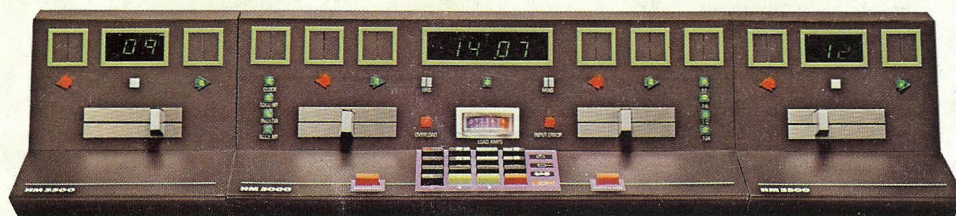
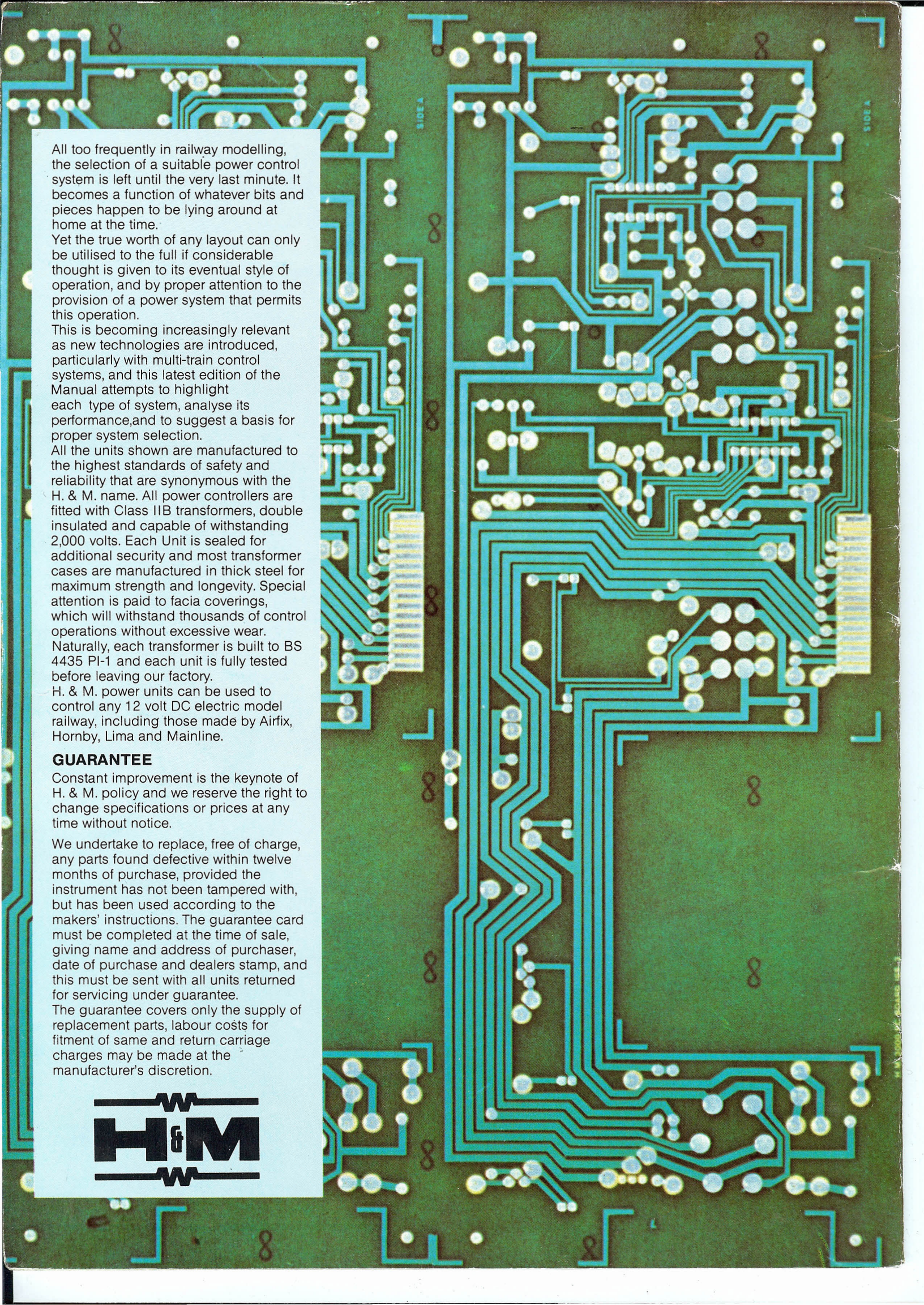


# HM MODEL EQUIPMENT HANDBOOK



11th EDITION





All too frequently in railway modelling, the selection of a suitable power control system is left until the very last minute. It becomes a function of whatever bits and pieces happen to be lying around at home at the time.

Yet the true worth of any layout can only be utilised to the full if considerable thought is given to its eventual style of operation, and by proper attention to the provision of a power system that permits this operation.

This is becoming increasingly relevant as new technologies are introduced, particularly with multi-train control systems, and this latest edition of the Manual attempts to highlight each type of system, analyse its performance, and to suggest a basis for proper system selection.

All the units shown are manufactured to the highest standards of safety and reliability that are synonymous with the H. & M. name. All power controllers are fitted with Class IIB transformers, double insulated and capable of withstanding 2,000 volts. Each Unit is sealed for additional security and most transformer cases are manufactured in thick steel for maximum strength and longevity. Special attention is paid to facia coverings, which will withstand thousands of control operations without excessive wear. Naturally, each transformer is built to BS 4435 PI-1 and each unit is fully tested before leaving our factory.

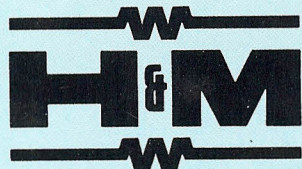
H. & M. power units can be used to control any 12 volt DC electric model railway, including those made by Airfix, Hornby, Lima and Mainline.

#### **GUARANTEE**

Constant improvement is the keynote of H. & M. policy and we reserve the right to change specifications or prices at any time without notice.

We undertake to replace, free of charge, any parts found defective within twelve months of purchase, provided the instrument has not been tampered with, but has been used according to the makers' instructions. The guarantee card must be completed at the time of sale, giving name and address of purchaser, date of purchase and dealers stamp, and this must be sent with all units returned for servicing under guarantee.

The guarantee covers only the supply of replacement parts, labour costs for fitment of same and return carriage charges may be made at the manufacturer's discretion.





The purpose of the information below is to simplify the selection of the optimum system for any layout. This is largely dependent upon the type of layout, who is going to be using it, and the capabilities of each system. It is worth pointing out that sophisticated systems are not always the best choice. Over-

complexity of control is equally to be avoided as over-simplification if the layout is to be enjoyable to operate. For example, the HM5000 system will provide the best method of "playing with trains", but the HM3000 system will provide the ultimate in the control of one locomotive.

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### SYSTEM 1. Micro-processor Programmed Electronic Multi-train Control – HM5000 System.

Index Position.	Catalogue Pages 4-9.
Purpose.	The control of several trains simultaneously and associated accessories.
System parameters.	2 Wire Control System. 16 locomotive capability. 99 function accessory capability.
Layout definition.	Any type, but particularly suitable for multi-track continuous run systems or systems with large locomotive studs.
Remarks.	Must rank as the state-of-the-art multi-train system. Extensive control features include multi-level inertia, digital readouts, power consumption meter, real/scale time clock. Perhaps best described as the optimum unit for sophisticated multi-train operations.
Considerations.	Small layouts cannot utilise full capabilities of this system. The H. & M. 5000 system is not compatible with other control systems, other than Hornby Zero 1 – all locos on the layout must be converted.

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### SYSTEM 2. Transistorised Electronic Single Train Control – HM 3000 System.

Index Position.	Catalogue Pages 10-14.
Purpose.	The ultimate control of a single train.
System Parameters.	Standard 12v DC System. Compatible with all other 12v DC Systems. 16v AC output for accessories.
Layout definition	Any type but particularly suitable for home layouts designed for use mainly by one person who wishes to have the most advanced control possible over one locomotive at a time.
Remarks.	Sophisticated electronics provide fully variable braking, inertia, and load compensation controls. The unit can be tuned to the individual characteristics of each locomotive or train – motor consumption, load etc.,
Considerations.	The best control systems do make good locos run better, but will also show up the defects of poor layout construction or poorly maintained rolling stock. Ensure that all components are in good condition.

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### SYSTEM 3. Transformer Rectifier. H. & M. Multi-pack System.

Index Position.	Catalogue Pages 15-19.
Purpose.	To provide a basic control system that can grow with the consumer's needs.
System Parameters.	Standard 12v DC system, compatible with all other 12v DC systems.
Layout Definition.	Any type, but particularly suitable for simpler layouts of up to 3 train simultaneous operation.
Remarks.	Ideal units for train set extensions and first layouts but also capable of providing control for layouts of considerable sophistication. Add-on approach allowing system enhancement as control requirements increase.
Considerations.	Although it does not include the control responsiveness of the HM 3000 or the wiring and operational simplicity of the HM 5000 for complex layouts, the Multi-pack approach has been proven over 20 years to provide a degree of reliability and toughness not to be found in any other system.

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### ACCESSORIES.

Index Position	Catalogue Pages 20 and 21. A range of useful accessories to simplify the construction of the control board. Designed specifically for use with H. & M. products.
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### WOODLAND SCENICS

Index Position.	Catalogue Pages 22-27. An extensive range of scenic accessories designed specifically for model railway usage, but suitable for any type of modelling from 1/35 – 1/90 scale. Proper use of scenic materials can bring a layout to life in the most natural way.
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### TECHNICAL

Index Position	Catalogue Page 28. Technical terms explained. Catalogue Page 29. Your questions answered. Catalogue Pages 30-31. Electrification systems in popular use.
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## HM5000. The shape of things to come.

**Reliability:** It's a word that describes Hammant & Morgan. This word sums up our company philosophy, our guarantee, our production methods, and our designs. It also sums up our approach to Multi-train Control Systems. You can rely on Hammant & Morgan to produce the best and most advanced.

Here are some indications of the advanced features available:-  
16 - Locomotive operation.  
99 - Accessory control functions.  
4 - levels of inertia.  
Digital readout of control status.  
Twin control master unit.  
Current load indicator.  
Clock - four time scales.  
Audible Overload Alarm.  
And more.

**System Components:** A master controller (HM5000) with twin controls for instant two-train operation - or more if continuous running is required.  
A separate 6 amp powerpack providing a low voltage AC supply to the HM 5000.  
A consort controller (HM5500) that will control a further train.  
A codable locomotive module. The same module type will fit all 16 locos (one module per loco).  
A codable accessory station.





**Control method:** 20v AC derived from the separate powerpack is fed by the HM 5000 into the track at all times. No locomotive will operate until a signal is transmitted to it.

This signal will give:-

1. The loco number.
2. The direction.
3. The speed.
4. The level of Inertia.

Any locomotive can be 'called up' in any order and can be operated at any throttle setting or direction regardless of any

other locomotive operating at that time. These signal transmissions are in computer code, and are thus free from the problems of interference that can be caused by frequency selective systems. The master unit (HM5000) houses two microprocessors and each loco module and accessory station contains a silicon chip. In essence, they "talk" to each other and pass, check and then double check the information for accuracy. This process is virtually instantaneous.

**Compatibility:** Multi-train control systems are not usually compatible with normal 12v.D.C. supply. Thus you cannot run an HM5000 system simultaneously with a normal 12v.D.C. supply. The reason for this is that the HM5000 delivers into the track 20v.A.C. The microprocessor circuit in the loco converts the current drawn from the track to 12v D.C. so that the motor functions in the normal way.

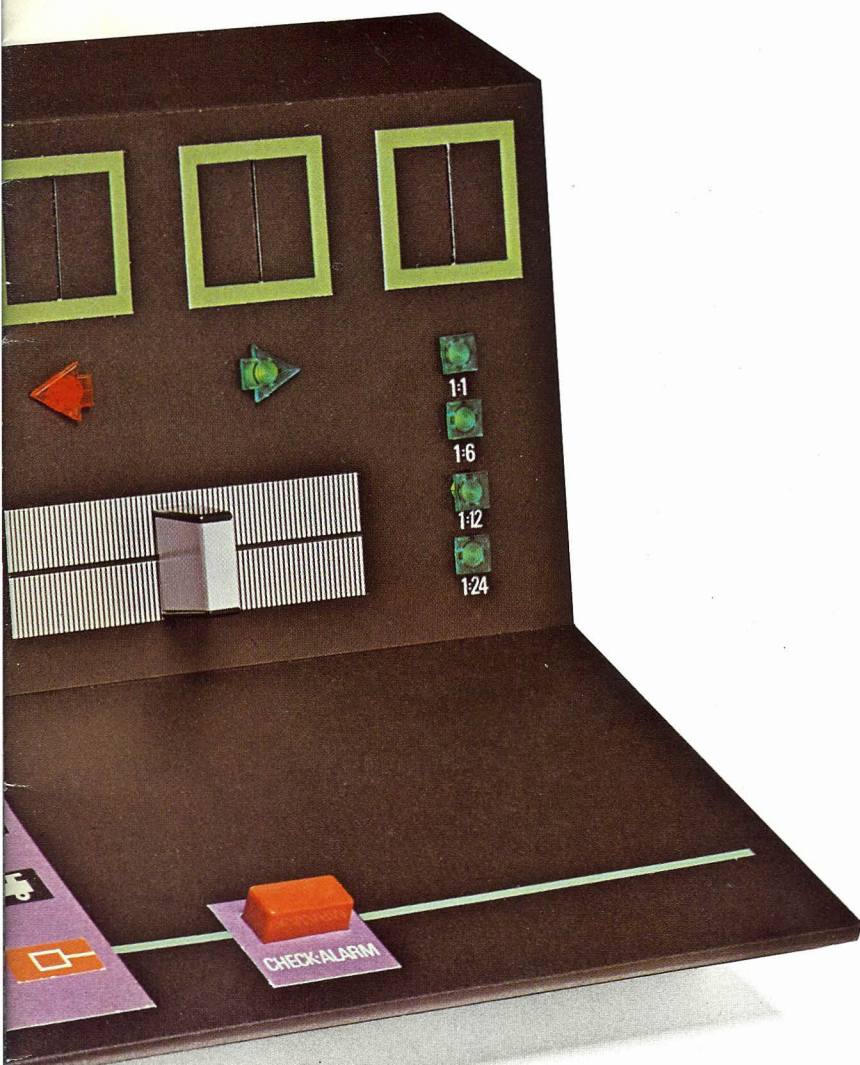
The HM5000 is compatible with the Hornby Zero One system, so that locos that are used on this system can be used with the HM5000, thus receiving the extra benefits that are available to "5000" users.

The HM5000, constructed in a tough metal case, is capable of operating 99 accessories and up to 16 locos depending on power consumption. Two of these locos may be controlled, while the others can be left running at pre-set speeds.

**POWERPACK** — this robust and powerful unit converts mains voltage into the low voltage supply required by the HM 5000. The unit should be mounted on the floor adjacent to any convenient mains power outlet socket, and the outlet cable connected into the rear of the HM 5000 at your control centre. This approach offers additional safety features by completely separating the controls from the mains voltage and reducing the risk of damage should the unit be dropped. The Powerpack is protected internally by a heavy duty thermal overload cut-out, in addition to the electronic overload protection provided in the HM 5000.

With the addition of two HM5500s to the HM5000, independent control can be extended to a total of four locos, whilst the remaining locos can be left running at constant speed.

Only two wires are required to carry the power to all the track.



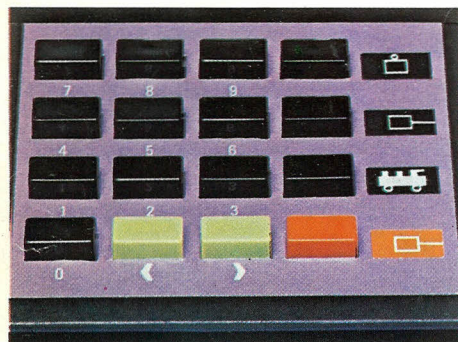


## HM5000. The optimum unit for sophisticated multi-train operation.

**Current Load Indicator:** The HM5000 has a Light Emitting Diode (LED) to indicate that the unit is switched on and power is available. The transformer used to provide the power is rated at 6 amps, and is housed in the separate powerpack. A Current Load Indicator will give a visual readout as to the amount of power being drawn. If the 6 amps. is exceeded the unit will immediately cut off and an alarm will sound. The alarm will continue until the situation is rectified. This safety feature will protect the unit on any overload including a short circuit.

**Keyboard:** All the instructions that relate to the locos, points, accessories, etc., are fed into the HM5000 computer via a keyboard. As the information is fed into the unit an audible tone is emitted to tell you that the information is correct and has been accepted. If an error is made an LED will light up. To clear this error, press the "Clear" key and the light will go out.

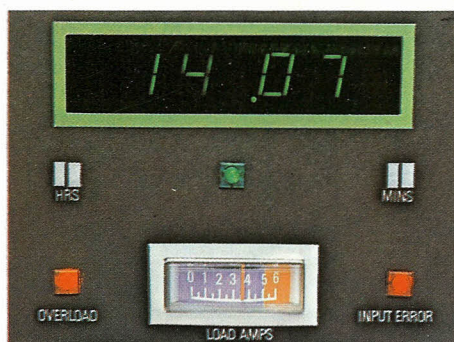
The keyboard is made up of 17 keys showing numbers 0-9, plus Controller, Loco, Inertia, Clear and Emergency keys.



In addition, there are two arrowed "Data Entry" keys which double as Direction Indicators when accessories are operated.

**Control Area:** The Control Area is divided into two sections, Number 1 Controller and Number 2. Each controller has a sliding regulator, which determines speed, and two direction touch switches with respective LEDs situated underneath. Also incorporated is an Emergency key which stops all operations if speed is of the essence to prevent a disaster.

**Operation:** To operate a loco, say Number 1 from control Number 2, the following procedure is adopted. Depress the key marked by a controller symbol and then Number 2, press the loco key and then Number 1. Either of the keys marked with an arrow may then be pressed to enter the information into the HM5000 memory.

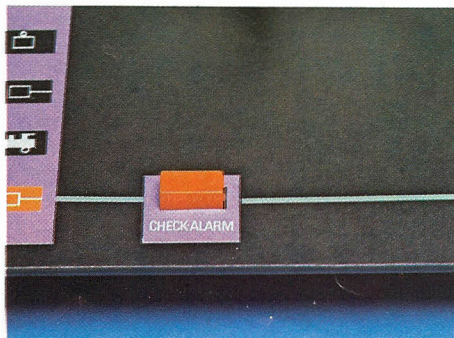


**Inertia:** Each loco can be individually programmed to one of four levels of inertia using the key sequence Inertia - inertia level (1-4) - loco - loco number (1-16). This facility enables you to simulate the acceleration and deceleration that you would expect from the type of train being used.

**Running:** Slide the regulator from minimum to maximum and the loco will gradually move off picking up speed. The eventual speed of the loco is determined by how far the control is moved towards the maximum position. To reduce speed return the control to the minimum setting. If Inertia has been selected then the loco will coast, slowing down gradually.

Once the loco has achieved the required speed and you wish to dispense with the inertia, simply code in the loco number, etc., but leave out the inertia setting. You will then have instant deceleration when the control is moved towards the minimum position.

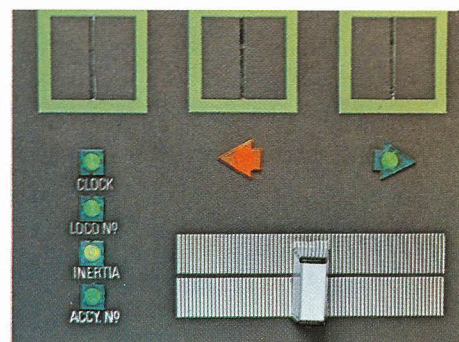
If you wish the No. 1 loco to carry on running while you control another train (say loco 14) from the same controller just feed in the relevant information which refers to No. 14. This "freezes" the control of No. 1 loco which will carry on at the speed which it was running at when disengaged from the controller. If you then wish to stop loco No. 1, regain control by entering the information referring to loco No. 1 and bring it to a halt.



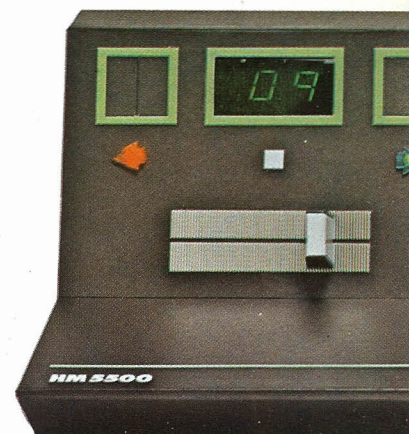
**Digital Readout:** To try to remember which locos you are controlling and at which inertia setting or which of your accessories you operated last, would require the full and deep concentration of the operator. We believe that this would destroy the overall independence that the HM5000 will give you. This is why the HM5000 has incorporated in its circuitry a powerful memory, which in turn is connected to a Digital Readout. By touching a switch sequentially you will be able to obtain one of four readings.

The first readout shows the numbers of the two locos that are being controlled by the HM5000 while the second readout shows which inertia settings they are on. The third readout will inform you which of your accessories you operated last and the fourth readout is a digital clock.

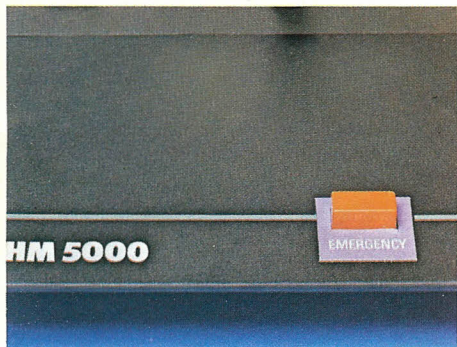
One LED in a vertical row of four will light up to indicate the readout chosen. With this added information at your finger tips multi-train control becomes less demanding and more enjoyable.



Below: Digital readout is switched onto 'loco numbers' and shows that locomotives number nine, fourteen, seven and twelve are all at present under independent control.







**Emergency Key:** if a collision is imminent and cannot be avoided there is an Emergency button which, when depressed, will bring the locos to a halt. This will then give you time to sort out the problem and re-program where necessary, before re-starting the locos using the "Clear" key.

**Double Heading:** Unlike the conventional 12v D.C. controllers, double heading (one loco attached to another loco) presents no problem to the HM5000. Simply code in one loco on Number 1 controller and code in another loco on Number 2 controller. Manoeuvre the locos together, then re-allocate the second loco to the same controller as the first, e.g. if loco Number 1 is on controller 1 and loco Number 2 is on controller 2, bring the two locos together then enter the instruction

Controller 2  
Locomotive 1  
Locomotive 2  
3 or 2

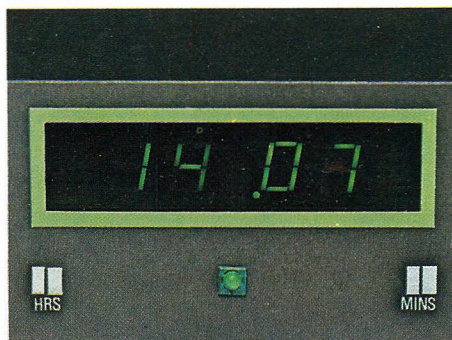
Both locos are then under the command of controller No. 2. Note that where one or both locos previously had an inertia level, the double-headed train will take the lowest level of inertia of the two.

**Clock Display:** To aid the railway enthusiast who wishes to operate his railway to a timetable, the HM5000 has integrated in its operation a selectable four scale clock.

The four scales are 1:1 (Real time),  
1:6 (24 hour timetable takes 4 hours)  
1:12 (24 hour timetable takes 2 hours)  
1:24 (24 hour timetable takes 1 hour)

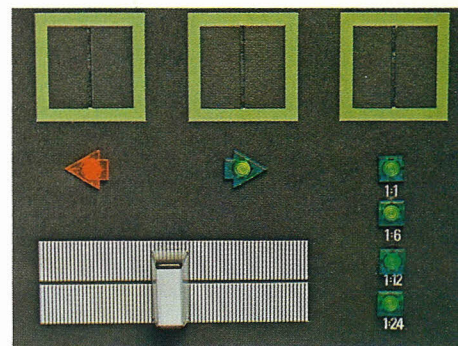
The clock readout is obtained by operating a touch switch until the LED, which indicates clock readout, lights up. The correct time scale is then achieved by a further touch switch, which when operated sequentially, illuminates one of four LEDs, each LED relating to a time scale.

Slow/Forward and Start/Stop touch controls have been provided so that the Clock can be started at any time required. By depressing both switches simultaneously the time is advanced very quickly. When the starting time is neared, the Slow Forward switch is used to achieve an accurate time. The Clock will only start when the Start/Stop touch



control is depressed, advancing the time by one minute.

Because of the HM5000's memory, the clock will continue to function even when the Digital readout shows the loco numbers etc., instead of the clock. The time readout may then be checked at

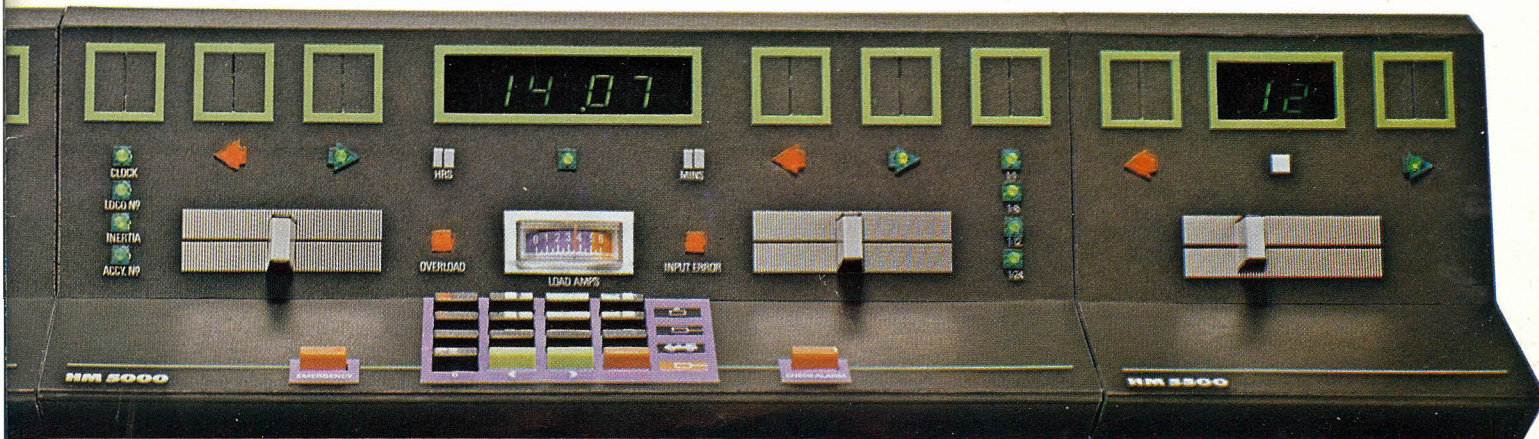


any moment by switching back onto "Clock".

The HM5000 is the only Multi-Train Controller with this feature. The operator can now operate his layout to a strict 24 hour timetable bringing a new dimension to model railway operation, thus preventing unscheduled crashes. Timing must be accurate, as in real life. Time must be allowed for the 09.05 passenger train to stop at a station and move off again before the 09.10 goods train arrives. Similarly, a local passenger train must be off the main line and on to a loop before the 14.30 Inter-City from Euston comes thundering through. Using the clock in conjunction with a timetable will give your layout that extra realism and yourself greater satisfaction and enjoyment.

The HM5000 system has been designed so that it will be capable of further operations and functions as time progresses. This in turn ensures that you can drive your trains into the technological world of the 1980s, towards the 21st century.

**Instant Control:** When the unit is switched on the controllers are automatically switched to correspond with the associated loco, i.e. Controller No. 1 controls loco No. 1 etc. This characteristic will apply to the HM5000s that are added.





To enlarge the controlling capabilities of the HM5000 it is necessary to add the HM5500 Control unit.

Two of these units can be banked together and then plugged into the sides of the HM5000, giving the HM5000 system control of four locos out of a possible sixteen. These four locos can be independently controlled at any one time, on any part of the layout, providing the power is available.

This can easily be judged by checking the Current Load Indicator on the HM5000 which will show the operator the amount of current being drawn. If the current being drawn exceeds 6 amps then the power is cut off automatically and the overload LED will light up. An alarm will also sound. When the overload situation has been corrected the power can be restored by pressing the "Clear" key. Each HM5500 Control unit has a Regulator control, Direction touch switches and indicators, and a two digit readout display.

When programmed via the HM5000 the digital readout will show either the loco number being controlled or the inertia setting. The HM5500 will not display the clock or accessory number.

Locos are programmed for control by the HM5500 by operating the HM5000 keyboard. The first HM5500 unit that is added would be classified as controller Number 3, the second would be Number 4. To programme a loco to the third controller, the same procedure would be applied as if you were operating the HM5000 Controller.

For example, if inertia was not required, the following input sequence would be necessary. Press the "controller" and the Number 3 keys, press the "loco" and the Number 9 keys and then **Q** or **R** key. You would then have control of Number 9 loco anywhere on the layout using the Number 3 controller.

Should you wish to control another loco on Controller 3, bring loco 9 to a halt and programme in the replacement loco. No extra wires are required to go to the track as the HM5500 Consort unit operates through the HM5000. No isolating switches or wiring are necessary.

The HM5500 can be situated remotely from the HM5000 and still operate by utilising the H. & M. interconnecting lead. An HM5500 can therefore be situated wherever particularly close examination is required, e.g. Shunting Yard.

The HM5500 allows the HM5000 system to be used to its fullest potential and creates an unbeatable combination.

With the HM5000 all the track is supplied with a constant 20v A.C. Current at all times.

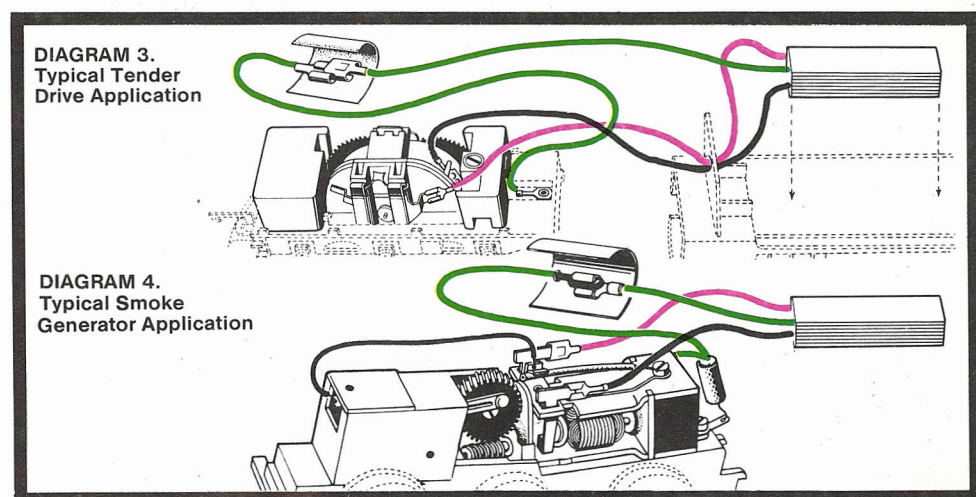
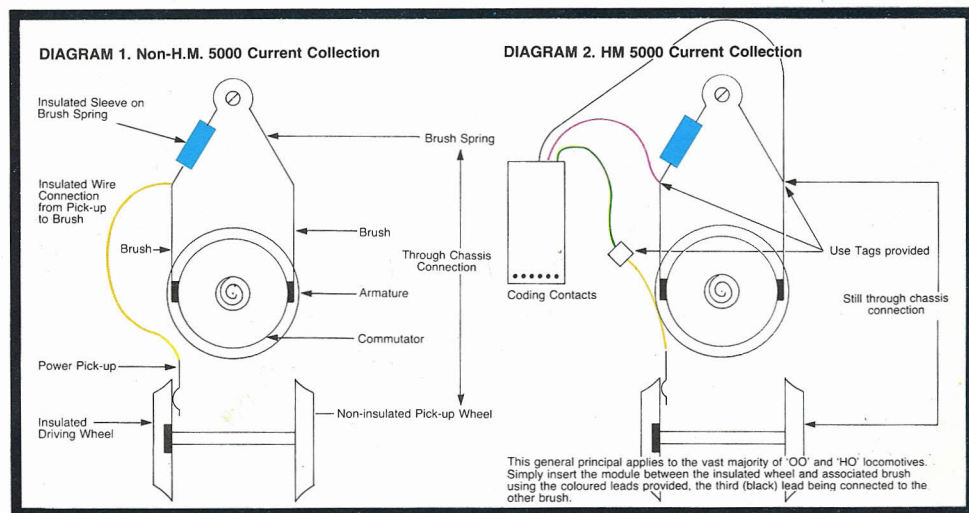
It is the job of the loco module to change this current to 12v D.C. and refer it to the motor. Therefore the loco is controlled from within just as in real life. For the technically minded, the signal arriving at the motor is in the form of pulses of full height, whose width is varied to adjust the speed. This method of control results in extremely good, slow running, with smooth gradual control up to full speed. The module is easily fitted between the loco pickup and motor. No soldering is required and the leads are long enough to suit tender driven locos. The Module's convenient size of 38 x 13 x 8 mm enables it to fit most locos of HO and OO gauge and it can control some of the more efficient 0 gauge, operating at currents up to 1 amp.

The module picks up signals via the track from the HM5000. If it recognises that they refer to itself, it interprets them and thus controls the power to the motor. Each module has four coding pads and by using the links provided can be set in 16 different ways. The coding and recoding is easily achieved and the linking method means that there is no need for tuning.

Designed for the discerning modeller, the HM5000 Accessory Station can be added stage-by-stage to any railway so that the modeller can gradually extend HM5000 control to the whole of his layout. Unlike locomotive control, where all locos operated by a multi-train control system must be converted by the addition of the loco module, the Accessory Station can be incorporated one unit at a time. The 16v AC output of the HM5000 can be used to power existing accessory circuits until the whole layout has been converted to HM5000 micro-electronic control.

**Functions:** Each station has 4 separate outputs capable of operating 4 points or 4 signals. In certain cases, it is possible to connect two point motors to 1 output, as for example with a twin-track crossover when neither point would ever be required to operate independently. Further, by using the switch incorporated on the SM3 point motor, a signal could also be switched.

Each of the 4 station outputs can supply either "burst" power for point operation, or "continuous" power for colour light signals. However, it should be noted that a single output cannot supply both "burst" and "continuous"



**Loco Module:** With the conventional 12v D.C. controllers, the regulation of the polarity and the amount of current to a section of track has previously come directly from the control system itself.



current. Both types of current may be mixed from 1 station:

Examples: Outputs 1 2 3 4  
Power requirements Burst Cont. Burst Burst  
or Cont. Burst Cont. Burst

Any combination of power requirements can be arranged.

**Baseboard Attachment:** The HM5000 Accessory station has been designed for below or above baseboard fitting. Two small screws are all that are needed to attach the station, or if the station has to be fitted to one of those awkward and inconvenient corners of the layout, the double-sided sticky pads available from most good stationers will do the job admirably.

For over-baseboard use, the size of the station makes it convenient to fit inside a signal box, station building, water-tower, etc.

**Power Connections:** Both power and the coded information is supplied to the station via the track. No connections are required back to the HM5000. A single two-wire connection to the nearest convenient section of powered track is required. It is important to note that the track section to which the station is connected is continuously powered, and is not isolated by the operation of a point. We suggest that a little time assessing any layout for the following features will be well spent:-

- 1) which points are operated most frequently (obviously, these should be given the most easily remembered numbers where possible).
- 2) Power Supply from convenient track section.
- 3) The fitting of the station if above baseboard within a convenient building.

Then simply connect the three-core ribbon cables to the points. The use of this type of cable ensures tidy wiring and simplicity of fault finding [see diagram (1)].

Please note that it does not matter which way round the power feed wires from track to station are connected.

**Coding:** Two coding operations are required for each station - to set the number coding for accessory commands and to set the "burst" or "continuous" power settings for each output on the station.

Instructions to set the number coding for the station are included with each station. As an example, let us say that we have coded the station "No. 1", outputs from this station become 1, 2, 3 and 4. If we had set the station coding to "No. 8", the outputs from the station would become 8, 9, 10 and 11. "No. 46" station has output numbers 46, 47, 48 and 49. And so on - its simplicity itself. The benefits of this approach are that if the layout is gradually expanding according to a set plan, then provisions for inserting additional stations into the system can be made at the earliest stages. The stations do not have to be consecutively numbered. It is possible to have only two stations on a layout answering to the codes "1" (outputs 1, 2, 3, 4) and "96" (outputs 96, 97, 98, 99). Secondly, each output can be coded independently for "burst" or "continuous" power requirements.

As with HM5000 loco modules, one standard station is supplied which the consumer codes to his particular requirements. Each station can be reset at any time to respond to a different code number or power setting.

Finally, another way to operate two points, from the same command is to overlap the coding of two stations: station (a) coded to respond to 1, 2, 3, 4 and station (b) coded to respond to 4, 5, 6, 7. Two separate functions are then operated by depressing Key '4'.

**Operation:** The control commands are already incorporated into the HM Unit. Simply input the call-up code, operate the correct command key and the point will change. For point 69, the sequence would be to press keys **6 9** and then whichever of the command keys that will switch the point into the required direction **◀** or **▶**.

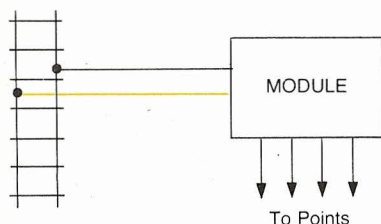
It is a good idea to specify a particular direction or mode of operation for the command keys. For example **◀** could always be "Main"; **▶** would then always be "Branch". Alternatively, **◀** could specify that the point is set "away" from your control position and **▶** "towards" your control position. Many other permutations are possible - a simple mimic diagram with direction signs on it is yet another. A little thought will indicate the best type for any particular layout.

As a safeguard, the station when providing power for a point only gives a single **measured** burst of power. Inadvertently holding down the command key will therefore **not** burn out your valuable point motor. If you press the wrong command key, and try to switch the motor to the direction in which it is already facing, this micro-seconds measured pulse will still be fed to the motor, but is of such short duration that no harm should be done.

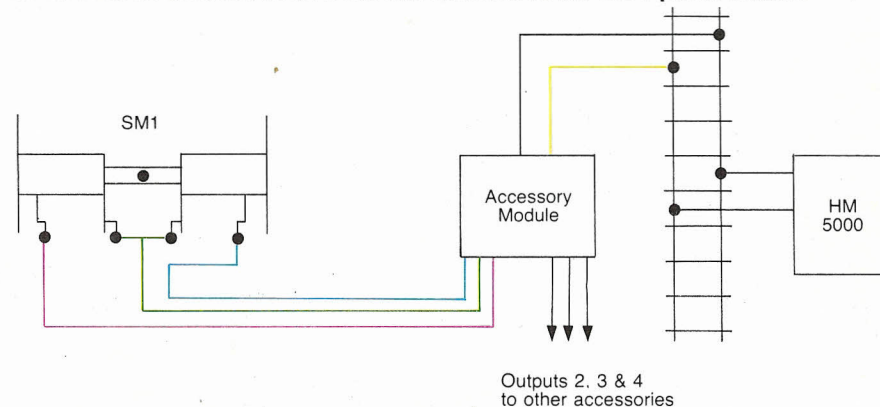
Finally, to ensure that the point switches in the direction required on the given command, before permanently fixing the station output leads to the motor, carry out this easy test.

Attach the output leads to the motor by wrapping. Then issue the command and try the point two or three times. If all operates satisfactorily and in the direction required **for a given command key** (e.g. **◀** for mainline running), fix permanently. However, if the direction required when pressing the command key is wrong, simply change over the two outer wire connections to the point motor (the centre of the three-wire ribbon cable is the return). The point will now respond correctly to the given command key. Diagram 2 shows these connections for the SM1 Hammant & Morgan Point Motor. The same principal applies to all 16v AC point motors and the **outputs** from the Accessory station can be considered to have similar attributes to other 16v AC accessory control systems from the wiring connections viewpoint.

**DIAGRAM 1.**  
Connecting your Accessory Module



**DIAGRAM 2. Connections from the module to an SM1 point motor.**





## HM3000. The ultimate control of a single train.

Following the call over recent years for greater detail on locos and rolling stock there has grown a demand for total control over a single loco, akin to the real thing.

Utilising sophisticated electronics the HM3000 provides you with the ultimate in braking, momentum simulation (inertia) and auto power regulation.

**Auto Power Regulator (A.P.R.)** This feature guarantees smooth control over all 12v DC motors, no matter what make or quality. It actually tunes your controller to the characteristics of the train you are operating.

Gradients no longer present a problem. The loco speed sensor compensates for unwanted speed changes caused by variations in load. A two way rocker switch enables you to dispense with this facility if you so wish. (This facility must not be used with Lima N gauge locos).

### Variable Momentum Control (V.M.C.)

The weight of the prototype is simulated by setting this control.

Set it at Minimum for locos which accelerate quickly, i.e. Diesel Multiple units. Use at Maximum for slow heavy loads, i.e. long iron ore trains.





### Regulator Control and Brake Control

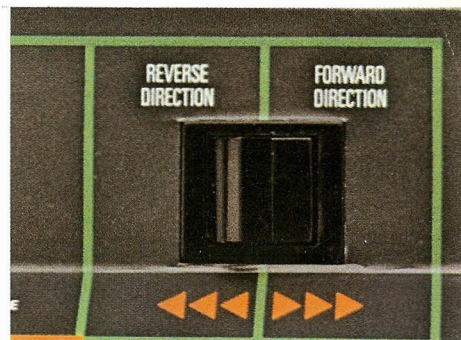
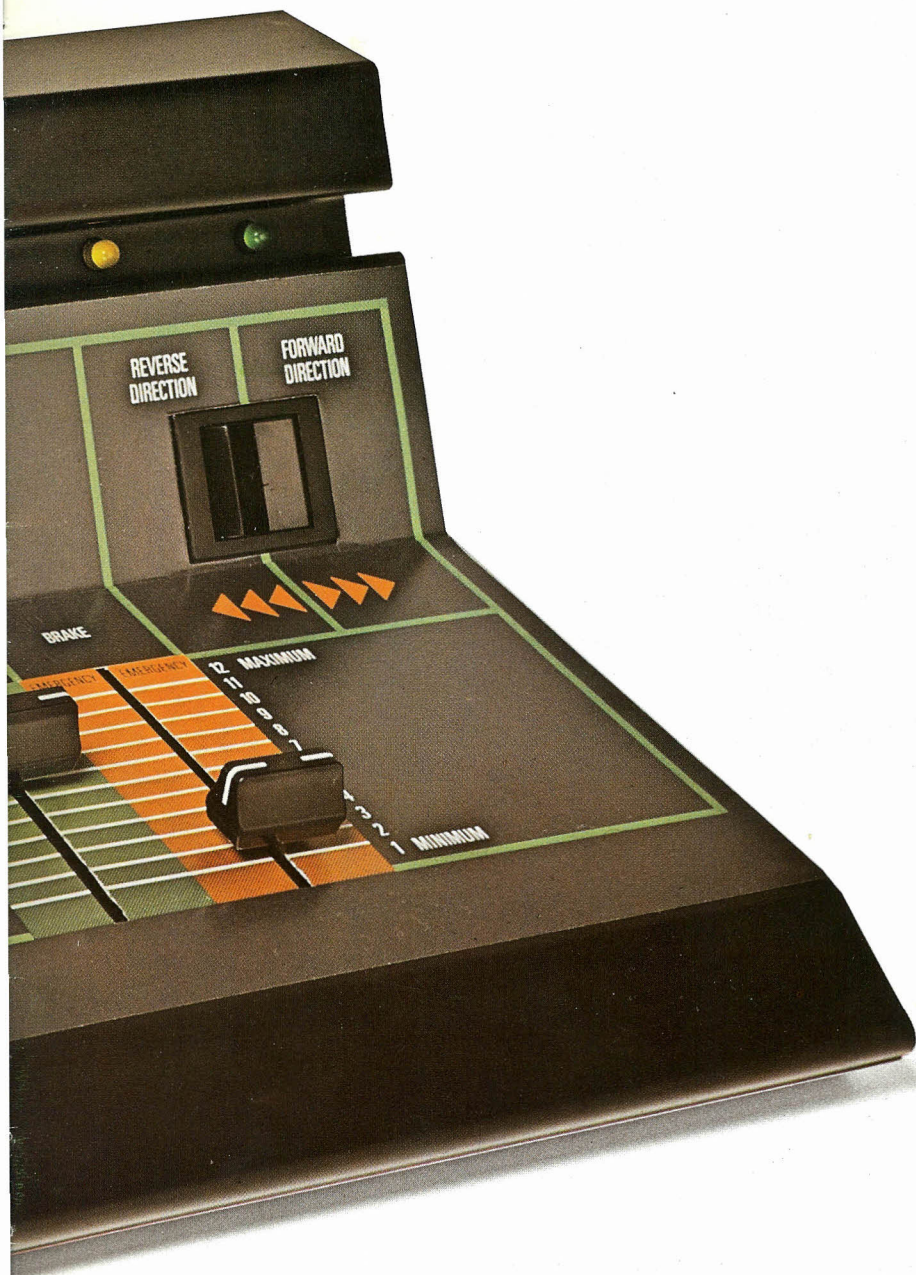
The power regulator determines the eventual speed of the train from minimum through to maximum. Without V.M.C., the regulator directly controls the loco speed. With V.M.C. selected, the loco will coast for some considerable time after the regulator has been returned to minimum.

In this mode, gentle application of the brake will slow the train; the more the brake is applied, the faster the train will

decelerate. The brake control is useful when pulling into stations (just like the real thing). For emergencies, slide the control into the stop position and the train will halt immediately. The brake overrides all other controls.

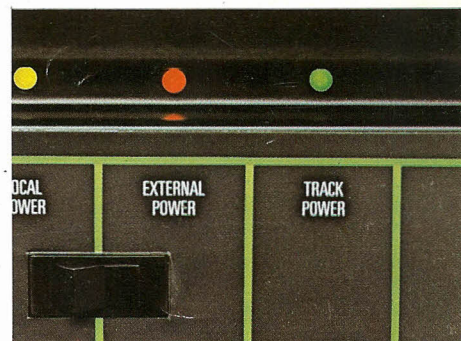
If the V.M.C. is switched off, the brake and regulator can be used together to give a slow, precise control for shunting operations.

Both regulator and brake are operated by slide controls that give extremely smooth response.



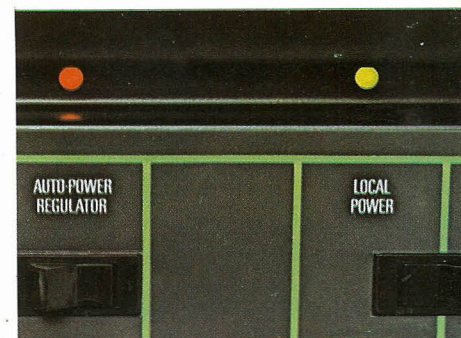
**Forward/Reverse Direction** A three position switch (centre off) determines the direction of the loco by reversing the polarity of the outlet rear terminals. The centre off position ensures that the locomotive motor cannot suddenly be switched from one direction to another, and thus improves motor life.

**Control Position Indicator** An illuminated display panel using LEDs (Light Emitting Diodes) shows at a glance the Functions selected. These include track power, direction and overload indication.



**Local and External Power** The HM3000 is suitable for N, HO, OO, O and even gauge one. Should the controlled power required be more than 1 amp, an external (additional) transformer can be connected at the rear with an output of up to 20v A.C. at 3 amps.

Banished from the house? No problems! Provided that the unit is under cover, the HM3000 is thus suitable for use with large garden layouts.





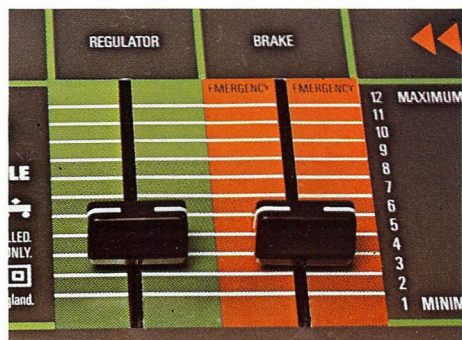


### Variable Momentum

Allows speed to build up gradually, thus simulating the weight of a real train.

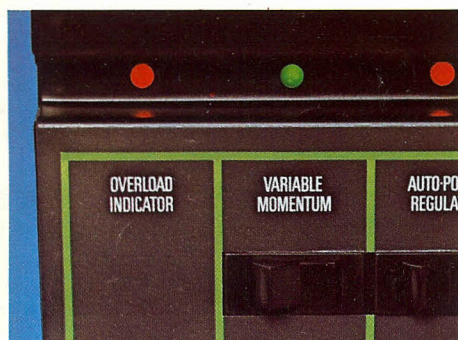
Can be switched off for shunting operations.

**Safety** The HM3000 is made in durable steel and finished in black. Built to BS4435, it is double insulated and fitted with a two core mains cable. Separate thermal cutouts protect the AC outlet and the DC controlled outlet which is also protected by an electronic cutout.



**Regulator Control** Slider control gives infinite response from full off to full on. Train will coast if no braking is applied with momentum selected.

**Brake Control** Adjustable slider gives a complete range of brake force from slight retardation to full emergency stop. Can be used in conjunction with the Regulator for even finer control.

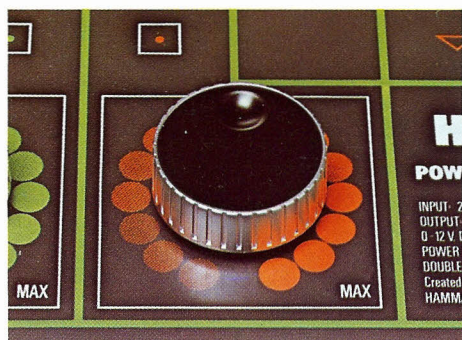


The overload LED illuminates if a short circuit occurs and will go out when the fault is corrected.

By using the above features in any combination, precise control is at your fingertips.

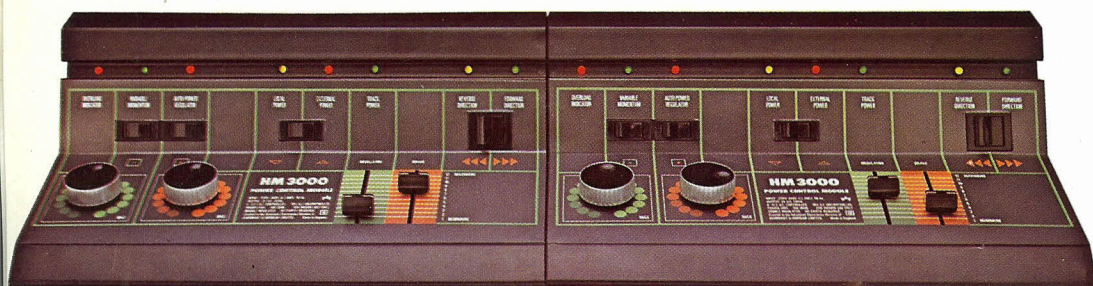
You are in the drivers seat. A unique and truly exciting experience.

**16v AC Uncontrolled Outlet** This outlet (1 amp) is for use with accessories such as point motors, colour light signals, the HM Relco etc. Alternatively, this outlet provides enough power for independent control of another train by using the HM Walkabout unit.



### Auto Power Regulator (APR).

Gradients are no longer any problem, stalling or running away on hills is completely eliminated – adjustable for any loco from 'Z' Gauge to Gauge 1. Locomotive speed sensor automatically compensates for unwanted speed changes. (Over-ride switch also incorporated).





## HM Walkabout. Puts precise control into the palm of your hand.

New from the Advanced Electronics Division of H. & M.; The WALKABOUT. For the first time H. & M. have produced an electronic hand held unit which incorporates 3 inertia settings, with regulator and brake control.

The WALKABOUT is a "consort" unit which because of its unique design can be connected to any suitable 16v AC or 12v D.C. supply.

The WALKABOUT puts precise and accurate control into the palm of your hand. We are sure it will give you years of pleasure 'riding the footplate'.

**Connections** The handheld WALKABOUT comes complete with a two metre length cable. The operator is therefore free to deal with any emergencies on his layout (de-railed wagons, sticking points or the family cat!) without letting go of the controls.

The cable is made up of 4 wires. Two of these wires (input) are connected to the 16v A.C. or 12v D.C. uncontrolled outlet of a suitable transformer. The other two wires (output) take the controlled 12v D.C. current from the WALKABOUT to the track.

For use with the WALKABOUT and available separately are wanderplugs and sockets. By positioning several sockets around the track and connecting to the transformer it is possible by plugging in the WALKABOUT, to control chosen circuits at close quarters. This is ideal for delicate shunting, etc. A really exciting prospect.

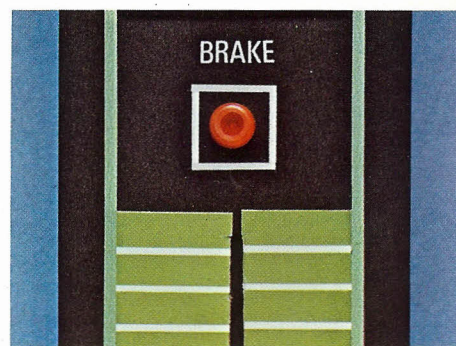
The WALKABOUT is an ideal consort unit for use with the HM3000. Simply connect the WALKABOUT'S power input wires to the HM3000's 16v A.C. uncontrolled outlet. The WALKABOUT output leads can then be connected to the chosen section of track, either directly or by using the wanderplugs and sockets. Main line trains on a continuous circuit could then be operated by the HM3000, perhaps utilising the Auto Power Regulator. The WALKABOUT would then be used for branchline trains or in the shunting yard. There are many layouts which use conventional controllers and to change fully to electronic control, with all its benefits, can be costly. The WALKABOUT allows the modeller to enter the field of electronic control with the minimum of expenditure. The unit is suitable for use with all controllers which have a 16v A.C. or 12v D.C. outlet of ½ amp. or more. A large separate 16v A.C. or 12v D.C. transformer can be used to power several WALKABOUTS. Care must be taken to ensure that the number of WALKABOUTS used do not exceed the amps the transformer can deliver. As a general rule allow ½ amp. per loco. but please note that if used in this way the Walkabout is unsuitable for common return systems.

**THIS UNIT MUST NOT BE CONNECTED TO THE MAINS.**

**Regulator Control** The Regulator is a slider control.

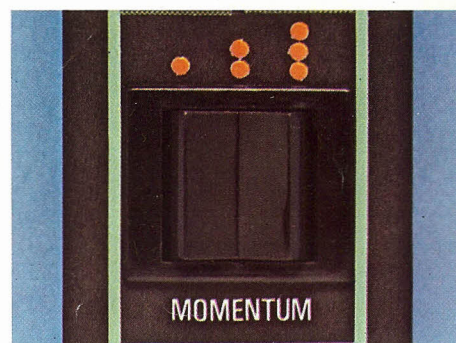
When the appropriate inertia has been selected set the Regulator to the approximate speed level required. Slowly and smoothly the loco will move off and accelerate.

The use of a slider permits smoother control than is normally associated with rotary units, and is much more convenient for a hand-held controller.



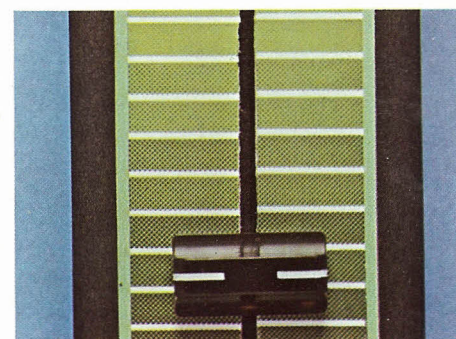
**Brake Control** To reduce the coasting time operate the brake control button to bring your loco to a gradual and controlled halt. If you require the loco to slow down, release the brake when the desired speed is reached. Use any combination of the above features to obtain the best performance from your loco.

**Forward/Reverse Direction** A three position (centre "off") switch determines the direction of the loco.



**Momentum Control** There is a choice of three momentum settings Min – Half – Maximum. A three position rocker switch selects the function required. The minimum setting will give instant response suitable for shunting. Use the Half setting for trains that accelerate quickly, e.g. Passenger trains. The maximum setting is for slow acceleration such as one would find with heavy goods trains.

The WALKABOUT, in the distinctive black case, is easy to handle and operate.







The unscheduled stopping and starting of a model train can be a most irritating problem. This is frequently caused by particles of dust, grease and grime adhering to the track. The power may then be unable to pass from track to the locomotive, or at best be severely restricted. Many layouts have sections which are difficult to reach and therefore are seldom cleaned.

With the new HM Relco, the chore of cleaning the track is greatly reduced. This is how it works. The HM Relco unit senses dirt on the track from the feedback it gets from the loco. It then passes a high frequency current between the loco and the track. This breaks through the dirt and allows the D.C. current to flow unhindered to the loco. No jerks, just continued smooth operation.

The high frequency current generated will in no way harm your loco and is perfectly safe.

An orange neon light on the face of the unit will light up when the HM Relco is functioning. If this light is continuously lit, when the loco is on a particular

stretch of track, cleaning is then recommended.

On the reverse of the unit are two pairs of input tabs and a pair of output tabs. The first pair is for a 16v AC uncontrolled input to power the unit. The second pair is the input for the power leads from the controlled 12v DC Controller. These are attached internally to the deposit sensor. The pair of output tabs are connected by leads to the track. The unit can be mounted on top or by the side of all our Electronic and Resistance Controllers, provided they have a 16v AC uncontrolled output.

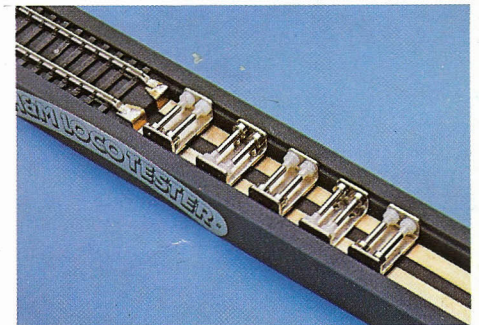
To obtain the full benefits of this unit it is advisable to have an HM Relco attached to each controller – as a simple rule of thumb, use an HM Relco unit for each circuit.

This unit is not a substitute for track cleaning, but will enable you to postpone cleaning for much longer intervals without any ill effects, thus enabling you to spend more time running a railway. Not suitable for use with the HM5000.

Any locomotive, just like a car, requires running-in when new, regular maintenance and the occasional repair in order to keep it in tip-top condition. Unfortunately such a programme is all too rare.

Long ago, car maintenance engineers solved this problem with the invention of the 'Rolling Road'. Locomotive engineers soon followed suit, but alas the model railway world has lagged behind. Until now! The HM Loco Tester has arrived. Suitable for all 'OO' gauge locomotives, tanks, tender drive units, etc. etc., it will greatly simplify the task of locomotive maintenance. Manufactured on a solid seasoned hardwood base, the unit comes with track and power contacts already assembled and five pairs of rollers mounted in 'U' frames of hardened steel. Operation is simplicity itself.

1. Connect your 12v DC power supply to the contacts provided.
2. Arrange the rollers – one set beneath each pair of driving wheels (additional sets can support bogies if necessary).
3. Ensure that the insulated ends of the rollers are arranged such that power can feed through the wheels to the



motor. In the case of certain locos (e.g. some tender drive units) all the insulated rollers will be on one side. Full instructions are included with each unit.

Scratchbuilders will find this piece of equipment particularly useful for "tweaking" running gear to achieve perfect mesh, pick-up contact, etc. Additional sets of rollers may be obtained from the H. & M. Service Dept.





The H. & M. range of Resistance Controllers provide a basic form of control in an easy to operate style. Favoured by the beginner for his first train set, is the **Rocket**. This unit controls the speed of a single train by the turning of a control knob. Turn to the left and the train starts operating. Turning the control to the right changes the direction, having gone through the "OFF" position first, thus eliminating direction changes at high speed. We consider this is a most important feature particularly for train set users. For a motor to have its polarity changed without stopping first can do nothing but harm. This feature is common throughout all our 12v DC controllers.

The **ROCKET** is made in tough blue polypropylene. The eyeletted construction allows for easy fixing to the baseboard.

If you require power to operate accessories, then the **Flyer** would be more suitable for your first train set. As well as running a single train, it has separate 16v AC sockets for signals, lights, points, HM Relco, etc.

This unit is made from tough durable steel as are the rest of our controllers.

The H. & M. Multipack "plug-in" system is designed so that as your train set grows, you are able to add controllers at low cost.

The **Clipper** is the first controller in our range which shows the distinctive Multipack design. This unit is designed for the operation of a single train and accessories.

Because of its power (1½ amps.) up to three trains can be operated by plugging in two Multipack DC Controllers.

As well as this facility the Clipper has a Wave Switch and a Resistance Switch. For normal main line operation the Wave Switch should be on Full. Set in the half position, the Wave Switch is capable of allowing very slow controlled running, combined with good pulling power.

"N" gauge motors consume very little current and tend to overheat if used for prolonged periods on half wave. We therefore recommend that the half wave is not used with "N" gauge.

The Resistance Switch has two settings – High and Low – enabling the controller to be switched to the motor in use.

The Resistance Switch should be set to High for high resistance, low current motors, such as normally found in "N" gauge locos. It should be set to Low for motors requiring more current; most "OO" gauge motors will require this setting.

It may be found that for some "OO" locos a better control is achieved with the setting on High. We suggest that you use this switch in whatever setting you find your loco is best suited. No harm can be done.

In addition, the Clipper has 12v DC uncontrolled and 16v AC outlets for accessories.

The **Multipack DC controller** is an "add on" or consort unit which enables a second or third train to be operated by a simple plug-in method. Controllers are attached to the 12v uncontrolled outlet of the Multipack range.

This unit also incorporates a Resistance switch for control of N or OO/HO gauge locos, and a self resetting thermal cutout.

The DC Controller has an uncontrolled 12v DC outlet on its right side, so that another DC controller or other accessories can be added.

Any number of these consort units can be plugged together, providing the transformer used has enough 12v DC power. As a general rule allow ½ amp. per loco.

**THE D.C. CONTROLLER MUST NOT BE CONNECTED TO THE MAINS.**

The first layout in the average household is normally an oval with sidings. It is not very long before this proves to be insufficient, especially when a second loco is purchased. A second oval is then

added to the outside and is linked to the inner oval by points. This gives the operator the opportunity to run two locos simultaneously.

The most obvious choice of controller for this type of layout would be the H. & M.

### **Duette**

The Duette is unique in our range. It can be likened to two Clippers in one unit with the added benefit of a cost saving.

The Duette controls two trains independently of each other. Also, the Duette has provision for accessories, signals, points, turntables, lights, HM Relco etc., and further expansion. Each control has a Wave and Resistance switch. The total power output for each controller is 1 amp. With the addition of one D.C. Multipack Controller a third train can be operated.

The Duette has a 12v DC uncontrolled output on the right side, where a Multipack DC Controller can be located, and a 16v AC outlet on the left for accessories.

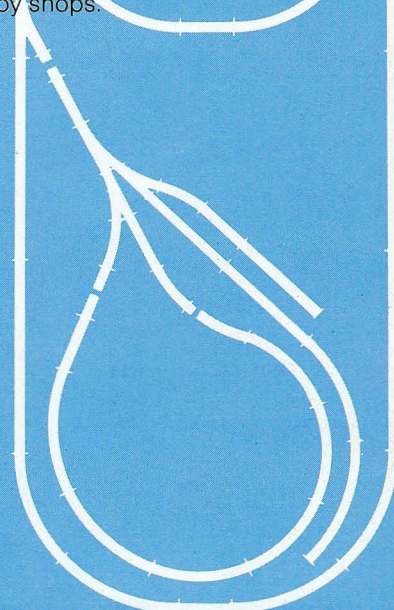
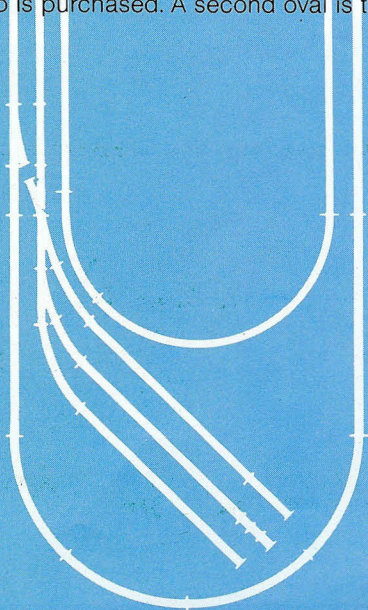
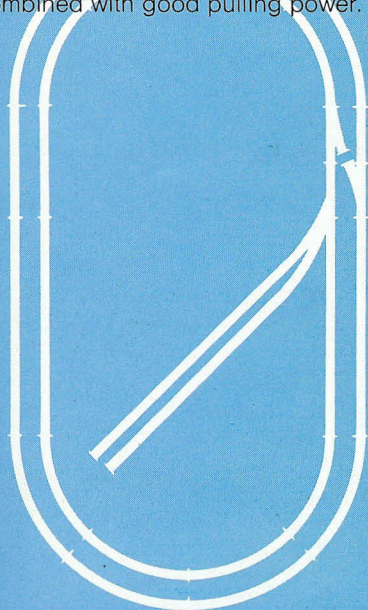
For your safety, H. & M. have positioned these outlets so that the Multipack AC and D.C. units cannot be incorrectly connected.

Power to the track is supplied from terminals at the rear of all the above units, except the Rocket, as the terminals on this unit are at the front.

All H. & M. Resistance Power controllers are fitted with Double Insulated Transformers and built to BS4435.

They come supplied with a 2 core mains lead. Each unit is protected by a self-resetting thermal cutout.

For over twenty years H. & M. have been developing and producing Variable Resistance Controllers to very stringent quality and safety standards. These units are simple to operate and can be used with all "N", "HO", "OO", and "O" gauge 12v Electric trains. They give extremely good control and are highly recommended by all good Model and Toy shops.





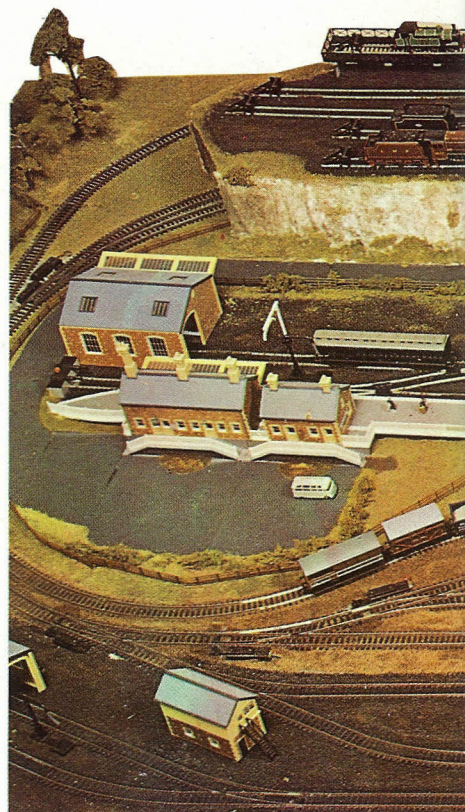
### H200 The Rocket

For the Beginner. Full Speed Control Forward & Reverse. Single Knob Operation.  
Simply plug in Mains Lead, then connect controller to track using connecting wires provided. Easy fitting to baseboard.  
Input: 220 - 240v AC Mains.  
Output: 12v DC Controlled  $\frac{1}{2}$  amp.



### H201 The Flyer

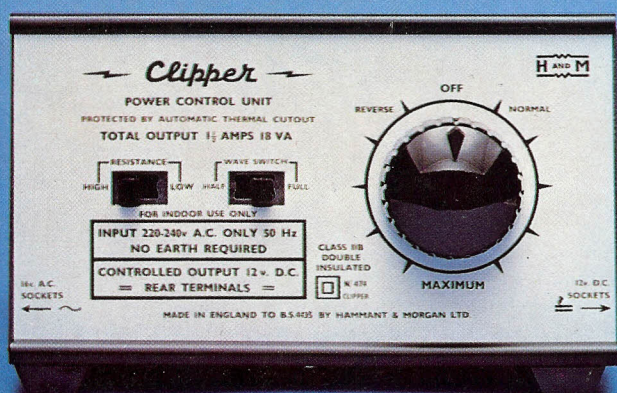
16v AC Uncontrolled Sockets provide power for Points, Signals, Lights, HM Relco, etc., Ideal for first layout. Steel case designed for strength and durability. Automatic overload cutouts with no need to reset. Double insulated.  
Input: 220-240v. AC Mains.  
Output: 12v DC Controlled  
16v AC Uncontrolled  
 $\frac{3}{4}$  amp. total.



### H202 Clipper

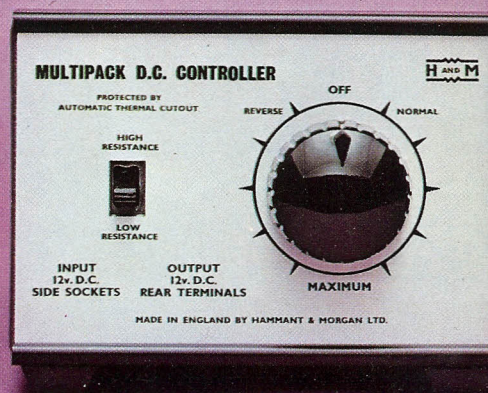
Single train control with ample power for expansion. Two DC Control Units can be added, Power for Accessories. Two switches to obtain better control. Resistance Switch - HIGH/LOW to suit all N and OO gauge locos.  
Wave Switch Full for normal running. Half reduces power for shunting. Protected by

Automatic thermal cutout.  
Input: 220-240v AC Mains.  
Output: 12v DC Controlled at Rear Terminals  
16v AC Uncontrolled L/H side sockets for accessories  
12v DC Uncontrolled R/H Side Socket.  
1  $\frac{1}{2}$  amp. total



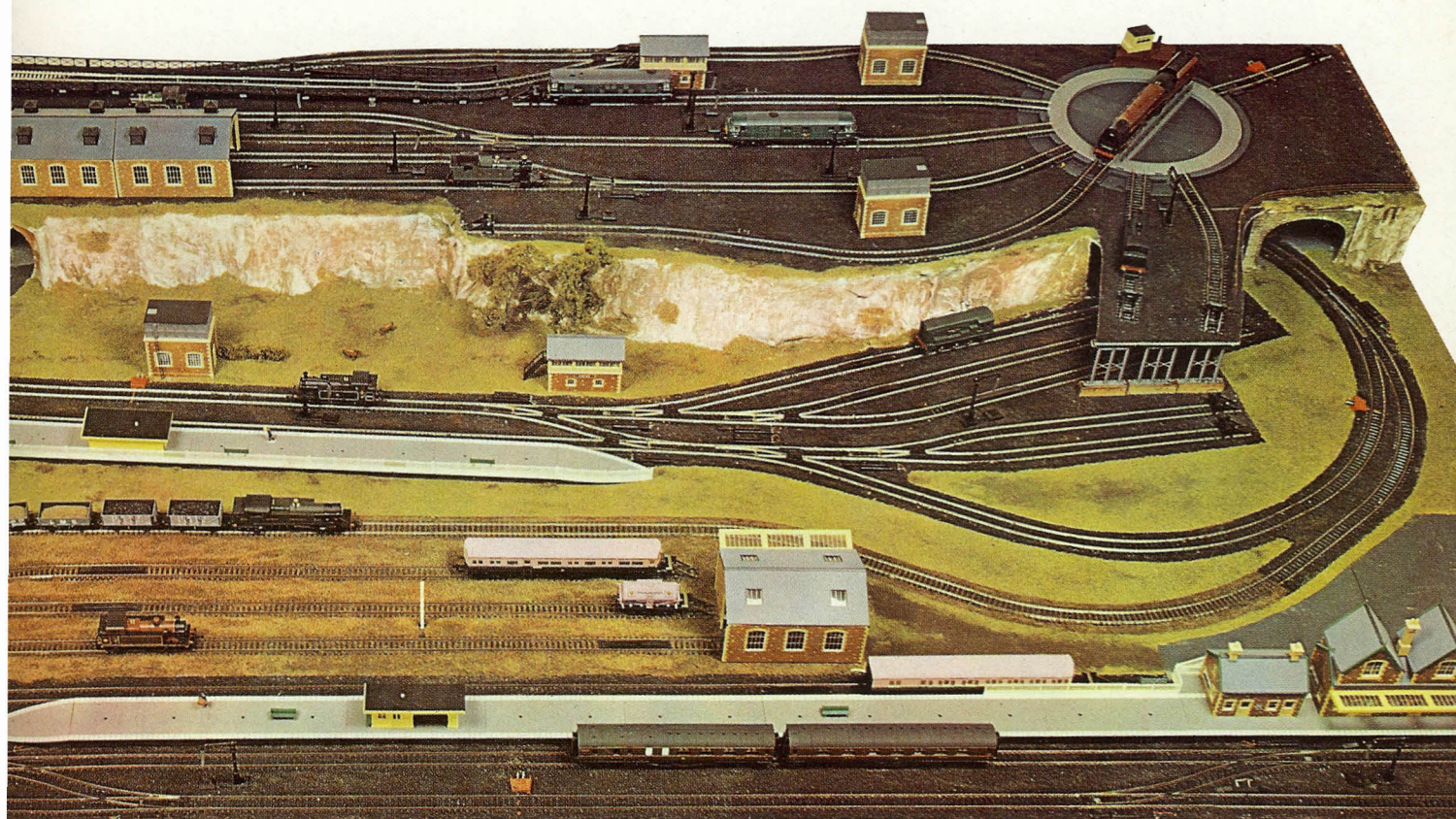
### H352 Multipack DC Controller

This unit plugs on to the R/H side of the Clipper and Duette to give control of another train. No wiring necessary except to track. This unit is for 12v DC Input and must **NOT** be connected to the Mains. Resistance Switch ensures smooth operation of DC Motors up to 1 amp. working load.  
Input: 12v DC Uncontrolled L/H Side Sock  
Output: 12v DC Controlled Rear Terminals  
12v DC Uncontrolled R/H Side Sockets.





Based on Plan 9/5 Hornby Trackplans  
5th Edition.



## H204 Duette

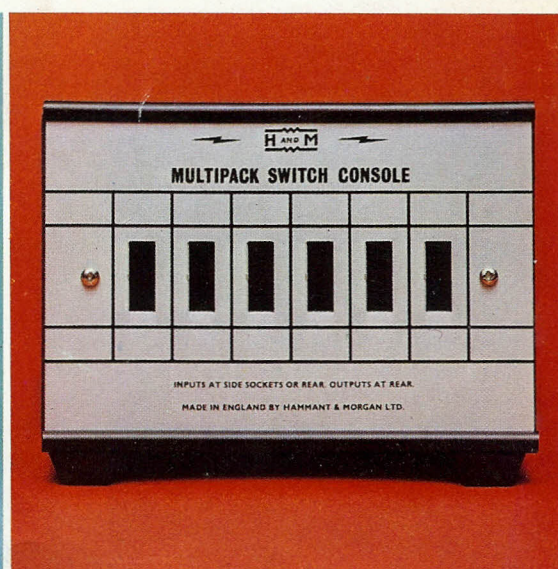
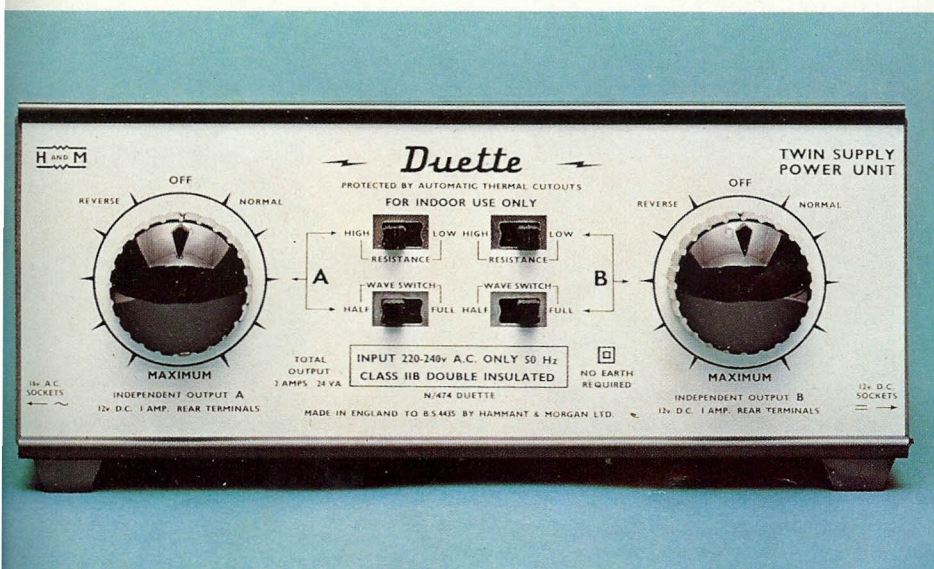
Built to save you money, this unit incorporates independent twin train control with facilities for accessories and a third train control at a later date. Separate dual control means that the unit is suitable for common return. Separate High/Low Resistance Switches and Wave Switches for each control. Input: 220-240v. AC Mains.

Output: 2 Independent 12v DC Controlled Outputs at rear terminals.  
16v AC Uncontrolled L/H side sockets.  
12v DC Uncontrolled R/H side sockets.  
1 amp. from each controller or side socket.

Uncontrolled outputs are not suitable for common return circuits.

## H417 Multipack switch console unit

A neat and attractive console which provides panels for mounting FS2 switches for point operation or SL4 switches for lights, turntables, etc. Just purchase the exact number of switches you need for your accessories and fit them using the diagram provided with the console. 16v AC **INPUT** is situated on the left of the unit so that it will plug straight into the side of a Clipper or Duette.





**Panel Mounting** Before you start to wire your layout, draw up a wiring diagram. It is much easier to alter a mistake on a plan than to clamber underneath a layout with a soldering iron gripped between your teeth.

Once you are happy with the circuit diagram you are ready to commence wiring. Refer to the H. & M. Accessory section for multistrand wire and connection blocks.

A soldering iron would be handy as well. Try to avoid the type used by shipbuilders! A 25 w with a 1/8th in. bit should be more than adequate. However, some H. & M. products have plug-in connections that will greatly simplify the task.

When you start wiring, colour code your wires for identification as this is most important for initial wiring and maintenance. Wire the layout up in stages, checking every section as you go. Time spent in these early stages will pay dividends.

Be tidy with your wiring underneath the baseboard. There is nothing attractive about a rats nest. Do not overtighten the wires. If there are several going the same

way, bind them together. There's strength in numbers. Try to use common connections where possible by using the terminal blocks. This will save you time, money and wire.

Poor connections can create hard to find faults. So take your time, and check each connection **electrically** as it is made.

For the modeller who wishes to construct his own control panel as well, H. & M. produce a range of Panel Mounting equipment.

As with the layout, draw a diagram of your control panel. Decide where the controllers and switches are going to be situated.

When you are satisfied, construct your panel from thin board as this will make it easy for you to obtain access to terminals that may need soldering.

The wiring up of the controllers, etc., is very important.

Remember, keep wiring simple and tidy by using common connections where possible.

Think ahead. Leave space for another controller and switches. You may wish to extend your layout later.

The CU1/LC is ideal for panel mounting.

The choice of thermal cutout is left up to you. The resistance mat fitted is Medium, but this may be changed to suit different gauges of 12v model railways.

The panel mounting of point motor switches (FS2) and ON/OFF/ON switches (SL4) is made simple by using the Switch Console Panel.

Try to be systematic when wiring the FS2 to the point motors, e.g. up for the Main line, down for the branch lines, goodsyards, loco sheds, etc., Use one FS2 to change two points where appropriate, this could save a switch and the associated wiring.

A diagrammatical drawing of the layout showing points, with numbers corresponding to the switches, enables you at a glance to know what switch is for what point. Keep this drawing close to the switches.

The panel mounting SB6 is a block of 6 ON/OFF switches, most suitable for track isolation.

When constructing your panel and wiring your layout, take your time, make good connections and solder joints. Above all, always keep a clear wiring diagram of your layout.

### CU1

This is the basic controller as used in all H. & M. variable resistance control units. It provides smooth progressive control for your locomotive. It has a single knob control with polarity reverse. All connecting leads are fitted and no additional switches are required. Longer leads can be easily fitted by the customer, so that the unit can be hand held for remote operation.

The smart metal case is finished in instrument grey and a 1 1/2 amp. overload cutout is incorporated. Fitted with a medium resistance mat for motors of 0.3 - 0.5 amp. rating, it is thus suitable for current "OO" models from major

manufacturers. Alternative resistance mats are available for motors with different current consumptions; and can be fitted at the factory on request. A small charge will be made for this service. Input: 12v DC Uncontrolled

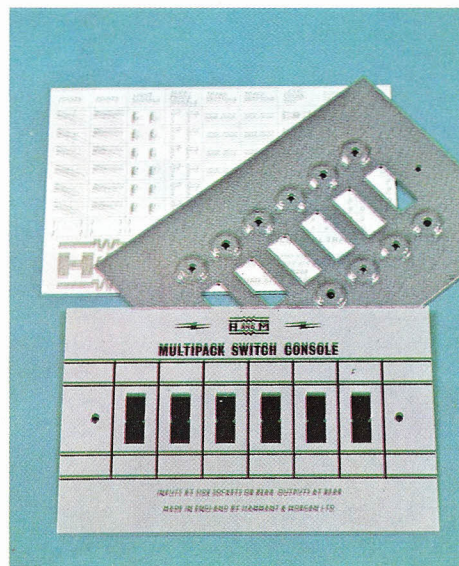
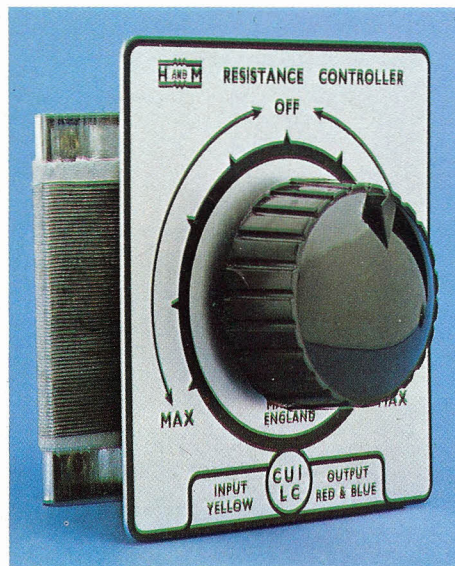
**CU1/LC** Output: 12v DC Controlled.

Specifications are the same as the CU1 but supplied without case and thermal cutout. Simple to mount and connect up to 12v D.C. power source, this unit is custom made for panel mounting. The medium resistance mat can be changed to suit all gauges.

THESE UNITS MUST **NOT** BE CONNECTED TO THE MAINS.

**Switch Console Panel** A neat panel for mounting 6 FS2 and SL4 switches in whatever sequence required.

The switches are screwed into the base plate and the assembled unit mounted from behind the panel. An aluminium nameplate is placed over the assembly to achieve a professional appearance. The Switch Console Panel is provided with a Multi-symbol transfer sheet so that the appropriate switches can be marked with their particular function.





## FS2

This switch allows a quick burst of current to pass as the lever is moved from the Off position, through the On to the Off again, in one motion.

This provides enough current, for a brief moment, to operate a point motor, which in turn changes a point.

By reversing the switch motion the point is changed back again.

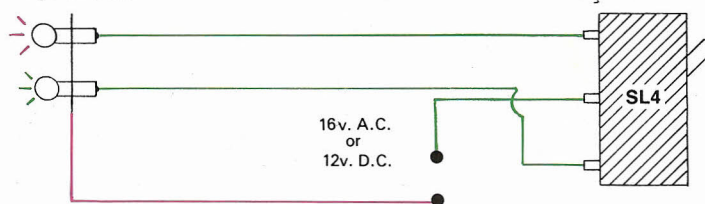
It is advisable to have these switches wired up in such a way that the direction of the points can be determined by the switch position, e.g. Up for straight on, Down for the turn off.

The lever is moulded in white and the switch body is made from metal. For good contact the switch assembly is heavily zinc plated. The FS2s contacts are self-cleaning.

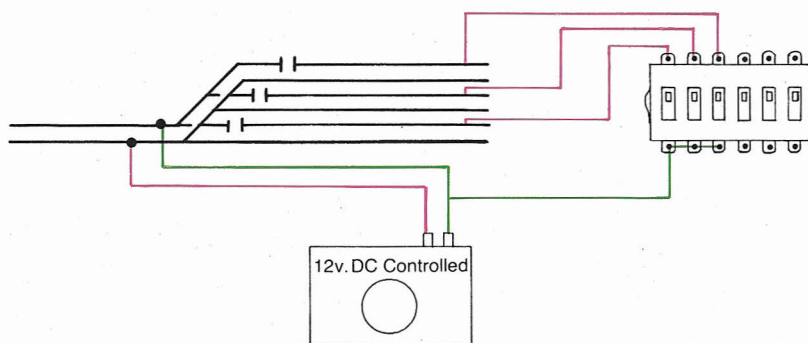
For quick easy mounting, the switch can be fitted into the Multipack Switch Console or the Switch Console Panel.

## SL4 ON/OFF/ON Switch

This switch can be used for the control of SM3 point motors, but is more normally used for the control of colour light signals, isolating sections, cab control systems etc.



## SB6 Block of 6 ON/OFF Switches



## SL4

The SL4 is an ON/OFF/ON switch and can be used to switch power from one circuit to another.

It is especially suitable to operate 2 way coloured light signals. Up for red, through Off and down for green. As well as this it can be used to switch on lights, turntable, level crossings and other electrical accessories which use 12v D.C. or 16v A.C. power. It may also be used to isolate track sections.

The SL4 may be used to operate an SM3 point motor utilising the SM3s built-in switch.

The lever is moulded in black to distinguish from the FS2. Like the FS2, the switch is made from heavily zinc plated metal with self-cleaning contacts. The use of the Multipack Switch Console or the Switch Console Panel, makes the fitting and operation simplicity itself.

## SB6

A neatly moulded switch block incorporating six ON/OFF selector switches, ideal for isolating track or switching lights.

Snap action switch levers in black polystyrene.

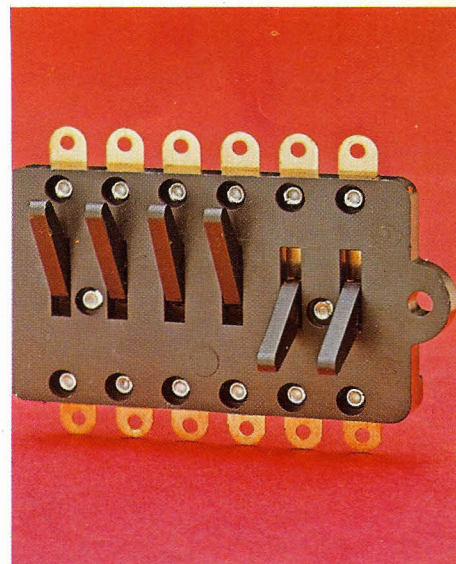
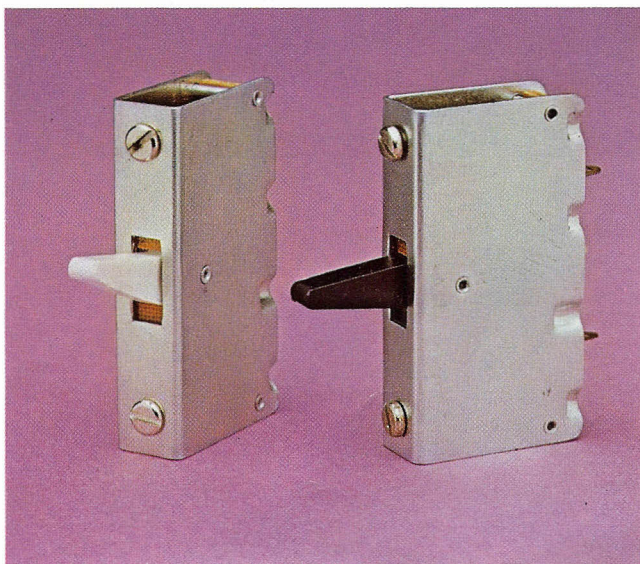
For panel mounting only – Fixing centres 2¾ inches.

## Switches

For Points FS2 Flash Switch — white lever.

For Colour Light Signals, Turntables, and other accessories SL4 Selector Switch — black lever.

For Isolating Tracks SB6 Switch Block — set of 6 ON/OFF switches.





Too often frustration arises when trying to fit your model railway layout to your control equipment because the standard components produced by manufacturers do not suit an individual's requirements. When you are connecting wires the correct way, or else they are always in the

same colour – which causes confusion with the mass of wire hidden underneath the layout. Even the connection of wires to sockets or power clips can become a nightmare when one looks for tags or pins to do the job only to discover that nothing is suitable.

The H. & M. Accessory Range is designed to overcome these difficulties by the provision of a complete system of electrical components which can be tailored to suit your layout.

to conform with the Consumer Protection Act and Toy Safety Regulations, no spare parts will be supplied by Hammant & Morgan Limited for the internal repair of mains power units. Specialised spares:

- Link Set for SM3 Solenoid Motor
- Deck Assemblies for SM3 Solenoid Motor
- Thermal Cutout – Autotherm 15 (1½ Amps)
- Thermal Cutout – Autotherm 30 (3 Amps)
- Thermal Cutout – Autotherm 40 (4 Amps)

- Pair of Mounting Brackets for Multipack Units
- Pair of Output Terminal Nuts
- Spare Coil for SM3 Solenoid Motor
- Spare Coil for SM1 Solenoid Motor
- Control Knob
- Extra High (80 Ohms) Resistance Mat for Motors 0.15 Amps rating
- High (60 Ohms) Resistance Mat for Motors 0.15 to 0.3 Amps rating
- Medium (40 Ohms) Resistance Mat for Motors 0.3 to 0.5 Amps rating
- Low (30 Ohms) Resistance Mat for Motors 0.5 to 0.75 Amps rating
- Extra Low (20 Ohms) Resistance Mat for Motors 0.75 to 1.5 Amps rating
- Heavy Current (10 Ohms) Resistance Mat for Motors 1.5 to 3.0 Amps rating

**H 704 Red Wire – 15 Metres**  
Multi-strand (13/0.2mm) wire suitable for all track and accessory wiring, rated at up to 15 amps continuous current.

**H 705 H 706 H 709 H 711**  
H 704 in alternative colours.

**H 719**  
Handy tags push on to any 1mm (7/64") standard tab, as used to SM1 Point Motor.

**H 722 Sockets and Screws**  
In panel mounting sockets to accept the H 716 wander plugs. Suitable for plug-in connections for temporary or interchangeable wiring. Solder connections at rear.

**H 720 Connecting Pins**  
12 tough brass pins for connection to uncontrolled outlets on H & M Power units – especially for connection of slave control units.

**H 716 Wander Plugs**  
4 plugs, suitable for connection to Accessory outlets on H & M power units, or to the H 722 panel mounted output sockets. Neat solderless connection to wire for easy installation.

**H 718 Ringed Tags**  
12 tags which can be crimped or soldered to wires to form a more permanent connection to H & M control unit rear terminal – cannot come off without removal of terminal nut.

**H 714 Crocodile Clips**  
4 handy clips, easily attached to wires using screw provided, to give quick easy and tough temporary connection to track, controller, etc.

**H 721 Transfer Sheet**  
This set of transfers covers all the accessories likely to be required and enables you to augment your control panel with meaningful diagrammatic information on switch positions, etc.

**H 717 Spade Solder Tags**  
6 tags which can be crimped or soldered to wires to form a neat easily removable connection to a H & M control unit rear terminal.

**H 703 Ribbon Cable - 5 Metres**  
3 easily separated cores of PVC covered wire, each wire comprising 7 strands of 0.2mm copper wire, suitable for operation up to 1.4 amps. Not suitable for Mains wiring.

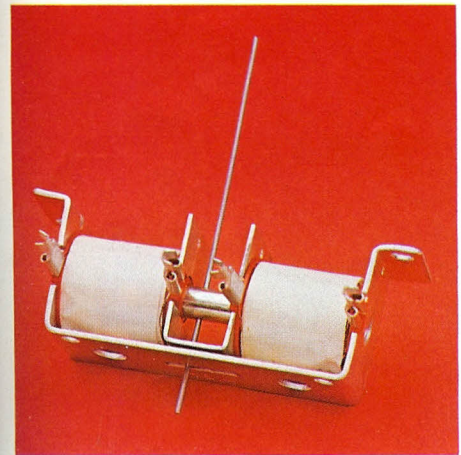
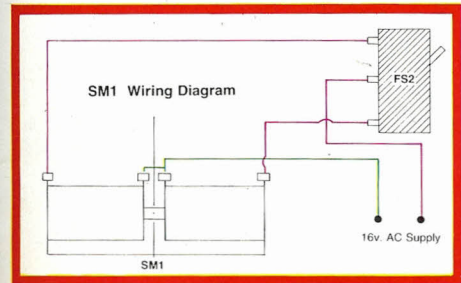
**H 712 Black Leads – 1 Metre**  
Two leads each terminated at one end with spade, for connection to controller, at the other end with pin to fit most track power clips. **H 713** As H 712 but available in white  
**H 715 Two position switch**  
A neat two pole rocker switch giving changeover contacts suitable for switching accessories such as lights, etc. Push fit into suitable panel cutout. Rated at 4-amps.





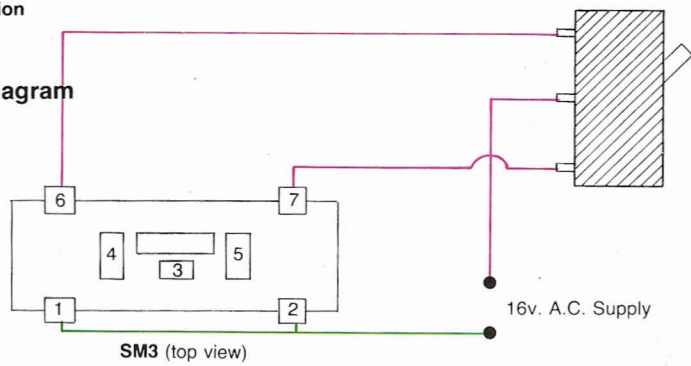
SM1

The SM1 is a truly universal point motor. The metal framed construction provides rigid fixing points for mounting above or below the baseboard. It has been designed to operate most major point systems without adaptors or additional accessories. The SM1 is supplied complete with wire terminal contacts for easier connections – no soldering is required. The SM1 has been designed to operate with the FS2 flash switch, but will of course operate with other makes of point switches. For mounting underneath the board the only hole needed is a slot 6mm. long, allowing the solenoid pin through to the point slide bar. Consequently there are no unsightly holes to disguise. The SM1 has a full 4 mm throw. Because of the easy fixing underneath the board, the removal of the SM1 is achieved without disturbing the track. Aboveboard operation can be achieved by utilising the wire link provided. Each coil is wound with high grade copper wire and can be replaced individually. The SM1 operates from a .75 amp. transformer 12 – 20v AC or DC. Each motor comes with full instructions for wiring and fitting, together with a 12 month guarantee.

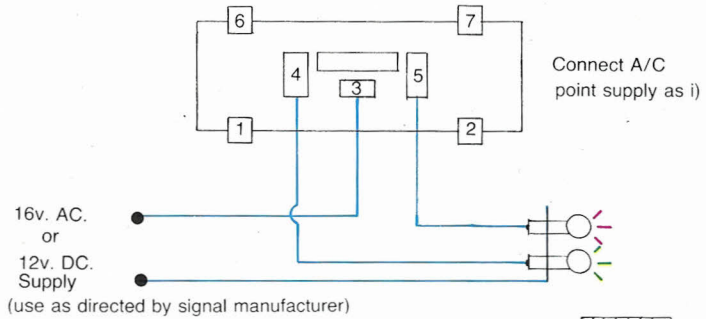


i) Point Operation

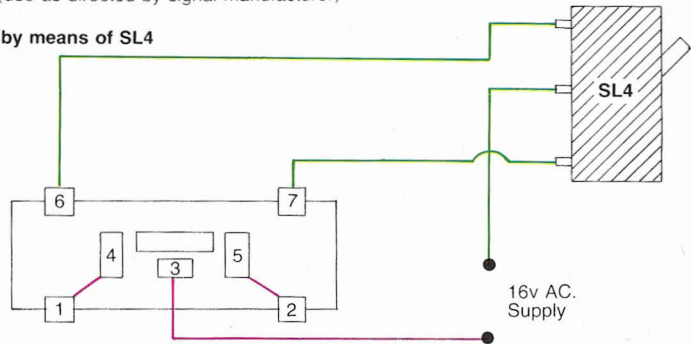
SM3 Wiring Diagram



ii) Use of integral switch for colour light signal operation.



iii) Use of SM3 by means of SL4



SM3

As with its little brother (SM1) the SM3 is of a metal framed construction making mounting above or below the board simple. The powerful SM3 is capable of operating two points which have been linked together. The SM3's self locking mechanism makes it ideal for use with points that are

not sprung loaded.

The crank is available to give 1/8" – 1/4" throw.

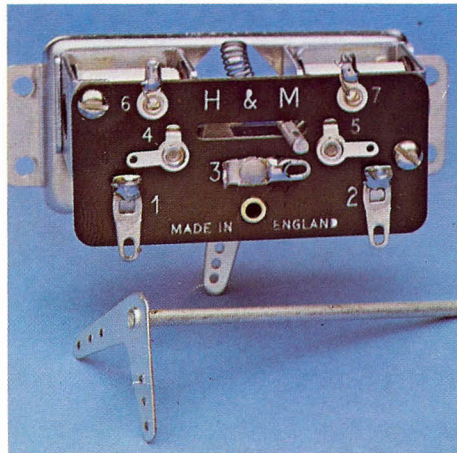
A 90° crank is supplied with the SM3 so that a link to a point or a semaphore signal can easily be made.

There is an auxiliary lever for hand operation.

As well as these features, the SM3 incorporates a Single Pole changeover switch. A signal wired to this switch will change when the point is changed, thus saving a switch and associated wiring. The FS2 is normally used to operate the SM3, but an SL4 may be used, utilising the Single Pole switch on the motor which will switch the point motor off automatically once it has finished its travel. A second switch plate can be mounted on top of the SM3, giving the facility for power to be switched to other parts of the layout or accessories.

The solenoid coils are made from high quality copper wire and can be easily replaced.

Each motor comes with full instructions and a year's guarantee.





## Woodland Scenics. Bring even greater variety and realism to your layout.

Even if you had to take out a second mortgage to refurbish your railway, it would be criminal to allow the small extra cost of scenic materials, or rather the lack of it, to spoil the finished layout.

What better way to show off your layout to its best advantage than to give it a natural setting. The location can make or break the visual achievement of the final scene.

For between £10-£15 a large layout can be transformed into a masterpiece in its own right enhancing your railway system. So why settle for anything less than the best?

Picture your style of railway in real life. Is it a familiar setting or one you long to escape to? Make a mental note of the season and maturity of the surroundings that suit your layout best.

Can you see a modern Spring scene with fresh greens, young trees and orchards of blossom? Or high Summer, parched fields and full trees giving lazy shade, while Nature recovers her territory? Do you prefer the glorious shades of Autumn, with ploughed fields, bushes and trees heavy with fruit, a peaceful and perpetual spot through centuries of progress. Perhaps the crisp beauty of Midwinter?

Yes. Then why spoil it?

Woodland Scenics have designed a complete range of materials to fire your imagination and allow your creative ability to run riot. No creative ability! Try Woodland Scenic and you will see how wrong you are.

Simply decide on the area and season and then choose the appropriate items from our versatile selection.

There are eight types of trees to choose from.

These packs contain trunks made from pliable cast metal which can be twisted and bent to any shape you wish. With the shape decided, the trunks can be sprayed or painted with enamel paint or lacquer.

The ample foliage included in the tree packs is then cut and stretched over the branches to give a 3D "lacy" appearance. Any "leaves" which drop off during this operation can be kept and used as fallen leaves. A touch of white glue and a spray of hair lacquer will eliminate the danger of a sudden "Autumn".

They are as easy as that to make. The whole process can just take a matter of minutes to make a very realistic tree. There may even be a danger of them being attacked by Dutch Elm disease because they look so real.

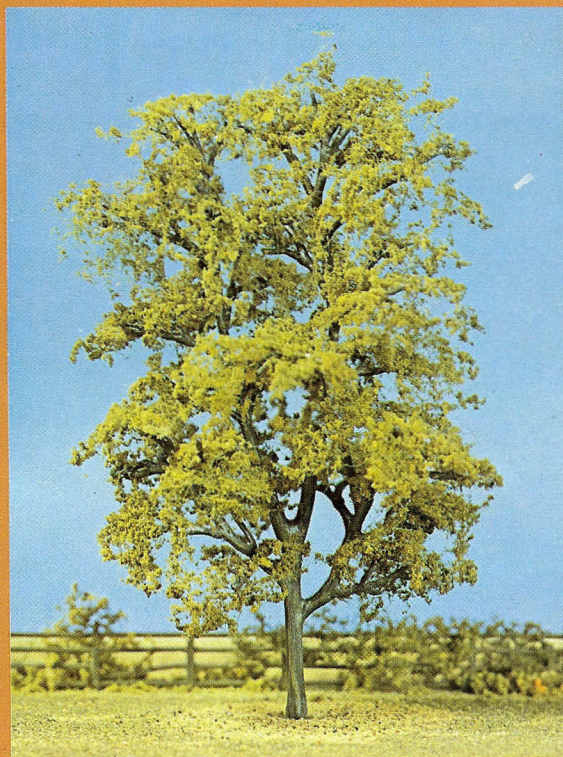
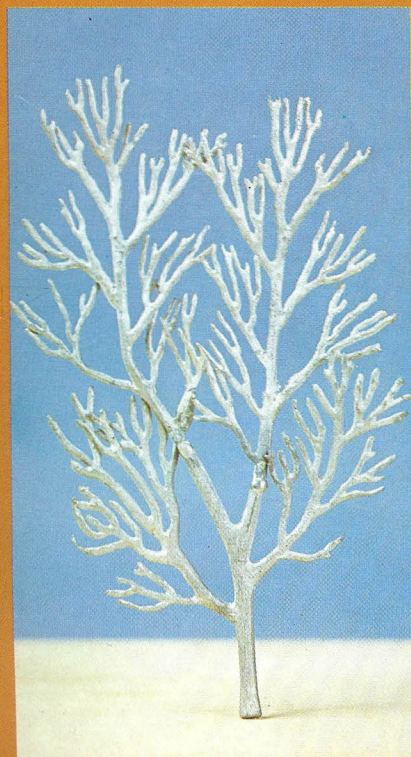
Separate foliage packs enable you to make a really individual approach to your landscape. The wide range of colours can be used in endless ways. Cut, rolled and twisted into shapes from which to create the beauty of the hedgerow.

Allow foliage to creep over buildings and walls. Drape it over fences or form into clumps in your fields. Use small pieces to highlight tree foliage. Use anywhere where you would find dense undergrowth. The contents give you plenty to choose from. You have a choice of six shades.

The turf range of scatter material can be used for ploughed fields, paths, mudtracks, fields, etc.

Provided the instructions are followed properly, we can guarantee flowers which bloom forever, lawns which stay short and weeds that will not take over. The material is as fine as dust, and subtle colours can be blended to highlight ballast and trees. Leave it in the basic shade if you prefer.

A packet of turf may look expensive, but because it is so fine a packet will go a long way. So there's no need to skimp. Any surplus can be easily vacuumed off into a clean bag and reused. Nothing is wasted.





# Simpler, easier and more realistic landscaping.

To complete your scene, try some of our ballast and aggregate selection. For perfection in detail, we have included in our range two different grades of coal. All these selections can be used in coal yards, wagon loads, loco tenders, roads, building sites and, of course, with tracklaying.

Remember to be consistent when laying ballast. If your layout is based on a modern line use a light grey. If it is an old branch line use one of the darker colours. You have seven to choose from. When your scenicing is finished and you don't like the result, don't despair. Even Picasso must have had a bin full of rejects.

But not with Woodland Scenics. You need not waste anything, everything is reusable. Just try it a different way using the same materials. You will not fail because this range has been deliberately created to give maximum versatility.

With imagination you will no doubt find endless other uses for our Woodland Scenic materials.

Try it. EXPERIMENT, and if you come up with something special let us know.

With Woodland Scenics you can achieve perfection without really trying.

## Turves

T41 Soil

T42 Earth

T41

T42

T43 Yellow Grass

T44 Burnt Grass

T43

T44

T45 Green Grass

T46 Weeds

T45

T46

T49 Green Blend

T50 Earth Blend

T49

T50

## Foliage

F51 Light Green

F52 Medium Green

F51

F52

F53 Dark Green

F54 Conifer Green

F53

F54

F55 Early Autumn

F56 Late Autumn

F55

F56

## Ballast

B78 Dark Brown

B79 Brown

B78

B79

B80 Buff

B81 Lt. Grey

B80

B81

B82 Grey

B83 Cinders

B82

B83

B91 Adhesive (Cement)

B92 Mine Run Coal

B93 Lump Coal

B91

B92

B93

TK 26 7 — 7½"  
Big Old Trees  
2 Trees per kit.

TK 19 — 4"  
Shade Tree  
2 Trees per kit.

TK 21 — 4½"  
Gnarled  
2 Trees per kit.

TK14  
2¾" Softwood Pine  
5 Trees per kit.

TK 13  
2½" Straight Trunk  
5 Trees per kit.

TK 23 6 — 9"  
Pine Trees  
5 Trees per kit.

TK 18 — 3½"  
Double Fork  
2 Trees per kit.

TK 20 — 4½"  
Columnar Pine  
4 Trees per kit.





## Trees. To match the realism of your locomotives and rolling stock.

The making of a Woodland Scenic tree is not difficult. Wash trunks with soap and warm water, and soak for about five minutes to make more malleable. Bend the trunk to a realistic shape and break off some branches for more variety. For Pine trees, twist the main trunk in a spiral fashion to make branches project in many directions from the trunk. Twist larger branches at trunk to a horizontal plane.

Brush or spray the bent trunk with any matt enamel or lacquer. The colour will depend on the type of tree you wish to create. When the paint is dry, lightly paint in high spots of bark with a lighter or darker shade of paint for added effect. Take the foliage material and with scissors, cut it into irregular shapes approximately 1" x 2". Stretch the pieces in all directions until they are twice the size, and have achieved a "tree"-dimensional and lacy appearance. Then place the pieces of foliage on the tree, pulling it and shaping it into the desired form. Remember trees with thin foliage are more realistic.

For Pine trees the foliage is cut into pieces about the size of a halfpenny and placed on top of the branches.

Use a spot of white glue where the foliage touches the branches. Trim off any strands of foliage and spray with hair lacquer so that it keeps its shape.

To plant the tree, just drill a hole in your board and pop it in. The "leaves" and branches which may have come off in the process can be placed underneath the tree for added realism. Any foliage that you have left can be used for hedges, etc.

The height of the trees can be varied by

cutting off the base and "planting". Pine trees may be made taller by cutting off the base of one and the top of another and sticking or soldering them together. The pieces that you have left from this exercise can be used as fallen trees. Just splinter the end of the tree with a file or knife and lay it next to a "planted" tree stump. Use the turf material on the bark to simulate moss.

Dying trees can be easily made by leaving the foliage partially off or off altogether. The trunk should then be

painted a lighter colour with darker tones in parts to highlight weathering. Strands of foliage can be stuck or wrapped round the trunk as ivy.

Care must be taken to use the right trees for the right area in which your layout is based.

To enable you to make each tree individual, Woodland Scenics produce a range of eight Tree Packs, Straight Trunks, Softwood Pines, Double Forks, Shade Trees, Columnar Pines, Gnarled Trees, Pine Trees, Big Old Trees.





## Turfs. Have a real field with them on your layout.

The Woodland Scenics Turf will enable you to produce unbelievably realistic ploughed fields, clumps of weeds, lawns, paths and flower beds. They can also be used as mentioned, to highlight trees and ballast.

The turf material is in the form of an extremely fine powder that is colour fast and will not fade in sunlight.

There are several ways of laying the turf. It can be laid straight on top of hair lacquer or a similar adhesive. The best method is to lay the turf straight onto a coat of paint. Any paint will do although it is best to match the paint to the colour of the ground you require under the turf. Hold the turf in the palm of your hand and "dribble" it on to the wet paint. Press it down firmly with your fingers or a piece of paper and allow it to dry.

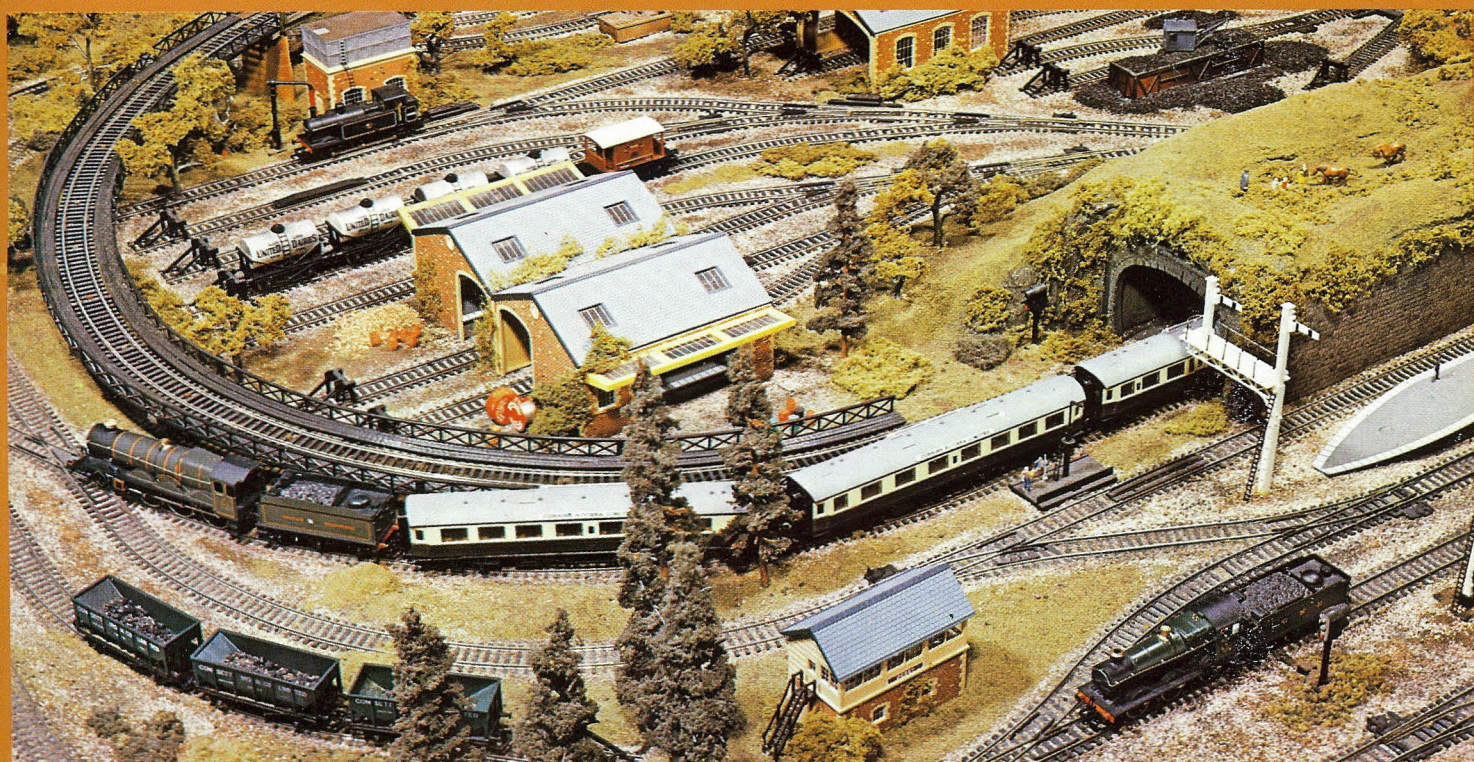
When dry, vacuum off the excess into a clean bag so that you may use it again. If you look at a stretch of countryside you will see that it is made up of several shades of colour. Woodland Scenics turf allows you to tone in these colours. For

places that are in shadow, use a darker turf. The same applies to paths and tracks. Fields are made up of different colour tones. Use the varying shades of green. The fineness of the turf allows you to experiment until you are completely satisfied, then spray over with a lacquer to finally secure.

A realistic ploughed field may be created in the following way. Make a layering of Polyfilla and run through it an old comb or spreader; the type used when fitting wall tiles. Cover it with turf material and

leave to harden. When dry vacuum off. A similar method can be employed when you wish to produce a rocky hillside. Simply use Polyfilla to obtain a rough, rocky escarpment and give a light sprinkling of turf. Vacuum off and you will find you have a most realistic scene. Remember to use different shades to obtain the best effect.

Woodland Scenic Turf is available in 8 colours: Soil, Earth, Yellow Grass, Burnt Grass, Green Grass, Weeds, Green Blend and Earth Blend.





## Foliage. You can even choose the time of the year.

Woodland Scenics Foliage Packs may be used in many different ways. Its flexibility enables it to be easily cut, thinned, twisted and rolled into shapes to create varied hedgerow scenes.

As has been mentioned earlier, the foliage can be attached to tree trunks as ivy. Use this ivy to clamber up barns, houses and telegraph poles. The foliage may be used as brambles and gorse by the side of an embankment. On a disused railway line this vegetation would be gradually taking over, threading its way around the line and over the sleepers.

Fences can be "broken" with foliage "growing" through the spaces, or draped over fences. Using these two methods together makes the fence a part of the scene rather than just an addition. By mixing two of the foliage together a shaded hedge can be achieved. Just roll the two colours together, thin out and place where your hedge wants to be. Trim with scissors and as a final touch sprinkle a little turf over the hedge as a highlight. If you are happy with the result, spray with hair lacquer.

Small bushes or young trees can be formed by rolling some foliage into shapes and placing them on twigs or cocktail sticks. These bushes can then be used to disguise point motors or power connecting clips.

Many fields that have been left as arable

for some time have clumps of grass and thistle. Use foliage to simulate these things together with the growth around ponds and marshy ground.

To make a large shrubland area, the type one would see on a wild desolate moorland, take several pieces of foliage. Vary the colour, thin and lay them out slightly unevenly to create a blanket effect. Again sprinkle with a little turf over the top and spray with hair lacquer. Woodland Scenics produce two shades of autumn foliage. If your layout is an

Autumn scene then use these two shades in your trees. The "leaves" that fall off can be used as dead leaves, fruit in the hedgerows or flowers. If you just want to highlight the parts of a dying tree then replace part of the foliage with a lighter shade.

The best way of adhering the foliage is by using a P.V.A. glue.

Foliage Packs are available as: Light Green, Medium Green, Dark Green, Conifer Green, Early Autumn, Late Autumn.





## Ballast. Brings you realism right down to the nitty gritty.

Some idea of the attention to detail that Woodland Scenics have put into this selection may be gauged from the fact that the ballast material includes two types of coal, mine run and lump. This coal is ideally suited for coal tenders, wagon loads and coalyards. The other ballast materials are also suitable for wagon loads, roadworks, gravel bins, etc., and of course, ballasting track.

Like the turf there are several ways of laying the ballast. The first is by mixing the Woodland scenic powder glue with the ballast, i.e. two parts ballast and one part glue. Lay the ballast out to the required area and spray with water. An eyedropper or syringe may also be used. A small amount of detergent in the water will allow the water to spread more easily. Alternatively, you can mask off the area you require ballasting and paint with an appropriate coloured paint. Lay your track onto the wet paint, pin down, and sprinkle the ballast over the exposed area. Leave to dry, vacuum off the surplus into a clean bag

and remove the masking tape. Woodland Scenics include 6 shades of ballast to enable you to select the correct shade for your layout. Great care must be taken when choosing, that you take into account the era you are modelling, the area and whether it is a new track or an old one. For instance you would not use a light grey ballast for an old branch line in Wales. The chances are that this would be brown.

Use the green turf and foliage as weeds growing in the ballast. Also use the soil

to simulate oil spots between the sleepers.

If you are running a steam layout do not forget to sprinkle some of the mine run coal by the side of the track, as many a piece has been dropped off a tender to be salvaged later by a passing farm worker.

This attention to detail will enhance your layout and accord critical acclaim.

Ballast packs are available in the following colours: Dark Brown, Brown, Buff, Light Grey, Grey, Cinders.





## Some Technical Terms Explained.

**A.C. (Alternating Current)** This type of electric current flows backwards and forwards alternately in the conductor. The time taken for the current to flow completely once in both directions is termed a CYCLE. The number of cycles of flow in each second is called the FREQUENCY of the current. The English standard frequency is 50 cycles per second. There is no polarity to alternating current, i.e. we do not have a Positive and a Negative, for the direction of the current is continually changing.

**Airflow Resistance Mat** A length of resistance wire wound on asbestos around a metal former, especially designed in a flat form but allowing a current of cooling air to pass through the former. Invented by H. & M. to combine cool operation with long life. Cannot burn out under normal use within the current range for which it was designed (See p 20).

**Automatic Power Regulator (A.P.R.)**

This feature, incorporated in the HM 3000, automatically compensates for changes in load caused by inclines, curves, etc., by increasing or decreasing the voltage to the loco so as to maintain speed nearly constant. This is achieved by comparing the speed of the loco (the backEMF) with the required speed setting (from the Regulator). If they are not the same then the voltage to the track is increased or decreased until the speed achieves the required level. This method of feeding back the train speed, comparing, and adjusting, is termed "Closed loop feedback control."

**Common Return** A conductor which is common to more than one part of an electric circuit and which forms the return path for the current from these parts of the circuit. Examples of this will be seen in many of the diagrams. In 2 rail systems one rail is chosen as the common rail and current from all sections returns to the power units via this rail, the other rail being broken into sections.

**D.C. Direct Current** This type of electric current flows constantly in the same direction along its conductors which are termed positive pole and negative pole. The polarity of the conductors is dependant upon which is positive and which is negative. D.C. is produced in a low voltage power unit by means of a Rectifier which converts the A.C. from the transformer into Direct Current.

**Inertia/Momentum Simulation** The great weight of a real locomotive makes sudden changes in speed impossible. The same effect can be achieved in a model locomotive by using electronic time-delay circuits which prevent sudden changes in track voltage. This simulation of the locomotive mass by electronic means is termed Inertia or Momentum Simulation.

**Overload Cutout** A protective device built into an electrical circuit for the purpose of switching off the current when the load reaches a predetermined number of amps. The cutout may be magnetic i.e. operated by means of an electro-magnetic coil which operates instantly when the cut off load is reached, or it may be Thermal delay i.e. operated by a Bi-metal strip which is heated by the current and which after a delay of a few seconds will open the contacts and switch off the circuit, or Electronic, whereby the load current is sensed and causes the power-output circuit to switch off if the current exceeds a pre-set value. On the HM 3000 this is followed by a time delay of 1 second, after which the trip circuit is reset, allowing the loco to restart.

**Passing Contact Switch** This is a specially designed switch, making a temporary wiping contact when actuated. The H. & M. passing contact switches (sometimes called Flash-Switches) are double acting i.e. one side makes contact temporarily when the lever is moved one way and the other side makes temporary contact when the lever is moved in the opposite direction. Thus they are very suitable for the operation of solenoid motors in which it is necessary to activate 2 coils alternately whilst leaving no permanent current running through the coils.

**Primary Winding** This is the winding of a transformer which is connected to the source of supply. In the mains transformer the primary is connected to the mains supply.

**Pulse Power** This is the name given to the feature of half-wave Rectification and it is used for the very slow control of D.C. motors. Extremely slow running combined with good pulling power can be achieved by means of half-wave rectification. Pulse power can be obtained by means of a switch, the function of which is to open or close the Rectifier Bridge, thus changing from full-wave to half-wave rectification. Pulse power is more suitable for motors of ½ amp current rating or more. N gauge motors consuming very little current tend to overheat after prolonged use of half-wave and should always be run on full-wave

**Rectifier** This is a device which converts A.C. into D.C. and has the property of allowing an electric current to pass in one direction only. It thus blocks the return path of Alternating Current (see A.C.) and the Uni Directional current which does pass along the circuit is Direct Current (or rectified A.C.).

**Secondary Wiring** This is the output winding of a transformer and is usually isolated from the primary or input winding. In the power-control unit

suitable for the operation of 12 volt D.C. motors, the Secondary winding will give an output voltage of about 16 volts A.C. which when rectified will emerge as 12 volts D.C.

**Shunt Winding** A method of connecting the control resistance of a variable resistance unit across the D.C. supply instead of in series with it. This gives better control of low current motors. The High/low resistance switch on certain units enables the resistance to be switched between Series (Low) and Shunt (High) connection to accommodate high or low current motors respectively.

**Solenoid Motor** A device used for the purpose of operating small mechanisms (such as Model Railway Points) which require a movement of about ¼". Solenoid motors are usually double acting, producing a backwards or forwards movement of a steel armature which in turn actuates the operating crank.

**Transformer** A component normally used to 'transform' or change the voltage of an A.C. supply (See also Primary Winding and Secondary Winding). A Transformer may also be used to supply an isolated A.C. Voltage.

**Transistor** This is three electrode crystal of silicon or germanium, which has the property of amplifying an input signal. This will result in larger variations in the output signal.

**Volt** This is the standard unit of electrical pressure, and indicates the potential difference between conductors of a circuit, either A.C. or D.C.

**Voltmeter** An instrument for measuring the voltage or potential differences between two conductors.

**Zener Diode** A semi-conductor device which has the property of a diode (i.e. rectifier) in one direction. In the other direction the device blocks the flow of current until the voltage reaches a value at which the device 'breaks down' and conducts. This breakdown voltage is effectively independent of the current flowing and can be used to maintain a constant voltage out of a power unit.



In this section we go over some of the questions that our Technical Department are frequently asked in order to explain the use and interconnection of some of our power units and controllers.

**Q. 1**  
**What unit should I plug into my Clipper in order to run a second train?**

**A. 1**  
The D.C. Controller is the natural choice; plugged into the DC side sockets of the Clipper. However, there is no reason why a C.U.1 should not be used, connected to the Clipper using wander plugs. Points to note are:-  
(a) The Clipper side socket is not isolated from the controlled output, so beware of common return loops.  
(b) The output of the D.C. Controller will be 1/2-wave if the Clipper is set to 1/2-wave. A third train could be run using a second D.C. Controller, and so on up to the Clipper output current limit of 1 1/2A (approx: 3 trains OO or 5 trains N gauge); but common return paths must be avoided if they are to run simultaneously.

**Q. 2**  
**How do I connect my C.U.1 and what resistance mat do I need?**

**A. 2**  
(a) The C.U.1 must be connected to a source of 12v DC either from a power unit (H. & M. or another manufacturer) or an accumulator or battery. The yellow leads can be attached to wander plugs to connect into the side sockets of an existing power controller. The blue and red leads must then be connected to the track.  
(b) The resistance mat normally fitted is Medium (40-ohms). If the loco will not go slow but jumps to about half speed, then the resistance is too low. Either change the mat to High or Extra High resistance, or send the unit back to the factory for modification to "Shunt Wound" configuration — this latter method gives better control. If the control has to be turned nearly to maximum before a loco starts to move, the resistance is too high. Change the mat to low. Extra Low or Heavy Duty. To make the correct choice it is necessary to know how much current the motor takes on full load, then consult your local model shop for the appropriate mat.

**Q. 3**  
**What is the purpose of the High/Low and 1/2-wave switches?**

**A. 3**  
Resistance High/Low Switch: this connects the control resistance within the unit as a Series resistance (Low) or a Shunt resistance (High). Better control of

low current (high resistance) motors is achieved, especially at low speed, if the HIGH position is selected, and the switch should remain at HIGH whenever these motors are run. The LOW position gives better control of low resistance (higher current) motors (see the answer to Q. 4)

1/2-Wave Switch: This switch gives the alternative of half or full-wave rectification. Half-wave rectification, or "pulse power" gives pulses of electricity 50 times a second and is used for shunting and low speed work. The maximum voltage available is 6-volts. Full wave gives 100 pulses per second, 12 volts maximum; 1/2-wave should not be used for N Gauge motors — excellent low speed operation can be achieved by selecting HIGH RESISTANCE without the use of the 1/2-wave feature.

**Q. 4**  
**Can I use a Duette for Common Return circuits, and how can I run a 3rd train on this system?**

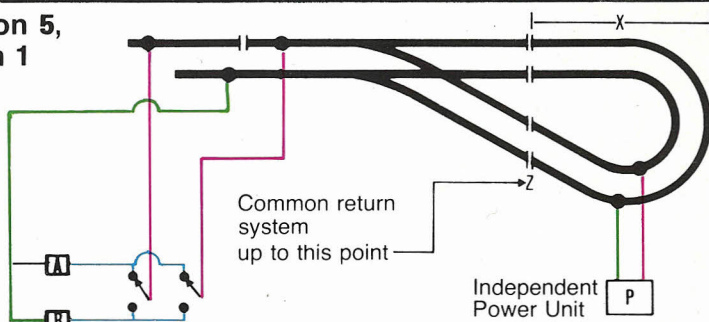
**A. 4**  
The Duette is ideal for a Common Return system since the two controlled outputs are electrically isolated from each other. However, the side sockets are not isolated, the right-hand socket (DC) being connected to the right-hand controller, and the left-hand socket (AC) to the left-hand controller. Consequently a third train should not be run from a D.C. Controller plugged into the Duette if a Common return system is to be used.

Either (a) isolate both tracks from the common return system and use a DC Controller  
or (b) use an independent power unit for the 3rd train, with a common return system.

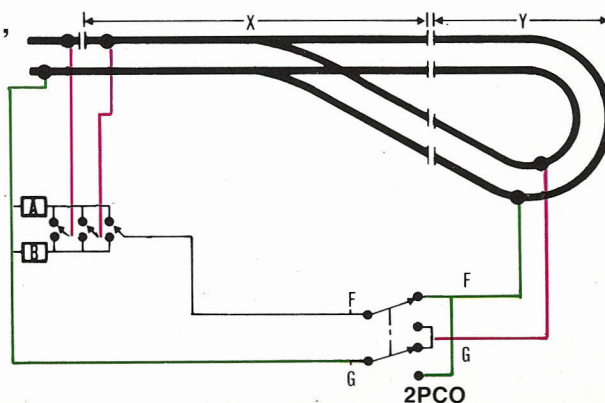
**Q. 5**  
**How should I wire a reversing loop?**  
(This question, although not strictly of concern to a power unit manufacturer is included here because it is asked so frequently):-

**A. 5**  
**System 1**  
With this system, power unit P must match the loco speed and polarity as it enters section X and the speed and polarity of the loco must be matched as it leaves section X at Z.  
**System 2**  
With this system either cab A or B can take a loco into the loop. Once in the loop the other cab is reversed while the loco is moving so that the loco re-enters section X with the correct polarity, with section X controlled by the other cab. The 2PCO switch allows the loco to rotate in the loop in either direction. If only clockwise direction is required, this switch could be removed and connections made F-F and G-G. Anticlockwise rotation in the loop can be achieved without the 2PCO switch if a change of cab is made as the loco enters section Y. The cab taking the loco round the loop can then be used to take the loco out into section X.

**Question 5, System 1**



**Question 5, System 2**





## System No. 1

### Single supply: Single Track

This is the simplest form of control requiring one Power Control Unit, one locomotive and a length of track. If desired, the track may be sectioned by making suitable breaks in one rail, and running leads from the respective sections through switches to the controller, so that more than one locomotive can be used, some standing parked on dead sections, and one being live to the controller.

Suitable H. & M. units for System No. 1 are:-

#### Power Units

HM3000  
CLIPPER  
FLYER  
ROCKET

#### Section Switches

MULTIPACK SWITCH CONSOLE  
+ SL4 SWITCHES  
SB6

## System No. 2

### Single Supply: Double Track

This system is suitable for double-track working, with an Up and a Down Line, each independently controlled. There are two ways of operating this system.

- With a common-return track.
- With fully isolated tracks.

The electrical equipment required for (a) and (b) sometimes differs, the distinction is important so we must discuss both in greater detail.

#### Group (a) — With a common return track

Note: From the illustration it will be observed that both controllers must be completely isolated from one another, either by using two separate power control units, or by using isolated windings.

Suitable H. & M. units for Group (a) are:-

DUETTE  
TWO HM3000  
TWO CLIPPERS  
TWO FLYERS  
TWO ROCKETS  
HM3000 + WALKABOUT

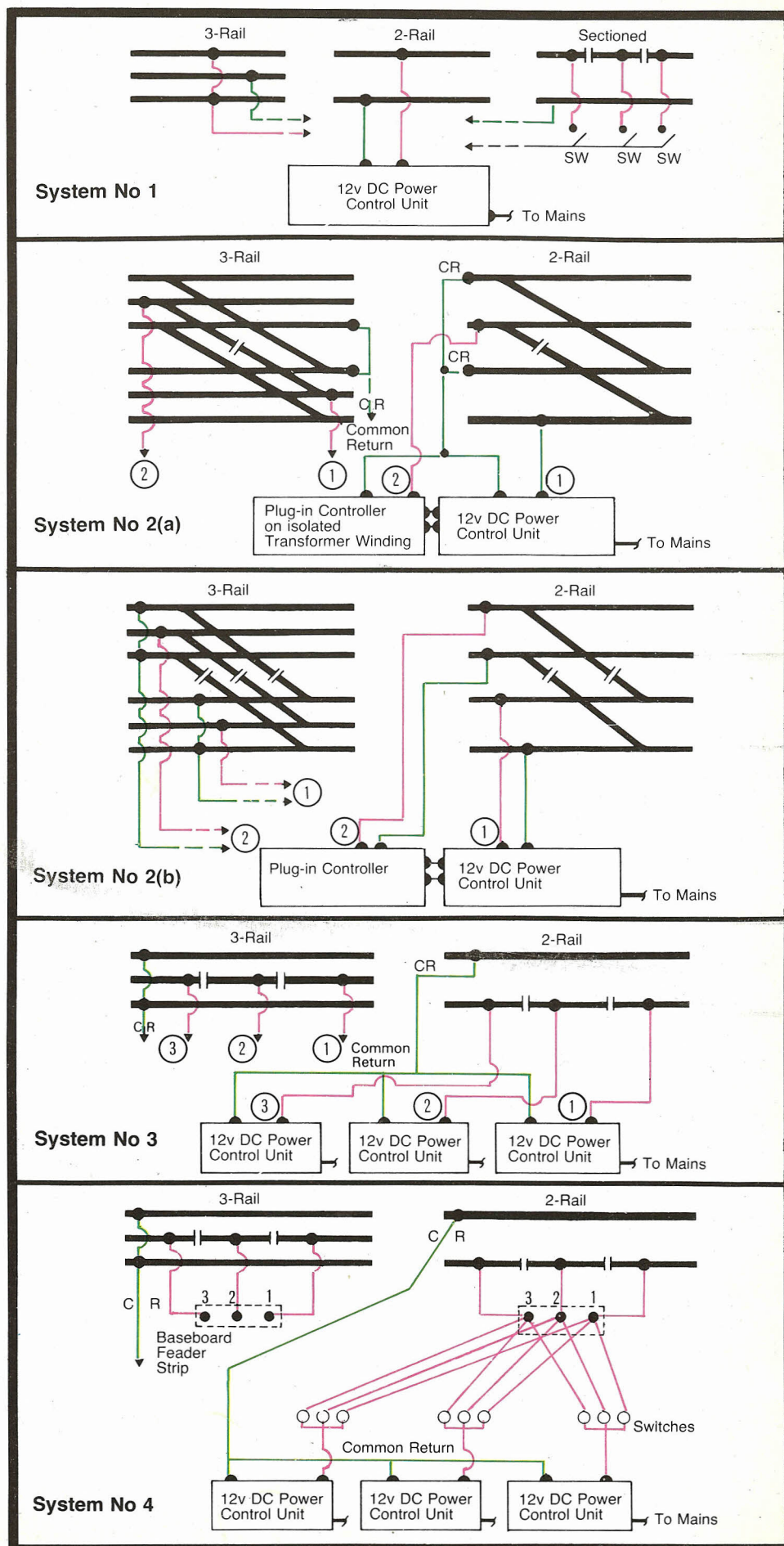
#### Group (b) — With fully isolated tracks

All rails must be separated at section breaks to provide complete isolation of tracks. Because the track sections are isolated, no further isolation is necessary in the power unit, hence more than one controller may operate from one transformer winding without short circuiting.

Suitable H. & M. units for above are:-

CLIPPER + D.C. Controller  
CLIPPER + WALKABOUT  
FLYER + WALKABOUT

Also any of the alternatives for group (a) can be used for group (b) but the alternatives for group (b) cannot be used for group (a).





### **System No. 3**

#### **Individual Supply**

This system strongly resembles System No. 2(a) and similar control units may be used, but the main difference lies in the fact that it is not essential to employ double-track working with Up and Down lines. Individual supply may be used equally well for a simple point to point layout. It is of great value to the modeller who is developing his layout, proceeding possibly from the single supply system to the flexible CAB control system. For each new locomotive added, one need only purchase another complete Power-Control Unit. Each locomotive has the advantage of its own individual power supply, which eliminates the sometimes annoying voltage-drop when successive locomotives are brought into use on a system utilising only one power supply. The common return wiring may be used thus simplifying the output connections.

Suitable H. & M. units for the above are:-

For each locomotive

HM3000

CLIPPER

FLYER

ROCKET

For each pair of locomotives:-

DUETTE

Also the alternatives shown for system No. 2(a).

### **System No. 4**

#### **Cab Control or Selective Control**

In this useful system, probably the most popular method now in general use, it is possible for each operator to control his locomotive, from his own controller right throughout the layout, in true Cab fashion, as in fullscale operation. Each section must of course be occupied by only one locomotive at a time. This system is a development of No. 3 Individual Supply, by the addition of Section Switches, one for each section per Cab, and as in No. 3 is best operated by means of complete power control units thus avoiding the possibility of any locomotive affecting the running of another.

Suitable H. & M. units for the above are:-

#### **Power Units**

for each locomotive

HM3000

CLIPPER

FLYER

ROCKET

for each pair of locomotives:-

DUETTE

Also the alternatives shown for system No. 2(a).

#### **Section Switches**

MULTIPACK SWITCH CONSOLE

+ SL4 SWITCHES

S.B.6

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