance or other application numeric data that can be user-specified during operation.

Note

- Measuring block write commands may or may not execute immediately. The "in process" response may be seen by the control system in the cyclic data before the command is completed.

Example

Command	Description	Value
Write preset tare weight	Sets preset tare to value provided	201
Write Comparator 1 Limit	Sets comparator 1 limit to value provided	240
Write filter mode	Sets filter to value provided	290

Valid command response

– The device receives a valid measuring block write command and reacts as follows:
  ⇨ It places the "in process" response in field indicator value and begins to process the command.
  ⇨ It loads the supplied value into the device's internal variable and reports the value stored in the floating point value of the measuring block.
  ⇨ It updates the response word to indicate what command was received. This matches the command & channel value of the command request of the measuring block (write).
  ⇨ It increments and updates the sequence bits in the status word.

Timeout command data response appear in write commands.

7.2.3 Measuring block operation commands

Measuring block operation commands trigger an operation. Measuring block operation commands may or may not require a sequence of responses. Simple operations can be executed immediately and do not require additional sequence steps. More complex operations take multiple steps to be executed and require additional commands from the control system to continue through the entire process.

Example

Command	Description	Value
Tare immediate	Motion not checked, tare executed	403
Zero immediate	Motion not checked, zero executed	404
Clear tare	Motion not checked, clear tare executed	402

Valid command response

– The device receives a valid measuring block operation command and reacts as follows:
  ⇨ It places the "in process" response in field indicator value and begins to process the command.
  ⇨ It triggers the device's operational function requested by the command.
  ⇨ It waits for a response from the device. If the process takes multiple steps and the current step is finished successfully, it reports "step complete". If the current step was unsuccessful it reports "step failed".
  ⇨ It waits for the "Continue" or "Abort" command from the control system to start the next test.
  ⇨ If the process is complete, it updates the response word to indicate what command was received. This matches the command & channel value of the command request of the measuring block (write).
  ⇨ It increments and updates the sequence bits in the status word.

7.3 Status block commands

Status block commands request data which is sent by the device in its status blocks. These commands are used to get data which is continuously updated, e.g. scale, target, physical discrete input/output information.

Example

Command	Description	Value
Report default status	RedAlert alarm, scale group and I/O group	0
Report I/O mix 1	I/O group 2, I/O group 3, I/O group 4	9
Report alarms and scale group	RedAlert alarm, alarm, scale group	21

Valid command response

– The device receives a valid status block command and reacts as follows:
  ⇨ It places the "in process" response in field indicator value and begins to process the command.
  ⇨ It reports the requested data in the status group word of the status block.
  ⇨ It updates the response word to indicate what data is present in the scale status group word. This matches the command & channel value of the command request of the status block (write).
  ⇨ It continues to updates the status bits until another command is received.

Timeout and invalid command data responses can not appear in report commands.

See also

SAI Status Block Command List ▸ Page 57

7.4 Other command responses

In addition to valid command responses, other responses can occur:

Reserved commands for unique status or command sequencing

For all measuring and status blocks, there are some reserved commands used for unique status or command sequencing:

Command	Description	Value
Response only	To indicate failed command status through the floating point value. Each of these responses turn on bit 15 and the bit value shown in brackets.	Bit 15 = 1 + ()
	Command failed invalid.	Bit 0 value (1)
	Command failed timeout.	Bit 1 value (2)
	Command failed unknown.	Bit 2 value (4)
	Command failed value invalid.	Bit 3 value (8)
	Command failed aborted.	Bit 4 value (16)
	Command step failed.	Bit 5 value (32)
	Test command failed.	Bit 6 value (64)

General system commands

For all measuring and status blocks, there are some general system commands:

Command	Description	Value
Response only	Command has been received and evaluation is in progress.	2047
Response only	Step successful.	2046
NOOP	No operation command to test command response, clear prior command.	2000
Cancel operation	Abort sequence. Response value = abortion in progress.	2004

Complex command responses

The links to the command responses are listed below:

See also

- Invalid command response ▸ Page 26
- Unknown command response ▸ Page 26
- Invalid command data response ▸ Page 26
- Timeout command response ▸ Page 26
- Aborted command response ▸ Page 26
- Step successful command response ▸ Page 27
- Step failed command response ▸ Page 27

7.4.1 Invalid command response

An invalid command response is sent if the device determines that the command is known but cannot be executed.

It can occur due to state restrictions, e.g. attempting to zero when the scale is outside of acceptable zero range.

– The device receives an invalid command and reacts as follows:
  ⇨ It places the "in process" response (2047) in the field indicator value and begins to process the command.
  ⇨ It updates the response word to indicate the invalid command: **Bit 0 = 1, error value = 1**
  ⇨ It increments and updates the sequence bits in the status word.

7.4.2 Unknown command response

An unknown command response is sent if the device does not support the information; e.g. rate values are requested from a device that does not provide rate functionality.

– The device receives an unknown command and reacts as follows:
  ⇨ It places the "in process" response (2047) in the field indicator value and begins to process the command.
  ⇨ It updates the response word to indicate the unsupported command: **Bit 2 = 4, error value = 4**
  ⇨ It increments and updates the sequence bits in the status word.

7.4.3 Invalid command data response

An invalid command data response is sent if the device receives a valid command (write) with an invalid value; e.g. the value is smaller or larger than the allowed value.

– The device receives an invalid command and reacts as follows:
  ⇨ It places the "in process" response (2047) in the field indicator value and begins to process the command.
  ⇨ It updates the response word to indicate the invalid command value: **Bit 3 = 8, error value = 8**
  ⇨ It increments and updates the sequence bits in the status word.

7.4.4 Timeout command response

A timeout command response is sent if the device receives a valid command which is unable to execute within a pre-determined time; e.g. a command which requires no motion or stable weight before execution.

– The device receives an invalid command and reacts as follows:
  ⇨ It places the "in process" response (2047) in the field indicator value and begins to process the command.
  ⇨ It updates the response word to indicate the command timeout failure value: **Bit 15 = 1, error value = 2**
  ⇨ It increments and updates the sequence bits in the status word.

Note

- If the control system aborts the previous command, it can issue a special command to cancel operation of the aborted command as long as its status is "in process" or during any step of a multiple step sequence.

  After the cancel command is acknowledged through the use of its value as an "abort in process"-response, the device will provide a response to indicate the initial command has been aborted.

7.4.5 Aborted command response

An aborted command response is sent once a second command to cancel the prior command has been received and processed.

This can only occur if the original command:

- permits cancellation.
- has not already completed successfully.
- has already failed.

– The device receives an aborted command response and reacts as follows:
  ⇨ It places the "abort in process" response (2004) in the field indicator value and begins to process the command.
  ⇨ It updates the response word to indicate the command abort failure value: **Bit 15 = 1, error value = 16**
  ⇨ It increments and updates the sequence bits in the status word.

See also

Command sequences ▸ Page 21

7.4.6 Step successful command response

A step successful command response is sent if the device determines that the command's current step has been successfully executed and requires acknowledgement to start the next step in the process.

– The device receives a step successful command response and reacts as follows to start the next step in sequence:
  ⇨ It places the "in process" response (2047) in the field indicator value and begins to process the command.
  ⇨ It updates the response word to indicate step successful when ready to execute next step: **Bit 15 = 1, error value = 2046**
  ⇨ It increments and updates the sequence bits in the status word.

7.4.7 Step successful / Next value command response

A step successful / next value command response is sent when device determines that the command's current step has been successfully executed and requires the next value and acknowledgement to start the next step in the process. When a previous step completes and the next step in the sequence requires another value to execute the next step in the process, the device does the following:

1. Places the "in process" response in the field indicator value and begin processing the command….
2. Updates the Response word to indicate step successful and next value is needed when ready to execute next step (value = 2045).
3. Increments and updates the sequence bits in the status word.

The control system should send one of the next step commands with the required value in the floating point words to continue with the next step in the process.

7.4.8 Step failed command response

An step failed command response is sent if the device determines that the command's current step has failed.

1 The device receives a step failed command response and reacts as follows:
  ⇨ It places the "in process" response (2047) in the field indicator value and begins to process the command.
  ⇨ It updates the response word to indicate the failed step: **Bit 15 = 1, error value = 32**

2 If it is a cyclic command, the device increments and updates the sequence bits in the status word.

3 If it is a cyclic command, the control system starts to abort the sequence (2004)

8 PROFINET IO RT

PROFINET IO RT supports the following features:

- User programmable IP addressing.
- Capability for bi-directional discrete mode communications (cyclic messaging) of weight or display increments, status and control data between the control system and the device.
- Acyclic or unscheduled message transfer between the control system and the device.

METTLER TOLEDO provides product specific device description files for an efficient implementation in a control system project. The pre-defined format needs no configuration and simplifies the integration.

The file can be downloaded from the product web page on www.mt.com. Check the documentation tab on the corresponding product web page.

8.1 Functional description

8.1.1 Industrial ethernet LED status

	SF (dual LED)		BF (dual LED)	
	Green	**Red**	**Green**	**Red**
PROFINET IO RT		System failure (SF)		Bus failure (BF)

8.1.2 PROFINET IO RT specific terms

Term	Definition
PNIO	Short for PROFINET IO
PROFINET IO	PROFINET IO is a communication concept for the implementation of modular decentralized applications. The real time capabilities of PROFINET IO are further divided into RT and IRT.
PROFINET IO RT	PROFINET IO with real time (RT) capabilities. Optimized real time communication channel for time critical I/O data and alarms. Real time capabilities are implemented in the software.
DAP	Device access point.
DCP	Discovery and basic configuration protocol. Used for IP configuration over PROFINET IO RT.
GSDML	XML-based descriptive language for GSD-files.
Initial Record Data	Record data write-requests destined for a sub-module
IOCS	IO consumer status.
IOPS	IO provider status.
IO Controller	Controlling device which acts as a client for several IO devices; usually a control system.
IO Device	Field device assigned to an IO controller.
IO Supervisor	Programming device with commissioning and diagnostic functions.
Module	Hardware or logical component of a network device.
Submodule	Hardware or logical component of a module.
PDEV	Physical device. From specification version 2.0 onwards, it is possible to describe the physical ethernet interface and its ports (ODEV or physical device) with a special mechanism. This is done with special submodules at slot 0. The module at slot 0 is the access point for the device.
Record data	Acyclic read/write data.

8.1.3 Communication

The SAI device utilizes component parts to ensure complete compatibility with Siemens PROFINET IO RT network. An SAI device is recognized as a generic PROFINET IO RT device by the control system.

IP address

Each PROFINET IO RT device connected to the PROFINET IO RT network is assigned one IP address. This address is chosen by the system designer and can be assigned by the control system using DCP and MAC address association.

The IP address entry must be unique for each device. Once the SAI device is configured to work on the network (MAC address, IP address, Subnet mask, router, module name) and the control system is configured to add the device to its network, the device begins to send gross weight data.

8.2 Module parameters

See control system project tool (e.g. SIEMENS TIA portal) > menu "module parameter" for device configuration parameters.

8.3 Data formats

The PROFINET IO RT interface provides discrete data transfer. Data transfer is accomplished via the control systems cyclic (UDP) messaging respectively. Discrete data is continuously available. The PROFINET IO RT interface has its own logical IP address to send and receive information to and from the control system continuously. Only floating point format of discrete data is supported.

Acyclic (TCP/IP) messaging is also supported. The SAI protocol provides a read and a write message block that contains parameters to refer to the device's internal variables. The method employs the acyclic message itself to select the variable (slot, sub slot and index value) using a fieldbus specific parameter in its message block.

9 EtherNet/IP

EtherNet/IP supports the following features:

- User-programmable IP addressing.
- Capability for bi-directional discrete mode communications (class 2 messaging) of weight or display increments, status and control data between the control system and the device.
- Acyclic or explicit unscheduled message transfer between the control system and the device.

METTLER TOLEDO provides product specific device description files for an efficient implementation in a control system project. The pre-defined format needs no configuration and simplifies the integration.

The file can be downloaded from the product web page on www.mt.com. Check the documentation tab on the corresponding product web page.

9.1 Functional description

9.1.1 Industrial ethernet LED status

	MS (dual LED)		NS (dual LED)	
	Green	**Red**	**Green**	**Red**
EtherNet/IP	Module status (MS)	Module status (MS)	Network status (NS)	Network status (NS)

9.1.2 EtherNet/IP specific terms

Term	Definition
Adapter Class	An adapter class product emulates functions provided by traditional rack-adapter products. This type of node exchanges real-time I/O data with a scanner class product. It does not initiate connections on its own.
Class 1 Messaging	In EtherNet/IP communication protocol scheduled (cyclic) message transfer between a control system and CIP adapter class device.
Class 3 Messaging	In EtherNet/IP communication protocol unscheduled (acyclic) message transfer between a control system and CIP adapter class device. This is used by the ACT350 for acyclic messaging.
Connected Messaging	A connection is a relationship between two or more application objects on different nodes. The connection establishes a virtual circuit between end points for transfer of data. Node resources are reserved in advance of data transfer and are dedicated and always available. Connected messaging reduces data handling of messages in the node. Connected messaging can be implicit or explicit. See also unconnected messaging.
Connection Originator	Source for I/O connection and message requests. Initiates an I/O connection or explicit message connection.
Explicit Messaging Acyclic Messaging	Explicit messages (acyclic messages, class 3 messages, discrete messages) can be sent as a connected or unconnected message. CIP defines an explicit messaging protocol that states the meaning of the message. This messaging protocol is part of the message data. Explicit messages provide a one-time transport of a data item. Explicit messaging provides the means by which typical request/response functions are performed (e.g. module configuration). These messages are typically point-to-point.
Implicit Messaging I/O Messaging	Implicit messages (cyclic messages, class 1 messages) are exchanged across I/O connections with an associated connection ID. The connection ID defines the meaning of the data and establishes the regular/repeated transport rate and the transport class. No messaging protocol is contained within the message data as with explicit messaging. Implicit messages can be point-to-point or multicast and are used to transmit application-specific I/O data.

Term	Definition
I/O Client	Function that uses the I/O messaging services of another device to perform a task. Initiates a request for an I/O message to the server module. The I/O client is a connection originator.
I/O Server	Function that provides I/O messaging services to another device. It responds to a request from the I/O client. The target of the connection request is the I/O server.
Message Client	Function that uses explicit messaging services of another device to perform a task. Initiates an explicit message request to the server device.
Message Server	Function that provides explicit messaging services of another device to perform a task. Initiates an explicit message request to the server device.
Scanner class	A scanner class product exchanges real-time I/O data with adapter class and scanner class products. This type of node can respond to connection requests and can also initiate connections on its own.
Target	Destination for I/O connection or message requests. Can only respond to a request, can not initiate an I/O connection or message.
Unconnected Messaging	Unconnected messaging provides a means for a node to send message requests without establishing a connection prior to data transfer. More overhead is contained within each message and the message is not guaranteed destination node resources. Unconnected messaging is used for non-periodic requests. Explicit messages only, see also "Connected Messaging".

9.1.3 Communication

The SAI device utilizes component parts to ensure complete compatibility with the EtherNet/IP network. SAI devices are recognized as a generic EtherNet/IP device by the control system.

METTLER TOLEDO recommends using the provided electronic data sheets (EDS-File). The EDS-File can be downloaded from the product web page on www.mt.com. Check the documentation tab on the corresponding product web page.

The wiring between the control system and the device is an industrial ethernet twisted pair cable. The cable installation procedure and specification including distance and termination requirements are the same as recommended for the EtherNet/IP network.

The SAI device only uses class 1 cyclic data for discrete data and class 3 explicit messages for access to the device variables. Explicit message blocks may be connected or unconnected. The programmer must make this choice.

IP address

Each EtherNet/IP device connected to the EtherNet/IP network represents a physical IP address. This address is chosen by the system designer and programmed into the device and control system or from a DHCP server. DHCP is active as default for all EtherNET/IP devices. More information on how to configure the device can be found in the device specific manual.

The IP address entry must be unique for each device. Once the SAI device is configured to work on the network (MAC address, IP address, Subnet mask, router, module name) and the control system is configured to add the device to its network the device begins to send gross weight data.

9.2 Module parameters

See control system project tool (e.g. Rockwell Software Studio 5000) > menu "module parameter" for device configuration parameters.

9.3 Data formats

The EtherNet/IP interface provides discrete data transfer and class 1 and class 3 messaging. Data transfer is accomplished via the control systems cyclic (UDP) messaging respectively. Discrete data is continuously available. The EtherNet/IP interface has its own logical IP address to send and receive information to and from the control system continuously. Only floating point format of discrete data is supported.

Acyclic data transfer and class 3 acyclic messaging are also supported. The SAI protocol provides a read and a write message block that contains parameters to refer to the device's internal variables. The method employs the acyclic message itself to select the variable (index or class/instance attribute) using a fieldbus specific parameter in its message block.

10 PROFIBUS Interface

PROFIBUS DP interface enables to communicate to a PROFIBUS DP master according to DIN 19245. PROFIBUS is based on a variety of existing national and international standards. The protocol architecture is based on the Open Systems Interconnection (OSI) reference model in accordance with the international standard ISO 7498.

The implemented PROFIBUS-DPV1 supports cyclic and acyclic data exchange, diagnostics, and process alarm handling.

METTLER TOLEDO provides product specific device description files for an efficient implementation in a control system project. The pre-defined format needs no configuration and simplifies the integration. The file can be downloaded from the product web page on www.mt.com. Check the documentation tab on the corresponding product web page.

10.1 Node address

Each device represents one physical node. The node address is chosen by the system designer. Please check the installation manual of the specific product to get more information how to set the note address.

11 SAI Measuring Block Command List

11.1 Weight commands

Weight commands are commands for weight values in display units.

Cyclic commands - measuring block

Command	Description
0 (default)	Gross weight - rounded
1	Gross weight - rounded
2	Tare weight - rounded
3	Net weight - rounded
5	Gross weight - internal resolution
6	Tare weight - internal resolution
7	Net weight - internal resolution

Acyclic command - read

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x2000	0x300	0x01	0x01	1	0x14	Float 32	Gross weight - rounded
0	1	0x2001	0x300	0x01	0x02	1	0x15	Float 32	Gross weight - rounded
0	1	0x2002	0x300	0x01	0x03	1	0x16	Float 32	Tare weight - rounded
0	1	0x2003	0x300	0x01	0x04	1	0x17	Float 32	Net weight - rounded
0	1	0x2004	0x300	0x01	0x05	1	0x18	Float 32	Gross weight - internal resolution
0	1	0x2005	0x300	0x01	0x06	1	0x19	Float 32	Tare weight - internal resolution
0	1	0x2006	0x300	0x01	0x07	1	0x1A	Float 32	Net weight - internal resolution

Note

- Reports weight data in display unit
- Check device status group ([Parameters of measuring block (read) ▸ Page 7])
  - Data okay
  - Alarm condition
  - Center of zero
  - Motion
  - Net mode
  - Alternative weight unit

11.2 Zero / tare commands

Zero / tare commands are commands for zero and tare settings.

Cyclic commands - measuring block

Command	Description
400	Tare when stable
401	Zero when stable
402	Clear tare
403	Tare immediately
404	Zero immediately
201	Preset tare (display unit); Parameter = PreTareWeight (float 32)

Acyclic commands - read

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x2009	0x300	0x01	0x17	1	0x24	UInt 16	Zero procedure status bits
0	1	0x2008	0x300	0x01	0x16	1	0x1F	UInt 16	Tare procedure status bits

Acyclic commands - write

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x2010	0x300	0x01	0x09	1	0x1C	UInt 8	Tare when stable
0	1	0x2013	0x300	0x01	0x14	1	0x22	UInt 8	Zero when stable
0	1	0x2012	0x300	0x01	0x11	1	0x1D	UInt 8	Clear tare
0	1	0x2011	0x300	0x01	0x10	1	0x1E	UInt 8	Tare immediately
0	1	0x2014	0x300	0x01	0x15	1	0x23	UInt 8	Zero immediately
0	1	0x2020	0x300	0x01	0x08	1	0x1B	Float 32	Preset tare (display unit

Note

- Check device status group ([Parameters of measuring block (read) ▶ Page 7])
  - Data okay
  - Alarm condition
  - Center of zero
  - Motion
  - Net mode
  - Alternative weight unit

11.3 Filter settings

Filter settings are commands for changing the filter behavior.

Cyclic commands - measuring block

Command	Description
290	Write weighing mode
90	Report weighing mode
291	Write weighing environment
91	Report weighing environment
292	Write filter cut-off frequency
92	Report filter cut-off frequency
290	Write weighing mode

Acyclic commands - read / write

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x4256	0x415	0x01	0x06	1	0x41	Float 32	Weighing mode
0	1	0x4257	0x415	0x01	0x07	1	0x42	Float 32	Weighing environment
0	1	0x4258	0x415	0x01	0x08	1	0x43	Float 32	Cut-off frequency

Parameters

Parameter	Command value
Weighing mode	0: Universal weighing 2: Fix filter
Weighing environment	0: Very stable 1: Stable 2: Standard 3: Unstable 4: Very unstable
Cut-off frequency	0: Predefined frequency used, changeable over weighing environment. 0.001 Hz - 20.0 Hz

Note

- Changing settings is also possible via module parameter (PROFINET IO RT or EtherNet/IP).

11.4 Stability criteria settings

Stability criteria settings are commands for weighing tare and zeroing.

Cyclic commands - measuring block

Command	Description
84	Report observation time for zero
284	Write observation time for zero
85	Report tolerance for zero
285	Write tolerance for zero
86	Report observation time for tare
286	Write observation time for tare
87	Report tolerance for tare
287	Write tolerance for tare
88	Report observation time for weighing
288	Write observation time for weighing
89	Report tolerance for weighing
289	Write tolerance for weighing

Acyclic commands - read / write

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x4353	0x417	0x01	0x03	1	0x48	Float 32	Observation time for zero
0	1	0x4354	0x417	0x01	0x04	1	0x49	Float 32	Tolerance for zero
0	1	0x4355	0x417	0x01	0x05	1	0x4A	Float 32	Observation time for tare
0	1	0x4356	0x417	0x01	0x06	1	0x4B	Float 32	Tolerance for tare
0	1	0x4357	0x417	0x01	0x07	1	0x4C	Float 32	Observation time for weighing
0	1	0x4358	0x417	0x01	0x08	1	0x4D	Float 32	Tolerance for weighing

Parameters

Parameter	Command value
Observation time	0.1 - 4.0 seconds
Tolerance	0.25 - 1000 digits

Note

- Changing settings is also possible via module parameter (PROFINET IO RT or EtherNet/IP).

11.5 General settings

General settings are commands for general weight value configuration.

Cyclic commands - measuring block

Command	Description
296	Write readability
96	Report readability
283	Write timeout time
83	Report timeout time

Acyclic commands - read / write

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x4351	0x417	0x01	0x01	1	0x46	Float 32	General timeout
0	1	0x436E	0x417	0x01	0x1E	1	0x63	UInt 8	Automatic zero tracking
0	1	0x436F	0x417	0x01	0x1F	1	0x64	UInt 8	Zeroing at start-up
0	1	0x430B	0x416	0x01	0x0B	1	0x7A	Float 32	Readability
0	1	0x4301	0x416	0x01	0x01	1	0x70	Float 32	Geo code

Parameters

Parameter	Command value
Timeout time	0 - 65535 seconds
Automatic zero tracking	0: Disabled 1: Enabled
Zeroing at start-up	0: Disabled 1: Enabled
Readability (d=digits)	0: 1d 1: 10d 2: 100d 3: 1000d 4: 2d 5: 5d
Geo code	-1.0 … 31.0

Note

- Changing settings is also possible via module parameter (PROFINET IO RT or EtherNet/IP).

11.6 Adjustment / test

Adjustment / test commands are commands for internal and external adjustment and tests.

Cyclic commands - measuring block

Not supported

Acyclic commands - read

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x4007	0x410	0x01	0x07	1	0x86	UInt 16	Adjustment and test status Information
0	1	0x4008	0x410	0x01	0x08	1	0x87	Float 32	Test deviation
0	1	0x4011	0x410	0x01	0x11	1	0x91	Float 32	Requested weight

Acyclic commands - write

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x4001	0x410	0x01	0x01	1	0x80	UInt 8	Start adjustment with internal weight
0	1	0x4002	0x410	0x01	0x02	1	0x81	UInt 8	Start adjustment with external weight
0	1	0x4003	0x410	0x01	0x03	1	0x82	UInt 8	Start customer standard calibration
0	1	0x4004	0x410	0x01	0x04	1	0x83	UInt 8	Cancel adjustment / test
0	1	0x4005	0x410	0x01	0x05	1	0x84	UInt 8	Start test with internal weight
0	1	0x4006	0x410	0x01	0x06	1	0x85	UInt 8	Start test with external weight
0	1	0x4009	0x410	0x01	0x09	1	0x88	Float 32	External adjustment weight
0	1	0x4012	0x410	0x01	0x12	1	0x92	Float 32	External test weight

Parameters

Parameter	Command value
External adjustment weight	Weight in gram depending on the product.
External calibration test weight	

Note

- To cancel the adjustment/test a 1 must be sent to the device.

Response information

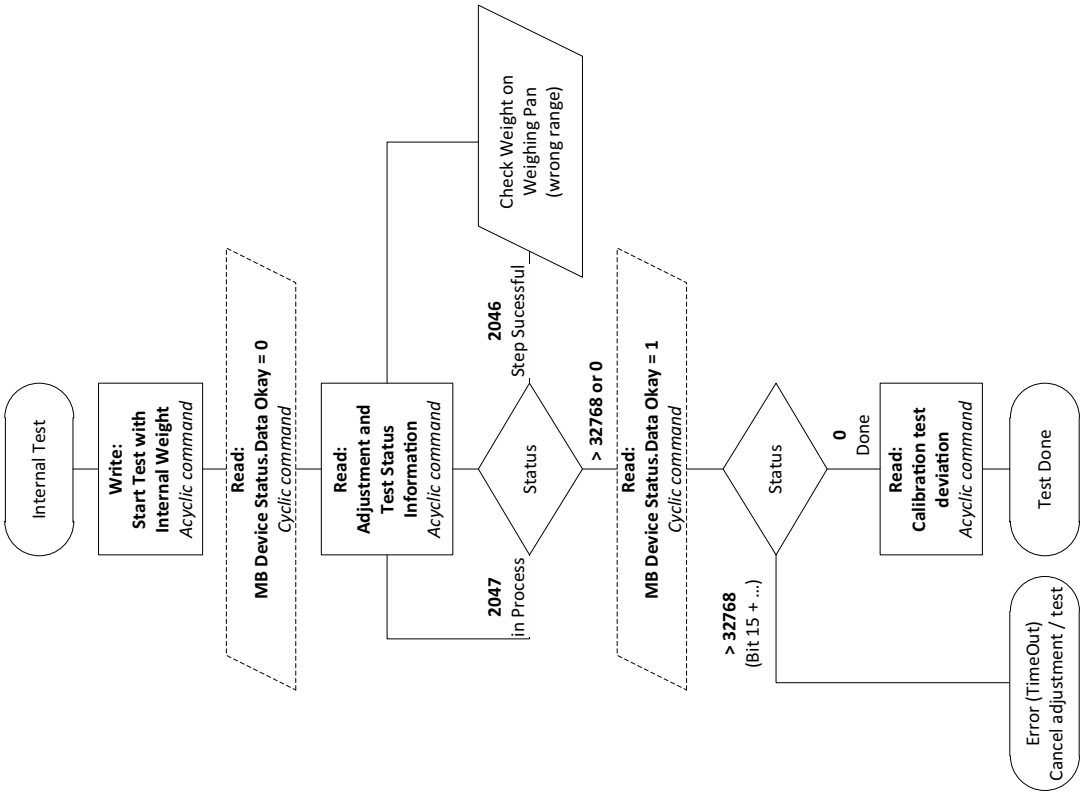
Adjustment / calibration status

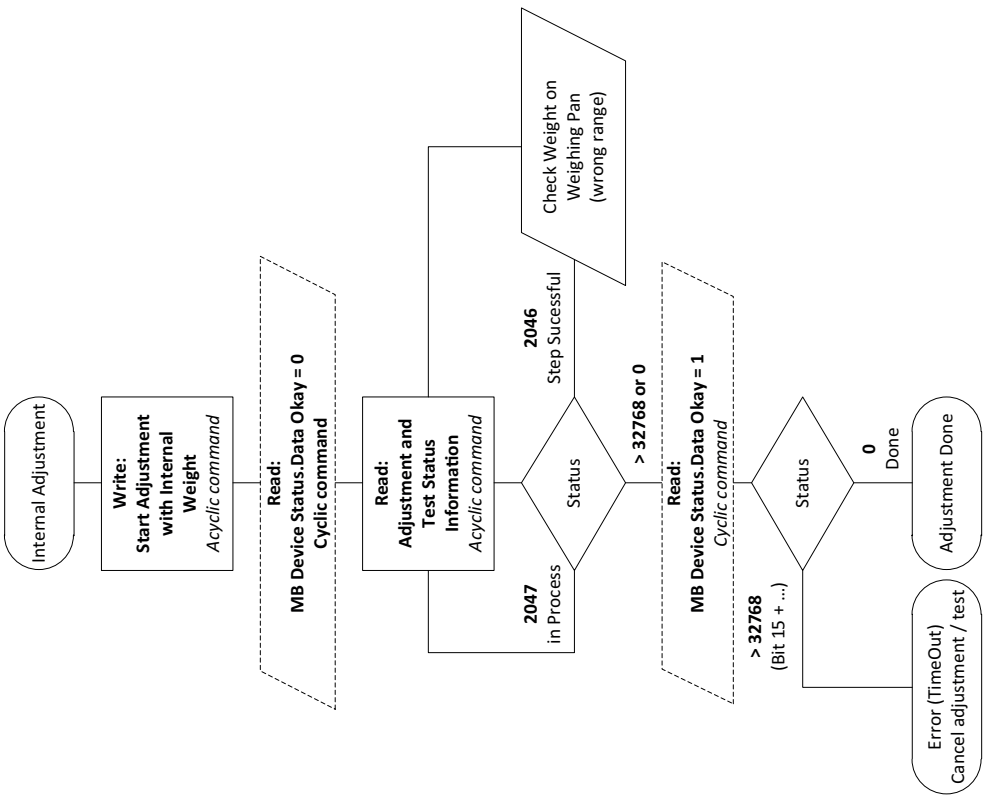
see [Other command responses ▸ Page 25]

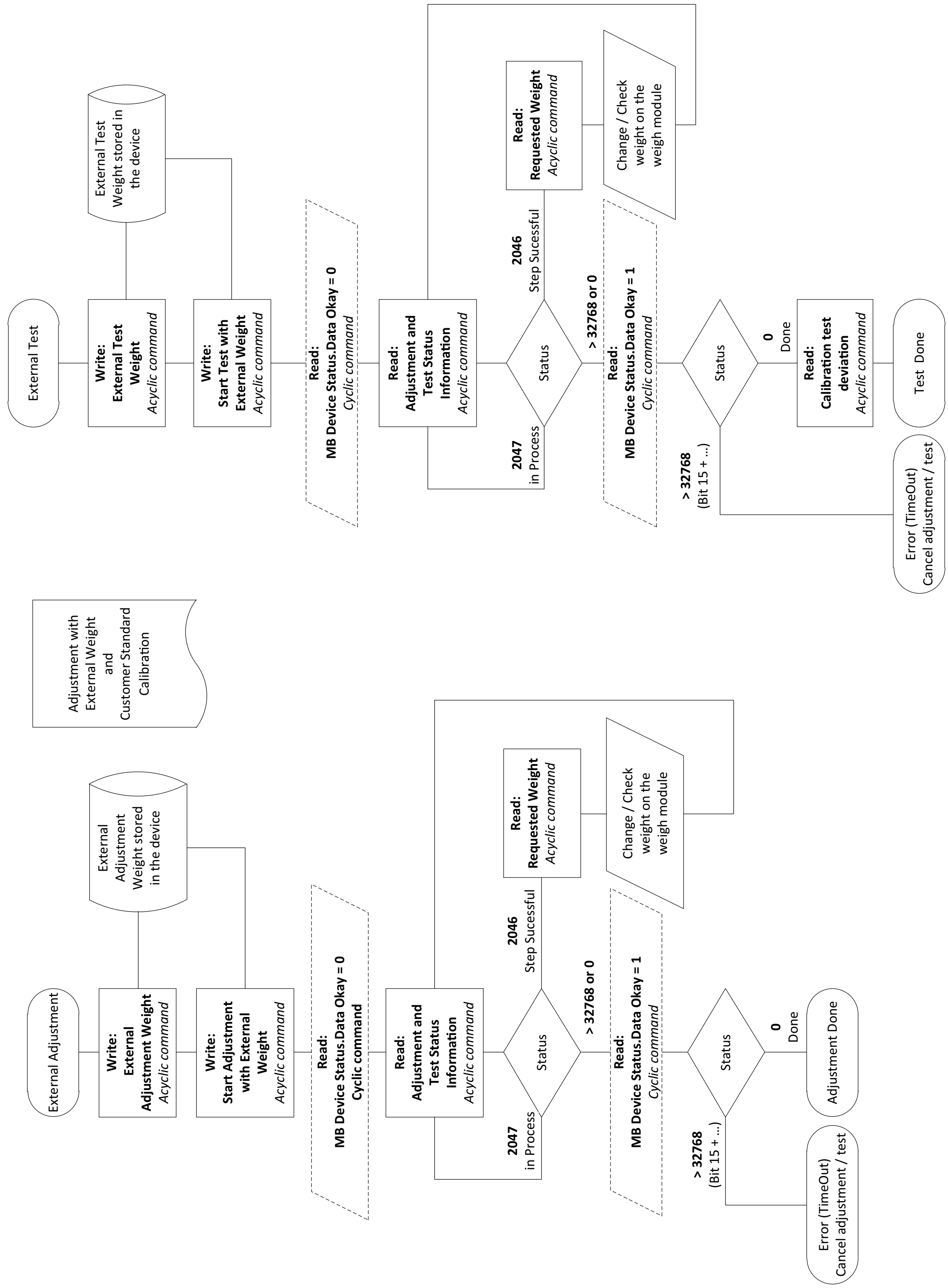
Note

- Changing settings is also possible via module parameter (PROFINET IO RT or EtherNet/IP).

Examples


Internal Test
Write:
Start Test with
Internal Weight
Acyclic command
Read:
MB Device Status.Data Okay = 0
Cyclic command
Read:
Adjustment and
Test Status
Information
Acyclic command
Status
2046
Step Sucessful
Check Weight on
Weighing Pan
(wrong range)
2047
in Process
> 32768 or 0
Read:
MB Device Status.Data Okay = 1
Cyclic command
Status
> 32768
(Bit 15 + ...)
0
Done
Read:
Calibration test
deviation
Acyclic command
Test Done
Error (TimeOut)
Cancel adjustment / test


Internal Adjustment
Write:
Start Adjustment
with Internal
Weight
Acyclic command
Read:
MB Device Status.Data Okay = 0
Cyclic command
Read:
Adjustment and
Test Status
Information
Acyclic command
Status
2046
Step Sucessful
Check Weight on
Weighing Pan
(wrong range)
2047
in Process
> 32768 or 0
Read:
MB Device Status.Data Okay = 1
Cyclic command
Status
> 32768
(Bit 15 + ...)
0
Done
Adjustment Done
Error (TimeOut)
Cancel adjustment / test


Adjustment with External Weight and Customer Standard Calibration
External Test
Write: External Test Weight Acyclic command
External Test Weight stored in the device
Write: Start Test with External Weight Acyclic command
Read: MB Device Status.Data Okay = 0 Cyclic command
Read: Adjustment and Test Status Information Acyclic command
Status
2047 in Process
2046 Step Sucessful
Read: Requested Weight Acyclic command
Change / Check weight on the weigh module
> 32768 or 0
Read: MB Device Status.Data Okay = 1 Cyclic command
Status
0 Done
Read: Calibration test deviation Acyclic command
Test Done
> 32768 (Bit 15 + ...)
Error (TimeOut) Cancel adjustment / test
External Adjustment
Write: External Adjustment Weight Acyclic command
External Adjustment Weight stored in the device
Write: Start Adjustment with External Weight Acyclic command
Read: MB Device Status.Data Okay = 0 Cyclic command
Read: Adjustment and Test Status Information Acyclic command
Status
2047 in Process
2046 Step Sucessful
Read: Requested Weight Acyclic command
Change / Check weight on the weigh module
> 32768 or 0
Read: MB Device Status.Data Okay = 1 Cyclic command
Status
0 Done
Adjustment Done
> 32768 (Bit 15 + ...)
Error (TimeOut) Cancel adjustment / test

11.7 Weigh module information

Weigh module information are commands for information about the weigh modules.

Cyclic commands - measuring block

Not supported

Acyclic commands - read

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x4367	0x417	0x01	0x17	1	0x5C	Float 32	Maximal capacity
0	1	0x4366	0x417	0x01	0x16	1	0x5B	Float 32	Readability
0	1	0x2041	0x302	0x01	0x02	1	0x28	UInt 16	Alarm status group
0	1	0x2050	0x303	0x01	0x01	1	0x2B	String 160	Model type
0	1	0x2053	0x303	0x01	0x04	1	0x2E	String 160	Software OS version
0	1	0x2054	0x303	0x01	0x05	1	0x2F	String 160	Fieldbus stack version
0	1	0x2055	0x303	0x01	0x06	1	0x30	String 160	Software application version
0	1	0x2056	0x303	0x01	0x07	1	0x31	String 160	SAI version

11.8 Diagnostic

Diagnostic commands are commands for information about the weight modules.

Cyclic commands - measuring block

Command	Description
97	Internal temperature

Acyclic commands - read (SLP85xD)

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x4169	0x413	0x01	0x19	1	0xB8	Float 32	Internal temperature
0	1	0x4161	0x413	0x01	0x11	1	0xB0	Struct 256	Voltage monitor channels
0	1	0x4162	0x413	0x01	0x12	1	0xB1	Struct 512	Load cycle monitor channels
0	1	0x4163	0x413	0x01	0x13	1	0xB2	Float 32	Zero deviation
0	1	0x4164	0x413	0x01	0x14	1	0xB3	Struct 256	Zero deviation monitor channels
0	1	0x4165	0x413	0x01	0x15	1	0xB4	Struct 512	Temperature monitor channels
0	1	0x4166	0x413	0x01	0x16	1	0xB5	Struct 96	Temperature gradient
0	1	0x4167	0x413	0x01	0x17	1	0xB6	Struct 128	Temperature gradient channels
0	1	0x4168	0x413	0x01	0x18	1	0xB7	Struct 128	Temperature values

11.9 SLP85xD filling process

More information about the configuration of the filing application can be found in the SLP85xD application note: www.mt.com/SLP85xD.

The following load cells have an integrated filling application: SLP852D and SLP854D.

Cyclic commands - measuring block

Command	Description
500	Run filling application
501	Pause filling application
502	Resume filling application

Acyclic commands - read

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x420D	0x414	0x01	0x0D	1	0xFB	Struct 224	Filling statistics
0	1	0x420F	0x414	0x01	0x0F	1	0xFD	UInt 16	Filling application status
0	1	0x4210	0x414	0x01	0x10	1	0xFE	UInt 8	Report filling status

Acyclic commands - write

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x420E	0x414	0x01	0x0E	1	0xFC	UInt 8	Clear filling statistics
0	1	0x4211	0x414	0x01	0x11	1	0xFF	UInt 8	Control filling status

Acyclic commands - read/write

PROFINET IO RT			EtherNet/IP			PROFIBUS DP		Data Type	Description
Slot	Sub slot	Index	Class	Instance	Attribute	Slot	Index	Type bits	
0	1	0x4201	0x414	0x01	0x01	1	0xEF	Struct 32	Automatic prefilling
0	1	0x4202	0x414	0x01	0x02	1	0xF0	UInt 16	Material filling duration
0	1	0x4203	0x414	0x01	0x03	1	0xF1	UInt 8	Automatic refilling
0	1	0x4204	0x414	0x01	0x04	1	0xF2	Struct 128	Target weight
0	1	0x4205	0x414	0x01	0x05	1	0xF3	Struct 24	Optimization function
0	1	0x4206	0x414	0x01	0x06	1	0xF4	Struct 480	Weight monitor function
0	1	0x4207	0x414	0x01	0x07	1	0xF5	Struct 320	Time monitor function
0	1	0x4208	0x414	0x01	0x08	1	0xF6	Struct 64	Filter stability criteria
0	1	0x4209	0x414	0x01	0x09	1	0xF7	Struct 480	Filing phase
0	1	0x420A	0x414	0x01	0x0A	1	0xF8	Struct 192	Automatic tare
0	1	0x420B	0x414	0x01	0x0B	1	0xF9	Struct 80	Digital output function
0	1	0x420C	0x414	0x01	0x0C	1	0xFA	Struct 48	Emptying function

12 ACT350 Comparator Commands

Command	Description	Value
Report Comparator 1 Limit	Read value for comparator # 1	40
Report Comparator 2 Limit	Read value for comparator # 2	42
Report Comparator 3 Limit	Read value for comparator # 3	44
Report Comparator 4 Limit	Read value for comparator # 4	46
Report Comparator 5 Limit	Read value for comparator # 5	48

Command	Description	Value
Write Comparator 1 Limit	Write value for comparator # 1	240
Write Comparator 2 Limit	Write value for comparator # 2	242
Write Comparator 3 Limit	Write value for comparator # 3	244
Write Comparator 4 Limit	Write value for comparator # 4	246
Write Comparator 5 Limit	Write value for comparator # 5	248

13 ACT350 Acyclic Commands (Level-2 Variables)

Command	Description	Read/ Write	Data type	PROFIBUS slot	PROFIBUS Index	EIP class code	EIP instance values	EIP attribute #	PROFINET slot +subslot	PROFINET Index Value
Application-Specific Commands										
Report Comparator 1 Limit	Read value for comparator # 1	Read	float,4	2	0x04	0x411	1	0x05	0,1	0x4055
Write Comparator 1 Limit	Write value for comparator # 1	Write	float,4							
Report Comparator 2 Limit	Read value for comparator # 2	Read	float,4	2	0x05	0x411	1	0x06	0,1	0x4056
Write Comparator 2 Limit	Write value for comparator # 2	Write	float,4							
Report Comparator 3 Limit	Read value for comparator # 3	Read	float,4	2	0x06	0x411	1	0x07	0,1	0x4057
Write Comparator 3 Limit	Write value for comparator # 3	Write	float,4							
Report Comparator 4 Limit	Read value for comparator # 4	Read	float,4	2	0x07	0x411	1	0x08	0,1	0x4058
Write Comparator 4 Limit	Write value for comparator # 4	Write	float,4							
Report Comparator 5 Limit	Read value for comparator # 5	Read	float,4	2	0x08	0x411	1	0x09	0,1	0x4059
Write Comparator 5 Limit	Write value for comparator # 5	Write	float,4							
Report # of Comparator used	Read how many comparators are used	Read	byte,1	2	0x03	0x411	1	0x04	0,1	0x4054
Write # of Comparator used	Write how many comparators are used	Write	byte,1							
Apply parameters	Apply parameters, reinitialize	Write	byte,1	2	0x1E	0x411	1	0x1F	0,1	0x406F
Report #1 Input Polarity	Read DI/O Input 1 polarity	Read	byte,1	2	0x10	0x418	1	0x01	0,1	0x4401
Write #1 Input Polarity	Set DI/O Input 1 polarity	Write	byte,1	2						
Report #1 Input Assignment	Read functionality assignment on Input 1	Read	byte,1	2	0x11	0x418	1	0x02	0,1	0x4402
Write #1 Input Assignment	Select functionality assignment on Input 1	Write	byte,1	2						
Report #2 Input Polarity	Read DI/O Input 2 polarity	Read	byte,1	2	0x13	0x418	1	0x04	0,1	0x4404
Write #2 Input Polarity	Set DI/O Input 2 polarity	Write	byte,1	2						
Report #2 Input Assignment	Read functionality assignment on Input 2	Read	byte,1	2	0x14	0x418	1	0x05	0,1	0x4405
Write #2 Input Assignment	Select functionality assignment on Input 2	Write	byte,1	2						

Command	Description	Read/ Write	Data type	PROFIBUS slot	PROFIBUS Index	EIP class code	EIP instance values	EIP attribute #	PROFINET slot +subslot	PROFINET Index Value
Report #3 Input Polarity	Read DI/O Input 3 polarity	Read	byte,1	2	0x16	0x418	1	0x07	0,1	0x4407
Write #3 Input Polarity	Set DI/O Input 3 polarity	Write	byte,1	2						
Report #3 Input Assignment	Read functionality assignment on Input 3	Read	byte,1	2	0x17	0x418	1	0x08	0,1	0x4408
Write #3 Input Assignment	Select functionality assignment on Input 3	Write	byte,1	2						
Report Output Polarity	Read DI/O Output polarity	Read	byte,1	2	0x1C	0x418	1	0x0D	0,1	0x440D
Write Output Polarity	Write DI/O Output polarity	Write	byte,1	2						
Report #1 Output Assignment	Read functionality assignment on Output 1	Read	byte,1	2	0x1D	0x418	1	0x0E	0,1	0x440E
Write #1 Output Assignment	Select functionality assignment on Output 1	Write	byte,1	2						
Report #2 Output Assignment	Read functionality assignment on Output 2	Read	byte,1	2	0x24	0x418	1	0x15	0,1	0x4415
Write #2 Output Assignment	Select functionality assignment on Output 2	Write	byte,1	2						
Report #3 Output Assignment	Read functionality assignment on Output 3	Read	byte,1	2	0x2B	0x418	1	0x1C	0,1	0x441C
Write #3 Output Assignment	Select functionality assignment on Output 3	Write	byte,1	2						
Report #4 Output Assignment	Read functionality assignment on Output 4	Read	byte,1	2	0x32	0x418	1	0x23	0,1	0x4423
Write #4 Output Assignment	Select functionality assignment on Output 4	Write	byte,1	2						
Report #5 Output Assignment	Read functionality assignment on Output 5	Read	byte,1	2	0x39	0x418	1	0x2A	0,1	0x442A
Write #5 Output Assignment	Select functionality assignment on Output 5	Write	byte,1	2						
Comparator status group 1	Comparator status group 1 according specification page 24	Read	short,2	1	0xD0	0x411	1	0x01	0,1	0x4051

Command	Description	Read/ Write	Data type	PROFIBUS slot	PROFIBUS Index	EIP class code	EIP instance values	EIP attribute #	PROFINET slot +subslot	PROFINET Index Value
Diagnostic Commands										
Display - Energy Saving Mode	Time value for the display to turn off " Green MT feature"	Read/ Write	float,4	1	0x78	0x416	1	0x09	0,1	0x4309
Update CANMaster power diagnosis	Send 1 command to update the voltage and current of CANMaster	Write	byte,1	1	0xCE	0x413	1	0x2E	0,1	0x417E
Maximum supply power for LCs	Inquire maximum supply voltage for LCs in history as mv for unit	Read	unsigned short,2	1	0xCF	0x413	1	0x2F		0x417F
Maximum supply current for LCs	Inquire maximum supply voltage for LCs in history as mA for unit	Read	short,2	1	0xEC	0x413	1	0x30	0,1	0x4180
Supply power error counts	Inquire supply power error counts. Once over current happened, the error counts would increase one. Int type, range 0~65535	Read	unsigned short,2	1	0xD1	0x413	1	0x31		0x4181
Supply current error counts	Inquire supply current error counts. Once over current happened, the error counts would increase one. Int type, range 0~65535	Read	unsigned short,2	1	0xD2	0x413	1	0x32	0,1	0x4182
Maximum voltage of CANH	Inquire maximum voltage of CANH as mv for unit	Read	short,2	1	0xD3	0x413	1	0x33		0x4183
Minimum voltage of CANH	Inquire minimum voltage of CANH as mv for unit	Read	short,2	1	0xD4	0x413	1	0x34	0,1	0x4184
Maximum voltage of CANL	Inquire maximum voltage of CANL as mv for unit	Read	short,2	1	0xD5	0x413	1	0x35		0x4185
Minimum voltage of CANL	Inquire minimum voltage of CANL as mv for unit	Read	short,2	1	0xD6	0x413	1	0x36	0,1	0x4186
Current supply power for LCs	Inquire the current supply power for LCs	Read	short,2	1	0xD7	0x413	1	0x37		0x4187

Command	Description	Read/ Write	Data type	PROFIBUS slot	PROFIBUS Index	EIP class code	EIP instance values	EIP attribute #	PROFINET slot +subslot	PROFINET Index Value
Current supply current for LCs	Inquire the current supply current for LCs	Read	short,2	1	0xD8	0x413	1	0x38	0,1	0x4188
Update LCs voltage diagnosis	Send 1 to update the current VIN_LC , VIN_COM,V_SHIELD voltage of LCs, every LC need one second to update data	Write	byte,1	1	0xD9	0x413	1	0x39		0x4189
VIN_LC of LCs	Inquire the current VIN_LC voltage of LCs as mv for unit	Read	long*1 4,56	1	0xDA	0x413	1	0x3A	0,1	0x418A
Temperature of LCs	Inquire the current temperature of every LCs as ℃ for unit	Read	long*1 4,56	1	0xDB	0x413	1	0x3B		0x418B
VIN_COM of LCs	Inquire the current VIN_COM voltage of every LCs as mv for unit	Read	long*1 4,56	1	0xDC	0x413	1	0x3C	0,1	0x418C
V_SHIELD of LCs	Inquire the current V_SHIELD voltage of every LCs as mv for unit	Read	long*1 4,56	1	0xDD	0x413	1	0x3D		0x418D
Update LCs gas diagnosis	Send 1 to update the current gas sensor value of LCs, every LC need maximum six seconds to update data	Write	byte,1	1	0xDE	0x413	1	0x3E	0,1	0x418E
Gas concentration of LCs	Inquire the current gas sensor value of LCs as percent for unit	Read	long*1 4,56	1	0xDF	0x413	1	0x3F		0x418F
Update LCs information	Send 1 to update the current capacity、unit、sw version of LCs, every LC need one seconds to update data	Write	byte,1	1	0xE0	0x413	1	0x40	0,1	0x4190
Communication error counts of LCs	Inquire the current communication error counts of every LC. Once first normal then LCs communication error happened, the error counts would increase one. Int type, range 0~65535	Read	long*1 4,56	1	0xE1	0x413	1	0x41		0x4191

Command	Description	Read/ Write	Data type	PROFIBUS slot	PROFIBUS Index	EIP class code	EIP instance values	EIP attribute #	PROFINET slot +subslot	PROFINET Index Value
Overload normal range counts of LCs	Inquire the current overload normal range counts of every LC. Once first weight normal then overload between 101% ~ 150% of LC normal capacity happened, the error counts would increase one. Int type, range 0~65535	Read	long*1 4,56	1	0xE2	0x413	1	0x42	0,1	0x4192
Overload operate range counts of LCs	Inquire the current overload operate range counts of every LC. Once first weight normal then overload larger than 150% of LC normal capacity happened, the error counts would increase one. Int type, range 0~65535	Read	long*1 4,56	1	0xE3	0x413	1	0x43		0x4193
Temperature beyond normal range counts of LCs	Inquire the current temperature beyond normal range counts of every LC. Once first normal then temperature beyond LC normal range happened, the error counts would increase one. Int type, range 0~65535	Read	long*1 4,56	1	0xE4	0x413	1	0x44	0,1	0x4194
Temperature beyond operate range counts of LCs	Inquire the current temperature beyond operate range counts of every LC. Once first normal then temperature beyond LC operate range happened, the error counts would increase one. Int type, range 0~65535 The operate ranges differ by LC type (index 736)	Read	long*1 4,56	1	0xE5	0x413	1	0x45		0x4195

Command	Description	Read/ Write	Data type	PROFIBUS slot	PROFIBUS Index	EIP class code	EIP instance values	EIP attribute #	PROFINET slot +subslot	PROFINET Index Value
Temperature beyond operate range counts of LCs after temperature RunFlat trigger	Inquire the current temperature beyond operate range counts of every LC after temperature RunFlat trigger. Once first normal then temperature beyond LC operate range happened, the error counts would increase one. Int type, range 0~65535 The operate ranges differ by LC type (index 736)	Read	long*14,56	1	0xE6	0x413	1	0x46	0,1	0x4196
PLC communication failure count	Cable / PLC /Device failure Each time fieldbus lost connection, count increase one	Read	unsigned short,2	1	0xE7	0x413	1	0x47		0x4197
Scale overload count	Scale overload count	Read	unsigned long,4	1	0xE8	0x413	1	0x48	0,1	0x4198
Scale calibration count	Scale calibration count	Read	unsigned long,4	1	0xE9	0x413	1	0x49		0x4199
Scale zero command count	Scale zero command count	Read	unsigned long,4	1	0xEA	0x413	1	0x4A	0,1	0x419A
Scale zero command failed count	Scale zero command failed count	Read	unsigned long,4	1	0xEB	0x413	1	0x4B		0x419B

Command	Description	Read/ Write	Data type	PROFIBUS slot	PROFIBUS Index	EIP class code	EIP instance values	EIP attribute #	PROFINET slot +subslot	PROFINET Index Value
Calibration / Adjustment Commands										
Abort Test Function / Adjustment	Abort Test Function / Adjustment	Write	byte,1	1	0x83	0x410	1	0x04	0,1	0x4004
Report Adjustment / Test status	Adjustment / Test status	Read	unsigned short,2	1	0x86	0x410	1	0x07	0,1	0x4007
Set external adjustment weight and start adjust	Adjustment / Test value	Write	float,4	1	0x88	0x410	1	0x09	0,1	0x4009
Number of linearity ranges	Sets the unit to 0=None, 1=3, 2=4, 3=5 points of linearity adjustment	Read/ Write	unsigned short,2	1	0x89	0x410	1	0x0A	0,1	0x400A
Zero Adjustment	Resets the zero (absolute reference)	Write	byte,1	1	0x8A	0x410	1	0x0B	0,1	0x400B
Zero Adjustment Count	Resets the zero (absolute reference)	Read/ Write	long,4	1	0xE5	0x410	1	0x20	0,1	0x4020
Span Adjustment Value 1 xLow	Allows the replacement of a transmitter or Sensor	Read/ Write	float,4	1	0x8C	0x410	1	0x0C	0,1	0x400C
Span Adjustment Value 2 Low	Allows the replacement of a transmitter or Sensor	Read/ Write	float,4	1	0x8D	0x410	1	0x0D	0,1	0x400D
Span Adjustment Value 3 Middle	Allows the replacement of a transmitter or Sensor	Read/ Write	float,4	1	0x8E	0x410	1	0x0E	0,1	0x400E
Span Adjustment Value 4 High	Allows the replacement of a transmitter or Sensor	Read/ Write	float,4	1	0x8F	0x410	1	0x0F	0,1	0x400F
Validate (Confirm) Adjustment	Allows the replacement of a transmitter or Sensor	Read/ Write	byte,1	1	0x90	0x410	1	0x10	0,1	0x4010
Span Adjustment Counts 1 xLow	Used with Span adjustment value to read/write calibration	Read/ Write	long,4	1	0x93	0x410	1	0x13	0,1	0x4013
Span Adjustment Counts 2 Low	Used with Span adjustment value to read/write calibration	Read/ Write	long,4	1	0x94	0x410	1	0x14	0,1	0x4014
Span Adjustment Counts 3 Middle	Used with Span adjustment value to read/write calibration	Read/ Write	long,4	1	0x95	0x410	1	0x15	0,1	0x4015

Command	Description	Read/ Write	Data type	PROFIBUS slot	PROFIBUS Index	EIP class code	EIP instance values	EIP attribute #	PROFINET slot +subslot	PROFINET TIndex Value
Span Adjustment Counts 4 High	Used with Span adjustment value to read/write calibration	Read/ Write	long,4	1	0x96	0x410	1	0x16	0,1	0x4016
Set number of steps & begin step calibration	Set number of steps and begin step calibration	Write	byte,1	1	0x97	0x410	1	0x17	0,1	0x4017
Sets weight value for current step in calibration & starts step	Set weight value for current step in calibration and starts step	Write	float,4	1	0x98	0x410	1	0x18	0,1	0x4018
Get temporary weight in step mode	Set weight value for current step in calibration and starts step	Read	float,4	1	0x8B	0x410	1	0x1F	0,1	0x401F
CalFree Plus	Trigger CalFress Plus calibration start	Read/ Write	unsigned short,2	1	0x9F	0x410	1	0x1E	0,1	0x401E
"d", increment	Smallest available digit	Read/ Write	float,4	1	0x5B	0x417	1	0x16	0,1	0x4366
Nmax	Scale/Sensor capacity	Read/ Write	float,4	1	0x5C	0x417	1	0x17	0,1	0x4367
Weight Unit	Weight unit (number representing unit from chart)	Read/ Write	byte,1	1	0x99	0x300	1	0x18	0,1	0x200A

14 Test Commands

Command	Description	Value
Alarm Bit	FP = 0 to set OFF	1900
Motion Bit	FP = 1 to set ON or	1901
Net Mode bit	Turn on or off bit in scale status word when in test mode …	1902
Center of zero bit		1903
Alt weight bit	Allows user to set state of status bit	1904
Device bit 1		1905
Device bit 2		1906
Device bit 3		1907
Device bit 4		1908
Device bit 5		1909
Device bit 6		1910
Device bit 7		1911

15 General System Commands

Command	Description	Value
Response only	Command has been received and is being evaluated (in process)	2047
Response only	Step successful	2046
Response only	Step successful, next value	2045
NOOP 1	No operation command – used to test command response, clear prior command, etc.	2000
Next step 1	Continue to next step in sequence	2002
Next step 2	Continue to next step in sequence	2003
Cancel operation	Abort sequence … response value means abort in process	2004
Retry Step	After step failure, retries previous step in sequence	2005
Skip Step	After step failure, skips step and advances to next in sequence	2006

16 Special Commands

Command	Description	Value
Test Command	Used to determine communication works and byte / word order & enter test mode	FP = 2.76 Mask = 80h, 80h Cmd = 80h, 80h Bit 15 = 1 + … 2185 for both words
Exit Test Mode	Used to return to normal operation	FP & Mask = 0 Cmd = 88h, 88h Bit 15 = 1 + … 6553
Response only	These are used to indicate failed command status through the floating point field … each of these responses turns on bit 15 and the bit value shown in ()	Bit 15 = 1 + …
Response only	Command failed invalid	-1
Response only	Command failed timeout	-2
Response only	Command failed unknown	-4
Response only	Command failed value invalid	-8
Response only	Command failed aborted	-16
Response only	Command step failed	-32
Response only	Test command failed	-64

17 SAI Status Block Command List

Status block commands are commands for the status block which are selectable.

Cyclic commands - status block

Value	Description
0 (default)	RedAlert alarm, Scale group, I/O group
1	RedAlert alarm, Scale group, I/O group
2	Report target / Comparator status
16	Report comparator mix 1
21	RedAlert alarm, Alarm, Scale group
23	Alarm, I/O group 1, Customer application group 1

See also

Parameters of status block (read) ▸ Page 8

17.1 Cyclic command list for measuring block

Value	Description	WMF	SLP85xD	ACT350	ACT350DIO	ACT350POWE
0 (default)	Gross weight - rounded	x	x	x	x	x
1	Gross weight - rounded	x	x	x	x	x
2	Tare weight - rounded	x	x	x	x	x
3	Net weight - rounded	x	x	x	x	x
5	Gross weight - internal resolution	x	x	x	x	x
6	Tare weight - internal resolution	x	x	x	x	x
7	Net weight - internal resolution	x	x	x	x	x
400	Tare when stable	x	x	x	x	x
401	Zero when stable	x	x	x	x	x
402	Clear tare	x	x	x	x	x
403	Tare immediately	x	x	x	x	x
404	Zero immediately	x	x	x	x	x
201	Preset tare (display unit)	x	x	x	x	x
290	Write weighing mode	x	x			
1000	Turn all internal & external outputs OFF				x	x
8080h	Start cyclic test mode			x	x	x
8888h	Stop cyclic test mode			x	x	x
90	Report weighing mode	x	x			
291	Write weighing environment	x	x			
91	Report weighing environment	x	x			
292	Write filter cut-off frequency	x	x			
92	Report filter cut-off frequency	x	x			
290	Write weighing mode	x	x			
84	Report observation time for zero	x	x			

Value	Description	WMF	SLP85xD	ACT350	ACT350DIO	ACT350POWE
284	Write observation time for zero	x	x			
85	Report tolerance for zero	x	x			
285	Write tolerance for zero	x	x			
86	Report observation time for tare	x	x			
286	Write observation time for tare	x	x			
87	Report tolerance for tare	x	x			
287	Write tolerance for tare	x	x			
88	Report observation time for weighing	x	x			
288	Write observation time for weighing	x	x			
89	Report tolerance for weighing	x	x			
289	Write tolerance for weighing	x	x			
97	Internal temperature	x				
500	Run filling application		x			
501	Pause filling application		x			
502	Resume filling application		x			
40	Report comparator 1 limit			x	x	x
42	Report comparator 2 limit			x	x	x
44	Report comparator 3 limit			x	x	x
46	Report comparator 4 limit			x	x	x
48	Report comparator 5 limit			x	x	x
240	Write comparator 1 limit			x	x	x
242	Write comparator 2 limit			x	x	x
244	Write comparator 3 limit			x	x	x
246	Write comparator 4 limit			x	x	x
248	Write comparator 5 limit			x	x	x
1900	Alarm bit			x	x	x
1901	Motion bit			x	x	x
1902	Net mode bit			x	x	x
1903	Center of zero bit			x	x	x
1904	Alt weight bit			x	x	x
1905	Device bit 1			x	x	x
1906	Device bit 2			x	x	x
1907	Device bit 3			x	x	x
1908	Device bit 4			x	x	x
1909	Device bit 5			x	x	x
1910	Device bit 6			x	x	x
1911	Device bit 7			x	x	x
2047	Command has been received and is being evaluated (in process)		x	x	x	x
2046	Step successful			x	x	x
2045	Step successful, next value			x	x	x

Value	Description	WMF	SLP85xD	ACT350	ACT350DIO	ACT350POWE
2000	No operation command – used to test command		x	x	x	x
2002	Continue to next step in sequence			x	x	x
2003	Continue to next step in sequence			x	x	x
2004	Abort sequence … response value means abort in process		x	x	x	x
2005	After step failure, retries previous step in sequence			x	x	x
2006	After step failure, skips step and advances to next in sequence			x	x	x

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