Contents

■ Symbols used in this manual

When reading this manual you will come across different symbols that require special attention. The symbols used are the following:

Indicates something to be noted by the reader

Indicates a general warning

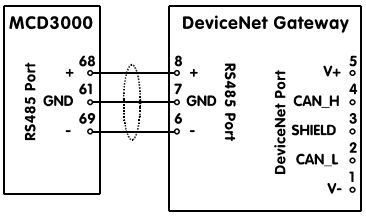
Indicates a high voltage warning

■ Description

The MCD3000 DeviceNet Gateway is designed for connection between the MCD3000 RS485 Serial Communications Port and a DeviceNet network.
From the DeviceNet network MCD3000 soft starters can be started, stopped and trip conditions reset. Also operational status, motor conditions or trip status can be read.
The MCD3000 DeviceNet Gateway is a Group 2 Only Device implementing the predefined master/slave connection set. I/O data is consumed and produced using Polled I/O messages. This allows a DeviceNet scanner to become a master of the gateway, thus providing remote control of the MCD3000.
Each MCD3000 to be connected to a DeviceNet network requires its own MCD3000 DeviceNet Gateway.

■ Soft starter to gateway connection

The MCD3000 DeviceNet Gateway must be connected to the MCD3000 as shown below.



ATTENTION

Where the MCD3000 DeviceNet Gateway is located away from the MCD3000, the communications cabling should not be located closer than 300mm to power cabling. Where this cannot be avoided, consideration should be given to providing a magnetic screen to reduce induced common mode voltages. Where problems are found with reflections on the communications cabling, termination resistors should be fitted at each end of the cable to match the characteristic impedance of the cable.

■ Soft starter configuration

For the MCD3000 to communicate with the MCD3000 DeviceNet Gateway the MCD3000 must be program with a satellite Address of 20 and a baud rate of 9600 baud. These are the MCD3000 default settings for Par 22. *Serial Communications - Baud Rate* and Par 23. *Serial Communications - Satellite Address*.

22 Serial Communications - Baud Rate

Value:

1 - 5 ★ 4 (9600 baud)

1 = 1200 baud
2 = 2400 baud
3 = 4800 baud
4 = 9600 baud
5 = 19200 baud

Function:

Sets the baud rate for serial communications.

Description of choice:

Set to 4 (9600 baud) for operation with the DeviceNet Gateway.

23 Serial Communications - Satellite Address

Value:

1 - 99 ★ 20

Function:

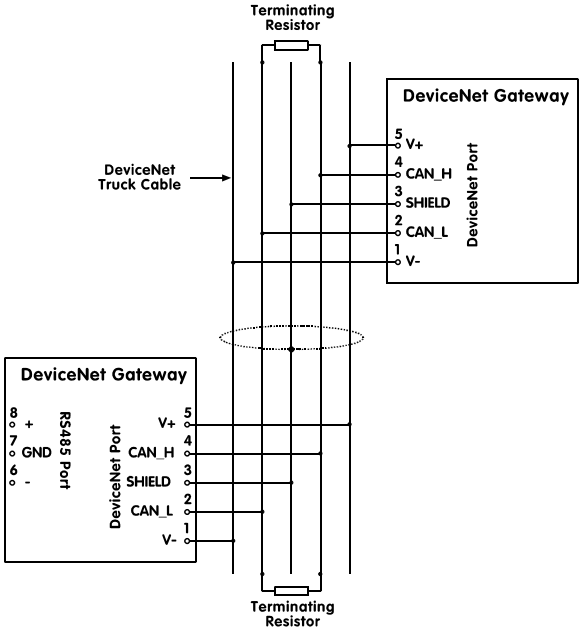
Assigns the MCD3000 an address for serial communications.

Description of choice:

Set to 20 for operation with the DeviceNet Gateway.

■ Gateway to DeviceNet connection

The MCD3000 DeviceNet Gateway must be connected to the DeviceNet network as shown below.



ATTENTION

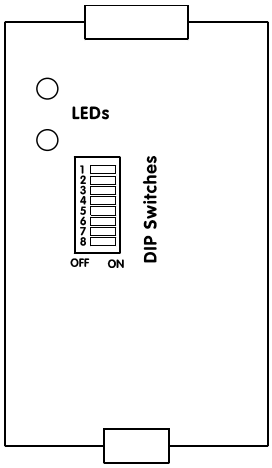
Power for the MCD3000 DeviceNet Gateway is obtained directly from the DeviceNet network. No additional power connection is required.

■ Gateway configuration

The node address (MAC ID) and baud rate of the MCD3000 DeviceNet Gateway are configured with an 8-way DIP switch that is located on the circuit board. The node address of the gateway must be set to a unique value that is not used by any other device on the DeviceNet network. The baud rate must be set to the baud rate of the DeviceNet network.

The procedure for setting the node address and baud rate DIP switches is as follows:

- Ensure that the MCD3000 DeviceNet Gateway is not powered up by unplugging the DeviceNet connector.
- Unscrew and remove the front panel of the MCD3000 DeviceNet Gateway.
- Set the DIP switches on the circuit board to the desired value (see table below).
- Replace front cover and screws.
- Reinsert the DeviceNet connector.



DIP Switch Number	Function		
1 ~ 6	Node address (MAC ID) 00 to 63 (Switch 1 is the most significant bit)		
7 & 8	**7**	**8**	**Baud Rate**
	OFF	OFF	125 Kbps
	OFF	ON	250 Kbps
	ON	OFF	500 Kbps

For example, to set up the adapter for a MAC ID of 25 and baud rate of 250, the DIP switches should be set as follows:

Function	Switch Number	Position
MAC ID = 25	1	OFF
	2	ON
	3	ON
	4	OFF
	5	OFF
	6	ON
BAUD RATE = 250	7	OFF
	8	ON

■ Operation

A DeviceNet scanner must be configured to be the master of the MCD3000 DeviceNet Gateway.

■ EDS Installation

The MCD3000 DeviceNet Gateway must be added to the DeviceNet manager project. This will allow the DeviceNet manager to be used to configure the DeviceNet scanner to be a master of the gateway. A floppy disk with an EDS file for the MCD3000 DeviceNet Gateway is supplied with the gateway for loading into the DeviceNet configuration/management software. The EDS file name is “DCM.EDS”. Follow the instructions in the DeviceNet configuration/management User Manual for loading the EDS file and adding the gateway to the network.

■ Scanner configuration

The scanner must be configured to receive data from, and transmit data to, the MCD3000 DeviceNet Gateway. Once the EDS has been loaded, the gateway must be added to the scan list of the scanner with the parameters shown in the following table. When entering the parameters, follow the instructions in the DeviceNet configuration/management and scanner User Manuals for editing the scan list. Ensure that the Data-table map is updated with the 8 receive bytes and 2 transmit bytes.

Parameter	Value
I/O connection type	Polled
Poll receive size	8
Poll transmit size	2

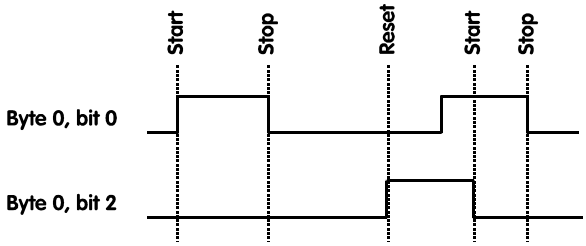
■ PLC operation

After the scanner, MCD3000 DeviceNet Gateway, and MCD3000 soft starter have been correctly connected, powered up and configured, the PLC will receive eight bytes of data from the soft starter and transmits two bytes to the soft starter. The function of the PLC receive and transmit data is outlined in the following tables, thus the PLC may be programmed accordingly.

Data output by the PLC.

Byte	Bit	Function
0	0	1 = Start Command 0 = Stop Command
	1	Reserved
	2	1 = Reset command
	3 ~ 7	Reserved
1	1 ~ 7	Reserved

The MCD3000 DeviceNet Gateway only sends a command to the soft starter when the information in the PLC output data changes. For example, to start the starter setting bit 0 of byte 0 of the PLC output data is required. The following figure illustrates an example scenario of start, stop, reset, start, stop.



Data received by the PLC.

Byte	Bit	Function	Value
0 Status	0	Tripped/Fault	1 = Starter tripped
	1	*Reserved*	
	2	Running 1	0 = Stopped, Tripped 1 = Starting, Running, Stopping
	3	*Reserved*	
	4	Ready	1 = Ready to start
	5	Control From Net	1 (Always = 1)
	6	*Reserved*	
	7	*Reserved*	
1	0~7	Status	2 = Not ready (restart delay) 3 = Ready to start 4 = Enabled (Starting, Running) 5 = Stopping (Soft Stop) 7 = Tripped/Fault
2	0~7	low byte	Current (Amps)
3	0~7	high byte	
4	0~7	low byte	Temperature (%)
5	0~7	high byte	
6	0~7	Trip/Fault Code	0 = No trip 20 = Overcurrent 21 = Starter Overtemperature 26 = Phase Imbalance 28 = Instantaneous Overload (Jam) 29 = Undercurrent 54 = Phase Rotation 75 = Motor Thermistor 100 = Power Circuit
7	0	Overload	1 = Current > FLC
	1	Run	1 = Motor at full voltage
	2	*Reserved*	
	3	*Reserved*	
	4	*Reserved*	
	5	*Reserved*	
	6	Phase Sequence	1 = Positive Phase Sequence
	7	RS485 Error	1 = RS485 Error Detected

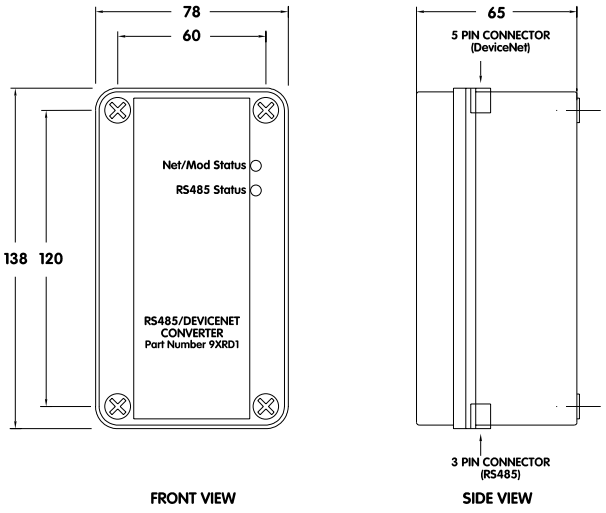
Note, should communication between the DeviceNet scanner and the gateway fail, the gateway will attempt to send a stop command to the soft starter. However, when the scanner initially communicates with the gateway, the scanner may alter internal parameters of the gateway (specifically, the explicit messaging watchdog timer) such that the gateway will not detect some communication failures.

■ LED Indicators

The two indicator LEDs on the adapter indicate the DeviceNet/Module status and the RS485 serial link status. The operation of the LEDs is shown in the following table.

LED	State	Description
Net/Mod Status	Off	Duplicate MAC ID test has not been completed (Device is not ready).
	Flash Green	Device is on-line but no connections to another device are established.
	Green	Connection to another device has been established.
	Flash Red	I/O connection has timed out.
	Red	Network error (duplicate MAC ID or bus-off).
RS485 Status	Off	Device is not ready.
	Green	RS485 communicating correctly.
	Flash Green	RS485 error

■ Dimensions



■ Objects

The objects described in this section are the DeviceNet objects that are internal to the gateway. These objects may be directly accessed through DeviceNet Explicit Messaging Connections. The details of these objects are included here for completeness and will not be of use for normal configuration of this DeviceNet device.

■ Identity

Details		Value (hex)	Comment
Object Address		01	Identity Object
Connection Instance		01	
Services	Get Attribute Single	0E	Request details of specific attribute
	Reset	05	Resets the DeviceNet converter (not the starter)

Attribute Name	Attribute ID	Access Rule/Service	Comment
Vendor ID	01	Get Attribute Single	Vendor identification number
Device Type	02	Get Attribute Single	ODVA device type
Product Code	03	Get Attribute Single	Vendor assigned product code
Revision	04	Get Attribute Single	Revision number written as **major.minor**
Status	05	Get Attribute Single	Status of the converter (hex) 0001 Configured 0400 Major recoverable fault 0800 Major unrecoverable fault
Serial Number	06	Get Attribute Single	Vendor assigned serial number
Product Name	07	Get Attribute Single	Vendor assigned product name
State	08	Get Attribute Single	State of the identity object (hex) 00 Non-existent 01 Device self testing 02 Standby 03 Operational 04 Major recoverable fault 05 Major unrecoverable fault

■ DeviceNet

Details		Value (hex)	Comment
Object Address		03	DeviceNet Object
Connection Instance		01	
Services	Get Attribute Single	0E	Request details of specific attribute
	Allocate master/slave	4B	Requests allocation of Master/Slave connection set
	De-allocate master/slave	4C	Requests release of master/slave connection set

Attribute Name	Attribute ID	Access Rule/Service	Comment
MAC ID	01	Get Attribute Single	DeviceNet node address
Baud Rate	02	Get Attribute Single	DeviceNet baud rate
Bus-off Interrupt	03	Get Attribute Single	The default, 01hex, is for the device to reset the CAN controller
Allocation Info	04	Get Attribute Single	Indicates allocation configuration of master/slave connection set
MAC ID switch changed	06	Get Attribute Single	Indicates that the MAC ID switch has changed
Baud rate switch changed	07	Get Attribute Single	Indicates that the baud rate switch has changed
MAC ID switch value	08	Get Attribute Single	Actual MAC ID switch value
Baud rate switch value	09	Get Attribute Single	Actual baud rate switch value

■ Polled I/O Connection

Details		Value (hex)	Comment
Object Address		05	Connection Object
Connection Instance		02	Polled I/O connection
Services	Get Attribute Single	0E	Request details of specific attribute
	Set Attribute Single	10	Sets details of specific attribute
	Reset	05	Returns object to established state (if timed out)

Attribute Name	Attribute ID	Access Rule/Service	Comment
State	01	Get Attribute Single	State of the object 00 Non-existent 01 Configuring 03 Established 04 Timed out
Instance type	02	Get Attribute Single	Indicates I/O messaging
Transport class trigger	03	Get Attribute Single	Defines behaviour of the connection
Produced connection ID	04	Get Attribute Single	Produced message CAN identifier value
Consumed connection ID	05	Get Attribute Single	Consumed message CAN identifier value
Initial communication characteristics	06	Get Attribute Single	Messaging characteristics.
Produced connection size	07	Get Attribute Single	Max number of bytes transmitted
Consumed connection size	08	Get Attribute Single	Max number of bytes received
Expected packet rate	09	Get Attribute Single Set Attribute Single	Value for inactivity/watchdog timer for this object instance (miliseconds)
Watchdog timeout action	12	Get Attribute Single	Transition to timed out state
Produced connection path length	13	Get Attribute Single	
Produced connection path	14	Get Attribute Single	
Consumed connection path length	15	Get Attribute Single	
Consumed connection path	16	Get Attribute Single	

■ Explicit Connection

Details		Value (hex)	Comment
Object Address		05	Connection Object
Connection Instance		01	Explicit messaging connection
Services	Get Attribute Single	0E	Request details of specific attribute
	Set Attribute Single	10	Sets details of specific attribute
	Reset	05	Returns object to established state (if timed out)

Attribute Name	Attribute ID	Access Rule/Service	Comment
State	01	Get Attribute Single	State of the object 00 Non-existent 03 Established
Instance type	02	Get Attribute Single	Indicates Explicit messaging
Transport class trigger	03	Get Attribute Single	Defines behaviour of the connection
Produced connection ID	04	Get Attribute Single	Produced message CAN identifier value
Consumed connection ID	05	Get Attribute Single	Consumed message CAN identifier value
Initial communication characteristics	06	Get Attribute Single	Messaging characteristics.
Produced connection size	07	Get Attribute Single	Max number of bytes transmitted
Consumed connection size	08	Get Attribute Single	Max number of bytes received
Expected packet rate	09	Get Attribute Single Set Attribute Single	Value for inactivity/watchdog timer for this object instance (miliseconds)
Watchdog timeout action	12	Get Attribute Single	Transition to non-existent state
Produced connection path length	13	Get Attribute Single	N/A
Produced connection path	14	Get Attribute Single	N/A
Consumed connection path length	15	Get Attribute Single	N/A
Consumed connection path	16	Get Attribute Single	N/A

■ Control Supervisor

Details		Value (hex)	Comment
Object Address		29	Control Supervisor Object
Connection Instance		01	
Services	Get Attribute Single	0E	Request details of specific attribute
	Set Attribute Single	10	Sets details of specific attribute
	Reset	05	Returns object to established state (if timed out)

Attribute Name	Attribute ID	Access Rule/Service	Comment
Run 1	03	Get Attribute Single Set Attribute Single	State of starter 1 Starting, running, or stopping 0 Other state Set, Transition 1 =>1 to start, 0 to stop
State	06	Get Attribute Single	State of the control supervisor object 02 Not ready 03 Ready 04 Enabled 05 Stopping 07 Faulted
Ready	09	Get Attribute Single	State of starter 1 Ready, enabled, or stopping 0 Other state
Faulted	10	Get Attribute Single	State of starter 1 Trip occurred (latched) 0 No faults present
Fault Reset	12	Set Attribute Single	Set to 1 to reset trip
Fault Code	13	Get Attribute Single	Control Supervisor Fault code
DN Fault Mode	16	Get Attribute Single Set Attribute Single	Action on loss of DeviceNet 01 Fault and stop 02 Ignore (warning only)

■ Output Assembly

Details		Value (hex)	Comment
Object Address		04	Assembly Object
Connection Instance		05	Extended Soft Starter Output
Services	Set Attribute Single	10	Sets details of specific attribute

Attribute Name	Attribute ID	Access Rule/Service	Comment
Data	03	Set Attribute Single	8 Bytes of data as shown in following table

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved	Reserved	Reserved	Reserved	Reserved	Fault Reset	Reserved	Run 1
1	Reserved							
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							

■ Input Assembly

Details		Value (hex)	Comment
Object Address		04	Assembly Object
Connection Instance		3D	Extended Soft Starter Input
Services	Get Attribute Single	0E	Request details of specific attribute

Attribute Name	Attribute ID	Access Rule/Service	Comment
Data	03	Get Attribute Single	8 Bytes of data as shown in following table

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At Reference (= 0)	Reserved	Control From Net (= 1)	Ready	Running 2 (= 0)	Running 1	Warning	Fault/ Tripped
1	Status							
2	Motor Current (Low Byte)							
3	Motor Current (High Byte)							
4	Motor Temperature – Thermal Model (Low Byte)							
5	Motor Temperature – Thermal Model (High Byte)							
6	Fault Code							
7	RS485 Error	Positive Phase Seq	Reserved	Reserved	Reserved	Reserved	Run	Overload