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Monitron LCTL5L-XX Sensor Transmitter User's Manual

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Disclaimer: This device is not designed nor intended for use as a life safety device.

I. FCC Information

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: 1) This device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.

WARNING: Under FCC 15.21, any changes or modifications (including the antennas) made to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment.

Note: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.



Location of FCC Label Inside LCTL5L-XX Lid (LCTL5 is shown for reference only)

II. Introduction

The LCTL5L-XX Sensor Transmitter is a sophisticated processor and transmitter housed in a compact rugged case which facilitates storage, transportation, and concealment. This unit is ideal for long term deployment from 3 months to one year or longer depending on configuration. Constructed of injection-molded plastic, the watertight and corrosion-proof case may either be deployed above ground or buried for security and stealth. Only the antenna needs to be above ground for proper operation. A single LCTL5L-XX unit receives, processes, and transmits information generated by contact closure/open, seismic (SPS-21), passive infrared (PIR), or dual-axis magnetometer (MS-10) probes either individually or in various combinations of deployment, giving the system maximum flexibility. A classify/detect switch combined with PORT SELECT switches control how the inputs are processed. Four standard models are available with the following designations and inputs:

LCTL5L-DS	1 Directional + 1 Seismic + 1 Pair N.O. Contacts
LCTL5L-DD	2 Directional
LCTL5L-SS	2 Seismic + 1 Pair N.O. Contacts
LCTL5L-CC	3 Pairs N.O. Contacts + 3 Pairs N.C. Contacts

The LCTL5L-XX was optimized to operate on two 6 VDC lantern batteries and can transmit over 90,000 alarms before battery replacement is required. Other power supply options are available and include rechargeable batteries as well as an external power input for sources such as an external battery, solar-panel, or other 12 VDC supply. Proper selection of these options depends on environmental conditions and the length of time the unit is to be deployed. For further information, contact Monitron, Inc.

Alarm Format

When an intrusion is detected and classified, an alarm is encoded using the following format:

XXXX-P, where: XXXX = unit's address, P = alarm Port number generated by the processor. When the LCTL5L-XX generates a self test alarm, or a test alarm is manually sent, P is the unit's programmed port number.

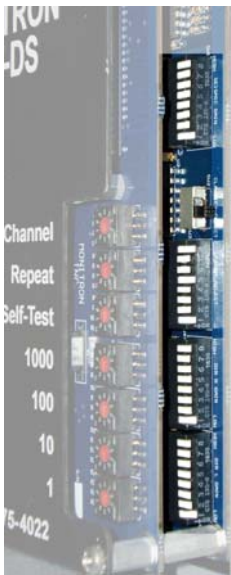
The letter "B" is added to the end of the alarm message when the batteries need to be replaced.

III. Connections & Controls



Input connectors and the standard BNC jack for the antenna are located on the lid of the LCTL5L-XX. Note that input J1 is closer to the handle and J2 is closer to the hinge.

Control functions for channel select, power output, alarm repeat, self-test time, and address are set using decimal format rotary switches, which are clearly labeled and easily read.



Each sensor input has user selectable individual sensitivity gain setting and alarm number (Port). A slide switch controls operation in either classify or detect mode.

IV. Antenna Preparation

Using the Allen wrench included with the antenna, loosen the set screw in the side of the BNC connector and remove the whip. Refer to the Rod Cutting Chart included with the antenna and cut the whip to the length appropriate for the frequency the LCTL5L-XX will be transmitting on. Insert the whip into the connector and tighten the set screw.

V. Battery Installation

The LCTL5L-XX has been impedance matched for use with two Duracell ProCell 6 volt lantern batteries (PC915). The use of inferior batteries may significantly shorten operational time.

Connect the red wire of the battery wire harness to the positive terminal of the first battery (Figure 1) and the black wire to the negative terminal of the second battery. Connect the black jumper wire to the remaining two terminals. Verify that all four terminal knobs are securely tightened. Tape the batteries together (Figure 2) to prevent unnecessary movement.



Figure 1



Figure 2

Insert the batteries on their side into the cutout section of foam in the bottom of the LCTL5L-XX case. Orient the batteries so that the screw terminals are in the center of the case. Install the antenna BEFORE plugging the battery into the ET board socket, as shown in Figure 3. NOTE: It is normal for the LCTL5L-XX to transmit one to three “false” alarms right after the batteries are connected. It also transmits the first self-test within one minute of powering up.

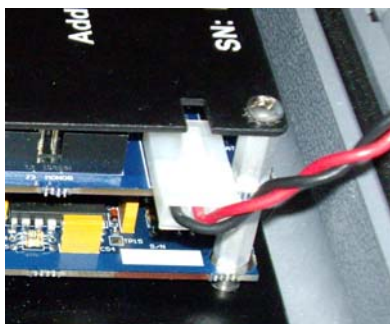


Figure 3

VI. Encoder/Transmitter Settings

All Encoder/Transmitter functions are set via the decimal-format rotary switches. To avoid damage to the switch, adjustments should ONLY be made with a standard, flat-blade 2.5 mm screwdriver. The triangle points to the current switch position. There are also detents at each position providing a tactile indication that the switch is properly set. Failure to have the switch settled in the detent will lead to erratic behavior. Switch functions are as follows:

Channel:

- Channel 1 = F1 @ 5 Watts full power
- Channel 2 = F2 @ 5 Watts full power
- Channel 3 = F1 @ approximately 75% of full power
- Channel 4 = F2 @ approximately 75% of full power
- Channel 5 = F1 @ approximately 50% of full power
- Channel 6 = F2 @ approximately 50% of full power
- Channel 7 = F1 @ approximately 25% of full power
- Channel 8 = F2 @ approximately 25% of full power
- Channel 9 = F1 @ 5 Watts full power
- Channel 0 = F2 @ approximately 25% of full power

Repeat: Valid operational settings are 0 through 3. Position 9 may be used to measure transmitter RF power output.

- 0 – No repeat. One message sent for every alarm or self test.
- 1 – 1 repeat. 2 transmissions of each alarm.
- 2 – 2 repeats. 3 transmissions of each alarm.
- 3 – 3 repeats. 4 transmissions of each alarm.
- 9 – Transmitter power cycles between 3 seconds on CCW and 12 off

Settings 4-8 are reserved. Setting Repeat to these positions will not cause the unit to malfunction, but should be avoided as they may be used to implement future diagnostic modes.

Self-Test: Settings are 0 through 9.

- 0 – No self-test is sent.
- 1 – Self-test sent once per minute.
- 2 – Self-test sent once every five minutes.
- 3 – Self-test sent once every 65 minutes.
- 4 – Self-test sent once every 360 minutes (6 hours).
- 5 - Self-test sent once every 1500 minutes (25 hours). DEFAULT**
- 6 – Self-test sent once every 25 hours w/ 5 seconds transmit delay
- 7 – Self-test sent once every 25 hours w/ 10 seconds transmit delay
- 8 – Self-test sent once every 25 hours w/ 15 seconds transmit delay
- 9 - Self-test sent once every 25 hours w/ random 15-40 seconds transmit delay

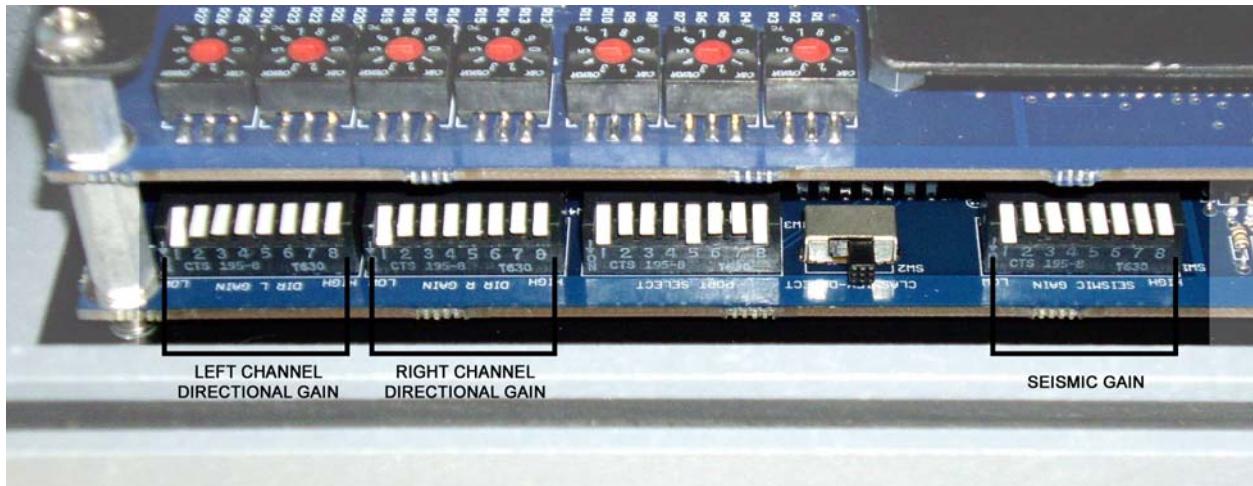
- The processor reads the self-test switch once a minute to check for a change in setting. When a change is detected the LCTL5L-XX transmits a Port 4 alarm and

the new self test interval begins.

- Self-test transmissions begin within 60 seconds after the operator changes the Self-Test switch.
- With transmit delay settings, when a target triggers the sensor, the LCTL5L-XX waits for the specified time before sending the alarm message. During the delay period, additional trigger events will be ignored.

Address: Set the desired four-digit unit address, reading from top to bottom. The address can be any number between 0000 and 9999.

VII. Setting Gain Level



Gain Switch Locations

Gain switches adjust the sensitivity of the sensor. One (1) is the lowest gain level and eight (8) is the highest level. To select a gain, press the switch in towards the board. **It is important to use ONLY the minimum gain needed for the area under surveillance to reduce the possibility of false alarms.** For directional inputs, set both gain switches for a particular input to the same value. The picture above is for an LCT-DS. For LCT-DD transmitters, the Seismic Gain switches on the right are replaced by two sets of Directional Gain switches like those on the left. For LCT-SS transmitters, the two sets of Directional Gain switches on the left are replaced by a single bank of Seismic Gain switches.

GAIN WARNINGS:

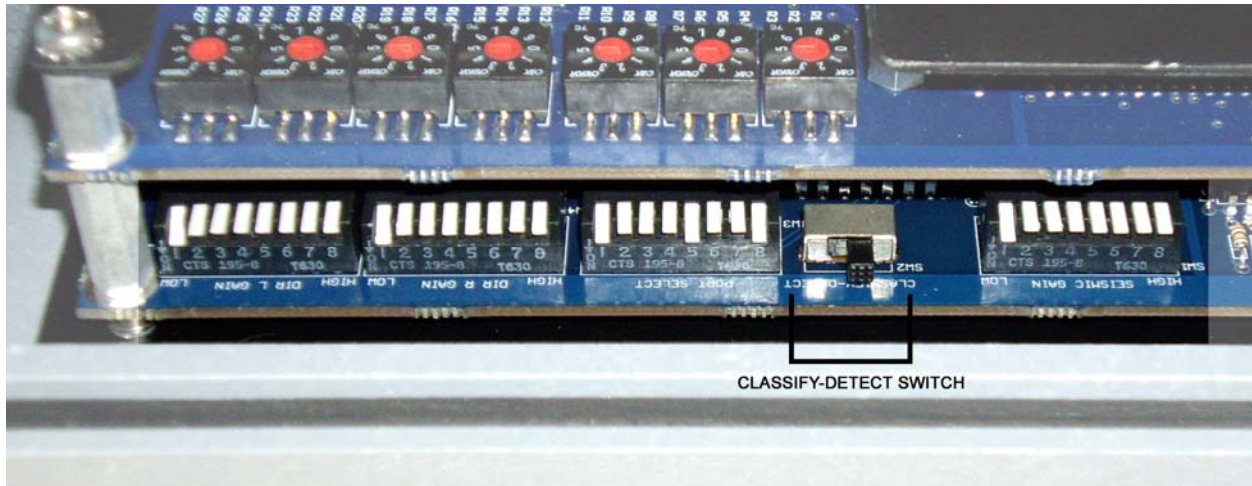
- For Directional Gains, both the Right and Left channels must be set.
- Gain for an unused input must be set to one for the LCTL5L-XX to function properly.
- There is no “zero” gain. If a gain is not selected, background noise is amplified by a factor of 700,000 rendering the LCTL5L-XX inoperative until the gain is correctly set.

It is possible to select gain settings that are between the standard eight single-switch levels. Refer to table below for switch combinations and relative gain levels.

Switch(es)	Seismic Gain Level	Directional Gain Level
1+2	0.28	3.38
1	0.37	5.1
2+3	0.81	6.67
2	1.1	10
3+4	2.2	12
3	3.1	20
4+5	4.8	17.7
4	7.5	30
5+6	9.9	27.3
5	13.5	43
6+7	27.3	42.9
6	37.5	75
7+8	60	60
7	100	100
8	150	150

Note: Contact Closure boards do not have gain settings.

VIII. Selecting Classify or Detect Mode



In Classify Mode, the LCTL5L-XX generates alarm codes based on the TYPE of signal the probe sees, regardless of the input source. Although there are special situations where two probes provide the most effective intrusion detection, Classify Mode is utilized primarily with a single probe to:

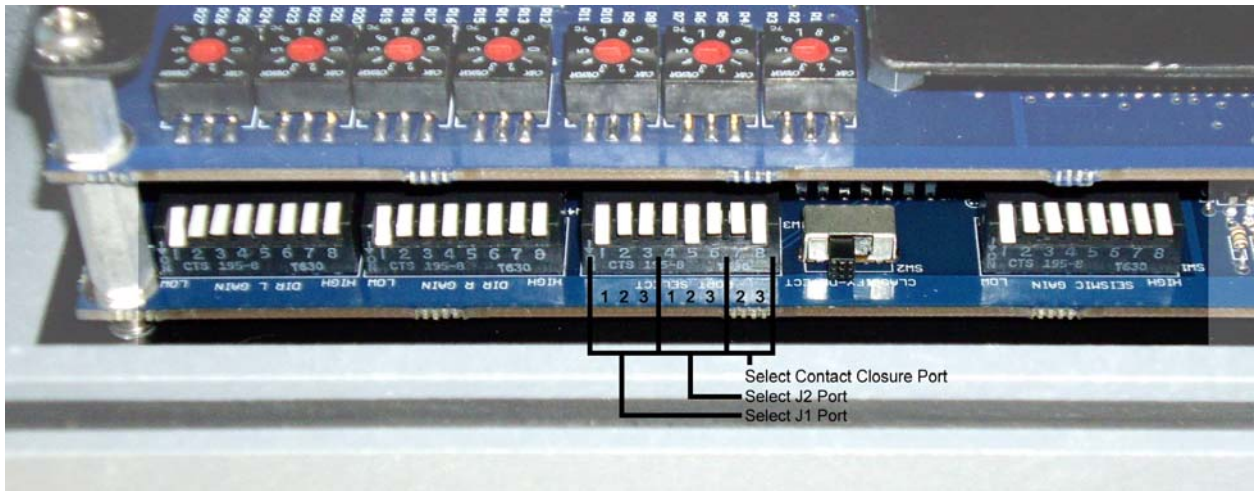
- Discriminate between pedestrian and vehicular seismic signals
- Determine direction of travel in front of infrared and magnetic probes

In Detect Mode, the LCTL5L-XX generates alarm codes based on which input SOURCE (J1 or J2) is stimulated, but does not distinguish the type (vehicle/pedestrian or direction of travel) of the signal. Detect mode can be used with either one or two probe inputs.

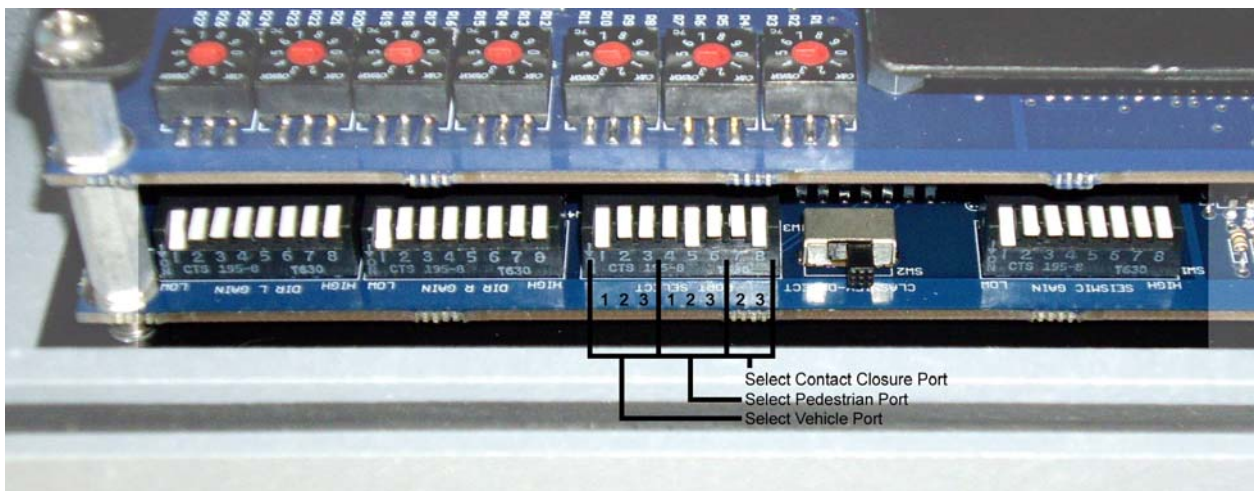
NOTE: Contact Closure (CC) sensor boards do not have Classify/Detect modes.

IX. Selecting Output Ports

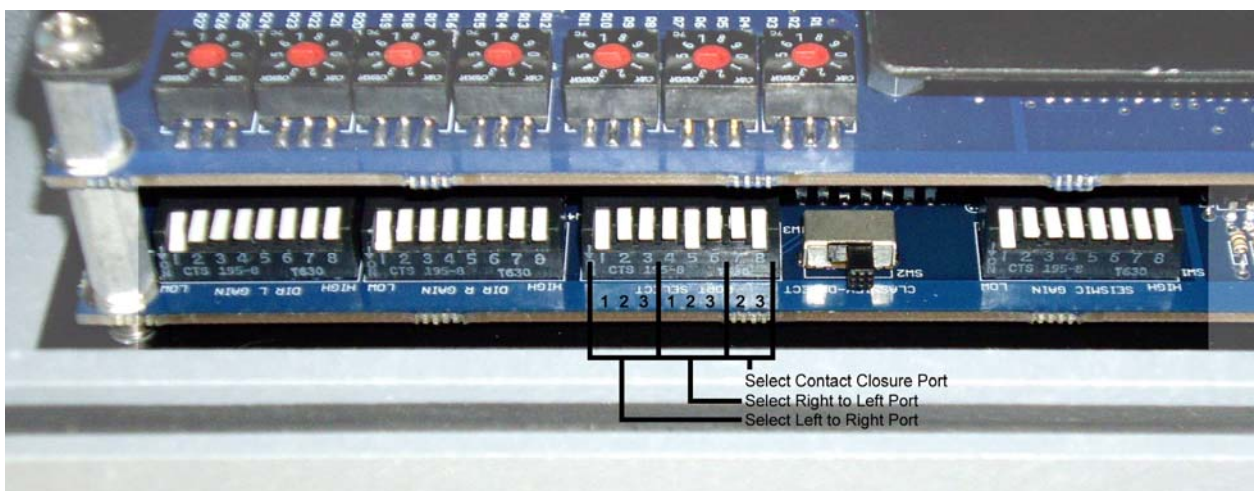
A sensor board's output ports are the three lines of communication from it to the Encoder/Transmitter board. Alarm pulses generated by the sensor board are (or are not) sent to the Encoder/Transmitter board depending on which PORT SELECT switches are turned on. To turn a switch on, press it down towards the circuit board. Only select one Port for each function. Do not select duplicate Ports for different functions as this prevents the alarm from being sent. To prevent a particular function from being sent, do not select a Port for it. The Contact Closure (CC) switches are only used when a normally open contact closure probe is connected to J1 on LCTL5L-DS and LCTL5L-SS models. The pictures on the next page show the PORT SELECT switch assignments for all models except the LCTL5L-CC which do not have selectable ports.



Detect Mode Port Select Switch Assignments



Classify Mode Port Select Switch Assignments for Seismic Probe Only




Classify Mode Port Select Switch Assignments for Directional Probe Only


X. LCTL5L-CC Contact Closure Transmitters

The LCTL5L-CC provides three sets of inputs for external devices that signal detected activity by means of opening or closing a switch. Unlike other LCTL5L-XX models, there are no sensor board switches to set with these transmitters. Instead, alarm pulses are automatically assigned to the Ports associated with the inputs. For each of the three Ports, there is a normally closed pair of contacts in J1 and a normally open pair of contacts in J2.

XI. Sensor Board Input Pin Assignments

LCTL5L-CC Triple Contact Closure Sensor

<u>J1</u>	<u>Pin</u>	<u>Function</u>
	A	Normally Closed 1
	B	Common 1
	C	Normally Closed 2
	D	Common 2
	E	Normally Closed 3
	F	Common 3

<u>J2</u>	<u>Pin</u>	<u>Function</u>
	A	Normally Open 1
	B	Common 1
	C	Normally Open 2
	D	Common 2
	E	Normally Open 3
	F	Common 3

LCTL5L-DD Dual Directional Sensor

J1



Pin

Function

A	Right input
B	Signal Ground
C	Left input
D	Probe +6 VDC supply
E	Probe -6 VDC supply
F	Shield Ground

J2



Pin

Function

A	Right input
B	Signal Ground
C	Left input
D	Probe +6 VDC supply
E	Probe -6 VDC supply
F	Shield Ground

LCTL5L-DS Directional / Seismic Sensor

J1



Pin

Function

A	Seismic (+)
B	Seismic (-)
C	No connection
D	Contact Closure input
E	Contact Closure common
F	Shield Ground

J2



Pin

Function

A	Right input
B	Signal Ground
C	Left input
D	Probe +6 VDC supply
E	Probe -6 VDC supply
F	Shield Ground

LCTL5L-SS Dual Seismic Sensor

J1



Pin

Function

- A Seismic (+)
- B Seismic (-)
- C No connection
- D Contact Closure input
- E Contact Closure common
- F Shield Ground

J2



Pin

Function

- A Seismic (+)
- B Seismic (-)
- C No connection
- D Contact Closure input
- E Contact Closure common
- F Shield Ground

XII. Examples

1. An LCTL5L-DS with both SPS-21 and PIR probes connected and PORT SELECT switches 1 and 5 selected responds as follows:

- In Classify Mode:
 - A vehicle stimulating the SPS-21 triggers a Port 1 alarm.
 - A pedestrian stimulating the SPS-21 triggers a Port 2 alarm.
 - A vehicle or pedestrian traveling left to right in front of the PIR (looking out from the PIR) triggers a Port 1 alarm.
 - A vehicle or pedestrian traveling right to left in front of the PIR (looking out from the PIR) triggers a Port 2 alarm.
- In Detect Mode:
 - A vehicle or pedestrian stimulating the SPS-21 triggers a Port 1 alarm.
 - A vehicle or pedestrian stimulating the PIR in either direction triggers a Port 2 alarm.

2. An LCTL5L-DD with a PIR probe connected to J1, an MS-10 connected to J2, and PORT SELECT switches 2 and 4 selected responds as follows:

- In Classify Mode:
 - A vehicle or pedestrian traveling right to left in front of the PIR (looking out from the PIR) triggers a Port 1 alarm.
 - A vehicle or pedestrian traveling left to right in front of the PIR (looking out from the PIR) triggers a Port 2 alarm.
 - A vehicle traveling left to right in front of the MS-10(looking out from the MS-10) triggers a Port 1 alarm.
 - A vehicle traveling right to left in front of the MS-10 (looking out from the MS-10) triggers a Port 2 alarm.
- In Detect Mode:
 - A vehicle or pedestrian stimulating the PIR in either direction triggers a Port 1 alarm.
 - A vehicle stimulating the MS-10 in either direction triggers a Port 2 alarm.

3. An LCTL5L-SS with a normally open contact closure device connected to J1, an SPS-21 connected to J2, and PORT SELECT switches 4 and 7 selected responds as follows:

- In Classify Mode:
 - A pedestrian stimulating the SPS-21 triggers a Port 1 alarm.
 - A vehicle stimulating the SPS-21 does not trigger an alarm.
 - A contact closure in the device connected to J1 triggers a Port 2 alarm.
- In Detect Mode:
 - A vehicle or pedestrian stimulating the SPS-21 triggers a Port 1 alarm.
 - A contact closure in the device connected to J1 triggers a Port 2 alarm.

XIII. Deployment Tips

A. LCTL5L-XX

- When changing batteries or settings, it is important to make sure that the case O-ring and mating surface are clean. Debris between the O-ring and mating surface creates a leak path which allows water to enter the unit.
- The LCTL5L-XX should only be buried deeply enough to cover the input connectors. If it is buried too deeply, the antenna's signal is significantly attenuated.
- Maximum transmit range is achieved when the LCTL5L-XX has an unobstructed line of sight to the receiver's or repeater's antenna. When circumstances permit, use coax to remote-mount the antenna in an elevated location to improve performance in difficult terrain.

B. Seismic Probes (SPS-21)

- Although the probe's cable is shielded, strong sources of electromagnetic energy can be conducted to the LCTL5L-XX's seismic amplifiers. Excess coiled cable should be placed under the unit to avoid picking up alarm transmissions. The unit should also be deployed away from other strong EM sources such as high-power transmission lines, power transformers, and radio towers.
- To reduce the possibility of non-target alarms, deploy probes well away from sources of ground noise such as: heavy traffic; windblown trees, signs, etc.; pumps, compressors, and other machinery; livestock and animal trails.
- Vibrations travel farther and retain more energy in hard or rocky ground. If the probe seems too sensitive with the LCTL5L-XX on the lowest gain setting (switches 1 and 2 down), one or more of the following techniques should be used:
 - Use a shorter spike on the probe or eliminate it altogether.
 - Dig an oversized hole for the probe and fill it with a softer material like potting soil.
 - Connect an attenuator cable between the probe cable and transmitter to cut the signal in half.
 - Connect additional probes end to end to form a line string. Line strings may be composed of up to six probes.
- Vibrations dampen out quickly in soft or wet soil. To increase the probe's sensitivity, replace the probe's spike with a longer one or with a length of 3/8"-16 all-thread.

C. Dual-Axis Magnetometer Probes (MS-10)

- Magnetic probes generate an alternating magnetic field and react to ferrous metals and other magnetic fields moving within that field. If the magnetometer is deployed above ground, it must be rigidly secured to prevent movement. Whether above or below ground, the MS-10 must not be deployed near sources of interference such as: windblown fencing, guy wires, signs, etc.; power lines and transformers; and electric motors.
- Under certain circumstances, the temperature of the MS-10's may be elevated above its operational limit of 60°C (140F°). This typically occurs during very hot weather and when the MS-10 is in direct sunlight or is shallowly buried in an unshaded area. If the probe gets too hot, false alarms may be generated. To eliminate false alarms, bury the probe a few inches deeper or deploy it in a shaded location.

D. Passive Infrared Probes (PIR)

- Passive infrared probes react to changes in temperature in the direction they are pointed. False alarms may be generated if the probe is pointed where there is background or animal movement, heat waves, or excessive incident light.
- It is important that the probe be rigidly mounted so that its own movement does not cause false alarms.
- NOTE: under no circumstances should an infrared probe be pointed where it will see direct or strongly reflected sunlight.

XIV. Specifications

ELECTRICAL

Operating Power:	12VDC nominal
Standby current:	
Dual Seismic:	510 μ A
Dual Directional:	520 μ A + 385 μ A for each MS-10 and/or 15 μ A for each PIR
Seismic / Directional:	515 μ A + 385 μ A for MS-10 or 15 μ A for PIR
Contact Closure/Open:	470 μ A
Transmit current:	2.5A
Power Supply:	(2x) 6VDC Duracell PC915 lantern batteries

TRANSMITTER

FCC ID:	V88-TRX876
FCC Rules:	Part 90
Input Voltage:	8.5 to 14 VDC
Operating Bandwidth:	Narrowband (12.5 kHz)
Frequency Range:	150-174 MHz
RF Output Power:	5 watts, factory preset
Frequency Stability:	\pm 2.5 ppm
Transmitter Attack Time	
From Power Up:	15ms
RF Load Impedance:	50 ohms

MECHANICAL

Size:	10 ⁵ / ₈ " x 9 ⁷ / ₈ " x 4 ⁷ / ₈ "
Weight:	4.0 lbs. w/o batteries
Case construction:	Polypropylene with O-ring seal
Weather resistance:	IP64
User Interface:	decimal coded rotary switch DIP switch for gain and port settings Slide toggle switch for Classify/Detect Mode setting
RF Output Connector:	BNC
Input Connections:	(2) Environmental connectors
Operating Temp:	-4° to 158° F (-20° to +70° C)

XV. Warranty

Limited Warranty

Monitron products are warranted against defects in materials and workmanship for a period of one year from the date of shipment, as evidenced by receipts or other documentation. Monitron Inc. will, at its option, repair or replace equipment that proves to be defective during the warranty period. This warranty includes parts and labor.

A Return Material Authorization (RMA) number must be obtained from Monitron Inc. and must be clearly marked on the outside of the package before any equipment will be accepted for warranty work. Monitron Inc. will pay the shipping costs of returning to the owner parts which are covered by warranty.

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