USER MANUAL

Integra | Embedded Monitor for Power & Energy Detectors

121-203008

gentec-eo
PARTNERS for ACCURACY

WARRANTY

All Gentec-EO products carry a one-year warranty from the date of shipment on material or workmanship defects when used under normal operating conditions.

Gentec-EO will repair or replace, at its sole discretion, any product that proves to be defective during the warranty period.

The warranty does not cover damages caused by product misuse, product modifications, accidents, abnormal operating or handling conditions, or third-party battery leakage. Any attempt by an unauthorized person to alter or repair the product voids the warranty. Gentec-EO is not liable for consequential damages of any kind.

CLAIMS

For warranty service, please contact your Gentec-EO representative or fill out an RMA request:

https://www.gentec-eo.com/contact-us/support-rma-request

To help us answer your request more efficiently, please have your product serial number ready before contacting customer support.

Upon receipt of return authorization, ship the product according to the RMA instructions. Do not ship items without a return authorization. Transport is at the customer's expense, in both directions, unless the product has been received damaged or non-functional. Gentec-EO assumes no responsibility for the damage caused in transit.

SAFETY INFORMATION

Do not use a Gentec-EO device if the monitor or the detector looks damaged or if you suspect that the device is not operating properly.

Appropriate installation must be done for water-cooled and fan-cooled detectors. Refer to the specific instructions for more information. Wait a few minutes before handling the detectors after they are powered up. The surfaces of the detectors get very hot, and there is a risk of injury if they have not cooled.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, try to correct the interference by taking one or more of the following steps:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and receiver.
- Connect the equipment to an outlet that is on a different circuit than the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications not expressly approved in writing by Gentec-EO Inc. may void the user's authority to operate this equipment.

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1. INTEGRA

1.1. INTRODUCTION

The INTEGRA is a series of all-in-one detectors that combine a detector and a meter in one convenient product. The small but powerful meter of the INTEGRA series presents a direct USB or RS-232 connection so you can plug it into your PC. Simply use the PC-Gentec-EO software supplied with your product and be ready to make power or energy measurements within seconds! Each detector of the INTEGRA series offers the same incredible performance as the usual detector and meter combination, from pW to kW and from fJ to J. And the good news is that all our most popular products are available with the INTEGRA option.

1.2. SPECIFICATIONS

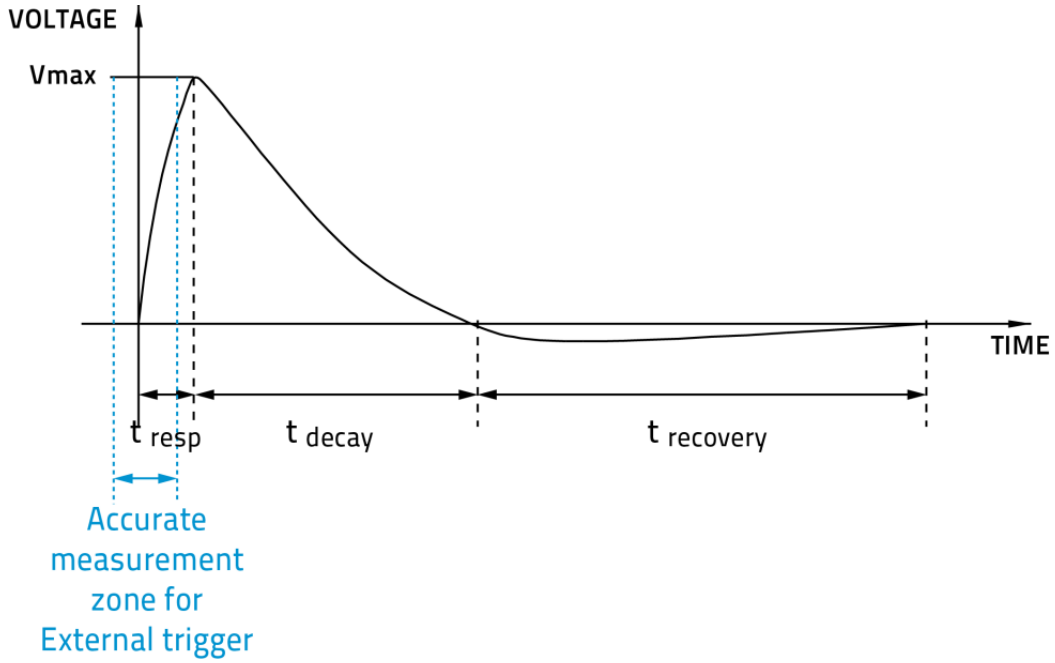
The following specifications are based on a one-year calibration cycle, an operating temperature of 18 ºC to 28 ºC (64 ºF to 82 ºF) and a relative humidity not exceeding 80%. INTEGRA must be stored in an environment between 10 ºC to 45 ºC (50 ºF to 113 ºF) and a relative humidity not exceeding 90%. Photodiodes are sensitive to temperature, especially at longer wavelengths. It is best to keep the temperature in the range of 25 ºC (77 ºF) close to the calibration temperature.

Power meter specifications	
Power range	4 pW to 30 kW
Power scales: Photo detectors Thermal detectors	 21 scales: 300 pW to 3 W 16 scales: 300 µW to 30 kW
Pyroelectric in power mode (UM-B)	8 scales: 100 µW, to 300 mW
Accuracy[1]	± 2.5%[1] ± 5 µV best scale[1]
Data transfer rate	6.7 Hz
Energy meter specifications	
Energy range	2 fJ to 30 kJ
Energy scales: Photo detectors Pyroelectric detector	 22 scales: 300 fJ to 30 mJ 15 scales: 3 mJ to 30 kJ
Accuracy [2]	3.0%[2] ± 50 µV < 5.2 kHz best scale
Trigger level: Default Software	 2% 0.1% to 99.9%, 0.1% resolution
Data transfer rate	No missing point throughput serial frequency 5200 Hz, 200 Hz via RS-232 @ 115,200 bps
Frequency measurement	Accurate frequency measurement up to 5.2 kHz 0-5,200 Hz: ± 1%
Voltage range for RS-232 supply	4-30 Vdc @ 60 mA
Voltage range for special option for external trigger	2.5 - 18 volts, max 20 volts
Minimum pulse width for external trigger signal	1 µs - the trigger happens on the rising edge of the pulse
External trigger timing requirements	Between 20% of the specific head risetime before the laser pulse to the specific head risetime minus the minimum pulse width after the laser pulse. Please see the example below.
Software specifications	
Please refer to the PC-Gentec-EO manual (202322).	

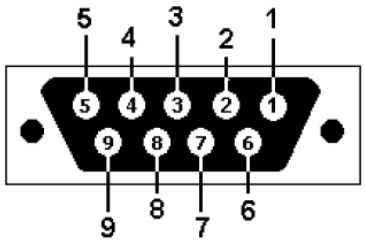
[1] Including linearity, detector accuracy and is detector dependent.
[2] Excludes non-linearity.

Example for the external trigger timing requirements:

- If the head detector has a risetime of Tresp = 20 µs, the time frame will be from (20% * 20 µs = 4 µs) before the laser pulse to (20 µs – 1 µs = 19 µs) after the laser pulse.
- Then, the external trigger signal must happen between 4 µs before to 19 µs after the laser pulse.
- The graph below visualizes the synchronization of the external trigger signal compared to the laser pulse signal.



1.2.1. DB-9 pinout



Female DB9 pin	Function
2	RS-232 output
3	RS-232 input
1, 4, 6, 7, 8, 9	Not used
5	Ground/shield

1.2.2. Range adjustment

The INTEGRA monitor can add or remove the last available power or energy range depending on the wavelength (spectral sensitivity), the repetition rate or the presence of an attenuator. This is done so that the INTEGRA does not trigger on noise or that the electrical offset affects the measurements.

2. QUICK START PROCEDURE

1. Install the **PC-Gentec-EO software** on your PC.
2. Install the power or energy detector head on its optical stand.
3. Connect the INTEGRA device to the PC with the appropriate USB cable.
4. Start the PC-Gentec-EO software.
5. Choose the appropriate display for your measurement:

a. 

Real time with bar graph

b.  Scope

c.  Needle

d.  Averaging

e.  Histogram

f. 

Statistics

6. Press the **Connect** button on the top left corner of the main window and change the measurement and display options in the appropriate tabs.
   a. Power heads will default to power measurement. Energy heads will default to energy measurement. The display will default to a dual display in real time and scope in auto range mode.
   b. Remove the head's protective cover and start the laser.
   Put the detector head into the laser beam path. Leave it there for a few minutes until the detector has reached an equilibrium temperature. The entire laser beam must be within the sensor aperture. Do not exceed the maximum specified densities, energies or powers. For the most accurate measurement, spread the beam across 60% to 80% of the sensor area.

   Warning: **Power detectors can be used with both CW and pulsed lasers.**
   Energy detectors can only be used with pulsed lasers.

7. Adjust the **zero**:

   The power read by PC-Gentec-EO when no laser beam is incident on the detector may not be exactly zero. For power measures, this is because the detector is not thermally stabilized OR there was a heat source in the field of view of the detector when you connected the PC-Gentec-EO. As for photo detectors, zeroing will remove the detector's offset.

- **Thermal and pyroelectric detectors**: Block all laser radiation on the detector. To reset the zero, wait until the reading has stabilized and click **Set Zero** in the main menu.
- **Photo detectors:** You must block all forms of radiation (cover the detector). Click on **Set Zero** in the main menu. In some software versions, a message will appear requesting you to put the black cover over your photo detector. Press the **OK** button after you have done so. The software passes through all the scales to determine the zero for each scale.

See notes.

Notes:

a. Refer to specific power detector documentation for complete installation and operating instructions.

b. Power detectors are thermal sensors and are thus sensitive to temperature variations.

c. For high-precision measurements, it is recommended to:

    i. Allow the power detector to thermally stabilize before zeroing the software.

    ii. Touch only the stand when handling the power detector. Do not touch the detector itself. This is especially true for highly sensitive detectors.

    iii. Do not adjust the zero for energy detectors, such as the QE series.

    iv. Avoid forced airflow or drafts around the detector.

3. USER INTERFACE

Please refer to the PC-Gentec-EO manual for more information concerning the user interface. The manual can be downloaded on our website at: https://gentec-eo.com/downloads/specsheets-manuals.

4. USB AND RS-232 SERIAL COMMUNICATION

4.1. DESCRIPTION

The INTEGRA has two communication modes: the binary mode for fast data acquisition and the ASCII mode. Both modes will require text input commands which must follow the rules stated in Section 0. The output can be in binary mode or in ASCII mode. Section 0 describes all the commands in ASCII output mode, but keep in mind, it is also valid for binary mode, as described in Section 4.4.

The USB class used by INTEGRA is a CDC or Communication Device Class. This means it shows up in the host PC as a COM port, but it is not a COM port, rather a true full speed USB port. You can communicate with this port as if it were an RS232 port, but very fast when it comes to speed. Follow the Windows command prompts to install the USB drivers. The USB drivers are fully tested and digitally signed by Microsoft.

Open the appropriate port in your software with standard COM port tools. None of the port settings matter since they are not used, so leave them at whatever default they are in. It is a real USB connection.

Use the standard COM port writes and reads to control the INTEGRA.

4.2. SETTING UP COMMUNICATION TO THE INTEGRA

4.2.1. Connect the monitor

Use your favourite serial terminal emulator to connect to the COM port. Some example serial terminal programs are:

- CoolTerm: https://freeware.the-meiers.org/
- PuTTY: http://www.putty.org/
- RealTerm: https://realterm.sourceforge.io/

If you need to know the COM port number, you can find it in Windows Device Manager.

Use the following communication parameter settings:

USB

INTEGRA COM port settings	
Bits per second	Any setting will work
Data bits	Any setting will work
Parity	Any setting will work
Stop bits	Any setting will work
Flow control	Any setting will work

RS-232

INTEGRA COM port settings	
Bits per second	115,200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

4.2.2. To echo commands

The commands you type will not appear in the terminal window unless you set up the terminal emulator to do so. Only the response from the monitor will be displayed. If you prefer to see the commands you are typing, enable "Local Echo" or equivalent setting.

4.2.3. Test the connection

In the terminal window, type *VER. If the response is the version of your monitor, you are successfully connected and ready for serial command action.

4.3. SERIAL COMMAND FORMAT

4.3.1. Serial protocol rules

Commands are sent as text strings. The response will either be data or an empty string.

4.3.2. Text mode rules

All text commands must begin with a trigger character (*). You do not need to end with a line feed or a carriage return. Parameters must NOT be separated by spaces. Characters do not have to be capitals, mixed upper and lower cases are fine. Replies to all text mode commands are also in text mode and end with a carriage return and a line feed.

In case of an error, the reply string is one of the following:

"Command error. Command not recognized."

or

"Command error. Command must start with '*'"

Because all text mode replies end with a carriage return <CR> or a line feed <LF> (or both), a text reply contains tabulations when many elements need to be separated in the string. This is useful when exporting data to a spreadsheet.

4.4. BINARY MODE OUTPUT FORMAT

4.4.1. Description

The INTEGRA's resolution is 12 bits for the joulemeter mode. To be compatible with other Gentec-EO monitors, a 14-bit value is sent, but the two LSBs of the low byte are not significant.

Only joulemeters support the binary mode. Thermopiles in energy mode, thermal heads in standard mode and photo detectors are coded in ASCII.

By default the joulemeters are in ASCII mode. To turn on the binary mode, send the command *SS11. Please refer to the Detailed Description of the Serial Commands for INTEGRA (Complete) section for more information.

All commands are valid in binary mode and are sent as text strings as well. Only the commands *CAU, *CVU, *CEU and *CTU will return binary results. All other commands will reply in ASCII.

Examples to decode binary commands	
Decoding *CAU or *CVU	
If you send *cau, INTEGRA will send continuous data with 2 bytes per pulse. If you send *cvu, INTEGRA will send the current measurement with 2 bytes per pulse. Bit 7 of each byte is the order bit, and the rest is the binary data. If the order bit is 0, the byte is the high byte. If the order bit is 1, the byte is the low byte. You must then mask, shift the MSB, add and divide the data by the scale. See the example below. The 2 bytes are decoded as follows:	
Byte 2	0XXX XXXX.0 = High byte, and X is the upper binary data. If it is over the range, this byte is 0xFE.
Byte 1	1XXX XXYY. 1 = Low byte, X is the lower binary data and Y is not significant data. Y will always be 0. If it is over the range, this byte is 0x7F.

Examples to decode binary commands

Example 1: Using *CAU or *CVU

INTEGRA is measuring 151 mJ in a 300 mJ scale. The data sent by INTEGRA will be: 0x40B4.

Decode this as follows:

1. Look at bit 7 of each byte to determine the high and low bytes.
2. Keep bits 0 to 6 of each byte (and with 0x7F).
3. Shift the high byte left by 7 bits (multiply by 128).
4. Add the high and low bytes.
5. Divide the result by the full-scale value, 16,382.
6. Multiply the result by the set scale, 300 mJ.

The two data bytes are 0x40 and 0xB6. In binary they are: 0100 0000 and 1011 0100.

The byte order bit is 0 for the high byte and 1 for the low byte. The high byte is therefore 0x40, and the low byte is 0xB6.

The data is the lower 7 bits of each byte or high byte of 0x40 and low byte of 0x34.

Shifting the high byte 7 by its results in 0x40 x 128 = 0x2000.

Adding this value to the low byte results in 0x2034, or 8,244 decimal: 8,244 / 16,382 * 300 mJ = 151 mJ.

If the value of these bytes is 0xFE7F, an out-of-scale condition exists.

Decoding *CEU or *CTU

If you send *ceu, INTEGRA will send continuous data with 9 bytes per pulse.
If you send *ctu, INTEGRA will send the current measurement with 9 bytes per pulse.

The 9 bytes are decoded as follows:

Byte 8	Always 0X02 or STX. Let the host know this is the start of data.
Byte 7	The scale index or with 0x80. This is done so it can never be the STX or ETX byte. Therefore, if the scale was set to 29, then this byte would be hex (29) = 0x1D. Or this with 0x80, and the value sent is 0x9D.
Byte 6	The upper 7 data bits of the energy, or'd with 0x80. If the pulse is over the range, this byte is 0xFE.
Byte 5	The lower 7 data bits of the energy, or'd with 0x80. If the pulse is over the range, this byte is 0x7F.
Byte 4	The upper 7 bits of the pulse period timer, or'd with 0x80 (28 bits total).
Byte 3	The next 7 bits of the pulse period timer, or'd with 0x80 (28 bits total).
Byte 2	The next 7 bits of the pulse period timer, or'd with 0x80 (28 bits total).
Byte 1	The lower 7 bits of the pulse period timer, or'd with 0x80 (28 bits total).
Byte 0	Always 0X03 or ETX. Let the host know this is the end of the data.

Example 2: Using *CEU and *CTU

INTEGRA is measuring 151 mJ in a 300 mJ scale. The pulse frequency is 1531 Hz. The data sent by INTEGRA will be: 0x0297A0B68080FABC03.

Decode this as follows:

1. The valid data is between the 0x20 (Start of Text) and 0x03 (End of Text) codes.
2. Valid data is 0x97A0B68080FABC.
3. The first byte is the scale, or'd with 0x80.
4. The second and third bytes are the data, each or'd with 0x80.
5. The remaining 4 bytes are the pulse period counts, each or'd with 0x80.

Valid data is 0x97A0B68080FABC.

The scale byte is 0x97. Mask off bit 7 resulting in 0x17 or 23 decimal. The scale is 23 or 300 mJ.

The energy data bytes are 0xA0B6. If the value of these bytes is 0xFE7F, an out-of-scale condition exists.

If no out-of-scale condition exists, mask off bit 7 of each byte: 1010 0000 1011 0110 ≥ 0010 0000 0011 0110, resulting in 0x2036 or 8,246 decimal: 8,246 / 16,382 * 300 mJ = 151 mJ.

Examples to decode binary commands

The pulse period bytes are 0x8080FABC. Mask off bit 7 of each byte resulting in 0x003D3C or 15,676 decimal. The period timer is based on a 24E6 Hz clock, so the period is found as:

- If you send *ceu, it will be 15,676 counts / 24E6 counts per second = 653.17us.
- If you send *ctu, the pulse frequency will be 1 / 653.17us = 1531 Hz.

4.5. LIST OF SERIAL COMMANDS FOR THE INTEGRA (SUMMARY)

#	Command name	Command	Description
Display			
01	Set scale	SCS	Manually sets the scale
02	Set scale up	SSU	Changes scale to the next higher scale
03	Set scale down	SSD	Changes scale to the next lower scale
04	Get current scale index	GCR	Returns scale index between 0 and 41
05	Set autoscale	SAS	Sets the autoscale
06	Get autoscale	GAS	Returns autoscale status
07	Display valid scale	DVS	Displays the valid scales for the connected head
08	Set trigger level	STL	Sets the internal trigger level for pulse energy
09	Get trigger level	GTL	Returns trigger level value
10	Get measure mode display	GMD	Returns the current measure mode on INTEGRA
Measurement			
Data acquisition			
11	Query current value	CVU	Gets the value currently in ASCII or binary
12	Send continuous transmission of data	CAU	Sends the values in ASCII or binary to the serial port with the data sampling setting
13	Send continuous value with period	CEU	Sends continuous value with period in ASCII or binary
14	Send current value with frequency	CTU	Sends current value with frequency in ASCII or binary
15	Stop the CAU command	CSU	Stops the *CAU and *CEU commands
16	Query new value ready	NVU	Determines if new reading is available or not
17	Get laser frequency	GRR	Sends the laser rep rate frequency in ASCII
18	Set binary joulemeter mode	SS1	Sets the binary joulemeter mode or ASCII mode
19	Get binary joulemeter mode	GBM	Returns the binary joulemeter mode or ASCII mode
Setup			
20	Set personal wavelength correction in nm	PWC	Specifies the wavelength in nm
21	Set personal wavelength correction in microns	PWM	Specifies the wavelength in microns (for THZ heads only)
22	Get wavelength	GWL	Returns the wavelength in nm
Control			
23	Set anticipation	ANT	Turns the anticipation on or off
24	Get anticipation status	GAN	Returns the anticipation status
25	Noise suppression	AVG	Applies the noise suppression algorithm
26	Set zero offset	SOU	Zeroes the reading for a power detector
27	Clear zero offset	COU	Undoes the zeroing of the reading for a power detector
28	Get zero offset	GZO	Returns the zero offset status
29	Set diode zero offset	SDZ	Zeroes the reading for all the scales for a photo detector
30	Set user multiplier	MUL	Sets the multiplier value
31	Get user multiplier	GUM	Returns the current multiplier value
32	Set user offset	OFF	Sets the offset value
33	Get user offset	GUO	Returns the current offset value
34	Set single shot energy mode	SSE	Sets the single shot energy mode
35	Set attenuator	ATT	Sets the attenuator
36	Get attenuator	GAT	Returns the attenuator status
37	External trigger	ET	Activates or deactivates the external trigger
Instrument and detector information			
38	Change baud rate	BPS	Sets the baud rate for RS-232
39	Query version	VER	Gets firmware version of the monitor
40	Query status	STS	Retrieves the detector information and monitor settings
41	Query extended status	ST2	Returns the extended status

The serial command format is:

All text commands must begin with a trig character (*) and MUST NOT end with a line feed or a carriage return. All parameters MUST NOT have a space between the command and the list of parameters, nor between the parameters themselves. The characters do not have to be in capital letters. Mixed cases are fine. Replies to all text mode commands are also in text mode and end with a carriage return and line feed.

- *MUL+8 character numerical value, e.g. « *MUL1.000000 » or « *MUL-1.34e-3 » or «*MUL0.000543 »
- *OFF+8 character numerical value like above
- *STL+4 character numerical value like « *STL10.2 » or « *STL00.2 »
- *SSE1 / *SSE0: Single Shoot Energy ON or OFF
- *ATT1 / *ATT0: Attenuator ON / OFF (when available)

Automation software must allow sufficient time for data to be processed after each command before sending subsequent commands.

4.6. DETAILED DESCRIPTION OF THE SERIAL COMMANDS FOR INTEGRA (COMPLETE)

4.6.1. Display

01 - Set scale

This command is used to force the display of the current data into a specific scale. The lower scale is always zero, the higher scales can be found in the table below. The autoscale mode applies the best scale for the current values in real time. The parameter must be one of the identifiers in the table below and have two digits.

Command	Parameters	Answer
SCS	Range index	

Range identifiers

Index	Value	Index	Value
00	1 picowatt or picojoule	21	30 milliwatts or millijoules
01	3 picowatts or picojoules	22	100 milliwatts or millijoules
02	10 picowatts or picojoules	23	300 milliwatts or millijoules
03	30 picowatts or picojoules	24	1 watt or joule
04	100 picowatts or picojoules	25	3 watts or joules
05	300 picowatts or picojoules	26	10 watts or joules
06	1 nanowatt or nanojoule	27	30 watts or joules
07	3 nanowatts or nanojoules	28	100 watts or joules
08	10 nanowatts or nanojoules	29	300 watts or joules
09	30 nanowatts or nanojoules	30	1 kilowatt or kilojoule
10	100 nanowatts or nanojoules	31	3 kilowatts or kilojoules
11	300 nanowatts or nanojoules	32	10 kilowatts or kilojoules
12	1 microwatt or microjoule	33	30 kilowatts or kilojoules
13	3 microwatts or microjoules	34	100 kilowatts or kilojoules
14	10 microwatts or microjoules	35	300 kilowatts or kilojoules
15	30 microwatts or microjoules	36	1 megawatt or megajoule
16	100 microwatts or microjoules	37	3 megawatts or megajoules
17	300 microwatts or microjoules	38	10 megawatts or megajoules
18	1 milliwatt or millijoule	39	30 megawatts or megajoules
19	3 milliwatts or millijoules	40	100 megawatts or megajoules
20	10 milliwatts or millijoules	41	300 megawatts or megajoules

Default: Autoscale

Example

The following example sets the scale to 3 nanowatts or nanojoules.

Command: *SCS07 Answer:

02 - Set scale up

This command is used to force the display of the current data into a higher scale.

Command	Parameters	Answer
SSU	None	

03 - Set scale down

This command is used to force the display of the current data into a lower scale.

Command	Parameters	Answer
SSD	None	

04 - Get current scale index

This command returns the scale index between 0 and 41. Please refer to set scale command (SCS) details for the complete scale index table.

Command	Parameters	Answer
GCR	None	Index from 0 to 41

Example

Command: *GCR Answer: Range: 10<CR><LF>

05 - Set autoscale

This command is used to force the display into autoscale.

Command	Parameters	Answer
SAS	1: On 0: Off	

06 - Get autoscale

This command returns whether or not the autoscale option is activated.

Command	Parameters	Answer
GAS	None	1: On 0: Off

Example

Command: *GAS Answer: Autoscale: 1<CR><LF>

07 - Display valid scale

This command is used to display all of the valid scales the connected head supports. The scales are displayed in the scale index. Please refer to the set scale section for the table correspondence.

Command	Parameters	Answer
DVS	None	The valid scale index

The following example is for a UP19K INTEGRA, which can have the following scales:

- 100 mW
- 300 mW
- 1 W
- 3 W
- 10 W
- 30 W
- 100 W

Example

Command:	*DVS	Answer:	[22]: 100.0 m<CR><LF> [23]: 300.0 m<CR><LF> [24]: 1.000<CR><LF> [25]: 3.000<CR><LF> [26]: 10.00<CR><LF> [27]: 30.00<CR><LF> [28]: 100.0<CR><LF>

08 - Set trigger level

This command sets the internal trigger level when using the device in energy mode.

Command	Parameters	Answer
STL	The trigger level (in percentage) must be four numerical values.	

Default: 2%

The value should be set between 0.1 and 99.9.

Example

Command:	*STL15.4 (15.4%) *STL00.2 (0.2%)	Answer:	

09 - Get trigger level

This command returns the trigger level in %. The value is between 0.1% and 99.9%.

This is for joulemeters and wattmeters in energy mode only.

Command	Parameters	Answer
GTL	None	Returns the trigger level in %

Example

Command:	*GTL	Answer (original series 1.00.00): 2.0<CR><LF> Answer (new series): Trigger level: 2.0<CR><LF>

10 – Get measure mode display

This command returns the INTEGRA's measurement mode. Depending on the head, it can be power mode in W, energy mode in J or single shot energy mode in J (SSE).

Command	Parameters	Answer
GMD	None	POWER = 0 ENERGY = 1 SSE = 2

Example

Command:	*GMD	Answer: Mode: 0<CR><LF>

4.6.2. Data acquisition

11 - Query current value

This command is used to query the value that is currently being displayed by the monitor. The value is displayed in watts or in joules. For joulemeters, the data can also be in binary format (refer to Section 4.4).

Command	Parameters	Answer
CVU	None	Data in ASCII (scientific notation with the new series only) or in binary format.

Example

For example, with the original series v1.00.XXX, an 8.002557-microwatt reading would be displayed as shown below.

Command: *CVU Answer: 8.002557e-06<CR><LF>

For example, with the new series, a 506,601-watt reading and a -12.25631-milliwatt reading would be displayed as shown below.

Command: *CVU Answer: +5.066010e+02<CR><LF>
Command: *CVU Answer: -1.225631 e-02<CR><LF>

12 - Send continuous transmission of data

This command is used to send data to the serial port, according to the data sampling setting. For joulemeters, the data can also be in binary format (refer to Section 4.4).

Command	Parameters	Answer
CAU	None	Data in ASCII (scientific notation with the new series only) or in binary format.

Example

For example, with a wattmeter, a reading of around 500 milliwatts would be displayed as shown below until the command *CSU is sent.

Command:	*CAU	Answer (original series v1.00.XX):	Answer (new series):
		0.5066010<CR><LF>	+5.066010e-01<CR><LF>
		0.5066012<CR><LF>	+5.066012e-01<CR><LF>
		0.5066014<CR><LF>	+5.066014e-01<CR><LF>
		0.5066022<CR><LF>	+5.066022e-01<CR><LF>
		0.5066032<CR><LF>	+5.066032e-01<CR><LF>
		0.5066042<CR><LF>	+5.066042 e-01<CR><LF>
		…	…

In the original series v1.00.XX, the joulemeters and photodiodes also use the scientific notation. For example, with a joulemeter, a reading of around 500 millijoules would be displayed as shown below until the command *CSU is sent.

Command:	*CAU	Answer (original series v1.00.XX):	Answer (new series):
		5.066010e-01<CR><LF>	+5.066010e-01<CR><LF>
		5.066012e-01<CR><LF>	+5.066012e-01<CR><LF>
		5.066014e-01<CR><LF>	+5.066014e-01<CR><LF>
		5.066022e-01<CR><LF>	+5.066022e-01<CR><LF>
		5.066032e-01<CR><LF>	+5.066032 e-01<CR><LF>
		…	…

13 - Send continuous value with frequency

INTEGRA will send continuous energy data and the pulse repetition rate in Hz. They are comma-separated.

This is for joulemeters only. For joulemeters, the data can also be in binary format (refer to Section 4.4).

Command	Parameters	Answer
CEU	None	Continuous value with pulse repetition rate in Hz in ASCII (scientific notation with the new series) or binary format.

Example

This example is for a 32-Hz laser.

Command:	*CEU	Answer (original series v1.00.XX):	Answer (new series):
		5.066010e-01,32.0<CR><LF>	+5.066010e -01,32.0<CR><LF>
		5.066012e-01,32.0<CR><LF>	+5.066012e -01,32.0<CR><LF>
		5.066015e-01,32.0<CR><LF>	+5.066015e -01,32.0<CR><LF>
		5.066021e-01,32.0<CR><LF>	+5.066021 e -01,32.0<CR><LF>
		…	…

14 - Send current value with frequency

INTEGRA will send the current measurement and the pulse repetition rate in Hz. They are comma-separated. *This is for joulemeters only*. For joulemeters, the data can also be in binary format (refer to Section 4.4).

Command	Parameters	Answer
CTU	None	Current value with pulse repetition rate in Hz in ASCII (scientific notation with the new series) or binary format.

Example

This example is for a 32-Hz laser.

Command:	*CTU	Answer (original series v1.00.XX): 5.066E-01,32.0<CR><LF> Answer (new series): +5.066010e -01,32.0<CR><LF>

15 - Stop the CAU or CEU command

This command is used to stop the real-time transfer enabled by the CAU and CEU commands.

Command	Parameters	Answer
CSU	None	

16 – Query new value ready

This command is used to check whether a new value is available from the device. Though optional, its use is recommended when used with a single pulse operation.

This is for joulemeters only.

Command	Parameters	Answer
NVU	None	New data available or New data not available

Example

Command:	*NVU	Answer: New data not available <CR><LF>

17 - Get laser frequency

This command is used to getting the laser frequency.

This is for joulemeters only.

Command	Parameters	Answer
GRR	None	Data in ASCII

18 - Set binary joulemeter mode

This command is used to set the monitor in binary or ASCII mode. Refer to Section 4.4 for the INTEGRA binary mode description.

This is for joulemeters only.

Command	Parameters	Answer
SS1	0= ASCII 1= Binary	

Example

Command: *SS11 Answer:

19 - Get binary joulemeter mode

This command returns whether or not the binary joulemeter mode is activated for serial communication. Refer to Section 4.4 for the INTEGRA binary mode description.

This is for joulemeters only.

Command	Parameters	Answer
GBM	None	1: On 0: Off

Example

Command: *GBM Answer: Binary joulemeter mode: 0<CR><LF>

4.6.3. Setup

20 - Set personal wavelength correction in nm

This command is used to specify the wavelength in nm being used on the detector. The EEPROM in the detector contains measured spectral data for a wide range of wavelengths. A valid value is set between the lowest and highest wavelengths supported by the device, and it should not be a floating point value. The input parameter must have five digits. If the desired wavelength does not have five digits, you must enter a zero-padded number. For example, to set the wavelength at 514 nm, you must enter 00514.

In the new series, specifying zero as a wavelength or providing an out-of-bound value as a parameter cancels the command. In the original series v1.00.XX, the closest valid value is used when an out-of-bound wavelength is provided.

Command	Parameters	Answer
PWC	Wavelength	

Default: Calibration wavelength (typically 1064 nm, varies with the detector model).

Example

The following example sets the wavelength to 1,550 nm.

Command:	*PWC01550	Answer:

21 - Set personal wavelength correction in microns

This command is used to specify the wavelength in microns for THZ detectors only. The EEPROM in the detector contains measured spectral data for a wide range of wavelengths. A valid value is set between the lowest and highest wavelengths supported by the device. The input parameter must have five digits and can be a floating point value. If the desired wavelength does not have five digits, you must enter a zero-padded number. For example, to set the wavelength at 10.6 microns, you must enter 010.6. Please note that the resolution is limited as follows:

Wavelength range	Resolution limit
Less than 100 µm	10 nm
Greater than 99.99 µm or less than 1000 µm	100 nm
Greater than 999.9um	1 µm

In the new series, specifying zero as a wavelength or providing an out-of-bound value as a parameter cancels the command. In the original series v1.00.XX, the closest valid value is used when an out-of-bound wavelength is provided.

Command	Parameters	Answer
PWM	Wavelength	

Default: Calibration wavelength (typically 1064 nm, varies with the detector model).

 Example

The following example sets the wavelength to 25 microns (25,000 nm).

Command:	*PWM025.0	Answer:

22 - Get wavelength

This command returns the wavelength in nm.

Command	Parameters	Answer
GWL	None	Returns the wavelength in nm

 Example

Command:	*GWL	Answer: PWC: 1064<CR><LF>

4.6.4. Control

23 - Set anticipation

This command is used to enable or disable the anticipation processing when the device is reading from a wattmeter. The anticipation is a software-based acceleration algorithm that provides faster readings using the detector's calibration.

Command	Parameters	Answer
ANT	1: On 0: Off	

Default: On

Example

The following example sets the anticipation on.

Command: *ANT1 Answer:

24 - Get anticipation status

This command returns the anticipation status. If the anticipation is not available, it will always be at "off".

Command	Parameters	Answer
GAN	None	1: On 0: Off

Example

Command: *GAN Answer: Anticipation: 0<CR><LF>

25 - Noise suppression

Sets or queries the sampling size of the noise suppression. For pyroelectric detectors and UM detectors only.

The INTEGRA joulemeter instrument has a special proprietary algorithm that can lower the noise-induced error when reading low energy levels or energy readings of any level with noise present. This feature greatly reduces the effect of noise on the peak-to-peak measurement in joulemeter mode. INTEGRA will need to measure the number of pulses selected in the sampling size before the algorithm will settle to the noise-suppressed value. Once the readings have stabilized, any subsequent reading will be stable until the sampling size is changed. The system will then stabilize to the new value. Larger sampling sizes will result in more noise suppression. Noise suppression works best with the external trigger. This function will greatly improve the accuracy of the lowest scale, or any scale, when used in a noisy environment.

Command	Parameters	Answer
AVG###	###: average size	

 Example

The following example sets the sampling size to 16 pulses.

Command: *AVG016 Answer: Ok.<CR><LF>

26 - Set zero offset

This command subtracts the current value from all future measurements the moment the command is issued to set a new zero point. This command does not work with photodiodes. Please refer to *SDZ.

Command	Parameters	Answer
SOU	None	Autoscale: Please Wait… Done! Fixed scale:

 Example (when in autoscale)

Command: *SOU Answer: Please Wait…<CR><LF>
Done!<CR><LF>

27 - Clear zero offset

This command undoes the zero offset command to set the zero point at zero.

Command	Parameters	Answer
COU	None	

28 - Get zero offset

This command returns whether the zero offset has been activated or not.

Command	Parameters	Answer
GZO	None	1: On 0: Off

Example

Command: *GZO Answer: Zero: 0<CR><LF>

29 - Set diode zero offset

This command subtracts the current value for all available scales from all future measurements the moment the command is issued to set a new zero point.

This is for photodiodes only. Please refer to *SOU for other detectors.

Command	Parameters	Answer
SDZ	None	Autoscale: Please Wait… Done! Fixed scale:

Example (when in autoscale)

Command: *SDZ Answer: Please Wait…<CR><LF>
Done!<CR><LF>

30 - Set user multiplier

This command is used to set the value of the multipliers.

Command	Parameters	Answer
MUL	Eight-character numerical value	

Default: 1

Example

The following example sets multiplier = 33.

Command:	*MUL00000033 Or *MUL3.3000e1	Answer:

31 - Get user multiplier

This command returns the multiplier value.

Command	Parameters	Answer
GUM	None	Current multiplier value

Example

Command:	*GUM	Answer: User Multiplier: 1.0000000E+00<CR><LF>

32 - Set user offset

This command is used to set the value of the offset.

Command	Parameters	Answer
OFF	Eight-character numerical value	

Default: 0

Example

The following example sets the offset to 1.5 milliwatts or 1.5 millijoules.

Command:	*OFF0.001500 or *OFF1.500e-3	Answer:

The other option available is the zero offset. The zero offset operation is done first, before the user multipliers and offsets.

33 - Get user offset

This command returns the offset value.

Command	Parameters	Answer
GUO	None	Current offset value

Example

Command:	*GUO	Answer: User Offset: 1.5000000E-03<CR><LF>

34 - Set single shot energy mode

This command is used to toggle to single shot energy mode when using a wattmeter. It is recommended to wait at least 2 seconds after this command before sending another command to avoid communication problems.

Command	Parameters	Answer
SSE	1: On 0: Off	

Default: Off

35 - Set attenuator

This command is used to adjust the processing of the monitor with the readings of the head, depending on whether the head is using an external attenuator or not.

Command	Parameters	Answer
ATT	1: On 0: Off	

Default: Off

Example

The following example sets the attenuator on. This means that the attenuator in on the detector:

Command:	*ATT1	Answer:

36 - Get attenuator

This command returns the attenuator status. If the attenuator is not available, it will always be off.

Command	Parameters	Answer
GAT	None	1: On 0: Off

Example

Command: *GAT Answer: Attenuator: 0<CR><LF>

37 – External trigger

Activates or deactivates the external trigger for INTEGRAs which have an external trigger option.

Command	Parameters	Answer
ET	None	1: On 0: Off

Example

Command: *ET1 Answer:

4.6.5. Instrument and detector information

38 - Change baud rate for RS-232

This command is used to default baud rate of the INTEGRA for RS-232 only. This will permanently change the baud rate and save it in the INTEGRA flash memory. If you want to change it back, you will have to send the command again at the new baud rate. If you want to update the INTEGRA firmware, you will have to change the baud rate to 115200.

Command	Parameters	Answer
BPS	0 9600 1 19200 2 38400 3 57600 4 115200	ACK:New Baud Rate

Example

Command: *BPS0 Answer: ACK: 9600<CR><LF>

39 - Query version

This command is used to query the device to get information about the firmware version and the device type.

Command	Parameters	Answer
VER	None	Version and device type

Example

Command: *VER Answer: INTEGRA Version 1.00.00<CR><LF>

40 - Query status

This command is used to query the device to get information about the following characteristics:

- Measure mode
- Maximum, minimum and current scale
- Maximum, minimum and current wavelength with and without attenuation
- Attenuator availability and status
- Detector model
- Detector serial number

Command	Parameters	Answer
STS	None	A hexadecimal structure is described in the table below.

The first byte represents the validity of the structure: 0 represents a valid line while 1 is the end of the structure. The next 4 bytes represent the address line, and the last 4 bytes are the actual value. The values are written on 32 bits, which means that all the values are written on two lines. The first line represents the LSB, and the second line represents the MSB.

The following table shows the output with an XLP12-3S-H2-INT-D0, serial number 199672.

Note that text data values such as detector name and serial number are in ASCII-encoded little-endian 16-bit chunks. The byte order must be reversed to be converted into a readable format.

Hexadecimal structure			Converted value	Definition
Valid	Address	Value		
:0	0000	0003	3	Reserved
:0	0001	0000	0	Reserved
:0	0002	0003	3	Reserved
:0	0003	0000	0	Reserved
:0	0004	0000	0	Measure Mode LSB
:0	0005	0000	0	Measure Mode MSB
:0	0006	0015	21	Current scale LSB (refer to scale index *SCS)
:0	0007	0000	0	Current scale MSB (refer to scale index *SCS)
:0	0008	0019	25	Maximum scale LSB (refer to scale index *SCS)
:0	0009	0000	0	Maximum scale MSB (refer to scale index *SCS)
:0	000A	0011	17	Minimum scale LSB (refer to scale index *SCS)
:0	000B	0000	0	Minimum scale MSB (refer to scale index *SCS)
:0	000C	0428	1064	Current wavelength LSB (nm)
:0	000D	0000	0	Current wavelength MSB (nm)
:0	000E	2968	10600	Maximum wavelength LSB (nm)
:0	000F	0000	0	Maximum wavelength MSB (nm)
:0	0010	00C1	193	Minimum wavelength LSB (nm)
:0	0011	0000	0	Minimum wavelength MSB (nm)

Hexadecimal structure			Converted value	Definition
Valid	Address	Value		
:0	0012	0001	1	Is Attenuator available LSB (1= yes 0 = no)
:0	0013	0000	0	Is Attenuator available MSB (1= yes 0 = no)
:0	0014	0000	0	Is Attenuator on LSB (1= yes 0 = no)
:0	0015	0000	0	Is Attenuator on MSB (1= yes 0 = no)
:0	0016	2968	10600	Maximum wavelength with attenuation LSB (nm)
:0	0017	0000	0	Maximum wavelength with attenuation MSB (nm)
:0	0018	00C1	193	Minimum wavelength with attenuation LSB (nm)
:0	0019	0000	0	Minimum wavelength with attenuation MSB (nm)
:0	001A	4C 58	L X	Detector name, in ASCII (XLP12-3S-H2-INT-D0)
:0	001B	31 50	1 P	
:0	001C	2D 32	- 2	
:0	001D	53 33	S 3	
:0	001E	48 2D	H -	
:0	001F	2D 32	- 2	
:0	0020	4E 49	N I	
:0	0021	2D 54	- T	
:0	0022	30 44	0 D	
:0	0023	CC 00		00 = Null termination character. Bytes reserved for longer detector names. May contain invalid data.
:0	0024	CC CC		
:0	0025	CC CC		
:0	0026	CC CC		
:0	0027	CC CC		
:0	0028	CC CC		
:0	0029	CC CC		
:0	002A	39 31	9 1	Detector serial number, in ASCII (199672)
:0	002B	36 39	6 9	
:0	002C	32 37	2 7	
:0	002D	00 00		00 = Null termination character
:1	0000	00 00		End of structure

41 - Query extended status

This command is used to query the device to get information about the following characteristics:

- Measure mode
- Maximum, minimum and current scale
- Maximum, minimum and current wavelength with and without attenuation
- Attenuator availability and status
- Detector model
- Detector serial number
- Trigger level (0.1 to 99.9)
- Autoscale mode
- Anticipation mode
- Zero offset mode
- User multiplier
- User offset

Command	Parameters	Answer
ST2	None	A hexadecimal structure described in the table below.

The first byte represents the validity of the structure: 0 represents a valid line while 1 is the end of the structure. The next 4 bytes represent the address line, and the last 4 bytes are the actual value. The values are written on 32 bits, which means that all the values are written on two lines. The first line represents the LSB, and the second line represents the MSB.

The following table shows the output with an XLP12-3S-H2-INT-D0 (s/n 199672).

Note that text data values such as detector name and serial number are in ASCII-encoded little-endian 16-bit chunks. The byte order must be reversed to be converted into a readable format.

Hexadecimal structure			Converted value	Definition
Valid	Address	Value		
:0	0000	3	3	Reserved
:0	0001	0	0	Reserved
:0	0002	3	3	Reserved
:0	0003	0	0	Reserved
:0	0004	0	0	Measure mode LSB
:0	0005	0	0	Measure mode MSB
:0	0006	11	17	Current scale LSB (refer to scale index *SCS)
:0	7	0	0	Current scale MSB (refer to scale index *SCS)
:0	0008	19	25	Maximum scale LSB (refer to scale index *SCS)
:0	0009	0	0	Maximum scale MSB (refer to scale index *SCS)
:0	000A	11	17	Minimum scale LSB (refer to scale index *SCS)
:0	000B	0	0	Minimum scale MSB (refer to scale index *SCS)
:0	000C	428	1064	Current wavelength LSB (nm)
:0	000D	0	0	Current wavelength MSB (nm)
:0	000E	2968	10600	Maximum wavelength LSB (nm)
:0	000F	0	0	Maximum wavelength MSB (nm)
:0	0010	00C1	193	Minimum wavelength LSB (nm)
:0	0011	0	0	Minimum wavelength MSB (nm)
:0	0012	1	1	Is Attenuator available LSB (1= yes 0 = no)
:0	0013	0	0	Is Attenuator available MSB (1= yes 0 = no)
:0	0014	0	0	Is Attenuator on LSB (1= yes 0 = no)
:0	0015	0	0	Is Attenuator on MSB (1= yes 0 = no)
:0	0016	2968	10600	Maximum wavelength with attenuation LSB (nm)
:0	0017	0	0	Maximum wavelength with attenuation MSB (nm)
:0	0018	00C1	193	Minimum wavelength with attenuation LSB (nm)
:0	0019	0	0	Minimum wavelength with attenuation MSB (nm)
:0	001A	4C 58	L X	Detector name, in ASCII (XLP12-3S-H2-INT-D0)
:0	001B	31 50	1 P	
:0	001C	2D 32	- 2	
:0	001D	53 33	S 3	
:0	001E	48 2D	H -	
:0	001F	2D 32	- 2	
:0	0020	4E 49	N I	
:0	0021	2D 54	- T	
:0	0022	30 44	0 D	
:0	0023	CC 00		00 = Null termination character Bytes reserved for longer detector names. May contain invalid data.
:0	0024	CC CC		
:0	0025	CC CC		
:0	0026	CC CC		
:0	0027	CC CC		
:0	0028	CC CC		
:0	0029	CC CC		
:0	002A	39 31	1 9	Detector serial number, in ASCII (199672)
:0	002B	36 39	9 6	
:0	002C	32 37	7 2	

Hexadecimal structure			Converted value	Definition
Valid	Address	Value		
:0	002D	0 0		00 = Null termination character
:0	002E	0000		Reserved
:0	002F	0000		Reserved
:0	0030	0001	1	Is autoscale mode on? LSB
:0	0031	0000	0	Is autoscale mode on? MSB
:0	0032	0000	0	Is anticipation on? LSB
:0	0033	0000	0	Is anticipation on? MSB
:0	0034	0000	0	Is zero offset on? LSB
:0	0035	0000	0	Is zero offset on? MSB
:0	0036	0000	1.0000	Correction multiplier LSB
:0	0037	3F80	(0x3F800000)	Correction multiplier MSB
:0	0038	0000	0.0000	Correction offset LSB
:0	0039	0000	(0x00000000)	Correction offset MSB
:1	0000	0000	0	End of structure

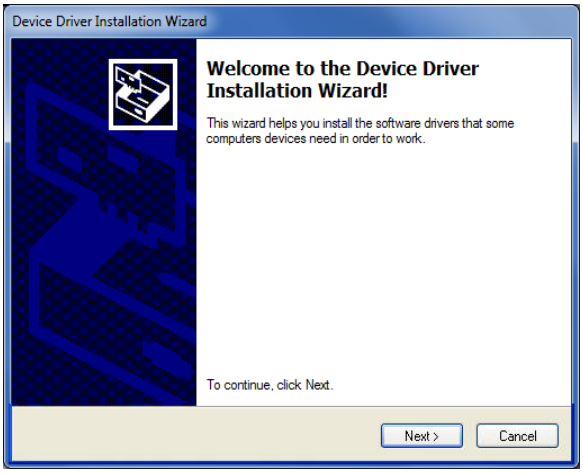
4.7. ERROR MESSAGES

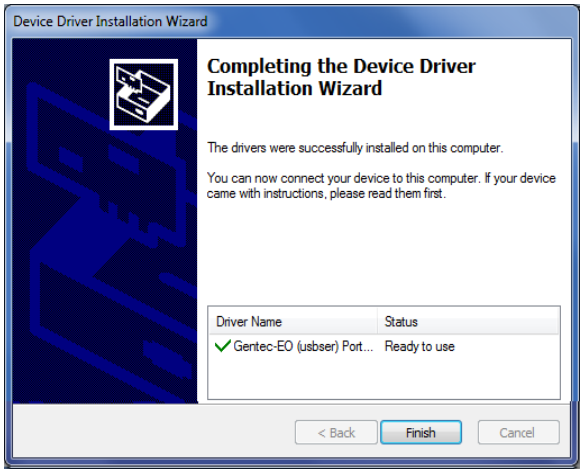
#	Error	Comment
1	Command error. Command not recognized.	Command is invalid.
2	Command error. Command must start with '*'.	All text commands must begin with a trig character (*).

5. USB DRIVER INSTALLATION

INTEGRA USB drivers will install a virtual COM port on your PC. Please download the USB driver at: https://gentec-eo.com/downloads.

1. Do not connect the INTEGRA to your computer.
2. Follow the installation steps until you have the message indicating that the INTEGRA is ready to be used.





3. You can now connect the INTEGRA and install the software.

6. MAINTENANCE

6.1. FREE SOFTWARE UPGRADE

Keep up to date with the latest versions of PC-Gentec-EO software to get the new features and options. As new and improved versions of the device firmware are created, it is in your best interest to update your INTEGRA. The latest device firmware can be downloaded from the Gentec-EO website at https://gentec-eo.com/downloads. Go to the Downloads section, find the file that corresponds to your INTEGRA and follow our simple, easy-to-use instructions.

6.2. TROUBLESHOOTING

When using the INTEGRA with serial commands, please ensure to always close the communication port after you are done using the INTEGRA. If you do not do so, the INTEGRA will not be recognized the next time you connect it to the computer.

7. DECLARATION OF CONFORMITY

CE

Application of Council directive(s): 2014/30/EU EMC Directive
tests in compliance with FCC part 15 subpart B

Manufacturer's name: Gentec Electro Optics, Inc.
Manufacturer's address: 445, Saint-Jean-Baptiste, Suite 160
Québec (Québec) G2E 5N7
Canada

Representative's name: Laser Component S.A.S.
Representative's address: 45 bis Route des Gardes
92190 Meudon (France)

Type of equipment: Laser Power/Energy Meter
Model no.: INTEGRA V2
Year of test and manufacture: 2016

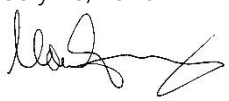
Standard(s) to which conformity is declared:
EN61326-1 (2013) Emission generic standard

Test name Standards	Test specifications	Performance criterion	Results
Conducted Emissions FCC part 15 (2013) subpart B	Class A 150kHz-30MHz	N/A	Pass
Radiated Emissions FCC part 15 (2013) subpart B	Class A 30MHz-1GHz	N/A	Pass
Conducted Emissions CISPR11 (2009) A1 (2010)	Group 1 - class A 150kHz-30MHz	N/A	Pass
Radiated Emissions CISPR11 (2009) A1 (2010)	Group 1 - class A 30MHz-1GHz	N/A	Pass
Harmonic Current Emission Limits EN61000-3-2 (2006) A1 (2009) A2 (2009)	Class A	N/A	Pass
Voltage Fluctuations and Flicker Limitations EN61000-3-3 (2008)	Observation period for Pst: 10 min Observation period for Plt: 120 min	N/A	Pass
Electrostatic Discharge Immunity IEC61000-4-2 (2008)	Contact: ±4 kV Air: ±8 kV	B	Pass
Radiated Electromagnetic Field Immunity IEC61000-4-3 (2006) A1 (2007) A2 (2010)	80MHz-1000MHz: 10 V/m 1.4GHz-2GHz: 3 V/m 2GHz-2.7GHz: 1 V/m	A	Pass
Electrical Fast Transient Immunity IEC61000-4-4 (2012)	Power: ±2 kV/5kHz I/O Ports: ±1 kV/5kHz Communication Ports: ±1 kV/5kHz	B	Pass
Surge Immunity IEC61000-4-5 (2005)	Power: ±2 kV L-PE/±1 kV L-L I/O Ports: N/A Communication Ports: N/A	B	Pass
Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields IEC61000-4-6 (2008)	Power: 3V I/O Ports: 3V Communication Ports: 3V	A	Pass

Test name Standards	Test specifications	Performance criterion	Results
Voltage Dips, Short Interruptions and Voltage Variation Immunity on AC Input IEC61000-4-11 (2004)	Voltage dips: 0% during 1 cycle 40% during 10 cycles 70% during 25 cycles Short interruptions: 0% during 250 cycles	 B C C C	Pass

I, the undersigned, hereby declare that the equipment specified above conforms to the above directive(s) and standard(s).

Place: Quebec (Quebec)
Date: July 15, 2016



(President)

8. UKCA DECLARATION OF CONFORMITY

Application of Council directive(s): 2014/30/EU EMC Directive
tests in compliance with FCC part 15 subpart B

Manufacturer's name: Gentec Electro Optics, Inc.
Manufacturer's address: 445, rue Saint-Jean-Baptiste, Suite 160
Québec (Québec) G2E 5N7
Canada

Representative's name: Laser Component S.A.S.
Representative's address: 45 bis Route des Gardes
92190 Meudon (France)

Type of equipment: Laser Power/Energy Meter
Model no.: INTEGRA V2
Year of test & manufacture: 2016

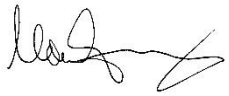
Standard(s) to which conformity is declared:
EN61326-1 (2013) Emission generic standard

Test name Standards	Test specifications	Performance criterion	Results
Conducted Emissions FCC part 15 (2013) subpart B	Class A 150kHz-30MHz	N/A	Pass
Radiated Emissions FCC part 15 (2013) subpart B	Class A 30MHz-1GHz	N/A	Pass
Conducted Emissions CISPR11 (2009) A1 (2010)	Group 1 - class A 150kHz-30MHz	N/A	Pass
Radiated Emissions CISPR11 (2009) A1 (2010)	Group 1 - class A 30MHz-1GHz	N/A	Pass
Harmonic Current Emission Limits EN61000-3-2 (2006) A1 (2009) A2 (2009)	Class A	N/A	Pass
Voltage Fluctuations and Flicker Limitations EN61000-3-3 (2008)	Observation period for Pst: 10 min Observation period for Plt: 120 min	N/A	Pass
Electrostatic Discharge Immunity IEC61000-4-2 (2008)	Contact: ±4 kV Air: ±8 kV	B	Pass
Radiated Electromagnetic Field Immunity IEC61000-4-3 (2006) A1 (2007) A2 (2010)	80MHz-1000MHz: 10 V/m 1.4GHz-2GHz: 3 V/m 2GHz-2.7GHz: 1 V/m	A	Pass
Electrical Fast Transient Immunity IEC61000-4-4 (2012)	Power: ±2 kV/5kHz I/O Ports: ±1 kV/5kHz Communication Ports: ±1 kV/5kHz	B	Pass
Surge Immunity IEC61000-4-5 (2005)	Power: ±2 kV L-PE/±1 kV L-L I/O Ports: N/A Communication Ports: N/A	B	Pass
Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields IEC61000-4-6 (2008)	Power: 3V I/O Ports: 3V Communication Ports: 3V	A	Pass

Test name Standards	Test specifications	Performance criterion	Results
Voltage Dips, Short Interruptions and Voltage Variation Immunity on AC Input IEC61000-4-11 (2004)	Voltage dips: 0% during 1 cycle 40% during 10 cycles 70% during 25 cycles Short interruptions: 0% during 250 cycles	 B C C C	Pass

I, the undersigned, hereby declare that the equipment specified above conforms to the above directive(s) and Standard(s).

Place: Quebec (Quebec)
Date: November 29, 2021



(President)

9. APPENDIX A: WEEE DIRECTIVE

Recycling and separation procedure for WEEE directive 2002/96/EC

This section is used by the recycling centre when the monitor reaches its end of life. Breaking the calibration seal or opening the monitor will void the INTEGRA warranty. For the head, please refer to the head's manual.

The complete monitor contains:

1 monitor
1 USB cable

Separation

Plastic: INTEGRA enclosure
Printed circuit board: inside the INTEGRA (no need to separate less than 10 cm^2)

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