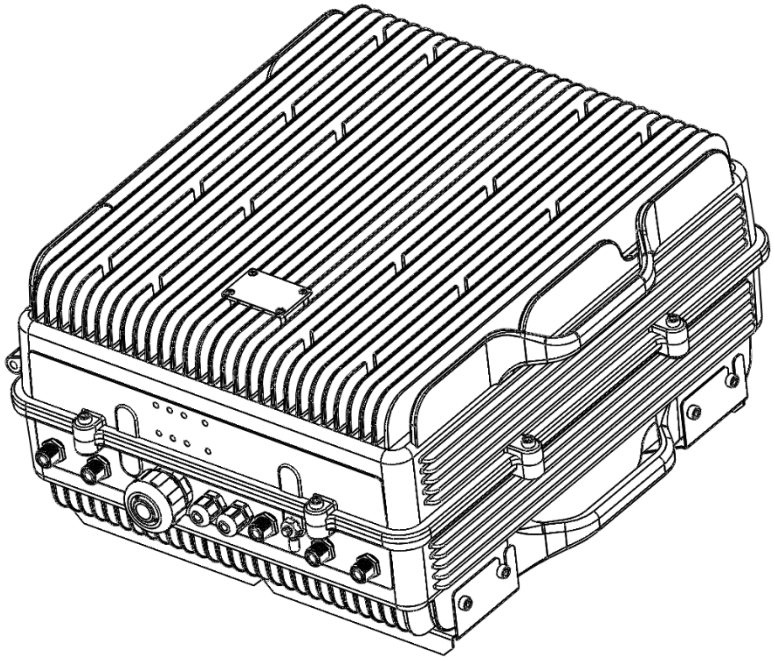
English

fipleX®

DHS37-R-DU – PS800 Digital Fiber Remote Unit
User & Installation Manual



Document History

Description	Revision	Date Issued
Original version	1.0	July 3rd, 2014
General Review	2.0	March 2nd, 2016
General Update	3.0	7 June, 2017

About this manual

This manual describes installation, commissioning, operation and maintenance of the **Fiplex DHS37-R-DU Digital Remote Unit**, and ***Fiplex Control Software (FCS)***.

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The first part of the manual describes the Digital Fiber DAS hardware and the second part describes the software.

Hardware and software mentioned in this manual are subjected to continuous development and improvement. Consequently, there may be minor discrepancies between the information in the manual and the performance and design of the hardware and software. Specifications, dimensions and other statements mentioned in this manual are subject to change without notice.

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Abbreviations

AGC	Automatic Gain Control
AMPS	Advanced Mobile Phone Service
ARFCN	Absolute Radio Frequency Channel Number
BCCH	Broadcast Control Channel (GSM broadcast channel time slot)
BS	Base Station, BS antenna = towards the base station
CDMA	Code Division Multiple Access
DC	Direct Current
DCS	Digital Communication System (same as PCN)
DL	Downlink signal direction (from base station via repeater to mobile station)
DPLX	Duplex filter
EEPROM	Electrical Erasable Programmable Read Only Memory
EGSM	Extended Global System for Mobile communication
ETACS	Extended Total Access Communication System
ETSI	European Telecommunications Standard Institute
FCS	Fiplex Control Software
GSM	Global System for Mobile communication
HW	Hardware
LED	Light Emitting Diode
LNA	Low Noise Amplifier, uplink and downlink
MS	Mobile Station, MS antenna = towards the mobile station
OMS	Operation and Maintenance System
OL	Overload
PA	Power Amplifier
PCN	Personal Communication Network (same as DCS)
PCS	Personal Communication System
PS	Power Supply
RF	Radio Frequency
RSSI	Received Signal Strength Indication
SW	Software
TDMA	Time Division Multiple Access
UL	Uplink signal direction (from mobile station via repeater to base station)
WEEE	Waste of Electric and Electronic Equipment

Part 1 HARDWARE

1. Safety

Caution!

This manual lists a set of rules and warnings to be accomplished when installing, commissioning and operating a Fiber DAS Master Optical Unit from FIPLEX. Any omission may result in damage and/or injuries to the System and/or the System Operators or Users.
If an instruction is not clear or you consider is missing, please contact immediately to Fiplex. See www.fiplex.com for contact information.

Dangerous Voltage Warning

Any personnel involved in installation, operation or service of this equipment **must** understand and obey the following:

The power supply unit supplied from the mains contains dangerous voltage level, which can cause electric shock. Switch the mains off prior to any work in such equipment. Any local regulations are to be followed when servicing MOUs. Authorized service personnel only are allowed to service repeaters while the main is switched on.

R&TTE Compliance Statement

This equipment complies with the appropriate essential requirements of Article 3 of the R&TTE Directive 1999/5/EC.

Station Ground

BTS chassis, MOU, feeders, donor antenna, service antenna/s and auxiliary equipment (splitters, tabs, .etc) are required to be bonded to protective grounding using the bonding stud or screw provided with each unit.

Electrostatic Discharge

Static electricity means no risk of personal injury but it can severely damage essential parts of the equipment, if not handled carefully.
Parts on the printed circuit boards as well as other parts in the unit are sensitive to electrostatic discharge. **Never touch printed circuit boards or uninsulated conductor surfaces unless absolutely necessary.**
If you must handle printed circuit boards or uninsulated conductor surfaces, use ESD protective equipment. Never let your clothes touch printed circuit boards or uninsulated conductor surfaces.

Disposal of Electric and Electronic Waste

Pursuant to the WEEE EU Directive electronic and electrical waste must not be disposed of with unsorted waste. Please contact your local recycling authority for disposal of this product.

Class 1 Laser.

MOU1x Series is equipped with Class 1 Laser according to EN 60825-1.
Cautions:

Never look directly into the laser beam.
Never point a laser beam at a person.
Do not aim the laser at reflective surfaces.

CLASS 1
LASER
PRODUCT

Fibers carry transmission power in both direction due to the use of WDM
Never view a laser pointer using an optical instrument, such as binocular or a microscope.
Never handle non-dark fibers.

RF Exposure.

As a part of a Telecommunications System, MOU1x is not intended to radiate signals and meets EMC directives, but within the System may have cables and antennas that are potential sources of radiating. Contact the System Design to verify the compliance of the Exposure to Non-Ionising Radiation.

FCC Compliance

This is a 90.219 Class B device.

WARNING: This is a 90.219 Class B device. This is **NOT** a **CONSUMER** device. It is designed for installation by **FCC LICENSEES** and **QUALIFIED INSTALLERS**. You **MUST** have an **FCC LICENSE** or express consent of an FCC Licensee to operate this device. You **MUST** register Class B signal boosters (as defined in 47 CFR 90.219) online at www.fcc.gov/signal-boosters/registration. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation. The installation procedure must result in the signal booster complying with FCC requirements 90.219(d). In order to meet FCC requirements 90.219(d), it may be necessary for the installer to reduce the UL and/or DL output power for certain installations.

ATTENTION: This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

ATTENTION: FCC regulation mandate that the ERP of type B devices should not exceed 5W (+37dBm). This device has a maximum programmable composite output power of 5W (+37dBm), therefore this unit should always have its output attenuated by 2dB, including cable loss, splitter loss, directional coupler loss, all passive elements loss and also antenna gain. The loss in cables and passive devices connected to the output of the device and the gain of the DL antenna should be of 0dBi or less and maintain a minimum separation of 26 cm from all persons

2. Product Description.

The DHS37-R-DU is an FPGA based Digital Fiber Optic Remote Unit that transmit in the Downlink frequencies of 851-869MHz and receives in the Uplink frequencies 806-824MHz for United States.

This Remote Unit extends the radio coverage into areas inside the Base Station range where propagation losses prevent reliable communication.

The DHS37-R-DU is fed by fiber via a Digital Master, the DHS00-M. The DHS00-M is connected directly to the B|ase Station with no radiating elements.

The Master Unit provides the wired interface to the Base Station.

The DHS37-R-DU Remote Unit is the device where the service antennas are connected. Each DHS37-R-DU has dual hardware, so it works as two identical and independent Remote Units integrated into one box. Each DHS37-R-DU has two DL outputs and two UL inputs one per each internal Remote Unit.

The physical connection between the Master Unit and the Remote Unit is SM Fiber Optic cord. Each Remote unit inside the DHS37-R-DU uses a separate fiber.

The Master Unit receives the DL input signal from a direct connection of Base Station, after that, it is sent though a digital link to the Remote Unit. The Remote Unit the data is converted back to RF, amplified and radiated to the Service antennas.

At the Uplink Input port, the Remote Unit receives the UL signal. The UL input signal comes from the Service antennas, after that, this signal is digitally converted from RF to optical signal, and sent over the fiber. This signal in the FO cord is captured by the Master Unit, re-converted from Optical to RF and sent back to the Base Station though a direct connection.

The optical link allows the system to cover places which are far away from Base Station with fewer losses.
This DAS System is capable of handling 24 filters in uplink and 24 filters in downlink. The center frequency of each one of the 24 filters can be tuned via a software interface.

The intermediate filtering of this equipment is performed by using FPGA based Digital Signal Processing that, among many, has the following features:

- High Selectivity vs Low Delay performance selection.

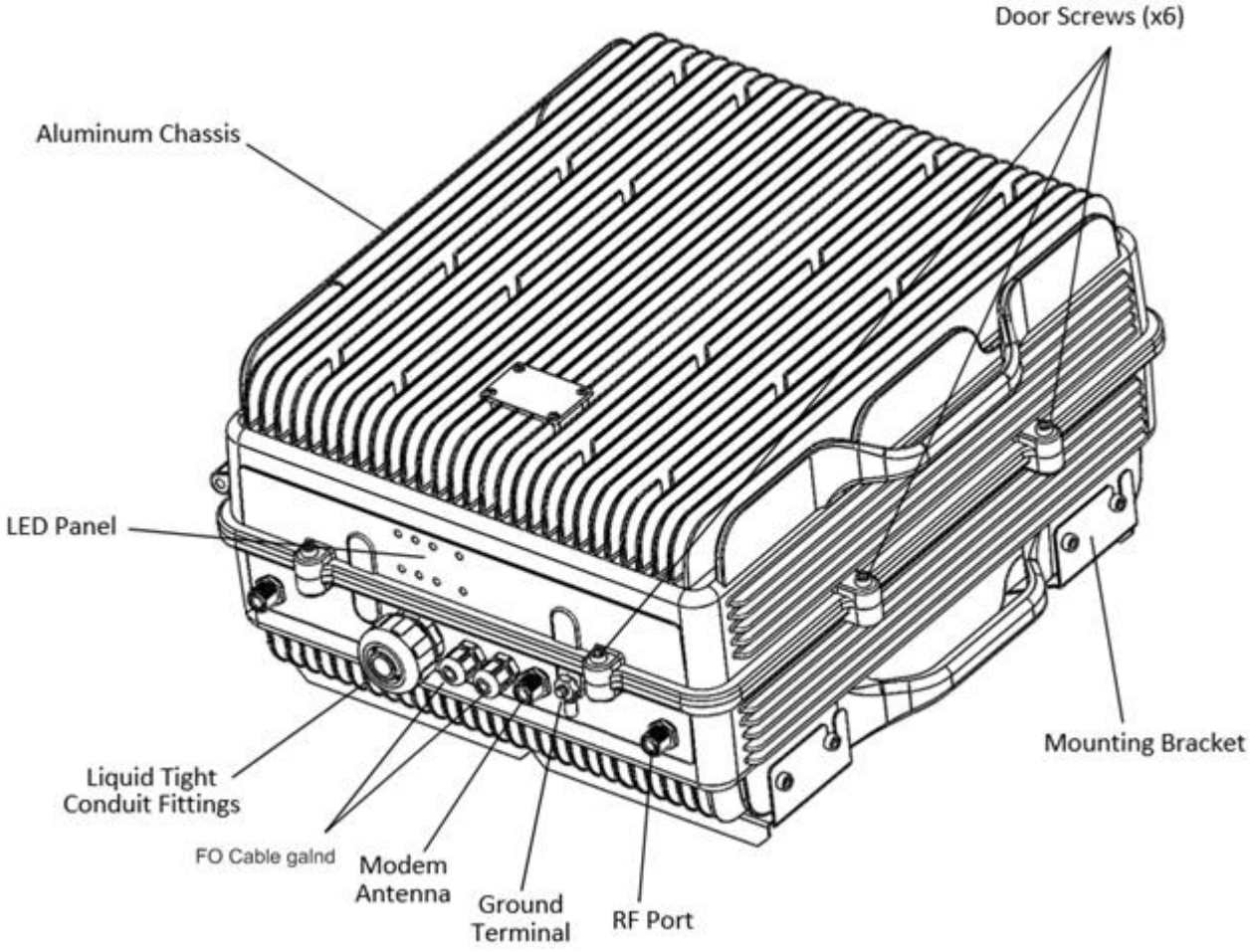
- AGC per channel and per time slot.

- Squelch per channel and per time slot.

- Integrated Spectrum Analyzer.

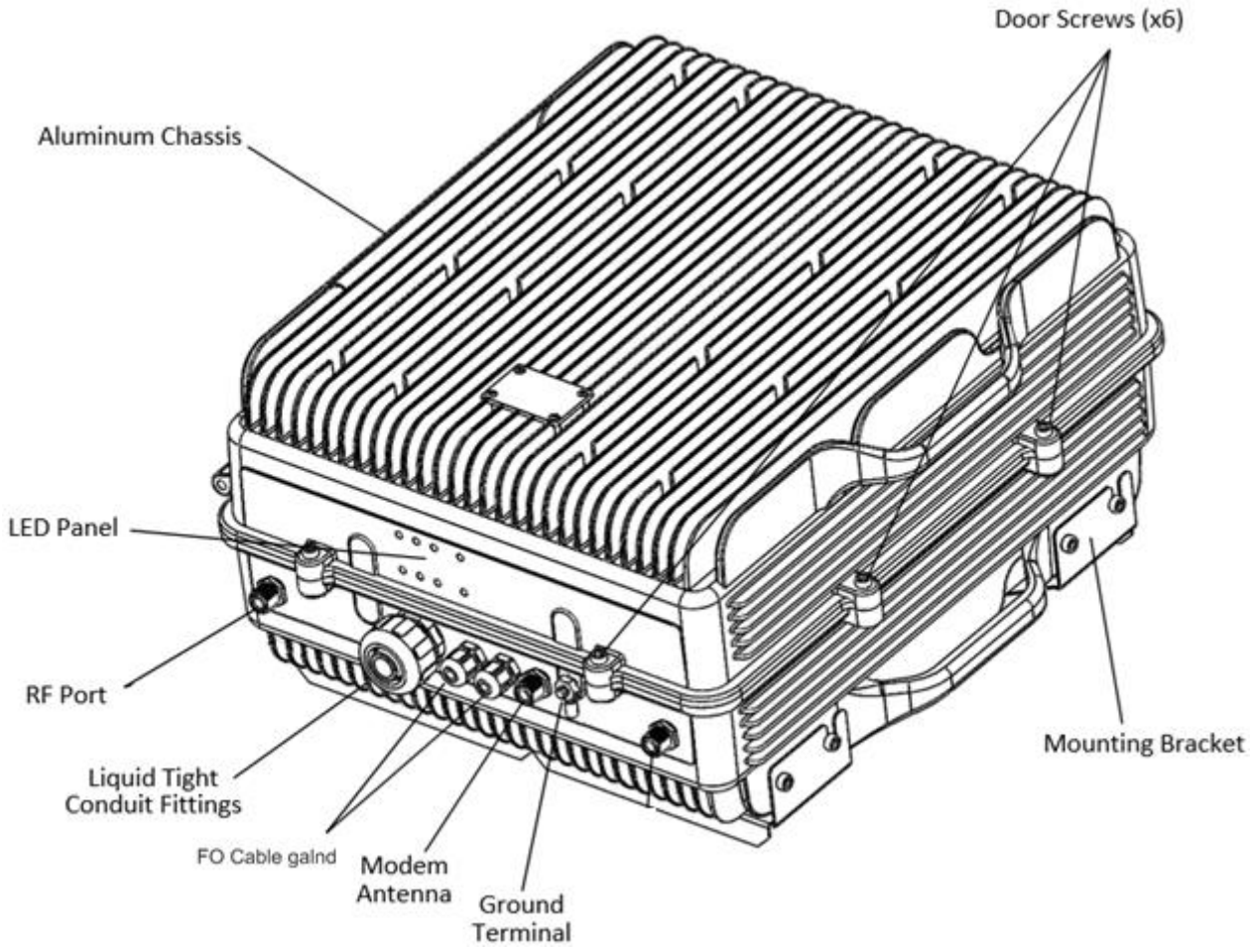
Both Master Units and Remotes has the same a heavy duty IP67/NEMA4X cabinet for outdoor usage, it is designed to be wall or pole mounted..

2.1 Digital Master Unit Ports



The Digital Master Unit is equipped with internal duplexers, therefore, the enclosure has the “To Base” RF Port.

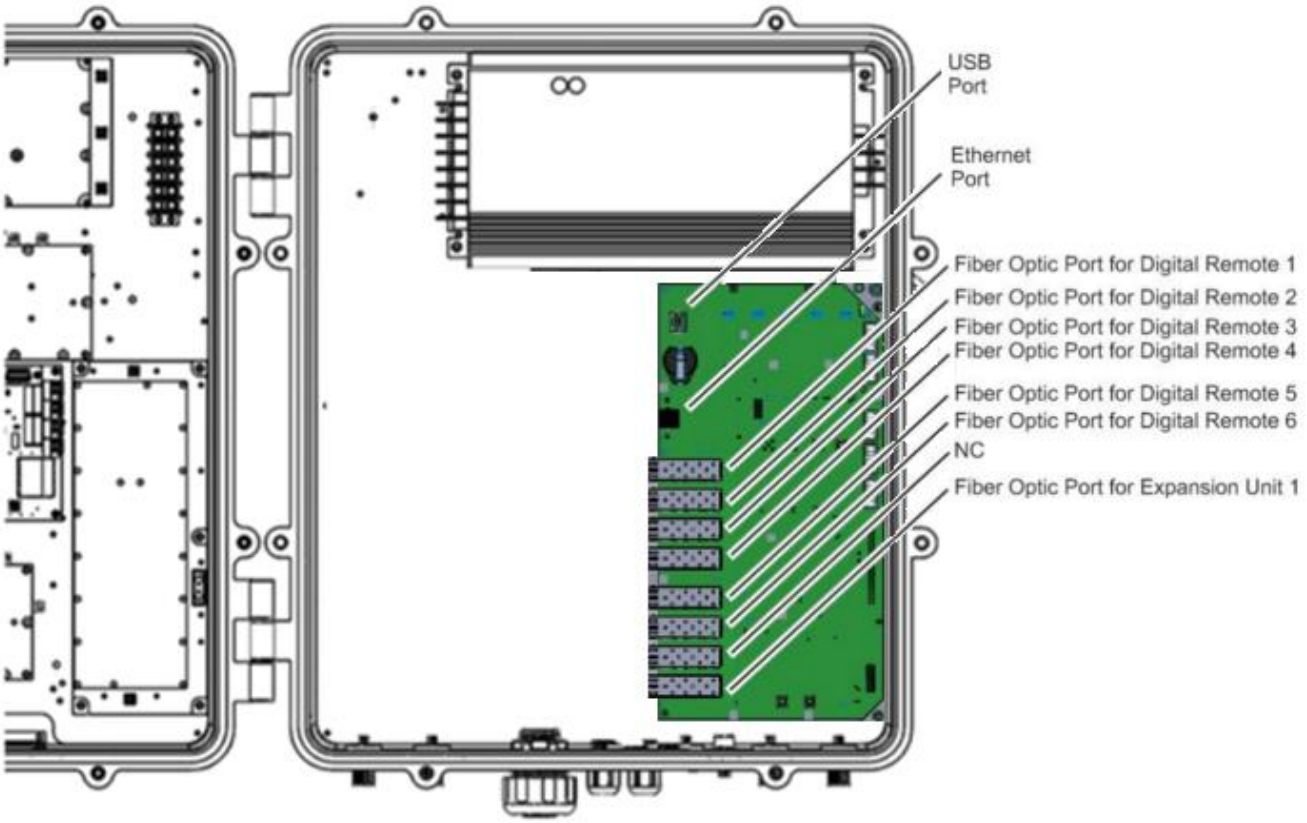
2.2 Digital Remote Unit Ports



The Digital Remote Unit is equipped with internal duplexers, therefore, the enclosure has the “To Mobile” RF Port.

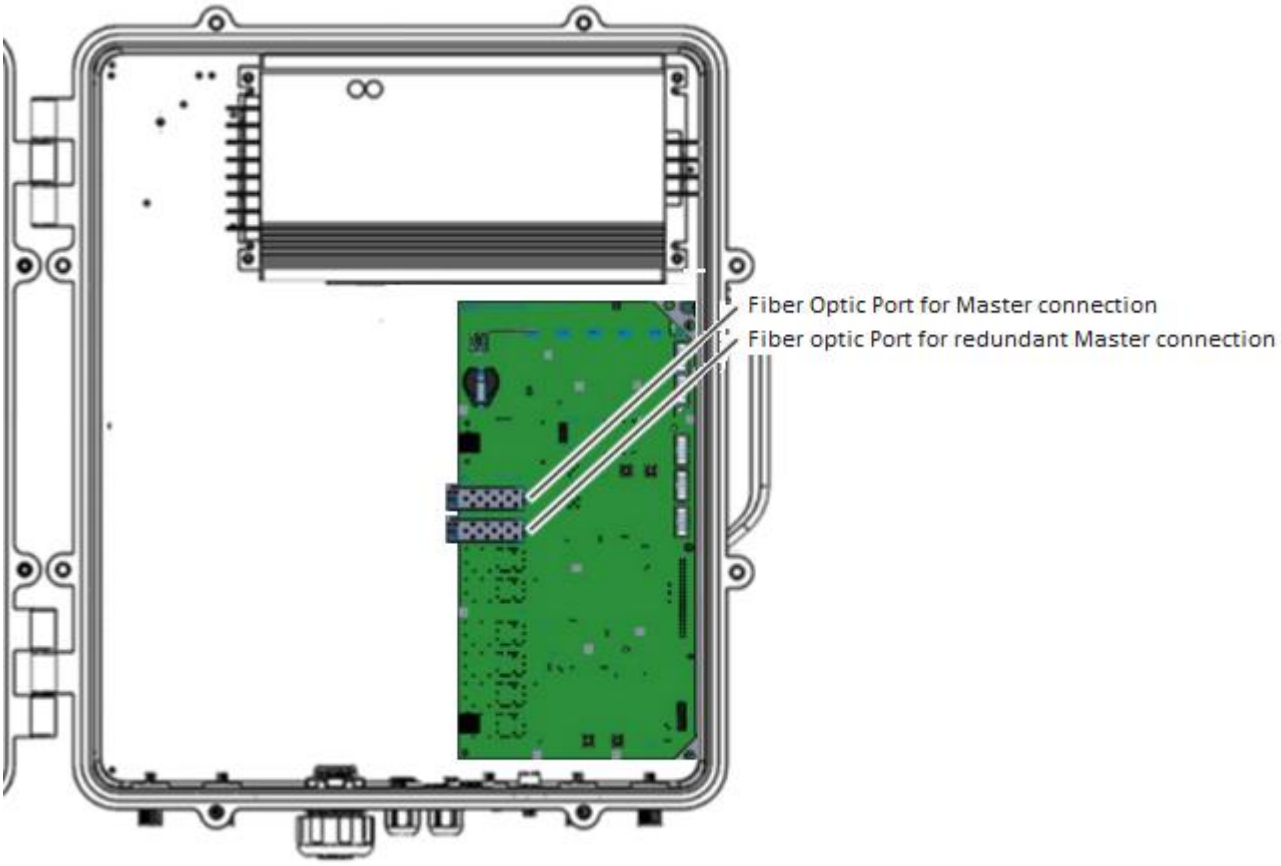
2.3 FO Connection

2.3.1 FO Connection in Master Unit



Note: Each fiber connection is performed with simplex fiber and LC-APC connector.

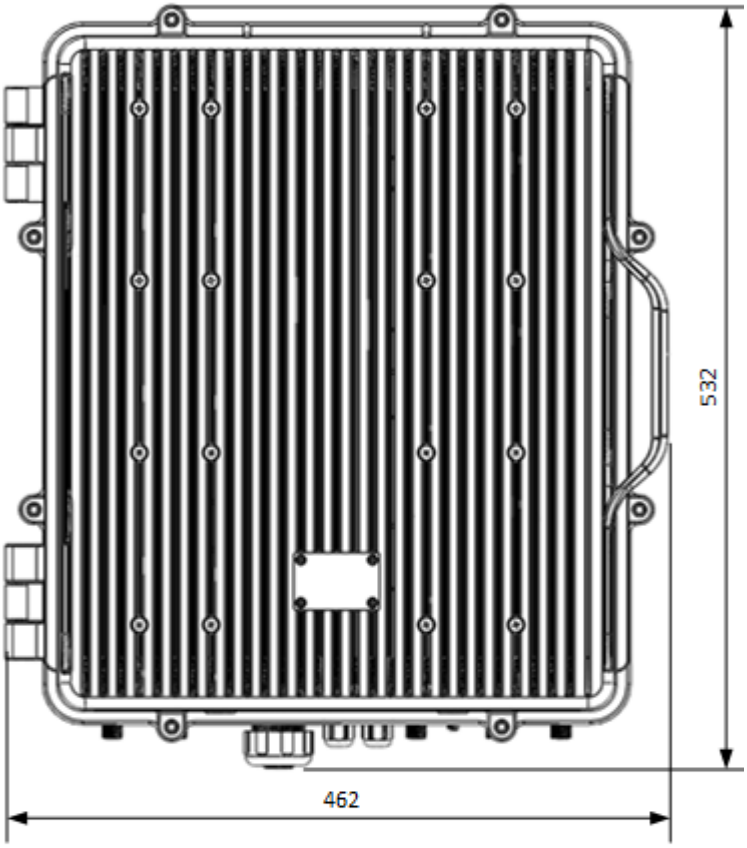
2.3.2 FO Connection in Remote Unit

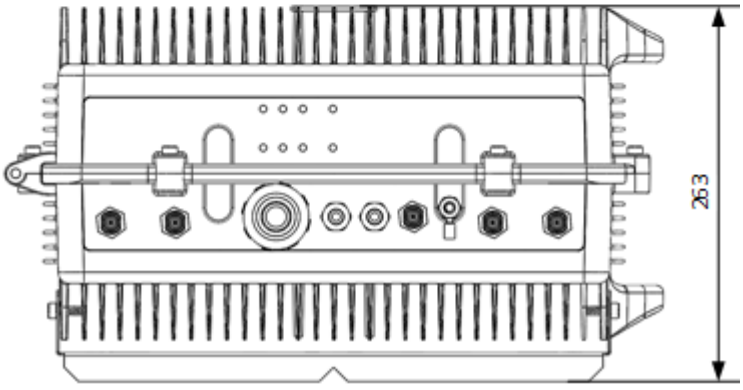


Note: Each fiber connection is performed with simplex fiber and LC-APC connector.

2.4 Dimensions

2.4.1 Digital Master, Expansion and Remote Unit Cabinet Dimensions





3 Installation

Mounting the cabinet

Fiplex Digital DAS is designed for outdoor usage with a weather proof outdoor NEMA4 cabinet that can be mounted without any kind of shelter from rain, snow or hail.
However, to improve reliability, it is recommended to mount the Digital DAS on a site with shelter from direct exposure to sun, rain, snow and hailing.

It is not recommended to operate the DAS under bad weather conditions, such as:

- Intense rainfall, snowfall or hail
- Storm or high wind
- Extremely low or high temperature
- High humidity of the air

Mounting

1. Mount the bracket
The cabinet can be mounted on a wall or pole. These mounting cases are shown below in Figure 1 and Figure 2. The bracket is provided with each cabinet.

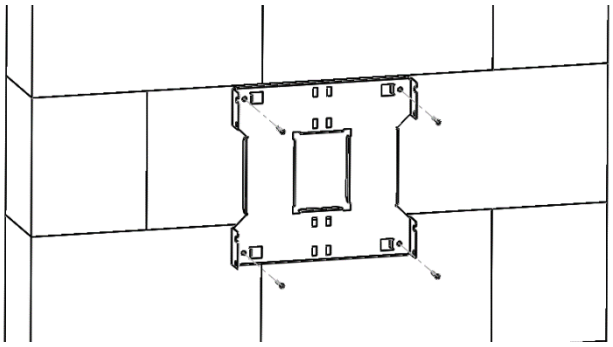


Figure 1

Figure 1 shows a bracket attachment to a wall using three fixing screws.

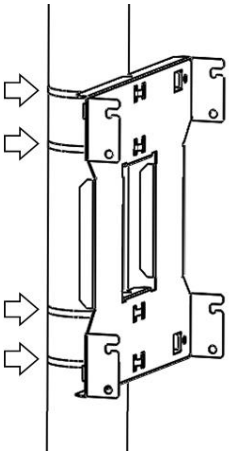


Figure 2

Figure 2 shows a bracket attachment to a pipe using four inox hose clamps (provided with bracket).

2. After attaching the bracket hang the cabinet as shown in Figure 3.

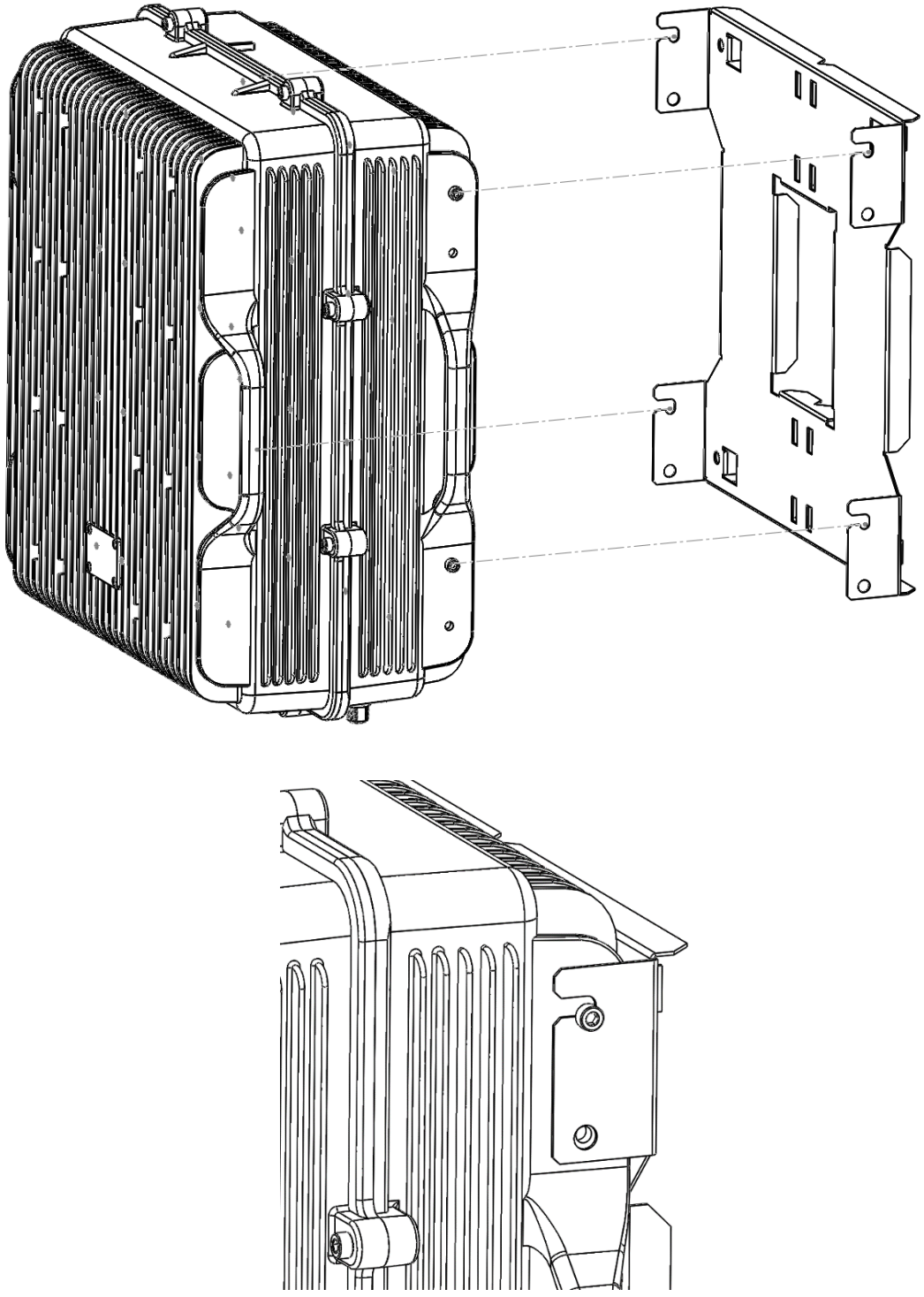


Figure 3

3. Secure the cabinet to the bracket as shown in Figure 4. To attach the cabinet to the bracket use the provided four M6 x 1/2” allen screws.

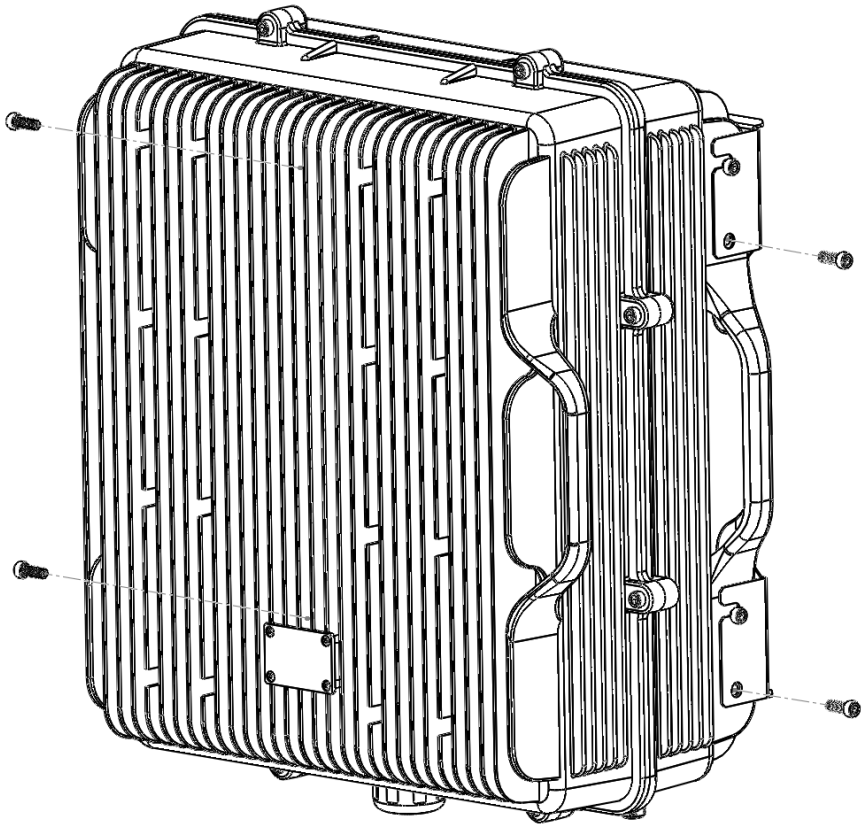
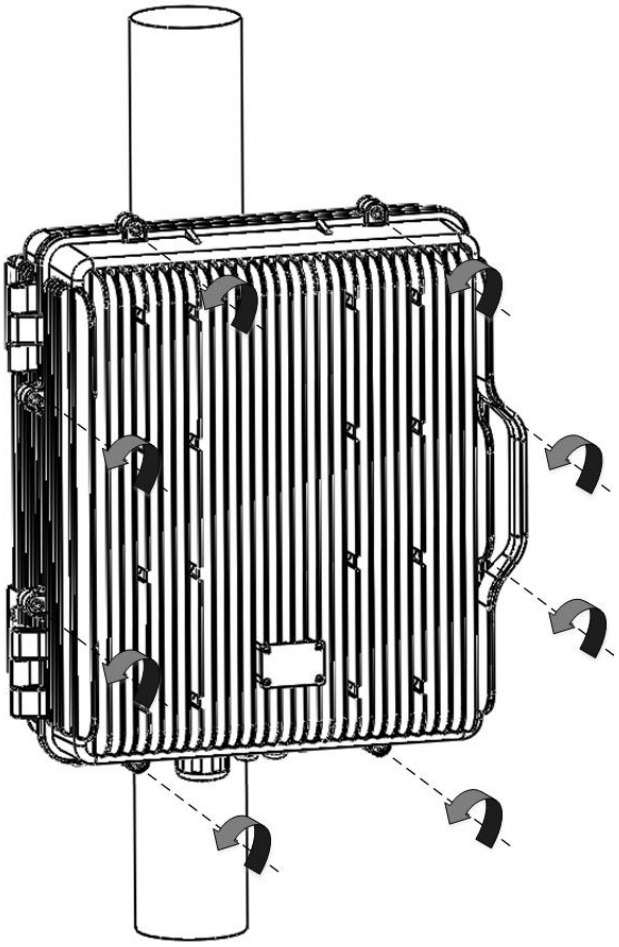


Figure 4

Opening and Closing the Cabinet

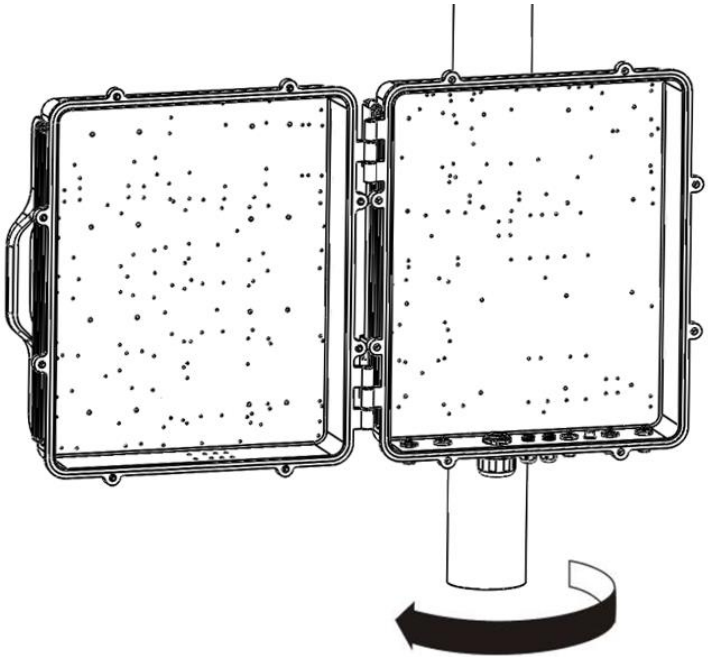
To open the cabinet, release the 8 door screws indicated in figure 5 using the provided special allen key.



A - Release cabinet cover.

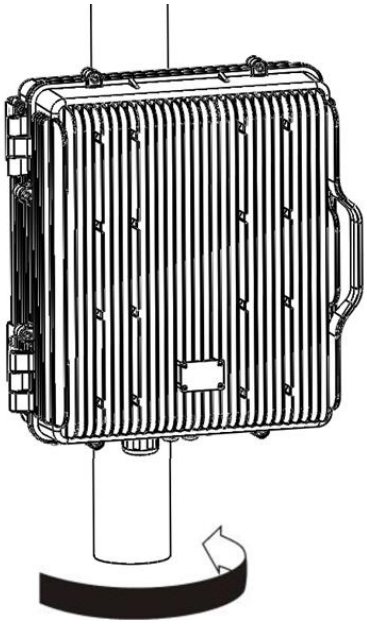
Figure 5

Use the special allen key N°6



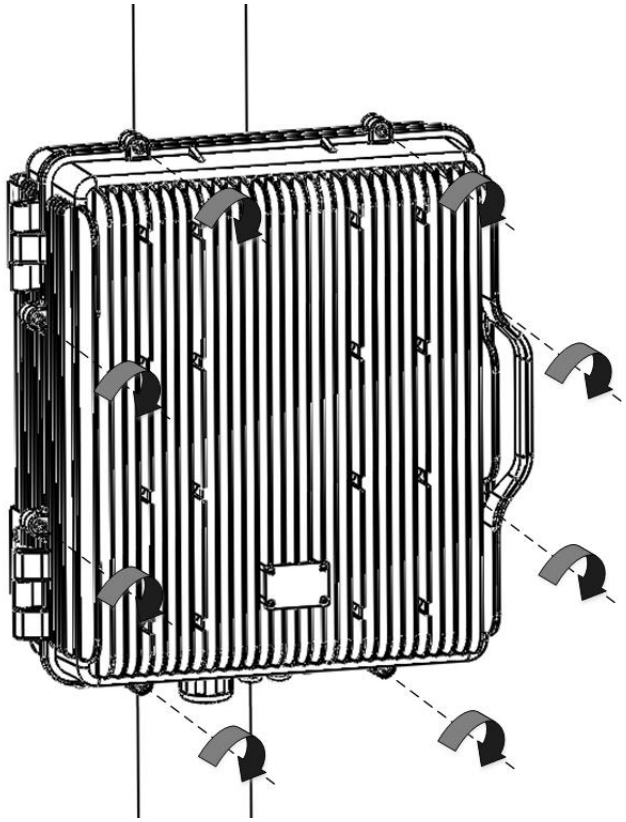
B - Open the cabinet cover.

Figure 6



C – Close the cabinet cover.

Figure 7



D - Secure cabinet cover.

Figure 8

Use of Liquid Tight Conduit

The unit has available a Liquid Tight Conduit Fitting connector. The unit as standard has the connector installed, so if the user requires to use this connector, if available, the NFPA cables, Ethernet, DC and AC cables can be routed through this connector.

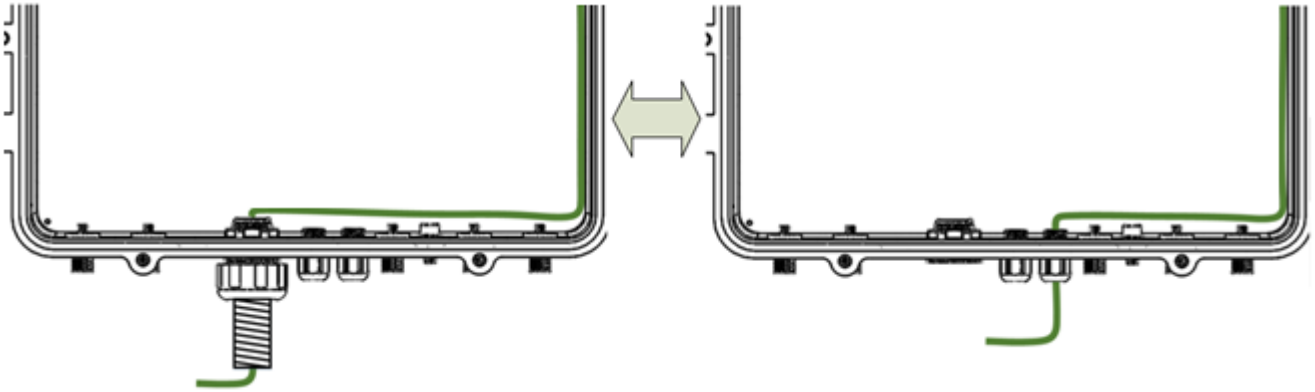
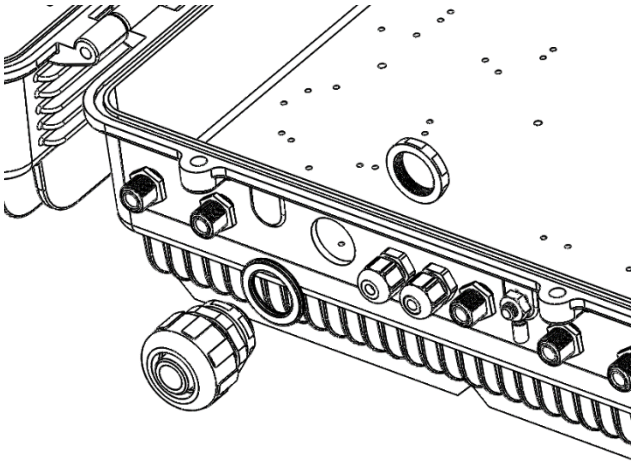
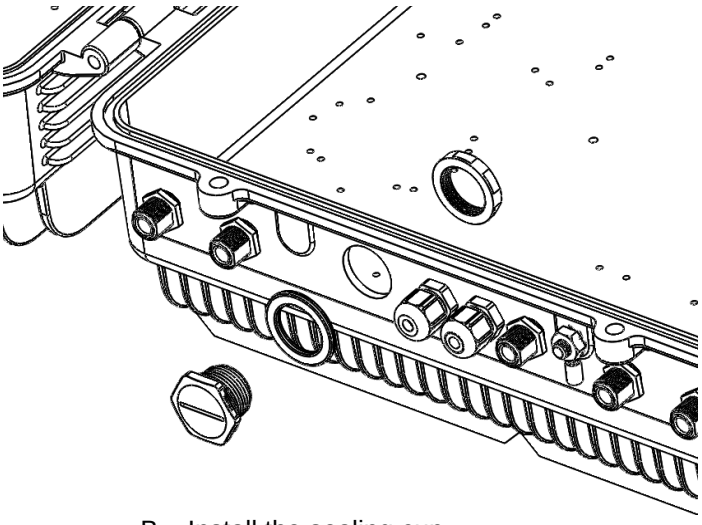


Figure 9; AC Routing through cable gland or conduit connector

If the is not going to use Liquid Tight Conduits, then the connector should be replaced by the provided sealing cup as indicated in Figure 10.



A - Remove the conduit connector



B – Install the sealing cup

Figure 10; Replacement of Conduit connector to sealing cup

Nema4X considerations

This device is equipped with a Nema4X enclosure, however, to ensure the Nema rating, the user must have the following considerations:

1. Correct use of the Liquid Tight Conduit. In case this interface is not used, it should be replaced with the sealing cup.
2. Sealing cups should be installed in the non-used cable glands.
3. The RF Ports should be perfectly mated.

4 Commissioning

4.1 Connection step by step

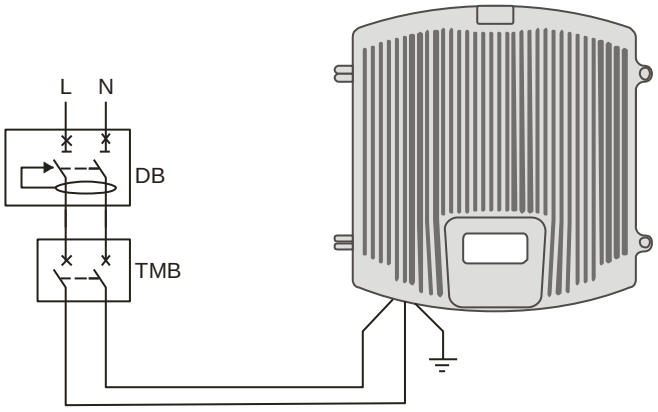
Connect the RF ports, Power, Fibers and Ethernet Cable Glands location, for Master, Expansion and Remote units following the next steps:

1. For Master Unit:
    a. Connect the signal coupled from the base station to the “UL in” RF port. N type female connectors are used in the unit.
    b. Connect fiber cables to internal optical modules. LC-APC connectors are used in the unit. Connect the remote units on the dedicated ports and the expansion units on the dedicated ports.
    c. Connect USB Cable for local management.

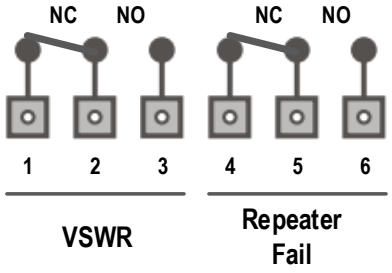
2. For Remote Unit:
    a. Connect service antenna (“DL Out 1 and 2” ports) coaxial cable to remote unit. N type female connectors are used in the unit.
    b. Connect fiber cable to internal optical module. LC-APC connector is used in the unit.

3. Once RF ports of the unit are properly loaded connect the Main Power the AC or DC source depending on the model.

   If using the AC model, electrical installation must provide differential and thermo-magnetic breaker elements according to electric safety international regulations.



4. For NFPA connection in Master and Remote, there is a dedicated cable gland for this purpose (“NFPA” in figure 11 and 12). A multi-conductor cable can be used to connect the NFPA dry contacts to the Fire Department Control Box.



Status of contacts (**Alarms Off**)

Pin 1 – 2 = VSWR (normally closed contact)
Pin 2 – 3 = VSWR (normally open contact)
Pin 4 – 5 = Repeater Fail (normally closed contact)
Pin 5 – 6 = Repeater Fail (normally open contact)

Figure 11; NFPA Dry Contact connection configuration

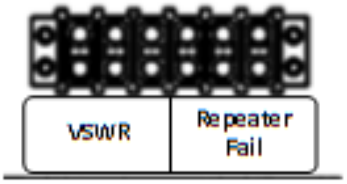


Figure 12; NFPA Dry Contact connection location inside the cabinet

5. Once the unit has been connected to the power source, it takes about 30 seconds to run a booting routine. After that time unit is ready to be connected via USB cable to the Digital Master to a computer running Fiplex Control Software (FCS) in order to be properly configured.

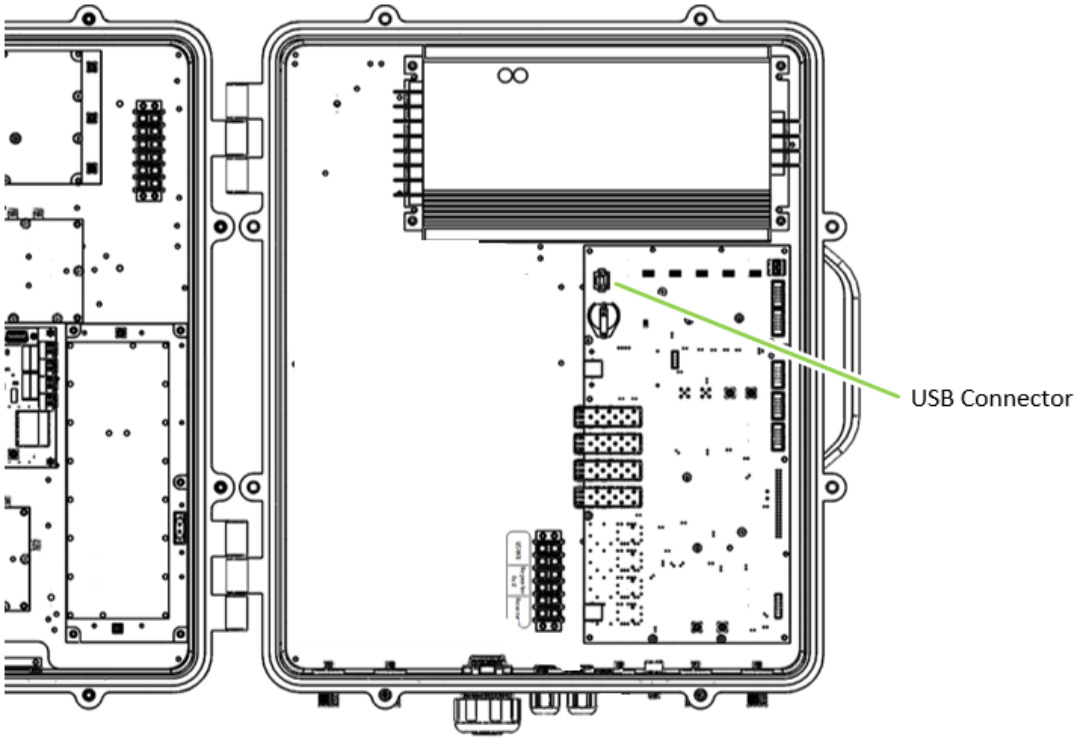
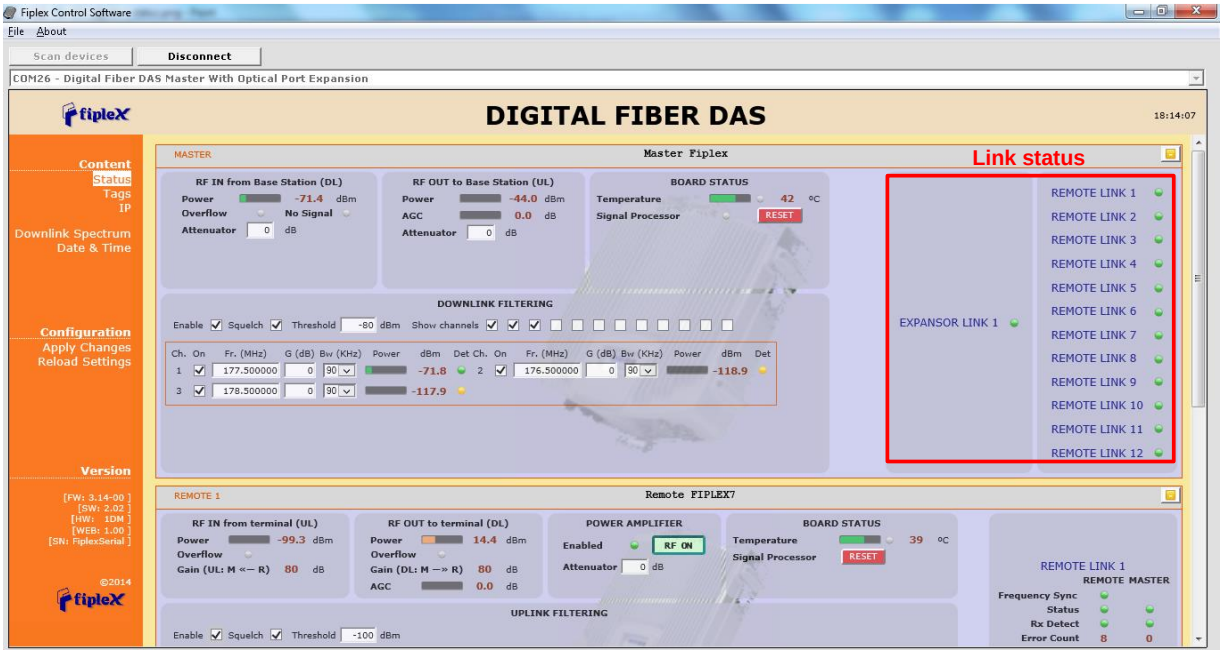


Figure 13; USB Port location

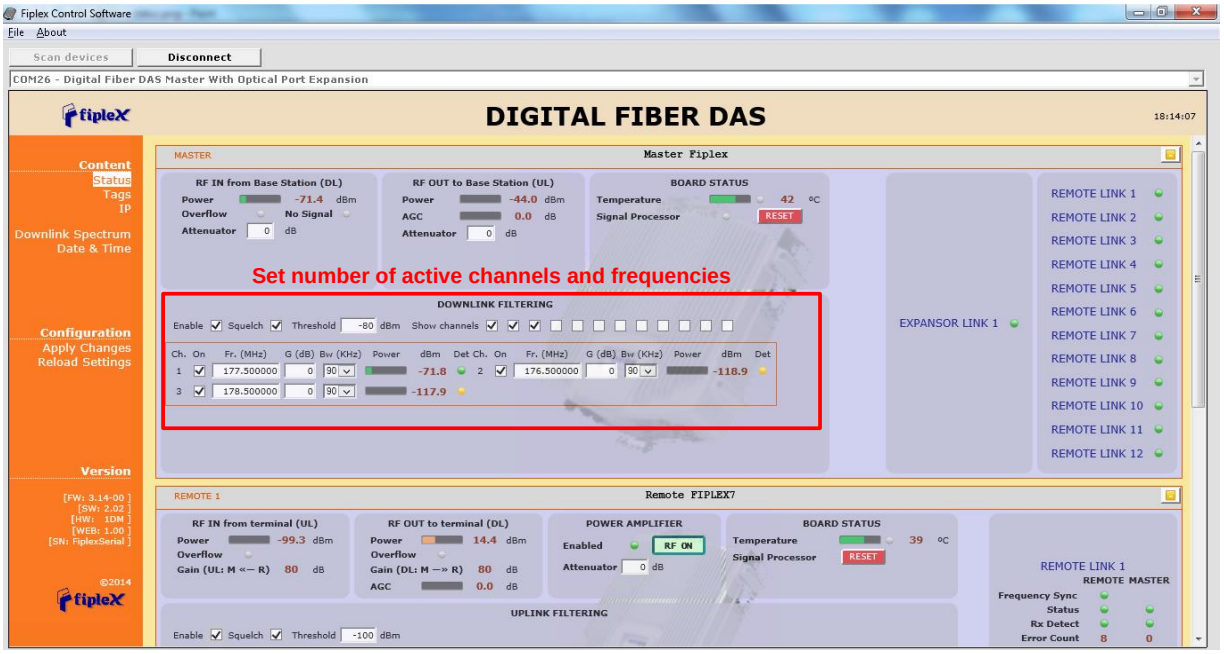
4.2 Starting Operation

BE SURE THAT "TO MOBILE" AND "TO BASE" PORTS ARE PROPERLY LOADED EITHER WITH 50 OHMS DUMMY LOADS, OR RADIATING SYSTEM.

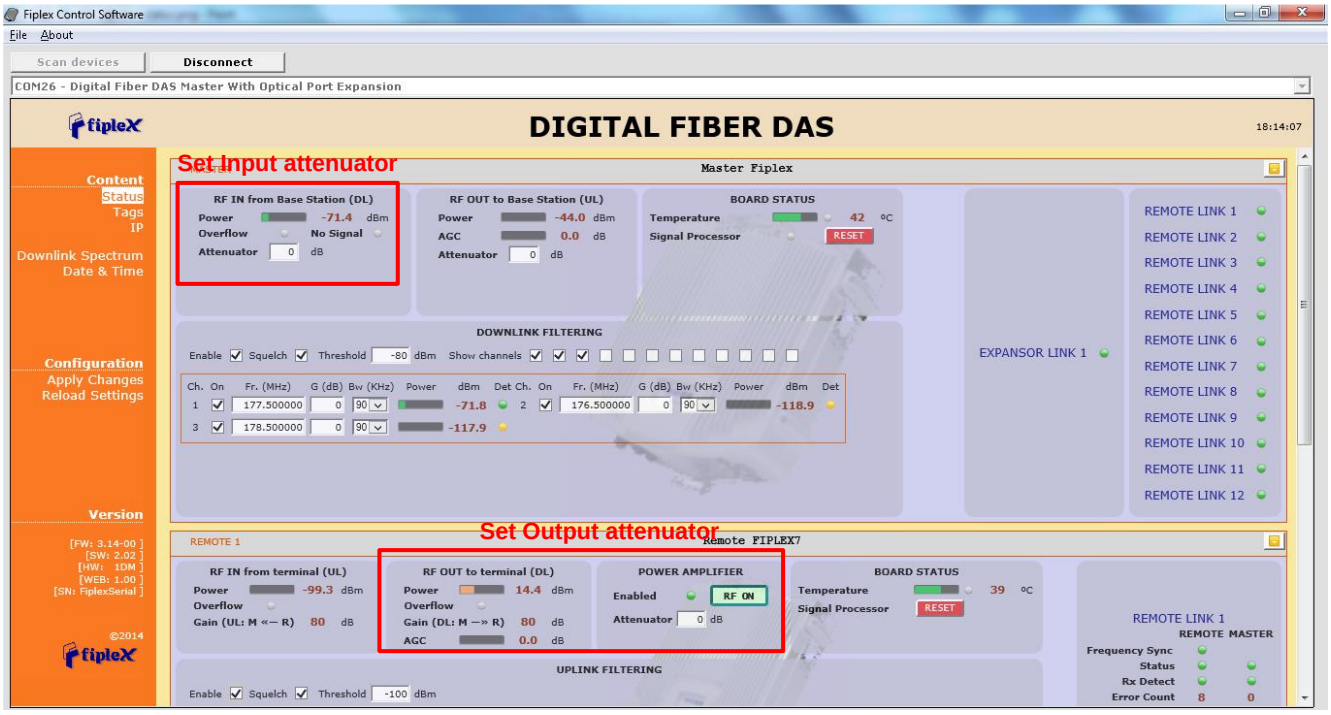
1. Turn on the repeater, connect computer to repeater through USB cable, and run Fiplex Control Software. Check that all remote units are connected to the master through fiber optic checking link status.



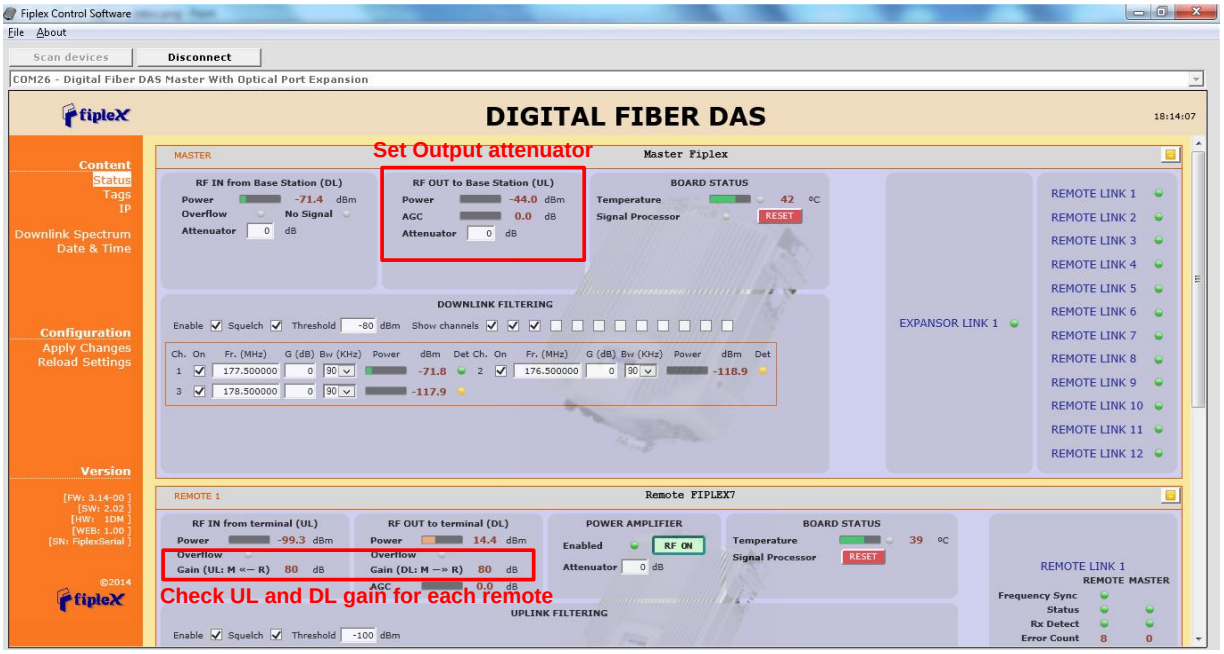
2. Enable channel filtering if needed and setup desired channel frequencies. If Fiplex Digital Fiber DAS is used as channel selective, user has to know what frequencies are used in base station. Each channel can be enabled independently. Channels not used can be showed / hidden using the "Show channels" checkboxes. If remote units are on and connected through optical fiber, the corresponding uplink frequencies will be automatically set, too.



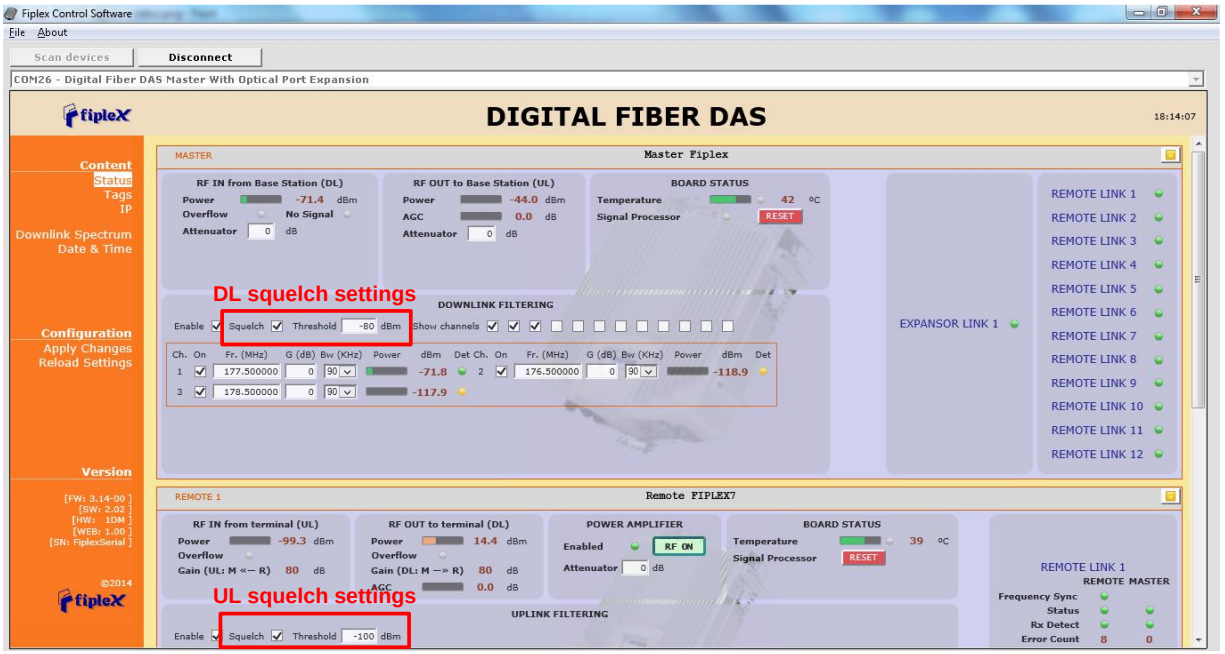
3. According to DL RF input levels, program input attenuator to avoid input overflow, and output attenuator for each remote to obtain desired output level in each remote.



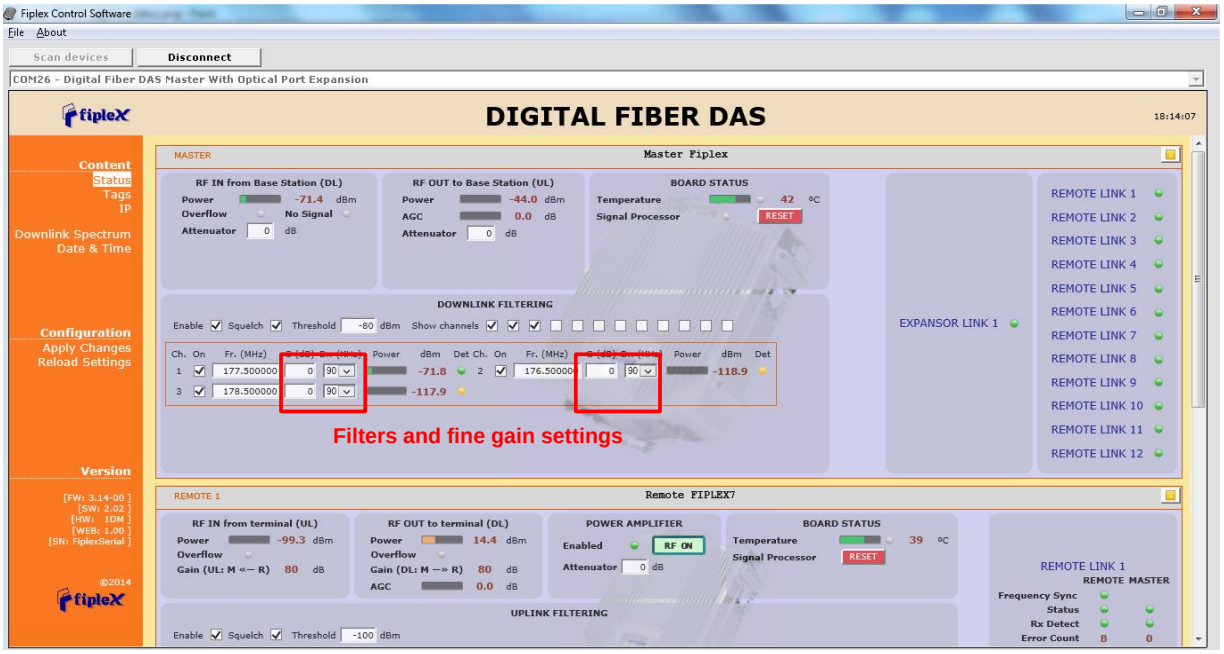
4. Reciprocally, set UL band gain adjusting output attenuator of master unit. It is recommended that DL gain and UL gain be equal.



5. Set up squelch settings. Controls are independent in UL (for each remote) and DL (master) bands. Typical values for UL are between -110dBm and -100dBm for squelch threshold. For DL, recommended value for squelch threshold is minimum level received in any active channel minus 10dB.



6. Setup desired filter bandwidth, depending on presence of adjacent channels. In principle, recommended bandwidth filter is 90KHz due to its low delay, but if adjacent signal is detected, narrow filters can be used. Fine gain can be set to equalize input signals.


Fiplex Control Software
File About
Scan devices
Disconnect
COM26 - Digital Fiber DAS Master With Optical Port Expansion
DIGITAL FIBER DAS
18:14:07
Content
Status
Tags
IP
Downlink Spectrum
Date & Time
Configuration
Apply Changes
Reload Settings
Version
[FW: 3.14-00]
[SW: 2.02]
[HW: 1DM]
[WEB: 1.00]
[SN: FiplexSerial]
©2014
MASTER
Master Fiplex
RF IN from Base Station (DL)
Power -71.4 dBm
Overflow
No Signal
Attenuator 0 dB
RF OUT to Base Station (UL)
Power -44.0 dBm
AGC 0.0 dB
Attenuator 0 dB
BOARD STATUS
Temperature 42 °C
Signal Processor
RESET
DOWNLINK FILTERING
Enable Squelch Threshold -80 dBm Show channels
Ch. On Fr. (MHz) Power dBm Det
1 177.500000 -71.8
3 178.500000 -117.9
Ch. On Fr. (MHz) Power dBm Det
2 176.500000 -118.9
Filters and fine gain settings
EXPANSOR LINK 1
REMOTE LINK 1
REMOTE LINK 2
REMOTE LINK 3
REMOTE LINK 4
REMOTE LINK 5
REMOTE LINK 6
REMOTE LINK 7
REMOTE LINK 8
REMOTE LINK 9
REMOTE LINK 10
REMOTE LINK 11
REMOTE LINK 12
REMOTE 1
Remote FIPLEX7
RF IN from terminal (UL)
Power -99.3 dBm
Overflow
Gain (UL: M «— R) 80 dB
RF OUT to terminal (DL)
Power 14.4 dBm
Overflow
Gain (DL: M —» R) 80 dB
AGC 0.0 dB
POWER AMPLIFIER
Enabled
RF ON
Attenuator 0 dB
BOARD STATUS
Temperature 39 °C
Signal Processor
RESET
UPLINK FILTERING
Enable Squelch Threshold -100 dBm
REMOTE LINK 1
REMOTE MASTER
Frequency Sync
Status
Rx Detect
Error Count 8 0

4.3 Status Indicators

There is an indicator panel located at the front panel of the repeater. This led panel works as a status monitor, in order indicate warning or alarms of repeater
There are four leds, first one the power ON indication led, labelled “PWR”.
A Second led, labelled “STS” summarizes warnings regarding critical operational conditions of the repeater.
Third and fourth led summarizes operational conditions for uplink “UL” and downlink “DL” chains.
In general, leds has four states: off, slow blinking, fast blinking, on. Table 1 describes alarm and warning conditions for each led state in the master device and Table 2 is for remote devices.

Table 1

Indicator Panel	LED indication description
	Unit is not powered or fail in power supply
	Normal state: Unit is powered on
	Normal state
	HW fail: digital signal processor is not detected Temperature: very high internal unit temperature Optical fiber alarm in at least one link
	TBS Warning: No signal is detected coming from base station
	Normal state
	RF input overflow: maximum level at RF input is exceeded
	Normal state
Where:	
	Led OFF
	Led slow blinking with period of 2 seconds aprox. WARNING
	Led fast blinking with period of 0.5 seconds aprox. ALARM
	Led ON

Table 2

Indicator Panel	LED indication description
	Unit is not powered or fail in power supply
	Normal state: Unit is powered on
	Normal state
	HW fail: digital signal processor is not detected Temperature: very high internal Unit temperature Optical fiber alarm in at least one link
	Normal state
	PA Overflow or excessive temperature alarm.
	PA Underflow: PA output level is lower than +25dBm
	Normal state
Where:	
	Led OFF
	Led slow blinking with period of 2 seconds aprox. WARNING
	Led fast blinking with period of 0.5 seconds aprox. ALARM
	Led ON

4.4 Laboratory Measurements

For specific parameters verification and laboratory tests, please contact factory.
Detailed procedures, recommended tests set up, and a knowledge engineering team will bring adequate support to perform this measurements in a comfortable and safely way.

Part 2 SOFTWARE

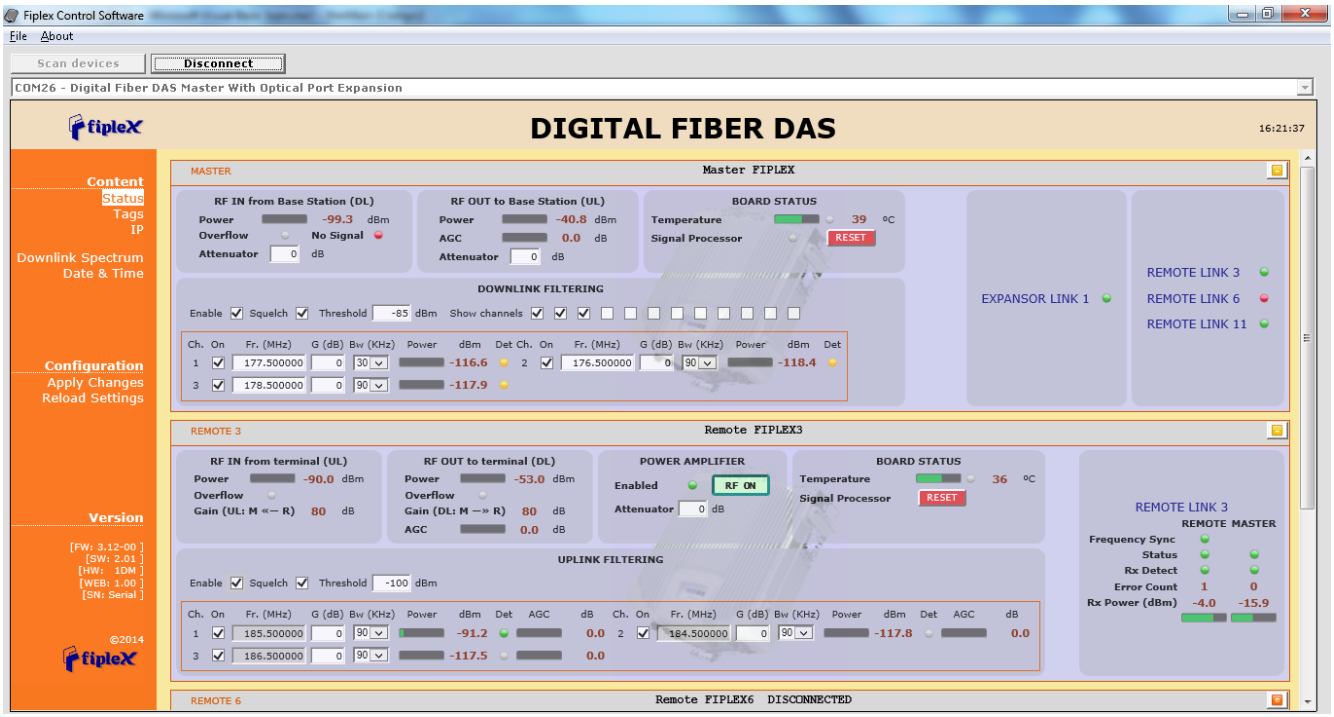
5 Introduction

Fiplex Fiber DAS can be fully configured and monitored through USB connection. Digital Master unit receives through optical links monitoring and configuration data from remotes units. For this reason, whole system can be fully configured and supervised from digital master unit.

6 USB Software

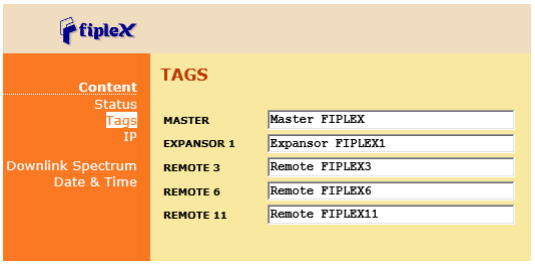
6.1 Software description (Digital Master)

If software has been successfully installed and connected to Digital Master (see section 7) status screen will appear. In this screen, RF configurations parameters (channel frequencies, bandwidth filter, gains / attenuation) and RF and optical links monitoring (RF input/output levels, AGC status, optical link status) are shown.

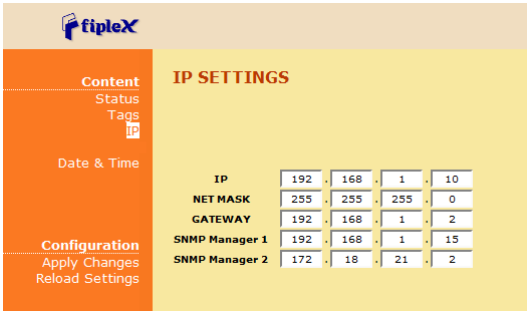


At left side of webpage, configuration menus are shown:

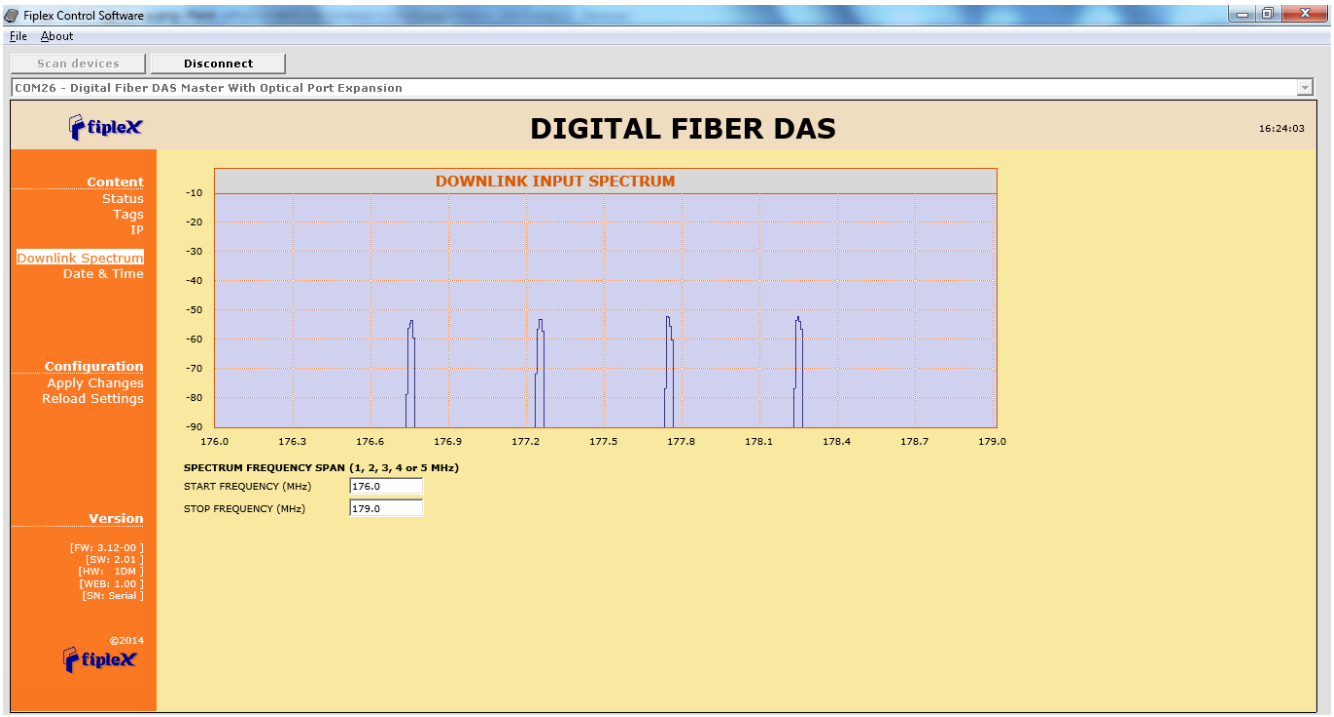
- Content
  - Status: whole RF configuration and monitoring parameters are shown. These parameters are described in next section.
  - Tag: user can set a tag to ease repeater identification. For modifying the TAG, write a new value in text field and click over Apply Changes link



- IP: At this page (for units with Ethernet supervision), IP addresses configuration and addresses of SNMP Managers are shown. User can set addresses of two SNMP Managers (IP where SNMP agent will send TRAP information). To modify, click over Apply Changes link after writing new values on text fields. Also router 3G IP address can be viewed in this screen (if 3G router option is installed)

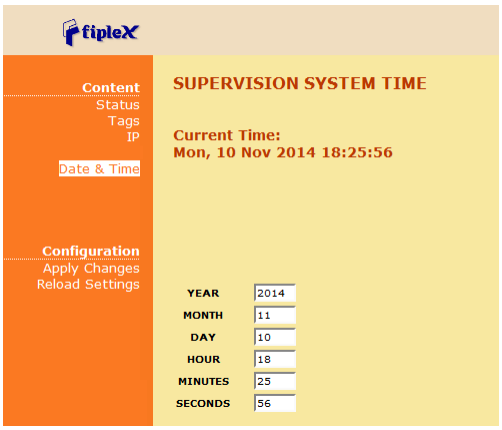


- Downlink Spectrum: in order to know input signal: level of desired channels, unwanted channel levels, Digital Master provides an spectrum analyzer that shows input signal in frequency domain.

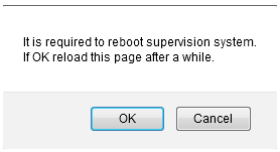


- Date & Time (for units with Ethernet supervision): page to modify real time clock. When the repeater is not powered, this clock runs with a voltage supply provided by

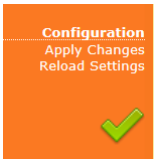
a 3V lithium battery, button type of 20mm (CR2032) with 220mA·h. This suffices for at least half year. When the repeater is powered, no current is drained from the battery. So, actual battery life will depend on repeater usage. For battery replacement, please locate battery holder between USB and Ethernet connectors on main board. Battery positive side is UP, i.e. on holder clip.

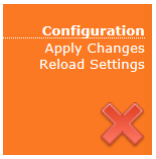


After clicking on “Apply Changes” link, next message will appear, warning the user that system needs to be rebooted.



- Configuration
  - Apply Changes: as it is said above, this link is used to load changes to the repeater, in configuration, tag, IP, password and date and time menus. After any configuration change, web page will show and icon that allows user to know if configuration has been successfully applied:

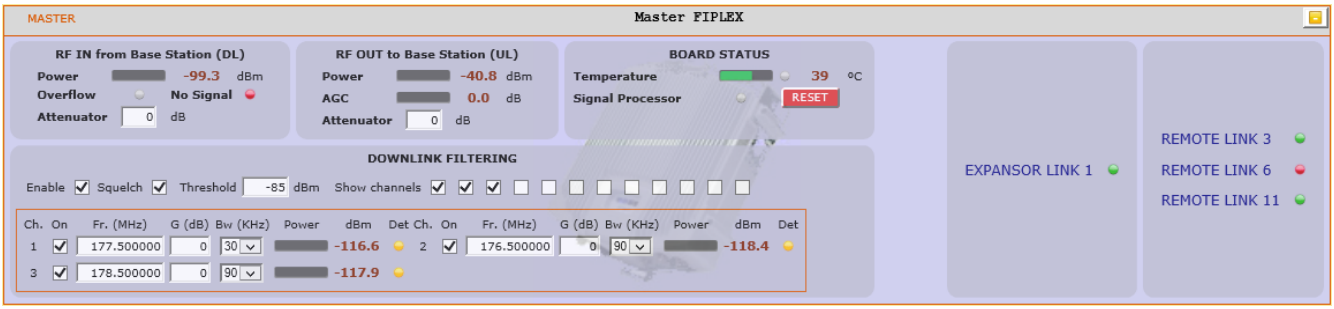




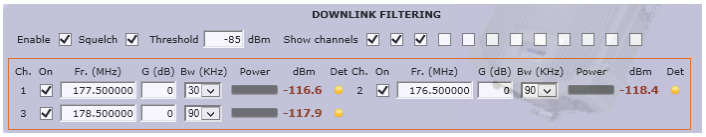
  - Reload Settings: clicking this link, repeater configuration data is refreshed.
- Version: shows hardware, firmware and software versions of repeater and serial number.

6.2 RF parameters description (Digital Master)

“Status” menu shows whole RF configuration and RF and optical links monitoring data that are distributed along the webpage.
The first frame called “MASTER” is placed in top of webpage, showing configuration of digital master unit. Below this, some frames titled “REMOTE 1”, “REMOTE 2”... . There is one for each remote unit connected to the master, and configuration and status information related to each remote can be viewed. Next figures show these frames:

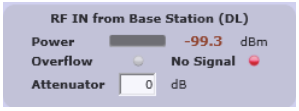


- Digital Master frame. There are five sub-sections inside this frame:



  - Downlink filtering: this section contains fields to modify channel frequencies, squelch options and filtering options. Parameters are described in following table:

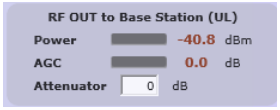
Parameter	Range	Description
Frequency	Downlink band	Downlink frequency channels. Frequency resolution is 3.125KHz
Channel enable	Enabled / disabled	Each of 12 channels can be enabled/disabled
Bw Filter	90KHz / 45KHz / 30KHz / 20KHz / 15KHz	Bandwidth of channels filter can be independently adjusted (if filtering is enabled)
Fine Gain Adjust	-5 to +5dB	If filtering is enabled, gain of each channel can be fine adjusted
Power indicator	---	Level of each channel, measured according to its bandwidth filter, is shown in dBm units. Led indicator shows if levels exceeds squelch threshold (green) or not (yellow).
Squelch enable control	Enabled / disabled	Enabling this control, repeater does not transmit in each channel if RF input power do not exceed the threshold level configured according to next row
Squelch threshold control	-90dBm to 40dBm	If squelch is enabled, input levels below this threshold are not transmitted.
Filtering enable	Enabled / disabled	Filtering option can be bypassed. If filtering is disabled, fine gain adjustments and squelch options are ignored



  - Master RF Input parameters. Next table describes information of this frame:

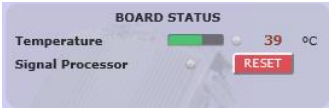
Parameter	Range	Description
Broad band level	---	This indicator shows input level measured along DL band

Overflow	Grey: normal state / Red: alarm state	This indicator shows overflow on input circuitry is occurring. This condition can be avoided increasing input attenuator
Input Attenuator - RF IN from TBS (DL)	0dB to 30dB	Input attenuator to accommodate input levels. This value must be set to avoid overflow condition. Together with output attenuator of remotes sets the downlink gain: **G_DL (dB) = 80 – AttINmaster(dB) – AttOUTremote(dB)**



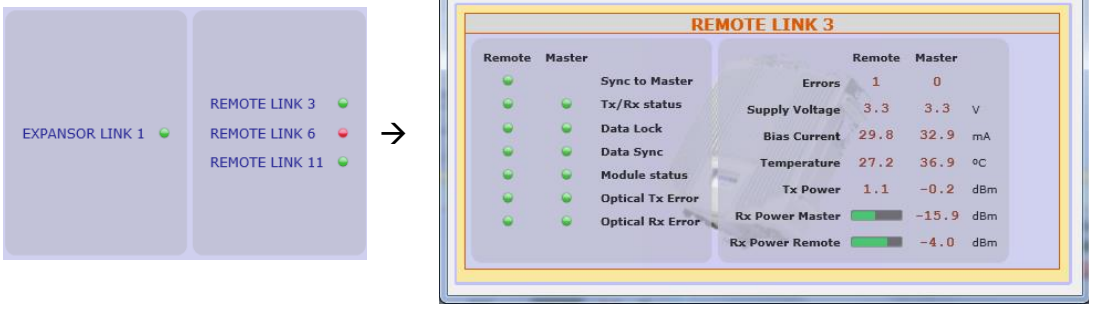
- Master RF Output parameters. Next table describes information of this frame:

Parameter	Range	Description
UL Output power	---	This indicator shows output level in UL band
AGC	Grey: normal state / Red: alarm state	This indicator shows gain reduction that master unit is applying at RF output to prevent PA UL overload
Output Attenuator RF OUT to Base Station (UL)	0dB to 30dB	Output attenuator to adjust UL gain. System UL gain can be computed as: **G_UL (dB) = 80 – AttOUTmaster(dB)**

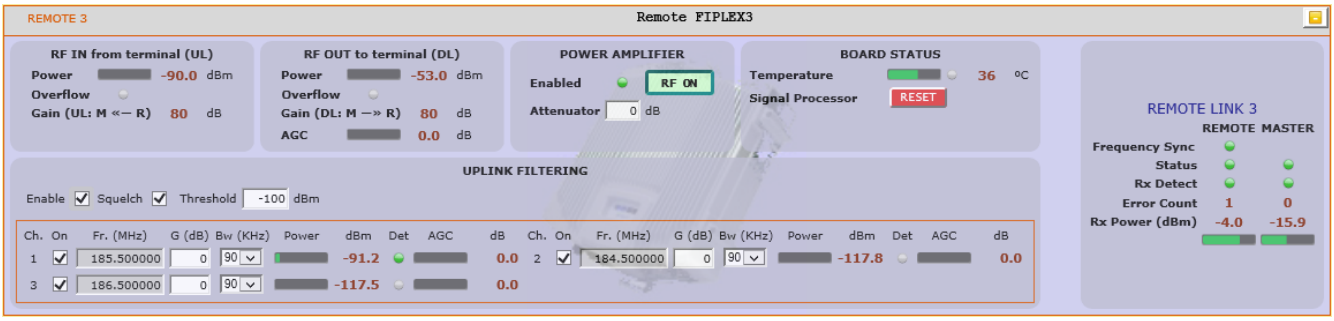


- Master Board status: general parameters of master unit are contained in this frame

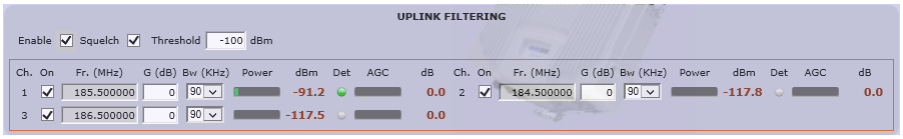
Parameter	Range	Description
Temperature	---	This indicator shows unit temperature
High temperature alarm	Grey: normal state / Red: alarm state	High temperature alarm condition is indicated with this led.
Signal processor alarm	Grey: normal state / Red: alarm state	Alarm indicates that digital signal processor is not working properly.
RESET control	---	With this control, unit can be restarted



- Optical link status: each indicator shows optical link status between digital master and each remote unit. Clicking on “REMOTE LINK n” detailed monitoring data of each optical link can be viewed: voltage, current and temperature of each optical module, transmitted and received optical power, and alarms related to digital data recovery system. If Expansion Unit is used to increase number of remote units a new frame appears with “EXPANSOR LINK n” title, showing link status (between Digital Master and Expansion Unit). Data of two optical modules involved in each link are shown: master unit side (or expansion unit side) and remote unit side.



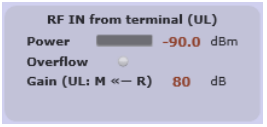
- Remote frame: shows configuration and monitoring information of each remote unit. The frame is divided in the following sections:



- Uplink filtering: this section shows equivalent parameters of downlink filtering of master unit.

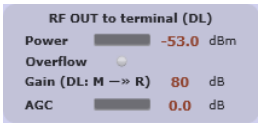
Parameter	Range	Description
Frequency	UL band	Uplink frequency channels. These frequencies are derived automatically from downlink frequencies, taking into account frequency separation between DL and UL bands
Channel enable	Enabled / disabled	Each of 12 channels can be enabled/disabled
Bw Filter	90KHz / 45KHz / 30KHz / 20KHz / 15KHz	Bandwidth of channels filter can be independently adjusted (if filtering is enabled)
Fine Gain Adjust	-5 to +5dB	If filtering is enabled, gain of each channel can be fine adjusted
Power indicator	---	Level of each channel, measured according to its bandwidth filter, is shown in dBm units. Led indicator shows if levels exceeds squelch threshold (green) or not (yellow).
AGC	---	Show gain reduction to prevent overloading in AGC per channel
Squelch enable control	Enabled / disabled	Enabling this control, repeater does not transmit in each channel if RF input power do not exceed the threshold level configured according to next row
Squelch threshold control	-110dBm to -70dBm	If squelch is enabled, input levels below this threshold are not transmitted.

Filtering enable	Enabled / disabled	Filtering option can be bypassed. If filtering is disabled, fine gain adjustments and squelch options are ignored



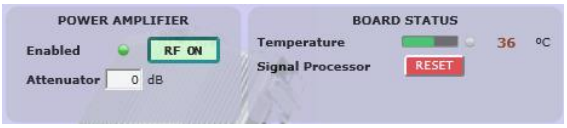
- Remote RF Input parameters. Next table describes information of this frame:

Parameter	Range	Description
Broad band level	---	This indicator shows input level measured in UL band
Overflow	Grey: normal state / Red: alarm state	This indicator shows overflow on input circuitry is occurring.
Uplink gain from remote to master	--	Shows system uplink gain for each remote. Can be calculated as: **G_UL (dB) = 80 – AttOutMaster(dB)**



- Remote RF Output parameters. Next table describes information of this frame:

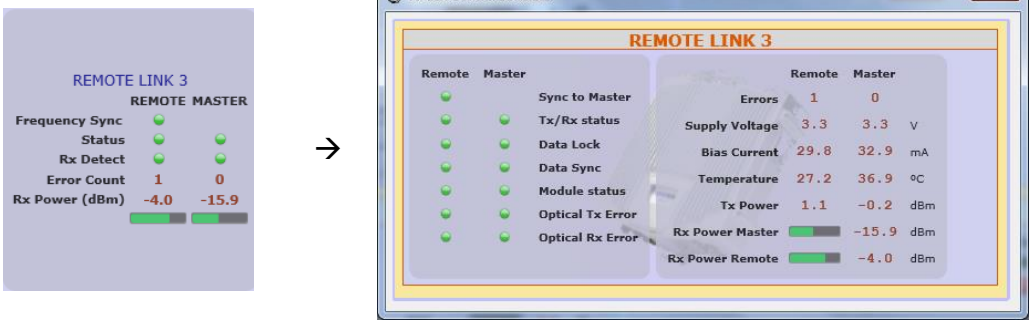
Parameter	Range	Description
Output power level	---	This indicator shows the PA output power
PA Overflow	Grey: normal state / Red: alarm state	Indicates that PA is overloaded. Condition is output power higher than +43dBm
Downlink gain from master to remote	---	Shows downlink gain for each remote. Can be calculated as: **G_DL (dB) = 80 – AttInMaster(dB) – AttOutRemote(dB)**
AGC	---	Shows gainr reduction applied in DL band signal to prevent PA overload



- RF on/off control and Board Status:

Parameter	Range	Description
RF on/off Indicator	Green: RF Enabled / Red: RF Disabled	This indicator shows PA status. Power amplifier can be automatically disabled if other alarm conditions occurs: a) Fail in optical link b) PA Overflow
RF Enable Control	On / Off	With this control RF DL and UL chains can be disabled

Output attenuator	0 to 40dB	This control sets the output attenuation used to set DL gain together with Master Input Attenuator
Temperature	---	This indicator shows unit temperature
High temperature alarm	Grey: normal state / Red: alarm state	High temperature alarm condition is indicated with this led.
RESET control	---	With this control, unit can be restarted



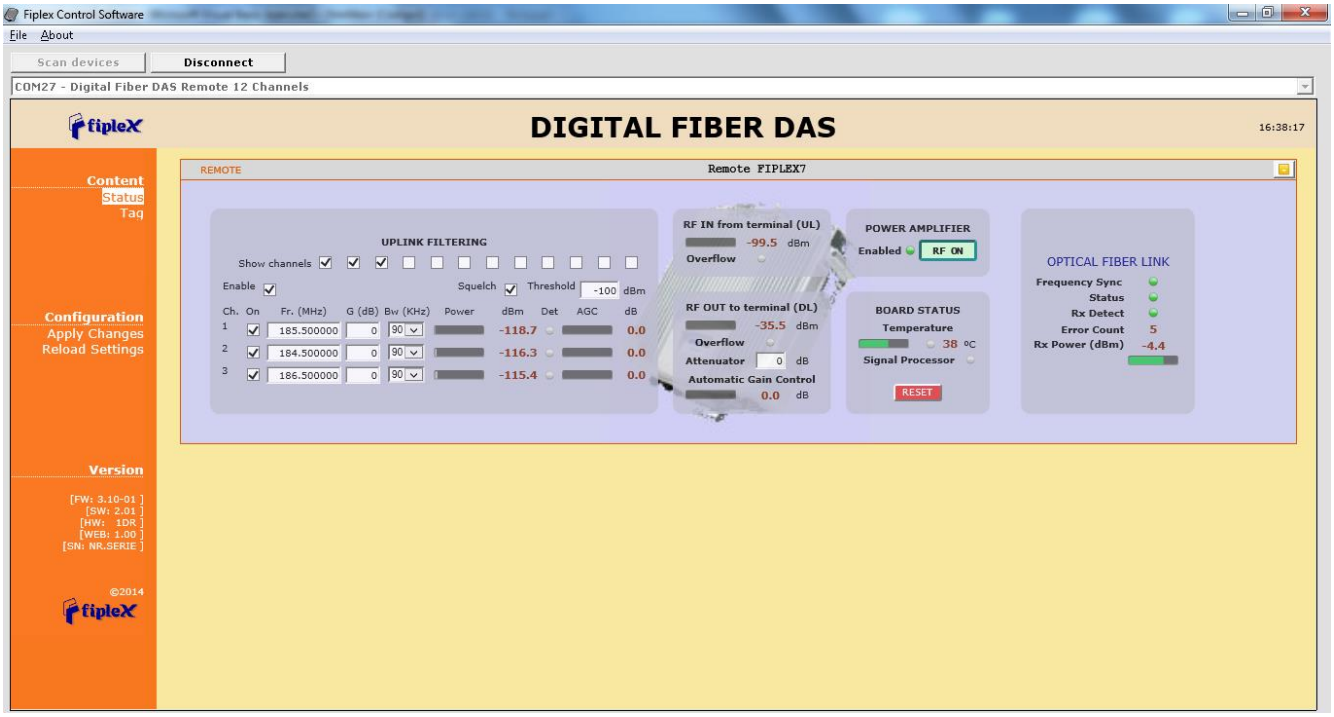
- Optical link status: shows optical link status between master and each remote unit. Moreover, clicking on “REMOTE LINK n” detailed monitoring data of each optical link can be viewed: voltage, current and temperature of each optical module, transmitted and received optical power, and alarms related to digital data recovery system. The main window shows only general parameters:

Parameter	Range	Description
Frequency Sync	Green: Normal state / Red: Alarm state	This indicator shows frequency synchronization status between master and remote unit
Status	Green: Normal state Yellow: Warning state Red: Alarm state	This indicator summarizes the status of optical module based in voltage, current, temperature and optical transmitted power
Rx Detect	Green: Normal state Yellow: Warning state Red: Alarm state	This indicator summarizes the status of optical reception based in received optical power and digital data recovery system
Error Count	---	Counter that it is incremented when optical link fails.
Rx Power	---	Shows optical received power. For reliable optical link, RX power must be higher than -25dBm

6.3 Software description (Remote Unit)

While software connected to digital master allows configuration and monitoring of whole system, if software is connected to remote unit, only parameters of this unit can be viewed / modified.

Then, status screen of remote unit only shows information regarding this unit:



Distribution and meaning of the controls contained in status page are very similar to single remote frame of master status page, only optical frame is different due to only remote side of optical link is monitored.

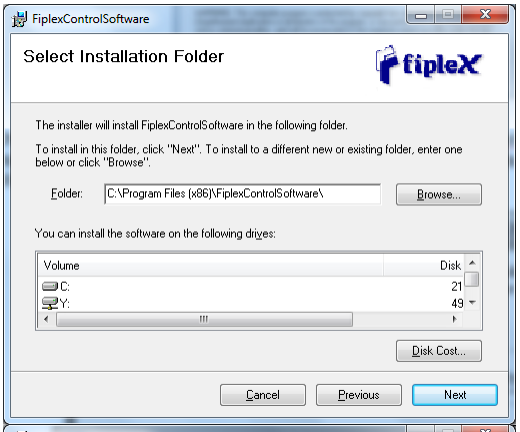
7 Local Software. Installation and troubleshooting

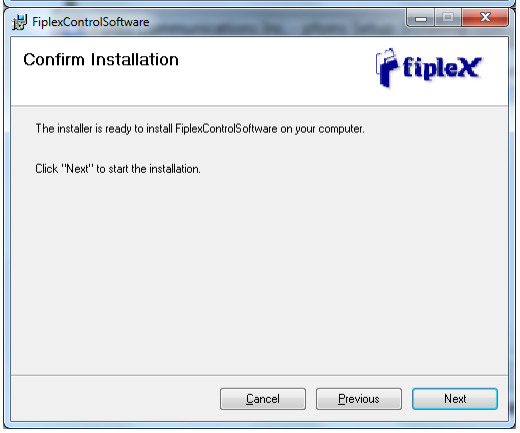
7.1 Installation

The following section will describe the steps to be followed in order to install and use the Fiplex Control software with your Fiplex repeater.

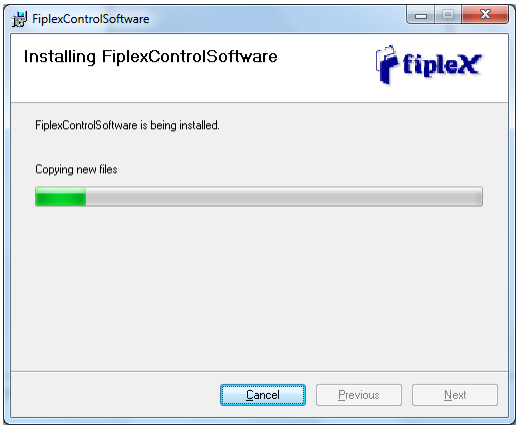
1. Before connect USB cable between computer and repeater, run the FiplexControlSoftware.msi File. Next screen will appear…

2. Choose the default installation path “C:\Program Files (x86)\FiplexControlSoftware”. Note that this can change according to your system configuration (32bits or 64bits), language and Windows Version.

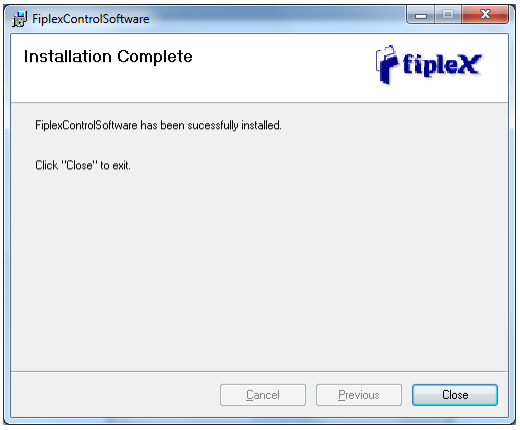




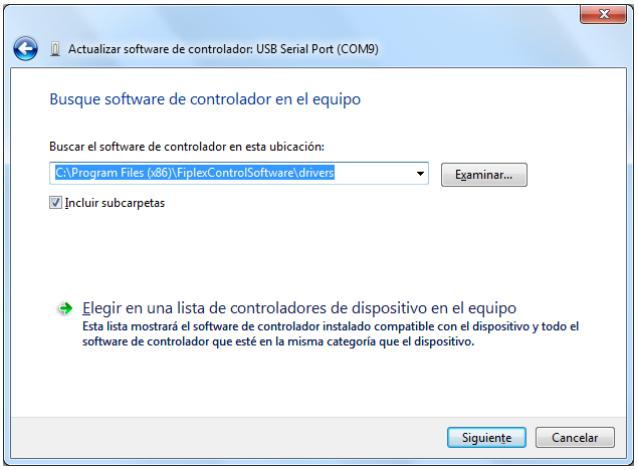
3. The installer will start to copy the necessary files.



4. After installation has completed, a shortcut in user desktop will appear.



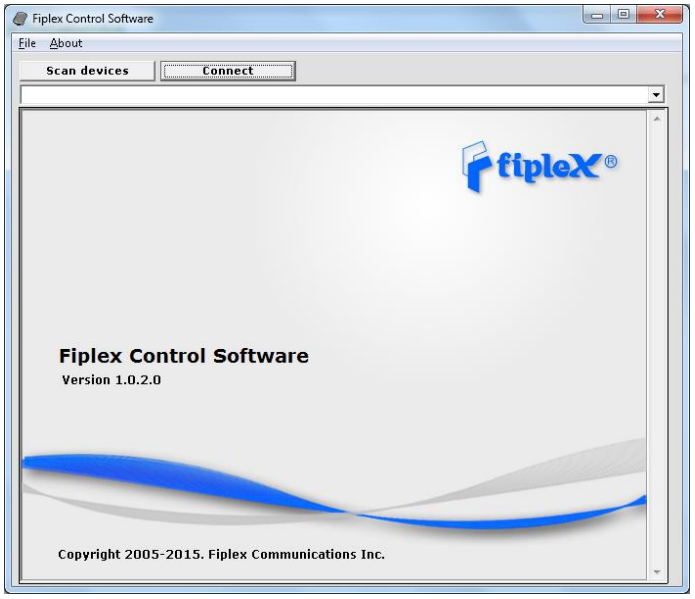
5. Connect USB cable between computer and repeater, keeping the repeater powered off. Usually, drivers will be automatically installed, but depending on Windows version, screen asking for drivers of new device can appear. Drivers can be found in application folder: C:\Program Files (x86)\FiplexControlSoftware\drivers".



6. Turn on the Repeater

BE SURE THAT "TO MOBILE" AND "TO BASE" PORTS ARE PROPERLY LOADED EITHER WITH 50 OHMS DUMMY LOADS, OR RADIATING SYSTEM.

7. Execute the Fiplex Control Software. Next window will appear:

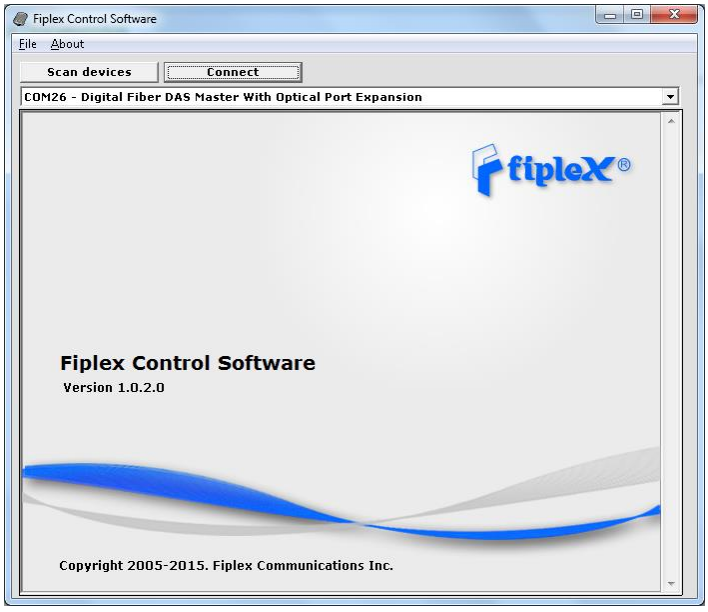


User interface has the following controls:

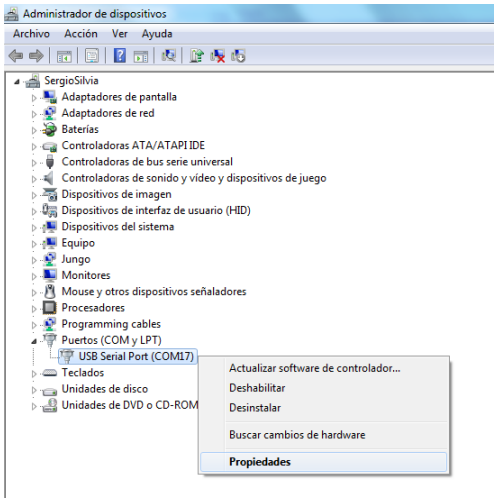
- Scan Devices Button: refresh the available COM ports and identify Fiplex devices
- Connection Button: connect / disconnect software from repeater
- List of available devices: below two buttons, is placed a dropdown list that shows all available COM ports. Available COM ports not related to Fiplex devices will be shown with its number and “Unknown device” label. COM ports related to Fiplex devices will show a device description.
- Embedded Web browser: graphical area where configuration and monitoring parameters will be shown.
- File menu: contains menus to save repeater configuration to a file and load configuration from file to repeater.

NOTE: if Fiplex Repeater is not turned on, related COM port will appear as “Unknown device”

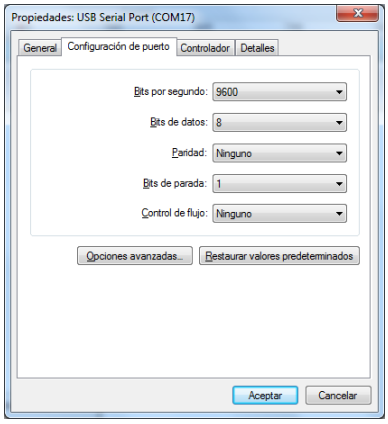
8. Click “Scan Devices”



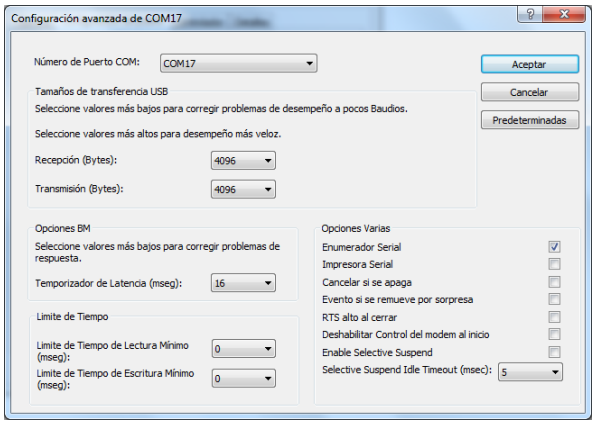
Now, the Fiplex unit is shown in the list of available devices, and connection button is enabled.
NOTE: Fiplex repeater could not appear in list, if COM port number is higher than COM16, depending on Windows version. COM port number can be forced to arbitrary number (below COM16) through Device Administrator. In order to change COM number, click “Properties” pop-up menu:



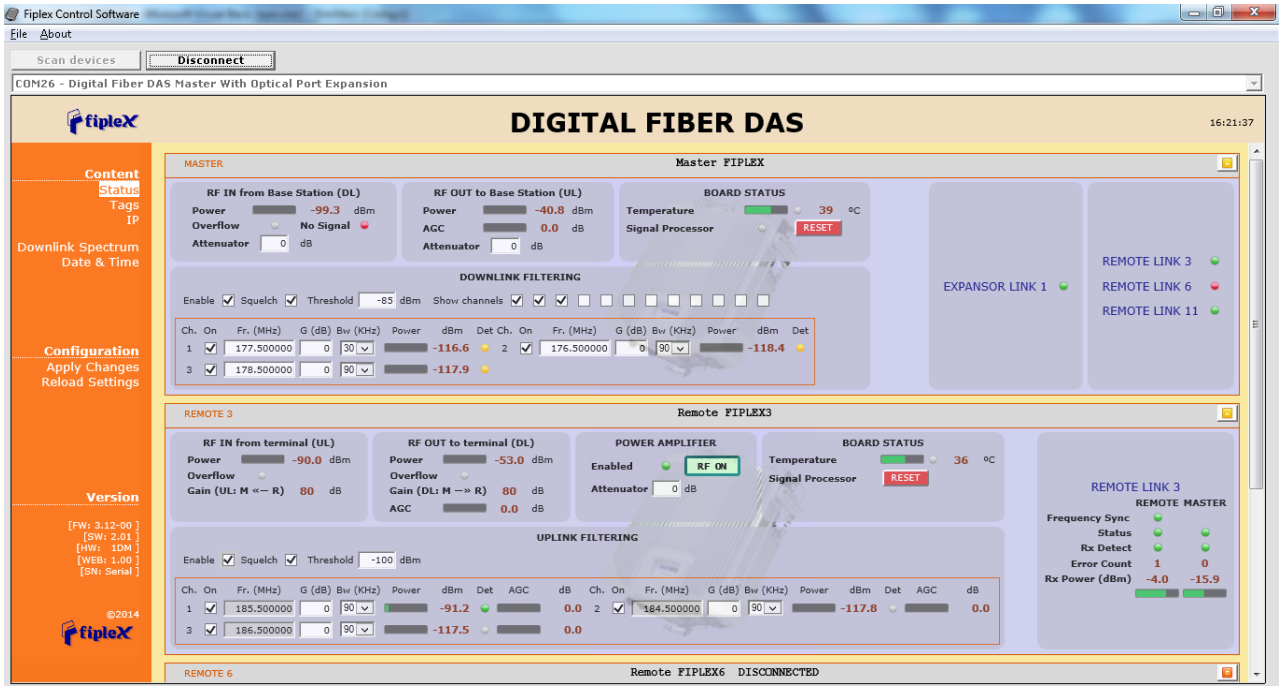
Click “Advanced Options”



Change COM port number



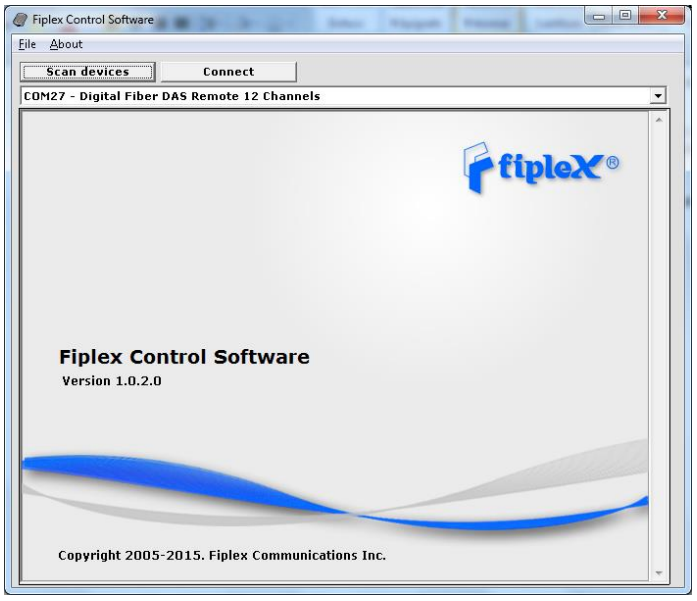
9. Click “Connect”. Fiplex Control Software window will be automatically maximized, and it will show the configuration screen described in previous sections.



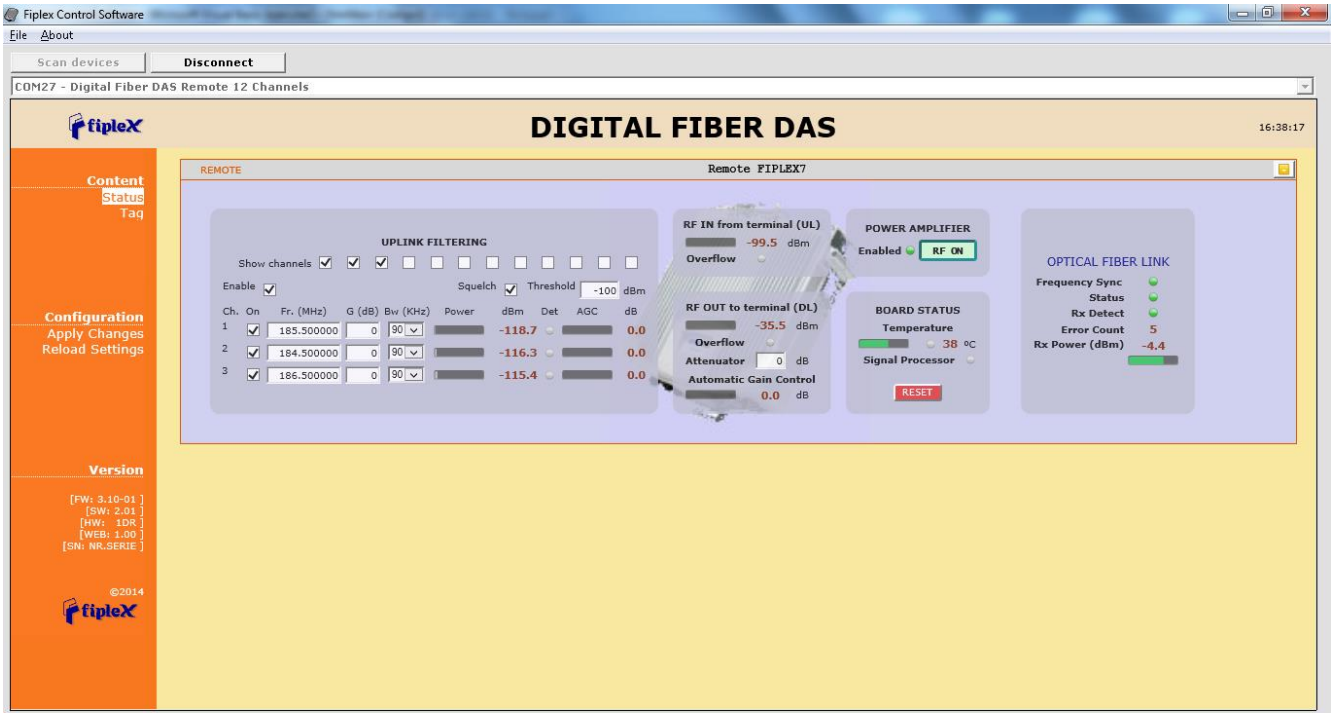
10. Once system is configured, user can disconnect software using connection button, now labelled “Disconnect”. Initial window will be shown.

    If repeater is disconnected or turned off, while Fiplex Control Software is connected to device, software will go back to initial window. Moreover, if some communication problem occurs while device is monitored, the software will go back to initial state as well.

11. Remote unit can be controlled through USB port. In this case, Fiplex Control Software will show that connected device is a remote unit.



After click on “Connect” button, program will show only remote configuration and monitoring parameters, with same graphical interface described in previous sections:


Fiplex Control Software
File About
Scan devices
Disconnect
COM27 - Digital Fiber DAS Remote 12 Channels
DIGITAL FIBER DAS
16:38:17
Content
Status
Tag
Configuration
Apply Changes
Reload Settings
Version
[FW: 3.10-01]
[SW: 2.01]
[HW: 1DR]
[WEB: 1.00]
[SN: NR.SERIE]
©2014
REMOTE
Remote FIPLEX7
UPLINK FILTERING
Show channels
Enable
Squelch
Threshold -100 dBm
Ch. On Fr. (MHz) G (dB) Bw (KHz) Power dBm Det AGC dB
1 185.500000 0 90 -118.7 0.0
2 184.500000 0 90 -116.3 0.0
3 186.500000 0 90 -115.4 0.0
RF IN from terminal (UL)
-99.5 dBm
Overflow
RF OUT to terminal (DL)
-35.5 dBm
Overflow
Attenuator 0 dB
Automatic Gain Control
0.0 dB
POWER AMPLIFIER
Enabled
RF ON
BOARD STATUS
Temperature
38 °C
Signal Processor
RESET
OPTICAL FIBER LINK
Frequency Sync
Status
Rx Detect
Error Count 5
Rx Power (dBm) -4.4