EVO Series

PRODUCT MANUAL

T2 | T5 | PT5 | PT4+

RadioMaster & MicroBox

ARVA TECHNOLOGY

pike® signals

Contents

Introduction

THE EVO SERIES FROM PIKE SIGNALS

The Evo series from Pike Signals delivers a breakthrough in combined vehicle and pedestrian phase control within portable systems. Drawing upon our long history within vehicle control dating back to 1932 and particularly our pioneering work with high-reliability radio-linked computerised systems, the Evo series is so named because it represents a natural, yet hard fought evolution to be the best. The best for reliability, the best for flexibility and the best for safety.

Evo series provide great flexibility, adherence to four TOPAS specifications (TOPAS 2502B, TOPAS 2503B, TOPAS 2537A and TOPAS 2538A).

The Evo series is centred around a range of controllers, which can support up to nine vehicle phases and can operate as master or slave. This means that with a fleet of Evo controllers you will be able to configure the equipment in any order, maximising utilisation.

The Evo series provides vehicle control, vehicle control with pedestrian facilities and pedestrian only control. Using the PT5 controller as a Master provides up to five vehicle phases and a pedestrian facility with up to four crossing points.

To ensure that no job is too large for the Evo series, the PT4 expansion controller connects directly to the PT5 and raises the maximum capabilities of the system to nine vehicle phases and a further four pedestrian crossing points.

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.

Caution

Risk of explosion if battery is replaced by an incorrect type.

Dispose of used batteries according to the instructions.

Further important details about battery disconnection, handling and disposal can be found in the Operator's guide for the signal unit within which the controller is installed.

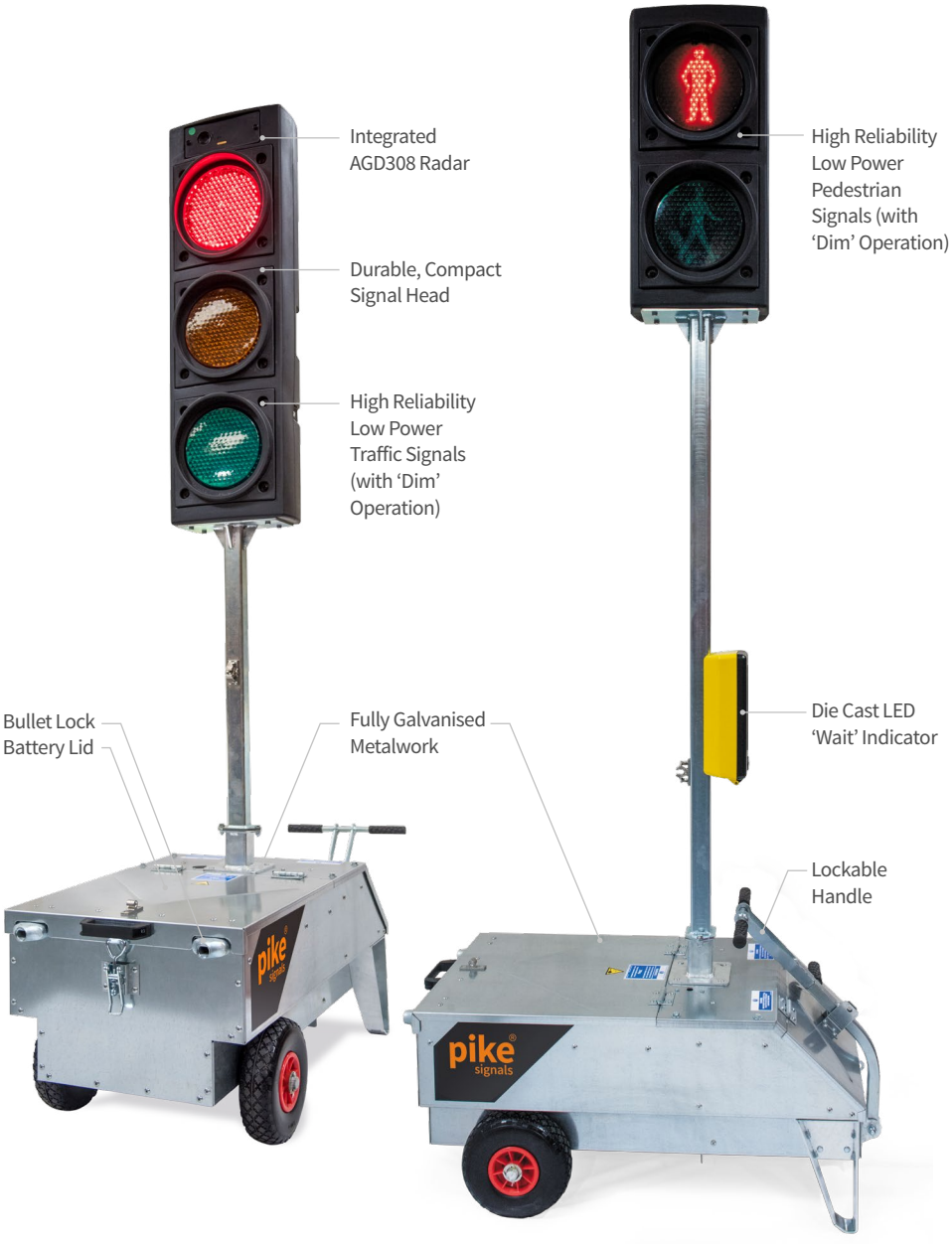
TOPAS
A supplier of TOPAS registered products

THE QUEEN'S AWARDS
FOR ENTERPRISE:
INNOVATION
2016

Evo Series traffic signals are patent pending GB2554529 (A). Other patents and IP protection may apply.

System Overview - RadioMaster

DESIGN FEATURES



EVO® System RadioMaster

SPECIFICATION	
Model	**RadioMaster**
Function	**T2, T5, PT5, PT9, PT4+ Controller Options**
Battery Power Technology	4 off Deep Cycle VRLA Batteries (12V 105Ah)
Battery Charger (not as standard)	30A in-built charger 110V supply (Option)
System Operation Time	Up to 14 days
System Phases	Up to 9 Traffic Phases (18 heads) & 8 Pedestrian Phases (16 heads)
Vehicular Signal Aspects	3 Aspect, Low Power LED, RAG + Integrated Radar
Pesdestrian Signal Aspect	2 Aspect, Low Power LED, Red/Green Man + LED Wait
Handle	Integrated, Folding and Lockable
Detection	AGD 308 Smart Radar Approved to TOPAS 2504
System Function	TOPAS 2502, 2537, 2538
System Range	5 to 500m subject to line of sight variations.
Weight	<210 Kgs including batteries
Security	Fully integrated design
External Charge Point	Integrated 110V 16A 4H (for battery charger option)

System Overview - MicroBox

DESIGN FEATURES

EVO® System MicroBox

SPECIFICATION	
Model	**MicroBox**
Function	**T2, T5, PT5 Controller Options**
Battery Power Technology	2 off Deep Cycle VRLA Batteries (12V 105Ah)
Battery Charger (not as standard)	15A in-built charger 110V supply (Option)
System Operation Time	Up to 7 days
System Phases	Up to 9 Traffic Phases (18 heads) & 8 Pedestrian Phases (16 heads)
Vehicular Signal Aspects	3 Aspect, Low Power LED, RAG + Integrated Radar
Pesdestrian Signal Aspect	2 Aspect, Low Power LED, Red/Green Man + LED Wait
Handle	Integrated, Folding
Detection	AGD 308 Smart Radar Approved to TOPAS 2504
System Function	TOPAS 2502, 2537, 2538
System Range	5 to 500m subject to line of sight variations.
Weight	<122 Kgs including batteries
Security	Fully integrated design
External Charge Point	Integrated 110V 16A 4H (for battery charger option)

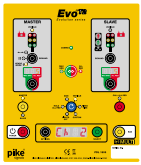
EVO® Configuration

CONFIGURE YOUR REQUIREMENT

STEP 1 → CHOOSE A CARRIAGE →

STEP 2 → ADD A SIGNAL →

STEP 3 → ADD A CONTROLLER →



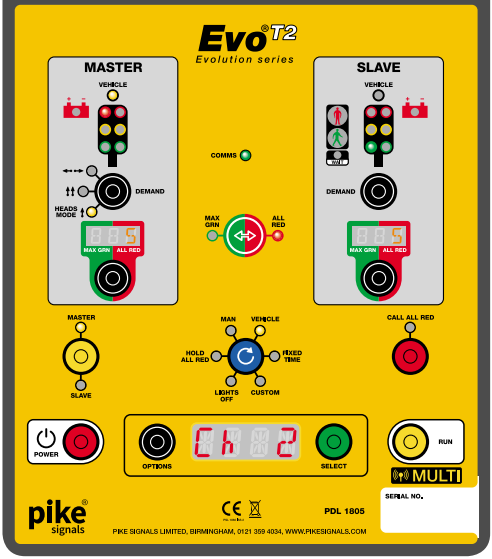
STEP 4 → ON BOARD CHARGER → YES / NO

STEP 5 → CUSTOMISE PAINT & LABELS → YES / NO

EVO Controller Overview

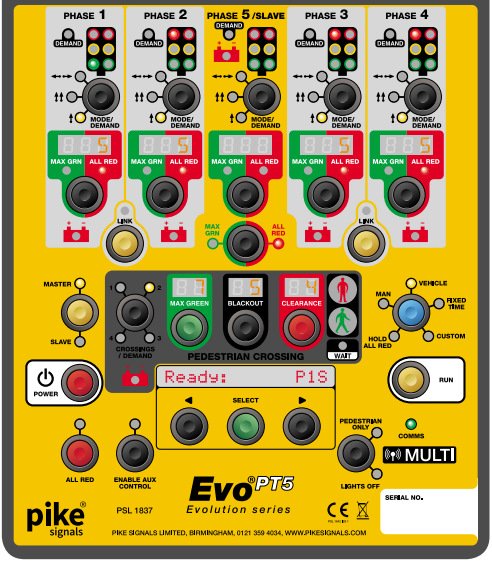
EVO T2

The Evo T2 controller can operate as a master for two vehicle phases; as a vehicle slave to an Evo T5, or as either a vehicle or a pedestrian slave to an Evo PT5.



EVO PT5

The main controller in the Evo range, this model can control up to five vehicle phases plus up to four pedestrian crossings.

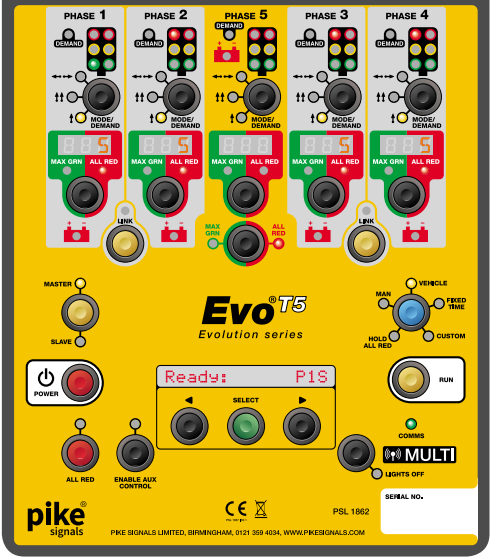


EVO PT4+

The Evo PT4+ companion controller can be linked to any Evo PT5 to add a further four vehicle phases plus another pedestrian phase supporting up to four more crossings.

EVO T5

The Evo T5 controller has all of the controls and capabilities of the Evo PT5, except for the pedestrian crossing functions.



EVO T2 Panel Layout

THE EVO T2 CONTROLLER IS HIGHLY COMPACT AND OFFERS MASTER AND SLAVE CAPABILITIES

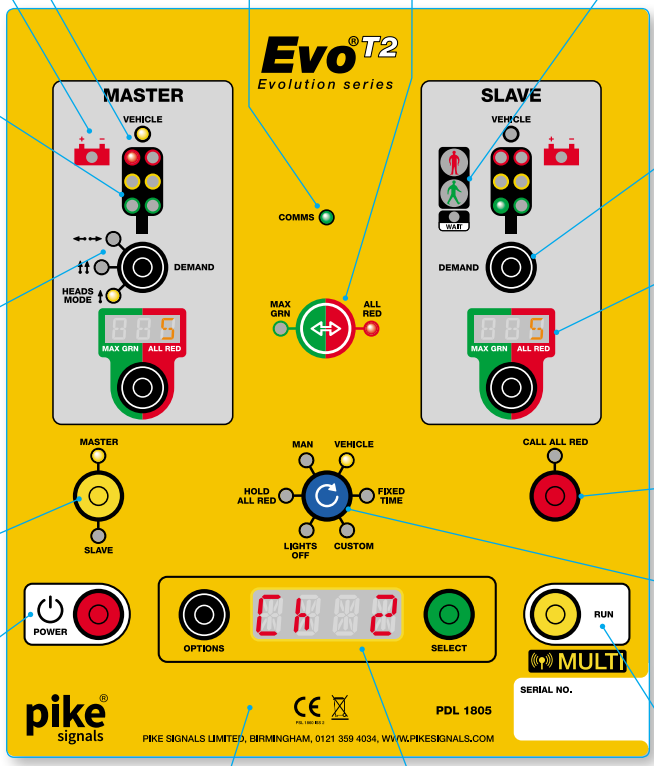
Low battery indicator
Illuminates to warn that one or both of the remote heads on this phase are getting low on battery charge (see page 22).

VEHICLE
This indicator shows when the microwave vehicle detector recognises an approaching vehicle (see page 13).

COMMS
Flashes green to indicate active links with signal heads (see page 24).

ALL RED / MAX GREEN selector
Press to change between adjusting the MAX GREEN and the ALL RED timings on all active phases (see page 15).

Pedestrian signal head mimic
The Evo T2 can operate as a pedestrian slave when controlled by an Evo PT5. In such cases, this mimic shows the current status of the pedestrian signals.



Vehicle signal head mimics
During operation, these indicators show the signals currently being given at the head(s) for this phase (left side = single head; right side = dual head).

HEADS MODE / DEMAND
When setting up (as master), determines the signal head configuration, e.g. single or dual head or off (see page 15).

During operation, can be used to place a demand on this phase.

DEMAND
During operation, can be used to place a demand on this phase.

Combined MAXIMUM GREEN and ALL RED phase timer
In master mode, this button and 3-digit readout are used to set the red and green timings for this phase (see page 15).

MASTER/SLAVE
Determines the role of this controller (see page 13).

CALL ALL RED
Press to hold all signals at red (see page 21).

Operation mode
As master, selects the main operation mode for the system as a whole (see page 16).

POWER
Press and release to switch on, press and hold for two seconds to switch off (see page 13).

RUN
Press to begin (master or slave) operation (see page 14).

MULTI
Indicates that the controller supports 17 different radio channels (see page 18).

Text display section
Shows setup details, timings and error codes. The OPTIONS and SELECT buttons allow you to change settings (see page 13).

EVO T2

The Evo T2 controller can operate as a master for two vehicle phases; as a vehicle slave to an Evo T5, or as either a vehicle or a pedestrian slave to an Evo PT5.

Installation - T2 Controller

SETTING UP THE SIGNAL HEADS

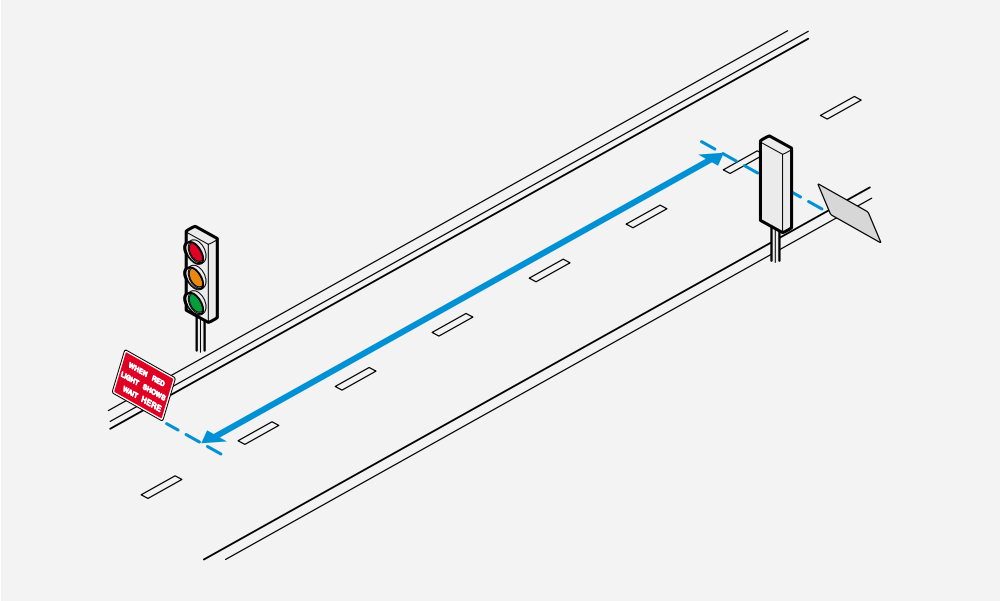
1 Set up the signals with the appropriate traffic management scheme for the prevailing roadwork site conditions.

Recommended references

The latest issues of:

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

2 Measure the distance between the **WAIT HERE** signs.



3 Follow the system setup procedure beginning on page 12.

Please see Appendix 1, starting on page 60 for example signal head layouts.

Preparing for Operation - T2 Controller

PREPARING FOR OPERATION

This chapter covers the actions required when setting up an EVO system involving the Evo T2. The main stages are:

- Setting all vehicle slaves - **page 13**
- Setting all pedestrian slaves - **page 14**
- Set up the master - **page 14**

NOTES

- An Evo T2 controller can operate as a vehicle and/or pedestrian **Slave** within any Evo installation.
- An Evo T2 controller can operate as a **Master** for a basic two phase vehicle-only installation (in combination with Evo T2, Evo T5 or Evo PT5 controllers acting as slaves.
- Older Pike XL2 slave controllers can be used as part of an Evo layout for vehicle control, however, if you require pedestrian crossings, then only Evo controllers can be used. Once an XL2 controller is introduced, the system operation will automatically revert to an earlier HA Specification requirement which is limited to four vehicle phases and has no provision for pedestrian facilities.
- Every Evo controller can automatically sense which type of signal heads (vehicle and/or pedestrian) and will restrict/allow certain adjustments accordingly. For instance, if an Evo T2 controller has only a vehicle signal head attached, then no pedestrian slave options will be offered.

* If a tactile indicator on a pedestrian panel is not sensed by the controller during startup, the display will first show TCTN. Press **SELECT** to acknowledge.

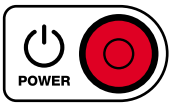
SCAN option

At switch on, after scrolling through the first 17 radio channel options, if the controller is in Master mode, you will see a SCAN option. If you press **SELECT** to choose this option, the controller will scan the surrounding area and show the first available clear radio channel (takes approx. 20 seconds). You can either press **SELECT** to choose that channel or manually choose a different one. See page 17 for details.

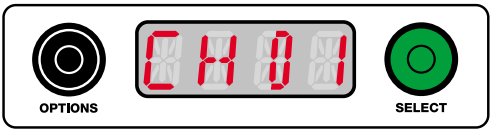
Preparing for Operation - T2 Controller

SETTING A SLAVE (VEHICLE AND/OR PEDESTRIAN)

1 Press **POWER** to switch on.



The text display will briefly show PIKE and then*:



- To choose radio channel CH01 (the usual choice), go straight to step **2** below.
- To choose a different radio channel, press **OPTIONS**. With each press, the text display will advance through the available channels from CH01 to CH17. After CH17, the display may show SCAN (see the lower left box) and after that it will show CABL, which is a function reserved for future use - and then it will roll over to channel CH01. See page 17 for details.

2 Press **SELECT** to fix the chosen radio channel. The display will now show PWR3. In normal conditions, press **SELECT** to choose this option.

3 If the controller is in Slave mode, the text display will show the previously used designation, such as P 2D or X 1R.

NEXT

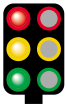
- If the previous mode is appropriate, press **SELECT** and go to step **6**.
- If you need to make changes, go to step **4**.
- If you need to change from master to slave mode, press **MASTER/SLAVE** until the **SLAVE** indicator is lit. Then go to step **4**.

Note: If vehicle and pedestrian heads are both fitted to the same slave controller, you will be prompted to choose the vehicle head designation, followed by the pedestrian head.

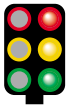
...SETTING A SLAVE - VEHICLE

4 Press **OPTIONS** to scroll through the various vehicle slave signal designations: e.g. P 1S, P 1D, P 2S, P 2D... See below for an explanation of the designations.

As you scroll through the first four head designations for the phases, the mimic displays will show red, amber and green on either the left side or the right side, to highlight the **S**ingle or **D**ual head designations.



Mimic showing that this will be the primary head



Mimic showing that this will be the secondary head

5 When the required phase setting is displayed, press **SELECT** to fix it. The text display will show: RDY

6 Press **RUN**. This controller is now ready to begin working with the master. The text display will show that it's waiting for the master: WAIT

NEXT

- Repeat this procedure for all vehicle slaves.
- Set all pedestrian slaves - see next page
- Set up and run the master - **see page 14** (or, if a different Evo controller model is being used, refer to the guide for that model).

SETTING A SLAVE (VEHICLE AND/OR PEDESTRIAN)

Vehicle slave designations on the text display

The text display uses the following abbreviations to represent the vehicle head modes:

P 1S, P 2S, P 3S to P 9S - this will either be the Single head for the phase (where only one head is used) or otherwise the primary head of a dual head arrangement.

P 1D, P 2D, P 3D to P 9D - this will be the secondary head of a Dual head arrangement.

Note: P 1S is reserved for the signal head that is wired to the master controller, unless being used as a remote. i.e. no head fitted, or if the master is a Ped.

Pedestrian slave designations on the text display

The text display uses the following abbreviations to represent the various pedestrian signal heads:

X 1A, X 2A, X 3A to X 8A - this will be the primary pedestrian signal head in a pair.

X 1B, X 2B, X 3B to X 8B - this will be the secondary pedestrian signal head in a pair.

Note: X 1A is reserved for a pedestrian master (if the master controller is wired to a pedestrian head). IMPORTANT: Each pedestrian crossing must be served by a **matched pair** of pedestrian signal heads.

SETTING A SLAVE - PEDESTRIAN

4 Press **OPTIONS** to scroll through the various slave pedestrian signal head designations: i.e. X 1A, X 1B, X 2A... See below for an explanation of the designations.

5 When the required phase setting is displayed, press **SELECT** to fix it. The text display will show: RDY

6 Press **RUN**. This controller is now ready to begin working with the master. The text display will show that it's waiting for the master: WAIT

Next

- Repeat this procedure for all pedestrian slaves.
- Set all vehicle slaves - see previous page
- Set up and run the master
  (or, if a different Evo controller model is being used, refer to the guide for that model).

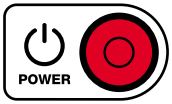
SETTING THE MASTER

This section covers the following for the master controller:

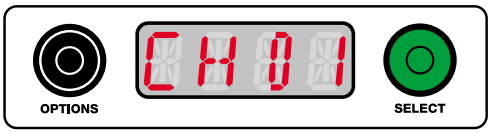
- Switching on - below.
- Setting vehicle phases - opposite.
- Starting operation - **page 16.**

SETTING THE MASTER - SWITCHING ON

1 Press **POWER** to switch on.



The text display will briefly show PIKE and then*:



- To choose radio channel CH01(the usual choice), go straight to step **2** below.

SETTING THE MASTER (CONT.)

- To choose a different radio channel, press **OPTIONS**. With each press, the text display will advance through the available channels from CH01 to CH17. After CH17, the display may show SCAN (see the SCAN option box shown right) and after that it will show CABL, which is a function reserved for future use - and then it will roll over to channel CH01. See **page 17** for details.

2 Press **SELECT** to fix the chosen radio channel. The display will now show PWR3. In normal conditions, press **SELECT** to choose this option.

3 If the controller is in Master mode, the text display will show the previously used settings on the various panel indicators and the text display will show: RDY

Next

- If the previous setup is appropriate, press **SELECT** and go to **page 16**.
- If you need to alter settings, go to step **4**.
- If you need to change from slave to master mode, press **MASTER/SLAVE** until the **MASTER** indicator is lit. Then continue with settings.

Note: An Evo T2 controller can operate as a Master for a basic two phase vehicle-only installation (in combination with Evo T2, Evo T5 or Evo PT5 controllers acting as slaves.

* If a tactile indicator on a pedestrian panel is not sensed by the controller during startup, the display will first show TCTN. Press **SELECT** to acknowledge.

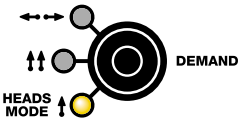
SCAN option

On **MULTI** controllers at switch on, after scrolling through the first 17 radio channel options, you will see a SCAN option. If you press **SELECT** to choose this option, the controller will scan the surrounding area and show the first available radio channel (takes approx. 20 seconds). You can either press **SELECT** to choose that channel or manually choose a different one. See **page 17** for details.

4 Repeatedly press **HEADS MODE/DEMAND** until the required setting is illuminated (this one button configures both phases):

selects one approach, one head per approach,

selects one approach, two heads per approach,



selects two approaches,one head per approach (aka: two opposed heads).

Note: When the option is lit, a further press of **HEADS MODE/DEMAND** will disable the phase (press again to choose the required setting).

5 Set the All Red time:

Ensure that the **ALL RED** indicator is flashing. If it is not, press the **MAX GRN ALL RED** button located in the centre of the panel.

Using the measurement taken earlier (between the **WAIT HERE** signs) and the table shown below, repeatedly press the phase timing button until the appropriate time is shown on the 3-digit readout.

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

0m	50m	100m	150m	200m	250m	300m
5 seconds	10 seconds	15 seconds	20 seconds	25 seconds	30 seconds	

Preparing for Operation - T2 Controller

SETTING THE MASTER (CONT.)

6 Set the Maximum Green time

Ensure that the **MAX GRN** indicator is flashing. If it is not, press the **MAX GRN ALL RED** button located in the centre of the panel.

Using the measurement taken earlier (between the **WAIT HERE** signs) and the table shown below, repeatedly press the button until the appropriate time is shown on the 3-digit readout.

7 Repeat steps **5** and **6** for the other phase and then:

STARTING OPERATION

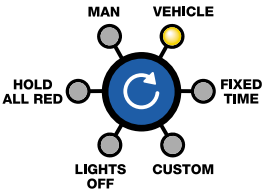
Once the following stages are complete:

- All heads, signs and cones placed in appropriate locations,
- Slave controller(s) set,
- Master controller set,

...then you should be ready to start operation using the master controller.

TO START OPERATION

a On the master controller, press the blue button to choose the appropriate operation mode. For normal operation, this should be set to **VEHICLE**.

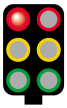


b Press **RUN**.

The various signal heads of the installation will now start up in an orderly manner:

- The master phase will show amber and then go to red.
- The slave phase will wait for the longest all red time to run and then change to green.
- Normal operation will then commence according to the setting of the blue mode button.

The phase mimics will show what each of the signal heads are currently displaying.

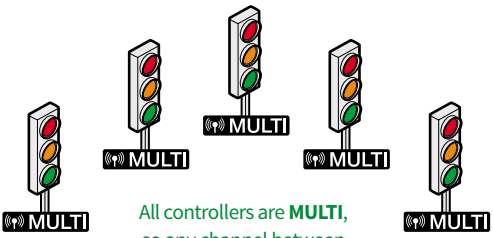


RADIO CHANNELS

All Evo controllers that show the **MULTI** logo on their front panels offer a greatly increased number of radio communication channels (1 to 17). This compares with the first generation (Standard) Evo controllers, which provide channels 1 and 2.

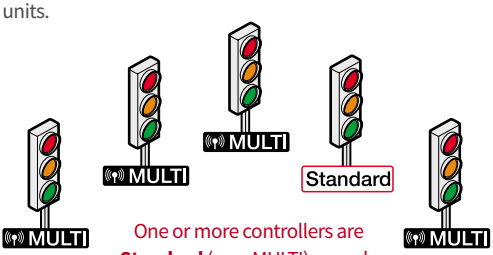
When mixing Multi-channel and standard controllers

If all of your Evo controllers are the **MULTI** type, then you can use any of the available 17 channels:



All controllers are **MULTI**, so any channel between **1** and **17** can be used.

However, if your installation contains *any* standard Evo controllers (those that do not have the MULTI logo) then you must choose either channel **1** or channel **2** for all units.



One or more controllers are **Standard** (non-MULTI), so only channels **1** or **2** can be used.

If you choose channels **3** to **17** then the standard controller(s) will not be found and the installation will not run.

IMPORTANT: Obviously, you need to ensure that all controllers within a set are configured to use the same radio channel.

Using the scan option

1. Press **POWER** to switch on. The text display will show CHXX, where XX is the last channel used.
2. Press **OPTIONS** to advance to channel 17 and then press once more to show SCAN. Press **SELECT**.

   Note: The controller must be in Master mode to access the Scan function.

   The controller will now scan the radio channels. After roughly 20 seconds, the text display will show the first available clear radio channel that was detected during the scanning process.
3. Press **SELECT** to choose the recommended channel, or manually choose a different channel.
4. Continue with the usual configuration steps. Don't forget to manually select the same radio channel on all of the other Evo controllers within the set.

Discovering the radio channel during operation

When the system is running, you can check which radio channel is being used as follows:

1. During normal operation, on the master controller, press the **SELECT** button. The text display will show LOCV and the Master phase timing display will show the current local battery charge.
2. Press the **OPTIONS** button to show the radio channel, for example: CH01
3. Press the **SELECT** button to return to the normal display (or wait for 12 seconds and the text display will automatically return).

TRANSMITTER POWER

Evo controllers that show the MULTI logo on their front panels provide an option, when they are first switched on, to change the transmitter power:

PWR3

The standard power level is **3** and for most installations this should not be changed; simply press **SELECT** during startup to choose the standard option.

Reducing transmitter power to avoid interference

Reducing transmitter power *may* be a useful option when two (or more) separate Evo installations are placed near to each other and you begin to experience communication issues.

IMPORTANT: You should always try to solve interference issues by changing the radio channels first before attempting to reduce transmitter power. If the Evo controllers in set are all MULTI units, you have the choice of 17 different channels to switch them all to; if not, you have a choice of 2 channels. See page 17 for details.

If changing radio channels does not solve the problem, then you could consider reducing the Tx power in one or more units that are in closest proximity between the affected sets.

Note: When reducing power in a controller, you must ensure that its transmissions are sufficiently strong to still reach its own master; or if it is the master, that it can reach ALL of its slaves.

It is not necessary to change the Tx power level in all Evo units within a set. A change in Tx power affects only the transmission of a controller, it has no effect of the reception of signals by that controller.

As a rough guide, the line of sight transmission distances (when there are no external sources of interference) are as follows:

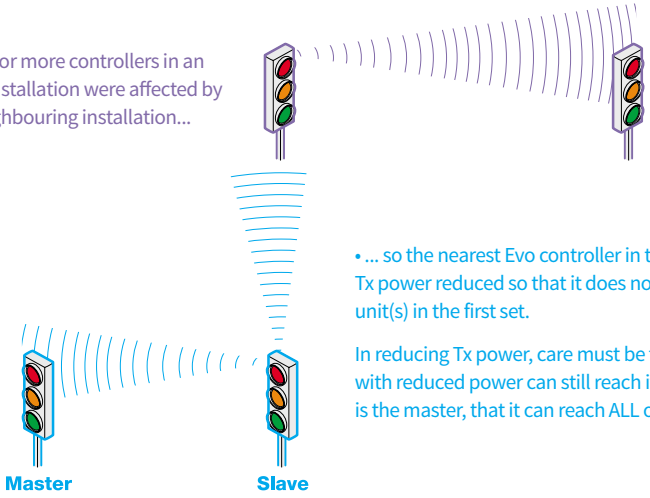
Tx power level	Power mode	Approx. Tx distance
3 and 2	Standard	300 metres (984 feet)
1 and 0	Low	100 metres (328 feet)

To reduce power on an Evo T2 controller

1. Switch on the controller in the usual manner.
2. Select the radio channel and press **SELECT**. The display will now show: PWR3
3. Use the **OPTIONS** button to change the Tx radio power value and press **SELECT**.
4. Continue with your configuration in the usual manner.

   Note: If the controller is switched off and back on, the Tx power level will be offered at the normal setting of 3.

• One or more controllers in an Evo installation were affected by a neighbouring installation...



• ... so the nearest Evo controller in the second set has its Tx power reduced so that it does not reach the closest unit(s) in the first set.

In reducing Tx power, care must be taken that the unit with reduced power can still reach its own master (or if it is the master, that it can reach ALL of its slaves.

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 a particular approach, consider making careful adjustments to alleviate the problem.

Timing adjustments can be made to either 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 in small steps.

1. Ensure that the **ALL RED** indicator is flashing. If it is not, press the **MAX GRN ALL RED** button located in the centre of the panel.
2. Press the phase timing button for the phase that needs to be adjusted to increase the ALL RED time.
3. Allow several full vehicle cycles to occur and observe the changes to traffic behaviour.
4. Repeat if necessary.

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 in small steps.

1. Ensure that the **MAX GRN** indicator is flashing. If it is not, press the **MAX GRN ALL RED** button located in the centre of the panel.
2. Press the phase timing button for the phase that needs to be adjusted to increase the MAX GRN time.
3. Allow several full vehicle cycles to occur and observe the changes to traffic behaviour.
4. Repeat if necessary.

Operation - T2 Controller

OPERATION MODES

The blue mode switch determines how the system operates.

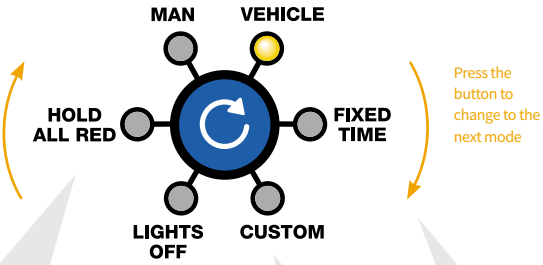
MANUAL

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.

LIGHTS OFF

The system continues to operate, however, all signals are extinguished until this mode is changed.

CUSTOM

This is the positional setting for ARVA for those controllers with this functionality.

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.

COMMUNICATION FAILURES

The Evo system continually monitors itself to check for any type of failure so that it can take appropriate action:

After a temporary communications loss

Firstly, all signals will show red for 50 seconds. After that period, all signals will switch off (unless the master controller is running in **HOLD ALL RED** or **MANUAL** modes, in which case all signals will remain at red). The text display on the master controller will show the following:

COMR

The controller will wait for ten minutes and will then go through an automated restart procedure:

- The master phase will show amber and then go to red.
- The slave phase will wait for the longest all red time to run and then change to green.
- Normal operation will then commence according to the setting of the blue mode button.

Note: During the ten minute recovery period, it is possible for an operator to manually restart the whole system.

After a serious communications loss

Following a serious or sustained loss of communication, the master controller text display will show the following:

COMF

All signals will be instructed to remain off (or at red, if **HOLD ALL RED** or **MANUAL** modes are running). The whole system will require corrective action by the operator and a manual restart.

CALLING 'HOLD ALL RED'

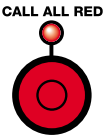
The system allows the 'hold all red' mode to be invoked either from the Evo master controller or from any of the remote slave controllers. This is a useful feature for:

- 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 'manual hold all red' from a slave T2 controller

To call 'manual hold all red' from a slave T2

1 On a remote slave controller, press **CALL ALL RED**. The adjacent red indicator will illuminate.



- All signal heads will be returned to red and will stay at red until the state is overridden.
- The text display on the master controller will show RRED.

To resume operation

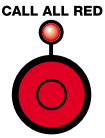
1 On the master controller, press **CALL ALL RED**.
The adjacent red indicator will extinguish.

Calling 'hold all red' from the master controller

To call 'hold all red from the master

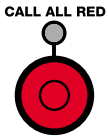
1 On the master controller, press **CALL ALL RED**.

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 **CALL 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**:
  - The text display will show LRED.
  - Any signals currently at green will wait for a minimum of 12 seconds and then return to red.
  - To resume operation: press **CALL ALL RED**.



CHECKING BATTERY CHARGE LEVELS

When the system is operating you can quickly check the exact battery charge levels for the master and all slaves, from the master text display.

To check battery charge levels

1 During normal operation, on the master controller, press the **SELECT** button.

The text display will show... ➲

⊂ ... while the left hand time display will shows the charge level (in Volts) for the master (local) controller's battery.

2 Press the **OPTIONS** button to advance to the next display:

This is the current radio channel ➲

3 Press the **OPTIONS** button to advance to the next display.

The text display will show... ➲

⊂ ... while the left hand time display will shows the charge level (in Volts) for the first slave controller's battery.

If another slave is connected, press the **OPTIONS** button again to view its battery charge level.

4 When you have finished checking battery levels, press the **SELECT** button to return to the normal display.

Note: *You can use this procedure to check a slave battery charge level from the slave controller itself, but it will not be able to report on any other units. The slave unit will report itself as 'LOCL' and the voltage level will be shown in the left hand time display as shown above.*

RESETTING THE SYSTEM

Certain failures within the Evo 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 master controller indicators to trace the problem, page 3 provides descriptions.

2 If the problem is traced to one or more signal heads, visit each affected head and check the slave controller(s).
Depending on the fault:

- If possible, rectify the problem and reset the slave controller(s).
- Try performing a radio frequency scan to determine whether a different channel would provide better operation. See "Using the scan option" on page 17.

or

- Replace the signal head(s)/ controller(s) and follow the set up instructions shown previously to select the correct phase number(s).

  Note: If any slave unit is replaced, the master controller must be powered off and then on again to force it to look for all new slaves.

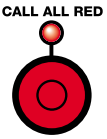
3 When all affected heads have been reset, on the master controller press the **RUN** button to restart operation. Monitor the system operation until you are sure that it is working correctly.

DECOMMISSIONING THE SYSTEM

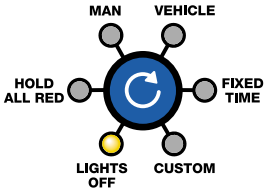
When the portable signals are no longer required, please follow this procedure to decommission their use.

To decommission the system

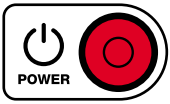
1. Ensure that the shuttle lanes are cleared of obstructions (with the exception of the signals heads, cones and related warning signs).
2. Press the **CALL ALL RED** button to bring any aspects that are currently on green to red.



3. Change the blue mode selector on the master controller to **LIGHTS OFF** to extinguish all signals.



4. In turn, go to all approaches, power off each slave controller (press and hold their **POWER** buttons) and face the signal heads away from the traffic.



5. If necessary, press and hold the **POWER** button on the master controller to switch it off.
6. Remove the signal heads from the carriageways.

INCIDENTS DURING OPERATION

In accordance with Highways Agency specifications, the Evo master 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 vehicle signal failures

- If ALL red vehicle signals fail on an approach, then 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.
- If more than one approach has a total red signal failure, all the signal heads will immediately return to **ALL RED** for 50 seconds, after which all signals will extinguish and the controller will stop operation.

  On the master controller, the text display will show **E 84** and the mimic indicators representing the failed red signals will flash. See **Resetting the system** on page 22.

Green vehicle signal conflicts

When the operation mode is either Vehicle or Fixed Time:

- If opposing phases show green signals simultaneously at any time, then the signals on all approaches will immediately return to **ALL RED** for 50 seconds, after which all signals will extinguish and the controller will stop operation.

  On the master controller, the text display will show **E 89** and the mimic indicators representing the failed green signals will flash. See **Resetting the system** on page 22.

When the operation mode is either Hold All Red or Manual:

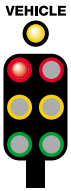
- If opposing phases show green signals simultaneously at any time, then all signals immediately change to red (no amber signal) and will remain at red.

  One the master controller, the text display will show **E 89** and the mimic indicators representing the failed green signals will flash. See **Resetting the system** on page 22.

ERROR INDICATIONS

The Evo 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 main (or only) signal head for a phase, the right three indicators represent the second of a dual head arrangement (if used). The **VEHICLE** indicator shows when a vehicle is detected by the microwave vehicle detector (on either signal head).

Battery indicators (for each phase)

Note: *See also page 22 for details about checking exact charge levels.*

During startup, if the voltage of any controller battery is below 11.5V, the text display will show **BFXX** (where **XX** is the affected controller) and the master will refuse to operate.

During operation, when there are roughly two hours of operational time remaining within a remote signal head battery, the battery indicator will flash and the text display will show **LBAT**.

When the battery becomes too low for operation, the signal head will go to red for the **MAX RED** time and then switch off, the controller with the low battery will then power down. The corresponding indicator on the Evo master controller will remain on and the text display will show **BFXX**, where **XX** is the slave number.

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 signal head will provide further details.

Comms indicator

In normal operation the **COMMS** indicator will show a flashing green light:

Master controller

Flashing green	System running correctly.
Off	Loss of communication.
On	Fault state.

Slave controller

Flashing green	System running correctly.
Off	Loss of communication.

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 22.

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 22.

The Comms indicator is not flashing

There is a communication error. See **Error indications** opposite.

The text display is displaying a code

See right 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.

ERROR INDICATIONS - TEXT DISPLAY - T2

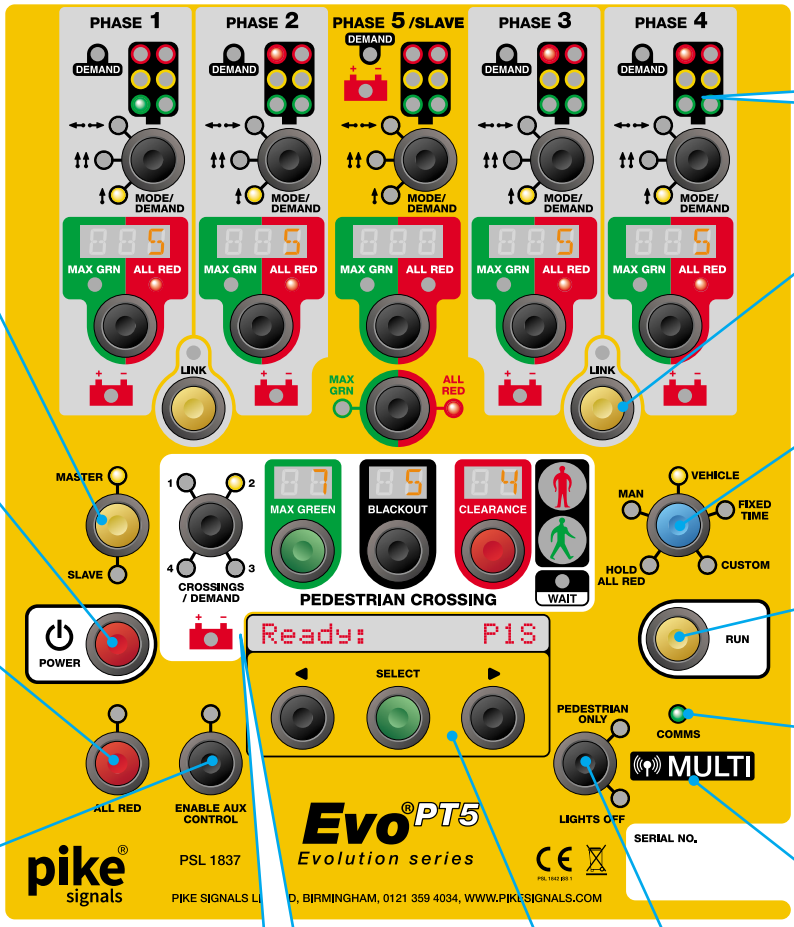
The text display at the bottom of the control panel shows a continual count of the elapsed time for the current signal of the active phase. In error situations, this display is used to provide alphanumeric status codes, as follows:

BF	Insufficient battery voltage to continue.
BFXX	Critical battery voltage on slave xx.
CE01	Insufficient battery voltage.
CE02	Duplicate serial number.
CE03	Invalid operational mode.
CE04	Language mismatch.
CE05	Software mismatch.
CE06	Nearside/farside mismatch.
CE07	Configuration incompatible with XL2 slaves.
CE08	System does not have common protocol for all slaves.
CE10	Master has unconfigured vehicle head.
CE11	Master has unconfigured pedestrian head.
CE12	A slave has unconfigured pedestrian head.
CE13	A slave has unconfigured vehicle head.
CE14	Remote master operation disallowed.
CE20	No vehicle phases configured.
CE21	No pedestrian phases configured.
CE30	Awaiting confirmation of radio channel.
CE32	Awaiting confirmation of slave identity.
CE33	Radio board failed to respond to commands.
CE40	No head detected.
CE50	Engineers terminal interlocking active.
CE99	Internal error.
COMF	Communications failure.
COMR	Communication recovery in progress.
CONF	Configuring.
E010	Invalid configuration data.
E012	Incompatible software installed.
E013	Controller started following a watchdog reset.
E020	Local monitor fault (whilst lamp was on).
E021	Local monitor fault (whilst lamp was off).
E022	Local lamp conflict detected on disused head.
E023	Local lamp conflict detected by CPLD.
E024	Local CPLD watchdog fault.
E025	Local front panel fault.
E030	Master detected invalid broadcast.
E031	Master detected aspects are not set as requested.
E032	Master detected invalid response from slave.
E040	Master has been notified of CAT1 fault on slave.
E041	Master has been notified of invalid broadcast on slave.
E 77	The amber or green vehicle aspect failed to turn on or off.
E 78	The tactile aspect failed to turn off.
E 79	The wait aspect failed to turn on or off.
E 80	The green man pedestrian aspect failed to turn on or off.
E 81	The red man pedestrian aspect failed to turn on or off.
E 82	The amber vehicle aspect failed to turn on or off.
E 83	The green vehicle aspect failed to turn on or off.
E 84	The red vehicle aspect failed to turn on or off.
E 88	Near and far side.
E 89	Green or green man aspect was on unexpectedly.
FP V	FP software version.
LATI	Language and timing information.
LBAT	Battery voltage becoming too low.
LOCL	Local battery voltage.
LRED	Local red call.
MB V	Main board software version.
PFXX	Could not find a slave for pedestrian phase xx.
RB V	Radio board software version.
RDY	Ready.
RRED	Remote red call.
SP V	SP software version.
SRCH	Searching.
STOP	System has stopped due to CAT1 fault.
TCTN	No tactile aspect detected.
TCTY	Tactile aspect present.
VFXX	Could not find a slave for phase xx.
WAIT	Waiting for a response from the master.

Introduction - PT5 Controller

EVO PT5 PANEL LAYOUT

Evo controllers are highly compact and yet offer full master and slave capabilities.



MASTER/SLAVE
Determines the role of this controller (see page 30).

POWER
Press and release to switch on, press and hold for two seconds to switch off (see page 30).

MANUAL ALL RED
Press to hold all signals at red see page 42).

ENABLE AUX CONTROL
Press to allow remote control.

PEDESTRIAN section
Contains all items needed to configure and monitor (in master mode) up to four separate pedestrian crossings (see page 34).

TEXT DISPLAY SECTION
Shows setup details, timings and error codes. The arrow and SELECT buttons allow you to change settings (see page 31).

PEDESTRIAN ONLY / LIGHTS OFF
During setup, places master into dedicated pedestrian mode (see page 36). During operation, places all signal heads into blackout.

Introduction - PT5 Controller

LINK
Combines two phases to allow more signal heads per approach

OPERATION MODE
As master, selects the main operation mode for the system as a whole (see page 40).

RUN
Press to begin (master or slave) operation (see page 31).

COMMS
Flashes green to indicate active links with signal heads (see page 46).

MULTI
Indicates that the controller supports 17 different radio channels (see page 37).

DEMAND

This indicator shows when the microwave vehicle detector recognises an approaching vehicle (see page 35).

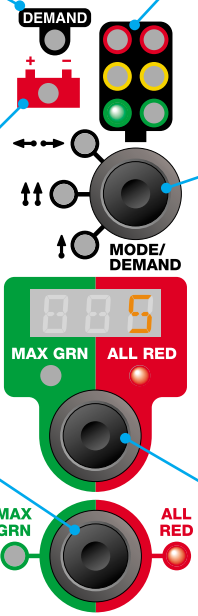
Low battery indicator

Illuminates to warn that one or both of the remote heads on this phase are getting low on battery charge (see page 46).

ALL RED / MAX GREEN selector

Press to change between adjusting the MAX GREEN and the ALL RED timings on all active phases (see page 33).

For each phase



Signal head mimic

During operation, these indicators show the signals currently being given at the head(s) for this phase (left side = single head; right side = dual head).

Phase MODE / DEMAND

When setting up (as master), determines the signal head configuration, e.g. single or dual head or off (see page 33).

During operation, can be used to place a demand on this phase.

Combined MAXIMUM GREEN and ALL RED phase timer

In master mode, this button and 3-digit readout are used to set the red and green timings for this phase (see page 33).

When the controller is used as a slave, regardless of which phase is set, the Phase 5/Slave mimics are used to show what the Slave is doing.

For other Evo models, please see the next page

SETTING UP THE SIGNAL HEADS

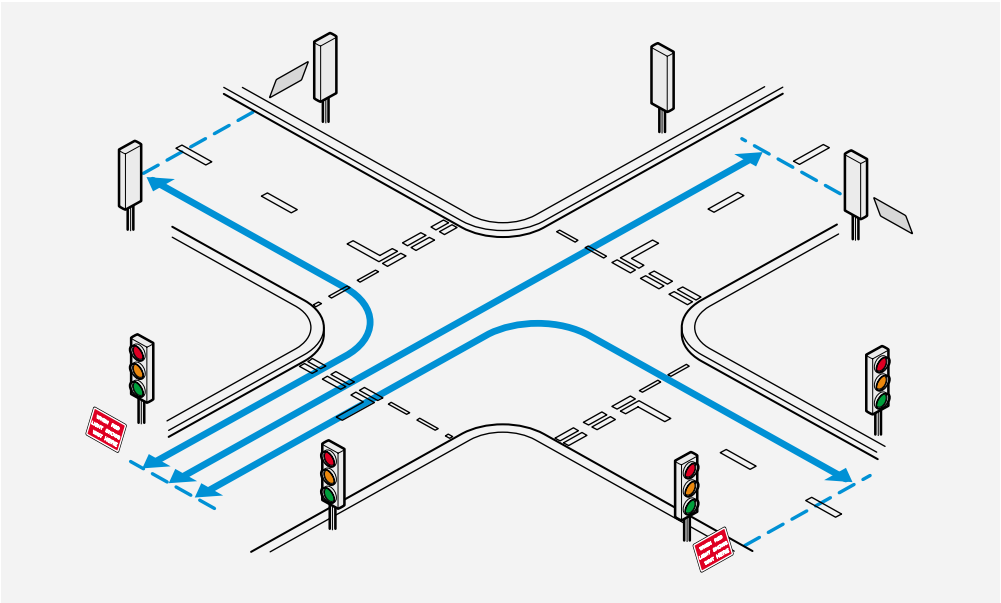
1 Set up the signals with the appropriate traffic management scheme for the prevailing roadwork site conditions.

Recommended references

The latest issues of:

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

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



3 Follow the system setup procedure beginning on **page 30**.

Please see Appendix 1, starting on page 60 for example signal head layouts.

Preparing for Operation - PT5 Controller

PREPARING FOR OPERATION

This chapter covers all of the actions that you need to carry out when setting up an EVO system. The main stages are:

- Setting all vehicle slaves - page 30
- Setting all pedestrian slaves - page 31
- Set up the master - page 31

NOTES

- If you are setting up a dedicated pedestrian crossing, go to page 36.
- Older Pike XL2 slave controllers can be used as part of an Evo layout for vehicle control, however, if you require pedestrian crossings, then only Evo controllers can be used. Once an XL2 controller is introduced, the system operation will automatically revert to an earlier HA Specification requirement which is limited to four vehicle phases and has no provision for pedestrian facilities.
- Every Evo controller can automatically sense which type of signal heads (vehicle and/or pedestrian) and will restrict/allow certain adjustments accordingly. For instance, if an Evo PT5 controller has only a vehicle signal head attached, then no pedestrian slave options will be offered.

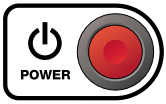
* If a tactile indicator on a pedestrian panel is not sensed by the controller during startup, the display will first show NO TACTILE. Press **SELECT** to acknowledge.

SCAN option

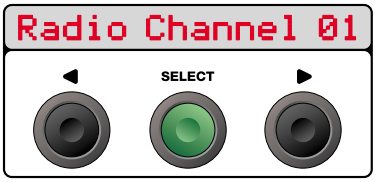
At switch on, after scrolling through the first 17 radio channel options, if the controller is in Master mode, you will see a SCAN option. If you press **SELECT** to choose this option, the controller will scan the surrounding area and show the first available clear radio channel (takes approx. 20 seconds). You can either press **SELECT** to choose that channel or manually choose a different one. See page 37 for details.

SETTING SLAVES (VEHICLE AND/OR PEDESTRIAN)

1 Press **POWER** to switch on.



The text display will briefly show PIKE SIGNALS and then*:



- To choose radio channel 01 (the usual choice), go straight to step **2** below.
- To choose a different radio channel, press ▶.
  The text display will advance through the available channels (either 1 and 2 for a standard unit or 01 to 17 for a MULTI controller). After 17, the display may show SCAN (see the lower left box) and after that it will show CABLE, which is a function reserved for future use - and then it will roll over to channel 01. See page 13 for details.

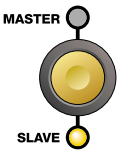
2 Press **SELECT** to fix the chosen radio channel. The display will now show RADIO TX POWER 3. In normal conditions, press **SELECT** to choose this option.

3 The text display will show the previously used mode, such as SLAVE VEH 2S.

NEXT

- If the previous mode is appropriate, press **SELECT** and go to step **6**.

- If you need to make changes, go to step **4**.
- If you need to change from master to slave mode, press **MASTER/SLAVE** until the **SLAVE** indicator is lit. Then go to step **4** opposite.

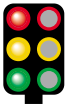


Note: If vehicle and pedestrian heads are both fitted to the same slave controller, you will be prompted to choose the vehicle head designation, followed by the pedestrian head.

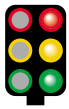
SETTING A SLAVE - VEHICLE

4 Press ◀ or ▶ to scroll through the various vehicle slave signal designations: e.g. SLAVE VEH 1S, SLAVE VEH 1D, SLAVE VEH 2S, SLAVE VEH 2D... See below for an explanation of the designations.

As you scroll through the head designations for the phases, the mimic display for the current phase will show red, amber and green on either the left side or the right side of the mimic, to highlight the **S**ingle or **D**ual head designations.



Mimic showing that this will be the primary head



Mimic showing that this will be the secondary head

5 When the required phase setting is displayed, press **SELECT** to fix it. The text display will show: READY

6 Press **RUN**. This controller is now ready to begin working with the master. The text display will show that it's waiting for the master: WAITING

NEXT

- Repeat this procedure for all vehicle slaves.
- Set all pedestrian slaves - **see page 32**
- Set up and run the master - **see page 32**

SETTING A SLAVE (VEHICLE AND/OR PEDESTRIAN)

VEHICLE slave designations on the text display

The text display uses the following abbreviations to represent the vehicle head modes:

SLAVE VEH 1S, SLAVE VEH 2S, SLAVE VEH 3S, etc. - this will either be the **S**ingle head for the phase (where only one head is used) or otherwise the primary head of a dual head arrangement.

SLAVE VEH 1D, SLAVE VEH 2D, SLAVE VEH 3D, etc. - this will be the secondary head of a **D**ual head arrangement.

Note: PHASE 1S is reserved for the signal head that is wired to the master controller, unless being used as a remote. i.e. no head fitted, or if the master is a Ped.

PEDESTRIAN slave designations on the text display

The text display uses the following abbreviations to represent the various pedestrian signal heads:

SLAVE PED 1A, SLAVE PED 2A, SLAVE PED 3A, etc.- this will be the primary pedestrian signal head in a pair.

SLAVE PED 1B, SLAVE PED 2B, SLAVE PED 3B, etc. - this will be the secondary pedestrian signal head in a pair.

Note: PED 1A is reserved for a pedestrian master (if the master controller is wired to a pedestrian head).

IMPORTANT: Each pedestrian crossing must be served by a **matched pair** of pedestrian signal heads.

SETTING A SLAVE - PEDESTRIAN

4 Press ◀ or ▶ to scroll through the various slave pedestrian signal head designations: e.g. SLAVE PED 1A, SLAVE PED 1B, SLAVE PED 2A... See below for an explanation of the designations.

5 When the required phase setting is displayed, press **SELECT** to fix it. The text display will show: READY

6 Press **RUN**. This controller is now ready to begin working with the master. The text display will show that it's waiting for the master: WAITING

Next

- Repeat this procedure for all pedestrian slaves.
- Set all vehicle slaves - see previous section
- Set up and run the master - opposite

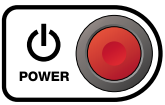
SETTING THE MASTER

This section covers the following for the master controller:

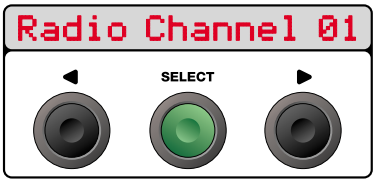
- Switching on - below.
- Setting vehicle phases - opposite.
- Setting pedestrian crossings - **page 35**
- Starting operation - **page 36**

SETTING THE MASTER - SWITCHING ON

1 Press **POWER** to switch on.



The text display will briefly show PIKESIGNALS and then*:



SETTING THE MASTER (CONT.)

- To choose radio channel 01 (the usual choice), go straight to step **2** below.
- To choose a different radio channel, press ▶. The text display will advance through the available channels (either 1 and 2 for a standard unit or 01 to 17 for a MULTI controller). After 17, the display may show SCAN (see the SCAN option box shown right) and after that it will show CABLE, which is a function reserved for future use - and then it will roll over to channel 01. See page 37.

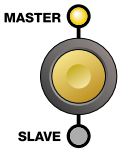
2 Press **SELECT** to fix the chosen radio channel. The display will now show RADIO TX POWER 3. In normal conditions, press **SELECT** to choose this option.

3 The text display will show the previously used mode, such as: READY P1S

Previous settings will also be shown on the various panel indicators.

Next

- If the previous setup is appropriate, press **SELECT** and go to **page 35**.
- If you need to alter **vehicle** settings, go to step **4** opposite.
- If you need to alter **pedestrian** settings, go to step **4** on **page 36**
- If you need to change from slave to master mode, press **MASTER/ SLAVE** until the **MASTER** indicator is lit. Then continue with vehicle and/or pedestrian settings (on **pages 31** and **32**, respectively).



Note: If you are creating a dedicated pedestrian crossing (i.e. a single vehicle phase that serves only the pedestrian crossing), please use the Pedestrian only method of setup shown on page 36.

* If a tactile indicator on a pedestrian panel is not sensed by the controller during startup, the display will first show NO TACTILE. Press **SELECT** to acknowledge.

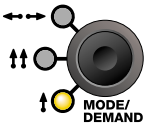
SCAN option

On **MULTI** controllers at switch on, after scrolling through the first 17 radio channel options, if the controller is in Master mode, you will see a SCAN option. If you press **SELECT** to choose this option, the controller will scan the surrounding area and show the first available clear radio channel (takes approx. 20 seconds). You can either press **SELECT** to choose that channel or manually choose a different one. See page 38 for details

SETTING THE MASTER (CONT.) - VEHICLE PHASES

For each vehicle phase that you need to use:

4 Repeatedly press **MODE/DEMAND** for the phase until the required setting is illuminated:



selects one approach, one head per approach,

selects one approach, two heads per approach,

selects two approaches, one head per approach (aka: two opposed heads).

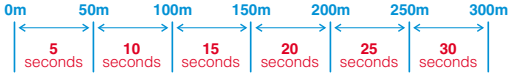
Note: When the option is lit, a further press of **MODE/DEMAND** will switch off that phase.

5 Set the All Red time:

Ensure that the **ALL RED** indicator is on. If it is not, press the **MAX GRN ALL RED** button located in the centre of the panel.

Using the measurement taken earlier (from this phase's **WAIT HERE** sign to the **WAIT HERE** sign furthest away) and the table shown below, repeatedly press the phase timing button until the appropriate time is shown on the 3-digit readout.

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



6 Set the Maximum Green time

Ensure that the **MAX GRN** indicator is on. If it is not, press the **MAX GRN ALL RED** button located in the centre of the panel.

Using the measurement taken earlier (from this phase's **WAIT HERE** sign to the **WAIT HERE** sign furthest away) and the table shown below, repeatedly press the button until the appropriate time is shown on the 3-digit readout.

7 If this and the neighbouring phase need to be linked in order to provide more heads per approach, see page 12 for details.

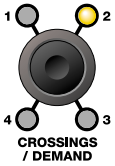
8 Repeat steps **4** to **7** for each active phase and then:

Next

- If you need to alter pedestrian settings, go to **page 31**.
- To start operation, go to **page 35**.

SETTING THE MASTER (CONT.) - PEDESTRIAN PHASES

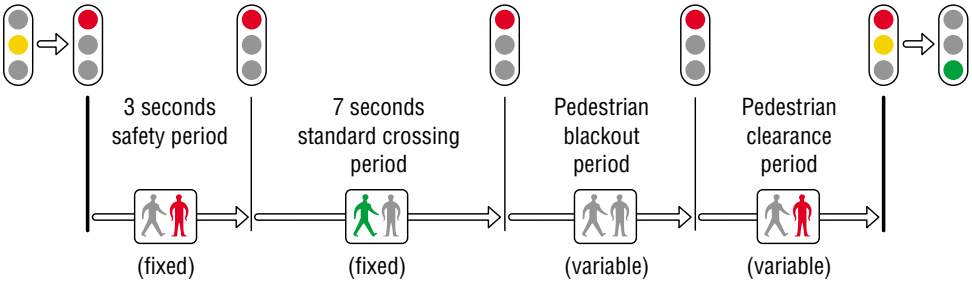
4 Where one or more pedestrian crossings are required, on the master controller press **CROSSINGS/DEMAND** until the indicator for the appropriate number of crossings is lit (1-4). When 4 is lit, a further press of **CROSSINGS/ DEMAND** will switch off pedestrian mode.



Note: The timings that you choose in this section will apply to all pedestrian crossings associated with this controller.

Note: To create a dedicated pedestrian crossing (i.e. a single vehicle phase serving the pedestrian crossing only), please use the 'Pedestrian only' setup shown on page 36.

5 Use the timing buttons within the **PEDESTRIAN CROSSING** section to set the appropriate **BLACKOUT** and **CLEARANCE** times as follows:



Choose a **BLACKOUT** period (in seconds) that is sufficient to allow an able bodied pedestrian to walk the whole of the crossing.

The **CLEARANCE** setting allows you to determine an additional safety factor (4 seconds is the usual setting).

The green crossing time is fixed at seven seconds for almost all installations. However, there are special circumstances where this time may need to be adjusted. The pedestrian **MAX GREEN** control allows this to be done on Evo control panels that have been suitably adjusted. This feature is not available on standard Evo controllers.

Next

- If you need to alter vehicle settings, go to page 30.
- To start operation, see right

SETTING THE MASTER (CONT.) - STARTING OPERATION

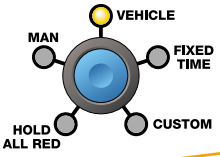
Once the following stages are complete:

- All heads, signs and cones placed in appropriate locations,
- Vehicle slave controllers set,
- Pedestrian slave controllers set (if used),
- Vehicle phase(s) set on the master,
- Pedestrian crossings set (if used) on the master.

...then you should be ready to start operation using the master controller.

To start operation

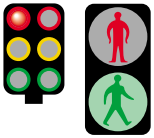
a On the master controller, press the blue button to choose the appropriate operation mode. For normal operation, this should be set to **VEHICLE**.



b Press **RUN**.
The various signal heads of the installation will now start up in an orderly manner:

- All pedestrian crossings will show red.
- The lowest numbered vehicle phase will show amber and then go to red.
- The next lowest numbered vehicle phase will show amber and then red. This will continue through all enabled vehicle phases until the final one.
- The final vehicle phase will wait for the longest all red time to run and then changes to green.
- Normal operation will commence once the highest numbered vehicle phase has completed its initial cycle.

The vehicle phase and pedestrian mimics will show what each of the signal heads are currently displaying.



Note: When the controller is used as a slave, regardless of which phase is set, the Phase 5/Slave mimics are used to show Slave operation.

The vehicle **DEMAND** and pedestrian **WAIT** mimics will show how requests are being made to the controller by road users and pedestrians, respectively.

Performing a test start

With the standard set up procedure, the system does not come into full operation until you press the **RUN** button. It's at that point you discover whether all the slaves are properly responding. In some situations, particularly where the Evo installation is about to replace a large set of fixed signals, it is important to confirm that all units are correctly co-operating before the fixed signals are switched off. By performing a test start, the Evo master will begin running as normal, however, it will inform all heads to not show any signals.

To initiate a test start

1 Before starting operation (as described left), press the **PEDESTRIAN ONLY/ LIGHTS OFF** button until the **LIGHTS OFF** indicator illuminates.

2 Proceed with the usual start up, as described left.

If there are any problems, these will be reported on the master text display.

If everything is OK, although the lights don't sequence and the mimics do not illuminate, you will see the display timer counting through its phases.

3 When you are confident that all is OK, either press the **LIGHTS OFF** button to take the system into normal start up signal sequence; or press and hold the **POWER** button to halt the system and switch off (if actual operation will occur later on).

PEDESTRIAN ONLY INSTALLATIONS

Where the sole reason for an installation is to form a portable pedestrian crossing, i.e. a single vehicle phase serving only the crossing, you are recommended to use the **PEDESTRIAN ONLY** feature of the Evo controller.

This setting maximises traffic efficiency by resting the vehicle phase at green whenever there are no pedestrian demands (normal vehicle operation is to keep all signals at red during quiet periods).

IMPORTANT: The PEDESTRIAN ONLY option can only be used when all vehicle phases are running the same signals; such as a single road (or dual carriageway) where all signals operate in the same manner. Layouts where opposing traffic streams would cross, such as shuttle working, crossroads, etc. must NOT be used with the PEDESTRIAN ONLY option.

To use Pedestrian only mode

1. Position the vehicle and pedestrian signal heads in accordance with Highways Agency regulations and set the slave controllers on each head in the usual manner, as shown on page 31 and 32.

2. On the master controller, press **PEDESTRIAN ONLY**, the adjacent indicator will illuminate.

3. Enable all of the phases that will be used and set the master controller as shown on the previous four pages, with the following restrictions:
   - Use the Phase 1 controls to set details for all phases.
   - Use only the ↑ or ↑↑ modes; it is not possible to use the 'Two opposed heads' mode (←→) in **PEDESTRIAN ONLY** installations.
   - It is possible to use the **LINK** buttons to join vehicle phases in **PEDESTRIAN ONLY** mode, however, all linked signal heads **MUST** face in the same direction.

4. Press **RUN** to begin. Operation will start as follows:
   - All pedestrian crossings will show red.
   - After seven seconds, the vehicle signal heads will go to green.
   - Shortly afterwards, a single pedestrian crossing cycle will occur (i.e. vehicles to red, pedestrians to green, etc.).
   - The system will now rest at 'vehicles on green' until a pedestrian demand is received.

LINKING PHASES

Evo controllers allow you to optionally join phases 1 and 2 as well as (separately) phases 3 and 4 to suit road layouts. When phases are linked, all signal heads associated with both of the phases will act together in the same manner. The extra signal heads can be made to work in opposing directions or in the same direction (see examples on pages 64-73).

IMPORTANT: It is possible to use the LINK buttons to join vehicle phases when using PEDESTRIAN ONLY mode, however, all linked signal heads MUST face in the same direction. This ensures that the signal failure modes are handled correctly.

To link phases

1. Switch on the master controller, as shown on page XX.

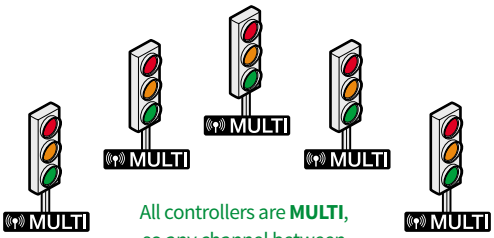
2. On the master controller, press the **LINK** button that is located just below the two phases that you need to join. The indicator next to the button will illuminate.
3. Choose the required settings for the linked phases, as shown on the previous three pages, using the controls as follows:
   - Use the Phase 1 controls to set the Phase 1 + 2 pair.
   - Use the Phase 3 controls to set the Phase 3 + 4 pair.

RADIO CHANNELS

All Evo controllers that show the **MULTI** logo on their front panels offer a greatly increased number of radio communication channels (1 to 17). This compares with the first generation **(Standard)** Evo controllers, which provide channels 1 and 2.

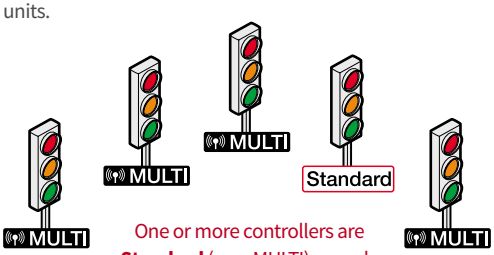
When mixing Multi-channel and standard controllers

If all of your Evo controllers are the **MULTI** type, then you can use any of the available 17 channels:



All controllers are **MULTI**, so any channel between **1** and **17** can be used.

However, if your installation contains *any* standard Evo controllers (those that do not have the MULTI logo) then you must choose either channel **1** or channel **2** for all units.



One or more controllers are **Standard** (non-MULTI), so only channels **1** or **2** can be used.

If you choose channels **3** to **17** then the standard controller(s) will not be found and the installation will not run.

IMPORTANT: Obviously, you need to ensure that all controllers within a set are configured to use the same radio channel.

Using the scan option

1 Press **POWER** to switch on. The text display will show RADIO CHANNEL XX, where XX is the last channel used.

2 Press ▶ to advance to channel 17 and then press once more to show RADIO CHAN. SCAN. Press **SELECT**.

Note: The controller must be in Master mode to access the Scan function.

The controller will now scan the radio channels. After roughly 20 seconds, the text display will show the first available clear radio channel that was detected during the scanning process.

3 Press **SELECT** to choose the recommended channel, or manually choose a different channel.

4 Continue with the usual configuration steps. Don't forget to manually select the same radio channel on all of the other Evo controllers within the set.

DISCOVERING THE RADIO CHANNEL DURING OPERATION

When the system is running, you can check which radio channel is being used as follows:

1 During normal operation, on the master controller, press the **SELECT** button. The text display will show the current battery charge.

2 Press the ▶ button to show the radio channel: RADIO CHANNEL 01

3 Press the **SELECT** button to return to the normal display (or wait for 12 seconds and the text display will automatically return).

TRANSMITTER POWER

Evo controllers that show the MULTI logo on their front panels provide an option, when they are first switched on, to change the transmitter power:

RADIO TX POWER 3

The standard power level is **3** and for most installations this should not be changed; simply press **SELECT** during startup to choose the standard option.

Reducing transmitter power to avoid interference

Reducing transmitter power *may* be a useful option when two (or more) separate Evo installations are placed near to each other and you begin to experience communication issues.

IMPORTANT: You should always try to solve interference issues by changing the radio channels first before attempting to reduce transmitter power. If the Evo controllers in set are all MULTI units, you have the choice of 17 different channels to switch them all to; if not, you have a choice of 2 channels. See page 37 for details.

If changing radio channels does not solve the problem, then you could consider reducing the Tx power in one or more units that are in closest proximity between the affected sets.

Note: When reducing power in a controller, you must ensure that its transmissions are sufficiently strong to still reach its own master; or if it is the master, that it can reach ALL of its slaves.

It is not necessary to change the Tx power level in all Evo units within a set. A change in Tx power affects only the transmission of a controller, it has no effect of the reception of signals by that controller.

As a rough guide, the line of sight transmission distances (when there are no external sources of interference) are as follows:

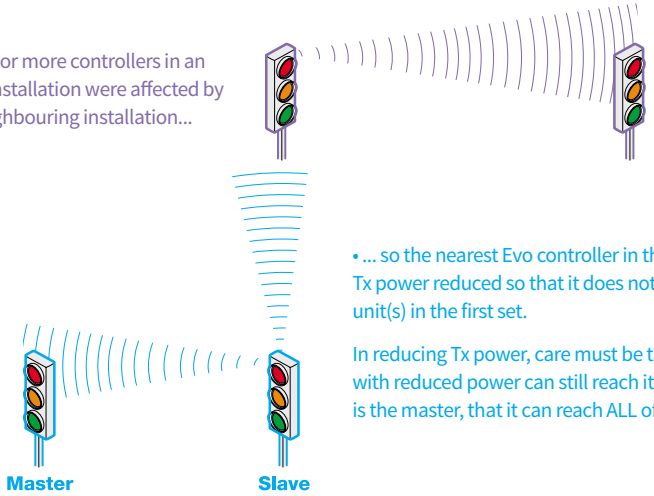
Tx power level	Power mode	Approx. Tx distance
3 and 2	Standard	300 metres (984 feet)
1 and 0	Low	100 metres (328 feet)

To reduce power on an Evo T2 controller

1. Switch on the controller in the usual manner.
2. Select the radio channel and press **SELECT**. The display will now show: RADIO TX POWER 3
3. Use the ◀ or ▶ buttons to change the Tx radio power value and press **SELECT**.
4. Continue with your configuration in the usual manner.

   Note: If the controller is switched off and back on, the Tx power level will be offered at the normal setting of 3.

• One or more controllers in an Evo installation were affected by a neighbouring installation...



• ... so the nearest Evo controller in the second set has its Tx power reduced so that it does not reach the closest unit(s) in the first set.

In reducing Tx power, care must be taken that the unit with reduced power can still reach its own master (or if it is the master, that it can reach ALL of its slaves.

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 a particular approach, consider making careful adjustments to alleviate the problem.

Timing adjustments can be made to either 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 in small steps.

1. Ensure that the **ALL RED** indicator is flashing. If it is not, press the **MAX GRN ALL RED** button located in the centre of the panel.
2. Press the phase timing button for the phase that needs to be adjusted to increase the ALL RED time.
3. Allow several full vehicle cycles to occur and observe the changes to traffic behaviour.
4. Repeat if necessary.

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 in small steps.

1. Ensure that the **MAX GRN** indicator is flashing. If it is not, press the **MAX GRN ALL RED** button located in the centre of the panel.
2. Press the phase timing button for the phase that needs to be adjusted to increase the MAX GRN time.
3. Allow several full vehicle cycles to occur and observe the changes to traffic behaviour.
4. Repeat if necessary.

Operation - PT5 Controller

OPERATION MODES

The blue mode switch determines how the system operates.

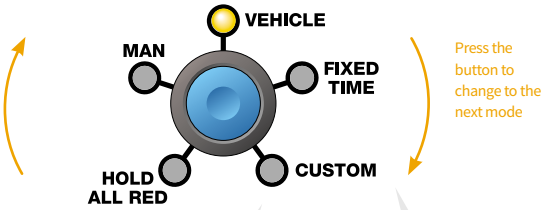
MANUAL

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.

CUSTOM

This is the positional setting for ARVA for those controllers with this functionality.

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.

COMMUNICATION FAILURES

The Evo system continually monitors itself to check for any type of failure so that it can take appropriate action:

After a temporary communications loss

Firstly, all signals will show red for 50 seconds. After that period, all signals will switch off (unless the master controller is running in **HOLD ALL RED** or **MANUAL** modes, in which case all signals will remain at red). The text display on the master controller will show the following:

COMS RECOVRY 123

Once the counter reaches 600 (10 minutes), the system will go through an automated restart procedure:

Vehicle only installations

- The lowest numbered vehicle phase will show amber, then red.
- The next lowest numbered vehicle phase will show amber and then red. This will continue through all enabled vehicle phases until the final one.
- The final vehicle phase will show amber then red and wait for the longest set ALL RED time. The lowest numbered vehicle phase will then change to green.
- Normal operation will commence once the highest numbered vehicle phase has completed its initial cycle.

Vehicle plus pedestrian installations

- All pedestrian signals to red.
- Vehicle signals in turn show amber then red.
- All signals are held at red for the longest set ALL RED time.
- All pedestrian signals go through a normal green cycle and then return to red.
- Normal operation continues with the next vehicle phase.

Note: During the ten minute recovery period, it is possible for an operator to manually restart the whole system.

After a serious communications loss

Following a serious or sustained loss of communication, the master controller text display will show the following:

COMMS FAIL

All signals will be instructed to remain off (or at red, if **HOLD ALL RED** or **MANUAL** modes are running). The whole system will require corrective action by the operator and a manual restart.

CALLING 'HOLD ALL RED'

The system allows the 'hold all red' mode to be invoked either from the Evo master controller or from any of the remote slave controllers. 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 'manual hold all red' from a slave Evo controller

To call 'manual hold all red' from a slave

1 On a remote slave controller, press **ALL RED**. The adjacent red indicator will illuminate.

- All signal heads will be returned to red and will stay at red until the state is overridden.
- The text display on the master controller will show REMOTE RED CALL.

To resume operation

1 On the master controller, press **ALL RED**.
The adjacent red indicator will extinguish.

Calling 'hold all red' from the master controller

To call 'hold all red from the master

1 On the master controller, press **CALL ALL RED**.
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.

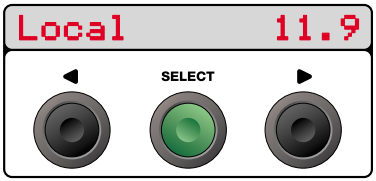
- When running **VEHICLE**, **FIXED TIME** or **HOLD ALL RED**:
  - Any signals currently at green will wait for a minimum of 12 seconds and then return to red.
  - The **ALL RED** indicator will then extinguish and the time display will show LOCAL RED CALL. Operation will remain halted with all signals at red until you restart it:
  - **To resume operation**: press **ALL RED**.

CHECKING BATTERY CHARGE LEVELS

When the system is operating you can quickly check the exact battery charge levels for the master and all slaves, from the master text display.

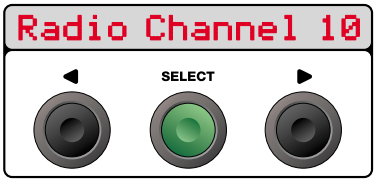
To check battery charge levels

1 During normal operation, on the master controller, press the **SELECT** button. The text display will show:



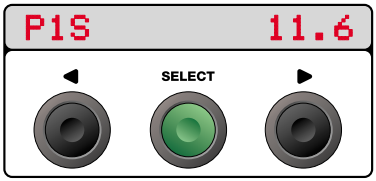
This is the charge level for the master controller's battery.

2 Press the ▶ button to advance to the next display:



This is the current radio channel.

3 Press the ▶ button to advance to the next display:



This is the charge level for the first slave's battery.

With each successive press of the ▶ button, the text display will show the battery charge levels for each of the slaves.

4 When you have finished checking battery levels, press the **SELECT** button to return to the normal display.

Note: *You can use this procedure to check a slave battery charge level from the slave controller itself, but it will not be able to report on any other units. The slave unit will report itself as '*LOCAL*'.*

RESETTING THE SYSTEM

Certain failures within the Evo 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 master controller indicators to trace the problem, page 3 provides descriptions.

2 If the problem is traced to one or more signal heads, visit each affected head and check the slave controller(s).
Depending on the fault:

- If possible, rectify the problem and reset the slave controller(s).
- Try performing a radio frequency scan to determine whether a different channel would provide better operation. See "Using the scan option" **on page 37**.

or

- Replace the signal head(s)/controller(s) and follow the set up instructions shown on **pages 28 and 29** to select the correct phase number(s).

Note: If any slave unit is replaced, the master controller must be powered off and then on again to force it to look for all new slaves.

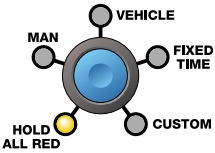
3 When all affected heads have been reset, on the master controller press the **RUN** button to restart operation. Monitor the system operation until you are sure that it is working correctly.

DECOMMISSIONING THE SYSTEM

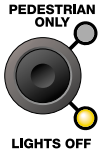
When the portable signals are no longer required, please follow this procedure to decommission their use.

To decommission the system

1. Ensure that the shuttle lanes are cleared of obstructions (with the exception of the signals heads, cones and related warning signs).
2. Change the blue mode selector on the master controller to **HOLD ALL RED**. The master controller will bring any aspects that are currently on green to red using the normal timings.

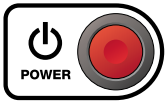


3. Press the **LIGHTS OFF** button to extinguish all signals.



4. In turn, go to all approaches, power off each slave controller (press and hold their **POWER** buttons) and face the signal heads away from the traffic.
5. If necessary, press and hold the **POWER** button on the master controller to switch it off.
6. Remove the signal heads from the carriageways.

INCIDENTS DURING OPERATION



In accordance with Highways Agency specifications, the Evo master 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 VEHICLE/PEDESTRIAN SIGNAL FAILURES

Red vehicle signal failure in Vehicle plus Ped or Ped-only setups:

- If ALL red vehicle signals fail on an approach*, then the signals on all approaches will immediately return to **ALL RED** for 50 seconds, after which all signals will extinguish and the controller will stop operation.

  On the master controller, the text display will show STOPPED and the mimic indicators representing the failed red signals will flash. See Resetting the system on page 43.

Red vehicle signal failure in Vehicle-only setups:

- If ALL red vehicle signals fail on an approach*, then 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.
- If more than one approach has a total red signal failure, all the signal heads will immediately return to **ALL RED** for 50 seconds, after which all signals will extinguish and the controller will stop operation.

  On the master controller, the text display will show STOPPED and the mimic indicators representing the failed red signals will flash. See **Resetting the system** on page 43.

Red pedestrian signal failure:

- If any single red man signal has a failure this is treated as a total approach fail. The signals on all approaches will immediately return to **ALL RED** for 50 seconds, after which all signals will extinguish and the controller will stop operation.

  On the master controller, the text display will show STOPPED and the mimic indicators representing the failed red signals will flash. See **Resetting the system** on page 43.

DECOMMISSIONING THE SYSTEM (CONT.)

GREEN VEHICLE SIGNAL CONFLICTS

When the operation mode is either Vehicle or Fixed Time:

- If opposing phases show green signals simultaneously at any time, then the signals on all approaches will immediately return to **ALL RED** for 50 seconds, after which all signals will extinguish and the controller will stop operation.

  On the master controller, the text display will show STOPPED and the mimic indicators representing the failed green signals will flash. See **Resetting the system** on page 43.

When the operation mode is either Hold All Red or Manual:

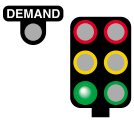
- If opposing phases show green signals simultaneously at any time, then all signals immediately change to red (no amber signal) and will remain at red. See **Resetting the system** on page 43.

** 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 master controller will maintain normal operation until the last remaining head ceases normal operation, whereupon the above procedures will occur.*

ERROR INDICATIONS

The Evo 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 main (or only) signal head for a phase, the right three indicators represent the second of a dual head arrangement (if used). The **DEMAND** indicator shows when a vehicle is detected by the microwave vehicle detector (on either signal head).

Battery indicators (for each phase)

Note: *See also page 43 for details about checking exact charge levels.*

During startup, if the voltage of any controller battery is below 11.5V, the text display will show LOW BATTERY and the controller will refuse to operate.

During operation, when there are roughly two hours of operational time remaining within a remote signal head battery, the battery indicator will flash and the text display will show LOW BATTERY.

When the battery becomes too low for operation, the signal head will go to red for the **MAX RED** time and then switch off, the battery indicator will remain on and the text display will show BATT FAIL. The corresponding indicator on the Evo master controller will remain on and the text display will show BATT FAIL NN, where NN is the slave number.

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 signal head will provide further details.

Comms indicator

In normal operation the **COMMS** indicator will show a flashing green light:

Master controller

Flashing green	System running correctly.
Off	Loss of communication.
On	Fault state.

Slave controller

Flashing green	System running correctly.
Off	Loss of communication.

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 43.

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 43.

The Comms indicator is not flashing

There is a communication error. See Error indications above.

The text display is displaying a code

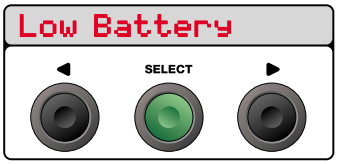
See page 47 for a list of all display codes.

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.



ERROR INDICATIONS - TEXT DISPLAY

The text 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:

LOW BATTERY	Battery voltage becoming too low.
BATT FAIL	Insufficient battery voltage to continue.
RED FAULT	The red vehicle aspect failed to turn on or off.
AMBER FAULT	The amber vehicle aspect failed to turn on or off.
GREEN FAULT	The green vehicle aspect failed to turn on or off.
RED MAN FAULT	The red man pedestrian aspect failed to turn on or off.
GRN MAN FAULT	The green man pedestrian aspect failed to turn on or off.
WAIT FAULT	The wait aspect failed to turn on or off.
TACTILE FAULT	The tactile aspect failed to turn off.
ERROR 010	Invalid configuration data.
ERROR 011	Failed to communicate with configuration plug.
ERROR 012	Incompatible software installed.
ERROR 013	Controller started following a watchdog reset.
COMS RECOVRY NNN	Recovering from comms loss (10 minute period).
COMMS FAIL	Sustained communications fault.
CONFIG ERROR 01	Insufficient battery voltage.
CONFIG ERROR 02	Duplicate serial number.
CONFIG ERROR 03	Invalid operational mode.
CONFIG ERROR 04	Language mismatch.
CONFIG ERROR 05	Software mismatch.
CONFIG ERROR 06	Nearside/farside mismatch.
CONFIG ERROR 07	Configuration incompatible with XL2 slaves.
CONFIG ERROR 10	Master has unconfigured vehicle head.
CONFIG ERROR 11	Master has unconfigured pedestrian head.
CONFIG ERROR 12	A slave has unconfigured pedestrian head.
CONFIG ERROR 13	A slave has unconfigured vehicle head.
CONFIG ERROR 20	No vehicle phases configured.
CONFIG ERROR 21	No pedestrian phases configured.
CONFIG ERROR 30	Awaiting confirmation of radio channel.
CONFIG ERROR 31	Awaiting confirmation of authority mode.
CONFIG ERROR 32	Awaiting confirmation of slave identity.
CONFIG ERROR 40	No head detected.
CONFIG ERROR 50	Engineers terminal interlocking active.
CONFIG ERROR 99	Internal error.
VEH FAIL NN	Could not find a slave for phase nn.
PED FAIL NN	Could not find a slave for pedestrian phase nn.
BATT FAIL NN	Critical battery voltage on slave nn.
LAMP FAULT	The amber or green vehicle aspect failed to turn on or off.
STOPPED	System has stopped due to CAT1 fault.
GREEN CONFLICT	Green or green man aspect was on unexpectedly.
ERROR 020	Local monitor fault (whilst lamp was on).
ERROR 021	Local monitor fault (whilst lamp was off).
ERROR 022	Local lamp conflict detected on disused head.
ERROR 023	Local lamp conflict detected by CPLD.
ERROR 024	Local CPLD watchdog fault.
ERROR 025	Local front panel fault.
ERROR 030	Master detected invalid broadcast.
ERROR 031	Master detected aspects are not set as requested.
ERROR 032	Master detected invalid response from slave.
ERROR 040	Master has been notified of CAT1 fault on slave.
ERROR 041	Master has been notified of invalid broadcast on slave.

Operation

ARVA

ARVA based Signal System

- Advanced low-power Radar system with multi-target capture capability.
- Specially optimised traffic management algorithms within the ARVA controller process the unique high quality radar data.

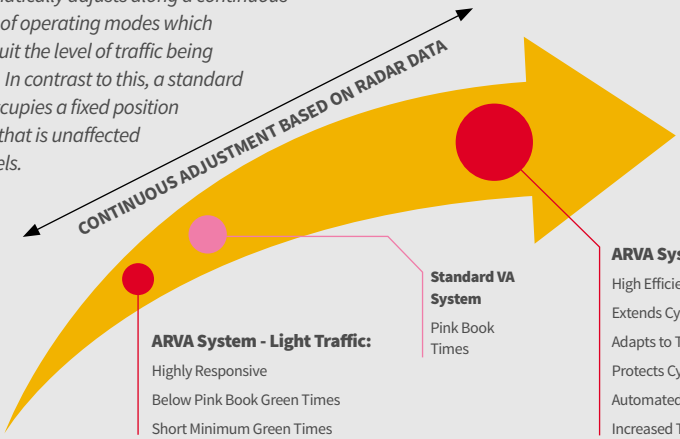
Overview

ARVA is a sophisticated new operating mode for portable signals. At a wide range of sites, the use of ARVA improves traffic flows, ensures better balance between phase timings and generally provides a more consistent optimisation of signal operation throughout the day.

ARVA makes use of the extensive capabilities of a new FMCW radar developed specifically for this application by AGD Systems. As illustrated below, the ARVA radar allows the system to automatically adjust the operation of the lights according to the current traffic conditions. The system also automates a range of actions that a person on site would perform in response to specific traffic scenarios and delivers these in a consistent and quantified manner.

ARVA® COMPATIBILTY WITH STANDARD EVO® SYSTEM			
		MASTER	
		EVO®	ARVA®
SLAVE	EVO®	✓	X
	ARVA®	✓	✓

***ARVA** automatically adjusts along a continuous sliding scale of operating modes which specifically suit the level of traffic being experienced. In contrast to this, a standard VA system occupies a fixed position on the scale that is unaffected by traffic levels.*



An extensive programme of ARVA trials performed at many sites across the UK has optimised the operation of the ARVA algorithms in real world traffic conditions over a long period. ARVA has been shown to out-perform traditional VA based operation for busy sites – please ask for more details.

ARVA (CONT.)

Deployment Guidance

For many sites, ARVA can manage traffic without operator input at any time throughout the day. This is a significant extension beyond the capabilities of traditional Doppler radar portable signals.

For sites where traffic flows are especially high and / or where other complicating factors exist, it becomes necessary to plan the deployment of portable signals in more detail and to consider a range of mitigations for any issues that are identified. A commonly employed such mitigation is the use of Manual Control. ARVA has been designed to significantly reduce the number of sites at which Manual Control is required. It will however still be necessary in a small proportion of deployments.

Some examples of the type of factors that should be considered when assessing a site with a view to deploying an ARVA system are:

- Traffic Flow Rates on the roads to be put under portable signal control.
- Traffic Flow Rates on nearby roads that could be affected by the deployment.
- Sites that are subject to significant 'tidal flow' demands giving high asymmetric flows at different times of the day.
- The location of any key routes which require special consideration in terms of any impact from the proposed site.
- Proximity of the portable signals to other junctions and pedestrian crossings.
- The level and variability of demand at nearby pedestrian crossings.
- Pinch points close to the works that could inhibit or block traffic flow.
- Time specific fluctuations in demand, for example as a result of a nearby school or sporting event.

Pike Signals offer a training course which provides attendees with further knowledge to allow them to make the best assessment of specific sites in regard of the deployment of ARVA or of a range of other systems, including the Pike UTC system.

ARVA (CONT.)

TMO Guidance

As a Traffic Management Operative using ARVA, there are a number of things to be aware of as follows:

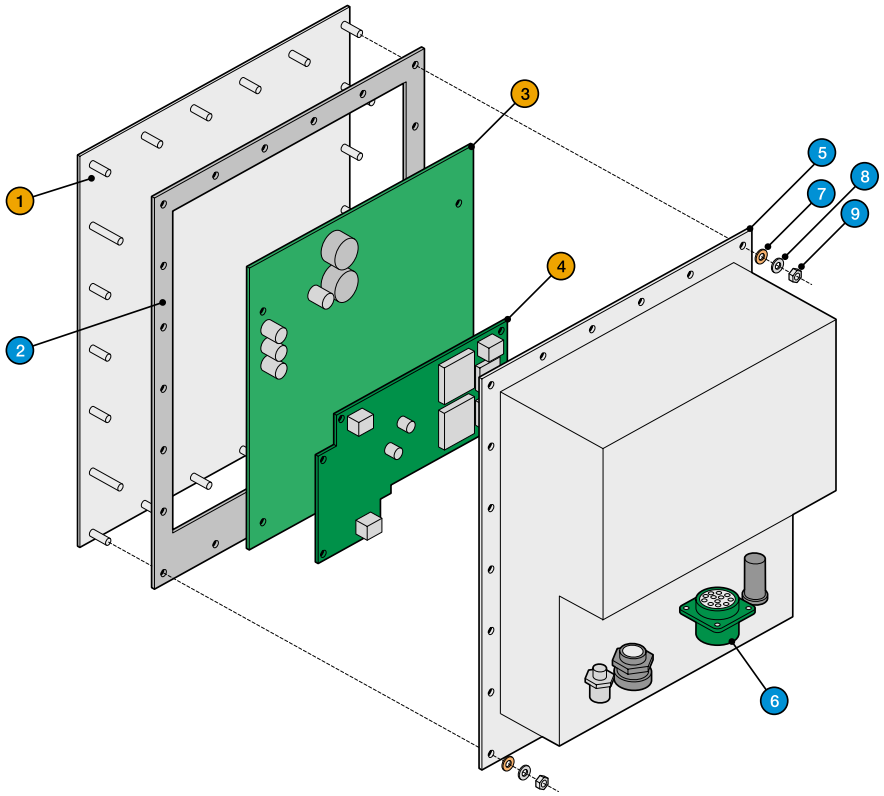
- ARVA requires that you specify red times only. All green times will be calculated automatically.
- When entering red times, set the amount that is required to safely clear the site in normal conditions based on its geometry and gradient. ARVA will increase red times automatically in order to alleviate problems at peak times therefore you should generally not need to add in extra time for this.
- ARVA maintains a concept of a 'Max Green' time for each phase and will optimise this automatically.
- ARVA will adjust Max Green times once every cycle by either adding or subtracting from the current Max Green time. Reductions in Max Green times can also occur at other times in response to specific traffic problems observed by the ARVA radars.
- The ARVA adjusted Max Green time in operation for each phase is available to view on the controller at any time in the usual manner.
- Under 'normal' traffic flows, the Max Green will generally drift towards the Pink Book value for the given site. For light traffic the Max Green will be slightly below the Pink Book value to increase the responsiveness of the system. However, for heavy traffic flows, the Max Green can be significantly increased above the Pink Book value as the system quickly adjusts to maximising the traffic throughput on the site.
- The ARVA system has been designed to be very responsive and for a 100m site it can adapt from its lightest traffic operation through to managing the highest throughput in less than 25 minutes.

Site Monitoring

For some higher profile ARVA sites operating without operator input, especially those running for a number of days, it may be prudent to visit the site shortly after deployment in order to check on its operation. To assess how well ARVA is performing at the site, it is recommended that the site should be observed at peak time for a period of around 20 minutes. During this time, in the unlikely event that a significant issue occurs at the site, such as a breakdown of flow, ARVA should correct for it on the next cycle. If an issue takes longer than two cycles to resolve, or if it recurs multiple times during the 20 minute observation period, it may be worth revisiting the planning of this site and considering other strategies including the use of Manual Control.

End Of Life – Disposal Instructions (EOL)

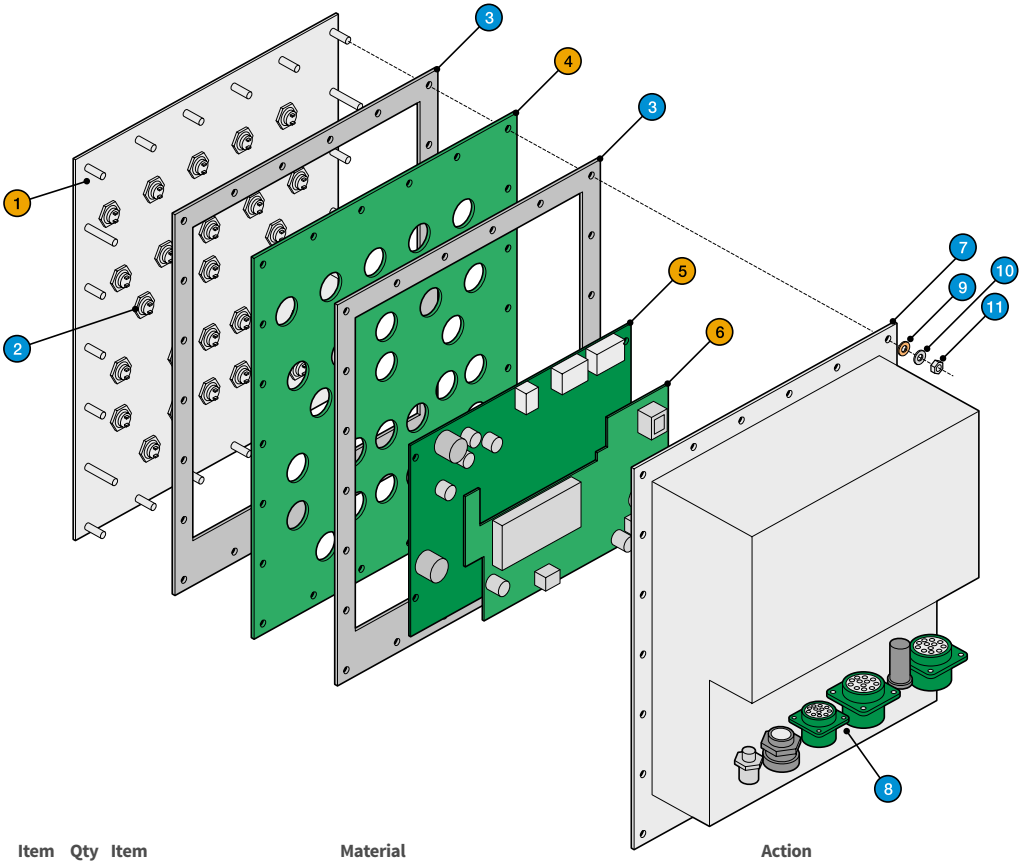
PIKE EVO T2 CONTROLLER



Item	Qty	Item	Material	Action
1	1	Fascia	Aluminium with vinyl cover, switches & stainless steel bolts	**Separate and recycle**
2	1	Waterproof seal	Neoprene	**Reuse/recycle**
3	1	Main controller board	FR-4 glass epoxy with electronic components (may also include Lithium battery x 1)	**Separate and recycle**
4	1	Communications board	FR-4 glass epoxy with electronic components	**Separate and recycle**
5	1	Rear cover	Mild steel sheet	**Reuse/recycle**
6	4	Connectors & fuse holder	Mixed metals and plastic	**Reuse/recycle**
7	22	Fibre washer	Glass fibre	**Reuse/recycle**
8	22	Washer	Steel	**Reuse/recycle**
9	22	Nyloc nut	Steel	**Reuse/recycle**

End Of Life – Disposal Instructions (EOL)

PIKE EVO T5, PT5, PT4+ CONTROLLERS



Item	Qty	Item	Material	Action
1	1	Fascia	Aluminium with vinyl cover & stainless steel bolts	**Separate and recycle**
2	27	Push button	Mixed metals and plastic	**Reuse/recycle**
3	2	Waterproof seal	Neoprene	**Reuse/recycle**
4	1	Front panel assembly	FR-4 glass epoxy with electronic components	**Separate and recycle**
5	1	Main controller board	FR-4 glass epoxy with electronic components	**Separate and recycle**
6	1	Communications board	FR-4 glass epoxy with electronic components	**Separate and recycle**
7	1	Rear cover	Stainless steel	**Reuse/recycle**
8	6	Connectors & fuse holder	Mixed metals and plastic	**Reuse/recycle**
9	22	Fibre washer	Glass fibre	**Reuse/recycle**
10	22	Washer	Stainless steel	**Reuse/recycle**
11	22	Nyloc nut	Stainless steel	**Reuse/recycle**

Safety Precautions

It is important that the products concerned should be installed and maintained by competent persons in accordance with good engineering practice, statutory requirements and codes of practice.

To comply with the Department of Transport specification TR 2502, it is mandatory to use Portable Traffic signals as a complete unit with the appropriate detection equipment.

In cases of special junction applications the permission of the appropriate authority must be sought.

It is necessary to utilise batteries within the systems covered by this Manual that involves a need for managed handling, usage and disposal techniques to ensure the safety of operatives and care of the environment.

All work must be performed in accordance with company working practices, in-line with adequate risk assessments. Only skilled and instructed persons should carry out work with the product.

Attention is drawn to the following;

1. This system is compliant to the Restriction of Hazardous Substances (RoHS - European Union directive 2011/65/EU).

2. No user-maintainable parts are contained within the product. Removing or opening the outer casing is deemed dangerous and will void all warranties.

3. Under no circumstances should a product suspected of damage be used. Damage may be suggested by unusual behaviour, an unusual odour or damage to any of the outer enclosures of the system. Please contact Hollco Limited for further advice.

4. 'Control of lead at Work Regulations 2002' The Approved Code of Practice for the Control of Lead at Work' from the Health and Safety Commission.

5. Automotive batteries are classed as hazardous waste and therefore must be stored, transported and disposed of in accordance with the following pieces of legislation.

Environmental Protection Act 1990, Part II 2.

Environmental Protection (Duty of Care) Regulations 2014

The Waste Management Licensing Regulations 1994

The Controlled Waste (Registration of carriers and seizure of vehicles) Regulations 2012

Hazardous Waste Regulations 2011 and List of waste regulations 2011

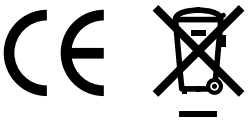
The Carriage of Dangerous Goods by Road Regulations 2009

Radio Equipment Directive (2014/53/EU)

BE	BG	CZ	DK	DE	EE	IE	EL	ES	
FR	HR	IT	CY	LV	LT	LU	HU	MT	
NL	AT	PL	PT	RO	SI	SK	FI	SE	UK

6. Guidance for the correct deployment of signals and the associated signage can be found in; Traffic Signs Manual Chapter 8: Traffic safety Measures and Signs for Road Works and Temporary Situations

7. Advice and Guidance contained in DfT Traffic Advisory Leaflet 2/11 Portable Traffic Signal for the Control of Vehicular Traffic.



8. This product contains a Radio Communications system which operates at 458MHz and can only be operated in the UK.

Warranty

Evo controllers are 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.

The following warranty periods apply:

LED Aspects (Vehicle and Pedestrian)	**3 years****
LED Wait Indicators	**3 years**
EVO® Controllers	**3 years**
AGD Radars	**2 years**

Chargers and all other components 1 year.

Batteries are excluded from this warranty provision.

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.

Please refer to our Terms and Conditions of Sale for further details on warranty provision.

**See special warranty provision regarding failure of individual LED's within a signal aspect.

Disclaimer

While we **(Pike Signals Limited)** endeavour to keep the information in this manual correct at the time of print, we make no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability or availability with respect to the information, products, services, or related graphics contained herein for any purpose.

Any reliance you place on such information is therefore strictly at your own risk. In no event will we be liable for any loss or damage including without limitation, indirect or consequential loss or damage, or any loss or damage whatsoever arising from loss of data or profits arising out of, or in connection with, the use of this manual.

This product has been designed, developed and extensively tested as required to ensure its safety and reliability in service. It should be deployed and operated at all times in accordance with the User Manual and all current portable traffic signalling guidance by suitably trained personnel only. Training should cover both the general concepts of portable traffic signalling and the operation of this RC2 product itself.

In particular, your attention is drawn to the following:

- **An Introduction to the Use of Portable Vehicular Signals (The Pink Book)**
- **TAL 2/11 & TAL 3/11**
- **Safety at Street Works and Road Works – A code of Practice (The Red Book)**
- **Traffic Signs Manual Chapter 8**

Training should be periodically refreshed. It shall be drawn to the operator's attention that with incorrect deployment and / or configuration, this product has the potential to create unsafe traffic conditions.

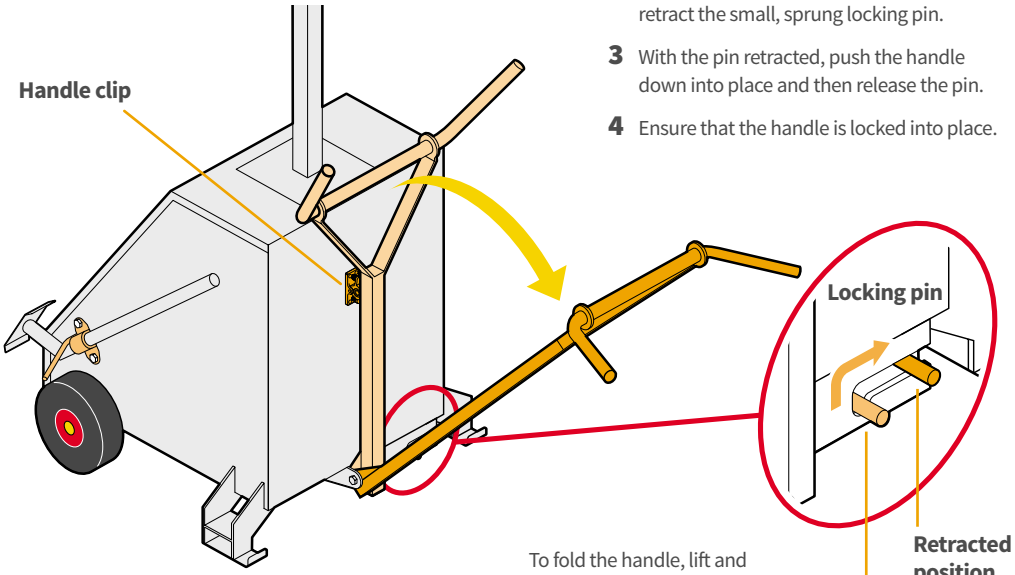
In the unlikely event that the unit suffers a failure or in any other way performs in a manner that is deemed to be unexpected or potentially incorrect by the operator, all lights at the site in question should be powered off. No attempt to operate the system should be made until such time as the system has been inspected by suitably qualified service personnel.

Safety Information MicroBox

PROVIDES IMPORTANT OPERATION AND MAINTENANCE INFORMATION TO PROMOTE SAFE AND CONSISTENT SERVICE

IMPORTANT: When moving an MicroBox carriage, always fold out and lock the handle into place first.

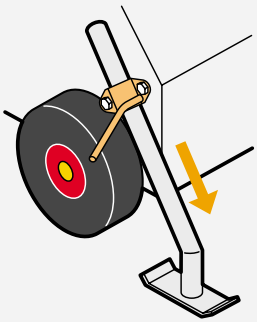
1. Release the handle clip by pressing on either side of it and fold out the handle.
2. As the handle nears its full extension, lift and retract the small, sprung locking pin.
3. With the pin retracted, push the handle down into place and then release the pin.
4. Ensure that the handle is locked into place.



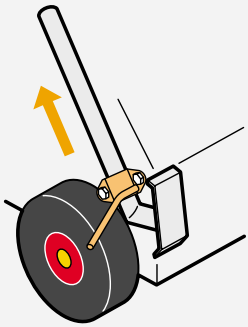
To fold the handle, lift and retract the locking pin, fold up the handle and then release the pin.

Stabiliser legs

When the MicroBox is in position, lower the two stabiliser legs to the ground and secure their clamps.



After use, raise and secure both stabiliser legs before moving the MicroBox unit.



Routine maintenance

Prior to use, please make the following checks:

- On each carriage, check that the handle pivots are clean and that each handle moves with ease.
- On each carriage, check that the locking pin channel and its return spring are clean and that each locking pin moves with ease. If a locking pin does not return to its locked position then the spring may need to be replaced.
- On the trailer, in addition to the standard road-worthiness checks, ensure that the lynch pins (which hold each carriage in place) are clean and can be moved with ease.

Remedies

1. If necessary, clean off any contaminants using a suitable method.
2. Apply a silicon-based lubricant spray to the movable part.

IMPORTANT: Do not use grease on any areas as this will attract further contamination.

- On each carriage, check that the wheels are in good condition and show no signs of cracking or excessive wear.

Replace any carriage wheels that show signs of wear or damage.

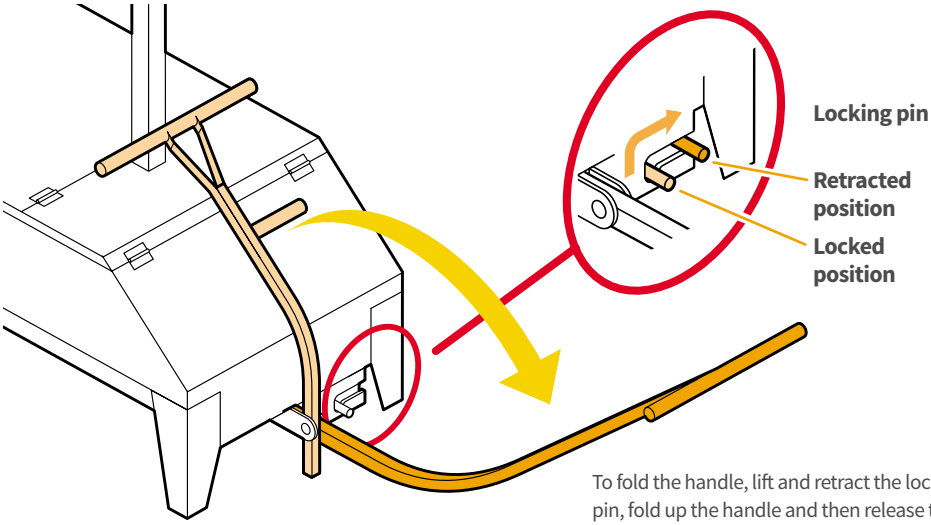
IMPORTANT: If any damage is discovered, do not use the unit until the problem is fully remedied.

Safety Information RadioMaster

PROVIDES IMPORTANT OPERATION AND MAINTENANCE INFORMATION TO PROMOTE SAFE AND CONSISTENT SERVICE

IMPORTANT: When moving an RadioMaster carriage, always fold out and lock the handle into place first.

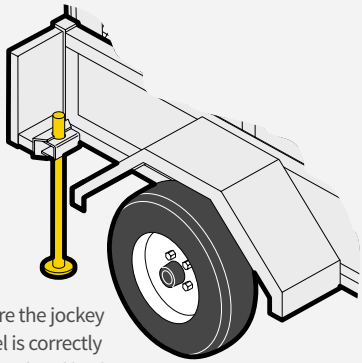
1. Fold out the handle.
2. As the handle nears its full extension, lift and retract the small, sprung locking pin.
3. With the pin retracted, push the handle down into place and then release the pin.
4. Ensure that the handle is locked into place.



To fold the handle, lift and retract the locking pin, fold up the handle and then release the pin.

Securing the trailer

- Place the trailer on level ground and ensure that it cannot move.
- Before using the ramp, lower both prop stands and the jockey wheel to the ground and secure.
- Ensure that all clamps and cotter pins are in good condition, including their sprung retaining clips. Replace any worn items.



Ensure the jockey wheel is correctly adjusted and both prop stands are lowered to the ground

Routine maintenance

Prior to use, please make the following checks:

- On each carriage, check that the handle pivots are clean and that each handle moves with ease.
- On each carriage, check that the locking pin channel and its return spring are clean and that each locking pin moves with ease. If a locking pin does not return to its locked position then the spring may need to be replaced.
- On the trailer, in addition to the standard road-worthiness checks, ensure that the lynch pins (which hold each carriage in place) are clean and can be moved with ease.

Remedies

1. If necessary, clean off any contaminants using a suitable method.
2. Apply a silicon-based lubricant spray to the movable part.

IMPORTANT: Do not use grease on any areas as this will attract further contamination.

- On each carriage, check that the wheels are in good condition and show no signs of cracking or excessive wear.

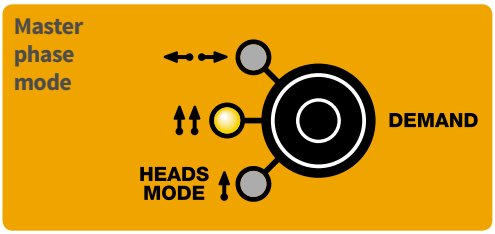
Replace any carriage wheels that show signs of wear or damage.

IMPORTANT: If any damage is discovered, do not use the unit until the problem is fully remedied.

Appendix 1: T2 as Master

PHASE SET UP EXAMPLES

This section provides various examples of typical traffic control scenarios. Each example shows how to set the phase mode on the Evo T2 master controller and also the corresponding designations for each slave signal head so that they are all addressed correctly and uniquely within the installation. Firstly, this page offers an explanation of the conventions used within this section.



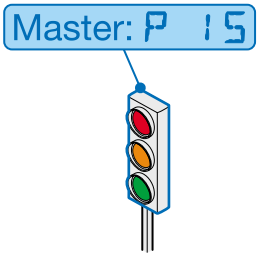
The master phase mode button

This single button fundamentally determines how the master and slave controllers/heads should be physically arranged and designated.

It has four states:

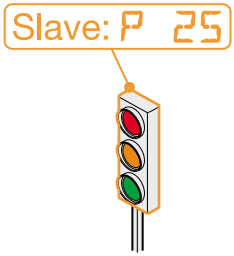
- Off,
- One head per approach (↑),
- Two heads per approach (↑↑), or
- Two opposed heads (←→).

The three pages that follow show the type of head arrangements and designations that are expected for each of the master phase mode settings.



Master signal head

The signal head that is cable-connected directly to the master controller will always have the designation **P 15.**



Slave signal head identities

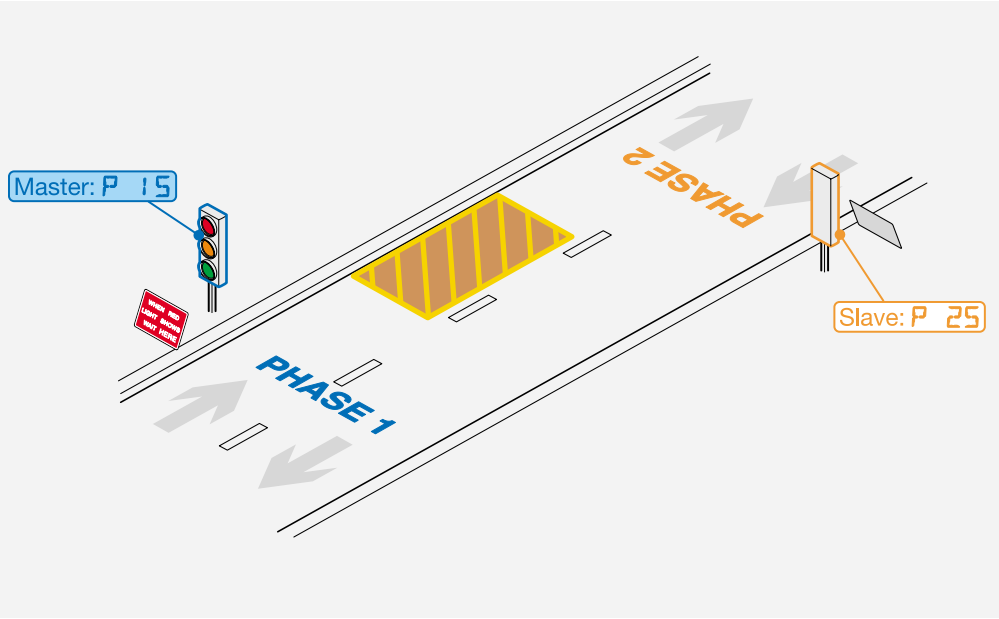
Each slave must be given an appropriate designation identity to match the phase on the master controller that is determining the signals that it should display. The LED-style text in each bubble shows the exact setting you should choose on the text display of each slave Evo T2 controller. The blue and orange outline colours used in these diagrams are help to identify the separate phases.

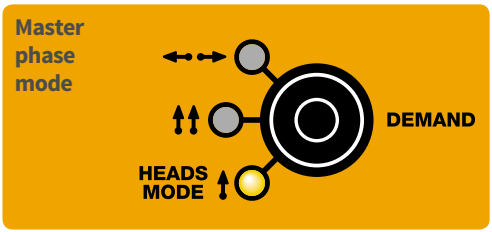
Appendix 1: T2 as Master

EXAMPLE 1: BASIC SHUTTLE WORKING

2 vehicle phases, 2 approaches, 1 head per approach

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





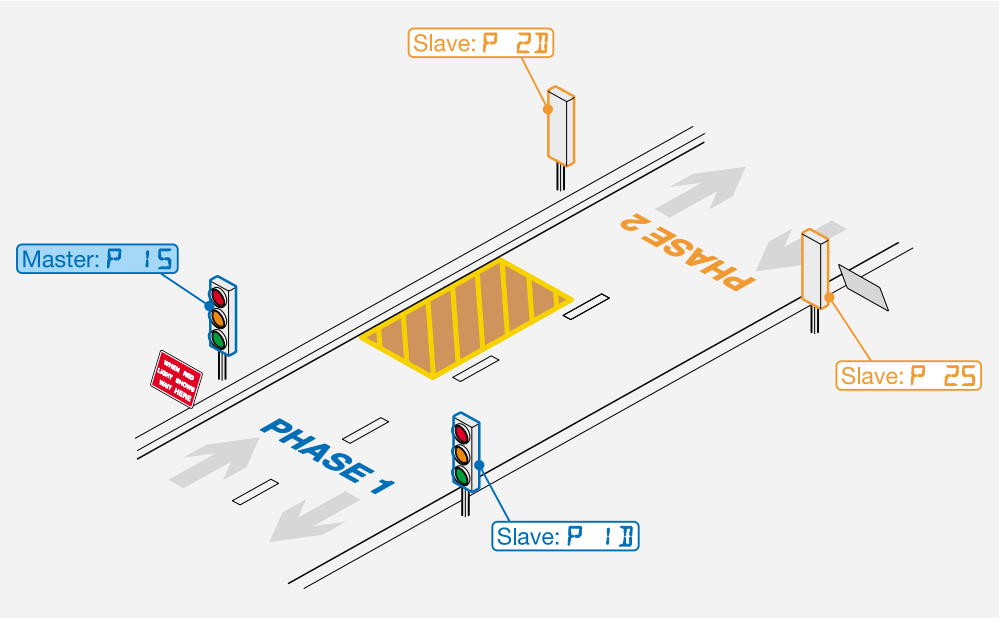
Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

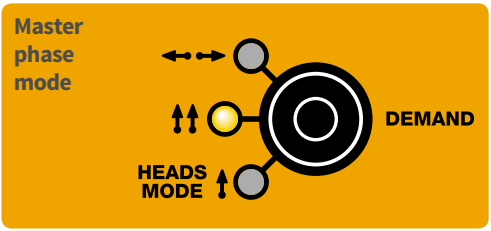
Appendix 1: T2 as Master

EXAMPLE 2: TWO HEAD SHUTTLE WORKING

2 vehicle phases, 2 approaches, 2 heads per approach

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





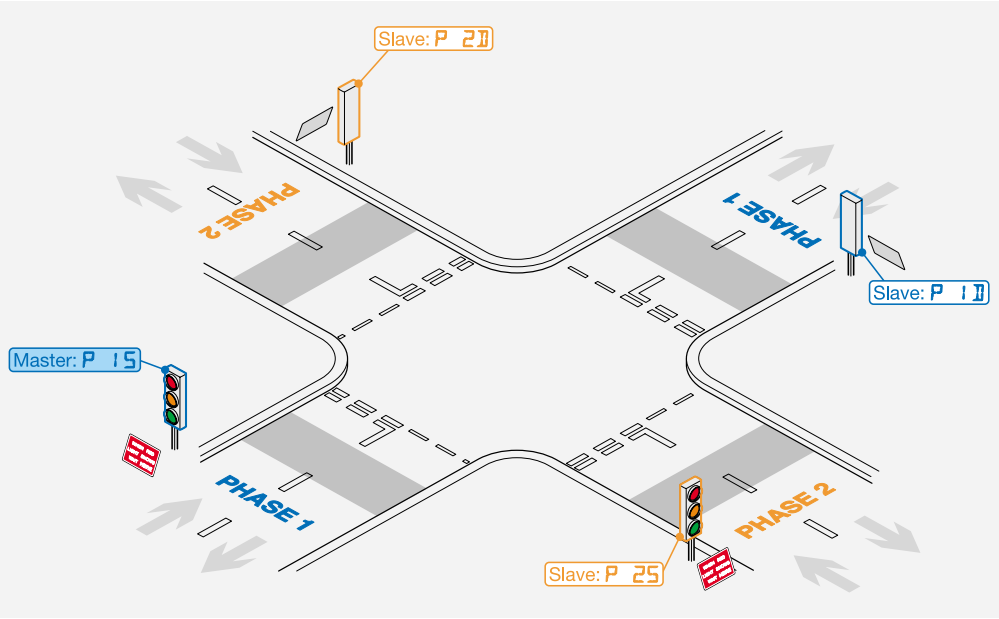
Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

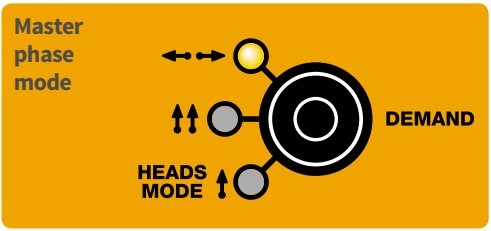
Appendix 1: T2 as Master

EXAMPLE 3: CROSSROAD

2 vehicle phases, 4 approaches, 2 opposed heads (per phase)

This example shows a crossroad controlled by two dual-approach phases, each with one signal head per approach.





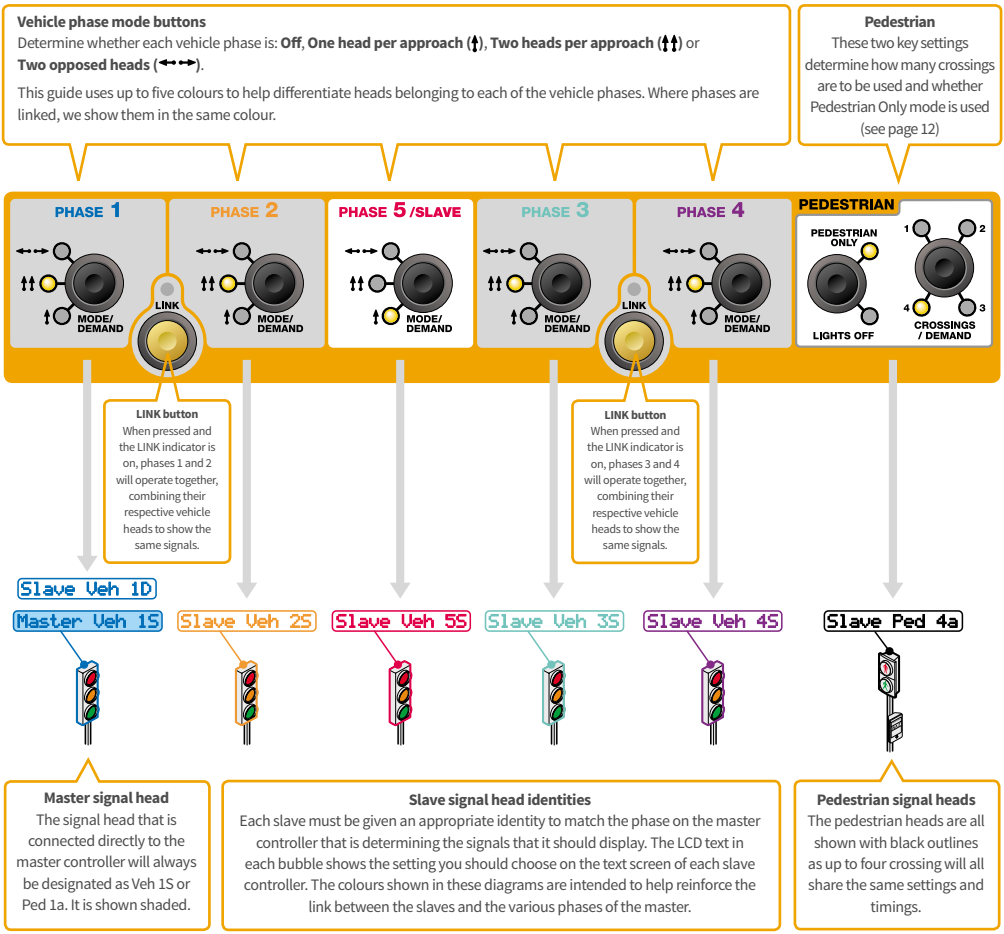
Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

Appendix 2: PT5 as Master

PHASE SET UP EXAMPLES

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

This page offers an explanation of the conventions used within this section. The row of controls shown at the foot of each example are not exactly as they appear on the controller, however, they should provide reasonable visual cues as to how each mode should be set. Of course, other button presses (timings, etc.) are required to produce a working layout.

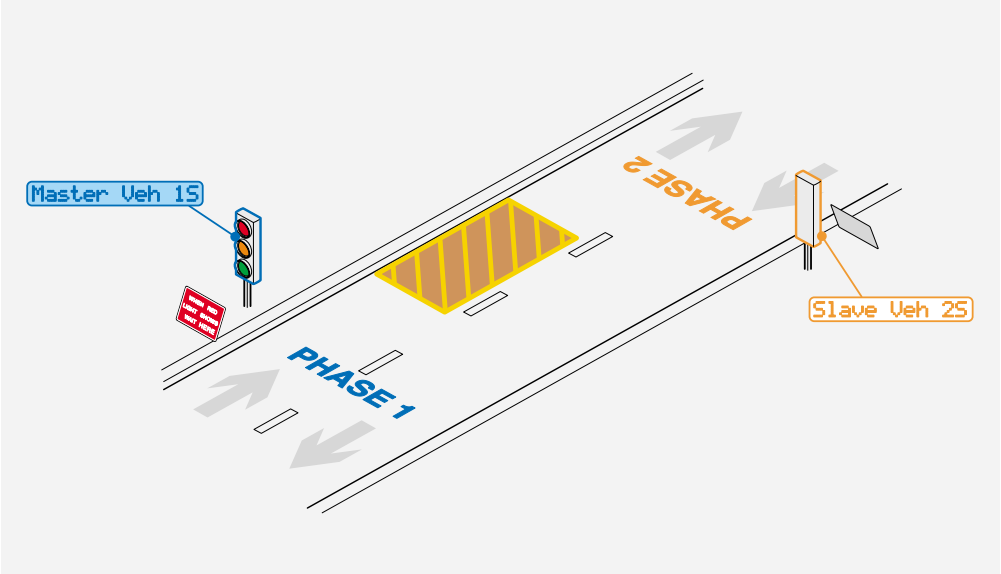


Appendix 2: PT5 as Master

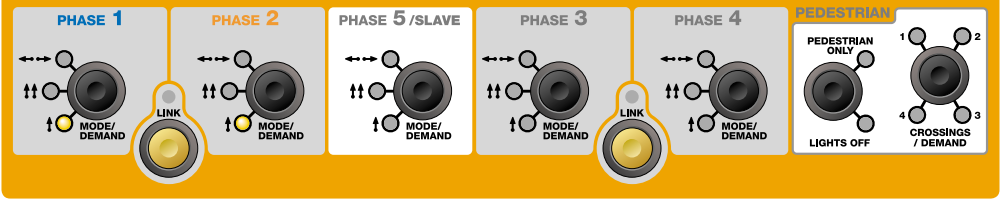
EXAMPLE 1: BASIC SHUTTLE WORKING

2 vehicle phases, 2 approaches, 1 head per approach

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



Master phase modes



Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

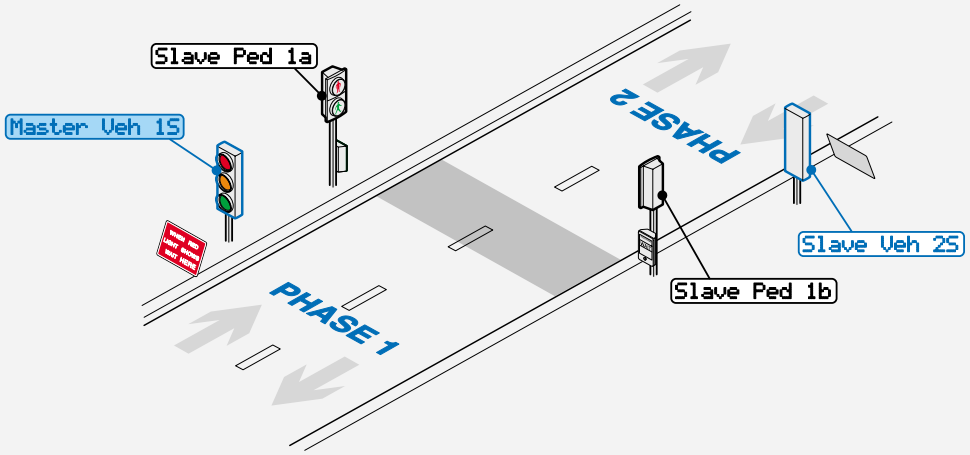
Appendix 2: PT5 as Master

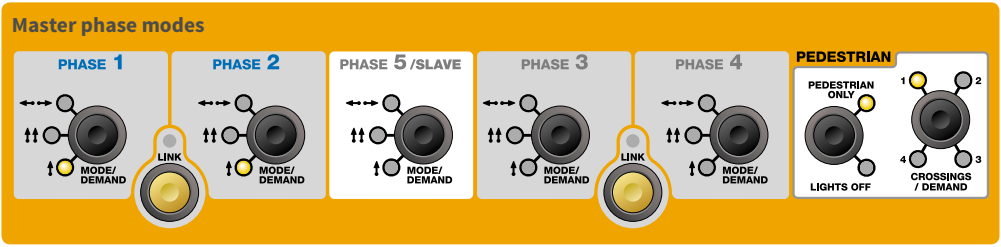
EXAMPLE 2: STANDALONE PEDESTRIAN CROSSING

2 vehicle phases, 2 approaches, 1 head per approach with single pedestrian crossing

This example shows a basic pedestrian crossing and uses the **PEDESTRIAN ONLY** mode to use the most appropriate settings.

Note: When the PEDESTRIAN ONLY mode is invoked, all active phases operate as one.





Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

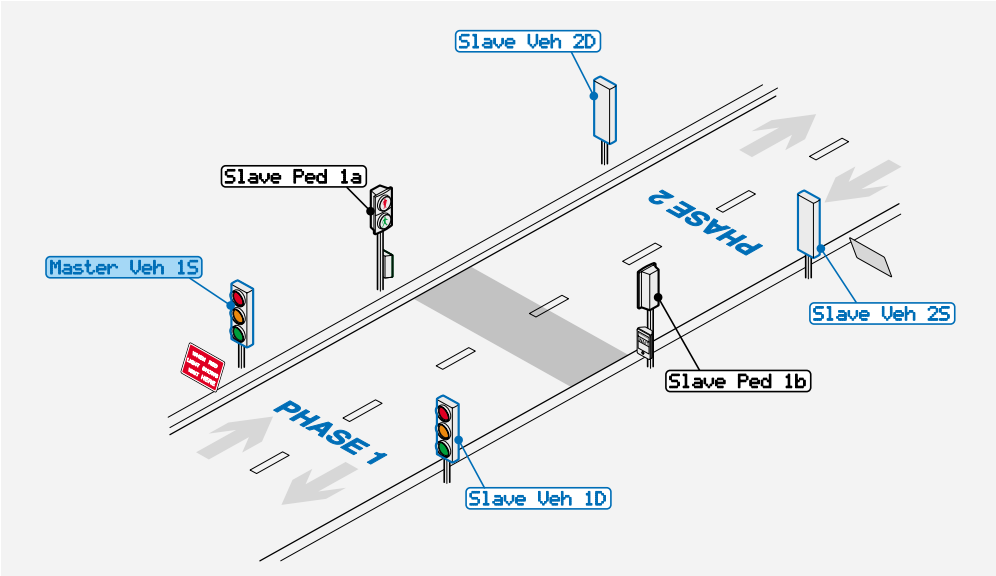
Appendix 2: PT5 as Master

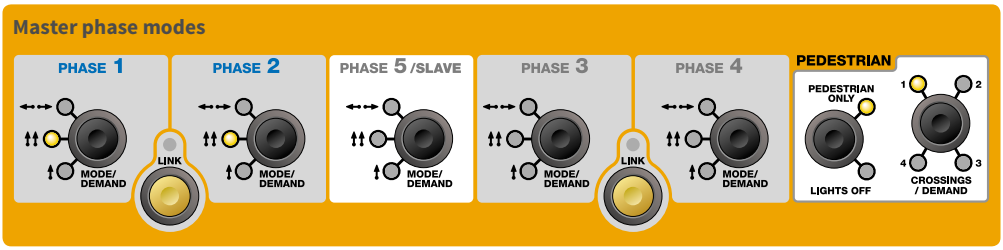
EXAMPLE 3: STANDALONE PEDESTRIAN CROSSING WITH TWO VEHICLE HEADS PER APPROACH

2 vehicle phases, 2 approaches, 2 heads per approach with single pedestrian crossing

This example shows a pedestrian crossing that might be used on a faster road with extra vehicle signals for added visibility and uses the **PEDESTRIAN ONLY** mode to use the most appropriate settings.

Note: When the PEDESTRIAN ONLY mode is invoked, all active phases operate as one.





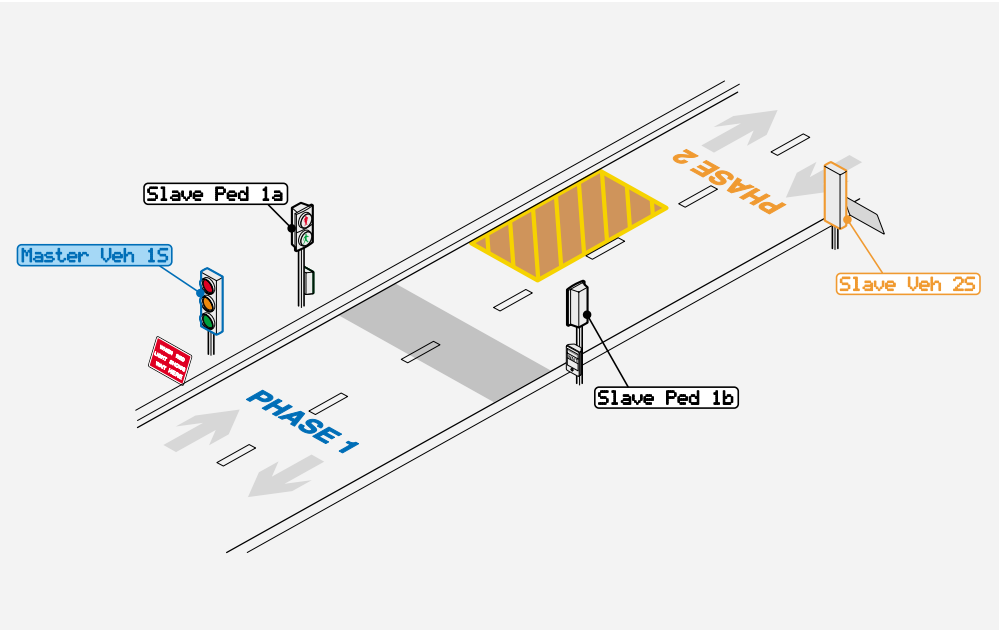
Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

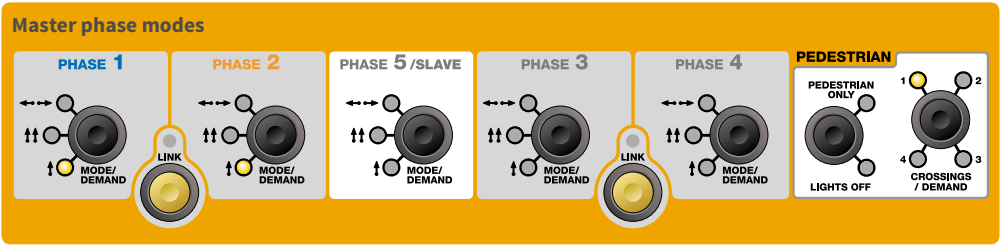
Appendix 2: PT5 as Master

EXAMPLE 4: SHUTTLE WORKING PLUS PEDESTRIAN CROSSING

2 vehicle phases, 2 approaches, 1 head per approach with single pedestrian crossing

This example shows a pedestrian crossing combined with shuttle working.





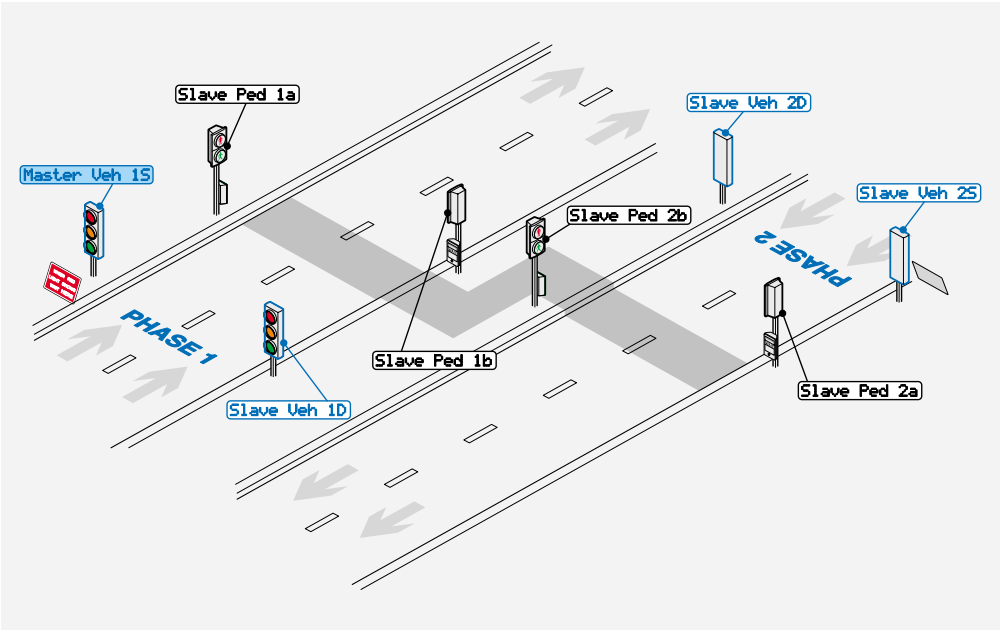
Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

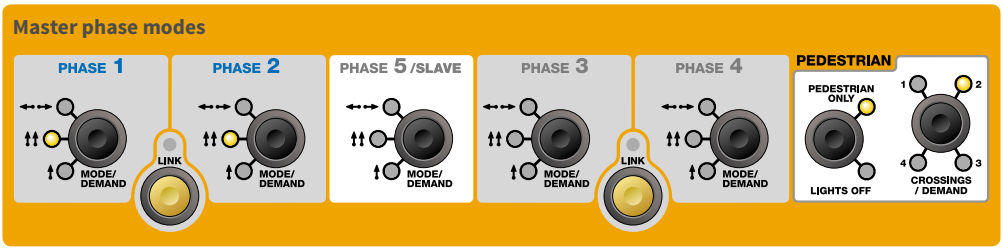
Appendix 2: PT5 as Master

EXAMPLE 5: COMBINED CARRIAGEWAY PLUS PEDESTRIAN CROSSINGS

This example shows two linked pedestrian crossings that are staggered across two carriageways. The layout uses the **PEDESTRIAN ONLY** mode to use the most appropriate settings.

Note: When the PEDESTRIAN ONLY mode is invoked, all active phases operate as one.



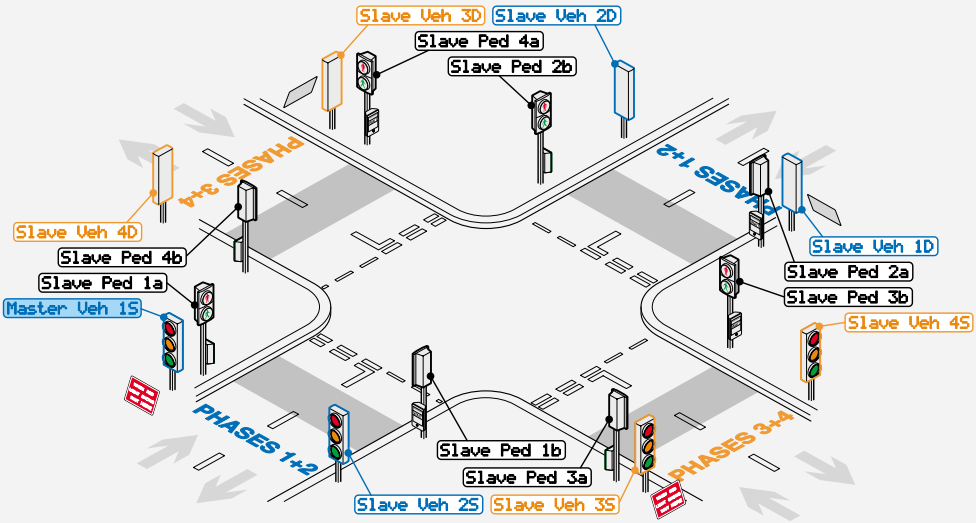


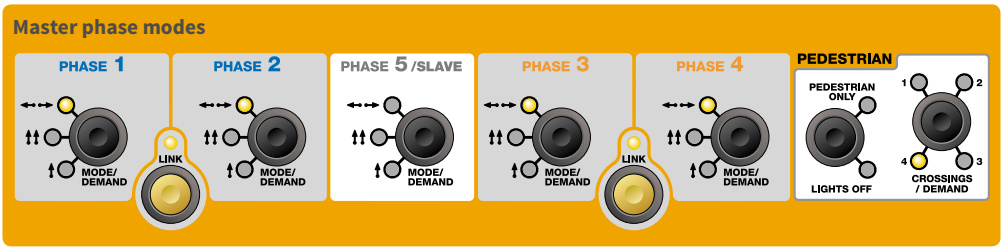
Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

Appendix 2: PT5 as Master

EXAMPLE 6: TWO-WAY CROSSROAD PLUS PEDESTRIAN CROSSINGS

This example shows a crossroad with two vehicle (linked) phases and four pedestrian crossings.



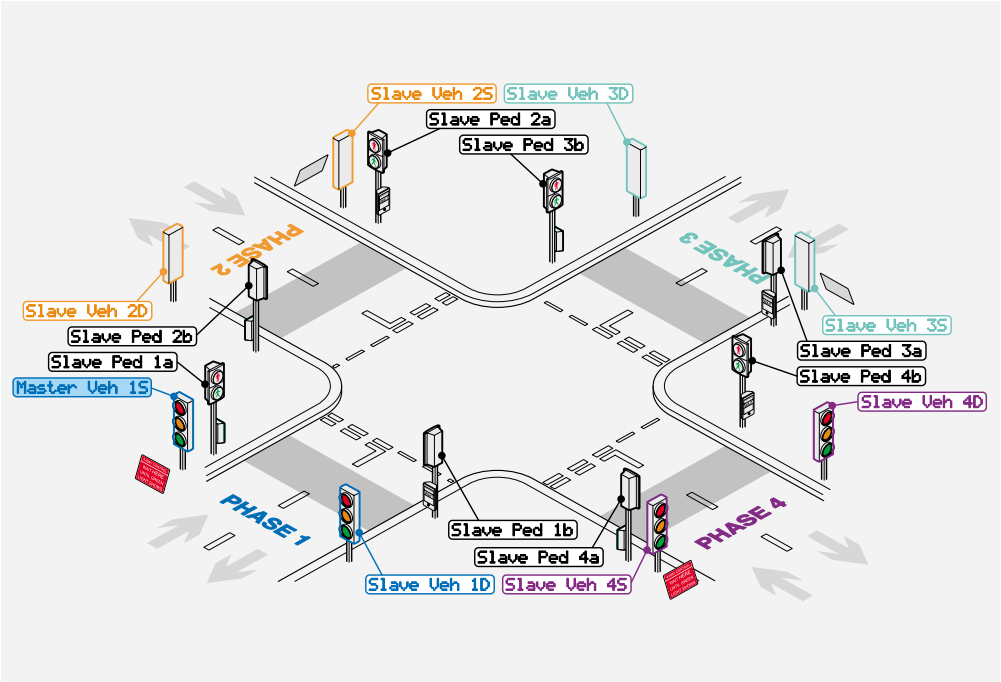


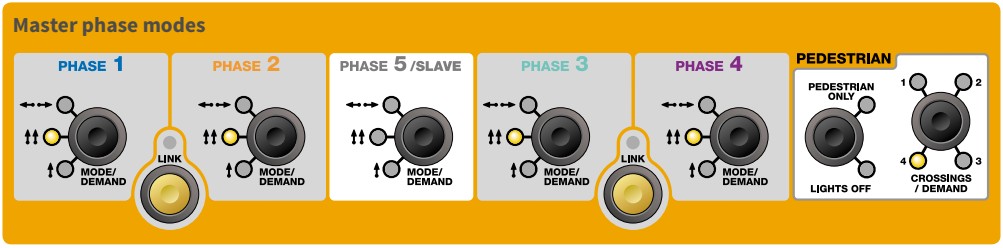
Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

Appendix 2: PT5 as Master

EXAMPLE 7: FOUR-WAY CROSSROAD PLUS PEDESTRIAN CROSSINGS

This example shows a crossroad with controlled by four vehicle phases with four pedestrian crossings.



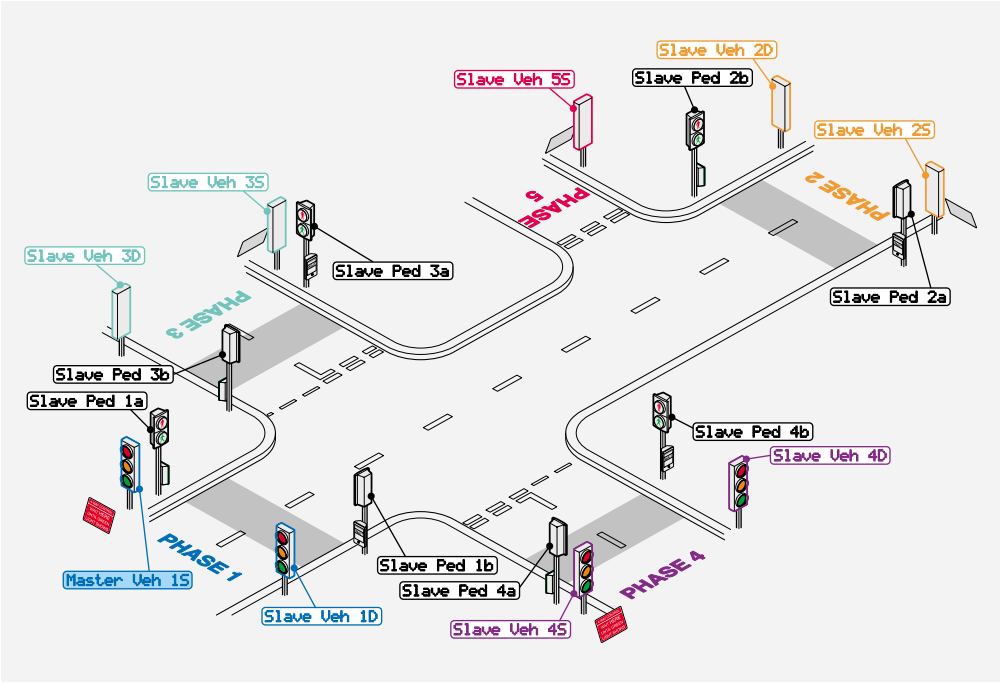


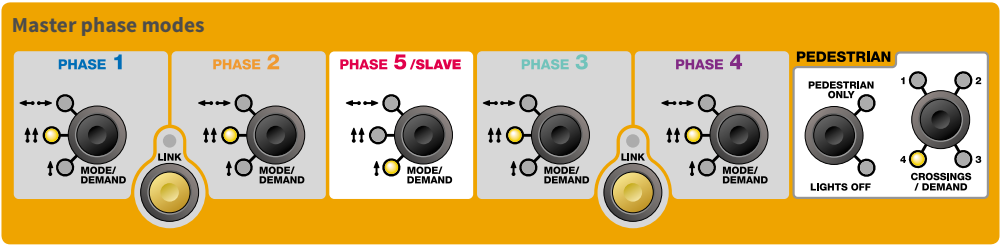
Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

Appendix 2: PT5 as Master

EXAMPLE 8: FIVE-WAY STAGGERED JUNCTION PLUS PEDESTRIAN CROSSINGS

This example shows a major junction controlled using all five vehicle phases as well as four pedestrian crossings.



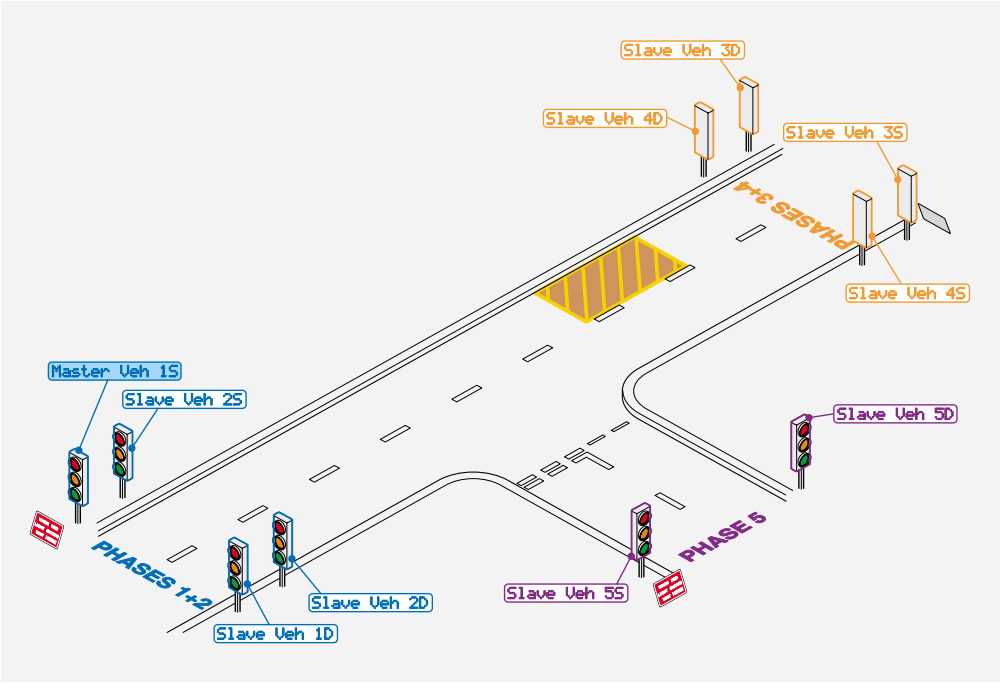


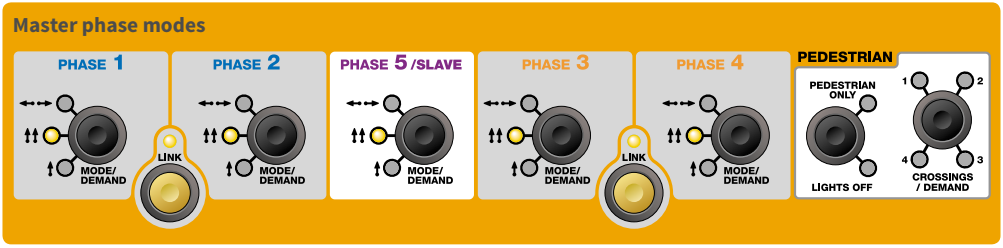
Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

Appendix 2: PT5 as Master

EXAMPLE 9: FAST CARRIAGEWAY WITH SIDE ROAD

This example shows the control of shuttle working on a fast carriageway with a side road.





Note: All junction layout examples given in this document are meant for rough guidance only. Please refer to Highways Agency specifications for actual signal, sign and cone placements for any particular junction types.

Declaration of Conformity

EU Declaration of Conformity

We Pike Signals Limited
Units 7,9 & 11, Phoenix Business Park
Avenue Road
Aston
Birmingham,
B7 4NU
United Kingdom

This declaration of conformity is issued under the sole responsibility of the manufacturer

Equipment Model Type(s)
a. Radiomaster
b. Micro
c. Evolight
d. Pike Doc

Equipment Description Portable Traffic Lights

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

Radio Equipment Directive 2014/53/EU

Restriction of Hazardous Substances (RoHS) 2011/65/EU

The product is in conformity with the following standards and/or other normative documents:

SAFETY (art 3.1.a):

EN 60950-1:2006 +A1:2010 +A11:2011 +A12:2011 +AC:2011 +A2:2013
EN 60950-22-2006 +AC:2008
EN 62479:2010

EMC (art 3.1.b):

EN 301 489-3 V2.1.1
EN 50293:2012

SPECTRUM (art 3. 2):

EN 300 220-2 V3.1.1 (2017-02)

RESTRICTION OF HAZARDOUS SUBSTANCES

EN 50581:2012

Technical file held by: Pike Signals Ltd.....

Place and date of issue (of this DoC) Pike Signals Ltd ...Wednesday, 09 May 2018.....

Signed by or for the manufacturer:.....
(Signature of authorised person)

Name P M Hutchinson.....

Title: Director.....

Notes

EVO SERIES
T2 | T5 | PT5 | PT4+

For more information on any Pike Signals product please contact us on:

Tel: *+44 (0) 121 359 4034*
eMail: *enquiries@pikesignals.com*
Web: *pikesignals.co.uk*

pike® signals

TRAFFIC GROUP SIGNALS

Pike Signals Limited Units 7, 9 & 11, Pheonix Business Park, Avenue Road, Aston, Birmingham, B7 4NU, UK
Tel: +44 (0) 121 359 4034 **eMail:** enquiries@pikesignals.com **Web:** pikesignals.co.uk

www.TrafficGroupSignals.com