Motoman®

Motoman Vision User's Manual

for Cognex® In-Sight

Part Number: 147865-1CD

Revision: 0

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SECTION 1
INTRODUCTION

The Motoman Vision manual provides detailed information regarding integration of the Cognex In-Sight vision system with the Motoman robot controller.

1.1   About this Document

This manual is intended to provide a system integration overview for personnel familiar with the operation of the Motoman robot, and the Windows PC operating enviornment. For more detailed instructions, you will be refered to the manuals listed in Section 1.3. This manual contains the following sections:

SECTION 1 - INTRODUCTION

Provides general informtion about the Motoman vision system and its components, including a list of reference documents and customer service information.

SECTION 2 - SAFETY

This section provides general information regarding safe use and operation of the Motoman vision system.

SECTION 3 - INSTALLATION

Provides overview instructions for setup and installation of the Motoman vision system.

SECTION 4 - OPERATION

Provides overview instructions for setup and installation of the Motoman vision system.

1.2   System Overview

The Motoman vision system is designed around the Cognex In-Sight vision sensor. It features a rugged onboard vision processing unit, high-speed camera, onboard light control, built-in descrete I/O, and VGA display output.

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1.2.1 System Layout

The camera is mounted at the customer work station. Communication cables are routed to the In-Sight module.
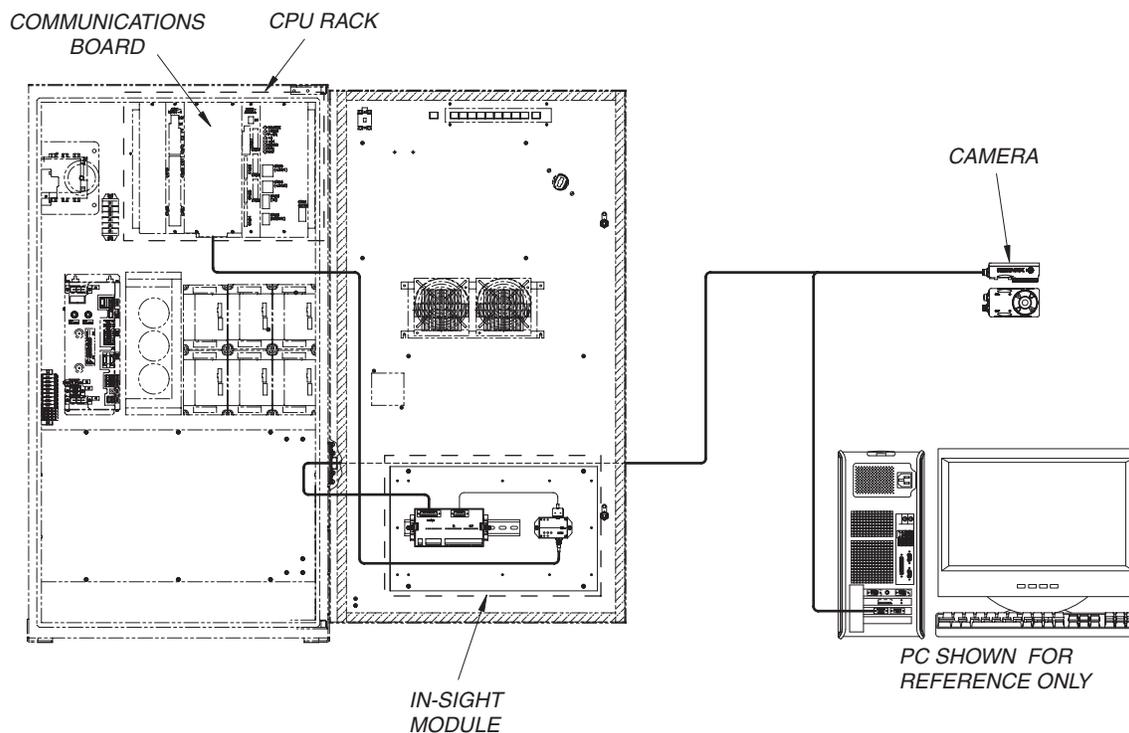
Figure 1-1   Basic System Layout

The Motoman vision system includes the following major components:

- In-Sight Camera
- Camera Mount
- Serial Adapter
- Cognex In-Sight Reference Guide

1.2.2 System Requirements

The Motoman robot controller must have the DCI Communications option installed to use the Motoman vision system.

1.3   Reference to Other Documentation

- Motoman Manipulator Manual
- Motoman Operator's Manual
- Motoman Concurrent I/O Parameters Manual (P/N 149230-1)
- Cognex In-Sight documentation

1.4 *Customer Service Information*

If you are in need of technical assistance, contact the Motoman service staff at (937) 847-3200. Please have the following information ready before you call:

- Robot Type (UP6, UP20, etc.)
- Application Type (welding, handling, etc.)
- Robot Serial Number (located on the back side of the robot arm).
- Robot Sales Number (located on the back side of the controller).

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SECTION 2
SAFETY

2.1 Introduction

> **It is the purchaser's responsibility to ensure that all local, county, state, and national codes, regulations, rules, or laws relating to safety and safe operating conditions for each installation are met and followed.**

We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems. This information can be obtained from the Robotic Industries Association by requesting ANSI/RIA R15.06. The address is as follows:

Robotic Industries Association

900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: 313/994-6088
FAX: 313/994-3338

Ultimately, the best safeguard is trained personnel. The user is responsible for providing personnel who are adequately trained to operate, program, and maintain the robot cell. **The robot must not be operated by personnel who have not been trained!**

We recommend that all personnel who intend to operate, program, repair, or use the robot system be trained in an approved Motoman training course and become familiar with the proper operation of the system.

This safety section addresses the following:

- Standard Conventions (Section 2.2)
- General Safeguarding Tips (Section 2.3)
- Mechanical Safety Devices (Section 2.4)
- Installation Safety (Section 2.5)
- Programming Safety (Section 2.6)
- Operation Safety (Section 2.7)
- Maintenance Safety (Section 2.8)

2.2   *Standard Conventions*

This manual includes information essential to the safety of personnel and equipment. As you read through this manual, be alert to the four signal words:

- DANGER
- WARNING
- CAUTION
- NOTE

Pay particular attention to the information provided under these headings which are defined below (in descending order of severity).

DANGER!

Information appearing under the DANGER caption concerns the protection of personnel from the immediate and imminent hazards that, if not avoided, will result in immediate, serious personal injury or loss of life in addition to equipment damage.

WARNING!

Information appearing under the WARNING caption concerns the protection of personnel and equipment from potential hazards that can result in personal injury or loss of life in addition to equipment damage.

CAUTION!

Information appearing under the CAUTION caption concerns the protection of personnel and equipment, software, and data from hazards that can result in minor personal injury or equipment damage.

NOTE: Information appearing in a NOTE caption provides additional information which is helpful in understanding the item being explained.

2.3   *General Safeguarding Tips*

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this robot system.

- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the robot cell.

- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).

- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.

- In accordance with ANSI/RIA R15.06, section 6.13.4 and 6.13.5, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

2.4   *Mechanical Safety Devices*

The safe operation of the robot, positioner, auxiliary equipment, and system is ultimately the user's responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06 safety standards, and other local codes that may pertain to the installation and use of industrial equipment. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety measures are available:

- Safety fences and barriers
- Light curtains
- Door interlocks
- Safety mats
- Floor markings
- Warning lights

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.

2.5   Installation Safety

Safe installation is essential for protection of people and equipment. The following suggestions are intended to supplement, but not replace, existing federal, local, and state laws and regulations. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. Installation tips are as follows:

- Be sure that only qualified personnel familiar with national codes, local codes, and ANSI/RIA R15.06 safety standards are permitted to install the equipment.

- Identify the work envelope of each robot with floor markings, signs, and barriers.

- Position all controllers outside the robot work envelope.

- Whenever possible, install safety fences to protect against unauthorized entry into the work envelope.

- Eliminate areas where personnel might get trapped between a moving robot and other equipment (pinch points).

- Provide sufficient room inside the workcell to permit safe teaching and maintenance procedures.

2.6   Programming Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Programming tips are as follows:

- Any modifications to PART 1 of the MRC controller PLC can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1. Making any changes without the written permission of Motoman will **VOID YOUR WARRANTY!**

- Some operations require standard passwords and some require special passwords. Special passwords are for Motoman use only. **YOUR WARRANTY WILL BE VOID** if you use these special passwords.

- Back up all programs and jobs onto a floppy disk whenever program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.

- The concurrent I/O (Input and Output) function allows the customer to modify the internal ladder inputs and outputs for maximum robot performance. Great care must be taken when making these modifications. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations that may damage the robot or other parts of the system.

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.

- Inspect the robot and work envelope to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Be sure that all safeguards are in place.
- Check the E-STOP button on the teach pendant for proper operation before programming.
- Carry the teach pendant with you when you enter the workcell.
- Be sure that only the person holding the teach pendant enters the workcell.
- Test any new or modified program at low speed for at least one full cycle.

2.7   *Operation Safety*

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Operation tips are as follows:

- Be sure that only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories are permitted to operate this robot system.
- Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Inspect the robot and work envelope to ensure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Ensure that all safeguards are in place.
- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the cell.
- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.

2.8   Maintenance Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Maintenance tips are as follows:

- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.

- Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.

- Back up all your programs and jobs onto a floppy disk whenever program changes are made. A backup must always be made before any servicing or changes are made to options, accessories, or equipment to avoid loss of information, programs, or jobs.

- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the cell.

- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.

- Be sure all safeguards are in place.

- Use proper replacement parts.

- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

- All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.

- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).

SECTION 3
INSTALLATION

The Motoman Vision System can be installed easily in a short time. Follow established safety procedures **at all times** throughout the installation process. Failure to use safe work practices can result in damage to equipment and injury to workers.

⚠ *CAUTION!*

Installation of the Motoman Vision System is not a task for the novice. The system is not fragile, but it is a highly sophisticated vision system. Handle components with care. Rough handling can damage system electronic components.

3.1 *Hardware Installation*

In addition to this manual, please have manuals available for the vendor-supplied Cognex In-Sight manual (refer to Section 1.5).

These procedures assume that the Vision System is connected to the same power disconnect as the NX100 controller.

⚠ *DANGER!*

All power must be disconnected from the controller before beginning internal wiring. Failure to disconnect power can result in serious personal injury, loss of life, or equipment damage. Be sure to follow all Lockout/Tagout procedures.

Procedure –

1. Mount the camera in the desired location using hardware provided (refer to Cognex In-Sight vendor manual for mounting specifications).
2. Mount the In-Sight module in the controller (refer to system prints provided).
3. Make all necessary cable or electrical connections to the In-Sight module (refer to Cognex In-Sight vendor manual).
4. Connect the In-Sight module to the appropriate communications/DeviceNet board located in the controller CPU rack.
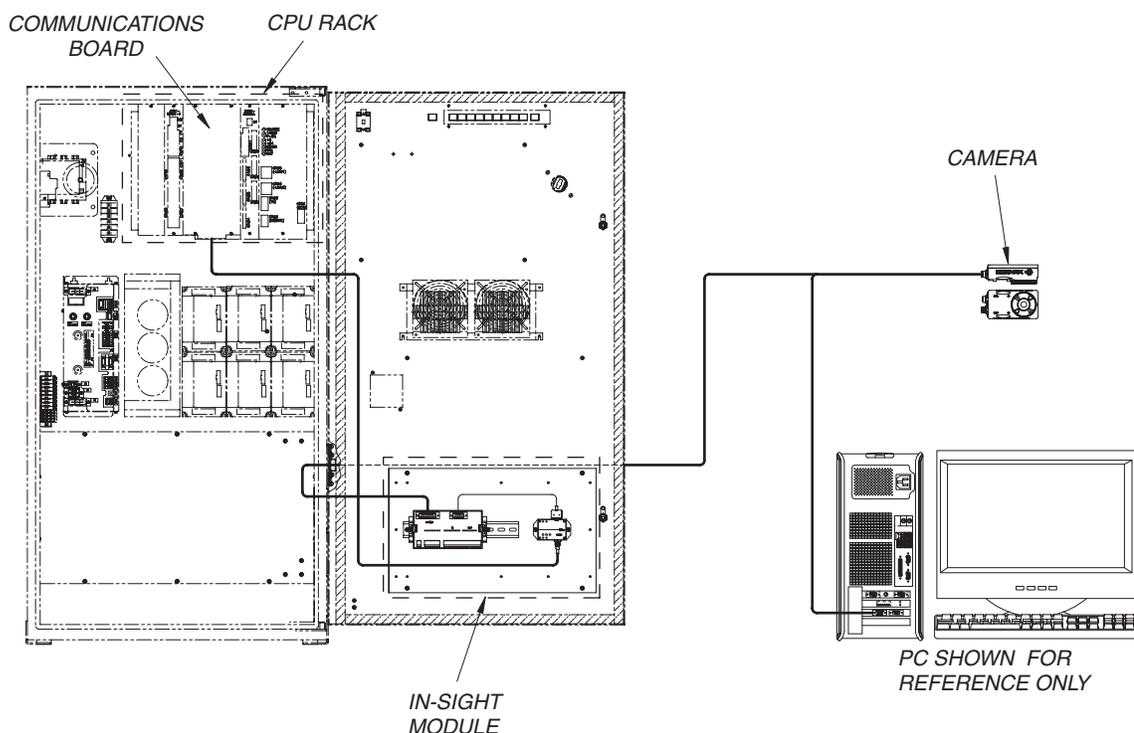
Figure 3-1   Sample Installation Layout

3.2 Software Installation

3.2.1 Robot Controller Software

The robot controller must have the DCI Communications option installed. Motoman Visual DCI must be initialized by a <u>trained Motoman technician</u>.
Re-initialization of the controller by a non-Motoman employee may void your warranty. If the Motoman Visual DCI option has not been installed, please contact the Motoman service staff at (937) 847-3200.

3.2.2 In-Sight Processor Configuration

The In-Sight processor must be configured for Motoman serial communications to understand the Motoman serial communications protocol. Once configured, the In-Sight processer is able to respond to the commands recieved from the Motoman controller. To configure the In-Sight processor for Motoman communication, refer to your Cognex documentation.

The In-Sight processor defaults to standard Motoman controller serial port settings. However, if your controller uses different settings, be sure to configure the In-Sight processor to use the same serial port settings as those on the Motoman controller.

NOTE:

- *The Motoman controller must be configured for DCI communications. Communications in Host mode are not currently supported.*

- *Although the Motoman controller specifies "None" for Flow Control, the In-Sight processor uses "Hardware" Flow Control when communicating with the Motoman controller.*

SECTION 4
OPERATION

Motoman robot controllers use a complex, highly robust error checking protocol to communicate with other devices over RS-232 serial ports. When configured for Motoman serial communications mode, the In-Sight processor understands this protocol and is able to respond to the commands it receives from the Motoman controller.

Motoman Mode is an extension of In-Sight's Native Mode communications. Because Motoman robot controllers send only numeric text over the RS-232 port, In-Sight's standard Native Mode commands cannot be sent. Instead, the Motoman controller must send the In-Sight processor a numeric representation of the Native Mode commands, with additional parameters appended as necessary.

Because Motoman Mode is based on Native Mode, an In-Sight job may be developed and tested in Native Mode, then switched to Motoman Mode only when the actual robot controller is connected to the In-Sight processor. No other changes to the job are required.

4.1 Communications

The Motoman robot controller initiates all data communication between itself and the In-Sight processor, whether sending data and commands or receiving data. Communication between the In-Sight processor and a Motoman controller is accomplished using a two-command procedure initiated from the controller:

4.1.1 Sending Data

To send a command or data to the In-Sight processor from the robot controller, four Motoman SAVEV commands are used. The first SAVEV specifies the index of the Motoman variable containing the command. The second SAVEV specifies the command number, and the cell address if required. The third SAVEV specifies the index of the Motoman variable containing the parameter for the command. The fourth SAVEV specifies the parameter to append to the command number.

4.1.2 Retrieving Data

To retrieve data from the In-Sight processor to the robot controller, three Motoman SAVEV commands followed immediately by a LOADV command are used. The first SAVEV specifies the index of the Motoman variable containing the command. The second SAVEV specifies the command number, and the cell address, if required. The third SAVEV specifies the index of the Motoman variable that will contain the result data sent from the In-Sight processor. The LOADV command causes the data to be sent.

4.1.3 Specifying Commands

Nine Native Mode commands are supported in Motoman mode. The robot controller programmer must send all commands as Motoman "D" variables. The supported commands, and their Motoman mode equivalents, are listed below:

Table 4-1   Native Mode Commands

In-Sight Native Mode	Motoman Mode Equivalent
SetJob (SJ)	100000
GetJob (GJ)	200000
Set Online (SO)	300000
Get Online (GO)	400000
Set Event (SE)	500000
Set Integer (SI)	600000
Set Float (SF)	700000
Set String (SS)	800000
Get Value (GV)	900000

The commands SJ, GJ, SO, GO, and SE do not require any additional parameters to fully specify the command. Therefore, any value between 100000 and 199999 represents an SJ command, any value between 200000 and 299999 represents a GJ command, and so on.

The commands SI, SF, SS, and GV do require additional parameters be sent as part of the command, specifically, a reference to a cell in the In-Sight spreadsheet. However, because Motoman robot controllers do not send alpha characters, the column reference for the desired In-Sight cell must be specified numerically. The column number is 01000 through 26000, where 01000 indicates column 'A', 02000 indicates column 'B', and so on (e.g. 26000 indicates column 'Z'). The row number is added on as-is to complete the cell address.

Because a complete Motoman-equivalent Native Mode command is always a number in excess of 100000, all commands sent by the robot controller must be stored as Motoman D-variables.

A complete Motoman mode command is constructed as follows:

Robot controller D-value command = N + CC + RRR

N is the Native Mode "equivalent" {100000 through 900000}

CC is the column number "equivalent" (01000 through 26000)

RRR is the row number.

Example: A command to get the value from cell B123 in the active job would be written in Native Mode as GVB123. The equivalent command issued from the Motoman robot controller would be 902123 (900000 + 02000 + 123).

$$\begin{array}{r} 900000 \text{ - Get Variable command} \\ 002000 \text{ - Column "B"} \\ +\ \underline{000123} \text{ - Row 123} \\ 902123 \text{ - Motoman equivalent command} \end{array}$$

4.2   *Sample Jobs*

Below are examples of the Motoman command sequences needed to duplicate the functionality of each of the corresponding Native Mode commands. In each example, Motoman variable D001 is used to hold the command, Motoman variable B000 is used to hold the index pointing to D001, and Motoman variable B001 is used to hold the index pointing to the Motoman variable holding the parameter to be sent or data received.

4.2.1   *Set Job*

Activates the job in slot #13 of the In-Sight processor.

Native Mode Command: SJ13

Motoman Equivelant Command: 100000

Table 4-2   SJ (Set Job) Sample Job

Line	*Step*	*Instruction*	*Explanation*
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 100000	Sets this variables value to the Motoman Mode equivelant command for Set Job (100000).
0003		SET B001 2	Sets the index for the variable containing the parameter to 2.
0004		SET B002 13	Sets the job number parameter to 13.
0005		SAVEV B000	Transmits the index for the Motoman variable containing the command (D001) to the In-Sight processor.
0006		SAVEV D001	Transmits the command number (100000) to the In-Sight processor.
0007		SAVEV B001	Transmits the index for the Motoman variable containing the command parameter (B002) to the In-Sight processor.
0008		SAVEV B002	Transmits the command parameter (13) to the In-Sight processor.

Note: *The Motoman B-variable B002 holds the job # parameter.*

4.2.2   *Get Job*

Retrieves the job number of the active In-Sight job.

Native Mode Command: GJ

Motoman Equivelant Command: 200000

Table 4-3   GJ (Get Job) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 200000	Sets this variables value to the Motoman Mode equivelant command for Get Job (200000).
0003		SET B001 3	Sets the index for the variable containing the parameter to 3.
0004		SAVEV B000	Transmits the index for the Motoman variable containing the command (D001) to the In-Sight processor.
0005		SAVEV D001	Transmits the command number (200000) to the In-Sight processor.
0006		SAVEV B001	Transmits the index for the Motoman variable that will contain the command parameter (B003) to the In-Sight processor.
0007		LOADV B003	Loads the active In-Sight job number into Motoman B-variable 3.

Note: The Motoman B-variable B003 holds the number of the active In-Sight job (0 to 19).

4.2.3   Set Online

Sets the In-Sight processor Online.

Native Mode Command: SO1

Motoman Equivelant Command: 300000

Table 4-4   SO (Set Online) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 300000	Sets this variables value to the Motoman Mode equivelant command for Set Online (300000).
0003		SET B001 4	Sets the index for the variable containing the online/offline command parameter to 4.
0004		SET B004 1	Sets the online/offline command parameter to 1 (Online). B004 = 1 Online B004 = 0 Offline
0005		SAVEV B000	Transmits the index of the Motoman variable containing the command (D001) to the In-Sight processor.
0006		SAVEV D001	Transmits the command number (300000) to the In-Sight processor.
0007		SAVEV B001	Transmits the index for the Motoman variable containing the command parameter (B004) to the In-Sight processor.
0008		LOADV B004	Loads the command parameter (1 - Online) to Motoman B-variable 4.

Note: The Motoman B-variable B004 holds the parameter. To set the In-Sight processor Offline, SET B004 to 0 in line 004.

4.2.4   Get Online

Retrieves the Online/Offline state of the In-Sight processor.

Native Mode Command: GO

Motoman Equivelant Command: 400000

Table 4-5   GO (Get Online) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 400000	Sets this variables value to the Motoman Mode equivelant command for Get Online (400000).
0003		SET B001 5	Sets the index for the variable containing the parameter to 5.
0005		SAVEV B000	Transmits the index of the Motoman variable containing the command (D001) to the In-Sight processor.
0006		SAVEV D001	Transmits the command number (400000) to the In-Sight processor.
0007		SAVEV B001	Transmits the index for the Motoman variable that will contain the command parameter (B005) to the In-Sight processor.
0008		LOADV B005	Loads the active Online/Offline state (1 or 0) to Motoman B-variable 5.

4.2.5 Set Event 7

Triggers the event specified in the active In-Sight job as Soft 7.

Native Mode Command: SE7

Motoman Equivelant Command: 500000

Table 4-6   SE (Set Event) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 500000	Sets this variables value to the Motoman Mode equivelant command for Set Event (500000).
0003		SET B001 6	Sets the index for the variable containing the parameter to 6.
0003		SET B006 7	Sets the event number parameter to 7
0005		SAVEV B000	Transmits the index of the Motoman variable containing the command (D001) to the In-Sight processor.
0006		SAVEV D001	Transmits the command number (500000) to the In-Sight processor.
0007		SAVEV B001	Transmits the index for the Motoman variable containing the command parameter (B006) to the In-Sight processor.
0008		SAVEV B006	Transmits the event number parameter (7) to the In-Sight processor.

Note: The Motoman B-variable B006 holds the Event number parameter.

4.2.6   Set Event 8 (Aquire Image)

Triggers the Acquire Image Event.

Native Mode Command: SE8

Motoman Equivelant Command: 500000

Table 4-7   SE8 (Set Event - Aquire Image) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 500000	Sets this variables value to the Motoman Mode equivelant command for Set Event (500000).
0003		SET B001 6	Sets the index for the variable containing the parameter to 6.
0003		SET B006 8	Sets the event number parameter to 8 (Aquire Image).
0005		SAVEV B000	Transmits the index of the Motoman variable containing the command (D001) to the In-Sight processor.
0006		SAVEV D001	Transmits the command number (500000) to the In-Sight processor.
0007		SAVEV B001	Transmits the index for the Motoman variable containing the command parameter (B006) to the In-Sight processor.
0008		SAVEV B006	Transmits the event number parameter (8 Aquire Image) to the In-Sight processor.

4.2.7   Set Integer

Sets the value of an EditInt function contained in cell A13 of the active In-Sight job to integer value 11.

Native Mode Command: SIA013 11

Motoman Equivelant Command: 601013

Table 4-8   SI (Set Integer) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 601013	Sets this variables value to the Motoman Mode equivelant command for Set Integer (600000), the column reference for A (01000), and the row reference for 13.
0003		SET B001 7	Sets the index for the variable containing the parameter to 7.
0003		SET I007 11	Sets the integer parameter to 11.
0005		SAVEV B000	Transmits the index of the Motoman variable containing the command to the In-Sight processor.
0006		SAVEV D001	Transmits the command number (601013) to the In-Sight processor.
0007		SAVEV B001	Transmits the index for the Motoman variable containing the command parameter (I007) to the In-Sight processor.
0008		SAVEV I007	Transmits the parameter value (11) to the In-Sight processor.

Note: The Motoman I-variable I007 stores the integer parameter.

4.2.8   Set Float

Sets the value of an EditFloat function contained in cell B14 of the active In-Sight job to the double, or real value 3.142.

Native Mode Command: SFB014 3.142

Motoman Equivelant Command: 702014

Table 4-9   SF (Set Float) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 702014	Sets this variables value to the Motoman Mode equivelant command for Set Float (700000), the column reference for B (02000), and the row reference for 14.
0003		SET B001 8	Sets the index for the variable containing the parameter to 8.
0003		SET R008 3.142	Sets the parameter to 3.142.
0005		SAVEV B000	Transmits the index of the Motoman variable containing the command (1) to the In-Sight processor.
0006		SAVEV D001	Transmits the command number (702014) to the In-Sight processor.
0007		SAVEV B001	Transmits the index for the Motoman variable containing the command parameter (R008) to the In-Sight processor.
0008		SAVEV R008	Transmits the parameter value (3.142) to the In-Sight processor.

Note: The Motoman R-variable R008 stores the double or real parameter.

4.2.9   Set String

Sets the value of an EditString function contained in cell C15 of the active In-Sight job to the string, or P-variable, "1.1,2.2,3.3,4.4,5.5,6.6".

Native Mode Command: SSC015 1.1,2.2,3.3,4.4,5.5,6.6,00

Motoman Equivelant Command: 803015

Table 4-10   SI (Set String) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 803015	Sets this variables value to the Motoman Mode equivelant command for Set String (800000), the column reference for C (03000), and the row reference for 15.
0003		SET B001 9	Sets the index for the variable containing the parameter to 9.
0004		SETE P009 (1) 1100	Sets element 1 of P-variable 9 to 1.1.
0005		SETE P009 (2) 2200	Sets element 2 of P-variable 9 to 2.2.
0006		SETE P009 (3) 3300	Sets element 3 of P-variable 9 to 3.3.
0007		SETE P009 (4) 440	Sets element 4 of P-variable 9 to 4.4.
0008		SETE P009 (5) 550	Sets element 5 of P-variable 9 to 5.5.
0009		SETE P009 (6) 660	Sets element 6 of P-variable 9 to 6.6.
0010		SAVEV B000	Transmits the index of the Motoman variable containing the command (D001) to the In-Sight processor.
0011		SAVEV D001	Transmits the command number (803015) to the In-Sight processor.
0012		SAVEV B001	Transmits the index for the Motoman variable containing the command parameter (P009) to the In-Sight processor.
0013		SAVEV P009	Transmits the parameter value to the In-Sight processor.

Note: *The Motoman P-variable P009 stores the P-variable parameter. In your In-Sight job, you should use Token$ functions to parse the values of a P-variable.*
Example: Retrieve the string contained in cell C15 in the active In-Sight job (as set in the above example), and place the result in the designated Motoman variable.

4.2.10 Get Value

Retrieves the value contained in cell C015 in the active In-Sight job and places the result in the designated Motoman variable.

Native Mode Command: GVC015

Motoman Equivelant Command: 903015

Table 4-11   GV (Get Value) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 903015	Sets this variables value to the Motoman Mode equivelant command for Get Value (900000), the column reference for C (03000), and the row reference for 15.
0003		SET B001 10	Sets the index for the variable containing the parameter to 10.
0004		SAVEV B000	Transmits the index of the Motoman variable containing the command (D001) to the In-Sight processor.
0005		SAVEV D001	Transmits the command number (903015) to the In-Sight processor.
0006		SAVEV B001	Transmits the index for the Motoman variable containing the command parameter (P010) to the In-Sight processor.
0007		LOADV P010	Loads the parameter value to the Motoman controller.

Note: *The Motoman P-variable P010 will contain 1.1,2.2,3.3,4.4,5.5,6.6.*

4.2.11   Get Value

Retrieves the value contained in cell D016 in the active In-Sight job and places the result in the designated Motoman variable.

Native Mode Command: GVD016

Motoman Equivelant Command: 904016

Table 4-12   GV (Get Value) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 904016	Sets this variables value to the Motoman Mode equivelant command for Get Value (900000), the column reference for D (04000), and the row reference for 16.
0003		SET B001 11	Sets the index for the variable containing the parameter to 11.
0004		SAVEV B000	Transmits the index of the Motoman variable containing the command (D001) to the In-Sight processor.
0005		SAVEV D001	Transmits the command number (904016) to the In-Sight processor.
0006		SAVEV B001	Transmits the index for the Motoman variable containing the command parameter (I011) to the In-Sight processor.
0007		LOADV I011	Loads the parameter value to the Motoman controller.

Note: *The requested data is formatted to match the specified data type (integer or floating point) indicated by the Motoman variable in the controller program.*
An In-Sight cell containing any numeric value will return a float value formatted to 3 decimal places when requested by the Native Mode command GV, regardless of whether the cell contains an integer or a floating point value.

In this example, an I-variable (integer) is requested. So:

If the value contained in cell D016 is 123, the Motoman I-variable I011 will contain '123'.

If the value contained in cell D016 is 123.555, the Motoman I-variable I011 will also contain '123'.

Note: *The Motoman mode command does not perform any rounding operation when converting a floating-point value into an integer; the decimal part is simply truncated. It is up to the user to perform a mathematical rounding function, if necessary, to transmit an In-Sight floating-point value into a Motoman integer variable.*

4.2.12 Get Value

Retrieves the value contained in cell E017 in the active In-Sight job and places the result in the designated Motoman variable.

Native Mode Command: GVE017

Motoman Equivelant Command: 905017

Table 4-13   GV (Get Value) Sample Job

Line	Step	Instruction	Explanation
0001		SET B000 1	Sets the index for the variable containing the command to 1.
0002		SET D001 905017	Sets this variables value to the Motoman Mode equivelant command for Get Value (900000), the column reference for E (05000), and the row reference for 17.
0003		SET B001 12	Sets the index for the variable containing the parameter to 12.
0004		SAVEV B000	Transmits the index of the Motoman variable containing the command (D001) to the In-Sight processor.
0005		SAVEV D001	Transmits the command number (905017) to the In-Sight processor.
0006		SAVEV B001	Transmits the index for the Motoman variable containing the command parameter (R012) to the In-Sight processor.
0007		LOADV R012	Loads the parameter value to the Motoman controller.

In this example, an R-variable (real) is requested. So:

If the value contained in cell E017 is 123, the Motoman R-variable R012 will contain '123.000'.

If the value contained in cell E017 is 123.555, the Motoman R-variable R012 will contain '123.555'.

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