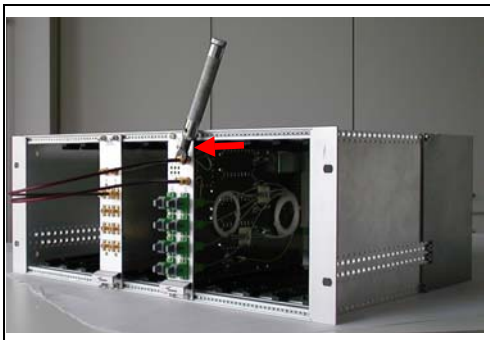
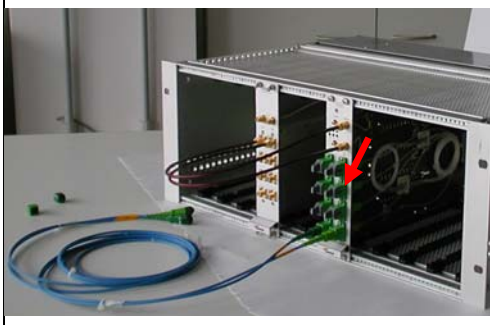


Then connect the UL and the DL RF cable *(which come from a TBSI or a TLCN module, depending on how the system has been designed)* to the TFLN UL and DL ports, respectively.
Use a specific torque wrench to fix these RF cables to DL and UL ports.



Remove the caps from TFLN optical ports and connect the SC-APC fibre optic cables to the ports.
UL and DL cables coming from the same remote unit have to be connected to UL and DL ports marked by the same number on the TFLN front panel.

As you switch on the system, carefully refer to the TFLN Start-Up section.
Remember that remote units should be switched on before than the Master Unit in order to follow a correct Start-Up procedure.

TFLN behaviour at system start-up

Before the Master Unit is switched on, make sure that:

- all expected modules have been inserted into the Master Unit
- the modules have been connected each other by RF jumpers, according to what planned in the system design
- every TFLN local unit has been connected to relevant remote units
- each remote unit has been connected to its coverage antennas
- the supervision agent, if present, has been connected to the Master Unit
- different Master Units are connected each other via bus RS485

After that, remember that only when all the remote units are already on, the Master Unit itself can be turned on.
Once the Master Unit has been switched on, the TFLN behaviour at system start-up can be summarized as per the following steps:

1. When Master Unit is turned on all the six LEDs upon the TFLN front panel go on for a couple of seconds. After that, the green LED remains on (indicating proper power supply) while the other LEDs indicate the local unit status, according to the following table.
   Note: In case unused optical ports of the TFLN have not been masked through LMT yet, corresponding LEDs will be on. If so, wait for the end of step 3 (discovery phase) then use LMT to mask them (please refer to relevant Application Note)

Label	*LED colour*	*Status*
=	Green	ON (power supply is on)
⌐┘	Red	OFF (no major failure affects TFLN operations)
1	Red	OFF (no major failure affects corresponding remote unit or UL connection)
2	Red	OFF (no major failure affects corresponding remote unit or UL connection)
3	Red	OFF (no major failure affects corresponding remote unit or UL connection)
4	Red	OFF (no major failure affects corresponding remote unit or UL connection)

Tab. 11: Status of the TFLN LEDs in full-working conditions

2. About 10 seconds after the system has been switched on, TFLN module begins a "discovery" phase to identify connected remote units. This operation is necessary to collect all the information to be provided to the supervision system.
   While the discovery phase is working, the TFLN general alarm (LED ⌐┘) blinks while the other LEDs go on showing previously detected status. Time dedicated to discovery phase can be at maximum 4min and depends on system complexity. ***Do not connect/disconnect any cable or any piece of equipment during the discovery phase!*** This may result in failing the identification of remote units.
   Please note that, while the discovery phase is running, the whole system is working correctly. Discovery operations aim to collect information about remote units but they don't affect the system functionality.

3. Once the discovery is finished, the TFLN general alarm (LED ⌐┘) stops blinking and switches OFF. The power supply LED (green LED) remains on while LEDs 1,2,3,4 show either the status of the remote units or the quality of the UL connections. In case some of these LEDs remain on, check if they refer to unused optical ports or not. In case of unused TFLN ports use LMT to mask it otherwise if LED referring to a connected remote unit remains on, please refer to Troubleshooting procedure.

Removing a TFLN module

Switch off the Master Unit power supply, remove the SC-APC optical connectors, and insert the protection caps into TFLN optical ports. Then

- unscrew the 4 screws and slowly remove the card.
- put the removed TFLN card in its safety box.
- switch on again the Master Unit power supply, and refer to Start Up section.

TFLN troubleshooting

In case a TFLN local unit has any problem, this will be easily revealed through LEDs on TFLN front panels.
Troubleshooting procedure can be easy when failure detection is directly carried out through LMT or supervision system, as an alternative, a manual troubleshooting procedure can be carried out.
LEDs panel on TFLN front detect not only failures inside the TFLN, but they also reveals malfunctions located on related remote unit.
The following table reports a brief description of the TFLN alarms, together with a reference to the corresponding alerted LEDs:

Alarm description	*Alerted LED*	*Alarm priority level*
The optical power received on UL port 1 is too low and the AGC can no more compensate the optical losses on UL port 1	**1**	High
The optical power received on UL port 2 is too low and the AGC can no more compensate the optical losses on UL port 2	**2**	High
The optical power received on UL port 3 is too low and the AGC can no more compensate the optical losses on UL port 3	**3**	High
The optical power received on UL port 4 is too low and the AGC can no more compensate the optical losses on UL port 4	**4**	High
The optical power received on UL port 1,2,3, or 4 is near to critical level but AGC still works	**none**	Low
High priority alarm on Remote Unit 1	**1**	High
High priority alarm on Remote Unit 2	**2**	High
High priority alarm on Remote Unit 3	**3**	High
High priority alarm on Remote Unit 4	**4**	High
Low priority alarm on Remote Units 1, 2, 3 or 4	**none**	Low
TFLN laser failure	⌐	High
UL RF amplifier failure	⌐	High
DL RF amplifier failure	⌐	High
Short circuit on TFLN module	⌐	High
Overtemperature on TFLN board[1]	**none**	Low

Tab. 12: TFLN LEDs description

As the table shows, LEDs on the TFLN front panel signal all high priority alarms while minor alarms, which detect critical situations which should be checked and tested in order to avoid future possible system faults, are only revealed by LMT or supervision system.
Each TFLN is provided with an AGC system which compensates optical losses < 3 dB. TFLN LED alarms switch on when the estimated optical losses are > 4dB, the AGC not being able to compensate these losses any more.
One of LEDs 1,2,3,4 might turn on not only to indicate a high optical loss detected by TFLN, but also to reveal a remote unit failure. Understanding the reason why one of LEDs 1,2,3 or 4 is on (a remote unit failure, an optical cable fault or an external equipment malfunction) can be done following the troubleshooting procedure reported hereinafter.

[1] Remember that proper TFLN environmental temperature is between +5°C and +40°C

Main troubleshooting procedure

(The following procedure is summarized by the flow-chart in fig. 21)

- In case the TFLN general alarm (LED ⌐┘) is on replace the faulty TFLN local unit with a new one and contact the manufacturer for assistance.
- In case one of the LEDs 1,2,3,4 is on the corresponding TFLN adapter might be dirty. Try cleaning it using pure ethyl alcohol. If the LED is still on go to the corresponding remote unit side and check the red LED upon TFAxxx warm side:
  - If it is off, the optical cables or the optical connections are supposed to have some problem on DL path. Refer to fibre optic DL troubleshooting for more information (fig. 22).
  - If it is on, refer to dry-contact troubleshooting (fig. 10) to understand whether the alarm can depend on external equipment failure or not. In case dry-contact troubleshooting does not reveal any failure, clean the remote unit optical adapters.
    If the problem still persists the UL optical cable or optical connections is supposed to have some problems. Please refer to the fibre optic UL troubleshooting (fig. 11) for more information.

Fibre optic DL troubleshooting

(The following procedure is summarized by the flow-chart in fig. 22)

- Check if there is any point where fibre experiences a short radius of curvature. In this case, rearrange the optical path in order to avoid sharp bends (if necessary, replace the optical cable with a longer one). If TFLN red LED switches off, troubleshooting has been successfully carried out. Otherwise, follow next steps.
- Check if SC-APC connectors are properly installed at both fibre ends. In case they are not, fix better SC-SPC connectors to adapters. If TFLN red LED switches off, troubleshooting has been successful. Otherwise, follow next steps.
- Disconnect the optical fibre and clean it better at both ends then clean the SC-APC ports on both the TFLN and the remote unit. Re-connect the fibre to relevant ports after cleaning. If it doesn't made TFLN red LED switch off, follow next steps.
- Disconnect the optical SC-APC connector from remote unit DL port, and measure the *output power* $P_{out(DL)}$ at the corresponding fibre end. Then, go to the TFLN side, disconnect the optical SC-APC connector from TFLN DL port and measure the *input power* $P_{in(DL)}$ coming out of the TFLN DL port. Calculate the DL fibre attenuation A_{DL} as $A_{DL}\ [dB] = P_{in(DL)} - P_{out(DL)}$
  - If $A_{DL} > 4dB$, then the fibre optic cable has some problems. Replace it with a new one.
  - If $A_{DL} < 4dB$ troubleshooting procedure has not identified the problem. Refer to supervision system or contact assistance.

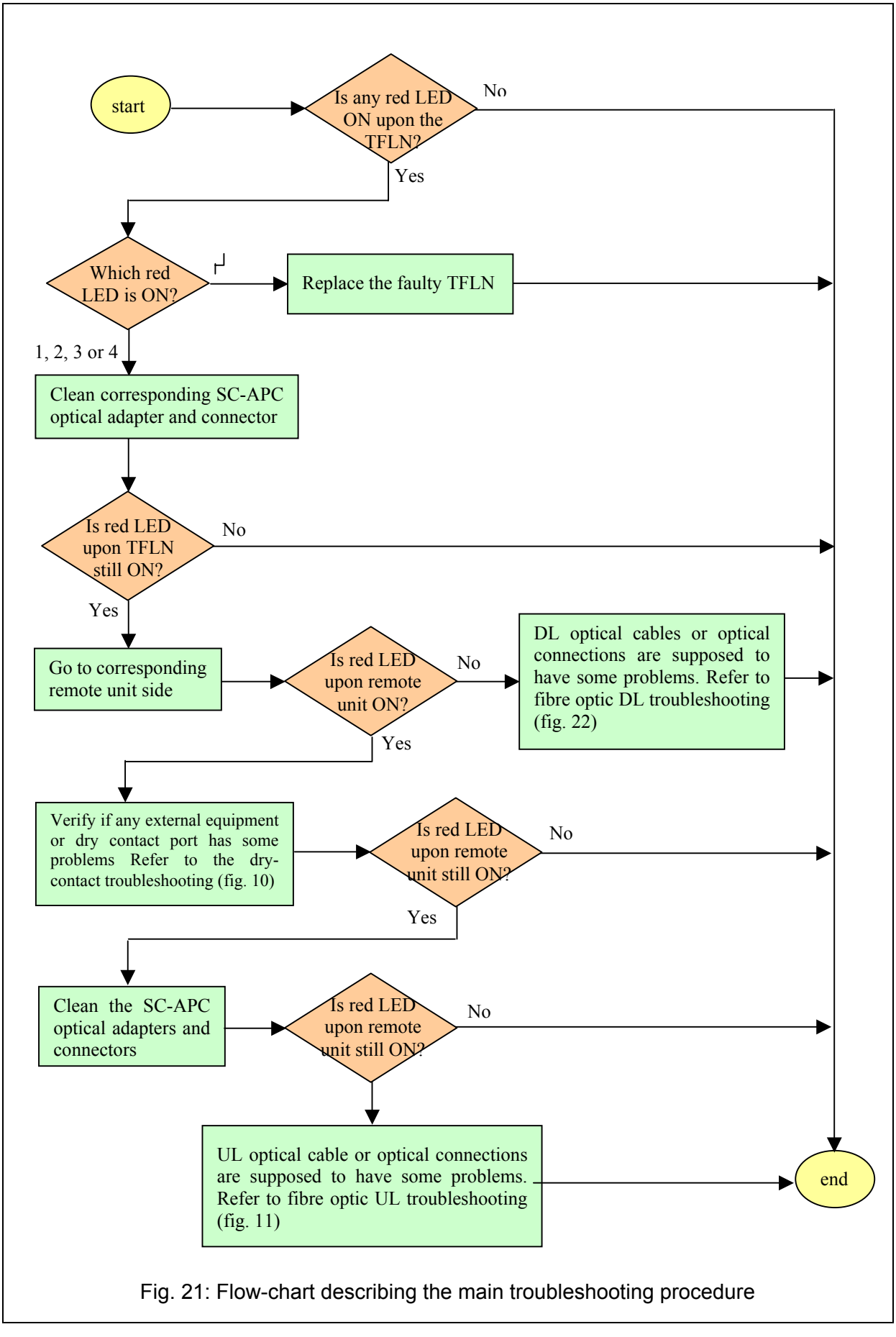


Fig. 21: Flow-chart describing the main troubleshooting procedure

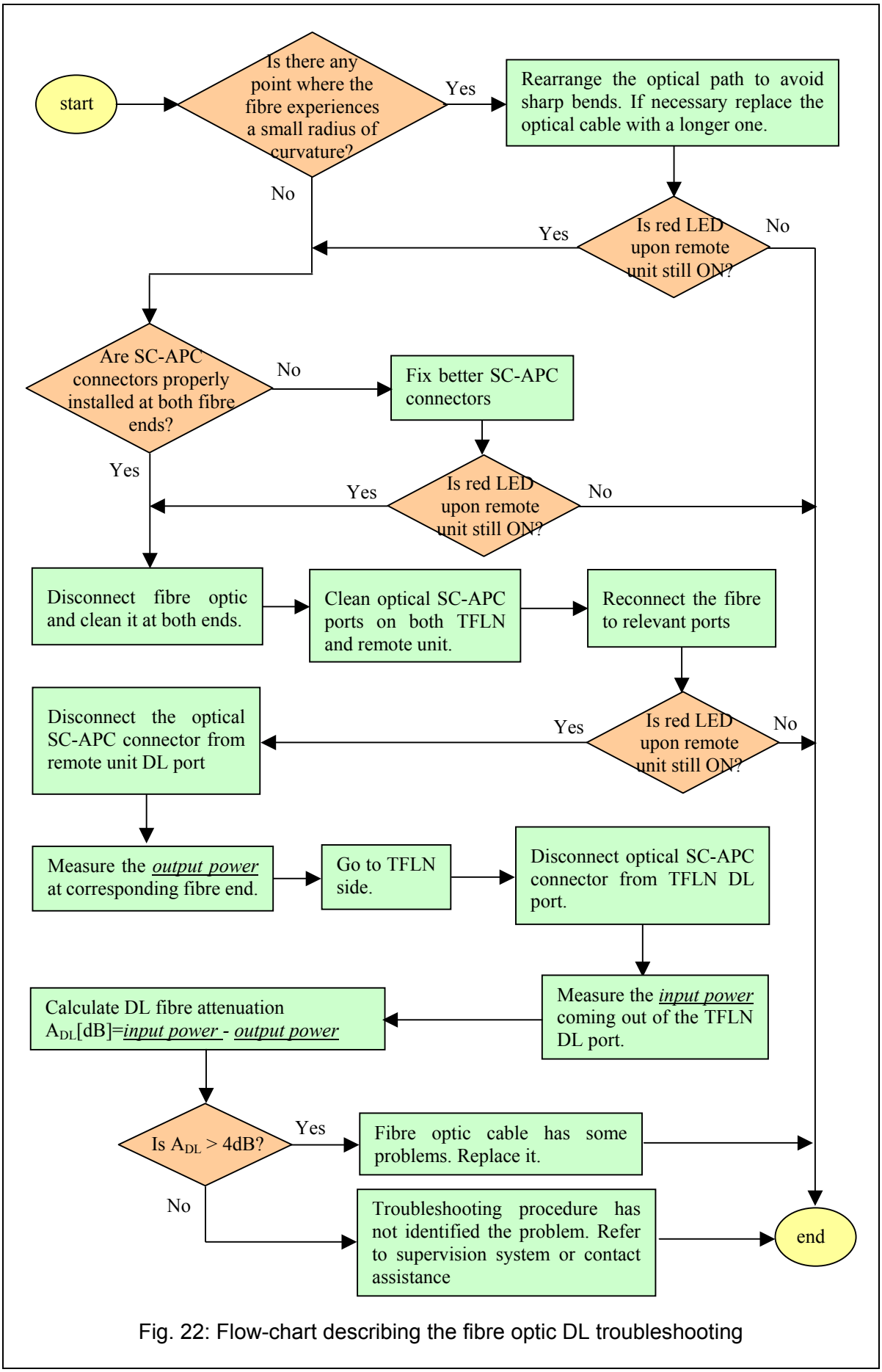
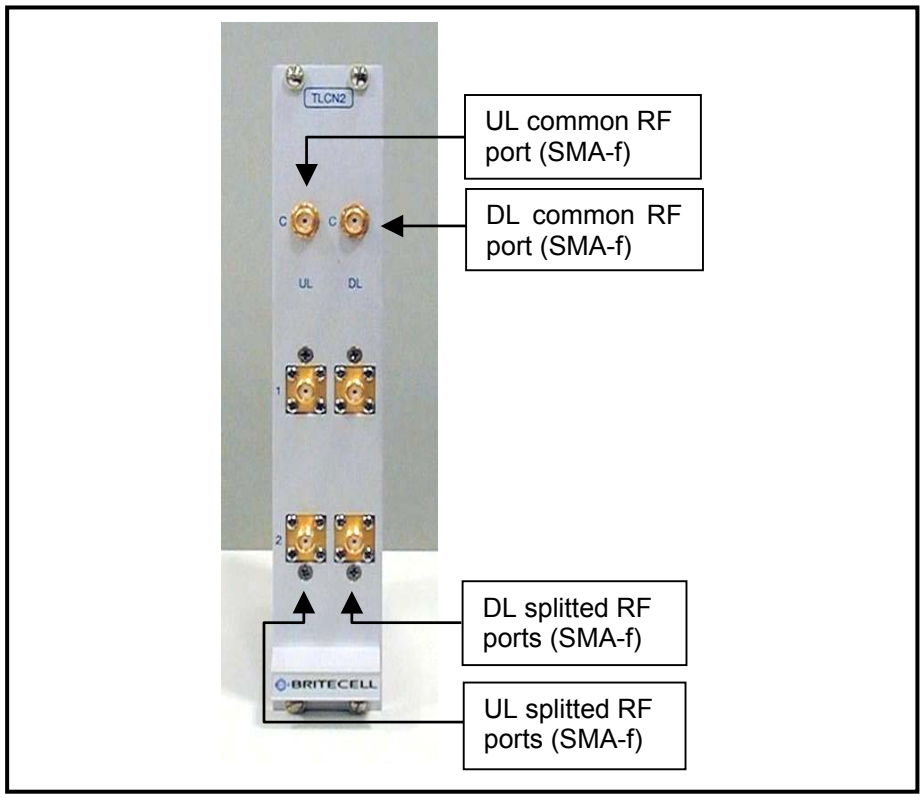


Fig. 22: Flow-chart describing the fibre optic DL troubleshooting

4.3. 2-way splitter TLCN2

Module name: **TLCN2**	**Description:** The TLCN2, bidirectional 2-way splitter/combiner, can be used to: ➢ combine 2 RF signals into a common RF output ➢ split an RF input into 2 RF output signals It is a passive device which doesn't require power supply. In case of splitting "C" works as an input port while "1" and "2" ports are the outputs. In case of combining "1"and "2" work as input ports while "C" is the output one.
RF ports: ➢ 1 DL common RF port ("C") ➢ 2 DL splitted RF ports ("1","2") ➢ 1 UL common RF port ("C") ➢ 2 UL splitted RF ports ("1","2") Note: each port is bidirectional.	

TLCN2 main applications

Main applications of the TLCN2 module are:

- Connecting a BTS to more than one TFLN local unit, so that:
  - ➢ TLCN2 splits the DL input coming from a BTS into 2 output signals entering 2 different TFLN local units
  - ➢ TLCN2 combines the UL inputs coming from 2 TFLN local units into 1 common signal, entering the BTS
- Connecting a TFLN local unit to more than one BTS, so that:
  - ➢ TLCN2 combines the two DL inputs coming from 2 BTSs into 1 output signal entering the TFLN local unit
  - ➢ TLCN2 splits the UL inputs coming from TFLN local unit into 2 different output signals entering 2 different BTSs

More TLCN2 modules can be used in cascade connections.

TLCN2 insertion loss

The TLCN2 insertion loss varies slightly with the frequency bands:

	700-1400MHz	***1400-2200MHz***	***2200-2500MHz***
TLCN2 insertion loss	3.7 ± 0.4dB	4.1 ± 0.5dB	4.6 ± 0.4dB

When designing the system, remember to take into account the insertion loss of the TLCN2.

Warnings

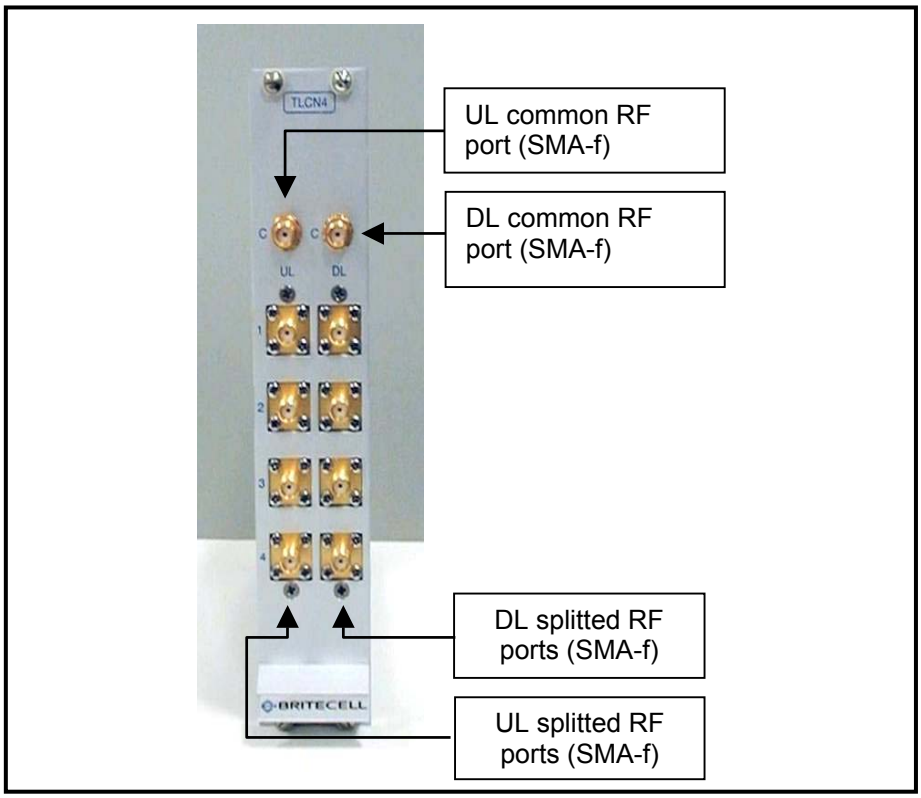
The overall input power must not exceed +24dBm

TLCN2 Installation

Since the TLCN2 module requires no power supply it can be housed either in an active or a passive TPRN subrack.

1. Unpack the kit which include
   - 1 TLCN2
   - 4 RF jumpers
2. Carefully insert the TLCN2 module in any of the TPRN subrack slots and lock the 4 screws on the front corners.
3. Connect RF cables to UL and DL ports, according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.
4. In case some ports remain unused remember to connect them to a 50 Ω load (not included)

4.4. 4-way splitter TLCN4

Module name: **TLCN4**	**Description:** The TLCN4, bidirectional 4-way splitter/combiner, can be used to: ➢ combine 4 RF signals into a common RF output ➢ split an RF input into 4 RF output signals It is a passive device which doesn't require power supply. In case of splitting "C" works as an input port while "1", "2", "3" and "4" ports are the outputs. In case of combining "1", "2", "3" and "4" work as input ports while "C" is the output one.
RF ports: ➢ 1 DL common RF port ("C") ➢ 4 DL splitted RF ports ("1","2","3","4") ➢ 1 UL common RF port ("C") ➢ 4 UL splitted RF ports ("1","2","3","4") Note: each port is bidirectional.	

TLCN4 main applications

Main applications of the TLCN4 module are:

- Connecting a BTS to more than one TFLN local unit, so that:
  - ➢ TLCN4 splits the DL input coming from a BTS into 4 output signals entering 4 different TFLN local units
  - ➢ TLCN4 combines the UL inputs coming from 4 TFLN local units into 1 common signal, entering the BTS
- Connecting a TFLN local unit to more than one BTS, so that:
  - ➢ TLCN4 combines the two DL inputs coming from 4 BTSs into 1 output signal entering the TFLN local unit
  - ➢ TLCN4 splits the UL inputs coming from TFLN local unit into 4 different output signals entering 4 different BTSs

More TLCN4 modules can be used in cascade connections.

TLCN4 insertion loss

The TLCN4 insertion loss varies slightly with the frequency bands:

	700-1400MHz	*1400-2200MHz*	*2200-2500MHz*
TLCN4 insertion loss	7.4 ± 0.4dB	8.0 ± 0.5dB	8.4 ± 0.4dB

When designing the system, remember to take into account the insertion loss of the TLCN2.

Warnings

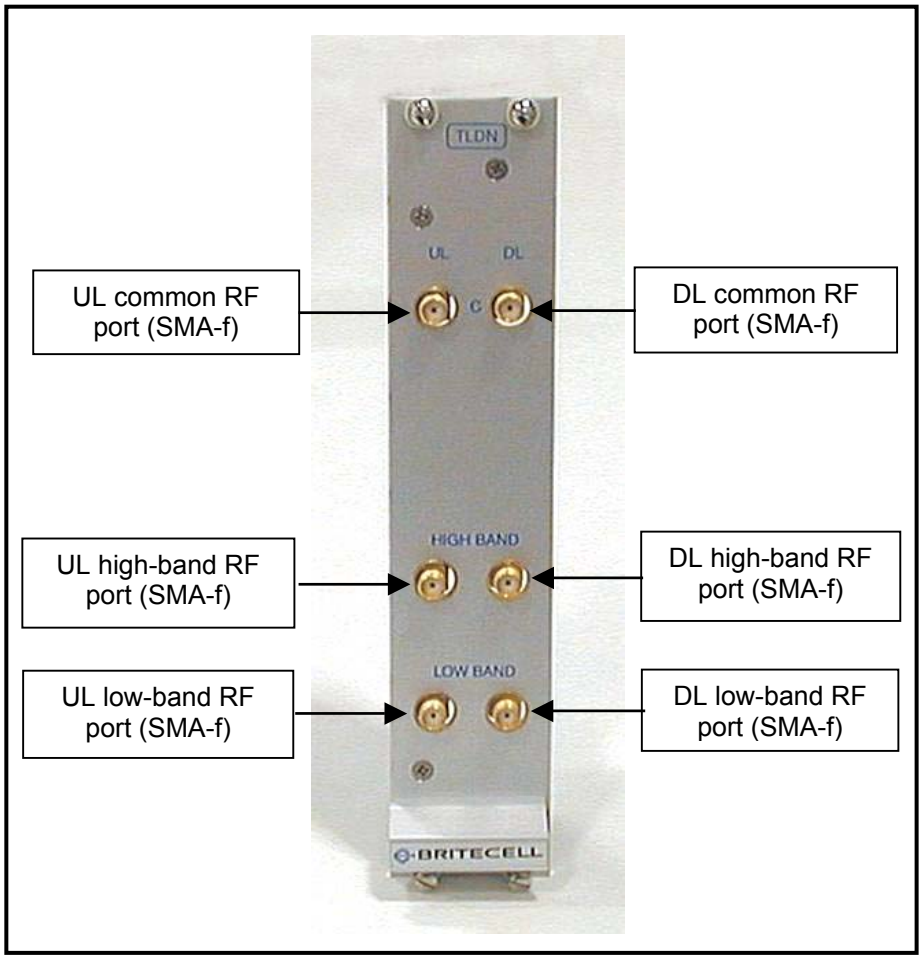
The overall input power must not exceed +24dBm

TLCN4 Installation

Since the TLCN4 module requires no power supply it can be housed either in an active or a passive TPRN subrack.

1. Unpack the kit which include
   - 1 TLCN4
   - 8 RF jumpers
2. Carefully insert the TLCN4 module in any of the TPRN subrack slots and lock the 4 screws on the front corners.
3. Connect RF cables to UL and DL ports, according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.
4. In case some ports remain unused remember to connect them to a 50 Ω load (not included)

4.5. RF diplexer TLDN

Module name: **TLDN**	**Description:** The TLDN is a passive RF diplexer which combine/split low-band (800-1000MHz) and high-band (1700-2200MHz) signals in a multi-band system. Main operations carried out are: ➢ In Downlink it combines a low band RF signal (800MHz to 1000MHz) and a high band RF signal (1700MHz to 2200MHz) into a common RF path ➢ In UpLink it splits a composite signal into a low-band (800MHz to 1000MHz) and a high-band (1700MHz to 2200MHz) one. As it is a passive device it doesn't need power supply.
RF ports ➢ 1 DL common RF port ("C"), which sends out the combined DL signal ➢ 1 DL high-band RF input port, which receives the high-band signal ➢ 1 DL low-band RF input port, which receives the low-band signal ➢ 1 UL common RF port ("C"), which receives the combined UL signal ➢ 1 UL high-band RF output port, which sends out the high-band signal ➢ 1 UL low-band RF output port, which sends out the low-band signal	

TLDN main applications

Main applications of the TLDN module are:

- Connecting 2 BTSs with different services to one TFLN local unit in a dual band system, so that:
  - ➢ TLDN combines the DL inputs coming from 2 different BTSs (carrying different services) into an output signal entering a TFLN local unit
  - ➢ TLDN divides the UL input coming from a TFLN local unit into 2 UL outputs entering 2 different BTSs (carrying different services)

TLDN insertion loss

The TLDN insertion loss is as follows:

TLDN insertion loss	<1.5dB

When designing the system, remember to take into account the insertion loss of the TLDN.

Warnings

The overall input power must not exceed +27dBm

TLDN Installation

Since the TLDN module requires no power supply it can be housed either in an active or a passive TPRN subrack.

1. Unpack the kit which include
   - 1 TLDN
   - 4 RF jumpers
2. Carefully insert the TLDN module in any of the TPRN subrack slots and lock the 4 screws on the front corners.
3. Connect RF cables to UL and DL ports, according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.

4.6. RF triplexer TLTN

Module name:
TLTN

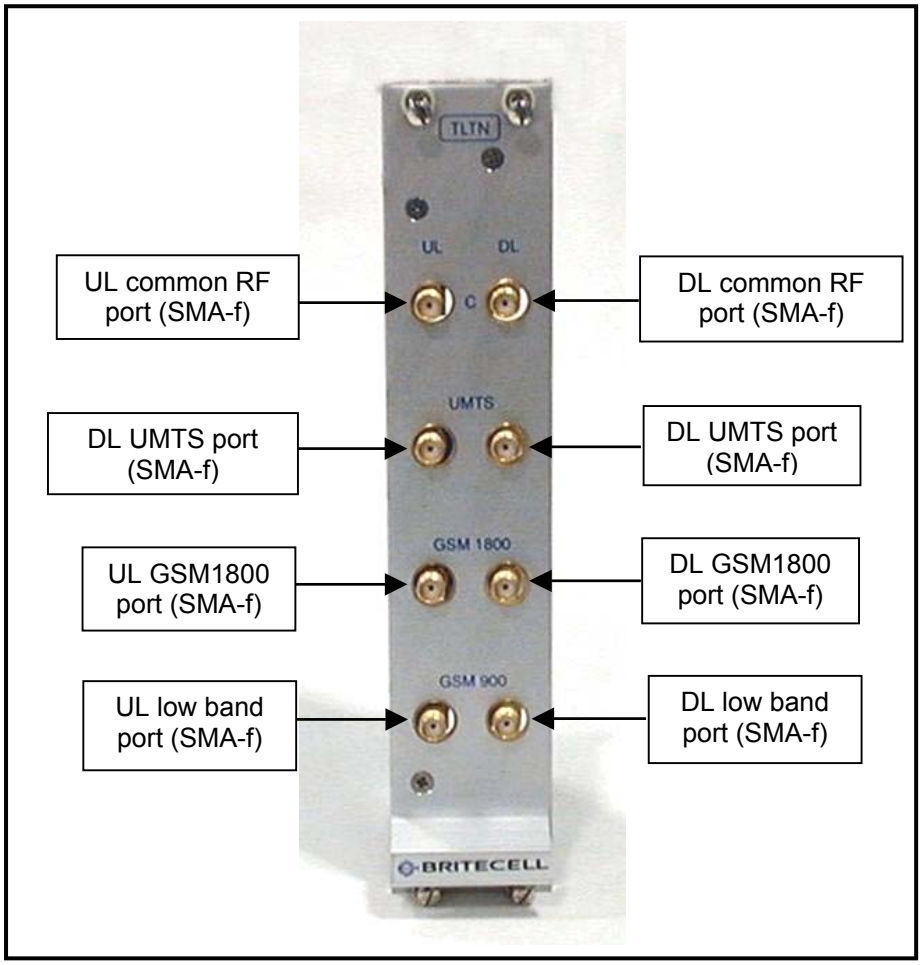
Description:
The TLTN is a passive RF triplexer which combine/split low-band (800-1000MHz), GSM1800 and UMTS signals in a multi-band system.
Main operations carried out are:

- In Downlink it combines a low band RF signal (800MHz to 1000MHz) a GSM1800 signal and an UMTS signal into a common RF path
- In UpLink it splits a composite signal into a low-band (800MHz to 1000MHz) a GSM1800 and an UMTS one.

As it is a passive device it doesn't need power supply.

RF ports

- 1 DL common RF port ("C"), which sends out the combined DL signal
- 1 DL UMTS RF input port, which receives the UMTS band signal
- 1 DL GSM1800 RF input port, which receives the GSM1800 signal
- 1 DL low band RF input port, which receives the low band signal
- 1 UL common port ("C"), which receives the combined UL signal
- 1 UL UMTS RF output port, which sends out the UMTS signal
- 1 UL GSM1800 RF output port. which sends out the GSM 1800 signal
- 1 UL low band RF output port, which sends out the low band signal



TLTN main applications

Main applications of the TLTN module are:

- Connecting 3 BTSs with different services to one TFLN local unit in a tri-band system, so that:
  - TLTN combines the DL inputs coming from 3 different BTSs (carrying different services: low band, GSM1800 and UMTS) into an output signal entering a TFLN local unit
  - TLTN divides the UL input coming from a TFLN local unit into 3 UL outputs entering 3 different BTSs (carrying different services: low band, GSM1800 and UMTS)

TLTN insertion loss

The TLTN insertion loss is as follows:

TLTN insertion loss	<3.5dB

When designing the system, remember to take into account the insertion loss of the TLDN.

Warnings

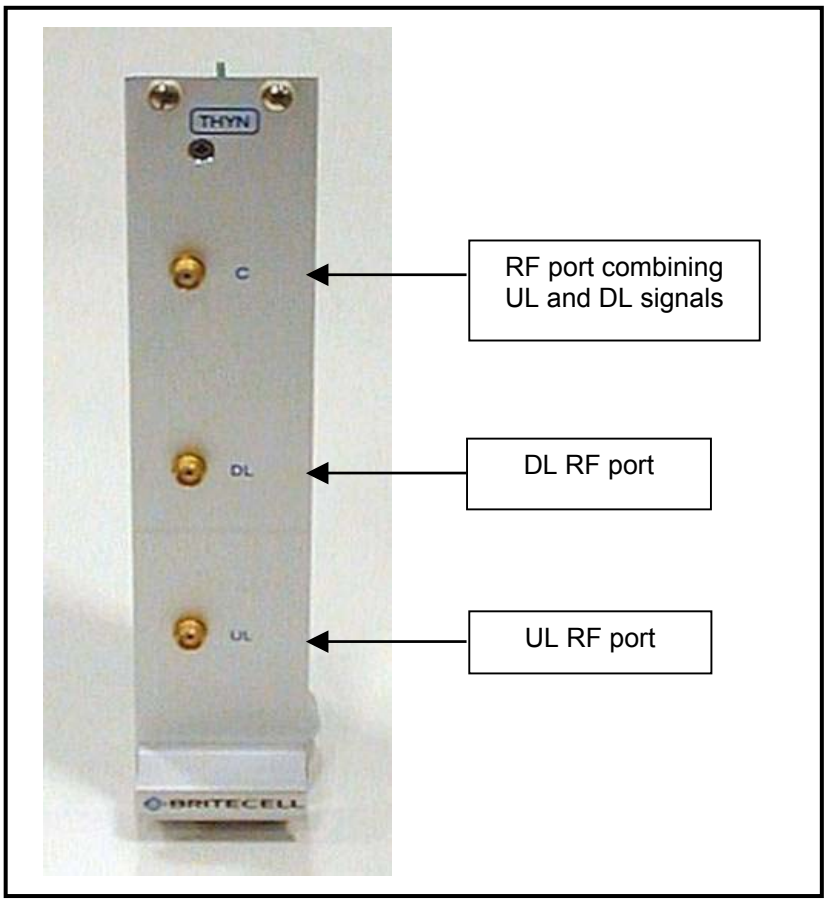
The overall input power must not exceed +27dBm

TLTN Installation

Since the TLTN module requires no power supply it can be housed either in an active or a passive TPRN subrack.

1. Unpack the kit which include
   - 1 TLTN
   - 6 RF jumpers
2. Carefully insert the TLTN module in any of the TPRN subrack slots and lock the 4 screws on the front corners.
3. Connect RF cables to UL and DL ports, according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.

4.7. RF duplexer THYN

Module name: **THYN**	**Description:** THYN is a family of duplexers which combines/splits the downlink and uplink paths into a single one while maintaining the required isolation. As this device is band dependent be sure to choose the right single band version.
RF ports ➢ 1 DL port, which receives DL signal ➢ 1 UL port, which sends out the UL signal ➢ 1 common port ("C"), which provides an UL and DL combined signal	

THYN main applications

Main applications of the THYN module are:

- Connecting a BTSs with duplexed antenna port to a Britecell Plus system, so that:
  - ➢ THYN combines/splits the DL and UL signals coming from a single port of the BTS into two separated ports

THYN insertion loss

The THYN insertion loss is as follows:

	Frequencies < 1GHz	***Frequencies > 1 GHz***	***UMTS***
THYN UL insertion loss	7.0 ± 1dB	7.0 ± 1.5dB	2.0 ± 0.5dB
THYN DL insertion loss	3.3 ± 0.5dB		

When designing the system, remember to take into account the insertion loss of the TLDN.

Warnings

The overall input power must not exceed +30dBm

THYN Installation

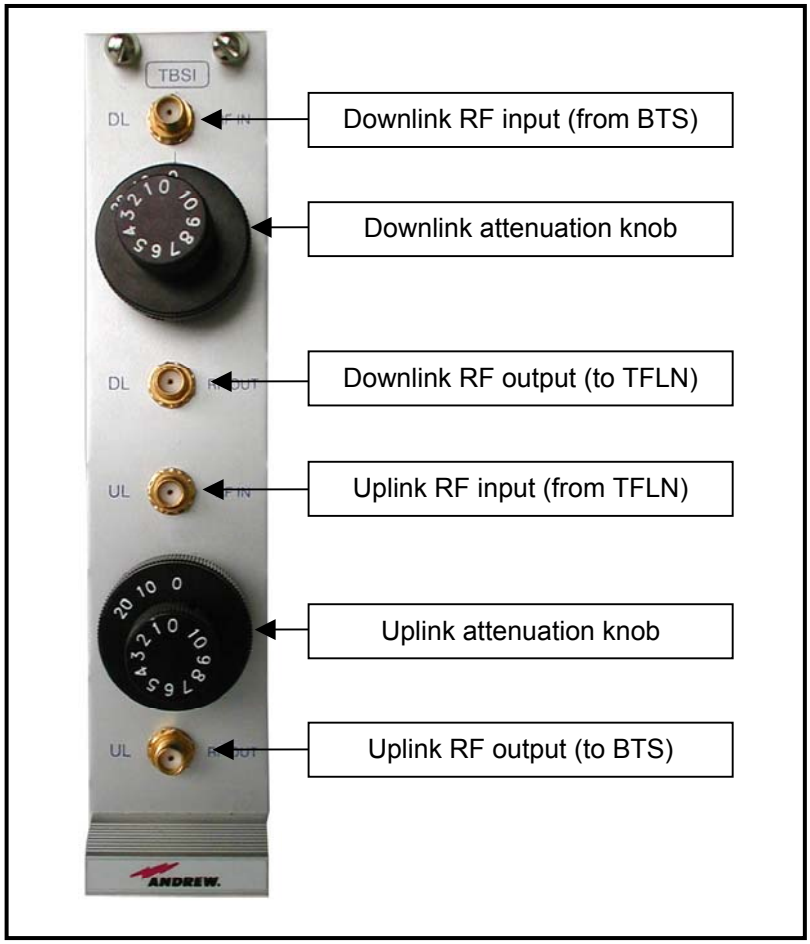
Since the THYN module requires no power supply it can be housed either in an active or a passive TPRN subrack.

1. Unpack the kit which include
   - 1 THYN
   - 2 RF jumpers
2. Carefully insert the THYN module in any of the TPRN subrack slots and lock the 4 screws on the front corners.
3. Connect RF cables to common, UL and DL ports, according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.

4.8. RF attenuator TBSI

<table>
<tr>
<td>Module name:
<u>TBSI</u></td>
<td>Description
The TBSI module is an adjustable RF attenuator, necessary in order to:
➢ set the correct power level for the RF downlink signal entering the DL input port of the TFLN local unit;
➢ set the correct power level for the RF uplink signal entering the BTS, in order to meet desired requirements about BTS blocking level and BTS receiver sensitivity
In order to set these different attenuations TBSI provides 2 separate knobs to regulate UL and DL attenuations independently (please refer to BriteTool manual to understand how to calculate the right value of attenuation trough BriteTool)</td>
</tr>
<tr>
<td>RF ports

➢ 1 DL RF input port receiving the DL signal to be attenuated
➢ 1 DL RF output port sending out the attenuated DL signal
➢ 1 UL RF input port receiving the UL signal to be attenuated
➢ 1 UL RF output port sending out the attenuated UL signal

The attenuation required both on DL and UL can be properly set through relevant knob (30dB range, 1dB step).</td>
<td> 
</td>
</tr>
<tr>
<td colspan="2">TBSI main applications

Main applications of the TBSI module are:
• adjusting RF levels coming to/from a BTSs:
➢ TBSI adjusts the DL signal to meet the required power level at TFLN DL input
➢ TBSI adjusts the UL signal coming from TFLN to provide the required blocking level and receiver sensitivity to the BTS</td>
</tr>
</table>

TBSI insertion loss

The TBSI insertion loss is as follows:

	DC to 2GHz	*2GHz to 2.17GHz*
TBSI insertion loss	< 1dB	< 1.3dB

When designing the system, remember to take into account the insertion loss of the TBSI.

Warnings

The overall input power must not exceed +30dBm

TBSI Installation

Since the TBSI module requires no power supply it can be housed either in an active or a passive TPRN subrack.

1. Unpack the kit which include
   - 1 TBSI
   - 2 RF jumpers
2. Carefully insert the TBSI module in any of the TPRN subrack slots and lock the 4 screws on the front corners.
3. Connect RF cables according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.
4. Set proper attenuation values.

4.9. Digital RF attenuator TDI

Module name:

TDI

Description

The TDI module is a digital adjustable RF attenuator, necessary in order to:

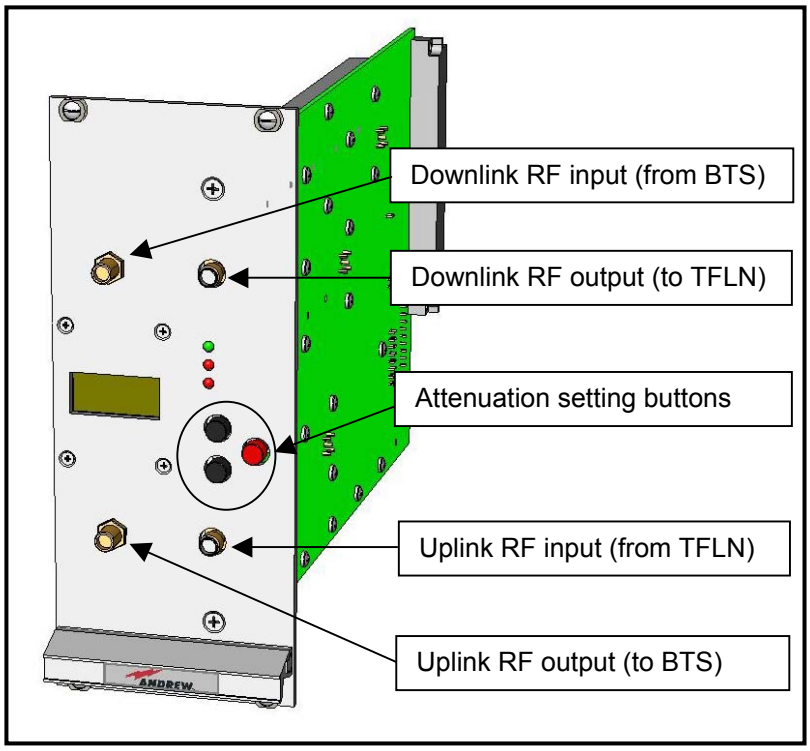
- set the correct power level for the RF downlink signal entering the DL input port of the TFLN local unit;
- set the correct power level for the RF uplink signal entering the BTS, in order to meet desired requirements about BTS blocking level and BTS receiver sensitivity. In UL apart from the 30dB attenuation range, it is provided with a gain allowing increasing dynamic available for the optimisation of the performances at BTS side.

Being digital, the TDI is provided with a LCD panel and buttons allowing setting the different attenuations on UL and DL independently (please refer to BriteTool manual to understand how to calculate the right value of attenuation trough BriteTool). The attenuation settings can also be done remotely through the supervision system.

RF ports

- 1 DL RF input port receiving the DL signal to be attenuated
- 1 DL RF output port sending out the attenuated DL signal
- 1 UL RF input port receiving the UL signal to be attenuated
- 1 UL RF output port sending out the attenuated UL signal

The attenuation required both on DL and UL can be properly set through LCD display or supervision system (30dB range, 1dB step).



TDI main applications

Main applications of the TDI module are:

- adjusting RF levels coming to/from a BTSs:
  - TBSI adjusts the DL signal to meet the required power level at TFLN DL input
  - TBSI adjusts the UL signal coming from TFLN to provide the required blocking level and receiver sensitivity to the BTS

It is advisable to use this module when an increase of the dynamic available on the UL path is needed.

TDI visual alarms

The TDI front panel is provided with 2 LEDs showing status and alarm information.
LED meaning is reported on the rightward table.
Further information about alarm status is delivered by Britecell Plus supervision system.

Label	*LED colour*	*Meaning*
Power	Green	Power supply status OK
UL Alarm	Red	UL amplifier failure

Tab. 13: Summary of TDI LEDs meaning

The Temperature alarm is considered a minor alarm and as the policy is to show through LED signalling only the major alarm, it will be provided only by the supervision system.
In case of power supply degradation the green LED switch off and the problem is signalled through the supervision system.

TDI power supply

Each TDI digital attenuator is supplied by the subrack back-plane (+12V).
The power consumption of each TDI is 3W max.

Warnings

The overall input power must not exceed +30dBm

Inserting or removing TDI modules

- Do not remove or insert any TDI module into TPRN subrack before having switched off main power supply.
- The TDI modules must be handled with care, in order to avoid damage to electrostatic sensitive devices.

TDI Installation

The TDI digital attenuator is housed in a TPRN subrack and its dimensions are 19" width and 4HE height. A TDI module can be accommodated in any of these 12 slots.

Note: In case a new TDI module has to be installed in a still working Master Unit, switch off the subrack before inserting the plug-in TDI module

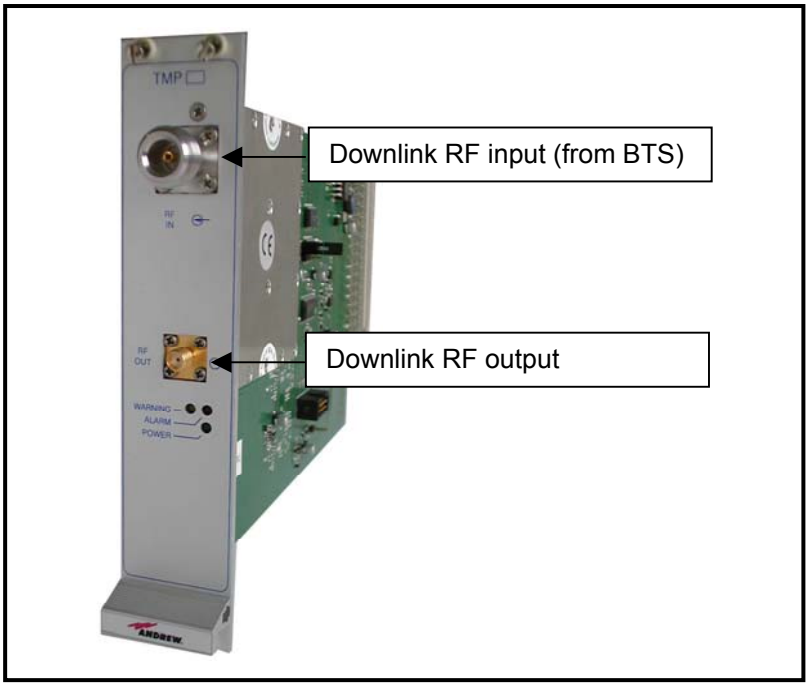
1. Unpack the kit which include
   - 1 TDI
   - 2 RF jumpers
2. Carefully insert the TDI module in any of the TPRN subrack slots and lock the 4 screws on the front corners.
3. Connect RF cables according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.
4. Switch on the subrack and set proper attenuation values.

Removing a TDI module

Switch off the Master Unit power supply and remove RF jumpers. Then

- unscrew the 4 screws and slowly remove the card.
- put the removed TDI card in its safety box.
- switch on again the Master Unit power supply.

4.10. Power limiter TMPx-10

Module name: **TMPx-10**	**Description** TMPx-10 power limiter is available in two versions, one suitable for 2G services and the other for 3G. This module monitors the DL input power and when Operator's BTS power increases above a set threshold, it ensures the signal path being attenuated by 10dB to avoid subsequent circuits being overdriven. TMPx-10 threshold is programmable through the supervision system.
RF ports ➢ 1 DL RF input port receiving the DL signal to be checked from the BTS ➢ 1 DL RF output port sending out the DL signal	

TMP main applications

Main applications of the TMP module are:

- Check DL RF level coming from a BTS in order to protect the system if the level exceed a programmed threshold

TMP visual alarms

The TMP front panel is provided with 3 LEDs showing status and alarm information.
LED meaning is reported on the rightward table.
Further information about alarm status is delivered by Britecell Plus supervision system.

Label	*LED colour*	*Meaning*
Power	Green	Power supply status OK
Warning	Amber	It signals a general warning which can be due to: - over temperature - no RF signal at input port
Alarm	Red	General TMP failure, it can be: - power supply degradation - switched mode active (10dB att.)

Tab. 14: Summary of TMP LEDs meaning

TMP power supply

Each TMPx-10 power limiter is supplied by the subrack back-plane (+12V).
The power consumption of each TMPx-10 is 2W max.

TMP insertion loss

The TMP insertion loss is as follows:

TMP insertion loss	< 1.5dB

When designing the system, remember to take into account the insertion loss of the TMP.

Warnings

The overall input power must not exceed +35dBm

Inserting or removing TMP modules

- Do not remove or insert any TMP module into TPRN subrack before having switched off main power supply.
- The TMP modules must be handled with care, in order to avoid damage to electrostatic sensitive devices.

TMP installation

The TMP power limiter is housed in a TPRN subrack and its dimensions are 19" width and 4HE height. A TMP module can be accommodated in any of these 12 slots.
Note: In case a new TMP module has to be installed in a still working Master Unit, switch off the subrack before inserting the plug-in TMP module

1. Unpack the kit which include
   - 1 TMP
   - 1 RF jumper
2. Carefully insert the TMP module in any of the TPRN subrack slots and lock the 4 screws on the front corners.
3. Connect RF cables according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.
4. Switch on the subrack

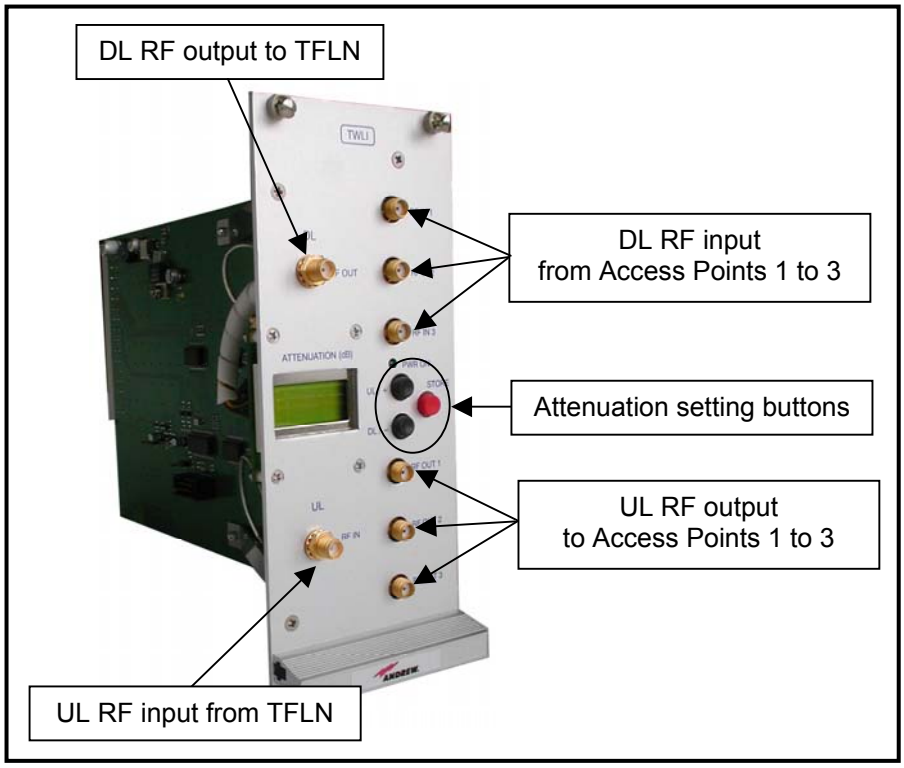
Removing a TMP module

Switch off the Master Unit power supply and remove RF jumpers. Then

- unscrew the 4 screws and slowly remove the card.
- put the removed TMP card in its safety box.
- switch on again the Master Unit power supply.

5. Optional equipment and accessories

5.1. WLAN interface TWLI

Module name: **TWLI**	**Description** Britecell Plus system allows distributing WLAN service (802.11b) through an auxiliary channel while concentrating all the Access Points together with the central equipment. The TWLI module allows connecting up to 3 Access Points to one TFLN and setting up to 4dB attenuation, if needed, on the DL path.
RF ports ➢ 3 DL RF input ports receiving the DL signals from up to 3 different Access Points ➢ 1 DL RF output port sending out the DL signal to the TFLN auxiliary port ➢ 1 UL RF input port receiving the UL signal from the TFLN auxiliary port ➢ 3 UL RF output ports sending out the UL signals to up to 3 different Access Points A 4dB attenuation range is available on the DL path in order to adjust levels coming from the Access Points.	

TWLI main applications

Main applications of the TWLI module are:

- provide to the TFLN the WLAN signals coming from up to 3 Access Points concentrated on the same room.

TWLI power supply

Each TWLI WLAN interface module is supplied by the subrack back-plane (+12V).
The power consumption of each TWLI is 2W max.

Warnings

The overall input power must not exceed +19dBm

Inserting or removing TWLI modules

- Do not remove or insert any TWLI module into TPRN subrack before having switched off main power supply.
- The TWLI modules must be handled with care, in order to avoid damage to electrostatic sensitive devices.

TWLI installation

The TWLI WLAN interface is housed in a TPRN subrack and its dimensions are 19" width and 4HE height. A TWLI module can be accommodated in any of these 12 slots.

Note: In case a new TWLI module has to be installed in a still working Master Unit, switch off the subrack before inserting the plug-in TWLI module

1. Unpack the kit which include
   - 1 TWLI
   - 2 RF jumpers
2. Carefully insert the TWLI module in any of the TPRN subrack slots and lock the 4 screws on the front corners.
3. Connect RF cables according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.
4. Switch on the subrack

Removing a TWLI module

Switch off the Master Unit power supply and remove RF jumpers. Then

- unscrew the 4 screws and slowly remove the card.
- put the removed TWLI card in its safety box.
- switch on again the Master Unit power supply.

5.2. Amplifier TWANx

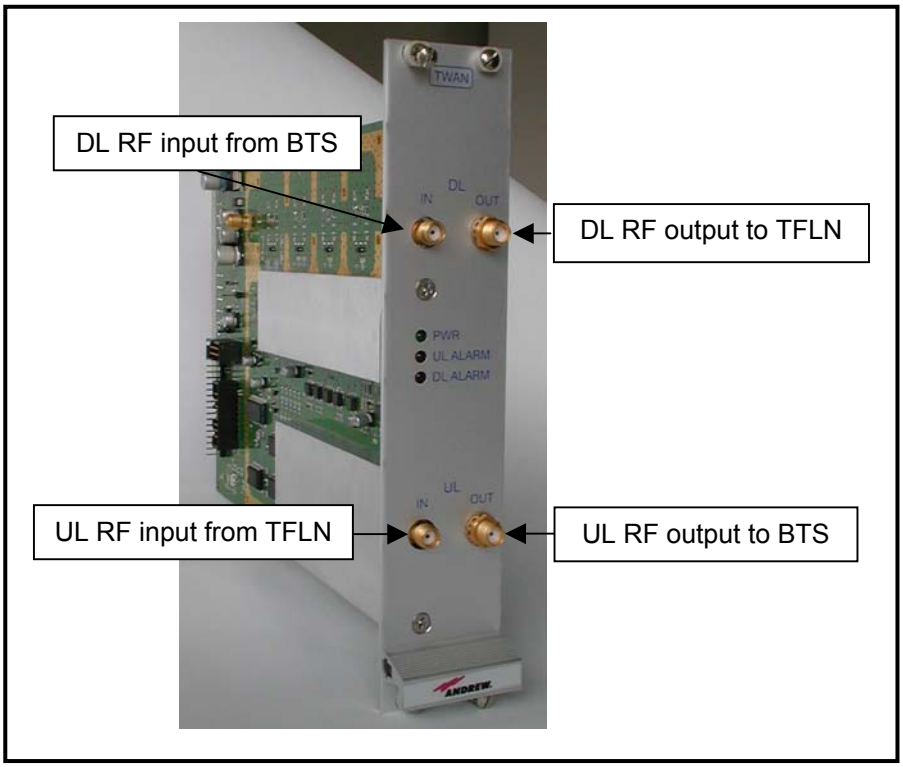
Module name:
TWAN

Description

The purpose of the TWAN module is to amplify DL and UL signals when Britecell Plus is interfaced with a low power BTS.
The gain allows also compensating for losses in splitting/combining network.
As this device is band dependent be sure to choose the right single band version.

RF ports

- 1 DL RF input port receiving the DL signal from BTS
- 1 DL RF output port sending out the amplified DL signal to the TFLN
- 1 UL RF input port receiving the UL signal from TFLN
- 1 UL RF output port sending out the amplified UL signal to the BTS



TWAN main applications

Main applications of the TWAN module are:

- amplifying the levels to/from a low power BTS:
- compensate for splitting/combining network losses

TWAN visual alarms

The TWAN front panel is provided with 3 LEDs showing status and alarm information.
LED meaning is reported on the rightward table.
Further information about alarm status is delivered by Britecell Plus supervision system.

Label	*LED colour*	*Meaning*
Power	Green	Power supply status OK
UL Alarm	Red	UL amplifier failure
DL Alarm	Red	DL amplifier failure

Tab. 15: Summary of TWAN LEDs meaning

The Temperature alarm is considered a minor alarm and as the policy is to show through LED signalling only the major alarm, it will be provided only by the supervision system.
In case of power supply degradation the green LED switch off and the problem is signalled through the supervision system.

TWAN power supply

Each TWAN digital attenuator is supplied by the subrack back-plane (+12V).
The power consumption of each TWAN module is 3W max.

Warnings

The overall input power must not exceed 0dBm

Inserting or removing TWAN modules

- Do not remove or insert any TWAN module into TPRN subrack before having switched off main power supply.
- The TWAN modules must be handled with care, in order to avoid damage to electrostatic sensitive devices.

TWAN Installation

The TWAN digital attenuator is housed in a TPRN subrack and its dimensions are 19" width and 4HE height. A TWAN module can be accommodated in any of these 12 slots.

Note: In case a new TWAN module has to be installed in a still working Master Unit, switch off the subrack before inserting the plug-in TWAN module

1. Unpack the kit which include
   - 1 TWAN
   - 2 RF jumpers
2. Carefully insert the TWAN module in any of the TPRN subrack slots and lock the 4 screws on the front corners.
3. Connect RF cables according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.
4. Switch on the subrack.

Removing a TWAN module

Switch off the Master Unit power supply and remove RF jumpers. Then

- unscrew the 4 screws and slowly remove the card.
- put the removed TWAN card in its safety box.
- switch on again the Master Unit power supply.

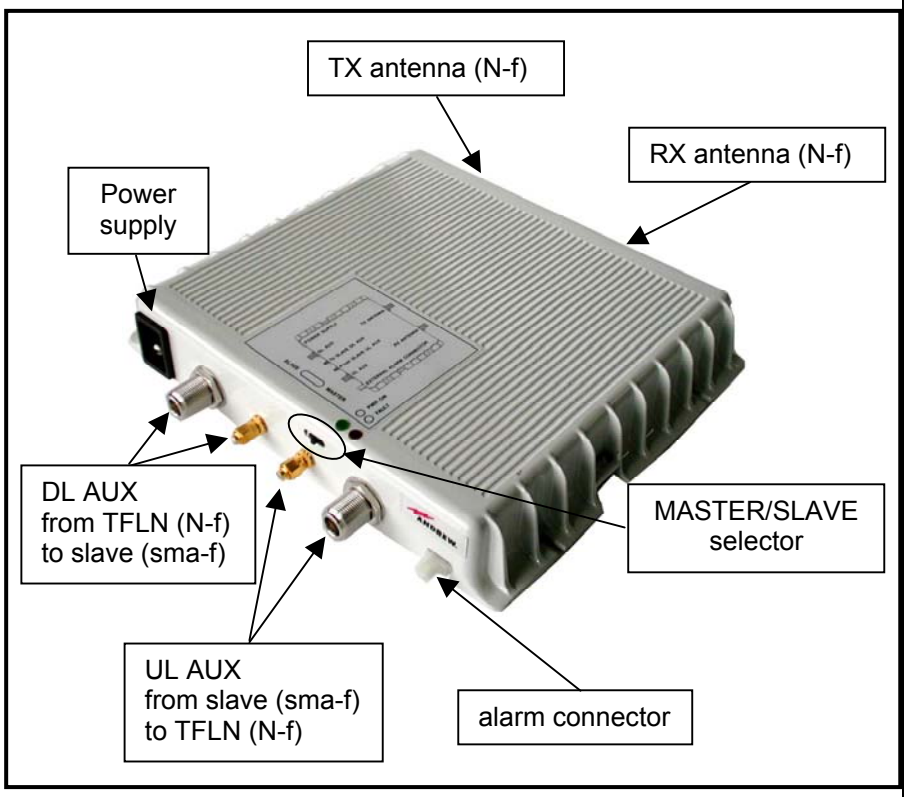
5.3. WLAN booster TFBWx

Module name: **TFBW**	**Description** Britecell Plus system allows distributing WLAN service (802.11b) through an auxiliary channel while concentrating all the Access Points together with the central equipment. The TFBW radio front end is connected to the remote unit in order to provide the radio coverage through the antennas (one for TX and the other for RX, required isolation between these antennas is 50dB). Up to 2 TFBW boosters can be cascaded to provide two coverage points.

RF ports

- 1 DL RF AUX input port receiving the DL signal from TFLN
- 1 DL RF AUX output port sending out the DL signal to another TFBW slave
- 1 TX antenna port
- 1 UL RF AUX input port receiving the UL signal from another TFBW slave
- 1 UL RF AUX output port sending out the UL signal to the TFLN
- 1 RX antenna port

A MASTER/SLAVE selector is provided allowing connecting two cascaded boosters



TFBW main applications

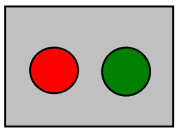
Main applications of the TFBW module are:

- amplify UL and DL WLAN signals coming to/from the auxiliary channel of a TFLN
- provide WLAN coverage through a TX and a RX antenna

Visual alarms:

Two control LEDs are provided on the TFBW front side.
The green LED describes the power supply status, while the red LED describes the major booster failures.

TFBW LED panel

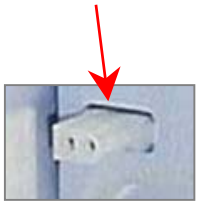


Led colour	*Meaning*
Red	DL amplifier failure
Green	Power supply status OK

Dry contact alarms:

TFBW is provided with a dry contact output, which can be connected to any of the dry contacts available on the remote unit. In such a way, the alarm information about this external device can be signalled through the red LED of remote unit.

dry contact



Dry contacts are open under non-alarm condition

Power supply:

TFBW WLAN booster can be powered by universal mains (85/265 Vac) or by negative supply (-72/-36 Vdc).
The power consumption of each TFWB module is 16W max.

Warnings

Choosing a proper installation site for the WLAN booster

- WLAN boosters are to be installed as close as possible to the radiating antennas, in order to minimize coaxial cable length.
- When positioning the TFBW booster, consider that the placing of the relating antennas should guaranteed an isolation between antennas of at least 50dB
- The TFBW booster is intended to be fixed on walls, false ceilings or other flat vertical surfaces

TFBW installation

The kit includes:

- 1 TFBW booster
- 2 50 Ω sma loads
- 2 RF jumpers
- 1 alarm cable

and according to the chosen model mains plug or -48 plug

To install the TFBW WLAN booster follow next steps:

1. drill into the wall so as to install four M4 screw anchors (not included) according to the dimensions indicated by the installation drawing in fig. 6.
2. fix the TFBW booster to the wall by firmly screwing the anchors.
3. connect RF cables according to what planned by designer. Use a specific torque wrench to fix each cable to relevant ports.
4. connect the TFBW to the power supply.

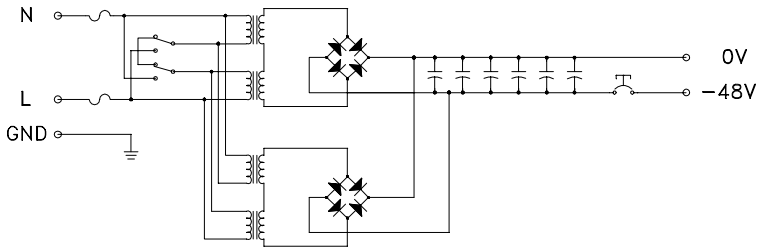
5.4. Remote power supply TRS/TRSN

Module name:
TRS/TRSN

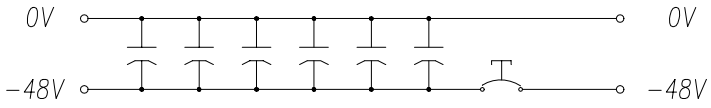
Description

TRS/TRSN provides centralised supply to all remote units through individual outputs with short circuit protection switches.
Main supply (230Vac or 115Vac) is converted into a -48Vdc.
TRS/TRSN supply unit has been designed to provide DC supply with standard AWG14/16 copper line to the remote units. Maximum allowed distance depends on copper section, remote unit current consumption and voltage range.
A passive option is available if -48Vdc is already provided.

Active distribution



Passive distribution



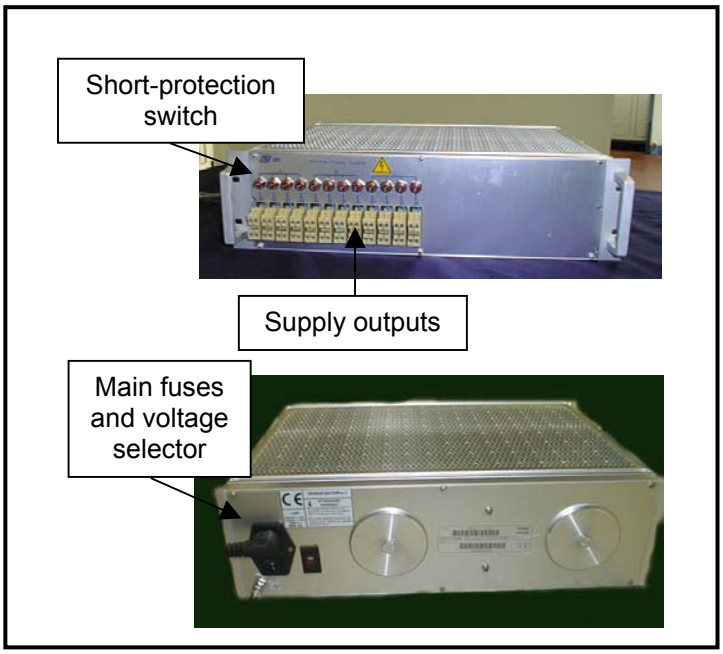
Ports

TRS version is applicable to all low power remote units and TFAN20. It is available with

- 24 supply outputs
- 12 supply outputs

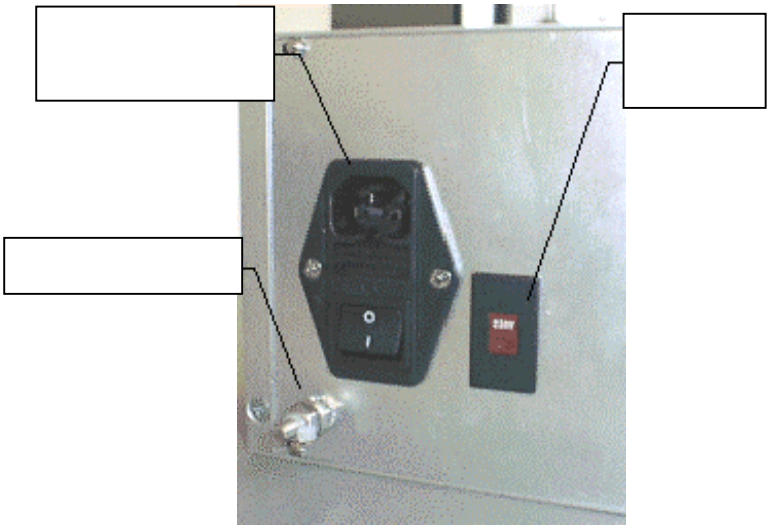
TRSN version is applicable to tri-band and medium power remote units. It is available with

- 12 supply outputs



Power supply:

Two types of mains (115/230VAC, 50/60Hz) can be applied to the TRS/TRSNx2 versions which have been designed for active distribution of nominal -48VDC. Mains connector and voltage selector are placed on the back panel.



A TRS/TRSNx1 passive version is available in which a direct current (–72 to –36 VDC) can be applied to the system. Power supply cabling is provided: the blue cable support –48 VDC, the black one 0 VDC.

Ground terminals are part of supply connectors. An external grounding terminal (screw) is also available.

Mains connector and switch houses also the fuses:

- 250V, 4A delayed type for the active version
- -48V, 15A delayed type for the passive version

Warnings

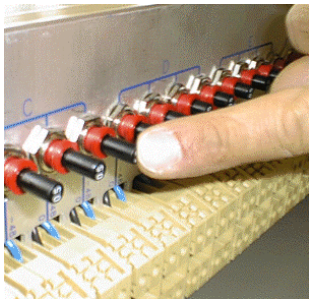
- Caution: do not open the unit before disconnecting the mains. Internal assemblies can be accessed by qualified personnel only
- Do not connect supply outputs to remote units before switching off the unit or disconnecting the mains
- Being a DC supply provided, a wrong connection can damage the remote unit. Verify the proper polarity before switching on the equipment.

TFBW installation

The TRS/TRSN subrack should be placed as near as possible to the TPRN to allow an easy cabling in case of mixed fibre-copper cables. If the subrack mounting location is not provided with a good air circulation, leave at least one unit free between subracks.
The kit includes a TRS/TRSN and a power cable.

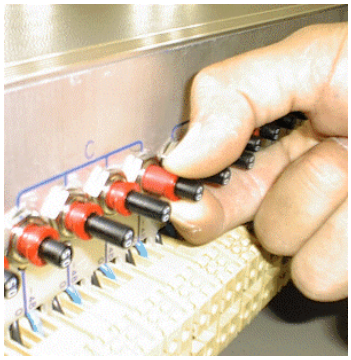
1. Fix the TRS/TRSN subrack to the cabine with 4 screws
2. During the installation phase don't connect the power cable to the main power line and don't switch on the TRS/TRSN
3. Set the switch in accordance with your main power line (115 Vac or 230 Vac) for universal mains option. In case of negative supply option (-48 VDC), no switch is provided. Then connect the ground screw.
4. Before connecting the wires from TRS/TRSN to the remote units, open all the fuses pulling the red circle then connect electrical wires for the remote units
5. When all electrical wires have been connected and the system is ready to start, connect the power cable, switch on the TRS/TRSN. Push one fuse at a time.

Each remote unit can be switched on-off by the relevant switch. The pictures below show how to do it.



OFF position

ON position: push down the black button



To switch off pull out the red collar.

If a surge or an overloading condition occurred the switch automatically jump into an OFF position.

TRS/TRSN startup

- Check that power supply voltage selector is in the correct position (115 or 230 VAC). In passive distribution version this selector is not present.
- Have all the switches in OFF position
- Check the connection polarity is not wrong
- Power on the TRS/TRSN unit through the back general switch
- Power on each remote unit through the front panel switches
- Check if the remote units shows the proper green supply led ON

TRS/TRSN Troubleshooting

If the remote unit doesn't appear to be properly supplied

- Check the fuses on the rear panel
- Check the voltage at the front panel screw connectors: nominal value without load is -59VDC, nominal value with full load is -48VDC. If Those values are exceeded by 10% check the if the mains are within the allowed limits. In passive distribution version, the output voltage depends on the supply source.
- Check the voltage at the remote side it should be in the range -36 to -72 VDC that is the maximum allowed range admitted by the remote units.

If the protection switch jump always in OFF position

- Check if any short on the line
- Check if the remote unit shows the nominal current power consumption.
- Check if any long period overshooting related to the mains supply.

If the fuses blow up after a power-on with all the front switches ON, there should be a too high initial peak current transient: check the proper fuse (delayed type) or substitute with an higher current fuse (i.e. 6A or 10 A). If the problem still persists check the proper ground /mains connection.