E-BAM PLUS
USER 7500
SPECIFICATION

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5.

1. Overview

This document describes the implementation of the 7500 protocol used in E-BAM PLUS.

2. Instrument Communication Modes

2.1. Overview

There are three modes of communication:

1. *User communication* – This is a user interactive mode using simple letter commands for ease of use.
2. *Computer communication* – This mode is used for computer-to-device communication. It includes a level of data integrity.
3. *Network communication* – This mode is used for computer-to-device communication with more than one device on a network.

2.2. User Communication

In the user communication mode (terminal mode), the user simply presses the Enter key, <cr>, three times to enter the mode. In this mode simple character commands can be issued with no <Esc> character required.

An asterisk character appears when entering terminal mode, and also after a command has completed. The asterisk indicates that the instrument is ready for a new command. Commands are echoed back from the instrument in this mode.

Pressing <Esc> or Q<cr> will exit terminal mode.

2.3. Computer Communication

In the computer communication mode the command format include a level of data integrity – checksum.

This mode is entered whenever an <Esc> character is sent to the instrument.

Character echo is suppressed in this mode.

2.3.1. **Computer Command Format**

The computer command has the following format:

```
<Esc>Cmd p1 p2*cs<cr>
```

Computer commands are prefaced with an `<Esc>` (0x1B) character followed directly by a command, `Cmd`, which is variable in length depending on the command. After the command characters there can be zero or more parameter fields, `p1 p2`. Each parameter field is delimited by one or more Space characters (0x20). The end of the message is signaled by the Checksum Delimiter character `*` (0x2A) followed by the checksum, `cs`, and finally terminated with a carriage return `<cr>` (0x0D) character.

A computer command example follows:

```
<Esc>RV 1*1234<cr>
```

All command responses are terminated with a checksum

```
RV 1 E-BAM PLUS, 82102, R1.0.0*01563<cr><lf>
```

2.3.2. **Checksum Computation**

Checksum is calculated as the 16 bit unsigned integer sum of all of the characters after the `<Esc>` character up to but not Including the Checksum Delimiter Character `*` (0x2A). It is printed out as an ASCII decimal number.

The result is always 5 characters in length with leading zeros.

The checksum may be bypassed in the following manner: `*//<cr>`.

2.4. Network Communication

Refer to the 7500 Network Protocol Specification.

3. Command Summary

3.1. Command List

Command	Description
#	Request MetRecord Revision
1	Request settings report
2	Request All User data report
3	Request New User data report
4	Request Last User data report
7	Request Alarm report
C	Clear data log file
D	Get/Set date part of the real time clock
H	Help menu
K	Get/Set the Factory K-Factor Calibration
Q	Quit out of terminal mode
T	Get/Set time part of the real time clock
AR	Get/Set analog output range
CA	Clear the Alarm log
CO	Get/Set analog concentration offset
CR	Get/Set analog concentration range
CT	Get/Set concentration type
CU	Get/Set concentration units
DS	Report data log channel descriptors
DT	Get/Set the date and time of the real time clock
HS	Get/Set Ethernet flow control
ID	Get/Set location ID or address
MA	Get/Set Modbus Slave Address
NW	Set Network Mode
OI	Get output interval
OP	Get/Set operation command
PM	Get/Set PM Inlet type
PR	Print report
PW	Unlock protected commands

QH	Report current readings header
RQ	Report current readings without header
RS	Request settings report
RV	Report Model/Part/Revision
SB	Get/Set baud rate
SS	Get Met One serial number
ST	Get/Set sample time (data log period)
TS	Get/Set timestamp mode
UN	Get/Set data log channel units
AIR	Get/Set AIRSIS protocol enable
SPW	Get/Set user password
TZO	Get/Set time zone offset
XRF	Xmodem read file
XRD	Get Xmodem record descriptor report
BKGD	Get/Set background offset
FTSP	Get/Set filter temperature set point
SPAN	Get/Set mass span audit
STDT	Get/Set standard temperature
TPER	Get/Set tape advance period
DSCRC	Get the data log channel descriptors CRC
MODEM	Get/Set Cloud Modem mode
RTPER	Get/Set real-time average period
TPRES	Get/Set tape advance pressure
XRDCRC	Get Xmodem record descriptor CRC
CLKSYNC	Get/Set Clock Sync mode

4. E-BAM PLUS Commands

The command and responses shown below are for computer mode unless otherwise noted. User mode responses are more verbose and similar in nature.

4.1. # – Request MetRecord Revision

Command	Description
#	Request the MetRecord Revision.

Response	Description
# 7500 r	7500 – This document number r – The revision of this document implemented in firmware

Example
#<cr> # 7500 C<cr><lf>

4.2. 1 – Report Settings

Command	Description
1	Report the settings.

Response

```
E-BAM PLUS Settings Report
2017-01-17 14:58:36

      Firmware, 82102, R1.1.2
          CPLD, 81699, R1.0.0
       Display, 82451, R1.0
 Digital Sen 1, 597, 10503-01, R01.0.0
 Digital Sen 2, MSO, 10463-03, R1.1.0

 Serial Number, U16264
      Location, 1
     Baud Rate, 9600
Ethernet FlowControl, NONE
        AIRSIS, OFF
  Data Average, 1 HR
RealTime Period, 60
   Tape Period, 1 HR
 Tape Pressure, 250
 Standard Temp, 25 C
 PM Inlet Type, PM2.5
     Conc Type, ACTUAL
             K, 1.063
    Background, 0.0017
           Usw, 0.325
    Audit Span, 0.789
    Conc Units, ug/m3
      USB Days, 14
     USB Files, ALL
Analog Range 1, 0-5.0 V
Analog Range 2, 0-5.0 V
     Conc Span, 1000 ug/m3
   Conc Offset, 0 ug/m3
Hourly Timestamp, ENDING
  FT Set Point, 40.0
     FT P-Gain, 0.500
     FT I-Gain, 0.300
RealTime Alpha, 0.2316
RealTime Gamma, 0.1500
   Beep Volume, 100
ModBus Address, 1
    Byte Order, 512
  Factory Mode, OFF
 Flow 1 P-Gain, 10000.000
 Flow 1 I-Gain, 5000.000
 Flow 2 P-Gain, 10000.000
```

```
Flow 2 I-Gain, 5000.000
  Cloud Modem, NONE
    Time Zone, UTC -01:00
   Clock Sync, NONE

 Name, Offset,  Slope
FLOW1,  0.000,  1.000
FLOW2,  0.000,  1.000
   AT, -1.130
   BP, -2.020
   FT,  0.000
UPPER, -1.119
LOWER, -0.687
  FRH,  0.000


    DAC Cal 1, 0.0,6,5.0,52771
    DAC Cal 2, 0.0,34,5.0,52849
```

4.3. 2 – Report All Data

Command	Description
2	Report all the data. The 2 command always sends the data in CSV format.

Header Response: A report header is present for the CSV format when execute from terminal mode. It is suppressed in computer mode.

```
Data Report
2016-01-25 16:15:09
Location, 1, U16264

Time,ConcRT(ug/m3),ConcHR(ug/m3),Flow(lpm),WS(m/s),WD(Deg),AT(C),RH(%),BP(mmHg),FT(C),FRH(%),BV(V),
PM,Status
```

4.4. 3 – Report New Data

Command	Description
`3`	Report the new data since the last request.

Response:
The response is the same as the 2-command.

4.5. 4 – Report Last Data

Command	Description
`4`	Report the last data record.
`4 0`	Report all the data records.
`4 -1`	Report the new data records since the last request.
`4 n`	Report the last `n` hours where `n` is less than or equal to 2000.
`4 ts`	Request the last data since timestamp, where `ts` has the format `yyyy-MM-dd HH:mm:ss`.

Response:
The response is the same as the 2-command.

4.6. 7 – Report Alarm Events

Command	Description
7	Report all alarm events

Response:

```
Alarm Report
2016-01-25 17:10:19
Location, 1, U16264

Time,Alarm
2016-01-25 17:10:02,TAPE BREAK,12
2016-01-25 17:10:02,BETA DETECTOR,500
2016-01-25 17:10:02,SENSOR RANGE,FLOW1,0.0
2016-01-25 17:10:02,SENSOR RANGE,FLOW2,0.0
2016-01-25 17:10:02,SENSOR RANGE,WS,0.0
2016-01-25 17:10:02,SENSOR RANGE,WD,0.0
2016-01-25 17:10:02,SENSOR RANGE,AT,-50.0
2016-01-25 17:10:02,SENSOR RANGE,RH,0.0
2016-01-25 17:10:02,SENSOR RANGE,BP,375.0
2016-01-25 17:10:02,SENSOR RANGE,UPPER,228.0
2016-01-25 17:10:02,SENSOR RANGE,LOWER,228.0
2016-01-25 17:10:02,SENSOR RANGE,FT,-40.0
2016-01-25 17:10:02,SENSOR RANGE,FRH,0.0
2016-01-25 17:10:02,SENSOR RANGE,BOX,-40.0
2016-01-25 17:10:02,SENSOR RANGE,BV,-1.0
2016-01-25 17:10:02,SENSOR RANGE,FLOW,0.0
2016-01-25 17:10:02,SENSOR RANGE,BETA,500.0
2016-01-25 17:10:02,SENSOR RANGE,FLOW1,200.0
2016-01-25 17:10:02,SENSOR RANGE,FLOW2,6.0
2016-01-25 17:10:02,SENSOR RANGE,WS,50.0
2016-01-25 17:10:02,SENSOR RANGE,WD,360.0
2016-01-25 17:10:02,SENSOR RANGE,AT,70.0
2016-01-25 17:10:02,SENSOR RANGE,RH,100.0
2016-01-25 17:10:02,SENSOR RANGE,BP,825.0
2016-01-25 17:10:02,SENSOR RANGE,UPPER,818.0
2016-01-25 17:10:02,SENSOR RANGE,LOWER,818.0
2016-01-25 17:10:02,SENSOR RANGE,FT,60.0
2016-01-25 17:10:02,SENSOR RANGE,FRH,98.9
2016-01-25 17:10:02,SENSOR RANGE,BOX,60.0
2016-01-25 17:10:02,SENSOR RANGE,BV,16.0
2016-01-25 17:10:02,SENSOR RANGE,FLOW,20.0
```

```
2016-01-25 17:10:02,SENSOR RANGE,BETA,20000.0
2016-01-25 17:10:02,TAPE ADVANCE,250.0
2016-01-25 17:10:02,FLOW FAILURE,0.0,0.0
2016-01-25 17:10:02,VANE FAILURE,UP
2016-01-25 17:10:02,VANE FAILURE,DOWN
2016-01-25 17:10:02,VANE FAILURE,FOIL INSERT
2016-01-25 17:10:02,DIGITAL LINK DOWN
2016-01-25 17:10:02,POWER OUTAGE,Off,0.00:03:30,On,0.01:33:09
2016-01-25 17:10:02,MAINTENANCE
```

4.7. C – Clear Data Log

Command	Description
C Y	Clear the data log.

Response
C Y

Example
C Y<cr> C Y<cr><lf>

4.8. D – Request or Set the Date Only

Command	Description
D	Request the date part of the real time clock.
D yyyy-MM-dd	Set the date part of the real time clock.

Response
D yyyy-MM-dd

Parameter	Description
yyyy	Years 2000 – 2037
MM	Months 1 – 12
dd	Days 1 – 31

Example
D<cr> D 2013-01-08<cr><lf> D 2013-01-08<cr> D 2013-01-08<cr><lf>

4.9. H – Help Menu

Command	Description
H	Report the help menu.

Response
E-BAM PLUS Help Menu 1 - Report Settings 2 - Report All Data 3 - Report New Data 4 - Report Last Data 7 - Report Alarm Log C - Clear Data Log D - Set Date T - Set Time CA - Clear Alarm Log DT - Set Date/Time QH - Report Data Record Header RV - Report Model/Part/Revision RQ - Report Current Readings

4.10. K – Request or Set the Factory K-Factor Calibration

Warning: You should only change the factory K-factor under advice from the factory. Changing the K-factory will invalidate the factory calibration.

Command	Description
`K`	Request the factory k-factor calibration
`K n`	Set the factory k-factor calibration, where `n` is from `0.8` to `1.2`.

Response	Description
`K n`	n – the factory k-factor calibration setting

Example

`K<cr>`
`K 1.000<cr><lf>`
 	
`K 1.101<cr>`
`K 1.101<cr><lf>`

4.11. Q – Exit User Mode

Command	Description
Q	Exit User mode and enter Computer mode.

Response	Description
Q Exit Terminal Mode	The command was successful.

Example
Q<cr> Q Exit Terminal Mode<cr><lf>

4.12. T – Request or Set the Time Only

Command	Description
T	Request the time part of the real time clock.
T HH:mm:ss	Set the time part of the real time clock.

Response	Description
T HH:mm:ss	HH – Hours 0 – 23. mm – Minutes 0 – 59. ss – Seconds 0 – 59, this parameter is optional. When omitted the value will be 0.

Example
T<cr> T 13:18:38<cr><lf> T 14:13:12<cr> T 14:13:12<cr><lf>

4.13. AR – Request or Set the Analog Output Range

Command	Description
AR	Request the analog output range.
AR 0	Request the number of analog output channels
AR c e	Set the analog output range where c is the channel number and e is the enumerator for values 0-0-1.0 V, 1-0-2.5 V, 2-0-5.0 V, 3-4-20 mA

Responses	Description
AR c	c – the number of analog output channels
AR c,e-v	c – the channel number e – the enumerator value v – the analog output range value

Example
AR<cr> AR 1,2-0-5.0 V<cr><lf> AR 2,2-0-5.0 V<cr><lf> AR 0<cr> AR 2<cr><lf> AR 2 2<cr> AR 2,2-0-5.0 V<cr><lf>

4.14. CA – Clear Alarm Log

Command	Description
CA Y	Clear the alarm log.

Response
CA Y

Example
CA Y<cr> CA Y<cr><lf>

4.15. CO – Request or Set the Concentration Offset

Command	Description
CO	Request the concentration offset.
CO e	Set the concentration offset, where e is 0—-15 ug/m3, 1—-10 ug/m3, 2—-5 ug/m3, 3-0 ug/m3, 4-5 ug/m3

Response	Description
CO e-V	e – The enumerator setting. V – The concentration offset value.

Example
CO<cr> CO 1—0 ug/m3<cr><lf> CO 4<cr> CO 4-5 ug/m3<cr><lf>

4.17. CR – Request or Set the Concentration Range

Command	Description
CR	Request the concentration range.
CR e	Set the concentration offset, where e is 0-100 ug/m3, 1-200 ug/m3, 2-500 ug/m3, 3-1000 ug/m3, 4-2000 ug/m3, 5-5000 ug/m3, 6-10000 ug/m3

Response	Description
CR e-V	e – The enumerator setting. V – The concentration range value.

Example
CR<cr> CR 6—10000 ug/m3<cr><lf> CR 4<cr> CR 4-2000 ug/m3<cr><lf>

4.18. CT – Request or Set the Concentration Type

Command	Description
CT	Request the concentration type.
CT e	Set the concentration type, where e is 0-ACTUAL,1-STANDARD.

Response	Description
CT e-name	e – The enumerator setting. name – The concentration type name.

Example
CT<cr> CT 0-ACTUAL<cr><lf> CT 1<cr> CT 1-STANDARD<cr><lf>

4.19. CU – Request or Set the Count Units

Command	Description
CU	Request count unit setting.
CU e	Set the count unit setting, where e is 0-ug/m3, 1-mg/m3.

Response	Description
CU e-unit	e – The enumerator setting. unit – The unit name.

Example
CU<cr> CU 0-ug/m3<cr><lf> CU 1<cr> CU 1-mg/m3<cr><lf>

4.20. Field Descriptors

Retrieval commands are used to query the instrument for Descriptor Information Table. These commands can be accessed by any serial device such as a data logger or software.

Information can be retrieved in either in single line responses or in bulk. Single line responses are needed for devices with limited serial input buffer sizes.

4.20.1. DS 0 – Query Abbreviated Descriptor Information

Command	Description
`DS 0`	This command returns the general header information.

Response	Description
`DS n,id,r`	The response will indicate the general descriptor information. `n` – Number of field descriptor lines available. `id` – Location ID `r` – Reserved for future use. 0 is the default.

Example
`DS 0<cr>` `DS 14,001,0<cr><lf>`

4.20.2. **DS c – Specific Descriptor Information**

Command	Description
`DS c`	This command returns the specific channel header information in the Descriptor Information Table. `c` – Channel number.

Response
`DS c,FieldName,MeasureType,units,prec,math,max,min`

Parameter	Description
`c`	Field number – 1 based.
`FieldName`	Field name string in printable ASCII. This is the user selected name for the measurement. Example: AT1 for air temp, FT1 for flow temp, etc.
`MeasureType`	Measurement type string in printable ASCII See the definitions in Appendix A of the 7500 Protocol document
`units`	Engineering units string in printable ASCII. See the definitions in Appendix B of the 7500 Protocol document.
`prec`	Display value precision.
`math`	Math type field. Vector (V), Scalar (S), Total (T), Minimum (MIN), Maximum (MAX), Standard Deviation (STD), Bitwise OR (OR), No Math (NO).
`max`	Maximum measurement value.
`min`	Minimum measurement value.

Example
`DS 3<cr>` `DS 3,ConcHR,CONC,ug/m3,0,S,10000,-15<cr><lf>`

4.20.3. **DS – Request All Descriptor Information**

Command	Description
DS	This command returns all of the general and header information. The command can be used for devices that have a large serial input buffer size.

Example

```
DS<cr>
DS 1,Time,TIME,,0,NO,0,0
DS 2,ConcRT,CONC,ug/m3,0,S,10000,-15
DS 3,ConcHR,CONC,ug/m3,0,S,10000,-15
DS 4,Flow,FLOW,lpm,1,S,20.0,0.0
DS 5,WS,WS,m/s,1,S,60.0,0.0
DS 6,WD,WD,Deg,0,V,360,0
DS 7,AT,AT,C,1,S,70.0,-50.0
DS 8,RH,RH,%,0,S,100,0
DS 9,BP,BP,mmHg,0,S,825,200
DS 10,FT,AT,C,1,S,70.0,-50.0
DS 11,FRH,RH,%,0,S,100,0
DS 12,BV,BV,V,1,S,16.0,0.0
DS 13,PM,INFO,,0,NO,0,0
DS 14,Status,INFO,,0,OR,0,0
```

4.20.4. **DSCRC – Descriptor table CRC**

Command	Description
DSCRC	This command returns the instrument descriptor table CRC. The intent is for the system or software to query and save this CRC. The value is then compared on subsequent reads to check for any instrument configuration changes. If the CRC does not match the previous CRC then check for a change in the field configuration parameters.

Response	Description
DSCRC hhhh	hhhh – The CRC value in hexadecimal.

Example
DSCRC<cr> DSCRC 7F61<cr><lf>

4.21. DT – Request or Set the Date and Time

Command	Description
DT	Request the date and time part of the real time clock.
DT yyyyMMddHHmmss DT yyyy-MM-dd HH:mm:ss	Set the date and time part of the real time clock.

Response
DT yyyy-MM-dd HH:mm:ss

Parameter	Description
yyyy	Years 2000 – 2037
MM	Months 1 – 12
dd	Days 1 – 31
HH	Hours 0 – 23
mm	Minutes 0 – 59
ss	Seconds 0 – 59

Example
DT<cr> DT 2013-01-08 11:39:23<cr><lf> DT 2013<cr> DT 2013-01-01 00:00:00<cr><lf> DT 20130108<cr> DT 2013-08-08 00:00:00<cr><lf> DT 2013-01-081141<cr> DT 2013-01-08 11:41:00<cr><lf>

4.22. HS – Request or Set the Ethernet Flow Control

Command	Description
HS	Request the Ethernet flow control.
HS e	Set the Ethernet flow control, where e is 0-NONE, 1-RTS/CTS,

Response	Description
HS e-n	x – The enumerator setting. n – The Ethernet flow control setting name

Example
HS<cr> HS 0-NONE<cr><lf> HS 1<cr> HS 1-RTS/CTS<cr><lf>

4.23. ID – Request or Set the Location ID

Command	Description
ID	Request the Location ID.
ID id	Set the Location ID. The range is 1 to 999.

Response	Description
ID id	id – The location ID. The ID value is three characters with leading zero's.

Example
ID<cr> ID 001<cr><lf> ID 2<cr> ID 002<cr><lf>

4.24. MA – Request or Set the Modbus Address

Command	Description
MA	Request the Modbus address.
MA a	Set the Modbus address. The range is 1 to 247.

Response	Description
MA a	a – The Modbus address.

Example
MA<cr> MA 1<cr><lf> MA 2<cr> MA 2<cr><lf>

4.25. NW – Set Network Mode

Refer to the ***7500 Network Protocol Specification*** document for more information.

Command	Description
NW	Request the measurement concentration setting.
NW m	Set the network mode where m is 0-Off, 1-On.

Response	Description
NW 0	.

Example
NW<cr> NW 0 <cr><lf> <Esc>A NW 0*cs<cr> NW 0<cr><lf>

4.26. OI – Request or Set the Output Interval

Command	Description
`OI i`	Set Output Interval. This command is provided for compatibility with 7500 protocol masters which expect to turn off output with this command. Where i is the Interval. 0=No volunteered output, 1=Output at end of measurement. Only 0 is supported

Response	Description
`OI 0`	Response is the same whether setting or getting the parameter.

Example

`OI<cr>`
`OI 0<cr><lf>`
 	
`OI 1<cr>`
`OI 0<cr><lf>`

4.27. OP – Request or Set the Operation State

Command	Description
`OP`	Request the current operation state.
`OP n`	Set the operation state where `n` is `0=stop operation, 1=start operation`

Response	Description
`OP n-state`	`n` – the current state enumerator `state` – the name of the current state

Example

`OP<cr>`
`OP 1-UNIT OFF<cr><lf>`
 	
`OP 1<cr>`
`OP 3-STARTING...<cr><lf>`

4.28. PM – Request or Set the PM Inlet Type

Command	Description
PM	Request the current operation state.
PM e	Set the PM Inlet type where n is 0-PM2.5,1-PM10,2-TSP

Response	Description
OP e-name	n – the PM Inlet type enumerator name – the name of the PM Inlet type

Example
PM<cr> PM 0-PM2.5<cr><lf> PM 2<cr> PM 2-TSPcr><lf>

4.29. PR – Print Report

Command	Description
PR f	Print report where f is the file number. 0 – Settings 1 – Data Log 2 – Alarm Log
PR f 0	Report all the data.
PR f -1	Report the new data since the last request.
PR f n	Report the last n hours where n is less than or equal to 2000.
PR f ts	Request the last data since timestamp, where ts has the format yyyy-MM-dd HH:mm:ss.

4.30. PW – Unlock User Commands

Command	Description
PW nnnn	This command Unlocked the user protected commands. The command and screen password is the same.

Response	Description
Unlocked	If the user password is correct, you will see this response.

Example
PW 1234<cr> Unlocked<cr><lf>

4.31. QH – Report Data Record Header

Command	Description
QH	Report data record header.

Response
Time,ConcRT(ug/m3),ConcHR(ug/m3),Flow(lpm),WS(m/s),WD(Deg),AT(C),RH(%), BP(mmHg),FT(C),FRH(%),BV(V),PM,Status

4.32. RQ – Request Last Record

Command	Description
RQ	Request the instantaneous measurement record.

Response:
The response is the same as the 4-command.

Example:
RQ<cr> 2017-01-17 15:14:39,+000010,+000015,+16.7,00.0,000,+020.7,028, 725,+023.0,020,12.3,0,00000,*04417

4.33. RS – Report Settings

Command	Description
RS	Report the settings.

Response:
The response is the same as the 1-command.

4.34. RV – Report Model, Firmware, Revision

Command	Description
RV	Request the model number, firmware part number, and revision string. Instruments with more than one processor or programmable devices will include more than one part number and revision on the next subsequent lines.

Response	Description
m, p, r	m – Device model name. p – Firmware part number. r – Firmware revision.

Example
RV<cr> E-BAM PLUS, 82102, R1.1.2<cr><lf> CPLD, 81699, R1.0.0<cr><lf> Display, 82451, R1.0<cr><lf>

4.34.1. RV 0 – Request the number of processor/devices supported

Command	Description
RV 0	Request the number of processor or programmable devices.

Response	Description
RV n	n – Number processor or programmable devices.

Example
RV 0<cr> RV 3<cr><lf>

4.34.2. **RV n – Request individual processor/device information**

Command	Description
`RV n`	Request the model number, firmware part number, and revision for a specified processor or programmable device `n`.

Response	Description
`RV e m, p, r`	`e` – Device enumerator. `m` – Device model name. `p` – Firmware part number. `r` – Firmware revision.

Example

`RV 1<cr>`
`RV 1 E-BAM PLUS, 82102, R1.1.2<cr><lf>`
 	
`RV 3<cr>`
`RV 3 Display, 82451, R1.0<cr><lf>`

4.35. SB – Request or Set the Serial Baud Rate

Command	Description
SB	Request the serial baud rate setting.
SB m	Set the serial baud rate where m is 2-1200,3-2400,4-4800, 5-9600,6-19200,7-38400,8-57600,9-115200.

Response	Description
SB m-name	m – Serial baud rate enumerator. name – enumerator name.

Example
SB<cr> SB 5-9600<cr><lf> SB 6<cr> SB 6-19200<cr><lf>

4.36. SS – Get the Serial Number

Command	Description
SS	Get the serial number.

Response	Description
SS A99999	

Example
SS<cr> SS A99999<cr><lf>

4.37. ST – Request or Set the Sample Time

Command	Description
ST	Request the Sample Time.
ST e	Set the Sample Time. e – the Sample Time, where e is 0-1 MIN,1-5 MIN,2-10 MIN, 3-15 MIN,4-30 MIN,5-1 HR

Response	Description
ST e-v	e – The enumerator value. v – The current sample time value.

Example
ST<cr> ST 5-1 HR<cr><lf> ST 1<cr> ST 1-5 Min<cr><lf>

4.38. TS – Request or Set the Timestamp Mode

Command	Description
TS	Request the Timestamp Mode setting.
TS e	Set the Timestamp Mode setting, where e is 0-ENDING,1-BEGINNING.

Response	Description
TS e-name	e – The enumerator setting. name – The enumerator name.

Example
TS<cr> TS 1-BEGINNING<cr><lf> TS 0<cr> TS 0-ENDING<cr><lf>

4.39. UN c – Request Specific Channel Available Field Units

Command	Description
`UN c`	Request the list of available channel/field units. `c` – Desired channel/field

Response	Description
`UN c e-name,...`	Returns the available units for the channel/field units. `1-a` – The enumerator and name `...` – More enumerators and names If a field has no units associated with it, a single response with an enumerator of 0 is returned with a unit name of N/A

Example

`UN 2<cr>`
`UN 2 1-ug/m3,2-mg/m3<cr><lf>`
 	
`UN 1<cr>`
`UN 1 0-N/A<cr><lf>`

4.40. UN c u – Set Specific Channel Field Units

Command	Description
`UN c u`	Set the channel/field units. `c` – Desired channel/field `u` – Enumerated unit (1, 2, 3 etc.) Enumerators are 1 based. Sending a 0 enumerator to this command will echo back the current setting with no changes.

Response	Description
`UN c e-name`	Returns the enumerator and unit name after the change. `c` – channel/field `e-name` – The enumerator and unit name

Example

`UN 2<cr>`
`UN 2 1-ug/m3,2-mg/m3<cr><lf>`
 	
`UN 2 2<cr>`
`UN 2 2-mg/m3<cr><lf>`

4.41. AIR – Request or Set the AIRSIS Protocol Enable

Command	Description
AIR	Request the AIRSIS Protocol Enable setting.
AIR e	Set the AIRSIS Protocol Enable setting, where e is 0-OFF,1-ON.

Response	Description
AIR e-name	e – The enumerator setting. name – The enumerator name.

Example
AIR<cr> AIR 0-OFF<cr><lf> AIR 1<cr> AIR 1-ON<cr><lf>

4.42. SPW – Request or Set the User Password

Command	Description
SPW	Request the user password.
SPW wxyz	Set the user password, where w,y,x,z are digits from 1 – 9.

Response	Description
SPW ----	---- - The user password has not been entered and therefore cannot be shown.
SPW wxyz	wxyz – The current user password.

Example
SPW<cr> SPW ----<cr><lf> PW 1234<cr> PW Unlocked<cr><lf> SPW<cr> SPW 1234<cr><lf> SPW 1122<cr> SPW 1122<cr><lf>

4.43. TZO – Request or Set the Time Zone Offset

Command	Description
TZO HH:mm	Get/Set the Time Zone Offset. HH – Offset hours, -12 to 14 mm – Offset minutes, 00 to 59

Response	Description
TZO UTC +HH:mm	+ - Sign of the hours HH – Current Offset Hours mm – Current Offset Minutes

Example
TZO<cr> TZO UTC +00:00<cr><lf> TZO 8:13<cr> TZO UTC +08:13<cr><lf>

4.44. XRD – Request the Xmodem Record Descriptors

Refer to the ***File Record Descriptor Specification*** document for more information.

Command	Description
`XRD e`	Request the X-modem record descriptors, where `e` is `1=data file record`.

Response	Description
	Go to Wikipedia for more information on the XMODEM protocol – http://en.wikipedia.org/wiki/XMODEM

Example

```
XRD 1<cr>
XRD 1,2,14,1,LE
1,Time,,0,NO,DATETIME,1.0E+00,0.0E+00
2,Status,,0,OR,UINT32,1.0E+00,0.0E+00
3,ConcRT,ug/m3,0,S,FLOAT,1.0E+03,0.0E+00
4,ConcHR,ug/m3,0,TOH,FLOAT,1.0E+03,0.0E+00
5,FLOW,LPM,1,S,FLOAT,1.0E+00,0.0E+00
6,WS,m/s,1,S,FLOAT,1.0E+00,0.0E+00
7,WD,Deg,0,V,FLOAT,1.0E+00,0.0E+00
8,AT,C,1,S,FLOAT,1.0E+00,0.0E+00
9,RH,%,0,S,FLOAT,1.0E+00,0.0E+00
10,BP,mmHg,0,S,FLOAT,1.0E+00,0.0E+00
11,FT,C,1,S,FLOAT,1.0E+00,0.0E+00
12,FRH,%,0,S,FLOAT,1.0E+00,0.0E+00
13,BV,V,1,S,FLOAT,1.0E+00,0.0E+00
14,PM,,0,NO,UINT32,1.0E+00,0.0E+00
```

4.45. XRF – Xmodem Read File

Refer to the ***File Record Descriptor Specification*** document for more information.

Command	Description
`XRF e ts te`	Request the data file in binary xmodem protocol where `e` is `1=data file` and `ts` (optional) is the start timestamp and `te` (optional) is the end timestamp.

Response	Description

4.46. BKGD – Request or Set the Background Offset

Command	Description
`BKGD`	Request the background offset setting.
`BKGD n`	Set the background offset setting, where `n` is from `-0.050` to `0.050`.

Response	Description
`BKGD n`	`n` – the background offset setting value

Example

`BKGD<cr>`
`BKGD 0.0000<cr><lf>`
 	
`BKGD 0.035<cr>`
`BKGD 0.035<cr><lf>`

4.47. FTSP – Request or Set the Filter Temperature Set Point

Command	Description
FTSP	Request the filter temperature set point.
FTSP n	Set the filter temperature set point, where n is from 0.0 to 50.0.

Response	Description
FTSP n	n – the filter temperature set point value

Example
FTSP <cr> FTSP 45.0<cr><lf> FTSP 35<cr> FTSP 35.0<cr><lf>

4.48. SPAN – Request or Set the Span Calibration Verification

Command	Description
SPAN	Request the span calibration verification value.
SPAN n	Set the span calibration verification, where n is from 0.4 to 2.0.

Response	Description
SPAN n	n – the span calibration verification value.

Example
SPAN<cr> SPAN 0.780<cr><lf> SPAN 1<cr> SPAN 1.000<cr><lf>

4.49. STDT – Request or Set the Standard Temperature

Command	Description
STDT	Request standard temperature.
STDT e	Set the standard temperature, where e is 0-0 C,1-20 C,2-25 C.

Response	Description
STDT e-n	e – the standard temperature enumerator n – the standard temperature value name

Example
STDT <cr> STDT 2-25 C<cr><lf> STDT 1<cr> STDT 1-20 C<cr><lf>

4.50. DSCRC – Channel Descriptor table CRC

Command	Description
DSCRC	This command returns the channel descriptor table CRC. The intent is for the system or software to query and save this CRC. The value is then compared on subsequent reads to check for any instrument configuration changes. If the CRC does not match the previous CRC then check for a change in the field configuration parameters.

Response	Description
DSCRC hhhh	hhhh – The CRC value in hexadecimal.

Example
DSCRC<cr> DSCRC F69F<cr><lf>

4.51. MODEM – Request or Set the Modem Connection Type

Command	Description
MODEM e	Get/Set the modem connection type e – enumerator for connection type, 0-NONE, 1-GSM, 2-CDMA

Response	Description
MODEM e-n	e – enumerator setting n – name of connection type

Example
MODEM<cr> MODEM 0-NONE<cr><lf> MODEM 1<cr> MODEM 1-GSM<cr><lf>

4.52. RTPER – Request or Set the Real-time Average Period

Command	Description
RTPER	Request the real-time average period.
RTPER n	Set the real-time average period, where n is from 15 to 60.

Response	Description
RTPER n	n – the span calibration verification value.

Example
RTPER <cr> RTPER 60<cr><lf> RTPER 30<cr> RTPER 30<cr><lf>

4.53. TPRES – Request or Set the Tape Advanced Pressure

Command	Description
`TPRES`	Request the tape advanced pressure setting.
`TPRES n`	Set the tape advanced pressure setting, where `n` is from `50` to `350`.

Response	Description
`TPRES n`	`n` – the tape advanced pressure setting.

Example

`TPRES <cr>`
`TPRES 250<cr><lf>`
 	
`TPRES 150<cr>`
`TPRES 150<cr><lf>`

4.54. XRDCRC – Request the Xmodem File Descriptor CRC

Refer to the ***File Record Descriptor Specification*** document for more information.

Command	Description
`XRDCRC 1`	Request the file descriptor CRC.

Response	Description
`XRDCRC f hhhh`	`f` – the file number. `hhhh` – the file record descriptor CRC value in hexadecimal.

Example
`XRDCRC 1<cr>` `XRDCRC 1 7923<cr><lf>`

4.55. CLKSYNC – Request or Set the Clock Sync Mode

Command	Description
`CLKSYNC`	Request the clock sync mode.
`CLKSYNC e`	Set the clock sync mode, where `e` is `0-NONE,1-CLOUD`.

Response	Description
`CLKSYNC e-name`	`e` – the clock sync mode enumerator. `name` – the enumerator name.

Example

`CLKSYNC<cr>`
`CLKSYNC 0-NONE<cr><lf>`
 	
`CLKSYNC 1<cr>`
`CLKSYNC 1-CLOUD<cr><lf>`

5. Modbus Map

This section will cover the E-BAM PLUS Modbus Map.

5.1. 3x Modbus Map

Name	Address	Type	Points	Description
Word	0	Uint16	1	Fixed value of 1
Dword	1	Uint32	2	Fixed value of 123456789
Float	3	Float32	2	Fixed value of 123456.0
String	5	String	3	Fixed value of “ABCDE”
Year	100	Uint16	1	Current time Year
Month	101	Uint16	1	Current time Month
Day	102	Uint16	1	Current time Day
Hour	103	Uint16	1	Current time Hour
Minute	104	Uint16	1	Current time Minute
Second	105	Uint16	1	Current time Second
Date/Time	106	Uint32	2	Current Unix time (Seconds since Jan 1 1970)
N Channel	200	Uint16	1	Number of channels in last data record
Serial Number	201	String	5	MOI serial number (10 Bytes including 0 terminator)
Revision	206	String	20	Product Model, part number, and revision
Digital Revision	226	String	20	Digital sensor Model, part number, and revision

Instantaneous real time readings

Name	Address	Type	Points	Description
Date/Time	1000	Uint32	2	Current Unix time (Seconds since Jan 1 1970)
Status	1002	Uint32	2	Current alarm status
Conc RT	1004	Float	2	Real time concentration (ug/m3 or mg/m3)
Conc HR	1006	Float	2	Previous hour's concentration (ug/m3 or mg/m3)
Flow1	1008	Float	2	(LPM) Total flow rate
Flow2	1010	Float	2	(LPM) Sheath flow rate
WS	1012	Float	2	(m/s) Wind Speed
WD	1014	Float	2	(Deg) Wind Direction
AT	1016	Float	2	(C) Ambient temperature
RH	1018	Float	2	(%) External relative humidity
BP	1020	Float	2	(mmHg) Barometric pressure
PX1	1022	Float	2	(mmHg) Upper tape pressure
PX2	1024	Float	2	(mmHg) Lower tape pressure
FT	1026	Float	2	(C) Filter temperature
FRH	1028	Float	2	(%) Filter relative humidity
BXT	1030	Float	2	(C) Box temperature
BV	1032	Float	2	(V) Battery voltage
Flow	1034	Float	2	(LPM) Sample flow rate
Beta	1036	Float	2	(Hz) Beta counts

Last data record readings

Name	Address	Type	Points	Description
Date/Time	2000	Uint32	2	Unix timestamp (Seconds since Jan 1 1970)
Status	2002	Uint32	2	Alarm status
Conc RT	2004	Float	2	Real time concentration (ug/m3 or mg/m3)
Conc HR	2006	Float	2	Previous hour's concentration (ug/m3 or mg/m3)
Flow	2008	Float	2	(LPM) Flow rate
WS	2010	Float	2	(m/s) Wind speed
WD	2012	Float	2	(Deg) Wind direction
AT	2014	Float	2	(C) Ambient temperature
RH	2016	Float	2	(%) External relative humidity
BP	2018	Float	2	(mmHg) Barometric pressure
FT	2020	Float	2	(C) Filter temperature
FRH	2022	Float	2	(%) Filter relative humidity
BV	2024	Float	2	(V) Battery voltage
PM Type	2026	Unit32	2	PM Inlet type

5.2. 4x Modbus Map

Name	Address	Type	Points	Description
Modbus Address	0	Int16	1	Modbus address
Byte Order[1]	1	Int16	1	Value 1 to 4
Year	100	Uint16	1	Set time Year (YYYY)
Month	101	Uint16	1	Set time Month
Day	102	Uint16	1	Set time Day
Hour	103	Uint16	1	Set time Hour
Minute	104	Uint16	1	Set time Minute
Second	105	Uint16	1	Set time Second
Date/Time	106	Uint32	2	Set Unix time (Seconds since Jan 1 1970)

[1] For more information on Byte Order refer to ***Interfacing with Modbus*** document.