DN-A244

Quick Reference Guide

Document # 2509001

Revision	Date	Notes
1.00		Original Release
1.01		Minor Revisions
1.02	8/22/07	Add names to the Digital and Analog I/O Add the Serial Client Object Add the Serial Protocol Description

1. DN-A244 Quick Reference Guide

1.1 Objects Present

Class Id		Object Name	Instances	Description
Dec	**Hex**			
1	0x01	Identity	1	Identity information and RESET Service
2	0x02	Message Router	1	Routes Explicit Messages to the appropriate object
3	0x03	DeviceNet	1	Network Parameters and Quick Connect
4	0x04	Assembly	2	#108 Input Assembly #126 Output Assembly
5	0x05	Connection	3	#1 Explicit Messaging #2 Poll Connection #4 COS/Cyclic Connection
8	0x08	Digital Input	4	GPI1..GPI4
9	0x09	Digital Output	4	GPO1..GPO4
10	0x0A	Analog Input	4	AI1..AI4
11	0x0B	Analog Output	2	AO1..AO2
43	0x2B	Acknowledge Handler	1	COS/Cyclic Acknowledgements
106	0x6A	Serial Link Object	1	Serial Port Definitions
166	0xA6	Virtual SPI	1	SPI Interface Diagnostics
170	0xAA	Non Volatile Test	1	Non-volatile Memory Test
176	0xB0	Vendor Specific Parameter	1	Build Date and Time
177	0xB1	Vendor Specific Application Parameter	1	RF Generator Parameters

1.2 Assembly Data Mapping

1.2.1 Assembly #108 – Input Assembly

This assembly has nine(9) bytes of data.

Byte		7	6	5	4	3	2	1	0
0	Analog	AI1[7..0]							
1	In #1	0	0	0	0	AI1[11..8]			
2	Analog	AI2[7..0]							
3	In #2	0	0	0	0	AI2[11..8]			
4	Analog	AI3[7..0]							
5	In #3	0	0	0	0	AI3[11..8]			
6	Analog	AI4[7..0]							
7	In #4	0	0	0	0	AI4[11..8]			
8	Digital In	SPE	0	0	GPI4	0	GPI3	GPI2	GPI1

1.2.2 Assembly #108 – Data Mapping

Data Item	Data Name	Data Mapping		
		Class	Instance	Attribute
GPI1 POS	Digital Input	0x08	0x01	3
GPI2 FF	Digital Input	0x08	0x02	3
GPI3 TS	Digital Input	0x08	0x03	3
GPI4 INTS	Digital Input	0x08	0x04	3
AI1 Forward Power Sense	Analog Input	0x0A	0x01	3
AI2 Reflected Power Sense	Analog Input	0x0A	0x02	3
AI3 Frequency Readback	Analog Input	0x0A	0x03	3
AI4 Not Used	Analog Input	0x0A	0x04	3
SPE	Serial Port Error	0x6A	0x01	14

1.2.3 Assembly #126 – Output Assembly

This assembly has five(5) bytes of data

Byte		7	6	5	4	3	2	1	0
0	Analog	AO1[7..0]							
1	Out #1	0	0	0	0	AO1[11..8]			
2	Analog	AO2[7..0]							
3	Out #2	0	0	0	0	AO2[11..8]			
4	Digital Out	0	0	0	0	GPO4	GPO3	GPO2	GPO1

1.2.4 Assembly #126 – Data Mapping

Data Item	Data Name	Data Mapping		
		Class	Instance	Attribute
GPO1 Power On	Digital Output	0x09	0x01	3
GPO2 Tuning Mode	Digital Output	0x09	0x02	3
GPO3	Digital Output	0x09	0x03	3
GPO4	Digital Output	0x09	0x04	3
AO1 Power Output Setpoint	Analog Output	0x0B	0x01	3
AO2	Analog Output	0x0B	0x02	3

2. Connectors

2.1 DeviceNet Micro Connector

The five pin DeviceNet Micro connector is wired per the DeviceNet specifications.

2.2 Serial Port Connector

The six pin JST connector is used to access the serial port on the processor. There is no support for the serial port in the application firmware. The levels on this connector are TTL levels, and not RS-232 levels.

2.3 Auxiliary I/O Connector

This connector is a sixteen pin dual row male header. Pin #1 is marked on the DN-A244 Pin Definition (Figure 2.3.1) below. The pin numbering is conventional for headers of this type. Pin #2 is horizontally adjacent to Pin #1, and Pin # 3 is below Pin #1 and adjacent to the edge of the board when the board is oriented in the same fashion as on the drawing.

Figure 2.3.1 - DN-A244 Pin Definitions

NC Factory use	1
NC Factory use	2
Tx (DN-A244)	3
GND	4
Rx (DN-A244)	5
GND	6

Pin 1

GPO1	1	2	GPO2
GPO3	3	4	GPO4
GPI1	5	6	GPI2
GPI3	7	8	GPI4
GND	9	10	AI1
AI2	11	12	AI3
AI4	13	14	AO1
AO2	15	16	+15V
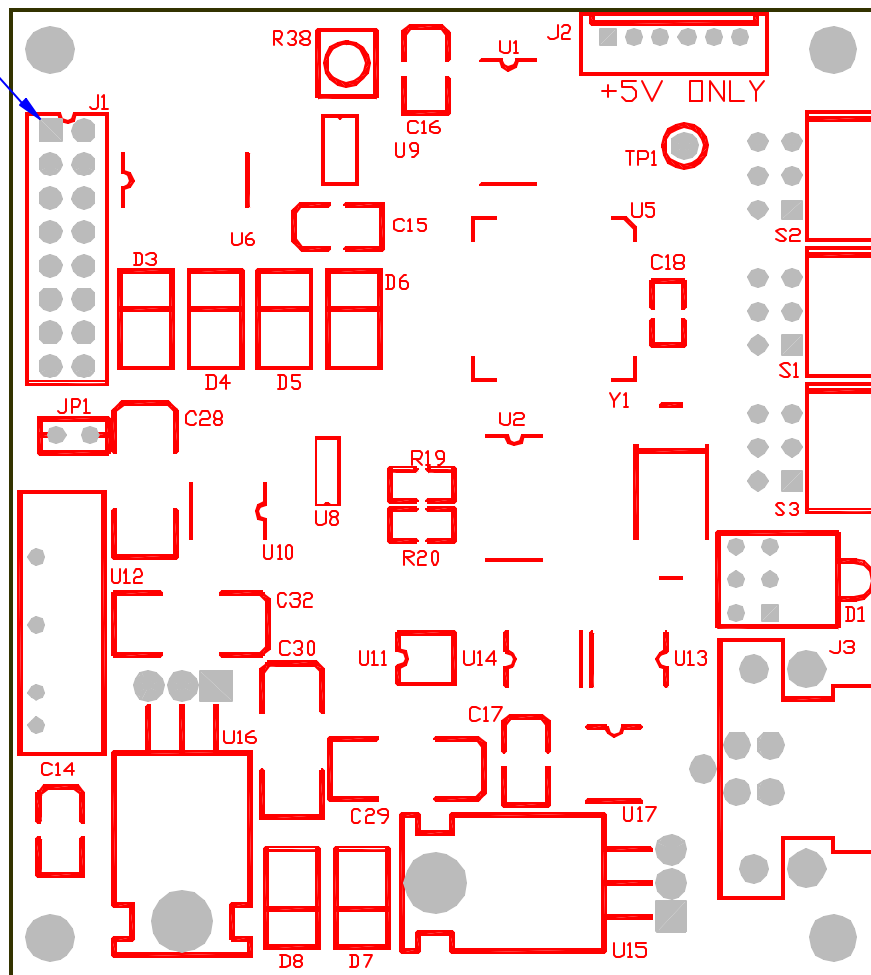
3. Vendor Specific Objects

3.1 Application Parameter Object

Class Code: 0xB1

3.1.1 Class Attributes

There are no required class attributes for this object.

3.1.2 Instance Attributes

Attribute ID	Attribute Name	Access Rule	Data Type	Description
1	Start Frequency	Get/Set	UINT	Range [0..65535]
2	Direction	Get/Set	BOOL	0 = Down 1 = Up
3	Band	Get/Set	USINT	Range [0..255]
4	Gain	Get/Set	UINT	Range [0..65535]
5	Lock	Get/Set	USINT	Range [0..255]
6	Up-ramp	Get/Set	USINT	Range [0..25.5] seconds
7	Down-ramp	Get/Set	USINT	Range [0..25.5] seconds
8	Generator Part #	Get	Short String	8,[A-Z,a-z,0-9,' ',\0]*
9	Generator S/N	Get	UDINT	Range [0..FFFFFFFF]
10	Generator FW	Get	USINT	Range [0..255]
11	DeviceNet Status	Get	USINT	0x00 = Normal 0x80 = Bus Off

Attributes 8, 9, and 10 will be maintained as local copies on the DN-A244. The values will be read over the serial port at reset, and when SPE transitions out of error condition. Attribute 11 is determined by the DN-A244 and will be written over the serial port regularly

3.1.3 Instance Services

Two instance services are supported.

Service ID	Service Name	Description
0x0E	Get Attribute Single	Return the value of an attribute
0x10	Set Attribute Single	Set the value of an attribute

3.1.4   Data Transport Behavior

There are four distinct data transport behaviors:

1 – DeviceNet I/O access to hardware I/O

This is the movement of DeviceNet data by I/O messaging, such as Polled I/O, to or from actual digital or analog hardware I/O.

2 – DeviceNet Explicit Message access to local data

This is conventional DeviceNet messaging performing 'get', 'set', or other services to obtain data or parameters that are stored locally on the DN-A244. This is how most DeviceNet attributes are read or written. It is also how the local copies of the parameters in Application Parameter Object (Class 0xB1) attributes 8, 9, and 10 will be accessed over DeviceNet.

3 – DeviceNet Explicit Message with Deferred Response

This is DeviceNet messaging access to remote data. Upon receipt, a serial port command will be sent to move the necessary data over the serial port, then the necessary DeviceNet reply is sent. This is how attributes 1 through 7 of the Application Parameter Object will be accessed

4 – Independent Serial Port Transport

These will be exchanges of data over the serial port that are not dependent upon DeviceNet messaging. The parameter values used for attributes 8, 9, and 10 of the Application Parameter Object will be obtained (copied) over the serial port at times not related to DeviceNet messages. Attribute 11 of the Application Parameter Object will also be sent over the serial port regularly, independent of DeviceNet messages.

3.2 Serial Link Object

Class Code: 0x6A

3.2.1 Class Attributes

Attribute ID	Need in Implementation	Access Rule	Name	DeviceNet Data Type	Description of Attribute
1	Conditional	Get	Revision	UINT	Revision of this object Current Value = 0x0003
2	Conditional	Get	Max Instance	UINT	Maximum instance number
3-7	Optional	These attributes are optional and described in Volume II chapter 5 of the DeviceNet Specification			

3.2.2 Instance Attributes

Attribute ID	Attribute Name	Access Rule	Data Type	Description
1	Baudrate	Get	UINT	9534 = 0x253E
2	Mode	Get	USINT	'A' = Asyncronous
3	Parity	Get	USINT	'N' = None
4	Data Bits	Get	USINT	'8' = Eight Data Bits
5	Stop Bits	Get	USINT	'1' = One Stop Bit
6	Checksum	Get	USINT	'N' = No Checksum
7	Diagnostic Action	Get/Set	USINT	'0' = Normal Operation '1' = Echo '2' = Transmit Continuous '3' = Transmit Sequential
8	Diagnoistic Character	Get/Set	USINT	Range [0..255] Default:'U' = 0x55
9	Link Timer	Get/Set	UINT	Any value in the range [0..65535] in milliseconds Default = 2000
10	Framing Errors	Get/Set	UINT	Range [0..255]
11	Data Overrun	Get/Set	UINT	Range [0..255]
12	Serial Transactions	Get/Set	UINT	Range [0..65536]
13	Serial Status Register	Get/Set	USINT	Get returns and clears the Serial Status Register: SSR.7 = Invalid Level SSR.1 = Framing/Data Error SSR.0 = Timeout Error
14	Serial Port Error (SPE)	Get	BOOL	SSR (Attribute 13) != 0

3.2.3   Instance Services

Two instance services are supported.

Service ID	Service Name	Description
0x0E	Get Attribute Single	Return the value of an attribute
0x10	Set Attribute Single	Set the value of an attribute

3.2.4   Serial Port Behavior

The serial link timer is started when a message is transmitted. If no response is received before the timer expires, the link is considered timed out. This will be reflected in the Serial Link Status Attribute and the Serial Port Error Attribute. In addition the Module Status LED is flashing red when the link is timed out. Upon expiration the next queued message will be transmitted, and the timer restarted. The timed out indications are discontinued once a proper response message is received within the timer interval.   The serial link timer will also be used to generate the periodic message to set the value of the DeviceNet Status Attribute of the Application Parameter Object (Class 0xB1).

Generic Serial Parameter Protocol
3.3   General Requirements

This serial protocol allows a DeviceNet node and a connected product to exchange information about the values of parameters. It is helpful, when monitoring the serial link, for the exchange to consist of printable ASCII characters and simple line formatting characters. A message can be either a request or a response, and contains at least a service identifier, and a parameter number. Depending on the service identifier there may be a separator character to improve readability and a numeric value or a string value. Finally there should be an end delimiter that indicates the end of a message. This end delimiter should also signal the receiver that it may process the current message and prepare for the next one. In order to improve readability on a monitoring device certain characters may be included in the message which can be ignored by the receiver and have no semantic meaning.

The serial connection is point to point, so there is no need for the concept of node address on either end. A connection is assumed to exist, and mechanisms may be implemented to determine the absence of a cable or valid signal levels at the receiver. One end of the serial connection will be the client endpoint. The client will produce requests and it will consume responses. The DeviceNet unit will be the client. The other endpoint of the connection will be the server endpoint. The server endpoint will consume requests and generate responses.

3.4   Semantic Units

3.4.1   Service Identifiers

A service identifier consists of a single printable ASCII character.

Service ID	Service Name	Used By
G	Get Parameter	Client
S	Set Parameter	Client
P	Parameter Value	Server
E	Error Service	Server

3.4.2   Parameter Address

Parameters are arranged in a flat structure and numbered sequentially from 01 to 99.   There is no parameter number 00.   A parameter address must be represented by two decimal digits.

3.4.3   Parameter Values

A numeric parameter can be represented by a string of decimal digits. Leading zeros are allowed, but are not required.

A string parameter can be represented by a string of printable ASCII characters.

Parameters that are determined to be too long, or that prevent determination of a valid value, such as numeric parameters that cause an overflow, will be ignored. The parameter will be considered invalid and an appropriate DeviceNet Error Response will be sent   This GSPP policy on length checks is preliminary and may not become fully implemented, or may change in the future.

3.4.4   End Delimiter

The end delimiter is a newline character. It is also called a line feed and has the hexadecimal value of 0x0A. Multiple end delimiters are treated as if only the last one was present in the data stream.

3.4.5   Ignored Characters

The following characters may be optionally inserted in the body of a message to improve the readability on debugging or monitoring devices. They contain no semantic or syntactic information and should be ignored by the receivers at both connection endpoints.

Character	Name	Reason
' '	Blank	Separate fields of a message (note 1)
HT	Tab	Separate fields of a message
','	Comma	Separate fields of a message
'='	Equals	Insert between Parameter Address and Parameter Value
CR	Carriage Return	Used with newline for some devices that require it

Note 1 – blanks are not ignored if the occur within a string parameter

3.4.6   Examples

The following examples will use the C language escape sequences to represent non-printable ASCII control characters.

Request Messages	Description
"G02\r\n"	Get the value of Parameter 2. The \r is ignored
"G 02\n"	Get the value of Parameter 2. The blank is ignored
"S 02 = 44\n"	Set the value of Parameter 2 to the value 44 decimal.
"S 06 = ABC123\n"	Set the value of Parameter 6 to "ABC123". The equals sign and the spaces and the newline are not part of the string
"S06ABC123\n"	Set the value of Parameter 6 to "ABC123". All extra characters have been removed.

Response Messages	Description
"P02117\r\n"	The value of Parameter 2 is 117 decimal
"P 02 = 117\r\n"	The value of Parameter 2 is 117 decimal. Spaces an an equals sign added for readability.
"E 11,03\r\n"	The last request resulted in an error. An error message will always contain four decimal digits. A comma has been inserted for readability.
"P\r\n"	Standard Success Response to a Set ("S") Service. Including address or value is allowed, but not required.