# Product Specification and User Guide

## Finisar EDFA Adapter Board

## 50-45-0056-01R

### PRODUCT FEATURES

- Evaluation boards for Finisar MSA form factor EDFAs
- 30-pin connector interface to EDFA module
- Integrated communications and power supply connector in Sub-D format (25 pin)
    - Interfaces with 18-10-0006R Cable combining RS-232 communication and power supply
    - RS232 standard communication levels

### APPLICATIONS

- Operation of EDFAs for evaluation purposes

Finisar Amplifier with MSA form factor are equipped with 30-pins connectors with a standard pinout. In the absence of a linecard to host the modules, evaluation boards can be used for amplifier testing and basic operation. The interface cable 18-10-0006R used in conjunction with the evaluation board delivers the power supply and communications interface (RS-232) necessary to power up and communicate with the EDFA modules under test.

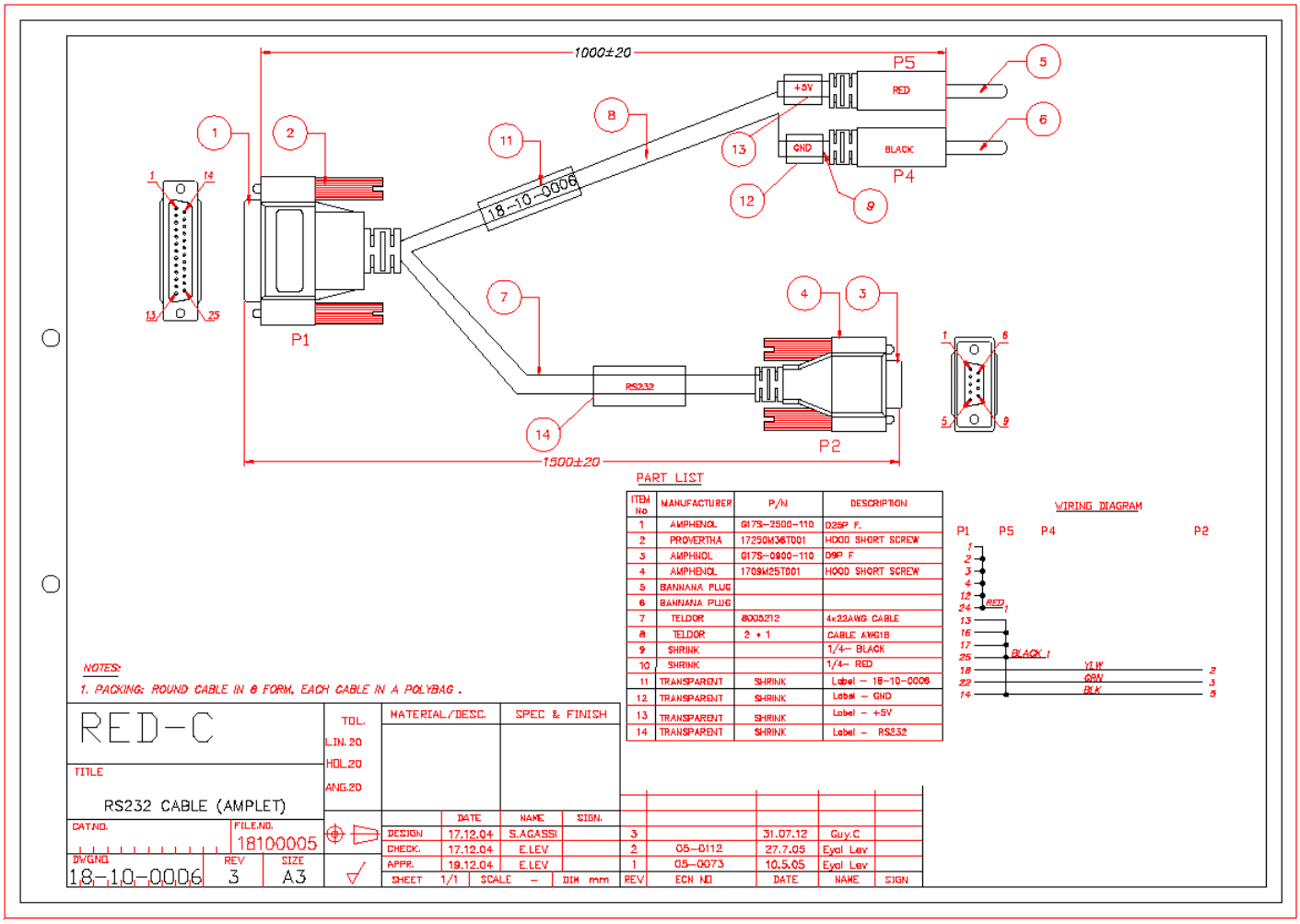
## I. EDFA Connector Pinout

Electrical Interface with the MSA module

| Pin# | Function | Pin# | Function |
|---|---|---|---|
| 1 | NC | 2 | NC |
| 3 | +5V | 4 | +5V |
| 5 | Ground | 6 | Ground |
| 7 | Serial Input | 8 | Serial Output |
| 9 | Ground | 10 | Ground |
| 11 | NC | 12 | RESET Input |
| 13 | Amplifier Disable Input | 14 | Output Power Mute Input |
| 15 | EDFA Case (>75C) or Pump Temperature Alarm (T<15C or T>35C) | 16 | NC |
| 17 | Pump Temperature Alarm | 18 | Pump Bias Alarm |
| 19 | Loss of Input Power Alarm | 20 | Loss of Output Alarm |
| 21 | NC | 22 | NC |
| 23 | Dedicated Serial Channel (input) | 24 | Dedicated Serial Channel (output) |
| 25 | Ground | 26 | Ground |
| 27 | +5V | 28 | +5V |
| 29 | NC | 30 | NC |

## II. Interface Cable

The Interface Cable 18-10-0006R is used to provide power supply to the evaluation board and the EDFA module. The cable assembly also includes a 9-pole sub-D RS-232 connector that can be used to connect to a computer in order to provide commands to the EDFA module.
Drawing and pinout of the interface cable are shown here below.




| ITEM No | MANUFACTURER | P/N | DESCRIPTION |
|---|---|---|---|
| 1 | AMPHENOL | G17S-2500-110 | D25P F. |
| 2 | PROVERTHA | 17250M36T001 | HD00 SHORT SCREW |
| 3 | AMPHNOL | G17S-0900-110 | D9P F |
| 4 | AMPHENOL | 1709M25T001 | HOOD SHORT SCREW |
| 5 | BANNANA PLUG | | |
| 6 | BANNANA PLUG | | |
| 7 | TELDOR | 8005212 | 4x22AWG CABLE |
| 8 | TELDOR | 2 + 1 | CABLE AWG18 |
| 9 | SHRINK | | 1/4" BLACK |
| 10 | SHRINK | | 1/4" RED |
| 11 | TRANSPARENT | SHRINK | Label – 18-10-0006 |
| 12 | TRANSPARENT | SHRINK | Label – GND |
| 13 | TRANSPARENT | SHRINK | Label – +5V |
| 14 | TRANSPARENT | SHRINK | Label – RS232 |

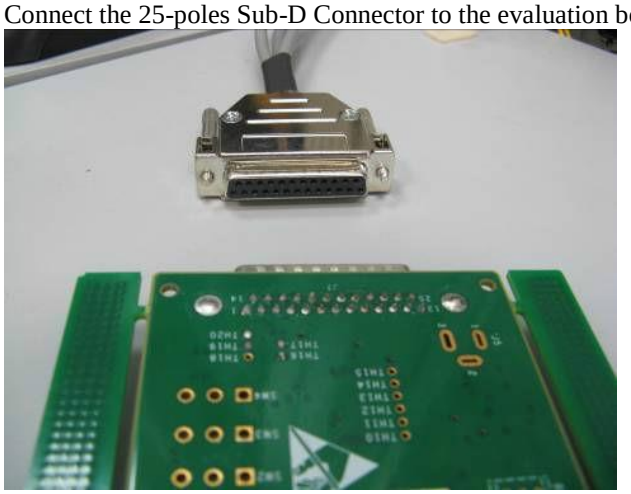
## III. Installation Procedure

1. Connect the 9-pin female Sub-D RS-232 connector to a local computer.

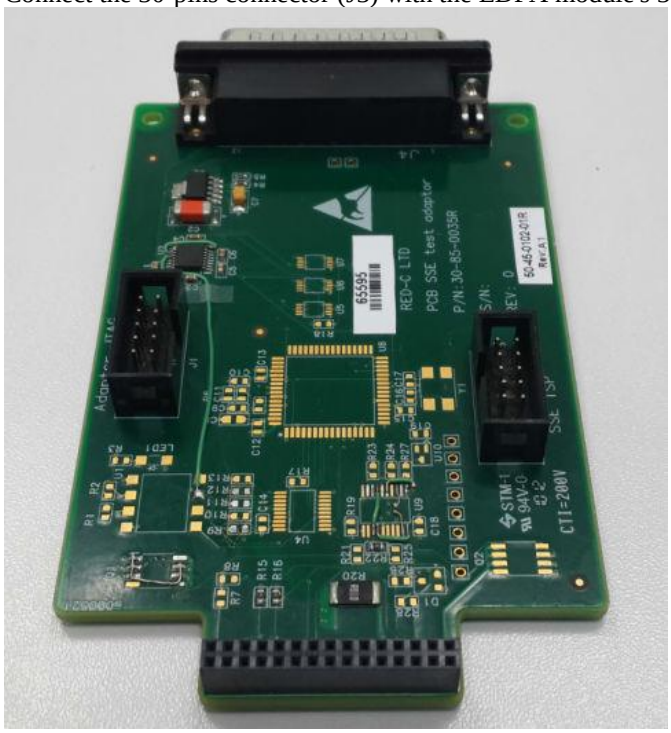
2. Connect the power supply plugs of the interface cable to a suitable power supply


   a. The power supply plugs (+5V – denoted by red color, and GND – denoted by black color) must be connected to 5V DC power supply source.

3. Connect the 25-poles Sub-D Connector to the evaluation board (Connector J4 on the eval board)



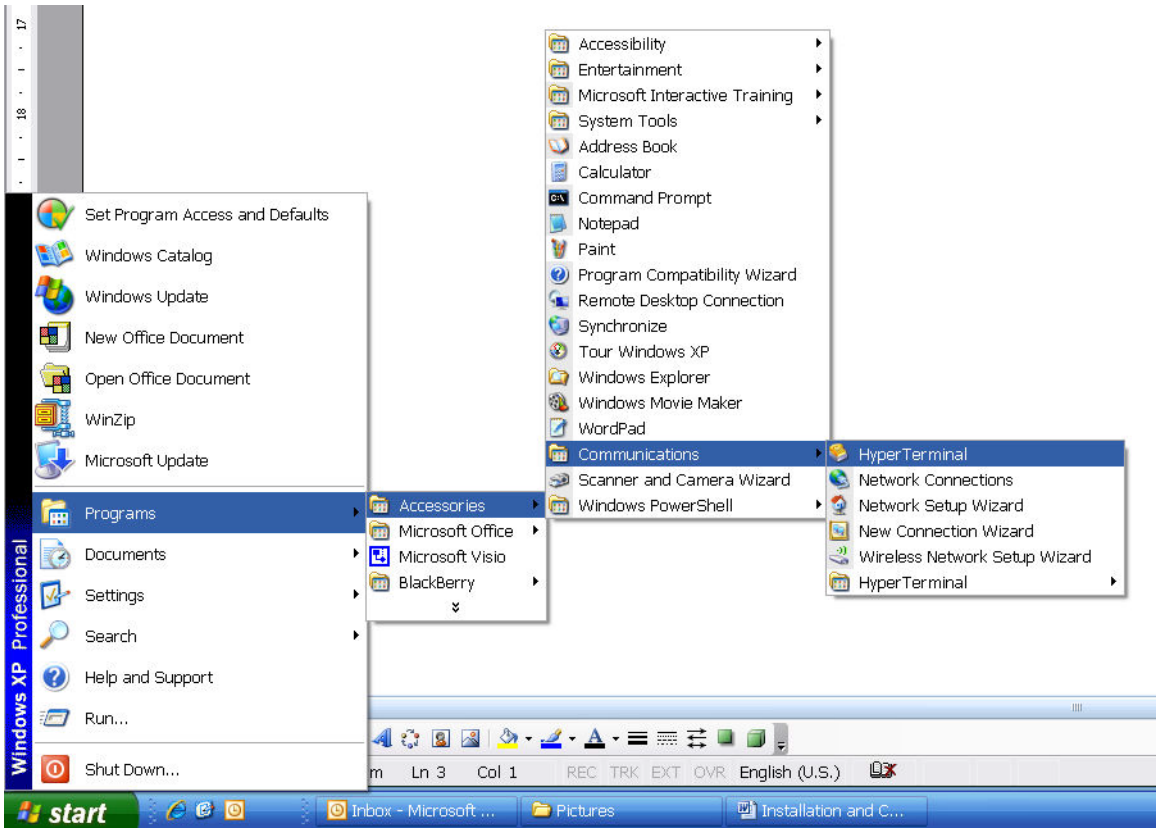
4. Connect the 30-pins connector (J3) with the EDFA module's 30-pins connector



## IV. Communicating with the EDFA Module with the Evaluation Board

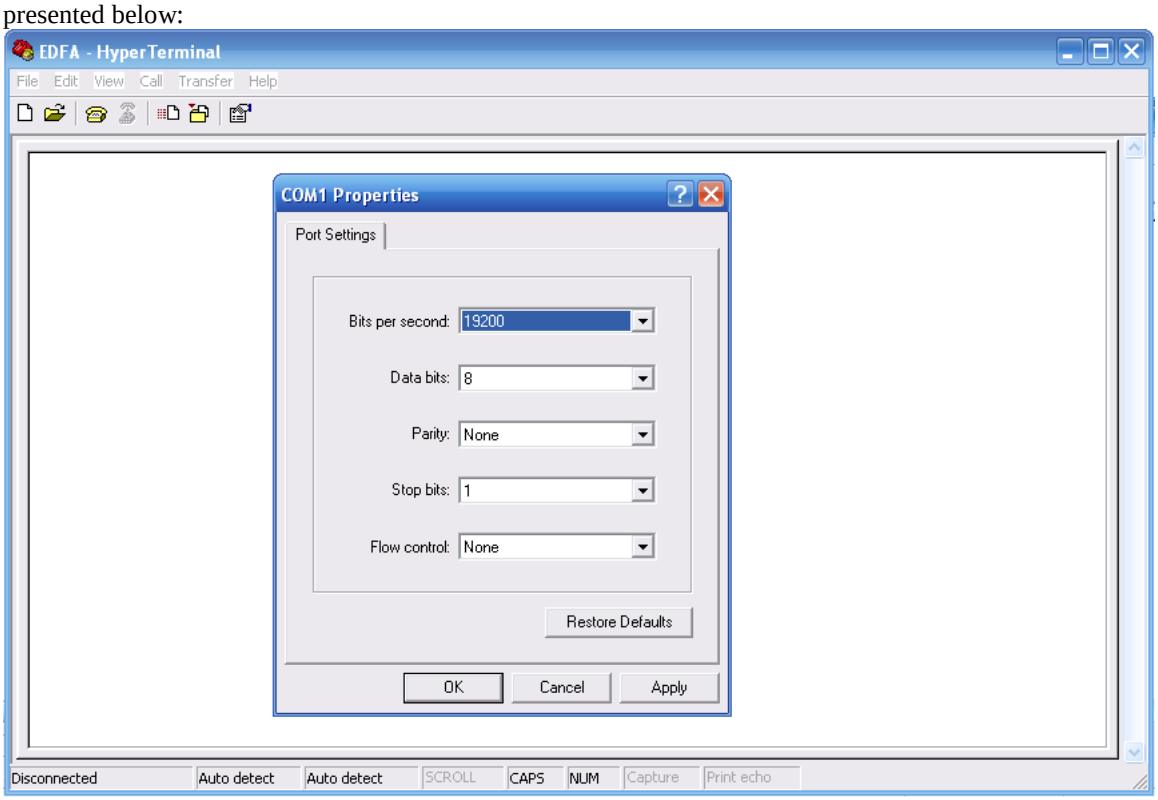
When the EDFA module is connected to PC's COM port, and to 5V power supply, the following steps should be followed:

1. Opening Hyper-terminal on the local computer
    a. On a Windows system Press: Start ➔ Programs ➔ Accessories ➔ Communications ➔ Hyper Terminal




2. Configure Hyper-terminal
    a. The communication protocol of each EDFA module is RS-232, 8 bits, no parity, 1 stop bit, no handshaking, and programmable baud rate. The default baud rate is 19200 bps for EDFA modules. The Hyper Terminal definitions should be accomplished accordingly, as

presented below:




## V. Operating the EDFA

When the EDFA module is connected and the Hyper Terminal is configured, the power supply of 5V can be turned on to operate the module. To communicate with the EDFA please use the communication protocol, which appears in the Finisar User Guide of the specific product.
In the next section a list of commonly used commands is provided – please note that this is purely indicative, as specific part numbers might fewer or additional commands.

## VI. EDFA Communication Commands

This document describes the wide variety of communication commands involved in configuring and controlling the EDFA, divided by EDFA type:

- MSA form factor FG EDFA
- MSA form factor VG EDFA without Mid-Stage Access
- MSA form factor VG EDFA with Mid-Stage Access (for DCM only)
- Dual Stage VG EDFA with Mid-Stage Access

The commands are of two types, either Read (Get) commands or Write (Set) commands.

1. Set commands are used to set parameters within the EDFA.
2. Get commands are used to acquire information about the amplifier settings. These commands canalso be used to acquire the current values of parameters that have been defined using the Set commands

Each command is a case-insensitive US ASCII string, and ends with a terminator. It consists of the command name and optional parameters (up to 3), separated by one or more space character(s).

1. The terminator is either <CR>, <LF>, or <CR><LF>.
2. The parameters may be strings of letters, integers or floating-point numbers.
3. The amplifier sends data either on reset or as a command response:
4. In the first case – it sends startup messages followed by a prompt.
5. In the latter case – it sends an optional response, or an error message starting with "?", followed by a prompt. The prompt is <CR><LF> ">".

## VII. Commands for Compact Single Stage Fixed Gain EDFAs

| Command | Description | Type | Example |
|---|---|---|---|
| VER | Displays serial number and version information. | R | >ver<br>Configuration: 2107<br>Firmware Vers: 720.2<br>Serial Number: 11735<br>Hardware Vers: 01A<br>Firmware Date: Feb 14 2007<br>Boot Vers: 6.2<br>Cat. Num= 50-11-0042<br>Product Date: FEB 05 2007<br>> |
| Amp_Type | Determines the amplifier type:<br>"P" For pre amp<br>"B" for booster | R | Amp_Type=P |

| Command | Description | Type | Example |
|---|---|---|---|
| ECHO ON<br>ECHO OFF<br>ECHO | Sets the echoing of the command line to “ON” or “OFF”.<br>If no parameter is provided – the current setting is displayed. | R/W | >echo<br>ECHO: ON<br>>echo off<br>>echo<br>ECHO: OFF<br>> |
| BAUD baud<br>BAUD | Sets the baud rate to baud.<br>Legal values: 9600, 19200, 38400, 57600, and 115200.<br>The change takes effect only after the prompt, in response to the command, is sent.<br>If no parameter is provided – the current baud rate is displayed. | R/W | >baud<br>BAUD: 9600<br>>baud 115200<br>> |
| MODE mode val<br>MODE mode<br>MODE | Sets the amplifier control mode to mode with gain/output power val.<br>Legal values for mode:<br>G: Gain control mode: val is the required gain in dB.<br>P: Output power control mode: val is the required output power in dBm.<br>M: Manual control mode: pump is driven at a fixed current (set by the PUMP ISP command), or automatically controlled (if set to AUTO).<br>D: Disable mode: pump is shut off.<br>If no parameter is provided – the current mode (and required gain/output power) is displayed. | R/W | >mode<br>MODE: G 12.00 dB<br>>mode g 21.00<br>>mode<br>MODE: G 21.00 dB<br>>mode p 7.00<br>>mode<br>MODE: P 7.00 dBm<br>>mode d<br>>mode<br>MODE: D |
| PLIM limit<br>PLIM | Sets the power limit in gain control mode to limit dBm.<br>If limit equals “D” – the feature is disabled.<br>If no parameter is provided – the current limit is displayed. | R/W | >plim<br>PLIM: D<br>>plim 14<br>>plim<br>PLIM: 14.00 dBm |
| GLIM x<br>GLIM | Sets the gain limit in power control mode to limit dB.<br>If limit equals “D” – the feature is disabled.<br>If no parameter is provided – the current limit is displayed. | R/W | >glim<br>GLIM: D<br>>glim 10.5<br>>glim<br>GLIM: 10.50 dB<br>> |

| Command | Description | Type | Example |
|---|---|---|---|
| PIN<br>POUT<br>PSIG<br>GAIN | Displays input power, total output power, signal output power, and<br>signal gain. Signal power is total power less estimated ASE power. | R | >pin<br>PIN: -10.00 dBm<br>>pout<br>POUT: 7.00 dBm<br>>psig<br>PSIG: 7.00 dBm<br>>gain<br>GAIN: 22.00 dB<br>> |

### a. Control and Alarm Registers

| Command | Description | Type | Example |
|---|---|---|---|
| MT | Displays case temperature in degrees C. | R | >mt<br>MT: 35.3 C<br>> |
| PUMP *pump param*<br>PUMP *pump*<br>PUMP | Displays status of the pump. The *pump* parameter is always 1 and can be omitted. The *param* parameter can be one of the following:<br>ILD: Pump current in mA<br>EOL: Pump end-of-life current in mA<br>TMP: Pump temperature in degrees C<br>ISP: Required pump current in mA<br><br>If *param* is omitted – all of the above parameters are displayed. | R | >pump<br>PUMP ILD: 100.0 mA<br>PUMP EOL: 400.0 mA<br>PUMP TMP: 38.2 C |
| PUMP *pump* ISP *cur*<br>PUMP *pump* AUTO | Sets pump current to *cur* mA. The *pump* parameter is always 1 and can be omitted. The AUTO parameter restores automatic pump control.<br>This command is permitted only in manual control mode. | R/W | >pump isp 100.0<br>>pump isp<br>PUMP ISP: 100.0mA |

| Command | Description | Type | Example |
|---|---|---|---|
| ALRM *alrm param*<br>ALRM *alrm*<br>ALRM | Displays information about alarms. The *alrm* parameter can be one of the following:<br>ILD: Pump overcurrent alarm<br>TMP: Pump temperature alarm<br>MTH: High case temperature alarm<br>MTL: Low case temperature alarm<br>LOS: Loss of input power alarm<br>LOP: Loss of output power /gain alarm<br>RFL: High back reflection alarm<br><br>The *param* parameter can be one of the following:<br>STA: Current status<br>SST: Latching (sticky) status<br>THR: Threshold<br>HYS: Hysteresis (relative to threshold)<br><br>If *param* is omitted – all of the above parameters are displayed.<br>If *alrm* is omitted – information for all alarms is displayed.<br>If no parameter is provided – all parameters for all alarms are displayed. | R | >alrm ild sta<br>ALRM ILD STA: ON<br>>alrm thr<br>ALRM LOS THR: -29.00dBm<br>ALRM ILD THR: 95.0 %<br>ALRM TMP THR: 0.0 C<br>ALRM MTH THR: 70.0 C<br>ALRM MTL THR: 0.0 C |
| ALRM *alrm* THR *val*<br>ALRM *alrm* HYS *val*<br>ALRM *alrm* CLR | Sets threshold or hysteresis level for the specified alarm. *val* specifies the threshold or hysteresis level.<br>"CLR" resets the latching status of the specified alarm.<br>If *alrm* is omitted – the latching status of all the alarms are reset. | R/W | >alrm lop thr 1.5<br>>alrm lop hys 0.5<br>>alrm lop<br>ALRM LOP STA: OFF<br>ALRM LOP SST: ON<br>ALRM LOP THR: 1.50 dB<br>ALRM LOP HYS: 0.50 dB |
| AST | Lists all alarms whose status is on – normal or latching if alarm<br>status mode is "N" or "S", respectively.<br>If no alarms are on – the response is "OK". | R | >ast<br>AST: LOP ILD<br>>ast<br>AST: OK<br>> |

| Command | Description | Type | Example |
|---|---|---|---|
| ASTM N<br>ASTM S<br>ASTM | Sets alarm status mode to normal (N) or latching (S – sticky) mode.<br>If no parameter is provided – the current mode is displayed. | R/W | >astm<br>ASTM: S<br>>astm n<br>>astm<br>ASTM: N<br>> |
| MST | Displays amplifier status – one or more of the following:<br>DIS: Amplifier disabled due to amplifier disable input or alarm<br>ES: Amplifier in eye-safe mode due to eye-safe input or alarm<br>LIM: Amplifier gain or output power limited by GLIM/PLIM<br>OK: Amplifier is operating normally | R | >mst<br>MST: DIS ES<br>>mst<br>MST: OK<br>> |
| LOS *mode*<br>LOS<br>LOS I val | Determines the behavior of the amplifier on input LOS. The *mode* parameter can be one of the following:<br>A: Pump disabled in gain control, power control, and manual control modes.<br>I: Pump idled in gain control mode, pump disabled in power control and manual control modes.<br>P: No effect in gain control mode, pump disabled in power Control and manual control modes.<br>N: No effect in any mode.<br><br>Val: Set-point for current in-case of loss (in mA).<br>If no parameter is provided – the current LOS mode is displayed. | R/W | >los<br>LOS: A<br>>los p<br>>los<br>LOS: P<br>> LOS I 300<br>> |
| RST | Resets all settings to factory default values. Changes take effect only after reset.. | W | >rst<br>> |
| BOOT | Resets the firmware. | W | >boot<br>(startup message)<br>> |

## VIII. Amplifier Commands for Compact Variable Gain EDFA without MSA

### a. Module Type

| | |
|---|---|
| Purpose: | Returns module type, firmware version and serial number |
| Type: | Get |
| RS232 Command: | **Ver [ENTER]** |
| *Answer:* | Example:<br>VER:<br>Configuration: M7300<br>Firmware Vers: 572.3<br>Serial Number: 27308<br>Hardware Vers: 01A<br>Firmware Date: Mar 16 2011<br>Monitor IL : 20.3<br>Boot Version: 21.1<br>> |

### b. ECHO

| | |
|---|---|
| Purpose: | If echo is "ON" line echoing exists (command, parameters and values are echoed to user). |
| Type: | Set / Get |
| RS232 Set Command: | **ECHO ON (or OFF) [ENTER]** |
| *Answer:* | > |
| RS232 Get Command: | **ECHO [ENTER]** |
| *Answer:* | **ECHO: ON (or ECHO: OFF)**<br>> |

### c. Baud Rate

| | |
|---|---|
| Purpose: | Defines the communication Baud rate of the module.<br>Values: 9600, 19200, 38400, 57600, 115200. |
| Type: | Set / Get |
| RS232 Set Command: | **BAUD 19200 [ENTER]** |
| *Answer:* | > |
| RS232 Get Command: | **BAUD [ENTER]** |

*Answer:* **BAUD: 19200**

>

### d. Operation Mode and Gain/Power Setting

Purpose: Sets (or Gets) amplifier mode of operation. Operation Modes are:

**a.** Automatic Gain Control (AGC) where signals gain is kept constant. **MODE G**

**b.** Automatic Optical Power Control (APC) where total optical power at amplifier output is kept constant. **MODE P**

**c.** Manual mode where pumps current is set manually. **MODE M**.

**d.** Disable mode. The pump shuts down. **MODE D**.

Type: Get / Set

RS232 Get Command: **MODE [ENTER]**

*Answer:* **MODE: Z XX.X dB** for AGC

>

Where Z is either **G** or **P** or **M** or **D**

(XX.X value is only for G and P modes. For G the value is in dB, whereas for P the value is in dBm, and a sign "–" can precede signified value)

RS232 Set Command: **MODE G XX.X** [ENTER] for AGC, where XX.X is gain in dB

*Answer:* >

RS232 Set Command: **MODE P XX.X** [ENTER] for APC, where XX.X is total output power in dBm

*Answer:* >

RS232 Set Command: **M** or **D** [ENTER]

*Answer:* >

### e. Pump Current Setting

Purpose: The command Reads/Sets each of the pumps current.

This command is operative only in Manual operation mode

Type: Get / Set

RS232 Set Command: **PUMP ISP ZZZZ.Z [ENTER]**

ZZZZ.Z is pump current in mA.

*Example:* PUMP ISP 500.0 [ENTER]
(Set current of first pump to 500mA)

*Answer:* >

RS232 Get Command: **PUMP ISP [ENTER]**

*Answer:* **PUMP ISP: ZZZZ.Z mA**

Remark: Command **PUMP AUTO** introduces Automatic Pump control in which previous values of pump current according to the operation mode are kept. These values are kept until the next PUMP ISP command is given.

### f. VOA Attenuation Value

Purpose: Gets the attenuation value of the EVOAs that are located in the EDFA. VOA1 is the VOA related to Pre-amp (or first amplifier in package) and VOA2 to VOA in Booster (or second amplifier in same package).

Type: Get

RS232 Command: For reading EVOA number X attenuation:
**VOA X [ENTER]**

*Answer:* Answer will contain three lines:

**VOA X SET: XX.XX dB**

(Where SET shows attenuation requested by software)

**VOA X ACT: XX.XX dB**

(Where ACT shows actual VOA loss)

**VOA X STA: YYY**

(Where status is either:

**OK**: VOA ACT=VOA SET

**ERR**: VOA ACT not equal VOA SET

**PWR**: VOA setting failed due to low power or unstable signal.

**BSY**: VOA loss still varying.

Remark: If only VOA command is given information regarding all VOAs in the module will be displayed.

### g. Gain Tilt Setting

Purpose: Reads/sets gain tilt (relevant only for modes AGC and APC). Tilt is linear. Negative tilt means that longer wavelengths have

| | |
|---|---|
| | higher attenuation, whereas positive tilt means longer wavelengths have lower attenuation. |
| Type: | Get / Set |
| RS232 Get Command: | **TILT [ENTER]** |
| *Answer:* | **TILT: YX.X dB** (Where Y designates blank for the sign + or - for -). For example if TILT is –1dB the response for this command is **TILT: -1.0 dB**<br>> |
| RS232 Set Command: | **TILT YX.X [ENTER]** (Where Y designates a blank for a positive value + or - for a negative value) and X.X the tilt. |
| *Answer:* | > |
| Remark: | To set tilt of –1dB the command is:<br>**TILT -1.0** |

### h. Maximal Operative Gain

| | |
|---|---|
| Purpose: | Sets Gain limit for EDFA. When module is in APC mode, output power value is automatically reduced so maximum gain value is not above the set value. |
| Type: | Get / Set |
| RS232 Set Command: | **GLIM XX.X [ENTER]**<br>(Where XX.X is the value of maximum gain in dB). |
| *Answer:* | > |
| RS232 Get Command: | **GLIM [ENTER]** |
| *Answer:* | **GLIM: XX.X dBm**<br>> |
| Remark: | Setting XX.X value to **D** disables limitation |

### i. Maximal Operative Power

| | |
|---|---|
| Purpose: | Sets Power limit for EDFA. When module is in AGC mode, output power value is automatically reduced to reach this value. |
| Type: | Get / Set |
| RS232 Set Command: | **PLIM XX.X [ENTER]**<br>(Where XX.X is the value of maximum gain in dB). |
| *Answer:* | > |

RS232 Get Command: **PLIM [ENTER]**

*Answer:* **PLIM: XX.X dBm**

>

Remark: Setting XX.X value to **D** disables limitation

### j. Optical Power/Gain Monitoring

Purpose: Used for monitoring:

**a.** Input power **(PIN)**
**b.** Total Output power **(POUT)**
**c.** Total Output Power minus ASE **(PSIG)**
**d.** Gain **(GAIN)**

Type: Get

RS232 Command: **PIN [ENTER] or POUT [ENTER] or PSIG [ENTER] or GAIN [ENTER]**

*Answer:* **PIN : YXX.X dBm**

>

Or

**POUT: YXX.X dBm**

>

Or

**PSIG: YXX.X dBm**

>

Or

**GAIN: XX.X dB**

>

(Where Y designates sign, blank for + and "-" for -)

### k. Optical Power Setting in APC Mode with no Input Power

Purpose: Setting output power in LOS N mode (when amplifier remains operative when no input power exists).

Type: Set

RS232 Command: **MODE P XX.X [ENTER] where XX.X is total output power in dBm**

**(Signal + ASE power is kept constant)**

*Answer:* >

### l. APC Mode Definition

| | |
|---|---|
| Purpose: | In APC mode it is possible to either keep constant the output power with ASE or the signal power. The operation is defined with the command: “APC_SW”. |
| Type: | Get/Set |
| RS232 Get Command: | **APC_SW [ENTER]** |
| *Answer:* | **APC_SW: X**<br>> |
| Remark: | If X=1, signal + ASE power is kept constant, If X=0 signal power is kept constant. |
| RS232 Set Command: | **APC_SW=X [ENTER]** |
| *Answer:* | > |

### m. Nominal Laser Temperature

| | |
|---|---|
| Purpose: | Displays the nominal laser temperature: 25C or 45C |
| Type: | Get |
| RS232 Command: | **NomLasTemp [ENTER]** |
| *Answer:* | **NomLasTemp: XX.X C**<br>> |

### n. Case Temperature Monitoring

| | |
|---|---|
| Purpose: | Gets the case temperature. |
| Type: | Get |
| RS232 Command: | **MT [ENTER]** |
| *Answer:* | **MT: YXX.X C**<br>><br>(Where Y designates blank for the sign + or –for the sign -). |

### o. Pump Status

| | |
|---|---|
| Purpose: | Gets the pump status. |
| Type: | Get |
| RS232 Command: | **PUMP Y [ENTER]** |

Y is one of the following:

e. **ILD** – LD current in mA
f. **EOL** – LD EOL current in mA
g. **TMP** – LD temperature
h. **ISP** – LD current set point in mA (or AUTO)

*Answer:* For parameters 1,2 and 4:

**PUMP Y: XXXX.X mA**

>

For parameter 3:

**PUMP TMP: XX.X C**

>

Remark: If Y is not specified the command will display all possible statuses, if X is not specified both pumps statuses are displayed.

### p. Alarm Information

Purpose: Displays values in which alarm will be declared. Values are related for the following amplifier parameters:

i. Max current of pump **(ILD)**
j. Max pump temperature **(TMP)**
k. PCB temperature higher then 85C **(MTH)**
l. Low case temperature **(MTL)**
m. Out of range coil temp. **(CT)**
n. Loss of input signal for n stage/amplifier **(LOS)**
o. Wrong output power in APC and wrong Gain in AGC **(LOP)**

For each parameter the alarm value can relate for the following:

p. Current status can be On or OFF **(STA)**
q. Latched alarm **(SST)**
r. Threshold **(THR)**
s. Hystheresis **(HYS)**

Type: Get

RS232 Command: **ALRM Y [ENTER]**

Where **Y** is the current status or Threshold or Hystheresis or latched.

*Answer*: **ALRM Y: XXX.X** with appropriate units following.

>

*Example Command:* **ALRM LOS THR [ENTER]**

*Example Answer:* **ALRM LOS THR: -21.0dB**

>

Remark: If the Y parameter is not given then all Y parameters are displayed. If Both the X and Y parameters are not given then all parameters for all alarms are given.

Table summing up all alarms:

| Alarm | | EDFA Action |
|---|---|---|
| CT<br>Coil temperature is lower than 45C or higher than 65C. | Set | No action |
| | Clear | No action |
| LOS<br>Input LOS Alarm | Set | Stage shifts to disable mode. This behavior is configurable. |
| | Clear | Returns to previous mode |
| LOP<br>Correct gain in AGC or correct power in APC cannot be achieved | Set | n/a |
| | Clear | |
| ILD<br>One of pump currents > 0.95EOL | Set | No action |
| | Clear | No action |
| MTH Block Temperature bigger then 80C(TBD) alarm<br>MTL Block Temperature smaller then threshold alarm | Set | No action |
| | Clear | No action |
| TMP<br>If pump temp >35 or < 15 (for NomLasTemp=25C) OR >55 or < 35 (for NomLasTemp=45C) alarm is lit | Set | Configurable:<br>No change<br>Module shifts to disable mode<br>Default: Module shifts to disable. |
| | Clear | Returns to previous mode |

### q. Alarms Threshold and Hystheresis Setting

Purpose: Setting values in which alarm is declared and hystheresis for turning on and off the alarm.

Type: Set

RS232 Command: **ALR M X THR Y [ENTER]**

Or

**ALRM X HYS Y [ENTER]**

(Where X value is same as in paragraph 21 and Y value is

given according to user requirements)

*Answer:* >

*Example Command:* **ALRM LOS THR –21 [ENTER]**

*Example Answer:* >

Remark: ALRM X CLR clears Alarm from latched status, ALRM CLR clears all alarms from latched status.

### r. Alarms With ON status

Purpose: Gets all alarms which are ON

Type: Get

RS232 Command: **AST [ENTER]**

*Answer:* **AST: X1 X2 ….. Xn**

>

(Where list of alarms is given in paragraph 21)

If all alarms are off answer is:

**AST: OK**

>

### s. Alarms Latching Information

Purpose: In case an alarm was declared and immediately shut off before management system received the alarm notification, the state of alarms can be latched till status reading is performed. The latching mode is designated as **S** mode. In this mode the AST command displays only latched alarms. In Normal mode (designated as **N** mode), the AST command displays only current alarms.

Type: Set / Get

RS232 Set Command: **ASTM N [ENTER]**
(Where **N** switches to normal mode).

*Answer*: >

RS232 Get Command: **ASTM [ENTER]**

*Answer*: **ASTM: N**

>

Remark: Command is also affective to hardware PIN alarms.

### t. Module Operation When Loss of Input Power Occurs

| | |
|---|---|
| Purpose: | Indicate module mode of operation when input power to module is below designated threshold. Four modes of operation are available:<br>**t.** Pumps are disabled in AGC, APC and Manual modes **(A)**<br>**u.** In AGC mode the EDFA operates as APC mode with power in "pout_n" value. In APC and Manual modes there is no effect to input loss. **(N)** |
| Type: | Set / Get |
| RS232 Set Command: | **LOS X [ENTER]**<br>(Where **X** is one of the four options specified) |
| *Answer:* | > |
| RS232 Get Command: | **LOS [ENTER]** |
| *Answer:* | **LOS: X**<br>> |

### u. Module Operation For LOS N

| | |
|---|---|
| Purpose: | Determines the pout when no input signal and the mode of operation is AGC LOS N |
| Type: | Set / Get |
| RS232 Set Command: | **POUT_N X [ENTER]** |
| *Answer:* | > |
| RS232 Get Command: | **POUT_N [ENTER]** |
| *Answer:* | **POUT_N: X**<br>> |

### v. Reset to Factory Default

| | |
|---|---|
| Purpose: | Reset all setting to factory settings (defaults). Micro controller has to be re-booted in order for the command to take effect. |
| Type: | Set |
| RS232 Command: | **RST [ENTER]** |
| *Answer:* | > |

### w. Boot

| | |
|---|---|
| Purpose: | Reboots the firmware. |
| Type: | Set |
| RS232 Command: | **BOOT [ENTER]** |
| *Answer:* | > |

### x. Software Download

| | |
|---|---|
| Purpose: | Downloads operating software from system management. |
| Type: | Set |
| RS232 Command: | **RECV FW [ENTER]**<br>(Where **FW** is new firmware) |
| Answer: | > |

# IX. Amplifier Commands for VG EDFA with Mid-Stage Access

## a. Module Type

| | |
|---|---|
| Purpose: | Returns module type, firmware version and serial number |
| Type: | Get |
| RS232 Command: | **Ver [ENTER]** |
| *Answer:* | Example:<br>VER:<br>Configuration: M7300<br>Firmware Vers: 788.0<br>Serial Number: 73318<br>Hardware Vers: 01A<br>Firmware Date: May 9 2013<br>> |

## b. ECHO

| | |
|---|---|
| Purpose: | If echo is "ON" line echoing exists (command, parameters and values are echoed to user). |
| Type: | Set / Get |
| RS232 Set Command: | **ECHO ON (or OFF) [ENTER]** |
| *Answer:* | > |
| RS232 Get Command: | **ECHO [ENTER]** |
| *Answer:* | **ECHO: ON (or ECHO: OFF)**<br>> |

## c. Baud Rate

| | |
|---|---|
| Purpose: | Defines the communication Baud rate of the module.<br>Values: 9600, 19200, 38400, 57600, 115200. |
| Type: | Set / Get |
| RS232 Set Command: | **BAUD 19200 [ENTER]** |
| *Answer:* | > |
| RS232 Get Command: | **BAUD [ENTER]** |
| *Answer:* | **BAUD: 19200** |

>

### d. Operation Mode and Gain/Power Setting

| | |
|---|---|
| Purpose: | Sets (or Gets) amplifier mode of operation. Operation Modes are:<br>**v.** Automatic Gain Control (AGC) where signals gain is kept constant. **MODE G**<br>**w.** Automatic Optical Power Control (APC) where total optical power at amplifier output is kept constant. **MODE P**<br>**x.** Manual mode where pumps current is set manually. **MODE M**.<br>**y.** Disable mode. The pump shuts down. **MODE D**. |
| Type: | Get / Set |
| RS232 Get Command: | **MODE [ENTER]** |
| *Answer:* | **MODE: Z XX.X dB** for AGC<br>><br>Where Z is either **G** or **P** or **M** or **D**<br>(XX.X value is only for G and P modes. For G the value is in dB, whereas for P the value is in dBm, and a sign "–" can precede signified value) |
| RS232 Set Command: | **MODE G XX.X** [ENTER] for AGC, where XX.X is gain in dB |
| *Answer:* | > |
| RS232 Set Command: | **MODE P XX.X** [ENTER] for APC, where XX.X is total output power in dBm |
| *Answer:* | > |
| RS232 Set Command: | **M** or **D** [ENTER] |
| *Answer:* | > |

### e. Pump Current Setting

| | |
|---|---|
| Purpose: | The command Reads/Sets each of the pumps current. |

This command is operative only in Manual operation mode

| | |
|---|---|
| Type: | Get / Set |
| RS232 Set Command: | **PUMP ISP ZZZZ.Z [ENTER]**<br>ZZZZ.Z is pump current in mA. |

| | |
|---|---|
| *Example:* | PUMP ISP 500.0 [ENTER]<br>(Set current of first pump to 500mA) |
| *Answer:* | > |
| RS232 Get Command: | **PUMP ISP [ENTER]** |
| *Answer:* | **PUMP ISP: ZZZZ.Z mA** |
| Remark: | Command **PUMP AUTO** introduces Automatic Pump control in which previous values of pump current according to the operation mode are kept. These values are kept until the next PUMP ISP command is given. |

### f. VOA Attenuation Value

| | |
|---|---|
| Purpose: | Gets the attenuation value of the EVOA that is located in the EDFA. |
| Type: | Get |
| RS232 Command: | **VOA [ENTER]** |
| *Answer:* | Answer will contain three lines:<br>**VOA SET: XX.XX dB**<br>(Where SET shows attenuation requested by software)<br>**VOA ACT: XX.XX dB**<br>(Where ACT shows actual VOA loss)<br>**VOA STA: YYY**<br>(Where status is either:<br>**OK**: VOA ACT=VOA SET<br>**ERR**: VOA ACT not equal VOA SET<br>**PWR**: VOA setting failed due to low power or unstable signal.<br>**BSY**: VOA loss still varying. |

### g. Gain Tilt Setting

| | |
|---|---|
| Purpose: | Reads/sets gain tilt (relevant only for modes AGC and APC). Tilt is linear. Negative tilt means that longer wavelengths have higher attenuation, whereas positive tilt means longer wavelengths have lower attenuation. |
| Type: | Get / Set |
| RS232 Get Command: | **TILT [ENTER]** |
| *Answer:* | **TILT: YX.X dB** (Where Y designates blank for the sign + or - |

| | |
|---|---|
| | for -). For example if TILT is –1dB the response for this command is **TILT: -1.0 dB**<br>> |
| RS232 Set Command: | **TILT YX.X [ENTER]** (Where Y designates a blank for a positive value + or - for a negative value) and X.X the tilt. |
| *Answer:* | > |
| Remark: | To set tilt of –1dB the command is:<br>**TILT -1.0** |

### h. Maximal Operative Gain

| | |
|---|---|
| Purpose: | Sets Gain limit for EDFA. When module is in APC mode, output power value is automatically reduced so maximum gain value is not above the set value. |
| Type: | Get / Set |
| RS232 Set Command: | **GLIM XX.X [ENTER]**<br>(Where XX.X is the value of maximum gain in dB). |
| *Answer:* | **>** |
| RS232 Get Command: | **GLIM [ENTER]** |
| *Answer:* | **GLIM: XX.X dBm**<br>> |
| Remark: | Setting XX.X value to **D** disables limitation |

### i. Maximal Operative Power

| | |
|---|---|
| Purpose: | Sets Power limit for EDFA. When module is in AGC mode, output power value is automatically reduced to reach this value. |
| Type: | Get / Set |
| RS232 Set Command: | **PLIM XX.X [ENTER]**<br>(Where XX.X is the value of maximum gain in dB). |
| *Answer:* | **>** |
| RS232 Get Command: | **PLIM [ENTER]** |
| *Answer:* | **PLIM: XX.X dBm**<br>> |
| Remark: | Setting XX.X value to **D** disables limitation |

### j. Optical Power/Gain Monitoring

| | |
|---|---|
| Purpose: | Used for monitoring:<br>Input power **(PIN)**<br>Total Output power **(POUT)**<br>Total Output Power minus ASE **(PSIG)**<br>Gain **(GAIN)**<br>Second stage input **(PMID)**<br>First stage output to mid-stage **(PMIDI)**<br>First stage output to mid-stage **(PMID_IN)** |
| Type: | Get |
| RS232 Command: | **PIN [ENTER] or POUT [ENTER] or PSIG [ENTER] or GAIN [ENTER] or PMID_IN [ENTER] or PMID [ENTER]** |
| *Answer:* | **PIN : YXX.X dBm**<br>><br>Or<br>**POUT: YXX.X dBm**<br>><br>Or<br>**PSIG: YXX.X dBm**<br>><br>Or<br>**GAIN: XX.X dB**<br>><br>*(*Where Y designates sign, blank for + and "-" for -) |

### k. Optical Power Setting in APC Mode with no Input Power

| | |
|---|---|
| Purpose: | Setting output power in LOSS N mode (when amplifier remains operative when no input power exists). |
| Type: | Set |
| RS232 Command: | **MODE P XX.X [ENTER] where XX.X is total output power in dBm**<br>**(Signal + ASE power is kept constant)** |
| *Answer:* | > |

### l. APC Mode Definition

| | |
|---|---|
| Purpose: | In APC mode it is possible to either keep constant the output power with ASE or the signal power. The operation is defined with the command: “APC_SW”. |
| Type: | Get/Set |
| RS232 Get Command: | **APC_SW [ENTER]** |
| *Answer:* | **APC_SW: X**<br>> |
| Remark: | If X=1, signal + ASE power is kept constant, If X=0 signal power is kept constant. |
| RS232 Set Command: | **APC_SW=X [ENTER]** |
| *Answer:* | > |

### m. Mid-stage restart

| | |
|---|---|
| Purpose: | If mid-stage power (PMID) is greater than this value during mid-stage loss power reduction, automatic restart is enabled. |
| Type: | Get |
| RS232 Command: | **MID_RE XX.X [ENTER]** |
| *Answer:* | **MID_RE: XX.X dBm**<br>> |

### n. Mid Stage Loss and Tilt

| | |
|---|---|
| Purpose: | This command is used when a FGB-type DCM is located at mid-stage and sets the insertion loss. In cases where ASE filtering effect is minor, the command can be set to automatically tune mid-stage loss by means of internal photo-detectors. |
| Type: | Get / Set |
| RS232 Set Command: | **DCM LOSS XX.X [ENTER]** or<br>**DCM TILT ZY.Y [ENTER] or**<br>**MSA XX.X [ENTER]**<br>Where XX.X is loss of MSA in dB and Y.Y is tilt in dB where Z signifies tilt sign. In order to activate automatic measurement of mid-stage loss, set the value of XX.X to **U.** In this case the command is **DCM LOSS U** (this will cause automatic compensation of DCM loss by means of internal photo-detectors – relevant when ASE filtering is negligible to loss measurement). |
| *Answer:* | > |
| RS232 Get Command: | **DCM LOSS [ENTER]** or<br>**DCM TILT [ENTER]** |
| *Answer* | **DCM LOSS: XX.X**<br>><br>Or<br>**DCM TILT: ZY.Y**<br>> |
| Remark: | If DCM command is given without parameters both the loss and tilt status will be given. |

### o. Case Temperature Monitoring

| | |
|---|---|
| Purpose: | Gets the case temperature. |
| Type: | Get |
| RS232 Command: | **MT [ENTER]** |
| *Answer:* | **MT: YXX.X C**<br>><br>(Where Y designates blank for the sign + or –for the sign -). |

### p. Pump Status

Purpose: Gets the pump status.

Type: Get

RS232 Command: **PUMP X Y [ENTER]**

X is the pump number (no value when single pump).
Y is one of the following:

a. **ILD** – LD current in mA
b. **EOL** – LD EOL current in mA
c. **TMP** – LD temperature
d. **ISP** – LD current set point in mA (or AUTO)

*Answer:* For parameters 1,2 and 4:

**PUMP 2 Y: XXXX.X mA**

>

For parameter 3:

**PUMP 1 TMP: XX.X C**

>

Remark: If Y is not specified the command will display all possible statuses, if X is not specified both pumps statuses are displayed.

### q. Alarm Information

Purpose: Displays values in which alarm will be declared. Values are related for the following amplifier parameters:

a. Max current of pump **(ILD)**
b. Max pump temperature **(TMP)**
c. PCB temperature higher then 85C **(MTH)**
d. Low case temperature **(MTL)**
e. Out of range coil temp. **(CT)**
f. Loss of input signal for n stage/amplifier **(LOS1)**
g. Wrong output power in APC and wrong Gain in AGC **(LOP)**

For each parameter the alarm value can relate for the following:

a. Current status can be On or OFF **(STA)**
b. Latched alarm **(SST)**
c. Threshold **(THR)**
d. Hystheresis **(HYS)**
e. Midstage alarm **(AMS)**
f. Midstage loss **(LOS2)**

Type: Get

RS232 Command: **ALRM Y [ENTER]**

Where **Y** is the current status or Threshold or Hystheresis or latched.

*Answer*: **ALRM Y: XXX.X** with appropriate units following.

>

*Example Command:* **ALRM LOS THR [ENTER]**

*Example Answer:* **ALRM LOS THR: -21.0dB**

>

Remark: If the Y parameter is not given then all Y parameters are displayed. If Both the X and Y parameters are not given then all parameters for all alarms are given.

Table summing up all alarms:

| Alarm | | EDFA Action |
|---|---|---|
| LOSn<br>Input LOS Alarm for each stage (n) | Set | Stage shifts to disable mode. This behavior is configurable. |
| | Clear | Returns to previous mode |
| LOP<br>Correct gain in AGC or correct power in APC cannot be achieved | Set | n/a |
| | Clear | |
| ILD<br>One of pump currents > 0.95EOL | Set | No action |
| | Clear | No action |
| MTH Block Temperature bigger then 80C(TBD) alarm<br>MTL Block Temperature smaller then threshold alarm | Set | No action |
| | Clear | No action |
| TMP<br>If pump temp >35 or < 15 (for NomLasTemp=25C) OR >55 or < 35 (for NomLasTemp=45C) alarm is lit | Set | Configurable:<br>No change<br>Module shifts to disable mode<br>Default: Module shifts to disable. |
| | Clear | Returns to previous mode |

### r. Alarms Threshold and Hysteresis Setting

Purpose: Setting values in which alarm is declared and hystheresis for turning on and off the alarm.

Type: Set

| | |
|---|---|
| RS232 Command: | **ALR M X THR Y [ENTER]**<br>Or<br>**ALRM X HYS Y [ENTER]**<br>(Where X value is same as in paragraph 21 and Y value is given according to user requirements) |
| *Answer:* | > |
| *Example Command:* | **ALRM LOS THR –21 [ENTER]** |
| *Example Answer:* | > |
| Remark: | ALRM X CLR clears Alarm from latched status, ALRM CLR clears all alarms from latched status. |

### s. Alarms With ON status

| | |
|---|---|
| Purpose: | Gets all alarms which are ON |
| Type: | Get |
| RS232 Command: | **AST [ENTER]** |
| *Answer:* | **AST: X1 X2 ….. Xn**<br>><br>(Where list of alarms is given in paragraph 21)<br>If all alarms are off answer is:<br>**AST: OK**<br>> |

### t. Alarms Latching Information

| | |
|---|---|
| Purpose: | In case an alarm was declared and immediately shut off before management system received the alarm notification, the state of alarms can be latched till status reading is performed. The latching mode is designated as **S** mode. In this mode the AST command displays only latched alarms. In Normal mode (designated as **N** mode), the AST command displays only current alarms. |
| Type | Set / Get |
| RS232 Set Command: | **ASTM N [ENTER]**<br>(Where **N** switches to normal mode). |
| *Answer*: | > |
| RS232 Get Command: | **ASTM [ENTER]** |

| | |
|---|---|
| *Answer*: | **ASTM: N**<br>> |
| Remark: | Command is also affective to hardware PIN alarms. |

### u. Module Operation When Loss of Input Power Occurs

| | |
|---|---|
| Purpose: | Indicate module mode of operation when input power to module is below designated threshold. Four modes of operation are available:<br>**a.** Pumps are disabled in AGC, APC and Manual modes **(A)**<br>**b.** In AGC mode the EDFA operates as APC mode with power in "pout_n" value. In APC and Manual modes there is no effect to input loss. **(N)** |
| Type: | Set / Get |
| RS232 Set Command: | **LOS X [ENTER]**<br>(Where **X** is one of the four options specified) |
| *Answer:* | > |
| RS232 Get Command: | **LOS [ENTER]** |
| *Answer:* | **LOS: X**<br>> |

### v. Module Operation For LOS N

| | |
|---|---|
| Purpose: | Determines the pout when no input signal and the mode of operation is AGC LOS N |
| Type: | Set / Get |
| RS232 Set Command: | **POUT_N X [ENTER]** |
| *Answer:* | > |
| RS232 Get Command: | **POUT_N [ENTER]** |
| *Answer:* | **POUT_N: X**<br>> |

### w. Reset to Factory Default

| | |
|---|---|
| Purpose: | Reset all setting to factory settings (defaults). Micro controller has to be re-booted in order for the command to take effect. |
| Type: | Set |

RS232 Command: **RST [ENTER]**

*Answer:* >

### x. Boot

Purpose: Reboots the firmware.

Type: Set

RS232 Command: **BOOT [ENTER]**

*Answer:* >

### y. Software Download

Purpose: Downloads operating software from system management.

Type: Set

RS232 Command: **RECV FW [ENTER]**
(Where **FW** is new firmware)

Answer: >

## X. Revision History

| Revision | Date | Description |
|---|---|---|
| A01 | 2015-07-01 | First release. |

## XI. For More Information

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