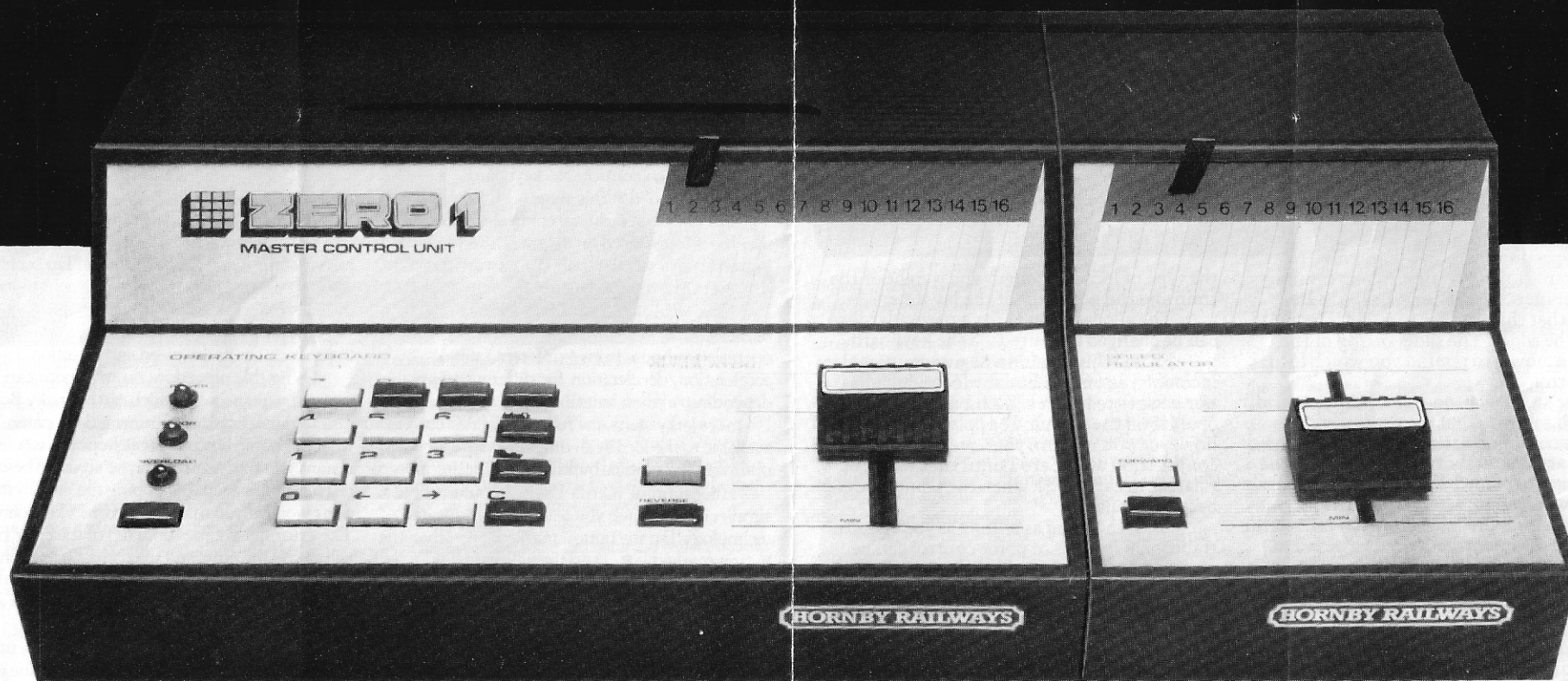


The enthusiast's guide to Zero 1.



If you missed this informative series in the railway model press, here's your chance to catch up on how the ultimate in control systems can help you get more enjoyment from your railway system

The ultimate control system from Hornby Railways.



The enthusiast's guide to Zero 1.

Part 1. The master control unit.

The Zero 1 Master Control Unit incorporates everything for a truly complete control system. A 4-Amp transformer, a micro-processor (a mini computer) and a 17 button keyboard which controls all the functions. This includes the running of at least 4 trains simultaneously (out of a possible 16) and the control of up to 69 points and other powered accessories. All this in the Master Unit alone.

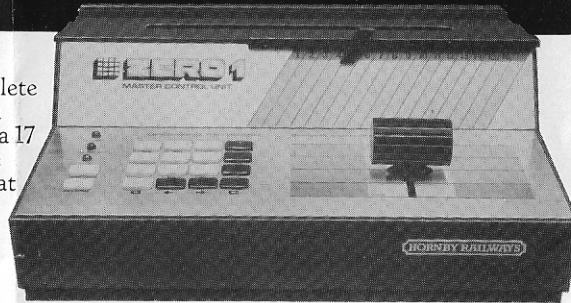
The speed and direction controls enable you to **control** one loco while running three others at constant pre-set speeds. If **control** rather than pre-set running is required, slaves can be added. The slider on top of the unit can be moved to remind you which loco is under control.

There's a "power-on-light." An "overload" light which tells you that the protective circuit has come into action - this occurs when there's an accidental short circuit or when the 4-amp limit is exceeded. The "error" indicator comes on when an incorrect keyboard entry is made. Depressing the "clear" button cancels the error and then the correct code can be fed in.

If an operational error is made and a disaster is imminent when the layout is running, the "panic" button stops the system instantly.

Once again the "clear" button re-sets the system, and the locos will automatically return to their original settings unless fresh speed and direction instructions have been entered. The rate of return depends on the inertia levels allocated to each loco.

There are 4 levels of inertia programmed into the unit, the choice of inertia (which determines the rate of acceleration and deceleration) can be made by you depending



the type of loco, the length and weight of the train and the geometry of the layout.

The allocated level for a particular loco can be changed as desired via the keyboard.

Phase 1 this autumn will give you complete locomotive control. But any loco which has not been fitted with a Zero 1 module will not operate on the system. For point control, however, you can run your present system in conjunction with Zero 1 until the launch of Phase 2, in early 1980, when the point modules become available.

Until then, and as long as you require, traditional systems of point control can be powered from the 16 volt A.C. output on the back of the Master Unit, and a slot is provided on the top of the unit to take standard Hornby lever frames.

With all these features in one unit, it's not surprising that Zero 1 really is the ultimate control system.

Next month: Keyboard operation and loco control.



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The enthusiast's guide to Zero 1.

Part 2. Keyboard operation and loco control.

Last month we explained how Zero 1's remarkable Master Controller works.

This month we'd like to tell you how simple it is to operate.

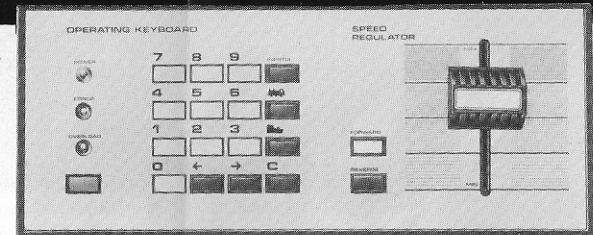
As with an ordinary power controller when you switch on, you have immediate loco control. No keyboard entries are needed at this stage.

But unlike an ordinary controller, whichever way the loco is placed on the track, the 'forward' button always sets the train in a forward direction, the 'reverse' button backwards.

Now let's use the keyboard to make use of Zero 1's unique inertia feature. This allows the operator to choose from 4 different rates of acceleration/deceleration for different trains depending on their length, weight, and type. No more jerky starts, the full 20 volts AC current available to the loco at all times ensures a smooth pull away and gradual build up to the desired speed.

Allocation of Inertia Level 2 couldn't be simpler even though you're using sophisticated technology. Tap the button marked **INERTIA** then the button marked **2** and then allocate this instruction to the loco by tapping the buttons marked **1** and **1** for loco 1. Finally tap the entry button either **←** or **→**. The reason there are 2 arrowed entry buttons is that these also serve as direction controls when operating points or lights (of which more later in this series).

Having set this inertia level the Master will remember that loco 1 must accelerate/decelerate at Inertia Level 2 however many other keyboard operations are made after that. No other system has Zero 1's powerful memory feature.



Another aspect of Zero 1's memory comes into play when you want to control a different loco. Let's assume loco 1 is now running. Tap buttons **1**, **2** and **←** or **→**. Loco 2 is now under the Master's speed and direction control.

But meanwhile the Master's memory continues to run loco 1 at its set speed and direction.

Using this procedure up to 4 locos can be made to run simultaneously which can be tricky. But if a disaster like a crash is imminent, don't panic. That's what the 'panic' button's for: It stops the whole system instantly so that controls can be adjusted before resetting the system by tapping the 'clear' button. And don't worry if you make an incorrect keyboard entry. The 'error' light comes on, a tap of the 'clear' button will cancel the error, and the correct entry can then be made. The 'clear' button is also used to reset the circuit if there is a power overload (over 4 amps) or a short circuit indicated by the 'overload' light.

All this technology to bring you the utmost simplicity of control. It's difficult to describe just how easy it is. It's the ultimate control system. Just wait and see. Because the ultimate is always worth waiting for.

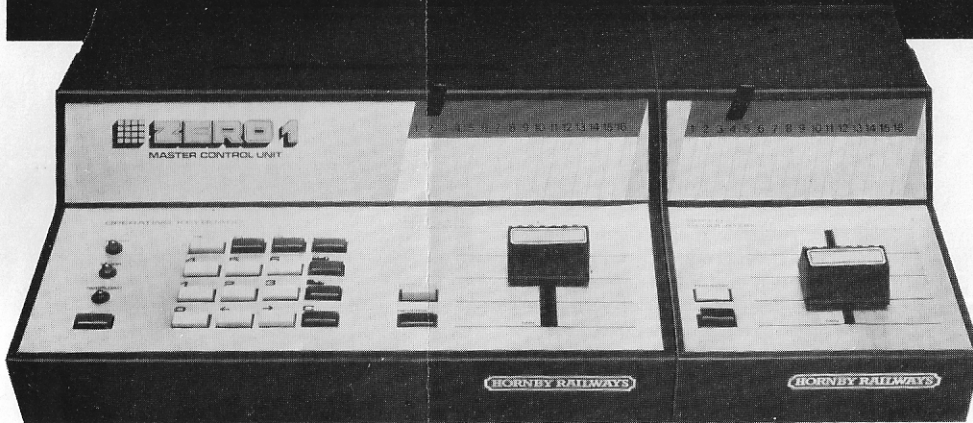
Next month: Train control with the Master and Slaves.



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Part 3. Master and Slaves.








We have already demonstrated the power of the Master Control Unit with its capability of running at least four locos at the same time. However, to get simultaneous and independent control of more than one loco, Slave Controllers are needed.

Each Slave Unit has a speed regulator and direction controls plus a cursor scale to remind the user which loco is under control.

The Slave Controller plugs directly into the Master. But the Slave operates through the Master Control Unit and no additional connections to the track are needed.

Up to three Slave Units can be added to the Master Controller providing independent control of four locos in total. If desired the Slaves can be located remotely around the layout with the simple addition of extension leads linking the Master with the Slave Units.

Locos are assigned to the Slaves via the Master keyboard. The first Slave Unit is called Controller 2 ( 2), The Master Control Units always being Controller 1. To assign loco 3 to the 1st Slave Unit, for example, depress  2  3  or . It's that easy. Once the assignment is made the Slave

will control the speed and direction of loco 3 wherever it is on the layout.

Inertia levels can be added to the loco as desired using the Master keyboard—there is no need to go through the Slave Unit. The Master Control Unit will always remember the inertia level allocated to each loco. For example to allocate inertia level (1) to a loco being controlled by any Slave Unit use this sequence:

 1  2 .

The Slave Controller can naturally handle double headed trains as well as single locos. Zero 1 has yet another useful feature to make things simple for the user. When the system is first switched on the Master Controller is automatically in control of loco 1, the 1st Slave in control of loco 2, and so on. No initial keyboard entries are needed.

No other system can offer such simple and complete loco control as Zero 1. It really is the ultimate system.

Next month: The locomotive module - capability and coding.



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Part 4. The locomotive operating module.

Here it is. The loco operating module. Think of it as a driver inside the cab of a life size loco. Just as he controls the engine from the footplate, the operating module controls the engine from on board the loco. That's why Zero 1 is so much better than traditional control systems.

Model railway control systems in the past have had to regulate the polarity and amount of current in sections of track to control the direction and speed of trains. The Zero 1 system however has 20 volts A.C. current in all parts of the track at all times. It is the operating module which rectifies the current to 12 volts D.C. and regulates the amount of current powering the loco motor.

Signals from the computerised Master Controller Unit are passed down the track and are picked up by the loco module which is connected between the loco pick up and the motor. It is these signals, which the module firstly has to recognise as its own, then interpret, which are its instructions to regulate current to the motor.

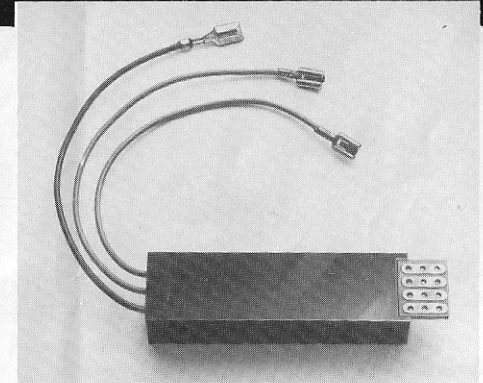
How is all this achieved?

Firstly, coding. The illustration above right shows the locomotive module. On the right of the module can be seen the 4 coding pads. By using the simple link provided, the module can be coded 16 different ways. If two locos are required to respond to the same command both vehicles should be coded identically. The modules are very easy to code—and re-code if needed. No tuning is required, and the modules can be fitted off-track.

Secondly, the circuit board. We have encapsulated the components to provide additional protection and to prevent any possible short circuiting. A custom designed 'chip' made for Hornby by Texas Instruments, the world's largest semiconductor manufacturer, is the heart of the system. It is the 'chip' which interprets the coded signals from the Controller.

Thirdly, the wiring connections required for fitting the module into the locomotive have been specially designed to be as simple as possible. No soldering is required and the leads supplied are long enough to be used with tender-drive units. No other modifications to locomotives are necessary.

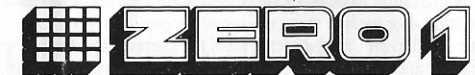
Finally, the power supply. The motor regulator feeds power to the motor as rectified 12 volts D.C. current in the form of rectangular pulses. The technically minded will appreciate that, in contrast to 1/2 sine wave drive (commonly



known as 1/2 wave rectification), this overcomes many of the low speed problems inherent in small electric motors. The result is incredibly good low speed control and smooth throttle response. The module itself is small—40 x 13 x 8mm, so it will fit into most ready-to-run locomotives. After considerable research we have come to the conclusion that this rectangular format fits more locomotives than would a cube. (Length is easier to accommodate than height.) It is also robust. Rated at 1 amp continuous, it has been designed for 'HO' and 'OO' locos, but it can also be used with some of the more efficient 'O' gauge models.

That's how Zero 1 enables you to control an engine from on board the loco itself. We could say it's almost like being on the footplate. It certainly brings much more realism to model railway operations. In fact no other system can offer such simple and complete loco control. A comprehensive instruction booklet is included with each Master Unit, detailing fitting procedures for all Hornby locomotives produced over the past 15 years. Naturally the unit has been tested with and will operate other manufacturers locomotives provided there is space available.

Next month: The track and loco operation.



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Part 5. The track and loco operation.



Zero 1 has many advantages over other available control systems. Not the least of these is the greater operational realism it allows by eliminating many of the cumbersome track procedures inherent in conventional systems.

No more controller interaction

For simultaneous control of two locos, traditional systems require separate controllers regulating current to sections of track isolated from each other. But if a loco is to pass from one of these sections to a section where another loco is operating, the other loco must first be stopped in an isolated section. Its controller must then be turned right down or the two controllers would interact.

This just can't happen with Zero 1. 20 volts A.C. current and signals from the Master Control and Slave Units reach all parts of the layout, so locos can move freely to all sections.

No more isolating rails

With a traditional control system, if two locos get on to the same sections of 'live' track they will react in the same way at the same time to the amount and direction of current in the track. So isolating rails are needed for many operations which in real life are so simple, like driving one loco up to another. Or shunting with more than one loco in a yard or sidings. Or stabling several locos in an engine shed. Or changing over locos on a passenger train in a terminal station. For each of these manoeuvres, one loco has to be stopped in an isolated section and the current switched off before another loco can operate in the same part of the layout. Tedious and unrealistic.

With Zero 1, isolating rails are just not necessary. Nor is the wiring and switching which goes with them. Because just as a real driver controls his loco from the footplate, Zero 1's locomotive operating module controls the engine from on board the loco. It recognises its own uniquely coded signals passed down the track by the Master Control Unit.

So several locos can be stopped in the same section of live track one after the other. Locos can be shunted up to each other. They can even run in opposite directions on the same section of track!

Easier operation on reverse loops

To construct a reverse loop a double pole changeover switch is needed to prevent short circuiting because the outer rail at one end joins the inner rail at the other. With a traditional system the controller has to be turned down and the train stopped on the loop. The switch has then to be operated and the direction control has to be reversed before moving on again. Otherwise the train would go back the way it came!

With Zero 1 all you need to do is to operate the switch whilst the train is going round the loop. It's that simple.

Control with more realism.

That's Zero 1. No other system has all its advantages.

Next month: Points and accessory control.

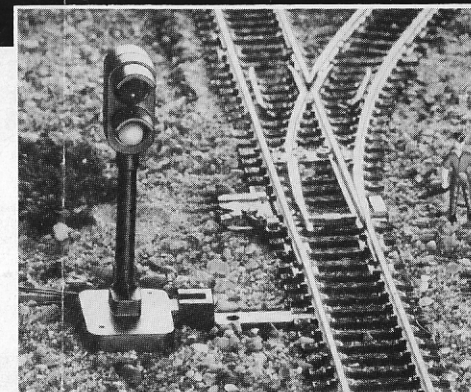


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Part 6. Point and accessory control.

There'll soon be a much better way of operating electrical accessories. It will be possible to operate them using your Zero 1 Master Controller. As with loco control this will be achieved by passing coded signals from the Master Keyboard down the track. To decode the signals – and rectify the current from the track to suitable current for the accessories – there will be the Accessory Module. Available in 1980, there will be one type with which 99 different codes will be possible, permitting the operation of at least as many different accessories. The module will have 4 outlets each of which can be uniquely coded so only one module will be needed for every 4 accessories. It will be possible to code or recode modules by means of a combination of switches. The diagram shows how, by setting one number, the other 3 outlets from the module are coded sequentially.



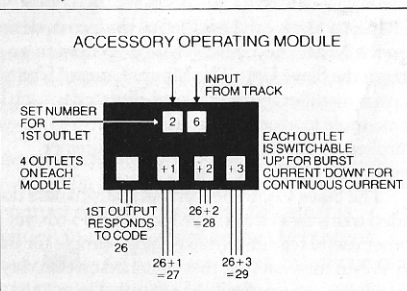
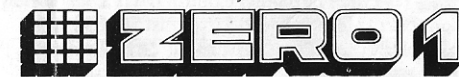
then either or depending on the direction you wish to switch the points. The same goes for colour light signals of course. And if you connect accessories all the same way you will always be able to use as left or branch, and as right or main for your points and signals.

Traditional Control

Zero 1's Master Control Unit has a suitable power output for standard accessories. So when you first change your layout to Zero 1 you will be able to power and switch your accessories just as before. In fact there's a special channel on top of the Master and Slave Controllers designed to accommodate lever frame switches.

But when Accessory Modules are fitted power is distributed to accessories through the track, and control is through the Master Keyboard. Think how much wiring and how many switches that will save. All so much more realistic. That's why we call Zero 1 the ultimate control system. It's well worth waiting for.

Next month: The system summarised.



An Accessory Module is connected to the track at a suitable place on the layout – say by a group of points or signals. The module's outlets are then connected to appropriate accessories. No other wiring or switching is needed. Note that the module outlets can be switched for burst current – needed for points motors, or continuous current – needed for colour light signals.

Once connected, to switch a point coded, say 27, press these keys on the Master Keyboard:

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