Preliminary

Animatics SmartMotor™ *with* DeviceNet Specifications:

Appendices

Revision 0	4/08/03	Jason Hyatt
Revision 1	10/6/03	Jason Hyatt

APPENDIX: I/O POLLING MESSAGE FORMATS

MOTION COMMAND MESSAGE TYPES

Type 01 hex Target Position
Type 02 hex Target Velocity
Type 03 hex Acceleration
Type 04 hex Deceleration (=Acceleration for SmartMotor™)
Type 05 hex Torque

Command Message Format

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Enable	n/a	Hard Stop	Smooth Stop	Direction (V. Mode)	Incremental	n/a	Load Data/ Start Profile
1	Not used by SmartMotor™							
2	Not used by SmartMotor™			Command Message Type				
3	Not used by SmartMotor™			Response Message Type				
4	Command Data 0 (Least Significant)							
5	Command Data 1							
6	Command Data 2							
7	Command Data 3 (Most Significant)							

ATTRIBUTE COMMAND MESSAGE TYPES

Type 1A hex Position Controller Supervisor Attribute
Type 1B hex Position Controller Attribute

Command Message Format

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Enable	n/a	Hard Stop	Smooth Stop	Direction (V. Mode)	Incremental	n/a	Load Data/ Start Profile
1	Attribute Number to GET							
2	Not used by SmartMotor™			Command Message Type				
3	Not used by SmartMotor™			Attribute Number to SET				
4	SET Data 0 (Least Significant)							
5	SET Data 1							
6	SET Data 2							
7	SET Data 3 (Most Significant)							

MOTION RESPONSE MESSAGE TYPES

Type 01 hex Actual Position
Type 02 hex Command Position
Type 03 hex Actual Velocity
Type 04 hex Command Velocity
Type 05 hex Torque
Type 07 hex Captured Index Position

Response Message Format

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Enable	Index Level	n/a	Current Direction	General Fault	n/a	n/a	Profile in Progress
1	Not Used By SmartMotor™							
2	Load Complete	n/a	FE Fault	n/a	n/a	Rev Limit	Fwd Limit	n/a
3	Not Used By SmartMotor™			Response Message Type				
4	Response Data 0 (Least Significant)							
5	Response Data 1							
6	Response Data 2							
7	Response Data 3 (Most Significant)							

ERROR RESPONSE MESSAGE TYPE

Type 14 hex Command/Response Error

Response Message Format

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Enable	Index Level	n/a	Current Direction	General Fault	n/a	n/a	Profile in Progress
1	Reserved = 0							
2	Load Complete	n/a	FE Fault	n/a	n/a	Rev Limit	Fwd Limit	n/a
3	Not Used By SmartMotor™			Response Message Type				
4	General Error Code							
5	Additional Code							
6	Copy of Command Message Data Byte 2							
7	Copy of Command Message Data Byte 3							

ATTRIBUTE RESPONSE MESSAGE TYPES

Type 1A hex Position Controller Supervisor Attribute
Type 1B hex Position Controller Attribute

Response Message Format

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Enable	Index Level	n/a	Current Direction	General Fault	n/a	n/a	Profile in Progress
1	Attribute Number to GET							
2	Load Complete	n/a	FE Fault	n/a	n/a	Rev Limit	Fwd Limit	n/a
3	Not Used By SmartMotor™			Response Message Type				
4	Response Data 0 (Least Significant)							
5	Response Data 1							
6	Response Data 2							
7	Response Data 3 (Most Significant)							

APPENDIX: SAMPLE USING I/O MESSAGING

POSITION MODE (assuming acceleration and velocity have already been set)

Command Message 8 byte payload

80	00	01	01	01	02	00	00

Meaning

80	Enable
00	unused
01	Command Target Position
01	Request Actual Position Response
01	Target Position LSB = 1
02	Target Position next sig byte = 512
00	Target Position 0
00	Target Position MSB =0

(Target Position = 0+0+1+512 = 513)

Response Message 8 byte payload

80	00	00	01	00	00	00	00

Meaning

80	Enabled
00	
00	
01	Target Position Response Message
00	Actual Position LSB to MSB = 0
00	
00	
00	

(Actual Position = 0+0+0+0 = 0)

Command Message

8**1**	00	01	01	01	02	00	00

Meaning

8**1**	Enable + **Load Data**

Response Message

Preliminary

Meaning
91 00 **8**0 01 00 00 00 00
91 Enabled+**Forward Direction**+**Move Profile in Progress**
00
80 **Data has been Loaded**

Command Message
80 0 01 01 01 02 00 00

Meaning
8**0** Enable+clear Load Data to complete handshake, preparing for next command since Response Message byte 2 bit 7 indicates data has been loaded

Response Message
91 00 00 01 **0A** 00 00 00

Meaning
(Actual Position is 0+0+0+10 = 10, motor has begun to move)

Command Message
80 00 01 01 01 02 00 00

Response Message
91 00 00 01 **0B** **01** 00 00

Meaning
(Actual Position is 0+0+11+256 = 267.)

Command Message
80 00 01 01 01 02 00 00

Response Message
8**0** 00 00 01 **01** **02** 00 00

Meaning
8**0** Enabled+cleared Forward Direction+cleared Move Profile in Progress

(Actual Position is 0+0+1+512 = 513 = Target Position)

APPENDIX: CONCISE I/O MESSAGE FORMAT

Command Message Format

All Types

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Enable	Reg Arm	Hard Stop	Smooth Stop	Direct-ion (V mode)	Incre-mental	Start Block*	Load Data/ Start Move Profile
1	**<type specific meaning>**							
2	Command Axis*			**|**	Command Message Type			
3	**<type specific meaning>**							
4	Data Value Low Byte							
5	Data Value Low Middle Byte							
6	Data Value High Middle Byte							
7	Data Value High Byte							

Type Specific Byte Meanings

Type 01 hex Target Position
Type 02 hex Target Velocity
Type 03 hex Acceleration
Type 04 hex Deceleration*
Type 05 hex Torque

1	Block Number*	
3	Response Axis* |	Response Message Type

Type 1A hex Position Controller Supervisor Attribute
Type 1B hex Position Controller Attribute

1	Attribute to Get
3	Attribute to Set

*(not supported by SmartMotor™)

Response Message Format

All Types

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Enable	Reg Level	Home Level*	Current Direction	General Fault	On Target Position*	Block Execution*	Profile in Progress
1	**<type specific meaning>**							
2	Load Complete	Block Fault*	FE Fault	Neg Limit	Pos Limit	Rev Limit	Fwd Limit	Fault Input Fault*
3	Response Axis*			|	Response Message Type			
4	Data Value Low Byte							
5	Data Value Low Middle Byte							
6	Data Value High Middle Byte							
7	Data Value High Byte							

Type Specific Byte Meanings

Type 01 hex Actual Position
Type 02 hex Command Position
Type 03 hex Actual Velocity
Type 04 hex Command Velocity
Type 05 hex Torque
Type 07 hex Captured Index Position

1 Block Number*

Type 14 hex Command/Response Error

1 Reserved = 0

4 General Error Code
5 Additional Code
6 Copy of Command Message Byte 2]
7 Copy of Command Message Byte 3

Type 1A hex Position Controller Supervisor Attribute
Type 1B hex Position Controller Attribute

1 Attribute to Get

*(not supported by SmartMotor™)

APPENDIX: OFTEN-USED ATTRIBUTES

Position Controller Supervisor, Class 36 decimal, Instance 1

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Get Action	Set Action
25	Set	Follow Enable	BOOL	0=disabled 1=enabled	**RMODE** == F or S or X-> 1	**1, <encoder>:** MF4 MFR G **1, <step+dir>:** MS MSR G **0:**
27	Set	Follow Divisor	DINT	Used to calculate the Command Position by dividing the Follow Axis position with this value	a=MFDIV Ra	MFDIV=nnn
28	Set	Follow Multiplier	DINT	Used to calculate the Command Position by dividing the Follow Axis position with this value	a=MFMUL Ra	MFMUL=nnn
100	Set	Follow Type	USINT	0=Step+Dir 1=Encoder		

Position Controller, Class 37 decimal Instance 1

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Get Action	Set Action
3	Set	Mode	USINT	Operating Mode	RMODE, P/R=0, V=1, T=2	**0:** MP **1:** MV **2:** MT
6	Set	Target Position	DINT	Position value to set		**absolute:** P=nnn **incremental:** D=nnn
7	Set	Target Velocity	DINT	Velocity value to set	RV	V=nnn
8	Set	Acceleration	DINT	Acceleration rate	RA	A=nnn
10	Set	Incremental Position Flag	BOOL	0=absolute, 1=incremental		
11	Set	Load Data/ Start Profile/ Profile in Progress	BOOL	On set, loads data and starts the current profile. On get, reports Profile in Progress	RW status bit 0	**1:** G **0:** N/A
13	Set	Actual Position	DINT	Actual absolute position. Set to redefine actual position.	RP (or RPW)	O=nnn

Preliminary

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Get Action	Set Action
14	Get	Actual Velocity	DINT	Reports actual velocity	RV (only valid in Torque Mode)	N/A
15	Get	Commanded Position	DINT	The instantaneous calculated position	RP (or RPW) + RPE	N/A
16	Get	Commanded Velocity	DINT	The instantaneous calculated velocity	RV	N/A
17	Set	Enable	BOOL	0=disable 1=enable		**1:** G or MP D=0 G, allow G or MT **0:** OFF
20	Set	Smooth Stop	BOOL	Smooth Stop motor	0	**1:** X
21	Set	Hard Stop	BOOL	Hard Stop motor	0	**1:** S
23	Set	Direction	BOOL	Instantaneous Direction 0=reverse, 1=forward	Position Mode (direction of move) Velocity Mode (sign of Velocity). Torque Mode, sign of Torque	V=+/-nnn G T=+/-nnn
25	Set	Torque	DINT	Output Torque	RT	T=nnn or T=-nnn
47	Set	Following Error Fault	BOOL	Following error occurrence flag	RW status bit 5	
48	Get	Actual Following Error	DINT	Actual Following error	RPE	N/A
58	Get	Load Data Complete	BOOL	valid data for a valid I/O command message type has been loaded into the position controller		N/A
100	Set	Current Limit	DINT	Current limit of motor 0 to 1023	RAMPS	AMPS=nnn

APPENDIX: Identity Object: ID and Versions

The Identity Object is object class hex 01. It has a single instance, instance 1.

CLASS 01 INSTANCE 1

Attri-bute ID	Access Rule	Name	Device Net Data Type	Description
1	GET	Vendor ID	UINT	Vendor number, ODVA -assigned in SYCON software Get Attribute dialog box, this is displayed as two hex bytes, 2 hex digits per byte, low order byte first. 2A03 is 03 * 256 = 768 2*16 = 32 A*1 = 10 --- 810 (a few original units used 1101 = 273)
4	GET	Revision	STRUCT USINT USINT	 major revision minor revision in SYCON software Get Attribute dialog box this is displayed as two hex bytes, 2 hex digits per byte, major revision first. for example: 0105 is major revision 1 minor revision 3