Indikon
A Riverhawk Company

SCM 1100

Single Channel Monitor

Product Manual

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1 System Description

This SCM 1100 is a Single Channel Monitor for vibration monitoring utilizing the Indikon A1 seismic sensor. It is a direct replacement for the older V/P-T3, VT-11A, and Series 2000 TriLight products. Through the interconnecting cable, the A1 sensor receives an excitation signal from the monitor and in turn provides an output back to the monitor. The monitor processes, filters, conditions, measures and displays the signal. Vibration is measured as displacement and displayed as a peak-to-peak amplitude value on the graphical LCD.

The SCM 1100 system operates entirely on 48 VDC external battery power with the option of 120VAC hookup.

2 Operation

2.1 Power-Up Sequence

When power is applied, the monitor will display the start-up messages.

The first message is:

INDIKON

A RIVERHAWK COMPANY

315-624-7171

The second message is:

SCM 1100

S/N XXXXX-XX

SOFTWARE REV 2.6

The third message is configurable and can be used to specify any information desired.

The serial number will vary by job number and unit number. The software revision will change as software updates or enhancements are included.

2.2 Normal Display

Under normal operating conditions, the OK indicator will be lit and the output relays will be energized, closing the Normally Opened contacts. Excessive vibration will actuate the ALARM and/or TRIP capability of the monitor. In such cases, the OK indicator will go off and the ALARM and/or TRIP indicators will be lit and the corresponding relays will be de-energized. Both Normally Opened and Normally Closed contacts are provided on each relay.

The display is a graphical white-on-blue LCD that provides a variety of information. For new users of this monitor, the unit has a demonstration mode that helps with initial familiarization. Install a jumper wire between terminals 14 and 15 on the 16-terminal block and apply 48 VDC[1] power to terminals 1 and 2. The monitor will ramp the displayed value between 1.5 and 3.5 mils pk-pk. With the alarm set-point at 2 mils and the trip set-point at 3 mils, the indicators and relays will react accordingly.

[1] for 120V option monitor terminal 1 is 120VAC, terminal 2 is Neutral.

The LCD will display the following:

- Vibration level in large numerals at the upper left
- The engineering units at the upper right – MILS PK-PK
- The STATUS at the middle right – OK, ALARM, or TRIP
- A bargraph towards the bottom with:
  - 0 and span values displayed – typically 0 and 5
  - An “A” and “T” at the alarm and trip points
  - A vertical bar at the alarm and trip points
  - A thin horizontal bar across the display
  - A thick horizontal bar indicating the magnitude of the displayed value
- The ALARM and TRIP set-point values displayed at the bottom

The monitor has four keys on the front panel; an up arrow, a down arrow, a SET PT, and a RESET key. These will be referred to in this manual as UP, DOWN, SP, and RESET.

2.3 Operating Properly Indicator

With the monitor is functioning properly, a small square indicator (special character), located in the upper right corner of the display will alternate on and off each second

2.4 Sensor Wiring Break Detection

The monitor can detect faults in the sensor wiring, for both sensor excitation and output wires. When a break is detected in the excitation wiring, it will display the following message:

SENSOR PROBLEM

LACK OF CONTINUITY
RED/BLACK WIRING
(V TEST = ___)

When the monitor detects a short circuit in the excitation wiring, it will display the following message:

SENSOR PROBLEM

APPARENT SHORT IN
RED/BLACK WIRING
(V TEST = ___)

When a break or short circuit is detected in the sensor output wiring (signal into the monitor), it will display the following message:

SENSOR PROBLEM

LACK OF CONTINUITY
OR A SHORT IN
GREEN/WHITE WIRING
(V TEST = ___)

The Test Voltage shown in the parentheses for each error message is an internal voltage which may be used to help troubleshoot application problems. If any of these error messages persist despite remedial actions, note the message and it's corresponding Test Voltage, and call Indikon Customer Service with the information.

As these are static messages and the keypad has no function at this point, the “operating properly” indicator will flash to signify that the monitor is functioning properly. Once the wiring problem is resolved, the display of normal information will resume.

When a wiring break is detected, the monitor will take one of three actions, depending on how it has been configured:

1. Set the vibration value to zero, which will cause no alarm or trip,

2. Set the vibration value to just above the alarm set-point, which will cause an alarm, or

3. Set the vibration value to just above the trip set-point, which will cause an alarm and trip condition.

2.5 Set-Point Adjustments

With the normal display shown, pressing SP will hide the bargraph and set-point values and display only the alarm set-point. Pressing SP again display the trip set-point. Pressing SP again will return the monitor top the normal display.

With the alarm or trip set-point value displayed, pressing UP or DOWN will increment or decrement the value. Pressing RESET will move the cursor under the digits to the left. Pressing UP or DOWN will increment or decrement the value above and to the left of the cursor, not changing any digits to the right. After the value has been adjusted, press SP to advance to the next display.

2.6 Set-Points Lock

The monitor can be configured with a lock on set-point changes. The “lock code” can be any 1 to 7 digit number. If the set-points lock feature is configured (configuration value not equal to zero), when the SP key is pressed, the following will be displayed on the bottom three lines:

SET-POINTS ARE LOCKED

LOCK # = 0

Pressing UP or DOWN will increment or decrement the digit, and only the digit selected. After the correct digit is displayed, pressing RESET will move the cursor to the right. Repeat this process until the lock number has been entered. When the entire lock number is correctly displayed, press SP to continue. If the correct lock number has been entered, the alarm setpoint will be displayed and can be changed.

If the wrong lock number has been entered, the following will be displayed:

INCORRECT LOCK #

Press SP to return to the normal display and press SP again to correct the lock number.

When entering the lock number, the RESET key moves the cursor to the right and provides zero extension of the lock number. If the cursor is on the seventh digit, pressing RESET will move it all the way to the left and any trailing zeros will be eliminated.

Once set-point changes have been unlocked, they will remain unlocked until no key has been pressed for 60 seconds.

2.7 Alarm and Trip Operation

The alarm and trip capability is not latching, but rather automatically resets when the vibration reduces below the set-point. The monitor has a delay before actuation and a delay before reset for the alarm and trip. These are initially set to one second.

If observing the demonstration mode, it can be observed that the states change one second after the value passes each set-point.

2.8 Higher Set-Point Operation

The “Higher Set-Point” feature, HSP for short, provides higher alarm and trip points during start-up. This capability is activated by and external contact closure (relay or switch), typically from a supervisory system or start-up control system. Both normal set-points are multiplied by a factor that is initially set to 5, but can be any value.

If observing the demonstration mode, the HSP feature can be actuated by placing a jumper between terminals 13 and 15 on the 16-terminal block.

When HSP is active, “HSP” will be shown on the display just above “STATUS”, on the bottom line of the normal display “ALARM” and “TRIP” will change to “HALRM” and “HTRIP”, and the displayed set-points will reflect the “higher” values.

When HSP is active, the scale of the bargraph in the normal display will also be expanded. This would typically be expanded by the same factor as the set-points, but it can be different.

2.9 Analog Output

An analog output is available for transmission of the vibration signal to a PLC or DCS supervisory system. It is essentially a standard 4-20mA output, but can easily be configured to provide a 0-20mA, 1-5VDC, or 0-5VDC. The span of the output, vibration level corresponding to 20mA is variable.

2.10 Contrast Adjustment

As with most LCD displays, the contrast may need to be adjusted occasionally for an optimal display. With the normal display shown, repeated depression of the UP or DOWN key will adjust the contrast.

2.11 Operation of the Keys

A summary of the functions of the keys is as follows:

Normal Display

SET PT	Displays the individual set-points and allows changes
UP	Increases the contrast
DOWN	Decreases the contrast
RESET	No function on this monitor (automatic reset of alarm and trip are used)

Set-Point Display (applies to the bottom 3/5ths of the display)

SET PT	Displays the individual set-points and allows changes
UP	Increases the value displayed
DOWN	Decreases the value displayed
RESET	Moves the cursor to another digit

3 Configuration

While the operation of the SCM 1100 described above has been simplified, the unit has many parameters that can be modified to vary the operation of the unit. These parameters are configured at the factory to meet the specific needs of the customer. Should parameters need to be varied in the field to better suit the characteristics of the operating environment, such as the level of vibration being monitored, the amount of instantaneous variation in the vibration, or more appropriate actuation or reset delays, changes can easily be made in the field by using a laptop computer and a simple PC application.

On the front panel of the monitor there is a jack (connector) for a Configuration Cable. The cable is a standard 4-wire audio cable with 1/8” diameter plugs on each end. A Configuration Adapter provides the connectivity between the standard DB-9 serial port connector on a PC/laptop and the Configuration Cable. The Configuration Adapter and the Configuration Cable are available from Indikon as a “KIT”. Also available is a USB port to DB-9 serial port adapter, should that type of connection be required or more convenient.

The installation and operation of the PC/laptop application is covered in a separate manual.

The Configuration Parameters and Values are discussed in DOC1046.

4 Detailed System Description

4.1 The Monitor

The SCM 1100 is a sophisticated product utilizing a single board computer and capable graphical display. Besides the configurability through software and many parameters, it has a lot of hardware capability as well. The vibration measuring circuitry has two peak detectors and an RMS detector, so it can measure a value that focuses more on the spikes or the average vibration level. Different software filters can be utilized and configured to best measure and display the vibration level. Data presentation could be changed to match customer preferences.

The monitor also includes checks on the functionality of the sensing circuit and the sensor. It can detect and report/display messages if the sensor excitation is not functioning, if there is a wiring break in the primary circuit (black and red wires to the sensor), and if there is a wiring break in the secondary circuit (green and white wires from the sensor).

Since the monitor can detect a wiring break, it can provide only an alarm indication if this happens, advising of the situation, rather than ignoring or failing to recognize it or tripping the system. This insures safe operation with minimal down time.

An alarm bypass feature could easily be provided, if desired, as a second digital input is available, currently used for the Demonstration Mode.

4.2 The Seismic Sensor

The A1 sensor employs the basic type of “spring-mass damping” system used in most seismic vibration sensors, including the well-known “velocity” type. For frequencies sufficiently beyond its natural or resonant frequency (about 7Hz), the mass remains effectively fixed, while the sensor case vibrates relative to it. This relative motion is measured by an LVDT, Linear Variable Differential Transformer. The primary or center winding of the LVDT is powered/excited by the monitor and the resulting signal (output) from the two secondary windings of the LVDT is returned to the monitor.

What distinguishes the Indikon A1 pickup from other vibration sensors are the following:

1. It measures vibration amplitude directly.
2. It has healthy internal mechanical clearances, which permit ruggedness of construction.
3. It uses eddy current damping rather than viscous damping, thereby minimizing the effect of temperature.

The pickup is furnished with either a 4 pin MS connector or mounted inside an explosion-proof condulet. In the latter case, the field wiring had solder connections, but the newer version includes a terminal block with captive wire clamps for ease of installation.

IMPORTANT NOTE

Each vibration pickup is set at the factory to measure either vertical or horizontal vibration, but not both, and must be installed accordingly as described in section 5.3.

4.3 The Interconnecting Cable

Indikon type SB-5 cable for connecting the A1 sensor to the monitor is a special 4-conductor low-capacitance cable. The conductors are divided into two pairs of color coded AWG #22 stranded wire with overall PVC jacket. Each pair is individually shielded; both shields having a common AWG #22 stranded drain wire for connecting them to ground. One pair (red and black) supplies the excitation to the sensor, while the other pair (green and white) connects the output to the monitor.

Cable lengths up to 800 feet are permitted without significantly influencing the calibration accuracy of the system. Consult the factory for use of cable lengths from 800 to 2000 feet.

5 Installation

5.1 Initial Inspection

Check the monitor for external damage such dents or scratches on the surfaces. If the shipping carton is not damaged, check the cushioning material and note any sign of severe stress as an indication of rough handling in transit. It's a good idea to check the operation of the monitor on the bench prior to installation.

5.2 Monitor Installation

5.2.1 Mounting

The monitor is designed for panel mounting and requires an opening as shown in Appendix A. This is the same opening and screw hole arrangement that was used on many older products, including the V/P-T3, VT-11A, and Series 2000 TriLight products. Secure the instrument to the panel with four #8 lock washers and nuts behind the panel. Screws are not needed as the monitor has threaded studs on the back of its front panel. The monitor can be mounted in any standard filler panel.

5.2.2 Environment

The monitor should be mounted in a control room environment, free from contamination and excessive ambient temperatures.

5.2.3 Rear Panel Connections

All external connections are made to the monitor at the two terminal blocks on the rear panel as shown in Appendix B. These are high quality pluggable blocks with captive wire clamps. These blocks have a high retention force and the 16-position plug is not easy to remove. It is easiest to use a pair of slip jaw type pliers to grab the raised edges of the plug.

One inch diameter holes are located below terminal blocks for cable entrance. Rubber grommets or strain relief cable clamps, with or without reducers, can be used to protect external wiring as needed.

5.2.4 16-Position Terminal Block

Power Connections – For units designed for 48VDC power, Terminal 1 is positive and Terminal 2 is negative. For units designed for AC power, Terminal 1 is hot/line and

Terminal 2 is neutral. The AC version will operate on any voltage between 85 and 264 VAC.

IMPORTANT NOTE

Insure that correct polarity is applied.

IMPORTANT NOTE

Safety ground must be connected to terminal 3 (cabinet ground).

Relay Contacts – If the vibration level exceeds the set-point the relay de-energizes and the Common-NC contacts will close (terminals 5-4 and 8-7) and the Common-NO contacts will open (terminals 5-6 and 8-9)

Analog Output – Terminal 11(+) and 10(-) are provided as inputs to external equipment, such as a recorder or computer. The output is typically a 4-20mA output, but it can be configured as a 0-20mA output. The output can be configured as a 1-5VDC or 0-5VDC output by moving an internal jumper or addition of a 250 ohm resistor at the connector or at the instrument it is connected to. The current output is a source, so no external power supply is needed. Terminal 12 is connected to safety ground/cabinet ground and should be used for the shield of the connecting wires.

IMPORTANT NOTE

The Analog Output is fully isolated from the input power and the (-) terminal is not an internal circuit common. There is no internal resistive path to cabinet ground. The Analog Output does have a common return line with the two Digital Inputs, which are likewise isolated from the input power and cabinet ground.

Digital Inputs – DI1 is used for the HSP feature and a relay or switch contact closure should be connected to terminals 13 and 15. Terminal 16 is connected to safety ground/cabinet ground and should be used for the shield of the connecting wires.

DI2 initiates the Demo Mode when a connection is made between terminals 14 and 15.

IMPORTANT NOTE

The Digital Inputs are contact closure sensing inputs. They do not require power and should not be connected to any outputs that supply power.

5.2.5 6-Position Terminal Block

A1 Sensor Connection – Terminals 1 and 2 connect to the black and red wires and supply the excitation to the sensor. Terminals 4 and 5 connect to the green and white wires which are the output from the sensor. Terminal 3 is connected to safety ground/cabinet ground and should be used for the shield of the connecting cable.

5.3 Pickup Installation

For details on pickup identification, outline, and installation, refer to the A1 manual. Install horizontal pickups mechanically within 3 degrees vertical with the long dimensions horizontal. Vertical sensing pickups must be on a surface horizontal within 3 degrees. Failure to insure this may cause false vibration readings when the machine being monitored is not running.

It is also important that mounting surfaces be flat. The pickup must be firmly bolted to this surface and the bolts must be centered in clearance holes so that pickup base is not distorted. If brackets are used, they must be sufficiently rigid so that there can be no flexing to introduce spurious results. If in doubt, advice should be requested from Indikon.

Connect the SB-5 cable wires to the terminal strip inside the conduit. The cable wires are color-coded and must be connected to the corresponding.

IMPORTANT NOTE

The cable internal shield (bare drain wire) should not to be connected to ground at the sensor. The shield is to be connected to its designated terminal at the monitor. Therefore at the conduit, the SB-5 cable shield (aluminum foil and drain wire) should be cut off and insulated to prevent accidental contact with conduit or any other possible ground.

Cable lengths up to 800 feet are permitted without significantly influencing the calibration accuracy of the system.

6 Installation Checklist

Review the installation of the system. The following is a list of common errors of instrument users in the past. This list has been compiled solely as an aid to the user in avoiding installation pitfalls.

6.1 Interconnection Wiring

Incorrect Connections - The most dangerous is connecting power to the wrong terminals. The most subtle is running signal wiring too close to high power wiring. This may result in noisy and intermittent system performance. Wires that normally conduct AC voltage, such as those going to relay contacts, should not be allowed to run close or rest against the non-shielded part of cable inner conductors.

Loose Connections – Insure that all screw terminal connections have been sufficiently tightened. Do not use too large a screwdriver when tightening screw-on connections, since it could break off portions of the barrier type of terminal strip. Be sure plugs and connectors are completely inserted and tightened.

Ground Loops – Exposed shields on cables must not be allowed to touch any ground potential surface, especially at the pickup. The ground for the system is at the monitor. Such exposed shields must be taped to avoid accidental grounding.

Damaged Cables – All cables should have proper strain relief, as needed, and be routed away from sharp edges and moveable mechanical parts.

6.2 Pickup Installation

Incorrect Positioning – For a vertical sensing pickup with or without a conduit, mounted on a horizontal surface, this surface must be truly horizontal surface within 3 degrees.

Similarly for a horizontal sensing pickup mounted on a vertical surface, this surface must be truly vertical within 3 degrees, with the following restrictions: of all possible orientations, only those which result in the conduit entry hole or connector facing upwards or downwards within 3 degrees of vertical can be used. The latter position is preferred for a drip-proof installation.

Loose Mounting – The sensor must be firmly bolted to the surface being monitored and bolts must be centered in clearance holes to avoid distortion of pickup base. If support brackets are used, these must be sufficiently rigid so there can be no flexing to introduce spurious results.

6.3 Monitor Installation

Poor Environment – Monitors are designed for a control room environment. Temperatures must not exceed 135°F. Weatherproof doors, air purging, or other means of protection, must be provided where the environment is poor.

No Instrument Ground – The monitor chassis must be grounded. Refer to rear terminal drawings for the ground connection.

6.4 Applications

Other conditions and/or exceptions to any of the above should be discussed thoroughly with Indikon. Most applications can be handled with minor modifications to standard systems. Should trouble occur in an existing system, our service engineers are available to lend assistance. Most troubles can be pinpointed in the course of a telephone conversation.

7 Maintenance

7.1 General

Maintenance requirements have been minimized as a result of the design of the system. However, the monitor and especially the vibration sensor must be handled as precision instruments. Reasonable care should be taken making connections to the rear panel. Maintenance, if required, is in general limited to replacement of defective components, isolated by standard trouble-shooting techniques.

7.2 Calibration

7.2.1 Monitor Adjustments

No internal adjustments to the monitor should be needed and the system should maintain calibration for an extended period of time.

7.2.2 Periodic Calibration

The system, which consists of the monitor and the sensor, should be checked for calibration annually.

7.2.3 Monitor Calibration

If a shaker/vibration table is available, the monitor can be checked by connecting to a known good sensor and vibrating it at applicable levels to verify the monitor displays the correct value.

If a sensor simulator is available, the monitor can be checked by connecting it to the simulator to verify the monitor displays correct values.

If no such equipment is available, monitors should be returned to the factory for calibration.

7.2.4 Sensor Calibration

If a shaker/vibration table is available, the sensors can be checked by connecting to a known good monitor and vibrating the sensors at applicable levels to verify that the monitor displays the correct value.

If no such equipment is available, sensors should be returned to the factory for calibration.

7.3 Troubleshooting

7.3.1 Preliminary - To locate trouble in the system, start with a thorough visual inspection and then proceed with an electrical check as necessary. Remove power from the equipment and inspect the system for a loose pickup, loose or improper connections, a blown fuse, burned insulation, etc. Repair any defect discovered and system performance before troubleshooting further.

7.3.2 Self-Check – Damaged connecting cables may be causing noise or intermittent connections. Proceed with pickup “substitution” or “electrical tests”. If the monitor fails a self-check the cause is internal and will require checking at the factory.

7.3.3 If the malfunction still exists, the cause may be internal to the monitor, sensor, or cable.

7.4 Replacement Parts

It has been our experience that sensors are most often the source of problems, not because they fail, since they rarely do, but because they are often accidentally damaged during the course of mechanical maintenance on the machine itself.

7.5 Record Keeping

Many users of vibration monitoring equipment find that daily or at least weekly logging of vibration readings is valuable in noting trends in machine behavior, enabling them to schedule a shutdown for necessary repairs.

8 Specifications

Input Sensor

Indikon A1 Vibration Sensor

Vibration Measurement

Normal Range: 0-5 mils peak-to-peak
Measuring Capability of the Monitor: 0-25 mils peak-to-peak
Measuring Accuracy: +/- 1% of span

Frequency Range

750-60,000 RPM – 12.5 Hz to 1,000 Hz

Filter

Low Pass, 26 db/octave slope, 3 db point at 1000 Hz
High Pass, 26 db/octave slope:
Corner frequencies available: 12.5Hz, 15Hz, 20Hz, 30Hz, and 60Hz

Sensor Wiring Break Detection

Red/Black wires for LVDT excitation
Green/White wires for LVDT output to the monitor

Set-Point Range

0.1 to 99.9 mils peak-to-peak

Alarm and Trip Actuation Time Delay

0 to 60 seconds

Alarm and Trip Reset

Automatic with variable delay, 0 to 60 seconds

Higher Set Point Feature

Up to 5 times is typically used – completely adjustable

Relay Contacts

DPDT, rated 5A resistive
Suitable for signal level switch until they actuate a high current load

Analog Output

4-20 mA, for load resistance less than 500 ohms
Actual range: 0-22mA
Accuracy of output: 1% of full scale value
Can be configured as a 0 to 20mA output via software
Can be configured as a 1 to 5VDC or a 0 to 5VDC output via a hardware jumper

Rear Panel Connectors

Pluggable Phoenix connectors with captive wire clamps, 6 and 16 terminals

Sensor Cable

Indikon Type SB-5, 800 feet maximum
2 twisted pair, red/black and green/white
22 AWG, 7/30 tinned copper, polyethylene insulation
Mylar laminated aluminum shield with a drain wire, gray PVC jacket
Conductor to conductor capacitance: 22pf/foot
Conductor to shield capacitance: 37pf/foot

Operating Power – 48VDC version

Voltage	48 Vdc nominal
Normal Operating Range	37 to 58 Vdc
Absolute Maximum Voltage	72 Vdc
Maximum Reverse Voltage	60 Vdc
Power Consumption	8 watts, typical
Fuse Rating	0.25 amp (Type 3AG, Fast Acting)

Operating Power –AC version

Voltage	120VAC nominal
Normal Operating Range	85 to 264VAC
Power Consumption	8 watts, typical
Fuse Rating	2.5 amp (Type 3AG, Fast Acting)

Isolation

Digital Inputs	Isolated from case/earth ground and power
Analog Output	Isolated from case/earth ground and power
Isolation	350 Vac, 500 Vdc

Mechanical

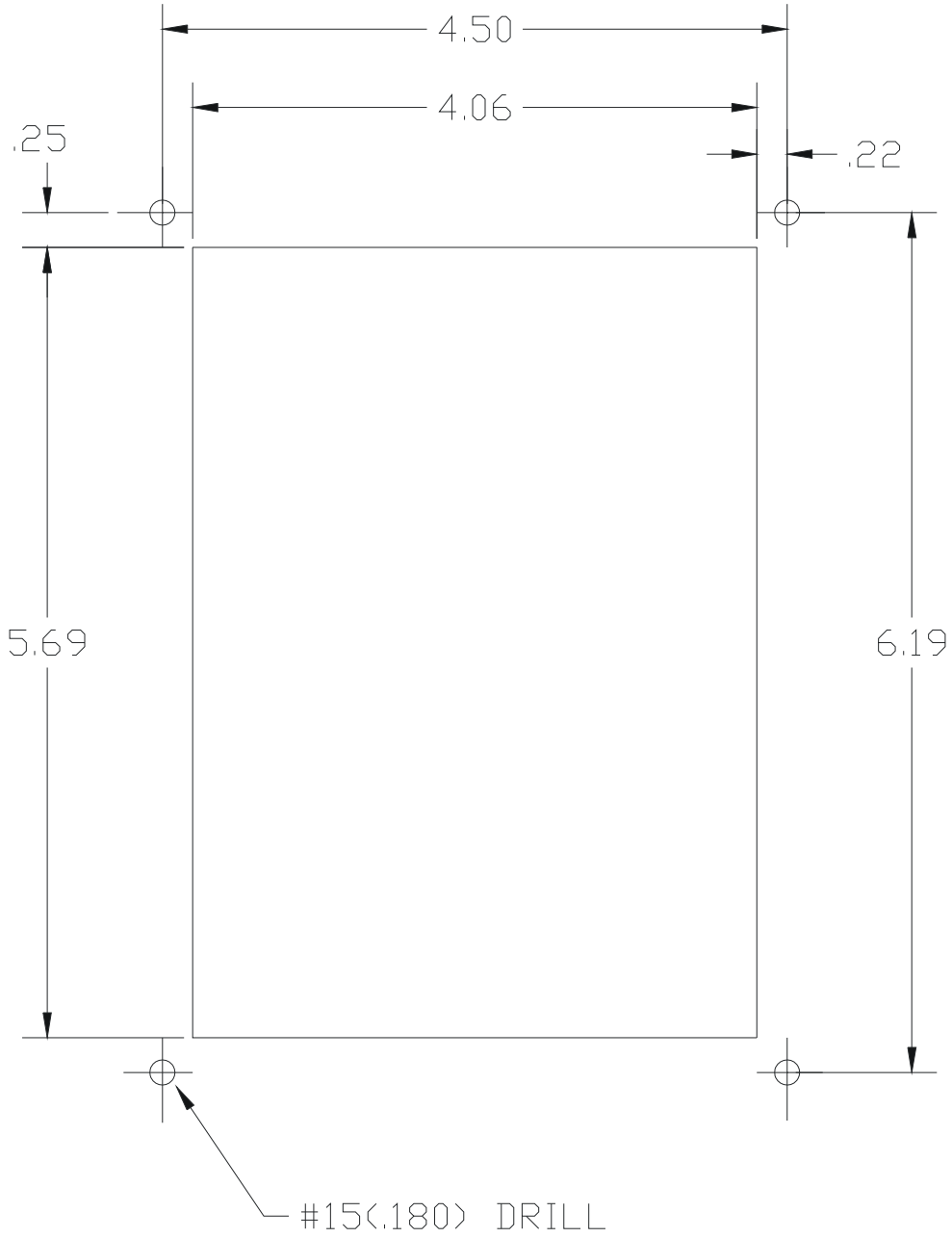
Aluminum anodized enclosure	
Dimensions – Face Plate	5.38” W x 6.8” H (137mm x 173mm)
Dimensions – Enclosure	14.0” L x 3.8” W x 5.44” H (356mm x 97mm x 138mm)
Mounting Studs	#8
Mounting Cutout/Holes	See diagram

Environmental

Ambient Operation Temperature	32ºF to 131ºF (0ºC to 55ºC)
Humidity	0 to 100% RH, non-condensing
Transportation Vibration	IAW Commercial Handling/Shipping

Warranty

Standard	1 year



Same as V/P-T3, VT-11A, and Series 2000 TriLight

Appendix A – Panel Cutout

DIGITAL	SHIELD	16
	RETURN	15
	DIG IN 2	14
	DIG IN 1	13
ANALOG	SHIELD	12
	OUT +	11
	OUT -	10
ALARM	N.O.	9
	COMMON	8
	N.C.	7
TRIP	N.O.	6
	COMMON	5
	N.C.	4
POWER	GROUND	3
	48 VDC -	2
	48 VDC +	1

TB1

6		
5	WHITE	A1 SENSOR
4	GREEN	
3	SHIELD	
2	RED	
1	BLACK	

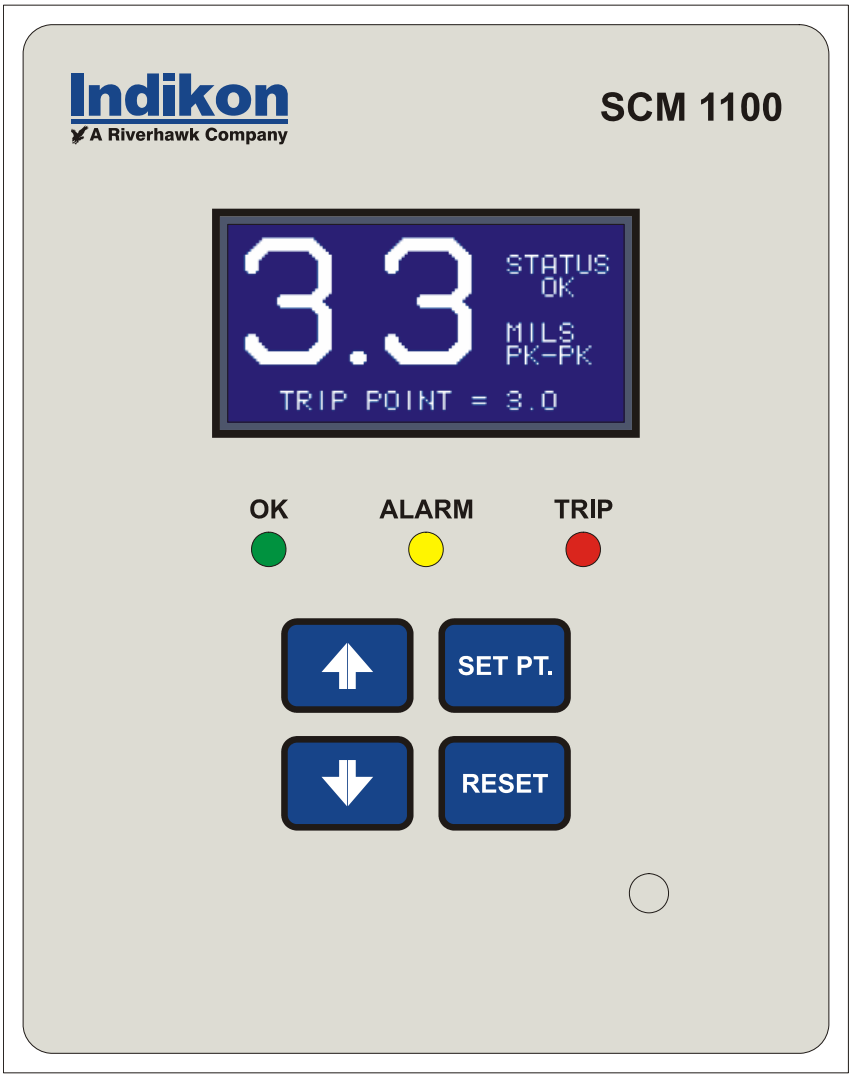
TB2

48VDC Powered Version Shown Above

POWER	GROUND	3
	NEUTRAL	2
	120 VAC	1

Differing Connections for AC Powered Version

Appendix B – Rear Panel Wiring



The data shown in the LCD is representative, but not correct

Appendix C – Front Panel Representation

9 Warranty Statement

Limited Warranty: Vibration monitoring equipment and accessories are warranted by the Seller for one year to be free from defects in both materials and workmanship under normal use and service. This warranty is in lieu of and excludes any other warranty, express or implied, including, but not limited to, any implied warranty derived from quote or fitness of purpose. (Manufacturer's liability and Buyer's limited remedies under Manufacturer's warranty shall be limited solely to repair, replacement, credit or refund, at the manufacturer's option, with respect to products supported by a Return Material Authorization number obtained from the Manufacturer and returned to the Manufacturer. The Manufacturer shall not be liable, under any circumstances, for consequential or incidental damages, including, but not limited to, labor costs or loss of profits arising in connection with the use of or inability to use products purchased from the Seller)

Product Application: The Buyer is solely responsible in determining the suitability of the Manufacturer's products in its application regardless of circumstances.

Manufacturer reserves the right to make future design changes to any of its products without thereby incurring any obligations to make changes to or replacements of this product.

Manufacturer neither makes nor authorizes any person to make on its behalf any other guarantee or warranty concerning its products.

Service

To obtain service under this Limited Warranty call Riverhawk Customer Service Department in **New Hartford** to obtain an RMA (Return Material Authorization) number.

Pack the item(s) in its original shipping container (or equivalent)

Put the RMA number on the address label

Put the RMA number on the shipping carton

Insure it (or assume the risk of loss / damage during shipment)

Ship the product freight pre-paid to **New Hartford**

Manufacturer is not responsible for damage to inbound product.

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