CS-400 ™

MULTI-WAY PORTABLE TRAFFIC LIGHT CONTROLLER

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OPERATOR'S MANUAL

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A1 Roadlines Pty Ltd

The CS-400 Portable Traffic Lighter Controller complies with Australian Standards

AS 4191-2015 Portable Traffic Signal Systems

Manufactured and Serviced by:

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A FEW WORDS OF INTRODUCTION

The CS-400 is a comprehensive, easy-to-use traffic controller for use with portable lantern heads.

A1 Roadlines recommend you read this manual thoroughly to get to know the controller.

It has maintained many of the features you may be familiar with from the CS-200 controller, while adding a host of new features.

There is a glossary near the end of the guide which will assist you in understanding some of the terminology used.

Care notes:

While the controller has been designed to be heavy-duty in construction, it is not immune to damage.

The keypads and screen are resistant to being splashed with water, however, we do not warrant the controller will survive liquid immersion or long-term exposure to corrosive environments.

The keys and buttons are designed to be activated using a light press.

The glass covering the main screen is not toughened, so heavy objects must not be allowed to rest on the top surface of the controller.

If you believe you have found any kind of error in this guide, please contact us so that we can correct it.

Likewise, if you find the way something is done just doesn't seem right, let us know.

Keep in mind that, while it can take a while to implement changes, if it's worth doing we'll do it!

We're happy to accept compliments, too!

A1 Roadlines hopes you enjoy using our products.

CS-400 OPERATION MANUAL

SPECIFICATIONS

General

Supply Voltage	12-16V DC
Current Consumption	400mA plus lantern current
Operating Temperature	-15°C to +60°C
Max Lamp Current	4A

RF

Connector	BNC
Frequency	900 MHz (ISM band)
Tx Output Power	1W
Max Distance	1km (clear line of sight)

Alarm Levels

Low Battery Voltage	<11.5V	alarm sounds
Critical Battery Voltage	<11.0V	system selects flash yellow mode
Shutdown (fatal) Voltage	<10.0V	system turns OFF

Alarm Times

Fault Response Time	< 0.5 sec
Communication's Failure	< 5.0 sec
Audible Alarm Duration	5.0 minutes

Dimensions

Length	275 mm
Width	270 mm
Height	100 mm
Weight	4.2 kg

Specifications are for normal operation with LED lanterns and antennae which are line-of-sight.

FEATURES

- All operator controls are on the front panel.
- Configuration Selection:
  - Shuttle
  - 2 WAY: Haul road
  - 3 WAY standard T-intersection
  - 3 WAY Shuttle T-intersection
  - 4 WAY standard intersection
  - 4 WAY Shuttle Road-1 only
  - 4 WAY Shuttle Road-2 only
  - 4 WAY Shuttle Road-1 & Road-2
  - Custom
- System Repeater (optional)
  - Allows the CS-400 to work in difficult situations including over & around hills, trees and buildings.
- Single unit design means there is no designated MASTER or SLAVE. Therefore:
  - All standard CS-400 units are the same and interchangeable;
  - Once operational, the system can be operated from ANY unit saving time and increasing efficiency;
  - Fewer units are required to cater for varying jobs.
- Menu-style operating system of functions that require frequent use:
  - No need to remember programming codes;
  - No need to have an operating manual on hand at all times.
- Radio uses frequency-hopping technology to reduce interference
- Once synchronised and operator verifications done (where applicable), the system can be fully controlled from any CS-400.
- The screen can be easily read in full daylight through to low-light environments.
- Following on from the design of its predecessor, the CS-200, many operational aspects are the same.
- Multiple CS-400 systems can be operated in the same location.
- Options:
  - CS-TRH4 wireless remote control.
  - MC-400 wired remote control.
  - GPS tracking/Mobile phone reporting of faults and operational status.
  - Cable connection.

Operational Matrix:

	SHUTTLE	2 WAY	3 WAY	3 WAY SHUTTLE R1	4 WAY	4 WAY SHUTTLE R1	4 WAY SHUTTLE R2	4 WAY SHUTTLE R1 & R2	CUSTOM	
									SINGLE	DUAL LANTERN
VEHICLE SENSOR	Y	-	Y	Y	Y	Y	Y	Y	-	Y
AUTO	Y	-	Y	Y	Y	Y	Y	Y	-	Y
MANUAL	Y	Y	CS-TRH4 ONLY	CS-TRH4 ONLY	CS-TRH4 ONLY	CS-TRH4 ONLY	CS-TRH4 ONLY	CS-TRH4 ONLY	Y	Y
RP-1 REPEATER	Y	Y	-	-	-	-	-	-	-	-
MC-400 WIRED REMOTE CONTROL	Y	Y	-	-	-	-	-	-	Y	Y
CS-TRH4 WIRELESS REMOTE CONTROL	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Y = allowed

Summary of CS-400 System Operations

Ensure CONFIGURATION and UNIT switches are set correctly to suit the intersection.

Ensure the UNIT switch is correctly positioned (marker on U1, U2, U3 or U4.)

Ensure each CS-400 controller has a unique UNIT identity, starting with U1.
    (For example, there should not be two 'U2' controllers.)

Press [MENU] for 1 second to access menu items.

Press [CLEAR] to silence alarms. (Otherwise, alarms will remain active for 5 minutes.)

When only one lantern head is used, it must be connected to the LANTERN 1 socket.

When VEHICLE SENSORs are used, they must be connected to *all* controllers in the system.

Not all functions can be used in every configuration.
Check the Operational Matrix (page 7) for details.

CS-TRH4 (wireless remote) option:
    Can only be synchronised to U1.
    Must be switched ON to SYNC.
    Must be within range of U1 to work.

GPS-SMS (tracking and reporting) option:
    When installed in U1, allow 90 seconds after powering ON to enable/disable it or to edit contact numbers.
    Once enabled, ensure contact numbers are added.
    Ensure both antennae are connected.

CS-RP1 REPEATER option:
    Can only be used in SHUTTLE and 2 WAY configurations.
    Synchronise U1 to U2 first, *then* synchronise all desired TRH4 radio remotes to U1 *then* synchronise the REPEATER to U1.
    To add a REPEATER, press U1's SYNC button for 3 seconds (note prompt) then press the SYNC button on the REPEATER. U2 will automatically connect via the REPEATER.

MC-400 (wired remote) option:
    Can not be used in 3 WAY or 4 WAY configurations.

FRONT PANEL

ON – SYNC – OFF buttons

Press to perform any of these functions

> ON: Turns the controller ON.
> SYNC: Synchronises the controller to another compatible device.
> OFF: Turns the controller OFF.

CONFIGURATION switch

Selects one of the 9 configurations available

> - SHUTTLE
> - 2-WAY - HAUL ROAD
> - 3-WAY
> - 3-WAY SHUTTLE ON ROAD 1
> - 4-WAY
> - 4-WAY SHUTTLE ON ROAD 1
> - 4-WAY SHUTTLE ON ROAD 2
> - 4-WAY SHUTTLE ON ROAD 1 & ROAD 2
> - CUSTOM

UNIT switch

Selects the unit number of each CS-400 controller in a system

> - U1 = Unit number 1
> - U2 = Unit number 2
> - U3 = Unit number 3
> - U4 = Unit number 4

MODE Keypad

Selects the 4 main modes of operation

> - VEHICLE SENSOR
> - AUTO
> - MANUAL
> - FLASH YELLOW

SCREEN

This is a 40 column, 4 row text-only back-lit display.
It is NOT a touch screen.

CONTROL Keypad

Used for numeric entry, time adjustments and menu selection

Time Adjustments:

The GREEN times for each UNIT is adjusted by typing in the time (in seconds) then pressing the corresponding UNIT GREEN TIME button.

The RED clearance time for Road 1 and Road 2 are set by typing in the time (in seconds) then pressing the U1 or U3 RED TIME button for 5 sec.

Alternatively the MENU system can be used.

CLEAR / MENU / YES Button

This button has 3 functions depending on the current operation with the controller:

CLEAR	Clears an incorrect data entry (use like a 'back space' button).
MENU	Press for 2 seconds to select the main menu.
YES	Answer YES to questions.

0 / HOME / NO Button

This button has 3 functions depending on the current operation with the controller:-

0	Selects number 0
HOME	Closes the MENU system and returns to the HOME screen
NO	Answer NO to questions

ENTER Button

Selects the menu options

Additional information on the rotary switches:

CONFIGURATION switch.

This is a rotary switch which can be rotated clockwise or anti-clockwise in the range indicated by the knob marker line. Each position has tactile feedback to indicate when it is correctly rotated.
Do not attempt to rotate it past the 'SHUTTLE' or 'CUSTOM' positions or damage may occur to the switch.

UNIT switch.

This is a rotary switch which can be rotated clockwise or anti-clockwise in the range indicated by the knob marker line. Each position has tactile feedback to indicate when it is correctly rotated.
Do not attempt to rotate it past the 'U1' or 'U4' positions or damage may occur to the switch.
Note: There are tactile positions between each of the marked positions. These are not recognised by the CS-400.

THE CONNECTOR PANEL

Contains the antenna connectors for normal wireless communications between CS-400 controllers.

When the option is installed, it also contains the antenna connectors for the GPS-SMS modem.

Includes the heavy-duty sockets for connecting to a power supply, lantern heads, cable mode, cabled remote controller and vehicle detector sensor.

THE SIDE PANELS

Each side panel contains two M5 (5mm) integrated nuts for the convenience of securing to trailer hardware.
Please Note: - The **maximum** length of the mounting bolts can not exceed **25mm**

HOW TO UNDERSTAND THE SCREEN INFORMATION:

This figure also shows the case labelling (yellow) adjacent to the screen

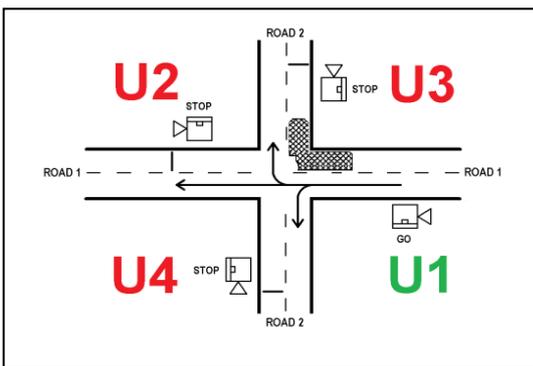### 4 Way (Shuttle R1&R2)

Diagram 1

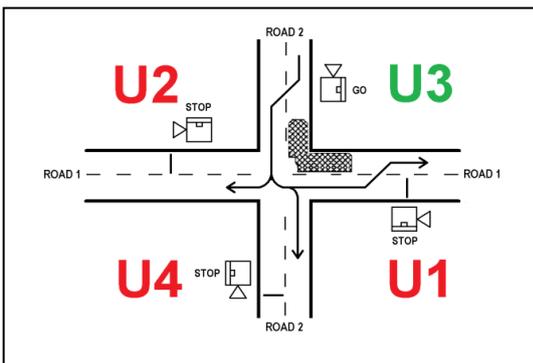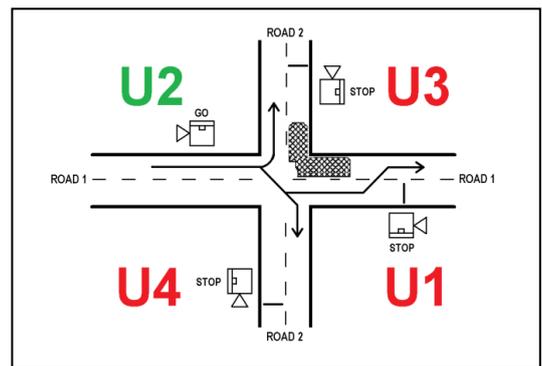

Diagram 2

Diagram 3

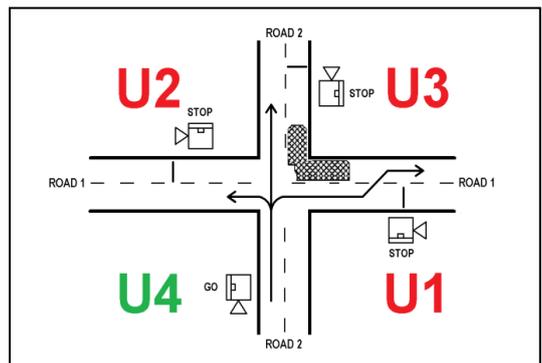Diagram 4

ROAD 1:   The times below ROAD 1 relate to ROAD 1

ROAD 2:   The times below ROAD 2 relate to ROAD 2

RED: (Associated with ROAD 1)
                 The RED CLEARANCE time for ROAD 1. This will be the same in both directions.
                 The example shows 11 seconds.

RED: (Associated with ROAD 2)
                 The RED CLEARANCE time for ROAD 2. This will be the same in both directions.
                 The example shows 22 seconds.

U1-G: The time the traffic is allowed for flow from left to right on ROAD 1 (Diagram 1)
                 This example shows 33 seconds.

U2-G: The time the traffic is allowed for flow from left to right on ROAD 1 (Diagram 2)
                 This example shows 55 seconds.

U3-G: The time the traffic is allowed for flow from bottom to top on ROAD 2 (Diagram 4)
                 This example shows 44 seconds.

U4-G: The time the traffic is allowed for flow from top to bottom on ROAD 2 (Diagram 3)
                 This example shows 33 seconds.

MODE is AUTO (automatic).
                 The operating MODE is using pre-programmed (AUTO) timers to control traffic flow.

COMMS (communications) link is active:
                 When using a wireless link (the default method): RX (receive) and TX (transmit)
                 indicate messages between controllers are being received and transmitted.

                 When using a wired link (using a cable between U1 and U2), the screen will show
                 'CABLE' after the RX and TX text.

UNIT 1 indicates that this unit is UNIT 1

4 Way indicates that the system is in 4 Way configuration

This CS-400 is measuring its power source at about 13.1 VOLTS.

INITIAL SET UP - SYNCHRONISING

Bring together 1, 2, 3 or 4 portable traffic light trailers depending on the configuration required.

- On each CS-400, use the <u>CONFIGURATION</u> switch to select the configuration required:-

    - SHUTTLE
    - 2-WAY
    - 3-WAY
    - 3-WAY SHUTTLE ON ROAD 1
    - 4-WAY
    - 4-WAY SHUTTLE ON ROAD 1
    - 4-WAY SHUTTLE ON ROAD 2
    - 4-WAY SHUTTLE ON ROAD 1 & 2
    - CUSTOM

    On each controller use the <u>UNIT</u> switch to select the UNIT number.

    - U1
    - U2
    - U3
    - U4

Note: **Each controller must be set to the same configuration.**
             Each controller must have a different Unit number.

Synchronising a system

Turn ON all UNITS and SYNC together as per following instructions:-

Each controller can only be synchronised to U1.
The process must be done one controller at a time.

1.   Ensure each controller has been configured the same and its UNIT number is unique.
2.   Power on all controllers.

For SHUTTLE or 2 WAY configurations, U1's screen will show:

```
UNIT-2 - SYNC OR CHECK
```

For 3 WAY configuration, U1's screen will show:

```
UNIT-2 - SYNC OR CHECK
UNIT-3 - SYNC OR CHECK
```

For 4 WAY configuration, U1's screen will show:

```
UNIT-2 - SYNC OR CHECK
UNIT-3 - SYNC OR CHECK
UNIT-4 - SYNC OR CHECK
```

UNIT-2 will indicate its status

```
WAITING FOR U1 OR RESYNC
```

3.   Press the SYNC button on **U1.**
     The display indicates the system is in SYNC mode.

```
                SYNCING
PLEASE PRESS SYNC ON OTHER DEVICE
```

U1 will stay in this mode for only 15 seconds or until the current synchronising process has
      finished.

2. Press the SYNC button on **U2 within a 15 seconds of pressing U1's SYNC button.** When the synching process has finished, both U1and U2 will show a similar display to the following:

Note: This would be the display for U1

Synchronising a CS-TRH4 wireless remote to a system:-

After you have synchronised the CS-400 controllers, a CS-TRH4 may be added.

The SYSTEM **must** be in FLASH YELLOW to perform this function.

Turn the CS-TRH4 on. If it has not been synchronised only a single RED LED will be flashing which indicates the position of U1 on the controller.

This will continue until either:
    (a) the TRH-4 automatically shuts down after 5 minutes; or
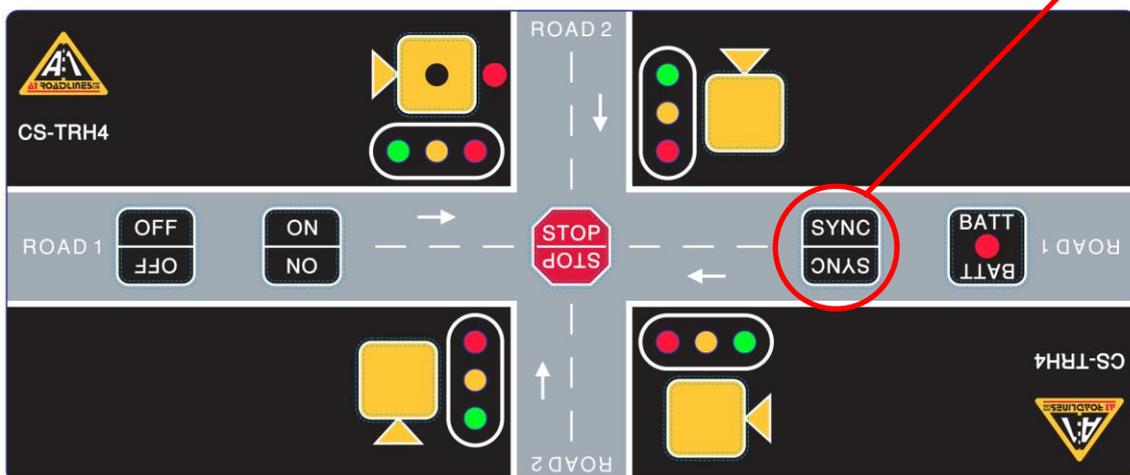   (b) the SYNC button is pushed.

To SYNC to U1:
    Ensure U1 is in FLASH YELLOW mode;
    Ensure the CS-TRH4 is switched ON;
    Press SYNC on U1;
    Within a few seconds, press the SYNC button on the CS-TRH4:

All GREEN LED's will flash indicating that the unit is in SYNC mode.
Within a few seconds of successfully synchronising to U1, it will echo the status of U1.

MODES OF OPERATION

1. <u>FLASH YELLOW</u>

There are three ways the system enters this mode:-

1.   When the CS-400 is turned ON;
2.   If a fault is detected;
3.   By pressing the FLASH YELLOW mode button

2. <u>MANUAL</u>

A handheld cabled controller (MC-400) can be connected to any CS-400 and is used to control all manual functions:

The MC-400 can **only** be used in **SHUTTLE, 2 WAY** & **CUSTOM** modes of operation. For any other configuration, a CS-TRH4 wireless remote must be used instead.

MC-400   **CS-TRH4**

The MC-400 is connected to the CS-400 via a 25 metre cable, which can be extended to a maximum of 50 metres if required.

The manual controller has three buttons:

        STOP
        U1 GREEN
        U2 GREEN

Three status lights indicate the state of U1 and U2's lantern heads.
The lights will flash if a command key on the MC-400 is pushed while the system is in a RED CLEARANCE or MIN GREEN time to indicate the demand has been received.
They remain flashing until the CS-400 starts executing the request.

Pressing the STOP button will immediately terminate the GREEN running phase.
The lanterns will go YELLOW then RED.
U1 and U2 will remain RED until either MC-400 GREEN buttons are pressed.

Pressing the green button of the MC-400 Manual Controller or UNIT button of CS-TRH4 wireless remote will initiate a STOP, RED CLEARANCE and GREEN sequence for the selected Unit.

If the CS-400 is in VEHICLE SENSOR or AUTO mode when MANUAL mode is selected, all demands are cancelled and both Units go RED and stay RED until a GREEN request is received.
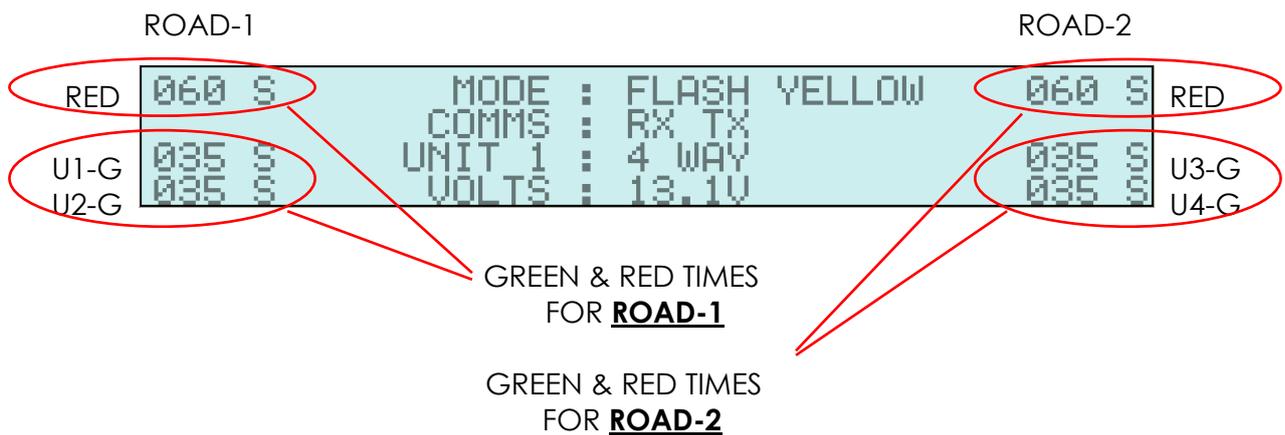
> Note:-   The <u>RED CLEARANCE TIME</u> and <u>GREEN MIN TIMES</u> cannot be overridden in MANUAL mode.

3. <u>AUTO (Time mode)</u>

In this mode, preset timers are used to regulate RED and GREEN times. All times are shown on the display and are automatically stored in memory when the system is turned off. The following display shows times on a 4 WAY intersection:

If the system is in FLASH YELLOW mode when the AUTO button is pressed, then all UNITS will change to RED and traffic will be controlled in accordance with the preset times.

If the system is in MANUAL or VEHICLE SENSOR modes when the AUTO button is pressed, a STOP command is automatically performed and then the system reverts to AUTO mode.


```
          ROAD-1                                              ROAD-2

   RED   060 S      MODE : FLASH YELLOW    060 S   RED
                    COMMS : RX TX
   U1-G  035 S      UNIT 1 : 4 WAY         035 S   U3-G
   U2-G  035 S      VOLTS : 13.1V          035 S   U4-G
```

GREEN & RED TIMES
FOR **ROAD-1**

GREEN & RED TIMES
FOR **ROAD-2**

Before entering this mode, RED clearance time and GREEN times should be determined and entered into one of the CS-400 units. Please refer to SETTING TIMES on the next page.

SETTING TIMES

GREEN TIMES

GREEN times are entered on the CONTROL keypad and assigned to the appropriate times using the UNIT GREEN TIME key.

To set GREEN times, enter the time (in seconds) then press the required UNIT GREEN TIME button.

Example: Enter a time of 35 seconds for U2.

In FLASH YELLOW mode, type '35' and press the [GREEN / U2 / GREEN] button.

The screen will show '035' next to 'U2-G'

Note: **If an incorrect time is entered, the CS-400 will prompt the operator with the available range. (CLEAR button acts as a back space)**

RED CLEARANCE TIMES

There are two ways to enter RED CLEARANCE times.

1.   From the HOME screen:

Press the FLASH YELLOW key;
Type in the time in seconds;
Press and hold the [RED / U1 / GREEN] key for ROAD 1 or the [RED / U3 / GREEN] key for ROAD 2 until the time

on the screen under the respective ROAD label changes to the time entered.
This time is typically around 5 seconds.

Example: Enter a time of 15 seconds for ROAD 2:

Press the following keys: FLASH YELLOW, type 15, [RED / U3 / GREEN] key until the ROAD 2 RED time changes to '015'.

2.   From the MENU system:

Press the FLASH YELLOW key;
Press the MENU key for 2 seconds;
Select 1 RED CLEARANCE TIME;
Select 1 ROAD-1 RED CLEARANCE
                              or
              2 ROAD-2 RED CLEARANCE
Type in the time in seconds (within the permitted range) and press ENTER.

Example: To Enter a time of 55 seconds for ROAD 2:
Press the following keys: FLASH YELLOW, MENU (for 2 seconds) 1, 2, 55, ENTER and HOME.

Notes:

If the entered time is outside of the permitted range, an error message will appear prompting the operator to press a key which will then take them back to the HOME screen.

If ROAD 2 is not in use for the current configuration:
The RED ROAD 2 time will not be shown on the screen;
Any valid entry to the RED ROAD 2 time will be accepted but not stored in memory.

4. <u>VEHICLE SENSOR</u>

This mode uses vehicle detectors in conjunction with preset timers to control traffic. When a moving vehicle is detected a demand is stored, shown on the display and then used to control traffic flow.

All CS-400 units in use <u>MUST</u> have vehicle detectors connected to allow selection of this mode

Failure to ensure detectors are connected will result in the following screen:

```
**************** WARNING ****************
       NOT ALL VEHICLE SENSORS ATTACHED
          U1 [Y] U2 [Y] U3 [N] U4 [Y]
```

Note: This screen adjusts to suit the number of controllers in the system and shows which controller(s) does not detect a sensor.
In the above example, U3's detector is not seen as connected to U3.

Before entering this mode, the RED clearance times should be entered into one of the units.

To set the RED clearance times refer to the previous page

When the VEHICLE SENSOR button is pressed, the system automatically registers an artificial demand for all directions and then allows the detectors to control the flow of traffic.

If the vehicle detector is **not connected** the system will **NOT** select this mode and the operator is informed which unit is at fault.

EXAMPLES OF VEHICLE SENSOR MODE:

1.   OPERATION

In normal operation, both ROADS are RED if no vehicles are detected.
As soon as a vehicle is detected and if the RED CLEARANCE time has expired, the lantern goes GREEN allowing the vehicle which triggered the sensor to proceed.

If no more vehicles are detected, the lantern goes back to RED after 3 - 6 seconds, as set by the GREEN EXT time.
For example, a GREEN EXT time of 6 seconds will allow for a gap of 6 seconds between vehicle detections. If more than 6 seconds occurs between detections, the cycle will end for that ROAD and the lantern will go RED.

2.   CONTINOUS TRAFFIC MAINLY IN ONE DIRECTION (direction 'A')

Because there are continuous detections of cars in direction 'A', the lantern stays green until:-

A   There is a break in traffic more than the GREEN EXT Time. The lantern will go YELLOW then RED and because there is no traffic waiting at the other end of the road works (direction 'B'), the lantern will go back to GREEN as soon as another vehicle is detected and the MIN RED time has expired.

B   A demand is received from direction 'B' at the other end of the road works. Direction 'A' will stay GREEN until the GREEN TIME has expired at which point the Lantern head for direction 'A' will go to YELLOW then RED. Once the RED CLEARANCE time expires, the vehicle from direction 'B' will be given GREEN.
U1 GREEN RUNNING TIME is started when U1 receives a demand from U2

NOTE 1:- The type of vehicle actuator used may detect movement only. It is therefore possible for a vehicle to be waiting and not have been detected. If this is deemed to be a problem, the sensor can be modified to produce a pulse every 2.5 minutes. Contact supplier for details.

NOTE 2:- Systems are supplied with detectors operating on a frequency of 10.525 GHz which do not require an individual licence.

NOTE 3:- Check at least once a year that frequencies and licences are still valid as some units will require calibration
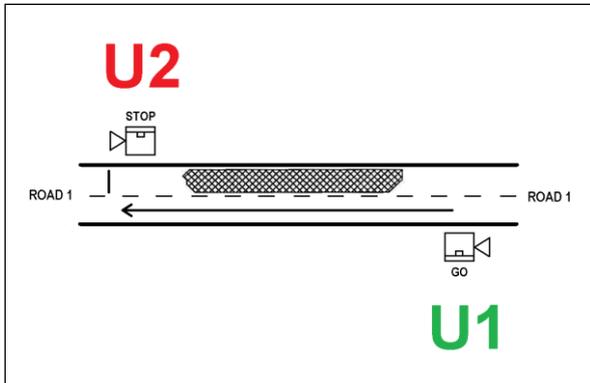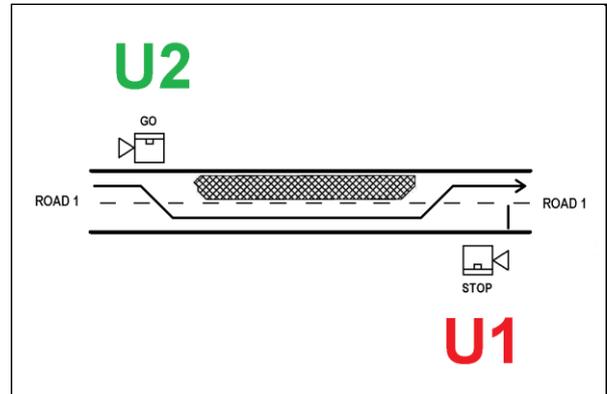
CONFIGURATION

1. Shuttle

Diagram D1.1

Diagram D1.2

In SHUTTLE configuration, traffic flow is alternated from each direction through a single, bi-directional lane. Traffic from one direction must stop while the traffic from the opposite direction is permitted to use the lane for a set period of time and then they swap.

To configure:
1. Obtain two CS-400 controllers.
2. With their power off, set each controller's CONFIGURATION switch to SHUTTLE.
3. Select controller Unit identity:
   - Select U1 for the first controller;
   - Select U2 for the second controller.
4. Turn both controllers on.
5. Synchronise the controllers using the procedure on page 14
   Once synchronising is complete, the screen will show the following:

```
050 S        MODE : FLASH YELLOW
             COMMS : RX TX
040 S      UNIT 1 : SHUTTLE
040 S       VOLTS : 13.1V
```

6. Place the controllers at either side of the road works as per Diagram D1.1

- All Modes are available in this configuration:

  - FLASH YELLOW
  - MANUAL
  - AUTO
  - VEHICLE SENSOR

- Control of the system is possible from either U1 or U2.
- A REPEATER can be used in this mode.
- CS-TRH4 wireless remote can be used.

2.   2 WAY - Haul Road

This CONFIGURATION can **ONLY** be operated in **MANUAL** mode
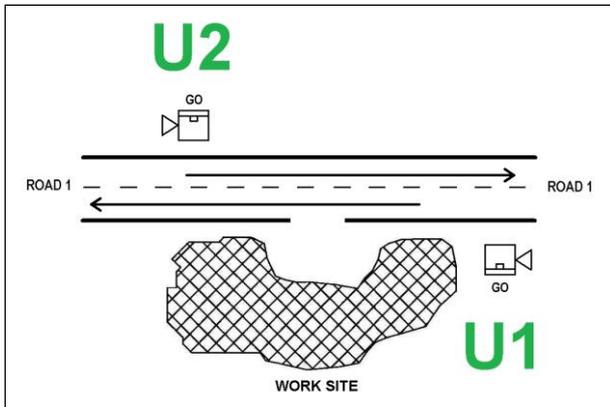
2 WAY - HAUL ROAD (VEHICLE ACCESS):
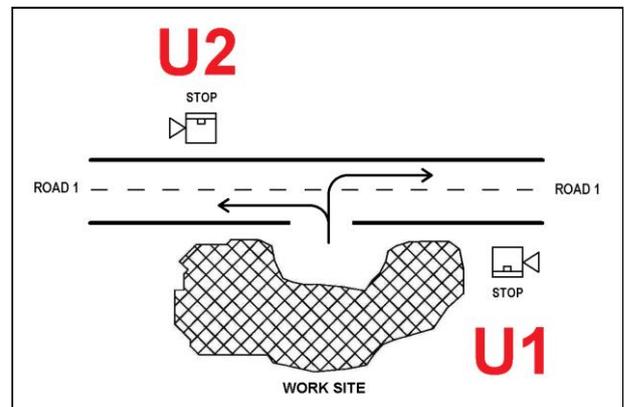

Diagram D2.1

Diagram D2.2

In 2 WAY mode, both directions of traffic are stopped at the same time and both are allowed to move at the same time.
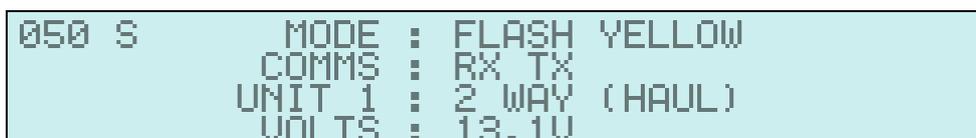The lanterns at either end follow the same control sequence.

To configure:

1.   Obtain two CS-400 controllers.
2.   With their power off, set each controller's CONFIGURATION switch to 2 WAY.
3.   Select controller Unit identity:
           - Select U1 for the first controller;
           - Select U2 for the second controller.
4.   Turn both controllers on.
5.   Synchronise the controllers using the procedure on page 14
6.   Once synchronising is complete, the screen will show the following:

```
     2-WAY CONFIG IS SELECTED

         IS THIS CORRECT?
              YES / NO
```

If YES is selected, the operator is taken to the HOME screen:

```
050 S      MODE : FLASH YELLOW
           COMMS : RX TX
           UNIT 1 : 2 WAY (HAUL)
           VOLTS : 13.1V
```

If 'NO' is selected, the operator is asked to check the CONFIGURATION settings and re-start the controller:

```
***************** ERROR ****************
     CHANGE CONFIGURATION AND RE-START

     PRESS ANY KEY TO RE-START PROCESS
```

   7.   Place the controllers at either side of the road works as per Diagram D2.1(Pg 22)

NOTE:

- 'Re-start' means to power OFF the controller wait a few seconds then power ON the controller.

- Any CS-TRH4 wireless remote controllers must be synchronised to U1 <u>before</u> selecting the only possible mode, MANUAL.

- Where a MC-400 cabled remote controller is to be used, it should be connected to U1.

- Once remote controllers are synchronised and/or connected into the system, MANUAL mode can be selected.

- The system is now under operator control.

- Any attempt to operate in AUTO or VEHICLE SENSOR modes will generate one of the following error messages:

```
**************** WARNING ****************
          AUTO MODE NOT ALLOWED
```

```
**************** WARNING ****************
      VEHICLE SENSOR MODE NOT ALLOWED
```

3. 3 WAY (T - Intersection)

There are 2 configurations available at a 3 WAY (T – intersection):
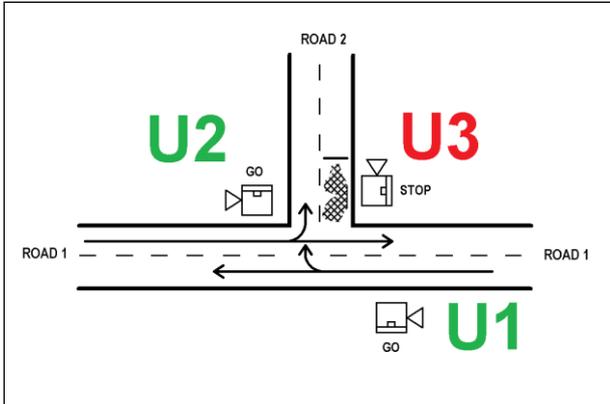The configuration procedure is the same for both.
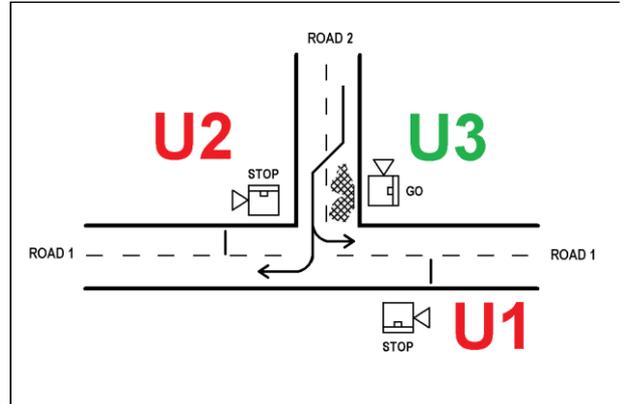
3 WAY

Diagram D3.1
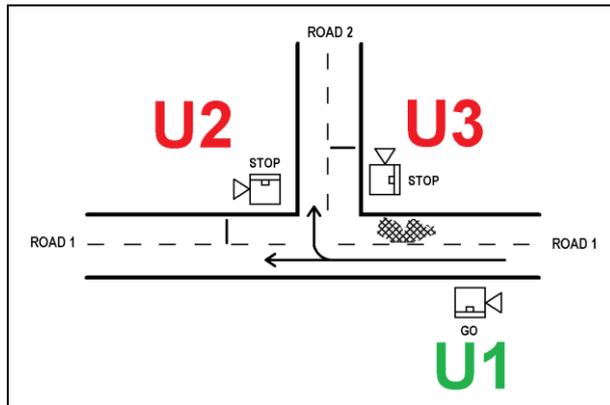

Diagram D3.2

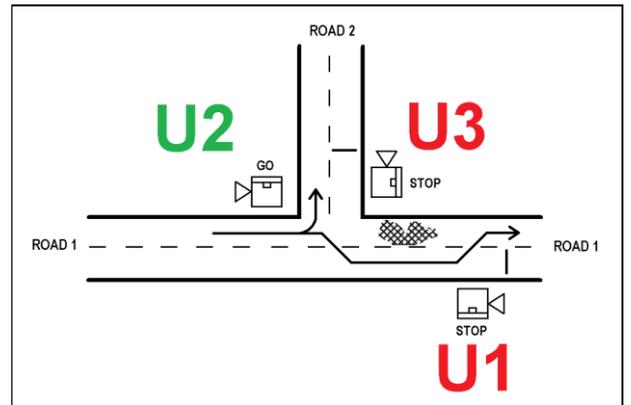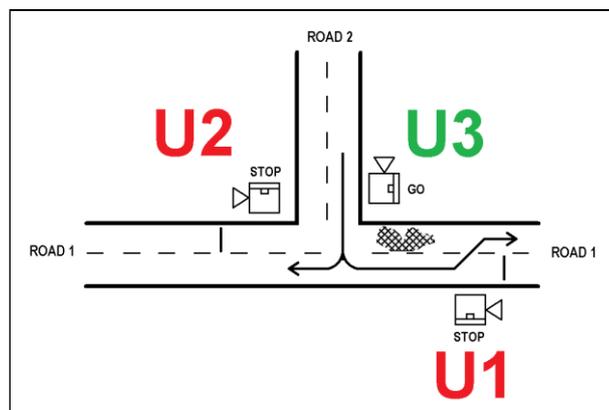### 3 WAY (SHUTTLE R1)

Diagram D3.3

Diagram D3.4

Diagram D3.5

Notes:
VEHICLE SENSOR, AUTO, MANUAL and FLASH YELLOW modes are all available
MANUAL mode is <u>ONLY</u> available with the use of a <u>CS-TRH4 wireless remote.</u>

To configure:

1.   Obtain three CS-400 controllers.
2.   With their power off, set each controller's CONFIGURATION switch to:
        3 WAY or
        3-WAY (SHUTTLE R1)
        (Ensure it is the same on each controller.)
3.   Select U1 for the first controller;
        Select U2 for the second controller;
        Select U3 for the third controller.
4.   Place controllers as per diagram D4.1 or D5.1
5.   Turn all controllers on.
6.   Synchronise the controllers using the procedure on page 14.
7.   Once synchronising is complete, the screen on U1 will show the following:

```
2 ¦ ¦ 3     ** FLASHING AUX LAMP OF U1**
--+ +--
--------     IS U1 IN THE CORRECT POSITION?
      1                 YES / NO
```
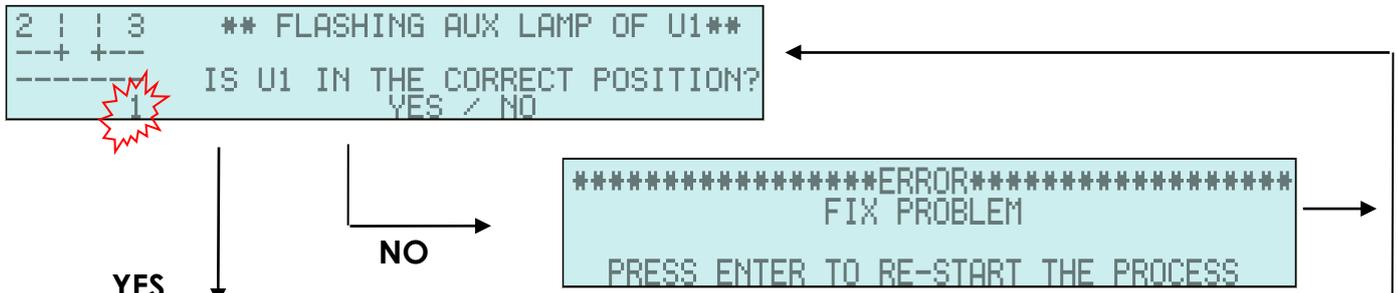
Until the above screen is confirmed, the following screen on U2 and U3 will show:

```
            GO TO UNIT 1
             FOR SETUP
```
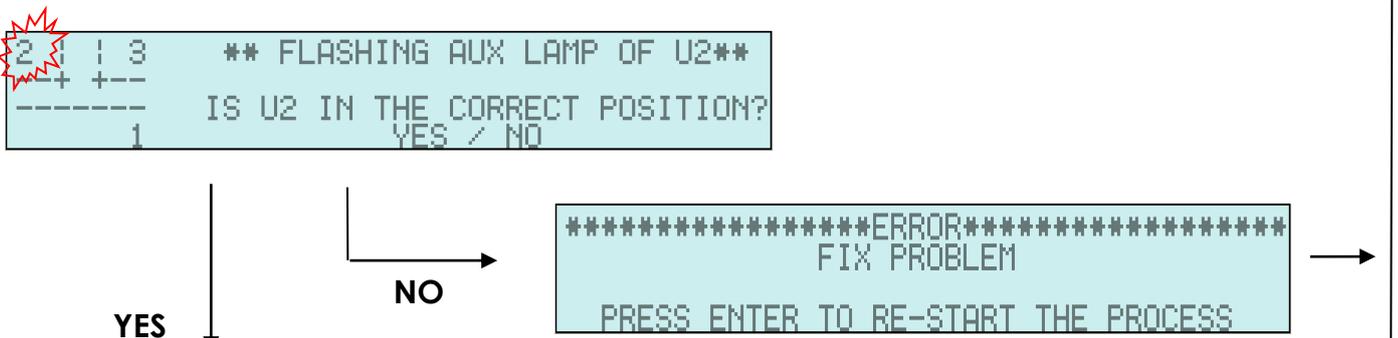
This directs the operator to go to U1 to confirm the setup.

The operator must now answer a series of questions to make sure all controllers are in the correct position **BEFORE** traffic control is enabled. Please refer to the following page for full example.
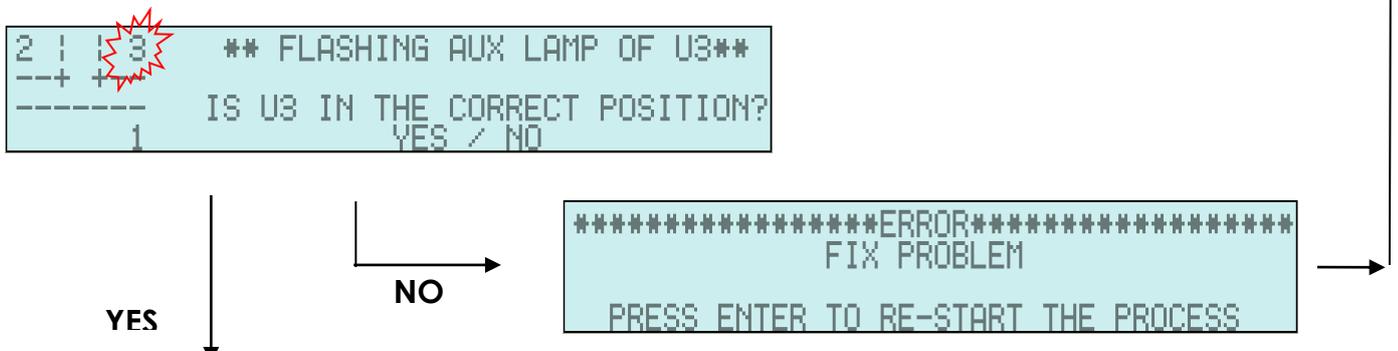
The AUX lamp will begin flashing *only* on U1 and the '1' digit in the simulated intersection on the left side of the screen will begin flashing:

```
2 ¦ ¦ 3     ** FLASHING AUX LAMP OF U1**
--+ +--
-------     IS U1 IN THE CORRECT POSITION?
     1                YES / NO
```

NO →

YES ↓

```
*****************ERROR*******************
                FIX PROBLEM

    PRESS ENTER TO RE-START THE PROCESS
```

If YES is pressed, the AUX lamp will begin flashing *only* on U2 and the '2' digit in the simulated intersection on the screen will begin flashing:

```
2 ¦ ¦ 3     ** FLASHING AUX LAMP OF U2**
--+ +--
-------     IS U2 IN THE CORRECT POSITION?
     1                YES / NO
```

NO →

YES ↓

```
*****************ERROR*******************
                FIX PROBLEM

    PRESS ENTER TO RE-START THE PROCESS
```

If YES is pressed, the AUX lamp will begin flashing *only* on U3 and the '3' digit in the simulated intersection on the screen will begin flashing:

```
2 ¦ ¦ 3     ** FLASHING AUX LAMP OF U3**
--+ +--
-------     IS U3 IN THE CORRECT POSITION?
     1                YES / NO
```

NO →

YES ↓

```
*****************ERROR*******************
                FIX PROBLEM

    PRESS ENTER TO RE-START THE PROCESS
```

When you have answered YES to all 3 questions (without a 'NO'), the following HOME screen will appear:

```
045 S          MODE : FLASH YELLOW    045 S
              COMMS : RX TX
035 S        UNIT 1 : 3 WAY           035 S
035 S         VOLTS : 13.1V
```
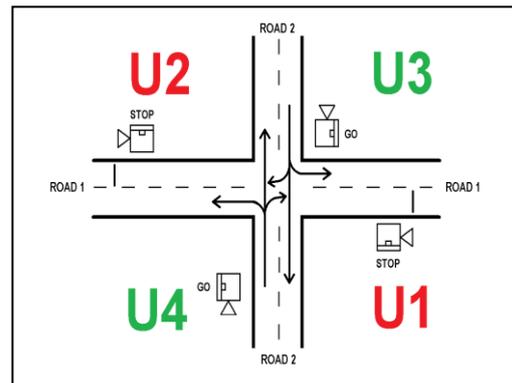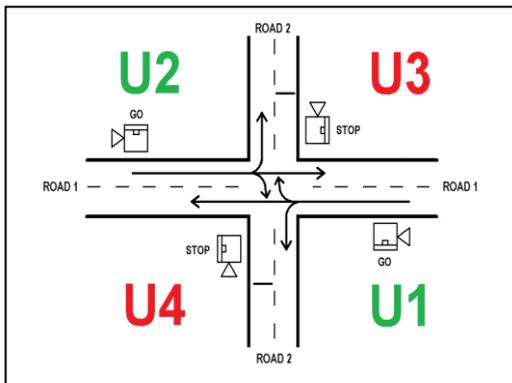
VEHICLE SENSOR, AUTO and MANUAL modes can now be selected.

4. 4 WAY Intersection Control

There are four configurations available for roadworks at a four way intersection.
The configuration procedure is the same for all four.

- 4 WAY
- 4 WAY – SHUTTLE R1
- 4 WAY – SHUTTLE R2
- 4 WAY – SHUTTLE R1 & R2
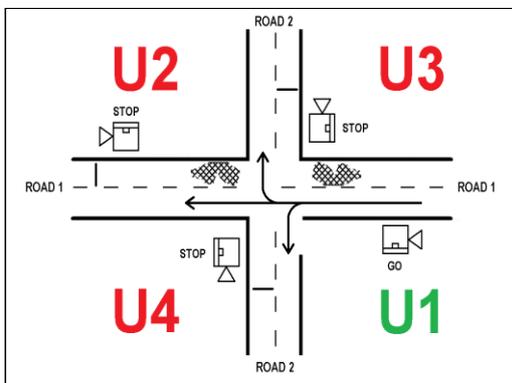

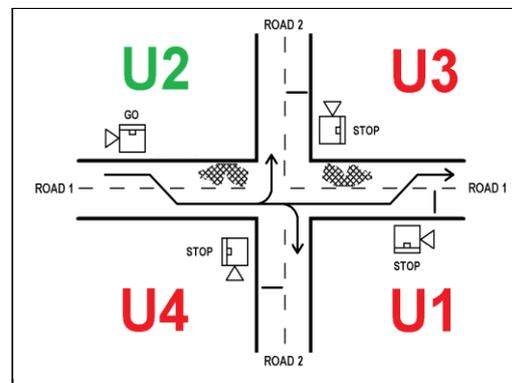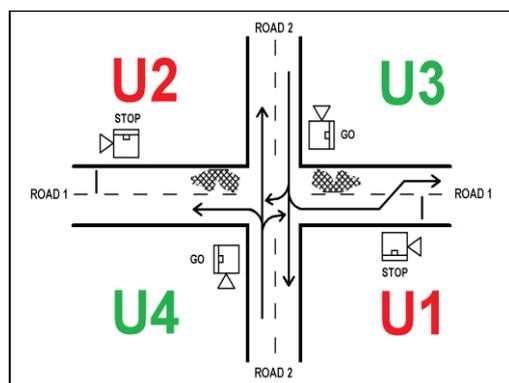### 4- WAY (Shuttle R1)

Diagram D4.1

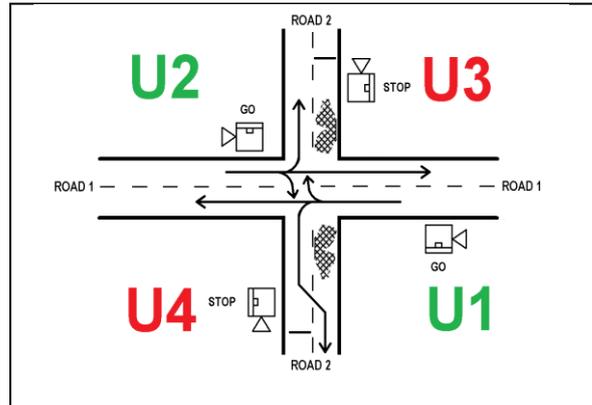Diagram D4.2

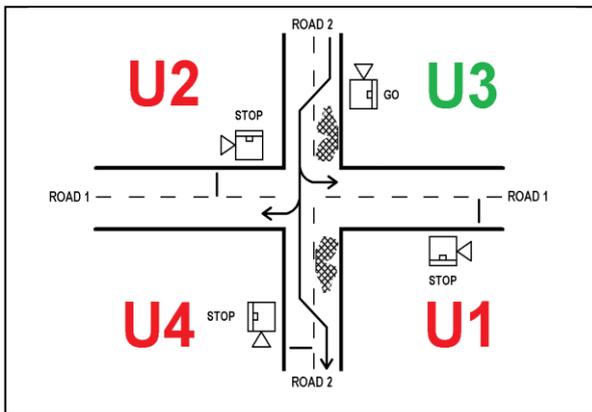Diagram D4.3

4-WAY (Shuttle R2)
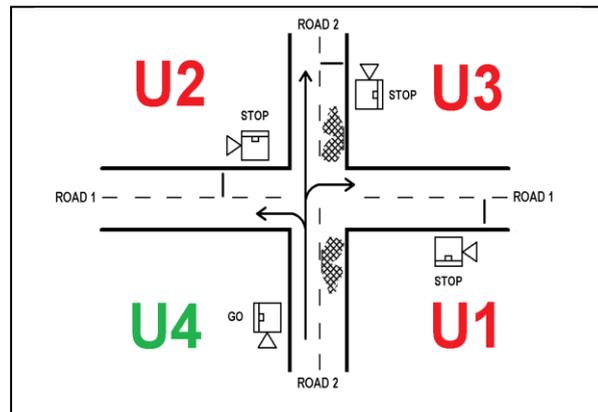

Diagram D4.4
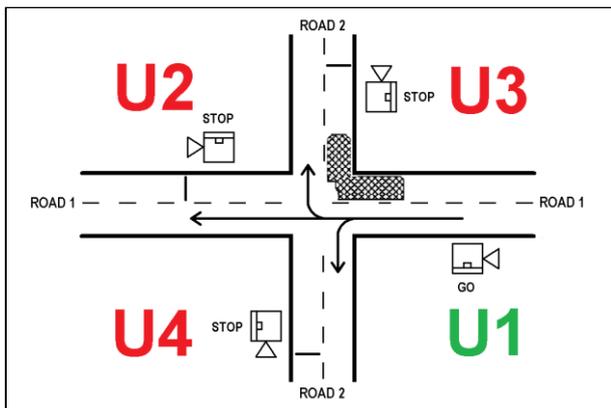

Diagram D4.5

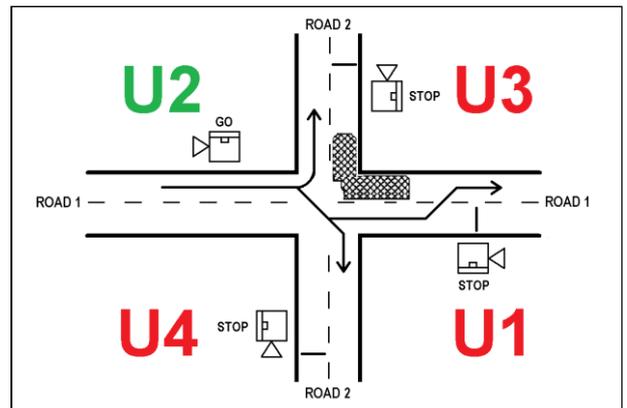Diagram D4.6

4-WAY (Shuttle R1 & R2)

Diagram D4.7

Diagram D4.8
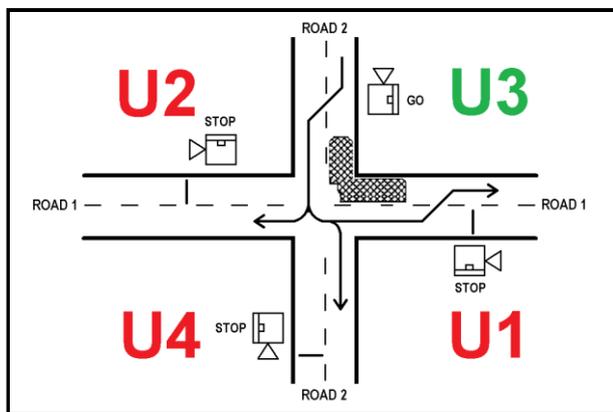
Diagram D4.9
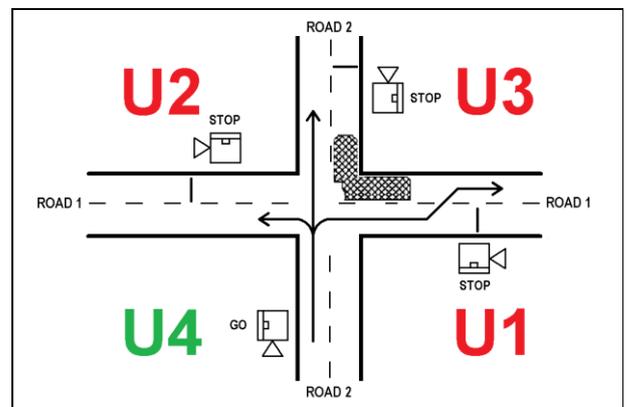
Diagram D4.10

Notes:

VEHICLE SENSOR and AUTO modes are available.

MANUAL mode is only available with the use of a CS-TRH4 wireless remote.

To configure:

1.   Obtain four CS-400 controllers.
2.   With their power off, set each controller's CONFIGURATION switch to:
        4 WAY or
        4 WAY (SHUTTLE R1) or
        4 WAY (SHUTTLE R2) or
        4 WAY (SHUTTLE R1 & R2)
        (Ensure it is the same on each controller)
3.   Select U1 for the first controller;
4.   Place controllers as per previous diagrams.
        Select U2 for the second controller;
        Select U3 for the third controller;
        Select U4 for the fourth controller.
5.   Turn all controllers on.
6.   Synchronise the controllers using the procedure on page 14.
7.   Once synchronising is complete, the screen on U1 will show the following:

```
2 ¦ ¦ 3      ** FLASHING AUX LAMP OF U1**
--+ +--
--+ +--      IS U1 IN THE CORRECT POSITION?
4 ¦ ¦ 1             YES / NO
```

Until the above screen is confirmed, the following screen on U2, U3 and U4 will show:

```
            GO TO UNIT 1
            FOR SETUP
```

This directs the operator to go to U1 to confirm the setup.

Note:
The operator must now answer a series of questions to make sure all controllers are in the correct position BEFORE traffic control is enabled.
Please refer to the following page for a full example.

The AUX lamp will begin flashing *only* on U1 and the '1' digit in the simulated intersection on the left side of the screen will begin flashing:

```
2 ¦ ¦ 3      ** FLASHING AUX LAMP OF U1**
--+ +--
--+ +--      IS U1 IN THE CORRECT POSITION?
4 ¦ ¦ 1                YES / NO
```
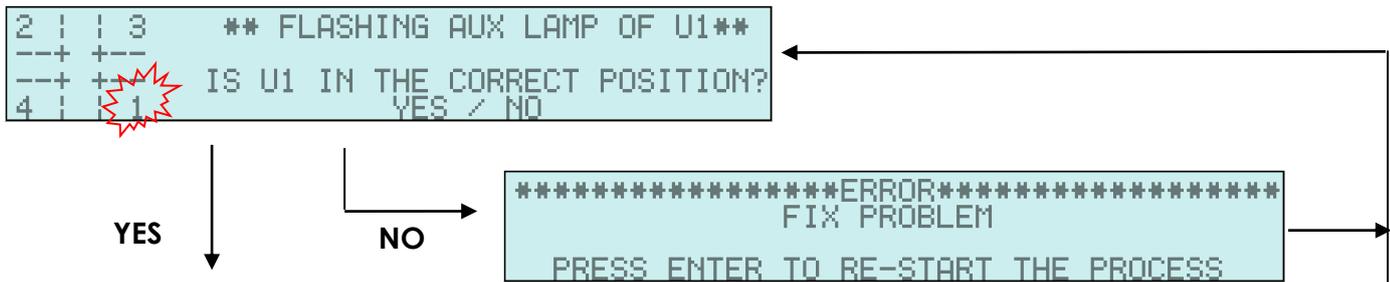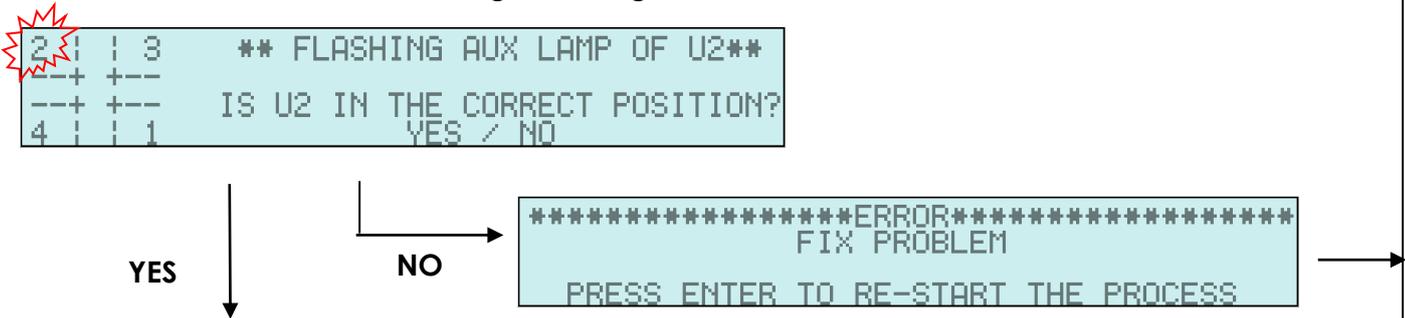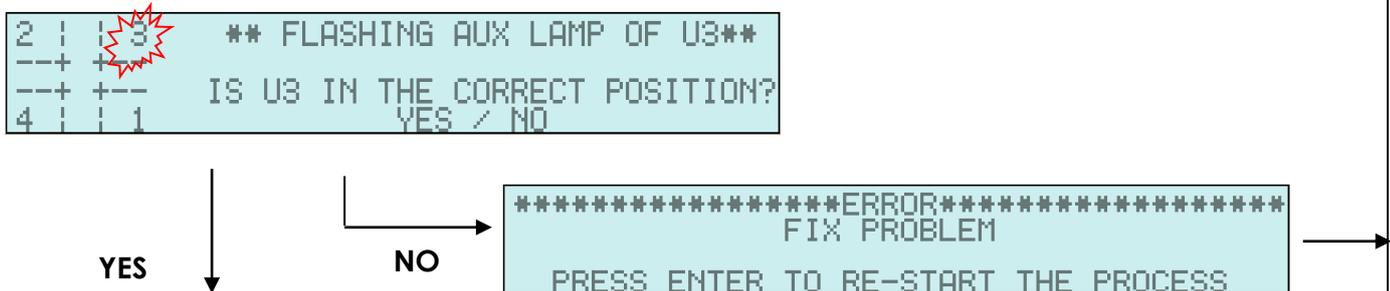
YES   **NO**

```
********************ERROR********************
                FIX PROBLEM

    PRESS ENTER TO RE-START THE PROCESS
```

If YES is pressed, the AUX lamp will begin flashing *only* on U2 and the '2' digit in the simulated intersection on the screen will begin flashing:

```
2 ¦ ¦ 3      ** FLASHING AUX LAMP OF U2**
--+ +--
--+ +--      IS U2 IN THE CORRECT POSITION?
4 ¦ ¦ 1                YES / NO
```

YES   **NO**

```
********************ERROR********************
                FIX PROBLEM

    PRESS ENTER TO RE-START THE PROCESS
```

If YES is pressed, the AUX lamp will begin flashing *only* on U3 and the '3' digit in the simulated intersection on the screen will begin flashing:

```
2 ¦ ¦ 3      ** FLASHING AUX LAMP OF U3**
--+ +--
--+ +--      IS U3 IN THE CORRECT POSITION?
4 ¦ ¦ 1                YES / NO
```

YES   **NO**

```
********************ERROR********************
                FIX PROBLEM

    PRESS ENTER TO RE-START THE PROCESS
```

If YES is pressed, the AUX lamp will begin flashing *only* on U4 and the '4' digit in the simulated intersection on the screen will begin flashing:

```
2 ¦ ¦ 3      ** FLASHING AUX LAMP OF U4**
--+ +--
--+ +--      IS U4 IN THE CORRECT POSITION?
4 ¦ ¦ 1                YES / NO
```

YES   **NO**

```
********************ERROR********************
                FIX PROBLEM

    PRESS ENTER TO RE-START THE PROCESS
```
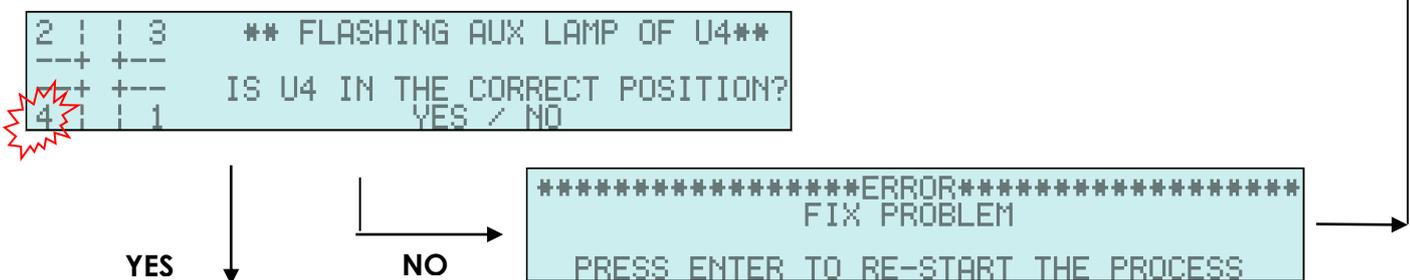
When you have answered YES to all 4 questions (without a 'NO'), the following HOME screen will appear:

```
045 S          MODE : FLASH YELLOW      045 S
               COMMS : RX TX
035 S          UNIT 1 : 4 WAY           035 S
035 S          VOLTS : 13.1V            035 S
```

VEHICLE SENSOR, AUTO and MANUAL modes can now be selected.

5. CUSTOM

This selection enables either SINGLE controller operation (for a one way road); or a variation of the SHUTTLE operation but with two controllers facing each direction of traffic on one road.

SINGLE MODE:

One road, with one or more lanes allowing traffic in one direction only.
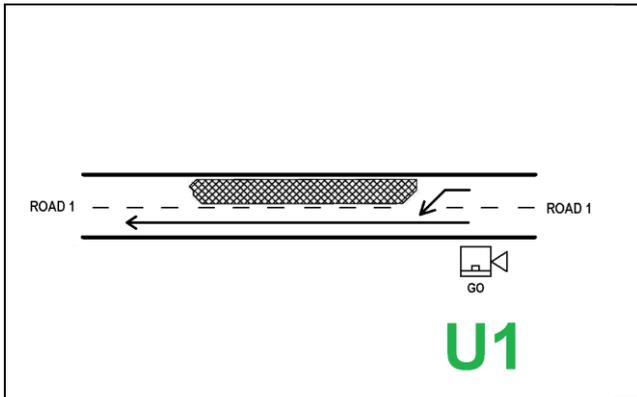
Diagram D5.0
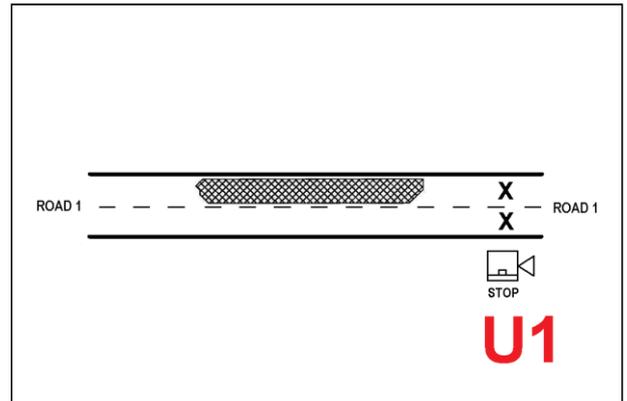
Diagram D5.1

DUAL LANTERN MODE:

Two lanterns in each direction.
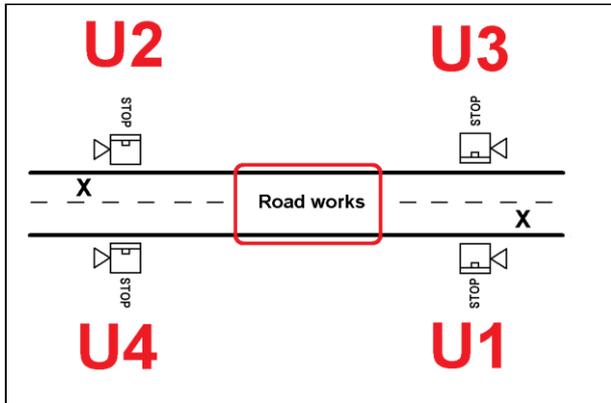
Diagram D5.3
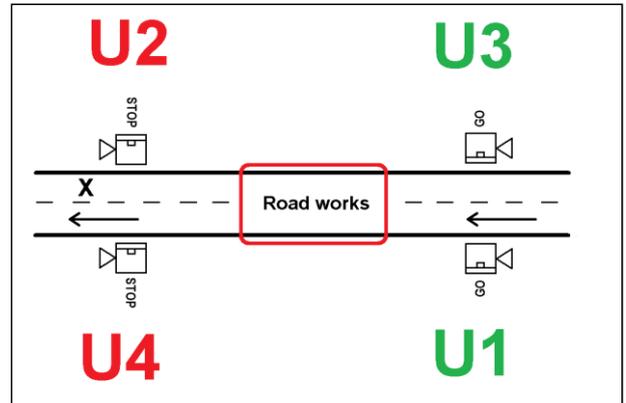
Diagram D5.4
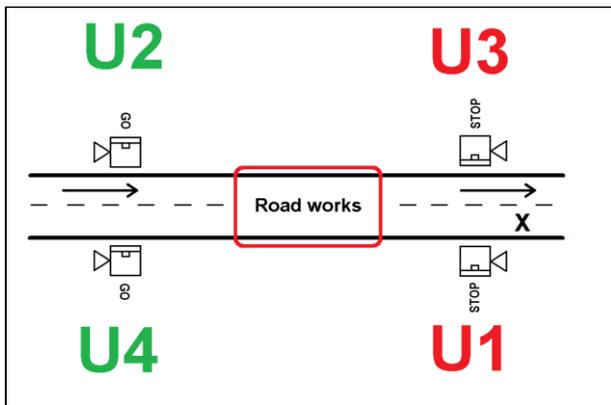
Diagram D5.5

Note: The SHUTTLE version accessed directly via the CONFIGURATION switch allows for only one controller facing each direction of traffic on one road.

In DUAL LANTERN mode, U3 duplicates U1's status and U4 duplicates U2's status.
An additional lantern on the roadside assists traffic in seeing the main (U1 or U2) lantern.

5.1 SETUP (SINGLE):

With the power off, set the CONFIGURATION switch to CUSTOM and the UNIT switch to U1.
Power on and the screen will show:

```
             SELECT MODE

         1 - SINGLE MODE
     2 - DUAL LANTERN MODE
```

In SINGLE mode, only one controller is used.
This configuration can ONLY be used in MANUAL mode

After the operator presses "1", the HOME screen will appear:

```
004 S              MODE : FLASH YELLOW
                  COMMS :       TX
                 UNIT 1 : SINGLE
                  VOLTS : 13.8V
```

This configuration must be controlled manually, so a MC-400 wired controller or CS-TRH4
wireless controller will need to be connected.

Once connected, select MANUAL mode or press the MC-400's RED button / CS-TRH4's STOP
button.
The lantern will go RED and is now under the control of the wired/ wireless controller.

Note:
If it is desired to use DUAL LANTERN configuration immediately after SINGLE configuration, the operator must:
  1. **Power off;**
  2. **Select another configuration;**
  3. **Power on;**
  4. **Power off;**
  5. **Select CUSTOM again;**
  6. **Select DUAL LANTERN;**
  7. **Continue as usual.**

5.2 SETUP (DUAL LANTERN):

The setup for DUAL LANTERN is similar to normal SHUTTLE configuration combined with 4 WAY
configuration.

To configure:

1.   Obtain four CS-400 controllers.
2.   With their power off, set each controller's CONFIGURATION switch to CUSTOM
3.   Select U1 for the first controller;
       Select U2 for the second controller;
       Select U3 for the third controller;
       Select U4 for the fourth controller.
5.   Turn all controllers on and select option 2. "DUAL LANTERN MODE"
6.   Synchronise the controllers using the procedure on page 14.
7.   Once synchronising is complete, the screen on U1 will show the following:

```
2      3    ** FLASHING "U1" LAMP OF U1 **
-------
-------      IS U1 IN THE CORRECT POSITION?
4      1    YES / NO
```

This follows the same approach as any of the 4 WAY configurations.
The left side of the screen simulates one road and the position of all controllers.

8.   Power off all controllers and re-position Units 2, 3 & 4 to their correct location.
9.   Power on all controllers and go to Unit 1.
10.   Confirm all screen questions. (Refer to page 33 for details.)

During this verification procedure, Units 2, 3 & 4 will show:

```
            GO TO UNIT 1
            FOR SETUP
```

Once U4's position has been verified, all controllers will show the HOME screen:

```
010 S            MODE : FLASH YELLOW
                COMMS : RX TX
020 S          UNIT 1 : 2 WAY DUAL LANTERN
030 S           VOLTS : 13.5V
```

The system may now be controlled using all MODES.

MC-400 wired remote controls may be plugged in to any or all CS-400 controllers.
CS-TRH4 wireless remote controls may now be synchronised to U1.

Notes:
Although four controllers are in use, this CONFIGURATION is equivalent to normal SHUTTLE. As a result, only one RED TIME and two GREEN TIMES are shown.

The REPEATER option is not usable in this configuration.

If it is desired to use SINGLE configuration immediately after DUAL LANTERN configuration, the operator must:
1. **Power off;**
2. **Select another configuration;**
3. **Power on;**
4. **Power off;**
5. **Select CUSTOM again;**
6. **Select SINGLE;**
7. **Continue as usual.**

6. Repeater

The use of a REPEATER is to allow the operation of a portable traffic light system where clear line of sight is not possible. This may arise when road works are carried out in hilly terrain or where the road curves around the side of a hill.
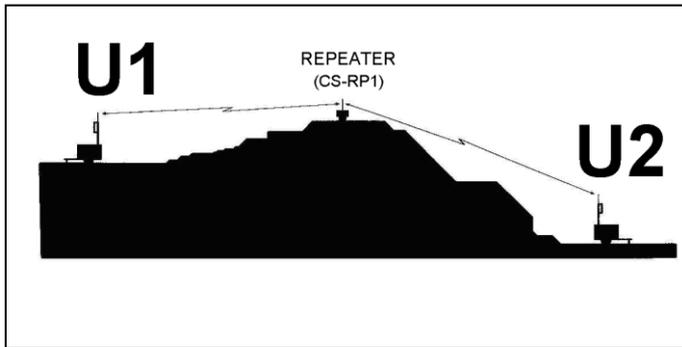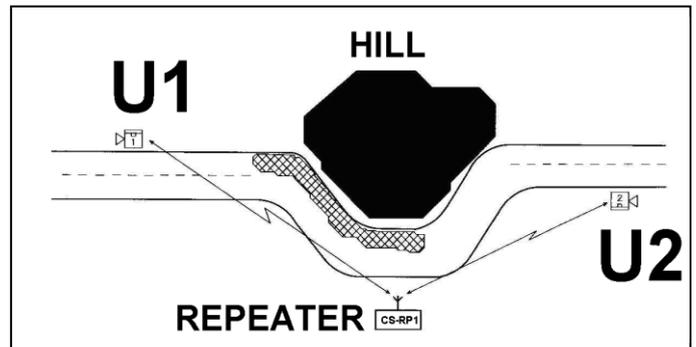

Diagram D6.0

Diagram D6.1

NOTE
- Repeaters can ONLY be added to a **SHUTTLE** or **2 WAY** configuration
- Only **ONE** repeater can be added to a system
- CS-TRH4 wireless remotes **must** be synchronised to U1 before U1 is synchronised to the Repeater

*Note: The REPEATER **must** be synchronised last.*

To configure:

- Obtain two CS-400 controllers, one CS-RP1 REPEATER and CS-TRH4 radio remote if it is to be used.
- Select SHUTTLE configuration on U1 and U2 and synchronise CS-400's controllers using the procedure on page 14.
- Synchronise CS-TRH4 remote using the procedure on page 15.
- Check TRH4 can communicate with U1.

After all the previous steps, now synchronise U1 to the REPEATER:

Press the SYNC button on U1 for 5 seconds. U1's screen will show:

```
            SYNCING TO REPEATER
    PLEASE PRESS SYNC ON OTHER DEVICE
```

Press the SYNC button on the REPEATER.
When synchronised, the HOME screen on U1 will show:

```
050 S        MODE : FLASH YELLOW
             COMMS : RX TX  [R]
060 S      UNIT 1 : SHUTTLE
060 S       VOLTS : 14.2V
```

Note the **[R]** repeater character. This shows U1 and U2 are communicating via the REPEATER.
Note: Only U1 is required to be synchronised to the REPEATER.
U2 will synchronise automatically.

Various connectivity screens will show on the REPEATER until the following main HOME screen is reached:

```
UNIT 1 [OK]                          UNIT 2 [OK]

             COMMS : RX TX
             VOLTS : 13.4V
```

This shows U1 and U2 are being received (OK), the REPEATER is receiving (RX) and transmitting (TX) data. The detected supply voltage is 13.4V.

Placement of Controllers

Position the REPEATER at the top of the hill or on the corner of a bend so that both U1 and U2 have clear line of site of the REPEATER.

Position the U1 & U2 at either end of the road works as per the diagram on page 35 and turn on.

- All modes are available in this configuration
    - Flash Yellow
    - Manual
    - Auto
    - Vehicle Sensor

- The system can be controlled at either U1or U2

To reset Repeater (Delete all stored data)

- Turn repeater off
- While holding down **SYNC** button, turn repeater **ON**
- All stored data has now been reset

* Reason:
      When a REPEATER has been enabled in a system, it effectively takes control of the system away from U1. Resetting the REPEATER allows U1 to regain control.

7.   Cable Connection

Where a wireless (radio) connection between two controllers is not practical, it is possible to connect them via a cable.

Procedure:

1.   Ensure distance between U1 and U2 does not exceed length of the cable.
2.   Connect the cable to the connectors marked CABLE, between U1 and U2.
3.   Select the correct CONFIGURATION; either:
               SHUTTLE or
               2 WAY (HAUL ROAD)
4.   Power on both U1 and U2.

Both U1 and U2's screen will show 'RX TX CABLE', indicating a successful link between U1 and U2:

```
045 S        MODE : FLASH YELLOW
             COMMS : RX TX CABLE
040 S        UNIT 1 : SHUTTLE
040 S        VOLTS : 13.1V
```

Notes: No SYNC is required.
           System operation is the same as wireless communications.
           A cable link can only be used in SHUTTLE or 2-WAY configuration.

If the cable is removed from U1, the following is immediately shown on U1's screen:

```
*************** WARNING ****************
      NOT RECEIVING DATA FROM UNIT 2
                 CABLE
```

If the cable remains unplugged for more than 5 seconds, U1's screen will show the error:

```
*************** ERROR ****************
         LOST COMMS WITH UNIT 2
```

If an operational error occurs 5 or more times in 20 minutes, the screen on U1 and the offending Unit will show 'system unreliable':

```
*************** ERROR ****************
           SYSTEM UNRELIABLE
```

MENU OPTIONS

- A menu system provides access to less used features of the CS-400
- To select the menu, **press and hold** the MENU button for 2 seconds
- To correct an entry error or go back to a previous screen press the CLEAR button
- To exit the MENU system and return to the main operating screen, press the HOME button

MENU screen:

```
1 RED CLEARANCE TIME   5 HOUR METER
2 ERROR LOG            6 PHONE REPORTING
3 HAUL                 7 AUX LAMP [SOLID]
4 LANTERN TIMES        8 MISC
```

1.   RED CLEARANCE TIME:

```
1 ROAD-1 RED CLEARANCE   004
2 ROAD-2 RED CLEARANCE   004
```

Selecting either 1 or 2 will show:

```
                        TIME 000

        (RANGE 004 TO 100)
     TYPE IN TIME & PRESS ENTER
```

Enter the time in seconds within the specified range for the new RED CLEARANCE time.
A correct time will update the RED CLEARANCE time menu screen with the newly-entered value.

An incorrect entry informs the operator of the error and requires them to press a key to continue and re-enter a correct value

2.   ERROR LOG.

The following screen shows U1's error log. This would be expected when no errors have been generated:

```
01  - U1 HAS NO ERROR
02  - U1 HAS NO ERROR
03  - U1 HAS NO ERROR
04  - U1 HAS NO ERROR
```

By default, the most recent error message is shown.
Pressing the '2' key to scroll UP and the '8' key to scroll DOWN will reveal an additional 8 entries.
Note: The asterisk ' ＊ ' next to 01 and 02, indicates a fault that occurred on a controller within the configuration. In the example below, U2 has had 2 faults occur.

```
01* - U2 HAS LANTERN 1 GREEN FAIL
02* - U2 HAS LANTERN 1 RED FAIL
03  - U1 HAS LOW VOLTAGE ON 11.2V
04  - U1 HAS LOST COMMS WITH U2
```

### 3.		VOLTAGES

From U1, shows the detected supply voltage for all connected controllers.
From U2 – U4, shows only the local supply voltage.

### 4.		LANTERN TIMES

The default screen for LANTERN TIMES is:

```
1 STATE CODES-VIC   5 MIN RED        004
                    6 MAX RED        100
3 YELLOW      004   7 MIN GREEN      010
4 GREEN EXT   005   8 MAX GREEN      150
```

STATE CODES

The default setting is VIC.
To change, select 1; the screen will show this screen:

```
1 ACT   5 SA        SELECTED STATE
2 NSW   6 TAS            VIC
3 NT    7 VIC
4 QLD   8 WA
```

Select the digit next to the state required.

The screen will prompt the operator for a password. After correctly entering the password, the state selected will automatically appear in the main LANTERN TIMES menu along with all time changes relevant to that state.

<p align="center">**<u>Example:</u>**</p>
<p align="center" style="color:red">From the LANTERN TIMES menu, to change from the default VIC state to QLD
enter the following button sequence:</p>

<p align="center" style="color:red">1, 4, {password}, ENTER</p>

The password is, by default, the serial number of the CS-400 controller.

NOTE: If this number is entered and the password is wrong, consult your supplier.

YELLOW time

The default time is 4 seconds (shown as '004').

Pressing menu option '3' will show this screen:

```
         YELLOW TIME 000

        (RANGE 004 TO 005)
     TYPE IN TIME & PRESS ENTER
```

Type in '4' or '5' and press ENTER.

The operator will then be returned to the main LANTERN TIMES screen with the updated YELLOW TIME displayed.

Note: If a time other than '4' or '5' is entered, the operator will be presented with an error message. This will then require a key to be pressed by the operator and a correct value to be entered

GREEN EXTENSION TIME

This time refers to the VEHICLE SENSOR mode extension time.
The default is 5 seconds (shown as '005').

Pressing menu option '4' will show this screen:

```
          GREEN EXTENSION TIME 000

             (RANGE 003 TO 006)
          TYPE IN TIME & PRESS ENTER
```

Enter a value within the range specified and press ENTER.
The operator will then be returned to the main LANTERN TIMES screen with the updated GREEN EXT time displayed.

Note:
- If an incorrect value is entered, the operator will be presented with an error message. This will then require a key to be pressed by the operator and a correct value to be entered

** Refer to VEHICLE SENSOR section for details on how this time is used.

MIN RED time

This refers to the minimum time in any other menu that the RED lantern time can be set to.
The default is 4 seconds (shown as '004') for Victoria. This will change from state to state.

Pressing menu option '5' will show this screen:

```
             MIN RED TIME 000

             (RANGE 002 TO 099)
          TYPE IN TIME & PRESS ENTER
```

Enter a value within the range specified and press ENTER.
The operator is presented with a "Forticode Code" which he/she must take a photo of the display and send it to A1 Roadlines to obtain a deciphered code which is entered.
The operator will then be returned to the main LANTERN TIMES screen with the updated MIN RED time displayed.

Note:
- If an incorrect value is entered, the operator will be presented with an error message. This will then require a key to be pressed by the operator and a correct value to be entered

- When the configuration is changed, all times revert back to the default setting.

MAX RED time

This refers to the maximum time in any other menu that the RED lantern time can be set to. The default is 100 seconds (shown as '100') for Victoria. This will change from state to state.

Pressing '6' will show this screen:

```
        MAX RED TIME 000

       (RANGE 002 TO 255)
     TYPE IN TIME & PRESS ENTER
```

Enter a value within the range specified and press ENTER.
The operator is presented with a "Forticode Code" which he/she must take a photo of the display and send it to A1 Roadlines to obtain a deciphered code which is entered.
The operator will then be returned to the main LANTERN TIMES screen with the updated MAX RED time displayed.

Note:
- If an incorrect value is entered, the operator will be presented with an error message. This will then require a key to be pressed by the operator and a correct value to be entered

- When the configuration is changed, all times revert back to the default setting.

MIN GREEN time

This refers to the minimum time in any other menu that the GREEN lantern time can be set to. The default is 10 seconds (shown as '010') for Victoria. This will change from state to state.

Pressing '7' will show this screen:

```
        MIN GREEN TIME 000

       (RANGE 002 TO 099)
     TYPE IN TIME & PRESS ENTER
```

Enter a value within the range specified and press ENTER.
The operator is presented with a "Forticode Code" which he/she must take a photo of the display and send it to A1 Roadlines to obtain a deciphered code which is entered.
The operator will then be returned to the main LANTERN TIMES screen with the updated MIN GREEN time displayed.
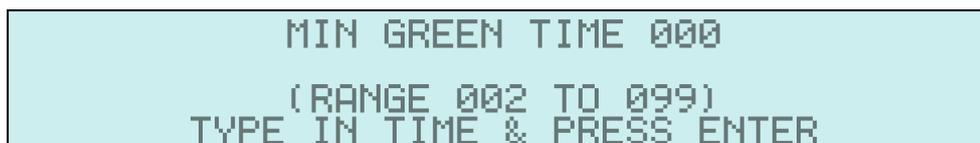
Note:
- If an incorrect value is entered, the operator will be presented with an error message. This will then require a key to be pressed by the operator and a correct value to be entered

- When the configuration is changed, all times revert back to the default setting.

MAX GREEN time

This refers to the maximum time in any other menu that the GREEN lantern time can be set to. The default is 150 seconds (shown as '150') for Victoria. This will change from state to state.

Pressing '8' will show this screen:

```
          MAX GREEN TIME 000

          (RANGE 002 TO 255)
     TYPE IN TIME & PRESS ENTER
```

Enter a value within the range specified and press ENTER.
The operator is presented with a "Forticode Code" which he/she must take a photo of the display and send it to A1 Roadlines to obtain a deciphered code which is entered.
The operator will then be returned to the main LANTERN TIMES screen with the updated MAX GREEN time displayed.

Note:
- If an incorrect value is entered, the operator will be presented with an error message. This will then require a key to be pressed by the operator and a correct value to be entered

- When the configuration is changed, all times revert back to the default setting.

5.   HOUR METER

This displays the total operating hours of the individual CS-400:

```
HOUR METER:           154.2 HOURS
```

Note: It is not possible for the operator to reset this meter.

6.   AUX LAMP

The AUX lamp is designed to turn on when the attached lantern head is RED.
The operator can choose whether the lamp stays on or pulses about once per second.

7.   MISC

Select FLASH YELLOW mode, then enter the MENU system.
Selecting 8 MISC shows the following screen:

```
          (C) A1 ROADLINES
     S/N : 1111 CH: 53 NET: 229

     6 TESTS   7 INFO   8 A1
```

Option **6 TESTS** provides a way to test the lantern head for both Lantern 1 and Lantern 2:

```
1 LANTERN 1 - ALL ON 10 SECONDS
2 LANTERN 2 - ALL ON 10 SECONDS
```

Selecting 1 LANTERN 1 will turn on all of Lantern 1's RED, YELLOW and GREEN lights.
Selecting 2 LANTERN 2 will turn on all of Lantern 2's RED, YELLOW and GREEN lights.

Notes: No indication will appear on the controller's status LEDs that all lantern lights are on.

Option **7 INFO** provides manufacturer contact details.

Option **8 A1 Roadlines** is for use by A1 Roadlines personnel only.

TROUBLESHOOTING

Change radio communication channel

If communications are intermittent, the radio communication channel can be changed manually which may improve the reliability of the connection.

Select FLASH YELLOW
On **U1**, hold down the ENTER key for 5 seconds
The screen will show

```
*************** WARNING ****************
          COMMS CHANNEL UPDATED
```

The system will automatically change ALL UNITS, including wireless remotes, to a new frequency channel.

Ensure CS-TRH4 wireless remotes are switched ON when this change is done. This avoids the need to manually synchronise them again.

If an existing unit does not synchronise automatically, re-synchronise it as per the initial synchronising procedure on page 14

Faults and remedies:

FAULT	REMEDY (in steps)
Ux lost comm's with Uy	Change channel, replace Ux, replace Uy, check line-of-sight, check for interference, check antenna systems, check power supplies…
Controller will not turn ON	Check power supply, replace controller…
Lantern X {colour} fail	Check lantern head, installed Ux in known good trailer, check power supply…
Screen blank after power ON	Is temperature very cold/hot? (Y: wait a few minutes), N: Check power supply…
Screen missing characters or lines of text	Check CONFIGURATION…
Audible alarm won't stop after 5 minutes	Did error clear and then re-occur?...
Comm's error when cable is removed from between U1 & U2.	Normal. Power OFF U1 & U2 and re-SYNC them…
System does not respond to CS-TRH4 key presses	Do the CS-TRH4 status LEDs flash? Re-SYNC CS-TRH4 to U1…
System does not respond to MC-400 button presses	Valid CONFIGURATION?, valid MODE?...
Can't SYNC Ux to U1	Check CONFIGURATION is the same as U1, check UNIT number is appropriate for CONFIGURATION,
Can't SYNC TRH4 to U1 after REPEATER synchronised.	Must SYNC all TRH4 radios to U1 before SYNCing U1 to REPEATER.
TIMES are not shown on screen	TIMES are not shown in MANUAL mode.
GPS-SMS option not seen	Is option installed? Wait 90 seconds after power ON, check antenna systems…

GLOSSARY

UNIT CONTROLLER	The CS-400 device drives a lantern head. On a roadway with two or more controllers, each CS-400 must be uniquely identified. From an operator's perspective, this is done using a 'U' (Unit) number. To simplify this guide, we use 'U1' to mean Unit 1, 'U2' to mean Unit 2, etc.
SYNC	Synchronising, to enable two CS-400 compatible devices to communicate with each other
REPEATER	A device that allows two CS-400s to communicate with each other when 'line-of-sight' is not possible.
RED CLEARANCE TIME	The time after a signal goes RED which allows traffic to clear an area before conflicting traffic is given a GREEN signal
GREEN RUNNING TIME	The allocated time the GREEN lantern is on to allow traffic to flow through the road works.
SMS	Short Message Service; text messaging (39 Characters for address entry)
GPS	Global Positioning System. A system that permits a device to know where it is located anywhere on the Earth's surface.
RF	Radio Frequency. Wireless. The primary method two CS-400 devices communicate with each other.
Cable	An alternative method for two CS-400 devices to communicate. This is a wired connection, typically 25 metres long.
System	A set of CS-400 controllers. This may be as few as one controller or as many as four controllers. It may include wired and wireless remote controls.
HOME screen	The normal operating screen on the controller.
MENU	A selectable set of options used to preset the operational characteristics of the controller.

REVISION HISTORY

Version	Date	Comments
14.3	07.11.2018	Changed all references for the Configuration position "OTHER" to "CUSTOM".
14.2	04.10.2018	• Updated RP1 note to clarify Repeater synchronising process. • Updated Operational Matrix to include Repeater in 2 Way mode.
14.1	31.08.2018	Initial published document

Warranty

A1 Roadlines Pty Ltd warrants the equipment to be free from defects in material and workmanship on the date of delivery to customer.

As the customer's sole remedy for breach of this warranty, A1 Roadlines Pty Ltd will, for a period of twelve (12) months from the date of delivery, repair or replace any part of the equipment proven defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with instructions and recommendations.

This warranty does not cover, and we shall not be liable for, any malfunction, damage or wear caused by inappropriate use, corrosion, inadequate maintenance, negligence, accident, tampering or substitution of non-compatible component parts. Nor shall we be liable for malfunction, damage or wear caused by the incompatibility with the manufacturer's equipment of structures, accessories, equipment or materials not supplied by A1 Roadlines Pty Ltd.

A1 Roadlines will not recognise a warranty claim under the following circumstances:

1. If a defect to this product resulted from repair attempts by personnel other than A1 Roadlines.

2. If a defect has occurred as a result of connection to incompatible equipment.

3. If a defect occurs where the product has been modified.

4. If any defect, failure or damage caused is by improper use, improper or inadequate maintenance or improper care.

This warranty is conditioned upon the pre-paid return of the equipment claimed to be defective for examination by A1 Roadlines Pty Ltd to verify the claimed defect. If the claimed defect is verified, A1 Roadlines Pty Ltd will repair or replace, free of charge, and defective parts. The equipment will be returned to the Customer, transport pre-paid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at reasonable charge, such charges may include the cost of parts, labour and transport.

To arrange warranty service please contact:

<div align="center">

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