Sheet1

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

Manual   M								Data										
Section of the sect		Notes			Command	Command (HEX)	) Data Length	Byte:1	2	3	4	5	6	7 8	9	10	11	12
Seth printed rooms (	Main			0	1	1						-			-			$\vdash$
Story primary control to See April   Story	5	Starts planned move	Start		2	2	0											
Month   Sept	_		Pause	0	3	3	0											
Top   Market   Column   Colu	b	before controller will accept other	Stop	0	4	4	0											
Set Stored Starts	Ţ	Toggles on/off state of debug LED	Debug LED															
Grant Device Address   0   8   8   1   2.255 (bird)	-			_	6 7	6 7			Christa I	1 10 Characters Null terminated	No II no delegal	$\perp$						$\vdash$
March 15th 15th 15th 15th 15th 15th 15th 15t	-				8	8		2-255 [Byte]	String [	1-10 Characters, Nuil-terminated,	Null padded	т т			T			_
Reduct room of Management   Company   Compan				0	9	9	1	0,1,2 [Byte]										
No. of Experiments			Return Home All Motors	0	10	A	0											
Mary   Company   Mary	L		Motors Max Step Rate	0	11	В	2	Steps/	Second [Int]		l							
Mary   Company   Mary	T.	Not vet implemented	Alt Input Edge (RISING, FALLING, or CHANGE)	0	12	С	1	0.1.2 [Byte]			1	Т			T			
An Output Defens but I rough			Alt I/O Mode	0	13	D	2	Ring (0-255) [Byte]	Tip (0-255) [Byte]									
At Output After State Design Transport Control of the Control of t	L					E	1	True/False (1,0) [Byte]	() (									
Accordance Service Services   Control   Cont	-					10		Time	e (ms) (int)			-			-			_
Accordance   Acc	-		Alt Output Before Shot Time	0		11	2											
March Program Real Tree   0   20   14   4   March Tree (in) (long)	[		Alt Output After Shot Time	0	18		2	Time	e (ms) [Int]									
South Program Cology   South Time Cology (sections)   More	ļ.							HIGH/LOW (1,0) [Byte]	M	7 H 1					_			-
Set 565   Continuous Program Modes   0   22   16   1   0   0   0   1   0   0   0   0   0	-		Max Program Run Time Start Program Delay		20										-			$\vdash$
Stitla Regiett   0   100	-		Set SMS / Continuous Program Mode	0				0 (SMS), 1 (Cont.) [Byte]	Citate Finite Delay (occorn	l l l l l l l l l l l l l l l l l l l								
Finance Vessor   0   100   64   0   Value Type Byol   Transfer   1   1   1   1   1   1   1   1   1	-											-						
Frames Virsion   0   100   64   0   Value Tige Byel   Version at   1   1   1   1   1   1   1   1   1	F		Statue Peguset	0	100			«Statue Tuno»		creturnes with he	ader and meeter	address	in front (0	0.00.00.00.00	EE 00 00	01 Langth F	lata)	
Route State   0   101   65   0   Vasa Type (Red   Transfer   Tra	F					64	0		Version #	returns> with he	auer and master	auuress	iir iiont (0	0 00 00 00 00	1 00 00	o i Length L	rald)	
Currenty Espoarse	H		Run Status	0	101	65	0	Value Type [Byte]										
Trong Market Value	Ī		Run Time		102	66	0	Value Type [Ulong]		Time (ms)								
Name	Į.							Value Type [Byte]				+				$\vdash$		
Motors Number   Motors Number   Motors Number   Motors Number   Motors Number   Motors   Mo	-							Value Type [Byte]	True/False	String [1-10 Chars	ictors Null-termi	nated Nu	habben III					_
Volume   V	-							Value Type [Uint]	Steps/	Second String [1-10 Chara	T Transferring	lateu, ivu	iii paudeu		T			
Current to Motors			Voltage Reading	0	107	6B	0	Value Type [Fixed]	Voltage (V) (Fixed	point - must divide by 100 on ma	ster side)							
Not yet implemented				0					Current (amps) (Fixe	d point – must divide by 100 on r	naster side)							
Notes   Note	1	Not yet implemented	Alt Input Edge (RISING, FALLING, or CHANGE)					Value Type [Byte]		(Dute 41 Tip (0.055)		+			_			$\vdash$
All Output Before Shot Delay Time									[Byte 0] Ring (0-255)	[Byte 1] Tip (0-255)		-			_			$\vdash$
AA Output After Shot Deby Time	ř	tot jet implemented										_						
All Output Trigger level			Alt Output After Shot Delay Time					Value Type [Uint]	Time	(ms)								
All Output Trigger level	L		Alt Output Before Shot Time	0				Value Type [Uint]	Time	(ms)		$\vdash$						_
Staff Program Delay   0   117   75   0   Value Type (Byte)   0 (EMS) 1 (Cont.)	-		Alt Output After Shot Time	0	115			Value Type [UInt]	HIGH/LOW (1.0)	(ms)		+			-			-
Motors   SMS / Continuous Program Mode   0   118   76   0   Value Type (Byte)   0 (SMS) 1 (Coord.)				0						tart Time Delay (seconds)								
Motors			SMS / Continuous Program Mode					Value Type [Byte]	0 (SMS), 1 (Cont.)	1								
Reserve for core protocol   1-3   1   1   0	L		Controller Power Cycle	0	119	77	0	Value Type [Byte]	True/False (1,0)									
Reserve for core protocol   1-3																		
Cuts power to motor when not executing a move.   Motor Sieep   1-3   2   2   1   True/False (1,0) [Byte]	Motors		NOOP	1-3	0	0	0				1							
Moute facility of the securing a move.   Motor Enable   1-3   3   3   1   TrueFalse (1,0) [Byte]			Reserve for core protocol	1-3	1	1	0											
Must embled before executing a move.  Motor Enable  1-3 3 3 1 True/Falte (1,0) [Byte]  Stops motor even if a planned move is in stops motor even if a planned move is in stops motor even if a planned move is in stops motor even if a planned move is in stops motor even if a planned move in addition to the commanded distance when reversing direction.  General Motor Commands  General Motor Commands  Fips motor direction, regardless of current program.  Set Microstep Value  Set Microstep Value  1-3 6 6 6 1 1,2,4,8,16 [Byte]  There are 200 full steps per relation of the motor (and -3800 full steps per gearbox outputs that rotation)  Set Motor Max Step Speed  1-3 7 7 7 2 Steps/Second [Unit]  Set Motor Max Step Speed  1-3 8 8 1 0,1 [Byte]  The motor (increase)  Set Motor Set Motor Set Motor Set Motor Max Step Speed  1-3 8 8 8 1 0,1 [Byte]  Seves nome limit position  Set Home Limit Here  1-3 9 9 9 0  Seves nome limit position  Set Home Limit Here  1-3 10 A 0 0  Set Motor Set Set Set Motor Set Set Set Motor Set		Cuts power to motor when not executing a	Motor Sleep	1-3	2	2	1	True/False (1,0) [Byte]										1
Stops motor, even if a planned move is in group regress.   Stop Motor Now   1-3   4   4   4   0   0			Motor Enable	1-3	3	3	1											
Number of steps the motor should move in addition to the commanded distance when the	l s	Stops motor, even if a planned move is in																
Reversing direction.	<u> </u>	orogress. Number of steps the motor should move in										+						
There are 200 full steps per rotation of the motor (and -300 full steps per greathox output shaft rotation)   Set Microstep Value   1-3   6   6   1   1, 2, 4, 8, 16 [Byte]	n	reversing direction.	Set Backlash Steps	1-3	5	5	2	Ste	Steps [Uint]									
Fips motor direction, regardless of current program   Set Direction   1-3   8   8   1   0,1 [Byte]	Commands n	There are 200 full steps per rotation of the motor (and ~3800 full steps per gearbox																
See See Note   Institute   See Note   See	]					<del> </del>			Second [Uint]			$\perp$			_			
Saves home limit position   Set Home Limit Here   1-3   9   9   0		Flips motor direction, regardless of current program	Set Direction	1-3	8	8	1	0, 1 [Byte]										
Saves end limit position	S	Saves home limit position				9												
Send Motor to End Limit   1-3   12   C   0		Saves end limit position																
Does not apply to finite manual moves   Set Continuous Speed   1-3   13   D   4   Steps/Second [float]						В					-	+		$\vdash$	+	$\vdash$		-
Manual Move   Does not apply to finite manual moves   Set Motor Continuous Motion Accel/Decel Rate   1-3   14   E   4   Steps/Second*2 [float]	$\Box$		Sena Motor to Ena Limit	1-3	12	L L	U											-
Manual Move Commands   Does not apply to finite manual moves   Set Motor Continuous Motion Accell/Decel Rate   1-3   14   E   4   Steps/Second*2 [float]						D												
Execute Simple Motor Move   1-3   15   F   5   Dir (0, 1) [Byte]   Steps [Uong]	Manual Move	Does not apply to finite manual moves	Set Motor Continuous Motion Accel/Decel Rate			E	4			loat]								1
Set Program Stop point   1-3   17   11   4   Step position [long]		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]								
Set Program Stop point   1-3   17   11   4   Step position [long]			Set Brogram Start point	12	16	10	1 4		Sten nocities flee	nal .					_			
1 = Linear, 2 = Quadratic, 3 = Inverted Quadratic Set Easing (Ramping) Mode 1-3 18 12 1 1, 2, 3 (2, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4,	<del> </del>								Step position flor	ng]					1			_
Quadratic		1 = Linear, 2 = Quadratic, 3 = Inverted		1-3	18	12	1	123							1			
Programmed How many shots should this motor wait Set Lead-in Shots 1-3 19 13 2 Shots [Uint]	Programmed H	How many shots should this motor wait							ots (Uint)			+			1			<del>                                     </del>
	Travel b	pefore moving?	I .		1					() (1) [[] [[]		$\vdash$			_	$\vdash$		←
Commands         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]	Commands		Set Program Accel	1-3				۸,	Snots (SMS) or Total Travel Time	in ms (Cont.) [Ulong]		-		$\vdash$	+	$\vdash$		
Set Program Decel   1-3   22   16   4     Decel Period - Shots (SMS) or Time in the (Cont.) [Ulong]	1		Set Program Decel												1			
Send Motor to Program Start Point 1-3 23 17 0			Send Motor to Program Start Point	1-3	23		0											
Send Motor to Program Stop Point   1-3   24   18   0			Send Motor to Program Stop Point	1-3	24	18	0											$\Box$

								Sileeti										
Stop-Motion	Manual SMS movement. Not yet	Advance One	e SMS Increment	1-3	25	19	0											
Travel	implemented.													_	-			_
Commands	Manual SMS movement. Not yet implemented.	Go Back One	e SMS Increment	1-3	26	1A	0											
	implemented.																	
	Sets the current position as home, disables														$\neg$			$\top$
	limits, and sets start/stop positions to home	Reset Limits and Pro	gram Start/Stop Positions	1-3	27	1B	0											
	position.		,															
			s Request	1-3	100			<status type=""></status>		<returns> with he</returns>	ader and master a	ddress	in front (00	00 00 00	00 FF 00	00 01 Length	Data)	
		Moto	or Enable	1-3	100	64	0	Value Type [Byte]	True/False (1,0)						-			_
			lash Steps	1-3	101	65 66	0	Value Type [Uint]	Ste	ps					-			-
Seneral Motor			step Value irection	1-3 1-3	102	67	0	Value Type [Byte]	1, 2, 4, 8, 16		_				-	_		+
Query			ax Step Speed	1-3	103	68	0	Value Type [Byte] Value Type [Int]	0, 1	Second	_				-	_		+
Commands			mit Position	1-3	104	69	0	Value Type [Long]	Steps/S	Position			_	_	+			+
		Current N	Motor Position	1-3	106	6A	0	Value Type [Long]		Position					-			+
			r Running	1-3	107	6B	0	Value Type [Byte]	True/False (1,0)						-			$\top$
					•			71 - 71 - 71										
								Value Type [Psudo-float										Т
Manual Move		Continu	uous Speed	1-3			0	Fixed point - must divide by		Steps/Second								
Querv					108	6C		100 on master side]							-			_
Commands				4.0				Value Type [Psudo-float										
		Motor Continuous N	Motion Accel/Decel Rate	1-3	109	6D	0	Fixed point – must divide by 100 on master side]		Steps/Second^2								
		motor Continuous ii	IOLIOTI / LOCAL Decor i Late		100	05		100 on master statej		Otopa Octobria 2								
		Easing (Ra	amping) Mode	1-3	110	6E	0	Value Type [Byte]	1, 2, 3						$\overline{}$			$\top$
			m Start point	1-3	111	6F	Ö	Value Type [Long]	., ., .	Position					$\overline{}$			
Programmed		Progran	m End point	1-3	112	70	0	Value Type [Long]		Position					$\perp$			工
Travel Query		Travel Shots(SMS	S) / Travel Time (Cont.)	1-3	113	71	0	Value Type [Ulong]		S) or Total Travel Time (ms) (con	t.)							$\perp$
Commands			f-In Shots	1-3	114	72	0	Value Type [Int]	Sho	ots								
			ram Accel	1-3	115	73	0	Value Type [Ulong]		<ul> <li>Shots (SMS) or Time in ms (C</li> </ul>								
		Progr	ram Decel	1-3	116	74	0	Value Type [Ulong]	Decel Period -	<ul> <li>Shots (SMS) or Time in ms (C</li> </ul>	ont.)							
Cameras			NOOP	4	1 0	1 0	0					_			$\overline{}$	_		_
Callieras			or core protocol	4	1	1	0								-	_		+
			era Enable	4	2	2	1	True/False (1,0) [Byte]						_	-			+
	Triggers exposure with length set by					-		(1,0,12,10)							-			+
	"Exposure Time" command.	Expo	ose Now	4	3	3	0											
		Expos	sure Time	4	4	4	4		Exposure Time (mS) [	[Ulong]								
		Foc	cus Time	4	5	5	2	Focus Tim	e (mS) [Uint]									
	The system will stop a move once it																	
	reaches the max number of camera exposures.			4	6	6	2	Cour	nt [Uint]									
	exposures.	Firmer	euro Deleu	4	7	7	2	Delay (	mS) [Uint]						-			
			sure Delay s w Shutter	4	8	8	1	True/False (1,0) [Byte]	no) (onit)					_	+	_		_
	This causes two trigger signals to be sent to		w Gridder		<u> </u>	-	-	Truen alse (1,0) [Byte]							-	_		+
	the camera in the event that the user has	Mirror Up	(Repeat Shot)	4	9	9	1	True/False (1,0) [Byte]										
	the camera in "mirror up" mode.																	
	Length of SMS interval	In	nterval	4	10	A	4		Interval Time (mS) [L	Jlong]								
			s Request	4	100			<status type=""></status>		<returns> with he</returns>	ader and master a	ddress	in front (00	00 00 00	00 FF 00	00 01 Length	Data)	
		Came	era Enable	4	100	64 65	0	Value Type [Byte]	True/False (1,0)						-	_		_
			sing now?	4			0	Value Type [Byte]	True/False (1,0)	Funcaura Tima (mC)				_	-	+		+
			sure Time cus Time	4	102	66 67	0	Value Type [Ulong] Value Type [Uint]	Focus Tir	Exposure Time (mS)				-	+	+		+
			us rime	4	103	68	0	Value Type [Ulong]	-ocus III	Count				-	+-	+	<del>                                     </del>	+
			sure Delay	4	104	69	0	Value Type [Uint]	Delay					-1-	+-	+	<b>+</b>	+
			s w Shutter	4	106	6A	0	Value Type [Byte]	1. 0	,					-			+
		Mirror Up	(Repeat Shot)	4	107	6B	Ö	Value Type [Byte]	True/False (1,0)						$\overline{}$			
			rval Time	4	108	6C	0	Value Type [Ulong]		Interval Time (mS)								$\perp$
			Address	Sub-Address	Command	Data Length	Data	4										
Broadcasts		Start	1	0	1	0												
	These function the same as the start, stop, and pause commands above, but can be							4										
	used to synchronize movement of multiple	Stop	1	0	2	0												
	controllers.			_				1										
		Pause	1	0	3	0												
	Use this to assign an address to a																	
controller with an unknown address. use when controllers are daisy-chain		Assign Address	1	0	4	1	2-255											
		Assign Address		l "	"		2-255											
	together.							J										
		Note: nodes do not give a	a response to broadcast cor	nmands.														
		Query Value Types		٦														
				1														
			Puto	7														
		0	Byte Unsigned Int	7														

Query Value Types		
0	Byte	
1	Unsigned Int	
2	Int	
3	Long	
4	Unsigned Long	
5	Float	The floats are actually fixed points. They are multiplied by 100 and transmitted as longs, so they need to be divided by 100 on the master side to resolve the true value.
6	String	