GASCARD/CHILLCARD NG

Procedures for RS232 communication with the Gascard/Chillcard NG

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1.	Procedures for RS232 communication with the Gascard NG

Connect the serial communications port of the Gascard NG to an available communications port on your computer using a suitable cable (see Appendix 1 and Application Note AN034-1for information on how to do this.) and power the Gascard NG. Start the terminal programme you intend to use to communicate with the Gascard NG (e.g. HyperTerminal) and ensure that it is set to the COM port connected to the Gascard NG. (e.g. COM1) set the properties of the port to the following values:

Bits per second	57600
Data bits	8
Parity	None
Stop bits	1
Flow Control	none

In the following instructions the nomenclature d<value><return> is used to represent the sending of commands where "d" is the letter to send "value" is a number and "return" is the command to send the instructions (usually the return key on the computer keyboard).

Note: All commands are case sensitive.

Data from the Gascard NG is sent as ASCII with spaces between the fields so a typical line would look like:-

 N 0.3617 -0.0000 -0.0000 -0.0000 -0 33265 1071.8 0

In a simple terminal such as Hyperterminal

or with more detailed RS232 analyser software:-

N<Space>0.3647<Space>-0.0000<Space>-0.0000<Space>-0.0000<Space>-0<Space>33265<Space>1071.8<Space>0<CR><LF>

2.	Serial Commands

2.1. Command modes

Below is a list of the available RS232 command modes, the default mode on start-up is Normal mode. To change from one mode to another the Gascard NG must be sent the characters listed after the mode name, so to enter Normal Mode from any other mode send Shift N i.e. the ASCII character N followed by <CR> where N is uppercase n, usually obtained by holding down the "Shift key" and pressing the "N" key followed by carriage return, normally obtained by pressing the "Enter" key. After sending a command character it is necessary to wait for the Gascard NG to echo the command before sending any further commands, this is not a problem if you are using a terminal and typing the commands but may be if you are using automated communications.

2.2. Normal Mode: Shift N

This mode is the default mode which displays the outputs from all Sensor channels plus temperature and pressure. For the Gascard NG, of the Conc values only Conc1 has meaning. Conc 1 is the fraction of the full scale concentration currently being indicated. The current temperature value is an internal variable related to the head temperature and the pressure is the current barometric pressure measured by the on board pressure sensor in mb.

Display:

	Conc 1	Conc 2	Conc 3	Conc 4	Conc 5	Current Temperature	Current Pressure	Current Humidity
N	0.5000	0.0000	0.0000	0.00	0.0000	30000	983.1	0

Commands: None.

2.3. Normal Channel Mode: Shift N1

This mode displays the input, output and concentration for each individual Sensor channel plus the temperature and pressure.
Display:

	Channel No.	Sample Channel	Reference Channel	**Voltage PWM Value**	Concentration	Temperature	Pressure
N	1	31000	32000	5502	0.5000	30000	983

Commands:

o<value><return> this will force the PWM output for the relevant channel to this value.

2.4. Normal Channel Mode: Shift Nx
(where x is the Sensor number 2 to 5)

This mode has no function in the Gascard NG

2.5. Coefficient Channel Mode: Shift C1

This mode is used for displaying and changing linearization coefficients and correction factors for each individual Sensor channel.

Display:

	Chan.	CoeffA	CoeffB	CoeffC	CoeffD	Zero gas corr. Factor	Span gas corr. Factor	Zero Pot	Span Pot	Sam. Pot	Ref. Pot
C	1	-0.0036	1.2603	-2.1196	1.8629	0.9000	0.2000	3276	3276	102	120

Commands:

z	starts zero gas calibration routine and calculates zero gas correction variable. **Zero gas must be applied to the sensor before initiating this command**
s\<value>\<return>	starts the span gas calibration routine, where \<value> is the gas concentration applied, as a fraction of the instruments full scale (so for a 10% instrument 10% gas would be entered as "1"). The valid range is 0.50 to 1.20. **Span gas must be applied to the sensor before initiating this command**
h\<value>\<return>	changes the 1st order linearization coefficient to the number \<value>.
i\<value>\<return>	changes the 2nd order linearization coefficient to the number \<value> .
j\<value>\<return>	changes the 3rd order linearization coefficient to the number \<value>.
k\<value>\<return>	changes the 4th order linearization coefficient to the number \<value> .
p	this will automatically set the Reference and Sample gain pots to suitable values for the relevant channels. This command should only be required following sensor head replacement or cleaning. **Zero gas must be applied to the sensor before initiating this command. The command may take up to a minute to execute and the sensor must be re-calibrated once this operation has been completed.**

2.6. Coefficient Chanel Mode: Shift Cx
(where x is the Sensor number 2 to 5)

This mode is has no function in the Gascard NG

2.7. Environmental Channel Mode: Shift E1

This mode is used for displaying and changing environmental variables for the sensor. The values in this table are set on calibration and are described here for diagnostic purposes only. **WARNING changing any of the variables listed below will lead to incorrect operation of the gas sensor and a <u>False</u> output of gas concentration.**

Display:

	Chan	Zero cal. temp.	Span cal. Temp.	Pressure sensor slope cor. (m)	Pressure sensor offset cor.(x)	Press 4th Coeff(c)	Press 3rd Coeff(d)	Press 2nd Coeff(e)	Press 1st Coeff(g)	ZeroTemp correction value (z)	Span Temp correction value (s)
E	1	30000	30000	0.3470	878	0.0000	-0.1752	0.9401	0.2351	-14	-445

Commands:

z<value><return>   this changes the Zero Temperature Correction value. Value displayed is multiplied by 10^8

s<value><return>   this changes the Span Temperature Correction value. Value displayed is multiplied by 10^8

c<value><return>   this changes the 4th order pressure linearization coefficient.

d<value><return>   this changes the 3rd order pressure linearization coefficient.

e<value><return>   this changes the 2nd order pressure linearization coefficient.

g<value><return>   this changes the 1st order pressure linearization coefficient.

m<value><return>   changes the pressure sensor slope correction.

x<value><return>   changes the pressure sensor offset correction.

2.8. Environmental Chanel Mode: Shift Ex

(where x is the Sensor number 2 to 5)

This mode is has no function in the Gascard NG

2.9. Output channel mode: Shift O1

This mode is used for displaying and changing output variables for each individual Sensor.
Display:

	Chan (R)	PWM Voltage Output slope Corr (m)	PWM Voltage Output Offset Corr (c)	PWM Voltage Value	PWM Current Output slope Corr (a)	PWM Current Output Offset Corr (b)	PWM Current Value
O	1	1.0100	-0.1999	5502	1.0094	0.0007	18012

Commands:

m<value><return>   this will change voltage output PWM calibration

x<value><return>   this will change the voltage output PWM calibration

a<value><return>   this will change the current output PWM calibration

b<value><return>   this will change the current output PWM calibration

v<value><return>   This command sets the voltage output range. If <value> =1 the output is set be 0 to 1V. If <value> =5 the output is set be 0 to 5V. Note that the NG does not show the v setting anywhere.

2.10.   Output channel mode: Shift Ox
(where x is the Sensor number 2 to 5)

This mode has no function in the Gascard NG

2.11.   Date mode: Shift D

This mode is used for displaying and setting the time and date and has no function in the Gascard NG.

2.12. <u>Settings mode: Shift X</u>

This mode is used for displaying the firmware version, serial number and bit-switch state and setting some aspects of the Gascard NG configuration.

Display:

	Firmware Version	Serial Number	Config Register	Frequency (f)	Time Constant (t)	Switches State
X	1.09	9999	4106	8	8	48

<u>Switches state description:</u>

Byte	Bit 5	-	0 is adaptive filter, 1 is RC filter
	Bit 4	-	0 is 4 to 20mA output scale, 1 is 0 to 20mA scale
	Bit 3	-	No function in NG must be 0
	Bit 2	-	No function in NG must be 0
	Bit 1	-	No function in NG must be 0
	Bit 0	-	No function in NG must be 0

Commands:

f\<value\>\<return\>   this will change frequency of the lamp in Hz to value between 1 and 9
WARNING: changing the lamp frequency will invalidate the calibration and may require changes in the instrument set up to restore normal operation.

t\<value\>\<return\>   this will change the time constant of the RC filter

d\<return\>   **WARNING** This command resets all sensor variables to pre-setup defaults that **will overwrite** all setup and calibration data with test values and **will render the sensor useless until it is completely re-setup.**

q\<return\>   Initiates a soft restart of the firmware.

2.13.　　User Interface mode: Shift U

This mode is used for viewing the Gas sensor configuration, setting the display type and testing the display (if fitted).

Display:

	Gas Range	Gas type	Background Gas	Display selection
U	100	CO2	Air	0

Commands:

d\<value\>\<return\>　　　　　Display selection.

t　　　　　　　　　　　Test the LED's & display segments

3. Software Calibration Procedure

3.1. ZERO Calibration

- Apply ZERO gas to the sensor head and wait for stabilisation
- Using terminal software send the letter "C" and the number "1" (shiftC1\<return\>) to the Gascard NG to enter Coefficient Channel 1 mode followed by the letter 'z' (z\<return\>).

The yellow calibration LED will stop flashing and remain 'ON' and the concentration variable will read "+0.000"or "0.000" until the ZERO gas calibration has completed.

3.2. SPAN Calibration

- Apply SPAN gas to the sensor head and wait for stabilisation
- Using terminal software send the letter 's' followed by the value representing the actual applied gas concentration as a fraction of the Gascard NG's full scale (1 being SPAN gas 0.9 being 90% of the SPAN gas etc.) s\<value\>\<return\>. The minimum Gas concentration that may be used with this command is 50% of SPAN (0.5).

The yellow calibration LED will stop flashing and remain 'ON' and the concentration variable will read "+0.000" or "0.000" until the SPAN gas calibration has completed.

4. Gain Reset Procedure

After replacing a defective IR source or disassembling the sensor head for cleaning it will be necessary to rebalance the channel gains.

- Using terminal software send the letter "C" and the number "1" (shiftC1<return>) to the Gascard NG to enter Coefficient Channel 1 mode.
- Confirm that the mode has changed (line should begin with a C1)
- Apply zero gas
- Using terminal software send the letter "p" this will automatically set the Reference and Sample gain pots to suitable values for the relevant channels.

Note: Zero gas must be applied to the sensor before initiating the p command. The command may take up to a minute to execute and the sensor must be re-calibrated once this operation has been completed.

Appendix 1

In order to use the RS232 connection on the Gascard NG it is necessary to make or purchase a suitable cable. A 0.5m long assembled and tested cable may be purchased from Edinburgh Instruments Ltd. part No. S75212-S.
Alternatively a suitable cable may be assembled from individual parts.
In order to make a cable you will need some 10 way ribbon cable, a 10 way Micro match free plug and a 9 Way IDC 'D' type free socket (suitable parts are Farnell Part No. 149081, 1097963 or Digikey A99461CT-ND and Farnell 10 way ribbon cable Part No.1746559 or equivalents).
The Gascard NG Serial adapter cable is made by cutting an appropriate length of ribbon cable then removing ~1cm of conductor #10 from one end. Attach the 9 way 'D' socket to the, now 9 way, end of the ribbon cable (wire#1 to pin #1). Finally attach the 10 way Micro match plug to the ribbon cable (pin#1 to wire #1).
Once completed the cable should be tested to ensure that all 9 wires are connected.
The resulting cable may be used to directly connect the Gascard NG to the DTE 9 Way "D" Type Plug on most PC's.

Document History

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