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Training Manual for Cscape and XLe

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PREFACE

This manual provides introductory level training for Cscape Software users using XLe.

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ABOUT PROGRAMMING EXAMPLES

Any example programs and program segments in this manual or provided on accompanying diskettes are included solely for illustrative purposes. Due to the many variables and requirements associated with any particular installation, Horner APG cannot assume responsibility or liability for actual use based on the examples and diagrams. It is the sole responsibility of the system designer utilizing Cscape Software to appropriately design the end system, to appropriately integrate the Cscape and to make safety provisions for the end equipment as is usual and customary in industrial applications as defined in any codes or standards which apply.

Note: The programming examples shown in this manual are for illustrative purposes only. Proper machine operation is the sole responsibility of the system integrator.

TABLE OF CONTENTS

Introduction to Cscape

Quick Start Guide

Intro to Cscape: Quick Start Guide

Objective:

The objective of this Quick-Start Guide is to familiarize yourself with some of the features and functionality of the Cscape programming software.

Equipment Needed:

A PC with Cscape loaded.

1.0 Help File

- 1.1 Open the help file. The help file is located under **Help** from the main tool bar.
- 1.2 Select **Contents** to access the help file.
- 1.3 The first screen has a lot of useful information that is listed below.
  - 1.3.1 What's New in Version X.XX – This section will include all of the additions that were added to that particular release of Cscape.
  - 1.3.2 Cscape Reference Manual – This section allows the user to navigate to all of the information in the help file.
  - 1.3.3 The User Interface – This describes some of the user features of Cscape and how to navigate through the software.
  - 1.3.4 Creating and Editing Ladder Programs – This section does a multitude of things from the different ladder elements to clearing out an old program.
  - 1.3.5 Creating and Editing Text Screens – This discusses how to create and manipulate the HMI portion of an OCS program.
  - 1.3.6 Networking and Communication – This section discusses the different aspects of the CsCan network and serial communications.
  - 1.3.7 I/O and CPU Configuration – This section covers how to configure a controller and a quick reference to a few of the I/O cards like the High Speed Counter, Stepper Module, and more.
  - 1.3.8 Debugging – This section covers the aspects of running the debug option in the software.
  - 1.3.9 Inside the Controller – This section covers the system resources of the controller, updating the firmware, cabling, and other features
  - 1.3.10 Project Management – This covers how to build a CsCan project for more than 1 node system.
  - 1.3.11 How Do I? – This is a quick start guide on how to get started on certain task.
  - 1.3.12 Additional Technical Support – This covers information on how to contact Horner APG.

1.4 Searches can be done through selecting **Find** from the top of the screen.

1.4.1 Upon opening the Find portion of the help file, type in “Contacts” and the following will be shown on the screen.

1.5 The programmer also has the ability to open the help file by pressing F1 on the keyboard of the PC.

2.0 Getting Started

2.1 There are 2 ways to create a new program. A new program will have a name of “Untitled” until the program is saved as its file name.

2.1.1 Create a program under the **File** selection on the main menu

2.1.2 Create a new program by pressing the New File from the Tool Bar at the top of the screen.

2.2 There are 2 ways to save a program. All programs will be saved as the “filename”.csp

2.2.1 Save a program under the **File** selection on the main menu

2.2.2 Save a program from the shortcut on the Tool Bar at the top of the screen.

2.3 There are 3 ways to open a program.

2.3.1 Open the program under the **File** selection on the main menu.

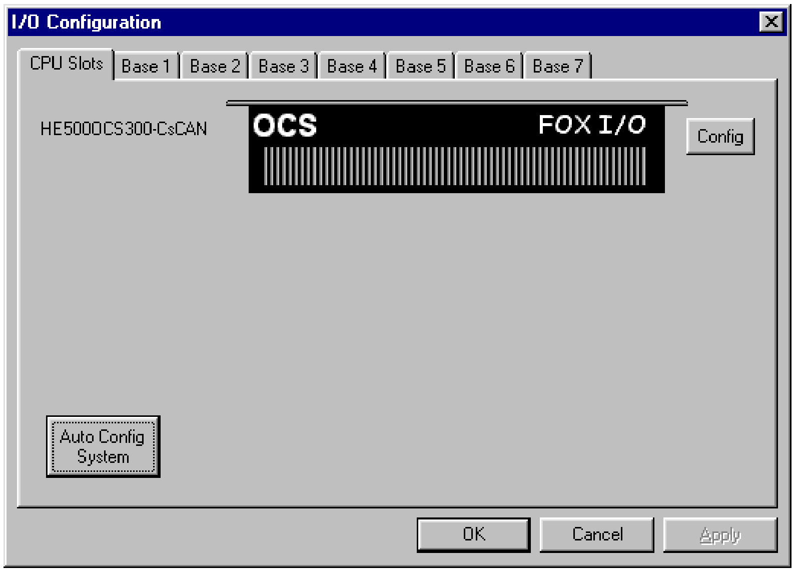
2.3.2 Open a program from the shortcut on the Tool Bar at the top of the screen.

2.3.3 The program will automatically open if the program is double clicked on in the location where it is stored on your PC.

2.4 Configuring a controller is done be clicking the **Controller** menu and selecting **I/O Configuration**. This will bring up the screen below. If no controller is attached to the PC, the controller will default to the OCS300. If there is a controller attached to the PC and the target ID matches the local ID; the controller will match what the PC is attached to. There are 2 ways to configure the controller.

2.4.1 Manually configure the controller by pressing the Config button next to the controller and then select the controller from the pull down list.

2.4.2 Configure the controller from the Auto-Configure option. Keep in mind on existing programs that Auto-Configure will erase I/O configurations that deviate from the default parameters. An example of this would be in an application with a High Speed Counter that uses an option other than option 1 or any analog modules that have the ability to change the input or the output type.



2.5 Configuring the I/O is done from the same place as configuring a controller. I/O is never automatically configured without the user telling it to happen, unlike the controller that will automatically configure if the PC is connected to it when Cscape is opened.

2.5.1 If the Auto-Configuration option is used, the I/O will be recognized when you Auto-Config. On OCS units utilizing the FOX I/O system, the I/O will appear on the base where the I/O is connected. On the OCS250 and below, the I/O will appear on the stack with the controller. The one exception is for Ethernet cards, which will always be connected directly to the controller, regardless of controller type.

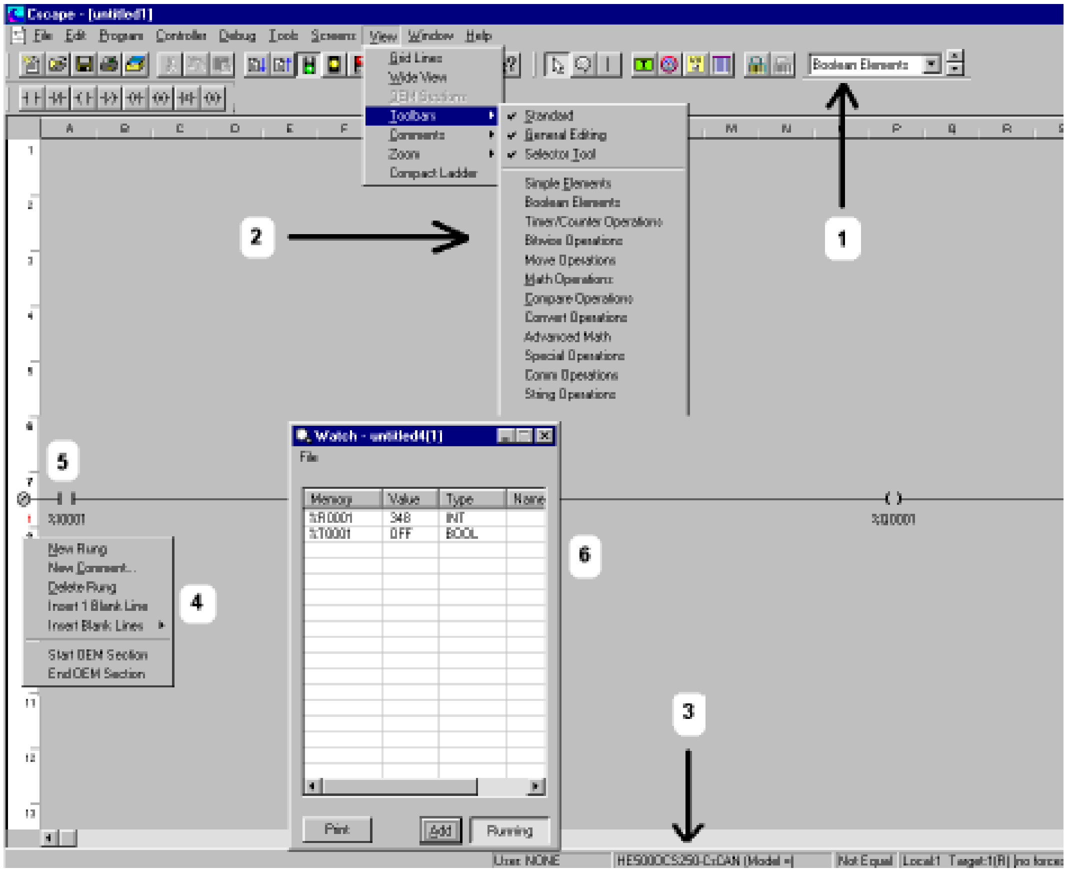
2.5.2 If the I/O is manually configured, go to the position that the module is to be configured and click on the Config button or double click on the position. The screen shown below will appear. Select the appropriate module for the slot. For FOX I/O systems, select the tab corresponding to the FOX base address.

2.6 Toolbars are used to place Ladder elements and functions.

2.6.1 Selector Tool – This allows the programmer to select between the different tool bars with 1 shown on the screen at a time. This is achieved through the pull down menu at the top of the screen. **#1** in the picture below illustrates the location of the pull down selection.

2.6.2 Menu Toolbar Selection – The user can setup Cscape to display multiple Toolbars at a time. This is done through selecting multiple Toolbars under **View** and **Toolbars**. **#2** in the picture below illustrates this. The toolbars can be left floating over the main

Cscape program or can be dragged and “docked” to the top or left side of the screen.



Memory	Value	Type	Name
%R0001	348	INT	
%T0001	OFF	BOOL	

User: NONE HE500OCS250-CsCAN (Model =) Not Equal Local:1 Target:1(R) no forces

2.7 The status bar has many useful features. **#3** points to the status bar.

2.7.1 **User** – The User field indicates which user is currently logged into the program via use of the Security features. If security is not configured or if no one is currently logged in, this will indicate NONE as it does in the illustration.

2.7.2 **Model** – This will let the programmer know which unit the program is configured for and whether the configured model is equal to the model that the PC is connected to.

2.7.3 **Program Equality** – This is the box to the right of the Model box. This will let the user know if the program in the unit and the program in Cscape are equal. If the status indicates Unknown, the user might need to perform a verify between the controller and the software.

2.7.4 **Local and Target** – The Local ID indicates the node ID of the controller that the PC is directly connected to while the Target ID indicates the node ID of the controller that Cscape is trying to talk to. The Target ID does not need to match the local id. If programming is to be performed across the CsCAN Bus, then the Target will be the node that will receive the download. The (R) indicates that the controller is in RUN mode, (I) indicates that the controller is in STOP or IDLE mode, and (D) indicates that the controller is in DO/IO state. If a (B) is shown, it means the controller is Busy because another computer is trying to talk to it at that moment.

2.8 Starting a New Rung of logic can be done in either of two different ways.

2.8.1 **Placing a contact** – A new rung can be started by dropping a contact on to the screen. The user needs to drop the contact in A column for this to occur. To verify that a new rung has been started, look at the left margin. If there is a screw head in the margin, a new rung has been started. See **#5** in the picture on the previous page. Another thing to consider when programming a parallel contact is that placing the parallel contact in the A column will start a new rung. To get around this, place the branches first.

2.8.2 **Right clicking in the margin** – right clicking in the left-hand margin and selecting **New Rung** can also create a new rung. See **#4** in the picture on the previous page.

2.9 Data Watch enables the user to monitor and/or change values in a table. **#6** is what Data Watch looks like. Data Watch is selected from the magnifying glass on the Toolbar or through selecting it from the **Controller** menu. New fields are added to Data Watch by clicking Add and then keying in the register and the type. Ranges of addresses can be added at one time by using the notation ‘r15-25’, which will add 11 registers from %R15 through %R25.

Notes:

LAB 1

Basic OCS Programming and Configuration

Lab 1: Basic OCS Programming and Configuration

Objective:

The objective of this lab is to give you the knowledge to use Cscape to create a program including hardware configuration, logic design, and screen development.

This foundation will then be used to help you expand your skills in the use of Cscape and the XLe OCS.

Procedure:

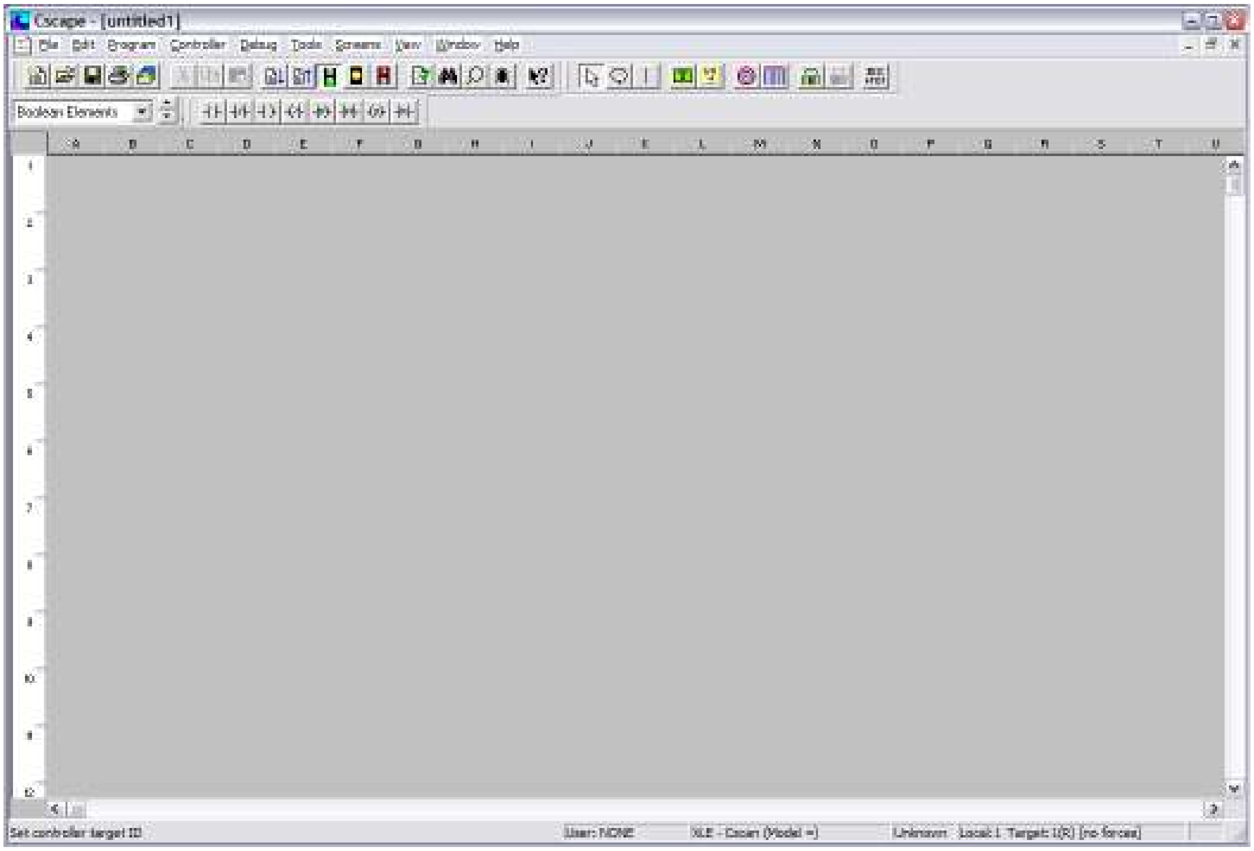
Step 1

- **Connect the OCS to your PC.** Connect the serial cable provided between the XLe MJ1 programming port and the 9 pin serial port on your PC using the RJ-45 to 9-pin adapter.

Step 2

- **Power up the OCS and start Cscape on your PC.** Connect the power supply to the XLe. Open the Cscape program on your PC. A new, blank program called “untitled1” is automatically opened and should be automatically configured for your XLe if the serial cable is properly connected.

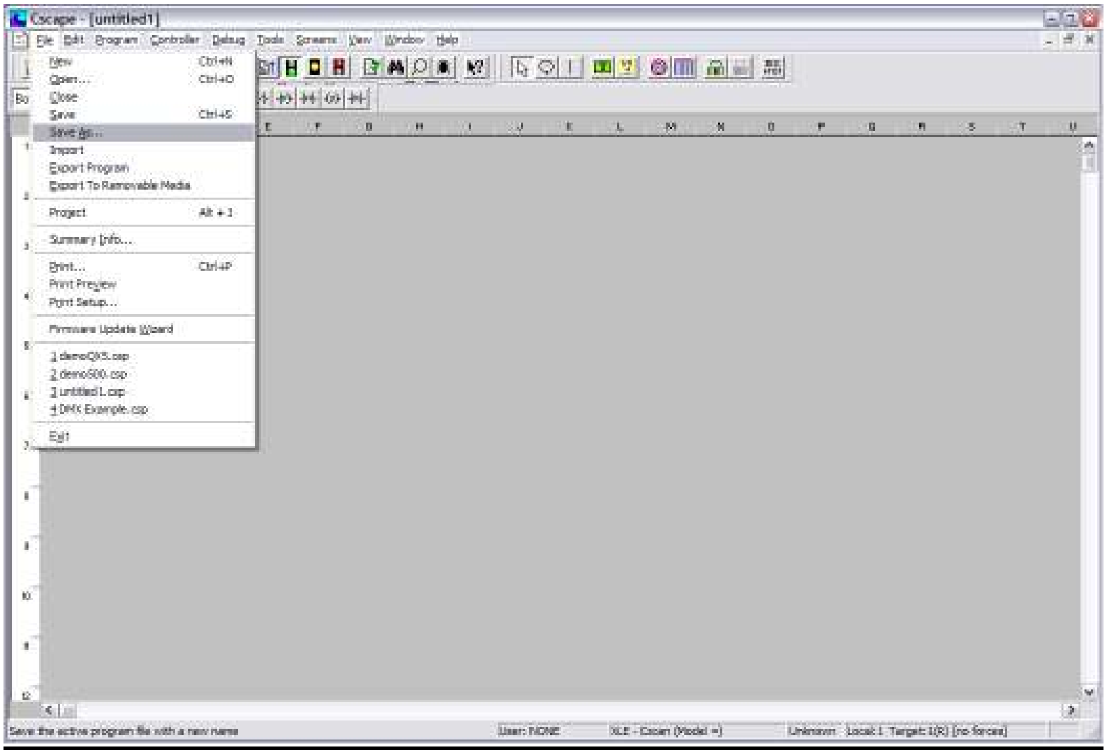
  NOTE: Only the controller is automatically configured as described above. Any I/O will still have to be configured as described later in this lab.


Cscape - [untitled1]
File Edit Program Controller Debug Tools Screens View Window Help
Boolean Elements
A B C D E F G H I J K L M N O P Q R S T U
1
2
3
4
5
6
7
8
9
10
11
12
Set controller target ID
User: NONE
XLE - Cscan (Model =)
Unknown Local: 1 Target: 1(R) [no forces]

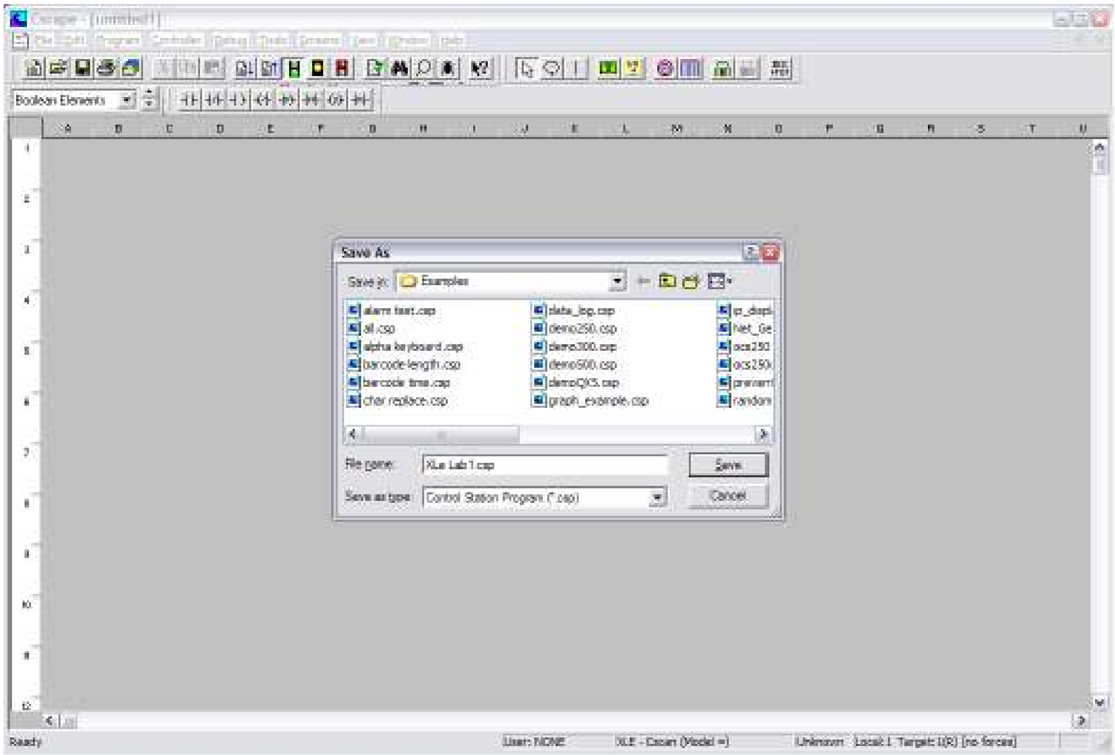
Step 3

- **Save the ‘untitled1’ program with a new name.**

Click on the **File** menu and select **Save As…**



Type your program name, such as ‘XLe Lab1.csp’, in the File Name dialog box and click the Save button.



Save in: Examples

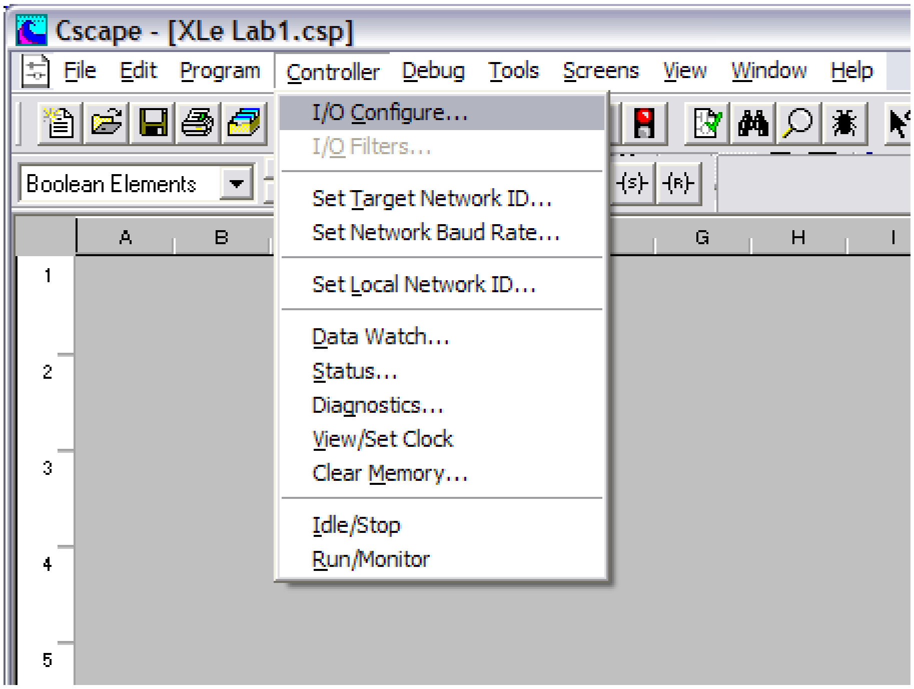
File name: XLe Lab1.csp

Save as type: Control Station Program (*.csp)

Step 4

- **Configure the OCS Controller**

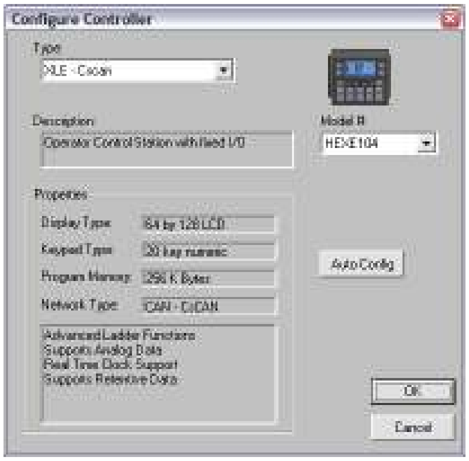
Click on the **Controller** menu and select **I/O Configure**.



If you are online with the OCS, use the Auto Config System button. Clicking it will automatically configure the controller and any attached I/O if you are connected to the OCS properly.

Otherwise, to do it manually:

1. Double click on the controller picture or click the 'Config' button next to it.
2. Select 'XLe – Cscan' or 'XLe – No Net' from the Type list depending on your model. Then select the Model # to match your model. For this example, the HEXE104 is used.
3. Click OK to see the overall I/O configuration.


Configure Controller

Type: XLE - Cscan

Description: Operator Control Station with fixed I/O

Model #: HEXE104

Properties

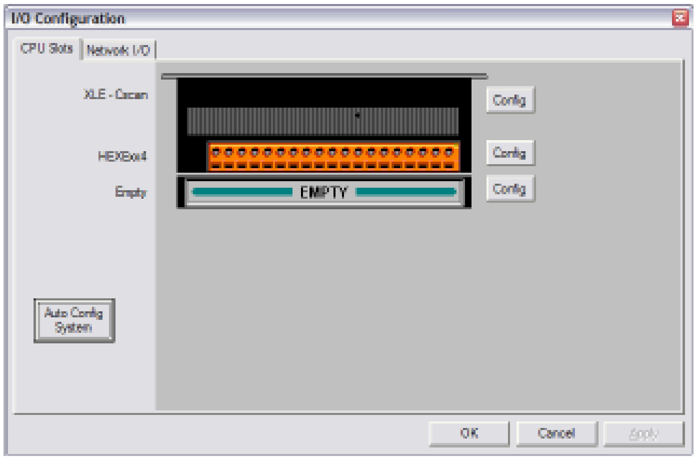
Display Type: 64 by 128 LCD

Keypad Type: 20 key numeric

Program Memory: 256 K Bytes

Network Type: CAN - CsCAN

Advanced Ladder Functions
Supports Analog Data
Real Time Clock Support
Supports Retentive Data


I/O Configuration

CPU Slots: XLE - Cscan; HEXEx04; Empty

4. Click OK again to exit the I/O configuration.

Step 5

➢ **Save the program.**

Click on the **File** menu and select **Save**.

Step 6

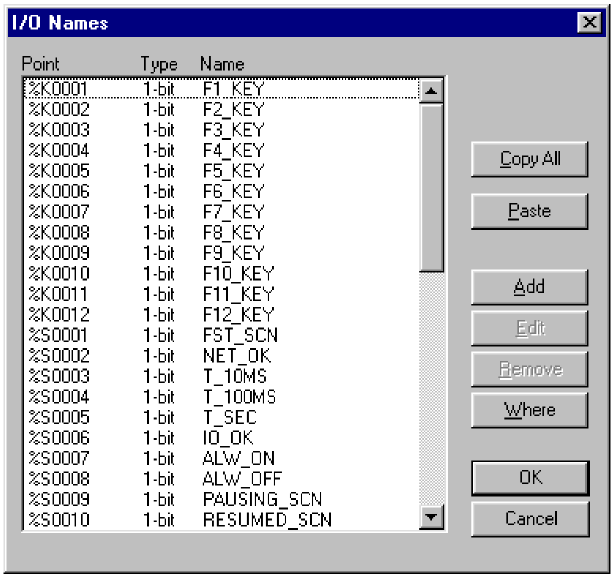
➢ **Name some I/O points.**

Click on the **Program** menu and select **I/O Names**.

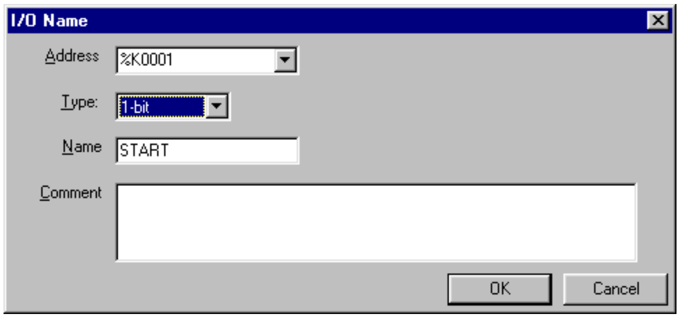
- **Add** I/O points by clicking the 'Add' button and filling in the information.
- **Edit** an existing I/O point by finding it in the list and double-clicking it.

Add or edit the following I/O points:

%I01	E_STOP – Configure for 1 bit
%K1	START – %K1 is named 'F1_KEY' by default so it will need to be edited instead of added. Configure for 1 bit.
%K2	STOP - %K2 is named 'F2_KEY' by default so it will need to be edited instead of added. Configure for 1 bit.
%Q1	RUN – Configure for 1 bit
%D1	Stopped_Screen – Configure for 1 bit
%D2	Running_Screen – Configure for 1 bit



Point	Type	Name
%K0001	1-bit	F1_KEY
%K0002	1-bit	F2_KEY
%K0003	1-bit	F3_KEY
%K0004	1-bit	F4_KEY
%K0005	1-bit	F5_KEY
%K0006	1-bit	F6_KEY
%K0007	1-bit	F7_KEY
%K0008	1-bit	F8_KEY
%K0009	1-bit	F9_KEY
%K0010	1-bit	F10_KEY
%K0011	1-bit	F11_KEY
%K0012	1-bit	F12_KEY
%S0001	1-bit	FST_SCN
%S0002	1-bit	NET_OK
%S0003	1-bit	T_10MS
%S0004	1-bit	T_100MS
%S0005	1-bit	T_SEC
%S0006	1-bit	IO_OK
%S0007	1-bit	ALW_ON
%S0008	1-bit	ALW_OFF
%S0009	1-bit	PAUSING_SCN
%S0010	1-bit	RESUMED_SCN



Address: %K0001

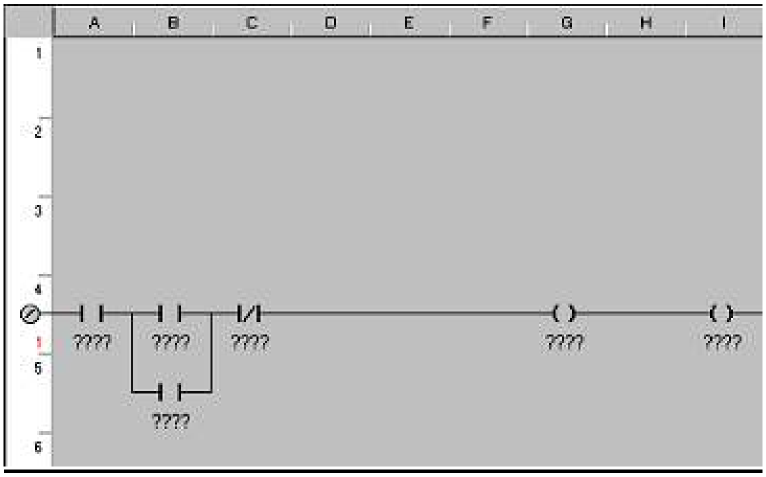
Type: 1-bit

Name: START

Comment:

Step 7

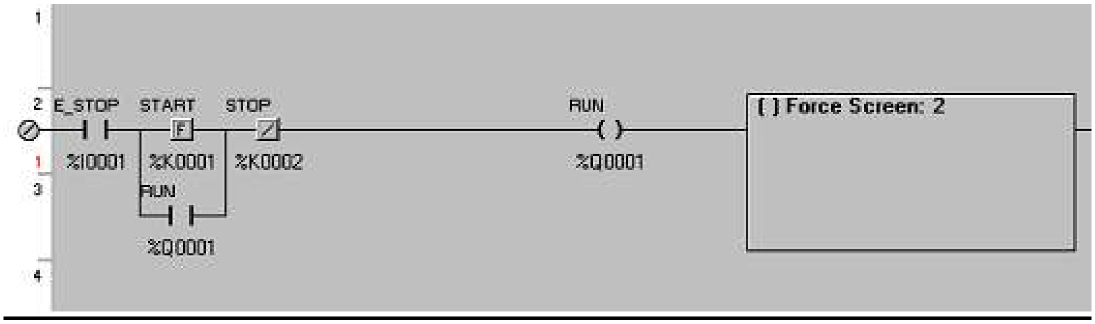
➢ **Program the following rung:**



1. Select and drop the three normally open contacts.
2. Select and drop the normally closed contact.
3. Add the vertical connecting lines.
4. Select and drop two normally open coils.

Step 8

➢ **Add the element names.**



1. Double click on each element in the rung.
2. Select the name or address from the drop down list. Name the last coil %D2 and specify it as a Force Screen.
3. Click OK

Step 9

➢ **Add words to screen 2.**

1. Double click the screen in the ladder logic.
2. Click Edit Screen.
3. Using the Static Text object in the graphics editor, insert Static Text at the top center of the screen. To do this, click once on the button T in the graphics editor toolbar, bring the mouse down to the screen, click AND HOLD at the top-

left of where you want the text, drag out the text box to the size you want, then release the mouse button. Double-click it to configure it and edit the text to display MACHINE.

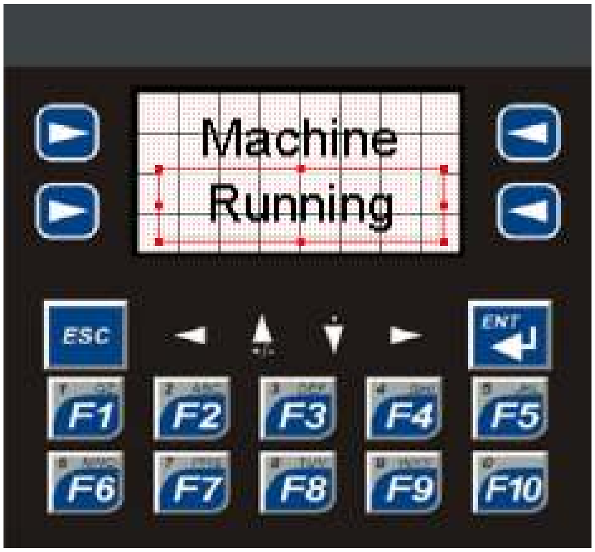
Note: You may have to un-click the 'Snap To Grid' buttons ( )on the graphics editor toolbar in order to move the static text where you want it.

4. Insert Static Text in the center of the screen just below the text insert above. This Static Text should indicate RUNNING.
5. Note that the size of the box will need to be stretched and the font sized should be increased from the default.
6. Close the graphics editor.
7. Click OK

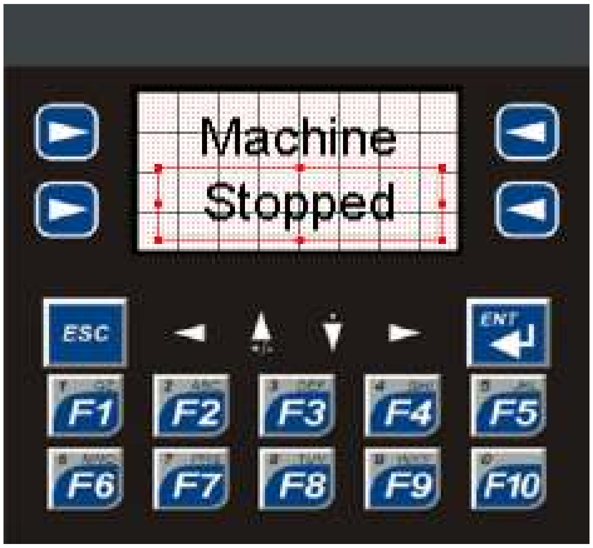
Step 10

➢ **Add Screen 1**

1. Click in the Cscape toolbar or click on the **Screens** menu and select **View / Edit Screens…**
2. Repeat steps 3 – 6 from above for Screen 1, but make is say 'Machine Stopped'.


Machine
Running

Screen 2


Machine
Stopped

Screen 1

3. Close the graphics editor … everything is saved automatically, there is no need to save the graphics portion separately.

Step 11

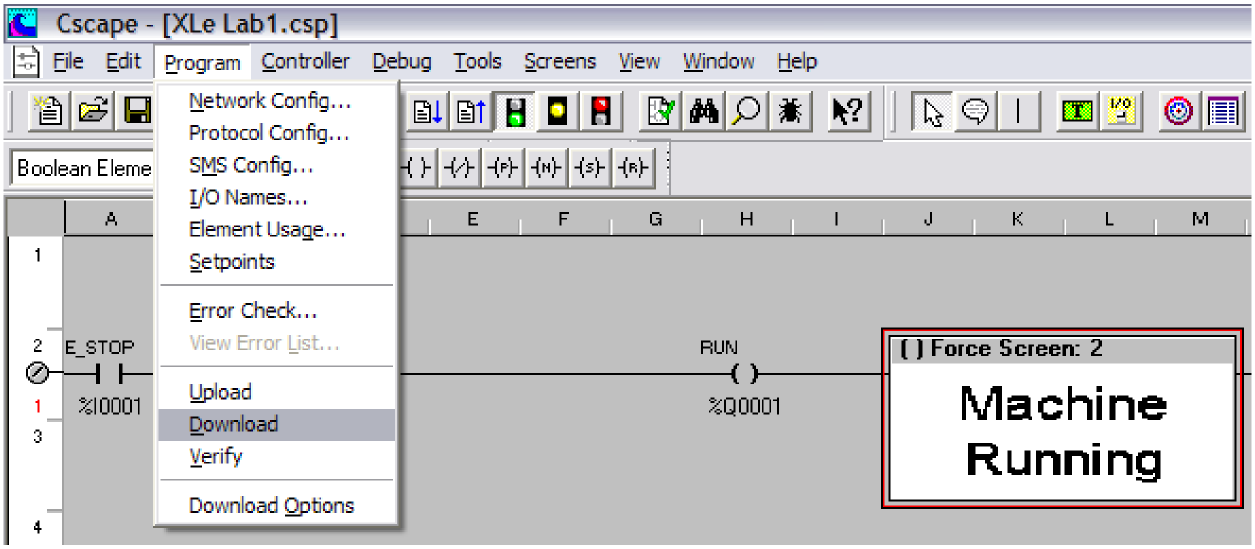
➢ **Save the program.**

Step 12

➢ **Download the program to the XLe.**

1. Click in the Cscape toolbar or select the **Program** menu and click **Download**.

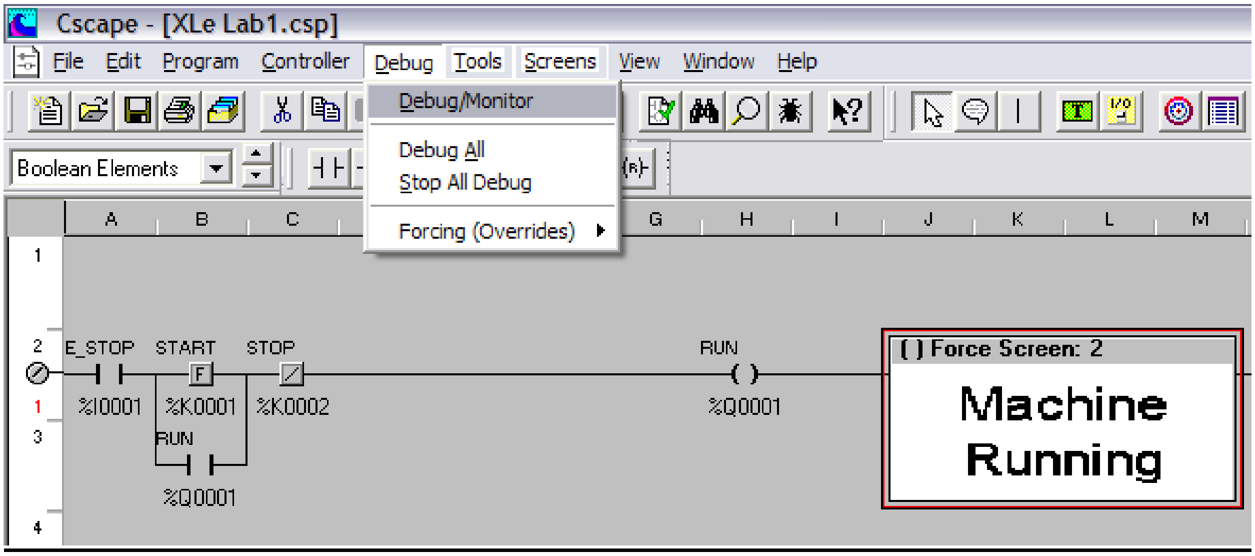
2. Use the SmartLoad function when the Download dialog box appears.
3. Click OK.



Once downloaded, make sure the XLe is in Run mode (the green traffic light on the toolbar).

Step 13

➢ **Debug your program**



Click 🐞 in the Cscape toolbar or click on the **Debug** menu and select **Debug/Monitor**

Close switch 1 on the Input Simulator.

Switch 1 is connected to the first digital input on the XLe, which is addressed to %I01.

- In Cscape, using Debug, E_STOP & STOP should be red.
- On the XLe, the screen should show MACHINE STOPPED.

Push the F1 key.

- □ In Cscape, using Debug, START should turn red until you release the F1 key.
- □ The RUN coil and contact should both turn red.
- □ On the XLe, the screen should change to MACHINE RUNNING.
- □ Output 1 should turn ON

Push F2 or open switch 1.

- □ The output should turn OFF
- □ The screen should show MACHINE STOPPED.

CONGRATULATIONS! You have finished your first OCS program. Now move on to LAB 2 and learn additional skills.

Lab 1: Basic OCS Programming and Configuration

Notes:

Notes:

LAB 2

Text Tables

Lab 2: Text Tables

Lab 2: Text Tables

Objective:

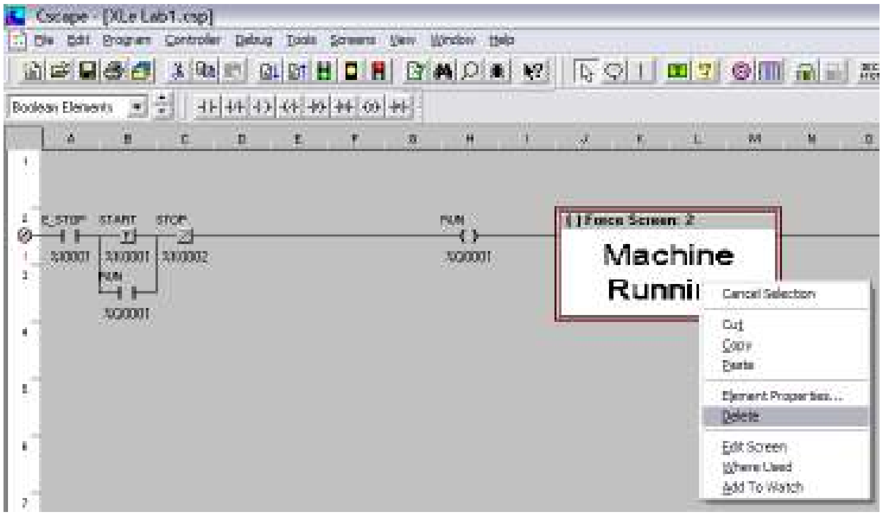
Learn to use Text Tables. Text Tables allow text to be linked to values in a register. On the display, the user will see text instead of a number in a register or text instead of the 0 or 1 state of a digital input or output. This can make it easier for the user to determine what's going on. This lab is a continuation of LAB 1.

Procedure:

Step 1

➢ **Delete the reference to screen 2 in the program.**

Right click on screen 2 in the rung. Then click Delete. This does **not** delete screen 2, it only deletes the ladder logic that tells screen 2 to display.



Note: Screens **do not** have to be referenced in ladder logic in order for them to exist and to display properly. They are still there regardless of whether you use ladder logic or other methods (See the Screen Manipulation lab) to display them.

Step 2

➢ **Edit screen 1.**

Click T in the Cscape toolbar or click on the **Screens** menu and select **View/Edit Screens**.

Step 3

➢ **Delete the Static Text.**

1. Delete both Static Text Fields on screen 1.

2. Delete both Static Text Fields on screen 2. Hint: Press CTRL A (Select All), then press the 'Del' key on your keyboard to delete the elements.

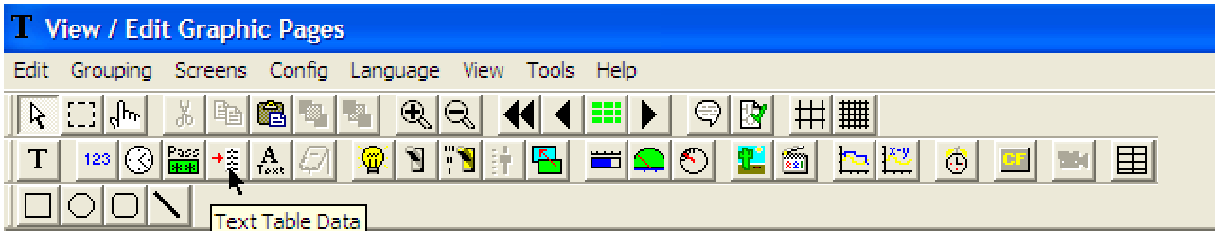
Note: THIS is what deletes screen 2.

Lab 2: Text Tables

Step 4

➢ **Add a field.**

1. Place the Text Table Object on screen 1 using the same method as with the Static Text. Remember that the field will need to be stretched to size and the parameters will need to be configured.



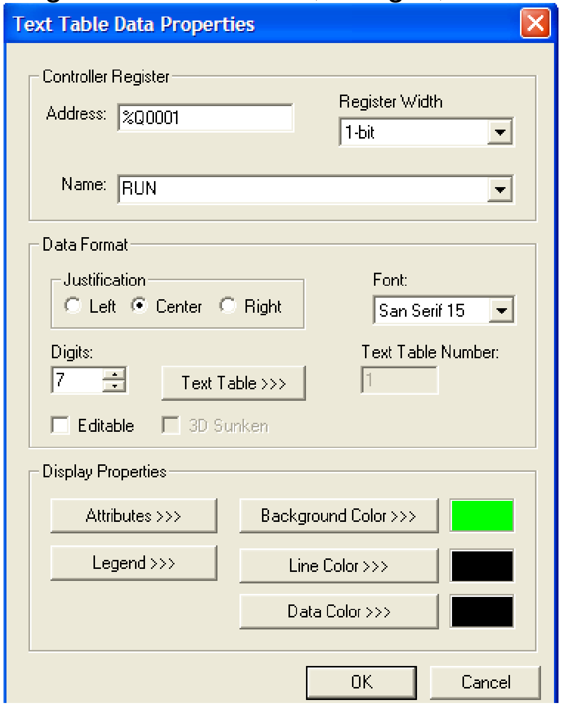
Step 5

➢ **Edit the field.**

1. Double Click on the field.
2. Change Address to %Q1.

In Data Format verify:

Register Width = 1-bit, 7 Digits, Editable is not checked, and Font = San Serif 15.



Text Table Data Properties

Controller Register

Address: %Q0001

Register Width: 1-bit

Name: RUN

Data Format

Justification: ○ Left ● Center ○ Right

Font: San Serif 15

Digits: 7

Text Table >>>

Text Table Number: 1

□ Editable □ 3D Sunken

Display Properties

Attributes >>>

Background Color >>> 🟩

Legend >>>

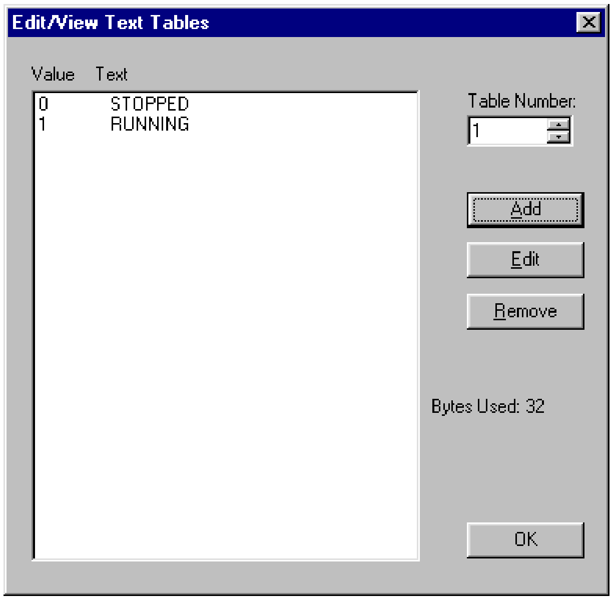
Line Color >>> ■

Data Color >>> ■

OK Cancel

3. Click on Text Table.
4. Click on Add.
5. For Value = 0, add String = STOPPED.
6. Click OK.
7. Click on Add.

8. For Value = 1, add String = RUNNING.

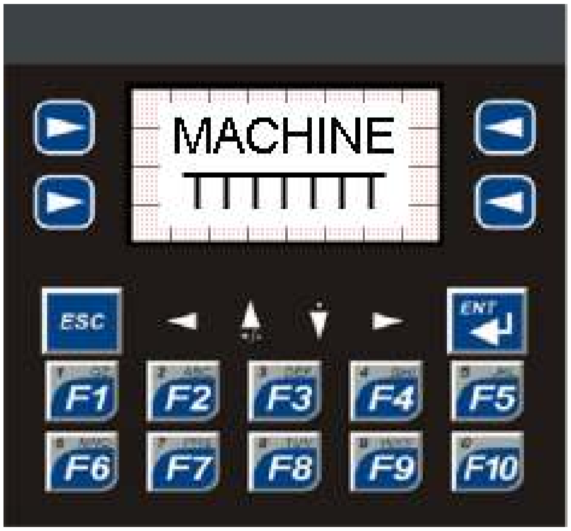


Value	Text
0	STOPPED
1	RUNNING

Table Number: 1

Bytes Used: 32

9. Click OK.
10. Click Legend
11. Change the Legend to “MACHINE”
12. Change the Legend Font to San Serif 15
13. Click OK.
14. Click Attributes
15. Uncheck Border
16. Click OK.
17. Click OK.



18. Close the Graphics editor.

Lab 2: Text Tables

Step 6

- **Save the program.**

Click on **File** and select **Save** or use **Save As…** to save it as a different program.

Step 7

- **Download to the XLe.**

Click or click on the **Program** menu and select **Download.**

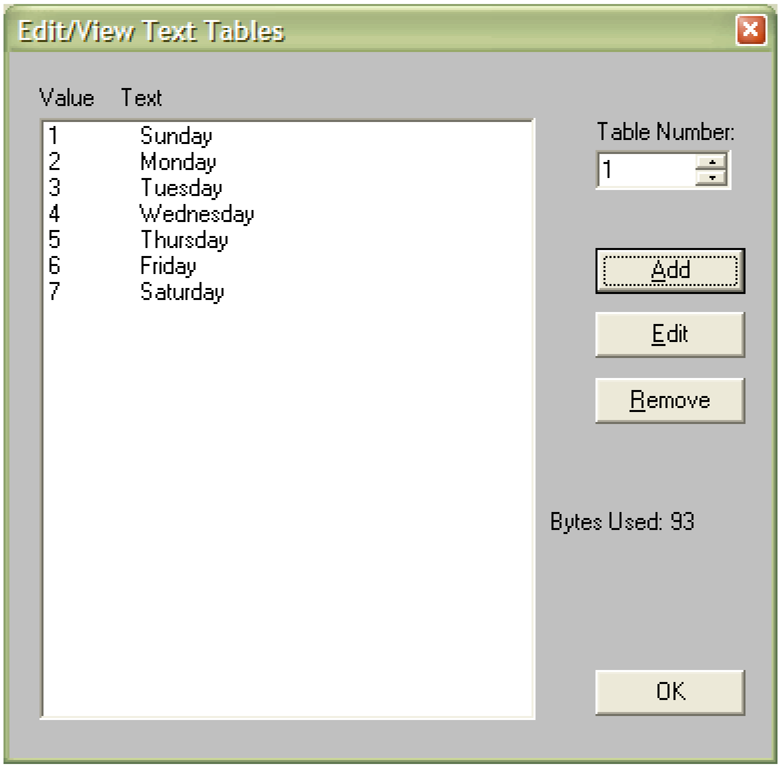
Step 8

- **Check the program operation.**

The program should operate exactly the same as it did before. The screen should look and act the same as before. However, using Text Tables, only one screen is used instead of two.

This shows some of the flexibility of the Horner controllers and how easy it is to configure some of the screen features. Text tables can often be used in place of an entirely new screen or simply to associate text with a number to make it easier to decipher that number.

Take, for example, the system register %SR50. This registers represents the Day of the Week for the controller's internal Real Time Clock. It contains a value of 1-7 depending on what day it is. Linking a text table directly to %SR50 and configuring the text table as shown would display the days of the week instead of just a number:



Value	Text
1	Sunday
2	Monday
3	Tuesday
4	Wednesday
5	Thursday
6	Friday
7	Saturday

Table Number: 1

Bytes Used: 93

This concludes Lab 2!

Lab 2: Text Tables

Notes:

Lab 2: Text Tables

Notes:

LAB 3

Screen Manipulation

Lab 3: Screen Manipulation

Lab 3: Screen Manipulation

Objective:

The objective of this lab is to demonstrate several different methods used to manipulate screens through ladder logic and through the “Screen Jump” object in the graphics editor. This is how the programmer will determine when any given screen will be displayed.

Screen Overview

When using Horner APG graphics-based controllers, you have 1023 screens to use in your program. There is not a built-in way of scrolling through these screens in graphics-based controllers, so screen manipulation must be done either through ladder logic or through objects in the graphics editor… or through a combination of both.

When writing a program, planning is needed to determine what screens need to be seen and when they need to be seen. Many times, a dedicated alarm screen is used so that, when the alarm occurs, the alarm screen can be forced on. Or perhaps there is a main menu screen that has links to configuration or data monitoring screens.

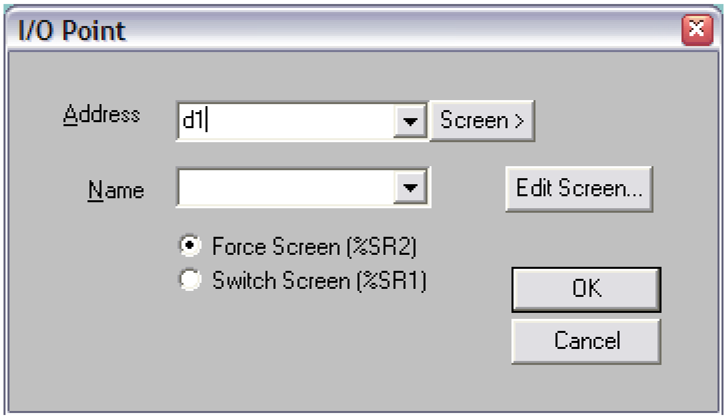
There are dedicated %D bit-length registers that are numbered the same as the screen they represent. %D1 is for screen 1, %D312 is for screen 312, and so on. They can be used as an output coil to switch to or force a screen such as in Lab 1. They can also be used as input contacts to indicate when a particular screen is currently being viewed.

There are also three system registers that reflect exactly what the display is currently doing. These registers are the %SR1 User Screen register, the %SR2 Alarm Screen register, and the %SR3 System Screen register. The numbers in these registers reflect the number of the screen currently displaying. %SR2 takes priority over %SR1 and %SR3 takes priority over %SR2.

Part 1 – Switching and Forcing

%D registers can be used as coils to control screens. To do this, simply place a normally open coil in your ladder logic and then configure it for a %D register.

Once a coil is configured for a %D register, the configuration box changes to account for some additional options:


I/O Point

Address: d1

Name:

● Force Screen (%SR2)
○ Switch Screen (%SR1)

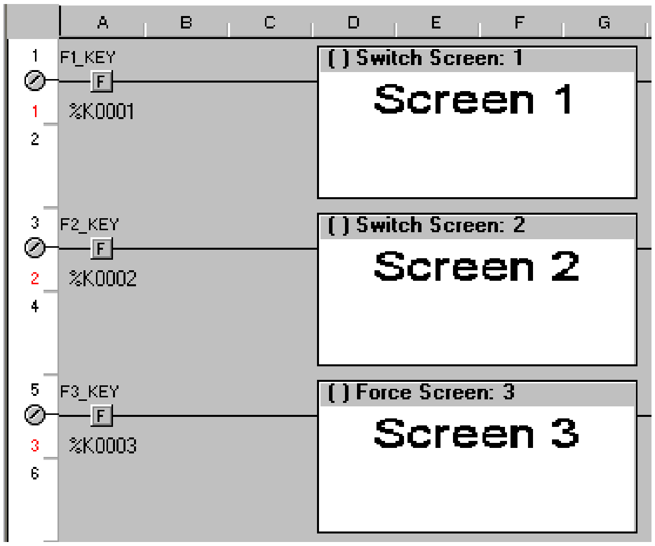
From this configuration box, there is the added ability to click the ‘Edit Screen…’ button and go directly to the screen editor for the screen specified. There is also an option of using this coil to **Force** the screen or **Switch** the screen.

Lab 3: Screen Manipulation

When **forcing** a screen, the screen will be forced to display for as long as the coil has power. The screen number of the screen being forced is also reflected in %SR2. If a screen is forced, the value in %SR1 is not affected and stays the same as it was. When the screen is no longer forced, the controller will return to the screen reflected in %SR1. For example, if screen 51 is being displayed and an alarm occurs that forces screen 20, %SR1 will have a value of 51 and %SR2 will have a value of 20. When screen 20 is released from its force, %SR1 will still have a value of 51 and %SR2 will have a value of 0.

When **switching** a screen, the screen specified by the %D register will be switched to and will stay there even after power to the coil has been lost. This change is reflected in %SR1. For example, if screen 51 is being displayed and the screen is switched to screen 30, %SR1 will change from 51 to 30.

1. Create a new program for the XLe. Configure the I/O as shown in Lab 1.
2. Using the screen editor (Screens menu, View/Edit Screens…, or click T on the toolbar), put a Static Text label on screen 1 that says “Screen 1”. Do the same for Screen 2 and Screen 3 with Static Text labels that say “Screen 2” and “Screen 3”.
3. Exit the screen editor and save the file.
4. Add ladder logic so that the F1 key will **SWITCH** to Screen 1 and the F2 key will **SWITCH** to Screen 2. Note that when you are configuring the coil, you can click the ‘Screen>’ button and choose the screen to associate the coil with from the thumbnails shown. The %D address will automatically fill in this way.
5. Add ladder logic so that the F3 key will **FORCE** screen 3.



6. Save and download the program to the controller.

Screen 1 should display after the program is downloaded. Press the F2 key and note how the switch screen works. Press F1 to switch back to screen 1. Press F3 and watch how screen 3 will be on only for as long as you hold down the button. When you let go, the screen you were previously viewing will come back up. Try pressing F3 from both screen 1 and screen 2 to see this. Open a Data Watch window in Cscape and add %SR1 and %SR2 as INT values to watch the system registers and what they do when the buttons are pressed.

Part 2 – Changing the System Registers

Another way of displaying a screen is to directly move a value into one of the screen system registers. Using a Move function (Move functions are gone over in detail in an upcoming lab), a value representing the screen number can be moved to %SR1 to switch the screen. Cscape programming does not allow the user to write a value to %SR2 to change the screen. To turn on Alarm Screens (%SR2), either the %D coil for that screen will need to be specified as 'Force Screen' or the logic Alarm handler can be used.

Part 3 – Screen Jumps

One way of letting a user change screens from the screen itself without involving any ladder logic is to use Screen Jumps. This is an object that is placed on the screen just like any other object or data field on the screen. A screen number is specified as the screen to jump to.

One advantage to using Screen Jumps, in addition to not having to program ladder logic to do it, is that a menu-like structure can be simulated. (See Part 4 of this lab for other menu functionality.) When configuring a Jump Screen, there is an option to "Allow ESC to Return". With this option checked, using the jump keeps the last page on an internal memory stack so that it can be recalled. Pressing the ESC key on controllers with an ESC key on the keypad will recall the page from which the current page was jumped to. On touch-screen controllers that don't have an ESC key built in, a screen jump can be configured with the option to "Simulate ESC". Up to 16 "layers" can be recalled in order to back up through a menu system.

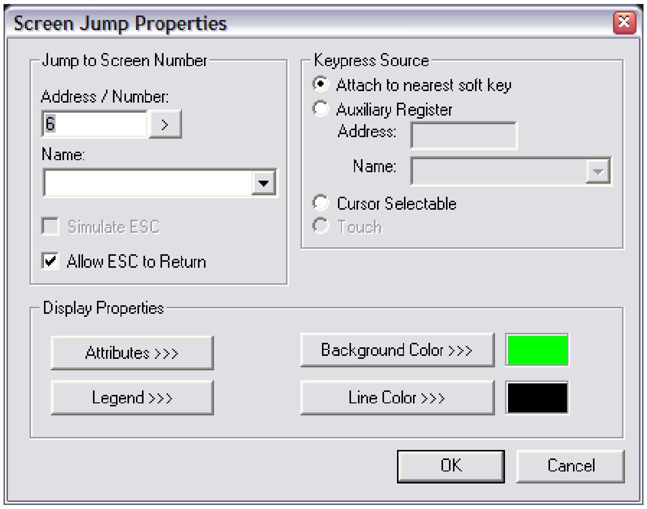
Note: When mixing Screen Jumps and Ladder Logic control of screens, the "Allow ESC to Return" memory stack is erased as soon as Ladder Logic switches or forces a screen. Be careful!

Adding to the program from Parts 1 and 2:

1. Add screen 6 with a Static Text label as done with the other screens.
2. Go to screen 1 and add a Screen Jump . On models without a touch-screen, this will be linked to the nearest softkey. The softkeys are the buttons on the side of the screen with arrows on them ▶ ◀ and can be linked to on-screen objects. On touch-screen controllers, the Screen Jump will be a pushbutton on the touch-screen.

Lab 3: Screen Manipulation

3. Double-click the Screen Jump and configure it to jump to screen 6. Check the “Allow ESC to Return” box. Change the Legend to something meaningful.



Screen Jump Properties

Jump to Screen Number

Address / Number: 6

Name:

☐ Simulate ESC

☑ Allow ESC to Return

Keypress Source

● Attach to nearest soft key

○ Auxiliary Register

Address:

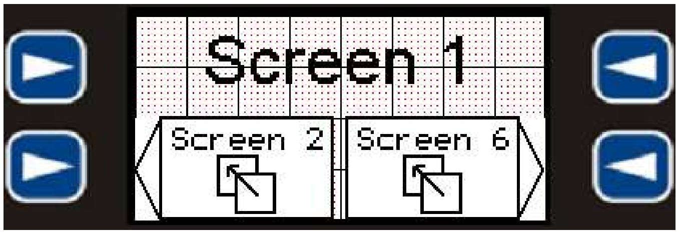
Name:

○ Cursor Selectable

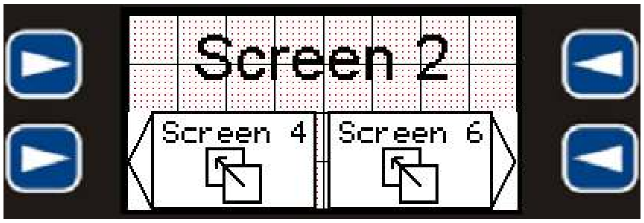
○ Touch

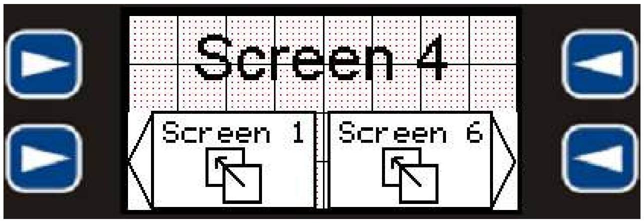
Display Properties

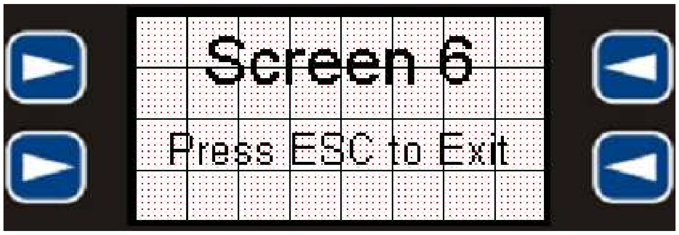
4. Add another Screen Jump to go to screen 2. Do NOT check the “Allow ESC to Return” option. Change the Legend. Your screen might look something like this:



5. On screen 2, configure the same Screen Jump to screen 6 (copy and paste it from screen 1 if desired). Make sure “Allow ESC to Return” is checked.
6. Add another Screen Jump to go to screen 4. Again, do NOT check “Allow ESC to Return” for this jump.
7. Repeat step 5 and 6 for screen 4. Make the second Screen Jump go to screen 1







8. If using a controller with a built-in ESC key, skip to step 10.
9. For touch-screen controllers without a built-in ESC key, go to screen 6 and put in another Screen Jump. Double-click on it to configure it and check the “Simulate ESC” box. This is all that is needed for this jump.
10. Exit the screen editor and save the program.
11. Download the program to the controller.

Screen 1 should display after the program is downloaded. Press the Screen Jump to go to screen 2, then to screen 4 and back to screen 1. On any of those screens, press the Screen Jump to go to screen 6. When screen 6 is displayed, pressing the ESC key on the keypad (or the pushbutton on the touch screen controllers) will return to the screen that screen 6 was called from.

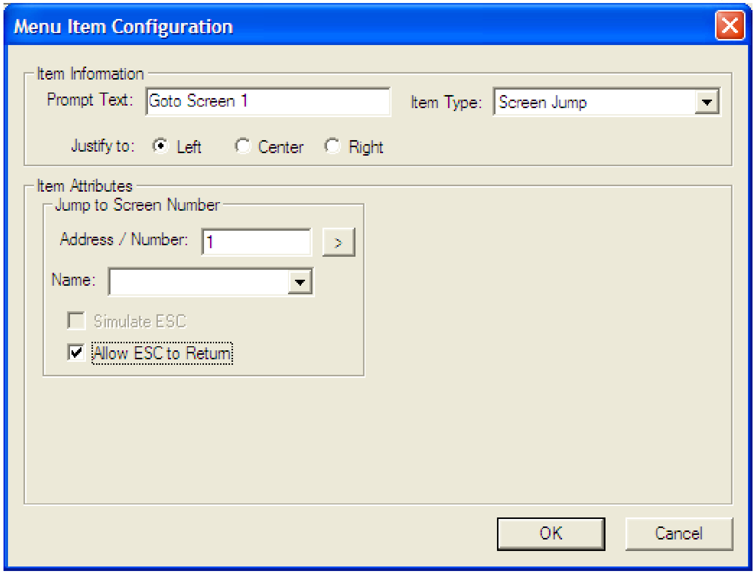
Part 4 – Menu Object

On XLe and NX22x controllers, the display is limited to 2 soft keys on each side of the display thus limiting the size and the number of items placed on the screen. To overcome this obstacle, the Menu Object can be used. The Menu Object has many features but for our lab, we will be using it for screen manipulation.

1. Start a new program. Configure the Controller and the I/O like in the previous labs.
2. Open the Graphics Editor and configure screens 1 – 6 to indicate ‘SCREEN #’ using the Static Text like before. # will indicate the number of the screen that is being configured so replace # with a 1 on screen 1, 2 on screen 2, and so on.
3. Place a Menu on screen 7. ▦ Stretch it out to cover the entire screen.
4. Double-click the Menu Object and click on Configure Menu Pages.
5. Press Add.

Lab 3: Screen Manipulation

6. In the Prompt Text, type ‘ Goto Screen 1’, select Screen Jump in the Item Type, put a 1 in the Address/Number, check the ‘Allow ESC to Return’, and press OK.



Prompt Text: Goto Screen 1

Item Type: Screen Jump

Justify to: ● Left ○ Center ○ Right

Address / Number: 1

Name:

□ Simulate ESC

☑ Allow ESC to Return

7. Go back to the Main Menu of the Menu object and repeat the steps for screens 2-6.
8. Configure screen 7 as the initial screen by clicking on the Screens Menu of the graphics editor and selecting Set Initial Screen and putting a 7 into the First Screen to display box.
9. Change the Legend of the Menu Object to reflect ‘ Screen Manipulation’.
10. Once done, close the graphics editor and download the program to the XLe.
11. Once done downloading the program, test the program by using the up and down arrow keys on the XLe to change the highlighted selection and pressing the Enter Key. The ESC key will allow you to navigate back to the Menu Screen.

Extra Credit #1

On non-touch-screen controllers, pressing the up and down arrows simultaneously gets into the system menu. Touch-screen controllers have a System key on the keypad.

Add ladder logic to your program to lock out the System key on the controller. %SR3 contains a number reflecting the system screen currently displayed. If none is shown, %SR3 contains a 0.

You can monitor %SR3 for a non-zero value and, if it is non-zero, move a zero back into it. Use a compare function to compare the value to zero. Compare functions will pass power to the rest of the rung if they are true.

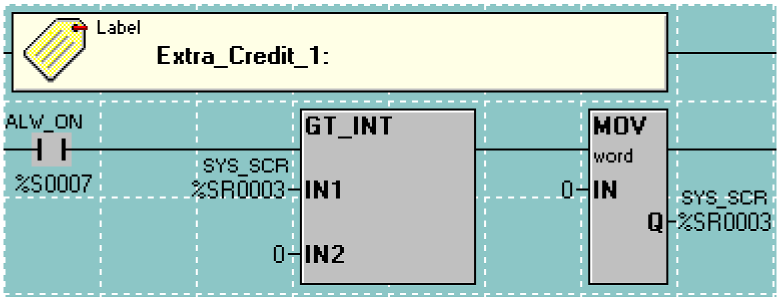
Extra Credit #2

Create ladder logic to scroll through the screens on the controller using the up and down arrow keys on the keypad.

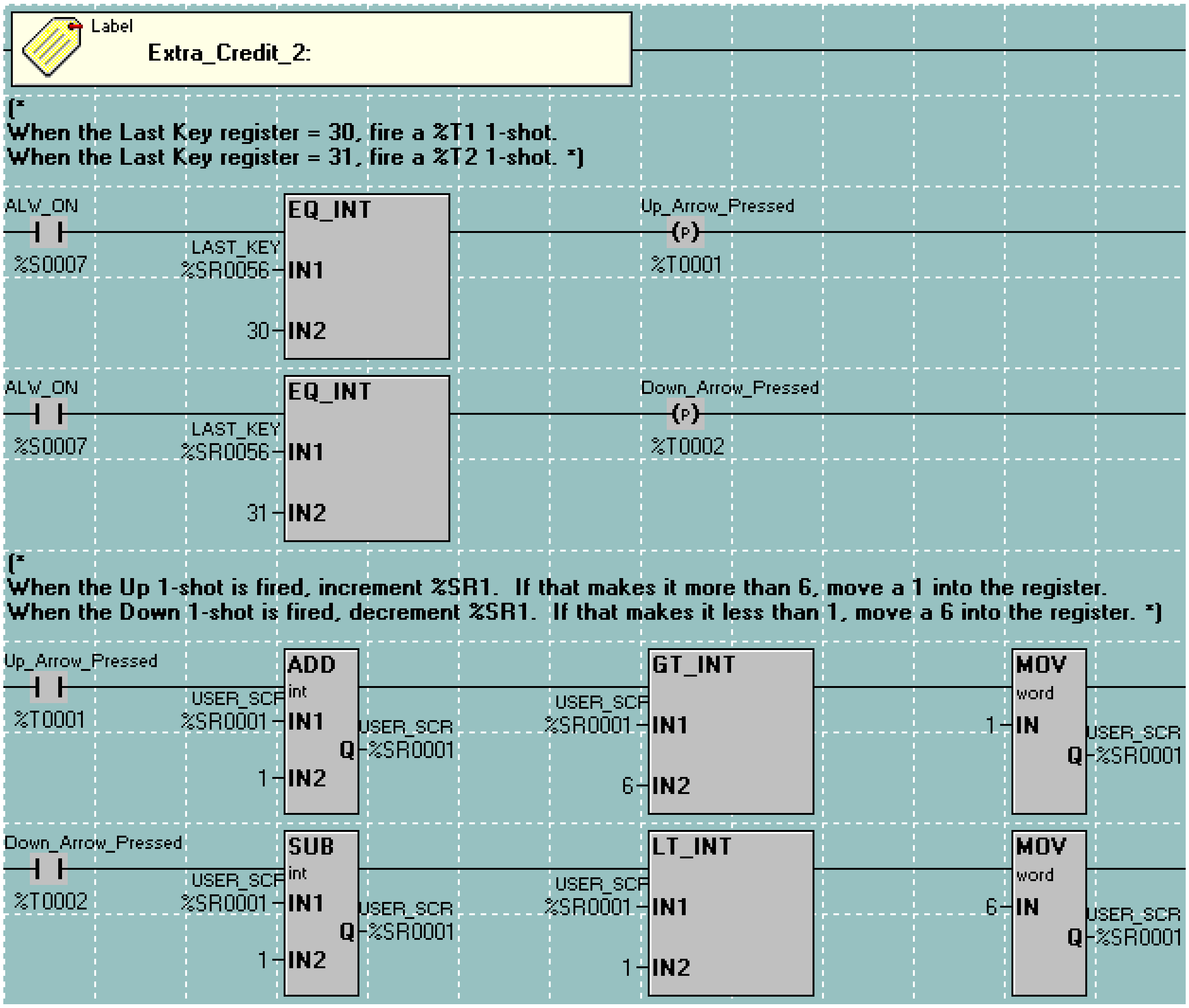
%SR56 is the 'Last Key' register and reflects a value unique to the button being pressed. The Up key is a value of 30 and the down key is a value of 31.

If %SR56 is equal to 30, increment %SR1 by 1 using an ADD Math Operation. If it is 31, decrement it by 1 using a SUB Math Operation. Be careful when pressing the Down key from screen 1… you'll have to put a value of 6 in %SR1 to "wrap around". Be careful when pressing the Up key from screen 6… you'll have to put a value of 1 in %SR1 to "wrap around". If you want to skip any screens in between 1 and 6, you'll have to program that in, too. And one last warning… Math Operations will take place on every scan if they are powered. Positive Transition (1-shot) coils will have to be thrown into the mix.

Solutions



Lab 3: Screen Manipulation



Label
Extra_Credit_2:

(*
When the Last Key register = 30, fire a %T1 1-shot.
When the Last Key register = 31, fire a %T2 1-shot. *)

(*
When the Up 1-shot is fired, increment %SR1. If that makes it more than 6, move a 1 into the register.
When the Down 1-shot is fired, decrement %SR1. If that makes it less than 1, move a 6 into the register. *)

Lab 3: Screen Manipulation

Notes:

Lab 3: Screen Manipulation

Notes:

LAB 4

Timers and Counters

Lab 4: Timers and Counters

Objective:

Review and understand Timers and Counters.

Timers Overview:

The purpose of the Timers portion of this lab is to show how each type of Timer operates and what the difference is between them. Also, using built-in status bits in the Timer registers can be useful in many cases instead of using additional coils in the ladder logic.

Note: You will almost ALWAYS use %R registers for Timers and Counters. Also, Timers and Counters always use 2 consecutive word-length registers!

REMEMBER! If a timer is addressed to %R1, then %R2.15 will indicate whether the timer is receiving power (for Counters and TON Timers only). %R2.16 will indicate whether the timer is passing power to the rest of the rung. In the same way, if addressed to %R846, then %R847.15 and %R847.16 are those status bits.

Part 1 – TON Timers:

1. Create a new program.
2. Title the program "Timers.csp".
3. Set the target ID to match the controller you are going to program.
4. Configure the controller. (Reference Lab 1 for correct procedure)
5. Configure a timer at %R1 that will pass power to a coil, %M1, when the F1 key is pressed and held for 3 seconds or more. Configure the timer for 100ms resolution.

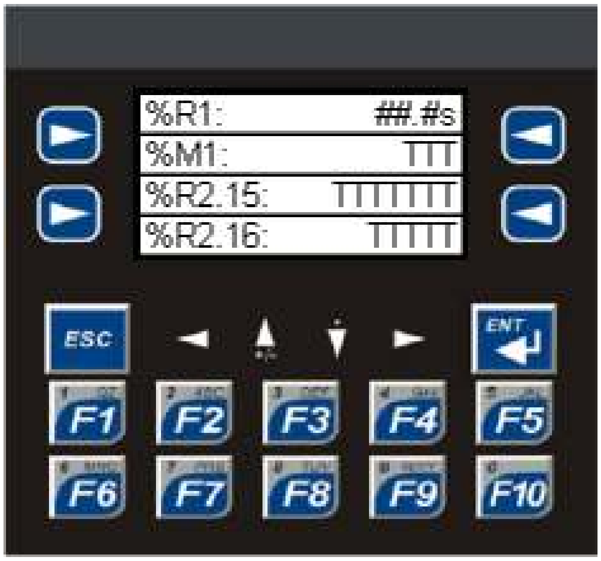
HINT: Since the timer is set for 100ms resolution, 3 seconds is equal to a "Pt" of 30. 30 100ms pulses equals 3 seconds.

6. Configure a text table (remember lab 2?) on the screen to show 'Off' or 'On' depending on the state of %M1.
7. Configure a second text table to show 'Off' or 'Enabled' depending on the state of %R2.15. %R2.15 will reflect whether or not the Timer is currently enabled.

HINT: There are up to 200 text tables to use. By default, every new text table field you make references text table 1. You will have to make new text tables and point the new text table to the appropriate table number.

8. Configure a third text table to show 'Off' or 'Power' depending on the state of %R2.16. %R2.16 will reflect whether or not the Timer is currently passing power to the rest of the ladder rung. It will pass power when the timer is done timing.
9. Configure a Numeric data field that displays how much time has elapsed in the timer. This will be the accumulated value of the timer, %R1. Configure the data field to be un-editable and displaying a length of 3 with 1 decimal place.

10. Label each field on the screen so you can tell them apart. This can be done by modifying the legend for each of the objects placed on the screen. Your screen might look something like this in the graphics editor:

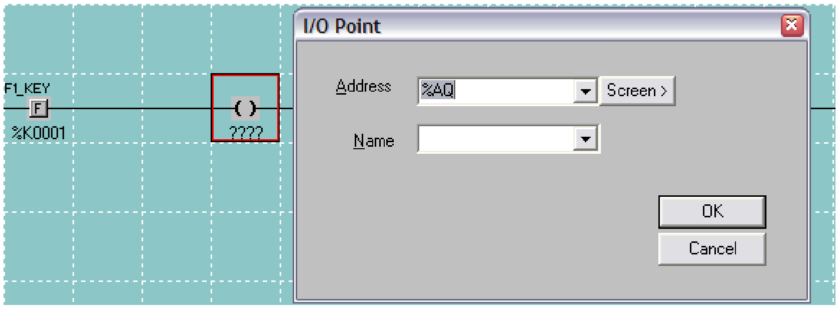


%R1: ###.#s
%M1: TTT
%R2.15: TTTTTTT
%R2.16: TTTTT

11. If this data is on a screen other than screen 1, you will need to add ladder logic or a Screen Jump to switch to this screen or back to it once you have switched away from it.

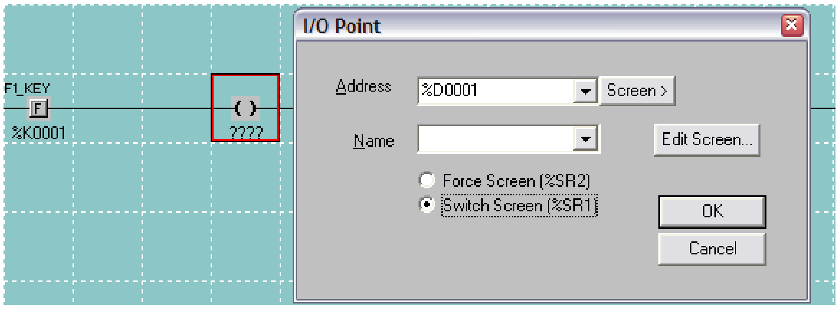
- Add a normally open contact addressed to the F1 key (%K1).

- Use it to fire a Switch Screen addressed to the screen above. Place a normally open coil and double-click on it to configure it. Click the ‘Screen>’ button and choose this screen from the thumbnails.



I/O Point
Address: %AQ
Name:

- Once the screen is chosen, make sure to specify the ‘Switch Screen’ option and click OK.



I/O Point
Address: %D0001
Name:
○ Force Screen (%SR2)
● Switch Screen (%SR1)

12. Download the program to your controller and make sure it is in RUN mode.
13. Compare the operation of %R2.15 (“Off” or “Enabled”) to the operation of the F1 key. They should be the same.
14. Compare the operation of %R2.16 (“Off” or “Power”) to %M1. They should be the same. You can use %R2.16 in place of %M1 in programming.
15. Watch the value in %R1 to see the accumulated time when F1 is pressed. Letting go of F1 before the 3 seconds is up will cause the timer to automatically reset to 0.

Part 2 – Retentive TON Timers

1. To the above program, add a timer that times and keeps track of how long the F2 key has been pressed. After the total has reached 5 seconds, the timer should pass power… unless the F10 key is pressed to reset the accumulated time. Configure the Timer for 10ms resolution.

HINT: Since this timer is set for 10ms resolution, 5 seconds is equal to a ‘Pt’ of 500. 500 10ms pulses equals 5 seconds.

HINT: Remember; each Timer or Counter takes 2 word-length (%R) registers. The timer from Part 1 takes up %R1 and %R2. Don’t overlap this timer with that one!

2. Configure a text table on the screen to show ‘Off’ or ‘On’ depending on the state of the Timer “Passing Power” status bit. (You may have to start a new screen.)

HINT: Since you have already created a text table for %R2.16 with ‘Off’ and ‘Power’, you can link this timer’s status bit to the same text table. Two different registers can use the same text table.

3. Configure a numeric data field that displays how much time has accumulated in the timer. Configure the numeric field for un-editable, 3 digits, and 2 decimal places.
4. Label each field using the legend so that you can tell them apart.
5. If the screen information is on a screen other than Screen 1, add more logic or a Screen Jump to switch to the appropriate screen.
6. Download the program to your controller and make sure it is in RUN mode.
7. Press the F2 key and watch the time increment. Let go before the 5 seconds is up and the time should stay where it is. Pressing F2 again will resume where it left off. You will have to press F10 to get the timer to restart at 0 again.

Part 3 – TOF Timers

1. To the above program, add a timer that will immediately pass power when the F3 key is pressed and will keep passing power for 5 seconds after the F3 key is released. Configure this timer for 100ms resolution.

HINT: Remember not to overlap the timers! Use the Timer Status bit to determine when the timer is passing power.

2. Configure a text table on the screen to show ‘Off’ or ‘Power’ depending on the state of the timer’s status bits to show when the timer is passing power. (You may have to

start a new screen and, remember, you can re-use the text table you already have for 'Off' and 'Power'.)

3. Label everything.
4. Add logic or a Screen Jump to switch to this screen if needed.
5. Download and make sure the controller is in RUN mode.
6. Notice how this timer shows 5.0 seconds in its accumulated time when it is inactive, but the status bit shows 'Off' because power is not being passed.
7. Notice how the accumulated time goes to 0.0 when you press the F3 key and the status bit shows 'Power' immediately.
8. Notice how the accumulated time then starts counting when you let go of the F3 key and how the status bit still shows 'Power' to the rest of the ladder rung, even though power to the rung has been interrupted.
9. Notice how power is discontinued when the timer reaches its 5 seconds.

Counters Overview:

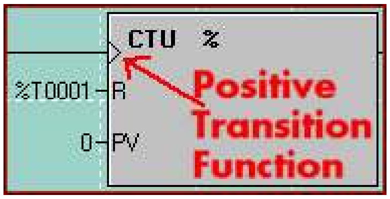
The purpose of the Counters portion of the lab is to demonstrate how Counters work and what the difference is between a Count-Up Counter and a Count-Down Counter.

Count-Up counters (CTU) reset to 0 and count up from there, passing power when they reach their preset value (PV).

Count-Down counters (CTD) reset to their preset value (PV) and count down from there, passing power when they reach 0.

Status bits in the Counter's second register work the same way as the Timer's status bits.

Counters increment or decrement only once every time they see power come on from the ladder rung. This is what the little triangle at the counter input means:



Part 4 – CTU Counters

1. To your program, add a counter that will count the number of times the F4 key has been pressed. If F4 is pressed a total of 4 times or more, power should be passed to the rest of the rung.

HINT: Just like Timers, Counters also take up 2 word-length (%R) registers. Don't step on any of your timers!

2. Make the F10 key reset the counter.
3. Create another screen with a numeric data field and a text table to show the counter's accumulated count and its status bit to let you know whether or not it is passing power.

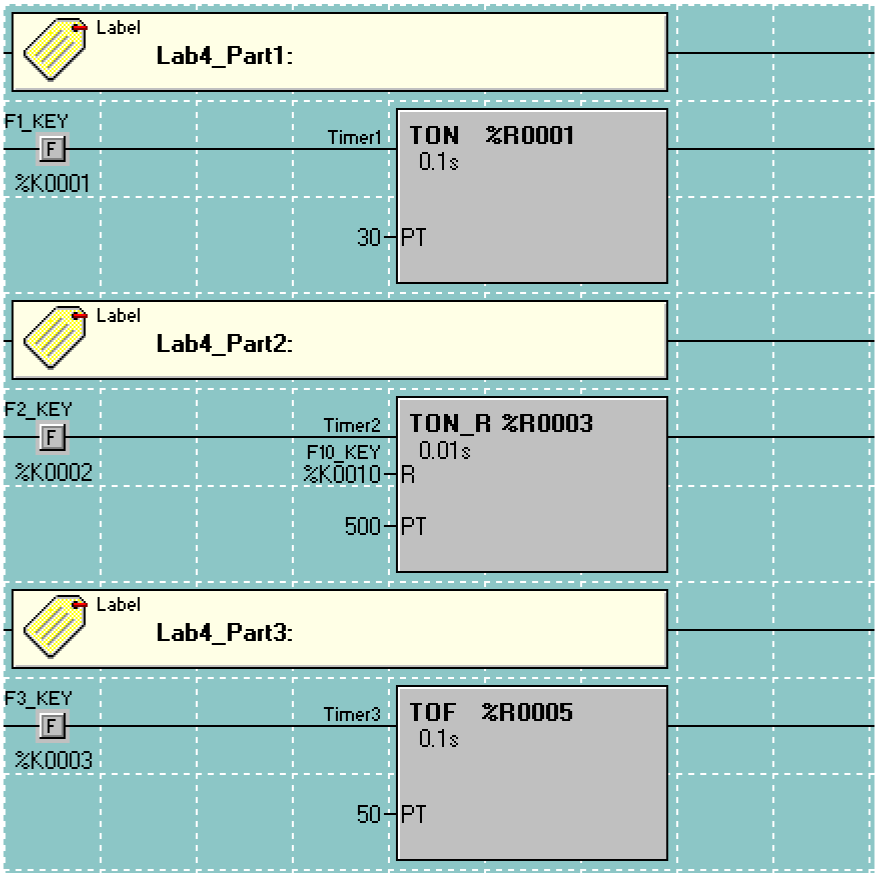
4. Add logic or a Screen Jump to switch to this screen if needed.
5. Download and make sure the controller is in RUN mode.
6. Press the F4 key and watch the count increment. When it reaches 4, power should be passed. Pressing F10 will reset the counter regardless of where it is in the count.
7. Notice how the counter continues to count past its preset value if you keep pushing the F4 key. It will continue to count and will also pass power until it is reset.
8. Notice how the counter's status bit acts the same as the timer status bit.

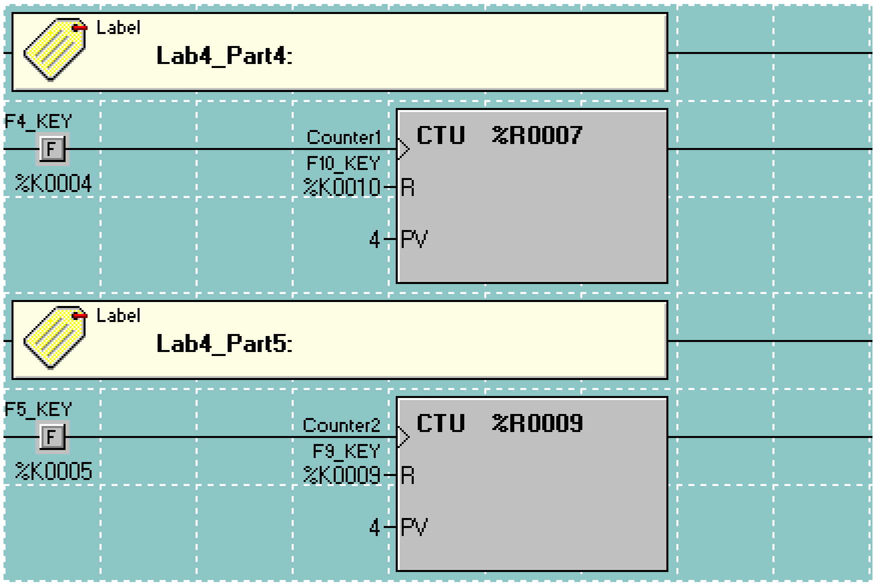
Part 5 – CTD Counters

1. To your program, add another counter that will count the number of times the F5 key is pressed. However, use a CTD counter to count down from 4. Use the F9 key to reset the counter.
2. Create another screen to monitor this counter, just like you have for all the other timers and counters. However, make sure the numeric data field for the accumulated count is set up for 6 digits and make sure it is set up for a 'Signed Decimal' display format.
3. Add logic or a Screen Jump to switch to this screen if needed.
4. Download and make sure the controller is in RUN mode.
5. Make sure the counter is reset by pressing the F9 key. Notice how it resets to the preset value.
6. Press the F5 key and watch the count value decrement. When the count reaches 0, power will be passed.
7. Notice how the counter will continue to decrement past 0. Depending on how you have your data field set up, it will either show -1, -2, -3, etc. (Signed Decimal display format), or it will show 65535, 65534, 65533, etc. (Decimal display format, also known as Unsigned Decimal).

CONGRATULATIONS, YOU'VE FINISHED TIMERS AND COUNTERS!

Solutions:


Label
Lab4_Part1:
F1_KEY
F
%K0001
Timer1
TON %R0001
0.1s
30
PT
Label
Lab4_Part2:
F2_KEY
F
%K0002
Timer2
F10_KEY
%K0010
TON_R %R0003
0.01s
R
500
PT
Label
Lab4_Part3:
F3_KEY
F
%K0003
Timer3
TOF %R0005
0.1s
50
PT


Label
Lab4_Part4:
F4_KEY
F
%K0004
Counter1
F10_KEY
%K0010
CTU %R0007
R
4
PV
Label
Lab4_Part5:
F5_KEY
F
%K0005
Counter2
F9_KEY
%K0009
CTU %R0009
R
4
PV

Lab 4: Timers and Counters

Notes:

Lab 4: Timers and Counters

Notes:

LAB 5

Move Operations

Lab 5: Move Operations

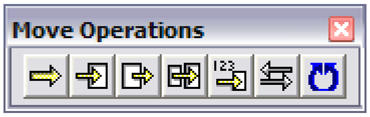
Lab 5: Move Operations

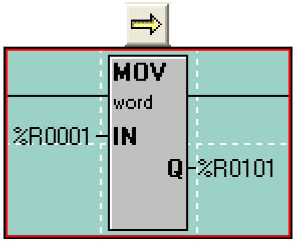
Objective:

Review and understand Move Operations

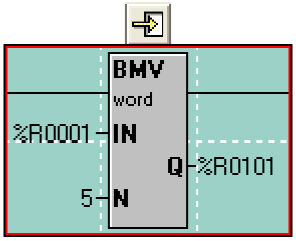
Overview:

There are several types of Move functions available for use for several types of different occasions. The ‘Move Operations’ toolbar appears as follows:

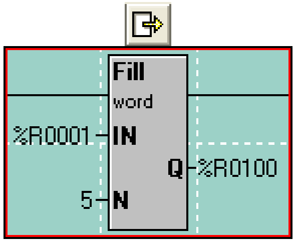




The first type of Move is the ‘Move Word’, or ‘MOV’. It is used to copy a single byte, word or double-word from one location to another. The count is locked at 1. In the case of the example to the left, the value in %R1 is copied into %R101. This only happens when the ladder rung receives power. The value in %R101 is NOT taken back out when power is lost to the rung. The IN can be either a register or a constant value.

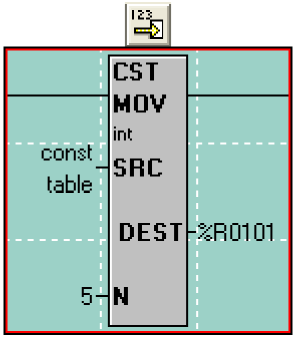


The next type of Move is the ‘Move Data Block’, or ‘BMV’. It is used to copy a group of bytes, words or double-words to another location. The count (N) determines how many registers are to be copied. In the example to the left, %R1-%R5 are copied into %R101-%R105. Again, this only happens when the ladder rung receives power. The IN must be a register reference and constant values are not allowed.

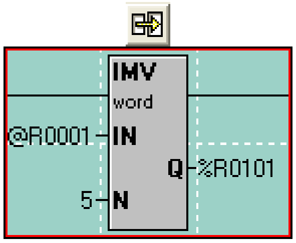


The next type of Move is the “Fill WORD”, or “Fill”. It is used to copy the contents of a single register or value into multiple other registers, thus filling that one value into a group of registers. The count (N) determines how many registers to fill that single value into. In the example to the left, the value in %R1 is copied into %R101-%R105 so that %R101-%R105 all will have the same value in them. This can be used to zero-out a group of registers. The IN can be either a register or a constant value.

Lab 5: Move Operations

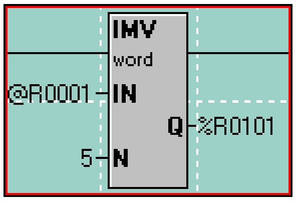


Skipping to the ‘Constant Move’, or ‘CST MOV’, it is used to move a group of constant values into a group of consecutive registers. If, for example, you want to move the values 1, 2, 3, 4 and 5 into %R101, %R102, %R103, %R104 and %R105, respectively, then you can use the Constant Move function. The count (N) is automatically determined by how many constant values you enter into the configuration for this function. The source data can ONLY be constant data and cannot be register references.

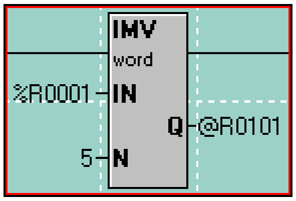


Moving back one to the ‘Indirect Move’, or ‘IMV’, it is used to move data from variable positions or to variable positions or both. It functions, for the most part, like the Block Move function. If specified as Indirect, the IN and/or the Q are used as pointers to where in the %R registers to get data from or put data to. When looking at the ladder logic, the @ symbol will appear next to the IN or Q address if it is specified as Indirect. This function can and most likely will get hairy to the uninitiated. It is most handy, though, when data-logging to register memory.

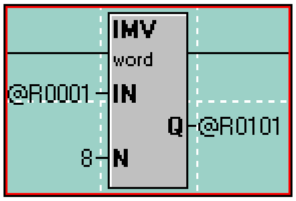
Indirect Move Examples



In this example, the IN is specified as Indirect. This means the controller will look at %R1 and see a value within it. If %R1 has a value of 501 in it, the controller will go to %R501 to get the source data. 5 registers will then be moved from %R501-%R505 to %R101-%R105.



In this example, the Q is specified as Indirect. This means the controller will look at %R101 and see a value within it. If %R101 has a value of 851, the controller will take the data in %R1-%R5 and move it into %R851-%R855.



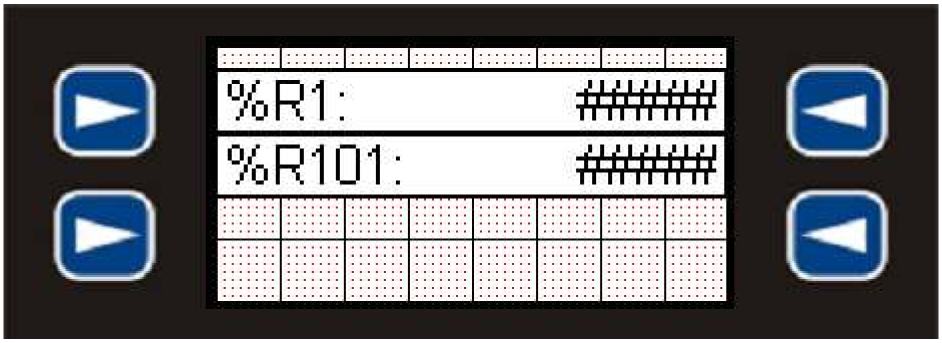
In this example, the Mother of All Confusion, both the IN and the Q are specified as Indirect. This means the controller will look at %R1 and see a value. Let’s say it is 241. The controller also looks at the value in %R101. Let’s say it is 341. The controller will then take the values in %R241-%R248 and move them into %R341-%R348.

Confused yet? Let’s get on with the lab.

Lab 5: Move Operations

Part 1 – Move

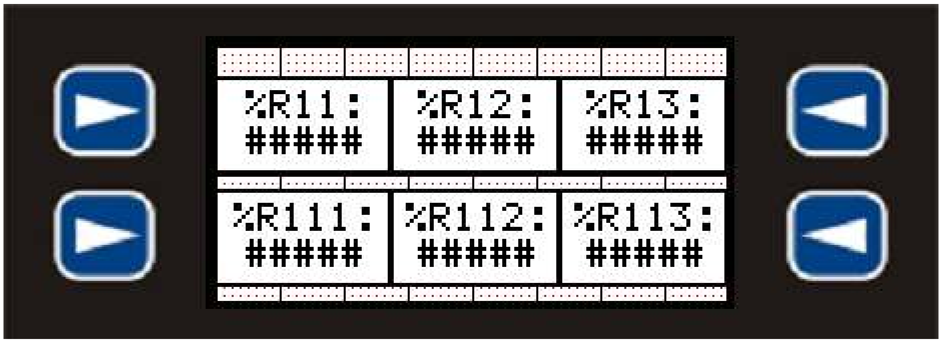
1. Start a new program for the controller you are connected to and call it whatever you want. Configure the controller and I/O as you have done before.
2. Move the value in %R1 to %R101 when the F1 key is pressed.
3. Move the value of 0 into %R101 when the F2 key is pressed.
4. Create a screen with numeric data fields that show %R1 and %R101 and label the fields. Be sure to make the %R1 data field editable:



5. Add logic or a Screen Jump to switch to this screen if needed.
6. Download the program and make sure the controller is in RUN mode.
7. Edit the value in %R1 to whatever you like by pressing the Enter key when the field is outlined, typing in a value on the keypad, and then pressing Enter again.
8. Press the F1 key to move the value you just edited into %R101.
9. Press the F2 key to move a value of 0 into %R101.

Part 2 – Block Move

1. Add programming to move the values in %R11-%R13 to %R111-%R113 when the F3 key is pressed.
2. Create another screen with data fields to show the registers. Be sure to make the %R11, %R12 and %R13 data fields editable:

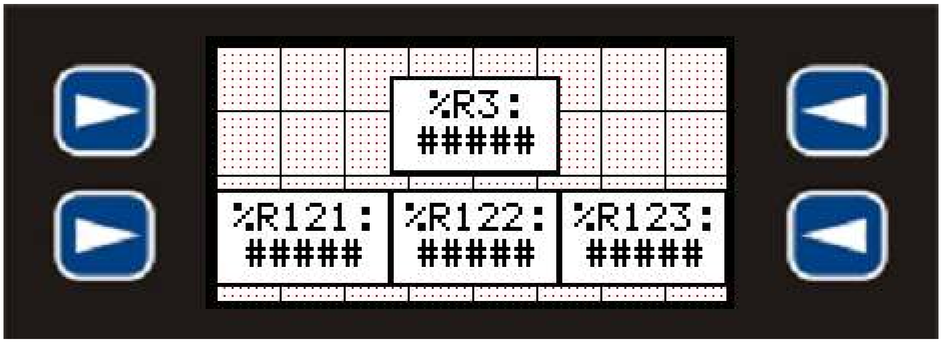


3. Add logic or a Screen Jump to switch to this screen if needed.
4. Download the program and make sure the controller is in RUN mode.

5. Edit the values in %R11-%R13 to whatever you like. Use the arrow keys on the keypad (not the soft keys) to select a field, press the Enter key when the field is outlined, type in a value on the keypad, and then press Enter again.
6. Press the F3 key to move all the values you just edited in %R11-%R13 to %R111-%R113.

Part 3 – Fill WORD

1. Add programming to fill the value contained in %R3 into all the registers from %R121-%R123 when the F4 key is pressed.
2. Fill those same registers with a value of 0 when the F5 key is pressed.
3. Create another screen with data fields to show the registers. Be sure to make the %R3 data field editable:



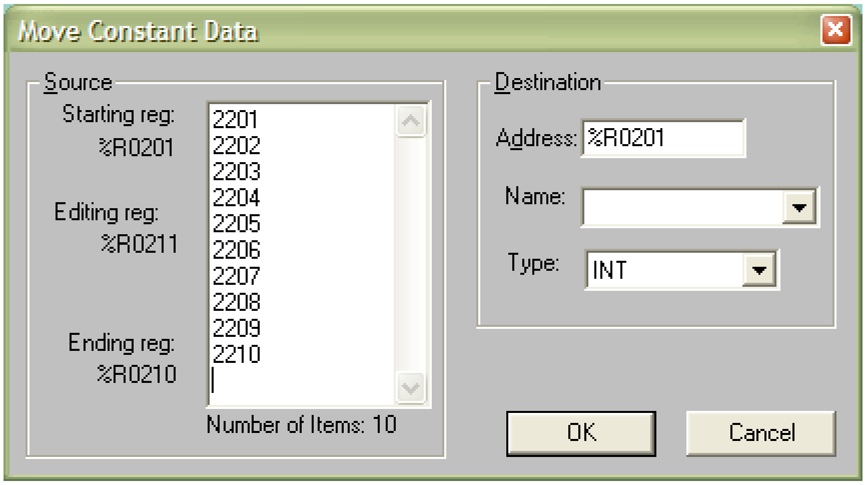
4. Add logic or a Screen Jump to switch to this screen if needed.
5. Download the program and make sure the controller is in RUN mode.
6. Edit the value in %R3 to whatever you like.
7. Press the F4 key to fill the value you just edited into %R121-%R123.
8. Press the F5 key to zero out the values in %R121-%R123

Lab 5: Move Operations

Part 4 – Constant and Indirect Moves

1. Using the Constant Move, add programming that will move the values of 2201-2210 into registers %R201-%R210 on First Scan.

HINT: On your Cheat Sheet, find the %S register that is the system coil for First Scan.



Move Constant Data

Source

Starting reg: %R0201

Editing reg: %R0211

Ending reg: %R0210

2201
2202
2203
2204
2205
2206
2207
2208
2209
2210

Number of Items: 10

Destination

Address: %R0201

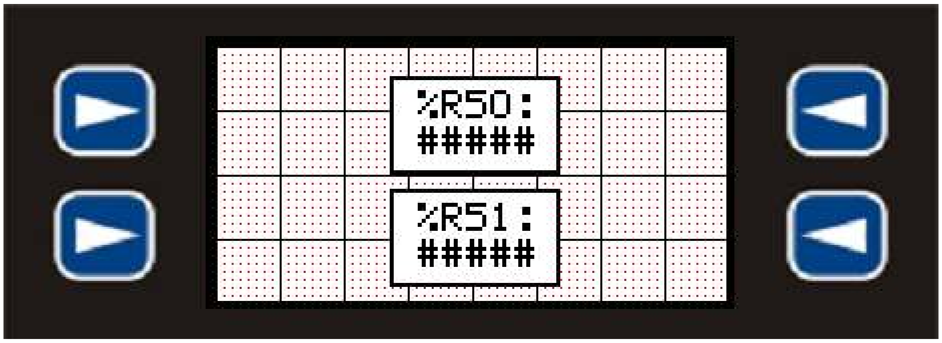
Name:

Type: INT

2. Add an Indirect Move to your program that is powered with an Always-On system contact.

HINT: Use the Cheat Sheet to find the Always-On contact!

3. Use the value in %R50 as the “from” address, or pointer. This means you will have to check the Indirect option in the Source area. Use %R51 as the destination register. Do NOT check the Indirect option for the Destination.
4. Create a screen with data fields showing %R50 (editable) and %R51:



%R50:
#####

%R51:
#####

5. Add logic or a Screen Jump to switch to this screen if needed.
6. Download the program and make sure the controller is in RUN mode.
7. Edit the value in %R50 to equal something between 201 and 210. You will be able to see the values in %R201-%R210, moved with your Constant Move function, in %R51, based on the value in %R50.

Lab 5: Move Operations

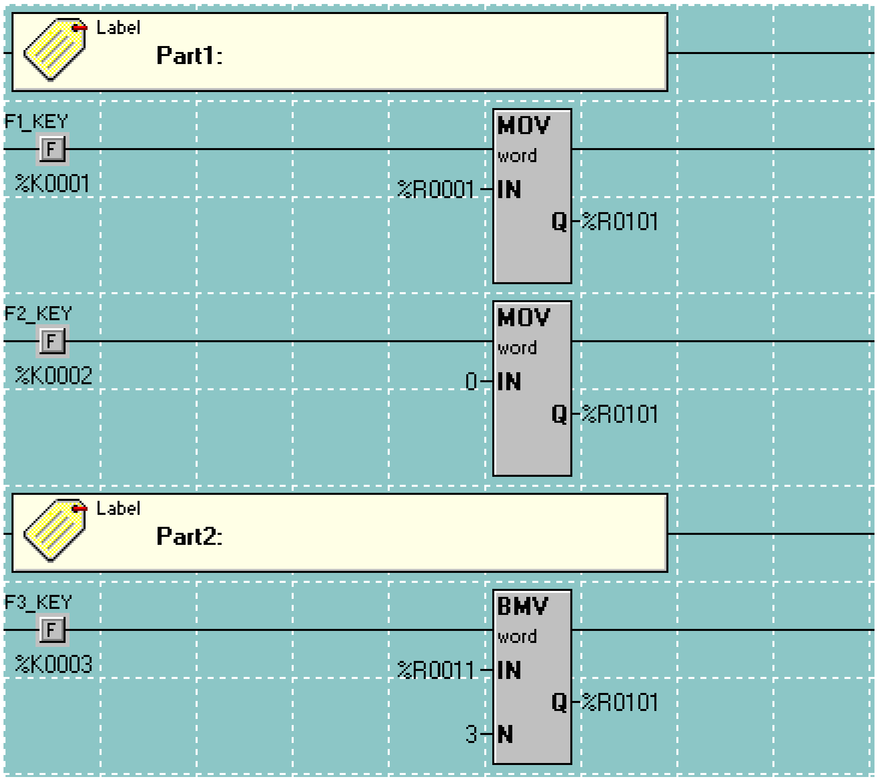
Extra Credit

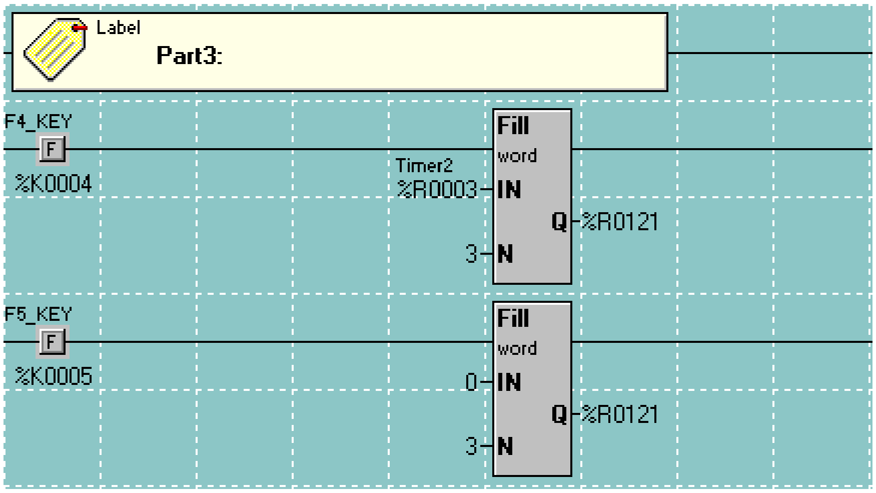
Use a Move Word function and the F1, F2, F3 and F4 keys to change between your screens in the program. F1 should change to the screen with the Move Word information, F2 should change to the screen with the Block Move information, and so on. Refer to Lab 3 if needed.

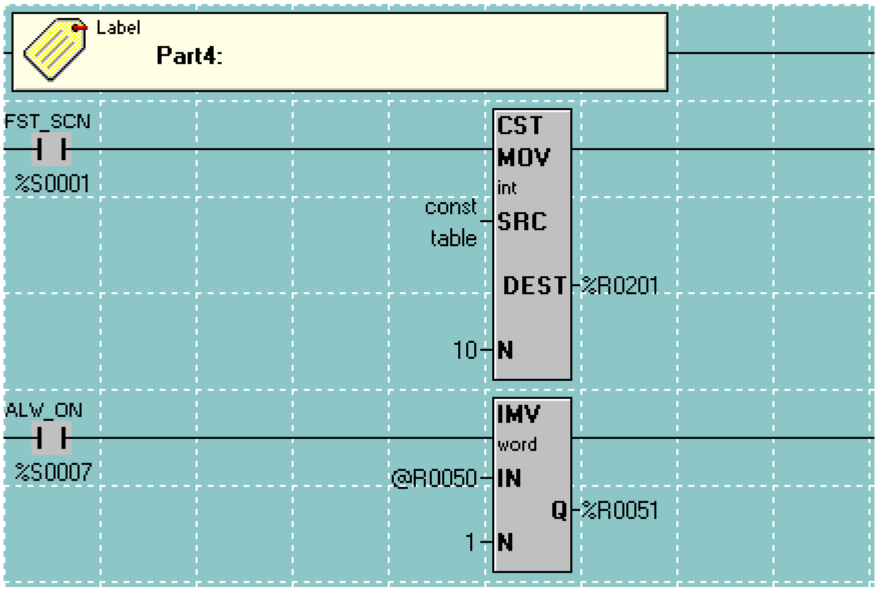
CONGRATULATIONS, YOU'VE FINISHED THE LAB ON MOVE FUNCTIONS!

Lab 5: Move Operations

Solutions:



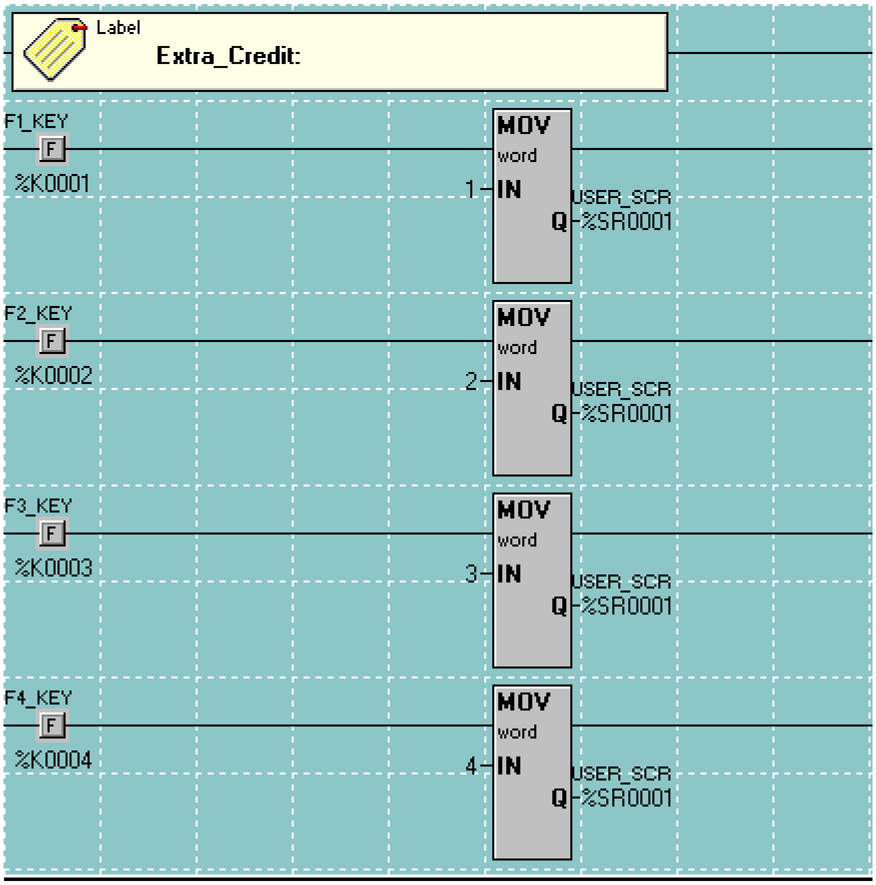




```
Label
Part4:

FST_SCN                         CST
  %S0001                        MOV
                                int
                   const  -SRC
                   table
                                DEST-%R0201
                     10-N

ALW_ON                          IMV
  %S0007                        word
                @R0050-IN
                                   Q-%R0051
                      1-N
```



```
Label
Extra_Credit:

F1_KEY                          MOV
  %K0001                        word
                      1-IN          USER_SCR
                           Q-%SR0001

F2_KEY                          MOV
  %K0002                        word
                      2-IN          USER_SCR
                           Q-%SR0001

F3_KEY                          MOV
  %K0003                        word
                      3-IN          USER_SCR
                           Q-%SR0001

F4_KEY                          MOV
  %K0004                        word
                      4-IN          USER_SCR
                           Q-%SR0001
```

Lab 5: Move Operations

Notes:

Lab 5: Move Operations

Notes:

LAB 6

CsCAN Basic Networking

Lab 6: Basic CsCAN Networking

Objective:

Review and Understand global data transfer from OCS-to-OCS and from OCS-to-Network I/O over CsCAN.

Overview:

For Part 1 and Part 2 of this lab, you will network two controllers together… yours and someone else's. Work together with a person next to you or take turns using the equipment. For Part 3, a SmartStix I/O block will be added to the network.

Procedure:
Part 1 - Analog Data Over CsCAN

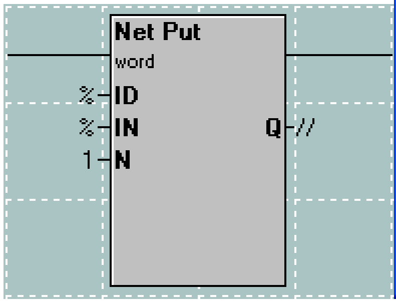
Step 1

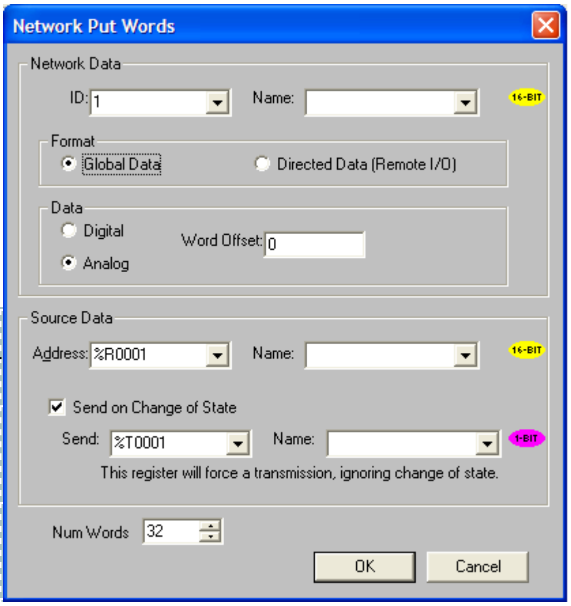
➢ **Create a new program.**

1. Title the program 'Lab 6 Node 1.csp'.
2. Set the target to node id 1. Verify through the system menu that the node address is set to 1 and that the baud rate is 125K.
3. Configure the controller. (Reference Lab 1 for correct procedure)
4. Write a ladder program to increment a counter every 1 second. Assign the counter to %R1. The counter should be configured to count to 200. Use the 16th bit of the second word of the counter, %R2.16, to reset the counter upon the counter reaching the preset value. Remember that the counter will occupy 2 registers so the counter will consume % R1 – R2.

HINT: %S5 is a system register that pulses every second… Address a Normally Open contact to %S5 to fire the counter once every second.

5. Write a line of code to place the accumulated value of the counter out onto the network allowing other nodes on the network to read the information. To perform this task, use an ALW_ON contact, %S7, with a NET_PUT instruction block.




Network Put Words

Network Data

ID: 1 Name:

Format

● Global Data ○ Directed Data (Remote I/O)

Data

○ Digital Word Offset: 0

● Analog

Source Data

Address: %R0001 Name:

☑ Send on Change of State

Send: %T0001 Name:

This register will force a transmission, ignoring change of state.

Num Words 32

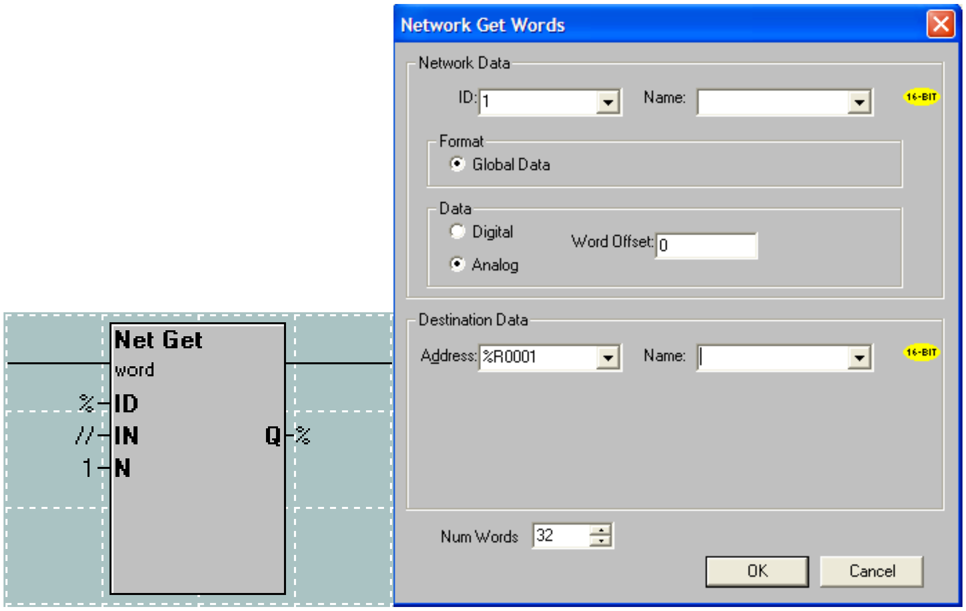
6. Configure a screen to display the accumulated value of the counter. Consult the previous labs for help with this task.
7. Save the program to the PC and then download the program to the controller.

Step 2

- **Create another new program.**

1. Title the program 'Lab 6 Node 2.csp'.
2. Set the target to node id 2. Verify through the system menu of the 2nd controller that the node address is set to 2 and that the baud rate is 125K.
3. Configure the controller. (Reference Lab 1 for correct procedure)
4. Configure the network to read the information from Node 1 into %R1.

   This will be achieved by using the NET_GET instruction block.



Network Get Words

Network Data

ID: 1 Name:

Format

● Global Data

Data

○ Digital

● Analog

Word Offset: 0

Destination Data

Address: %R0001 Name:

Num Words 32

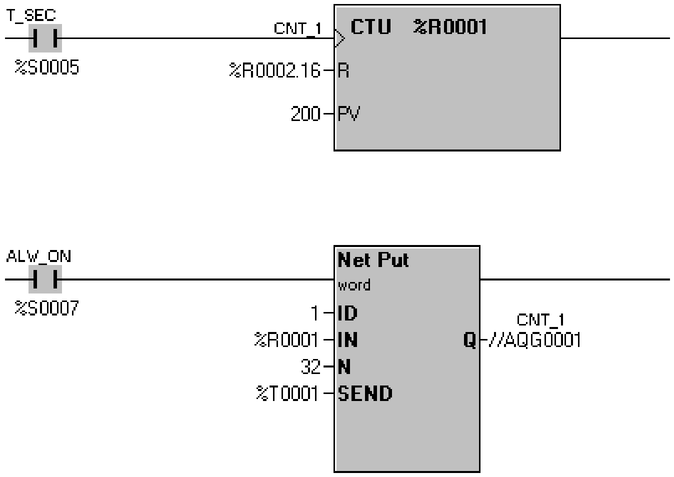
5. Configure Screen 1 to display "Incoming Data". This will be data coming from Node 1.
6. Save the program and then download it to the controller.

Step 3

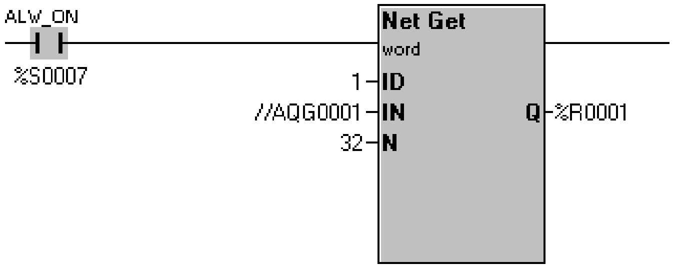
- **Verify the program's functionality.** Both controllers should display the same value when the value on Node 1 is edited.

Lab 6: Basic CsCAN Networking

- **Part 1 Solution.**



Node 1 Ladder Logic



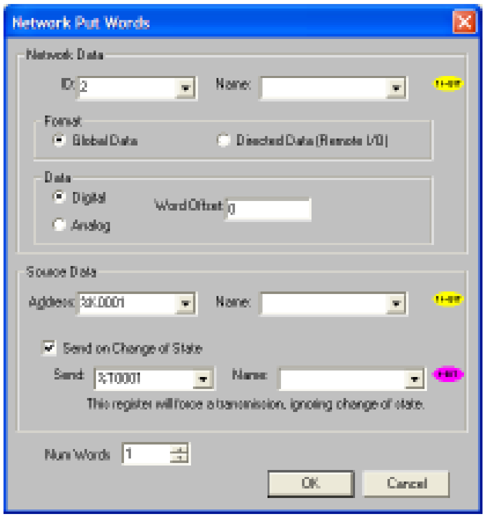
Node 2 Ladder Logic

Part 2 – Digital Data Over CsCAN

Step 1

➢ **Modify the Program for Node 2**

1. Broadcast the function keys onto the CsCAN network. This will require a NET_PUT instruction block. The instruction block will be configured for node id 2, digital, and the source will be K1 with the number of words equal to 1.



Network Put Words

Network Data

ID: 2 Name:

Format

● Global Data ○ Directed Data (Remote I/O)

Data

● Digital Word Offset: 0

○ Analog

Source Data

Address: %K0001 Name:

☑ Send on Change of State

Send: %T0001 Name:

This register will force a transmission, ignoring change of state.

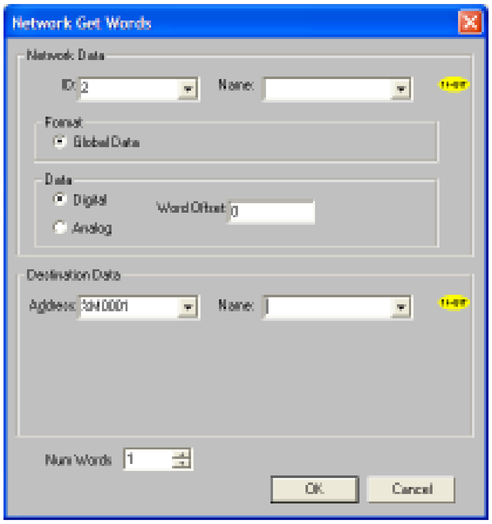
Num Words 1

2. Save the program and then download the program to the controller.

Step 2

➢ **Modify the Program for Node 1**

1. Configure Node 1 to read the function keys from Node 2 and put them into registers starting at %M1. Write a line of code that uses a NET_GET instruction configured for discrete from Node 2 with the destination of %M1.



Network Get Words

Network Data

ID: 2 Name:

Format

● Global Data

Data

● Digital Word Offset: 0

○ Analog

Destination Data

Address: %M0001 Name:

Num Words 1

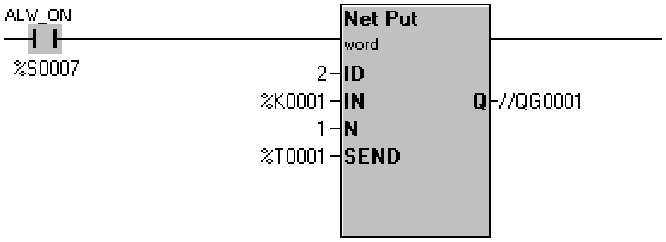
2. Write additional rungs of logic that will turn on outputs (%Q) when the %M registers from above come on (M1 will turn on Q1, M2 will turn on Q2, etc.). This can either be done using contacts and coils or via a move command.

Step 3

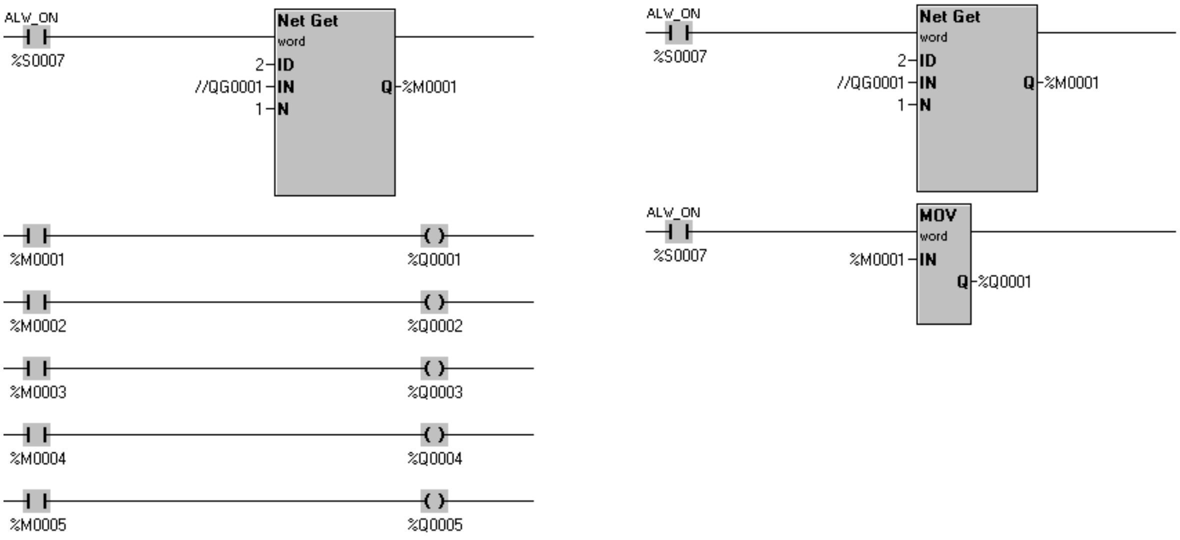
- **Verify the program's functionality.**

When F1 on Node 2 is pressed, the 1st output on Node 1 should turn on.

- **Part 2 Solution**



Node 2 Program Addition



Option 1

Option 2

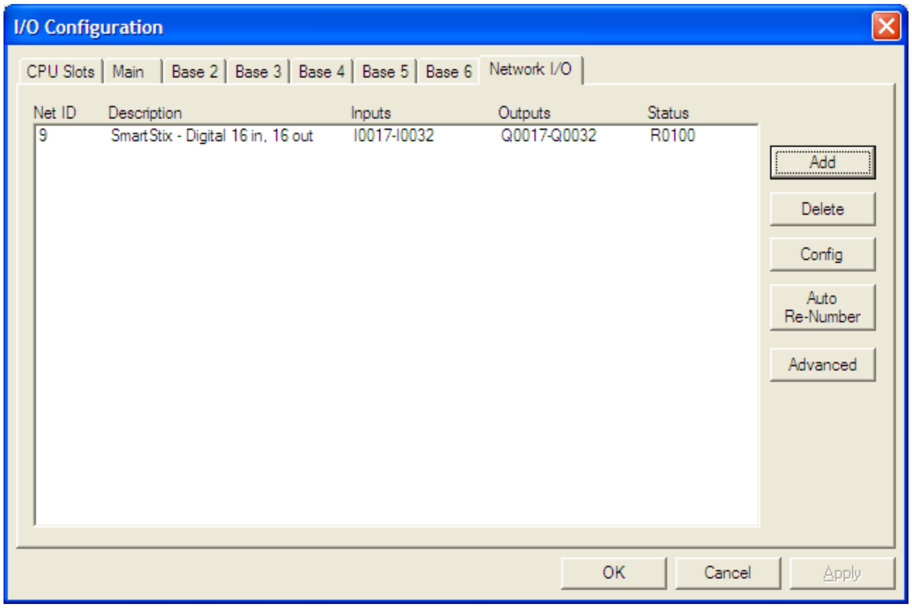
Node 1 Program Addition

Part 3 – SmartStix

Step 1

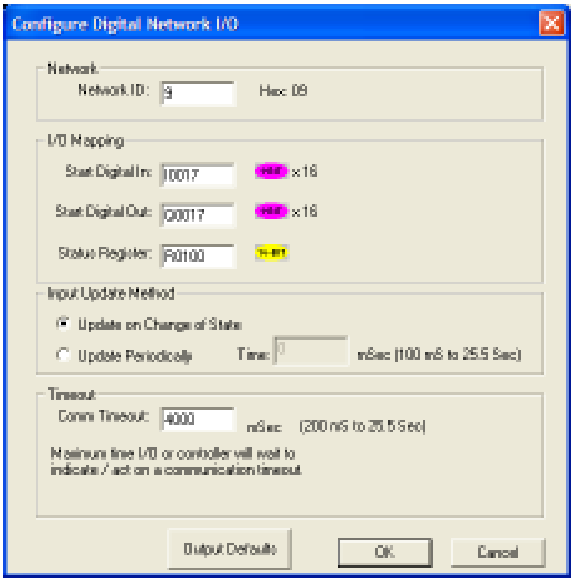
➢ **Modify the Program for Node 1**

1. Configure Node 1 for SmartStix I/O. This is done via the Network I/O tab located in the I/O configuration.



Net ID	Description	Inputs	Outputs	Status
9	SmartStix - Digital 16 in, 16 out	I0017-I0032	Q0017-Q0032	R0100

2. Press Add and select “SmartStix – Digital 16in, 16out”.
3. Configure the SmartStix as illustrated in the picture below:



Network ID: 9 Hex: 09

Start Digital In: I0017 x 16

Start Digital Out: Q0017 x 16

Status Register: R0100

● Update on Change of State

○ Update Periodically Time: 0 mSec (100 mS to 25.5 Sec)

Comm Timeout: 4000 mSec (200 mS to 25.5 Sec)

Maximum time I/O or controller will wait to indicate / act on a communication timeout.

Note: Make sure the Network ID matches the rotary switches on the SmartStix. Also, the rotary switches are in Hexidecimal.

4. Press OK
5. Press OK

6. Modify the Node 1 program to turn on %Q17 - %Q25 when the function keys of Node 2 are pressed. Depending on which option you chose in part 2, it will require either changing the address of the coils or changing the destination of the move command.
7. Save program and download changes to Node 1.

Step 2

- **Verify functionality.**

Press the F1 key on Node 2 and the first output LED on the SmartStix should turn on, F2 should turn on the second, etc.

CONGRATULATIONS ON COMPLETING THE NETWORKING LAB!

Notes:

LAB 7

Graphics Editor

Lab 7: Graphics Editor

Lab 7: Graphics Editor

Objective:

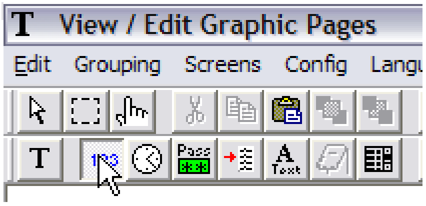
Understand more about how to create screens using the Graphics Editor.

Overview:

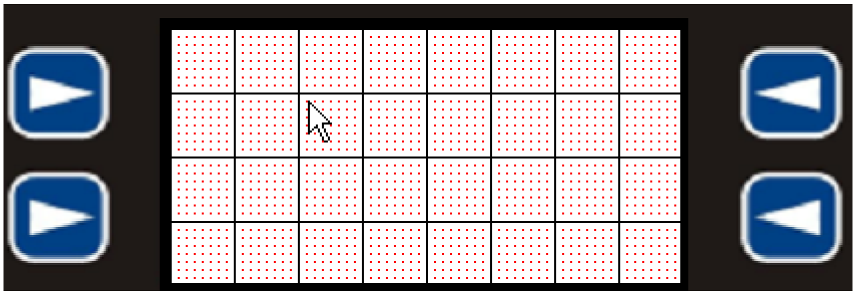
In previous labs, you have learned a couple of things here and there about how to create screens. In this lab, there is more detail on the different objects that can be placed on a screen to either show data in different formats or simply “pretty-up” the display, making it easier to read.

In order to keep from having problems, the recommended way of placing graphics objects on the screen is to click on the desired object on the toolbar and releasing the mouse button, just like in the ladder logic part of Cscape. You do NOT drag something from the toolbar onto the screen. Once selected, bring the mouse down into the screen. Click AND HOLD the left mouse button at the top left corner of where you want your object, then drag it out to size. Simply clicking and immediately releasing may make an “invisible” object or may bury the object halfway off the screen to where it needs to be deleted and replaced.

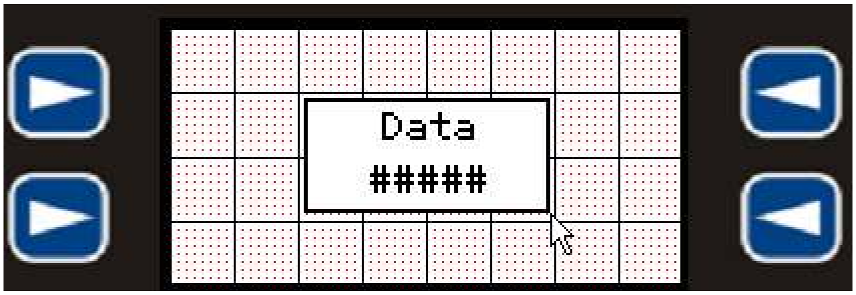
Click and release to select an object:



Click and hold at top left of desired position:



Drag out the object on the screen. Release the mouse button once the object is sized to your liking… it can always be moved and resized later:



Lab 7: Graphics Editor

Graphics Objects:

Static Text

T

You have already used Static Text in previous labs. Static Text is used as a label and is not attached to any register data.

Numeric Data

123

You have already used Numeric Data in previous labs. Numeric Data is a way to display data in Integer, Double Integer, Floating Point, Hexidecimal, and several other formats. This field is linked to register memory and can be selected as Editable, which means the user will be able to edit the data in this field from the controller, or can be used only as a display that the user cannot change.

Time Data

🕒

Time Data is an automatically formatted data field that shows either the Time or Date. This field is linked to 3 consecutive registers that contain either the time or date in the same order as in the RTC system registers %SR44 - %SR50.

For time: Seconds in the first register, Minutes in the second, Hours in the third.

For date: Day in the first register, Month in the second, Year in the third.

Password Data

Pass ***

Password Data is a data field linked to register memory that must be 32-bits in length… 2 %R registers, for instance. On the screen, asterisks will display instead of the actual data.

Text Table

→☰

You have already used Text Tables in previous labs. Text Tables objects are lookup tables linked to register memory and a single text table. Instead of displaying the actual numeric value in the register, those values will cross-reference to the entries in the text table. Depending on the value in the register, the corresponding text will display. Many different Text Table objects on many different screens linked to many different registers can all access the same text table if it contains the text needed for them all. There are 200 text tables to use, each with twenty 20-character entries, each entry linked to a value.

Lab 7: Graphics Editor

Menu

You have used the Menu Object in a previous lab. The Menu object makes the creation of a menu system easy. Each entry in the menu can be specified as a screen jump, a link to a sub-menu or a register value to edit.

Indicator

The indicator is used as an OFF/ON indicator for discrete data. It is linked to a 1-bit register. There are several display options to choose from for the desired look.

Switch / Button

The Switch, a.k.a. Button, is used to indicate and control discrete data. It is linked to a 1-bit register in and can be specified to operate as a momentary or toggle switch, as well as “always turn ON” and “always turn OFF”. On controllers with softkeys, the switch will most likely be connected to the nearest softkey by default. On touch-screen controllers, the switch is activated by pressing it directly on the screen. There are several display options to choose from for the desired look.

Selector

The Selector is a method of choosing one of up to 4 items by pressing the selection desired. It is linked to a word-length register that will contain a value depending on the selected item… ‘0’ for Item 1, ‘1’ for item 2, ‘2’ for item 3 and ‘3’ for item 4. The number of items selectable and their names are configurable.

Screen Jump

You have used Screen Jumps in several of the previous labs. This is one of the methods of navigating through the screens on the controller.

Bar Graph / Meter / 360° Gauge

These are different ways of displaying the data in a word-length register. The Bar Graph can be configured in either a horizontal or vertical fashion based on its dimensions.

The Meter displays a needle and a sweep from the left to the right.

The 360° Gauge is simply a floating needle that can sweep from any angle to any angle in a 360-degree range… its scale marks or gauge face design must be done separately as a bitmap background or using other methods.

The Bar Graph and Meter objects can be configured to show any number of equally spaced hash marks along their scales. All three objects will automatically scale their sweep to the Min and Max values they are configured for.

Static Bitmap / Animation

These are methods of displaying custom graphics or symbols from the optional Symbols Library software that can be purchased. The Static Bitmap is just one picture that can be loaded from a bitmap file on the hard drive or be specified from the Symbols Library.

The Animation is a group of bitmaps… up to 50, one for each frame of the animation. The Animation is linked to a register and, depending on the value from 0 to 49 in the register, shows that frame number. It is up to the ladder logic to then provide the means of changing that number as desired.

Data Trend / X-Y Graph

These objects are methods of showing a graph of data on the screen.

The Trend object can have up to four pens configured, each linked to a different word-length register. It displays a graph of data as samples over a period of time. The graph fills over a period of time depending on the frequency of the samples. The sample period is configurable, as are many other attributes of this object. The Trend can be configured to either stop filling the graph when it is full or continue to scroll it across the screen as samples are taken.

The X-Y Graph can also have up to four pens configured, each linked to a set of word-length registers. It displays all of its data at once, filling the entire graph, immediately when triggered, using data in consecutive registers following the first one specified for a given pen and as many as are specified in the configuration.

Alarm Object

The Alarm object (gone over in detail later in this lab) is the user interface portion of the Graphic Alarms. It can be displayed as a button or as a list of alarms and can be configured to show either a current summary or a history of alarms.

Lab 7: Graphics Editor

Removable Media Manager

This object allows access to the directory of the Removable Media card. A directory of files will be shown. Depending on the configuration of this object, the user may or may not be able to delete files, format the card, change the directory, etc. This is a way to give a user limited access to the Removable Media card.

Rectangle / Ellipse / Rounded Rectangle / Line

These simple drawing objects are used solely for the purpose of beautifying the screen. They are not linked to any register. The border and line widths can be altered. On the Rectangle, Ellipse and Rounded Rectangle, the fill color can be specified as transparent or as any of the available colors.

Procedure:

Start a new program and configure the controller and I/O as you have learned in past labs. Save the program.

From the Graphics Editor, click on the **Config** menu and select **Alarm**.

Configure Alarms as following:

❑ Alarm Trigger:	%M1601
❑ Max Number of Alarms:	32

Name the first 4 alarms as follows by double-clicking them in the list:

❑ Alarm 1, Group 1	Low-speed Warning
❑ Alarm 2, Group 1	High-speed Warning
❑ Alarm 3, Group 1	Motor Overload Trip
❑ Alarm 4, Group 1	E-stop Trip

Exit the Alarm configuration and the graphics editor.

Using what you learned in Lab 1, add logic for a Start/Stop holding circuit (F1 Starts, F2 Stops).

Add logic to trigger Alarm 1 (%M1601) whenever the value in %R7 is less than 15 AND the circuit is started.

Add logic to trigger Alarm 2 (%M1602) whenever %R7 is greater than 90.

Add logic to trigger Alarm 3 (%M1603) whenever %I1 is off. Add a normally-closed %I1 to your run circuit so that the circuit will not run if %I1 is on.

Add logic to trigger Alarm 4 (%M1604) whenever %I2 is off. Add a normally-closed %I2 to your run circuit so that the circuit will not run if %I2 is on.

Lab 7: Graphics Editor

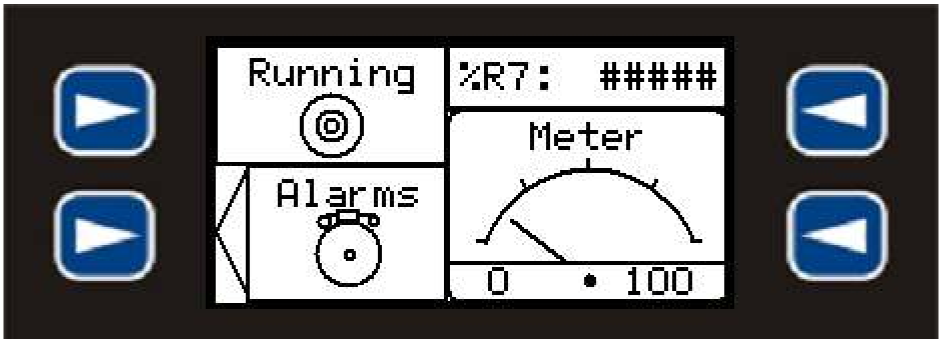
Add logic to switch to screen 1 when F6 is pressed.

In the graphics editor on screen 1, add an editable data field linked to %R7. Restrict its range between 0 and 100. Add a meter to reflect %R7.

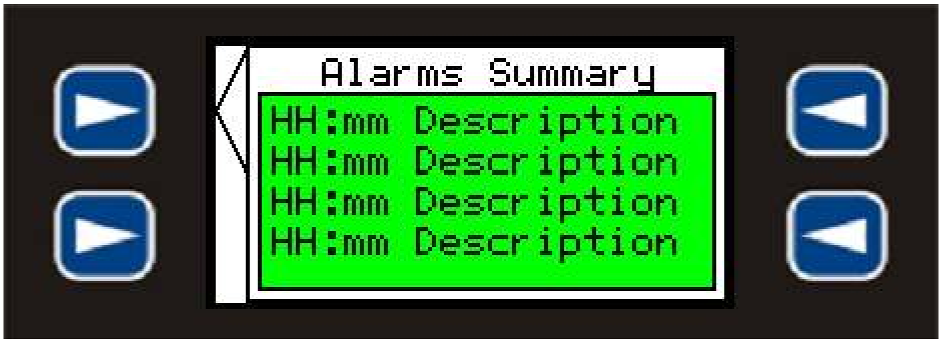
Add an indicator to tell you when the circuit is Started or Stopped.

Add an Alarm Indicator Button to the Screen. The Alarm Indicator should display an Alarm Summary when pressed, for all Alarm groups.

An example of what this screen might look like is shown on the next page.



Create a new screen that is called whenever F7 is pressed. This screen should contain an Alarm Summary Object.



```
HH:mm Description
HH:mm Description
HH:mm Description
HH:mm Description
```

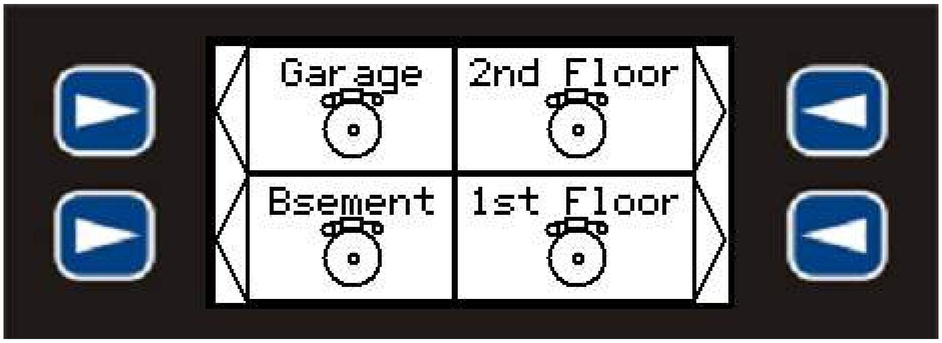
Create a new screen that is called whenever F8 is pressed. This screen should contain an Alarm History Object. It will look very similar to the above screen.

Download and execute the application. Practice triggering alarms, acknowledging them and clearing them. Note the differences between what is displayed in the "Summary" log, and what is displayed in the "History" log.

Use the "Alarm Indicator" button on the first screen as a means of viewing the Alarm Summary. Note the conditions that will cause the Alarm Indicator buttons to change color.

Extra Credit: Create a screen representing different areas of a house. Place an alarm indicator button the Basement (Group 1), First Floor (Group 2), Second Floor (Group 3) and Garage (Group 4). Add new alarms to the Alarm Configuration, a couple each for groups 2, 3, and 4. Trigger those new alarms with unused I/O (%I3-%I8).

Note how groups are a great way to segment alarms into manageable groups that can be monitored in separate alarm summary and history logs, as well as larger groups.



Notes:

LAB 8

Removable Media Functions

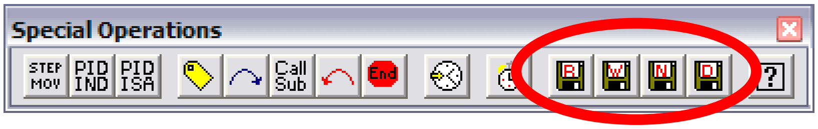
Lab 8: Removable Media Functions

Objective:

Understand the functionality of the Removable Media (RM) on controllers that support it.

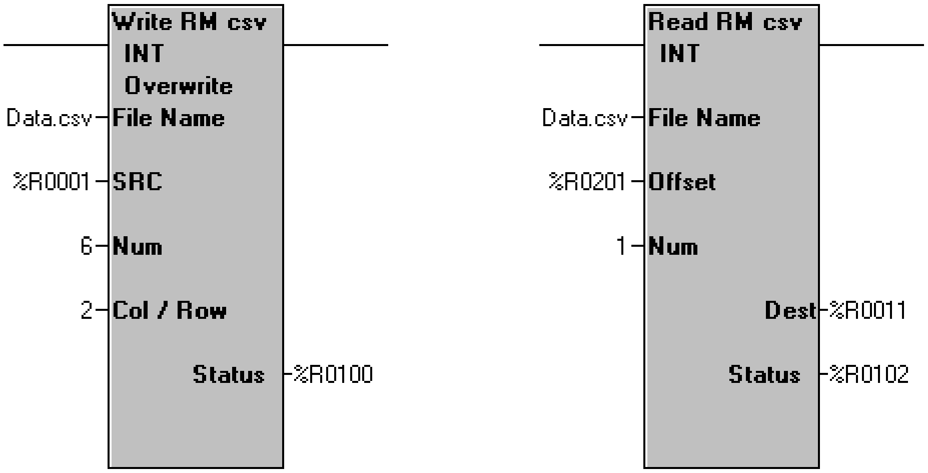
Overview:

The following controllers support compact flash: OCS451/551/651, NX22X/25X and XLe. This gives the program the ability to store information to the RM card and also read information back into the program. Since the information is stored in a Comma Separated Value (CSV) format, the RM card can be removed from the unit and then read into a spreadsheet on a PC. Conversely, a CSV file could be created from a PC, stored to the flash card, and then read into the OCS. The Read (R), Write (W), Rename (N) and Delete (D) RM ladder functions are found in the Special Operations toolbar.



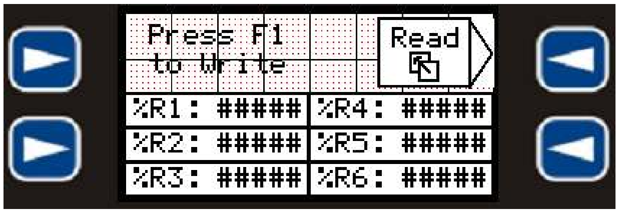
Procedure:

1. Open Cscape and create a ladder program that will **write** 6 registers of information, starting at %R1, when triggered by the F1 key. Use the Write RM function configured for <u>Overwrite</u> to perform this action and call the file Data.csv. Configure the Columns Per Row to be 2 and check the “End of Row Now” box.
2. Create a line of code that will **read** one value from the Data.csv file and store the information in %R11 when the F2 key is pressed. The offset should be configured for %R201. If a constant is used as the offset, the program will always be reading the value from the same place in the file.
3. Create a line of code that uses the Delete RM block and use the filename of Data.csv. Trigger this Delete function with the F3 key.



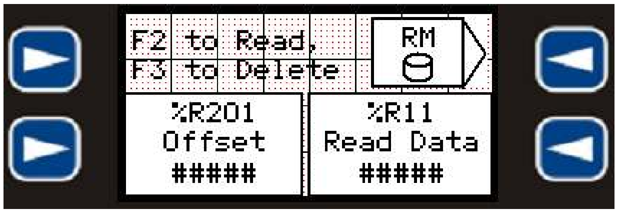
Lab 8: Removable Media Functions

4. Configure Screen 1 to have the following:
   - ❑ Register fields for %R1 - %R6 that are all editable.
   - ❑ Instructions (static text) to “Press F1 to Write”.
   - ❑ A screen jump to Screen 2… specify “Allow ESC to Return”.
5. Configure Screen 2 to have the following:
   - ❑ Register field for %R201, the offset, that is editable. The valid offset values for this lab as written would be anywhere between 0 and 5.
   - ❑ Register field for %R11 that is read only
   - ❑ Instructions to “Press F2 to Read, F3 to delete”
   - ❑ A screen jump to Screen 1
   - ❑ Place an RM manager on the screen



Press F1
to Write

%R1: ##### %R4: #####
%R2: ##### %R5: #####
%R3: ##### %R6: #####



F2 to Read,
F3 to Delete

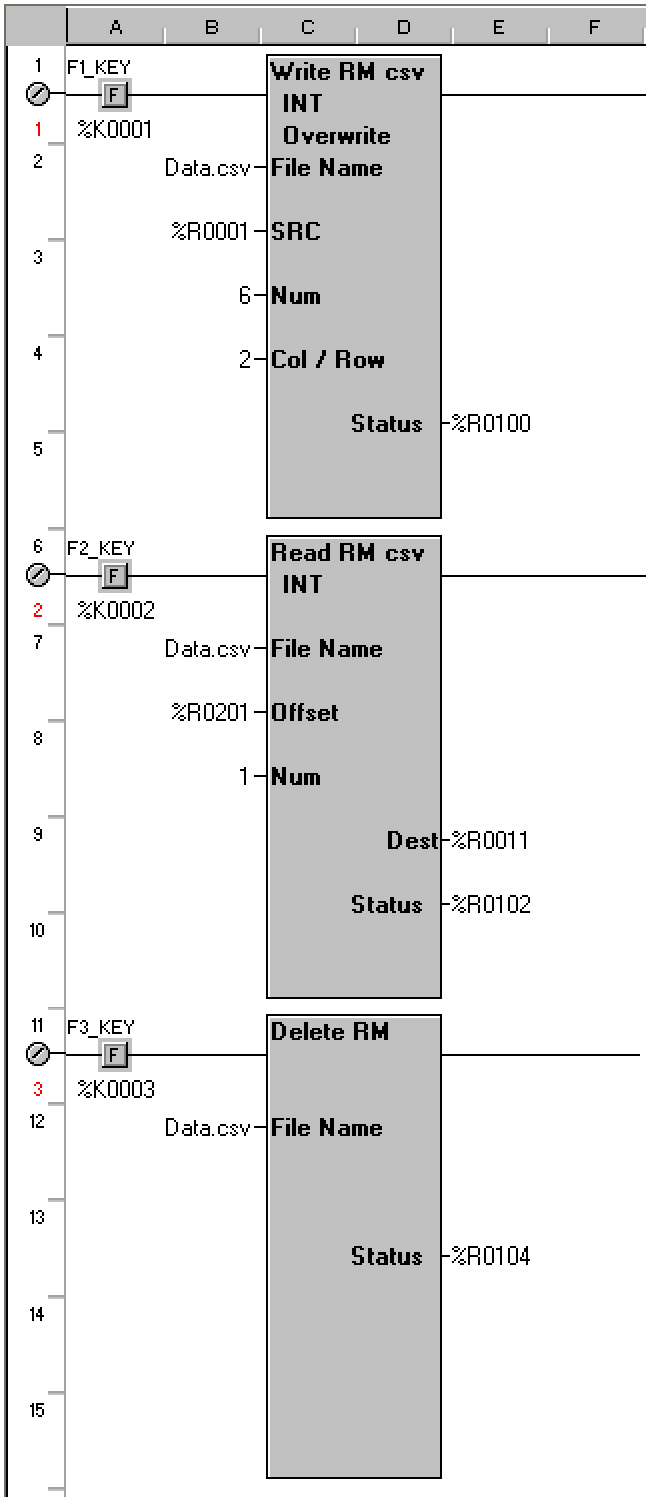
%R201
Offset
#####

%R11
Read Data
#####

6. Download the program to the controller.
7. Change the values in %R1-%R6 on Screen 1.
8. Press the F1 key. The information in %R1-%R6 is now stored to the RM card.
9. Go to Screen 2 and make the %R201 offset ‘0’. Press the F2 key. The first piece of data (what was in %R1) should now appear in the %R11 data field on the screen.
10. Change %R201 to other offsets from 0-5 and press the F2 key. Depending on the offset, you will read one of the 10 values you wrote to the RM card from Screen 1.
11. Use the RM manager to view the contents of the RM card.
12. Press F3 to delete the file… confirm it is no longer there by viewing the contents of the card using the RM manager.

Lab 8: Removable Media Functions

Solution:



Lab 8: Removable Media Functions

Removable Media File Naming

The RM function blocks support the flash with a DOS/Windows standard FAT16 file system. All names must be limited to the “eight dot three” (8.3) format where the filename contains a maximum of eight characters, a period, and an extension with a maximum of three characters. The entire filename including any path must be less than or equal to 147 characters in length.

When creating filenames and directories, it is sometimes desirable to include parts of the current date or time. There are six special symbols that can be entered into a filename that are replaced by the OCS with current time and date information.

Symbol	**Description**	**Example**
$Y	Substitutes the current 2 digit year	2004 = 04
$M	Substitutes the current month with a 2 digit code	March = 03
$D	Substitutes the current day	22nd = 22
$h	Substitutes the current hour in 24 hour format	4 PM = 16
$m	Substitutes the current minute	
$s	Substitutes the current second	
$p	Substitutes the currently displayed 4-digit screen number (1-1023, Intended mainly for screen capture)	53 = 0053

Note that all the symbols start with the dollar sign ($) character. Date symbols are in upper case; time symbols are in lower case.

The following are examples of the substituted time/date filenames:

If the current date and time = March 1, 2004 3:45:34 PM
Data$M$D.csv = Data0301.csv
Year$Y\Month$M\aa$D_$h.csv = Year04\Month03\aa01_15.csv
Month_$M\Day_$D\$h_$m_$s.csv = Month_03\Day_01\15_45_34.csv

Lab 8: Removable Media Functions

Removable Media File Counters

Another tool available for use in naming Removable Media files is the Filename Counter. There are four available Filename Counters that can be separately configured. Configuration is done through the Graphics Editor by clicking **Config** and selecting **Filename Counters**.

Each Filename Counter requires a 32-bit register regardless of the maximum values that the counter will see. A maximum value is specified for each counter and also the options to auto-increment and wrap the counter value.

The auto-increment function causes the counter to be automatically incremented by a value of 1 each time the Filename Counter is accessed.

The wrap counter function causes the counter to start over at 0 when the maximum value is exceeded. If the wrap counter function is not activated and the counter reaches the maximum value, the counter will no longer automatically increment and the value will remain at the maximum setting.

Accessing the counters is done similarly to the date and time symbols. The format to access any of them is as follows:

$[counter number]u[# of digits, 1-8]

For example, using counter 1 for a screen capture, if the counter has a Max value of 59, the current value is 35 and the Auto Increment is checked:

$1u4 = 0035

The next time the screen is captured, the value will be 0036, then 0037, etc. This can be implemented into the filename as follows:

Given:

Current date and time = March 1, 2004 3:45:34 PM

Counter 3 Auto Incrementing, Max of 59, currently at 58, Wrap turned ON

Captures\Chan3\$M-$D-$Y\$h$m-$3u2.bmp

= Captures\Chan3\03-01-04\1545-58.bmp

Next screen capture (assuming same time and date)

= Captures\Chan3\03-01-04\1545-59.bmp

Next screen capture (assuming same time and date)

= Captures\Chan3\03-01-04\1545-00.bmp

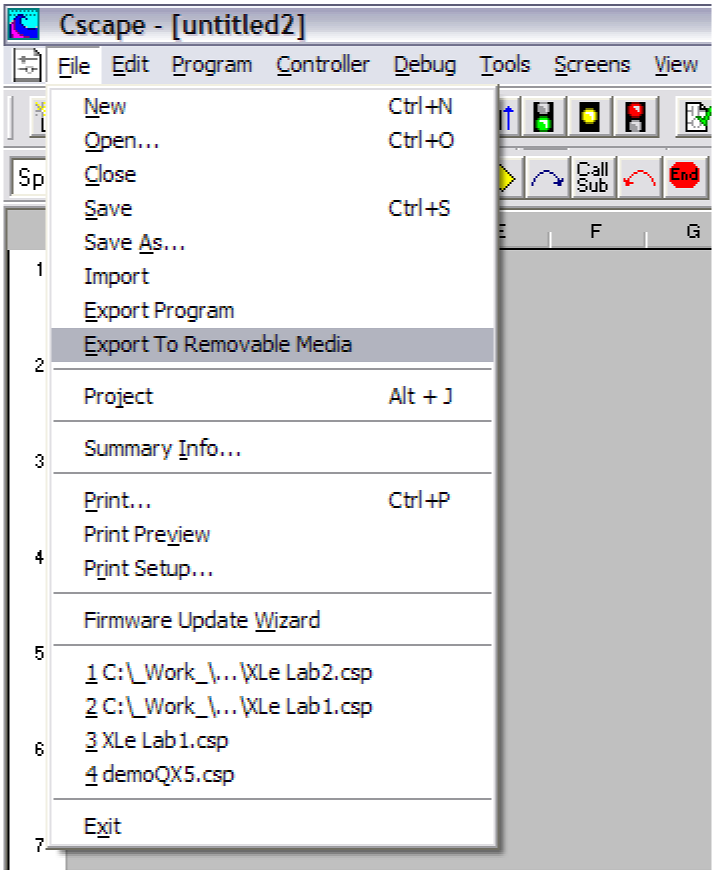
Note: You MUST specify the filename extension in all cases if you want there to be one. It is never automatically added.

Lab 8: Removable Media Functions

Removable Media Program Downloads

One feature of the Removable Media functionality is the ability to load a controller that has RM capabilities with a program from a RM card instead of through Cscape.

The programmer saves the Cscape program as a special file type with a .pgm extension by clicking the **File** menu and selecting **Export to Removable Media**. It can be exported directly to a Removable Media writer connected to the computer or to anywhere else on the computer to be transferred to Removable Media later. The user will then insert the RM card into the OCS and, through the OCS System Menu, select Removable Media to find the correct file to load.



Removable Media Screen Captures

Controllers with Removable Media capabilities have the ability to capture a displayed screen to Removable Media as a JPEG or Bitmap file. These images can then be recalled on the unit through the CF manager or viewed on a computer with a graphics viewer.

Lab 8: Removable Media Functions

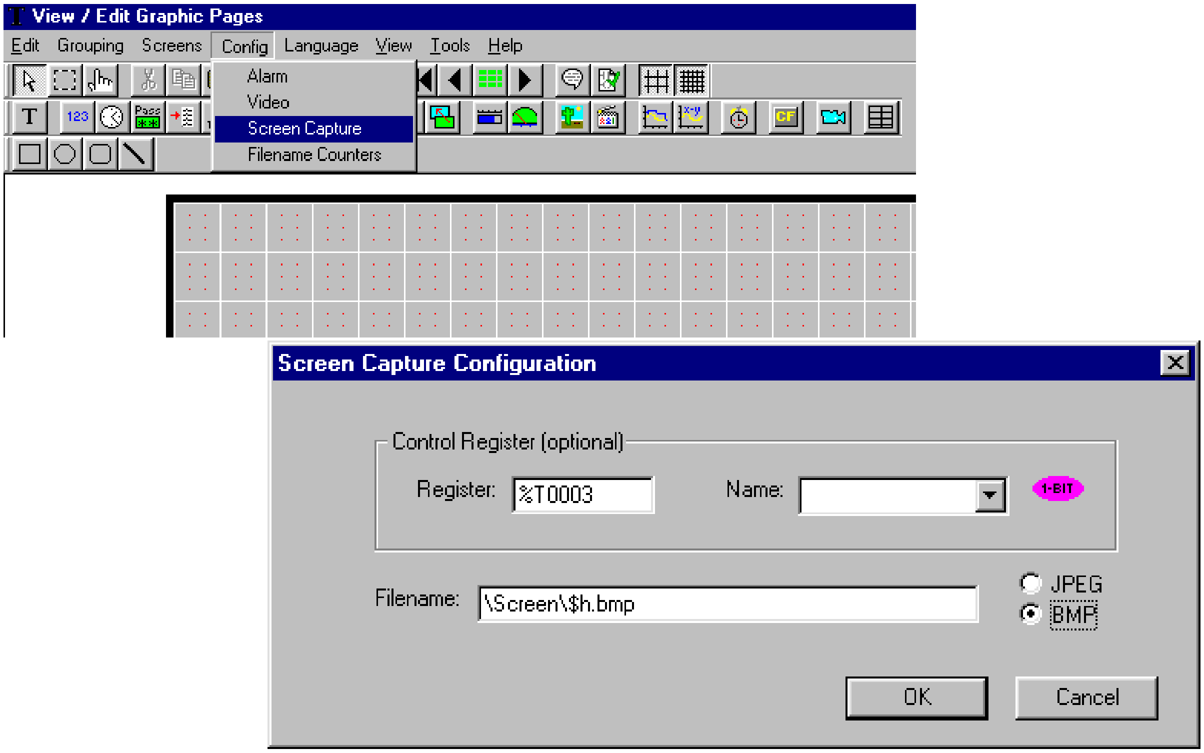
Configuring the Screen Capture function is done through the Graphics Editor by clicking the **Config** menu and selecting **Screen Capture**. A 1-bit register must be configured as a trigger and a filename for the captured graphic file must be specified. The filename date functions and filename counters can be used for this. The OCS provides feedback that the screen capture is done by resetting the 1-bit register to an OFF state.

Note: Since the OCS provides feedback by turning off the trigger bit:

- Do NOT use a 1-shot to trigger a screen capture… setting or toggling on a %T is recommended. When it turns off, the capture is done writing to RM.
- Be careful of using F-keys… Again, the OCS will try to reset it when the capture is done. Using a %T as noted above is recommended instead.

Procedure:

1. Make F10 perform a screen capture. Set %T3 in ladder logic when F10 is pressed.
2. In the Screen Editor, configure the Screen Capture to trigger off of %T3 and specify a filename.


View / Edit Graphic Pages
Edit Grouping Screens Config Language View Tools Help
Alarm
Video
Screen Capture
Filename Counters
Screen Capture Configuration
1-BIT
OK
Cancel

Control Register (optional)

Register: %T0003 Name:

Filename: \Screen\$h.bmp

○ JPEG
● BMP

3. Download to the OCS
4. Press F10 key.
5. Go to the screen with the RM Manager on it from before, open the RM manager and find the captured graphic.
6. Use the arrow keys to scroll to the file and press Enter to view it.

CONGRATULATIONS ON FINISHING THE REMOVEABLE MEDIA LAB!

Lab 8: Removable Media Functions

Notes:

Lab 8: Removable Media Functions

Notes:

CHEAT SHEET

Data Types

BOOL - Boolean; A single bit. It can contain only the values '0' or '1', a.k.a ‘FALSE’ or ‘TRUE’

BYTE - Byte; A string of 8 consecutive bits. Byte format is used more where the value of the data is not as important as the bit patterns (shifts and rotates).

WORD – Word; A string of 16 consecutive bits. Word format is used more where the value of the data is not as important as the bit patterns (shifts and rotates).

DWORD - Double Word; A string of 32 consecutive bits. DWORD format is used where the value of the data is not as important as the bit patterns (shifts and rotates).

INT – Integer; A 16-bit signed value. Integers are used where the value of the data is expected to be in the range of -32,768 to +32,767

SINT - Short Integer; An 8-bit signed value. Short Integers are used where the value of the data is expected to be in the range of -128 to +127.

DINT - Double Integer; A 32-bit signed value. Double Integers are used where the value of the data is expected to be in the range of -2,147,483,648 to +2,147,483,647.

UINT - Unsigned Integer; A 16-bit unsigned value. Unsigned Integers are used where the value of the data is expected to be in the range of -0 (zero) to 65,535.

USINT - Unsigned Short Integer; An 8-bit unsigned value. Unsigned Short Integers are used where the value of the data is expected to be in the range of 0 (zero) to 255

UDINT - Unsigned Double Integer; A 32-bit unsigned value. Unsigned Double Integers are used where the value of the data is expected to be in the range of 0 (zero) to 4,294,967,296.

REAL - Floating Point; A 32-bit value. Values are stored and operated on in IEEE single precision (six digit) format. Values range from -3.40282E+38 to +3.40282E+38.

STRING – String; A variable-length succession of characters. Each character is represented by one byte.

Register Types

Type	Description and example of what might use the type	Format	Retentive	#Available
%I	Discrete Inputs from the field; prox sensors, panel buttons, etc	BOOL	YES	2048
%Q	Discrete Outputs to the field; relays, indicator lamps, etc.	BOOL	NO	2048
%AI	Analog Inputs from the field; Thermocouples, 4-20mA inputs	WORD	YES	512
%AQ	Analog Outputs to the field; 0-10VDC or 4-20mA outputs	WORD	NO	512
%IG	Global Discrete Inputs from the CAN; in from other OCS	BOOL	YES	64 per node
%QG	Global Discrete Outputs to the CAN; out to other OCS	BOOL	NO	64 per node
%AIG	Global Analog Inputs from the CAN; in from other OCS	WORD	YES	32 per node
%AQG	Global Analog Outputs to the CAN; out to other OCS	WORD	NO	32 per node
%T	Internal Temporary bits, use for contacts and coils	BOOL	NO	2048
%M	Internal Temporary bits, use for contacts and coils	BOOL	YES	2048
%R	Internal Registers, use for Timers and Counters and other data	WORD	YES	2048-9999
%K	Keypad bits, reflect Function Key status	BOOL	NO	5-12
%D	Display bits, control screens or indicate screen on/off	BOOL	NO	200-1023
%S	Internal System Bits (See System Registers)	BOOL	---	---
%SR	Internal System Registers (See System Registers)	WORD	---	---

Cheat Sheet

System Bits

Point	Name	Function
%S01	FST_SCN	Indicates First Scan
%S02	NET_OK	Network is OK
%S03	T_10MS	10mS pulse
%S04	T_100MS	100mS pulse
%S05	T_1SEC	1 second pulse
%S06	IO_OK	I/O is OK

Point	Name	Function
%S07	ALW_ON	Always ON
%S08	ALW_OFF	Always OFF
%S09	PAUSING_SCN	Pause 'n Load soon
%S10	RESUMED_SCN	Pause 'n load done
%S11	FORCE	I/O being forced
%S12	FORCE_EN	Forcing is enabled

System Registers

SR #	Name	Min	Max
1	User Screen Number	0	200*
2	Alarm Screen Number	0	200*
3	System Screen Number	0	10*
4	Self Test Result		
5	Controller Mode (RUN..)	0	2
6	Scan Rate Avg		
7	*Reserved*		
8	*Reserved*		
9	Edit Buffer Low		
10	Edit Buffer High		
11	Ladder Size Low		
12	Ladder Size High		
13	User Text Size Low		
14	User Text Size High		
15	System Text Size Low		
16	System Text Size High		
17	I/O Config Size Low		
18	I/O Config Size High		
19	Net Config Size Low		
20	Net Config Size High		
21	Security Data Size Low		
22	Security Data Size High		
23	Ladder CRC		
24	User Text CRC		
25	System Text CRC		
26	I/O Config CRC		
27	Net Config CRC		
28	Security Data CRC		
29	Network ID Low	1	253
30	Network Baud Rate	0	3
31	Network Required	0	1
32	LCD Contrast	1	255
33	Key Toggle Mode	0	1
34	Serial Protocol		
35	Serial Number Low		
36	Serial Number High		
37	Model Number		
38	Engine Version		

SR #	Name	Min	Max
39	BIOS Version		
40	FPGA Version		
41	LCD Columns		
42	LCD Rows		
43	Keypad Type		
44	RTC Seconds	0	59
45	RTC Minutes	0	59
46	RTC Hours	0	23
47	RTC Day of Month	1	31
48	RTC Month	1	12
49	RTC Year	1996	2095
50	RTC Day of Week	1	7
51	Network Error Count		
52-55	*Reserved*		
56	Last Key		
57	LCD Backlight		
58	User Leds		
59-60	*Reserved*		
61	Num Ids		
62-174	*Reserved*		
175	CF Status		
176	CF Free Low		
177	CF Free High		
178	CF Total Low		
179	CF Total High		
180	Reserved		
181	Alarms Unacknowledged		
182	Alarms Active		
183	System Beep	0	1
184	User Beep	0	1
185	Screen Saver	0	1
186	Screen Saver Time	5	1200
187	Network Usage (Avg)	0	1000
188	Network Usage (Min)	0	1000
189	Network Usage (Max)	0	1000
190	Network TX Use (Avg)	0	1000
191	Network TX Use (Min)	0	1000
192	Network TX Use (Max)	0	1000

*Maximum User, Alarm and System screens vary from model to model

Max = 200 for MiniOCS, OCS1x0, OCS2x0… Max = 1023 for XLe, NX2xx, OCS3xx, OCS4/5/651

For Details on the functionality of the different SR registers, consult the Cscape help file.

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