



Original Series

New Series

USER MANUAL

Integra | Embedded Monitor for Power & Energy Detectors

WARRANTY

First Year Warranty

All Gentec-EO devices carry a one-year warranty (from date of shipment) against material and/or workmanship defects, when used under normal operating conditions. The warranty does not cover damages related to battery leakage or misuse.

Gentec-EO Inc. will repair or replace, at Gentec-EO Inc.'s option, any device that proves to be defective during the warranty period, except in the case of product misuse.

Any attempt by an unauthorized person to alter or repair the product voids the warranty.

The manufacturer is not liable for consequential damages of any kind.

In case of malfunction, contact your local Gentec-EO distributor or nearest Gentec-EO Inc. office to obtain a return authorization number. The material should be returned to:

Contacting Gentec Electro-Optics Inc.

Gentec Electro-Optics, Inc.
445, St-Jean-Baptiste, Suite 160
Québec, QC
Canada G2E 5N7

Tel: (418) 651-8003
Fax: (418) 651-1174
Email: service@gentec-eo.com

Website: www.gentec-eo.com

CLAIMS

To obtain warranty service, contact your nearest Gentec-EO agent or send the product, with a description of the problem, and prepaid transportation and insurance, to the nearest Gentec-EO agent. Gentec-EO Inc. assumes no risk for damage during transit. Gentec-EO Inc. will, at its option, repair or replace the defective product free of charge or refund your purchase price. However, if Gentec-EO Inc. determines that the failure is caused by misuse, alterations, accident or abnormal conditions of operation or handling, it would therefore not be covered by the warranty.

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 power is applied. Surfaces of the detectors get very hot and there is a risk of injury if they are not allowed to cool down.

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 to 28°C (64 to 82°F) and a relative humidity not exceeding 80%. INTEGRA must be stored in an environment between 10°C to 45°C (50 to 113°F) and a relative humidity not exceeding 90%. Photodiodes are sensitive to temperature, especially at longer wavelength. It is the best to keep the temperature in the range of 25 °C (77 °F) close to the calibration temperature.

| Power Meter Specifications | |
|--|---|
| Power Range | 4 pW to 30 kW |
| Power Scales: Photo Detectors Thermal Detectors | <u>21 scales:</u> 300 pW to 3 W <u>16 scales:</u> 300 μW to 30 kW |
| Pyroelectric in Power Mode (UM-B) | <u>8 scales:</u> 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 | <u>22 scales:</u> 300 fJ to 30 mJ <u>15 scales:</u> 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 points throughput serial frequency 5200 Hz, 200 Hz via RS-232@115200bps |
| Frequency Measurement | Accurate frequency measurement up to 5.2 kHz 0-5200 Hz: ±1% |
| Voltage range for RS-232 supply | 4-30 Vdc @ 60 mA |
| Voltage range for special option External trigger | 2.5- 18 volts, max 20 volts. |

¹ Including linearity, detector accuracy and is detector dependent.

² Excludes non-linearity.

| | |
|--|--|
| Minimum pulse width for external trigger signal | 1 μ s. 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) | |

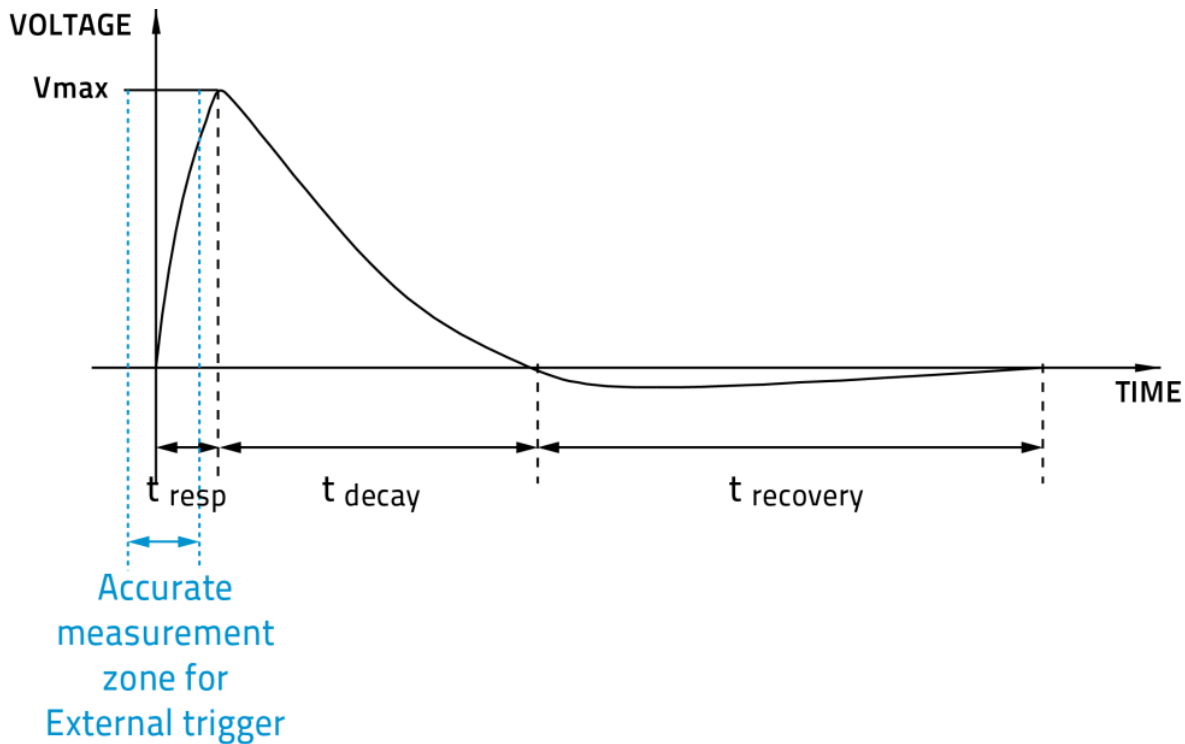
Example for the external trigger timing requirements.

If the head detector has a risetime of $T_{resp} = 20 \mu$ s.

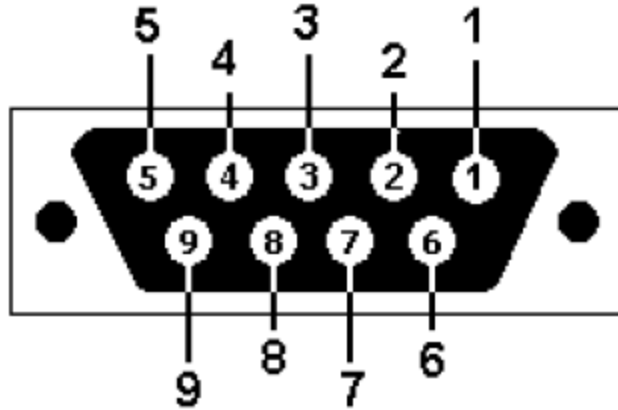
The time frame will be from $(20\% * 20 \mu$ s = 4 μ s) before the laser pulse to $(20 \mu$ s - 1 μ s = 19 μ s) after the laser pulse.

Then, the external trigger signal must happen between 4 μ s before to 19 μ s after the laser pulse.

The graph below visualizes the synchronization of the external trigger signal compared to the laser pulse signal.



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 |
| | |

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 in order for the Integra not to trigger on the noise or have the electrical offset affect the measurements.

3. 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:



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 (Fig 2-1) 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 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 form of radiation (cover the detector). Click **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.

4. 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>.

5. USB AND RS-232 SERIAL COMMUNICATION

5.1. 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 rules stated in section 5.3. The output can be in binary mode or in ASCII mode. Section 5.6 describes all the commands in ASCII output mode, but keep in mind, it is also valid for Binary Mode as described in section 5.4.

The USB class used by INTEGRA is a CDC, or Communications 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 talk to it like as if it were an RS232 port, but very fast when it comes to speed. Follow the Windows 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's a real USB connection.

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

5.2. SETTING UP COMMUNICATION TO THE INTEGRA

5.2.1. Verify the COM Port

To verify the USB installation and find the COM port number, click:

Start → Settings → Control Panel → System → Device Manager

Scroll down to **Ports (COM & LPT)** and double click that line. One of the options should be

Integra USB-Meter (COM#)

Note the COM port number, you will need it for the next step.

5.2.2. Connect the INTEGRA

You may use any serial communications software that you are familiar with. Our instructions are for HyperTerminal because it is widely available on PCs with Windows™.

Select:

Start → Programs → Accessories → Communications → HyperTerminal

To save communication settings, enter a name for the connection. In the drop down menu for “**Connect using**” select the COM port that the USB driver was installed on (Section 5.2.1). Select **OK**.

Input the following settings into the communications parameter window that appears next.

USB

| INTEGRA COM Port Settings | |
|---------------------------|------------------------|
| Bits per second | Any settings will work |
| Data bits | Any settings will work |
| Parity | Any settings will work |
| Stop bits | Any settings will work |
| Flow control | Any settings will work |

RS-232

| INTEGRA COM Port Settings | |
|---------------------------|--------|
| Bits per second | 115200 |
| Data bits | 8 |
| Parity | None |
| Stop bits | 1 |
| Flow control | None |

Click **OK** to begin entering serial commands in the HyperTerminal window.

5.2.3.To Echo Commands

The commands you type will not appear in the HyperTerminal window unless you setup the HyperTerminal to do so. Only the response from the INTEGRA will be displayed. If you prefer to see the commands you are typing on the HyperTerminal window click the **File** menu and execute the following sequence:

File → Properties → Settings → ASCII setup → “Echo typed characters locally” → OK

5.2.4.Test the Connection

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

5.2.5.To Add a Character Delay

In some cases, the INTEGRA has connection problems that can be solved by adding a character delay. To adjust this delay, click the File menu and execute the following sequence:

File → Properties → Settings → ASCII setup → “Character delay”: add a few milliseconds of delay → **OK**

5.2.6.HyperTerminal Settings Shortcut

When you end the session, HyperTerminal asks if you want to save your settings. To avoid inputting the communication parameters again in the future, save by clicking **Yes**. The next time you execute the string of commands, the name of your session will appear after HyperTerminal. Clicking on the session name will open the connection using the saved settings. To avoid re-entering the string of commands, put a shortcut to this file on your desktop: search for the file name, select the file. Right click and select **Shortcut** in the drop down menu.

5.3. SERIAL COMMAND FORMAT

5.3.1. Serial Protocol Rules:

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

5.3.2. Text Mode Rules:

All text commands must begin with a trig character (*). You do not need to end with a line-feed and/or a carriage-return. Parameters must NOT be separated by spaces. Characters do not have to be capitals, mixed upper and lower cases is ok. 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 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.

5.4. BINARY MODE OUTPUT FORMAT

5.4.1. Description

The INTEGRA's resolution is 12-bit for Joulemeter mode. To keep a compatibility with other Gentec-EO monitors, a 14-bit value is sent, but the two LSB of the low byte are not significant.

Only the 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 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 range, this byte is 0xFE.
 Byte 1 1XXX XYYY. 1 = Low byte, X is the lower binary data and Y is not significant data. Y will always be 0. If it is over range, this byte is 0x7F.

Example 1: Using *CAU or *CVU

INTEGRA is measuring 151 mJ in a 300mJ 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, 16382.
6. Multiply the result by the set scale, 300mJ.

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 8244 decimal: 8244 / 16382 * 300mJ = 151mJ.

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 that it can never be the STX or ETX byte. So 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 range, this byte is 0xFE.
 Byte 5 The lower 7 data bits of the energy, or'd with 0x80. If the pulse is over 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 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 8246 decimal: $8246 / 16382 * 300 \text{ mJ} = 151 \text{ mJ}$.

The pulse period bytes are 0x8080FABC. Mask off bit 7 of each byte resulting in 0x003D3C, or 15676 decimal.

The period timer is based on a 24E6 Hz clock, so the period is found as:

- If you send *ceu it will be $15676 \text{ counts} / 24\text{E}6 \text{ Counts per second} = 653.17\text{us}$.
- If you send *ctu the pulse frequency will be $1 / 653.17\text{us} = 1531\text{Hz}$.

5.5. 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 | Determine 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 Commands Format is:

All text commands must begin with a trig character (*) and DO 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 capitals and mixed case is ok. 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 Ex: « *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.

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

5.6.1. 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 2 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 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 | Trigger Level (in percentage) must be 4 numerical values | |

Default: 2%

The value should be set between 0.1 and 99.9.



Example

| | |
|---------------------------|---------|
| Command: *STL15.4 (15.4%) | Answer: |
|---------------------------|---------|

| |
|----------------|
| *STL00.2 (.2%) |
|----------------|

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> |
|---------------|-------------------------|

5.6.2.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 <u>new series</u> only) or in binary format |



Examples

For example, with the original series v1.00.XXX, a 8.002557 microwatts reading would be displayed like this:

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

For example, with the new series, a 506.601 watts reading and a -12.25631 milliwatts reading would be displayed like this:

| | |
|---------------|-------------------------------|
| Command: *CVU | Answer: +5.066010e+02<CR><LF> |
| Command: *CVU | Answer: -1.225631e-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 <u>new series</u> only) or in binary format |



Examples

For example, with a wattmeter, a reading around 500 milliwatts would be displayed like this until the command *CSU is sent:

| | | |
|---------------|---|-------------------------------|
| Command: *CAU | Answer (<u>original series v1.00.XX</u>): | Answer (<u>new series</u>): |
| | 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> | +5.066042e-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 around 500 millijoules would be displayed like this until the command *CSU is sent:

| | | |
|---------------|---|-------------------------------|
| Command: *CAU | Answer (<u>original series v1.00.XX</u>): | Answer (<u>new series</u>): |
| | 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> | +5.066032e-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 <u>new series</u>) or binary format |



Example

This example is for a 32 Hz laser:

| | | |
|---------------|--|-------------------------------|
| Command: *CEU | Answer (<u>original series</u> v1.00.XX): | Answer (<u>new series</u>): |
| | 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> | +5.066021e-01,32.0<CR><LF> |
| | ... | ... |

14 - Sent 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 <u>new series</u>) or binary format |



Example

This example is for a 32 Hz laser:

| | |
|---------------|--|
| Command: *CTU | Answer (<u>original series</u> v1.00.XX): |
| | 5.066E-01,32.0<CR><LF> |
| | Answer (<u>new series</u>): |
| | +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 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 get 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 5.4 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 5.4 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> |
|---------------|---|

5.6.3.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 5 digits. If the desired wavelength does not have 5 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 1550 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 5 digits and can be a floating point value. If the desired wavelength does not have 5 digits you must enter a zero-padded number. For example, to set the wavelength at 10.6 micron, you must enter 010.6. Please note that the resolution is limited as follow:

| Wavelength Range | Resolution limit |
|--|------------------|
| Less than 100 μm | 10 nm |
| Greater than 99.99 μm or less than 1000 μm | 100 nm |
| Greater than 999.9 μm | 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 micron (25000 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> |
|---------------|---------------------------|

5.6.4.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 in 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 | 8-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 | 8-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 is 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: |
|---------------|---------|

5.6.5. 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 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 a XLP12-3S-H2-INT-D0 (s/n 199672)

| 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) |
| :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 | X L | Detector name (You must convert the hexadecimal values in ASCII characters) |
| :0 | 001B | 31 50 | P 1 | |
| :0 | 001C | 2D 32 | 2 - | |
| :0 | 001D | 53 33 | 3 S | |
| :0 | 001E | - H | | |
| :0 | 001F | 2 - | | |
| :0 | 0020 | D 0 | | |
| :0 | 0021 | | | 0000 = Null termination character |
| :0 | 0022 | | | The rest of the characters aren't valid until line 002A |
| :0 | 0023 | | | |
| :0 | 0024 | | | |
| :0 | 0025 | 40 03 | @ | |
| :0 | 0026 | 00 1A | | |
| :0 | 0027 | 00 00 | | |
| :0 | 0028 | E1 20 | á | |
| :0 | 0029 | 00 3A | : | |
| :0 | 002A | 39 31 | 1 9 | Detector serial number (You must convert the hexadecimal values in ASCII characters) |
| :0 | 002B | 36 39 | 9 6 | |
| :0 | 002C | 32 37 | 7 2 | |
| :0 | 002D | 00 00 | | 0000 = 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 (0.001 to 0.999)
- ▶ 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 a XLP12-3S-H2-INT-D0 (s/n 199672)

| 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 | X L | Detector name (You must convert the hexadecimal values in ASCII characters) |
| :0 | 001B | 31 50 | P 1 | |
| :0 | 001C | 2D 32 | 2 - | |
| :0 | 001D | 53 33 | 3 S | |
| :0 | 001E | 48 2D | - H | |
| :0 | 001F | 2D 32 | 2 - | |
| :0 | 0020 | 30 44 | D 0 | |
| :0 | 0021 | 0 0 | | 0000 = Null termination character |
| :0 | 0022 | 0 0 | | The rest of the characters aren't valid until line 002A |
| :0 | 0023 | 0 0 | | |
| :0 | 0024 | 1F 0 | | |
| :0 | 0025 | 40 3 | @ | |
| :0 | 0026 | 0 1A | | |
| :0 | 0027 | 0 0 | | |
| :0 | 0028 | E1 20 | Å | |
| :0 | 0029 | 0 3A | : | |
| :0 | 002A | 39 31 | 1 9 | Detector name (You must convert the hexadecimal values in ASCII characters) |
| :0 | 002B | 36 39 | 9 6 | |
| :0 | 002C | 32 37 | 7 2 | |
| :0 | 002D | 0 0 | | 0000 = Null termination character |
| :0 | 002E | D70A | 0.0200 | Trigger Level LSB (between 0.001 and 0.999) |
| :0 | 002F | 3CA3 | | Trigger Level MSB (between 0.001 and 0.999) |
| :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 | | Correction Multiplier MSB |
| :0 | 0038 | 0000 | 0.0000 | Correction Offset LSB |
| :0 | 0039 | 0000 | | Correction Offset MSB |
| :1 | 0000 | 0000 | 0 | End of structure |

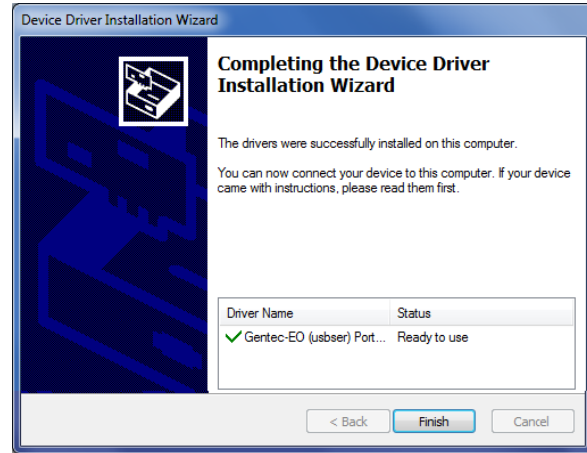
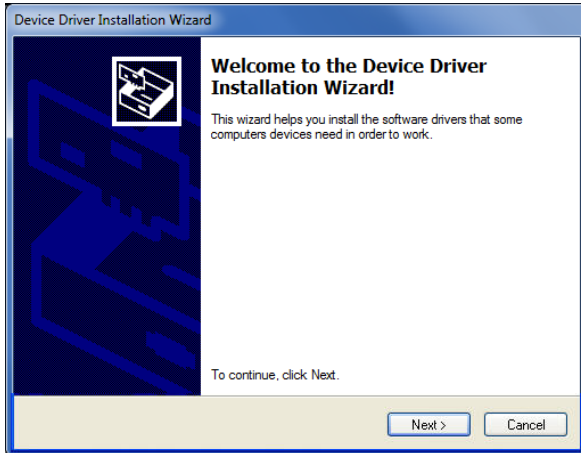
5.7. ERROR MESSAGES

| # | 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 (*). |

6. 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 INTEGRA ready to use.



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

7. MAINTENANCE

7.1. 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's 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.

7.2. 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.

8. 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 St-Jean Baptiste, suite 160
(Québec), Canada G2E 5N7

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 : ±4kV Air : ±8kV | B | Pass |
| Radiated Electromagnetic Field Immunity IEC61000-4-3 (2006) A1 (2007) A2 (2010) | 80MHz-1000MHz : 10V/m 1.4GHz-2GHz : 3V/m 2GHz-2.7GHz : 1V/m | A | Pass |
| Electrical Fast Transient Immunity IEC61000-4-4 (2012) | Power : ±2kV / 5kHz I/O Ports : ±1kV / 5kHz Communication Ports : ±1kV / 5kHz | B | Pass |
| Surge Immunity IEC61000-4-5 (2005) | Power : ±2kV L-PE / ±1kV 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)

9. 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 St-Jean Baptiste, suite 160
(Québec), Canada G2E 5N7

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

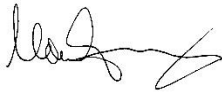
| Test Name Standards | Test Specifications | Performance Criterion | Results |
|--|---|-----------------------|---------|
| Conducted Emissions FCC part 15 (2013) subpart B | Class A 150kHz-30MHz | N/A | Pass |
| Radiated Emissions FCC part 15 (2013) subpart B | Class A 30MHz-1GHz | N/A | Pass |
| Conducted 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 : ±4kV Air : ±8kV | B | Pass |
| Radiated Electromagnetic Field Immunity IEC61000-4-3 (2006) A1 (2007) A2 (2010) | 80MHz-1000MHz : 10V/m 1.4GHz-2GHz : 3V/m 2GHz-2.7GHz : 1V/m | A | Pass |
| Electrical Fast Transient Immunity IEC61000-4-4 (2012) | Power : ±2kV / 5kHz I/O Ports : ±1kV / 5kHz Communication Ports : ±1kV / 5kHz | B | Pass |
| Surge Immunity IEC61000-4-5 (2005) | Power : ±2kV L-PE / ±1kV 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)

APPENDIX A: WEEE DIRECTIVE

Recycling and Separation Procedure for WEEE Directive 2002/96/EC

This section is used by the recycling center 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 cm²)

LEADER IN LASER BEAM MEASUREMENT SINCE 1972



POWER & ENERGY METERS



BEAM PROFILING



THZ MEASUREMENT

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- Werner von Siemens Str. 15
82140 Olching, GERMANY
- Office No. 101, EXL111 building,
Takinogawa, Kita-ku, Tokyo
114-0023, JAPAN