



CP410

Installation and Operation Manual

ABB, 1SBC159101M0202 2008-09

English

CP410 Installation and Operation Manual

Foreword

CP410 is a Human Machine Interface (HMI) with a 3" STN Liquid Crystal Display, and is water- and dust-resistant according to IP65/NEMA 4X (indoor use only).

CP410 is CE-marked and meets your need to be highly transient-resistant while in operation.

Also, its compact design makes connections with other machinery more flexible, thus achieving the optimal performance of your machines.

CP400Soft is used to design applications of CP410; it is reliable, user-friendly and compatible with many models.

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Please read the entire installation manual prior to installing and using this equipment.

Only qualified personnel may install, operate or repair this equipment. ABB is not responsible for modified, altered or renovated equipment.

Because the equipment has a wide range of applications, users must acquire the appropriate knowledge to use the equipment properly in their specific applications.

Only parts and accessories manufactured according to specifications set by ABB may be used.

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Contents

1 Safety Precautions

Both the installer and the owner and/or operator of the operator terminal must read and understand this installation manual.

General

- Only qualified personnel may install or operate the operator terminal.
- The operator terminal must be installed according to the installation instructions.
- The operator terminal is designed for stationary installation on a plane surface, where the following conditions are fulfilled:
 - no high explosive risks
 - no strong magnetic fields
 - no direct sunlight
 - no large, sudden temperature changes
 - for use in Pollution Degree 2 Environment
 - for use on the flat surface of Types 1 and 4X (indoor use only) enclosures
- Never allow fluids, metal filings or wiring debris to enter any openings in the operator terminal. This may cause fire or electrical shock.
- The operator terminal fulfills the requirements of article 4 of EMC directive 2004/108/EC.
- Storing the operator terminal where the temperature is lower/higher than recommended in this manual can cause the LCD display liquid to congeal/ become isotopic.
- The LCD display liquid contains a powerful irritant. In case of skin contact, wash immediately with plenty of water. In case of eye contact, hold the eye open, flush with plenty of water and get medical attention.
- The supplier is not responsible for modified, altered or reconstructed equipment.
- Use only parts and accessories manufactured according to specifications of the supplier.
- Peripheral equipment must be appropriate for the application and location.
- The figures in this manual serves an illustrative purpose. Because of the many variables associated with any particular installation, the supplier cannot assume responsibility for actual use based on the figures.
- The supplier neither guarantees that the operator terminal is suitable for your particular application, nor assumes responsibility for your product design, installation or operation.

Safety Precautions

Power source

- The operator terminal is equipped with a 24 V DC input. Supply power other than 24 V DC \pm 15% will severely damage the operator terminal. Thus, check the power supply supporting the DC power regularly.

Grounding

- Without grounding, the operator terminal may be severely affected by excess noise. Make sure that the grounding is done properly from the power connector at the rear side of the operator terminal. When power is connected, make sure that the wire is grounded.
- Use a cable of at least 2 mm² (AWG 14) to ground the operator terminal. Ground resistance must be less than 100 Ω (class3). Note that the ground cable must not be connected to the same ground point as the power circuit.

Installation

- Communication cables must be separated from power cables for operational circuits. Only use shielded cables to avoid unpredictable problems.

During Use

- Emergency stop and other safety functions may not be controlled from the operator terminal.
- Do not use too much force or sharp objects when touching the keys, display etc.

Service and Maintenance

- Only qualified personnel should carry out repairs.
- The agreed warranty applies.
- Before carrying out any cleaning or maintenance operations, disconnect the equipment from the electrical supply.
- Clean the display and surrounding front cover with a soft cloth and mild detergent.

Dismantling and Scrapping

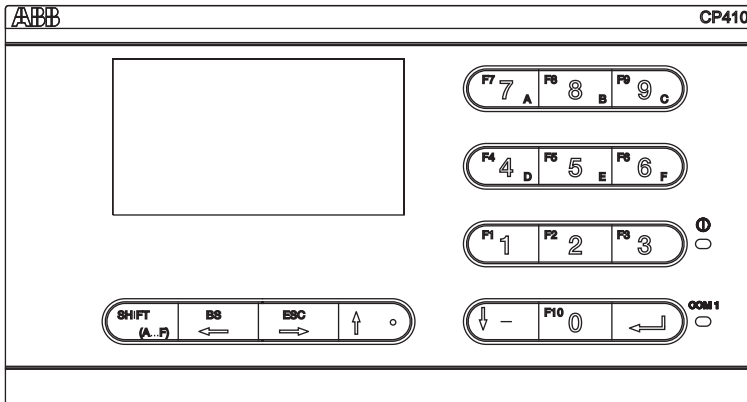
- The operator terminal or parts thereof shall be recycled according to local regulations.
- The following components contain substances that might be hazardous to health and the environment: lithium battery, electrolytic capacitor and display.

2 Installation

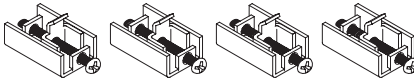
2.1 Package Contents

The following parts are found in the box:

- Operator terminal CP410



- 4 installation fasteners



- Power connector (connected to the 24 V DC power input)



- Installation and operation manual (1SBC159101M0202)

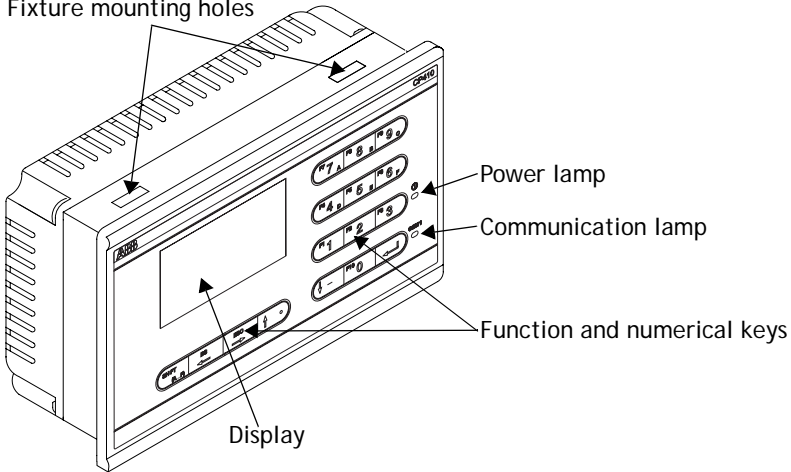
3 Product Specifications

Parameter	CP410
Front panel, W x H x D	173.0 x 105.5 x 7.8 mm
Mounting depth	51.8 mm
Cut-out dimensions	160.8 x 93.3 mm
Front panel protection	IP 65/NEMA 4X (indoor use only)
Keypad specifications	16 mechanical switches. Lifetime of each switch is over 500,000 activations. Membrane overlay is resistant to most solvents and chemicals.
Weight	0.37 kg
Communication ports	RS232/RS422/RS485
Flash ROM	4 MB
RAM	128 KB
CPU	32-bit RISC
Battery backed memory	No
Real time clock	Yes
Display	Mono STN LCD. 160 x 80 pixels, black/white with 16 gray levels. Yellow-green LED backlight lifetime: approximately 50,000 h.
Active area of display, W x H	65 x 35 mm. 20 x 10 characters of 8 x 8 size can be displayed.
Contrast adjustment	Contrast adjustable by potentiometer on the back.
Power supply	24 V DC \pm 15% (or 20 - 28 V DC). Less than 8 W.
Ambient temperature	0 ° to +50 °C
Storage temperature	-10 ° to +60 °C
Ambient humidity	20 - 90% RH non-condensed
Vibration endurance	0.5 mm displacement, 10-55 Hz, 2 hours per X-, Y- and Z-axis directions
Shock endurance	10 G, 11 ms 3 times in each direction of X-, Y- and Z-axes
CE	EN-61000-6-4, EN-61000-6-2
Cooling	Natural cooling

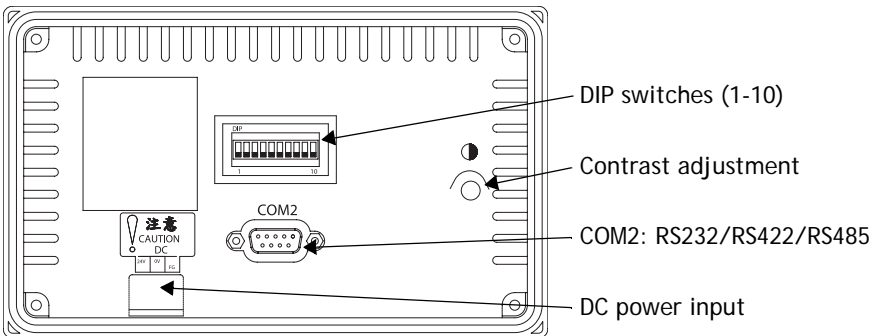
3.1 Description of Parts

Front

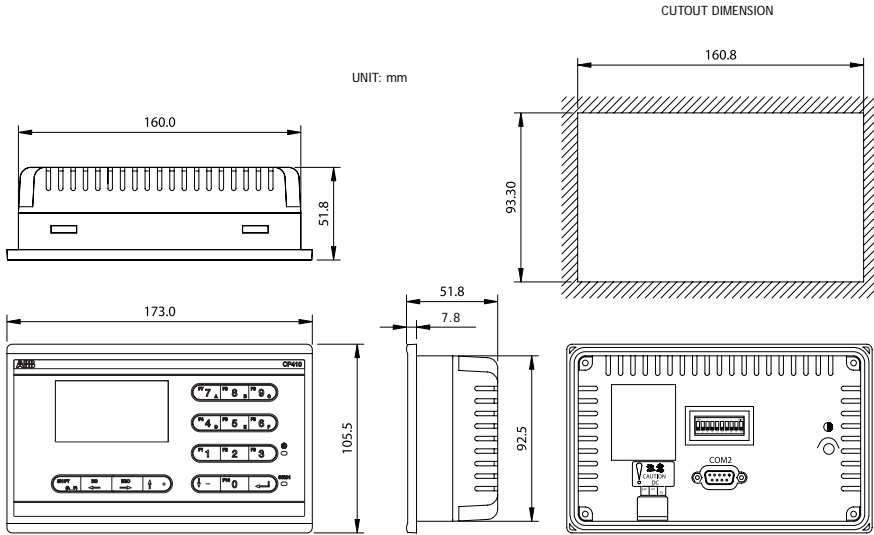
Fixture mounting holes



Back

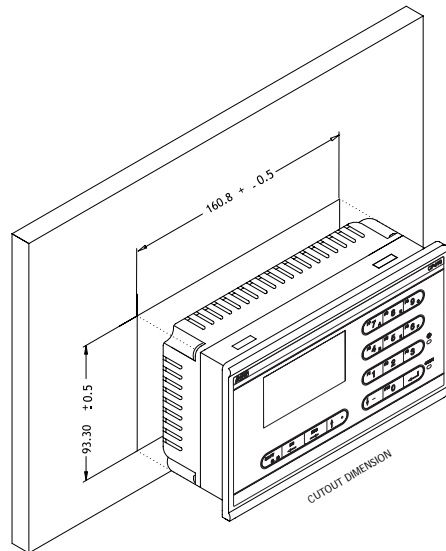


3.2 External and Cut-out Dimensions

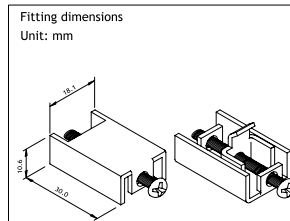
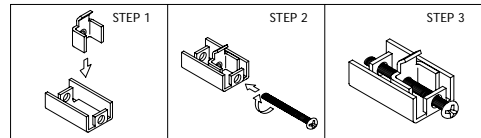
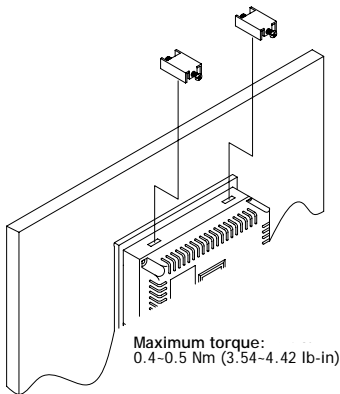


3.3 Mounting Procedure

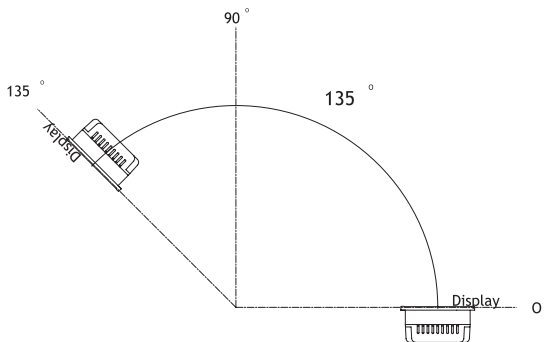
1. Cut out the control front panel to match the dimensions (mm) below.



2. Mount the operator terminal into the cut-out. Insert the fixtures to the holes on the unit and fasten the screws into the front panel. Do not tighten the screws with too much force or it may cause the deformation of the operator terminal.



3. The operator terminal is to be installed within the angle of 0 to 135 ° as shown below.



3.4 Grounding

To make sure that the operator terminal works properly and to prevent it from radiating radio frequency noise, it must be connected to the earth ground.

3.5 Power Supply and Wiring

CP410 must use the power supply with 24 V DC and the power consumption is 8 W.

Warning:

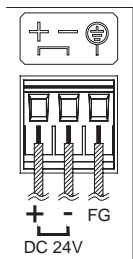
To avoid an electrical shock, be sure to switch off the power before connecting the communication/download cable to the operator terminal.

Perform the following steps to wire the power connector:

1. Unplug the power connector and unscrew the screws.
2. Strip approximately 7-8 mm of insulation. Insert the wire all the way into the power connector and then turn the screws tight.
3. Plug in the connector to the power input of the operator terminal.

Note:

The power connector is already plugged into the power input of operator terminal when the package is first opened.



Use copper conductors only, 60/75 °C.

Type	Wire Gauge (AWG)	Stripped Length	Torque
Solid	28-12	7-8 mm	4.5 lb-in
Stranded	30-12	7-8 mm	4.5 lb-in

4 Dip Switches

Dip switch		Function
SW1		Reserved
SW2		Reserved
SW3	SW4	Operation Mode
ON	ON	Runs user application
ON	OFF	Runs burn-in test program
OFF	ON	Updates BIOS
OFF	OFF	Runs bench test program
SW5		Communication Parameters
ON		The operator terminal uses the communication parameters defined on the operator terminal's configuration screen for controller communication.
OFF		The operator terminal uses the communication parameters defined in CP400Soft for controller communication.
SW6		Password
ON		The operator terminal asks the operator to enter a password after power-on self-test.
OFF		No password is required to start the operator terminal.
SW7		System Menu
ON		The operator terminal displays the system menu.
OFF		The operator terminal runs user application without displaying the system menu.
SW8		Default User Level
ON		The default user level is set to 1 if the operator terminal requires no password to start its operation.
OFF		The default user level is set to 9 if the operator terminal requires no password to start its operation.
SW9		Reserved (no function)
SW10		Com2 Port
ON		For RS485, this switch has to be set ON.
OFF		For RS422, this switch has to be set OFF.
		For RS232, this switch has no effect.

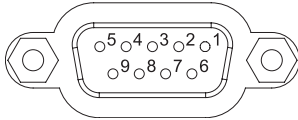
5 Communication Port

COM2 is used to connect the operator terminal to a controller via RS232, RS422 or RS485. COM2 is a 9-pin female connector.

Note:

Make sure that the connection is in accordance with the setting of the dip switches, for example RS485 corresponds to SW10 = ON. See section [4 Dip Switches](#).

COM 2



Pin	Function
1	RS422 TX+ (RS485+)
2	RS232 RXD
3	RS232 TXD
4	RS422 RX+
5	Signal ground
6	RS422 TX- (RS485-)
7	RS232 RTS
8	RS232 CTS
9	RS422 RX-

For connection between the operator terminal and the controller, please see the controller documentation.

6 LCD Contrast Adjustment

The potentiometer on the back of the operator terminal is used to adjust LCD Contrast (STN LCD). Use a small screwdriver to turn the potentiometer (clockwise = contrast down; counter-clockwise = contrast up).

7 Operation

7.1 Self Test

Once the operator terminal is turned on, it will automatically execute a self-test to check its hardware. The results of the self-test will be displayed on the screen according to the following picture.

```
BIOS Version V1.0
(C) 2007 ABB
System RAM.... 128KB
Flash Memory.... 4MB
Battery check..... ^ (or x)
Parameter check... ^ (or x)
BIOS check..... ^ (or x)
Firmware check.... ^ (or x)
Application check. ^ (or x)
RTC check..... ^ (or x)
DIP SW 8~1: 11011111 (or other combinations)
```

If any of the tests does not pass the self-test, the following message will be displayed on the screen for about two seconds and then disappear.

```
Error code: 0x18
Wait for a minute
to continue
```

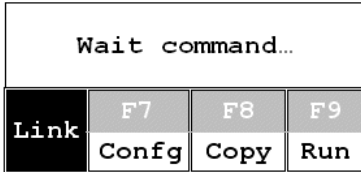
If the power to the operator terminal or the PC was interrupted while downloading, **Firmware check** or **Application check** will not pass the self-test, indicated by an x-mark in the self-test results after power is restored. If this happens, the user can simply follow the download procedure to re-download the application or data. After downloading again, all items should pass the self-test.

Note:

When using the operator terminal for the first time, remember to reset the real time clock (RTC).

7.2 System Menu

Set the dip switch SW7 = ON. After the self-test, the system menu of the operator terminal is displayed on the screen:

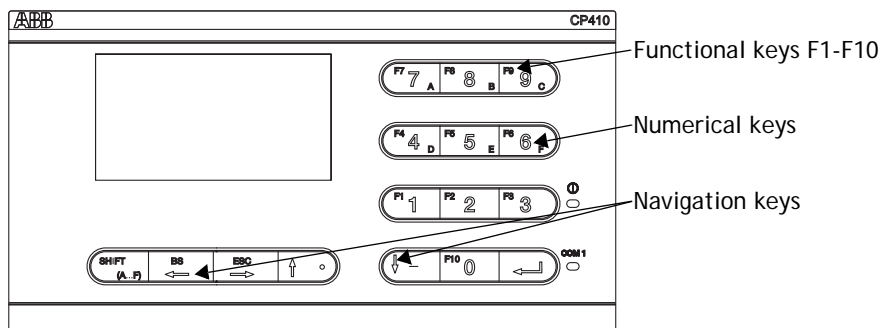


A command that is highlighted with black background on the screen is currently being executed by the operator terminal. Commands with gray background (e.g. F7, F8 ...) can be executed if the associated function keys are pressed. The functions of the commands are briefly explained below:

System menu command	Function
Link	The operator terminal is connected.
F7 - Config	Sets up the internal time clock and communication parameters in the operator terminal. Use ← and → to move to desired field and ↑ and ↓ to set the value of the field.
F8 - Copy	Copies application data to another CP410.
F9 - Run	Runs the application.

7.3 Key Pad

The CP410 has 16 keys, that can be categorized into **Numerical Keys**, **Navigation Keys** and **Functional Keys**.

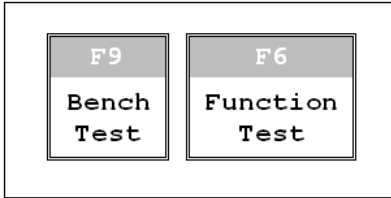


The **Functional** or **Auxiliary Keys** F1- F10 can be defined in CP400Soft. They can, for example, be used to set a controller bit or register, to change a screen or to display a password table. Please see the CP400Soft User's Manual for details.

When a key is pressed, the operator terminal will make a “beep” sound to signal that a command is pressed. The default setting, a 200 ms beep, can be configured in CP400Soft.

7.4 Bench and Function Tests

Set dip switches **SW3** and **SW4** = **OFF** to be able to run the bench and function tests for the CP410. Turn on the operator terminal to display the following screen:



The following items are tested:

CP410	Description	
F9 - Bench test	Keyboard Test: 16 keys BIOS: System RAM, Flash memory, Buzzer, LED, BIOS, Battery Status, RTC, COM port, Flash ROM	
F6 - Function Test	F1: LED F2: Buzzer F3: DIP SW F4: LCD	F5: RS232 F6: RS422 F7: RS485 F8: KEY

7.5 Setting Parameters

There are two ways to configure working parameters; to set parameters in the operator terminal or in CP400Soft.

To set parameters in the operator terminal, select **F7 - Config** in the system menu.

Note:

Remember to set dip switch **SW5** = **ON** if parameters are set in the operator terminal.

To set parameters in CP400Soft, select **Application/Workstation Setup**. Select the **Connection** tab to set communication parameters.

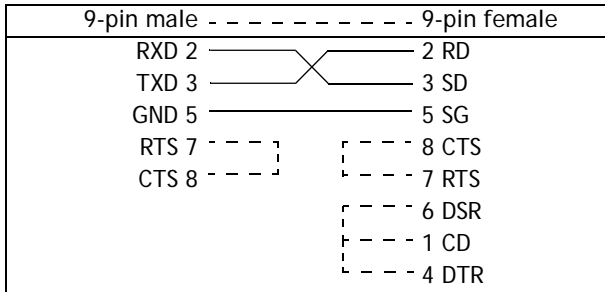
Note:

Remember to set dip switch **SW5** = **OFF** if parameters are set in CP400Soft.

7.6 Downloading an Application

Connect the RS232 port on the PC to the COM2 port on the CP410 using a TK401 cable.

The connection can also be made according to the the illustration below:



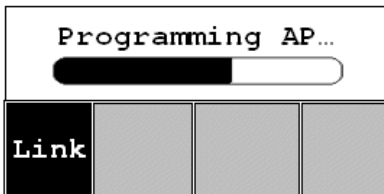
Warning:

To avoid an electrical shock, be sure to switch off the power before connecting the download cable to the operator terminal.

Set the dip switch **SW7 = ON**. After the self-test, the system menu will be displayed on the screen and the operator terminal is ready to download the application.

Start CP400Soft and open the application file to be downloaded. Make sure that the communication parameters are correctly configured. Also remember to compile the file before downloading it. The file has to be compiled every time a change has been made in the file before downloading it.

Then select **Application/Download Firmware/Application** in CP400Soft if it is the first time to download the application to the operator terminal; otherwise, select **Application/Download Application**. The following appears on the screen while the operator terminal is downloading:



7.7 Uploading an Application

An application can also be uploaded from the operator terminal to the PC. Thus, a user can save an application as a *.V6F file in CP400Soft for future use.

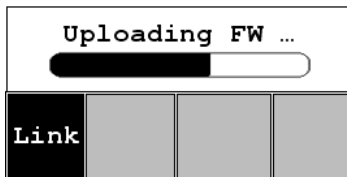
Warning:

To avoid an electrical shock, be sure to switch off the power before connecting the communication cable to the operator terminal.

Make sure that the operator terminal and the PC are connected according to section [7.6 Downloading an Application](#). Set the dip switch **SW7 = ON**. After the self-test, the system menu will be displayed on the screen and the operator terminal is ready to upload the application.

Also make sure that communication parameters are correctly configured. Select **File/Upload Application** in CP400Soft and the **Save As** dialog box will appear on the screen. Enter the name of a firmware file (*.AF6) to save. Click **Save**. Then the operator terminal will prompt for a password: enter the password set in CP400Soft from **Application/Workstation Setup**. Once the correct password is entered, the operator terminal starts to upload the application to the PC. For information about setting a password, please see section [7.9 Passwords](#).

While the operator terminal is uploading, the following is displayed:



After uploading, select **File/Reconstruct Source** in CP400Soft to display the **Open** dialog. Open the uploaded application file (*.C64 or *.AA6). The application screen will be displayed on the PC monitor. Finally, select **File/Save As** to save the application as a *.V6F file. Thus a source file can serve the purposes of maintenance and modification.

Note:

When uploading for the first time, make sure to first run the application once, or else the upload function will not work.

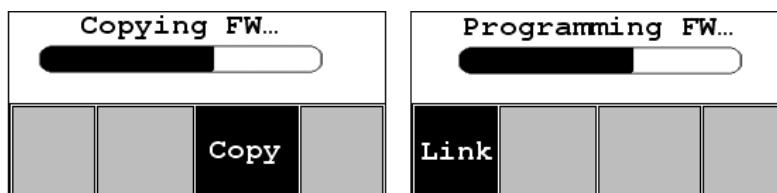
7.8 Copying an Application

To copy an application from one CP410 to another CP410, select **F8 - Copy** from the system menu. Set the dip switch **SW7 = ON** and connect the two operator terminals with a download cable using COM2. After the self-test, the system menu will be displayed on the screen.

Select **F8 - Copy** in the system menu from the operator terminal with the application to be copied. The operator terminal will prompt for a password: enter the password set in CP400Soft from **Application/Workstation Setup**. Once the correct password is entered, the CP410 starts to copy the application to the other CP410.

For information about setting a password, please see section [7.9 Passwords](#).

The following appears on the screens during the copying:



Note:

When copying for the first time, make sure to first run the application once, or else the copy function will not work.

7.9 Passwords

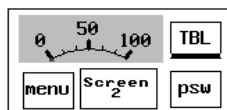
Scenario 1: Requiring a password to start the operator terminal

If the dip switch SW6 = ON, the user needs to enter a password to start the operator terminal. For this purpose, the designer can use the object **Action Button** in CP400Soft to create a button which displays the password table on the operator terminal display. A user with the right to access the table can register passwords and user levels in the table, shown below.

#	Password	Lv1
1	00000000	1
2	00000000	1 F1:
3	00000000	1 CANCEL
4	00000000	1
5	00000000	1
6	00000000	1 F2:
7	00000000	1 OK
8	00000000	1

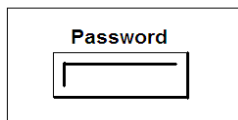
Use the arrow keys ←, →, ↑ and ↓ to move and the ↵ key to highlight an area for entering a value.

In the illustration below, the **TBL** button is an action button used to display the password table. When the button is selected the password table is displayed on the screen for a user with the right to access the table.



How to configure an **Action Button** is described in the CP400Soft User's Manual.

After registering passwords and user levels, set the dip switch SW6 = ON (i.e. password required). Restart the operator terminal and after the self-test the user will be prompted to enter a password in order to run the operator terminal.



The operator terminal will determine the user level from the entered password. For instance, if the level of the password entered by the user is 1, then the operator terminal will set the user level to 1; if the level of the password entered by the user is 2, then the operator terminal will set the user level to 2. **User level 1** has the highest privilege and **User level 9** has the lowest.

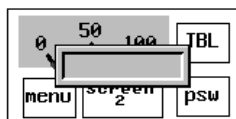
Note:

Only users of **User Level 1** has the right of access to the password table.

Scenario 2: Re-entering a password

The object **Action Button** in CP400Soft also allows the designer to create a button which asks the user to re-enter a password.

In the example below, the **psw** button is used to prompt a user to re-enter a password. After entering the password, the operator terminal will update the user level according to the most recent password which has been entered. Therefore, this button can be applied to raise or drop one's privileges while the operator terminal is in operation.



How to configure an **Action Button** is described in the CP400Soft User's Manual.

Scenario 3: Password-protecting a button in the operator terminal

The designer can create a button which is protected by a password for execution. For example, a **Goto Screen** button can be designed with a high level of security; which means that a password with a high level of privilege is required in order to open the other screen. As the button is selected and the current user has a lower privilege than has been set for the button, the operator terminal will prompt the user for a password. The user will need a password with at least the level of privilege that has been set for the button. This function can restrict users to access to certain parts of the application.

Scenario 4: Requiring a password to copy or upload application

When selecting **F8 - Copy** in the system menu or **File/Upload Application** in CP400Soft, the operator terminal will prompt for a password. The user will need to enter the correct password to copy an application from one CP410 to another. Note that setting this password is different from the passwords set in Scenario 1-3. To set this password, select **Application/Workstation Setup** in CP400Soft. Under the **Password** tab, the designer is able to set the password.



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