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Model

If you select a PLC other than *Test*, CP then asks you to select a model. If more models are available than CP can display on a single line, then you must press [→] to see additional model selections.

After you pick the model, CP fills in the default communications setting for the model you have chosen. You can usually leave those fields alone.

PLC Configuration

After you have entered PLC manufacturer and model, CP brings up a data entry panel with several additional fields:

```
PLC station number: 10
         Baud rate: 9600
            Parity: Even
         Data bits: 8
         Stop bits: 1
```

PLC Station Number

Enter the station number of the programmable controller as set by DIP or rotary switches on the PLC or via the PLC's programming software. Even if the Workstation is connected only to a single programmable controller, many programmable controllers require a station number. Listed below are those PLCs that do *not* require a station number:

Allen-Bradley PLC-2 (if direct to programming port)

Allen-Bradley SLC-100/150

Mitsubishi F Series and FX Series

Siemens

Square D (if direct to programming port)

SIMATIC/TI 500/505 series PLCs

Telemecanique

Westinghouse

If you select GE SNP, this field reads "PLC ID"; if you select Allen-Bradley SLC-500, this field reads "Node Address."

If you are connecting your Workstation to multiple PLCs that support the same communications scheme, then just enter the station number of any one of those PLCs. Although the Edit function (described in the next four chapters) uses your entry as its "default" value, you can change that value for any screen your create.

Note

The PLC station number should be *different* from the Workstation's "Station Number" field later on this screen. The reason is that the PLC station number is the "destination address" of the message that the Workstation sends to read or write a PLC location, while the Workstation's station number is the "originating address" for that message.

If both the destination and originating addresses are the same, your Workstation will probably not communicate with your PLC and will display a MESSAGE ERROR or NO RESPONSE ERR.

Allen-Bradley

You must enter the PLC station number in octal, which is the same format you use to set the station number on the PLC itself.

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Workstation

You should select which model of Workstation you are using. CP uses this information to figure out what percentage of Workstation memory that your application requires and whether to offer you communications port and printer port options.

Workstation Configuration

The data entry panel for the Workstation Configuration is shown below:

```
Workstation station#: 9
         Port to PLC: COM1
          Multi-drop: No
Communications delay: 0.000
    Inactivity delay: 0
          Scan ratio: 1
          Alarm Horn: Once
       Remove Alarms: Oldest
        Screen saver: 60
          Upload key: Enabled
         Auto-repeat: Disabled
         Date format: U.S.
```

Workstation Station

Most PLCs require you to assign a station number to your Workstation. Choose a number for the Workstation that is *not* the same as the PLC station number. However, if you're using an Allen-Bradley 1770-KF2 or 1785-KE module, the station number must match the DIP switch setting on the module.

If you select GE SNP, this field reads "PLC ID"; if you select Allen-Bradley SLC-500, this field reads "Node Address."

Listed below are those PLCs that do *not* require you to assign a station number to the Workstation:

- Allen-Bradley PLC-2 (if direct to programming port)
- Allen-Bradley SLC-100/150
- Mitsubishi A Series, F Series and FX Series
- Modbus
- Siemens
- Square D (if direct to programming port)
- SIMATIC/TI 500/505 series PLCs
- Westinghouse

Note The PLC station number should be *different* than the Workstation's Station Number field. The reason is that the PLC station number is the "destination address" of the message that the Workstation sends to read or write a PLC location, while the Workstation's station number is the "originating address" for that message.

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Scan Ratio

Your Workstation continually monitors the status of any register or on/off locations for which you have set up alarms. The "scan ratio" is the number of alarm locations that the Workstation examines between updates of the current status screen. You should typically set this value to between 1 and 10; values above 10 have little effect on performance.

Screen/alarm update time

The default ratio of 1 means that the Workstation alternately updates the current screen and then reads another register or on/off location to check for an alarm condition. A scan ratio of 5 means that the Workstation checks for 5 alarm conditions between updates of the current screen.

With the "Communications delay" set to 0, the typical Workstation can read the PLC five to ten times each second; if you set the scan ratio to 5, the Workstation updates the current screen every one-half second while checking as many as 8 to 10 alarms each second.

Improving alarm response time

If you find that your Workstation is too slow to report alarm conditions, you may want to increase the scan ratio in order to improve its response time. (Of course, increasing the scan ratio also slows updates of the current screen.) Increasing the scan ratio above 10 offers little additional improvement of performance.

Alarm Horn

You can select whether the Workstation beeps once, continually or not at all when an alarm occurs. Select *Once* so that the Workstation beeps only once when the alarm occurs; select *Continual* so that the Workstation beeps continually until the operator acknowledges the alarm; or select *None* so that the Workstation does not beep at all. If you have an alarm horn connected to an output on your PLC, then you can use the Workstation to control this output by enabling "Alarm Horn Output" as described later in this chapter.

Remove Alarms

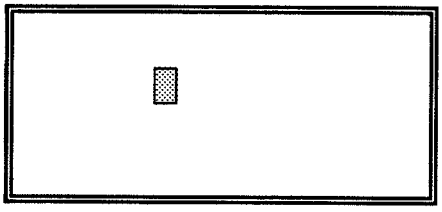
You can configure the Workstation to erase alarm reports automatically when the alarm condition clears or when the alarm has both been acknowledged and cleared. Or the Workstation can retain the last 50 alarm reports regardless of their status. The following table describes the choices available to you:

Oldest	The Workstation removes only the oldest alarms after the alarm buffer fills up to its limit of 50 alarms.
Cleared	The Workstation removes alarms the moment they clear, even if the operator has not yet acknowledged them.
Ack'd/Cleared	The Workstation removes cleared alarms only if the operator has acknowledged them.

Screen Saver

The screen saver feature extends the life of your Workstation's display by turning it off after a period of inactivity. You can set this value to 0 to disable the screen saver.

To save the LCD display of a Series 110 Workstation, the unit turns off the LED backlighting. To save the VFD display of a Series 120 Workstation, the unit continually moves a flashing solid block across a blank screen to remind you that the screen is blanked.



Series 120 Workstations, which all have VFD displays, indicate that the screen is saved by moving a flashing block slowly across each line of the screen. To cancel, press any key.

To cancel the screen saver and revive the display, the operator can press any key. The Workstation ignores the keypress that cancels the screen saver.

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Workstation Printer

If your Workstation is model IWS-117 or IWS-127, then you can connect a printer to the Workstation in order to print out a variety of simple reports, including alarm messages, operator changes, and screens. You can connect the printer to a serial port (COM2 or COM3) or the parallel port (LPT1).

Printer Port

If you do not plan to connect a printer to your Workstation, choose *None*. Otherwise, choose the port that you plan to connect to your printer. If you choose *LPT1*, you see the following screen:

```
          Printer port: LPT1
           Line length: 80
           Left indent: 0
              Line-end: None
           Page length: 66
            Top margin: 0
         Bottom margin: 0
Initialization string:
```

Note If you do not select a printer port, CP does not offer you the option to print alarm messages or other reports. In other words, you *must* choose a printer port if you want to print reports; otherwise, the Workstation does not print, even if you connect a printer.

Line Length

The Line Length is the number of characters that your printer can print on each line. The Workstation has three formats for alarm messages, depending on which of the four line lengths you select. (The format for 80-column printers is the same as for 132-column printers.)

Page Length

Enter a number between 0 and 99, where 0 indicates a continuous roll of paper. The default setting is 66 because the standard 8-1/2" by 11" page has 66 lines. The Workstation uses the page length along with "Bottom margin" and "Top margin" to skip perforations (so that it doesn't print right down to the paper's edge). You should select 0 if your paper comes in a continuous roll without perforations.

Left Indent

The Left Indent is the number of spaces the Workstation prints at the beginning of each line. You can adjust the left side of your listing by increasing or decreasing the left indent. For example, you should increase the left indent if the Workstation prints on a left-hand perforation.

Line-end

This field allows you to specify exactly how the printer handles the end of a line. This is necessary because some printers automatically print a carriage return, line feed, or both. (A "carriage return" simply returns the print head to the left side of the paper, while a "line feed" advances the paper to the next line.)

Bottom Margin

The Bottom Margin is the number of blank lines that your printer leaves at the bottom of each page if your "Page length" is not 0. For example, if you want to leave a 1" margin at the bottom of your paper and if your printer prints 6 lines per inch, then you specify a bottom margin of 6.

Top Margin

The Top Margin is the number of blank lines that your printer leaves at the top of each page if your "Page Length" is not 0. For example, if you want to leave a 1/2" margin at the top of your paper and if your printer prints 6 lines per inch, then you specify a top margin of 3.

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```
PLC Acknowledge: Enabled
   PLC station#: 8
    PLC address:
```

PLC Station Number In this field you enter the station number of the PLC that holds the PLC Acknowledge.

PLC Address In this field you enter the actual address of the PLC Acknowledge within the PLC. For example, if you have programmed the PLC Acknowledge at I/O address 1, then you would enter 1 in this field.

Alarm Horn Output

You can configure the Workstation to turn on a coil in your PLC when an alarm occurs, and to turn off that coil when the operator acknowledges the alarm (and no alarms remain to be acknowledged).

If you enable this feature, you must enter the PLC's station number and the address of the coil that the Workstation controls.

```
Alarm Horn Output: Enabled
     PLC station#: 8
      PLC address:
```

PLC Station Number In this field you enter the station number of the PLC with the coil that the Workstation controls.

PLC Address In this field you enter the actual address of the coil within the PLC. For example, if you have wired up an alarm horn at I/O address 1, then you would enter 1 in this field.

Screen Select Register

When you select *Enabled* for the "Screen Select Register" field, you are enabling a feature of the Workstation that allows your PLC to control which screen the Workstation displays or prints.

Some applications for the screen select register (SSR) are:

- Recipe entry, to force the operator to make one or more entries before the start of a new batch.
- Print a simple report at the end of a shift or a batch.
- Continually scroll several screens to simulate several separate display devices.

Your PLC can control the Workstation by setting one of its data registers to the number of the screen you want to display. We call this register the "Screen Select Register" (SSR). For example, if you designate register number 2 as the screen select register, the Workstation continually monitors the status of register 2. When the Workstation sees register 2 *change* to a non-zero value, say 5, then it displays screen 5.

The screen select register is simply a data register inside your PLC that the Workstation continually reads. Your PLC does not send a command to the Workstation; it simply sets a selected data register to the number of the screen it wants to display or print.

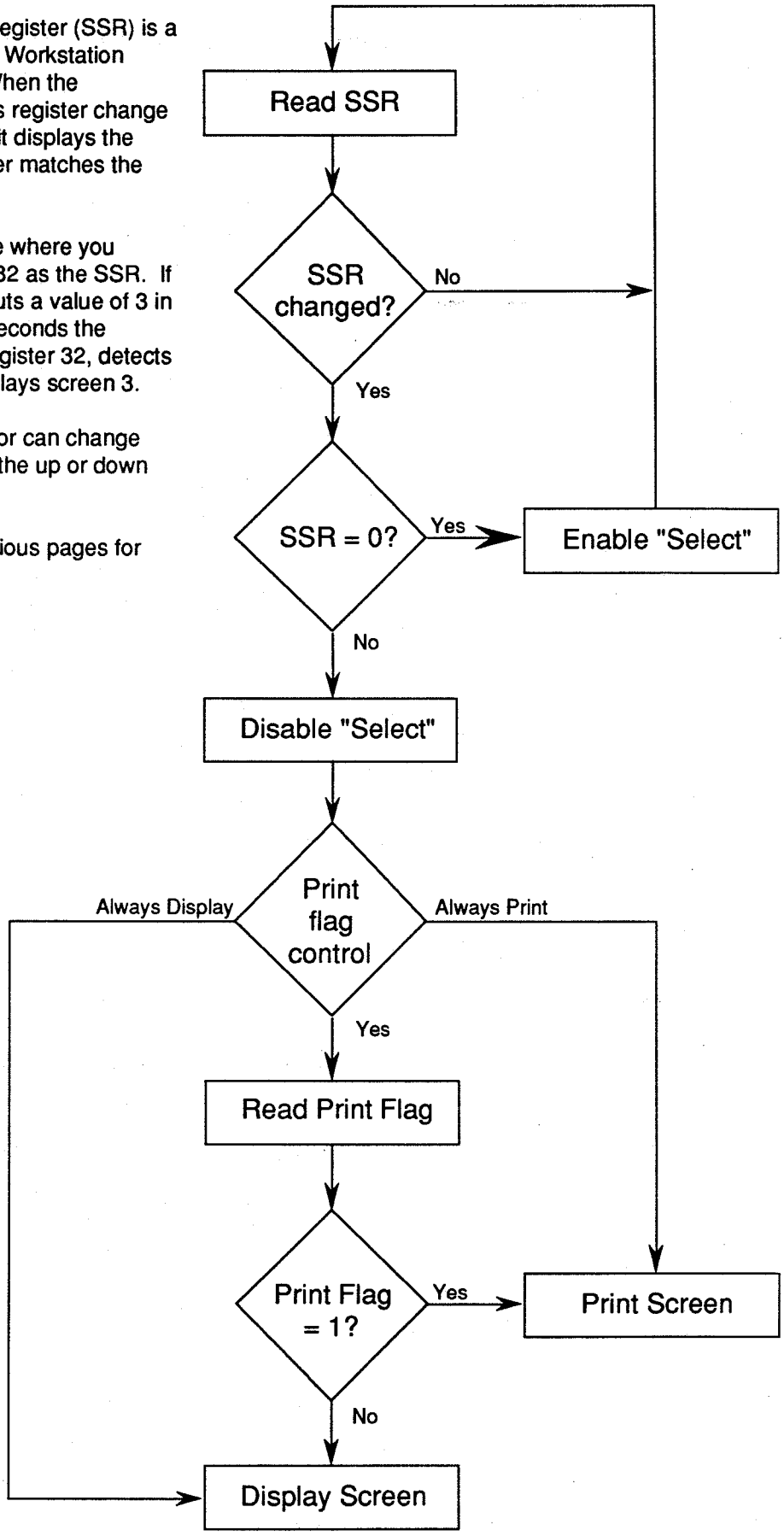
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The Screen Select Register (SSR) is a PLC register that the Workstation continually scans. When the Workstation sees this register change to a non-zero value, it displays the screen whose number matches the register.

Consider an example where you assign PLC register 32 as the SSR. If your PLC program puts a value of 3 in this register, within seconds the Workstation reads register 32, detects the change, and displays screen 3.

After that, the operator can change screens by pressing the up or down arrows.

Please read the previous pages for more information.



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Screen Number Register

If you enable the Screen Number Register, the Workstation writes the current screen number to that register every time the screen changes. If the operator calls up some special function, then the Workstation sets the Screen Number Register to the corresponding value, as shown in the following table:

Screen	Number
Entry outside min/max	986
Screens help	987
New unacknowledged alarm	988
Alarms help	989
Alarms	990
Select help	991
Select	992
Function Menu help	993
Function Menu	994
Passcode invalid	995
Passcode	996
Upload	997
Inactive	999

To enable the "Screen Number Register," you must select *Enabled* for the Screen Number Register field, which brings up the following data entry panel:

```
Screen Number Register:Enabled
          PLC station#: 8
           PLC address:
             Data size: Byte
           Data format: Unsigned Binary
```

PLC Station Number

Enter the station number of the PLC that holds the Screen Number Register. There is a full explanation of PLC station numbers on page 9-3.

PLC Address

Enter the actual address of the Screen Number Register within the PLC. For example, if you have programmed the Screen Number Register at register 1, then you would enter *1* in this field. There is a full explanation of PLC addresses on page 11-2.

Data Size

You must select the size of the register that holds the Screen Number Register. There is a full explanation of register data sizes on page 11-2.

Data Format

You must select the format of the register that holds the Screen Number Register. There is a full explanation of register data formats on page 11-3.

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Chapter 10

Screen Types

This chapter describes the various types of screens that the Workstation can display, plus the configuration information that is common to all types.

Screen Types

When you select the Edit function from the Main Menu, you can choose among four types of screens:

```
Select screen type:
Register  On/Off  Custom  Empty
```

Following is a description of each screen type; there is no limit to the combination of screen types in an application:

Type	Description
Register/ alarm	Displays text on the top two lines, a single numeric location on the third line, and if enabled, accepts changes to that location on the fourth line. Also allows you to set up low/high or yellow/orange alarm limits.
On/Off/ alarm	Displays text on the top two lines, a single on/off location on the third line, and if enabled, accepts changes to that location on the fourth line. Also allows you to set up alarms.
Custom	Displays four lines that you can configure to show a register, on/off location, text, bar graph, or time and date. For each location, you can configure whether the operator is allowed to change that location. A Custom screen can display up to four locations but has no alarm capability.
Empty	Displays nothing; this is useful as a space saver for later use. OEMs who want to use consistent screen numbering when the actual number of screens varies from one application to another can simply change the screen type of the unused screens to *Empty*. You can add Empty screens anywhere in your screen file except at the end. To add empty screens at the end, you must create a screen at the end that is not empty, insert empty screens before that screen, and then delete the last screen when you're finished. CP does not include Empty screens from the end of your file when you download your file to the Workstation.

If you want to configure an alarm on a location shown only on a Custom screen, you can simply create a Register or On/Off screen that refers to that location and configure the alarms there. If you want to configure more alarm limits than one screen can handle, then you can simply create another screen with additional alarm limits.

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Previous [↑] Screen

All screen types allow you to specify which screen the Workstation displays when the operator presses the [↑] key. Although the Workstation normally displays the screen with the next lower number (or the last if the Workstation is displaying the first), you can select another screen number.

For example, if you are configuring screen 1 and you enter *1* in this field, then you have effectively disabled the [↑] key when your operator is on this screen.

Next [↓] Screen

All screen types allow you to specify which screen the Workstation displays when the operator presses the [↓] key. Although the Workstation normally displays the screen with the next higher number (or the first if the Workstation is displaying the last), you can select another screen number.

For example, if you are configuring screen 5 and you enter *5* in this field, then you have effectively disabled the [↓] key when your operator is on this screen.

Enter Screen

All screen types allow you to specify which screen the Workstation displays when the operator presses the [Enter] key. Although the Workstation normally continues to display the current screen, you can select another screen number.

You can select the screen the Workstation displays when the operator presses the [Enter] key by entering a number in this field. For example, if you are on screen 1 and you enter *2* in this field, then the Workstation automatically displays screen 2 after the operator enters information in screen 1. (Before going to screen 2, however, the Workstation writes the new value, waits until it reads it back, and then pauses for another second.)

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Scope

There are three choices for the "scope" of each key: *Undefined*, *Local*, and *Global*.

The default value of each key's scope is *Undefined*; that simply means that this screen does not assign a function to this key. In other words, the key either performs a previously-assigned "global" function or its usual function (when there has been no explicit assignment).

A *Local* key assignment remains in effect only while the Workstation is displaying the screen, and temporarily replaces any Global definition.

A *Global* key assignment remains in effect throughout subsequent screens that the Workstation displays, except that a Local definition temporarily replaces a previously-defined Global definition, and a new Global definition permanently replaces a previous one. To cancel a global key definition, you must define it globally to its "normal" function.

Global key definitions do not apply under the following conditions:

- Displaying an alarm for the operator to acknowledge
- While running the on-line utility menu
- Entering a passcode

Note Global definitions of keys such as [Enter], [Cancel] or the numeric keys will probably prove inconvenient unless your application does not require operators to enter numbers. If you globally redefine or disable the [Upload] key, you can access the Upload function only by cycling power and pressing the [Upload] key during the power-up self-test.

Function

You can assign one of thirteen functions to a key:

Function	Description
Normal	Default function of the key. You can cancel a previous global key assignment by setting its scope to *Global* and its function to *Normal*. This also gives you the opportunity to passcode-protect a key's normal function.
Momentary	Turns on an on/off location within the PLC when the operator presses the key; turns off that location when the operator releases the key.
Toggle	Switches an on/off location within the PLC from its current state.
Set	Turns on an on/off location within the PLC.
Clear	Turns off an on/off location within the PLC.
+Jog/Set	On a register, increases that register's value by the jog amount; on an on/off location, turns it on.
–Jog/Reset	On a register, decreases that register's value by the jog amount; on an on/off location, turns it off.
Print	Prints the current screen along with the time and date.
Disabled	Disables the key entirely. For example, you can disable the [Upload] key by setting its scope to *Global* and its function to *Disabled*.
Goto	Displays a new screen.
Previous	Displays the screen defined in the "Previous [↑] screen" field.
Next	Displays the screen defined in the "Next [↓] screen" field.
Enter	Displays the screen defined in the "Enter screen" field.

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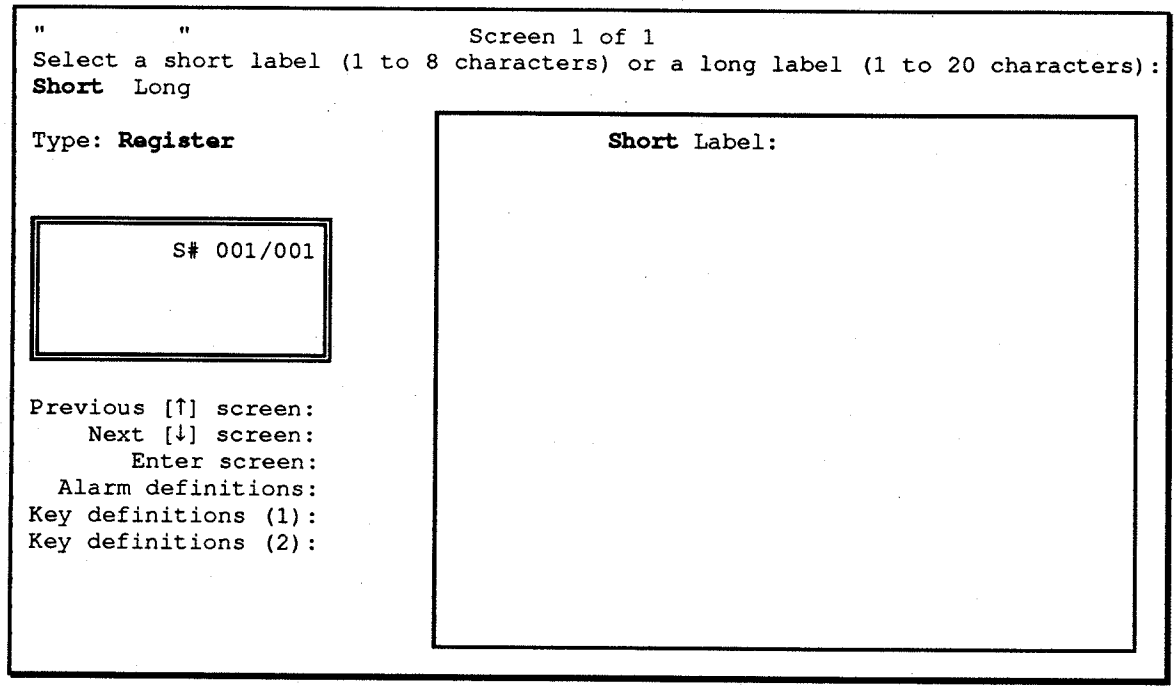
Chapter 11

Register Screens

Register screens display text and a single numeric value. They also allow you to configure low/high or yellow/orange alarm limits.

Line 1; Label

When you select a screen type of *Register*, the following screen appears:



Short/Long

You can select whether the label is short (up to 8 characters) or long (up to the screen's full width of 20 characters). If you choose a short label, then CP automatically includes the screen number and the total number of screens on the right half of the top line. The above screen shows an example: "S# 001/001" indicates that this is screen number 1 of 1.

Label

The label may be any combination of up to 8 or 20 characters, depending on your setting of the "Short/Long" field. Normally you should make each label unique, but CP does not prevent you from using the same label on more than one screen.

The label appears on the top line of the Workstation's display. The label is for the convenience of the operator, and has no effect on the programmable controller program.

The selection of a label depends on your application. Some users prefer function references, such as "COOKTIME" for the setpoint of a timer that measures cooking time. Other users prefer the tag name in their relay ladder program, such as "TMR22SP"; still others use the actual PLC address, such as "4035."

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The Workstation does not support floating point numbers. If your application requires the Workstation to display "cascaded" registers, you must use a "Custom" screen type and select a "Cascade" line type. See page 13-3 for a full description.

For more detailed information about selecting the data size, consult Chapter 22 or your programmable controller documentation.

Data Format

The Workstation needs to know the format your PLC uses to store its data. The Workstation recognizes three data formats: "Unsigned Binary," "Signed Binary," and "BCD."

The signed binary format uses the high bit of the register to indicate a negative value. The following table shows the range of values that a register can hold, depending on its data size and data format:

Data Format	Data Size	Range
Unsigned Binary	Byte	0 to 255
	12-bit Word	0 to 4,095
	Word (16 bits)	0 to 65,535
Signed Binary	Byte	-128 to 127
	12-bit Word	-2048 to 2047
	Word (16 bits)	-32,768 to 32,767
BCD	Byte	0 to 99
	12-bit Word	0 to 999
	Word (16 bits)	0 to 9,999

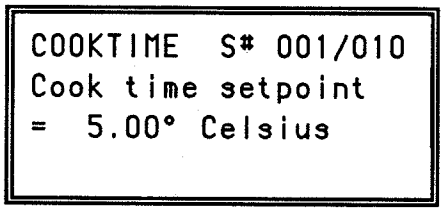
Each brand of programmable controller may support different combinations of data size and data format. For more detailed information about selecting the data size, consult Chapter 22 or your programmable controller documentation.

Operator Units

You can enter any combination of up to 12 characters for the units, which the Workstation displays immediately after the register value. If you want a space between the value and the units, then the first character of the units must be a space.

The figure below shows an example of a Workstation screen where the Operator units is "° Celsius."

Operator units (° Celsius) →



Decimal Point Position

This field allows you to select the position of the decimal point in the number that the Workstation displays. For example, selecting 2 causes the Workstation to display a decimal point before the last two digits of the number, as shown in the example above.

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Operator Units Minimum

"Operator units" refers to how the Workstation displays the current value of the register to the operator. The "Operator units minimum" is the lowest number that the Workstation displays when the actual "raw" value within the PLC is at its lowest value ("Raw data minimum").

The position of the decimal point indicates the range of numbers you can enter. When there is no decimal point, the range of acceptable entries for Operator units minimum is -32768 to 32767. But if the decimal point position is at 2, then the range is from -327.68 to 327.67.

Operator Units Maximum

You should read the preceding discussion of "Operator units minimum" for more information. The operator units maximum value can be any number between -32768 and 32767 (depending on the decimal point position).

Note Don't use the operator entry limits (described on page 11-6 and 11-7) as your operator units minimum and maximum. The operator entry limits are for limiting the range of operator entry, while the operator units minimum and maximum are strictly for scaling.

Note Once you set up Operator units, you enter the alarm limits and operator entry restrictions in operator units, not in raw units.

The rest of this description continues the discussion started earlier under "Raw data minimum." Let's say our analog input, whose raw value ranges from 819 to 4095, represents 0 to 100 degrees Celsius. When the raw value of the register is 819, the Workstation should display 0, and when the raw value is 4095, the Workstation should display 100. At various points in between, then, the Workstation should scale the raw value to the correct operator units.

In other words, the "Operator units minimum" would be 0 and the "Operator units maximum" would be 100. Following shows how we would fill in the scaling fields:

```
    PLC station number: 8
           PLC address: 4001
             Data size: Word
           Data format: Unsigned Binary
        Operator units: ° Celsius
      Decimal position: 2
               Scaling: Enabled
      Raw data minimum: 819
      Raw data maximum: 4095
Operator units minimum:0
Operator units maximum:100.00
```

The scaling formulas that the Workstation uses are shown below:

$$\text{Operator Units Displayed} = O_{min} + (\text{Raw data} - R_{min}) \times \left(\frac{O_{max} - O_{min}}{R_{max} - R_{min}}\right)$$

$$\text{Raw Value Written} = R_{min} + (\text{Data entered} - D_{min}) \times \left(\frac{R_{max} - R_{min}}{O_{max} - O_{min}}\right)$$

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Operator Entry High Limit

In this field you should enter the highest number that the Workstation accepts from your operator. If you enabled scaling, then your entry is in scaled units; for example, if the Operator units minimum is 0 and the Operator units maximum is 100, then the Operator entry high limit must be between 0 and 100.

If the operator tries to make a change outside the range you allow, the Workstation displays a message that tells the operator the minimum and maximum values that the Workstation accepts.

Jog Amount

You can enable the [←] and [→] keys to "jog" a register value down or up (respectively) by a specified value. The default value for the "Jog amount" field is 0, which means that the jog keys have no effect. If you enter a non-zero value in this field, the Workstation adds to or subtracts from the register this amount. If the operator tries to jog beyond the entry limits, the Workstation simply ignores that jog command.

Alarm Definitions

You can set up the Workstation to monitor continually the register's current value and compare it to alarm limits, even when the Workstation is not displaying that register. When the Workstation detects an alarm condition, it can display a message or screen, print a message or screen, and/or set an on/off location within the PLC. This section describes the many options available.

The Workstation can scan as many as 10 alarm points every second, depending on the speed of your programmable controller and your entries for "Scan ratio" and "Communications delay" on the Configuration screen. The Workstation scans only one alarm at a time; it does not use any kind of "block read" or "batch read" function.

When you enter information for a Register using CP's Edit function, you can set the Alarm type to *None*, *Low/High*, or *Yellow/Orange*. The following illustration shows the alarm data entry panel after you select *Low/High*:

```
Alarm type: Low/High
  Deadband:
   Low/low: Disabled
       Low: Disabled
      High: Disabled
 High/high: Disabled
```

Deadband

After you select the type of alarm handling, CP asks you to enter a "Deadband." This allows you to specify a degree of hysteresis for alarms, so that oscillations around an alarm setpoint do not trigger nuisance alarms.

For example, if you enter a deadband of 4 and a high alarm limit of 100, then the Workstation generates an alarm when the register reaches 100, but maintains that alarm until the register drops below 96. Until then, the register can dip below 100 and return to 100 or above without generating new alarms, unless it drops below 96.

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Setpoint (*Constant SP*)

If you select an alarm type of *Constant SP*, the data entry panel changes as in the following example:

```
          Alarm type: Low/High
            Deadband:
             Low/low: Constant SP
            Setpoint:
      Display message:
Control bit address:
                 Low: Disabled
                High: Disabled
           High/high: Disabled
```

You must enter the actual setpoint; neither your operator nor the PLC can change this value. While a "low-low" alarm setpoint is usually lower than "low" and a "high-high" is usually higher than "high," CP does not check your entries.

PLC Monitor Address (*PLC Monitor*)

If you select an alarm type of *PLC Monitor*, the data entry panel changes as in the following example:

```
          Alarm type: Low/High
            Deadband:
             Low/low: PLC SP
PLC monitor address:
      Display message:
Control bit address:
                 Low: Disabled
                High: Disabled
           High/high: Disabled
```

You must enter the address of the on/off location that signals an alarm; the Workstation uses the same station number that you entered for the alarm register itself.

Display, Print or Both

You can select *Display*, *Print*, or *Both* to have the Workstation display an alarm message or screen, print an alarm message or screen, or both display and print an alarm message or screen.

Message or Screen

When an alarm occurs, the Workstation can either display/print an alarm message or display/print a screen. If you select *Message*, then you can enter an alarm message up to 20 characters that the Workstation displays and/or prints when the alarm occurs. The format of the message that the Workstation displays or prints is shown on page 21-10.

If you select *Screen*, then you can enter the number of a screen that the Workstation displays and/or prints when the alarm occurs. Unlike messages, however, the Workstation does not log the alarm and does not require the operator to acknowledge the alarm. (In other words, this is an alternative to using the SSR to allow your PLC to control which screen the Workstation displays.)

Control Bit

The Workstation can optionally control an on/off location within the PLC to indicate the status of the alarm. If you enter an address in the "Control Bit" field, then the Workstation turns on the location when the alarm occurs and turns it off when the alarm clears.

The Workstation changes the Control Bit only on the transition of the alarm status; your PLC program can independently set or reset this bit.

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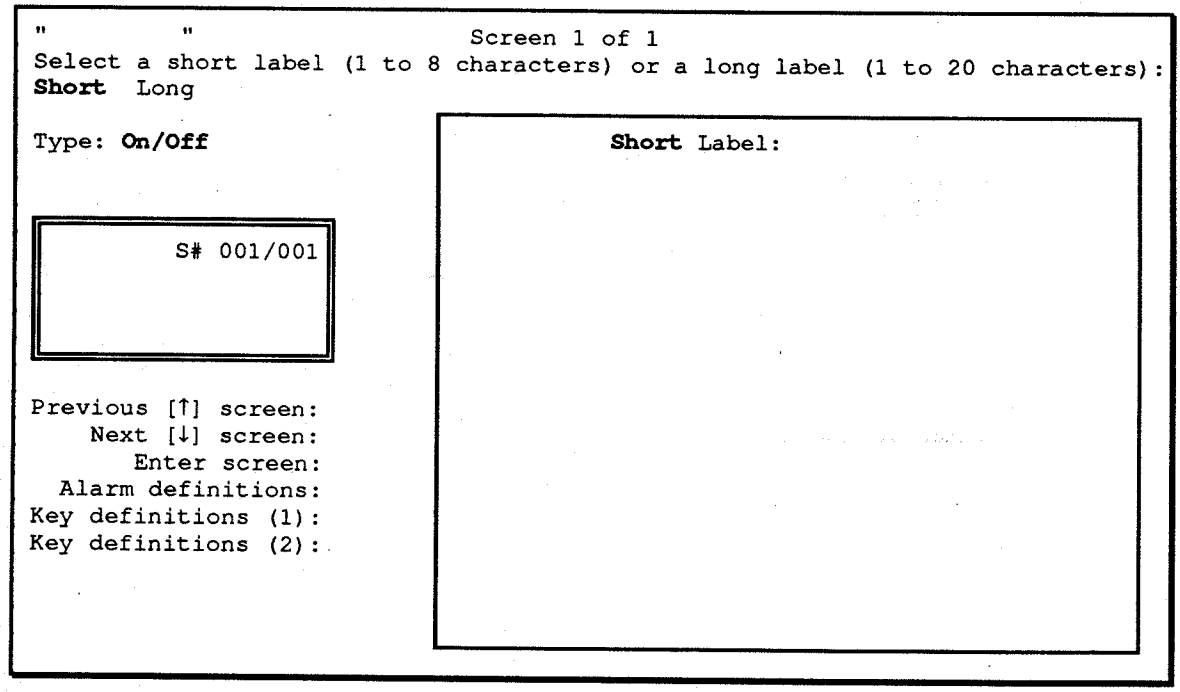
Chapter 12

On/Off Screens

On/Off screens display a message that represents the status of a single contact, coil, or bit within your programmable controller.

Line 1; Label

When you select a screen type of *On/Off*, the following screen appears:



Short/Long

You can select whether the label is short (up to 8 characters) or long (up to the screen's full width of 20 characters). If you choose a short label, then CP automatically includes the screen number and the total number of screens on the right half of the top line. The above screen shows an example: "S# 001/001" indicates that this is screen number 1 of 1.

Label

The label may be any combination of up to 8 or 20 characters, depending on your setting in the short/long field. Normally you should make each label unique, but CP does not prevent you from using the same label on more than one screen.

The label appears on the top line of the Workstation's display. The label is for the convenience of the operator, and has no effect on the programmable controller program.

The selection of a label depends on your application. Some users prefer function references, such as "COOKTIME" for the setpoint of a timer that measures cooking time. Other users prefer the tag name from their relay ladder program, such as "TMR22SP"; still others use the actual PLC address, such as "4035."

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OFF Message

Enter any combination of up to 19 characters for the message that the Workstation displays when the on/off location is off (i.e., when there is no power flow across the contact or coil).

The following screen shows an example of an on/off screen, where "Closed" is the ON message and "Open" is the OFF message, and the current status is on:

Label →
Description →
Current status (on) →
Press [Enter] for off →

```
Valve27  S# 013/057
Outflow valve
=Closed
>Open
```

Line 4; New Value

```
Allow operator changes:Yes
Print operator changes:No
```

The Workstation accepts operator entries, if permitted, on the fourth line of its display.

Allow Operator Changes

If you enter *Yes* in this field, CP then displays the remaining operator entry fields, as shown above, so that the Workstation can accept operator entries. If you select *No*, the Workstation does not allow the operator to make any changes.

Note The Workstation cannot permanently change a register that your PLC program also changes. If changes you enter through the Workstation don't seem to "stick," your PLC program is changing the register too.

Operator changes allowed

```
Valve27  S# 013/057
Outflow valve
=Closed
>Open
```

Operator changes not allowed

```
Valve27  S# 013/057
Outflow valve
=Closed
```

Print Operator Changes

If you answer *Yes* in this field, the Workstation prints a message to the printer every time the operator changes this register. The message contains the label, description, new value, time and date. Chapter 21 contains the format of this message.

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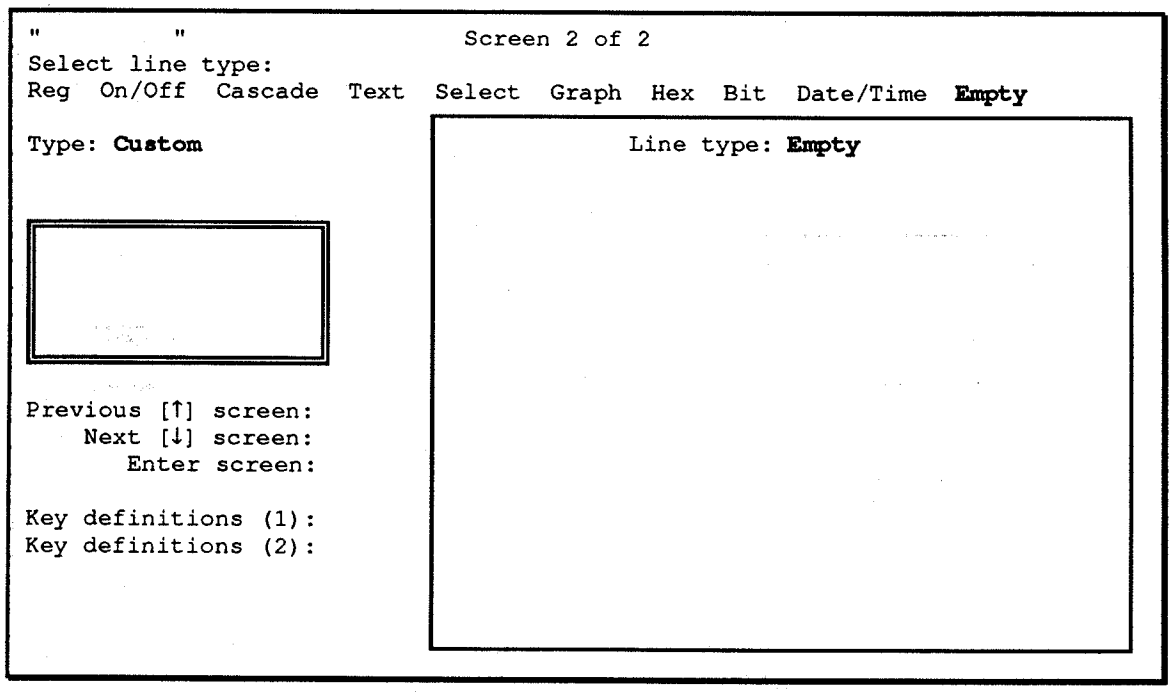
Chapter 13

Custom Screens

Custom screens allow you to configure each of the four lines of the display, *but lack the capability to generate alarms.*

If you want to generate an alarm on a location that you are displaying on a Custom screen, you can simply configure a Register or On/Off screen for that same location.

After you select a screen type of *Custom*, you see the following screen:



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On/Off

An *On/Off* line displays the current status of an on/off location as a message up to 19 characters long. The following example shows all the configuration options available; for more information about these options, please refer to page 12-2:

```
            Line type: On/Off
    PLC station number: 8
           PLC address: 01
            ON message: Open
           OFF message: Closed and off
Allow operator changes:Yes
Print operator changes:Yes
```

To use the Workstation to change an on/off location, press [←] or [→] and press [Enter].

Cascade

A *Cascade* line displays two registers as if they were a single register. This may be useful in applications such as parts counting or flow measurement, where the total produced may exceed the capacity of a single register.

When you select a *Cascade* line, you must enter the PLC addresses of the registers that hold the high and low parts of the total. In the following example, register 40003 holds the low part of the total; whenever this counter overflows, the PLC increments register 40001, which holds the high part of the total.

```
            Line type: Cascade
    PLC station number: 8
    PLC address (high): 40001
     PLC address (low): 40003
             Data size: Word
          Data format: Unsigned Binary
       Operator units: Liters
      Decimal position: 3
Allow operator changes:Yes
Print operator changes:No
    Operator low limit: 0
   Operator high limit: 2147483.647
```

Although the Workstation cannot perform scaling on a cascaded register, you can select a decimal point position. Of course, this is purely for display purposes; if the operator enters 102992.56, the Workstation writes 10299256 to the PLC.

The maximum range of a cascaded register depends on the data size of each register as well as the data format:

Maximum	Data size	Data format
9,999	Byte	BCD
999,999	12-bit Word	BCD
99,999,999	16-bit Word	BCD
65,535	Byte	unsigned binary
16,777,215	12-bit Word	unsigned binary
2,147,483,647	16-bit Word	unsigned binary

You can enter up to 7 characters of operator units. If you want a space between the number and the operator units, then you must limit your operator units to 6 characters.

The Workstation does not allow you to configure alarms on a cascaded register.

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Graph

A *Graph* line displays a horizontal bar graph scaled from the displayed range to a range of 0-100%.

If a single screen contains more than two bar graphs, the Series 120 Workstations cannot display the exact value of the third and fourth bar graphs. Instead, these Workstations round down the third and fourth bar graphs to the next lowest 5%. This limitation applies only to the Series 120 Workstations; the Series 110 Workstations can display all four bar graphs accurately.

```
            Line type: Graph
    PLC station number: 8
          PLC address: 40003
            Data size: Word
          Data format: BCD
      Decimal position: None
               Scaling: Enabled
      Raw data minimum: 0
      Raw data maximum: 9999
Operator units minimum: 0
Operator units maximum: 999
Allow operator changes: Yes
Print operator changes: No
    Operator low limit: 0
   Operator high limit: 100
            Jog amount: 1
```

Note You *must* enter a jog amount that is greater than zero, because the only way to change the value of a bar graph is to use the jog keys ([←] and [→]).

To use the Workstation to change a bar graph, press [←] or [→] until the Workstation is displaying the desired value and press [Enter].

Hex

A *Hex* line displays the current value of a register in hexadecimal notation.

```
            Line type: Hex
    PLC station number: 8
          PLC address: 40004
            Data size: Word
          Data format: BCD
        Operator units:
Allow operator changes: Yes
Print operator changes: No
    Operator low limit: 0
   Operator high limit: 9999
            Jog amount: 0
```

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Chapter 14

Download

The Download function allows you to transmit your screen file to the Workstation, which stores it in its own memory. You can also download firmware from this menu. CP's download functions do not work properly under Windows. You must exit Windows before running CP.

Screen File

The Download function is available from the main menu. Select the Download function from the main menu by typing *D* or by using [→] or [←] to highlight Download, then press [Enter]. To download your screen file, follow these steps:

1. **Turn on your Workstation.**

2. **Connect the Workstation's COM1 port to the PC's COM1 port.**

   Connect a cable between the Workstation's COM1 port and the COM1 serial port of your PC. The cable is included with the IWS-SETUP-120 software, which also includes an adapter for PCs with 9-pin serial ports. (If you have a GE Workmaster or Allen-Bradley 6120CBA, then you must make an adapter cable between your non-standard serial port pin-out and the standard pin-out of the Setup cable. Or you can make your own cable using the diagrams on page 5-5.)

3. **Select the Upload function on the Workstation.**

   To get to the Upload function, simply press the [Upload] key; the Workstation should display the following screen:

```
      Upload
  Waiting for start.
  Press [Cancel]
     to abort.
```

   Note If the Workstation does not respond to the [Upload] key, then try cycling power to the Workstation and pressing [Upload] once during the self-test.

4. **Select the Download function on the PC.**

   After you select the *Download* function from the main menu, you see the following:

```
"        "    Memory used:  17%        Download
Cancel  Go  Firmware
No, don't download the screen file.
```

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Troubleshooting

Note CP's download functions do not work properly under Windows. You must exit Windows before running CP.

If you abort the Download process by pressing the Workstation's [Cancel] key, you see the following:

```
        Upload
Uploading aborted.
Press [Cancel] to
return to menu.
```

If there is an error in communications between the PC and the Workstation (for example, if the cable between the PC's COM1 port and the Workstation's COM1 port becomes disconnected), you see the following message on the Workstation:

```
        Upload
An error has caused
the upload to abort.
   Press [Cancel].
```

There are several errors that can occur before or during downloading. When you select the Download function, the software checks all of your entries and notifies you with an error message if it finds anything wrong. For example, you may have omitted a PLC address.

A common problem is a missing firmware file; the .ROM files must be on the same directory as CP itself. Another common problem is a user-made cable; a bad cable can cause communications to be unreliable or impossible. If you made your own cable, please verify that it is completely correct.

Another common problem is that the Workstation firmware is a newer version than CP. This generates a "version error" message on your PC screen.

See Chapter 24 for more information about download errors.

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Chapter 15

File

The File function allows you to load and save your screen files. There are additional options for listing all the screen files on your disk, erasing a screen file, and changing the directory (pathname).

The File function is available from the main menu. Select the File function from the main menu by typing *F* or by using [→] or [←] to highlight File, then press [Enter].

```
Retrieve  Save  List  Erase  Directory
Retrieve screen file from disk.
```

If CP displays an error message when you do a File function, consult Chapter 24 to find the cause and possible remedies.

Retrieve

The Retrieve function retrieves a screen file from disk so that you can change or review any screens that you have previously saved.

If you choose the Retrieve function without saving your current screen file, you see the following message:

```
Warning! You will lose the changes to your screen file! Continue? No
No, don't retrieve the screen file.
```

If you choose to continue and retrieve a new file, CP loses any changes you have made to the old file since your last save to disk. You cannot recover the lost changes.

After you select *Retrieve*, the help line changes to:

```
Enter name of screen file to retrieve:
```

The names of screen files currently on the disk are listed under the help line. Use the arrow keys to select the screen file you wish to retrieve, then press [Enter].

For example, after you select Retrieve from the option list under File and press [Enter], you might see the following screen:

```
Enter name of screen file to retrieve:
CONVEY1   ASSY2   ASSY3   MACHINE5   FINAL4
```

At this point, you can either type in the name of a screen file that appears in the list or you can use the arrow keys to select a screen filename and press [Enter].

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Chapter 16

Print

The Print function lets you print out a screen file, including the Configuration screen and Edit screens. See Chapter 24 for a listing of errors that can occur during printing, possible causes and possible remedies.

The Print function is available from the main menu. Select the Print function from the main menu by typing *P* or by using [→] or [←] to highlight Print, then press [Enter].

When you select *Print*, you see the following screen:

```
Range   Go   Formats
```

Range

After you select *Range* from the Print menu, you can choose whether you want to print all or part of your screen file. If you want to print only part of your screen file, you can select a partial listing by page number or by screen number.

```
All   Pages   Screens
```

All

Select *All* when you want to print all screens and configuration data. This is the default option; if you want to print the entire listing, you don't have to make a Range selection.

Pages

Select *Pages* if you want to print only a specific range of pages. After you select *Pages*, CP asks you to enter the number of the first page to print and then the number of the last page to print.

Screens

Select *Screens* when you want to print only a specific range of screens. After you select *Screens*, CP asks you to enter the number of the first screen to print and then the number of the last screen to print.

This option does not allow you to select the Configuration screen only for printing; to do that, select *Pages* instead and enter *1* for both the first page and last page to print.

Go

After you select *Go*, CP asks you where you want to send your listing: to the printer or to the disk:

```
Select where to print listing:  Printer  Disk
```

CP begins printing as soon as you choose *Printer* or *Disk* and press [Enter]. You can cancel printing by pressing [Esc].

Printer

This option tells CP to send the current screen file to a printer connected to your PC's parallel port (if you have a serial printer, you must use the DOS command "MODE LPT1 = COM1" before running CP).

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Chapter 17

New

The New function clears the current screen file so that you can enter a new screen file.

The New function is available from the main menu. Select the New function from the main menu by typing *N* or by using [→] or [←] to highlight New, then press [Enter].

When you select the New option, CP asks you to confirm or cancel your decision to clear the screens.

Caution Once CP has executed the New function, you are not able to "undo" the command to restore the screens. Be sure to save your screen file on a disk before you execute the New function.

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Chapter 18

Options

The Options function allows you to select the serial port (COM1 or COM2) connected to your Workstation as well as the colors that CP uses for its display screens.

CP remembers whether you have made any changes to its configuration, and if so, asks you if you want to save your changes when you exit. If you answer *Yes*, then CP saves a file on the disk labeled CP.CFG that holds all of the configuration settings. If you answer *No*, then CP uses your new configuration settings only for the current session.

You can press [F7-Restore] at any time before exiting to cancel any changes you have made and restore the original settings.

Download Port

CP normally attempts to download screen files to the Workstation via your PC's COM1 serial port.

If your PC has a second serial port, labeled COM2, then you can set up CP to use that port instead. Just press the [→] key and press [Enter] to change from COM1 to COM2 (or back to COM1).

If you want CP always to use COM2, then exit and answer *Yes* when CP displays the message *Do you want to save the changes?* Otherwise, CP will use COM2 only during the current session.

Display Technique

This field allows you to select the method that CP uses to update the display on your computer; your choices are *Direct* and *BIOS*.

Direct is the default setting, which provides faster screen updates by writing directly to your computer's video memory. If your computer has a problem with that setting, then you must select the slower but safer *BIOS* setting.

You can start CP in the *BIOS* mode by typing *CP –v*.

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Chapter 19

Version

You must know the version of CP that you are using if you need to contact us for technical assistance. The Version function displays the date and version number of CP that you are using, for example:

```
This version of CP is dated November 3, 1993, and is numbered 3.52.
```

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Chapter 20

Quit

The Quit function allows you to leave CP and return to DOS.

The Quit function is available from the main menu. Select the Quit function from the main menu by typing *Q* or by using [→] or [←] to highlight Quit, then press [Enter].

If you select the Quit function without first saving your screens on the disk, CP displays the following message:

```
Warning! You will lose the changes to your screen file! Continue?
No  Yes
```

CP asks you to confirm or cancel your decision to leave CP and return to DOS.

There is no way to exit CP temporarily and return later by typing *EXIT*.

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Chapter 21

Operating Instructions

This chapter describes how to operate and set up your Series 110/120 PLC Workstation.

Power-Up/Self-Test

Immediately after power is applied, the Workstation displays something like the following screen as it performs a self-test.

```
PLC W.S. V3.52-G2
Model IWS-120; 30K
```

At the end of the self-test, the Workstation displays the first screen in its memory. If it has no screens in memory, then it displays the following:

```
No screens loaded.
You must upload.
```

Change Location (Enter New Value)

This section describes how to use the Workstation to change a location within the PLC. You must explicitly configure each location that the operator is allowed to change.

The Workstation initially positions the cursor on the top-most location that you can change (if any), and displays the ">" character. The first character of any other lines that display a value is "=".

If there are additional locations that you can change, then pressing [Enter] or [↓] moves the cursor to the next; if already on the next, pressing [↑] moves the cursor to the previous. If you press [Enter] or [↓] while on the last changeable location or [↑] while on the first, the Workstation changes the screen according to your settings for "Previous screen," "Next screen," and "Enter screen."

Register

To change a register, you simply type in a new value. On a Custom screen, when you press any number key to start entering a new value, the old value disappears. To finish entering a new value, you press [Enter].

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Date/Time

You enter a new date and time by changing the old value instead of typing in a new value. You press [→] to position the cursor over the digit you want to change, type in the new value, and press [Enter]. At any time until you press [Enter], you can cancel the current entry and restore the original value by pressing [Cancel], [↑] or [↓].

The Workstation does not check the validity of a new time and date. For example, the Workstation will accept a date of 44/55/66 or a time of 55:88:99.

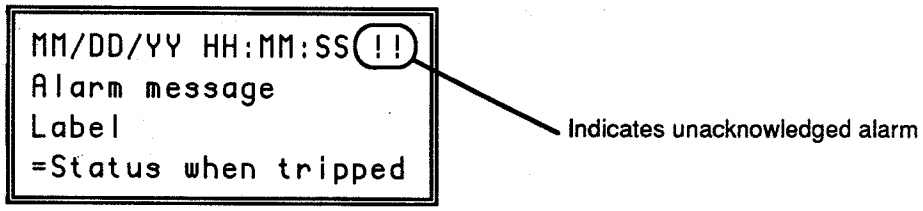
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Displayed Alarm

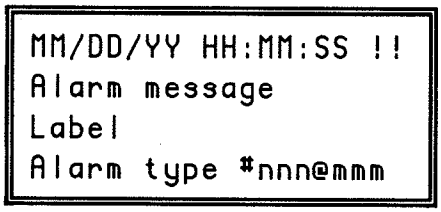
When the Workstation detects an alarm condition that you have configured the Workstation to display, it interrupts the current screen only if it is a normal display screen or an alarm that the operator has already acknowledged. While the Workstation displays some other type of screen, such as the Function Menu, it saves the alarm report until you return the Workstation to a normal display screen or acknowledged alarm.

If the Workstation detects an alarm condition to display when it is already displaying an unacknowledged alarm, then it saves the new report until the previous alarm is acknowledged. The Workstation normally saves as many as 50 new alarms to report while an unacknowledged alarm is displayed. The Workstation does not save any new alarms that occur above its storage capacity of 50. You can configure the Workstation so that it does not save alarms that have cleared or have both cleared and been acknowledged. See page 9-7 for more information.

Following is the format of an alarm report that the Workstation displays; the exclamation points indicate that the operator has not yet acknowledged the alarm.



The operator can view the alarm in an alternate format by pressing the [Alarms] key while the screen is displaying an alarm. The alternate format changes only the bottom line so that the operator can see a description of the current alarm's type, the screen number of the current alarm (*nnn*) and the alarm's relative position in the buffer (*mmm*; the oldest alarm is number 1):



The Workstation displays the alarm type using the abbreviation from the following table:

Abbreviation	Description
Low-low	Low-low alarm setpoint (register only)
Low	Low alarm setpoint (register only)
High	High alarm setpoint (register only)
High-high	High-high alarm setpoint (register only)
Yellow	Low or high side of a yellow alarm (if PLC Monitor)
Yellow low	Low side of yellow alarm setpoint (register only)
Yellow high	High side of yellow alarm setpoint (register only)
Orange	Low or high side of an orange alarm (if PLC Monitor)
Orange low	Low side of orange alarm setpoint (register only)
Orange high	High side of orange alarm setpoint (register only)
Alarm	Location is in alarm (on/off only)
Clear	Alarm is clear

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[Select]: Screen Select

You can press the [↓] or [↑] key to see the next or previous screen. (If you press [↓] on the last screen, the Workstation shows the first screen; if you press [↑] on the first screen, the Workstation shows the last screen.)

If you set up the "Previous screen," "Next screen," and "Enter screen" fields when you configured your screens, then you may have re-assigned the [↑] and [↓] keys to select some other screen instead.

To select a screen by entering its number, press [Select]; the Workstation then displays a screen in the following format:

```
Screen#:  2
1st line,screen #2
1st line,screen #3
1st line,screen #4
```

To select a new screen to display, type in its number and press [Enter].

The last three lines of the screen show the first line of the next three screens. If you press [↓] or [↑], you can view the first lines of the next or previous three screens.

[F()] or [Menu]: Function Menu

When you press the [F()] or [Menu] key, the Workstation displays the following Function Menu:

```
   Function Menu

1) Screens 3) Select
2) Alarms  4) Upload
```

To select an item from the Function Menu, you press the corresponding number. After you make your selection, you can return to the Function Menu by pressing [Cancel]. This is not true of the Screens selection; to return to the Function Menu from Screens, you must press the [F()] or [Menu] key.

Screens When you select Screens, the Workstation displays a normal display screen.

Alarms When you select Alarms, the Workstation displays the most recent alarm message. You can review past alarm messages by pressing [↓] or [↑].

Select The Select function allows you to select a screen to display by number. This capability is disabled when the Screen Select Register in your PLC is non-zero.

Upload When you select Upload, the Workstation waits to receive a new screen file from your PC via its COM1 port.

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Printed Alarm Reports

In the report formats that follow, the alarm number *nnn* is the number of the screen that contains the alarm definition; the date is either MM/DD/YY or DD.MM.YY, depending on the date format selection; and the word setpoint refers to the type of setpoint; the following table shows the abbreviations:

Setpoint	Description
Lo-lo SP	Low-low alarm setpoint (register only)
Low SP	Low alarm setpoint (register only)
High SP	High alarm setpoint (register only)
Hi-hi SP	High-high alarm setpoint (register only)
Yellow SP	Low or high side of a yellow alarm (if PLC Monitor)
Y-low SP	Low side of yellow alarm setpoint (register only)
Y-hi SP	High side of yellow alarm setpoint (register only)
Orange SP	Low or high side of an orange alarm (if PLC Monitor)
O-low SP	Low side of orange alarm setpoint (register only)
O-hi SP	High side of orange alarm setpoint (register only)

The report formats vary depending on the number of columns per line that your printer can print. You set the printer's "Line length" to 20, 40, 80, or 132 on the Configuration screen under the Workstation Printer data entry panel (see page 9-9).

20-column report when register alarm occurs:

```
MM/DD/YY HH:MM:SS   -
Alarm         message-
Label         message-
=status when tripped-
Alarm *nnn setpoint=-
 alarm setpoint     -
```

20-column report when on/off alarm occurs:

```
MM/DD/YY HH:MM:SS   -
Alarm         message-
Label         message-
=status when tripped-
Alarm *nnn
```

20-column report when alarm acknowledged:

```
MM/DD/YY HH:MM:SS   -
Alarm *nnn ack'ed.  -
Label         message-
=status when ack'ed -
```

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132-column report when register alarm occurs:

MM/DD/YY HH:MM:SS Alarm message; Label message=status;
<no new line:> Alarm #*nnn* setpoint =*alarm setpoint* -

132-column report when on/off alarm occurs:

MM/DD/YY HH:MM:SS Alarm message; Label message=status;
<no new line:> Alarm #*nnn*

Following are some examples of printed alarm reports:

```
12/07/93 09:33:52
Tank Level too high
Tank.Lvl
= 131.0"
Alarm #237 Lo-lo SP=
  130.0"
```

```
12/07/93 09:33:52
Tank 1 Valve Stuck!
Tank 1 Valve Status
=Open
Alarm #238
```

```
12/07/93 09:33:52   Tank Level too high
Tank.Lvl            = 131.0"
Alarm #237 Y-hi SP  = 130.0"
```

```
12/07/93 09:33:52    Tank Level too high ; Tank.Lvl          = 131.0"
                     Alarm #237 setpoint = 130.0"
```

```
12/07/93 09:33:52    Alarm #237 ack'ed.    Tank.Lvl          = 132.2"
```

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Chapter 22

PLC Connections

This chapter describes the equipment and cabling needed to connect your Series 110/120 PLC Workstation's COM1 or COM2 serial port to your programmable controller's networking or programming port.

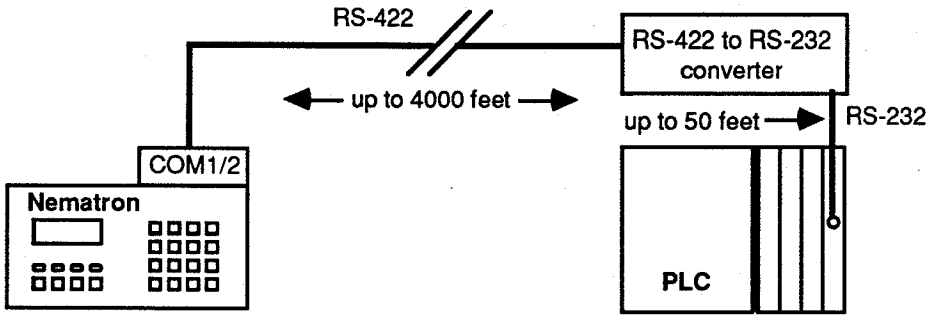
Cables

Although Nematron provides cables to connect Series 110/120 Workstations to most of the PLCs that the Workstation supports, this chapter provides diagrams for all cables. The only exceptions are CBL-L1 and CBL-C13, Rev. B, which contain special circuitry and are available only from Nematron.

Nematron's cables are 10 feet (3 meters) long; if you need a different length, you must make your own cable or contact a cable manufacturer.

Caution We see many problems when users fail to follow our instructions for making cables. Please read page 4-3 very carefully for instructions.

If your PLC supports only RS-232 communications and you want to place your Workstation more than 50 feet (15 meters) from your PLC, then you must purchase an external RS-232 to RS-422 converter, as shown in the diagram below:



A good source of RS-232 to RS-422 converters is B&B Electronics; their address and phone number are:

B&B Electronics
P.O. Box 1040
Ottawa, Illinois 61350
815-434-0846

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