Victorian Railways Signalling for JMRI

1. Introduction

These files allow Victorian Railways to be selected as the Signal System for signals defined in JMRI so Victorian Railways two and three position aspect names and rules can be used.

Aspects and speeds for three-position signalling using these signal mast types:
- double heads (A and B heads);
- double heads with a C head added;
- single head, typically used for dwarf signals; and
- repeating signals.

Aspects and speeds for two-position signalling using these signal mast types:
- single head home, with or without a call-on light;
- single head distant;
- single head repeating; and
- arrival heads (dolls) for 2 or 3 road options (displayed on screen as searchlight style);
- dwarf signals; and
- repeating signals.

These files map the aspect name to the appearance of each head on the mast, i.e. what colour each head displays. These apply to searchlight heads, “traffic light” heads or semaphore arm positions, the aspects and the logic to determine them are the same, the difference is in the mechanics and electrics on the layout which will vary depending on how you want to make them. Regardless of what signals are on the layout, all signals are displayed on screen as searchlight style except for dwarf discs.

The mast types and Home and automatic signals are logically the same, the only difference is cosmetic appearance on a computer screen, tablet or phone. The aspects and logic are the same, the lights are the same except being offset on the pole. Similarly, the logic for dwarf discs and dwarf lights is the same, the only difference is cosmetic appearance on the screen.

References used for these are vicsig.net and victorianrailways.net

2. JMRI Signalling

There is an excellent reference on JMRI’s web site to guide you through the steps necessary to set up signalling in JMRI, using JMRI’s signal mast logic. Use this link: JMRI Panel Pro Getting Started

The signalling logic will determine the appropriate aspect for a mast based on occupancy in the section ahead, the signal at the end of the section ahead, the position of points and speed restrictions. The logic also uses a group of files to define the signalling rules for simulating a specific prototypical signalling practice. Each railroad has its own rules and signal appearances and therefore its own set of files. The files described here fulfil this role for Victorian Railways 2 or 3 position signalling.

3. Installing the Signal files

As of Version 3.0 in September 2023, some mast names have been changed. This means that these definitions will be incompatible with older JMRI panel files so just keep the old definitions.

1. Click on the green ‘Code’ button on the VRsignals github page, then click on ‘Download ZIP’. This downloads VRsignals-master.zip. Extract all to the location of your choice. It will create a folder called **VRsignals-master**. Open that folder and right-click on the ‘**resources’** folder and select ‘**Copy’.**

2. Open JMRI with your desired profile, select ‘Help’, then ‘File Locations’ and then ‘Open User Files Location’. Click on ‘**Paste’**. If there is already a ‘resources’ folder in the User Files Location, the VR signals files will be merged into it, otherwise it will create the ‘resources’ folder with the VR signals files in it.

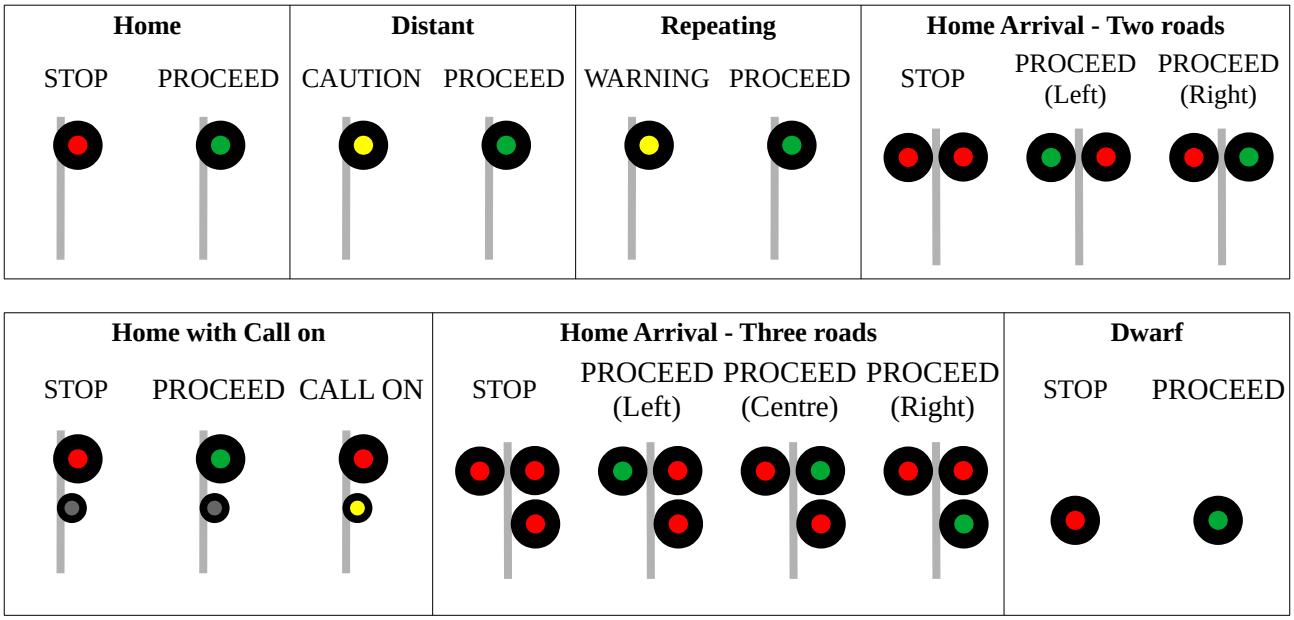
3. You may need to restart JMRI, just do it to be sure.

Three Position Signal Aspects

Aspect Name	Double searchlight	Double searchlight with C light
STOP (red over red)		
NORMAL SPEED WARNING (yellow over red)		
CLEAR NORMAL SPEED (green over red)		
MEDIUM SPEED WARNING (red over yellow)		
CLEAR MEDIUM SPEED (red over green)		
REDUCE TO MEDIUM SPEED (yellow over green)		
LOW SPEED CAUTION (red over red over yellow)		

Single head (dwarf)		Repeating	
STOP (red)		CAUTION (yellow over yellow)	
LOW SPEED CAUTION (yellow)		REDUCE TO MEDIUM SPEED (yellow over green)	
CLEAR LOW SPEED (green)		PROCEED (green over yellow)	

Two Position Signal Aspects



4. Creating signal masts

The signalling systems in JMRI use JMRI's 'Signal Mast Logic' so deal with Signal Masts and not Signal Heads. However, depending on what signalling hardware you use and how they connect to JMRI, you may have to define each signal head in JMRI and use "Signal Head Controlled Mast" as the Mast Driver in JMRI Signal Mast table for that mast. This should be avoided unless absolutely necessary, it's otherwise making things more complicated than need be, is a lot more work and this therefore more error-prone.

As examples, this note steps through the process to use these Victorian Railways definitions to create Virtual Masts, microprocessor controlled masts using MQTT communication and DCC controlled masts using NCE's Light-It modules as examples.

4.1. Virtual Mast

Virtual Masts are useful for having the signals on your Layout Editor diagrams if you don't want to put signals on your layout. Only masts are required, you should not configure individual heads.

You can use virtual masts if you are not ready to put signals on your layout but if/when you reach the point of wanting signals on your layout, the transition is difficult, either by starting again or very cautious, highly error-prone editing of the XML file with some help from some similarly complex JMRI tools to alter masts, though there have been some improvements in those tools.

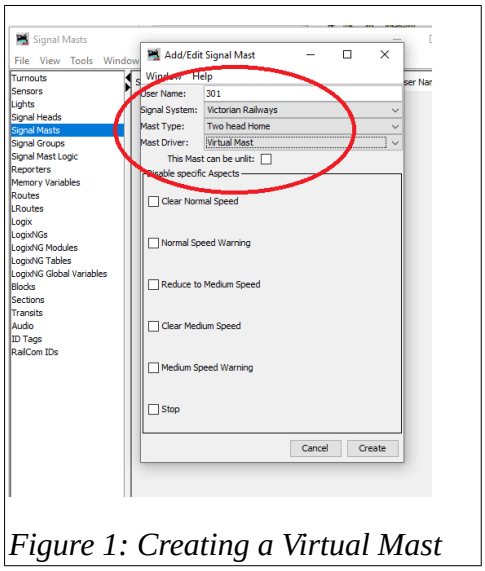


Figure 1: Creating a Virtual Mast

Create a Virtual Mast by selecting Victorian Railways as the Signal System, which of the mast types you require and Virtual Mast as the Mast Driver. See Figure 1.

4.2 MQTT Mast

Only masts are required, there is no need for individual heads. The mast aspect name will be sent to the MQTT signal microprocessor in order for that aspect to be set. It's up to the microprocessor to determine how to display that aspect on the signal mast(s) it controls.

MQTT messages have a 'topic' and a 'message', sometimes called a 'payload'. JMRI messages use

topics as the identifiers for each mast and the message as the aspect to which the mast is to be set. The MQTT message will look like this:

Topic: myLayout/signalmast/4001/04

Message: Clear Medium Speed; Lit; Unheld

The first portion of the message is the aspect. The last two portions are supplementary information that a microprocessor can optionally use.

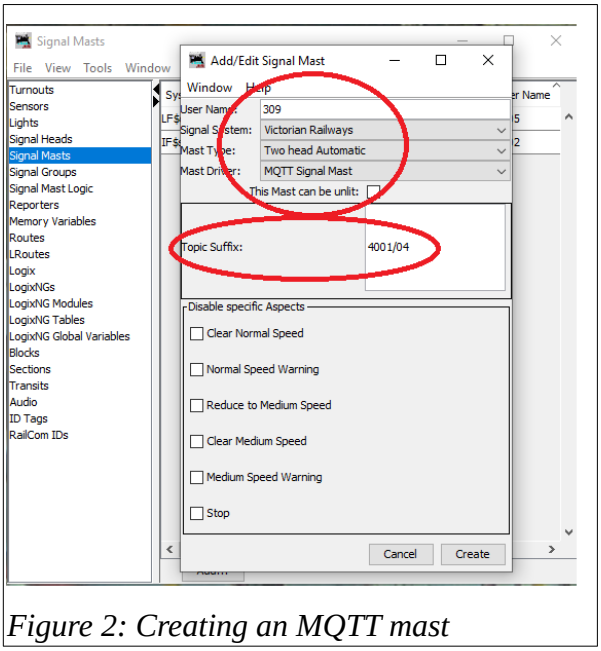


Figure 2: Creating an MQTT mast

4.3. DCC mast

There are many forms and many brands of DCC controlled masts. This example using NCE Light-It decoders for Victorian Railways signals is intended as one example that can be used as a guide for others. These connect to DCC track power so will work on any brand DCC system, not just NCE.

A Light-It can control up to 3 single-colour LEDs. These have a common anode (+ve) connection. You can use bicolour LEDs (3 legs) or tricolour LEDs (4 legs), connecting each leg to its appropriate mount point. Note that the common leg connects to +5V so LEDs must be common anode. Common cathode LEDs and 2-leg bipolar LEDs cannot be used.

There are several configuration options possible though your choice is limited to match the type of LEDs your mast uses.

To support all Victorian Railways aspects available on twin searchlight signals, two Light-It modules are required – one for each of the heads. If you only require one speed, i.e. top or bottom always red, then a standard red LED can be used for that with just the other head being controlled by a Light-It. A "C" light must be considered as a third head but it can be controlled by the same Light-It in some cases as described below.

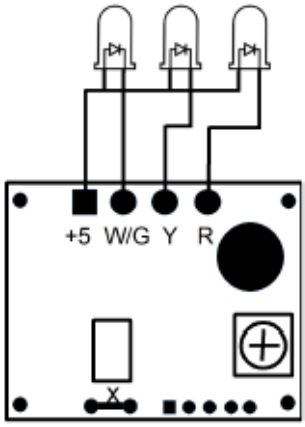


Figure 3: NCE Light-It wiring.

Table 1:

Aspect	Effect Number	Lighting effect
0	0	Red
1	1	Yellow
2	2	Green
3	3	flash red
4	4	flash yellow
5	5	flash green
6	6	red+yellow
7	7	flash red+yellow
8	8	red+flash yellow
9	9	red+green
10	10	flash red+green
11	11	red+flash green
12	12	yellow+green
13	13	flash yellow+green
14	14	yellow+flash green
15	15	effect 15=all on
30	--	all flash
31	--	all off

Figure 4: Aspect codes as shown in the NCE Light-It instruction

Refer to the NCE decoder instructions for guidance on setting the DCC address and to adjust brightness if needed. The table shown in Figure 5 is an extract from the instructions, showing what aspect number to use in the signal mast definition to get the desired colour.

For Victorian Railways, each head requires only red, yellow and green. There are several ways this can be done, depending on the type of LEDs being used. Three options are described here.

4.3.1. Option 1 – twin "traffic lights" with standard LEDs

Connect a red, a yellow and a green led to the relevant connection points on each of two Light-It

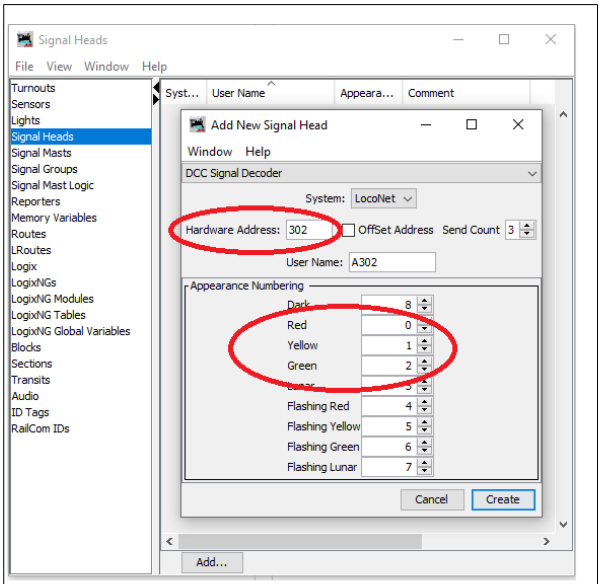


Figure 5: Creating a DCC Signal Head for a Light-It

modules. If a C light is required, that will be the 7th LED so requires a third Light-It or some other connection option. This option shown here excludes a C light.

This option requires each signal heads to be defined in JMRI first and then a signal mast using "Signal Head Controlled Mast". Create the heads with their DCC address as shown in Figure 5. The default appearance numbers for red, yellow and green are correct for the Light-It.

Create the mast in JMRI, selecting "Signal Head Controlled Mast" and the two heads created as shown in Figure 8.

Once these are created, selecting an aspect name for the mast will set the required colours for the heads as shown in Figure 7

4.3.2. Option 2 – "search lights" using bicolour or tricolour LEDs

This option is almost identical to option 1. It is essential that these LEDs are common anode type, to connect to the +5V. The other LED legs connect to

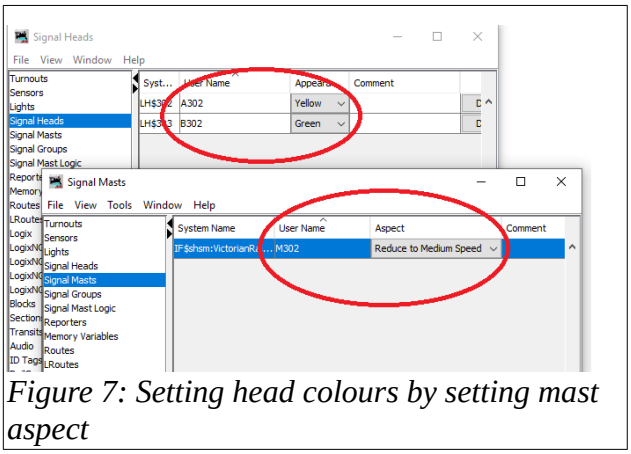


Figure 7: Setting head colours by setting mast aspect

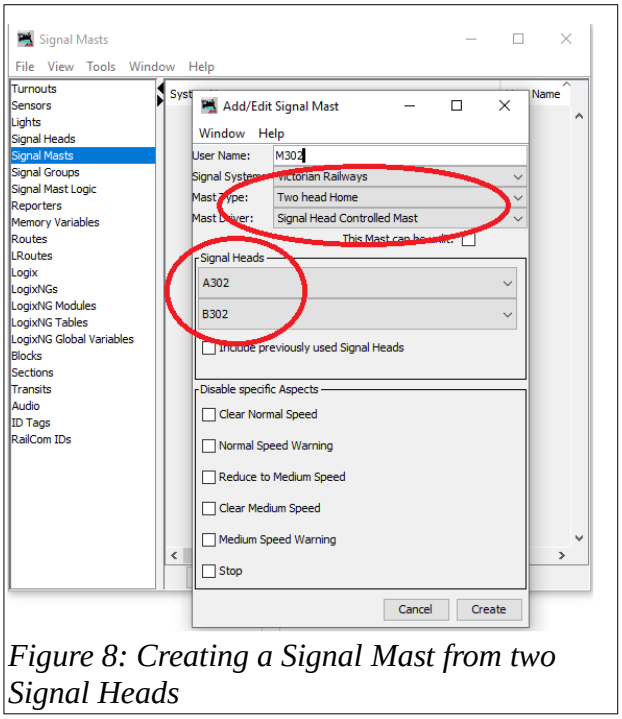


Figure 8: Creating a Signal Mast from two Signal Heads

their relevant connection points on the Light-It. For bicolour LEDs, connect the red and green legs to the red and green connection points. Use aspects 0 and 2 respectively for red and green and use aspect 9 to switch on both colours to give yellow.

4.3.3. Option 3 – Single speed with bicolour LED

This option is for masts that only ever display one speed, either normal or reduced speed. It only requires one Light-It so therefore is cheaper and easier.

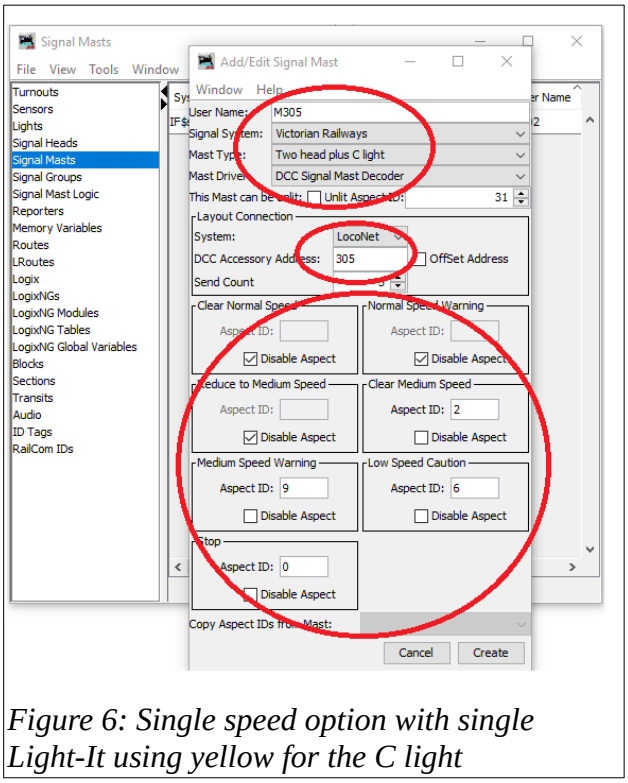


Figure 6: Single speed option with single Light-It using yellow for the C light

Use a standard red LED, independently powered, for the head that remains red. Use a bicolour (3 leg), red – green LED for the other head, with the red and green legs connected to the Light-It. If a C light is required, as shown in this example, the unused yellow connection point on the Light-It can have a yellow LED attached for the C light

This option only uses a mast in JMRI. Figure 6 shows how to configure this. When the Low Speed Caution aspect is selected, aspect id value of 6 sets the bicolour LED head to red and switches on the yellow C light.