

Nilesat, Eutelsat 8W,  
Badr 4/5/6/7 & Es'hail 2  
and Hot Bird 13E over  
2800 GPON Homes

Proposed by Greatway Technology

## 1.0 **Project Overview**

Nilesat, Eutelsat 8W, Badr 4/5/6/7 & Es'hail 2, Hot Bird 13E are the popular satellites in the middle east. People love to watch them. It is a tough job for one single family to install four satellite dishes serving only one satellite receiver. It is a difficult job for the subscribers living in one building to share the four satellite dishes over a bundle of coaxial cables. Internet is the top priority demand on this planet. If there is GPON fiber to each subscriber, Greatway Technology makes this job easier at affordable cost. This proposal gives the solution of 4 satellites selected most popular FTA or encrypted contents FTTH to about 2800 GPON ONU subscribers.

## 2.0 **Key Points**

Each satellite has about 10~96 transponders. 20% contents are popular in 80% subscribers. To save each FTTH home cost, we just pick 32 popular transponders (32 User Bands) from each satellite to all GPON homes. To do this, we need 4pcs dCSS static LNB with the selected 32UB of each satellite. (We recommend to use Inverto dCSS LNB and SatPal or similar products. Greatway can supply the dCSS LNB with fixed static 32UB output if we know your satellite name and 32 desired transponders either in Horizontal or Vertical)

### **DTT signal conversion**

DTT is offered by a few operators in the city and the DTT transmitting towers may stand in different locations of the city. The DTT signal next to DTT tower might be strong to enter TV set directly. To avoid the same frequency interference, it is recommended to convert all DTT carrier frequency before the optical transmitter Terr TV input. In this project, there are 3 Terrestrial RF carriers: VHF7 and UHF32, UHF36. We suggest to use one GTC250 terrestrial TV frequency converter to have the following new Terrestrial TV frequencies: VHF8, and UHF33 and UHF31 (Due to the PAL-B/G standard and DTT signal features, we recommend VHF to VHF and UHF to UHF conversion). GTC250 has four VHF/UHF inputs and one up to maximum 32ch DTT RF output. 1pcs GTC250 can output clean high quality 3ch DTT RF (each at 85dBuV RF level) to the optical transmitter, filtering or blocking 4G and 5G mobile signals.

### **Satellite signal selection**

Nilesat 201 & Eutelsat 7 West A at 7.0 °W has about 52 transponders.

Eutelsat 8 West B at 8.0 °W has about 31 transponders.

Badr 4/5/6/7 & Es'hail 2 at 26.0 °E has about 62 transponders.

Hot Bird 13E has about 87 transponders.

We recommend using 1pcs Inverto dCSS LNB (<https://www.inverto.tv/lnb/373/programmable-40mm-lnb-with-32-ub>) for each of the above 4 satellites. This dCSS LNB can be set at static mode by 1pcs Inverto SatPal, outputting selected maximum 32 user bands from either horizontal or vertical polarity.

### **Optical Transmitter**

1pcs GLB3500M-4TD DWDM optical transmitter receives 4x32UB satellite inputs and one DTC250 terrestrial RF input, converting all of them over 1550nm DWDM SM fiber.

Since each DWDM laser consumes more energy to maintain the optical wavelength, GLB3500M-4TD has the 19" 1RU version, where 2pcs GLB3500A-2TD are installed in one 19" 1RU chassis for better heat dissipation. GLB3500A-2T has CE certificate.

GLB3500M-4TD optical transmitter should be installed indoor. The RG6 coaxial cable to each dCSS LNB length should be less than 50 meters.

### **Optical Splitter**

Since all 2800 GPON subscribers are grouped by 1x16 splitter, there are at least 175 groups.

GLB3500M-4TD has about +9dBm output power, which shall be followed by 1pcs 1x4 PLC splitter first. Among the 4 splitter outputs, 3 splitter outputs are connected with 3pcs GWA3500-34-64W optical amplifier respectively, 1 splitter output as standby port.

### **Optical Amplifier**

Each GWA3500-34-64W optical receiver has one 1550nm optical input, 64 OLT inputs, and 64 com ports, where each com ports has  $>+12\text{dBm}@1550\text{nm}$ . Each com port is connected with 1x16 PON splitter, offering both sat TV and GPON Ethernet.

GWA3500-34-64W optical amplifier should be installed next to GPON OLT or close to the fiber cable hub.

3pcs GWA3500-34-64W optical amplifiers have 192 output ports, besides the 175 connected ports, the unused ports as standby ports.

The former GPON system should have 1x16 splitter installed. We listed them in case you need 1x16 splitter.

### **Optical Receiver and GPON ONU**

At each GPON ONU, we suggest using one SC/UPC adapter and 1 meter duplex SC/UPC to LC/UPC jumper, where 1 fiber converts the incoming SC/UPC fiber to LC/UPC to GLB3500M-4RH4-K optical LNB and the other converts the loop out GPON signal back to SC/UPC to the existing GPON ONU.

GLB3500M-4RH4-K has four RF ports, each RF port offer 4x32UB satellite contents and terrestrial TV. If there are more than 4 satellite decoders at each GPON ONU location, each RF port of GLB3500M-4RH4-K can be connected by one 4-way or 8-way satellite splitter to support 16 or 32 satellite receivers, where the satellite splitter has one RF port pass DC only. The satellite receiver connecting with DC passing port selects 1 of the four satellites, the satellite receivers connecting at no DC port watches the selected 32UB satellite contents.

### **Satellite Receiver**

Regular satellite receiver supporting multi satellites contents search can watch all FTA contents and encrypted contents with CA card. No unicable function requirement on the satellite receiver.

### **Fiber Jumper**

Due to the high density EYDFA, we might use LC/UPC connector instead of SC/UPC connector. There should be some jumping fiber patchcord such as LC/UPC to SC/UPC or LC/APC to SC/APC.

# 4 Satellites Fiber to the home over GPON or XGPON

Sohail-sat    Arabsat    Nilesat    Hot Bird

GLB3500M-4TD transmitter converts 4x32UB RF from four satellite dCSS LNBS and Terrestrial TV into 1 SM fiber via DWDM

3m~500m SM fiber

1550nm

Terr TV

Hot Bird dCSS LNB selected static 32UB

GWA3530 1550nm Amplifier has 8/32 OLT ports 8/32 outputs for 1550nm DWDM and GPON/XGPON

Community

1310nm/1490nm or 1270nm/1577nm

8 core Fiber Cable to the community 100m~15Km

GOLT2000 8 PON ports

**GPON OLT Center**

www.greatwaytech.com

GLB3500M-4RH4-K Optical LNB has 4 RF outputs. Each port has any 32UB RF from 4 sats and Terr TV. Designed for 4 sats FTTH to 4 sat decoders. WDM to GPON/XGPON ONU

\*dCSS LNB selects the most popular 32 transponders of each satellite.  
\*Local Terrestrial TV  
\*Broadcasting huge live TV in high quality without consuming GPON streams

UHD TV

GLB3500M-4RH4-K Optical LNB has 4 RF outputs. Each port has any 32UB RF from 4 sats and Terr TV. Designed for 4 sats FTTH to 4 sat decoders. WDM to GPON/XGPON ONU

1pcs GLB3500M-4TD DWDM TX and 1pcs opt. amplifier support up to 2048pcs GLB3500M-4RH4 receivers in 20Km fiber distance. GPON or XGPON option. Solution for 32~50K subscribers.

UHD TV





**Bill of Materials (BoM) for this project**

<b>Part A: DTT and Satellite LNB</b>		
<b>Part Number</b>	<b>Description</b>	<b>Qty</b>
	DTT Antenna for the best DTT signal quality	1
GTC250	Terrestrial TV Frequency Converter	1
	Satellite dish	4
	Inverto dCSS LNB with static mode for selecting the most popular 32UB	4
	Inverto SatPal for selecting the static 32UB of the satellite on Inverto dCSS LNB	1
<b>Part B: DTT+SAT Optical Transmitter</b>		
GLB3500M-4TD	1550nm DWDM Optical Modular Transmitter, Terr input 174~806MHz, 4 dCSS LNB static 32UB input: 950~2150MHz, reverse 14V DC to dCSS LNB, +9dBm, SC/APC, 19V DC, 19" 1RU	1
MPFS-4-P-SA	1x4 PLC Splitter in plastic box, SC/APC	1
<b>Part C: Distribution EYDFA</b>		
		<b>Quantity</b>
GWA3530-34-64W	High Power 1550nm optical amplifier, 1 1550nm input and 64 OLT inputs, 64 Outputs, 12dBm@1550nm each port, LC/APC, 19" 2RU	3
MPFS-16-P-SA	1x16 PLC Splitter in plastic box, SC/APC	
LA-SA-SS-2M	LC/APC to SC/APC jumper, SM, 2meter	
LU-SU-SS-2M	LC/UPC to SC/UPC jumper, SM, 2meter	
<b>Part D: Fiber to the Home equipment</b>		
		<b>Quantity</b>
GLB3500M-4RH4-K	Optical Receiver with 1 LC/UPC fiber input, 1 LC/UPC to GPON ONU, 4 Sat RF ports for 4 sat decoders, each RF 4x32UB satellites and Terr TV contents, 12V 1A power adapter	2800
LA-SU-DS-1M	LC/UPC-SC/UPC SM Duplex Jumper, 1 meter	2800
GSS-04	4-way Satellite Splitter with one port DC pass only	
<b>Part E: Home electronics</b>		
		<b>Quantity</b>
TJ168	Regular satellite receiver, 950~2150MHz RF input, HDMI to TV set	2800

**Key Product specifications**

1. GTC250 Terrestrial TV converter
2. GLB3500M-4TD DWDM optical transmitter
3. MPFS 1x4 Splitter
4. Fiber Patchcord
5. High power DWDM optical amplifier with GPON OLT inputs
6. GLB3500M-4RH4-K optical receiver
7. 4-way Satellite Splitter

Greatway Technology

## GTC250 Terrestrial TV Converter

GTC250 Terrestrial TV Converter is an all-in-one programmable terrestrial TV signal booster, filter, combiner, channel converter, equalizer, and amplifier. It is suitable for collective antenna application where terrestrial TV signals can be selected, processed, filtered, combined, equalized, and amplified at once. With embedded LCD and key pad, GTC250 is convenient to select output channels and adjust output RF level.

### Feature:

- Capture full VHF & UHF channel, convert
- Integrated Pre-Amplifier and Automatic Ga
- 4 inputs to select the best signal from VHF/UHF/FM optimized antennas
- Adjustable output level up to 113 dB $\mu$ V with 6 active channels
- Intuitive key pad programming with LCD display for output channel conversion
- Automatic LTE filter selection to minimize 4G signal interference

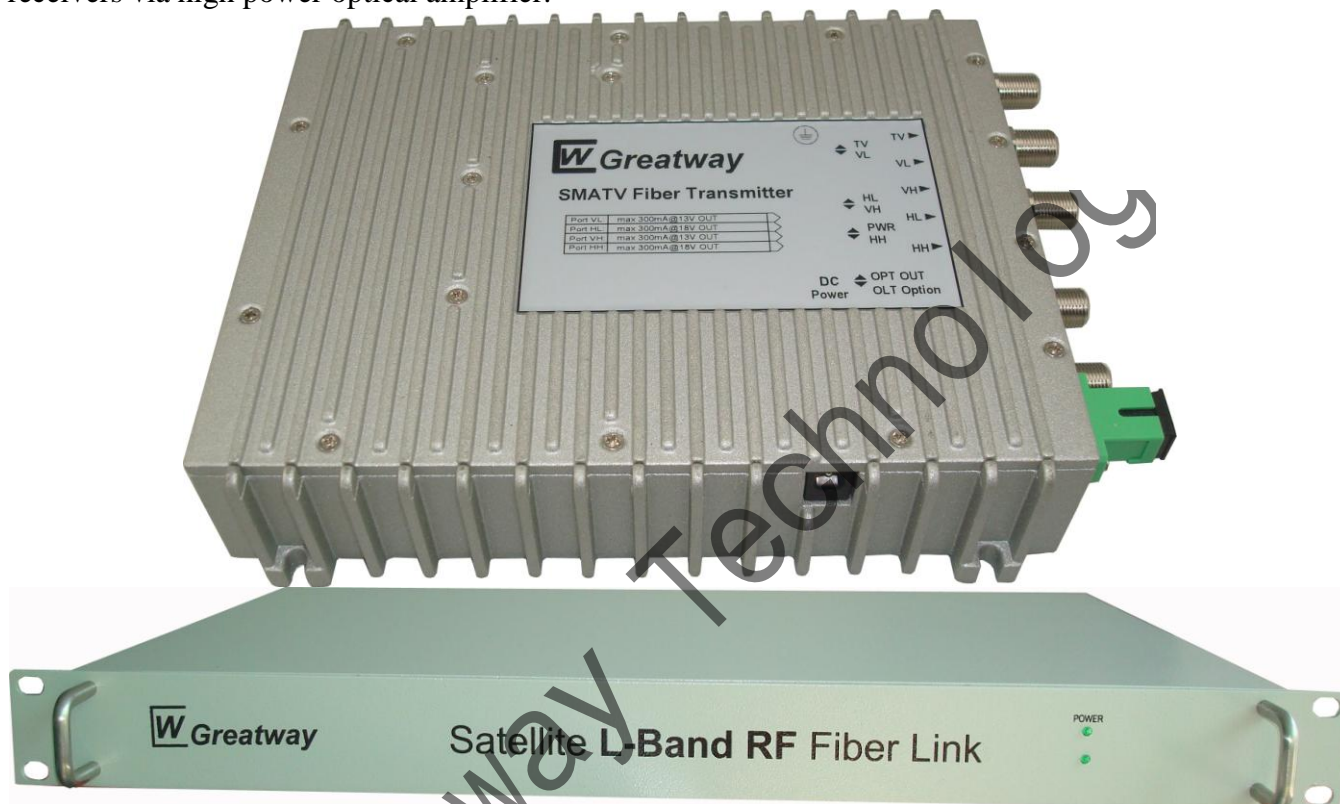
### Specifications



Input	Parameter
Input Port Number (VHF & UHF / FM)	4 / 1
Input Frequency (VHF & UHF / FM)	174~862MHz / 88~108MHz
Automatic Filter for each VHF / UHF Input	VHF: 174 to 240 MHz UHF: 470 to 862 MHz
LTE Protection	Automatic selection: 694MHz, 790MHz or OFF
Input Power Level (VHF & UHF / FM)	108dBuV / 78dBuV Max
Input Return Loss	10dB
Channel Capture/Convert Band	32 max. (Programmable)
RF Output Impedance	75 $\Omega$
Channel Capture Band Bandwidth	6 ~ 9MHz
Output	
Output Port Number	1 main + 1 test port (-30 dB)
Output Port Connectors	F-Type Female
Output Frequency (VHF & UHF / FM)	174 ~ 862 / 88 ~ 108MHz
Output Power Level	113dBuV max. (Programmable)
FM Gain Level	5 or 35 dB
Output Return Loss	10dB
Output MER	35 (with input MER $\geq$ 38 dB)
Environment	
AC Input Voltage	100 - 240V
Power Consumption	10W
Programming Port and Interface	Intuitive Key Pad with LCD Display
Operating Temperature	-10 to 50 $^{\circ}$ C
Dimension (L*W*H)	208mm $\times$ 150mm $\times$ 46mm
Weight	718g (not including power adapter)

### GLB3500M-4TD Optical Transmitter

GLB3500M-4TD is a DWDM broadband RF fiber optic transmitter converts four 950~2150MHz Satellite RF and one 174~806MHz Terrestrial TV RF over one SM fiber to multi FTTH subscribers. The four satellite RFs can be either VL/VH/HL/HH from one Quattro LNB or four static 32UB from four satellite dCSS LNBs. GLB3500M-4TD DWDM optical transmitter can have the 19" 1RU chassis with built-in two CE certified GLB3500A-2T DWDM optical transmitter modules. With DWDM lasers/photodiode and low noise RF gain control circuit, one GLB3500M-4TD can deliver high quality RF to maximum 32 GLB3500M-4RH4 optic receivers directly or thousands of GLB3500M-4RH4 optic receivers via high power optical amplifier.



#### Features:

- Compact aluminum housing with excellent heatsink and RF isolation
- One Quattro LNB (or four dCSS LNBs) and Terr TV over one SM fiber transmission
- Four satellite RF bandwidth: 950MHz to 2150MHz
- Reverse 13V/18V DC to Quattro LNB or dCSS LNB
- Terrestrial TV bandwidth: 174~806MHz
- 1550nm C-band DWDM wavelengths in the range of EDFA or EYDFA
- AGC on optical transmitter and receiver
- High Linearity Photodiode
- Excellent RF Isolation
- Low noise RF Gain Control circuit
- 19" 1RU Chassis available

#### Specifications:

##### GLB3500M-4TD Optical Transmitter

RF Input	
RF Input Port Number	5 (Quattro LNB or four dCSS LNBs, one Terrestrial TV)
RF Bandwidth at each port	Satellite: 950~2150MHz Terrestrial TV: 174~806MHz
Minimum RF Input Power	-50dBm



Maximum RF Input Power	-30dBm
RF Connector	F-Type, American Female
RF Return Loss	10dB
RF Impedance	75 Ohm
Power to LNB	Reverse 13V or 18V DC to each LNB RF port
RF AGC	Preset at 30 RF carriers in the bandwidth
AGC Flatness	±3.0 dB
<b>Optics</b>	
Optical Output Port	One
Fiber	9μm / 125μm Single Mode Fiber
Fiber Connector	SC/APC
Output optical wavelength	1550nm DWDM wavelength
Laser Output Power	>+9dBm
<b>LED Status</b>	6 Green Color LED on the panel, representing DC Power, RF1, RF2, RF3, RF4, RF5. LED “ON” when there is the corresponding signal.
<b>Physical</b>	
Power Supply	19V 2A DC Power Adaptor
Power Consumption	25W
Dimensions (W x H x D) mm	185×146×38 or 19” 1RU
Operating Temperature ( °C)	-20 - +60
Storage Temperature ( °C)	-40 - +85
Humidity	10%~90% non-condensing
Weight	4.5Kg

## MPFS PLC Splitter



## Duplex SC/UPC to LC/UPC Fiber Patchcord



## **GWA3530 Series 1550nm Fiber Amplifier**

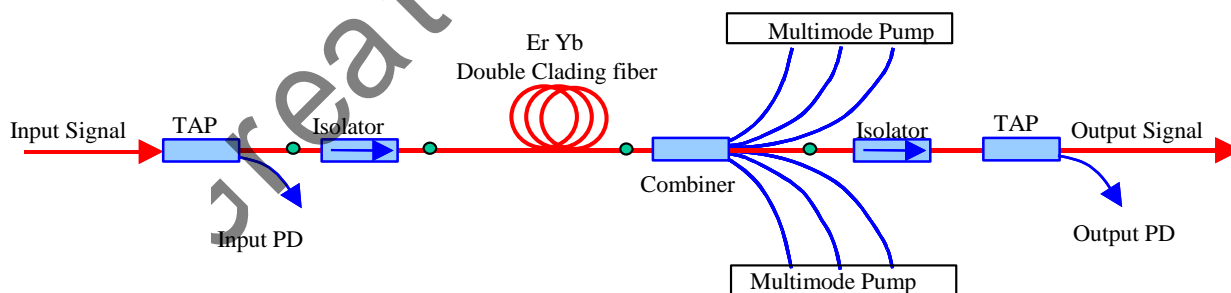
With up to 35dBm 1550nm output, GWA3530 series Er-Yb Doped Fiber Amplifiers are important 1550nm relay transmission equipments for High performance supertrunking links, High power distribution networks, Fiber Deep architectures and FTTx networks. GWA3530 Fiber Amplifier is designed to meet the most demanding noise performance requirements of CATV and FTTx applications. GWA3530 fiber amplifier provides optical isolation on the input and output of the gain block for stable, low noise operation. The input and output optical signal power levels are detected for monitoring and control. The input optical signal is amplified with active gain control for a constant output power level, or with active output power control for constant gain mode. GWA3530 series optical amplifiers also provide monitoring functions and associated alarms for all vital characteristics. The optical output of the GWA3530 series optical amplifiers can be split into up to 64 ports by an optional internal splitter.

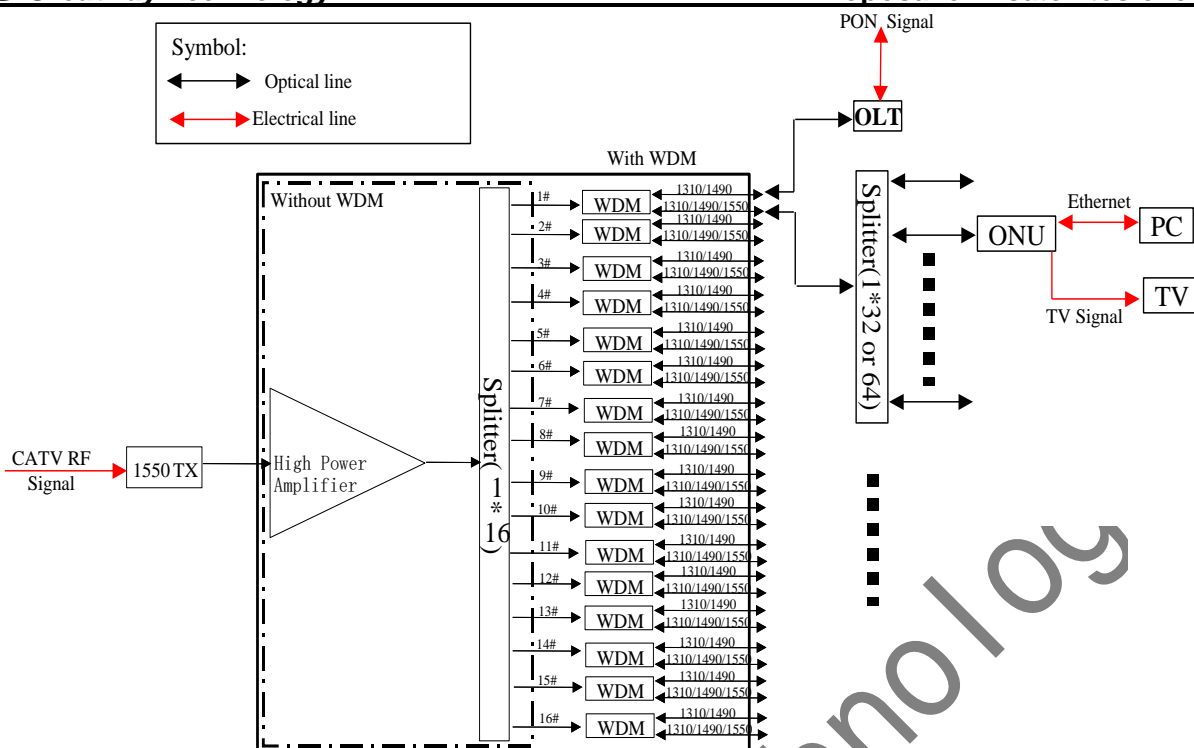


### **Features**

- High adjustable output power: maximum 40dBm
- Fiber output supporting multi-ports: 20dBm×N or 17dBm×N
- Low NF: Typical <5.5dB @+5dBm input
- Extremely low CSO distortion: < -70dBc
- Dual CPU dealing with amplifier local controller and remote communication
- High stability and reliability: MTBF ≥150000 hours
- Dual Hot-swappable 110V AC or -48V DC Power supplies
- Ethernet, RS485 and RS232 network interfaces
- Supporting Telnet and SNMP network management
- Intelligent temperature control system: Employ special temperature control chip, radiating and power consumption can be reduced 30%
- Built-in 1310nm, 1490nm, 1550nm WDM(Optional)
- RoHS Complied
- Bellcore GR-1312-CORE Complied

### **Block and Application Diagram**





EPON System Diagram

## Specifications

### Optical Parameter

Parameters	Symbol	Min.	Typ.	Max.	Unit
Wavelength(CATV)	$\lambda_c$	1545	1550	1570	nm
Wavelength(PON)	$\lambda_{R1}$	1260	1310	1360	nm
Wavelength(PON)	$\lambda_{R2}$	1480	1490	1500	nm
Output port <sup>(1)</sup>				64	
Output Power (Total)		30		40	dBm
Input Power	$P_i$	-3	-----	+10	dBm
Each output power	$P_o$	17		22	dBm
Noise Figure <sup>(2)</sup>	NF	-----	5.5	6	dB
Output power stability	$\Delta P_o$	-----	$\pm 0.2$	$\pm 0.5$	dB
Input/Output Isolator	ISO i/o	30	-----	-----	dB
Input/output Pump Leakage	PumpL in/out	-----	-----	-30	dB
Return Loss	RL	50	-----	-----	dB
PDG	PDG	-----	-----	0.5	dB
PMD	PMD	-----	-----	0.5	ps

(1): Optional

(2): Test at 0dBm input

### Power Supply

Power Supply: AC: 90V~265V (50/60 Hz) or -48V DC

Power Consumption:  $\leq 80W$

**Environment**

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature	Tw	-5		60	°C
Storage Temperature	Ts	-40		80	°C
Humidity		10		85	%

**Physical Parameters**

Weight:  $\leq 20\text{Kg}$

Dimensions (mm):  $483 \times 240 \times 88$  (19" 2RU)

**Ordering Information**

GWA3530-AB-C-D-E-F High Power Fiber Optical Amplifier in 19" 2RU

AB (Output Power): 30\_30dBm, 35\_35dBm, 40\_40dBm

C (Output Ports): 04\_4 ports, 08\_8 ports, 16\_16 ports, 32\_32 ports, 64\_64 ports

D (Connector): LA\_LC/APC SA\_SC/APC

E (Power Supply): Default\_single 220V AC, 48\_single -48V DC,

AA\_Two AC power supplies, DD\_Two DC Power supplies;

AD\_AC and DC power supplies

F (1310nm/1490nm/1550nm WDM at each fiber output port): Default\_None, W\_WDM



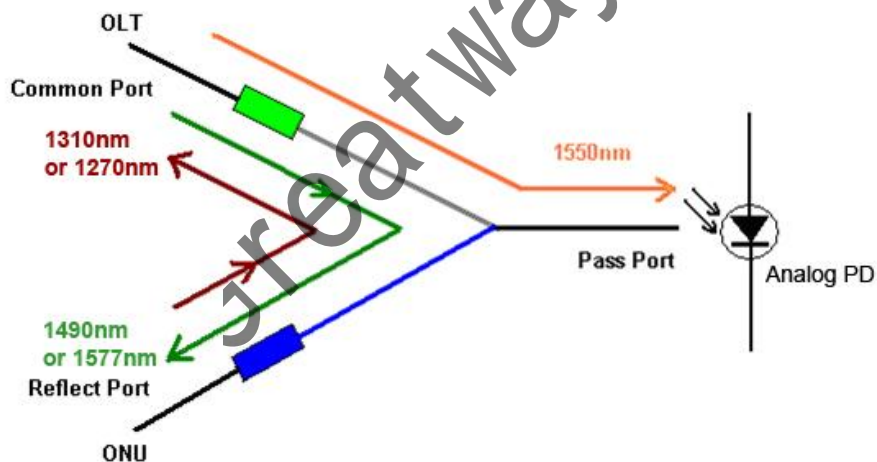
## GLB3500M-4RH4-K Optical Receiver with WDM to GPON

GLB3500M-4RH4-K 1550nm satellite TV RF FTTH optical receiver with 1310nm/1490nm GPON WDM or 1270nm/1577nm XGPON WDM, receiving 1540nm~1560nm Terrestrial TV and Sat RF optical signal from Passive Optical Network (PON) while passing GPON or XGPON signals to ONU device. Working with GLB3500M-4TD fiber optic transmitter, GLB3500M-4RH4-K outputs high quality terrestrial TV and satellite TV RF.



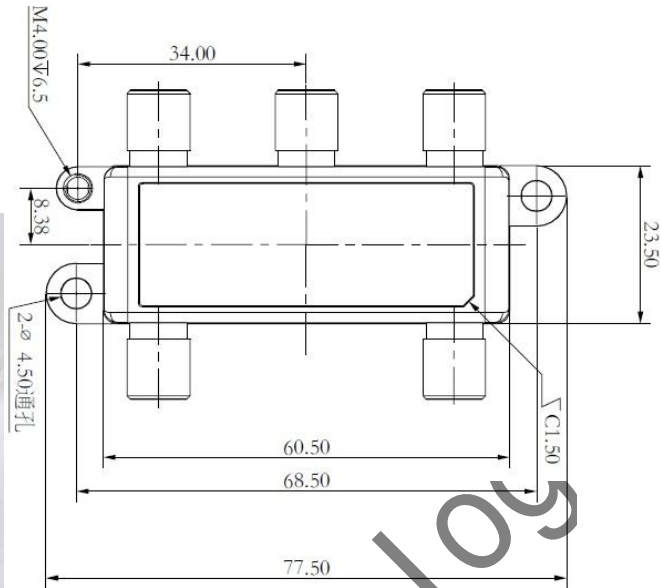
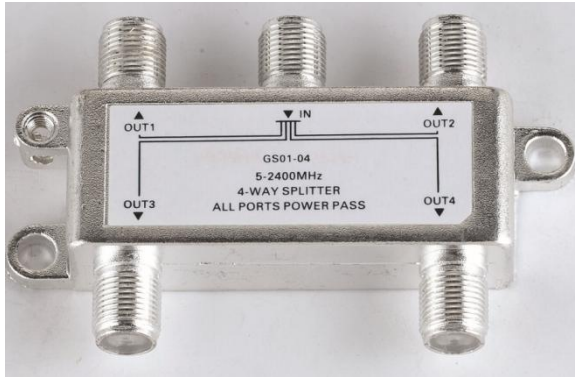
### Features:

- Compact plastic flame retarding housing
- 4 RF port, each output Satellite selected by DiSEqC
- Terr TV available at all 4 RF ports
- 1310nm/1490nm Optical Bypass Port to GPON ONU
- 1270nm/1577nm Optical Bypass port to XGPON ONU
- DC Power and optical input LED indicator



<b>Optical Input</b>	
Optical Input Port	One dual LC/UPC Port
Input Optical Wavelength	1540~1560nm
Reflecting Channel Wavelength	1260~1360nm, 1400~1548nm and 1570~1610nm
Fiber	9μm / 125μm Single Mode Fiber
Fiber Connector	Two LC/UPC: one for PON input and one for GPON ONU
Input optical wavelength	1550nm DWDM Wavelength and OLT/ONU wavelength
Optical Input Power	-10dBm~+6dBm
Optical AGC range	-5dBm~+3dBm
Output to ONU	
Loss at 1310nm/1490nm/1577nm	<0.8dB
Isolation (Com-Pass at 1310nm)	> 35dB
Isolation (Com-Pass at 1490nm)	> 30dB
Isolation (Com-Pass at 1577nm)	> 30dB
Isolation (Com-Reflect at 1550nm)	> 18dB
RF Output	
RF Output Port Number	Four
Each RF output bandwidth: Sat: 950~2150MHz Terr TV: 174~806MHz	4 Sats FTTH, 32UB each sat, Satellite selected by DiSEqC
RF Output Level	>70dBμV @ -6dBm optical input (SAT) >65dBμV @ -6dBm optical input (Terr TV)
RF Flatness	±3.0 dB
RF Return Loss	10dB
RF Connector	F-Type, American Female
RF Impedance	75 Ohm
IMD 2nd order	≥32dB (two input tones at -15 dBm)
IMD 3RD order	≥52dB (two input tones at -15 dBm)
<b>LED Status</b>	5 Green Color LED on the panel, representing DC Power, RF1, RF2, RF3, RF4, LED “ON” when there is the corresponding signal.
<b>Physical</b>	
Power Supply	12V 1A CE Power Adapter
Power Consumption	<7W
Dimensions (W x H x D) mm	168×115×32
Operating Temperature (°C)	-20 - +60
Storage Temperature (°C)	-40 - +85
Humidity	10%~90% non-condensing
Weight	0.6Kg (without power adaptor)

## GSS-4 Four-way Satellite Splitter



Frequency Range (MHz)	Insertion Loss(dB)	Mutual Isolation(dB)	Return Loss(dB)
5-40	≤8.0	≥22	≥10
40-1000	≤9.0	≥22	≥12
1000-1750	≤11.0	≥20	≥12
1750-2400	≤11.5	≥20	≥10