Intro to Decoder Programming with JMRI/DecoderPro

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JMRI (Java Model Railroading Interface) is open source (no cost) software for connecting a model railroad layout to a computer, and performing various model railroading tasks via the computer. JMRI was/is developed by a group of volunteer programmers under the leadership of Bob Jacobsen.

JMRI uses the Java programming language. JMRI continues to grow . . .
How is JMRI Organized?

JMRI has an extensive library of model railroading software, and several front-end applications focusing on different areas of model railroading.

All JMRI applications use this common library.

JMRI Applications include:

- DecoderPro - Programming DCC decoders.
- PanelPro - Layout display for running trains.
- Other applications (JmriDemo, LocoTools, etc.)
What Computer Systems are Supported by JMRI?

Windows - Vista, XP, 2000, 98SE

Macintosh - MacOS X

Linux - several flavors
What Model Railroading Systems are Supported by JMRI?

Loconet - Digitrax (Chief, Empire Builder, Zephyr), Uhlenbrock - Intellibox
Lenz - LI100, LI100F, LI101, LIUSB
NCE Atlas Commander
C/MRI ZIMO MX-1 Roco
EasyDCC ZTC m-RPS
Wangrow Fleischmann Hornby
SPROG TMCC (Lionel) Protrak Grapevine
XPA Modem Oak Tree Systems and More…
What Model Railroading Tasks are Supported?

Programming DCC decoders
Computer Panel Displays (including full CTC Panel)
Computer throttles
Consisting
Control of Turnouts (Including Optional Feedback)
Routes (Controlling groups of Turnouts and/or Sensors)
Logix (Control and Automation Logic)
Control of Layout Lighting
Fast Clock
Control of Signals

and More …
How do I get started?

1. Connect your computer to your model railroad layout.
2. Download JMRI.
   One download contains all JMRI applications.
   Large download - CD’s are available.
3. Configure JMRI.
4. Test communications.

Detailed instructions for various computers and model railroading systems are on JMRI web site.

No computer programming is required.
Computer Connection
Example

Workshop system:

Digitrax DCS100
Locobuffer II
Serial to USB adapter
Macintosh PowerBook G4
Configuration Panel
Select the type of layout connection from an extensive pull-down menu.
Select the command station type from the menu of types compatible with the layout connection.
Select a serial port from the menu listing the serial ports that JMRI can detect.
Select a default programmer (Comprehensive is usually best).
Click the “Save” button to write the connection configuration to disk.
Click the “Yes” button, to quit the program.

Restart the JMRI application.

Notes: Restart is required anytime preferences are changed for the preferences to take effect.

Preferences must be set for each JMRI application. They each have separate preferences files.
The program is set up according to the saved preferences.

Note: Startup window contains program version and Java version, in addition to connection information.
Connection Testing Example
Select “Monitor LocoNet” to snoop on traffic.
1. Plug in a throttle, and select a locomotive.
2. Look for traffic on the Loconet.
1. Select **Power Control**…
2. See if you can turn track power on/off.
If traffic looks reasonable and power goes on/off. Open a JMRI throttle to test further.
Select a train from the Roster.

- or -

Type in a locomotive address.

Click the “Set” button.
Run a train from the computer.

If all works OK, then JMRI is successfully communicating with your command station.
Configuration preferences may be accessed at any time via the Edit menu.
Advanced Preferences

- Allow many useful options including:
- A second layout connection.
- Automatic loading files at startup.
- Running scripts at startup.
How do I get help?

1st - Most JMRI windows have a Help menu.
   Window Help … Documentation related to that window
   General Help … Overall JMRI documentation

2nd - The JMRI web site - http://jmri.sourceforge.net/
   Documentation and detailed instructions

3rd - JMRI Yahoo discussion group. jmriusers
   Monitored by JMRI ‘experts’, eager to provide help.
   Information on JMRI web site on how to sign up.
What is DecoderPro?

DecoderPro is a JMRI application.
DecoderPro is a better tool for programming DCC decoders.
DecoderPro simplifies the job of configuring complicated DCC decoders.
DecoderPro supports mobile decoders (decoders in locomotives).
DecoderPro supports some static decoders.
Basic Terminology

Decoder - small microcomputer based control unit

Mobile Decoder - Decoder in a locomotive, “decodes” DCC commands to control locomotive.

CV (Control Variable) - 8-bit data byte in a decoder that specifies user options.

Programming a Decoder - setting the values of the CV’s to user’s options.

Decoders have many CV’s. Many CV’s follow NMRA Standards, but some are vendor specific.

Each mobile decoder has an Address - a number that allows the locomotive to be uniquely identified.
Setting up an Address

Decoder (locomotive) addresses can be 2 digits or 4 digits on modern decoders and DCC throttles.

Usually set the address to the locomotive number.

Most decoders are set to address 03 on arrival.

A locomotive will respond to speed control and function commands that bear its address.

Setting the address is usually the first (and sometimes the only) programming needed.

It’s easy to set up an address in DecoderPro.
Example - Setting the address of a new decoder

Put the locomotive with the new decoder on the programming track.

Start Decoder Pro. When the window below comes up, click “Service Mode (Programming Track) Programmer”
NMRA standards:
Two CV’s identify a decoder:
CV8 - Manufacturer ID
CV7 - Manufacturer Version Number.
Both are read only.

Note: Some command stations cannot read CV’s! For these, select the decoder in the list manually.
DecoderPro identified the decoder as a Digitrax DH121 with others possible. (Sometimes the user has to choose among several possibilities.)

Click on DH121, to select it, and click “Open Programmer”. <-
Fill in Roster information and click “Save”.
Click the Basic tab.
Click “Read full sheet”. Yellow items are replaced with factory default values.
Switch off analog, and set new two-byte address. Click “Write changes on sheet” to send to loco.
Return to Roster Entry and “Save” the Roster file to disk.

All done!
What are Roster Files?

DecoderPro stores the final information for each decoder in a Roster File. These Roster Files are used to construct a Roster menu for JMRI applications. A Roster file allows easy reprogramming if decoder needs to be reset. The Roster menu allows easy selection of a loco in JMRI tools--decoder programmer, throttle, consist, etc.
The Roster Menu

Provides useful functions when working with your Rosters. Accessed in Programmer Setup window and in main DecoderPro window.
Changing a decoder’s programming

Select loco from Roster
- or -
<- Click “Ident” to have DecoderPro read the loco address and find it in the Roster.

After loco is identified, click “Open Programmer”

Note: “Open Programmer” is not active until a decoder is identified.
<-
The saved information is back!
Click “Speed Control”.
Yellow color indicates the values are from the Roster file. Orange - changed, but not written to decoder.

Enter a value in “Vstart”.

Click “Write changes on sheet”
Changed Vstart was written to the decoder. Select File>Save… to save the change to disk.

It’s done.

Go run the loco!
Support for new decoders is continuously added to DecoderPro.

DecoderPro works through the command station, so it’s usually limited to what you can do with your throttle. Think of DecoderPro as a smart throttle.

DecoderPro supports other modes of programming. Access these other modes using the “Set…” button to get the dialog shown at the right.

Some decoders need a different mode for programming.

Some new sound decoders need a programming track booster to communicate with some command stations.
Object: To match the speed of two or more engines.

1. Preliminary: Determine which engine runs slowest. Warm up engines (3-4 minutes). Make sure wheels and track are clean!
2. Make sure all engines have DecoderPro roster files, and start speeds are set.
3. Make a consist with your slowest engine as the lead engine. Do not couple the engines.
Select the JMRI Consisting Tool.
Give the new consist a two-digit address, and add the two engines to the table for the new consist, the slowest first.
After locomotives are in the table, hit the “Throttle” button to make the consist and open a new JMRI Throttle to control it.
You can now run the consist using this throttle.

**Remember:** Do not couple the locos. Space them about 12 inches apart.
4. Open a programmer for the faster loco in DecoderPro using “Ops mode”.

Select “Operations Mode (Main Track) …”
Select the roster entry for the faster loco, and click “Open Programmer”.
5. Slow the faster loco using the decoder speed table.

Select the “Speed Control” pane.
Select “Use Table”, and reduce the value in the 28th (last) step of the speed table. Click “Match Ends” to adjust all steps.
Click “Write changes on sheet” to send the new table to the decoder.
As each step is written, DecoderPro indicates progress as shown below.
6. Continue to adjust speed table until loco runs the same speed as the lead engine.

Run consist the same speed each trial (50% works well).

Stop consist between speed table adjustments if the speeds are much different.

Note: When programming on the main, CV’s usually cannot be read--only written!

Remember to Save the roster file when done.
Decoder was programmed to match the speed of the two engines, and engines were consisted *without having to know anything about individual CV’s.*

Isn’t that a great way to program DCC decoders!
Sound Decoder Demo

DecoderPro Animated Demos:

Peter Ulvestad (Edmonton Model Railroad Association)

http://www3.telus.net/public/ulvestad/DecoderProDemos.html