**Complete with FREE software
4 Function Keys
4 lines by 20 characters
vacuum fluorescent display
Connects to FMT range of
controllers & other PLCs
RS232 and RS485 Serial
communications
IP67 Rated
CE Compliant**

HMI-4420A Human-Machine Interface

Introduction

The HMI-4420A is a Human-Machine-Interface which can be seamlessly connected to the Colter FMT / BIS range of controllers via RS232 or RS485. The HMI-4420A can also be connected to many other PLC systems.
The HMI-4420A can be used as a cost effective way of replacing push buttons lamps and thumb wheels.

In 'simple text' mode the HMI-4420A will display characters received on the RS232 or RS485 port from the connected host. Any key pressed will send a string of data representing the status of all the keys to the host, via the RS232 or RS485 port.
In 'multidropped' mode upto 255 displays can be connected together using the protocol described on page 3.

The display is a 4 x 20 character **V**acuum **F**lourescent **D**isplay (**VFD**), this display technology offers excellent visibility and wide viewing angle in the harshest environments.

The HMI-4420A is IP67 rated when panel mounted in a suitable enclosure.

General Ratings

Storage temperature	-20 to +85 $^{\circ}$C
Operating temperature	0 to 70 $^{\circ}$C
Relative Humidity	10-90%
Weight	Typically 450g
Dimensions	137 mm wide
	88 mm high
	30 mm deep
Screw terminal wire gauge	Up to 4 mm csa (14 AWG)
Supply voltage	10 - 30VDC
Supply currents	Maximum 100 mA @ 24VDC
Environmental protection	IP67 rated, when mounted in a suitable enclosure

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Page 1.

Connection Details
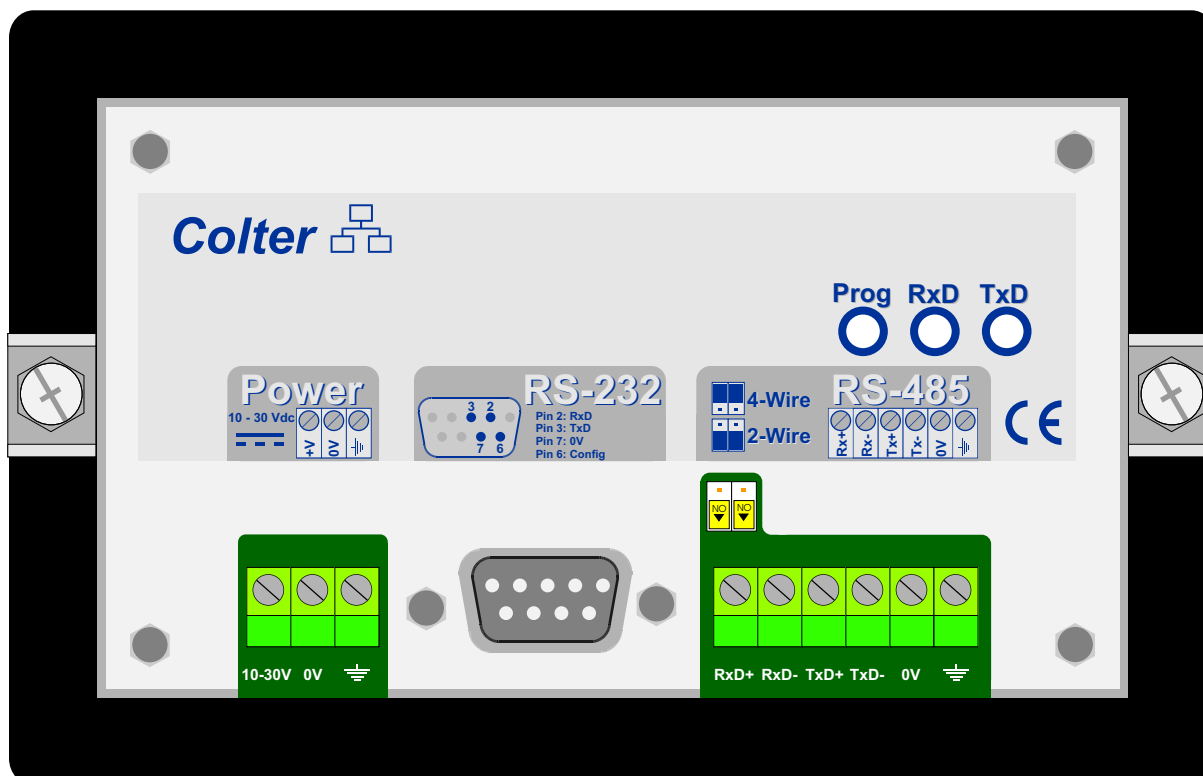
Connections are made to terminals on the rear of the HMI-4420A as shown in the above back view:

RS232 Port:
- Pin 2: Receive Data (RxD)
- Pin 3: Transmit Data (TxD)
- Pin 7: 0V (RS232 0V common)
- Pin 6: Config (Used to sense when the configuration lead is plugged into the HMI-4420A)

RS485 Port:
- RxD+: +VE Receive Data
- RxD-: -VE Receive Data
- TxD+: +VE Transmit Data
- TxD-: -VE Transmit Data
- 0V: RS485 common 0V
- Earth: Protective Earth - for cable screen connection

Power:
- 10-30V: Connect +10VDC to +30VDC (Nominal 24VDC) from your power supply to this terminal.
- 0V: Connect the 0V connection from your power supply to this point.
- Earth: Earth Connection

Two Wire Operation: To configure the RS485 port for 2 wire operation slide the two jumper link switches (located above the RS485 port) into the two wire position, as shown in the above diagram. **NOTE:** You must also select this option within the HMI configuration software.

Four Wire Operation: To configure the RS485 port for 4 wire operation slide the two jumper link switches (located above the RS485 port) into the four wire position, as shown in the above diagram. **NOTE:** You must also select this option within the HMI configuration software.

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Communication Details

Communications To The HMI:

Simple text mode:

Communications to the display are via simple ASCII text strings sent from the system that the HMI is connected to (i.e. Colter's FMT or BIS range of controllers or a third party PLC) using either RS232 or RS485 communications. The display has no 'intelligence' itself and so all formatting characters (e.g. Carriage Return or Line Feed etc) must be included in the relevant ASCII text strings that are sent by the system that the HMI-4420A is connected to.

Multidrop mode:

Communications to the display using the multidrop mode are very similar to the simple text mode, however you must send the unit address at the start of your text string so that the text is displayed on the unit that you intend it to be. The text string would take the format of that illustrated below:

<An> Text to be displayed including any formatting characters 'etx'

Where *n* is the unit address as a single hexadecimal character (not ASCII), 01 to FF for unit address 1 to 255. **Broadcast:** If n = 0 then the text string will be displayed on all of the HMI's that are connected.

'etx' is the ASCII character etx (Hex 03) do not include the quotation marks in you text string.

The unit will reply with the status of it's keys (pressed or not) in the form of a three character message (as described below) when it receives a text string that is for itself ie. the text string starts with the unit's address.

However the unit will not reply with the status of it's keys if it receives a broadcast message.

If you require to know the status of the keys on a particular unit but do not wish to send it a text string to be displayed then send the command below:

<Kn>

Where *n* is the unit address as a single hexadecimal character (not ASCII), 01 to FF for unit address 1 to 255. Use the unit address for the unit that you wish to know the key status of. The unit will reply with a three character message. Note that you can not use address 0 with this command.

Formatting Characters (applicable to Simple Text Mode and Multidrop mode):

HEX 09: Sending this value to the display will cause the line of text to be cleared to the end of the line from wherever the cursor is. Note: This is usually the value for ASCII tab (tab).

HEX 0A: Sending this value to the display will cause the cursor to jump to the start of the next line. This is the value for ASCII line feed (lf).

HEX 0C: Sending this value to the display will cause the display to be cleared and the cursor to go to the start of the first line. This is the value for ASCII form feed (ff).

HEX 0D: Sending this value to the display will cause the cursor to go to the start of the first line. This is the value for ASCII carriage return (cr).

Using The Function Keys (applicable to Simple Text Mode and Multidrop mode):

When a function key is pressed a start character is sent followed by a byte of data of which the bottom 4 bits of this byte correspond to the bit pattern of keys pressed, a terminating character is then sent.

In **simple text mode** the keypress data is sent when a key is pressed, in **multidrop mode** the keypress data is only sent when the unit is being addressed, therefore if the unit is not being addressed when a key is pressed then that key press will be missed.

The start and terminating characters can be configured using the HMI-4420A configuration software 'HMI', but as default are set to: Start: decimal 2 (ASCII STX) and Terminate: decimal 13 (ASCII Carriage return). Please see the next page for a more detailed explanation:

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Communication Details (continued)

Ignoring start and terminating characters the byte of information that is sent back for various key presses is shown below (in Hex):

Example 1:   **Key F1 pressed:**   **31 (Hex)**
Example 2:   **Key F3 pressed:**   **34 (Hex)**
Example 3:   **Key F1 and F4 pressed at the same time:**   **39 (Hex)**
Example 4:   **Keys F1, F2, F3 and F4: all pressed:**   **3F (Hex)**

Explanation:

If the hexadecimal number that is generated by the key presses is shown as the binary value the bit pattern that is been generated will become clearer:

Example 1:   **31 (Hex) = 00110001 (binary)**
Example 2:   **34 (Hex) = 00110100 (binary)**
Example 2:   **39 (Hex) = 00111001 (binary)**
Example 3:   **3F (Hex) = 00111111 (binary)**

It can be seen from the above that key F1 is the least significant bit.

To remove the 30 (Hex) 'offset' from the byte that is returned and therefore produce an exact bit pattern of the key(s) pressed the value of the data byte should be ANDed with 0F (Hex) e.g:

Example 1:   **31 (Hex) AND 0F (Hex) = 01 (Hex) = 00000001 (binary)**
Example 2:   **34 (Hex) AND 0F (Hex) = 04 (Hex) = 00000100 (binary)**
Example 3:   **39 (Hex) AND 0F (Hex) = 09 (Hex) = 00001001 (binary)**
Example 4:   **3F (Hex) AND 0F (Hex) = 0F (Hex) = 00001111 (binary)**

LED descriptions

The LEDs are located on the rear of the unit:

Label:	Function:	Colour:
Prog	Illuminates when the configuration lead is connected	Amber
RxD	Illuminates when the unit is receiving data	Green
TxD	Illuminates when the unit is sending data	Red

This space is intentionally blank

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Communication Details

Communication Settings:

The HMI-4420A comes pre-configured with default factory settings and is ready for use. However if these settings need to be changed they can be, using the supplied software 'HMI' and your FMT / BIS programming lead (Order: FMT-PL). The various options along with the defaults are shown below:

Baud Rates:
- 1200
- 2400
- 4800
- **9600 (default factory setting)**
- 19200
- 38400
- 57600

Comms Option:
- **RS232 only (default factory setting)**
- RS485 2-wire
- RS485 4-wire

Protocol:
- **Simple Text (default factory setting)**
- Multidrop Protocol

Address: 1 to 255 (only applicable to the multidrop protocol)

Data and Parity bits:
- 7 data bits, Even Parity
- 7 data bits, Odd Parity
- **8 data bits, No Parity (default factory setting)**
- 8 data bits, Even Parity
- 8 data bits, Odd Parity

Key Press String: Start Character Value: Any character allowable **(decimal 2, ASCII stx, is the default factory setting).**
Terminating Character Value: Any character allowable **(decimal 13, ASCII carriage return, is the default factory setting).**

Other Adjustable Parameters

Display Brightness:

The brightness of the display can be adjusted via the HMI-4420A configuration program 'HMI'. The brightness value can be set from 3 (bright) to 0 (dim). This value is downloaded to the display as part of the configuration. **The value is preset to the default factory setting of 3.**

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Mechanical Details

28.5

137.0

117.0

68.0

88.0
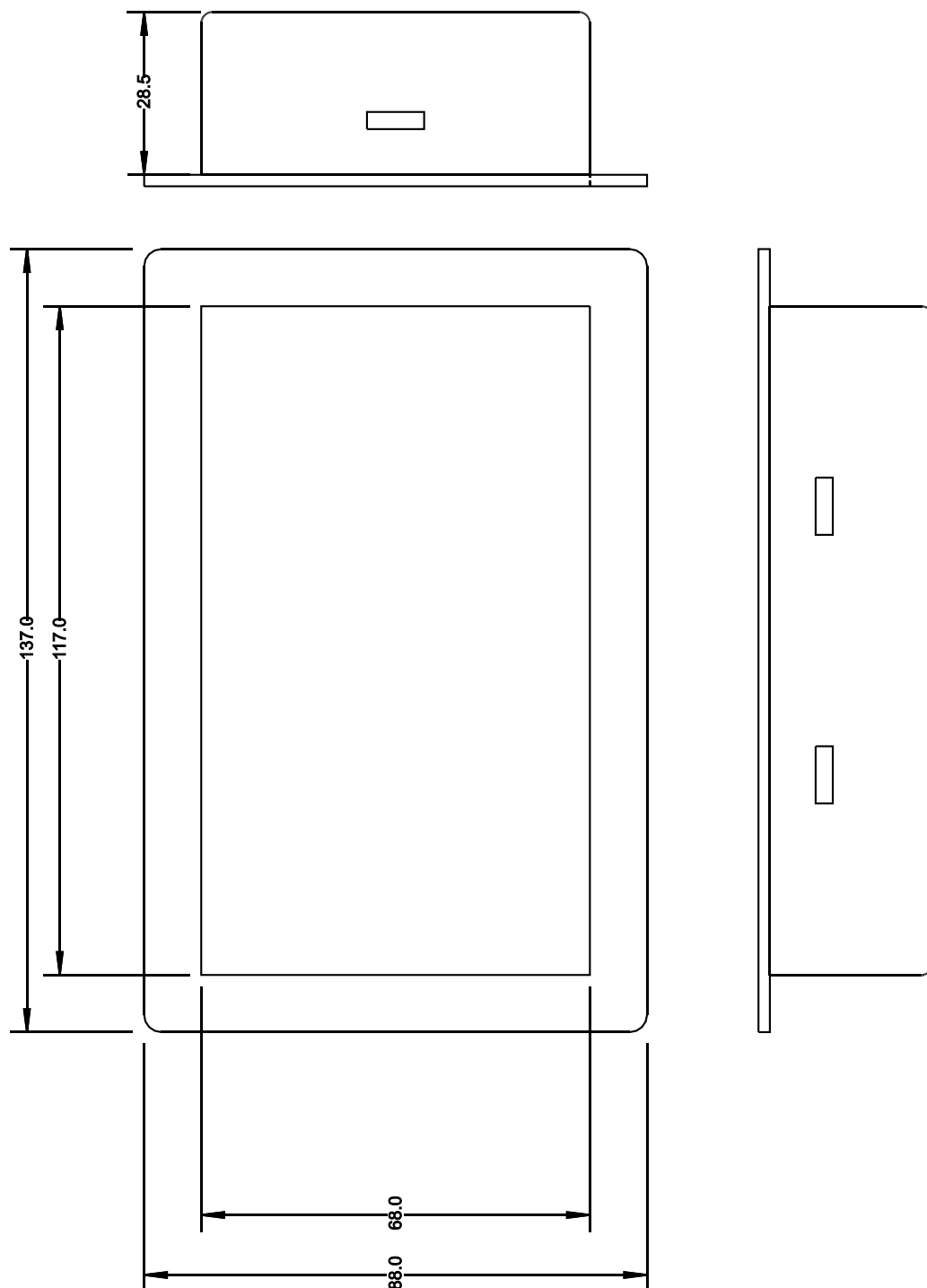
Panel Cut Out and Mounting of the HMI

The panel cut out size required is 119mm x 70mm (tolerance +/- 0.5mm).

To mount the HMI-4420A to the panel first pass the gasket over the back of the HMI-4420A then place the HMI-4420A into the hole previously cut into the panel ensuring that the gasket is 'sandwiched' between the HMI and the panel. Now take the two mounting brackets supplied and place the 'ears' of these brackets into the slots on either side of the HMI. Now turn the screws on the brackets clockwise until the brackets pull the HMI tight against the panel.

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ASCII Table

Note 1: These HEX values refer to the special formatting characters (see Communication Details section)

The characters in the above table may be displayed on the HMI-4420A by sending the appropriate ASCII value to the display. If using the text string function within Flex32 to create text strings to be sent from your FMT / BIS programmable controller then 'normal' characters (ABC def 123 ? £ ! etc) may be entered into the text string as they appear. If you require 'special' characters to be displayed (graphic symbols, arrows, various size square blocks etc. as in the above table) then you will need to enter the ASCII value (in HEX) into the text string, 'click' on the 'ASCII' button within the text string editor to enter the required value.

The HEX value for any character can be obtained from the table as follows: select the character you require, the ASCII HEX value is given first by the column and then by the row that the character resides in the table..

Examples: A has the ASCII HEX value of 41

                        h has the ASCII HEX value of 68

                        9 has the ASCII HEX value of 39

HMI Configuration Software

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The HMI-4420A is supplied with free configuration software so that any of the default settings may be altered if required. The main points of the software are highlighted in the screen shots below - it will be found that the software is self explanatory when used.
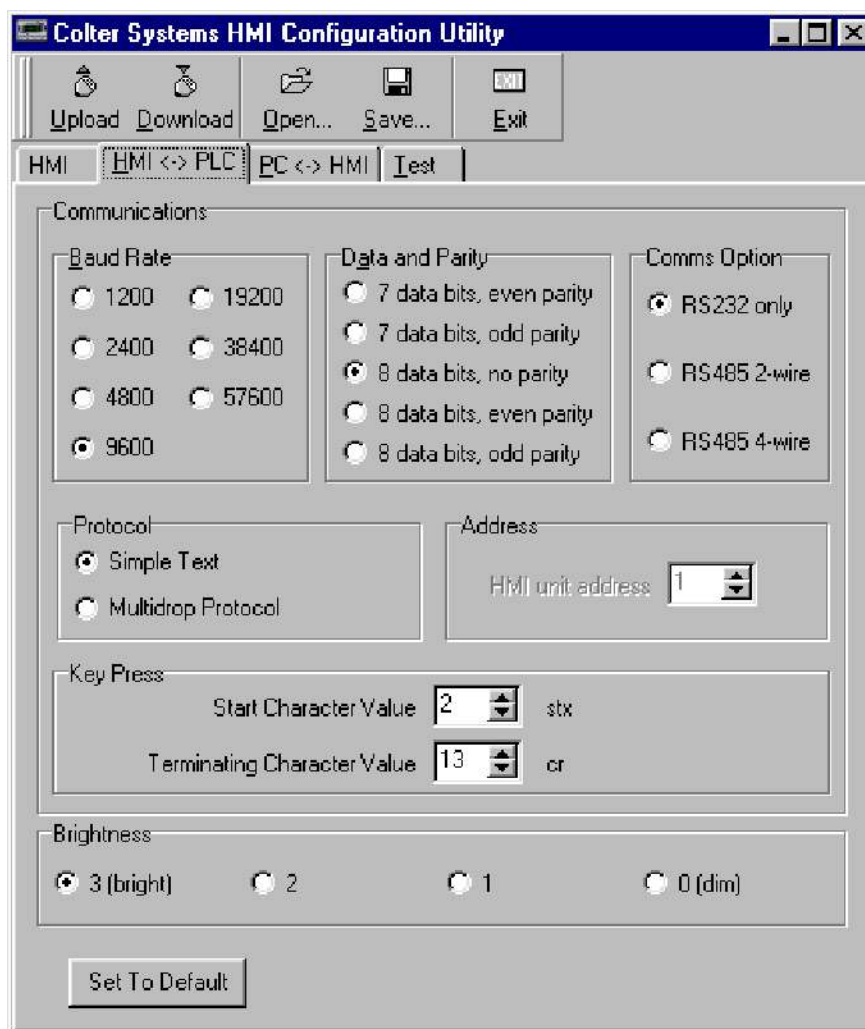

The above screen is displayed when the HMI <-> PLC tab is 'clicked'. Here settings for the HMI to PLC communications can be altered. Click on the button by the settings that you require. After the settings are as you require click the download button and the configuration will be downloaded to the HMI-4420A (you must have the configuration lead (FMT-PL) plugged into the HMI-4420A and to you PC's RS232 serial port).

Notes:

Comms Options: RS232 only: Select this if you only intend to use RS232 communications.

RS485 2-wire: Select this if you intend to use RS485 two wire communications (ensure jumper links are set on the HMI-4420A as well).

RS485 4-wire: Select this if you intend to use RS485 four wire communications (ensure jumper links are set on the HMI-4420A as well).

Protocol Set to simple text if using simple text mode or multidrop protocol if using several HMIs multidropped together

Address: HMI unit address. Set between 1 and 255 if using multidrop mode

Set To Default: Sets HMI to default factory settings, click on the download button after clicking the Set To Default button

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HMI Configuration Software
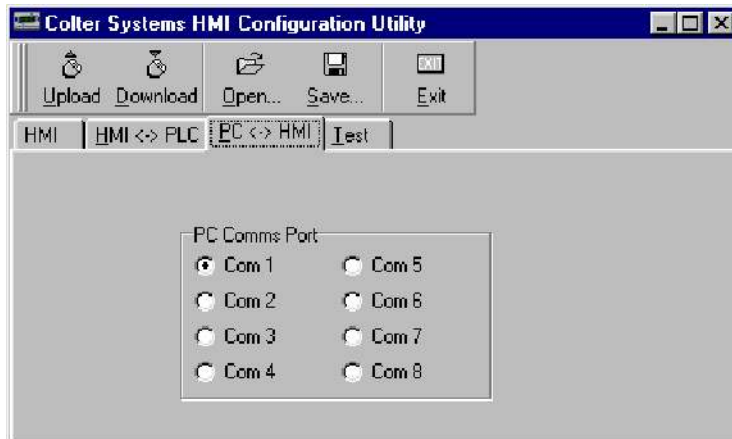
The above screen is used to set which PC communications port the HMI configuration software will use. Select the port that you will be connecting the configuration lead to then click the download button
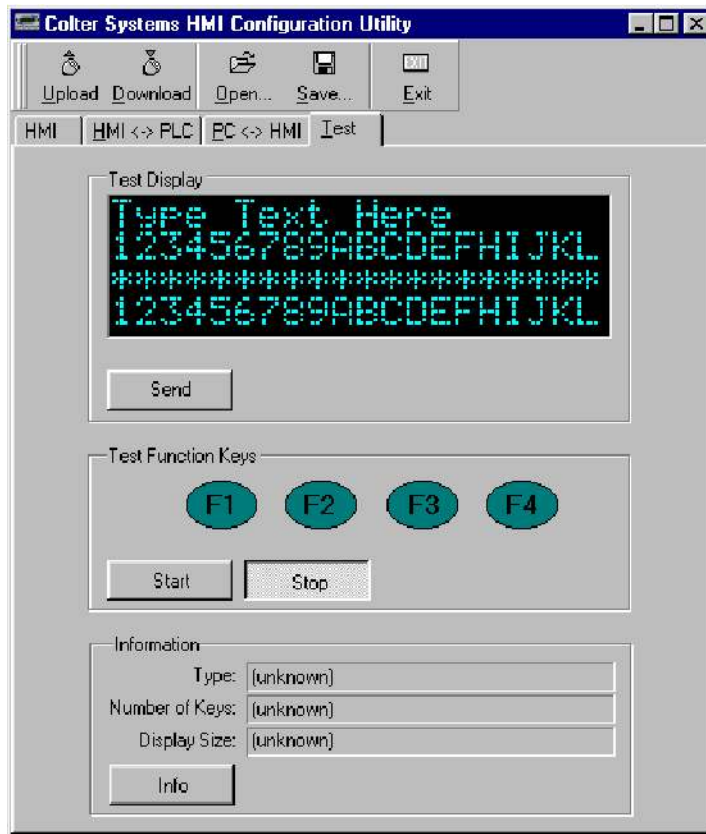
The above screen may be used to test the HM-4420A when the configuration leadis plugged into the HMI-4420A and you PC.
To test the text display: Type text you wish to display in the window then click send. The text should appear on the HMI-4420A display.
To test the function keys: Click the start button, when a function key is pressed on the HMI-4420A it should be highlighted in the configuration software.
Information: Click this button to see information about the HMI-4420A that you are connected to.

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Order Codes

Part Number
HMI-4420A

COLTER GROUP

COLTER PRODUCTS LIMITED

UNIT 7, ZONE C
CHELMSFORD ROAD INDUSTRIAL ESTATE
DUNMOW
ESSEX
CM6 1HD

Telephone: + 44 (0) 1371 876887
Fax: + 44 (0) 1371 875638

E-Mail: sales@coltergroup.co.uk
Web Site: www.coltergroup.co.uk

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