

## **FuelCell Addendum – Alarm Definitions**

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### **Alarm Configuration**

Alarm actions for each auxiliary digital alarms signals are configured in the [Alarm] section of the FuelCell.ini configuration file.

```
[Alarms]  
Text5=Anode Humidifier Low  
Mode5=7  
Text6=Cathode Humidifier Low  
Mode6=7  
Text7=Aux Alarm 3  
Mode7=0
```

### **Mode Definitions**

Mode0: EStop  
Mode1: Purge Gas lost  
Mode2: Cathode Gas lost  
Mode3: Anode Gas Lost  
Mode4: Load Temperature High  
Mode5: Aux #1  
Mode6: Aux #2  
Mode7: Aux #3

### **Action Definitions**

0=nothing, alarm signal disabled  
1=load removed  
2=load,gas,pressure removed  
3=load reduced  
4=load,gas,pressure,temp removed  
5=load,temp removed  
6=notify only  
7=humidifier dry shutdown  
8=Anode Humidifier Alarm, Reduce Temperature of Humidifier  
9=Cathode Humidifier Alarm, Reduce Temperature of Humidifier  
10=Standby Mode

### **Alarm Actions**

When an alarm occurs one or more of the following actions are possible:

**Load Removed:** Same action as Stop Load button.

**Load Reduced:** The current is reduced or the voltage is increased until the alarm condition is corrected.

**Gasses Removed:** Same action as Stop Fuel button.

**Temperature Removed:** All temperature controllers are set to the temperature defined in Instrument Configuration screen.

**Pressure Removed:** Backpressure regulators are set to 0.

**Alarm Notification:** This message is displayed if no actions occur because of the alarm.

## Digital Alarms

The following Digital Alarms may occur:

### **Emergency Stop Switch is Off**

Default Action: Load Removed, Gasses Removed, Temperature Removed, Pressured Removed

Inert Gas Pressure Lost

Location: Pin x

Default Action: Load Removed, Gasses Removed, Temperature Removed, Pressured Removed

Cathode Gas Pressure Lost, Cell Gasses Purged

Location: Pin x

Default Action: Load Removed, Gasses Removed, Temperature Removed, Pressured Removed

Anode Gas Pressure Lost, Cell Gasses Purged

Location: Pin x

Default Action: Load Removed, Gasses Removed, Temperature Removed, Pressured Removed

Load Temperature Exceeded Limits, Load Removed

Location: Pin x

Default Action: Load Reduced. Note: This alarm may occur many times before the alarm condition is corrected.

Aux1 Alarm

Location: Pin x

The action is defined in the Instrument Configuration screen

Aux2 Alarm

Location: Pin x

The action is defined in the Instrument Configuration screen

Aux1 Alarm

Location: Pin x

The action is defined in the Instrument Configuration screen

## Measured Value Alarms

The following alarms occur when a measured value exceeds specified limits:

### Cell Potential Under Limits

The Cell Potential is below the Minimum E setting in the Setup Cell screen.

Action: Reduce current by 10 %

This alarm may occur many times until the alarm condition is corrected

### Cell Potential Under Shut Down Limits

The Cell Potential is below the Shut Down E setting in the Setup Cell screen.

Action: Load Removed

### Cell Current Over Limits

The Cell Current is larger than the Maximum I setting in the Setup Cell screen

Action: The potential is increased by 20 mV

This alarm may occur many times until the alarm condition is corrected

### Cell Current Over Shut Down Limits

The Cell Current is larger than the rated maximum current for the unit.

Action: Load Removed

### Cell Power Over Limits

The Cell Power is larger than the Maximum Power setting in the Setup Cell screen

Action: The current is reduced by 10% or the potential is increased by 20 mV (depending on the control mode in operation).

This alarm may occur many times until the alarm condition is corrected

### Cell Power Over Shut Down Limits

The Cell Power is larger than the rated maximum power for the unit.

Action: Load Removed

### Back Pressure Differential exceeded Maximum Limit

The difference between anode and cathode pressure is larger than the Limit in the Setup Pressure screen.

Action: Remove Backpressure

### Cell Temperature Over Limits

The Cell Temperature is larger than the Maximum Temperature setting in the Setup Cell screen

Action: Load Removed, Gasses Removed, Temperature Removed, Pressured Removed

### Aux Temperature Over Limits

The Aux Temperature is larger than the Maximum Temperature setting in the Setup Cell screen

Action: Load Removed, Gasses Removed, Temperature Removed, Pressured Removed

**Anode Temperature Over Limits**

The Anode Humidifier Temperature is larger than the Maximum Temperature setting in the Setup Fuel screen

Action: Load Removed, Gasses Removed, Temperature Removed, Pressured Removed

**Cathode Temperature Over Limits**

The Cathode Humidifier Temperature is larger than the Maximum Temperature setting in the Setup Fuel screen

Action: Load Removed, Gasses Removed, Temperature Removed, Pressured Removed

**Gpib Communications Error**

A communications error has occurred.

The 890C will automatically shut down and create this message if it has not been accessed by the PC for 10 seconds.

Action: Load Removed, Gasses Removed, Temperature Removed, Pressured Removed

**FRA Communications Failure, Impedance measurements will be skipped**

The FRA does not respond.

Action: The impedance measurement is skipped. Measurement continues with the next experiment.

**Invalid Fuel Flow: Requested flow > flow controller size**

The requested Fuel Flow cannot be satisfied. The flow is larger than the controller size, or the reformat mixture cannot be created.

Action: Alarm Notification only. The alarm will continue to occur until valid fuel values are entered.

**Desired current/voltage cannot be applied, the total current is being limited by lead resistance**

The electronic load is at its minimum load resistance condition, but the desired current/voltage cannot be achieved.

Action: Alarm Notification only. The alarm will continue to occur until a controllable condition (current/voltage) is selected. The user should replace the cell cables with a larger gauge.

## **Alarm Log File**

Starting in FuelCell version 3.5, all alarms will be saved to a text file.

All alarm messages displayed by the FuelCell program will also be copied to the file:

*C:\FuelCell\FuelCell Alarm Log.txt*

The Alarm Log file is never cleared. The file may be deleted by the user and a new file will be created when the next alarm occurs.

## **SAI890OLE Alarms**

Communications errors will cause the instrument to remove load, remove fuel, remove temperature, remove pressure. The program will wait 5 seconds and attempt to resume communications.

Most error messages are accompanied by additional error information. Typically the gpib address of the instrument is listed or the text of the string that was being sent or received at the time of the error is given.

### **Output Retry Error** – “text of gpib command”

The Serial Poll Response of the 890C does contain the ready for new command bit (bit 1) after 1 second of waiting.

### **Output Error** – “text of gpib command”

The gpib write command failed

### **Input Integer Error** – “gpib error number”

The gpib read of an integer value failed

### **Input Error** – “text of input message”

### **Input Binary Error** – “number of characters received”

The gpib read from the instrument failed

### **TMPExt Get Error**

### **TMPExt Get1 Error**

### **TMPExt Get2 Error**

### **TMPExt Get Error – Bad Format**

### **TMPExt Get Error – Bad Comm**

### **TMPExtSC Get1 Error**

Reading the temperature from an external temperature controller failed

Note: This error is non-fatal. It will not cause an alarm in the main fuelcell program and will not cause the SAI890OLE to attempt a restart of the system.

### **TMPExt Set Error**

Setting the temperature to an external temperature controller failed

### **TMPAutoMode Set Error**

Changing an external control between auto and manual mode failed

### **TMPManual Set Error**

Setting an external controller manual value failed

### **TMPInt Input Error**

### **TMPInt Get1 Error**

**TMPInt Get2 Error**

**TMPInt Get Error – Bad Format**

**TMPInt Get Error – Bad Comm**

Reading the temperature from an internal controller failed

**TMPIntGetDecimal1 Error**

**TMPIntGetDecimal2 Error**

Reading the decimal setting (1 degree or 0.1 degree) of an internal temperature controller failed

**TMPInt Set Error**

Setting the temperature to an internal temperature controller failed

**892Ext Get1 Error**

**892Ext Get2 Error**

**892Ext Get3 Error**

**892Ext Get4 Error**

**892ExtSC Get1 Error**

Reading an 892 auxiliary input module failed.

Note: This error is non-fatal. It will not cause an alarm in the main fuelcell program and will not cause the SAI890OLE to attempt a restart of the system.

**892Ext SetGain1 Error**

**892Ext SetGain2 Error**

**892Ext SetGain3 Error**

**892Ext SetGain4 Error**

**892Ext SetGain Error – Bad Comm**

**892Ext SetGain Error – Bad Format**

Failure when attempting to reset the gain range of an 892 module.

**Input STATUS Error**

The Status command returned fewer than 11 characters

**Input READB Error**

The READB command returned 0 characters

**Input SCALEI Error**

**Input SCALEWE Error**

**Input SCALEHE Error**

Failure when trying to read the scaling factors from the instrument during startup.

**ReformA Input Error**

**ReformC Input Error**

Error when reading firmware version of an external 891 during startup.

**ReformA Output Error**



**ReformC Output Error**

The gpib write to the external 891 failed

**Serial Poll Error**

Reading the serial poll value of the instrument failed (890, 890B only)

**No Data after 20 retries**

The Serial Poll Response of the 890/890B does not contain the ready for new command bit (bit 128) after 1 second of waiting.

**Input AMI Error**

The “measure cell voltage and current” command failed (890, 890B only)