VX 29 B series

RF amplifier, remotely powered

417050-a (07/2020)

Please read the user instructions before using the equipment.

Stay up to date

For more information on your device, please visit our support website at **wisiconnect.tv** and browse to:
Knowledge Base > VX series > Products > VX 26 B / VX 29 B

bit.ly/wisivx2xb

CE declaration of conformity

Please find the declaration of conformity at our website:

download-area.wisi.de

Then navigate through "CE Declarations of Conformity" and select the document link corresponding to your device.

Document revision information:

Date	Doc. rev.	Document changes
07.07.2020	a	First release FW v1.0.0.12 / HFC manager+ v2.7.12 / HFC updater v0.4.8

Operating instructions

VX 29 B series -
RF amplifier, remotely powered

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1 Safety and warning notes

Please familiarize with the instructions before start-up.

Carefully inspect the device for any obvious damage. If it appears to have been damaged, contact your WISI representative.

Do not use any equipment with noticeable damage!

1.1 ESD protection

This product contains electrostatic sensitive components.

These parts can be damaged or effectively destroyed by electrostatic discharge (ESD) during unpacking, installation, removal, storage, or shipment if incorrectly handled.

Please note that discharge might go unnoticed by a user.

Always take common anti-static precautions when handling the equipment.

1.2 Electrical safety

Risk of bodily injury from electric shock!

Failure to adhere to these instructions could result in personal injury and/or damage to electrical components.

- The equipment must be grounded in accordance to local and national electrical standards.
- The device is started up immediately when the power plug is inserted into the mains socket. To turn off the power supply, the plug must be removed from the socket. Never pull at the cable.
- The mains socket should be easily accessible. In the event of operational error, the plug must be immediately removed from the socket.
- The power supply partition of the equipment as well as all coaxial interfaces carrying remote power feeding contain dangerous voltages. All service or maintenance work should be carried out by qualified personnel who can get assistance by contacting the manufacturer's agent.

2 Device overview

2.1 Options and Accessories

Powering options (see section 2.3)

WISI type	Description
VX 29 B xxxx	RF amplifier, 27...65 V AC
XE 29	Cabling kit for external power insertion

RF connectors

WISI type	Description
ZG 27	PG 11 case connection for WISI MK 15 cable
ZG 28	PG 11 adapter, F female
ZG 35 A	PG 11 adapter, 3.5/12 female

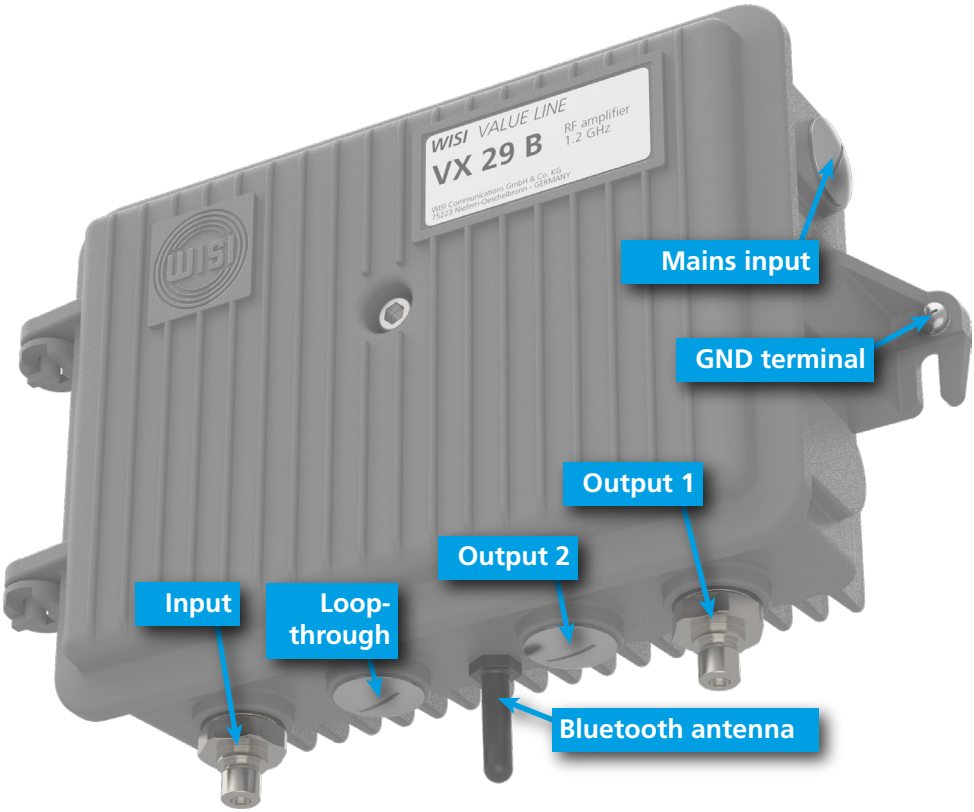
Input / output configuration modules (see section 4.1)

WISI type	Description
-	Output bridge
XM 51 B	Splitter 4 dB / 4 dB
XM 53 B	Tap 8 dB / 2 dB
XM 55 B	Tap 13 dB / 1 dB
XM 56 B	Tap 18 dB / 1 dB

Control tools (see chapter 3)

WISI type	Description
OH 41	Handset for local device control
HFC manager+	Android app for device control via bluetooth
HFC updater	Mobile app for firmware update and recovery via bluetooth

2.2 Outer features



Outer interfaces of the amplifier.

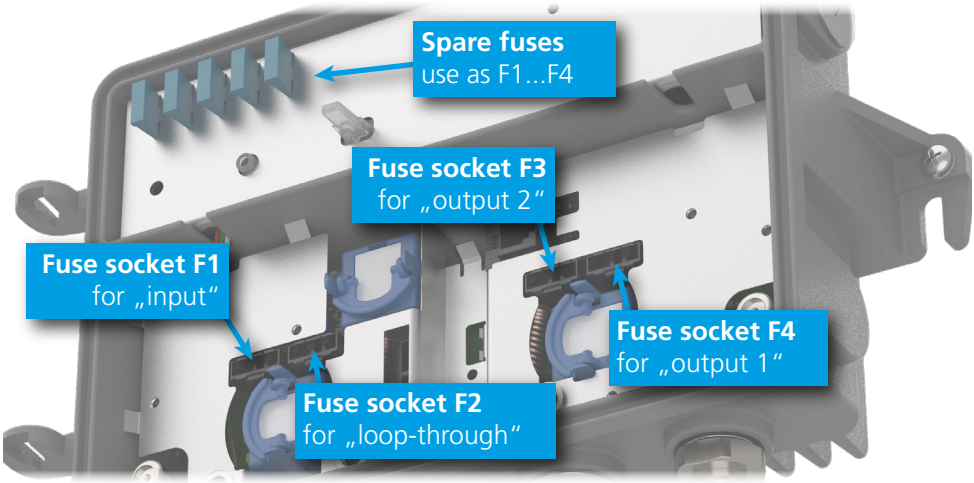
2.3 Powering options

NOTE: The power supply partition of the equipment as well as all coaxial interfaces carrying remote power feeding contain dangerous voltages. Please see the safety notes in section 1.2!

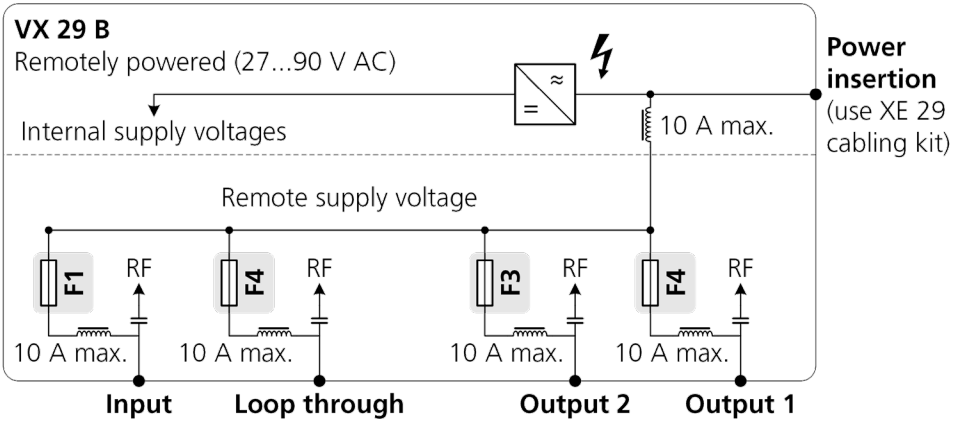
VX 29 B uses a 27...90 V AC voltage input. The optional ***WISI*** XE 29 cabling kit allows for the power insertion from a suitable voltage supply directly via the mains

input. Alternatively, remote powering can be engaged from one of the RF ports by plugging the according fuse.

Each of the the fuse sockets also allows for the forwarding of the applied device supply voltage to the corresponding RF port.



The fuse sockets connect the internal remote supply plane to the particular RF ports.

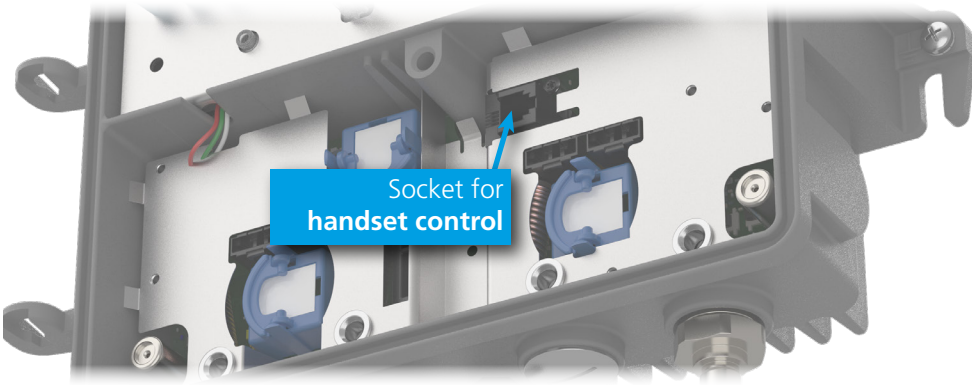


Powering options with the remotely-powered VX 29 B types

3 Control interfaces

3.1 Handset interface (for *WISI* OH 41)

NOTE: VX 29 B only works with handsets OK 41 A and OH 41. OK 41 is outdated and not compatible.



Position of the handset connector.

Handset basics

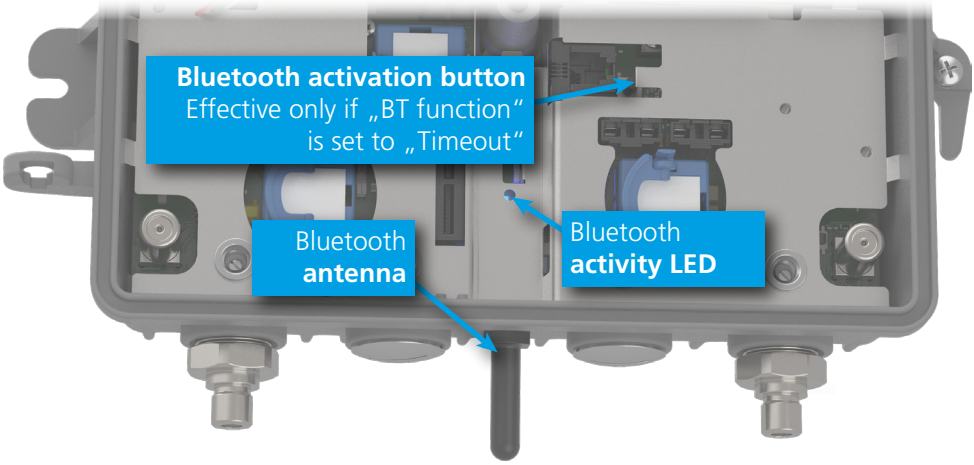
Parameter menu	
▲▼ keys	Select parameter
► key	Open parameter sub-menu
◄ key	Back

Parameter sub-menu	
◄► keys	Select digit to be changed (cursor blinks under the active digit)
▲▼ keys	Change the value
Saving: After completion of all settings, press the ► key for leaving the value field. The settings are saved now. **NOTE**: If not saved, settings are lost as soon as the handset is disconnected.	

3.2 Bluetooth interface basics

The management interface of VX 29 B can be accessed using the bluetooth low-energy (BLE) wireless technology. The bluetooth antenna enables the radio connection to a smart phone or tablet.

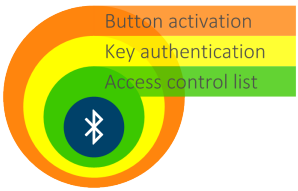
The Android app ***WISI*** HFC Manager+ provides the GUI for the configuration of the fiber node, whereas the ***WISI*** HFC updater brings firmware update and recovery functions.



Bluetooth access elements

Multilevel security implementation

There are three security levels to prevent the node from unauthorized access:



Level 1: Button activation

The BT activation button inside the node (see figure above) opens the bluetooth interface for connections. The **button activation behavior** can be modified via handset.

Level 2: Key authentication

If **Bluetooth bonding** is enabled, the connecting mobile device needs to authenticate with a configurable key. The initial key is 565835, you can change it as described below (**key modification**).

NOTE: Please activate the bluetooth bonding and change the key during the first setup in order to avoid unauthorized access!

Level 3: Access control list (ACL)

Once paired, a BT device is put on the access list. If **ACL restriction** is enabled, the node will only allow clients within this list to connect. The list is cleared by switching the ACL restriction filter off.

Button activation behavior:

Handset: Bluetooth > BT Function >	timeout / disabled (off) / hold (on) default: timeout

Bluetooth bonding (key restriction)

Handset: Bluetooth > BT Bondmanager >	no bonding / bonded / scrambled default: no bonding

Key modification:

Handset: Bluetooth > BT Key >	6 digits, numerical default: 565835

ACL restriction:

Handset: Bluetooth > BT MACFilter >	filter off / filter on default: filter off

3.3 Device control using *WISI* HFC manager+

Please install the android app from the Google Play Store:

https://play.google.com/store/apps/details?id=de.wisi.hfc_manager

When starting up the application, the device scan listing will populate with the active bluetooth devices nearby:

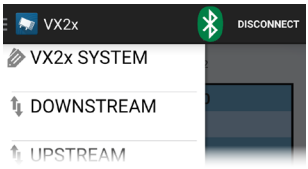
Device scan list (example)

Select your device and wait for the connection to be established. Once connected, the Bluetooth logo in the upper right corner will show the connection quality.

The start screen provides a selected set of device details:

Device overview (example)

The menu is available through the blue logo in the upper left corner or by swiping from the left screen edge.



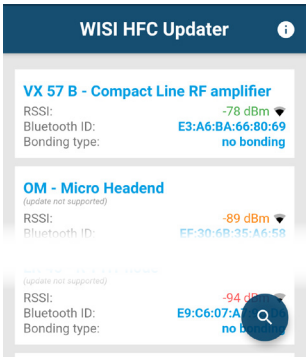
App menu overview (example)

3.4 Firmware updates and recovery using *WISI* HFC updater

You can use the ***WISI*** HFC updater app to update the amplifier's firmware via a bluetooth connection.

3.4.1 Basic update procedure

1. When starting up the application, the device scan listing will populate with the active Bluetooth devices nearby. The list is sorted by signal strength. Tapping the search button on the lower right will initiate another scan.

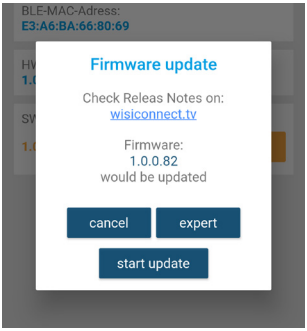


Device scan list (example)

2. Tap on the device you want to operate on. After a few seconds of loading time, the device inventory will show up.

Device inventory (example)

3. If there is an update available for your device, the SW version will be highlighted.
4. The „Update“ button opens the update screen. This will only be available, if the particular device does support FW updates via bluetooth.



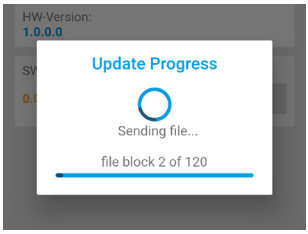
Update screen (example)

5. Double check the firmware versions. Maybe you want to follow the link to our support website wisiconnect.tv in order to check the release notes.

NOTE: Although all user settings will be restored after the update, signal transmission will be affected temporarily during the update process!

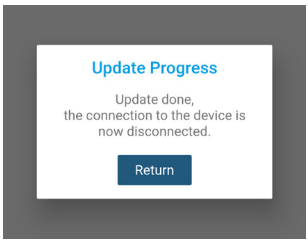
6. If sure to proceed, start the update process by tapping **start update**. The firmware upload can take up to 10 minutes. Avoid disturbing the bluetooth connection during the update process: Leave the HFC updater app active on

the mobile device, do not make or take calls, and stay within the reach of the bluetooth connection.



Update progress (example)

7. Once finished, the app will show a message on the outcome of the update process.

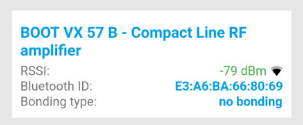


Confirmation message (example)

8. Depending on your device settings, you may have to re-activate the bluetooth interface using the bluetooth button. Then, reconnect to the amplifier and verify the installed firmware version.

3.4.2 Recovery of devices stuck in bootloader

Mainly due to adverse bluetooth radio conditions during update operations, you may find an amplifier stuck in bootloader mode. A bootloader device can be identified by a modified device name in the scan list.



Found device in bootloader mode (example)

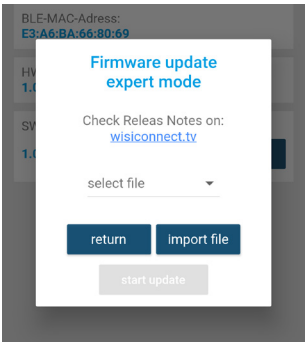
Typically, restarting the basic update procedure will automatically find an applicable firmware and accomplish the update task.

Expert mode:

In case the HFC updater fails to identify the device type correctly, the "expert" mode can help recover the unit, either by choosing one of the included firmware images from the "select file" list or by importing an update file from your mobile storage.

IMPORTANT NOTES on updates in expert mode:

- Applying an inappropriate firmware update can lead to severe malfunctions!
- Be sure to choose the correct device type from the "select file" list!
- Use only update files from trusted sources!
- Never change any file name or contents of update files!



Expert mode of the update screen

3.5 Remote control via FSK receiver module VT 21

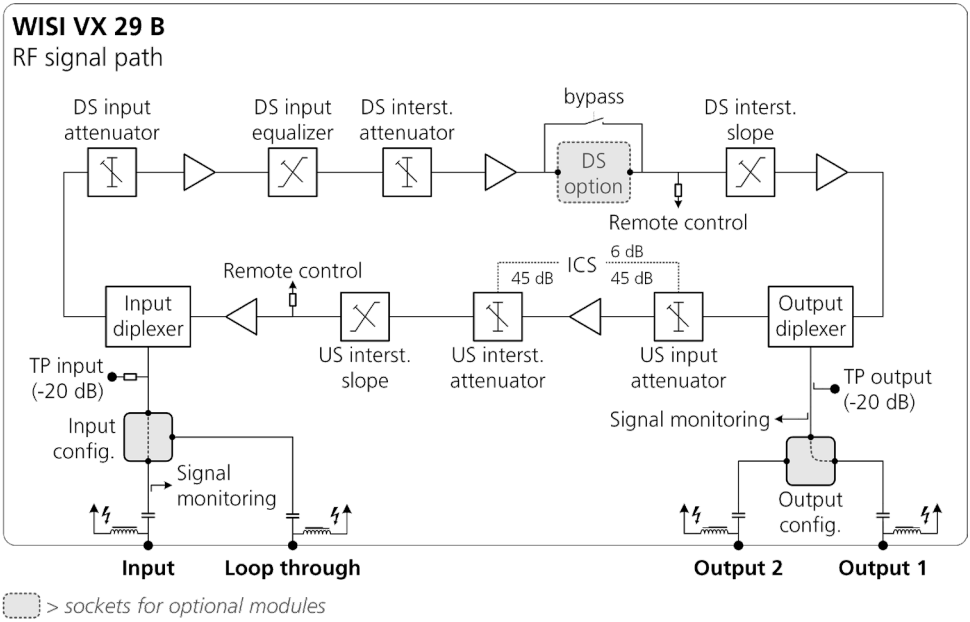
Compatible modules:

WISI type	Description
VT 21	FSK receiver module, 868 MHz
VT 21 B	FSK receiver module, 862 MHz
VT 21 T	FSK receiver module, tunable

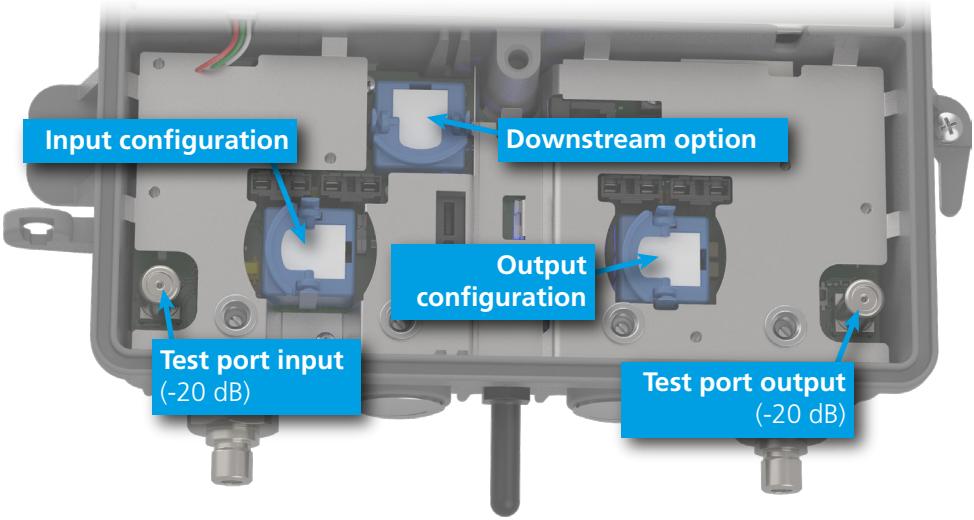
The FSK-receiver modules from the WISI VT 21 series provide remote control functionalities compatible to the FOSTRA-F system (HEC 2191) and EN 60728-14.

4 Configuration of signal transmission

4.1 General signal path setup



Signal transmission block diagram



Signal configuration features inside the amplifier housing

4.1.1 Modules for input and output configuration

WISI type	Description
-	Bridge
XM 06 B	Attenuator 0 dB / 6 dB
XM 51 B	Splitter 4 dB / 4 dB
XM 53 B	Tap 8 dB / 2 dB
XM 55 B	Tap 13 dB / 1 dB
XM 56 B	Tap 18 dB / 1 dB
XM 69 B	Attenuator 6 dB / 9 dB

Input configuration socket

The nominal RF input level for the VX 2x B is 70 dBµV per channel. If, due to special signal scenarios, the input signal is strongly sloped or much higher than the nominal level, pluggable input configuration modules can be used in order to facilitate the signal alignment.

Also, by placing a tap module for the input configuration, the loop-through port can be used as an additional, unamplified signal output.

Output configuration socket

The output configuration modules allow for the distribution of the power stage output signal to the RF output ports 1 and 2.

NOTE: The insertion loss of the splitters and taps will affect the maximum available downstream level at the RF ports!

4.1.2 Downstream option modules

***WISI* type**	**Description**
-	no module - socket bypassed
XE 51 B	Slope 3 dB & 9 dB
XE 52 B	Slope 12 dB & 18 dB
XE 57 B	Cable simulation 6 dB & 9 dB

Downstream option bypass

Handset:	Downstream > ModuleByPass >	auto / bypass / through default: auto

4.1.3 Diplexer frequency switch (FlexAccess)

Diplexer frequency switch

HFC manager:	FLEX ACCESS > Diplex Switch >	F1 / F2 (frequencies depending on amplifier type)
Handset:	Upstream > DiplexSwitch >	

4.2 Basic downstream alignment

Downstream input attenuator

HFC manager:	DOWNSTREAM > Input Attenuator >	0...20 dB 0.5 dB steps
Handset:	Downstream > InputAttenuator >	

Downstream input equalizer

HFC manager:	DOWNSTREAM > Input Eq. > Input Eq. >	0...25 dB 0.1 dB steps
Handset:	Downstream > InputEqualizer >	

HFC manager:	DOWNSTREAM > Input Eq. > Cable Sim. >	0 / 5 / 10 dB default: 0 dB
Handset:	Downstream > CableSimulator >	

Downstream interstage attenuator

HFC manager:	DOWNSTREAM > Interstage Atten. >	0...20 dB 0.1 dB steps
Handset:	Downstream > InterStageAtt >	

Downstream interstage slope

HFC manager:	DOWNSTREAM > Interstage Slope >	0...15 dB 1.0 dB steps
Handset:	Downstream > InterStageSlope >	

4.3 Basic upstream alignment

Upstream input attenuator

HFC manager:	UPSTREAM > Input Attenuator >	0...15 dB 0.5 dB steps
Handset:	Upstream > US InputAtt >	

Upstream interstage attenuator

HFC manager:	UPSTREAM > Interstage Attenuator >	0...15 dB 0.5 dB steps
Handset:	Upstream > US IntStageAtt	

Upstream interstage slope

HFC manager:	UPSTREAM > Interstage Slope >	0...12 dB 1.0 dB steps
Handset:	Upstream > US Slope >	

Ingress control switch (ICS)

HFC manager:	UPSTREAM > ICS >	0 / 6 / > 45 dB default: 0 dB
Handset:	Upstream > US ICS >	

4.4 Spectral monitoring

WISI VX 29 B makes use of an integrated RF tuner for spectrally resolved level measurements of the amplifier's input and output signals.

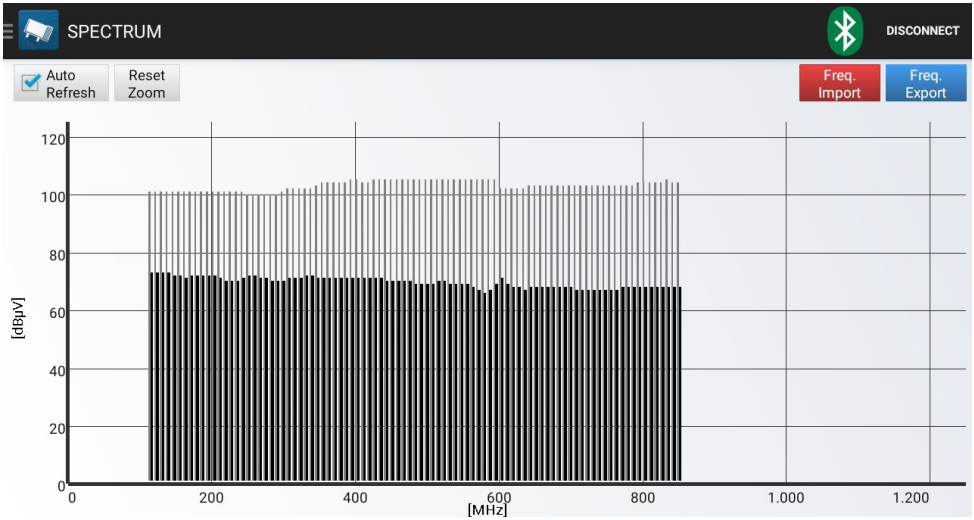
This enables spectral monitoring of downstream signals (as following), and moreover the auto-alignment routine (section 4.5) and the automatic level and slope control (ALSC, section 4.6).

NOTES on the reference point for the measurements:

- The output measurement signal is tapped from the diplexer output (see diagram in section 4.1).
- The measurements are compensated for losses of the output path including the insertion loss of the detected output configuration modules.
- The monitored output levels are given for the signal interface RF in/out 1, so keep in mind that RF in/out 2 can deviate if an asymetric **output configuration module** (see section 4.1.1) is plugged.
- Input measurements are compensated for losses of the input path from the connector to the detector.

Spectral monitoring GUI

The **WISI** HFC manager+ (see section 3.3) provides a quick and simple overview on the amplified RF signals without the need for external measurement equipment.



Spectral representation of the RF input (black) and output (grey) signals

RF channel table

In order to obtain a meaningful representation of the spectrum analysis, the RF channel table stored in the LR 45 should match your downstream channel lineup.

The channel table consists of semicolon-separated values in a *.csv file with the following line format:

`[frequency];[modulation format]<CR><LF>`

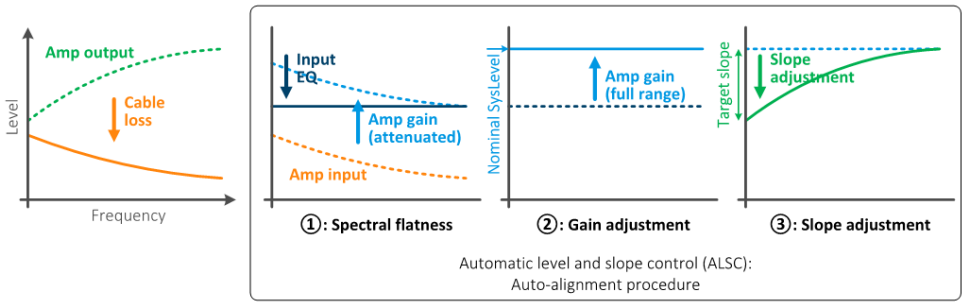
Syntax item	Description
`[frequency]`	RF channel frequency in MHz PAL: carrier frequency / QAM: center frequency
;	Column separator: ; [semicolon]
`[modulation format]`	`CW` (unmodulated) / `PAL` / `QAM` (necessary for correct sensor calibration)
<CR><LF>	Line break (typically given by the spreadsheet editor)

example.csv:

```
311.25;PAL
319.25;PAL
330;QAM
338;QAM
```

4.5 Auto-Alignment

The auto-alignment functionality allows for a quick and easy, error-free optimum level adjustment of the VX amplifier chain.



Principle and sequence of the auto-alignment process

Follow these steps in order to execute the auto-alignment:

1. Make sure that the **ALSC mode** is set to „off“.
2. Auto-Alignment functionality is reliant on the **number of reference channels** (pilots) set to “two pilots”.
3. Choose two channels from your RF channel lineup and set the **pilot frequencies** and the **pilot modulation formats** accordingly. If possible, select two frequencies far apart from each other.
4. Enter the **target downstream level** and the **target downstream slope** which you want the amplifier output to provide. Please respect the note on the reference point for the measurements on page 21 (section 4.4).
5. Select whether or not to perform the **automatic upstream alignment**.

6. If automatic upstream alignment is chosen, the the transmission loss of the incoming cable span has to be estimated. To do so, enter the **previous downstream level** and **previous downstream slope**.
7. You can automatically start the **ALSC after successful auto-alignment**.
8. Now you can **start the auto-alignment** process. In case of wrongly plugged modules or severe level deviations there will be a notification.

ALSC mode

HFC manager:	ALSC > ALSC Mode >	ALSC on / ALSC off
Handset:	ALSC-Unit > ALSC Mode >	

Number of reference channels

HFC manager:	AUTO ALIGNMENT > Pilots >	one pilot / two pilots
Handset:	ALSC-Unit > ALSC Mode >	

Pilot frequencies

HFC manager:	AUTO ALIGNMENT > Frequency [1/2] >	40...1002 MHz 0.1 MHz steps
Handset:	ALSC-Unit > ALSC Freq [1/2] >	

Pilot modulation formats

HFC manager:	AUTO ALIGNMENT > Mod. Type [1/2] >	QAM / PAL / CW
Handset:	ALSC-Unit > ALSC Type [1/2] >	

Target downstream level

HFC manager:	AUTO ALIGNMENT > Nominal SysLevel >	80...115 dBµV 0.1 dB steps
Handset:	ALSC-Unit > AALIG SysLevel >	

Target downstream slope

HFC manager:	AUTO ALIGNMENT > Target Slope >	0...30 dB 0.1 dB steps
Handset:	ALSC-Unit > AALIG SysSlope >	

Automatic upstream alignment

HFC manager:	AUTO ALIGNM. > Upstream Alignment >	on / off
Handset:	ALSC-Unit > AALIG Start > [NoUS+Xxx]	

Previous downstream level

HFC manager:	AUTO ALIGNMENT > Previous SysLevel >	80...115 dBµV 0.1 dB steps
Handset:	ALSC-Unit > AALIG PrevLevel >	

Previous downstream slope

HFC manager:	AUTO ALIGNMENT > Previous Slope >	0...30 dB 0.1 dB steps
Handset:	ALSC-Unit > AALIG PrevSlope >	

ALSC after successful auto-alignment

HFC manager:	AUTO ALIGN. > ALSC after Alignment >	on / off
Handset:	ALSC-Unit > AALIG Start > [Xxx+ON/OFF]	

Start the auto-alignment

HFC manager:	AUTO ALIGNMENT > START >	
Handset:	ALSC-Unit > AALIG Start >	

4.6 Automatic level and slope control (ALSC)

The integrated signal monitoring circuitry enables the amplifier to regulate its gain in order to keep particular pilot carriers on a referenced level, compensating for fluctuations in end-to-end link loss, e.g. due to temperature-dependent cable losses.

NOTE: The ALSC requires regulation headroom in the settings of input attenuator and slope. Thus, ALSC setup will fail with a corresponding error message, if attenuator and/or slope settings are too close to the boundaries.

4.6.1 Activation of the ALSC

For the activation of the ALSC regulation, follow these steps:

1. Make sure that the **ALSC mode** is set to „off“.
2. Adjust the downstream attenuators and downstream slopes (see section 4.2). You can also perform the auto-alignment procedure as described in section 4.5.

The **ALSC wizard** implemented in the HFC manager+ app since v2.7.0 will guide you through the following procedure. Alternatively, you can perform the settings parameter by parameter.

3. Choose the **number of reference channels** (pilots) from your RF channel lineup and set the **pilot frequencies** and the **pilot modulation formats** accordingly.
4. Check the **measured pilot levels** at the reference frequencies. Please respect the note on the reference point for the measurements on page 21 (section 4.4).
5. **Normalizing the ALSC** stores the currently measured pilot levels as **ALSC reference level**.
6. Activate the regulation by setting the **ALSC mode** to “on”.
7. After some adjustment time, the **ALSC state** should become “OK”, and the measured pilot levels settle close to the reference levels.

ALSC mode

HFC manager:	ALSC > ALSC Mode >	ALSC on / ALSC off
Handset:	ALSC-Unit > ALSC Mode >	

ALSC wizard

HFC manager:	ALSC > Start ALSC Wizard >	

Number of reference channels

HFC manager:	ALSC > [set by ALSC wizard]	one pilot / two pilots
Handset:	ALSC-Unit > ALSC Mode >	

Pilot frequencies

HFC manager:	ALSC > [set by ALSC wizard]	40...1002 MHz 0.1 MHz steps
Handset:	ALSC-Unit > ALSC Freq [1/2] >	

Pilot modulation formats

HFC manager:	ALSC > [set by ALSC wizard]	QAM / PAL / CW
Handset:	ALSC-Unit > ALSC Type [1/2] >	

Measured pilot levels

HFC manager:	ALSC > Level [1/2]	read-only
Handset:	ALSC-Unit > ALSC Level [1/2]	

Normalizing the ALSC

HFC manager:	ALSC > [set by ALSC wizard]	yes / no
Handset:	ALSC-Unit > ALSC Normalizing >	

NOTE: Normalizing of the ALSC requires regulation headroom in the settings of input attenuator and slope. Thus, normalization will fail with a corresponding error message, if attenuator and/or slope settings are too close to the boundaries.

ALSC reference level

HFC manager:	ALSC > Ref Level [1/2]	read-only
Handset:	ALSC-Unit > ALSC RefLev [1/2] >	

4.6.2 ALSC regulation behavior

While the **ALSC mode** is set to "ALSC on", the regulation tries to minimize the **pilot level deviation** by means of attenuator and equalizer adjustment.

Additional to the reference levels, the amplifier stores the actual attenuator and equalizer settings at the normalization time. During regulation due to input level variations, there will be **attenuator deviation** and **equalizer deviation**, both relative to their stored reference values.

With the deactivation of the ALSC (**ALSC mode** "off"), all attenuators and equalizers will return to their referenced values, regardless of their previously ALSC-induced positions.

The **ALSC state** indicates the actual regulation status.

ALSC mode

HFC manager:	ALSC > ALSC Mode >	ALSC on / ALSC off
Handset:	ALSC-Unit > ALSC Mode >	

Pilot level deviation

HFC manager:	ALSC > Level [1/2] Dev.	read-only

Attenuator deviation

HFC manager:	ALSC > Input Att. Dev.	read-only

Equalizer deviation

HFC manager:	ALSC > Input Eq. Dev.	read-only

ALSC state

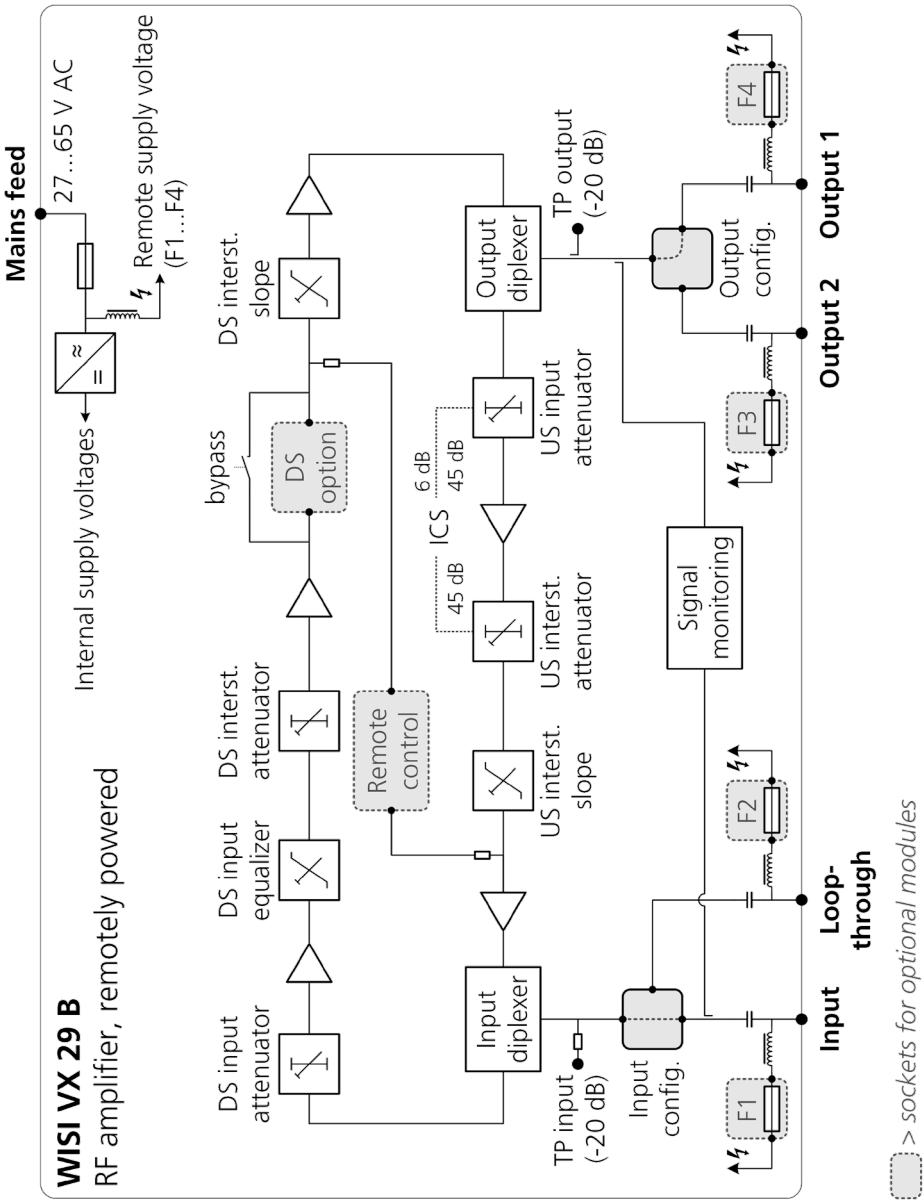
In order to prevent signal disturbances in case of pilot failure, the ALSC is prohibited to use extreme attenuator or equalizer adjustments. The lock-in range of the regulation is limited to +/- 6 dB in attenuator deviation (+/-4 dB if slope pivot frequency is set to 1006 MHz).

HFC manager:	ALSC > ALSC State	read-only
Handset:	ALSC-Unit > ALSC CtrlState	see table below

ALSC state	Status description	Typical scenarios
OK	All values in tolerance	Normal steady-state operation
fail	ALSC trying to reach lock-in range	ALSC newly activated; Insufficient level detected
frozen	Attenuators and equalizers fixed on last valid value	30 seconds after last valid measurement
fail & frozen	Deviation out of lock-in range; Attenuators and equalizers fixed on last valid value	Pilot / input loss; Normalizing stored inappropriate / unreachable reference levels

space for your notes...

5 Functional diagram



6 Service and support: wisiconnect.tv

The web portal

Link to the portal: **wisiconnect.tv**
You will find the following information in the portal:

- **Documentation and Software Updates** – Datasheets, Quick Guides, Manuals, Firmware Updates, Known Issues List, etc.
- **Entitlements for your Units** after registration
- **Forum** – You can discuss or share information about product configuration
- **FAQ**

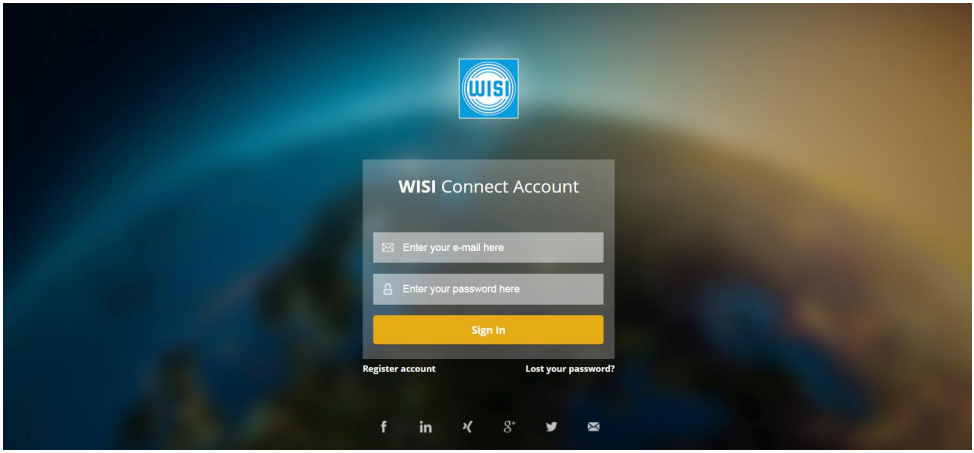
Requesting access to the wisiconnect.tv portal

If you do not have a password for access to the portal, please click the „register" link and fill in the required fields.

Login to wisiconnect.tv

Enter your e-mail address and password, and click **Login**.

If you have forgotten your password, click the **Forgot password?** link, and an e-mail will be sent to the entered address. The e-mail contains a hyper-link that you should follow to confirm the request for a new password.



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