

Signal Box Operation Manual

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The **Signal Box Rule** consists of two main components for each signal box:

- A **signalman** in each signal box on the route:

The signalman has a 'camera' so that you can stand in the signal box and see what is going on outside. You can rotate your view using the arrow keys and zoom in and out using the mouse wheel or [Page Up] and [Page Down] keys. This is particularly useful when controlling shunting operations, as we will see shortly.



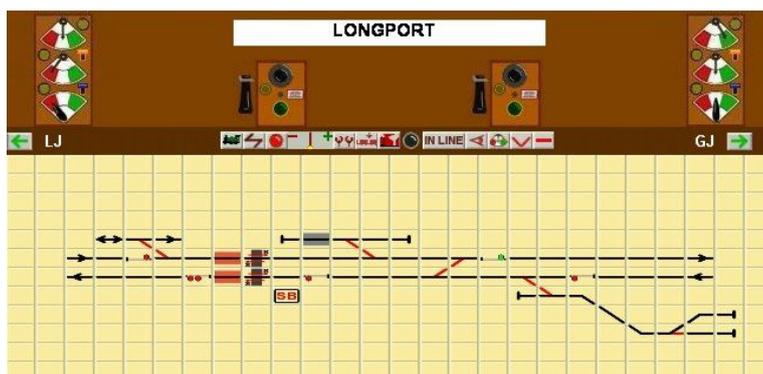
- A **Signal Box Control Panel (SBCP)** for each signal box:

This panel enables you to **monitor** and **control** the **signals** and **points** (junctions) connected to this signal box. It has three parts:

At the top, a Block Instrument (BI) and telephone for each line (single or double track) controlled by the box.

Then a 'Multi-function Control Panel' (MCP) which enables you to:

- move between different signal boxes on the route,
- control whether the signal box which you are in is simply monitoring or is controlling its signals,
- control a locomotive from the signal box.



At the bottom, a Track Control Panel (TCP) which enables you to control the signals, points (junctions), turntables and level crossing gates controlled by this signal box.

This Operation Manual describes the operation of a signal box in detail.

The procedure for installing signal boxes on a route and in a session is described in the Signal Box Installation Manual.

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1. Introduction

These signal boxes operate using the 'Absolute Block' system which was used extensively in many places up to the introduction of modern computer controlled signalling systems beginning in earnest in the 1970s and 1980s.

The operation of this system is demonstrated in the following film made by the London Midland and Scottish (LMS) Railway in 1936. It is on Youtube in three parts and is well worth watching before operating these signal boxes.

<http://www.youtube.com/watch?v=6CZHPZAUrBo>

<http://www.youtube.com/watch?v=2nGIW0muMhM&feature=related>

<http://www.youtube.com/watch?v=Rso8GbZJOE&feature=related>

The operation of the signals controlled by these signal boxes is described in detail in the Trainz TC3 Signalling Tutorial: 'Trainz_TC3_Signalling_Tutorial.pdf' available under 'Guides' at <http://www.trainzclassics.co.uk/>

The following summary of the Absolute Block system is taken from that document:

The 'Absolute Block' signal system

In the block system of signalling a railway route is divided into block sections separated from each other by signal boxes and signals. The general principle is that no train leaves the protection of the signals of one box, to enter a block section, until the preceding train has cleared the signals of the next box. In other words there is at least one complete block section between any two moving engines or trains on the same line of rails.

Semaphore Signals for Block Working

The signals which control the movement of trains are known as ‘fixed’ signals because of their fixed location. In the 1960s most signals of this type in the UK were still semaphore of which there are two principal types:



“Stop” signals which have square ended arms painted red on the face, with a vertical white stripe near the outer end. At night the stop signal displays a red light for stop and green for clear.

Figure 1



“Distant” signals with a fishtail type notch in the end of the arm. This signal type is painted yellow with a forked black stripe near the outer end. At night a distant signal displays a yellow light for caution and green for clear.

Figure 2.

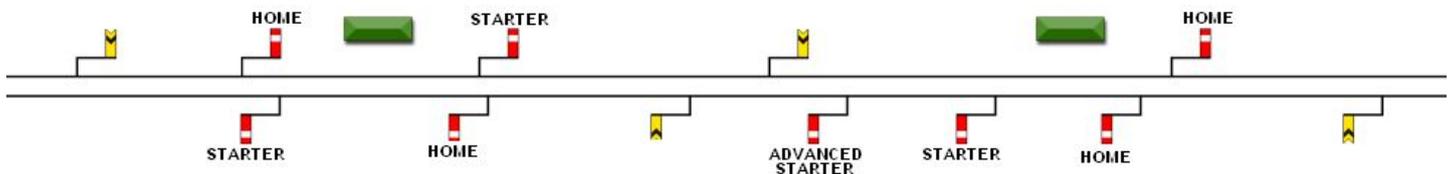
In all countries where traffic follows the left hand track the signal arms, as seen by the driver, point to the left of the post. Where rail traffic follows the right hand track all signal arms point to the right. In the stop or ‘on’ mode (caution in the case of a distant signal) the signal arm is horizontal but to show go (or more commonly ‘clear’ or ‘off’) the end is raised or lowered to 45 degrees or more.

Block working in practice

As a train approaches a signal box, the first signal reached is the distant signal. When the distant arm is ‘on’ it is warning the driver that the next signal is at danger. The driver can pass the distant signal but must be ready to bring the train to a stand before the stop signal. The distance between the distant and stop signal varies from several hundred yards to a mile according to the speed limit and gradient.

If the distant is in the clear position the driver knows that all stop signals controlling access to the next block section are also clear, and therefore the train can proceed without slackening pace. This is because the signalman is unable to pull off the distant until all stop signals are also off. The signal box controls at least one, normally two and often three or more stop signals in each direction. The home signal is normally the first, and sometimes the only stop signal reached by a passing train. The second stop signal is the starter, and it usually guards the exit to the next block section. If there are sidings beyond the starter an “advanced starter” is provided, so that a train may carry out shunting duties within the protection of the signals controlled by the signal box.

Figure 3



If a signal box is guarding a junction it is normal practice for the home signals for the two converging routes to be placed before the junction. These may be preceded by “outer homes” on one or both routes. This allows the acceptance of trains from the box(es) in the rear, even though the junction may be blocked, the train is permitted to draw up to the outer home as there are two stop signals, the outer home and the home, standing between the train and any possible obstruction.

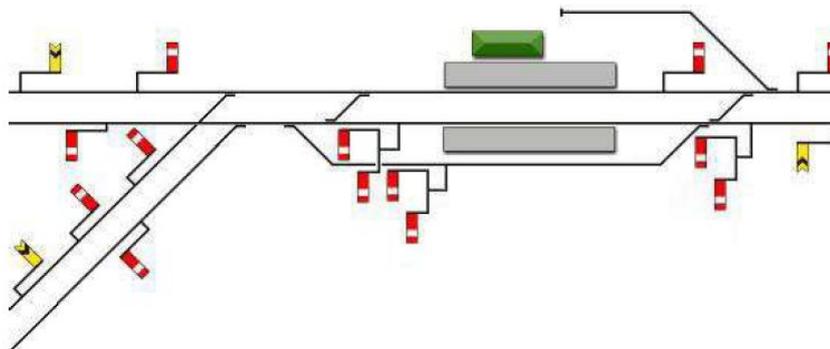


Figure 4

The length of a block section is generally determined by the traffic density of the route; the busier the route the shorter the block section. The busy West Coast Main Line (WCML) in the UK had signal boxes placed at intervals of about 2 miles, whilst block sections of up to 10 miles were found in the more remote areas of Scotland. Another factor is that signal boxes have to be close to junctions when there are no point motors to assist the signaller. Consequently at large stations there are quite often signal boxes placed within a few hundred yards of each other, resulting in very short block sections.

With short block sections the starting signal of one box is often on the same post as the distant of the box in front. This is called a combination signal and even though each signal is under the control of different signal boxes only certain displays are allowed. For example the distant signal of a combination cannot display “clear” when the stop signal is at danger.

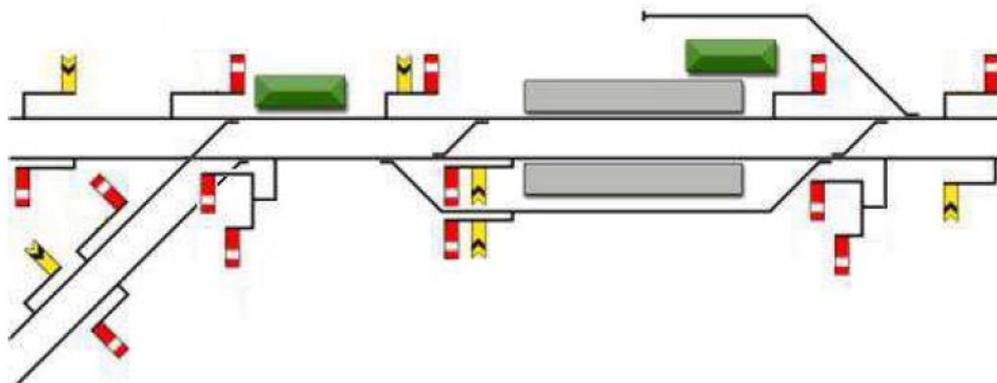


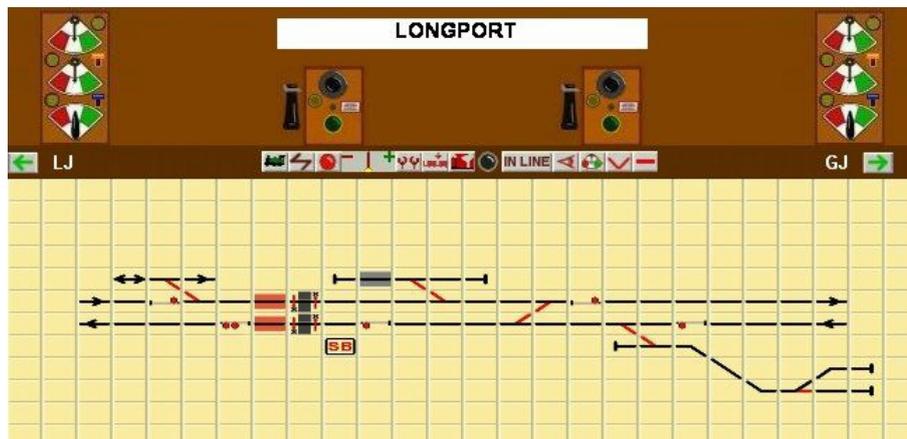
Figure 5

At junctions, signals are grouped to give the clearest possible indication of the purpose served by each. Where lines diverge the highest arm of a group of signals refers to the main line; arms at lower levels to the left and/or right indicate divergences in those directions.

2. Operating a Signal Box

This is the **Signal Box Control Panel [SBCP]** as it appears in ‘DRIVER’ for the signal box at Longport (Signal Box code ‘LP’) on the LMS main line a few miles north of Stoke-on-Trent.

Each signal box on the route is identified by a two or three letter code.



The name of the signal box is shown at the top centre. The codes for adjacent boxes are shown under the Block Instruments controlling the lines to those boxes – in this case Longport Junction [LJ] to the left when looking out the front windows of the box and Grange Junction [GJ] to the right, and in the UP direction towards Stoke-on-Trent..

The **Track Control Panel** – the lower portion of the SBCP – is laid out from the point of view of the signalman looking out the front windows of the box. This makes operation of the signals and junctions quite intuitive.

If the signal Box is located on the **DOWN** side of the line, that is on the left of the line as seen by trains going **away** from the major city served by the line (in this case London), the box to the left on the SBCP (i.e. Longport Junction) is in the DOWN direction and the one to the right (i.e. Grange Junction) is in the UP direction.

If the signal box is on the **UP** side of the line – on the left for trains **approaching** the major city – the UP direction will be to the left on the SBCP and the Down direction will be to the right.

This can be a bit confusing at first when moving from box to box. Once you are familiar with the route and which side of the line each box is located, you will not have any difficulty getting oriented.

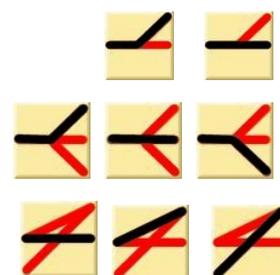
2.1 The Track Control Panel – located at the bottom of the SBCP

2.1.1 Points (Junctions)

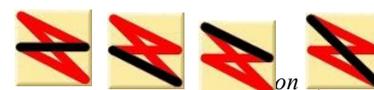
Points are changed simply by clicking on the appropriate cell. The black line shows the direction in which the points are set.

All junctions at Longport, as shown above, are simple two-path junctions:

Some points (Let’s call them ‘Junction Groups’) have more than two possible settings. To set the direction of these, continue to click until the Junction Group cycles to the desired setting. For example, the single slip and the 3-way junction have three positions and need to be clicked three times to move through all settings.



The double slip has four settings.

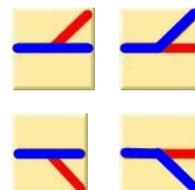


If you find that a multi-junction Junction Group is all red (i.e. no black line), the junctions are set in such a way that they do not represent a 'standard' path. A junction may have been set by a train under AI control, in which case the train will still be able to pass through it safely. You may need to adjust the default junction settings in SURVEYOR – See the Installation Manual for more details. If you click an 'all red' Junction Group in DRIVER it will cycle through its settings as usual. Don't do this if a train is crossing it!



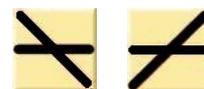
Each set of points is identified by the code of the Signal Box which controls it followed by a number, and if it forms part of a Junction Group, by a lower case letter beginning at 'a'. Placing the cursor over a cell displaying a single junction or a Junction Group will display its number. If the Signal Box code is not shown, this junction or Junction Group belongs to the Signal Box whose panel you are using.

Some junctions have a blue line, rather than black, indicating the direction in which the junction is set. These junctions are actually controlled by a nearby Signal Box, but for convenience of game operation, can be controlled using this SBCP. Placing the cursor over these junctions shows both the Signal Box code and number of the junction. This arrangement of junctions usually occurs when major sidings enter the main running lines, or where there are two very closely located signal boxes.

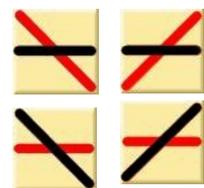


Diamond Crossings can give rise to special problems. When installing trackwork, Trainz is not able to recognise that when one track crosses another in a Diamond Crossing, the possibility of collisions occurs. Each track is managed independently, so that conflicting signal indications can occur and one train can appear to 'drive through' another without either derailing. Neither of these situations is prototypical! The Signal Box Rule employs two sets of Diamond Crossings to manage this situation.

a. *Passive Diamond Crossings:* These simply indicate the location of a diamond crossing and cannot be 'operated' by the Signal Box. To ensure prototypical signal operation and to prevent 'drive through' collisions, the programming of AI controlled trains and Signal Box operation must set surrounding junctions and signals to protect trains using the diamond crossing.



b. *Switched diamond Crossings:* These diamond crossings can be 'switched' by the Signal Box, and by AI trains, in such a way as to properly protect the diamond crossing. These crossings require the installation of two invisible junctions on the route.



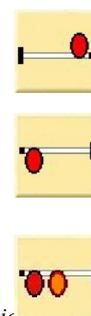
The choice of type of Diamond Crossing to use depends on how the track has been installed.

2.1.2 Signals

Signals come in a wide variety of shapes and sizes to meet the various requirements of the track arrangements. All signals in a Home Section controlled by a Signal Box are shown on the Track Control Panel, as illustrated above.

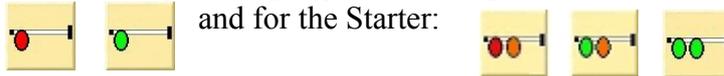
2.1.2.1 Main Line Signals

The arrangement at Longport is very simple: There is a Home and Starter signal on the Up track from Longport Junction to Grange Junction. These are both single arm signals and are represented as shown here. Note that the indicator lamp at the top of the post is in the direction of travel. In the Down direction, towards Longport Junction, there are three signals: a Home at the far right, an Inner Home protecting the level crossing and a Starter beyond the down platform. The Home and Inner Home are represented as shown at the right: The Starter is a Combined signal. Because the next block is short, the same post carries the Starter arm or lamp and also the Distant Signal for the next Box. The Distant is controlled by the Longport

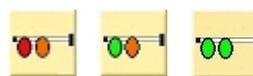


Junction Box. This signal's icon is shown at the right:

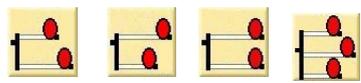
The signal icons change colour as the signals they represent change state. Here are the sequences for the Down Home signal at Longport:



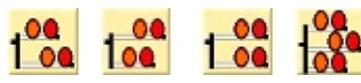
and for the Starter:



As well as these single post signals, here are some other arrangements:



Left, Right, Equal & 3way branches



Left, Right, Equal & 3way Combined branches



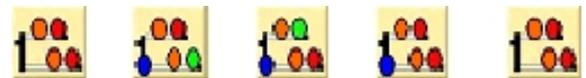
Combined Main + 2 left branches



Combined Main + 3 left branches

With the Signal Box switched OUT of LINE (i.e. in Monitoring or Automatic mode), signals are generally controlled automatically by the game. However, in an emergency, or to unblock a problem, you can temporarily change a signal's state manually by clicking its icon. When you have taken temporary control of a signal with the Signal Box switched OUT of LINE, a blue lamp illuminates on the icon and remains illuminated until the signal is returned to its automatic state.

To change a signal's state, click on its icon and cycle through its available states until you reach the one you need. Here is the sequence for a Combined Left Junction signal with the Box switched OUT of LINE:



This action removes control of the signal from the game's Artificial Intelligence (AI) so you must remember to return it to its automatic state when you have solved your problem.

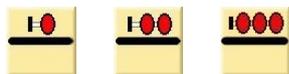
When the Signal Box is switched IN LINE, you are in full control of all the signals on the Track Control Panel. You must click them to pull them ON or OFF.

The Signal Box rule does not control Distant Signals. These are allowed to operate automatically based on the state of their associated Home signal.

You cannot change the state of the Distant signal on the post or doll of a Combined Signal. This is controlled by the next Signal Box.

2.1.2.2 Shunting or Auxiliary Signals

As well as Main Line signals, a variety of shunting or auxiliary signals are also used to control access to the main lines from sidings or yards, or to control movement of traffic on goods lines. These are also controlled by the Signal Box. They operate and are operated just like Main Line signals. As illustrated above, Main Line Signal icons have the signal post in the centre of the icon. Shunting or Auxiliary signals are shown beside the line.



The top indicator or arm of shunting signals controls the left-most path beyond the signal and the bottom indicator controls the right-most path.

2.1.3 Turntables

Click the Turntable icon to move the turntable to its next track. If there is only one track, a single click will completely turn the locomotive.



2.1.4 Level Crossings

Click on the Level Crossing icon to open or close the level crossing's gates when the box



is switched IN LINE.

Signalmen are strictly prohibited from making abusive remarks to drivers of motor vehicles who sound their horn when they consider that level crossing gates have not been opened quickly enough. They are, however, permitted to smile at them as the second train speeds through the crossing.

2.1.5 Signal Boxes



These icons indicate the approximate location of signal boxes.

Clicking on a signal box icon will take you to that box. You will view the route from the selected signal box and see that box's Control Panel.

There are several types of signal box:

 'Standard' box: This is the most common type. It has all the elements described above: Block Instruments and phones, Multi-function Control Panel and Track Control Panel. It controls one or more main line blocks. Longport and Tunstall are examples of this type of box.

 'View Only' box: This box provides a viewing position but shares the Signal Box Control Panel with another box. This is used, for example, where a moderately complex Home Section has two signal boxes. This arrangement permits viewing operations from different locations but controlling access to and from the area from one panel. Stoke Carriage Shed [NCS] is an example of this type of box.

 'Auxiliary' box: This controls a relatively complex yard or locomotive depot but has no Block Instruments. It does not control any portion of a main line. It has its own Track Control Panel. Etruria Gas Works [EGM] is an example of this type of box.

Some yards do not have actual signal boxes so the signalman or shunter will be found standing somewhere in the yard where he has a good view of operations. Here is the signalman/shunter at Hellifield MPD on the Settle and Carlisle line.



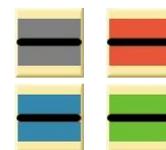
Note: There is a fourth type of box which is not visible in DRIVER. The 'Portal' box is located at the entrance/exit of portals and notifies the entry and exit of trains to the route.

These box types are described more fully in the Installation Manual.

2.1.6 Infrastructure

The Track Control Panel also shows significant items of infrastructure in the area controlled by the box:

- The location of important facilities: platforms, sheds, cattle docks, fuel points, siding numbers. Placing the mouse pointer over these items will give details of what they represent.



- The location to which a line leads. The tooltip for these arrows gives details of the location.

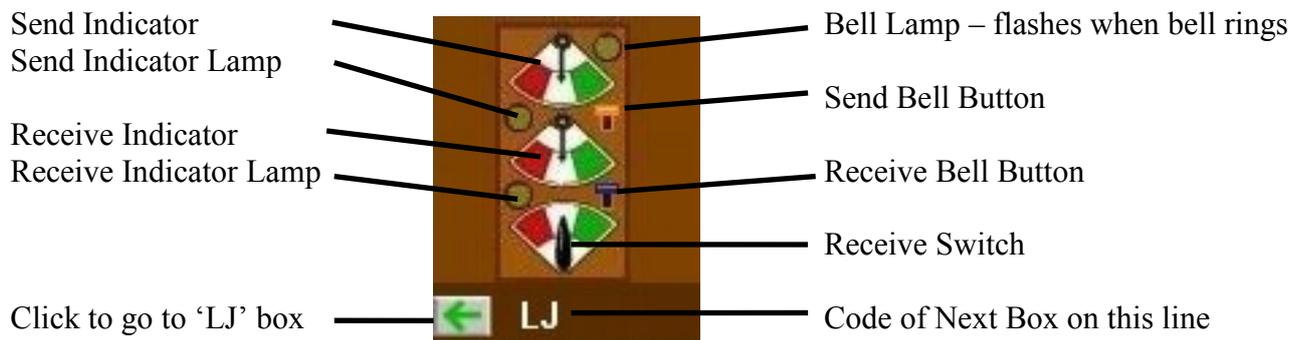


These icons are indications only and clicking them will not affect anything in the session.

2.2 Block Instruments

A Block Instrument and associated telephone are provided for each arriving / departing line.

The Block Instrument has the following elements:



The Send Indicator, Receive Indicator and Receive Switch indicate:

- Red: Train on Line A train is in the block of track between this and the next box
- White: Line Normal No train is permitted to use this track
- Green: Line Clear A train is authorised to enter this track

Placing the cursor over the Send Indicator or the Receive Indicator displays the name of the train given or requesting 'Line Clear' or 'Train on Line'

With the Signal Box switched 'IN LINE' you will be required to send the following bell codes:

- 1 bell - to 'Call attention' to an adjacent signal box or to acknowledge a 'Call attention' message.
- 2 bells - to request or acknowledge 'Line Clear'
- 3 bells - to advise or acknowledge 'Train on Line'
- 4 bells - to advise or acknowledge 'Line Normal'

If you ring the wrong number of bells, wait a few seconds and ring the correct number. The other signal box knows what response is expected and will only respond to the correct number of bells.

Operation of the Block Instrument and its components is described in detail below.

2.3 Phones:

There is one phone for each Block Instrument. The phones and Block Instruments are in the same relative positions.

The phone is used by adjacent boxes and by the District Controller to communicate with you. You also use the phone to advise an adjacent Signal Box that you are unable to accept a train when requested.

The phone has the following elements:



- Click the Earpiece to lift it and answer a call.
- When the Earpiece is off the hook, click the Earpiece location to hang up.
- Click the Call Button to call the box to which this phone is directly connected.
- The phone Lamp will come on whenever the box connected by this phone calls you, and will remain on until you hang up.

The operation of the Phones is described in detail below.

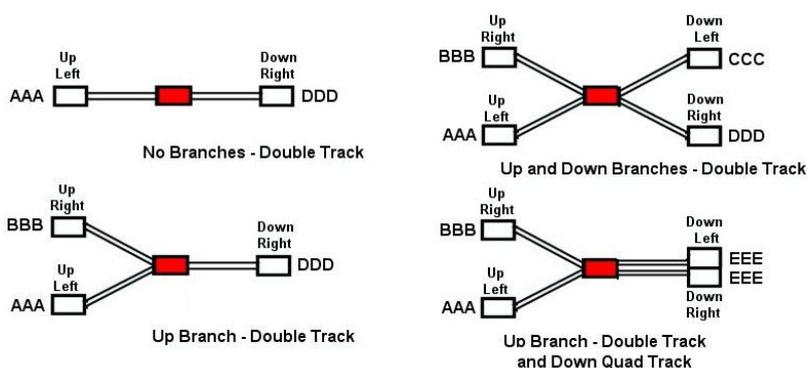
2.4 Traffic Notices

The 'Traffic Notice' Driver Command <kuid2:96148:94030:1> is used in conjunction with the Signal Box Rule to advise the focus Signal Box in the session of the approach of trains on goods lines which are not controlled by block instruments.



The Signal Box Rule provides two block instruments in the Up and two in the Down direction. Each of these can control a single or double track line. Here are a few typical examples:

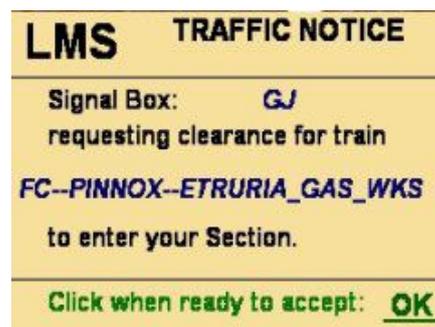
The block instruments are generally used to control Main Lines. In many locations, however, the section controlled by a signal box may also be accessible to one or more freight lines which may have comprehensive, limited or no signalling. In these diagrams which show a branch on the Up (left) side, both Up block instruments are being used to control these lines. There is no capacity to provide the same control if one or both of the branches has 'freight' tracks in addition to the main tracks.



It is important, however, that signalmen are aware of all trains seeking to enter their area of responsibility. This situation is managed using the 'Traffic Notice' Driver Command, as follows:

The Traffic Notice driver command is inserted in a driver's schedule when setting up a session.

When the Traffic Notice driver command is reached in the train's schedule, a message is displayed indicating the code of the Signal Box offering the train and the identity of the train. This should be sufficient information for the signalman to know where the train is coming from and where it needs to go. With this information the decision on whether the train can be accepted immediately or must be held for some time can be made. Points and signals can also be set for its acceptance and onward journey.



The message seeks clearance for this train to proceed into the block controlled by the focus Signal Box. A bell is rung to alert the focus signalman to the Traffic Notice.

The Traffic Notice will stop the train at the point reached in its schedule, not allowing it to enter the block controlled by the focus Signal Box, and will hold it there until the signalman in the focus signal box accepts the train by clicking 'OK' on the Traffic Notice.

This driver command is useful when preparing sessions in which the user signalman remains in a particular signal box or progresses with the advance of a particular train. It may not be as useful if the focus of the session is driving a train using several signal boxes.

To use this driver command when setting up a schedule, find or place a trackmark some distance in rear of the starter signal of the adjacent signal box in the direction from which the train is coming. The trackmark should be located so that, when the train reaches the trackmark, it will stop realistically near the starter signal.

In the train's driver schedule, insert a 'Drive to', 'Navigate to' or similar driver command referencing this trackmark. Insert the 'Traffic Notice' driver command immediately after the driver command which brings the train to the trackmark.

2.5 Multi-function Control Panel



The Multi-function Control Panel below the phones has the following elements, from left to right:

2.5.1 Locomotive Controls



These buttons permit the control of a locomotive while you are sitting/standing in a signal box:



Locomotive Selector: This button opens a pick list of all locomotives on the route which do not have schedules. Selecting a locomotive from this list enables control of that locomotive using the following controls: The button will illuminate when a locomotive is under the control of this signal box controller.

Click this button again to terminate control of the selected locomotive. The illuminated icon will go out.



Change the logical direction of the controlled train. This does not change the physical direction of the train but makes what was the rear of the train become the front. This is particularly useful when operating double ended locomotives or multiple unit trains.



Stop button: This button brings the train steadily to a stop. Useful in emergencies!



Throttle Control: This operates in a similar manner to the DCC Controller. Click on the Green [+] to increase speed and on the Red [-] to decrease speed. The yellow lamp at the bottom of the indicator illuminates when the throttle is at zero. There are 10 throttle steps in each direction.



Uncouple Loco: Uncouples the leading locomotive from the train. If this is a steam locomotive with tender, the loco and tender will uncouple. This is particularly useful when shunting.



Uncouple from Vehicle Number X: This button opens a panel which allows you to select the position of the vehicle in the train from which you wish to uncouple the loco plus any vehicles forward of the selected vehicle. Count vehicles from the loco end of the train, beginning with the vehicle behind the first loco. The tender of the leading loco is considered part of the loco. To uncouple the loco (including its tender if any) plus the next three vehicles from the 4th vehicle in the train, select [4].



Move to Loco Cab: Click this button to move from the signal box to the cab of the locomotive which you are controlling. This is particularly helpful when shunting. You will still be able to control the locomotive from the signal box panel, but can also control it using the DCC Controller or keyboard.

2.5.2 Panel Reset Button



This button resets the status of all Block Instruments and updates the state of all signals and junctions. The locations of all trains affecting the signal box are checked and the instruments set accordingly. This button is very useful if you are not sure what is happening and want to confirm that the SBCP is reporting conditions correctly. Resetting the Box will switch it OUT of LINE.

2.5.3 Signal Box State Button



This button enables you to switch the signal box between 'Monitoring' mode in which the Block

Instruments monitor and report the presence of trains automatically but do not control any signals, and 'Control' mode in which you are responsible for the operation of the Block Instruments and for controlling all signals under the control of the signal box.

In 'Monitoring Mode' this button is not illuminated and the box is said to be switched 'OUT OF LINE'.

When the Signal Box is 'Out of Line', the Block Instruments monitor, but do not control, approaching and departing trains. All Block Instruments, and signal icons are passive. The phones do not operate.

In 'Control Mode' this button is illuminated  and the box is said to be switched 'IN LINE'. When the Signal Box is switched 'In Line' the Signal Box controls the movement of trains into and out of the local area controlled by the box. All Block Instruments, signal icons and phones are active. Pay attention – you are in charge!!

Monitoring or 'Out of Line' operation may be used when shunting a yard. This mode ensures that you are aware of conditions on the main lines but do not have to respond to all block Instrument operations.

2.5.4 Signal Box Access

 Signal Boxes are fitted with a signalman who also acts as a camera. This button opens a pick-list of signal boxes with signalman cameras. Selecting one of these moves the view to the interior of the selected signal box.

These signalman cameras behave just like a vehicle with an interior view. Internal, external and roaming views are available and you can rotate, raise, lower and zoom the view.

This button does not change the current Signal Box Control Panel. This allows you to see what is happening at a different box while still retaining control at the original box.

 This button opens a pick-list of Signal Box Control Panels. Selecting one of these closes the current Signal Box Control Panel.

This switches the current box 'Out of Line' so that it no longer controls its signals. The new Signal Box Control Panel is opened in 'Out of Line' mode and needs to be switched 'In Line' if you want to take control. You will retain control of a locomotive if you have selected one as described above.

2.5.5 Show/Hide Controls

 Hide/Show Track Control Panel

This button hides / shows the Junction Control Panel, allowing the Signal Box control Panel to take up less screen space while still displaying the Block Instruments, phones and Multi-function Control Panel.

 Minimise Signal Box Panel

This button hides / displays the Signal Box Control Panel. This does not affect the Box State. Beware! Things may happen while the panel is not visible!

When minimised, and at startup, a signal box icon appears at the bottom right of the screen.

Click this button to display the Signal Box Control Panel.



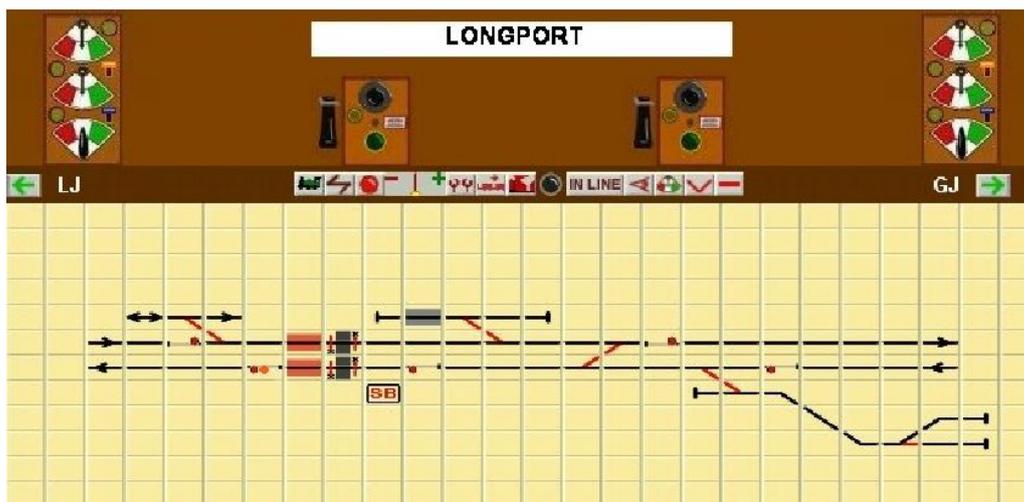
Note that the SBCP can be hidden by pressing the [5] key.

3. Operating the Signal Box in Monitoring or 'Out of Line' mode:

When the Signal Box Control Panel for a newly selected signal box opens, the box is switched 'Out of Line' – it is in monitoring or automatic mode. This is true when the 'Startup' Signal Box Control Panel is opened at the start of a Session. You can switch points at any time but the phones do not operate and the block instruments and signals respond automatically to the state of the signals and advise the location of approaching and departing trains but you do not need to operate them.

Here is what happens when a train passes your signal box when it is 'Out of Line' in Monitoring mode:

- 3.1. You are in Longport Box. Here is it's Control Panel with no trains approaching in either direction. Longport Junction [LJ] is the next Box in the Down direction and Grange Junction [GJ] is the next in the Up direction. Their codes are shown under the Block Instruments controlling the block between them and Longport Box.



Note that default junction settings are arranged to allow trains to pass through Longport and all signals are at STOP..

- 3.2. A train has been detected approaching from the direction of Longport Junction. The Longport Junction box has requested 'Line Clear' and in response your box has set the LJ block instrument switch to 'Line Clear' and two bells are rung. The Receive Indicator follows the switch setting, confirming that the Send Indicator in the Longport Junction box has also followed the switch setting change. The train is now cleared to approach the Longport Home Signal on the line to Longport Junction. All Longport signals remain ON.

Typically the next Box will request 'Line Clear' when the Starter signal of the second signal box away from your box is set OFF.



Placing the cursor over the Receive Indicator will show the identity of the approaching train.

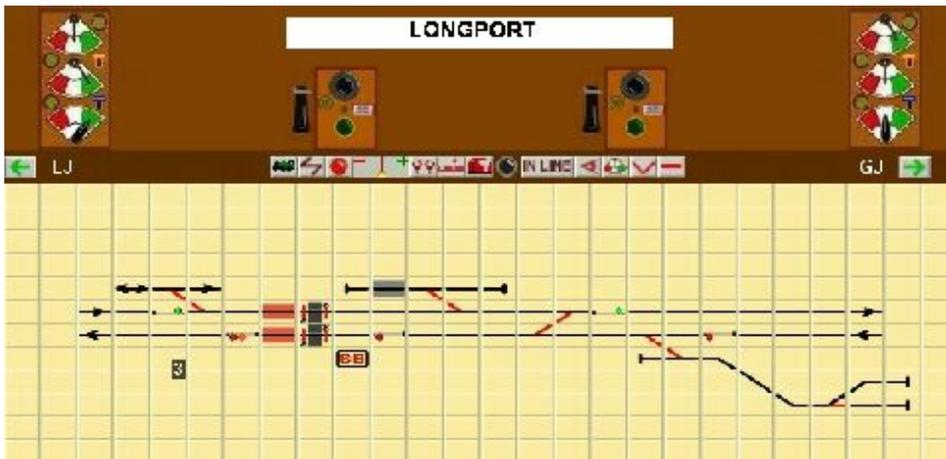


The identity of departing trains can be found by placing the cursor over the Send Indicator, Train identification is achieved by editing the Drivers' names in the 'Driver Setup' rule for the session.

In naming trains it may be found helpful to use a simple code for the type of train, perhaps the time it left its point of origin to distinguish it from others following the same route, and the start and end points for the train. A start time is not shown in the example above but this train is a 'P'assenger 'X'press (to distinguish it from a 'L'imited express or 'S'topping service) travelling from MANCHESTER to LONDON.

- 3.3. Typically, when the approaching train enters the third block from your box, your Box will request 'Line Clear' from the Grange Junction [GJ] box which will grant it and set your Grange Junction 'Send Indicator' to 'Line Clear'. Two bells will be heard.

The approaching train is now cleared to proceed through Longport to Grange Junction's Home Signal. Your Starter signal will be set OFF, as will any other signals between your Starter and the approaching train, including your Home, as illustrated here:



- 3.4. The approaching train passes the Starter Signal at Longport Junction and enters the block controlled by your box. This is notified by the Longport Junction box. Your box sets the block instrument switch for the line to Longport Junction to 'Train on Line' and 3 bells are rung. The Receive Indicator follows the switch setting.



- 3.5. The approaching train passes your box's Home signal. This signal goes ON and this box sets the Down Block Instrument to 'Normal', advising the Longport Junction box that the train has left the block. The Receive Indicator follows the switch and 4 bells are rung to indicate that 'Line Normal' has been set.

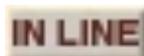


4. Operating the Signal box in 'In Line' mode.

Once you switch your signal box 'In Line' you must pay attention at all times!! You are in charge of this Home Section of track and the adjacent blocks. If you make a mistake or miss something, there will be consequences, and they will generally not be pleasant!!! If you get really confused, press the black Reset button.



When the box is switched 'In Line' by pressing the Signal Box State Button, the 'IN LINE' indicator will illuminate:



As in Monitoring mode, points/junctions controlled by the signal box can be changed at any time. All signals, turntables and level crossing gates must now be controlled from your box.

IMPORTANT: When pressing the Receive and Send Bell Buttons it is essential that you press them the correct number of times. Incorrect numbers of bells will be ignored. Sometimes the buttons are a bit 'sticky' – it is best not to press them too quickly but with an easy rhythm, at about the rate used by the adjacent signalmen. You have 5 seconds to complete your bell call after the first ring. If you make a mistake, or if the button's tooltip does not change to indicate the next step of the process, wait a few seconds and send the call again. If the correct number of bells is detected your call will be accepted.

Except in cases where trains need to be temporarily refused, you should not receive phone messages. The absence of phone messages is a good indication that you are doing your job well!

We will now follow the same process described above but with the box switched IN LINE.

4.1. No train approaching or departing.

Block instruments will be at 'Normal'. [as in 3.1 above]
Placing the cursor over the Receive Bell Button will indicate that there is no train within several blocks of your box.



4.2. 'Line Clear' requested for an approaching train.

When a train causes the near starter of the second signal box from your one to come OFF, the next signal box to this one will 'Call Attention' by ringing one bell. The **Receive Lamp** will also come on.

Whenever a Receive Lamp, Send Lamp or Phone lamp is on, you have an action to perform. The lamp will stay on until you have completed the required action or actions. These will be described in what follows. The lamps are particularly useful when things get busy. As a box may have up to four block instruments controlling 8 tracks and therefore 8 trains, the potential for confusion is considerable and it may not always be easy to determine who rang the bell!

The Bell Lamp at the top right of each block instrument flashes whenever the bell of that instrument rings, whether it is rung by you or by the adjacent box. This is helpful when trains are passing and it is not always possible to hear the bells.

Respond to the 'Call Attention' by pressing the blue **Receive Bell button** once. This will ring one bell. Note that the Receive Bell button tooltip will advise what you are required to do.

If you fail to acknowledge 'Call Attention' from an adjoining box, that signalman will phone you to find out why you did not acknowledge his call. The Phone Bell will ring and the Phone Lamp will come on. Pick up the receiver to take the call. Hang up when the message is finished. The Phone Lamp will stay

on until you hang up. If you do not answer the call it will sit in a queue and when the next call comes you will get the messages in the order they were sent – and you will soon become very confused – so answer the phone when it rings!! If you get a ‘reminder’ call about something you have done or failed to do, simply complete the required action. This will generally cancel the phone call because the caller is now happy, and the phone lamp will go out. There is no need for you to make a call.

The next box will then ring two bells, requesting you to set ‘Line Clear’.

Note that the Longport Junction block instrument Receive Lamp is illuminated and the tooltip is showing that you have to do one of two things:



1. **Accept the train:** If you are able to accept the train – that is, if you are prepared to allow the train to come as far as your Home Signal - move the switch to ‘Line Clear’ and then ring two bells by clicking the blue Receive Bell Button twice. **Don’t press the button until after you have set the Receive Switch or you will get a phone call from the Longport Junction signalman telling you that you have not set the Receive Switch to ‘Line Clear’!**

As you have no further action on this train at the moment, the Receive Lamp will go out. The next action is for Longport Junction to call you when the train enters the block.

2. **Refuse the train:** If you are not able to accept the train – shunting might be happening which obstructs the block or main line, for example – take the Phone Earpiece off the hook, press the ‘Phone Call’ button and a phone message will be sent to the next box advising that you have refused the train at this time and that you will phone again when the line can be cleared. Hang up the Phone. This will cancel the request from the next box. The Receive Lamp will stay on while the train is refused, as a reminder that you must call the next box.

When you are ready to accept the train, lift the earpiece, press the ‘Phone Call’ button again and a phone message will advise the next box to start the process again, then hang up the earpiece. The next box will then ‘Call Attention’, as described above. You acknowledge. The next box will again request ‘Line Clear’ and you will accept by setting the Receive Switch to ‘Line Clear’ and ringing two bells.

Rejecting a train: If your signal box is in rear of a junction you may get calls requesting ‘Line Clear’ for trains which are not in fact coming your way. This will happen if the box at the junction detects the approaching train and the junction’s points are still set in your direction. The train will generally be under AI control but it will not set the points at the junction until it is fairly close to it because setting them too early may unnecessarily block other trains using the junction.

If your box is in rear of a junction you need to check the destination of all trains being offered to you by placing the cursor over the Receive Indicator. If the train is for you, respond as described above. If the train is to take another line you can REJECT the train. This will cancel the offer from the junction box.

If you respond to the ‘Call Attention’ with four bells on the blue Receive Button, the call will be cancelled. If you inadvertently accept the train and then realise that it is not for you, Call Attention (one bell) to the box in the direction of the approaching train, and after he responds, set the block instrument to ‘Line Normal’ and ring four bells. The junction box will acknowledge with four bells, cancelling the call.

If you do not reject the train the requesting box will reset the line to ‘Normal’ when the points are set to take the train in another direction. Waiting for this to happen may cause you to delay other trains and is not good practice.

4.4. Preparing to pass the train on:

Once you have accepted the train by setting 'Line Clear', you are responsible for it until it either terminates in your Home Section or until it has passed out of your area of responsibility by leaving the next block after it has departed.

Setting 'Line Clear' allows the train to proceed to your Home signal. It will be held there until you pull that signal Off by clicking its icon on the Track Control Panel. Before you do that, you need to ensure that your points are set correctly for the train to either terminate at its required location in your Home Section or to pass on to the next box.

Once you are ready for the train to enter your Home Section you can pull your Home signal OFF, but you must not pull your Starter off yet.

Particularly if the train is an express or through freight, as soon as you set 'Line Clear' you should contact the box to which you intend to forward the train and request 'Line Clear'.

To do this, 'Call Attention' to the box to which you are sending the train by pressing the **orange Send Bell Button**. This will ring one bell and turn the Send Lamp on. After a few moments the box to which you are sending the train will acknowledge with one bell.

Press the Send Bell button twice to request 'Line Clear'. Two bells will be rung.

If the next box can accept the train, that box will set the Send Indicator to 'Line Clear' and ring two bells to advise that this has been done.

The Send Lamp will remain on because you have responsibility for the next action concerning this train: You will need to advise the next box when the departing train enters the block. But it hasn't arrived at your box yet.

When you have 'Line Clear' from the next box you are able to pull your Starter signals OFF so that the train is clear to proceed and is not slowed unnecessarily. Before you pull the Starter OFF, make sure that your Home and any signals between the Home and Starter are also OFF so that the train has a clear path.

If the train is passing through your section it is advisable to clear its path as soon as you have accepted it. If it enters the approaching block and does not have clear signals it will begin to slow for your Home or Starter signals which are still ON. When the train arrives you have a few tasks to perform in quick succession and you will not want to be doing something then which you could have done before.

If the next box cannot accept the train you will receive a phone call advising that the train has been REFUSED. This will only happen if a train is in the block – perhaps shunting beyond the Home Signal. When the line is clear you will receive another call advising that the train can be accepted. You then 'Call Attention' and start the 'Line Clear' request process again.

4.5. Approaching train enters the block.

When the train approaching your box enters the block under your control, the next box [Longport Junction in this case] will 'Call Attention' – one bell. The Receive Lamp will come on.

You acknowledge by pressing the Receive Bell button – one bell.

The next box will ring 3 bells to advise that the train has entered the block. You must then set the switch to 'Train on Line' and advise that this has been done by pressing the Receive Bell button three times. Three bells will be rung.

The Receive lamp will remain on as you have the next action for this train.. You must advise when the train arrives and so leaves the block.

Note that the Receive Bell Button, and indeed the Send Bell Button tooltips will always tell you what the next step in the process is.

4.6. The train arrives:

As soon as the train arrives, pull the Home signal ON by clicking its icon. This is important as this signal protects your Home Section. If you forget to do this, you will get a phone call from the Fat Controller, warning you that you might be in for a surprise if you don't fix it!

Particularly if the train is an express or fast freight and is passing through your Home Section without stopping, it is more important that you advise the next box towards which the train is proceeding that it has entered the block between you and that box than to advise the box that sent the train to you that it has arrived. But don't forget to acknowledge its arrival or you will get a call from the sending box!

If the train is stopping in your Home Section, advise it's arrival to the sending box as soon as possible.

Call Attention to the box which sent you the train – one bell. That box will acknowledge – one bell.

Set the switch to 'Normal' and press the Receive Bell button four times to advise that the train has arrived – four bells will be rung. The next box will acknowledge shortly with four bells.

If you have already pulled the Home signal On, the Receive Lamp will go out and you are finished with this block instrument for this train.

4.7. Sending the train on its way:

As the departing train enters the next block, pull your Starter Signal ON. Call Attention to the next box by pressing the orange Send Bell button once. One bell will be rung. The next box will acknowledge with one bell.

Press the Send Bell button three times to advise that the train has entered the block. Three bells will be rung. The next box will set the Send Indicator to 'Train on Line' and confirm with three bells.

Don't forget to pull the Starter On or you will get another 'bung' from the Fat Controller!

When the train leaves the block and the next box's Home Signal comes ON, that box will Call Attention – one bell. Acknowledge this by pressing the Send Bell button once – one bell.

The next box will set the Send Indicator to 'Normal' and ring four bells to advise this. Confirm that you have received this message by pressing the Send Bell button four times. Four bells will ring and the Send Lamp will go out.

Ensure that all points/junctions and signals are at their normal position.

You are now finished with this train.

5. Signal Box Demonstration Sessions – Potteries Loop Line Route

Signalman Training 1 - Block Instruments and Signals

Welcome to Longport Signal Box for the first of three training sessions for signalmen on the LMS.

In this session you will learn about how the signal box controls work when the box is switched OUT OF LINE and is automatically monitoring signals, points and trains, and how they function when the box is switched IN LINE and you take full control of your section of line.

This session focuses on the operation and control of the Block Instruments and signals.

Signalman Training 2 - Operating Points

Welcome to Longport Junction Signal Box for the second of three training sessions for signalmen on the LMS.

In this session you will learn more about signal box operation. This session focuses on the operation of points (junctions).

As the operation of points is the same whether the signal Box is switched OUT OF LINE or IN LINE, we will leave it switched OUT OF LINE for this session so that it will monitor Main Line traffic automatically and control the signals. This will allow us to focus on operation of the points.

Signalman Training 3 - Locomotive control

Welcome to Longport Junction Signal Box for the third of three training sessions for signalmen on the LMS.

In this session you will learn more about the signal box controls.

This session focuses on the control of a locomotive from the signal box. This feature is particularly useful when conducting shunting operations. You will learn how to take control of a locomotive, drive it from the box or from its cab, and control points (junctions) as necessary for the task at hand.

In this session we will leave the signal box switched OUT OF LINE so that it monitors Main Line traffic automatically. The signal box will also manage the signals.

You may choose to switch the box IN LINE. You will then also need to operate the block instruments and signals as well as control your shunting operation. This can become a bit of a handful, particularly if the Main Line gets busy.

Morning Turn - 9.20 to 10.am - Longport Junction Signal Box

Operate Longport Junction Signal Box between 9.20am and 10.00am on a weekday morning.

The session can be run in several ways:

- Fully automatic signal box operation - you watch what happens and learn the road.
- You operate the signals and points (junctions) and let the box control the block instruments.
- You take full control of the box.

You will control 12 train movements. This session is moderately difficult, particularly if you take full control of the box.

You should read the Signal Box Operation Manual before running this session in anything other than fully automatic mode.

Morning Turn - 9.20 to 10.am - Etruria Junction Signal Box

This session covers the same operating period as that for Longport Junction Signal Box. The number of trains and the complexity of the session are greater.

Morning Turn - 9.20 to 10.am - Newcastle Junction Signal Box

This session covers the same operating period as that for Longport and Etruria Junction Signal Boxes. The number of trains and the complexity of the session are greater.

Morning Turn - 9.20 to 10.am - Stoke North Signal Box

This session covers the same operating period as that for Longport, Etruria and Newcastle Junction Signal Boxes. The number of trains and the complexity of the session are greater.

These 'Morning Turn' sessions are based on actual timetables of the period.

Local Transfer - Longport to Pinnox Junction and return - RIDE

Collect a loaded coal train from Longport Sidings, deliver it to Pinnox Sidings for onforwarding to the Chatterley-Whitfield mine and return light engine to Longport Sidings.

In this session your train is under AI control. Your task is to use the Longport Junction, Pinnox Junction and Pinnox Crossing signal boxes to set points and signals for your train.

This session is an extension of the 'Signalman Training 2 - Operating Points' session which you should complete before doing this one.

Once you are familiar with the task for this train, the ability to move from signal box to locomotive cab and the operation of points and signals, move on to the corresponding 'DRIVE' session in which you will also drive the locomotive, either from it's cab or from the signal boxes along its route.

Local Transfer - Longport to Pinnox Junction and return - DRIVE

Collect a loaded coal train from Longport Sidings, deliver it to Pinnox Sidings for onforwarding to the Chatterley-Whitfield mine and return light engine to Longport Sidings.

In this session you take control of your locomotive from Longport Junction signal box and drive it using the signal box Multi-Function Panel or keyboard controls. You will use the Longport Junction, Pinnox Junction and Pinnox Crossing signal boxes to set points and signals for your train.

This session is an extension of the 'Signalman Training 3 - Locomotive control' session which you should complete before doing this one.

Gas Works Coal - Pinnox Sidings to Etruria Gas Works - RIDE

Take a loaded coal train from Pinnox Sidings to the Etruria Gas Works.

In this session your train is under AI control. Your task is to use the various signal boxes along the way to set points and signals for your train.

Once you are familiar with the task for this train, the ability to move from signal box to signal box and the operation of points and signals, move on to the corresponding 'DRIVE' session in which you will also drive the locomotive, either from it's cab or from any of the signal boxes along its route.

Gas Works Coal - Pinnox Sidings to Etruria Gas Works - DRIVE

Drive a loaded coal train from Pinnox Sidings to the Etruria Gas Works.

Take control of 3F 7338 from the Signal Box Control Panel and use the various signal boxes along the way to set points and signals for your train. You can switch instantly from viewing the operation from any signal box along the route to driving from the loco's cab.

6. Adding the Signal Box Rule to new session

If you wish to create a new session for the Potteries Loop Line route and you wish to include signal box control, you could simply add the 'PLL Signal Boxes' rule to the list of rules applicable to the session. This would, however, not import all the data about each signal box, into your session.

If you are using Trainz TS12 Service Pack 1 or later, you have the ability to simply copy the Signal Box Rule from any of the built-in sessions listed above by right-clicking on the Signal Box Rule in the 'built in' session and copying it to the clipboard using the 'Copy' option which appears. You can then simply right-click on any of the default rules in your new session and 'Paste' the rule, complete with all the data for each signal box on this route, into your new session.