OP-640

Operator Panel

Manual Number OP-640-M

WARNING

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To minimize the risk of potential safety problems, you should follow all applicable local and national codes that regulate the installation and operation of your equipment. These codes vary from area to area and usually change with time. It is your responsibility to determine which codes should be followed, and to verify that the equipment, installation, and operation is in compliance with the latest revision of these codes.

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Manual Revisions

If you contact us in reference to this manual, be sure and include the revision number.

Title: OP-640 Operator Panel User Manual
Manual Number: OP-640-M

Issue	Date	Effective Pages	Description of Changes
Original	9/99	All	Original Issue

EU Information

This product is manufactured in compliance with European Union (EU) Directives and carries the CE mark. The following information is provided to comply with EU documentation requirements.

NOTE: Products with CE marks perform their required functions safely and adhere to relevant standards as specified by EU directives provided they are used according to their intended purpose and that the instructions in this manual are adhered to. The protection provided by the equipment may be impaired if this equipment is used in a manner not specified in this manual. Only replacement parts supplied by **PLC***Direct* or its agents should be used. A listing of international affiliates is available at our Web site http://www.plcdirect.com

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SELV Circuits

All electrical circuits connected to the communications port receptacle are rated as Safety Extra Low Voltage (SELV).

Environmental Specifications

Operating Temperature	0° to 50° C
Storage Temperature	-20° to 70° C
Operating Humidity	95% (non-condensing)
Air Composition	No corrosive gases permitted

Preventative Maintenance and Cleaning

No preventative maintenance is required. To clean the exterior of the panel disconnect the input power and carefully wipe the panel with a cloth moistened with plain water.

External Fuse Protection for Input Power

There are no internal fuses for the input power circuits, so external circuit protection is needed to ensure the safety of service personnel and the safe operation of the equipment itself. To comply with EU specifications, the input power must be fused. Use a fuse rated at **twice** the input current rating of the panel. For example, if the panel has an input current rating of 0.5 amperes, use a fuse rated for 1 ampere.

Table of Contents

Chapter 1: Getting Started

Chapter 2: Installation and Specifications

Chapter 3: Understanding the Features

Chapter 4: Configuring Your Operator Panel

1

Getting Started

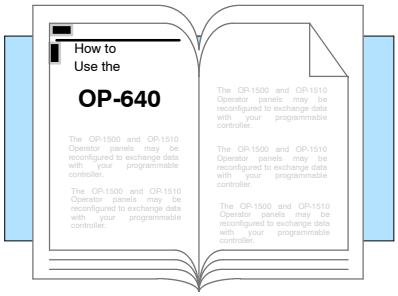
In This Chapter. . . .

- Introduction
- Conventions Used
- OP-640 Overview
- Frequently Asked Questions

Introduction

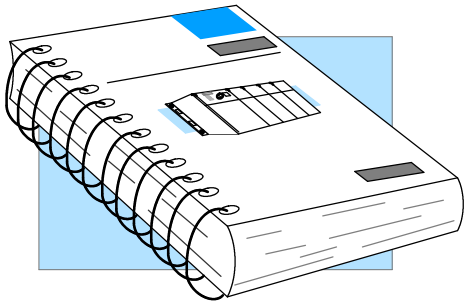
The Purpose of this Manual

Thank you for purchasing an OP-640 OptiMate panel. This User Manual shows you how to install, configure, and program the OP-640. Also included are application examples. Be sure to keep this manual handy for reference when you run into questions. If you understand PLC systems and operator interface units, this manual will provide all the information that you need to get and keep your panel up and running.



Supplemental Manuals

Reference the appropriate PLC/CPU user manuals for the commands and address references required for your system. If you are using a ***Direct***LOGIC PLC product, you will want to keep the ***Direct***SOFT User Manual handy while programming your system. For *other* PLC brands you must reference their user manuals to properly program the ladder logic required to operate the OP-panel.



Technical Support

We realize that even though we strive to be the best, we may have arranged our information in such a way that you cannot find what you are looking for. First, check these resources for help in locating the information:

- **Table of Contents** – chapter and section listing of contents, in the front of this manual
- **Index** – located at the end ot this manual
- **Appendices** – reference material for key topics, near the end of this manual

You can also check our online resources for the latest product support information:

- **Internet** – the address of our Web site is www.automationdirect.com

If you still need assistance, please call us at 1-770-844-4200. Our technical support group will be glad to work with you in answering your questions. They are available Monday through Friday from 9:00 A.M. to 6:00 P.M. Eastern Standard Time. If you have a comment or question about any of our products, services, or manuals, please fill out and return the 'Suggestions' card that was shipped with this manual.

Chapters The main contents of this manual are organized into the following five chapters:

1	**Getting Started**	Introduces the physical and functional characteristics. Discusses pushbuttons, lamps and the LCD display. Also provides introduction to planning your system.
2	**Installation and Specifications**	Shows how to prepare for system installation, including specifications and mounting instructions. Includes connecting cables part numbers and specifications.
3	**Understanding the Features**	Explains the features and functions of the OP-640. Teaches concept of how data is exchanged between the panel and the PLC. Also discusses the function of the status register.
4	**Configuring the Operator Panel**	Shows how to use the OP-WINEDIT configuration software to configure your panel. Shows how to load the software on your personal computer, call up the screens you will need and how to download the configuration program to your panel.
5	**Programming Examples**	Provides example programs for using the standard functions and features. These examples include ladder logic for implementing pushbuttons and messages using ***Direct***LOGIC compatibles and Allen-Bradley SLC 5/03, 5/04 and Micrologix CPUs.
6	**Troubleshooting**	Provides help with troubleshooting your OptiMate panel. Includes tips on isolating communications faults by use of LED status.

Appendices Additional reference information is in the following appendices:

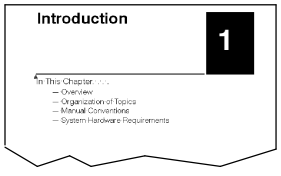
A	**Worksheets**	Has worksheets that you can use to help setup your OP-panel.

Conventions Used

The "note pad" icon in the left-hand margin indicates the paragraph to its immediate right will be a **special note**.

The "exclamation mark" icon in the left-hand margin indicates the paragraph to its immediate right will be a **warning** or **caution**. These are very important because the information may help you prevent serious personal injury or equipment damage.

Key Topics for Each Chapter The beginning of each chapter will list the key topics that can be found in that chapter.

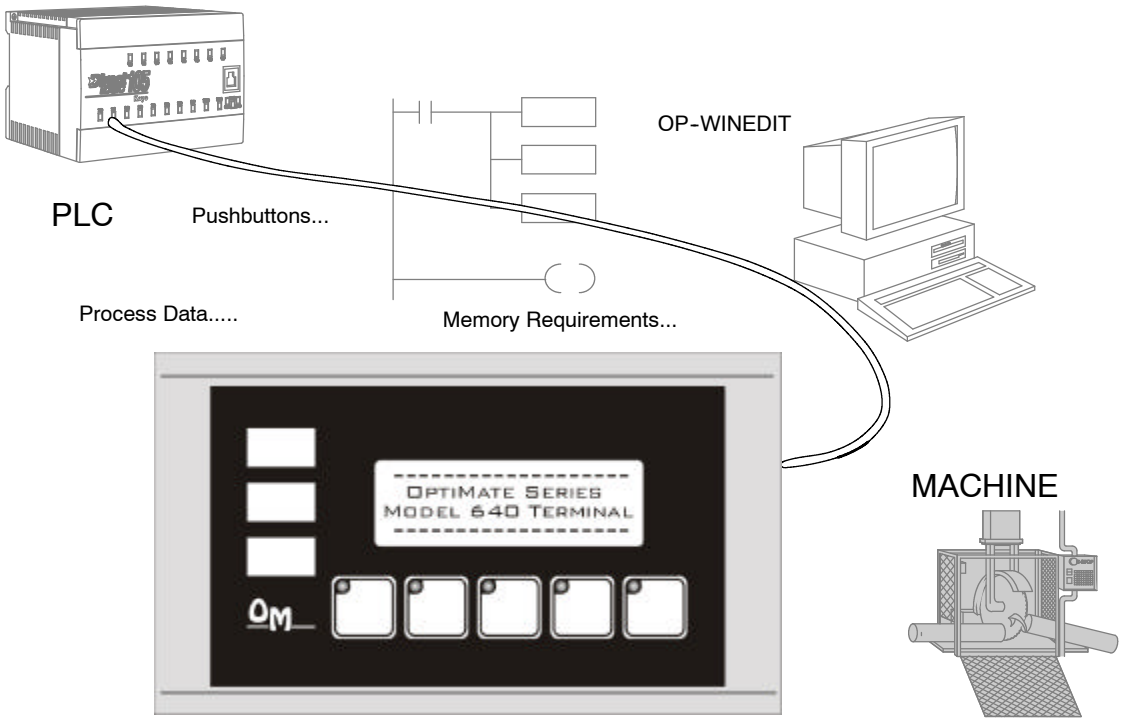


OP-640 Overview

Plan your System

Let's look at the OP-640 operator panel and its individually-supported features. As you continue through this manual, try to relate the examples to your Operator Panel application. The application worksheets located in Appendix A will be helpful during the design and configuration of your system.

It is important to read and understand all topics discussed before installing, configuring and programming your application. You should plan your system with all operator interface requirements in mind.

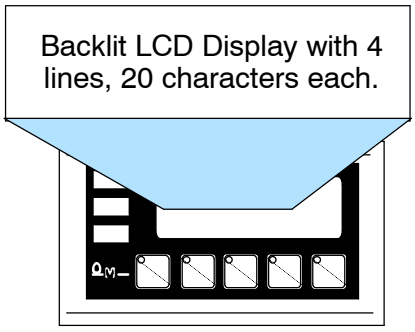


General Panel Information

The OP-640 operator panel provides a man-machine interface to your PLC automation system. This panel is *not* designed for applications which demand large amounts of operator data entry. The panel communicates with your PLC using RS-232 or RS-422 serial communication. Details on configuration software and programming your operator panel are covered in later chapters. The OP-640 operator panel can be used in a stand alone fashion with one panel used with each CPU RS-232 port, or can be used in multi-panel applications using an OP-9001 Commucations Master. You may network up to 31 panels using an OP-9001.

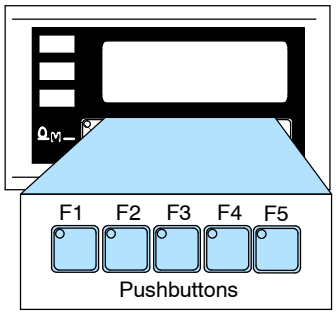
LCD Display Window

The OP-640 features an LCD display window to display user-defined messages. Up to 160 messages may be configured and stored in the operator panel using OP-WINEDIT configuration software. The PLC logic program controls which messages are displayed. Details on how to enter and use messages are covered in later chapters.



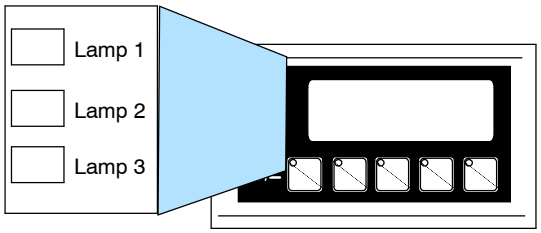
Pushbuttons

Many applications require operator panel pushbuttons for controlling the machine or process. These pushbuttons are used as input signals to the PLC which start and stop a machine or process. Configure these pushbuttons as momentary or alternating to best fit your operator interface application. You may create custom text labels.



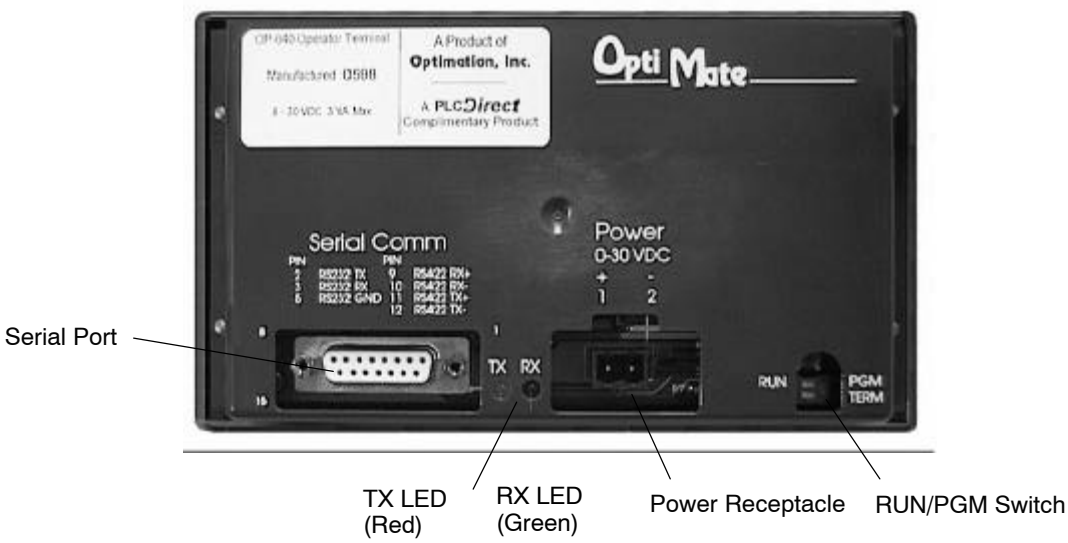
Annunciator Lamps

The three lamps are turned on, off and flashed through your ladder logic program. You may create custom text labels.



Back-Panel Layout

The back panel contains a serial communications port with transmit (TX) and receive (RX) LEDs, a power receptacle, and RUN/PGM and TERM switches.



Serial Communications Port

The serial communications port is a 15-pin, female D-shell connector, which supports using RS-232 or RS-422 interface wiring. This port is used for communications between the OP-panel and PLC, as well as for programming your panel configurations. In the case of a Multi-panel application, this port may be connected to the OptiMate OP-9001 Communications Master.

Power Receptacle

The supplied block style connector with screw terminals is used to connect an external 24VDC power supply.

RUN/PGM and TERM Switches

The RUN/PGM Switch must be set to ON (PGM) before downloading from the PC to the panel. The TERM Switch is only set to ON (right position) when the panel is at the end of a system using RS-422 communications. In all other cases, including downloading, it is set to OFF (left position).

Frequently Asked Questions

Q. What is required to get started using the OP-640 in my application?

A. You must read this manual and understand the OP-panel requirements and application concepts. You must have programming knowledge for the PLC product you're using, the PLC serial communications capabilities which are available, as well as hook-up and connecting cable data.

Q. How do I configure the OP-640 operator panel?

A. Using the OP-WINEDIT configuration software available from Automationdirect. This software allows you to configure the OP-panels in a Microsoft Windows™ environment. You may configure your programs offline, upload, and/or download them to your OptiMate panel. The OP-WINEDIT software is provided with installation documentation and Help screens.

NOTE: OP-WINEDIT version 2.3 or later is required.

Q. Can the OP-640 be used with other PLC products?

A. Yes. The OP-640 does support Allen-Bradley SLC 5/03, SLC 5/04, and Micrologix.

Q. What are the power supply requirements for the OP-640?

A. The OP-640 panel requires a 24VDC external power supply. See the Specifications for details.

Q. Will the OP-panels support graphics, animation, or color operator display screens?

A. No. The OP-panels which support display capabilities allow numeric data display, and some panels will also allow text message display.

Q. Can I connect more than one OP-panel to one PLC/CPU?

A. Yes, this is referred to as a Multi-Panel application. You may network up to 31 panels to communicate using RS-422 multi-drop communications between the OP-panels and OP-9001 Communications Master unit. Also, if your CPU has secondary ports, you may connect a single panel to each available serial port.

Q. Why does my panel lose communication after being in service for a period of time?

A. Once a panel gains communication with a PLC there are only a few reasons why it does not continue: 1) RFI from nearby motors, welders, starters, etc. causing anything from memory corruption to damaged driver chips; and 2) an inadequate power supply.

Q. When I have my panel connected to a DL205, my LCD and/or lamps work, but my pushbuttons don't...why?

A. The Optimate module cannot WRITE to the PLC's memory when the CPU's RUN/TERM switch is in the Run position, therefore only the LCD and/or lamps visually function. The CPU should be set to the Term position in order for the Optimate panel to write to it.

Q. My module will occasionally fail when I power up my system. Why does this happen?

A. Normally this is caused by an inadequate power supply corrupting the memory. When determining the size of a power supply be sure to include ALL sources of energy consumption and also account for the surge these devices require. For example an OP-613 requires 1.5 Amps (for 2 milliseconds) at start-up, but after start-up needs only 90 mA at 24VDC to function.

Q. My panel lights flash when connected to the bottom port of a D2-240. What's wrong?

A. The lower port on the D2-240 defaults to ASCII mode and needs to be set to HEX mode in order to communicate with an Optimate panel. Access the port settings from DirectSOFT by PLC->Setup->Setup Secondary Com Port.

Q. In a multi-panel system, how should I wire the panels if more than one power supply is being used?

A. It is highly recommended that all the power supply grounds be wired together. Failure to do so may result in failed modules. Also, ensure that power supply and wire size is large enough to handle the current, especially at long distances. It is also highly recommended that all shields be tied to earth ground. For power cable distances greater than 50' or in noisy environments, a two-twisted pair shielded wire such as Belden 9729 (or equivalent) should be used. There is an OP-9001 Supplemental Sheet with diagrams, included with all OP-9001's, depicting the three most typical wiring arrangements.

Q. Why does my module work in a stand-alone situation, but not when connected to my OP-9001?

A. The most obvious reason is that the module was not configured for a multi-panel situation or that the OP-9001 was not configured for the module. Next, the OP-9001 communicates with the module via RS-422 cable, so verify that the pin-outs are correct. Lastly, the RS-422 driver in the module or OP-9001 may have failed due to cabling or power supply problems. Please reference the OP-9001 Supplemental Sheet for wiring directions.

Q. I've loaded a new configuration into my panel and still get some of the old messages. How do I get rid of the old messages?

A. The OP-WINEDIT does not clear the message list in the OP panel when you load a new configuration. If you had more messages in the old configuration than the new configuration, the extra messages do not get overwritten. You can clear the message list from CONFIGURE>CLEAR LIST>THE CONNECTED PANEL. Reload the new configuration and the old messages will be gone.

2

Installation and Specifications

In This Chapter. . . .

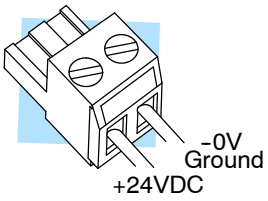
- Connecting a Power Supply
- Preparing Panel for Configuration
- Preparing Panel for Communications
- OP-9001 Multi-panel Configurations
- Choosing Connecting Cables
- Connecting Cable Details
- Labeling the Lamps and Pushbuttons
- Templates for Manually Creating labels
- Dimensions for Mounting
- Panel Specifications

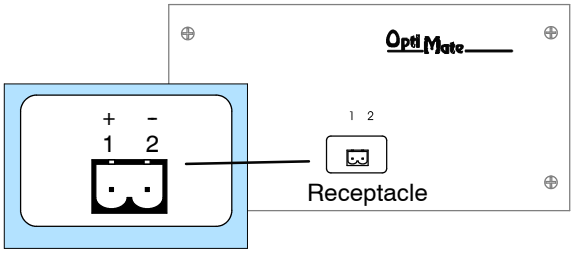
Connecting a Power Supply

Power Supply Connections

An external power supply is adapted to supply operating voltage to the OP-640 unit. The power supply must deliver a range between 8 to 30 VDC, and provide a minimum of 5 watts continuous power to the units. Connect your power supply using the terminal block connector supplied with each panel. The connector is keyed to prevent reversing the polarity.

Use 18-24 AWG conductor wire and connect the power supply to the connector block which is supplied with each operator panel. The terminal marked 1 is the positive (+8-30 VDC) connection and terminal 2 is the common ground (0V) connection.

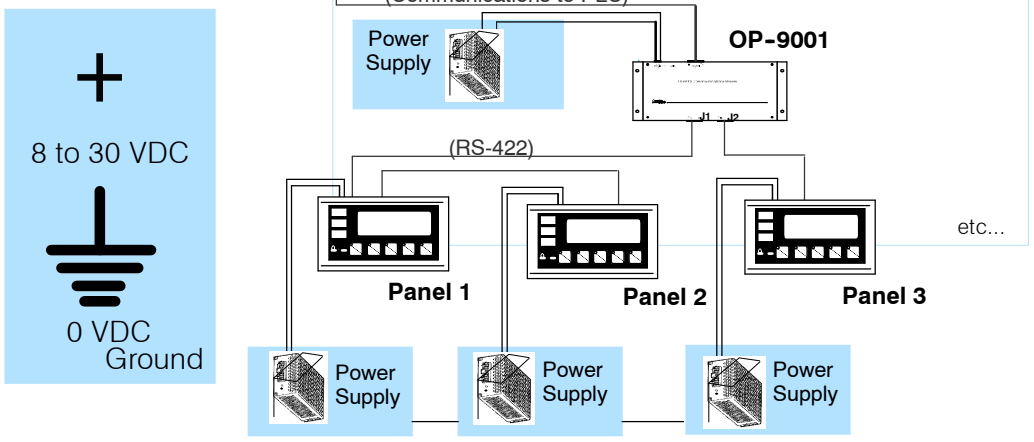




Plug the terminal block connector into Power receptacle located on the back side of the panel.

Multi-panel Power Supply Connection

In Multi-panel applications, if separate power supplies are used, make sure the electrical ground connections do not have a great potential difference. When using a single power supply in a Multi-panel application, the power supply must maintain the specified voltage and current consumption levels under all conditions (including power-up) for each of the individual units. See individual panel power requirements under Panel Specifications.

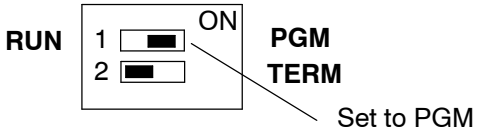


Preparing the Panel for Configuration

RUN/PGM Switch

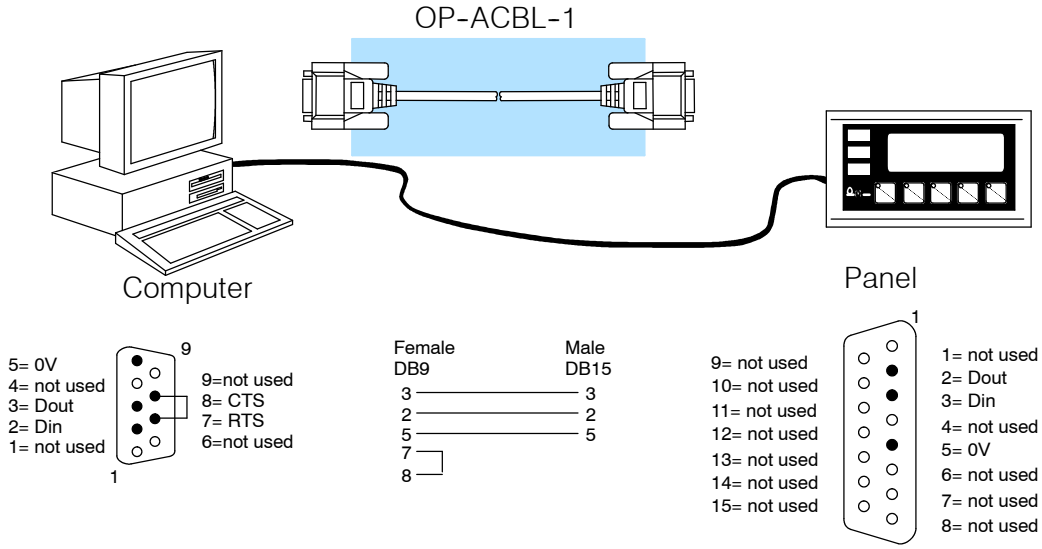
The RUN/PGM Switch must be set to PGM (ON) before downloading from the PC to the panel. The TERM switch should remain off.

NOTE: You must cycle power to the panel to activate the new switch settings.



Configuration Cable

Connect the configuration cable (OP-ACBL-1) between the serial port of the OP-panel and the serial port of the personal computer. The panel may then be configured using the OP-WINEDIT configuration software. The figure below shows programming cable connectors and wiring specifications. Wiring diagrams refer to the cable connectors, *not* the communication ports.

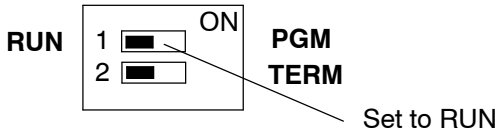


Preparing the Panel for Communications

RUN/PGM Switch

The RUN/PGM Switch must be set to **RUN** after loading the configuration program. The TERM switch should remain off.

NOTE: You must cycle power to the panel to activate the new switch settings.



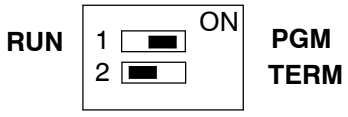
OP-9001 Multi-Panel Configurations

If you are connecting more than one OptiMate panel to a single CPU this is referred to as Multi-panel configuration. Multi-panel configurations require the OP-9001 Communications Master. The OP-9001 communicates with the CPU as well as the connected OP-panels. The OP-9001 looks for an address within the range of 0 to 30 for each panel connected. Each panel connected in an RS-422 link must have a unique address. A more detailed description of multiple panel configurations and installation is given in the OP-9001-M User Manual.

The TERM Switch

When using an RS-422 communications link, the *last panel* must be terminated by setting the TERM Switch to ON. Systems which are using the OP-9001 in a multi-panel application use RS-422 wiring. Operator panels communicating more than 50 feet distance *must* use RS-422 links. The TERM Switch stays OFF for RS-232 communications.

NOTE: Only the *last panel* of each RS-422 link should be terminated (TERM switch ON). All other panels must have the TERM switch OFF. After changing the DIP switch settings, remember to cycle power on the panel to activate the new switch settings.



Choosing Connecting Cables

Depending on which PLC you are using, you may require as many as two cables. Here are the requirements:

- **OP-ACBL-1:** *all* units require this cable for configuration. This is a 9-pin female to 15-pin male cable that connects your personal computer to the OP-panel. This cable is also used to connect an OP-panel to the Allen-Bradley SLC 500 CPUs.
- **CPU Cables:** You will also need the appropriate cable to connect your CPU to the OP-panel. Use the chart shown to the right to choose the correct communications cable.

OP-9001 Cable Connectors

If you're planning to use multiple panels and an OP-9001, then you'll need to build your own custom cables. Since the proper cable choice really depends on your application, we offer the following connectors.

- **OP-CMCON-1** — pack of 4 ribbon cable connectors.
- **OP-CMCON-2** — pack of 4 solder-type connectors.
- **OP-CMCON-3** — pack of 2 D-shell connectors with screw terminals for use with OP-9001 & multiple OP-panels.
- **OP-PSCON** — pack of 4 power supply block connectors.

For electrically noisy environments, we recommend an individually paired and shielded cable, such as Belden 9729 or equivalent. This type of cable will require the solder-type or D-shell with screw terminal connectors. If you're going 30 feet or less, you can use ribbon cable. For ribbon cable, we recommend Belden 9L28015 or 3M 3365/15.

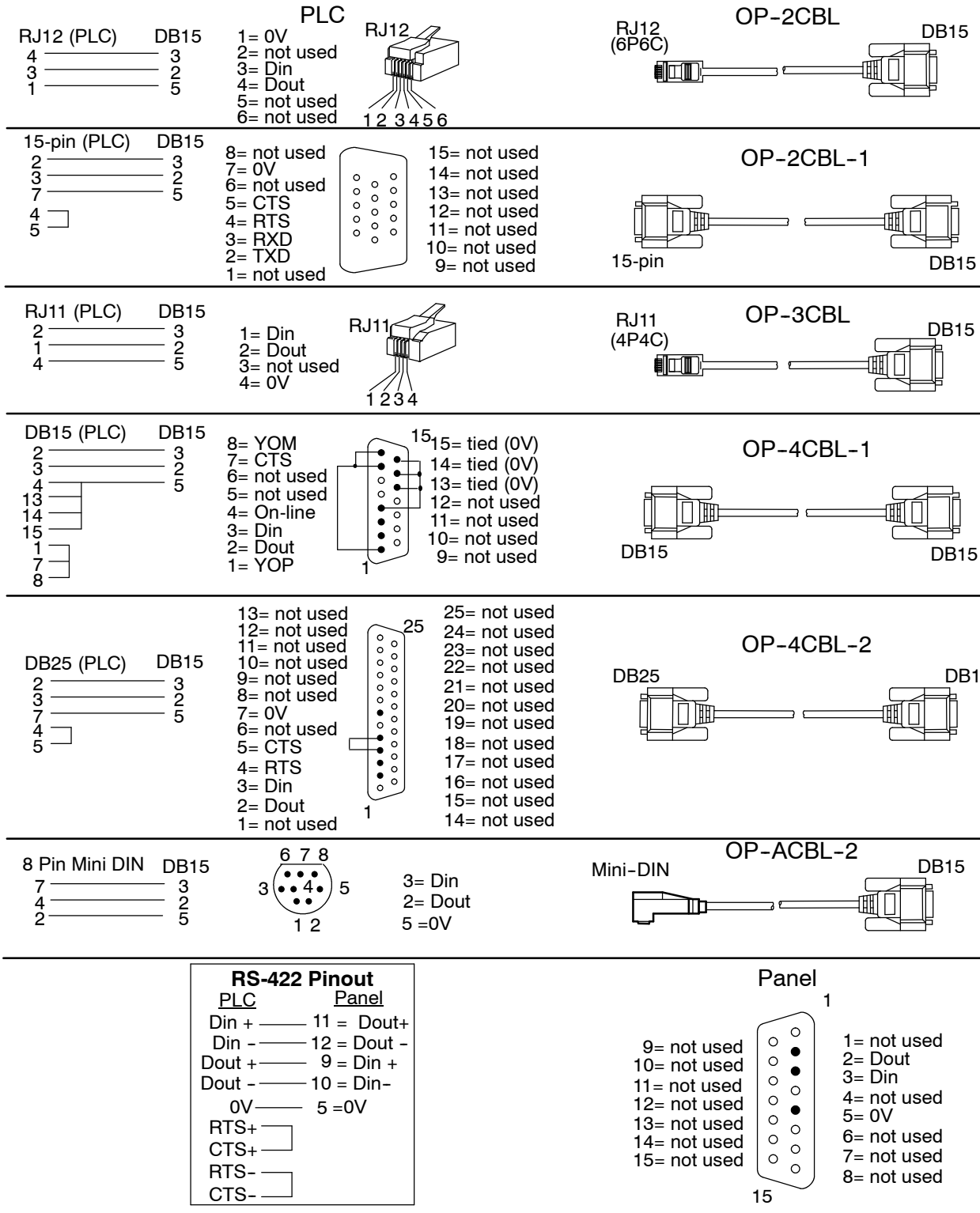
OptiMate Cables			
Family	**CPU (or other device)**	**Port**	**Cable**
DirectLOGIC™ DL05 / DL105	DL05: D0-05 DL105: DL130	DL05: Both ports DL105: Only one port	OP-2CBL
DirectLOGIC™ DL205	DL230	Only port	OP-2CBL
	DL240	Top port	OP-2CBL
		Bottom port	OP-2CBL
	DL250	Top port	OP-2CBL
		Bottom port	OP-2CBL-1
	D2-DCM (module)	Only port	OP-4CBL-2
DirectLOGIC™ DL305	DL330	Requires DCU*	OP-4CBL-2
	DL330P	Requires DCU*	OP-4CBL-2
	DL340	Top port	OP-3CBL
		Bottom port	OP-3CBL
	DL350	Top port	OP-2CBL
		Bottom port	OP-4CBL-2
DirectLOGIC™ DL405	DL430	Top port (15-pin)	OP-4CBL-1
		Bottom port (25-pin)	OP-4CBL-2
	DL440**	Top port	OP-4CBL-1
		Bottom port	OP-4CBL-2
	DL450**	Phone Jack	OP-2CBL
		Top port (15-pin)	OP-4CBL-1
		Bottom port (25-pin)	OP-4CBL-2
	D4-DCM (module)	Only port	OP-4CBL-2
	Slice I/O panels	Only port	OP-4CBL-1
GE® Series 1	IC610CPU105/106	Requires DCU*	OP-4CBL-2
TI305™ / SIMATIC® TI305™	325-07, PPX:325-07	Requires DCU*	OP-4CBL-2
	330-37, PPX:330-37	Requires DCU*	OP-4CBL-2
	325S-07 (or 325 w/ Stage Kt)	Requires DCU*	OP-4CBL-2
	330S-37, PPX:330S-37	Requires DCU*	OP-4CBL-2
	335-37, PPX:335-37	Phone Jacks	OP-3CBL
		If DCU is used*	OP-4CBL-2
TI405™ / SIMATIC® TI405™	425-CPU, PPX:425-CPU **	Only port	OP-4CBL-1
	PPX:430-CPU	Top port (15-pin)	OP-4CBL-1
		Bottom port (25-pin)	OP-4CBL-2
	435-CPU, PPX:435-CPU **	Top port (15-pin)	OP-4CBL-1
		Bottom port (25-pin)	OP-4CBL-2
	Smart Slice™ I/O panels	Only port	OP-4CBL-1
A-B SLC 500	5/03, 5/04	Bottom port	OP-ACBL-1
A-B	MicroLogix	Only port	OP-ACBL-2

* — requires RS232 Data Communications Unit (D3-232-DCU)

**- also available in DC versions

Connecting Cable Details

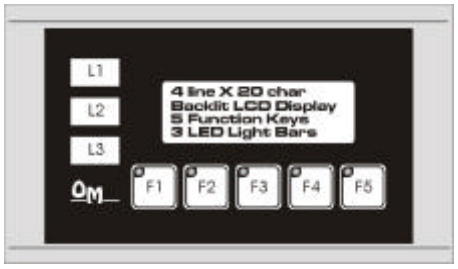
Connecting Cable The OP-640 connecting cable may vary depending on the CPU used. Refer to the previous page to confirm the proper cable is chosen for connecting to your PLC.



Labeling the Lamps and Pushbuttons

Labeling the Lamps and Pushbuttons

In any manufacturing environment it is important to have legible labels on the pushbuttons. Labeling the OP-640 panel is a relatively simple process that involves removing the bezel and sliding a label transparency into a pocket in the panel overlay. The transparent film can be purchased from almost any office supply store in standard 8-1/2" x 11" sheets. It is designed to run through a copy machine or laser printer.



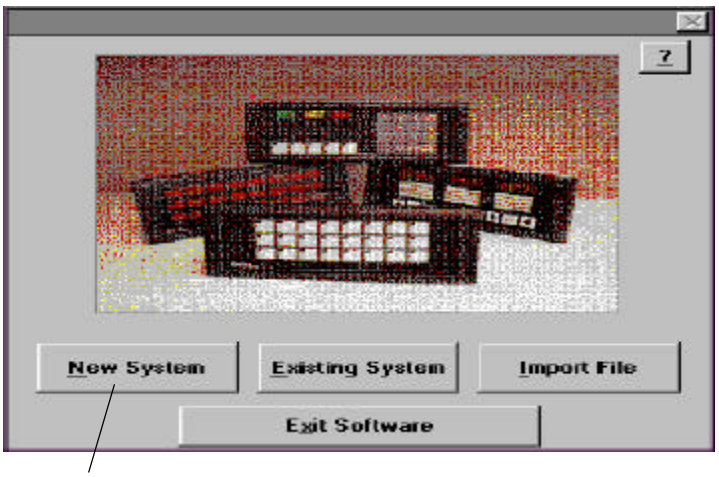
Creating the Labels

The easiest way to create labels is to use the built-in label making function of the OP-WINEDIT configuration software. This is the preferred method and is shown below. The labels can also be created manually using the template shown in the next section to help layout the transparency film. Here are some ways of manually creating labels:

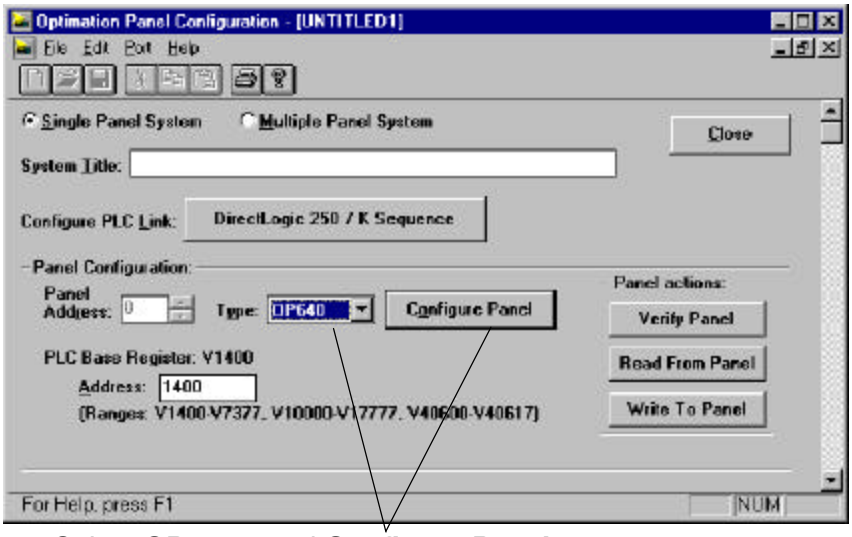
- Use a computer graphics program and a laser printer to create the transparency directly, or print the labels on paper and photocopy them to a transparency sheet.
- Use press-on letters on a transparency sheet.
- Use a typewriter or lettering machine, or use press-on letters to create labels on a paper sheet, then photocopy the paper sheet onto a transparency sheet.

Creating Labels Using OP-WINEDIT

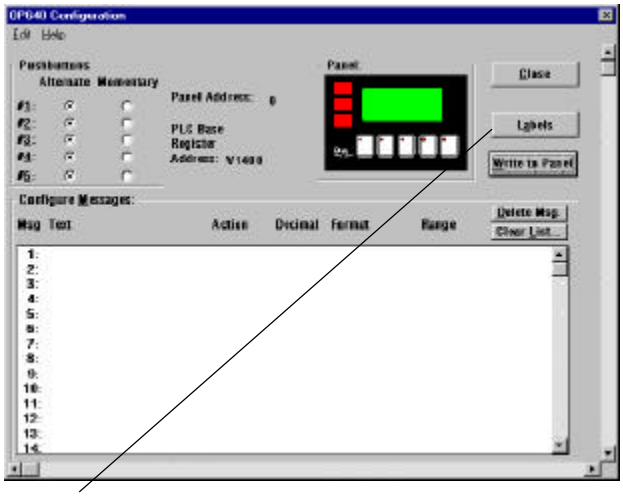
Making labels using the OP-WINEDIT configuration software is easy (see Chapter 4 for information on loading and using OP-WINEDIT). After loading OP-WINEDIT, follow these steps:



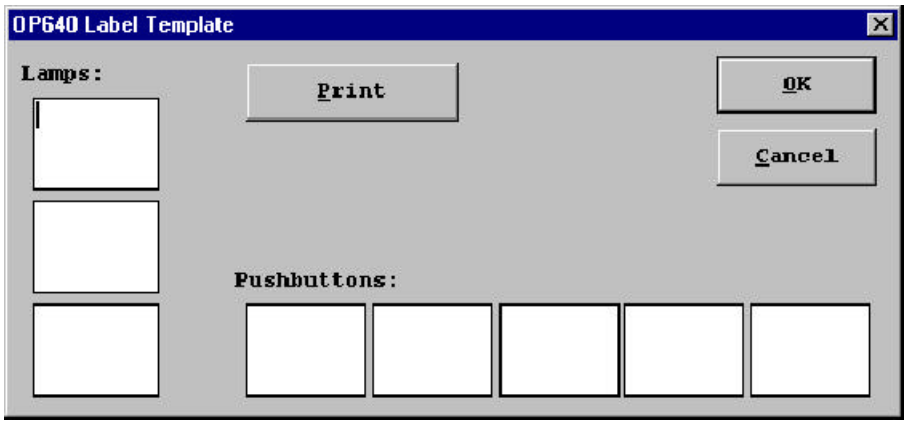
1. Open OP-WINEDIT and select **New System.**



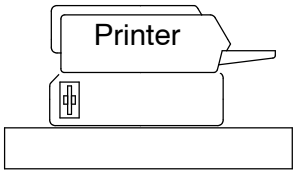
2. Select **OP-640**, and **Configure Panel.**



3. Select **Labels.**

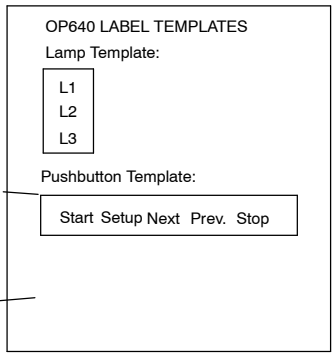


4. The OP-640 Label Template appears. Type in the label text for the five pushbuttons and the three lamps. Press **OK** to save the labels.

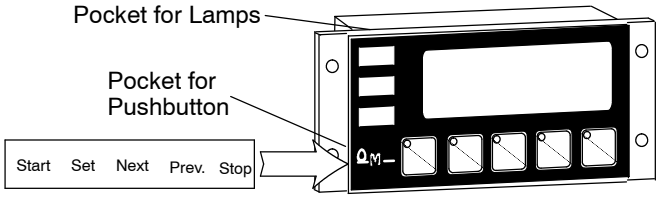


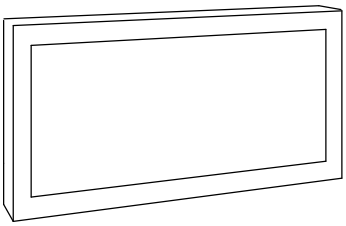
5. **Print** label on transparent film.

6. Cut out the block of labels and insert them in the panel.



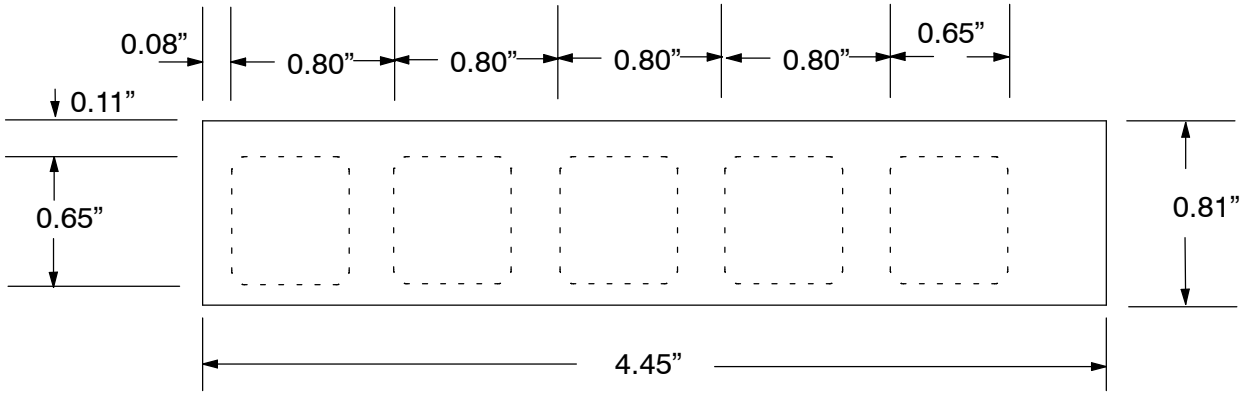
Transparent Sheet



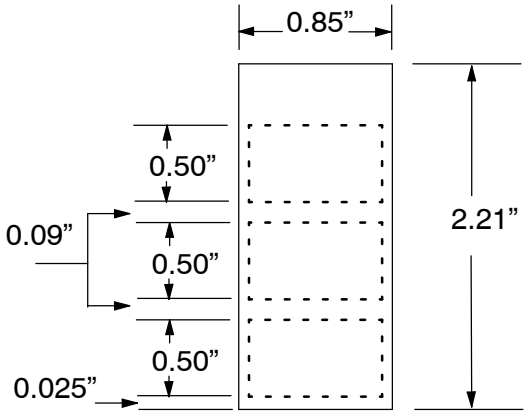


Remove the bezel from the module by unsnapping the four plastic tabs which secure the bezel to the module frame. Locate the pocket, and carefully slide the labels into place. Re-attach the bezel by snapping the bezel onto the case.

Templates for Manually Creating Labels

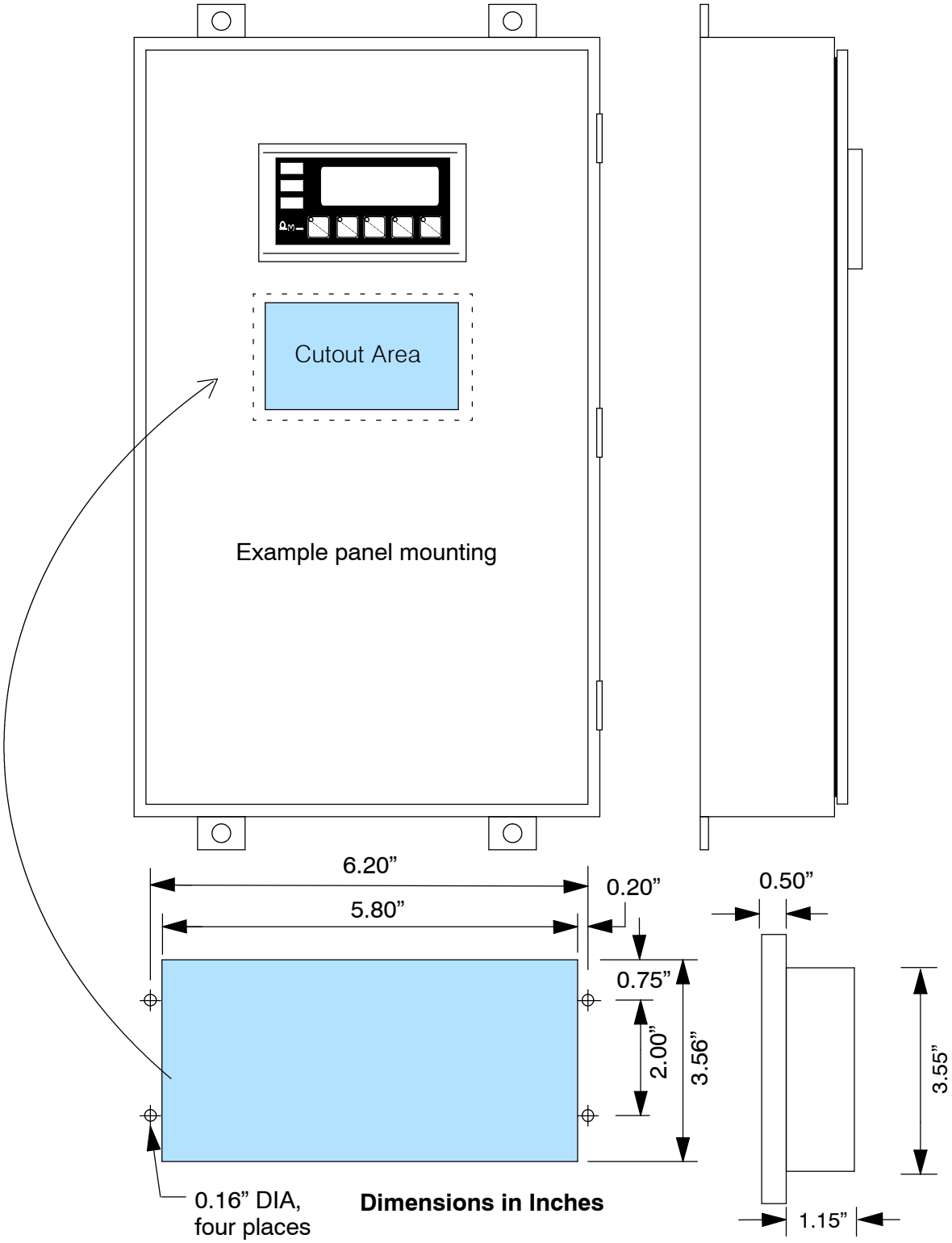


Pushbutton Label Strip Pattern



Indicator Lamp Label Strip Pattern

Dimensions for Mounting



Panel Specifications

Physical Specifications

Weight	12 ounces
Panel Fasteners	Four 6x32 threaded studs
Pushbutton Life	1,000,000 switch cycles
LCD Display	4 line x 20 character STN with LED backlight; 4.75mm high x 2.95mm wide character size
Lamp Colors	Red, Yellow and Green
NEMA Rating	NEMA 4 (when properly installed)

Environmental Specifications

Operating Temperature	0° to 50° C
Storage Temperature	-20° to 70° C
Operating Humidity	95% (non-condensing)
Air Composition	No corrosive gases permitted

Operating Specifications

Power Consumption	2.4W @ 8-30VDC (Power On surge of 1.5-2.0A for 1 ms max.)
Power Connector	Keyed terminal block
Diagnostics	LED Status
Communication Link	RS-232 4800 to19200 baud 15 pin female D shell connector
Message Types (160 max.)	General Text Data display (one value per line)
Numeric Types & Values	Integer Fixed Point BCD (values 0 - 9999, with appropriate decimal placement) BCD Double (values 0 - 99999999, with appropriate decimal placement) Binary (values 0 - 65535, with appropriate decimal placement) Floating Point (values -3.402823E+38 to 3.402823E+38 with appropriate decimal placement)

3

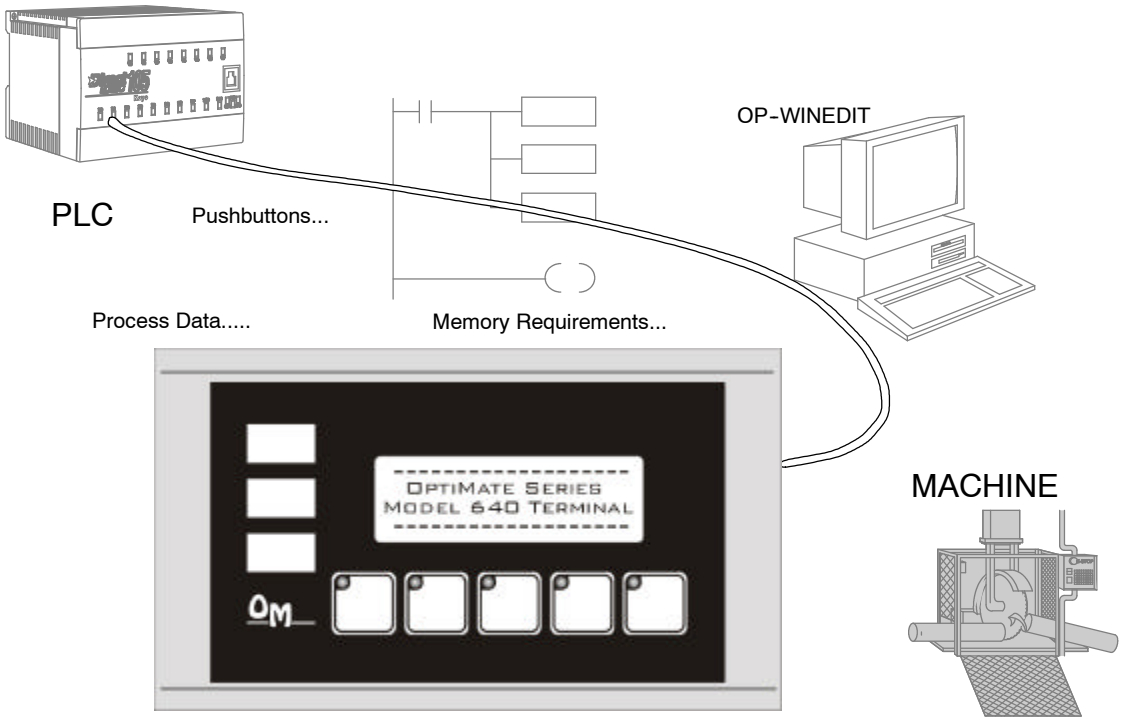
Understanding the Features

In This Chapter. . . .

Learning the Features

In this section, the subject of how to use the OP-640 features is described. The details for using pushbuttons and messages are covered. We recommend that you study this chapter before attempting to configure and use the OP-panel. As you proceed through this chapter, relate the topics discussed with how your operator panel may be implemented. The concepts discussed in this chapter are applicable to all PLCs.

- Message and Menu Operations
- Memory Mapping Process
- Controlling the Lamps
- Using the Pushbuttons
- Static Messages
- Dynamic Messages



Status and Control Registers

Status and Control Register Overview

The OP-panels communicate to the PLC through user defined PLC data registers. The starting or "Base" register is assigned during panel configuration and automatically occupies fourteen consecutive 16-bit data registers. In this manual the registers are identified as M+0, M+1, M+2, thru M+13. Each OptiMate panel which is connected to the PLC maintains separate Status and Control registers within the PLC. These registers (M+12, M+13) contain information to monitor and control individual OP-panel functions and features. Shown in the figure below, base registers M+12 and M+13 ***must have*** bit level access by the user control program. That means Status and Control **word** register memory (OP-panel Base registers) must be mapped to user memory bit registers. These bit registers are referred to as Internal Control Relays such as C0, C1, etc.

NOTE: Depending on which CPU is used and the Base memory which is assigned, the Status and Control registers *may not* require the mapping process.

Bit Level Access

Once again, the Status and Control bits are monitored and manipulated by the PLC ladder logic. For discrete operations such as pushbuttons and lamps, the registers M+12 and M+13 bits are accessed by the PLC control program. The figure below shows the fixed definition of the Status and Control register bits. These bits are labeled F1-F5 (Pushbuttons), L1-L3 (Lamps), for example. The bits and associated labels are described on the following page. First examine the figure below to begin understanding the OP-panel registers and functions. You must structure your ladder logic program to coordinate OP-panel functions asynchronously. This means the operations are triggered successively-not by a clock, but by the completion of an operation.

PLC Register	Register Function
M+0	Top line message selection
M+1	Second line message selection
M+2	Third line message selection
M+3	Bottom line message selection
M+4	Top line data
M+5	Top line data 2 (for long BCD and floating point numbers)
M+6	Second line data
M+7	Second line data 2 (for long BCD and floating point numbers)
M+8	Third line data
M+9	Third line data 2 (for long BCD and floating point numbers)
M+10	Bottom line data
M+11	Bottom line data 2 (for long BCD and floating point numbers)
M+12	Status register
M+13	Control register

MSB **Status Register M+12** **LSB**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
											F5	F4	F3	F2	F1

MSB **Control Register M+13** **LSB**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
									BD	LF3	LF2	LF1	L3	L2	L1

Register Definition The following describes the function of each of the registers shown in the table.

- **Register M+0** – When a number from 1 to 160 is placed in this register, the predefined message associated with that number will be displayed on the **top** line of the LCD display.
- **Register M+1** – When a number from 1 to 160 is placed in this register, the predefined message associated with that number will be displayed on the **second** line of the LCD display.
- **Register M+2** – When a number from 1 to 160 is placed in this register, the predefined message associated with that number will be displayed on the **third** line of the LCD display.
- **Register M+3** – When a number from 1 to 160 is placed in this register, the predefined message associated with that number will be displayed on the **bottom** line of the LCD display.
- **Register M+4** – This contains numeric data associated with the **top** line display (this is described in more detail later).
- **Register M+5** – This is used for long BCD and floating point data only.
- **Register M+6** – This contains numeric data associated with the **second** line display (this is described in more detail later).
- **Register M+7** – This is used for long BCD and floating point data only.
- **Register M+8** – This contains numeric data associated with the **third** line display (this is described in more detail later).
- **Register M+9** – This is used for long BCD and floating point data only.
- **Register M+10** – This contains numeric data associated with the **bottom** line display (this is described in more detail later).
- **Register M+11** – This is used for long BCD and floating point data only.
- **Register M+12** – This is the Status Register (details below).
- **Register M+13** – This is the Control Register (details below).

Status and Control Register Definition The Status register (M+12) and Control register (M+13) are used for data exchange between the OP-panel and PLC program. The figure below shows the individual bits within each data register. The function of the Status and Control register bits are described below. Mapping these registers is covered at the end of this chapter.

MSB **Status Register M+12** **LSB**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
											F5	F4	F3	F2	F1

MSB **Control Register M13** **LSB**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
									BD	LF3	LF2	LF1	L3	L2	L1

Status Register (M+12):
F1–F5 – Are the status function for the OP-panel definable pushbuttons. These bits are set to 1 (ON) when the button is active.
Control Register (M+13):
L1–L3 – Lamp ON/OFF control for each of the three lamp annunciators. Set to 1 (ON) to turn the lamp on.
LF1–LF3 – Lamp Flash control for each of the three lamp annunciators. To flash the lamp set Lamp and Lamp Flash bits both to 1 (ON).
BD– Buzzer Disable. If set to 1 buzzer does not beep when buttons are pressed.

Messages

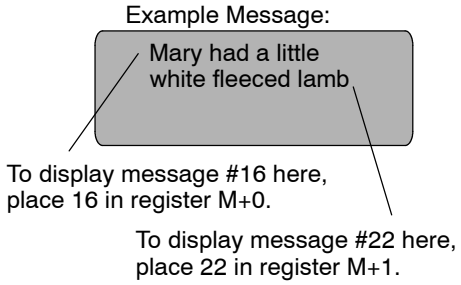
Displaying Messages on the LCD Screen

Through the OP-WINEDIT software, up to 160 predefined messages can be entered and stored in the OP-640. These messages are 20 characters long and can include a field for the display of numeric data.

Any predefined message can be displayed on either the top or bottom line. The messages entered during configuration are numbered 1 thru 160. To display a particular predefined message on the display, simply place that message's number in the message selection register.

For example, let's assume that we have defined message #16 as "Mary had a little" and message #22 as "white fleeced lamb". If we wanted to put these two lines on the top and second lines respectively, we would simply need to put the number 16 in register M+0 and 22 in register M+1.

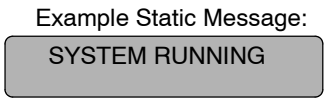
If any number other than 1 thru 160 is placed in a message selection register, the associated line will not change.



There are two types of messages which may be displayed on this panel, **Static** and **Dynamic** messages.

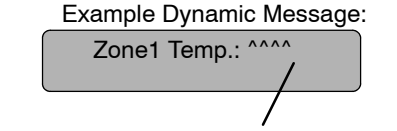
Static Messages

Static messages are text displays which have *no* embedded data. The static messages may be displayed when an event or condition becomes true. You enter the messages during configuration.



Dynamic Messages

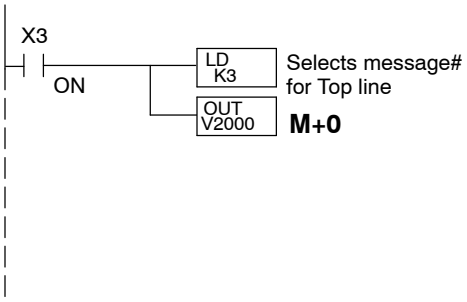
Dynamic messages are text messages which include embedded data. These messages are used to present the operator with important PLC data. This data is information which helps the operator closely monitor and control the machine or process.



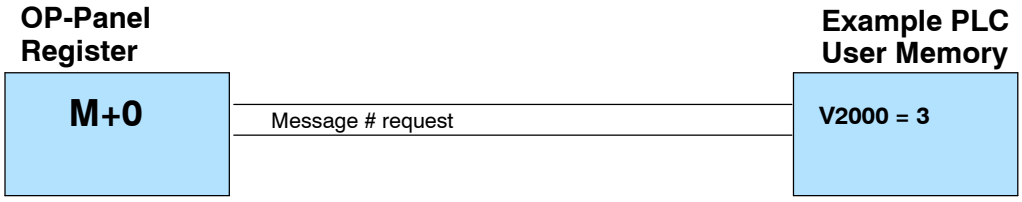
Displaying Messages

The logic required to display the configured message is quite simple. Simply put the message number (1–160) in memory location **M+0** for the top line message, **M+1** for the second line message, **M+2** for the third line message, or **M+3** for the bottom line message. The figure below demonstrates an example of a Static message with the panel configured for a starting address of V2000.

Static Message Operation



In this example, if the PLC's input signal X3 is ON, the 16 bit integer (K3) value is placed in Word register V2000 (M+0), selecting message #3 to be displayed on the top line.



Static Display

Description

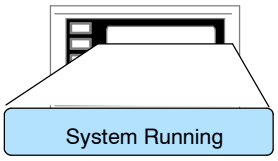
All supported CPUs use the first OP-panel register for displaying a top line static message.

Your ladder logic program must sequence the message being displayed by placing an integer value (1–160) in register M+0.
The OP-panel operating system automatically updates the latest messages according to values placed in the highlighted registers.

Top Line Static Message

Register	Value	Function
M+0	**3**	Top line message selection
M+1		Second line message selection
M+2		Third line message selection
M+3		Bottom line message selection
M+4		Top line data
M+5		Top line data 2
M+6		Second line data
⋮		⋮

Example Message #3



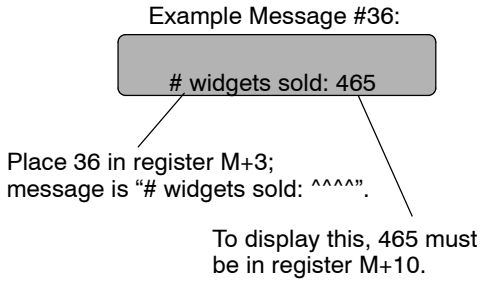
Dynamic Message Operation

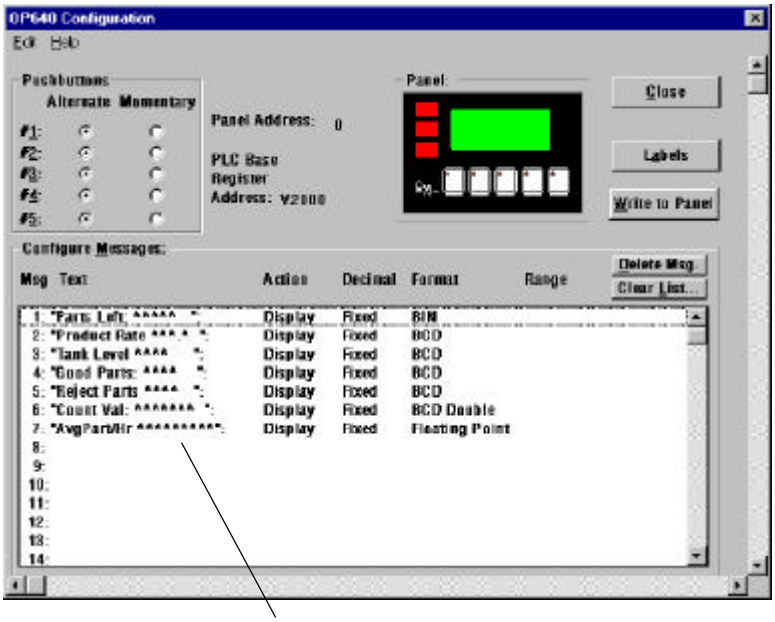
You may program message numbers 1-160 to be used as dynamic messages. One numeric field per line is allowed. Dynamic messages may be displayed on either the top or bottom display lines. The maximum number of digits which may be displayed is five if binary data format is used, four if BCD is used, and eight if BCD double is used. The figure below demonstrates the OP-WINEDIT screens for programming a dynamic message.

Enter the message text and place the caret (^) symbol(s) depending on the number of digits you would like to display. The value range which may be displayed is 0-65,535 integer, 0-9999 BCD or 0-99999999 BCDD. Choose binary, BCD, or BCD double format and fixed point decimal placement.

For dynamic messages which require fixed decimal point placement within the value, you must use the OP-WINEDIT to perform parameter placement type. For fixed position decimal points you must enter the decimal directly into the message text, such as Zone1 Temp = ^^.^^.

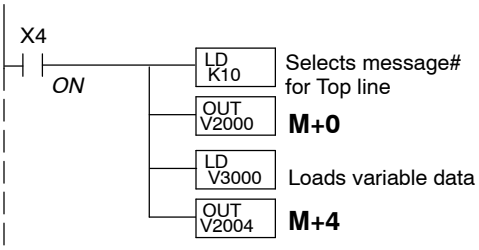
For example, let's say message #36 is "# widgets sold: ^^^^". Let's also say that 465 widgets have been sold today. To display the current number of widgets sold on the bottom line of the display, you would place 36 in register M+3 and 465 in register M+10. The bottom line would then display: "# widgets sold: 465".



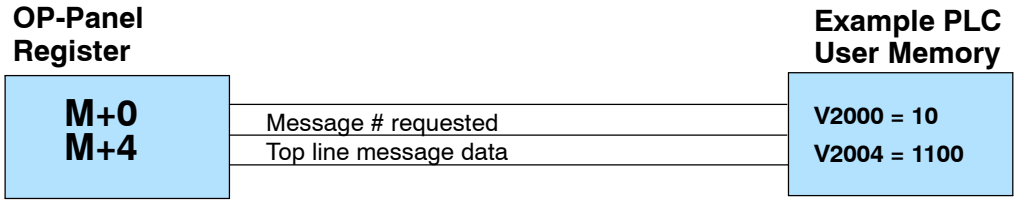


Examples of dynamic messages. Notice the caret (^) symbols, which is where data will be when the message is displayed.

Dynamic Message Top Line

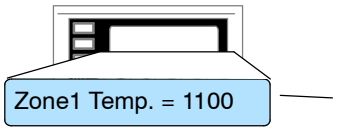


In this example, if the PLC's input signal X4 is ON, the 16 bit integer (K10) value is placed in Word register V2000 (M+0) selecting message #10 to be displayed on the top line. The data value in register V3000 (let's say 1100) is moved into V2004 (M+4), which is embedded in the top line message. The top line data value will update as long as X4 is enabled (ON).



Remember, your ladder logic program must select the message being displayed by placing an integer value between 1 and 160 (message #) in register M+0. The embedded data for the top line message is controlled by loading a 16 bit value into register M+4.

Example Message #5

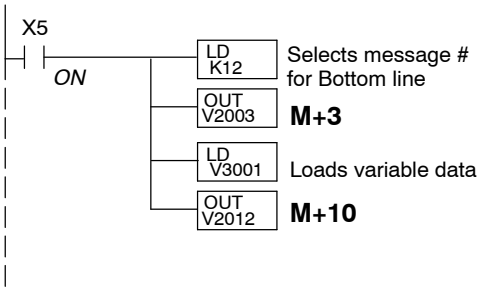


Top Line Dynamic Message

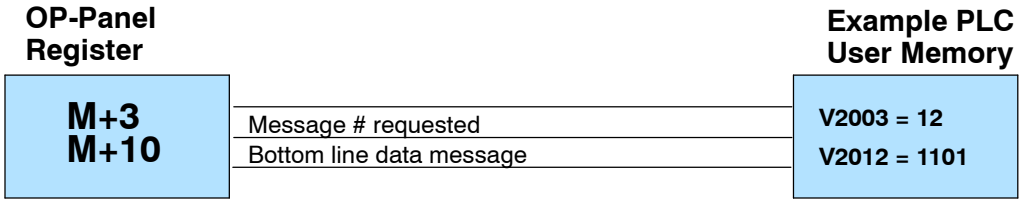
Register	Value	Function
M+0	**10**	Top line message selection
M+1		Second line message selection
M+2		Third line message selection
M+3		Bottom line message selection
M+4	**1100**	Top line data
M+5		Top line data 2
M+6		Second line data

The highlighted registers M+0 and M+4 in this figure result in displaying this top-line dynamic message.

Dynamic Message Bottom Line

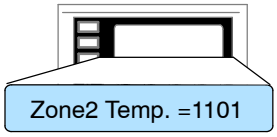


In this example, if the PLC's X5 input signal is ON, the 16 bit integer (K12) value is placed in Word register V2003 (M+3) requesting message #12 to be displayed on the bottom line. The data value in register V3001 (let's say 1101) is moved into V2012 (M+10), which is embedded in the bottom line message. The bottom line data value will update as long as X5 is enabled (ON).



Remember, your ladder logic program must select the bottom line message being displayed by placing an integer value between 1 and 160 (message #) in register M+3.

Example Message #12



Bottom Line Dynamic Message

Register	Value	Function
M+0		Top line message selection
M+1		Second line message selection
M+2		Third line message selection
M+3	**12**	Bottom line message selection
⋮	⋮	⋮
M+10	**1100**	Bottom line data

The highlighted registers shown in this figure results in displaying this bottom-line dynamic message.

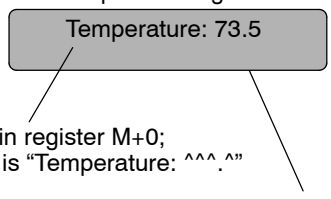
Displaying Data With a Decimal Point

The OP-640 panel allows you to display fixed point numbers, which are numeric values that have a known decimal point placement and are simply handled as integer values within the PLC program. The only time you see an actual decimal point is on the LCD display. An example of a fixed point number is a program that uses temperature as a control variable, and within the program all temperatures are scaled in tenths of a degree. The values are integer, so a temperature of 73.5 degrees would be 735 in a data register. For the convenience of the operator, you would want the LCD display to include the decimal.

Fixed point numbers are handled by simply placing a decimal point or period in the message field during configuration.

For example, let's say you want to display the message "Temperature: 73.5" on the top line, and the message is #47. Enter message #47 as "Temperature:^^^.^" during configuration.

Example Message #47:



Place 47 in register M+0; message is "Temperature: ^^^.^"

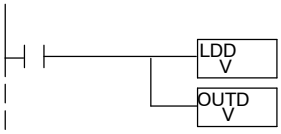
To display this, 735 must be in register M+4.

Displaying BCD and Binary Numbers

Normally, numeric values to be displayed are values contained in one 16-bit register. One 16-bit register will handle values between 0 and 65535 in binary form, or between 0 and 9999 in BCD form. For these type numbers register M+4 is used for the numeric value for the top line, M+6 is used for the second line, M+8 is used for the third line, and M+10 is used for the bottom line.

Displaying BCD Double Numbers

The OP-640 will handle large numeric numbers. If you select the option **BCD Double** when the display message is being defined, your display can handle numbers between 0 and 99,999,999. The panel will use data in the register pair M+4 and M+5 for the top line, and use M+6 and M+7 for the second line, etc. The data must be in BCD.



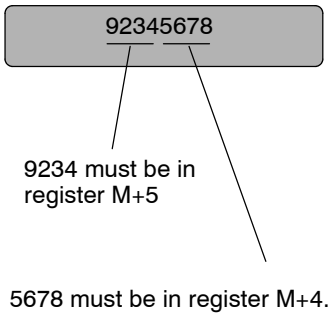
Notice that double registers are used.

M+2 & M+3

When placing a BCD double number in the display registers, the first register numerically in the sequence of two registers (M+4, M+6, M+8 or M+10) will contain the *four least significant digits* of the number. The second register in the sequence (M+5, M+7, M+9 or M+11) contains the data for the *four most significant digits* of the BCD double number.

For example, to display the number 92345678 on the top line of the display, the top line data registers, M+4 and M+5, must contain 5678 and 9234 respectively.

Example: BCD Double



Displaying Floating Point Numbers

The OP-640 has the capability to display Floating Point (or Real) numbers if you select the option **Float** when the display message is being defined in the OP-WINEDIT software.

Floating point numbers can only be used with the D2-250, D3-350, and D4-450 CPUs since they are the only compatible CPUs that support the IEEE 32-bit floating point number format, which is where the floating point numbers are stored. They always occupy two 16-bit register locations regardless of the size of the number. See the PLC User Manual for more information on the IEEE 32-bit floating point number format.

An IEEE 32-bit floating point number has a range of -3.402823E+38 to +3.402823E+38. The OP-640 will be able to display any number within that range. The panel always uses the format ±X.XXE±XX to display the numbers.

The panel does not have the ability to display all the significant digits of a floating point number, it only displays the first three significant digits. The OP-640 truncates the remaining digits so you always see the true number. The two examples below show the data contained in the PLC registers and the corresponding value displayed on the panel in its format. Notice how the data is truncated, not rounded.

The configuration of a floating point number message is similar to any other message. First, you select the message number, then type in the text using nine caret symbols (^) as a place holder for each of the nine floating point number symbols. To do this, type in one caret symbol, select the **Float** option for the data format, and then type in the remaining eight caret symbols.

Example: Floating Point Numbers

PLC Registers	OP-640 Display
12301.789	+1.23E+04
123.96783	+1.23E+02

For example, let's say you wanted to configure message #58 to display a floating point number. In the OP-WINEDIT software, select OP-640 as the module type, and then select message #58 with the mouse. Type in the following message: "Float Pt ^^^^^^^^" and select floating point as the message format (you must type in at least one caret symbol and then select Float before you can type in all nine caret symbols).

To display a number, simply move it into either the top or bottom line data registers and load the appropriate message number into the corresponding top or bottom line message selection register. For example, if you display the number 632.15 in message #58, it will be displayed as "Float Pt # +6.32E+02".

Pushbuttons and Lamps

The OP-640 has five user-defined pushbuttons. Pushbuttons may be used to begin events or tasks within the PLC, such as start/stop control. This section describes concepts of how to monitor and control the pushbuttons on your OP-panel.

Pushbutton Operation

The OP-panel pushbutton inputs are monitored for ON/OFF conditions in your PLC ladder logic program. From a practical point of view we need to control and monitor the bits in the status register on an individual basis. The OP-640 pushbuttons are assigned to the *first five bits* of the **Status Register (M+12)**. Examine the highlighted status bits below which show each user-definable pushbutton.

M+10	Bottom line data
M+11	Bottom line data 2 (for long BCD and floating point numbers)
M+12	Status register
M+13	Control register

MSB **Status Register** **LSB**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
											F5	F4	F3	F2	F1

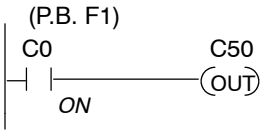
MSB **Control Register** **LSB**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
									BD	LF3	LF2	LF1	L3	L2	L1

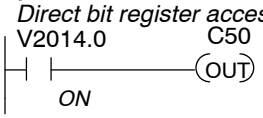
Pushbutton Example

The pushbutton example shown here is using ***Direct***LOGIC PLC address references. The equivalent instructions for *other* PLC products supported are shown in Chapter 5 of this manual.

NOTE: In this example we assume that the OP-panel is configured with a base register of V2000. In this case, status register M+12 is V2014 which we will assume has been mapped to V40600, the ***Direct***Logic internal control relay memory. Mapping details are discussed later in this chapter.



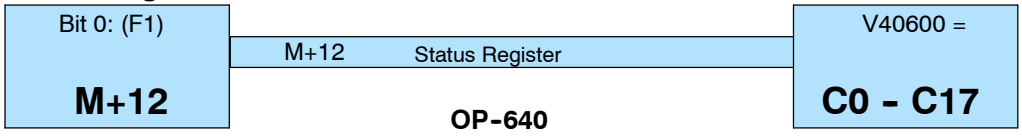
(D2-250/D3-350/D4-450 Only)
Direct bit register access



In this example, C0 represents the pushbutton No.1 (F1) via the mapping process. When push-button No.1 is pressed C0 is true and Coil C50 is energized.

Status Register (M+12) = V40600: C0 - C17

Status Register **PLC Program User Memory**



OP-640
Status Register **M+6**

C17	C16	C15	C14	C13	C12	C11	C10	C7	C6	C5	C4	C3	C2	C1	C0
											F5	F4	F3	F2	F1

Pushbuttons Using Direct Access to Status Register Bits

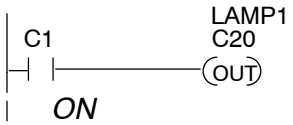
The ***Direct***Logic D2-250/D3-350/D4-450 CPUs and the Allen-Bradley SLC 5/03 and 5/04 support instructions which provide individual status bits access. This is called **Bit-of-Word** capability. For example, in the previous example, the ladder logic for the D2-250/D3-350/D4-450 monitors the first bit of the status word directly. Once again, our example assumes that we configured the OP-panel with a starting base address of V2000.

Pushbutton LEDs

There are LEDs located on each of the user defined pushbuttons, indicating pushbutton status (ON or OFF). You may choose the pushbutton type (alternate or momentary) while configuring your OP-panel. In the case of an alternating configured pushbutton, the LED will change state each time the pushbutton is pressed. With momentary configured pushbuttons the LED is ON only as long as the pushbutton is being pressed.

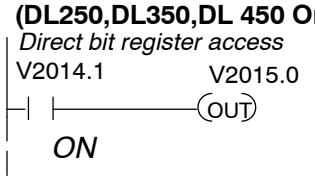
Lamp Example

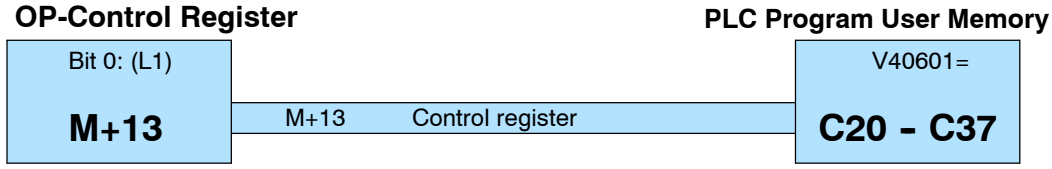
The lamp examples shown here are using ***Direct***LOGIC PLC address references. The equivalent instructions for *other* PLC products supported are shown in Chaper 5.



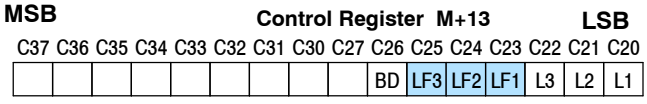
In this example, C1 represents the pushbutton No.2 (F2) via the mapping process. When *alternating* pushbutton No.2 is pressed internal Control Relay C20 is true and via mapping process Control register Bit 0 (L1 Lamp) is energized.
* Control Register (M+13) = V40601: C20 - C37

(DL250,DL350,DL 450 Only)



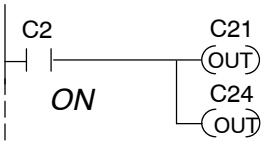


All lamps may be controlled using the concept shown above. You may use the Lamp Flash option by controlling the appropriate Flash bit via the ladder logic program. The example figure below demonstrates how to use the Control register Flash bits (LF1, LF2, and LF3).



Lamp Flash

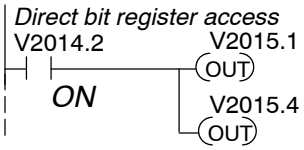
The lamp flash examples shown here are using ***Direct***LOGIC PLC address references. The equivalent instructions for *other* PLC products supported are shown in Chapter 5.



In this example, C2 represents the pushbutton No.3 (F3) via the mapping process. When *alternating* pushbutton No.3 is pressed internal Control Relay C21 and C24 are energized ON. This process manipulates Control register bit 1 and bit 4 which controls yellow lamp and flashing.

*Control Register (M+13) = V40601: C20-C37

(DL250/D3-350/D4-450 Only)



Memory Mapping Process

Each OP-640 is assigned 224 bits of PLC user memory which will be used as the OP-panel database. The ladder logic program must access this assigned OP-panel memory. Let's take a closer look at this user memory and how it relates to the OP-panel features.

OP Base Register Memory Definition

As discussed earlier, regardless of which PLC product you are using the base registers addressed M+0 through M+13 are formatted the same. In this manual, when the terms M+0 through M+13 are used, this identifies which base register(s) are affected for the topic being covered.

Operator Panel Base Memory

PLC user memory is assigned to each panel with the OP-WINEDIT configuration software. For new OP-panels and add-on applications the programmer must define fourteen 16-bit registers for PLC interface. Below is a figure showing memory layout for ***Direct***LOGIC DL05, DL105, DL205, D3-350, DL405 PLC's and uses V2000-V2015 for the OP-640 panel. See the next page for other PLC product memory usage examples.

You must reserve 224 bits (fourteen 16-bit registers or twenty-eight 8-bit registers) which are used to process data between the panel and your PLC. You must configure the **Base** register for the OP-panel. This base register address is stored in the OP-panel memory.

CPU User's memory

OP-640 Panel Data Base

V2000	M+0	16 bits
V2001	M+1	16 bits
V2002	M+2	16 bits
V2003	M+3	16 bits
V2004	M+4	16 bits
V2005	M+5	16 bits
V2006	M+6	16 bits
V2007	M+7	16 bits
V2010	M+8	16 bits
V2011	M+9	16 bits
V2012	M+10	16 bits
V2013	M+11	16 bits
V2014	M+12	16 bits
V2015	M+13	16 bits
	Total: 224 bits	

OP-Panel User Memory

Let's examine the different address conventions for ***Direct***LOGIC and Allen-Bradley. For example, the ***Direct***LOGIC address references are **octal**, and the Allen-Bradley is **decimal**.

The ***Direct***LOGIC DL05/DL105/DL205/D3-350/DL405 OP-panel address uses V-memory registers which are 16-bit registers. The D3-330/340 CPUs use reference assignments with 8-bit registers. This means that they require fourteen 8-bit registers for data handling. The Allen-Bradley memory is defined with a reference **(Nx)** which represents the memory area, and **(:n)** which defines the word within the memory area. Please refer to the appropriate CPU User manual for the PLC product you are using.

DirectLOGIC PLCs

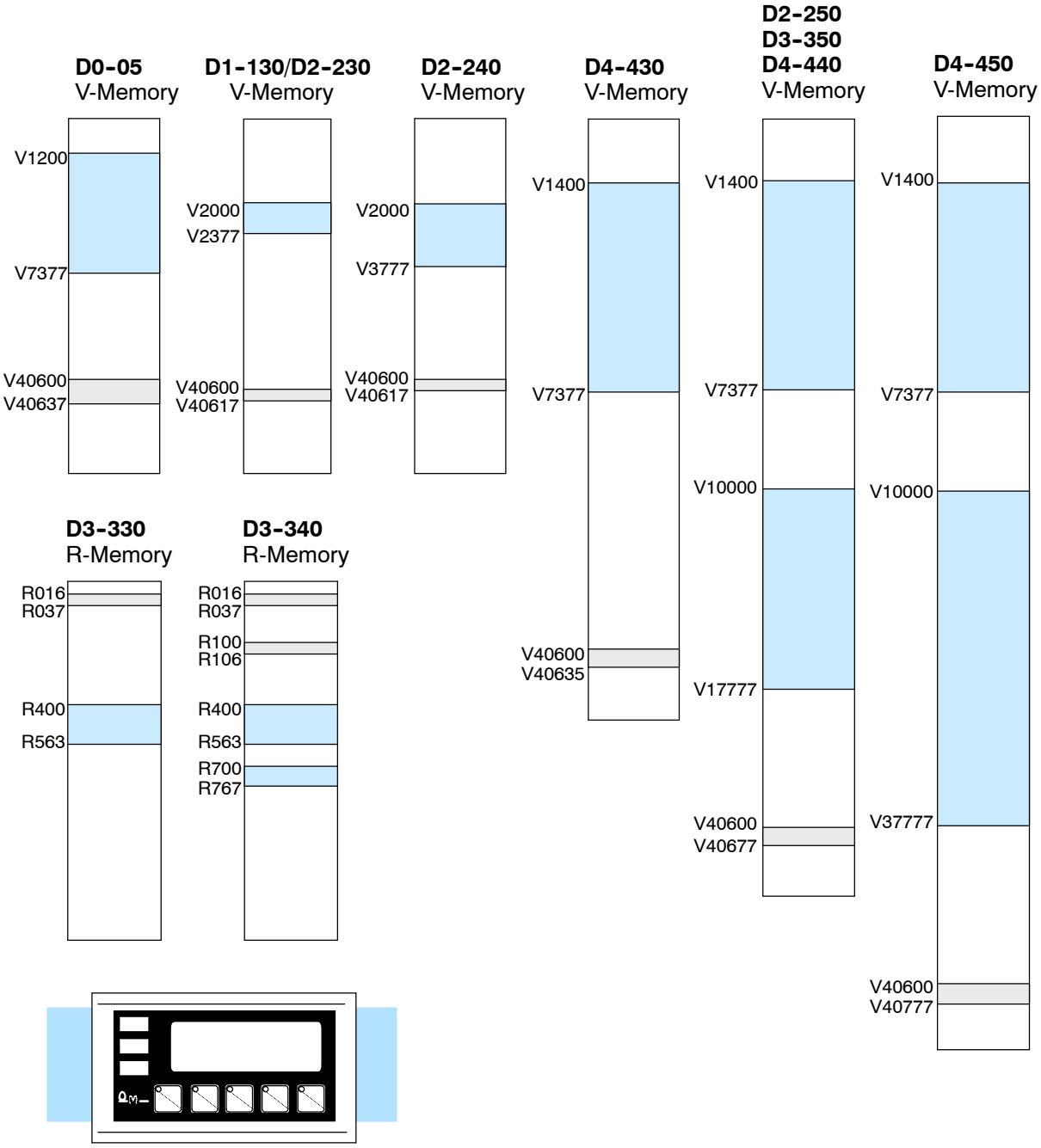
Example PLC Register Address			Register Function
DL05/105/205/ D3-350/DL405	D3-330/ D3-340	Generic	
V2000	R400/R401	M+0	Top line message selection
V2001	R402/R403	M+1	Second line message selection
V2002	R404/R405	M+2	Third line message selection
V2003	R406/R407	M+3	Bottom line message selection
V2004	R410/R411	M+4	Top line data
V2005	R412/R413	M+5	Top line data 2 (for long BCD and floating point numbers)
V2006	R414/R415	M+6	Second line data
V2007	R416/R417	M+7	Second line data 2 (for long BCD and floating point numbers)
V2010	R420/R421	M+8	Third line data
V2011	R422/R423	M+9	Third line data 2 (for long BCD and floating point numbers)
V2012	R424/R425	M+10	Bottom line data
V2013	R426/R427	M+11	Bottom line data 2 (for long BCD and floating point numbers)
V2014	R430/R431	M+12	Status register
V2015	R432/R433	M+13	Control register

Allen-Bradley SLC 500

Example PLC Register Address		Register Function
N7:0	M+0	Top line message selection
N7:1	M+1	Second line message selection
N7:2	M+2	Third line message selection
N7:3	M+3	Bottom line message selection
N7:4	M+4	Top line data
N7:5	M+5	Not used (see Note)
N7:6	M+6	Second line data
N7:7	M+7	Not used (see Note)
N7:8	M+8	Third line data
N7:9	M+9	Not used (see Note)
N7:10	M+10	Bottom line data
N7:11	M+11	Not used (see Note)
N7:12	M+12	Status register
N7:13	M+13	Control register

NOTE: While the OP-640 will display BCD Double and Floating Point numbers, it does not support these functions when used with Allen-Bradley PLCs.

*Direct*LOGIC User Memory Overview



DirectLOGIC PLCs use octal addressing, as indicated by the shaded areas.

Mapping Operation

We explained earlier that the PLC and OP-panel must exchange data on a *bit-level* basis. For ***Direct***LOGIC controllers, the OP-panel Status Register (M+12) must be mapped into internal control relays such as C0, C1, etc (and the control relays C20–C37 must be mapped into the Control Register, M+13). This allows *direct access* to the Status bit register and the Control bit register. You must execute mapping every CPU scan in order to update data between the OP-panel and PLC.

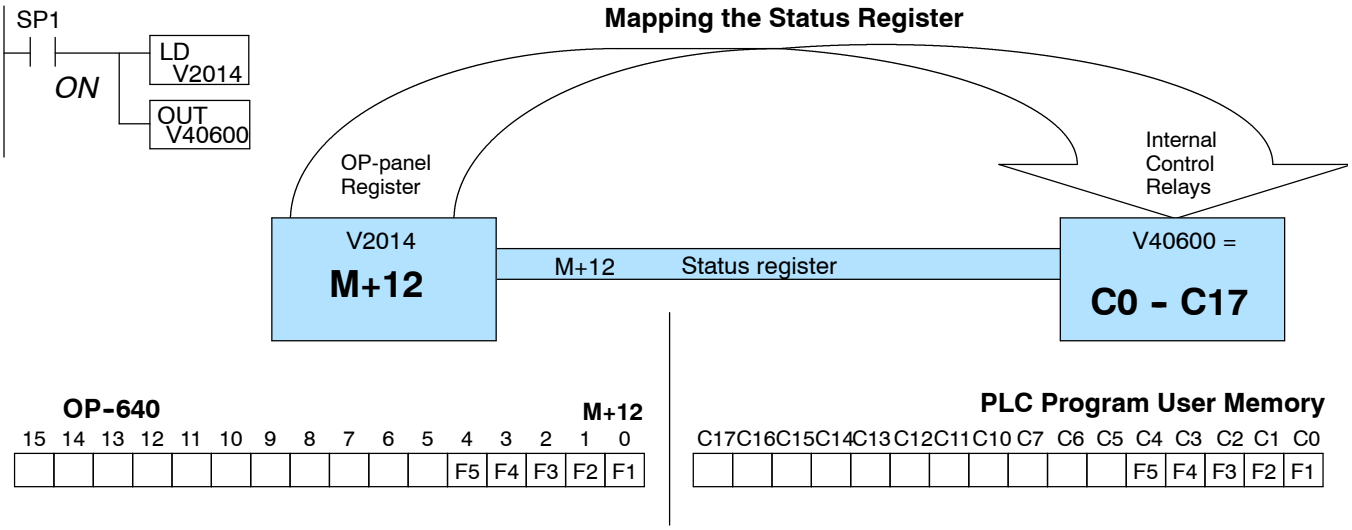
The following examples assume the OP-panel starting base-register (M+0) is assigned to word register V2000. For example, the DL05, DL105, DL205, D3–350, and DL405 CPUs have internal control relays starting at register V40600. They are designated as C0, C1, etc. Mapping updates status data (M+12) into base register V2014 and control data (M+13) into base regiser V2015 with each PLC scan.

Mapping Examples (DL05, 105, DL205, D3–350, and DL405)

Mapping the Status Register

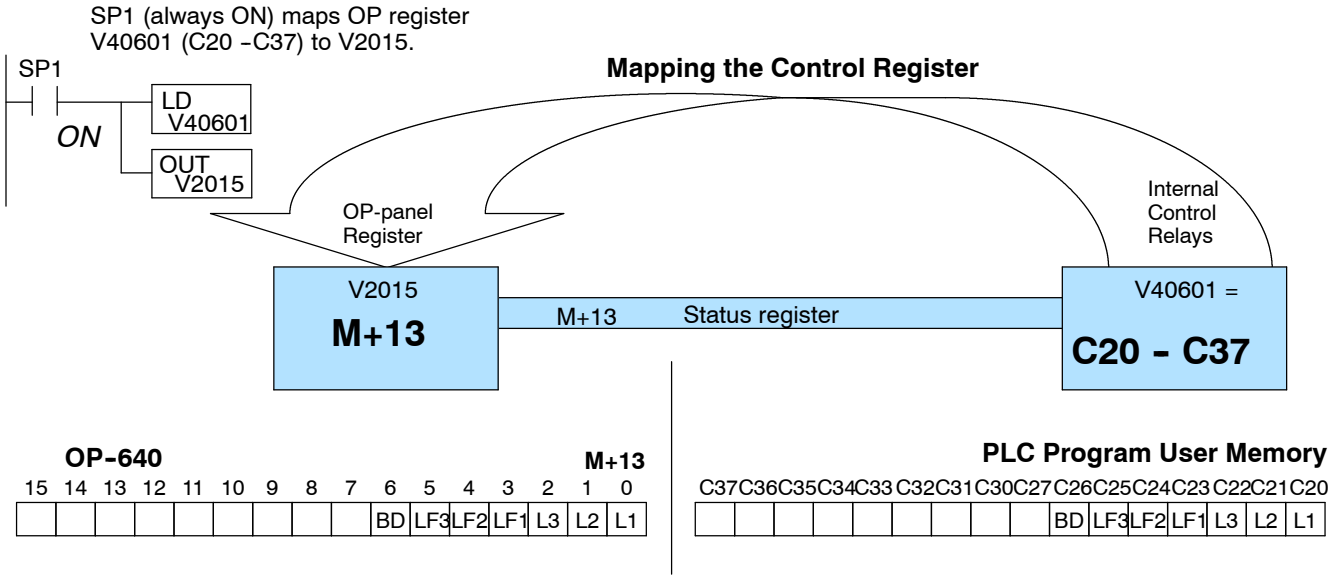
The figure below demonstrates how the OP-panel status register is mapped to user memory for bit manipulation. Notice the sixteen bits in the status register are loaded into the Internal Control Relays C0–C17. These control relays are used within the ladder logic program for monitoring pushbuttons and coordinating data entry control.

SP1 (always ON) maps OP register V2014 to V40600:C0 –C17.



Mapping the Control Register

The figure below demonstrates how the Internal Control Relays C20-C37 are mapped to the OP-panel control register. Notice the sixteen bits in the Internal Control Relays C20-C37 are loaded into the control register. These control relays function as outputs for the Lights.

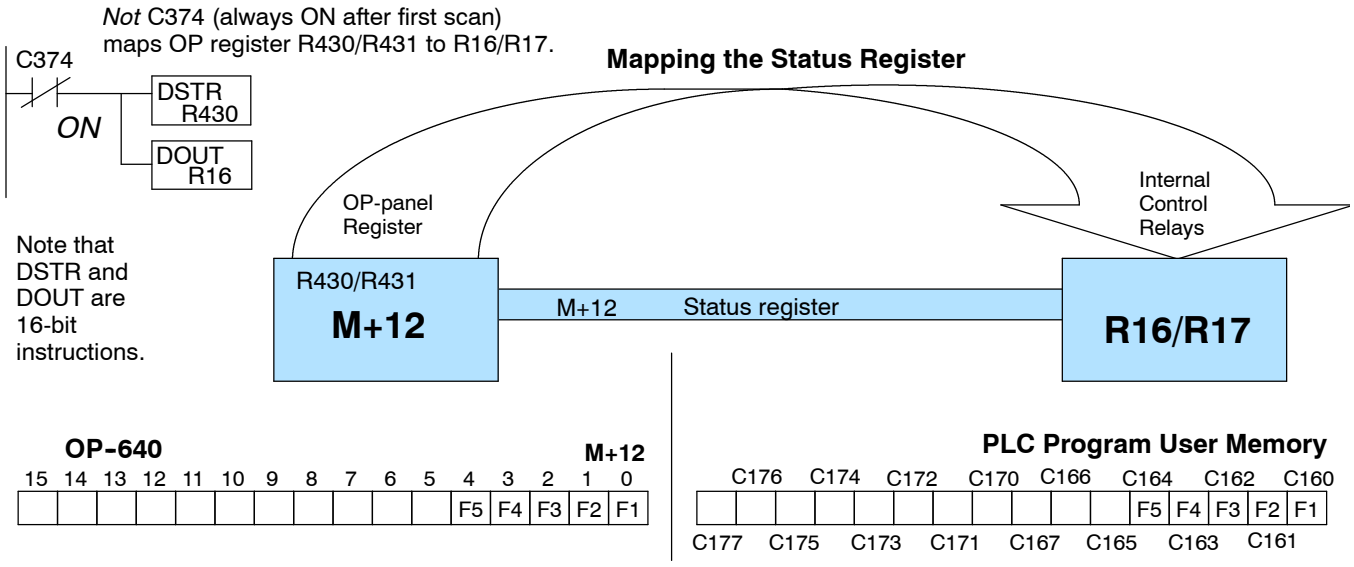


Mapping Example (D3-330/340)

Unlike the DL05, DL105, DL205, D3-350, and DL405 mapping examples, the D3-330/340 CPUs use 8-bit words. So it takes two 8-bit words for each mapped memory location because each mapped memory location needs sixteen consecutive bits. We will assume that R400 was used as the base register address and we want the mapping to start at R16 for the status register.

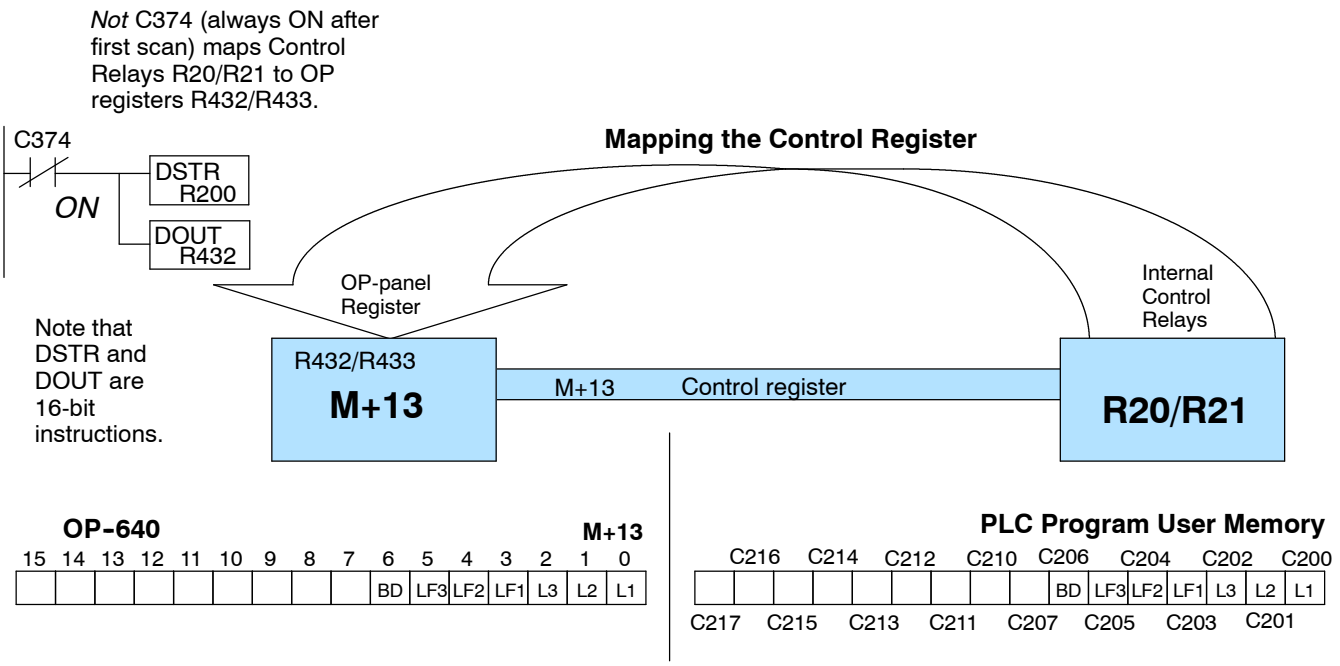
Mapping the Status Register

The figure below demonstrates how the OP-panel status register is mapped to user memory for bit manipulation. Notice the sixteen bits in the status register are loaded into the Internal Control Relays C160-C177. These control relays monitor pushbuttons and coordinate data entry control.



Mapping the Control Register

The figure below demonstrates how the Internal Control Relays are mapped to the OP-panel control register. Notice the sixteen bits in the Internal Control Relays C200–C217 are loaded into the control register. These control relays function as outputs for the Lights.



4

Configuring Your Operator Panel

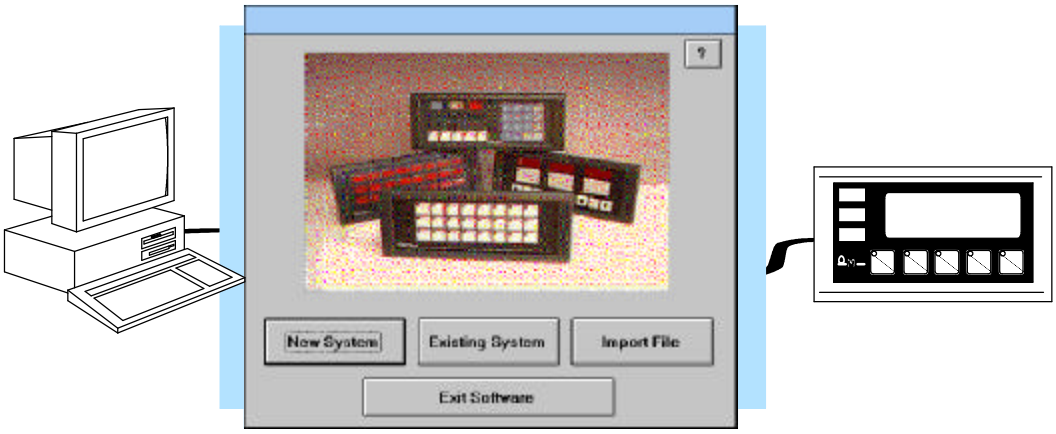
In This Chapter. . . .

— Preparing for Configuration
— How to Configure Your Panel

Preparing for Configuration

OP-WINEDIT Software

The OP-640 is configured with software running on a personal computer. This software is available through ***Automationdirect.com*** and is referred to as OP-WINEDIT configuration software.



More about OP-WINEDIT

The OP-WINEDIT configuration software allows you to configure OP-panel applications, as well as download (write to panel) and upload (read from panel) the configurations. Use this software to configure your communication link, select pushbutton control, and enter operator display messages. Order the software using part number OP-WINEDIT. The OP-640 panel requires version 2.3 or later.

HELP Screens

The OP-WINEDIT software provides **Help** windows which supply instructions for performing all necessary configuration tasks. Should you have problems understanding how to program your panel, refer to these built-in Help windows. To access the Help windows, point and click on the Help menu and choose Using help, or click on the [?] icon located near the top of the main configuration window.

HELP Screen Menu

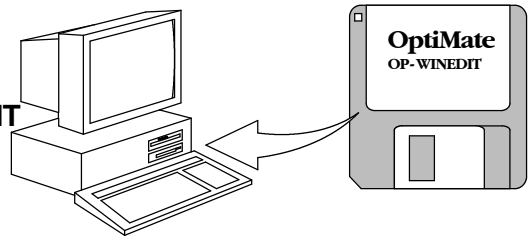
Application Worksheets

To prepare your application, use the Application Worksheets which are provided in Appendix A of this manual. The example worksheets will help you configure the OP-640 panel. The blank worksheets can be photocopied and used in planning your own applications.

Computer System Requirements

Your personal computer must meet the following minimum requirements:

- ✓ IBM type 386 or above
- ✓ **Windows 3.1 or later, including Windows 95, 98 or NT**
- ✓ 1 meg of hard drive
- ✓ 1 meg of RAM



How to Configure Your Panel

Follow these steps to configure your OP-640 operator panel.

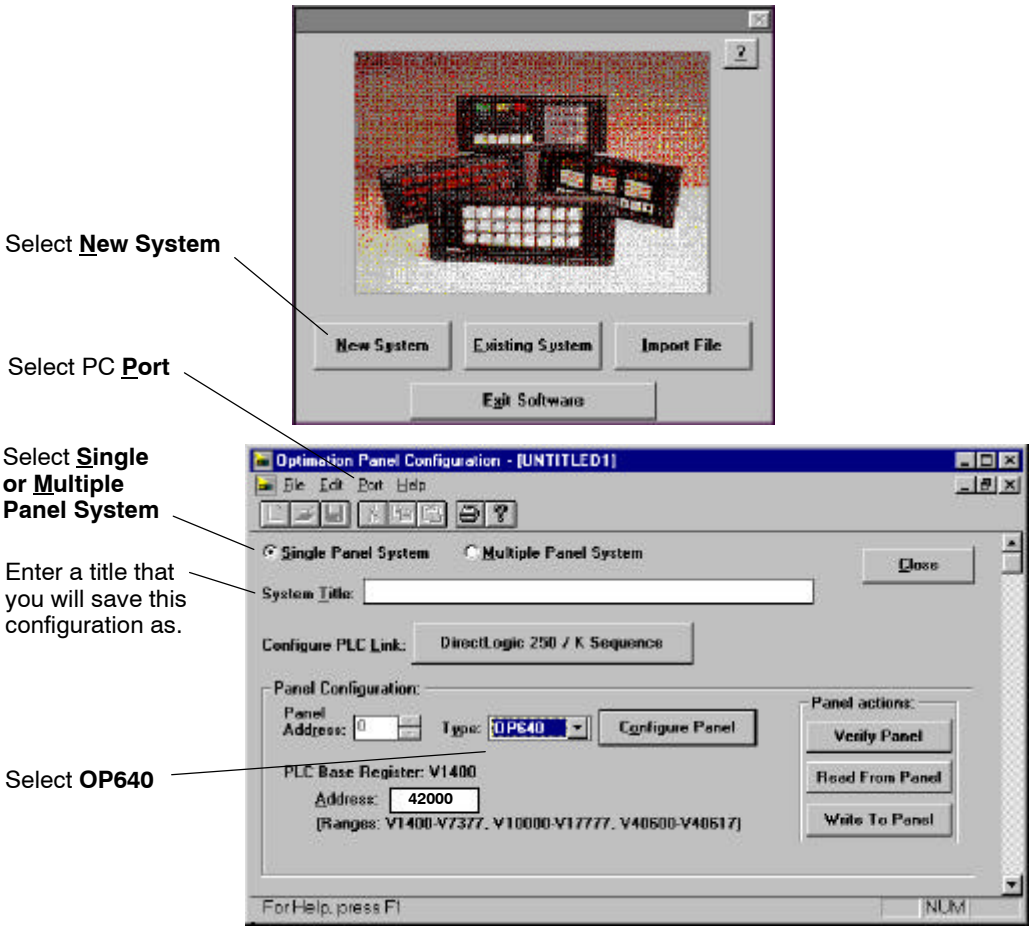
Step 1 **Load OP-WINEDIT** - If you are not already using the configuration software or have an older version, you must install version 2.3 or later (if you are using an older version of OP-WINEDIT you can obtain an upgrade at our web site). The software is provided on one 3-1/2 inch high-density diskette and comes with its own manual. Here are brief installation instructions.

- Place the installation disk into your computer's floppy drive (usually either drive A or drive B).
- Open Microsoft™ Windows (3.1 or above). For Microsoft Windows 95 or NT the **Start**/**Run** program task bar is located at the bottom left portion of your screen. For Microsoft Windows 3.x versions select **File**/**Run** from the Program Manager screen.
- Select **Run**, and a pop-up window appears. Type in the path for the drive in which you have placed the setup disk and designate the file **setup**. Click on **OK** when you are finished.

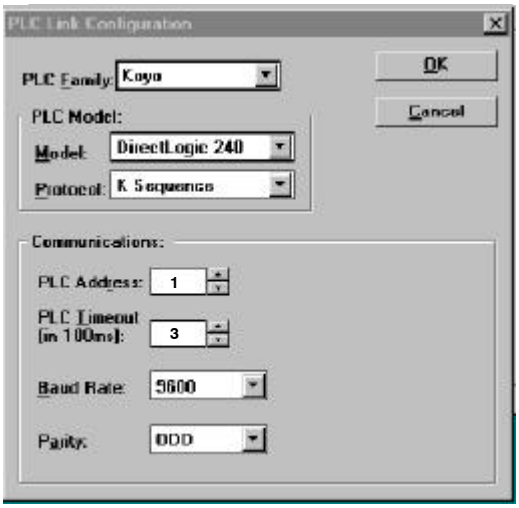
Step 2 **Connect Panel to PC** - Connect the OP-640 to your personal computer using the OP-ACBL-1 configuration cable.

Step 3 **Open OP-WINEDIT** – Select New System.

Step 4 **Start Configuring Your Panel** – Start by filling in these parameters:



Step 5 **Select Configure PLC Link** – Here is where you define protocol items such as PLC address, baud rate and parity. Enter the appropriate parameters for your PLC. The following table provides the necessary information for most ***Direct***LOGIC controllers. For other PLC families, reference that product's user manual to determine the port communications capabilities.



During configuration, make sure that your address and communications parameters match the PLC port settings. The PLC Timeout works like this: When the panel sends a message to the PLC and does not receive a response or does not understand the response, it will wait the time-out period before resending the message.

You also have several ports which can be used to connect your communications cable. Some of these ports have fixed PLC address assignments, and some *do not*. The ports which allow configuring the PLC addresses can be set to a unique address, ranging from 1 through 90. **Refer to your User Manual for specific information on the ports of your PLC**.

NOTE: For A-B PLCs, connect to Channel 0 (bottom port), using DF1 full duplex. Additionally, the A-B software allows you to set the bottom port to a unique PLC address. The software default is PLC Address 1. You must select CRC error detection and match the address on the configuration screen to the address you have assigned. This port must also be configured for either 4800 or 9600 baud. No other baud rates are supported for communicating between the OP-panels and an A-B PLC. Since the A-B software uses a default baud rate of 1200, you must change the settings.

PLC Model		Port/Baud Rates	Parity	Stop Bit
DL05	**Port 1**	9600	Odd	1
	Port 2	9600/19.2K	Odd/None	
DL105/D2-230/ D2-240	**Top**	9600	Odd	1
	Bottom (DL240 only)	9600/19.2k	Odd/None	
D2-250	**Top**	9600	Odd/None	1
	Bottom	9600/19.2K	Odd/None	
D3-330	**DCU Only**	4800/9600/19.2k	Odd/None	1
D3-340	**Bottom &Top**	4800/9600/19.2k	Odd/None	1
D3-350	**Top**	9600	Odd/None	1
	Bottom	4800/9600/19.2K	Odd	
D4-430/440	**Top**	9600	Odd	1
	Bottom	9600/19.2k	Odd/None	
D4-450	**DB15**	9600	Odd	1
	DB25	9600/19.2k	Odd/None	
	RJ12	9600/19.2k	Odd/None	

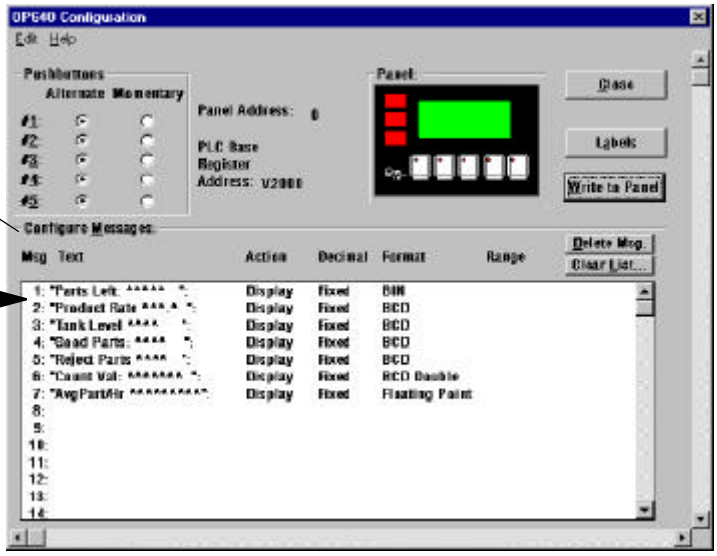
Step 6 **Select the Base Register Address -** This step is very important because it establishes the link in your PLC memory to the panel. Chapter 3, Understanding the Features, describes the mapping process. Once you are familiar with the mapping process and you know which memory block in your PLC to use (refer to the user manual for your PLC), enter your selection.

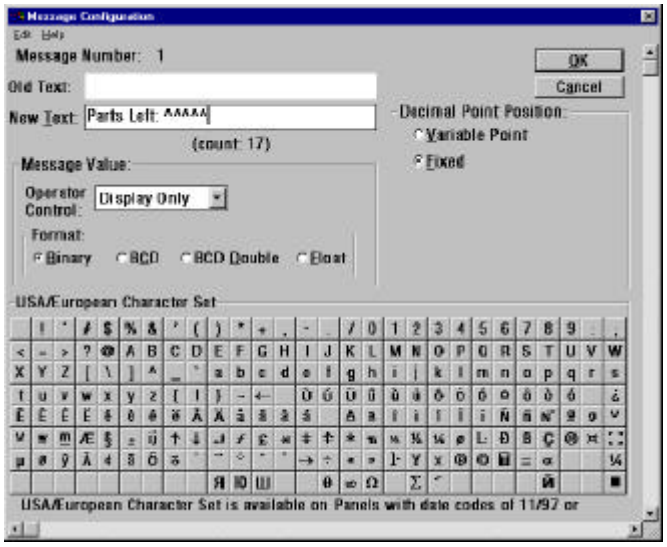
If you choose Allen-Bradley as your PLC Type, you must enter the PLC File Number in addition to a Base Register Address. You must expand the memory map in the Allen-Bradley PLC to include all registers being used by the OP-panel. The panel will only recognize integer file types N7 and user-defined file types N9 through N255. Enter the number only and not the prefix N. The Base Register Address is any number between 0 and 255.

Step 7 **Configure the Panel Features** – These features are discussed in detail in Chapter 3, but they include:

- **Pushbutton Configuration** – The pushbuttons can be configured as either Momentary or Maintained (alternate ON/OFF). Momentary pushbuttons remain ON as long as they are pressed, while Maintained pushbuttons retain their status (ON or OFF) until the next time they are pressed.
- **Messages** – Enter all messages using the Configure Messages window.

Select **Configure Messages**





For example, to enter message #1, place curser by the "1." area and double-click. This screen appears, allowing you to enter the message. Select OK when message is written.

Step 8 **Save and Download** – Connect the OP-ACBL-1 configuration cable to the panel and *set the RUN/PGM Switch to ON (PGM) and the TERM switch to OFF*. Select Write to Panel to download the configuration to your panel. When the program is finished downloading, wait a few seconds before disconnecting the configuration cable. When downloading to OP-panels which have already been configured, first clear the message list (Clear List) before loading the new configuration. This removes old messages which may reside within the OP-panel's memory. Remember to save your configuration program before closing OP-WINEDIT.

5

Programming Examples

In This Chapter. . . .

- Examples Using ***Direct*Logic** PLCs
- DL05/105/DL205/D3–350/DL405 Examples
- D3–330/340 Examples
- Allen-Bradley™ SLC 5103–5105 and Micrologix Examples
- Troubleshooting

Examples Using *Direct*LOGIC PLCs

Register Usage

The OP-WINEDIT configuration software allows you to configure a panel to use a block of registers at a starting value that you define. For a DL05, DL105, DL205, D3-350 or DL405 CPU the recommended memory to use is the general purpose data words starting at V2000. For the 305 family (except the D3-350) the recommended memory is the registers beginning at R400. Any block of registers within the data word range can be used.

The first eleven PLC registers in the block used by the OP-640 panel are used for numeric information, and this makes them ideally suited for the general purpose data registers. The M+12 and M+13 registers use individual bits for pushbutton status and light control, making it better suited for the control relay register range of memory. The solution to this minor conflict is to define the base register address in general purpose data register memory and place a rung in your PLC program to copy the last register to a control relay register (we show you how to do this later).

The following table lists the data word registers for ***Direct***LOGIC™ CPUs.

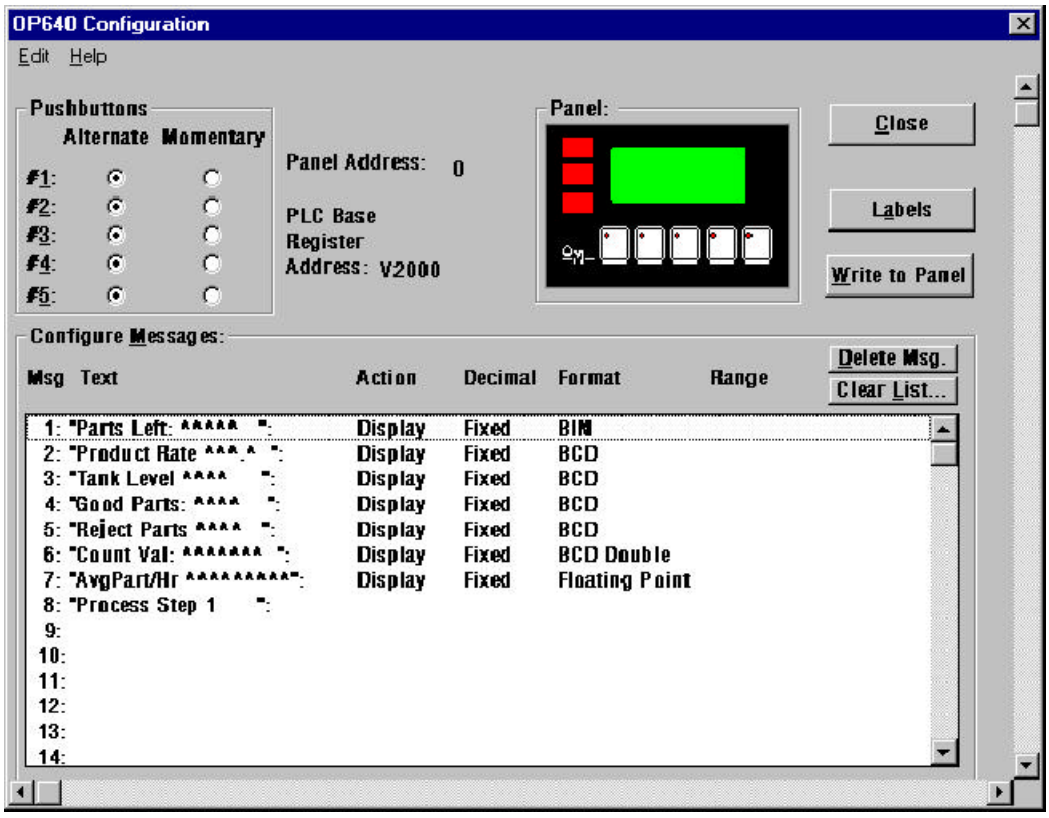
Data Word Registers for *Direct*LOGIC™ PLCs		
Family	**CPU**	**Control Relay Registers**
DirectLOGIC™ DL05	D0-05	V1200-V7377
DirectLOGIC™ DL105	F1-130	V2000-V2377
DirectLOGIC™ DL205	D2-230	V2000-V2377
	D2-240	V2000-V3777
	D2-250	V1400-V7377 and V10000-V17777
DirectLOGIC™ DL305	D3-330/D3-330P	R400-R563
	D3-340	R400-R563 and R700-R767
	D3-350	V1400-V7377 and V10000-V17777
DirectLOGIC™ DL405	D4-430	V1400-V7377
	D4-440	V1400-V7377 and V10000-V17777
	D4-450	V1400-V7377 and V10000-V37777

DL05, DL105, DL205, D3-350 and DL405 Examples

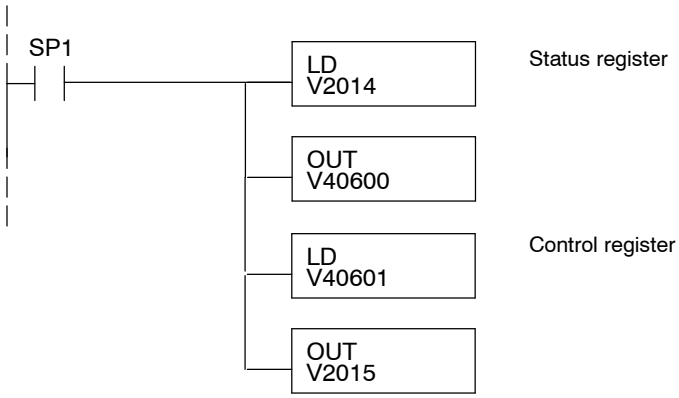
Defining the Status Register

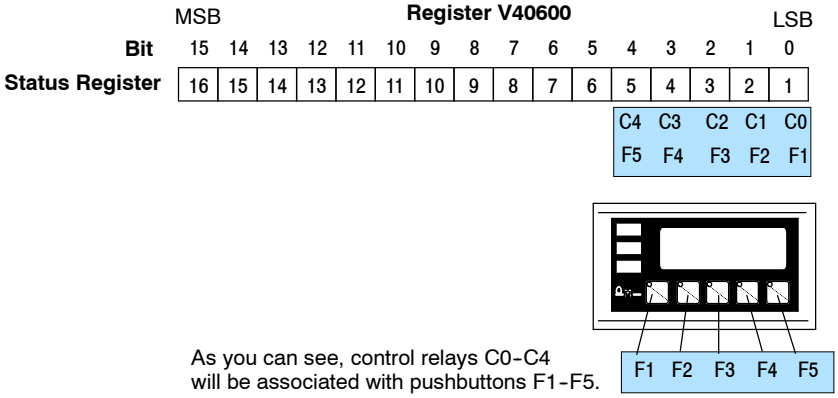
The following examples assume that the OP-640 is configured for a base address of V2000. When configuring the panel, use the configuration data and messages shown in the following figure.

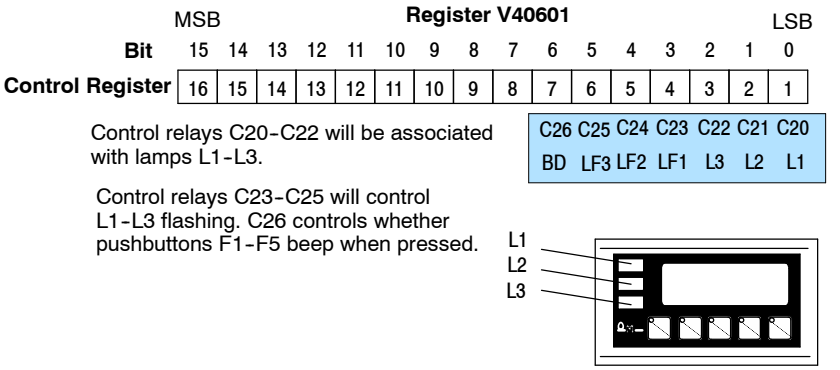
NOTE: The Example Worksheet in Appendix A also has the configuration data and messages needed for these examples. The example shows how to plan your configurations.



Place the following program rung in the program to copy the status register to memory location V40600 and copy V40601 to the control register. With this rung placed in the PLC program, the status and control bits will be control relays.

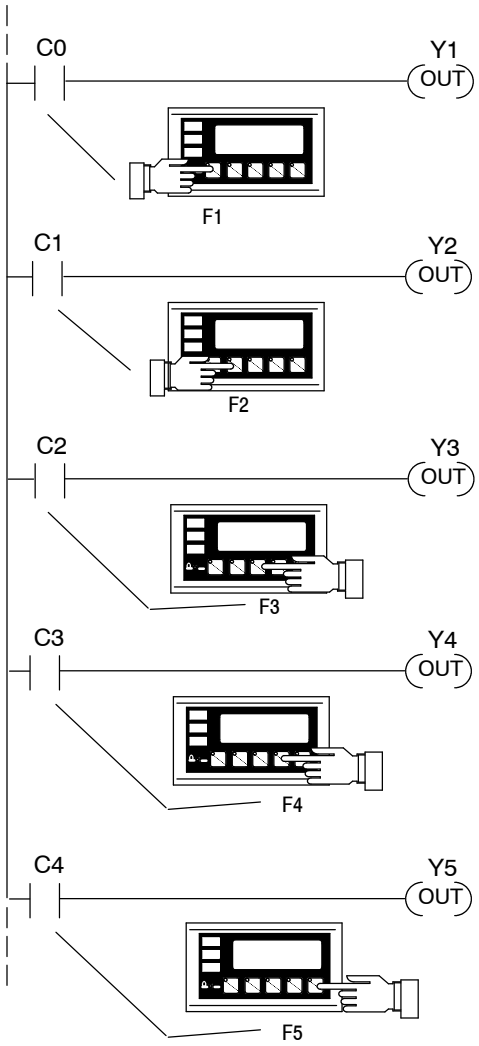






Using a Function Button

The five function buttons will appear as control relay coils in your program (assuming the register copy rung shown previously is in the program).



This rung turns on output Y1 when pushbutton F1 is active.

This rung turns on output Y2 when pushbutton F2 is active.

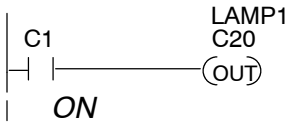
This rung turns on output Y3 when pushbutton F3 is active.

This rung turns on output Y4 when pushbutton F4 is active.

This rung turns on output Y5 when pushbutton F5 is active.

Lighting a Lamp

Lighting a lamp simply requires activating the control relay associated with the lamp. The following example will light the first lamp when relay C1 is on. Remember to place the register copy rung shown previously in the program.



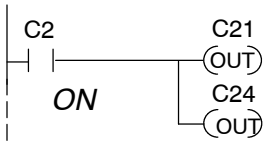
(DL250,DL350,DL 450 Only)

Direct bit register access

In this example, C1 represents the pushbutton No. 2 (F2) via the mapping process. When *alternating* pushbutton No. 2 is pressed internal Control Relay C20 is true and via mapping process Control register Bit 0 (L1 Lamp) is energized.
* Control Register (M+13) = V40601: C20 - C37

Flashing a Lamp

Flashing a lamp simply requires activating the lamp control relay (to turn the lamp on) and the flash control relay.

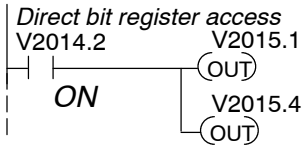


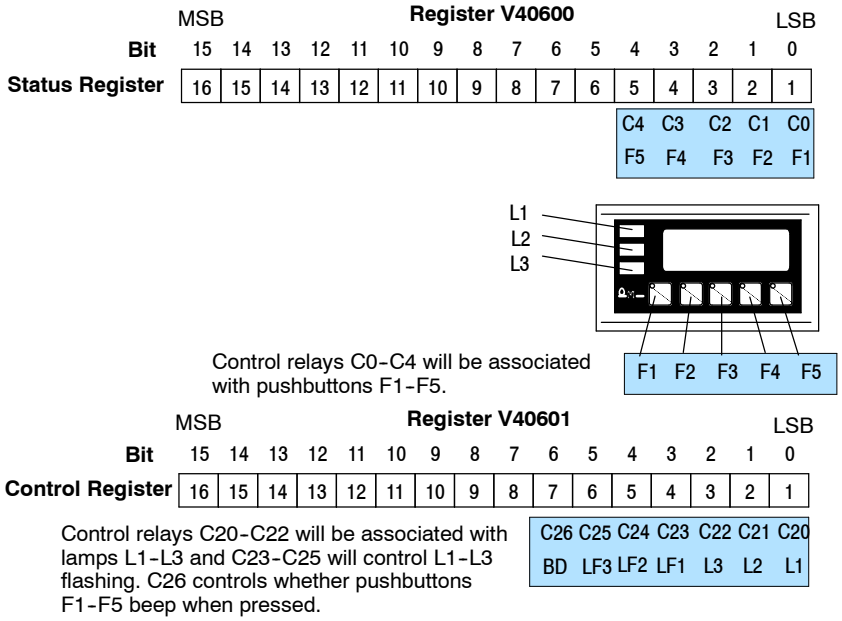
In this example, C2 represents the pushbutton No. 3 (F3) via the mapping process. When *alternating* pushbutton No. 3 is pressed internal Control Relay C21 and C24 are energized ON. This process manipulates Control Register bits 1 and 4 which controls lamp L2 on/off and L2 flashing (LF2).

*Control Register (M+13) = V40601: C20-C37

(DL250/D3-350/D4-450 Only)

Direct bit register access



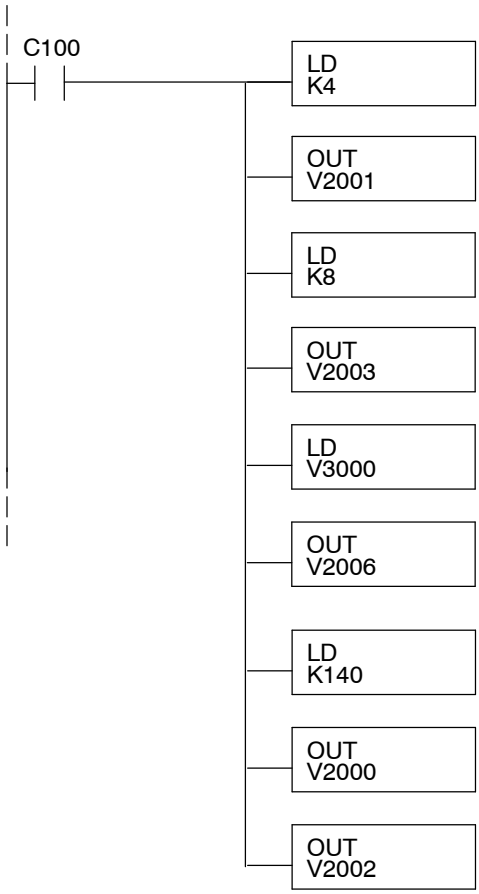


Control relays C0-C4 will be associated with pushbuttons F1-F5.

Control relays C20-C22 will be associated with lamps L1-L3 and C23-C25 will control L1-L3 flashing. C26 controls whether pushbuttons F1-F5 beep when pressed.

Displaying Messages

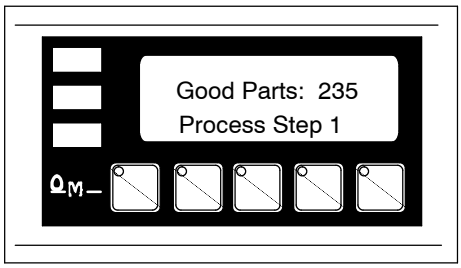
The following example shows two messages being displayed. The example assumes that the messages shown earlier are entered, and shows two messages that will be displayed as long as C100 is on. The second line is displaying message #4 and the bottom line is displaying message #8. The top and third lines use data message display #140, which has been configured as a blank text message.



This selects message #4 to be displayed in the second line.

This selects message #8 to be displayed in the bottom line.

This puts data from V3000 (235 in this example) into the second line data field (^^^^).

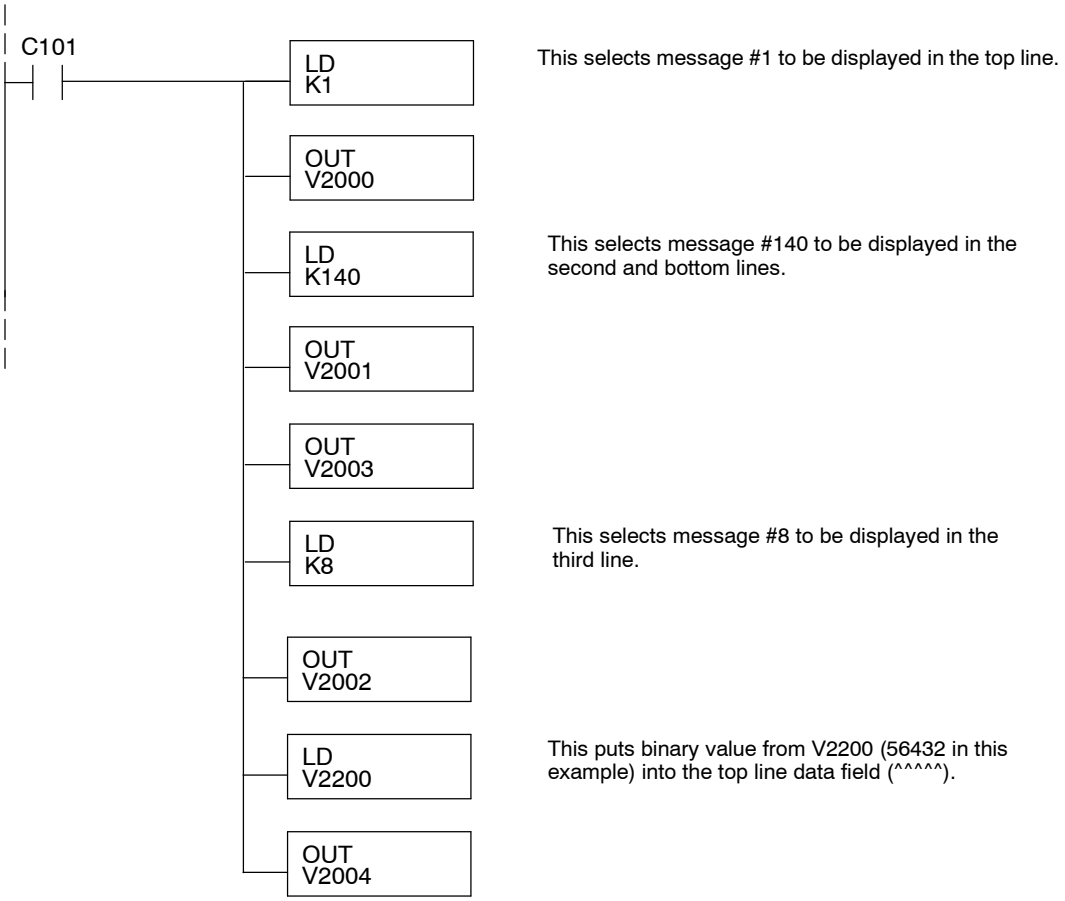


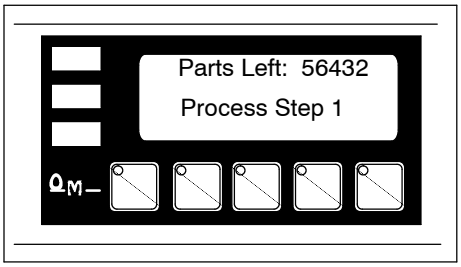
The last three instructions select message #140 (blank text) and loads it into both the top and third lines to blank those lines.

PLC Register	Register Function
V2000	Top line message selection
V2001	Second line message selection
V2002	Third line message selection
V2003	Bottom line message selection
V2004	Top line data
V2005	Top line data 2 (for long BCD and floating point numbers)
V2006	Second line data
V2007	Second line data 2 (for long BCD and floating point numbers)
V2010	Third line data
V2011	Third line data 2 (for long BCD and floating point numbers)
V2012	Bottom line data
V2013	Bottom line data 2 (for long BCD and floating point numbers)
V2014	Status register
V2015	Control register

Displaying Binary Numbers

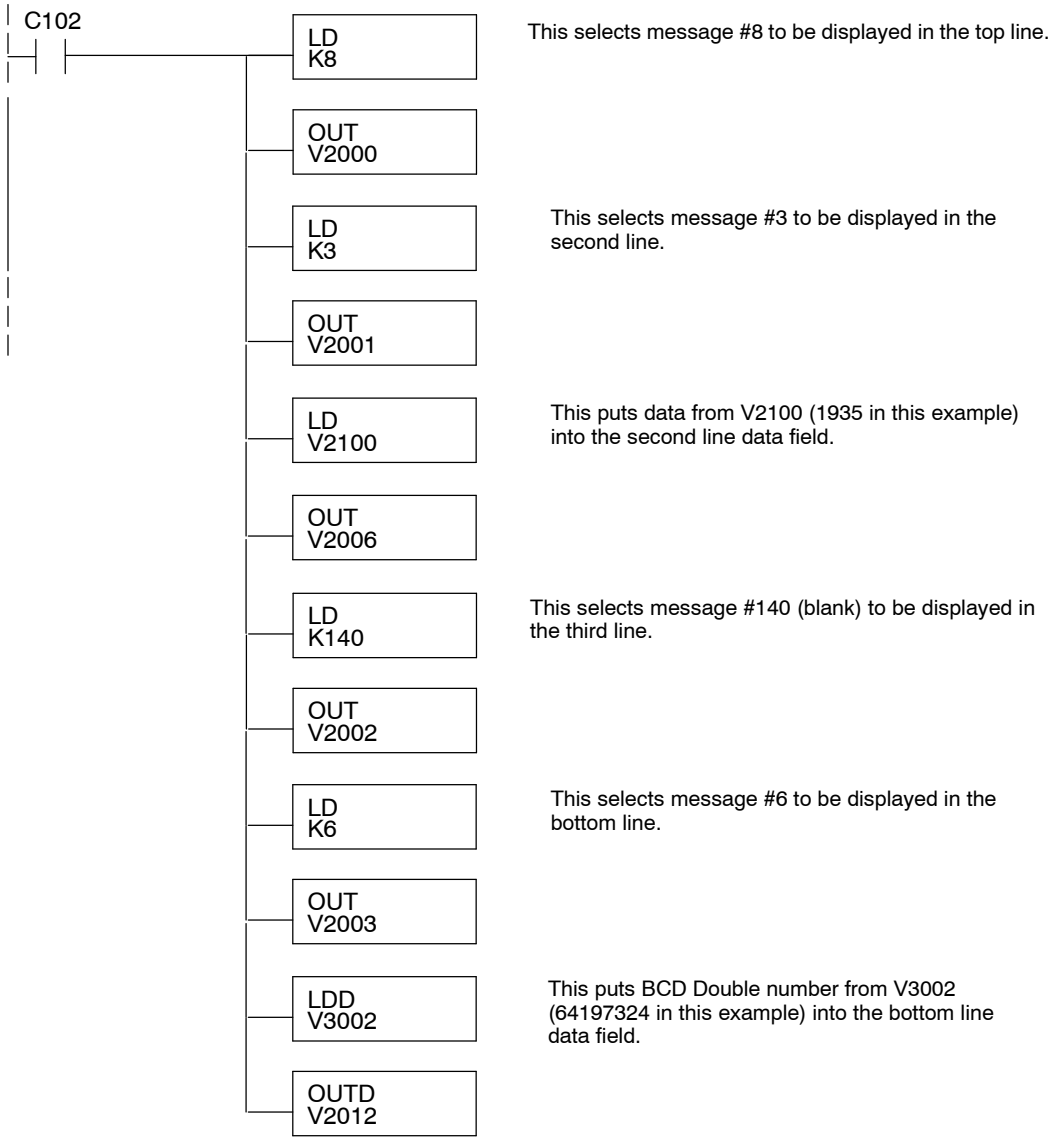
This example is similar to the previous example, except that it uses a binary number in the top display. The top line uses data display message #1, which has been configured as a binary display message. The data for the top data field is number 56432 (from V2200). The third line is text message #8. The second and bottom lines use message #140 which has been configured as a blank text message.





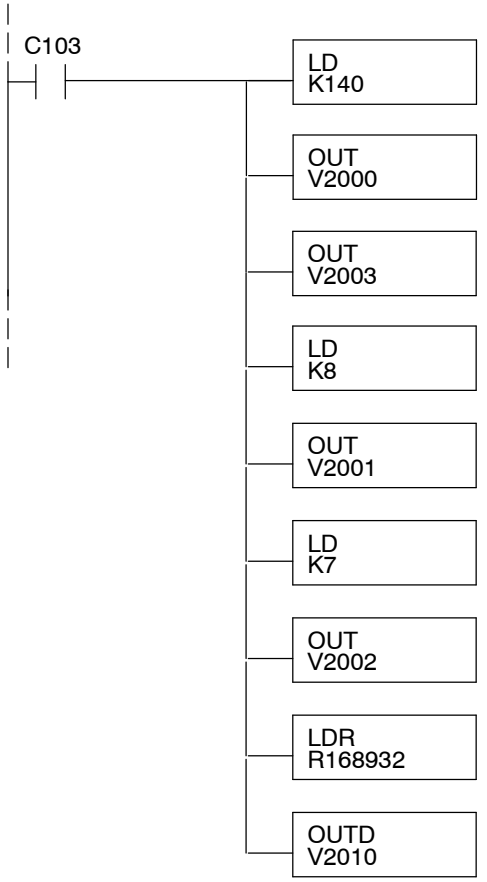
Displaying BCD Double Numbers

This example is similar to the previous example, except that it uses a BCD Double number in the bottom line display. The bottom line uses data display message #6, which has been configured as a BCD Double display message. The data for the bottom line data field is from V3002 and V3003. V3002 contains the four least significant digits while V3003 contains the four most significant digits. The top line is text message #8. The second line displays message #3. The data for the second line BCD message comes from register V2100. The third line uses message #140, which has been configured as a blank text message.



Displaying Floating Point Numbers Example 1

This example uses a floating point number in the third line display message. The third line uses data display message #7, which has been configured as a floating point display message. Since the data is a floating point number, it uses two 16-bit registers. The two registers have to be looked at together, not individually, for the data to be understandable. In this example, the data is a constant number (168932) which is loaded into the third line data display registers using an LDR (load real number) instruction. The top and bottom lines use message #140, which has been configured as a blank text message. The second line is text message #8.

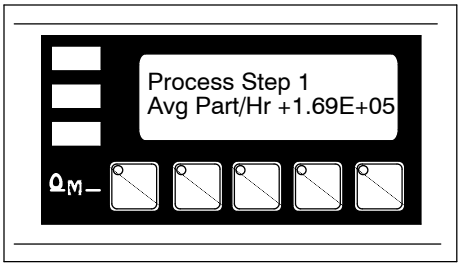


This selects message #140 (blank) to be displayed in the top and bottom lines.

This selects message #8 to be displayed in the second line.

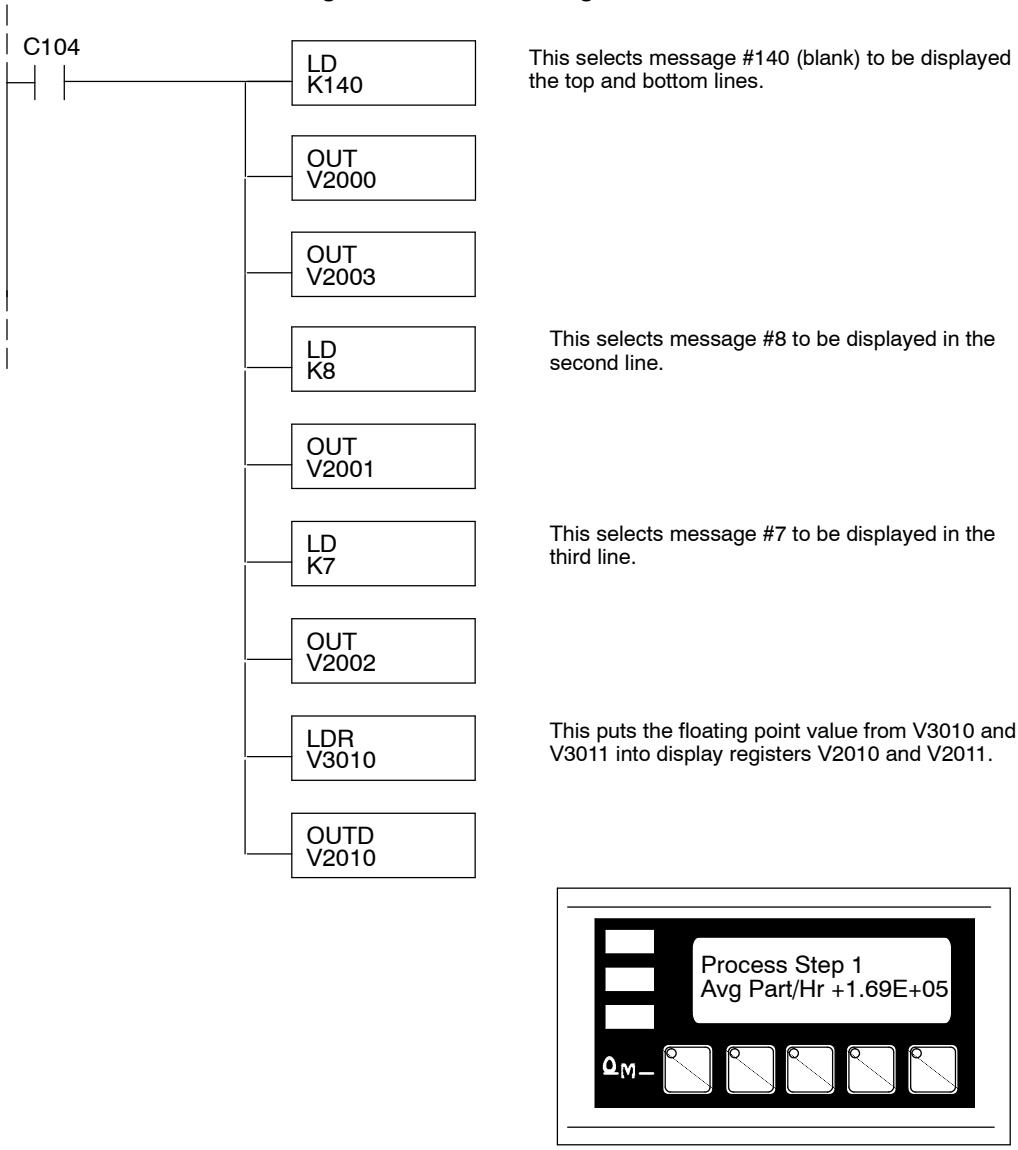
This selects message #7 to be displayed in the third line.

This puts the floating point value 168932 into the third line data field. Notice that the displayed value is truncated.



Displaying Floating Point Numbers Example 2

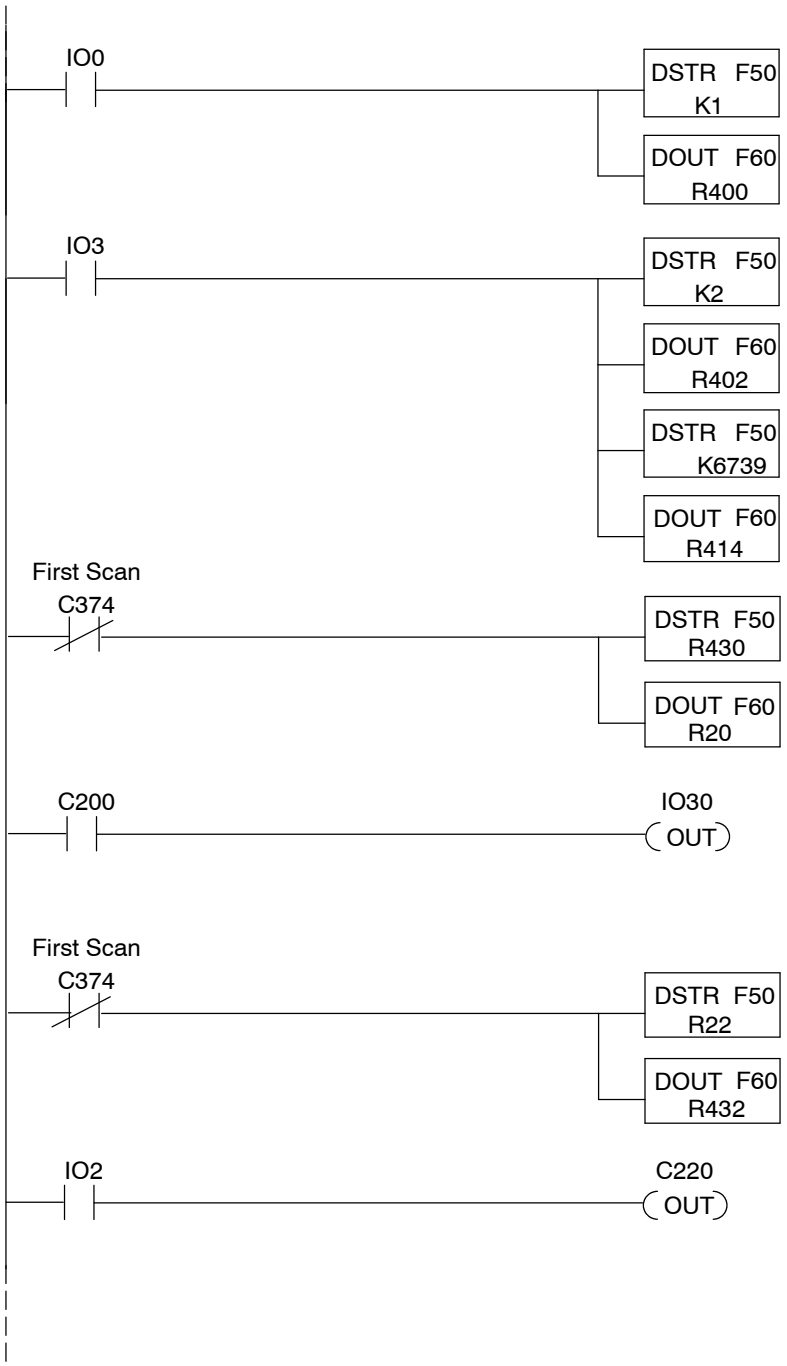
This example is similar to the previous one, except that it gets its value from two PLC registers instead of a constant value. The third line uses data display message #7, which has been configured as a floating point display message. Remember, floating point numbers require two 16-bit registers and they must be read together. In this example, the data is loaded from V3010 and V3011 using an LDR (load real number) instruction to the third line display registers V2010 and V2011. The top and bottom lines use message #140, which has been configured as a blank text message. The second line uses message #8, a text message.



Example Using D3-330/340

Example

The following example assumes that the OP-640 is configured for a base address of R400/R401. When configuring the panel, enter the messages shown in the previous section for the DL05, DL105, DL205, D3-350 and DL405 examples.



Displaying Messages

This rung displays message #1 in the top display line.

This rung displays message #2 and BCD data in the second display line.

Second line message.

Second line data.

This rung remaps the status register (pushbuttons) into control relays R20/21.

Pushbutton Example

This rung allows pushbutton F1 to turn on output IO30.

This rung remaps control relays R22/23 into the control register (lamps).

Lamp Example

This rung allows input IO2 to turn on lamp L1.

Allen-Bradley™ SLC 5/03 & 5/04 and Micrologix Examples

Interfacing to A-B Memory

OptiMate panels interface to Allen-Bradley SLC 5/03 & 5/04 and Micrologix PLCs via integer file type N. The 5/03 and 5/04 have file type N7 as standard. Other “N” type files can be created. The Micrologix has a fixed file type N7. Please see A-B documentation for information on setting up and using “N” type files.

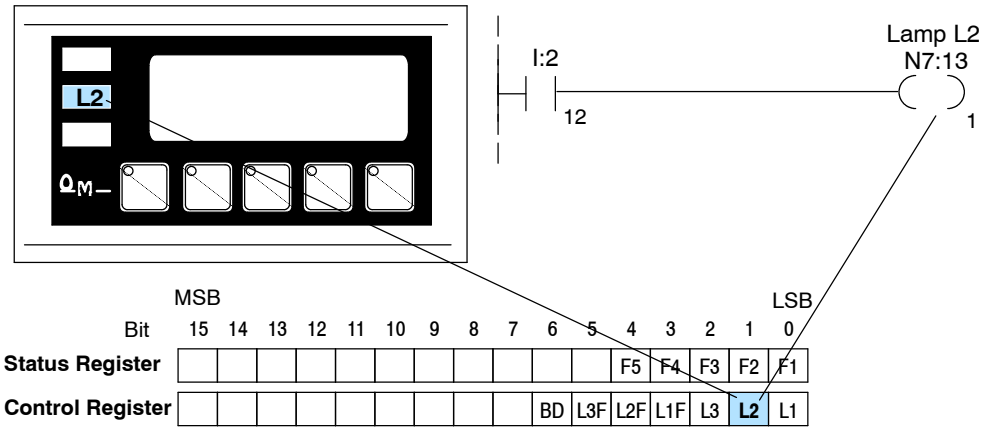
NOTE: When using an OP-640 with an Allen-Bradley PLC, always be sure that at least fourteen words of memory are allocated to allow proper communications.

All of the examples shown assume the OP-640 has been configured (using OP-WINEDIT) for a file number N7 and base register address 0. With this configuration, the status register will be at N7:12 and the control register will be at N7:13. This table relates status register and control register bits to their N7 locations.

Status Register		Control Register	
Bit	**Location**	**Bit**	**Location**
F1	N7:12/0	L1	N7:13/0
F2	N7:12/1	L2	N7:13/1
F3	N7:12/2	L3	N7:13/2
F4	N7:12/3	L1F	N7:13/3
F5	N7:12/4	L2F	N7:13/4
		L3F	N7:13/5
		BD	N7:13/6

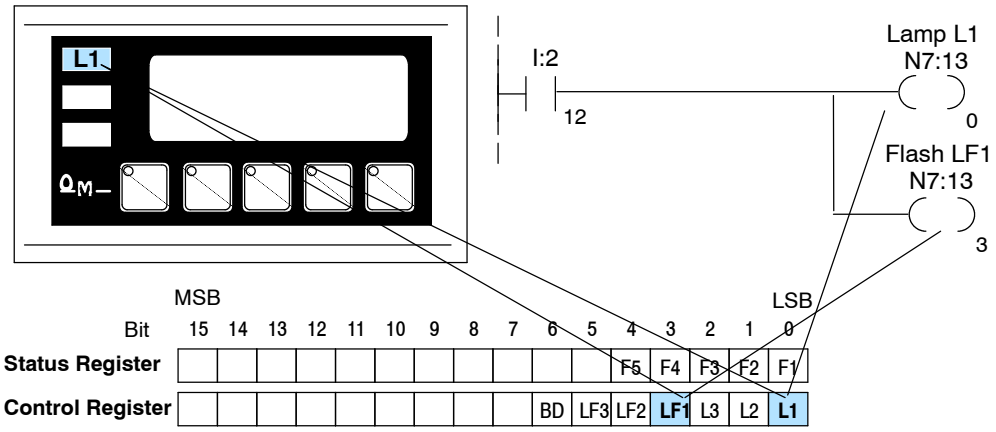
Lighting a Lamp

Lighting a lamp simply requires activating the control relay associated with the lamp. This example will light lamp L2 when input I:2/12 is active.



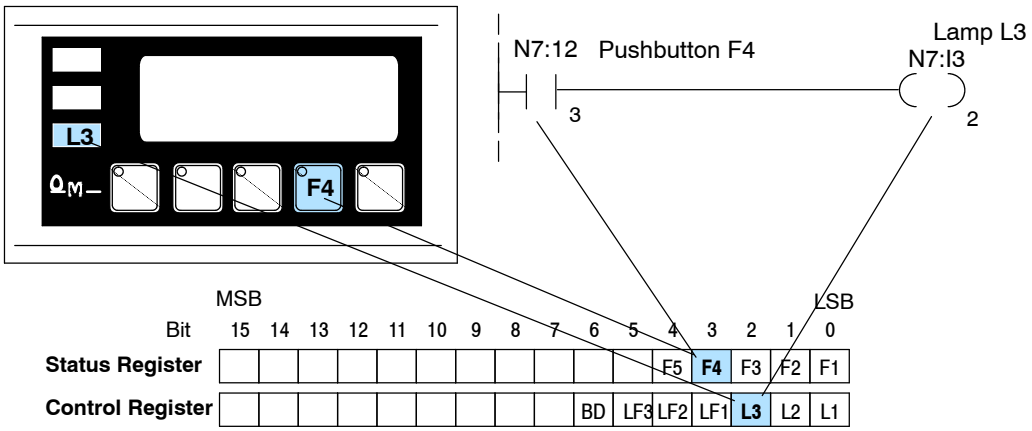
Flashing a Lamp

Flashing a lamp simply requires activating the control relay to turn on the lamp and the flash control relay. This example will flash lamp L1 when input I:2/12 is active.



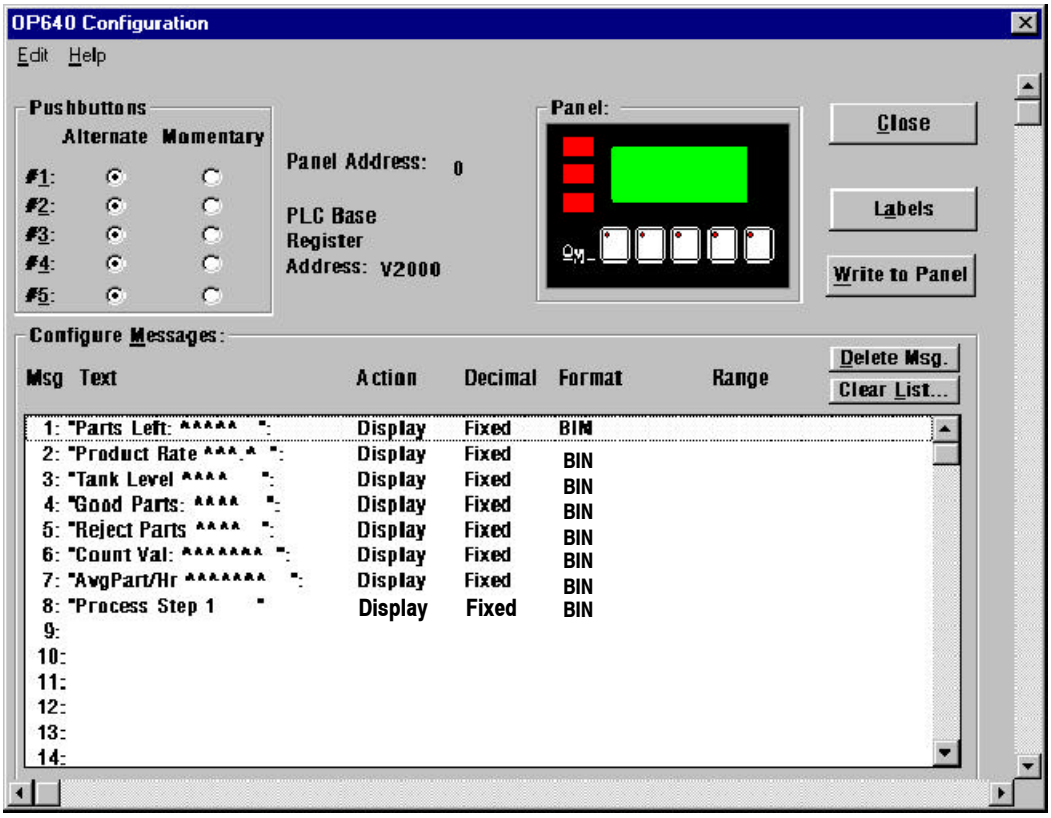
Using a Function Button

The five function buttons will appear as control relay coils in your program. This example turns on lamp L3 (N7:13/2) when button F4 (N7:12/3) is active.



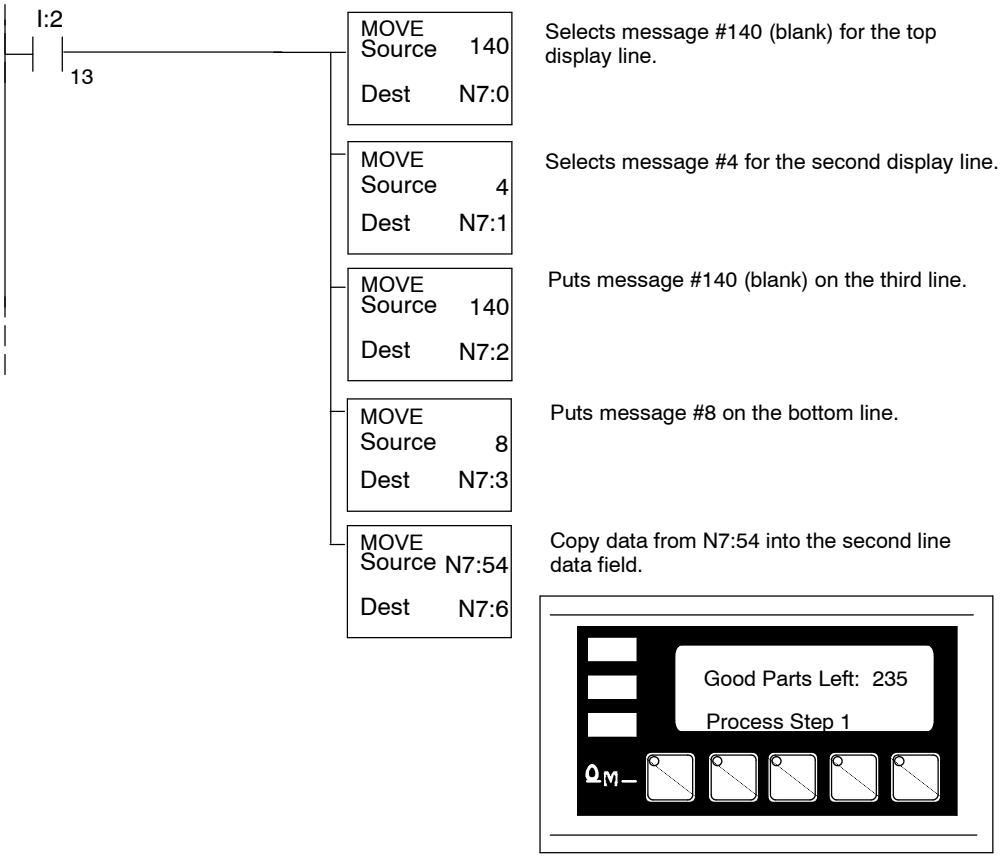
Displaying Messages

The following example uses the configuration shown below.



Displaying Messages Example

The second line is displaying BCD message #4. The data for the data field which is displayed in the second line is from location N7:54. The bottom line is displaying text message #8. The top and third lines use data display message #140, which has been configured as a blank text message.



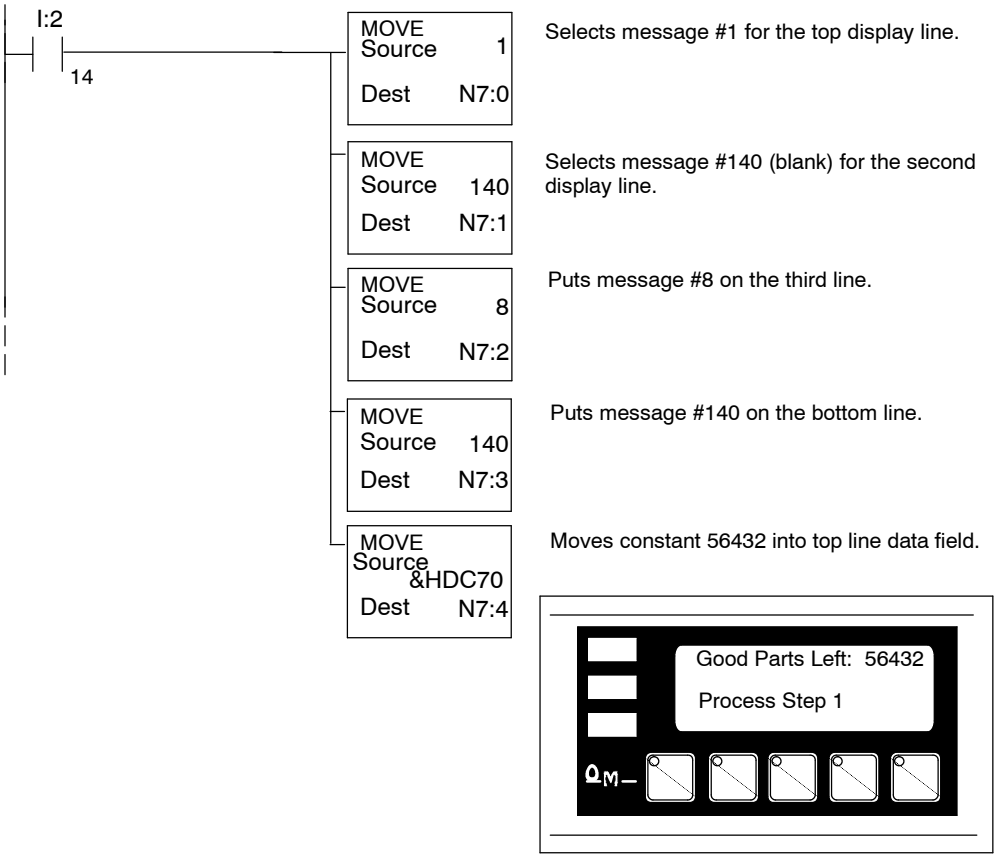
Example Address		Function
N7:0	**M+0**	**Top line message selection**
N7:1	**M+1**	**Second line message selection**
N7:2	**M+2**	**Third line message selection**
N7:3	**M+3**	**Bottom line message selection**
N7:4	M+4	Top line data
N7:5	M+5	Not used with A-B (see Note)
N7:6	**M+6**	**Second line data**
N7:7	M+7	Not used with A-B (see Note)
N78	M+8	Third line data
N7:9	M+9	Bottom line data
N7:10	M+10	Top line data
N711	M+11	Not used with A-B (see Note)

N7:12	M+12 Status												F5	F4	F3	F2	F1
N7:13	M+13 Control										BD	L3F	L2F	L1F	L3	L2	L1

NOTE: While the OP-640 will display BCD Double and Floating Point numbers, it does not support these functions when used with A-B PLCs.

Displaying Binary Numbers

This example is similar to the previous example, except that it uses a binary number in the top line display. The top line uses data display message #1, which has been configured as a Binary display message. The data for the top line data field is a constant number, 56432 (DC70 Hexadecimal). The third line is text message #8. The second and bottom lines use text message #140, which has been configured as a blank text message.



Example Address		Function
N7:0	**M+0**	**Top line message selection**
N7:1	**M+1**	**Second line message selection**
N7:2	**M+2**	**Third line message selection**
N7:3	**M+3**	**Bottom line message selection**
N7:4	**M+4**	**Top line data**
N7:5	M+5	Not used with A-B (see Note)
N7:6	M+6	Second line data
N7:7	M+7	Not used with A-B (see Note)
N78	M+8	Third line data
N7:9	M+9	Bottom line data
N7:10	M+10	Top line data
N711	M+11	Not used with A-B (see Note)
N7:12	M+12 Status	F5 F4 F3 F2 F1
N7:13	M+13 Control	BD L3F L2F L1F L3 L2 L1

6

Troubleshooting

In This Chapter. . . .

- Troubleshooting
- Panel Configuration Problems
- Panel to PLC Communications
- A-B Panel to PLC Communications

Troubleshooting the OP-640 Panel

Troubleshooting

In this section, we explain how to isolate potential problems which may occur while using the OP-640. If you are unable to troubleshoot and correct your problem using these procedures, please contact our technical product support team between the hours of 9:00 AM and 6:00 PM (EST) Monday through Friday.

We have organized the troubleshooting section into two categories:

- Panel configuration problems
- Panel and PLC communications failures

Panel Configuration Problems

We explained in previous sections that the OP-WINEDIT configuration software is used to create OP-panel applications and to download and upload your OP-panel programs. If you are online with the panel and communications fails, the following error message is displayed:

"Could not communicate with panel" (OP-WINEDIT)

If this occurs, check the following in the order given:

1. Check the rear panel RX/TX LEDs while attempting the Upload or Download operation. Both LEDs should be giving slow alternating flash signals, indicating the PC and OP-panel are connected. If *only* the TX (transmitter) LED is flashing, or if the TX/RX LEDs are *not* alternating between flashes, check that the OP-panel is set to the configuration mode by setting the RUN/PGM DIP switch to the PGM position.

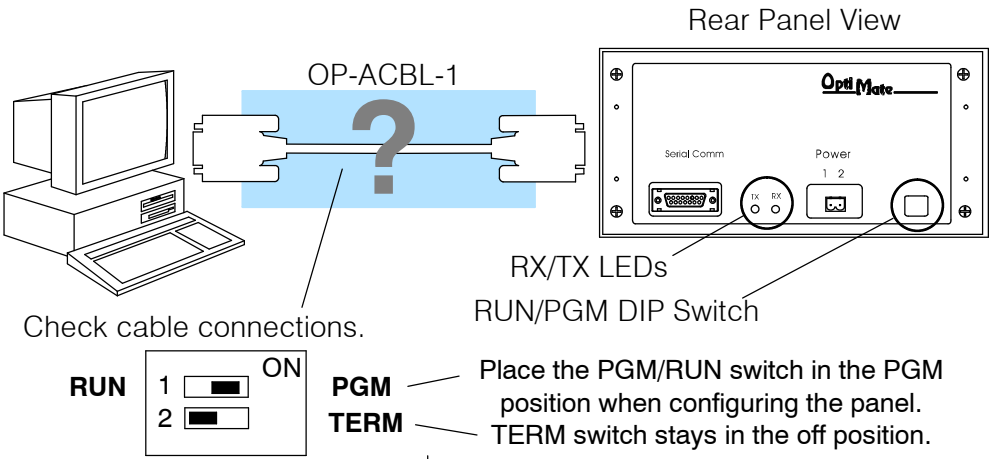
2. Check to make sure the configuration cable **(OP-ACBL-1)** is properly connected.

3. Make sure the correct communications port is selected with the software, such as COM1, COM2, COM3, COM4.

4. Check the 24VDC power source and connections.

5. Make sure that ***Direct***SOFT programming software is not running.

6. After checking the above items, repeat the online panel Download or Upload procedure.



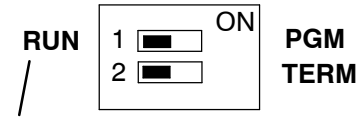
Panel to PLC Communications Problems

If you experience communications difficulties between the OP-panel and PLC for a period of twelve seconds, the LEDs in the corners of the five pushbuttons will flash rapidly.

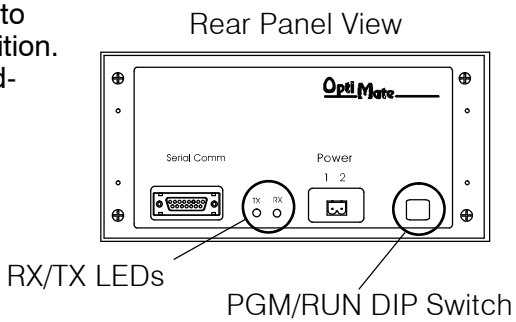
In this case, you should check the following items:

1. Observe the TX and RX LEDs on the rear of the panel. Both LEDs should be a steady flash or glow (depending on baud rate). If not, check and make sure you are using the proper communications cable and that it is securely connected.

2. Examine the PGM/RUN DIP switch to make sure it is placed in the RUN position. You must cycle OP-panel power for address switch changes to take effect.



Place the PGM/RUN switch in the RUN position when running the program.



3. Examine the communications information for the proper PLC type, protocol, baud rate, parity, stop bit, address number. Use the user manual for the PLC product you are using to determine the proper settings.

4. If you are using an OP cable, verify cable pinout. For RS–422 connections use a Belden 9729 or equivalent cable.

5. Check 24VDC power source and connections.

Direct LOGIC PLC

DirectLOGIC **PLCs :** If you are using the secondary communications port such as ***Direct***LOGIC PLC port 2, ensure the communications port address and protocol setting match.

Allen-Bradley Panel to PLC Communications Problems

For Allen-Bradley, you must connect to Channel 0 (bottom serial port), using DF1 in full duplex mode. Typically, the only change that needs to be made to channel 0 is the baud rate. Leave all other settings at their default value. The Allen-Bradley port must be set to either 4800 or 9600 baud. No other baud rates are supported between the OP-panel and Allen-Bradley PLC. Also, the base memory area must be expanded to include the full range of registers such as N7:0 through N7:13.

***OTHER* PLCs :** Regardless of which PLC brand you are implementing, the communications parameters should be reviewed and properly configured. Please check the appropriate manual for your PLC product to ensure proper communications port and panel type settings.

Appendix A
Worksheets

A

In This Appendix. . . .

— *Example* Application/Message Worksheet

— Blank Application/Message Worksheet

EXAMPLE WORKSHEET PAGE: _____

DESCRIPTION : OP-640 Demo

System Type: Single Panel

Panel Type: OP-640

PLC Base Register Addr: V2000

PLC CONFIGURATION :

PLC Family: DirectLOGIC

CPU Model: F1-130

Protocol: K Sequence

PLC Address: 1

PLC Timout: 3

Baud Rate: 9600

Parity: ODD

Data/Stop Bits: _____

PUSHBUTTONS / LAMPS :

A M (Alternate/Momentary)

F1 [X] [ ] _____

F2 [X] [ ] _____

F3 [X] [ ] _____

F4 [X] [ ] _____

F5 [X] [ ] _____

Red **Lamp1** _____

Yellow **Lamp2** _____

Green **Lamp3** _____

MESSAGE:

	Text	
No. 1	Parts Left: ^^^^^	Action: Display Text Message; Data Format: Binary; Range: N/A
No. 2	Product Rate ^^^.^	Action: Display Text Message; Data Format: BCD; Range: N/A
No. 3	Tank Level: ^^^^	Action: Display Text Message; Data Format: BCD; Range: N/A
No. 4	Good Parts: ^^^^	Action: Display Text Message; Data Format: BCD; Range: N/A
No. 5	Reject Parts: ^^^^	Action: Display Text Message; Data Format: BCD; Range: N/A
No. 6	Count Val: ^^^^^^^^	Action: Display Text Message; Data Format: BCD Double; Range: N/A
No. 7	Avg Part/Hr: ^^^^^^^^^	Action: Display Text Message; Data Format: BCD Double; Range: N/A
No. 8	Process Step 1	Action: Display Text Message; Range: N/A
No. 9		Action: Text Message; Data Format: ; Range:
No. 10		Action: ; Data Format: ; Range:

OP-640 APPLICATION WORKSHEET PAGE: _____

DESCRIPTION : _____

System Type _____

Panel Type _____

PLC Base Register Addr _____

PLC CONFIGURATION :

PLC Family _____

CPU Model _____

Protocol _____

PLC Address _____

PLC Timout _____

Baud Rate _____

Parity _____

Data/Stop Bits _____

PUSHBUTTONS/LAMPS

A M (Alternate/Momentary)

F1 ☐☐ _____

F2 ☐☐ _____

F3 ☐☐ _____

F4 ☐☐ _____

F5 ☐☐ _____

Red **Lamp1** _____

Yellow **Lamp2** _____

Green **Lamp3** _____

MESSAGE:

Text Message

No.			
	Action:	Data Format:	Range:
No.			
	Action:	Data Format:	Range:
No.			
	Action:	Data Format:	Range:
No.			
	Action:	Data Format:	Range:
No.			
	Action:	Data Format:	Range:
No.			
	Action:	Data Format:	Range:
No.			
	Action:	Data Format:	Range:
No.			
	Action:	Data Format:	Range:
No.			
	Action:	Data Format:	Range:
No.			
	Action:	Data Format:	Range:

OP-640 MESSAGE WORKSHEET

PAGE: ________

MESSAGE:

Text Message

No.
Action: Data Format: Range:

No.
Action: Data Format: Range:

No.
Action: Data Format: Range:

No.
Action: Data Format: Range:

No.
Action: Data Format: Range:

No.
Action: Data Format: Range:

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No.
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No.
Action: Data Format: Range:

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