

Short form User Manual

PD130 Enhanced Vehicle Detector

The PD130 is a single channel microprocessor based detector designed specifically for parking and vehicle access control application. The PD130 has been designed using the most up-to-date technology in order to meet the requirements of a vast number of parking applications in terms of operating conditions and options available to the user.

The primary function of the detector is to detect vehicle presence by means of an inductance change caused by the vehicle passing over a wire loop buried under the road surface.



The detector has been designed for ease of installation and convenience. The various modes are selected by changing the positions of the switch on the front of the unit.

The switches allow for different loop frequency settings, sensitivity settings and mode settings.

The PD130 provides visual output (LED) on the front of the enclosure and relay changeover contacts are taken on the 11-pin connector at the rear of the enclosure. The LED indicates the power has been applied to the unit, that a vehicle is present over the loop and if there is a fault on the loop. The Presence relay is fail-safe and will close on a vehicle detect or in the event of power failure.

In accordance with the manufacturer's policy of updating and improving product designs, product specification is subject to change without notice. This information is contained herein is intended for use with genuine Nortech products and is not applicable for use with 'clones' or copies manufactured and distributed by third parties.



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2. User Warnings

WARNING: This unit when installed must be correctly earthed!

WARNING: Disconnect power before plugging / unplugging or working on this unit!

WARNING: Installation and service to be undertaken by qualified personnel only!

WARNING: No user serviceable parts are inside.
Warranty is void if unauthorised modifications are made to this unit!

WARNING: Ensure safety to vehicles and personnel at sites where this item is installed to control motorised gates.
Close off access to vehicles and pedestrians before disconnection or making adjustments!

WARNING: Cutting into post tensioned concrete slabs for loop installation can have catastrophic consequences.
As a general rule 30mm is the deepest slot depth allowable in such cases. When any doubt exists the structural engineer’s approval must be sought prior to commencement of slot cutting.

3. Principle of Operation

An inductive loop vehicle detector senses the presence of a vehicle over an area defined by a loop of two or more turns of wire, laid under the road or pavement surface. This loop of wire is connected to the detector by a twisted pair of wires called a loop feeder.

A vehicle passing over a sensing loop causes a small reduction in the inductance of the loop, which is sensed by the detector. The sensitivity of the detector is adjustable to accommodate a wide range of vehicle types, as well as different loop and feeder combinations.

Upon detection of a vehicle passing over the loop the detector operates its output relays, which may be used to indicate controls associated with the installation.

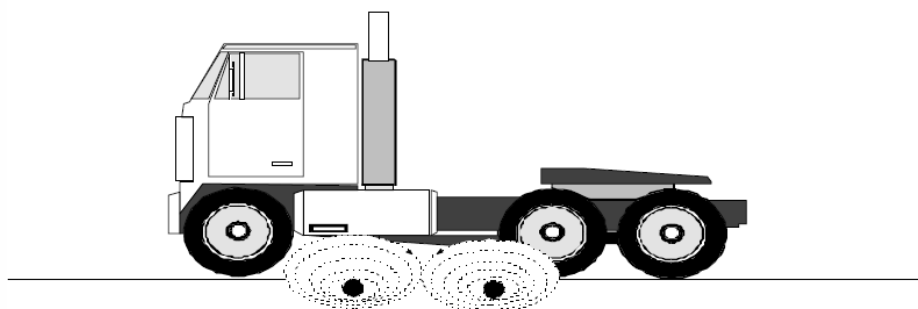


Figure 4.1 Principle of Operation

4. Operating Parameters

4.1. Detector Tuning

Tuning of the detector is fully automatic. When power is applied to the detector upon installation of the system, or when a reset is initiated, the detector will automatically tune itself to the loop to which it is connected. The detector will tune to any loop to inductance range 20 to 1500 microhenries.

This wide range ensures that all loop sizes and feeder combinations will be accommodated in the tuning range of the detector.

Once tuned, any slow environmental change in loop inductance is fed to a compensating circuit within the detector that keeps the detector correctly tuned.

4.2. Modes of Operation

The detector has “presence” and “pulse” outputs. The Presence output will be on continuously during the presence of a vehicle over the inductive loop. The pulse relay outputs a pulse of 150 milliseconds duration on arrival or departure of a vehicle.

Normally the presence output is available for only a limited time due to the environmental compensation circuitry of the detector. The detection memory time will be dependent on the change of inductance due to the vehicle over the loop. The presence time on the limited presence setting will be approximately 1 hour for 3% $\Delta L/L$.

If permanent presence is selected, then the presence output is maintained indefinitely, to the detriment of the environmental compensation that operates only when the loop is unoccupied.

When set to "pulse on detect" the detector will give a pulse on detection of a vehicle. When set to "pulse on un-detect" the detector will give a pulse output when the vehicle leaves the loop.

The presence output is known as a fail-safe output. This implies that in the event of a power or loop failure the detector will give a detect output. The pulse outputs are not fail safe and will not operate if a fault occurs.



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4.3. Detector Sensitivity

Sensitivity of the detection system is dependent on factors such as loop size, number of turns in the loop, feeder length and the presence of metal reinforcing beneath the loop.

The nature of the application determines the required sensitivity that may be adjusted by means of the sensitivity switches on the front of the enclosure.

Sensitivity levels of the PD130 have been carefully optimised for parking and vehicle access control applications. The detection of small unwanted objects such as bicycles and trolleys can be eliminated by selecting lower sensitivity levels whilst high-bed vehicles and vehicle/trailer combinations will not loose detection by using automatic sensitivity boost (ASB) option.

ASB operates as follows. When ASB is disabled the undetect level is dependent on the sensitivity setting of the detector. Hence as the detector is made less sensitive, the undetect level will reduce accordingly. When the ASB is enabled the undetect level will always be the same irrespective of the sensitivity setting and will be equivalent to the undetect level when the sensitivity is on maximum setting.

4.4. Hardware configuration

The PD130 Enhanced Vehicle single channel parking detector is designed to be shelf or DIN rail mounted, with the controls and visual indicators at the front, and wiring at the rear of the enclosure.

The power, loop and relay outputs are all connected to the single 11-pin plug, which is mounted at the rear of the enclosure.

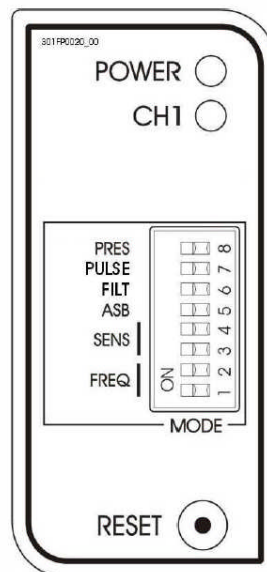


Figure 4.1 PD130 Faceplate layout

5. Switch Settings

5.1.1. Frequency Switch

The frequency switches are the lower two switches, switches No. 1 and 2. There are four frequency selections:

SW2	SW1	
Off	Off	- High
On	Off	- Medium-High
Off	On	- Medium-Low
On	On	- Low



The frequency switches allow the loop to be shifted higher or lower depending on the switch position. The frequency of the loop is determined by the loop size, and the frequency of the switch simply causes a frequency shift on the loop.

Where more than one detector is used the detectors must be set-up to ensure that there is no cross-talk (interference) between the detectors. This can be achieved by ensuring that the loops of the two detectors are spaced sufficiently apart (approximately 2 metres between adjacent edges) and also ensuring that the detectors are set to different frequencies. As a general rule, the detector connected to the inductive loop with the greatest inductance should be set to operate at the lowest frequency. Loop inductance increases as loop size, number of turns in the loop and feeder length increases.

5.1.2. Sensitivity

The sensitivity of the detector allows the detector to be selective as to the change of inductance necessary to produce an output. There are four sensitivity selections and these are set as follows: -

<u>SW4</u>	<u>SW3</u>	
Off	Off	- High
On	Off	- Medium-High
Off	On	- Medium-Low
On	On	- Low

5.1.3. Automatic Sensitivity Boost

Automatic sensitivity boost is a mode that alters the “undetected” level of the detector. This mode is selected by switch No. 5 on the front of the enclosure and is as follows: -

<u>SW5</u>	
Off	- Disabled
On	- Enabled

Automatic sensitivity boost causes the sensitivity to be boosted to a maximum on detection of a vehicle, and maintained at this level during the presence of the entire vehicle over the loop. When the vehicle departs the loop and the detection is lost the sensitivity reverts to the pre-selected level.

5.1.4. Filter Mode

The filter mode is selected with the mode switch No. 6. The filter produces a delay turn-on time of two seconds when a vehicle occupies the loop. This is to enable unwanted objects (trolleys) to pass over the loop without being detected. The filter option may be used on any sensitivity setting and is selected as follows: -

<u>SW6</u>	
Off	- Disabled
On	- Enabled

5.1.5. Pulse Relay

The pulse relay may be made to operate on detect (entry) or on “undetected” (exit) of a vehicle. This option is selected from Switch No. 7 and is configured as follows: -

<u>SW7</u>	
Off	- Pulse on Detect
On	- Pulse on Undetect



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5.1.6. Presence Time

The presence time may be set to permanent presence or to limited presence. See Section 4.1 for details. The presence mode is set with switch No. 8 and is configured as follows: -

SW8

Off - Limited Presence
On - Permanent Presence

5.1.7. Reset Switch

The detector automatically tunes to the inductive loop connected to it when the power is applied, whether on initial installation or after any break in power supply. Should it be necessary to re-tune the detector, as may be required after changing any of the switches or after moving the detector from one installation to another, momentary operation of the RESET switch will initiate the automatic tuning cycle.

5.2. Front Panel Indicators

While the detector is tuning, the ON (Red) LED will glow and the OUTPUT LED (Green) will extinguish when the system is tuned. Thereafter, the green LED will flash at a rate of 1 Hz. This is used to indicate the frequency of the loop to the user. Every flash of the LED is equivalent to 10 kHz. It will stop when the operating frequency is reached. This operation is also performed whenever the reset button is depressed.

The ON (red) LED will glow permanently to indicate that the unit is functional. The red LED also serves as an optical interface to the DU100 Diagnostic Unit.

If faults exist with the loop the green LED will come on and flash off at the rate of 2Hz indicating the fault. If the fault is self-healing the detector will continue to operate but the LED will remain on indicating to the user that a fault has occurred. The LED will go off for a moment during an “undetected”, indicating this state, thereafter returning on. This condition can be restored by removing the power or by depressing the reset button.

The green LED will also glow whenever a vehicle is detected passing over the inductive loop.

6. Technical Data

6.1.1. Functional Data

Tuning	Fully Automatic
Self-tuning range	20 μ H to 1500 μ H
Sensitivity	Four step switch selectable
	High 0.02% Δ L/L
	Medium High 0.05 % Δ L/L
	Medium Low 0.10 % Δ L/L
	Low 0.50 % Δ L/L
Frequency	Four step switch selectable Frequency dependent on loop size
Automatic Sensitivity Boost	Switch selectable
Filter	Switch selectable 2 second filter
Presence Relay	Fail-safe
Presence Time	Switch selectable: Limited presence / Permanent presence
Pulse Relay	Switch selectable: Pulse on detect / Pulse on undetect



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Pulse Output Duration	150 milliseconds
Response Times	100 milliseconds
Drift Compensation Rate	Approx. 1% Δ L/L per minute
Visual Indications	1 x Power LED – Red 1 x Channel Status LED - Green
Reset	Push button on front of enclosure
Surge protection	Loop isolation transformer, gas discharge tubes and Zener diode clamping on loop input

6.2. Electrical Data

Power requirements	12 V -10% to 24 V +10% (PD134) 230 VAC \pm 10% (48 to 62Hz) (PD132) 1.5 VA Maximum @ 230 V
Relay Contact Rating	Relays rated - 5 A @ 230 VAC Factory Option - Opto Isolated 50mA @ 30VDC

6.3. Environmental Data

Storage Temperature	-40° to +80°C
Operating Temperature	-40° to +70°C
Humidity	Up to 95% relative humidity without condensation
Circuit protection	Conformal coating over the PCB and all components
IP Rating	IP30

6.4. Mechanical Data

Housing Material	ABS blend
Mounting Position	Shelf or DIN rail mounting
Connections	11-pin Sub-magnal (JEDEC No. B11-88)
Size of Housing	78mm (H) X 41mm (W) X 80mm (D)

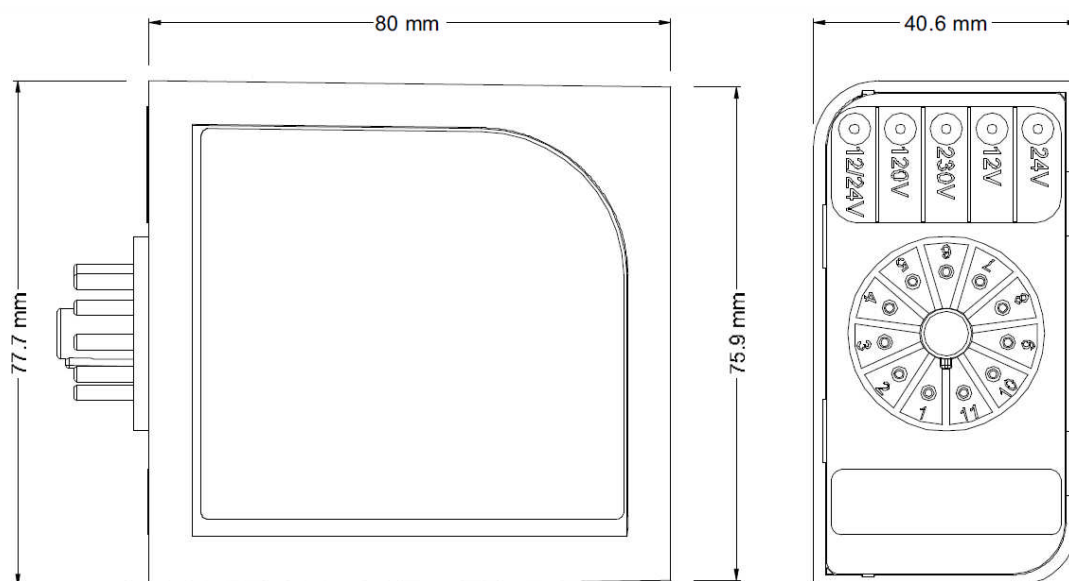


Figure 6.1 PD130 Housing dimension

7. Wiring Connections

11-pin connector wiring

pin	colour	designation	
1	Red	Live	230V AC 50/60 Hz
2	Black	Neutral	OR 12 - 24V AC/DC
3	Grey	Pulse Relay	Normally Open contact
4	Violet	Pulse Relay	Common contact
5	Yellow	Presence Relay	Normally Open contact
6	Brown	Presence Relay	Common contact
7	Blue	Loop	Twist this pair
8	Blue	Loop	
9	Green	Earth	
10	Pink	Presence Relay	Normally Closed contact
11	White	Pulse Relay	Normally Closed contact

8. Part Numbers

Part Number	Model Number	Description
301FT0101_01	PD132 - Enhanced	230 V ac operation
301FT0122_01	PD134 - Enhanced	12 - 24V ac/dc operation
895FT 0001	DU100 - English	Hand Held Diagnostic Unit
301FT0041	Wiring Harness	Option - 1 metre plug and harness
CTR119090		DIN Rail Screw terminal base



9. Installation Guide

Optimum functioning of the detector module is largely dependent on factors associated with the inductive sensor loop connected to it. These factors include choice of material, loop configuration and correct installation practice. A successful inductive loop vehicle detection system can be achieved bearing the following constraints in mind, and strictly following the installation instructions. The detector must be installed in a convenient weatherproof location as close as possible to the loop.

9.1. Operational Constraints

9.1.1. Crosstalk

When two loop configurations are in close proximity, the magnetic fields of one can overlap and disturb the field of the other. This phenomenon, known as crosstalk, can cause false detects and detector lock-up.

Crosstalk between adjacent loops operating from different detector modules can be eliminated by:

1. Careful choice of operating frequency. The closer together the two loops, the further apart the frequencies of operation must be.
2. Separation between adjacent loops. Where possible a minimum spacing of 2 metres between loops should be adhered to.
3. Adequate twisting of feeder cables (20 twists per metre). Adequate screening if they are routed together with other electric cables. The cable screen must be earthed at the detector end only.

9.1.2. Reinforcing

The existence of reinforced steel below the road surface has the effect of reducing the inductance, and therefore the sensitivity, of the loop detection system. Hence, where reinforcing exists 2 turns should be added to the normal loop, as referred to in section 5.3.

The ideal minimum spacing between the loop and the cable and steel reinforcing is 150mm, although this is not always practically possible. The slot depth should be kept as shallow as possible, taking care that the feeder remains exposed after the sealing compound has been applied.

WARNING : Cutting into post tensioned concrete slabs can have catastrophic consequences. As a general rule 30mm is the deepest slot depth allowable in such cases. When any doubt exists the structural engineer's approval must be sought prior to commencement.

9.2. Loop and Feeder Specification

The loop and feeder should preferably constitute a single un-joined length of insulated copper conductor, with a minimum rating 15Amp.

Joints in the loop or feeder are not recommended. Where this is not possible, joints are to be soldered and terminated in a waterproof junction box. This is extremely important for reliable detector performance.

9.3. Sensing Loop Geometry

Sensing loops should, unless site conditions prohibit, be rectangular in shape and should normally be installed with the longest sides at right angle to the direction of traffic movement. These sides should ideally be 1 metre apart.

The length of the loop will be determined by the width of the roadway to be monitored. The loop should reach to within 300mm of each edge of the roadway.

In general, loops having a circumference measurement in excess of 10 metres should be installed using two turns of wire, while loops of less than 10 metres in circumference, should have three turns or more. Loops having a circumference measurement less than 6 metre should have four turns. It is good practice at time of installation to construct adjacent loops with alternate three and four turn windings.

10. Loop Installation

All permanent loop installations should be installed in the roadway by cutting slots with a masonry cutting disc or similar devise. A 45° crosscut should be made across the loop corners to reduce the chance of damage that can be caused to the loop at right angle corners.

NOMINAL SLOT WIDTH: 45mm

NOMINAL SLOT DEPTH : 30mm TO 50mm

A slot must also be cut from the loop circumference at one corner of the loop to the roadway edge to accommodate the feeder.

A continuous loop and feeder is obtained by leaving a tail long enough o reach the detector before inserting the cable into the loop slot. Once the required number of turns of wire is wound into the slot around the loop circumference, the wire is routed again via the feeder slot to the roadway edge. A similar length is allowed to reach the detector and these two free ends **are twisted together to ensure they remain in close proximity to one another (minimum 20 turns per metre)**. Maximum recommended feeder length is 100 metres.

It should be noted that the loop sensitivity decreases as the feeder length increases, so ideally the feeder cable should be kept as short as possible.

The loops are sealed using “quick-set” black epoxy compound or hot bitumen mastic to blend with the roadway surface.

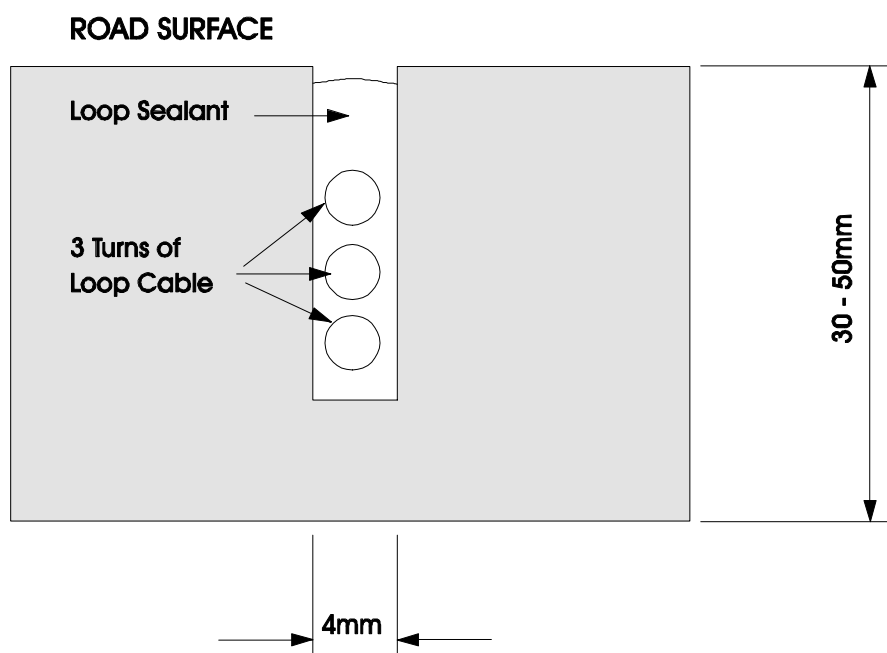


Figure 10.1 Slot details

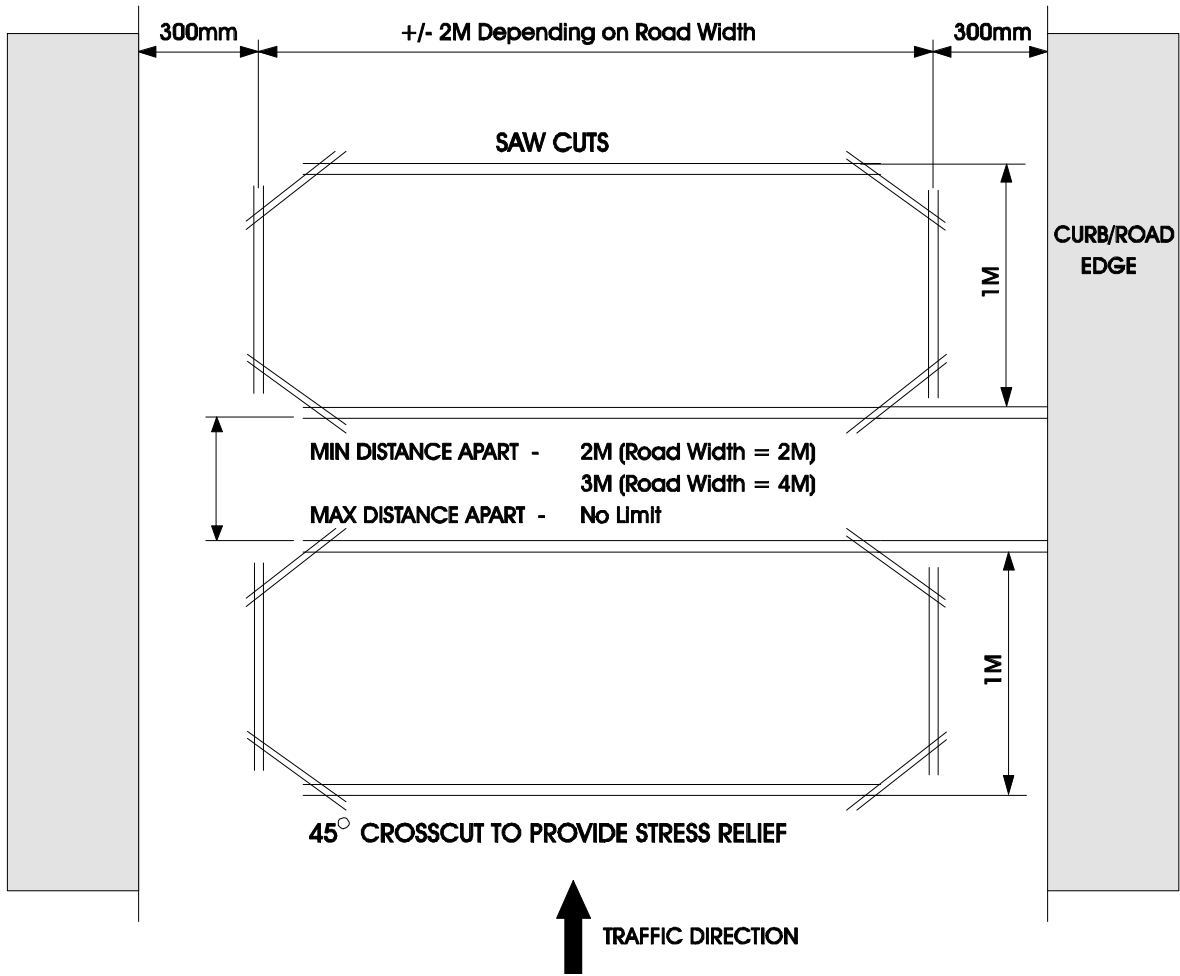


Figure 10.2 Adjacent loops connected to different detector modules



11. Fault Finding

FAULT	CAUSED BY	REMEDY
Red LED does not glow on power up.	If the indicator is off then there is a fault with the power connection to the unit.	Check power feed to the unit.
After the initial tune period the Green LED flashes continuously (ON for 1 second and OFF for ½ second).	i) Unit cannot tune to the loop due to faulty loop or feeder connection. ii) Loop inductance may be too small or too large. iii) Faulty detector unit.	i) Check loop installation and connections. ii) Re-cut loop as per installation instructions. iii) Replace unit.
After tuning, the loop output LED flashes intermittently and the relay chatters.	The detector is giving spurious detects due to: a) Crosstalk with adjacent detector. b) Faulty loop or untwisted loop feeder connection. c) Electrical interference	a) Change frequency setting on one unit. b) Check that the feeders are correctly connected and adequately twisted . c) Isolate sources of nearby electrical equipment and high voltage cables

12. Warranty

- i. A conditional 24-month Warranty is offered on all items covering faulty workmanship or materials.
- ii. Warranty is calculated from the unit serial number which incorporates the date of manufacture.
- iii. Goods for return under warranty are to be returned to the Company at the customer's expense.
- iv. Goods repaired or exchanged under warranty will be returned to a customer at our expense.
- v. Warranty specifically excludes any on site service obligation or liability for any 3rd party equipment malfunction or damage, and excludes damage by fire, electrocution, accident, misuse, or abuse, or other cause beyond the normally intended use of the product.

Return Address for warranty items

Nortech Detection Pty Ltd
 370 – 380 Cambridge Road,
 MORNINGTON TAS 7018

Post : Nortech Detection Pty Ltd
 P.O. Box 2104
 HOWRAH TAS 7018

13. Sales and Technical support

Tel: 02-8977 4047
 Fax: 02-9475 4742
 email: support@nortechdetection.com.au
 website: www.nortechdetection.com.au

Sydney Office hours
 08:30 to 17:00 Mon – Friday