MechoNet RS-232 Protocol Document - ZGN

1.0 Scope

This document describes the ZGN communication interface for RS232 which is specifically available to any third party to operate and monitor window coverings attached to the MechoNet communication network. It is designed to support various serial interface devices including IQ/MLC2 and the MechoNet Network Interface (MNI). For those third parties who wish to support an enhanced driver that interacts with the full feature set of MechoNet including various automation solutions like occupancy sensors, schedulers, daylight sensors or SolarTrac®/SunDialer® solutions please contact Technical Support at MechoSystems to arrange for a discussion with Engineering (+1 718-729-2020, x2006 or email techsupport@mechosystems.com)

MechoNet is a bi-directional, double-terminated low voltage bus capable of supporting serial control for thousands of motorized window coverings over a common, scalable backbone. Its CSMA-CD architecture helps ensure reliable and responsive communication without concerns for lost messages. Devices attached to the network (nodes) are wired in a daisy chain fashion and each segment of the network can handle up to 250 nodes maximum over 4000 ft. of Cat 5/5e/6 cabling. The addressing structure is capable of being implemented in a hierarchical fashion or non-hierarchical fashion to support over 65,000 control addresses whereby most window coverings may be controlled at multiple levels by up to 9 different addresses.

MechoNet supports control of a variety of window covering types including, but not limited to, motorized roller shades, roman shades, draperies and louvers/venetian blinds. In order to function on the bus these window coverings must ultimately be controlled by a MechoSystems control card with MechoNet communication capability. The motor may inherently possesses a MechoNet communication card like WhisperShade IQ2, or the motor may be non-intelligent but accesses the bus through one of MechoSystems' motor controllers such as the IQ/MLC2 or MechoNet Network Interface (MNI).

2.0 Communication Settings

In order to communicate via RS232 with MechoNet through the serial interface device, the communication settings for the port on the third party equipment should conform to:
- Baud Rate: 19200
- Data Bits: 8
- Start Bits: 1
- Stop Bits: 1
- Parity: None
- Flow Control: None

Communication Port

The RS-232 Port for the MechoNet serial interface device employs an RJ12 connector with the following pin assignments:

IQ/MLC2:

Serial Port: (RS232)
6-conductor, 26 AWG Silver Satin Cable or 3UTP Cat-3/5/6
25 ft Max

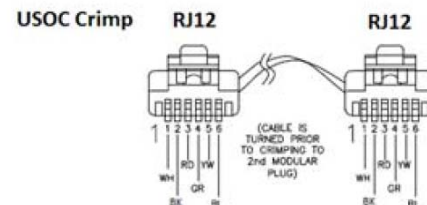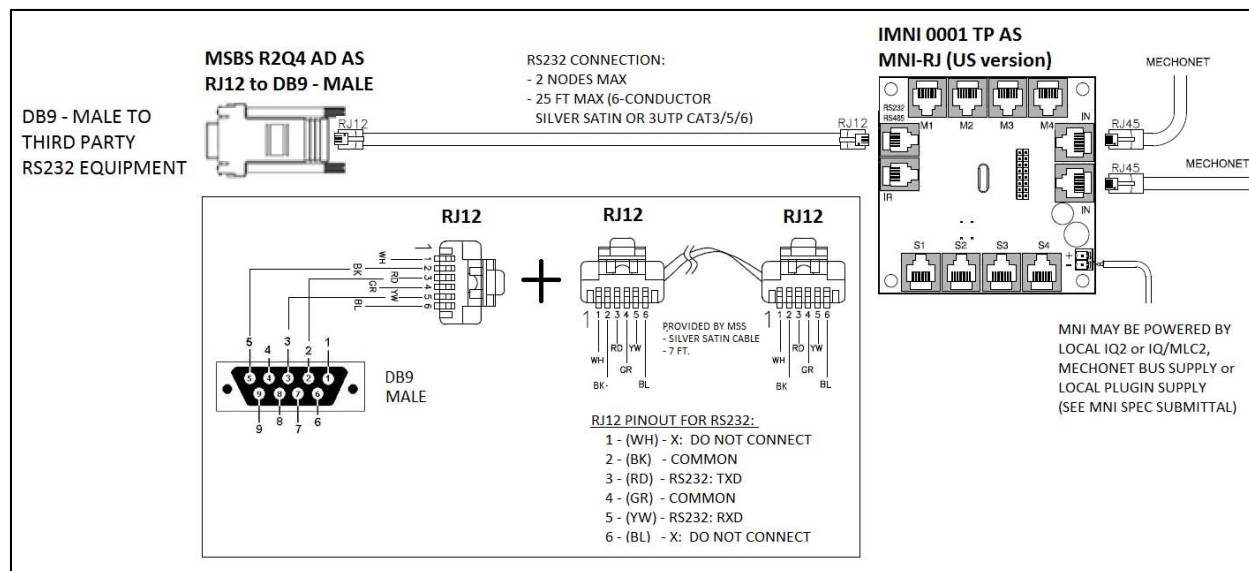| RJ12 pin	connection	symbol	Third Party RS-232 DB9 connection
1	N/C		X
2	Common	COM-RS/IR	DB9 COM: Pin5
3	RS232-TXD	TXD	DB9 RX: Pin2
4	Common	COM-RS/IR	DB9 COM: Pin5
5	RS232-RXD	RXD	DB9 TX: Pin3
6	N/C		X
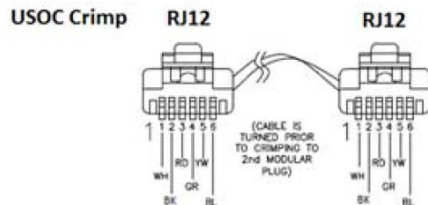
MNI:

Serial Port: (RS232/RS485)
6-conductor, 26 AWG Silver Satin Cable or 3UTP Cat-3/5/6
25 ft Max

RJ12 pin	connection	symbol	Third Party RS-232 DB9 connection
1	RS485-A	A	X
2	Common	COM-RS/IR	DB9 COM: Pin5
3	RS232-TXD	TXD	DB9 RX: Pin2
4	Common	COM-RS/IR	DB9 COM: Pin5
5	RS232-RXD	RXD	DB9 TX: Pin3
6	RS485-B	B	X

Below is an example RS232 integration wiring diagram between the MNI and a third party DB9 adapter:

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3.0 Broadcast Commands (1-way)

The ZGN protocol follows an ASCII-based format. Broadcast command messages are intended to be 1-way messages broadcast across the entire network so that a single command can tell multiple nodes to do a specific task. Command packets utilize the following structure:
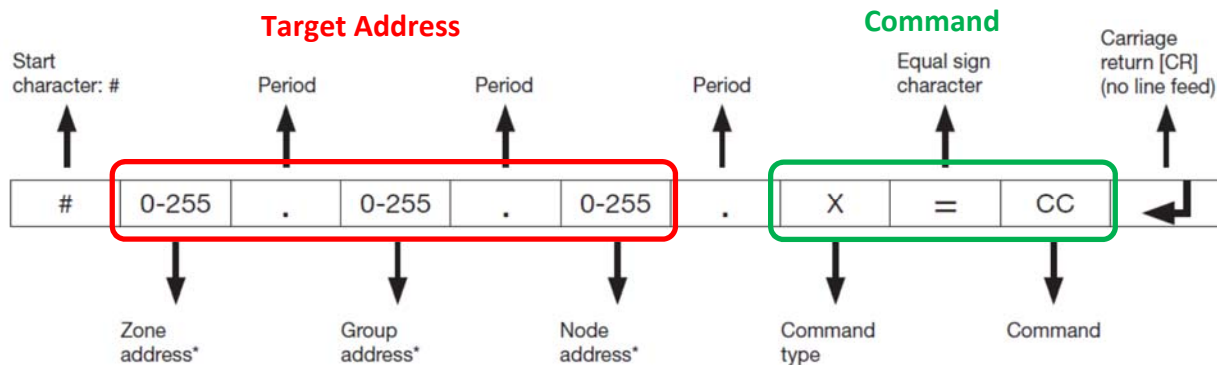
Where

- Start character   "#"   (Decimal:35, Hex:$23)
- Target Address   Z.G.N   Ranges from 0.0.0 to 255.255.255 - See section 5.0
- Delimeter   "."   (Decimal:46, Hex:$2E)
- Command Type   X   A or B (See tables on pages 5 and 6)
- Command Delimeter: "="   (Decimal:61, Hex:$3D)
- Command   CC   (See table on page 5)
- End character   "<CR>" (Decimal:13, Hex:$D) Carriage Return w/o LF

Examples:

1. Move window coverings with ZGN 1.1.0 UP   #1.1.0.A=UP<CR>
2. Move window coverings with ZGN 255.1.255 DOWN   #255.1.255.A=DN<CR>
3. STOP window coverings with ZGN 1.2.3   #1.2.3.A=ST<CR>
4. Move all window coverings to Preset 1   #0.0.0.A=G1<CR>

Target Address - ZGN:

After the start character, the first part of a broadcast command identifies the target address of the device(s) to which the message is intended. This address is called a ZGN Address which is named for the 3 hierarchical levels that comprise it: **Z**ones, **G**roups and **N**odes or "ZGN". In a broadcast command, each level of the ZGN address is separated by a "." delimiter. (i.e. In the first example above, 1.1.0 is the ZGN Target Address.)

The hierarchy in the addressing structure enables the person planning the network to offer some organization to the project. By employing a hierarchy within the addressing scheme, one can take advantage of features like using "0" as a wild card for a zone, group or node portion of the address in order to move a specific grouping of motors (see below).

The structure of the ZGN Address is as follows:
- Node Address: A node is a communicating device that is attached to a network. Therefore, the node address is envisioned to be the lowest grouping level on the MechoNet network. Typically, it is setup to facilitate individual control. The node address can range from 0 to 255 where 0 is a wildcard that includes all node addresses. When coding the node address into a command over RS232 each digit is individually coded into the command. (ie. The address 100 is coded as an ASCII "1" + ASCII "0" + ASCII "0" in 3 bytes. The address 1 is coded as an ASCII "1" using a single byte where the leading 0s are dropped.)

- Group Address: This address structure is designed to support a "group" of multiple node addresses. For example, a group address can be setup to organize nodes within a room or within a floor. The node address can range from 0 to 255 where 0 is a wildcard that includes all node addresses. When coding the node address into a command over RS232 each digit is also individually coded into the command just like the Node address.

- Zone Address: This address structure is designed to support a "zone" of multiple group addresses. For example, a zone address can be setup to organize nodes within a floor or a building (multi-building campus). The node address can range from 0 to 255 where 0 is a wildcard that includes all node addresses. When coding the node address into a command over RS232 each digit is additionally individually coded into the command just like the Node and Group addresses.

Window covering motors (motorized shades, blinds, drapes, etc.) can be attached to the MechoNet network either through a controller (ie. IQ/MLC2) or they can possess their own intelligence and attach directly to the network (ie. IQ2 Electronic Drive Unit). As such, each motor is capable of responding to up to 9 levels of ZGN addresses over the network which includes a dedicated local switch control address. The local switch control address is a special control structure within MechoNet that is differentiated because it represents an override that is local to the motor's location. Here the user is directly experiencing the impact of the shade position and therefore commands from this source have priority over other types of commands such as automation commands.

For MechoSystems projects, the dealer for the window coverings can provide an address table to third parties to support integration with the relevant window covering address configurations.

Commands
The next feature in the message structure identifies the command being sent to the target address. The command is comprised of a command type (X) and the associated command (CC) being issued. Type A commands are called Local Override Commands which enable window coverings to be overridden as if someone is standing local to the shade. These are high priority

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commands that take precedence over other types of commands that may originate from automation or scheduling controllers.

Type A commands can override the position of the window covering over MechoNet in the same way that a low voltage dry contact switch does through the Local Switch Port on an IQ/MLC2 or IQ2 Dual Splitter connected directly to a WhisperShade IQ2. This port provides one-touch positioning capability through a switch for up/open, down/close, stop and movement to any one of three (3) presets which default to 25% closed, 50% closed and 75% closed.

NOTE: In the diagram on the following page you will notice that there is no STOP command button shown on a standard IQ2 Decorator Switch. This is because the switch is designed to stop the window covering from moving by a button press on any button. However, because MechoNet commands are sent remotely to the targeted motor over the network, shades will operate exactly as they are commanded. Therefore, only a dedicated STOP command can actually stop a shade before it reaches its upper or lower limits. In addition, if a second command is sent prior to the motor finishing the first command, then the motor/window covering shall begin to follow the second command.
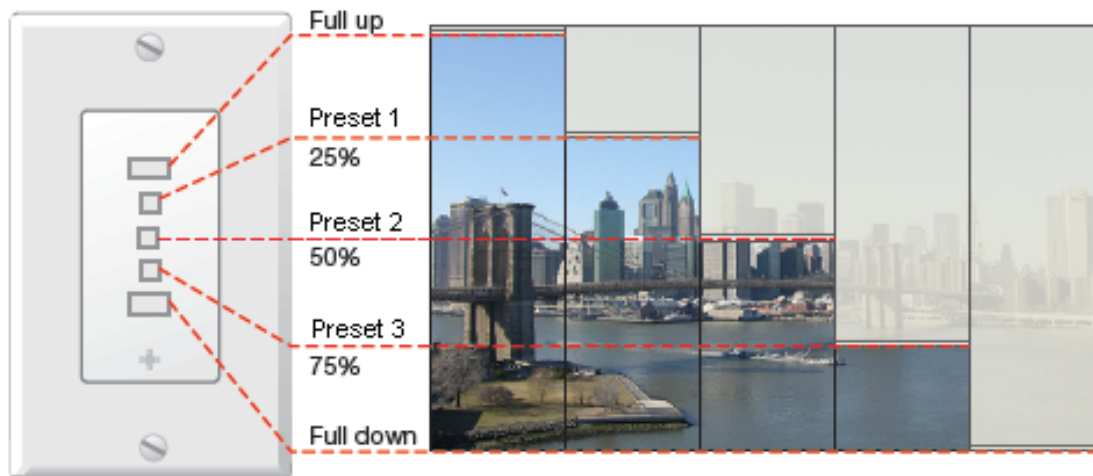
The ZGN commands available for Type A commands are listed in the following table:

Functions	Type (X)	Command (CC)	Description
Motor Control (Override)	A	DN	Down: Moves the window covering to the Bottom Limit or Closed Limit.
		UP	Up: Moves the window covering to the Top Limit or Open Limit.
		ST	Stop: Stops the window covering movement.
		G1	Goto Preset 1: Moves the window covering to preset position 1 which defaults to 25% down / closed.
		G2	Goto Preset 2: Moves the window covering to preset position 2 which defaults to 50% down / closed.
		G3	Goto Preset 3: Moves the window covering to preset position 3 which defaults to 75% down / closed. NOTE – there are up to 32 preset positions for window coverings motorized with the IQ2 Motor. However, only presets 1-3 are available through the low voltage switch input control. Call Technical Support for further details.

4.0 Query Commands (2-way)

The Query command is a special command which enables a third party to retrieve the position of the window covering. The format of the message is the same as that for Broadcast Commands except that CC = QY. For example:

Query the window covering position for ZGN 1.1.0:   #1.1.0.A=QY<CR>

However, these messages are different than broadcast commands in that a Query command will generate a response from nodes that match the Target Address. Because ZGN messages can apply to groups of motors, the response commands must have a way of identifying uniquely which node is responding. Therefore, each node on a MechoNet system possesses a special unique address identifier called the UID. This is a 2 byte address (0 to 9,999) given at the time of manufacturing which should be unique within the network.

Query response packets utilize the following structure:
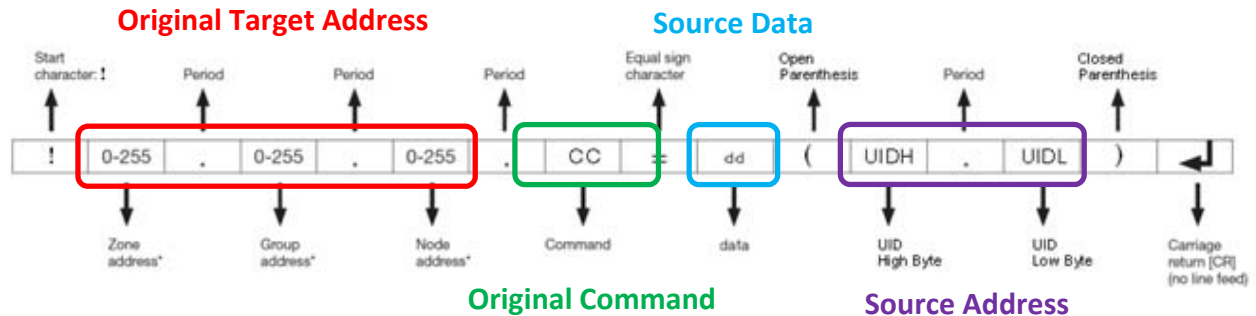
Where
- Start Character   "!"   (Decimal:33, Hex:$21)
- Original Target Address Z.G.N   Ranges from 0.0.0 to 255.255.255 - See section 5.0
- Delimiter   "."   (Decimal:46, Hex:$2E)
- Original Command   "QY"   CC = Query Command
- Command Delimiter: "="   (Decimal:61, Hex:$3D)
- Source Data   dd   Position of the source formatted in Hex

                                   The actual encoder value will be scaled to fit

                                   $00 = Top Limit

                                   $FF = Bottom Limit

- Source Address
  - Delimiter   "("   (Decimal:40, Hex $28)
  - UID High Byte   UIDH   Represented in decimal ranging from 0-39

                                   Actual value is the integer of UID/256

  - Delimiter   "."   (Decimal:46, Hex:$2E)
  - UID Low Byte   UIDL   Represented in decimal ranging from 0-255

                                   Actual value is the remainder of UID/256

  - Delimiter   ")"   (Decimal: 41, Hex:$29)
- End Character   "<CR>" (Decimal:13, Hex:$D) Carriage Return w/o LF

NOTE1: The start character is different than the Broadcast Command start character.

NOTE2: The Query Command can take up to 15 seconds worst case to ensure all nodes respond when taking into account worst case message collisions.

Examples

Query the position of the shades for ZGN 1.1.0:

      Command: **#1.1.0.A=QY<CR>**
      Response: !1.1.0.QY=FF(2.128)<CR>
      Response: !1.1.0.QY=FF(2.129)<CR>

There are 2 responses. Therefore, there are 2 shade motors that possess the ZGN 1.1.0 within their address table.

These 2 shades possess UIDs 640 (2x256+128) and 641 (2x256+129).

These 2 shades are positioned at the bottom limit of their shade travel ($FF).

NOTE: this does not mean that the 2 shades are the same height! The query position command provides relative information about the shade position since 00 = the top limit while FF = the bottom limit.

Query the position of the shades for ZGN 255.4.255:

      Command: **#255.4.255.A=QY<CR>**
      Response: !1.1.0.QY=7F(0.4)<CR>

There is only 1 response. Its UID is 4 (0x256+4).

This shade is positioned at its mid-point ($7F). This is typically preset 2.

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