



## The MERG DCC User Guide

July 2013

*A number of new products are available from the Kit Locker which constitute a complete DCC system and which supersede the original BC1a Command Station and its handset kits (kits 42 and 43). They comprise a DCC Command Station (CANCMD kit 91), a hand held plug-in Handset (CANCAB kit 92), a connector kit for the Handsets (CANRJ kit 93) and a DCC Booster, in 5A or 10A versions (NB1B kit 58). This document provides details of how to interconnect and use these kits.*

 Note, where the word CBUS appears in this document it refers to the MERG CBUS system of layout control modules based on CANBUS.

This Technical Bulletin describes the operation of the CANCMD version 2p and CANCAB version 3f of the firmware for each. It is likely that new versions of the firmware will become available from time to time with additional features. These will be available for download from the Software Downloads page on the MERG Forum

<http://www.merg.org.uk/softwarewiki/doku.php>

### Introduction

An overview of the DCC kit range appears in Technical Bulletin DCC 21 'The MERG 2<sup>nd</sup> Generation DCC System' and it is recommended that the builder is fully conversant with this before embarking on any purchases. This should assist in determining what to obtain to satisfy your requirements.

What follows here gives details of the connection and operation of the system once you have completed the items and it is assumed that they have been built and tested in accordance with the Building Instructions enclosed with each kit.

### The CANCMD Command Station

Figure 1 shows the completed Command Station and the following paragraphs detail what is required to put it into operation.

#### Power supply.

The CANCMD requires an AC supply of 15V or a DC supply of 15 to 24V connected to J1 (1 and 2). The current capacity should be at least 2 amps and when power is applied, the green LED should be illuminated. The yellow LED may also be illuminated depending on the setting of jumper J7.

The CANCMD has a secondary DC power output, supplied by internal regulators, which appears on J2 terminals 1 and 4 and is selected by link LK2 to be either 5V or 12V. This is primarily to supply power to attached CANCAB handsets, 12v being recommended. Link LK1 should be installed for this to operate properly.

If you wish to provide the handsets with a separate power supply, then do not fit links LK1 or LK2.

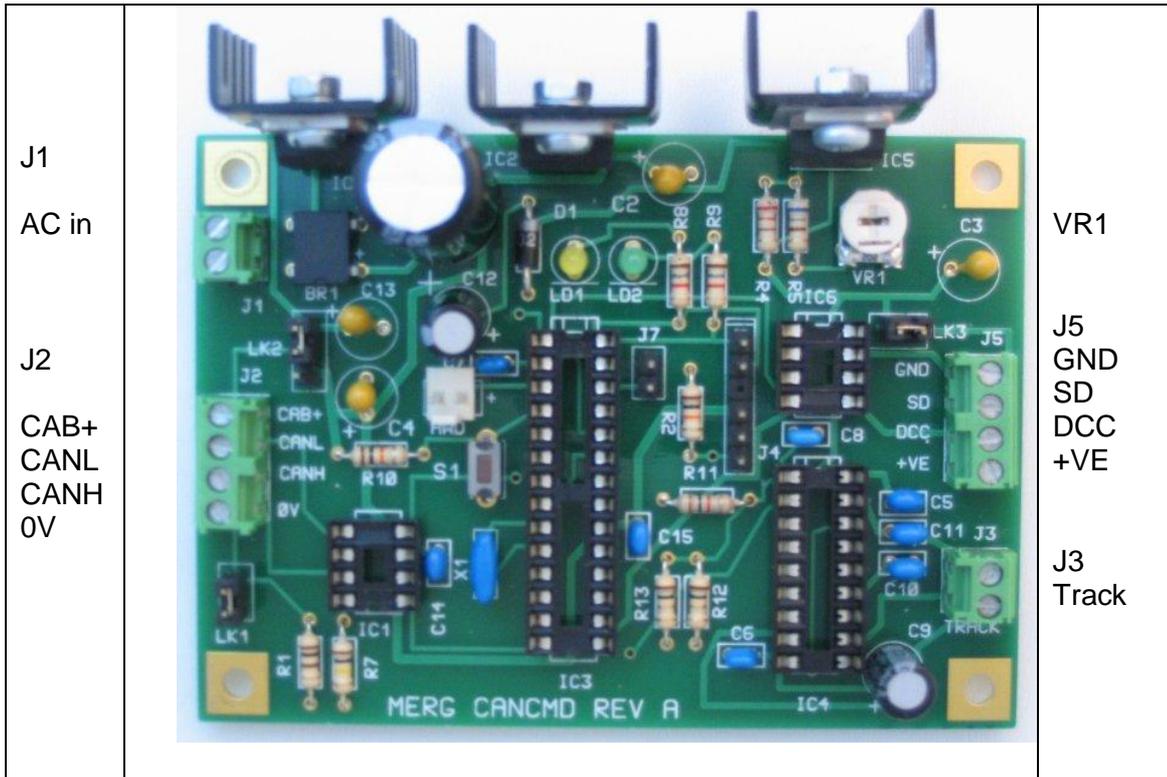


Figure 1 The CANCMD Command Station

**Main DCC Output**

This appears on J5 and comprises an unbalanced DCC output (terminal 3) and a 'shutdown' command output (terminal 2) specifically for connection to one or more DCC Boosters which are connected in parallel. This is adjustable between 5V and 15V by trimpot VR1 (see below) and should be compatible with most commercially available Boosters as well as MERG's Booster NB1B. This DCC output is not suitable for connecting directly to track and it is not short-circuit protected. Connect to the NB1B as shown in Figure 2. Consult the User Guides of commercial Boosters for appropriate connections.

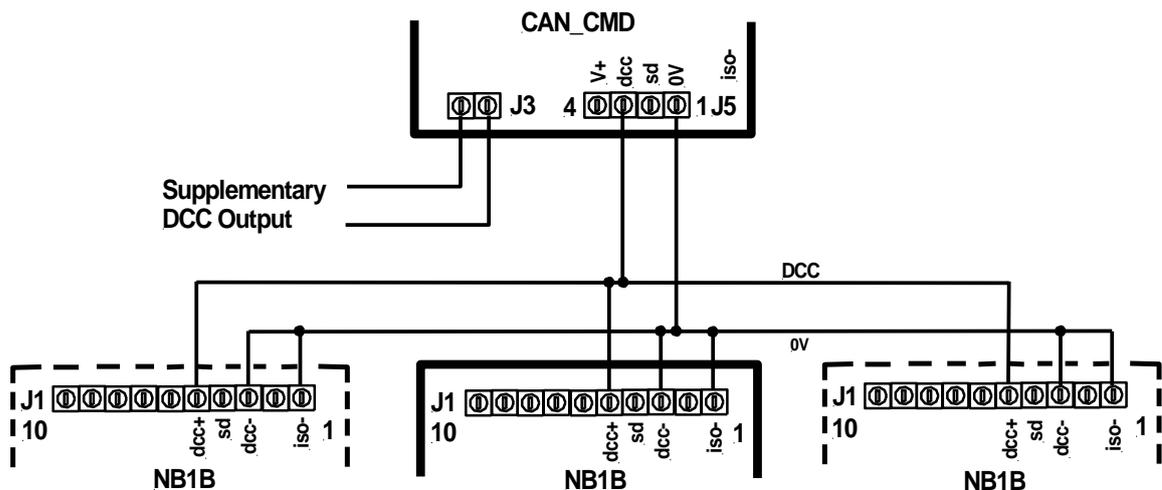


Figure 2 Connections between CANCMD and NB1B Booster

## Supplementary DCC Output

This is a balanced, low power, short-circuit protected DCC output appearing on J3 which may be used as a mini-booster for driving the track of a small layout or an independent programming track. This is set at 1 amp maximum and the DCC voltage is also set by trimpot VR1. Short-circuit protection here does not affect the main DCC output.

It is not possible to use this output stage as a mini-booster and a 'service mode' programmer simultaneously.

### Adjusting the DCC Output Voltage.

DCC Output voltage is set by trimpot VR1 and is common to both main and supplementary DCC outputs. To set the output voltage, apply power to the CANCMD. Take a Voltmeter set to a DC voltage range and attach it between the GND (0V) and +VE outputs of J5 (terminals 1 and 4 respectively, link LK3 must be installed). Turn VR1 until the voltage is the desired value. When using the CANCMD to drive additional Boosters via the supplementary DCC output, set this for 12V and connect the external booster to J5, terminals 1 and 3. When using the CANCMD to drive a small layout using the 'track' output, set this between 12V and 14V as required

### Selection of Supplementary DCC Output Function

The function of the Supplementary DCC Output is selected by jumper J7.

If the jumper J7 is absent, service mode programs a loco on a programming track connected to J3 of the CANCMD and operations mode programs locos on the main layout, connected to the booster. In other words J3 is connected to a "programming track" and control of locomotives is via J5 and a booster. The yellow LED will illuminate briefly during CV programming, whilst power is applied to the programming track.

A short-circuit during programming causes the power to be turned off to the programming track, the yellow LED goes out and the message "Over" is displayed on the handset.

A short-circuit on the main track driven by the booster is dealt with by the booster – see the documentation for your booster.

If the jumper J7 is present, service mode is not available and operations mode programs locos on the main layout, connected to J3 of the CANCMD via a booster. The yellow LED LD2 will be illuminated. In other words, there is no "programming track" and the output of J3 may be used for controlling a small layout provided the total current draw does not exceed 1A.

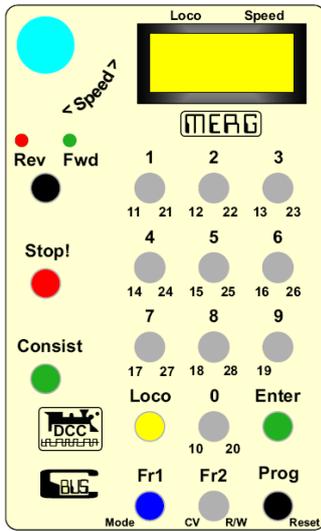
In this mode, a short-circuit will result in the power to the track being cut off, the CANCMD beeps and the yellow LED goes out. The CANCMD will attempt to restore power at about half second intervals. This results in beeps with short pauses and the yellow LED flashing until the short is removed.

### DCC Control Input

Handset and computer control of the CANCMD is exercised through the CBUS input on J2 terminals 2 and 3 which is compatible with the CBUS system. Therefore handsets can be directly connected via the RJ22 connector unit (CANRJ22 kit 93) included with the CMD kit or can be integrated with a layout-wide CBUS network. See below for handset connections via the CBUS.

Note that if the CANCMD is unable to transmit on CBUS, 2 beeps will sound. This will be normal behaviour if you turn on the command station with nothing connected to the CBUS connector i.e. no CANCEBs and no CBUS modules (CANUSB, CANACC8, CANACE3 etc.)

**The CANCEAB Handset**



**Figure 3 DCC Handset**

A picture of the handset appears in Figure 3. The handset attaches to the layout cabling by means of a standard pluggable telephone-type cable which plugs into the RJ22 Connector module. This makes it easily disconnected in order to allow the operator to roam the layout. The handset control output is a CBUS interface which is compatible with MERG's CBUS system. This allows multiple handsets and multiple connecting points around the layout. The handset is powered through the RJ22 lead from a 5V or 12Vdc (recommended) layout bus either from a stand-alone source or direct from the CANCECMD secondary DC supply on the J2 terminal block.

A picture of the handset appears in Figure 3. The handset attaches to the layout cabling by means of a standard pluggable telephone-type cable which plugs into the RJ22 Connector module. This makes it easily disconnected in order to allow the operator to roam the layout. The handset control output is a CBUS interface which is compatible with MERG's CBUS system. This allows multiple handsets and multiple connecting points around the layout. The handset is powered through the RJ22 lead from a 5V or 12Vdc (recommended) layout bus either from a stand-alone source or direct from the CANCECMD secondary DC supply on the J2 terminal block.

NOTE - that the handset cables used are those used to connect telephone handsets to their bases, not those that connect to the BT wall socket. They are not a 'one to one' connection but are a 'mirror image' at each end. The wiring in the handsets allows for this. Do not use any other type of connection or damage may result.

The RJ22 Connector module (KIT 93) offers a variety of ways to connect with the CBUS and derive the handset power. The bus wires may be soldered directly to the connector module PCB or via the 3.5mm terminal blocks provided. Use of a terminal block allows easy 'daisy chaining'.

Figures 4a, 4b and 4c show how to directly connect handsets through the connector module:

- a. as a dual plug-in connector. This simply provides dual sockets for two adjacent handsets to connect with the Command Station. Both RJ22 modules should have a CBUS terminating resistor installed.
- b. as two separated connectors. This provides single connectors at different points of the layout for remote handsets. Both RJ22 modules should have a CBUS terminating resistor installed.

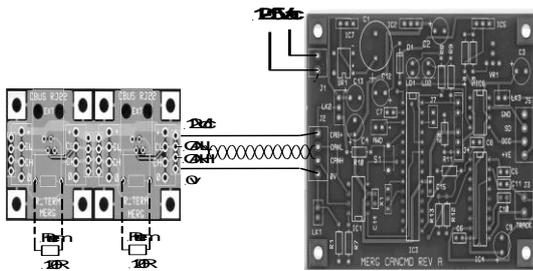


Fig. 4a One Dual Handset Connector

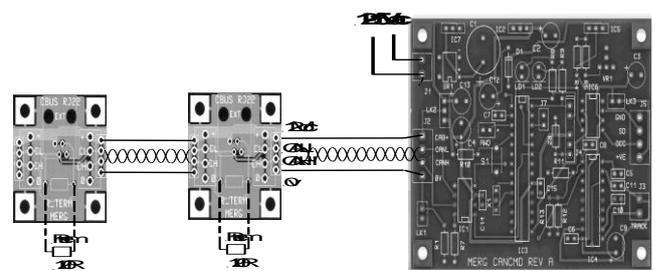


Fig. 4b Two Single Handset Connectors

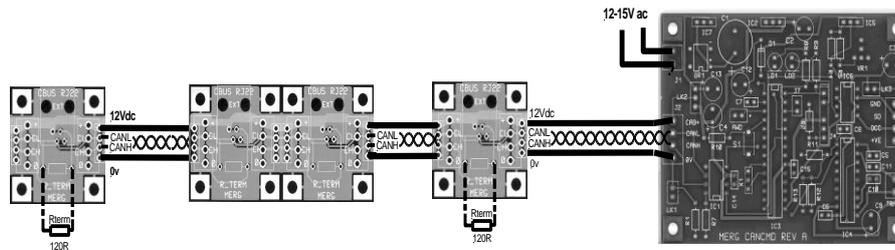


Fig. 4c Additional Handset Connectors

c. Further RJ22 modules for additional handsets may be inserted as required, but omit the CBUS 120R terminating resistors except for the modules at the ends.

**Handset Connection through a CBUS network**

The Layout Network may also be used to connect handsets to a CANCMD module where these items simply become additional resident modules on the network coexisting alongside accessory modules such as CANUSB, CANACC4 etc. The connection uses the same communications protocol as for other CBUS modules (see TBs G32/0 to G32/8).

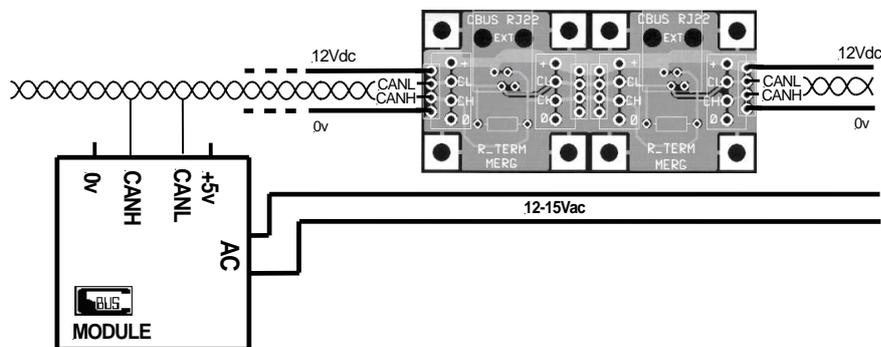
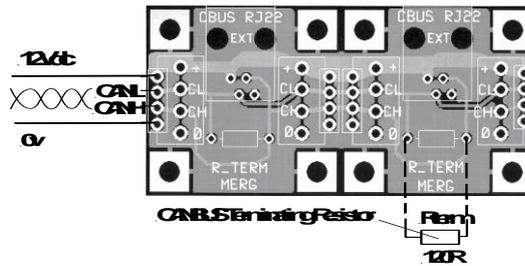


Fig 5 The CANRJ22 module inserted into CBUS layout cabling

To insert the CANRJ22 module into the CBUS cabling connect as shown in Figure 5. Do not install a CBUS terminating resistor and pay particular attention to both the correct polarity of the DC power supply wires and the correct polarity of the CANH and CANL wires which should be a twisted pair. AC power wires must NOT be connected to the RJ22 module or a handset.

To use a CANRJ22 module at an end of the CBUS cabling connect as shown in Figure 6 and install one 120R terminating resistor. If in any doubt about placement of terminating resistors please note that the CBUS should have a maximum of 2 terminations, one each at the extreme ends of the twisted pair.



**Fig 6 Terminating RJ22 Module**

Particular care must be exercised in routing DC power for the handsets alongside the bus cabling since it is vital not to cross-connect two PSUs in parallel. If a standalone 12Vdc PSU is used on the CBUS network and this is chosen to power the handsets, then LK1 and LK2 on the command station must NOT be fitted. You should not connect the external +12V to the CAB+ pin on J2, but the external 0V should be connected to the 0V signal on J2 to provide a ground reference.

Also, if other CBUS modules are 5V versions then the 12V supply from the CANCMD must ONLY connect with the handsets and not those other modules.

**Limitations**

There can be up to 32 active locos at any one time. This is set by the stack size on the CANCMD. The limit to the numbers of connected handsets (but not active) is set by the limit of 110 nodes on a CAN segment. It will therefore depend on what other modules are in use.

**COMMAND STATION STARTUP**

When you turn on the command station, it issues a reset command on CBUS. This will reset any handsets that are connected, as described in the following section.

If the command station is unable to communicate with any other modules on CBUS, you will hear 2 beeps. If you find that the handsets will not select locos, check the CBUS connections as described in the previous section. See also the testing section of the CANCMD building instructions.

**HANDSET STARTUP**

The display on the handset shows a title "MERG CAB" on the first line and the firmware version number on the second line for about 3 seconds at startup. For example -

**MERG CAB**  
**Ver 2p**

The startup message is not displayed when you plug the handset back in using walkaround, in this case it just continues with the selected loco. If you don't want to wait 3 seconds to get started, just press the loco button (or press the Prog button when attaching the handset).

The startup message is displayed again if you reset the command station.

**HANDSET OPERATION**

**Selecting a loco.**

When the CANCMD is powered up with a handset attached, the green handset LED will light and the display will show

**SEL. LOCO**

=

Key in the loco number (address) with the numeric buttons and press **Enter**.

If the speed control was already at zero (fully anticlockwise) there will be a short 'beep' and the display will change to show the loco address and speed. e.g.

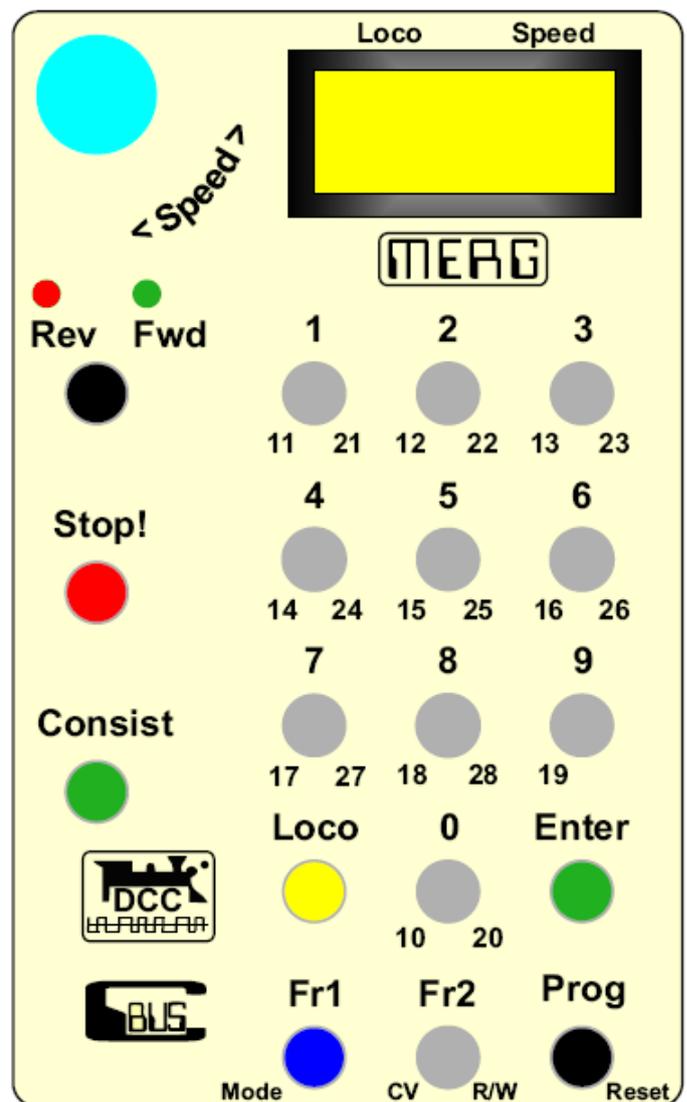
**123      0**

If the beep continues and the display does not change, turn the speed to zero. This is a safety feature to prevent a loco setting off at high speed.

**Addresses.**

The system will accept short or long addresses. The short address range is 1 to 127. The long address range is 0001 to 9999. Hence you can have long addresses less than 127. (You can force low addresses to be long by prefacing the number with leading zeros. e.g. address "1" is short, addresses "01", "001" as well as "0001" are long). Keying an address greater than 127 will automatically assume a long address.

You should now be able to drive the selected loco. The speed is controlled by the knob and the handset is designed to be used in the left hand and the knob 'rolled' with the thumb if preferred. The display shows the speed step on the top line. (000 to 127)



**Mistakes.**

If you enter the wrong address, press the **Loco** (yellow button). This will cancel the number and prompt again

**SEL. LOCO**

=

**Direction selection**

Direction is selected using the black button below the two LEDs. Pressing this changes direction. The green LED indicates 'forward' direction is selected and the red LED 'reverse'.

**Changing locos.**

The handset only allows one loco at a time to be controlled so it is necessary firstly to release that currently selected.

Press **Loco**. The display will show

123 0  
RELEASE?

To release the loco press **Enter** and it will be released from your control.

NOTE - *It will NOT stop the loco if it is moving.*

The display then prompts

**SEL. LOCO**

=

Select another loco as above. If you change your mind about releasing, press **Loco** instead of **Enter**.

**Walkaround**

The system allows you to disconnect a handset and reconnect in another socket without interrupting operation. The time allowed for this is about 20 seconds. If this time is exceeded, the CANCMD releases your loco and control is lost.

**Caution.** If you leave your handset disconnected, another user may take over your selected loco. If you subsequently reconnect the same loco will be re-acquired, creating the possibility that two handsets are controlling one loco. To avoid this situation, hold the **Prog** button in (bottom right hand corner of the handset) while reconnecting. This will reset the handset and cancel the information retained from the last session. This will also be necessary if the system is powered up with the handset disconnected.

**Speed Step Settings**

The CAB has the ability to set 14, 28 or 128 speed steps for any given loco. However, the choice must be made before the loco is selected.

With no loco selected, the prompt is

**SEL. LOCO**

=

At this stage you can select a speed step range with the Fr1 (mode) button. The default setting is 128 step as this is by far the most common. If you press the Fr1 button, the display changes to

**SEL. STEP**

s128



First select a loco as above. Check it runs. Select the direction it will face in the consist. If it is to run forwards, set it to 'forward'. If backwards set to 'reverse'.

Press the **Consist** button (green). The display will show

**Consist**

=

Key in the address of the consist and Press **Enter**. (Changed your mind? Press **Loco**) The loco is added to the consist. The display now reverts to

**SEL. LOCO**

=

Repeat the above steps for each loco you wish to include in the consist.

When you are ready to drive your consist, enter your chosen consist address just like any other loco and drive all the locos in the consist together from the one handset.

Consisting works best when the speed responses of the locos are reasonably matched – see the following section on programming CVs.

#### **To remove a loco from a Consist.**

If you are driving the Consist, release it by pressing **Loco, Enter**. Then select the address of the loco you want to remove. You will not be able to drive it as it is still consisted but the functions should work (see below)

Now press the **Consist** button twice. Display will show

**Consist**

**Clear?**

Press **Enter** and the loco will be released. You now have full control of the selected loco. (Changed your mind? Press **Loco**)

#### **Functions**

When you have selected a loco, the number buttons send function commands to your loco. Numbers 0 to 9 send functions F0-F9 (F0 is also sometimes referred to as FL as it usually controls the main running lights). When you press a number button, the function number will show in the display.

To select functions above F9, press the **Fr1** (function range 1) button. The display will add **Fr1** to the bottom line. Now the numbers represent functions F10 to F19. The correct Fn number will be shown in the display. For numbers above F19, press the **Fr2** button. Now you have functions F20 to F28. (There is no F29 defined by the NMRA).

When a loco function key is pressed, a CBUS event packet is sent in addition to a DCC function packet. This allows the action of pressing a loco function to be taught to a CBUS consumer. This feature is in addition to the dedicated accessory control feature (see later). The same event is generated whatever loco has been selected.

NOTE - The CANCMD only remembers the function settings F0 to F12 and only these are sent to the loco regularly. Higher functions are sent only once when the button is pressed.

#### **Momentary or toggle action for Fn buttons.**

Any function from F0 to F28 can be set individually to be either 'toggle' (ON or OFF) or 'momentary' (ON as long as button is pressed). The default state is 'toggle'. The display now shows the Fn number and either ON or OFF when the button is pressed. This display remains till another Fn button is selected.

To set a Function to 'momentary', select the Fn (0 to 28) and hold the button in. Now press the '**Consist**' button. The display on the bottom line will change to **Fn mom +** if the Fn was originally ON or to **Fn mom -** if it was originally OFF. In momentary mode, the Fn button will send an ON event when pressed and an OFF event when released. The sign will indicate the state.

To clear a momentary action back to a toggle, hold in the Fn button and press the Consist button – in that order.

The Fn button action is stored in the CAB EEPROM. It will remain the same for that CAB after a power off or a workaround. To clear all Fn buttons back to toggle (the default) unplug the CAB. Hold in the Consist button and then replug the CAB.

### Programming

A handset allows you to program any loco CV with any value using OTM (**O**n **T**he **M**ain) programming. Not all decoders may allow you to change some CVs using this method.

First select a loco as above. Check it drives. Then press the **Prog** button. The display shows

**CVnumber**

=

Key in the CV number and press **Enter**. The Display now shows

**CV Value**

=

Key in the CV value (decimal) and press **Enter**. The CV is now programmed into the loco. The CV range is 1 to 1024. The CV value range is 0 to 255.

Note: CVs can be changed while the loco is moving. However, the process may not be 100% reliable if the track contact is poor during the programming sequence. You can always try again.

You can cancel the programming sequence at any stage by pressing **Loco**.

### Reset

The **Prog** button is also used to reset the handset. If you unplug a handset whilst a loco is selected, it will remember that loco in its memory as part of the 'workaround' mechanism. When you reconnect, the CANCMD will check the loco number against its stack data and refresh the handset if the loco selection is not timed out.

To avoid conflicts, if another handset has selected the same loco, press and hold **Prog** whilst plugging into the network. This releases any previously selected locos. The CANCMD stack is unaffected.

NOTE – Since connected handsets are reset by the CANCMD module on power up, loco selection conflicts will only arise if a handset is reconnected after power up.

### Setting a long address

The system allows you to set the long address of a loco in one stage. This works on both the programming track and "on the main", however not all decoders will permit you to set the long address "on the main".

With a loco selected using its current address (long or short), press the **Prog** button twice. The display now shows

**Long Adr**  
=

Key in the long address, 01 to 9999 (use 1 or more leading zeros for addresses below 1000). Press **Enter**. The long address will be set into the loco. Now select the new long address to drive the loco.

**Service mode Programming (Programming Track)**

This is the ability to read and write CVs in 'Service Mode' using the programming track capability of the CBUS Command Station.

A loco must first be selected. This may be any valid number and doesn't need to be either an actual loco or the one on the 'programming track'.

Then press the **Prog** button. The first press is for CV programming 'On the Main'. The second press is for entering a 'long address' in one step. Finally the third press goes into service mode.

Service mode read and write allows for all the specified modes. These are Direct, Page, Register and Address.

See the documentation for your decoder to find out which mode you should use. If in doubt, try direct mode first.

**Reading CVs**

The default is Direct mode and read CV. So the first message on the third press of the **Prog** button is

**Read Dir**  
**CV=**

Enter the CV number (N) to be read and press **Enter**. Response is

**CV    N**  
**=    Val**

Where Val is the CV value in decimal.

This will be accompanied by a beep.

If the loco decoder does not acknowledge the event, either because there is no loco, the decoder is defective, that CV is not supported or you may have jumper J7 installed, the response is

**CV    N**  
**=    No Ack**

Again with a beep. If the programmer senses an overload on the programming track (in line with the NMRA requirements), the response is

**CV    N**  
**=    Over**

Pressing the **Prog** button allows you to read another CV. For direct mode read, the direct bit scheme is used so the read is always fast.

**Programming CVs**

Pressing the **Fr2** button (with sub labels “CV” and “R/W”) toggles between CV read and CV write. The display changes accordingly so if you were in the

**Read Dir**  
**CV=**

mode, pressing the **Fr2** button once now shows

**Prog Dir**  
**CV=**

Enter the CV number (N) and press **Enter**. Display changes to

**Prog CV**  
**N =**

Where **N** is the CV number entered. CV numbers can range from 1 to 1024. Insert the required CV value as a decimal number (V). Value range is 0 to 255. Again press **Enter**. If programming is correctly carried out, the response is

**CV    N**  
**=    V    OK**

This will be accompanied by a beep.

If the loco decoder does not acknowledge the event, either because there is no loco, the decoder is defective, that CV is not supported or you may have jumper J7 installed, the response is

**CV    N**  
**=    No Ack**

Again with a beep. If the programmer senses an overload on the programming track (in line with the NMRA requirements), the response is

**CV    N**  
**=    Over**

Following any of the above operations, or if you enter an incorrect number, pressing the **Prog** button takes you back to the previous Service Mode prompt. It does not take you back to the ‘On the Main’ prompt. Once in Service Mode, it remains there until the **Loco** button is pressed. This allows repeated service mode operations like programming or reading CVs.

The **Fr1** button (with sub label “Mode”) is used to sequence through the four possible programming or read modes. The sequence is Direct, Page, Register and Address and then back to Direct.

For Page mode the display and sequence is the same as for direct mode except the display changes to

**Prog Pag            or            Read Pag**  
**CV=                                    CV=**

For register mode the format is

**Prog Reg            or            Read Reg**

**Reg =****Reg =**

Enter the register number from 1 to 8. Program or read as before.

For address only operation, there is no CV number or register number to enter. To program an address you get

**Prog Adr****Adr =**

Enter the address value and press **Enter**. This will be acknowledged or not as the case may be. The address is the 'short' address from 1 to 127. To read an address, the prompt is

**Read Adr****Adr =**

Simply press **Enter** and the address value will be displayed.

You can cycle through the 4 modes with the **Fr1** button without changing the read / write and also change between read and write (**Fr2** button) without changing the mode.

To exit service mode, press **Loco**. This takes you back to operating the selected loco as normal. You can leave your loco running while performing service mode operations but you cannot change its speed or direction. However, all other CABs remain operational so layout running carries on as normal, provided you are using the external booster output for the main layout.

The command station can perform service mode operations via the on-board track output and run the layout via the booster at the same time. However, only one CAB at a time may perform service mode operations.

### Controlling CBUS Accessories

The ability to control CBUS accessories from a CAB has now been added. As an accessory needs to be controlled from any CAB, only the 'Device addressing' or 'short event' scheme can be used. Devices such as turnouts need their own unique Device Number (DN).

#### To operate a CBUS Accessory device.

Press **Enter**.

This will bring up the accessory set menu provided the CAB is not expecting an **Enter** for any other reason such as when selecting a loco, a consist or any programming activity. In normal driving mode or with no loco selected, **Enter** will show the accessory message. Note that this will not affect the driving of a loco and the speed, direction and Emergency. Stop will remain active. However, the numeric keys will not now activate a function.

The message format is similar to the following (which shows loco ID 123 at speed step 48)

**123 48**  
**Ac= +**

The '+' sign shows an ON event and can be changed to a '-' for an OFF event by pressing the **Consist** button. At some future stage, the labelling may be changed to show this dual function.

Enter the device number with the numeric keys. 0 to 9999 are valid. If you enter an incorrect value, press **Enter** again. This will clear the value. Re-enter the correct one. To send the event, press the **Consist** button. Repeated pressing of this button will toggle the accessory between ON and OFF. The + and –

sign will change. If another CAB or accessory control, like a control panel or PC changes the same accessory (e.g. turnout), the sign on your CAB will change. When you press the **Consist** button again, the turnout will always change from what it was. The accessory number will not change when you press the **Consist** button so you can keep repeating the action.

To change the number, simply enter a different value.

At any stage, you can abort the process just by pressing the **Loco** button.

The CABs will send 'short' events with a Node number (upper two bytes of the four byte message) set to all zeroes. This means that you can teach devices their Device Numbers from a CAB. To do this, put the module into learn mode and select the desired input or output with the SLiM switches. (See individual module instructions for further information on this). Send an event from the CAB with the desired device number. (ON or OFF is irrelevant here). Take the module out of learn mode. Note that a 'device' can comprise a complete route so you can set a whole route, signals, the lot, from a CAB just by entering the 'route' number.

You can now activate that device from any CAB.

You can even teach a control panel switch (CANACE3) or an input module (CANACE8C) a Device Number for its switch or input. If you make that number the same as the one taught to an output module (turnout driver) then the control panel or other input will activate the turnout directly as well as being able to activate it via the CAB. This way, you can use a CAB for layout configuration without a PC connection, albeit in SLiM mode only.

### Language options.

The CAB code now allows for language options for the display using a specified language file (cbusmessages.inc). This is not user selectable and is implemented at assembly time by choosing the appropriate language '.inc' file, and programming the CAB. You can cycle through all the messages by repeatedly pressing the 'Prog' button with no loco selected.

### Loco 'Dispatch'

If you 'release' a loco (by pressing the **Loco** button) with its speed already at zero, it will show '**Release?**' on the display. If the speed is not zero, it will show '**Dspatch?**' instead. Presently, the action will be the same and the loco will continue until the command station 'times out' after about 20 seconds. Future upgrades in the command station will recognise a 'Dispatch' and allow another CAB to take over the loco without it stopping.

### Finally

If you have a selected loco and change your mind about anything, just press the **Loco** button. If you have not selected a loco, you still operate accessories and send an 'Emergency Stop All'. Also, if the display goes blank press the **Loco** button.

### Limitations

At present if you release a loco while it is running, it continues to run although its speed/direction packets are not refreshed. This allows another user to select that loco. The only way to stop it is to reselect it and turn the speed to zero, or to use the Emergency Stop All facility.

The command station supports up to 32 locos simultaneously.

At present a handset can only control mobile decoders (as fitted in locomotives) and CBUS Accessories (such as the turnout drivers CANACC4 & CANACC5) but not stationary DCC accessory decoders

## CONTROLLING THE CANCMD MODULE FROM A COMPUTER

In order to control the CANCMD from a computer a bus-resident module such as the CANUSB or CANRS must be used. This allows software such as JMRI's DecoderPro to transmit locomotive commands over the CBUS connection alongside or instead of handsets. If you have a working PC connection to your network it provides a useful way to test the CANCMD module after construction in isolation from any handsets.

DecoderPro is free and download details can be found from the link below. Versions are available for Windows, Linux and Mac operating systems.

<http://jmri.sourceforge.net/help/en/html/apps/DecoderPro/index.shtml>

The following notes provide an outline of using DecoderPro as an example, to control locomotives via a CANCMD. It is not intended as a comprehensive summary of all the features of DecoderPro. Version 2.12 or later is recommended.

NOTE - At the time of writing, all MERG CBUS kits are 5V modules whereas the CANCMD and handsets are 12V modules. Therefore the +ve CAB supply connection on terminal 1 of the CANCMD terminal block J2 must **NOT** be connected to the CANUSB or CANRS modules which must obtain their 5V power from elsewhere. Only the CANH and CANL should be connected.

Once everything is connected, start DecoderPro, select the Edit | Preferences tab and enter

**MERG** as the System manufacturer, and either

**CAN via MERG CANRS or CANUSB** as the System connection

Or

**CAN via MERG Network Interface** for use with the CANETHER

### Using the CANRS or CANUSB

Finally define the serial port used for the connection and click on "Save" to preserve the settings. DecoderPro will then ask to be restarted for the preferences to take effect.

### CBUS Console

On restart, a new menu item "CBUS" will be seen in the main window which provides access to the CBUS Console as shown in Figure 7.

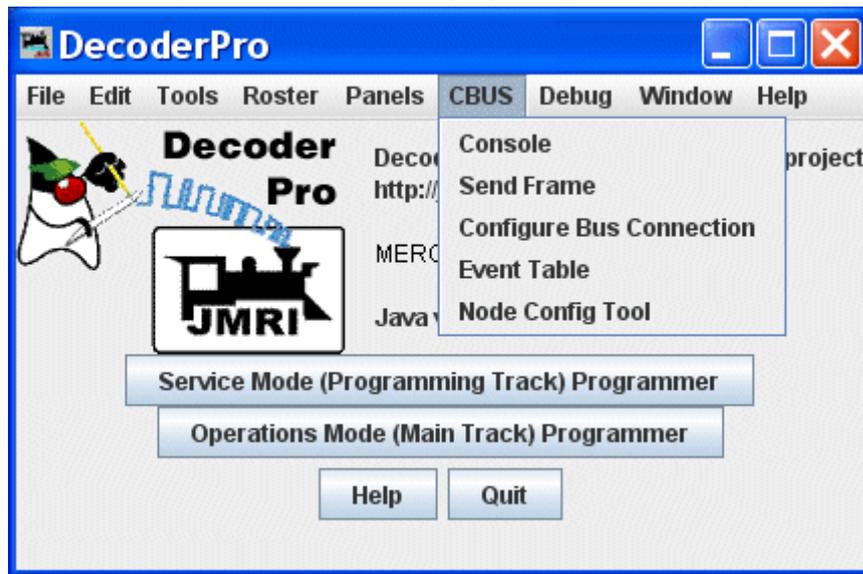


Figure 7 DecoderPro Main Window

Once the CBUS Console is opened it will show all activity on the CBUS including messages between any accessory modules present and between the CANCMD and any handsets. Whilst this is not essential for controlling a locomotive from the computer, it is useful to ensure communications are working correctly. This is illustrated in Figure 8 below

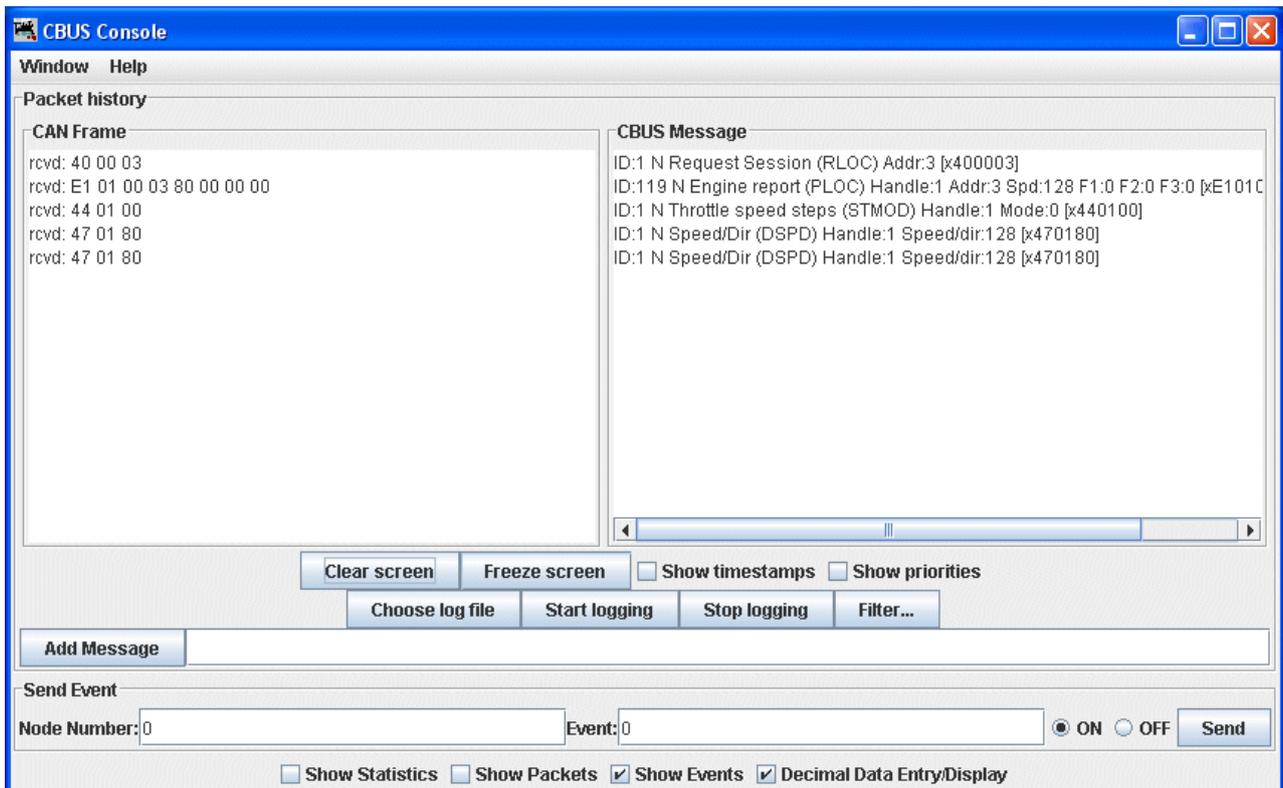


Figure 8 CBUS Console in use

To control a locomotive it is necessary to start a software throttle, use Tools | Throttles | New Throttle from the main window (Figure 9)



Figure 9 Opening a Throttle

A further window will open allowing entry of the selected locomotive address to be entered in the Address Panel and “Set” clicked. The slider is used to control speed, and the “Forward” and “Reverse” buttons control direction. This is shown in Figure 10.

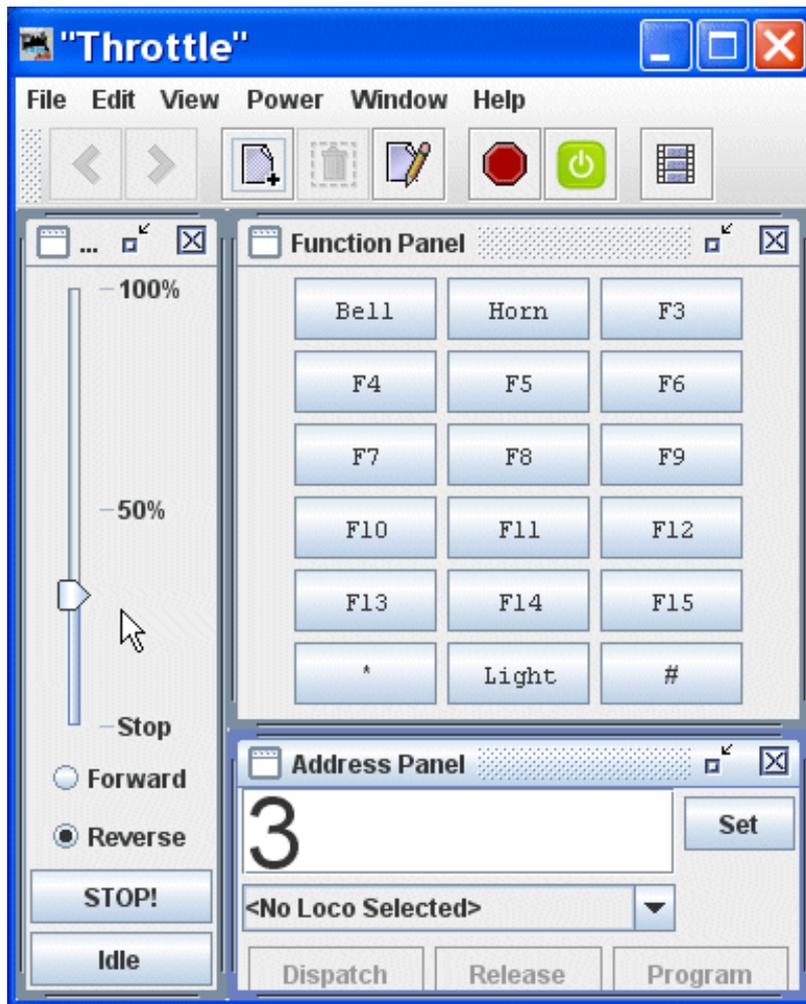


Figure 10 Software throttle controlling loco address 3

**NOTE - The “STOP!” button only stops the selected locomotive. However** an emergency STOP ALL (stop button pressed twice) on a CANCAB will also stop any trains controlled by JMRI. If that happens, you can then restart your train from the JMRI throttle as usual.

Using wireless throttles (such as I-Phones, I-Pods, Android phones, Wii handsets etc.) via JMRI will also work with the MERG CANCMD. See the JMRI website for further details.

From the main JMRI window of DecoderPro (Figure 7 above) you can open either the "Service Mode Programmer" or "Operations Mode Programmer" and these will work with CANCMD. These provide a more user friendly way of setting CVs.

## UPDATING THE CAB AND COMMAND STATION FIRMWARE

The firmware can be updated by directly re-programming the PIC micro-controllers in the command station and each cab. For the CANCMD the ICSP connector can be used for those who have PIC programming facilities (for example using a PICKit2). MERG members who do not have this facility, may use the PICMasters programming service - see the MERG website members pages for details.

The CANCAB is more problematic as the PIC is surface mounted and hence soldered onto the PCB. The MERG PICMasters programming service may be used before the PIC is surface mounted in the CANCAB, or leads can be attached to the PCB for an ICSP connector.

Alternatively, the firmware for both CANCMD and CANCAB can be updated over the CBUS from a computer. You will need to install a computer interface such as the CANETHER, CANUSB or CANRS, as described in the previous section. You will also need the CBUS FliM Configuration Utility which can be downloaded from the MERG Software Download pages-

<http://merg.org.uk/forum/merg-software.php>

Follow the user guide provided with the program to update the firmware in your command station and cabs.



Figure 11. Completed CAB in use.