



AIS-R2 Inclinometer System



Operation & Installation Manual

Product Information

General Description

APSCO's inclinometer system is intended to provide the operator with visual and audible information regarding the angle of the vehicle or equipment being operated. This warning system includes a sensor, display, and connection cables.

The display has a built-in clock that works in conjunction with the system data logging feature. The clock can be reset to your specific time zone and read using a PC connection with the USB cable. This allows the user to download and view any recorded alarm event history with date & time stamp of the event.

The sensor has a maximum angle measuring range of $\pm 20^\circ$. The trip alarm has a setting range of 2.0° to 9.9° . Optional display and sensor mounting brackets are available upon request.

Features

This device is designed for use in industrial and mobile equipment applications.

- Stable and reliable performance
- Automatic logging function
- Power supply and power polarity protection.

Typical Applications

- Dump Truck & Dump Trailers
- Vehicle inclination measurement and logging capabilities

User's Manual

Section A: System setup Date, Time, Passowrd & Alarm using a PC:

1. **Data Time Set** - allows the user to adjust the system date & time. The date format is displayed as *MM/DD/YYYY* and the time format is displayed as *HH:MM:SS*.
2. **Alarm angle** – the default trip alarm is set at $\pm 2.0^\circ$. The Alarm angle may be set from the display or when connected to a PC up to a maximum angle of 9.9° . The current angle and time will be recorded when the current angle is \geq the alarm angle setting.
3. The displayed **Current Angle** can be set to zero after the inclinometer has been installed by adjusting the sensor angle so that the displayed angle reads zero (0). When connected to a PC, the system can also be re-calibrated to assume the the current sensor angle reading is $= 0.0^\circ$.
4. **Save Alarm Log** - allows the user to export the event data log as a .txt file.
5. **Read Alarm Log** - allows the user to view the event data log
6. **Clean Alarm Log** - allows the user to erase the event data log
7. **Password** - allows the user to change the system display access password

Section B: Event Recording Function

The following events types will be saved in the system

1. **Angle Alarm** = when the Hydraulic source (PTO) is “on” and the sensor is connected, the tilt angle will be recorded if the angle is greater than or equal to (\geq) the system alarm trip angle setting.
2. **Angle Recovery** = when the hydraulic source (PTO) is “on” and the sensor is connected, the inclination (measured tilt angle) is less than or equal to (\leq) the preset alarm trip angle setting.
3. **Break Alarm** = sensor is not connected to the display.
4. **Break Recover** = sensor re-connected to the display.
5. **Hydraulic On** = Hydraulic pressure switch is turned on. The system is armed.
6. **Hydraulic Off** = Hydraulic pressure switch is turned off. The system is not armed

The system will record the date, time, event type and sensor tile angle reading at the time the event occurred. The maximum number of events recorded = 4000. After 4000 events have been recorded, any new events will over-write the previously saved events on a First-In / First-Out (FIFO) principle.

Section C: Display functions:

1. The screen displays information on 4 different rows as follows:
 - 1st row = **Current Date**
 - 2nd row = **Current Angle** and **Current Time**
 - 3rd row = **Alarm Setting**
 - 4th row = **INCLINE DIRECTION** if the **Hydraulic Circuit** is “**ON**” or “**OFF**”.

2. There are three type alarm events: “**ANGLE**” alarm, “**OPEN CIRCUIT**” alarm and “**LIMIT**” alarm. When no alarm events occur, the actual “**ANGLE**” will be shown; if all three alarms occur at one time, “**ALLAM**” will be displayed. When two different alarms happen, following the will be displayed:

Alarm Type	Angle	Open Circuit
Angle (A)	AGALM	AGBRK
Open Circuit (B)	AGBRK	BREAK

When (A) Angle alarm sounds; the (B) Open Circuit alarm sounds
 When (B) Open Circuit alarm sounds, the (A) Angle alarm is disabled.

3. **REAL ANGLE (actual angle)** is shown on the left side of the display second row. By default: left inclination is shown as a negative angle valve and right inclination is shown as a positive angle valve.
4. When the inclination (tilt angle) is less than 2°, three upward arrows are shown on the left bottom corner of the screen and beeper signal is disabled. If inclination angle is within the range of 2° to the set alarm angle, an arrow pointing left with three upward arrows will be displayed when the inclination angle is toward the left; an arrow pointing right with three upward arrows will be displayed when the inclination angle is toward the left. When the hydraulic source (PTO) is “ON”, the beeper will sound once the actual angle is > 2.0° and increase in frequency as the actual angle approaches the alarm angle setting. If inclination angle is greater than the alarm angle setting and the hydraulic source (PTO) is “ON”, two arrows pointing left and three arrows pointing up will be displayed when the inclination angle is toward the left; two arrows pointing right and three arrows pointing up will be displayed when the inclination angle is toward the right. At the same time, beeper will sound with a continuous steady tone and the output relay contacts will close.

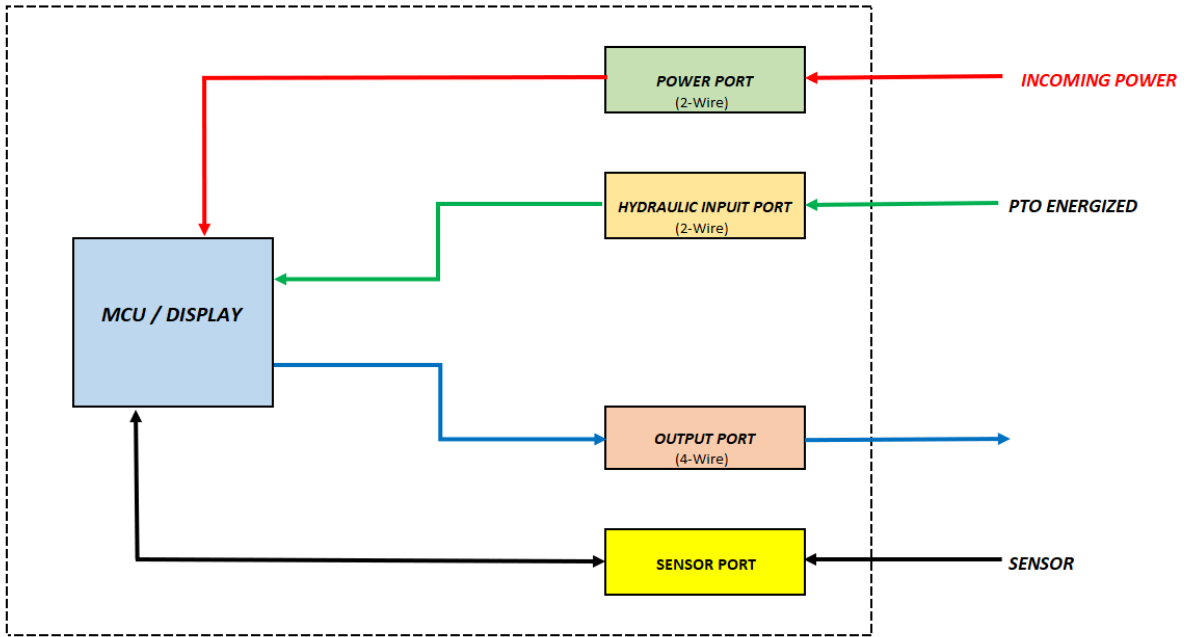
5. A low amperage relay (capacity < 5 amps) is mounted inside the display and is wired to the "OUTPUT" port on the back of the display unit. Use of an externally mounted high capacity relay is recommended for application that require a higher amperage capacity. When the inclination angle is greater than or equal to (\geq) the alarm trip angle setting, common port and normal open (NO) contacts of the relay are closed. When inclination angle is less than (<) alarm trip angle setting, common port and normal closed (NC) contacts of the relay are closed.

6. There are six buttons on the display. $\uparrow, \downarrow, \leftarrow, \rightarrow$, "SET", "OK". The "SET" button is used to move to different screen display modes: normal display mode, password typing mode, or password setup mode; The "OK" button is used to save the operation; the other buttons are used to adjust the alarm angle and input/set password. The angle alarm can be set to a value between 2.0° to 9.9°; access is protected by a 6 digit password, the default password is: **123456**. The hydraulic source (PTO) must be "on" and the sensor cables connected before the password and alarm angle can be changed.

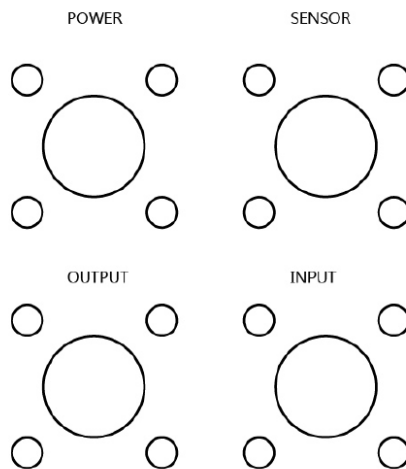
7. When "Erasing the device log", the display will stop working for about 1-2 minutes. During this period of time, the display will not record any alarm data and all other operational and setup functions will be disabled.

Section D: Power and control line wiring schematic

AIS-R2 System General Wiring Schematic



Section E: Display Port Layout & Cable Wiring Color Code.



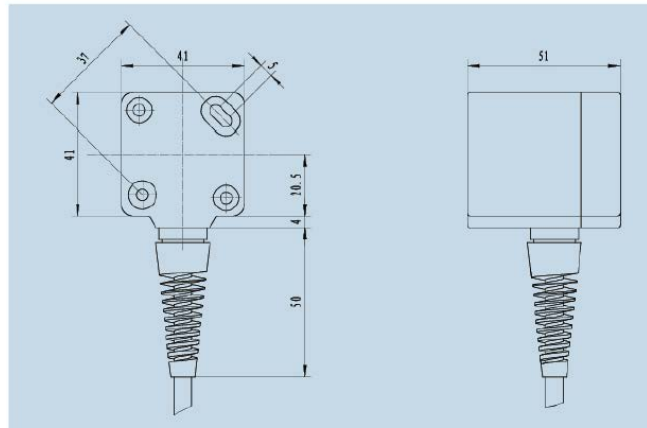
CABLE WIRING - Color Code

POWER Port (2-pin male Socket)	Pin No.	PIN 1	PIN 2		
	Wire Color	Brown	Blue		
	Function	8-36Vdc (+)	Ground (-)		
SENSOR Port (4-pin male socket)	Pin No.	PIN 1	PIN 2	PIN 3	PIN 4
	Wire Color	No visible exposed cable, please refer to the corresponding relation between PIN and function.			
	Function	Sensor Power Supply Positive (+)	Sensor Power Supply Negative (-)		
OUTPUT Port (4-pin Female Socket)	Pin No.	PIN 1	PIN 2	PIN 3	PIN 4
	Wire Color	Brown	Black		Yellow/Green
	Function	Relay Off (NC)n	Relay On (NO)	Open	Ground (-)
HYDRAULIC INPUT Port (2-pin Female Socket)	Pin No.	PIN 1	PIN 2		
	Wire color	Brown	Blue		
	Function	Hydraulic Input Positive (+)	Hydraulic Input Negative (-)		

Note:

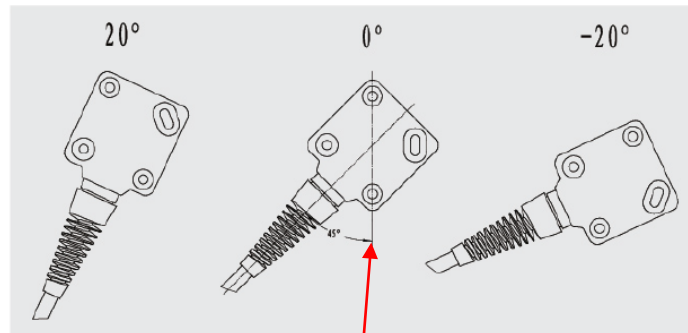
1. When the relay output port is connected to a high-power DC inductive load, installation of a power diode (of the same rating) in parallel with the load is required to avoid damage of the relay contact circuit.
2. After the display unit is powered “on” and a PC has been connected to the display unit using a USB port cable, the Inclinator log information can be accessed. The USB connection port will only transmit data, this port will not power the display unit.

Section F: Sensor's Dimensions



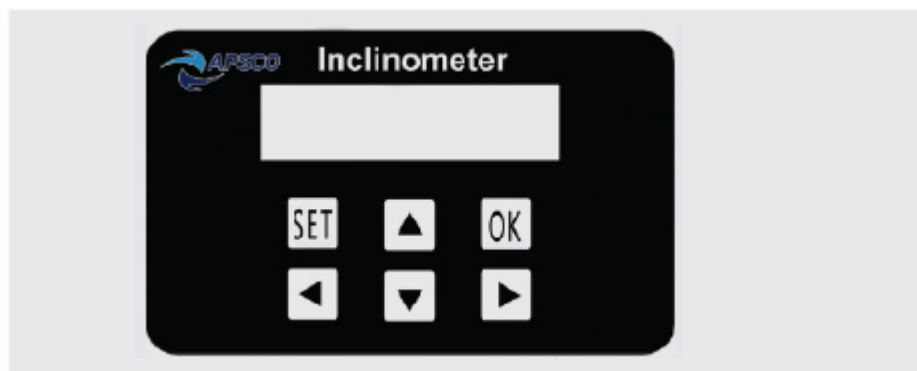
Units (mm)

Section G: Sensor's installation

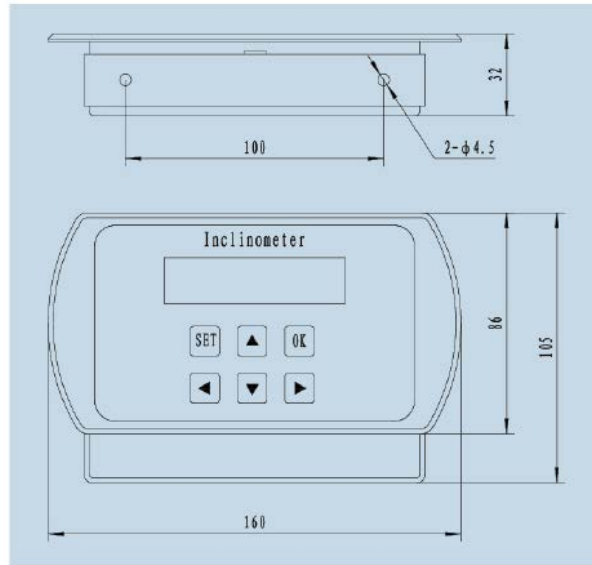


Mount sensor on Vertical axis as shown

Section H: Display Image

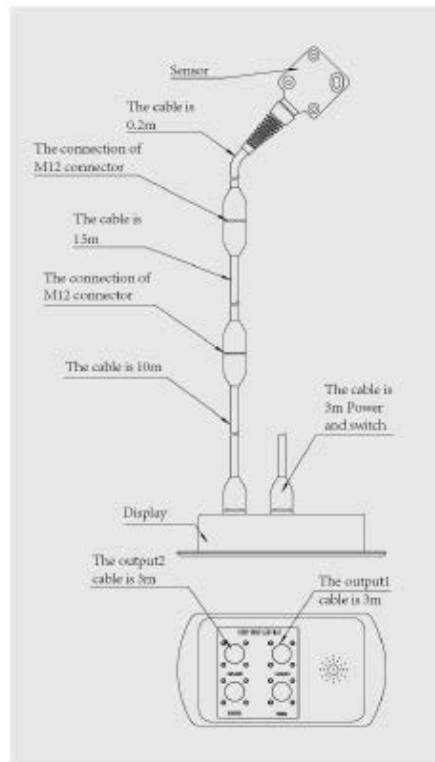


Section I: Display's Dimensions



Units (mm)

Section J: Connection diagram



Section K: Parts List

<i>Item #</i>	Description	Qty
AIS-DR2	Display with mounting bracket	1
AIS-SR2	Sensor with M12 connector	1
AIS-CB2R2	Sensor Port Cable (10 M) 4-pin male connector / M12 connector	1
AIS-CB5R2	Sensor Extension Cable (15 M) M12 connector / M12 connector	1
AIS-CB3R2	Output Port Cable (3 M) 4-pin female connector / cable	1
AIS-CB4R2	Hydraulic Port Input Cable (3 M) 2-pin female connector / wire	1
AIS-CB1R2	Power Port Cable (3 M) 2-pin male connector/wire	1

Optional Mounting Brackets & accessories

<i>Item #</i>	Description	Qty
Contact factory	AIS-R2 Display Mount – display to side of existing console	
Contact factory	AIS-R2 Sensor Mount – Truck frame	
Contact factory	AIS-R2 Sensor Mount – trailer 4” axle tube	
Contact factory	AIS-R2 Sensor Mount – trailer 5” axle tube	
Contact factory	AIS-R2 Sensor Cable Bulkhead Connector with mount	

Technical Specifications

	Parameter	Test/Condition	Min	Typ.	Max.	Unit	
Operation parameter	Power supply		8	24	36	V (DC)	
	No Load ⁽¹⁾ Current	No load VCC-24V		60	100	mA	
	Alarm Current	VCC=24V		150	200	mA	
	Alarm Angle	Relay action point	2.0	User defined	9.9	°	
	Relay contact capacity	24V(DC)/250V(AC) Normally Open (NO)				10	A
		24V(DC)/250V(AC) Normally Closed (NC)				5	A
	Work temp range	Display		-20		+70	C
Sensor			-40		+85	C	
Specification parameter	Measuring range	1-axis	-20		+20		
	Resolution			0.1		°	
	Accuracy ⁽²⁾	RMS			±0.2	°	
	Zero temp drift			±0.05	±0.08	°/C	
	Size	Display			160*105*32		mm
		Sensor			41*41*51		mm
	IP	Display			IP54		
Sensor				IP67			

Note 1: “No Load” refers to work current when power supply is DC24VOL and sensor’s angle is less than alarm angle.

Note 2: Accuracy refers to RMS value between actual angle and measuring angle (>16 times)

EMC (electromagnetic compatibility) measure and test

Circumstance phenomenon	Test Grade	Unit	Test Standard	Performance Grade
Static electricity (contact discharge)	±4 (charging voltage)	KV	GB T 17626.2	C
Static electricity (air discharge)	±4 (charging voltage)	KV	IEC 61000-4-2	
Fast transient pulses	±2 (charging voltage)	KV	GB T 17626.4	C
	5/50	Tr/Th ns	IEC 61000-4-4	
	5 (repeat frequency)	KHz		
Surge (line-earth) (line-line[positive and negative of power line]) ①	±2 (open voltage)	KV	GB T 17626.5	C
	1.2/50	Tr/Th us	IEC61000-4-5	

Product Registration

Product name	APSCO Inclinometer System
Product part number	AIS-R2
Serial number#	
Date Purchased	
Date Installed	
Company Name (Owner)	
Address Street City, State, Zip Country	
Phone	

Submit product registration to:

APSCO
PO Box 470948
Tulsa, Oklahoma USA 74145
Phone: 918-622-5600

e-mail Sales@APSCOPOWER.com