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ISO 9001 REGISTERED

MODEL U-1400 OPERATION MANUAL

Firmware: MDL U1400 Version 4.0

Four Loop Inputs, Eight Vital Outputs, and Four Vital Inputs

Built-in Loop Analyzer For Each Channel

Features added with the Firmware Version 4.0 include the Island Circuit, Shunt Enhancement, and Password Protection.

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MODEL U-1400 OPERATION MANUAL

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1.0 GENERAL DESCRIPTION

This product manual is for people installing, operating, and maintaining the Reno A&E Model U-1400 inductive loop vehicle detector. The Model U-1400 is a stand-alone, box-type, four-channel inductive loop vehicle detector. We designed the U-1400 for use in applications that require detection of railway vehicles in large detection areas or roadway vehicle detection at grade crossings. Typically areas that require classification yard switch and sideswipe protection, interlocking and moveable bridge occupancy detection, or detection of roadway vehicles and/or railway vehicles in at-grade crossing sites.

The Model U-1400 monitors and processes signals from four loop / lead-in circuits, four check loop circuits, and four Vital inputs. These inputs can be programmed to control eight Vital outputs, four primary Vital outputs and four auxiliary Vital outputs. Each of the four primary Vital outputs can be controlled by any combination of the four loop inputs and/or any combination of the four Vital inputs. In addition to the four loop inputs and four Vital inputs (as described above), the four auxiliary Vital outputs can be controlled by the four loop Health Status inputs that are continuously monitored by the processor. A loop failure will deactivate the Vital output that the loop status input and/or loop Health Status input is programmed to control. The check loop circuits can be programmed to simulate a vehicle detection (every 1 to 255 minutes) in the loop area as a means of verifying proper loop operation. The Vital outputs and Vital inputs are monitored to ensure they are in the correct state. If the state of a Vital input is not correct, the front panel LED indicator corresponding to that input will turn red and all Vital outputs will deactivate. If the state of any Vital output is not correct, the front panel LED corresponding to that output will turn red and all Vital outputs will deactivate.

A liquid-crystal display (LCD), the sixteen LEDs, and the four front panel pushbuttons are used to display and program all detector functions. The Model U-1400 also incorporates a series of front panel mounted connectors to facilitate set-up and operation. A 55-pin circular connector is used for detector input and output connections, a 15-pin D-subminiature connector is used to allow connection of an external EEPROM memory module, and a nine pin RS-232 connector is used for communication with a laptop computer.

The use of a LCD is one feature that distinguishes this detector from that of other manufacturers. It allows for the display of more information, never before available, to the user during normal operation of the detector. A technician has several diagnostic modes available to aid in troubleshooting detection problems. The LCD also allows easy viewing and setting of all programmable values in the detector. The detector can continue to operate normally while being programmed. An eight-segment bargraph at the top of the LCD provides a graphical representation of the relative change of inductance as seen by the detector. This automatically takes into account loop size, loop inductance, number of loops, number of turns, geometry, lead-in length, etc. The presence of the first bargraph segment represents the minimum inductance change necessary for the detector to output a call. The presence of more segments indicates larger inductance changes. Each additional segment represents the next sensitivity level exceeded. Therefore, the bargraph indicates whether the sensitivity is set too high or too low, easily facilitating the ideal setting of the sensitivity level.

All programmed settings are stored in non-volatile memory and change only by programming new settings. Memory storage consists of an internal EEPROM and an external EEPROM memory module. Settings programmed on either component must match those programmed on the other for the detector to operate. Loss of power or a detector reset will not change the programmed settings. If a loop failure occurs, the LCD will display the type of loop failure as ***L lo*** (for -25% change or shorted loop conditions) or ***L hi*** (for +25% change or open loop conditions). Each loop failure is counted (up to a maximum of 255 failures) and accumulate in the Loop Failure Memory. Information on the number of failures since the last detector reset or power interruption is very useful during analysis of problems due to intermittent loop operation.

The Model U-1400 detector is a scanning detector. The scanning operation sequentially activates the ON and OFF cycle of each detector channel's oscillator. Because only one channel's input loop(s) is (are) active at a given time, crosstalk between adjacent loops connected to the same scanning detector is minimized. Several Model U-1400 detectors can be linked together via the Synch In and Synch Out lines. This allows the scanning in series or parallel of different loops connected to different detectors. When in Program Mode, the Model U-1400 detector displays the real time loop frequency reading for each channel. The eight frequency levels can be incremented or decremented to provide precise frequency settings. This removes the guesswork when changing frequency settings to eliminate crosstalk. NOTE: Adjacent loops connected to different channels of a non-scanning detector or different scanning detectors should be set to different frequencies with the maximum separation possible.

The Reno A&E Model U-1400 uses the first major innovation in inductive loop detectors since the introduction of digital detectors. The programming of all of the detector's parameters with four normally open pushbutton switches not only simplifies setup by removing binary coded rotary or DIP switches, but also increases the reliability of the detector by removing the dependence on switch contacts during normal operation. The detailed descriptions displayed on the LCD eliminate the interpretation of numerous LED flash rates to determine the detector status.

2.0 GENERAL CHARACTERISTICS

2.1 Loop Frequency

Each loop input has eight selectable loop frequency settings (normally in the range of 20 to 100 kilohertz). The actual loop operating frequency is a function of the loop / lead-in network and the components of the loop oscillator circuit. The digital display of the actual loop operating frequency for each setting makes it easy to quickly identify and eliminate crosstalk in the most difficult to configure installations. The frequency display is typically very stable when the loop is vacant and vehicles are not passing close to the loops. If the reading is varying by more than ±1 in the last digit, this is an indication of possible crosstalk between loops.

2.2 Sensitivity

Each loop input has ten selectable sensitivity levels plus Continuous-Call and Loop-Off. The sensitivity levels are designed so that a one level increase actually doubles the sensitivity and a one level decrease halves the sensitivity. A unique bargraph display on the LCD makes it easy to quickly set sensitivity at the ideal level for any loop / lead-in network situation. (See Section 3.4 for actual detection levels at each sensitivity level.)

CONTINUOUS-CALL: When set to the Continuous-Call state, the Loop Status is continuously in the Call state, regardless of the presence or absence of vehicles over the loop, and the loop oscillator is disabled. If the Loop Status Input is assigned to a Vital Output, the Continuous-Call state will deactivate the Vital Output. This state is indicated by ***CALL*** flashing on the LCD. Select this option from the Sensitivity menu in the Program Mode and use it for checking controller response and other troubleshooting activities.

LOOP-OFF: When set to the Loop-Off state, the Loop Status is continuously in the No-Call state, regardless of the presence or absence of vehicles over the loop, and the loop oscillator is disabled. If the Loop Status Input is assigned to a Vital Output, the Loop-Off state will not affect the Vital Output. This state is indicated by ***OFF*** flashing on the LCD. Select this option from the Sensitivity menu in the Program Mode and use it for checking controller response and other troubleshooting activities.

2.3 Option 1, Loop Inductance Display

Toggle ON or OFF the Loop Inductance Display setting by momentarily pressing either the ▲ (UP) or ▼ (DOWN) button. When enabling (ON) this option, the LCD displays the total loop inductance (actual loop inductance plus actual lead-in inductance) in microhenries for loop inductance values in the range of 20 to 2500 microhenries. By recording the inductance of the loop / lead-in circuit when first installed, you can compare the actual inductance to the expected inductance to help identify defective loop / lead-in circuits. Easily estimate the loop / lead-in inductance by using the simple formulas included in Section 8.2 of this manual. NOTE: Enabling (ON) this option activates it for all loop inputs. This option automatically disables (OFF) 15 minutes after activation or on loss of power.

2.4 Option 2, Loop Inductance -ΔL/L Display

Toggle ON or OFF the Loop Inductance -ΔL/L Display setting by momentarily pressing either the ▲ (UP) or ▼ (DOWN) button. When enabling (ON) this option, the LCD displays the percentage of inductance change (-ΔL/L value) during the Call state. To facilitate the viewing of the maximum amount of change in the -ΔL/L value while traffic is in motion over the detection zone, the channel holds the peak -ΔL/L value for a period of two seconds. NOTE: Enabling (ON) this option activates it for all loop inputs. This option automatically disables (OFF) 15 minutes after activation or on loss of power.

2.5 Option 3, Noise Filter

Each loop input's Option 3 has four settings ranging from 3.00 to 3.03. When Option 3 is set to 3.00, the option is disabled (OFF), and normal noise filtering is used. When Option 3 is set to 3.01, 3.02, or 3.03 the option is ON, and increased filtering of the loop signal is used to eliminate problems associated with particular types of noise. Turning this option ON when not required can degrade the performance of the detector. The default setting of Option 3 is 3.00. **This option should only be turned ON at the advice of CTC or Reno A&E.** NOTE: Enable each loop independently.

3.00 = 250 milliseconds filter

3.01 = 1 second filter

3.02 = 2 seconds filter

3.03 = 10 seconds filter

2.6 Option 4, Detection Zone Tracking

Each loop input's Option 4 has ten settings ranging from 4.00 to 4.10. This option allows the user to select a detection zone tracking setting that will maintain detection zone occupancy for an extended period of time. When Option 4 is set to 4.00, the detector will track out the vehicle (i.e. drop the detection of the vehicle) in four minutes to several hours depending on the amount of inductance change ($-\Delta L/L$) caused by the vehicle when detected. The greater the change caused by the vehicle, the longer the time needed to track out the vehicle. When Option 4 is set to 4.01, 4.02, 4.03, 4.04, 4.05, 4.06, 4.07, 4.08, or 4.10 the option is ON, and the detector will provide extended detection times. The default setting of Option 4 is 4.02.

There are many factors that influence the proper setting of this option. A full explanation of how to determine the correct setting is beyond the scope of this manual. Contact Technical Support at CTC or Reno A & E regarding proper setting of this option.

NOTE: Changing this option is not recommended. The detector may drop the call prior to the vehicle totally exiting the loop.

4.00 = Tracking Rate 0

4.01 = Tracking Rate 1

4.02 = Tracking Rate 2

4.03 = Tracking Rate 3

4.04 = Tracking Rate 4

4.05 = Tracking Rate 5

4.06 = Tracking Rate 6

4.07 = Tracking Rate 7

4.08 = Tracking Rate 8

4.10 = Tracking Rate 10

2.7 Option 5, Sensitivity Boost

Each loop input's Option 5 has five settings ranging from 5.00 to 5.04. When Option 5 is set to 5.00, the option is disabled (OFF), and no sensitivity boost is added. When Option 5 is set to 5.01, 5.02, 5.03, or 5.04 the option is ON, and sensitivity boost is enabled. After detection, the sensitivity is boosted to the currently selected sensitivity level plus the number of level(s) selected. The maximum sensitivity level obtainable with or without sensitivity boost is level 10.

5.00 = Off

5.01 = 1 level

5.02 = 2 levels

5.03 = 3 levels

5.04 = 4 levels

2.8 Option 6, Audible Detect Signal

Each loop input's Audible Detect Signal setting can be toggled ON or OFF by momentarily pressing either the ▲ (UP) or ▼ (DOWN) button. You can only turn on one loop input at a time. Turning this option ON for one loop input automatically turns it OFF for the other loop inputs. When enabling this option, an audible signal activates whenever the detection zone for the selected loop input is occupied. However, when Option 4, Detection Zone Tracking, is set to 4.07, 4.08, or 4.10, a vehicle must highlight three segments of the bargraph on the LCD (which indicate sensitivity) before the audible detect signal activates. The audible signal indicates actual occupancy of the loop detection zone. This feature allows a technician to watch the detection zone and confirm correct detector operation without having to look at the detector display. NOTE: This option automatically disables 15 minutes after activation or on loss of power.

2.9 Loop Check

The Loop Check feature provides a means of automatically verifying the proper operation of each loop circuit. Set the Loop Check Timer for an interval ranging from 0 to 255 minutes in one-minute increments. A setting of ***000*** indicates that the Loop Check feature is off.

2.10 Detector ID

Use this feature in conjunction with the Synch feature (Option 7) and also use it as a means of providing each detector with a unique identification signature for communication purposes. Detector ID settings can range from 000 to 255. If, however, you set the detector to an ID value of 255, it is considered to be in an un-initialized state and the detector will not save any power down data. When a detector with an ID setting of 255 powers up, the LCD will alternate between ***id*** and ***255*** until the ID setting is changed to something other than 255 and the new setting is saved in the detector memory. When first initialized, a detectors ID setting is, by default, ***255***.

2.11 Option 7, Synch Feature

This option provides a means to link together up to four U-1400 detectors. Each detector's Option 7 has three settings ranging from 7.00 to 7.02. Two modes of Synch exist, Series Synch and Parallel Synch. When set to operate in Series Synch mode, one detector channel in the entire detector system is active at any given time. This has the advantage of minimizing crosstalk between adjacent loops connected to different U-1400 detectors. When set to operate in Parallel Synch mode, all detectors scan their respective channel 1, 2, 3, or 4 inputs at the same time. Parallel Synch offers a faster response time than Series Synch; however, the potential for crosstalk is greater.

7.00 = Off

7.01 = Series Synch

7.02 = Parallel Synch

NOTE: When operating in either Series or Parallel Synch mode, all linked detectors must have Option 7 set to the same setting.

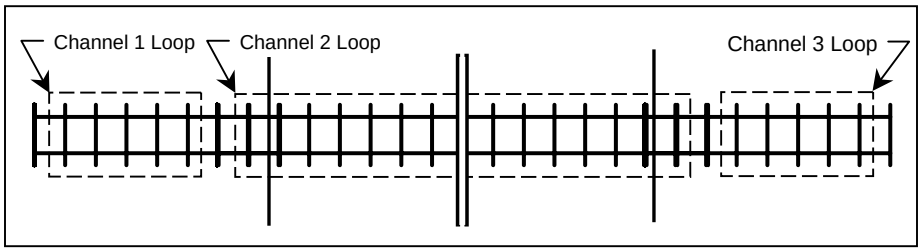
2.12 Option 8, Inductive Island Circuit Feature

Toggle ON or OFF the detector's Inductive Island Circuit option by momentarily pressing either the ▲ (UP) or ▼ (DOWN) button. Option 8 is a detector wide option. Turning this option ON for one loop input automatically turns it ON for the other loop inputs. NOTE: Option 8 is mutually exclusive with Option 9. Only one option is on at a given time. If you attempt to turn an option on while the other is engaged, then a warning buzzer will sound to alert you that the other mutually exclusive option is on.

For proper operation, you must connect the arming loops to input channels 1 and 3; and you must connect the main channel loops to input channels 2 and 4.

When enabling (ON) Option 8, the Inductive Island Circuit feature is enabled (ON). The sequence of operation starts with a detection on one of the two arming loops. Once this presence detection has occurred, the remaining two or three input channels arm and the Auxiliary Vital Output 1 deactivates. As the vehicle proceeds from the first arming loop onto the main channel loop(s) and onto the other arming loop, presence detection continues and deactivation of Auxiliary Vital Output 1 is maintained. Once the vehicle has cleared the second arming loop, presence detection ends and Auxiliary Vital Output 1 reactivates.

Use this feature in applications where it is necessary to monitor the presence of vehicles within at-grade crossings. The expected installation is two 20-foot arming loops located on either side of the crossing, and one or two main channel loops spanning the crossing. **NOTE: Contact a Field Engineer at CTC or Reno A & E regarding proper loop configurations and spacing for specific applications.**



Basic Installation - Single Main Channel Loop
Channel 1 and Channel 3 loops are Arming Loops.
Channel 2 and Channel 4 loops are Main Channel Loops.

2.13 Option 9, Inductive Shunt Enhancement Circuit Feature

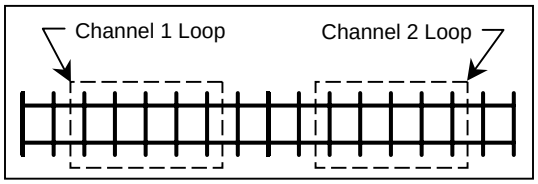
Toggle ON or OFF each input's Inductive Shunt Enhancement Circuit setting by momentarily pressing either the ▲ (UP) or ▼ (DOWN) button. Option 9 is a paired input option. This means that it takes two inputs to implement the feature. Therefore, when this option is toggled ON or OFF in one input, its paired input is also set to the same state. In the Model U-1400, input channel 1 is paired with input channel 2 and input channel 3 is paired with input channel 4. NOTE: Option 9 is mutually exclusive with Option 8. You can only have one option or the other on at a given time. If you attempt to turn an option on while the other is engaged, then a warning buzzer will sound to alert you that the other mutually exclusive option is on.

When enabling (ON) Option 9, the Inductive Shunt Enhancement Circuit feature is enabled (ON). The sequence of operation starts with a detection on one input channel. When both of the paired input channels have detection, the last input channel to have detection will output a Call and its Primary Vital Output(s) (if mapped) and Auxiliary Vital Output(s) (if mapped) deactivate until the detection for the last input ends, even if the detection ends for the first input channel. Primary Vital Output timing functions (Primary Vital Output Delay or Primary Vital Output Extension) are unaffected by the setting of this feature.

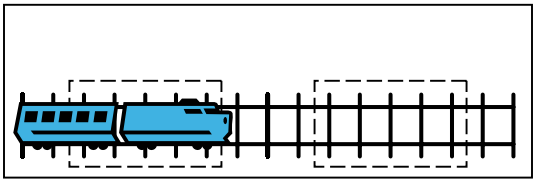
When detection ends for both input channels, the Call output will cease and the Primary Vital Output(s) (if mapped) and Auxiliary Vital Output(s) (if mapped) will reactivate.

Use this feature in applications where it is necessary to determine the travel direction of vehicles operating on a two-way section of railway trackage. The expected installation is two 20-foot long loops spaced approximately 25 to 28 feet apart. **NOTE: Contact a Field Engineer at CTC or Reno A & E regarding proper loop configurations and spacing for specific applications.**

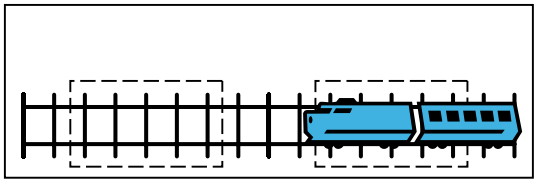
When Option 9 is turned on, a vehicle entering the first loop will cause that input channel to enter a pending state. As the vehicle enters the second loop while still occupying the first loop, the second input channel will enter the Call state while the first input channel remains in the pending state. A call is never output on the first input channel with a detection. Under normal conditions you cannot have both outputs on at the same time. However, if one of the loops fails, both outputs will come on and stay on until the failure is corrected.



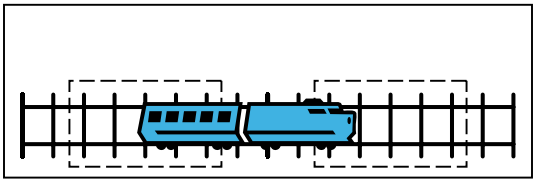
Basic Installation



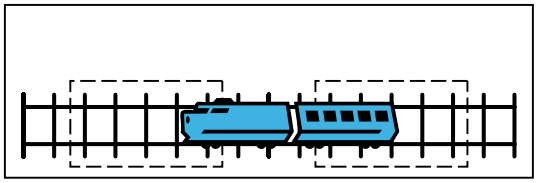
Vehicle enters Channel 1 Loop
No Call is output



Vehicle enters Channel 2 Loop
No Call is output



Vehicle proceeds to Channel 2 Loop
Call is output on Channel 2



Vehicle proceeds to Channel 1 Loop
Call is output on Channel 1

2.14 Primary Vital Output Delay

Condition each Primary Vital Output (***Vital Out***) with a Delay time that is adjustable from 0.0 to 25.5 seconds in 0.1-second steps. Primary Vital Output Delay time starts counting down when a Call state is received from a Loop Status Input or Vital Input (***Vital In***) that is mapped to the Primary Vital Output (***Vital Out***). When the timer reaches zero, the Primary Vital Output deactivates. Primary Vital Output Delay does not condition the Auxiliary Vital Outputs (***Vital Aux***).

2.15 Primary Vital Output Extension

Condition each Primary Vital Output (***Vital Out***) with an Extension time that is adjustable from 0.0 to 25.5 seconds in 0.1-second steps. Primary Vital Output Extension time starts counting down when a Call state is cleared from a Loop Status Input or Vital Input (***Vital In***) that is mapped to the Primary Vital Output (***Vital Out***). The Primary Vital Output will remain OFF until the Extension time reaches zero. Any vehicle entering the loop detection zone during the Extension time period causes the Primary Vital Output to remain in the OFF state. And later, when the last vehicle clears the loop detection zone, the full Primary Vital Output Extension time starts counting down again. The Primary Vital Output Extension does not condition the Auxiliary Vital Outputs (***Vital Aux***).

2.16 Input / Output Mapping

Assign the Loop Status Inputs and/or Vital Inputs (***Vital In***) to one or more of the Primary Vital (***Vital Out***) and Auxiliary Vital (***Vital Aux***) Outputs. Health Status can only be mapped to the Auxiliary Vital Outputs (***Vital Aux***).

2.17 Full Restore To Factory Default Settings

Pressing all four front panel switches simultaneously and continuously for five seconds resets the detector and restores all the factory default settings. The countdown of the five-second period is displayed on the LCD. Releasing any of the switches before the countdown ends aborts the Full Restore operation. (See Default Settings). NOTE: Resetting the detector to factory default settings will clear any previously mapped output(s).

2.18 Diagnostic Features Activation

When the detector is operating in the normal mode, pressing either the ▲ (UP) or ▼ (DOWN) button will temporarily activate Option 1 (Loop Inductance Display) and Option 2 (Loop Inductance -ΔL/L Display) for all loop inputs. Option 6 (Audible Detect Signal) will also activate for the loop input indicated in the lower portion of the LCD. All three of these diagnostic options will remain active for 15 minutes.

2.19 Password Protection

This detector has password protection against accidental settings changes. When viewing a setting, press the ▲ (UP) or ▼ (DOWN) button. ***PSd*** will display. NOTE: Pressing the CHAN button for 2 seconds at any time will exit the password entry mode. Press the ▲ (UP) or ▼ (DOWN) button to get ***000*** to display. The first ***0*** should be flashing. Press the ▼ (DOWN) arrow button to change the digit to ***9***. Press the CHAN button to get the second ***0*** to flash. Press the ▲ (UP) button to change the digit to ***1***. Press the CHAN button to get the third ***0*** to flash. Press the ▲ (UP) button to change the digit to ***1***. Press the FUNC button to apply the password. You can now change all the settings. Protection may be re-enabled by holding the CHAN button for 2 seconds followed by pressing the ▲ (UP) button twice—otherwise the protection automatically enables 15 minutes after the last button press.

3.0 SPECIFICATIONS

3.1 Physical

WEIGHT: 2.73 lb (43.6 oz) (1236 gm).

SIZE: 7.65 inches (19.43 cm) high x 3.90 inches (9.91 cm) wide x 7.13 inches (18.11 cm) deep including connectors.

OPERATING TEMPERATURE: -40°F to +180°F (-40°C to +82°C).

CIRCUIT BOARD: Printed circuit boards are 0.062 inch thick FR4 material with 2 oz. copper on both sides and plated through-holes.

CONNECTORS:

PRIMARY INTERFACE CONNECTOR: MS type, 55 Pin, Circular, Male, 71-570128-55M.

AUX PORT CONNECTOR: DB-15, 15 pin, right angle, PC Board mount, metal shell, D subminiature receptacle with gold plated female contacts and latching blocks.

COMM PORT CONNECTOR: DB-9, nine pin, right angle, PC Board mount, metal shell, D subminiature receptacle with gold plated female contacts and nuts for retaining screws.

3.2 Electrical

POWER: 9.5 to 18 VDC, 3.0 A maximum.

FUSE: 3 A, 3AG (Slo-Blow) type located in a fuse holder mounted on the front panel.

POWER DOWN: When the DC voltage drops below the low power detection threshold (7.9 VDC), the detector will save all needed information to hold calls through the power down sequence. Upon power restoration (a minimum of 9.0 VDC), the detector will use this saved data to determine the correct occupancy state of all loops.

LOOP FEEDER LENGTH: Up to 1500 feet (450 m) maximum with proper feeder cable and appropriate loops.

LOOP INDUCTANCE RANGE: 20 to 2500 µH with a Q factor of 5 or greater.

LOOP INPUTS: Transformer isolated. The minimum capacitance added by the detector is 0.068 µF.

LIGHTNING PROTECTION: The detector can tolerate, without damage, a 10 µF capacitor charged to 2,000 volts being discharged directly into the loop input terminals, or a 10 µF capacitor charged to 2,000 volts being discharged between either loop terminal and earth ground.

RESET: Application of a 30 ms low state (relative to +12 VDC) to Pin Z of the primary interface connector resets all loops. Manually reset each loop input channel by selecting the loop input channel then pressing and holding the front panel CHAN button for three seconds, or by changing the sensitivity or loop frequency of the loop input channel.

SYNCHRONIZE SCAN CONTROL: The SYNCH IN input and SYNCH OUT output allow the loops from different detectors to be scanned sequentially, either in series or parallel. Use this feature to eliminate crosstalk between adjacent loops connected to different U-1400 detectors. NOTE: Response times will vary depending on the number of detectors (up to a maximum of four) on the SYNCH Line. (See Section 3.4.)

VITAL OUTPUTS: The Primary and Auxiliary Vital Outputs are transformer isolated and are capable of sourcing 200 mA at 12 VDC. Opto-isolated circuitry verifies that the Vital Output is in the desired state. If any Vital Output fails its self-check, then all of the detector's Vital Outputs will deactivate.

VITAL INPUTS: 12-volt inputs isolated from the detector. Opto-isolated circuitry verifies that the Vital Inputs are operational.

CHECK LOOP RELAYS: Contacts rated for 6.0 A maximum, 150 VDC, 300 VAC, and 500 VA maximum switched power.

3.3 Operational

LOOP STATUS INDICATORS: Each loop input has a super high intensity red light-emitting diode (LED) to indicate a CALL (vehicle detected over loop) or loop failure.

INPUT / OUTPUT INDICATORS: The detector has 12 dual color (green / red) LEDs to indicate the following:

Vital In LED Status	**Meaning**
OFF	Vital Input is deactivated (low voltage level).
GREEN ON	Vital Input is activated (high voltage level).
RED ON	Vital Input has failed its self-check (Vital Inputs, Primary Vital Outputs, and Auxiliary Vital Outputs revert to OFF state).
Vital Out LED Status	**Meaning**
OFF	Primary Vital Output is deactivated (low voltage level).
GREEN ON	Primary Vital Output is activated (high voltage level).
GREEN 2Hz FLASHING	Timing Delay activated and Primary Vital Output is working (high voltage level until delay times out).
GREEN 5Hz FLASHING	Timing Extension activated and Primary Vital Output is working (low voltage level until extension times out).
RED ON	Primary Vital Output has failed its self-check (Vital Inputs, Primary Vital Outputs, and Auxiliary Vital Outputs revert to OFF state).
Vital Aux LED Status	**Meaning**
OFF	Auxiliary Vital Output is deactivated (low voltage level).
GREEN ON	Auxiliary Vital Output is activated (high voltage level).
RED ON	Auxiliary Vital Output has failed its self-check (Vital Inputs, Primary Vital Outputs, and Auxiliary Vital Outputs revert to OFF state).

RESPONSE TIME: See Section 3.4 for actual response times.

SELF-TUNING: Each loop circuit tunes and is operational within two seconds after application of power or after being reset. Full sensitivity and hold time require 30 seconds of operation.

ENVIRONMENTAL & TRACKING: The detector is fully self-compensating for environmental changes and loop drift over the full temperature range and the entire loop inductance range.

GROUNDED LOOP OPERATION: The loop isolation transformer allows operation with poor quality loops, which may include one short to ground at a single point.

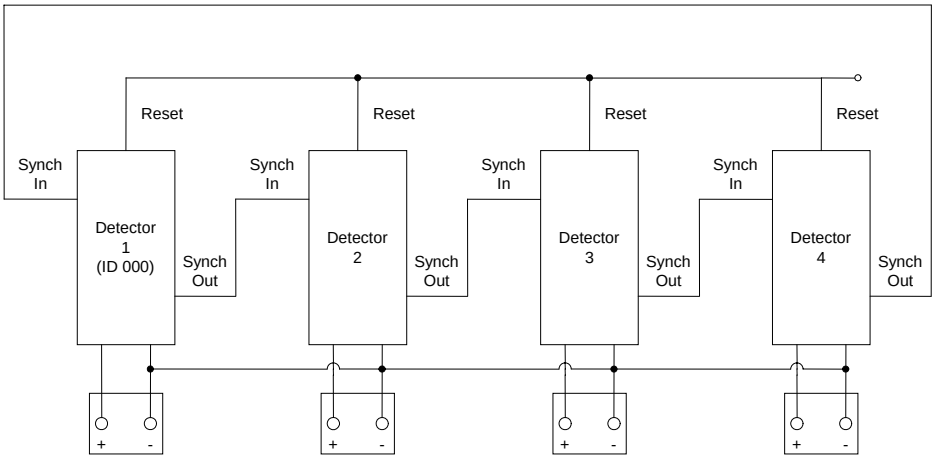
LOOP (FAIL) MONITOR: If the total inductance of a channel's loop input network goes out of the range specified for the detector, or rapidly changes by more than ±25%, and the Loop and/or Health status outputs are mapped, the Loop and/or Health status outputs will immediately enter Fail-Safe mode and the LCD will display ***LOOP FAIL***. The type of loop failure will also be displayed as ***L lo*** (for -25% change or shorted loop conditions) or ***L hi*** (for +25% change or open loop conditions). This will continue as long as the loop fault exists. At the time of a loop failure, the Loop status LED will begin to flash at a rate of three flashes per second. The LED will continue this display pattern until the loop input channel is manually reset or power is removed. If the loop self-heals, the ***LOOP FAIL*** message on the LCD will extinguish and the loop input channel will resume operation in a normal manner. However, the Loop status LED will continue its three flashes per second display pattern, thus providing an alert that a prior Loop Fail condition has occurred. Each loop failure for the loop input channel is counted and accumulated into the Loop Fail Memory. By stepping through the loop input channel's detector functions in Program Mode to the ***LOOP FAIL*** message, you can see the total number of loop failures written into the Loop Fail Memory (since the last power interruption or manual reset). When the status of one or more loops is assigned to a Vital Output, a loop failure will deactivate the Vital Output and the corresponding ***Vital Out*** LED will turn from green to OFF to indicate the failure. When a Health Status is assigned to an Auxiliary Vital Output, a loop failure will deactivate the Auxiliary Vital Output and the corresponding ***Vital Aux*** LED will turn off.

LOOP CHECK: Use this feature as a means of verifying proper operation of each inductive loop connected to a detector. In a typical installation, a separate loop of wire called a check loop will be wound around the perimeter of each inductive loop. Program the Loop Check Timer with a value ranging from 1 to 255 minutes. Once this time interval has elapsed, the detector will automatically short the check loop simulating vehicle detection in the inductive loop. If this initial loop check test fails, the detector will enter a verification mode to make certain that the loop failure is indeed due to a loop related problem. While operating in this verification mode, the detector will perform a series of ten verification tests and the LCD will flash ***Pcl***. If the ten loop check verification tests all fail, the Vital Output(s) to which the Loop Status Input(s) and/or Health Status Input(s) is (are) mapped will deactivate. The loop check test will repeat at regular intervals depending on the value programmed into the Loop Check Timer.

The Vital Output(s) to which the Loop Status Input(s) and/or Health Status Input(s) is (are) mapped will not activate until the problem with the check loop is corrected and the channel reset or until the Loop Check function is turned off. During a check loop failure the LCD will flash ***Lcl***. NOTE: If you set the Loop Check Timer to 0 minutes, then the Loop Check function will be off.

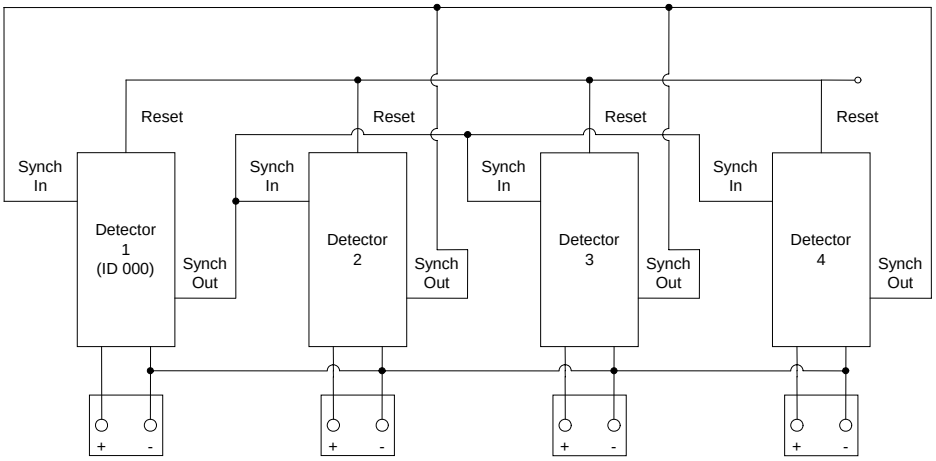
SYNCH MODE: The Synch feature provides a means of linking up to four U-1400 detectors together. You can configure the detector in one of two modes: Series Synch or Parallel Synch.

Use the Series Synch mode to eliminate the possibility of crosstalk between adjacent loops. Series Synch will activate one loop at a time, cycling through all loops configured to detect in the Series Synch mode. When the detector system is configured to operate in Series Synch mode, you must identify one detector as the master unit. That is the detector that starts the Synch pulse. This master unit must be assigned a Detector ID value of 000. The scanning sequence for the detector loop input channels is Detector ID 000 channel 1, Detector ID 000 channel 2, Detector ID 000 channel 3, Detector ID 000 channel 4; second detector channel 1, second detector channel 2, second detector channel 3, second detector channel 4, and so on until the synch pulse returns to the first detector. The Synch-out of the first (master) unit is connected to the Synch-in of the second detector. The Synch-out of the second detector is connected to the Synch-in of the third detector. This connection scheme is continued until the Synch-out of the last detector is connected to the Synch-in of the first (master) detector.



Series Synch Connections

When set to operate in Parallel Synch mode, all detectors configured to operate in Parallel Synch mode start scanning their respective channel 1 loop inputs at the same time and then proceed to sequentially scan their respective channel 2, 3, and 4 loop inputs. When the detector system is configured to operate in Parallel Synch mode, you must identify one detector as the master unit. You must assign this master unit a Detector ID value of 000. Connections between detectors differ from those in Series Synch mode in that the Synch-out of first detector is connected to the Synch-in of the other detectors and the Synch-in of the first detector is connected to the Synch-out of the other detectors.



Parallel Synch Connections

Operation in either of the Synch modes requires that you tie together the Reset inputs (pin Z of the primary interface connector) of all the detectors; and that you tie together the DC Common inputs (pin G of the primary interface connector) of all the detectors. To start operation in either Synch mode, you must reset the detectors using the Reset pin (pin Z of the primary interface connector).

When operating in Series Synch mode, if any detector fails to Synch, all of the Vital Outputs of every detector configured to operate in Synch mode will deactivate. If the detector that has failed to Synch has the Synch feature turned off, however, the other detectors configured to operate in Synch mode will continue to operate in Series Synch mode.

When operating in Parallel Synch mode, if the master unit fails, all of the Vital Outputs of every detector configured to operate in Synch mode will deactivate. If one or more of the detectors connected to the master unit fails, only those Vital Outputs of that (those) detector(s) which has (have) failed will deactivate.

When operating in either Series or Parallel mode, ***FSY*** will display on the LCD screen of the detector(s) associated with the failure. This display state will continue until the problem is corrected and the detectors are reset, powered down and re-powered, or until the Synch function is turned off.

In either mode of operation, the Synch feature will continue to function if one or more detectors have (has) been disabled.

INDUCTIVE ISLAND CIRCUIT: The Inductive Island Circuit feature provides a means of monitoring and detecting the presence of vehicles within at-grade crossings. The expected installation is two 20-foot long arming loops located on either side of the crossing and one or two main channel loops spanning the crossing. You must connect the two arming loops to detector channels 1 and 3. If two main channel loops are required, they are connected to channels 2 and 4. If the installation requires a single main channel loop, you should connect it to channel 3, and you should deactivate channel 4 (that is set the channel 4 sensitivity to Loop Off).

This option is a detector wide option. Turning this option ON for one loop input automatically turns it ON for the other loop inputs. When enabling (ON) Option 8, the Inductive Island Circuit feature is enabled (ON). The sequence of operation starts with a detection on one of the two arming loops. Once this presence detection has occurred, the remaining two or three input channels are armed and Auxiliary Vital Output 1 is deactivated. As the vehicle proceeds from the first arming loop onto the main channel loop(s) and onto the other arming loop, presence detection continues and deactivation of Auxiliary Vital Output 1 is maintained. Once the vehicle has cleared the second arming loop, presence detection ends and Auxiliary Vital Output 1 is reactivated.

INDUCTIVE SHUNT ENHANCEMENT CIRCUIT: The Inductive Shunt Enhancement Circuit feature provides a means of determining the travel direction of vehicles operating on a two-way section of railway trackage. The expected installation is two 20-foot long loops spaced approximately 25 to 28 feet apart. You must connect the loops to channels 1 and 2 or channels 3 and 4.

This option is a paired input option. This means that it takes two inputs to implement the feature. Therefore, when this option is toggled ON or OFF in one input, its paired input is also set to the same state. Channel 1 is paired with Channel 2 and Channel 3 is paired with Channel 4. When enabling (ON) Option 9, directional logic is enabled (ON). Directional logic starts with a detection on one input channel. When both of the paired input channels have detection, the last input channel to have detection will output a Call and its Primary Vital Output(s) (if mapped) and Auxiliary Vital Output(s) (if mapped) will deactivate until the detection for the last input channel ends, even if the detection ends for the first input channel. Primary Vital Output timing functions (Primary Vital Output Delay or Primary Vital Output Extension) are unaffected by the setting of this feature.

When detection ends for both input channels, the Call output will cease and the Primary Vital Output(s) (if mapped) and Auxiliary Vital Output(s) (if mapped) will reactivate.

3.4 TABLE: Sensitivity, -ΔL/L, & Response Time

Sensitivity	-ΔL/L	Response Time (milliseconds)							
		One Detector	Two Detectors		Three Detectors		Four Detectors	
			Series Synch	Parallel Synch	Series Synch	Parallel Synch	Series Synch	Parallel Synch
OFF	-------	-------	-------	-------	-------	-------	-------	-------
1	5.12 %	121 ±25	268 ±52	278 ±58	400 ±80	278 ±58	530 ±110	278 ±58
2	2.56 %	121 ±25	268 ±52	278 ±58	400 ±80	278 ±58	530 ±110	278 ±58
3	1.28 %	121 ±25	268 ±52	278 ±58	400 ±80	278 ±58	530 ±110	278 ±58
4	0.64 %	121 ±25	268 ±52	278 ±58	400 ±80	278 ±58	530 ±110	278 ±58
5	0.32 %	121 ±25	268 ±52	278 ±58	400 ±80	278 ±58	530 ±110	278 ±58
6	0.16 %	121 ±25	268 ±52	278 ±58	400 ±80	278 ±58	530 ±110	278 ±58
7	0.08 %	121 ±25	268 ±52	278 ±58	400 ±80	278 ±58	530 ±110	278 ±58
8	0.04 %	121 ±25	268 ±52	278 ±58	400 ±80	278 ±58	530 ±110	278 ±58
9	0.02 %	121 ±25	268 ±52	278 ±58	400 ±80	278 ±58	530 ±110	278 ±58
10	0.01 %	121 ±25	268 ±52	278 ±58	400 ±80	278 ±58	530 ±110	278 ±58
CALL	-------	-------	-------	-------	-------	-------	-------	-------

3.5 TABLES: Default Settings

CHANNEL & DETECTOR SETTINGS:

Function	Channel 1	Channel 2	Channel 3	Channel 4
Frequency	2	4	6	8
Sensitivity	6	6	6	6
Option 1 - Loop Inductance Display	OFF	OFF	OFF	OFF
Option 2 - Loop Inductance -ΔL/L(%) Display	OFF	OFF	OFF	OFF
Option 3 - Noise Filter	3.00	3.00	3.00	3.00
Option 4 - Detection Zone Tracking	4.02	4.02	4.02	4.02
Option 5 - Sensitivity Boost	5.00	5.00	5.00	5.00
Option 6 - Audible Detect Signal	OFF	OFF	OFF	OFF
Loop Check Feature	005	005	005	005
Detector ID Setting	255			
Option 7 - Synch Feature	7.00			
Option 8 - Inductive Island Circuit Feature	OFF	OFF	OFF	OFF
Option 9 - Inductive Shunt Enhancement Circuit Feature	OFF	OFF	OFF	OFF

VITAL OUTPUT SETTINGS:

Function	Output 1	Output 2	Output 3	Output 4
Primary Vital Output Delay Time	00.0	00.0	00.0	00.0
Primary Vital Output Extension Time	00.0	00.0	00.0	00.0
Primary Vital Output Mapping	00	00	00	00
Auxiliary Vital Output Mapping	000	000	000	000

3.6 TABLES: Pin Assignments

PRIMARY INTERFACE CONNECTOR

SEQUENTIAL PIN ASSIGNMENTS

Pin	Function	Pin	Function
A	Channel 1 Primary Vital Output -	f	Channel 3 Primary Vital Output +
B	Channel 1 Vital Input -	g	Channel 4 Primary Vital Output -
C	Channel 2 Vital Input +	h	Channel 4 Primary Vital Output +
D	Channel 3 Loop Input	i	Channel 2 Check Loop Input
E	Channel 3 Loop Input	j	Channel 3 Check Loop Input
F	Channel 4 Loop Input	k	Channel 2 Auxiliary Vital Output -
G	DC Common (Non-isolated)	m	Channel 2 Primary Vital Output -
H	12 VDC + (Non-isolated)	n	Channel 1 Auxiliary Vital Output +
J	Channel 4 Auxiliary Vital Output -	p	Channel 1 Auxiliary Vital Output -
K	Channel 3 Primary Vital Output -	q	Channel 1 Vital Input +
L	Channel 3 Auxiliary Vital Output +	r	Channel 4 Vital Input +
M	Channel 3 Auxiliary Vital Output -	s	Channel 4 Vital Input -
N	Channel 1 Check Loop Input	t	Reserved
P	Channel 2 Check Loop Input	u	Channel 1 Check Loop Input
R	Channel 3 Check Loop Input	v	Channel 4 Check Loop Input
S	Channel 1 Loop Input	w	Reserved
T	Channel 1 Loop Input	x	Reserved
U	Channel 2 Loop Input	y	Channel 3 Vital Input +
V	Channel 2 Loop Input	z	Channel 2 Auxiliary Vital Output +
W	Channel 2 Vital Input -	AA	No Connection
X	Synch In	BB	Channel 2 Primary Vital Output +
Y	Channel 3 Vital Input -	CC	No Connection
Z	Reset	DD	No Connection
a	Reserved	EE	Chassis Ground
b	Channel 4 Loop Input	FF	Channel 1 Primary Vital Output +
c	Synch Out	GG	No Connection
d	Channel 4 Check Loop Input	HH	No Connection
e	Channel 4 Auxiliary Vital Output +		

PRIMARY INTERFACE CONNECTOR

FUNCTIONAL PIN ASSIGNMENTS

Pin	Function	Pin	Function
H	12 VDC + (Non-isolated)	m	Channel 2 Primary Vital Output -
n	Channel 1 Auxiliary Vital Output +	f	Channel 3 Primary Vital Output +
p	Channel 1 Auxiliary Vital Output -	K	Channel 3 Primary Vital Output -
z	Channel 2 Auxiliary Vital Output +	h	Channel 4 Primary Vital Output +
k	Channel 2 Auxiliary Vital Output -	g	Channel 4 Primary Vital Output -
L	Channel 3 Auxiliary Vital Output +	q	Channel 1 Vital Input +
M	Channel 3 Auxiliary Vital Output -	B	Channel 1 Vital Input -
e	Channel 4 Auxiliary Vital Output +	C	Channel 2 Vital Input +
J	Channel 4 Auxiliary Vital Output -	W	Channel 2 Vital Input -
N	Channel 1 Check Loop Input	y	Channel 3 Vital Input +
u	Channel 1 Check Loop Input	Y	Channel 3 Vital Input -
P	Channel 2 Check Loop Input	r	Channel 4 Vital Input +
i	Channel 2 Check Loop Input	s	Channel 4 Vital Input -
R	Channel 3 Check Loop Input	EE	Chassis Ground
j	Channel 3 Check Loop Input	G	DC Common (Non-isolated)
d	Channel 4 Check Loop Input	Z	Reset
v	Channel 4 Check Loop Input	X	Synch In
S	Channel 1 Loop Input	c	Synch Out
T	Channel 1 Loop Input	AA	No Connection
U	Channel 2 Loop Input	CC	No Connection
V	Channel 2 Loop Input	DD	No Connection
D	Channel 3 Loop Input	GG	No Connection
E	Channel 3 Loop Input	HH	No Connection
F	Channel 4 Loop Input	a	Reserved
b	Channel 4 Loop Input	t	Reserved
FF	Channel 1 Primary Vital Output +	w	Reserved
A	Channel 1 Primary Vital Output -	x	Reserved
BB	Channel 2 Primary Vital Output +		

AUX PORT (DB-15 External EEPROM Connector)

Pin	Function
1	No Connection
2	No Connection
3	No Connection
4	No Connection
5	No Connection
6	No Connection
7	I^2C DC +
8	I^2C Clock
9	No Connection
10	No Connection
11	No Connection
12	No Connection
13	No Connection
14	I^2C Common
15	I^2C Data

COMM PORT (DB-9 Communication Interface Connector)

Pin	Function
1	No Connection
2	RS-232 TX
3	RS-232 RX
4	No Connection
5	RS-232 Common
6	No Connection
7	No Connection
8	No Connection
9	No Connection

3.7 TABLE: Pin Assignments / Wire Colors

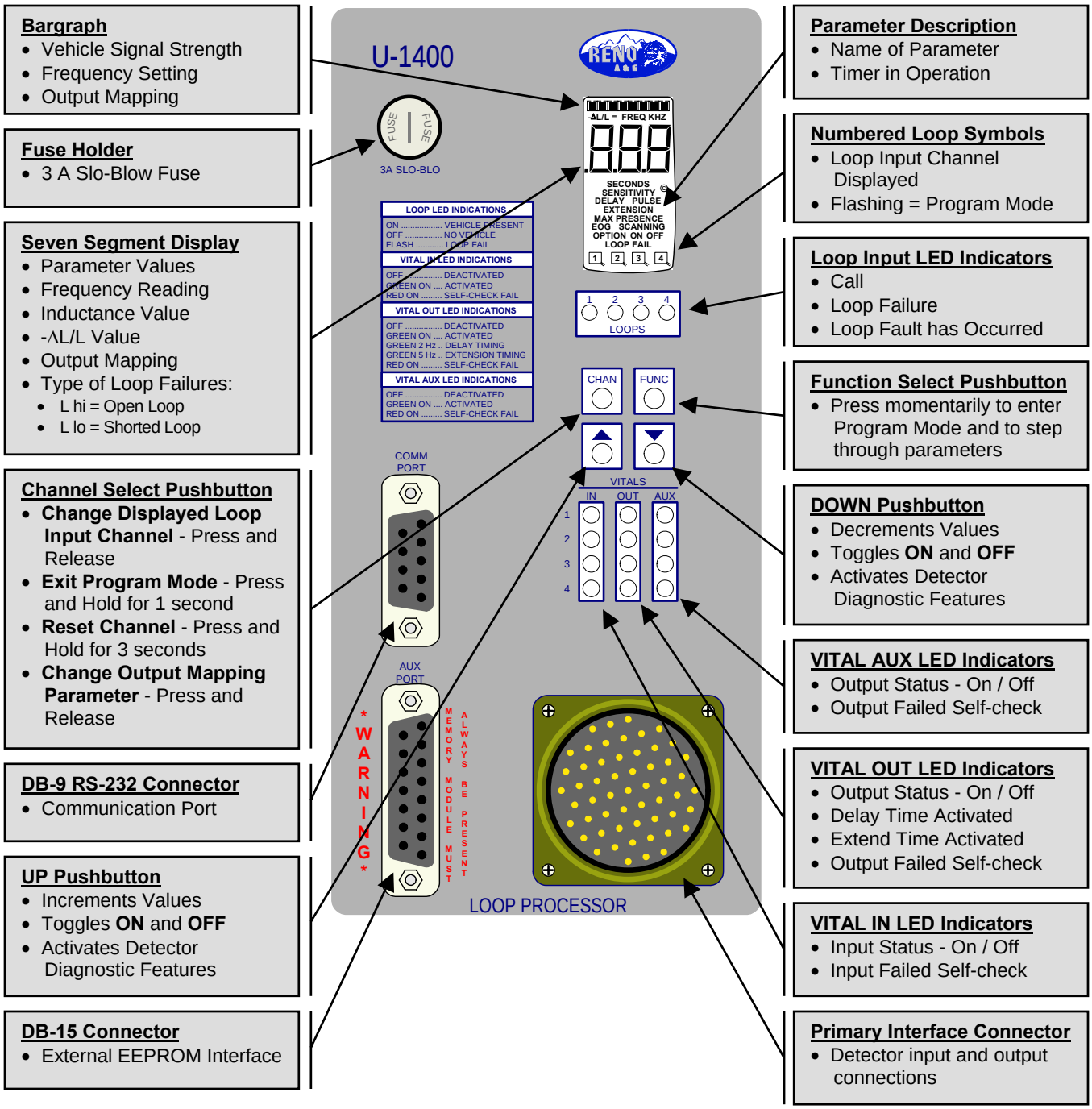
MODEL 805-3-S & MODEL 805-8-S WIRING HARNESS

Pin	Function	Wire Color	Pin	Function	Wire Color
A	Channel 1 Primary Vital Output -	Brown / Blue	f	Channel 3 Primary Vital Output +	Blue / Orange
B	Channel 1 Vital Input -	Brown / Gray	g	Channel 4 Primary Vital Output -	Yellow / Blue
C	Channel 2 Vital Input +	Gray / Red	h	Channel 4 Primary Vital Output +	Blue / Yellow
D	Channel 3 Loop Input	Orange	i	Channel 2 Check Loop Input	White
E	Channel 3 Loop Input	Orange	j	Channel 3 Check Loop Input	White
F	Channel 4 Loop Input	Yellow	k	Channel 2 Auxiliary Vital Output -	Red / Violet
G	DC Common (Non-isolated)	Black	m	Channel 2 Primary Vital Output -	Red / Blue
H	12 VDC + (Non-isolated)	Red / White	n	Channel 1 Auxiliary Vital Output +	Violet / Brown
J	Channel 4 Auxiliary Vital Output -	Yellow / Violet	p	Channel 1 Auxiliary Vital Output -	Brown / Violet
K	Channel 3 Primary Vital Output -	Orange / Blue	q	Channel 1 Vital Input +	Gray / Brown
L	Channel 3 Auxiliary Vital Output +	Violet / Orange	r	Channel 4 Vital Input +	Gray / Yellow
M	Channel 3 Auxiliary Vital Output -	Orange / Violet	s	Channel 4 Vital Input -	Yellow / Gray
N	Channel 1 Check Loop Input	White	t	Reserved	N/A
P	Channel 2 Check Loop Input	Red	u	Channel 1 Check Loop Input	Brown
R	Channel 3 Check Loop Input	Orange	v	Channel 4 Check Loop Input	White
S	Channel 1 Loop Input	Brown	w	Reserved	N/A
T	Channel 1 Loop Input	Brown	x	Reserved	N/A
U	Channel 2 Loop Input	Red	y	Channel 3 Vital Input +	Gray / Orange
V	Channel 2 Loop Input	Red	z	Channel 2 Auxiliary Vital Output +	Violet / Red
W	Channel 2 Vital Input -	Red / Gray	AA	No Connection	N/A
X	Synch In	Blue	BB	Channel 2 Primary Vital Output +	Blue / Red
Y	Channel 3 Vital Input -	Orange / Gray	CC	No Connection	N/A
Z	Reset	Gray	DD	No Connection	N/A
a	Reserved	N/A	EE	Chassis Ground	Green
b	Channel 4 Loop Input	Yellow	FF	Channel 1 Primary Vital Output +	Blue / Brown
c	Synch Out	Violet	GG	No Connection	N/A
d	Channel 4 Check Loop Input	Yellow	HH	No Connection	N/A
e	Channel 4 Auxiliary Vital Output +	Violet / Yellow			

NOTES: The pairs of wires connected to Pins D & E, Pins F & b, Pins N & u, Pins P & i, Pins R & j, Pins S & T, Pins U & V, and Pins d & v are twisted together.

Use the additional green wire in the harness wire bundle to ground the connector shell.

4.0 USER INTERFACE



NOTES: The LCD backlighting illuminates whenever any pushbutton is pressed. Backlighting will extinguish 15 minutes after the last pushbutton press.

Pressing any two or three pushbuttons illuminates the LCD backlighting, displays all LCD segments, and illuminates the Vital In, Vital Out, and Vital Aux Output LEDs. The Output LEDs are illuminated in their red phase as a means of confirming proper function of the detector's Vital Output failure feature.

5.0 INSTALLATION AND SET-UP

The detector has no DIP switches or jumpers to configure. In order for the detector to operate, you **MUST** connect the external EEPROM memory module shipped with the detector to the DB-15 Aux Port connector on the front panel. Connect an appropriately wired harness to the 55-pin Primary Interface Connector on the front panel and apply power to the detector. If the detector is not new from the factory, you may find it advantageous to reset the detector back to the factory defaults to avoid having to check every setting for every loop input channel. To reset the detector to factory default, press all four pushbutton switches simultaneously for five seconds. When all four buttons are depressed, the display will start counting down from five. When the countdown reaches zero (0), releasing the pushbuttons will reload the factory defaults and reset all loop input channels. NOTE: Resetting the detector to factory default settings will clear any previously mapped output(s).

Adjust all operating parameters from the front panel. The Password Protect code must be entered to disable it before the parameters can be selected. The detector continues to operate normally while in the Program Mode. The value currently displayed is always the actual value being used. Example: If you are changing the delay time, the time displayed at the instant that a vehicle enters the detection zone for that loop input channel is the value used for the delay timer.

Pressing the FUNC button enters the Program Mode. The FUNC button has an auto repeat function. This allows quick navigation to the desired parameter. The FUNC button only moves forward through all of the parameters. There is no way to move backwards through the parameters.

While viewing any parameter, pressing the CHAN button will display the same parameter in the next loop input channel. The currently selected channel is indicated at the bottom of the LCD display. Pressing and holding the CHAN button for one second will exit the Program Mode and return to the Normal Mode.

Pressing and holding either the ▲ (UP) or ▼ (DOWN) button will cause the value to change rapidly until the button is released.

U-1400 Mounting Instructions:

The Model U-1400 is shipped with two mounting brackets and six 10-32 x 3/8″ pan head machine screws that you can use to mount the detector to a shelf or a wall. The left and right sides of the U-1400 each have three 10-32 threaded inserts you can use to secure the mounting brackets to the sides of the unit.

Treaded Inserts
Left Side Shown, Right Side Similar

Shelf Mount:

1. Use four of the pan head machine screws to secure the mounting brackets to each side of the detector using the two pairs of horizontally oriented threaded inserts as shown below.

Mounting Bracket - Shelf Mount
(Left Side Shown, Right Side Similar)

Unused Hole - Shelf Mount
(Left Side Shown, Right Side Similar)

2. Insert the two remaining pan head machine screws in each of the two unused threaded inserts as shown below.
3. Use the remaining holes on the mounting brackets and user supplied #10 hardware to secure the detector to the shelf.

Wall Mount:

1. Use four of the pan head machine screws to secure the mounting brackets to each side of the detector using the two pairs of vertically oriented threaded inserts as shown below.

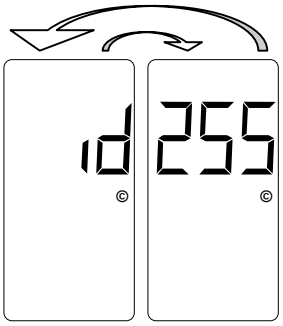
Mounting Bracket - Wall Mount
(Left Side Shown, Right Side Similar)

Unused Hole - Wall Mount
(Left Side Shown, Right Side Similar)

2. Insert the two remaining pan head machine screws in each of the two unused threaded inserts as shown below.
3. Use the remaining holes on the mounting brackets and user supplied #10 hardware to secure the detector to the wall.

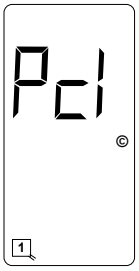
5.1 Initial Installation Start-up Mode Display Screens

Upon application of power, the LCD screen will show the detector model letter and firmware version, in this case, Model U-1400 firmware version 3. This screen displays for two seconds.

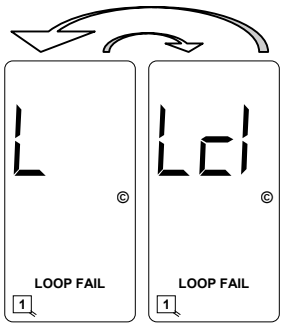


The next LCD screens displayed will show the Detector ID setting. The display will toggle between the two screens shown with a 50% duty cycle. When shipped from the factory, the Detector ID is set to 255 and the detector is considered to be un-initialized. This will be the case on initial start-up. Before proceeding, you must change the detector ID to something other than 255. To do so, use the ▲ (UP) or ▼ (DOWN) button to change the setting to the desired ID number. When set to the correct value, press the FUNC button to accept and store the setting. If the detector in question is used as the master unit when utilizing the Synch feature, the Detector must be assigned an ID value of 000.

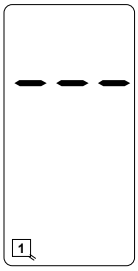
The detector will next confirm the state of the check loops connected to it. If all four check loops are connected and are intact, the LCD screen will display an indication of the successful completion of the check loop verification. This screen will flash twice.



If all four check loops are not connected or one (or more) is (are) damaged in some way, the detector will initiate its check loop verification process. The LCD screen will display an indication of a pending state during the check loop verification. This screen will flash for 55 seconds until one of three things happen: The check loop verification fails, the check loop(s) causing the check loop verification is (are) connected or restored to a functional state, or the check loop(s) causing the check loop verification is (are) turned off—that is, the Loop Check Timer of the loop(s) is set to 000.



If the check loop verification process continues for the entire 55-second period and no action is taken to connect or restore the check loops causing the check loop verification, the LCD screen will toggle between the two screens shown with a 50% duty cycle.



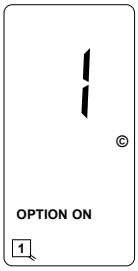
If the detector passes its check loop verification process or a pending loop check failure state is resolved in one of the ways mentioned above, the LCD screen will show a normal (idle) condition.

5.2 Program Mode Display Screens

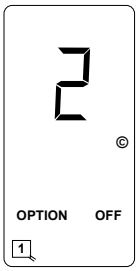
PARAMETER ..... Password Protection Screen.
SETTING ..... 911 disables the Password Protection.
SETTING DISPLAYED ..... PSd.
7-SEGMENT DISPLAY ..... Press the up or down arrow button to display "000" for entry mode.
DEFAULT SETTINGS ..... Password mode active.
EXAMPLE ..... Password mode is available for access.
NOTES..... Pressing the CHAN button for 2 seconds at any time will exit the password mode.

PARAMETER ..... Frequency.
SETTINGS..... Eight selections: 1 to 8.
SETTING DISPLAYED ..... Bargraph indicates settings from 1 (left) to 8 (right).
7-SEGMENT DISPLAY ..... Actual frequency of the loop circuit, typically 20.0 to 99.9 kHz.
DEFAULT SETTINGS ..... Loop Input 1 = 2, Loop Input 2 = 4, Loop Input 3 = 6, and Loop Input 4 = 8.
EXAMPLE ..... Frequency setting 4 is selected for loop input. The loop frequency is 34.9 kHz.
NOTES..... Changing the frequency will reset the Loop Input. An unstable frequency display varying more than ±0.2 kHz may indicate loop crosstalk or other interference.

PARAMETER ..... Sensitivity.
SETTINGS..... 12 selections: 1 to 10, OFF, or CONTINUOUS-CALL.
SETTING DISPLAYED ..... 7-segment display will show currently selected setting.
7-SEGMENT DISPLAY ..... Currently selected Sensitivity.
DEFAULT SETTING ..... 6 for all loop inputs.
EXAMPLE ..... Sensitivity 6 is selected for loop input 1.
NOTES..... Changing the sensitivity will reset the loop input. The bargraph will show the strength of the vehicle calls so that you can verify the correct sensitivity from this screen.



PARAMETER ..... Option 1 (Loop/Lead-In Inductance Display).
SETTINGS..... ON or OFF.
SETTING DISPLAYED ..... The word ON or OFF will be displayed.
7-SEGMENT DISPLAY ..... The number of this option.
DEFAULT SETTING ..... OFF for all loop inputs.
EXAMPLE ..... Option 1 is turned ON for all loop inputs.
NOTES..... This option is a detector-wide setting. Changing it for one loop input changes it for all loop inputs. This option will automatically turn off in 15 minutes.



PARAMETER ..... Option 2 (Percentage of Inductance change, -ΔL/L).
SETTINGS..... ON or OFF.
SETTING DISPLAYED ..... The word ON or OFF will be displayed.
7-SEGMENT DISPLAY ..... The number of this option.
DEFAULT SETTING ..... OFF for all loop inputs.
EXAMPLE ..... Option 2 is turned OFF for all loop inputs.
NOTES..... This option is a detector-wide setting. Changing it for one loop input changes it for all loop inputs. This option will automatically turn off in 15 minutes.