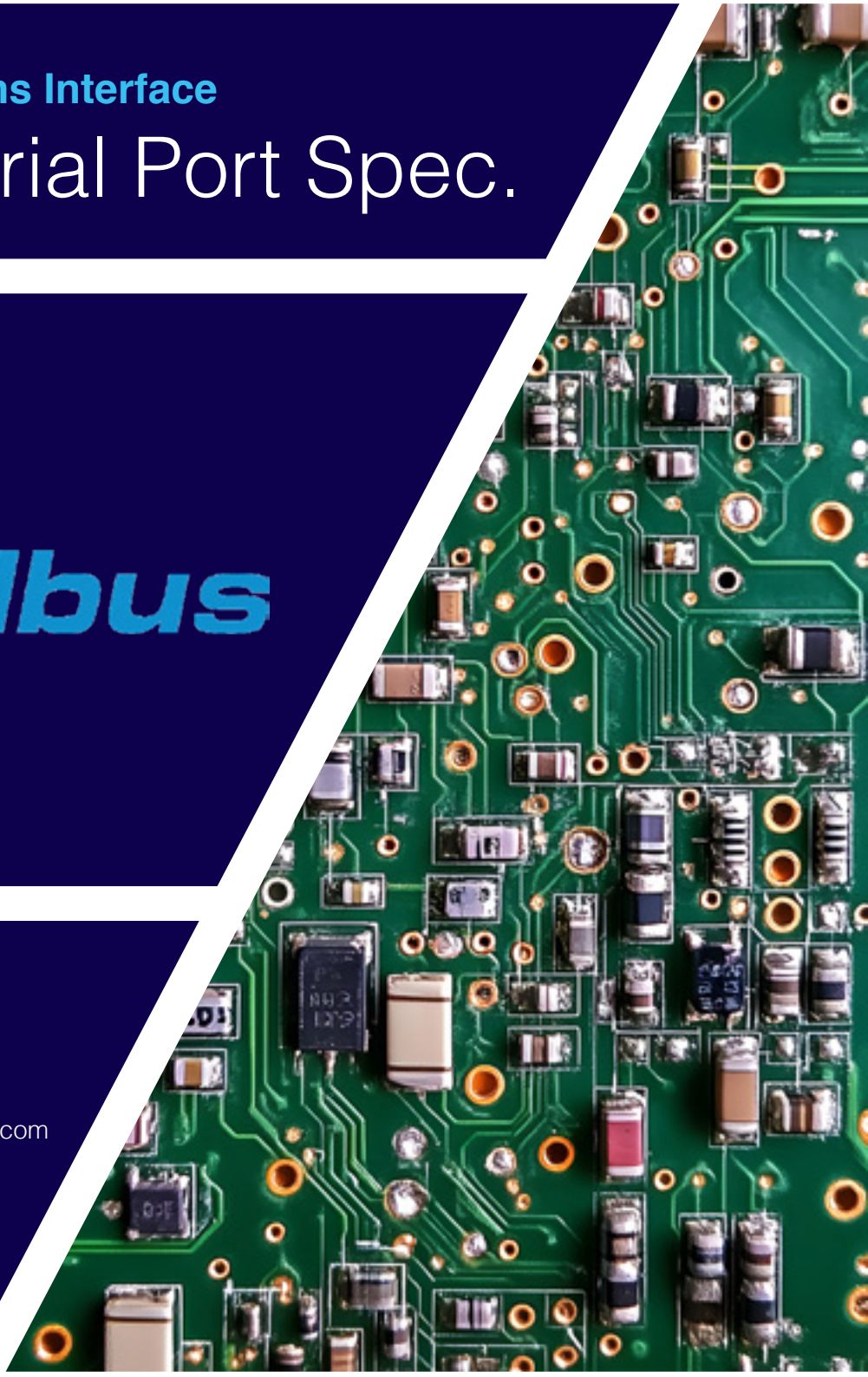
IGD Modbus Implementation
Document Ref: SL-081 V21

International Gas Detectors

Analyser to PC Comms Interface

Modbus Serial Port Spec.



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1: Functions

Read Comments	Fn	Register	Sensor	Returned Word
Read Sensor Conc	04	30,001 to 30,999	1 to 999	Note#2 Superseded by Command Read Scaled Sensor Conc
Read Sensor Volts#1 #2	04	31,001 to 31,999	1 to 999	Min = 0 (0.00V) Max =500 (5.00V) Resolution = 0.01V
Read Sensor Status	04	33,001 to 33,99	1 to 999	Bit0 = AL1 Bit1 = AL2 Bit2 = AL3 Bit3 = Fault Bit4 = Sensor Disabled Bit5 = Sensor Fault Bit6 = Under Range Fault Bit7 = Over Range Fault Bit8 = Comms Fault Bit9 = AL4#4 Bit10 = AL3 Muted#6 Bit11 = AL4 Muted#4 Bit12 = Low Flow Fault#13 Bit13 = AL1 Muted Bit14 = AL2 Muted Bit15 = AL3 Muted#5
Read Scaled Sensor Conc#3	04	34,001 to 34,999	1 to 999	-
Read Software Version#5	04	35,001	-	x1000 e.g. 3100 is V3.100
Read Soft, Checksum#5	04	35,002	-	-
Read Serial Number#5	04	35,003	-	-
Read Total Sensors#5	04	35,004	-	-
Read Total Relays#5	04	35,005	-	-
Read Seconds Timer#11	04	35,006	-	Counter from 0 to 59, rollover back to 0. Incremented once per second
Read Panel Status#7	04	36,001	-	Bit0 = Common AL1 Bit1 = Common AL2 Bit2 = Common AL3 Bit3 = Common Fault Bit4 = Zero in Progress Bit5 = Cal in Progress Bit6 = In Menu Bit7 = In Inhibit Mode Bit8 = On Battery Backup Bit9 = In Warmup Bit10 = SelfTest Fault Bit11 = Output Test Bit12-Bit15 = Not Used

Read Comments	Fn	Register	Sensor	Returned Word
Read Sensor Channel[#8]	-	-	-	-
Active Channel	04	38,001	-	Current Sensor Channel 0(Disabled) to 999
Last Write Command	04	38,002	-	Last Write Register
Live Conc[#3]	04	38,003	-	-
Live Faults	04	38,004	-	Bit0 – Warmup Bit1 – Under Bit2 – Over Bit3 – Fault Bit4 – Comms Bit5 – Low Flow Bit6 – Self Test Bit7 – Forced
Live Volts/Ratio[#3]	04	38,005	-	-
Zero Volts/Ratio[#3]	04	38,006	-	-
Cal Volts[#3]	04	38,007	-	-
Cal Bottle[#3]	04	38,008	-	-
Zero Date	04	38,009	-	Bits 0-4=Day Bits 5–8=Month Bits 9-15=Year
Cal Date	04	38,010	-	Bits 0-4=Day Bits 5–8=Month Bits 9-15=Year
Type	04	38,011	-	Channel Type, see: “2Wire Serial Communication Protocol Vxx”
Software Version	04	38,012	-	x1000 e.g. 3100 is V3.100
Range	04	38,013	-	-
Status	04	38,014	-	Same as Register 33,xxx
HUB V5.100 onwards	-	-	-	-
Address and Cable	04	38,015	-	LSB=Address MSB=Cable
Alarm1 Level[#3]	04	38,016	-	-
Alarm2 Level[#3]	04	38,017	-	-
Alarm3 Level[#3]	04	38,018	-	-
AL1&2 Alarm Type[#9]	04	38,019	-	Bits0-7 = AL1 Type Bits8-15 = AL2 Type

Read Relay Commands	Fn	Register	Sensor	Returned Word
Read Relay Status[#12]	04	39,001 to 39,999	1 to 999	Bit0 = Enabled Bit1 = Active Bit2 = Comms Fault Bit3 = Normally Energised

Write Commands	Fn	Register	Sensor	Returned Word
Mute All Alarms	05	1	ALL	Pass = 0 Fail = 1
Reset All Alarms	05	2	ALL	Pass = 0 Fail = 1
Enter Inhibit Mode (1 Hour Timeout)[#12]	05	3	N/A	Pass = 0 Fail = 1
Disable Sensor	05	1,001 to 1,999	1 to 999	Pass = 0 Fail = 1
Enable Sensor	05	2,001 to 2,999	1 to 999	Pass = 0 Fail = 1
Zero Sensor[#6]	05	3,001 to 3,999	1 to 999	Pass = 0 Fail = 1
Cal Sensor (Existing Cal Bottle)	05	4,001 to 4,999	1 to 999	Pass = 0 Fail = 1

Write Sensor Channel Commands	Fn	Register	Tx Data (Word)	Returned Word
-	-	-	-	All commands: If Fails Rx = 0
Set Sensor Channel	06	7,001	Sensor Channel (0=Disable)	Sensor Channel
Enable Sensor	06	7,002	Sensor Channel	Sensor Channel
Disable Sensor	06	7,003	Sensor Channel	Sensor Channel
Zero Sensor	06	7,004	Sensor Channel	Sensor Channel
Cal Sensor (Existing Cal bottle)	06	7,005	Sensor Channel	Sensor Channel
Cal Sensor (New Cal bottle[#3]) (Current Sensor Channel)	06	7,006	Cal Bottle[#3]	Cal Bottle[#3]
Set Year	06	7,007	0 to 99	Pass = 0 Fail = 1
Set Month/Date	06	7,008	MSB = month LSB = date (Month * 256) + date	Pass = 0 Fail = 1
Set Hours	06	7,009	-	Pass = 0 Fail = 1
Set Minutes/Seconds	06	7,010	-	Pass = 0 Fail = 1

NOTE 1 - Lengthy Commands
As part of normal operation, Panel will not reply to all requests, Remote system must account for this.

NOTE 2 - Scaling
T700+ V3.01 and earlier and T750.

T700 Range	Offset	Multiplier	Min Value	Max Value
ALL	-100	0.1	0 = -10ppm	1200 = 110ppm

E.g. Modbus Register = 1234, Conc = (1234 – 100) * 0.1 = 113.4

T700+ V3.02 and later

T700 Range	Offset	Multiplier	Min Value	Max Value
> 10,000	-1000	10.0	0 = -10,000ppm	12,000 = 110,000ppm
1,001 to 10,000	-1000	1.0	0 = -1,000ppm	12,000 = 11,000ppm
101 to 1000	-1000	0.1	0 = -100ppm	12,000 = 1,100ppm
91 to 100	-100	0.1	0 = -10ppm	1200 = 110ppm
1 to 90	-1000	0.01	0 = -10ppm	12,000 = 110ppm

NOTE 3
Scaling (T700+ V3.10 & later, T920 HUB V4.84 & later, T750 V1.200 & later)
(Modified IEEE 754 Half Precision)

Bits 0-9 = 10bits = Value (LSBit = Bit0)
Bits 10-14 = 5bits = Multiplier (LSBit is Bit10)
Bit 15 = 1bit = Sign (0 = +ve, 1=-ve)

Value = 0-1023
Multiplier = 2 raised to Exponent -20
Min Multiplier = 0, 20-20 = 2-20 = 0.000000954
Max Multiplier = 31, 231-20 = 2+11 = 2048

E.g.1 Modbus Register = 0x18D2, 6354
Value = 210
Mult = 6 = 26-20 = 2-14 = 0.0000610
Sign = 0
Conc = 210 * 0.0000610 * 1 = 0.0128

E.g.2 Modbus Register = 0x7401, 29697
Value = 1
Mult = 29 = 229-20 = 29 = 512.0
Sign = 0
Conc = 1 * 512 * 1 = 512.0

E.g.3 Modbus Register = 0xF01F, 61471
Value = 31
Mult = 28 = 228-20 = 28 = 256.0
Sign = 1
Conc = 31 * 256 * -1 = -7936.0

NOTE 4
Only on T640 V1.35 and later

NOTE 5
Only on T750, T650, T635+, T750+

NOTE 6
Not on T750 and T650

NOTE 7
Only on T750 and T650 V3.100 or later

NOTE 8
Only on T750+ and T635+

NOTE 9 - Alarm Action

DISABLED	-	0
RISING	LATCHING	1
RISING	NONLATCHING	2
FALLING	LATCHING	3
FALLING	NONLATCHING	4

NOTE 10 - Sensor Volts
Only for hub on-board sensors (total 4)

NOTE 11
Only on T750+ SW from V5.203 onwards

NOTE 12
Only on T750+ SW from V5.300 onwards

NOTE 13
Only on T750+ SW from V5.303 onwards. Not implemented otherwise.

2: Communications Protocol

Parameter	Setting
1: Modbus Mode	RTU Mode Only
2: Operating Mode	Slave Mode Only
3: Response Time[#1]	Maximum = 100mS (5s for Zero Command)
4: Requests	Maximum = 32 per Second
5: Panel Address	100 to 131 (100=default)
6: Baud Rate	**T700:** 4800, 9600, 19200 (19200=default) **T920:** 4800, 9600, 19200 (19200=default) **T750:** 9600,19200 (Default), 57600 & 115200
7: Start Bits 1	1
8: Data bits 8	8
9: Parity	T700: None only T920: None(default) , Odd, Even T750: None only
10: Stop	1
11: Flow Control None	None
12: Physical Interface	2 Wire RS232, 2 Wire RS485 (2 Wire RS485=Optional on T900)
13: Bit Order	Least significant bit transmitted first
14: Byte Order	Most significant byte transmitted first
15: Inter-byte Spacing	Maximum = 1.5 bytes times (781uS @ 19200 Baud)
16: Inter-packet Spacing	Minimum = 3.5 bytes times (1823uS @ 19200 Baud)
17: Maximum No. of Registers (n) (Per Command)	**T700** = 16 **T920** = 32 **T750** = 40

Packet Format: BMS / PC to Analyser - Single Register Read

Slave Address	Function	Data	CRC
100 to 131	1 Byte	2 Bytes	2 Bytes

Packet Format: Analyser to PC / BMS - Single Register Read

Slave Address	Function	Data	CRC
100 to 131	1 Byte MSB set if an error	2 Bytes	2 Bytes

Packet Format: BMS / PC to Analyser - Multiple Register Read

Slave Address 100 to 121	Function	Start Register MSB First	No. of Regs (n) MSB First	CRC
1 Byte	1 Byte	2 Bytes	2 Bytes	2 Bytes

Packet Format: Analyser to PC / BMS – Multiple Register Read

Slave Address 100 to 131	Function	Data Byte Count	No. of Regs (n) MSB First	CRC
1 Byte	1 Byte	1 Byte	2 x (n) Bytes	2 Bytes