AGRITRONICS

AGRICULTURAL ELECTRONICS FOR PRODUCTIVITY

Agritronics Modular Monitor System (AMMS)

Installation and Operating Instructions

System Overview

Some areas of a Seed cleaning Plant, Feed Processing plant or Fertilizer handling plant operations are considered a hazardous dust environment. The classification for inside bins, hoppers, elevators, and machines is Class 2 Division 1 Group G. The classification of storage areas is considered to be Class 2 Division 2 Group G. The use of dust collection apparatus can reduce the classification from Division 1 to Division 2 in some areas.

The Agritronics Modular Monitor System (AMMS) is designed as Intrinsically Safe (I.S.) Associated Apparatus that is able to safely operate wiring and sensors that are installed in the Class 2 Division 1 or 2 Group G hazardous areas. The voltage and current available from each module is limited so that even if the wiring or sensors in the hazardous area was damaged and was intermittently shorted or open, there would be insufficient energy available tjo cause a fire or explosion.

The Canadian Electrical Code Handbook Section 18 and Appendix f describe the details of I.S. installations.

Installation Overview

The Monitor Modules are to be installed in a Standard Electrical area near a 120Vas power outlet. The plant office is a common location that is used.

The I.S. installation requires that a pair of ground wires be connected from the back of the Power Module (SPM148PWR-IS-1) to the building power system ground. These redundant grounds are an important aspect of maintaining an I.S. system.

The wiring to the sensors and the sensors themselves can be mounted wherever appropriate for their function within the plant. When the wires go between Div1, Div2 and a Standard area, there needs to be a dust seal around the wire (jacket). This is a normal installation procedure in a plant. You do not need to use a gas-tight potted type seal in a Group G installation.

The wire to the sensors does not need to be special, it can be what is called Class 2 or low voltage wiring. It is however good practice to install sensors and wires in a way to minimize the chances of mechanical damage that will cause a malfunction of the system.

In high vibration areas, you need to use finely stranded wire conductors to maximize service life. The wire provided for connection to each sensor is 2 conductor, 18 gauge 41 strand SJTW black jacketed cable. This cable should be used where wiring is outdoors and where there is mechanical vibration.

The individual sensor wires pairs can be combined at a terminal strip into a multi-pair cable for long runs back to the monitor panel. If there is minimal vibration, this multi-pair cable could have solid copper conductors such as is used in telephone and intercom installations.

Note, that a PAIR of wires is to be connected from each Bin and Shaft Module to their associated sensor that may be mounted in the hazardous dust area. Do not connect Intrinsically Safe circuits together and do not use a common return wire for several sensor circuits.

Power Module

SPM148PWR-IS-1

How it works:

The Power module gets nominal 12Vdc power from a wall mounted Class II AC/DC power adaptor with up to 1 amp supply. Inside the Power module, the voltage is monitored and protected against over voltage in case of input power supply failure using “fuse protected redundant over-voltage crow-bar circuitry”.

This over-voltage protection is a key aspect of providing an Intrinsically Safe monitor system. An Intrinsically Safe electrical system is specifically designed and approved by Canadian Standards Association so that if there was to be a failure of the wiring or sensors in a hazardous (potentially explosive or flammable) area, there is not sufficient energy available to cause ignition.

Installation Notes:

There are a pair of grounding terminals on the back of this module that are to be separately (redundantly) connected to the building earth ground / electrical system ground according to CSA C22.1 Section 18 and Appendix F (the principle criteria is that the resistance from these protective terminals to earth ground must be not more than one ohm - see F3.2.2(e)).

The power module provides voltage-protected operating power to the modules through the ribbon cable on the back of the modules.

Operation Notes:

There is a power ON-OFF switch on the power Module.

Alarm Module

SPM147ALM-1

How it works:

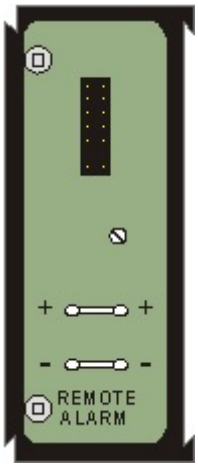
The alarm module provides a local audible alarm in response to an alarm condition that is detected by any of the signal input modules.

There is an Alarm Acknowledge push button switch on this module that will silence the alarm and sends a signal to the module(s) that created the alarm so they can cease their blinking function.

Installation Notes:

The alarm module picks up an alarm signal from the ribbon cable attaching it to the other modules in the system. The Alarm Acknowledge switch sends a signal to the modules to stop their alarm generation when the operator pushes the switch.

There is a Remote Alarm Output connection on the back of this module that provides switched DC power to operate a remote audio alarm. This output power to a remote alarm is over-voltage protected but not infallibly current protected so it is not Intrinsically Safe. The wiring to a remote alarm and the remote alarm must stay in the standard electrical area.



Shaft Module

SPM146SHF-DKIT

How it works:

The circuitry in the shaft module measures the time between pulses received from the shaft speed sensor.

- If the sensor is activated by a single magnet clamped to the rotating shaft, then the module will time the period of each shaft turn. (This is the preferred type of shaft sensor because it will always give a stable reading.)
- If the sensor is activated by a magnet disk, then there are 8 pulses produced per revolution of the shaft. The module measures time between adjacent pole pulses from the sensor. (The magnet disk is helpful for very slow turning shafts because it can detect the speed of the shaft with only 1/8 of a revolution. It is important that the magnet disk be mounted so that it rotates smoothly without wobbling or the time between adjacent pulses will vary considerably.)

The time between pulses is compared to a reference period set by DIP switches and the adjustable potentiometer that is accessible on the front of the module.

If the time between pulses is less than the reference period, (indicating that the shaft is turning faster than the set point) then:

- the Green indicator comes ON.
- The alarm chirps twice to indicate to the plant operator that the shaft was turned ON

If the time between pulses is too long, (indicating that the shaft is turning slower than it should be), then:

- the Green indicator turns OFF,
- the Red indicator comes ON blinking, and
- the alarms sounds

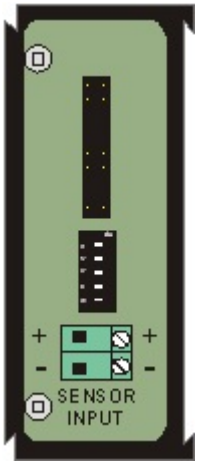
The alarm can be silenced by:

- pressing the alarm acknowledge switch on the front of the Alarm Module
- pressing the (optional) remote alarm acknowledge switch
- will automatically silence in 2 seconds if the module is set for automatically silence if the shaft speed resumes to its normal operating speed. (In this case, the Red indicator will remain ON flashing and the Green indicator will also be ON continuously to indicate to the plant operator which channel caused the temporary alarm. This feature is helpful for troubleshooting intermittent sensors and wiring.)

Logic Output

There are logic output signals available on the last 4 pins of the ribbon connector. These signals are inputs to a Programable Logic Module that can combine signals from input sensors to signal shut down of systems when a fault is found or a limit is reached. A Programable Logic Module can also be set up to control a batch process.

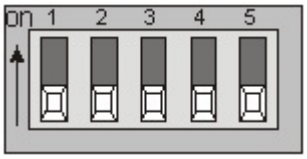
Installation:



Slide the shaft module onto the panel. Connect the ribbon cable (provided) onto the set of connector pins. (The 4 spare pins have signals to be used by optional logic modules and the ribbon cable is not connected to them.)

Connect the sensor to the Sensor Input terminal strip. If you have used multi-pair wires to bring a batch of signals from a terminal strip that is mounted near a batch of sensors be careful that you do not nick the wire or it could easily break from vibration.

Dip Switch Configuration:



On the back of the Shaft Module, there is a 5- position DIP Switch that can be set for various options.

- Dip Switch 1 is used to select the sensor current required. Magnetically operated reed switches will use the 1ma setting. Active sensors such as shaft encoder will require the 25ma setting.

- Dip Switch 2 is used to select if the Alarm output must be acknowledged or if it will time out by itself in 2 seconds.

- Dip Switches 3, 4, 5 are used to select the range of the shaft rpm from 5 rpm to 10,000 rpm. (This monitor is expecting one pulse per turn of the shaft. For very slow turning shafts, a multi-pole magnet disk is available that will produce 8 pulses per turn. A magnet disk will improve response time to changes in the speed of very slow turning shafts.)

Dip Switch	Off	On
1	Normal Sensor Current(12V/1ma)	High Sensor Current(12V 25ma)
2	Latched Alarm	Momentary Alarm
3	Select ONE Only	5-100 RPM
4		50-1000 RPM
5		500-10,000 RPM

Alarm Speed Adjustment

To set the alarm speed threshold, you will need to select a range with the Dip Switch and adjust the front panel screw.

- Select the speed range using one of the Dip Switch 3,4, or 5. (Only select one of the dip switches, if more than one is selected, the actual reference speed will be higher than expected!)

- With the shaft operating with its normal load, turn the front panel adjustment screw Clockwise until the Green Led comes on.(If the Green Led is already on then turn it CCW until the Red Led comes on.)

- The adjustment screw has a range of 20 turns. When you get to the end of the adjustment you will hear a clicking sound. If you have reached the end of the adjustment, you will need to select the next Dip Switch. Turn the adjustment screw an additional turn CW to provide a threshold so the shaft will not alarm on minor dips in shaft speed.

Bin Module

SPM145BIN-PKIT

How it works:

When the level of material in the bin or hopper is below the sensor (for an upper bin level sensor) then the Green indicator will be ON. When the level of material in the bin or hopper is above the sensor (for a lower bin level sensor) then the indicator will be ON.

When the level of material in the bin or hopper changes to activate the sensor (material goes above the sensor for an upper bin or goes below the sensor for a low bin) then:

- the Green indicator on the module will go OFF
- the Red indicator will come ON blinking, and the alarm will sound.

The alarm can be silenced several ways:

- by pressing the Alarm Ack switch on the front of the Alarm Module
- by pressing the (optional) remote alarm acknowledge switch if there is one connected
- the alarm will automatically silence after 2 seconds if the DIP switch setting on the back of the module is set to enable a momentary alarm

If the level of material in the bin keeps the sensor activated (material stays above the sensor for a high bin level alarm or the material stays below the sensor for a low bin level alarm) then the Red indicator will stay ON continuously.

When the level of material in the bin changes to de-activate the sensor (material lowers below the sensor for a high bin level alarm or material rises above the sensor for a low bin level alarm) then:

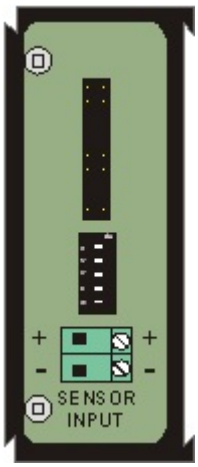
- the Red indicator goes OFF, and
- the Green indicator come back ON

If the sensor is activated for a short time (for some reason the level of material in the bin rises above the alarm point and then falls below again) then:

- the alarm is automatically silenced ut the RED indicator stays on blinking, and
- the Green indicator comes ON. (The Green indicator never blinks.This feature shows the operator which sensor gave the temporary alarm and is helpful in troubleshooting loose wire connections and intermittent sensors.)

If the sensor is activated and de-activated near its sensing range (this sometimes happens if you are bagging from a bin that is “full”) then the alarm may come ON every time you fill a bag which is very annoying. There is a DIP switch setting on the back of the module that will provide a 5 minute re-alarm delay. The bin sensor must be in the “normal” condition for 5 minutes before the module will generate a new alarm.

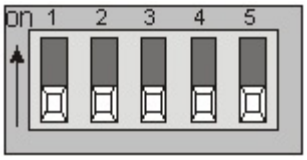
Installation:



Slide the shaft module onto the panel. Connect the ribbon cable (provided) onto the set of connector pins. (The 4 spare pins have signals to be used by optional logic modules and the ribbon cable is not connected to them.)

Connect the sensor to the Sensor Input terminal strip. If you have used multi-pair wires to bring a batch of signals from a terminal strip that is mounted near a batch of sensors be careful that you do not nick the wire or it could easily break from vibration.

Dip Switch Configuration:



On the back of the Shaft Module, there is a 5- position DIP Switch that can be set for various options.

- Dip Switch 1 is used to select the sensor current required. Pressure operated bin switches use the 1ma setting. Active sensors require the 25ma setting.

- Dip Switch 2 is used to select the sensor switch as Normally Closed (NC) or Normally Open (NO).

- Dip Switch 3 is used to select if the alarm output must be acknowledged or if the alarm will time out by itself in 2 seconds.

- Dip Switch 4 is used to select if a re-alarm delay is to be used. In some bins when material is removed slowly after the bin has been over-filled, the bin level sensor will switch ON and OFF several times until the material falls below the switch level. To prevent this annoying re-alarm, a delay of 5 minutes can be selected where the bin switch must see an “empty” signal continuously of 5 minutes before it will enable another alarm. The indicator on the module may switch between Red and Green during the re-alarm delay period, but the alarm will not sound.

- Dip Switch 5 is used to select if the module is used as a Bin Level Module or as a Remote Alarm Acknowledge Module. In the Remote Alarm Acknowledge mode, a bin level switch is mounted in the plant where an operator can press it to silence the alarm instead of having to go into the office and press the button on the panel. The remote alarm acknowledge switch can be in a hazardous area since it is operated from an I.S. module.

Dip Switch	Off	On
1	Switch Type Sensor (12V/1ma)	Optical Type Sensor (12V 25ma)
2	Sensor Switch Normally Open	Sensor Switch Normally Closed
3	Latched Alarm	Momentary Alarm
4	No Alarm Re-enable Delay	5 Min alarm Re-enable Delay
5	Normal Bin Module	Remote Alarm Bin Module