

FuelCell Addendum – Alarm Definitions

D. Johnson
Scribner Associates, Inc.
3/25/2021

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

Cell Current < PSTAT Min I

Cell Current > PSTAT Max I

Cell Potential < PSTAT Min E

Cell Potential > PSTAT Max E

When using the 885 PSTAT, the current or voltage exceeded the selected limits

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 Exceeds Limits

The Cell Temperature is larger than the Maximum Temperature setting in the Setup Cell screen, or lower than the Minimum Temperature Limit.

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

Aux Temperature Exceeds Limits

The Aux Temperature is larger than the Maximum Temperature setting in the Setup Cell screen, or lower than the Minimum Temperature Limit.

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

Anode Temperature Exceeds Limits

The Anode Humidifier Temperature is larger than the Maximum Temperature setting in the Setup Fuel screen, or lower than the Minimum Temperature Limit.

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, or lower than the Minimum Temperature Limit.

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

Temperature Rise Slower Than Watchdog Limit

The cell temperature change is very slow, indicating a bad thermocouple placement

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.

Option 892 Aux# exceeds limits

A channel from the 892 Aux inputs exceeds its Maximum or Minimum limits

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

FRA input overload, Impedance value will not be accurate

The signal received by the FRA exceeds its input limits.

Action: None. Data may be lower quality

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 reformate 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 retrys

The Serial Poll Response of the 890/890B does 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)

EnterMX**LeaveMX****EnterCX****LeaveCX**

Thread lock timeout. Displayed if an OLE thread is not able to process for >5 seconds.