Advanced User Guide

SE77-DeviceNet

Commander SE

Part Number: 0452-0054
Issue Number: 1

www.controltechniques.com

Safety Information

The solutions module and its associated drive are intended as components for professional incorporation into complete equipment or systems. If installed incorrectly the drive may present a safety hazard. The drive uses high voltages and currents, carries a high level of stored electrical energy and is used to control mechanical equipment that can cause injury.

Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and User Guide carefully.

Careful consideration must be given to the functions of the drive and solutions module, which might result in a hazard, either through their intended functions e.g. auto-start or through incorrect operation due to a fault or trip e.g. stop/start, forward/reverse, maximum speed, loss of communications link.

In any application where a malfunction of the drive or solutions module could lead to damage, loss or injury, a risk analysis must be carried out and where necessary further measures taken to reduce the risk. To ensure mechanical safety additional safety devices such as electro-mechanical interlocks may be required. The drive must not be used in a safety critical application without high-integrity protection against hazards arising from a malfunction.

General Information

The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation or adjustment of the optional operating parameters of the equipment or from mismatching the variable speed drive (Drive) with the motor.

The contents of this guide are believed to be correct at the time of printing. In the interests of a commitment to a policy of continuous development and improvement, the manufacturer reserves the right to change the specification of the product or its performance, or the contents of this guide, without notice.

Drive software version

This product is supplied with the latest version of user-interface and machine control software. If this product is to be used in a new or existing system with other Drives, there may be some differences between their software and the software in this product. These differences may cause this product to function differently. This may also apply to Drives returned from a Control Techniques Service Centre.

If there is any doubt, contact a Control Techniques Drive Centre.

Issue Code: 1

Hardware: RD77 Issue 01.00

Firmware: V1.01.00

Commander SE:V1.08.00 or later

Contents

1 Introduction

NOTE Commander SE parameters are denoted in this manual by "#MM.PP", where MM refers to the menu number, and PP refers to the parameter number within that menu. Please refer to the Commander SE manual for full parameter definitions.

1.1 SE77-DeviceNet card for Commander SE

The SE77-DeviceNet card is a single option card that fits neatly inside the Commander SE. The SE77-DeviceNet card uses a 16-bit processor and is capable of communicating at 500 Kbits/sec., currently the fastest data rate available for DeviceNet. SESoft V1.04.00 and later provides full support for the Commander SE SE77-DeviceNet card.

Parameter data is transferred to and from the Commander SE using a 2-wire RS485 link into the RJ-45 serial communications connector on the Commander SE.

Power is taken from external DeviceNet power supply. This ensures that the SE77-DeviceNet card is kept powered up, and continues to communicate with the DeviceNet master controller, even when the Commander SE is powered down.

1.2 Product Conformance Certificate

The SE77-DeviceNet card has been awarded full DeviceNet Conformance Certification by the Open DeviceNet Vendors Association (ODVA). Further details are available on the ODVA web site at www.odva.org.

1.3 Overview Specification

- Auto-configuration of the serial communications port when the SE77-DeviceNet card is connected to the Commander SE.
- Supported data rates (bits/sec): 500K, 250K, 125K
- Three 16 bit input/output polled words supported
- Explicit communications supported
- 6 pre-defined DeviceNet profiles supported
- CT Single Word non-cyclic data channel (optional)

2 Mechanical Installation

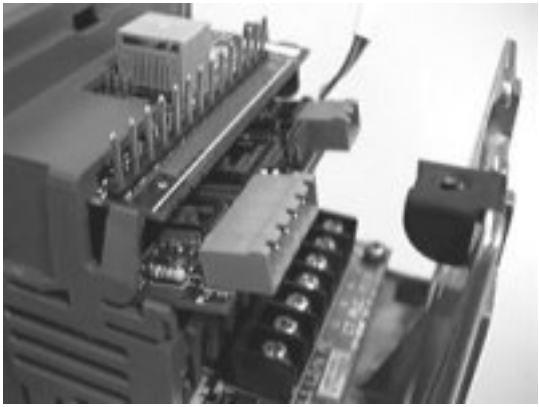
The Commander SE must be disconnected from the mains supply before installing or removing an option module.

NOTE Care should be taken when handling the SE77-DeviceNet card, as it may be damaged by electrostatic discharge. To prevent inadvertent damage, touch an earthed bare metal surface to discharge yourself before removing the SE77-DeviceNet card from the anti-static bag.

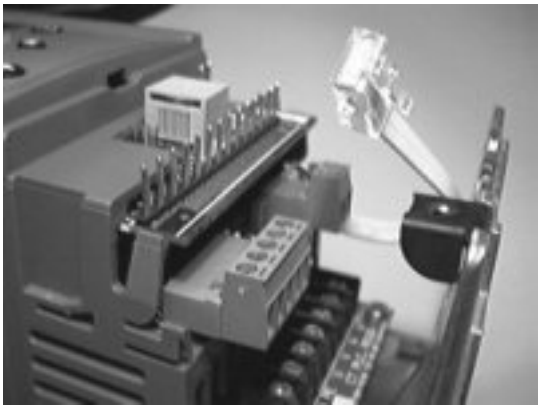
2.1 Commander SE Size 1

1. Remove the two terminal blocks from the option card. Slide the SE77-DeviceNet card diagonally into the Commander SE.

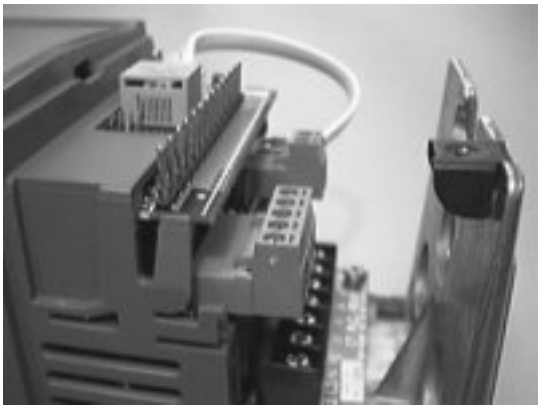
2. Ensure that the SE77-DeviceNet card is aligned between the runners moulded into the plastic casing, and slide into the Commander SE.



3. Push the SE77-DeviceNet card firmly into the Commander SE until the plastic spring clips latch it securely in place.

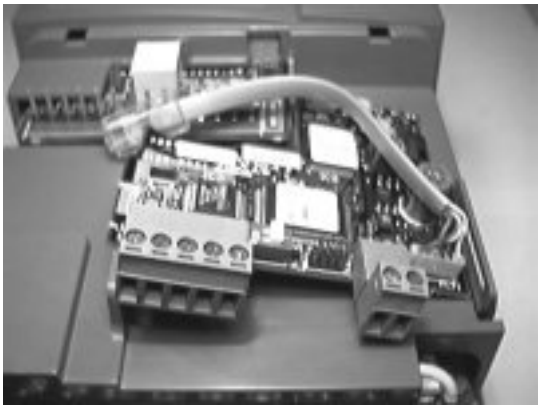


4. Plug the flylead into the RJ45 socket on the Commander SE.



2.2 Commander SE Sizes 2, 3, 4 and 5

1. Locate the right hand side of the SE77-DeviceNet card under the flange.

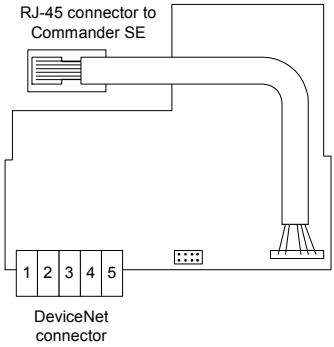


2. Push the left hand side of the SE77-DeviceNet card down to clip into place. Connect the fly-lead to the RJ-45 connector on the Commander SE.

3 Electrical Installation

3.1 SE77-DeviceNet Card

The SE77-DeviceNet card has a single 5-way screw terminal block connector for the DeviceNet data connections.



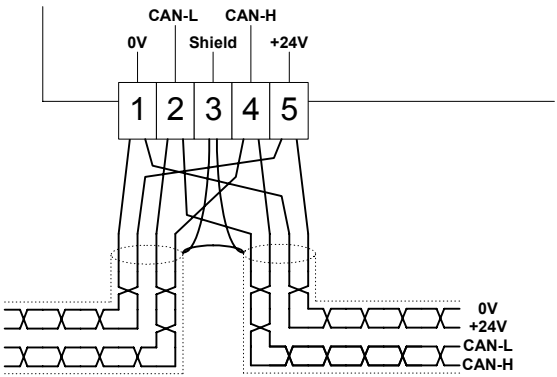
The connections for the DeviceNet connector are given in the table below.

Table 3.1 SE77-DeviceNet Terminals

Terminal	Function	Description
1	0V	0V DeviceNet external supply
2	CAN-L	Negative data line
3	Screen	Cable braided screen connection
4	CAN-H	Positive data line
5	+24V	+24V DeviceNet external supply

3.2 DeviceNet Data Connections

To connect the Commander SE to the DeviceNet network, make the connections as shown in the diagram below. The length of the "pigtail" screen connection should be kept as short as possible.



3.3 DeviceNet Cable

DeviceNet cable has 2 twisted pairs plus overall screening. The data wires are white and blue, and the network power supply wires are red and black.

Table 3.2 DeviceNet Cable Colour Codes

Cable	Data Signal	Terminal	Description
Black	0V	1	0V external power supply
Blue	CAN-L	2	Negative data line
Braided Shield	Screen	3	Cable screen
White	CAN-H	4	Positive data line
Red	+24V	5	+24V external power supply

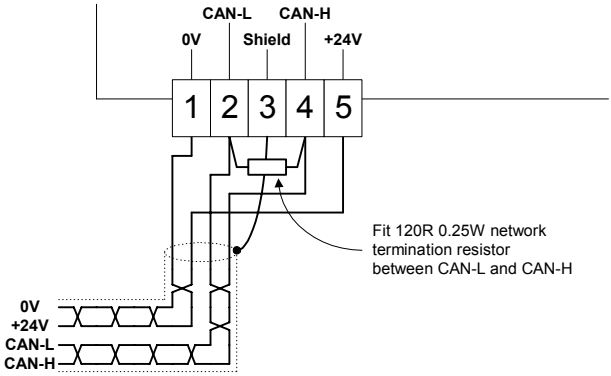
DeviceNet networks run at high data rates, and require cable specifically designed to carry high frequency signals. Low quality cable will attenuate the signals, and may render the signal unreadable for the other nodes on the network. Cable specifications and a list of approved manufacturers of cable for use on DeviceNet networks is available on the Open DeviceNet Vendors Association web site at www.odva.org.

NOTE Control Techniques can only guarantee correct and reliable operation of its SE77-DeviceNet cards if all other equipment installed (including the network cable) has been approved by the ODVA.

3.4 DeviceNet Network Termination

It is very important in high-speed communications networks that the network communications cable is fitted with the specified termination resistor network at each end of the cable. This prevents signals from being reflected back down the cable and causing interference.

Termination resistors should be fitted as shown in the diagram below.



NOTE Failure to terminate a network correctly can seriously affect the operation of the network. If termination is not fitted, the noise immunity of the network is greatly reduced, while if too many nodes have their internal termination resistor networks enabled, the network will be over-loaded and may not operate at all

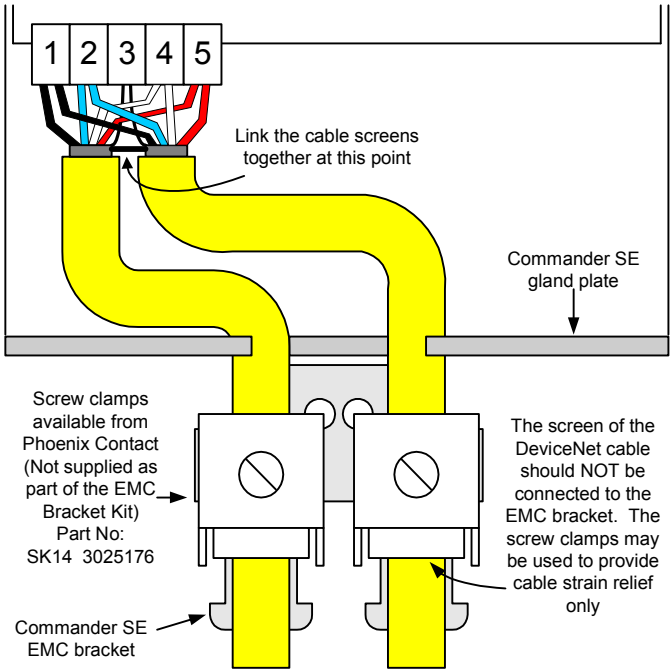
3.5 DeviceNet Cable Screen Connections

An EMC Bracket Kit is available for each size of Commander SE. This plate can be attached to the Commander SE gland plate, and provides a suitable point to clamp the motor cable screen to earth.

Table 3.3 EMC Bracket Kits

Commander SE	Kit Part No	Kit Name
Size 1	9500-0014	SE11
Size 2	9500-0016	SE12
Size 3	9500-0017	SE13
Size 4	9500-0018	SE14
Size 5	9500-0041	SE15

The SE77-DeviceNet card should be wired with the cable shields isolated from earth at each Commander SE. The cable shields should be linked together at the point where they emerge from the cable, and formed into a short pigtail to be connected to pin 3 on the DeviceNet connector.



CAUTION

The DeviceNet cable shield should be grounded at one place ONLY in the network. This is to prevent the cable from becoming live in the unlikely event of a fault in one of the DeviceNet nodes.

3.6 DeviceNet Power Supply Requirements

A comprehensive guide to wiring and sizing a power supply for a DeviceNet network is available from the Allen Bradley web site at www.ab.com. DN-6.7.2 “DeviceNet Cable System: Planning and Installation Manual” provides all necessary details and guidelines to specifying and installing a suitable power supply for a DeviceNet network.

The SE77-DeviceNet card is powered by the DeviceNet network power supply. The typical operating currents drawn from the DeviceNet power supply are shown in the table below. A factor of 2 should be allowed for in-rush current during power-up.

Table 3.4 Power Consumption

DeviceNet Supply Voltage	Typical Current
19.2V (24V -20%)	45mA
21.6V (24V -10%)	40mA
24V nominal	38mA
26.4V (24V +10%)	35mA
30V (24V+20%)	35mA

3.7 Maximum Network Length

The maximum number of nodes that can be connected to a single DeviceNet network segment is 64 nodes. The maximum length of network cable for a DeviceNet network is specified by the Open DeviceNet Vendors Association, and depends on the data rate to be used. Full details of network cable lengths and wiring limitations are available in the Allen Bradley Document Reference DN-6.7.2.

Table 3.5 Maximum Network Length

Data Rate (bits/sec)	Maximum Trunk Length (m)	Maximum Drop Length (m)	Max. Cumulative Drop (m)
125K	500	6	156
250K	250	6	78
500K	100	6	39

4 Getting Started

Full explanations of the polled data functions and supported data formats are given in Chapter 5. Non-cyclic data and node configuration using non-cyclic data are described in Chapter 7.

NOTE The Commander SE must be fitted with firmware V1.08.00 or later for use with a fieldbus interface. SESoft V1.04.00 or later provides support for all Commander SE fieldbus interfaces.

4.1 SESoft Wizard

The SESoft Wizard guides the user through the basic configuration of the Commander SE. Specify the power supply and motor details in pages 1 and 2 of the Wizard. For the "Speed Input References" screen (page 3), follow the instructions below:

- Set the Speed Input to "**Fieldbus**".
- Set the Fieldbus Type to "DeviceNet".
- Specify the Node Address for the Commander SE. (Not required for the Interbus interface.)
- Specify the Data Rate to be used. (Not required for Profibus-DP or Interbus networks.)

Complete the remainder of the Wizard, and click **DOWNLOAD** to download the configuration to the Commander SE. When complete, click **FINISH** to exit the Wizard.

The Wizard will download all appropriate information to the Commander SE, configure it to use the digital speed reference #1.21, change the communications mode to "FbuS", and save all parameters in the Commander SE.

- Power down the Commander SE.
- Plug the SE77-DeviceNet card into the Commander SE.
- Power up the Commander SE.

The SE77-DeviceNet card is now ready to communicate with the DeviceNet master controller.

4.2 Basic Communications Quick Start

The SE77-DeviceNet card can also be configured to establish basic DeviceNet communications from the Commander SE keypad and display.

- Connect the SE77-DeviceNet card to the Commander SE.
- Power up the Commander SE, and ensure that #0.10 is set to "L2".
- Set the communications mode (#0.41) to "FbuS".
- Set the node address (#0.45) as required and press the M key.
- Set the data rate (#0.46) as required and press the M key.
- Power down the Commander SE.

When the SE77-DeviceNet card is next connected to the Commander SE, it will read the configuration parameters and configure itself accordingly..

Table 4.1 BAsic Configuration Parameters

Function	Parameter	Recommended Setting
Communications Mode	#0.41	“Fbus”
Node Address	#0.45	1 to 61
Data Rate	#0.46	4, 3, or 2
Network Status	#0.47 (RO)	Indicates the current status of the SE77-DeviceNet card

NOTE "FbuS" mode must be selected to allow keypad access to #0.45, #0.46 and #0.47.

4.3 Commander SE Communications Mode

Commander SE: #0.41

The Commander SE has several communications mode that can be selected by #0.41. When a fieldbus card is connected to the Commander SE, it will automatically change the communications mode to "FbuS". This change will take effect immediately without any need to store the parameters or reset the Commander SE.

4.4 DeviceNet Node Address

Commander SE: #0.45

Every node on a DeviceNet network must be given a unique network address. If 2 or more nodes are assigned the same address, only one node will join the network and start communicating with the master controller. All other nodes with the same address will be prevented from joining the network. The valid range of addresses is from 0 to 63, with a default address of 63

If an invalid node address is set in #0.45, the SE77-DeviceNet card will reject the configured address, default to 63, and update #0.45 with the address that is actually being used.

NOTE Changes to #0.45 will be stored automatically when the MODE button is pressed after the value has been set..

4.5 DeviceNet Data Rate

Commander SE: #0.46

Every node on a SE77-DeviceNet card must be configured to run at the network data rate. If a node is configured with the wrong data rate, it may cause errors on the CAN network, and eventually trip on “t60”, Bus Off error. This parameter should be set to the same value on all nodes on the network. The SE77-DeviceNet card has a default data rate setting of 125 Kbits/sec.

Table 4.2 Data Rate

#0.46	bits/sec
4	125K
3	250K
2	500K

4.6 DeviceNet Data Format

The default data format is 3 Polled Words, which is the same data format as used on Unidrive and Mentor II. Each polled data word is mapped to a Commander SE parameter with default mappings as shown in the table below.

Table 4.3 Default Data Mapping

Polled Word	Default Mapping Status
OUT Word 0	Control word
OUT Word 1	Digital speed reference 1
OUT Word 2	Not mapped
IN Word 0	Status word
IN Word 1	Post-ramp speed reference
IN Word 2	Motor load current as % of rated load current

Other data formats with are also supported. For further details. see section 5.2.

4.7 DeviceNet Network Status

Commander SE: #0.47

The status of the SE77-DeviceNet node and DeviceNet network is displayed in #0.47, and can be viewed on the display on the Commander SE.

Table 4.4 DeviceNet Network Status

#0.47	Status	Description
>0	Network healthy	Indicates the number of network cycles per second, and the slave is exchanging data with the master controller.
0	Network healthy, no data transfer	Indicates that the master controller has established communications with the node, but data transfer has not yet started.
-1	No network master	Indicates that the DeviceNet interface has initialised correctly, and is waiting for the master controller to initialise communications
-2	Internal failure	Indicates that part of DeviceNet interface initialisation test was not successful. Replace the module if this error persists.

4.8 Network Loss Trip

4.8.1 Loss of DeviceNet Network

If the DeviceNet network stops operating, the SE77-DeviceNet card will trip the Commander SE on “t62”. The default time delay between network loss and Commander SE trip is 200ms, so the actual delay trip time will be between 200 and 400ms. (See section 10.2 for more details.) The master controller will automatically detect that the slave node is no longer communicating on the network, and will update its own internal status registers. Refer to the master controller documentation for details.

4.8.2 Loss of RS485 "FbuS" Link

The Commander SE has a serial communications watchdog that must be updated at least once every second. The SE77-DeviceNet card ensures that the watchdog is updated regularly while the RS485 link is healthy. If the RS485 link is broken, the watchdog in the Commander SE will not get updated, and the Commander SE will trip "SCL".

If the SE77-DeviceNet card remains powered up, it will continue to communicate with the DeviceNet master controller. The loss of the RS485 link to the Commander SE is indicated by bit 15 of the status word being set to 1. (All other bits in the status word are reset to 0 in this state.) Bit 15 is reset to 0 when the RS485 link is re-established.

NOTE If bit 15 of the status word is set to 1, the remaining IN polled data words will continue to hold the last values read from the Commander SE. Bit 15 is an important check for the validity of the IN data.

More more details about the status word, refer to section 6.

4.9 Restore DeviceNet Defaults

Commander SE: #15.30

Default DeviceNet values can be restored to the Commander SE using SESoft or the Universal Keypad. This resets ALL SE77-DeviceNet configuration parameters (including node address) back to the factory default values.

Table 4.5 Restore Defaults

#15.30	Status
0	No action
1	Restore default settings

NOTE To restore communications to the node, the node address (#0.45) must be set to the required value, and the Commander SE powered down. Communications will be re-established (with default settings) when power is re-applied to the Commander SE. (This does not apply to the Interbus interface.)

4.9.1 Commander SESoft

- Power down the Commander SE and disconnect the SE77-DeviceNet card.
- Connect the SESoft communications lead, and power up the Commander SE.
- In SESoft, go to **MENU 15**, and click **LOAD DEFAULTS**.
- Power down the Commander SE and re-connect the SE77-DeviceNet card.
- Re-apply power to the Commander SE.
- The SE77-DeviceNet card will overwrite all #15.PP parameters with their default values. The default values will take effect immediately.

4.9.2 Universal Keypad

- Set #15.30 to 1.
- Store the Commander SE parameters from the Universal Keypad by setting #MM.00 to 1000, and pressing the red **RESET** button.
- Power down the Commander SE, and re-connect the SE77-DeviceNet card.
- The SE77-DeviceNet card will overwrite all #15.PP parameters with their default values. The default values will take effect immediately.

4.10 Restore Previous DeviceNet Configuration

The SE77-DeviceNet card stores the last set of configuration parameters in its own FLASH memory. These values can be restored to the Commander SE using SESoft or the Universal Keypad.

4.10.1 Commander SESoft

- Go to the Menu 15 Screen
- Set the Fieldbus Type to "**None**" and click on the **PROGRAM** button. SESoft will set #15.01 to 0 and store all parameters.
- Power down the Commander SE, and re-connect the SE77-DeviceNet card.
- Re-apply power to the Commander SE.
- The SE77-DeviceNet card will detect that #15.01 is 0, and download the previously stored values (including the node address) to all #15.PP parameters. The stored values will take effect immediately.

4.10.2 Universal Keypad

- Set #15.01 to 0.
- Store the Commander SE parameters from the Universal Keypad by setting #MM.00 to 1000, and pressing **RESET**.
- Power down the Commander SE, and re-connect the SE77-DeviceNet card.
- Re-apply power to the Commander SE.
- The SE77-DeviceNet card will detect that #15.01 is 0, and download the previously stored values (including the node address) to all #15.PP parameters. The stored values will take effect immediately.

NOTE Universal Keypads with firmware V1.01.05 or earlier fitted, do not provide access to #15.01. It is recommended that the Universal Keypad should have firmware V1.04.00 or later fitted.

5 Polled Data

NOTE "OUT data" and "IN data" describe the direction of data transfer as seen by the DeviceNet network master controller.

5.1 What is Polled Data?

Polled data is a method of data transfer that must be set-up during network configuration, but is transmitted automatically once configuration is complete. The high-speed data transfer is achieved by transmitting only a 16-bit data value for each polled channel over the DeviceNet network, and relying on local mapping information within the Commander SE to ensure the correct data is sent to the correct locations. This method relies on the master controller program writing and reading data values to and from the registers allocated to the node during network configuration, and the source and destination of IN and OUT data being set-up correctly in the Commander SE itself.

The flexibility of the SE77-DeviceNet card means that each polled data OUT channel can be directed to any read-write Commander SE parameter. Similarly, each polled data IN channel can use any Commander SE parameter as a source of data.

NOTE The polled data mappings cannot be changed dynamically, as changes to the mapping parameters will only take effect during initialisation of the SE77-DeviceNet card, i.e. at power up.

5.2 DeviceNet Data Formats

Commander SE: #15.05

The SE77-DeviceNet card must be configured with the required data format. The table below shows the data formats that are supported.

Table 5.1 Supported Data Formats

#15.05	Polled Data Words	Non-cyclic Data Mode	Description
0.03	3	0	Same format as used on the Unidrive and Mentor II SE77-DeviceNet cards
1.03	3	1	Word 0 used for CT Mode Single Word non-cyclic data format
0.00	2 or 3	0	User must select one of the pre-defined assembly objects

The mapping for the polled data channels on Commander SE can be changed using either the SESoft configuration software, or a Universal Keypad. The mapping method is similar to the method used in Commander SE for mapping analogue inputs and outputs. The value entered in the mapping parameter takes the form MMPP, where MM = menu number of the target parameter and PP = parameter number of the target parameter.

NOTE If a mapping parameter is set to an invalid value, e.g. destination parameter is read only, or parameter does not exist, the Commander SE will reset the mapping parameter (#15.PP) to 0.

If a polled data channel is not required, setting the mapping value to 0 will disable it. The data word will still be transmitted over the network to the SE77-DeviceNet card, but no data value will be written to any Commander SE parameter. This helps to improve the update time of all parameters by reducing the number of messages that must be transmitted over the RS485 link to the Commander SE.

NOTE The polled data channels do not use decimal points. For example, the digital speed reference 1 (#1.21) has units of Hertz, accurate to 1 decimal place. To write a value of 24.6Hz to #1.21, the value must be transmitted as 246.

5.2.1 3 Polled Words Only

This data format provides three 16-bit polled data words, with no non-cyclic data channel. To select this data format, set #15.05 = 0.03.

Table 5.2 Format 0.03 Mapping

Data Word	Mapping Parameter	Default Mapping Status
IN Word 0	----	Status word
IN Word 1	#15.11	#2.01, post-ramp speed reference
IN Word 2	#15.12	#4.20, motor load as % of rated motor load
OUT Word 0	----	Control word
OUT Word 1	#15.21	#1.21, digital speed reference 1
OUT Word 2	#15.22	Not mapped

5.2.2 3 Polled Words with CT Single Word

This data format provides three 16-bit polled data words, plus CT Single Word (Mode 1) non-cyclic data. To select this data format, set #15.05 = 1.03.

Table 5.3 Format 1.03 Mapping

Data Word	Mapping Parameter	Default Mapping Status
IN Word 0	----	Reserved for non-cyclic data channel
IN Word 1	----	Status word
IN Word 2	#15.11	#2.01, post-ramp speed reference
IN Word 3	#15.12	#4.20, motor load as % of rated motor load
OUT Word 0	----	Reserved for non-cyclic data channel
OUT Word 1	----	Control word
OUT Word 2	#15.21	#1.21, digital speed reference 1
OUT Word 3	#15.22	Not mapped

5.2.3 Pre-defined DeviceNet Assembly Object

The pre-defined DeviceNet Assembly objects provide additional control formats for the polled data. See section 10.3 for more details.

5.3 Storing DeviceNet Parameters

Menu 15 parameters are stored in the Commander SE and the SE77-DeviceNet card. If the Commander SE has previously stored DeviceNet settings, these will always be used by the SE77-DeviceNet card. All #15.PP parameters will be read and stored automatically in FLASH memory on the SE77-DeviceNet card.

NOTE If the stored values in the Commander SE are for a different type of fieldbus interface, the SE77-DeviceNet card will download its stored values to the Commander SE, and configure itself using those values.

5.3.1 Commander SE

Menu 0 parameters are automatically stored when they are edited using the keypad on the Commander SE. All other parameters can be stored using SESoft by selecting **TOOLS** and **SAVE PARAMETERS IN DRIVE**.

If a Universal Keypad is being used, set #MM.00 to 1000 and press the red **RESET** button to store all Commander SE parameters.

5.3.2 SE77-DeviceNet Card

When the SE77-DeviceNet card establishes the "FbuS" communications link, it checks the value in #15.01. If this is set to 1, it uploads all menu 15 parameters from the Drive and stores them in the FLASH memory.

If #15.01 is not set to 1 and #15.30 is set to 0, the previous set of values stored in the FLASH memory are downloaded to the Commander SE.

If #15.01 is not set to 1, and #15.30 is set to 1, default values are downloaded to the Commander SE, and these values are stored in the FLASH memory.

5.4 Mapping Conflicts

When the mapping parameters for the DeviceNet cyclic channels are set, care must be taken to ensure that there are no clashes with the mapping of the analogue and digital inputs within the Commander SE. The SE77-DeviceNet card will not indicate if there is a conflict of mapping parameters. This only applies to analogue and digital inputs, and OUT data on the DeviceNet network.

If a numerical parameter is written to from two different sources, the value of this parameter will depend entirely upon the scan times for the analogue or digital input and the DeviceNet network. Further confusion may be caused due to the update rate of the display. A parameter may appear to be steady at a particular value, but an occasional glitch in the displayed value may be seen. In reality, this value may be changing continuously, leading to unusual behaviour from the Commander SE.

Table 5.4 Commander SE Destination Parameters

Function	Mapping Parameter		Function	Mapping Parameter
Analogue Input 1	#7.10		Logic Output 1	#9.10
Analogue Input 2	#7.14		Motorised Pot Output	#9.25
Digital Input 1	#8.21		Comparator 1 Output	#12.07
Digital Input 2	#8.22		Source Select Output	#12.11
Digital Input 3	#8.23		PID Output	#14.16
Digital Input 4	#8.24		Cyclic OUT Word 2	#15.21
Digital Input 5	#8.25		Cyclic OUT Word 3	#15.22
Digital Input 6	#8.26			

The Linking Screen in SESoft displays all mapping parameters within the Commander SE, allowing the user to easily check that there are no mapping conflicts.

5.5 Disabling Data Channels

If any data words are not being used in an application, the mapping parameter should be set to 0. Although the data word will still be transmitted over the DeviceNet network, no corresponding message will be generated to read or write a parameter over the "FbuS" RS485 link to the Commander SE. This reduces the number of "FbuS" messages required to complete a single data cycle, and improves the efficiency of data transfer over the RS485 link, allowing each parameter to be updated more frequently.

6 Control and Status Words

6.1 DeviceNet Control Word

The DeviceNet control word allows the digital control of the Commander SE to be implemented using a single data word. Each bit in the DeviceNet control word has a particular function, and provides a method of controlling the output functions of the Commander SE (RUN FWD, JOG, TRIP, etc.) with a single data word.

b15	b14	b13	b12b	b11	b10	b9	b8
Reserved							

b7	b6	b5	b4	b3	b2	b1	b0
TRIP	RESET	DIG REF	FBUS CTRL	RUN REV	JOG	RUN FWD	ENABLE

NOTE For safety reasons, the external HARDWARE ENABLE signal (terminal 9) must be present (connected to +24V, terminal 7) before the fieldbus control word can be used to start the Commander SE. Typically, this terminal is controlled by the external Emergency Stop circuit to ensure that the Commander SE is disabled in an emergency situation.

To enable fieldbus control of the Commander SE, set the FBUS CTRL bit to 1. The 0-1 transition of the FBUS CTRL bit will cause the SE77-DeviceNet card to set #6.43 to 1 in the Commander SE, and enable fieldbus control of the Commander SE. When the FBUS CTRL bit is reset to 0, the SE77-DeviceNet card will reset #6.43 to 0, thus putting the Commander SE back into terminal control mode.

The DIG REF bit allows the source of the speed reference to be changed via the fieldbus. The 0-1 transition of the DIG REF will cause the fieldbus interface to set #1.14 to 3, selecting digital speed reference as the source of the speed reference. (By default, this will Digital Speed Reference 1, #1.21.) When the DIG REF bit is reset to 0, the SE77-DeviceNet card will set #1.14 to 1, selecting the analogue input as the source of the speed reference. (The actual digital speed reference selected will depend on the setting of the Digital Speed Reference Selector, #1.15)

Table 6.1 DeviceNet Control Word

Bit	Function	Description
0	ENABLE	Must be set to 1 to put the Commander SE in READY mode. Resetting to 0 will immediately disable the Commander SE, and the motor will coast to stop. The external HARDWARE ENABLE signal (terminal 9) must also be present before the Commander SE can be enabled and run.
1	RUN FWD	Set to 1 (with ENABLE set to 1) to run the motor in the forward direction. When reset to 0, the Commander SE will decelerate the motor to a controlled stop before the outputs disabled
2	JOG	Set to 1 with RUN FWD or RUN REV bit also set to one to jog the motor in the appropriate direction. The Commander SE will ramp the motor to the normal speed reference if the bit is reset to 0
3	RUN REV	Set to 1 (with ENABLE set to 1) to run the motor in the reverse direction. When reset to 0, the Commander SE will decelerate the motor to a controlled stop before the outputs disabled
4	FBUS CTRL	A 0-1 transition of this bit will set #6.43 to 1 to enable fieldbus control of the Commander SE. #6.43 can subsequently be over-written by a digital input if a terminal or fieldbus control selector switch is required. A 1-0 transition will reset #6.43 to 0, setting the Commander SE back into terminal control.)

Table 6.1 DeviceNet Control Word

Bit	Function	Description
5	DIG REF	A 0-1 transition of this bit will set #1.14 to 3 to select digital speed reference control. #1.14 can subsequently be over-written by a digital input controlling #1.42 if an analogue/digital reference select switch is required. A 1-0 transition will reset #1.14 to 1 to select analogue reference control.
6	RESET	A 0-1 transition will reset the Commander SE from a trip condition. If the cause of the trip has not been cleared, the Commander SE will trip again immediately
7	TRIP	A 0-1 transition will force a “t52” trip on the Commander SE. If the RESET and TRIP bits change from 0 to 1 on the same cycle, the TRIP bit will take priority
8-15	Reserved	

When a trip occurs, the SE77-DeviceNet card automatically sets the Commander SE control word (#6.42) to 0. This ensures that, for safety reasons, the Commander SE is in a safe, disabled state and cannot re-start immediately when it is reset.

However, the DeviceNet control word held in the SE77-DeviceNet card is not affected by a Commander SE trip. As the DeviceNet interface will only update the Commander SE control word (#6.42) when it sees a change in the DeviceNet control word, if the DeviceNet control word is not updated, the Commander SE will not automatically restart when full communications is re-established. A change to the DeviceNet control word is required before the Commander SE control word will be updated.

For this reason, it is necessary (and good safety practice!!) for the master controller program to monitor the status word, and reset the DeviceNet control word to a safe state if any Commander SE trip, DeviceNet fault or RS485 "FbuS" link loss error is detected. (The Commander SE’s internal control word is reset to 0 automatically when the Commander SE trips.) When both DeviceNet and “FbuS” communications links are healthy again, and it is safe to reset and re-start the Commander SE, the appropriate DeviceNet control word can be set, a change of DeviceNet control word is detected, the SE77-DeviceNet card will update the Commander SE control word (#6.42) and the Commander SE will restart.

Some example DeviceNet control word values to control the Commander SE are given in the table below.

Table 6.2 Example DeviceNet Control Words

Control Word (Hex)	Control Word (Dec.)	Action
0x0000	0	Control word disabled, Commander SE will operate under terminal control
0x0010	16	Disabled
0x0011	17	Enabled, stopped
0x0033	51	Enabled, run fwd, digital speed ref
0x0039	57	Enabled, run rev, digital speed ref
0x0013	19	Enabled, run fwd, analogue speed ref
0x0019	25	Enabled, run rev, analogue speed ref
0x0017	23	Enabled, jog fwd
0x001D	29	Enabled, jog rev
0x0080	128	Trip Commander SE
0x0070	112	Reset Commander SE into fieldbus control
0x0040	64	Reset Commander SE into terminal control

6.2 DeviceNet Status Word

The status word returns the status of multiple functions within the Commander SE, e.g. At Speed, Zero Speed, Drive Healthy, etc., and provides a quick method of checking the current status of the Commander SE. The status word is mapped to polled data as #90.12.

b15	b14	b13	b12b	b11	b10	b9	b8
FBUS LOSS	#10.15	#10.14	#10.13	#10.12	#10.11	#10.10	#10.09

b7	b6	b5	b4	b3	b2	b1	b0
#10.08	#10.07	#10.06	#10.05	#10.04	#10.03	#10.02	#10.01

Bit 15 of the status word will be set to 1 (with all other bits reset to 0) if the "FbuS" communications link between the DeviceNet interface and the Commander SE is lost.

NOTE Bit 15 of the status word effectively indicates that the master controller does not have control of the Commander SE. Under this condition, it is the User's responsibility to ensure that the master controller takes appropriate action to ensure system safety is maintained, in all respects.

The table below shows the function indicated by each bit in the status word when set to 1. A bit set to 0 indicates that the condition is false.

Table 6.3 DeviceNet Status Word

Bit	Parameter	Description
0	#10.01	Drive Healthy
1	#10.02	Drive Running
2	#10.03	Zero Speed
3	#10.04	Running At Or Below Minimum Speed
4	#10.05	Below Set Speed
5	#10.06	At Speed
6	#10.07	Above Set Speed
7	#10.08	Load Reached
8	#10.09	In Current Limit
9	#10.10	Regenerating
10	#10.11	Dynamic Brake Active
11	#10.12	Dynamic Brake Alarm
12	#10.13	Direction Commanded
13	#10.14	Direction Running
14	#10.15	Mains Loss
15	FBUS LOSS	"FbuS" Communications Link lost

6.3 Selecting Control Source Externally

A selector switch can be used to select whether the RUN FWD, JOG, RUN REV functions are controlled externally by the digital inputs, or remotely DeviceNet master. This allows a machine to be run in a “manual” mode temporarily, e.g. while feeding new material though a machine, and switched to “automatic” mode, running under PLC control once material loading has been completed.

Another switch can also be used to select the source of the speed reference for the Commander SE. This may allow the speed of the machine to be controlled manually while new material fed through at a slow speed, and switched to automatic PLC control once material is flowing freely.

6.3.1 FBUS CTRL

When a 0-1 transition of the FBUS CTRL bit in the DeviceNet control word occurs, the SE77-DeviceNet card will set #6.43 to 1. This will disable terminal control of the Commander SE, and allow the fieldbus to control the ENABLE, RUN FWD, JOG and RUN REV functions of the Commander SE. Similarly, when FBUS CTRL is reset to 0, the DeviceNet interface will set #6.43 to 0 to enable terminal control again.

If a digital input is configured to directly control #6.43 in the Commander SE, the value written to #6.43 by the SE77-DeviceNet card will be immediately overwritten by the digital input. This allows the source of the ENABLE, RUN FWD, JOG and RUN REV functions of the Commander SE to be selected externally.

NOTE Use SESoft or the Universal Keypad to configure a spare digital input to control #6.43.

6.3.2 DIG REF

When a 0-1 transition of the DIG REF bit in the DeviceNet control word occurs, the SE77-DeviceNet card will set #1.14 to 3. This will select the digital speed references as the source of the Commander SE speed reference. When DIG REF is reset to 0, the SE77-DeviceNet card will set #1.14 to 1 to re-select the analogue reference as the source of the speed reference.

If a digital input is configured to directly control #6.43 in the Commander SE, the value written to #6.43 by the SE77-DeviceNet card will be immediately overwritten by the digital input. This allows the source of the ENABLE, RUN FWD, JOG and RUN REV functions of the Commander SE to be selected externally.

NOTE #1.14 cannot be controlled directly by a digital input, but #1.42 can be used to select digital speed reference externally. Use SESoft or the Universal Keypad to configure a spare digital input to control #1.42.

Refer to the Commander SE User Guide for details on how to configure digital inputs.

7 Non-Cyclic Data

"Explicit data" is the non-cyclic data channel on DeviceNet that provides access to any parameter and DeviceNet object within the SE77-DeviceNet card. Non-cyclic data access is controlled entirely by the master controller program, and is not configured in any way when the DeviceNet network map is defined.

The method of using non-cyclic data will depend entirely on the type of master controller used on the DeviceNet network. For this reason, Control Techniques is unable to offer any specific technical support with implementing non-cyclic data transfer on any particular DeviceNet scanner and PLC combination.

The CT Single Word Mode of non-cyclic data is also available. This method uses an additional polled data word to access any Commander SE parameter. (DeviceNet objects cannot be accessed using CT Single Word mode.)

The SE77-DeviceNet card currently provides one format for non-cyclic data, plus the option to disable non-cyclic data.

Table 7.1 Non-Cyclic Modes

Non-Cyclic Mode	Data Format (#15.05)	Description
Disabled	0.xx	Non-cyclic data disabled
CT Single Word	1.xx	CT Single Word Format, as used in Unidrive and Mentor II

NOTE The non-cyclic data channel does not use decimal points. For example, the digital speed reference 1 (#1.21) has units of Hertz, accurate to 1 decimal place. To write a value of 24.6Hz to #1.21, the value must be transmitted as 246.

7.1 Explicit Parameter Access

The Control Techniques object (Class 100 or 0x64) provides access to all Commander SE parameters, using the parameters as shown:

Class Code:	100 (0x64)	
Instance:	Menu	
Attribute:	Parameter	
Read Code:	14 (0x0E)	Get_Attribute_Single
Write Code:	16 (0x10)	Set_Attribute_Single

All supported pre-defined DeviceNet objects can also be accessed using explicit messaging. See Chapter 11 for full details. Refer to the master controller documentation for full details about explicit messaging, and how to implement explicit messaging within the particular master controller.

NOTE Multiple parameter access is not supported by the SE77-DeviceNet card.

7.2 CT Single Word Mode (Mode 1)

The CT Single Word Format (Mode 1) of non-cyclic data uses one word for non-cyclic data. The non-cyclic sub-protocol requires a specific sequence of 4 words or "telegrams" to implement the parameter access. Each non-cyclic word or telegram is split into 2 bytes to implement the sub-protocol, with the high byte containing the control codes for each telegram, and the low byte containing the data for each telegram.

b15	b14	b13	b12	b11	b10	b9	b8
READ	ERROR	Reserved		Stamp Number			

b7	b6	b5	b4	b3	b2	b1	b0
Data Byte							

Table 7.2 CT Single Word Control

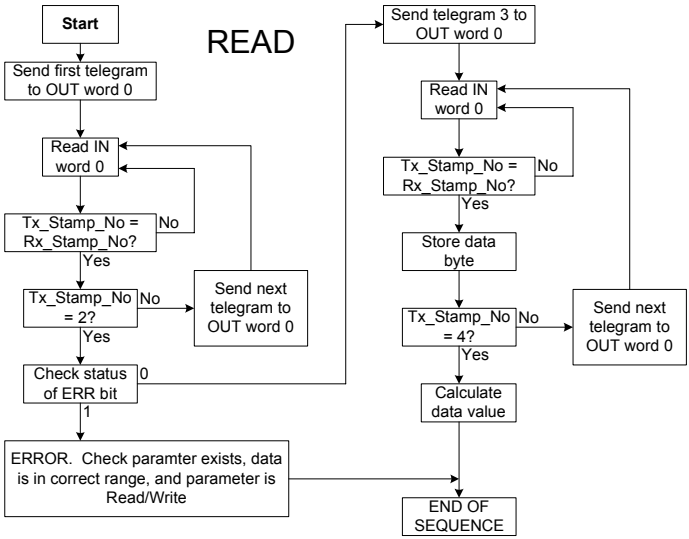
Bit	Function	Values	Description
0 to 7	Data	0 to 255	Depending on the stamp number of the telegram, this byte contains the menu or parameter number, or high data or low data byte
8 to 11	Stamp number	0 to 4	Indicates the stamp number of the word. This shows which part of the message is currently in progress. Setting the stamp number to 0 resets the internal non-cyclic state machine
12, 13	Not Used	0	These should be set to 0
14	ERROR	0 = Data OK 1 = Error	Indicates the success or failure of the message. Failure could occur if the parameter does not exist, or is a read-only or write-only parameter
15	READ	0 = Write 1 = Read	SPecifies a READ message when set to 1, and a WRITE message when set to 0

NOTE X = don't care. Generally, these bits should be set to 0. If a message is aborted part way through, the non-cyclic OUT word should be reset to 0. This will reset the non-cyclic state machine, and allow the message sequence to be restarted.

7.2.1 Reading parameters using Mode 1

To read parameters using the non-cyclic channel, the following “telegrams” must be transmitted to construct the final message.

- Telegram 1 Define menu number.
- Telegram 2 Define parameter number.
- Telegram 3 Request high data byte.
- Telegram 4 Request low data byte.



The following example telegrams show how to read the post-ramp frequency reference (in Hz) from #2.01 in the Commander SE.

TELEGRAM 1

The first telegram from the DeviceNet master indicates a READ cycle, and the stamp number is 1. The data byte would contain the menu number for the parameter that is to be read.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	1000	0001	0000	0010

Data word = 0x8102

Stamp number = 1

Menu = 2

When the first telegram has been received and processed in the slave node, it is mirrored in the non-cyclic IN word back to the PLC. This is the signal to the master controller program that the first telegram of the message has been received and understood, and the second telegram can be transmitted.

TELEGRAM 2

The second telegram from the DeviceNet master also indicates a READ cycle, but the stamp number is now 2. The data byte would contain the parameter number for the parameter that is to read.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	1000	0010	0000	0001

Data word = 0x8201

Stamp number = 2

Parameter = 1

When the second telegram has been received and processed in the slave, it is mirrored in the non-cyclic IN word. This is the signal to the master controller program that the second telegram of the message has been received and understood, and the third telegram can be transmitted.

If telegrams 1 and 2 were not received correctly, or an invalid parameter was specified, e.g. parameter is write only, or does not exist, the DeviceNet interface will set the ERROR bit to 1 (b14 = 1). The data bits will have no significance.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	1100	0010	XXXX	XXXX

Data word = 0xC2XX

Stamp number = 2

If an error is reported, it is recommended that the non-cyclic data word is set to 0 to ensure that the non-cyclic state machine is completely reset, and ready for the next non-cyclic READ or WRITE sequence.

TELEGRAM 3

The third telegram from the DeviceNet master acts as the indication to the slave to send the high data byte from the requested parameter. The data byte is not used in this telegram, and should be set to 0.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	1000	0010	0000	0000

Data word = 0x8300

Stamp number = 3

When the third telegram has been received and processed in the slave node, the node will mirror the stamp number in the non-cyclic IN word, and load the high byte of the parameter value into the data byte.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	1000	0011	0000	0101

Data word = 0x8305

Stamp number = 3

Data high byte = 5

TELEGRAM 4

The fourth telegram from the DeviceNet master acts as the indication to the slave to send the high data byte from the requested parameter. The data byte is not used in this telegram and should be set to 0.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	1000	0100	0000	0000

Data word = 0x8400

Stamp number = 4

When the fourth telegram has been received and processed in the slave node, the node will mirror the stamp number in the non-cyclic IN word, and load the low byte of the parameter value into the data byte.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	1000	0100	1101	1100

Data word = 0x84DC

Stamp number = 4

Data low byte = 220

Speed feedback= (Data high byte * 256) + Data low byte

= (5 * 256) + 220

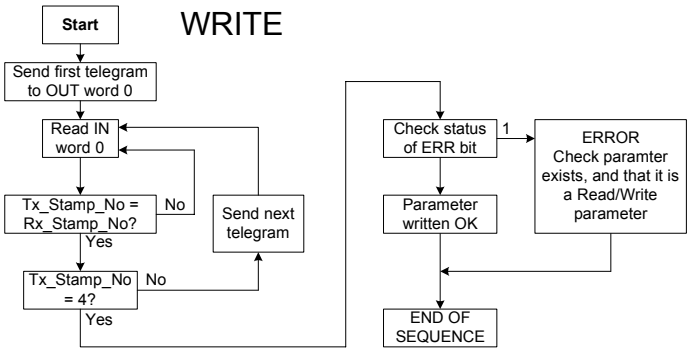
= 1500

= 150.0 Hz

7.2.2 Writing parameters using Mode 1

To write to parameters using the non-cyclic channel, the following telegrams must be sent on each network cycle to construct the final message.

- Telegram 1 Define menu number.
- Telegram 2 Define parameter number.
- Telegram 3 Send high data byte.
- Telegram 4 Send low data byte.



The following example telegrams show how to set the digital speed reference 1 (#1.21) to 40.0Hz (400) in the Commander SE.

TELEGRAM 1

The first telegram from the DeviceNet master indicates a WRITE cycle by setting the R/W bit to 0. The stamp number is set to 1. The data byte contains the menu number for the parameter that is to be written to.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	0000	0001	0000	0001

Data word = 0x0101

Stamp number = 1

Menu = 1

When the first telegram has been received and processed in the slave node, it is mirrored in the non-cyclic IN word. This is the signal to the master controller program that the first telegram of the message has been received and understood, and the second telegram can be transmitted.

TELEGRAM 2

The second telegram from the DeviceNet master also indicates a Write cycle, but the stamp number is now set to 2. The data byte would contain the parameter number for the parameter that is to be written to.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	0000	0010	0001	0101

Data word = 0x0215

Stamp number = 2

Parameter = 21

When the second telegram has been received and processed in the slave node, it is mirrored in the non-cyclic IN word. This is the signal to the master controller program that the second telegram of the message has been received and understood, and the third telegram can be transmitted.

TELEGRAM 3

The third telegram from the DeviceNet master has the stamp number set to 3. The data bits contain the high data byte for the parameter being written to.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	0000	0011	0000	0001

Data word = 0x0301

Stamp number = 3

Data high byte = 1

When the third telegram has been received and processed in the slave node, it is mirrored in the non-cyclic IN word. This is the signal to the master controller program that the third telegram of the message has been received and understood, and the fourth telegram can be transmitted.

TELEGRAM 4

The fourth telegram from the DeviceNet master has the stamp number set to 4. The data bits contain the low data byte for the parameter that is being written to.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	0000	0100	1001	0000

Data word = 0x0490

Stamp number = 4

Data low byte = 144

When the fourth telegram has been received and processed in the slave node, it will write the data (#1.21 = 40.0) as transmitted. (The decimal point is automatically inserted iwhen the data is transferred to the Commander SE.) If the operation is successful, the ERR bit is reset to 0 and the telegram is reflected in the non-cyclic IN word.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	0000	0100	1001	0000

Data word = 0x0490

Stamp number = 4

Data low byte = 144

If there was a problem with writing the data to the defined parameter, e.g. parameter is read only, does not exist, or data is out of range, the ERR bit is set to 1.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	0100	0100	XXXX	XXXX

Data word = 0x44XX

Stamp number = 4

7.2.3 Abort Mode 1 Non-cyclic Message

The internal state machine that controls the non-cyclic data transfer will only accept a new telegram if it contains the next expected telegram, i.e. after accepting telegram 2, the state machine will only respond to telegram 3. If telegram 4 is received, it will be ignored.

If an error occurs in the master controller that causes the telegrams to get out of step, the master controller program should time-out, abort the message and reset the non-cyclic state machine.

A Mode 1 non-cyclic message can be be abandoned by resetting the state machine. This is done be setting the non-cyclic word to 0.

Bit	b15-b12	b11-b8	b7-b4	b3-b0
Value	0000	0000	0000	0000

Data word = 0x0000

Stamp number = 0

7.3 DeviceNet Set-up using Non-Cyclic Data

The SE77-DeviceNet card can also be configured via the non-cyclic data channel. Menu 15 in the Commander SE contains the parameter values currently being used, and these can be modified as required using a non-cyclic data WRITE command.

Cyclic data mapping parameters can be edited via the non-cyclic data. Any changes made to the data mapping will take effect immediately, but changes are not stored automatically. Setting #15.31 (not available in Commander SE) to 1 will store the mapping changes in the SE77-DeviceNet card, and reset the SE77-DeviceNet card. This will cause a temporary interruption in communications with the master controller.

The parameters listed below are the parameters that can be written to configure the SE77-DeviceNet card. However, care must be taken when writing to certain parameters. For example, if the master changes the node address parameter (#15.03 or #0.45) controller, and the interface is forced to re-configure, the node will appear on the DeviceNet network at the new address.

Table 7.3 Configuration Parameters

Parameter	Default	Description
#15.03	63	Node Address Also displayed in menu zero #0.45
#15.04	4	Data Rate Also displayed in #0.46
#15.05	0.03	Data Format Indicates the number of non-cyclic and cyclic data words as X.Y, where X = non-cyclic data mode, Y = cyclic data words
#15.07	200	Trip Delay Time (ms) Specifies the time-out period for the DeviceNet network. If no network messages are received in this time period, the network loss trip is invoked. (See section 9.1)
#15.08	0	Advanced EDS File Select See section 7 for more details
#15.11	2.01	IN Channel 2 Mapping
#15.12	4.20	IN Channel 3 Mapping
#15.21	1.21	OUT Channel 2 Mapping
#15.22	0	OUT Channel 3 Mapping
#15.30	0	Load Option Defaults

The parameters listed in the table below return information about the SE77-DeviceNet card. Writing to these parameters will not affect the operation of the node.

Table 7.4 Read Only Parameters

Parameter	Description
#15.01	Option ID Code DeviceNet = 5
#15.02	Software Version Vxx.yy (See section 9.2)
#15.06	Fieldbus Diagnostic Indicates the status of the node, also displayed in #0.47
#15.50	Software Version - zz (See section 9.2)

Other parameters are available (and stored) in the SE77-DeviceNet card, but not in the Commander SE. These can only be accessed using the DeviceNet non-cyclic data channel.

Table 7.5 Internal SE77-DeviceNet Parameters

Parameter	Default	Description
#15.10	90.12	IN Channel 1 Mapping
#15.20	90.12	OUT Channel 1 Mapping
#15.31	0	Save Option Parameters. (See section 9.2)

7.4 Restore Fieldbus Defaults

Default values can be restored using the DeviceNet non-cyclic data channel. This resets ALL fieldbus parameters (including node address) back to the factory default values.

- Set #15.30 to 1.
- Set #15.31 to 1. (See section 10.2)

The DeviceNet card will restore default values (including the node address) in all #15.PP parameters, download these values to the Commander SE, and reset. The default values (including node address) will take effect immediately.

NOTE As the node address will be reset to 0, communications between the node and the master will be lost. To re-establish communications, re-enter the required node address in #0.45.

7.5 Restore Previous Fieldbus Configuration

The SE77-DeviceNet card itself stores the last set of configuration parameters that were used. These values can be restored to the Commander SE using the non-cyclic data channel.

- Set #15.01 to 0.
- Set #15.31 to 1 to store the parameters. (See section 10.2)
- The SE77-DeviceNet card will store all values and reset.

On re-initialisation, the SE77-DeviceNet card will detect that #15.01 is 0, and write it's stored values (including the node address) to all #15.PP parameters. The stored values will take effect immediately

8 EDS Files

8.1 What are EDS Files?

EDS (Electronic Data Sheets) files are text files that are used by DeviceNet network configuration software tools. They contain information about the device, such as manufacturer, product type, product code, etc., and they also provide information on the default settings and functions supported by the device. Mapping information is also included that allows access to device parameters over the DeviceNet network.

EDS files are not downloaded to the PLC or scanner, and are only used during network configuration. It is actually possible to configure a network without the EDS files, but they do help to provide a good picture of the network within the network configuration software.

8.2 Generic EDS Files

A generic EDS file is available for use with any Commander SE fitted with Version 1.xx.xx software. Generic EDS files for Mentor II and Unidrive are also supplied. These files are available from your local Control Techniques Drive Centre.

These files contain a basic common selection of the Commander SE parameters, allowing configuration of speed or torque references, acceleration and deceleration ramps, motor data set-up, digital and analogue I/O configuration parameters, and DeviceNet configuration parameters.

Table 8.1 Generic EDS Files

Drive	Drive Firmware	Generic EDS File
Unidrive Open Loop	V2.XX.XX	G2_OPEN.EDS
Unidrive Open Loop	V3.XX.XX	G3_OPEN.EDS
Unidrive Closed Loop	V2.XX.XX	G2_CLSD.EDS
Unidrive Closed Loop	V3.XX.XX	G3_CLSD.EDS
Unidrive Servo	V2.XX.XX	G2_SERVO.EDS
Unidrive Servo	V3.XX.XX	G3_SERVO.EDS
Unidrive Regen	V3.XX.XX	G3_REGEN.EDS
Mentor II	V5.01.XX	G501_M4Q.EDS
Mentor II	V5.02.XX	G502_M4Q.EDS
Mentor II	V5.04.XX	G504_M4Q.EDS
Mentor II	V5.05.XX	G505_M4Q.EDS
Commander SE	V1.XX.XX	G1D_CSE.EDS
Commander SE	V2.XX.XX	G2D_CSE.EDS

Drive icon files are also supplied for use with the DeviceNet configuration software being used. EDS files must usually be installed into the software package being used to configure a DeviceNet network. Refer to the software documentation for instructions on how to install EDS files. Control Techniques cannot provide specific technical support for any of these software packages.

8.3 EDS File Revisions

The EDS files from Control Techniques have undergone several revisions as specifications have been changed or tightened up. The table below shows the compatibility with the most common DeviceNet configuration tools.

Table 8.2 EDS File Compatibility

EDS Revision	DeviceNet Manager	RSNetworx
1.X	OK	Not compatible
2.X	OK	V2.XX.XX and earlier
3.X	OK	V3.XX.XX

8.4 Advanced EDS Files

Advanced EDS files provide access to the complete Commander SE parameter set for a specific version of software.Commander SE Advanced EDS files must be created using the Advanced EDS File Compiler, available from your local Control Techniques Drive Centre.

To generate and use an advanced EDS file:

1. Specify the Drive as “Commander SE”
2. Specify the firmware version of the Commander SE (#0.41)
3. Select “File” and “Build EDS File” to generate the EDS file
4. Specify a name for the EDS file
5. Install the EDS file into the DeviceNet configuration software
6. Set #15.08 to 1 in the Commander SE
7. Store the Commander SE parameters
8. Power down the Commander SE and SE77-DeviceNet card.

When the network is re-scanned, the product code of the Commander SE will have changed, and this should be matched to the EDS file that has just been created.

9 Diagnostics

The information from the parameters described below should always be noted before contacting Control Techniques for technical support.

9.1 Fieldbus Code

Commander SE:#15.01

The fieldbus code identifies the fieldbus option module last fitted to the Commander SE.

Table 9.1 Fieldbus Code

#15.01	Fieldbus
1	Profibus-DP
2	Interbus
3	Reserved
4	Reserved
5	DeviceNet
6	CANopen

9.2 Firmware Version

Commander SE:#15.02

The version of firmware present in the SE77-DeviceNet card can be read from #15.02 in the Commander SE.

Table 9.2 Firmware Version

Major Code (#15.02)	Minor Code (#15.50)	Firmware Version
1.01	0	V1.01.00

9.3 DeviceNet Node Address

Commander SE:#0.45 or #15.03

Every DeviceNet node must be assigned a unique node address. If two or more nodes have the same address, this will cause a conflict when the master attempts to initialise the network.

DeviceNet nodes default to a node address of 63, so ideally, each node address should be configured on each node BEFORE any attempt is made to connect it to the network. #0.45 can be modified using the keypad on the Commander SE itself.

9.4 DeviceNet Data Rate

Commander SE:#0.46 or #15.04

The SE77-DeviceNet card must be configured to run at the network data rate. This parameter should be set to the same value on all nodes on the network.

Table 9.3 Data Rate

Data Rate (#0.46 or #15.04)	bit/s
4	125K
3	250K
2	500K

9.5 Network Status

Commander SE:#0.47 or #15.06 (Read only)

The network activity can be monitored in #0.47 on the Commander SE. When the interface is communicating with the DeviceNet network, the approximate number of messages per second is displayed. If polled data transfer is stopped by the master, but is not due to any network errors, #0.47 will show 0.

-1 indicates that the SE77-DeviceNet card has initialised correctly, but is waiting for the master to initiate communications.

- Check that the DeviceNet cables and screens have been wired correctly, and the physical connections are good.
- Ensure that the SE77-DeviceNet card is connected to the RJ-45 communications connector on the Commander SE, and that the network status parameter indicates that the network is running.
- Ensure that the network has been terminated.
- Check that the node address has been set correctly and only one node on the network has that particular address.
- Check that the node has been configured correctly in the master.
- Data format selected is correct.

-2 indicates an initialisation failure. If this fault persists, replace the SE77-DeviceNet card.

9.6 No Data Transfer

If data is not being transferred from the master controller to the Commander SE, make the following checks:

- The mapping parameters have been programmed correctly. If an incorrect mapping was entered, it will have been reset to 0.
- Check that there are no mapping parameter conflicts, i.e. an analogue input is not trying to control the same parameter as a polled OUT channel. The "Linking Screen" in SESoft shows all input and output mapping parameters on a single screen for this purpose.
- Check that the Network Status (#0.47) is >0. (See section 4.7)

9.7 Commander SE Trip Codes

If certain errors occur, the Commander SE will trip and show the trip code in the upper window.

Table 9.4 Trip Codes

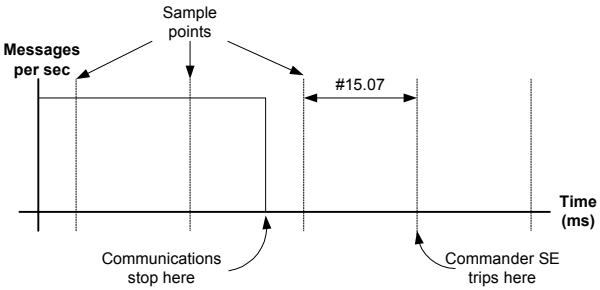
Trip Code	Error
t52	This code indicates that the trip was caused by bit 7 in the control word being set to 1. The trip is initiated by a 0-1 transition of bit 7 in the control word. (See section 6.1)
t60	DeviceNet network failure. This trip can be caused by a network fault, e.g. broken wire, disconnected node, missing termination resistors, etc. "t60" will also occur if the master controller stops the network while it is being re-programmed or reset. (See section 4.8.1)
t62	DeviceNet Network Loss. The node has not received a polled data message for a time period specified in #15.07. This trip can be caused by a network fault, e.g. broken wire, disconnected node, missing termination resistors, etc. "t62" may also occur if the master controller stops the network while it is being re-programmed or reset. (See section 10.2)
t63	Polled Connection Timeout. The polled data connection has timed out. The timeout delay is defined as 4 * Expected Packet Rate. This trip is disabled when #15.07 is set to 0. (Expected Packet Rate is defined i nhte master controller configuration, and usually defaults to 75ms.)
SCL	RS485 "FbuS" link failure. Communications between the SE77-DeviceNet card card and the Commander SE (RJ45) port have been interrupted. (See section 4.8.2)

10 Advanced Features

10.1 DeviceNet Network Loss Trip

Commander SE:#15.07

The SE77-DeviceNet card counts the number of valid network cycles received in a time period specified by #15.07. The trip is triggered if no messages are received in a given sample period, and messages were received in the previous sample period. The default setting for #15.07 is 200ms.



As can be seen from the diagram, the actual time from network loss to the network loss trip actually occurring will range from #15.07 ms to 2 * #15.07 ms. By decreasing #15.07, the maximum trip time will be reduced, but if the trip time is set too low, spurious network loss trips will be seen.

The actual network loss trip time depends entirely on the number of messages per second being received under normal operation. As a rough guide, the Network Loss Trip time (#15.07) should be set such that a minimum of 5 messages will be received in any given sample period under normal operating conditions.

The Network Loss trip can be disabled by setting #15.07 to 0, but the Commander SE will continue to operate using the last received values in the case of a network loss. It is the User's responsibility to ensure that adequate safety precautions are taken to prevent damage or injury in the event of a communications network loss.

10.2 Non-Cyclic Parameter Store

SE77-DeviceNet card:#15.31

#15.31 is not available inside the Commander SE itself. It stores the current configuration parameters, and resets the SE77-DeviceNet card. This stores any changes made that have been made via the non-cyclic communications, and resets the SE77-DeviceNet card to make the changes take effect.

10.3 Supported Drive Profiles

The input (attribute 101) and output (attribute 100) assembly objects are set in the Control Supervisor. The default assembly objects are the Control Techniques Input (106) and Output (107) objects, which allow each data word to be mapped using the menu 15 parameters. Refer to sections 10.4.10 and 10.4.11 for more details.

The DeviceNet specification includes a series of set profiles for different devices, including Drives, and the Commander SE SE77-DeviceNet card supports several of these pre-defined assembly objects. The format of the DeviceNet pre-defined assembly objects is fixed.

Table 10.1 Supported Profiles

Object	Type	Object Name
20 (0x14)	Output	Basic Speed Control Output
21 (0x15)	Output	Extended Speed Control Output
22 (0x16)	Output	Speed and Torque Control Output
23 (0x17)	Output	Extended Speed and Torque Control Output
70 (0x46)	Input	Basic Speed Control Input
72 (0x48)	Input	Speed and Torque Control Input

There are 3 ways to select a pre-defined Input or Output assembly object:

1. Use the PLC Explicit communications to write directly to the Control Supervisor. (See page 43 in DeviceNet User Guide Issue 1.) The relevant attributes are 100 (Output) and 101 (Input).
2. Use the Class Instance Editor within RSNetworx to modify the Control Supervisor directly yourself. Refer to page 43 to check the supported services for Commander SE SE77-DeviceNet card.
3. Double-click on a node to go on-line to it, and look under the group "DeviceNet Config". In this group, you will find the attributes "Polled Input Assembly" and "Polled Output Assembly". Update with the appropriate value.

NOTE The parameter mapping of the pre-defined DeviceNet objects CANNOT be changed.

10.3.1 Basic Speed Control

Output Assembly Object 20

The scanner must be configured for 4 Tx bytes (or 2 Tx words) if this output assembly object is selected.

Table 10.2 Basic Speed Control Data Format

Data Word	Function
Word 0	Basic Control Word (See below)
Word 1	SpeedRef (See section 11.5.5)

The Basic Control Word uses a full 16-bit word, with the bits having functions as shown below. Refer to section 11.4 for mapping details of each function.

b15	b14	b13	b12	b11	b10	b9	b8

b7	b6	b5	b4	b3	b2	b1	b0
					FaultRst		RunFwd

10.3.2 Extended Speed Control

Output Assembly Object 21

The scanner must be configured for 4 Tx bytes (or 2 Tx words) if this output assembly object is selected

Table 10.3 Extended Speed Control Data Format

Data Word	Function
Word 0	Extended Control Word (See below)
Word 1	SpeedRef (See section 11.5.5)

The Extended Control Word uses a full 16-bit word, with the bits having functions as shown below. Refer to section 11.4 for mapping details of each function.

b15	b14	b13	b12	b11	b10	b9	b8

b7	b6	b5	b4	b3	b2	b1	b0
	NetRef	NetCtrl			FaultRst	RunRev	RunFwd

10.3.3 Basic Speed and Torque Control

Output Assembly Object 22

The scanner must be configured for 6 Tx bytes (or 3 Tx words) if this output assembly object is selected

Table 10.4 Basic Speed And Torque Control Data Format

Data Word	Function
Word 0	Basic Control Word (See below)
Word 1	SpeedRef (See section 11.5.5)
Word 2	TorqueRef (See section 11.5.7)

The Basic Control Word uses a full 16-bit word, with the bits having functions as shown below. Refer to section 11.4 for mapping details of each function.

b15	b14	b13	b12	b11	b10	b9	b8

b7	b6	b5	b4	b3	b2	b1	b0
					FaultRst		RunFwd

10.3.4 Extended Speed and Torque Control

Output Assembly Object 23

The scanner must be configured for 6 Tx bytes (or 3 Tx words) if this output assembly object is selected.

Table 10.5 Extended Speed And Torque Control Data Format

Data Word	Function
Word 0	Extended Control Word (See below)
Word 1	SpeedRef (See section 11.5.5)
Word 2	TorqueRef (See section 11.5.7)

The Extended Control Word uses a full 16-bit word, with the bits having functions as shown below. Refer to section 11.4 for mapping details of each function.

b15	b14	b13	b12	b11	b10	b9	b8

b7	b6	b5	b4	b3	b2	b1	b0
	NetRef	NetCtrl			FaultRst	RunRev	RunFwd

10.3.5 Basic Speed Feedback

Input Assembly Object 70

The scanner must be configured for 4 Rx bytes (or 2 Rx words) if this input assembly object is selected

Table 10.6 Basic Speed Feedback Data Format

Data Word	Function
Word 0	Basic Status Word (See below)
Word 1	SpeedActual (See section 11.5.4)

The Basic Status Word uses a full 16-bit word, with the bits having functions as shown below. Refer to section 11.4 for mapping details of each function.

b15	b14	b13	b12	b11	b10	b9	b8

b7	b6	b5	b4	b3	b2	b1	b0
					FaultRst		RunFwd

10.3.6 Basic Speed and Torque Feedback

Input Assembly Object 72

The scanner must be configured for 6 Rx bytes (or 3 Rx words) if this input assembly object is selected.

Table 10.7 Basic Speed And Torque Feedback Data Format

Data Word	Function
Word 0	Basic Status Word (See below)
Word 1	SpeedActual (See section 11.5.4)
Word 2	TorqueActual (See section 11.5.6)

The Extended Control Word uses a full 16-bit word, with the bits having functions as shown below. Refer to section 11.4 for mapping details of each function.

b15	b14	b13	b12	b11	b10	b9	b8

b7	b6	b5	b4	b3	b2	b1	b0
					FaultRst		RunFwd

11 DeviceNet Object Model

The Object Model used to represent an AC or DC Drive has the following object classes present.

Table 11.1 Supported Objects

Object Class	Class Code
Identity	0x01 (1)
Message Router	0x02 (2)
DeviceNet	0x03 (3)
Connection	0x05 (5)
Assembly	0x04 (4)
Control Supervisor	0x29 (41)
AC/DC Drive	0x2A (42)
Motor Data	0x28 (40)
Control Techniques Group	0x64 (100)

11.1 Identity Object

Class code: 0x01 (1)

This object provides identification of and general information about the device.

11.1.1 Vendor ID

Class: 0x01Instance:0x01Attribute:0x01

Access: GetData Type:UINT

Returns the Vendor ID code, which is 0x101 (257) for Control Techniques.

11.1.2 Device Type

Class: 0x01Instance:0x01Attribute:0x02

Access: GetData Type:UINT

Returns the Device Type code. The Commander SE belongs to Group 2, AC Drives.

11.1.3 Product Code

Class: 0x01Instance:0x01Attribute:0x03

Access: GetData Type:UINT

Identifies the current Commander SE configuration. This value is used in matching the appropriate EDS file to the current device configuration.

Table 11.2 Product Code

#15.08	Product Code
0	256
1	256 + (#11.29 / 100)

11.1.4 Revision

Class: 0x01Instance:0x01Attribute:0x04

Access: GetData Type:UINT

Returns the major and minor revisions of the Commander SE. The major revision is returned in the high byte, while the minor revision is contained in the low byte.

Table 11.3 Major Revision

#15.08	Major Revision	Minor Revision
0	#11.29 / 100	(#11.29 Mod 100) + 1
1	(#11.29 Mod 100) + 1	1

The major revision value is used in matching the appropriate EDS file to the current device configuration.

11.1.5 Serial Number

Class: 0x01Instance:0x01Attribute:0x06

Access: GetData Type:UDINT

Returns a serial number of the SE77-DeviceNet card. This value is entered during production, and cannot be edited.

11.1.6 Product Name

Class: 0x01Instance:0x01Attribute:0x07

Access: GetData Type:SHORT_STRING

Returns a short string to indicate the Product Name. The Commander SE SE77-DeviceNet card returns the string “SE RD77”.

11.2 DeviceNet

Class code: 0x03 (3)

The DeviceNet Object provides the configuration and status of the DeviceNet port. The MAC-ID and Data Rate can also be set in #0.45 and #0.46 on the Commander SE keypad.

11.2.1 MAC-ID

Class: 0x03Instance:0x01Attribute:0x01

Access: Get/SetData Type:USINT

The MAC-ID is read from #15.03 (#0.45) at power up and reset. When this attribute is written to, the SE77-DeviceNet card will update the MAC-ID in #15.03, set the save bit to 1 and reset, causing the new value to take effect immediately.

11.2.2 Data Rate

Class: 0x03Instance:0x01Attribute:0x02

Access: Get/SetData Type:USINT

The Data Rate is read from #15.04 at power up and reset. When this attribute is written to, the SE77-DeviceNet card will update the Data Rate in #15.04. The new value is not stored automatically, and the SE77-DeviceNet card is not reset.

The table below shows the attribute values for each data rate. Note that they are different to the values that will be displayed in #15.04.

Table 11.4 Data Rate

Setting	bits/sec
0	125K
1	250K
2	500K

11.2.3 Bus Off Interrupt

Class: 0x03Instance:0x01Attribute:0x03

Access: GetData Type:USINT

Indicates how the Commander SE SE77-DeviceNet card will behave if the Bus Off condition is encountered. This attribute is fixed at 0, meaning that the CAN controller requires an external reset before it will resume communications.

11.2.4 Bus Off Counter

Class: 0x03Instance:0x01Attribute:0x04

Access: GetData Type:USINT

Indicates the number of Bus Off conditions that have occurred. This attribute will always be cleared to 0 on reset.

11.2.5 Allocation Information

Class: 0x03Instance:0x01Attribute:0x05

Access: GetData Type:USINT

Returns 2 bytes of information. The low byte contains the Allocation Byte, with each bit assigned as shown in the table below.

The high byte indicates the MAC-ID of the master device which allocated the Master/Slave Pre-defined Connection set. 255 means the Predefined Master/Slave Connection set has not yet been allocated.

Table 11.5 Allocation Byte

Bit	Action
0	Explicit Message
1	Polled
2	Strobed (Not supported)
3	Reserved
4	Change of State (Not supported)
5	Cyclic (Not supported)
6	Acknowledge Suppression
7	Reserved

11.3 Motor Data Object

Class code: 0x28 (40)

11.3.1 Motor Type

Class: 0x28Instance:0x01Attribute:0x03

Access: Get/SetData Type:USINT

Motor types 6 (Wound rotor induction motor) and 7 (Squirrel cage induction motor) are supported for this attribute. When this attribute is changed, #15.31 must be set to ensure that the new value is retrieved at power up.

11.3.2 Rated Current

Class: 0x28Instance:0x01Attribute:0x06

Access: Get/SetData Type:USINT

Specifies the rated current of the motor in Amps. This attribute is mapped directly to #5.07 in the Commander SE.

11.3.3 Rated Voltage

Class: 0x28Instance:0x01Attribute:0x07

Access: Get/SetData Type:USINT

Specifies the rated motor voltage in Volts. This attribute is mapped directly to #5.09 in the Commander SE.

11.4 Control Supervisor

Class code: 0x29 (41)

11.4.1 RunFwd

Class: 0x29Instance:0x01Attribute:0x03

Access: Get/SetData Type:USINT

Set to 1 to run the Commander SE in the forward direction.

Set true #90.12 |= 0x0002

Set false #90.12 &= 0xFFFD

Get (#6.42 & 0x0020) >> 1

11.4.2 RunRev

Class: 0x29Instance:0x01Attribute:0x04

Access: Get/SetData Type:USINT

Set to 1 to run the Commander SE in the reverse direction.

Set true #90.12 |= 0x0008

Set false #90.12 &= 0xFFF7

Get (#6.42 & 0x0040) >> 3

11.4.3 NetCtrl

Class: 0x29Instance:0x01Attribute:0x05

Access: Get/SetData Type:USINT

Switches the Commander SE between terminal and fieldbus control.

Set true #6.43 = 1

Set false #6.43 = 0

Get #6.43

11.4.4 RunningFwd

Class: 0x29Instance:0x01Attribute:0x07

Access: GetData Type:USINT

Indicates that the Commander SE is running in the forward direction.

Get True (#90.12 & 0x2002) == 0x0002

Get False (#90.12 & 0x2002) != 0x0002

11.4.5 RunningRev

Class: 0x29Instance:0x01Attribute:0x08

Access: GetData Type:USINT

Indicates that the Commander SE is running in the reverse direction.

Get True (#90.12 & 0x2002) == 0x2002

Get False (#90.12 & 0x2002) != 0x2002

11.4.6 Ready

Class: 0x29Instance:0x01Attribute:0x09

Access: GetData Type:USINT

Indicates that the Commander SE is enabled and ready to run.

Get (#90.12 & 0x0001) == 0x0001

11.4.7 Faulted

Class: 0x29Instance:0x01Attribute:0x0A

Access: GetData Type:USINT

Indicates that the Commander SE is tripped, i.e. not healthy

Get !#10.01

11.4.8 FaultRst

Class: 0x29Instance:0x01Attribute:0x0C

Access: SetData Type:USINT

Resets the Commander SE from a tripped condition.

Set true #90.12 |= 0x0040

Set false #90.12 &= 0xFFBF

11.4.9 FaultCode

Class: 0x29Instance:0x01Attribute:0x0D

Access: GetData Type:USINT

If the Commander SE is tripped, the fault code is obtained from parameter #10.20 in the Commander SE.

Get #10.20

If the fault code in #10.20 is one of the following, the table gives the appropriate ODVA code.

Table 11.6 DeviceNet Fault Codes

Commander SE Fault Code	ODVA Fault Code
1	0x3220
2	0x3210
3	0x2300
4	0x7112
6	0x9000
20	0x2310
21	0x4300
26	0x5112
32	0x3130

If the code is not on the above list, the error code will be returned as 0x1000 + #10.20.

11.4.10 OutputAssembly

lass: 0x29Instance:0x01Attribute:0x64

Access: Get/SetData Type:USINT

Selects the output assembly object to be used. After this attribute has been written, #15.31 must be set to ensure that the change takes effect at next power-up.

11.4.11 InputAssembly

Class: 0x29Instance:0x01Attribute:0x65

Access: Get/SetData Type:USINT

Selects the input assembly object to be used. After this attribute has been written, #15.31 must be set to ensure that the change takes effect at next power-up.

11.4.12 DriveEnable

Class: 0x29Instance:0x01Attribute:0x66

Access: Get/SetData Type:USINT

Enables the Commander SE. This puts the Commander SE into the “Ready” state, allowing the RunFwd and RunRev attributes to control the Commander SE. RunFwd and RunRev will have no effect if DriveEnable is not set to 1.

Set true #90.12 |= 0x0001

Set false #90.12 &= 0xFFFE

Get #6.42.0

NOTE The external hardware enable signal (terminals 7 and 9) must also be present before the Commander SE will go to the Ready state.

11.5 AC/DC Drive Object

Class code: 0x2A (42)

11.5.1 AtReference

Class: 0x2AInstance:0x01Attribute:0x03

Access: GetData Type:USINT

Indicates that the Commander SE is running at the requested speed.

Get (#90.12 & 0x0020) == 0x0020

11.5.2 NetRef

Class: 0x2AInstance:0x01Attribute:0x04

Access: Get/SetData Type:USINT

Selects the source of the speed reference. Analogue input 1 is used as the speed reference when running under local control, with Digital Speed Reference 1 being used as the speed reference for network control.

Set true #1.14 = 3

Set false #1.14 = 1

Get #1.14

The reference can only be changed between local and remote when the Commander SE is configured in speed control mode. If a change is requested when in torque mode then a ‘Device state conflict’ error code 10h will be returned.

11.5.3 DriveMode

Class: 0x2AInstance:0x01Attribute:0x06

Access: Get/SetData Type:USINT

Selects torque control mode when set. Speed control mode is used when this attribute is reset.

Set true #4.11 = 1

Set false #4.11 = 0

Get #4.11

11.5.4 SpeedActual

Class: 0x2AInstance:0x01Attribute:0x07

Access: GetData Type:USINT

Returns the actual speed of the motor in RPM. As Commander SE does not use a feedback device, this value is the calculated speed of the motor, based on the slip of the motor and current loading of the motor.

Get #5.04

11.5.5 SpeedRef

Class: 0x2AInstance:0x01Attribute:0x08

Access: Get/SetData Type:USINT

Sets the speed reference in RPM. As the Commander SE uses units of Hz for speed, these values are converted when reading from or writing to this attribute.

Set #1.21 = (RPM * Pole Pairs) / 6

Get RPM = (#2.01 * 6) / Pole Pairs

11.5.6 TorqueActual

Class: 0x2AInstance:0x01Attribute:0x0B

Access: GetData Type:USINT

Returns the actual load on the motor as a percentage of the rated motor load. This attribute has 1 decimal place fixed precision, so a value of 1000 represents 100.0% load.

Get #4.20

11.5.7 TorqueRef

Class: 0x2AInstance:0x01Attribute:0x0C

Access: Get/SetData Type:USINT

Sets the load (torque) reference as % of rated motor load (torque). This attribute has 1 decimal place fixed precision, so a value of 1000 represents 100.0% load.

Set #4.08

Get #4.08

11.6 Control Techniques Object

Class code: 0x64 (100)

The Control Techniques object provides access to all Commander SE parameters. For example, parameter #4.20 would be accessed as Class 100, Instance 4, Attribute 20.

Table 11.7 CT Object Mapping

Instance	Menu	Name
1	1	Speed Reference
2	2	Ramp Control
3	3	Speed Control
4	4	Current Control
5	5	Motor Control
6	6	Sequencing
7	7	Analogue I/O
8	8	Digital I/O
9	9	Logic
10	10	Drive Status
11	11	Drive Set-up
12	12	Programmable Thresholds
13	13	Position Control
14	14	Process PID Loop
15	15	Fieldbus Configuration
21	21	Second Motor Map
100	0	Basic Menu

12 Quick Reference

12.1 Complete Parameter Reference

Table 12.1 Parameter Reference

Parameter	Default	Description
#15.01	----	Option ID Code (Read only)
#15.02	----	Major Software Version (Read only)
#15.03	63	Node Address Also displayed in #0.45
#15.04	4	Data Rate (Default is 125K) Also displayed in #0.46
#15.05	0.03	Data Format
#15.06	----	Fieldbus Diagnostic (Read only) Also displayed in #0.47
#15.07	200	Trip Delay Time (ms)
#15.08	0	Advanced EDS File Select
#15.11	2.01	IN Channel 2 Mapping
#15.12	4.20	IN Channel 3 Mapping
#15.21	1.21	OUT Channel 2 Mapping
#15.22	0.00	OUT Channel 3 Mapping
#15.30	0	Load Option Defaults
#15.50	----	Minor Software Version (Read only)

12.2 DeviceNet Data Formats

Table 12.2 Data Formats

Format (#15.05)	Non-cyclic Data Mode	Polled Words	Comment
0.03	None	3	Same format as used on the Unidrive and Mentor II SE77-DeviceNet cards
1.03	1	3	Word 0 used for CT Single Word non-cyclic data
0.00	None	2 or 3	User must select one of the pre-defined assembly objects. See sections 10.4.10 and 10.4.11.

12.3 DeviceNet Control Word

Table 12.3 DeviceNet Control Word

Bit	Function	Description
0	ENABLE	Must be set to 1 to put the Commander SE in READY mode. Resetting to 0 will immediately disable the Commander SE, and the motor will coast to stop. The external HARDWARE ENABLE signal (terminal 9) must also be present before the Commander SE can be enabled and run.
1	RUN FWD	Set to 1 (with ENABLE set to 1) to run the motor in the forward direction. When reset to 0, the Commander SE will decelerate the motor to a controlled stop before the outputs disabled
2	JOG	Set to 1 with RUN FWD or RUN REV bit also set to one to jog the motor in the appropriate direction. The Commander SE will ramp the motor to the normal speed reference if the bit is reset to 0
3	RUN REV	Set to 1 (with ENABLE set to 1) to run the motor in the reverse direction. When reset to 0, the Commander SE will decelerate the motor to a controlled stop before the outputs disabled
4	FBUS CTRL	A 0-1 transition of this bit will set #6.43 to 1 to enable fieldbus control of the Commander SE. #6.43 can subsequently be over-written by a digital input if a terminal or fieldbus control selector switch is required. A 1-0 transition will reset #6.43 to 0, setting the Commander SE back into terminal control.)
5	DIG REF	A 0-1 transition of this bit will set #1.14 to 3 to select digital speed reference control. #1.14 can subsequently be over-written by a digital input controlling #1.42 if an analogue/digital reference select switch is required. A 1-0 transition will reset #1.14 to 1 to select analogue reference control.
6	RESET	A 0-1 transition will reset the Commander SE from a trip condition. If the cause of the trip has not been cleared, the Commander SE will trip again immediately
7	TRIP	A 0-1 transition will force a “t52” trip on the Commander SE. If the RESET and TRIP bits change from 0 to 1 on the same cycle, the TRIP bit will take priority
8-15	Reserved	

12.4 DeviceNet Status Word

Table 12.4 DeviceNet Status Word

Bit	Parameter	Description
0	#10.01	Drive Healthy
1	#10.02	Drive Running
2	#10.03	Zero Speed
3	#10.04	Running At Or Below Minimum Speed
4	#10.05	Below Set Speed
5	#10.06	At Speed
6	#10.07	Above Set Speed
7	#10.08	Load Reached
8	#10.09	In Current Limit
9	#10.10	Regenerating
10	#10.11	Dynamic Brake Active
11	#10.12	Dynamic Brake Alarm
12	#10.13	Direction Commanded
13	#10.14	Direction Running
14	#10.15	Mains Loss
15	FBUS LOSS	“FbuS” Communications Link lost

12.5 Commander SE Trip Codes

Table 12.5 Trip Codes

Trip Code	Error
t52	This code indicates that the trip was caused by bit 7 in the control word being set to 1. The trip is initiated by a 0-1 transition of bit 7 in the control word. (See section 5.6)
t60	DeviceNet network failure. This trip can be caused by a network fault, e.g. broken wire, disconnected node, missing termination resistors, etc. "t60" will also occur if the master controller stops the network while it is being re-programmed or reset. (See section 4.8.1)
t62	DeviceNet Network Loss The node has not received a polled data message for a time period specified in #15.07. This trip can be caused by a network fault, e.g. broken wire, disconnected node, missing termination resistors, etc. "t62" may also occur if the master controller stops the network while it is being re-programmed or reset. (See section 9.1)
t63	Polled Connection Timeout. The polled data connection has timed out. The timeout delay is defined as 4 * Expected Packet Rate. This trip is disabled when #15.07 is set to 0. (The Expected Packet Rate is defined i nhte master controller configuration, and usually defaults to 75ms.)
SCL	RS485 "FbuS" link failure. Communications between the SE77-DeviceNet card and the Commander SE (RJ45) port have been interrupted. (See section 4.8.2)