Header						Address	Sub-Address	Command	Data Length	Data
0	0	0	0	0	FF	0-FF	0-FF	0-FF	0-FF	

								Data								
	Notes	Action	Sub-Address	Command	Command (HEX)	Data Length	Byte:1	2	3	4	5	6	7	8	9
Main		NOOP	0	0	0	0									
		Reserve for core protocol	0	1	1	0									
	Starts planned move	Start	0	2	2	0									
		Pause	0	3	3	0									
	Stops planned move. Must be executed before controller will accept other commands.	Stop	0	4	4	0									
	Toggles on/off state of debug LED	Debug LED	0	5	5	0									
		Timing Master	0	6	6	0									
		Set Stored Name	0	7	7	1-10	String [1-10 Characters, Null-terminated, Null padded]								
		Set Device Address	0	8	8	1	2-255 [Byte]								
		Set Common Line for Step Pulsing	0	9	9	1	0,1,2 [Byte]								
		Return Home All Motors	0	10	A	0									
		Motors Max Step Rate	0	11	B	2	Steps/Second [Int]								
	Not yet implemented	Alt Input Edge (RISING, FALLING, or CHANGE)	0	12	C	1	0,1,2 [Byte]								
	Not yet implemented	Alt I/O Mode	0	13	D	2	Ring (0-255) [Byte]	Tip (0-255) [Byte]							
		Set Manual Move Flag	0	14	E	1	True/False (1,0) [Byte]								
		Alt Output Before Shot Delay Time	0	15	F	2	Time (ms) [Int]								
		Alt Output After Shot Delay Time	0	16	10	2	Time (ms) [Int]								
		Alt Output Before Shot Time	0	17	11	2	Time (ms) [Int]								
		Alt Output After Shot Time	0	18	12	2	Time (ms) [Int]								
		Alt Output Trigger level	0	19	13	1	HIGH/LOW (1,0) [Byte]								
		Max Program Run Time	0	20	14	4	Max Run Time (mS) [Ulong]								
		Start Program Delay	0	21	15	4	Start Time Delay (seconds) [Ulong]								
		Set SMS / Continuous Program Mode	0	22	16	1	0 (SMS), 1 (Cont.) [Byte]								
		Status Request	0	100			<Status Type>	<returns> with header and master address in front (00 00 00 00 00 FF 00 00							
		Firmware Version	0	100	64	0	Value Type [Byte]	Version #							
		Run Status	0	101	66	0	Value Type [Byte]	True/False							
		Run Time	0	102	66	0	Value Type [Ulong]	Time (ms)							
		Currently Exposing	0	103	67	0	Value Type [Byte]	True/False							
		Timing Master Value	0	104	68	0	Value Type [Byte]	True/False							
		Name	0	105	69	0	Value Type [String]	String [1-10 Characters, Null-terminated, Null padded]							
		Motors Max Step Rate	0	106	6A	0	Value Type [Uint]	Steps/Second							
		Voltage Reading	0	107	6B	0	Value Type [Fixed]	Voltage (V) (Fixed point – must divide by 100 on master side)							
		Current to Motors	0	108	6C	0	Value Type [Fixed]	Current (amps) (Fixed point – must divide by 100 on master side)							
	Not yet implemented	Alt Input Edge (RISING, FALLING, or CHANGE)	0	109	6E	0	Value Type [Byte]	0,1,2							
	Not yet implemented	Alt I/O Mode	0	110	6F	0	Value Type [Int]	[Byte 0] Ring (0-255)	[Byte 1] Tip (0-255)						
	Not yet implemented	Limit Switch High/Low Status	0	111	70	0	Value Type [Int]	[Byte 0] Ring, High/Low (1,0)	[Byte 1] Tip, High/Low(1,0)						
		Alt Output Before Shot Delay Time	0	112	70	0	Value Type [Uint]	Time (ms)							
		Alt Output After Shot Delay Time	0	113	71	0	Value Type [Uint]	Time (ms)							
		Alt Output Before Shot Time	0	114	72	0	Value Type [Uint]	Time (ms)							
		Alt Output After Shot Time	0	115	73	0	Value Type [Uint]	Time (ms)							
		Alt Output Trigger level	0	116	74	0	Value Type [Byte]	HIGH/LOW (1,0)							
		Start Program Delay	0	117	75	0	Value Type [Ulong]	Start Time Delay (seconds)							
		SMS / Continuous Program Mode	0	118	76	0	Value Type [Byte]	0 (SMS), 1 (Cont.)							
		Controller Power Cycle	0	119	77	0	Value Type [Byte]	True/False (1,0)							
Motors		NOOP	1-3	0	0	0									
		Reserve for core protocol	1-3	1	1	0									
General Motor Commands	Cuts power to motor when not executing a move. True by default.	Motor Sleep	1-3	2	2	1	True/False (1,0) [Byte]								
	Must enabled before executing a move.	Motor Enable	1-3	3	3	1	True/False (1,0) [Byte]								
	Stops motor, even if a planned move is in progress.	Stop Motor Now	1-3	4	4	0									
	Number of steps the motor should move in addition to the commanded distance when reversing direction.	Set Backlash Steps	1-3	5	5	2	Steps [Uint]								
	Number of microsteps per full motor step. There are 200 full steps per rotation of the motor (and ~3800 full steps per gearbox output shaft rotation)	Set Microstep Value	1-3	6	6	1	1, 2, 4, 8, 16 [Byte]								
		Set Motor Max Step Speed	1-3	7	7	2	Steps/Second [Uint]								
	Flips motor direction, regardless of current program	Set Direction	1-3	8	8	1	0, 1 [Byte]								
	Saves home limit position	Set Home Limit Here	1-3	9	9	0									
	Saves end limit position	Set End Limit Here	1-3	10	A	0									
		Send Motor to Home Limit	1-3	11	B	0									
		Send Motor to End Limit	1-3	12	C	0									
Manual Move Commands	Does not apply to finite manual moves	Set Continuous Speed	1-3	13	D	4	Steps/Second [float]								
	Does not apply to finite manual moves	Set Motor Continuous Motion Accel/Decel Rate	1-3	14	E	4	Steps/Second^2 [float]								
	Direct move command, does not require use of "start" and "stop" commands.	Execute Simple Motor Move	1-3	15	F	5	Dir (0, 1) [Byte]	Steps [Ulong]							

Programmed Travel Commands		Set Program Start point	1-3	16	10	4	Step position [long]											
		Set Program Stop point	1-3	17	11	4	Step position [long]											
	1 = Linear, 2 = Quadratic, 3 = Inverted Quadratic	Set Easing (Ramping) Mode	1-3	18	12	1	1, 2, 3											
	How many shots should this motor wait before moving?	Set Lead-In Shots	1-3	19	13	2	Shots [Uint]											
		Set Travel Shots(SMS) / Travel Time (Cont.)	1-3	20	14	4	Shots (SMS) or Total Travel Time (ms) (cont.) [Ulong]											
		Set Program Accel	1-3	21	15	4	Accel Period – Shots (SMS) or Time in ms (Cont.) [Ulong)]											
		Set Program Decel	1-3	22	16	4	Decel Period – Shots (SMS) or Time in ms (Cont.) [Ulong]											
		Send Motor to Program Start Point	1-3	23	17	0												
		Send Motor to Program Stop Point	1-3	24	18	0												
Stop-Motion Travel Commands	Manual SMS movement. Not yet implemented.	Advance One SMS Increment	1-3	25	19	0												
	Manual SMS movement. Not yet implemented.	Go Back One SMS Increment	1-3	26	1A	0												
	Sets the current position as home, disables limits, and sets start/stop positions to home position.	Reset Limits and Program Start/Stop Positions	1-3	27	1B	0												
		Status Request	1-3	100			<Status Type>	<returns> with header and master address in front (00 00 00 00 00 FF 00 00										
General Motor Query Commands		Motor Enable	1-3	100	64	0	Value Type [Byte]	True/False (1,0)										
		Backlash Steps	1-3	101	65	0	Value Type [Uint]	Steps										
		Microstep Value	1-3	102	66	0	Value Type [Byte]	1, 2, 4, 8, 16 [byte]										
		Direction	1-3	103	67	0	Value Type [Byte]	0, 1										
		Motor Max Step Speed	1-3	104	68	0	Value Type [Int]	Steps/Second [int]										
		End Limit Position	1-3	105	69	0	Value Type [Long]	Position [long]										
		Current Motor Position	1-3	106	6A	0	Value Type [Long]	Position [long]										
		Motor Running	1-3	107	6B	0	Value Type [Byte]	True/False (1,0)										
Manual Move Query Commands		Continuous Speed	1-3	108	6C	0	Value Type [Psudo-float--Fixed point – must divide by 100 on master side]	Steps/Second										
		Motor Continuous Motion Accel/Decel Rate	1-3	109	6D	0	Value Type [Psudo-float--Fixed point – must divide by 100 on master side]	Steps/Second^2										
Programmed Travel Query Commands		Easing (Ramping) Mode	1-3	110	6E	0	Value Type [Byte]	1, 2, 3										
		Program Start point	1-3	111	6F	0	Value Type [Long]	Position [long]										
		Program End point	1-3	112	70	0	Value Type [Long]	Position [long]										
		Travel Shots(SMS) / Travel Time (Cont.)	1-3	113	71	0	Value Type [Ulong]	Shots (SMS) or Total Travel Time (ms) (cont.) [unsigned long]										
		Lead-In Shots	1-3	114	72	0	Value Type [Int]	Shots [int]										
		Program Accel	1-3	115	73	0	Value Type [Ulong]	Accel Period – Shots (SMS) or Time in ms (Cont.) [unsigned long]										
		Program Decel	1-3	116	74	0	Value Type [Ulong]	Decel Period – Shots (SMS) or Time in ms (Cont.) [unsigned long]										

Cameras		NOOP	4	0	0	0												
		Reserve for core protocol	4	1	1	0												
		Camera Enable	4	2	2	1	True/False (1,0) [Byte]											
	Triggers exposure with length set by "Exposure Time" command.	Expose Now	4	3	3	0												
		Exposure Time	4	4	4	4	Exposure Time (mS) [Ulong]											
		Focus Time	4	5	5	2	Focus Time (mS) [Uint]											
	The system will stop a move once it reaches the max number of camera exposures.	Max Shots	4	6	6	2	Count [Uint]											
		Exposure Delay	4	7	7	2	Delay (mS) [Uint]											
		Focus w Shutter	4	8	8	1	True/False (1,0) [Byte]											
	This causes two trigger signals to be sent to the camera in the event that the user has the camera in "mirror up" mode.	Mirror Up (Repeat Shot)	4	9	9	1	True/False (1,0) [Byte]											
	Length of SMS interval	Interval	4	10	A	4	Interval Time (mS) [Ulong]											
		Status Request	4	100			<Status Type>	<returns> with header and master address in front (00 00 00 00 00 FF 00 00										
		Camera Enable	4	100	64	0	Value Type [Byte]	True/False (1,0)										
		Exposing now?	4	101	65	0	Value Type [Byte]	True/False (1,0)										
		Exposure Time	4	102	66	0	Value Type [Ulong]	Exposure Time (mS)										
		Focus Time	4	103	67	0	Value Type [Uint]	Focus Time (mS)										
		Max Shots	4	104	68	0	Value Type [Ulong]	Count										
		Exposure Delay	4	105	69	0	Value Type [Uint]	Delay (mS)										
		Focus w Shutter	4	106	6A	0	Value Type [Byte]	1, 0										
		Mirror Up (Repeat Shot)	4	107	6B	0	Value Type [Byte]	True/False (1,0)										
		Interval Time	4	108	6C	0	Value Type [Ulong]	Interval Time (mS)										

			Address	Sub-Address	Command	Data Length	Data
Broadcasts	These function the same as the start, stop, and pause commands above, but can be used to synchronize movement of multiple controllers.	Start	1	0	1	0	
		Stop	1	0	2	0	
		Pause	1	0	3	0	

Use this to assign an address to a controller with an unknown address. Don't use when controllers are daisy-chained together.	Assign Address	1	0	4	1	2-255

Note: nodes do not give a response to broadcast commands.

10	11	12

01 Length Data)		

01 Length Data)

01 Length Data)
