Introduction

This guide provides information for customers considering developing with the *ADVANCED* Motion Controls' RS485/232 serial command set. Serial communications between a master and *ADVANCED* Motion Controls' drive requires sending and receiving hex data. This document describes how to use Docklight to send/receive hex numbers via a COM port. Docklight is available for download here:

http://www.docklight.de/download_en.htm

Note: The free version allows opening, but not save/copy/paste.

A supplementary set of sample Docklight files are available here.

Tools such as Docklight are very useful for development and troubleshooting, though are not a complete solution. A user will still need something programmable with the ability to generate messages to the drive.

Messages to the drive require the following:

1. Setup a Message Header
2. Placing the header CRC
3. Applying the data (if necessary)
4. Placing the data CRC (if necessary)

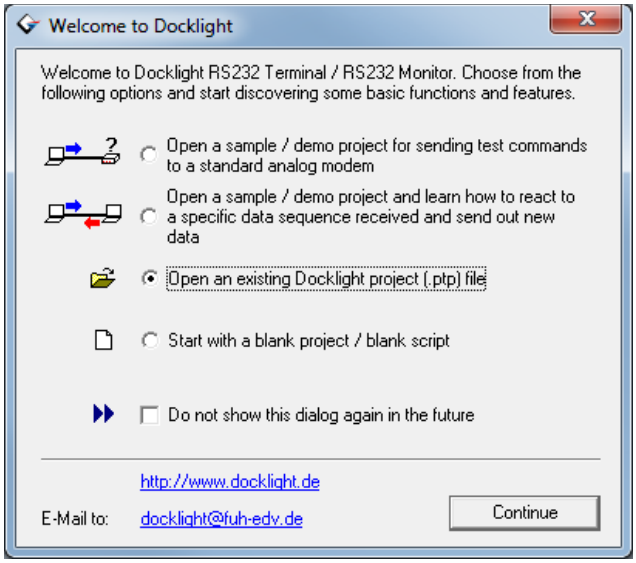
When using the sample Docklight files all of the above steps are already completed. Docklight can be used in conjunction with *ADVANCED* Motion Controls' drive commissioning software, DriveWare, available for download here. *ADVANCED* Motion Controls also provides a serial communication manual for use with DigiFlex® Performance™ RS485/232 drives. (See Sections 1.2 and 1.3 for message structure references)

Example 1 – Enable the Bridge

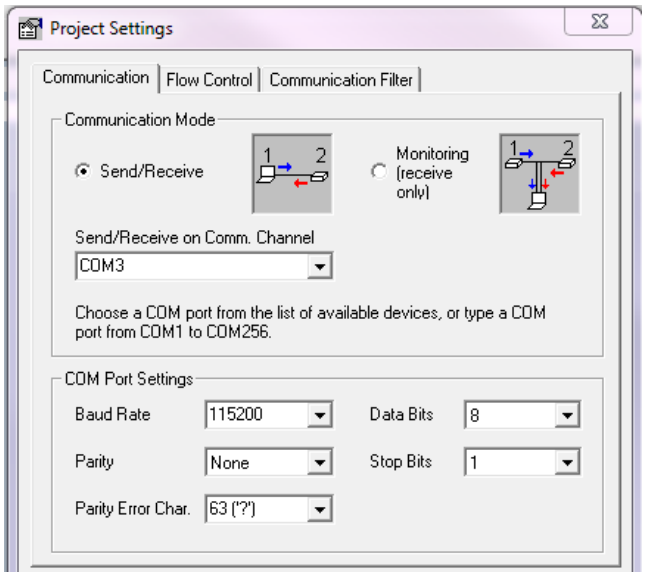
This example will use Docklight buttons and the serial interface as an input to the system to enable the power bridge.

Note: The following example will allow power to the motor when the bridge is enabled. Make sure your system is in a safe state for enabling the power bridge before continuing. If in doubt, remove the motor leads.

1. Install Docklight.
2. Open the sample Docklight file enable.de.

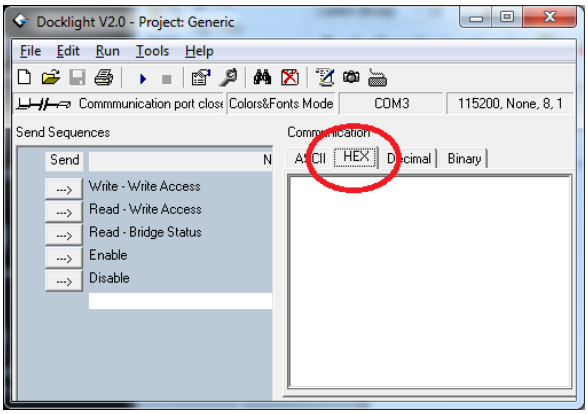


3. Set up the communication channel and baud rate in Docklight (Tools -> Project Settings).

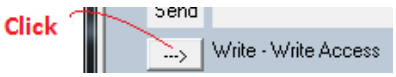


Note: ADVANCED Motion Controls' servo drives use a baud rate of 115200 by default.

4. Setup the screen to display HEX, rather than ASCII.



5. Get Write Access to the drive.



Verify the drive responded in the display screen.

```
Response: A5 FF 00 01 00 00 CF B6
```

If no response is seen, the wiring may be disconnected/incorrect, the COM port may be in use, or the power may be off.

Note: The Auto Detect routine in DriveWare can be used to find the correct COM port if it is unknown. Once the correct COM port is determined, disconnect from DriveWare before reconnecting with Docklight.

6. Click the Enable button.

7. Check that the green status light on the servo drive in use has turned on.

8. If the drive has not enabled, check the COM port settings, Drive Status in DriveWare, cabling, or logic power.

Example 2 – Setup a Message to Write 123 (decimal) to Interface Input 1

Application Note 6, in conjunction with the *ADVANCED* Motion Controls' RS485/232 Communication Manual, contain all the necessary information on sending messages to the drive. Docklight can take new arbitrary messages and send them to the drive.

1. Setup a Message Header

A message header is always 8 bytes. This example will use the drive's default address of 0x3F (63 decimal) so every message will have the first two bytes the same:

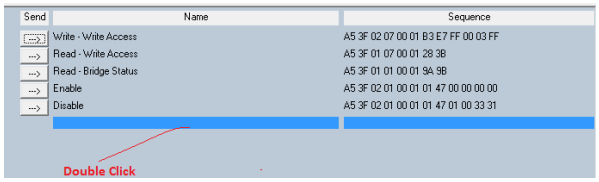
HOST READ/WRITE COMMAND								
Header Section							Data Section	
0xA5	0x3F							
SOF (A5h)	Address	Control Byte	Index	Offset	Data Words	CRC (MSB first)	Data Field (LSB first)	CRC (MSB first)
8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	16 bits	255 word max	16 bits

Figure 1

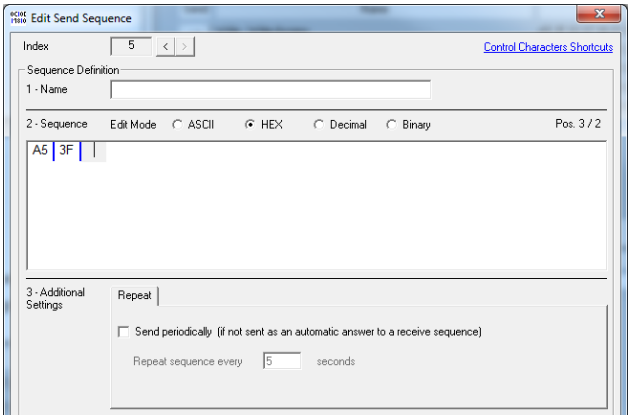
SOF – Start of Frame (always 0xA5)
Address – Drive serial address as set in NVM or by switches (default 0x3F)
Control Byte – 1 for a read, 2 for a write (other bits used for tracking messages, which will not be implemented in Docklight)
Index – Location of the data of interest. The command set has a list of Indexes and their behavior
Offset – A subset of an Index, which contains specific data within the Index
Data Words – Determines the length of a read or write for the Data Field. A setting of 1 indicates 16 bits.
CRC MSB – CCITT 16 CRC MSB calculated using all of the bits to the left
CRC LSB – CCITT 16 CRC LSB calculated using all of the bits to the left

SOF and Address:

The red hex numbers shown in Figure 1 will be placed into Docklight by opening a new message window and typing in the bytes.



The first two bytes written in red in Figure 1 are entered into the Edit Send Sequence window. A name may also be specified at this time.



Control Byte:

As we are assembling a write message to the drive, 0x02 is selected (0x01 used for a read).

HOST READ/WRITE COMMAND								
Header Section							Data Section	
0xA5	0x3F	0x02						
SOF (A5h)	Address	Control Byte	Index	Offset	Data Words	CRC (MSB first)	Data Field (LSB first)	CRC (MSB first)
8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	16 bits	255 word max	16 bits

Figure 2

Index:

This example goes to an interface input. As provided in the RS485/232 Communication Manual, the interface inputs are all at Index 0x45.

HOST READ/WRITE COMMAND								
Header Section							Data Section	
0xA5	0x3F	0x02	0x45					
SOF (A5h)	Address	Control Byte	Index	Offset	Data Words	CRC (MSB first)	Data Field (LSB first)	CRC (MSB first)
8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	16 bits	255 word max	16 bits

Figure 3

Offset:

The offset byte for the interface input indicates which interface input is used. As we are using interface input 1, offset 0x00 is used.

HOST READ/WRITE COMMAND								
Header Section							Data Section	
0xA5	0x3F	0x02	0x45	0x00				
SOF (A5h)	Address	Control Byte	Index	Offset	Data Words	CRC (MSB first)	Data Field (LSB first)	CRC (MSB first)
8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	16 bits	255 word max	16 bits

Figure 4

Data Words:

This byte is data type and index specific. The interface input uses 32 bits, so 0x02 will make the data section the correct size.

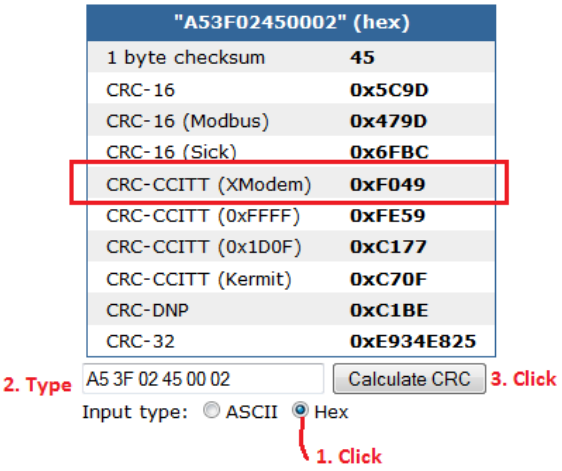
HOST READ/WRITE COMMAND								
Header Section							Data Section	
0xA5	0x3F	0x02	0x45	0x00	0x02			
SOF (A5h)	Address	Control Byte	Index	Offset	Data Words	CRC (MSB first)	Data Field (LSB first)	CRC (MSB first)
8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	16 bits	255 word max	16 bits

Figure 5

CRC:

The header CRC section gets filled in by sending the already filled in bytes through a CRC generation process. *ADVANCED* Motion Controls provides two methods for generating CRC using C. These methods are provided in the Appendix of the RS485/232 Communication Manual. Alternatively, there are many libraries available to generate CRC, as well as web based CRC calculators. This link has a library, and online calculator:

http://www.lammertbies.nl/comm/info/crc-calculation.html



The header CRC used will correspond to the XModem field in the online calculator. These bytes get filled in MSB first:

HOST READ/WRITE COMMAND								
Header Section							Data Section	
0xA5	0x3F	0x02	0x45	0x00	0x02	0xF0 0x49		
SOF (A5h)	Address	Control Byte	Index	Offset	Data Words	CRC (MSB first)	Data Field (LSB first)	CRC (MSB first)
8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	16 bits	255 word max	16 bits

Figure 6

This completes the header section. Reading data from the drive only requires these 8 bytes.

2. Setup the Data Section

This message requires a data section and additional CRC. The first step will require changing 123 to a hex value: 0x7B.

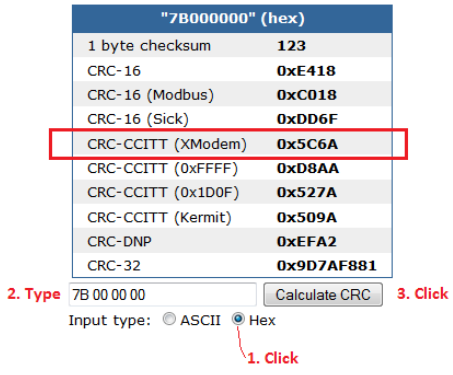
The data section for both reads and writes requires Little Endian Data (LSB first). The right hand side of the Data Field will get padded with 0x00's as follows:

HOST READ/WRITE COMMAND								
Header Section							Data Section	
0xA5	0x3F	0x02	0x45	0x00	0x02	0xF0 0x49	0x7B 0x00 0x00 0x00	
SOF (A5h)	Address	Control Byte	Index	Offset	Data Words	CRC (MSB first)	Data Field (LSB first)	CRC (MSB first)
8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	16 bits	255 word max	16 bits

Figure 7

Note: The 32 bit data field is based on the 0x02 previously filled in the Data Words section.

The Data CRC must now get filled. The same method as the Header CRC is used for the Data CRC. However, only the data gets sent through the CRC process.

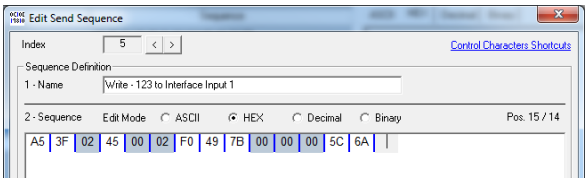


The Data CRC is applied to the message, and the message is complete.

HOST READ/WRITE COMMAND								
Header Section							Data Section	
0xA5	0x3F	0x02	0x45	0x00	0x02	0xF0 0x49	0x7B 0x00 0x00 0x00	0x5C 0x6A
SOF (A5h)	Address	Control Byte	Index	Offset	Data Words	CRC (MSB first)	Data Field (LSB first)	CRC (MSB first)
8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	16 bits	255 word max	16 bits

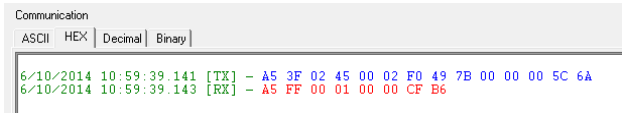
Figure 8

The Docklight message will need to have all of these values in the same order as follows:

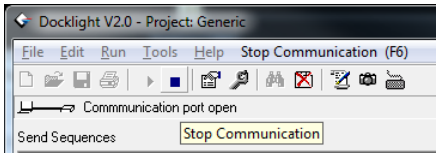


Click OK and send the message to the drive by clicking on the → button.

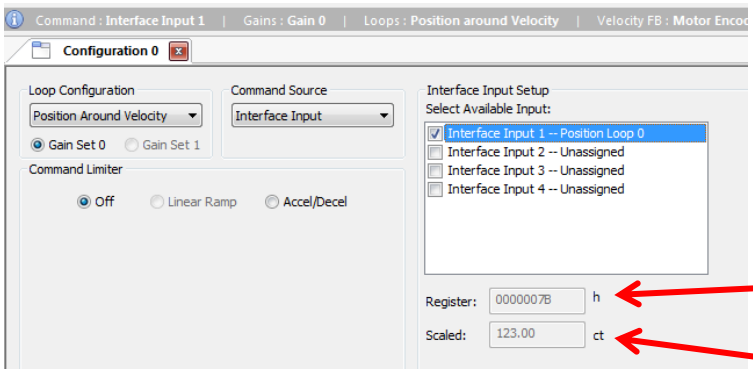
If everything has worked properly, the following outgoing and incoming messages will appear in the watch window:



The written value can be verified by inspecting the response message, or pressing the stop button and connecting with DriveWare.



Stop Communication in Docklight



Verification in DriveWare