PWS3000/3100 PLC WORKSTATION

APPLICATION MANUAL

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About PWS3000/3100

D.1 Introduction

The PWS3000/PWS3100 is equipped with a 9.4" VGA sized (640Hx480V) flat panel display and analog resistive touch screen. The IP 65 (NEMA 4) rated front panel seal and INDUSTRIAL GRADE touch screen make the product rugged and durable. There are THREE display options: color TFT LCD, black and white FSTN LCD, and blue mode STN LCD. You can choose appropriate ones according to your application's requirement. Every PWS3100 Workstation comes with a LPT port that allows you to hardcopy the current screen. This is a way of generating documents with sophisticated formats. The upgraded model PWS3100 is more compact and compatible with PWS3000 as well.

This chapter describes how to install your Workstation in a panel, set its DIP switches, and make cables for its communications and printer ports.

D.2 General Specification of PWS3100/3120

Item	standard	PWS3100-STN	PWS3100-FSTN	PWS3100-TFT
	enhanced	PWS3120-STN	PWS3120-FSTN	PWS3120-TFT
Display Type		Mono STN LCD	Mono FSTN LCD	Color TFT LCD
Display Color		Blue;16 grey levels	B/W;16 grey levels	16 colors
Display Size		9.4" (diagonal)		
Number of Pixels		640x480		
Display Adjustment		Contrast only	Contrast only	Brightness only
Back Light		CCFT	CCFT	CCFT
Touch Screen		Analog resistive type; Max. Number of switches are 80x60 Chemically strengthened glass backing panel; Over 1 million point activations; Hard coat is resistant to most solvents and chemicals		
Flash Memory		768KB (640K Byte for application)		
Battery Backed Memory		64KB SRAM ** only suited for PWS-3120-xxx series		
Communication Ports		COM1: RS232/RS422; COM2: RS232/RS422/RS485		
Printer Port		Centronics compatible		
Power Consumption		24VDC±10%;12W	24VDC±10%;12W	24VDC±10%;18W
Operating Temperature		0~50°C	0~45°C	0~50°C
Ambient Humidity		20-90% RH (non-condensing)		
Storage Temperature		-20~60°C	-20~60°C	-20~60°C
Front Panel Seal		IP 65 / NEMA 4		
Vibration Endurance		0.5mm displacement, 10-55Hz, 2 hours per X, Y, and Z-axis directions		
Shock Endurance		10g, 11ms three times in each direction of X, Y, and Z axes		
RF Emissions		CISPR 22, Class A		
Electrostatic Discharge		IEC 801-2 Level 3		
RF Susceptibility		IEC 801-3 Level 2		
High Frequence Transients		IEC 801-4 Level 2		

Weight	**2.9 Kg**	**2.9 Kg**	**3.2 Kg**
Cooling	**Natural cooling**		

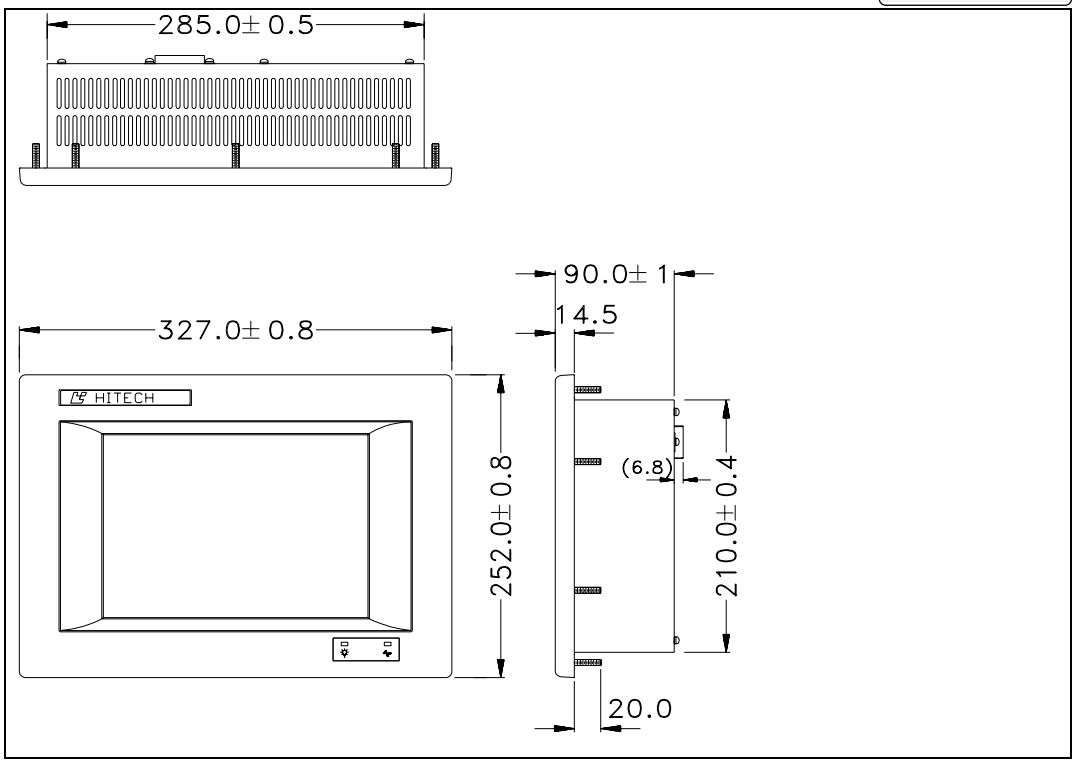
D.2.1 Environment

Listed below are the various environment specifications and tolerances of the Workstation.

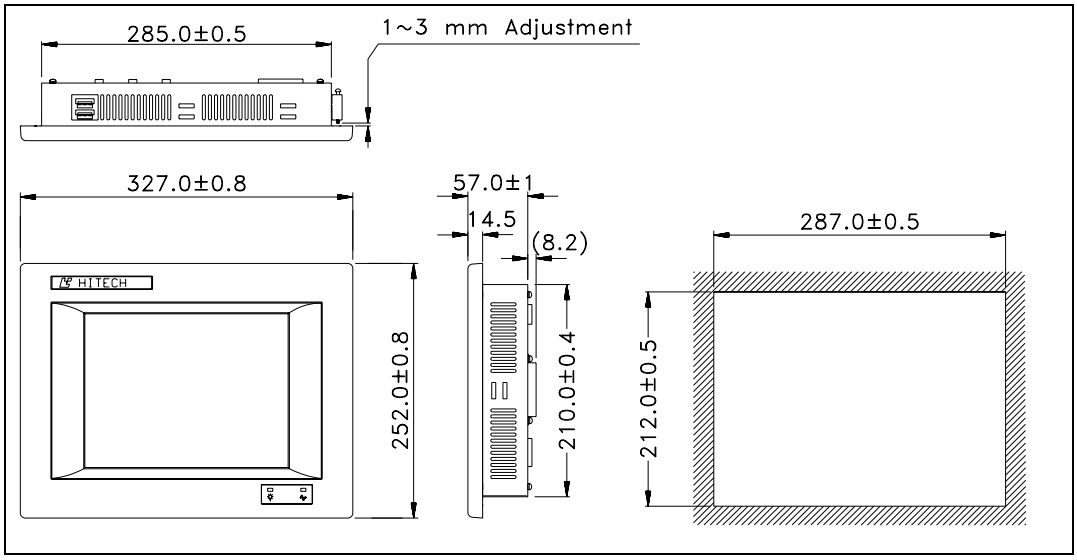
Item / Model	30xx-STN 31xx-STN	30xx-FSTN 31xx-FSTN	30xx-TFT 31xx-TFT
Operating Temperature	0~50°C	0~45°C	0~50°C
Relative Humidity (non-condensing)	10~85%	10~85%	5~90%
Shock and Vibration	The Workstation passes the tests of IEC 68-2-6 and IEC 68-2-27.		
Front Panel Seal	Your unit is rated for NEMA 4 (water-tight) and NEMA 12 (dust-tight) environment, provided you install it with its gasket intact in a similarly-rated enclosure.		

D.3 Dimensions of PWS30xx

This section illustrates the dimensions of the Workstations themselves as well as the cutout dimensions. The unit of dimensions is millimeter. You should allow 10 cm (4") of clearance behind the workstation for cable connectors and 5 cm (2") above and below for airflow. Method of installation: Mount the PWS to the preserved hole from the front side. Attach the mounting brackets from behind, and fasten the screw of the brackets with a screwdriver. Don't tighten the screws with too much force or it may cause a damage of the panel.



D.3.1 Dimensions of PWS31xx



D.3.2 Torque Specifications

After placing the Workstation in the cutout, you should tighten each nut to 0.07 newton-meters (10 inch/pounds) of torque. If you don't have a torque wrench, then try to tighten the nuts to compress the gasket to about 50% of its original thickness.

D.4 Power Connections

You must ground your Workstation at all times. You should also ensure that the Workstation is on the same ground as any other equipment connected to its communications ports.

D.4.1 Power Connector

The three-position power connector accepts 24VDC only. The unit's power consumption is shown in the following:

Item / Model	30xx-STN 31xx-STN	30xx-FSTN 31xx-FSTN	30xx-TFT 31xx-TFT
Power Consumption	24VDC±10% 15W	24VDC±10% 15W	24VDC±10% 20W
Fuse Rating	1A	1A	1A

Be sure to use all three terminals when connecting power. To make a connection, strip about 0.64 cm (1/4") of insulation, turn the screw counter-clockwise until the gap is wide open, insert the wire all the way in, and turn the screw clockwise until it's tight.

D.4.2 Electrical Grounding

You must make sure that your Workstation is properly connected to earth ground, to prevent it from radiating radio frequency noise.

If you connect a communications cable to your unit after static electricity has built up or when the Workstation and the other device are on different grounds, the resulting discharge could damage the electronics in either device.

D.5 Touch Panel

The PWS30xx/PWS31xx is equipped with a 9.4" VGA sized (640Hx480V) flat panel display and analog resistive touch screen.

You can design touch keys for each of your screens. You can configure a touch key to display another screen or control an on/off location within your PLC. The shape of the touch key must be rectangular, but the size of a touch key is configurable and can be as small as a single touch switch or as large as the entire screen. One screen can have up to 80x60 touch keys for PWS3100. For each changeable Object of a screen, the Compile function of ADP3 automatically groups those touch switches that the display area of the Object covers to form a touch key for the selection purpose.

When you press a touch key, the Workstation responds by sounding the buzzer for 200 milli-seconds (default) and reversing the color of that touch key for 200 milli-seconds. With the feedback, you know the Workstation accepts your key-press. You can use Miscellaneous Settings dialog box of ADP3 to set the parameter of touch screen for your Workstation.

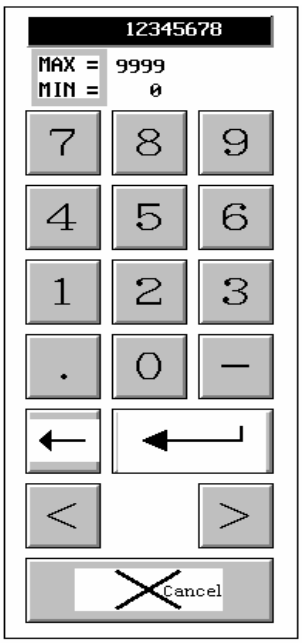


Figure D-1

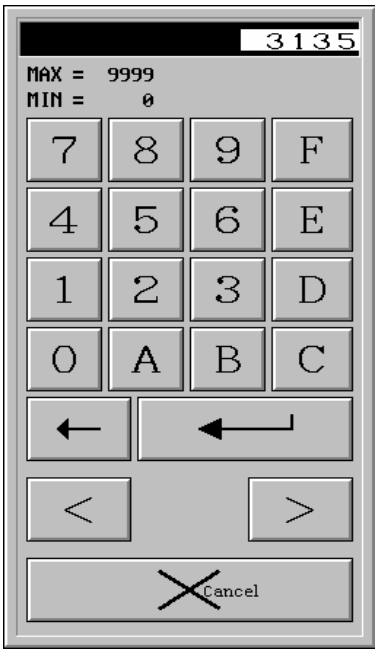


Figure D-2

Figure D-3

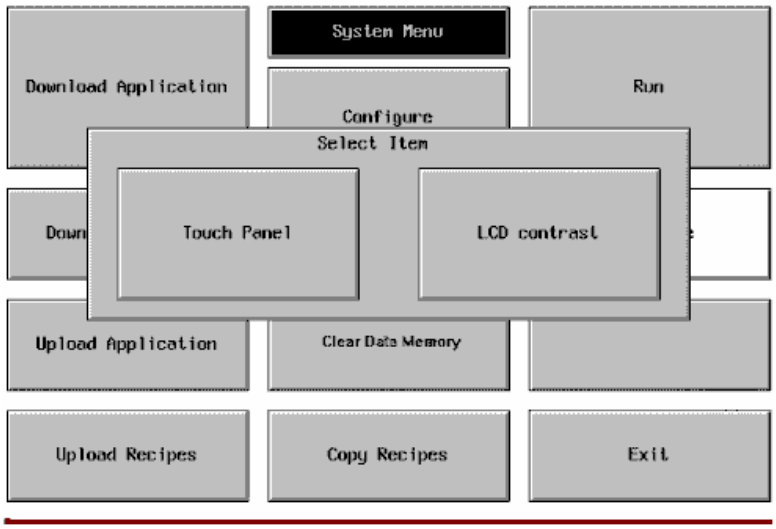
D.5.1 Built-in Touch Keys

The built-in touch keys are touch keys that the ADP3 automatically configure for your application so that you don't have to spend any time to program them. The built-in touch keys allow the operator to select and change a PLC location very easily.

There are two groups of built-in touch keys called Numeric Touch Keypad and Password Reentering Keypad that the Workstation displays for you to change data. The Numeric Touch Keypad Its image is shown in the Figure D-1/D-3.

D.5.2 Calibrating Touch Panel

To calibrate the touch panel,



1. Press Calibrate button on the System Menu. The Select Item box appears.

2. Press Touch Panel button on the Select Item box. A white dot appears on the upper-left corner of the screen and the message "Pin-point the white dot on the upper-left corner" appears.

3. Use a pencil that is not sharp or anything that is soft and suitable to pin-point the white dot on the screen. The small dot moves to the lower-left corner of the screen and the message changes to "Pin-point the white dot on the lower-left corner."

   Do not use anything that is made of metal or is sharp, such as a screw driver or ball pen to pin-point the touch panel.

4. Pin-point the white dot again. The calibration is completed. The System menu displays again.

D.6 Setting of DIP Switches

There are ten DIP switches that you can access through the back cover. The purposes of these switches are stated in the following:

SW2	SW1	Type of Display
ON	ON	TFT(PWS-31xx)
OFF	OFF	Mono STN(PWS-12xx/31xx) / FSTN(PWS-31xx)

SW4	SW3	Running Mode
ON	-	Runs user application.
OFF	ON	Runs burn-in test program.
OFF	OFF	Runs bench test program.

SW5	Communication Parameters
ON	The Workstation uses the parameters set in the Configuration Table for PLC communications.
OFF	The Workstation uses the downloaded parameters for PLC communications.

SW6	Password
ON	The Workstation asks the operator to enter a password after power-on self-test.
OFF	No password is required to start the Workstation.

SW7	System Menu
ON	The Workstation displays System Menu after it gets a legal password or after power-on self-test if SW6 is off.
OFF	The Workstation doesnot display System Menu.

SW8	Default User Level
ON	The default user level is one if the Workstation requires no password to start its operation.

OFF	The default user level is three if the Workstation requires no password to start its operation.

SW9	Reserved switch
ON	Should be on. Enables COM2's RS-232/RS-422/RS-485 circuitry.
OFF	Enables COM2's 20 mA current loop circuitry. (Only the old version of PWS-3000 has current loop circuitry.)

SW10	COM2 Port
ON	Enable RS485 circuitry of the COM2.
OFF	Enable RS422 circuitry of the COM2.

D.7 Self Test

After power is applied, the Workstation runs a self-test that checks its hardware. After each test, the Workstation displays the result as shown in the following example. The version number of ROM BIOS refers to the EPROM chips, which will likely never change. If your Workstation doesnot have battery or doesnot process data that should be keeped by battery such as recipes and nonvoltile logged data, you can choose not to test the battery by disable "Battery check" in the Configuration Table.

```
PWS-3100 Series PLC Workstation
ROM BIOS Version 1.4
(C) 1997 Hitech Electronics Corporation

Display Type ..................... Color TFT Display
System RAM Size ..................... 128 Kbytes
Video RAM Size ..................... 512 Kbytes
Firmware Memory Size ................ 128 Kbytes
User Memory Size .................... 640 Kbytes

Working RAM Test .................... Passed
Battery Status ..................................... Failed
Flash Chips U1 Checksum ............. Passed
Flash Chips U2 Checksum ............. Passed
RTC Function Test ................... Passed
RTC Register Test ................... Passed
RTC Register Checksum ............... Passed
Communication Port 1 Test ........... Passed
Communication Port 2 Test ........... Passed
Printer Port Test ................... Passed
DIP Switches Setting (8..1) ......... 11011011
```

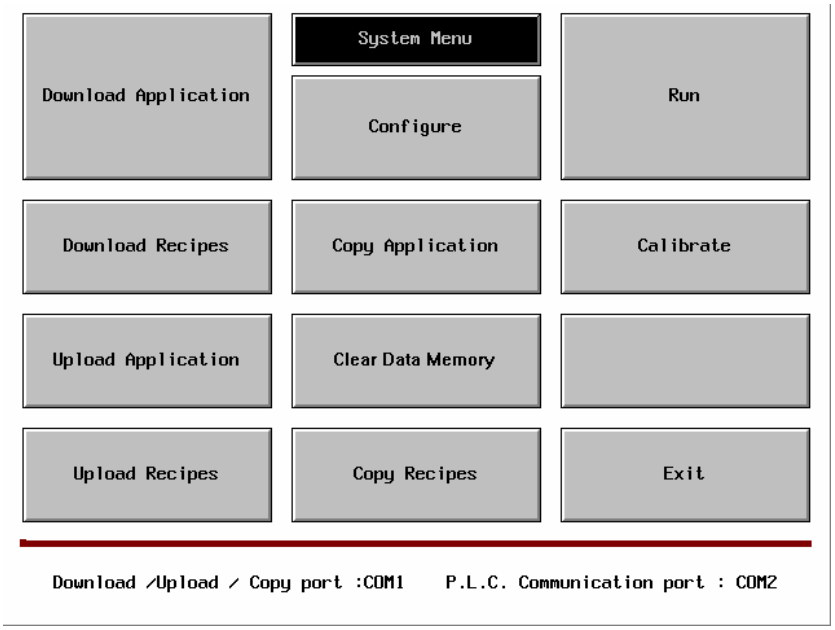
If you have never configured your Workstation, the self-test may report a failure of the real time clock. If this happens, configure as described in section D.10. If you have never downloaded an application to the Workstation, the self-test may report a problem in the flash chips. You can ignore these errors. If you have interrupted a download to the Workstation by switching off the power, disconnect the communication cable, or click cancel button in the ADP3 while a download is in progress, the self-test may report a problem in the Firmware Checksum or Application Checksum. You can ignore these errors and try to download again.

If there are any items of the self-test the Workstation doesn't pass, the message "**System error is detected! Press screen to continue.”** appears. The Workstations continues its operation after you press **screen**.

We will not describe the operations of PWS3000 specifically, because of the similarity between the PWS3000 and PWS3100.

D.8 System Menu

After the user level is determined by a password or by the default, the Workstation displays System Menu if the DIP switch No.7 is on; If DIP switch 7 is off, the Workstation starts running your application immediately.



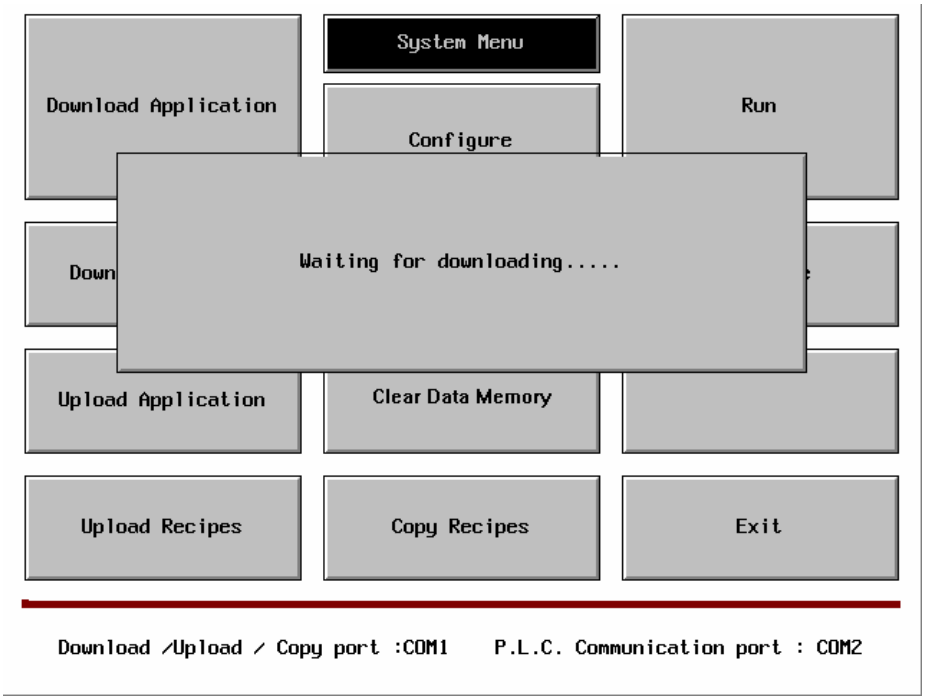
The buttons on the System Menu are summarized in the following:

Button	Function	User Level
Run	Starts running your application.	1-3
Configure	Allows you to set the Workstation's operating parameters.	1
Calibrate	Allows you to calibrate the touch panel and set the contrast or brightness of the display.	1
Download Application	Allows you to download an application to the Workstation from a PC or another Workstation.	1
Upload Application	Allows you to upload the application in the Workstation to a PC.	1
Copy Application	Allows you to copy the application in the Workstation to another Workstation.	1
Download Recipes	Allows you to download recipes to the Workstation from a PC or another Workstation.	1
Upload Recipes	Allows you to upload the recipes saved in the Workstation to a PC.	1
Copy Recipes	Allows you to copy recipes saved in the Workstation to another Workstation.	1

Exit	Starts from the self-test again.	1-3

D.9 Downloading Application

To make the Workstation ready for receiving downloaded application, press the Download Application button on System Menu. The Workstation displays the message "Waiting for downloading...” when it is ready.

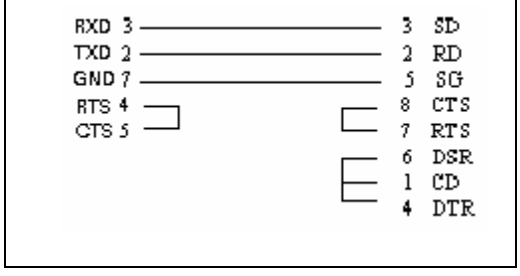


After downloading, the System Menu is active again.

You should have a cable with the following connection for the download.

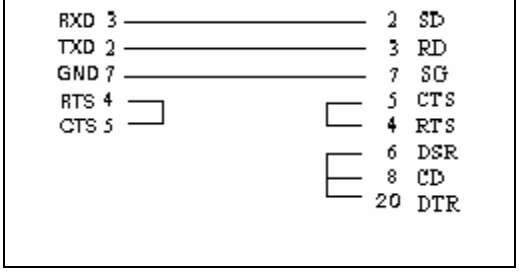
PWS to PC's 9-pin connector

PWS-COM2 PC COM RS232C
25-pin female --CABLE--- 9-pin female



PWS to PC's 25-pin connector

PWS-COM2 PC COM RS232C
25-pin female --CABLE---25-pin female



Warning: To avoid electric shock, be sure to switch off

the power when connecting the communication/download cable to the PWS unit .

D.9.1 Downloading Recipes

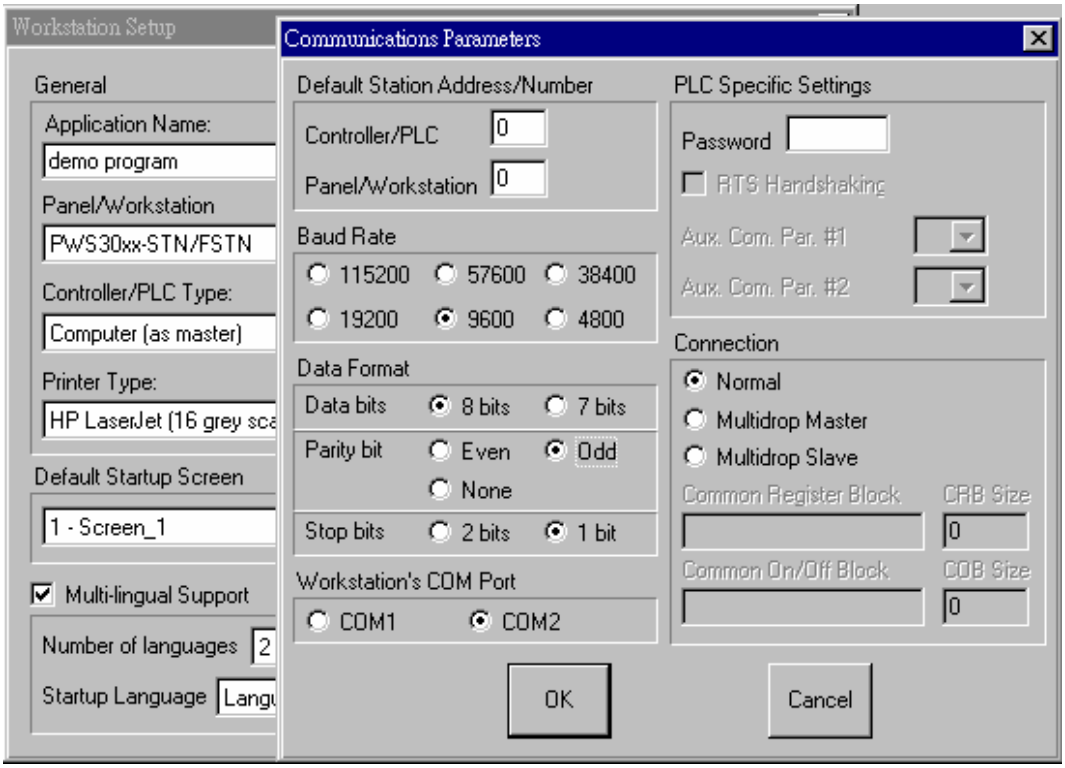
To make the Workstation ready for receiving downloaded recipes, press the Download Recipes button on System Menu. The Workstation displays the message "Waiting for downloading...” when it is ready. You may download recipes to the Workstation from a PC or another Workstation.

After downloading, the System Menu is active again.

D.10 Setting Operating Parameters

You can use Communication Parameter dialog box of ADP3 to set the parameters for the communications between your PWS3000/3100 and PLC. The parameters set in ADP3 is transmitted to the Workstation along with all other data when you download an application.

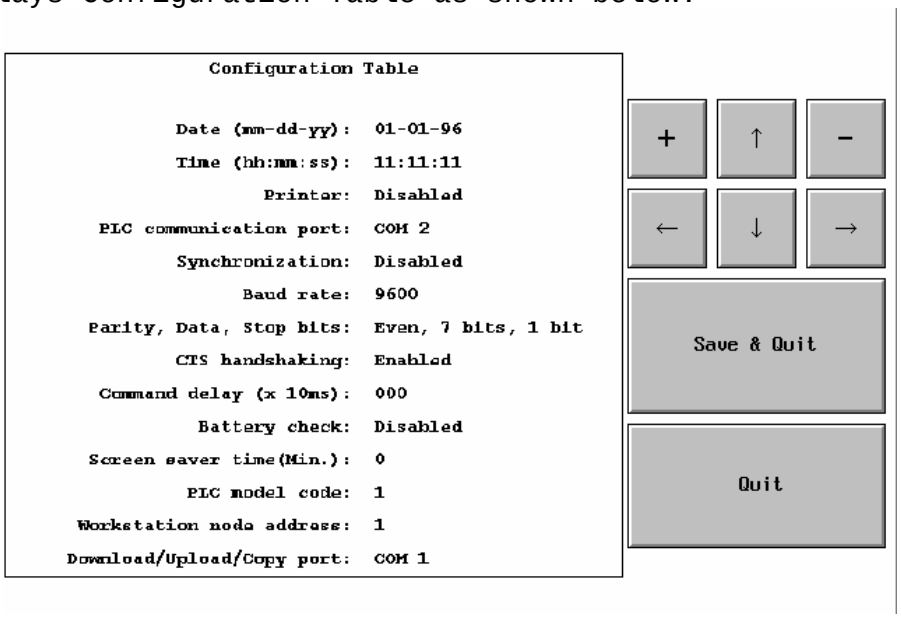
To get Communication Parameters dialog box, click Communications button in Workstation Setup dialog box. The Communication Parameter dialog box appears with the following options:



The Workstation uses these parameters for PLC communications, if the DIP

switch No.5 is off. If DIP switch 5 is on, the parameters set in the Configuration Table will be used for PLC communications.

To set up the Operating Parameters of the Workstation, press the Configure button on System Menu. The Workstation displays Configuration Table as shown below.



Following are descriptions of each of these parameters. To move among fields, press arrow buttons; to change a parameter, press [+] or [-] to adjust the value or selection. When you are finished, press [Save & Quit] to save all changes you made or press [Quit] to abandon all changes.

Parameter	Description
Date (mm-dd-yy)	You can set the date in the Real Time Clock chip.
Time (hh:mm:ss)	You can set the time in the Real Time Clock chip.
Printer	Select **Enabled** if you have printer. The default setting is **Disabled**.
PLC communication port	Select either **COM1** or **COM2** to specify the port that is connected to the PLC. Select **Disabled** if you want to disable the PLC communications. When you disable PLC Communications, the Workstation doesn't communicate with the PLC but still can display screens. The default setting is **COM2**.
Synchronization	Select **Enabled** if you want the synchronization function to be enabled. The default setting is **Disabled**.
Baud rate	Select **4800**, **9600**, or **19200** baud to specify the baud rate for communications between the Workstation and the PLC. The default setting is **9600**.

Parameter	Description
Parity	Select the parity of the communications between the Workstation and the PLC. Your choices are **None**, **Odd**, or **Even**. The default setting is **None**. If you set "Parity" to None, then you cannot set "Data size" and "Stop bits" to 7 and 1; you must set these parameters either to 8 and 1 or to 7 and 2.
Data	Select **7** or **8** to specify the number of data bit for communications between the Workstation and the PLC. The default setting is **8**. If you set "Data size" to 8, then you must set "Stop bits" to 1.
Stop bits	Select **1** or **2** to specify the number of stop bits for the communications between the Workstation and the PLC. The default setting is 1.
CTS handshaking	Select **Enabled** or **Disabled** to specify if the Workstation should wait to transmit until the CTS input on the communication port is asserted. This is sometimes called "hardware handshaking." The default setting is **Disabled**.
Command delay	Enter a number between 0 and 255 to specify the amount of time that the Workstation waits between sending commands to your PLC. The unit of time is 10 milliseconds and the default is 0. In virtually all cases, you should leave the "Command delay" at 0. However, many PLCs consume additional scan time to service requests from the Workstation, and if you find that your PLC's scan time is too long, you can increase the "Command delay" to slow down the Workstation.
Battery check	Select **Enabled** if you want the Workstation to check the battery during self-test. The default setting is **Disabled**.
Screen saver time	Enter a number between 0 and 60 to specify the time that the Workstation turns off the back light of the display if the touch panel has not been touched for that amount time. The unit of time is minute. This is for lengthening the life of the CCFT back light. If you set "Screen saver time" to 0, the Workstation never turns off the back light.
PLC model code	Select a number to specify the sub-type of your PLC. This parameter is only useful for some types of PLCs.
Workstation node address	Select a number to specify the address of your Workstation. This parameter is only useful for some types of PLCs.
Download/Upload/ Copy port	Select either **COM1** or **COM2** to specify the port that you use to download, upload, and copy application and recipes. The default setting is **COM1**.

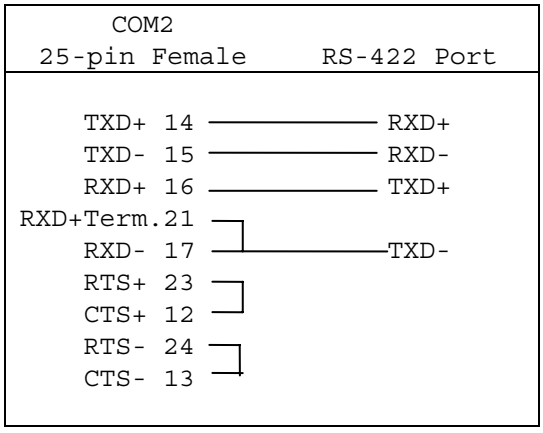
D.11 Serial Communication Port2 (COM2)

COM2 is a serial port that supports RS-232, RS-422, and RS-485 operation. The old version of PWS-3000 supports 20mA current loop operation also; to enable current loop circuitry, set the DIP switch #9 to off.
The pin assignments of the port are listed in the following table:

Pin	Function	Pin	Function
1	Chassis ground	14	RS-422 TXD+ and RS-485 TXD/RXD+
2	RS-232 TXD	15	RS-422 TXD- and RS-485 TXD/RXD-
3	RS-232 RXD	16	RS-422 RXD+
4	RS-232 RTS	17	RS-422 RXD-
5	RS-232 CTS	18*	Current loop RXD+
6	(no function)	19	(no function)
7	Signal ground	20	(no function)
8*	11VDC 20mA (the current source for current loop)	21	RS-422 terminating resistor for RXD-; the other terminal of the resistor (120Ω, 1/2W) is already connected with the RXD+
9*	Current loop TXD+	22	RS-422 terminating resistor for CTS-; the other terminal of the resistor (120Ω, 1/2W) is already connected with the CTS+
10	(no function)	23	RS-422 RTS+
11*	Current loop TXD-	24	RS-422 RTS-
12	RS-422 CTS+	25*	Current loop RXD-
13	RS-422 CTS-		

* These pins have no functions on the PWS-3100 and new model PWS-3700.

COM2 to RS-422



D.11.1 Serial Communication Port1 (COM1)

COM1 is a serial port which supports RS-232 and RS-422 operation. The PWS-3700 supports RS-485 operation also. The pin assignments of the port are listed below. See section D.9/D.11 for the examples of connections.

Pin	Function	Pin	Function
1	Chassis ground	14	RS-422 TXD+
2	RS-232 TXD	15	RS-422 TXD-
3	RS-232 RXD	16	RS-422 RXD+
4	RS-232 RTS	17	RS-422 RXD-
5	RS-232 CTS	18	(no function)
6	(no function)	19	(no function)
7	Signal ground	20	(no function)
8	(no function)	21	RS-422 terminating resistor for RXD-; the other terminal of the resistor (120Ω, 1/2W) is already connected with the RXD+
9	(no function)	22	RS-422 terminating resistor for CTS-; the other terminal of the resistor (120Ω, 1/2W) is already connected with the CTS+
10	(no function)	23	RS-422 RTS+
11	(no function)	24	RS-422 RTS-
12	RS-422 CTS+	25	(no function)
13	RS-422 CTS-		

D.11.2 Printer Port (LPT)

LPT is a parallel printer port that can drive a Centronics-type parallel printer. The connector is compatible with the IBM PC's parallel printer connector.

Following are the pin assignments on the LPT connector:

Pin	Direction	Function
1	Output	Data Strobe
2	Output	D0 - data bit 0
3	Output	D1 - data bit 1
4	Output	D2 - data bit 2
5	Output	D3 - data bit 3
6	Output	D4 - data bit 4
7	Output	D5 - data bit 5
8	Output	D6 - data bit 6
9	Output	D7 - data bit 7
10	Input	Acknowledge Not
11	Input	Busy
12	Input	Paper Empty
13	Input	Printer Selected
14	Output	Auto-feed
15	Input	Error Not
16	Output	Reset Not
17	Output	Select
18-25	Signal ground	

D.12 Entering Password

After the self-test, if the DIP switch No.6 is on, the Workstation displays a keypad to prompt you to enter a password; if DIP switch No.6 is off, the Workstation doesn't ask you to enter a password and the default user level is 1 after the power-on self-test if the DIP switch SW8 is set to on; the default user level is 3 if the SW8 is set to off.

If a password is required, the Workstation doesn't continue its operation until a legal password is entered.

D.12.1 Password and User Level

The Workstation saves passwords in the Real Time Clock chip. A password must have eight numeric characters. When you create a password, you must specify the user level associative with that password. The user level of a password determines the privilege of the user who enters that password to start the operation of the Workstation. When a user wants to use the function of the System Menu, change to another screen, or make change to a PLC location, the Workstation checks the user's user level. There are three user levels: level 1, level 2, and level 3. Level 1 users have the highest privilege and Level 3 users have the lowest privilege.

The passwords and their user levels of your application are unpredictable until you define them.

D.12.2 Registering Passwords

To register new passwords or modify existing passwords for your application, you have to create an Action button on a screen and assign the function "Display Password Table" to that button. When the Workstation is running the application, a level 1 user can get the password table as the example shown below when he presses and releases an Action button that displays the Password Table.

You can register up to eight passwords for your application. To change a password or the user level of a password,

(1) Select the password or the user level by touching it.

(2) If you select a user level, enter a number between 1 and 3 to change the user level. If you select a password, enter eight numeric characters to change the password. When you press [ENTER], the Workstation accepts the change.

(3) To abandon the current change, select another field to exit the current selection.

(4) To save all changes that you made to the password table, press [Save & Quit]. To abandon all changes, press [Quit].

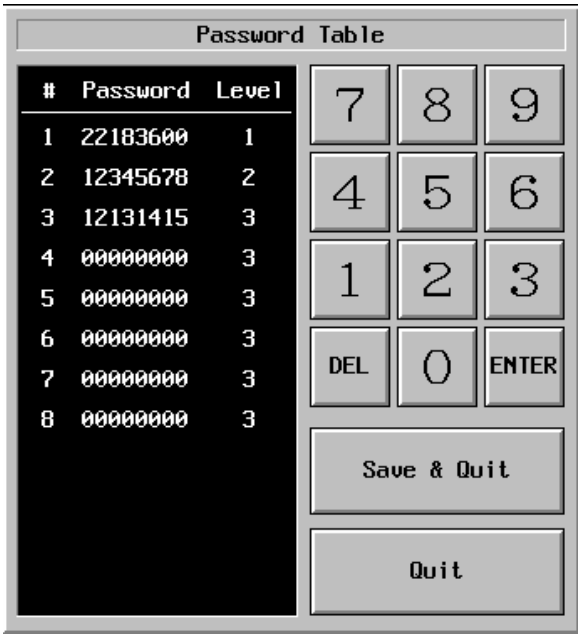


Figure D-4 Numeric keys for password table

Figure D-5 Reentering a password

D.12.3 Reentering a Password

When the Workstation is running the user application, you can enter a password to change the current user level by pressing an Action button that is assigned the function of "Reenter Password." To cancel the input of a new password, press [Quit].

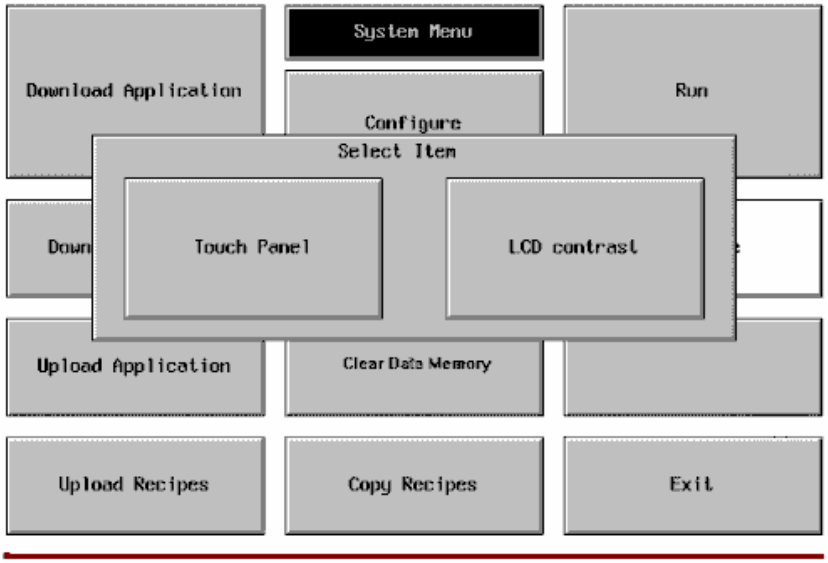
When a screen object requiring a certain user level is activated and the current user level is higher than the specified user level with that screen object, the Workstation automatically displays a box to let you enter a new password. This is a chance to change the current user level. The screen object proceeds to performs its function if a valid password with qualified user level is entered; otherwise, the Workstation keeps on asking for a password or cancel the operation if [Quit] is pressed.

D.12.4 Setting the Lowest User Level

You are able to set the current user level of the Workstation to level 3 by pressing an Action button that is assigned the function of “Set Lowest User Level.”

D.13 Adjusting Display Contrast/Brightness

You can adjust the contrast of the STN/FSTN LCD or the brightness of the TFT LCD at any time the Workstation is running your application. To increase the contrast or brightness, press an Action button which is assigned the function of “Contrast Up.” To reduce the contrast of brightness, press an Action button which is assigned the function of “Contrast Down”. To save the setting, press an Action button which is assigned the function of “Save Contrast”. The user can calibrate the LCD contrast by pressing the "Calibrate" button on System Menu as well. The



Workstation displays Select item as shown below.

PLC Workstation