

COGNEX

AS200 Alignment Sensor Communication Manual

2019 March

AS200 Version 2.0

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Revision History

Revision Date	Rev.	Description
Sept. 2018	1.0	First revision
Oct. 2018	1.6	XAS, XTS, TM, Error Codes added
Dec. 2018	1.7	SGP, GGP, GCP added
Feb. 2019	2.0	Added Multi-Step commands
March	2.0	Error codes updated

1. Overview

This document describes the AS200 communication interface for both TCP/IP and SLMP connections.

1.1. TCP/IP Command Structure

With TCP/IP communication, a command is an ASCII string with the command and arguments, separated by comma:

`<Command>[,<Argument0>,<Argument1>,...,<Argument n>]`

Examples:

`HEB,0`

`XA,0,Off,100.0,140.123,0,15.36,0,0`

The response returned by the vision system is also a string containing the command this is the response for, a status value and result values, all separated by comma:

`<Command>,<Status>[,<Result 1>,<Result 2>,...,<Result n>]`

Examples:

`HEB,1`

`XA,1,0.035,0.056,0.0,0.002,0.0.0.0`

By default, command string and result string are terminated by CR/LF.

1.2. SLMP Communication

SLMP communication uses four memory blocks in the PLC's D-Register set to exchange data with the vision system. For each of the memory blocks an offset and a size must be specified. The four memory blocks are:

Name	Offset	Size (Words)	Purpose
Control Block	VCB_Offset	2	Contains Control Bits to control the Vision system
Status Block	VSB_Offset	2	Contains Status Bits providing status information of the Vision system
Input Block	VIB_Offset	25	Memory area to write user data to the Vision system
Output Block	VOB_Offset	29	Memory area to receive result data from the Vision system.

The size of the Control Block and Status Block is fixed to 2.

The Offset values must be specified on the SLMP configuration page while creating a sensor.

Example:

VCB_Offset = D300, Size = 2
 VSB_Offset = D302, Size = 2
 VIB_Offset = D304, Size = 25
 VOB_Offset = D350, Size = 29

The screenshot shows the 'PLC/Robot Communication' configuration window. It has two radio buttons: 'TCP/IP' (unselected) and 'SLMP Scanner' (selected). Below this, there are several configuration fields:

- PLC Controller:** A dropdown menu showing 'iQ-R/Q/L Series (3E Frame)'.
- PLC IP Address:** A text input field containing '192.168.21.102'.
- Host Port:** A numeric spinner field set to '7890'.
- Poll Interval:** A numeric spinner field set to '100'.
- Control Data Block:** A table with 'Offset' set to '300' and 'Size' set to '2'.
- Status Block:** A table with 'Offset' set to '302' and 'Size' set to '2'.
- Input Block:** A table with 'Offset' set to '304' and 'Size' set to '25'.
- Output Block:** A table with 'Offset' set to '350' and 'Size' set to '29'.

1.2.1. Control Block Layout

The Control Block has a size of 2 Words, i.e. 4 Bytes or 32 Bit.

It is used to initiate actions to be performed by the Vision system like

- Executing a Command
- Loading a Recipe

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Set Offline	Reserved		Execute Command	Reserved			
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved							
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
Reserved							Set User Data
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
Reserved							Soft Event 0

1.2.2. Status Block Layout

Like the Control Block, the Status Block has a size of 2 Words.

It is used by the Vision System to provide Status information to the PLC and to acknowledge Control Block Bit status changes.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Online	Reserved			Reserved			
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved	Command Failed	Command Completed	Command Executing	Reserved			
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
Reserved							Set User Data Ack
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
Reserved							Soft Event Ack 0

1.2.3. Input Block Layout

The Input Block is used by the PLC to write commands and arguments to the Vision System. It has a two-Word header (4 Bytes) preceding the actual command data:

Word Offset	Length (Word)	Name	Description
VIB_Offset + 0	1	Command	The ID (1-999) number of the Recipe to load when the "Execute Command" bit is set in the Control Block.
VIB_Offset + 1	1	Reserved	Unused
VIB_Offset + 2	1 (int)	Command	The ID of the command to be executed, if the "Set User Data" Bit was set in the Control Block.
VIB_Offset + 3	2 (float)	Argument0	The first command argument.

VIB_Offset + 5	2 (float)	Argument1	The second command argument.
VIB_Offset + 7	2 (float)	Argument2	The third command argument.
....	
VIB_Offset + 23	2 (float)	Argument10	The eleventh command argument

1.2.4. Output Block Layout

The Output Block is used by the Vision System to send result data to the PLC. It has a header of 5 Words length preceding the actual data:

Word Offset	Length (Word)	Name	Description
VOB_Offset + 0	1	RecipeID	The ID of the currently running Recipe
VOB_Offset + 1	1		Reserved
VOB_Offset + 2	1		Reserved
VOB_Offset + 3	1		Reserved
VOB_Offset + 4	1		Reserved
VOB_Offset + 5	1 (int)	Command	The ID of the command this data is the result from
VOB_Offset + 6	1 (int)	Status	The result status (Success: 1, Fail: <=0)
VOB_Offset + 7	2 (float)	Result 0	Result data (e.g. X coordinate)
VOB_Offset + 9	2 (float)	Result 1	Result data (e.g. Y coordinate)
...
VOB_Offset +27	2 (float)	Result 10	Result data

2. AS200 Commands

2.1. Overview

This section describes the commands supported by the AS200 Alignment Sensor.

Status & Version

2.2. Get State

GS

Returns the current State.

TCP/IP:

Command String:

GS,<cam>

Field	Arguments
GS	The command
<cam>	The camera(s) to be read 0: All available cameras 1: Camera 1 only 2: Camera 2 only

Result String:

GS,<Status>

Field	Arguments
GS	The command
<Status>	The result status 1: Sensor ready <=0: Sensor not ready/Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	1010	Command: "GS" command ID
VIB_Offset + 3	<cam>	Argument0: The camera(s) to be read

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	1010	Command: "GS" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Sensor ready

		<=0: Sensor not ready/Fail
--	--	----------------------------

2.3. Get Version

GV

Returns the current version of the loaded recipe.

TCP/IP:

Command String:

GV,<cam>

Field	Arguments
GV	The command
<cam>	The camera(s) to be read 0: All available cameras 1: Camera 1 only 2: Camera 2 only

Result String:

GV,<Status>,<Major>,<Minor>,<SubMinor>

Field	Arguments
GV	The command
<Status>	The result status 1: Success <=0: Fail
<Major>	The Major Version
<Minor>	The Minor Version
<SubMinor>	The Sub Minor Version

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	1011	Command: "GV" command ID
VIB_Offset + 3	<cam>	Argument0: The camera(s) to be read

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	1011	Command: "GV" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail
VOB_Offset + 7	<Major>	The Major Version
VOB_Offset + 9	<Minor>	The Minor Version
VOB_Offset + 11	<SubMinor>	The Sub Minor Version

Trigger

2.4. Trigger Mode

TM

Switches the hardware trigger on/off.

Version 1.6 and higher.

TCP/IP:

Command String:

TM,<cam>,<hw trigger>

Field	Arguments
TM	The command
<cam>	The camera(s) to be changed 0: All available cameras 1: Camera 1 only 2: Camera 2 only
<hw trigger>	0: off 1: on

Result String:

TM,<Status>

Field	Arguments
TM	The command
<Status>	The result status 1: Success <=0: Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	1050	Command: "GS" command ID
VIB_Offset + 3	<cam>	Argument0: The camera(s) to be set
VIB_Offset + 5	<hw trigger>	0: off 1: on

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	1050	Command: "TM" command ID
VOB_Offset + 6	<Status>	The result Status:

		1: Success <=0: Fail
--	--	-------------------------

Hand-Eye Calibration

2.5. Hand Eye Begin

HEB

Initiate a Hand-Eye calibration.

TCP/IP:

Command String:

HEB,<cam>

Field	Arguments
HEB	The command
<cam>	The camera(s) to calibrate 0: All available cameras 1: Camera 1 only 2: Camera 2 only

Result String:

HEB,<Status>

Field	Arguments
HEB	The command
<Status>	The result status 1: Success <=0: Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	2020	Command: "HEB" command ID
VIB_Offset + 3	<cam>	Argument0: The camera(s) to be calibrated

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	2020	Command: "HEB" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

2.6. Hand Eye Execute Step

HE

Execute a Hand-Eye calibration step.

TCP/IP:

Command String:

HE,<cam>,<featureID>,<X>,<Y>,<Z>,<A>,,<C>

Field	Description
HE	The command
<cam>	The cameras to be calibrated: 0: All available cameras 1: Camera 1 only 2: Camera 2 only
<featureID>	1: Feature 1 2: Feature 2 For a shuttling camera, feature 1 must be used to calibrate shuttling position 1, feature 2 for shuttling position 2.
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

HE,<Status>

Filed	Arguments
HE	The command this is the result from
<Status>	The result status 1: Success <=0: Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	2021	Command: "HE" command ID
VIB_Offset + 3	<cam>	Argument0: The camera(s) to be calibrated
VIB_Offset + 5	<featureID>	Argument1: Selects the camera feature to be located for calibration: 1: Feature 1 2: Feature 2

		For a shuttling camera, feature 1 must be used to calibrate shuttling position 1, feature 2 for shuttling position 2.
VIB_Offset + 7	<X>	Argument2: The X-coordinate of the current motion position
VIB_Offset + 9	<Y>	Argument3: The Y-coordinate of the current motion position
VIB_Offset + 11	<Z>	Argument4: The Z-coordinate of the current motion position
VIB_Offset + 13	<A>	Argument5: The Z-rotation of the current motion position
VIB_Offset + 15		Argument6: The Y- rotation of the current motion position
VIB_Offset + 17	<C>	Argument7: The X- rotation of the current motion position

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	2021	Command: "HE" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

2.7. Hand Eye End

HEE

Computes the Hand-Eye calibration from the data collected in the previous "HE" steps.

TCP/IP:

Command String:

HEE,<cam>

Field	Arguments
HEE	The command
<cam>	The camera(s) to compute the calibration for 0: All available cameras 1: Camera 1 only 2: Camera 2 only

Result String:

HEE,<Status>

Field	Arguments
HEE	The command
<Status>	The result status 1: Success <=0: Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	2022	Command: "HEE" command ID
VIB_Offset + 3	<cam>	Argument0: The camera(s) to be calibrated

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	2022	Command: "HEE" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

AutoCalibration

2.8. Auto-Calibration Begin

ACB

Initiate an AutoCalibration.

TCP/IP:

Command String:

ACB,<cam>,<featureID>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
ACB	The command
<cam>	The camera to calibrate 1: Camera 1 only 2: Camera 2 only
<featureID>	1: Feature 1 2: Feature 2 For a shuttling camera, feature 1 must be used to calibrate shuttling position 1, feature 2 for shuttling position 2.
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

ACB,<Status>,<X>,<Y>,<Z>,<A>,,<C>

Field	Description
ACB	The command
<Status>	The result status 2: Success, move to returned position and execute "AC" command <=0: Fail
<X>	The X coordinate of the next position to move to
<Y>	The Y coordinate of the next position to move to
<Z>	The Z coordinate of the next position to move to
<A>	The Z-rotation of the next position to move to
	The Y-rotation of the next position to move to
<C>	The X-rotation of the next position to move to

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	2030	Command: "ACB" command ID
VIB_Offset + 3	<cam>	Argument0: The camera to be calibrated
VIB_Offset + 5	<featureID>	Argument1: Selects the camera feature to be located for calibration: 1: Feature 1 2: Feature 2 For a shuttling camera, feature 1 must be used to calibrate shuttling position 1, feature 2 for shuttling position 2.
VIB_Offset + 7	<X>	Argument2: The X-coordinate of the current motion position
VIB_Offset + 9	<Y>	Argument3: The Y-coordinate of the current motion position
VIB_Offset + 11	<Z>	Argument4: The Z-coordinate of the current motion position
VIB_Offset + 13	<A>	Argument5: The Z-rotation of the current motion position
VIB_Offset + 15		Argument6: The Y- rotation of the current motion position
VIB_Offset + 17	<C>	Argument7: The X- rotation of the current motion position

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	2030	Command: "ACB" command ID
VOB_Offset + 6	<Status>	The result Status: 2: Success, move to returned position and execute "AC" command <=0: Fail
VOB_Offset + 7	<X>	The X coordinate of the next position to move to
VOB_Offset + 9	<Y>	The Y coordinate of the next position to move to
VOB_Offset + 11	<Z>	The Z coordinate of the next position to move to
VOB_Offset + 13	<A>	The Z-rotation of the next position to move to
VOB_Offset + 15		The Y-rotation of the next position to move to
VOB_Offset + 17	<C>	The X-rotation of the next position to move to

2.9. Auto-Calibration Execute Step

AC

Execute AutoCalibration step.

TCP/IP:

Command String:

AC,<cam>,<featureID>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
AC	The command
<cam>	The camera to calibrate 1: Camera 1 2: Camera 2
<featureID>	1: Feature 1 2: Feature 2 For a shuttling camera, feature 1 must be used to calibrate shuttling position 1, feature 2 for shuttling position 2.
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

AC,<Status>,<X>,<Y>,<Z>,<A>,,<C>

Field	Description
AC	The command
<Status>	The result status 1: Success, calibration done. 2: Success, move to returned position and execute next "AC" command <=0: Fail
<X>	The X coordinate of the next position to move to
<Y>	The Y coordinate of the next position to move to
<Z>	The Z coordinate of the next position to move to
<A>	The Z-rotation of the next position to move to
	The Y-rotation of the next position to move to
<C>	The X-rotation of the next position to move to

SLMP

Send command (Input Block)

Offset	Value	Description
--------	-------	-------------

VIB_Offset + 2	2031	Command: "AC" command ID
VIB_Offset + 3	<cam>	Argument0: The camera to be calibrated
VIB_Offset + 5	<featureID>	Argument1: Selects the camera feature to be located for calibration: 1: Feature 1 2: Feature 2 For a shuttling camera, feature 1 must be used to calibrate shuttling position 1, feature 2 for shuttling position 2.
VIB_Offset + 7	<X>	Argument2: The X-coordinate of the current motion position
VIB_Offset + 9	<Y>	Argument3: The Y-coordinate of the current motion position
VIB_Offset + 11	<Z>	Argument4: The Z-coordinate of the current motion position
VIB_Offset + 13	<A>	Argument5: The Z-rotation of the current motion position
VIB_Offset + 15		Argument6: The Y- rotation of the current motion position
VIB_Offset + 17	<C>	Argument7: The X- rotation of the current motion position

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	2031	Command: "AC" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success, calibration done 2: Success, move to returned position and execute "AC" command <=0: Fail
VOB_Offset + 7	<X>	The X coordinate of the next position to move to
VOB_Offset + 9	<Y>	The Y coordinate of the next position to move to
VOB_Offset + 11	<Z>	The Z coordinate of the next position to move to
VOB_Offset + 13	<A>	The Z-rotation of the next position to move to
VOB_Offset + 15		The Y-rotation of the next position to move to
VOB_Offset + 17	<C>	The X-rotation of the next position to move to

Custom Calibration

2.10. Custom Calibration Begin

CCB

Initiate Custom calibration.

TCP/IP:

Command String:

CCB,<cam>,<SwapHandedness>,<FeatureOffsetX>,<FeatureOffsetY>

Field	Arguments
CCB	The command
<cam>	The camera to calibrate 1: Camera 1 2: Camera 2
<SwapHandedness>	A value indicating whether the camera's handedness must be swapped 0: Don't swap 1: Swap
<FeatureOffsetX>	The X-Offset of the feature to be located from the rotation center of the motion system.
<FeatureOffsetY>	The Y-Offset of the feature to be located from the rotation center of the motion system.

Result String:

CCB,<Status>

Field	Description
CCB	The command
<Status>	The result status 1: Success <=0: Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	2040	Command: "CCB" command ID
VIB_Offset + 3	<cam>	Argument0: The camera to be calibrated
VIB_Offset + 5	<SwapHandedness>	Argument1
VIB_Offset + 7	<FeatureOffsetX>	Argument2
VIB_Offset + 9	<FeatureOffsetY>	Argument3

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	2040	Command: "CCB" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

2.11. Custom Calibration Execute Step

CC

Execute a CustomCalibration Step.

Note: CustomCalibration supports calibration with either 2 steps (motion only in X or Y) or 9 steps (motion in X and Y).

TCP/IP:

Command String:

CC,<cam>,<featureID>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
CC	The command
<cam>	The camera to calibrate 1: Camera 1 2: Camera 2
<featureID>	1: Feature 1 2: Feature 2 For a shuttling camera, feature 1 must be used to calibrate shuttling position 1, feature 2 for shuttling position 2.
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

CC,<Status>

Field	Description
CC	The command
<Status>	The result status 1: Success, calibration done. 2: Success, move to returned position and execute next "AC" command

<=0: Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	2041	Command: "CC" command ID
VIB_Offset + 3	<cam>	Argument0: The camera to be calibrated
VIB_Offset + 5	<featureID>	Argument1: Selects the camera feature to be located for calibration: 1: Feature 1 2: Feature 2 For a shuttling camera, feature 1 must be used to calibrate shuttling position 1, feature 2 for shuttling position 2.
VIB_Offset + 7	<X>	Argument2: The X-coordinate of the current motion position
VIB_Offset + 9	<Y>	Argument3: The Y-coordinate of the current motion position
VIB_Offset + 11	<Z>	Argument4: The Z-coordinate of the current motion position
VIB_Offset + 13	<A>	Argument5: The Z-rotation of the current motion position
VIB_Offset + 15		Argument6: The Y- rotation of the current motion position
VIB_Offset + 17	<C>	Argument7: The X- rotation of the current motion position

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	2041	Command: "CC" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

2.12. Custom Calibration End

CCE

Computes the Hand-Eye calibration from the data collected in the (2 or 9) previous "CC" steps.

TCP/IP:

Command String:

CCE,<cam>

Field	Arguments
CCE	The command
<cam>	The camera to compute the calibration for 1: Camera 1 2: Camera 2

Result String:

CCE,<Status>

Field	Arguments
CCE	The command
<Status>	The result status 1: Success <=0: Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	2042	Command: "CCE" command ID
VIB_Offset + 3	<cam>	Argument0: The camera to be calibrated

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	2042	Command: "CCE" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

Golden Pose Alignment

2.13. Train Alignment Golden Pose

TA

Train the “Golden Pose” of the target.

TCP/IP:

Command String:

TA,<partID>

Field	Arguments
TA	The command
<partID>	The part to train the golden pose for. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0

Result String:

TA,<Status>

Field	Description
TA	The command
<Status>	The result status 1: Success <=0: Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	3010	Command: “TA” command ID
VIB_Offset + 3	<partID>	Argument0: The part to train the golden pose for. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	3010	Command: "TA" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

2.14. Execute Alignment

XA

Execute "Golden Pose Alignment"

TCP/IP:

Command String:

XA,<partID>,<resultMode>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
XA	The command
<partID>	The part locate. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0 : The part consists of Cam1 and Cam2 feature 1 : The part consists of Cam1 feature only 2 : The part consists of Cam2 feature only 3 : Same as 0
<resultMode>	Specifies how the result will be returned: "Abs": Return the absolute motion position to get the target to the trained golden pose. "Off": Return the Offset from the current motion position to get the target to the trained golden pose.
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

XA,<Status>,<X>,<Y>,<Z>,<A>,,<C>

Field	Description
XA	The command
<Status>	The result status 1: Success <=0: Fail
<X>	The X-coordinate (absolute or offset) of the motion system's destination pose.
<Y>	The Y-coordinate (absolute or offset) of the motion system's destination pose.
<Z>	The Z-coordinate (absolute or offset) of the motion system's destination pose.
<A>	The Z-rotation (absolute or offset) of the motion system's destination pose.
	The Y-rotation (absolute or offset) of the motion system's destination pose.
<C>	The X-rotation (absolute or offset) of the motion system's destination pose.

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	3011	Command: "XA" command ID
VIB_Offset + 3	<partID>	Argument0: The part locate. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
VIB_Offset + 5	<resultMode>	Argument1: The requested result mode: 1: Absolute 2: Offset
VIB_Offset + 7	<X>	The X-coordinate of the current position of the motion system
VIB_Offset + 9	<Y>	The Y-coordinate of the current position of the motion system
VIB_Offset + 11	<Z>	The Z-coordinate of the current position of the motion system
VIB_Offset + 13	<A>	The Z-rotation of the current position of the motion system
VIB_Offset + 15		The Y-rotation of the current position of the motion system
VIB_Offset + 17	<C>	The X-rotation of the current position of the motion system

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	3011	Command: "XA" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail
VOB_Offset + 7	<X>	The X-coordinate of the result pose (absolute or offset)
VOB_Offset + 9	<Y>	The Y-coordinate of the result pose (absolute or offset)
VOB_Offset + 11	<Z>	The Z-coordinate of the result pose (absolute or offset)
VOB_Offset + 13	<A>	The Z-rotation of the result pose (absolute or offset)
VOB_Offset + 15		The Y-rotation of the result pose (absolute or offset)
VOB_Offset + 17	<C>	The X-rotation of the result pose (absolute or offset)

XAS

Execute “Golden Pose Alignment”

Version 1.6 and higher

TCP/IP:

Command String:

XAS,<partID>,<resultMode>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
XAS	The command
<partID>	The part locate. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0 : The part consists of Cam1 and Cam2 feature 1 : The part consists of Cam1 feature only 2 : The part consists of Cam2 feature only 3 : Same as 0
<resultMode>	Specifies how the result will be returned: “Abs”: Return the absolute motion position to get the target to the trained golden pose. “Off”: Return the Offset from the current motion position to get the target to the trained golden pose.
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

XAS,<Status>,<X>,<Y>,<Z>,<A>,,<C>,<Score>

Field	Description
XAS	The command
<Status>	The result status 1: Success <=0: Fail
<X>	The X-coordinate (absolute or offset) of the motion system’s destination pose.
<Y>	The Y-coordinate (absolute or offset) of the motion system’s destination pose.
<Z>	The Z-coordinate (absolute or offset) of the motion system’s destination pose.
<A>	The Z-rotation (absolute or offset) of the motion system’s destination pose.
	The Y-rotation (absolute or offset) of the motion system’s destination pose.
<C>	The X-rotation (absolute or offset) of the motion system’s destination pose.
<Score>	The current score of the 1 st feature.
<Score2>	The current score of the 2 nd feature. This applies only to parts that have 2 features.

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	3012	Command: "XAS" command ID
VIB_Offset + 3	<partID>	Argument0: The part locate. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
VIB_Offset + 5	<resultMode>	Argument1: The requested result mode: 1: Absolute 2: Offset
VIB_Offset + 7	<X>	The X-coordinate of the current position of the motion system
VIB_Offset + 9	<Y>	The Y-coordinate of the current position of the motion system
VIB_Offset + 11	<Z>	The Z-coordinate of the current position of the motion system
VIB_Offset + 13	<A>	The Z-rotation of the current position of the motion system
VIB_Offset + 15		The Y-rotation of the current position of the motion system
VIB_Offset + 17	<C>	The X-rotation of the current position of the motion system

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	3012	Command: "XAS" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail
VOB_Offset + 7	<X>	The X-coordinate of the result pose (absolute or offset)
VOB_Offset + 9	<Y>	The Y-coordinate of the result pose (absolute or offset)
VOB_Offset + 11	<Z>	The Z-coordinate of the result pose (absolute or offset)
VOB_Offset + 13	<A>	The Z-rotation of the result pose (absolute or offset)
VOB_Offset + 15		The Y-rotation of the result pose (absolute or offset)
VOB_Offset + 17	<C>	The X-rotation of the result pose (absolute or offset)
VOB_Offset + 19	<Score>	The current score of the target.
VOB_Offset + 21	<Score2>	The current score of the 2 nd feature. This applies only to parts that have 2 features.

2.15. Set Golden Pose

SGP

Set the “Golden Pose” of a camera feature to the new coordinates.

Version 1.7.3 and higher

TCP/IP:

Command String:

SGP,<stepID>,<coords>,<X>,<Y>,<Theta>

Field	Arguments
SGP	The command
<stepID>	This argument defines the feature to set the golden pose for. One camera, one feature configuration (default): 1: Feature 1 One camera, two features configuration (stationary or shuttling): 1: Feature 1 2: Feature 2 Two stationary cameras, one feature each configuration: 1: Feature 1 (i.e. camera 1) 2: Feature 2 (i.e. camera 2)
<coord>	“Home2D” “Cam2D” “Raw2D”
<X>	X-coordinate of the Golden Pose in the selected coordinate system
<Y>	Y-coordinate of the Golden Pose in the selected coordinate system
<Theta>	Theta of the Golden Pose

Result String:

SGP,<Status>

Field	Description
SGP	The command
<Status>	The result status 1: Success <=0: Fail

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	3020	Command: "SGP" command ID
VIB_Offset + 3	<stepID>	Argument0: This argument defines the feature to set the golden pose for. One camera, one feature configuration (default): 1: Feature 1 One camera, two features configuration (stationary or shuttling): 1: Feature 1 2: Feature 2 Two stationary cameras, one feature each configuration: 1: Feature 1 (i.e. camera 1) 2: Feature 2 (i.e. camera 2)
VIB_Offset + 5	<coord>	1: Home2D 2: Cam2D 3: Raw2D
VIB_Offset + 7	<X>	X-coordinate of the Golden Pose in the selected coordinate system
VIB_Offset + 9	<Y>	Y-coordinate of the Golden Pose in the selected coordinate system
VIB_Offset + 11	<Theta>	Theta of the Golden Pose in the selected coordinate system

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	3020	Command: "SGP" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

2.16. Get Golden Pose

GGP

Returns the trained “Golden Pose”.

Version 1.7.3 and higher

TCP/IP:

Command String:

GGP,<stepID>,<coord>

Field	Arguments
GGP	The command
<stepID>	This argument defines the feature to get the golden pose for. One camera, one feature configuration (default): 1: Feature 1 One camera, two features configuration (stationary or shuttling): 1: Feature 1 2: Feature 2 Two stationary cameras, one feature each configuration: 1: Feature 1 (i.e. camera 1) 2: Feature 2 (i.e. camera 2)
<coord>	“Home2D” “Cam2D” “Raw2D”

Result String:

GGP,<Status>,<X>,<Y>,<Theta>

Field	Description
GGP	The command
<Status>	The result status 1: Success <=0: Fail
<X>	X-coordinate of the Golden Pose
<Y>	Y-coordinate of the Golden Pose
<Theta>	Theta of the Golden Pose

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	3021	Command: “GGP” command ID

VIB_Offset + 3	<stepID>	<p>Argument0: This argument defines the feature to get the golden pose for.</p> <p>One camera, one feature configuration (default): 1: Feature 1</p> <p>One camera, two features configuration (stationary or shuttling): 1: Feature 1 2: Feature 2</p> <p>Two stationary cameras, one feature each configuration: 1: Feature 1 (i.e. camera 1) 2: Feature 2 (i.e. camera 2)</p>
VIB_Offset + 5	<coord>	1: Home2D 2: Cam2D 3: Raw2D

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	3021	Command: "GGP" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail
VOB_Offset + 7	<X>	X-coordinate of the Golden Pose in the selected coordinate system
VOB_Offset + 9	<Y>	Y-coordinate of the Golden Pose in the selected coordinate system
VOB_Offset + 11	<Theta>	Rotation of the Golden Pose in the selected coordinate system

2.17. Get Current Pose

GCP

Returns the current pose of the selected feature in the selected coordinate system.

Version 1.7.3 and higher

TCP/IP:

Command String:

GCP,<stepID>,<coord>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
GCP	The command
<stepID>	This argument defines the feature to get the current pose for. One camera, one feature configuration (default): 1: Feature 1 One camera, two features configuration (stationary or shuttling): 1: Feature 1 2: Feature 2 Two stationary cameras, one feature each configuration: 1: Feature 1 (i.e. camera 1) 2: Feature 2 (i.e. camera 2)
<coord>	“Home2D” “Cam2D” “Raw2D”
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

GCP,<Status>,<X>,<Y>,<Theta>

Field	Description
GCP	The command
<Status>	The result status 1: Success <=0: Fail
<X>	The current X-coordinate of the target in the selected coordinate system

<Y>	The current Y-coordinate of the target in the selected coordinate system
<Theta>	The current rotation of the target in the selected coordinate system

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	3022	Command: "GCP" command ID
VIB_Offset + 3	<stepID>	Argument0: This argument defines the feature to get the current pose for. One camera, one feature configuration (default): 1: Feature 1 One camera, two features configuration (stationary or shuttling): 1: Feature 1 2: Feature 2 Two stationary cameras, one feature each configuration: 1: Feature 1 (i.e. camera 1) 2: Feature 2 (i.e. camera 2)
VIB_Offset + 5	<coord>	1: Home2D 2: Cam2D 3: Raw2D
VIB_Offset + 7	<X>	The X-coordinate of the current position of the motion system
VIB_Offset + 9	<Y>	The Y-coordinate of the current position of the motion system
VIB_Offset + 11	<Z>	The Z-coordinate of the current position of the motion system
VIB_Offset + 13	<A>	The Z-rotation of the current position of the motion system
VIB_Offset + 15		The Y-rotation of the current position of the motion system
VIB_Offset + 17	<C>	The X-rotation of the current position of the motion system

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	3022	Command: "GCP" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail
VOB_Offset + 7	<X>	The current X-coordinate of the target in the selected coordinate system
VOB_Offset + 9	<Y>	The current Y-coordinate of the target in the selected coordinate system
VOB_Offset + 11	<Theta>	The current rotation of the target in the selected coordinate system

Robot commands (Vision Guided pick or place)

In order to do a guided pick or guided place, a part pose and a corresponding robot pick (or place) pose must be trained.

2.18. Train Target Pose

TT

Train the target pose.

TCP/IP:

Command String:

TT,<partID>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
TT	The command
<partID>	The part the pose shall be trained for. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

TT,<Status>

Field	Description
TT	The command
<Status>	The result status 1: Success <=0: Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	4010	Command: "TT" command ID
VIB_Offset + 3	<partID>	Argument0: The part the pose shall be trained for. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
VIB_Offset + 5	<X>	The X-coordinate of the current position of the motion system
VIB_Offset + 7	<Y>	The Y-coordinate of the current position of the motion system
VIB_Offset + 9	<Z>	The Z-coordinate of the current position of the motion system
VIB_Offset + 11	<A>	The Z-rotation of the current position of the motion system
VIB_Offset + 13		The Y-rotation of the current position of the motion system
VIB_Offset + 15	<C>	The X-rotation of the current position of the motion system

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	4010	Command: "TT" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

2.19. Train Robot Pick Pose

TTR

Train the robot pick (or place) pose.

TCP/IP:

Command String:

TTR,<partID>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
TTR	The command
<partID>	The part the pick pose shall be trained for. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
<X>	The X-coordinate of the robot's pick (or place) pose
<Y>	The Y-coordinate of the robot's pick (or place) pose
<Z>	The Z-coordinate of the robot's pick (or place) pose
<A>	The Z-rotation of the robot's pick (or place) pose
	The Y-rotation of the robot's pick (or place) pose
<C>	The X-rotation of the robot's pick (or place) pose

Result String:

TTR,<Status>

Field	Description
TTR	The command
<Status>	The result status 1: Success <=0: Fail

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	4011	Command: "TTR" command ID
VIB_Offset + 3	<partID>	Argument0: The part the pose shall be trained for. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values:

		0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
VIB_Offset + 5	<X>	Argument1: The X-coordinate of the robot's pick (or place) pose
VIB_Offset + 7	<Y>	Argument2: The Y-coordinate of the robot's pick (or place) pose
VIB_Offset + 9	<Z>	Argument3: The Z-coordinate of the robot's pick (or place) pose
VIB_Offset + 11	<A>	Argument4: The Z-rotation of the robot's pick (or place) pose
VIB_Offset + 13		Argument5: The Y-rotation of the robot's pick (or place) pose
VIB_Offset + 15	<C>	Argument6: The X-rotation of the robot's pick (or place) pose

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	4011	Command: "TTR" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

2.20. Execute Target Alignment

XT

Locate the part and get the corrected robot pick (or place) pose.

TCP/IP:

Command String:

XT,<partID>,<resultMode>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
XT	The command
<partID>	The part to be located for picking. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
<resultMode>	Specifies how the result will be returned: "Abs": Return the absolute motion position to get the target to the trained golden pose. "Off": Return the Offset from the current motion position to get the target to the trained golden pose.
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

XT,<Status>,<X>,<Y>,<Z>,<A>,,<C>

Field	Description
XT	The command
<Status>	The result status 1: Success <=0: Fail
<X>	The X-coordinate (absolute or offset) of the corrected pick (or place) pose.
<Y>	The Y-coordinate (absolute or offset) of the corrected pick (or place) pose.
<Z>	The Z-coordinate (absolute or offset) of the corrected pick (or place) pose.
<A>	The Z-rotation (absolute or offset) of the corrected pick (or place) pose.
	The Y-rotation (absolute or offset) of the corrected pick (or place) pose.
<C>	The X-rotation (absolute or offset) of the corrected pick (or place) pose.

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	4012	Command: "XT" command ID
VIB_Offset + 3	<partID>	Argument0: The part to be located for picking. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0 : The part consists of Cam1 and Cam2 feature 1 : The part consists of Cam1 feature only 2 : The part consists of Cam2 feature only 3 : Same as 0
VIB_Offset + 5	<resultMode>	Argument1: The requested result mode: 1: Absolute 2: Offset
VIB_Offset + 7	<X>	The X-coordinate of the current position of the motion system
VIB_Offset + 9	<Y>	The Y-coordinate of the current position of the motion system
VIB_Offset + 11	<Z>	The Z-coordinate of the current position of the motion system
VIB_Offset + 13	<A>	The Z-rotation of the current position of the motion system
VIB_Offset + 15		The Y-rotation of the current position of the motion system
VIB_Offset + 17	<C>	The X-rotation of the current position of the motion system

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	3012	Command: "XT" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail
VOB_Offset + 7	<X>	The X-coordinate of the result pose (absolute or offset)
VOB_Offset + 9	<Y>	The Y-coordinate of the result pose (absolute or offset)
VOB_Offset + 11	<Z>	The Z-coordinate of the result pose (absolute or offset)
VOB_Offset + 13	<A>	The Z-rotation of the result pose (absolute or offset)
VOB_Offset + 15		The Y-rotation of the result pose (absolute or offset)
VOB_Offset + 17	<C>	The X-rotation of the result pose (absolute or offset)

XTS

Locate the part and get the corrected robot pick (or place) pose and the score of the feature.

Version 1.6 and higher

TCP/IP:

Command String:

XTS,<partID>,<resultMode>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
XTS	The command
<partID>	The part to be located for picking. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
<resultMode>	Specifies how the result will be returned: "Abs": Return the absolute motion position to get the target to the trained golden pose. "Off": Return the Offset from the current motion position to get the target to the trained golden pose.
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

XTS,<Status>,<X>,<Y>,<Z>,<A>,,<C>,<Score>

Field	Description
XTS	The command
<Status>	The result status 1: Success <=0: Fail
<X>	The X-coordinate (absolute or offset) of the corrected pick (or place) pose.
<Y>	The Y-coordinate (absolute or offset) of the corrected pick (or place) pose.
<Z>	The Z-coordinate (absolute or offset) of the corrected pick (or place) pose.
<A>	The Z-rotation (absolute or offset) of the corrected pick (or place) pose.
	The Y-rotation (absolute or offset) of the corrected pick (or place) pose.
<C>	The X-rotation (absolute or offset) of the corrected pick (or place) pose.
<Score>	The current score of the target
<Score2>	The current score of the 2 nd feature. This applies only to parts that have 2 features.

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	4013	Command: "XTS" command ID
VIB_Offset + 3	<partID>	Argument0: The part to be located for picking. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0 : The part consists of Cam1 and Cam2 feature 1 : The part consists of Cam1 feature only 2 : The part consists of Cam2 feature only 3 : Same as 0
VIB_Offset + 5	<resultMode>	Argument1: The requested result mode: 1: Absolute 2: Offset
VIB_Offset + 7	<X>	The X-coordinate of the current position of the motion system
VIB_Offset + 9	<Y>	The Y-coordinate of the current position of the motion system
VIB_Offset + 11	<Z>	The Z-coordinate of the current position of the motion system
VIB_Offset + 13	<A>	The Z-rotation of the current position of the motion system
VIB_Offset + 15		The Y-rotation of the current position of the motion system
VIB_Offset + 17	<C>	The X-rotation of the current position of the motion system

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	4013	Command: "XTS" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail
VOB_Offset + 7	<X>	The X-coordinate of the result pose (absolute or offset)
VOB_Offset + 9	<Y>	The Y-coordinate of the result pose (absolute or offset)
VOB_Offset + 11	<Z>	The Z-coordinate of the result pose (absolute or offset)
VOB_Offset + 13	<A>	The Z-rotation of the result pose (absolute or offset)
VOB_Offset + 15		The Y-rotation of the result pose (absolute or offset)
VOB_Offset + 17	<C>	The X-rotation of the result pose (absolute or offset)
VOB_Offset + 19	<Score>	The current score of the feature
VOB_Offset + 21	<Score2>	The current score of the 2 nd feature. This applies only to parts that have 2 features.

Multi-Step Commands

The multi-step commands apply when the part has two features that will be located in individual steps (e.g. shuttling position of camera or part). These commands use multiple steps to locate the features of a part using the LF command. When all features have been located using the “LF” command, the requested pose is computed using the GP command.

The following command set is used in multi-step configurations:

Command	Purpose	Configuration
LF	Locates part features	All
TP	Registers a part’s golden pose	All
TPR	Register a motion pose associated with a part’s golden pose	<ul style="list-style-type: none"> • Shuttling part • AlignMode 2
GP	Returns the runtime result pose	All

Some MultiStep commands require an argument <AlignMode>. This argument specifies how the result pose will be computed:

AlignMode	Description
1	Aligns the part with a trained golden pose (part attached to motion system)
2	Aligns the motion system (e.g. robot gripper) with the part (part not attached to motion system)

The following sections describe the MultiStep command usage in the various configurations.

Locate Features

LF

Locates the features of a part and stores the feature poses in the internal feature table.

Which features to be located is specified with the *StepID* argument.

TCP/IP

Command String:

LF,<StepID>,<ProductID>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
LF	The command
<StepID>	<p>One camera, one feature configuration (default): 1: Feature 1</p> <p>One Shuttling camera or shuttling part configuration: 1: Feature 1 (i.e. shuttling Position 1) 2: Feature 2 (i.e. shuttling Position 2)</p> <p>One camera ,two features, no shuttling configuration: 1: Feature 1 2: Feature 2 3: Both features at a time</p>

	<p>Two stationary cameras, one feature each configuration:</p> <p>1: Feature 1 (i.e. camera 1) 2: Feature 2 (i.e. camera 2) 3: Both features (i.e. both cameras)</p> <p>Note: Adding a value of 4096 (Bit 12 = 1) to the <StepID> argument will show a crosshair at the feature's trained position, as registered with the "TP" command.</p>
<ProductID>	Ignored (always 0) for AS200
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

The motion pose is required for the shuttling part configuration. It will be ignored in the other cases.

Result String:

Response: LF, <Status>, <Token>, <ProductID>

Field	Description
LF	The command
<Status>	The result status 1: Success <=0: Fail

The <Token> and <ProductID> results apply to AlignPlus and can be ignored.

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	5011	Command: "LF" command ID
VIB_Offset + 3	<StepID>	Argument0: One camera, one feature configuration (default): 1: Feature 1 One Shuttling camera or shuttling part configuration: 1: Feature 1 (i.e. shuttling Position 1) 2: Feature 2 (i.e. shuttling Position 2) One camera ,two features, no shuttling configuration: 1: Feature 1 2: Feature 2 3: Both features at a time

		<p>Two stationary cameras, one feature each configuration:</p> <p>1: Feature 1 (i.e. camera 1) 2: Feature 2 (i.e. camera 2) 3: Both features (i.e. both cameras)</p> <p>Note: Adding a value of 4096 to the <StepID> argument will show a crosshair at the feature’s trained position, as registered with the “TP” command.</p>
VIB_Offset + 5	<ProductID>	Argument1: Ignored (always 0) for AS200
VIB_Offset + 7	<X>	Argument2: The X-coordinate of the current motion position
VIB_Offset + 9	<Y>	Argument3: The Y-coordinate of the current motion position
VIB_Offset + 11	<Z>	Argument4: The Z-coordinate of the current motion position
VIB_Offset + 13	<A>	Argument5: The Z-rotation of the current motion position
VIB_Offset + 15		Argument6: The Y- rotation of the current motion position
VIB_Offset + 17	<C>	Argument7: The X- rotation of the current motion position

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	5011	Command: “LF” command ID
VOB_Offset + 7	<Status>	The result Status: 1: Success <=0: Fail
VOB_Offset + 9	<Token>	Applies to AlignPlus and can be ignored.
VOB_Offset + 11	<ProductID>	Applies to AlignPlus and can be ignored.

2.21. Clear Positions

CP

Clears the runtime feature locations in the internal feature table. This command should be used at the beginning of a cycle. It prevents a part pose from being computed using feature locations from a previous cycle.

TCP/IP

Command String:

CP

Result String:

CP, <Status>

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	5010	Command: “CP” command ID
VIB_Offset + 3	<Status>	Argument0: the requested status

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	5010	Command: "CP" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

2.23. Train Part Pose

TP

Trains the golden poses for the part located by previously executed "LF" command(s)

Command Format:

TCP/IP

Command String:

TP, <PartID>,<AlignMode>

AlignMode	Description
1	Aligns the part with a trained golden pose (part attached to motion system)
2	Aligns the motion system (e.g. robot gripper) with the part (part not attached to motion system)

The <PartID> argument will always be 1 for single camera configurations.

Result String:

TP, <Status>

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	5012	Command: "TP" command ID
VIB_Offset + 3	<PartID>	Argument0: Selects the part to train the pose for. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
VIB_Offset + 5	<AlignMode>	Argument1: Selects the AlignMode (1 or 2)

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	5012	Command: "TP" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

2.24. Train Motion Pose

TPR

Trains the motion pose that corresponds to the feature poses that were trained by the TP command.

This command is required for shuttling part configurations or for AlignMode 2 applications.

TCP/IP

Command String:

TPR,<PartID>,<AlignMode>,<X>,<Y>,<Z>,<A>,,<C>

Field	Arguments
TPR	The command
PartID	Argument0: Selects the part to train the pose for. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
<AlignMode>	The AlignMode (1 or 2)
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result String:

TPR, <Status>

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	5013	Command: "TPR" command ID
VIB_Offset + 3	<PartID>	Argument0: Always 1 for AS200
VIB_Offset + 5	<AlignMode>	Argument1: 1 or 2

VIB_Offset + 7	<X>	Argument2: The X-coordinate of the current motion position
VIB_Offset + 9	<Y>	Argument3: The Y-coordinate of the current motion position
VIB_Offset + 11	<Z>	Argument4: The Z-coordinate of the current motion position
VIB_Offset + 13	<A>	Argument5: The Z-rotation of the current motion position
VIB_Offset + 15		Argument6: The Y- rotation of the current motion position
VIB_Offset + 17	<C>	Argument7: The X- rotation of the current motion position

Receive Result (Output Block)

Offset	Value	Description
VOB_Offset + 5	5013	Command: "TPR" command ID
VOB_Offset + 6	<Status>	The result Status: 1: Success <=0: Fail

Example of TPR, LF, and TP Commands with shuttling part configuration

1. Part is attached to stage.
2. Move stage to bring part in golden pose.
3. Run `TPR,1,1,<motion pose>` command.
4. Move stage to bring first feature in camera field of view.
5. Run `LF,1,0,0,<motion pose>` command. This locates the 1st feature.
6. Move second feature in camera field of view.
7. Run `LF,2,0,0,<motion pose>` command. This locates the 2nd feature.
8. Run `TP,1,1` command. This registers the previously located feature poses as golden poses, in conjunction with the motion pose provided with TPR command.

2.26. Get Pose

GP

Gets the motion pose required to align the part with its golden pose. The pose is the current motion posed based on the features found using LF command.

TCP/IP

Command format

GP,<PartID>,<AlignMode>,<ResultMode>, [current motion pose]

Field	Arguments
GP	The command
<PartID>	Argument0: Selects the part to get the pose for. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0 : The part consists of Cam1 and Cam2 feature

	1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
<AlignMode>	AlignMode
<ResultMode>	Abs: The result pose will be returned as absolute pose Off: The result pose will be returned as relative pose (offset) from the trained pose (see TPR command)
<X>	The X-coordinate of the current position of the motion system
<Y>	The Y-coordinate of the current position of the motion system
<Z>	The Z-coordinate of the current position of the motion system
<A>	The Z-rotation of the current position of the motion system
	The Y-rotation of the current position of the motion system
<C>	The X-rotation of the current position of the motion system

Result string:

GP, <Status>, <X>, <Y>, <Z>, <A>, , <C>

SLMP

Send command (Input Block)

Offset	Value	Description
VIB_Offset + 2	5014	Command: "GP" command ID
VIB_Offset + 3	<PartID>	Argument0: Selects the part to get the pose for. Always 1 in single camera configurations. For two camera configurations, the PartID can have the following values: 0: The part consists of Cam1 and Cam2 feature 1: The part consists of Cam1 feature only 2: The part consists of Cam2 feature only 3: Same as 0
VIB_Offset + 5	<AlignMode>	Argument1: AlignMode (1 or 2)
VIB_Offset + 7	<ResultMode>	Argument2: 1: Absolute 2: Offset
VIB_Offset + 9	<X>	Argument3: The X-coordinate of the current motion position
VIB_Offset + 11	<Y>	Argument4: The Y-coordinate of the current motion position
VIB_Offset + 13	<Z>	Argument5: The Z-coordinate of the current motion position
VIB_Offset + 15	<A>	Argument6: The Z-rotation of the current motion position
VIB_Offset + 17		Argument7: The Y- rotation of the current motion position
VIB_Offset + 19	<C>	Argument8: The X- rotation of the current motion position

Receive Result (Output Block)

Offset	Value	Description
VIB_Offset + 5	5014	Command: "GP" command ID
VIB_Offset + 6	Status	Argument0: The result Status:

		1: Success <=0: Fail
VIB_Offset + 7	<X>	Argument1: The X-coordinate of the current motion position
VIB_Offset + 9	<Y>	Argument2: The Y-coordinate of the current motion position
VIB_Offset + 11	<Z>	Argument3: The Z-coordinate of the current motion position
VIB_Offset + 13	<A>	Argument4: The Z-rotation of the current motion position
VIB_Offset + 15		Argument5: The Y- rotation of the current motion position
VIB_Offset + 17	<C>	Argument6: The X- rotation of the current motion position

3. Loading a Recipe

A Recipe can only be loaded when the Sensor (Master) is in Offline mode. When in a two camera configuration the Master has finished loading the Recipe file and is set back to Online mode, it will automatically call the Slave camera to load the corresponding Recipe.

TCP

A Recipe change using TCP command is not supported by In-Sight. Therefore, a set of native commands must be sent via a telnet connection (Port 23) to the Master camera:

- Close TCP connection
- Open a Telnet connection to the Master In-Sight (user = "admin", Password = "").
- Execute native command: "SO0" (Set Offline)
- Execute native command: "LF<RecipeName>" (Load File)
- Execute native command: "SO1" (Set Online)
- Close Telnet connection
- Open TCP connection

Please note that the Recipe filename consists of the Recipe ID (3 digits) and the Recipe name, e.g.

[000_DefaultRecipe.job](#)

When the commands have been successfully executed, the client can close the Telnet connection and open the TCP connection, then send a TCP command to check the status of the sensor, i.e. whether the (optional) slave has also loaded the recipe job:

GS,0

The response will be:

GS,<status>

Status	
0	Sensor not ready
1	Sensor ready

SLMP

As opposed to TCP connection, the SLMP connection supports loading a Recipe. This is performed as follows:

- Set Master In-Sight offline by setting the "Set Offline" bit in the control block to 1
- Wait for the "Online" Bit in the Status Block to be 0
- Set the "Command" field to the desired recipe's ID
- Start the load process of the recipe with setting the "Execute Command" bit in the control block
- Wait for the "Command Executed" bit in the status block
- Set Master In-Sight online by by setting the "Set Offline" bit in the control block to 0
- Wait for the "Online" Bit in the Status Block to be 1

4. Error Codes

Error Code	Description	Commands	Version
0	All errors	Each command	V 1.0.0 – V1.5.1
-9999	Internal error		V 1.6.0
-1000	Timeout	Each command	V 1.6.0
-1001	Unknow command		V 1.6.0
-1002	Index out of range	Each command	V 1.6.0
-1003	Too few arguments	Each command	V 1.6.0
-1004	Invalid argument type (e.g. char instead of number)	Each command	V 1.6.0
-1005	Invalid argument	Each command	V 1.6.0
-1006	Command not allowed	Each command	V 2.0.0
-1007	Combination not allowed	SGP, GGP, GCP	V 2.0.0
-1008	Busy	Each command	V 2.0.0
-1009	Not fully implemented	-	V 2.0.0
-1010	Not supported	-	V 2.0.0
-1101	Different recipe names	GS	V 1.6.0
-1102	Different versions	GS, GV	V 1.6.0
-2001	Not calibrated	TA, XA, XAS, TT, XT, XTS	V 1.6.0
-2002	Calibration failed	AC, CCE, HEE	V 1.6.0
-2003	Invalid calibration data	CCE, HEE	V 1.6.0
-2004	Not given calibration pose reached	AC	V 1.6.0
-2005	No start command	HE, HEE, CC, CCE,	V 2.0.0
-3001	Feature not trained	ACB, AC, CCB, CC, HE, TA, XA, XAS, TT, XT, XTS	V 1.6.0
-3002	Feature not found	ACB, AC, CCB, CC, HE, TA, XA, XAS, TT, XT, XTS	V 1.6.0
-3003	Feature not mapped	XA, XAS, XT, XTS	V 1.6.0
-3004	Target pose not trained	XA, XAS, XT, XTS	V 1.6.0
-3005	Robot pose not trained	XT, XTS, GP	V 1.6.0
-4001	Invalid part ID	TP, TPR, GP	V 2.0.0
-4002	Not all features located for this part	GP, TP	V 2.0.0