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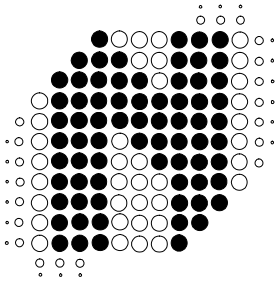

TD450L
USER MANUAL

Document No.: 879UM0002-03
Date of issue: September 2002

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WARNING: 1. THIS UNIT MUST BE EARTHED !

WARNING: 2. DISCONNECT POWER BEFORE WORKING ON THIS UNIT!

WARNING: 3. INSTALLATION AND OPERATION BY QUALIFIED SERVICE PERSONNEL ONLY !

WARNING: 4. NO USER SERVICEABLE PARTS INSIDE. WARRANTY VOID IF COVER REMOVED!

1. INTRODUCTION

The TD450L series of microprocessor based vehicle detectors have the same performance characteristics as the reliable, proven TD420 series Eurocard detectors.

This boxed four channel detector is packaged according to industry standards and is ideal for use in traffic control and toll equipment vehicle detection applications.

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

The detector is designed for ease of installation and convenience. The various modes i.e. presence times and sensitivities can be individually set for each channel via a DIP switch on the front panel of the unit. Frequency and four different operating modes may be selected by means of a DIP switch mounted on the front panel.

The TD450L provides outputs in the form of LED's on the faceplate and change-over relay contacts. The LED has three possible states. They are no-detect, detect and loop fault.

The relays are fail safe, meaning they will close on a vehicle detect or in the event of a power failure. A common fault relay provides an output in the event of a faulty loop or a power failure.

The TD450L is a versatile detector, which may be used in a number of applications, which include vehicle counting, speed measuring and for vehicle actuated (VA) control in conjunction with traffic controllers.

The TD450L, while providing separate vehicle presence outputs per channel, may also be configured to operate as a direction logic detector. The detector can also provide speed logic and headway logic outputs. An output will be provided when the pre-set speed or headway threshold has been exceeded, and can be utilised for switching variable warning signs or for gathering traffic statistics.

RELATED DOCUMENTS:

Data Sheet	Document No. 879DS0002
Installation Instructions	Document No. 879LF0006

2. TECHNICAL DATA

2.1 Functional Data

Self-tuning range	15 to 2000 (µH) micro-Henries
Sensitivity	Four step selectable High 0.02 %ΔL/L Medium-High 0.05 %ΔL/L Medium-Low 0.1 %ΔL/L Low 0.5 %ΔL/L
Frequency	Four step selectable High, Medium-High, Medium Low, and Low Minimum operating frequency 24 kHz Maximum operating frequency 150 kHz Frequency dependent on loop geometry
Presence Time	Four step selectable: 1 Second 4 Minutes 40 Minutes Infinity – no fixed time-out
Pulse Output	Approximately 150 ms
Response Times	Turn-on 30 ms ± 5 ms Turn-off 40 ms
Drift Compensation Rate	Approximately 1 %ΔL/L per minute
Indications	1 x Run Indicator - Red 1 x Green LED per channel On – Detect On – Fault Off – Undetect
Output Relay Mode	Switch selectable (Presence relays are fail-safe and will close on a vehicle detect or in the event of power failure or loop fault)

MODE	OUTPUT
1. Normal	Presence (CH1) Presence (CH2) Presence (CH3) Presence (CH4)
2. AB Logic	A to B (CH1) B to A (CH2) Presence (CH3) Presence (CH4)
3. Speed Logic	Presence (CH1) Speed Pulse (CH2) Presence (CH3) Presence (CH4)
4. Headway	Headway Pulse (CH1) Headway Pulse (CH2) Presence (CH3) Presence (CH4)

Fault Output — Common fault output
Normally open relay contact

Reset — Push button on front panel

Speed Logic Option — 0 – 150 kph in 10 kph steps

Headway Logic Option — 0 – 3 seconds in 0.2 second steps

Surge Protection — Gas discharge tube protection, loop isolation transformers and Zener diode clamping on loop inputs.

2.2 Electrical Data

Power requirements:

120 V_{AC} ± 10% 48 to 62 Hz (TD451 models)

230 V_{AC} ± 10% 48 to 62 Hz (TD452 models)

TD451 and TD452 models: 4 VA Maximum at 230 V

12 V –10% to 24 V +10% DC/AC 48 to 62 Hz (TD454 models)

TD454 models: 2 VA Maximum at 24 V

Relay Contact Rating

Using wiring harness supplied with the units
Maximum 1 A @ SELV voltages
(less than 60 V dc or less than 42 V_{AC})

Using TD450 Socket Mounting Plate Nortech Part No. 879FT0038
Maximum 1 A @230 V_{AC}

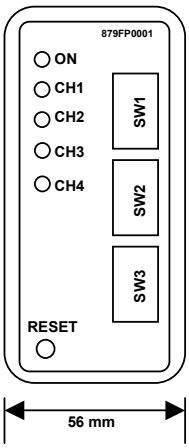
Using user supplied CE Approved 11 PIN sockets
Maximum 1A @ 230 V_{AC}

2.3 Environmental Data

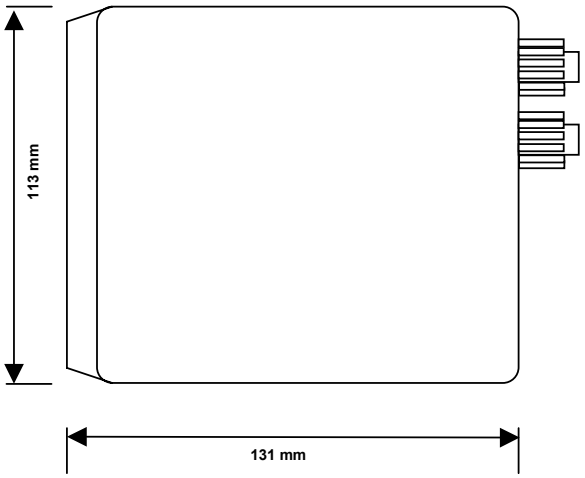
Storage Temperature	-40°C to +85°C
Operating Temperature	-40°C to +70°C
Humidity	Up to 95% relative humidity without condensation
IP Rating	IP30

2.4 Mechanical Data

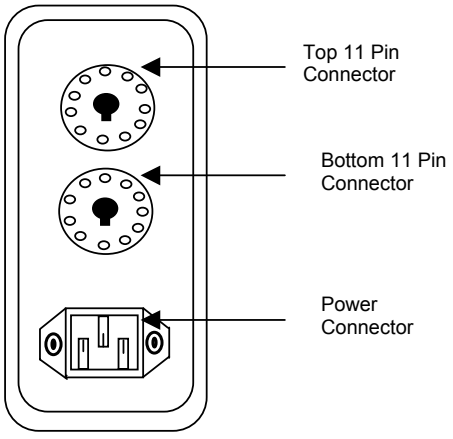
Housing material	ABS blend
Mounting Position	Shelf mounting
Connections	2 x 11-pin submagnal type (JEDEC No. B11-88) 1 x 3-pin VDE plug for AC mains
Size of Housing	131 mm (Deep) x 113 mm (High) x 56 mm (Wide)



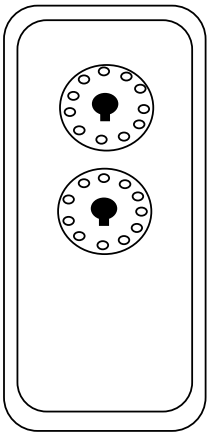
Front View



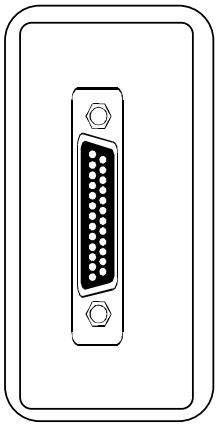
Side View



TD451 & TD452
Back View



TD454
Back View



TD454 25 Way 'D'
Back View

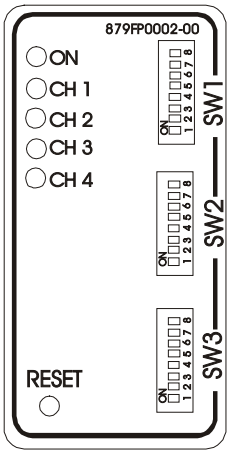
Mechanical Diagrams

2.5 Approvals

C.E. Regulations	EN 50293:2000	
	EN 301 489 Parts 1 &-3	Equipment Type III Equipment Class: 2 with Performance Criteria B as per EN 50293
Safety	EN 60950	

3. OPERATING INSTRUCTIONS

3.1 Controls and Indicators



There are 5 visual indicators on the detector module. These are explained below:

Power and Operation Indicator :

Red LED flashes (at 1 second intervals) when detector is operating.

Channel Status Indicators :

Four Green LED's - One per channel with four possible states per indicator:

1.	Off	Tuned and in the undetect state.
2.	On	Either in the detect state
3.	On	Or in the tuning state, or there is a fault on the loop.

On initial power-up the detector will automatically begin to tune to the loops. The channel status indicators will be green. When the loops have tuned the indicators will go off. If the loop cannot be tuned then the indicator for that channel will remain green.

After a successful tune, and subsequent vehicle presence over a loop, the detector will give a detect and the status indicator for that channel will turn On for the duration of the vehicle presence.

3.2 Switch Setting Selections

Three 8-way DIP switches on the front panel of the unit allow for various configuration options to be selected.

- SW1 provides individual sensitivity and presence selections for CH1 and CH2.
- SW2 provides individual sensitivity and presence selections for CH3 and CH4.
- SW3 sets the detector in the various operating modes (for direction logic, speed and headway). SW3 also allows for four different frequency selections to be made.

3.2.1 Reset Switch

The detector automatically tunes to the inductive loops connected to it within 4 seconds after applying power. Should it be necessary to retune the detector, as may be required after changing the position of any of the switches, momentary operation of the RESET switch will initiate the tuning cycle.

3.2.2 Presence Time Settings

(SW1 - S5, S6 AND S1, S2) – CH1 and CH2
(SW2 – S5, S6 AND S1, S2) – CH3 and CH4

SW1

Presence Time	S5	S6	CH1
	S1	S2	CH2
1 second	On	On	
4 minutes	On	Off	
40 minutes	Off	On	
Infinity - no fixed time-out	Off	Off	

SW2

Presence Time	S5	S6	CH3
	S1	S2	CH4
1 second	On	On	
4 minutes	On	Off	
40 minutes	Off	On	
Infinity - no fixed time-out	Off	Off	

The Presence time as shown above may be altered according to the requirements.

The 1 second setting will give a pulse on detection of a vehicle with a duration of 1 second. The detector will immediately re-adjust to the normal operating point and will give another detect in the event of a further change in the loop inductance, i.e. the detector may be used as a passage detector in this mode.

The 4 minute and 40 minute settings work in the same way as the 1 second setting, however the detector will now give outputs of 4 minutes or 40 minutes. If the vehicle which caused the inductance change moves off the loop then the detector will go out of detect and the time will be reset to zero for the next detect cycle. `The detector may undetect before the expired time period if the change in inductance for the vehicle is small.

The “infinite” setting does not have a fixed time out and the detect period is dependent on the magnitude of the inductance change caused by the vehicle over the loop.

3.2.3 Sensitivity Settings

(SW1 – S7, S8 AND S3, S4) – CH1 and CH2
(SW2 – S7, S8 AND S3, S4) – CH3 and CH4

The sensitivity of the detector can be individually set for each channel and allows the detector to be selective as to the change of inductance necessary to produce a detect. Four possible sensitivity settings are available.

SW1

Sensitivity	S7	S8	CH1
	S3	S4	CH2
Low (0.5% ΔL/L)	On	On	
Medium-Low (0.1% ΔL/L)	On	Off	
Medium-High (0.05% ΔL/L)	Off	On	
High (0.02% ΔL/L)	Off	Off	

SW2

Sensitivity	S7	S8	CH3
	S3	S4	CH4
Low (0.5% ΔL/L)	On	On	
Medium-Low (0.1% ΔL/L)	On	Off	
Medium-High (0.05% ΔL/L)	Off	On	
High (0.02% ΔL/L)	Off	Off	

3.2.4 Frequency Switch (SW3 - S1, S2)

Switches 1 and 2 on the 8-way DIP switch SW3 are used to shift the loop oscillator frequency to prevent crosstalk with other detector units. The various frequencies are selected as follows:

SW3

Frequency	S1	S2
High	Off	Off
Medium-High	Off	On
Medium -Low	On	Off
Low	On	On

The frequency switch allows the loop operating frequency to be shifted higher or lower depending on the switch position. The four channels shift in frequency simultaneously as they are multiplexed and share a common oscillator. The four channels will not necessarily be at the same frequency, as the frequency is determined by the loop size and feeder length and the frequency switch simply causes a frequency shift.

Where a single detector is being used the frequency switch may be at any setting. However, where more than one detector is used the detectors must be set-up to ensure that there is no crosstalk between the detectors. This can be achieved by ensuring that the loops of the 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 setting. Loop inductance increases as loop size, number of turns in the loop and feeder length increases.

3.2.5 Detector Mode Settings (SW3 – S7, S8)

These two switches are used to select the various mode of operation of the detector and are as follows:-

NORMAL MODE (SW3 – S7 (OFF), S8 (OFF)):

This is the normal mode and the detector will operate as a vehicle detector with no additional features. Each channel will operate independent of the other and will detect the presence of a vehicle.

AB LOGIC MODE (SW3 – S7 (OFF), S8 (ON)):

In this mode the detector is used as a direction sensor and the primary task is to indicate the direction of travel over the loops.

If a vehicle enters Loop A (channel 1) and then proceeds to Loop B, a presence output will be issued on Loop A relay output and remain until the vehicles leaves Loop B.

If a vehicle now enters Loop B (channel 2) and then proceeds to Loop A, a presence output will be issued on Loop B relay output and remain until the vehicle leaves Loop A.

In this way the direction of a vehicle can be determined.

SPEED LOGIC MODE (SW3 – S7 (ON), S8 (OFF))

In this mode channel 2 output relay is configured to provide a pulse output when a pre-set speed threshold has been exceeded. The input to this mode is provided by both channel 1 and channel 2 sensor loops, which are required to be spaced at exactly one metre between adjacent edges. See figure 3.2.

The speed threshold can be in the range 0 – 150 kph, with 10 kph steps selectable. It should be emphasised that this output is intended to be utilised in the switching of variable warning signs, for traffic analysis purposes or for extending phases in a traffic control application, and is <u>not</u> suitable for speed prosecution applications.

Channel 1 output relay is configured to provide a presence output in this mode, with the actual presence time determined by the position of SW1, S6 and S5. An application for this relay could be to drive a counter which would give you a total vehicle count figure, whilst channel 2 output could be used to establish the number of vehicles exceeding the pre-set threshold. Channel 3 and Channel 4 operate as normal presence detectors.

HEADWAY LOGIC MODE (SW3 – S7 (ON), S8 (ON))

Headway can be defined as the following interval between vehicles, and is taken from the point of departure of the first vehicle to the arrival of the following vehicle, and is measured in seconds. In this mode both channels 1 and 2 are configured to provide pulse outputs in the event of the vehicle headway being less than the pre-set threshold, with these two outputs operating entirely independent of each other. See figure 3.3

The Headway threshold can be in the range 0 – 3 seconds, and can be set in the steps of 0.2 seconds. It is intended that the pulse output, which is of 150 milliseconds duration, be used to switch a variable warning sign should the vehicle headway be less than the pre-set threshold, or alternatively for traffic analysis surveys. This list should not be considered to be exhaustive as other applications for these logic modes are possible. Channel 3 and Channel 4 operate as normal presence detectors.

3.2.6 Speed and Headway Settings (SW3 – S3 to S6)

S6	S5	S4	S3	Speed Mode (kph)	Headway Mode
OFF	OFF	OFF	OFF	0	0 Seconds
OFF	OFF	OFF	ON	10	0.2 Seconds
OFF	OFF	ON	OFF	20	0.4 Seconds
OFF	OFF	ON	ON	30	0.6 Seconds
OFF	ON	OFF	OFF	40	0.8 Seconds
OFF	ON	OFF	ON	50	1.0 Seconds
OFF	ON	ON	OFF	60	1.2 Seconds
OFF	ON	ON	ON	70	1.4 Seconds
ON	OFF	OFF	OFF	80	1.6 Seconds
ON	OFF	OFF	ON	90	1.8 Seconds
ON	OFF	ON	OFF	100	2.0 Seconds
ON	OFF	ON	ON	110	2.2 Seconds
ON	ON	OFF	OFF	120	2.4 Seconds
ON	ON	OFF	ON	130	2.6 Seconds
ON	ON	ON	OFF	140	2.8 Seconds
ON	ON	ON	ON	150	3.0 Seconds

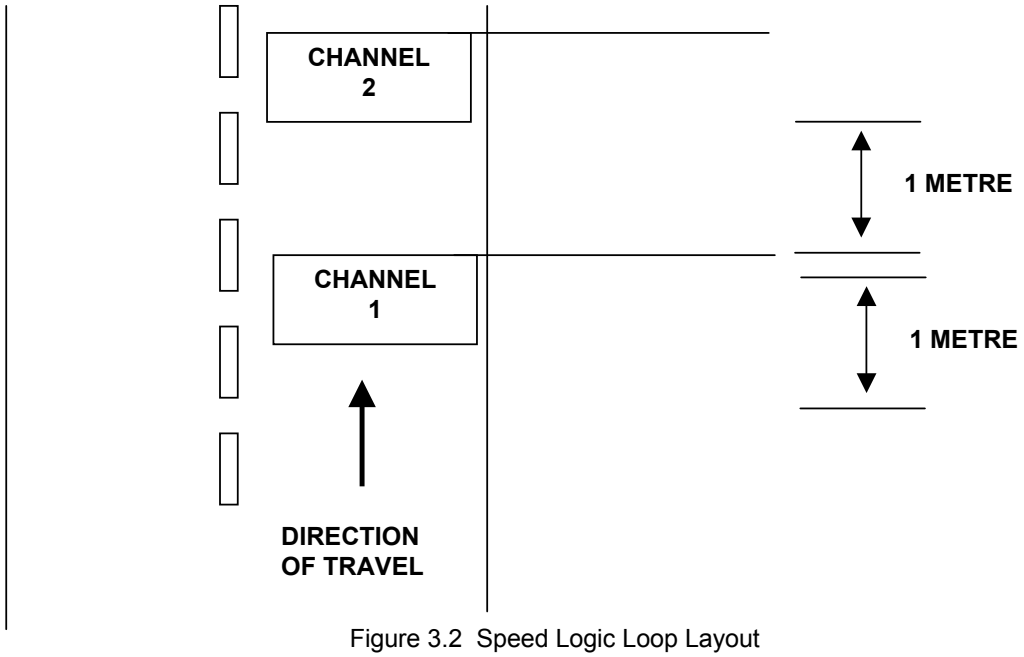


Figure 3.2 Speed Logic Loop Layout

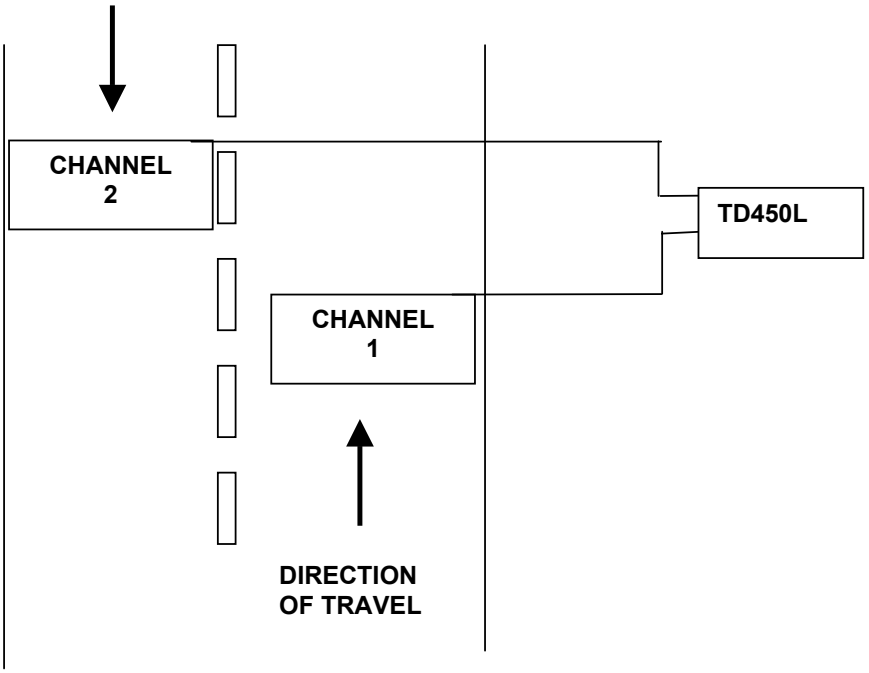


Figure 3.3: Typical Headway Logic Loop Layout

* Distance will vary according to average vehicle speed and the required time of warning sign illumination.

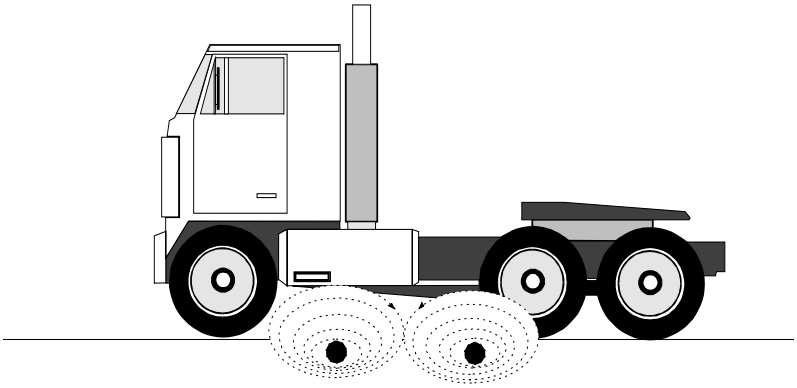
D (Distance in Metres) = S (Speed in metres per second) x T (Time in seconds)

4. PRINCIPLE OF OPERATION

The 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.



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 15 to 2000 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, which keeps the detector correctly tuned.

4.2 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.

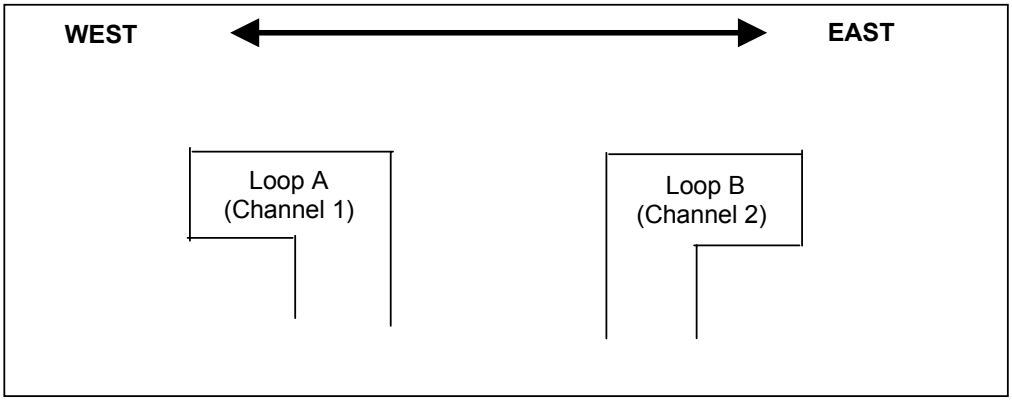
The nature of the application determines the required sensitivity which may be adjusted by means of the front panel switches. Sensitivity levels on the TD450L have been carefully optimised for traffic applications. The detection of small, unwanted objects can be eliminated by selecting lower sensitivity levels, whilst high-bed vehicles and vehicle / trailer combinations will not loose detection on the high sensitivity settings.

4.3 Modes of Operation

The TD450L can operate in four different modes:

In the NORMAL mode the detector provides a continuous output during the presence of a vehicle over the inductive loop. The maximum possible duration of output is determined by the presence time setting. The various presence time modes are covered in section 3.2.2

AB LOGIC is a direction logic mode, and is capable of determining direction of travel of a vehicle. Two loops are laid in the direction of travel to provide the input for this mode.



A vehicle travelling from West to East will provide an output "A to B " on the channel 1 output relay. Conversely, a vehicle travelling from East to West will produce an output "B to A" on the channel 2 output relay. This mode is used to activate equipment requiring vehicle direction inputs such as automatic fee collection equipment, vehicle counters, or warning devices in one-way systems.

SPEED LOGIC MODE allows for the speed of a vehicle to be determined when a pre-set speed threshold has been exceeded an output will result and can be utilised for traffic control applications.

HEADWAY LOGIC MODE can be used to determine the following interval between vehicles. Outputs resulting from vehicles whose headway is too short can be used for traffic analysis and traffic management applications.

4.4 Response Times

The response time of the detector is the time taken from when a vehicle moves over the loop to when the detector gives an output on that channel. The response times of the TD450L have been adjusted to prevent false operation in electrically noisy environments, but retains adequate response to vehicles travelling at very high speeds.

4.5 Sequential Polling

The TD450L four-channel detector employs scanning techniques which positively eliminate crosstalk between loops connected to the same module. This is due to the fact that only one channel is energised at a time. Advantage should be taken of this by allocating adjacent loops, or loops sharing close proximity feeder runs, to the same detector unit.

4.6 Fault Output

This is normally an open relay contact which appears on the rear connector on the backplate of the detector. The fault output is used to indicate the functional status of the detector. If the TD450L has tuned correctly to all loops then the fault output will indicate no fault. The fault output will be activated when a loop is faulty such as open or short circuit, or when the power has been removed from the unit. The fault monitor signals from a number of detectors may be wired out individually or coupled together to provide a common fault indication.

5. 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 by bearing the following constraints in mind, and strictly following the installation instructions.

5.1 Product Safety Requirements

- **i) WARNING:** The unit must be EARTHED.
- **ii) WARNING:** Disconnect the power before working on the unit.
- **iii) WARNING:** On 120 V AC and 230 V AC models a readily accessible disconnect device must be incorporated into the mains wiring (as per EN60950 Section 1.7.2).
- **iv) WARNING:** On all models the power supply to the unit MUST have short circuit protection and over current protection installed at the power supply source (As per EN60950 Section 1.7.11). Typically this will be a 5 Amp Magnetic Circuit Breaker for AC models and a fuse for DC models.
- **v) WARNING:** This product must be installed in an enclosure.
- **vi) WARNING:** No user serviceable parts inside. Warranty void if cover removed.
- **vii) WARNING:** Only use **CE** approved 11 pin relay socket or use Nortech's "**TD450 socket mounting plate**" Nortech Part No. 879FT0038

  As an alternative to the 11 pin relay base, Nortech has three 11 pin wiring harness, Nortech Part No. 879CM0036, 879CM0037 and 879CM0039 which can only be used with SELV voltages (less than 60 V dc or less than 42 V ac).

5.2 Operational Constraints

5.2.1 Crosstalk

When two loop configurations are in close proximity, the magnetic fields of one can overlap and disturb the field of the other. This phenomena, known as crosstalk, can cause false detects and detector lock-up. Should the loops be connected to the same four channel detector crosstalk will not occur, due to the fact that sequential polling of the loops takes place, resulting in only one loop being energised at a given time.

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. Careful screening of feeder cables if they are routed together with other electrical cables. The screen must be earthed at the detector end only.

5.2.2 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 additional turns should be added to the normal loop, as referred to in section 5.4.
The spacing between the loop and the cable should be greater than 150 mm, although this is not always practically possible. The slot depth should be kept as shallow as possible, taking care that no part of the loop or the feeder remains exposed after the sealing compound has been applied.

5.3 Loop and Feeder Specification

The loop and feeder should preferably constitute a single unjoined length of insulated copper conductor, with a minimum rating of 1.5 mm² cross sectional area.

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.

5.4 Sensing Loop Geometry

NOTE: 1) The circumference of the loop must not exceed 30 m.
2) The area of the loop must not exceed 30 m^2 and must not be less than 1 m^2.
3) The loop must be constructed as detailed below.

Sensing loops should, unless site conditions prohibit, be rectangular in shape and should normally be installed with the longest sides at right angles to the direction of traffic movement. These sides should ideally be 1 metre apart. The only factor which governs maximum separation between loops is the feeder length, with 100 metres being the maximum recommended length. 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, but greater than 6 metres, should have three turns. Loops having a circumference measurement less than 6 metres should have four turns. It is good practice at time of installation to construct adjacent loops with alternate three and four turn windings.

For additional information on loop geometry refer to the following documents:

"INDUCTIVE LOOP VEHICLE DETECTION" – Nortech Document. No. MKT01
"TRAFFIC DETECTION" – Nortech Document. No. MKT02
"TRAFFIC APPLICATION MANUAL" – Nortech Document. No. MKT004

5.5 Loop Installation

All permanent loop installations should be installed in the roadway by cutting slots with a masonry cutting disc or similar device. 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 : 4 mm Nominal
NOMINAL SLOT DEPTH : 30 mm to 50 mm

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

A continuous loop and feeder is obtained by leaving a tail long enough to reach the detector before inserting the cable into the loop slot. Once the required number of turns of wire are 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 a "quick-set" black epoxy compound or hot bitumen mastic to blend with the roadway surface.

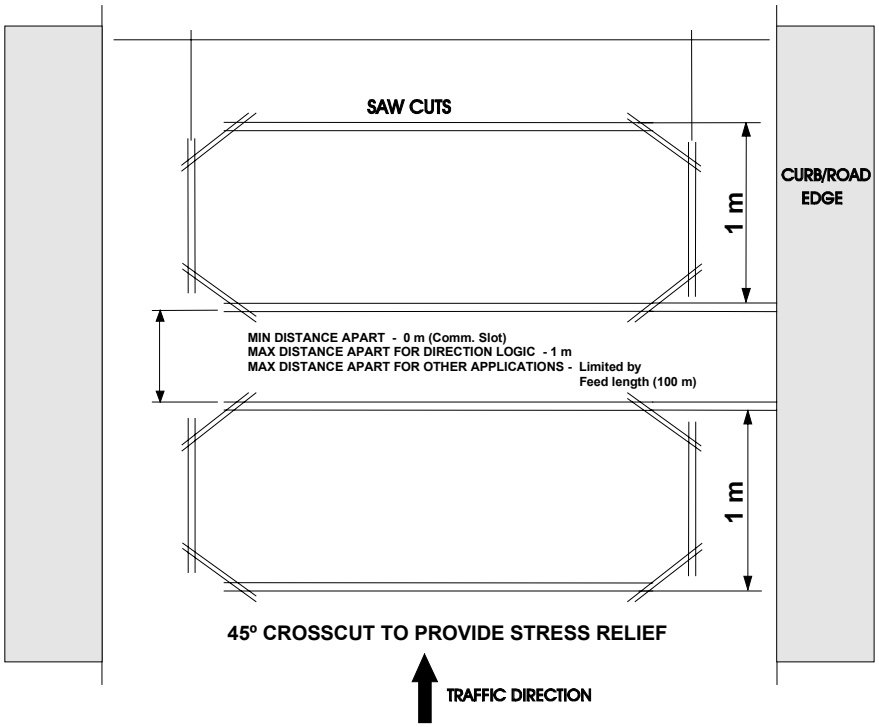


Figure 5.1 Adjacent loops connected to a TD450LS detector

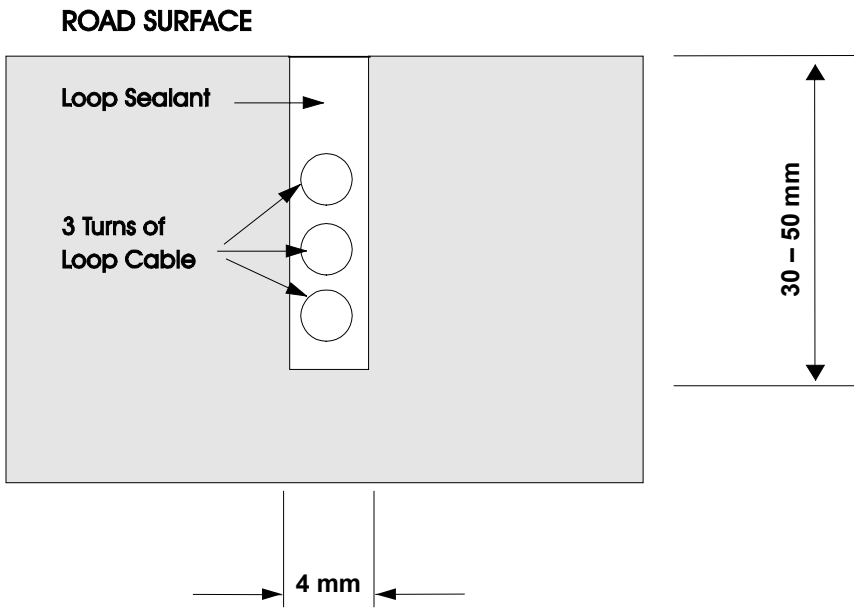


Figure 5.2 Slot details

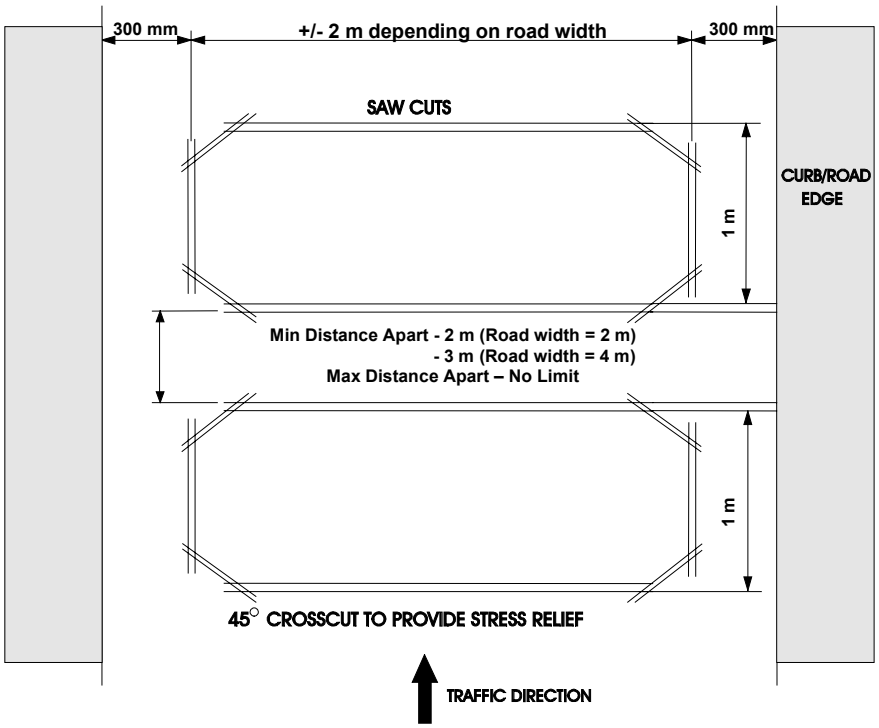


Figure 5.3 Adjacent loops connected to different modules

6. CONFIGURATION

WARNING 5: The connector PIN assignments vary from model to model

Refer to the label on the side of the unit for connector PIN assignment

Note 1: The tables below show the PIN assignments for Nortech's standard TD450
Models the pin assignments may change.

WARNING 6: Wiring harnesses supplied with the units i.e. 879CM0039, 879CM0037 and 879CM0039 are only rated for SELV voltages (less than 60V dc or less than 42 V ac)

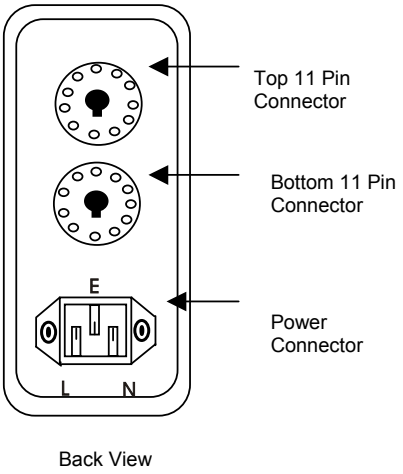
If the relays are to switch higher voltages use CE approved 11 PIN sockets or use Nortech's TD450 socket mounting plate Part No. 879FT0038 (See appendix B of this manual)

6.1 TD451 Detector – Order number 879FT0035

Wiring for TD451 DETECTOR – Order number 879FT0035

Top 11 Pin Connector

879CM0036 Wiring Harness wire colours	Pin Number	Top 11 Pin Connector Function	
	1	-	
	2	-	
White	3	CH1 Loop	Twist this pair
White	4	CH1 Loop	
Yellow	5	CH2 Loop	Twist this pair
Yellow	6	CH2 Loop	
Grey	7	CH2 N/O Contact	
Grey	8	CH2 Common	
	9	-	
Green	10	CH1 N/O Contact	
Green	11	CH1 Common	



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Bottom 11 Pin Connector Wiring

879CM0037 Wiring Harness Wire Colours	Pin Number	Bottom 11 Pin Connector Function	
Mauve	1	N/O Fault Contact	
Mauve	2	Common Fault	
Orange	3	CH3 Loop	Twist this pair
Orange	4	CH3 Loop	
Pink	5	CH4 Loop	Twist this pair
Pink	6	CH4 Loop	
White/Blue	7	CH4 N/O Contact	
White/Blue	8	CH4 Common	
	9	-	
White/Black	10	CH3 N/O Contact	
White/Black	11	CH3 Common	

3 Pin connector wiring code

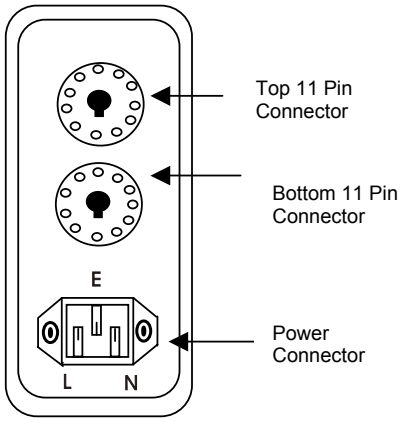
Power Harness Wire Colour	Pin Number	3 Pin Power Connector Function	
Yellow / Green	E	Earth	
Blue	N	Neutral	Power supply
Brown	L	Live	120V ± 10% 50/60Hz

6.2 TD452L Detector – Order number 879FT0022

Wiring for TD452L DETECTOR – Order number 879FT0035

Top 11 Pin Connector

879CM0036 Wiring Harness wire colours	Pin Number	Top 11 Pin Connector Function	
	1	-	
	2	-	
White	3	CH1 Loop	Twist this pair
White	4	CH1 Loop	
Yellow	5	CH2 Loop	Twist this pair
Yellow	6	CH2 Loop	
Grey	7	CH2 N/O Contact	
Grey	8	CH2 Common	
	9	-	
Green	10	CH1 N/O Contact	
Green	11	CH1 Common	



Back View

Bottom 11 Pin Connector

879CM0037 Wiring Harness Wire Colours	Pin Number	Bottom 11 Pin Connector Function	
Mauve	1	N/O Fault Contact	
Mauve	2	Common Fault	
Orange	3	CH3 Loop	Twist this pair
Orange	4	CH3 Loop	
Pink	5	CH4 Loop	Twist this pair
Pink	6	CH4 Loop	
White/Blue	7	CH4 N/O Contact	
White/Blue	8	CH4 Common	
	9	-	
White/Black	10	CH3 N/O Contact	
White/Black	11	CH3 Common	

3 Pin connector wiring code

Power Harness Wire Colour	Pin Number	3 Pin Power Connector Function	
Yellow / Green	E	Earth	
Blue	N	Neutral	Power supply
Brown	L	Live	230V ±10% 50/60Hz

6.3 TD454L Detector - Order number 879FT0036

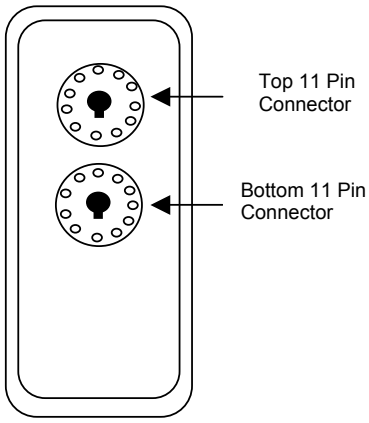
Wiring for TD454L DETECTOR – Order number 879FT0036

Top 11 Pin Connector

879CM0039 Wiring Harness wire colours	Pin Number	Top 11 Pin Connector Function	
Red	1	Live or +Ve	Power Supply 12 V –10% to 24 V +10% DC or AC
Black	2	Neutral or -Ve	
White	3	CH1 Loop	Twist this pair
White	4	CH1 Loop	
Yellow	5	CH2 Loop	Twist this pair
Yellow	6	CH2 Loop	
Grey	7	CH2 N/O Contact	
Grey	8	CH2 Common	
Green/Yellow	9	Earth	
Green	10	CH1 N/O Contact	
Green	11	CH1 Common	

Bottom 11 Pin Connector

879CM0037 Wiring Harness Wire Colours	Pin Number	Bottom 11 Pin Connector Function	
Mauve	1	**N/O Fault Contact**	
Mauve	2	Common Fault	
Orange	3	CH3 Loop	Twist this pair
Orange	4	CH3 Loop	
Pink	5	CH4 Loop	Twist this pair
Pink	6	CH4 Loop	
White/Blue	7	CH4 N/O Contact	
White/Blue	8	CH4 Common	
	9	-	
White/Black	10	CH3 N/O Contact	
White/Black	11	CH3 Common	



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6.4 TD454L 25 Way "D" – 879FT0031

Wiring for TD454L 25 Way 'D' DETECTOR – Order number 879FT0031

Top 11 Pin Connector

Optional Wiring Harness 879CM00?? wire colours	Pin Number	Top 11 Pin Connector Function
	1	AC Live
	2	Not Used
	3	Chassis Ground
	4	Loop input CH4
	5	Loop input CH3
	6	Loop input CH2
	7	Loop input CH1
	8	Output CH4 Relay N/C
	9	Output CH4 Relay N/O Opto (+)*
	10	Output CH3 Relay N/O Opto (+)*
	11	Output CH2 Relay N/O Opto (+)
	12	Output CH1 Relay N/O Opto (+)
	13	Output CH3 Relay N/C
	14	-
	15	AC Neutral
	16	Loop input CH4
	17	Loop input CH2
	18	Loop input CH2
	19	Loop input CH1
	20	Output CH2 Relay N/C
	21	Output CH4 Relay Common/Opto (-)*
	22	Output CH3 Relay Common/Opto (-)*
	23	Output CH2 Relay Common/Opto (-)*
	24	Output CH1 Relay Common/Opto (-)
	25	Output CH1 Relay N/C

WARNING 7: **The wiring harness wire colour to PIN No. assignment only applies to the stated wiring harness Part No.**

Other wiring harness will have different wire colour to PIN No. assignments.

7. APPLICATIONS

The TD450L four-channel detector can be used in a variety of applications in the traffic environment.

- Traffic counting
- Speed discrimination
- Queue detection
- Vehicle actuated traffic control
- Toll equipment

For more details on traffic applications, refer to the “Traffic Applications Manual”, Nortech Document No. MKT004.

8. CUSTOMER FAULT ANALYSIS

8.1 Fault Finding

FAULT	CAUSED BY	REMEDY
Red LED does not glow on power up.	If the indicator is off then there is a fault on the power connection to the unit.	Check power feed to the unit.
After the initial tuning period one of the channel indicators is still green.	Unit cannot tune to the loop due to faulty loop or feeder connection. Loop may be too small or too large. Faulty detector unit.	Check loop installation and connections. Recut as per installation instructions. Replace unit.
After tuning, the loop output indicator flashes green *intermitently* and the relay chatters.	The loop is getting spurious detects due to: a) Crosstalk with adjacent detector. b) Faulty loop or feeder connection.	 a) Change frequency setting. b) Check that the feeders are adequately twisted.
On detect one channel indicator turns green but the relay is not activated.	The detector is operating in the AB logic mode.	Change the operating mode to normal.

8.2 Functional Test

To test a detector, connect it to an inductive loop with a total inductance in the order of 300 micro-Henries.(μH) (This may be achieved in the workshop by winding (x) turns of wire on a non-metal former of diameter (y)).

x = 19 turns 0.25 mm wire
y = 238 mm (9.4 inches)

Bring a small metal object approximately the size of a matchbox close to the loop coil. The following will happen on detection:

NORMAL MODE:

The output LED will light up green and the presence output relay will operate immediately. On removal of the metal object the output LED will then turn off and the presence output relay will resume its undetected state.

FAULT OUTPUT:

An open / short circuit across any loop input or the removal of power from the detector will operate the fault relay.

To check the sensitivity, presence time et cetera, use should be made of a calibrated tester which comprises of a calibrated loop similar to the one described above with a movable vane which can be moved over the loop at pre-determined heights.

APPENDIX A –REQUEST FOR TECHNICAL SUPPORT FORM

For Technical support please fill in the form below and send it to your supplier. Its is recommended that at installation you complete this form as a record of the Installation. If there is a problem later on you can identify what has changed.

Contact Details:- Your Name: _____

Your company: _____

Telephone No. _____ Mobile/Cellphone No. _____

FAX No. _____

Postal address: _____

_____

_____

Product Model (i.e. TD452L) _____ Product FT No. **879FT**_____

Product Serial Number: _____

Site Name: _____ Detector No. (at the site): _____

What are the settings of the switches on the front of the unit ON or OFF

DIP Switch SW1

Switch 1 _____ (PRES Presence Ch 1)

Switch 2 _____ (PRES Presence Ch 2)

Switch 3 _____ (SENS Sensitivity Ch 2)

Switch 4 _____ (SENS Sensitivity Ch 2)

Switch 5 _____ (PRES Presence Ch 1)

Switch 6 _____ (PRES Presence Ch 1)

Switch 7 _____ (SENS Sensitivity Ch 1)

Switch 8 _____ (SENS Sensitivity Ch 1)

DIP Switch SW2

Switch 1	_____	(PRES	Presence Ch 4)
Switch 2	_____	(PRES	Presence Ch 4)
Switch 3	_____	(SENS	Sensitivity Ch 4)
Switch 4	_____	(SENS	Sensitivity Ch 4)
Switch 5	_____	(PRES	Presence Ch 3)
Switch 6	_____	(PRES	Presence Ch 3)
Switch 7	_____	(SENS	Sensitivity Ch 3)
Switch 8	_____	(SENS	Sensitivity Ch 3)

DIP Switch SW3

Switch 1	_____	(FREQ	Frequency)
Switch 2	_____	(FREQ	Frequency)
Switch 3	_____	(VAR	Variable – 1 Binary)
Switch 4	_____	(VAR	Variable – 2 Binary)
Switch 5	_____	(VAR	Variable – 4 Binary)
Switch 6	_____	(VAR	Variable – 8 Binary)
Switch 7	_____	(MODE	Mode selection)
Switch 8	_____	(MODE	Mode selection)

What application is this unit used in (short description)_____

_____

_____

_____

POWER SUPPLY DETAILS:

Nominal Voltage: _____ V Minimum Voltage: _____ V Maximum Voltage: _____ V

AC or DC ? _____ If AC then the Frequency _____ Hz

LOOP DETAILS

Loop 1

Size of loop: ___ m by ___ m Shape of loop: _____

Number of Turns: _____

Size of wire used (mm^2 or AWG) _____

Type of wire insulation and thickness of insulation:_____

How far below the surface is the loop: _____ mm

Loop 2

Size of loop: ___ m by ___ m Shape of loop: _____

Number of Turns: _____

Size of wire used (mm^2 or AWG) _____

Type of wire insulation and thickness of insulation:_____

How far below the surface is the loop: _____ mm

Loop 3

Size of loop: ___ m by ___ m Shape of loop: _____

Number of Turns: _____

Size of wire used (mm^2 or AWG) _____

Type of wire insulation and thickness of insulation:_____

How far below the surface is the loop: _____ mm

Loop 4

Size of loop: ___ m by ___ m Shape of loop: _____

Number of Turns: _____

Size of wire used (mm^2 or AWG) _____

Type of wire insulation and thickness of insulation:_____

How far below the surface is the loop: _____ mm

Are there any metal objects below any of the loops such as concrete reinforcing, water pipes etc if yes please give details:

_____

_____

_____

Are there any power cables below any of the loops if yes please give details:

_____

_____

_____

Are there any other loops in the area if so how many? _____ and how close are the other loops to the loops on this detector? _____ m

FEEDER CABLE DETAILS

Feeder Cable to Loop 1

Length of feeder cable _____m

Size of wire used (cross sectional area of copper mm^2 or AWG) _____
(should be 1.5 mm^2 or larger)

Feeder Cable to Loop 2

Length of feeder cable _____m

Size of wire used (cross sectional area of copper mm^2 or AWG) _____
(should be 1.5 mm^2 or larger)

Feeder Cable to Loop 3

Length of feeder cable _____m

Size of wire used (cross sectional area of copper mm^2 or AWG) _____
(should be 1.5 mm^2 or larger)

Feeder Cable to Loop 4

Length of feeder cable _____m

Size of wire used (cross sectional area of copper mm^2 or AWG) _____
(should be 1.5 mm^2 or larger)

Type of wire insulation and thickness of insulation:_____ (should be _____)

Type of feeder cable used (screened, armoured, multicore, etc.)

_____

_____

In the feeder cable how many twists per meter are there?_____ (should be more than 20 per metre)

Are there any other cables close to this feeder cable? If so please give details:

_____

_____

FEEDER CABLE and LOOP DETAILS

Loop 1 and Feeder Cable

DC resistance of Feeder plus Loop: _____ ohms

Inductance of Feeder plus Loop: _____ Micro Henries

Loop and feeder resistance to earth (with detector unplugged) using a 500V Megger: _____ Ohms (should be greater than 10 Mega Ohms)

Loop 2 and Feeder Cable

DC resistance of Feeder plus Loop: _____ ohms

Inductance of Feeder plus Loop: _____ Micro Henries

Loop and feeder resistance to earth (with detector unplugged) using a 500V Megger: _____ Ohms (should be greater than 10 Mega Ohms)

Loop 3 and Feeder Cable

DC resistance of Feeder plus Loop: _____ ohms

Inductance of Feeder plus Loop: _____ Micro Henries

Loop and feeder resistance to earth (with detector unplugged) using a 500V Megger: _____ Ohms (should be greater than 10 Mega Ohms)

Loop 4 and Feeder Cable

DC resistance of Feeder plus Loop: _____ ohms

Inductance of Feeder plus Loop: _____ Micro Henries

Loop and feeder resistance to earth (with detector unplugged) using a 500V Megger: _____ Ohms (should be greater than 10 Mega Ohms)

APPENDIX B

TD450 Connector Mounting Plate
Nortech Part No. 879FT0038