



## Hawk Alarms and Sensor Error Codes

Hawks with version 4.57 or higher firmware have a sophisticated error detection system that can help both the operator and our technicians quickly fix faults. On each screen and via ModBus the error codes will show up indicating there is a problem. Below is a description of the Typical Alarm Screens and what they mean

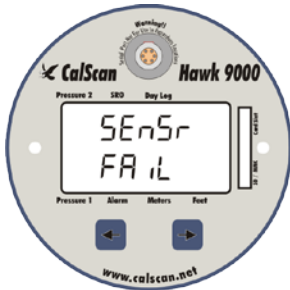
### Number of Alarms



When there is an alarm, this screen comes up indicating the number of alarm conditions currently active. The example to the left has 1 alarm active.

If a screen shows “0 Alarm” this indicates to the operator the Hawk was in Alarm condition but the alarm is not currently active anymore.

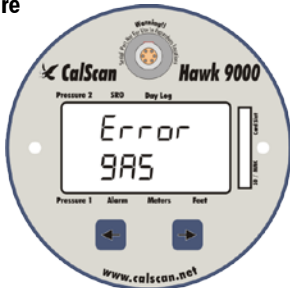
### Alarm Descriptions



Clicking the right arrow or the outside button will indicate what has failed. There are 5 possible alarms.

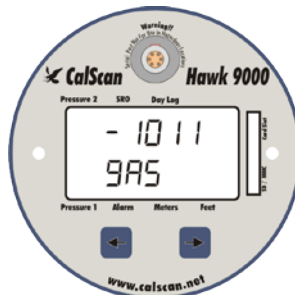
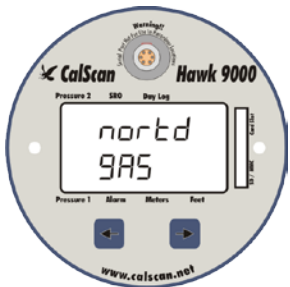
- 1) “**SEnSr FA iL**” *Sensor Failure* : One of the activated sensors is not working correctly. See Sensor Failure below to find out which sensor has failed.
- 2) “**dAtA FULL**” *Data Full*: On a Hawk 9000 this error indicates no more samples are being stored. A Hawk 9500 has circular sample storage and so cannot have this error.
- 3) “**Power FA iL**” *Power Fail*: Main Power from an external source has failed.
- 4) “**LoW bAt**” *Low Battery*: The internal battery is low.
- 5) “**StOrE FA iL**” *Store Failure*: The Flash is not writing the data correctly for some or all the data. Data should be downloaded and verified.

### Sensor Failure



A Sensor Failure Alarm indicates one or more sensors or calculated channels are in an error condition.

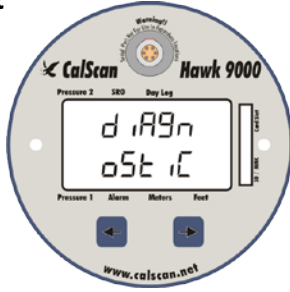
Each LCD screen that normally shows the sensor’s value will instead show an error message indicating the sensor has failed. This example shows that the RTD temperature probe is missing.



The LCD will alternate between saying “Error” and a short text description or a numeric error number starting from -1000 as shown to the left.

If the Hawks RTD shown to the right was polled via ModBus, it would return a value of -1011, to indicate the sensor is in an error condition.

## Diagnostic



“d iAGn oSt iC” The Diagnostic menu is used with a button combination to enter into diagnostic mode that can help diagnose problems with the Hawk. See the application note “Hawk 9000 Diagnostic Mode” for more information.

## Sensor Error Codes

Some error codes are shown as text, shown below, as opposed to the actual error number on the Hawk, see the Numeric Error Code for more information.

- “Sro rESEt” Error Code = -1016.0 Current detected no data for over a minute, cycle power to reset tool
- “t iE OUL” Error Code = -1013.0 No new data from the SRO tool has been received for at least one minute
- “OPEn” Error Code = -1012.0 One of the wires leading to the RTD is broken open
- “nortd” Error Code = -1011.0 The external RTD is missing.
- “noCAL” Error Code = -1009.0 Bad Polynomial Calibration File – CRC failure or file format bad
- “Sro bAtt” Error Code = -1008.0 The power to the SRO tool is missing or has been shut off due to low voltage to protect the battery from damage.
- “no inFo” Error Code = -1007.0 SRO tool has just started up no information yet
- “Sro in iL” Error Code = -1006.0 Downhole Tool has been detected, tool now Initialing or starting up
- “Sro Short” Error Code = -1005.0 There is a short condition connecting the E-lines center wire to the outside ground armor/braid. Sometime seen when downhole tool is flooded.
- “Sro OPEn” Error Code = -1004.0 The E-line cable wire is broken open. Sometime seen when downhole tool is flooded.

## Numeric Error Codes

Error	Title	Description
-1000	Standard NAN error	Mathematical Software Error or a dependent variable, such as a sensor value, is in an error state
-1001	Variable Not Initialized	RAM or Dataflash based float is being accessed before it is initialized
-1002	General Sensor Failure	Sensor has failed. Normally seen on a downhole quartz tool, this code indicates a math error usually caused by either the temperature or pressure oscillator on the quartz pressure stopping.

-1003	SRO Unknown Error	A non normal error has occurred.
-1004	SRO Open <i>Sro OPEn</i>	The electric line cable leading to the downhole tool is broken open. The downhole tool is not drawing any power.  Solutions & Causes:
-1005	SRO Short <i>Sro Short</i>	There is a short condition connecting the E-lines center wire to the outside ground armor/braid. Sometime seen when downhole tool is flooded  Solutions: 1) The tools downhole e-line connection has been flooded causing a short 2) The e-line cable is damaged causing a short 3) Surface connection is damaged causing a short. This can be tested by disconnection the e-line on surface to see if the short condition has gone.
-1006	SRO Initialize <i>Sro Init</i>	Downhole tool activity has been detected, tool is starting up
-1007	SRO No Information <i>Sro Info</i>	SRO tool has just started up no information yet
-1008	SRO Low Battery <i>no batt</i>	The power to the SRO tool is missing or has been turned off to protect the battery from damage due to low voltage
-1009	Calibration File Bad	Polynomial Calibration File –File format bad, possible missing sensor or damaged memory chip
-1010	Curve Fit Out of Bounds	Result is reading way outside its calibrated range, such as a temperature sensor reading -200 °C
-1011	External RTD Missing <i>no rtd</i>	The external RTD is missing or damaged  Solutions: 1) See if the RTD is installed, if not install it. 2) Try a different cable as it might be damaged 3) Send in Hawk for service
-1012	RTD Open <i>OPEn</i>	One of the wires leading to the RTD is broken open  Solutions: 1) Try a different cable 2) Send in Hawk for service
-1013	SRO Time Out <i>Time Out</i>	No new data from the SRO tool has been received for at least one minute
-1014	Quartz No Acknowledge	Quartz sensor cannot communicate to the Hawk Solutions: Either the sensor is not plugged, the cable is bad in or bad reply
-1015	Quartz I2C Serial Number Match Error	The Quartz Sensor calibration file does not match the one loaded in the Hawk. Either the wrong sensor or calibration file has been used.

-1016	SRO Reset Sro rE5Et	Current detected no data for over a minute, cycle power to reset tool
-1017	Calibration File corrupt	Calibration Polynomial has a bad CRC Solution: Reprogram the Hawk as it will reinsert the calibration, if its still in error send it in for service as the Dataflash might be damaged
-1018	Feature Not Enabled	Software feature is being used that has not been enabled or installed
-1019	RPN Global Undefined	Hawk Global float being accessed does not exist
-1020	RPN Channel Undefined	RPN channel being accessed does not exist
<b>Gas Measurement Errors: -1257 to -1512</b>		
-1257	Static Pressure Error	Sensor supplying the static pressure is in an error state. Solution: Check the pressure sensors error code to see why
-1258	Meter Temperature Error	Flowing Meter temperature probe is in an error condition. Solution: Check the Meter Temperature sensors error code to see why the temperature probe is in error
-1259	Differential Pressure Error	Differential pressure sensor in error Solution: Check the differential pressure sensors error code to see why the sensor is in error
-1260	Gas Turbine Communication Failure	The Hawk was unable to communicate to the Turbine CPU
-1261	Gas Turbine High Count	Too many turbine pulses were detected in the last sample
-1262	Gas Turbine Low Count	Too few turbine pulses were detected in the last sample
-1263	Gas Turbine Curve Fit Error	Result is reading way outside its calibrated range and cannot possibly be correct. Solution: Most likely the calibration file has been incorrectly entered, verify it is correct
-1264	Gas Turbine Curve Fit Bad or Erased	The curve fit on the Hawk has not been programmed or not in the right format Solution: Reprogram the calibrations for the Hawk
-1265	Gas Turbine Curve Fit Bad CRC	The calibration file is corrupt. Solution:

		Verify a copy on a computer or recreate the calibration file from scratch and reinsert it into the Hawk
-1266	Gas Sensor Communication Fail	The Hawk cannot communicate to the Gas Sensor Solution: Try unplugging the battery, wait 5 seconds, and plug it back in. If it still fails send it in for service as most likely there is a hardware fault
-1267	Gas Sensor Raw Too High	The raw data is too high and is out of range
-1268	Gas Sensor Raw Too Low	The raw data is too low and is out of range
-1269	Gas Sensor Curve Fit Error	Result is reading way outside its calibrated range and cannot possibly be correct. Solution: Most likely the calibration file has been incorrectly made, verify it is correct, or the sensor is damaged and needs service
-1270	Gas Sensor Curve Fit Bad or Erased	The curve fit on the Hawk has not been programmed or not in the right format Solution: Reinsert the calibrations into the Hawk
-1271	Gas Sensor Curve Fit Bad CRC	The calibration file is corrupt. Solution: Reinsert the calibrations into the Hawk

### AGA 8 Equation of State Calculation Errors

-1320	Gas_AGA8_Error0	There has been a Equation of State gas calculation error Solution: Confirm gas mole breakdown
-------	-----------------	--

### WARK Equation of State Calculation Errors

-1352	Gas_WARK_Error0	There has been a Equation of State gas calculation error Solution: Confirm gas mole breakdown
-------	-----------------	--

### AGA 3 Orifice Calculation Errors

-1369	Timeout	Timeout, calculation took too long as was canceled
-1370	Beta Ratio Error	Orifice Beta ratio > 0.05 and < 0.75
-1371	Reynolds Number Out of Range	The flowing gas is too fast for the size of the meter run and orifice plate. Solution: Use a bigger a larger orifice plate and if beta ratio is to large you will need to increase the meter size too
-1372	Isentropic Exponent	If Isentropic Exponent must be < 0.1 or > 2000 then error

-1373	Fluid Dynamic Viscosity Error	Viscosity must be > 0 centipoise ( 0 Pas ) and < 10000 centipoise ( 10 Pas )
-1374	Fluid density	Density must be > 0.000001 kg/m <sup>3</sup> and < 10000 kg/m <sup>3</sup>
-1375	Orifice Plate Linear Coefficient of Thermal Expansion Error	If < 0 m/m-K or > 0.01 m/m-K then error
-1376	Orifice Plate Bore Temperature Error	If temperature at which orifice plate bore diameter was measured < -50°C or > 100°C
-1377	Orifice Bore Diameter Out of Range	Orifice must be > 1.5mm ( 0.059 inch) and < 0.75 x meter tube diameter
-1378	Meter Tube Linear Coefficient of Thermal Expansion Error	If < 0 m/m-K or > 0.01 m/m-K then error
-1379	Meter Temperature Internal Diameter Error	If temperature at which meter tube internal diameter was measured < -50°C or > 100°C
-1380	Meter Tube Internal Diameter Out of Range	If < 24mm (0.945 inches) or > 1000mm ( 39.37 inches ) then error
-1382	Differential Pressure Error	If the differential pressure > 0.3 x Upstream Static Pressure then there is a AGA3 error. This usually only occurs when the static pressure is low.  Solution: Use a bigger a larger orifice plate to reduce the differential pressure
-1383	Meter Temperature Error	If < -273.15 °C or > 9726.85 °C then error
-1384	Static Pressure Out of Range	If < 0.000001 kPaa ( 1.45E-7 psia ) or > 1.00E6 kPaa ( 145037 psia ) then error

### ISO5167 Orifice Calculation Errors

-1403	Reynolds Number Out of Range	The flowing gas is too fast for the size of the differential device  Solution: Use a bigger differential device (such as a orifice plate) to slow the velocity of the gas down
-1404	Beta Ratio Error	The Beta Ratio is the Orifice Bore Diameter / Meter Diameter. This value is out of range and the range depends on what kind of flow sensor is being used adjust your orifice or equivalent plate size.
-1406	Differential Device Fault	if Hawk was programmed for a differential that ISO5167 doesn't support then error
-1408	Mass Flow Rate Error	if the mass flow rate is 0.001 < kg/h or >=1E+9 kg/hour then error
-1409	Meter Tube Internal Diameter Out of Range	The meter tube is too large/small for the differential device chosen
-1410	Orifice Bore Diameter Out of Range	The orifice size is too large/small for the differential device chosen
-1411	Isentropic Exponent Error	If Isentropic Exponent must be < 0.1 or > 2000 then error
-1412	Fluid Dynamic Viscosity Error	Viscosity must be > 0 centipoise ( 0 Pas ) and < 10000 centipoise ( 10 Pas )
-1413	Fluid Density Out of Range	(0.0 >= d[kg/m <sup>3</sup> ] >= 10000), otherwise =0.

-1414	Differential Pressure Error	If < 0.00025 or > 0.25 x Upstream Static Pressure then error
-1415	Meter Temperature Error	If < -273.15 °C or > 9726.85 °C then error
-1416	Static Pressure Out of Range	If < 0.000001 kPaa ( 1.45E-7 psia ) or > 1.00E6 kPaa ( 145037 psia) then error
<b>Sensor Fault: -1513 to - 1768</b>		
-1513	SCADA Bus Fault	SCADA system has detected a hardware bus fault with the RS485 communication to the Hawk
-1514	SCADA Timeout	SCADA system has tried to communicate with the Hawk but there was no response within the allotted time
-1515	SCADA Bad CRC	SCADA system communicated with the Hawk but the reply was corrupted
-1516	Main Bus Communication Bus Fault	Main CPU has detected a bus fault to a daughter CPU Solution: Send tool in for service if this is not just a glitch
-1517	Main Bus Communication Timeout	Main CPU has tried to communicate with a daughter card but got no response in the allocated time
-1518	Main Bus Communication Bad CRC	Hawk main CPU communicated with daughter CPU's but the reply was corrupted. This can be caused by improper seating of the cards, moisture/corrosion on the PCB boards  Solutions: 1) Open the case and inspect for loose or damaged cards. If the cards are loose squeeze them so they are better seated. 2) Send the probe and Hawk in for service if nothing can be found or if moisture corrosion damage has occurred.
-1519	Remote Sensor Communication Bus Fault	The hawk has detected a cable issue such as a short or open  Solution: 3) Try replacing the cable. 4) Send the probe and Hawk in for service
-1520	Remote Sensor Communication Timeout	A Hawk was communicating with Remote sensor but there was no response within the allotted time  Solution: 5) Try unplugging the cable, wait 5 seconds, and plug it back in. 6) It could be a bad communication cable try a different one or the cable it near a source of electrically noise such as a electric motor 7) If it still fails send it in for service as most likely there is a hardware fault with either the Hawk or the Remote Sensor
-1521	Remote Sensor Communication Bad CRC	A Hawk was communicating with Remote sensor but the reply was corrupted  Solution: 1) It could be a bad communication cable try a different one or the cable it near a source of electrically noise such as a electric motor 2) Try unplugging the battery, wait 5 seconds, and plug it back in. 3) If it still fails send it in for service as most likely there is a hardware fault

-1568	Sensor Not Started	Sensor was not started and yet a request for data was still asked for
-1569	Sensor Float Low	Smart sensor that calculates its own value is way out of range to low
-1570	Sensor Float High	Smart sensor that calculates its own value is way out of range to high
-1571	Sensor No New Samples	Sensor has been setup to sample but a new sample is not ready
-1572	Sensor Initializing	Sensor has been told to startup/sample but hasn't finished initializing yet
-1573	Sensor Not Initialized	Tool has just been powered up/reset and hasn't started up yet
-1574	Sensor Timed Out	Sensor failed to reply that it was ready with new data within its allotted time
-1575	Sensor Not Installed	Tool is asking for a sensor that does not exist
-1576	Sensor Failure	When the failure mode cannot be encoded in a Sensor Fault Failure, or other specific failure
<b>Sensor Fault Codes -1705 to -1768</b>		
Error Codes -1705 to -1769	The codes are low level sensor errors indicating a major hardware malfunction. Return the equipment to Calscan for services	