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# O V E R V I E W

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## How To Use This User Guide

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This user guide is designed to help you install, develop, and maintain your system. Each chapter begins with a list of specific objectives that should be met after you have read the chapter. This section is intended to help you find and use the information in this user guide.

## Assumptions

This user guide assumes that you have the skills or fundamental understanding of the following information.

- ❑ Basic electronics concepts (voltage, switches, current, etc.)

## User Guide Contents

This user guide contains the following information.

Chapter ① Introduction	This chapter provides a description of the product and a brief account of its features.
Chapter ② Getting Started	This chapter contains a detailed list of items you should have received with your RP240 or RP240-NEMA4 shipment. It will help you become familiar with the system and ensure that each component functions properly.
Chapter ③ Installation	This chapter provides instructions to properly mount the system and make all electrical and non-electrical connections. Detailed instructions for wiring the RP240 to Compumotor's 6200 Indexer and 6250 Servo Controller, Model 500 Indexer, SX, and ZX Indexer/Drives is provided. Upon completion of this chapter, your system should be completely installed and ready to perform basic operations.
Chapter ④ Extended X Command Summary and Application Design	This chapter helps you integrate the RP240 to the Model 500 Indexer, and SX, and ZX Indexer/Drives. Command enhancements to the X language commands are described, and sample applications are provided.
Chapter ⑤ 6000 Series Command Summary & Application Design	This chapter helps you integrate the RP240 to the 6200 Indexer, and 6250 Servo Controller. RP240 commands within the 6000 Series language are described, and sample applications are provided.
Chapter ⑥ Direct Control of RP240	This chapter describes the internal command set of the RP240.
Chapter ⑦ Hardware Reference	This chapter contains information on system specifications (electrical, I/O, etc.).

This chapter describes Compumotor's recommended system maintenance procedures. It also provides methods for isolating and resolving hardware and software problems.

## Installation Process Overview

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To ensure safe, trouble-free system integration and operation, you should pay special attention to the environment in which the RP240 equipment will operate. Environmental conditions include the layout, mounting, and wiring, grounding, and shielding practices used.

### Installation Procedures

Before you install this product, you should complete the following steps:

- ① Review this entire user guide. Become familiar with the user guide's contents so that you can quickly find the information you need.
- ② Read Chapter ① Introduction to develop a basic understanding of all system components, their functions, and interrelationships.
- ③ Read Chapter ② Getting Started, and verify that you have received all the proper components for your system, and that all the items in your shipment have arrived without damage. Follow the step-by-step bench test procedures to verify the basic functionality of the RP240.
- ④ After reading Chapter ② begin the installation process. Do not deviate from the sequence or installation methods provided.
- ⑤ Perform as many basic functions as you can with the configuration established in Chapter ②. You can perform this task only if you have reviewed the entire user guide.

### Related Publications

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The following publications may be helpful resources.

- ❑ Current Parker Compumotor Motion Control Catalog
- ❑ User guide for the Compumotor Indexer or Servo Controller that you will use with the RP240
- ❑ Schram, Peter (editor). *The National Electric Code Handbook (Third Edition)*. Quincy, MA: National Fire Protection Association

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## Introduction

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### Chapter Objective

The information in this chapter will enable you to:

- ❑ Understand the product's basic functions & features

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### Product Description

The RP240 is designed to operate as an operator interface for Compumotor's Extended X (the SX Indexer/Drive, ZX Indexer/Drive, and Model 500 Indexer) and 6000 Series products (6200 Indexer and 6250 Servo Controller). The RP240 operates strictly as a dumb terminal. No programming of any kind can be accomplished using the RP240. The RP240 is controlled by commands available in the Extended X and 6000 Series command sets. The commands allow the programmer to create a program (within the Extended X or 6000 Series product) to prompt an operator for numeric information, read function keys, display variables and text, and control the 8 LEDs located on the RP240.

If the RP240 is not used with the SX, ZX, Model 500, 6200, or 6250, ASCII command strings sent directly to the RP240 can be used to control the functions contained within the RP240 (refer to *Chapter ⑥ Direct Control of the RP240*).

---

### RP240 Features

- ❑ Operates directly with Compumotor's SX and ZX Indexer/Drives, and the Model 500 Indexer
- ❑ Operates directly with Compumotor's stand-alone 6000 Series products (6200 and 6250)
- ❑ Can be used with any controller capable of transmitting ASCII strings across RS-232C
- ❑ Screw terminal connections for easy wiring
- ❑ Optional NEMA specification ratings (standard RP240 is NEMA 12, optional RP240-NEMA4 meets NEMA 4 & NEMA 12 specifications when panel mounted.)
- ❑ Adjustable contrast for the LCD display
- ❑ Eight independent LEDs
- ❑ Numeric and function key data entry
- ❑ Uses less than 100 mA of current at 5VDC



# C H A P T E R ②

## Getting Started

### Chapter Objectives

The information in this chapter will enable you to:

- Verify that each component of your system has been delivered safely
- Become familiar with system components and their interrelationships

### What You Should Have

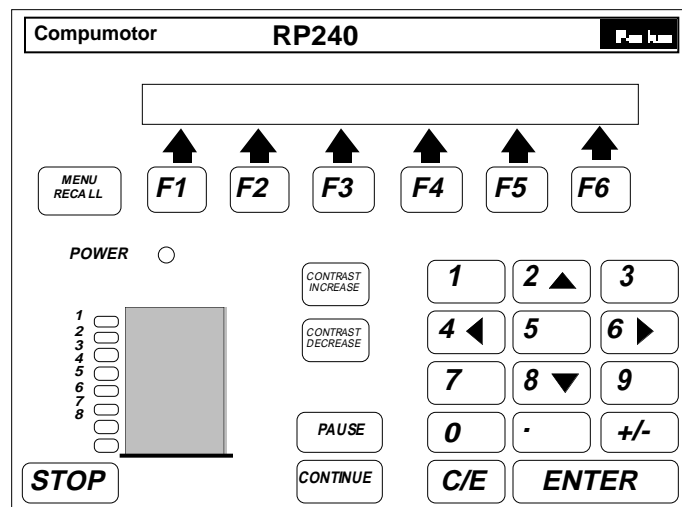
Inspect your RP240 shipment upon receipt for damage to its shipping container. Report any damage to the shipping company as soon as possible. Parker Compumotor cannot be held responsible for damage incurred in shipment. The items listed in the table below should be present and in good condition.

	RP240	RP240-NEMA4
Description	Part #	Part #
RP240 Main Unit	RP-240	RP-240 NEMA4
Gasket	58-009135-01	58-013341-01
RP240 User Guide	88-012156-01	88-012156-01

#### CAUTION

Do not use sharp objects such as pencils, screw drivers, etc. on the front panel it will cause permanent damage to the membrane and will void the warranty.

### Basic System Configuration

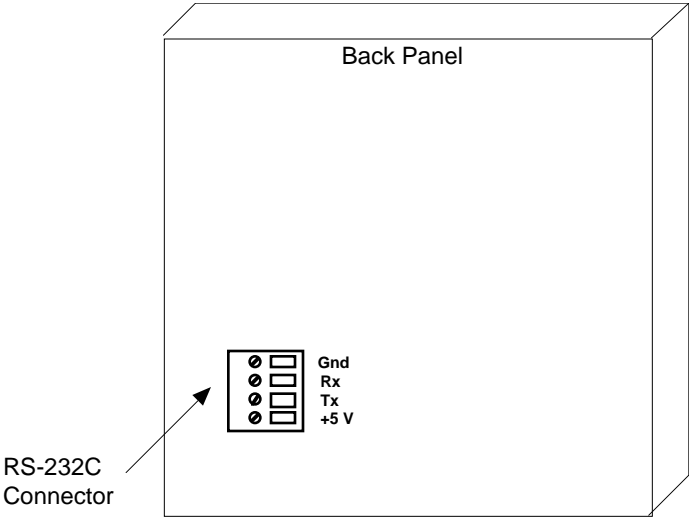




# Wiring Connections

The following figure illustrates the RS-232C and power; connector. This connector is located on the back of the RP240.

👉 Helpful Hint:  
RP240 Back Panel



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## *Installation*

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### Chapter Objectives

The information in this chapter will enable you to:

- Mount the RP240 properly
- Wire the RP240 correctly
- Verify that the complete system is installed properly

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### Environmental Considerations

 **Helpful Hint:**  
For more on NEMA standards, contact the *National Electrical Manufacturers Association*, 2101 L Street Northwest, Washington, D.C. 20037. Ask for NEMA Standards Publication No. 250 Enclosures for Electrical Equipment.

The RP240 is designed to be mounted to a door, on a panel front, desk, or carried by hand. The RP240-NEMA4 is designed to be flush mounted in a door. Both the RP240 and RP240-NEMA4 are designed to work in temperatures up to 122°F (50°C). NEMA 12 specifications are achieved when the RP240 is door or panel mounted using the provided gasket. NEMA 4 specifications are achieved when the RP240-NEMA4 is door or panel mounted using the provided gasket. NEMA Type 12 enclosures provide a degree of protection against dust, falling dirt, and dripping non corrosive liquids. NEMA Type 4 enclosures provide a degree of protection against windblown dust and rain, splashing water, and hose-directed water.

### Electrical Noise

Minimize the potential for electrical noise before installing the RP240 rather than attempting to solve such problems after installation. You can prevent electrical noise by observing the following installation precautions:

- Do not put high-voltage wires and low-level signals in the same conduit
- Do not expose wiring (shield all wires)
- Ensure that all components are properly grounded

### Airborne Contaminants

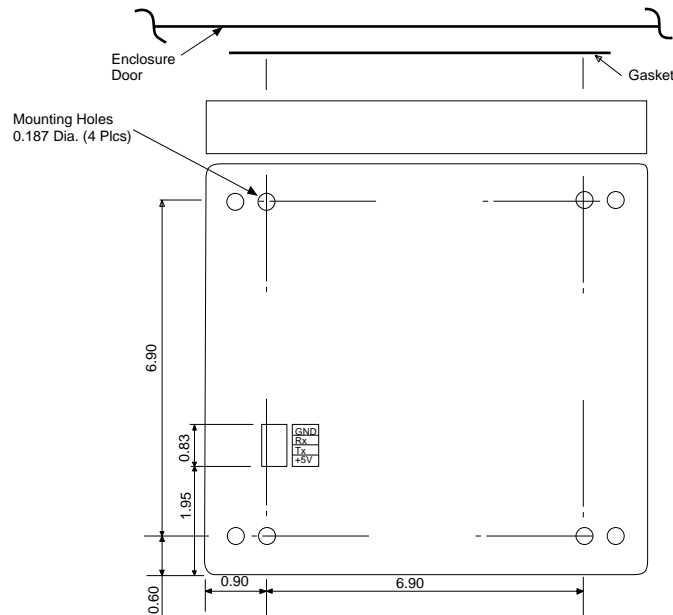
Contaminants that may come in contact with the RP240 should be carefully controlled. Particulate contaminants, especially electrically conductive ones (such as metal shavings), can damage the RP240.

# System Mounting

## RP240 Door Mount

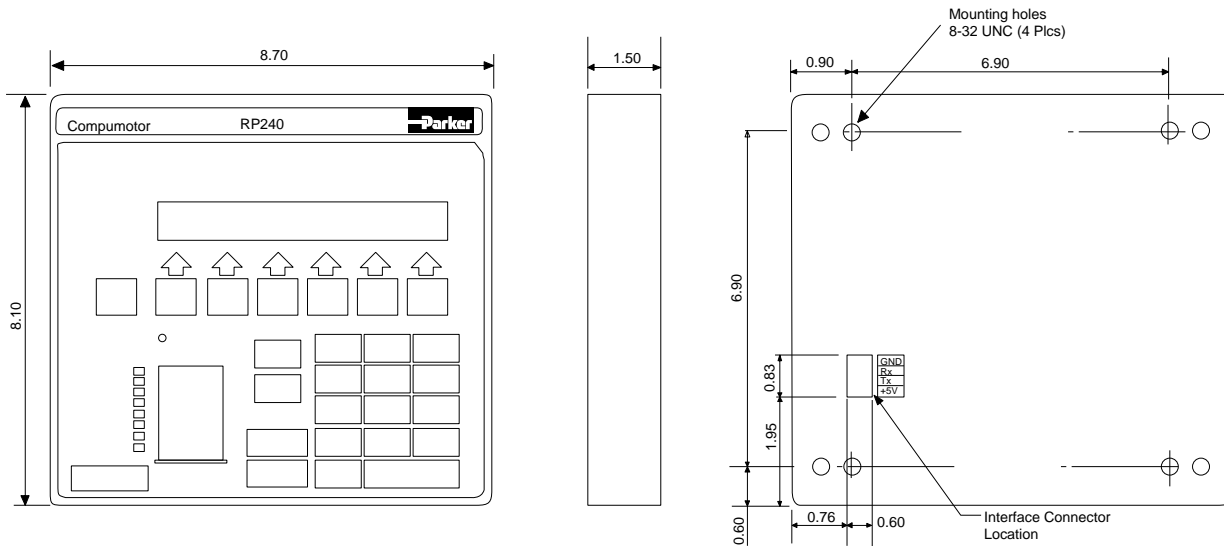
To mount the RP240 operator panel to the door of an enclosure, or on a panel, follow the steps below.

- ① Drill four holes as shown in the following figure
- ② Remove the bayonet mounts (screws and standoffs) and rubber feet from the back of the operator panel (save the screws for mounting).
- ③ Put one screw through the door.
- ④ Put the gasket (provided) on the screw.
- ⑤ Put the operator panel onto the screw and tighten.
- ⑥ Align the panel and gasket and insert the remaining three screws.
- ⑦ Connect the 4 wires between the operator panel and the Extended X or 6000 Series product. See *RP240 Connections* later in this chapter.



## RP240 Dimensions

The following figure shows the dimensional drawing for the RP240. Mounting holes and their dimensions are given.

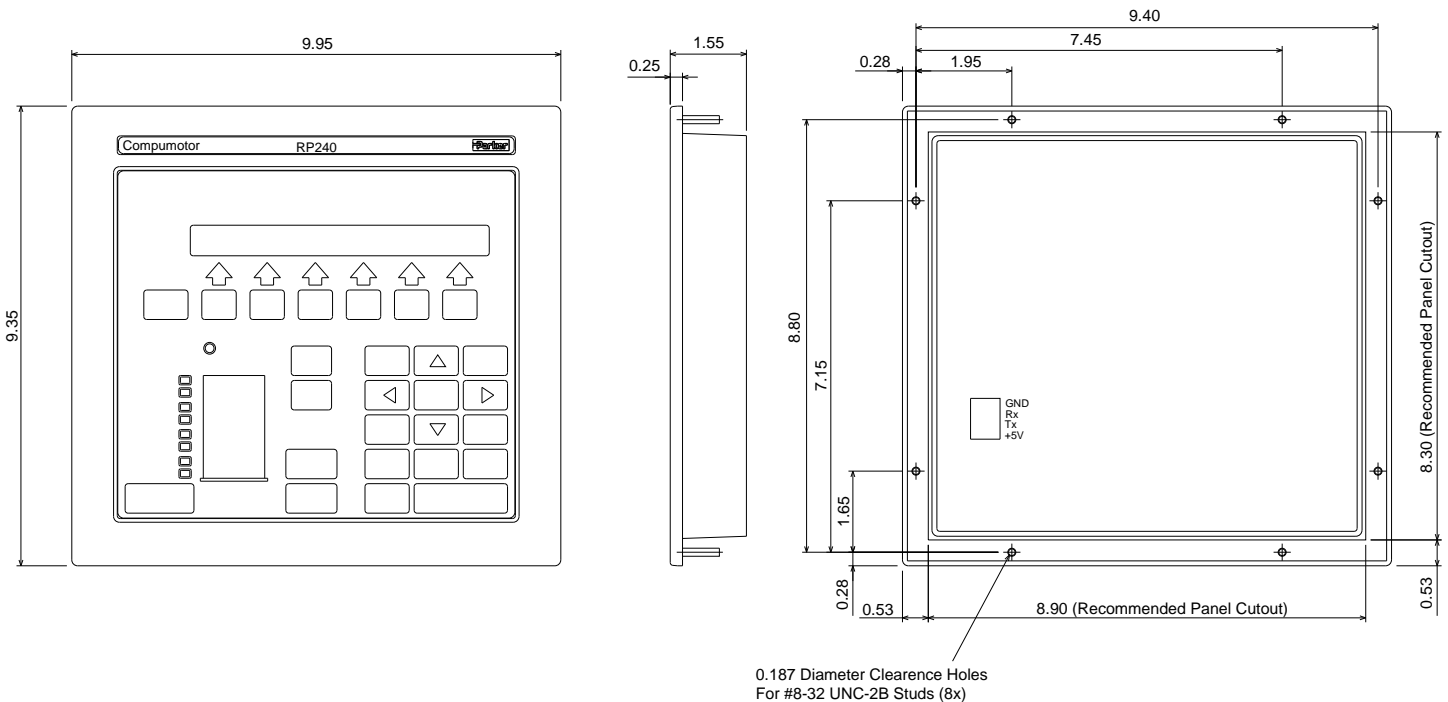


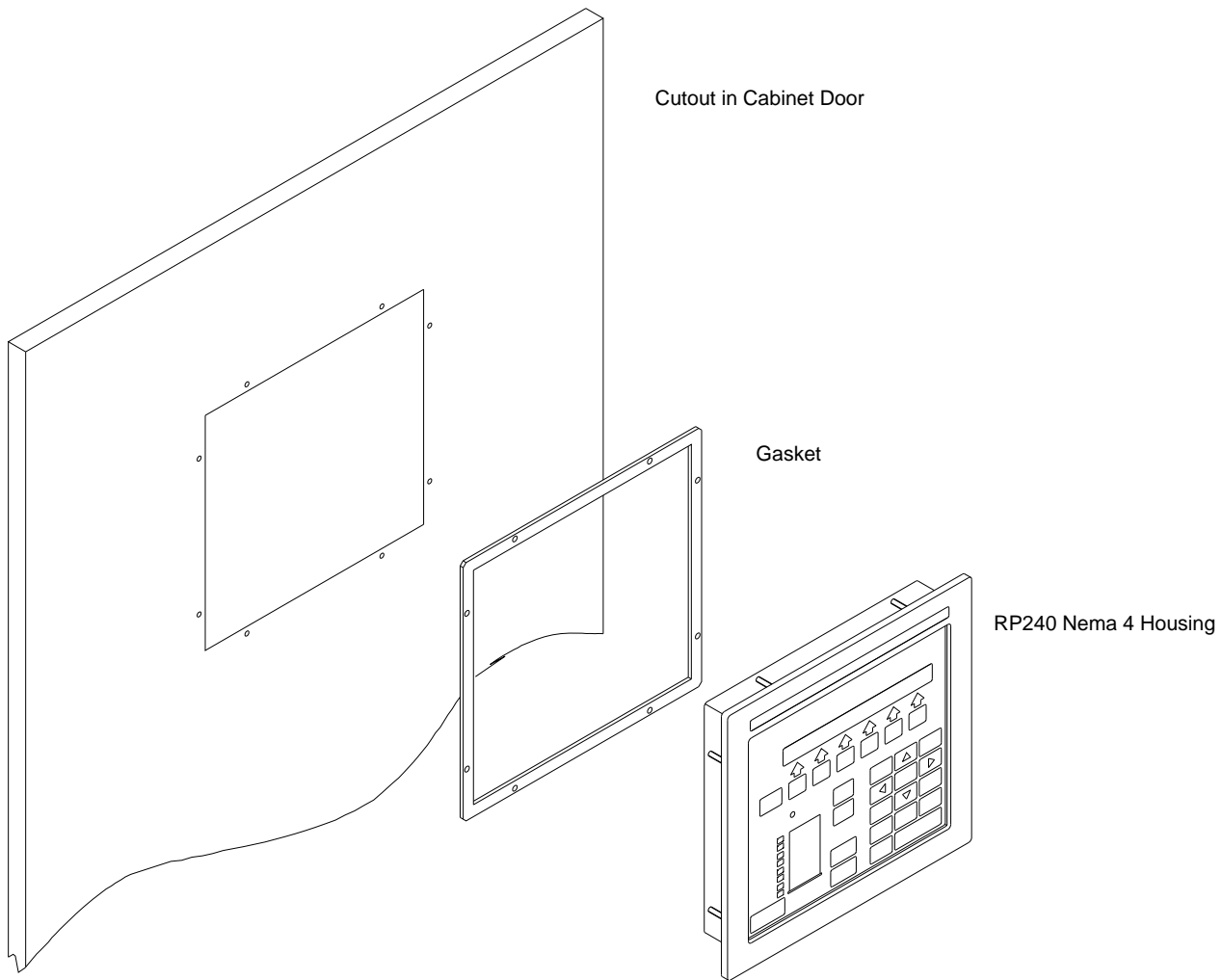
## RP240-NEMA4 Door Mount

To mount the RP240-NEMA4 operator panel through the door of an enclosure, or in a panel, follow the steps below.

- ① Cut an 8.3 inch vertical by 8.9 inch horizontal hole in the door of the enclosure or panel as shown on the following page.
- ② Drill eight holes in the locations shown.
- ③ Place the gasket (provided) on the RP240-NEMA4.
- ④ Put the operator panel through the door and tighten the eight nuts provided.
- ⑤ Connect the 4 wires between the operator panel and the Extended X (SX, ZX, or Model 500) or the 6000 Series (6200 or 6250) product.

The following figure shows the dimensional drawing for the RP240-NEMA4. Mounting studs and the required diameter clearance holes are given.





## Wiring Guidelines

**Helpful Hint:**  
All earth ground connections must be continuous and permanent. Compumotor recommends a single-point grounding setup.

Proper grounding of electrical equipment is essential to ensure the safety of personnel. You can reduce the effects of electrical noise due to electromagnetic interference (EMI) by proper grounding. All Compumotor equipment should be properly grounded. A good source of information on grounding requirements is the *National Electrical Code* published by the National Fire Protection Association of Boston, MA. In general, all components and enclosures must be connected to earth ground through a grounding electrode conductor to provide a low impedance path for ground fault or noise-induced currents.

## RP240 Connections

The RP240 operator panel is connected to the Extended X (SX, ZX, or Model 500) and 6000 Series (6200 or 6250) products by means of a four wire shielded cable (user supplied). For cable lengths up to 50 feet long, Compumotor recommends using 20 AWG wire. Cable lengths longer than 50 feet are not recommended. This in accordance with the Electronic Industries Association (EIA) recommendations for RS-232C at 9600 baud.

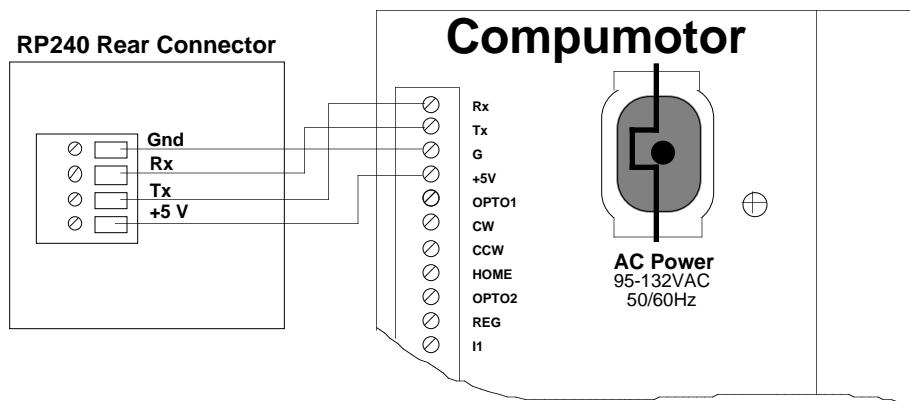
To wire the RP240 to a 6000 Series product (6200 or 6250), connect the +5VDC connection on the RP240 to the +5VDC source on the 6000 Series connector labeled RP240. Connect the RP240 ground connection to the ground on the 6000 Series connector labeled RP240. Connect the RP240 Receive Data (Rx) terminal to the controller's Transmit Data (Tx) terminal, and the RP240 Transmit Data (Tx) terminal to the controller's Receive Data (Rx) terminal. Make all connections on the 6000 Series connector labeled RP240.

To wire the RP240 to an Extended X product, connect the +5VDC connection on the RP240 to a +5VDC source capable of supplying 100 mA of current. You must supply 5VDC  $\pm 2\%$  to pin 1 of the RP240. You can use the 5VDC power supplies on the SX, ZX, or Model 500 provided there is enough current remaining. Current levels are shown in the table below. Current levels are shown in the table below.

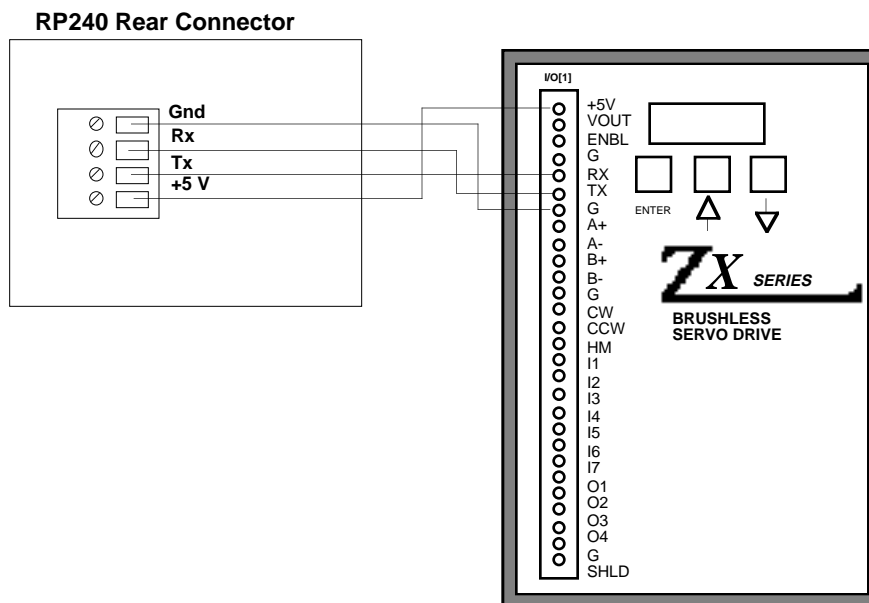
	Available	Current Requirements		
		Encoder	I/O	RP240
SX	250 mA	150 mA	10 mA each	100 mA
ZX	500 mA	150 mA	0 mA	100 mA
500	500 mA	150 mA	0 mA	100 mA

Connect the RP240 ground connection to the ground of the +5VDC power supply. Connect the RP240 Receive Data (Rx) to the controller's Transmit Data (Tx), and the RP240 Transmit Data (Tx) to the controller's Receive Data (Rx). Connect the RP240 only after you have programmed the controller for operation with the RP240.

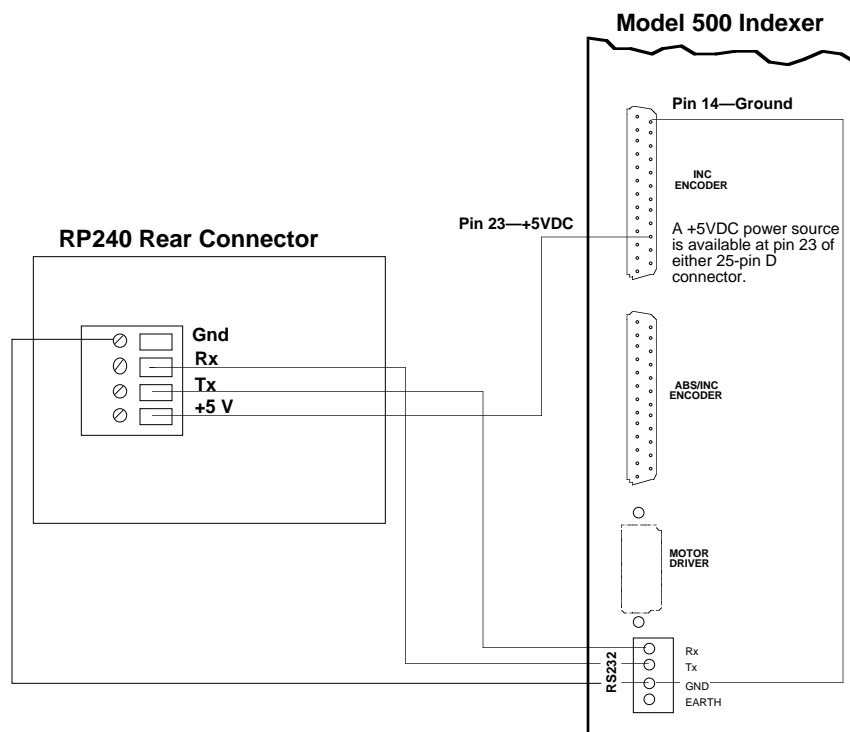
### RP240 to SX Wiring Diagram



### RP240 to ZX Wiring Diagram



# RP240 to Model 500 Wiring Diagram



## RP240 Connector Pin Out

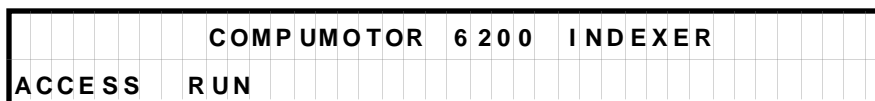
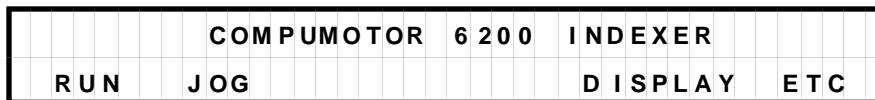
The following table provides the pin out for the RP240 connector.

Pin	In/Out	Function	Description
1	In	Ground	Logic Ground
2	In	Receive (Rx)	RS-232C Receive Data input
3	Out	Transmit (Tx)	RS-232C Transmit Data output
4	In	+5VDC	Input Power (100 mA minimum)


## Installation Verification

### 6000 Series

To verify the operation of the RP240 and the 6000 Series product to which it is connected, apply power to the 6000 Series product. The RP240 display should look similar to one of the following screens. If you are using an Extended X product, go to the next section.



## Using the RP240 With An Extended X Language Product

 **Helpful Hint:**  
If you are using the RP240 with a 6000 Series product, skip this section.

Before continuing with this section, you should be familiar with the Extended X Language product you will be using. An understanding of programming sequences is important. Download the following program to Sequence #100 in the Extended X Language product.

<u>Command</u>	<u>Description</u>
>XE100	Erase sequence #100
>XD100	Begin definition of sequence #100
DCLR0	Clear all lines of the RP240 display
DPC100	Cursor to line 1, column 0
DTXTTHIS_IS_A_QUICK_DEMO	Display text at current cursor location
VAR1=FUN	Wait for function key
DLED11111111	Turn on all LEDs
DCLR0	Clear all lines of RP240 display
DPC100	Cursor to line 1, column 0
DTXTTHE_LEDS_WILL_TURN_OFF_IN_5_SECONDS	Display text
T5	Wait 5 seconds
DLED00000000	Turn off all LEDs
DCLR0	Clear all lines of RP240 display
XT	End sequence definition
>	

Attach the RP240 after you have downloaded the above sequence correctly. Cycle power. The following is displayed.



THIS IS A QUICK DEMO

Press any function key to continue. After pressing any function key, all the LEDs on the RP240 will turn on and the display will read as shown below.



THE LEDS WILL TURN OFF IN 5 SECONDS

After 5 seconds, all the LEDs on the RP240 will turn off and the display will be cleared.



# C H A P T E R ④

## ***Extended X Command Summary and Application Design***

### Chapter Objectives

The information in this chapter will enable you to:

- Program the SX, ZX, or Model 500 to control the RP240
- Customize the system to meet your requirements

#### **PROGRAMMING NOTE**

This chapter provides Extended X programming information that is required to communicate with the RP240. If you are using a 6000 Series product (6200 or 6250), skip ahead to *Chapter ⑤ 6000 Series Command Summary and Application Design*.

### Extended X Language Command Summary

<b>Command</b>	<b>Description</b>
DCLR	Clear the display
DCNT	Enable/Disable PAUSE and CONTINUE Keys
DLED	Turn RP240 LEDs On/Off
DPC	Position Cursor
DSTP	Enable/Disable STOP Key
DTXT	Display Text Data on RP240 LCD
DVO	Display Variable Data on RP240 LCD
VARn=FUN	Enable and Read Function Keys
VARn=NUM	Enable and Read Numeric Keypad

# Description of Extended X Language Command Format

The following is a definition of the format fields for the Extended X Language products.

## ① **DCLR** Clear Display

③ <b>Type</b>	Programming
④ <b>Syntax</b>	<DCLRn
⑤ <b>Units</b>	line number
⑥ <b>Range</b>	Ø, 1, 2
⑦ <b>Default</b>	None
⑨ <b>Response</b>	None
⑩ <b>See Also</b>	DPC, DTXT, DVO

② <b>Version</b>
<b>SX</b> Rev C2
<b>ZX</b> Rev D
<b>500</b> Rev C
⑧ <b>Attributes</b>
[x] Buffered
[ ] Device specific
[ ] Saved independently
[ ] Saved in sequences

- |                               |   |
|-------------------------------|---|
| ① Mnemonic Code and Full Name | This box contains the command's mnemonic code.  |
| ② Valid Revision Level        | This field contains the revision history of the command. It includes the revision of software when the command was added or modified. If the revision level of software you are using is equal to or greater than the revision level listed in this field, you are using the proper version of the software.  |
| ③ Type                        | This portion of the box contains the command type. All X Language RP240 commands are programming commands. All of these commands affect program flow.   |
| ④ Syntax                      | The proper syntax for the command is shown here. The specific parameters associated with the command are also shown. Definitions of the parameters are described below: <ul style="list-style-type: none"><li><b>a</b> This indicates that a device address must accompany the command. Only the device specified by this parameter receives and executes the command. If this parameter, or any other parameter appears within brackets &lt;a&gt;, it is optional.</li><li><b>n</b> This represents an integer value.</li><li><b>b</b> This represents a binary value. The binary value must be either 0 or 1.</li></ul> |
| ⑤ Units                       | This field describes what unit of measurement or value the parameter in the command syntax represents.  |
| ⑥ Range                       | This is the range of valid values that you can specify for an argument (or any other parameter specified).  |
| ⑦ Default                     | The default setting for the command is shown in this box. A command will perform its function with the default setting if you do not provide a value.   |
| ⑧ Attributes                  | This field indicates that these commands are buffered. Buffered commands are executed in the order that the system receives them with other buffered commands. Buffered commands can be stored in a sequence.   |
| ⑨ Response                    | There are no system responses associated with these X Language commands.  |
| ⑩ See Also                    | Commands that are related or similar to the command described are listed here.  |

# Extended X Language Command Listing

## DCLR Clear Display

### Version

**SX** Rev C2

**ZX** Rev D

**500** Rev C

### Attributes

[X] Buffered

[ ] Device specific

[ ] Saved independently

[ ] Saved in sequences

**Type** Programming  
**Syntax** <DCLRn  
**Units** line number  
**Range** 0, 1, 2  
**Default** None  
**Response** None  
**See Also** DPC, DTXT, DVO

The Clear Display (**DCLR**) command clears a specified line of the RP240 display, and repositions the cursor to the beginning of the line.

n = Ø Clear all lines of the RP240 display

n = 1 Clear line 1 of the RP240 display

n = 2 Clear line 2 of the RP240 display

<u>Command</u>	<u>Description</u>
> DCLR1	Clear line one (1) of the RP240 display

## DCNT Enable/Disable Pause and Continue

### Version

**SX** Rev C2

**ZX** Rev D

**500** Rev C

### Attributes

[X] Buffered

[ ] Device specific

[ ] Saved independently

[ ] Saved in sequences

**Type** Programming  
**Syntax** <a>DCNTb  
**Units** None  
**Range** 0, 1  
**Default** 0  
**Response** None  
**See Also** SSH, SSL

This command enables or disables the PAUSE and CONTINUE keys on the RP240.

DCNTØ Disable PAUSE and CONTINUE keys

DCNT1 Enable PAUSE and CONTINUE keys

When the PAUSE and CONTINUE keys are enabled (**DCNT1**), pressing the PAUSE key will cause the RP240 to send a Stop (S) command to the Model 500, SX, or ZX. Pressing the CONTINUE key will cause a Continue (C) command to be sent. To have the Model 500, SX, or ZX pause motion, the Save Command Buffer on Stop (**SSH1**) and the Resume Execution Enable (**SSL1**) must be enabled.

Once you have activated the PAUSE and CONTINUE keys, they will remain active at all times, except when numeric or function key information has been requested (**VARn=NUM** or **VARn=FUN**).

<u>Command</u>	<u>Description</u>
>XE1ØØ	Erase sequence #100
>XD1ØØ	Begin definition of sequence #100
SSH1	Enable save command buffer on stop
SSL1	Enable resume execution
DCNT1	Enable PAUSE and CONTINUE keys
DSTP1	Enable STOP key
XT	End definition of sequence #100
>	



## DSTP Enable/Disable Stop

### Version

SX Rev C2

ZX Rev D

500 Rev C

### Attributes

[x] Buffered

[ ] Device specific

[ ] Saved independently

[ ] Saved in sequences

**Type** Programming  
**Syntax** <DSTPb  
**Units** None  
**Range** 0, 1  
**Default** 0  
**Response** None  
**See Also** SSH, SSL

The DSTP command enables or disables the STOP key on the RP240.

- DSTP0 Disable STOP key
- DSTP1 Enable STOP key

When the STOP key is enabled (DSTP1), pressing the STOP key will cause the RP240 to send a Kill (κ) command to the Model 500, SX, or ZX.

### CAUTION

Using the STOP key (K command) causes motion in progress to be stopped with the maximum deceleration rate.

Once you have activated the STOP key, it will be active at all times.

<u>Command</u>	<u>Description</u>
>XE100	Erase sequence 100
>XD100	Begin definition of sequence 100
SSH1	Enable save command buffer on stop
SSL1	Enable resume execution
DCNT1	Enable PAUSE and CONTINUE keys
DSTP1	Enable STOP key
XT	End definition of sequence 100
>	

## DTXT Display Text Data on RP240 LCD

### Version

SX Rev C2

ZX Rev D

500 Rev C

### Attributes

[x] Buffered

[ ] Device specific

[ ] Saved independently

[ ] Saved in sequences

**Type**  
**Syntax** <a>DTXTtext\_data  
**Units** None  
**Range** None  
**Default** None  
**Response** None  
**See Also** DCLR, DPC, DVO

This command places the text string, `text_data`, beginning at the current cursor location. The text string can be any alpha character from **A** to **Z**, any numeric character from **0** to **9**, or the following characters:

`~, !, @, #, $, %, ^, &, (, ), -, +, =, {, }, [, ], |, :, ", ', <, >, ?, ., ., /`

An underscore (`_`) is used to separate words. The underscore will be displayed as a space on the RP240 display. The asterisk (`*`), semicolon (`;`), backslash (`\`), and tilde (`~`) are illegal characters to use with the DTXT command. If the text string is too long, the text string will wrap around to the next line.

<u>Command</u>	<u>Description</u>
>DPC205	Position the cursor on line 2, column 5
>DTXTCOMPUMOTOR_DEMO_PROGR AM_1	Place message COMPUMOTOR DEMO PROGRAM 1 at current cursor position

## DVO Display Variable Data on RP240 LCD

### Version

**SX** Rev C2

**ZX** Rev D

**500** Rev C

### Attributes

[X] Buffered

[ ] Device specific

[ ] Saved independently

[ ] Saved in sequences

**Type** Programming  
**Syntax** <DVO n,n,n,b  
**Units** None  
**Range** See Below  
**Default** None  
**Response** None  
**See Also** DPC, DTXT, DCLR

The DVO command is used to display a variable at the current cursor location. Any of the fifty variables available in the extended X products can be displayed.

1st n = Variable Number (Range = 1 to 50)

2nd n = Number of whole digits displayed, digits to left of decimal point (Range = 0 to 15)

3rd n = Number of fractional digits displayed, digits to the right of the decimal point (Range = 0 to 5)

b = Sign bit, 0 = no sign displayed, 1 = display plus or minus sign

<u>Command</u>	<u>Description</u>
>DPC205	Position the cursor on line 2, column 5
>DVO2,2,1,1	Place variable 2 at current cursor position. If variable 2 contained the number 53.23, then +53.2 is displayed on the RP240 LCD starting at column 5, line 2

## VARN=FUN Enable and Read Function Keys

### Version

**SX** Rev C2

**ZX** Rev D

**500** Rev C

### Attributes

[X] Buffered

[ ] Device specific

[ ] Saved independently

[ ] Saved in sequences

**Type** Programming  
**Syntax** <a>VARN=FUN  
**Units** variable number  
**Range** 1 to 50  
**Default** None  
**Response** None  
**See Also** VAR

The VARN=FUN command is used to enable the function keys on the RP240 and retrieve the function key pressed. Once this command is encountered, command processing stops until the RP240 returns a number corresponding to the function key pressed. Function key 1 (F1) returns a 1, function key 2 (F2) returns a 2, etc. MENU RECALL returns a zero. The number that is returned is placed in the variable n.

The RP240 is actually sending an exclamation point (!) before the number returned, allowing the Model 500, SX, or ZX to interpret the value returned.

Note: If you are using a kill sequence (XFK), place the command "\*" at the beginning of the kill sequence.

<u>Command</u>	<u>Description</u>
>XE1	Erase sequence 1
>XD1	Begin definition of sequence 1
DPC205	Position the cursor on line 2, column 5
DTXTPRESS_F1	Place message PRESS F1 at current cursor location
VAR1=FUN	Retrieve function key pressed value and place in variable 1
L	Begin endless loop
IF(VAR1=1)	If variable 1 equals 1, do the commands between IF and NIF
XG2	Branch to sequence 2
NIF	End IF statement
N	End endless loop
XT	End definition of sequence 1
>	

## VAR=NUM Enable and Read Numeric Keypad

**Version**  
SX Rev C2  
ZX Rev D  
500 Rev C

**Type** Programming  
**Syntax** <a>VAR=NUM  
**Units** None  
**Range** 1 to 50  
**Default** None  
**Response** None  
**See Also** VAR

**Attributes**  
[X] Buffered  
[ ] Device specific  
[ ] Saved independently  
[ ] Saved in sequences

This VAR=NUM command is used to enable the numeric keypad on the RP240 and retrieve the numeric information entered. Once this command is encountered, command processing stops until the RP240 returns a value entered on the numeric keypad. The +/- key changes the sign of the number entered. The +/- key must be pressed before the number is entered, or it will have no effect. The C/E key will clear the number you have entered and allow you to restart. The ENTER key sends the number entered to the 500, SX, or ZX. If no value was entered before the ENTER key was pressed, the ENTER key will have no effect.

The number that is returned by the RP240 is placed in the variable **n** of the 500, SX, or ZX. If either the +/- key or the . key is entered by itself, the variable will be set to zero.

The RP240 is actually sending an exclamation point (!) before the number returned, thus allowing the 500, SX, or ZX to interpret the value returned.

**Note:** If you are using a kill sequence (XFK), place the command **\_\_** at the beginning of the kill sequence.

<b>Command</b>	<b>Description</b>
>XE1	Erase sequence 1
>XD1	Begin definition of sequence 1
DCLR0	Clear Display
DPC105	Position the cursor on line 1, column 5
DTXTENTER_BAG_COUNT	Place message ENTER BAG COUNT at current cursor location
DCLR2	Clear Display
DPC121	Position the cursor on line 1, column 21
VAR1=0	Initialize variable 1
WHILE (VAR1<1_OR_VAR1>10)	Do statements between WHILE and NWHILE until 0<VAR1<11
DCLR2	Clear line 2 of RP240 display
DPC121	Position cursor on line 1, column 21
VAR1=NUM	Retrieve numeric value and place in variable 1
IF (VAR1<1)	If variable 1 < 1 do the commands between IF and NIF
DPC205	Position the cursor on line 2, column 5
DTXTBAG_COUNT_TOO_LOW	Place message BAG COUNT TOO LOW at current cursor location
T2	Time delay 2 seconds
NIF	End IF statement
IF (VAR1>10)	If variable 1 > 10 do the commands between IF and NIF
DPC205	Position the cursor on line 2, column 5
DTXTBAG_COUNT_TOO_HIGH	Place message BAG COUNT TOO HIGH at current cursor location
T2	Time delay 2 seconds
NIF	End IF statement
NWHILE	End WHILE statement
MN	Set to Normal mode
LD3	Disable limits (if not connected)
A10	Set acceleration to 10 rps <sup>2</sup>
V2	Set velocity to 10 rps
D25000	Set distance to 25000 steps
L (VAR1)	Loop as many times as specified by variable 1
G	Initiate motion
N	End loop
XT	End definition of sequence 1
>	

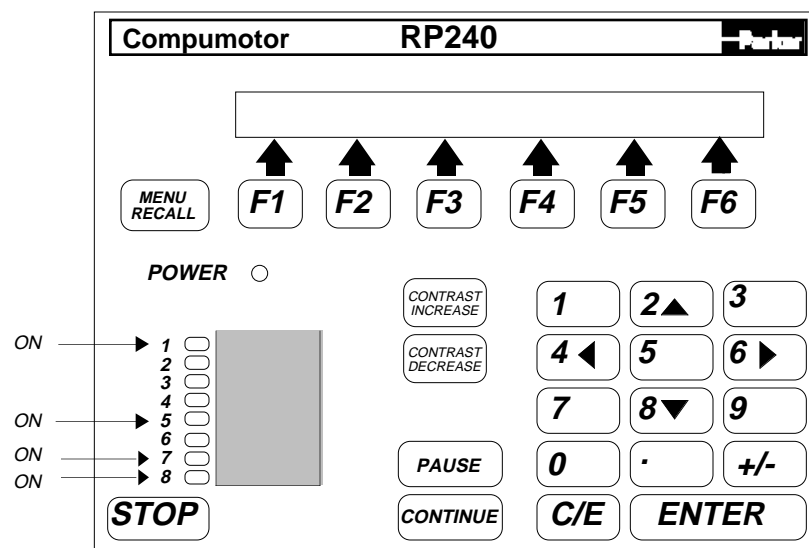
# Discussion of Extended X Language Commands

This section discusses the commands described previously in the command reference.

## Prompting an Operator or Displaying Information

In many motion control applications, the most important requirement is the operator interface. Presenting information to an operator in a desired format is often difficult at best. The RP240 has two visual indicators to help present information to the operator. The simplest indicator is the 8 LEDs on the panel. These LEDs; can be turned on or off with the **DLED** command. The LEDs can be used in conjunction with the outputs to show the state of an output, or they can be used to show status, such as motor moving, specific sequence in progress, etc.

IF a **DLED10001011** command is issued, the LEDs shown below would be illuminated. These eight LEDs can be labeled, using the slide-in card provided, to represent cycle status, output status, etc.



The other indicator is the two line, 40-character LCD display. This display can be controlled with specific Extended X Language commands. The Position Cursor (**DPC**) command allows the user to program the location of the cursor on the LCD display. The Display Text Data (**DTXT**) command on RP240 Display allows the user to place text, beginning at the current cursor location, on the LCD display.




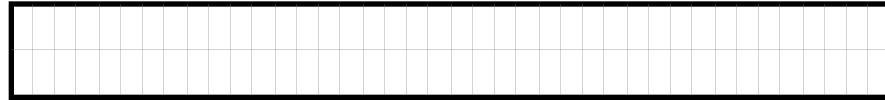
## Extended X Language Command Programming Example

A user wants his operator to see the message **ENTER THE CYCLE COUNT**. He wants this message placed on line two, starting after two spaces in from the left. He also wants the user to be able to enter the cycle count three spaces after the message. Below are the steps required to accomplish this.

### Step 1

Issue the **DPC202** command

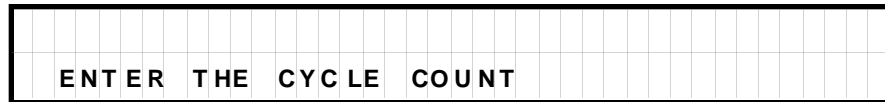
 **Helpful Hint:**  
The cursor does not appear on the display. The cursor is displayed when the **VARn=NUM** command is used.



↑  
Cursor Location

### Step 2

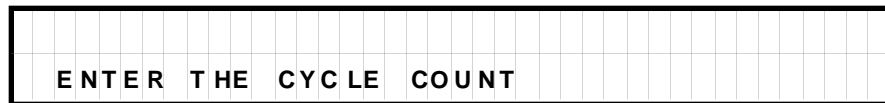
Issue the **DTXTENTER\_THE\_CYCLE\_COUNT** command



Cursor Location —↑

### Step 3

Issue the **DPC225** command

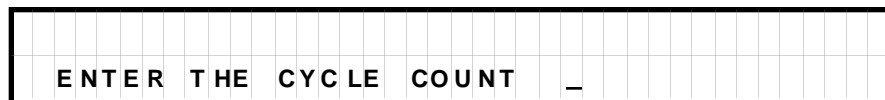


Cursor Location —↑

Now that we have provided the operator with the prompting message, how do we obtain the information? The Read and Enable Numeric Keypad (**VARn=NUM**) or Read and Enable Function Keys (**VARn=FUN**) commands provide the answer. The **VARn=NUM** command will enable the numeric keypad and allow the operator to enter information. The numbers, as entered, will be displayed at the current cursor location. Once the **ENTER** key is pressed, the number will be transmitted from the RP240 to the Model 500, SX, or ZX.

### Step 4

Issue the **VAR1=NUM** command



Cursor Location —↑

### Step 5

Press a 2, followed by a 5

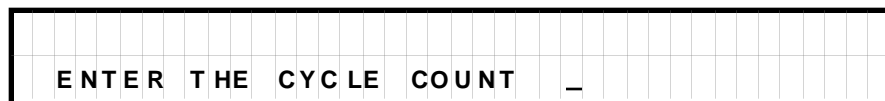


Cursor Location —↑

*If the wrong value is entered, press the C/E key and re-enter the value.*

### Step 6

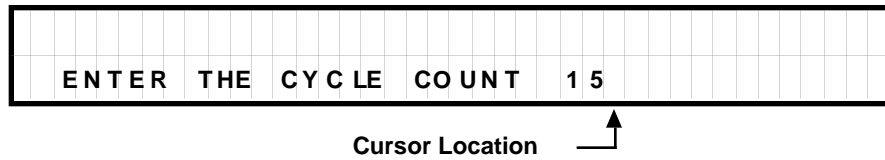
Press the C/E key



Cursor Location —↑

Step 7

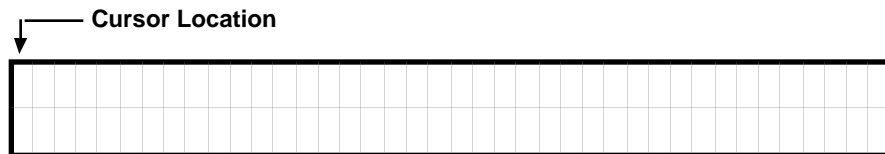
Press a 1, followed by a 5, followed by an ENTER



After the ENTER key is pressed, the RP240 will transmit the value 15 to the Model 500, SX, or ZX. This value will be stored in variable 1. Use the VARn=FUN command to enter information based on function key input. Steps 8 through 14 illustrate this capability.

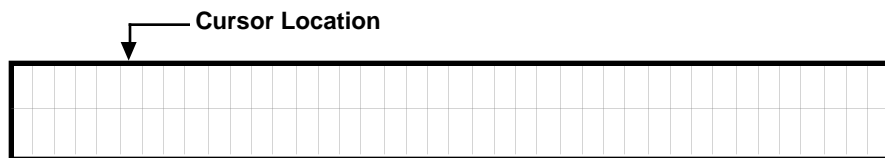
Step 8

DCLRØ command is issued.



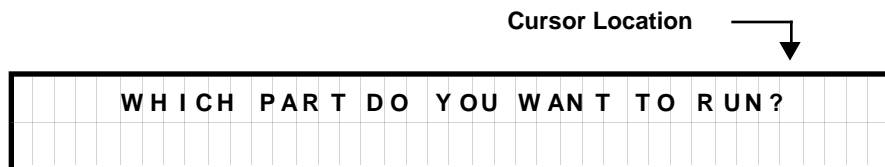
Step 9

Issue the DPC1Ø5 command



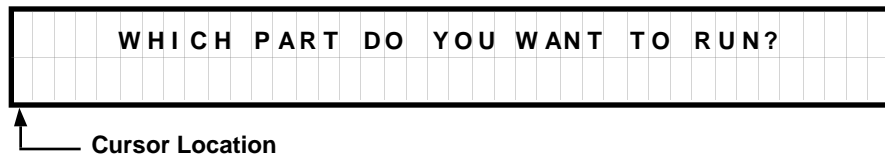
Step 10

Issue the DTXTWHICH\_PART\_DO\_YOU\_WANT\_TO\_RUN? command



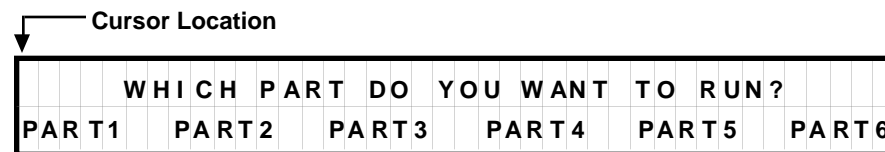
Step 11

Issue the DPC2ØØ command



Step 12

Issue the DTXTPART1\_\_PART2\_\_PART3\_\_PART4\_\_PART5\_\_PART5\_\_PART6 command. This text serves as an operator menu for the function keys.



Step 13

Issue the VAR2=FUN command

The VARn=FUN command enables the function (F1 - F6), and the MENU RECALL keys. When any of these keys are pressed, the number corresponding to the function key will be transmitted from the RP240 to the 500, SX, or ZX. Function keys 1—6 will return the values 1—6. The MENU RECALL key will return a zero.

Step 14

Press F1

After the F1 key is pressed, the RP240 will transmit the value 1 to the Model 500, SX, or ZX. This value will be stored in variable 2.

## Processing Information

Variables can be used in conditional statements like **IF**, **WHILE**, and **REPEAT**, or as data values in **D**, **V**, **A**, **AD**, **L**, or **T** commands. In step 7 above, the value 15 was entered stored in variable 1 to be used as the cycle count. The following is a command example:

Command	Description
D2400	Set distance to 2400 steps
V1	Set velocity to 1 rps
L(VAR1)	Loop the number of times as specified by variable 1
G	Initiate motion
T1	Wait one second
N	End the loop

In step 14, the operator pressed the **F1** key. This value was stored in variable 2, and was to be used to select **PART1**. The following is a command example:

Command	Description
IF(VAR2=1) XG11 NIF	Branch to sequence 11 if F1 is pressed
IF(VAR2=2) XG12 NIF	Branch to sequence 12 if F2 is pressed
IF(VAR2=3) XG13 NIF	Branch to sequence 13 if F3 is pressed
IF(VAR2=4) XG14 NIF	Branch to sequence 14 if F4 is pressed
IF(VAR2=5) XG15 NIF	Branch to sequence 15 if F5 is pressed
IF(VAR2=6) XG16 NIF	Branch to sequence 16 if F6 is pressed

For further information on the additional commands used in the examples above, refer to the appropriate user guide, or software reference guide for the Model 500, SX, or ZX.

## Enabling STOP and PAUSE Keys

In addition to the function keys and numeric keypad, there are three other keys. The **STOP** key, and the **PAUSE** and **CONTINUE** keys, must be enabled before they can be used.


Typically, if an application uses the **STOP** key, the key will be enabled (**DSTP1**) in the power-up sequence (sequence #100). However, the **STOP** key can be enabled and disabled in any sequence, and at any time. The **STOP** key issues a Kill (**κ**) command to the 500, SX, or ZX, immediately halting motion. **There is no controlled deceleration when using the STOP key.**

The **PAUSE** and **CONTINUE** keys can be enabled in any sequence. Before these keys will function as expected, you must enable the **commandSave Command Buffer on Stop (SSH1)** and **Resume Execution Enable (SSL1)** commands. The **DCNT** command enables the **PAUSE** and **CONTINUE** keys, and the commands **SSH1** and **SSL1** cause the **PAUSE** and **CONTINUE** keys to function in different ways.

If **SSH** is disabled (**SSH0**), the **PAUSE** key will function as a controlled stop. The motor will decelerate at the last programmed deceleration rate (**AD**) and the program buffer will be dumped. The program will be exited.

If you issue **SSH1** and **SSL0**, the **PAUSE** key will function as a controlled stop. After motion is halted, the **CONTINUE** key will not resume motion. Instead, it will resume command processing with the command directly following the command that was stopped with the **PAUSE** key.

If **SSH1** and **SSL1** are issued, the **PAUSE** key will function as a controlled stop. After motion is halted, command processing can be continued by pressing the **CONTINUE** key. If motion was in progress when the **PAUSE** key was pressed, that motion will be resumed. This is the recommended way to use the **PAUSE** and **CONTINUE** keys.

 **Helpful Hint:**  
Both the **SSH** and **SSL** commands should be placed in the power-up sequence (Sequence #100).

## Sample Program

This section provides an example of an RP240 application program. Refer to the specific indexer's Software Reference Guide for a more detailed description of the commands.

### Power-Up Sequence

The power-up sequence (Sequence #100) is used to initialize the SX, 500, or ZX to a state compatible with the RP240. The power-up sequence is also used to initialize variables.

<code>XE100</code>	Erase sequence #100
<code>XD100</code>	Begin definition of sequence #100
<code>LD0</code>	Enable limits (only if connected, otherwise <b>LD3</b> )
<code>SSH1</code>	Save command buffer on stop
<code>SSN0</code>	Disable Message mode
<code>DSTP1</code>	Enable <b>STOP</b> key
<code>VAR20=5</code>	Variable 20 will be used for the high jog velocity
<code>VAR21=1</code>	Variable 21 will be used for the low jog velocity
<code>XG1</code>	Branch to sequence #1
<code>XT</code>	End definition of sequence #100

### Sequence #1

Sequence #1 provides the main menu for a demonstration program. Control is transferred to another sequence based on a function key input.

<code>XE1</code>	Erase sequence #1
<code>XD1</code>	Begin definition of sequence #1
<code>DCLR0</code>	Clear all lines of the RP240 display
<code>DPC106</code>	Position cursor at row 1, column 6
<code>DTXTCOMPUMOTOR_RP240_DEMO_PROGRAM</code>	
<code>DPC200</code>	Position cursor at row 2, column 0
<code>DTXTACCESS</code>	
<code>DPC235</code>	Position cursor at row 2, column 35
<code>DTXTEXTIT</code>	
<code>VAR1=FUN</code>	Wait for function key and place value in variable 1
<code>IF (VAR1=1)</code>	If function key 1 is pressed
<code>XG2</code>	Branch to sequence 2
<code>NIF</code>	End If
<code>IF (VAR1=6)</code>	If function key 6 is pressed
<code>DCLR0</code>	Clear all lines of the RP240 display
<code>SSA0</code>	Enable echo
<code>SSI0</code>	Enable interactive mode
<code>HALT</code>	Halt program execution
<code>NIF</code>	End If
<code>DPC220</code>	Position cursor at row 2, column 20
<code>DTXTWRONG_BUTTON!</code>	
<code>T1</code>	Time delay of 1 second
<code>XG1</code>	Branch to sequence #1
<code>XT</code>	End definition of sequence #1

### Sequence #2

Sequence #2 prompts for a code number, and then transfers control to sequence #3. If the code number is incorrect, control is passed back to sequence #1.

<code>XE2</code>	Erase sequence #2
<code>XD2</code>	Begin definition of sequence #2
<code>DCLR0</code>	Clear all lines of the RP240 display
<code>DPC100</code>	Position cursor at row 1, column 0
<code>DTXTENTER_CODE_NUMBER_XXXX</code>	
<code>DPC118</code>	Position cursor at row 1, column 18
<code>VAR1=NUM</code>	Wait for numeric keypad input and place in variable 1
<code>IF (VAR1&lt;1234_OR_VAR1&gt;1234)</code>	If variable 1 is less than 1234 or greater than 1234
<code>DPC220</code>	Position cursor at row 2, column 20
<code>DTXTWRONG_NUMBER</code>	
<code>T1</code>	Time delay of 1 second
<code>XG1</code>	Branch to sequence #1
<code>ELSE</code>	Else part of If statement (Variable 1 equals 1234)
<code>XG3</code>	Branch to sequence #3
<code>NIF</code>	End If
<code>XT</code>	End definition of sequence #2

### Sequence #3

Sequence #3 asks for a selection via the function keys. Control is passed to a sequence based upon the function key pressed.

```
XE3          Erase sequence #3
XD3          Begin definition of sequence #3
DCLRØ       Clear all lines of the RP240 display
DPC1ØØ      Position cursor at row 1, column 1
DTXTJOG ___ I/O ___ TEACH MAKE ___ FEED ___ EXIT
DPC2Ø1      Position cursor at row 2, column 1
DTXTAXES ___ TEST ___ MODE ___ MOVE TO LENGTH
VAR1=FUN     Wait for function key and place value in variable 1
IF(VAR1=1) XR4 NIF    If function key 1 was pressed, gosub to sequence #4
IF(VAR1=2) XR5 NIF    If function key 2 was pressed, gosub to sequence #5
IF(VAR1=3) XR6 NIF    If function key 3 was pressed, gosub to sequence #6
IF(VAR1=4) XR7 NIF    If function key 4 was pressed, gosub to sequence #7
IF(VAR1=5) XR8 NIF    If function key 5 was pressed, gosub to sequence #8
IF(VAR1=6) XG1 NIF    If function key 6 was pressed, branch to sequence #1
XG3         Branch to sequence #3
XT          End definition of sequence #3
```

### Sequence #4

Sequence #4 simulates jogging with CW or CCW jog options, and either low or high velocity. The default jog velocities are stored in variables 20 and 21, which were assigned in power-up sequences (sequence #100).

```
XE1          Erase sequence #4
XD1          Begin definition of sequence #4
A75 AD75     Set acceleration and deceleration to 75 rev/sec/sec
VAR1=Ø VAR2=Ø Initialize variables 1 and 2 to zero
MC           Enable continuous mode
MPP          Enable position profiling mode
REPEAT       Repeat all the commands until the UNTIL condition is true
  VAR3=Ø     Set variable 3 equal to zero
  DCLRØ     Clear all lines of the RP240 display
  DPC1Ø2    Position the cursor at row 1, column 2
  DTXTCW ___ CW ___ CCW ___ CCW ___ STOP
  DPC2Ø1    Position the cursor at row 2, column 1
  DTXTLOW ___ HIGH ___ LOW ___ HIGH ___ MOTION
  VAR1=FUN  Wait for function key and place value in variable 1
  WHILE(VAR2<VAR1_OR_VAR2>VAR1_AND_VAR3=0)
    VØ       Set velocity to zero rev/sec
    TØ.3     Wait for 0.3 seconds
    IF(VAR1=1)
      H+ V(VAR21) G Set direction, velocity, and initiate motion
    NIF      End If
    IF(VAR1=2)
      H+ V(VAR2Ø) G Set direction, velocity, and initiate motion
    NIF      End If
    IF(VAR1=3)
      H- V(VAR21) G Set direction, velocity, and initiate motion
    NIF      End If
    IF(VAR1=4)
      H+ V(VAR2Ø) G Set direction, velocity, and initiate motion
    NIF      End If
    IF(VAR1=5)
      H+ V(VAR21) G Set direction, velocity, and initiate motion
    NIF      End If
    IF(VAR1=1)
      DCLRØ     Clear all lines of the RP240 display
      DPC212    Position the cursor at row 2, column 12
      DTXTINVALID_SELECTION
      T1        Wait for 1 second
      XG4       Branch to sequence #4
    NIF      End If
    VAR3=1     Set variable 3 to one
  NWHILE     End WHILE loop
  VAR2=VAR1  Set variable 2 equal to variable 1
UNTIL(VAR1=6) Exit REPEAT UNTIL loop when function key 6 is pressed
VØ          Set velocity to zero
NG          Exit position profiling (MPP) mode
MN          Mode normal (exit mode continuous)
VAR1=Ø     Set variable 1 equal to zero.
XT          End definition of sequence #4
```

## Sequence #5

Sequence #5 provides input status information and then toggles the eight LEDs of the RP240 on and off.

```

XE5           Erase sequence #5
XD5           Begin definition of sequence #5
DCLR0        Clear all lines of the RP240 display
DPC100       Position the cursor at row 1, column 0
DTXTINPUT_STATUS=
DPC200       Position the cursor at row 2, column 0
DTXTUPDATE
DPC233       Position the cursor at row 2, column 33
DTXTOUTPUTS
REPEAT       Repeat all the commands until the UNTIL condition is true
    VAR1=FUN  Wait for function key and place value in variable 1
    DPC113    Position the cursor at row 1, column 13
    IF(IN1) DTXT1 ELSE DTXT0 NIF
    IF(INX1) DTXT1 ELSE DTXT0 NIF
    IF(INXX1) DTXT1 ELSE DTXT0 NIF
    IF(INXXX1) DTXT1 ELSE DTXT0 NIF
    IF(INXXXX1) DTXT1 ELSE DTXT0 NIF
    IF(INXXXXX1) DTXT1 ELSE DTXT0 NIF
    IF(INXXXXXX1) DTXT1 ELSE DTXT0 NIF
    IF(INXXXXXXX1) DTXT1 ELSE DTXT0 NIF
    IF(INXXXXXXXX1) DTXT1 ELSE DTXT0 NIF
UNTIL(VAR1=6) Exit REPEAT UNTIL loop when function key 6 is pressed
DCLR0        Clear all lines of the RP240 display
DPC100       Position the cursor at row 1, column 0
DTXTTHE_LEDS_BELOW_WILL_CHANGE_STATE
DLED00000001 T1 Turn on LED 8 and wait 1 second
DLED00000011 T1 Turn on LEDs 7 and 8 and wait 1 second
DLED00000111 T1 Turn on LEDs 6, 7 and 8 and wait 1 second
DLED00001111 T1 Turn on LEDs 5, 6, 7 and 8 and wait 1 second
DLED00011111 T1 Turn on LEDs 4, 5, 6, 7 and 8 and wait 1 second
DLED00111111 T1 Turn on LEDs 3, 4, 5, 6, 7 and 8 and wait 1 second
DLED01111111 T1 Turn on LEDs 2, 3, 4, 5, 6, 7 and 8 and wait 1 second
DLED11111111 T1 Turn on LEDs 1, 2, 3, 4, 5, 6, 7 and 8 and wait 1 second
VAR1=0       Set variable 1 equal to zero.
XT           End definition of sequence #5

```

## Sequence #6

Sequence #6 demonstrates teaching moves that can be executed from sequence #7. This sequence uses the jog routine from sequence #4 to move to the desired locations. The distances taught are assigned to variables using other sequences (13, 14, and 15 in this example). The total number of moves taught is limited by the number of variables and the number of available sequences.

```

XE6           Erase sequence #6
XD6           Begin definition of sequence #6
MPA          Enable absolute positioning mode
MN           Enable preset mode
VAR28=13     Set variable 28 equal to 13 (First sequence to teach)
VAR29=1      Set variable 29 equal to 1
VAR30=1      Set variable 30 equal to 1
REPEAT       Repeat all the commands until the UNTIL condition is true
    DCLR0        Clear all lines of the RP240 display
    DPC100       Position the cursor at row 1, column 0
    DTXTHOW_MANY_MOVES_TO_TEACH?_x
    DPC200       Position the cursor at row 2, column 0
    DTXT(MAXIMUM_OF_THREE_MOVES)
    DPC125       Position the cursor at row 1, column 25
    VAR30=NUM    Wait for numeric keypad input and place in variable 30
UNTIL(VAR30>0_AND_VAR30<4) Exit REPEAT UNTIL loop when number entered is 1,2 or 3
L(VAR30)     Loop the number of times specified in variable 30
    PZ           Set the current position to absolute zero
    DCLR0        Clear all lines of the RP240 display
    DPC100       Position the cursor at row 1, column 0
    DTXTPLEASE_MAKE_MOVE#_
    DVO29,2,0,0 Display variable 29
    DPC200       Position the cursor at row 2, column 0
    T1           Wait 1 second
    XR4          Gosub to sequence #4
    XR(VAR28)    Gosub to the sequence specified in variable 28
    VAR28=VAR28+1 Increment variable 28 by 1
    VAR29=VAR29+1 Increment variable 29 by 1
N           End loop
VAR1=0       Set variable 1 equal to zero.
XT           End definition of sequence #6

```

## Sequence #7

Sequence #7 performs the moves taught in sequence #6. The distance for each move is based upon the distance that was stored in a variable in sequence #6.

```

XE7           Erase sequence #7
XD7           Begin definition of sequence #7
A100         Set acceleration to 100 rev/sec/sec
AD100        Set deceleration to 100 rev/sec/sec
MPI          Enable incremental position mode
PZ           Set the current position to absolute zero
V10          Set velocity to 10 rev/sec
VAR29=20     Set variable 29 equal to twenty
L(VAR30)     Loop the number of times specified by variable 30
  XR(VAR29)  Gosub to the sequence specified by variable 29
  G          Initiate motion
  VAR29=VAR29+1 Increment variable 29
N            End loop
VAR1=0       Set variable 1 equal to zero.
XT           End definition of sequence #7

```

## Sequence #8

Sequence #8 prompts the operator to select the feed length, maximum speed and count of items to be cut.

```

XE8           Erase sequence #8
XD8           Begin definition of sequence #8
DCLR0        Clear all lines of the RP240 display
DPC101       Position the cursor at row 1, column 1
DTXTSELECT_FEED_LENGTH,_MAX_SPEED,_&_COUNT
T2           Wait for 2 seconds
REPEAT       Repeat all the commands until the UNTIL condition is true
  DCLR0        Clear all lines of the RP240 display
  VAR2=0       Set variable 22 equal to zero (used to exit repeat loop)
  DPC102       Position the cursor at row 1, column 2
  DTXTENTER_FEED_LENGTH_IN_INCHES :_(0-99.9)
  DPC212       Position the cursor at row 2, column 12
  DTXTFEED_LENGTH=xx.x
  DPC224       Position the cursor at row 2, column 24
  VAR2=NUM     Wait for numeric keypad input and place in variable 2
  IF(VAR2>99.9_OR_VAR2<0) If variable 2 is greater than 99.9 or less than 0
    DCLR0        Clear all lines of the RP240 display
    DPC215       Position the cursor at row 2, column 15
    DTXTOUT_OF_RANGE
    T2           Wait for two seconds
  ELSE        Else (variable 2 is greater than 0 and less than 99.9)
    DCLR0        Clear all lines of the RP240 display
    DPC112       Position the cursor at row 1, column 12
    DTXTFEED_LENGTH=
    DPC125       Position the cursor at row 1, column 25
    DVO2,2,1,0  Display variable 2
    DPC202       Position the cursor at row 2, column 2
    DTXTYES
    DPC236       Position the cursor at row 2, column 36
    DTXTNO
    VAR22=FUN
  NIF
UNTIL(VAR22=1) Exit REPEAT UNTIL loop when variable 22 equals one
REPEAT       Repeat all the commands until the UNTIL condition is true
  DCLR0        Clear all lines of the RP240 display
  VAR2=0       Set variable 22 equal to zero (used to exit repeat loop)
  DPC101       Position the cursor at row 1, column 1
  DTXTENTER_MAX_SPEED_(RPM) :_(0-2400RPM)
  DPC215       Position the cursor at row 2, column 15
  DTXTMAX_SPEED=xxxxx
  DPC225       Position the cursor at row 2, column 25
  VAR3=NUM     Wait for numeric keypad input and place in variable 3
  IF(VAR3>2400_OR_VAR3<0) If variable 3 is greater than 2400 or less than 0
    DCLR0        Clear all lines of the RP240 display
    DPC215       Position the cursor at row 2, column 15
    DTXTOUT_OF_RANGE
    T2           Wait for two seconds
  ELSE        Else (variable 3 is greater than 0 and less than 2400)
    DCLR0        Clear all lines of the RP240 display
    DPC114       Position the cursor at row 1, column 14
    DTXTMAX_SPEED=
    DPC125       Position the cursor at row 1, column 25
    DVO3,4,2,0  Display variable 3
    DPC202       Position the cursor at row 2, column 2

```

DTXTYES	
DPC236	Position the cursor at row 2, column 36
DTXTNO	
VAR22=FUN	Wait for a function key to be pressed
NIF	End If
UNTIL (VAR22=1)	Exit REPEAT UNTIL loop when variable 22 equals one
REPEAT	Repeat all the commands until the UNTIL condition is true
DCLRØ	Clear all lines of the RP240 display
VAR22=Ø	Set variable 22 equal to zero (used to exit repeat loop)
DPC1Ø3	Position the cursor at row 1, column 1
DTXTENTER_TOTAL_NUMBER_OF_CUTS :_(1-1ØØ)	
DPC21Ø	Position the cursor at row 2, column 10
DTXTTOTAL_#_OF_CUTS=xxx	
DPC226	Position the cursor at row 2, column 26
VAR4=NUM	Wait for numeric keypad input and place in variable 4
IF (VAR4>1ØØ_OR_VAR4<1)	If variable 4 is greater than 100 or less than 1
DCLRØ	Clear all lines of the RP240 display
DPC215	Position the cursor at row 2, column 15
DTXTOUT_OF_RANGE	
T2	Wait for two seconds
ELSE	Else (variable 4 is greater than 1 and less than 100)
DCLRØ	Clear all lines of the RP240 display
DPC113	Position the cursor at row 1, column 13
DTXT#_OF_CUTS=	
DPC124	Position the cursor at row 1, column 24
DVO4,3,Ø,Ø	Display variable 3
DPC2Ø2	Position the cursor at row 2, column 2
DTXTYES	
DPC236	Position the cursor at row 2, column 36
DTXTNO	
VAR22=FUN	Wait for a function key to be pressed
NIF	End If
UNTIL (VAR22=1)	Exit REPEAT UNTIL loop when variable 22 equals one
REPEAT	Repeat all the commands until the UNTIL condition is true
DCLRØ	Clear all lines of the RP240 display
DPC2Ø1	Position the cursor at row 2, column 1
DTXTSTART	
DPC235	Position the cursor at row 2, column 35
DTXTEXIT	
VAR22=FUN	Wait for a function key to be pressed
IF (VAR22=1_OR_VAR22=6)	If variable 1 equals 1 or 6 do nothing
ELSE	Else, display an error message
DCLRØ	Clear all lines of the RP240 display
DPC212	Position the cursor at row 2, column 12
DTXTINVALID_SELECTION	
T2	Wait two seconds
NIF	End If
UNTIL (VAR22=1_OR_VAR22=6)	Exit REPEAT UNTIL loop when variable 22 equals 1 or 6
IF (VAR22=6)	If variable 22 equals 6
XG3	Branch to sequence #3
NIF	End If
DCLRØ	Clear all lines of the RP240 display
VAR5=VAR2*25ØØØ	Variable 5 equals distance, assuming 25000 steps/inch
VAR6=VAR3/6Ø	Variable 6 equals velocity in RPM
VAR7=VAR4	Using variable 7 as count down value
LD3	Enable limits
MN	Mode normal (preset moves)
A1ØØ	Set acceleration to 100 rev/sec/sec
AD1ØØ	Set deceleration to 100 rev/sec/sec
V (VAR6)	Set velocity to the value specified by variable 6
D (VAR5)	Set distance to the value specified by variable 5
DPC211	Position the cursor at row 2, column 11
DTXT#_LEFT_TO_CUT:	
L (VAR4)	Loop the number of times specified by variable 4
DPC225	Position the cursor at row 2, column 25
DVO7,3,Ø,Ø	Display variable 7
G	Initiate motion
VAR7=VAR7-1	Decrement variable 7
T.1	Wait 0.1 seconds
N	End loop
DCLRØ	Clear all lines of the RP240 display
DPC213	Position the cursor at row 2, column 13
DTXTJOB_COMPLETED!	
T1.5	Set distance to the value specified by variable 5
XG3	Branch to sequence #3
XT	End definition of sequence #8



## Sequences #13,#14,#15

Sequences #13, #14, and #15 store the current position into variables 6, 7, and 8, respectively.

<code>XE13</code>	Erase sequence #13
<code>XD13</code>	Begin definition of sequence #13
<code>VAR6=POS</code>	Variable 6 equals the current position
<code>XT</code>	End definition of sequence #13
<code>XE14</code>	Erase sequence #14
<code>XD14</code>	Begin definition of sequence #14
<code>VAR7=POS</code>	Variable 7 equals the current position
<code>XT</code>	End definition of sequence #14
<code>XE15</code>	Erase sequence #15
<code>XD15</code>	Begin definition of sequence #15
<code>VAR8=POS</code>	Variable 8 equals the current position
<code>XT</code>	End definition of sequence #15

## Sequences #20,#21,#22

Sequences #20, #21, and #22 set distance to the value stored in variables 6, 7, and 8, respectively.

<code>XE20</code>	Erase sequence #20
<code>XD20</code>	Begin definition of sequence #20
<code>D(VAR6)</code>	Set distance to the value stored in variable 6
<code>XT</code>	End definition of sequence #20
<code>XE21</code>	Erase sequence #21
<code>XD21</code>	Begin definition of sequence #21
<code>D(VAR7)</code>	Set distance to the value stored in variable 7
<code>XT</code>	End definition of sequence #21
<code>XE22</code>	Erase sequence #22
<code>XD22</code>	Begin definition of sequence #22
<code>D(VAR8)</code>	Set distance to the value stored in variable 8
<code>XT</code>	End definition of sequence #22

## Editing Sequences

If you wish to edit sequences in your SX, ZX, or Model 500, you must re-establish RS-232C communication **before** downloading the new sequences to the controller. Compumotor recommends using the following procedure.

- ① Remove power from your controller and the RP240.
- ② Remove connections between the controller and the RP240.
- ③ Connect Rx, Tx, and Ground between the controller and your RS-232C port.
- ④ Apply power to your controller.
- ⑤ Enter the TERMINAL EMULATOR portion of your communication software (preferably Compumotor's X-Ware).  
Initially you will not be able to establish communications if you have turned off command echo (`SSA1`) in your power-up sequence.
- ⑥ If using X-Ware `Device Not Ready` will appear on your screen (if you have disabled the command echo). Press the `<ENTER>` key. Next, press the `Y` key to enter the Terminal Emulator.
- ⑦ To terminate the power-up sequence, and turn on the command echo as well as the interactive mode, issue the following commands:  
`K <cr>`  
`SSA0 <cr>`  
`SSI0 <cr>`
- ⑧ Check the controller's status by issuing a `aR` command, where `a` is the device address (`1R <cr>`, for example). The controller should respond with a `*R`. If you do not receive a `*R`, consult the RS-232C Troubleshooting section of your controller user guide.
- ⑨ Edit the sequence as usual (If using X-Ware, hit the `<ESC>` key, then use arrow keys to select the Editor menu).

## Daisy Chaining

This section describes daisy chaining multiple Extended X language products with an RP240.

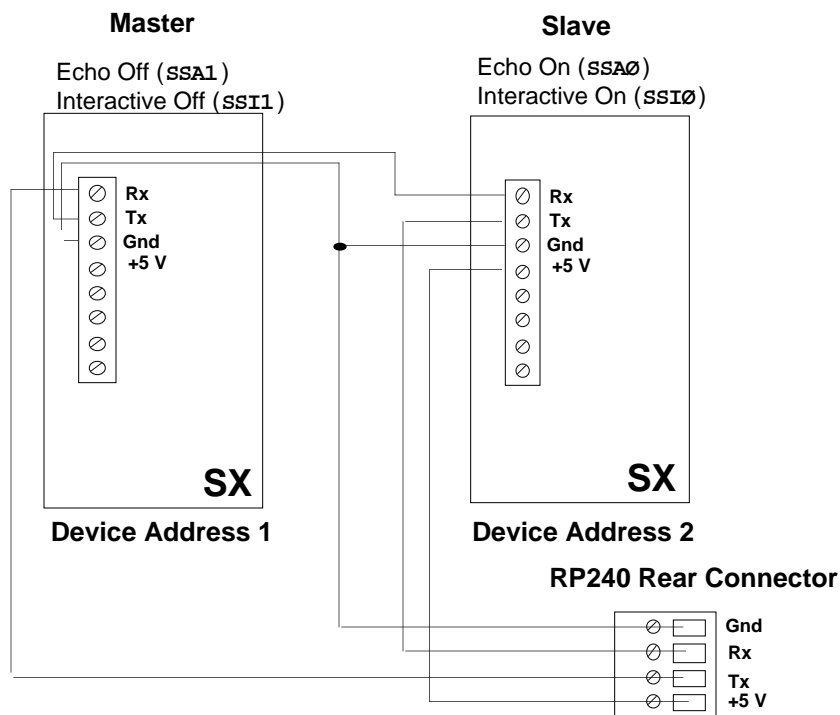
More than one SX, Model 500, or ZX can be daisy chained to a single RP240. Daisy chaining up to 16 units is not a trivial programming assignment. When multiple units are daisy chained together, one unit must act as the master, controlling all the slaves down the line. The RP240 must be placed at the end of the daisy chain, where it is a slave. The master unit must control all the messages displayed on the RP240, in addition to processing the input from the RP240. The master unit must also control the motion of all the other slave units. Controlling the motion of the slave units can be accomplished by either pre-programming sequences in the slave units and activating them with I/O from the master, or by sending the motion command across the RS-232C daisy chain via the Quote (") command or the Transmit Data (TX) command. In either case, motion between the master and slave units must be coordinated. It is good programming practice to download all desired sequences to each controller *before* wiring the daisy chain.

### CAUTION

When programming two daisy chained units, take caution in using the DSTP and DCNT command. The STOP and PAUSE keys only affect the master unit (i.e., if you issue a K command only the master unit will stop).

To set up the daisy chain, some command statements must be issued. Command Echo (SSA) and Interactive mode (SSI) must be turned off on the first unit (master) in the daisy chain. Command echo in all the succeeding units (slaves) must be turned on.

👉 Helpful Hint:  
Daisy Chain Wiring  
Diagram



Daisy Chain  
Sample  
Program

The following sample program demonstrates how to daisy chain two units and control the second across RS-232C. The program is downloaded to the master (device address 1).

## Power-Up Sequence

The power-up sequence (Sequence #100) is used to initialize the SX, 500, or ZX to a state compatible with the RP240.

<u>Command</u>	<u>Description</u>
1XE100	Erase sequence #100
1XD100	Begin definition of sequence #100
1LD3	Disable limits (Use <b>LD0</b> if limits are hard wired)
1SSA1	Disable command echo
1SSH1	Save command buffer on STOP
1SSI1	Disable Interactive mode
1"2E	Enable communications on axis 2
1"2LD3	Disable limits on axis 2
1"2SSA0	Enable command echo on axis 2
1"2SSI0	Enable interactive mode on axis 2
1"2F	Disable communications on axis 2
1DSTP0	Disable <b>STOP</b> key
1DCNT0	Disable <b>PAUSE</b> and <b>CONTINUE</b> keys
1XG1	Branch to sequence #1
1XT	End definition of sequence #100

## Sequence #1

Sequence #1 instructs you to enter the axis to jog. The you are allowed to jog axis one or axis two.

```

1XE1
1XD1
1A100
1V4
1MC
1"2E
1"2A100
1"2V2
1"2MC
1"2F
1DCLR0
1DPC101
1DXTWHICH_AXIS_DO_YOU_WANT_TO_JOG?
1DPC200
1DXTAXIS_1__AXIS_2
1DPC235
1DXTEXIT
1L
1VAR1=FUN
1IF(VAR1=1) 1XG2 1NIF
1IF(VAR1=2) 1XG3 1NIF
1IF(VAR1=6) 1DCLR0 1SSA0 1SSI0 1"2E 1HALT 1NIF
1N
1XT

```

## Sequence #2

Sequence #2 jogs axis 1.

```

XE2
XD2
1DCLR0
1DPC102
1DXTJOG___STOP___JOG
1DPC202
1DXTCCW_____CW
1DPC235
1DXTEXIT
1MPP
1L
1VAR1=FUN
1IF(VAR1=1) 1H- 1G 1NIF
1IF(VAR1=2) 1STOP 1NIF
1IF(VAR1=3) 1H+ 1G 1NIF
1IF(VAR1=6) 1STOP 1XG1 1NG 1NIF
1N
1NG
XT

```

### Sequence #3

### Sequence #3 jogs axis 2.

```
XE3
XD3
1DCLR0
1DPC102
1DXTJOG___STOP___JOG
1DPC202
1DXTCCW_____CW
1DPC235
1DXTEXIT
1MPP
1L
1VAR1=FUN
1IF(VAR1=1) 1"2E 1"2H- 1"2G 1"2F 1NIF
1IF(VAR1=2) 1"2E 1"2S 1"2F 1NIF
1IF(VAR1=3) 1"2E 1"2H+ 1"2G 1"2F 1NIF
1IF(VAR1=6) 1"2E 1"2S 1"2F 1XG1 1NG 1NIF
1N
1NG
XT
```

# C H A P T E R ⑤

## **6000 Series Command Summary and Application Design**

### Chapter Objectives

The information in this chapter will enable you to:

- Program the 6200 or 6250 to control the RP240
- Customize the system to meet your requirements

#### **PROGRAMMING NOTE**

This chapter provides the 6000 Series programming information that is required to communicate with the RP240. If you are using an Extended X product (SX, ZX, or 500), refer to *Chapter ④ Extended X Command Summary and Application Design*.

### 6000 Series Command Summary

<b>Command</b>	<b>Description</b>
<b>DCLEAR</b>	Clear the display
<b>DJOG</b>	Enable/Disable RP240 Jog Mode
<b>DLED</b>	Turn RP240 LEDs On/Off
<b>DPASS</b>	Change RP240 Password
<b>DPCUR</b>	Position Cursor
<b>DREAD</b>	Read RP240 Data from Numeric Keypad
<b>DREADF</b>	Read RP240 Function Keys
<b>DVAR</b>	Display Variable on RP240 LCD
<b>DWRITE</b>	Write Text to RP240 LCD

# Description 6000 Series Command Format

The following is a definition of the format fields for the 6000 Series commands.

<p>① <b>DCLEAR</b>    ② <b>Clear Display</b></p> <p>④ <b>Type</b>            Display (RP240) Interface</p> <p>⑤ <b>Syntax</b>            &lt;!&gt;DCLEARin/a</p> <p>⑥ <b>Units</b>             n/a</p> <p>⑦ <b>Range</b>            i = 0 (clear all lines), 1 (clear line 1), or 2 (clear line 2)</p> <p>⑧ <b>Default</b>           n/a</p> <p>⑨ <b>Response</b>        n/a</p> <p>⑩ <b>See Also</b>        DLED, DPASS, DPCUR, DVAR, DWRITE</p>	<table border="0"> <tr> <td style="text-align: right;"><b>③ Product</b></td> <td style="text-align: left;"><b>Rev</b></td> </tr> <tr> <td style="text-align: right;">6200</td> <td style="text-align: left;">1.0</td> </tr> <tr> <td style="text-align: right;">6250</td> <td style="text-align: left;">1.0</td> </tr> </table>	<b>③ Product</b>	<b>Rev</b>	6200	1.0	6250	1.0
<b>③ Product</b>	<b>Rev</b>						
6200	1.0						
6250	1.0						

Field Number	Field Description
①	<u>Mnemonic Code</u> : This field contains the command's mnemonic code.
②	<u>Full Name</u> : This field contains the command's full name.
③	<u>Valid Product &amp; Revision</u> : This field lists the 6000 Series products and the revision of each product when this command was incorporated. If the command does not apply to that particular product, the Rev is specified as n/a.
④	<u>Type</u> : This field contains the command's type. Since we are working with the RP240, this field will always display <i>Display (RP240) Interface</i> .
⑤	<u>Syntax</u> : The proper syntax for the command is shown here. The specific parameters associated with the command are also shown.
⑥	<u>Units</u> : This field describes what unit of measurement the parameter (b, d, i, r, or t) in the command syntax represents.
⑦	<u>Range</u> : This is the range of valid values that you can specify for an argument (or any other parameter specified).
⑧	<u>Default</u> : The default setting for the command is shown in this field. A command will perform its function with the default setting if you do not provide a value.
⑨	<u>Response</u> : Some commands allow you to check the status of the command. In the example above, entering the DCLEAR command by itself will result in an error message. The example responses provided are based on the default error level, Error Level 4, established with the ERRLVL command in the <i>6000 Series Software Reference Guide</i> .
⑩	<u>See Also</u> : Commands related or similar to the command described are listed here. Refer to the 6000 Series Software Reference Guide for additional information.

# RP240 X Language Command Listing

---

<b>DCLEAR</b>	<b>Clear Display</b>	<b>Product</b>	<b>Rev</b>
<b>Type</b>	Display (RP240) Interface	6200	1.0
<b>Syntax</b>	<!>DCLEARi	6250	1.0
<b>Units</b>	n/a		
<b>Range</b>	i = 0 (clear all lines), 1 (clear line 1), or 2 (clear line 2)		
<b>Default</b>	n/a		
<b>Response</b>	n/a		
<b>See Also</b>	DLED, DPASS, DPCUR, DVAR, DWRITE		

The Clear Display (DCLEAR) command clears lines (as specified with *i*) of the RP240 display:

After clearing a line, the cursor will be reset to the beginning of that line (or to the beginning of line 1 if all lines are cleared).

---

<b>DJOG</b>	<b>Enable RP240 Jog Mode</b>	<b>Product</b>	<b>Rev</b>
<b>Type</b>	Display (RP240) Interface	6200	1.0
<b>Syntax</b>	<!>DJOG<b>	6250	1.0
<b>Units</b>	n/a		
<b>Range</b>	b = 0 (disable) or 1 (enable)		
<b>Default</b>	n/a		
<b>Response</b>	0408 DJOG: *DJOG1		
<b>See Also</b>	JOG, JOGA, JOGAD, JOGVH, JOGVL		

The DJOG command allows you to branch into the RP240 front panel jog mode from within your user-defined program, adjust the position of the axes, and then return to program execution.

The DJOG1 command enables the RP240 jog mode on all axes. Once the RP240 jog mode is enabled, you can use the RP240 arrow keys to jog individual axes. Unlike the JOG command, command processing is suspended after the DJOG1 command is issued. Jogging is performed with the parameters set with the Jog Acceleration (JOGA) and Jog Deceleration (JOGAD) commands.

To disable the RP240 jog mode, press the MENU RECALL key or issue the immediate !DJOG0 command. Upon exiting the RP240 jog mode, the RP240's display is cleared

To have the jog mode continually enabled during program execution, you must use jog inputs and the JOG command.

---

<b>DLED</b>	<b>Turn RP240 Display LEDs On/Off</b>	<b>Product</b>	<b>Rev</b>
<b>Type</b>	Display (RP240) Interface	6200	1.0
<b>Syntax</b>	<!>DLED<b><b><b><b><b><b><b><b>	6250	1.0
<b>Units</b>	n/a		
<b>Range</b>	b = 0 (off) or 1 (on)		
<b>Default</b>	n/a		
<b>Response</b>	DLED: *DLED1101_0001		
<b>See Also</b>	DCLEAR, DPASS, DPCUR, DVAR, DWRITE		

The DLED command controls the state of the 8 programmable LEDs on the RP240. *It is legal to substitute a binary variable (VARB) for the DLED command*

<b>Example</b>	<b>Description</b>
> DLED11XXXX01	Turn on LEDs 1, 2, and 8; turn off LED 7; leave LEDs 3,4,5, and 6 unchanged
> VARB1=b10101010	Set bits 1, 3, 5 & 7 low, and bits 2, 4, 6, & 8 high
> DLED(VARB1)	Turn on LEDs 1, 3, 5 & 7; turn off LEDs 2, 4, 6, & 8

<b>DPASS</b>		<b>Change RP240 Password</b>	<b>Product</b>	<b>Rev</b>
<b>Type</b>	Display (RP240) Interface		6200	1.0
<b>Syntax</b>	<!*>DPASS<i>		6250	1.0
<b>Units</b>	i = integer of up to 4 characters			
<b>Range</b>	1 - 9999			
<b>Default</b>	6200 or 6250 (depending on if you have a 6200 or 6250)			
<b>Response</b>	DPASS: *DPASS6200			
<b>See Also</b>	DCLEAR, DLED, DPCUR, DVAR, DWRITE			

The DPASS command changes the RP240 password. If the default password is not changed by the user, there will be no password protection.

<b>Example</b>	<b>Description</b>
> DPASS1234	New password = 1234

<b>DPCUR</b>		<b>Position Cursor</b>	<b>Product</b>	<b>Rev</b>
<b>Type</b>	Display (RP240) Interface		6200	1.0
<b>Syntax</b>	<!*>DPCURi,i		6250	1.0
<b>Units</b>	1st i = line number, 2nd i = column			
<b>Range</b>	line number = 1 or 2, column = 0 - 39			
<b>Default</b>	n/a			
<b>Response</b>	n/a			
<b>See Also</b>	DCLEAR, DLED, DPASS, DVAR, DWRITE			

The DPCUR command changes the location of the cursor on the RP240 display. The RP240 lines are numbered from top to bottom, 1 to 2. The columns are numbered left to right, 0 to 39.

<b>Example</b>	<b>Description</b>
> DPCUR2,15	Position cursor on line 2, column 15

<b>[ DREAD ]</b>		<b>Read RP240 Data</b>	<b>Product</b>	<b>Rev</b>
<b>Type</b>	Display (RP240) Interface		6200	1.0
<b>Syntax</b>	See below		6250	1.0
<b>Units</b>	n/a			
<b>Range</b>	n/a			
<b>Default</b>	n/a			
<b>Response</b>	n/a			
<b>See Also</b>	DREADF, DVAR, DWRITE, VAR			

The Read RP240 Data (DREAD) command allows you to store numeric data entered in from the RP240's keypad into a variable. As the user presses RP240 numeric keys, the data will be displayed on the RP240 starting at the location equal to the current cursor location + 1 (for a sign bit):

VAR1=DREAD      Wait for RP240 numeric entry (terminated with the ENTER key), then set VAR1 equal to that value.

Additionally the DREAD command can be used as a variable assignment within another command that is expecting numeric data:

A(DREAD),5.0      Wait for RP240 numeric entry (terminated with the ENTER key), then set axis #1 acceleration to that value and set axis #2 acceleration to 5.0.

The DREAD command cannot be used in an expression such as VAR5=4+DREAD or IF(DREAD=1).



---

## [ DREADF ] Read RP240 Function Key

**Product** **Rev**

6200 1.0  
6250 1.0

**Type** Display (RP240) Interface  
**Syntax** See below  
**Units** n/a  
**Range** n/a  
**Default** n/a  
**Response** n/a  
**See Also** DREAD, DVAR, DWRITE, VAR

The Read RP240 Function Key (DREADF) command allows you to store numeric data entered in from a RP240 function key into a variable. Function key 1 (F1) = 1, F2 = 2, etc., and MENU RECALL (F0) = 0.

### Example

```
> VAR1=DREADF  
  
> IF(VAR1=5)  
GOx1  
NIF
```

### Description

Wait for RP240 function key entry, then set VAR1 equal to that value  
If function key 5 was hit then ...  
Start motion on axis #2  
End if statement

---

## DVAR Display Variable on RP240

**Product** **Rev**

6200 1.0  
6250 1.0

**Type** Display (RP240) Interface  
**Syntax** <!>DVARi,<i>,<i>,<i>  
**Units** See below  
**Range** n/a  
**Default** See below  
**Response** n/a  
**See Also** DREAD, DREADF, DWRITE, VAR

The Display Variable on RP240 (DVAR) command is used to display a numeric variable on the RP240's LCD at the current cursor location:

1<sup>st</sup> i = Variable number [Range 1 - 150]  
2<sup>nd</sup> i = Number of whole digits displayed (left of decimal point) [Range 0 - 9]  
3<sup>rd</sup> i = Number of fractional digits displayed (right of decimal point) [Range 0 - 8]  
4<sup>th</sup> i = Sign bit: 0 = no sign displayed, 1 = display + or -

### Example

```
> VAR2=542.14  
> DVAR2,6,3,1  
> DVAR2,3,1,0  
> DVAR2,3,,1
```

### Description

Assign the value 542.14 to variable #2  
Display variable #2 as +000542.140  
Display variable #2 as 542.1  
Display variable #2 as +542

---

## DWRITE Write Text on RP240

**Product** **Rev**

6200 1.0  
6250 1.0

**Type** Display (RP240) Interface  
**Syntax** <!>DWRITE"message"  
**Units** n/a  
**Range** Message can be ≤ 70 characters (may not use characters ", \ or :)  
**Default** See below  
**Response** n/a  
**See Also** DCLEAR, DLED, DPASS, DPCUR, DVAR

The Write Text on RP240 (DWRITE) command displays a message on the RP240's LCD starting at the current cursor location. A message is a character string of up to 70 characters in length. The characters within the string may be any characters except quote ("), backslash (\), and colon (:). Strings that have lower-case letters will be converted to upper case prior to display (see example).

### Example

```
> DCLEAR0  
> DPCUR1,12  
> DWRITE"Enter Number of Parts"  
> VAR1=DREAD
```

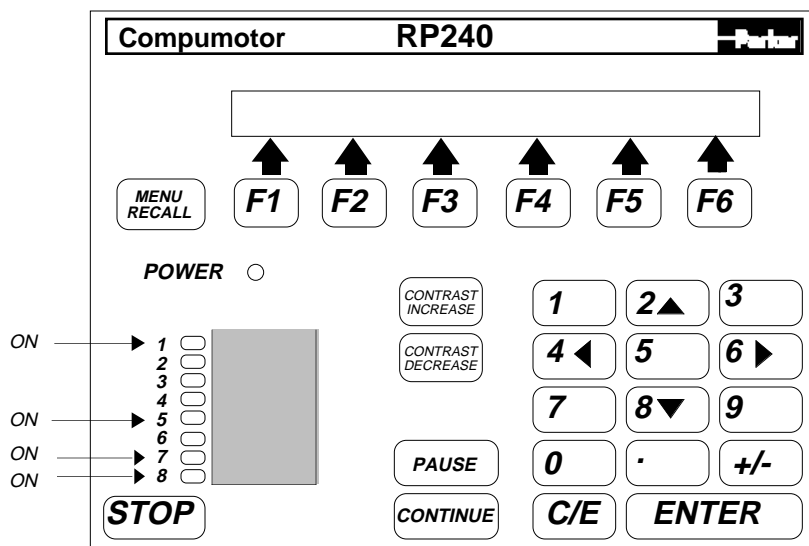
### Description

Clear RP240 display  
Move cursor to line 1, column 12  
RP240 will display: ENTER NUMBER OF PARTS  
RP240 waiting for data entry

## Prompting an Operator or Displaying Information

In many motion control applications, the most important requirement is the operator interface. Presenting information to an operator in a desired format is often difficult at best. The RP240 has two visual indicators to help present information to the operator. The simplest indicator is the 8 LEDs on the panel. These LEDs can be turned on or off with the **DLED** command. The LEDs can be used in conjunction with the outputs to show the state of an output, or they can be used to show status, such as motor moving, specific sequence in progress, etc.

IF a **DLED10001011** command is issued, the LEDs shown below would be illuminated. These eight LEDs can be labeled, using the slide-in card provided, to represent cycle status, output status, etc.



The other indicator is the two line, 40-character LCD display. The Position Cursor (**DPCUR**) command allows the user to program the location of the cursor on the LCD display. The Write Text Data on RP240 Display (**DWRITE**) command allows the user to place text, beginning at the current cursor location, on the LCD display.

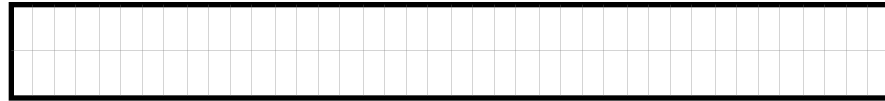
## 6000 Series Command Programming Example

A user wants his operator to see the message `ENTER THE CYCLE COUNT`. He wants this message placed on line two, starting after two spaces in from the left. He also wants the user to be able to enter the cycle count three spaces after the message. Below are the steps required to accomplish this.

**The cursor does not appear on the display. The cursor is displayed when the `VARn=DREAD` command is used.**

Step 1

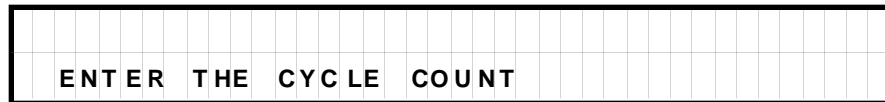
Issue the `DPCUR2,2` command



Cursor Location

Step 2

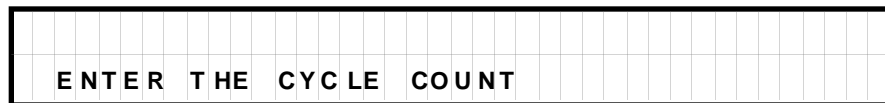
Issue the `DWRITE"ENTER THE CYCLE COUNT"` command



Cursor Location

Step 3

Issue the `DPCUR2,25` command



Cursor Location

Now that we have provided the operator with the prompting message, how do we obtain the information? The Read RP240 Data (`VARn=DREAD`) or Read RP240 Function Keys (`VARn=DREADF`) commands provide the answer. The `VARn=DREAD` command will allow the operator to enter information. The numbers, as entered, will be displayed at the current cursor location.

Step 4

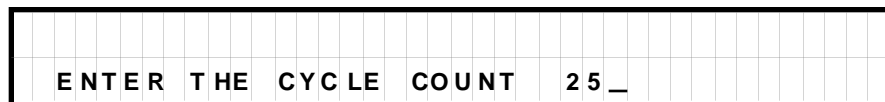
Issue the `VAR1=DREAD` command



Cursor Location

Step 5

Press a 2, followed by a 5

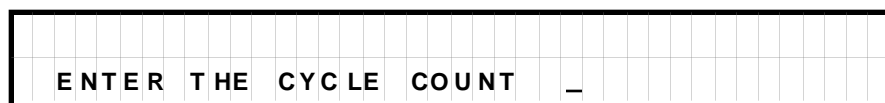


Cursor Location

If the wrong value is entered press the `C/E` key and re-enter the value.

Step 6

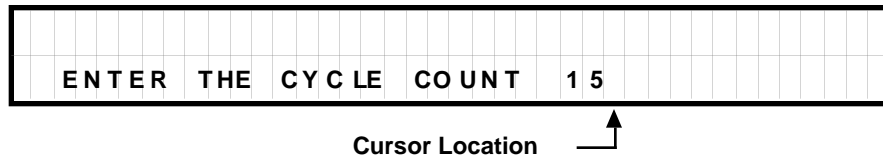
Press the `C/E` key



Cursor Location

Step 7

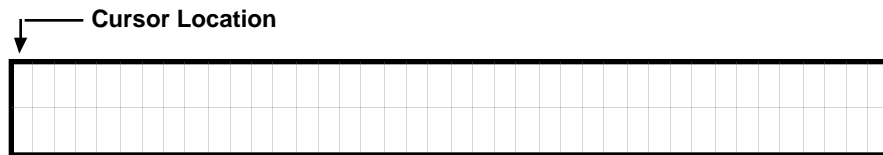
Press a 1, followed by a 5, followed by an ENTER



After the ENTER key is pressed, the value 15 will be stored in variable 1. Use the VARn=DREADF command to enter information based on function key input. Steps 8 through 14 illustrate this capability.

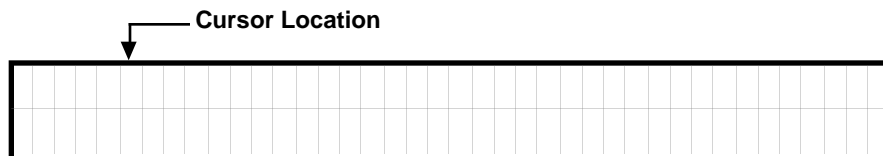
Step 8

DCLEARØ command is issued.



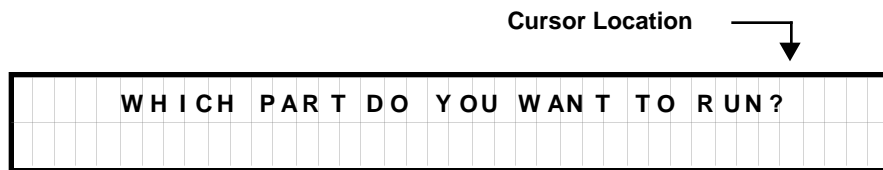
Step 9

Issue the DPCUR1,5 command



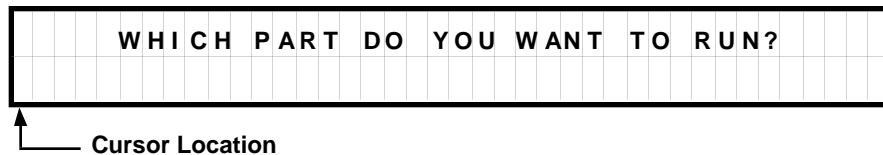
Step 10

Issue the DWRITE"WHICH PART DO YOU WANT TO RUN?" command



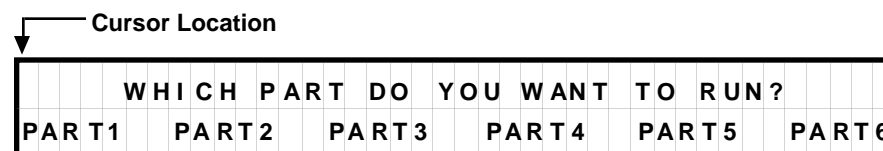
Step 11

Issue the DPCUR2,Ø command



Step 12

Issue the DWRITE"PART1 PART2 PART3 PART4 PART5 PART5 PART6" command. This text serves as an operator menu for the function keys.



Step 13

Issue the VAR2=DREADF command

The VARn=DREADF command waits for a function (F1 - F6) key or the MENU RECALL key to be pressed. When one of these keys is pressed, the number corresponding to the function key will be transmitted from the RP240 to the 6000 Series product. Function keys 1—6 will return the values 1—6. The MENU RECALL key will return a zero.

Step 14

Press F1

After the F1 key is pressed, the RP240 will transmit the value 1 to the 6000 Series product. This value will be stored in variable 2.





---

## Direct RP240 Control

### Chapter Objectives

The information in this chapter will enable you to:

- ❑ Control the RP240 without the use of an Extended X or 6000 Series product

#### **PROGRAMMING NOTE**

The information provided in this chapter is intended for users of the RP240 that do not have an Extended X or 6000 Series product. If you are using a Extended X product (SX, ZX, or 500), refer to *Chapter ④ Extended X Command Summary and Application Design*. If you are using a 6000 Series product (6200 or 6250) refer to *Chapter ⑤ 6000 Series Command Summary and Application Design*.

### RP240 Overview

---

The RP240 uses a Intel 8051 microprocessor to respond to keypress information and to display data on the LCD. The microprocessor receives commands via RS-232C (9600 baud, 8 data bits, 1 stop bit, no parity) from a "master" controller. The RP240 acts as a "slave" to the "master". There is no program storage and no program execution capability in the RP240. The RP240 can only parse and execute the commands summarized below.

### Command Summary

---

There are two modes of operation for the RP240. The default mode is the Extended X mode. In this mode, the function keys, numeric keypad, stop key, and pause and continue keys must all be enabled before they can be used. The RP240 will not report any keystrokes until the corresponding key or group of keys has been enabled.

The other mode of operation for the RP240 is the 6000 mode. In this mode, the RP240 will report back every key that was pressed and every key that was released.

If the desired mode of operation is Extended X, simply use the commands listed below. If the desired mode of operation is 6000, then the command **\*B<cr>** must be issued to the RP240.

The commands below only require sending an asterisk, followed by a letter, and a carriage return. All the commands below are valid with Extended X mode.

Command	Description	Valid in 6000 Mode
*B<cr>	Enable 6000 mode	Yes
*C<cr>	Report # of RP240 display lines	Yes
*D<cr>	STOP key enable	-
*E<cr>	STOP key disable	-
*F<cr>	PAUSE and CONTINUE key enable	-
*G<cr>	PAUSE and CONTINUE key disable	-
*H<cr>	Beeper on	Yes
*I<cr>	Beeper off	Yes
*J<cr>	Cursor on, not blinking	Yes
*K<cr>	Turn LCD display off	Yes
*L<cr>	Turn LCD display on	Yes
*M<cr>	Clear display	Yes
*N<cr>	Test display	Yes
*O<cr>	Cursor on, blinking	Yes
*Q<cr>	Cursor off	Yes
*R<cr>	Clear line 1	Yes
*S<cr>	Clear line 2	Yes
*W<cr>	Report back current revision	Yes
*X<cr>	Enable numeric keypad	-
*Y<cr>	Enable function keys	-
*^<cr>	Move line 1 to line 2	Yes
*a<cr>	Move line 2 to line 1	Yes

The following commands require more detailed command parameters.

Command	Description	Valid in 6000 mode
*A<data><cr>	Update LEDs	Yes
*P<data><cr>	Position cursor	Yes
*V<data><cr>	Display text string	Yes

#### \*A Command

The Update LEDs command (\*A) requires a hexadecimal value to indicate which LEDs will be **off**. The format of the command is \*A, followed by the 1 byte (1 character) hexadecimal value, followed by a carriage return (<cr>). From top to bottom, the LEDs correspond to the following hexadecimal values:

LED #	Hexadecimal Value	Decimal Value
1	80	128
2	40	64
3	20	32
4	10	16
5	08	8
6	04	4
7	02	2
8	01	1

To turn off LED 3 and leave LEDs 1,2,4,5,6,7, and 8 on, issue \*A<sp><cr>. The space key corresponds to ASCII 32.

#### \*P Command

The Position Cursor command (\*P) requires 3 ASCII characters to indicate which location to move the cursor. The format of the command is \*P, followed by 3 characters representing the line and column number, followed by a carriage return. The first of the three characters is the line number, the next two characters are the column number. Line 1, column 15 would correspond to \*P115<cr>. Line 2, column 26 would correspond to \*P226<cr>. The columns are numbered from 00 to 39, not 01 to 40.

#### \*V Command

The Display Text String command (\*V) requires a text string to be displayed. The format of the command is \*V, followed by the text string, followed by a carriage return. (i.e., \*VThis is a demo!<cr>) The display text string (\*V) command cannot display the underscore (\_) character.



## RP240 Response—Extended X Mode

The commands below enable the RP240 for specific functions in Extended X mode (default) only. Once these functions are enabled, the RP240 will respond with the information provided below.

\*D<cr> STOP key enable  
\*F<cr> PAUSE and CONTINUE key enable  
\*X<cr> Enable numeric keypad  
\*Y<cr> Enable function keys

When pressed, the STOP key will return a **space**, followed by a  $\kappa$ , followed by a **line feed and carriage return**.

When pressed, the PAUSE key will return a **space**, followed by a  $s$ , followed by a **line feed and carriage return**.

When pressed, the CONTINUE key will return a **space**, followed by a  $c$ , followed by a **line feed and carriage return**.

The numeric keypad will return an **exclamation point (!)** when enabled with the \*X<cr> command. As the number keys, decimal key, or plus/minus key are pressed, the corresponding character will be transmitted. When the ENTER key is pressed, a **line feed and carriage return** will be transmitted. If the C/E key is pressed, a single quote('), followed by a **line feed and carriage return**, followed by an **exclamation point (!)** will be returned.

The function keys will return an **exclamation point (!)** when enabled with the \*Y<cr> command. The number of the function key ( $\emptyset$  for MENU RECALL, 1 for F1, 2 for F2, etc.) will be returned, along with a **line feed and carriage return**, when the function key is pressed.

## Key Press Response of RP240—6000 Mode

Once 6000 mode has been enabled with the \*B<cr> command, each key pressed on the RP240 will return a 1 byte hexadecimal value. When the key is released, another 1 byte hexadecimal value will be returned.

Key	Key Press Hexadecimal	Key Release Hexadecimal
STOP	5B	DB
PAUSE	5C	DC
CONTINUE	5D	DD
C/E	2F	AF
ENTER	3D	BD
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
+/-	2D	AD
.	2E	AE
F1	21	A1
F2	22	A2
F3	23	A3
F4	24	A4
F5	25	A5
F6	26	A6
MENU RECALL	2C	AC

## Hardware Reference

### Chapter Objectives

The information in this chapter will enable you to:

- Use this chapter as a quick-reference tool for most system specifications (environmental, I/O, pin outs, etc.)

### Environmental

- Operating Temperature: 36°F to 122°F (5°C to 50°C)
- Storage Temperature: -22°F to 185°F (-30°C to 85°C)
- Humidity: 0% to 95% non-condensing

### Electrical Specifications

#### RP240 Connector

The table below contains pin outs for the RP240's 4-pin Power and RS-232C connector on the back of the RP240. The pin out is listed from top to bottom.

Pin	Input/Output	Description
1	IN	Ground
2	IN	Receive (Rx)
3	OUT	Transmit (Tx)
4	IN	+5VDC

#### Power

You must supply 5 VDC  $\pm$ 2% to pin 1 of the RP240. The power supply must be capable of providing 100 mA of current. You can use the 5 VDC power supplies on board the SX, ZX, or 500 Indexer provided there is enough current remaining. The 6000 Series products have no current restrictions. Current levels are shown in the table below.

	Current Requirements			
	Available	Encoder	I/O	RP240
<b>SX</b>	250 mA	150 mA	10 mA each	100 mA
<b>ZX</b>	500 mA	150 mA	0 mA	100 mA
<b>500</b>	500 mA	150 mA	0 mA	100 mA

#### **CAUTION**

The SX's on-board power supply may not provide adequate current for the RP240 if the power supply is also providing power to an encoder and/or I/O.

#### RS-232C Communication

Refer to *Chapter ③ Installation* for RS-232C wiring instructions. RS-232C communication parameters for all Compumotor Controllers are fixed at:

- 9600 Baud Rate
- 1 Stop Bit
- 8 Data Bits
- No Parity



# Troubleshooting

## Chapter Objectives

The information in this chapter will enable you to:

- Isolate and resolve system hardware problems
- Isolate and resolve system software problems

## PROM Table

In order to use the RP240, the Extended X product must have a PROM with a revision greater than or equal to the ones shown in the table below. If your unit does not have the correct PROM, call the Compumotor Applications Department at 1-800-358-9070 for more information.

Description	PROM Number and Revision
Model 500	92-011512-01 C
Model 500-FOL	92-011513-01 C
SX Indexer/Drive	92-011640-01 C2
SXF Indexer/Drive	92-012039-01 C2
ZX/ZXF Indexer Drive	92-011492-01 D

## Troubleshooting

When your system does not function properly (or as you expect it to operate), the first thing that you must do is identify and isolate the problem. When you have accomplished this, you can effectively begin to resolve the problem.

The first step is to isolate each system component and ensure that each component functions properly when it is run independently. You may have to dismantle your system to detect the problem. If you have additional units available, you may want to exchange them with existing components in your system to help identify the source of the problem.

Determine if the problem is mechanical, electrical, or software-related. Can you repeat or re-create the problem? Do not make quick rationalizations about problems. Random events may appear to be related, but they are not necessarily contributing factors to your problem. Carefully investigate and decipher the events that occur before the subsequent system problem.

You may be experiencing more than one problem. You must isolate and solve one problem at a time. Log (document) all testing and problem isolation procedures. You may need to review and consult these notes later. This will also prevent you from duplicating your testing efforts.

If you are having difficulty isolating a problem, be sure to document all occurrences of the problem with specific information (time of occurrence, RP240 status, and anything else that was happening when the problem occurred).

Refer to the problem solutions contained in this chapter. If your system's problem persists, contact Parker Compumotor's Applications Department at (800) 358-9070.

## Reducing Electrical Noise

For detailed information on reducing electrical noise in your system, refer to the current Compumotor Catalog.

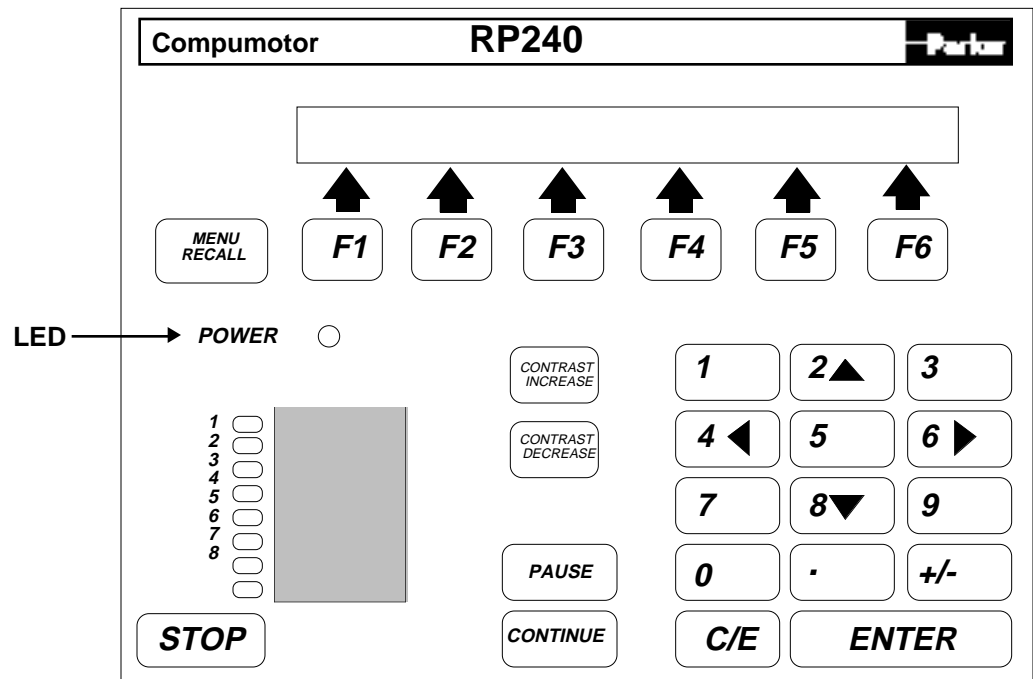
## Diagnostic LEDs

### RP240 Power LED

The RP240 has one LED indicator that can assist your troubleshooting efforts.

The power LED on the RP240 Main Unit indicates that the internal microprocessor is functioning properly. This two-color LED will be *green*, *red*, or *off*.

GREEN The LED will be green if power is applied and the RP240 is functioning properly.  
 RED The LED will be red if the microprocessor has failed.  
 OFF The LED will be off if power is not applied to the RP240.



## Basic Troubleshooting Procedure

Answer the following questions when troubleshooting the RP240.

- ① Is the RP240 Status LED on and **green**? If it is off, the RP240 is not receiving the proper DC input voltage. Check the +5VDC power source to make sure it has the proper voltage. The input voltage should be between +5VDC  $\pm$  2%. The RP240 requires at least 100 mA of current to operate reliably. If the voltage is correct and the LED is off, call Compumotor's Applications Engineering Department (800-358-9070).

If Power LED is on and **red**, the internal microprocessor has failed. If possible, document what was happening when it failed (it may be helpful when you attempt to isolate the cause). Cycle power to the RP240. If the LED is still red, there is an internal failure in the unit. If the LED is green, the fault may have been caused by electrical noise.

## Common Problems & Solutions

The following table presents some guidelines to help you isolate problems with your motion control system.

- ❑ Look for the symptom that most closely resembles what you are experiencing.
- ❑ Look through the list of possible causes so that you better understand what may be preventing proper operation.
- ❑ Start from the top of the list of remedies and use the suggested procedures to try and isolate the problem.
- ❑ Refer to other sections of the user guide for more information on wiring, software commands, etc.

### Extended X

Symptom	Cause	Remedy
STOP key does not work.	STOP key is not enabled.	Enable STOP key with DSTP command.
	Two units daisy chained.	No remedy. STOP key only affects master unit in daisy chain.
When you press the STOP key, your program quits.	STOP key sends a K command.	This is correct.
PAUSE key does not work.	PAUSE key is not enabled.	Enable PAUSE key with DCNT command.
	Two units daisy chained.	No remedy. PAUSE key only affects master unit in daisy chain.
When you press the PAUSE key, your program quits.	Have not enabled Save Command Buffer on Stop (SSB) command.	Enable (SSH1) command.
	Have not enabled Save Command Buffer on Stop (SSH) command.	Enable command (SSH1).
PAUSE key does not pause motion.	Resume Execution (SSL) command has not been enabled.	Enable command (SSL1).
CONTINUE key does not resume program.	Save Command Buffer on Stop (SSH) and Resume Execution (SSL) commands are not enabled.	Enable commands (SSH1, SSL1).
DTEXT command does not display anything on the RP240.	RS-232C connection reversed or not connected.	Verify RS-232C connection.
	A space has been inserted between DTEXT and the text to be displayed.	Remove the space between command and the text.
After running a program with the RP240, cannot communicate with SX,ZX, or 500.	SX, ZX, or 500 is still running the program for the RP240.	Issue a K command, a SSAØ command, and an SSIØ command.
Function keys are not being read (No beeping).	Function keys are not enabled.	Enter a VARn=FUN statement before function key prompt in program.
Numeric keypad is not being read (No beeping).	Numeric keypad is not enabled.	Enter a VARn=NUM statement before keypad entry prompt in program.

### 6000 Series

Symptom	Cause	Remedy
When you press the STOP key, your program quits.	STOP key sends an !S command.	This is correct. If you would like the stop key to pause motion, refer to the COMEXS command.
PAUSE key does not pause motion.	PAUSE key sends !PS command.	This is correct. If you want to pause motion, use the STOP key in combination with the COMEXS command..
DWRITE command does not display anything on the RP240.	RS-232C connection reversed or not connected.	Verify RS-232C connection
After running a program with the RP240, cannot communicate with 6200 or 6250.	6200 or 6250 is still running the program for the RP240.	Issue an !K command, or press the STOP key.

## RS-232C Communications

👉 Helpful Hint: If you are having problems communicating with the RP240, use the following procedure to troubleshoot the communications interface.

- ① Make certain the transmit (Tx) of the host is wired to the receive (Rx) of the RP240 and the receive (Rx) of the host (SX, ZX, Model 500, 6200, 6250 or computer) is wired to the transmit (Tx) of the RP240.
- ② Make certain that the ground on the SX, ZX, Model 500, or other device is wired to the ground on the RP240.
- ③ Configure the host to the same baud rate (9600), number of data bits (8), number of stop bits (1), and parity (none) as the RP240.
- ⑤ Use DC common or signal ground as your reference, *not* earth ground.
- ⑥ Cable lengths should not exceed 50 ft. unless you are using some form of line driver, optical coupler, or shield. As with any control signal, be sure to shield the cable to earth ground at one end only.

## Editing Sequences—Extended X

If you wish to edit sequences in your SX, ZX, or Model 500 controller, you must re-establish RS-232C communication **before** downloading the new sequences to the controller. Compumotor recommends using the following procedure.

- ① Remove power from your controller and the RP240.
- ② Remove connections between the controller and the RP240.
- ③ Connect Rx, Tx, and Ground between the controller and your RS-232C port.
- ④ Apply power to your controller.
- ⑤ Enter the TERMINAL EMULATOR portion of your communication software (Compumotor's X-Ware is recommended).

Initially, you will not be able to establish communication if you have turned the echo (*SSA1*) command off in your power-up sequence.

- ⑥ If you are using X-Ware, **Device Not Ready** will appear on your screen (if you have disabled the command echo). Press the <ENTER> key. Next, press the **Y** key to enter Terminal Emulator.
- ⑦ To terminate the power-up sequence, and turn on the command echo as well as the interactive mode, issue the following commands:  

```
K <cr>  
SSA0 <cr>  
SSI0 <cr>
```
- ⑧ Check the controller's status by issuing an (**aR**) command, where the device address is **1R** <cr>. The controller should respond with a **\*R**. If you do not receive a **\*R**, consult the RS-232C Troubleshooting section of your controller user guide.
- ⑨ Edit the sequence as usual. If you are using X-Ware, press the <ESC> key, then use arrow keys to select the Editor menu.

# I N D E X

---

---

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- WIRING
  - 20 AWG WIRE 8
  - 6000 SERIES 9
  - 6200 9
  - 6250 9
  - BACK PANEL 4
  - CABLE LENGTHS 8
  - CONNECTOR 4
  - EXTENDED X 8
  - GROUNDING 8
  - MODEL 500 8
  - POWER 4
  - SX 8
  - ZX 8





# Artisan Scientific

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