

6. COMMUNICATION PROTOCOL

The DataPort communication protocol consists of messages sent by the host software and responses sent by the EksoNR software. All messages are initiated by the host, and no messages, synchronous or asynchronous, are initiated by the EksoNR. The host sends one message and waits for a response or message timeout before sending the next message. The EksoNR must send a response to every message received with at least an acknowledge message. All messages conform to the following format:

Byte #	Description
1	Command
2	Message length
3	msgID (HighByte)
4	msgID (LowByte)
5 ... N-2	Message Body
N-1	CRC (HighByte)
N	CRC (LowByte)

Each response message consists of the same command and message ID and the remaining fields are filled with the appropriate values for the response.

The CRC calculation used for these messages is the CRC-CCITT algorithm which has the following parameters:

Name	Value
Polynomial	0x11021
Reversed	False
Initial Value	0xFFFF
XOR-out	0x0000
Check	0x29B1

This web page was helpful in getting the CRC working: <http://crcmod.sourceforge.net/crcmod.predefined.html>

The following table lists the available commands, arguments, expected responses and message lengths. The commands are grouped by type.

Command Name	Cmd ID	Data	Data Size (bytes)	Expected Response	Response Size (bytes)	Scale Factor
GetTime	150	None	0	Hour (0 - 23) Minute (0 - 59) Second (0 - 59)	1 1 1 3	1 1 1
GetDate	151	None	0	Year (0 - 99) Month (1 - 12) Day (1 - 31)	1 1 1 3	1 1 1
GetSettings	152	None	0	Upper Leg Length Lower Leg Length Step Length Step Height Swing Time Stand Time Knee Flexion Hip Flexion Forward Shift Lateral Shift Walk Stand Target Sounds Injury Mode Left Swing Assistance Right Swing Assistance Left Stance Support Right Stance Support Swing Complete PilotID Sit Lean Allowance	2 44	100 100 100 100 100 100 100 100 100 100 1 1 1 1 1 1 1 1 1 1 1 1 1
GetData	153	None	0	Torso Pitch Angle Torso Roll Angle Right Toe Pressure Right Heel Pressure Left Toe Pressure Left Heel Pressure Right Hip X Position Right Hip Y Position Left Hip X Position Left Hip Y Position Right Hip Current	2 2 2 2 2 2 2 2 2 2 2	100 100 1 1 1 1 10 100 10 100 100

				Right Hip Angle	2	100
				Right Knee Current	2	100
				Right Knee Angle	2	100
				Left Hip Current	2	100
				Left Hip Angle	2	100
				Left Knee Current	2	100
				Left Knee Angle	2	100
				State	2	1
				Foot State	2	1
				Min State	2	1
				LCD Button State	2	1
				Weight Shift	2	1000
				HMI Data	2	1
				VA Ref Time	2	10
				BootTime (high bytes)	2	1
				BootTime (low bytes)	2	1
				54		
GetFeedback	154	None	0	StepsTaken	2	1
				UprightTime	2	1
				WalkTime	2	1
				Max Fwd Assist, left	2	10
				Assist Gain, left	2	10
				Max Fwd Assist, right	2	10
				Assist Gain, right	2	10
				Hip stance support, left	2	10
				Knee stance support, left	2	10
				Hip stance support, right	2	10
				Knee stance support, right	2	10
				StepLength, left	2	10
				StepLength, right	2	10
				SwingTime, left	2	10
				SwingTime, right	2	10
				BootTime (high bytes)	2	1
				BootTime (low bytes)	2	1
				34		
SetValue (see table for parameter ID values)	155	ParameterID Value	2 2	Status	2	1
Cancel Action (Command can be any non-zero value)	156	Command	2	Status	2	1

ParameterID	Name	Scale Factor
200	Upper Leg Length	100
201	Lower Leg Length	100
202	Step Length	100
203	Step Height	100
204	Swing Time	100
205	Stand Time	100
206	Knee Flexion	100
207	Hip Flexion	100
208	Forward Shift	100
209	Lateral Shift	100
210	Stand Mode	1
211	Sit Mode	1
212	Walk Mode	1
213	Target Sounds	1
214	Lean Allowance	1
215	Injury Mode	1
216	Left Swing Assist	1
217	Left Stance Support	1
218	Right Swing Assist	1
219	Right Stance Support	1