# Afterburner JSON data encapsulation

### JSON data exchange

Information about the heater’s operation and configuration of the Afterburner can be exchanged by using a simple JSON formatted string.  
This exchange can take place over any of the following communication links:

* websocket *(port 81,* *for live HTML web page updates)*
* Bluetooth SPP *(Serial Port Protocol)*
* MQTT

The formatting employed is always a basic single level encapsulation, each name value pair (NVP) being delimited by commas. Eg: *(spaces optional)*  
**{“Name1”:*Value1*, ”Name2”:*Value2*, ”Name3”:*Value3* …… , ”NameX”:*ValueX*}**

Names must always be within quotes.  
Values may by numeric or string values (within quotes), dependent upon the Name being used. Eg:  
**{“TempDesired”:22}   
{“IP\_AP”:”192.168.4.1”}**

Note that moderation is employed so only changes to any specific Name’s value will be supplied.  
If a Value remains static, that NVP is not sent.  
If desired, a complete update of all NVPs can be requested by sending **{“Refresh”:1}**

### GPIO Port status & control

|  |  |  |
| --- | --- | --- |
| Name | Purpose |  |
| GPin1 | Current state of digital input #1 Simulate momentary closure of input #1 | 0: open, 1:closed 0: do nothing: 1 simulate closure |
| GPin2 | Current state of digital input #2 Simulate momentary closure of input #2 | 0: open, 1:closed 0: do nothing: 1 simulate closure |
| GPout1 | Current state of digital output #1 Change state of digital output #1 | 0: off, 1:on 0: off, 1:on |
| GPout2 | Current state of digital output #2 Change state of digital output #2 | 0: off, 1:on 0: off, 1:on |
| GPanlg | Current input to the analogue input in % | 0 – 100% |
| GPmodeIn1 | How system reacts to a closure on digital input #1 | "Disabled",  "Mom On",  "Hold On",  "Mom On/Off",  "Mom Off" |
| GPmodeIn2 | How system reacts to a closure on digital input #2 | "Disabled",  "Mom Off",  "Ext Thermo" |
| GPmodeOut1 | How digital output #1 is controlled | "Disabled",  "Status",  "User" |
| GPmodeOut2 | How digital output #2 is controlled | "Disabled",  "User" |
| GPmodeAnlg | How the system uses the analogue input | "Disabled",  "Enabled",  "HeatDemand" |

### Thermostat status & control

|  |  |  |
| --- | --- | --- |
| Name | Purpose | Value |
| Thermostat | Thermostat on/off | 0:Fixed Hz, 1:Thermostat active |
| ThermostatMethod | Thermostat method | 0: Standard 1: Adjustable dead band 2: Linear Hz 3: External thermostat on digital input #2 |
| ThermostatWindow | Span of control for thermostat method |  |
| ThermostatOvertemp | Cyclic suspend if > than desired temperature | +2 - +10 |
| ThermostatUndertemp | Cyclic restart if < than desired temperature | -1 - -10 |
| CyclicTemp | Temperature about which the cyclic thresholds are based | 8 – 35 |
| CyclicOff | Cyclic suspend if > than desired temperature | +2 - +10 |
| CyclicOn | Cyclic restart if < than desired temperature | -1 - -10 |
| ExtThermoTmout | Hold on period after contact opening on external thermostat (digital input #2) | Max 1 hour, in seconds. |

### MQTT configuration

|  |  |  |  |
| --- | --- | --- | --- |
| MEn | Purpose | Type | Value |
| MOnline | Status of MQTT broker connection | Integer | 0=no connection 1=connected |
| MHost | Dotted IPV4 address of broker | String |  |
| MPort | Port to connect to at broker | Integer | Default 1883 |
| Muser | Broker username *(if required)* | String |  |
| MPasswd | Broker password *(if required)* | String |  |
| MQoS | Quality of Service | Integer | 0, 1, 2 per MQTT spec |
| MTopic | Topic prefix used to ensure unique identity | String |  |

### System Information

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Purpose | Type | Value |
| DateTime | Current time (when sent, 24hr notation) | String | “D/M/YYYY HH:MM:SS” |
| Time12hr | Flag if clock is shown in 24/12 format | Integer | 0=24hr clock, 1=AM/PM |
| SysUpTime | Time system has been running | Integer | Seconds |
| SysVer | Build version | String | Typ. “X.Y.Z” |
| SysDate | Build release date | String | “D Mmm YYYY” \* |
| SysFreeMem | Free system memory size | Integer | Bytes |
| SysRunTime | Total operating time of heater | Integer | Seconds |
| SysGlowTime | Total time of glow plug operation | Integer | Seconds |

\* Mmm => Jan,Feb,Mar,Apr,May,Jun,Jul,Aug,Sep,Oct,Nov,Dec

### Communications information

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Purpose | Type | Value |
| IP\_AP | IP address of inbuilt Access Point | String | “192.168.4.1” |
| IP\_APMAC | MAC address of inbuilt Access Point | String | Varies |
| IP\_STA | IP address of STA connection | String | Varies |
| IP\_STAMAC | MAC address of STA connection | String | Varies |
| IP\_STASSID | SSID of WiFi network’s Access Point | String | Varies |
| IP\_OTA | Flag indicating if MDNS OTA is enabled | Integer | 0=Off, 1=On |
| BT\_MAC | MAC address of HC-05 Bluetooth peripheral | String | Varies |

### Temperature reporting

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Purpose | Type | Value |
| TempCurrent Temp2Current Temp3Current | Calibrated temperature from sensor(s) 2 & 3 only reported if sensor is fitted | Float | Celcius |
| TempOffset  Temp2Offset  Temp3Offset | Correction applied to raw sensor value(s) 2 & 3 only reported if sensor is fitted | Float | Celcius |
| TempMode | Units used to **display** the temperature | Integer | 0=°C, 1=°F |
|  |  |  |  |

### Fundamental heater operation

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Purpose | Type | Value |
| TempDesired | Desired temperature \*\* | Integer | \*\* |
| TempBody | Temperature of the heater casing | Integer **RO** | °C |
| Run | Heater run/stop indication | Integer | 0=Off, 1=On |
| RunState | Detailed run state information | Integer **RO** |  |
| RunString | String that describes the detailed run state | String **RO** |  |
| ErrorState | Error state of heater | Integer **RO** |  |
| ErrorString | String that describes error state of heater | String **RO** |  |
| PumpFixed | Demanded fixed Hz setting, derived from TempDesired | Float **RO** | \*\* |
| PumpActual | Present rate fuel is being pumped | Float **RO** | Hz |
| FanRPM | Present fan RPM | Integer **RO** | RPM |
| FanVoltage | Present fan voltage | Float **RO** | Volts |
| InputVoltage | Input voltage to heater unit | Float **RO** | Volts |
| GlowVoltage | Present voltage across glow plug | Float **RO** | Volts |
| GlowCurrent | Present current through glow plug | Float **RO** | Amps |
| BluewireStat | State of communications line to heater | String |  |
| PumpCount | Accumulated number of pump cycles (fuel gauge) | Integer | Send 0 to reset |

\*\* TempDesired is truly used to set the “heat demand” upon the heater.  
If using a thermostat mode, it specifies the temperature directly in °C.  
If NOT using a thermostat mode, it is used by the heater to define the fixed pump rate, fed back via PumpFixed.

#### Description of RunState

The heater advertises a state machine index that reveals the operation phases especially during start and stop.  
RunState 0-8 are genuine values reported by the heater.  
RunStates 9-12 are generated by the Afterburner, especially to indicate the states added within the firmware to allow cyclic mode (heater is stopped and started according to temperature).  
RunState 9 is a logical separation of the two distinct events when the heater first heats the glow plug, then a minute later starts the fuel pump.

|  |  |  |
| --- | --- | --- |
| RunState enumeration | RunString | Purpose |
| 0, 1 | " Stopped/Ready ", | Heater is in standby state, ready to start |
| 2 | "Igniting..." | Glow plug is at full temperature, fuel delivery started |
| 3 | "Ignition retry pause" | A pause period should a start fail to occur |
| 4 | "Ignited" | Heater has sensed a burn chamber temp increase |
| 5 | "Running" | Heater is now under user control |
| 6 | "Stopping" | User has requested the heater to stop (transient state) |
| 7 | "Shutting down" | Heater is slowing fuel, glow plug is on |
| 8 | "Cooling" | Heater is solely using fan to cool the heater to < 55°C |
| 9 | "Heating glow plug" | interpreted state - actually RunState 2, pump stopped! |
| 10 | "Suspended" | interpreted state - cyclic mode has suspended heater |
| 11 | "Suspending..." | interpreted state - cyclic mode is suspending heater |
| 12 | "Suspend cooling" | interpreted state - cyclic mode is suspending heater |

#### Description of ErrorState

|  |  |  |
| --- | --- | --- |
| ErrorState enumeration | ErrorString | Purpose |
| 0,1 | “E-00: OK” | No error (1 = No error when running) |
| 2 | "E-01: Low voltage" | Input voltage is below the minimum |
| 3 | "E-02: High voltage" | Input voltage is above the maximum |
| 4 | "E-03: Glow plug fault" | A glow plug fault has occurred |
| 5 | "E-04: Pump fault" | An electrical problem exists with the fuel pump |
| 6 | "E-05: Overheat" | The heater has over heated and been shutdown |
| 7 | "E-06: Motor fault" | The heater is unable to maintain correct RPM |
| 8 | "E-07: No heater comms" | No communications to heater |
| 9 | "E-08: Flame out" | The heater has sensed the body has dropped below 65°C |
| 10 | "E-09: Temp sense" | A problem exists with the body temperature sensor |
| 11 | "E-10: Ignition fail" | Heater failed 2 automatic start attempts |
| 12 | "E-11: Failed 1st ignite" | Heater failed the first automatic start. |

### Heater Tuning

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Purpose | Type | Value |
| TempMin | Lowest temperature setting | Integer **RO** | 8 |
| TempMax | Highest temperature setting | Integer **RO** | 35 |
| FanMin | FAN RPM for lowest heating power | Integer | RPM |
| FanMax | FAN RPM for highest heating power | Integer | RPM |
| FanSensor | Fan feedback divisor (SN-1/ SN-2) | Integer | 1=SN-1, 2=SN=2 |
| PumpMin | Pump rate for lowest heating power | Float | Hz |
| PumpMax | Pump rate for highest heating power | Float | Hz |
| PumpCal | Volume of fuel in mL / stroke of pump | Float | mL |
| SystemVoltage | Define nominal heater operating voltage | Float | 12/24 |
| LowVoltCutout | Threshold for low voltage shutdown (unloaded) | Float | Volts \* |

\* Low voltage cutout is compensated for glow plug current, threshold is lowered by 0.1V/A