

Operating Instructions

Model AX2 and AX2DL

Firmware Version 2.1

TWO CHANNEL LOOP DETECTOR

I General

The Model AX2 is a two channel inductive loop detector that monitors two independent inductive loops and provides a separate relay output for each loop input (channel). The loops connected to Channels 1 and 2 are scanned (alternating on and off cycles), which eliminates crosstalk between loops connected to the same Model AX2 detector. The Model AX2DL is factory configured to provide AB and BA directional logic outputs.

Please verify source voltage before applying power. The model designation indicates the input power required, number of connectors, Fail-Safe / Fail-Secure configuration, and contact designation for the detector as follows.

Model AX2-x-xx-x (xx)	Two channel loop detector
Model AX2DL-x-xx-x (xx)	Two channel loop detector with directional logic

	<p>(NC) = Normally Closed Contacts *</p> <p>(NO) = Normally Open Contacts *</p> <p>Blank = Fail-Safe</p> <p>S = Fail-Secure</p> <p>1C = One 11-pin connector</p> <p>2C = Two 11-pin connectors</p> <p>3 = 120 VAC</p> <p>4 = 12 VDC / 24 VDC / 24 VAC</p> <p>8 = 240 VAC</p>
--	--

* The 2C (two connector) models do not have the (NO) Normally Open or (NC) Normally Closed contact designation.

The detector is factory configured for either Fail-Safe or Fail-Secure operation (see unit side label). The output state of the either channel in Fail-Safe or Fail-Secure mode is listed in the table below.

	Fail-Safe		Fail-Secure	
	Power Failure	Loop Failure	Power Failure	Loop Failure
Ch 1 / Ch 2 Output	Call	Call	No Call	No Call

II Indicators and Controls

i Detect / Fail LEDs

The detector has one green and two red LED indicators that are used to provide an indication of the detector's power status, output state, and/or loop failure conditions. The table below lists the various indications and their meanings.

Status	POWER LED	CH 1 / CH 2 DETECT LED
OFF	No power or low power	No vehicle present and Loop OK
ON	Normal power to detector	Vehicle present (Detect)
Flash	N/A	1 Hz rate, 50% duty cycle - Shorted Loop 10 Hz rate, 50% duty cycle - Open Loop 3 Flashes per second - Prior Loop Failure (Loop has failed and the problem has been corrected.) NOTE: If a vehicle is detected, the LED will turn ON even if a prior loop failure condition exists.

NOTE: If the supply voltage drops below 75% of the nominal level, the power LED will turn off, providing a visual indication of low supply voltage. Model AX2 / AX2DL detectors will operate with supply voltage as low as 70% of nominal supply voltage.

ii **Front Panel DIP Switches (Both Channels)**

Switch	ON	OFF	Factory Default
1	Frequency		OFF
2	<i>(See Table under Frequency Section)</i>		OFF
3	Pulse Mode	Presence Mode	OFF
4	Sensitivity Boost	No Boost	OFF
5	Sensitivity		ON
6	<i>(See Table under Sensitivity Section)</i>		OFF

Frequency (DIP Switches 1 and 2)

Loops connected to channels 1 and 2 of a Model AX2 / AX2 DL detector *cannot* crosstalk (i.e. interfere with each other). In situations where loop geometry forces loops to be located in close proximity to one another and the loops are connected to different detectors, it may be necessary to select different frequencies for each loop to avoid loop interference. DIP switches 1 and 2 can be used to configure the detector to operate at one of four frequencies corresponding to *Low*, *Medium / Low*, *Medium / High*, and *High* as shown in the table below.

NOTE: *After changing any frequency switch setting(s), the detector must be reset by momentarily changing one of the other switch positions or pressing the front panel RESET pushbutton.*

Switch	Frequency			
	Low (0)	Medium / Low (1)	Medium / High (2)	High (3) *
1	ON	OFF	ON	OFF *
2	ON	ON	OFF	OFF *

* Factory default setting.

Presence / Pulse Mode (DIP Switch 3):

Each channel has two modes of operation, Presence or Pulse. When in Pulse mode (DIP switch 3 set to *ON*), a 250 millisecond pulse is output each time a vehicle enters the loop detection area. When in Presence mode (DIP switch 3 set to *OFF*), the channel's output operates in True Presence™ Mode and the detector channel will hold a Call output as long as a vehicle is present and power is not removed or reset applied. True Presence™ hold time applies only for normal size automobiles and trucks and for normal size loops (approximately 12 ft² to 120 ft²). The factory default setting is *OFF* (Presence Mode).

Sensitivity Boost (DIP Switch 4)

DIP switch 4 can be turned *ON* to increase sensitivity during the detect period without changing the sensitivity during the no detect period. The boost feature has the effect of temporarily increasing the sensitivity setting by up to two levels. When a vehicle enters the loop, the detector automatically boosts the sensitivity level. As soon as no vehicle is detected, the detector immediately returns to the original sensitivity level. This feature is particularly useful in preventing dropouts during the passage of high bed vehicles. The factory default setting is *OFF* (no Sensitivity Boost).

Sensitivity (DIP Switches 5 and 6)

Each channel has four (4) sensitivity levels. DIP switches 5 and 6 select one of the four sensitivity levels available as shown in the table below. Use the lowest sensitivity setting that will consistently detect the desired type(s) of vehicle(s) that must be detected. Do not use a sensitivity level higher than necessary.

Switch	Sensitivity Level (-AL/L)			
	0.32% (0)	0.16% (1) *	0.08% (2)	0.02% (3)
5	OFF	ON *	OFF	ON
6	OFF	OFF *	ON	ON

* Factory default setting.

III **Reset**

Pushing the front panel mounted pushbutton labeled **RESET** or changing any DIP switch (except 1 or 2) will reset the detector. After changing the frequency selection DIP switches, the detector must be reset.

IV **Power Down Memory**

When power is removed, the detector automatically remembers the status of the loop. During the loss of power, vehicles may enter or leave the loop detection area. When power is restored, the detector will correctly determine the current loop status and output a Call if a vehicle is in the loop detection area. If the loop detection area is vacant, a Call will not be output. (A power loss power dip of any duration will not bring a gate arm down onto cars as they wait at the gate). **IMPORTANT:** *After installing and applying power to the Model AX2 detector, momentarily push the RESET button to clear the Power Down Memory. This initializes the detector to the loops that are connected and clears the memory of any previous loop information.*

V **Failed Loop Diagnostics**

Each channel's **DETECT** LED indicates whether or not the loop connected to the channel is currently within tolerance. If the loop is out of tolerance, the LED indicates whether the loop is shorted (one Hz flash rate) or open (10 Hz flash rate). If and when the loop returns to within tolerance, the **DETECT** LED will flash at a three flashes per second rate to indicate that an intermittent loop fault has occurred and has been corrected. This flash rate will continue until another loop fault occurs, the detector is reset, or power to the detector is interrupted. If a vehicle enters the loop detection area while the **DETECT** LED is indicating an intermittent loop failure, the **DETECT** LED will turn on to indicate the presence of the vehicle.

VI Pin Connections

One Connector (1C) Models - Requires One (1) Reno A & E Harness (Model 802-4-2TP)

Pin	Wire Color	Function (NO Models)	Function (NC Models)
1	Black	AC Line / DC +	AC Line / DC +
2	White	AC Neutral / DC Common	AC Neutral / DC Common
3	Orange	Channel 2 Relay, Normally Open (N.O.)	Channel 2 Relay, Normally Closed (N.C.)
4	Green	No Connection	No Connection
5	Yellow	Channel 1 Relay, Common	Channel 1 Relay, Common
6	Blue	Channel 1 Relay, Normally Open (N.O.)	Channel 1 Relay, Normally Closed (N.C.)
7	Gray	Channel 1 Loop	Channel 1 Loop
8	Brown	Channel 1 Loop	Channel 1 Loop
9	Red	Channel 2 Relay, Common	Channel 2 Relay, Common
10	Violet, or Black / White	Channel 2 Loop	Channel 2 Loop
11	White / Green or Red / White	Channel 2 Loop	Channel 2 Loop

Two Connector (2C) Models - Requires Two (2) Reno A & E Harnesses (Model 802-4)

Pin	Wire Color	Function (Connector 1)	Function (Connector 2)
1	Black	AC Line / DC +	No Connection
2	White	AC Neutral / DC Common	No Connection
3	Orange	No Connection	No Connection
4	Green	No Connection	No Connection
5	Yellow	Channel 1 Relay, Common	Channel 2 Relay, Common
6	Blue	Channel 1 Relay, Normally Open (N.O.)	Channel 2 Relay, Normally Open (N.O.)
7	Gray	Channel 1 Loop	Channel 2 Loop
8	Brown	Channel 1 Loop	Channel 2 Loop
9	Red	No Connection	No Connection
10	Violet, or Black / White	Channel 1 Relay, Normally Closed (N.C.)	Channel 2 Relay, Normally Closed (N.C.)
11	White / Green or Red / White	No Connection	No Connection

NOTE: All pin connections listed above are with power applied, loops connected, and no vehicle detected.

VII Warnings

Separately, for each loop, a twisted pair should be created consisting of only two (2) loop wires running the entire distance from the loop to the detector (including runs through all wiring harnesses) at a minimum of six (6) complete twists per foot. For trouble free operation, it is **highly recommended** that **all** connections (**including crimped connectors**) be soldered.

VIII Directional Logic (Model AX2DL)

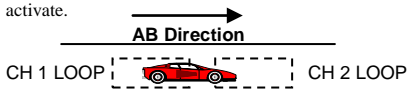
The Model AX2DL's directional logic feature uses the Channel 1 and Channel 2 loops to determine the direction a vehicle is traveling. The loops must be spaced such that the vehicle can span both loops. The expected installation is two loops, one after the other in the same lane, spaced anywhere from overlapping to 6 feet apart. **NOTE: Contact a Field Engineer at Reno A & E regarding loop configurations and loop spacing for specific applications.**

When a vehicle enters the first channel's loop detection area, that channel's **DETECT** LED will flash at a rate of 750 milliseconds ON and 250 milliseconds OFF to indicate the presence of the vehicle. This flash rate will continue until the vehicle is clear of the first channel's loop detection area.

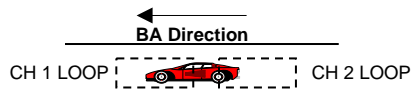
If the second channel's output is set to Presence mode, its relay will activate and its **DETECT** LED will turn ON as soon the vehicle enters the second channel's loop detection area. The relay will remain activated and the **DETECT** LED will remain ON until the vehicle is clear of the second channel's loop detection area.

If the second channel's output is set to Pulse mode, its relay will momentarily activate (i.e. generate a 250 millisecond pulse) and its **DETECT** LED will flash at a rate of 250 ms ON and 750 ms OFF to indicate the vehicle's presence over the second channel's loop detection area. This flash rate will continue until the vehicle is clear of the second channel's loop detection area.

If the vehicle moves out of the first channel's loop detection area before entering the second channel's loop detection area, directional logic detection is aborted and the second channel's relay and **DETECT** LED will not activate.



When a vehicle travels from the CH 1 Loop and enters the CH 2 Loop, the CH 2 Relay and LED activate to indicate the AB direction.



When a vehicle travels from the CH 2 Loop and enters the CH 1 Loop, the CH 1 Relay and LED activate to indicate the BA direction.

IX Loop Installation

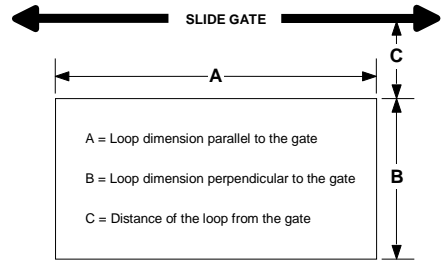
The vehicle detection characteristics of an inductive loop detector are greatly influenced by the loop size and proximity to moving metal objects such as gates. Vehicles such as small motorcycles and high bed trucks can be reliably detected if the proper size loop is selected. If the loop is placed too close to a moving metal gate, the detector may detect the gate. The diagram below is intended as a reference for the dimensions that will influence the detection characteristics.

General Rules

- The detection height of a loop is $\frac{2}{3}$ the shortest leg (A or B) of the loop. Example: Short leg = 6 feet, Detection Height = $\frac{2}{3} \times 6$ feet = 4 feet.

A =	6 ft	9 ft	12 ft	15 ft	18 ft	21 ft
C =	3 ft	4 ft	4.5 ft	5 ft	5.5 ft	6 ft

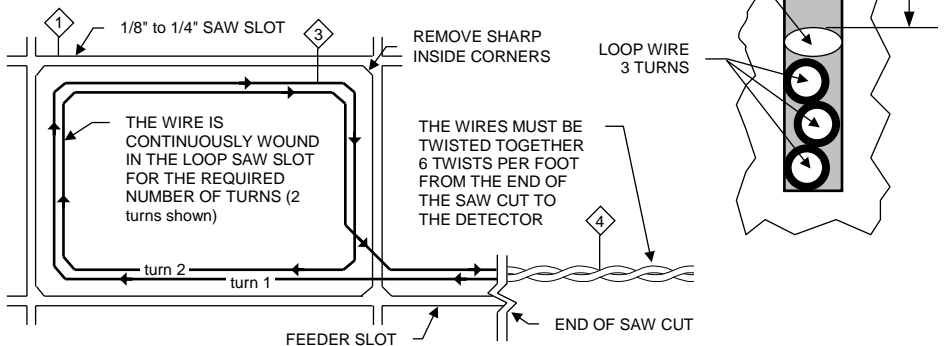
- As the length of leg A is increased, distance C must also increase.
- For reliable detection of small motorcycles, legs A and B should not exceed 6 feet.



Loop Installation - Saw Cut Type

- Mark the loop layout on the pavement. Remove sharp inside corners that can damage the loop wire insulation.
- Set the saw to cut to a depth (typically 2" to 2.5") that ensures a minimum of 1" from the top of the wire to pavement surface. The saw cut width should be larger than the wire diameter to avoid damage to the wire insulation when placed in the saw slot. Cut the loop and feeder slots. Remove all debris from the saw slot with compressed air. Check that the bottom of the slot is smooth.
- It is highly recommended that a continuous length of wire be used to form the loop and feeder to the detector. Loop wire is typically 14, 16, 18, or 20 AWG with cross-linked polyethylene insulation. Use a wood stick or roller to insert the wire to the bottom of the saw slot (do not use sharp objects). Wrap the wire in the loop saw slot until the desired number of turns is reached. Each turn of wire must lay flat on top of the previous turn.
- The wire must be twisted together a minimum of 6 twists per foot from the end of the saw slot to the detector.
- The wire must be held firmly in the slot with 1" pieces of backer rod every 1 to 2 feet. This prevents the wire from floating when the loop sealant is applied.
- Apply the sealant. The sealant selected should have good adhering properties with contraction and expansion characteristics similar to those of the pavement material.

Loop Perimeter	Number Of Turns
10 feet - 13 feet	5
14 feet - 26 feet	4
27 feet - 45 feet	3
46 feet - 100 feet	2
100 feet and up	1



Recommended Loop Wire:

Reno LW-120 for 1/8" slots
Reno LW-116-S for 1/4" slots