MÄRKLIN

Model Signals

Illustrated Handbook

0341

To our many friends and all enthusiasts for our HO Gauge Miniature Railway

Introduction of the centre-stud contact track has greatly improved the realism which is one of the main features of our model railway layout and, in view of the unqualified success of our semaphore signals, we have now decided to augment our production programme with an appropriate range of colour-light signals in line with developments on full-scale railway systems throughout the world.

These signal units are accurate miniature replicas of the real thing and we have concentrated on achieving efficient functioning over a wide range of practical applications. For example, the traction current switches in the home signals are fitted with silver contacts to withstand heavy current loadings. Highly rationalised design and manufacture have reduced the retail price of these signals to a very reasonable level.

As comprehensive details on the functional principles, operation and installation of these signals would entail lengthy instructions being enclosed with each signal unit individually, we have decided instead to publish this booklet in which you will find full information on the special features of each signal unit presented in a clear, concise and easily understandable manner.

GEBR. MÄRKLIN & CIE. GMBH · 732 GÖPPINGEN/WÜRTT.

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Signal location

The 7036 signals and subsequent models can be installed anywhere on the track layout — **both on straight and on curved track sections.** They are secured firmly in place by simply pressing the track section into the signal unit baseplate. Where the signal unit is to be screwed onto a wooden base alongside the track, it will first be necessary to remove the box cover to allow access to the two wood screw holes in the baseplate. Those users preferring left-hand traffic, in accordance with practice in their own countries, can also instal the signals on the left-hand side of the track.

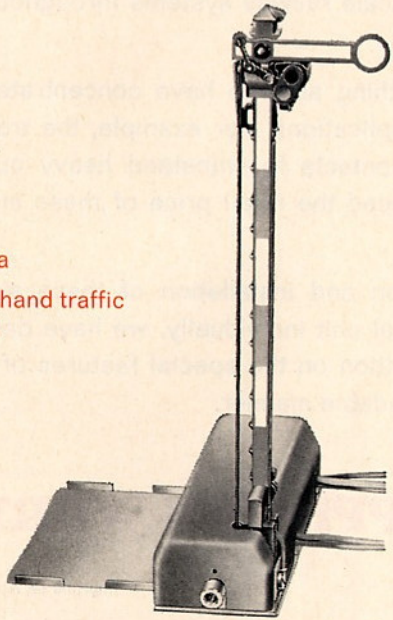


Fig. 1 a
Right-hand traffic signal

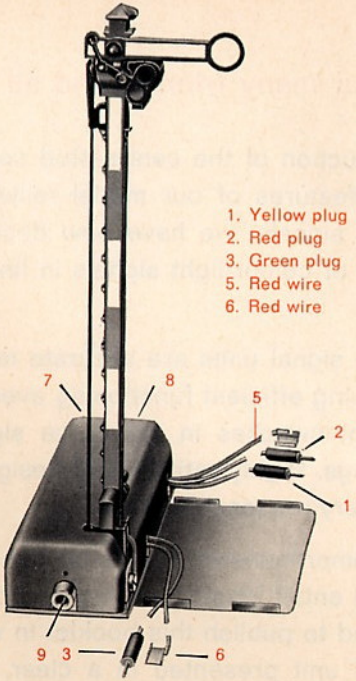


Fig. 1 b
The same signal set up for left-hand traffic

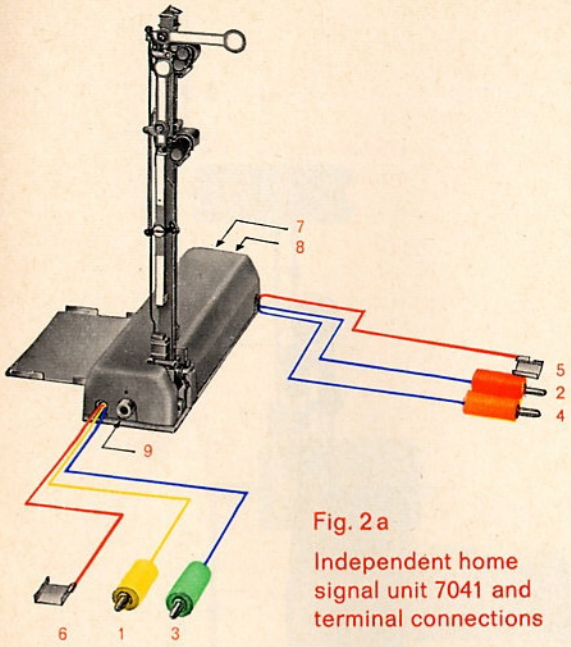


Fig. 2 a

Independent home signal unit 7041 and terminal connections

The one thing to be noted is that the baseplate must be pushed onto the signal base from the correct side (Figs. 1 a and 1 b).

Wiring and sockets on the signal units

On all train control signals a clear distinction is drawn between the signal operating current and the controlled current. The appropriate connections are shown in Fig. 1 b for signal 7039, in Fig. 2 a for signal 7041 and in Fig. 2 b for distant signal 7038. The connecting wires are attached similarly on all other signal units. The controlling current is fed to each signal through the yellow wire with yellow plug (1) thus energising the solenoid coils which generate the force required to set the signal. The current returns either through the blue wire with red plug (2), the blue wire with green plug (3) or the blue wire with orange plug (4).

The red wires (5 and 6) control traction current carried through **the track studs** and these are fitted at either end with a terminal tongue. They are connected to the centre contact tongues of the track. For **overhead traction current** the signal wiring mast plugs, through which the overhead conductor current flows, must be connected by means of sockets 7 and 8. When using earlier model track sections 3800 and 3900 or where no baseplate is used, the socket (9) on the front of the signal base is used to return the lighting current to earth.

Distant signals are not intended to control locomotive movement and are consequently not provided with terminals 5, 6, 7 and 8. Further details on the signal operating current and on control of the traction current will be found in the next two chapters.

Signal operating current

Connection to a Control Panel

The semaphore arm has two end positions and is raised or lowered by the movement of a solenoid-operated plunger. The force generated in the two solenoid coils determines the position of the plunger and thus that of the signal arm. Fig. 3 on page 5 shows a diagrammatic layout of the current flowing in these coils and the path of the signal operating current where this circuit is made through a **control panel.** The traction current connections are not shown in the diagram.

The current flows from the yellow (lighting) socket of the transformer (10) via a lighting wire (11), the distributor plate 7209 (12) and the yellow wire (1) on the signal to coils (13) and (14).

Return flow of the signal operating current

From coil (13) or coil (14) via a blue wire with red (2) green (3) or orange plug (4), control panel (15), earth wire (16) to the transformer (10) earthing socket. The signal positions assigned to the individual coils are shown on page 16 and on the following pages. Current for signal lighting is fed to bulb (17) through the yellow wire (1), returning to earth via two routes, i. e.:

1. With track sections 5100 and 5200 the lighting current is returned to earth (18) via the signal mast and track if the signal baseplate is connected conductively with the track.

Distant signal 7038 and connections

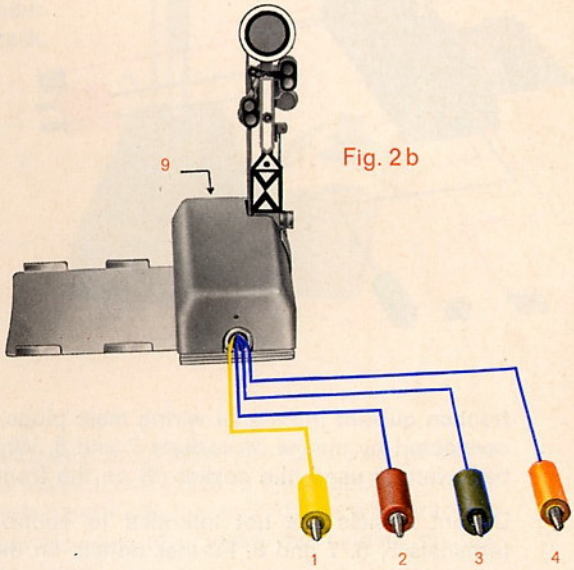
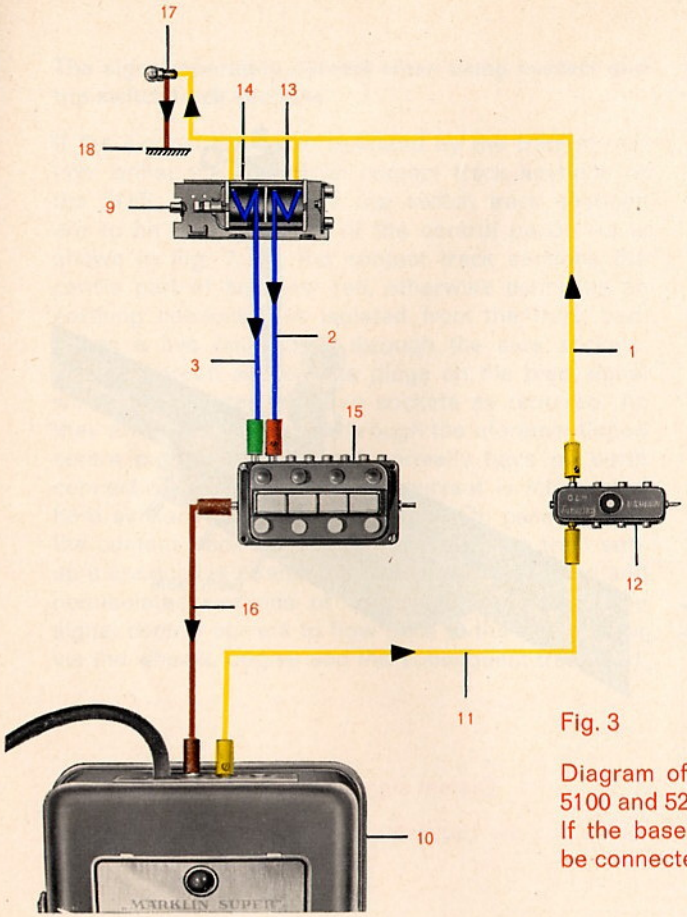


Fig. 2 b



2. With the previous 3800 and 3900 model tracks and with the present type of track, where no baseplate is used, the lighting current cannot be returned by this route, as the track section is not earthed. For this purpose the socket (9) on the front of the signal base can be used as an earth connection (using a 7209 distributor plate where necessary). If a distant signal is immediately in front of the home signal only **one** earth wire is needed for both signals, the two earthing sockets being interconnected by a 7140 cross plug (Fig. 4).

From the foregoing it is thus obvious that the coils controlling both the signals and the bulbs operate with the same voltage.

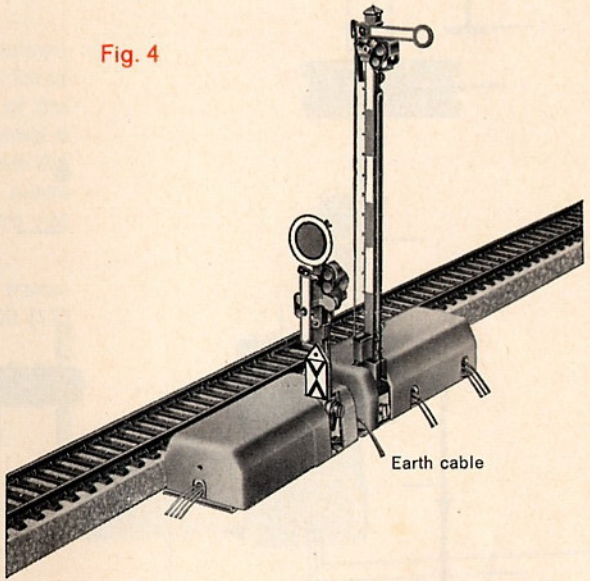
Fig. 3

Diagram of the signal operating and lighting current when using 5100 and 5200 track sections.
If the baseplate is not used, socket (9) on the signal base must be connected to earth (see also text on page 5 and Fig. 16).

Both are connected to the lighting current, which greatly simplifies the entire circuit. In designing the signal layout, no special lighting current feed system has been provided for the signal bulbs, as the second wire which this would entail for the lighting current would have impaired neat signal installation. However, if it is desired to instal a signal lighting system which can be switched off, the baseplate forming the live connection with the track section can be dispensed with when setting up the signals. In such cases the signal is screwed onto the base closely adjacent to the track and a wire is connected to the socket on the front of the signal base, this wire leading — preferably via a 7210 control panel — to the "0" socket on the transformer. If this connection is switched off at the switch panel, the signal lamp will be extinguished but the signal itself will continue operating unimpaired.

Illustrations 5 and 6 show circuit diagrams for a single-arm 7039 home signal controlled in one instance through a control panel and in the other automatically by the train in conjunction with contact or trip switch track sections.

Fig. 4



Distant signal connected to home signal

The signal operating current when using contact and trip switch track sections

If the signals are to be operated by the train in motion, either the 5104/5105 contact track sections or the 5146, 5147 and 5213 trip switch track sections are to be used in place of the control panel. As is shown in Fig. 7, on the contact track sections the centre part of an outer rail, otherwise acting as an earthing conductor, is isolated from the track bed. It has a live connection through the side sockets. The red, green and orange plugs on the blue signal wires are inserted in these sockets as required. As they are already isolated through the aforementioned centre part of the rail and normally have no earth connection, the signal control current is interrupted here similarly to the control panel. On passing over the contact track section, the bogie of the train sets up a conductive connection between the isolated and non-isolated sections of the track. This allows the signal control current to flow back to the transformer via the wheels, bogies and the subsequent track bed.

Fig. 6
On-off light on signal 7039 operated via contact or switching track sections

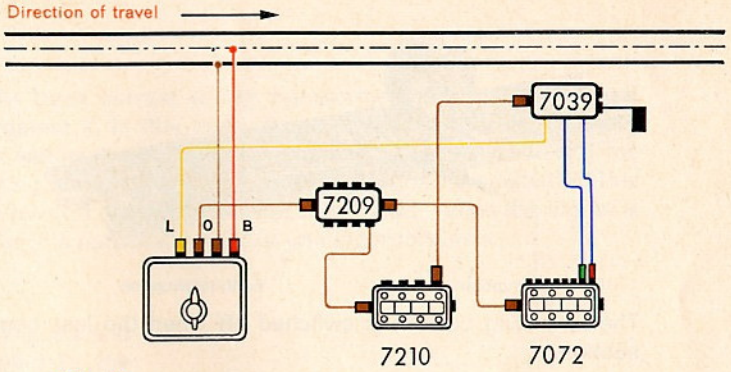
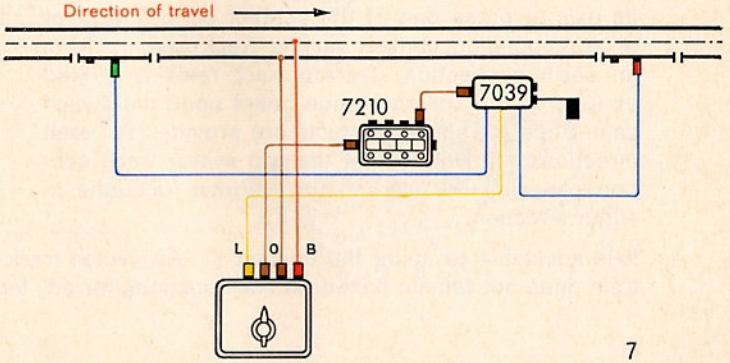


Fig. 5
Controlled lighting on signal 7039 operated through the 7072 switch panel



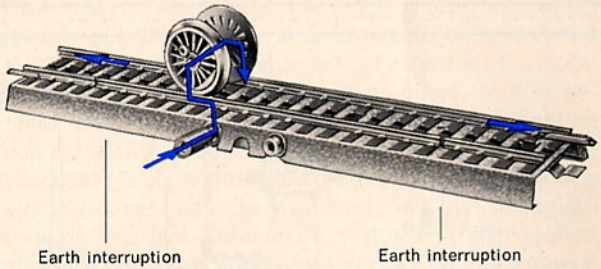


Fig. 7
Current path when the train passes over a contact track section

The operating current is switched off when the last bogie of the passing train has passed the contact track section.

In the case of trip switch track sections (Fig. 8) the power circuit is made by two completely independent contact springs which are isolated from the track bed and interconnected by one socket each. If a train fitted with a collector shoe passes over the trip switch track section, its control cam is turned about its axis to press one of the contact springs against a corresponding contact on the track bed, to form an earth connection. The contract remains closed as long as the collector shoe bears upon the switch cam. Separate spring contacts are provided for each direction of travel so that the trip switch track section can also be used to trip various functions in either direction.

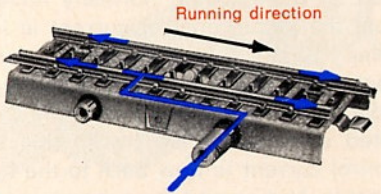


Fig. 8
Current path on a trip switch track section

It is advisable to instal the contact or trip switch track sections in the system at points where a stationary train does not remain halted on such sections for any lengthy period.

Controlling the track current

If the train is to be monitored from the transformer, the track current at the transformer can be switched off to bring the locomotive to a halt when the signal is against it. In this case, the red wires on the signal need not be connected. However, if the signal is to prevent **automatically** the unwanted entry of the train into the track section behind it, it must be installed so as to bring the train to a halt when the signal is against it. This is achieved by arranging a specific section of track in front of the signal so that it is "dead" when the signal is against the train and "live" when the signal is open. For this purpose the signal unit incorporates a

Track current switch

which regulates the track current as described above. Fig. 9a and 9b depict the construction of this switch. It is coupled to the plunger (1) which operates the signal arm linkage via a bell-crank lever (2) (in the illustrations the signal mast has been severed). On either side of the plunger a contact plate (3) is fitted for the overhead conductor wire and for the track conductor respectively. Two contact springs bear against these contact plates (contact springs 4 and 5 are shown in the drawing). Two red wires (6 and 7) leading out of the signal are soldered to the two contact springs. Fig. 9a shows the switch with the circuit closed.

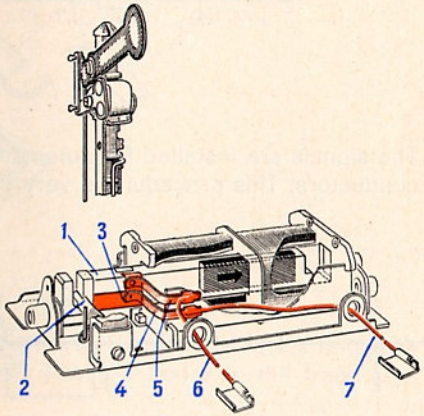


Fig. 9a Track current switch in "Drive" position

Both contact springs (4 and 5) bear on the contact plate (3) and are thus electrically interconnected. It is thus possible for the track current to run from one of the red wires (6) into the other (7) signal set to "Clear".
Fig. 9b shows the switch in open position. The plunger is pulled back as the signal closes, thus moving the upper silver contact spring (5) away from contact plate (3) and pressing it against the insulant plunger (1). This prevents current from passing from one red wire to the other (signal in "Halt" position).

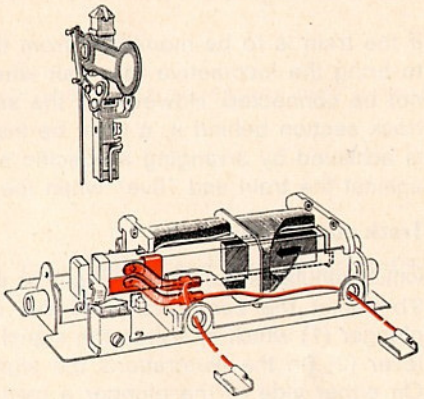


Fig. 9b Track current switch with signal set to "Halt"

The signals are installed for automatic track current control on the same principle for overhead and for track conductors. This procedure is very simple if the following instructions are observed.

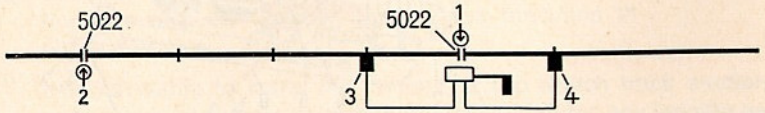


Fig. 10
Section of line with centre conductor isolated at points 1 and 2: terminal tabs inserted at points 3 and 4.

1. Track conductor

Fig. 10 shows the stretch of line before the signal, which is electrically isolated from the remaining current circuit. Normally this has a length equivalent to four complete track sections. At the track section joint (point 1) closest to the signal, a centre conductor isolator 5022 is pushed between the tab contacts, see Fig. 11. The same procedure is followed at point 2. The tabs on the two red signal wires are slipped over the contact tab at points 3 and 4 (See Figs. 12 and 13). When the signal is set to "Halt", the track lying between points 1 and 2 is dead. When the signal indicates that the train can proceed, the current flows from terminal tab 4 to terminal tab 3, thus supplying track current to the line between points 1 and 2. It is advisable to mark separation points 1 and 2 (Fig. 10) by means of 5015 isolator signs. The arrow visible on these small components is also used to denote isolators on full-scale railway systems.

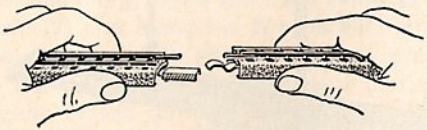


Fig. 11
Attaching the 5022 centre conductor isolator

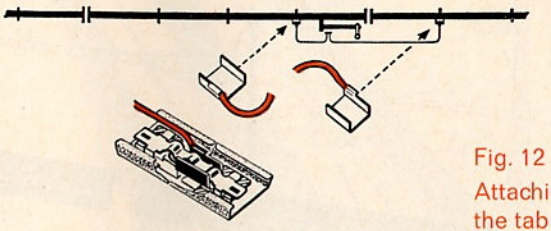


Fig. 12
Attaching the tab terminals

2. Overhead conductor wire mounted on catenary masts 7009

Signal set 7005 is needed for train control through the overhead conductor wire. The 7022 isolators enclosed with this signal set are interposed in the overhead line at points in line with points 1 and 2 in the track conductor studs (see Fig. 10).

The current is then fed to the section thus isolated via the signal connection mast. The red wires are plugged into the two sockets (7 and 8) on the back of the signal base (see Figs. 1 b und 2 a).
A similar procedure is followed with

3. Suspending the overhead conductor wire between tower masts

Fig. 14 shows how the overhead conductor current is interrupted by suspending the conductor wire on two 7006 trolley wire insulators arranged side by side, but the 7022 isolator is equally suitable for this purpose. Here the 7005 overhead wire kit is not needed.

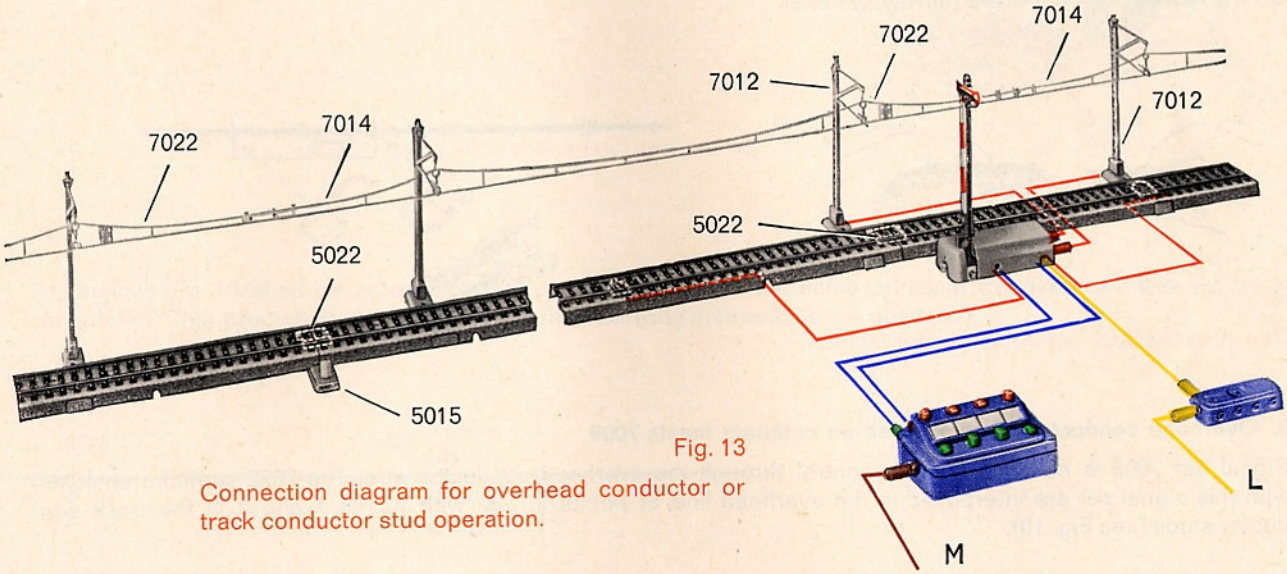


Fig. 13

Connection diagram for overhead conductor or track conductor stud operation.

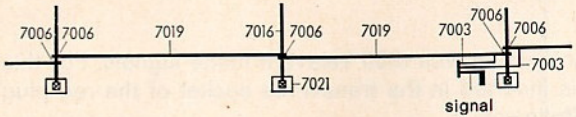


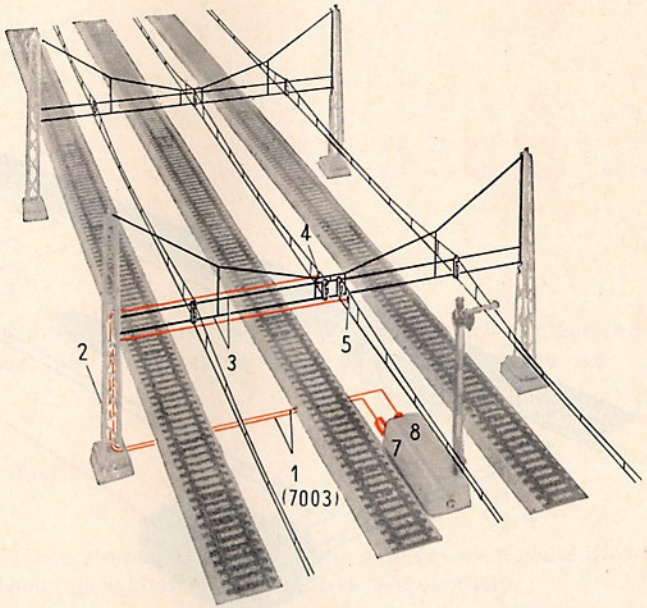
Fig. 14

Overhead conductor current interruption by two adjacent 7006 trolley wire isolators.

This is replaced by two overhead conductor connecting wires 7003, the connections being as shown in Fig. 15. The overhead conductor connecting wires (1) are inserted in sockets 7 and 8 (see also Figs. 1b and 2a) of the signal, then led along below the track sections to the mast (2) and along the two parallel struts of the cross join (3), after which they are fixed to the overhead conductor wire carriers by means of tab terminals (4 and 5) on either side of the overhead conductor wire isolation.

Fig. 15

Connection diagram for 7003 overhead conductor wire.



Coupling distant signals with home signals

In general the distant signals are controlled to operate in conjunction with their relevant home signals. For this purpose the red plug on the blue wire of the distant signal is inserted in the transverse socket of the red plug on the blue wire of the home signal. A similar procedure is followed with the green, and, where appropriate, also with the orange plugs (Fig. 16), where the signals are operated by a track contact

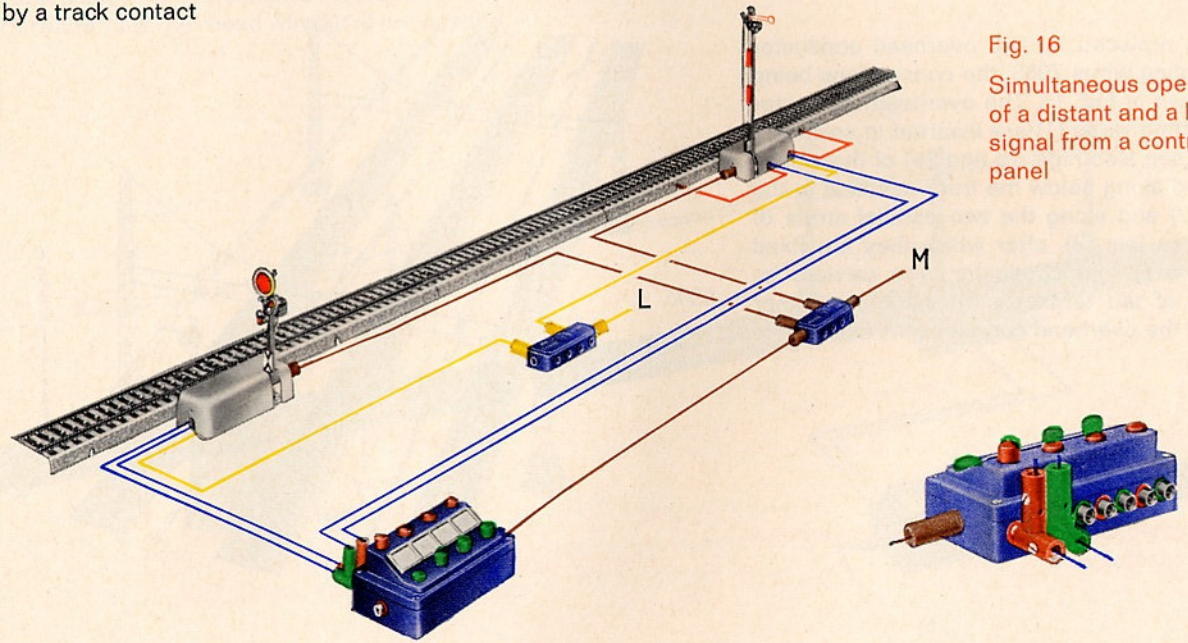


Fig. 16

Simultaneous operation of a distant and a home signal from a control panel

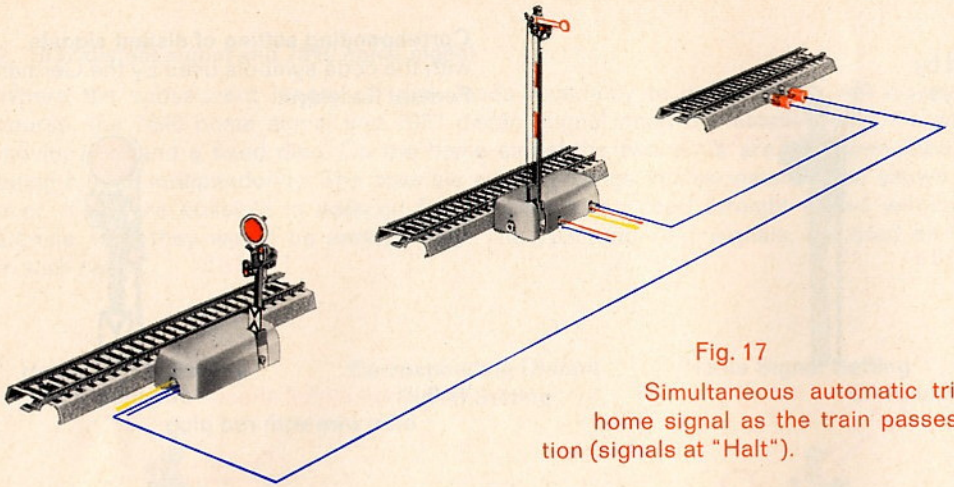


Fig. 17

Simultaneous automatic tripping of a distant and a home signal as the train passes over a track contact section (signals at "Halt").

Distant and home signal plugs can also be plugged side-by-side in the two sockets of the track contact sections. Fig. 17 shows the track contact section that resets the two signals to "Halt" as the train passes over.

Settings and applications for the various signals

1. 7036 distant signal, 7039 home signal

These signals are installed in the track system where there are **no points** behind the signals which could divert the train from its straight course. The range of signal settings is shown in Figs. 18a to 18d overleaf.

Home signal setting
with the code symbols used by the German Federal Railways

7039

Fig. 18a

Hp 0 "Halt", obtained from blue wire with red plug

Fig. 18c

Hp 1 "Clear" obtained with blue wire and green plug

Corresponding setting of distant signals
with the code symbols used by the German Federal Railways.

7036

Fig. 18b

Vr 0 "Halt signal ahead" obtained from blue wire with red plug

Fig. 18d

Vr 1 "Clear signal ahead" obtained by blue wire with green plug

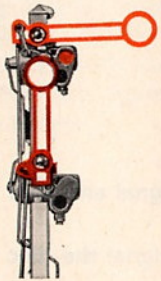
2. 7037 distant signal and 7040 home signal

Where the subsequent length of track leads invariably to points which will divert the train from its straight course, the 7040 home signal and 7037 distant signal must be installed. The distant signal has an additional moving arm and a fixed disc. On the home signal the two arms are interconnected, thus preventing one arm being moved independently. The possible signal settings in this instance are shown in Figs. 19a to 19d. However, if it were possible in addition for the train to proceed straight ahead without diversion, beyond these signals, then they would be unnecessary. The 7038 and 7041 signals, depicted on the next page, are for use in such cases.

Home Signal Setting

7040

Fig. 19a



Hp 0
"Halt" obtained with blue wire and red plug

Corresponding Distant Signal Setting

7037

Fig. 19b

Vr 0
"Halt Signal Ahead" obtained with blue wire with red plug

Home Signal Setting

Fig. 19c

Hp 2
"Slow" obtained with blue wire and green plug

Corresponding Distant Signal Setting

Fig. 19d

Vr 2
"Proceed with Caution" obtained with blue wire with green plug

7041

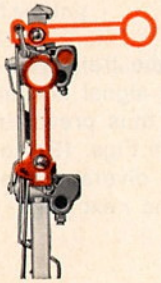


Fig. 20 a

Hp 0
"Halt" obtained with blue wire and red plug

7038

Fig. 20 b

Vr 0
"Halt signal ahead" obtained with blue wire and red plug

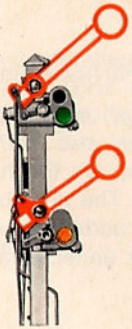


Fig. 20 e

Hp 2
"Slow" obtained with blue wire and orange plug

Fig. 20 f

Vr 2
"Proceed with Caution" obtained with blue wire and orange plug

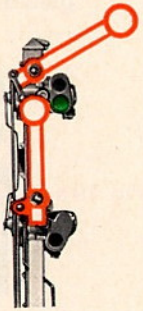


Fig. 20 c

Hp 1
"Clear" obtained with blue wire and green plug

Fig. 20 d

Vr 1
"Clear signal ahead" obtained with blue wire and green plug

3. The 7038 distant signal and 7041 home signal

On the 7038 distant signal **the disc is moveable** in addition to the extra arm. The 7041 home signal has two **unconnected arms.** It is thus possible to achieve three different settings with this signal, as illustrated in Figs. 20 a to 20 f.

"Slow" or a reduction in speed is required always when the train is to negotiate points beyond the signal which will divert it from its straight course. Consequently, when the signals are set as shown in Figs. 20c and 20d the train should not be guided over any points set to divert it from its straight course.
It is thus advisable for the points diverting the train from its straight course to be coupled with the signal, so that the points and the signal are re-set automatically. These two units are coupled by inserting the green points plug into the transverse socket of the green plug on the home signal and the red points plug in the transverse socket of the orange plug on the home signal.
The relevant circuit diagram is shown in Fig. 21. The points must be set to "Straight ahead" when the signal indicates "Clear". They must divert the train when the signal indicates "Slow ahead".

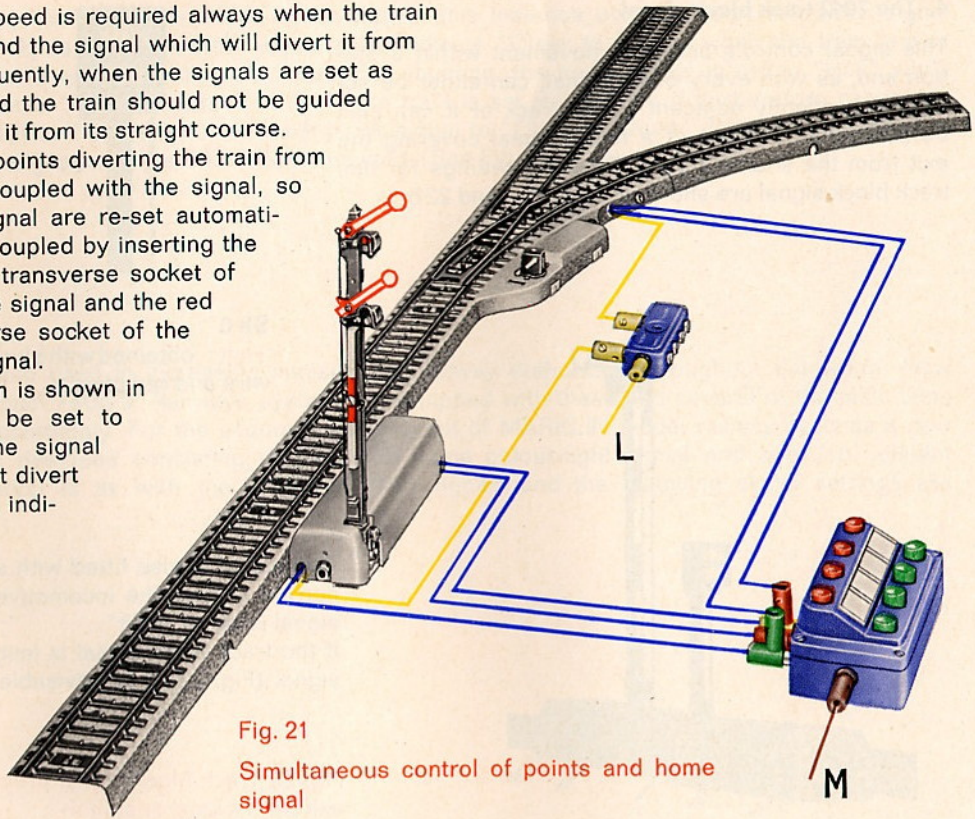
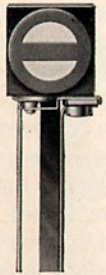


Fig. 21
Simultaneous control of points and home signal

4. The 7042 track block signal

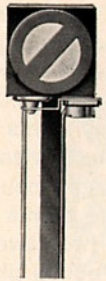
This signal controls shunting movement within a station and, as with every other signal, can either be set up independently adjacent to the track or it can also be positioned in front of a home signal covering the exit from the shunting yard. Possible settings for this track block signal are shown in Figs. 22 a and 22 b.

Fig. 22 a

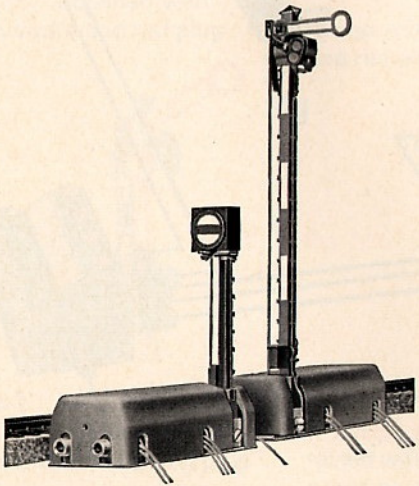


Sh 0
"Halt" obtained with blue wire and red plug

Fig. 22 b



Sh 1
"Clear to Shunt" obtained with blue wire and green plug



This signal is also fitted with a switch for regulating track current so that the locomotive cannot proceed when the signal is set at "Halt".
If the track block signal is immediately in front of a home signal (Fig. 23) it is advisable to dispense with controll-

Fig. 23 Track block signal preceding a home signal at the exit from a yard or station

ing the train by means of the home signal – which means that in this instance only the red track block signal wire is connected to the track, as the track block signal must indicate "Clear to Shunt" when the train leaves the yard or station – i. e. not only for shunting purposes. For shunting, the home signal is set to "Halt" while the track block signal indicates "Clear to Shunt". Before the train is set into motion it is therefore necessary for the home signal to be set to "Clear" and the track block signal to "Clear to Shunt". Where no shunting is to be carried out then both signals can also be interconnected. (See Fig. 16).

5. Colour-light signals

Colour-light signals are being used in increasing measure by railway authorities throughout the world. New railway stations in the German Federal Railways system are equipped with these and several of the main lines have also been modified accordingly. For the accurate scale layout of MÄRKLIN model railway systems a new range of signals has been designed consisting of one 7188 home colour-light signal and one 7187 distant colour-light signal. Installation is as with the 7039 and 7036 signals and the following signal settings are possible.

Distant signal

7187

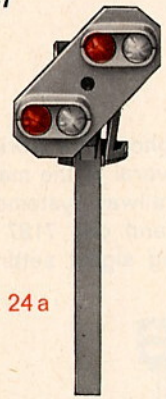


Fig. 24 a

Vr 0

"Halt Ahead"

Home signal

7188

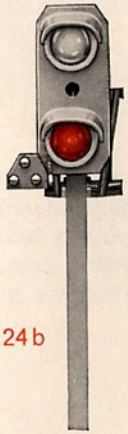


Fig. 24 b

Hp 0

"Halt"

Distant signal

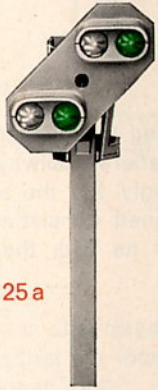


Fig. 25 a

Vr 1

"Clear Ahead"

Home signal

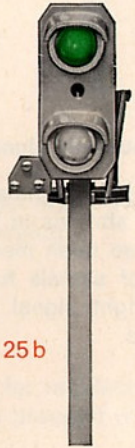


Fig. 25 b

Hp 1

"Clear"

The 7188 home signal (Fig. 26) is connected in accordance with the same colour specifications as the existing semaphore signals. Operation is also identical, i. e. either from a control panel or from the contact or trip switch track sections. The only difference arises with the 7187 distant signal. This has no integral drive or operating unit and its lamps are not controlled by the home signal control system. Consequently, the distant signal has two grey wires (lighting) which are provided with red and green plugs respectively. These lines are inserted in the appropriate red or green sockets on the main signal (Fig. 27).

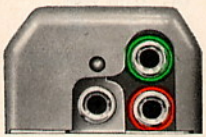


Fig. 27

Connection plate on 7188 home signal for the 7187 distant signal

An earth connection is required only on the earlier 3800 and 3900 model tracks and is used for signals on present tracks where no baseplate is being used. Care must be taken to ensure a good earth connection as otherwise all lights will show, on both the home signal and the distant signal, regardless of switch setting.

Fig. 26 Connection of colour-light signals

Signal symbols (Fig. 28 a–i)

To simplify illustration in the following layout plans the following symbols have been adopted for the individual signals:

Distant signal without extra arm suitable for use preceding 7039 home signal

a 7036

Distant signal with extra arm — on this signal the arm is moveable but not the disc. It is used in conjunction with the 7040 home signal b 7037

Distant signal with extra arm and movable distant signal disc — part of the 7041 home signal or of several different home signals

c 7038

Colour light distant signal — functions similarly to the distant signal without additional arm 7036 d 7187

Home signal with one arm

e 7039

Colour-light home signal — functions similarly to the home signal with one arm

f 7188

Home signal with two interconnected arms — the first arm cannot be operated alone on this signal.

g 7040

Home signal with two independent arms — here the arms can be moved independently

h 7041

Track block signal

i 7042

Examples showing use of the signals

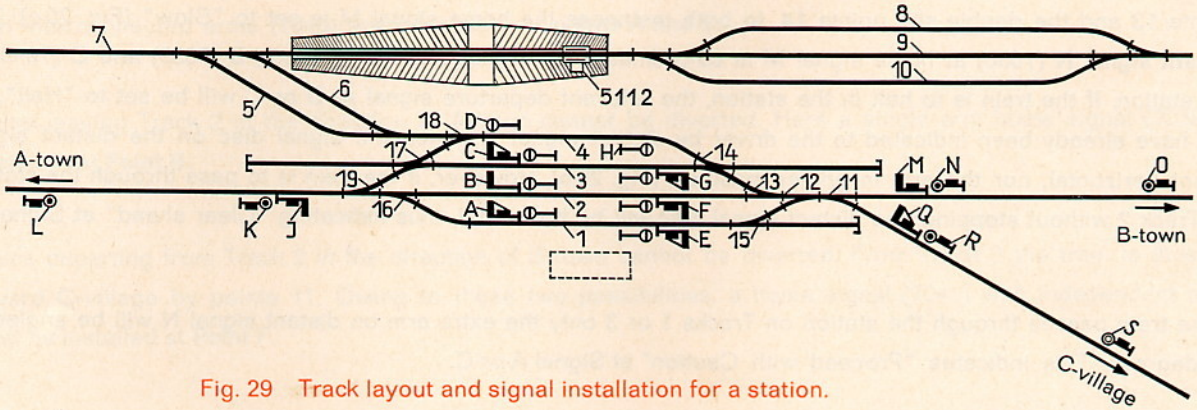


Fig. 29 Track layout and signal installation for a station.

Fig. 29 shows part of a station. We shall now deal with the arrangement of the various signals.
A train arriving from the direction of B-town first passes the **distant signal 0** (7038). This indicates to the train driver which of the following actions he must take on reaching the **home signal M** (7041):

1. Halt
2. Continue without slowing down.
3. Run past at reduced speed.

The home signal M will not indicate "Slow" if the train is to enter on Track 2, since it is not diverted by any points on approaching this track, consequently the signal indicates "Clear" (Fig. 20 c).

The driver is required to reduce speed only if the train is diverted onto Track 1 or Track 3 (or possibly Track 4). On approaching Track 1 the train passes over points 12 and 15 and on the approach to Track 3 it passes over points 13 and the double-slip points 14. In both instances the home signal M is set to "Slow" (Fig. 20e). **The distant signal N** (7038) at home signal M is co-ordinated with **home signals A** (7040), **B** (7039) **and C** (7040) in the station. If the train is to halt in the station, the relevant departure signal A, B or C will be set to "Halt", as will have already been indicated to the driver by distant signal N, since the signal disc on the distant signal is not horizontal, nor the arm in angled position (Fig. 20b). However, if the train is to pass through the station on Track 2 without stopping, the distant signal disc will be horizontal, thus indicating "Clear ahead" at Signal B.

If the train passes through the station on Tracks 1 or 3 only the extra arm on distant signal N will be angled at 45 degrees. This indicates "Proceed with Caution" at Signal A or C.

The situation is different with a train entering from the direction of C-village. In this instance the train cannot avoid passing over the points 11 which divert it from its previous track. Consequently, a home signal with two interconnected arms (7040) will be adequate at **Point Q.** This is combined with **distant signal S** (7037) with fixed disc.

The distant signal R (7038) is intended for home signals A, B and C in the station and on this, as with distant signal N, both the disc and the extra arm are moveable.

Signals J, K and L are subject to the same conditions as signals M, N and O.
Trains departing from Track 1 are diverted by points 16 or by points 15 and 12. Consequently, home signals with interconnected arms (7040) are necessary at **points A and E**.

Trains leaving Track 2 in the direction of A-town **cannot** be diverted. Here a single arm home signal (7039) is adequate at **Point B.**

Trains departing from Track 2 in the direction of B-town cannot be diverted. From Track 2 the train is diverted toward C-village by points 11. Owing to these two possibilities, a home signal (7041) with independent arms must be installed at **Point F.**

Track block signals are installed in front of all departure signals within the station system to safeguard the platform tracks during shunting operations. For example, if the locomotive is to be changed on a train which has entered the station this can be set into motion only when the track block signal indicates "Clear to Shunt". The relevant home signal will then be at "Halt". On the basis of these comments the reader will have little difficulty in working out for himself the procedure for installing those signals which have not been mentioned.

Access to Tracks 5 and 6 is via Track 4 and they serve as sidings for incoming goods trains. After the wagons have been registered the goods train is hauled onto train assembly line (7) and then reversed onto the hump.

The uncoupled wagons are channelled into Track 8, 9 and 10 in a gridiron siding.

The Block System

On full-scale railway systems the track distances between stations are divided into what are termed "block sections" as a safety measure. At the beginning of each block section a signal is positioned which allows the train to enter that section only if the preceding train has already passed through and a "Halt" signal is behind it. By appropriate circuit connections the block section signals can be set to "Clear" only where no possible danger exists.

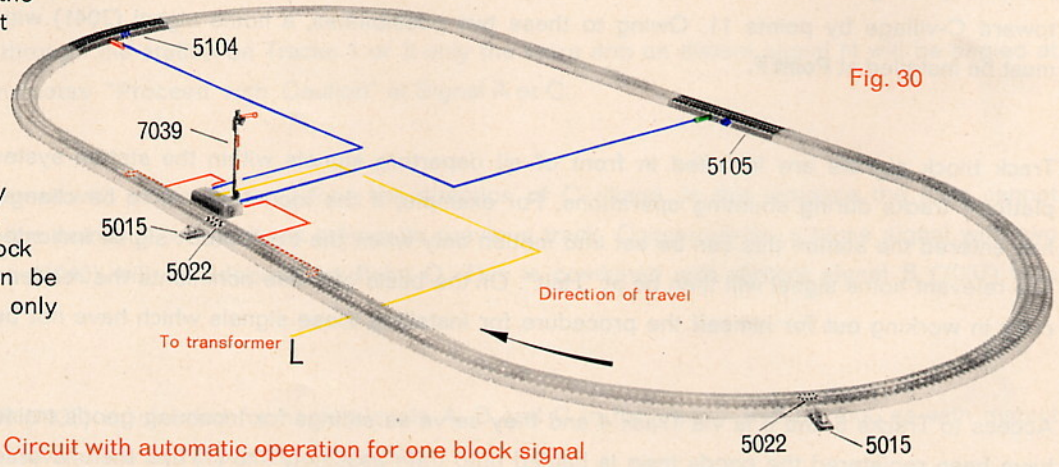


Fig. 30

Circuit with automatic operation for one block signal

With MÄRKLIN home signals it is possible to safeguard traffic on miniature railway systems and to run several trains at a time without risk of collision. Signal operation is fully automatic by the train itself.

Layout with one signal and two trains

This system is laid out as shown in Fig. 30. A track contact section connected by the red plug is installed about one train length behind the block signal while the position of the other track contact section, into which the green plug is inserted, has to be determined by trial and error. The position of the track section depends on the difference in speed between the two trains. Preferably it should first be interposed in the centre between the centre conductor isolator 5022 and the track contact section with the red plug on the side opposite to the signal. If the two trains then appear to be on a collision course the track section will have to be shifted accordingly.
Operating with one single block signal and two trains does not, however, offer any absolute guarantee against collision. If one train is halted or the signal is set to "Halt" by hand, collision may happen. To avoid this, three signals are needed for two trains and four signals for three trains, i. e. always one signal more than the number of trains in the layout.

Layout with three signals and two trains

Fig. 31 shows this layout. Contrary to this illustration the signal to be set at "Halt" is connected by the red plug and — viewed in the travel direction of the train — the preceding signal with the green plug can be connected to the same contact or trip switch track section.

Layout with five signals and four trains

This layout is similar to the one with three signals and two trains. Fig. 32 shows all of the relevant details.

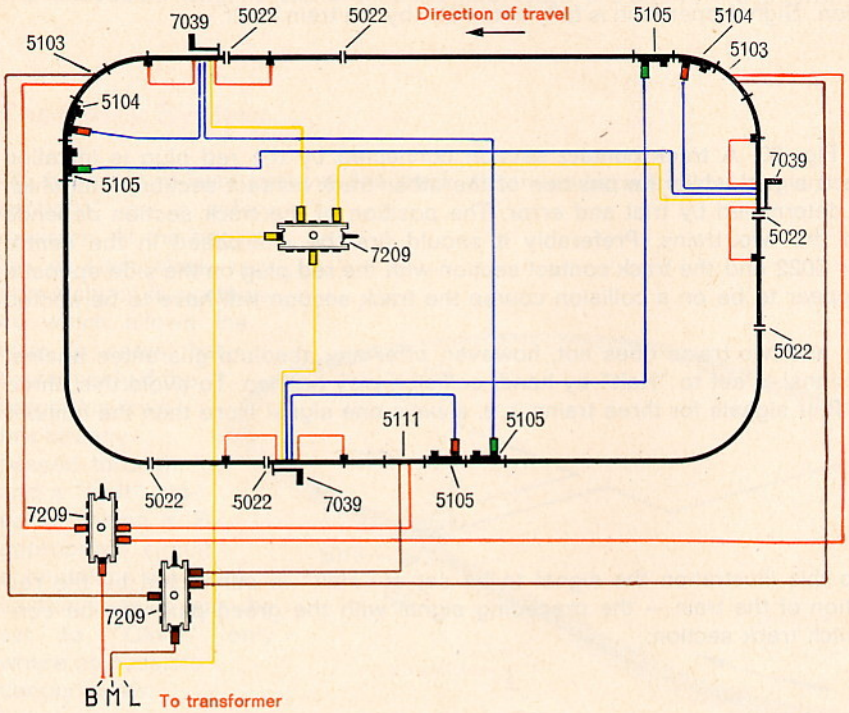


Fig. 31

Automatic loop with two trains on one oval track

Layouts with even more signals and trains are assembled accordingly. Where there are several trains, the load may well be too heavy for one transformer and two or more transformers would then be necessary. The layout can be divided into two or more circuits with a transformer for each one (Fig. 32).

The following points must be strictly observed for the layout shown in Fig. 31, 32 and 34.

A siding track section or a connecting wire for the centre core 5004 must be allocated to each signal, this being fitted between the preceding signal and centre stud isolator 5022. Ideally, this is achieved by laying a centre conductor connection (track siding section or connection wire),

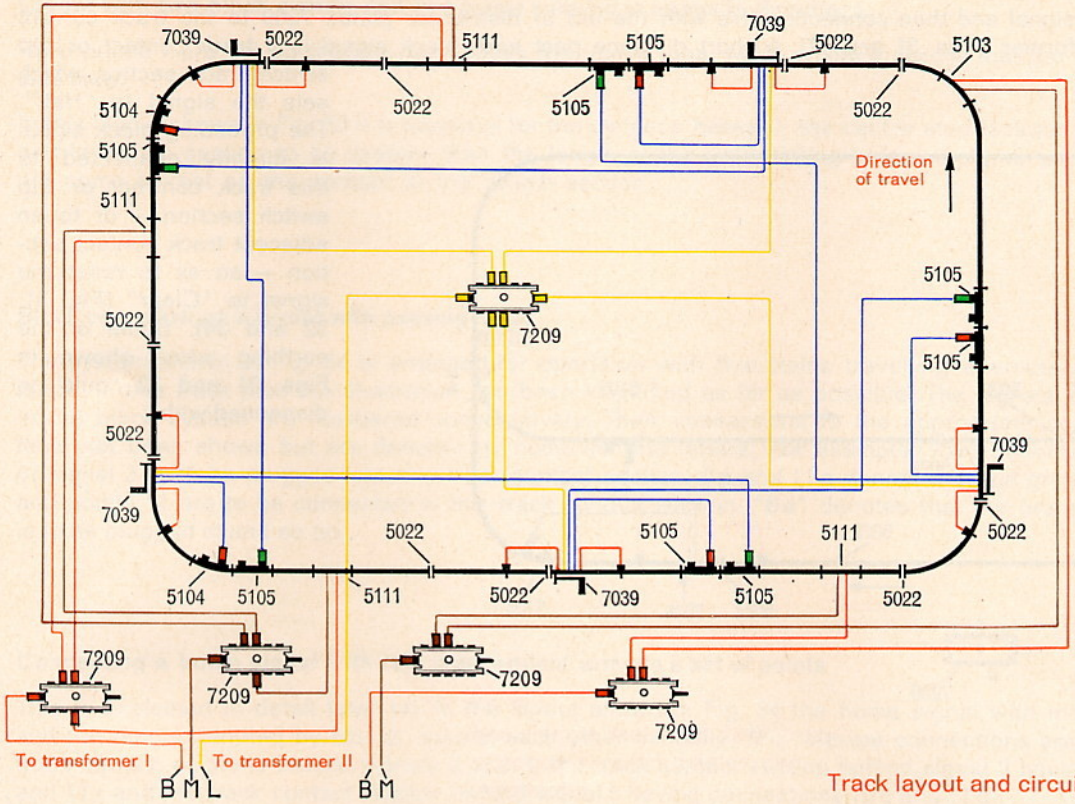


Fig. 32

Track layout and circuit for block sections

behind each block signal and then connecting this with the aid of distributor plates 7209 to the track current socket of the transformer (Figs. 31 and 32). A short distance past each block signal is a track contact or trip switch track section which sets the signal to "Halt". The preceding block signal is directly connected to this track contract or trip switch section — or to an adjacent track contact section — so as to reset the signal to "Clear" (Fig. 31, 32 and 34). Some of the earthing wires shown in Figs. 31 and 32 could be dispensed with.

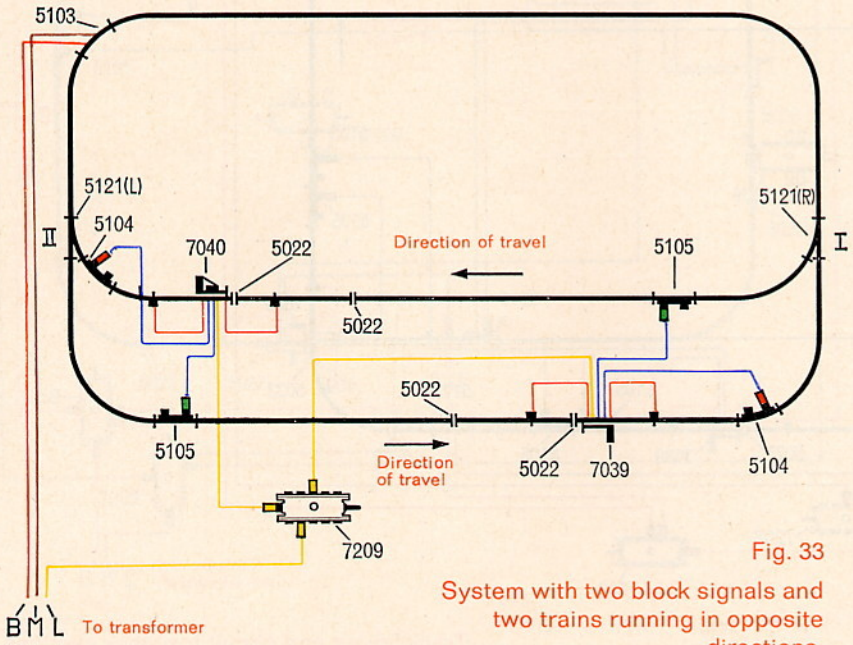


Fig. 33

System with two block signals and two trains running in opposite directions.

Layout with two block signals and two trains running in opposite directions

Here points I are set so that the train takes the **inside loop,** while points II ensure that the train takes the **outside loop.**

In this layout shown in Fig. 33 it is essential for the distance between the centre stud isolator 5022 and a contact or trip switch section to be greater than the length of the train halting before a signal, so that the train does not come to rest on the contact or trip switch section.

Block operation on a layout with passing loops

The system shown in Fig. 34 is arranged for operation with five trains travelling alternately over the passing loops. In this track plan the illustration has been simplified as far as possible. The signals and points included in the block system are numbered consecutively. Their connections to the appropriate contact track section have not been shown but are denoted by numerals and letters. For example, "3**r**" denotes that the red plug of signal 3 is to be plugged into this track contact section; 9**g** and 11**g** denote that the green plugs of signal 9 and points 11 are to be connected to this track contact section. "6**o**" denotes that the orange plug of signal 6 is to be plugged in and so on.

Connecting a home signal with two independent arms to a set of points

This is explained in detail later on. In the layout shown in Fig. 34 the home signal with independent arms 10 and the points denoted by No. 11 control each other mutually. The relevant connections are to be made at the track contact sections behind signals 2 and 3, the track contact section behind **signal** 2 having connections 10o and 11r and the track contact section behind **signal** 3 having connections 10g and 11g.

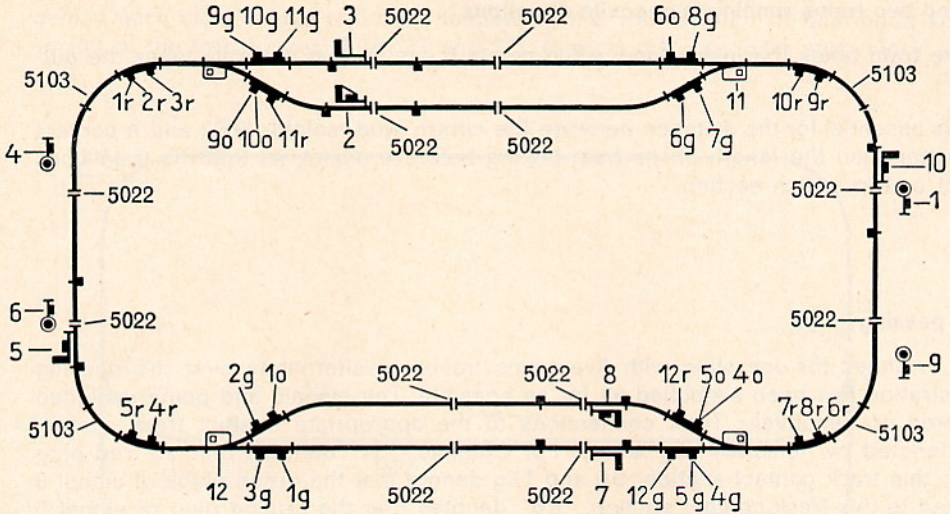


Fig. 34

Block Operation on a Layout with Passing Loops

If a train now travels past signal 2 it sets signal 10 to "Slow" and Points 11 to "Loop" on passing over the track contact section. The oncoming train then travels along the clear track until reaching the interconnected home signal 2, which has been set to "Halt" in the meantime.

However, if a train travels past signal 3, it sets signal 10 to "Clear" and points 11 to "Straight ahead" on passing over the track contact section. The oncoming train can now travel along the clear track until reaching signal 3 which has been set to "Halt" in the meantime.

The connection between home signal 7041 and a set of points can also be made as shown in Fig. 21.

Connecting distant signals

These connections are not shown in Figs. 30, 31, 32 and 33, as they might tend to complicate the circuit diagrams. They can, however, easily be connected by joining their plugs on the blue wire with the identical track contact sections to which their relevant home sections are connected. Therefore, the track contact section into which the red plug of the home signal is inserted will also take the red plug of the distant signal.

Circuits for single line tracks taking traffic in both directions

For trains travelling in right-hand traffic only those signals are valid which are positioned on the right-hand side of the track. The MÄRKLIN home signal circuits, however, require that the train be stopped by the signals set at "Halt" and standing on the left of the track. This disadvantage can be remedied as follows:

1. Appropriate signal arrangement.
   If signals are installed on single track lines as indicated in Fig. 35, i. e. with two signals controlling different directions having a common "Dead" section of track, the foregoing drawback is avoided.

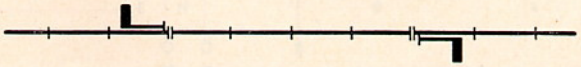


Fig. 35

2. Current supply via the control panel 7210 or 7211. The relevant circuit is shown in Fig. 36.

A train approaching from the right and passing over the section of track from which the current can be cut off will be supplied with its traction current through the control panel (via the connecting wire for centre conductor 5004) so that the train can travel past the signal without its being set to "Clear".

3. Current supply by the 7045 universal remote control switch.

   The example in Fig. 39 shows the arrangement of the signal and the universal remote control switch, train control by the signal on the single track line being interrupted temporarily for trains running in the opposite direction. The functional principles of the universal remote control switch are explained in the following:

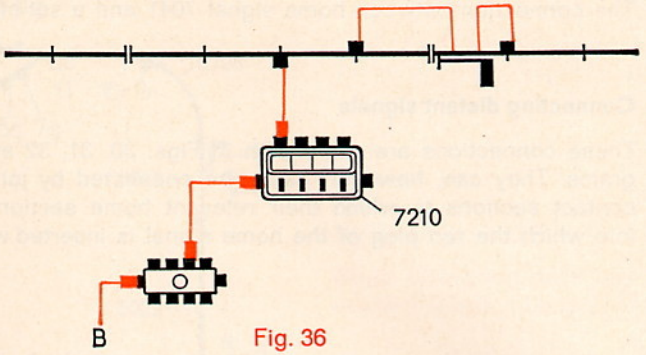


Fig. 36
Circuit for current supplied through control panel 7210

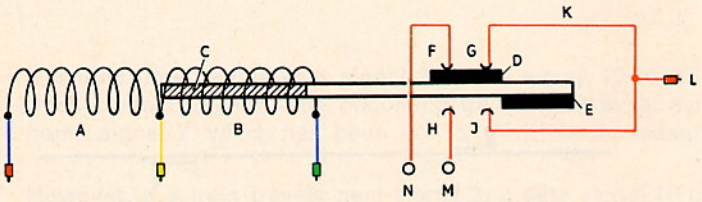


Fig. 37 The electrical functional principles of the universal remote control switch

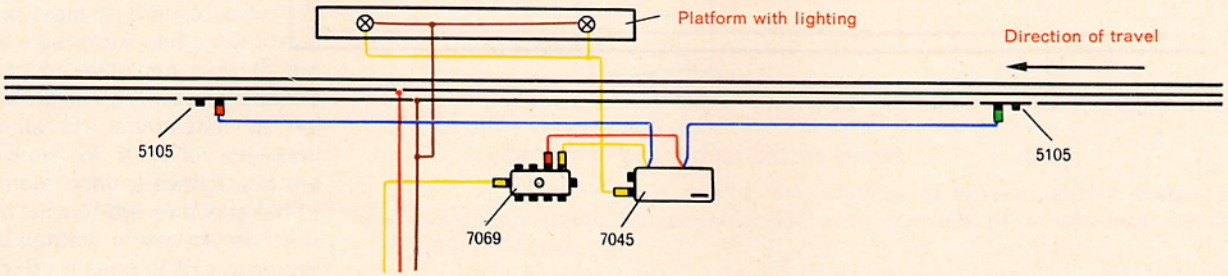
Solenoid coils A and B can be interconnected to actuate plunger C. As plunger C is coupled mechanically with contacts D and E, contacts FG or JH are thus connected alternately. By this means the voltage applied through LK can be switched either alternately to consumers connected to M or N or, conversely, a current consumer connected to L can be supplied alternately from two different sources of current through M or N.

From this action a number of other possible applications arise, of which a few details are described hereunder. To list all of the possibilities would exceed the limitations of this Book of Model Signals, but every model railway enthusiast will appreciate that the switch is extremely versatile. A separate remote control switch is required for the overhead wire current circuits on overhead systems.

Basic circuit I:

For switching a current consumer on or off. Operation alternating to coils A or B. Circuit operation via the path L-J-E-H-M (Fig. 37).
Example (Fig. 38): The lights on a platform are to be switched on by an incoming train before it enters the station and switched off again after it leaves.

Fig. 38



Switching a consumer on and off

Example (Fig. 39): On a single track line the train control action of a signal is to be suspended **temporarily** for oncoming trains.

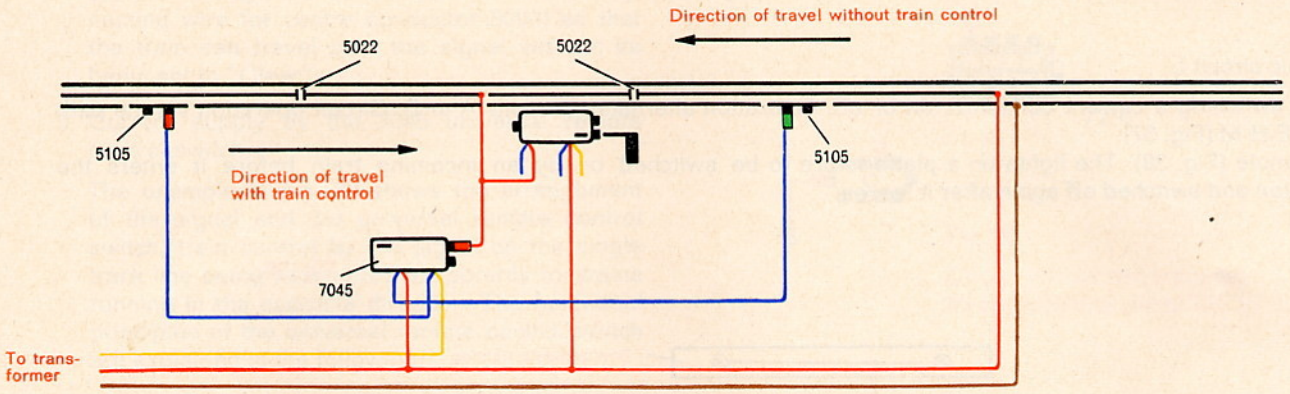


Fig. 39

Signal control suspended temporarily

The signal in the above arrangement can be connected up in the usual way and does not affect use of the universal remote switch.

Basic circuit II:

Alternating switch-over of two consumers on one current source. Alternating operation through solenoids A or B. Switching over current circuit L-J-E-H-M to current circuit L-K-G-D-F-N with current supplied at L and extracted at M or N (Fig. 37).

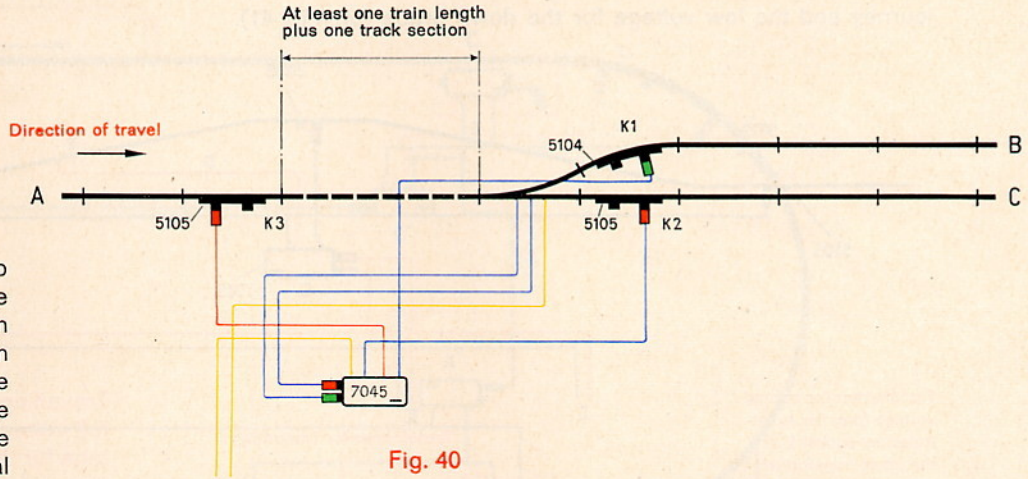


Fig. 40

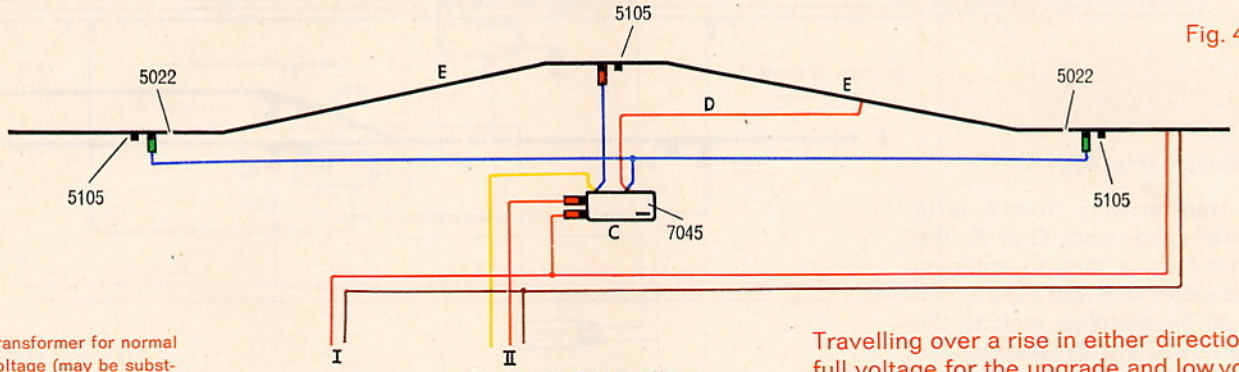
Automatic change of several station tracks for incoming trains by pre-selection with the aid of a universal remote control switch.

Example (Fig. 40):

A train arriving from A is to enter either track C or B. The next train is then to enter on the clear track and a third train is to be switched over to the first track. For this purpose the points are connected to the sockets of a 7045 universal remote control switch and the red wire of the switch is led to the contact or trip switch track K 3. By means of this arrangement the incoming train will set the points in the predetermined direction. The universal remote control switch is switched over by the contact or trip switch track K 1 or K 2. This allows preselection for setting the points for the next train arrival.

Basic circuit III:
Alternating switch-over of two current sources to one consumer. Alternating operation via solenoids A or B. Switching over the current circuits M-H-E-J-L to N-F-D-G-K-L with current supplied at M or N and extracted at L (Fig. 37).
Example (Fig. 41): When travelling over a rise the train will itself select the full travelling voltage for its upgrade journey and the low voltage for the down grade run (Fig. 41).

Fig. 41



Transformer for normal voltage (may be substituted by socket L of the other transformer)

Transformer for low voltage

Travelling over a rise in either direction, full voltage for the upgrade and low voltage for the downgrade stretches.

The red wire D of the remote control switch is led to the isolated track section E and connected at C to transformer I or II for the upgrade and downgrade stretches respectively. With this arrangement the transformers are adjusted so that the voltage of transformer II is lower than that of transformer I. These low-speed sections give the model railway a touch of realism closely related to its full-scale counterpart. The full tractive output is utilised in uphill travel and accidents are avoided on the downgrade. This arrangement functions efficiently regardless of direction of travel, i. e. whether the train runs left to right or from right to left.

A wide range of combinations can be assembled from the basic circuits described in the foregoing. Finally, a circuit is described allowing trains of very different types to operate over difficult and complicated layouts (also with long gradients).

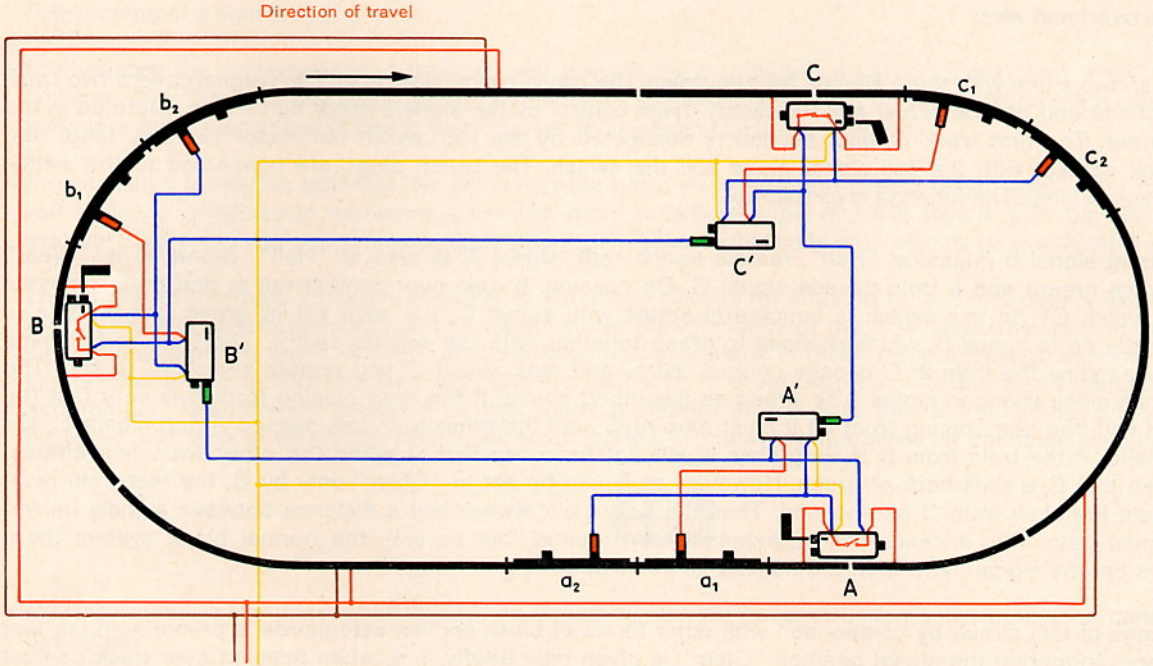


Fig. 42

Circuit for a line with three signals for two trains

For example, it is possible with this circuit for a long slow goods train to run in front of a short, fast railcar without any risk of collision. This circuit represents a block system with a double safeguard. The example incorporates the 7045 universal remote control switch. As the signal actuating mechanism has additional contacts for overhead conductor operation, these can be utilised in place of the remote switch if the signal is not being used for the overhead wire.

The circuit shows a line with three signals for two trains. The trains travel clockwise. Each signal covers two track contact sections and one universal remote switch. Train control by the signals (track current) is operated in the normal manner. The first track contact section is connected by the red switch conductor (voltage feed), the second track contact with the red signal plugs and the switch. The green plugs are connected to the switch on the following signal. The function is as follows:

A train halts at signal B (signal at "Halt", remote switch red), signal A is also at "Halt". Signal C is "Clear" (remote switch green) and a train passes signal C. On passing, it runs over contact rail c_1 and thus transmits current to switch C'. As this switch is coupled in series with signal C, i. e. also set at green, the voltage is carried directly on to signal B, which changes to green together with the remote switch. The train at B moves off. In the meantime the train at C passes contact rail c_2 and sets signal C and remote switch C' to red. The train at B has since changed signal A to green as described above. If the train coming from B is very fast (by comparison with the one coming from C) it must stop at C until the other train has passed A and clears C. On the other hand, if the train from B is very slow it will not have reached C when the other train has already passed A, so that C is thus back at green. However, as B can be set to "Clear" only by C, the fast train must halt at B until the slow train C has passed. Thus the slow train always has a distance between signals behind it and the next train. This distance can be extended as required, but as with the normal block system there must always be one signal more than the number of trains operating.

The advantage of this circuit by comparison with other forms of block section safeguards is primarily in the fact that the signal triggering the signal position "Clear" is given only briefly, i. e. when passing over track contact sections a_1, b_1 and c_1.

As soon as the subsequent track contact sections a_2, b_2 and c_2 are reached by the train the pulse is interrupted. The relevant signal can now therefore be switched immediately to "Halt". With the usual type of block arrangement this would not have been possible until the preceding train had completely cleared the relevant track contact section. Therefore, the layout as shown in Fig. 42 guarantees greater protection against unauthorised overrunning of a signal.

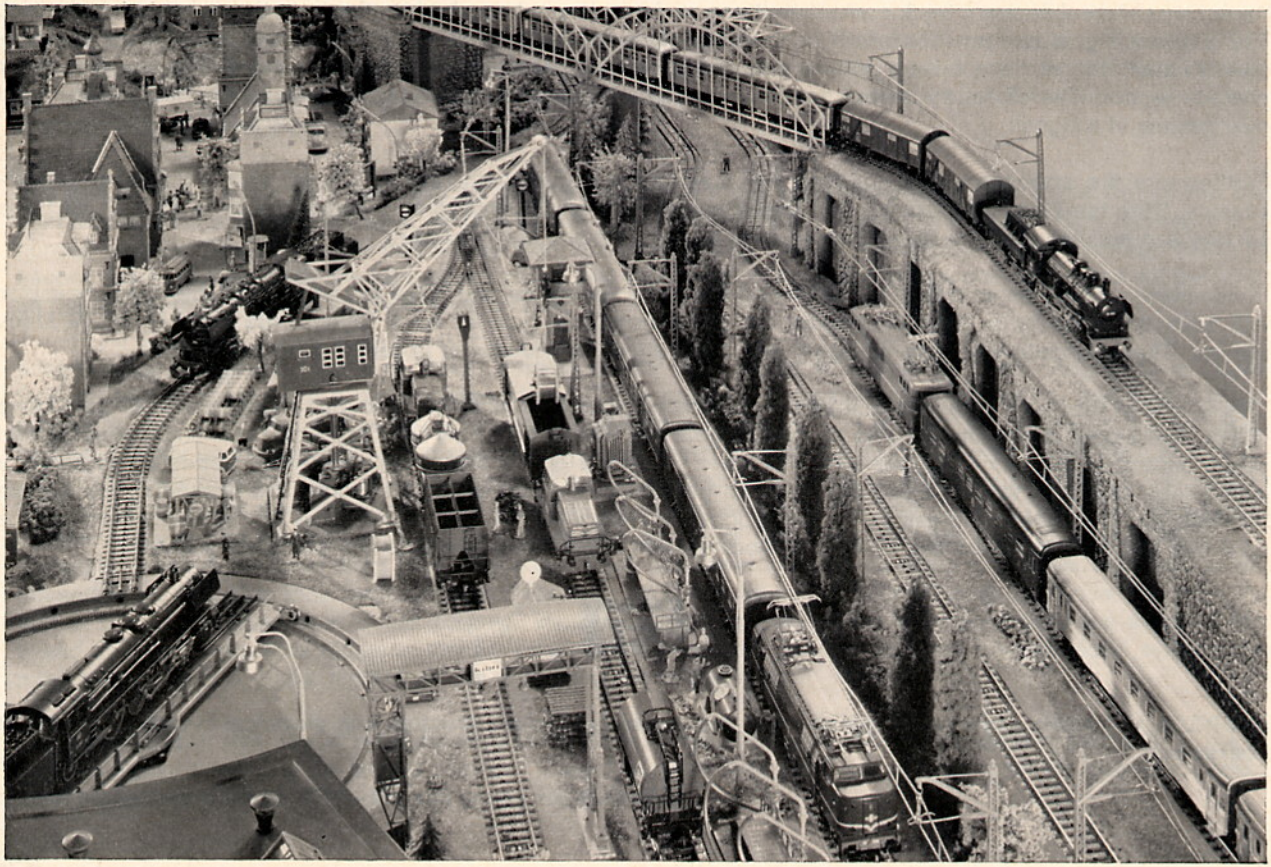
Furthermore the arrangement in question will prevent the signals being set to "Clear" and "Halt" in quick succession. With the standard block system this is liable to occur, depending on which of the track contact sections serving a particular signal is being passed over by the train at a given moment.

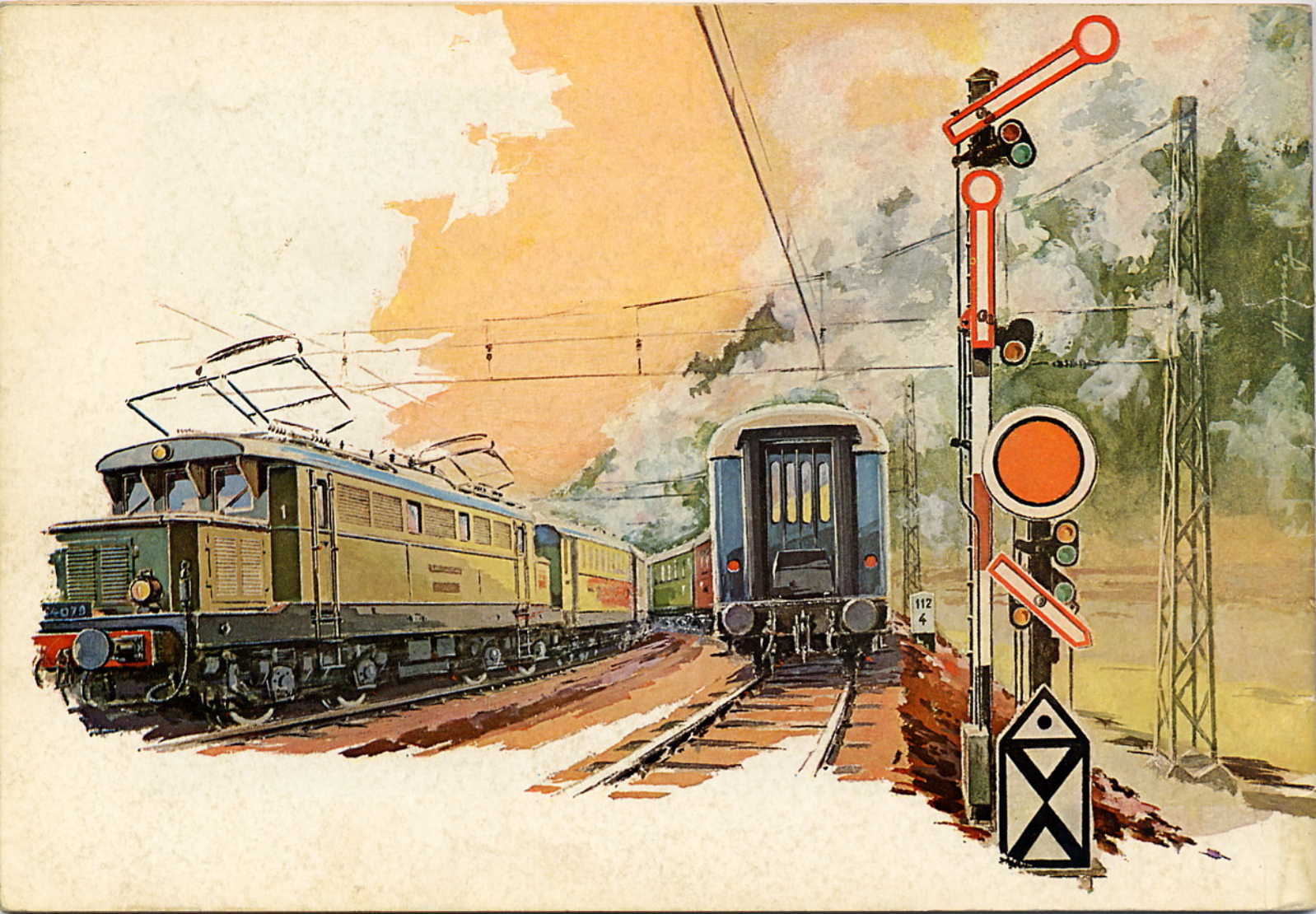
In conclusion it may be said that, by observing the basic examples and rules shown herein, the track operator will have no difficulty in equipping even the more ambitious type of track layout with the MÄRKLIN block system. These circuits will crop up again and again either individually or in combination with others.

This is one of the most attractive features of automatic circuits: in addition to layout planning also to be able to design the signal arrangements and to demonstrate the efficiency of the final layout by realistic operation and signal control of the trains. Anyone who has taken the first steps in these more advanced aspects and taking a closer look at the factors involved will have no hesitation in progressing still further and expanding his system accordingly. The inherent pleasure of this hobby increases in line with the degree of realism which can be achieved and here is where the MÄRKLIN block system offers every guarantee for complete success.

MÄRKLIN, the easily understood layout, clear and convenient in construction and electrical circuitry, reliable in operation.

MÄRKLIN for young and old—MÄRKLIN for the whole family.

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