

MEGAJOLT LITE JR.

PROGRAMMABLE IGNITION CONTROLLER

Controller API Documentation Version 3.1.0 / 2.7.0

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Revision 1: 10 Jan 2007
Revision 2: 11 Jan 2007

1 Overview

This document specifies the communication protocol used for the MegaJolt Lite Jr. (MJLJ) Ignition Controller.

1.1 Communications

The MJLJ Controller provides a standard RS232 Serial interface via a 9-pin DB9 female connector. The serial port configuration is described in Table 1.

Baud Rate	4800
Data Bits	8
Parity	None
Stop bits	1
Flow Control	None

Table 1: Serial Port Specifications

1.2 Protocol Description

The MJLJ Ignition Controller employs a simple command-response sequence to perform various operations upon the controller.

Commands are coded with a single character and, if applicable, a stream of data which flows to or from the controller. Figure 1 illustrates a command which updates a single cell in the ignition table:

Byte	1	2	3
Data	0x75 (ASCII 'u')	0x11	0x14
Description	Command	RPM / Load Bin	Ignition advance value

Figure 1: Example Update Cell Command

2 API Reference

2.1 Get Version

The Get Version command returns the current firmware version of the controller. The version indicates both hardware and API versions. As it is possible to load a version of firmware that does not match the targeted hardware, the Get Version command can not guarantee the version of hardware. Physical inspection of the controller circuit board will be required for absolute verification.

Byte	Description
1	character 'V' : ASCII 0x56

Table 2: Get Version Command

Byte	Description
1	Major version
2	Minor version
3	Bugfix version

Table 3: Get Version Response

2.2 Get State

The Get State command returns the current state of the controller. This command is retained for V3.0.0 / V2.5.0 compatibility.

The raw RPM count represents the number of microseconds elapsed between PIP signals emitted by the EDIS module. RPM may be calculated using the following formula:

$$\text{RPM} = 60 * (1 / ((\text{rpmTicks} / 1000000) * \text{cylinder}))$$

where:

cylinder = 2 for 4 cylinder engines

cylinder = 3 for 6 cylinder engines

cylinder = 4 for 8 cylinder engines

rpmTicks = 16 bit value- High Byte:Low Byte

Byte	Description
1	character 'S' : ASCII 0x53

Table 4: Get State Command

Byte	Description
1	Current advance Degrees
2	Raw RPM Count, high byte
3	Raw RPM Count, low byte
4	Current RPM Bin
5	Current Load Bin
6	Current Load Value (KPa or TPS%)

Table 5: Get State Response

2.3 Get State Ex

Like the Get State Command, the Get State Ex returns the current runtime state of the controller. The command is extended to indicate status of programmable outputs and the currently active ignition configuration.

The raw RPM count represents the number of microseconds elapsed between PIP signals emitted by the EDIS module. RPM may be calculated using the following formula:

$$\text{RPM} = 60 * (1 / ((\text{rpmTicks} / 1000000) * \text{cylinder}))$$

where:

cylinder = 2 for 4 cylinder engines

cylinder = 3 for 6 cylinder engines

cylinder = 4 for 8 cylinder engines

rpmTicks = 16 bit value- High Byte:Low Byte

Byte	Description
1	character '\$' : ASCII 0x24

Table 6: Get State Ex Command

Byte	Description
1	Current advance Degrees
2	Raw RPM Count, high byte
3	Raw RPM Count, low byte
4	Current RPM / Load Bins High 4 bits: RPM Bin Low 4 bits: Load Bin
5	Current Load Value (KPa or TPS%)
6	Controller State Bit 0: User Output 1 state (set=active; clear=inactive) Bit 1: User Output 2 state (set=active; clear=inactive) Bit 2: User Output 3 state (set=active; clear=inactive) Bit 3: User Output 4 state (set=active; clear=inactive) Bit 4: Rev Limit state (set=active; clear=inactive)

Bit 5: Shift Light state (set=active; clear=inactive) Bit 6: Reserved Bit 7: Currently active ignition configuration (set=Configuration 1; clear=Configuration 2)
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Table 7: Get State Ex Response

2.4 Get Ignition Configuration

The Get Ignition Configuration returns the currently active Ignition Configuration in the controller's RAM memory.

Byte	Description
1	character 'C' : ASCII 0x43

Table 8: Get Ignition Configuration Command

Byte	Description
1 - 10	RPM Bin values, from low to high Encoding: RPM value / 100
11 - 20	Load Bin values, from low to high Encoding: KPa (0 – 255) or TPS% (0 - 100)
21 - 120	Ignition Map Encoding: Ignition advance values (0 – 59 degrees) organized in a 100 element, 10 x 10 array in Row–major order. (Row == Load axis)
121	Number of Cylinders allowed values: 4, 6, 8
122	User Output configuration Bit 0: Output 1 Type (set = RPM; clear = Load) Bit 1: Output 2 Type (set = RPM; clear = Load) Bit 2: Output 2 Type (set = RPM; clear = Load) Bit 3: Output 3 Type (set = RPM; clear = Load) Bit 4: Output 1 Mode (set = Normal; clear = Inverted) Bit 5: Output 2 Mode (set = Normal; clear = Inverted) Bit 6: Output 3 Mode (set = Normal; clear = Inverted) Bit 7: Output 4 Mode (set = Normal; clear = Inverted)
123	User Output 1 threshold value encoding: Load, KPa : 0 – 255 Load, TPS%: 0 – 100 RPM (x100): 0 – 100
124	User Output 2 threshold value encoding: Load, KPa : 0 – 255 Load, TPS%: 0 – 100 RPM (x100): 0 – 100

125	User Output 3 threshold value encoding: Load, KPa : 0 – 255 Load, TPS%: 0 – 100 RPM (x100): 0 – 100
126	User Output 4 threshold value encoding: Load, KPa : 0 – 255 Load, TPS%: 0 – 100 RPM (x100): 0 – 100
127	Rev Limit threshold value encoding: RPM (x100): 0 – 100
128	Shift Light threshold value encoding: RPM (x100): 0 – 100

Table 9: Get Ignition Configuration Response

2.5 Update Ignition Configuration

The Update Ignition Configuration command loads new ignition configuration values to the controller's RAM. There is no response from the controller upon command completion.

Byte	Description
1	Character 'U': ASCII 0x55
1 - 10	RPM Bin values, from low to high Encoding: RPM value / 100
11 - 20	Load Bin values, from low to high Encoding: KPa (0 – 255) or TPS% (0 - 100)
21 - 120	Ignition Map Encoding: Ignition advance values (0 – 59 degrees) organized in a 100 element, 10 x 10 array in Row-major order. (Row == Load axis)
121	Number of Cylinders allowed values: 4, 6, 8
122	User Output configuration Bit 0: Output 1 Type (set = RPM; clear = Load) Bit 1: Output 2 Type (set = RPM; clear = Load) Bit 2: Output 2 Type (set = RPM; clear = Load) Bit 3: Output 3 Type (set = RPM; clear = Load)

	Bit 4: Output 1 Mode (set = Normal; clear = Inverted) Bit 5: Output 2 Mode (set = Normal; clear = Inverted) Bit 6: Output 3 Mode (set = Normal; clear = Inverted) Bit 7: Output 4 Mode (set = Normal; clear = Inverted)
123	User Output 1 threshold value encoding: Load, KPa : 0 – 255 Load, TPS%: 0 – 100 RPM (x100): 0 – 100
124	User Output 2 threshold value encoding: Load, KPa : 0 – 255 Load, TPS%: 0 – 100 RPM (x100): 0 – 100
125	User Output 3 threshold value encoding: Load, KPa : 0 – 255 Load, TPS%: 0 – 100 RPM (x100): 0 – 100
126	User Output 4 threshold value encoding: Load, KPa : 0 – 255 Load, TPS%: 0 – 100 RPM (x100): 0 – 100
127	Rev Limit threshold value encoding: RPM (x100): 0 – 100
128	Shift Light threshold value encoding: RPM (x100): 0 – 100

Table 11: Update Ignition Configuration Command

2.6 Update Ignition Cell

The Update Ignition Cell command updates a single cell in the ignition table. There is no response from the controller upon command completion.

Byte	Description
1	Character 'u' : ASCII 0x75
2	RPM / Load Bin encoding: high 4 bits: RPM Bin low 4 bits: Load Bin
3	New ignition advance value (0 – 59 degrees)

Table 12: Update Ignition Cell Command

2.7 Write Ignition Configuration to Flash

The Write Ignition Configuration to Flash command copies the ignition configuration values in controller RAM to the non-volatile storage in the controller's flash memory. There is no response from the controller upon command completion.

If the switchable ignition configuration option is enabled, the controller will write Ignition Configuration 1 when the Option port on the controller is logical low, or Configuration 2 when the Option port is logical high. If the switchable ignition configuration option is disabled, the controller will default to Configuration 1.

Byte	Description
1	Character 'W' : ASCII 0x57

Table 13: Write Ignition Configuration to Flash

2.8 Get Load Calibration

The Get Load Calibration command retrieves the calibration data used for the internal MAP sensor or TPS input, depending on controller configuration.

Byte	Description
1	Character 'l' : ASCII 0x6C

Table 14: Get Load Calibration Command

Byte	Description
1-256	Load calibration data. The raw analog-digital converter from the MAP or TPS sensor value is mapped to the value specified in this table. This mapped, or scaled, value is used to select the appropriate Load bin during ignition advance calculations.

Table 15: Get Load Calibration Response

2.9 Update Load Calibration

The Update Load Calibration Command writes a new load axis calibration table directly to the controller's flash memory.

During command processing, ignition advance calculation and communication with the EDIS module is not active.

Byte	Description
1	Character 'L' : ASCII 0x4C
2-257	Load calibration data. The raw analog-digital converter from the MAP or TPS sensor value is mapped to the value specified in this table. This mapped, or scaled, value is used to select the appropriate Load bin. NOTE: A 200ms delay is required after the first 128 bytes of the load calibration data.

Table 16: Update Load Calibration command

2.10 Read Load ADC

The Read Load ADC command retrieves a raw analog-digital reading

Byte	Description
1	Character 'a' : ASCII 0x61

Table 17: Read Load ADC command

Byte	Description
1	The raw ADC load axis value. Encoding: 0 – 255 value linearly scaled from 0 – 5v

Table 18: Read Load ADC response

2.11 Get Global Configuration

The Get Global Configuration Command retrieves global controller configuration values. These values contain options and configuration data which are not part of the standard ignition configuration. These values are read from non-volatile flash memory.

Byte	Description
1	Character 'g' : ASCII 0x67

Table 19: Get Global Configuration command

Byte	Description
1	Switchable ignition configuration enabled encoding: 1 = enabled, 0 = disabled
2 – 64	Reserved for future use

2.12 Update Global Configuration

The Update Global Configuration command updates the global controller configuration values. These values contain options and configuration data which are not part of the standard ignition configuration. This command writes the values directly to non-volatile flash memory.

During command processing, ignition advance calculation and communication with the EDIS module is not active.

Byte	Description
1	Character 'G': ASCII 0x47
2	Switchable ignition configuration enabled encoding: 1 = enabled, 0 = disabled
3 – 65	Reserved for future use

Revision History

Revision 1: Initial document version

Revision 2: Corrected various grammatical mistakes; added missing description for Get/Update Global Configuration Data commands; clarified various sections.