

# THE ORANGE BOOK

***XL*Multiphase**<sup>®</sup>  
***XLM2***

operator's guide

PSL1573 issue 5 rev b



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# Introduction

## Welcome

Thank you for choosing the XL Multiphase controller which allows you to orchestrate up to eight wireless signal heads controlling a maximum of four separate traffic phases.

Using sophisticated radio links and integral failsafe measures, the XL Multiphase system lets you quickly and safely install junction control without the complication of cables.

### Important

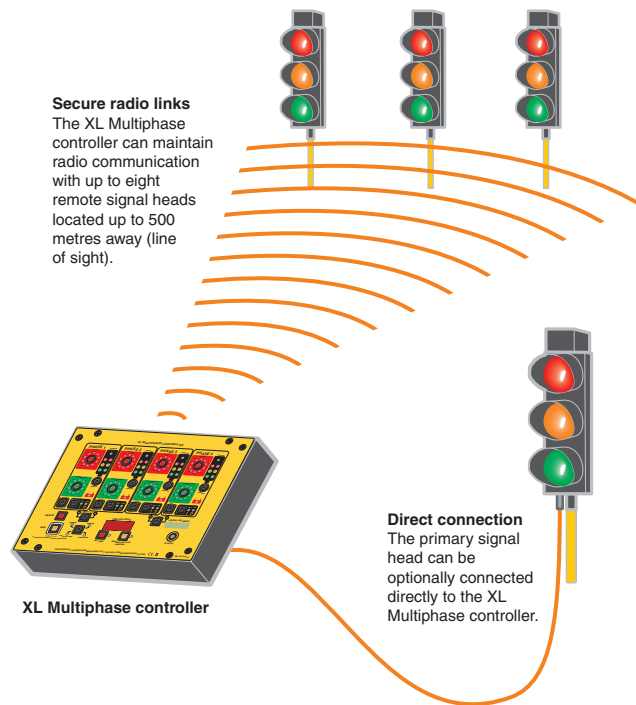
XL Multiphase marked ***XL M2*** may only be used with signal head panels that are marked ***XL 2***. No communication is possible with older XL signal heads.

The XL Multiphase controller has a panel with a logical layout which allows you to quickly apply settings and easily monitor every aspect of the system in operation.

The XL Multiphase controller is fully type approved to Highways Agency specification TR2502A and is manufactured in the UK in accordance with ISO 9001 Quality Assurance procedures.

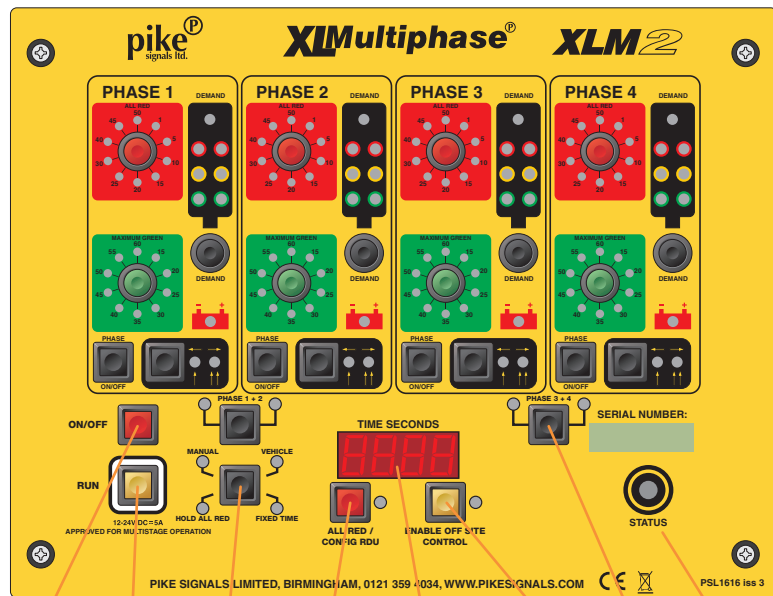
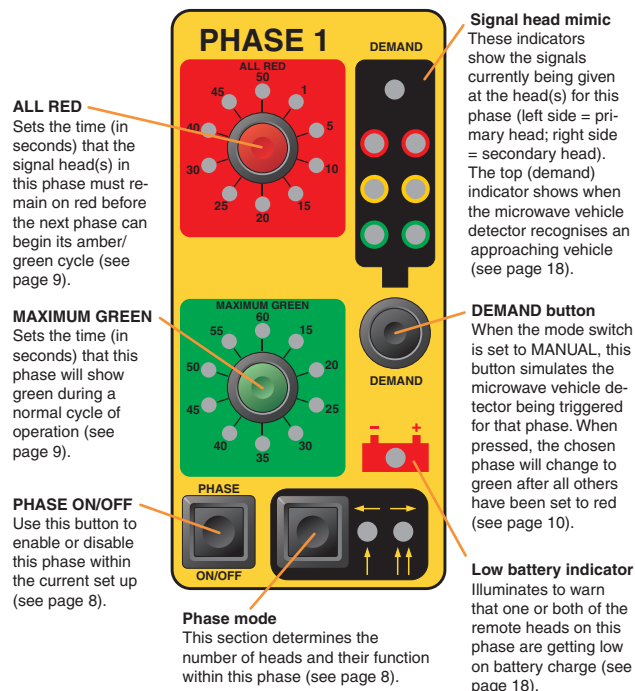
### Important

This system should be installed and operated only by fully trained and experienced personnel. The junction layout examples given in this document are for guidance only. Always consult your supervisor if you are in any doubt about correct procedures or if you are concerned about safety. Equipment must only be repaired by Pike Signals Ltd or authorised repair agents.



## XL Multiphase panel layout

The control panel of the XL Multiphase controller is arranged logically for ease of set up and use. General items are located in the lower section of the panel while controls specific to each phase are placed in four identical groups.



**ON/OFF**  
Press and release to switch on, press and hold for two seconds to switch off (see page 8).

**RUN**  
Press to begin running the programmed sequences (see page 10).

**Operation mode**  
Selects the main operation mode for the system as a whole (see page 14).

**ALL RED\***  
Press to hold all signals at red see page 15).

**TIME display**  
Counts the elapsed time in the current phase of operation and also displays error codes (see page 19).

**Off site\***  
For future expansion.

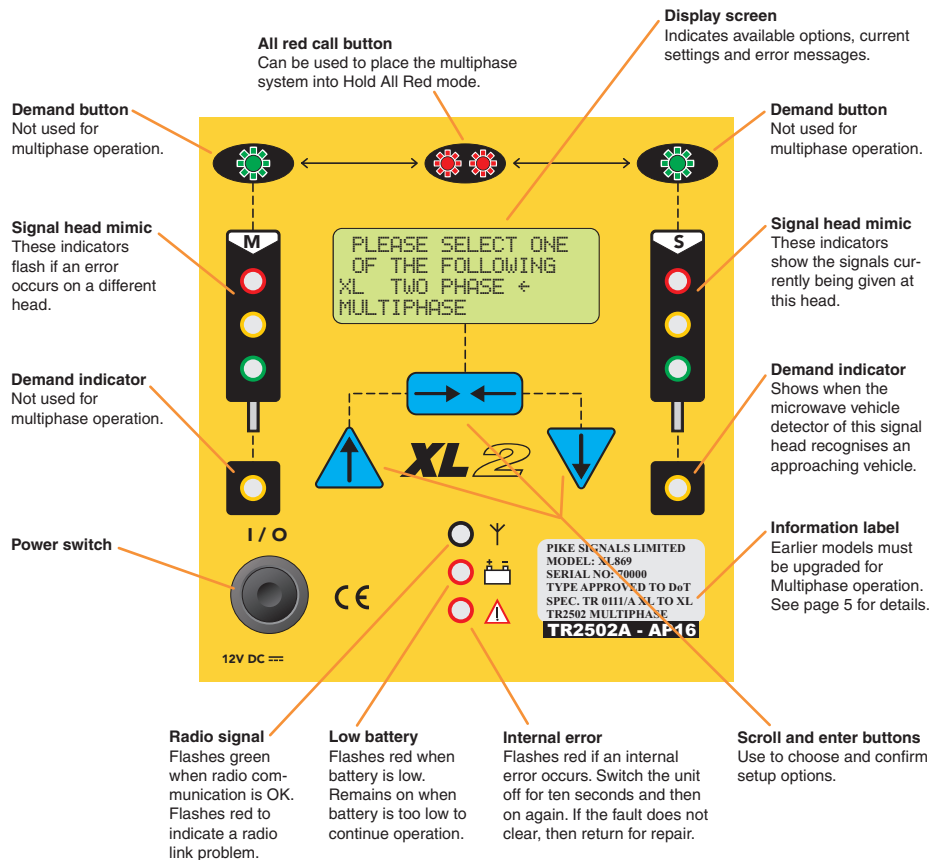
**Phase link\***  
Combines two phases (see page 12).

**Status**  
Displays green or red to indicate the current status of operation (see page 18).

## XL signal head panel layout

The control panel of each XL signal head is located either at the rear of the head or within the head's base unit.

All XL signal heads must be configured before the XL Multiphase controller begins operation. All configuration is achieved using the three blue buttons and the display screen.



### Important

XL Multiphase marked **XLM<sub>2</sub>** may only be used with signal head panels that are marked **XL<sub>2</sub>**. No communication is possible with older XL signal heads.

# Installation

The XL Multiphase controller can control up to four phases of traffic, either all via wireless links or with one phase directly connected by cable and the remainder by wireless. According to the junction layout, the XL Multiphase controller can be set to control each junction approach as a separate phase or alternatively combine both directions of a road within a single phase.

## XL signal heads

### Checking whether a head can be used

XL Multiphase controllers marked ***XLM2*** and signal head panels marked ***XL2*** use a radio communication system that is fundamentally different from the previous system used within Pike wireless units.

Older XL signal head panels must be factory upgraded before they can be used with an ***XLM2*** controller. Please contact Pike Signals before returning panels for upgrade.

# Setting up the heads and controller

## 1 Set up all signal heads, cones and signs according to Highways Agency regulations.

### Required reading

- 'The use of vehicle actuated portable traffic signals' (the 'Pink Book') ISBN: 0115529365
- 'Safety at street works and road works' (the 'Maroon Book') ISBN: 0115519580
- 'Traffic signs regulations and general directions' (TSRGD) Chapter 8 ISBN: 0110429427

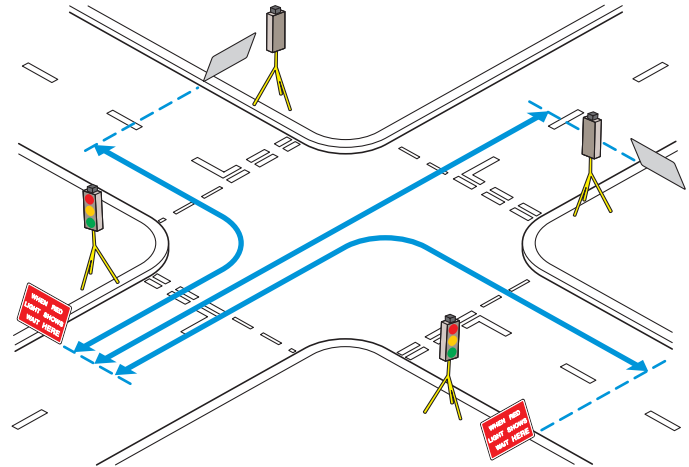
### Notes

The XL Multiphase controller should be OFF at this stage.  
The battery should be a 'deep cycle' type of no less than 105Ah capacity.

**If a signal head is directly connected to the XL Multiphase controller by cable, it will automatically become the primary signal head of phase 1 (PH1+S).**

If a signal head is directly connected to the XL Multiphase controller, the cable must be less than 5 metres in length and the signal lamps should be LED types.

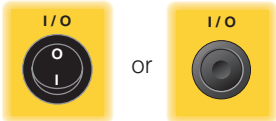
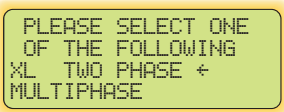





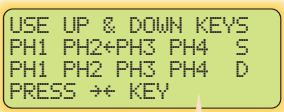



## 2 For each approach, measure the distance from each WAIT HERE sign to the WAIT HERE sign furthest away.

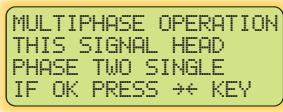



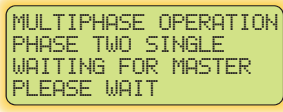


See **Appendix 1** at the rear of this document for example junction/signal head layouts.



### 3 On each remote XL signal head:

- a**  Switch on the signal head at the control panel.
- b**  Press  to choose (⇄) MULTIPHASE.  
Press  to proceed.
- c**  Press  to proceed or optionally, press  to use radio channel 2 (see **page 11** for details).
- d**  Press   to choose (⇄) the correct phase number for this head.  
See Appendix 1 on **pages 24 to 27** for phase set up examples.  
Press  to proceed.
- Use row **S** for a single or primary signal head.  
Use row **D** for a second signal head in a phase (if used).

- e**  The screen will confirm your settings.  
If correct, press  to proceed.  
If a change is required, use   to make the change, as per step **d**.
- f**  The head is now ready and waiting for control signals from the XL Multiphase controller. No signal lamps will be lit at this stage.

Repeat for all other signal heads then go to **step 4** overleaf ⇨

#### Notes

Ensure that each XL signal head is capable of operating with the XL Multiphase controller. See **page 5** for details.

**If a signal head is directly connected to the XL Multiphase controller by cable, it will automatically become the primary signal head of phase 1 (PH1+S).**

## Setting up (continued from previous page)

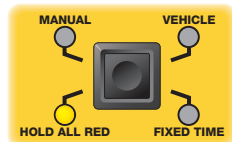
- 4 On the XL Multiphase controller, press the ON/OFF button.** Note: If the display shows **bAlt**, the battery level is too low to continue.



OPTIONAL: To use radio channel 2, press and hold the **DEMAND** button within the **PHASE 2** section while switching on the XL Multiphase controller (see [page 11](#) for details).



- 5 Press the operation mode button repeatedly until HOLD ALL RED is lit.** Note: The controller retains all configuration settings from its previous installation.



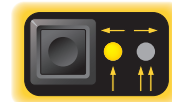
### 6 For each phase that will be used:

- a** Press the **PHASE ON/OFF** button to enable or disable the phase. **Ensure that all unused phases are disabled.**



- b** Press the phase mode button to choose the appropriate mode:

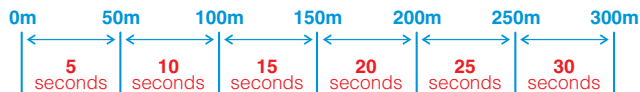
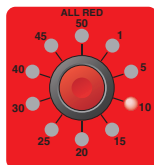
- 1 approach, 1 head per approach
- 1 approach, 2 heads per approach
- 2 approaches, 1 head per approach (aka: two opposed heads)



See Appendix 1 on [pages 24 to 27](#) for phase set up examples.

See [page 12](#) for details about linking phases.

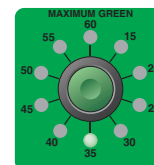
- c** Using the measurement taken earlier (from this phase's WAIT HERE sign to the WAIT HERE sign furthest away), set the **ALL RED** time (press the button repeatedly until the required time illuminates):



#### Note

On steep gradients, increase the **ALL RED** time by 5 seconds for the uphill phase(s).

- d** Using the measurement taken earlier (from this phase's WAIT HERE sign to the WAIT HERE sign furthest away), set the **MAXIMUM GREEN** time (press the button repeatedly until the required time illuminates):



Repeat **step 6** for each active phase and then go to **step 7** overleaf ⇒

## 7 Press the RUN button to begin operation.

It is at this point that the XL Multiphase controller will begin to communicate with the remote XL signal heads.



If any communication or configuration problems exist, it is now that they will become apparent. Errors are signalled on the XL Multiphase controller in three main ways:

- Flashing indicators within each phase section of the control panel,
- Error codes shown on the numeric TIME display, and/or
- Flash codes on the STATUS indicator.

Operation will not begin nor will the signal heads be lit until all communication and/or configuration problems are solved.

See pages 18 to 20 for details about error indications and possible remedies.

**When the XL Multiphase controller is fully confident of the system integrity, the signal heads in each phase/approach will in turn display amber and then red.**

## 8 You can now switch to VEHICLE activated operation.

**If traffic is tailing back significantly on one approach:**

- a** Press the operation mode button repeatedly until **MANUAL** illuminates.



- b** Press the **DEMAND** button for the approach/phase that has the tailback.



- c** Then, as the traffic starts to flow, press the operation mode button to illuminate **VEHICLE**.



**If traffic is evenly spread among the approaches:**

- a** Press the operation mode button repeatedly to illuminate **VEHICLE**.



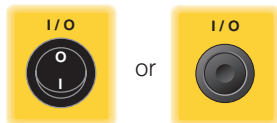
## Using the channel 2 radio link



XL Multiphase controllers marked ***XLM2*** and signal head panels marked ***XL2*** offer a second radio control channel that can be used whenever two separate signal installations are placed in close proximity.

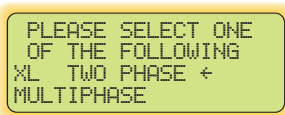
Using channel 2 does not affect any other aspects of XL Multiphase operation; the only difference is that an alternative radio frequency is used for communication between the controller and the signal heads to avoid interference.

### To select channel 2 on a remote XL signal head

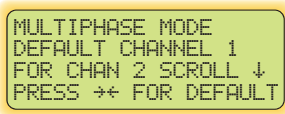
- a** Switch on the signal head at its control panel.




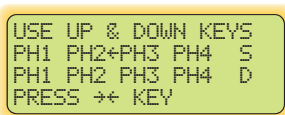
- b** Press  to choose (⇄) MULTIPHASE and press  to proceed.



- c** Press  to select radio channel 2.



- d** Continue with the usual phase selection or press  to use the existing phase settings. See [page 7](#) for details.



### To select channel 2 on the XL Multiphase controller

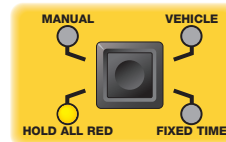
- a** Press and hold the **DEMAND** button within the **PHASE 2** section of the XL Multiphase controller...



...and then press the **ON/OFF** button to switch on.



- b** Continue with the usual mode selection. See [page 8](#) for details.



**IMPORTANT:** The XL Multiphase controller and remote XL signal heads will automatically revert to channel 1 whenever they are next powered on. You will need to repeat the steps shown here to re-engage channel 2 every time.

## Phase linking

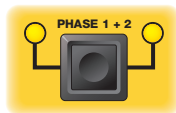
Phase linking allows two standard phases to operate in unison. This permits up to four signal heads to be controlled by a single set of phase timings.

*Note: Phase linking is not available on XL Multiphase controllers that have the code PSL 1615 iss1 shown in the lower right corner.*

Phases **1** and **2** can be linked to create **PHASE A**, while phases **3** and **4** can be separately linked to create **PHASE B**.

### To use phase linking

- 1** With the XL Multiphase controller switched on but not running, press the required phase linking button, either **PHASE 1 + 2** or **PHASE 3 + 4**.



- 2** Select the required operation mode for the linked phase.

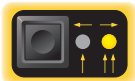
There are three modes, represented by combinations of the mode indicators of the two linked phases:



2 approaches,  
2 heads per approach



1 approach,  
3 heads per approach



1 approach,  
4 heads per approach

The initial combination of indicators will depend upon how each of the two individual phases were set up before they were linked.

Use the phase mode buttons within each of the linked phases to change the overall mode of the collective phase:



Use this button to change between modes:  
**2 approaches, 2 heads per.** (●●●●)  
and  
**1 approach, 3 heads per.** (●●●●)

To select **1 approach, 4 heads per.** (●●●●),  
use the other button to first select the mode  
**1 approach, 3 heads per.** (●●●●) and then  
press this button once.

- 3** Set the **ALL RED** and **MAXIMUM GREEN** times in the usual manner (see page 9), using the controls that remain active within the two linked phases.

The **ALL RED** and **MAXIMUM GREEN** setting indicators for one of the linked phases will extinguish, leaving the other set active to set the overall timings.

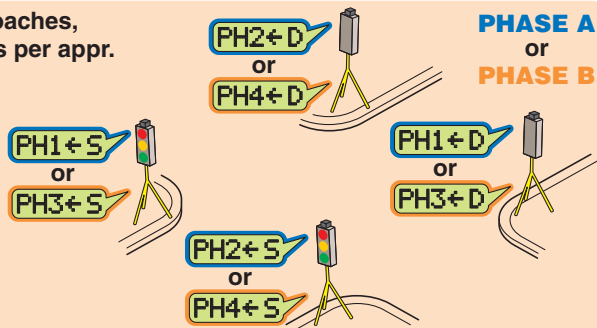
- 4** Ensure that each signal head is uniquely addressed to the correct linked phase.

The diagrams on the opposite page show the correct signal head addressing configurations for each linked phase mode.

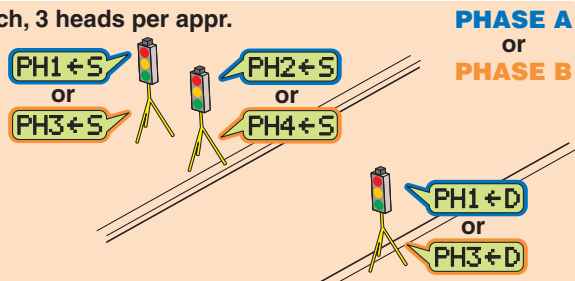
- 5** Set the system running in the usual manner.

These phase examples do not show complete junction layouts

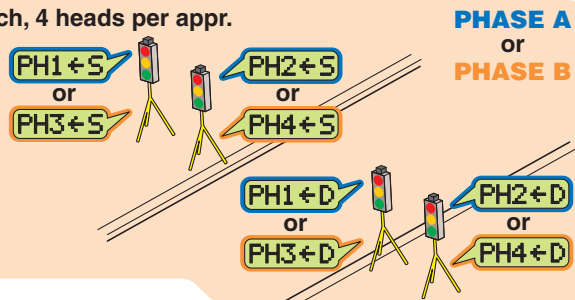
**2 approaches, 2 heads per appr.**



**1 approach, 3 heads per appr.**



**1 approach, 4 heads per appr.**



During linked phase operation, due to the duplication of signal heads facing in the same direction, the XL Multiphase controller is designed to continue normal operation despite losing one or more heads (i.e. red failures, etc.). The number of signal heads that are permitted to fail before a safety mode is triggered depends upon the linked phase mode:

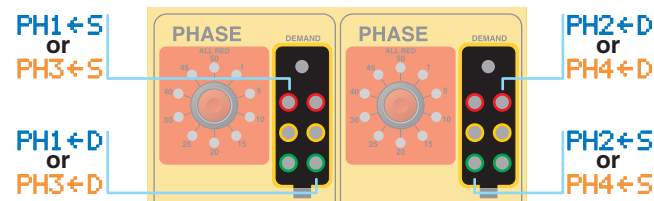
- **2 approaches, 2 heads per approach:** will continue normal operation until both heads on the same approach are lost.
- **1 approach, 3 heads per approach:** will continue normal operation until all three heads are lost.
- **1 approach, 4 heads per approach:** will continue normal operation until all four heads are lost.

**WARNING:** For the **2 approaches, 2 heads per approach** mode in particular, it is vital that the signal heads are correctly addressed:

- For **PHASE A**: PH1+S and PH2+S at one approach and PH1+D and PH2+D at the other approach.
- For **PHASE B**: PH3+S and PH4+S at one approach and PH3+D and PH4+D at the other approach.

Otherwise, a double signal head failure at one approach could continue to run without a safety intervention by the system.

**Linked phase signal mimics**



# Operation

## Making adjustments

When the system is running, continue to monitor the build up of traffic on each approach. If regular patterns of significant traffic queues are emerging on particular approaches, consider making careful adjustments to alleviate the problem.

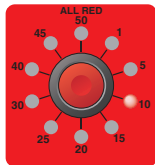
Timing adjustments can be made to a phase at any time. The effects of timing changes will be incorporated during the next full cycle of operation for each phase.

### Note

Introduce timing changes in small steps and one at a time. Observe the results before making any further changes.

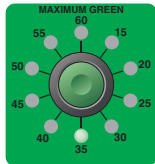
### Slow moving vehicles not clearing the works

If there are large numbers of slow moving vehicles which have difficulty in clearing the works before the signals have changed, increase the **ALL RED** settings for the affected approach(es) by 5 seconds.



### Vehicles taking more than one green period to clear the works

If substantial queues begin to form and vehicles regularly take more than one green period to get through the works, increase the **MAXIMUM GREEN** settings for the affected approach(es) by 5 seconds.



## Operation modes

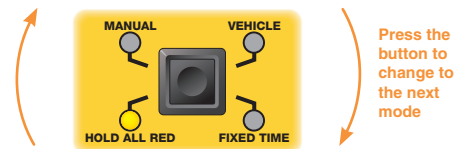
The mode switch determines how the system operates.

### MANUAL

Phases respond to the control panel DEMAND buttons - the microwave vehicle detectors of the heads are ignored. In this mode, the ALL RED time settings for each phase are used, the minimum green time is set at 12 seconds and the maximum green time is determined by the operator's actions. *Note: It is important to set the correct ALL RED time for each phase in order to prevent green signals being given too soon on opposing phases.*

### VEHICLE

All enabled phases use their configured timings and respond to the microwave vehicle detectors on each signal head. This is the most efficient mode of operation and should be used in most situations unless there are special circumstances.



### HOLD ALL RED

All signal heads are forced to red and held until the mode is changed.

### FIXED TIME

All enabled phases use only their configured timings - the microwave vehicle detectors of the heads are ignored. This is an inefficient mode of operation as it does not adapt to the prevailing traffic conditions.




## Calling 'hold all red'

The system allows the 'hold all red' mode to be invoked either from the XL Multiphase controller or from any of the remote signal heads. This is a useful feature for:


- Occasional heavy plant crossings,
- When the works involve temporarily blocking the shuttle lane(s), or
- When traffic needs to be stopped due to an accident or incident within the works area.

### Calling 'hold all red' from a signal head

#### To call 'hold all red' from a remote signal head

- 1 On the remote signal head, press the **all red call** button.
  - All signal heads will be returned to red and will stay at red until the state is overridden.
  - The time display on the XL Multiphase controller will show **rrr** (remote red call).

#### To resume operation

- 1 On the XL Multiphase controller, press the **RUN** button.
  - The system will resume with the mode that was running prior to the 'hold all red' request.

### Calling 'hold all red' from the XL Multiphase controller

*Note: An ALL RED button is not included on XL Multiphase controllers with the code PSL 1615 iss1 shown in the lower right corner. On these versions, use the operation mode switch to select the "Hold All Red" mode (see page 14).*

#### To call 'hold all red' from the XL Multiphase controller

- 1 On the XL Multiphase controller, press the **ALL RED** button.

The adjacent red indicator will illuminate and operation will be affected according to the current mode:



- When running **MANUAL**:
  - Any signals currently at green will wait for a minimum of 12 seconds and then return to red.
  - The **ALL RED** indicator will extinguish and the controller will continue running in Manual mode with all signals at red until a **DEMAND** button is pressed.
- When running **VEHICLE**, **FIXED TIME** or **HOLD ALL RED**:
  - Any signals currently at green will wait for a minimum of 12 seconds and then return to red.
  - The **ALL RED** indicator will then extinguish and the time display will show **lrr** (local red call). Operation will remain halted with all signals at red until you restart it:
  - **To resume operation**: press the **RUN** button.

## Resetting the system

Certain failures within the XL Multiphase system require the operator to cure/acknowledge the failure and reset the system as a whole. In such cases the system may be held within a special condition or remain operating in a reduced mode.

### To reset the system after an error

- 1 Inspect the XL Multiphase controller indicators to trace the problem. Pages 17 to 20 provide descriptions.
- 2 If the problem is traced to one or more signal heads, visit each affected head and check the control panel(s).  
Depending on the fault:
  - If possible, rectify the problem and reset the signal head(s),  
or
  - Replace the signal head(s) and follow the set up instructions in **step 3** (shown **on page 7**) to select the correct phase number(s).
- 3 When all affected heads have been reset, on the XL Multiphase controller press the **RUN** button to restart operation. Monitor the system operation until you are sure that it is working correctly.

## Decommissioning the system

When the portable traffic signals are no longer required, please follow this procedure to decommission their use:

- 1 Ensure that the shuttle lanes are cleared of obstructions (with the exception of the signals heads, their cones and related warning signs).
- 2 Change the mode switch of the XL Multiphase controller to **HOLD ALL RED**.
- 3 In turn, go to each approach and face the signal head away from the traffic.
- 4 When all signal heads have been faced away from traffic, press and hold the **ON/OFF** button on the XL Multiphase controller until all indicators extinguish.
- 5 Remove the signal heads from the carriageways.
- 6 Carefully remove all cones, then the signs, all in accordance with the recommended procedures given in the guide "Safety at street works and road works" ISBN: 0115519580.

## Incidents during operation

In accordance with Highways Agency specification TR2502A, the XL Multiphase controller and all associated signal heads monitor themselves continually for faults or unexpected incidents during operation. The system as a whole adheres to a defined set of responses for particular failures, as discussed here.

### Red signal failures

If a red signal failure is detected on a signal head\*:

- The green signals on all other approaches/phases will be suppressed. In other words, as any other phase begins its sequence, the green signal that should immediately follow the red/amber will be blanked. The signal head with the failed red is the only one that will continue to show green during its active cycle. The green times for all phases will be reduced to 12 seconds.
- On the XL Multiphase controller, the mimic indicator representing the failed red signal will flash continuously.

If failed red signals are detected on more than one approach\*:

- If more than one approach has a total red signal failure, all the signal heads will immediately return to **ALL RED** and the controller will stop operation.
- On the XL Multiphase controller, the TIME display will show **Stop** and the mimic indicators representing the failed red signals will flash. See **Resetting the system** on page 16.

### Green signal conflicts

If opposing phases show green signals simultaneously at any time:

- All signals will change directly to red (no amber signal) and all will remain at red. See **Resetting the system** on page 16.
- On the XL Multiphase controller, the **TIME** display will show **Stop** and the mimic indicator representing the signal head that incorrectly presented a green signal will flash.

*\* When phase linking is used, the duplication of signal heads facing in the same direction permits a slight relaxation of the above rules. Where 2, 3 or 4 signal heads are facing the same approach, the XL Multiphase controller will maintain normal operation until the last remaining head ceases normal operation, whereupon the above procedures will occur.*

## Error indications

The XL Multiphase controller uses its various panel indicators to provide assistance in tracing and solving operational problems.

### Mimic indicators (for each phase)

In normal operation these displays mimic the currently active lamps of each signal head with a steady illumination of the appropriate lamp colour. If a lamp fails or a green conflict is detected, the relevant indicator(s) will flash to highlight the location of the problem. The left three indicators of the mimic represent the primary signal head for a phase, the right three indicators represent the secondary head (if used). The top indicator shows when a vehicle is detected by the microwave vehicle detector (on either signal head).



### Battery indicators (for each phase)

The battery indicator will flash when there is roughly two hours of operational time remaining within a remote signal head battery. When the battery becomes too low for operation, the signal head will switch off and the indicator on the XL Multiphase controller will remain on. If two heads are used within a phase, the low battery state could signify low power at either or both signal heads - the control panel on each XL signal head will provide further details. When the primary signal head and the XL Multiphase controller are cable connected, they both use a common battery. The common battery's low power state is signified by a **bAt** message on the TIME display.



### Status indicator

In normal operation the status indicator will show a constant green light or other states as follows:

- Constant green** System running correctly.
- Constant red** System unconfigured, not running.
- Flashing green** Attempting to locate a remote head that is registered to be available according to panel settings.
  - or
  - Setting/state change made at the control panel but not yet transferred to the affected signal head(s).
  - or
  - Loss of communication.



## Time display

The four digit display at the bottom of the control panel shows a continual count of the elapsed time for the current signal of the active phase. In error situations, this display is used to provide alphanumeric status codes, as follows:



**Conn** then **LnF9** Connection/configuration problem with remote XL signal heads. There are several possible causes for this error:

- One or more signal heads are not configured to match the set up on the XL Multiphase controller,
- One or more signal heads are not available as expected,
- One or more signal heads are of an incorrect version to operate with the XL Multiphase controller - contact Pike Signals for assistance.

**bAtE** The battery supplying the XL Multiphase controller is running low. Existing configurations may run for two hours or less, however, new configurations are not possible.

**Err1** Insufficient phases to run a system.

**Err2** PIC failure.

**Err3** An illegal state has been detected - contact Pike Signals for assistance.

**Err4** Multiphase red lamp monitor failure.

**Err5** Slave (XL) red lamp monitor failure.

**rdUE** An optional RDU controller could not be found.

**rdwB** The optional RDU controller has a low battery warning.

**FUSE** The upper 12.5 amp fuse on the XL Multiphase controller has blown and needs to be replaced.

**LF 1** Lamp failure detected on a signal head controlled by phase 1. Check the signal mimic for phase 1 for details.

**LF 2** Lamp failure detected on a signal head controlled by phase 2. Check the signal mimic for phase 2 for details.

**LF 3** Lamp failure detected on a signal head controlled by phase 3. Check the signal mimic for phase 3 for details.

**LF 4** Lamp failure detected on a signal head controlled by phase 4. Check the signal mimic for phase 4 for details.

**LFE** The system has entered 'hold all red' mode because the ALL RED button has been pressed. Press **RUN** to override.

**rFE** The system has entered 'hold all red' mode due to a request from a remote signal head. Press **RUN** to override.

**SI9** Communications loss on the system. All signals will revert to RED and remain in this condition until communications have been re-established for more than 2 seconds, at which point the system will automatically restart.

**SL 1** One or more signal heads are of an incorrect version to operate with the XL Multiphase controller - contact Pike Signals for assistance.

**Stop** Operation has been stopped due to a serious fault. Check the other panel indicators and the signal head displays to locate and remedy the fault.

## Troubleshooting

### Green mimic indicator flashing

A green conflict has been detected. Reset or replace the corresponding signal head, as necessary. See **Resetting the system** on page 16.

### Red mimic indicator flashing

A red lamp failure has been detected. Check and replace the affected signal lamp or head, as necessary. See **Resetting the system** on page 16.

### The Status indicator is flashing

**Flashing green** Communications - attempting to locate a remote head that is registered to be available according to the panel settings.

or

Setting/state change made at the control panel but not yet transferred to the affected signal head(s).

### The TIME display is displaying a code

See page 19 for a list of all display codes.

### Battery symbol flashing

The indicated signal head has roughly two hours or less of operation remaining before it must shut down. Check the control panel of the affected signal head and replace its battery.

### Battery symbol on

The indicated signal head has shut down due to insufficient battery power. Change the battery of the affected signal head.

### XL Multiphase controller does not respond to ON/OFF button

A fuse may have blown within the controller. See page 21 for details.

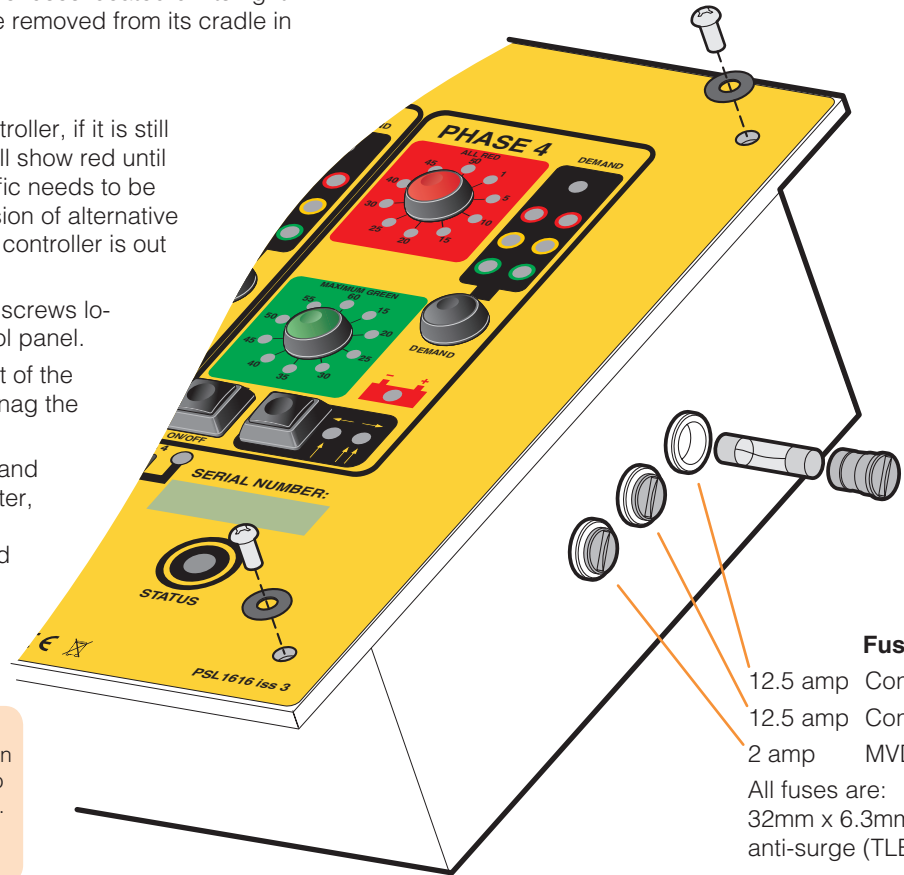
## Fuse replacement

The XL Multiphase controller has three fuses located on its right hand side. The control panel must be removed from its cradle in order to access the fuses.

### To change a fuse

- 1 Switch off the XL Multiphase controller, if it is still switched on - all slave signals will show red until the controller is reinstated. If traffic needs to be directed, make immediate provision of alternative controls while the XL Multiphase controller is out of action.
- 2 Remove the eight cross-headed screws located in the corners of the control panel.
- 3 Lift the control panel carefully out of the cradle. Take care not to pull or snag the cables at the rear.
- 4 Unscrew and pull out each fuse and inspect it visually (and with a meter, if necessary). If a fuse is blown, replace it with an identically rated fuse. Check all three fuses.
- 5 Place the control panel back into its cradle and replace the eight screws.

Note: The 2 amp fuse powers the Microwave Vehicle Detector (MVD) on the signal head connected directly to the XL Multiphase controller (if used). Check the MVD on the head for indications before checking the fuse.



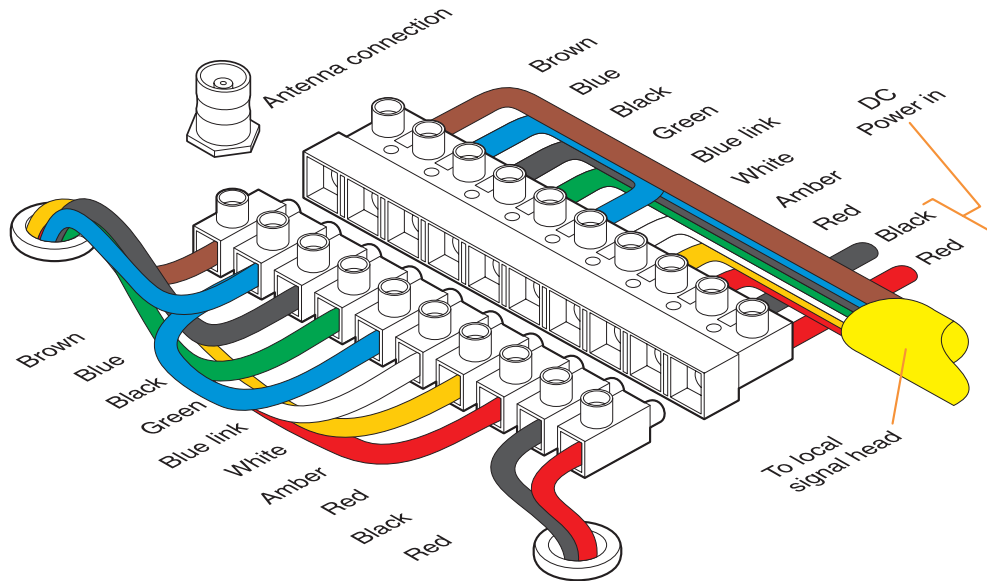
### Fuses

- 12.5 amp Controller power
- 12.5 amp Controller power
- 2 amp MVD (see note)

All fuses are:  
32mm x 6.3mm, glass,  
anti-surge (TLBC min)

# Further information

## Control panel rear connections



## Specifications

- Type approved to Highways Agency specification TR2502A Approval number: AP16/782. A copy of the approval authorisation can be provided upon request.
- Manufactured in the United Kingdom in accordance with ISO 9001 Quality Assurance procedures.

## Power requirements

- Operating range: 10.5Vdc to 14.5Vdc
- System shuts down at 10.5Vdc to protect supply batteries.
- Use only deep cycle batteries with a minimum power rating of 105Ah.



## Warranty

The XL Multiphase controller is guaranteed against failure subject to fair wear and tear, correct operation and return to our works carriage paid. We undertake to repair or replace this equipment free of charge providing:

- It has been maintained in good condition and operated with due care, and
- Any failures are directly traceable to faulty material or workmanship.

However, we cannot entertain any claims for labour or other expenditure in connection therewith. Items or components subject to another manufacturer's guarantee are subject to the terms of that guarantee only.

Any warranty given is void if seals on equipment are subsequently found to have been broken without prior permission by Pike Signals Limited.

Any item of equipment repaired by Pike Signals Limited is guaranteed from failure for three months from the date of repair, provided that the item has been subjected to fair usage and regular maintenance.

## Disclaimers

Pike Signals Ltd reserves the right to change or alter product specifications without prior notice. The information contained within this guide is subject to copyright and may not reproduced in part or in full without prior written permission by Pike Signals Ltd. While every effort has been taken to ensure that this guide provides accurate information, no liability shall be accepted for any errors or omissions.

It is a policy of Pike Signals Ltd to seek registered design and/or patent protection for its products.

## Environmental information

### EU directive 2002/95/EC on the Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

It is Pike Signals Limited's desire to meet customer requirements with respect to the RoHS initiative. We are actively working to achieve the important objective of making our products compliant with the EU RoHS directive (and similar initiatives) through efficient product design that reduces unnecessary waste; the use of recyclable materials throughout, and a transfer to lead-free components and solder.

### EU directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE)



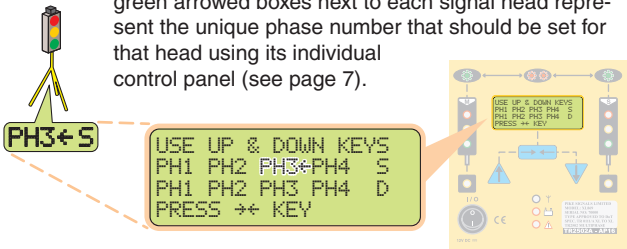
Pike Signals Limited is focussed on developing a compliance program for the European Union ("EU") Directive on Waste Electrical and Electronic Equipment, Directive 2002/96/EC. Under the EU WEEE Directive, manufacturers of covered electronic equipment are obligated to take back such products at the end of their useful life.

Pike Signals Limited is committed to meeting or exceeding environmental standards in the production of all products and is engaged in a comprehensive, company-wide effort towards full compliance with the EU WEEE Directive.

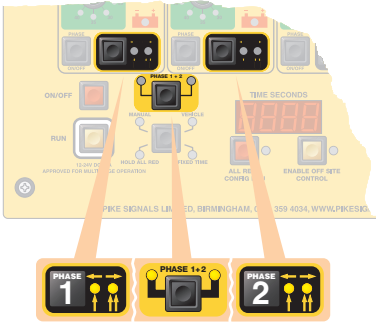
# Appendix 1: Phase set up examples

This section provides various examples of typical traffic control scenarios. Each example shows how to set the phase modes on the XL Multiphase controller and also how to set the phase numbering for each signal head so that they are all addressed uniquely within the installation.

**Signal head addressing** - The items shown in the green arrowed boxes next to each signal head represent the unique phase number that should be set for that head using its individual control panel (see page 7).

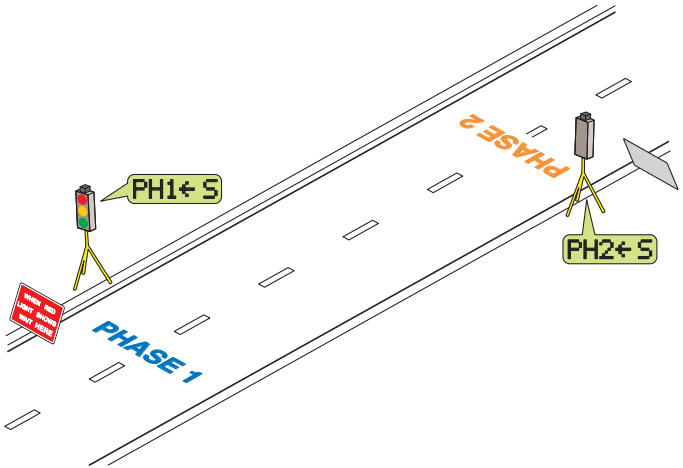


**Phase modes** - At the base of each page, the phase modes are represented as shown here. In addition to the mode for each phase, the state of the phase link button is also shown (see page 10 for details about phase linking).



## Example 1: Carriageway (2 phases, 2 approaches, 1 head per approach)

This example shows a carriageway controlled by two single-approach phases, each with one signal head.



### Phase modes

#### PHASE 1

1 approach  
1 head per app.



#### PHASE 2

1 approach  
1 head per app.



#### PHASE 3

Off



#### PHASE 4

Off

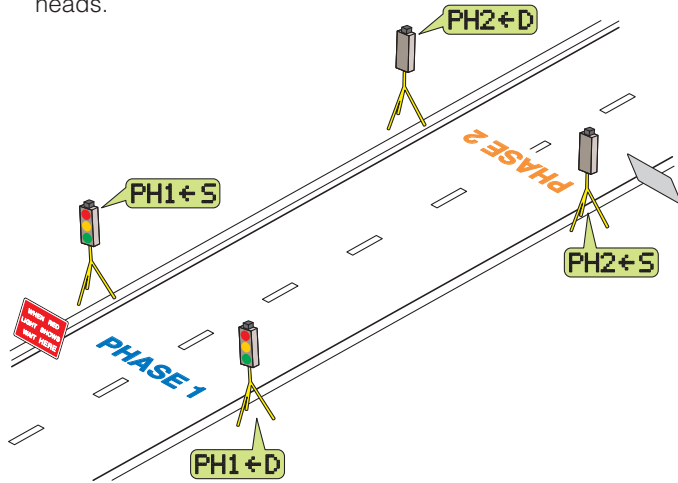


All junction layout examples given in this document are for guidance only.

### Example 2: Carriageway

(2 phases, 2 approaches, 2 heads per approach)

This example shows a carriageway controlled by two single-approach phases, each with nearside and offside signal heads.



#### Phase modes

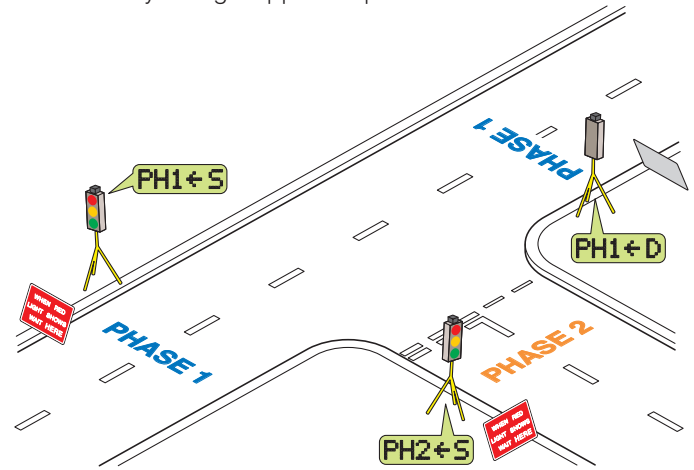
<b>PHASE 1</b> 1 approach 2 heads per app.	<b>PHASE 2</b> 1 approach 2 heads per app.	<b>PHASE 3</b> Off	<b>PHASE 4</b> Off
--	--	-----------------------	-----------------------



### Example 3: T-junction control

(2 phases, 3 approaches, 1 head per approach)

This example shows two approaches of a main road controlled by one phase with opposed heads. The side road approach is controlled by a single approach phase.



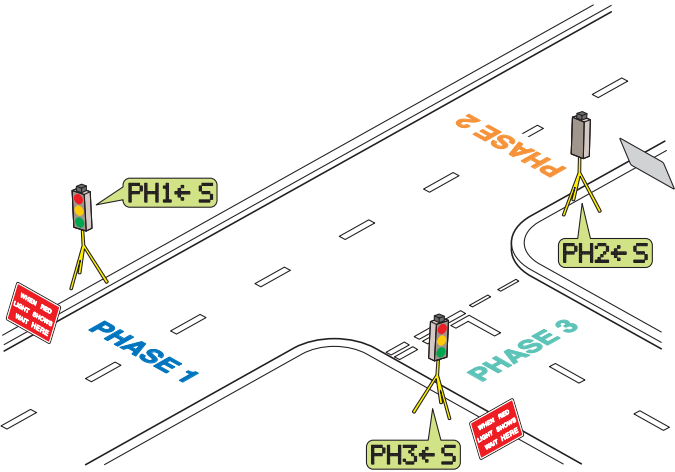
#### Phase modes

<b>PHASE 1</b> 2 approaches 1 head per app.	<b>PHASE 2</b> 1 approach 1 head per app.	<b>PHASE 3</b> Off	<b>PHASE 4</b> Off
---	---	-----------------------	-----------------------



**Example 4: T-junction control**  
(3 phases, 3 approaches, 1 head per approach)

This example shows two approaches of a main road controlled by two separate single approach phases. The side road approach is controlled by a third single-approach phase.



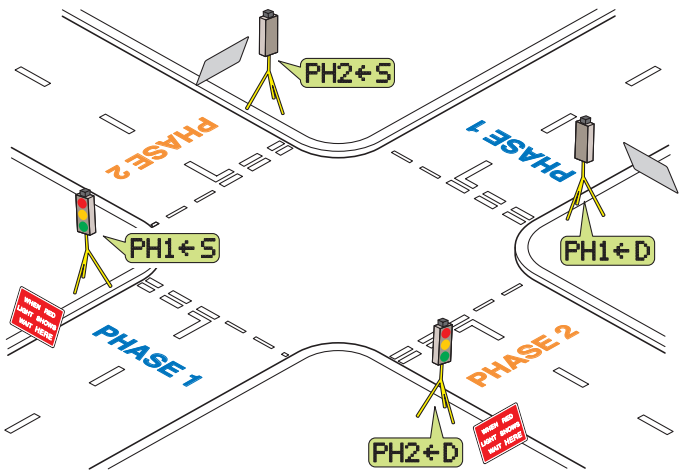
**Phase modes**

- |   |   |   |                       |
|---|---|---|-----------------------|
| <b>PHASE 1</b><br>1 approach<br>1 head per app. | <b>PHASE 2</b><br>1 approach<br>1 head per app. | <b>PHASE 3</b><br>1 approach<br>1 head per app. | <b>PHASE 4</b><br>Off |
|---|---|---|-----------------------|



**Example 5: Crossroad control**  
(2 phases, 4 approaches, 1 head per approach)

This example shows a crossroad (or staggered junction) controlled by two phases with single opposed heads on each.



**Phase modes**

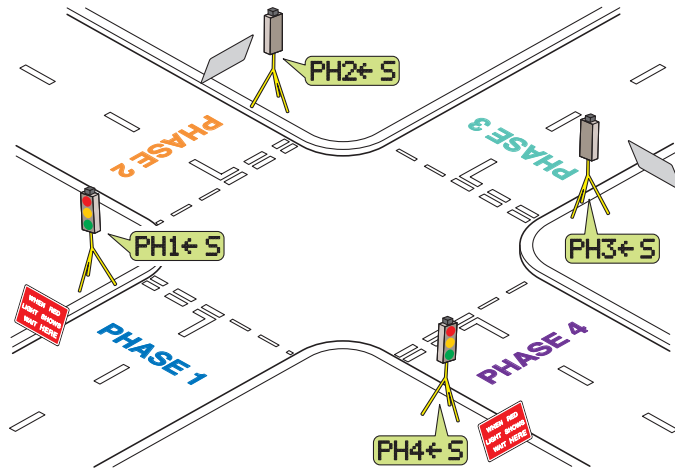
- |   |   |                       |                       |
|---|---|-----------------------|-----------------------|
| <b>PHASE 1</b><br>2 approaches<br>1 head per app. | <b>PHASE 2</b><br>2 approaches<br>1 head per app. | <b>PHASE 3</b><br>Off | <b>PHASE 4</b><br>Off |
|---|---|-----------------------|-----------------------|



### Example 6: Crossroad control

(4 phases, 4 approaches, 1 head per approach)

This example shows a crossroad (or staggered junction) controlled by four separate single-approach phases.



#### Phase modes

##### PHASE 1

1 approach  
1 head per app.



##### PHASE 2

1 approach  
1 head per app.



##### PHASE 3

1 approach  
1 head per app.



##### PHASE 4

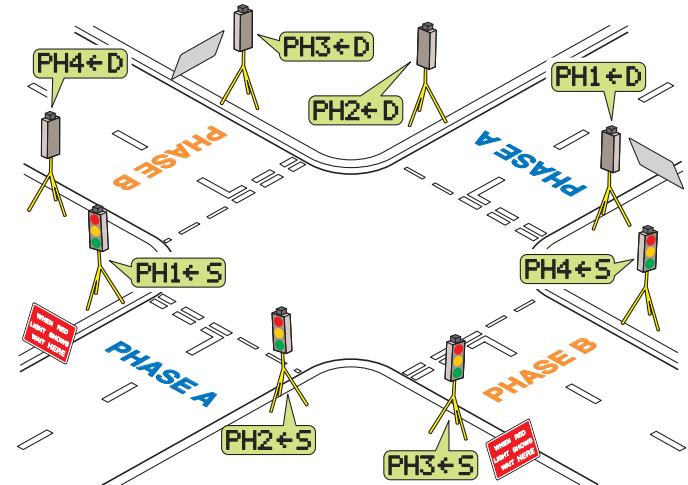
1 approach  
1 head per app.



### Example 7: Crossroad control

(2 phases, 4 approaches, 2 heads per approach)

This example shows a crossroad (or staggered junction) controlled by two separate phases, each of which are formed from two linked phases (not possible on PSL1615 models).



#### Phase modes

##### PHASE A

2 approaches  
2 heads per approach



##### PHASE B

2 approaches  
2 heads per approach









**RADIO LINK**



**UP TO 8 HEADS**



**EASY SET UP**



**BATTERY POWERED**



**PORTABLE**

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