DeviceNet
Expansion Board

Catalog No. EXBD05

Installation and Operating Manual

10/02 **MN1394**

Table of Contents

Section 1
General Information

Introduction The DeviceNet expansion board provides communications so ASDs (adjustable speed drives) can be linked together to form a network. Using a central PLC (Programmable Logic Controller) or PC based control system, this network can be continuously controlled to provide supervision and monitoring for each ASD in the system. All ASDs can be set–up using the keypad of one control, or connection to WorkbenchD.

DeviceNet is an open fieldbus standard for a wide range of applications in manufacturing, process and building automation. DeviceNet standards are maintained by the Open DeviceNet Vendor Association (ODVA).

Limited Warranty

For a period of one (1) year from the date of original purchase, BALDOR will repair or replace without charge controls and accessories which our examination proves to be defective in material or workmanship. This warranty is valid if the unit has not been tampered with by unauthorized persons, misused, abused, or improperly installed and has been used in accordance with the instructions and/or ratings supplied. This warranty is in lieu of any other warranty or guarantee expressed or implied. BALDOR shall not be held responsible for any expense (including installation and removal), inconvenience, or consequential damage, including injury to any person or property caused by items of our manufacture or sale. (Some states do not allow exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply.) In any event, BALDOR's total liability, under all circumstances, shall not exceed the full purchase price of the control. Claims for purchase price refunds, repairs, or replacements must be referred to BALDOR with all pertinent data as to the defect, the date purchased, the task performed by the control, and the problem encountered. No liability is assumed for expendable items such as fuses.

Goods may be returned only with written notification including a BALDOR Return Authorization Number and any return shipments must be prepaid.

Safety Notice

This equipment contains voltages that may be as great as 1000 volts! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

This equipment may be connected to other machines that have rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

PRECAUTIONS

⚠ **WARNING: Do not touch any circuit board, power device or electrical connection before you first ensure that power has been disconnected and there is no high voltage present from this equipment or other equipment to which it is connected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.**

⚠ **WARNING: Be sure that you are completely familiar with the safe operation of this equipment. This equipment may be connected to other machines that have rotating parts or parts that are controlled by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.**

⚠ **WARNING: Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury.**

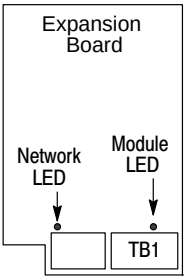
⚠ **WARNING: Do not remove cover for at least five (5) minutes after AC power is disconnected to allow capacitors to discharge. Dangerous voltages are present inside the equipment. Electrical shock can cause serious or fatal injury.**

⚠ **WARNING: Improper operation of control may cause violent motion of the motor shaft and driven equipment. Be certain that unexpected motor shaft movement will not cause injury to personnel or damage to equipment. Peak torque of several times the rated motor torque can occur during control failure.**

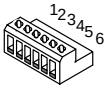
⚠ **WARNING: Motor circuit may have high voltage present whenever AC power is applied, even when motor is not rotating. Electrical shock can cause serious or fatal injury.**

Physical Installation The physical installation of the expansion board into the control is described in the installation and operation manual for the control. Refer to the control manual for further details.

Figure 2-1 Expansion Board Layout



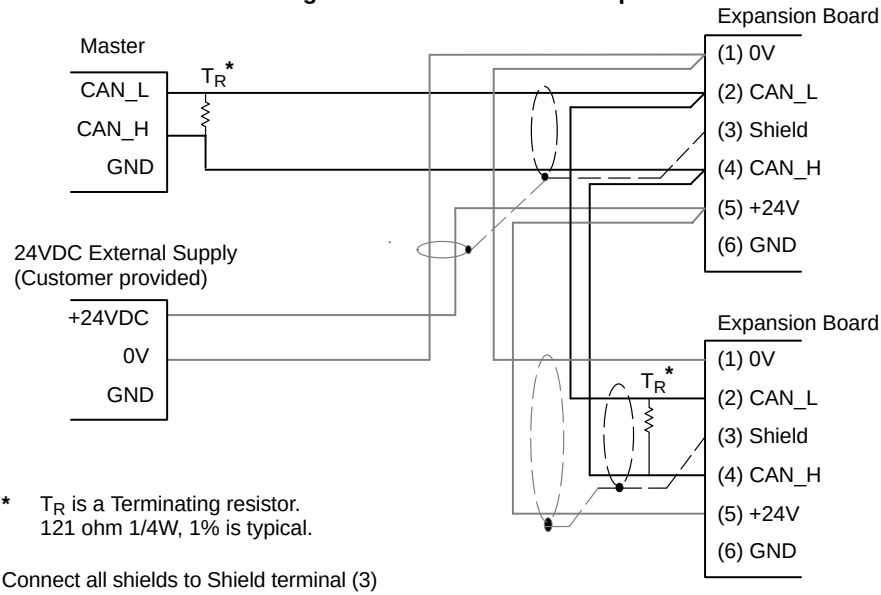
Tightening Torque is
0.5 lb–in (0.6Nm)



TB1 Modular Connector

TB1	Description
1	0V
2	CAN_L
3	Shield
4	CAN_H
5	+24VDC
6	GND

Figure 2-2 Connection Example



* T_R is a Terminating resistor.
121 ohm 1/4W, 1% is typical.

Connect all shields to Shield terminal (3) of each control.

Refer to the manual for the master device for cable requirements, termination, maximum cable lengths and other critical information.

Termination

A few brief words about termination resistance.

What does termination or a termination resistor do?

Termination resistance is used to match the impedance of the load to the impedance of the transmission line (cable) being used. Unmatched impedance causes the transmitted signal to not be fully absorbed by the load. This causes a portion of the signal to be reflected back into the transmission line (noise). If the *Source* impedance, *Transmission Line* impedance, and *Load* impedance are all equal, these reflections (noise) are eliminated.

Termination does increase load current and sometimes changes the bias requirements and increases the complexity of the system.

What is a termination resistor?

A resistor is added in parallel with the receiver input to match the impedance of the cable being used. The DeviceNet specification recommends 121 ohms, but the value should be chosen to equal as closely as possible the characteristic impedance of the cable.

Where are these resistors placed?

Terminators or Termination resistors are placed in parallel with the receiver at both ends of a transmission line. This means that you should **never** have more than two terminators in the system (unless repeaters are being used).

How many resistors should my system have?

Terminators or Termination resistors are placed in parallel with the receiver at both ends of a transmission line. This means that you should **never** have more than two terminators in the system (unless repeaters are being used).

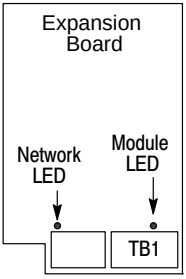
Power Off Checks

1. Verify the expansion board is correctly installed in the control. See Section 2.
2. Verify the termination resistors are correctly set. See Section 2.
3. Verify cable connections are correct. See Section 2.

Powerup The covers may remain off to view the LED's. LED activity is described in Figure 3-1. When the Modbus Plus expansion board is powered up it will do the following:

1. Perform a self test.
2. Verify communications.
3. Verify parameter settings for configuration.
4. Ready to go online.

Figure 3-1 LED Description



Network LED	Description
Off	Not ready, no power.
Short Flash	Failed communication tests.
Flash	Device has been on–line but has gone off–line.
Long Flash	Device is on–line but has no established connections.
On	Link is Ready for operation and has established connections.

Module LED	Description
Off	Not ready, no power.
Short Flash	Unrecoverable fault; it may need to be replaced.
Flash	Recoverable fault.
Long Flash	Invalid configuration. Set parameters correctly.
On	Ready for operation.

Note: The Network LED can only be ON when the Module LED is On continuously, indicating that the board is ready for communications. If the Module LED is not On continuously, the Network LED will be Off or flashing.

Initial Set–up for DeviceNet

Parameter settings for the Modbus option can be set from the Keypad or WorkbenchD. Refer to the control manual for keypad instructions or MN794 for WorkbenchD.

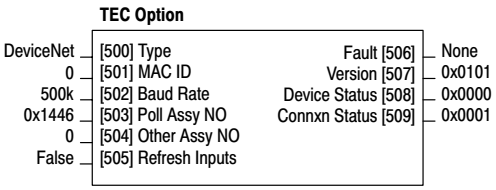
Note: When setting values for parameters from WorkbenchD you are able to select any value in the parameter's range, i.e. –32768 to 32767. If the value is incorrect, i.e. it doesn't correspond to a value that can be set using the keypad, then the Fault output parameter will be set to Parameter after Refresh Inputs ([505] or [755]) has been changed from False to True to False.

29D & 30D Configuration

When Type [500] is set to DeviceNet, the parameter choices are as shown.

1 SERIAL LINKS

2 TEC OPTIONS
- Tec Option Type
- Mac Id
- Baud Rate
- Poll Assy No
- Other Assy No
- Refresh Inputs
- TEC Option Fault
- TEC Option Ver
- Device Status
- Connxn Status



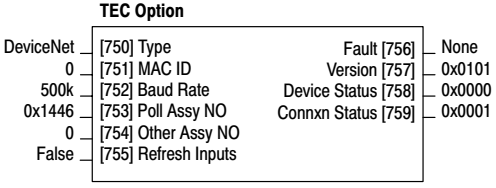
38D Configuration

When Type [750] is set to DeviceNet, the parameter choices are as shown.

1 SETUP

2 COMMUNICATIONS

3 TEC OPTION
- Tec Option Type
- Mac Id
- Baud Rate
- Poll Assy No
- Other Assy No
- Refresh Inputs
- TEC Option Fault
- TEC Option Ver
- Device Status
- Connxn Status



TYPE (Expansion Board Type)
Sets the type of expansion board being used.

Range: 0 : None
1 : RS485/Modbus
2 : Profibus
3 : Type 3
4 : Device Net
5 : Type 5
6 : Type 6
7 : Type 7
8 : Type 8
9 : Type 9
10 : Type 10
11 : Type 11
12 : Type 12
13 : Type 13
14 : Type 14
15 : Type 15

Initial Set–up for DeviceNet Continued

MAC ID Range: 1 to 63
The DeviceNet node address. Known as the Media Access Control Identifier, or MAC ID. Before the change can be in effect, [505] Refresh Inputs must be toggled (made true then false).

Baud Rate Range: 0 : 125 kbaud
Sets the communication baud rate. 1 : 250 kbaud
2 : 500 kbaud

Poll Assy No Range: 0x0000 to 0xFFFF
Selects assembly numbers for Connection Object instance 2 (the Polled I/O connection allocated by the Pre–defined Master–Slave Connection Set). The leftmost two digits select the producer's path; the rightmost two digits select the consumer's path. A producer transmits; a consumer receives.
Each pair of digits represents an instance in hexadecimal format. The default value is 0x1446, which selects assembly objects 0x14 (20 decimal) and 0x46 (70 decimal).
Before the change can be in effect, [505] Refresh Inputs must be toggled (made true then false).

Other Assy No Range: 0x0000 to 0xFFFF
Selects assembly numbers for Cyclic connection. The leftmost two digits select the producer's path; the rightmost two digits select the consumer's path. A producer transmits; a consumer receives.
Each pair of digits represents an instance in hexadecimal format. The default value is 0x1446, which selects assembly objects 0x14 (20 decimal) and 0x46 (70 decimal).
Before the change can be in effect, [505] Refresh Inputs must be toggled (made true then false).

Refresh Inputs Range: 0 : False
Used to register a change in Type [500}, MAC ID [501], Baud Rate [502], Poll Assy NO [503] and Other Assy NO [504]. It must be FALSE in normal operation, and toggled TRUE then FALSE before a change in any of these parameters is recognized. 1 : True

Fault Range: 0 to 5
The communication fault status within the Modbus option.

0 : None	no faults
1 : Parameter	parameter out–of–range
2 : Type Mismatch	Type parameter not set to DeviceNet
3 : Self Test	hardware fault – internal
4 : Hardware	hardware fault – external
5 : Missing	no option installed

Version Range: 0000 to FFFF

The version of the expansion board. If no expansion board is installed the version is reset to zero.

Device Status Range: 0x0000 to 0xFFFF

The status of the master and slave connection. This is a copy of the DeviceNet Identity Object (Class 1) Instance 1 Attribute 5 (Status). For more information refer to the DeviceNet specification, volume II. Its value is interpreted by examining each bit:

- BIT 0: Owned
- BITS 1, 3, 4, 5, 6, 7, 12, 13, 14, 15: Reserved – Not used, these bits are always set to 0.
- BIT 2: Configured – TRUE indicates parameter values have changed from factory settings. Does not include configuration of the communications.
- BIT 8: Minor Recoverable Fault – TRUE indicates the board detected a problem with itself. The problem does not cause the device to go into one of the fault states.
- BIT 9: Minor Non–recoverable Fault – TRUE indicates the board detected a problem with itself. The problem does not cause the device to go into one of the fault states.
- BIT 10: Major Recoverable Fault – TRUE indicates the board detected a problem with itself, which forced it into the "other faults" state.
- BIT 11: Major Non–recoverable Fault – TRUE indicates the board detected a problem with itself, which forced it into the "other faults" state.

Connxn Status Range: 0 to 4

The connection status of the expansion board.

- 0 : Non–existent – The connection has not been made.
- 1 : Configuring – Waiting to be properly configured.
- 2 : Waiting For Connection ID – The connection is configured except for the connection ID's, from which the CAN identifiers are determined.
- 3 : Established – The connection is operational.
- 4 : Timed Out – Indicates a watchdog timeout has occurred on this connection, and the connection is configured to enter this state in this event.

Device Net Configuration

The Device Net expansion board is a Slave device using the predefined master/slave connection set, as defined by the ODVA. It is capable of explicit messaging, as well as polled and/or COS/Cyclic I/O.

This EDS file (Electronic Data Sheets) is used by Device Net equipment to communicate with the BBP of the Baldor Device Net expansion board. The Baldor EDS file is provided on a diskette that is shipped with the expansion board. A Device Net configuration tool, such as Allen-Bradley "Device Net Manager" software should be used to configure the Device Net expansion board. The EDS file is also available on the Baldor World Wide WEB page (www.baldor.com).

Refer to the Installation & Operation manual for your control and set the following:

- Select DeviceNet in the TYPE parameter
- Enter a slave MAC ID
- Enter a baud rate
- Select a poll number if you intend to use Polled I/O or Cyclic messaging
- Toggle REFRESH INPUTS from TRUE to FALSE.
- Check the FAULT parameter for error messages, rectify if necessary

When setting values for parameters from WorkbenchD you are able to select any value in the parameter's range, i.e. –32768 to 32767. If the value is incorrect, i.e. it doesn't correspond to a value that can be set using the keypad, then the FAULT output parameter will be set to PARAMETER after REFRESH INPUTS has been changed from TRUE to FALSE.

Settings Device Net requires the following settings for Baldor Controls:
Vendor ID = 265
Device Type = 2 (for DC controls) or 19 (for AC controls).
Product Code = 4 digit name or number of the control

Configuring the PLC/Master

Other than setting the TEC Option Type, Address, Baud Rate and Assy Poll NO or Other Assy NO, all configuration is done using a DeviceNet configuration tool, such as DeviceNet Manager. Refer to the documentation for your configuration tool.

Access Drive Parameters

Three methods of accessing drive parameter information are supported:

- Explicit messaging, connection instance ID #1. Allows individual access to any tag within the control. It also provides conformance with the DeviceNet Drive profiles.
- Polled I/O connection, connection instance ID #2. Allows access to tags within the control by means of assembly objects. Some of the assembly objects defined in the DeviceNet Drive profile are supported, as well as some unique to this product.
- Cyclic connection, connection instance ID#3. Allows a drive to regularly report diagnostic and parameter values to a DeviceNet master, without being prompted.

Explicit Messaging

Through explicit messaging, the DeviceNet board allows access to any tag within the control. It can cause the drive to save and restore parameters and similar commands, and it also supports Motor Data, Control Supervisor and AC/DC Drive Objects defined in the DeviceNet Specification, volume II, chapter 6. Explicit messages are identified by a class number, instance number and attribute number.

Class Number	Name	Description
0x01	Identity Object	Returns identification of and general information about the device.
0x02	Message Router	Returns a messaging connection point.
0x03	DeviceNet Object	Returns configuration and status of a physical attachment to DeviceNet.
0x04	Assembly Object	Binds attributes of multiple objects.
0x05	Connection Object	Manages the characteristics of a communication connection.
0x28	Motor Data Object	A database of motor parameters.
0x29	Control Supervisor Object	Models all the management functions for devices within the hierarchy of motor control devices.
0x2A	AC/DC Drive Object	Models the functions specific to an AC or DC drive.
0x64	Tags 1 to 100	Allows access to tags 1 to 100.
0x65	Tags 101 to 200	Allows access to tags 101 to 200.
0x66	Tags 201 to 300	Allows access to tags 201 to 300
0x67	Tags 301 to 400	Allows access to tags 301 to 400
0x68	Tags 401 to 500	Allows access to tags 401 to 500
0x69	Tags 501 to 600	Allows access to tags 501 to 600
0x6A	Tags 601 to 700	Allows access to tags 601 to 700
0x6B	Tags 701 to 800	Allows access to tags 701 to 800
0x6C	Tags 801 to 900	Allows access to tags 801 to 900

Access Drive Parameters Continued

Class Number	Name	Description
0x6D	Tags 901 to 1000	Allows access to tags 901 to 1000
0x6E	Tags 1001 to 1100	Allows access to tags 1001 to 1100
0x6F	Tags 1101 to 1200	Allows access to tags 1101 to 1200
0x7F	Remote config	A means of remotely configuring the drive

Identity Object

For details, refer to the DeviceNet Standard Volume 2, Chapter 6 which defines the Identity Object.
Class = 0x01
Instance = 0x01
The following Identity Object attributes are supported:

1	Vendor ID = 0x002D
2	Product type = 0x0002 (AC drive) or 0x0013 (DC drive)
3	Product code = drives product identifier, e.g. 30D drive return 0x0030
4	Revision = Expansion board software version, e.g. 0x0102 is version 1.2 (major revision=1, minor version=2)
5	Status, a bit field defining the status of the DeviceNet technology option. Bit 0 = Owned Bits 1, 3, 4, 5, 6, 7, 12, 13, 14 and 15 = reserved Bit 2 = Configured Bit 8 = Minor recoverable fault Bit 9 = Minor non–recoverable fault Bit 10 = Major recoverable fault Bit 11 = Major non–recoverable fault
6	Serial Number of the DeviceNet technology option
7	Product name

Message Router Object

For details, refer to the DeviceNet Standard Volume 2, Chapter 6 which defines the Message Router Object.
Class = 0x02
Instance = 0x01
The following Objects are supported:

2	Maximum number of connections supported.

DeviceNet Object

For details, refer to the DeviceNet Standard Volume 2, Chapter 6 which defines the DeviceNet Object.
Class = 0x03
Instance = 0x01
The following Identity Object attributes are supported:

Instance Number	Description
1	MAC ID
2	Baud rate
3	Bus–Off Interrupt
4	Number of times CAN went to the bus–off state
5	Structure containing an Allocation Choice Byte and the master's MAC ID

Assembly Object

For details, refer to the DeviceNet Standard Volume 2, Chapter 6 which defines the Identity Object.
Class = 0x04
For range of instance numbers, refer to Polled I/O.

DeviceNet Connection Object

For details, refer to the DeviceNet Standard Volume 2, Chapter 6 which defines the Identity Object.
Class = 0x05
Instance = 0x01
The following Identity Object attributes are supported:

Instance Number	Description
1	State
2	Instance_type
3	Transportclass_trigger
4	Produced_connection_id
5	Consumed_connection_id
6	Initial_comm_characteristic
7	Produced_comm_characteristic
8	Consumed_connection_size
9	Expected_packet_rate
12	Watchdog_timeout_action
13	Produced_connection_path_length
14	Produced_connection_path
15	Consumed_connection_path_length
16	Consumed_connection_path_length
17	Production_inhibit_time

Motor Data Object

This class forms part of the DeviceNet drive profile, and is described in the DeviceNet Standard Volume II.
Class = 0x28
Instance = 0x01
Mapping attributes within this class to drive parameters varies with drive model.

Control Supervisor Object

This class forms part of the DeviceNet drive profile, and is described in the DeviceNet Standard Volume II.
Class = 0x29
Instance = 0x01
Mapping attributes within this class to drive parameters varies with drive model.

AC/DC Drive Object

This class forms part of the DeviceNet drive profile, and is described in the DeviceNet Standard Volume II.
Class = 0x29
Instance = 0x01
Mapping attributes within this class to drive parameters varies with drive model.

The following pages provide details for the Motor Data, Control Supervisor and the AC/DC Drive objects.

Motor Data Object. Class code 28hex.

Refer to DeviceNet Object Library, volume II, chapter 6. Supported attributes are:

Attrib ID	Name	Access	DeviceNet Data Type	Description	Conversion from Drive Tag #
3	MotorType	Get	USINT	7 = Squirrel Cage Induction Motor	Fixed value
6	RatedCurrent	Get	UINT	Rated Stator Current [100mA]	= tag 64
7	RatedVoltage	Get	UINT	Rated Base Voltage [V]	= (tag 122) / 10

Motor Control Supervisor Object. Class code 29hex.

Refer to DeviceNet Object Library, volume II, chapter 6. Supported attributes are:

Attrib ID	Name	Access	DeviceNet Data Type	Description	Conversion from Drive Tag #
3	RunFwd	Set/ Get	BOOL	1 = Run Forward	= tag 291 Tag 291 is the link destination. To set this attribute, the link must be disconnected. Refer to your drive manual.
4	RunRev	Set/ Get	BOOL	1 = Run Reverse	= tag 292
5	NetCtrl	Get	BOOL	0 = Run/Stop control is local. 1 = Run/Stop control is from DeviceNet.	= 1 if tag 307 is 0 or 2
7	RunningFwd	Get	BOOL	1 = Drive is running forward	= tag 291 AND tag 285
8	RunningRev	Get	BOOL	1 = Drive is running reverse	= tag 292 AND tag 285
9	Ready	Get	BOOL	1 = Drive is ready	= tag 287
10	Faulted	Get	BOOL	1 = Drive has tripped	= NOT tag 274
12	FaultRst	Set/ Get	BOOL	1 = Reset the trip condition.	= tag 282
13	FaultCode	Get	UINT	Fault Code 0000= No fault 1000= External trip 2200= Overcurrent trip 2220= Current limit 2250= Short Circuit 2300= I * T trip 3110= Link Overvolts 3120= Link Undervolts 3130= Phase Fail 4210= Motor Temperature 4310= Heatsink Temperature 5112= 24v Supply Failure 7110= Brake Resistor 7111= Brake Switch 7121= Motor Stalled 7200= Input 1 or 2 Break 7310= Low Speed 7500= Operator Station Fault 7510= Communications Lost	Tag #6 0 (No trip) 5 (External trip) 18 (Current limit) 3 (Overcurrent) 19 (Short circuit) 9 (I* T trip) 1 (Link overvolts) 2 (Link undervolts) 22 (Phase fail) 17 (Motor temperature) 4 (Heatsink temperature) 20 (24v failure) 10 (Brake resistor) 11 (Brake switch) 8 (Motor stalled) 6 (Input 1 break) or 7 (Input 2 break) 21 (Low speed) 12 (Operator station) 13 (Lost comms)
102	DriveEnable	Set/ Get	BOOL	1 = Drive Enabled	= tag 276

AC/ DC Drive attributes. Class code 2Ahex.

Refer to DeviceNet Object Library, volume II, chapter 6. Supported attributes are:

Attrib ID	Name	Access	DeviceNet Data Type	Description	Conversion from Drive Tag #
4	NetRef	Get	BOOL	0 = Torque or speed setpoint from local source 1 = Torque or speed setpoint from DeviceNet	= 1 if tag 308 is 0 or 2
6	DriveMode	Set/ Get	USINT	1 = Open Loop (V/ F) Speed Control 2 = Closed Loop Speed Control 3 = Torque Control	= 1 if tag 118 is 0 AND tag 366 is 0 = 2 if tag 118 is 1 = 3 if tag 118 is 0 and tag 366 is 1
7	SpeedActual	Get	INT	Actual Drive Speed [RPM]	= 3 * tag 591 / (tag 84 + 1)
8	SpeedRef	Set/ Get	INT	Speed Reference [RPM]	= 0.3 * tag 245 / (tag 84 + 1) (Remote setpoint operates only when Remote Reference Comms mode is selected.

Motor Data Object. Class code 28hex.

Refer to DeviceNet Object Library, volume II, chapter 6. Supported attributes are:

Attrib ID	Name	Access	DeviceNet Data Type	Description	Conversion from Drive Tag #
3	MotorType	Get	USINT	2 = Field controlled DC Motor	Fixed value
6	RatedCurrent	Get	UINT	Rated Current [100mA]	= tag 523
7	RatedVoltage	Get	UINT	Rated Voltage [V]	= tag 521

Motor Control Supervisor Object. Class code 29hex.

Refer to DeviceNet Object Library, volume II, chapter 6. Supported attributes are:

Attrib ID	Name	Access	DeviceNet Data Type	Description	Conversion from Drive Tag #
3	RunFwd	Set/ Get	BOOL	1 = Run Forward	= tag 536 bits 0 and 1
4	RunRev	Get	BOOL	0 = Not running reverse	Fixed value
5	NetCtrl	Set/ Get	BOOL	0 = Run / Stop is from local source. 1 = Run / Stop is from DeviceNet	= tag 535
7	RunningFwd	Get	BOOL	1 = Drive is running forward	= tag 537 bits 8 AND 9 AND 12
8	RunningRev	Get	BOOL	0 = Drive is running reverse	Fixed value
9	Ready	Get	BOOL	1 = Drive is ready	= tag 537 bit 12
10	Faulted	Get	BOOL	1 = Drive has tripped	= NOT tag 537 bit 11

Motor Control Supervisor Object. Class code 29hex. Continued

Attrib ID	Name	Access	DeviceNet Data Type	Description	Conversion from Drive Tag #
12	FaultRst	Set/ Get	BOOL	1 = Reset the trip condition.	= tag 536 bit 8
13	FaultCode	Get	UINT	FaultCode 0000 = No fault 1000 = General fault 2221 = Continuous overcurrent no. 1 2222 = Continuous overcurrent no. 2 3130 = Phase failure 3310 = Output overvoltage 3330 = Field circuit 4300 = Drive temperature 5000 = Hardware 5210 = Measurement circuit 5300 = Operator control circuit 5400 = Power section 6000 = Device software 6320 = Parameter error 7121 = Motor blocked 7120 = Motor 7301 = Tacho defective 7305 = Incremental encoder1 7310 = Speed 8100 = Communication 8112 = Synhronization fault 8113 = No command 9000 = External malfunction	Tag 528 0x0000 (no trip) 0xf001 (autotune error) or 0xf002 (autotune aborted) 0x2000 (armature current) 0x0004 (field current) 0x0200 (phase failure) 0x0020 (overvolts) 0x0100 (field failed) 0x0008 (heatsink trip) 0xff05 (pcb version) 0x8000 (accts failed) 0xf400 (no operator station) 0x0002 (missing pulse) 0xff06 (product code) 0xf200 (config enabled) 0x1000 (stall trip) 0x0010 (motor thermistor) 0x0040 (speed feedback) 0x0080 (encoder failed) 0x0001 (overspeed) 0x0800 (5703 receive error) 0x0400 (phase lock) 0xf006 (remote trip) 0xf005 (external trip)

AC/ DC Drive attributes. Class code 2Ahex.

Refer to DeviceNet Object Library, volume II, chapter 6. Supported attributes are:

Attrib ID	Name	Access	DeviceNet Data Type	Description	Conversion from Drive Tag #
3	AtReference	Get	BOOL	1 = Drive has achieved speed or torque reference.	= NOT tag 113
4	NetRef	Set Get	BOOL	0 = Torque or speed setpoint from local source 1 = Torque or speed setpoint from DeviceNet	= tag 346 (see note 1)
6	DriveMode	Set Get	USINT	2 = Closed Loop Speed Control 3 = Torque Control	= 2 if tag 119 is 0 = 3 if tag 119 1
7	SpeedActual	Get	INT	Actual Drive Speed [RPM]	= (tag 22 * tag 207) / 10000 (See note 2)
8	SpeedRef	Set Get	INT	Speed Reference [RPM]	= (tag 22 * tag 339) / 10000 (See notes 1 and 2)

Note 1: tags 339 and 346 are unconnected tags. They must be connected to appropriate destination tags in the drive by the user, and other links may need to be removed. Refer to the drive manual.

Note 2: Tag 22 is defined as encoder maximum RPM. In order for these attributes to set and return correct values, it must be set for all speed feedback devices.

Drive Tag Access

DeviceNet master devices can access drive tags as follows:

Class	Instance Number	Conversion from Drive Tag #
0x64	1 – 100	1 – 100
0x65	1 – 100	101 – 200
0x66	1 – 100	201 – 300
0x67	1 – 100	301 – 400
0x68	1 – 100	401 – 500
0x69	1 – 100	501 – 600
0x6A	1 – 100	601 – 700
0x6B	1 – 100	701 – 800

Within each class and instance, the following attributes can be returned by a Get operation, and written by a Set operation:

Access	Instance Number	Conversion from Drive Tag #
Get	1	Repeated instance number
	2	Data value
	3	Data type
	4	Lower limit
	5	Upper limit
Set	1	Data value

The Data Value is accessible by a get_attribute_single operation. The other attributes can be read only by a get_attributes_all operation.
Data types conform to the following table:

Data Type	Name	Description	Range
0x01	BOOL	A Boolean (bit) set to TRUE or FALSE	0 = FALSE, 1 = TRUE
0x02	BYTE	8 bit positive or negative numeric value. Byte types cannot have decimal points.	00 to FF (hexadecimal)
0x03	WORD	16 bit hexadecimal number	0000 to FFFF (hexadecimal)
0x07	INT	A positive or negative numeric value. INT types may have decimal points.	The upper and lower limits of the parameter. Indicating the parameter's true, internally–held, number.
0x11	ENUM	An enumerated value representing a selection.	A list of possible values for that parameter.

Note that STRING type values are not supported and will report an error if an attempt is made to read one.

Remote Configuration

DeviceNet master devices may send commands to the drive, for example, to save parameters and to return the status of saving. These commands are accessed as follows:
Class = 0x7F
Instance = 1
These are the functions that are available:

Attribute Number	Permitted Operation	Data Value	Function
0x0001	Set	0x0101	Restores Saved Configuration from drive's non-volatile memory
		0x4444	Exit Configuration Mode
		0x5555	Enter Configuration Mode
0x0002	Get	0x0000	Initializing (powering up)
		0x0001	Corrupted Product Code and Configuration
		0x0002	Corrupted Configuration
		0x0003	Restoring Configuration
		0x0004	Re-configuring Mode
		0x0005	Normal Operation Mode
0x0003	Set	0x0000	Reset Command. Acknowledges (clears) any previous save error
		0x0001	Saves Configuration to drive's non-volatile memory
0x0004	Get	0x0000	Idle
		0x0001	Saving in progress
		0x0002	Saving has failed

Polled I/O Connection

Polled I/O connections allow several parameter values to be passed in one transaction. Lists of parameters to be written to and read from the drive are defined in assembly objects. The user is able to choose from a list of pre–defined assembly object instances, and a DeviceNet technology box can have one instance operative in each direction at any time.
Instances 0x14 and 0x46 are defined by the DeviceNet specification, other instances are specific to Baldor DeviceNet expansion boards. Baldor specific instances indicate the drive tag number that is accessed in each case. All integer values are presented with the low order byte first (in even byte numbers within an assembly object structure) and high order byte last (in odd byte numbers). The following instance numbers are supported:

Instance Number	Read/Write	Number of bytes transferred	Drives applicable
0x14	Write	4	All
0x46	Read	4	All
0x64	Write	8	38D
0x65	Write	12	38D
0x66	Write	10	29D, 30D
0x67	Write	14	29D, 30D
0x6E	Read	10	38D
0x70	Read	30	38D
0x71	Read	12	29D, 30D
0x72	Read	36	29D, 30D

Instance 0x14

Applicable to drive type: All
Access: Write to Expansion Board

Byte Number	Description Bit field:		29D & 30D	38D
0	0	Run	Tag 536 bit 1	Tag 291 [1]
	1	Reserved		
	2	Fault Reset	Tag 536 bit 8	Tag 282
	3	Reserved		
	4	Reserved		
	5	Reserved		
	6	Reserved		
	7	Reserved		
1	Reserved			
2, 3	Speed Reference		=(tag 22 * tag 339) / 10000	= 0.3 * tag 245 / (tag 84 + 1) [2]

Instance 0x16

Applicable to drive type: All
Access: Read from Expansion Board

Byte Number	Description Bit field:		29D & 30D	38D
0	0	Run	Tag 536 bit 1	Tag 291 [1]
	1	Reserved		
	2	Fault Reset	Tag 536 bit 8	Tag 282
	3	Reserved		
	4	Reserved		
	5	Reserved		
	6	Reserved		
	7	Reserved		
1	Reserved			
2, 3	Speed Reference		=(tag 22 * tag 339) / 10000 [3]	= 0.3 * tag 591 / (tag 84 + 1)

[1] Tag 291 is the destination of a link. To set its value, the link must be disconnected.
[2] Remote setpoint (tag 245) operates only in Remote Reference Comms mode.
[3] Tag 339 is a miniLINK value. To set speed setpoint, it must be connected using one of the drive's internal links.

Instance 0x64

Applicable to drive type: 38D
Access: Write to Expansion Board

Byte Number	Description Bit field:		Drive Tag Number
0	0	Run Forward	291
	1	Run Reverse	292
	2	Fault Reset	282
	3	/Stop	293
	4	Jog	280
	5	Drive Enable	276
	6	/Fast Stop	277
	7	/Coast Stop	278
1	0	UserDefined #1 (preset 8 input 0)	554
	1	UserDefined #2 (preset 8 input 1)	555
	2	UserDefined #3 (preset 8 input 2)	556
	3	UserDefined #4 (preset 8 input 3)	557
	4	Reserved	
	5	Reserved	
	6	Reserved	
	7	Reserved	
2, 3	Speed Reference %		269
4, 5	User Defined #1 (preset 8 input 4)		558
6, 7	User Defined #2 (preset 8 input 5)		559

Instance 0x65

Applicable to drive type: 38D
Access: Write to Expansion Board

Byte Number	Description Bit field:		Drive Tag Number
0	0	Run Forward	291
	1	Run Reverse	292
	2	Fault Reset	282
	3	/Stop	293
	4	Jog	280
	5	Drive Enable	276
	6	/Fast Stop	277
	7	/Coast Stop	278
1	0	UserDefined #1 (preset 8 input 0)	554
	1	UserDefined #2 (preset 8 input 1)	555
	2	UserDefined #3 (preset 8 input 2)	556
	3	UserDefined #4 (preset 8 input 3)	557
	4	NetCtrl	Same as Class 0x29, Instance 1, Attribute 5
	5	NetRef	Same as Class 0x2A, Instance 1, Attribute 4
	6	Reserved	
	7	Reserved	
2, 3	Speed Reference %		269
4, 5	User Defined #1 (preset 8 input 4)		558
6, 7	User Defined #2 (preset 8 input 5)		559
8, 9	User Defined #3 (preset 8 input 6)		560
10, 11	User Defined #4 (preset 8 input 7)		561

Instance 0x66

Applicable to drive type: 29D, 30D
Access: Write to Expansion Board

Byte Number	Description Bit field:		Drive Tag Number
0, 1	Remote Sequence		536
2	0	Aux Start	161
	1	Aux Jog	227
	2	Aux Enable	168
	3	Current Control (Enable)	497
	4	UserDefined #1 (miniLINK logic 1)	346
	5	UserDefined #2 (miniLINK logic 2)	347
	6	UserDefined #3 (miniLINK logic 3)	348
	7	UserDefined #4 (miniLINK logic 4)	349
3	Reserved		
4, 5	Speed Reference %		309
6, 7	User Defined #1 (miniLINK value 2)		340
8, 9	User Defined #2 (miniLINK value 3)		341

Instance 0x67

Applicable to drive type: 29D, 30D
Access: Write to Expansion Board

Byte Number	Description Bit field:		Drive Tag Number
0, 1	Remote Sequence		536
2	0	Aux Start	161
	1	Aux Jog	227
	2	Aux Enable	168
	3	Current Control (Enable)	497
	4	UserDefined #1 (miniLINK logic 1)	346
	5	UserDefined #2 (miniLINK logic 2)	347
	6	UserDefined #3 (miniLINK logic 3)	348
	7	UserDefined #4 (miniLINK logic 4)	349
3	Reserved		
4, 5	Speed Reference %		309
6, 7	User Defined #1 (miniLINK value 2)		340
8, 9	User Defined #2 (miniLINK value 3)		341
10, 11	User Defined #1 (miniLINK value 4)		342
12, 13	User Defined #2 (miniLINK value 5)		343

Instance 0x6E

Applicable to drive type: 38D
Access: Read from Expansion Board

Byte Number	Description Bit field:		Drive Tag Number
0	0		289
	1		274
	2		287
	3		285
	4		303
	5		360
	6		543
	7		544
1	Reserved		
2, 3	First Trip		6
4, 5	Speed Demand %		255
6, 7	User Defined #1 (preset 7 input 4)		547
8, 9	User Defined #2 (preset 7 input 5)		548

Instance 0x70

Applicable to drive type: 38D
Access: Read from Expansion Board

Byte Number	Description Bit field:		Drive Tag Number
0	0	Tripped	289
	1	Healthy	274
	2	Ready	287
	3	Running	285
	4	Stopping	303
	5	Zero Speed	360
	6	Jogging	302
	7	Ramping	689
1	0	Digital input 1	31
	1	Digital input 2	34
	2	Digital input 3	37
	3	Digital input 4	40
	4	Digital input 5	43
	5	Digital input 6	726
	6	Digital input 7	728
	7	Digital input 8 (value returned is undefined)	730
2, 3	Analog Input 1		16
4, 5	Analog Input 2		25
6, 7	Analog Input 3		715
8, 9	Analog Input 4		722
10	0	Digital output 1	52
	1	Digital output 2	55
	2	Digital output 3	737
	3	UserDefined #1 (preset 7 input 0)	543
	4	UserDefined #2 (preset 7 input 1)	544
	5	UserDefined #3 (preset 7 input 2)	545
	6	UserDefined #4 (preset 7 input 3)	546
	7	Reserved	
11	Reserved		
12, 13	Analog Output 1		45
14, 15	Analog Output 2		731
16, 17	First trip		6
18, 19	Speed demand %		255
20, 21	Motor current %		66
22, 23	User Defined #1 (preset 7 input 4)		547
24, 25	User Defined #2 (preset 7 input 5)		548
26, 27	User Defined #3 (preset 7 input 6)		549
28, 29	User Defined #4 (preset 7 input 7)		550

Instance 0x71

Applicable to drive type: 29D, 30D
Access: Read from Expansion Board

Byte Number	Description Bit field:		Drive Tag Number
0, 1	Sequence Status		537
2	0	UserDefined #1 (miniLINK logic 5)	350
	1	UserDefined #2 (miniLINK logic 6)	351
	2	UserDefined #3 (miniLINK logic 7)	352
	3	UserDefined #4 (miniLINK logic 8)	353
	4	Reserved	
	5	Reserved	
	6	Reserved	
	7	Reserved	
3	Reserved		
4, 5	Health Store Word		116
6, 7	Speed Feedback %		207
8, 9	User Defined #1 (miniLINK value 6)		344
10, 11	User Defined #2 (miniLINK value 7)		345

Instance 0x72

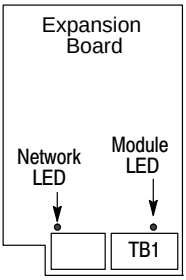
Applicable to drive type: 29D, 30D
Access: Read from Expansion Board

Byte Number	Description Bit field:		Drive Tag Number
0, 1	Sequence Status		537
2	0	/Program Stop input B8	80
	1	Digital input C3	68
	2	Digital input C4	69
	3	Digital input C5	70
	4	Digital input C6	71
	5	Digital input C7	72
	6	Digital input C8	73
	7	Ramping	113
3	0	Digital output B5	74
	1	Digital output B6	75
	2	Digital output B7	76
	3	UserDefined #1 (miniLINK logic 5)	350
	4	UserDefined #2 (miniLINK logic 6)	351
	5	UserDefined #3 (miniLINK logic 7)	352
	6	UserDefined #4 (miniLINK logic 8)	353
	7	Reserved	
4, 5	Analog Input 1		50
6, 7	Analog Input 2		51
8, 9	Analog Input 3		52
10, 11	Analog Input 4		53
12, 13	Analog Input 5		54
14, 15	Analog Output 1		55
16, 17	Analog Output 2		56
18, 19	Health Store Word		116
20, 21	Health word		115
22, 23	Speed Feedback %		207
24, 25	Speed demand %		89
26, 27	Armature current feedback %		65
28, 29	User Defined #1 (miniLINK value 6)		344
30, 31	User Defined #2 (miniLINK value 7)		345
32, 33	User Defined #1 (miniLINK value 8)		379
34, 35	User Defined #2 (miniLINK value 9)		380

Section 4
Troubleshooting

Two LEDs report the status of the DeviceNet expansion board.

Figure 4-1 LED Description



Network LED	Description
Off	Not ready, no power.
Short Flash	Failed communication tests.
Flash	Device has been on-line but has gone off-line.
Long Flash	Device is on-line but has no established connections.
On	Link is Ready for operation and has established connections.

Module LED	Description
Off	Not ready, no power.
Short Flash	Unrecoverable fault; it may need to be replaced.
Flash	Recoverable fault.
Long Flash	Invalid configuration. Set parameters correctly.
On	Ready for operation.

Note: The Network LED can only be ON when the Module LED is On continuously, indicating that the board is ready for communications. If the Module LED is not On continuously, the Network LED will be Off on flashing.

Table 4-1 Module LED

Module LED	Possible Cause	Corrective Action
	No power at the drive.	Check and apply power to the drive.
	Expansion board not installed correctly.	Check connections between expansion board and drive.
	MAC ID set to 0	Set the MAC ID to a non-zero value. Remember to toggle Refresh Inputs (True to False).
	Hardware fault.	If Health and Run LEDs are Off, replace the drive, else replace the expansion board.
	Wrong expansion board installed or selected.	Install the correct expansion board or select the matching value for the TYPE parameter in the TEC OPTION function block. (TYPE = DeviceNet). Remember to toggle Refresh Inputs (True to False).
	Set-up fault. A TEC OPTION parameter is out-of-range.	Select the correct value for the parameter in the TEC OPTION function block. Remember to toggle Refresh Inputs (True to False).
	Wrong expansion board installed or selected.	Install the correct expansion board or select the matching value for the TYPE parameter in the TEC OPTION function block. (TYPE = DeviceNet). Remember to toggle Refresh Inputs (True to False).
	Set-up fault. A TEC OPTION parameter is out-of-range.	Select the correct value for the parameter in the TEC OPTION function block. Remember to toggle Refresh Inputs (True to False).
	DeviceNet is operating normally.	None required.

Table 4-2 Network LED

Network LED	Possible Cause	Corrective Action
	Not ready.	See Module LED corrective actions.
	Incorrect wiring.	Check wiring, verifying the continuity of CAN_L and CAN_H connections to the master, and ensure that the correct terminals have been used. Be sure all shields are correctly terminated.
	Incorrect baud rate.	Check the baud rate is the same as the master device. Remember to toggle Refresh Inputs (True to False).
	Maximum cable length exceeded.	Ensure that the maximum cable length has not been exceeded for the Baud rate in use.
	Incorrect line terminations.	Ensure that the last unit on the transmission line is terminated correctly. Note that some equipment has built-in resistors that may be switched in and out of circuit.
	Invalid MAC ID.	Check the MAC ID setting is not 0 and that there isn't another unit on the network with the same MAC ID. If you change the MAC ID, remember to toggle Refresh Inputs (True to False).
	Invalid configuration, or configuration not downloaded to master device.	Ensure that the network has been correctly configured and that the configuration has been correctly downloaded to the master.
	Device has been on-line, and has now gone off-line.	Check the drive has been allocated to a master, and initiate communications.
	Device is online but has no connection.	Check the drive has been allocated to a master, and initiate communications.
	Link is ready for operation.	None required.

Note: Changing the Refresh Inputs state (True to False)can cause the DeviceNet to recover from many faults.

Table 4-3 TEC Option Fault

Fault	Possible Cause	Corrective Action
None	DeviceNet is operating normally.	None required.
Parameter	Invalid MAC ID or Baud rate.	Check that MAC ID is set to a valid value (from 1 to 63 inclusive), and Baud Rate is set to a valid value (125K, 250K or 500K). Remember to toggle Refresh Inputs (True to False).
Type Mismatch	Wrong expansion board installed or selected.	Install the correct expansion board or select the matching value for the TYPE parameter in the TEC OPTION function block. (TYPE = DeviceNet). Remember to toggle Refresh Inputs (True to False).
Hardware	The drive detected an expansion board, but could not establish communications with it.	Verify the DeviceNet board is installed correctly. If the fault persists, contact Baldor.
Missing	The drive could not detect a Technology Option.	Install a DeviceNet expansion board. If the fault persists, contact Baldor.

Table 4-4 Device Status

Status	Possible Cause	Corrective Action
0000	Off Line	Device is operational, but no connection has been established with a master.
0001	Normal Operation	None required.

Table 4-5 CONNXN Status

Status	Possible Cause	Corrective Action
0001	Normal Operation	None required.

Table 4-6 Decimal / Hexadecimal Values

	0	1	2	3	4	5	6	7	8	9
0	0000	0001	0002	0003	0004	0005	0006	0007	0008	0009
10	000A	000B	000C	000D	000E	000F	0010	0011	0012	0013
20	0014	0015	0016	0017	0018	0019	001A	001B	001C	001D
30	001E	001F	0020	0021	0022	0023	0024	0025	0026	0027
40	0028	0029	002A	002B	002C	002D	002E	002F	0030	0031
50	0032	0033	0034	0035	0036	0037	0038	0039	003A	003B
60	003C	003D	003E	003F	0040	0041	0042	0043	0044	0045
70	0046	0047	0048	0049	004A	004B	004C	004D	004E	004F
80	0050	0051	0052	0053	0054	0055	0056	0057	0058	0059
90	005A	005B	005C	005D	005E	005F	0060	0061	0062	0063
100	0064	0065	0066	0067	0068	0069	006A	006B	006C	006D
110	006E	006F	0070	0071	0072	0073	0074	0075	0076	0077
120	0078	0079	007A	007B	007C	007D	007E	007F	0080	0081
130	0082	0083	0084	0085	0086	0087	0088	0089	008A	008B
140	008C	008D	008E	008F	0090	0091	0092	0093	0094	0095
150	0096	0097	0098	0099	009A	009B	009C	009D	009E	009F
160	00A0	00A1	00A2	00A3	00A4	00A5	00A6	00A7	00A8	00A9
170	00AA	00AB	00AC	00AD	00AE	00AF	00B0	00B1	00B2	00B3
180	00B4	00B5	00B6	00B7	00B8	00B9	00BA	00BB	00BC	00BD
190	00BE	00BF	00C0	00C1	00C2	00C3	00C4	00C5	00C6	00C7
200	00C8	00C9	00CA	00CB	00CC	00CD	00CE	00CF	00D0	00D1
210	00D2	00D3	00D4	00D5	00D6	00D7	00D8	00D9	00DA	00DB
220	00DC	00DD	00DE	00DF	00E0	00E1	00E2	00E3	00E4	00E5
230	00E6	00E7	00E8	00E9	00EA	00EB	00EC	00ED	00EE	00EF
240	00F0	00F1	00F2	00F3	00F4	00F5	00F6	00F7	00F8	00F9
250	00FA	00FB	00FC	00FD	00FE	00FF	0100	0101	0102	0103
260	0104	0105	0106	0107	0108	0109	010A	010B	010C	010D
270	010E	010F	0110	0111	0112	0113	0114	0115	0116	0117
280	0118	0119	011A	011B	011C	011D	011E	011F	0120	0121
290	0122	0123	0124	0125	0126	0127	0128	0129	012A	012B
300	012C	012D	012E	012F	0130	0131	0132	0133	0134	0135
310	0136	0137	0138	0139	013A	013B	013C	013D	013E	013F
320	0140	0141	0142	0143	0144	0145	0146	0147	0148	0149
330	014A	014B	014C	014D	014E	014F	0150	0151	0152	0153
340	0154	0155	0156	0157	0158	0159	015A	015B	015C	015D
350	015E	015F	0160	0161	0162	0163	0164	0165	0166	0167
360	0168	0169	016A	016B	016C	016D	016E	016F	0170	0171
370	0172	0173	0174	0175	0176	0177	0178	0179	017A	017B
380	017C	017D	017E	017F	0180	0181	0182	0183	0184	0185
390	0186	0187	0188	0189	018A	018B	018C	018D	018E	018F

Table 4-6 Decimal / Hexadecimal Values Continued

	0	1	2	3	4	5	6	7	8	9
400	0190	0191	0192	0193	0194	0195	0196	0197	0198	0199
410	019A	019B	019C	019D	019E	019F	01A0	01A1	01A2	01A3
420	01A4	01A5	01A6	01A7	01A8	01A9	01AA	01AB	01AC	01AD
430	01AE	01AF	01B0	01B1	01B2	01B3	01B4	01B5	01B6	01B7
440	01B8	01B9	01BA	01BB	01BC	01BD	01BE	01BF	01C0	01C1
450	01C2	01C3	01C4	01C5	01C6	01C7	01C8	01C9	01CA	01CB
460	01CC	01CD	01CE	01CF	01D0	01D1	01D2	01D3	01D4	01D5
470	01D6	01D7	01D8	01D9	01DA	01DB	01DC	01DD	01DE	01DF
480	01E0	01E1	01E2	01E3	01E4	01E5	01E6	01E7	01E8	01E9
490	01EA	01EB	01EC	01ED	01EE	01EF	01F0	01F1	01F2	01F3
500	01F4	01F5	01F6	01F7	01F8	01F9	01FA	01FB	01FC	01FD
510	01FE	01FF	0200	0201	0202	0203	0204	0205	0206	0207
520	0208	0209	020A	020B	020C	020D	020E	020F	0210	0211
530	0212	0213	0214	0215	0216	0217	0218	0219	021A	021B
540	021C	021D	021E	021F	0220	0221	0222	0223	0224	0225
550	0226	0227	0228	0229	022A	022B	022C	022D	022E	022F
560	0230	0231	0232	0233	0234	0235	0236	0237	0238	0239
570	023A	023B	023C	023D	023E	023F	0240	0241	0242	0243
580	0244	0245	0246	0247	0248	0249	024A	024B	024C	024D
590	024E	024F	0250	0251	0252	0253	0254	0255	0256	0257
600	0258	0259	025A	025B	025C	025D	025E	025F	0260	0261
610	0262	0263	0264	0265	0266	0267	0268	0269	026A	026B
620	026C	026D	026E	026F	0270	0271	0272	0273	0274	0275
630	0276	0277	0278	0279	027A	027B	027C	027D	027E	027F
640	0280	0281	0282	0283	0284	0285	0286	0287	0288	0289
650	028A	028B	028C	028D	028E	028F	0290	0291	0292	0293
660	0294	0295	0296	0297	0298	0299	029A	029B	029C	029D
670	029E	029F	02A0	02A1	02A2	02A3	02A4	02A5	02A6	02A7
680	02A8	02A9	02AA	02AB	02AC	02AD	02AE	02AF	02B0	02B1
690	02B2	02B3	02B4	02B5	02B6	02B7	02B8	02B9	02BA	02BB
700	02BC	02BD	02BE	02BF	02C0	02C1	02C2	02C3	02C4	02C5
710	02C6	02C7	02C8	02C9	02CA	02CB	02CC	02CD	02CE	02CF
720	02D0	02D1	02D2	02D3	02D4	02D5	02D6	02D7	02D8	02D9
730	02DA	02DB	02DC	02DD	02DE	02DF	02E0	02E1	02E2	02E3
740	02E4	02E5	02E6	02E7	02E8	02E9	02EA	02EB	02EC	02ED
750	02EE	02EF	02F0	02F1	02F2	02F3	02F4	02F5	02F6	02F7
760	02F8	02F9	02FA	02FB	02FC	02FD	02FE	02FF	0300	0301
770	0302	0303	0304	0305	0306	0307	0308	0309	030A	030B
780	030C	030D	030E	030F	0310	0311	0312	0313	0314	0315
790	0316	0317	0318	0319	031A	031B	031C	031D	031E	031F

Table 4-6 Decimal / Hexadecimal Values Continued

	0	1	2	3	4	5	6	7	8	9
800	0320	0321	0322	0323	0324	0325	0326	0327	0328	0329
810	032A	032B	032C	032D	032E	032F	0330	0331	0332	0333
820	0334	0335	0336	0337	0338	0339	033A	033B	033C	033D
830	033E	033F	0340	0341	0342	0343	0344	0345	0346	0347
840	0348	0349	034A	034B	034C	034D	034E	034F	0350	0351
850	0352	0353	0354	0355	0356	0357	0358	0359	035A	035B
860	035C	035D	035E	035F	0360	0361	0362	0363	0364	0365
870	0366	0367	0368	0369	036A	036B	036C	036D	036E	036F
880	0370	0371	0372	0373	0374	0375	0376	0377	0378	0379
890	037A	037B	037C	037D	037E	037F	0380	0381	0382	0383
900	0384	0385	0386	0387	0388	0389	038A	038B	038C	038D
910	038E	038F	0390	0391	0392	0393	0394	0395	0396	0397
920	0398	0399	039A	039B	039C	039D	039E	039F	03A0	03A1
930	03A2	03A3	03A4	03A5	03A6	03A7	03A8	03A9	03AA	03AB
940	03AC	03AD	03AE	03AF	03B0	03B1	03B2	03B3	03B4	03B5
950	03B6	03B7	03B8	03B9	03BA	03BB	03BC	03BD	03BE	03BF
960	03C0	03C1	03C2	03C3	03C4	03C5	03C6	03C7	03C8	03C9
970	03CA	03CB	03CC	03CD	03CE	03CF	03D0	03D1	03D2	03D3
980	03D4	03D5	03D6	03D7	03D8	03D9	03DA	03DB	03DC	03DD
990	03DE	03DF	03E0	03E1	03E2	03E3	03E4	03E5	03E6	03E7

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