OP-1224

Pushbutton Panel

Manual Number OP-1224-M

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Manual Revisions

If you contact us in reference to this manual, remember to include the revision number.

Title: OP-1224 Pushbutton Panel User Manual
Manual Number: OP-1224-M

Issue	Date	Effective Pages	Description of Changes
Original	11/95	Cover/Copyright Contents Manual Revisions 1 — 45 Index	Original Issue
Rev. A	3/96	10	Pinout diagram for OP-4CBL-1 cable showed the wrong pins tied together
Rev. B	6/98	All Various Manual Revisions	Downsize to spiral Minor changes Rev. B
Rev. C	12/02	All	Upgrade/AutomationDirect
Rev. D	6/2010	All	Updated to current date

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OP-1224 Pushbutton Panel

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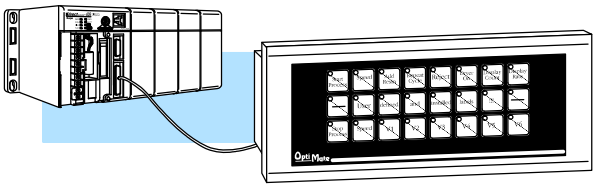
Getting Started

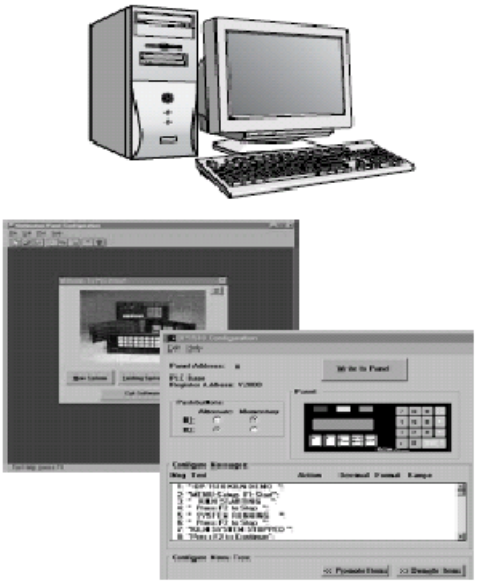
The Purpose of this Manual

This manual shows you how to install and operate your OP-1224 Pushbutton Panel. It includes wiring diagrams and power requirements, as well as the information you need for selecting the proper connecting cables.



Configuration Software

All OptiMate panels are configured using the OptiMate OP-WINEDIT configuration software.
OP-WINEDIT software is compatible with computers running Windows 95/98/2000/NT/XP.
OP-WINEDIT is ordered as a separate item from the OptiMate panel from AutomationDirect.
The software is loaded onto your personal computer and simple follow the setup instructions in the supplied user manual and the built-in HELP screens. The software allows setup of your complete application, including the type of PLC being used.
Note that OP-WINEDIT is also used to configure the OP-9001, Communications Master panel. The software can be used with Allen-Bradley PLCs.



Additional Manuals

There are several other manuals you will find helpful or necessary:

- Respective PLC User Manuals–Shows you the memory conventions, programming instruction sets, data or file types, communications protocol, etc.
- ***Direct***SOFT™ **Programmers Software Users Manual**–Shows you how to use the ***Direct***SOFT Windows software to write your ladder logic for ***Direct***LOGIC programmable controllers.
- OP-9001-M Communications Master User Manual provides details of how to use the OP-9001 for connecting multiple OP-Panels to a single CPU.

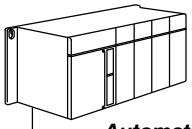
Technical Assistance

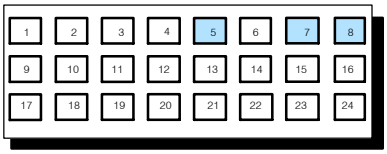
After completely reading this manual, and you are not successful with implementing the OP-1224, you may call AutomationDirect, 770-889-2858, Monday through Friday from 9:00 A.M. to 6:00 P.M. Eastern Standard Time. Our technical support group will work with you in answering your application questions. If you have a comment or question about our products, services, or manuals which we provide, please fill out and return the suggestions card included with this manual.

How the OP-1224 Works

To link the pushbuttons and the LEDs to your PLC, the OP-1224 uses a process called “memory mapping”. This process ties the pushbuttons and LEDs to specific reserved areas of memory in the PLC. You can use any available memory as long as it is consecutive.

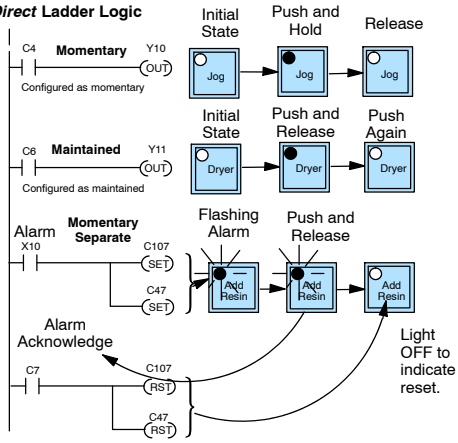
The base register addresses are entered during initial configuration using the OP-WINEDIT software. Each of the functions for the pushbuttons and LEDs are controlled by the status of their assigned bits within the memory words that you have reserved. You interface these words of memory through ladder logic. The logic below shows how the various features of the OP-1224 can be used. This will be explained in more detail later.



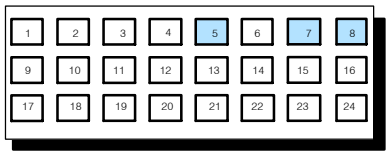


Mapped Memory Location	Function
m (such as V40600) C0-C17	Pushbuttons 1-16 ON/OFF
m+1 (such as V40601) C20-C37	Pushbuttons 17-24 ON/OFF
m+2 (such as V40602) C40-C57	LEDs 1-16 flash
m+3 (such as V40603) C60-C77	LEDs 17-24 flash
m+4 (such as V40604) C100-C117	LEDs 1-16 ON/OFF
m+5 (such as V40605) C120-C137	LEDs 17-24 ON/OFF
m+6 (such as V40606) C140-C157	Force Function Data (1-16)
m+7 (such as V40607) C160-C177	Force Function Mode/Data (17-24)

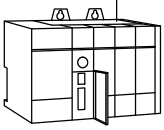
Automation*Direct* Ladder Logic Example



Notice that Pushbuttons 5, 7 and 8 are used in this example. These are controlled by internal relays C4, C6, and C7. Your configuration software (OP-WINEDIT) allows you to operate your pushbuttons as either momentary switches or ”maintained” alternate action switches. We have made C4 a momentary switch and C6 is a maintained switch. C7 is a momentary switch but we are controlling the separate ON/OFF and flashing of Pushbutton 8 with C47 and C107 respectively.

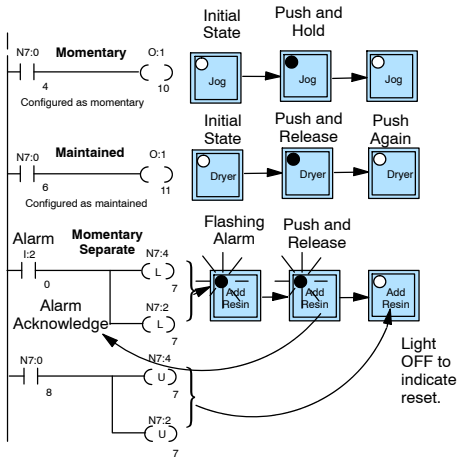


Allen-Bradley



Mapped Memory Location	Function
m (such as N7: 0/0– 0/15)	Pushbuttons 1-16 ON/OFF
m+1 (such as N7: 1/0 1/15)	Pushbuttons 17-24 ON/OFF
m+2 (such as N7: 2/0 2/15)	LEDs 1-16 flash
m+3 (such as N7: 3/0 3/15)	LEDs 17-24 flash
m+4 (such as N7: 4/0 4/15)	LEDs 1-16 ON/OFF
m+5 (such as N7: 5/0 5/15)	LEDs 17-24 ON/OFF
m+6 (such as N7: 6/0 6/15)	Force Function Data (1-16)
m+7 (such as N7: 7/0 7/15)	Force Function Mode/Data (17-24)

Allen-Bradley Ladder Logic Example

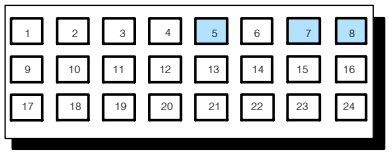


Notice that Pushbuttons 5, 7 and 8 are used in this example. These are controlled by bits 4, 6 and 7 in integer file N7:0/0. The configuration software (OP–WINEDIT) allows you to operate the pushbuttons as either momentary switches or “maintained” alternate action switches. Pushbutton 5 has been configured as a momentary switch and Pushbutton 7 has been configured as a maintained switch. Pushbutton 8 is a momentary switch but is configured to flash its LED with N7:2/7 while controlling the LED ON/OFF separately from the button status with N7:4/7.

Using the Pushbutton Panel...5 Easy Steps

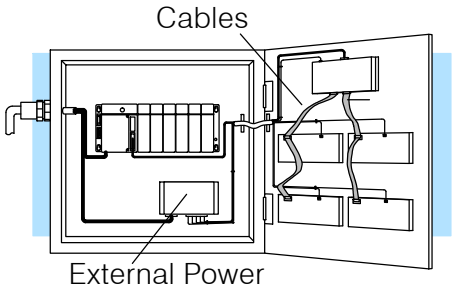
Step 1: Preparing the Pushbutton Labels (Pages 6-7)

First, you need to prepare the labels for each of the pushbuttons. The labels insert into plastic sleeves behind the main cover. To access the sleeve, you merely snap loose the front bezel.



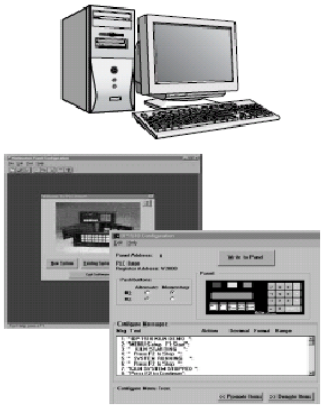
Step 2: Installing the Panel (Pages 8-14)

Preparing for installation, you will want to check the individual specifications. These include dimensions, power requirements, cabling requirements, and NEMA ratings. We include information you will need for mounting; i.e. cutout dimensions, cabling requirements, components needed, etc.



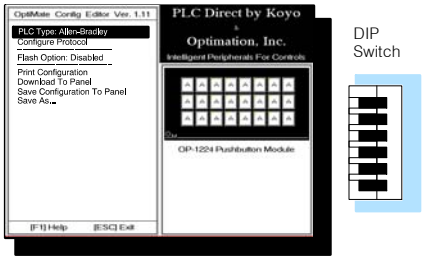
Step 3: Use OP-WINEDIT Software

You will need OptiMate OP-WINEDIT configuration software in order to configure the panel and PLC. OP-WINEDIT is ordered as a separate item from the OptiMate panel from AutomationDirect.
The software is used for both ***Direct***LOGIC and Allen-Bradley PLCs.



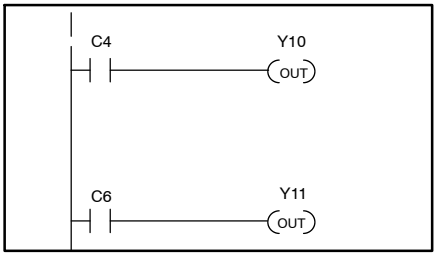
Step 4: Configure the Panel to Work with the CPU (Pages 15-16)

After setting a DIP switch on the rear of the panel and attaching the programming cable, you are ready to configure your panel. The simple and easy-to-follow screens make configuration a painless process.



Step 5: Applying Ladder Logic (Pages 17-41)

The amount of ladder logic programming knowledge you need is very basic. In most cases, you are already familiar with the elements of logic that are required. We'll give you examples in the final section of this manual, and you will see right away just how easy it is.

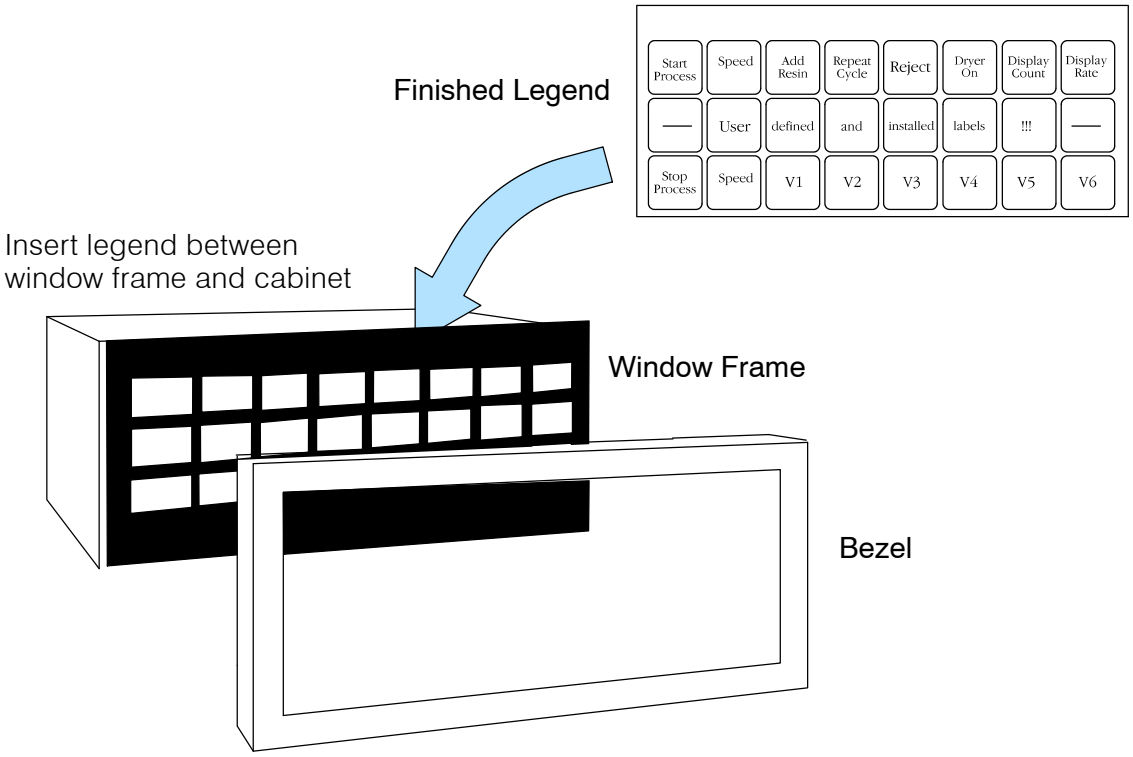


Preparing the Pushbutton Labels

Applying Text to Each Label

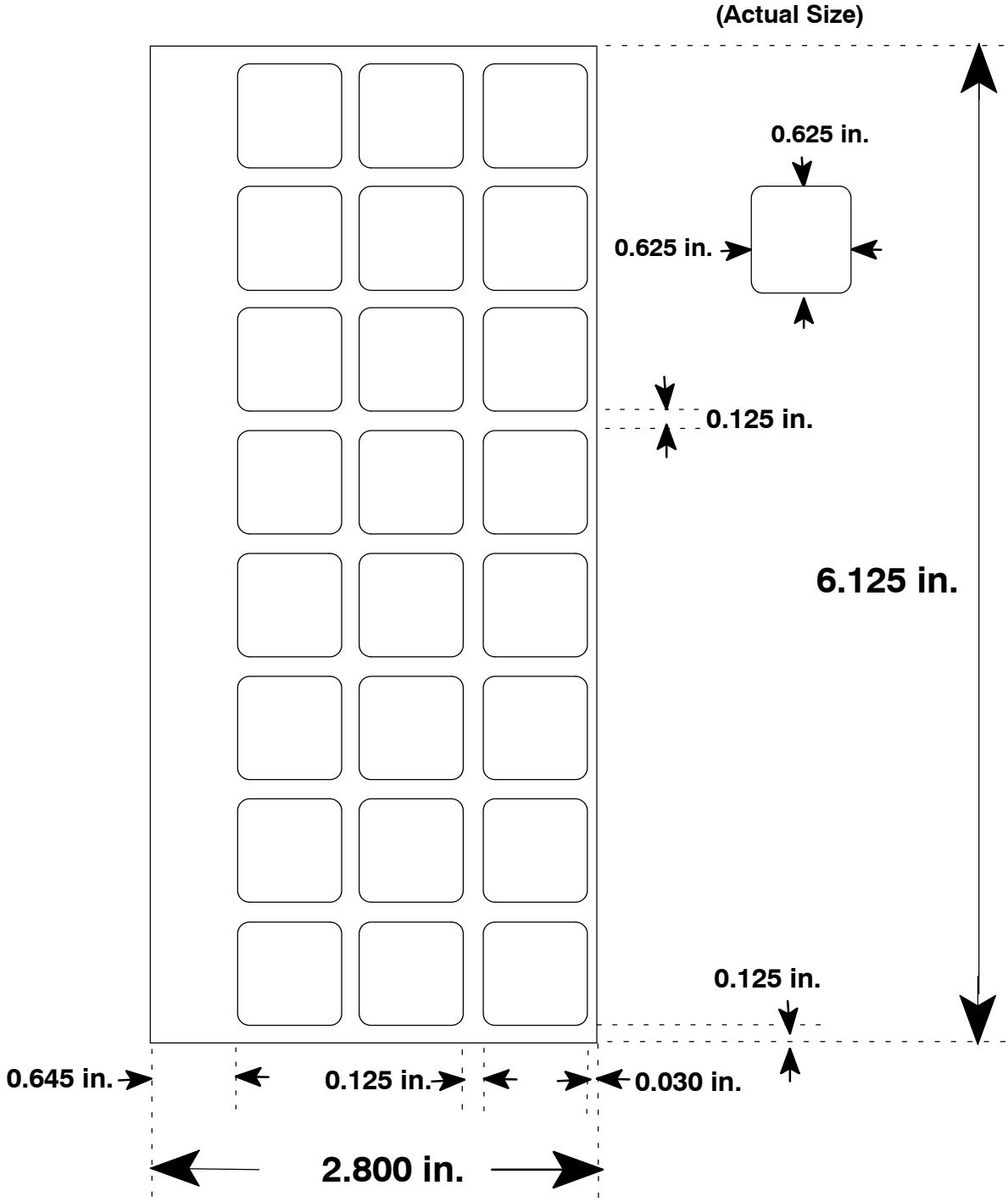
Preparing the labels for the OP-1224 panel requires you to slide a legend transparency into a pocket in the panel overlay. Use the following procedure:

1. Remove the bezel from the module by unsnapping the four tangs that hold the bezel to the module frame.
2. Create a legend transparency. There are several ways of doing this. A template is provided on the next page that gives you the available dimensions. The nicest legends result from using a computer graphics program and a laser printer to create the transparency.



3. Slide the finished legend into the pocket space between the window frame and LED bars.
4. Re-attach the bezel by snapping the bezel onto the case.

Template for Creating Labels



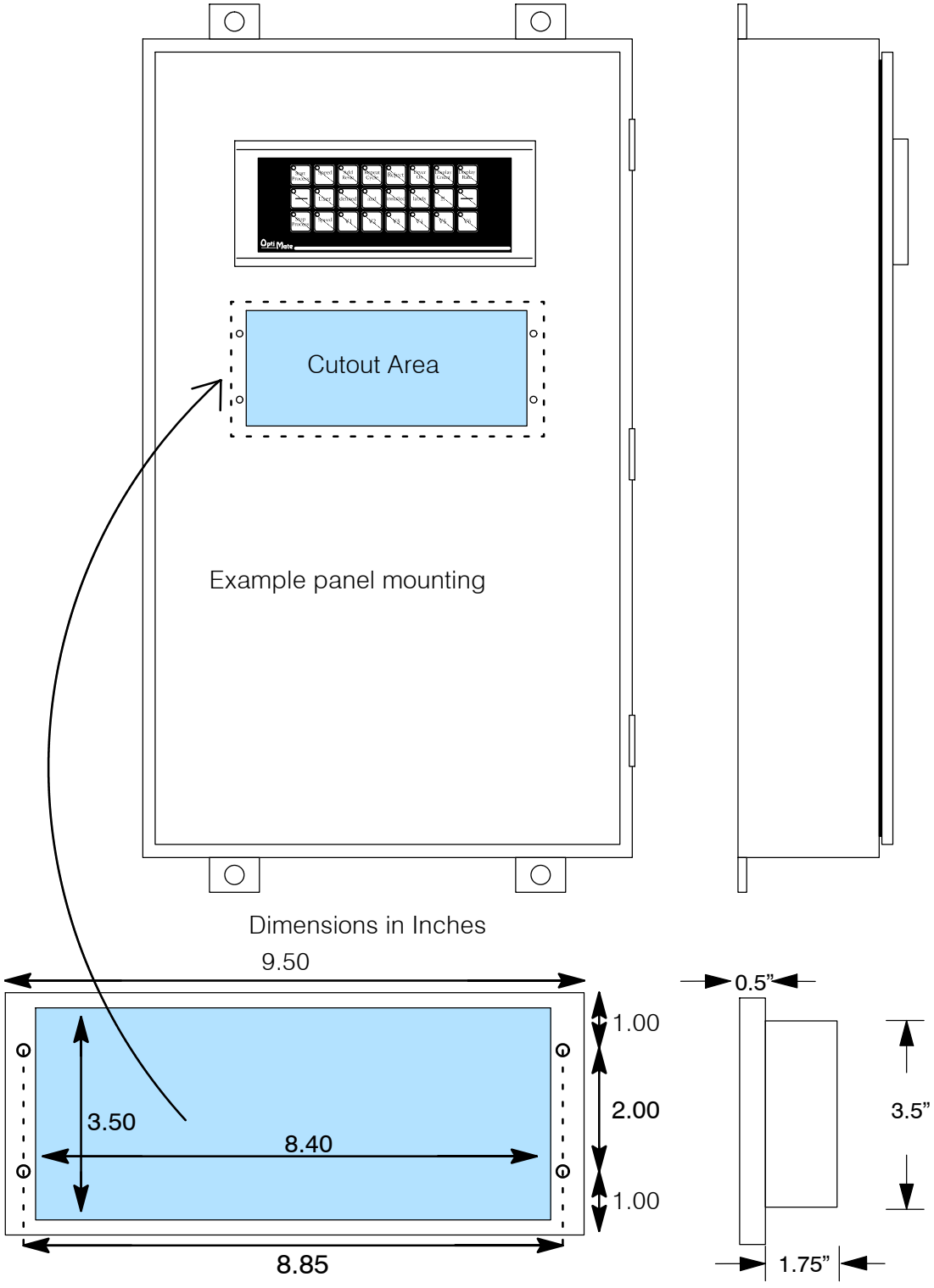
Installing the Panel

In this section, you will be given all of the information you need to install the panel. Before actually installing the OP-1224 panel, it may be helpful to examine the specifications and make sure that the requirements of your application are met.

Panel Specifications:

Physical Specifications	Weight	22 ounces
	Panel Fasteners	Four 6x32 threaded studs
	NEMA Rating	NEMA 4
Environmental Specifications	Operating Temperature	0° to 50° C
	Storage Temperature	–20° to 80° C
	Operating Humidity	5 to 95% (non-condensing)
	Air Composition	No corrosive gases permitted
Operating Specifications	Power Budget Requirement	4 VA @ 8 – 30 VDC 240 mA @ 12 VDC (all LEDs OFF) 310 mA @ 12 VDC (all LEDs ON) 120 mA @ 24 VDC (all LEDs OFF) 155 mA @ 24 VDC (all LEDs ON)
	Power Connector	Removable Terminal Block 2 position
	Absolute Maximum Voltage	32 VDC
	Diagnostics	Power On, CPU
	Communication Link	RS232 or RS422 4800, 9600 and 19200* baud 15 pin female D type connector *Only 4800 and 9600 baud will work with Allen-Bradley PLCs.

Dimensions for Mounting



Power and Cabling Requirements

What Are Your Application Needs?

The communication cable requirements will depend on your particular application. There are two types of configuration possibilities: point-to-point (a single operator interface connected to a PLC) and multi-drop (multiple operator interfaces connected to a PLC).

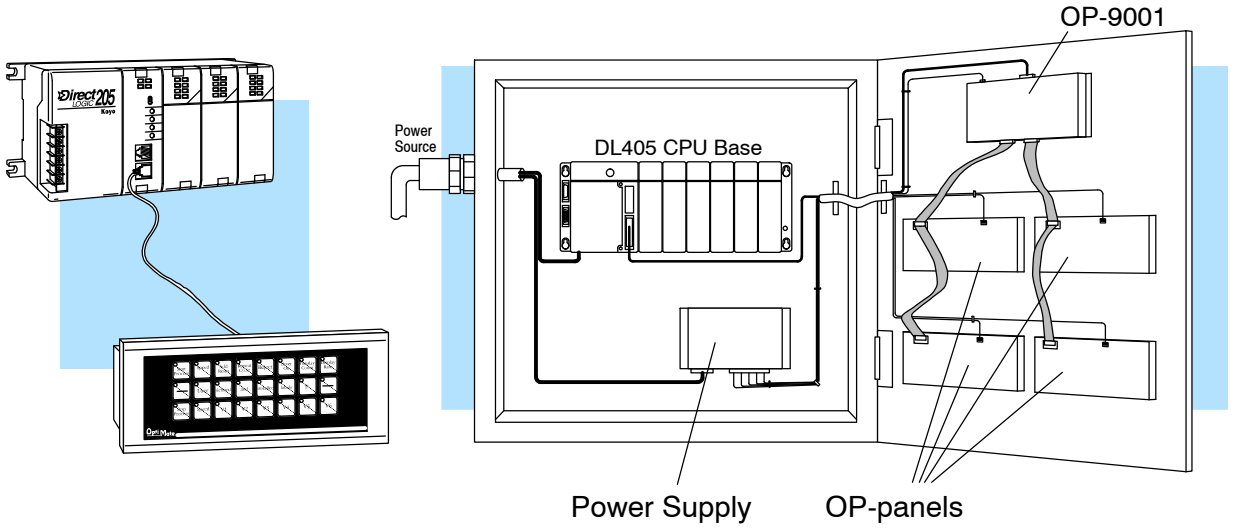
- **Point-to-Point –** If only one operator interface will be connected to one PLC, then just choose the appropriate cables from the chart on Pages 12 and 13.
- **Multi-drop –** By using an OptiMate OP–9001 Communications Master, multiple Optimate units can be connected to a single PLC. Up to 31 individual units can be connected in a daisy-chain fashion to the OP–9001. Communications are via RS422 between the OP–9001 and the operator interfaces. When using a quality shielded cable, a total distance of up to 4000 feet between the OP–9001 and the last operator interface unit in the chain can be achieved. If the distance 30 feet or less, a ribbon cable with easy-to-install crimp-on ribbon connectors can be used.

1. Point-to-Point

A single cable connection from the PLC to the panel gives you access to the PLC's data registers and ladder logic.

2. Multi-drop

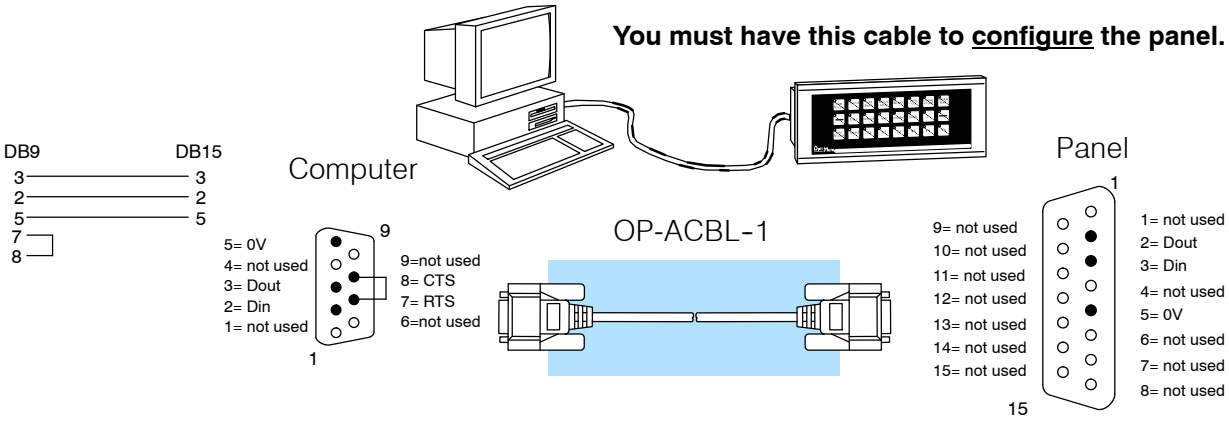
Multiple OP-panels can be interfaced to a single PLC. This requires the use of the OP-9001 Communications Master. With the Communication Master, up to 31 panels can be interfaced to a single CPU port. Each can be programmed for entirely different functions. Panels can be distributed up to 4000 feet* from the OP-9001.



NOTE: Please read and follow the cabling requirements in the OP-9001 User Manual (OP-9001-M) when using multiple panels. Failure to follow the guidelines of the User Manual may affect the integrity of the RS422 link, resulting in communication errors.

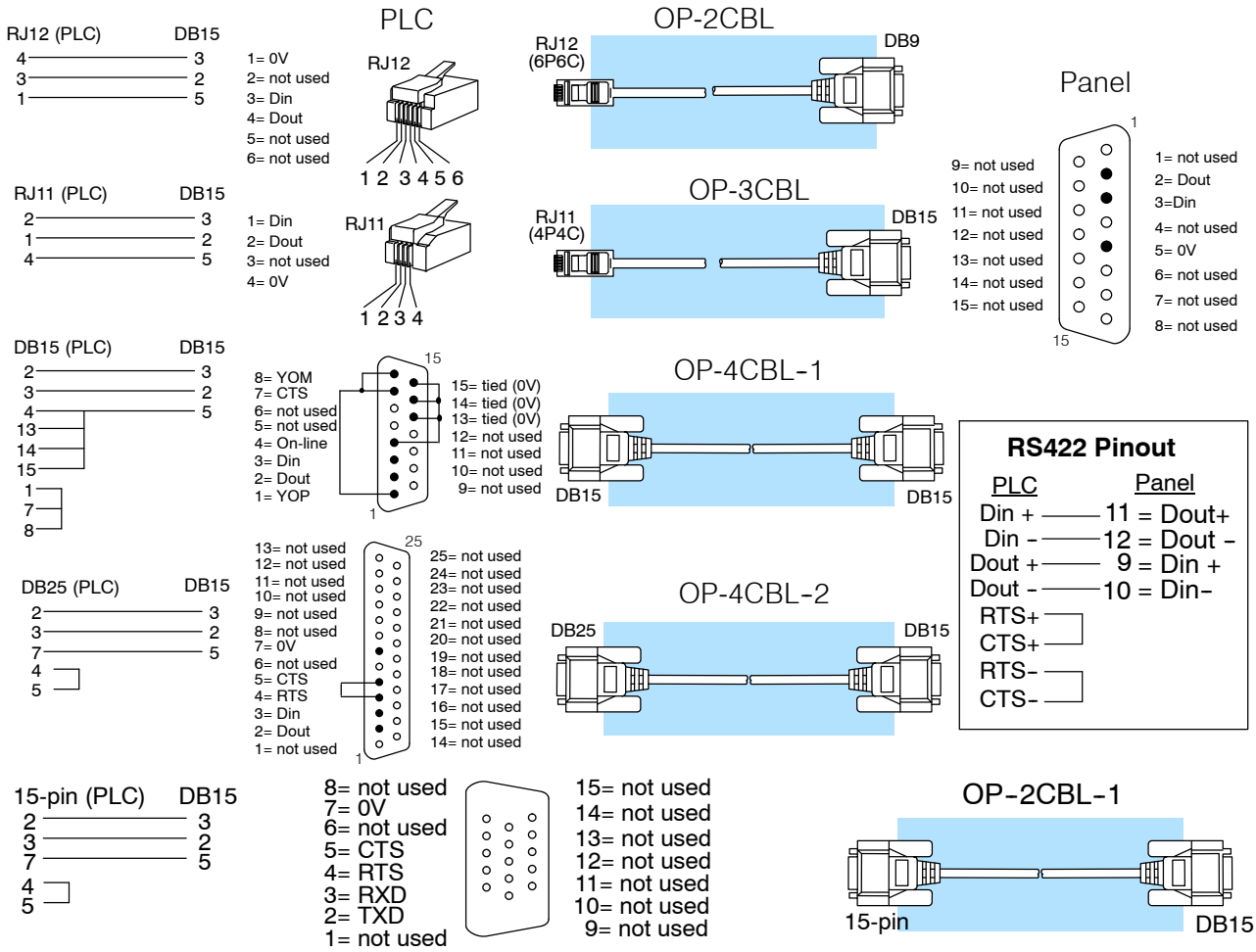
Programming Cable The OP-ACBL-1 is used to connect your OP-1224 panel to your computer for programming.

You must have this cable to configure the panel.



PLC to Panel Cable The OP-ACBL-1 (shown above) is also used to connect Allen-Bradley SLC 5/03 and 5/04 PLCs to an OP-1224 panel. Since the OP-1224 is compatible with all of the ***Direct***LOGIC and compatible CPUs, your cabling requirements wll vary depending on the CPU type you are using. Refer to the table on the next page for matching the proper cable to your PLC. Pin diagrams refer to the ends of the cables and not the communication ports.

See the next page for matching your PLC to the correct cable.



Choosing the Proper Connecting Cables

OptiMate Panel Cables

Depending on which PLC you are using, you may require as many as two cables–one to connect the panel to a personal computer for configuration; and one to connect the panel to the PLC. Here are the requirements:

- **OP-ACBL-1:** *all* units require this cable for configuration. This isa 9-pin male to 15-pin male cable that connects your personal computer to the OptiMate unit. (This cable is also used to connect an OptiMate panel to the Allen-Bradley SLC–500 PLC.
- **CPU Cables:** You will also need the appropriate cable to connect your CPU to the OptiMate unit. Use the chart shown to the right to choose the correct communications cable.
- **OP-ACBL-2:** The 8 Pin Mini–DIN is a non standard connector used for the Micrologix 1000. We recommend using the OP–ACBL–2 cable and modifying the length for any applications between 6.56 – 50 ft.

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.

For electrically noisy environments, we recommend a good shielded cable, such as Belden 9729 or equivalent. This type of cable will require the solder-type 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	DL05: D0–05	Port 1 (RJ12)	OP-2CBL
		Port 2 (RJ12)	OP-2CBL
DirectLOGIC DL06	DL06: D0–06	Port 1 (RJ12)	OP-2CBL
		Port 2 (15 pin)	OP-2CBL–1
DirectLOGIC DL105	DL105: F1–130	One port (RJ12)	OP–2CBL
DirectLOGIC DL205	D2–230	One port (RJ12)	OP–2CBL
	D2–240	Top port (RJ12)	OP–2CBL
		Bottom port (RJ12)	OP–2CBL
	D2–250–1 D2–260	Top port (RJ12)	OP–2CBL
		Bottom port (15 pin)	OP–2CBL–1
	D2–DCM (module)	Only one (25 pin)	OP–4CBL–2
DirectLOGIC DL305	D3–330	Requires DCU*	OP–4CBL–2
	D3–330P	Requires DCU*	OP-4CBL–2
	D3–340	Top port (RJ11)	OP-3CBL
		Bottom port (RJ11)	OP-3CBL
	D3–350	Top port	OP-2CBL
		Bottom port	OP-4CBL–2
DirectLOGIC DL405	D4–430	Top port (15-pin)	OP-4CBL–1
		Bottom port (25-pin)	OP-4CBL–2
	D4–440	Top port (15-pin)	OP-4CBL–1
		Bottom port (25-pin)	OP-4CBL–2
	D4–450	Phone Jack (RJ12)	OP-2CBL
		Top port (15-pin)	OP-4CBL–1
		Bottom port (25-pin)	OP-4CBL–2
	D4–DCM (module)	One port (25-pin)	OP-4CBL–2
	Slice I/O panels	One port (15-pin)	OP-4CBL–1
GE® Series 1	IC610CPU105, 106	Requires DCU*	OP-4CBL–2
GE® Series 90/30	All models (311–351)	RS422 serial port	Not available
GE® Fanuc™ Series 90 Micro	All models	RS422 serial port	Not available
MODICON	ModBus	RS45	OP–MCBL–1

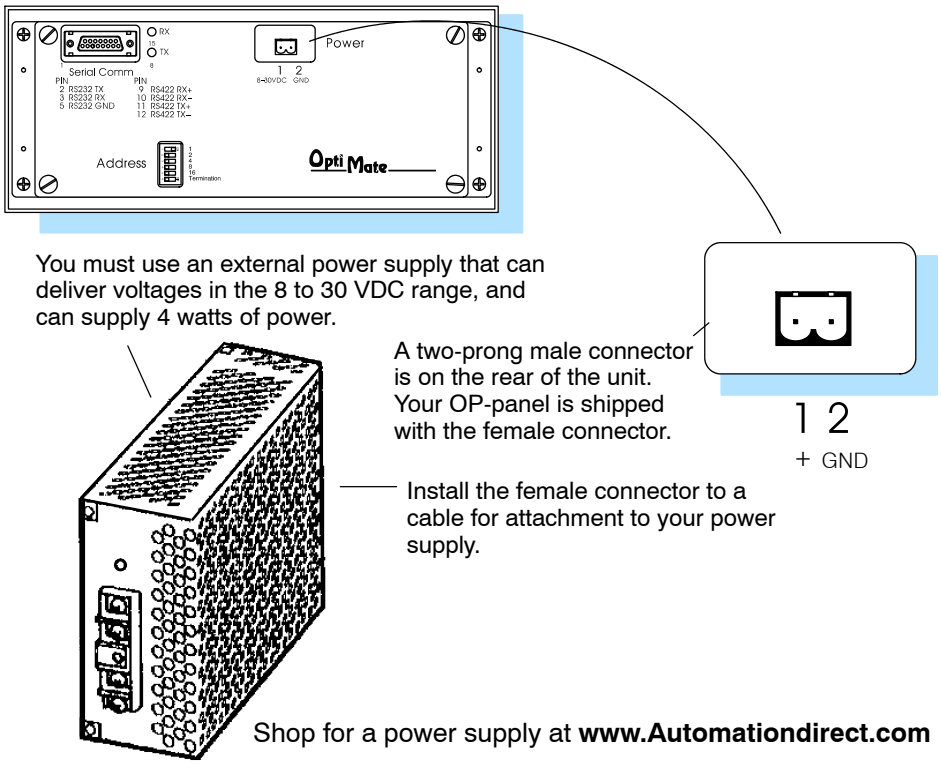
OptiMate Cables (cont'd)			
Family	**CPU (or other device)**	**Port**	**Cable**
TI305™ / SIMATIC® TI305™	325-07, PPX:325-07	Requires DCU*	OP-4CBL-2
	330-37, PPX:330-37	Requires DCU*	OP-4CBL-2
	325S-07 (or 325 w/ Stage Kt)	Requires DCU*	OP-4CBL-2
	330S-37, PPX:330S-37	Requires DCU*	OP-4CBL-2
	335-37, PPX:335-37	Phone Jacks (RJ11)	OP-3CBL
		If DCU is used*	OP-4CBL-2
TI405™ / SIMATIC® TI405™	425-CPU, PPX:425-CPU **	One port (15-pin)	OP-CBL-1
	430-CPU, 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	One port (15-pin)	OP-4CBL-1
Allen-Bradley SLC500	5/03 5/04	Bottom port	OP-ACBL-1
Allen-Bradley	Micrologix1000/1200/1500	One port (8-pin Mini Din)	OP-ACBL-2

* requires RS232 Data Communications Unit (D3-232-DCU)
** also DC versions

Connecting a Power Supply

Power Supply Connections

The OP-1224 panel can operate on DC voltages between 8 and 30 VDC rated at 4 watts. Connect the panel to a power supply (within the required voltage range and wattage) using the terminal block connector supplied. The connector is polarized to prevent reversing the connections. The male receptacle on the rear of the panel will only connect in one way with the female connector that is supplied with your OP-1224 panel. Pin 1 is the positive connection, while Pin 2 is the negative, or ground, connection.



Shop for a power supply at **www.Automationdirect.com**

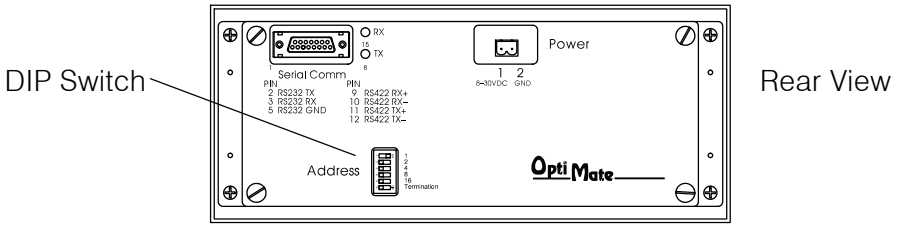
Model	Current Consumed at 12VDC	Current Consumed at 24VDC
OP-1224	0.24A (all LEDs OFF)	0.12A (all LEDs OFF)
	0.31A (all LEDs ON)	0.16A (all LEDs ON)

Configure the Panel to Work with the CPU

Assigning an Address to the OP-1224

A 6-position DIP switch on the rear of the OP-1224 allows you to assign a hardware Aaddress to your panel. Each panel must have a unique address. You can use any address between 0 and 30 when communicating between a panel and a PLC or the OP-9001 Master Communications panel. Address 31, however, is reserved. See the note that follows.

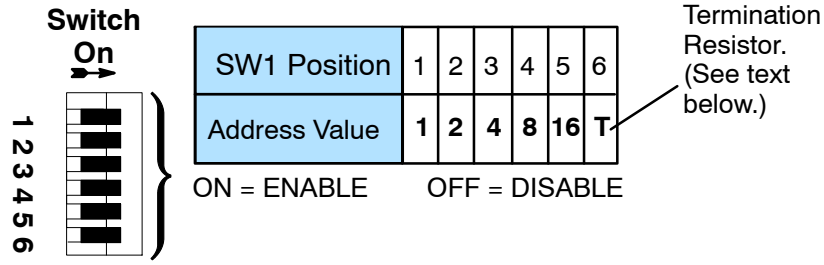
NOTE: You must use Address No. 31 when you are using the OP-WINEDIT software to download to the OP-1224 panel. No other address will work for the configuration process. In a similar manner, if you are connecting more that one OP-panel to a single CPU (through an OP-9001), then the OP-9001 needs to know which set of configuration parameters belong to which OP-panel. You do this by assigning an address in the range of 0 to 30 to each panel connected. Each panel must have a different address.



How to Set the Address

To set the address on the OP-1224, simply set the apppropriate switches on the dip switch to the desired address. The figure below shows the binary weighting of each switch position. Notice that it is in decimal format. To select address 14 for example, you would press switches 2, 3 and 4 down to the right, and switches 1, 3 and 5 to the left (2 + 4+ 8 = 14). Any address between 0 and 30 is valid for the OptiMate-to-CPU (or to OP9001) communications. Address 31, however selects the configuration mode. Use this mode when you connect your personal computer to the panel for configuration. To select address 31, turn switches 1 through 5 ON.

NOTE: When the dip switches are changed, the OP-1224 must be power cycled before the new settings will take effect.



The Termination Resistor

Switch position 6 enables or disables an internal termination resistor. The OptiMate panels communicate via an RS232 or RS422 communcations network. If you are using a single panel that will be located less than 50 feet from the CPU, then you can use RS232 and are not required to use a termination resistor (i.e. switch position 6 is turned OFF).

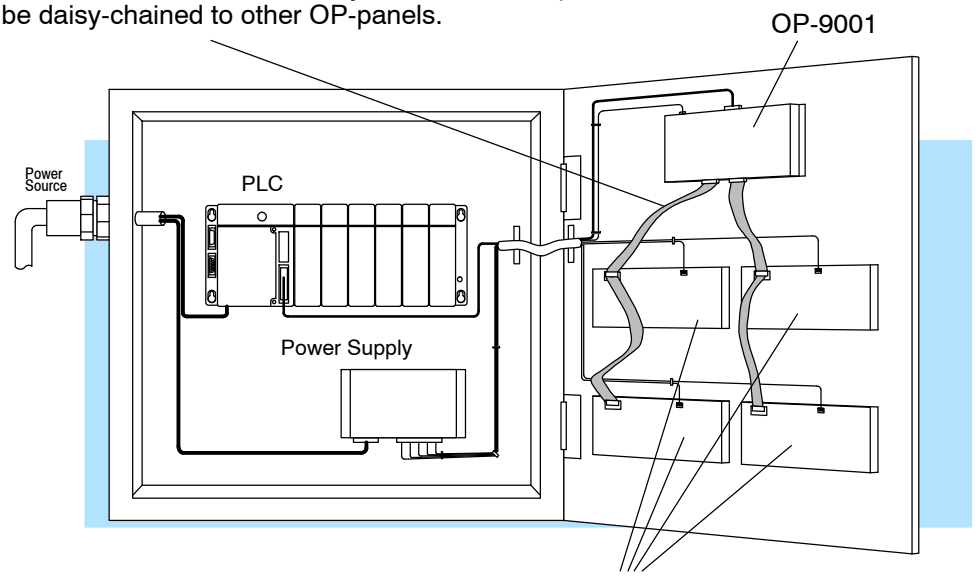
*If a panel will be located more than 50 feet from the CPU or you want to use multiple panels, you **must** use RS422.* For single panel installations, this means that switch 6 must be enabled (ON). For multi-drop installations, this means **the last panel only** must have switch 6 enabled (ON). All other panels must have switch 6 disabled (OFF). A more detailed description of multiple panel installations is given in the OP-9001-M User Manual.

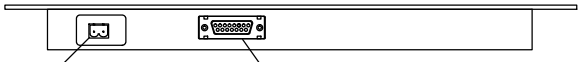
Using the OP-9001 to Connect Multiple Panels

The addition of the OP-9001 Communications Master panel will allow the connection of up to 31 OptiMate panels from one useable CPU port of the PLC. Shown below are the connection requirements. For specifics of the OP-9001 panel itself, refer to the Communications Master User Manual (OP-9001-M).

NOTE: The OP-9001 must be used in a multiple panel configuration.

Ribbon cable with DB15 male connectors attached.
Panels can be connected directly to the OP-9001 ports or be daisy-chained to other OP-panels.

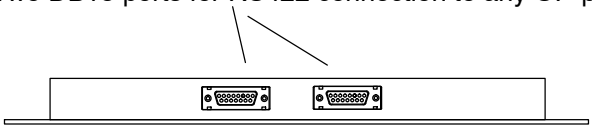




Power supply receptacle. Same as the one on the OP-1224. See Page 15.

DB15 for connecting to the PLC. See chart on Page 13 for selection of the proper cable.

Two DB15 ports for RS422 connection to any OP-panel.



Belden 9279 Specifications	
No. twisted pairs	2
Nom. Impedance (ohms)	100
Nom. Capacitance (pF/m)	41.0
Wire Gauge (AWG)	24

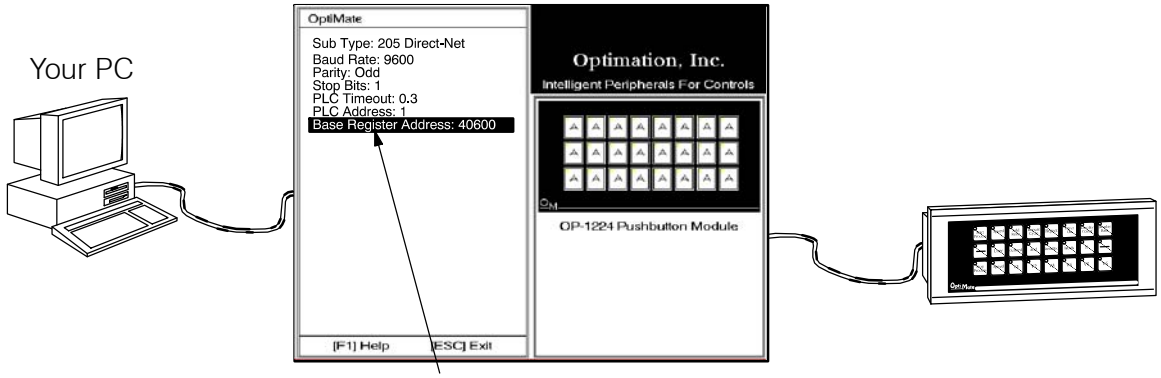
NOTE: Panels can be located as far away as 4000 feet from the OP-9001 when using shielded cable (Belden 9729 or equivalent). Flat ribbon connections can be used for a distance of 30 feet maximum. For ribbon cable, Belden 9L28015 or 3M 3365/15 is recommended.

Applying Ladder Logic

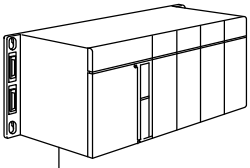
General Concepts

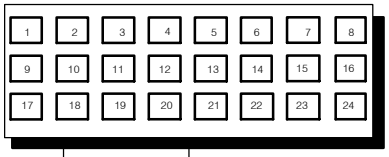
Memory Mapping

The OP-1224 uses memory mapping in order to link itself to a PLC. Memory mapping is a technique that maps the memory of the OP-1224 into the memory of the PLC. During initial configuration, you indicate where in the PLC memory you want to start the mapping process (Refer to the OP-WINEDIT manual). By knowing where the data of the specific panel is mapped, this data can be moved, changed or monitored using ladder logic.



During configuration, you determine the starting address for the memory mapping process.





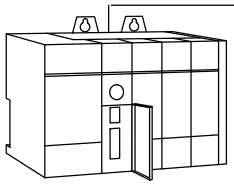
Mapping Assignments

DirectLOGIC

Mapped Memory Location	Function
m (such as V40600) C0-C17	Pushbuttons 1-16 ON/OFF
m+1 (such as V40601) C20-C37	Pushbuttons 17-24 ON/OFF
m+2 (such as V40602) C40-C57	LEDs 1-16 flash
m+3 (such as V40603) C60-C77	LEDs 17-24 flash
m+4 (such as V40604) C100-C117	LEDs 1-16 ON/OFF
m+5 (such as V40605) C120-C137	LEDs 17-24 ON/OFF
m+6 (such as V40606) C140-C157	Force Function Data (1-16)
m+7 (such as V40607) C160-C177	Force Function Mode/Data (17-24)

The pushbuttons are numbered left to right starting in the upper left corner.

Allen-Bradley

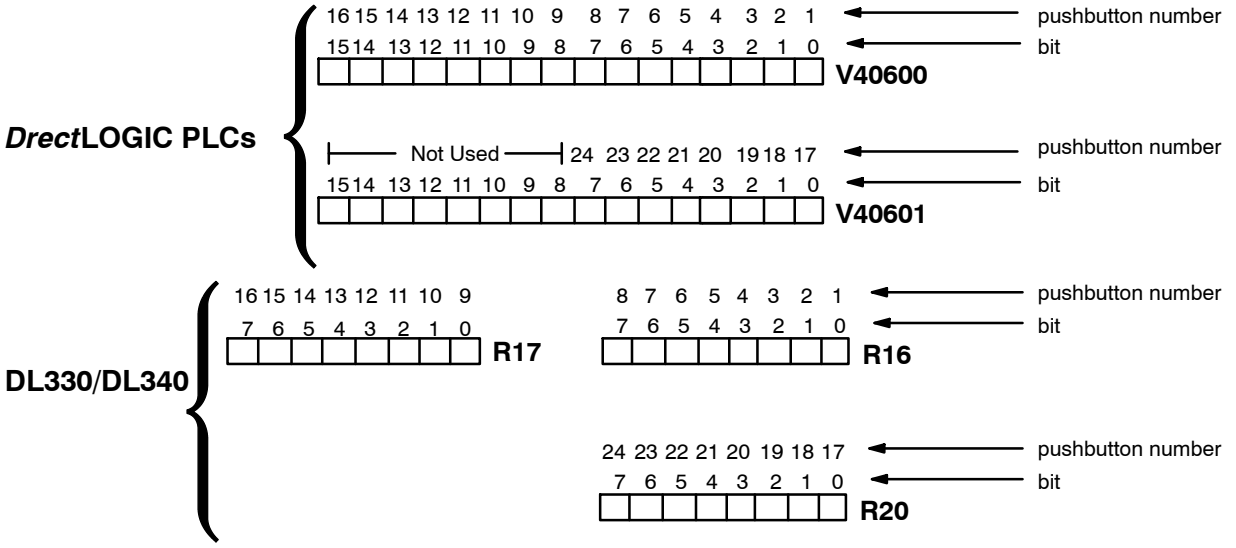


Mapped Memory Location	Function
m (such as N7: 0/0- 0/15)	Pushbuttons 1-16 ON/OFF
m+1 (such as N7: 1/0 1/15)	Pushbuttons 17-24 ON/OFF
m+2 (such as N7: 2/0 2/15)	LEDs 1-16 flash
m+3 (such as N7: 3/0 3/15)	LEDs 17-24 flash
m+4 (such as N7: 4/0 4/15)	LEDs 1-16 ON/OFF
m+5 (such as N7: 5/0 5/15)	LEDs 17-24 ON/OFF
m+6 (such as N7: 6/0 6/15)	Force Function Data (1-16)
m+7 (such as N7: 7/0 7/15)	Force Function Mode/Data (17-24)

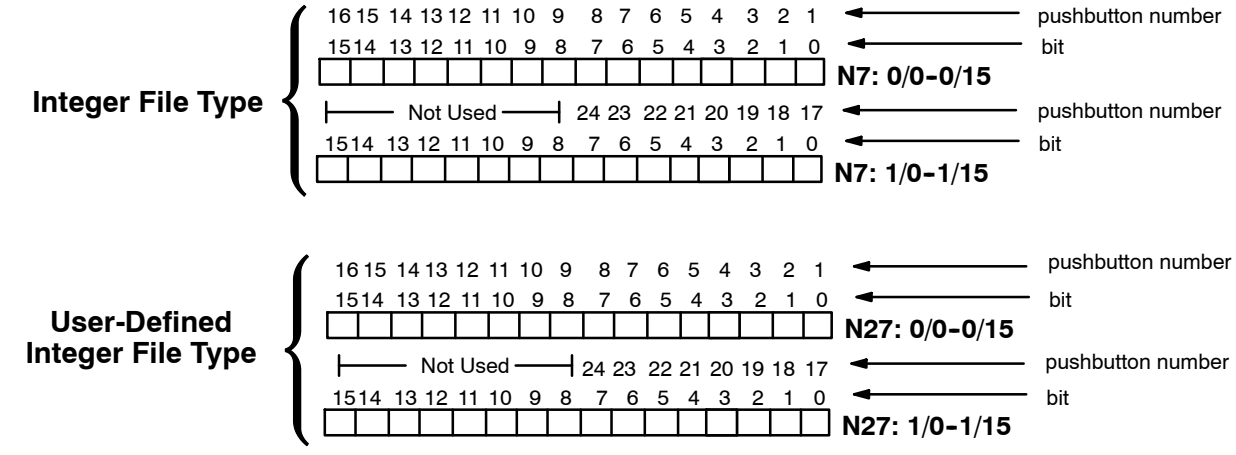
Addressing Conventions

Before getting into the ladder logic programming, take a moment to review and compare the addressing conventions used by ***Direct***LOGIC and Allen-Bradley.

Direct*LOGIC Memory–** A typical address within a ***DirectLOGIC PLC is Vxxxx (such as V40600 for the DL05, DL06, DL105, DL205, DL350 or DL405 families) or Rxxx (such as R16 for the DL330/340 family). The V-memory in the DL05, DL06, DL105, DL350, DL205 and DL405 is divided into 16-bit boundaries, and the R-memory in the DL330/340 is divided into 8-bit boundaries. Refer to your individual User Manuals for complete memory information. The two diagrams below are examples how the lamps of the OP-1224 could be mapped during configuration. In the examples, V40600 and R16 have been chosen as starting boundaries to map the pushbuttons to the PLC, but any available user or internal relay memory areas can be used as long as they are consecutive:



Allen-Bradley Memory– A typical address for Allen-Bradley might be N7:0/0 or N27:0/0. The OP-1224 will allow you to define a starting address for mapping purposes using either Allen-Bradley's integer (N7) file type or user-defined integer file types (N9–N255). *If you plan to use an integer file between N9 and N255, you must define these in the Allen-Bradley memory map before configuring the panel.* The example below shows how 16-bit integer files could be used to map the pushbuttons to the Allen-Bradley PLC.



Three Different Ways to Use the Panel

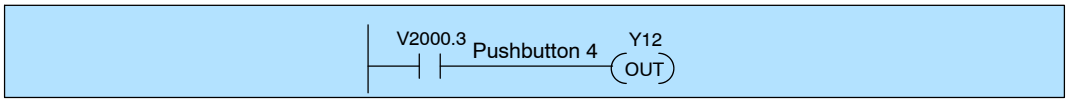
Depending on the type of CPU and the number of OP-1224 functions selected, there are three different ways to interface your ladder logic with the panel.

1. **Bit-of-Word**
2. **Internal Relays**
3. **User Memory Combined with Internal Relays**

Which of these methods is best for you depends on the make and model of the PLC being used. Look at each of these three methods to see what their relative merits are.

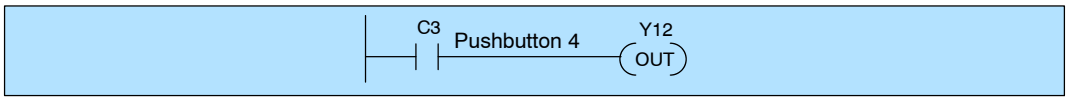
Method 1: Bit-of-Word DL05/DL06/DL250/ DL350/450 and Allen-Bradley

The most direct way to address the individual bits with ladder logic is to use "bit-of-word". This method is available with the DL05/DL06/DL250/DL350/DL450, ***Direct***LOGIC, PLCs and SLC 5/03 and 5/04, Allen-Bradley, PLCs. Below is a rung of logic that shows how the DL05/DL06/DL250/DL350/DL450 might use the status of bit 3 to control a process connected to Y12. **Refer to pages 18-22 for DL05/DL06/DL250/350/450 examples, and pages 37-41 for Allen-Bradley.**



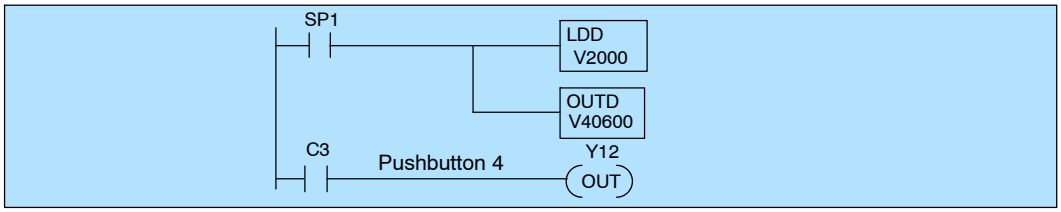
Method 2: Internal Relays (All Options Used)

This method is only available to ***Direct***LOGIC PLCs. If you are familiar with the DL05, DL06 DL105, DL205, DL305 and DL405 PLCs, then you know about internal relays. These relays, by PLC design, are mapped to certain bits in reserved memory areas. You can make use of these relays during configuration with OP-WINEDIT by mapping directly to the control relay reserved memory area. **This method should only be used if you plan to use all of the functions of the panel; otherwise it will consume internal relays unnecessarily.** Using this method automatically consumes 128 internal relays. One of the mapped pushbuttons is used to control the output Y12 in the example below. **Refer to Pages 23-27.**



Method 3: Remapping (Selected Options)

A better way to make use of internal relays when not using all of the OP-1224 options is to use a process of "remapping". With this technique the panel is mapped to user memory (such as V2000), then parts of the user memory are mapped only to those relays that are actually being used. The example below shows ladder logic necessary to detect when a pushbutton has been pressed. It maps V2000/V2001 to V40600/V40601 and consumes only 32 relays. It uses only the relays necessary for the option you have selected. This will become clearer with specific ladder logic examples that use this technique. **By convention, this manual uses syntax of the form V2000:V40600 to refer to memory locations that have been mapped together**. **Refer to Pages 28-33 for ladder logic examples.**



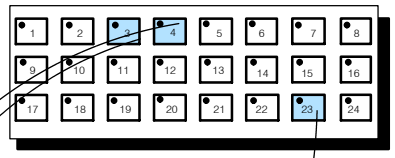
Using the OP-1224 with the *Direct*LOGIC PLCs

Using Pushbutton Status with Ladder Logic

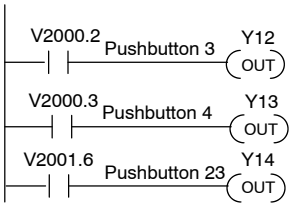
By convention, the letter "**m**" is used to refer to consecutive memory locations in the PLC. Memory locations **m** and **m+1** reflect the state of the pushbuttons. If you have a ***Direct***LOGIC PLC (DL05, DL06, DL250, DL350 or DL450), the status of the individual bits of these two words is easily determined by using the bit-of-word instruction. The example shown below uses a base register address of V2000 to map the status of the pushbuttons. When Pushbutton 3 is pressed it affects bit 2 of V2000. Likewise, Pushbutton 4 affects bit 3. Pushbutton 23 affects bit 6 of V2001.

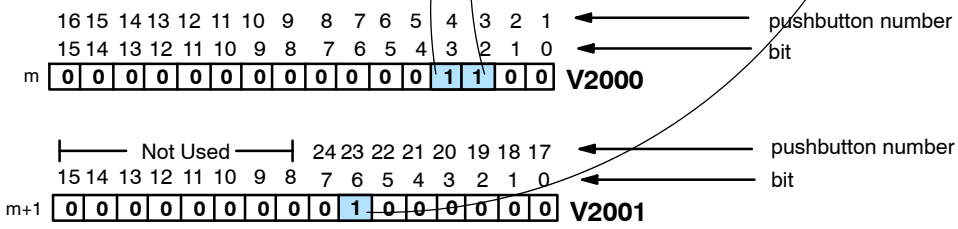
DL05/DL06/DL250/DL350/DL450

	Mapped Memory Location	Function
m	V2000	Pushbuttons 1-16 ON/OFF
m+1	V2001	Pushbuttons 17-24 ON/OFF
m+2	V2002	LEDs 1-16 flash
m+3	V2003	LEDs 17-24 flash
m+4	V2004	LEDs 1-16 ON/OFF
m+5	V2005	LEDs 17-24 ON/OFF
m+6	V2006	Force Function Data (1-16)
m+7	V2007	Force Function Mode/Data (17-24)



DL05/DL06/DL250/
DL350/DL450





NOTE: The DL105 does not support bit-of-word functions.

Controlling LEDs Separately with the *Direct*LOGIC PLCs

By default, the LED shows the state of the pushbutton–ON or OFF. If a pushbutton is configured for momentary operation, there are two options available for the LED. It can show the state of the pushbutton or it can be controlled independently by enabling the **LED Separation** feature. When the LED Separation feature is enabled, the ON/OFF state of the LED is controlled only by the status of the bits in **m+4** and **m+5**. These bits can be manipulated with ladder logic.

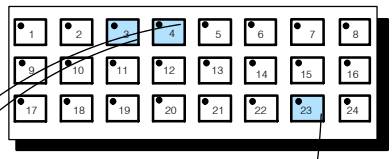
NOTE: Any pushbutton configured for maintained (alternate action) will ignore the bits in these two words.

In the example below, the bit-of-word instruction controls LEDs 3, 4 and 23 when V2000 has been designated as the base address during configuration with OP–WINEDIT. X12 turns ON LED3, X13 turns ON LED4, and X14 turns ON LED23.

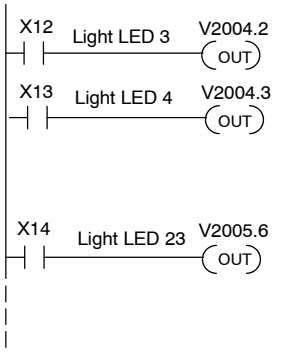
NOTE: Independent control of the LEDs can only be accomplished LED Separation has been enabled during initial configuration.

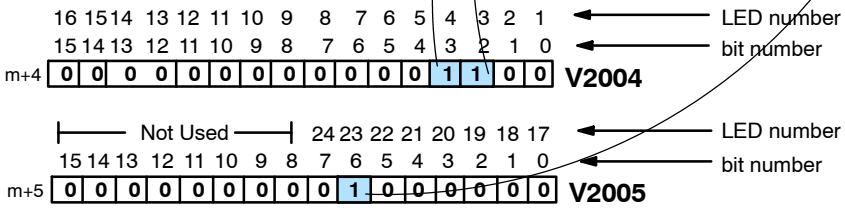
DL05/DL06/DL250/DL350/DL450

	Mapped Memory Location	Function
m	V2000	Pushbuttons 1-16 ON/OFF
m+1	V2001	Pushbuttons 17-24 ON/OFF
m+2	V2002	LEDs 1-16 flash
m+3	V2003	LEDs 17-24 flash
m+4	V2004	LEDs 1-16 ON/OFF
m+5	V2005	LEDs 17-24 ON/OFF
m+6	V2006	Force Function Data (1-16)
m+7	V2007	Force Function Mode/Data (17-24)



DL05/DL06/DL250/
DL350/DL450





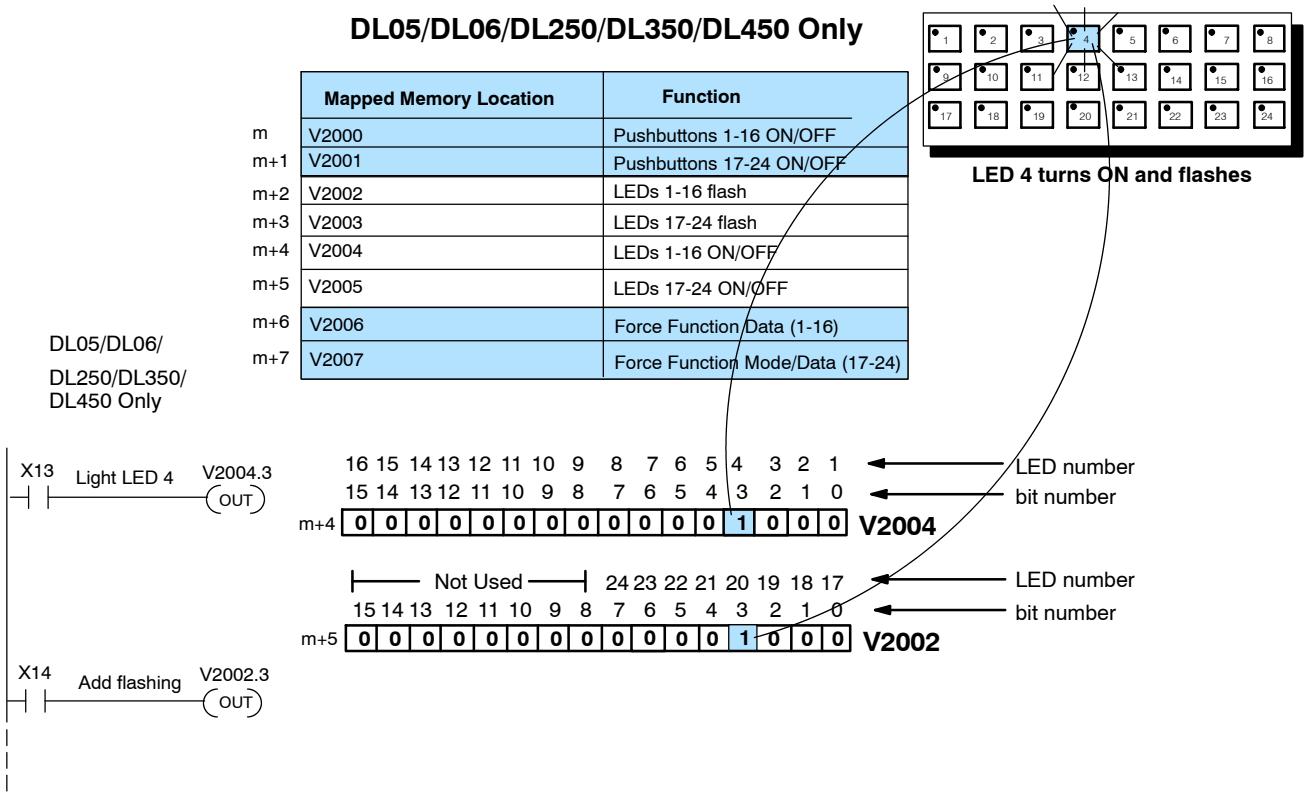
NOTE: The DL105 does not support bit–of–word functions.

Add Flashing with the DL05/DL06/ DL250/ DL350/DL450

If this feature is used with one or more pushbuttons, there are three things you must always remember during configuration:

1. Flashing is only available for those buttons that have been configured as **Momentary**.
2. **LED Separation** must be enabled.
3. The **Flash Option** must be enabled.

The flashing option is triggered through ladder logic. The previous page, showed how to turn ON an LED; this example shows how to add flashing to an LED that has been turned ON. The flashing feature is controlled by the status of the bits in **m+2** and **m+3** memory areas. The example below, mapping begins at V2000 during initial configuration. LED4 is turned ON and then made to flash. Bit 3 of V2004 turns the LED ON, and bit 3 or V2002 makes it flash.

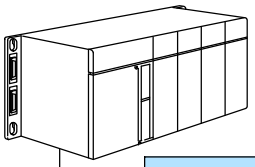


NOTE: The DL105 does not support bit-of-word functions.

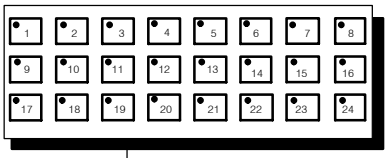
Force Function Registers

The OP-1224 has the ability to "force" a pushbutton ON or OFF with ladder logic. If this function is used, the force option must be enabled during configuration.

NOTE: The force function will only work for those pushbuttons that are configured as "maintained" (alternate action). It will not work for momentary pushbuttons.



Mapping Assignments



DirectLOGIC

Mapped Memory Location	Function
m (such as V2000)	Pushbuttons 1-16 ON/OFF
m+1 (such as V2001)	Pushbuttons 17-24 ON/OFF
m+2 (such as V2002)	LEDs 1-16 flash
m+3 (such as V2003)	LEDs 17-24 flash
m+4 (such as V2004)	LEDs 1-16 ON/OFF
m+5 (such as V2005)	LEDs 17-24 ON/OFF
m+6 (such as V2006)	Force Function Data (1-16)
m+7 (such as V2007)	Force Function Mode/Data (17-24)

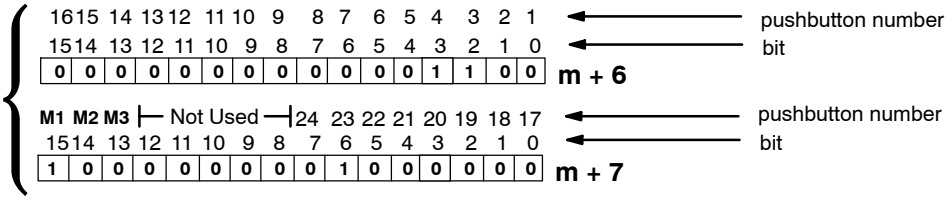
How the Memory is Used-Looking at the above memory map**, m+6** stores the forcing data for Pushbuttons 1-16 and **m+7** stores forcing data for Pushbuttons 17-24. There are three modes of the force function. These modes are controlled by the 3 most significant bits of m+7.

Mode 1 (M1)- This forces all of the Pushbuttons to reflect the status stored in m+6 and m+7. For example, the data shown below would force Pushbuttons 3, 4 and 23 to ON and all the others would be forced OFF. Notice that bit 15 of m +7 is set to 1 for this mode. M2 and M3 are set to 0's.

Mode 2 (M2)- This forces ON only those Pushbuttons matching the bits set in registers m+6 and m+7. The bits not set do not affect the status of the Pushbuttons. You would set M2 to 1 while M1 and M3 are set to 0.

Mode 3 (M3)- This forces OFF only those Pushbuttons matching the bits set in registers m+6 and m+7. The bits not set do not affect the status of the Pushbuttons. You would set M3 to 1, while M1 and M2 are set to 0.

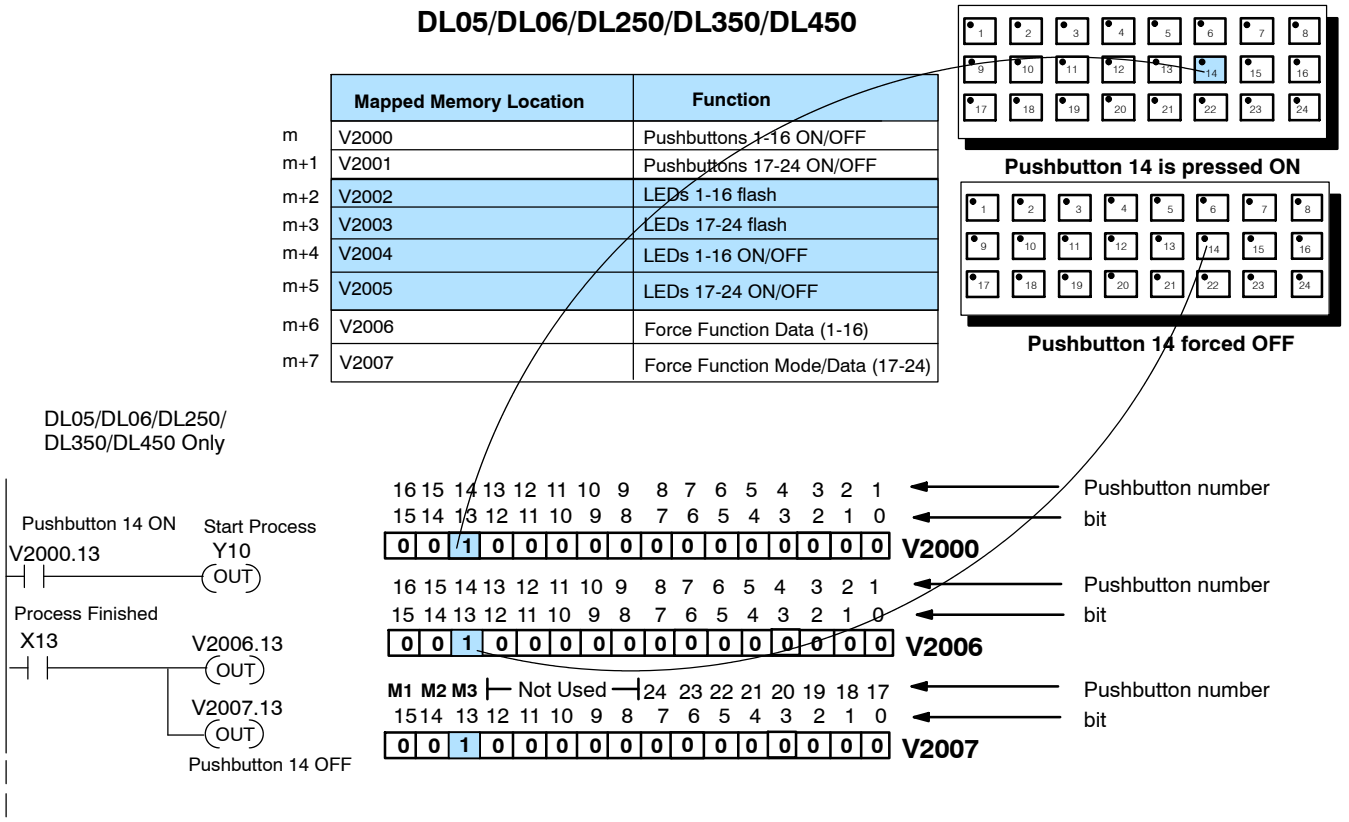
Force Function Registers



Think of forcing as a one-shot process. That is, once the mode has been set in m+7, the bit patterns in m and m+1 are changed (according to the mode selected), and then, all of the bits in m+6 and m+7 are set to zero. What this means is that all pushbuttons return to normal manual operation after the forcing is completed.

Forcing Pushbuttons ON/OFF with *Direct*LOGIC PLCs

Bit-of-word can also be used with the DL05/DL06/DL250/DL350/DL450 to force pushbuttons ON or OFF. In the following example, V2000 was chosen during configuration as the base address for the mapping in the PLC. In this example, Pushbutton 14 is used to start a process, then force the pushbutton OFF when the process is completed. Memory location **m** (V2000 in this case) holds the bit that reflects the status of Pushbutton 14. Memory locations **m+6** and **m+7** hold the data for the forcing. Here we have chosen to use Mode 3. With this mode, whichever bits are set to 1 in m+6 and m+7, the corresponding pushbuttons will be forced to OFF. In the following example, we only set bit 13 in m+6; so only Pushbutton 14 is turned OFF.

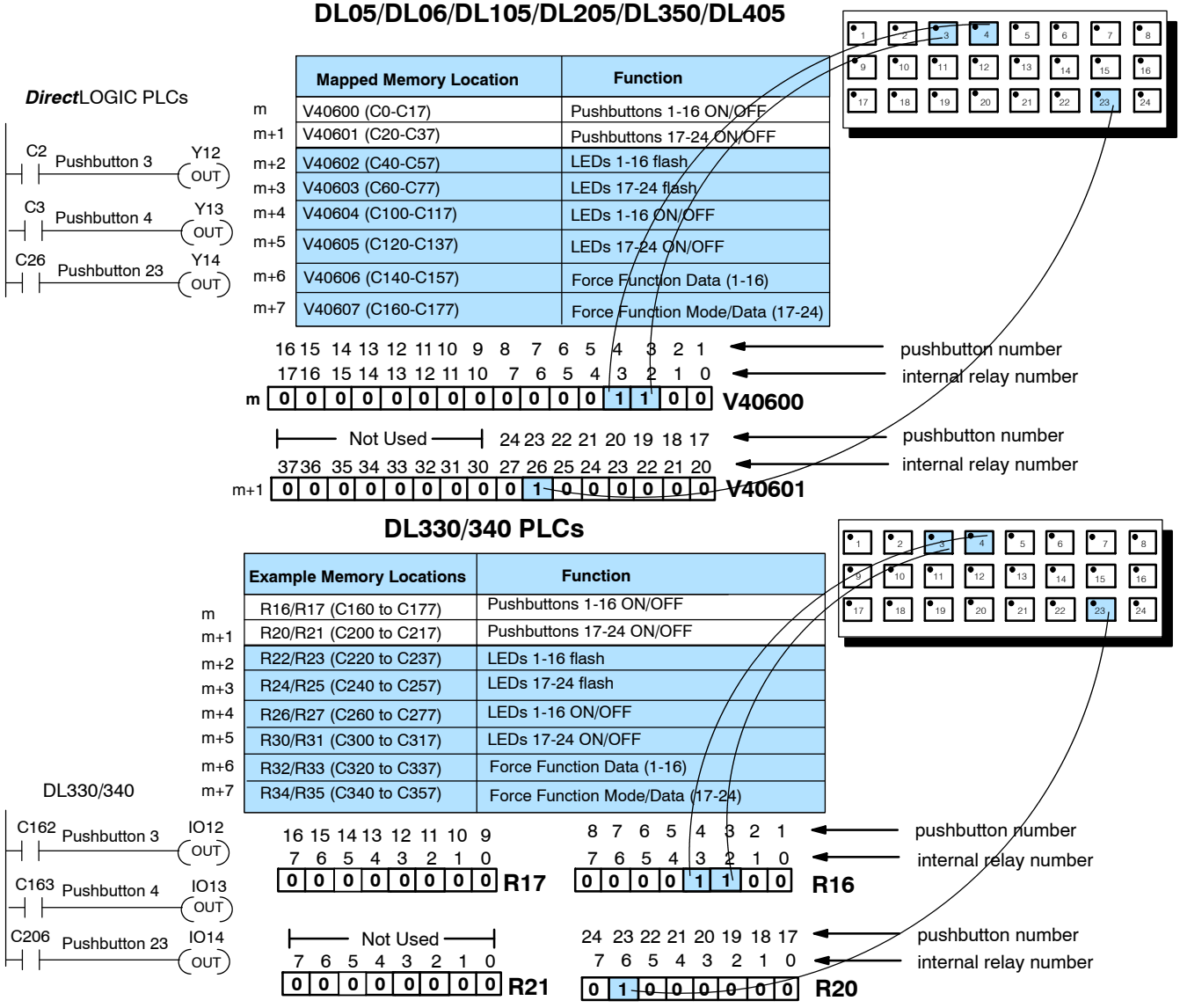


NOTE: The DL105 does not support bit-of-word functions.

*Direct*LOGIC PLCs (Using All Functions)

Using Pushbutton Status Via Ladder Logic

To configure the OP1224, a base address must be chosen in the CPU. This address can be a direct mapping to the reserved memory locations that are tied to internal relays. The internal relays of the DL05, DL06, DL105, DL205, DL350 and DL405 families start at V40600 and the internal relays of the DL305 family start at R16. Using this method, the total mapping consumes 128 internal relays. This method should only be used when using all of the OP-1224 functions. In the examples below, V40600 is selected as the starting address for either a DL05, DL06, DL105, DL205, DL350 or DL405. R16 has been selected as the starting address for the DL305. *Notice that the internal control relays are numbered in octal and not decimal.* In the examples below, the ladder logic is interacting with Pushbuttons 3, 4 and 23.



Note: To determine the control relay number, use the register number as the first two digits and the bit number as the last digit. For example, Bit 3 of R16 is referenced as C163.

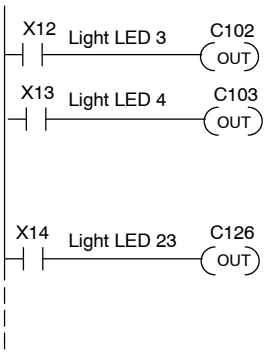
Controlling LEDs Separately

By default, the LED shows the state of the pushbutton–ON or OFF. If a pushbutton is configured for momentary operation, there are two options available for the LED. It can show the state of the pushbutton or it can be controlled independently by enabling the **LED Separation** feature. When the LED Separation feature has been enabled, the ON/OFF state of the LED is controlled only by the status of the bits in **m+4** and **m+5**. These bits can be manipulated via the ladder logic. In the examples below, the ladder logic is controlling LEDs 3, 4 and 23.

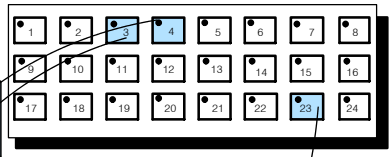
NOTE: Any pushbutton configured for maintained (alternate action) will ignore the bits in these two words. Independent control of the LEDs can only be accomplished if LED Separation has been enabled during the initial configuration.

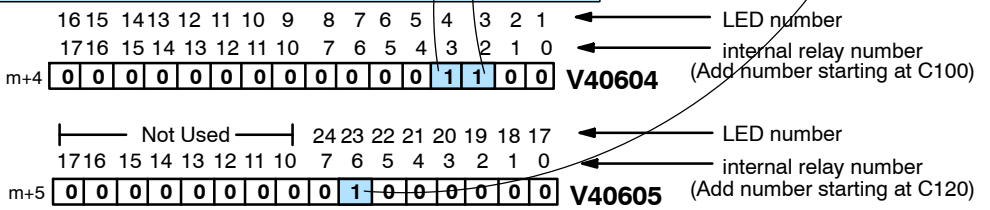
DL05/DL06/DL105/DL205/DL350/DL405

DirectLOGIC PLCs



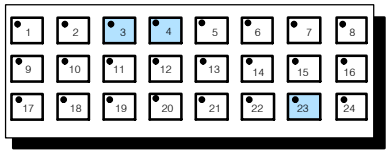
	Mapped Memory Location	Function
m	V40600 (C0-C17)	Pushbuttons 1-16 ON/OFF
m+1	V40601 (C20-C37)	Pushbuttons 17-24 ON/OFF
m+2	V40602 (C40-C57)	LEDs 1-16 flash
m+3	V40603 (C60-C77)	LEDs 17-24 flash
m+4	V40604 (C100-C117)	LEDs 1-16 ON/OFF
m+5	V40605 (C120-C137)	LEDs 17-24 ON/OFF
m+6	V40606 (C140-C157)	Force Function Data (1-16)
m+7	V40607 (C160-C177)	Force Function Mode/Data (17-24)



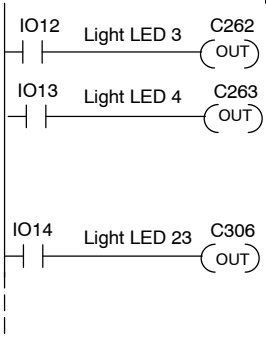


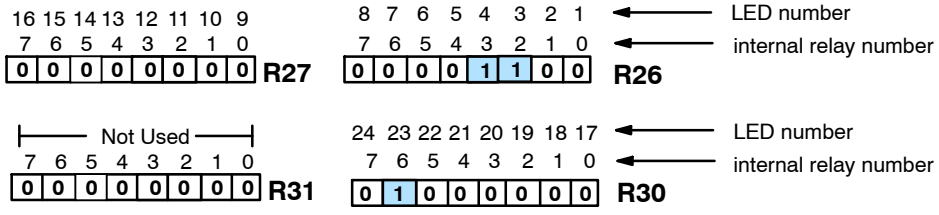
DL330/340 PLCs

	Example Memory Locations	Function
m	R16/R17 (C160 to C177)	Pushbuttons 1-16 ON/OFF
m+1	R20/R21 (C200 to C217)	Pushbuttons 17-24 ON/OFF
m+2	R22/R23 (C220 to C237)	LEDs 1-16 flash
m+3	R24/R25 (C240 to C257)	LEDs 17-24 flash
m+4	R26/R27 (C260 to C277)	LEDs 1-16 ON/OFF
m+5	R30/R31 (C300 to C317)	LEDs 17-24 ON/OFF
m+6	R32/R33 (C320 to C337)	Force Function Data (1-16)
m+7	R34/R35 (C340 to C357)	Force Function Mode/Data (17-24)



DL330/340





Note: To determine the control relay number, use the register number as the first two digits and the bit number as the last digit. For example, Bit 3 of R26 is referenced as C263.

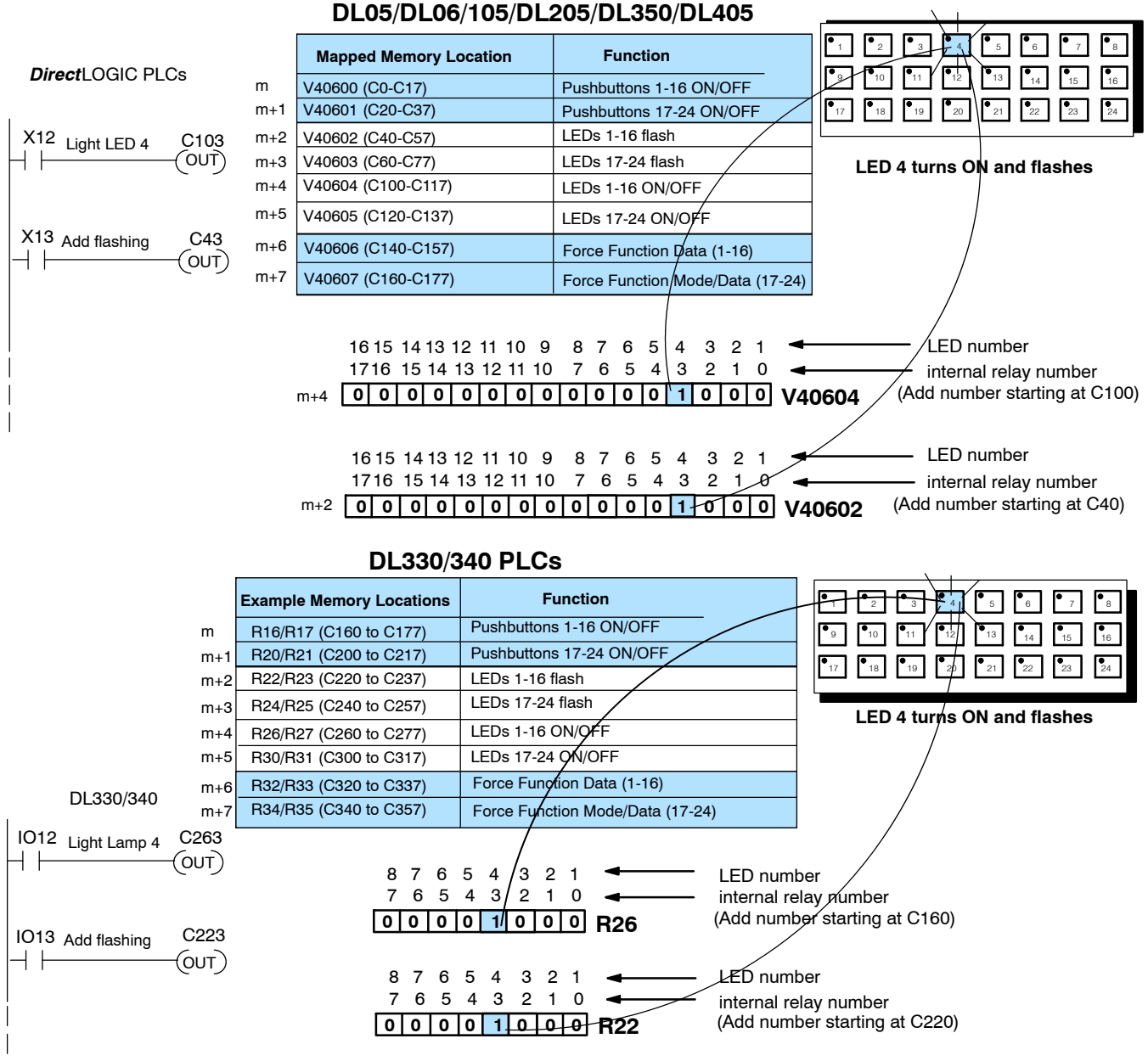
Adding Flashing

If using this feature with one or more pushbuttons, there are three things to remember during configuration:

1. Flashing is only available for those buttons that have been configured as **Momentary**.
2. **LED Separation** must be enabled.
3. The **Flash Option** must be enabled.

The flashing option is triggered through the ladder logic. On the previous page, the example illustrated how to turn ON an LED, this example illustrates how to add flashing to an LED that has been turned ON. The flashing feature is controlled by the status of the bits in **m+2** and **m+3** memory areas. The example below begins mapping at V40600 with the initial configuration. LED4 is turned ON and then made to flash. Bit 3 of **m+4** turns the LED ON, and bit 3 of **m+2** causes it to flash.

DL05/DL06/105/DL205/DL350/DL405

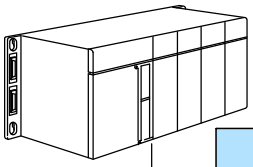


DL330/340 PLCs

Force Function Registers

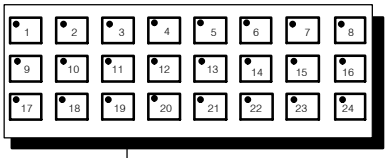
The OP-1224 has the ability to "force" a pushbutton ON or OFF with ladder logic. If this function is used, the force option must be enabled during configuration.

NOTE: The force function will only work for those pushbuttons that are configured as "maintained" (alternate action). It will not work for momentary pushbuttons.



*Direct*LOGIC

Mapping Assignments



Mapped Memory Location	Function
m (such as V40600, C0-C17)	Pushbuttons 1-16 ON/OFF
m+1 (such as V40601, C20-C37)	Pushbuttons 17-24 ON/OFF
m+2 (such as V40602, C40-C57)	LEDs 1-16 flash
m+3 (such as V40600, C60-C77)	LEDs 17-24 flash
m+4 (such as V40604, C100-C117)	LEDs 1-16 ON/OFF
m+5 (such as V40605, C120-C137)	LEDs 17-24 ON/OFF
m+6 (such as V40606, C140-C157)	Force Function Data (1-16)
m+7 (such as V40607, C160-C177)	Force Function Mode/Data (17-24)

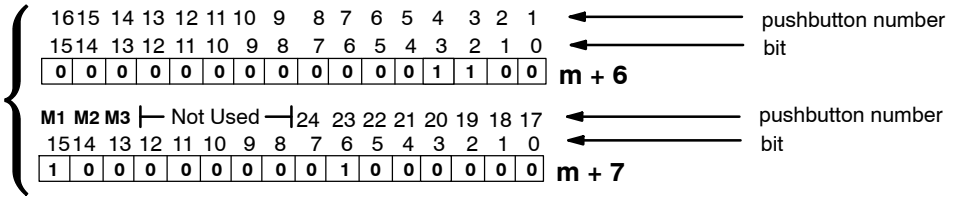
How the Memory is Used-Looking at the above memory map**, m+6** stores the forcing data for pushbuttons 1-16 and **m+7** stores forcing data for pushbuttons 17-24. There are three modes of the force function. These modes are controlled by the 3 most significant bits of m+7.

Mode 1 (M1)- This forces all of the pushbuttons to reflect the status stored in m+6 and m+7. For example, the data shown below would force pushbuttons 3, 4 and 23 to ON and all the others would be forced OFF. Notice that bit 15 of m +7 is set to 1 for this mode. M2 and M3 are set to 0's.

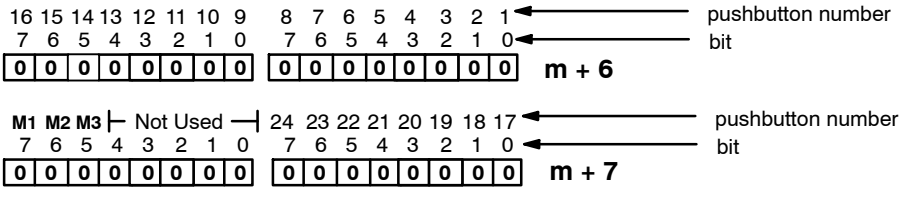
Mode 2 (M2)- This forces ON only those pushbuttons matching the bits set in registers m+6 and m+7. The bits not set do not affect the status of the pushbuttons. You would set M2 to 1 while M1 and M3 are set to 0.

Mode 3 (M3)- This forces OFF only those pushbuttons matching the bits set in registers m+6 and m+7. The bits not set do not affect the status of the pushbuttons. You would set M3 to 1 while M1 and M2 are set 0.

Force Function Registers for *Direct*LOGIC PLCs



Force Function Registers for DL330/340



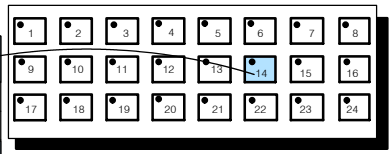
Think of forcing as a one-shot process. That is, once the mode has been set in m+7, the bit patterns in m and m+1 are changed (according to the mode selected), then, all of the bits in m+6 and m+7 are set to zero. What this means is that all pushbuttons return to normal manual operation after the forcing is completed.

Forcing Pushbuttons ON or OFF

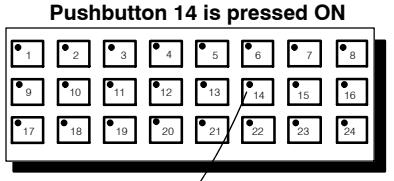
In this example, Mode 3 of the force function is used to force Pushbutton 14 OFF when a process has been completed. Be sure to read Page 28 to learn the function of all three modes. For the ***Direct***LOGIC PLC example, a base address of V40600 is used. R16 is used for the DL305 PLCs.

DL05/DL06/DL105/DL205/DL350/DL405

	Mapped Memory Location	Function
m	V40600 (C0-C17)	Pushbuttons 1-16 ON/OFF
m+1	V40601 (C20-C37)	Pushbuttons 17-24 ON/OFF
m+2	V40602 (C40-C57)	LEDs 1-16 flash
m+3	V40603 (C60-C77)	LEDs 17-24 flash
m+4	V40604 (C100-C117)	LEDs 1-16 ON/OFF
m+5	V40605 (C120-C137)	LEDs 17-24 ON/OFF
m+6	V40606 (C140-C157)	Force Function Data (1-16)
m+7	V40607 (C160-C177)	Force Function Mode/Data (17-24)

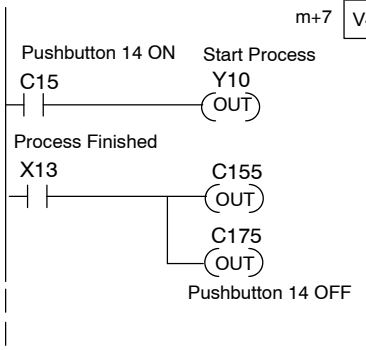


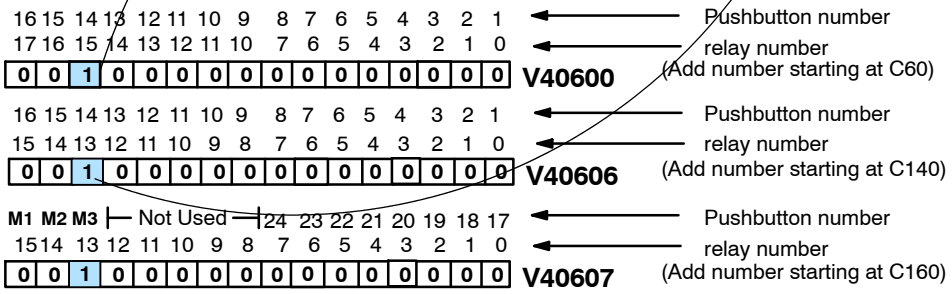
Pushbutton 14 is pressed ON



Pushbutton 14 forced OFF

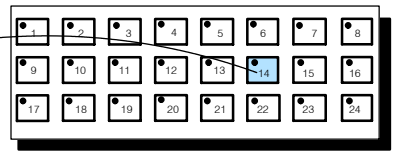
DirectLOGIC PLCs



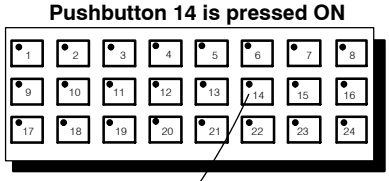


DL330/340 PLCs

	Example Memory Locations	Function
m	R16/R17 (C160 to C177)	Pushbuttons 1-16 ON/OFF
m+1	R20/R21 (C200 to C217)	Pushbuttons 17-24 ON/OFF
m+2	R22/R23 (C220 to C237)	LEDs 1-16 flash
m+3	R24/R25 (C240 to C257)	LEDs 17-24 flash
m+4	R26/R27 (C260 to C277)	LEDs 1-16 ON/OFF
m+5	R30/R31 (C300 to C317)	LEDs 17-24 ON/OFF
m+6	R32/R33 (C320 to C337)	Force Function Data (1-16)
m+7	R34/R35 (C340 to C357)	Force Function Mode/Data (17-24)

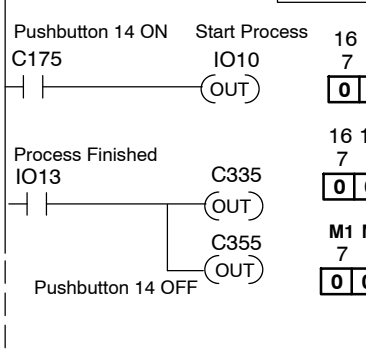


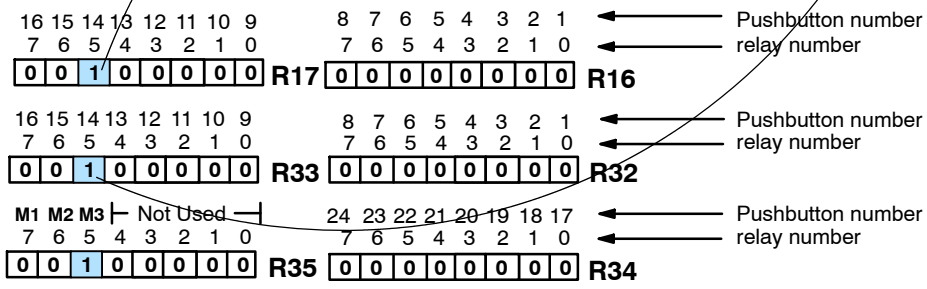
Pushbutton 14 is pressed ON



Pushbutton 14 forced OFF

DL330/340



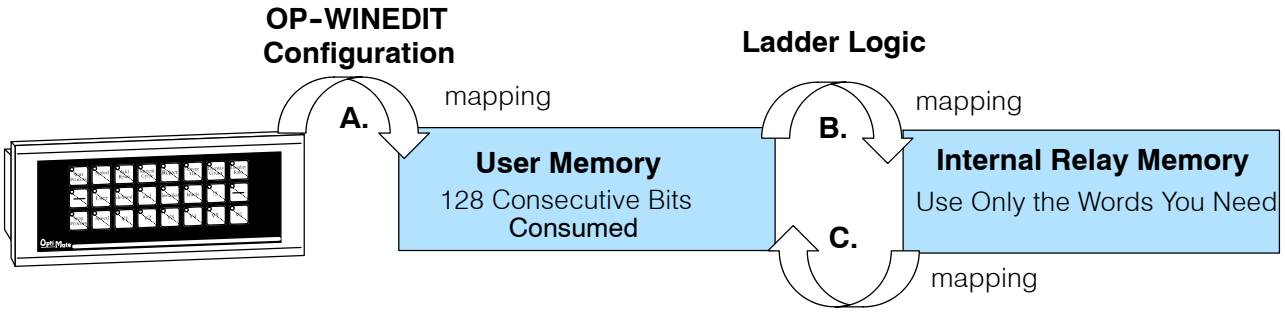


Note: To determine the control relay number, use the register number as the first two digits and the bit number as the last digit. For example, Bit 5 of R33 is referenced as C335.

Using Selected Functions with *Direct*LOGIC PLCs

Using the Remapping Process

The "remapping" process was briefly discussed as a method that allows you to easily manipulate individual bits to take advantage of the panels many functions. All the functions are bit-controlled. By using this method, the number of relays actually needed for the functions selected are consumed.

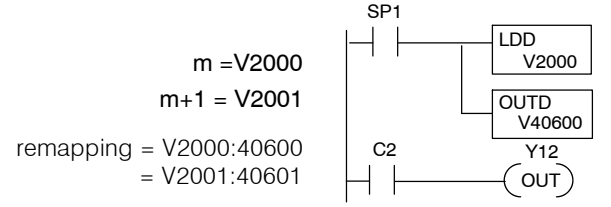


Using the remapping method, first indicate a base register address with the OP-WINEDIT software and download it to the panel. The panel configuration will automatically consume 128 consecutive memory bits in the PLC User Memory. This is indicated by the arrow A. But since User Memory doesn't provide bit control, the User Memory needs to be remapped with Internal Relay Memory. By remapping between User Memory and Internal Relay Memory, only the Relay Memory you need is consumed. There are two directions in which the ladder logic can do the remapping between User Memory and Internal Relay Memory:

1. For using the Pushbutton Status to control outputs, ladder logic needs to be writen to map User Memory to Internal Relay Memory (arrow B). This affects the User Memory in the **m** and **m+1** locations.
2. For controlling all other functions of the panel, ladder logic needs to be written to map Internal Relay Memory to User Memory (arrow C). This affects the User Memory in locations **m+2** through **m+7**.

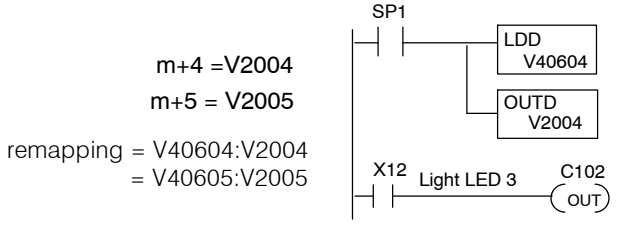
Below are two examples of remapping accomplished with ladder logic that demonstrate the two types of remapping that can be used with this technique. Assume that V2000 was used as the base register address:

Example of User Memory being mapped to Internal Relay Memory



Here, SP1 is used to map V2000/V2001 to V40600/V40601. This consumes 32 relay bits, 24 of which are tied to the 24 pushbuttons of the panel. By pressing Pushbutton 3, affects the status of the third relay in V40600 which is C2. In turn, C2 will control output Y12.

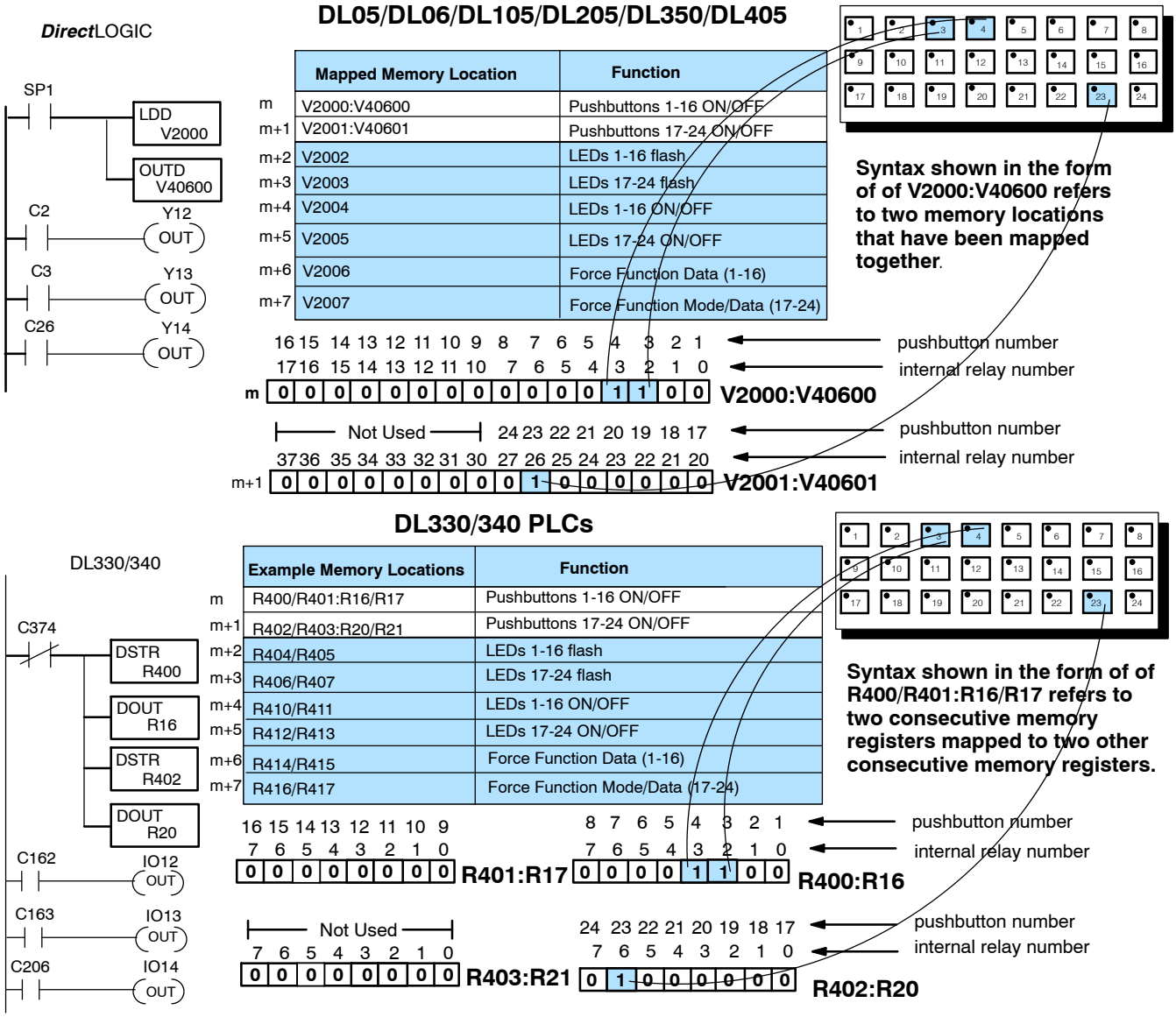
Example of Internal Relay Memory being mapped to User Memory



Here, SP1 is used to map V40604/V40605 to V2004/V2005. This consumes 32 relay bits, 24 of which are tied to the 24 LEDs of the panel. When a relay is ON, its corresponding LED is ON. By turning ON X12 with the ladder logic, the LED corresponding to C102 will also turn ON. C102 is bit 2 of the V40604 word and is tied to LED3 through the mapping process. See your PLC User Manual for relay number assignments

Using Pushbutton Status via Ladder Logic

In this example, user memory will be remapped to internal relay memory in order to use the the pushbutton status to control outputs. The internal relays of ***Direct***LOGIC PLCs start at V40600 and the internal relays of the DL305 family start at R16. In the examples below, V2000 is selected as the base address for either a ***Direct***LOGIC and SP1 (always ON relay) is used in the ladder logic to map it to V40600. R400 is the base address selected for the DL305 and used normally closed C374 in the ladder logic to map it to R16. Using SP1 and normally closed C374, the remapping is done every scan, otherwise m and m+1 would not be updated. In the examples below, the ladder logic is interacting with Pushbuttons 3, 4 and 23.



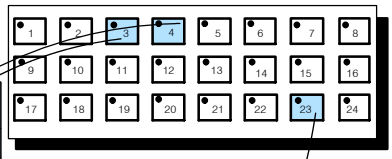
Note: To determine the control relay number, use the register number as the first two digits and the bit number as the last digit. For example, Bit 3 of R16 is referenced as C163.

Controlling LEDs Separately

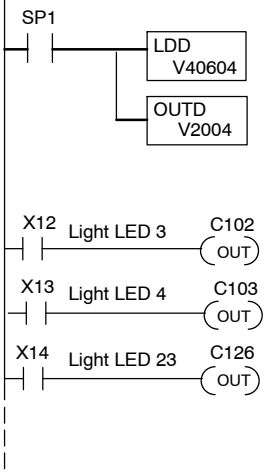
By default, the LED will show the state of the pushbutton–ON or OFF. If a pushbutton is configured for momentary operation, there are two options available for the LED. It can show the state of the pushbutton or it can be controlled independently by enabling the **LED Separation** feature. When the LED Separation feature is enabled, the ON/OFF state of the LED is controlled only by the status of the bits in **m+4** and **m+5**. These bits can be manipulated via your ladder logic. In the examples below, the user memory has been remapped to control relay memory to control LEDs 3, 4 and 23.

NOTE: Any pushbutton configured for maintained (alternate action) will ignore the bits in these two words. Independent control of the LEDs can only be accomplished if LED Separation has been enabled during the initial configuration.

DL05/DL06/DL105/DL205/DL350/DL405

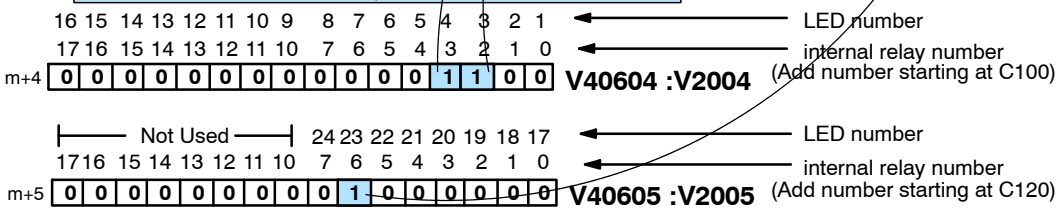


DirectLOGIC PLCs

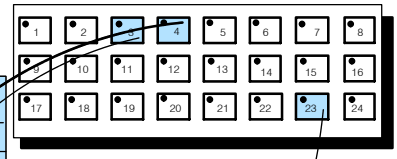


	Mapped Memory Location	Function
m	V2000	Pushbuttons 1-16 ON/OFF
m+1	V2001	Pushbuttons 17-24 ON/OFF
m+2	V2002	LEDs 1-16 flash
m+3	V2003	LEDs 17-24 flash
m+4	V40604:V2004	LEDs 1-16 ON/OFF
m+5	V40605:V2005	LEDs 17-24 ON/OFF
m+6	V2006	Force Function Data (1-16)
m+7	V2007	Force Function Mode/Data (17-24)

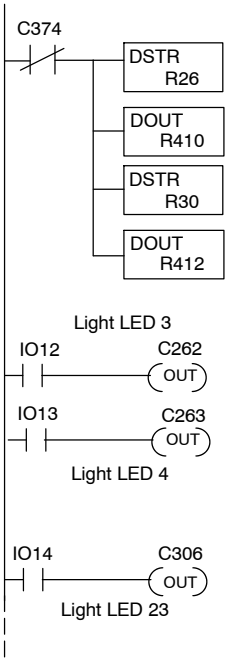
Syntax shown in the form of of V2000:V40600 refers to two memory locations that have been mapped together.



DL330/340 PLCs

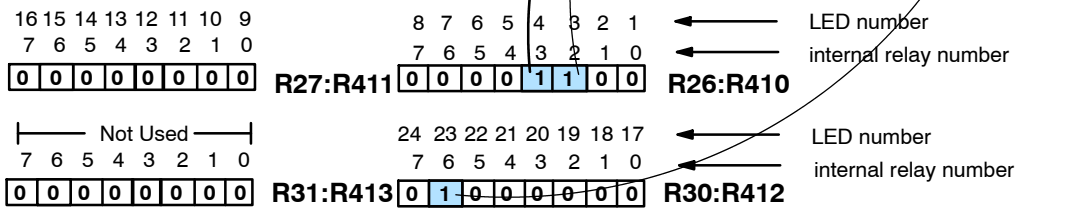


DL330/340



	Example Memory Locations	Function
m	R400/R401	Pushbuttons 1-16 ON/OFF
m+1	R402/R403	Pushbuttons 17-24 ON/OFF
m+2	R404/R405	LEDs 1-16 flash
m+3	R406/R407	LEDs 17-24 flash
m+4	R26/R27:R410/R411	LEDs 1-16 ON/OFF
m+5	R30/R31:R412/R413	LEDs 17-24 ON/OFF
m+6	R414/R415	Force Function Data (1-16)
m+7	R416/R417	Force Function Mode/Data (17-24)

Syntax shown in the form of of R400/R401:R16/R17 refers to two consecutive memory registers mapped to two other consecutive memory registers.



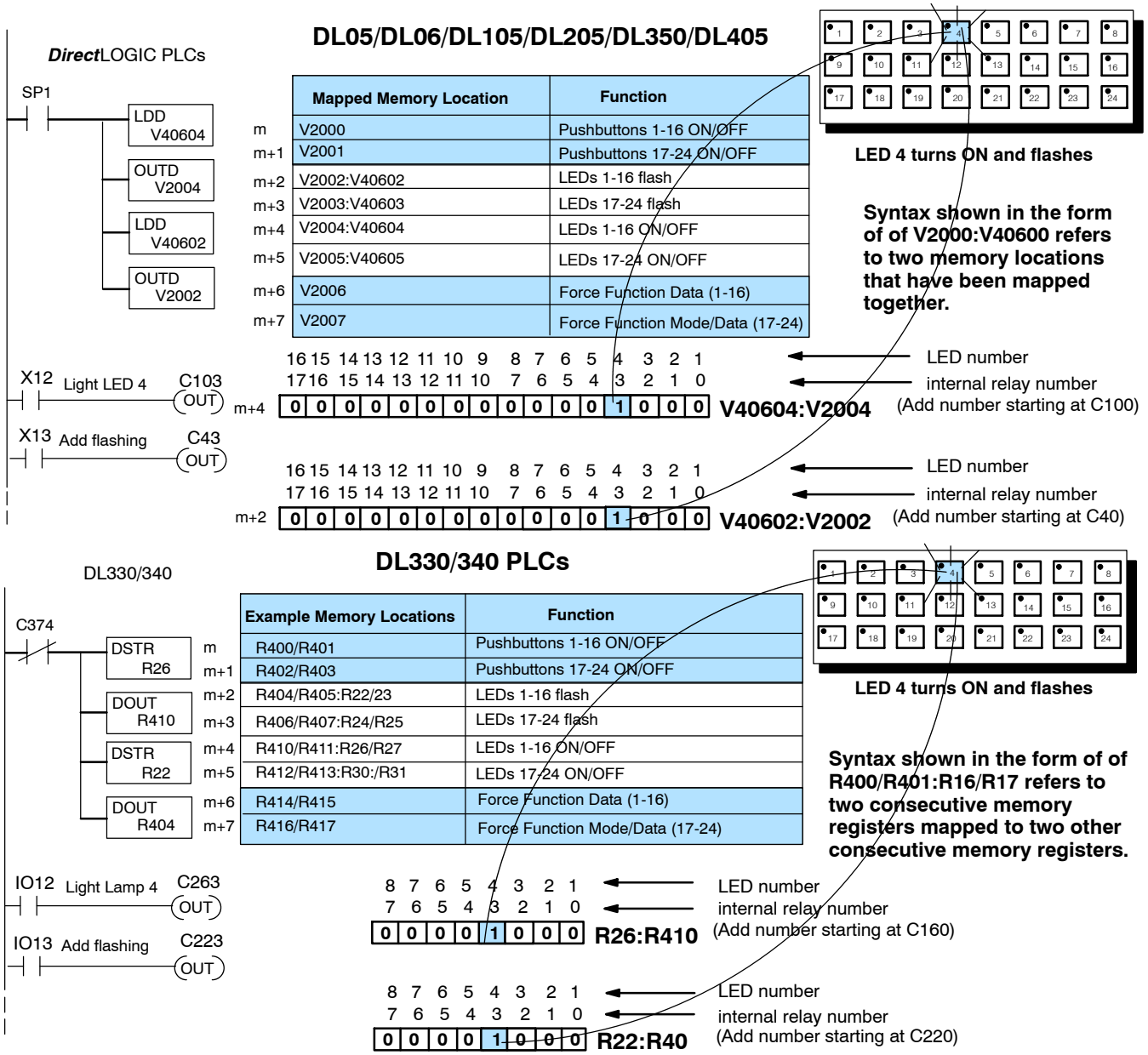
Note: To determine the control relay number, use the register number as the first two digits and the bit number as the last digit. For example, Bit 3 of R26 is referenced as C263.

Adding Flashing

There are three things that must always be remembered when configuring the panel if the flashing feature is used with one or more pushbuttons:

1. Flashing is only available for those buttons that have been configured as **Momentary**.
2. **LED Separation** must be enabled.
3. The **Flash Option** must be enabled.

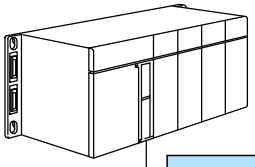
The flashing option is triggered through ladder logic. The example on the previous page, turned ON an LED. The following example will add flashing to an LED that has been turned ON. The flashing feature is controlled by the status of the bits in the **m+2** and **m+3** memory areas. The user memory has been mapped in these locations to internal relay memory. In the example below, mapping begins at V2000 during the initial configuration. LED4 is turned ON and then made to flash. Bit 3 of **m+4** turns the LED ON, and bit 3 of **m+2** makes it flash.



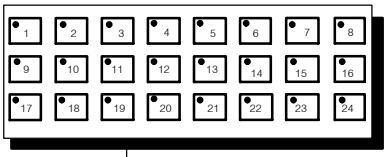
Force Function Registers

The OP-1224 has the ability to "force" a pushbutton ON or OFF with ladder logic. If this function is used, the force option must be enabled during configuration.

NOTE: The force function will only work for those pushbuttons that have been configured for "maintained" (alternate action). It will not work for momentary pushbuttons.



***Direct*LOGIC**



Mapping Assignments

Mapped Memory Location	Function
m (such as V40600:V2000)	Pushbuttons 1-16 ON/OFF
m+1 (such as V40601:V2001)	Pushbuttons 17-24 ON/OFF
m+2 (such as V40602:V2002)	LEDs 1-16 flash
m+3 (such as V40603:V2003)	LEDs 17-24 flash
m+4 (such as V40604:V2004)	LEDs 1-16 ON/OFF
m+5 (such as V40605:V2005)	LEDs 17-24 ON/OFF
m+6 (such as V40606:V2006)	Force Function Data (1-16)
m+7 (such as V40607:V2007)	Force Function Mode/Data (17-24)

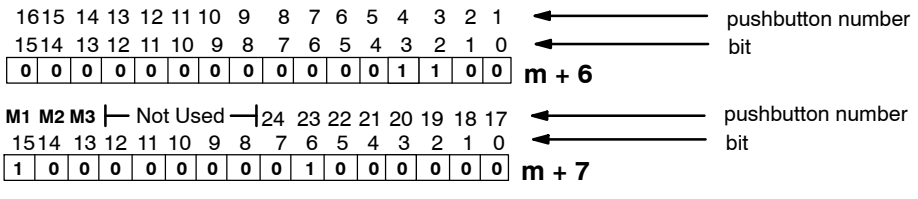
How the Memory is Used-Looking at the above memory map**, m+6** stores the forcing data for Pushbuttons 1-16 and **m+7** stores forcing data for Pushbuttons 17-24. There are three modes of the force function. These modes are controlled by the most significant bits of m+7.

Mode 1 (M1)- This forces all of the Pushbuttons to reflect the status stored in m+6 and m+7. For example, the data shown below would force Pushbuttons 3, 4 and 23 to ON and all the others would be forced OFF. Notice that bit 15 of m +7 is set to 1 for this mode. M2 and M3 are set to 0's.

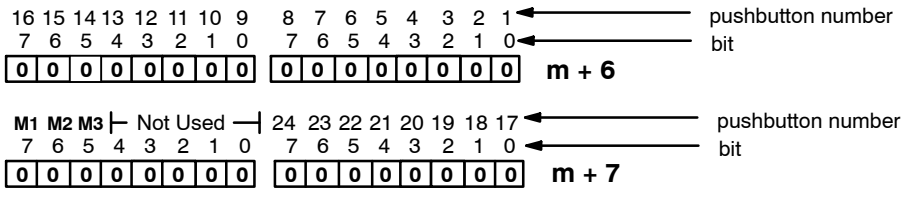
Mode 2 (M2)- This forces ON only those Pushbuttons matching the bits set in registers m+6 and m+7. The bits not set do not affect the status of the Pushbuttons. You would set M2to 1 while M1 and M3 are set to 0.

Mode 3 (M3)- This forces OFF only those Pushbuttons matching the bits set in registers m+6 and m+7. The bits not set do not affect the status of the Pushbuttons. You would set M3 to 1 while M1 amd M2 are set to 0.

Force Function Registers for *Direct*LOGIC PLCs



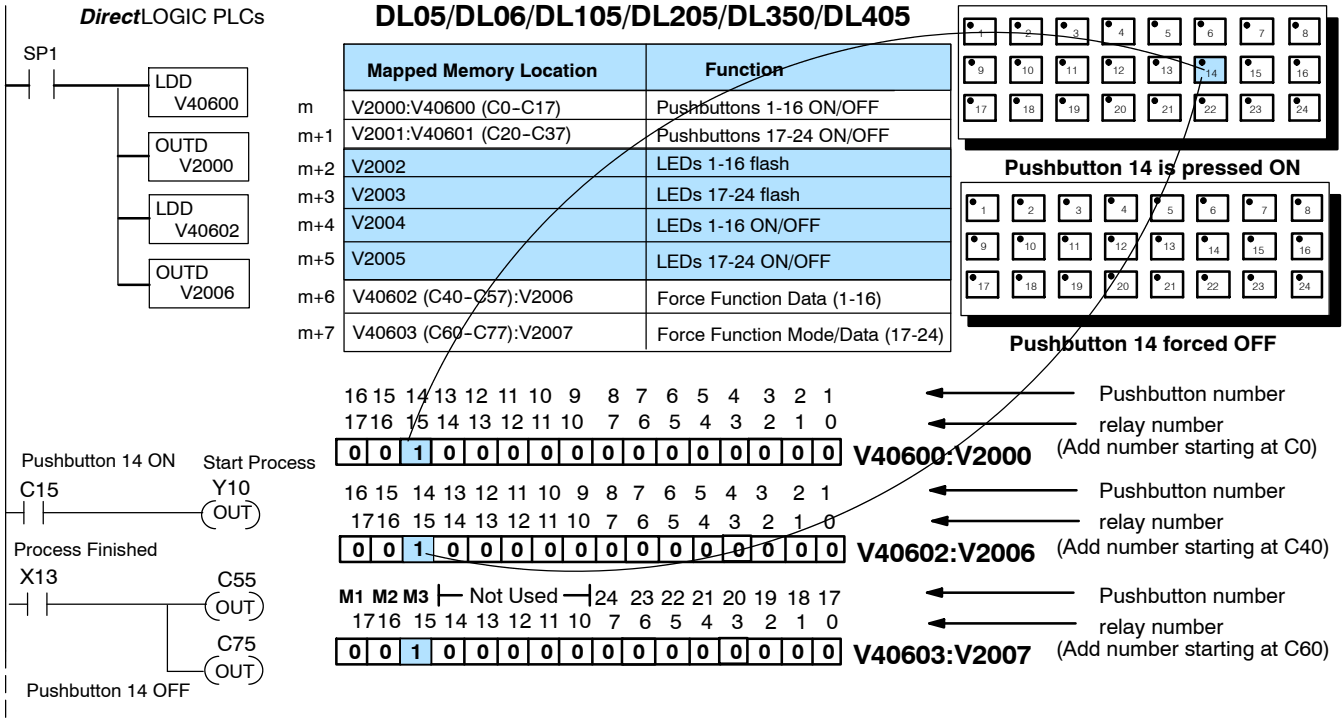
Force Function Registers for DL330/340 PLCs

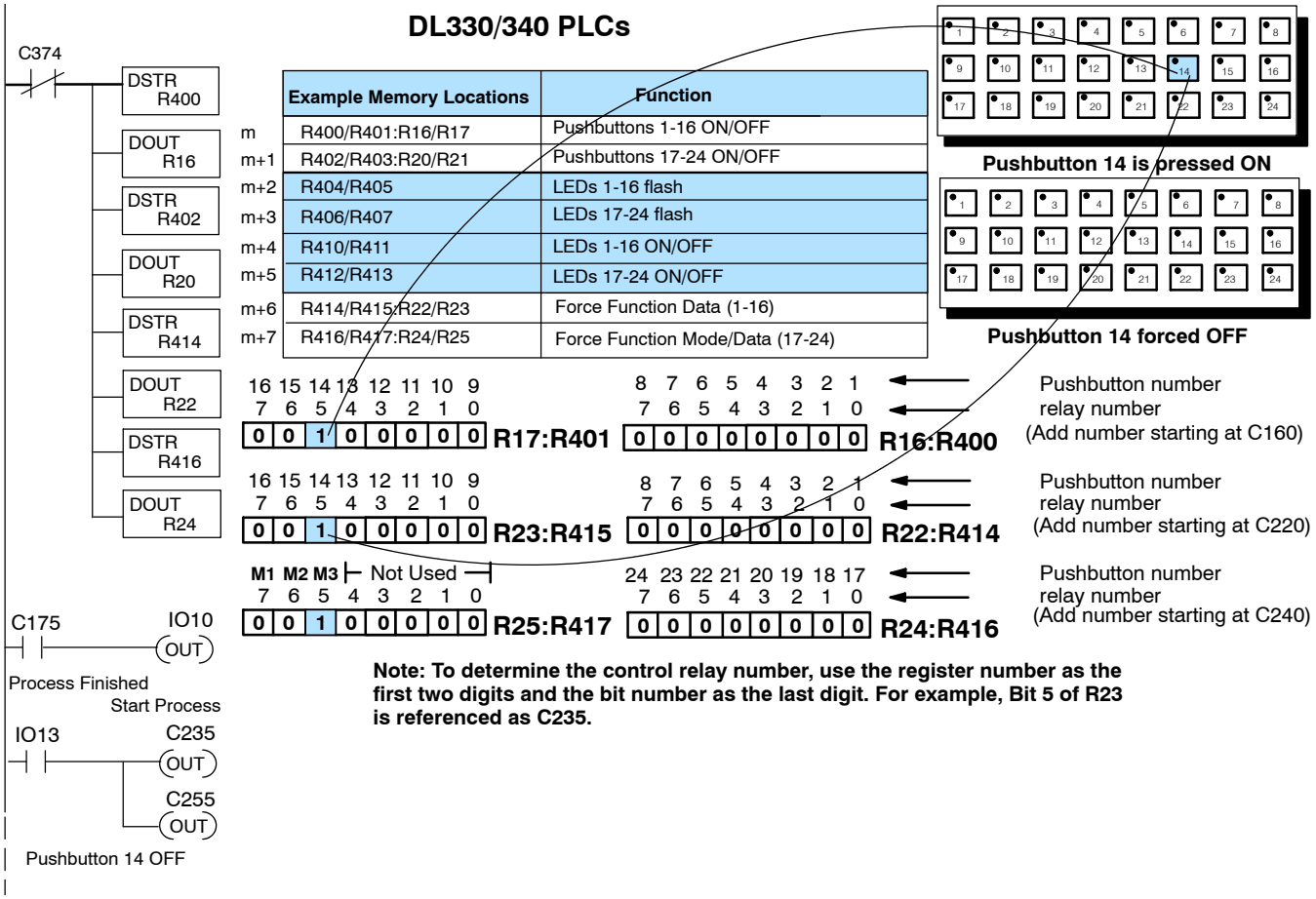


Think of forcing as a one-shot process. That is, once the mode has been set in m+7, the bit patterns in m and m+1 are changed (according to the mode selected), then, all of the bits in m+6 and m+7 are set to zero. What this means is that all pushbuttons return to normal manual operation after the forcing is completed.

Forcing Pushbuttons ON or OFF

In this example, Mode 3 of the force function is used to force Pushbutton 14 OFF when a process has been completed. Be sure to read Page 33 (if you haven't already done so) to learn the function of all three modes. For the ***Direct***LOGIC PLC example, a base address of V40600 is used. And for the DL305, R16 is used in the example on the next page.



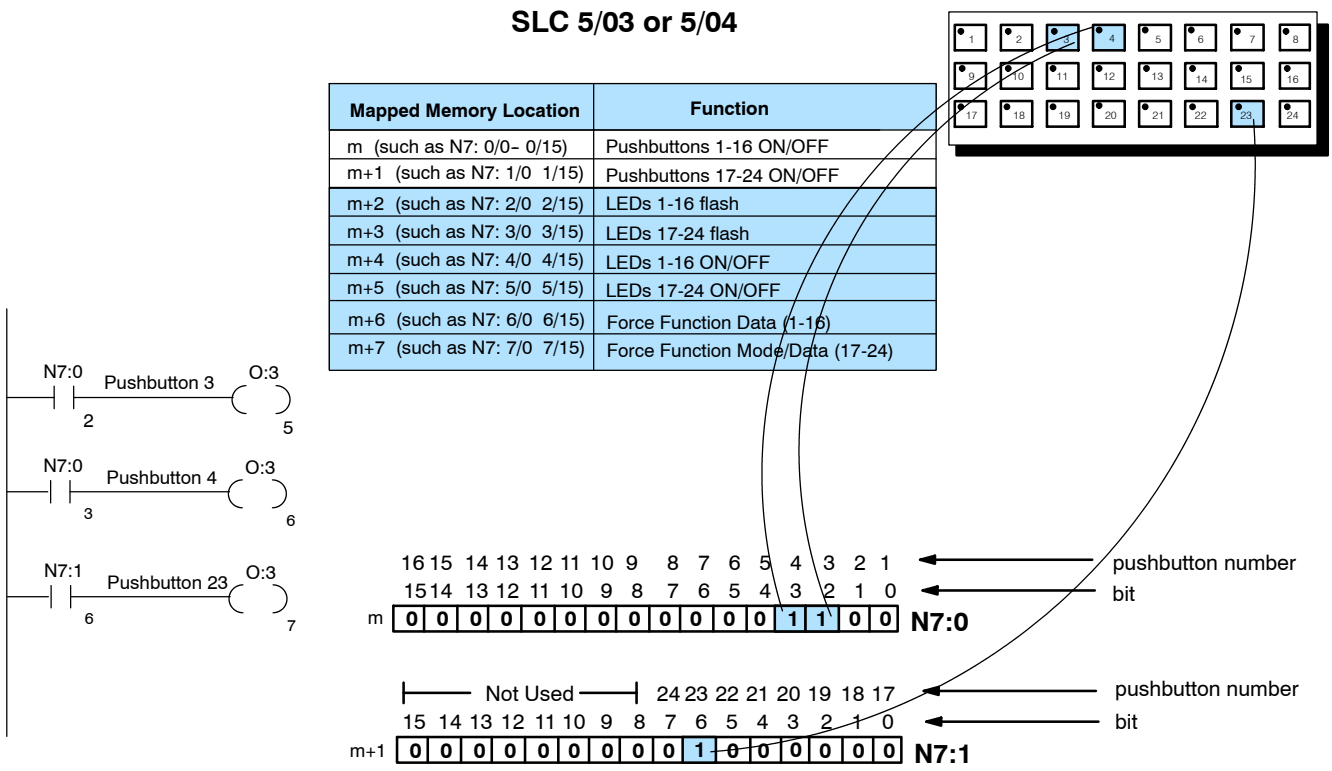


Note: To determine the control relay number, use the register number as the first two digits and the bit number as the last digit. For example, Bit 5 of R23 is referenced as C235.

Using the OP-1224 with an Allen-Bradley PLC

Using the Pushbutton Status

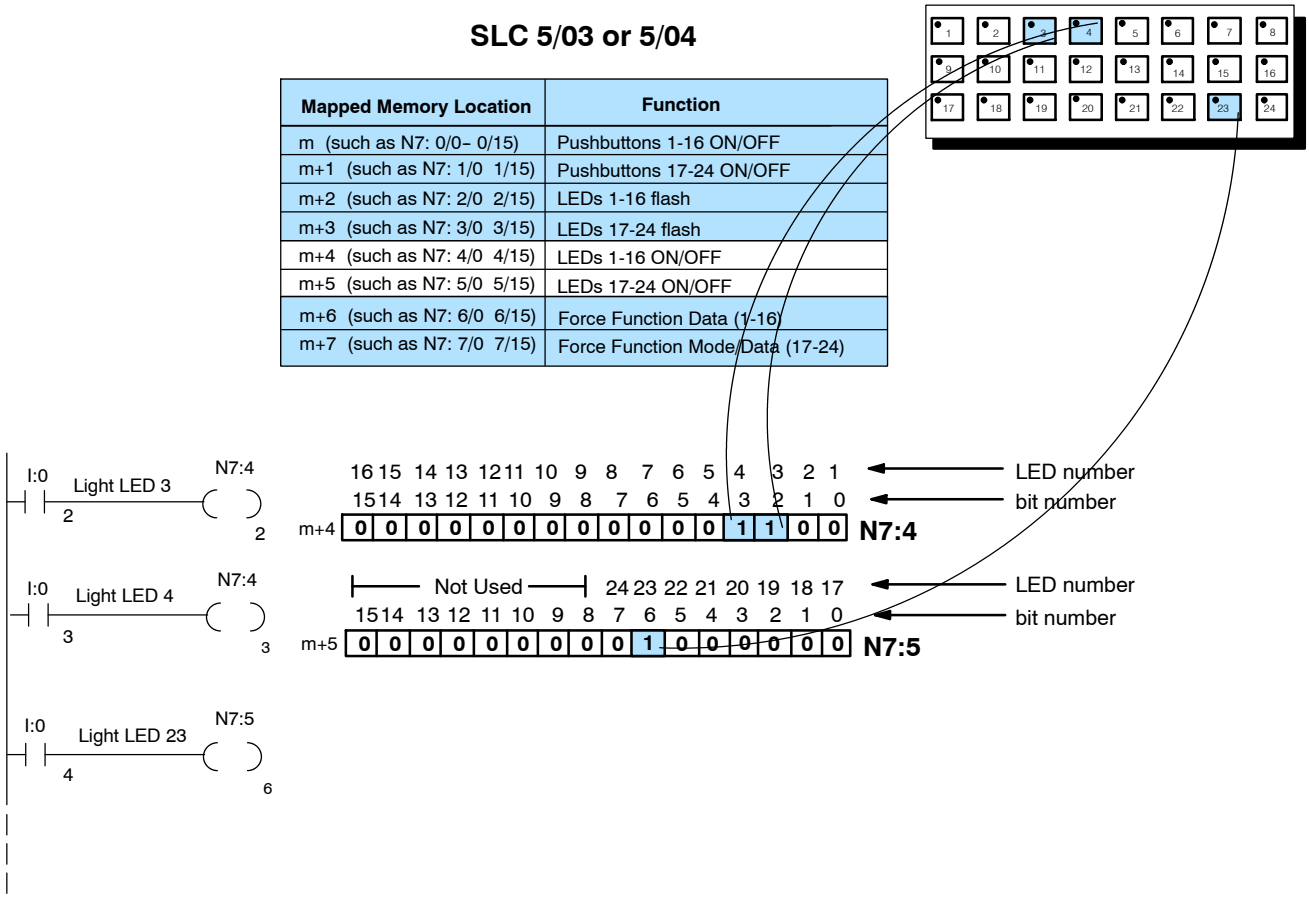
As mentioned previously, integer type files can be mapped for the Allen-Bradley PLC when using it with the OP1224. In the example below, integer file registers have been mapped starting at base address N7:0. Pushbutton 3 is used to control Output 5 (O:3/5), and Pushbutton 4 is used to control Output 6 (O:3/6) and Pushbutton 23 is used to control Output 7 (O:3/7).



Controlling LEDs Separately

The LEDs can be controlled separately from the status of the pushbuttons. In the example below, Allen-Bradley input type files (I:0/2, I:0/3 and I:0/4) are being used to trigger the ON/OFF of LED3, LED4 and LED5.

Remember: Any pushbutton configured for maintained (alternate action) will ignore the bits in these two words. Independent control of the LEDs can only be accomplished if LED Separation has been enabled during the initial configuration.

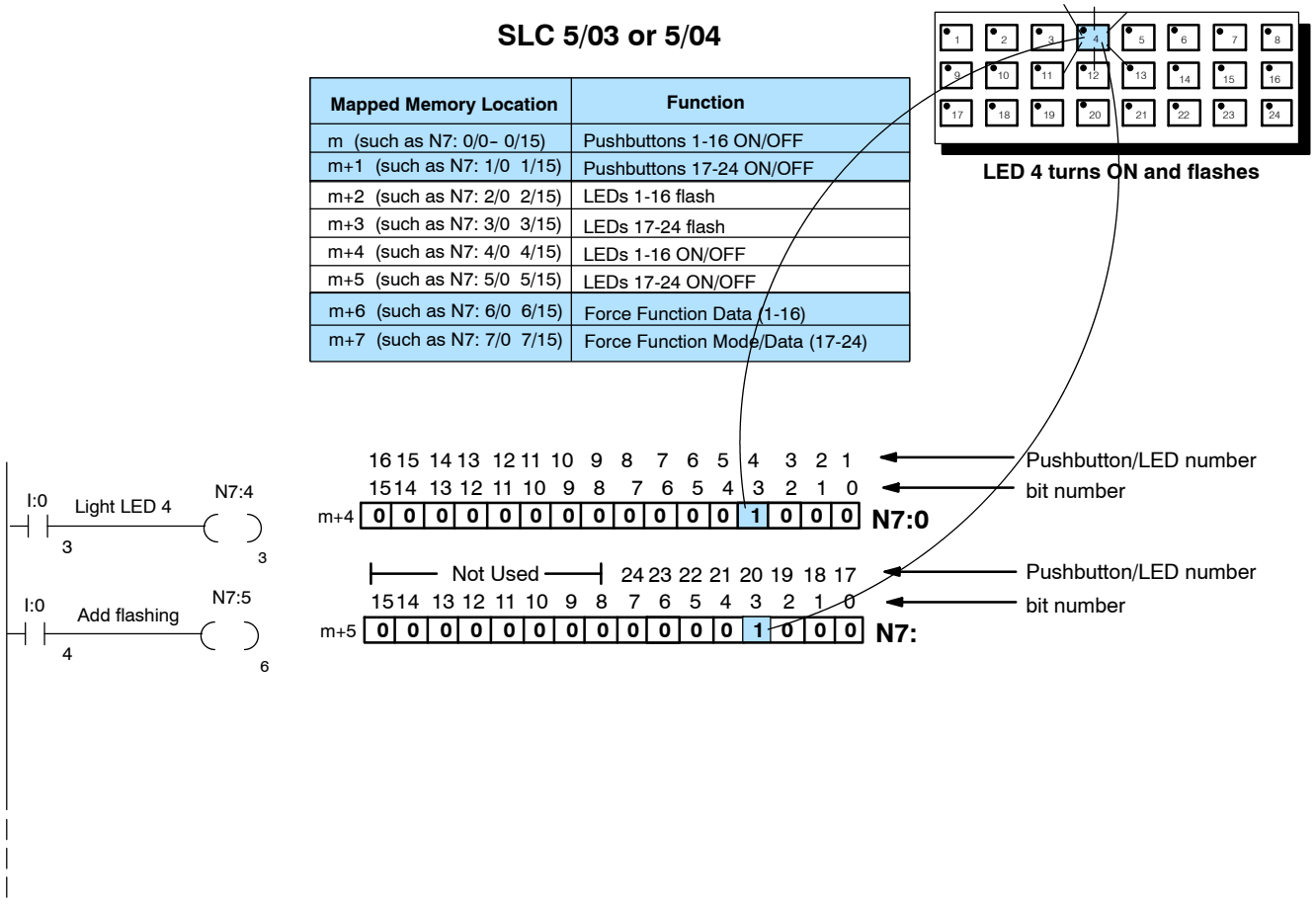


Adding Flashing

To draw extra attention to an LED that is lit, flashing can be added. If this feature is going to be used with one or more pushbuttons, there are three things which must always be remembered during panel configuration:

1. Flashing is only available for those buttons that have been configured as **Momentary**.
2. **LED Separation** must be enabled.
3. The **Flash Option** must be enabled.

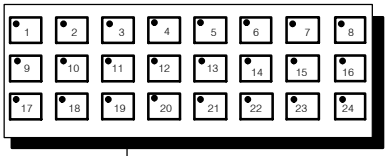
The flashing option is triggered through ladder logic. The example on the previous page turned ON an LED. The example below adds flashing to an LED that has been turned ON. The flashing feature is controlled by the status of the bits in the **m+2** and **m+3** memory areas. The user memory in these locations have been mapped to internal relay memory. The example begins mapping at **N7:0** during the initial configuration. LED4 is turned ON then made to flash. Bit 3 of **m+4** turns the LED ON, and bit 3 of **m+2** makes it flash. In the example, input type files (I:0/3 and I:0/4). I:0/3 are used to turn ON LED 4 and I:0/4 turns ON the flashing feature for that particular LED.



Force Function Registers

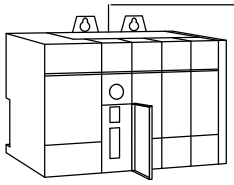
The OP-1224 has the ability to "force" a pushbutton ON or OFF with ladder logic. If this function is going to be used, the force option must be enabled during configuration.

NOTE: The force function will only work for those pushbuttons that have been configured as "maintained" (alternate action). It will not work for momentary pushbuttons.



Mapping Assignments

Allen-Bradley



Mapped Memory Location	Function
m (such as N7: 0/0– 0/15)	Pushbuttons 1-16 ON/OFF
m+1 (such as N7: 1/0 1/15)	Pushbuttons 17-24 ON/OFF
m+2 (such as N7: 2/0 2/15)	LEDs 1-16 flash
m+3 (such as N7: 3/0 3/15)	LEDs 17-24 flash
m+4 (such as N7: 4/0 4/15)	LEDs 1-16 ON/OFF
m+5 (such as N7: 5/0 5/15)	LEDs 17-24 ON/OFF
m+6 (such as N7: 6/0 6/15)	Force Function Data (1-16)
m+7 (such as N7: 7/0 7/15)	Force Function Mode/Data (17-24)

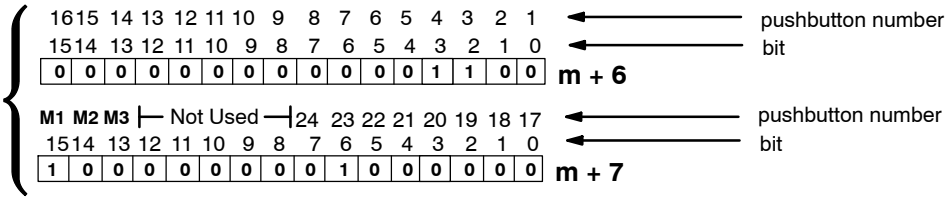
How the Memory is Used–Looking at the above memory map**, m+6** stores the forcing data for Pushbuttons 1-16 and **m+7** stores forcing data for Pushbuttons 17-24. There are three modes of the force function. These modes are controlled by the most significant bits of m+7.

Mode 1 (M1)– This forces all of the Pushbuttons to reflect the status stored in m+6 and m+7. For example, the data shown below would force Pushbuttons 3, 4 and 23 to ON and all the others would be forced OFF. Notice that bit 15 of m +7 is set to 1 for this mode. M2 and M3 are set to 0's.

Mode 2 (M2)– This forces ON only those Pushbuttons matching the bits set in registers m+6 and m+7. The bits not set do not affect the status of the Pushbuttons. You would set M2 to 1 while M1 and M3 are set to 0.

Mode 3 (M3)– This forces OFF only those Pushbuttons matching the bits set in registers m+6 and m+7. The bits not set do not affect the status of the Pushbuttons. M3 is set to 1 while M1 and M2 are set to 0.

Force Function Registers



Think of forcing as a one-shot process. That is, once the mode has been set in m+7, the bit patterns in m and m+1 are changed (according to the mode selected) then, all of the bits in m+6 and m+7 are set to zero. What this means is that all pushbuttons return to normal manual operation after the forcing is completed.

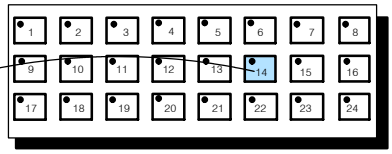
Forcing Pushbuttons ON or OFF

Allen-Bradley integer file types can also be used to force pushbuttons ON or OFF. N7:0 has been chosen as the base address for the mapping in the PLC. In this example, Pushbutton 14 is used to start a process then forces the pushbutton OFF when the process is completed. N7:0 holds the bit that reflects the status of Pushbutton 14. N7:6 and part of N7:7 hold the data that the force feature uses when executing one of the three selectable modes (M1, M2 or M3). These modes are selectable in the upper three bits of the mapped memory area m+7. In the example, below the mode is embedded in N7:7.

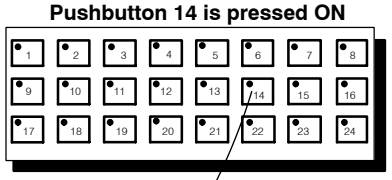
Mode 3 is used in the following example. Mode 3 looks at N7:6, and whichever bits are set to 1, the corresponding pushbuttons are forced OFF. Since the 13th bit of N7:7 (corresponding to LED14) is set, the OP-1224 will force LED14 OFF.

SLC 5/03 or 5/04

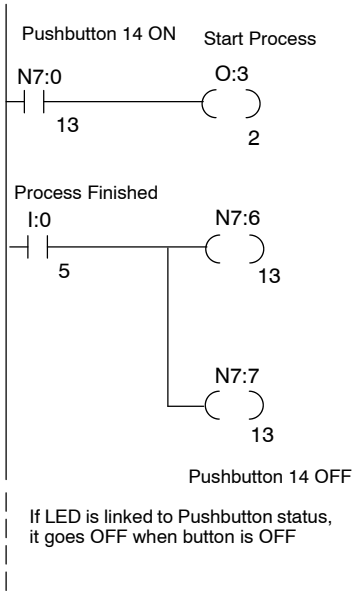
Mapped Memory Location	Function
m (such as N7: 0/0– 0/15)	Pushbuttons 1-16 ON/OFF
m+1 (such as N7: 1/0 1/15)	Pushbuttons 17-24 ON/OFF
m+2 (such as N7: 2/0 2/15)	LEDs 1-16 flash
m+3 (such as N7: 3/0 3/15)	LEDs 17-24 flash
m+4 (such as N7: 4/0 4/15)	LEDs 1-16 ON/OFF
m+5 (such as N7: 5/0 5/15)	LEDs 17-24 ON/OFF
m+6 (such as N7: 6/0 6/15)	Force Function Data (1-16)
m+7 (such as N7: 7/0 7/15)	Force Function Mode/Data (17-24)

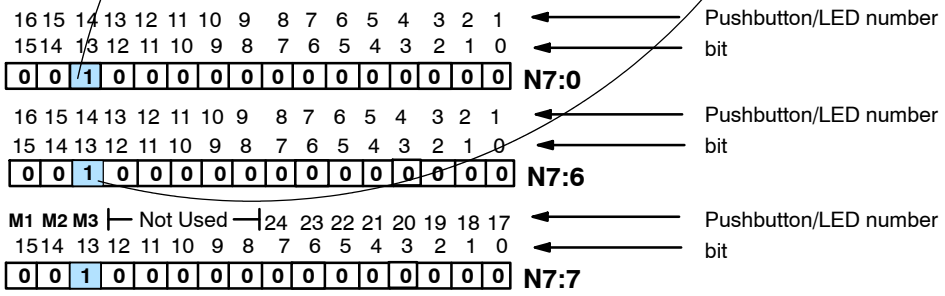


Pushbutton 14 is pressed ON



Pushbutton 14 forced OFF





European Union Directives

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 EC 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 AutomationDirect or its agents should be used. A listing of international affiliates is available at our website **http://www.automationdirect.com**.

Technical Support

If you need technical assistance, please call the technical support group at AutomationDirect, Inc. *(3505 Hutchinson Rd., Cumming, GA 30040, U.S.A.)* at 800-633-0405. Support is available Monday through Friday from 9:00 A.M. to 6:00 P.M. Eastern Standard Time. Our website address is **http://www.automationdirect.com**.

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.

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