

## SV Programming Tutorial

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I recommend you print off this document and check off the steps as you complete them.

Note: I recommend that you print out a copy of the SV page of the LocoIO documentation and keep a record of what values you have in which SV's. Although using ISP to re-program your PIC will not overlay your SV's, you should still keep a paper copy.

In order to program the SV's (also called registers or EEPROM data) in LocoIO you must have a program to do it. I offer a free one at the following location.

[http://groups.yahoo.com/group/loconet\\_hackers/files/LocoBuffer](http://groups.yahoo.com/group/loconet_hackers/files/LocoBuffer). You must use Version 3.1 or higher.

Download the RRCntl31.zip file to your machine. Put it in a temporary directory.

Un-compress the file using Winzip.

Run the setup program from the temporary directory that you unzipped the file to.

Start up the program using the following steps

Click on Start

Click on Programs

Click on RRCntl

Click on RRCntl

Turn on your layout.

Connect a LocoBuffer between your PC and the Loconet.

Connect your LocoIO to the Loconet.

Note: If this is the first time you are using your LocoIO, you should not have any devices connected to the JP1 connector. The reason for this is that I ship all the LocoIO PIC's with all the pins as output. If you connect an input device to a pin that's output, you could damage the PIC (I have never seen this happen but to be safe, follow this recommendation).

Note: When I refer to a port as output I mean that the PIC sends a signal out on that pin (as in lighting a LED). When I refer to a port as input, I mean that you are pulling a pin either up (+5) or down (0) (as a switch or block detector would do).

Note: Many of the setting from the SV's are only changed at power up time for the LocoIO. After you program the SV's, you should cycle the power to LocoIO. You don't have to do it for each SV but after you complete a programming session (and before you expect to use the LocoIO).

The first time you use RRCntl you must configure your serial port. To do this, do the following:

Click on CommPort

Click on Properties

Enter your port number

Enter your baud rate (19200 or 57600 depending on how the LocoBuffer is jumpered)

Click OK

Note: This will create some registry entries so it must be done at least once.

Next, open the communication port using the following instructions:

Click on CommPort

Click on Open Port

Open the Packets panel using the following instructions:

Click on the Tools menu item  
Click on Debug (this is so you can see if things are working)  
The title on this panel is Packets

Open the LocoIO panel using the following instructions:

Click on the Tools menu item  
Click on LocoIO

Note: All numbers are in decimal unless they have a note saying that they are hex. All packet notation is in hex. Also, I tried to put the hex value after all decimal numbers (0x51) is the hex value of decimal 81.

Each LocoIO on the Loconet needs a different address for programming purposes. I ship all LocoIO's with the high address of 01 and a low address of 81 (0x51). If you did anything to mess up the data in the EEPROM then this is not the case. If you did that, follow the instructions in the document Fixing\_EEPROM.txt which can be found at [http://groups.yahoo.com/group/loconet\\_hackers/files/locoio](http://groups.yahoo.com/group/loconet_hackers/files/locoio)

The first exercise is to see what value a SV has. To do this use the default values on the initial LocoIO panel. Click on Send on the LocoIO panel.

Note: All references to Clicking on Send refer to the Send button on the LocoIO panel (unless noted otherwise).

You should receive a 81 (0x51) in the D8 field on the right side of the screen. You should have also seen 2 E5..... messages come up on the Packets panel.

Note: Sometimes this doesn't happen correctly, so try again. I think Version 1.2 of the LocoIO code fixed most of the problems with this. This note applies to all the Send commands below.

Note: the PC has an address of 01 80. On the left side of the LocoIO panel you will see this value in the Destination High and Low fields. On the right side of the panel you will see these values in the destination fields.

Now we want to change the low address of this LocoIO. Do the following:

Change the value in the command field to 01.

Leave the Register number (I should change the label to SV) at 01 (which is the low address field).

Change the value in the Data field (for this tutorial we will use 82).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 82.

Now to address this LocoIO you must do the following:

Change the value in the Destination Low field to a different number (for the sake of this tutorial, use 82).

Note: All references to changing a value refer to the left column on the LocoIO panel. The right side is always for replies coming back.

In the rest of this tutorial, you have to make sure that the Destination Low field is correct.

## Toggle switch

Now we are going to configure a port for a toggle switch. I use single pole double throw switches but you can also use a single pole single throw if you use a proper pull up resistor.

Note: These set of instructions are for generating a OPC\_SW\_REQ (0xB0) message (usually from a switch action). To generate an OPC\_INPUT\_REP (0xB2) message (usually from a block detector) add 128 (0x80) to the value that you would put in the value1 field.

Example: When these instructions tell you to put a 28 (0x1C) in register (SV) 4, you would now put a 156 (0x9C) in register (SV) 4.

JP1 pin35 – goes to one side of the switch

JP1 pin1 – goes to the center of the switch

JP1 pin2 – goes to the other side of the switch

First you must determine what message you would like to send out when the toggle switch is thrown.

Go over to your DT100 type throttle and put it in switch mode.

Turn the knob until you are at the number of one of your switches. (for this tutorial we will use 29)

Press the t button on your throttle. On your Packets panel you will see the following message  
B01C1043 (all values are hex)

Press the c button on your throttle. On your Packets panel you will see the following message  
B01C3063 (all values are hex)

Now look in the SV chart in the LocoIO documentation you will see that JP1 pin1 uses SV's 3, 4 and 5.

Now we want to configure those 3 SV's. Do the following:

Change the value in the command field to 01.

Change the Register number to 03 (which is the configuration field).

Change the value in the Data field to 15 (0x0F).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 15.

Change the value in the command field to 01.

Change the Register number to 04 (which is the value1 field).

Change the value in the Data field to 28 (0x1C). (This is one less than the switch number on the DT100).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 28.

Change the value in the command field to 01.

Change the Register number to 05 (which is the value2 field).

Change the value in the Data field to 16 (0x10).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 16.

Now, turn off the power to the LocoIO.

Connect a SPDT toggle switch to JP1 pins 1, 2 and 35 as documented above.

Now, turn on the power to the LocoIO.

Now flip the toggle switch

What you will see on the Packets panel is that when the switch is thrown to the direction that has 0 volts, the following message is sent to the Loconet:

B01C1043 (all values are hex)

And the turnout is thrown to the thrown position

Flip the toggle switch to the other direction (to the +5 volt direction).

The following message is sent to the Loconet:

B01C3063 (all these values are hex)

And the turnout is thrown to the closed position

### **Push Button switch**

Now we are going to configure a port for a push button switch. I use single pole double throw switches but you can also use a single pole single throw if you use a proper pull up resistor.

JP1 pin35 – goes to one side of the switch

JP1 pin3 – goes to the center of the switch

JP1 pin4 – goes to the other side of the switch

First you must determine what message you would like to send out when the toggle switch is thrown.

Go over to your DT100 type throttle and put it in switch mode.

Turn the knob until you are at the number of one of your switches. (for this step we will use 30)

Press the t button on your throttle. On your Packets panel you will see the following message

B01D1042 (all values are hex)

Press the c button on your throttle. On your Packets panel you will see the following message

B01D3062 (all values are hex)

Now look in the SV chart in the LocoIO documentation you will see that JP1 pin3 uses SV's 6, 7 and 8.

Now we want to configure those 3 SV's. Do the following:

Change the value in the command field to 01.

Change the Register number to 06 (which is the configuration field).

Change the value in the Data field to 47 (0x2F).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 47.

Change the value in the command field to 01.

Change the Register number to 07 (which is the value1 field).

Change the value in the Data field to 29 (0x1D). (This is one less than the switch number on the DT100).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 29.

Change the value in the command field to 01.

Change the Register number to 08 (which is the value2 field).

Change the value in the Data field to 16 (0x10).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 16.

Now, turn off the power to the LocoIO.

Connect a SPDT push button switch to JP1 pins 3, 4 and 35 as documented above.

Now, turn on the power to the LocoIO.

Note: Depending on how the push button switch is wired, the turnout will be activated either on the press of the push button or the release. The next 2 paragraphs assume that the push button switch is wired for the push to be +5 volts and the release to be 0 volts.

Now push the push button switch

You will see nothing change on the Packets panel

Now release the push button

What you will see on the Packets panel is the following message is sent to the Loconet:

B01D3062 (all values are hex)

And the turnout is thrown to the closed position

Now push the push button switch

You will see nothing change on the Packets panel and the turnout will not change.

Now release the push button

What you will see on the Packets panel is the following message is sent to the Loconet:

B01D1042 (all values are hex)

And the turnout is thrown to the thrown position

Note: you can have the push button send the message either on the push or the release of the button. To change from one to the other, change the value in the configuration SV from 47 (0x2F) to 111 (0x6F)

### **Turning a LED on and off from a OPC\_INPUT\_REP (0xB2) message (usually turns on a LED to indicate block occupancy)**

First decide what is going to generate the OPC\_INPUT\_REP message. One way this is done is by a block detector.

Go over to your layout that has block detection on it. Put an engine in the block you want to work with

and look at the 0xB2 message that is generated. It will be something like (all these values are hex)

B2043079 or

B2042069

You will use 04 for SV value1

You will use 32 (0x20) for SV value2.

Or the message might look like

B2041059 or

B2040049

You will use 04 for SV value1

You will use 0 for SV value2.

Note: On a BigBoy system you will only get one of each pair of messages above. On a Chief, I believe it depends on how one of the DCS100 Op switches is set (I believe the default is to get both message in the message pair).

Now we are going to configure a port that has a LED attached to it.

JP1 pin5 – goes to one lead of the LED

JP1 pin6 – goes to a 1K resistor that then goes to the other lead of the LED

Note: You have to figure out which is the anode and which is the cathode (trial and error works and won't break anything).

Now look in the SV chart in the LocoIO documentation you will see that JP1 pin5 uses SV's 9, 10 and 11.

Now we want to configure those 3 SV's. Do the following:

Change the value in the command field to 01.

Change the Register number to 09 (which is the configuration field).

Change the value in the Data field to 192 (0xC0).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 192.

Change the value in the command field to 01.

Change the Register number to 10 (which is the value1 field).

Change the value in the Data field to 04.

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 04.

Change the value in the command field to 01.

Change the Register number to 11 (which is the value2 field).

Change the value in the Data field to 32 (0x20). (using the first example above)

Click on Send.

You should now see 2 E5.... messages come up in the Packets panel and the D8 field should change to 32.

Now, turn off the power to the LocoIO.

Connect a LED to JP1 pins 5 and 6 as documented above.

Now, turn on the power to the LocoIO.

Now take the engine off and back on to the block you are testing.  
The LED will now come on.

Now take the engine off and back on to the block you are testing.  
The LED will now go off.

**To turn a LED on and off from a OPC\_SW\_REQ (0xB0) message (usually to turn on a LED to indicate switch position)**

First decide what is going to generate the OPC\_INPUT\_REP message. One way this is done is by changing a turnout position.

Note: Normally to use this functionality you will work with 2 ports. One port will turn a LED on when a turnout is closed and turn the same LED off when the turnout is thrown. The other port will turn on a different LED when the same turnout is thrown and turn it off when it is closed.

Go over to your layout and change a turnout and look at the 0xB0 message that is generated. It will be something like (all these values are hex)

B01C1043 (this is thrown)  
You will use 28 (0x1C) for SV value1.  
You will use 16 (0x10) for SV value2.

or

B01C3063 (this is closed)  
You will use 28 (0x1C) for SV value1.  
You will use 48 (0x30) for SV value2.

Now we are going to configure a port that has a LED attached to it. We will do the thrown LED first.

JP1 pin7 – goes to one lead of the LED  
JP1 pin8 – goes to a 1K resistor that then goes to the other lead of the LED

Now look in the SV chart in the LocoIO documentation you will see that JP1 pin7 uses SV's 12, 13 and 14.

Now we want to configure those 3 SV's. Do the following:

Change the value in the command field to 01.

Change the Register number to 12 (which is the configuration field).

Change the value in the Data field to 128 (0x80).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 128.

Change the value in the command field to 01.

Change the Register number to 13 (which is the value1 field).

Change the value in the Data field to 28 (0x1C).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 28.

Change the value in the command field to 01.

Change the Register number to 14 (which is the value2 field).

Change the value in the Data field to 16.

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 16.

Now, turn off the power to the LocoIO.

Connect a LED to JP1 pins 7 and 8 as documented above.

Now, turn on the power to the LocoIO.

Now turn the turnout you are working with to thrown  
The LED will now come on

Now turn the turnout you are working with to closed  
The LED will now go off.

Now we are going to configure a port that has a LED attached to it. We will do the closed LED now.

JP1 pin9 – goes to one lead of the LED

JP1 pin10 – goes to a 1K resistor that then goes to the other lead of the LED

Now look in the SV chart in the LocoIO documentation you will see that JP1 pin9 uses SV's 15, 16 and 17.

Now we want to configure those 3 SV's. Do the following:

Change the value in the command field to 01.

Change the Register number to 15 (which is the configuration field).

Change the value in the Data field to 128 (0x80).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 128.

Change the value in the command field to 01.

Change the Register number to 16 (which is the value1 field).

Change the value in the Data field to 28 (0x1C).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 28.

Change the value in the command field to 01.

Change the Register number to 17 (which is the value2 field).

Change the value in the Data field to 48 (0x30).

Click on Send.

You should now see 2 E5..... messages come up in the Packets panel and the D8 field should change to 48.

Now, turn off the power to the LocoIO.

Connect a LED to JP1 pins 9 and 10 as documented above.

Now, turn on the power to the LocoIO.

Now turn the turnout you are working with to closed.  
The LED will now come on

Now turn the turnout you are working with to thrown.  
The LED will now go off.

If any of this doesn't work for you, send me an E-mail and I will help you out  
[jjabour@optonline.net](mailto:jjabour@optonline.net)