



OPERATOR PANELS

HMI

Operator Panels

Installation Manual

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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.

Product notice

Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

Precautions



WARNING: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.



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.



WARNING: Be sure that you are completely familiar with the safe operation and programming of this equipment. This equipment may be connected to other machines that have rotating parts or parts that are controlled by this equipment. Improper use can cause serious or fatal injury.



WARNING: Do not use the HMI (Human Machine Interface) operator panel to directly control motors or other actuators that are not equipped with additional safeguards, or which could be potentially harmful in the event of a fault on the HMI operator panel.



WARNING: Be sure all wiring complies with the National Electrical Code and all regional and local codes. Improper wiring may result in unsafe conditions.



WARNING: Be sure the system is properly earthed/grounded before applying power. Do not apply power before you ensure that earths/grounds are connected. Electrical shock can cause serious or fatal injury.



CAUTION: The safe integration of the HMI operator panel into a machine system is the responsibility of the machine designer. Be sure to comply with the local safety requirements at the place where the machine is to be used. In Europe these are the Machinery Directive, the ElectroMagnetic Compatibility Directive and the Low Voltage Directive. In the United States this is the National Electrical code and local codes.



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



CAUTION: Refer to EN60204-1 for guidelines on installing HMI operator panels.



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



CAUTION: To ensure reliable performance of this equipment be certain that all signals to/from the HMI panel are shielded correctly.



CAUTION: Avoid locating the HMI panel in direct sunlight as this could cause premature ageing of the front panel.



CAUTION: Avoid exposure of the HMI panel to corrosive substances or vapors, metal particles and dust.



CAUTION: Do not use tools or sharp objects to operate the HMI operator panel buttons or touchscreen.



CAUTION: Do not clean the HMI panel using solvents. Use only neutral soap based solutions.

2.1 HMI panel range

The Baldor HMI (Human Machine Interface) panels provide an easy to use operator interface for controlling machinery. They are designed to connect to a range of Baldor controllers and drives, using either a serial connection or an optional CANopen interface.



A range of panels are available:

Keypads	KPD-KG420-10	KPD-KG420-20	KPD-KG420-30	KPD-KG840-10
Screen	Mono LCD	Mono LCD	Mono LCD	Mono LCD
Pixels	120 x 32	120 x 32	120 x 32	240 x 64
Character display	4 x 20	4 x 20	4 x 20	8 x 40
Programmable keys	4	9	12	23
Programmable LEDs	5	9	12	24

Touchscreens	KPD-TS03M-10	KPD-TS05M-10	KPD-TS05C-10	KPD-TS10C-20	KPD-TS12C-20
Screen	3.8" mono LCD	5.6" mono LCD	5.6" color STN	10.4" color TFT	12.1" color TFT
Pixels	320 x 240	320 x 240	320 x 240	640 x 480	800 x 600
Character display (scalable)	16 x 40 max.	16 x 40 max.	16 x 40 max.	30 x 80 max.	40 x 100 max.

Available options include:

CBL034-501: PC to HMI panel RS232 serial cable (for programming).

CBL010MF-C: Controller to HMI panel CAN cable.

KPD-OPTC: CANopen interface card for HMI panel.

KPD-SW: Baldor HMI Designer programming software.

OPT033-501: Gender changer for CBL034-501 (KPD-KG420-10/20 / KPD-TS03M-10 only).

2.2 Receiving and inspection

When you receive your HMI panel, there are several things you should do immediately:

1. Check the condition of the shipping container and report any damage immediately to the carrier that delivered your HMI panel.
2. Remove the HMI panel from the shipping container. The container and packing materials may be retained for future shipment.
3. Verify that the catalog number of the HMI panel you received is the same as the catalog number listed on your purchase order.
4. Inspect the HMI panel for external damage during shipment and report any damage to the carrier that delivered your HMI panel.
5. If the HMI panel is to be stored for several weeks before use, be sure that it is stored in a location that conforms to the storage humidity and temperature specifications shown in section 8.1.5.

2.3 Units and abbreviations

The following units and abbreviations may appear in this manual:

A	Ampere
DC	Direct current
mA	milliampere
nF	nanofarad
V	Volt (also VAC and VDC)
in	inch
mm	millimeter
lb-in	pound-inch (torque)
N·m	Newton-meter (torque)
Kbaud	kilobaud (the same as Kbit/s in most applications)
KB	kilobytes
MB	megabytes
CCFL	Cold Cathode Fluorescent Lamp
LCD	Liquid Crystal Display
LED	Light Emitting Diode
STN	Super Twisted Nematic
TFT	Thin Film Transistor
SSFDC	Solid State Floppy Disk Card
RH	Relative Humidity
(NC)	Not Connected

3.1 Introduction

You should read all the sections in **Basic Installation** to ensure safe installation.

This section describes the mechanical and electrical installation of the HMI panel, including the panel cutout, 24 V supply and optional CANopen module.

3.1.1 Hardware requirements

The components you will need to complete the basic installation are:

- An 18-30 VDC power supply for the HMI panel.
- An RS232 serial cable.
- A PC with the following specification:

	Minimum specification	Recommended specification
Processor	Intel Pentium 133 MHz	Intel Pentium 200 MHz or faster
RAM	32 MB	64 MB
Hard disk space	140 MB*	140 MB*
CD-ROM	A CD-ROM drive	
Serial port	RS232 interface	
Screen	800 x 600, 256 colors	1024 x 768, 256 colors
Mouse	A mouse or similar pointing device	
Operating system	Windows 98, Windows ME, Windows NT (3.51+), Windows 2000 or Windows XP	

* The *Baldor HMI Designer Studio* software requires 140 MB disk for the installation process, but once installed only uses 70 MB. Software installation will be described later, in section 5.

- Your PC operating system user manual might be useful if you are not familiar with Windows.

3.2 Mechanical installation

The safe operation of this equipment depends upon its use in the appropriate environment; see sections 1 and 8.1.5 for details. The HMI panels are designed to be panel mounted, as shown in the following sections.

3.2.1 Faceplate and panel cutout dimensions

The following sections show the panel cutout and overall dimensions for each keypad. Dimensions have a tolerance of approximately ± 0.5 mm.

3.2.1.1 KPD-KG420-10

KPD-KG420-10 weighs approximately 1.0 kg (2.2 lb).

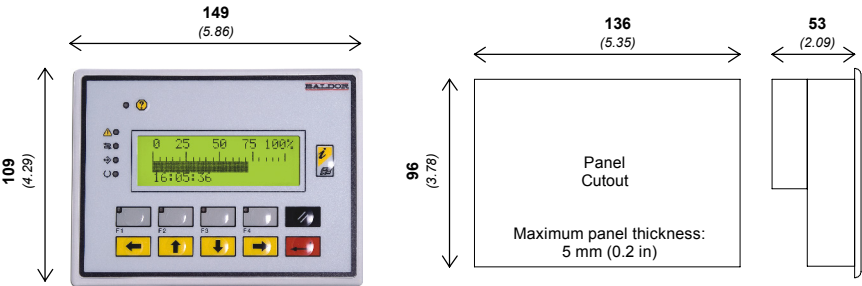


Figure 1 - Panel cutout dimensions for KPD- KG420-10

3.2.1.2 KPD-KG420-20

KPD-KG420-20 weighs approximately 1.0 kg (2.2 lb).

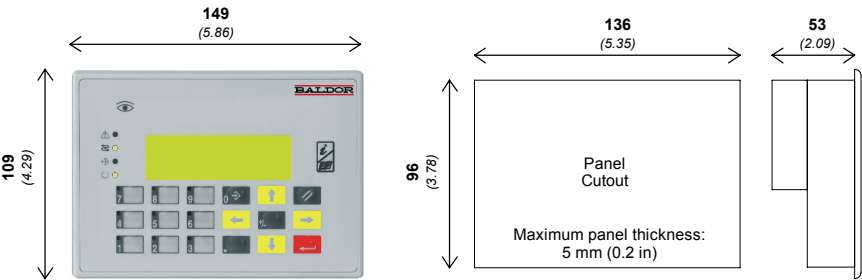


Figure 2 - Panel cutout dimensions for KPD- KG420-20

3.2.1.3 KPD-KG420-30

KPD-KG420-30 weighs approximately 1.1 kg (2.4 lb).

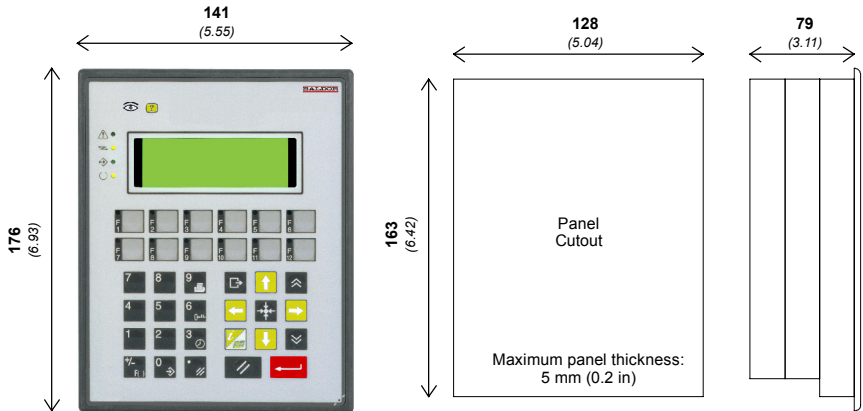


Figure 3 - Panel cutout dimensions for KPD-KG420-30

3.2.1.4 KPD-KG840-10

KPD-KG840-10 weighs approximately 2 kg (4.4 lb).

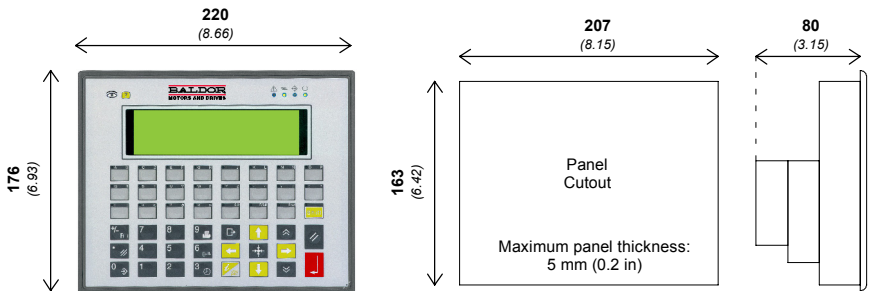


Figure 4 - Panel cutout dimensions for KPD-KG840-10

3.2.1.5 KPD-TS03M-10

KPD-TS03M-10 weighs approximately 1.0 kg (2.2 lb).

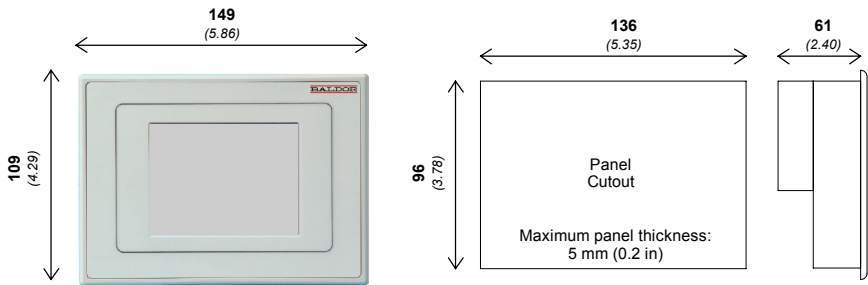


Figure 5 - Panel cutout dimensions for KPD-TS03M-10

3.2.1.6 KPD-TS05M-10

KPD-TS05M-10 weighs approximately 1.4 kg (3.1 lb).

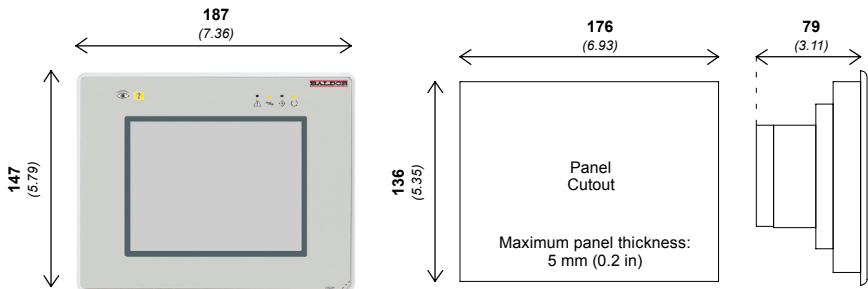


Figure 6 - Panel cutout dimensions for KPD-TS05M-10

3.2.1.7 KPD-TS05C-10

KPD-TS05C-10 weighs approximately 1.4 kg (3.1 lb).

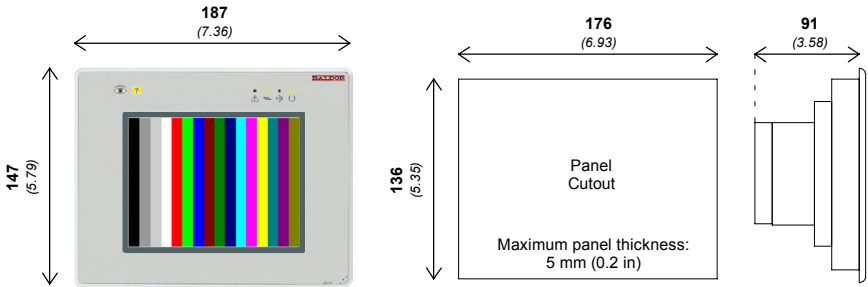


Figure 7 - Panel cutout dimensions for KPD-TS05C-10

3.2.1.8 KPD-TS10C-20

KPD-TS10C-20 weighs approximately 2.25 kg (5 lb).

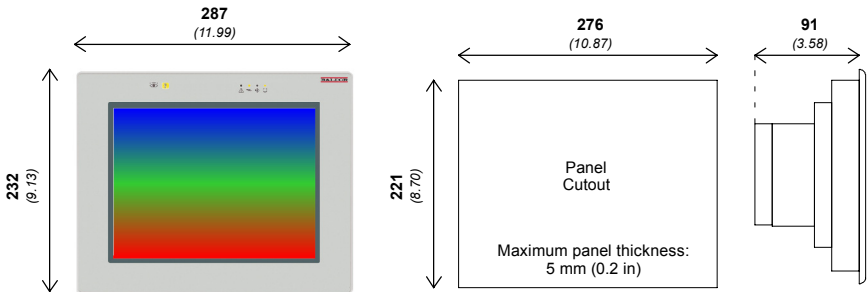


Figure 8 - Panel cutout dimensions for KPD-TS10C-20

3.2.1.9 KPD-TS12C-20

KPD-TS12C-20 weighs approximately 2.85 kg (6.3 lb).

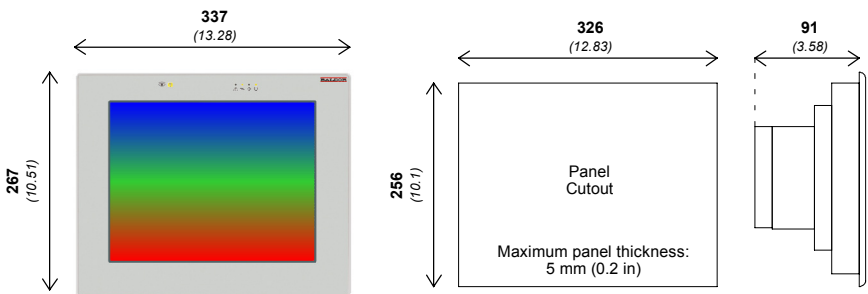


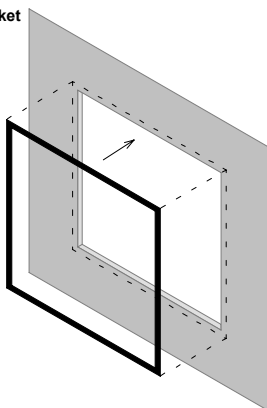
Figure 9 - Panel cutout dimensions for KPD-TS12C-20

3.2.2 Mounting

Ensure that the perimeter of the cutout aperture is flat and there are no burrs. The supplied self-adhesive gasket must be fitted around the cutout aperture to provide sufficient ingress protection. The gasket will either be a rectangular gasket of the correct size, or straight strips of gasket material.

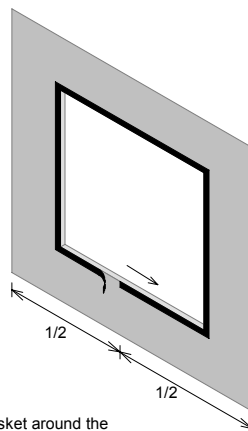
Rectangular gasket

Attach the single gasket to the border of the panel cutout. Do not stretch the gasket.

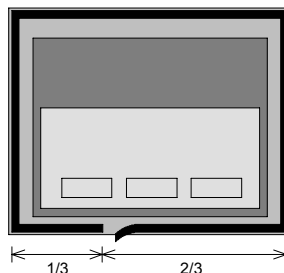


Straight gaskets

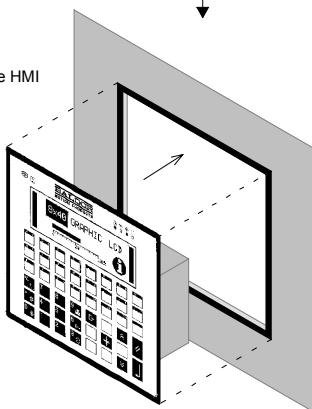
Attach the thin gasket to the border of the panel cutout. Start from half way along the bottom. Do not stretch the gasket material. The two ends should meet with no overlap.



Attach the thick gasket around the rear edge of the bezel. Start from one third along the bottom. Do not stretch the gasket. The two ends should meet with no overlap.



Mount the HMI panel.



Insert the fixing brackets in the slots around the edge of the HMI panel and tighten the screws. Most panels have four slots, but larger panels may have as many as ten.

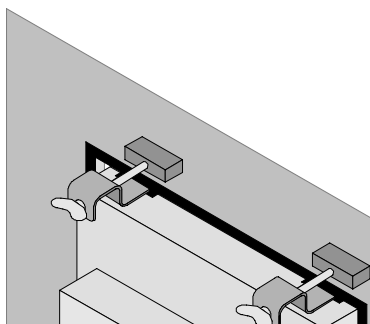


Figure 10 - Panel mounting

3.2.3 Installing the optional CANopen module (KPD-OPTC)

If the optional CANopen module has been ordered then it must be fitted inside the HMI panel back cover. Remove power from the HMI panel before installing the CANopen module.

CAUTION! Electrical components can be damaged by static electricity. Use ESD (electrostatic discharge) procedures when handling the HMI panel and CANopen module.

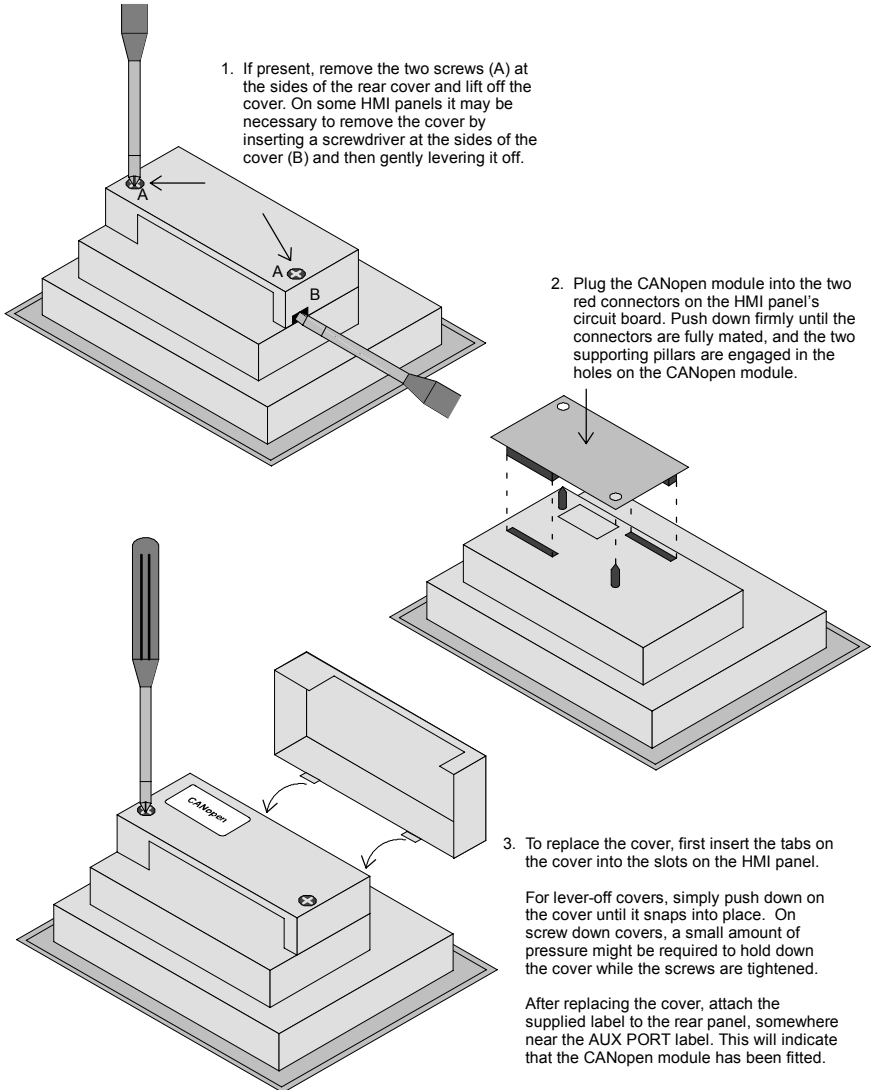
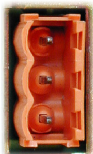


Figure 11 - CANopen module installation

3.2.4 Power connections

A 24 VDC supply must be provided to power the HMI panel.



Location	Orange 3-pin connector (Weidmüller BLZ 5.00/3)
Nominal input voltage	24 VDC
Range	18-30 VDC
Input current (maximum @ 24V)	KPD-KG420-10: 250 mA KPD-KG420-20: 250 mA KPD-KG420-30: 300 mA KPD-KG840-10: 400 mA KPD-TS03M-10: 400 mA KPD-TS05M-10: 600 mA KPD-TS05C-10: 600 mA KPD-TS10C-20: 700 mA KPD-TS12C-20: 800 mA

Tightening torque for terminal block connections is 0.4-0.5 N·m (3.5-4.4 lb-in).

Connect +24 V to the terminal labeled 24 V. Connect 0 V to the terminal labeled 0 V. Connect the ⊕ (protective earth) terminal to the large screw/faston terminal marked with the same ⊕ symbol. The power supply to the HMI panel may be either grounded or 'floating'. For a grounded power supply, connect 0 V to the ⊕ terminal, as shown by the dashed line in Figure 12. For a floating power supply, do not connect 0 V to the ⊕ terminal. Note that the internal HMI panel circuitry connects 0 V to ⊕ via a 1 MΩ resistor in parallel with a 10 nF capacitor. See also section 4.1.2.1 for details about powering the CAN bus.

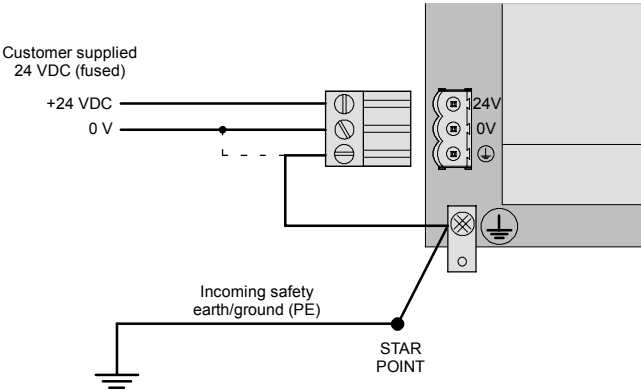


Figure 12 - 24 VDC power supply connections

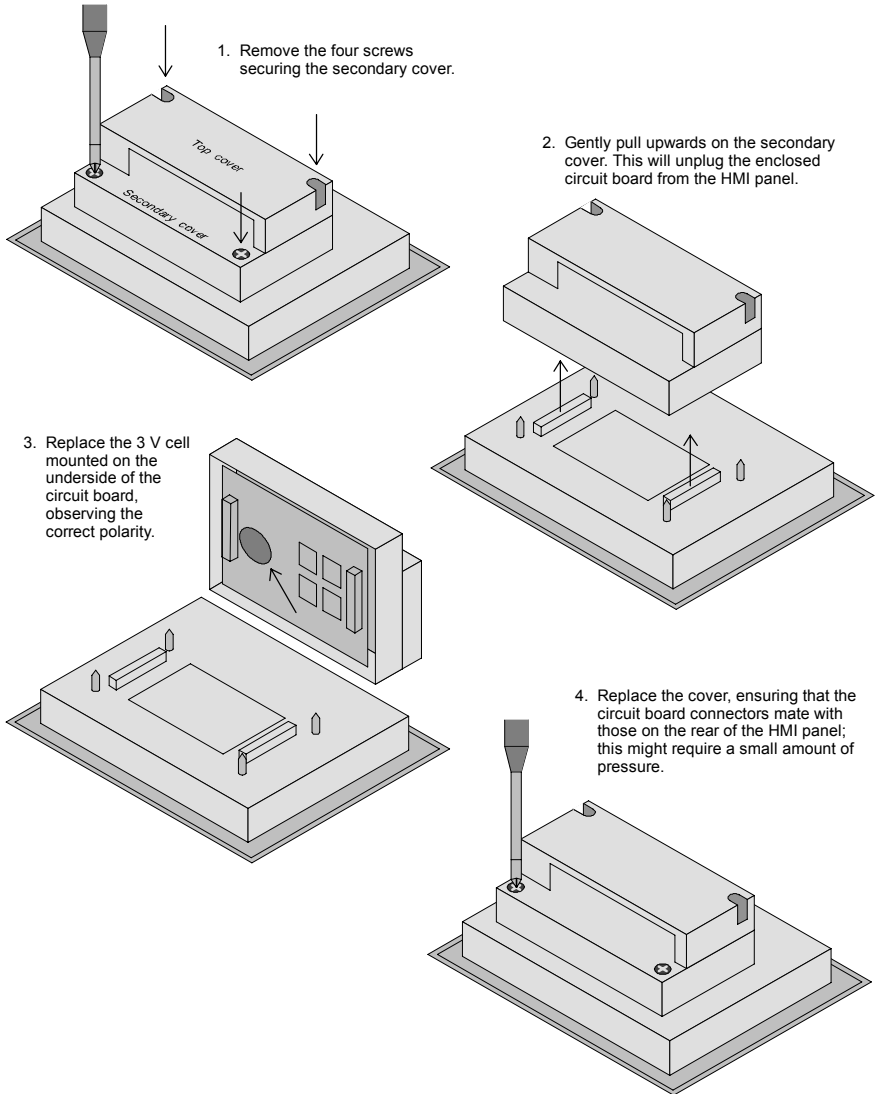
3.2.5 Battery protector

Some HMI panels contain a backup battery to retain the date and time, event list and recipe data. To prevent the battery becoming discharged during shipping and storage, a plastic battery protector film marked “Remove, Battery Protection” insulates the battery contacts. Pull firmly to remove this film before attempting to use the HMI panel.

3.2.6 Battery replacement

The HMI panel's backup battery is a CR2430, 3 V 270 mA button cell. To replace it, the secondary rear cover must be removed. For models fitted with the CANopen module, it may be necessary to remove the top cover first (see section 3.2.3).

CAUTION! Electrical components can be damaged by static electricity. Use ESD (electrostatic discharge) procedures when handling the HMI panel.



3.2.7 Memory card



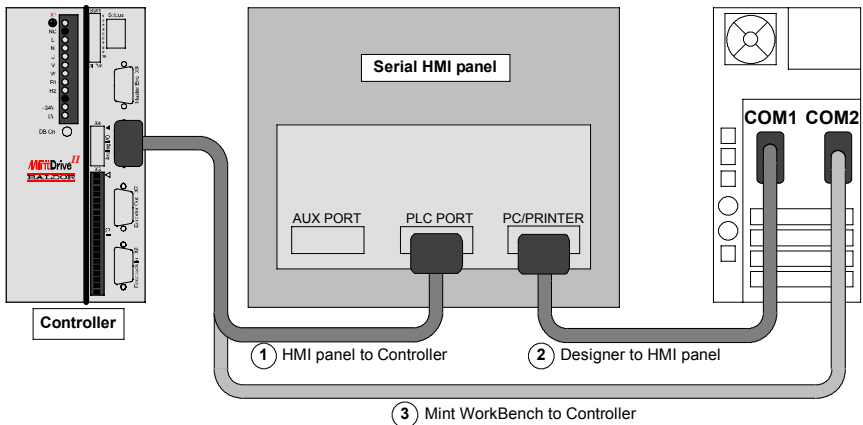
The memory on some HMI panels is provided by a SmartMedia card (also known as SSFDC memory). This is supplied already inserted in the HMI panel, and should only be removed from its slot if necessary. Note that the supplied card has a tape attached to its outer edge to allow easy removal; other memory cards should also have similar tape attached.

Contamination of the card's gold contacts can generate an insulating layer that may result in electrical contact problems with the socket. Before inserting a new memory card, the contact area should be carefully cleaned to remove contaminants such as oil, grease or fingerprint residue. Acidic chemicals may permanently damage the contacts.

Do not use a synthetic material to clean the card as this could cause electrostatic discharge which could permanently damage the internal flash memory. When transporting SmartMedia cards, always use an antistatic protective case.

3.2.8 Connection summary - controller without USB port

Figure 13 shows the typical connection between the HMI panel, PC and a controller without a USB port, for example MintDrive^{II}. The 24 VDC power supply connection is not shown.



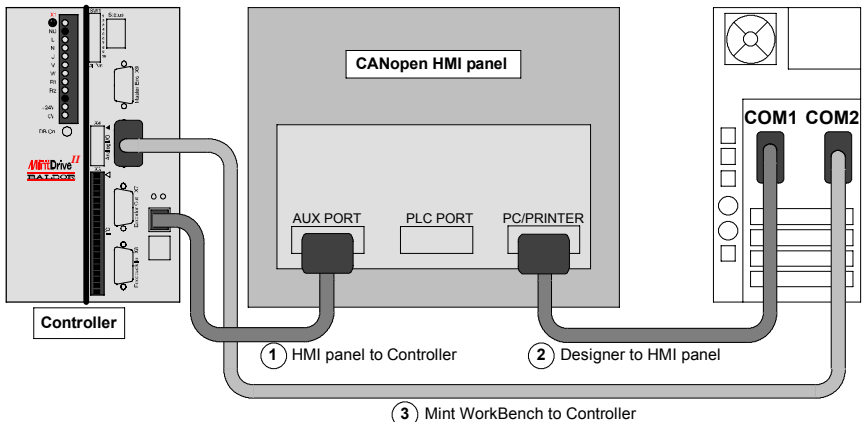
Cable 1 is the only cable required during normal operation.

Cable 2 is required when using Designer to program the HMI panel.

Cable 3 is required when using Mint WorkBench to program the controller.

Cables 1 and 3 both use the controller's serial port, so must be swapped when necessary.

On KPD-KG420-10 / 20 and KPD-TS03M-10, cables 1 and 2 share the PLC port, so must be swapped when necessary. If the PC has only one COM port, cables 2 and 3 must be swapped when necessary.



Cable 1 is the only cable required during normal operation.

Cable 2 is required when using Designer to program the HMI panel.

Cable 3 is required when using Mint WorkBench to program the controller.

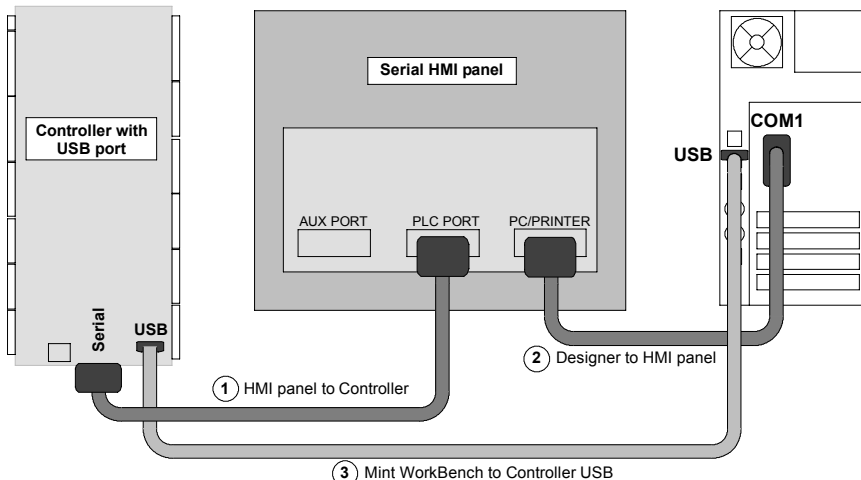
On KPD-KG420-10 / 20 and KPD-TS03M-10, cable 2 is connected to the PLC port.

If the PC has only one COM port, cables 2 and 3 must be swapped when necessary.

Figure 13 - Connecting the HMI panel, PC and controller (without USB port)

3.2.9 Connection summary - controller with USB port

Figure 14 shows the typical connection between the HMI panel, PC and a controller with a USB port, for example NextMove ESB. The 24 VDC power supply connection is not shown.

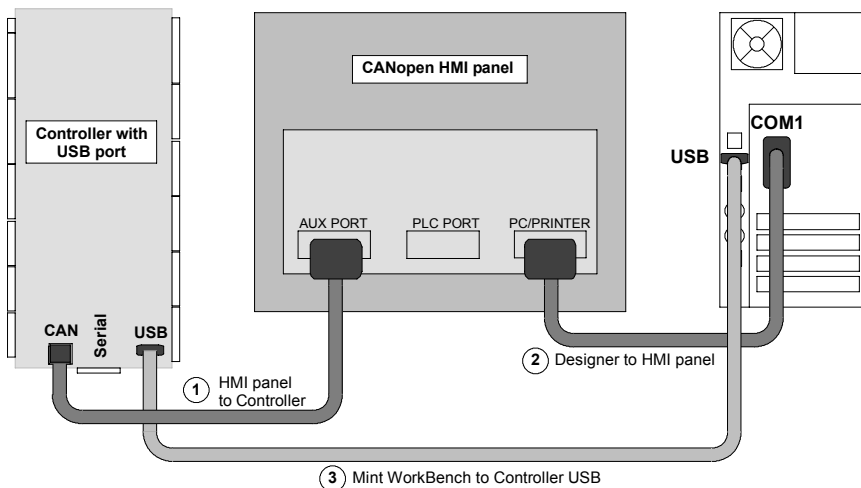


Cable 1 is the only cable required during normal operation.

Cable 2 is required when using Designer to program the HMI panel.

Cable 3 is required when using Mint WorkBench to program the controller.

On KPD-KG420-10 / 20 and KPD-TS03M-10, cables 1 and 2 share the PLC port, so must be swapped when necessary.



Cable 1 is the only cable required during normal operation.

Cable 2 is required when using Designer to program the HMI panel.

Cable 3 is required when using Mint WorkBench to program the controller.

On KPD-KG420-10 / 20 and KPD-TS03M-10, cable 2 is connected to the PLC port.

Figure 14 - Connecting the HMI panel, PC and controller (with USB port)

4.1 Introduction

This section describes the communication ports on the HMI panels.

4.1.1 PLC port (RS232 / RS422/485)



Location	PLC PORT or PC/PLC PORT 15-pin D-type male connector (not high density)	
Pin	Name	Description
1	Shield	Shield connection
2	RXD	RS232 receive
3	TXD	RS232 transmit
4	+5 V	+5 V output (100 mA max)
5	0 V GND	Ground
6	TX-	RS422/RS485 transmit
7	RX-	RS422/RS485 receive
8	(NC)	Not connected
9	(NC)	Not connected
10	RTS	RS232 Request To Send
11	CTS	RS232 Clear To Send
12	(NC)	Not connected
13	(NC)	Not connected
14	TX+	RS422/RS485 transmit
15	RX+	RS422/RS485 receive

The PLC PORT provides signals for RS232 or RS422/RS485 communication with the controller. The method of communication that is used is determined by the cable.

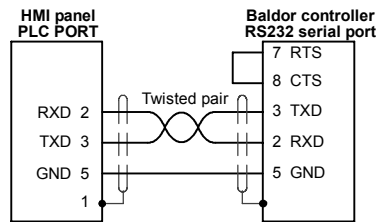


Figure 15 - RS232 cable wiring

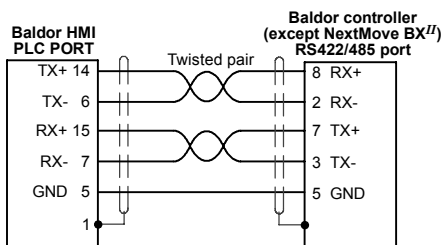


Figure 16 - RS422/485 cable wiring (except NextMove BX^{II})

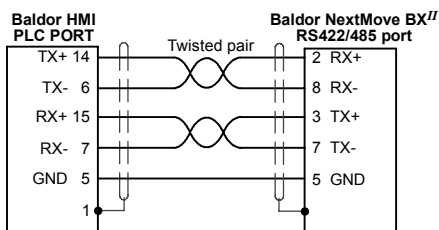
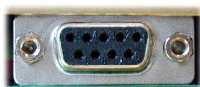


Figure 17 - RS422/485 cable wiring - NextMove BX^{II}

4.1.1.1 Programming using the PLC port (KPD-KG420-10 / 20 and KPD-TS03M-10 only)

Models KPD-KG420-10, KPD-KG420-20 and KPD-TS03M-10 do not have a PC/PRINTER port (section 4.1.3), so the PLC port is also used for programming the HMI panel when it is in configuration mode. Baldor cable CBL034-501 (not supplied) must be used in conjunction with gender changer OPT033-501 (not supplied) to connect the PLC port to a standard 9-pin serial (COM) port on the PC.

4.1.2 AUX port (CANopen)



Location	AUX PORT 9-pin D-type female connector	
Pin	Name	Description
1	(NC)	Not connected
2	CAN-	CAN signal
3	CAN GND	Ground
4	(NC)	Not connected
5	Shield	Shield connection
6	CAN GND	Ground
7	CAN V+	CAN signal
8	(NC)	Not connected
9	(NC)	Not connected

When the optional CANopen module KPD-OPTC is fitted (see section 3.2.3), the CANopen signals become available on the AUX port. Baldor cable CBL010MF-C (not supplied) connects the 9-pin D-type AUX port to the RJ45 CANopen connector on the controller.

If the CANopen module is not fitted, the AUX port is not used.

4.1.2.1 Powering the CAN bus

On many Baldor controllers, a power supply is required to drive the opto-isolated CAN port. To do this, cable CBL010MF-C can be modified to route the HMI panel's 24 V supply along the CAN cable to the controller. See the instruction manual supplied with the controller for details.

Alternatively, CAN D-type to RJ45 adaptors OPT-CNV001 (for the HMI panel) and OPT-CNV002 (for the controller) can be used, as shown in Figure 18. These adaptors convert the D-type connections to RJ45 sockets, and also allow power to be applied to the CAN bus.

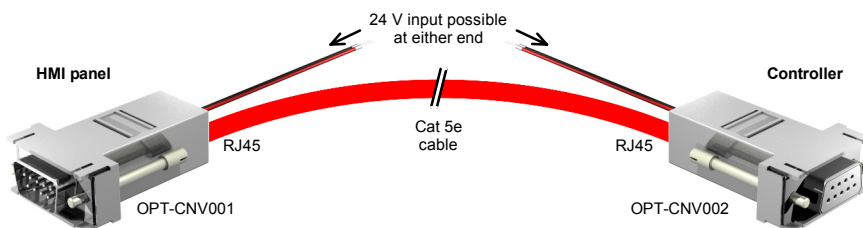
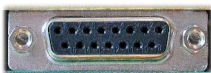


Figure 18 - CAN D-type to RJ45 adaptors

4.1.3 PC / PRINTER port



Location	PC / PRINTER PORT 15-pin D-type female connector (not high density)	
Pin	Name	Description
1	Shield	Shield connection
2	RXD	RS232 receive
3	TXD	RS232 transmit
4	+5 V	+5 V output (100 mA max)
5	0 V GND	Ground
6	(NC)	Not connected
7	(NC)	Not connected
8	(NC)	Not connected
9	(NC)	Not connected
10	RTS	RS232 Request To Send
11	CTS	RS232 Clear To Send
12	(NC)	Not connected
13	(NC)	Not connected
14	(NC)	Not connected
15	(NC)	Not connected

The PC / PRINTER port provides RS232 signals for communication with the PC that will be used for programming the HMI panel. The HMI panel is programmed using the *Baldor HMI Designer Studio* software KPD-SW, which can be ordered separately. Baldor cable CBL034-501 (not supplied) connects the PC / PRINTER port to a standard 9-pin serial (COM) port on the PC.

4.1.3.1 Models without a PC/PRINTER port

Models KPD-KG420-10, KPD-KG420-20 and KPD-TS03M-10 do not have a PC / PRINTER port, so the PLC port is used for programming the HMI panel. See section 4.1.1.1.

5.1 Introduction

Before connecting the HMI panel you will need to install the PC software *Baldor HMI Designer Studio*, part KPD-SW. This software includes all the required tools to configure and program the HMI panel. If you do not have experience of software installation or Windows applications you may need further assistance for this stage of the installation.

5.1.1 Installing the software

Run the setup.exe program and follow the on-screen instructions. The setup wizard will copy the files to appropriate folders on the hard disk. The default folder is C:\Program Files\Baldor HMI Software, although this can be changed during setup.

Baldor HMI Designer Studio (referred to simply as Designer) is a fully featured application for programming the HMI panels. The main Designer window contains a menu system, the Toolbox and other toolbars. Many functions can be accessed from the menu or by clicking a button - use whichever you prefer. Most buttons include a 'tool-tip'; hold the mouse pointer over the button (don't click) and its description will appear.

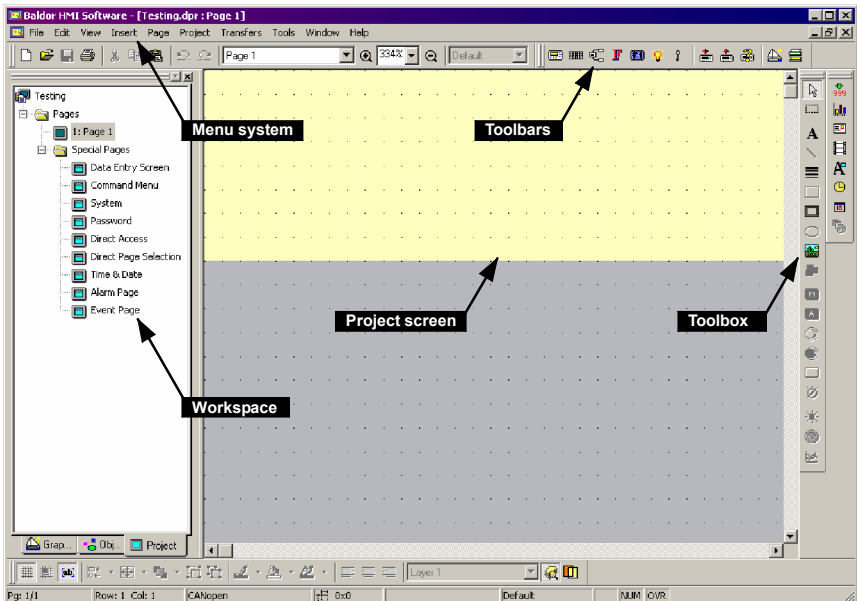


Figure 19 - The Baldor HMI Designer Studio software

5.1.2 Help file

Designer includes a comprehensive help file that contains information about every control and menu. On the left of the help window, the Contents tab shows the tree structure of the help file. Each book contains a number of topics (double click a topic name to display it). The Index tab provides an alphabetic list of all topics in the file, and allows you to search for them by name. The Search tab allows you to search for words or phrases appearing anywhere in the help file. Many words and phrases are underlined and highlighted with a color (normally blue) to show that they are links. Just click on the link to go to an associated keyword.

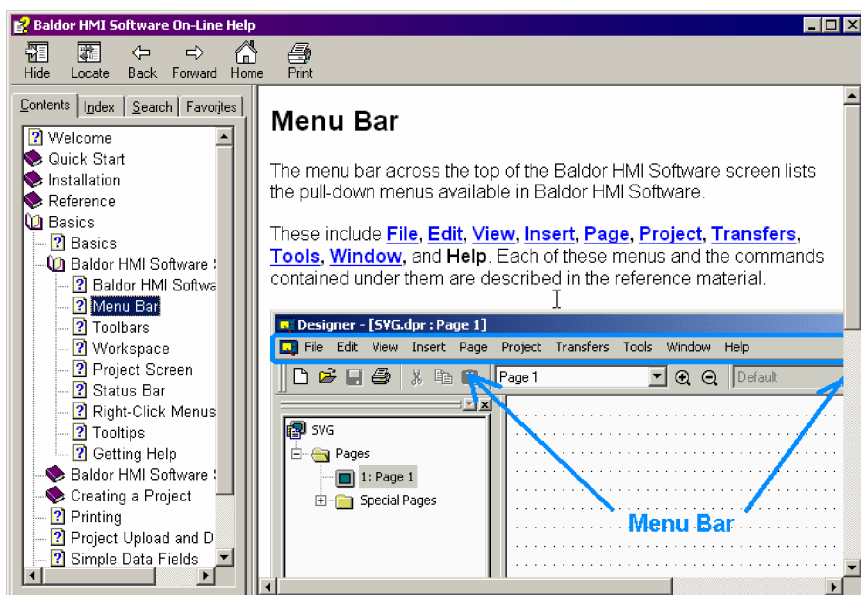
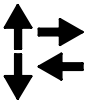
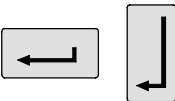


Figure 20 - The Baldor HMI Designer Studio help file

5.2 Main HMI panel controls

Many of the HMI panels have a similar range of control keys. Since touchscreen models have no physical keys, they provide equivalent on-screen graphical keys when needed.

	Cursor keys. Scroll up / down, previous / next page.
	Enter / accept. Press for three seconds to enter configuration mode. In configuration mode: Single press displays the type and version of communication driver installed (if any). Pressing for two seconds returns the panel to normal operation mode (if a valid communication driver and project are in the unit). In normal operation mode: Pressing for two seconds displays the command menu. In command menu: accepts the menu selection.
	Enter data entry mode. Used to activate numeric fields to accept data entry. When in data entry mode, use the cursor keys to move to other numeric fields.
	Print page / cancel printing. See the Designer help file for more information.
	Enter password insert mode. See the Designer help file for more information.
	Enter clock setting mode (if available). Use the cursor keys and return key to set and move between fields. When complete, press the exit key.
	Exit. Exits clock setting mode. Also exits an active data entry field, replacing or leaving the original value.

Most other keys can be programmed to perform a large number of functions using Designer's Keyboard Macro Editor tool, available on the Project menu. The key graphics shown in this tool's dialog may not exactly match the keys on your particular panel, and not all available keys may have a physical equivalent on your HMI panel. See the Designer help file for more information about the Keyboard Macro Editor tool.

Note: The KPD-KG840-10 has a large number of programmable keys with alphabetic characters on them. These correspond to the keys F1 to F23 shown in the Keyboard Macro Editor tool.

5.2.1 Forced configuration mode

An HMI panel must be in configuration mode to allow Designer to transfer data. If an HMI panel will not enter configuration mode by pressing the enter key (or bottom right hand corner of the touchscreen) for three seconds, an alternative method is available to force configuration mode.

- On models with a physical keypad, remove power from the HMI panel. Press and hold down any three keys and then re-apply power. Wait until the HMI panel enters configuration mode, then release the three keys.
- On touchscreen models, remove power from the HMI panel. Touch and hold the middle of the left side of the display, re-apply power and immediately start tapping the center of the screen about once per second until the HMI panel enters configuration mode.

5.2.2 Touchscreen calibration

It may be necessary to calibrate the touchscreen to ensure that on-screen controls are accurately triggered by the correct areas of the touchscreen surface.

- Press and hold the bottom right hand corner of the touchscreen to enter Configuration mode.
- Touch and hold the clear key  until a symbol appears at the top right of the screen.
- Touch and hold the symbol until it moves to the bottom left of the screen.
- Touch and hold the new symbol until a  symbol appears. Repeat this process for each symbol until the enter key  is displayed. Press and hold the enter key to complete the calibration and return to normal operation mode.

5.2.2.1 Forced calibration mode

If a touchscreen HMI panel will not enter calibration mode, use the following procedure. Remove power from the HMI panel. Re-apply power and immediately start tapping the center of the screen about once per second until the HMI panel enters calibration mode.

5.3 Configuring Designer for a serial HMI panel

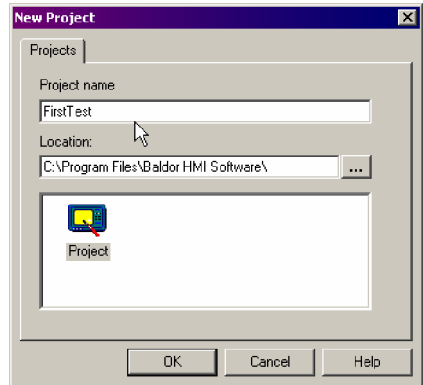
The following section describes how to configure Designer for communication with a serial HMI panel. To start Designer, go to the Windows **Start** menu and select Programs, Baldor HMI Software, Baldor HMI Software.

5.3.1 Selecting the serial driver

To simplify the driver selection process, the HMI panel should be disconnected from the PC.

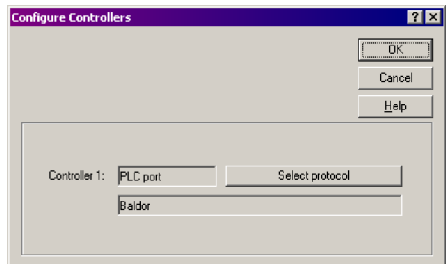
1. On the File menu, choose New to start a new project.

2. In the New Project window, type a name for the project and click **OK**.



3. On the Project menu, select Configure Controller...

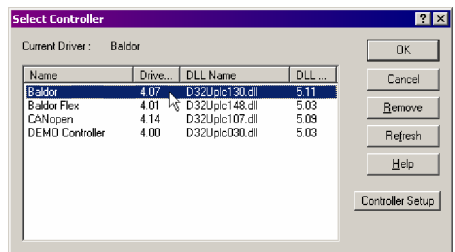
Click **Select protocol**.



4. In the Select Controller window, choose the Baldor driver. This must be version 4.04 (or later), and DLL version 5.05 (or later).

Note: If the highlighted serial driver is an earlier version then it will need to be updated. To do this, close Designer and then download the latest serial driver from www.baldormotion.com. Copy the downloaded file (D32Uplcxxx.dll) to the

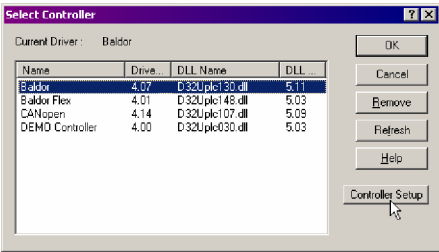
Baldor HMI installation directory (typically C:\Program Files\Baldor HMI Software), overwriting the existing file of the same name. Restart Designer, and in the Select Controller dialog, click **Refresh**. The new version will now be listed.



5.3.2 Configuring the node ID

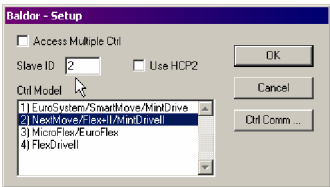
A Baldor serial HMI panel operates as a master device, so the node ID of the connected controller must be specified. If the panel is being connected to a RS422/485 network of controllers, then the node ID of each controller must be specified.

- 1. In the Select Controller window, click **Controller Setup** to display the Setup dialog.



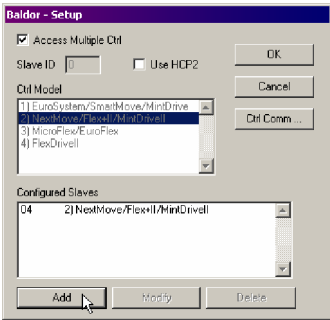
- 2. If there is only one controller connected to the HMI panel, click in the Slave ID box and enter the node number of the controller.

If there are many networked controllers, check the Access Multiple Ctrl option to display an extended setup dialog. Click **Add** to select a controller, choose the controller type and its node ID, then click **OK**. Repeat as necessary for each controller to be addressed by the HMI panel.



The Use HCP2 check box is available only for controllers that support Host Comms Protocol 2. HCP2 allows access to the controller's extended comms array; see the Mint WorkBench help file for details.

The **Ctrl Comm...** button displays a dialog where the serial connection's parameters can be configured. All Baldor controllers use no parity, 8 data bits and 1 stop bit, so these settings should not be altered. The baud rate must be set to match the baud rate being used by the connected controller(s). The maximum practical value that should be used is 19200 baud.

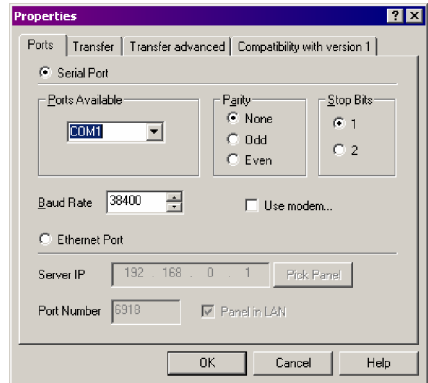


- 3. Click each dialog's **OK** button to return to the project screen.

5.3.3 Connecting the HMI panel to the PC

Designer can use any COM port on the PC, provided other software is not trying to access the same port.

1. Turn on the 24 VDC supply to the HMI panel.
2. On the Transfers menu, select Options...
3. On the Ports tab, select the COM port to which the HMI panel is connected. Parity should be set to None, and Stop Bits set to 1. The HMI panel will automatically recognize the selected baud rate.
4. Click **OK** to close the Properties dialog.
5. Now connect the serial cable between the chosen PC serial port and the HMI panel's PC/PRINTER port.



Note: Models KPD-KG420-10, KPD-KG420-20 and KPD-TS03M-10 do not have a PC/PRINTER port, so the PLC port is used for programming the HMI panel. Baldor cable CBL034-501 (not supplied) must be used in conjunction with gender changer OPT033-501 (not supplied) to connect the PLC port to a standard 9-pin serial (COM) port on the PC.

5.3.4 Selecting the HMI panel model

Designer needs to determine which HMI panel has been connected so that the correct programming environment can be created. The simplest method is to upload the necessary information from the HMI panel.

1. To program the HMI panel, it must be in configuration mode. For keypad models, press and hold the enter key  for three seconds. For touchscreen models, press and hold the bottom right corner of the touchscreen for three seconds. The display will show a number of options.
2. Use the arrow keys to highlight the CONFIG (or CFG) option, then press the enter key. The HMI panel will indicate that it is in configuration mode.
3. To upload information about the HMI panel, go to the Transfers menu and choose Get Panel Resources. The Panel Resources dialog will be shown.
4. Click **Yes** to copy the information to the Designer project.

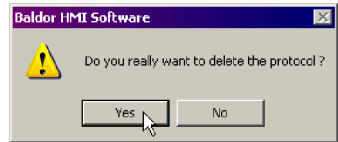
Panel Resources	
Panel Model :	KPD-TS03M-10
Panel FW version :	5.51
Controller type :	CANopen
FW driver version :	4.14
Project in panel :	Yes
Display type :	16x40 LCD SHARP
Max. num. of rows :	16
External keyboard :	Not attached
Internal memory :	448K
Recipe memory :	32K
Event list length :	1024
Support for graphics :	Yes
Colors Support :	No
Touchscreen present (code) :	Yes(6)
Pixel/Vector Graphics Support :	No
Double Protocol Support :	Yes
Copy resources to current project ?	
Yes	No
Cancel	Help

5.3.5 Downloading data to the HMI panel

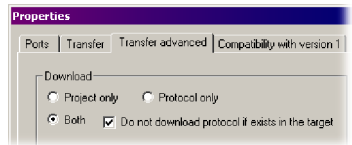
The communication protocol and the project (which contains the node ID and baud rate settings) should now be downloaded to the HMI panel. Any protocol already on the HMI panel should be deleted first.

1. Ensure that the HMI panel is in configuration mode (described in section 5.3.4).

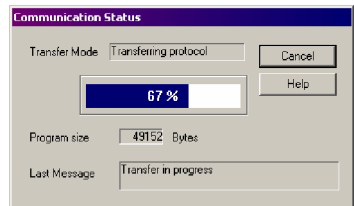
On the Tools menu, choose Advanced, Erase Protocols in Panel. Confirm the deletion.



2. On the Transfers menu, choose Options... to display the transfer Properties dialog. On the Transfer advanced tab, confirm that the Both option and the 'Do not download protocol if exists in the target' option are both selected. Click **OK** to exit.



3. On the Transfers menu, choose Download. The download will begin immediately. When the transfer is complete, click **OK** to close the dialog.



4. On the File menu, choose Save to save the project.

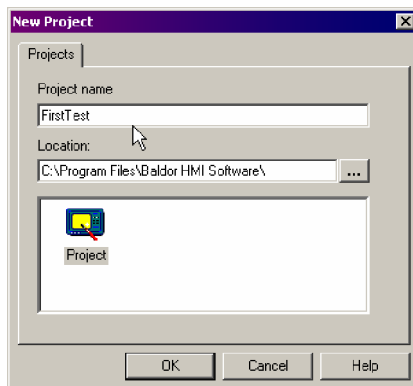
5.4 Configuring Designer for a CANopen HMI panel

The following section describes how to configure Designer for communication with a CANopen HMI panel. To start Designer, go to the Windows **Start** menu and select Programs, Baldor HMI Software, Baldor HMI Software.

5.4.1 Selecting the CANopen driver

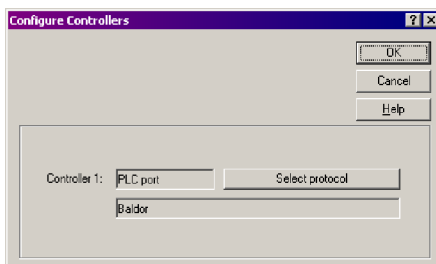
To simplify the driver selection process, the HMI panel should be disconnected from the PC.

1. On the File menu, choose New to start a new project.
2. In the New Project window, type a name for the project and click **OK**.



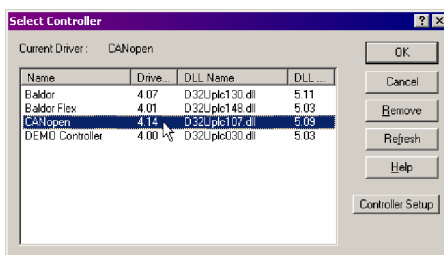
3. On the Project menu, select Configure Controller... .

Click the ... button.



4. In the Select Controller window, choose the CANopen driver. This must be version 4.06 (or later), and DLL version 5.04 (or later).

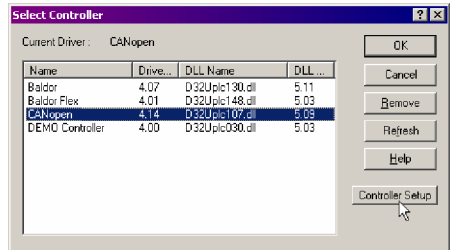
Note: If the highlighted CANopen driver is an earlier version then it will need to be updated. To do this, close Designer and then download the latest CANopen driver from www.baldormotion.com. Copy the downloaded file (D32Uplcxxx.dll) to the Baldor HMI installation directory (typically C:\Program Files\Baldor HMI Software), overwriting the existing file of the same name. Restart Designer, and in the Select Controller dialog, click **Refresh**. The new version will now be listed.



5.4.2 Configuring the node ID and baud rate

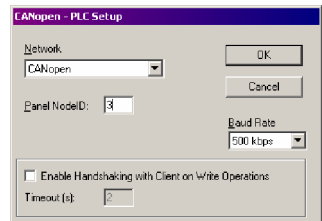
A Baldor CANopen HMI panel operates as a slave device, so it is necessary to assign its node ID and CAN baud rate.

1. In the Select Controller window, click **Controller Setup** to display the Setup dialog.



2. Click in the Panel NodeID box and enter a node ID for the HMI panel. This must be between 2 and 127, since node 1 is always used by the controller (the manager node). Node 3 has been selected in this example.

Click in the Baud Rate box and select the CAN baud rate (500 Kbit/s in this example). This must be the same baud rate used by all other CAN nodes in the network.

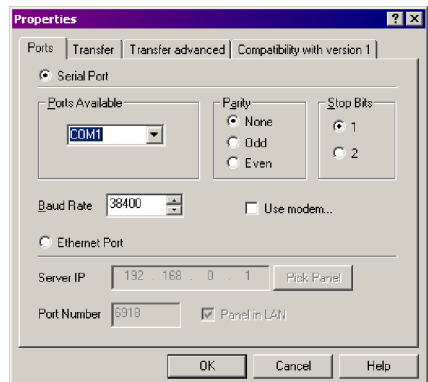


3. Click each dialog's **OK** button to return to the project screen.

5.4.3 Connecting the HMI panel to the PC

Designer can use any COM port on the PC, provided other software is not trying to access the same port.

1. Turn on the 24 VDC supply to the HMI panel.
2. On the Transfers menu, select Options...
3. On the Ports tab, select the COM port to which the HMI panel is connected. Parity should be set to None, and Stop Bits set to 1. The HMI panel will automatically recognize the selected serial baud rate.
4. Click **OK** to close the Properties dialog.
5. Now connect the serial cable between the chosen PC serial port and the HMI panel's PC/PRINTER port.



Note: Models KPD-KG420-10, KPD-KG420-20 and KPD-TS03M-10 do not have a PC/PRINTER port, so the PLC port is used for programming the HMI panel. Baldor cable CBL034-501 (not supplied) must be used in conjunction with gender changer OPT033-501 (not supplied) to connect the PLC port to a standard 9-pin serial (COM) port on the PC.

5.4.4 Selecting the HMI panel model

Designer needs to determine which HMI panel has been connected so that the correct programming environment can be created. The simplest method is to upload the necessary information from the HMI panel.

1. To program the HMI panel, it must be in configuration mode. For keypad models, press and hold the enter key  for three seconds. For touchscreen models, press and hold the bottom right corner of the touchscreen for three seconds. The display will show a number of options.
2. Use the arrow keys to highlight the CONFIG (or CFG) option, then press the enter key. The HMI panel will indicate that it is in configuration mode.
3. To upload information about the HMI panel, go to the Transfers menu and choose Get Panel Resources. The Panel Resources dialog will be shown.
4. Click **Yes** to upload the information to Designer.

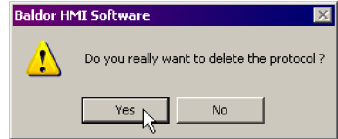
Panel Resources	
Panel Model :	KPD-TS03M-10
Panel Fw version :	5.51
Controller type :	CANopen
Fw driver version :	4.14
Project in panel :	Yes
Display type :	16x40 LCD SHARP
Max. num. of rows :	16
External keyboard :	Not attached
Internal memory:	448K
Recipe memory :	32K
Event list length :	1024
Support for graphics :	Yes
Colors Support :	No
Touchscreen present (code) :	Yes(6)
Pixel/Vector Graphics Support :	No
Double Protocol Support:	Yes
Copy resources to current project ?	
Yes	No
Cancel	Help

5.4.5 Downloading data to the HMI panel

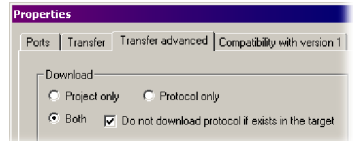
The communication protocol and the project (which contains the node ID and baud rate settings) should now be downloaded to the HMI panel. Any protocol already on the HMI panel should be deleted first.

1. Ensure that the HMI panel is in configuration mode (described in section 5.3.4).

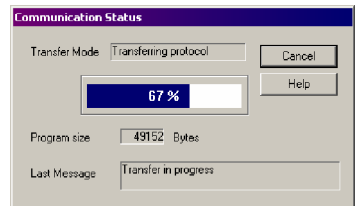
On the Tools menu, choose Advanced, Erase Protocols in Panel. Confirm the deletion.



2. On the Transfers menu, choose Options... to display the transfer Properties dialog. On the Transfer advanced tab, confirm that the Both option and the 'Do not download protocol if exists in the target' option are both selected. Click **OK** to exit.



3. On the Transfers menu, choose Download. The download will begin immediately. When the transfer is complete, click **OK** to close the dialog.



4. On the File menu, choose Save to save the project.

5.4.6 Controller to HMI panel CANopen connection

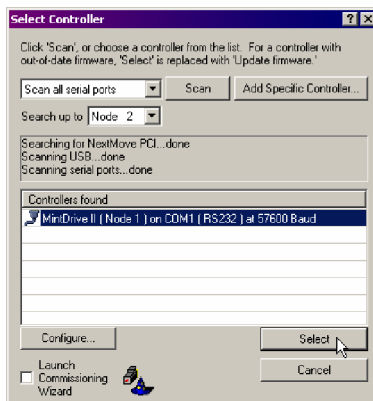
This subsection only applies to HMI panels with the optional CANopen module KPD-OPTC. If you have a serial HMI panel, go straight to section 6.

If all the previous steps have been followed, the HMI panel should now be in normal operation mode. Ensure that a CAN cable is connected between the controller and the HMI panel's AUX port, and that termination resistors are fitted or switched in where necessary. A serial connection between the PC and the controller will also be required.

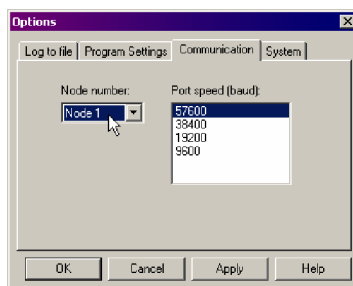
To enable CANopen communication between the controller and the HMI panel, the controller must set up a connection to the HMI panel. The Mint WorkBench software (supplied with the controller) is used to issue the required Mint commands from the controller.

1. If your PC has only one COM port, it may be necessary to close Designer before using Mint WorkBench.

Start the Mint WorkBench software and connect to the controller.



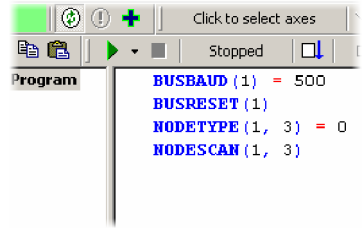
2. To allow the controller to configure the CAN connection it must have node ID 1, which makes it the CANopen manager node. By default, Baldor controllers are set to node 2. On the Mint WorkBench Tools menu, choose Options... On the Communication tab, select node ID 1 and click **OK**.



The controller must now issue a number of commands to connect to the HMI panel. These can either be entered individually in the Command Window, or written as a program which can be compiled and downloaded to the controller (select the Edit & Debug tool and then press Ctrl+N to open a program editing window).

3. Enter the commands:

```
BUSBAUD(1) = 500
BUSRESET(1)
NODETYPE(1, 3) = 0
NODESCAN(1, 3)
```



BUSBAUD(1) = 500 sets the controller's CANopen interface to operate at 500 Kbit/s, the same rate as chosen for the HMI panel in section 5.4.2, step 2.

BUSRESET(1) resets the controller's CANopen interface.

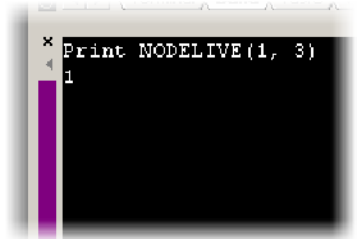
NODETYPE(1, 3) = 0 disconnects any existing node with node ID 3.

NODESCAN(1, 3) scans for node ID 3 (as chosen for the HMI panel in section 5.3.2, step 2.), and causes it to become 'live'.

4. After the program has been downloaded and run, check that the panel is 'live', by clicking in the command window and typing the command:

```
Print NODELIVE(1, 3)
```

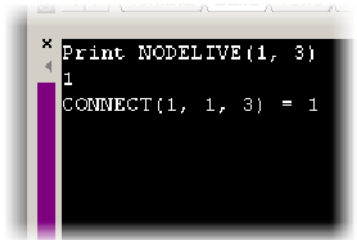
The controller should return the value 1, indicating that the HMI panel is 'live'.



5. Finally, the connection to the HMI panel is made using the command:

```
CONNECT(1, 1, 3) = 1
```

The HMI panel is now ready for programming.



6.1 Introduction

The following examples demonstrate how to read, write and display information on the HMI panel. Separate descriptions are provided for programming serial and CANopen HMI panels, due to the different way in which the controller / HMI panel connection operates. To avoid confusion, only read the sections that are relevant to your HMI panel.

After the serial / CANopen programming examples, section 6.4 explains the Mint code that can be used on the controller to respond to the actions of the HMI panel.

The examples do not form a comprehensive guide to the features of each HMI panel. For this information refer to Designer's help file, accessible from the Help menu.

6.1.1 Cable connections during programming

During the programming stage, it may be necessary to swap certain cables depending on the ports available on the PC, controller and HMI panel. If at any stage communication between any two devices appears to have failed, check that the correct connections have been made.

Connections are summarized in sections 3.2.8 and 3.2.9.

6.2 Programming a serial HMI panel

A serial HMI panel acts as a master device, reading and writing data held in the controller's 'comms array' memory. This array has 99 read/write elements (memory locations) that can hold integer or float data. The HMI panel uses the Baldor 'host comms protocol' (HCP1) to access the controller's comms array. Some Baldor controllers also support an enhanced version of the host comms protocol known as HCP2. In addition to elements 1 to 99, HCP2 allows access to a range of read only elements known as the extended comms array (elements 100 to 255). These elements contain important information such as the axis position, axis demand and error status. To allow the HMI panel to access extended comms array elements, the 'Use HCP2' box on the controller setup dialog must be checked - see section 5.3.2, step 2.

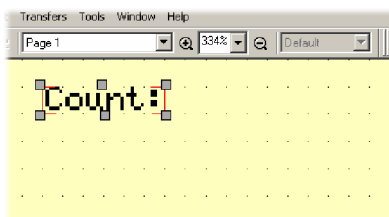
The controller can access its comms array by using the Mint COMMS keyword, specifying the element number. Section 6.2.1.1 will demonstrate the use of the COMMS keyword.

6.2.1 Displaying data (read only)

This example demonstrates how to make the HMI panel read data from the controller. This stage of this example uses Designer, so the PC's COM port must be connected to the HMI panel's programming port.

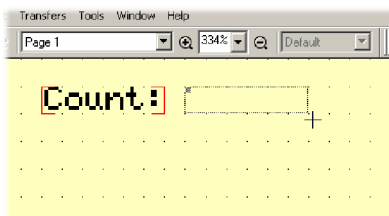
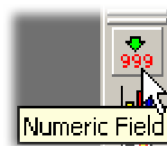
1. First, a label needs to be placed on the screen to describe the value to be shown.

Click on the yellow programming area and type something descriptive, for example Count:



2. Click the Numeric Field button, then drag a rectangle on the yellow screen area next to the label.

The field will be used to display the value read from the controller.



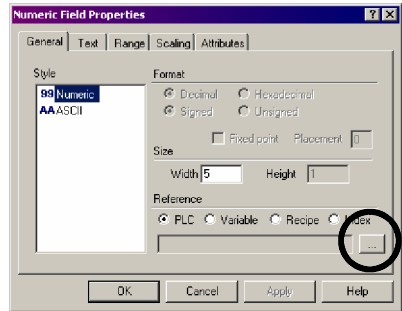
3. The Numeric Field Properties dialog appears immediately.

In the Style box, confirm that Numeric is selected.

The Width specifies the number of digits in the field. This example will require 5 digits, so enter 5 in the Width box.

Confirm that Reference is set to PLC (the controller).

Click the ... button.

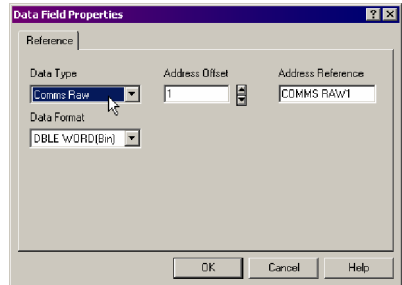


4. The Data Field Properties dialog defines the comms element (Address Reference) from which the HMI panel will derive its data, and the data type.

Set the Data Type to Comms Raw.

The controller's comms element (Address Reference) will change to COMMS RAW 1. The Address Offset and Data Format do not need to be altered.

Click **OK** to close the Data Field Properties dialog.



5. Click the Range tab, and confirm that the Read Only option is set.

Click **OK** to close the dialog.

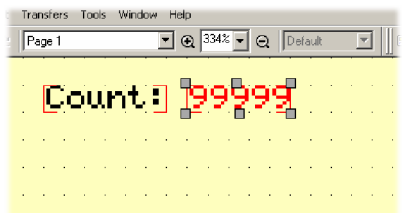
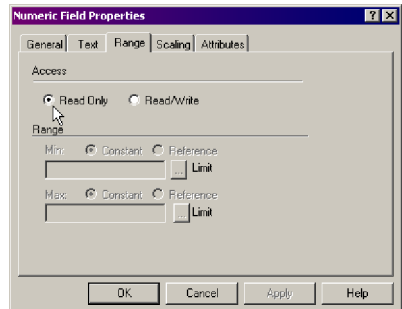
The yellow programming area will now show the field as 99999.

6. On the File menu, choose Save to save the project.

Set the HMI panel into configuration mode (see section 5.3.4 if you cannot remember how to do this).

On the Transfers menu, choose Download. The download will begin immediately. When the transfer is complete, click **OK** to close the dialog.

The HMI panel will exit configuration mode and the program will start.



Note: If the program does not start automatically, go to the Transfers, Options menu. On the Transfers tab, check that the *Start program after download* option is checked.

6.2.1.1 Testing the connection

To test the connection, a program that continuously increments comms element 1 will be downloaded to the controller and started. The HMI panel will then monitor the changing value in the controller's comms element 1.

Note: For non-USB controllers, the single RS232/RS485 serial port will be used by both the PC and the HMI panel during testing. It will therefore be necessary to download the program to the controller, run the program, disconnect the PC from the controller, then connect the HMI panel to the controller.

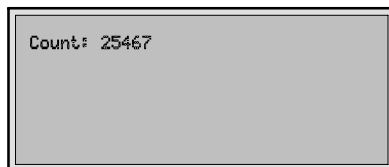
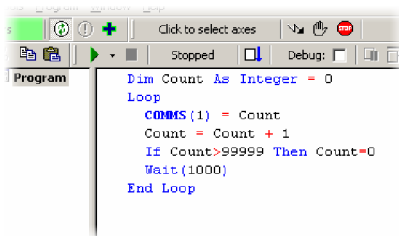
1. Start Mint WorkBench and connect to the controller. Select the Edit & Debug tool, press Ctrl+N to open a program editing window, and enter the following statements:

```
Dim Count As Integer = 0
Loop
  Comms(1) = Count
  Count = Count + 1
  If Count>99999 Then Count=0
  Wait(1000)
End Loop
```

Download and run the program.

2. (If necessary, disconnect the PC serial cable from the controller and connect the HMI panel serial cable.)

The HMI panel should now display the incrementing value in the numeric field.

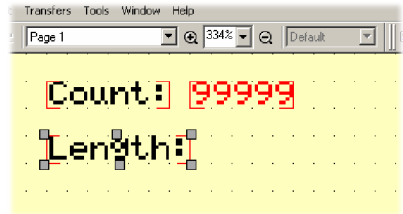


6.2.2 Displaying and changing data (read / write)

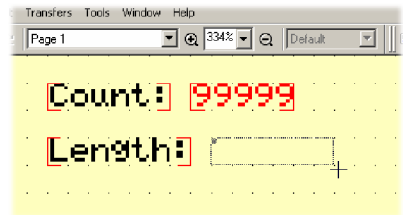
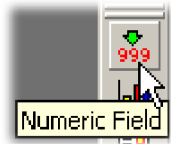
This example demonstrates how to make the HMI panel read data from the controller, and allow the user to change the data using the HMI panel. For example, the user might wish to enter a length for a cutting machine application. This stage of this example uses Designer, so the PC's COM port must be connected to the HMI panel's programming port.

1. First, a label needs to be placed on the screen to describe the value to be edited.

Click on the yellow programming area and type something descriptive, for example Length:



2. Click the Numeric Field button, then drag a rectangle on the yellow screen area next to the label.



3. The Numeric Field Properties dialog appears immediately.

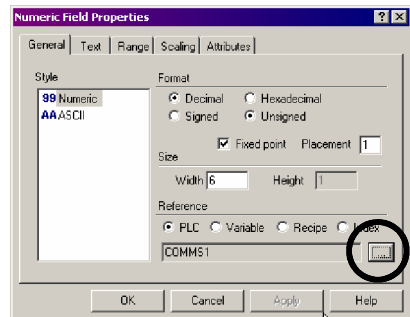
In the Style box, confirm that Numeric is selected. Confirm that the Format is set to Decimal and Unsigned.

Click the Fixed Point option and enter a Placement value of 1. This causes the field to display one decimal place.

The Width specifies the number of digits in the field. This example will require 6 digits (including the decimal point), so enter 6 in the Width box.

Confirm that Reference is set to PLC (the controller).

Click the ... button.



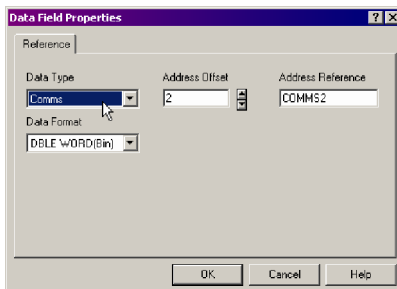
- The Data Field Properties dialog defines the comms element (Address Reference) from which the HMI panel will derive its data, and the data type.

Set the Data Type to Comms.

Set the controller's comms element (Address Offset) to 2.

Set the Data Format to DBLE WORD.

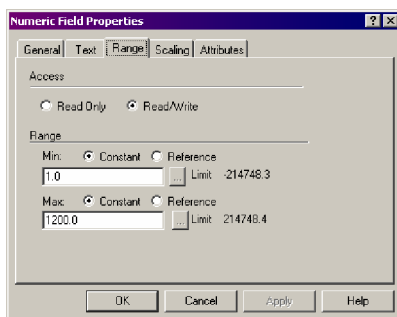
Click **OK** to close the Data Field Properties dialog.



- Click the Range tab, and confirm that the Read/Write option is set.

Set the minimum range to a constant value of 1.

Set the maximum range to a constant value of 1200.0



- Click **OK** to close the dialog.

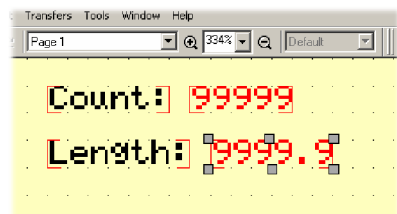
The yellow programming area will now show the field as 9999.9.

- On the File menu, choose Save to save the project.

Set the HMI panel into configuration mode (see section 5.3.4 if you cannot remember how to do this).

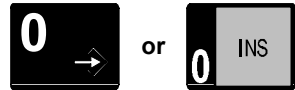
On the Transfers menu, choose Download. The download will begin immediately. When the transfer is complete, click **OK** to close the dialog.

The HMI panel will exit configuration mode and the program will start.



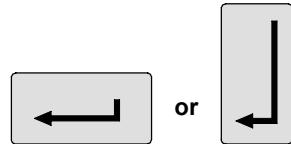
Note: If the program does not start automatically, go to the Transfers, Options menu. On the Transfers tab, check that the *Start program after download* option is checked.

8. Set the HMI panel into data entry mode. For most HMI panels, this is the key marked 0 or INS, as shown opposite.



For touchscreens, press the numeric field.

Enter a value for the length, for example 23.4, then press the enter key. For touchscreens, use the on-screen up/down arrow keys to enter the value.



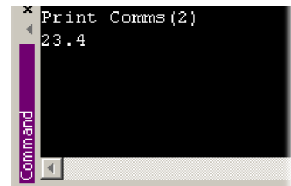
6.2.2.1 Testing the connection

If necessary, reconnect the PC serial cable to the controller.

1. Start Mint WorkBench and connect to the controller. In the Command window, type:

```
Print Comms(2)
```

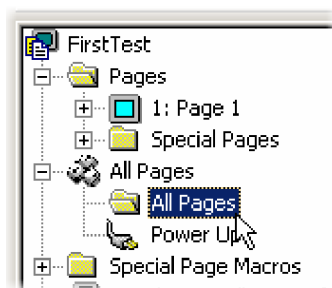
The value just entered using the HMI panel should be displayed in the command window. This confirms that the HMI panel succeeded in writing a value to the controller's comms array.



6.2.3 Triggering actions

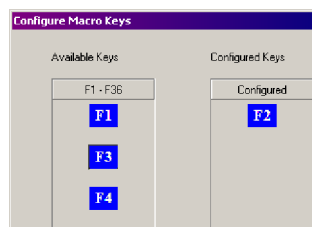
It is often necessary for controls on an HMI panel to directly control the physical actions of the controller, such as making a motor turn or activating a digital output. This is very similar to the read/write example in section 6.2.2, except that a single command key on the HMI panel will directly control an action by writing predefined values into the specified comms element. A key control can perform different actions when it is pressed down, released, or held down. In the following example, the F2 key will be programmed to write 1 when it is pressed down, and write 0 when it is released. For HMI panels that do not have a key marked F2, an alternative key can be chosen. This stage of this example uses Designer, so the PC's COM port must be connected to the HMI panel's programming port.

1. Open the All Pages entry in the menu tree. Double-click the All Pages folder. The Configure Macro Keys dialog appears immediately.



2. Double-click the F2 key to add it to the Configured Keys column.

Click **OK**.



Note: A key can also be added or deleted by right-clicking on it.

3. Expand the F2 entry. This provides three options for defining what will happen when the F2 key is pressed, released, or held down.

Double-click Key Pressed to define what will happen when the key is pressed down.

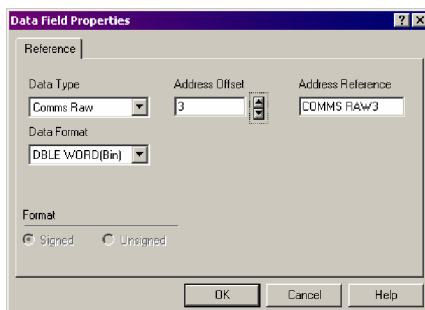


- In the Edit Macro List dialog, click the Write to Controller... button. The Data Field Properties dialog appears immediately.

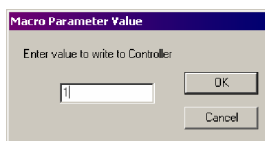


- Select the data type Comms Raw, data format DBLE WORD, and Address Offset 3 (i.e. controller comms element 3).

Click **OK** to close the Data Field Properties dialog.



The Macro Parameter Value dialog appears immediately. This setting defines the value that will be sent to comms element 3 when the key is pressed down. Enter a value of 1 and click **OK**.



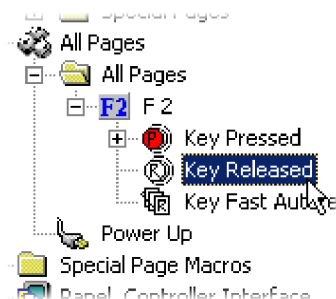
Click **OK** to close the Edit Macro List dialog.

- Double-click Key Released to define what will happen when the key is released.

Repeat step 5. above, except enter the value 0 in the Macro Parameter Value dialog.

Click **OK** to close the Macro Editor dialog.

Click **OK** to close the Edit Macro List dialog.



7. On the File menu, choose Save to save the project.

Set the HMI panel into configuration mode (see section 5.3.4 if you cannot remember how to do this).

On the Transfers menu, choose Download. The download will begin immediately. When the transfer is complete, click **OK** to close the dialog.

The HMI panel will exit configuration mode and the program will start. In section 6.4, an example Mint program shows how the controller can be made to react when the F2 (or alternative) key is pressed.

Note: If the program does not start automatically, go to the Transfers, Options menu. On the Transfers tab, check that the *Start program after download* option is checked.

6.3 Programming a CANopen HMI panel

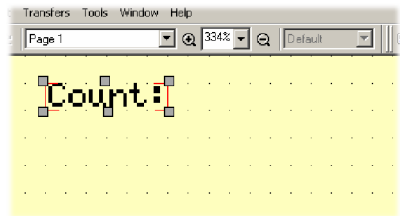
An HMI panel fitted with the optional KPD-OPTC CANopen module acts as a slave device, with the controller (the manager node) reading and writing data held in the HMI panel's memory. The HMI panel has two memory arrays that can be accessed by the controller. One array holds integer data and the other holds float data. To access the integer array, the controller uses the COMMS keyword, specifying the node number of the HMI panel and an array element (memory location) in the range 1 to 254. To access the float array, element numbers in the range 255 to 508 are used, where 255 corresponds to memory location 1 (FLOAT-1) in the HMI panel's float array. Section 6.3.1.1 will demonstrate the use of the COMMS keyword.

6.3.1 Displaying data (read only)

This example demonstrates how to make the HMI panel read data that has been sent from the controller. This stage of this example uses Designer, so the PC's COM port must be connected to the HMI panel's programming port.

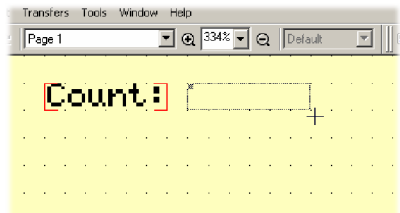
1. First, a label needs to be placed on the screen to describe the value to be shown.

Click on the yellow programming area and type something descriptive, for example Count:



2. Click the Numeric Field button, then drag a rectangle on the yellow screen area next to the label.

The field will be used to display the value read from the controller.



3. The Numeric Field Properties dialog appears immediately.

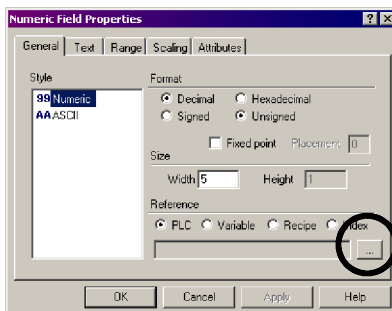
In the Style box, confirm that Numeric is selected.

In the Format area, select Decimal and Unsigned.

The Width specifies the number of digits in the field. This example will require 5 digits, so enter 5 in the Width box.

Confirm that Reference is set to PLC (the controller).

Click the ... button.

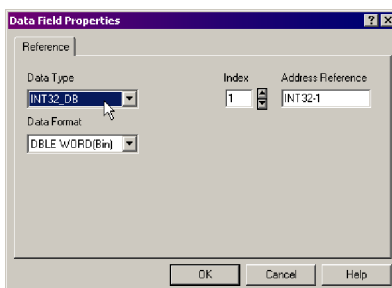


4. The Data Field Properties dialog defines the memory location (Address Reference) where the HMI panel will store the data, and the data type.

Since the count value will always be an integer, set the Data Type to INT32_DB.

The HMI panel's memory location (Address Reference) will change to INT32-1.

Confirm that the Data Format is set to DBLE WORD(Bin).

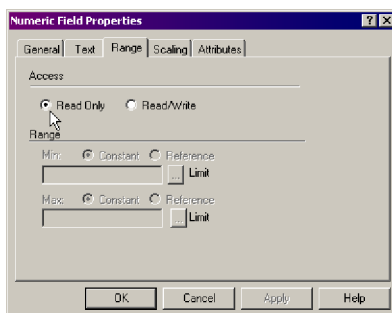


Click **OK** to close the Data Field Properties dialog.

5. Click the Range tab, and confirm that the Read Only option is set.

Click **OK** to close the dialog.

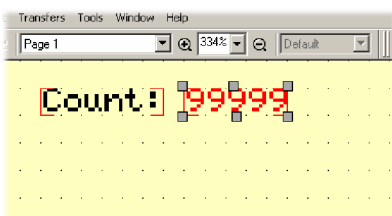
The yellow programming area will now show the field as 99999.



6. On the File menu, choose Save to save the project.

Set the HMI panel into configuration mode (see section 5.3.4 if you cannot remember how to do this).

On the Transfers menu, choose Download. The download will begin immediately. When the transfer is complete, click **OK** to close the dialog.



The HMI panel will exit configuration mode and the program will start.

Note: If the program does not start automatically, go to the Transfers, Options menu. On the Transfers tab, check that the *Start program after download* option is checked.

6.3.1.1 Testing the connection

Ensure that the controller's serial port (or USB port) is connected to the PC. If your PC only has one COM port, you can disconnect the HMI panel's programming cable. To perform testing, a program that continuously increments the value in memory location INT32-1 will be downloaded to the controller. The HMI panel can then display the changing value in its memory location.

1. Start Mint WorkBench and connect to the controller. Select the Edit & Debug tool, press Ctrl+N to open a program editing window, and enter the following statements. These are the same statements that were used in section 5.4.6, but because the HMI panel has been interrupted by downloading the project, they must be re-issued:

```
BUSBAUD(1) = 500
BUSRESET(1)
NODETYPE(1, 3) = 0
NODESCAN(1, 3)
Pause NODELIVE(1, 3)
CONNECT(1, 1, 3) = 1
```

Download and run the program.

The additional `Pause` statement causes the program to wait momentarily until the HMI panel's CANopen module reports that it has become 'live'; only then is the `CONNECT` statement issued.

2. To send a value to the HMI panel, click in the command window and type the command:

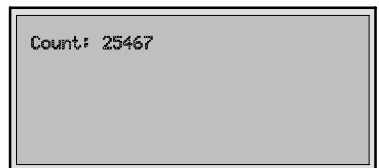
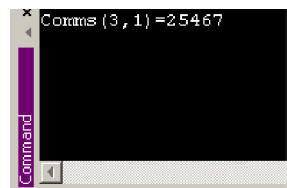
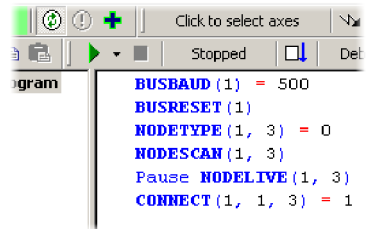
```
Comms(3, 1) = 25467
```

However, newer controllers such as NextMove e100 require the command:

```
REMOTECOMMSINTEGER(1, 3, 1) = 25467
```

The HMI panel should now display the value 25467 in the numeric field.

See the Mint help file for details of the `COMMS`, `REMOTECOMMS` and `REMOTECOMMSINTEGER` keywords.

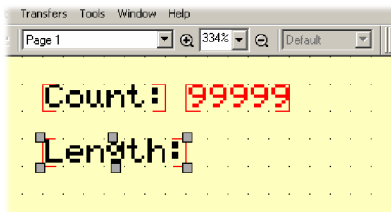


6.3.2 Displaying and changing data (read / write)

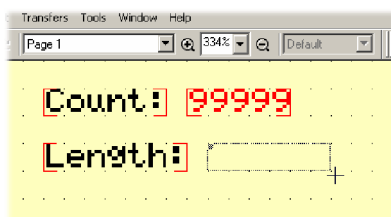
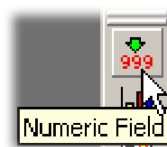
This example demonstrates how to allow the user to change data using the HMI panel. For example, the user might wish to enter a length for a cutting machine application. This stage of this example uses Designer, so the PC's COM port must be connected to the HMI panel's programming port.

1. First, a label needs to be placed on the screen to describe the value to be edited.

Click on the yellow programming area and type something descriptive, for example Length:



2. Click the Numeric Field button, then drag a rectangle on the yellow screen area next to the label.



3. The Numeric Field Properties dialog appears immediately.

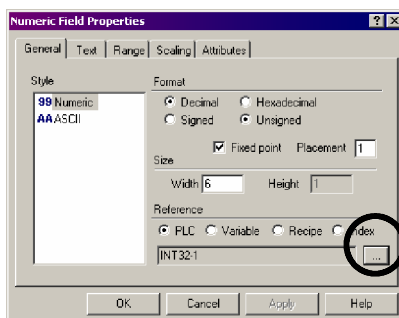
In the Style box, confirm that Numeric is selected. Confirm that the Format is set to Decimal and Unsigned.

Click the Fixed Point option and enter a Placement value of 1. This causes the field to display one decimal place.

The Width specifies the number of digits in the field. This example will require 6 digits, so enter 6 in the Width box.

Confirm that Reference is set to PLC (the controller).

Click the ... button.



- The Data Field Properties dialog defines the memory location (Address Reference) where the HMI panel will store the data, and the data type.

Since fractional values may be entered, set the Data Type to `FLOAT_DB`.

Set the HMI panel's memory location (Address Offset) to be 1.

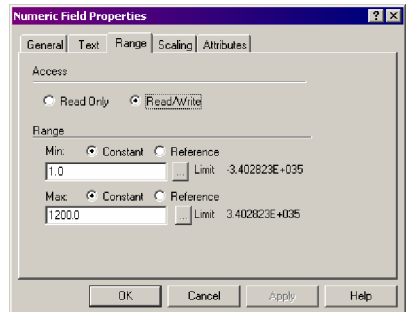
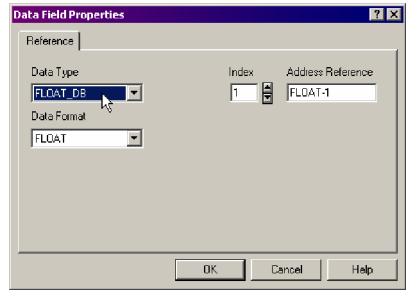
Set the Data Format to be `FLOAT`.

Click **OK** to close the Data Field Properties dialog.

- Click the Range tab, and confirm that the Read/Write option is set.

Set the minimum range to a constant value of 1.0 .

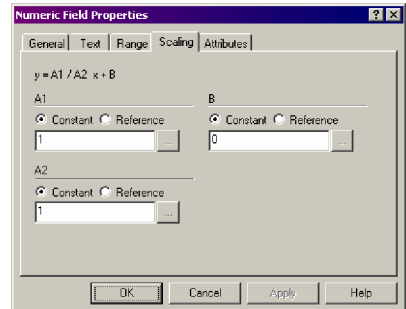
Set the maximum range to a constant value of 1200.0 .



- Click the Scaling tab and set A2 to 1. A1 should be set to 1 and B should be set to 0.

Click **OK** to close the dialog.

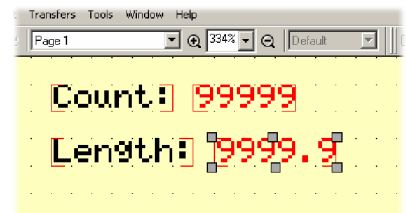
The yellow programming area will now show the field as 9999.9.



- On the File menu, choose Save to save the project.

Set the HMI panel into configuration mode (see section 5.3.4 if you cannot remember how to do this).

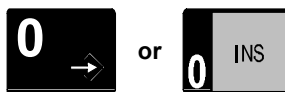
On the Transfers menu, choose Download. The download will begin immediately. When the transfer is complete, click **OK** to close the dialog.



The HMI panel will exit configuration mode and the program will start.

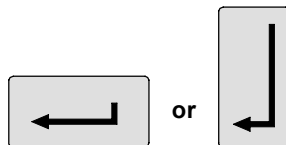
Note: If the program does not start automatically, go to the Transfers, Options menu. On the Transfers tab, check that the *Start program after download* option is checked.

8. Set the HMI panel into data entry mode. For most HMI panels, this is the key marked 0 or INS, as shown opposite.



For touchscreens, press the numeric field.

Enter a value for the length, for example 23.4, then press the enter key. For touchscreens, use the on-screen keypad or up/down arrow keys to enter the value.



6.3.2.1 Testing the connection

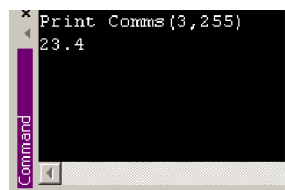
Ensure that the controller's serial port is connected to a COM port on the PC. If your PC only has one COM port, you can disconnect the HMI panel's programming cable.

1. Start Mint WorkBench and connect to the controller. In the Command window, type:

```
Print Comms(3, 255)
```

or, for newer controllers such as NextMove e100:

```
Print REMOTECOMMS(1, 3, 255)
```



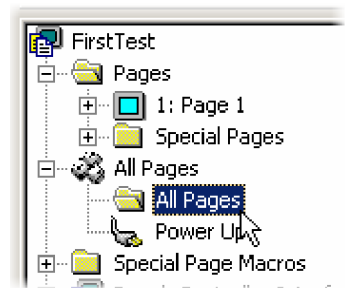
where 3 is the node number that was assigned to the HMI panel in section 5.4.2, and 255 is the HMI panel's FLOAT-1 memory location (see the introduction to section 6.3). The value just entered using the HMI panel should be displayed in the command window. This confirms that the HMI panel succeeded in writing a value to its own memory location.

See the Mint help file for details of the COMMS and REMOTECOMMS keywords.

6.3.3 Triggering actions

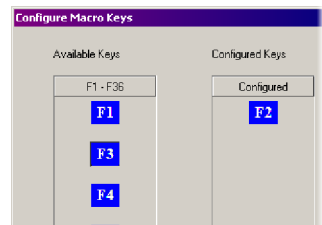
It is often necessary for controls on an HMI panel to directly control the physical actions of the controller, such as making a motor turn or activating a digital output. This is very similar to the read/write example in section 6.3.2, except that a single command key on the HMI panel will directly control an action by writing predefined values into the specified comms element. A key control can perform different actions when it is pressed down, released, or held down. In the following example, the F2 key will be programmed to write 1 when it is pressed down, and write 0 when it is released. For HMI panels that do not have a key marked F2, an alternative key can be chosen. This stage of this example uses Designer, so the PC's COM port must be connected to the HMI panel's programming port.

1. Open the All Pages entry in the menu tree. Double-click the All Pages folder. The Configure Macro Keys dialog appears immediately.



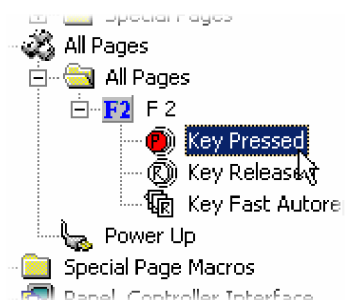
2. Double-click the F2 key to add it to the Configured Keys column.

Click **OK**.

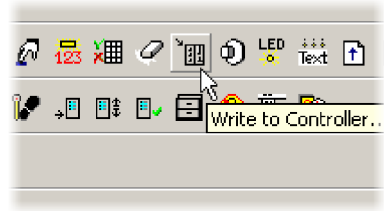


3. Expand the F2 entry. This provides three options for defining what will happen when the F2 key is pressed, released, or held down.

Double-click Key Pressed to define what will happen when the key is pressed down.

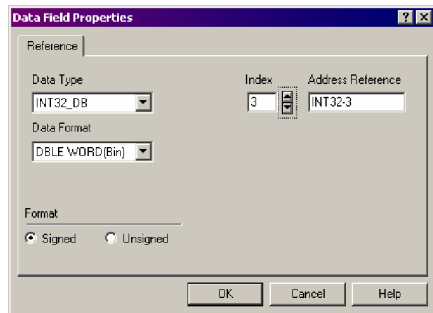


4. In the Edit Macro List dialog, click the Write to Controller... button. The Data Field Properties dialog appears immediately.

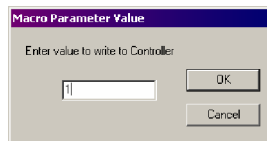


5. Click the Write to Controller... button. The Data Field Properties dialog appears immediately.

Select the data type INT32_DB, data format DBLE WORD, and Address Offset 3 (i.e. integer memory location 3). Click **OK** to close the Data Field Properties dialog.



The Macro Parameter Value dialog appears immediately. This setting defines the value that will be written to integer memory location 3 when the key is pressed down. Enter a value of 1 and click **OK**.



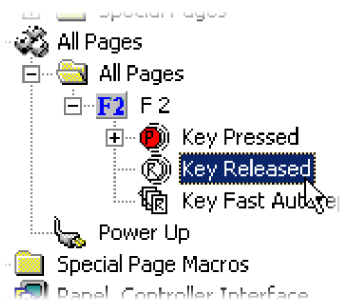
Click **OK** to close the Edit Macro List dialog.

6. Double-click Key Released to define what will happen when the key is released.

Repeat step 5. above, except enter the value 0 in the Macro Parameter Value dialog.

Click **OK** to close the Macro Editor dialog.

Click **OK** to close the Edit Macro List dialog.



7. On the File menu, choose Save to save the project.

Set the HMI panel into configuration mode (see section 5.3.4 if you cannot remember how to do this).

On the Transfers menu, choose Download. The download will begin immediately. When the transfer is complete, click **OK** to close the dialog.

The HMI panel will exit configuration mode and the program will start. In section 6.4, an example Mint program shows how the controller can be made to react when the F2 (or alternative) key is pressed.

Note: If the program does not start automatically, go to the Transfers, Options menu. On the Transfers tab, check that the *Start program after download* option is checked.

6.4 Monitoring HMI panel actions using Mint

The methods used to detect user input on the HMI panel are slightly different for serial and CANopen HMI panels. To avoid confusion, only read the section that is relevant to your HMI panel.

6.4.1 Using a serial HMI panel

A Mint program on the controller can be used to monitor changes to the controller's comms elements. In section 6.2.2, a value entered in the HMI panel's numeric field was written into comms element 2 on the controller. The following Mint program continuously polls comms element 2 to check for changes made by the HMI panel:

```
Dim fOldLength As Float
Loop
  'Has the user changed product length?
  If Comms(2) <> fOldLength Then
    subNewLengthEntered
    fOldLength = Comms(2)
  End If
End Loop
```

This program calls a subroutine called `subNewLengthEntered` whenever the contents of comms element 2 changes.

However, a much more efficient method is available using the Mint comms events. Mint automatically generates a comms event whenever data is written to any of the first five comms elements (from a source other than the Mint program itself). This event can be detected by adding a corresponding `COMMSx` event construct to the Mint program (where *x* is in the range 1 to 5). This is much more efficient than the polling method shown above, as the Mint program only executes the event code when necessary. The comms event can be used to start a task (on multi-tasking controllers) or a subroutine that handles the new HMI data.

The following example defines an event called `COMMS2` that will only be executed when there is a change to comms element 2. The event definition begins with the statement `Event COMMS2` and ends with the line `End Event`. The event code calls a task called `NewLength` to perform an action; for controllers without multi-tasking capability such as *Flex+DriveII*, the task could be replaced by a subroutine.

```
Event COMMS2
  'User changed Product Length
  Run NewLength
End Event

Task NewLength
  fProductLength = Comms(2)
End Task
```

In section 6.2.3, when the F2 key was pressed down, the value 1 was written into comms element 3 on the controller. When the key was released, the value 0 was written into comms element 0 on the controller. The following Mint program includes an event to react to the changes in comms element 3:

```

RESET
Loop

End Loop

Event COMMS3
If Comms(3) = 1 Then
    Jog(0) = 1000
Else
    Stop
End If
End Event

```

For testing purposes, the `Loop..End Loop` construct is a simple way to prevent the program ending; the program will remain in this loop until interrupted by the comms events. When the event is triggered, the `If Comms(3) = 1` statement tests if the key has been pressed (i.e. has written the value 1). If it has, the `Jog(0) = 1000` statement is executed, causing the motor to jog. If the value is not 1 it must be 0, indicating that the key must have been released. The program therefore jumps to the `Else` statement, allowing the following `stop` statement to be executed, stopping the motor.

6.4.2 Using a CANopen HMI panel

A Mint program on the controller can be used to monitor changes in the memory locations on the CANopen HMI panel. In section 6.3.2, a value entered in the HMI panel's numeric field was written into float memory location 1. The following Mint program continuously polls float memory location 1 (i.e. comms element 255) to check for changes made by the HMI panel:

```

Dim fOldLength As Float
Loop
    'Has the user changed product length?
    If Comms(3, 255) <> fOldLength Then
        subNewLengthEntered
        fOldLength = Comms(3, 255)
    End If
End Loop

```

This program calls a subroutine called `subNewLengthEntered` whenever the contents of the HMI panel's float memory location 1 changes.

However, a much more efficient method is available using CANopen 'bus events'. Whenever the HMI panel writes data to one of its memory locations, it generates a CANopen bus event. This is recognized by the controller as a Mint type 12 bus event, which has the predefined constant `_betHMI_COMMS_UPDATE`. This can be read in Mint using the `BUSEVENT` keyword. The bus event also includes information about which memory location changed, which can be read in Mint using the `BUSEVENTINFO` keyword.

The bus event can be detected by adding a `BUS1` event construct to the Mint program. This is much more efficient than the polling method shown above, as the Mint program only executes the event code when necessary. The `BUS1` event can be used to start a task (on multi-tasking controllers) or a subroutine that handles the new HMI data. The following example defines the `BUS1` event code that will only be executed when the HMI panel issues a bus event. The event definition begins with the statement `Event BUS1` and ends with the line `End Event`.

```

RESET
BUSBAUD(1) = 500
BUSRESET(1)
NODETYPE(1, 3) = 0
NODESCAN(1, 3)
Pause NODELIVE(1, 3)
CONNECT(1, 1, 3) = 1

Loop

End Loop

Event BUS1
    Dim nEvent As Integer
    Dim nInfo As Integer
    nEvent = BUSEVENT(1)           'Read event type into a variable
    nInfo = BUSEVENTINFO(1)       'Read event info into a variable

    Select Case nEvent
        Case _bethMI_COMMS_UPDATE 'User changed data on HMI
            Select Case nInfo
                Case 255           'Test which memory location changed
                    'User changed Product Length
                    Run NewLength  'Run a task
                Case 3             'User pressed F2
                    Print "User pressed F2"
                    If Comms(3, 3) = 1 Then
                        Jog(0) = 1000
                    Else
                        Stop
                    End If
                    'Add cases for other adjustable values here
            End Select
        Case Else
            'Add cases for other bus events such as node live
    End Select
End Event

Task NewLength
    fProductLength = Comms(3, 255)
    'As an example, code in the rest of task may calculate new move
    'parameters based on new value of Product Length entered by user
End Task

```

For testing purposes, the Loop..End Loop construct is a simple way to prevent the program ending; the program will remain in this loop until interrupted by the bus events. When the event is triggered, the first Select Case construct tests if the event type is an HMI comms update. If it is, the inner Select Case construct tests the BUSEVENTINFO to determine which memory location has changed. If it is location 255 (the HMI panel's float memory location 1) the NewLength task is called, which reads the product length from the HMI panel. If it is location 3 (the HMI panel's integer memory location 3), the value is tested; if 1 the motor is jogged, if 0 the motor is stopped.

On more recent controllers such as NextMove e100, any Comms statement will need to be replaced with either REMOTECOMMS or REMOTECOMMSINTEGER. For example:

```
If Comms(3, 3) = 1 Then
```

will need to be replaced with:

```
If REMOTECOMMSINTEGER(1, 3, 3) = 1 Then
```

For testing, the Print statement shows when the action has occurred - click the Terminal tab below Mint WorkBench's Output window to see the result. Other Print statements can be added where necessary to confirm the operation of the code.

By using this style of program, any type of bus event can be detected. Similarly, using the example of the HMI comms update bus event shown above, changes in any of the HMI panel's memory locations could be tested by simply adding further Case xxx statements inside the inner Select Case construct.

See the Mint WorkBench help file for details of each keyword.

6.5 Additional information

For clarity, the examples in sections 6.2 and 6.3 specified only the options required to complete the example. In many case, other options were available; these are outlined below.

6.5.1 Numeric field properties dialog

The ASCII option allows alphanumeric data to be exchanged between the HMI panel and a controller. However, a Baldor controller's comms array can only handle numeric data, so the ASCII option cannot be used.

The Format option provides a hexadecimal option which, if selected, will display integer values in hexadecimal format. For example if the controller's comms array element contained the value 31, the HMI panel would display this as 1F.

Width specifies the number of digits in the field, including any decimal point. For example, to display 12.3 would require a width of 4 digits. The length of the field can also be adjusted graphically by dragging the numeric field's handles to make it wider.

The Reference options also include Variable, Recipe and Index. These are explained in detail in Designer's help file.

6.5.1.1 Data field properties

When using a serial HMI panel, there are two possible data type selections, Comms and Comms Raw. Comms is used for the transfer of integer or floating point data that includes fractional data. If the WORD or DBLE WORD data formats are selected, the scaling must be set to suit the number of decimal places to be displayed (see section 6.5.1.3). If the FLOAT data format is selected then scaling is not necessary, although it may still be used if required. The HMI panel will show the float value read from the controller, rounding up the value to the chosen number of decimal places in the numeric field. Comms Raw is used for the transfer of the integer part of a number only. Comms Raw allows the scaling to be left at its default unity value and is therefore simpler to configure, although it cannot be used to display floating point values accurately.

When using a CANopen HMI panel alternative options are available, since the data is being stored on the HMI panel. The INT32_DB data type refers to the integer array of the HMI panel's memory, whereas the FLOAT_DB data type refers to the float array. The correlation between these memory locations and the location specified by the controller's Comms keyword is explained at the beginning of section 6.3.

The Data Formats that are available depend on whether a serial or CANopen HMI panel is being used. The BIT format allows a numeric field to set a single bit within the 32-bit data type of a given memory location. This allows very efficient use of memory space for simple on/off yes/no type data, and allows more than one piece of data to be stored in one memory location. Similarly, the BYTE option allows a single memory location to hold four separate 8-bit values, and the word option allows it to hold two 16-bit values. In each case, the limit values on the Range tab change automatically to show the allowable values for the chosen format.

6.5.1.2 Range tab

The Limit values change automatically to show the correct limits for the data format selected on the Data field Properties dialog. They are also affected by the choice of Signed / Unsigned on the General tab, since this determines whether negative (i.e. a signed) values are allowable. The Range tab provides two options for the limit values: Constant or Reference. In the examples, only the constant option was used, which means that the limits for the numeric field were fixed by the project. The Reference option allows a limit to be defined by the value in a memory location, meaning that the limit can be altered at any time by changing the value in the memory location. The ... button below the Reference option allows the memory location to be selected.

6.5.1.3 Scaling tab

The HMI panel can scale the value read from the controller (or for CANopen HMI panels, the value in the HMI panel memory) before it is displayed. The scaling factors are used in the formula $y = (A1/A2)x + B$, where y is the value that will be displayed and x is the value read from the controller or HMI panel memory.

For example, the Celsius to Fahrenheit conversion formula is: $F = (9/5)C + 32$. So, if a controller provides the HMI panel with a Celsius value, the scaling factors could be set to $A1=9$, $A2=5$, $B=32$ to make the HMI panel display the value in Fahrenheit.

The Reference option allows a scaling factor to be defined by the value in a memory location, meaning that the scaling factor can be altered at any time by changing the value in the memory location. The ... button below the Reference option allows the memory location to be selected.

When using a serial HMI panel, scaling may be essential when using the Comms data type in conjunction with the WORD or DBLE WORD data format. When supplying a value in a comms communication, the controller formats the value as ASCII characters, including a decimal point and four decimal places.* Since the HMI panel does not recognize the decimal point when using the WORD or DBLE WORD format, the value must be scaled by the HMI panel to reposition the decimal point before displaying the value. Furthermore, the scaling is altered if a fixed point placement value has been specified on the General tab, since this also causes the position of the decimal point to be adjusted. In summary, the following scaling factors should be included when using the Comms data type:

Data to be displayed	Fixed point <i>Placement</i> value	A2 scaling factor
Integer	Not selected	10000
x.x (one decimal place)	1	1000
x.xx (two decimal places)	2	100
x.xxx (three decimal places)	3	10
x.xxxx (four decimal places)	4	1

When using the Comms data type in conjunction with the FLOAT data format, or when using the Comms Raw data type, it is not necessary to adjust the scaling.

6.5.1.4 Text and Attributes tabs

These tabs can be used to alter the appearance and printing attributes of objects on the HMI panel's display. The available options depend on the type of HMI panel that is connected, and are explained in detail in Designer's help file.

6.5.1.5 Using the ASCII style

When using the ASCII style (typically for recipe names), care must be taken to allow sufficient storage space. For example, if an ASCII field is added with a width of 10 (characters), and the Address Reference set to COMMS1, then the COMMS1, COMMS2 and COMMS3 locations will all be required to store the field. This is because each location can hold only 4 bytes (characters), so COMMS1 and COMMS2 will hold 4 characters each, and COMMS3 will hold 2 characters. Attempting to use COMMS2 and COMMS3 to store other data will result in corruption, so they must not be used.

* Some older generation Mint v4 controllers use only three decimal places.

7.1 Introduction

This section explains common problems that may be encountered, together with possible solutions.

7.1.1 Problem diagnosis

If you have followed all the instructions in this manual in sequence, you should have few problems installing the HMI panel. If you do have a problem, read this section first.

7.2 LED indicators

Various LED indicators are present on the HMI panels:

	Battery status / key feedback (the ? symbol may not be present) Flashing red: The battery voltage is low. Solid red: There is a hardware fault. Solid green: A key is being pressed.
	Operation: Off: Hardware fault / panel is not powered. Solid green: Panel is powered and operational.
	Communication: Flashing green: Hardware fault or no communications. Solid green: Communication operating correctly.
	Alarm: Flashing red: Alarm requires acknowledgement. Solid red: Alarm active.

7.2.1 Communication

Problem	Solution
Cannot enter configuration mode.	If it is difficult to select configuration mode, try the following procedures: <u>HMI panels with keys:</u> 1. Turn off the HMI panel. 2. Press and hold any 3 keys. 3. Turn on the HMI panel. 4. Keep holding the three keys until configuration mode appears. <u>Touchscreen HMI panels:</u> 1. Turn off the HMI panel. 2. Touch and hold the middle of the left side of the display. 3. Turn on the HMI panel. 4. While still pressing the left side of the display, repeatedly touch the middle of the right side of the display, about once per second. Continue until configuration mode is displayed.
The optional CANopen module does not seem to be working	With the HMI panel powered and connected to the PC: 1. Run the Designer software. 2. From the menu, select Page, Special Pages and Page Modes, System. 3. Scroll to the bottom of the display to see diagnostic information for the CANopen module. For example, this might show: <pre>OPT032-501 0 H100 X030 OK</pre> where: OPT032-501 is the name of the module, 0 H100 X030 are the internal codes, with the first digit being the error code (see below) OK shows the module is operating correctly. The following error codes may be shown: 0 No errors 05 Time-out error - the controller has stopped sending Node Guarding messages after initiating the node guarding procedure. 06 Response error - Error in the response from the controller. 07 General error - internal software error. Ensure that the CANopen module has been installed correctly, as described in section 3.2.3.

8.1 Introduction

This section provides technical specifications for the HMI panels.

8.1.1 24 VDC supply input

	KPD KG420-10	KPD KG420-20	KPD KG420-30	KPD KG840-10
Nominal input voltage	24 VDC			
Min. input voltage	18 VDC			
Max. input voltage	30 VDC			
Maximum continuous current @24 VDC	250 mA	250 mA	300 mA	400 mA

	KPD TS03M-10	KPD TS05M-10	KPD TS05C-10	KPD TS10C-20	KPD TS12C-20
Nominal input voltage	24 VDC				
Min. input voltage	18 VDC				
Max. input voltage	30 VDC				
Maximum continuous current @24 VDC	400 mA	600 mA	600 mA	700 mA	800 mA

8.1.2 Display

	KPD KG420-10	KPD KG420-20	KPD KG420-30	KPD KG840-10
Technology	LCD			LCD
Characters (row x char)	4 x 20			8 x 40
Graphics (pixels)	120 x 32			240 x 64
Dimensions (mm)	70 x 21			127 x 34
Backlight	LED			CCFL
Touchscreen	No			No

	KPD TS03M-10	KPD TS05M-10	KPD TS05C-10	KPD TS10C-20	KPD TS12C-20
Technology	LCD	LCD	STN	TFT	TFT
Characters (row x char)	Scalable				
Graphics (pixels)	320 x 240	320 x 240	320 x 240	640 x 480	800 x 600
Dimensions (mm)	77 x 58	121 x 91	121 x 91	218 x 159	246 x 184
Backlight	LED	LED	CCFL	CCFL	CCFL
Touchscreen	Yes	Yes	Yes	Yes	Yes

8.1.3 Keys and LEDs

	KPD KG420-10	KPD KG420-20	KPD KG420-30	KPD KG840-10
Function keys	4	9	12	23
System keys	7	10	23	24
User LEDs	5	10	13	24
System LEDs	4	4	4	5

	KPD TS03M-10	KPD TS05M-10	KPD TS05C-10	KPD TS10C-20	KPD TS12C-20
Function keys	(Touchscreen)			1	1
System keys					
User LEDs	0			1	
System LEDs	0	5	5	4	4

8.1.4 Serial RS232 / RS422/485 interface

	Unit	All models
Signal		RS232, RS422, RS485
Bit rate	baud	9600, 19200, 38400

8.1.5 Environmental

	KPD KG420-10	KPD KG420-20	KPD KG420-30	KPD KG840-10
Operating temperature (EN60068-2-14)	0 - 50 °C (32-122 °F)			
Storage temperature (EN60068-2-14)	-20 to +70 °C (-4 to 158 °F)			
Operating & storage humidity (EN60068-2-30)	5% - 85% relative humidity, non-condensing			
IP rating (front panel)	IP65			
Shock (EN60068-2-27)	50 G, 11 ms, 3 pulses per axis			
Vibration (EN60068-2-6)	10 - 57 Hz, 0.075 mm peak 57 - 150 Hz, 1 G			

	KPD TS03M-10	KPD TS05M-10	KPD TS05C-10	KPD TS10C-20	KPD TS12C-20
Operating temperature (EN60068-2-14)	0 - 50 °C (32-122 °F)		0 - 45 °C (32-113 °F)		
Storage temperature (EN60068-2-14)	-20 to +70 °C (-4 to 158 °F)				
Operating & storage humidity (EN60068-2-30)	5% - 85% relative humidity, non-condensing				
IP rating (front panel)	IP65				
Shock (EN60068-2-27)	50 G, 11 ms, 3 pulses per axis				
Vibration (EN60068-2-6)	10 - 57 Hz, 0.075 mm peak 57 - 150 Hz, 1 G				

The HMI panels comply with the following standards:

Emitted interference: EN 50081-2, 1993

Noise immunity: EN 61000-6-2, 2000

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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:

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Comment:

continued...

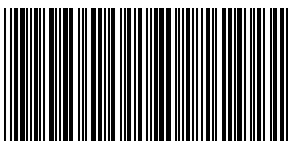
Thank you for taking the time to help us.



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