Loop Detector
Single and Dual Loops
Plug In

LDP1, LDP2

Instruction manual

Betriebsanleitung

Manuel d'instructions

Manual de instrucciones

Manuale d'istruzione

Brugervejledning

使用手册

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1. Introduction

This manual is a reference guide for Carlo Gavazzi loop detector LDP1 and LDP2. It describes the product specifications as well as how to install, set up and use the product for its intended use.

1.1 Description

Carlo Gavazzi loop detector are devices designed and manufactured in accordance with IEC international standards and are subject to the Low Voltage (2014/35/EU) and Electromagnetic Compatibility (2014/30/EU) EC directives.

Please do not hesitate informing us to make any suggestions for improving this document.

1.2 Validity of documentation

This manual is valid only for LDP1 and LDP2 Loop detector and until any newer documentation is published. This instruction manual describes the functions, operations and installation of the product for its intended use.

1.3 Who should use this documentation

This manual contains important information regarding installation and must be read and completely understood by specialized personnel dealing with these kinds of devices.
We highly recommend that you read the manual carefully before installing the loop detector. Please save the manual for future use. The installation manual is intended solely for qualified technical personnel.

1.4 Use of the product

Loop detector is primarily used to detect vehicles such as cars, trucks, buses and others.
A loop on the ground is required for the loop detector to detect any vehicles above the loop. The device works on the same principle of an inductive sensor; utilizing the phenomenon of eddy current. When a metal target/vehicle approaches on top of the loop, the magnetic field generated by the loop interacts with the target and make the loop detector to change its status.
Loop detector can be used in carpark barriers, bollards, gates, toll gantries and many other door access applications.

1.5 Safety precautions

This loop detector must not be used in applications where personal safety depends on the function of the loop detector (The loop detector is not designed according to the EU Machinery Directive).
Installation and use must be carried out by trained technical personnel with basic electrical installation knowledge.
The installer is responsible for correct installation according to local safety regulations and must ensure that a defective loop detector will not result in any hazard to people or equipment. If the loop detector is defective, it must be replaced and secured against unauthorized use.

1.6 Other documents

It is possible to find the datasheet, manuals, brochures and electrical drawings on the Internet at http://gavazziautomation.com

1.7 Acronyms

I/O	Input/Output
PD	Process Data
PLC	Programmable Locic Controller
SIO	Standard Input Output
SP	Setpoints
IODD	I/O Device Description
IEC	International Electrotechnical Commission
NO	Normally Open contact
NC	Normally Closed contact
NPN	Pull load to ground
PNP	Pull load to V+
Push-Pull	Pull load to ground or V+
QoR	Quality of Run
QoT	Quality of Teach
UART	Universal Asynchronous Receiver-Transmitter
SO	Switching Output
SSC	Switching Signal Channel

2. Product

2.1 Main features

- Loop input inductance: 20 µH to 1000 µH
- Adjustable sensitivity in 10 steps: 0.01% to 1.00% via potentiometer
- Automatic loop frequency tuning or manual tuning
- 4 adjustable loop frequency channels to avoid crosstalk
- Automatic Sensitivity Boost (ASB) for high bed vehicle detection
- Fail safe and fail secure mode is selectable
- 2 x SPDT relay outputs, selectable operation as pulse or presence switching
- Multicolor power/fault LED indication for easy setup and intuitive diagnostic
- Individual loop state multicolor LED to indicate different loop status and fault.
- Loop diagnostic capability: loop short circuit, loop open circuit, inductance out of range, channels crosstalk.
- Directional logic for dual loop.
- Wide range power supply: 24-240 VAC/VDC, 45-65 Hz

2.2 Identification number

Code	Option	Description
L	**-**	Loop
D	**-**	Detector
P	**-**	Plug in
1/2	**1**	Single Loop
	2	Dual Loop
P	**-**	Potentiometer
A	**-**	Adjustment
2	**-**	Number of outputs
D	**-**	2 x SPDT outputs
U24	**-**	Power supply 24 - 240 VAC/VDC

Number of loops	Code
1	LDP1PA2DU24
2	LDP2PA2DU24

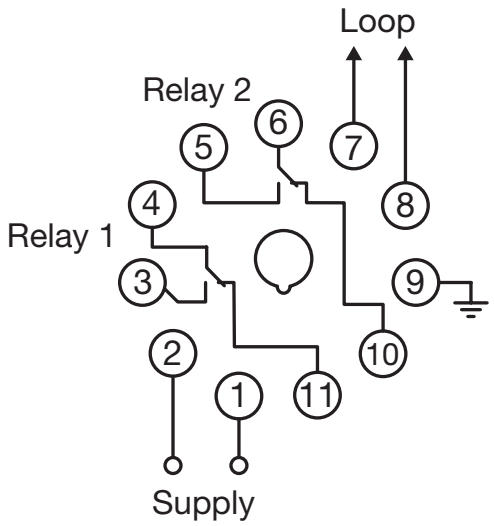
2.3 Specifications

Loop input inductance	20 µH ... 1000 µH
Adjustable sensitivity	0,01% ... 1,00%
Number of adjustable steps	10
Number of frequency channels	4
Frequency range	10 ... 130 kHz
Loop fault detection	Short circuit, open circuit, inductance out of range, frequency crosstalk
Response time	130 ms
Output type	Relay
No of output	2 x SPDT
Output mode	Pulse or presence; selectable via dip switch
Output Assignment	LDP1: 2 x SPDT for loop 1 LDP2: 1 x SPDT for loop 1 and 1 x SPDT for loop 2
Rated operational voltage	250 VAC/VDC
Rated operational current (Ie)	AC1: 5 A @ 250 VAC DC1: 1 A @ 30 VDC
Mechanical lifetime	15×10^6
Electrical lifetime	>100 000 operations (@5A load)
Protection	Reverse polarity and transients
Rated operational voltage (UB)	24 ... 240 VAC/VDC
LDP1 Power consumption	24 VAC/VDC < 2 W / 3.5 VA 115 VAC/VDC < 2 W / 6 VA 240 VAC/VDC < 2.5 W / 7 VA
LDP2 Power consumption	24 VAC/VDC < 2.5 W / 4 VA 115 VAC/VDC < 2.5 W / 7 VA 240 VAC/VDC < 3 W / 8 VA
Rated supply frequency	45 to 65 Hz
Rated insulation voltage	800 V
Rated impulse withstand voltage	4 kV (1.2/50 µs)
Power-ON delay (tv)	5 seconds
Protection	Reverse polarity, transients
Ambient temperature	-40° ... +70°C (-40° ... +158°F) (operating) -40° ... +70°C (-40° ... +158°F) (storage)
Ambient humidity range	0% ... 90% (operating) 0% ... 90% (storage)
Overvoltage category	III (IEC)
Degree of protection	IP30 (IEC)
Pollution degree	2 (IEC)
Connection type	11 pin circular plug-in
Connection at socket (ZPD11A)	Screw terminal
Housing material	PPO PX9406-802, PPO Noryl SE1
Colour	RAL 7035 (Grey)
Dimensions	81mm (h) x 35.5mm (w) x 60.2mm (d)
Weight	LDP1: 105 g LDP2: 108g

3. Wiring diagrams

LDP plug in version required to be plugged into a socket ZPD11A which is sold separately.

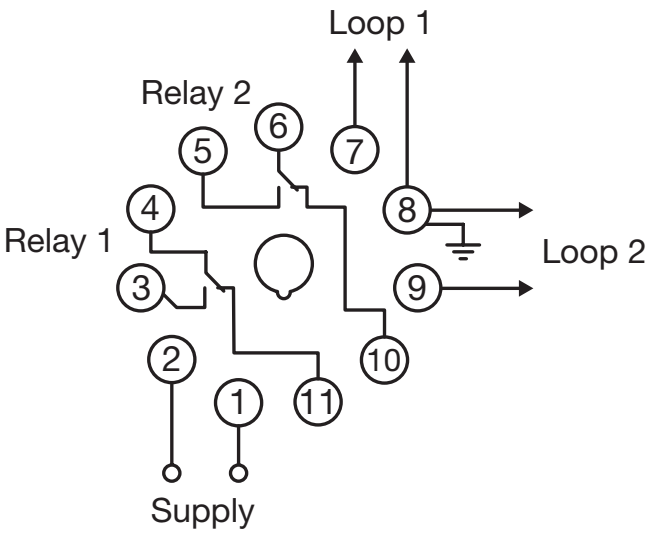
Single loop (LDP1) plug configuration



1	Supply
2	Supply
3	Relay 1 (N.O.)
4	Relay 1 (COM)
5	Relay 2 (N.O.)
6	Relay 2 (COM)
7	Loop
8	Loop
9	Earth
10	Relay 2 (N.C.)
11	Relay 1 (N.C.)

Earth pin must be connected to earth
Do not wipe grease off pins

Dual loop (LDP2) plug configuration

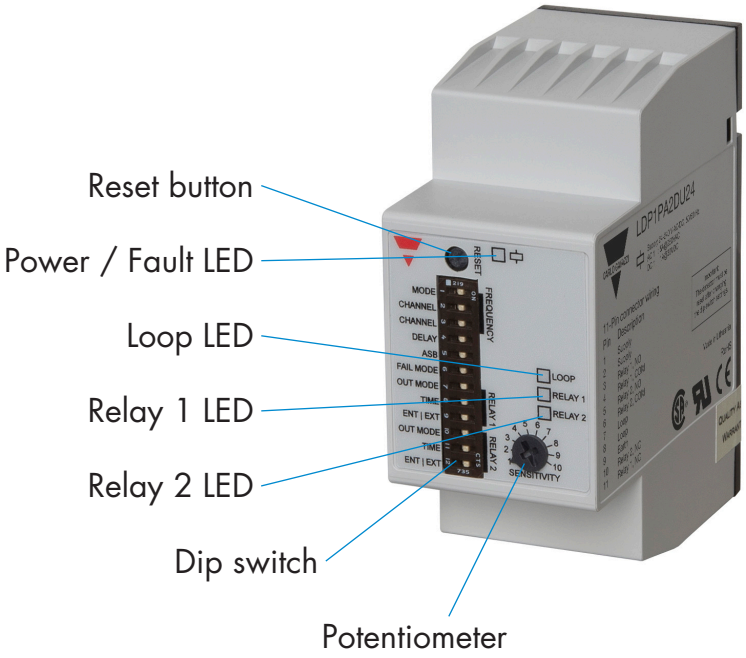


1	Supply
2	Supply
3	Relay 1 (N.O.)
4	Relay 1 (COM)
5	Relay 2 (N.O.)
6	Relay 2 (COM)
7	Loop 1
8	Loop 1, 2, Earth
9	Loop 2
10	Relay 2 (N.C.)
11	Relay 1 (N.C.)

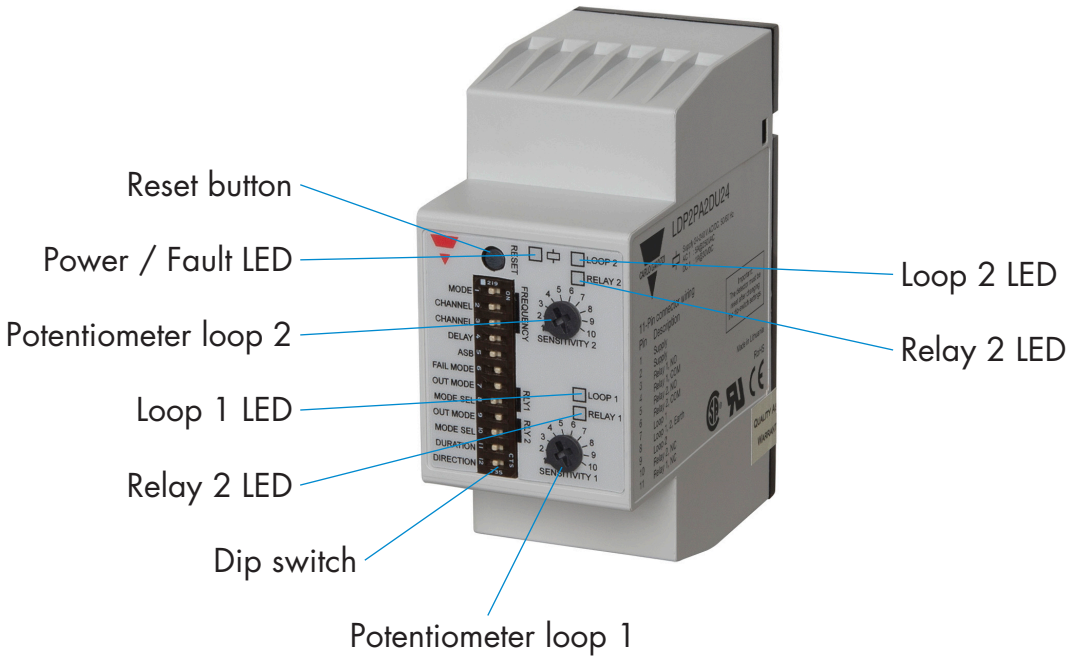
Earth pin must be connected to earth
Do not wipe grease off pins

4. Structure

LDP1 Single Loop



LDP2 Dual Loop



5. LED indications

In general, LDP loop detectors have 3 categories of LED indications; namely Power/Fault indicator LED, Loop state LED and Relay state LED:

Single loop (LDP1)

Power / fault indicator

LED colour	LED constant	LED Flashing (1 Hz)
●	All OK (ASB OFF)	DIP switch changed, but product not reset
●	Low signal indication	-
●	Channel crosstalk	-
●	ASB ON indication	-

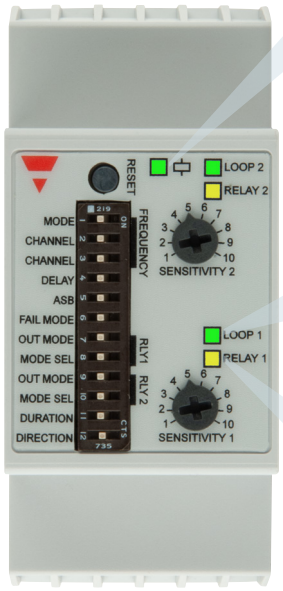
Loop state LED

LED colour	LED constant	LED Flashing (3 Hz)
●	Inductance OK	-
●	Inductance too high	Inductance too low
●	Loop is open circuit	Loop is short circuit

Relay state LED

LED colour	Mode	Relay deactivated	Relay activated
●	Presence mode	OFF	ON
	Pulse mode, 0.1 s	OFF	Flashing 0.5 s
	Pulse mode, 0.5 s	OFF	Flashing 1.0 s

Dual loop (LDP2)



Power / fault indicator

LED colour	LED constant	LED Flashing (1 Hz)
●	All OK (ASB OFF)	DIP switch changed, but product not reset
●	Low signal indication	-
●	Channel crosstalk	-
●	ASB ON indication	-

Loop state LED

LED colour	LED constant	LED Flashing (3 Hz)
●	Inductance OK	-
●	Inductance too high	Inductance too low
●	Loop is open circuit	Loop is short circuit

Relay state LED

LED colour	Mode	Relay deactivated	Relay activated
●	Presence mode	OFF	ON
	Pulse mode, 0.1 s	OFF	Flashing 0.5 s
	Pulse mode, 0.5 s	OFF	Flashing 1.0 s

5.1 Power / fault indicator LED

LED colour	LED constant	LED Flashing (1 Hz)
●	All OK (ASB OFF)	DIP switch changed, but product not reset
●	Low signal indication	-
●	Channel crosstalk	-
●	ASB ON indication	-

Explanation:

1. Green LED (steady): Unit is powered up and everything is working well.
2. Green LED (blinking): Dip switch has been changed since last power up and Loop Detector has not been reset yet. Please press the reset button.
3. Yellow LED (steady): Signal level is low in the loop.
4. Red LED (steady): Crosstalk of loop frequency with another loop detected. Select different frequency channel on DIP switches and reset product.
5. Blue LED (steady): Automatic Sensitivity Boost is turned ON and everything is working well

5.2 Loop state LED

LED colour	LED constant	LED Flashing (3 Hz)
●	Inductance OK	-
●	Inductance too high	Inductance too low
●	Loop is open circuit	Loop is short circuit

Explanation:

1. Green LED (steady): Loop inductance is within limit and working well
2. Yellow LED (steady): Loop inductance is too high (more than working range 1000µH)
3. Yellow LED (blinking): Loop inductance is too low (less than working range 20µH)
4. Red LED (steady): Loop is open circuit
5. Red LED (blinking): Loop is short circuit

5.3 Relay state LED

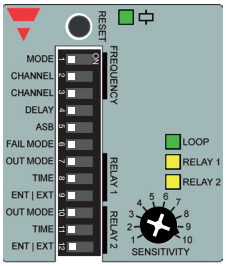
LED colour	Mode	Relay deactivated	Relay activated
●	Presence mode	OFF	ON
	Pulse mode, 0.1 s	OFF	Flashing 0.5 s
	Pulse mode, 0.5 s	OFF	Flashing 1.0 s

Explanation:

1. Yellow LED (off): Relay is not activated
2. Yellow LED (steady): Relay is activated and in presence mode
3. Yellow LED (Flashing 0.5 s): Relay is activated and in pulse mode, 0.1 s
4. Yellow LED (Flashing 1.0 s): Relay is activated and in pulse mode, 0.5 s

6. Dip Switch

DIP Switch settings for Single Loop (LDP1)



Frequency settings							
1	Selection mode	Automatic channel selection		Manual channel selection			
2 3	Channel selection	DIP switch 2 and 3 are not used in automatic channel selection		1	2	3	4
General settings							
4	Turn-on delay	Delay OFF		Delay 2.0 sec			
5	ASB	ASB OFF		ASB ON			
6	Failure mode	Fail safe		Fail secure			
Relay 1 settings							
7	Output mode	Pulse mode		Presence mode			
8	Time	0.1 sec pulse	0.5 sec pulse	Infinite	60 min	10 min	1 min
9	Entry / Exit	Vehicle entry	Vehicle exit				
Relay 2 settings							
10	Output mode	Pulse mode		Presence mode			
11	Time	0.1 sec pulse	0.5 sec pulse	Infinite	60 min	10 min	1 min
12	Entry / Exit	Vehicle entry	Vehicle exit				

DIP-switch 1 - Selection mode: The loop detector operates on one out of four channels. Depending on the noise sources in the vicinity (other loop detectors/frequency converters/starters etc. i.e. crosstalk) can it be helpful to choose a channel where the loop detector is not disturbed by the noise. The loop detector will indicate by a white flash which channel the loop detector are using after power up.

Set DIP SWITCH 1 to OFF for automatically selection During startup will the loop detector measure the noise levels on all channels and automatically select the channel with the least noise. This will be done once every time the loop detector is powered up.

Set DIP SWITCH 1 to ON for manual selection Use dip switch 2 and 3 for selecting channel 1 ,2 ,3 or 4.

Dip-switch 2 & 3 - Channel selection: Only used when dip switch 1 is set to "Manual". Not used if dip switch 1 is set to "Auto".
Select the loop operating frequency by using the combination below:

(Switch 4) Delay: To prevent false and unintentional detections of objects moving nearby to the loop, the loop turn on delay time can be prolonged to 2 seconds. This is to ensure a stable detection before a valid detection signal is accepted. Default detection time is 0.1 second (100ms)

(Switch 5) ASB: In installation whereby there is high bed vehicles (i.e. trucks, lorry, tractors); Automatic Sensing Boost (ASB) function can boost the loop sensitivity during detection. This ensures high bed vehicles will be detected correctly. Using this switch 5, ASB can be turned on or off.

(Switch 6) Fail Mode: Selecting "Fail Safe" will ensure that during power loss to the loop detector, the relay contacts will activate (energized) and hence resulting the barrier to open. This is preferred in application whereby during power loss, it is preferred to open the barrier such as in public areas, shopping malls etc.

While selecting "Fail Secure" will ensure that during power loss to the loop detector, the relay contacts will remain deactivated (deenergized) and hence resulting the barrier to close. This is useful in application whereby during power loss, it is preferred to close the barrier such as in private areas, private apartments etc.

Note: The fail safe and fail secure mentioned above is only referring to the power loss to the loop detector and not referring to the power loss of the main source or power loss to the barrier. This is because power is still required for the barrier to open or close regardless. If the same power source is used for loop detector and barrier, a kind of backup power is then required.

(Switch 7) (Switch 10) Out Mode: Relay output 1 and relay output 2 can be independently set to be in pulse mode or presence mode.

In pulse mode, the relay only activates only for a short period when the vehicle enters or exits the loop. In presence mode, the relay will remain activated as long as there is a vehicle parked on the loop.

Switch 7 is for relay 1 and switch 10 is for relay 2.

(Switch 8) (Switch 11) Time: If pulse mode is selected in switch 7 or switch 10, the pulse output duration can be set to be 0.1 second or 0.5 second duration.

Switch 8 is for relay 1 and switch 11 is for relay 2.

(Switch 9) (Switch 12) Ent|Ext: If pulse mode is selected in switch 7 or switch 10, the pulse output can set to be activated when vehicle enters the loop or only when the vehicle exits the loop.

Switch 9 is for relay 1 and switch 12 is for relay 2.

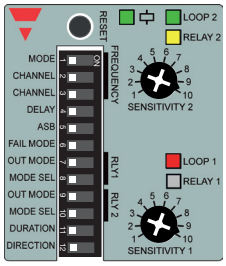
If presence mode is selected in switch 7 or switch 10, then switch 8/9 (relay 1) and switch 11/12 (relay 2) will change functionality.

In Presence mode, switch 8/9 (relay 1) and switch 11/12 (relay 2) are then used to set the maximum time of an activation. If setting is different from infinite, the relay output will deactivate after the specified time, following the table here:

Bit 1 setting	Bit 2 setting	Output Presence Time
0	0	Infinity
0	1	1 hour
1	0	10 minutes
1	1	1 minute

In infinite, the relay will continue to be activated as long as the vehicle is still on the loop.

DIP Switch settings for Dual Loop (LDP2)



Frequency settings						
1	Selection mode	Automatic channel selection		Manual channel selection		
2 3	Channel selection	DIP switch 2 and 3 are not used in automatic channel selection		1	2	3	4
General settings						
4	Turn-on delay	Delay OFF		Delay 2.0 sec		
5	ASB	ASB OFF		ASB ON		
6	Failure mode	Fail safe		Fail secure		
Relay 1 settings						
7	Output mode	Pulse mode		Presence mode		
8	Mode select	Vehicle entry	Vehicle exit	Infinite	1 m	
Relay 2 settings						
9	Output mode	Pulse mode		Presence mode		
10	Mode select	Vehicle entry	Vehicle exit	Infinite	1 m	
Relay 1 & 2 settings						
11	Pulse duration	0.1 s	0.5 s	Not used in Presence mode		
General settings						
12	Direction logic	OFF		ON		

(Switch 1 - Switch 6): Please refer to the explanation above in single loop detector (LDP1) as they are similar.

(Switch 7) (Switch 9) Out Mode: Relay output 1 and relay output 2 can be independently set to be in pulse mode or presence mode.
In pulse mode, the relay only activates only for a short period when the vehicle enters or exits the loop.
In presence mode, the relay will remain activated as long as there is a vehicle parked on the loop.

Switch 7 is for relay 1 and switch 9 is for relay 2.

(Switch 8) (Switch 10) Mode Select: If pulse mode is selected in switch 7 or switch 9, the relay output can set to be activated when vehicle enters the loop or only when the vehicle exits the loop.

If presence mode is selected instead in switch 7 or switch 9, switch 8 and switch 10 is then used to set the maximum time of relay activation of either infinite or 1 min.

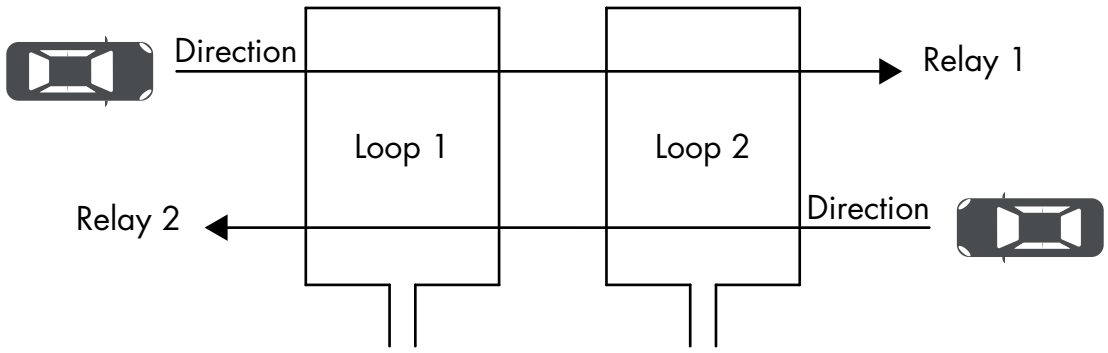
Switch 8 is for relay 1 and switch 10 is for relay 2.

(Switch 11) Duration: If pulse mode is selected in switch 7 or switch 9, the pulse output duration can be set to 0.1 seconds or 0.5 seconds. When presence mode is selected, switch 11 has no function.

Switch 11 is for both relay 1 and relay 2.

(Switch 12) Direction: When direction logic is turned on, relay 1 activates when car moves from loop 1 to loop 2. Relay 2 activates when car moves from loop 2 to loop 1.

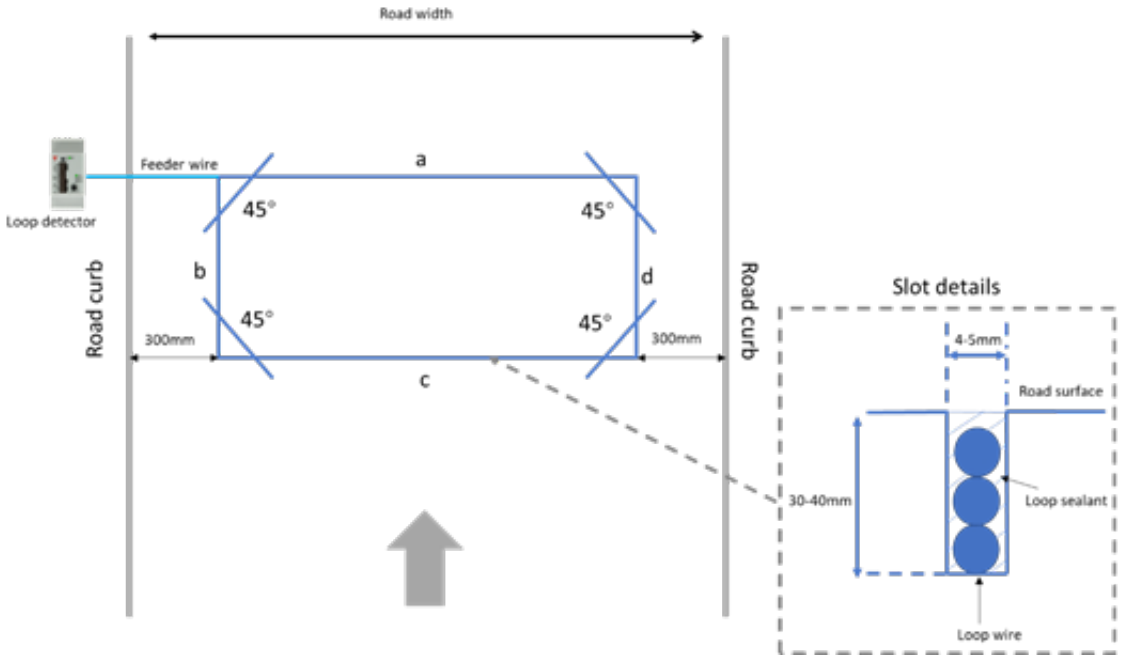
Switch 12 is for both relay 1 and relay 2.



7. Installation & Operations

7.1. Loop and wire specification

7.1.1. Loop section



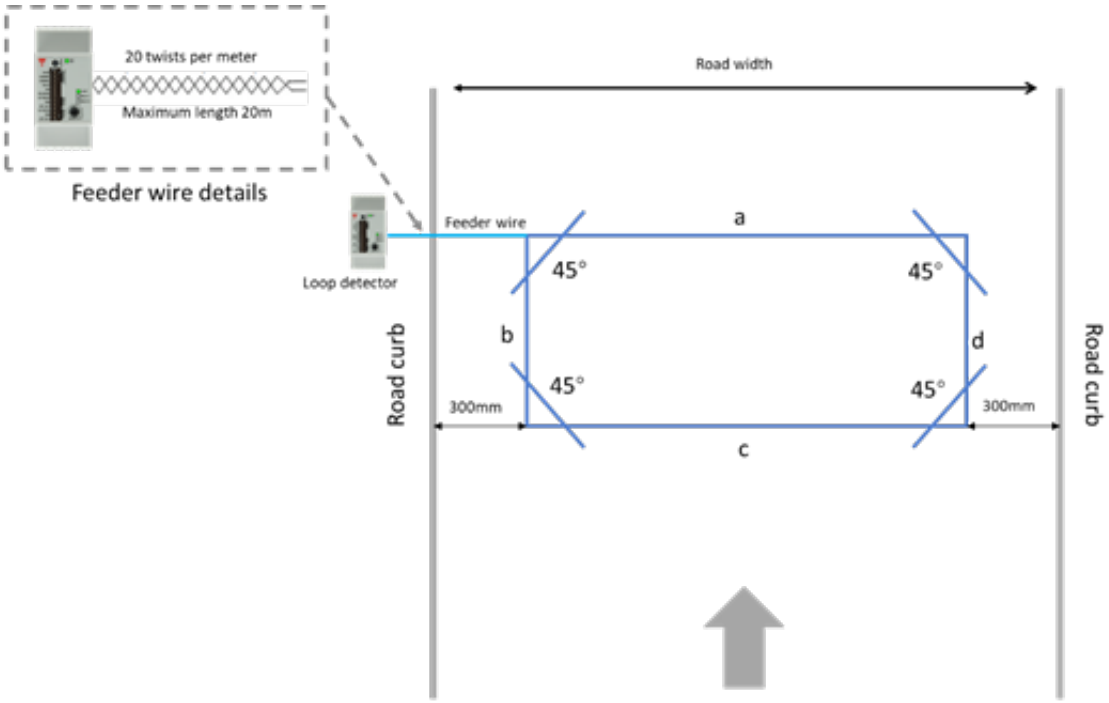
I. Dimension of the loop is dependent on the road size and normally is rectangular in shape with the longest sides at right angle to the direction of the traffic.
II. Typically, the loop should be around 2m (L) x 1m (D). However, this could be different depending on the actual road size.
III. The loop should reach maximum to within 300mm on each side to the edge of the road.
IV. No of turns around the loop groove should follow this table:

Loop Circumference (meter)	No of turns
>10	2
6-10	3
<6	4

Note: loop circumference = a+b+c+d

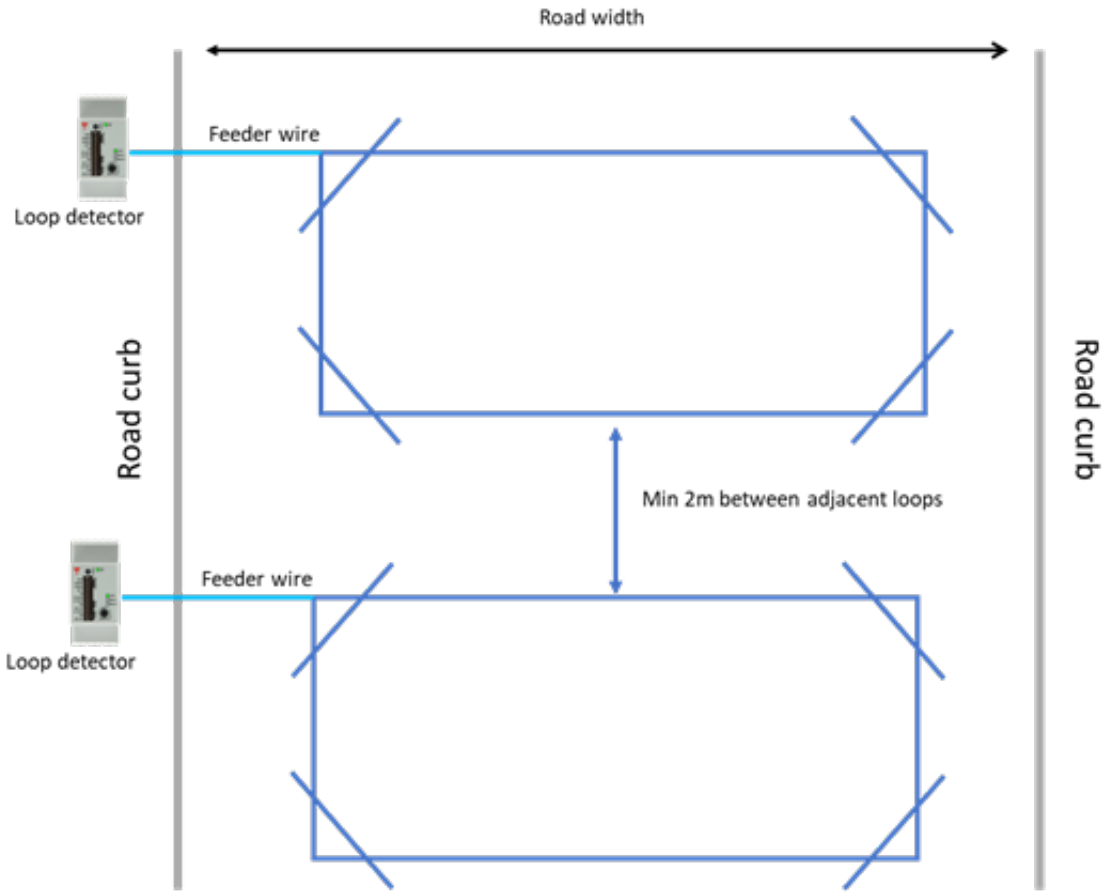
V. Recommended groove depth: 30mm-40mm
VI. Recommended groove slot width: 4-5mm
VII. 45° diagonal cut should be made to every edge in order to avoid strain on the loop wire.

7.1.2. Feeder section



I. A groove is to be cut from the corner of the loop to the loop detector for the feeder wire.
II. Feeder wire must be twisted all the way from that loop corner to the loop detector.
III. Minimum 20 twists per every meter.
IV. Maximum feeder wire length is 20 meters (length from loop to loop detector)
V. Feeder wire should not be in parallel with other electrical wires. Minimum distance of 10cm between feeder wire and other wires is required.
VI. Feeder wires of different loops should also not be in close proximity with each another and feeder wires shall not touch with other loop wires.

7.1.3. Adjacent Loops



I. Minimum distance of 2m shall be observed between 2 adjacent loops
II. If dual loop LDP2 is used, the loops can be installed nearer (0.5m) to each another.

7.1.4. Wire Specifications

Any coil of insulated cooper wire can be used. There are many copper wires in the market that marked suitable for loop detector application.

Recommended wire will be following but not restricted to:

I. Conductor cross sectional area of 1.5mm2
II. Thinned flexible copper conductor Class 5
III. Ethylene Propylene Rubber (EPR) insulation
IV. Polychloroprene (PCP) sheath
V. Voltage rating 600/1000v
VI. High temperature limit of around 85° for durability outdoor
VII. Bending radius of 6 x overall diameter
VIII. UV resistant
IX. Halogen free

7.2. Loop Installation

After determining the loop geometry, groove must be cut into the ground to install the loop. This can be done by using a concrete cutting disc saw or similar device.

Clean the groove to make sure it is free of debris and free from moisture.

Place the wire along the groove and make sure it fitted tightly and nicely into the groove.

Measure the loop inductance using an inductance meter. Recommended value is between 80 to 300μH.

Seal the groove with any suitable epoxy or loop sealant found in the market.

Make sure when sealing the groove:

I. The temperature of the sealing compound does not exceed the temperature of the loop wire insulation as this might melt the insulation and causes earth fault.
II. The loop wire must be totally fitted into the slot and not able to move after sealing.
III. The loop wire is placed nicely into the slot and no any section is exposed after sealing.
IV. The groove is clean and dry during sealing.

7.3. Loop Detector Installation

After finish installing the loop, the next step is to connect the loop to the loop detector.

I. Mount the socket to the din rail in the cabinet.
II. Laid the feeder cable to the socket neatly and connect to the socket screw terminals according to the wiring diagram. See section 3 of this manual.
III. Laid the power cable (24-240AC/DC) to the socket neatly and connect to the socket screw terminals according to the wiring diagram. See section 3 of this manual. Do not turn on the power switch yet.
IV. Connect other relevant devices to the 2 outputs of the loop detector accordingly and following the wiring diagram. See section 3 of this manual.
V. Plug in the loop detector to the socket.
VI. Finish the other wiring of the relevant devices that are connected to the outputs of the loop detector.

7.4. Initialization Setup

I. Set the dip switch to the preferred functions required. See section 6 of this manual.
II. Make sure that there is no object/vehicle on top of the loop.
III. Turn on the power switch to the loop detector.
IV. The loop detector will automatically calibrate the loop inductance to optimal level.
V. The loop detector will also automatically tune the frequency of the loop. If manual frequency tuning is preferred, it can be done manually via the dip switch.
VI. After loop detector has started, check that both loops indicate constant green on the loop LED
VII. Test the loop detector by activating the loop with an actual vehicle.
VIII. If the loop detector is found to be not reacting optimally, the sensitivity can be adjusted manually using the front potentiometer for that specific loop. Look at the loop state LED at the front of the loop detector to ascertain the loop is working fine. It is recommended to always start with a low sensitivity i.e. sensitivity level 5.
Then test the response of the loop and slowly tuned up the sensitivity accordingly and only when necessary.
IX. If required, adjust the dip switch for other setting such as the 2 relay outputs functions, ASB, directional logic etc. accordingly. See section 6 of this manual.

Attention: Remember to press the reset button after changing the dip switch.