MagneMotion

A Rockwell Automation Company

User Manual Addendum, Suspect Vehicle Bit

Document: 10005200152; MMI-UM029A-EN-P
Version: 00

Although every effort is made to keep this document accurate and up to date, MagneMotion® assumes no responsibility for any errors, omissions, or inaccuracies. Information that is provided in this document is subject to change without notice. Any sample code that that is referenced in this document or included with MagneMotion software is included for illustration only and is, therefore, unsupported.

MagneMotion, Inc.
A Rockwell Automation Company
139 Barnum Road
Devens, MA 01434
USA

Phone: +1 978-757-9100
Fax: +1 978-757-9200

www.magnemotion.com

Contents

Figures

Tables

Overview

The Suspect Vehicle Bit identifies vehicles that are manually moved out of the control region for that vehicle. Typically, control of the vehicle cannot be regained in this situation. Even if control is regained, the vehicle continues to be suspect. This update provides user control of the Suspect bit status, which allows the Suspect bit to be cleared once control of the vehicle is regained.

This document describes the changes to the NCHost TCP Interface Utility, the MM LITE Configurator Utility, the Host Controller TCP/IP Communication Protocol, and the Host Controller EtherNet/IP Communication Protocol.

Related Documents

This document references the following manuals:

- Host Controller TCP/IP Communication Protocol User Manual, 990000436.
- Host Controller EtherNet/IP Communication Protocol User Manual, 990000437.
- MagneMover LITE Configurator User Manual, 990000558.
- NCHost TCP Interface Utility User Manual, 990000562.

NOTE: Distribution of this document is not controlled. Changes to the document set or the software can be made at any time. To identify the current revisions or to obtain a current version, contact Customer Support at +1 978-757-9102 or ICTSupport@ra.rockwell.com.

NCHost TCP Interface Utility User Manual Addendum

This section is an addendum to the *NCHost TCP Interface Utility User Manual* and describes additions to the NCHost User Interface for vehicle commands.

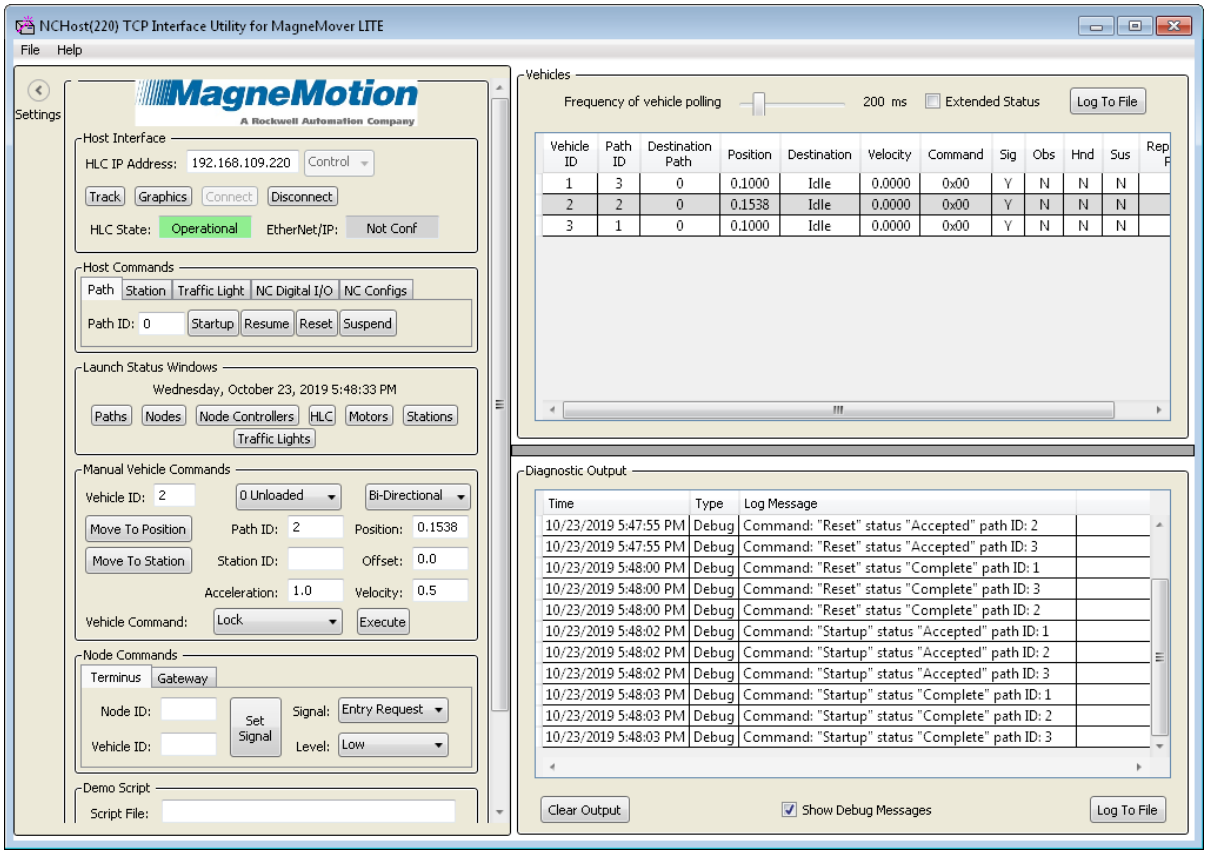

Figure 1: NCHost TCP Interface Utility for MagneMover LITE

Monitoring Vehicle Status

Vehicle status is available through the **Vehicles** pane that is shown in Figure 1. The Vehicles Pane can also display extended vehicle status, see Figure 2 and the **Vehicles** section in the *NCHost TCP Interface Utility User Manual* for detailed descriptions of all items).

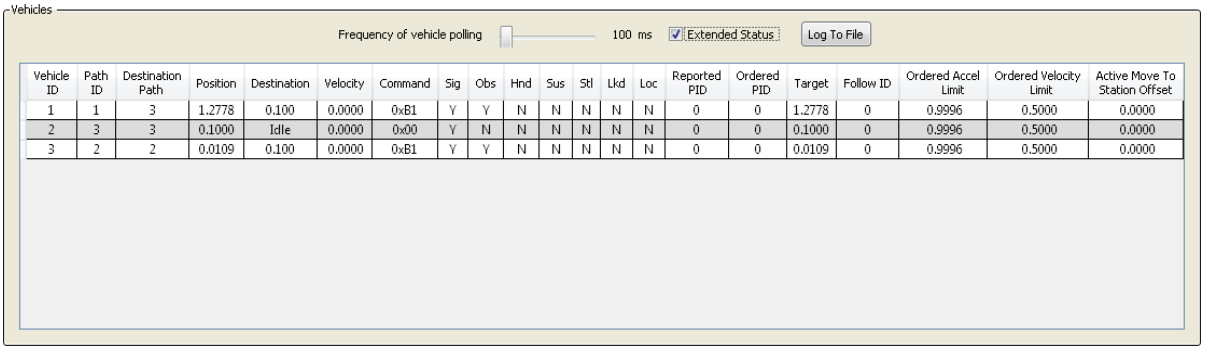

Figure 2: NCHost – Vehicles Pane

Manual Vehicle Commands

All vehicle commands available to be sent from NCHost to the high level controller (HLC) are in the **Manual Vehicle Commands** section (see Figure 3).

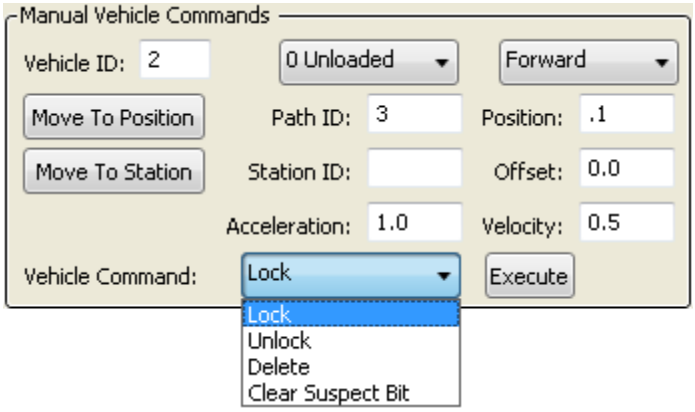

Figure 3: NCHost – Manual Vehicle Commands Section

Lock a Vehicle

1. Check the status of the vehicle in the **Extended Vehicle Status** pane to verify it is unlocked (Lkd = N).
2. Set the **Vehicle ID** in the **Manual Vehicle Commands** to the vehicle ID.
3. Select **Lock** from the **Vehicle Command** drop-down menu.
4. Select **Execute**.

   The vehicle locked status (Lkd) changes to Y.

Unlock a Vehicle

1. Check the status of the vehicle in the **Extended Vehicle Status** pane to verify it is locked (Lkd = Y).
2. Set the **Vehicle ID** in the **Manual Vehicle Commands** to the vehicle ID.
3. Select **Unlock** from the **Vehicle Command** drop-down menu.
4. Select **Execute**.

   The vehicle locked status (Lkd) changes to N.

Delete a Vehicle

NOTICE
Using the Delete Vehicle command to delete a vehicle that is physically present on the transport system can cause collisions as the system no longer accounts for that vehicle as it moves other vehicles.

1. Set the **Vehicle ID** in the **Manual Vehicle Commands** to the vehicle ID.

2. Select **Delete** from the **Vehicle Command** drop-down menu.
3. Select **Execute**.

   The HLC removes the vehicle from the vehicle status list and makes the vehicle ID available for reuse.

Clear Suspect Bit for a Vehicle

1. Check the status of the vehicle in either the **Vehicle Status** or the **Extended Vehicle Status** pane to verify it is suspect (Sus = Y).
2. Set the **Vehicle ID** in the **Manual Vehicle Commands** to the vehicle ID.
3. Select **Clear Suspect Bit** from the **Vehicle Command** drop-down menu.
4. Select **Execute**.

   The vehicle suspect status (Sus) changes to N.

MM Configurator Utility User Manual Addendum

This section is an addendum to the *MagneMover LITE Configurator User Manual* and describes additions to the MagneMotion Configurator User Interface for support of user control of the Suspect bit when using a PLC as the host controller.

Vehicle Suspect Bit Configuration

See **Set EtherNet/IP for a PLC** in the *MagneMover LITE Configurator User Manual* for configuring the EtherNet/IP settings in the Node Configuration File.

When using the functionality described in this document, it must be enabled when using a PLC to make sure that the correct tag data is pushed to the host controller. When not using the functionality described in this document, it must be disabled when using a PLC to prevent unexpected tag data being pushed to the host controller.

EtherNet/IP

EtherNet/IP is used to communicate with a PLC being used as a Host Controller. The EtherNet/IP page, which is shown in Figure 4, is accessed by selecting the EtherNet/IP category from the Configuration Tree.

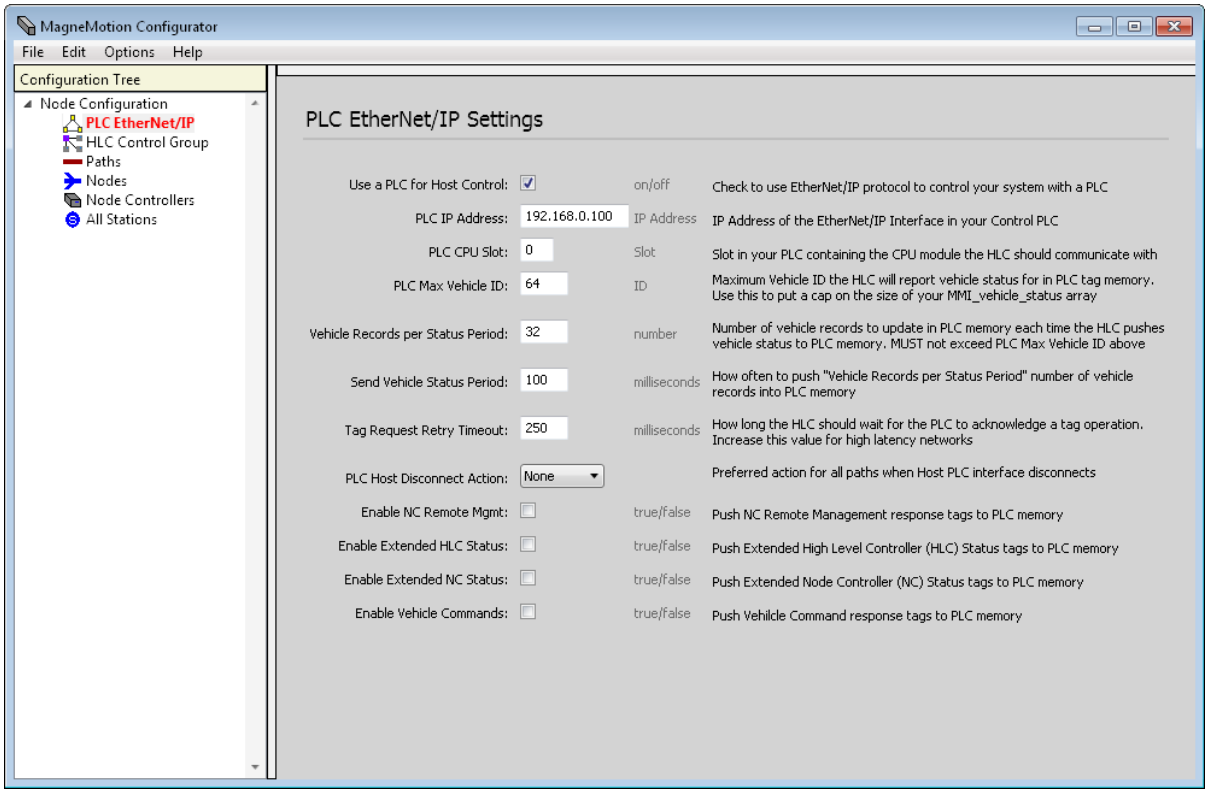

Figure 4: MagneMover LITE Configurator Utility – PLC EtherNet/IP Settings Page

See the *MagneMover LITE Configurator User Manual* for detailed descriptions of all page options.

- **Use a PLC for Host Control** – Select to enable PLC control of the transport system via EtherNet/IP protocol. The default is cleared (off).

- **PLC IP Address** – The IP address of the EtherNet/IP interface in the PLC for the HLC.

- **PLC CPU Slot** – The slot in the PLC that contains the CPU module that the HLC communicates with.

- **PLC Max Vehicle ID** – Maximum number of Vehicle IDs that the HLC reports vehicle status for to the tag memory in the PLC. The default is 64 (the maximum is system-dependent).

- **Vehicle Records per Status Period** – The number of vehicle records to update in PLC memory each time the HLC pushes vehicle status to the PLC memory. The default is 32.

- **Send Vehicle Status Period** – How often to send vehicle status records (defined in Vehicle Records per Status Period) to PLC memory in milliseconds. The default is 100 ms.

- **Tag Request Retry Timeout** – Time the HLC must wait for the PLC to acknowledge a tag operation in milliseconds. The default is 250 ms.

- **PLC Host Disconnect Action** – Identifies the action to be taken on all paths in the event the EtherNet/IP interface to the host controller disconnects. The default is None.
    - **None** – No action is performed when disconnect occurs.
    - **Suspend** – Directs all motors on the specified paths to suspend vehicle target requests and permissions and causes all vehicles to come to a controlled stop.

- **Enable NC Remote Mgmt** – Select to push NC remote management response tags to PLC memory.

- **Enable Extended HLC Status** – Select to push extended HLC status tags to PLC memory.

- **Enable Extended NC Status** – Select to push extended node controller status tags to PLC memory.

- **Enable Vehicle Commands** – Select to push vehicle command response tags to PLC memory. The vehicle subcommands supported include; Clear Suspect Bit

Host Controller TCP/IP Communication Protocol User Manual Addendum

This section is an addendum to the *Host Controller TCP/IP Communication Protocol User Manual* to support the vehicle subcommands feature. The additions to the protocol for communication between the high level controller (HLC) and a host controller that is equipped with a TCP/IP interface are described.

Host Controller to HLC Communications

This section describes the commands (listed in Table 1) sent from the host controller to the HLC as asynchronous requests for the transport system to perform an action. These requests are responded to by the HLC by routing the command to the appropriate node controller for completion and sending HLC responses to the host controller (listed in Table 2).

Table 1: Host Controller to HLC Commands

Description and Value	Use	Page
Vehicle Command (0xBF 03 04)	MM LITE	12

Vehicle Command (0xBF 03 04)

Type

Host Controller → HLC

Purpose

Used to send vehicle-specific subcommands to the motor controllers.

Support

This command is supported in the latest software release for the following product lines:

- MagneMover LITE transport systems.

Format

Offset	Item	Bytes	Range
0	Command Header	1	0xBF
1	Extension Type	1	0x03
2	Extension Subtype	1	0x04
3	Vehicle ID	2	1–65535
5	Subcommand	1	Values are: 0x00 – Clear vehicle suspect bit

Arguments

Command Header – Fixed message type that identifies this message as a Host Extension command.

Extension Type – Fixed extension type that identifies this command as a Vehicle extension command.

Extension Subtype – Fixed extension subtype that identifies this command as a Vehicle Command extension command.

Vehicle ID – The ID of the vehicle targeted by this command. The ID must be a nonzero integer that references a vehicle that exists in the transport system.

Subcommand – Fixed value that identifies the vehicle subcommand to execute.

Value	Subcommand
0x00	**Clear vehicle suspect bit –** Commands the master controller (motor) responsible for the specified vehicle to clear the suspect bit in the vehicle record for the vehicle.

Response

After receiving the command and verifying command parameters, the HLC sends either a ‘Command Accepted’ or ‘Command Rejected’ response as appropriate (refer to Command Status). If the command is accepted, the HLC routes the command to the master controller (motor) responsible for the vehicle.

On command completion, the HLC sends a ‘Command Complete’ or a ‘Command Failed’ response.

See Also

Command Status (0xD0) on page 15

HLC to Host Controller Communications

This section describes the responses (listed in Table 2) that are sent from the HLC to the host controller as asynchronous responses from the transport system after performing an action.

Table 2: HLC to Host Controller Responses

Description and Value	Use	Page
Command Status (0xD0)	MM LITE	15

Command Status (0xD0)

Type

HLC → Host Controller

Purpose

Acknowledges the reception or rejection of a command, signals command execution failure, or signals command completion.

NOTE: Receipt of a valid command or the event of a command completion is required.

Support

This response is supported in the latest software release for the following product lines:

- MagneMover LITE transport systems.

Format

Offset	Item	Bytes	Range
0	Response Header	1	0xD0
1	Command	1	0xB0–0xBC, 0xBF
2	Command Status	1	0x00–0x80
3	Command Data Detail	Varies	Varies for each command

Arguments

Response Header – Fixed message type that identifies this message as a Command Status response message.

Command – Header of the command that this message is acknowledging.

Cmd	Ext	Sub	Command	Valid Command Status Values
0xBF	0x03	0x04	Vehicle Command	0x00, 0x05, 0x0C, 0x0D, 0x12, 0x41, 0x42, 0x80

Command Status – The status of the command that this message is acknowledging, see HLC Status Codes on page 23.

Command Data Detail – Variable amount of data that provides the details of the command that is specified in the Command field.

Cmd	Ext	Sub	Command Description	Command Data
0xBF	0x03	0x04	Vehicle Command	Extension Type (1 byte) Extension Subtype (1 byte) Vehicle ID (2 bytes) Subcommand (1 byte)

See Also

Vehicle Command (0xBF 03 04) on page 12

Host Controller EtherNet/IP Communication Protocol User Manual Addendum

This section is an addendum to the *Host Controller EtherNet/IP Communication Protocol User Manual* to support the vehicle subcommands feature. The additions to the protocol for communication between the high level controller (HLC) and a host controller that is equipped with an EtherNet/IP interface are described.

Host Controller to HLC Communications

This section describes Explicit Message types and Tag memory formats that traverse TCP connections between the host controller (PLC) and the HLC.

Command (explicit) messages (listed in Table 3) are sent from the host controller to the HLC to request the HLC to perform an action. These requests are responded to by the HLC by routing the command to the appropriate master controller (motor) for completion and updating the corresponding response tags in PLC memory (listed in Table 6).

Table 3: PLC to HLC Explicit Message Requests

Message Name	Message Element	Use	Page
Vehicle Command Message	udt_MMI_vehicle_command	MM LITE	18

Vehicle Command Message

Type

Host Controller → HLC

Purpose

Contains one or more entries of type udt_MMI_vehicle_command used to specify vehicle subcommands.

Each command is monitored via its corresponding udt_MMI_vehicle_command_status entry in the MMI_vehicle_command_status tag.

Support

This command is supported in the latest software release for the following product lines:

- MagneMover LITE transport systems.

Message Element Data Type

The UDT that is described in Table 4 shows each field that is used to create udt_MMI_vehicle_command and its data type, style, and range. The table also shows the size of the UDT in bytes. Each field is described in more detail following the table.

Table 4: UDT Configuration for udt_MMI_vehicle_command

Field Name	Data Type	Style	Range
vehicle_id	INT	Decimal	1–65535
subcommand	SINT	Hex	**Values are:** 0x00 – Clear Vehicle Suspect Bit
active_flag	SINT	Hex	0 – HLC skips this entry 1 – HLC processes this entry
command_count	DINT	Hex	0x0–0xFFFFFFFF
Data Type Size			8 bytes

UDT Field Descriptions

vehicle_id – The ID of the vehicle targeted by this command. The ID must be a nonzero integer that references a vehicle that exists in the transport system.

Subcommand – Fixed value that identifies the vehicle subcommand to execute.

Value	Subcommand
0x00	**Clear vehicle suspect bit** – Commands the master controller (motor) responsible for the specified vehicle to clear the suspect bit in the vehicle record for the vehicle.

active_flag – This flag is used in configurations where a static table of udt_MMI_vehicle_command entries is used and the same table is sent every time. The HLC only processes those entries with the active_flag set.

Value	Description
0x00	The HLC skips the entry for this vehicle.
0x01	The HLC processes the entry for this vehicle.

command_count – Host controller derived unique counter, which is used to confirm that the HLC has received the command and to determine command status. This counter provides a convenient handshake mechanism to determine command status by matching the counter with the fields in the MMI_vehicle_command_status array.

Use of a scratch DINT tag as a counter is suggested. The scratch DINT tag can be incremented and copied to the command_count field each time a new vehicle subcommand is issued so the new command can be tracked against the various count fields that are described in MMI_vehicle_command_status.

Message Configuration

The **Source Element** vehicle_command shown in Table 5 is an array of data type udt_MMI_vehicle_command. It can be one tag with the Number of Elements set to 1, or it can an array with the Number of Elements set to the maximum of 256. When the **Source Element** is configured to use an array, the message can send multiple udt_MMI_vehicle_command s to the HLC with one message. The **Destination Element** is defined as the name of the tag (MMI_vehicle_command).

Table 5: Message Configuration for MMI_vehicle_command

Message Type	CIP Data Table Write
Source Element	vehicle_command
Tag Data Type	udt_MMI_vehicle_command
Number of Elements	Min: 1, Max: 256
Destination Element	MMI_vehicle_command

Response

After receiving the command, the HLC verifies the command parameters and updates MMI_vehicle_command_status as appropriate. If the command is accepted, the HLC routes the command to the master controller (motor) responsible for the vehicle. Once the command completes, the HLC updates MMI_vehicle_command_status to indicate completion.

See Also

MMI_vehicle_command_status on page 21

HLC to Host Controller Communications

This section describes the Status and Response Memory Tags that the HLC updates to interoperate with the PLC.

The HLC updates the Status Tags (listed in Table 6) on state change. Status Tags are informational for the PLC for disseminating status about the vehicle command functions.

Table 6: HLC to PLC Status Memory Tags

Message Name	Message Element	Use	Page
MMI_vehicle_command_status	udt_MMI_vehicle_command_status	MM LITE	21

MMI_vehicle_command_status

Type

HLC → Host Controller

Purpose

Reports the status of vehicle subcommands in the transport system. This tag is a one-dimension array of type udt_MMI_vehicle_command_status indexed by vehicle ID. This array must be sized the same as the MMI_vehicle_status array. The current minimum size is 257 entries. The MMI_vehicle_command_status array is updated only in response to an MMI_vehicle_command message sent from the PLC to the HLC.

This tag array is used to handshake vehicle subcommands so the PLC logic can know that the HLC received a command. The tag can then be either accepted it for processing, or rejected it with an appropriate error code. The tag array can be consulted to determine if a command completed and whether it completed successfully or an error occurred.

Support

This command is supported in the latest software release for the following product lines:

- MagneMover LITE transport systems.

Tag Format

Tag Name	MMI_vehicle_command_status
Type	udt_MMI_vehicle_command_status
Array	Yes
Array Dimension Limits	Minimum array size: 257 Maximum array size: 1281 Array index corresponds to HLC vehicle ID. Since vehicle ID 0 is invalid, array element 0 is not written to.

Message Element Data Type

The UDT that is described in Table 7 shows each field that is used to create udt_MMI_vehicle_command_status and its data type, style, and range. The table also shows the size of the UDT in bytes. Each field is described in more detail following the table.

A tag of name MMI_vehicle_command_status must be created as a one-dimensional array of the UDT with the size the maximum number of vehicles plus 1. If the transport system has a known maximum number of vehicles that does not exceed 256, the array can be dimensioned to the minimum size to save on tag memory space.

Table 7: UDT Configuration for udt_MMI_vehicle_command_status

Field Name	Data Type	Style	Range
last_command_count_received	DINT	Hex	0x0–0xFFFFFFFF
last_command_count_accepted	DINT	Hex	0x0–0xFFFFFFFF
last_command_type_received	SINT	Hex	**Values are:** 0x00 – Clear Vehicle Suspect Bit
last_command_received_status	SINT	Hex	**Clear Suspect Bit** 0x00, 0x05, 0x0C, 0x0D, 0x12
last_command_type_accepted	SINT	Hex	**Values are:** 0x00 – Clear Vehicle Suspect Bit
last_command_accepted_completion_status	SINT	Hex	0x41, 0x42, 0x80
Data Type Size			12 bytes

UDT Field Descriptions

last_command_count_received – The HLC writes the command_count field of the most recently received vehicle subcommand to this field. PLC logic can use this field to determine if the HLC received a vehicle subcommand.

last_command_count_accepted – The HLC writes the command_count field of the most recently accepted vehicle subcommand to this field when the HLC accepts a command. PLC logic can use this field to determine if a vehicle subcommand received by the HLC has been accepted.

last_command_type_received – The HLC writes the command type of the most recently received vehicle subcommand to this field.

last_command_received_status – The HLC writes an acceptance or rejection status to this field upon receiving a new vehicle subcommand from the PLC. See HLC Status Codes on page 23 for the meaning of the status codes.

last_command_type_accepted – The HLC writes the command type of the most recently accepted vehicle subcommand to this field. This field is not updated when a received command is rejected.

last_command_accepted_completion_status – The HLC writes the completion status of the last_command_count_accepted to this field when a vehicle subcommand actually completes or fails. See HLC Status Codes on page 23 for the meaning of the status codes.

See Also

Vehicle Command Message on page 18

HLC Status Codes

Table 8 lists the status codes that the HLC returns when it accepts, rejects, or completes vehicle subcommands.

Table 8: HLC Status Codes

Status Value	Status Description
0x00	Command Accepted
0x05	Command Rejected – E-stop signal active
0x0C	Command Rejected – Initialization has not completed
0x0D	Command Rejected – Reset active
0x12	Command Rejected – Unrecognized command
0x41	Command Failed – Unable to complete
0x42	Command Failed – Timed out
0x80	Command Completed Successfully

More Information

MagneMotion website: www.magnemotion.com

Questions and Comments: www.magnemotion.com/about-magnemotion/contact.cfm

Revision History

Ver.	Change Description
A	Initial release

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

Rockwell Automation maintains current product environmental information on its website at http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page.

Product certificates are located in the Rockwell Automation Literature Library: http://www.rockwellautomation.com/global/literature-library/overview.page

Rockwell Otomasyon Ticaret A.Ş., Kar Plaza İş Merkezi E Blok Kat:6 34752 İçerenköy, İstanbul, Tel: +90 (216) 5698400

www.rockwellautomation.com

Power, Control, and Information Solutions Headquarters
Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846