PEPPERL+FUCHS

LC20 - 2 INSTALLATION GUIDE
TDOCT-6306_ENG

Safety Instructions:

- All installation commissioning, repair, and service work to this product must be undertaken by suitably qualified and trained personnel.
- The unit must be earthed.
- Disconnect the power before working on the unit.
- On 230 VAC models, a readily accessible disconnect protection device must be incorporated in the mains wiring.
- On all models, the power supply MUST have short circuit protection and over current protection installed at the power source. Typically, this will be a 5Amp Magnetic Circuit Breaker for AC models and a fuse for DC models.
- This product must be installed in an enclosure.
- Always suspend traffic through the barrier area during installation and test as this may result in unexpected operation of the barrier.
- There are no serviceable parts or internal settings inside the product. The product warranty will be voided if the cover has been removed or if there is any tampering with the product.

Electrical Connections:

- Refer to the side-label on the side of the unit to verify the corresponding pin-out functions for both the 11 Pin Connector and DIN Rail housing variants of the LC20 the pin-outs may vary from model to model.
- Before connecting the detector to the power supply, ensure that you have the correct power supply for the model you are using:

  - LC20 - 2 - RB/DR 230VAC = 230VAC
  - LC20 - 2 - RB/DR 12-24VAC/DC = 12V to 24V AC/DC

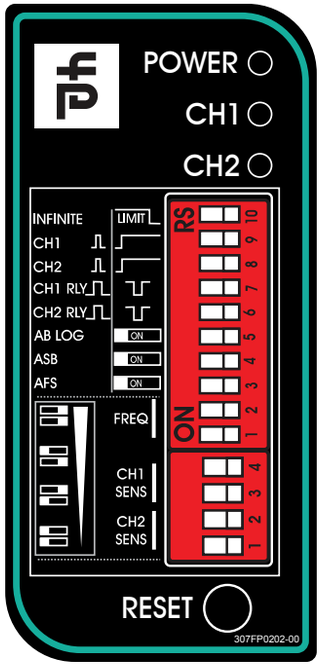
Front Panel Indications:

The front panel indicators consist of a Red Power / Communicator LED and two Green Channel LEDs.

Description	Function
Power LED	This red LED is on to indicate the unit is powered and functional This red LED is also used as a communications interface with the LC20DT diagnostic device to obtain information from the unit.
Channel LEDs	These green LEDs indicated the current status of the two detector channels. The can indicate four possible conditions namely, tuning, idle, detect, or fault. • Tuning condition - the detector is currently tuning the loop - green LED flashes at a rate of 2Hz • Idle condition - no vehicle is detected- green LED is off. • Detect condition - a vehicle is detected passing over the loop - the green LED is on. • Fault condition- the detector is unable to tune to the loop as it is either out of operational conditions such as low signal strength or frequency out of range or there exists a fault on the loop such as a short circuit or an open circuit - the green LED flashes at a rate of 2Hz. If the fault is self-healing the detector will continue to operate but the green LED will flash at a rate of 1Hz.

DIP Switch Selections:

Presence Time (Switch 10) – The presence time setting determines how the detector will track a detect. There are two selection options available, namely permanent presence and limited presence. The permanent presence mode setting will maintain the presence of a vehicle over the loop by continuously compensating for all environmental changes. The limited presence mode setting will limit the presence of a vehicle over the loop and the presence time is related to the size of the detect. Typically, a 1% ΔL/L will timeout after approximately 1 hour.



- **Pulse or Presence on Detect (Switch 9 and 8)** -When a vehicle enters the loop the relays can either give a 150ms pulse on detect or maintain an output for the duration the vehicle is detected. Each channel is set individually as per the faceplate.
- **Fail-safe of Fail-secure (Switch 7 and 6)** – The relay outputs can be switched between fail-safe and fail-secure. Each channel is set individually as per the faceplate.
- **AB Logic (Switch 5)** - This is used to count cars in a specified direction. A transition from loop 1 to loop 2 (forwards) results in a 150ms pulse output on Relay 1. The opposite direction results in a 150ms pulse output on Relay 2.
- **Automatic Sensitivity Boost (A.B.S.) (Switch 4)** – ASB is a mode which alters the undetect level of the detector. ASB causes the sensitivity level to be boosted to a maximum on detection of a vehicle, irrespective of the current sensitivity level maintained at this level during the entire presence of the vehicle over the loop. When the vehicle leaves the loop and the detection is lost, the sensitivity level reverts to the pre-selected level. This is typically used for vehicles with high beds, or vehicles towing trailers, where it is important to maintain the detect over the entire length of the vehicle.
- **Automatic Frequency Selection (A.F.S.) (Switch 3)** - This setting allows the detector to briefly evaluate all five frequency bands and select the best operating frequency available. The tuning time with AFS switched on can range between 5 and 20 seconds. With AFS switched off, the frequency can be selected manually.
- **Manual Frequency Selection (Switches 1 & 2) - **AFS must be turned to the OFF position to select the frequency manually.** There are four possible frequency selection options, High, Medium-High, Medium-Low and Low.
- **Sensitivity (Switches 1 to 4)** – The sensitivity of the detector determines the change of inductance necessary to produce a detect. There are four possible sensitivity selection options, High (0.01% ΔL/L), Medium-High (0.02% ΔL/L), Medium-Low (0.05% ΔL/L), and Low (0.1% ΔL/L). Sensitivity can be set per channel as indicated by the faceplate.

Relay Outputs:

The LC20-2 has one relay output per channel. Both are configurable as either presence or pulse relays and may be set to Fail-safe or Fail-secure mode. The relay states for the two fail modes are shown in the table below:

Presence Relay Programming		
	Fail Secure	Fail Safe
Relay		
Undetect	Closed	Open
Detect	Open	Closed
Fault	Closed	Closed
Power Off	Closed	Closed

***Note: This is representative of the LC20-2 default wiring. Units may have varied relay wiring therefore it is advisable to verify the expected relay outputs with the side-label of the unit.

Pushbutton:

The pushbutton is a multipurpose button which can be used to initiate a retune or can be used to either enable or disable the power fail feature, depending on how long the pushbutton is held in.

Description	Hold	Function
Reset	3 sec	This will initiate a detector retune.
Power Fail	10 sec	Hold for 10s to determine the state of Powerfail. If the LEDs are ON, Powerfail is ON. If the LEDs are OFF, Powerfail is OFF
Power Fail Toggle	30 sec	Holding for 30s will determine the Powerfail status. The state of the Powerfail is known after holding for 10s. After 30s, if the LEDs turn OFF, Powerfail is now OFF. If after 30s the LEDs turn on, Powerfail is now ON

Automatic Frequency Selection:

The Automatic Frequency Selection (A.F.S) feature enables the unit to briefly evaluate all five frequency bands and select the best operating frequency available. It weighs up each selection based on where the frequency is located within the operational range, the signal strength, and the level of detected noise. AFS allows the detector to evaluate all the frequency selections.

Due to the increased processing required, AFS takes longer to tune than when it is deactivated. The tune time with AFS on can range from 5 to 20 seconds. If after this period of time, the detector still has not tuned, it is also possible that none of the frequency selections are suitable for the loop. If this occurs, manual frequency selection should be used. Due to the sporadic nature of noise, the channel may seem quiet during the evaluation but still suffer from cross-talk.

Power Fail:

The Power fail feature allows the unit to remember its operating conditions and detect status in the event of power being removed. When power is restored, the unit continues operating from saved conditions and status. This is designed specifically for fail safe situations to retain the output state and prevent a glitch on the outputs for a power failure. As such, when the power is restored the detector will not retune but will instead return to the detect state prior to the power failure. If a vehicle was on the loop during the power failure, it will remain detected when the power is restored. Thus, it prevents the tuning out of a vehicle over the loop during a power failure.

Loop Installation Guide:

Optimum functioning of the detector is largely dependent on factors associated with the inductive sensor loop it is connected to. These factors include choice of material, loop configuration and correct installation practice. A successful inductive loop vehicle detection system can be achieved with 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.

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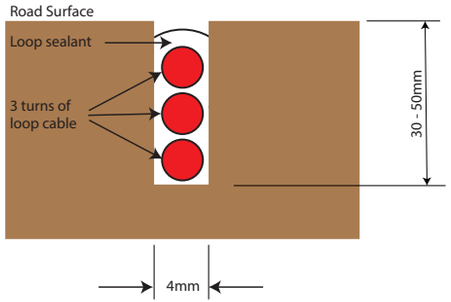
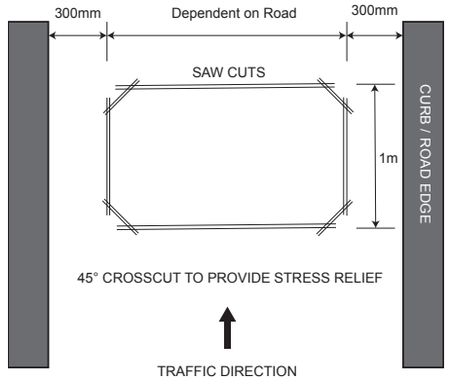
1. The loop and loop feeder cable should be constructed from an XLPE (Cross-linked polyethylene) insulated multi-stranded copper conductor with a minimum cross sectional area of 1.5mm².
2. The feeder cable should be twisted at a minimum rate of at least 20 turns per meter.
3. The perimeter of the loop must not exceed 30 meters.
4. The area of the loop must not exceed 30m² and must not be less than 1m².
5. The recommended number of turns is typically based on the loop perimeter - refer to the table below.

Loop Perimeter	No. of Turns
3-6 meters	4 Turns
6-10 meters	3 Turns
10-30 meters	2 Turns

6. 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 meter apart.
7. When two adjacent loops are laid in close proximity to each other, it is good practice at time of installation that a different number of turns are used in each loop to prevent cross-talk.
8. 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. Other forms of joins such as those available in kits, where the joint is properly sealed against moisture, are also permitted.
9. All permanent loop installations should be installed in the roadway by cutting slots with a missionary 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. The slot should have a nominal width of 4mm and slot depth of between 30mm and 50mm.

A slot must also be cut from the loop perimeter at one corner of the loop to the roadway edge to accommodate the feeder. After the turns of wire are wound into the slot around the loop perimeter, the wire must be routed again via the feeder slot to the roadway edge. The loops must then be sealed using a "quick-set" black epoxy compound or hot bitumen mastic that blends with the roadway surface.





Fault Finding Diagnostics:

Fault	Caused by	Remedy
Red LED does not glow on power up	If the Red LED indicator is off, then there is a fault with the power or the power connection unit.	Check the power feed to the unit. Check the power connections to the unit.
After the initial tune period the CH Green LED remains flashing at 2Hz	The unit cannot tune to the loop due to either a faulty loop or feeder connection.	Check the loop installation and the loop connections. Check the on-board diagnostics using the LC20DT to confirm the fault.
	The loop inductance is too small (<20µH) or is short circuited.	Check that there is no short circuit on the loop or feeder wiring. Re-install loops if required. If there is no short circuit on the loop, verify the loop inductance using an LCR meter. The loop inductance should lie between 20µH to 1500µH. Add loop turns to increase loop inductance.
	The loop inductance is too large (>1500µH) is open circuit.	Check if there is electrical continuity of the loop and feeder. Check all loop connections are secure. Re-install if required. If the loop is not open circuit, verify the loop inductance using and LCR meter. The loop inductance should lie between 20µH to 1500µH. Remove loop turns to decrease loop inductance.
	AFS is ON and one of the channels is unused or experiencing one of the above problems. Faulty Detector unit.	Turn the AFS DIP switch OFF and hold the reset button for 3 seconds to invoke a retune to determine which loop is faulty. Replace unit.
After tuning, the loop output LED flashes intermittently and the relay chatters.	The loop is getting spurious detections due to: a. Crosstalk with the loop of an adjacent detector. b. Faulty loop or feeder connections	 a. Change the frequency setting of the detector. b. Check the loop wiring and ensure that the feeders are adequately twisted. Ensure that any joins in the loop feeder are soldered and made waterproof.
	c. Electrical Noise d. Movement of the loop in the ground e. The sensitivity of the detector may be set too high.	c. Check that the loop feeder cables are adequately twisted. Ensure that the loop feeder cables are run separated from any other electrical cables to reduce any electrical noise coupling. Use screened loop feeder cable and ensure that the screen is earthed at the detector only. d. Check the loop installation for cracks in the road near the loops, as well as the condition of the loop sealant. e. Set the sensitivity lower on the DIP switches
Changing Frequency DIP switches does not initiate a retune.	The A.F.S feature is enabled, which overrides the manual setting of the frequency.	The A.F.S DIP switch needs to be switched off in order to configure the frequency manually. If A.F.S is disabled, holding the reset button for 3 seconds will result in the detector retuning.
The detector remains in detect after the vehicle has left the loop.	a. The sensitivity of the detector may be set too high. b. The loop is noisy and A.S.B feature is enabled. c. Movement of the loop in the ground or the feeder cables. d. Poorly crimped terminals	a. Determine the required sensitivity level via the on-board diagnostics using the LC20DT. Set the sensitivity lower on the DIP switches. b. Switch A.S.B feature off on the DIP switch c. Check the loop installation for cracks in the road near the loops, as well as the condition of the loop sealant. Ensure the feeder cables are secure in the cabinet/enclosure. d. Check the loop connection to the terminals.

*****IMPORTANT NOTE*****

On INITIAL installation:

- Automatic Frequency Select (AFS) is disabled by default. On power-up the detector will attempt to tune to the frequency determined by the Frequency DIP switches. Should the AFS DIP switch functionality be required please enable it using the AFS DIP switch and **hold the reset button for 3 seconds** to invoke the retune.
- Should only ONE inductive loop be connected to a dual channel detector, **AFS MUST BE DISABLED or a dummy loop should be connected to the unused channel** to achieve successful tuning.
- Power Fail functionality is disabled by default. Should the Power Fail functionality be required it may be turned on using the reset button. **Press and hold the reset button for 30 seconds to toggle the power fail functionality**. After holding the reset button for 10 seconds the LEDs on the unit will indicate the state of the Power Fail functionality. If the LEDs are OFF power fail is OFF and will turn on after 30 seconds. If the LEDs are ON, power fail is ON and will be turned OFF after 30 seconds.