

ACE (DCS2044)

DCC Controller



User Manual

(also includes use of the DRIVER handsets)



Sig-naTrak®

Model railway electronics by GFB Designs

Introduction.....

The *ACE* is the result of more than two years' design and development work and is a fully-featured model railway controller utilising the time-proven and internationally-standardised ***Digital Command Control*** (DCC) system.

Despite its internal complexity, the *ACE* is simple to use as we have designed it with you – the railway modeller – in mind. We want you to enjoy operating your layout without having to worry about complicated technical issues or computer jargon!

You naturally want to get “up and running” immediately, so we have included the “Quick Start Guide”, starting on page 6 of this manual, to enable you to drive your first train as soon as possible. However, we would encourage you to read the whole of this manual carefully in order to fully understand all of the features that the *ACE* offers.

Enjoy using the *ACE*, but please note that it is a “state of the art” piece of equipment and needs to be treated as such! In particular.....

- Take care not to knock or drop the *ACE*.
- Use only your finger and/or the plastic stylus on the touch screen.
- Do not operate the unit in damp, or excessively cold, environments.
- THE *ACE* IS NOT A TOY and it should not be used by persons under the age of 14 years unless supervised by an adult.
- Do not make any electrical connections to the *ACE* other than as described in this manual.
- Do not power the *ACE* from any electrical source other than the ZF120A-1504000 or ZF120A-1506000 power supply packaged with the unit without first consulting *GFB Designs*.
- Do not attempt to dismantle – or otherwise tamper with – the power supply.

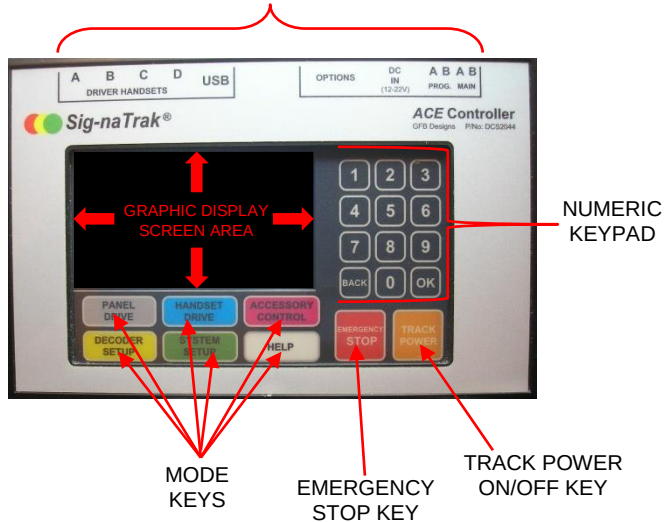
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THE ACE FRONT PANEL

ALL ELECTRICAL CONNECTIONS ON
REAR PANEL



NOTES

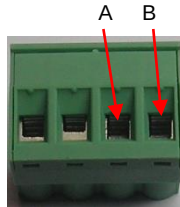
- The MODE KEYS do not change their function and are always active. This means that the mode of the ACE can be changed at will, even if the controller has only partially completed an operation.
- The numeric keypad keys, again, do not change their function. However, the numeric keypad is only active when the controller is expecting the entry of a number.

1 QUICK START GUIDE

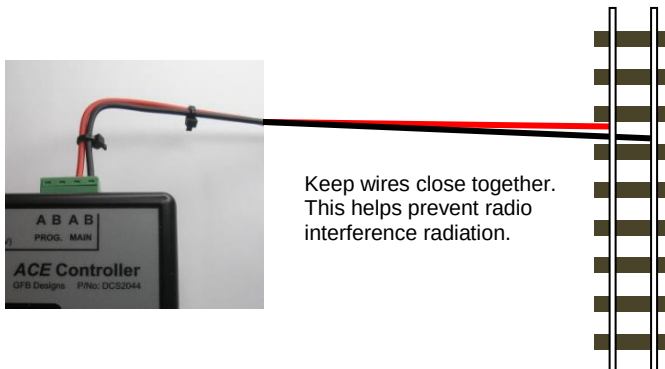
Follow these simple steps to start running.....

- i) Carefully unpack the ACE, its power supply and accessories bag containing the output connector and touch stylus.
- ii) Locate the output connector and orientate it as shown here:-

MAIN TRACK TERMINALS



- iii) Insert a wire into each of the MAIN TRACK terminals, A and B, and tighten the terminal screws. We recommend PCV-covered, stranded wire with approximately 6 to 10mm of insulation stripped from the end. See section (2.1.2) if you need advice on suitable wire sizes.
- iv) Connect the free ends of each wire to either a section of track or your layout, as shown below, and fully insert the connector into the matching socket on the ACE – note that the connector's screws face **down**.



(The exact method of connecting the wires to the track section, or your layout, will vary in accordance with your setup and preferences. However, we recommend that all wiring to track rails is soldered for reliability.)

- v) Place your chosen locomotive (or train) on the test track (or layout).

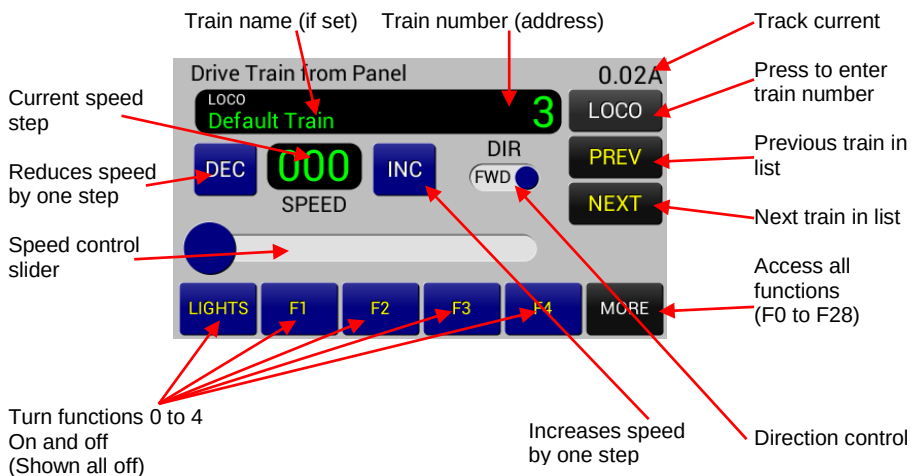
vi) Plug the mains lead into the two-pin “figure of eight” socket on the power supply and then insert the mains plug into a wall outlet. Switch on the mains supply and check that the green indicator on the power supply is illuminated.

vii) Insert the power supply's DC plug into the “**DC IN**” socket on the ACE.

After a short delay (5 seconds) you will be presented with the **SELF-TEST SCREEN:-**



The ACE will perform various internal tasks, turn on the **MAIN TRACK** power and then display then **PANEL DRIVE** screen:-



1.1 DRIVING YOUR FIRST TRAIN!

As shown above, the panel drive screen is set up to drive a train with locomotive *address* number 3 when first powered up (out of the box). This is because DCC decoders for locomotives are set to address 3 at the factory.

If the decoder in the train you want to drive has already been set to another address, proceed as follows:-

- viii) Touch the **LOCO** key then type in your required number (address).
- ix) Notice that the LOCO key has changed to **ENTER**. Now touch this key to activate your entered address.
- x) If your train has lights, try turning them on/off by touching the **LIGHTS** key. Notice that the key turns to a lighter shade of blue, and changes from a “3D” effect to “flat”, when the function (lights, in this case) is ON.
- xi) Set the direction of your train by touching the **DIR** *toggle*. Notice that the selected direction alternates, between FWD and REV, each time you touch the toggle.
- xii) Now press on the blue circular **speed slider** knob. Keeping pressure on the circular knob, you can slide it right and left to start your train and control its speed.
- xiii) Fine adjustment of speed can be achieved more easily by using the.... **DEC** and **INC** buttons. Each of these buttons changes the train's speed by one step, when it is momentarily touched. If you keep pressure on either of these buttons, the train's speed will “ramp” down or up at the rate of about one speed step per second.

NOTE: The ACE operates with 128 speed steps by default (as supplied). This gives a smooth, precise control over the train's speed and is supported by all modern DCC locomotive decoders. You can select 14, or 28, speed step operation from the SYSTEM SETUP screen (see page 20) if you have an older decoder which requires this.

1.2 ADDING AND OPERATING A SECOND TRAIN

To operate another train, proceed as follows:-

- i) Place the second train on the track – it must obviously have a decoder-equipped locomotive or power car! Ensure that it cannot collide with your first train!
- ii) Select the address (number) of the second train/locomotive by touching the **LOCO** key and then typing the address using the numeric keypad. Again, the LOCO key will change to **ENTER**. Touch this key to activate your second train's address.
- iii) You are now in control of the second train! It can be driven from the panel as described in section (1.1) above whilst the first train continues as previously commanded (i.e. it will continue to run if it was already moving when the second train was selected).
- iv) To return control to the first train, touch the **PREV** key. Notice that the second train continues as previously commanded.
- v) To regain control of the second train, touch the **NEXT** key. Notice that the first train continues as previously commanded.
- vi) You can now use the PREV/NEXT keys, as you wish, to swap control between the two trains.

***THIS COMPLETES THE BRIEF INTRODUCTION TO DRIVING TRAINS
WITH THE ACE – WELL DONE SO FAR !***

1.3 WHAT NEXT?

The following sections of this guide describe the operation of the ACE in more detail, allowing you to explore all of its features. You do not necessarily need to read them in order but we would encourage you to cover all sections at your leisure.

Most modellers will probably want to use our *DRIVER* handsets for train control – this is covered in sections (2.1.4) and (2.6) on pages 14 and 30.

2 OPERATION IN DETAIL

In addition to explaining the operation of the ACE controller, this manual is also intended to give related general advice with regard to the use of Digital Command Control. We hope that this will be useful if you are a newcomer to the world of DCC.

However, it is impossible to cover all necessary information “from the ground up” and so you may find it necessary to consult one of the several excellent DCC textbooks available. Also, it will be necessary to refer to the instruction manuals for your DCC decoders and/or locomotives.

Experienced DCC users will inevitably find some of the advice and information in this manual repetitive and may wish to skip the relevant sections.

2.1 CONNECTING UP THE ACE

To control a layout, you will need a minimum of the “Power Input” and the “Main Track Output” – additional connections will depend upon your requirements.

2.1.1 Power Input

The ACE is packaged with a suitable power supply for use with model railways, from N to O gauge, with a layout area of up to around 20m² (square metres – or around 60 square feet)¹. There are two standard power supplies:-

- i) **The ZF120A-1504000.**
Used with the standard ACE – DCS2044 – supporting a maximum track output current of 3.5amp. This will normally supply sufficient current for the running of up to 6 to 8 OO gauge trains (depending upon loading, gradients etc.).
- i) **The ZF120A-1506000.**
Used with the high-power ACE – DCS2044H – supporting a maximum track output current of 5.0amp. This is recommended for O gauge (or larger) layouts.

The ZF120A-1504000 power supply is shown below:-

¹ It is expected that such layouts would have a maximum of around six to eight trains running at any one time.



(The ZF120A-1506000 is similar, but slightly larger)

NOTE: Both of the above power supplies provide a nominal 15volt (V) smooth, regulated **direct current** (DC) output. This ensures a controlled track voltage from the ACE of around 14V, as stated in the *National Model Railroad Association (NMRA)* standards.

To provide (turn on) the power input:-

- i) Firmly and fully insert the AC CONNECTOR on the mains lead into the AC RECEPTACLE on the power supply. Plug the MAINS PLUG into a domestic (240V) mains outlet and switch on the mains supply at the outlet.
- ii) Ensure that the LED INDICATOR, on the power supply, is glowing.
- iii) Fully insert the DC PLUG into the “DC IN” socket on the rear panel of the ACE. This turns on the internal circuitry and starts the operation of the unit.

To turn off the power input:-

- i) Remove the “DC PLUG” from the “DC IN” socket on the ACE.

NOTE: Allow at least three seconds from power removal before re-applying power. Failure to observe this recommendation *may* disturb the operation of the internal microcomputer and *may* affect data storage.

Use of other power supplies

Generally, DON'T ! The ZF120A units have been carefully chosen, and tested by us, for compatibility with the ACE and for compliance with European safety standards.

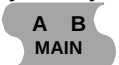
However, there are circumstances where a different operating voltage is desirable (e.g. lower for smaller scales, higher for larger scales than O gauge) and the ACE can accept an input of between 12 to 22V.

PLEASE ENSURE THAT.....

- A **SMOOTHED DC** supply is used.
- Absolute maximum voltage is 24V – a **REGULATED** supply is preferable.
- The supply must have built-in protection against short-circuits.
- **TRADITIONAL TRANSFORMERS, OR OTHER MODEL RAILWAY CONTROLLERS, MUST NOT BE USED UNDER ANY CIRCUMSTANCES!**

We suggest that you contact *GFB Designs* (details on page 48) for advice regarding non-standard operating voltages.

2.1.2 Main Track Output

The DCC power to operate your layout is supplied from an internal *booster* circuit and appears on the  terminals. Terminal A is connected to one rail of your track, and terminal B is connected to the other rail, as illustrated in section (1), page 6.

As the DCC signal is *alternating current* in nature, it is not usually critical as to which rail/terminal is which. HOWEVER, it is possible to drive a single non-decoder-equipped (i.e. DC) locomotive on the layout, using an address of 0 (zero). Under this circumstance, terminal A will assume a **positive** potential when the **forward** direction is selected (and **negative** with **reverse** selected).

Selection of wire type and size

We recommend PVC-covered stranded “*equipment wire*” which is available from www.signatrak.co.uk, most model railway retailers, and all electronic component suppliers. In the UK, the *gauge* of the wire is specified by the number and diameter of the internal conducting wire strands – commonly used sizes, and typical current ratings, are:-

- | | | |
|------------|--------------------------|------|
| • 7/0.2mm | (7 strands of 0.2mm dia) | 1.4A |
| • 16/0.2mm | (16 strands) | 3.0A |
| • 24/0.2mm | (24) | 4.5A |
| • 32/0.2mm | (32) | 6.0A |

The “rule of thumb” is generally “the thicker, the better” but – for practical purposes – we recommend 16/0.2 for small layouts, with no more than about three 00 trains running. 24/0.2 or 32/0.2 will be beneficial for larger setups.

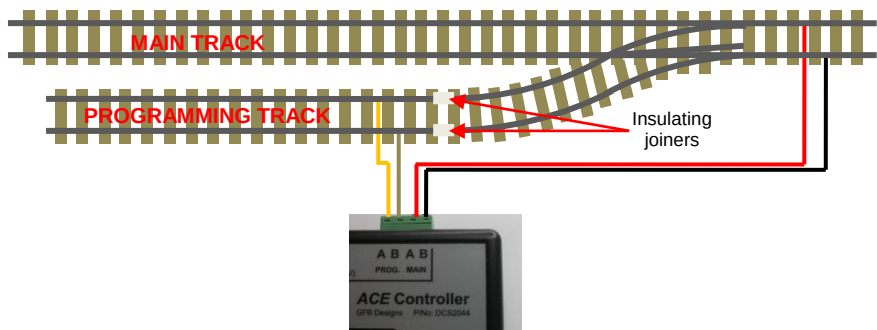
Note that the wire's current rating per se is not the governing factor here – the main desire is to minimise the overall cable *resistance* in order to keep *voltage drops* as low as possible.

Whilst discussing voltage drops, it is worth pointing out that the majority of these arise from bad connections – either due to poor soldering, or loose screw terminals. **NEVER RELY UPON TWISTING BARE WIRES TOGETHER TO MAKE ELECTRICAL CONNECTIONS!**

2.1.3 Programming Track Output

Most decoder setup – or *programming* – is performed using DCC signals with a specially-limited current output, in accordance with NMRA standards. The ACE provides the “PROG. A B” output for this purpose. Usually, a section of track on your layout will be dedicated as a PROGRAMMING TRACK and used for the setting up of locomotive decoders.

Both rails on the programming track should be electrically-isolated from the rest of your layout and should then be connected to the ACE's “PROG. A B” terminals. This ensures that the current limiting circuitry in the ACE will give a degree of protection to your decoder in the event of wiring faults. A typical scheme is shown below:-



Ensure that any two wires, in a pair carrying DCC signals, are kept close together and NOT arranged in a loop. This is because the wire could otherwise act as an antenna and unintentionally *radiate* components of the DCC signal, causing possible interference to other equipment. The ACE has been designed in accordance with the relevant European standards in order to minimise such effects.

2.1.4 Connecting the DRIVER Handsets



The *DRIVER* handset (part no: BHS1204) provides a low-cost means of adding up to four additional operators and/or giving a more traditional “knob and switches” method of control. A *DRIVER* can be plugged into any of the A, B, C or D sockets on the rear panel of the ACE, using the supplied cable.

NOTE: DO NOT PLUG ANY OTHER TYPE OF DEVICE INTO THESE SOCKETS! They are protected by an internal fuse but this is NOT user-replaceable.

Basic DRIVER features – see sections (2.6) and (2.7) for more details

- Control of speed, direction, DCC functions F0 to F4 and emergency stop is provided. Functions F5 to F28 can be controlled via the ACE's panel.
- Train *allocation* to the DRIVER is carried out from the HANDSET DRIVE screen on the ACE, corresponding to dispatching on full-size railways.
- Once the train is running, the handset can be *locked out*, unplugged and moved around your layout **without interrupting the train's movement**. The handset can then be plugged in again – perhaps on an extended lead – and *unlocked*, to resume driving.
- Trains can be swapped between handsets – or between a handset and the ACE's panel control – using the HANDSET DRIVE mode/screen.

2.2 GENERAL OPERATION

All users should have a working knowledge of this section (2.2) as it deals with fundamental features of the ACE which may be required at any time.

Use of the touch keys – If you are not familiar with touch panels, you may find that it takes a little practice to establish consistency with the operation of the keys. “Touching” a key, requires **positive** pressure – using either your finger or the supplied stylus – for about half a second. A lighter, or faster, touch may not be detected. Sometimes, it is necessary to maintain the pressure on a key, for certain functions, and this is stated where required.

2.2.1 Startup

As the ACE is a microcomputer-controlled device, it needs to perform a precise sequence of operations – from power application - in order to start running correctly. The start-up sequence takes approximately four seconds and consists of:-

- Microcomputer initialisation.
- Display initialisation (the screen will flash – this is normal).
- Self-test (checking of internal data and some hardware functions).
- Retrieval of the train list, accessory list, function key names and data relating to your last operating session.
- Entry to PANEL DRIVE mode.

Note that, during the start-up sequence, the track power is held OFF. Immediately prior to PANEL DRIVE entry, the MAIN A B track power is turned on and a stream of approximately 30 DCC *reset packets* – followed by a similar number of *idle packets* - is transmitted to ensure that all decoders on the layout start in a defined state.

2.2.2 Track Power Control

The  button is used to turn the “MAIN A B” output on and off.

It can, therefore, “kill” the power to your entire layout and should obviously be used with care in a multi-operator situation! Bear in mind that – upon restoration of the power – devices on the layout may not be in their previous states. For example:-

- All trains will be reset to STOP.
- Some train functions (e.g. lights, sound etc) may be reset to OFF. (Note – this is a feature of the decoder, not the ACE)
- Accessories (e.g. points, signals etc) may not reset to the expected position (depending upon the device, its manufacturer and its settings).

Hence, we recommend that the TRACK POWER OFF feature is used only when power removal is essential - e.g. if work on the track is required. For *emergency* situations – i.e. the rapid stopping of one, or all, train(s) – we suggest the EMERGENCY STOP features, described below.

To turn track power off:-

Touch the button when the power is **on**. In PANEL DRIVE, HANDSET DRIVE or ACCESSORY CONTROL modes you will see the following display.....

POWER OFF

.....which will replace the *track current* value in the top right-hand corner of the graphics screen.

To turn track power on:-

Touch the button when the power is **off**. In PANEL DRIVE, HANDSET DRIVE or ACCESSORY CONTROL modes you will see that the *track current* value is restored, e.g.....

0.32A

.....in the top right-hand corner of the graphics screen.

2.2.3 Emergency Stop Features



The **EMERGENCY STOP** key can be used to bring one – or all – trains to an immediate halt. In cases where a potential collision is observed, or a point is about to be traversed when set incorrectly, it may not be satisfactory to simply set “stop” (i.e. speed step 0) on the controller or handset. This is because the locomotive’s decoder may have a *deceleration* value set and it would take too long for the train to stop!

Stopping a train quickly (PANEL DRIVE):-

Touching the EMERGENCY STOP button will send a special DCC instruction over the track which will immediately stop the locomotive **currently being driven from the panel** – i.e. it is *train-specific*.

You will see: **EMGY – STOP** which replaces the track current display.

Note that the speed slider, and “SPEED” (steps) display are reset to zero.

Recovering from emergency stop (PANEL DRIVE):-

Simply touch the EMERGENCY STOP button again. The track current display will be restored.

Stopping ALL TRAINS quickly (PANEL DRIVE):-

If you maintain pressure on the EMERGENCY STOP key for about 1.5 seconds, the ACE will immediately stop **all trains on the layout**.

You will see: **ALL E–STOP** which replaces the track current display.

The speed slider, and “SPEED” (steps) display are, again, reset to zero.

NOTE - In this condition, the ACE sends *broadcast emergency stop* instructions to the track (the NMRA standards specify that ALL locomotive decoders must respond). **The track power is NOT turned off.**

Recovering from ALL E-STOP

Simply touch the EMERGENCY STOP button again. The track current display will be restored.

NOTE, also, that this action is used to recover from an ALL E-STOP condition commanded from a DRIVER handset – see below.

Stopping a train quickly (HANDSET DRIVE):-

Pressing the



button on a DRIVER handset momentarily – i.e. for

about 0.5 seconds – will bring the train **currently controlled from that handset** to an immediate stop. All other activity on the layout will continue.

In order to alert other operators, the track current display on the ACE is replaced with:-

H/S E-STOP

This condition applies to the **specific train** being driven from the **handset in question**. **Track power is NOT turned off**.

Recovering from emergency stop (HANDSET DRIVE):-

Recovery from emergency stop initiated from a *DRIVER* handset is rather different from panel drive mode. H/S E-STOP is reset by turning the relevant *DRIVER*'s speed control knob **fully anti-clockwise** (i.e. to "MIN" or normal stop position).

Once the knob is returned to MIN, the track current display on the *ACE* is restored.

Stopping ALL TRAINS quickly (HANDSET DRIVE):-

Holding the STOP button on a *DRIVER* handset pressed for longer than around 2 seconds will force the *ACE* to immediately stop all trains on the layout. You will see the

ALL E-STOP

display on the ACE's panel.

To restore driving, you must:-

i) Touch the



key on the ACE.

ii) Turn the DRIVER's speed control knob fully **anti-clockwise**.

NOTE that the DRIVER's speed control knob only affects the train controlled by the handset in question.

2.2.4 Overload Protection

Like all DCC controllers, the *ACE* has electronic protection circuitry built in to the outputs of its *boosters*.

MAIN A B (track) output

In the event of an overload or short-circuit between the A and B terminals, the following will occur:-

- i) The DCC output will be immediately turned off.
- ii) The ACE will wait about one second.
- iii) The output will be turned back on (“retry”).

This cycle repeats until the overload is removed and the audible alarm (high-pitched buzzer) will sound. You will also be presented with the following display – *overlaid* on the current screen:-

OVERLOAD !!
Check for short-circuits or de-railments

An “overload” is defined as a current draw – however brief - between the A and B outputs, of more than around **3.6A**. If you have the high-power version of the ACE (DCS2044H), this limit is increased to about **5.5A**.

PLEASE NOTE – Whilst the controller has been designed to withstand constant overloads, and will continue in its “output cycling” state indefinitely, this is NOT a desirable situation as it could lead to issues such as cable over-heating or, ultimately, damage to decoders and other layout devices.

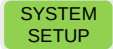
ALWAYS CORRECT OVERLOADS AND SHORT-CIRCUITS IMMEDIATELY!

PROG A B (programming) output

The (decoder) programming track output has special protection characteristics as defined by the NMRA. It is designed to protect both the ACE and decoders, and further details are given in section (3.1).

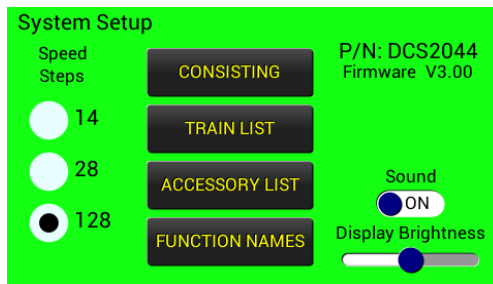
The following sections give a “guided tour” of the ACE’s screen displays and describe the associated operating modes and features.

2.3 SYSTEM SETUP

SYSTEM SETUP mode is entered by touching the  key.

The mode can be selected at any time BUT please note that the track power is turned OFF during SYSTEM SETUP. This is because most of the system setup features have a fundamental effect on train and layout operation so their behaviour could be unpredictable if left running!

Upon touching the system setup mode key, the MAIN A B track outputs are immediately turned off and the following screen appears:-



2.3.1 Speed Steps

Any ONE of “14”, “28” or “128” can be selected. We recommend the use of 128 speed steps as this gives the most precise and smoothest control of the trains’ speed (i.e. best *resolution*). All modern locomotive decoders support 128 speed steps.

The lower resolution – 14 and 28 – speed step modes have been included to support early decoders. If you need to use either of these, your newer decoders will still work but you will lose their 128 speed step capability.

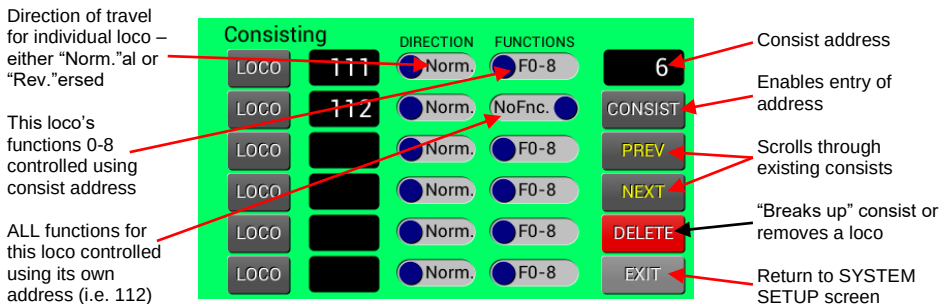
NOTE: In 14 speed step mode, the locomotive’s lights control information is combined with speed instructions. Your decoder must be correctly configured for this – see section (3.1.1).

2.3.2 Consisting

Consisting is the grouping of two or more locomotives (or multiple-unit power cars) on a single train (e.g. “double-heading”). The ACE will allow up to six locomotives in a single consist which works as follows:-

- A consist address (number), having a value of between 1 and 127, is chosen. This could be the address of the “lead locomotive” or an independent address, used simply to refer to the entire consist.
- All locomotives in the consist will be sent speed and direction instructions, when the consist address is used, and will all respond together “as one”.
- Each locomotive in the consist can be selected to run in its “normal” or “reversed” direction of travel.
- Locomotives’ functions F0 (lights) to F8 may be controlled from the consist address – and all locomotives will respond together.
- Each locomotive, however, can be selected to ignore “F0-8” instructions from the consist address. In this case, ALL functions on that locomotive will need to be controlled independently using the individual locomotive’s address.
- Functions F9 to F28 (if used) MUST be controlled independently, using the individual locomotive’s address.
- Each locomotive in the consist will always respond to its own address.

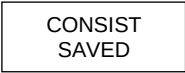
Touching the **CONSISTING** key will display the following screen:-



In the above case, an example consist has been previously set up (from this screen). A newly-supplied ACE will display all loco and consist number boxes blank.

As an example – to set up the above consist, proceed as follows:-

- Touch **CONSIST** , then touch “6” on the numeric keypad. The CONSIST key will have changed to **ENTER** . Touch the key to enter consist address 6.

- ii) Touch the topmost  key and type “1”, “1”, “1” on the numeric pad. The LOCO key will have changed to . Touch the key again to enter the first loco’s address.
- iii) Repeat step (ii) using the second LOCO key, and typing “1”, “1”, “2” on the numeric pad.
- iv) Touch the DIRECTION and FUNCTIONS toggles, as required.
- v) Touch “OK” on the numeric keypad. The consist data will now be saved in the ACE’s memory and  will be briefly displayed.

ALL DATA SAVED FROM SYSTEM SETUP SCREENS IS RETAINED WHEN POWER IS REMOVED – i.e. your operating session is restored when the ACE is re-powered next time.

To “break up” (“dissolve”) a consist

- i) From the SYSTEM SETUP screen, touch the CONSISTING key.
- ii) Select the desired consist, EITHER using the PREV/NEXT keys or by touching the CONSIST key and typing the consist address on the numeric pad.
Notice that all the numbers are WHITE at this stage.
- iii) Accept this consist, by touching “OK” on the numeric pad – the numbers will turn GREEN.
- iv) Now touch the  key. You will be challenged with a display asking “ARE YOU SURE?!” and giving a “YES” or “CANCEL” option.

NOTE that all three addresses will be retained in memory as *individual locomotives*.

To remove a locomotive from a consist

- i) Proceed as above up to, and including, step (iii).
- ii) Touch the relevant  key (i.e. the one you wish to remove). *Notice that its number turns WHITE.*
- iii) Now touch the  key. You will be challenged with a display asking “ARE YOU SURE?!” and giving a “YES” or “CANCEL” option.

2.3.3 Train List

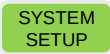
The ACE can store data for up to 127 trains in its memory. “Data” includes the locomotive address (number) and an optional name of up to 20 characters.

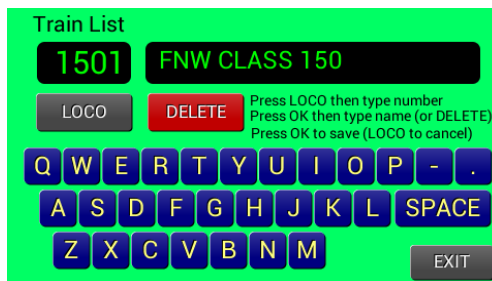
Locomotives/trains are stored in the *TRAIN LIST*, which is accessible from the SYSTEM SETUP screen, and there are two storage methods:-

- “AD-HOC” – this occurs when a new locomotive address (number) is entered via the PANEL DRIVE or HANDSET DRIVE screen. The locomotive/train is immediately available for driving – and layout operation is not interrupted – but it is not possible to assign a name to the train, at this stage, and the address/number will not be retained in the list when power is removed from the ACE.

Note, however, that an “ad-hoc” locomotive/train can be subsequently named – and/or permanently stored - by selecting SYSTEM SETUP followed by TRAIN LIST (accepting that power will be removed from the layout during this process).

- “NON-VOLATILE” – this means that the locomotive/train’s data is retained in the ACE’s memory even when power is removed. Non-volatile storage occurs when a locomotive/train is accessed and/or edited via the TRAIN LIST screen.

To access the train list, touch  , followed by  . The following screen will appear:-



As an example, to enter and store the above train, proceed as follows:-

- i) Touch the LOCO key and then type in the required address – “1501” in this case – using the numeric keypad.

ii) Touch the “OK” key, on the numeric pad, to enter the address.

If the locomotive/train is already in the list, its name will be displayed if previously entered. If the train was not named, or it is a new entry, a “_” will be displayed.

iii) Now type in a name, if required, using the “QWERTY” keypad on the display and/or the numeric keys (you may find it convenient to use the supplied plastic stylus).

Touching the “BACK” key, on the numeric pad, causes the last character to be erased and may be used to amend entries.

iv) Touch the “OK” key (on the numeric pad) to save the train data to the list.

The EXIT key may be used, at any stage, to return to the main SYSTEM SETUP screen.

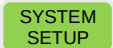
To delete a train from the list

To permanently remove a locomotive/train from the list, proceed as above BUT touch the  key at step (iii). You will be challenged with an “ARE YOU SURE?!” message and given the option to either proceed with the deletion or cancel the operation.

2.3.4 Accessory List

“Accessories” are any fixed devices on your layout, controlled by DCC, such as points, signals, shed doors, building lighting etc. Such devices are operated by *DCC accessory decoders* which are permanently wired into your DCC supply feed (or to the track).

The ACE can store data for up to 85 accessories in its memory. “Data” includes the accessory address (number) and an optional name of up to 20 characters. Like those for locomotives, accessory addresses can either be entered on an AD-HOC basis – via the ACCESSORY CONTROL screen – or permanently stored via the ACCESSORY LIST screen.

To access the accessory list, touch , followed by .

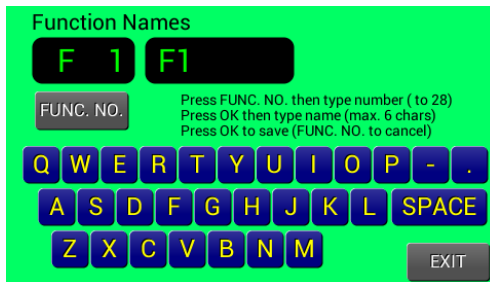
The resulting screen is almost identical to the train list screen and is used in the same manner as described in section (2.3.3) above.

2.3.5 Function Names

“Functions” are features on a DCC locomotive decoder – other than speed and direction control – which have a simple “on/off” characteristic. The most common example is lights but many decoders support several other functions and sound decoders can have features such as whistle/horn, brake squeal, coupling “clank” and many others.

The ACE provides control of up to 29 functions (as defined by the NMRA), designated “LIGHTS”, “F1”, “F2”,..... up to “F28”. You can, however, assign different names to the function keys via the FUNCTION NAMES screen.

To access this screen, touch **SYSTEM SETUP** followed by **FUNCTION NAMES** , and you will be presented with:-



This screen operates in the same manner as the train and accessory list screens, with the following exceptions:-

- There are always 29 functions available – functions cannot be deleted.
- Function names are limited to 6 characters.

2.3.6 Audible Alarm

A high-pitched buzzer is available to give acknowledgement of certain actions within the ACE. This can be turned on by touching the “**Sound**” toggle on the SYSTEM SETUP screen. **NOTE that the buzzer will always sound in the event of a main track output overload.**

2.3.7 Display Brightness

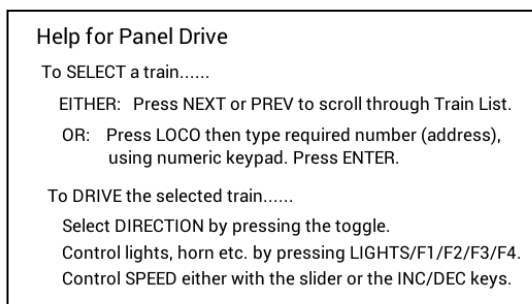
This is controlled with the “**Display Brightness**” slider on the bottom right-hand corner of the SYSTEM SETUP screen. Its setting is stored when power is removed from the ACE.

2.4 HELP SCREENS

Touching the  key will display a *help* screen which is appropriate to the mode that the ACE is currently operating in.

Please note that the HELP information can only be brief, and so it cannot be a substitute for this user manual, but it is intended as an “aide memoire” to assist during operating sessions.

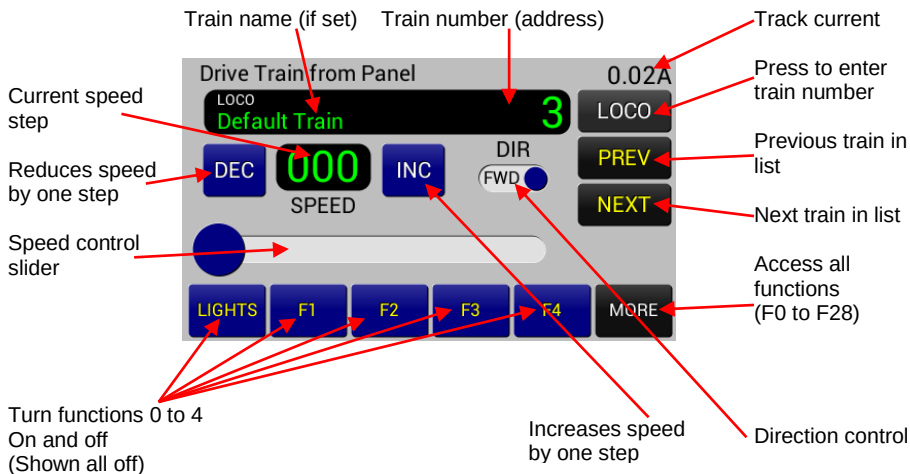
An example help screen – in this case – related to the PANEL DRIVE mode is shown here:-



TO RETURN FROM A HELP SCREEN, PRESS ANY MODE KEY (E.G. PANEL DRIVE, HANDSET DRIVE, ETC.)

2.5 PANEL DRIVE MODE

The driving of trains from the panel was basically covered in section (1) so this section is intended to “build on” that information and highlight some more detail. We repeat the PANEL DRIVE screen here, as a reminder.....



2.5.1 Selecting the Train

Locomotive/train addresses (numbers) can range from **1 to 9999**.

Address 0 – “analogue” locomotive

Please note that **address 0** has a special use – selecting this address causes the ACE to output a **DC (“analogue”)** voltage on the MAIN A B terminals when the speed slider is moved from its zero/stop position. This facilitates the use of a **single** non-decoder-equipped locomotive on your DCC layout and the DCC-equipped trains will function as normal.

Using address 0: Terminal A is **positive** relative to B with “**FWD**” selected.
Terminal A is **negative** relative to B with “**REV**” selected.

A “DC” locomotive will “buzz” when fed with DCC – this is normal.

CAUTION – The “analogue” output from DCC controllers is NOT true DC and **MUST NOT** be used with locomotives fitted with “coreless” or “low-inertia” type motors!! They could overheat!

Upon entry to PANEL DRIVE mode, the address of the last locomotive driven will be displayed. This also applies when the ACE is powered up as the main details of your last operating session are stored when power is removed.

To change the locomotive/train.....

- EITHER:
- i) Touch the **LOCO** key, then type the required address using the numeric keypad. The “BACK” key can be used to correct any mistyping of the number.
 - ii) The LOCO key will have changed to **ENTER**. Touch the key again to take control of the train.

OR:

Use the **PREV** or the **NEXT** key to scroll back or forward through the train list until you find the desired address.

2.5.2 Setting the Direction of Travel

Touching the “DIR” toggle changes between forward (“FWD”) and reverse (“REV”) directions with each touch.

NOTE – if the direction is changed whilst the train is moving, the speed is instantly commanded to **stop**. This is to avoid an abrupt direction change, at speed, which is un-realistic but could also damage the locomotive’s motor or mechanism.

2.5.3 Starting the Train and Controlling the Speed

EITHER the **slider** OR the **DEC/INC buttons** may be used.

A single touch of the DEC or the INC button will decrease or increase the speed by **one step**. Maintaining pressure on the button will cause it to **auto-repeat**, thus *ramping* the speed down or up at the rate of about **one step per second**.

NOTICE that the speed setting is digitally displayed. A **three-digit** display indicates that the ACE is operating in **128 speed steps**, whilst a **two-digit** display indicates either **14 or 28** speed step mode.

COMMANDING EMERGENCY STOP, OR TRACK POWER OFF WILL
RESET THE SPEED TO ZERO/STOP.

2.5.4 Function Control – F0 (LIGHTS) to F4

A single touch of the **LIGHTS** key will *toggle* the locomotive's lights (if fitted) between ON and OFF. Notice that the key is **dark blue**, and has a slight 3D effect, when the LIGHTS are commanded **off**. This changes to a **lighter blue**, and a flat effect, when an **on** command is being sent.

All function keys perform in the same manner.

Momentary functions can be controlled by maintaining pressure on the relevant key for about 1.5 to 2 seconds. You will see the key change from dark blue to light blue, and then back to dark blue again.

If you release the key at this point, the *ACE* will have transmitted a function **on-off** command and the key will be reset ready for the next time that you require the function.

An example of a momentary function is a brief sounding of an air horn. Your decoder instructions should clarify which functions are momentary.

2.5.5 Functions F5 to F28

Touching the **MORE** key (in the bottom right-hand corner of the PANEL DRIVE screen) will give access to the following screen:-



All available functions, for the train selected on the panel, can be controlled from this screen. The buttons work identically to those on the PANEL DRIVE screen.

Touching **EXIT** will return you to the PANEL DRIVE screen.

2.6 HANDSET DRIVE MODE

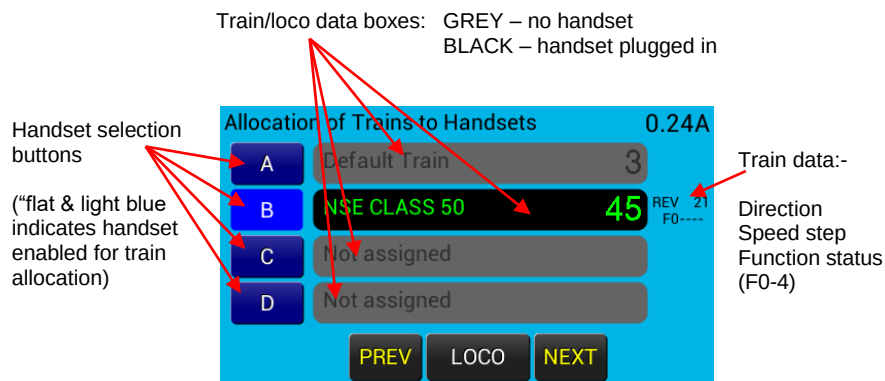
The HANDSET DRIVE mode manages the operation of up to four of our basic *DRIVER* handsets. This provides a very low-cost means of adding extra operators. The handsets are designated A, B, C and D and any combination of the four sockets can be used at any time.

The system works by selecting the HANDSET DRIVE screen on the ACE and allocating a train to a desired handset. The train is then driven from the handset.

CAUTION!

Only the *Sig-naTrak*® *DRIVER* (BHS1204) handset will work! DO NOT attempt to plug any other device into the A, B, C or D handset sockets – damage could occur!

To enter HANDSET DRIVE mode, touch the **HANDSET DRIVE** key. You will be presented with a screen similar to the following:-



Note that the illustration above shows an example of a train assigned to a plugged-in handset and being driven – see below.

Train data boxes

These are all GREY until a handset is plugged in, whereupon the box turns BLACK. Note, however that a train can still be entered into a box even though a handset may not be plugged in to the relevant socket (as shown for handset A above).

2.6.1 Allocating Trains to Handsets

PLEASE NOTE – Always pay attention to the *handset selection key* **which is currently highlighted**. It is to this handset that the train will be allocated! Always start a train allocation process by touching the appropriate handset selection key.

As usual, locomotive/train DCC addresses can range from the value of 1 to 9999. Address 0 can also be selected – as in PANEL DRIVE mode – to control one DC/analogue locomotive.

Train and handset allocations are retained in the ACE's memory after power down so that your last operating session is saved.

In the example illustrated above, we have a locomotive with address 45 named “NSE CLASS 50” already stored in the train list. To allocate this locomotive to *handset B*, proceed as follows:-

- i) Touch the **B** key – it will now be highlighted.
- ii) EITHER: touch the **LOCO** key, and then enter the loco's address (45 in this case) using the numeric keys. The LOCO key will change to **ENTER**. Touch the key again to activate the address.
- OR: Use the **PREV** or the **NEXT** key to scroll through your train list until you find loco 45 (in this case, its name will also be displayed as it was previously named when added to the list).

NOTE that once the LOCO key has been touched you must continue with numeric entry – the screen will appear to be “locked out” if any other key is touched.

To cancel or re-start the process, you will need to select another mode (e.g. PANEL DRIVE) and then re-enter HANDSET DRIVE.

2.6.2 Controlling from the DRIVER Handset

Now, provided that a DRIVER handset is plugged into handset socket B, the locomotive can be driven from the handset.

Speed control – using the rotary knob – is self-explanatory but please note that **you must set the speed to zero before switching direction**.

If the REV/FWD switch is moved whilst the locomotive/train is in motion, the handset will be *LOCKED OUT* and the message.....

Locked out! 45

.....will be displayed in the relevant train data box (on the HANDSET DRIVE screen). **The loco/train will continue moving at its previously-set speed.** Control is resumed when the REV/FWD switch is changed back to match the actual loco/train's direction.

On large layouts, it is advantageous to be able to move around with your train, by unplugging the handset and reconnecting it "further down the line". The above feature allows this without interrupting the train's movement. A *DRIVER BUS CABLE* needs to be installed around the layout to facilitate this – please contact *GFB Designs* for further information.

Functions F0-F4 can be directly controlled from the handset buttons. Note that the buttons need a positive, slightly sustained press in order for the function to respond.

Functions F5-F28 – These can be operated on the loco/train being driven by the handset but they need to be controlled from the "**Functions for Current Train**" screen on the ACE. This is set up as follows:-

- i) Enter PANEL DRIVE mode.
- ii) Select the required locomotive address (in PANEL DRIVE mode).
- iii) Enter HANDSET DRIVE mode and allocate the (same) locomotive to your chosen handset (as described above). You will now see.....

Already allocated 45

.....alternating with:-

Press OK to take over 45

- iv) Touch the OK key on the numeric pad. This will give you control **from the handset** but you can also revert to the PANEL DRIVE/MORE sub-screen to control functions up to F28.

Emergency stop

This is described fully in section (2.2.3) – page 18. **Remember** that the handset knob must be set to MIN to reset an emergency stop to a single train but ALL E-STOP must be reset from the ACE's panel.

2.7 TRANSFERRING TRAINS BETWEEN OPERATORS

This was briefly mentioned above, with regard to the “slaving” of the panel drive functions screen to a handset.

In general terms.....

- Any operator can take over a train from the operator currently driving the train.
- An operator – having had a train taken from them – can take the train back at any point.

2.7.1 Taking over a train

To take over a locomotive/train, simply select the train – in either PANEL DRIVE or HANDSET DRIVE modes - as described previously. If the loco/train is already being driven, the train data box will show this.....

Already allocated 45

.....alternating with this.....

Press OK to take over 45

Now touch the OK key (on the numeric pad). The data box will now display.....

NSE CLASS 50 45

.....confirming that you are now in control!

2.7.2 Taking a train back (“retrieving”)

In the above example, the previous operator will NOW see.....

Taken over ! 45

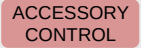
.....alternating with.....

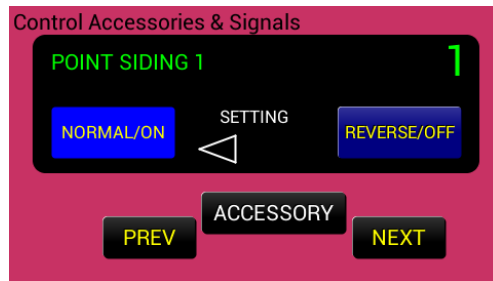
Press LOCO then OK to retrieve 45

They can then take the train back, by touching **LOCO** then OK. Their display will then appear as below, indicating that they are back in control.

NSE CLASS 50 45

2.8 ACCESSORY CONTROL MODE

Touch the  key and a screen similar to that shown below will appear:-



2.8.1 Selecting an Accessory

An accessory can have an address in the range of **1 to 2044**. Take care with addresses **2040-2044**, however, as these are defined as broadcast addresses and ALL accessory decoders will respond together!

The format of the above screen should, by now, be familiar! Selection and operation of accessories is accomplished in the same manner as for locomotives/trains but the following points are worthy of note:-

- The last accessory operated, before the ACE was powered down, will be displayed upon entry to the above screen **IF** the accessory was saved in the ACCESSORY LIST from SYSTEM SETUP.
- If the accessory was saved to the list with a name, then its name will automatically appear.

2.8.2 Controlling the Accessory

Control of accessories is simple as they only have two states: NORMAL or REVERSED (sometimes known as ON/OFF or CLOSED/THROWN).

Once its address has been selected the device is switched, from the screen, using the  or the  key.

3 DECODER SETUP

Both locomotive and accessory decoders require some degree of setting up, or *customising*, before they can be used on a layout. The setting up process is usually referred to as “programming” and this term is sometimes off-putting for modellers who are unfamiliar with computer-type technology. The *ACE*, however, has been designed to make the decoder setup/programming process as simple as possible.

Every decoder has pieces of data stored within it – these are known as *configuration variables*, or **CVs**. Each CV controls a particular feature, or function, within the decoder and many of them have a standardised purpose which is defined by the National Model Railroad Association (NMRA). Many of the more advanced decoders have several CVs which are specific to the decoder in question, and are defined by the decoder manufacturer, **so it is very important to read the decoder manufacturer’s instructions.**

The most important CVs in any decoder are those which determine the **address** of the locomotive or accessory because – in order to independently control devices on your layout – each device must have a **unique** address.

Locomotive addresses can have any value between **1 and 9999²** and **accessory addresses** can have any value between **1 and 2044**.

NOTE:-

- Accessory addresses between 2040 and 2044 are known as broadcast addresses. ALL accessory decoders on your layout will respond to any of these four addresses. (This can be useful – e.g. for initialising all your points and/or signals.)
- The values of the CVs are retained by the decoder when power is removed so, for example, a locomotive will “remember” its address.
- **Locomotive decoders** are pre-set to **address 3** at the factory.
- **Accessory decoders** are pre-set to **address 1** at the factory.
- The address ranges for locomotives and for accessories are **DISTINCT** so it is acceptable to have locomotives and accessories with the same address values and they will still be independently controlled.

Special DCC instructions are used for decoder setup and these are automatically generated by the *ACE* when in DECODER SETUP mode.

² The *ACE* treats values between 1 and 127 as *short* addresses and 128 to 9999 as *long* addresses.

There are two decoder programming methods:-

- i) **Operations mode, or “programming on the main”**. In the case of locomotives, this is used when you wish to adjust features or functions whilst the locomotive is running on the layout. Programming instructions are sent from the ACE’s **MAIN A B** output and the instructions are **specifically addressed** to an individual locomotive.

An example would be the adjustment of acceleration or deceleration settings in the decoder.

Accessory decoders can also be “programmed on the main” – in other words: whilst connected into the layout. An example here would be the adjustment of the “on time” of an output driving a point motor.

NOTE that it is generally not possible to *read* CV values when programming via the MAIN output.

NOTE ALSO that “programming on the main” is only recommended once a decoder installation has been tested as the full (3.5A or 5A) output current is available from the ACE and this could damage the decoder in the event of a wiring fault!

- ii) **Service mode or via programming track/output**. This utilises the PROG. A B output on the ACE and is the method which **must** be used to set decoder **addresses** and is the recommended method for new decoder installations.

The PROG A B outputs provide a controlled, limited amount of current which helps to protect the delicate decoder circuitry in the event of a wiring fault.

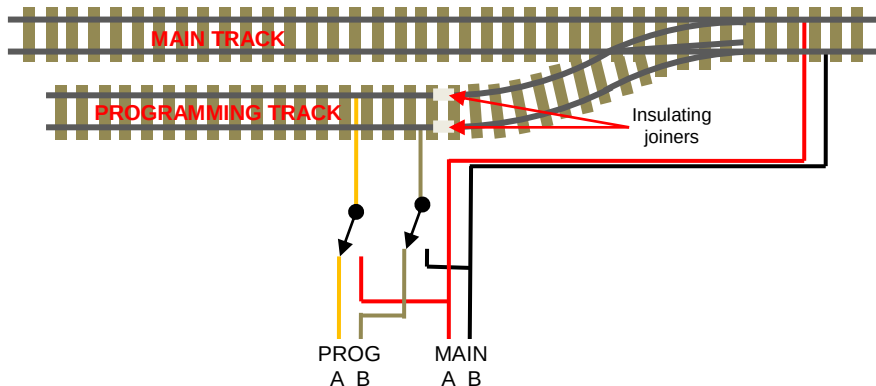
Use of the PROG. A B output has the added advantage that CV values can be **read** by the ACE for verification purposes, provided that the decoder also supports the “read back” feature³.

PLEASE NOTE – You should only connect ONE decoder at a time to the PROG. A B output! This is because *service mode* does not address a specific decoder and so ALL decoders receiving the programming instructions will be affected!

³ The decoder must have a facility to increase the load on the DCC supply for read back purposes. In locomotive decoders, this occurs by pulsing the motor on briefly.

3.1 USING A PROGRAMMING TRACK

As a reminder, the illustration below shows an example of a programming track which is isolated from your main layout.



This example, however, shows a recommended enhancement in the form of a **double-pole/double-throw** switch. With the switch in the position shown, the siding will receive decoder programming signals **ONLY** but, by setting the switch to the **right**, the siding will receive MAIN track signals allowing the locomotive to be driven onto the layout (following decoder setup).

We will now give examples of decoder setup/programming activities, showing the various features available in the DECODER SETUP mode.

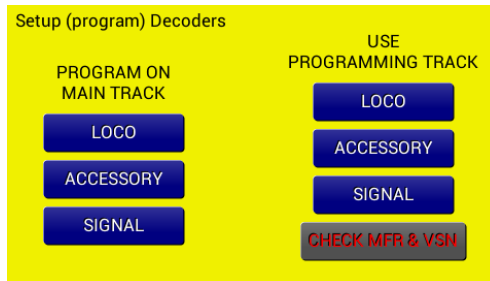
Please note that it is not possible to give instructions on locomotive decoder installation in this guide as there are many different possible configurations. You are advised to consult your locomotive and decoder manufacturers' literature, along with one or more of the excellent books available on the subject.

3.1.1 Initial Setup of Train/Locomotive Decoders

For this example, assume that you have a new "DCC fitted" locomotive along with a track configuration similar to that illustrated above. Let's assume that you wish to set the locomotive's address to **4701**.

Proceed as follows:-

- i) Ensure that the programming track is isolated from the remainder of the layout – i.e. the switch shown above is set to the **left**.
- ii) Apply power to the *ACE* and wait for the PANEL DRIVE screen to appear.
- iii) Touch the **DECODER SETUP** key. The following screen will be displayed:-



- iv) With the locomotive on the **programming track**, touch **CHECK MFR & VSN**.

The main track power will be turned off and the ACE will attempt to read two CVs in the decoder which give information on the decoder manufacturer and the version of its internal software (firmware).

ONCE THE INFORMATION IS DISPLAYED YOU CAN RETURN TO THE DECODER SETUP SCREEN BY TOUCHING THE DISPLAY.

If the read attempt fails, you may be presented with either of the following messages:-

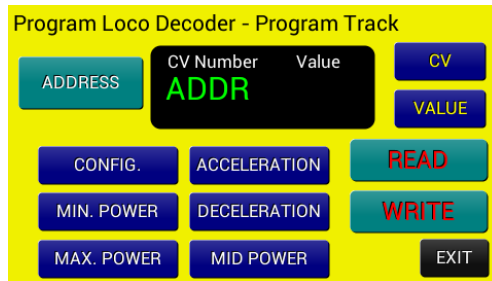
CV READ ERROR !!
Check connections

OVERLOAD !!
Check decoder wiring

In the first case, you should ensure that you have good connections between the programming track and the PROG A B terminals on the *ACE* (is the green connector block fully inserted?) and that the locomotive's wheels are making good contact with the track.

The "OVERLOAD" case is potentially more serious and you may need to consult the locomotive and/or decoder supplier. If, however, you installed the decoder yourself then you should carefully check for short-circuits (are the motor terminals fully isolated from the loco's frame and wheel pickups?).

- v) Assuming that the read back of the manufacturer data was satisfactory, touch the **LOCO** key under the “USE PROGRAMMING TRACK” heading. The following screen will be displayed:-



- vi) Touch the **ADDRESS** key, then the **READ** key. The ACE will interrogate the decoder (reading the relevant CVs), calculate the decoder's address and then display the result under the “Value” heading. Assuming that the locomotive is new “out of the box”, its address should be 3.
- vii) Now touch **ADDRESS** , followed by **VALUE** . Type “4701” using the numeric keypad. The VALUE key will have changed to **ENTER** . Touch this key again to activate the entered value.
- Now touch the **WRITE** key. **The decoder will be programmed with the new address of 4701.**

Setting other common locomotive performance features

The MIN. POWER (Vstart), MAX. POWER (Vhigh), MID POWER (Vmid), ACCELERATION and DECELERATION keys provide easy access to these parameters so that you do not have to know which CVs control them. Please check your decoder manual, though, to determine the allowable range of values.

For example, to set an acceleration value of 14.....

Touch **ACCELERATION** , **VALUE** , type “1”, “4” (numeric keys) then touch the ENTER key (which was the VALUE key). Now touch **WRITE** .

Setting other CVs

Modern locomotive decoders - especially those providing digital sound - have a rich set of CVs, many of which are specific to a particular decoder and/or manufacturer.

The  key enables the entry of any CV number between 1 and 1024 and the selected CV can then be read and written to as required.

For example.....

One well-known brand of high-quality sound decoder uses **CV121** to control the volume of the locomotive's horn. The decoder manual specifies a value range of **0 to 64** for this CV.

To set maximum volume, we would proceed as follows:-

- i) Access the "Program Loco Decoder – Program Track" screen (DECODER SETUP – USE PROGRAMMING TRACK, LOCO)
- ii) Touch the  key, then type "121" (numeric keys). The CV key will have changed to . Touch again, to activate the CV number.
- iii) Touch the  key, then type "64". The VALUE key will have changed to . Touch again, to activate the CV's value.
- iv) Now touch  to program the CV.

Decoder CONFIGuration (CV29)

From the “Program Loco Decoder – Program Track” screen, touch **CONFIG.**

The following screen will appear:-

Configuration for Loco -

CV Number	Value
29	6

DIRECTION ☒ Normal **RAILCOM** ☒ Off

LIGHTS CONTROL ☒ FL inst. **SPEED TABLE** ☒ CVs 2,5,&6

POWER TYPE ☒ DCC & DC **ADDRESS TYPE** ☒ Short

READ **WRITE** **EXIT**

CV29 is basically a set of *software switches* within the decoder and your decoder instructions will explain their purposes (which are standardised). Traditionally, it was necessary to calculate the value of CV29 manually but the **ACE** will do this for you!

As an example, one of the most common configuration changes is the **DIRECTION** of locomotive travel. We recommend the following procedure:-

- Place the locomotive on your programming track and access the above screen (DECODER SETUP – USE PROGRAMMING TRACK, LOCO – CONFIG.).
- Touch **READ**. The **ACE** will determine the decoder’s configuration settings and – more importantly – will set the **toggles** on the screen accordingly. This means that you will not inadvertently disturb settings that should not be changed (e.g. ADDRESS TYPE – the **ACE** sets this automatically according to the address value).
- Now touch the **toggle** for the feature you wish to change – in this example, the **DIRECTION**. The **ACE** calculates and displays a new value for CV29 (but you don’t need to worry what it is).
- Touch **WRITE**, and the job is done – loco direction reversed!

REMEMBER – always **READ** the configuration first; then make your change.

You should now be familiar with the techniques and formats for setting up DCC locomotive decoders using the ACE's PROGRAMMING output.

Procedures for setting up accessory decoders, and “programming on the main”, are very similar so the following sections are dedicated to illustrating the relevant screens and highlighting any differences from the above routines.

3.1.2 Initial Setup of Accessory Decoders

The image shows two screenshots of the ACE DCC Controller's programming interface for accessory decoders.

The left screenshot, titled "Program Accessory - Program Output", shows a screen with a yellow background. It features a central black box with "CV Number" and "Value" labels, and the word "ADDR" in green. To the left of this box is a blue "ADDRESS" button. To the right are two blue buttons labeled "CV" and "VALUE". Below the central box is a blue "CONFIG." button. To the right of the "CONFIG." button are two stacked blue buttons labeled "READ" and "WRITE". At the bottom right is a black "EXIT" button.

The right screenshot, titled "Configuration for Accessory -", also has a yellow background. It shows a white box with "CV Number" and "Value" labels, and the numbers "29" and "128" respectively. Below this box is a "RAILCOM" label with a blue circle and the word "Off". To the right of the "RAILCOM" box are two stacked blue buttons labeled "READ" and "WRITE". Below the "RAILCOM" box is an "ADDRESS METHOD" label with a blue circle and the word "Decoder". At the bottom right is a black "EXIT" button.

Accessory decoders are sometimes referred to as “stationery decoders” as they are used to control devices which – unlike locomotives – do not move around the layout. The main examples are points (turnouts) and signals⁴.

Accessory decoders generally have fewer CVs than locomotive decoders and this is reflected in the above screens. The use of CV numbers, in accordance with the decoder manufacturer's data, will be necessary.

The CONFIGURATION of accessory decoders is usually fixed according to its purpose. The ADDRESS METHOD is defined by the NMRA as:-

- **Decoder:** The decoder has multiple outputs – usually 4 or 6 – and the DCC address selects the group, or the decoder, as a whole.
- **Output:** The DCC address selects a specific output. This is always the case for decoders which have a single output (e.g. *Sig-naTrak*® GEM point motor).

⁴ Note that signals are generally controlled from a standard accessory decoder and not a dedicated *signal decoder*. The title “signal decoder” refers to a device which is specifically designed to drive **multiple-aspect colour-light signals** and such devices are generally not supported by most DCC systems.

3.1.3 Initial Setup of Signal Decoders

Note that signals are generally controlled from a standard accessory decoder and not a dedicated *signal decoder*. The title “signal decoder” refers to a device which is specifically designed to drive **multiple-aspect colour-light signals** and such devices are generally not supported by most DCC systems.

The NMRA has included DCC instructions for multiple-aspect colour-light signals in their standards, but has not fully defined them and so most manufacturers do not provide this feature⁵. The screens shown below have been included in the ACE “for completeness” as direct control of multiple-aspect signals may be provided as a future option.

Program Signal - Program Output

ADDRESS	CV Number	Value
	ADDR	

CV

VALUE

CONFIG.

READ

WRITE

EXIT

Configuration for Signal -

CV Number	Value
29	224

RAILCOM

Off

READ

WRITE

ADDRESS METHOD

Output

EXIT

⁵ The TT301 Colour-light Signal Decoder, by Traintronics, supports the extended accessory control instructions but we are not aware of any DCC controllers which generate the relevant instructions.

3.2 PROGRAMMING ON THE MAIN TRACK

For decoders which support the feature, programming on the main – or *operations-mode* programming – is mainly recommended for adjustment of locomotive features or performance **whilst running on the layout**.

The advantages of this mode are:-

- The main track power is not turned off, so other operators can continue driving their trains.
- The locomotive being adjusted does not have to be moved to the programming track.

The disadvantages, however, are:-

- Unless both the decoder and the controller are RailCom^{®6}-equipped, it is not possible to read back CV values in operations mode.
- Full track current is available. This could damage a faulty or incorrectly-wired decoder.

ALWAYS test a new decoder installation using the PROG A B output (i.e. on a programming track, in the case of locomotives).

Some accessory decoders will also respond to operations-mode CV programming instructions which means that they can have features adjusted once connected to your layout. Examples of such devices are:-

- *Sig-naTrak*[®] GEM Point Motor
- *Sig-naTrak*[®] IMP Servo Controller
- Traintronics TT300 Point Motor
- Traintronics TT301 Colour-light Signal Decoder

⁶ RailCom[®] is a trademark registered, in both Germany and the USA, by Lenz Elektronik GmbH. The technology is protected by European and American patents.

3.2.1 Configuring Train/Locomotive Decoders “on the main”

Touching the **DECODER SETUP** key, followed by the **LOCO** key, under the “PROGRAM ON MAIN TRACK” title, will display the following screen:-

The operation of this screen is similar to that described in section (3.1.1) above, with the following exceptions:-

- The MAIN track power remains on, and your layout will continue running.
- The locomotive whose features that you wish to adjust should also be on the main track.
- You can only WRITE to CVs – there is no feedback or read-back from the main track.
- The locomotive's address must be entered BEFORE selecting and writing to the CV.

The associated decoder configuration screen is shown below. This is accessed by first entering the locomotive's address **in the screen shown above** and then touching **CONFIG.** .

3.2.2 Configuring Accessories whilst on the Layout

The screens shown below are accessed from the DECODER SETUP screen by touching the **ACCESSORY** key, under the “PROGRAM ON MAIN TRACK” heading.

Program Accessory Decoder - On Main

Accessory No. 1

CV Number 2

Value

CONFIG.

WRITE

EXIT

ACCY

CV

VALUE

Configuration for Accessory -

Accessory No. 1

CV Number 29

Value 128

RAILCOM

Off

WRITE

ADDRESS METHOD

Decoder

EXIT

These provide the facility to adjust the operation of accessory decoders without having to disconnect them from the layout, but please bear in mind that not all accessory decoders support this.

3.2.3 Configuring Signals whilst on the Layout

As stated in section (3.1.3), the DCC instructions for multiple-aspect colour-light signals are not fully defined and so most manufacturers do not provide this feature⁷. The screens shown below have been included in the ACE “for completeness” as direct control of multiple-aspect signals may be provided as a future option.

Program Signal Decoder - On Main

Signal Number 1

CV Number 2

Value

CONFIG.

WRITE

EXIT

SIGNAL

CV

VALUE

Configuration for Signal -

Signal Number 1

CV Number 29

Value 224

RAILCOM

Off

WRITE

ADDRESS METHOD

Output

EXIT

⁷ The TT301 Colour-light Signal Decoder, by Traintronics, supports the extended accessory control instructions but we are not aware of any DCC controllers which generate the relevant instructions.

This concludes the guide on using the ACE.

The manual will be amended from time to time as/when we add options to, or improve features on, the controller.

At *GFB Designs*, we value all feedback from users – either with regard to the *ACE* itself, or the contents of this manual.

4 IMPORTANT INFORMATION

4.1 DISPOSAL OF WASTE ELECTRICAL & ELECTRONIC EQUIPMENT

European law requires that household waste from electrical and electronic equipment is collected separately from normal domestic waste and then properly recycled.

The *ACE* is marked with the crossed out wheeled bin symbol (shown opposite), in accordance with the European directive 2002/96/EC, which means that you must return any damaged or "end-of-life" units to your local authorised collection centre. *GFB Designs* will provide advice regarding the correct disposal procedures.



4.2 WARRANTY

All *GFB Designs* products are guaranteed against defects in materials and workmanship for a period of 24 months from the date of purchase. Should a defect arise within this period, the product will be repaired or replaced free of charge PROVIDED:-

- The product has been used and maintained in accordance with our instructions and (where applicable) any electrical ratings.
- No physical damage has occurred whilst the product is in the customer's possession.
- The fault has not been caused by any other form of misuse or neglect.

This guarantee is in addition to, and does not diminish, your statutory rights – for further information please contact your local Trading Standards Authority.

4.3 DECLARATION OF CONFORMITY

The undersigned declares that the *ACE DCC Controller* - manufactured by *GFB Designs* (contact details below) - complies, where applicable, in with the following European directives:-

93/68/CEE (CE marking)
2011/65/EU (RoHS)

2014/35/EU (Low voltage)
2014/30/EC (electromagnetic compatibility)

Relevant parts of the following standards have been used to demonstrate electromagnetic compatibility:-

BS EN 61000-6-1:2007

BS EN 61000-6-3:2007

Fraser Black, Proprietor

4.4 CONTACT DETAILS

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