

E-Series

DeviceNet Interface

Technical Manual

Part Number 4201-212 Revision B

IMPORTANT

This manual must be used in conjunction with the *E-Series AC Flux Vector Drive Technical Manual - Part Number 4201-180*.

Read and understand the procedures described in both manuals before attempting to install or commission your drive.

If in doubt, before proceeding, please contact Bardac Drives at:

410-604-3400

Bardac Corporation

40 Log Canoe Circle, Stevensville, MD 21666 USA

Phone: (410) 604-3400 Fax: (410) 604-3500

www.bardac.com

CONTENTS

SPECIFICATIONS	4
SECTION 1: GETTING STARTED	5
SECTION 2: INDICATORS AND SCREENS	6
SECTION 3: DATA FORMATS IN THE SCANNER	8
COMMAND BITS	10
OPERATION OF INSTANCES 100 & 101	11
INDEXED READ EXAMPLE	12
INDEXED WRITE EXAMPLE	12
STATE TRANSITION DIAGRAM	14
RUN/STOP EVENT MATRIX	14
SECTION 4: DEVICENET INTERFACE INSTALLATION	15
SECTION 5: DEVICENET INFORMATION	18
IDENTITY OBJECT CLASS CODE 0X01H	20
DEVICENET OBJECT CLASS CODE 0X03 H	20
ASSEMBLY OBJECT CLASS CODE 04 H	22
CONNECTION OBJECT CLASS CODE 0X05 H	24
PARAMETER OBJECT CLASS CODE 0X0F H	25
PARAMETER GROUP OBJECT CLASS CODE 0X10 H	29
MOTOR DATA OBJECT CLASS CODE 0X28 H	30
CONTROL SUPERVISOR OBJECT CLASS CODE 0X29 H	31
AC DRIVE OBJECT CLASS CODE 0X2A H	33
SHORT-FORM MODBUS REGISTER DETAILS ORDERED BY SCREEN	34

SPECIFICATIONS

Baudrate	125kbps / 250kbps / 500kbps
Protocol	DeviceNet
Power Supply	24V @100mA
Isolation	Optical isolation to 500V
Mounting	Fit inside Elite Series IP54 case
Cabling	Thin drop cable (6.9mm OD) refer: DeviceNet Cabling Systems Allen Bradley Publication 1485-6.7.1
Software required	Elite Series Version 2.3 minimum

Note: Modbus communications can not be used with this DeviceNet Interface installed.

SECTION 1: GETTING STARTED

STEP 1:

Wire and commission the Elite Series in accordance with the mounting and connection instructions in Elite Technical manual PDL Part No. 4201-180.

STEP 2:

On the Elite Series, set up the "H Serial Communications" screens as follows.

H1 Protocol = DeviceNet

H4a Mac ID = 63 Set to the MAC ID for this drive.

H4b Baud =125kps Set to the Baud rate of your network.

H4c Ass In = 70 Set to the required assembly input; refer Section 3.

H4d Ass Out = 20 Set to the required assembly output; refer Section 3.

H4e Ctrl Src = 02 Set to Local Control until tested.

H4f Ref Src = 02 Set to Local Reference until tested.

This allows for further testing of the drive interface before allowing the drive to respond to messages over DeviceNet.

STEP 3:

Switch supply to drive off and allow five minutes for the DC bus to discharge.

STEP 4:

Install the DeviceNet Interface Card as per instructions in Section 4.

STEP 5:

Power up the Elite Series and Network. The drive should now be able to be interrogated by DeviceNet software such as DeviceNet Manager. The status of the DeviceNet interface can be checked on Screen H4g. The status codes are:

Off Line	Interface board not responding or network not powered up.
No Net Power	24Volts missing on DeviceNet network
Self-Testing	Powering up.
Standby	Network power OK but no communications established.
Operational	Network is OK and communication is established.
R Fault	Recoverable network fault has occurred.
NR Fault	Non-recoverable network fault has occurred.

SECTION 2: INDICATORS AND SCREENS

Network Status LEDs

OFF	DeviceNet or Elite not powered
Flashing Red & Green	Power on Self Test.
Flashing Green	DeviceNet OK - No connections.
Solid Green	Connection established
Flashing Red	Connection Timed-out.
Solid Red	Fault

DeviceNet Screens on Elite:

Subgroup H4: DeviceNet Communication Parameters

Screen H4a Mac ID = 63

Description	Mac Identification number
Range	0 to 63
Default Value	63
Stop to Change	NO
Function	Defines the Mac ID for the Elite Series unit.
Setting Up	Each unit must have a unique Mac ID.
Note:	Changes to MAC ID have no effect until EDNi is reset via DeviceNet or the power is cycled.

Screen H4b BAUD = 125kbps

Description	DeviceNet Communication Baud rate
Range	125/250/500
Units	kbps
Default Value	125kbps
Stop to Change	NO
Notes:	Changes to MAC ID have no effect until Baud rate EDNi is reset via DeviceNet or the power is cycled.

Screen H4c Ass in = 70

Description	Assembly Input Instance
Range	70 Basic Speed Control Input 71 Extended Speed Control Input 101 PDL Control Input
Default Value	70
Stop to Change	NO
Setting Up	See Section 3 for description of formats.

Screen H4d Ass Out = 20

Description	Assembly Output Instance
-------------	--------------------------

Range	20	Basic Speed Control Output
	21	Extended Speed Control Output
	100	PDL Control Output
Default Value	20	
Stop to Change	NO	
Setting Up	See Section 3 for description format.	
Screen H4e	CTRL SRC = 00	
Description	DEVICENET CONTROL SOURCE	
Range	00	DNET DECIDES
	01	DNET CTRL
	02	LOCAL CONTROL
Default Value	00	
Stop to Change	NO	
Function	Controls the action that the Run & Reset flags from DeviceNet have on the Elite.	
Screen H4f	REF SRC = 00	
Description	DEVICENET REFERENCE SOURCE	
Range	00	DNET DECIDES
	01	DNET CTRL
	02	LOCAL CONTROL
Default Value	00	
Stop to Change	NO	
Function	Controls where the speed reference for the Elite Series comes from. Local Control selects the normal Elite Series reference. DNET CTRL selects the drives reference to come from DeviceNet and DNET DECIDES allows the Elite Series speed reference to come from the source selected by the "Reference from Net" bit in the input instance.	

SECTION 3: DATA FORMATS IN THE SCANNER

The polled data transfer from the Elite Series and the DeviceNet scanner can be individually configured for either 4 or 8 bytes of data transfer of Input and Output data. The format of the polled data bytes is determined by the Input and Output assembly instance numbers as set by Screen H4c and H4d.

The Elite DeviceNet Interface currently supports output (from the Network to the Elite Series) assembly numbers 20, 21 and 100 and input (from the Elite Series to the Network) assembly numbers 70, 71 and 101.

OUTPUT INSTANCE 20 (BASIC SPEED CONTROL OUTPUT)

BYTE	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0						Fault Reset		Run Forward
1								
2	Speed Reference (Low Byte) RPM							
3	Speed Reference (High Byte) RPM							

4202-251 Rev A

OUTPUT INSTANCE 21 (EXTENDED SPEED CONTROL OUTPUT)

BYTE	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0		Network Reference	Network Control			Fault Reset	Run Reverse	Run Forward
1								
2	Speed Reference (Low Byte) RPM							
3	Speed Reference (High Byte) RPM							

4202-252 Rev A

OUTPUT INSTANCE 100 (PDL CONTROL OUTPUT)

BYTE	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0		Network Reference	Network Control			Fault Reset	Run Reverse	Run Forward
1								
2	Speed Reference (Low Byte) RPM							
3	Speed Reference (High Byte) RPM							
4	Multiplexing Parameter index (Low Byte)							
5	Write Flag	Multiplexing Parameter index (High Byte)						
6	Data (Low Byte)							
7	Data (High Byte)							

4202-313 Rev A

INPUT INSTANCE 70 (BASIC SPEED CONTROL INPUT)

BYTE	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0						Running Forward		Faulted / Tripped
1								
2	Actual Speed (Low Byte) RPM							
3	Actual Speed (High Byte) RPM							

4202-253 Rev B

INPUT INSTANCE 71 (EXTENDED SPEED CONTROL INPUT)

BYTE	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	At Reference	Reference from Network	Control from Network	Ready	Running Reverse	Running Forward	Warning	Faulted / Tripped
1	Drive Status							
2	Actual Speed (Low Byte) RPM							
3	Actual Speed (High Byte) RPM							

4202-254 Rev A

INPUT INSTANCE 101 (PDL CONTROL INPUT)

BYTE	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	At Reference	Reference from Network	Control from Network	Ready	Running Reverse	Running Forward	Warning	Faulted/ Tripped
1	Drive Status							
2	Actual Speed (Low Byte) RPM							
3	Actual Speed (High Byte) RPM							
4	Index (Low Byte)							
5	Write Flag	Error Flag	Index (High Byte)					
6	Data (Low Byte)							
7	Data (High Byte)							

4202-314 Rev A

COMMAND BITS

Run Forward	Command to Start drive
Run Reverse	Command to Start drive at the negative of the Speed reference
Fault Reset	Drive fault is reset on 0-1 transition
Network Control	0 - Run & Reset flags have no effect 1 - Run & Reset flags effect drive operation
Network Reference	0 - Speed reference from Elite Series used 1 - Speed reference from DeviceNet used

STATUS BITS

Faulted/Tripped	Drive is in the fault state
Warning	Drive has thermal overload warning
Running Forward	Drive is on in a +ve direction
Running Reverse	Drive is on in a -ve direction
Ready	Drive is ready to Run or Runnig
Control from Network	DeviceNet has control of Run & Reset
Reference from Network	Drive reference is coming from DeviceNet
At Reference	Drive speed is within 1% of reference speed

OPERATION OF INSTANCES 100 & 101

Setting the high bit of the index in the output instance selects a write operation. The index is returned in the input instance with the data from the Elite Series.

Index numbers are the Parameter's Modbus address less 40000. These are listed in Appendix A.

The units of the parameter values retrieved in this way are internal PDL units. i.e. not converted to the units in the DeviceNet standard. For example a High Speed Limit of 100% will appear as 8192 not 1500rpm as it would if accessed through the AC Drive object.

See the Elite Series Serial Communication manual 4201-206 for a more detailed description of the formats for these numbers.

If Input Instance 101 is selected and Ouput Instance 100 is not selected then the default value of Motor Current will be sent from the drive along with its index in Input Instance 101.

The Error Flag will be set in Input Instance 101 if there was an error in accessing the data such as invalid index or value out of range for write.

USING I/O ASSEMBLY INSTANCES 100, 101

I/O assembly instances 100, 101 allow the user to access any of the drive parameters using a multiplexing algorithm. Since the data is being multiplexed asynchronously to the DeviceNet data cycle the user must synchronise the data exchange as described below.

INDEXED READ EXAMPLE

STEP 1: SET PARAMETER INDEX

Write the index into bytes 4 and 5 of the Output instance, the index is the MODBUS address of the required parameter from tables 5,6 or 7 (dependant upon drive type) minus 40000.

e.g. to access register 40101 (decimal) use the index value 101 (decimal).

STEP 2: CHECK FOR REPLY

Mask the error flag (bit 6 in byte 5) out of the returned index value (bytes 4 and 5) and compare this with the value of the index sent. If the values are different then data has not been sent, repeat this step until the values is the same.

STEP 3: CHECK FOR ERRORS

Check the value of the error flag (bit 6 in byte 5) if this is set to 0 then the read cycle has been successfully completed, the value of the parameter requested is returned in the input data (bytes 6 and 7).

If an error occurs the error flag will be set and the error code will be returned in the low byte of the data returned (byte 6), refer to Index Error Codes for a description of error codes returned.

INDEXED WRITE EXAMPLE

STEP 1: SET PARAMETER INDEX

Write the index into bytes 4 and 5 of the Output instance, the index is the MODBUS address of the required parameter from tables 5,6 or 7 minus 40000.

e.g. to access register 40101 (decimal) use the index value 101 (decimal).

STEP 2: SET DATA VALUE

Write the new value for the parameter into bytes 6 and 7 of the Output instance.

STEP 3: SET THE WRITE FLAG

Set bit 7 of byte 5 to a 1 to send the message.

STEP 4: CHECK FOR REPLY

Mask the error flag (bit 6 in byte 5) out of the returned index value and compare this with the value of the index sent. If the index values are different then data has not been sent, repeat this step until the values are the same.

STEP 5: CHECK FOR ERRORS

Check the value of the error flag (bit 6 in byte 5) if this is set to 0 then the write cycle has been successfully completed, the data sent (bytes 6 and 7) will be echoed in the returned data value.

If an error occurs the error flag will be set and the error code will be returned in the low byte of the data returned (byte 6), refer to Index error codes for a description of error codes returned.

INDEX ERROR CODES

Error Code	Name	Cause
1	Illegal function	Requested function is not supported
2	Illegal data address	The requested data index does not exist
3	Illegal data value	The data value sent is out of range
6	Busy, Reject	The requested function could not be completed, try again later
7	Negative Acknowledge	The requested function could not be performed

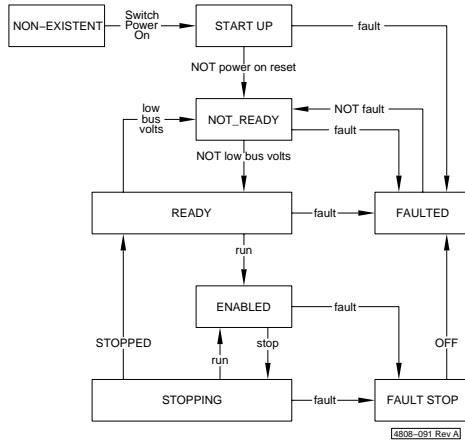
The meaning of the drive status codes returned in Byte 1 of the input instances is given below.

Drive Status (Byte 1 of Interface 71 & 101) is one of the following:

- 1 Start Up
- 2 Not Ready
- 3 Ready
- 4 Enabled
- 5 Stopping
- 6 Fault Stopped
- 7 Faulted

STATE TRANSITION DIAGRAM

The following State Transition Diagram provides a graphical description of the states and transitions between states.



RUN/STOP EVENT MATRIX

For Output Instance 21 and 100, the Network Control is used to request that Run/Stop events be controlled from the network.

If Input Instance 71 and 101, Control from Network is set to 1, the Run/Stop events are triggered by a combination of the Run Forward and Run Reverse attributes as shown in the following table.

RunFwd	RunRev	Trigger Event	Run Type
0	0	Stop	N/A
0->1	0	Run	RunFwd
0	0->1	Run	RunRev
0->1	0->1	No Action	N/A
1	1	No Action	N/A
1->0	1	Run	RunRev
1	1->0	Run	RunFwd

4202-295 Rev A

SECTION 4: DEVICENET INTERFACE INSTALLATION

The Microdrive Elite DeviceNet Interface (EDNi) is installed within the Microdrive Elite case.

NOTE: This installation note assumes that the Microdrive Elite has been commissioned and all power and control wiring is completed.

WARNING: The Microdrive Elite operates from high energy electrical supplies. Ensure that the supply is isolated and allow approximately five minutes for the DC bus to discharge before attempting installation of the Elite DeviceNet Interface Module. The Microdrive Elite contains static sensitive printed circuit boards. Use static safe procedures when handling these boards and the Elite DeviceNet Interface Module.

STEP 1: ISOLATION AND FRONT COVER REMOVAL

Disconnect the supply to the Microdrive Elite. Allow time for the DC Bus to discharge. The front cover of the Microdrive Elite can be removed by unscrewing the six fixing screws (see Fig. 4.1)

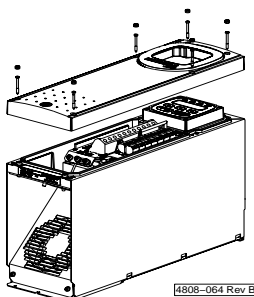


Fig. 4.1: Elite Front Cover Removal

STEP 2: REMOTE DISPLAY REMOVAL

Grasp display firmly on both sides and lift off the steel mounting plate holding the display (see Fig. 4.2)

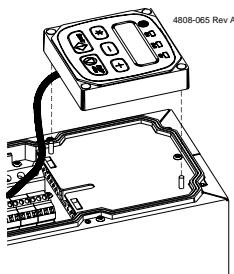


Fig. 4.2: Remote Display Removal

STEP 3: COVER PLATE REMOVAL

Remove the single fixing screw located at the top of the cover plate. Lift plate up slightly and slide upwards off the mounting tags. (see Fig. 4.3)

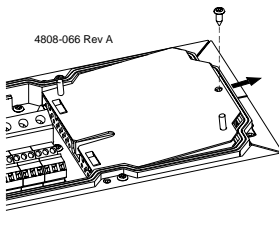


Fig. 4.3: Cover Plate Removal

STEP 4: CONTROL BOARD MOUNTING REMOVAL

NOTE: Use static safe procedures at all times

Remove the two fixing screws located in the top left and right of the Microdrive Elite control board and discard these screws (see Fig 4.4)

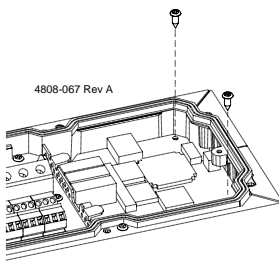


Fig. 4.4: Control Board Mounting Screw Removal

STEP 5: FITTING EDNI

Place Elite DeviceNet Interface carefully over the two sets of connecting pins ensuring that all pins are correctly lined up. Gently press EDNi into place. Fix the EDNi firmly in place using the two screws provided. (see Fig. 4.5)

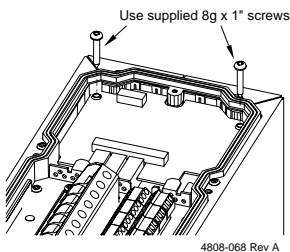
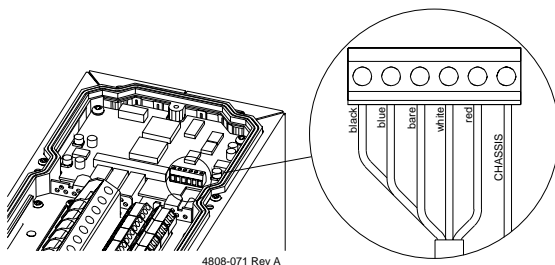


Fig. 4.5: Fitting EDNi PCB

STEP 6: CABLE CONNECTIONS

Install connection cable through cable glands and terminate on to the terminals of the DeviceNet Interface. (See Fig.4.6)

NOTE: Wire colours are shown on PCB.



4808-071 Rev A
Fig. 4.6: Wiring of EDNi

SECTION 5: DEVICENET INFORMATION

The Elite DeviceNet Interface allows the Elite Series to operate as a slave device on a DeviceNet network. The module is a Group 2 only Server supporting the predefined master/slave connection set and Polled I/O messages.

This section defines the DeviceNet message types, class services, and objects supported by the Elite DeviceNet Interface.

DeviceNet Message Types

Being a group 2 slave device the Elite DeviceNet interface module supports the following message types.

CAN Identifier field	Group 2 Message Type
10xxxxxx111	Duplicate MACID Check Messages
10xxxxxx101	Master IO Poll Command Messages
10xxxxxx100	Master Explicit Request Messages
10xxxxxx011	Slave Explicit Response Messages
10xxxxxx110	Unconnected Explicit Request Messages
01111xxxxxx	Slave Poll Response Messages

4202-296 Rev A

xxxxxx = Communication Module Node Address

OBJECT CLASSES

The module supports the following object classes.

Class	Object
0x01H	Identity
0x03 H	DeviceNet
0x04 H	Assembly
0x05 H	Connection
0x0F H	Parameter
0x10 H	Parameter Group
0x28 H	Motor Data
0x29 H	Control Supervisor
0x2A H	AC Drive

4202-297 Rev A

IDENTITY OBJECT CLASS CODE 0X01_H

CLASS ATTRIBUTES

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1

4202-259 Rev B

NUMBER OF INSTANCES : 1

INSTANCE ATTRIBUTES

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Vendor ID	UINT	174
2	Get	Device Type	UINT	2 = AC Drive
3	Get	Product Code	UINT	4 = Elite
4	Get	Revision Major Rev. Minor Rev.	STRUCT of USINT USINT	- -
5	Get	Status	WORD	-
6	Get	Serial No.	UDINT	-
7	Get	Product Name	SHORT_STRING	Microdrive Elite

4202-260 Rev A

COMMON SERVICES

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x05	No	Yes	Reset

4202-261 Rev C

DEVICENET OBJECT CLASS CODE 0X03_H

CLASS ATTRIBUTES

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	2

4202-262 Rev C

NUMBER OF INSTANCES : 1

INSTANCE ATTRIBUTES

Attribute ID	Access Rule	Name	Data Type	Value
1	Get/Set	MAC ID	USINT	0-63
2	Get/Set	Baud Rate	USINT	0 = 125kps 1 = 250 kps 2 = 500 kps

4202-263 Rev B

COMMON SERVICES

Service Code	Class	Instance	Service Name
0x0E	Yes	Yes	Get_Attribute_Single

4202-264 Rev B

ASSEMBLY OBJECT CLASS CODE 04_H**CLASS ATTRIBUTES : NONE SUPPORTED****NUMBER OF INSTANCES : 6****INSTANCE ATTRIBUTES**

Attribute ID	Access Rule	Name	Data Type	Value
3	Get	Data	ARRAY	-

4202-265 Rev B

OUTPUT INSTANCES

Output Instances supported are 20, 21, &100.

Output Instance Data Formats are described in Section 3.

The following table indicates the I/O Assembly Data Attribute mapping for Output Assemblies.

Data Component	Class		Instance	Attribute	
	Name	Number	Number	Name	Number
Run Forward	Control Supervisor	0x29 H	1	Run1	3
Run Reverse	Control Supervisor	0x29 H	1	Run2	4
Fault Reset	Control Supervisor	0x29 H	1	FaultRst	12
Network Control	Control Supervisor	0x29 H	1	NetCtrl	5
Network Reference	AC Drive	0x2A H	1	NetRef	4
Speed Reference	AC Drive	0x2A H	1	SpeedRef	8

4202-267 Rev B

Refer to Run/Stop Event Matrix described in Section 3 for a fuller description of Run Forward and Run Reverse bits.

INPUT INSTANCES

Input Instance supported are 70, 71, & 101.

Input Instance Data Formats are described in Section 3.

The following table indicates the I/O Assembly Data Attribute mapping for Input Assemblies.

Data Component	Class		Instance	Attribute	
	Name	Number	Number	Name	Number
Faulted	Control Supervisor	0x29 Hex	1	Faulted	10
Warning	Control Supervisor	0x29 Hex	1	Warning	11
Forward	Control Supervisor	0x29 Hex	1	Running	17
Reverse	Control Supervisor	0x29 Hex	1	Running	28
Ready	Control Supervisor	0x29 Hex	1	Ready	9
Cntrl Network	Control Supervisor	0x29 Hex	1	CtrlFromNet	15
Ref Network	AC Drive	0x2A Hex	1	RefFromNet	29
At Reference	AC Drive	0x2A Hex	1	AtReference	3
Speed Actual	AC Drive	0x2A Hex	1	SpeedActual	7

4202-272 Rev B

COMMON SERVICES

Service Code	Class	Instance	Service Name
0x0E	Yes	Yes	Get_Attribute_Single

4202-273 Rev B

CONNECTION OBJECT CLASS CODE 0X05_H

CLASS ATTRIBUTES : NONE SUPPORTED

NUMBER OF INSTANCES : 2

INSTANCE 1 — EXPLICIT MESSAGE CONNECTION

INSTANCE 2 — POLLED I/O MESSAGE CONNECTION

COMMON SERVICES

Service Code	Class	Instance	Service Name
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single
0x05	No	Yes	Reset

4202-276 Rev A

PARAMETER OBJECT CLASS CODE 0X0F_H
CLASS ATTRIBUTES

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1
2	Get	Max Instance	UINT	197
8	Get	Descriptor	Word	0B hex bit0 1=Supports parameter instances. bit1 1= Supports full attributes bit2 0= Do not have to execute non-volatile save command bit3 1= All full parameters are stored in non-volatile storage.
9	Get	Configuratio Assembly	UINT	0= Not supported
10	Get/Set	Native Language	UINT	0= English

4202-277 Rev A

NUMBER OF INSTANCES : DEPENDANT OF ELITE SOFTWARE REVISION

INSTANCE ATTRIBUTES

Attribute ID	Access Rule	Name	Data Type	Value
1	Get/Set	Parameter Value	data type	
2	Get/Set	Link Path Size	USINT	0 = No Link Specified
3	Get/Set	Link Path	ARRAY	
4	Get	Descriptor	WORD	Refer semantics of descriptor table
5	Get	Data Type	USINT	Refer Data Types & Data sizes table
6	Get	Data Size	USINT	Refer Data Types & Data sizes table
7	Get	Parameter Name String	SHORT_STRING	
8	Get	Units String	SHORT_STRING	
9	Get	Help String	SHORT_STRING	
10	Get	Min. Value	data type	
11	Get	Max. Value	data type	
12	Get	Default Value	data type	
13	Get	Scaling Multiplier	UINT	0 = No Scaling n = Multiplier Value
14	Get	Scaling Divisor	UINT	0 = No Scaling n = Divisor Value
15	Get	Scaling Base	UINT	0 = No Scaling n = Base Value
16	Get	Scaling Offset	INT	0 = No Scaling n = Offset Value
17	Get	Multiplier Link	UINT	0 = No Scaling Link n = Param. Instance of Multiplier Source
18	Get	Divisor Link	UINT	0 = No Scaling Link n = Param. Instance of Divisor Source
19	Get	Base Link	UINT	0 = No Scaling Link n = Param.Instance of Base Source
20	Get	Offset Link	UINT	0 = No Scaling Link n = Param.Instance of Offset Source
21	Get	Decimal Precision	USINT	

4202-278 Rev A

DATA TYPES AND DATA SIZES SUPPORTED BY PARAMETER OBJECT

Attribute Value	Definition	Data Size (bytes)	Description
1	WORD	2	16-bit word
2	UINT	2	16-bit unsigned integer
3	INT	2	16-bit signed integer
4	BOOL	1	Boolean
5	SINT	1	Short Integer
8	USINT	1	Unsigned Short Integer
11	REAL	4	Single floating point format (IEEE 754)
23	SHORT_STRING	n+1	Short n-byte character string
24	BYTE	1	8-bit string

4202-279 Rev B

SEMANTICS OF DESCRIPTOR INSTANCE ATTRIBUTE

Bit	Definition	Meaning
0	Supports Settable Path	Indicates that link path can be set
1	Supports Enumerated Strings	Indicates that enumerated strings are supported for and can be read with the Get_Enum_String service
2	Supports Scaling	Indicates that the scaling factor should be implemented to present the value to the user in engineering units
3	Supports Scaling Links	Indicates that the values for the scaling factor may be retrieved from other parameters
4	Read Only Parameter	Indicates that the attribute value can only be read not set
5	Monitor Parameter	Indicates that the attribute value is updated in real time by the device
6	Supports Extended Precision Scaling	Indicates that the extended precision scaling factor should be implemented to present the value to the user in engineering units

4202-280 Rev B

COMMON SERVICES

Service Code	Class	Instance	Service Name
0x01	Yes	Yes	Get_Attributes_All
0x05	Yes	No	Reset
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

4202-281 Rev A

OBJECT-SPECIFIC SERVICES

Service Code	Class	Instance	Service Name
0x4B	No	Yes	Get_Enum_String

4202-282 Rev A

PARAMETER GROUP OBJECT CLASS CODE 0X10_H

CLASS ATTRIBUTES

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1
2	Get	Max Instance	UINT	17
8	Get/Set	Native Language	USINT	0 = English

4202-283 Rev A

NUMBER OF INSTANCES : 18

INSTANCE ATTRIBUTES

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Group Name String	SHORT_STRING	
2	Get	Number of Members in Group	UINT	
3	Get	1st Param. Number in Group	UINT	
4	Get	2nd Param. Number in Group	UINT	
n	Get	(n-2)th Param. Number in Group	UINT	

4202-285 Rev A

COMMON SERVICES

Service Code	Class	Instance	Service Name
0x01	Yes	Yes	Get_Attributes_All
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	No	Set_Attribute_Single

4202-284 Rev A

MOTOR DATA OBJECT CLASS CODE 0X28_H**CLASS ATTRIBUTES**

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1

4202-286 Rev A

NUMBER OF INSTANCES : 1**INSTANCE ATTRIBUTES**

Attribute ID	Access Rule	Name	Data Type	Units	Min..Max	Default
1	Get	Num Attr	USINT	-	-	6
2	Get	Attributes	ARRAY of USINT	-	-	6,7,8,9,12,15
3	Get	Motor Type	USINT	-	-	7 = Squirrel Cage Induction Motor
6	Get/Set	Rated Current	UINT	0.01 Amps		
7	Get/Set	Rated Voltage	UINT	1 Volt	0..999	400
8	Get/Set	Rated Power	UDINT	1 Watt	0..65000	0
9	Get/Set	Rated Frequency	UINT	1 Hz	0..400	50
12	Get	Pole Count	UINT	-	0..20	0
15	Get/Set	Base Speed	UINT	1 RPM	0..24000	0

4202-287 Rev A

COMMON SERVICES

Service Code	Class	Instance	Service Name
0x10	No	Yes	Set_Attribute_Single
0x0E	Yes	Yes	Get_Attribute_Single

4202-288 Rev A

CONTROL SUPERVISOR OBJECT CLASS CODE 0X29_H**CLASS ATTRIBUTES**

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1

4202-289 Rev A

NUMBER OF INSTANCES : 1**INSTANCE ATTRIBUTES**

Attribute ID	Access Rule	Name	Data Type	Min..Max	Default	Description
1	Get	NumAttr	USINT	-	9	Nos. of Attributes supported
2	Get	Attributes	ARRAY USINT	-	3-8,10,12,15	List of Attributes supported
3	Get/Set	RunFwd	BOOL	0..1	Run/Stop	Event Matrix
4	Get/Set	RunRev	BOOL	0..1	Run/Stop	Event Matrix
5	Get/Set	NetCtrl	BOOL	0..1	0	Request Run/Stop control to
6	Get/Set	State	USINT	0..7		1 = StartUp 2 = Not Ready 3 = Ready 4 = Enabled 5 = Stopping 6 = Fault Stop 7 = Faulted
7	Get/Set	RunFwd	BOOL	0..1	0	1 = (Enabled and RunFwd) or (Stopping and RunningFwd) or (FaultStop and RunningFwd) 0 = Other State
8	Get/Set	RunRev	BOOL	0..1	0	1 = (Enabled and RunRev) or (Stopping and RunningRev) or (FaultStop and RunningRev) 0 = Other State
10	Get	Faulted	BOOL	0..1		1 = Fault Latched 0 = No Faults
12	Get/Set	Fault Reset	BOOL	0..1	0	0->1 Fault Reset 0 = No Action Note : The Elite resets fault reset commands to 0; Get_Attribute_Single will therefore always return a value of 0.
15	Get/Set	CtrlFromN	BOOL	0..1	0	Status of Run/Stop control source 0 = local control 1 = network control

4202-290 Rev A

COMMON SERVICES

Service Code	Class	Instance	Service Name
0x05	No	Yes	Reset
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

4202-291 Rev A

STATE TRANSITION DIAGRAM

The State Transition Diagram shown in Section 3 provides a graphical description of the states and transitions that are reflected in Attribute 6.

RUN/STOP EVENT MATRIX

Attribute 5, NetCtrl is used to request that Run/Stop events be controlled from the network.

If Attribute 15, CtrlFromNet is set to 1, the Run/Stop events are triggered by a combination of the RunFwd and RunRev attributes (Attributes 3 & 4 respectively) as shown in the RunEvent matrix in Section 3.

AC DRIVE OBJECT CLASS CODE 0X2A_H

CLASS ATTRIBUTES

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1

4202-292 Rev A

NUMBER OF INSTANCES : 1

INSTANCE ATTRIBUTES

Attribute ID	Access Rule	Name	Data Type	Units	Min..Max	Default	Description
1	Get	NumAttr	USINT	-	-		No. of Attributes
2	Get	Attributes	ARRAY of USINT				List of Attributes Supported
4	Get/Set	NetRef	BOOL	-	0..1	0	Request
6	Get/Set	DriveMode	USINT	-	1..3	1	1 = V/Hz 2 = Closed Loop Speed 3 = Closed Loop Torque
7	Get	SpeedActual	INT	RPM		0	Actual speed in RPM
8	Get/Set	SpeedRef	INT	RPM		0	Ref. speed in RPM
22	Get	SpeedScale	SINT	-	-	0	-
29	Get	RefFromNet	BOOL	-	0..1	0	Status of Reference

4202-293 Rev A

COMMON SERVICES

Service Code	Class	Instance	Service Name
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

4202-294 Rev A

SHORT-FORM MODBUS REGISTER DETAILS ORDERED BY SCREEN

Screen Range	Address	Description	Unit, Scale	Range Scaled
-	40040	Acceleration rate reference	0.1..6000%/s	1..60000
-	40041	Deceleration rate reference	0.1..6000%/s	1..60000
-	40052	Stop mode in use	0..5	0..5
-	40080	Host reset control	0..1	0..1
-	40081	Host stop control	0..1	0..1
-	40082	Host start control	0..1	0..1
-	40083	Host trip control	0..1	0..1
-	40084	Speed / Torque Mode reference	0..1	0..1
-	40094	Tacho calculated rotor speed***	-32768..+32767	-32768..+32767
-	40102	Estimated DB resistor temp. ***	0..800%	0..65535
-	40103	Reserved ***	-50..100	-50..100
-	40104	Reserved ***	-50..100	-50..100
-	40108	Fibre reference input ***	-400..+400%	-32768..+32767
-	40110	Fibre reference output ***	-400..+400%	-32768..+32767
-	40120	Analogue input 1 value ***	-400..+400%	-32768..+32767
-	40121	Analogue input 2 value***	-400..+400%	-32768..+32767
-	40122	Analogue output 1 value ***	-400..+400%	-32768..+32767
-	40123	Analogue output 2 value ***	-400..+400%	-32768..+32767
-	40124	Analogue input 1+2 value ***	-400..+400%	-32768..+32767
-	40153	Error code returned by Vista block ***		0..255 0..255
-	40176	Status of Multifunction I/P 7 / Ext.Trip ***		0..1 0..1
-	40180	Elite stop signal ***	0..1	0..1
-	40181	Elite start signal ***	0..1	0..1
-	40182	Elite reset signal ***	0..1	0..1
-	40183	Elite run command	0..1	0..1
-	40221	Process control enable ***	0..1	0..1
-	40222	Process control reference value ***	-400..+400%	-32768..+32767
-	40223	Process control feedback value ***	-400..+400%	-32768..+32767
-	40230	Inverter rated voltage volts	400,690Vac	400,690
-	40231	Inverter rated current	0..6553amps	0..65535
-	40613	Drive identification code ***(Note 1)	0..65535	-
-	40885	EEPROM Address***(excl. 40885)	40001..49999	40001..49999
-	41013	Comparator 1 output ***	0..1	0..1
-	41019	Multi-reference select ***	0..255	0..255

-	41062	Motorised potentiometer speed ***	-400..+400%	-32768..+32767
-	41063	Motorised potentiometer torque ***	-400..+400%	-32768..+32767
-	41113	Comparator 2 output ***	0..1	0..1
-	41114	Window comparator output ***	0..1	0..1
Status Line	40089	Status, overload, speed/torque indication ***		0..128 0..128
Status Line	40091	Motor torque ***	-400..+400%	-32768..+32767
Status Line	41090	Inverter and Motor overload warning ***		0..16 0..16
Status Line, A5	40090	Motor speed ***	-400..+400%	-32768..+32767
A1	41042	Keyboard speed/torque mode select		0..1 0..1
A2	41041	Keyboard torque reference	-250..+250%	-20480..+20480
A3	40088	Local speed reference	-250..+250%	-20480..+20480
A4	40161	Reference speed	-400..+400%	-32768..+32767
A4	40162	Reference torque	-400..+400%	-32768..+32767
A5	40098	Power output ***	-400..+400%	-32768..+32767
A6	40093	Current output ***	0..800%	0..65535
A7	40100	Estimated motor temperature ***	0..800%	0..65535
A7	40101	Estimated inverter temperature ***	0..800%	0..65535
A8	40092	DC bus voltage ***	0..800%	0..65535
A8	40099	Voltage output ***	0..800%	0..65535
C1	41012	Comparator 1 source select	0..18	0..18
C2	41010	Comparator 1 "ON" setpoint	-250..+250%	-20480..+20480
C3	41011	Comparator 1 "OFF" setpoint	-250..+250%	-20480..+20480
C4	41112	Comparator 2 source select	0..18	0..18
C5	41110	Comparator 2 "ON" setpoint	-250..+250%	-20480..+20480
C6	41111	Comparator 2 "OFF" setpoint	-250..+250%	-20480..+20480
D1	40020	Time constant of DB resistor	0..250s	0..250
D2	40021	Duty rating of DB resistor	OFF,1..100%	0..8192
F	40095	Current fault status ***	0..39	0..39
F1	40201	Fault History 1 ***	0..39	0..39
F2	40202	Fault History 2 ***	0..39	0..39
F3	40203	Fault History 3 ***	0..39	0..39
F4	40204	Fault History 4 ***	0..39	0..39
F5	40205	Fault History 5 ***	0..39	0..39
F6	40200	Clear Fault History	0..1	0..1
H3a	40030	Modbus serial comms address	1..240	1..240
H3b	40031	Modbus serial comms baud-rate	0..3	0..3
H2	40032	Modbus serial comms T/O period	0..3	0..3
I1	40085	Local start stop and reset control	0..3	0..3
I2	41014	Speed reference source select	0..8	0..8
I3	41015	Torque reference source select	0..7	0..7

I4	41016	Alt. speed reference source select	0..8	0..8
I5	41017	Alt. torque reference source select	0..7	0..7
I6a,Z3	40134	Analogue input 1 format	0..3	0..3
I6b	40125	Analogue input 1 low setpoint	-400..+400%	-32768..+32767
I6c	40126	Analogue input 1 high setpoint	-400..+400%	-32768..+32767
I6d,Z4	40135	Analogue input 2 format	0..3	0..3
I6e	40127	Analogue input 2 low setpoint	-400..+400%	-32768..+32767
I6f	40128	Analogue input 2 high setpoint	-400..+400%	-32768..+32767
I6g	40133	Zero band for analogue input sources		0..1 0..1
I7a	41007	Multi-function input mode select	0..5	0..5
I7b	40138	Multi-function input logical inversion	0..1	0..1
I7c	41001	Multi-function input 1 select	0..18	0..18
I7d	41002	Multi-function input 2 select	0..18	0..18
I7e	41003	Multi-function input 3 select	0..18	0..18
I7f	41004	Multi-function input 4 select	0..18	0..18
I7g	41005	Multi-function input 5 select	0..18	0..18
I7h	41006	Multi-function input 6 select	0..18	0..18
I8a	40116	Fibre optic input low setpoint	-400..+400%	-32768..+32767
I8b	40117	Fibre optic input high setpoint	-400..+400%	-32768..+32767
I8c	40107	Fibre optic control mode select	0..5	0..5
I8d	40113	Fibre optic communication timeout	0..3	0..3
L2	40011	Minimum speed	-250%..Max	-20480..Max
L3	40012	Maximum speed	Min Limit..+250%	Min..+20480
L4	40014	Minimum torque	-250%..Max Limit	-20480..Max
L5	40015	Maximum torque	Min Limit..+250%	Min..+20480
L6	40013	Speed limit timeout	0..25s,INFINITE	0..26000
L7	40016	Torque limit timeout	0..25s,INFINITE	0..26000
L8	40010	Regeneration limit	0..250%	0..20480
L9	40018	Current limit	25..+150%	2048..12288
L10	40190	Skip Speed 1	-250..+250%	-20480..+20480
L11	40191	Skip Speed 2	-250..+250%	-20480..+20480
L12	40192	Skip Bandwidth	0..20%	0..1638
M1	41020	Multi-reference 1 setpoint	-400..+400%	-32768..+32767
M2	41021	Multi-reference 2 setpoint	-400..+400%	-32768..+32767
M3	41022	Multi-reference 3 setpoint	-400..+400%	-32768..+32767
M4	41023	Multi-reference 4 setpoint	-400..+400%	-32768..+32767
M5	41024	Multi-reference 5 setpoint	-400..+400%	-32768..+32767
M6	41025	Multi-reference 6 setpoint	-400..+400%	-32768..+32767
M7	41026	Multi-reference 7 setpoint	-400..+400%	-32768..+32767
N1	40001	Rated (nameplate) motor current	20..150%	1638..12288

N2	40002	Rated (nameplate) motor volts	0..999Vac	0..999
N3	40003	Rated (nameplate) motor frequency	0..400Hz	0..400
N4	40004	Rated (nameplate) motor power	0..650kW	0..65000
N5	40006	Rated (nameplate) motor speed	0..24000rpm	0..24000
N6	40005	Motor cooling at zero speed	20..101%	1638..8273
N8	40007	PPR of tachometer encoder	0..8191ppr	0..8191
N9	40139	Encoder type select	0..1	0..1
O1a	41033	Analogue output 1 source selection	0..18	0..18
O1b,Z5	40136	Analogue output 1 format	0..3	0..3
O1c	40129	Analogue output 1 low setpoint	-400..+400%	-32768..+32767
O1d	40130	Analogue output 1 high setpoint	-400..+400%	-32768..+32767
O1e	41034	Analogue output 2 source selection	0..18	0..18
O1f,Z6	40137	Analogue output 2 format	0..3	0..3
O1g	40131	Analogue output 2 low setpoint	-400..+400%	-32768..+32767
O1h	40132	Analogue output 2 high setpoint	-400..+400%	-32768..+32767
O2a	41027	Relay 1 source select	0..22	0..22
O2b	41030	Invert the logic of Relay 1	0..1	0..1
O2c	41028	Relay 2 source select	0..22	0..22
O2d	41031	Invert the logic of Relay 2	0..1	0..1
O2e	41029	Relay 3 source select	0..22	0..22
O2f	41032	Invert the logic of Relay 3	0..1	0..1
O3a	41039	Fibre optic output source select	0..18	0..18
P1	40224	Process control reference source select		0..7 0..7
P2	40225	Process control feedback source select		0..7 0..7
P3	40226	Process control gain factor	1..100	1..100
P4	40227	Process control integration time	10..10010	10..10010
P5	40228	Process control differential factor	0..2500	0..2500
P6	40220	Process control error signal ***	-400..+400%	-32768..+32767
R1	41043	Acceleration rate	0.1..6000%/s	1..60000
R2	41044	Deceleration rate	0.1..6000%/s	1..60000
R3	41045	Alternative acceleration rate	0.1..6000%/s	1..60000
R4	41046	Alternative deceleration rate	0.1..6000%/s	1..60000
R5	41047	Break speed for alt. accel/decel	0..250%	0..20480
R6	40042	Decel. rate used when stopping	0.1..6000%/s	1..60000
R7	40043	Speed filter time constant	0..1s	0..1000
R8	40044	Torque filter time constant	0..10s	0..10000
S1	40057	V/Hz starting mode	0..2	0..2
S2	41048	Usual stopping mode	0..5	0..5
S4	41049	Alternative stopping mode	0..5	0..5
S5	40051	Start delay time	0..1s	0..1000

S6	40050	Off delay time	0..25s, INFINITE	0..26000
S7	40053	Mains power loss response	0..1	0..1
S8	40056	Level of dc current used for braking	0..150%	0..12288
S9	40058	DC holding voltage in V/Hz mode	0..25%	0..25%
S10	40059	DC heating current	OFF/1..40%	OFF/1..40
X1	41091	Control mode select	0..2	0..2
X2	40008	Autotune motor	0..1	0..1
X3a	40061	Main inductance	40..800%	3276..65535
X3b	40062	Stator resistance	0..15%	0..1228
X3c	40063	Rotor resistance	0..15%	0..1228
X3d	40064	Total leakage	0..20%	0..1638
X3e	40060	Field weakening point	50..100%	4096..8192
X4a	40210	Dynaflux minimum flux level	40..100%	3276..8192
X4b	40211	Select torque boost mode	0..2	0..2
X4c	40017	Starting torque (boost) adjustment	0..+250%	0..20480
X4d	40019	Start band	0..100%	0..8192
X4f	40070	Rotor speed PID loop proportional gain	0..25%	0..24576
X4g	40068	Rotor speed PID loop integral gain	0..4096	0..4096
X4h	40069	Rotor speed PID loop derivative gain	0..4096	0..4096
X5a	40212	Current limit slip value	0..10%	0..819
X5b	40213	Voltage limit slip value	0..10%	0..819
X5c	40214	No-load damping	0..20%	0..1638
X5d	40215	Slip compensation enable	0..1	0..1
X5e	40072	Modulation type	0..1	0..1
X5f	40073	Modulation frequency (Hz)	AUTO,4000..16000	3999..16000
X5g	40066	Current PI loop proportional gain	0..100%	0..8192
X5h	40067	Current PI loop integral gain	0..100%	0..8192
X5i	40071	Rotor speed PID filter constant	3..100%	246..8192
Y1	40150	Screen list select	0..255	0..255
Y3	40151	Current Vista configuration select	0..255	0..255
Y3	40152	Number of Vista configurations***	0..255	0..255
Z2	40140	Software version***	0..25.5	0..255
Z2	40141	Hardware version***	0..25.5	0..255
Z3	40120	Analogue input 1 value***	-400..+400%	-32676..+32767
Z4	40121	Analogue input 2 value***	-400..+400%	-32676..+32767
Z5	40122	Analogue output 1 value***	-400..+400%	-32676..+32767
Z6	40123	Analogue output 2 value***	-400..+400%	-32676..+32767
Z7	40170	Status of Multifunction input 1 ***	0..1	0..1
Z7	40171	Status of Multifunction input 2 ***	0..1	0..1
Z7	40172	Status of Multifunction input 3 ***	0..1	0..1

Z7	40173	Status of Multifunction input 4 ***	0..1	0..1
Z7	40174	Status of Multifunction input 5 ***	0..1	0..1
Z7	40175	Status of Multifunction input 6 ***	0..1	0..1
Z11	40114	Fibre optic input value***	-400..+400%	-32768..+32767

Note *** indicates that this parameter is a read only parameter.

Note 1: 40613 - Drive Identification Code

High Byte:	1 = Microdrive	Low Byte:	1 = ME-2.5,400V	34 = ME-31,400V
	2 = Microflo		33 = ME-6.5, 400V	66 = ME-38, 400V
	3 = Microvector		65 = ME-10.5, 400V	2 = ME-46, 400V
	4 = Elite Series		97 = ME-12, 400V	35 = UE-60, 400V
			96 = ME-16, 400V	67 = UE-75, 400V
			64 = ME-18, 400V	129= UE-90, 400V
			128 = ME-22.5,400V	36 = UE-115, 400V
			42 = ME-28, 400V	68 = UE-140, 400V

Table 3.3 Elite Modbus Screen Details

Bardac Corporation

40 Log Canoe Circle, Stevensville, MD 21666 USA

Phone: (410) 604-3400 Fax: (410) 604-3500

www.bardac.com