MotiFlex® e100
Mint Option Cards
OPT-MF-100
OPT-MF-101

Installation manual
MN1953 03/10
# Contents

1 General Information

2 Introduction
   2.1 Mint option card features ........................................... 2-1
   2.1.1 Installation ...................................................... 2-1

3 Input / Output
   3.1 Introduction ....................................................... 3-1
   3.1.1 Input / output numbering ....................................... 3-1
   3.1.2 Analog input .................................................... 3-3
   3.1.3 Analog output .................................................. 3-5
   3.1.4 Digital inputs DIN32 & DIN33 .................................. 3-6
   3.1.5 Digital inputs DIN34 & DIN35 .................................. 3-7
   3.1.6 Special functions on inputs DIN34 & DIN35 ................. 3-8
   3.1.7 Digital outputs DOUT32 & DOUT33 ............................ 3-9
   3.1.8 Digital outputs DOUT34 & DOUT39 ............................ 3-10
   3.1.9 Special functions on outputs DOUT34 & DOUT39 ............ 3-10
   3.1.10 Encoder input .................................................. 3-11
   3.1.11 Power consumption ............................................ 3-11
   3.2 Connecting an external servo axis .............................. 3-12

4 Mint
   4.1 Introduction ....................................................... 4-1
   4.1.1 Mint option card OPT-MF-100 .................................. 4-2
   4.1.2 Mint option card OPT-MF-101 .................................. 4-3
   4.1.3 Mint programming language .................................... 4-3
   4.1.4 Axis configuration ............................................. 4-4
   4.1.5 Controlled node (CN) operation ............................... 4-4
   4.1.6 Additional Mint WorkBench tools ............................. 4-5

5 FAQ
   5.1 Introduction ....................................................... 5-1
This manual is copyrighted and all rights are reserved. This document or attached software may not, in whole or in part, be copied or reproduced in any form without the prior written consent of Baldor. Baldor makes no representations or warranties with respect to the contents hereof and specifically disclaims any implied warranties of fitness for any particular purpose. The information in this document is subject to change without notice. Baldor assumes no responsibility for any errors that may appear in this document.

Mint™ is a registered trademark of Baldor. Windows 2000, Windows XP, Windows Vista are registered trademarks of the Microsoft Corporation. UL and cUL are registered trademarks of Underwriters Laboratories.

Limited Warranty
For a period of two (2) years from the date of original purchase, Baldor will repair or replace without charge controls and accessories that our examination proves to be defective in material or workmanship. This warranty is valid if the unit has not been tampered with by unauthorized persons, misused, abused, or improperly installed and has been used in accordance with the instructions and/or ratings supplied. This warranty is in lieu of any other warranty or guarantee expressed or implied. Baldor shall not be held responsible for any expense (including installation and removal), inconvenience, or consequential damage, including injury to any person or property caused by items of our manufacture or sale. (Some countries and U.S. states do not allow exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply.) In any event, Baldor’s total liability, under all circumstances, shall not exceed the full purchase price of the control. Claims for purchase price refunds, repairs, or replacements must be referred to Baldor with all pertinent data as to the defect, the date purchased, the task performed by the control, and the problem encountered. No liability is assumed for expendable items such as fuses. Goods may be returned only with written notification including a Baldor Return Authorization Number and any return shipments must be prepaid.

Baldor UK Ltd
Mint Motion Centre
6 Bristol Distribution Park
Hawley Drive
Bristol, BS32 0BF
Telephone: +44 (0) 1454 850000
Fax: +44 (0) 1454 850001
E-mail: motionsupport.uk@baldor.com
Web site: www.baldormotion.com

See rear cover for other international offices.
Product Notice

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

Safety Notice

Intended use: Drives incorporating the Mint option card are intended for use in stationary ground based applications in industrial power installations according to the standards EN60204 and VDE0160. They are designed for machine applications that require variable speed controlled three-phase brushless AC motors. These drives are not intended for use in applications such as:

- Home appliances
- Medical instrumentation
- Mobile vehicles
- Ships
- Airplanes.

Unless otherwise specified, the drive is intended for installation in a suitable enclosure. The enclosure must protect the drive from exposure to excessive or corrosive moisture, dust and dirt or abnormal ambient temperatures. The installation, connection and control of drives is a skilled operation, disassembly or repair must not be attempted. In the event that a drive fails to operate correctly, contact the place of purchase for return instructions.

Precautions

WARNING
Do not touch any circuit board, power device or electrical connection before you first ensure that no high voltage is present at this equipment or other equipment to which it is connected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt to start-up, program or troubleshoot this equipment.

MEDICAL DEVICE / PACEMAKER DANGER: Magnetic and electromagnetic fields in the vicinity of current carrying conductors and industrial motors can result in a serious health hazard to persons with cardiac pacemakers, internal cardiac defibrillators, neurostimulators, metal implants, cochlear implants, hearing aids, and other medical devices. To avoid risk, stay away from the area surrounding a motor and its current carrying conductors.

Electrical components can be damaged by static electricity. Use ESD (electrostatic discharge) procedures when handling this device.

To prevent equipment damage, be certain that input and output signals are powered and referenced correctly.

To ensure reliable performance of this equipment, be certain that all signals are shielded correctly.
**2.1 Mint option card features**

The Mint option cards are available as customer-fitted options for the MotiFlex e100 range of drives. The options add to the drive:

- Ability to download and run advanced Mint programs.
- 1 analog input, 1 analog output.
- 4 digital inputs, 4 digital outputs.
- An incremental encoder interface.
- (OPT-MF-101 only): ETHERNET Powerlink manager node (MN) capability when node ID is set to F0. Ability to profile moves for up to three additional axes (e.g. e100 drives connected over EPL).

The option card must only be inserted in the top slot (slot 1).

**2.1.1 Installation**

Before touching the option card, be sure to discharge static electricity from your body and clothing by touching a grounded metal surface. Alternatively, wear an earth strap while handling the card.

1. Pull off the drive’s top front panel cover. Remove the option slot cover’s retaining screw.

   ![Figure 2-1: Loosen retaining screw](image)

2. Insert a screwdriver under the edge of the option slot cover and gently lever out the cover.

   ![Figure 2-2: Lift out cover](image)
3. Confirm that the correct option card is being installed. The description is printed on the mounting bracket.

   Insert the option card with the smaller PCB facing towards the center of the drive. The edges of the larger PCB should locate behind retaining brackets inside the drive.

   ![Figure 2-3: Insert the option card](image)

4. Push in the option card until it clicks into place. The option card’s external connector plate should finish approximately level with the 8 posts along the edge of the option slot.

   ![Figure 2-4: Click into place](image)

5. Insert the retaining screw and tighten. If the screw will not locate in the threaded socket on the option card, then check the position of the option card.

   The screw must be fitted since it provides mechanical support and an electrical chassis connection for the option card.

   The recommended tightening torque is 0.7 N·m (6.2 lb-in).

   ![Figure 2-5: Tighten retaining screw](image)

6. Push on the drive’s front panel cover until it clicks into place.
3.1 Introduction

All external connections to the Mint option card are made using the 20-pin connector and 9-pin D-type connector. The required Weidmüller Minimate B2L 3.5/20 mating connector is supplied. All inputs and outputs are described in the following sections.

3.1.1 Input / output numbering

The ModFlex e100 implements a system of I/O ‘banks’. For analog I/O, each bank allows up to 8 inputs and outputs. For digital I/O, each bank allows up to 32 inputs and outputs. The I/O available as standard on the ModFlex e100 always resides in bank 0. The I/O available on option cards resides in bank 1 if the card is inserted in slot 1, or bank 2 if the card is inserted in slot 2. Since the Mint option card must only be inserted in the top slot (slot 1), its I/O is always in bank 1.

3.1.1.1 Analog I/O

For analog I/O, the numbering of bank 1 (slot 1) inputs and outputs always starts at 8, since 0-7 are reserved by bank 0 (even though only AIN0 is used by a standard ModFlex e100). This numbering system is summarized in the following table, and in Figure 3-1.

<table>
<thead>
<tr>
<th>Bank/Slot</th>
<th>Analog inputs</th>
<th>Analog outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Standard drive, connector X3</td>
<td>AIN0</td>
<td>(None)</td>
</tr>
<tr>
<td>1 Option card, top slot</td>
<td>AIN8</td>
<td>AOUT8</td>
</tr>
</tbody>
</table>

3.1.1.2 Digital I/O

For digital I/O, the numbering of bank 1 (slot 1) inputs and outputs always starts at 32, since 0-31 are reserved by bank 0 (even though only DIN0-DIN2 and DOUT0-DOUT1 are used by a standard ModFlex e100). This numbering system is summarized in the following table, and in Figure 3-1.

<table>
<thead>
<tr>
<th>Bank/Slot</th>
<th>Digital inputs</th>
<th>Digital outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Standard drive, connector X3</td>
<td>DIN0</td>
<td>DOUT0</td>
</tr>
<tr>
<td></td>
<td>DIN1</td>
<td>DOUT1</td>
</tr>
<tr>
<td></td>
<td>DIN2</td>
<td></td>
</tr>
<tr>
<td>1 Option card, top slot</td>
<td>DIN32</td>
<td>DOUT32</td>
</tr>
<tr>
<td></td>
<td>DIN33</td>
<td>DOUT33</td>
</tr>
<tr>
<td></td>
<td>DIN34</td>
<td>DOUT34</td>
</tr>
<tr>
<td></td>
<td>DIN35</td>
<td>DOUT35</td>
</tr>
</tbody>
</table>

The same numbering system is used when referring to the I/O using the Mint INX and OUTX keywords; for example DOUT32 is referred to as OUTX(32). See the Mint help file for details.
3.1.1.3 Encoder input

When the option card is installed in slot 1 (at the top of the MotiFlex e100), the encoder input becomes feedback input 1. This is because the MotiFlex e100’s main universal encoder feedback input (connector X8) is input 0. See MN1943 MotiFlex e100 Installation Manual for details.

This numbering system is summarized in the following table:

<table>
<thead>
<tr>
<th>Bank/Slot</th>
<th>Feedback input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard drive</td>
<td>0 - Universal encoder</td>
</tr>
<tr>
<td>3 - Step &amp; Direction (DIN1 / DIN2)</td>
<td></td>
</tr>
<tr>
<td>1 Option card, top slot</td>
<td>1</td>
</tr>
</tbody>
</table>

The same numbering system is used when referring to the feedback channels using the various Mint ENCODER... keywords. For example, the encoder input on an option card installed in slot 1 is referred to as ENCODER(1). See the Mint help file for details.

Figure 3-1: Connector pin assignments - slot 1 (top) numbering
3.1.2 Analog input

- Single ended or differential input.
- Voltage range: ±10 V.
- Resolution: 12-bit (accuracy ±4.9 mV)
- Common mode rejection: 40 dB
- Input impedance: >30 kΩ
- Sampling frequency: 1 kHz

The analog input can be connected as either a differential or a single ended input as shown in Figure 3-3. The analog input is not optically isolated from internal power rails, so care must be taken to avoid earth/ground loops and similar associated problems. The analog input passes through a differential buffer and second order low-pass filter with a cut-off frequency of approximately 1.2 kHz. To minimize the effects of noise, the analog input should be connected to the system using an individually shielded twisted pair cable with an overall shield. The overall shield should be connected to the chassis at one end only. No other connection should be made to the shield.

![Figure 3-2: AIN8 analog input circuit](image)

When the MotifFlex e100 is connected to Mint WorkBench, the analog input value (expressed as a percentage) can be viewed using the Spy window's Monitor tab. Alternatively, the expression `ADC(8)`, for example `Print ADC(8)`, can be used in the command window or Mint program to return the value of the analog input. See the Mint help file for details.
Figure 3-3: AIN8 analog input wiring

Figure 3-4: Typical input circuit to provide 0-10V (approx.) input from a 24V source

Figure 3-5: Analog input - typical connection from a Baldor NextMove e100
3.1.3 Analog output
- Bipolar analog output.
- Output range: ±10 VDC (±0.1%).
- Resolution: 12-bit.
- Output current: 20 mA maximum.
- Update frequency: 1 kHz.

The output may be used as a general purpose analog output - see the DAC keyword in the Mint help file. The analog output may be used to drive loads of 500 Ω or greater. Shielded twisted pair cable should be used. The shield connection should be made at one end only.

Figure 3-6: AOUT8 analog output circuit

When the Motiflex e100 is connected to Mint WorkBench, the analog output value (expressed as a percentage) can be viewed using the Spy window’s Monitor tab. The DAC command can be used in the command window or Mint program to set the value of the analog output as a percentage of full scale. For example the command \texttt{DAC(8)=50} will set the analog output to +50% (approximately +5 V). See the Mint help file for details.
3.1.4 Digital inputs DIN32 & DIN33

- Two independent digital inputs.
- Input voltage range: 12-30 VDC (input current not to exceed 50 mA).
- Sampling frequency: 1 kHz.

Each digital input is buffered by a TLP280 opto-isolator, allowing the input signal to be connected with either polarity.

When the MotiFlex e100 is connected to Mint WorkBench, the digital inputs can be configured using the Digital I/O tool. Alternatively, Mint keywords including RESETINPUT, ERRORINPUT and STOPINPUT can be used in the command window or Mint program. The state of these specially configured digital inputs can then be viewed using the Mint WorkBench Spy window’s Axis tab. The state of all digital inputs can also be viewed using the Spy window’s I/O tab. See the Mint help file for details.

![Figure 3-7: DIN32 digital input circuit](image)

![Figure 3-8: Digital input - typical connection from a Baldor NextMove e100](image)
3.1.5 Digital inputs DIN34 & DIN35

- Two independent fast digital inputs.
- Input voltage range: 12-30 VDC (input current not to exceed 10 mA).
- Sampling frequency: 1 kHz.

Each digital input is buffered by a TLP115 opto-isolator, allowing the input signal to be connected with either polarity.

When the MotiFlex e100 is connected to Mint WorkBench, the digital inputs can be configured using the Digital I/O tool. Alternatively, Mint keywords including `RESETINPUT`, `ERRORINPUT` and `STOPINPUT` can be used in the command window or Mint program. The state of these specially configured digital inputs can then be viewed using the Mint WorkBench Spy window’s Axis tab. The state of all digital inputs can also be viewed using the Spy window’s I/O tab. See the Mint help file for details.

![Figure 3-9: DIN34 fast digital input circuit](image)

![Figure 3-10: Fast digital input - typical connection from a Baldor NextMove e100](image)
3.1.6 Special functions on inputs DIN34 & DIN35

DIN34 and DIN35 can be configured to perform special functions.

3.1.6.1 Fast position capture

DIN34 or DIN35 can be configured using the LATCHTRIGGERCHANNEL keyword to become a fast latch input. This allows the position of the Mint option card’s encoder input (LATCHSOURCECHANNEL 1), to be captured in real-time and read using the Mint keyword LATCHVALUE. The input can be configured using the LATCHTRIGGEREDGE keyword to be triggered either on a rising or falling edge. Further control of position capture is provided by other keywords beginning with LATCH... See the Mint help file for details.

The latency between input triggering and capture is 1 µs. To prevent subsequent inputs causing the captured value to be overwritten, the interrupt is latched in software.

The Mint option card’s DIN34 / DIN35 cannot be used to latch the position of the MotiFlex e100’s standard axis (axis 0). Similarly, the MotiFlex e100’s standard digital inputs DIN1 / DIN2 cannot be used to latch the position of the Mint option card’s encoder, although they can be used to latch the position of axis 0.

Note: The fast inputs are particularly sensitive to noise, so inputs must use shielded twisted pair cable. Do not connect mechanical switches, relay contacts or other sources liable to signal ‘bounce’ directly to the fast inputs. This could cause unwanted multiple triggering.
3.1.7 Digital outputs DOUT32 & DOUT33

- Two independent digital outputs, sharing USR COM1 connection.
- User supply: 28 VDC maximum.
- Output current: 150 mA maximum.
- Update frequency: 1 kHz.

The optically isolated outputs are designed to source current from the user supply as shown in Figure 3-11. The TLP127 has a maximum power dissipation of 150 mW at 25 °C. The output includes a self-resetting fuse that operates at approximately 200 mA. The fuse may take up to 20 seconds to reset after the load has been removed. If the output is used to directly drive a relay, a suitably rated diode must be fitted across the relay coil, observing the correct polarity. This is to protect the output from the back-EMF generated by the relay coil when it is de-energized. The sense of the output can be configured in Mint WorkBench, and its state is displayed in the Spy window.

![Figure 3-11: DOUT32/33 digital output circuit, DOUT32 shown](image)

When the MotiFlex e100 is connected to Mint WorkBench, the active level of an output can be configured using the Digital I/O tool. Alternatively, the Mint keyword `OUTPUTACTIVELEVEL` can be used in the command window or Mint program. An output may also be configured for special purpose functions such as a motor brake output (`MOTORBRAKEOUTPUT`) or global error output (`GLOBALERROROUTPUT`). The state of these specially configured digital outputs can be viewed using the Mint WorkBench Spy window’s Axis tab. The state of all digital outputs can also be viewed using the Spy window’s I/O tab. See the Mint help file for details.
3.1.8 Digital outputs DOUT34 & DOUT35
Digital outputs DOUT34 & DOUT35 are electrically identical to DOUT32 & DOUT33, except they share a different common connection, USR COM2.

3.1.9 Special functions on outputs DOUT34 & DOUT35
In addition to the special purpose functions described for DOUT32 & DOUT33, digital outputs DOUT34 & DOUT35 may also be configured as position compare outputs.

3.1.9.1 Position compare outputs
DOUT34 or DOUT35 can be configured using the COMPAREOUTPUT keyword to become a position compare output, monitoring the position of the Mint option card’s encoder input. The compare output is activated when the axis position falls within the position range defined with the COMPAREPOS keyword. When the axis position is outside the position range, the output is de-activated. DOUT34 & DOUT35 cannot be used to monitor the position of the MotiFlex e150’s standard encoder input on connector X8. See the Mint help file for details.
3.1.10 Encoder input

The incremental encoder connections (ABZ channels) are made using the 9-pin D-type female connector. The encoder inputs accept differential signals only. Twisted pairs must be used for each complementary signal pair e.g. CHA+ and CHA-. The overall cable shield (screen) must be connected to the metallic shell of the D-type connector. The MotiFlex e100 provides a 5 VDC (±5%, 200 mA max.) encoder supply on pin 9. The maximum quadrature input frequency is 20 MHz (i.e. 5 MHz on both the A and B channels).

![Figure 3-13: Encoder input circuit - channel A](image)

![Figure 3-14: Encoder input cable connections](image)

3.1.11 Power consumption

The maximum overall power consumption of the Mint option card is 5 W. See the main MotiFlex e100 installation manual (MN1943) for further details about the option slots’ power supply and derating information.
3.2 Connecting an external servo axis

The Mint option card can control one external axis using analog output AOUT8 as the demand output, incremental encoder (X26) as the feedback input, and a digital output as a drive enable output. This allows the Mint option card to control a wide range of drives requiring a ±10 V demand signal, for example MicroFlex. See also section 4.1.4.

![Diagram of connections to external servo axis](image)

Figure 3-15: Connections to external servo axis (e.g. MicroFlex)
4.1 Introduction

A standard MotiFlex e100 is configured using the supplied Mint WorkBench software. Most of the configuration is completed using Wizards and other tools, which request necessary information about the application and then configure the MotiFlex e100. Mint keywords can also be used in the Mint WorkBench command window to further refine the configuration or send direct commands to the MotiFlex e100. The standard MotiFlex e100 supports a broad range of Mint programming functions, but the addition of a Mint option card provides many more features:

<table>
<thead>
<tr>
<th>Feature</th>
<th>MotiFlex e100 (standard)</th>
<th>MotiFlex e100 + OPT-MF-100</th>
<th>MotiFlex e100 + OPT-MF-101</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mint programming</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Advanced Mint programming features for complex motion applications, including FLY, FOLLOW, CAM, CONTOUR, FEEDRATE, TRIGGEROUT, MOVEPULSESOUT, MOVEOUT, and SPLINEx (PVT).</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Fast Mint execution *</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Additional program memory</td>
<td>64 KB</td>
<td>1 MB</td>
<td>1 MB</td>
</tr>
<tr>
<td>Additional analog I/O **</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Additional digital I/O **</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Control of 1 external analog drive</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Additional master encoder input</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EPL manager node (MN) capability; control up to 3 additional remote axes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Expandable with Fieldbus Option</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Typically 2 - 4 times faster than standard MotiFlex e100. Actual speed difference depends on the type of program operations being performed.

** Combined analog and digital I/O is available only on Mint option cards.
4.1.1 Mint option card OPT-MF-100

The addition of Mint option card OPT-MF-100 allows the MotiFlex e100 to store and run advanced multi-tasking Mint programs. The MotiFlex e100 becomes an autonomous controller that can now perform the intelligent functions previously managed by the external controller. It can control and profile moves for the standard axes and one additional analog axis, all governed by the onboard Mint program. If required, the Ethernet port can be used in standard TCP/IP mode to connect to an external PC for monitoring purposes using the Mint ActiveX tools. Alternatively, the MotiFlex e100 can still receive overall supervision from an external controller on the ETHERNET Powerlink network, while still controlling its own local subsystem.

Figure 4-1: MotiFlex e100 with Mint option card OPT-MF-100
4.1.2 Mint option card OPT-MF-101

Mint option card OPT-MF-101 has all the features of OPT-MF-100, but is also capable of acting as an ETHERNET Powerlink manager node (MN). This means the MotiFlex e100 can manage and profile moves for additional EPL enabled remote axes. Option cards fitted to other MotiFlex e100 drives in the system become visible to the Mint option card, providing additional I/O, encoder inputs, or fieldbus gateways to other systems such as PLCs.

Figure 4-2: MotiFlex e100 with Mint option card OPT-MF-101

4.1.3 Mint programming language

Mint is a structured form of Basic, custom designed for either servo or stepper motion control applications. It allows users to quickly get started with simple motion control programs. In addition, Mint includes a wide range of powerful commands for complex applications.

Supporting a Basic-like structure, Mint includes a number of motion-specific keywords which allow control of motor position, speed, torque, interpolation and synchronization of multiple axes. Full software control over the fundamental servo loop gains is also possible. Applications can vary from simple single axis positional control, to complex multi-axis systems. Between these two extremes, the flexible and powerful command set of Mint provides a solution to the vast majority of industrial motion control applications.

For a complete reference to the Mint language see the help file supplied with Mint WorkBench. For further examples of Mint code, see the Application Notes available at www.baldormotion.com/supportme.
4.1.4 Axis configuration

Both Mint option cards provide additional hardware and motion profiling capabilities that allow the MotiFlex e100 to profile four axes. This makes the following configuration possible:

Axis 0: This always refers to the MotiFlex e100's standard axis hardware, which uses the UVW motor outputs on connector X17 and the feedback input on connector X8. The axis cannot be renumbered. Any Mint command specifying axis 0, for example MOVER(0)=100, will control the motor attached to the MotiFlex e100.

Axis x: One additional servo axis can be configured, using the Mint option card's AOUT8 analog output as the demand output, and its incremental encoder (X26) as the feedback input. This allows the MotiFlex e100 to control a wide range of drives requiring a ±10V demand signal.

Axis y: A virtual stepper axis can be configured which uses no physical hardware inputs or outputs. A virtual axis allows motion to be simulated without moving a physical axis. This is useful for system design and testing, and for applications where the virtual axis is made to follow the position of another axis or encoder input. A virtual axis allows most Mint commands to be executed as normal, and the axis will simulate position and velocity information for any motion performed. The axis responds to stepper related Mint keywords - see the Mint help file for details.

Axis z: A second virtual axis can be configured which uses no physical hardware inputs or outputs. The axis does not respond to stepper related Mint keywords - see the Mint help file for details.

Axes x, y, and z can each be assigned an axis number in the range 1 to 63, provided it has not already been assigned to another axis.

4.1.4.1 Additional remote axes (OPT-MF-101 only)

OPT-MF-101 provides ETHERNET Powerlink manager node (MN) capabilities. This means it can control additional EPL enabled remote axes (e.g. MicroFlex e100 or MotiFlex e100) with all demand and feedback information being received over the EPL connection. These axes can each be assigned an axis number in the range 1 to 63, provided it has not already been assigned to another axis.

4.1.5 Controlled node (CN) operation

A standard MotiFlex e100 always behaves as a CN on the EPL network. When either of the Mint option cards are fitted, the MotiFlex e100 can still operate as a CN and can receive Process Data Objects (PDO) from the manager node (MN). This means the MN can 'map' comms or net data elements on the CN, allowing it to exchange values that can be used to control the program running on the Mint option card. PDOs are configured in the Mint WorkBench System Configuration Wizard. See the Mint help file for details of the REMOTECOMMS, NETINTEGER and NETFLOAT keywords.
4.1.6 Additional Mint WorkBench tools

Mint WorkBench provides a complete environment for configuring a standard MotiFlex e100. When a Mint option card is installed, Mint WorkBench automatically customizes its tools to account for the additional functions provided by the Mint option card. The changes that appear depend on the choice of Mint option card, and in the case of OPT-MF-101, whether it is configured as an EPL manager node (MN). All tools are described in detail in the Mint WorkBench help file, available by pressing F1.

System Configuration Wizard:
This tool displays an additional Axis Config page. This allows the Mint option card's hardware to be configured as axes, as described in section 4.1.4. When OPT-MF-101 is installed and configured as an MN (node ID = F0), a further EPL Devices screen is displayed to allow full configuration of remote axes (see section 4.1.4.1).

Operating Mode Wizard:
On the Operating Mode screen, the 'Analog Input 0 - NOT Profiled' and 'Analog Input 0 - Profiled' options will not be available. The MotiFlex e100 cannot follow an analog input demand when fitted with the Mint option card.

Edit & Debug tool:
This additional tool provides a complete programming environment for creating, debugging and downloading Mint programs to the MotiFlex e100. Press Ctrl+N to open a new editing window.

Spy window:
On the I/O tab, an additional 'Bank 1' becomes available, which refers to the Mint option card's digital inputs and outputs on connector X27. The other listed bank, Bank 0, refers to the MotiFlex e100's standard digital I/O bank on connector X3. On the Axis tab and Monitor tab, the additional configured axes become available for selection.

Digital I/O tool:
An additional 'Bank 1' for both inputs and outputs becomes available, which refers to the Mint option card's digital inputs and outputs on connector X27. The other listed bank, Bank 0, refers to the MotiFlex e100's standard digital I/O on connector X3.

Parameters tool:
This tool displays additional entries for each configured axis.

Homing tool:
This tool displays additional entries for each configured axis.
5.1 Introduction

This section lists frequently asked questions (FAQ) when using the Mint option cards.

Does the MotiFlex e100 I'm using support the Mint option card?
MotiFlex e100 hardware 'revision A' units with serial numbers of U080312xxx and greater support the Mint option card. All MotiFlex e100 hardware 'revision B' units support the Mint option cards. If you have a unit with a serial number outside this range, please contact your local Baldor office. The revision is indicated by the final letter of the part number shown on the product label. Revision A models have no letter, but revision B models and greater show an additional letter, e.g. MFE460A006B.

Does the version of Mint WorkBench I'm using support the Mint option card?
The Mint option card is supported in Mint WorkBench build 5600a onwards. There are enhancements in later releases, but all functionality is supported in this release. It is highly recommended to use the latest release to benefit from all the latest features. Go to www.baldormotion.com/supportme.

Does the firmware I'm using support the Mint option card?
Firmware builds from build 5610 onwards support the Mint option card. Although OPT-MF-100 is supported from 5610, OPT-MF-101 (multi-axis version) is only supported from build 5613. As with the Mint WorkBench, it is highly recommended to use the latest release to benefit from all the latest features. Go to www.baldormotion.com/supportme.

How do I know if the firmware on the Mint option card is compatible with the MotiFlex e100?
The firmware for the Mint option card is stored on the Mint option card, not on the MotiFlex e100. If a Mint option card is moved from one MotiFlex e100 to another there could be a mismatch of firmware versions between MotiFlex e100 and the Mint option card. If there is a compatibility issue then a controller error will be generated to warn you, for example:

Error 3026 (eMINT_OPTION_CARD_FIRMWARE_MISMATCH) Mint option card firmware version mismatch.

or

Error 3021 (eMINT_OPTION_CARD_VERSION_ERROR) Mint option card firmware version not supported.

or in some cases both. This indicates that the firmware version on the MotiFlex e100 is not 100% compatible with the firmware on the Mint option card. In this case re-download firmware to the MotiFlex e100. This will also download firmware to the Mint option card, matching the firmware version on the Mint option card to that on the MotiFlex e100. Note that MotiFlex e100 firmware files contain a matching firmware component for the Mint option card.
How can I check the firmware version running on the Mint option card?
The Mint WorkBench SupportMe information will list the contents of the file system on
the Mint option card, with the file names indicating the version of firmware. Also, the ‘Controller
Hardware’ section will list:

```
Controller Hardware
  MotiFlex e100
  Serial Number: U0803012992
  Functional Revision: 3
  Board Type: Mint Flex e100
  Power Cycles: 0
  Supported Axes: 1

Option Slot 1
  Board Type: Mint Option Card
  Hardware Version: 0
  Version: H160 bootloader v1.0
  Serial number: U0804080908
  Build number: Build 5413
  Axes supported: 8
```

...which shows the build number of the firmware on the Mint option card.

How does the Mint option card affect the MotiFlex e100?
The Mint option card adds to the MotiFlex e100 advanced Mint programmability and support
for more complex motion profiling. All of the existing MotiFlex e100 features are supported
with a Mint option card fitted, with the exception of direct speed or current control from the
analog input. The multi-axis Mint option card, OPT-MF-101, adds Ethernet Powerlink
network management and coordination of up to 5 axes of interpolated motion. Once installed
the MotiFlex e100 and Mint option card are designed to appear as one unit for simplicity.

Can I commission my MotiFlex e100 with a Mint option card fitted?
Yes, all existing MotiFlex e100 commissioning and auto-tuning functionality is retained when
a Mint option card is fitted.

Do I need to recommission my MotiFlex e100 if I add a Mint option card?
No. All MotiFlex e100 parameters are stored on the MotiFlex e100, including position loop
tuning. The Mint option card will upload what it needs when it boots.

Can I control a MotiFlex e100 from its analog input with a Mint option card installed?
No. The Mint option card is designed to take control of the MotiFlex e100 axis. However, it is
possible to read the analog input within a Mint program, using the ADC keyword.

Can I move a Mint option card to a different MotiFlex e100?
Providing the firmware build on the Mint option card matches the firmware version of the
MotiFlex e100, then yes. If not, the firmware must be updated to match. The Mint program
and DCF file that the Mint option card uses are not stored on the Mint option card but on the
MotiFlex e100. If you move your Mint option card you will need to download the Mint program
and the DCF file to the new MotiFlex e100 once the Mint option card has been installed.

Where is the MotiFlex e100 parameter table stored?
The parameter table is stored on the MotiFlex e100, not on the Mint option card. The
MotiFlex e100 retains all parameters when a Mint option card is fitted or removed.
Does a ‘Factory Default’ operation affect the Mint option card?
Performing a ‘Factory Defaults’ operation will delete the Mint program and the .DCF file from the MotiFlex e100 without prompting for confirmation. Be sure to backup both the Mint program and the .DCF file before performing a ‘Factory Default’ operation otherwise they will be lost.

What’s the difference between an OPT-MF-100 and an OPT-MF-101?
The OPT-MF-100 is capable of controlling the MotiFlex e100 and one external analog axis. The OPT-MF-101 has the additional capability to control up to 3 Ethernet Powerlink axes.

Do I need different firmware for OPT-MF-100 and OPT-MF-101?
No, the firmware will detect the type of option card and configure itself accordingly.

Is there a limit to how much PDO data I can transfer when using Ethernet Powerlink?
Yes, the Mint option card supports only 32 PDOs from MN to CN and 32 PDOs from CN to MN, per millisecond. This is scaled as the cycle time changes, so at 2 ms the Mint option card supports 64 PDOs from MN to CN and 64 PDOs from CN to MN. Knowledge of this limitation is built into later releases of Mint WorkBench, but if an earlier version is being used it is possible to create a .DCF file which attempts to map too much PDO data. If this happens the Mint option card will generate an error:

```
Error 30019 (_ecPDO_MAPPING_FAILED) The PDO mapping has failed
```

In the event of this overflow the PDO list will be truncated, so none of the PDOs that exceed the limit will be processed. This means that some or all of the EPL axes will not operate correctly. To correct this, change the number of PDO items using the System Configuration Wizard in Mint WorkBench. Typically, the default mapping for an axis requires 5 PDOs from MN to CN and 4 PDOs from MN to CN. So 3 EPL axes require 15 PDOs from MN to CN and 12 PDOs from CN to MN. Given the default configuration, at the default cycle time of 2 ms, 3 EPL axes will leave 48 spare MN to CN PDOs and 52 spare CN to MN PDOs. Changing the cycle time to 500 µs, the same PDO configuration will leave only 1 spare PDO from MN to CN and 4 spare PDOs from CN to MN.

Can I use multiplexed nodes with a Mint option card?
No, this is not supported.

Can I run a MotiFlex e100 + Mint option card as a CN on an EPL network?
Yes, when adding the node in the System Configuration wizard, be sure to select ‘MotiFlex e100 + Mint option card’ instead of ‘MotiFlex e100’. Currently the resources on the MotiFlex e100 + Mint option card cannot be PDO mapped. This means the hardware (encoder, digital I/O and analog I/O) and the axes on the MotiFlex e100 cannot be controlled from the MN, but PDO data can be exchanged. Currently, the only PDO objects supported as a CN are Comms and NetData.

What files are affected when a new system file is downloaded?
When a system file is downloaded to the MotiFlex e100, all items within the system file are downloaded. If items of the same file type are detected on the MotiFlex e100 they are deleted prior to the download of the new item. This means that if you have items in the file system that are not in the system file they are not affected by the download. System files do not contain any Mint programs or .DCF files so these files are unaffected by the download of a system file.
How do I know what keywords are supported?
The addition of the Mint option card enables new keywords to support extended motion capabilities. These are all shown in the help file as supported on ‘MicroFlex e100, MotiFlex e100’ with a line in the description stating that the Mint option card is required.

Using a Mint option card for the first time
If your MotiFlex e100 is running a firmware build less than 5610 then it will not support the Mint option card. A more recent version of firmware with Mint option card support must be downloaded, either from within Mint WorkBench or by going to www.baldormotion.com/supportme. As the Mint option card firmware is stored on the Mint option card, this initial update of the MotiFlex e100 firmware will not affect the Mint option card. In this case the firmware version on the Mint option card may be different from that on the MotiFlex e100. In this case it will be necessary to repeat the download of firmware to the MotiFlex e100. This second download will update the firmware on the Mint option card to match the firmware version on the MotiFlex e100. The need to update the firmware twice only happens if the MotiFlex e100 is running firmware that cannot communicate with the Mint option card.
If you have any suggestions for improvements to this manual, please let us know. Write your comments in the space provided below, remove this page from the manual and mail it to:

Manuals
Baldor UK Ltd
Mint Motion Centre
6 Bristol Distribution Park
Hawkeye Drive
Bristol
BS32 0BF
United Kingdom.

Alternatively, you can e-mail your comments to:

manuals@baldor.co.uk

Comment:

continued...
Thank you for taking the time to help us.