Dual Channel Loop Vehicle Detector

1 Introduction

The dual-channel inductor coil vehicle detector is a digital intelligent vehicle detector with a toroidal inductor and directional logic detection function, mainly used to detect the passage of vehicles. Dual-channel inductor coil vehicle detector is designed based on high-performance special-purpose microprocessor and high-stability oscillation circuit, Using channel sequential scanning technology to eliminate crosstalk between coils, with frequency adaptive and full environment tracking function, output interface optional relay or solid-state mode. The product is widely used in car park management, highway toll stations, signal light control, security bayonet monitoring and electronic police systems.

Figure 1, Product outline

2 Technical parameters

2.1 Function parameter

Channel sequential scanning: using channel coil sequential scanning technology to eliminate crosstalk between coils

Self -tuning range: 20~1000uH

Environmental tracking: Full automatic environment tracking compensation over the entire inductance range

Sensitivity: (-ΔL/L)：0.04%~0.32%, 2-bit DIP switch per channel, 4-stage adjustable

Frequency: 20KHz~110KHz, panel DIP switch 4 adjustable, actual operating frequency depends on coil geometry

Output configuration: single way output relay or OC gate output per channel

Pulse output duration (pulse width): approx. 150ms (factory selectable 250ms)
Presence: Permanent presence/limited presence (limited presence for approximately 1 hour 3%ΔL/L)
Automatic sensitivity increase: panel DIP switch is optional, release sensitivity automatically increases when allowed
Working mode and output mode: (internal selection)
①When there is no direction logic, presence or pulse output CH1 and CH2 can be independently selected
②In direction logic, A→B(CH1) or B→A(CH2) exist or pulse output
Display: The panel provides a power LED indication (ON), always on after power on;
2-channel LED indicators (CH1 and CH2):
①Tuning - Always on in standalone mode, and turn on in AB logic mode
②release status (not detected) - always off
③Trigger Status (Checked Out) - Constant
④fault status - light one second off one second recovery need manual reset)
Protection: Transformer input isolation, voltage regulator diode protection
Lightning surge: power supply: ±4KV (1.2/50uS); coil end: ±2KV (1.2/50uS);
Group pulse: Power end: ±3KV/5KHz; Coil end: ±3KV/5KHz;
Response time: ≤100ms
Drift compensation rate: about 1% ΔL/L per minute;
Output relay: contact rate 3A/220VAC, N/O contact per channel

2.2 Electrical parameters

Power supply: 220V AC±15%, 48~60Hz, maximum 2VA, 12-24V AC/DC±15%

2.3 Environmental parameters

Working environment: working temperature -40°C~+80°C, storage temperature: -40°C~+85°C,
Relative humidity: up to 95% (no dew)

2.4 Mechanical parameters

(1) Material: ABS engineering plastics
(2) Overall dimensions: 88(H)X34(W)X72(L)mm
(3) Installation: bracket or DIN rail socket
(4) Connector: Single 11-pin plug (86CP11) on rear panel

3 Working mode and status

The detector measures the amount of inductance change caused when the vehicle passes through a loop coil buried under the road surface to detect the presence of the vehicle.

The vehicle detector has three working modes that can be set by jumpers on the main board (see Figure 2).:

1. Independent mode - independent of two channels, no logical association;
2. Instant mode - with directional logic, output as presence;
3. Pass Mode - With directional logic function, the output is pulsed.

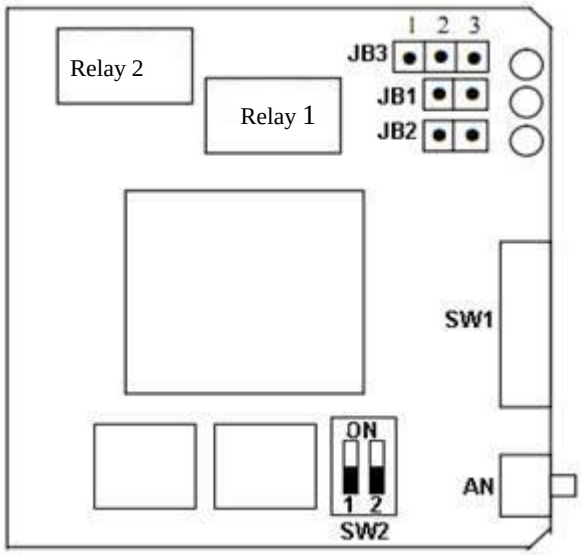

Figure 2 (board schematic)

Jumper use:

JP1-independent mode, channel 1 relay exists or pulse output mode is selected

JP2 - Standalone Mode, Channel 2 Relay Present or Pulse Output Mode Select

JP3-Set Detector Operation Mode (One of three alternatives)

3.1 Independent mode

3.1.1 Function: Independent between two channels, no logical association

3.1.2 Mode setting method: No short circuit between JP3-1, 2 and 2,3.

3.1.3 Relay output mode: Two channels can be set to different output modes.

JP1 is used for CH1 relay (J1) status selection: short-to-existence, no-short-pulse;

JP2 for CH2 relay (J2) status selection: short-to-existence, no-short-pulse.

3.1.4 The detector workflow and status are as follows:

⑴During system initialization

After power-up or reset, the detector enters the initialization routine and automatically tunes the operating frequency. This process takes approximately 2 seconds.

Detector Self- test status	Coil 1 status	Coil 2 status	Output method	Door panel LED indicator			Relay status	
				ON	CH1	CH2	J1	J2
Malfunction	X	X	X	Off	On	On	N/O	N/O
Normal	Normal	Normal	X	On	On	On	N/O	N/O
		Malfunction				Flicker		
	Normal	Normal		On	Flicker	on		
		Malfunction				Flicker		

Note: In the above table, N/C represents the relay's normally open point output, that is, the relay's common point and the normally open point are short-circuited, for the convenience of description, the N/O relay is used to indicate the opening of the relay common point and the normally open point. Coil fault means that the inductance exceeds the normal range, short circuit or open circuit must be rechecked coil.

(2)At the end of initialization

After the self-test passes, the detector goes into operation.

①Coil normal - ON light is always on, and channel status lights (CH1, CH2) are off.

When the output mode is set to exist mode, the relay is N/O output;

When the output mode is set to pulse mode, the relay is still N/O output.

②Coil failure - ON light is on, the status LED of the corresponding channel flashes, and the relay is N/O output

(3) Detector enters operating state

①Release state - When there is no vehicle passing over the coil, the channel indicator is always off and the relay is at the end of initialization.

②Trigger status - When the vehicle enters the coil and is detected, the indicator of the corresponding channel is always on. In the presence mode, the relay is N/C output; in the pulse mode, the relay output pulse (N/O→N/C→N/O), see section 2 technical parameters for pulse width.

(4) Coil failure during detector operation

When one of the coils fails during the normal operation of the detector, the indicator of the corresponding channel becomes flashing, the relay can still maintain the original state, and the other channel can still work normally. After the faulty channel is restored, the detector can automatically resume its operation.

3.2 Instant mode

3.2.1 Function: Directional logic function between two channels.

3.2.2 Mode setting method: short between JP3-2,3 (“ ⌐¬ ” position)。

3.2.3 Relay output mode: Existence mode (ignoring JP1, JP2 settings).

3.2.4 The detector workflow and status are as follows:

(1) During system initialization

After power-up or reset, the detector enters the initialization routine and automatically tunes the operating frequency. This process takes approximately 2 seconds.

Detector Self- test status	Coil 1 status	Coil 2 status	Output method	Door panel LED indicator			Relay status	
				ON	CH1	CH2	J1	J2
Malfunction	X	X	X	Off	On	On	N/O	N/O
Normal	Normal	Normal	X	On	Rotation	Rotation	N/O	N/O
		Malfunction				Flicker		
	Malfunction	Normal		On	Flicker	Rotation		
		Malfunction				Flicker		

(2) At the end of initialization

After the self-test passes, the detector goes into operation.

①Coil normal - ON light is on, channel status lights (CH1, CH2) are off, and both relays are N/O output.

②Coil fault - The ON light is on, the status light of the corresponding channel of the fault flashes, and the relay maintains its original status.

(3) Detector enters operating state

①Release status - When there is no vehicle passing over the coil, the channel indicator is always off and the relay is at the end of initialization。

②Trigger state - Define the CH1 coil as A, CH2 coil as B, then: A→B logic, meet the trigger condition, the CH1 relay N/C output; otherwise B →A logic, meet the trigger condition, the CH2 relay N/C output .

The triggering conditions and the process (using A→B logic as an example) are as follows: (See Figure 3)

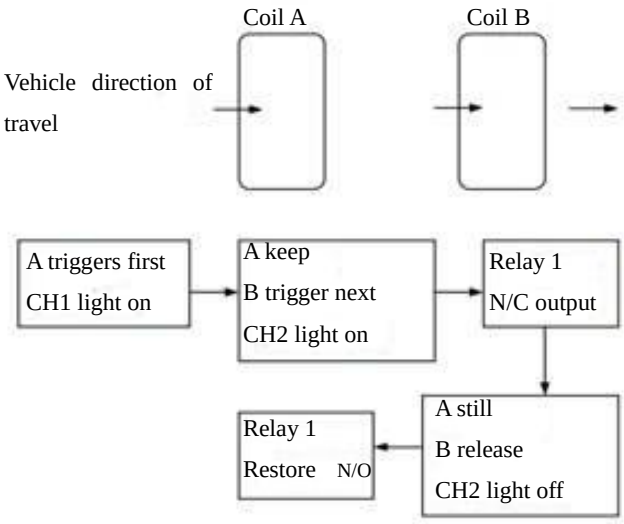

Figure 3

(4)Coil failure during detector operation

When one or two coils fail during the normal operation of the detector, the indicator of the corresponding channel becomes flashing, and the relay maintains the pre-fault condition. At this time, the detector cannot work normally. (The two coils are required normal for the direction logic function). After the coils all return to normal, the detector can automatically resume its work.

3.3 Through mode

3.3.1 Function: Directional logic function between two channels.

3.3.2 Mode setting method: short between JP1-1,2 (“ ” position)。

3.3.3 Relay output mode: Existence mode (ignoring JP1, JP2 settings).

3.3.4 The detector workflow and status are as follows:

(1) During system initialization

After power-up or reset, the detector enters the initialization routine and automatically tunes the operating frequency. This process takes approximately 2 seconds

(2) At the end of initialization

After the self-test passes, the detector enters the operating state

①Coil normal - ON light is on, channel status lights (CH1, CH2) are off, and both relays are N/O output.

②Coil failure - The ON light is on, the status light of the corresponding channel of the fault flashes, and the relay N/O is output.

(3) Detector enters operating state

①Release state - When there is no vehicle passing over the coil, the channel indicator is always off and the relay is at the end of initialization.

②Trigger state - Define the CH1 coil as A and the CH2 coil as B. When A→B logic, CH1 relay will output a pulse (N/O→N/C→N/O) when the trigger condition is met; conversely, when B→A logic, the CH2 relay outputs a pulse (N/O→N/C→N/O) when the trigger condition is met.

The triggering conditions and process (using A→B logic as an example) are as follows: (see Figure 4)

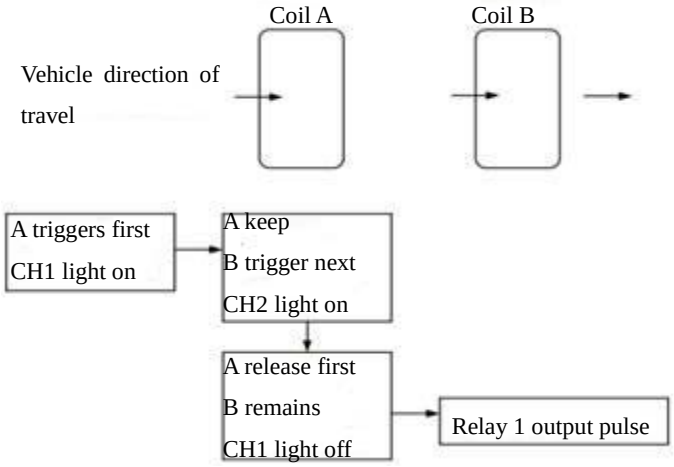

Figure 4

(4) Coil failure during detector operation

When one or two coils fail during the normal operation of the detector, the indicator of the corresponding channel goes to a flashing state, and the relay maintains the pre-fault state. At this time, the detector cannot work normally (2 coils are required for normal direction logic function). Need to wait until all the coils have returned to normal.

4 Operation guide

The detector operation can be selected by changing the 8-bit DIP switch setting on the front panel.

Note: Before the detector is powered on, please carefully check the power voltage level marking on the rear cover.

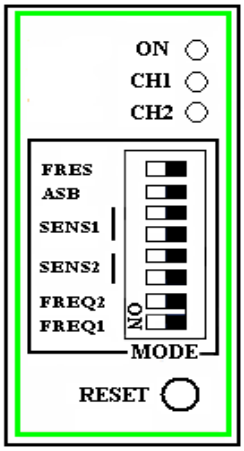

Figure 5 (front panel)

The front panel (see Figure 4) configures one power indication (ON), two channel status displays (CH1, CH2), an 8-bit DIP toggle switch, and a reset button (RESET). Rear panel configuration single 11-pin plug (86CP11)。

4.1 Panel display

⑴Power indicator LED (ON, red)

After power-up or reset the detector enters the self-test procedure:

Internal self -test is normal - always on;

Internal self-test failure - always off (CH1, CH2 is always on).

(2) Channel status display LED (CH1 and CH2, green)

During initialization - light or rotation;

After the initialization is complete: the system is normal - always off; the system is faulty - always on; the coil is faulty - flashing.

Triggered state (with car passing, check out) - constant light;

Release state (not detected) - always off;

Coil fault status - blinking (bright light off).

4.6 Reference picture of OC gate output interface

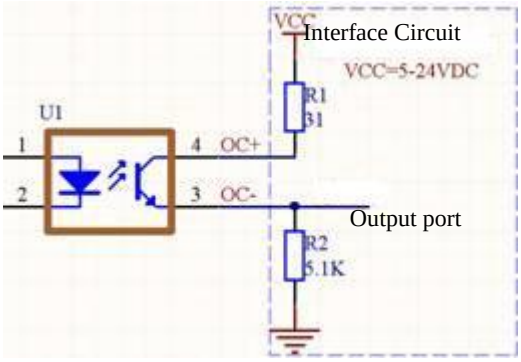

Figure 6 - Positive logic connection

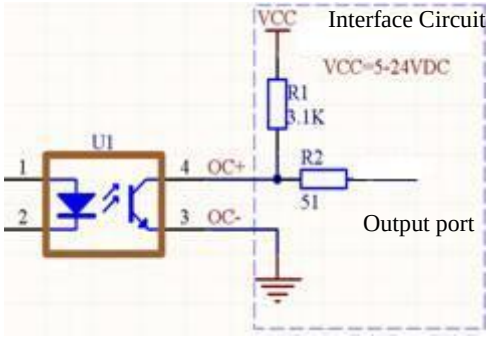

Figure 7 - Negative logic connection

Positive logic connection (Figure 6): release status (no car, no detection), output low level.

Negative logic connection (Figure 7): release status trigger (no car, not detected), output high.

Trigger status (car, check out), output low level.

6 Common Fault Analysis

Fault phenomenon	Cause	Solution
No display after power on	Problems with power supply	Turn off the power immediately and check if the power input is connected incorrectly and the power level is matched
After power-on, ON is off, CH1 and CH2 are on	The detector itself fails	Check the wiring after the correct test, the status is still, return to the manufacturer
After power on, ON is always on, and CH1 or CH2 flashes	The coil is short-circuited, opens or the inductance exceeds the auto-tuning range	Check the coil for good contact, if it is good then change the detection operating frequency or adjust the number of coil turns
The initialization state is normal. When there is a car passing, CH1/CH2 is off, and the relay/OC door has no output.	Sensitivity level set too low	Improve sensitivity and try again
When no car passes, accidentally trigger, relay/OC door output	Loose loops or crosstalk with other detectors	Change the detector operating frequency and recheck the coil if invalid