CBUS DCC system   Operating Instructions

Introduction

The CBUS DCC system comprises

1.   A command station (CS) with integral mini-booster / programmer.

2.   CABs (or handsets)

Power supply.

The CS requires an AC supply of 15V (12 to 16 V) or a DC supply of 15 to 24 V. The current should be at least 2 amps. When power is applied to the CS, the green LED should be lit. The CABs require a 5V supply which may be taken from the CS or supplied separately.

DCC boosters.

The CS has an output for conventional DCC boosters. This is a 5 to 15 V DCC signal which will suit most boosters. The CS also has a low power output stage which may be used as a mini-booster. This is set at 1 amp maximum and the DCC voltage is again adjustable. It is not possible to use this output stage as a mini-booster and a 'service mode' programmer at the same time. The mini-booster output is short circuit protected. This does not affect the separate DCC booster output.

Adjusting the output voltage.

The CS has a small 'trimpot' for setting the output voltage labelled VR1. This voltage is common to the mini-booster and DCC outputs. Apply power to the CS. Attach a voltmeter between the 0 (-) and + outputs of J5. Turn VR1 till the voltage is the desired value. For use as a booster, set to 12 to 14V. If driving a separate booster, 12V is recommended.

Attaching a booster.

The CS supplies a DCC signal which a positive waveform from 0V to V+, where V+ is the voltage set by VR1. Connect the external booster between the 0 and D terminals of J5. A suitable booster is the MERG NB1A.

CAB wiring.

The CABs connect to the CBUS using 4 way RJ22 connectors. Connect the CS to the CBUS in the usual manner. J2 is a CBUS terminal block. A 5V supply (1 amp) is available on this TB but if the CBUS has a separate 5V supply, this should not be connected.

If the CS is to be attached only to CABs, there must be a terminating resistor (68 ohms) across the CANH and CANL wires. This may be fitted at J2.

The CABs are connected to the CBUS via a small adapter PCBs fitted with a RJ22 socket. The bus wires may be soldered directly to this PCB or it may be fitted with a CBUS style terminal block (3.5mm spacing). Use of a TB allows easy 'daisychaining' .

The CABs plug into the sockets using a standard 'telephone handset' cable – the sort used to connect telephone handsets to their bases, not the type that connects to the BT wall socket. Note: These cables are not a 'one to one' connection but are a 'mirror image' at each end. The wiring in the CABs allows for this. Do not use any other type of connection or the CABs may be damaged.

Operation

Selecting a loco.

When the CS is powered up with a CAB attached, the green LED on the CAB will light and the display will show

SEL. LOCO
=

Key in the loco number (address) with the numeric buttons on the CAB. Then press the **Enter** button.

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   000

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. 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 round knob. The CABs are designed to be used in the left hand and the knob may be 'rolled' with the thumb. However, you can also hold the CAB in one hand and operate the knob with the other one. The display shows the speed step on the top line. (000 to 127)

Mistakes.

If you enter the wrong address, press the **Loco** 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 red LED shows reverse and the green LED shows forward.

Changing locos.

The present CABs only allow one loco at a time to be controlled from that CAB. If a loco is presently selected, press the **Loco** (yellow) button. The display will show

123   000
RELEASE?

To release the loco, now press **Enter**. This will remove that loco from the Command Station 'stack'. (It will NOT stop the loco if it is moving). The display will again prompt

SEL. LOCO
=

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

Walkaround

The CABs allow you to disconnect them and reconnect in another socket on the layout without interrupting operation. The time allowed for this is about 20 seconds. If this time is exceeded, the CS releases your loco and control is lost.

Caution. If you leave your CAB disconnected, another user may take over your loco. If you then replug your CAB it will find your loco again. You then can have two CABs controlling one loco. To avoid this situation, hold the **Prog** button in (bottom right hand corner of the CAB) while replugging your CAB. This will cancel the information retained in your CAB from the last session. This will also be needed if the system was powered up with the CAB disconnected.

Emergency Stop

The CAB has a red **Em Stop** button. Pressing this will cause the loco to stop immediately. It overrides any inertia in the loco (CV3 and CV4). The display will show

123   001
STOP

Note: speed 1 is defined as emergency stop. To start the loco again, turn the speed knob to zero. Then increase the speed as before. If the speed was 000 then the button has no effect.

The **Em Stop** only applies to your loco, not all locos on the layout.

Consisting

The system allows any number of locos to be included in a consist. However, the DCC standard only allows consist addresses of 1 to 127. It assumes your loco decoder supports 'advanced consisting'.

To put a loco into a consist.

First select a loco as above. Check it runs. Select the direction you want it to be in the consist. If it is to run forwards in the consist, set it to forward. If backwards in the consist set it 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
=

This allows you to select another loco to add to the consist (as above) or to select and drive the consist. If the former, you enter the address of the new loco, if the latter, you enter the consist address. The consist drives as if it were a single loco.

To remove a loco from a consist.

If you are driving the consist, release it. (Loco, release, enter). Then select the loco you want to take out of the consist. 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(FL) to F9. When you press a number button, the function number will show in the display for as long as you hold the button down. 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).

Note. The CS only holds functions F0 to F12 in its stack and only these are refreshed regularly. Higher functions are sent once when the button is pressed.

Programming

The CAB allows you to program any loco CV with any value using OTM (on the main) 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**. 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**.

Setting a long address

The system allows you to set the long address of a loco in one stage.

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

Long Adr
=

Key in the long address, 0001 to 9999. Press **Enter**. The long address will be set into the loco. Now select the new long address to drive the loco.

Notes. While the present CS supports functions F13 to F28, the CAB does not (yet)

> The present system only supports 128 speed steps.

> Eventually, it will be possible to program decoders in 'service mode' using the CAB and CS including CV readback. This has not been implemented yet.

> The command station supports up to 32 locos simultaneously.

> 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 can't do anything !

Mike Bolton   31 / 07 / 09   ©

Upgrade to CAB functions.   13/12/09

Following the writing of new code for the Command Station by Andrew Crosland, a number of additions have been made to the CAB functions. The main addition is the ability to read and write CVs in 'Service Mode' using the programming track capability of the CBUS Command Station. The other addition is the ability to select the speed step mode for any loco.

Service mode operation

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. As before, the first press is for CV programming 'On the Main'. The second press is for entering a 'long address' in one step. Now there is a third press to go into service mode.

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

The default is Direct and write (or 'program'). So the first message on the third press of the **Prog** button is

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 or that CV is not supported, 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.

Reading CVs

Pressing the **Fr2** button (also to be labelled R / W) toggles between CV read and CV write. The display changes accordingly so if you were in the

Prog Dir
CV=

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

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. Again, if there is no acknowledgement or an overload, the bottom line displays the condition in the same way as for programming. 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.

The **Fr1** (Mode) button 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. The command station can perform service mode operations and run the layout at the same time. However, only one CAB at a time may perform service mode operations.

Speed step setting

The CAB now has the ability to set 14, 28 and 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

You can cycle through the settings with more presses of the Fr1 button. e.g.

SEL. STEP   or   **SEL. STEP**
s14   **s28**

If you are happy with the selected speed step, press **Enter**. This will apply to the next selected loco.

If you deselect (release) a loco, the speed step setting will revert to 128 steps. This sequence was chosen as different locos may require different settings with 128 step the most common.

Once a loco has been selected, you can't change the speed step without deselecting it first. The step setting is maintained during a 'walkabout' but will revert to 128 if the CAB times out.

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