

# XWatch SS1

## Operation, Installation, and Setup Instructions



## Contact

Xwatch Safety Solutions Ltd,  
Avondale Way,  
Avondale Industrial Estate,  
Cwmbran,  
South Wales,  
NP44 1TS

01633 987344

## Document History

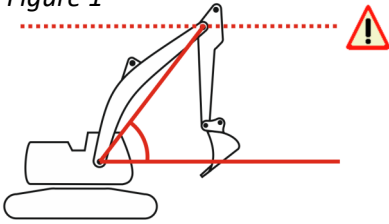
Version	Date	Change
V1.0	19-08-2019	Initial release
V1.1	18-10-2019	Change cover graphic. Change telemetry CAN ID
V1.2	02-01-2020	Correct controller wiring detail

## **Contents**

<b>Section</b>		<b>Page</b>
<b>1</b>	<b>Operation</b>	
1.1	<b>Important</b> Information	<b>4</b>
1.2	<b>ON</b> operation	<b>5</b>
1.2.1	Manual override	<b>5</b>
1.3	<b>OFF</b> operation	<b>5</b>
1.4	<b>SET</b> operation	<b>6</b>
1.5	Buzzer tones	<b>6</b>
<b>2</b>	<b>Installation</b>	
2.1	IO Controller	<b>7</b>
2.1.1	Mounting	<b>7</b>
2.1.2	Wiring	<b>9</b>
2.2	In cab controller	<b>10</b>
2.3	Angle sensor	<b>11</b>
2.4	Hydraulics	<b>12</b>
<b>3</b>	<b>Setup</b>	
3.1	Angle sensor	<b>13</b>
3.2	Approach angle	<b>13</b>
3.3	Speed reduction	<b>13</b>
<b>4</b>	<b>Telemetry</b>	
4.1	Output message	<b>14</b>

## 1.1 Important Information

Figure 1



**SS1** is an angle limiting device, it measures the angle of the first piece of the front end equipment. In this example, the boom (Figure 1). The system is effectively measuring the height of the arm pivot pin. **The system is unaware of, and has no control over, the rest of the articulations** (Figure 2).

Figure 2

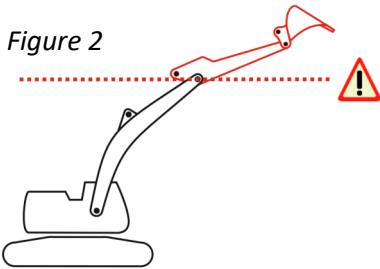
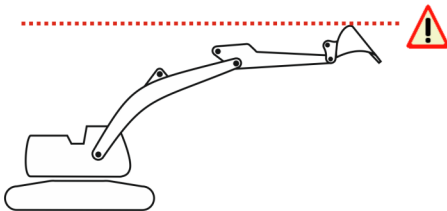
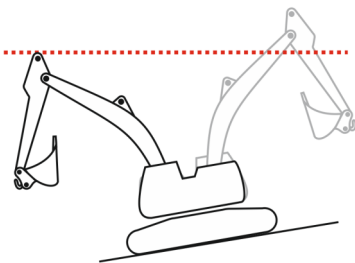


Figure 3



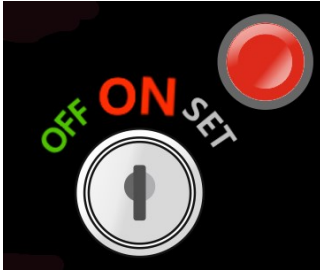
If control of the remaining articulations is required, make sure they are in their **least favourable** position when setting a height limit (Figure 3).

Figure 4



When working on slopes, take into account that slewing the machine may take the equipment beyond a height limit (Figure 4).

## 1.2 ON operation



When the key switch in the **ON** position, **SS1** will stop the first machine articulation when an angular limit is reached. A system that has a proportional motion control valve will slow the articulation down when the angle is beyond a pre-defined approach value.

A system equipped with a 'black and white' valve or electric motion control will come to an abrupt halt when the limit is reached.

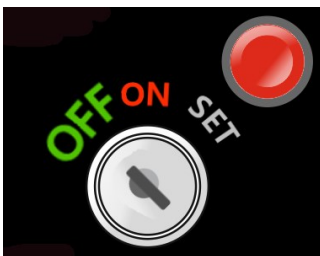
When moving at speed, **SS1** will automatically reduce the current height limit. This makes sure that the machine does not overshoot the limit. If moving very quickly and close to the height limit, the machine might stop short.

When at a limit, the internal buzzer will pulse at 1Hz.

For a handy anti-theft device, set the height limit with the equipment on the ground and remove the key in the **ON** position.

**1.2.1** If the **SS1** system has been specified with the optional manual override key switch, this switch can be used to permanently energise the motion control valve in the event of a system failure.

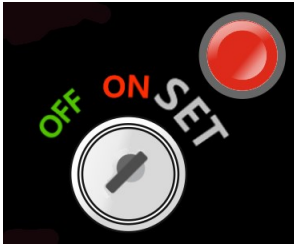
## 1.3 OFF operation



When the key switch in the **OFF** position, **SS1** will do nothing. As the motion control hydraulics/electric controller are plumbed/wired fail safe, **SS1** still needs to be active to hold the valve in the fully open position to allow free movement.

Unless a fault condition occurs, the internal buzzer will not sound.

## 1.4 SET operation



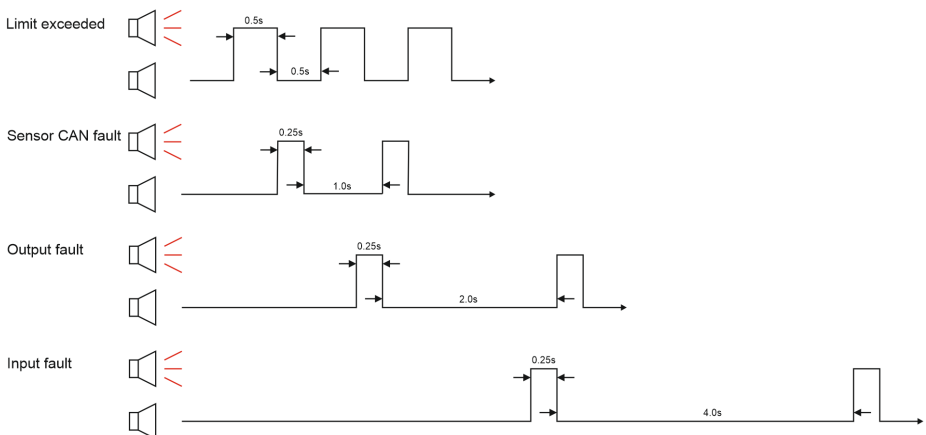
When the key switch in the **SET** position, a new angular limit can be set. In the set position, any motion limit will be cancelled, the machine is free to move. Position the equipment at the new limit (bearing in mind the conditions outlined on page 4) and press the red push button. The buzzer will sound to confirm the action. Return the key switch to the **ON** position and verify correct operation.

The limit value is stored in internal memory and will remain regardless of power status until a new value is set.

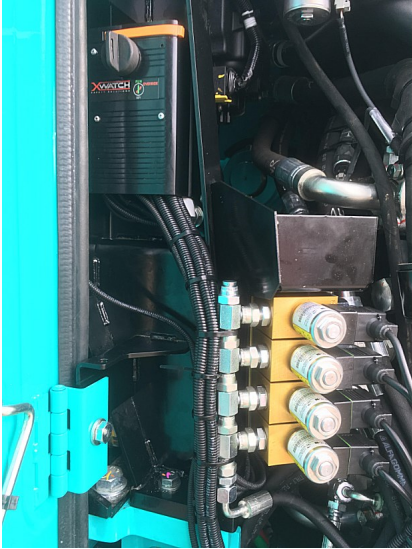
## 1.5 Buzzer tones

The internal buzzer will only sound if a limit is reached or a system fault is detected. A *Sensor CAN fault* is a failure of the equipment angle sensor or cabling. A *Output fault* is a failure of the electronics that operate the hydraulic control. An *Input fault* is a failure of the electronics that read the key switch, push button, and configuration links.

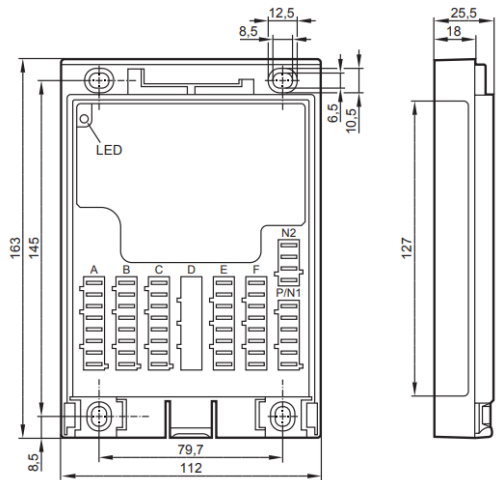
There are no user serviceable components in the **SS1** system. If a fault occurs, service should be sought. Contact details are given on page 2.



## 2.1 IO Controller

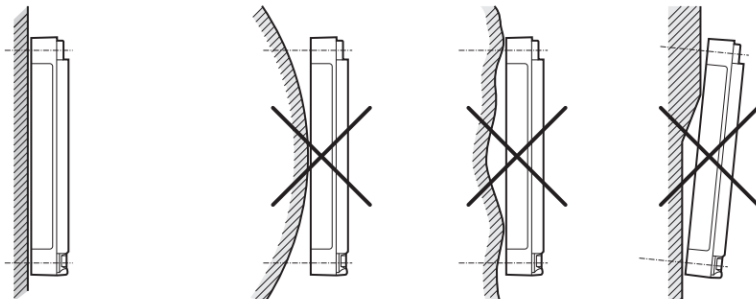


The IO Controller can be mounted in any convenient location where it will be kept dry and away from potential physical damage. Ensure that the location provides reasonable access for cable routing and wiring up.

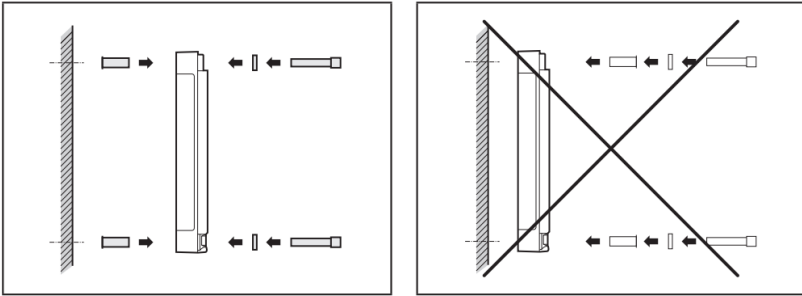


### 2.1.1 Mounting

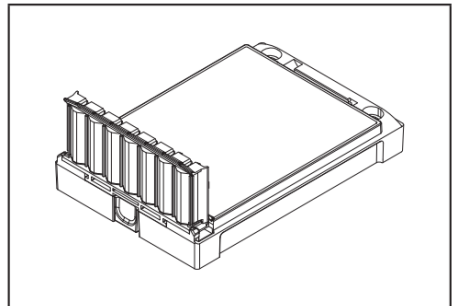
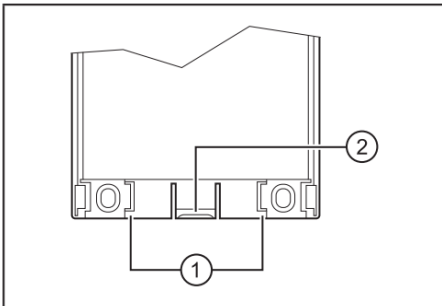
Ensure that the IO Controller is mounted on a flat surface. It is important that the unit is not distorted or put under any undue stress. If a flat surface is not available, use suitable stand-offs to enable correct attachment.



The IO Controller is supplied with steel mounting sleeves. Use M4 fasteners and washers to attach the unit as shown below.



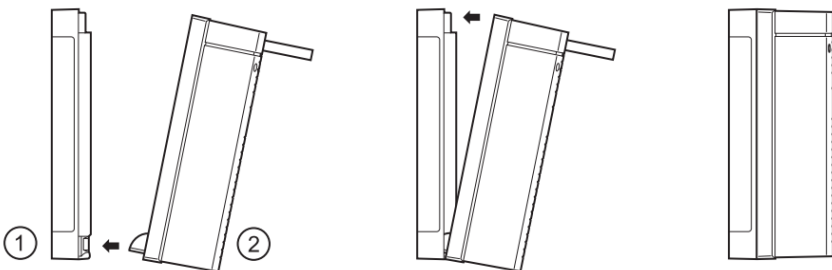
Fit the cable seal as shown below. When installed, this must be facing downwards. The seal provides no strain relief, so make sure none of the cabling is under any undue stress.



1. Locator for cable seal
2. Locking

Mounted cable seal

The inner face of the cable seal provides variously sized apertures for cable entry. Make sure a suitable entry point is used based on cable diameter. For cover attachment, see below.

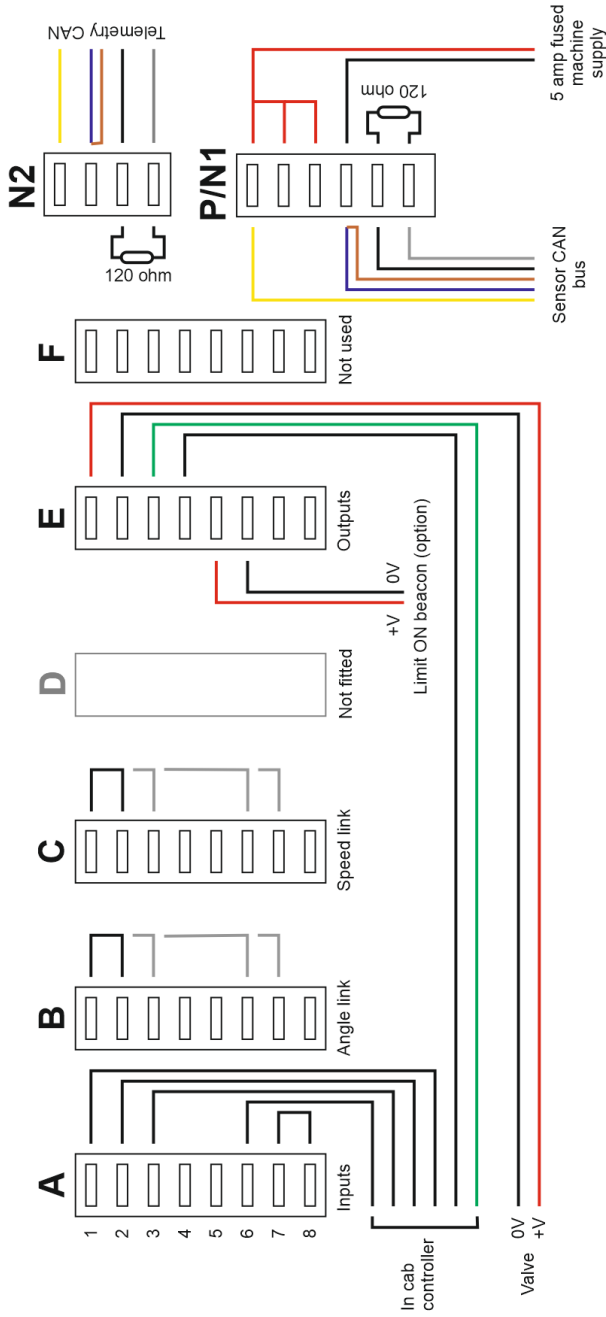




**Be aware** that there are **three** different sizes of crimps supplied to accommodate different sizes and numbers of wires.



**Make sure all CAN bus cables have 5 cores**



If the IO Controller has an **Override key switch** fitted, the +V valve signal must pass through the override PCB. The wire to the valve must be connected to position 1 on the **top** row of the spring connector, the bottom row is connected to **E1**.

## 2.2 In cab controller

The in cab controller should be mounted in clear view and within arms reach of the operator. The unit must not obscure any of the instruments, and must not foul any of the machine controls. Make sure that the front window can still be opened.

The unit can either be attached with fasteners or stuck in a suitable position.

Ensure that the cable is sensibly routed and secured.

### **Connections**

Wire            CR0401

**Green            A6**

**Orange          A2**

**White            A1**

**Blue             A3**

**Red              E3**

**Black            E4**

## 2.3 Angle sensor

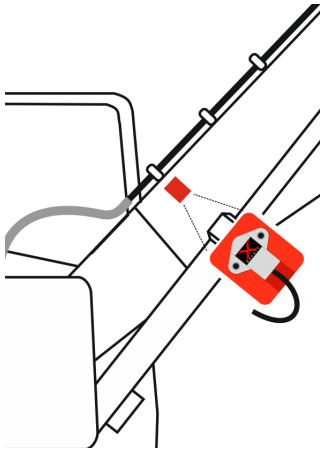


The angle sensor is connected with a single cable from the IO Controller. The sensor can be mounted in any convenient location on the equipment. This should be a position that offers a degree of protection from physical damage, and allows for discrete cable routing.

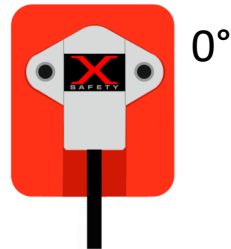
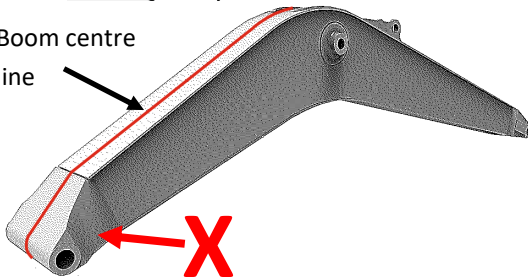
Once a location is decided, thoroughly clean/de-grease the area and attach the red mounting base with Gorilla tape or a suitable contact adhesive. The sensor is attached to the base with 2 M4 x 16 socket

head screws. The diagram below shows a typical installation.

**The sensor **MUST** be mounted on the right hand side of the boom (as viewed from the cab).**



Boom centre  
line

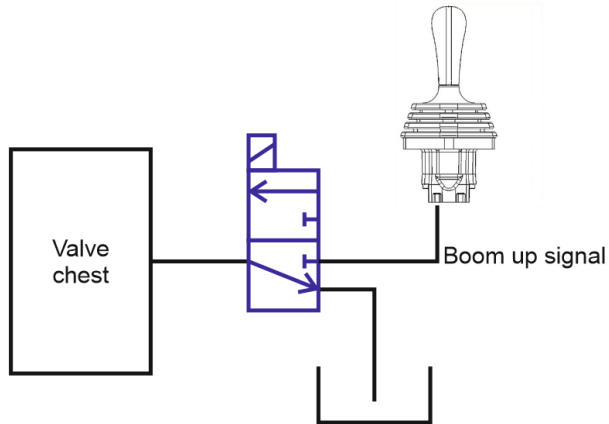


The diagram above shows the sensor zero degree orientation.

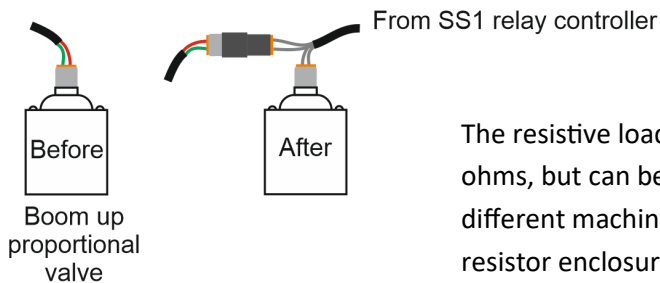
**NOTE:** The sensor mounting position must be parallel to the boom centre line. The base of the boom is normally at an angle to the boom centre line—the sensor must not be mounted here.

## 2.4 Hydraulics

Due to the huge variety of hydraulic systems in use, a detailed explanation of motion control valve installation is beyond the scope of this document. For proportional and 'black and white' valves a generic diagram is given below.



For machines with electrical control systems, the SS1 relay controller is required. This unit provides two functions, it fully closes the valve while simultaneously applying a resistive load to the electrical circuit to prevent the machine control ECU from flagging errors. Connect the SS1 Y cable in series with the original connector as shown below.



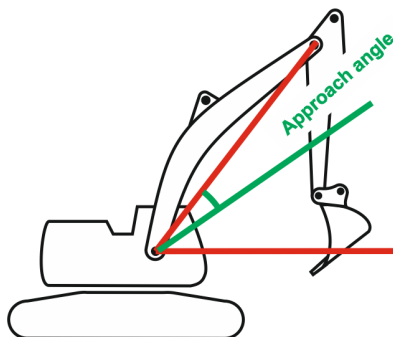
The resistive load is pre-set to 12 ohms, but can be adjusted to suit different machines by removing the resistor enclosure lid and moving the wiper on the variable resistor inside.

### 3.1 Angle sensor

The angle sensor requires no setup.

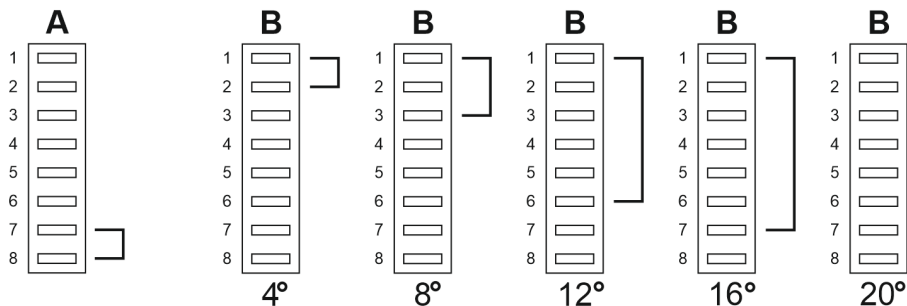
**Note:** If the angle sensor really must be on the left hand side, contact XWatch for a reconfigured sensor.

### 3.2 Approach angle



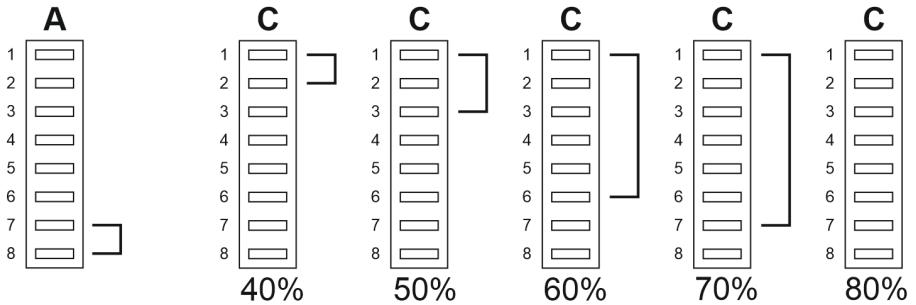
The approach angle is **only** available when a proportional motion control valve is fitted. The approach angle is an angular distance from the limit angle, and is where the motion will be slowed down.

To enable this feature, link pins 7 and 8 on connector **A** on the IO Controller. The available approach angles are shown below.



### 3.3 Speed reduction

The motion speed reduction is only active if a proportional motion control valve is fitted. The diagram on the following page details the available settings. The settings are quoted as a percentage of full speed.



#### 4.1 Telemetry - Output message

For the purpose of telemetry, **SS1** transmits a single CAN message on the second CAN bus (N2) once per second. A description of the message follows.

ID				DLC	D0	D1	D2	D3	D4	D5	D6	D7
18H	FFH	A0H	00H	8	F	-	-	-	S	L	A	

#### F General flags

Bit	0	1
0	Boom moving	Boom not moving (idle)
1	Below height limit	At a height limit
2	Height limiting OFF	Height limiting ON
3	Key switch not in SET position	Key switch in SET position
4	Set button not pushed	Set button pushed
5	Not used	
6	Not used	
7	Not used	

**S** System status. Anything other than 0000H indicates a problem.

Bit	If value = 1
0	No CAN messages from the angle sensor
1	Valve output error
2	Alarm output error
3	Limit ON/OFF key switch input error
4	Set position key switch input error
5	Set button input error
6	Proportional valve link input error
7	Approach angle link 1 input error
8	Approach angle link 2 input error
9	Approach angle link 3 input error
10	Approach angle link 4 input error
11	Slow speed link 1 input error
12	Slow speed link 2 input error
13	Slow speed link 3 input error
14	Slow speed link 4 input error
15	Not used

### **L** Limit angle

Current limit angle. Signed 8 bit value. Range  $-127^{\circ}$  to  $+127^{\circ}$ . This value is present regardless of limit ON/OFF status

### **A** Boom angle

Current boom angle. Signed 8 bit value. Range  $-127^{\circ}$  to  $+127^{\circ}$ . Values out of range (unlikely) are capped at  $\pm 127^{\circ}$ .