LumaSense™
TECHNOLOGIES

Interface Manual

1314i Photoacoustic Gas Monitor

1412i Photoacoustic Gas Monitor

3434i SF6 Leak Detector

BB6032-13

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1314i Photoacoustic Gas Monitor, 1412i Photoacoustic Gas Monitor and 3434i SF6 Leak Detector

From:
1314i Serial number: 702-130
1412i Serial number: 713-500
3434i Serial number: 952-110

April 2017

About this Interface Manual

This manual describes the programming and operation of the serial and parallel interfaces of the 1314i Photoacoustic Gas Monitor, 1412i Photoacoustic Gas Monitor and 3434i SF6 Leak Detector.

Although the physical aspect of cabling is touched on in this manual, it is assumed that users are familiar with the manual operation of the Gas Monitor, as described in the Instruction Manuals.

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Safety Considerations.

The 1314i Photoacoustic Gas Monitor, 1412i Photoacoustic Gas Monitor and 3434i SF6 Leak Detector complies with:

Throughout this manual Monitor is used for above mentioned instruments.

The Monitor complies with:

- EN/IEC 61010-1, 3rd Edition: Safety requirements for electrical equipment for measurement, control and laboratory use.

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- Can/CSA-C22.2 No. 61010-1-04 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.

- UL Std. No. 61010A-1 (3rd Edition) - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.

SAFETY SYMBOL

The apparatus will be marked with this symbol when it is important that the user refer to the associated warning statement given below.

To ensure safe operation and retain the Monitor in safe condition, note the following:

Power Cord must be detached before removing the enclosure.

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EXPLOSION HAZARD!
TO AVOID THE POSSIBILITY OF AN EXPLOSION; MONITORING OF FLAMMABLE GASES IN EXPLOSIVE CONCENTRATIONS MUST NEVER BE ATTEMPTED.

Never operate the Monitor in potentially explosive environments.

When monitoring potentially flammable or toxic gases it is essential that:

- The instrument itself is placed in a well-ventilated area outside the potentially hazardous zone.

- A sufficiently long tube is connected to the air-outlet on the back panel so that the sampled gas is carried away to the open air or to an extraction and/or filtration unit.

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Environmental Conditions for transport and storage:

Temperature: -25 to +55°C
Relative Humidity: 0 to 80% RH
Atmospheric Pressure: 800 to 1060 hPa

Warnings!

- Avoid water condensation in the instrument.

- Switch off all equipment before connecting or disconnecting their digital interface. Failure to do so could damage the equipment.

- Do not position the equipment in a way preventing the ability to unplug the cable on the back-panel.

- Whenever it is likely that correct function or operating safety of the apparatus has been impaired, the apparatus must be made inoperative and secured against unintended operation.

- Any adjustment, maintenance and repair of the open apparatus under voltage must be avoided as far as possible and, if unavoidable, must be carried out only by trained personnel.

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- If a fault is reported by the monitor that indicates correct function of the instrument may be impaired, consult your local LumaSense Technologies representative. Under no circumstances should repair be attempted by persons not qualified in service of electronic instrumentation.

- Use of the Monitor in a manner not specified by the manufacturer may impair the protection provided by the equipment

Applying Power

Connecting the mains supply.

The Monitor is operated from 50 to 60 Hz single phase AC mains supply. Voltage 100 to 240 Vac.

Before using the Monitor check that the available mains voltage match the specified voltage and frequency for the instrument.

Use the power Cord delivered with the Monitor or check that the Cord used is rated minimum 10A/250V with protective earth.

SAFETY SYMBOLS

Frame or Chassis   ⚡ Dangerous voltage   ⏚ Protective earth

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Chapter 1

Physical Level of the Interface

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1.1 The Monitor's Interface Ports

The interface ports, USB, Ethernet (TCP/IP) and RS-232 are located on the rear panel of the Monitor, see Fig. 1.1.

Fig. 1.1 The interface connections on the rear panel of the Monitor

WARNING! Before connecting any cables to the Monitor, ensure that the power to the Monitor is turned off. Cabling to the Monitor is covered in more detail in the Instruction Manual.

1.2 The USB Interface

The USB interface is designed in accordance with the USB specification, revision 2.0 (Full-speed).

It supports hot plugging and dynamic configuration of the device, meaning that Gas Monitor device can be connected to a USB cable while power is on.

The USB interface of the Monitor acts as a device controller, thus it can be connected to an USB host controller (typically in a PC), through an USB cable.

Interface Connector

The interface connector Fig. 1.3 is a Standard Type B USB connector. It is located on the rear panel of the Monitor as shown in Fig. 1.1. Next to interface connector the USB interface symbol is displayed, as shown in Fig. 1.2. Pin definitions are given in Table 1.1.

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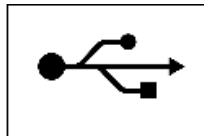
Fig. 1.2 The USB interface symbol
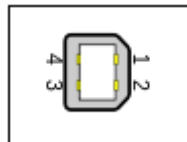
Fig. 1.3 The USB interface connector of the Monitor

Pin	Name	Cable color	Description
1	VBUS	Red	+5 V
2	D−	White(Gold *)	Data −
3	D+	Green	Data +
4	GND	Black(blue*)	Ground

- *Some manufacturers use

Table 1.1   Pin definitions of the USB interface

1.2.1 Interconnection

The USB data cable between the Gas Monitor and the PC provides, according to the USB 2.0 standard, a maximum cable length of 5 meters.

The cable connector at the PC end is a Standard A-plug and at the Gas Monitor end a Standard-B plug, as shown in Fig. 1.4.
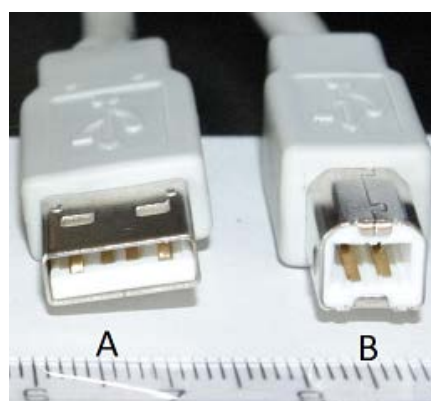
Fig. 1.4 Standard USB plugs of type A and B

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1.2.2 Interface Set-up

The interface is set-up by installing the "Lumasense 1412i USB driver" on the host PC, which communicates with the Gas Monitor.

The "Lumasense 1412i USB driver" is part of the installation of the LumaSoft Gas 7810 Singlepoint and the 7870 Multipoint application software.

The "Lumasense 1412i USB driver is based on the WINUSB driver from the Windows Driver Kit (WDK).

1.3 The Ethernet (TCP/IP) Interface

The Ethernet interface features a Fast Ethernet transceiver (transmitter and receiver). It is fully compliant with the IEEE 802.3u specification for Fast Ethernet at 100 Mbit/s.

It automatically detects the required cable connection type and configures the connection appropriately, supporting both straight-through and crossover Ethernet (TCP/IP) cables.

Interface Connector

The interface connector Fig. 1.6 is a standard RJ45 Ethernet connector. It is located on the rear panel of the Monitor as shown in . Next to interface connector, the Ethernet interface symbol is displayed, as shown in Fig. 1.5.
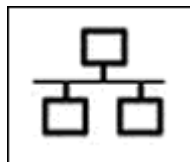
Fig. 1.5 The Ethernet interface symbol

The Amber LED indicates that the Gas Monitor is connected to an Ethernet network.

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The Green Led indicates data activity on the Ethernet connection.
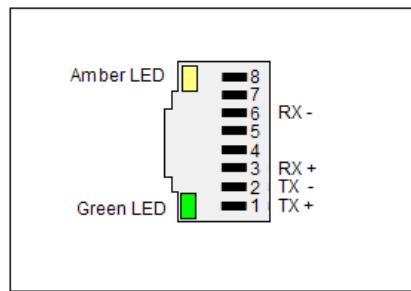
Fig. 1.6 The Ethernet interface connector of the Monitor

1.3.1 Interconnection

The Ethernet cable between the Gas Monitor and the Ethernet network should be a Category 5 cable (Cat 5).

Fig. 1.7 Category 5 Ethernet cable

The maximum length allowed for the Ethernet cable is 100 meters.

1.3.2 Interface Set-up

The Set-Up tree enables you to specify the Ethernet (TCP/IP) interface set-up of the Monitor. The selections are: SET-UP — CONFIGURATION — SYSTEM — COMMUNICATION — ADDRESSABLE — TCP/IP.

WARNING! You must partially reset the Monitor if the TCP/IP configuration is changed. See the Instruction Manual for details.

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IS 1412i/1314i/3434i's IP ADDRESS SET BY DHCP?

This determines whether the IP address of the Monitor is fixed or if the IP address is set by DHCP.

DHCP is a server on the Ethernet network who automatically assigns IP addresses to Ethernet devices on the network.

1412i/1314i/3434i's IP ADDRESS

If the IP address is not set by a DHCP server (as selected in the previous setup) the IP address of the Monitor can be entered manually.

1412i/1314i/3434i's IP PORT NUMBER:

The IP port number where communication between the Monitor and host PC goes through. The default port number is 23.

PROTECTED IP ADDRESS

This sets the IP address of the host PC, who is allowed to communicate with the Gas Monitor.

If the value is 000.000.000.000 the any host PC is allowed to communicate with the Gas Monitor.

CURRENT IP ADDRESS

This is shown if the IP address is set by the DHCP server. It tells which IP address have been assigned to the Gas Monitor by the DHCP server.

1.3.2 The Homepage of the Gas Monitor

The homepage of the Monitor can be displayed if the Monitor is connected to a Ethernet (TCP/IP) network.

Any web browser can be used to display the homepage of the Gas Monitor. The IP address obtained from the TCP/IP set-up of the Monitor can be entered in the address field of the web browser in order to display the homepage.

The last measured gas values are displayed together with information about the Gas Monitor, like the device serial number, if water- and cross-compensation is performed.
Error and warning messages will also be displayed on the homepage.

The grey "Update Measurements" link can be used to update the homepage with the last measurement results.

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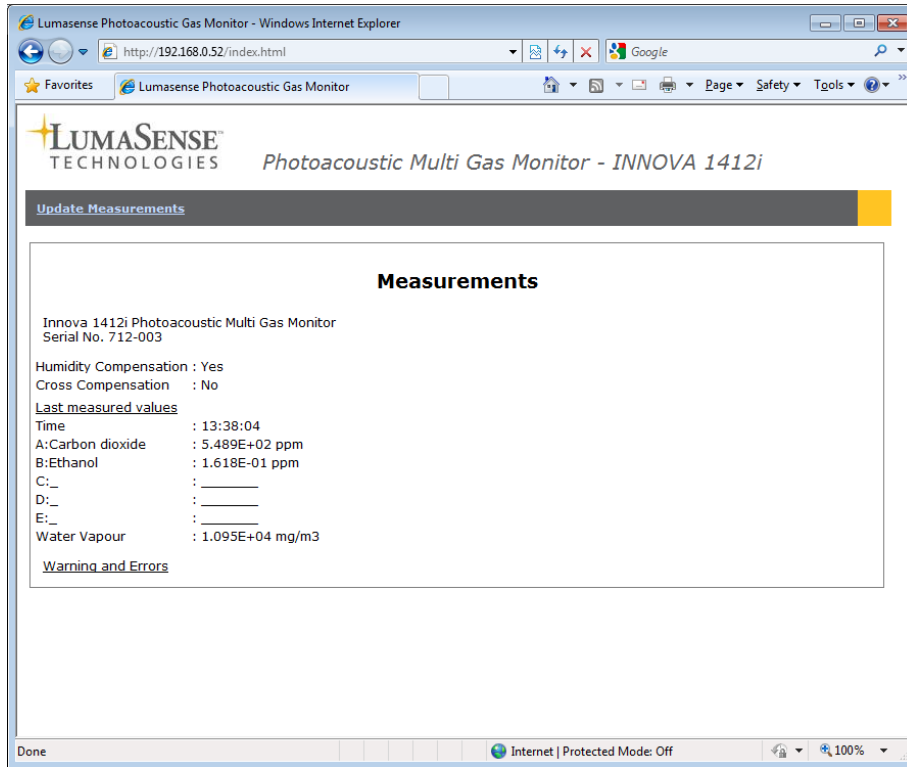
Fig. 1.8 The 1412i Gas Monitor homepage

1.4 The RS–232 Interface

The interface of the Monitor conforms with the EIA standard RS–232, which is equivalent to the CCITT V.24 recommendation.

The interface is coupled as "Data Terminal Equipment" (DTE), and it operates in full duplex mode, which means that the interface is capable of operating in both directions simultaneously.

Interface Connector

The interface connector is a 9-pin D-range male connector. It is located on the rear panel of the Monitor as shown in Fig. 1.1. Fig. 1.9 shows the numbering of the pins. Pin definitions are given in Table 1.2.

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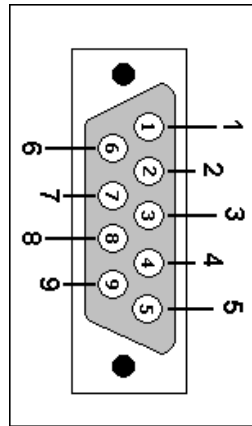
Fig. 1.9 The RS-232 interface connector of the Monitor

Pin No.	RS–232	CCITT V.24	Description	Mnemonic	Direction
Shield	AA	101	Protected Ground	P GND	—
3	BA	103	Transmitted Data	TxD	From Monitor
2	BB	104	Received Data	RxD	To Monitor
7	CA	105	Request to send	RTS	From Monitor
8	CB	106	Clear to send	CTS	To Monitor
6	CC	107	Data Set ready	DSR	To Monitor
5	AB	102	Signal Ground	S GND	—
1	CF	109	Data Carrier Detect	DCD	To Monitor
4	CD	108.2	Data terminal Ready	DTR	From Monitor

Table 1.2   Pin definitions of the RS – 232 interface

Data Lines

Pins 2 and 3, Transmitted Data and Received Data, are data lines. For data lines, RS–232 specifies that:

- A voltage below –3V signifies a binary 1

- A voltage above +3V signifies a binary 0

- When a data line is passive, it is held in the binary 1 condition.

Data transmission is asynchronous as shown in Fig. 1.10.
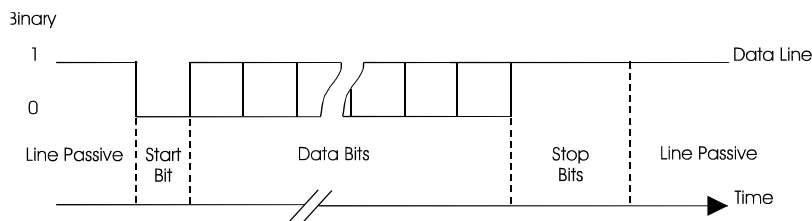
Fig. 1.10 Asynchronous transmission of character data

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The data is transmitted in the form of ASCII codes. All ASCII codes given in the following text are decimal numbers.

Control Lines

Pins 4, 5, 6, 8 and 20 are control lines. For control lines, RS–232 specifies that:

- A voltage above +3V signify the "on" state.
- A voltage below –3V signifies the "off" state.

The use of the control lines is described in section 1.4.2.

1.4.1 Interconnection

A null-modem cable must be used to interface the Monitor to another DTE-coupled device (computer or printer), so that the DTEs appear to each other to behave like modems. The null-modem cross connections which should be used with the Monitor are given in Fig. 1.11.
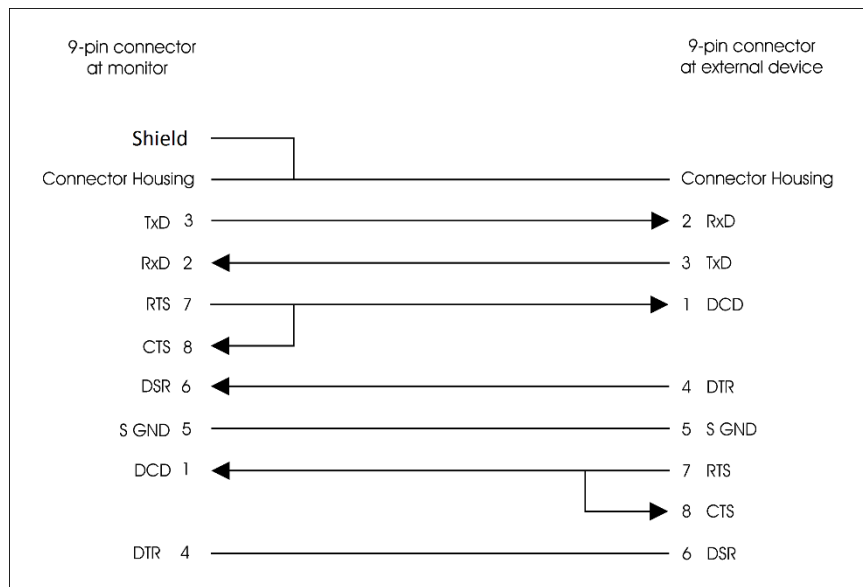
Fig. 1.11 Null-modem cable details (9-pin to 9-pin connectors)

1.4.2 Interface Set-up

The Set-Up tree enables you to specify the RS-232 interface set-up of the Monitor. The selections are :SET-UP — CONFIGURATION — SYSTEM — COMMUNICATION — RS–232–C.

WARNING! You must partially reset the Monitor if the RS–232 configuration is changed, for example, if the baud rate is changed. See the Instruction Manual for details.

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Baud Rate

The baud rate is the speed of data transmission. Possible baud rates are 300, 600, 1200, 2400, 4800 and 9600 bits/sec.

Parity

Checking the parity of a transmitted byte is a way of detecting transmission errors. Possible set-ups are:

- Even
- Odd
- None

Even (odd) parity means that a transmitted byte must contain an even (odd) number of binary 1's. To achieve this, one extra bit — the parity bit — is added to each byte transmitted. When "None" is selected, no parity check is performed.

Stop Bit

The stop bit is used to terminate a transmitted character (see Fig. 1.10). Together with the start bit, the stop bit frames the data bits and is used to synchronise data transmission. The Monitor can use either one or two stop bits.

Data Bit

The number of data bits determines how many bits are transmitted for every byte of data. Possible set-ups are 7 or 8 data bits to a byte.

Handshake Method

The handshake method is the method used by the Monitor and the external device to synchronize their transmissions. Three possible set-ups exist:

- X-On/X-Off handshake
- Hardwired handshake
- None

When X-On/X-Off handshake is used, the Monitor transmits the X-Off character (ASCII 19) when it can handle no more input data. When the Monitor is once again ready to receive data, it transmits the X-On character (ASCII 17) over the interface. Similarly, when the Monitor receives an X-Off character during a transmission, it stops transmitting until it receives the X-On character. If the X-On character does not arrive within 30 seconds, the Monitor regards the transmission as aborted and issues a time-out warning.

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In Hardwired-handshake mode, the Monitor sets the DTR control line (pin 20) off when it will accept no more data. When it is ready to receive more data, the DTR line is set on. When the external device sets the DSR control line (pin 6) off, the Monitor stops transmitting until DSR goes back on. If the DSR line remains off for more than 30 seconds, the Monitor issues a time-out warning.

If "None" is selected, handshaking is disabled.

If either "Hardwired" or "None" is selected and the external device attempts to use X-On/X-Off handshaking, the Monitor displays a warning. Similarly, if "X-On/X-Off" or "None" is selected and DSR is set off by the external device, a warning will appear.

Hardwire Mode

This parameter determines how the Monitor uses the control lines of the interface. Three set-ups exist:

- 3–Wire mode
- Switched–Line mode
- Leased–Line mode

In 3–wire mode, only the data lines are used. All control lines are ignored.

This means that X-On/X-Off handshake is the only handshake method available.

In Switched–Line mode, the CTS and DSR control lines are monitored. If one of the two control lines is set off, data transmission from the Monitor is blocked. It is recommended that the external device uses the DSR line for handshaking.

In Leased–Line mode, the CTS, DSR and DCD control lines are monitored. CTS and DSR have the same effect as in Switched-Line mode. If the DCD input control line goes off, the Monitor ignores all incoming data.

1.4.3 Transmission Interrupt

If the Monitor receives a Ctrl-C (ASCII 3) character over the interface during transmission of data, the transmission will be aborted.

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Chapter 2

Interface Messages

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2.1 List of Interface Messages

For remote control of the Monitor over the USB, Ethernet (TCP/IP) or RS-232 interface bus, various interface messages can be specified, a list of which is given in .

For the respective interfaces (USB, Ethernet (TCP/IP) or RS-232) it is specified which interface commands are available.

Please note that the commands for the USB and Ethernet (TCP/IP) interface, are available only in the "Minimum code" format.

Alphabetical list of interface messages						
	Minimum code	Input Job	Output Job	USB	Ethernet (TCP/IP)	RS-232
ACCEPT_CALIBRATION	A_C	I				R
ACCEPT_MESSAGE	A_M	I	O	U	E	R
ALARM_START	A_STA	I				R
ALARM_STOP	A_STO	I				R
CONTROL_SRQ	CO_SRQ	I	O	U	E	R
CURRENT_FILTER	C_F	I	O			R
CURRENT_SETUP	CU_SE	I	O			R
DELETE_MEASUREMENT	D_M	I				R
DHCP	DHCP?	I	O	U	E	R
DISPLAY_AVERAGE	D_A	I	O	U	E	R
DISPLAY_STATE	D_S	I	O	U	E	R
ERROR_STOP	ER_S	I				R
EXECUTE_STATE?	EX_S?		O	U	E	R
EXTENDED_CONTROL	E_C	I		U	E	R
IDENTIFICATION?	*IDN?		O	U	E	R
IDENTIFY?	ID?		O	U	E	R
IDENTIFY? CONFIGURATION	ID? CON		O	U	E	R
INTERFACE _ENTER?	I_E?		O	U	E	R
INTERFACE_OUTPUT	I_O	I		U	E	R
IP_ADDRESS	IP_ADDR	I	O	U		R
IP-PORT	IP_PORT	I	O	U		R
KEYBOARD_LOCKOUT	K_L	I	O	U	E	R
MEASURED_AIR_PRESSURE	M_A_P	I	O	U	E	R
MEASUREMENT_STATE	M_S		O			R
OUTPUT_CALIBRATION_DATA?	O_C_D?		O			R
OUTPUT_MEASUREMENT?	O_M?		O	U	E	R
OUTPUT_SETUP_DATA?	O_SE_D?		O			R
OUTPUT_SPECIAL_COMPILATION ?	O_SP_C?		O	U	E	R
PAUSE_MEASUREMENT	PAUSE_M	I	O			R
POP_UP_DISPLAY_BUFFER?	P_U_D_B?		O	U	E	R
PROTECTED IP ADDRESS	PROTECT	I	O	U		R
RECALL_MEASUREMENT	R_M	I				R
RELAY	R	I	O			R
REMOTE_DISPLAY_BUFFER	R_D_B	I	O	U	E	R
RESET_COMMAND	*RST	I		U	E	R

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RESET_STATUS_BYTE	R_S_B	I		U	E	R
RESET_SYSTEM	RESET_SY	I		U	E	R
SELF_TEST?	*TST?		O			R
SERVICE_REQUEST_ENABLE	S_R_E	I	O	U	E	R
SETUP	SE	I	O	U	E	R
SOFTWARE_IDENTIFICATION?	S_I?		O	U	E	R
START_CALIBRATION	STA_C	I				R
START_DELAYED_MEASUREMENT	S_D_M	I				R
START_MEASUREMENT	STA_M	I		U	E	R
STATUS_BYTE?	*STB?		O	U	E	R
STOP_MEASUREMENT	STOP_M	I		U	E	R
STORE_DEFAULT	STOR_D	I				R
STORE_MEASUREMENT	STOR_M	I				R
SYNCHRONIZE	SY	I	O	U	E	R
SYNCHRONIZED_MODE_CONTINUOUS_PUMP	SY_CON	I	O			R
SYSTEM_DISPLAY_BUFFER?	SY_D_B?		O	U	E	R
TIME_SINCE_RESET?	T_S_R?		O			R
UNPROTECT	UNPROTECT	I		U		R
ZDLOG	ZDLOG	I	O	U	E	R

Table 2.1   List of interface messages

2.2 Message Format

The same message format is used for programming the USB, Ethernet and RS-232. interfaces. Differences in individual messages are described in the relevant section for that message.

Four types of interface messages are possible: Command Messages, Command Messages with one or more parameters, Request Messages and Request Messages with one or more parameters. The syntax for these messages are very similar, each is illustrated below together with an example:

	Description
MESSAGE	This is the interface message
HS	This is the "Header Separator". A <SPACE> is always used, and must be inserted between the header the first parameter field.
PARAMETER	Some message and request commands require some parameters to be sent with them.
TE	The default terminator for the Monitor is <LF>. **Note:** when programming the Monitor via the interface, it sends data as a series of one or more text lines. Each of these lines is terminated by a "text line terminator". This can be changed using the Setup command. There are three possibilities: <LF>, <CR> or <CR><LF>. When the Monitor has finished sending data (all the text lines) the final terminator is sent. This is the same as the "Message Terminator".
BLOCK DATA	This defines the way in which block data is transferred to the Monitor. The block data fields conform to the general block data format as defined by ANSI/EEE Standard 488.2. It takes the form: #C n..n [n..n data bytes] C gives the number of characters in the following block length, and is an integer between 1 and 9 inclusive. e.g. #4 1200 [1200 data bytes]
NRX	These are numbers according to the IEEE−488 standards, where x can be 1, 2, or 3. NR1 is always an integer. NR2 is real without exponential. NR3 is real with an exponential.
Protected xx	Some messages are protected. This means the message will only be recognised by the Monitor if it is "unlocked". Unlocking the Monitor is done using the Extended_Control message, see [section 2.3.13](#). **Note:** you must unlock the message each time it is sent.

Table 2.2   Key to Syntax Messages

Command Messages:

```
Syntax:    [MESSAGE]—[Te]
```
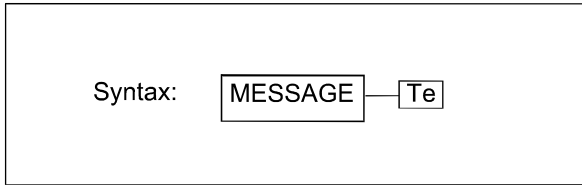
Example: A_M

Command Messages with Parameters:

```
Syntax:    [MESSAGE]—[Hs]—[PARAMETERS]—[Te]
```
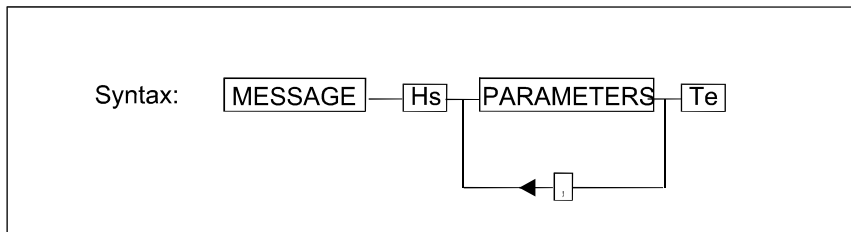
Example: C_L Y

Note: if several parameters need to be set, these are separated by a comma.

Request Messages:

```
Syntax:    [MESSAGE?]—[Te]

Output:    Readout —[Te]
```

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Request Messages with Parameters:

```
Syntax:   [MESSAGE?]—[Hs]   [PARAMETERS]—[Te]
                              [ ← ]

Output:   Readout —[Te]
```
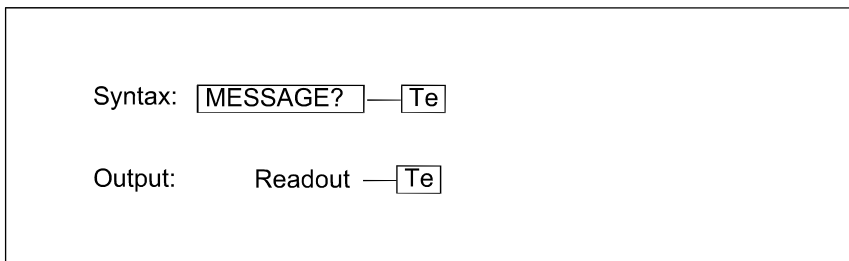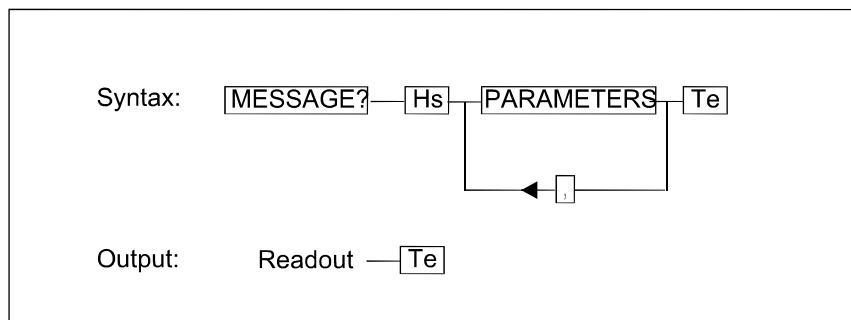
Example: CO_SRQ?   8

These standards will be used in the description of messages.

Message Note

The Monitor makes no distinction between the type of characters input. Messages can be input using upper- or lower-case characters.

For the USB and Ethernet (TCP/IP) interface only upper-case characters is allowed and the only "Minimum code" commands can be used (see Table 2.1).

2.3 The Individual Messages

2.3.1 ACCEPT_CALIBRATION

The command has minimum code **A_C** and excist only as input command. **A_C** has a similar function to pressing the Enter button on the front panel.

2.3.2 ACCEPT_MESSAGE

A_M? indicates if there is a message to acknowledge. **A_M** acknowledges the message. Corresponds to pressing "INFO" if there is a message.

2.3.3 ALARM_START

A_STA starts the Monitor's acoustic alarm.

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2.3.4 ALARM_STOP

A_STO stops the Monitor's acoustic alarm.

2.3.5 CONTROL_SRQ

CO_SRQ? reads out the event number, NR_1 (0..255), for the events that have been registered in the Event Register specified, NR_1 (1..8). **CO_SRQ?** can be followed by the character data parameter **MEM**ory.

CO_SRQ? NR1 provides a read out acknowledged by the SRQ register, while **CO_SRQ?** NR1, **MEM** provides a read out without acknowledging any changes to the register.

Examples using **CO_SRQ?**:
If the AVERAGE button has been activated on the Monitor.

CO_SRQ? 8 requests the number stored in register 8.   Output: **1**

This is because the bit number is set as a result of the event "key pressed". See Table 2.3 to Table 2.7.

CO_SRQ sets the specified Event Enable Register. The first number, NR_1 (1..8), is the register number. The second number, NR_1 (0..255), is a bit-mask that tells which occurrence can generate SRQ.
For example: **CO_SRQ 8,12**

The number 12 is written into Register 8 (Special Event Enable Register), setting bits 3 and 4, so that whenever the air pump is started and stopped a Service Request is generated. See Table 2.3 to Table 2.7 for a description of the registers.

Note: Register 5, Register 6 and Register 7 are not used.

Register 1 (Data Ready Register)		
Bit no.	Decimal no.	Bit name
1	1	Sample Data Ready
2	2	Measurement Task Data Ready
3	4	Calibration Data Ready
4..8		Not used

Table 2.3   The contents of Register 1

Register 2 (Reset Activated Register)		
Bit no.	Decimal no.	Bit name
1..8		Not used

___

Table 2.4   The contents of Register 2

Register 3 (Command Completed Register)		
Bit no.	Decimal no.	Bit name
1	1	Input/Output Command Finished
2	2	Measurement Task Finished
3	4	Calibration Finished
4	8	Setup Operation Finished
5	16	Memory Operation Finished
6	32	Print Finished
7..8		Not used

Table 2.5   The contents of Register 3

Register 4 (Error Register)		
Bit no.	Decimal no.	Bit name
1	1	Error in Self-test Detected
2..6		Not used
7	64	HW Error Detected
8	128	SW Error Detected

Table 2.6   The contents of Register 4

Register 8 (Special Event Register)		
Bit no.	Decimal no.	Bit name
1	1	Key Pressed
2	2	Synchronize Required
3	4	Pump Started
4	8	Pump Stopped
5	16	Sample Measurement in Progress
6	32	Bus Control Requested
7	64	SRQ Button Activated
8	128	Self-test Running

Table 2.7   The contents of Register 8

2.3.6 CURRENT_FILTER

C_F? reads out the "filter id". This indicates which filter (gas) is currently in use.

For example: If the Monitor is using the water filter, **C_F?** will cause the Monitor to output F_W.

C_F determines which filter (gas) is displayed.

For example: **C_F,F_A** causes filter (gas) A to be displayed.

_____

2.3.7 CURRENT_SETUP

CU_SE? reads out the number of the active "Measurement Task" on the display. The output from the Monitor will be an integer, NR_1 (1..10).

CU_SE defines which "Measurement Task" will be active.
For example: **CU_SE 5** defines that measurement task 5 is active.

2.3.8 DELETE_MEASUREMENT

D_M erases the contents of the defined Memory Location, NR_1 (1..10), from the background memory.

2.3.9 DHCP

DHCP?   Reads out the Monitors IP address set by the DHCP server
         i.e. DHCP? Responds: 192.168.000.092

2.3.10   DISPLAY_AVERAGE

D_A? indicates the state of the average function. The output from the Monitor can be **Y**es (average function is active) or **N**o (average function is inactive).

D_A followed by a **Y**es or a **N**o defines the state of the average function.

2.3.11   DISPLAY_STATE

D_S? indicates which display buffer is being displayed on the Monitor. The output (display id) from the Monitor is one of the following:

POp_**U**p   Used for error/status/reset messages.
REMote   The content is chosen via interface.
SYstem   Default display.

/***** PROTECTED 1 *****/

D_S selects the display buffer to be read out on the display.

For example, when:
D_S SY is typed, the Monitor will read out "SY" to the controller during normal system, display.

_____

_____

2.3.12   EXECUTE_STATE?

EX_S? requests a status of the Monitor. The output from the Monitor can come as one NR_1 or two NR_1s. The first NR_1 gives a general description of the current status of the Monitor.

Output no. (NR_1)	Name	Description
0	Display_Run	Normal idle state
5	Meas_Clean_Up	Just after stop measurement
6	Meas_Count_Down	Waiting for time to run out
7	Meas_Init_Mode	Measurement mode selected
8	Meas_Run	Measurement running
9	Calib_Run	Calibration running
10	Memory_Run	Memory mode related
11	Pause_Measurement	Monitor in Pause mode
12	Print_Menu	Print selected but not started
14	Print_Run	Print in progress
15	Setup_Run	Setup mode selected
16	Test_Run	Test mode

Table 2.8   The meaning of the output from EXecute_State?

The second NR_1 is used only if the first NR_1 indicates that the Monitor is calibrating. It describes the calibration procedure. The key to the first integer, NR_1, is shown in Table 2.8.
The second integer, given when the Monitor is calibrating, indicates one of the following:

0	No error occurred
1	Warning(s) detected
2	Errors detected

2.3.13   EXTENDED_CONTROL

E_C is used to gain access to a protected message. The **E**xtended_**C**ontrol message must be send prior to and every time a protected message is sent.

For example, the **SY**NCHRONIZE message is a "protected 59" message. E_C 59 must be send Prior to sending the message. i.e.

E_C 59
SY

_____

These messages send the synchronization to the Monitor.

Note: Protected Messages in this manual are identified with
/***** protected 59*****/(see section)

2.3.14   IDENTIFICATION?

*IDN? gives the identification of the instrument in the following format:

B&K,1412,ssss,VPxxxx
or
B&K,1314,ssss,VPxxxx

where:

ssss string of max 10 characters containing the serial number.

xxxx software revision number.

If a 1409 Multipoint Sampler is connected to the Gas Monitor, the number of channels will be added to the IDN respond, given the following format for a 1409-12, as an example.

B&K,1412,ssss,VPxxxx,12

See appendix ? for further commands to 1409

2.3.15   IDENTIFY?

ID? gives the identification of the instrument in this format:

LUMASENSE 1412
or
LUMASENSE 1314

2.3.16   IDENTIFY? CONFIGURATION

ID? CON gives the identification of the instrument including its
configuration. The format is:

LUMASENSE 1314 5 REMOTE ANALOG 12

Where:

1314	is the gas monitor type
5	is the no. of gasses (1, 2 or 5)
REMOTE	is shown if the front panel is not present
ANALOG	is shown if the UA1373 Analog interface module is installed
12	is the no. of 1409 channels and is shown if a 1409 is connected

A 1314i-1 with an analog output module and a 1409-6 connected will
respond:
LUMASENSE 1314 1 ANALOG 6

2.3.17   IP Address

IP_ADDR x,x,x,x   set the Monitors IP address
(i.e. IP_ADDR 168,168,001,126)

IP_ADDR?   Reads out the Monitors IP Address
(i.e. 192.168.001.126)

2.3.18   IP Port

IP_PORT x   Sets the Monitors IP Port number (i.e. IP_ADDR 23)

IP_PORT?   Reads out the Monitors IP Port

2.3.19   KEYBOARD_LOCKOUT

K_L?   indicates whether the front panel push-buttons of the Monitor are locked.

K_L   followed by a parameter **Y** locks or **N** unlocks the front panel push-buttons of the Monitor.

2.3.20   MEASURE_AIR_PRESSURE

The atmospherical air pressure is measured during reset, measurement, calibration or by the command **M**easure_**A**ir_**P**ressure.

M_A_P   starts an atmospherical air pressure measurement.

M_A_P?   reads out the atmospherical air pressure.

2.3.21   MEASUREMENT_STATE?

M_S?   indicates whether the Monitor is measuring. The Monitor's output can be Y, it is measuring, or N, it is not measuring.

2.3.22   OUTPUT_CALIBRATION_DATA?

O_C_D?   provides a readout of calibration data from the Monitor in ASCII form. When issuing the interface message, the command parameter can be one of the following:

ALl   Data for all filters

Filter**_A**   Data for filter A

Filter**_B**   Data for filter B

Filter**_C**   Data for filter C

Filter**_D**   Data for filter D

Filter**_E**   Data for filter E

Filter**_W**   Data for filter W

For example, to get a read out of the calibration data for all the filters, type:

O_C_D? AL

_____

2.3.23   OUTPUT_MEASUREMENT?

O_M? provides a readout of measurement data from the Monitor in ASCII form. The **O_M?** command is followed by none or one of the following character data:

Alphabetical list of interface character data		
Data fields	Minimum code	Output Values
ALARM_LIMIT NUMBER 1	A_L, 1	NR1
ALARM_LIMIT NUMBER 2	A_L, 2	NR1
ALARMLOG	AL	"string"
ALARMLOG CHANNEL	AL,(0-24)	"string"
ALARMLOG CHANNEL NUMBER	AL,(0-24),n	"string"
ALARMLOG FILTER	AL,F_(A-W)	"string"
ALARMLOG FILTER NUMBER	AL,F_(A-W),n	"string"
ALARMLOG NUMBERS	AL,N	NR1
ALARMLOG NUMBERS CHANNEL	AL,N,(0-24)	NR1
ALARMLOG NUMBERS FILTER	AL,N,F_(A-W)	NR1
AIR_PRESSURE	A_P	NR2
BANK1	B	NR1
CHAMBER_FLUSH_TIME	C_F_T	NR1
CHANNEL	(0-24)	"string"
CONTINUOUS_SAMPLING	C_S	Y or N
CROSS_COMPENSATION	C_C	Y or N
DATE	DA	"string"
EVENT_MARK	E_M	NR1
FILTER	F_(A-W)	"string"
FIXED_TIME_FLUSH	F_T_F	Y or N
GAS_NAME1	G_N	"string"
MEMORY	MEM	NR1
MONITORING_MODE	M_M	Y or N
MONITORING_PERIOD	M_P	"string"
MULTIPLEXER CONTROLLER	M_C	Y or N
NORMALIZATION_TEMPERATURE	N_T	NR2
SAMPLE_INTERVAL	S_I	"string"
SAMPLE_INTEGRATION_TIME[1]	S_I_T,	NR1
TIME FRAME	T_F	"string"
TUBE_FLUSH_TIME	T_F_T	NR1
TUBE_LENGTH	T_L	NR2
USE CHANNEL	U_CH	Y or N
USE_FILTER	US_F	Y or N
USE_MEASURED_AIR_PRESSURE	US_M_A_P	Y or N
WATER_COMPENSATION	W_C	Y or N

Table 2.9   List of interface character data for use with O_M?

_____

When no character data follows, then **O_M?** reads out measurement data in ASCII form to the screen of the controller.

In some cases, the data character command must be clarified. For example, to obtain the Sample Integration Time for a specific filter (e.g. A) the command must be written as:

O_M? S_I_T,F_A   returns the sample integration time for filter A.

O_M? A_L,F_X,1   returns measurement alarm limit 1 for filter x.

O_M? A_L,F_X,2   returns measurement alarm limit 2 for filter x.

O_M? US_M_A_P   returns measurement printout including air pressure table.

O_M? X,Y,US_M_A_P
                     returns measurement samples including air pressure from filter number x to y.

O_M? 0,"yyyy-mm-dd","hh:mm:ss","yyyy-mm-dd","hh:mm:ss"
                     Returns the measurements in the display memory within the specified timeframe.
                     The channel number value at 0 is used when no multiplexer is connected and the gas monitor is not set the Multiplexer system controller.
                     The response will be the same as for the O_M? channel job shown below.

The following examples shows the use of O_M? messages when the Gas monitor is set to be the Multiplexer system controller:

O_M? M_C   Returns Y or N for Multiplexer system controller.

O_M? U_CH,1   Returns Y or N for if Channel 1 is used.

O_M? U_CH   Returns a list of all the channels activation status if the channel number is not specified.
                     i.e.
                     1,1,2,1,3,1,4,0,5,0,(etc. up to),24,0
                     Channel 1, 2 and 3 are in this case activated

O_M? T_F,1   Returns the measurement time frame for channel 1
                     eg. 2016-02-24 08:00:32 2016-04-15 07:47:26

O_M? T_F,O   Returns the measurement time frame for all channels.

O_M? 1,"yyyy-mm-dd","hh:mm:ss","yyyy-mm-dd","hh:mm:ss"
Returns the measurements from channel 1 in the display memory within the specified timeframe.
The monitor will return all measurements in the display memory if no timeframe is specified.

Eg.
10, 9
2015-12-01,07:46:23,443.15E-03,-,-,-,-,5.9372E+03,0,0,0,0,0,0,0,1,0,0

The format is:
Number of samples total,number of samples in each transmission block
Date, time, Gas A, Gas B, Gas C, Gas D, Gas E, Gas W,P,O,W,B,F,A,R,V,J,S

Gas monitor marks:
P   Power up flag
O   Operational error flag
W   Warning flag

Gas marks:
B   Bad result, Monitor incapable of calculating the Gas Concentration
F   Filter Alignment error
A   Alarm limit exceeded

Multipoint sampler marks:
R   Reset done flag
V   Power failed flag
J   Job error flag
S   Software error flag

O_M? F_A,"yyyy-mm-dd","hh:mm:ss","yyyy-mm-dd","hh:mm:ss"
Returns the measurements from Filter A in the display memory within the specified timeframe.
The monitor will return all measurements in the display memory if no timeframe is specified.

Eg.

18,10

2015-12-01,07:37:06,421.16E-03,-,0,0,0,0,0,0,0,0,0,0
2015-12-01,07:37:33,-,417.19E-03,-,0,0,0,0,0,0,0,0,0,0

The format is:
Number of samples total, number of samples in each transmission block

Date,time,Ch.1,Ch.2,(etc. up to),Ch.24,P,O,W,B,F,A,R,V,J,S
The marks are the same as for the O_M? channel job.

O_M? AL,N or **O_M? AL,N,0**
> Returns the total numbers of alarm events for all channels.

O_M? AL,N,1 Returns the total numbers of alarm events for channel 1.
O_M? AL,N,F_A Returns the total numbers of alarm events for Filter A.

O_M? AL or O_M? AL,0
> Returns the total alarm log for all channels.

O_M? AL,1 Returns the total alarm log for channel 1.

O_M? AL,1,10 Returns the 10 latest alarm events for channel 1.

O_M? AL,F_A Returns the total alarm log for Filter A.

O_M? AL,F_A,10
> Returns the 10 latest alarm events for Filter A.

The format is: date,time,channel,Gas,concentration

Eg.
2016-02-26,08:16:23, 9,Gas A,20.305E+03
2016-03-01,14:07:50, 1,Gas A,31.395E+03

2.3.24 OUTPUT_SETUP_DATA?

O_SE_D? reads out setup data from the Monitor in ASCII form. The parameter block, which defines what is readout can be one of the following:

ALl

COMmunication

CONfiguration

ENvironment

Chapter 2
_____

FIlters

FOrmat

General

MEAsurement

SYstem

Units

These names refer to the headings in the "setup tree". All data below these headings will be printed.

2.3.25   OUTPUT_SPECIAL_COMPILATION?

O_SP_C?   reads out specially compiled data from the Monitor in ASCII form. This command requires two parameters. The syntax is shown below.

```
Syntax:    [O_SP_C?]─[Hs]─[type]─[,]─[Filter id]─[Te]



Output:    Readout─[Te]
```
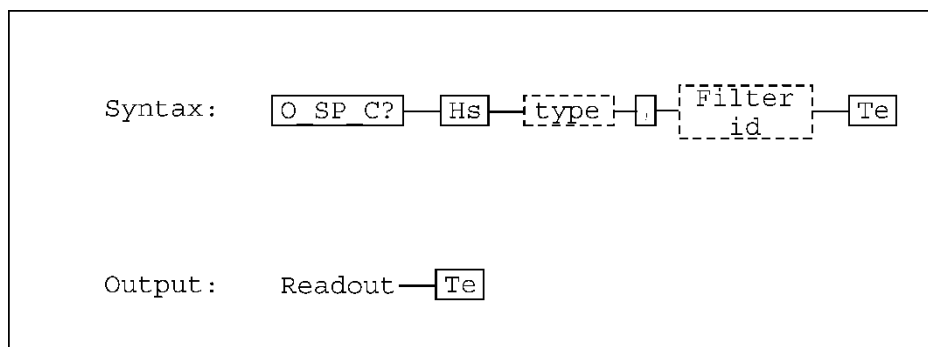
Where *type* is one of the following:

APplication   Data for 7620 Application Software.

SAmple_**DA**ta   Reads out data for all filters or a specified filter

O_SP_C?<type><filterid>,AL
                        Returns measurement data including chamber temperature and air pressure.

The filter id is the same parameter used for <u>section 2.3.22</u> OUTPUT_CALIBRATION_DATA?

_____

The **SA**mple_**DA**ta output "readout" format for each sample consists of the following:

[Filter Error, Alarm][10 characters per gas][3 error and warning bits][Event no.][Time stamp]

An example of a read out for all filters is shown below:
FA 309.57E-06,_____,....,....,....,....,000,R0,X0,E_____,3 13:56:40

The 10 characters for each gas consist of the concentrations of each in the internal units, which are mg/m^3. This may or may not be the same units as the current units manually selected in the set-up tree of the Monitor.

To interpret the read out use the following key:

F	Filter alignment error
A	Alarm
000	Air Flag, Error Flag, Warning Flag
R	Power down: 0=no, 1=yes
X	Operational error or warning: 0=no, 1=yes
E_____	User event, where ___ is the event number (0001)
.....	Gas is not read out
_____	Bad result

3 13:56:40 Time stamp (DD HH:MM:SS)

Dot marks (...) mean that the gas was not measured. A straight line (_) means that the Monitor was unable to calculate the concentration of the gas. Of the error/warning bits, the first bit corresponds to gas feed errors/warnings, the second bit corresponds to any errors, and the third bit corresponds to any warnings. The time stamp gives hours, minutes, seconds, in addition to the date.

If a additional **C_U** parameter is added to the command i.e. **O_SP_C? SA_DA,AL,C_U** the Monitor will output the Gas concentrations in the Current Unit selected in the Set-Up.

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If an additional **AL** parameter is added to the command i.e. **O_SP_C? SA_DA,AL,AL**, the Monitor will add Chamber temperature and Ambient pressure i.e.

    1.0818E+03,....,....,....,...., 7.4709E+03,000,R0,X0,E____,24
15:07:22,305.23,100.89

Where the additional data are:
305.23   Chamber temperature in Kelvin

100.89   Ambient pressure in KPa

2.3.26   PAUSE_MEASUREMENT

PAUSE_M stops measurement or calibration but leaves the chopper running and the IR source heated (Pause mode).

2.3.27   POP_UP_DISPLAY_BUFFER?

P_U_D_B? reads out the contents of the Pop-up display.

For example the output string might be:
"UNKNOWN HEADER OR CHARACTER DATA"

2.3.28   PROTECTED IP ADDRESS

PROTECT x,x,x,x   Sets an protected IP address up on the Monitor
                         i.e. PROTECT 192.168.000.046
                         The Monitor is unprotected if the Address is set to
                         0.0.0.0

PROTECT?   Reads out the protected IP Address

2.3.29   RECALL_MEASUREMENT

R_M   transfers measurement data from the Memory
                         Location specified, **NR_1** (1..10), in the
                         background memory into the display memory.

_____

2.3.30   RELAY

R?   indicates the condition of/control over the relays. If the relay number is included, for example, **R? 1**, then condition of Relay 1 will be readout. Two outputs are possible:

Yes   active
No   inactive

/***** PROTECTED 59 *****/ (see section 2.3.13)

The relay(s) condition can be set using **R**. If the relay number is specified, for example:

R 1,Y

Then the relay specified can be set as shown below:

Yes   active
No   passive

If the number is left out:

Yes   the relays will be controlled via the interface
No   the relays will be controlled by the Monitor.

2.3.31   REMOTE_DISPLAY_BUFFER

R_D_B?   reads out the contents of Remote display. The output from the Monitor will be whatever has been written into the buffer via the interface by the user.

R_D_B   reads new contents into Remote display buffer. The data string is 80 characters long and must be enclosed by double quotes("").

2.3.32   RESET_COMMAND

*RST partially resets the Monitor. For details about resetting the Monitor, see the Instruction Manual.

_____

2.3.33   RESET_STATUS_BYTE

R_S_B clears the Status byte, i.e. it is set to 00000000

2.3.34   RESET_SYSTEM

Warning! during a full reset of the Monitor, all data in the Display Memory and Background Memory will be lost.

RESET_SY is followed by a parameter, which should be one of the following:

> **PART**ial   The Monitor is partially reset.

> **FUL**l   The Monitor is fully reset.

If the parameter is omitted, the Monitor is partially reset.

/***** PROTECTED 71 *****/

Warning! during a factory reset of the Monitor, all data in the Source Memory will be lost.

> **FA**ctory   The Monitor makes a total E2PROM reset.

See the Instruction Manual for information on resetting the Monitor.

_____

2.3.35   SELF_TEST?

*TST   causes the Monitor to carry out a self-test. The self-test can only be carried out when the Monitor is in idle mode.

*TST?   Causes the Monitor to output the result of the self-test (NR_1).

The output has one of these values:

-4   The self-test is not performed

-3   The self-test is in progress

−2   The Monitor is not in idle mode (display mode). Therefore the test can't be carried out.

−1   Operational Error Flags have been set after the test.

0   No flag has been set after the test.

1   Warning Flags have been set after the test.

For more details about self tests and Warning and Error messages, refer to the Instruction Manual.

2.3.36   SERVICE_REQUEST_ENABLE

The Service Request Enable Register is a mask for the Status Byte (see 2.3.42) i.e. a bit that is set in the Status Byte will only cause a Service Request if the corresponding bit in the Service Request Enable Register is also set. This register is, therefore, used by the controller to enable and disable Service Requests.

S_R_E? will read out the decimal value of the SRQ enable register. The output (NR_1) is in the range 0..255. For example, if the register contained the binary number 0000 1000 and you typed:
       S_R_E?

The Monitor would read out the decimal number 8, indicating that bit 4 is set and that an error has occurred.

S_R_E sets the Service Request Enable Register. The number in the register lies in the range 0..255. For example, if you typed:
       S_R_E 8

_____

_____

The Monitor would set bit 4 of the register to binary 1, so that whenever bit 4 of the Status Byte is set (the Error bit) an SRQ is generated.

The contents of the Service Request Enable Register is given in Table 2.11.

Service Request Enable Register		
Bit no.	Bit value	Bit name
1	1	Data Ready
2	2	Reset Activated
3	4	Command
4	8	Completed
5	16	Error
6	32	(Not user
7	64	definable)
8	128	Abnormal
		(Not user
		definable)
		Special event

Table 2.11 The contents of the Service Request Enable Register

_____

2.3.37   SETUP

Syntax: SE? — Hs ►— — [Param id] — ► — Te
                         │   │
                         ,   ,
                         └► NR_1   └► [filter id]

Output: [value] — Te
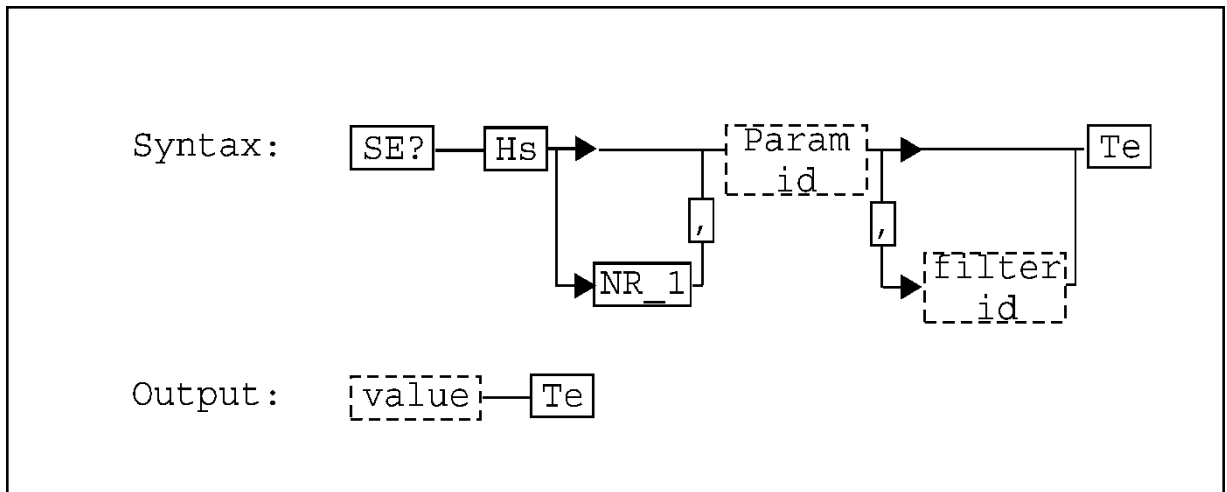
SE? reads out a specified parameter from the "setup" of the Monitor.

NR_1(1..10)   is Setup Number

Param id   is the parameter identification.

Filter id   is the filter identification. e.g. F_A...F_W

Value   is numeric data (types NR1..3), character data or string data.

SE defines the specified parameter of the setup of the Monitor.

NR_1 (1..10)   is Setup Number

Param id   is the parameter identification.

Filter id   is the filter identification. e.g. F_A...F_W

Value   is numeric data (types NR1..3), character data or string data.

The following examples show the use of the SE message with the parameter value different in each case:

_____

SE T_L,10.5   in this case value is numeric and the length of the sampling tube is set to 10.5 in the current length units.

SE S_H,X_O   in this case value is character data.

SE G_N,F_A,"carbon dioxide"

in this case value is a text string and the gas name for filter A is set to carbon dioxide

SE 2,M_P,"2 12:00"

in this case value is a time string. Monitoring task No. 2 is set up for a period of 2 days and 12 hours.

SE F_T_F,Y   in this case, the Fixed Time Flushing is activated. The times for the chamber and the tube need to be set. Acceptable values for these parameters are given in the Instruction Manual. To set the times to 10s for the chamber and 20s for the tube, send:
SE C_F_T,10 and SE T_F_T,20.

SE? C_W_S   returns Y og N to Continuous_Warm_System.

SE C_W_S,Y (or N)

takes character data Y or N as parameter.
Y states that the measurement system is heated in idle mode. Heated means that the infrared source is heated, the chopper is running and the filters are positioned in a cyclic sequence. The heating is started after reset, finished measurement and finished calibration.
N states that the measurement system is only kept warm during measurement and calibration.
Changes in heating mode are updated after reset, finished measurement and finished calibration.
Default after EEPROM reset is N.

SE? US_M_A_P   returns Y or N to Use_Measured_Air_Pressure.
SE US_M_A_P,Y (or N)

takes character data Y or N as parameter.
Y states that the measured atmospherical pressure is used for calculations.
N states that the entered actual air pressure in setup is used for calculations.

_____

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SE? USER_L   returns 1,2 or 3 for the User_Level.
SE USER_L   takes NR1 data 1,2 or 3.
The number is the user level associated with the lock function.
Default after EEPROM reset is 3.

SE? PASSWORD   returns a string of length 0 to 5.
SE PASSWORD   takes a string of length 0 to 5.
The string is the password associated with the lock function. When comparing the password string with the password entered from the front panel (always 5 characters) the string is considered to be right padded with spaces.
Default after EEPROM reset is "*****".

SE A_L, F_x,y, 1 sets setup alarm limit 1 for filter x to y.
SE A_L, F_x,y, 2 sets setup alarm limit 2 for filter x to y.
SE? A_L, F_x, 1 returns setup alarm limit 1 for filter x.
SE? A_L, F_x, 2 returns setup alarm limit 2 for filter x.

SE? MEM   returns Y or N.
SE MEM   takes character data Y or N as parameter.
Y states that measurement history is stored, i.e. all available memory is used for storing measurement results.
N states that only the results of the latest gas sample are stored. This enables a faster start up of the analyser.
Default after EEPROM reset is Y.

SE? PR,A_P   returns Y or N.
SE PR,A_P   takes character data Y or N as parameter.
Y states that an air pressure table is printed when the measured concentrations are printed.
N states that no air pressure table is printed when the measured concentrations are printed.
Default after EEPROM reset is N.

SE DHCP,Y (or N) Y sets the Monitors IP Address to be set by the DHCP server.
N sets the Monitors IP address to be locally.

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The following examples show the use of the SE message for multiplexer control:

SE M_C,Y	Y sets the Monitors to be multiplexer system controller. N sets the Monitor not to be system controller.
SE U_CH,1,Y	Activate Multiplexer channel 1. N Deactivates Multiplexer channel 1.
SE? U_CH,1	returns Y or N for use of the defined channel.
SE? U_CH	returns a list of activated channels. i.e. 1,1,2,1,3,1,4,0,5,0,(etc. up to),24,0 Channel 1, 2 and 3 are in this case activated.

The following examples show the use of the SE message for Analog output and Relay output setup:

SE A_U,U_4_20MA_PPM
Setup the Analog unit to 4-20 mA / ppm
SE? A_U   Returns the Analog unit

SE A_MI_C,F_A,100.0
Setup the Analog minimum concentration for Filter A to the value 100

SE A_MA_C,F_A,1.0E3
Setup the Analog maximum concentration for Filter A to the value 1000

SE A_MA_C,F_A,1E32
Resets the Analog maximum concentration for Filter A

SE A_R_C_M,Y   Activates the Analog relay channel mode

SE A_R_N,1,2   Setup Alarm limit exceeded on Multiplexer channel 1 to activate Relay 2 on the Analog & Relay output module.

SE A_R_N,1,__ (or 65535)
Setup Alarm limit exceeded on Multiplexer channel 1 to not activate any Relays on the Analog & Relay output module.

_____

_____

SE? A_R_N,1   Returns the Relay linked to Channel 1

SE? A_R_N   Return a list of all channels and the linked relays.
Ie.
1,2,2,1,3,0,4,2,(etc. up to),24,0
In this example
Ch.1 is linked to Relay 2
Ch. 2 is linked to Relay 1
Ch. 3 is not linked to any Relays
Ch. 4 is linked to 2
Ch. 24 is not linked to any Relays

SE A_C_A,A1   Setup the alarm level on channel 1 to be high alarm limit 1.

SE? A_C_A,1   Returns the alarm level for channel 1

SE? A_C_A   Setup the alarm level on channel 1 to be high alarm limit. i.e.
1,1,2,1,3,2,4,2,(etc. up to),24,1
In this example
Ch. 1, 2 and 24 are set to alarm limit 1
Ch. 3 and 4 are set to alarm limit 2

All allowable parameter ids and values for Setup are given in Table 2.12 and Table 2.13.

Setup parameter id	Minimum code
ALARM_LIMIT	A_L
AIR_PRESSURE	A_P
ANALOG CHANNEL ALARM	A_C_A
ANALOG MINIMUM CONCENTRATION	A_MI_C
ANALOG MAXIMUM CONCENTRATION	A_MA_C
ANALOG RELAY CHANNEL MODE	A_R_C_M
ANALOG RELAY NUMBER	A_R_N
ANALOG UNIT	A_U
AVERAGE_TIME	A_T
BANK (Filter)	B
BAUD_RATE	B_R
CHAMBER_FLUSH_TIME	C_F_T
CLOCK	CL
CROSS_COMPENSATION	C_C
CONTINUOUS_SAMPLING	C_S
CONTINUOUS_WARM_SYSTEM	C_W_S
CONCENTRATION_UNIT	C_U
DATE	DA

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DATA_BIT	D_B
DATA_LOG	D_L
DHCP	DHCP
ERROR_LOGGING	E_L
FIXED_TIME_FLUSH	F_T_F
GAS_NAME	G_N
GAS_WEIGHT	G_W
HARD_WIRE	H_W
HUMIDITY_UNIT	H_U
LENGTH_UNIT	L_U
MEMORY	MEM
MONITORING_MODE (preset period)	M_M
MONITORING_PERIOD	M_P
MULTIPLEXER CONTROLLER	M_C
NORMALIZATION_TEMPERATURE	N_T
PARITY	PARI
PASSWORD	PASSWORD
PRESSURE_UNIT	PR_U
PRINT,AIR_PRESSURE	PR,A_P
PRINT_ALL	P_P_A
PRINT_FILTER	P_P_F
PRINTER_LINK	PR_L
POWER_UP_TEST (+ regular self-test)	P_U_T
SAMPLE_INTERVAL	S_I
SAMPLE_INTEGRATION_TIME	S_I_T
SOFT_HANDSHAKE (Handshake mode)	S_H
SOUND_VOLUME	S_V
STOP_BIT	S_B
TEMPERATURE_UNIT	T_U
TUBE_FLUSH_TIME	T_F_T
TUBE_LENGTH	T_L
UA_NUMBER	UA_N
USE CHANNEL	U_CH
USE_FILTER	US_F
USE_MEASURED_AIR_PRESSURE	US_M_A_P
USER_LEVEL	USER_L
WATER_COMPENSATION	W_C

Table 2.12   The setup parameter ids

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Setup parameter value	Minimum code
ALARM LIMIT 1	A1
ALARM LIMIT 2	A2
EVEN	EV
ETHERNET	ETH
HARD_WIRE	H_W
LEASED_LINE	L_L
NO (none)	N
ODD	O
RS_232	RS
SWITCHED_LINE	S_L
THREE_WIRE	T_W
UNIT_C	U_CE
UNIT_F	U_FA
UNIT_ft	U_FEET
UNIT_K	U_KE
UNIT_kPa	U_KPA
UNIT_mbar	U_MBAR
UNIT_m	U_METER
UNIT_mg/m^3	U_MG_M
UNIT_mmHg	U_MM_HG
UNIT_ppm	U_PPM
UNIT_Tdew	U_TDEW
USB	USB
X-ON/X-OFF	X_O
YES	Y
UNIT 0-20 Ma / mg/m3	U_0_20MA_MG_M3
UNIT 4-20 Ma / mg/m3	U_4_20MA_MG_M3
UNIT 0-10 V / mg/m3	U_V_MG_M3
UNIT 0-20 Ma / ppm	U_0_20MA_PPM
UNIT 4-20 Ma / ppm	U_4_20MA_PPM
UNIT 0-10 V / ppm	U_V_PPM
FILTER A	F_A
FILTER B	F_B
FILTER C	F_C
FILTER D	F_D
FILTER E	F_E
FILTER W	F_W
NONE	__ or 65535

Table 2.13   Setup parameter values

2.3.38   SOFTWARE_IDENTIFICATION?

S_I?   reads out the software identification string, for example the output might be "SOFTWARE ID VPxxxx 05-10-21 08.10".

2.3.39 START_CALIBRATION

The command has minimum code **STA_C** and exists only as input command.

STA_C, *calibration type, calibration parameters* starts a calibration of the specified *calibration type*. The *calibration parameters* depend on the calibration type.

Calibration type	Minimum code	Calibration parameters
Calibration_Zero	C_Z	Filter ABCDE, filter W
Calibration_Hum	C_H	Filter ABCDE, filter W
Calibration_Zero_Hum	C_Z_H	Filter ABCDE, filter W
Calibration_Gas_Span	C_G_S	Filter, two point, low conc, high conc, cross
Calibration_Water_Span	C_W_S	Conc

Calibration Parameter	Value
Filter ABCDE	YES or NO to all installed filters from A to E
Filter W	YES or NO to filter W
Filter	One of FILTER A to FILTER W
Two point	YES or NO to two point calibration
Low conc.	Two point low concentration
High conc.	Two point high concentration or single point concentration
Cross	YES or NO to cross calibration
Conc.	Span concentration

Examples:
STArt_Calibration Calibration_Zero,Yes,No
Calibration of Filter A to E. Filter W not calibrated.

STArt_Calibration Calibration_Zero,Yes,Yes
Calibration of Filter A to W.

STArt_Calibration Calibration_Zero,No,Yes
Calibration of Filter W without calibration of Filter A to E is not valid.

STArt_Calibration Calibration_Zero_Hum,Yes,No
Combined zero- and humidity calibration of Filter A-E. Filter W not zero calibrated.

STArt_Calibration Calibration_Zero_Hum,Yes,Yes
Combined zero- and humidity calibration of Filter A-E. Filter W is zero calibrated. (First time calibration of instrument!).

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STArt_Calibration Calibration_Gas_Span, Filter_A,No,0.0,345.34,Yes
Single Point calibration of filter A with 345.34 ppm gas and with cross calibration.

STArt_Calibration Calibration_Water_Span,18000
Calibration of water filter with 18000mg/m^3 water.

2.3.40   START_DELAYED_MEASUREMENT

S_D_M "d hh:mm" or **S_D_M "dd hh:mm"** starts a Monitoring task at the specified time.
D ~ day, h ~ hour, m ~ minute.

2.3.41   START_MEASUREMENT

STA_M starts a monitoring task immediately.

2.3.42   STATUS_BYTE?

*STB? reads out the contents of the Status-Byte, see Fig. 7.1.The number (NR_1) is in the range 0..255.

For example, if the Status Byte contained the binary number 00000001 and you typed *STB? , the Monitor would return the decimal number 1, indicating that the Data Ready bit was set. The contents of the Status Byte is shown in Table 2.14.

Bit no.	Bit name
1	Data ready
2	Reset activated
3	Command completed
4	Error
5	Busy
6	Abnormal
7	SRQ_line
8	Special event

Table 2.14   Contents of Status Byte

_____

2.3.43   STOP_MEASUREMENT

STOP_M stops the current measurement task.

2.3.44   STORE_DEFAULT

STOR_D stores the current setup in non volatile memory. A full reset will recall the saved setup as the current setup. Exists only as input command.

2.3.45   STORE_MEASUREMENT

STOR_M stores the contents of the display memory in the background memory at a specified (NR_1) (1..10) location.

2.3.46   SYNCHRONIZE

SY? Reads out the pump synchronization condition. This message is for use when an external pump (ex. A pump in the 1409) is connected to the Monitor.

There are two possible outputs:

Yes   indicates that the Monitor pump will start only when a synchronization command is received from the controller. This is the required condition when an external pump is connected to the Monitor. If the synchronization condition is not set to Yes, and an external pump is connected, then airway errors can occur.

No   indicates that the Monitor pump is controlled by the Monitor.

/***** PROTECTED 59 *****/ (see section 2.3.13)

SY sets the pump synchronization condition:

Yes   the Monitor pump will start only when a synchronization command is received from the controller.

No   the pump will be controlled by the Monitor.

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If a **Y**es or **N**o parameter is not given, then the Monitor pump starts if the Monitor is waiting for the **Sy**nchronize command.

2.3.47   SYNCHRONIZED_MODE_CONTINUOUS_PUMP

SY_CON set-up the Monitor in Continuous pump synchronization mode.

In Continuous pump synchronization Mode the predefined Tube- and Chamber-flush times are disabled.

Tube-flush is performed while Gas-measurements are performed on all optical filters (a complete Gas-Measurement cycle).

Chamber-flush start as soon as a complete Gas-Measurement cycle is performed.
The Chamber-flush continues until a synchronization message is received, then the Chamber-flush stops and the Gas-measurement cycle is repeated.

It the Monitor is set-up to measure the ambient air pressure the pump stops for a few seconds in each Measurement cycle to enable the Monitor to measure the ambient air pressure.

Following commands are used:

SY? CON   Reads out the continuous pump synchronization mode.

Possible outputs are:

Yes   The Gas-Monitor is set in continuous pump synchronization mode.

No   Indicates that the Monitor pump sequence is controlled by the monitor.

SY? 1   Reads out if synchronization is required.

Possible outputs are:

Yes   The Gas-Monitor waits for synchronization to continue Gas measurement. Chamber-flush is activated.

No   Synchronization is not required.

SY 1   Synchronize the Gas-Monitor.

/*****PROTECTED 59*****/ (see section 2.3.13)

        SY CON   Sets the continuous pump synchronization mode

        Yes   Activates the continuous pump synchronization mode

        No   Deactivates the continuous pump synchronization mode.

2.3.48   SYSTEM_DISPLAY_BUFFER?

SY_D_B? reads out the contents of the Monitor default display. For example, the output might be:

SELECT SETUP BRANCH MEASUREMENT FORMAT CONFIGURATION

2.3.49   TIME_SINCE_RESET?

T_S_R? reads out the number of seconds since the last reset/power-up of the Monitor. The output (NR1) is in the range 0..4294967295 (about 136 years).

2.3.50   UNPROTECT

UNPROTECT   Sets the Monitors protected IP Address to 0.0.0.0 meaning that it is unprotected

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2.3.51   ZDLOG

The ZDLOG is used to log events in the firmware like i.e. software errors that causes the system to reboot. The type and numbers of events is defined with Mask with the following definitions:

Byte	Decimal	Event Mask
0	1	EVMASK_INITIALIZE
1	2	EVMASK_MEASURE
2	4	EVMASK_CALIBRATE
3	8	EVMASK_MEASERROR
4	16	EVMASK_MEASWARNING
5	32	EVMASK_MEASCONTROL
6	64	Not used
7	128	EVMASK_ADDDEVICE
8	256	EVMASK_SOFTERROR
9	512	EVMASK_MEMORY
10	1024	EVMASK_CANBUS
11	2048	EVMASK_RS232
12	4096	EVMASK_ETHERNET
13	8192	EVMASK_USB
14	16384	EVMASK_KEYENTRIES

Default Mask is 792 meaning that Memory, Softerrors, Measurement warnings and Measurement errors are logged.

ZDLOG?   Reads out the Mask

/*****PROTECTED 1*****/ (see section 2.3.13)

ZDLOG <mask>   selects the Mask.
                        e.g. E_C 1;ZDLOG 792

ZDLOG ERASE   erases the log.

ZDLOG? <mask>,x   reads out the last x numbers of occurrences in the
                        log with the defined mask.

e.g. E_C 1;ZDLOG? 792,10 reads out the last 10 occurrences of mask 792 and could give the following output:

2014-06-10 14:01:59.4965 SOFTERR ZD0810 SOFT ERROR AT uticht.c 1534
Ex_Store_Meas Unknown Mem_Result

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Chapter 3

Interface Character Data

April 2017

3.1 List of Interface Character Data

Alphabetical list of interface character data	
Data fields	Minimum code
ALL	AL
APPLICATION	AP
ALARM_LIMIT	A_L
AVERAGE	AV
ALARM LIMIT 1	A1
ALARM LIMIT 2	A2
ALARM_LIMIT_NUMBER1	A_L_1
ALARM_LIMIT_NUMBER2	A_L_2
ALARMLOG	AL
ALARMLOG CHANNEL	AL,(0-24)
ALARMLOG CHANNEL NUMBER	AL,(0-24),n
ALARMLOG FILTER	AL,F_(A-W)
ALARMLOG FILTER NUMBER	AL,F_(A-W),n
ALARMLOG NUMBERS	AL,N
ALARMLOG NUMBERS CHANNEL	AL,N,(0-24)
ALARMLOG NUMBERS FILTER	AL,N,F_(A-W)
AIR_PRESSURE	A_P
ANALOG CHANNEL ALARM	A_C_A
ANALOG MINIMUM CONCENTRATION	A_MI_C
ANALOG MAXIMUM CONCENTRATION	A_MA_C
ANALOG RELAY CHANNEL MODE	A_R_C_M
ANALOG RELAY NUMBER	A_R_N
ANALOG UNIT	A_U
AVERAGE_TIME	A_T
BANK	B
BAUD_RATE	B_R
CALIBRATION_DATA	C_D
CHAMBER_FLUSH_TIME	C_F_T
CLOCK	CL
COMMUNICATION	COM
CONFIGURATION	CON
CONTINUOUS_SAMPLING	C_S
CONTINUOUS_WARM_SYSTEM	C_W_S
CONCENTRATION_UNIT	C_U
CROSS_COMPENSATION	C_C
CURRENT_FILTER	C_F
DATA_BIT	D_B
DATA_LOG	D_L
DATE	DA
DOWN_DIRECTION	DO_D
ENTER_EXECUTE	E_E
ENVIRONMENT	EN

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ERROR_LOGGING	E_L
ERROR_VALUES	E_V
EVEN	EV
EVENT_MARK	E_M
EXCLUSIVE	EX
FACTORY	FA
FILTERS	FI
FILTER_A	F_A
FILTER_B	F_B
FILTER_C	F_C
FILTER_D	F_D
FILTER_E	F_E
FILTER_W	F_W
FIXED_TIME_FLUSH	F_T_F
FORMAT	FO
FULL	FUL
GAS_NAME	G_N
GAS_VALUES	G_V
GAS_WEIGHT	G_W
GENERAL	G
HARD_WIRE	H_W
HUMIDITY_UNIT	H_U
IDENTITY	ID?
IDENTITY CONFIGURATION	ID? CON
INCLUSIVE	IN
INFO	STATU
LEASED_LINE	L_L
LEFT_DIRECTION	LE_D
LENGTH_UNIT	L_U
LINEAR	LIN
MEASUREMENT	MEA
MEASUREMENT_DONE	M_D
MEMORY	MEM
MONITORING_MODE	M_M
MONITORING_PERIOD	M_P
MULTIPLEXER CONTROLLER	M_C
NO (NONE)	N
NORMALIZATION_TEMPERATURE	N_T
ODD	O
PASSWORD	PASSWORD
PARITY	PARI
PARTIAL	PART
POP_UP	PO_U
POWER_UP_TEST	P_U_T
PRESSURE_UNIT	P_U

PRINT	PR
PRINT,AIR_PRESSURE	PR,A_P
PRINT_ALL	P_P_A
PRINT_FILTER	P_P_F
PRINTER_LINK	PR_L
PROCESS_DATA	PR_D
PUMP_DONE	PU_D
PUSH_KEY	P_K
REMOTE	REM
RESET	RES
REVERSE	REV
RIGHT_DIRECTION	RI_D
RS232	RS
SAMPLE_DATA	SA_DA
SAMPLE_DONE	SA_DO
SAMPLE_INTEGRATION_TIME	S_I_T
SAMPLE_INTERVAL	S_I
SELECT_1	S_1
SELECT_2	S_2
SELECT_3	S_3
SETUP	SE
SETUP_DATA	SE_D
SOFT_HANDSHAKE	S_H
SOUND_VOLUME	S_V
STANDARD	STAN
STATISTICS	STATI
STOP_BIT	S_B
SWITCHED_LINE	S_L
SYSTEM	SY
TEMPERATURE_UNIT	T_U
THREE_WIRE	T_W
TIME FRAME	T_F
TUBE_FLUSH_TIME	T_F_T
TUBE_LENGTH	T_L
UA_NUMBER	UA_N
UNITS	U
UNIT_C	U_CE
UNIT_F	U_FA
UNIT_ft	U_FEET
UNIT_K	U_KE
UNIT_kPa	U_KPA
UNIT_mBar	U_MBAR
UNIT_m	U_METER
UNIT_mg/m	U_MG_M
UNIT_mmHg	U_MMHG

UNIT_ppm	U_PPM
UNIT_Tdew	U_TDEW
UNIT 0-20 mA / mg/m3	U_0_20MA_MG_M3
UNIT 4-20 mA / mg/m3	U_4_20MA_MG_M3
UNIT 0-10 V / mg/m3	U_V_MG_M3
UNIT 0-20 mA / ppm	U_0_20MA_PPM
UNIT 4-20 mA / ppm	U_4_20MA_PPM
UNIT 0-10 V / ppm	U_V_PPM
USE CHANNEL	U_CH
WARNING_VALUES	W_V
WATER_COMPENSATION	W_C
X-ON/X-OFF	X_O
YES	Y

Table 3.1   List of interface character data

Chapter 4

Error Messages

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4.1 List of Error Messages.

Error Message	Description
AD BLOCK SPECIFICATION SYNTAX	Syntax error. Illegal specification of the block data. The correct syntax is #nc…c, where n is the length count and c is the digit. The size of the block may be wrong.
BAD CHARACTER DATA SYNTAX	Syntax error. Illegal character found in the character data types.
BAD HEADER DATA SYNTAX	Syntax error. Illegal character found in the message header.
BAD STRING DATA SYNTAX	Syntax error. The text string is not surrounded by quotes (")
BAD TERMINATOR	Syntax error. Illegal message terminator, (not <LF>).
BAD TIME STRING SYNTAX	Syntax error. The text string to indicate date/time is not correct.
BLOCK DATA EXPECTED	Syntax error. Illegal data type received.
BLOCK DATA NOT COMPLETED	Syntax error. Block data ended/interrupted before the usual termination.
BLOCK DATA OVERRUN	Syntax error. Block data has not been ended according to the block specification.
BLOCK DATA. PARAMETER OUT OF RANGE	The data in the block is illegal
CHARACTER DATA EXPECTED	Syntax error. The wrong data type was received.
HANDSHAKE ERROR	Occurs in connection with the RS–232
ILLEGAL CHARACTER	Illegal syntax. The error can appear in many contexts.
ILLEGAL CHARACTER DATA	The character data is not correct in this context.
ILLEGAL STATE FOR OPERATION	The Monitor is currently in an operating state where the message is illegal.
ILLEGAL STRING DATA	The contents of the string is not correct.
INTERNAL BUFFER OVERFLOW	Syntax error. The header/Character data is too big. The text string is too long etc.
JOB IS CANCELLED	The current output-message is interrupted by a new input-message.
JOB NOT ALLOWED FOR INPUT OR OUTPUT	Syntax error. The user has changed an input-only message into an output message b use of a "?", or an output-only message into an input message.
MISSING CHARACTER	E.g. a "+" and <LF> are received. The "+" indicates that a numerical value (NRx) is to follow, but this numerical value does not

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Error Message	Description
	appear.
OUTPUT DATA CANCELLED	The current output-message is interrupted by a new input message.
PARAMETER EXPECTED	Syntax error. The parameter for the message is missing.
PARAMETER OUT OF RANGE	The numerical parameter is illegal.
RECEIVE ERROR	A fundamental error in receiving the message.
RELAY CONTROL NOT ENABLED	The user is trying to control the Monitor's alarm relays, but access to the relays has not been opened.
STRING DATA EXPECTED	Syntax error. Illegal data type received.
STRING LENGTH OUT OF RANGE	The string is longer than allowed.
TOO MUCH DATA	Syntax error. There are more parameters in the message than necessary. Otherwise, the message is correct and will usually be executed.
UNKNOWN HEADER OR CHARACTER DATA	Syntax error. Unknown message header and character data.
WARNING: CTS HANDSHAKE CONFLICT	The Monitor receives a handshake signal on the RS–232 CTS line without being setup for using CTS. There is a handshake conflict between the Monitor and the device connected to the RS–232.
WARNING: DSR HANDSHAKE CONFLICT	The Monitor receives a handshake signal on the RS–232 DSR line without being set up for using DSR. There is a handshake conflict between the Monitor and the device connected to the RS–232.
WARNING: MEMORY FULL WARNING: MEMORY LOCATION ALREADY USED WARNING: MEMORY LOCATION EMPTY	Errors in connection with the use of the Background Memory.
WARNING: NO DATA FOR PRINT	There is insufficient data in the Monitor to make a print.
WARNING: RS232 FRAMING ERROR DATA LOST	The Monitor was receiving corrupted data on the RS–232 RX line.
WARNING: RS232 OVERFLOW. DATA LOST	The Monitor receives data on the RS–232 RX line faster than it can handle. The internal buffer is full.
WARNING: RS232 OVERRUN. DATA LOST	The Monitor receives data on the RS–232 RX line faster than it can handle.
WARNING: RS232 PARTIY	The Monitor receives data with illegal

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Error Message	Description
ERROR. DATA LOST	parity.
WARNING: SETUP AND / OR CALIBRATION CONFLICT	The Monitor is about to start a measurement, but the setup of the Monitor and the possibilities of the current calibration are in conflict.
WARNING: TIMEOUT. DEVICE NOT READY	The Monitor wishes to send print/error-/data-log. The transmission starts, but the device stops reception of data for too long. The device may be off-line. The device may be too slow. The device may no longer be properly connected.
WARNING: X-ON/X-OFF HANDSHAKE CONFLICT	The Monitor receives the X-On/X-Off signal via RS–232 without being set up to use X-On/X-Off. There is a hand-shake conflict between the Monitor and the device connected to the RS–232.
WRONG DATA TYPE	

Table 4.1   List of error messages at RS-232 interface

_____

Error Message	Description
Parameter is misplaced	Syntax error. The parameters in the command are not correctly formatted.
Parameter delimiter fault	Syntax error. Typically the delimiter should be a comma-sign.
Quote error in parameter string	Syntax error. Wrong quote in parameter string.
The Command is non-query	Not allowed to send this command as a non-query.
The Command is query only	Not allowed to send this command as a query.
The Command is unknown	The command does not exist.
Parameter is unknown	Syntax error. Illegal parameter.
There is too many parameters	Syntax error. Too many parameters are specified.
Setup is missing	
Wrong command/parameter(s)	Syntax error. Illegal command and/or parameter.
Missing parameters to command	Syntax error. The parameter for the message is missing.
Wrong parameter type to command	Syntax error. The parameter is not of the correct type.
Parameter value is outside range	The specified parameter is out of range.
No response to the job caused timeout	No response on internal CAN-bus within the timeout limit.
OUT OF RANGE	Internal CAN-bus error.
DATA NOT ALLOWED IN CURRENT STATE	Internal CAN-bus error.

Table 4.2   List of error messages at USB and Ethernet interface

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Chapter 5

Code Examples

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5.1 Interface Commands to make a Sample Measurement

This chapter gives an example which interface command to send before and during a measurement.

Commands send to Gas Monitor are in RED text colour, responses from Gas Monitor are in BLUE text colour and comments are in GREEN text colour.

5.1.1 Setup before measurement

This describes the interface commands used for setting up the Gas Monitor before a measurement. The example sets up all the five filters for measuring.

Command	Comment
SE L_U,U_METER	set gas monitor display unit for length
SE H_U,U_TDEW	set gas monitor display unit for humidity
SE PR_U,U_MBAR	set gas monitor display unit for pressure
SE T_U,U_CE	set gas monitor display unit for temperature
SE C_U,U_PPM	set gas monitor display unit for concentration
SE C_C,Y	enable cross compensation
SE W_C,Y	enable water compensation
SE C_S,Y	enable cross compensation
SE N_T,20.0	set normalization temperature
SE CL,"10:08"	set time
SE DA,"2012-07-26"	set date
SE MEM,N	set store measurement history
SE M_M,N	do not use preset period
SE F_T_F,N	use Fixed Time Flush
SE T_L,0.0	tube length is 0.0
SE US_F,F_A,Y	use filter A
SE B,F_A,1	use bank 1 for filter A
SE S_I_T,F_A,5.0	5 SIT for filter A
SE US_F,F_B,Y	use filter B
SE B,F_B,1	use bank 1 for filter B
SE S_I_T,F_B,5.0	5 SIT for filter B
SE US_F,F_C,Y	use filter C
SE B,F_C,1	use bank 1 for filter C
SE S_I_T,F_C,5.0	5 SIT for filter C
SE US_F,F_D,Y	use filter D
SE B,F_D,1	use bank 1 for filter D
SE S_I_T,F_D,5.0	5 SIT for filter D
SE US_F,F_E,Y	use filter E
SE B,F_E,1	use bank 1 for filter E
SE S_I_T,F_E,5.0	5 SIT for filter E
SE US_F,F_W,Y	use filter W
SE S_I_T,F_W,5.0	5 SIT for filter W

_____

A_M?   Check that all setup commands is received by Gas Monitor

N   N means OK, Y means error

5.1.2 Measurement sequence

This describes the interface commands used for making a measurement.

It uses a service request register to indicate when sample data for a measurement is ready.

CO_SRQ 1,1   use Register 1, bit no. 1, to signal "Sample Data Ready"

STA_M   start the measurement

EX_S?   check state of monitor

8   8 means "Measurement running"

A_M?   Check that no error occurred in the Gas Monitor

N   N means OK, Y means error

CO_SRQ? 1,MEM   wait for Register 1, bit no. 1, to be set

2

CO_SRQ? 1,MEM

2

CO_SRQ? 1,MEM

3   now Register 1, bit no. 1, is set meaning "Sample Data Ready"

CO_SRQ? 1   acknowledge Register 1, bit no. 1

3

A_M?   Check that no error occurred in the Gas Monitor

N

O_SP_C? SA_DA,AL   get concentration values in mg/m3

-14.66E+03, -1.197E+03, 1.1506E+06, 254.55E+03, -15.26E+03, 12.494E+03,000,R0,X0,E_____,26 10:38:28

M_A_P?   get air pressure

1008.7

SE? PR_U   get air pressure unit

U_MBAR

CO_SRQ? 1,MEM   wait for Register 1, bit no. 1, to be set

0

CO_SRQ? 1,MEM

0

CO_SRQ? 1,MEM

1   now Register 1, bit no. 1, is set meaning "Sample Data Ready"

CO_SRQ? 1   acknowledge Register 1, bit no. 1

1

A_M?   Check that no error occurred in the Gas Monitor

N

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O_SP_C? SA_DA,AL   get concentration values in mg/m3
-14.61E+03, -1.192E+03, 1.1455E+06, 253.54E+03, -15.19E+03,
12.435E+03,000,R0,X0,E____,26 10:39:05
M_A_P?   get air pressure
1008.7
SE? PR_U   get air pressure unit
U_MBAR
STOP_M   stop measurement
EX_S?   check state of monitor
8
EX_S?
0   0 means measurement stopped

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Chapter 6

Multipoint Sampler 1409 commands

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6.1 Interface to 1409 Multipoint Sampler

The 1409 Multipoint Sampler can be controlled via the Gas monitors interface when it is connected to the Monitors USB Host Connector.

The following commands are possible:

I_O 1,"cmd"   This command sends the cmd to the 1409.

I_E? 1   This reads the answer from the 1409 if the previous CMD was a query.

6.1.1 Idendity

I_O 1,"*IDN?" This job sends the *IDN? To the 1409

The Gas monitor will respond the 1409 ID on I_E? 1:
i.e. INNOVA,1409,6,VP9507

6 is the number of Sample Channels. 6 can also be 12, and 24

6.1.2 Reset the 1409

I_O 1,"*RST"   This job will reset the 1409 Multipoint Sampler. Close any open sample valves and set the 3-way valve in waste air.

6.1.3 Controlling the Sample valves

I_O 1,"O_S_V x"   This job sends the Open Sample Valve command to the 1409.

O_S_V 1   will open Sample valve 1 and close all other open valves
O_S_V 2   will open Sample Valve 2 and close all other open valves
Etc.
O_S_V   will close any open Sample valve.

6.1.4 Controlling the 3 way valve

I_O 1,"C_S_V T_M"   Sets the 3-way valve to Analyzer

I_O 1,"C_S_V T_S_P"   Sets the 3-way valve to waste air

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6.1.5 Warning interface job

I_O 1,"W?"   This job will check the Warning register in the 1409

I_E? 1   This job will read out the 8 bit warning flag register in decimal values.

Warning flags		
Bit. no	Dec. value	Flag description
0	1	Reset done flag
1	2	Na
2	4	Power fail flag
3 - 7		Na

Reset done flag
Indicates that the 1409 has completed a reset, following either the Reset system job or by switching on the 1409.
This flag is reset when the warning flags are read out from the 1409.

Power fail flag
Is set if the internally 12Vdc Power from the 1409's Power supply is below the specification.The flag reset when the Voltage in back within the specification or by resetting the 1409. If the error is persistent, have the 1409 serviced.

6.1.6 Error interface job

I_O 1,"E?"   This job will check the Error register in the 1409

I_E? 1   This job will read out the 8 bit Error flag register in decimal values

Error flags		
Bit. no	Dec. value	Flag description
0	1	Na
1	2	Na
2	4	Na
3	8	Na
4	16	Na
5	32	Job specification error
6	64	Software error flag
7	128	Na

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Job specification error

Is set if any interface job sent to the 1409 is not recognized. The flag is reset by reading out the Error flags or by resetting the 1409

Software error flag

Is set if the 1409 software develops an error when running. When the flag is set, the 1409 is reset automatically. The flag is reset by reading out the error flags or by resetting the 1409.

If the error persist, have the 1409 serviced.

Chapter 7

Service Requests

April 2017

7.1 Introduction to Service Requests

Under certain circumstances, it is necessary for the Monitor to demand attention from the controller or otherwise interrupt the normal sequence of the interface communication. The Monitor does this by raising the Service Request (SRQ) line in the Status Byte. Service requests can, therefore, be used for device synchronization. The SRQ function is commonly used to synchronize the operation of the Monitor with an external computer that has RS–232 controller capabilities. Typically, SRQ indicates that data is ready to be transmitted or an error condition exists. The Monitor generates a Service Request which interrupts the computer. The computer is then free to perform other tasks while waiting for a signal from the Monitor.
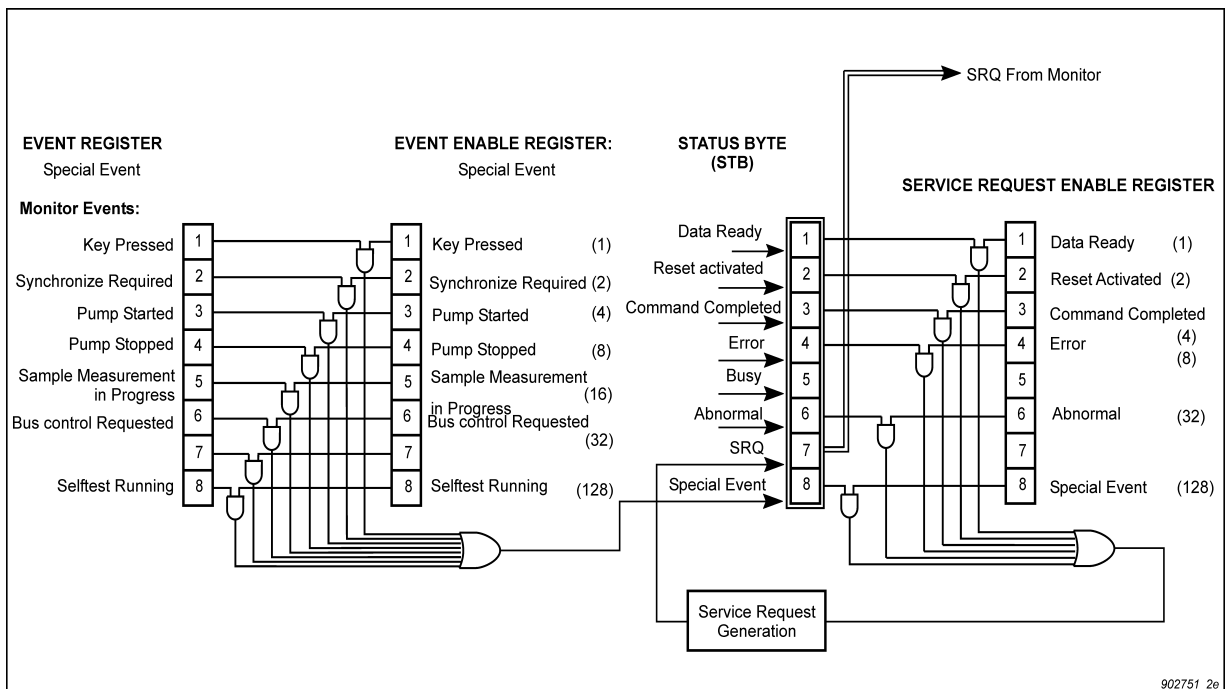

Fig. 7.1 Logic diagram of the "Special Event" Event register, Event Enable Register, Status Byte and Service Request Enable Register.

Fig. 7.1 shows part of the logic diagram for generating Service Requests. The input to 5 of the 8 bits of the Status Byte (bits 1 − 4 and 8) come from the 5 pairs of Event Registers and Event Enable Registers (in this case the "Special Event" Registers) is shown.

- The Event Enable Registers act as masks for the Event Registers.

- The Service Request Enable Register acts as a mask for the Status Byte.

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7.2 The Status Byte

The Status Byte has 8 bits, which are by default set to 0. Seven of the bits (1..6 and 8) are only set when specific conditions occur, bit 7 is used to signal that the Monitor has sent a service request. For example, when a command has been completed, bit 3 in the Status Byte is set. The Status Byte can be read using the message ***STB?** It can also be read out as a part of a serial poll sequence. There is no interface message enabling you to change the contents of the Status Byte.

7.3 The Service Request Enable Register

This register is a mask for the Status Byte. An event that causes a bit to be set in the Status Byte will not alone cause a service request to be sent. If, however, the corresponding bit in the Service Request Enable Register has also been set, then the Status Byte bit will cause a service request to be sent.

All bits in the Service Request Enable Register have default value 0. You can read out the contents of the register using the **S**ERVICE**_R**EQUEST**_E**NABLE**?** message, and you can define the bit pattern by using the **S**ERVICE**_R**EQUEST**_E**NABLE message. This determines which conditions cause the Monitor to send a service request.

7.4 The Event and Event Enable Register

The input to 5 of the 8 bits of the Status Byte (bits 1–4 and 8) come from 5 pairs of Event Registers and Event Enable Registers. These pairs of registers are linked together in a similar way to the Status Byte and Service Request Enable Register. 20 bits from the 5 Event Registers are used to indicate specific events. Each of these 20 bits has a corresponding bit in an Event Enable Register. As with the Status Byte, a corresponding Event Enable Register bit must be set before an event can generate an output. The contents of the 5 Event Registers are given in Table 2.3 – Table 2.7. Using the **CO**NTROL**_SRQ** message, you can define the contents of the Event Enable Register specified. Using the **CO**NTROL**_SRQ?** message, you can read the contents of the Event Enable Register specified.

A bit may be set in the Special Event Register, for example, when a key is pressed. In that case, bit 1 is set. If bit 1 is also set in the Special Event Enable Register, then the Special Event bit, which is bit 8, of the Status Byte is set.

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1314i
1412i
3434i