

Mint^{MT} Multi-Tasking Application Note**AN00196-001 – Replacing BaldorCAN Peripherals****Overview**

BaldorCAN is a proprietary fieldbus protocol that operates on CAN. The protocol is based on the CAN Application Layer for Industrial Applications messaging protocol (CAL), as specified by the CAN in Automation group (CiA). There is a large installed base of BaldorCAN peripherals such as keypads (KPD002-501, KPD002-502, KPD002-505) and I/O modules like the I/O Node 24 (ION004-501). These peripherals allowed the expansion of features on motion controllers such as Smartmove, NextMoveBX, NextMovePCI (amongst others). These BaldorCAN peripherals are now obsolete and are no longer manufactured.

As Baldor products have developed over the last 10 years the use of BaldorCAN has been phased out with a move towards the widely available CANopen protocol being favoured instead. During this period some products have supported both BaldorCAN and CANopen (either together or as an either/or option).

Baldor has for some time offered keypads/HMIs suitable for use with CANopen but I/O expansion had to be provided via third party suppliers (e.g. Wago). Now Baldor are able to offer their own CAN based I/O modules.

The range includes:

- ION201-501: CAN 16 Digital Input Expansion Module
- ION202-501: CAN 8 Relay Expansion Module
- ION203-501: CAN 16 Digital Output Expansion Module
- ION205-501: CAN 16 Bidirectional Digital Input/Output Expansion Module
- ION206-501: CAN 8 analog input, 4 analog output Module



These new I/O modules have been designed such that a dip switch may be used to select between either CANopen or BaldorCAN protocol. This means that these new I/O modules may be used to replace existing BaldorCAN I/O modules (apart from the analog module which only supports CANopen as there was no BaldorCAN equivalent).

This application note details how to replace existing BaldorCAN I/O modules with the latest CAN modules, whilst still retaining use of the BaldorCAN protocol (to minimize changes required to any associated Mint configuration and/or program files).

Important: There is no replacement for a BaldorCAN keypad utilizing the BaldorCAN protocol so applications using a BaldorCAN keypad must be assessed to see whether **all** of the BaldorCAN peripherals can be replaced with CANopen based peripherals (this will only be possible where the motion controller supports CANopen of course). If the user needs to update all peripherals to CANopen then please refer to MN1962 for details on how to use these new modules with the CANopen protocol.

Mint^{MT} Multi-Tasking Application Note

Products Supporting BaldorCAN

For legacy applications requiring replacement of existing BaldorCAN peripherals (due to obsolescence) there are some decisions to be made.

If the motion controller only supports BaldorCAN then it will only be possible to replace the I/O peripherals and NOT any BaldorCAN keypad that might be present (as there is no replacement for the BaldorCAN keypad that still supports the BaldorCAN protocol).

If the motion controller supports BaldorCAN and CANopen then any existing I/O modules on BaldorCAN can be replaced by the latest I/O modules. These new modules can either be switched to use BaldorCAN and physically connected to the BaldorCAN network or setup to use CANopen and physically connected to the CANopen network.

The table below summarizes where BaldorCAN replacement may be possible or not:

Product Family	BaldorCAN support?	CANopen Support?	Update retaining BaldorCAN Possible?	Update to CANopen peripherals possible?
Eurosystem	No	No	No	No
SmartMove	Yes (later models only)	No	Yes ¹	No
NextMoveBX	Yes	Yes	Yes	Yes
NextMovePC	Yes	No	Yes ¹	No
NextMovePCI	Yes	Yes	Yes ²	Yes
MintDrive	Yes (on Dual CAN variant only)	Yes	Yes ²	Yes
MintDrive ^{II}	Yes (on Dual CAN variant only)	Yes	Yes ²	Yes
NextMoveBX ^{II}	Yes	Yes	Yes ²	Yes ⁴
NextMove ESB	Yes (firmware variant)	Yes (firmware variant)	Yes ³	Yes
NextMove ESB-2	Yes (firmware variant)	Yes (firmware variant)	Yes ³	Yes
NextMove PCI-2	Yes (firmware variant)	Yes (firmware variant)	Yes ¹	Yes ³
E100	No	Yes	No	Yes

1 – If BaldorCAN keypad is not used in the application

2 – Any BaldorCAN keypads must be replaced with CANopen keypad (e.g. KPD202-501). User can decide whether to leave I/O on BaldorCAN physical network or not

3 – Any BaldorCAN keypads must be replaced with CANopen keypad (e.g. KPD202-501). All I/O must be updated to latest CAN modules and fitted to CANopen physical network. As a result controller firmware may have to be switched to CANopen variant

4 – Requires firmware version 5362 or later

Mint^{MT} Multi-Tasking Application Note

Selecting BaldorCAN operation

The CAN I/O modules share a common arrangement of dip switches. These switches allow the node address, baud rate and CAN protocol to be selected.



Switch	Label	Function
1	1	Switches 1 to 5 select Node ID (switch 1 is Least significant bit). Range 1 to 31
2	2	
3	4	
4	8	
5	16	
6	BR1	Switches 6 and 7 select Baud rate (00=125k, 10 = 250k, 01 = 500k, 11 = 1M)
7	BR2	
8	PS	Switch 8 selects protocol (Off = CANopen, On = BaldorCAN)

Refer to manual MN1962 for full description of these switches

The modules are shipped setup to operate on CANopen by default (switch 8 set to Off). Turn switch 8 on to select the BaldorCAN protocol. BaldorCAN peripherals operated at 125k baud so set switches 6 and 7 Off if using the CAN node as a BaldorCAN replacement.

Selecting Replacement Peripherals

The table below indicates suggested replacements for BaldorCAN peripherals:

BaldorCAN Peripheral	BaldorCAN default Node ID	Suggested Replacement
Keypad (KPD002-502)	14	CANopen keypad (KPD202-501)
8 way input module (ION001-501, ION001-502)	1	16 digital input module (ION201-501)
8 way output module (ION003-501, ION003-502)	7	16 digital output module (ION203-501)
8 way relay module (ION002-501, ION002-502)	7	8 relay module (ION202-501)
24 I/O module (ION004-501, ION004-502)	8	3 x 16 digital input module (ION201-501) + 3 x 16 digital output module (ION203-501)

Important considerations:

- Mint controllers are only able to access the first 8 I/O channels of any of the new CAN nodes when operating in BaldorCAN mode so it is **NOT** possible to use a 16 channel CAN node to replace two existing 8 channel nodes (i.e. for every existing 8 channel BaldorCAN node a new CAN module must be fitted and for every existing BaldorCAN 24 I/O node **six** new CAN modules must be fitted)
- BaldorCAN peripherals were provided with a jumper which allowed a terminating resistor to be fitted (between CAN-H and CAN-L) when the jumper (JP5) was fitted. The new CAN modules must be fitted with a separate 120 ohm (0.25W) resistor if they are at the end of a BaldorCAN or CANopen network.

Software Changes

If the new CAN modules are used to replace existing BaldorCAN modules and are setup to operate in CANopen mode then some software changes will definitely be required to the existing Mint application code (for example, the BUS number will change from 2 to 1). Full details on the CANopen keywords supported by these modules are listed in manual MN1962.

If the new CAN modules are used to replace existing BaldorCAN modules and are setup to operate in BaldorCAN mode then there may be no changes required to the existing Mint application code at all (e.g. if the application uses only 8 channel BaldorCAN nodes and the user replaces each of these with a new 16 channel CAN module, leaving the top 8 channels of the new modules unconnected).

If the new CAN modules are used to replace an existing 24 I/O Node (ION004-501 or ION004-502) then some software changes will definitely be necessary. The amount and detail of the changes will depend on the type of motion controller being used by the application and how the I/O is addressed (i.e. as a bank or as an individual channel).

The REMOTEINPUTACTIVELEVEL, REMOTEOUTPUTACTIVELEVEL (REMOTREAL if using a SmartMove) and REMOTEDEBOUNCE settings for BaldorCAN nodes were retentive on the nodes themselves (i.e. the user could enter these settings at the command prompt, negating the need to include them in the Mint program, and the nodes would retain these settings). The new CAN modules do not retain these settings (e.g. all inputs and outputs are active high by default) so if the user needs to change these the appropriate Mint code should be added to the existing Mint program.

Mint^{MT} Multi-Tasking Application Note**Example: Replacing a 24 I/O Node****1. SmartMove**

A Smartmove motion controller is currently fitted with a 24 I/O BaldorCAN node (ION004-501) configured as Node 8 on the BaldorCAN network. The user wishes to update this system to use the latest CAN nodes whilst still utilizing the BaldorCAN protocol (because there is a BaldorCAN keypad in the system).

As a SmartMove can only address the first 8 channels of a CAN I/O node the system has to be updated to utilize 3 off 16 way input modules (ION201-501) and 3 off 16 way output modules (ION203-501) instead (with the I/O wired to the first 8 channels of each module).

Although the I/O Node used to consume 3 node addresses on the network the Mint program only used to address the first of these (e.g. Node 8 by default). The replacement modules will now consume **six** node addresses but now the SmartMove/Mint program will need to specifically address each of these nodes to access the 8 channels it is able to use on each.

The new modules are configured as nodes 8-10 for the input modules (ION201-501) and nodes 11-13 for the output modules (ION203-501).

I/O Addressing Changes		
<i>Original I/O Channel</i>	<i>BaldorCAN module</i>	<i>CAN modules configured for BaldorCAN</i>
Inputs 0 – 7	REMOTEIN.8.0	REMOTEIN.8.0
Inputs 8 – 15	REMOTEIN.8.1	REMOTEIN.9.0
Inputs 16 – 23	REMOTEIN.8.2	REMOTEIN.10.0
Outputs 0 – 7	REMOTEOUT.8.0	REMOTEOUT.11.0
Outputs 8 – 15	REMOTEOUT.8.1	REMOTEOUT.12.0
Outputs 16 – 23	REMOTEOUT.8.2	REMOTEOUT.13.0

Mint^{MT} Multi-Tasking Application Note

2. NMBX (or other Mint v3 controller)

The NextMoveBX used to be able to address all 24 I/O channels on the BaldorCAN node (via a single node address) but as it can only address the first 8 channels of the new CAN nodes the user has to utilize **six** replacement nodes (wiring only the first 8 channels on each). The new modules are configured as nodes 8-10 for the input modules (ION201-501) and nodes 11-13 for the output modules (ION203-501).

As a NextMoveBX Mint program can access individual I/O channels there are potentially more changes required to the existing program in comparison to a SmartMove's program:

I/O Addressing Changes		
Original I/O Channel	BaldorCAN module	CAN modules configured for BaldorCAN
Inputs 0 – 23	REMOTEIN.8	(REMOTEIN.8 Or (REMOTEIN.9 * 256) Or (REMOTEIN.10 * 65536))
Input 0	REMOTEIN.8.0	REMOTEIN.8.0
Input 1	REMOTEIN.8.1	REMOTEIN.8.1
...
Input 6	REMOTEIN.8.6	REMOTEIN.8.6
Input 7	REMOTEIN.8.7	REMOTEIN.8.7
Input 8	REMOTEIN.8.8	REMOTEIN.9.0
Input 9	REMOTEIN.8.9	REMOTEIN.9.1
...
Input 14	REMOTEIN.8.14	REMOTEIN.9.6
Input 15	REMOTEIN.8.15	REMOTEIN.9.7
Input 16	REMOTEIN.8.16	REMOTEIN.10.0
Input 17	REMOTEIN.8.17	REMOTEIN.10.1
...
Input 22	REMOTEIN.8.22	REMOTEIN.10.6
Input 23	REMOTEIN.8.23	REMOTEIN.10.7
Outputs 0 – 23	REMOTEOUT.8 = x	REMOTEOUT.11 = (x AND 0xFF) REMOTEOUT.12 = (x AND 0xFF00) / 256 REMOTEOUT.13 = (x AND 0xFF0000) / 65536
Output 0	REMOTEOUT.8.0	REMOTEOUT.11.0
Output 1	REMOTEOUT.8.1	REMOTEOUT.11.1
...
Output 6	REMOTEOUT.8.6	REMOTEOUT.11.6
Output 7	REMOTEOUT.8.7	REMOTEOUT.11.7
Output 8	REMOTEOUT.8.8	REMOTEOUT.12.0
Output 9	REMOTEOUT.8.9	REMOTEOUT.12.1
...
Output 14	REMOTEOUT.8.14	REMOTEOUT.12.6
Output 15	REMOTEOUT.8.15	REMOTEOUT.12.7
Output 16	REMOTEOUT.8.16	REMOTEOUT.13.0
Output 17	REMOTEOUT.8.17	REMOTEOUT.13.1
...
Output 22	REMOTEOUT.8.22	REMOTEOUT.13.6
Output 23	REMOTEOUT.8.23	REMOTEOUT.13.7

Mint^{MT} Multi-Tasking Application Note

3. NextMovePCI (or other Mint v4/v5 controller)

The NextMovePCI used to be able to address all 24 I/O channels on the BaldorCAN node (via a single node address) but as it can only address the first 8 channels of the new CAN nodes the user has to utilize **six** replacement nodes (wiring only the first 8 channels on each). The new modules are configured as nodes 8-10 for the input modules (ION201-501) and nodes 11-13 for the output modules (ION203-501).

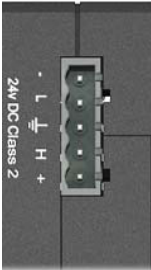
As a NextMovePCI Mint program can access individual I/O channels there are potentially more changes required to the existing program in comparison to a SmartMove's program:

I/O Addressing Changes		
Original I/O Channel	BaldorCAN module	CAN modules configured for BaldorCAN
Inputs 0 - 23	REMOTEIN.2.8	(REMOTEIN.8 Or (REMOTEIN.9 * 256) Or (REMOTEIN.10 * 65536))
Input 0	REMOTEINX.2.8.0	REMOTEINX.2.8.0
Input 1	REMOTEINX.2.8.1	REMOTEINX.2.8.1
...
Input 6	REMOTEINX.2.8.6	REMOTEINX.2.8.6
Input 7	REMOTEINX.2.8.7	REMOTEINX.2.8.7
Input 8	REMOTEINX.2.8.8	REMOTEINX.2.9.0
Input 9	REMOTEINX.2.8.9	REMOTEINX.2.9.1
...
Input 14	REMOTEINX.2.8.14	REMOTEINX.2.9.6
Input 15	REMOTEINX.2.8.15	REMOTEINX.2.9.7
Input 16	REMOTEINX.2.8.16	REMOTEINX.2.10.0
Input 17	REMOTEINX.2.8.17	REMOTEINX.2.10.1
...
Input 22	REMOTEINX.2.8.22	REMOTEINX.2.10.6
Input 23	REMOTEINX.2.8.23	REMOTEINX.2.10.7
Outputs 0 - 23	REMOTEOUT.2.8 = x	REMOTEOUT.2.11 = (x AND 0xFF) REMOTEOUT.2.12 = (x AND 0xFF00) / 256 REMOTEOUT.2.13 = (x AND 0xFF0000) / 65536
Output 0	REMOTEOUTX.2.8.0	REMOTEOUTX.2.11.0
Output 1	REMOTEOUTX.2.8.1	REMOTEOUTX.2.11.1
...
Output 6	REMOTEOUTX.2.8.6	REMOTEOUTX.2.11.6
Output 7	REMOTEOUTX.2.8.7	REMOTEOUTX.2.11.7
Output 8	REMOTEOUTX.2.8.8	REMOTEOUTX.2.12.0
Output 9	REMOTEOUTX.2.8.9	REMOTEOUTX.2.12.1
...
Output 14	REMOTEOUTX.2.8.14	REMOTEOUTX.2.12.6
Output 15	REMOTEOUTX.2.8.15	REMOTEOUTX.2.12.7
Output 16	REMOTEOUTX.2.8.16	REMOTEOUTX.2.13.0
Output 17	REMOTEOUTX.2.8.17	REMOTEOUTX.2.13.1
...
Output 22	REMOTEOUTX.2.8.22	REMOTEOUTX.2.13.6
Output 23	REMOTEOUTX.2.8.23	REMOTEOUTX.2.13.7

Mint^{MT} Multi-Tasking Application Note

Connection of CAN modules

The new CAN modules are provided with screw terminal connections as shown below:



Location	Top Panel	
Pin	Name	Description
1	-	Power 0Vdc
2	L	CAN -
3	Earth	Shield
4	H	CAN +
5	+	Power 24Vdc

Older BaldorCAN modules are fitted with 2 off RJ45 sockets for connection of the BaldorCAN network.

As a result there are three ways to modify the existing wiring to allow connection of the replacement modules:

- Cut off the existing RJ45 connector(s) and rewire to the new screw terminals
- Fit an additional RJ45 to screw terminal adaptor (e.g. ASI Catalog No. 16001, Type IMRJ0845, Interface Module, RJ45 Cat5 Ethernet cable to Fixed Screw Clamp Terminal Block or Phoenix Contact Part Number 5543630). Connect the existing RJ45 ended cable to this adaptor and then wire a new cable from the screw terminals on this adaptor to the screw terminals on the new CAN module (e.g. Baldor cable CBL0043CM-CSS0). See <http://www.asi-ez.com/member/x026-RJ-DIN-Rail-Interface-Modules.asp> for further details on the ASI interface module or http://www.phoenixcontact.com/signal-level-matching/31259_30762.htm for further details on the Phoenix Contact equivalent.
- Replace the existing cabling with pre-made RJ45 to flying lead cables (see table below). Use pre-made flying lead to flying lead cable CBL0043CM-CSS0 for inter-module cabling

CAN power to the motion controller would previously have been routed via the BaldorCAN I/O module's supply connection so this 24Vdc supply should now be rewired to the power connections on the replacement CAN modules.

Pre-made RJ45 to flying lead cables:

Part Number	Length
CBL0025CM-CSS1	0.25m
CBL005CM-CSS1	0.50m
CBL010CM-CSS1	1.00m
CBL020CM-CSS1	2.00m
CBL050CM-CSS1	5.00m
CBL100CM-CSS1	10.00m
CBL200CM-CSS1	20.00m

Flying lead to flying lead cable:

Part Number	Length
CBL0043CM-CSS0	0.43m

Mint^{MT} Multi-Tasking Application Note**BaldorCAN Pinout**

The table below details the BaldorCAN connections to be made between Baldor motion controllers (fitted with RJ45 connection socket) and the replacement CAN modules (fitted with screw terminals):

All controllers except SmartMove:

Motion Controller (RJ45 Pin)	CAN Module Terminal
1 (Not Used)	No connection
2 (Not Used)	No connection
3 (Not used)	No connection
4 CAN 0V	- (and must also connect to 0Vdc)
5 CAN V+	+ (and must also connect to 24Vdc)
6 (Not used)	No connection
7 CAN+	H
8 CAN-	L
Shield	Shield

SmartMove:

Motion Controller (RJ45 Pin)	CAN Module Terminal
1 CAN+	H
2 CAN-	L
3 (Not used)	No connection
4 CAN 0V	- (and must also connect to 0Vdc)
5 CAN V+	+ (and must also connect to 24Vdc)
6 (Not used)	No connection
7 (Not used)	No connection
8 (Not used)	No connection
Shield	Shield