Developer Notes
Micro Module Shutter

Micro Module Shutter

(XXXXX - Dev 0x01 / Sub 0xXX)

Version 001
June 28, 2012

Revision History

Rev	Date	Comments
001	6/28/12	Initial Release

Table of Contents

Firmware Description

INSTEON Commands Supported

Standard length common INSTEON commands:

All direct commands will be ignored if the sender's ID is not in the I2CS device's database with the exceptions below. The Micro Module Shutter will reply with a NAK and 0xFF in cmd2 to indicate that the ID is not in the database.

Standard length Micro Module Shutter INSTEON commands:
Assign to ALL-Link Group Command
Description: Sent when holding down the SET Button for 3 seconds on the device. Blinks the LED green for 4 minutes or until linked to another device.
Example (Hex): AA BB CC 01 XX XX CF 01 01 (where AA.BB.CC is the Device's ID)

SD Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Notes
Assign to ALL-Link Group	From Device	Device's ID	0x01, 0xXX, 0xXX (firmware revision)	Broadcast	0x01	0x01	Sent when holding down SET Button for 3 seconds. Group number for Micro Module Shutter is 0x01

Delete from ALL-Link Group Command
Description: Sent when holding down the SET Button for 3 seconds on the device, then pressing and holding the set button for 3 seconds. Blinks the LED red for 4 minutes or until unlinked from another device.
Example (Hex): AA BB CC 01 XX XX CF 02 01 (where AA.BB.CC is the Device's ID)

Delete from ALL-Link Group	From Device	Device's ID	0x01, 0xXX, 0xXX (firmware revision)	Broadcast	0x02	0x01	Group number for Micro Module Shutter is 0x01

Ping Command

Description: Same as holding down the SET Button for 3 seconds on the device, then pressing and holding the set button for 3 seconds. Blinks the LED red for 4 minutes or until unlinked from another device.

Example (Hex): AA BB CC DD EE FF 0F 0A 01 (where AA.BB.CC is the Device's ID, DD.EE.FF is the Sender's Id)

Ping	To device	Sender's ID	Device's ID	Direct	0x0F	0x00 -> 0xFF (Don't Care Value)	
	Response	Device's ID	Sender's ID	Ack	0x0F	Same as sent	

ID Request Command

Description: Same as holding down the SET Button for 3 seconds on the device, then pressing and holding the set button for 3 seconds. Blinks the LED red for 4 minutes or until unlinked from another device.

Example (Hex): AA BB CC DD EE FF 0F 0A 01 (where AA.BB.CC is the Device's ID, DD.EE.FF is the Sender's Id)

ID Request	To device	Sender's ID	Device's ID	Direct	0x10	0x00 -> 0xFF (Don't Care Value)	
	Response	Device's ID	Sender's ID	Ack	0x10	Same as sent	
	Sent from Device	Device's ID	0x01 0xXX 0xXX (firmware revision)	Broadcast	0x01	0x00	Same as holding down SET Button for 3 seconds, but device not in linking mode

SD Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Notes
Status Request	To device	Sender's ID	Device's ID	Direct	0x19	0x00	
	Response	Device's ID	Sender's ID	Ack	Database Delta	Switch On level	

Success Report Broadcast

Description: Sent at the end of a group broadcast

Example (Hex): AA BB CC 11 03 01 CF 06 01 (where AA.BB.CC is the Device's ID, cleanup of cmd1 = 0x11, group = 0x01, 1 out of 3 devices failed to cleanup correctly)

SD Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Notes
Broadcast cleanup	From device	Device's ID	Hi byte = cmd1 being Cleaned up Med byte = Number of devices to be cleaned up Lo byte = Group Number	Group Broadcast	0x06	0x00 -> 0xFF (Number of Failed Cleanups)	

Standard length Micro Module Shutter INSTEON commands:

SD Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Notes
Shutter Open	To device	Sender's ID	Device's ID	Direct	0x11	0x01 -> 0xFF	
	Response	Device's ID	Sender's ID	Ack	0x11	Same as sent	
Shutter Open Fast	To device	Sender's ID	Device's ID	Direct	0x11	0x01 -> 0xFF	
	Response	Device's ID	Sender's ID	Ack	0x11	Same as sent	
Shutter OFF	To device	Sender's ID	Device's ID	Direct	0x13	0x00 -> 0xFF (Don't Care Value)	Go to Off at saved Ramp Rate
	Response	Device's ID	Sender's ID	Ack	0x13	Same as sent	
Shutter OFF Fast	To device	Sender's ID	Device's ID	Direct	0x14	0x00 -> 0xFF (Don't Care Value)	Go to Off instantly
	Response	Device's ID	Sender's ID	Ack	0x14	Same as sent	

SD Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Notes
Read Operating Flags	To device	Sender's ID	Device's ID	Direct	0x1F	Operating Flags Command	See Read Operating Flags Table
	Response	Device's ID	Sender's ID	Ack	0x1F	Same as sent	

Read Operating Flags Table	
0	bit 0 = Plock bit 1 = LED on TX bit 2 = Resume Dim bit 3 = N/A bit 4 = LED OFF bit 5 = LoadSense
1	Data Base Delta flag….gets incremented with any change in the Database

SD Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Notes
Instant On/Off	To device	Sender's ID	Device's ID	Direct	0x21	0x00 -> 0xFF (on level)	Uses instant Ramp Rate
	Response	Device's ID	Sender's ID	Ack	0x21	Same as sent	

RR On	To device	Sender's ID	Device's ID	Direct	0x2E	On level = 16*On + 0F RR = 2*RR+1	
	Response	Device's ID	Sender's ID	Ack	0x2E	Same as sent	

RR Off	To device	Sender's ID	Device's ID	Direct	0x2F	On level = 00 RR = 2*RR+1	
	Response	Device's ID	Sender's ID	Ack	0x2F	Same as sent	

Beep	To device	Sender's ID	Device's ID	Direct	0x30	0x00 -> 0xFF (Don't care value)	Beeps for standard duration (same as Set Button Pressed)
	Response	Device's ID	Sender's ID	Ack	0x30	Same as sent	

Extended length Micro Module Shutter INSTEON commands:

Remote Enter Linking Mode Command
Description: Same as holding down the SET Button for 3 seconds on the device. Blinks the LED red for 4 minutes or until unlinked from another device.

Extended Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Data 1 (1 byte)	Data 2 (1 byte)
Enter Linking Mode	To device	Sender's ID	Device's ID	Extended Direct	0x09	0x00 -> 0xFF (Don't Care Value; Always enter	0x00	See Extended Enter Linking mode Info

						group 0x01 linking)		
	Response	Device's ID	Sender's ID	Ack	0x09	Same as sent		
	Sent from Device	Device's ID	0x01 0xXX 0xXX (firmware revision)	Broadcast	0x01	0x00	Same as holding down SET Button for 3 seconds	Same as holding down SET Button for 3 seconds

Extended Enter Linking mode Info									
Data 2 (1 byte)	**Data 3**	**Data 4 (1 byte)**	**Data 5**	**Data 6**	**Data 7**	**Data 8**	**Data 9**	**…**	**Data 14**
0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00		Checksum (0xF6, for group 1 in cmd2)

Extended Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Notes
Set Operating Flags	To device	Sender's ID	Device's ID	Extended Direct	0x20	Operating Flags Command	See Set Operating Flags Table below Data 14 to contain Checksum
	Response	Device's ID	Sender's ID	Ack	0x20	Same as sent	

Set Operating Flags Table	
00	Programming lock On
01	**Programming lock off**
02	LED on with Insteon TX
03	**LED off with Insteon TX**
04	Resume Dim On (Dimmers only)
05	**Resume Dim Off** (Dimmers only)
…	
08	Led Off
09	**Led On**
0A	KeyBeep On

0B	**KeyBeep Off**
0C	RF Off (As an originator, will still hop messages)
0D	**RF On**
0E	Insteon Off
0F	**Insteon On (Will go back to on every power cycle**
10	TenD flag On (Turns on App retries read out of database and cu error report)
11	**TenDflag Off**
12	X10Offflag On (Disables all X10 rx and tx)
13	**X10Offflag Off**
14	**Error Blink Off**
15	Error Blink On
16	**Cleanup Report Off**
17	Cleanup Report On
18	**Checksum Off for Database/Properties write**
19	Checksum On for Database/Properties write
1A	**Standard Holdoff (2-9**

	zero-crossings)
1B	Standard Holdoff *8 (16-72 zero-crossings)
1C	**Start Hops of last Rx ACK (SmartHops)**
1D	Start Hops of 1
24	Normal Direction
25	Reverse Direction

Extended Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Data 1 (1 byte)	Data 2 (1 byte)
Get for Group/Button	To device	Sender's ID	Device's ID	Extended Direct	0x2E	0x00	0x00 -> 0xFF (Group/Button)	0x00
	Response	Device's ID	Sender's ID	Standard Ack	0x2E	0x00	N/A	N/A
	From device	Device's ID	Sender's ID	Extended Direct	0x2E	0x00	Same as sent	See Returned Extended Get Message Info

Returned Extended Get Message Info									
Data 2 (1 byte)	**Data 3**	**Data 4**	**Data 5**	**Data 6**	**Data 7**	**Data 8**	**Data 9**	**Data 10**	**Data 14**
0x01	N/A	N/A	N/A	N/A	Ramp Rate	On-Level	LED brightness	N/A	N/A

Extended Command	**Message Direction**	**From Address (3 bytes)**	**To Address (3 bytes)**	**Message type**	**Cmd1 (1 byte)**	**Cmd2 (1 byte)**	**Data 1 (1 byte)**	**Data 2 (1 byte)**
Set for Ramp Rate	To device	Sender's ID	Device's ID	Extended Direct	0x2E	0x00	**0x00 (other values are ignored)**	See Set Ramp Rate Info
	Response	Device's ID	Sender's ID	Standard Ack	0x2E	0x00	N/A	N/A

Set Ramp Rate Info									
Data 2 (1 byte)	**Data 3**	**Data 4**	**Data 5**	**Data 6**	**Data 7**	**Data 8**	**Data 9**	**Data 10**	**Data 14**
0x05	0x00 -> 0x1F (Ramp Rate)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Checksum

Extended Command	**Message Direction**	**From Address (3 bytes)**	**To Address (3 bytes)**	**Message type**	**Cmd1 (1 byte)**	**Cmd2 (1 byte)**	**Data 1 (1 byte)**	**Data 2 (1 byte)**
Set for On Level	To device	Sender's ID	Device's ID	Extended Direct	0x2E	0x00	**0x00 (other values are ignored)**	See Set On Level Info
	Response	Device's ID	Sender's ID	Standard Ack	0x2E	0x00	N/A	N/A

Set On Level Info									
Data 2 (1 byte)	**Data 3**	**Data 4**	**Data 5**	**Data 6**	**Data 7**	**Data 8**	**Data 9**	**Data 10**	**Data 14**
0x06	0x00 -> 0xFF (On Level)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Checksum

Extended Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Data 1 (1 byte)	Data 2 (1 byte)
Set for LED Brightness	To device	Sender's ID	Device's ID	Extended Direct	0x2E	0x00	0x00	See Set LED Brightness Info
	Response	Device's ID	Sender's ID	Standard Ack	0x2E	0x00	N/A	N/A

Set LED Brightness Info									
Data 2 (1 byte)	**Data 3**	**Data 4**	**Data 5**	**Data 6**	**Data 7**	**Data 8**	**Data 9**	**Data 10**	**Data 14**
0x07	0x11 -> 0x7F (LED brightness, 0x11 = least bright, 0x7F = most bright)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Checksum

Extended Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Data 1 (1 byte)	Data 2 (1 byte)
Get Database	To device	Sender's ID	Device's ID	Extended Direct	0x2F	0x00	0x00 -> 0xFF (Don't Care Value)	See Get Database Info
	Response	Device's ID	Sender's ID	Standard Ack	0x2F	0x00	N/A	N/A
	From device	Device's ID	Sender's ID	Extended Direct	0x2F	0x00	Same as sent	See Returned Extended Get Database Info

Get Database Info									
Data 2 (1 byte)	**Data 3**	**Data 4**	**Data 5**	**Data 6**	**Data 7**	**Data 8**	**Data 9**	**Data 10**	**Data 14**
0x00	0x00 -> 0xFF (Hi Byte Address)	0x00 -> 0xFF (Lo Byte Address)	0x00 -> 0xFF (# of Records, 0x00 dumps all records	N/A	N/A	N/A	N/A	N/A	N/a

Returned Extended Get Database Info (will continue to be sent until # of records is sent or until the first never been used record is sent)									
Data 2 (1 byte)	**Data 3**	**Data 4 (1 byte)**	**Data 5**	**Data 6**	**Data 7**	**Data 8**	**Data 9**	**…**	**Data 14**
0x01	0x00 -> 0xFF (Hi Byte Address)	0x00 -> 0xFF (Lo Byte Address)	0x00	Byte 1 of record	Byte 2 of record	Byte 3 of record	Byte 4 of record		Byte 8 of record

Extended Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Data 1 (1 byte)	Data 2 (1 byte)
Set Database	To device	Sender's ID	Device's ID	Extended Direct	0x2F	0x00	0x00 -> 0xFF (Don't Care Value)	See Set Database Info
	Response	Device's ID	Sender's ID	Standard Ack	0x2F	0x00	N/A	N/A

Set Database Info									
Data 2 (1 byte)	**Data 3**	**Data 4 (1 byte)**	**Data 5**	**Data 6**	**Data 7**	**Data 8**	**Data 9**	**Data 13**	**Data 14**
0x02	0x00 -> 0xFF (Hi Byte Address)	0x00 -> 0xFF (Lo Byte Address)	0x01 -> 0x08 (# of bytes to write, over 0x08 is an error and ignored)	Byte 1 of data	Byte 2 of data	Byte 3 of data	Byte 4 of data	Byte 8 of data	Checksum

Extended Command	Message Direction	From Address (3 bytes)	To Address (3 bytes)	Message type	Cmd1 (1 byte)	Cmd2 (1 byte)	Data 1 (1 byte)	Data 2 (1 byte)
Trigger Group	To device	Sender's ID	Device's ID	Extended Direct	0x30	0x00	0x00 -> 0xFF (Group/Button)	See Trigger Group Info
	Response	Device's ID	Sender's ID	Standard Ack	0x30	0x00	N/A	N/A

Trigger Group Info									
Data 2 (1 byte)	**Data 3**	**Data 4 (1 byte)**	**Data 5**	**Data 6**	**Data 7**	**Data 8**	**Data 9**	**…**	**Data 13**
0x00 = use local On-Level, 0x01 = use Data 3 Level (Note: The Command to the group is not parsed, so if you want the local load to go off, you must set data2 to 1 and data3 to 0)	0x00 -> 0xFF (On-Level if data2 = 0x01)	Cmd1	Cmd2	0x00 = local Ramp Rate, 0x01 = instant Ramp Rate	N/A	N/A	N/A		N/A

Checksum Information

For Set Database, Set Properties and 0x20, Data14 will contain a 2s compliment of cmd1 through 2nd to last data record in the last data record.

Example of Checksum:

01 02 03 04 05 06 1F 2F 00 01 02 0F FF 08 E2 01 08 B6 EA 00 1B 01 11
From 01.02.03 to 04.05.06
a record at 0FFF (A valid boundary)
08 bytes a record that 04.05.06 will control
Group 1 the responder is 08.B6.EA (00 1B 01 DNC)
11 is the check sum

Int	Hex	
47	2F	
0	00	
1	01	
2	02	
15	0F	
255	FF	
8	08	
226	E2	
1	01	
8	08	
182	B6	
234	EA	
0	00	
27	1B	
1	01	
1007	3EF	Sum
	10	Compliment (Last byte)
	11	Add 1

Memory Map

All-Link Database (AL /L) Overview

The AL /L starts at the top of external (serial) EEPROM and grows downward. In the Micro Module Shutter, top of memory is 0x0FFF. Each AL /L Record is 8 bytes long, so the first record starts at 0x0FF8, the second record starts at 0x0FF0, and so on down to 0x0300 for a total of 416 links. In what follows, the 3-byte INSTEON Address contained in a record is called the *Device ID* or sometimes just the *ID*. The high byte (MSB) of the Device ID is *ID2*, the middle byte is *ID1*, and the low byte (LSB) is *ID0*.

Micro Module Shutter External EEPROM Structure Overview

Location		Comments
0x0FF8	0xA2 01 AA BB CC FF FE 00	All-Link Database Record
0x0FF0		
0x0FD8		
……		
0x0300		Last Record, 416 total links allowed
0x02XX	N/A	Addressing below 0x0300 is ignored by database

AL /L Record Format

Micro Module Shutter AL Record Format

Database entries with Record Control Bit 6: 0 = Responder and Group 1 will control the local load.

Linear ALL-Link Database (AL /L) Record Format		
Field	**Length (bytes)**	**Description**
Record Control	1	Record Control Flag Bits: Bit 7: 1 = Record is in use, 0 = Record is available Bit 6: 1 = Controller (Master) of Device ID, 0 = Responder to (Slave of) Device ID Bit 5: Not used Bit 4: Not used Bit 3: Not used Bit 2: Not used Bit 1: 1 = Record has been used before, 0 = 'High-water Mark' Bit 0: Not used
Group	1	ALL-Link Group Number this Device ID belongs to
ID	3	Device ID (ID2, ID1, ID0 in that order)
Data 1	1	Not used
Data 2	1	Not used
Data 3	1	Not used

To add a record to an AL /L, you search for an existing record that is marked available. (Available means the same as empty, unused or deleted.) If none is available, you create a new record at the end of the AL /L.

An unused record will have bit 7 of the *Record Control* byte set to zero. The last record in an AL /L will have bit 1 of the *Record Control* byte set to zero.

Overwriting an Empty AL /L Record

If you found an empty record, you simply overwrite it with your new record data.

Change bit 7 of the *Record Control* byte from zero to one to show that the record is now in use.

Set bit 6 of the *Record Control* byte to one if the device containing the AL /L is an INSTEON Controller of the INSTEON Responder Device whose *ID* is in the record. If instead the device containing the AL /L is an INSTEON Responder to the INSTEON Controller Device whose *ID* is in the record, then clear bit 6 of the *Record Control* byte to zero. In other words, within an AL /L, setting bit 6 means “I’m a Controller,” and clearing bit 6 means “I’m a Responder.”

Put the ALL-Link Group number in the *Group* field, and put the *Device ID* in the *ID* field. Finally, set the *Data 1*, *Data 2*, and *Data 3* fields appropriately for the *Record Class* you are storing.

Creating a New AL /L Record

To create a new record at the end of the AL /T, find the record with bit 1 of the *Record Control* byte set to zero, indicating that it is the last record in the AL /L. Flip that bit to one.