ACcess Series

User Manual

Teleste Corporation

AC8800

Intelligent fibre optic platform

Contents

Introduction

AC8800 is a dual active output optical node. It supports two optical receiver modules with redundancy for downstream signal path on the motherboard. The upstream signal path can also be fully redundant with double optical transmitter modules. When more segmentation is needed, the optical transmitters can be fed with separate individual return signals.

The amplifier stages are based on high performance hybrids, which makes the usable output level range especially wide. The platform and accessories of AC8800 are fully functional up to 1 GHz.

True plug-and-play

An intelligent automatic alignment system with wide level control range ensures optimum operation of the AC8800 node. It replaces conventional mechanical plug-in module adjustments and laborious control of parameters. All the adjustments are electrical and controlled with a management interface. Plug-in attenuators or equalisers are not needed.

Local configuration of AC8800 is done via its USB interface using a PC or PDA equipped with CATVisor Commander software.

AC6990 / AC6991 / AC6980 transponder unit

AC8800 node can be monitored and controlled remotely via optional plug-in transponder unit, which also adds ALC with fully user programmable pilots and both forward and return path monitoring functionality. AC6990 supports forward path measurement up to 862 MHz, AC6991 and AC6980 up to 1000 MHz.

AC6990 and AC6991 support CATVisor and HMS protocols. AC6980 supports DOCSIS protocol. Remote monitoring and control is possible with CATVisor tools or with 3rd party SNMP management applications.

AC8800 feature map	Without transponder	With transponder
Intelligent continuous adjustments	●	●
Local control through USB connection	●	●
Remote monitoring and control	-	●
ALC with fully user programmable pilots	-	●
Intelligent backup functionality in both forward and return path	●	●
Automatic forward path OMI alignment	●	●
Automatic return path OMI alignment	●	●
Automatic forward and return path alignment with single pushbutton[1)]	-	●
Forward path spectrum analyser[1)]	-	●
Return path signal quality monitoring with automatic ingress control[1)]	-	●
Return path pilot generator[1)]	-	●[2)]

1) These features need to be enabled with a Product Key.
2) AC6980 DOCSIS transponder does not support pilot generator.

Table 1. AC8800 feature map

Installation

Housing

The AC8800 can be installed either into a street cabinet or to the outdoor environment. The fibre node should be installed vertically so that the external cable connectors and ventilation hole are underneath, securing the housing with three mounting brackets. Figure 1 depicts for the positions of mounting brackets as well as other installation dimensions.

The lid opens with the hinges to the left. The open cover can be removed by first opening the lid into a 90 degrees angle and the lifting it off the hinges. Note! Before removing the lid detach carefully the power unit ribbon cable.

Before closing the lid is should be checked that:

- nothing is trapped between the lid and the case
- all case gaskets are in their correct positions
- lid seats evenly on the rubber gasket

Using 4 mm allen key, the lid retaining bolts are fasten in a diagonal sequence with a tightening torque of 3 Nm. The class of enclosure is IP54 when correctly installed and tightened.

Node housing should be grounded with at least 4 mm^2 grounding wire (Cu) from a proper earth to the grounding point.

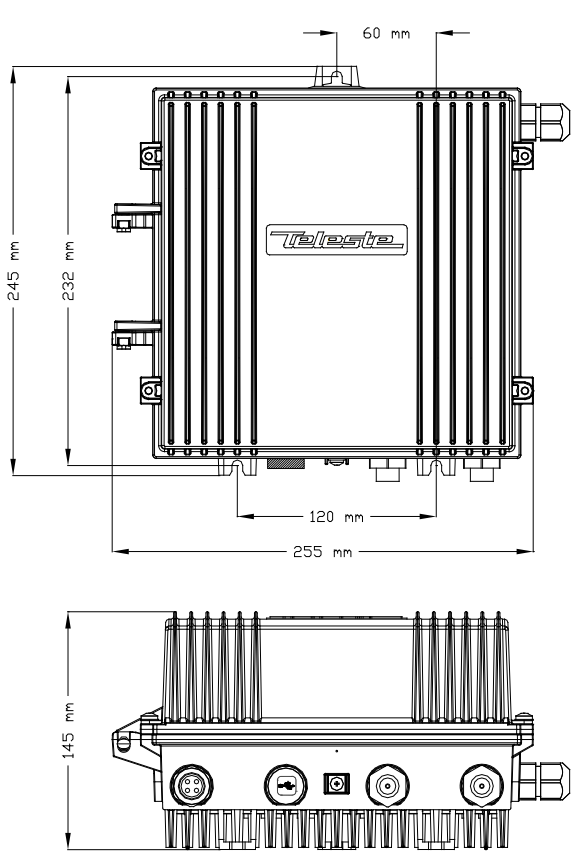

Figure 1. AC8800 housing dimensions – top and side view

Interfaces

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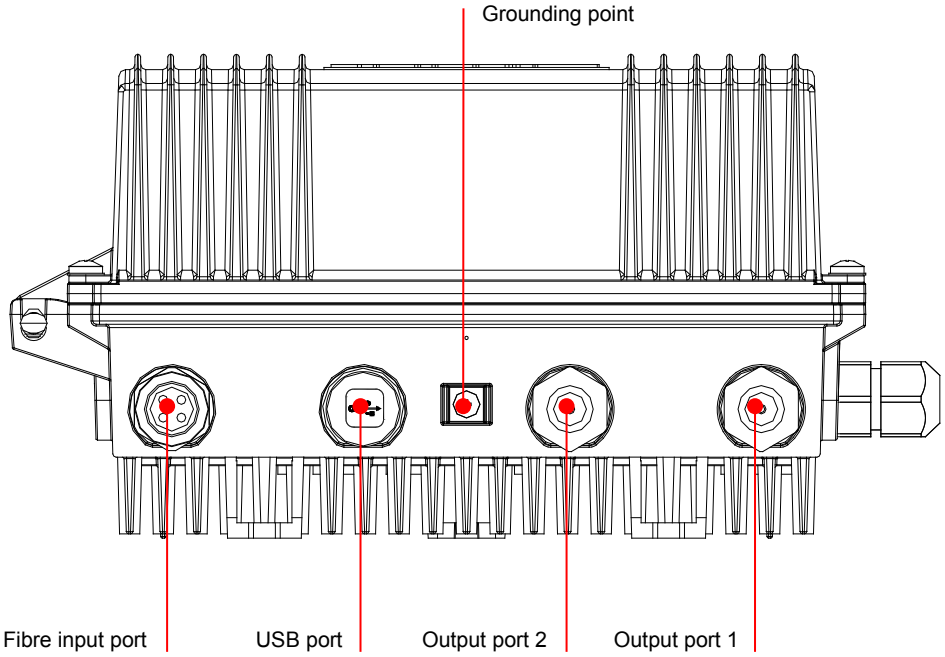

Figure 2. Port locations

The AC8800 node has three dedicated cable connection points: one input for fibre entries and two coaxial RF outputs. In addition there is a port for the USB management interface.

All coaxial outputs have a standard PG11 thread and they accept any KDC type adapter or connector. A suitable length of the coaxial cable inner conductor exposed for the connectors is approximately 20 mm (Figure 3).

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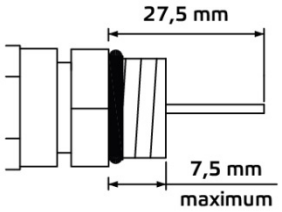

Figure 3. Centre conductor length

Transponder

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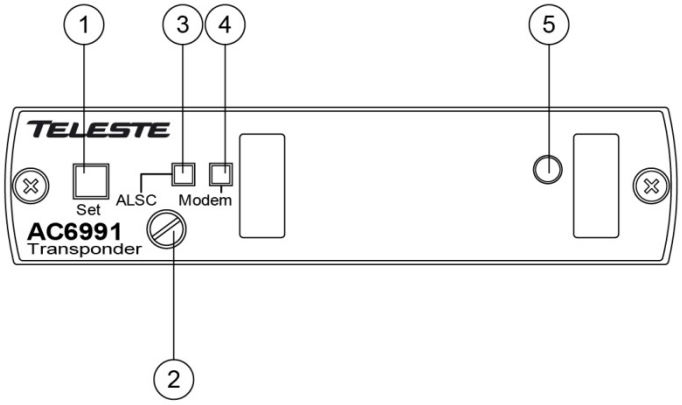

Figure 4. AC6991 transponder unit, 1) "Set" -button, 2) Fastening bolt, 3) Indicator for ALSC status , 4) Indicator for modem status, 5) Light sensor

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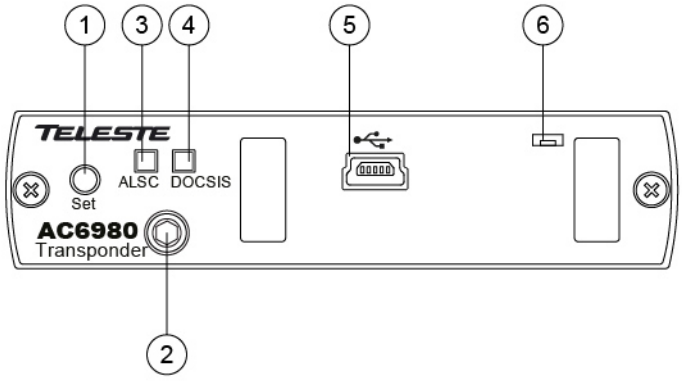

Figure 5. AC6980 DOCSIS transponder unit, 1) "Set" -button, 2) Fastening bolt, 3) Indicator for ALSC status, 4) Indicator for DOCSIS status, 5) Remote management USB connector, 6) Light sensor

To install a transponder unit, first locate the correct installation position. Snap off the segments of the shrouds break-away type slot cover and remove the slot cover. Insert the unit by pressing it gently into place. The unit will fit only in one orientation. Finally tightly fasten the mounting bolt to ensure proper grounding and cooling, using flat screwdriver with AC6990/AC6991 transponders and 3 mm allen key with AC6980 transponder. There is no need to switch off the supply voltage during module installation.

The USB connector in AC6980 transponder front panel is reserved for remote management connection. Local management of the AC8800 unit should be done via motherboard USB connector.

Fibre connections

The node accepts up to four fibre cables. These cables carry forward path and return path optical signals. When feeding the optical cable into the node, a suitable PG11 threaded feed-through adapter type KDO900, is available.

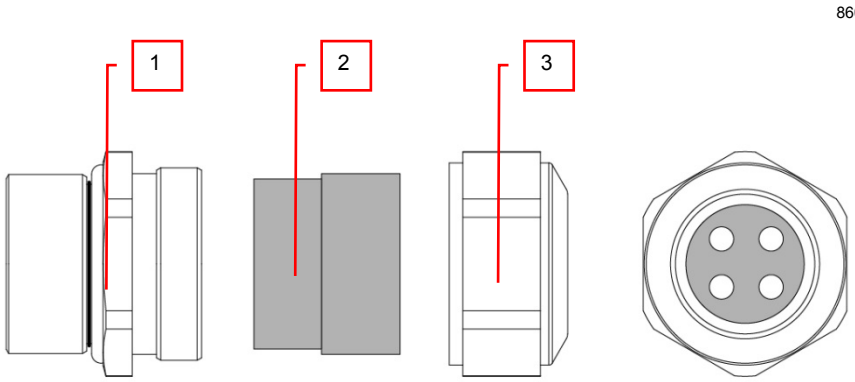

Figure 6. KDO900 adapter components

Remove the outer ring of the cable gland, thread the installation fibre filaments with connectors through the outer ring (Figure 6 pos. 3), through the sealing insert (Figure 6 pos. 2) and finally through the cable gland (Figure 6 pos. 1).

Mount the cable gland on the housing. The fibre filament length inside the fibre organiser is adjusted to sufficient measurement before tightening the outer ring.

Use the synthetic locking pins (supplied) to seal up unused holes in the sealing insert.

Optical receivers

The housing has slots for two optical receivers but it is possible to order the AC8800 with only one optical receiver installed and add a second receiver later. If two optical receivers are used the primary signal must be connected to optical receiver 1. If only one receiver is used it should be installed to slot 1.

AC6610 is a fibre optic receiver module for AC8800 optical node. The led on the receiver's front panel gives a visual indication of the optical input power.

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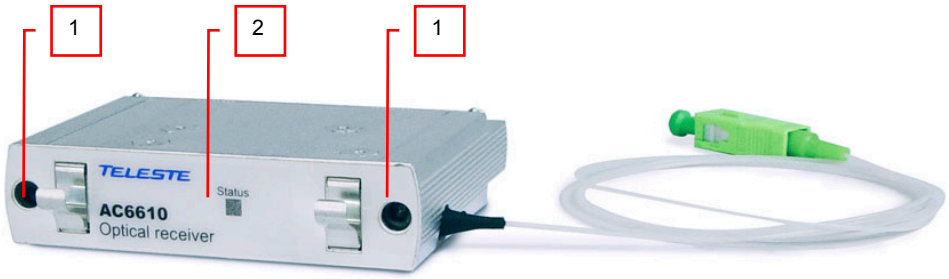

Figure 7. AC6610 Fibre optic receiver, 1) Retaining screw, 2) Status indicator

Led on AC6610	Description
Yellow	Optical input power is below low major alarm limit (user editable, default -7.0 dBm)
Green	Optical input power is within the nominal range
Red	Optical input power exceeds high major alarm limit (user editable, default +3.0 dBm)

Table 2. Optical receiver module status led

Optical return transmitters

The housing has slots for two return path transmitters but it is possible to order the AC8800 with one transmitter installed and add a second one later. If only one transmitter is used it should be installed to slot 1.

There are a variety of options for transmitter modules available for the return path applications of ACcess platform (AC67 Tx). The return path transmitters are available either in 1310 nm or 1550 nm DFB versions. In addition the platform can be equipped with CWDM transmitters. The CWDM lasers deploy eight wavelengths in range of 1470…1610 nm. On the product label you can find the product name, used wavelength and optical output power.

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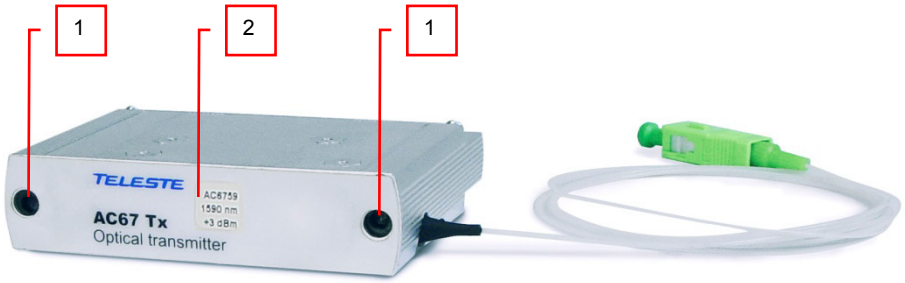

Figure 8. AC67 Tx Fibre optic transmitter, 1) Retaining screw, 2) Product label

Installation of optical units

To install any of the AC6610 / AC67 Tx optical units, first locate the correct installation position. Insert the unit by pressing it gently into place. The unit will fit only in one orientation. Finally, using 3 mm allen key, fasten the retaining screws with a tightening torque of 1.2 Nm. There is no need to switch off the supply voltage during module installation.

Note that optical units shouldn't be installed or removed while the unit is powered via USB only.

Powering

The AC8800 is available with a standard 27...65 V AC / 35...90 V DC (AC6310) power supply or the optional 40...90 V AC power supply.

Standard: 27...65 V AC / 35...90 V DC

The AC6310 power supply unit (PSU) accepts 27...65 V AC / 35...90 V DC either via a coaxial cable by inserting a fuse to the corresponding fuse holder or directly at the external input. The external input is located on the power distribution board at the upper right corner of the node. External power can also be fed through the node into the network. Maximum feed-through current is 12 A per port (16 A total). If powering will be provided through a dedicated output port, the port must be equipped with a fuse (supplied).

Optional: 40...90 V AC

The node can alternatively be delivered with a 40...90 VAC (square or quasi square) for remote supply. Power is supplied either via a coaxial cable by inserting a fuse to the corresponding fuse holder or directly at the external input. The external input is located on the power distribution board at the upper right corner of the node. External power can also be fed through the node into the network. Maximum feed-through current is 12 A per port (16 A total). If powering will be provided through a dedicated output port, the port must be equipped with a fuse (supplied). Note! This PSU option is not fully compliant with the EN 60728-11:2010 standard because powering voltage can exceed 65 VAC.

In general only one power supply is needed in the node. However the power supply unit can work alone or in dual-operation mode if a back-up of the PSU is needed. In dual powering operation the units are connected in parallel operating in a passive load sharing mode. The output voltages can be separately monitored via user interface. The power supply unit also has an auto shut down feature, which prevents too high input currents if the input voltage should drop below 24 V AC.

Cable gland at external input

The cable gland assembly provides the necessary protection against ingress of solid objects and moisture as well as providing cable retention.

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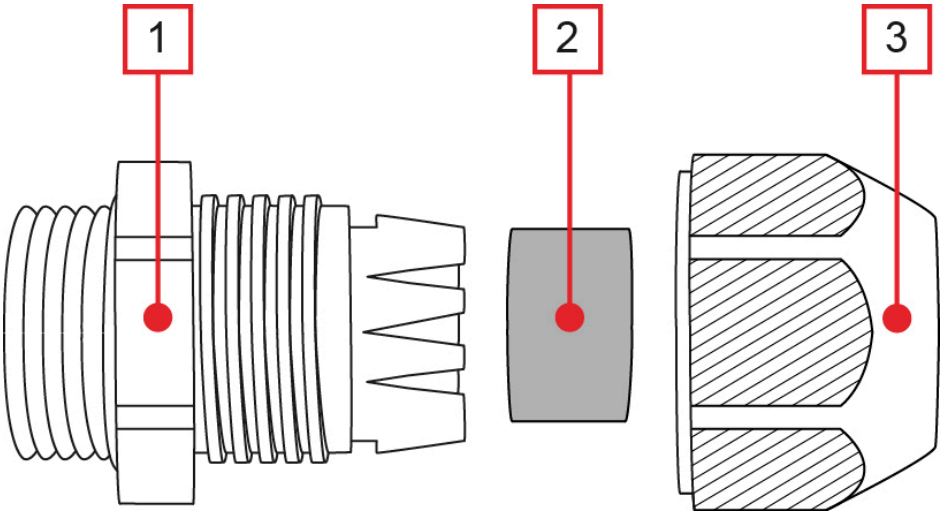

Figure 9. Cable gland components

Strip the cable sheath of the supply cord with a suitable length to suit the equipment and pass it through gland nut (3), seal (2) and plug body (1). Place appropriate conductors into plug pin housing assembly terminals and tighten screws to secure bared conductors and ensure good electrical contact. Screw the plug body tight onto the node housing to ensure that IP rating is maintained. Position the end of the cable sheath in line with the plug body and tighten the gland nut.

Installing the PSU

To gain access to PSU retaining screws, first remove the protective aluminum shroud. The shroud is attached to the lid, to shield the electronics from electromagnetic interference. Install the PSU board with the four M3x8 mm torx screws (Figure 10 pos. A). Use the silicon elastomers (Figure 10 pos. C) between the unit and the heatsink brackets. Make sure to use the fixing springs in the locations marked with B (Figure 10).

ac8k_power_b

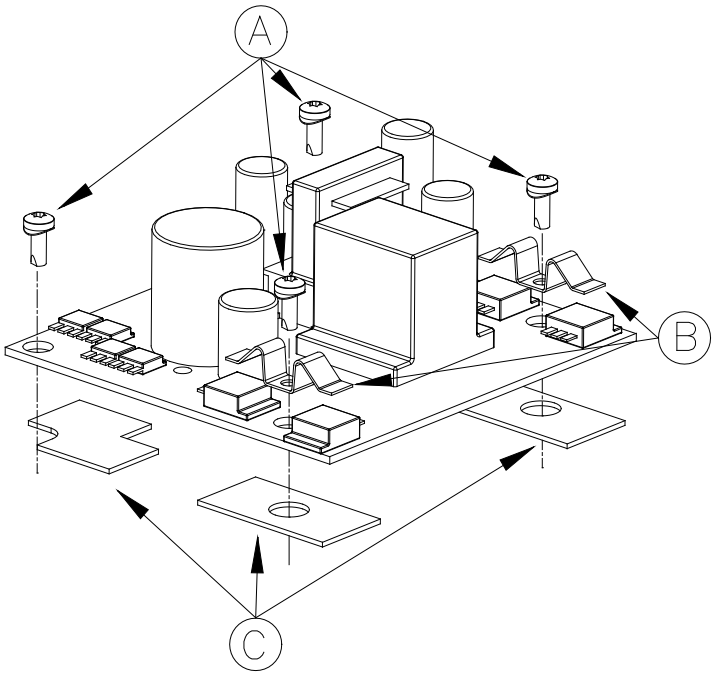

Figure 10. AC6310 mounting screws (A), fixing springs (B), and silicon elastomers (C)

Primary and secondary power supplies are physically identical. Their functional differences are controlled by a jumper. See Figure 11 for locations of the jumper pins. The jumper must be positioned prior to installation. The primary power supply unit must be installed into the first place (closest to the hinges). Locate the 10-pin connectors and attach the supplied ribbon cable.

After PSU installation carefully refit the shroud in the reverse order of removal. Ensure that all RFI gaskets are in place before the shroud is refitted.

Before connecting the power make sure that

- both power supplies are installed in correct positions
- jumpers is set correctly (Figure 11)

Connect the power source. The led on the PSU circuit board indicates that the unit is powered up and that the DC power supply voltage is present.

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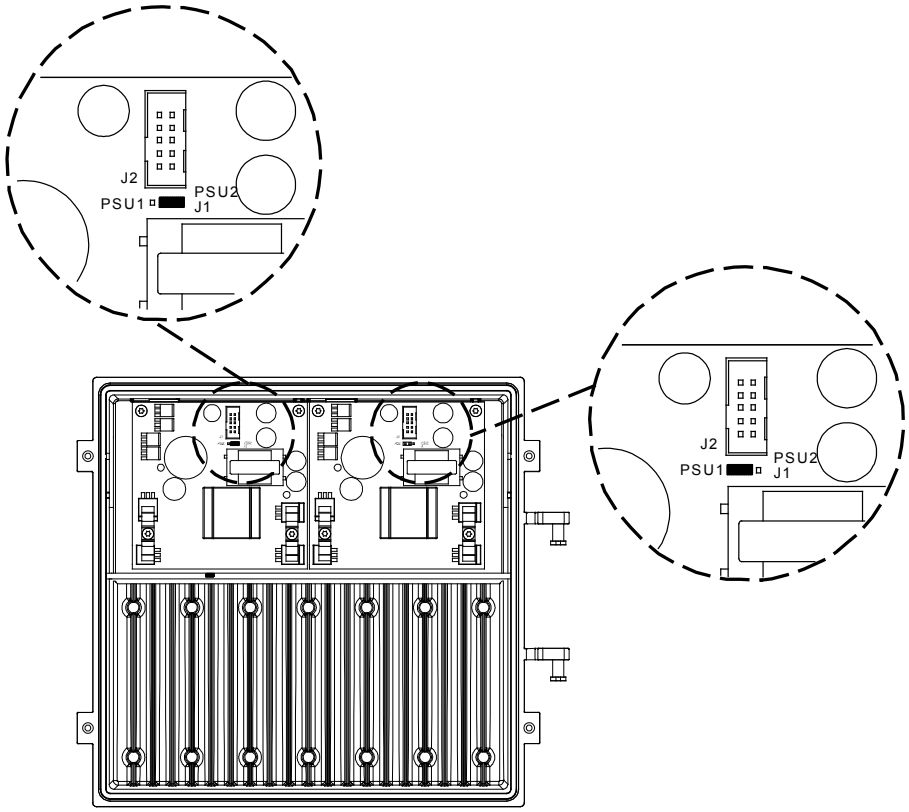

Figure 11. Diagram illustrating the AC8800 lid with both PSUs installed.

Fibre installation

Fibre installation is a critical procedure and it should be done with carefulness. Incorrect handling of the fibres can result in damage and degraded performance. Example of routing the fibres can be seen in figure 8.

Cleaning fibre connectors

- For correct optical operation ensure that all optical connectors are cleaned immediately before mating using a suitable optical connector cleaning kit.
- If a cleaning kit is not available, wipe the end of the connector using pure isopropyl alcohol (99%) and a lint-free wipe. Dry it with filtered compressed air. Wait until dry to insert connector into the adapter.
- When fibre optic connectors are unmated, the optical fibre end faces must be protected from contamination using suitable dust caps. Contamination of fibre end faces will reduce the performance of the optical fibre and could ultimately cause failure of the system. Contamination could also damage the fibre end faces when the connectors are mated.

DANGER! Do not look into the optical connector of the return transmitter with power applied. Laser light, visible or invisible, can seriously injure eyes or even cause blindness.

Fibre organiser mechanics

Standard fibre organiser

The standard fibre management option offers an efficient double sided fibre organiser module, which accommodates six universal type connections ensuring compatibility with variety of existing connectors and adapters. With this option the outside plant fibre cabling is done through the base coupling (Figure 14 pos.1).

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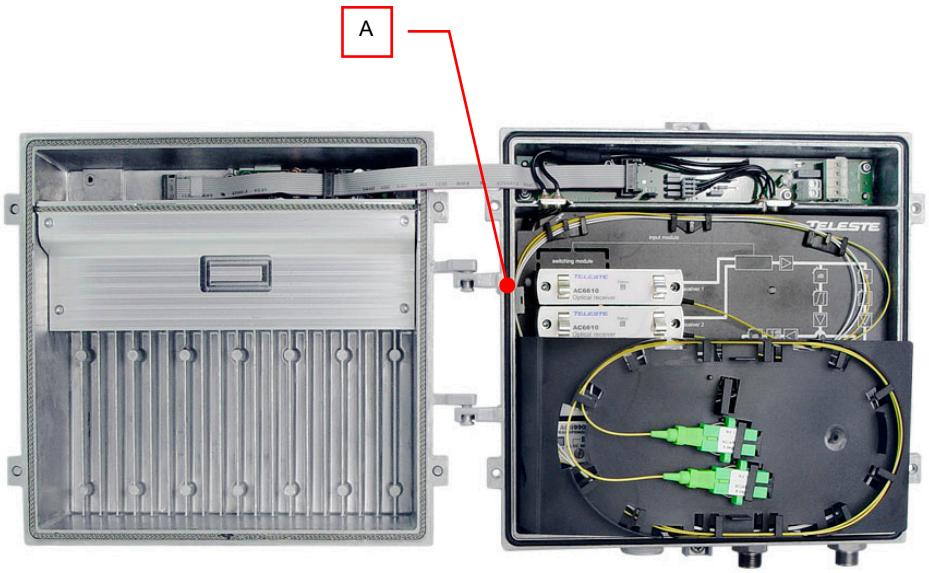

Figure 12. Standard fibre organiser, A) Retaining clip

Fitting of the fibres under the retaining tabs is designed to keep the fibres in place without the use of cable ties. The fibre organizer is equipped with lids for further fibre protection.

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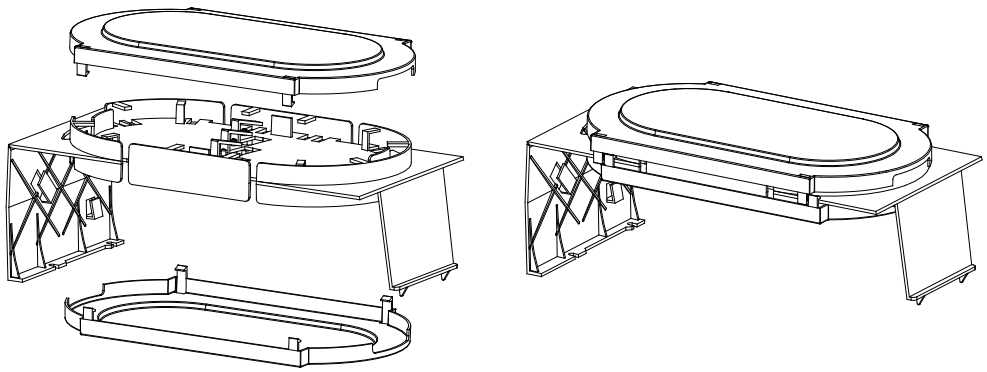

Figure 13. Standard fibre organiser with protective lids

Carefully wind the fibres around the fibre tray noting the entry points for the installation fibre filaments and the fibre pigtails (Figure 14 pos. A). Each fibre should be connected to its corresponding adapter (Figure 14 pos. B). The fibre organiser tray is equipped with slots (Figure 14 pos. C) for fibres to be routed on either side of the fibre tray. The under side of the fibre tray is reserved for fibre pigtails of return units and the upper side for fibre pigtails of forward units.

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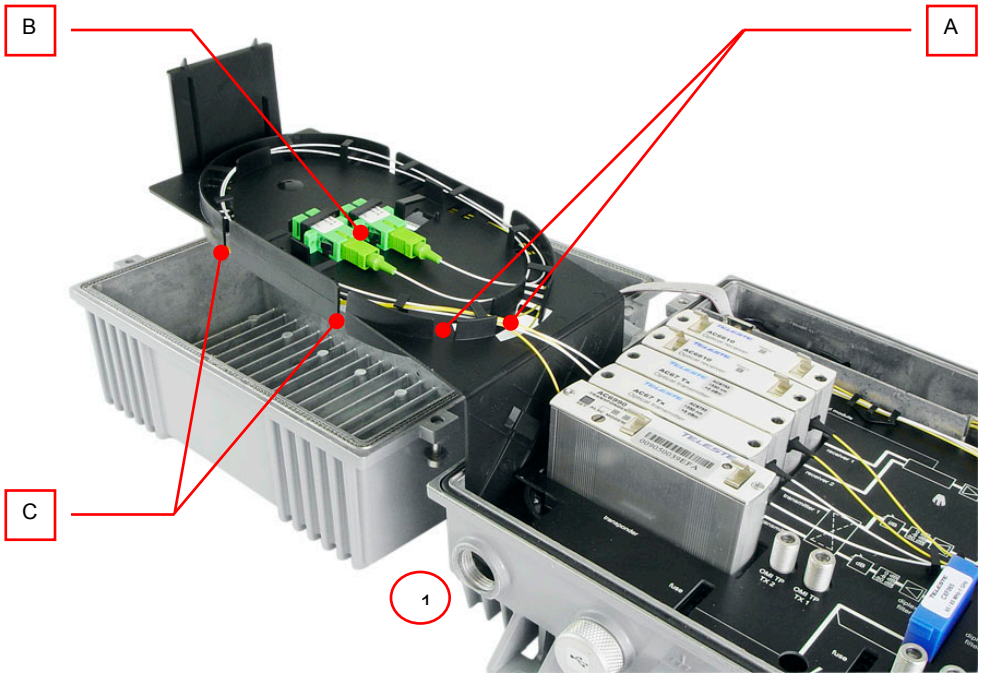

Figure 14. Routing fibres - typical configuration

When installing optical units gently route the fibre pigtails around fibre retaining tabs on the base and along the base wall under the retaining clip (Figure 12 pos. A) to the fibre organiser. Where fibres pass the bending point of the fibre organiser tray, there must not be any strain on attachments or excessive slack when it is opened or closed.

Splice and fibre organise in the lid

The lid management assembly consist of a splice tray (Figure 16 pos. 1), with slots for maximum of twelve splices, and a termination tray (Figure 16 pos. 2) containing up to four mounting points for fibre optic adapters. Connectors and adapters are held in place by universal holders, thus ensuring compatibility with variety of existing connectors and adapters. In the lid management option the outside plant fibre cabling is done through the lid coupling (Figure 15 pos.1)

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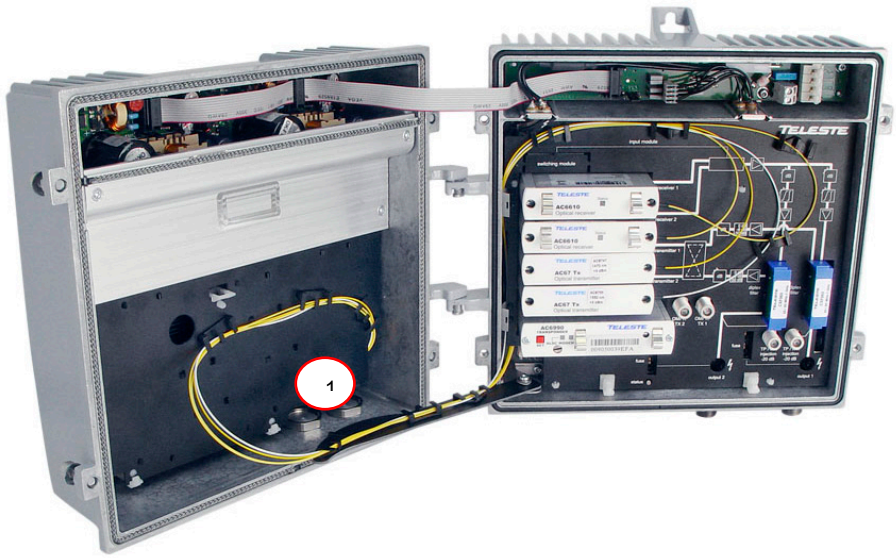

Figure 15. Fibre organiser – lid management option

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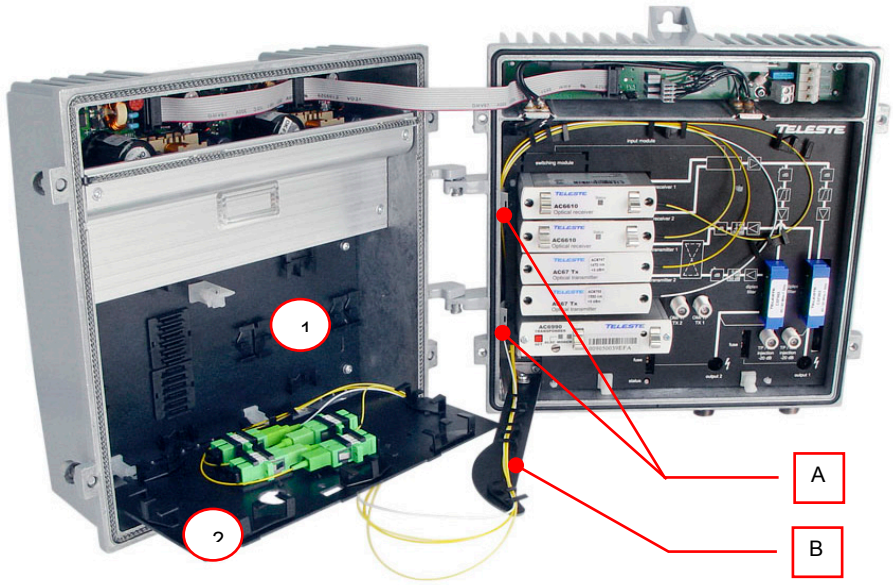

Figure 16. Routing fibres – typical configuration, A) Retaining clips, B) Swing arm

When installing optical units gently route the fibre pigtails around fibre retaining tabs on the base and along the base wall under the retaining clips (Figure 16 pos. A). to the termination tray. Where fibres pass the swing arm (Figure 16 pos. B), be sure to leave sufficient slack for the pigtails to permit closing or opening the lid without damaging fibres. Ensure that no fibres are pinched while the lid is closed.

The termination tray provides means for terminating outside plant cables and fibre optic terminal fibres. The termination tray is hinged to the chassis of the fibre organiser and swings outwards to provide access for connecting installation fibre filaments (external fibre optic cables) and fibre pigtails (ACcess units).

The termination tray may also be removed to provide additional access when outside plant cables are spliced to pigtails (Figure 17). When termination tray is removed, the lid of the node can be detached and splices can be done in a separate, more convenient place.

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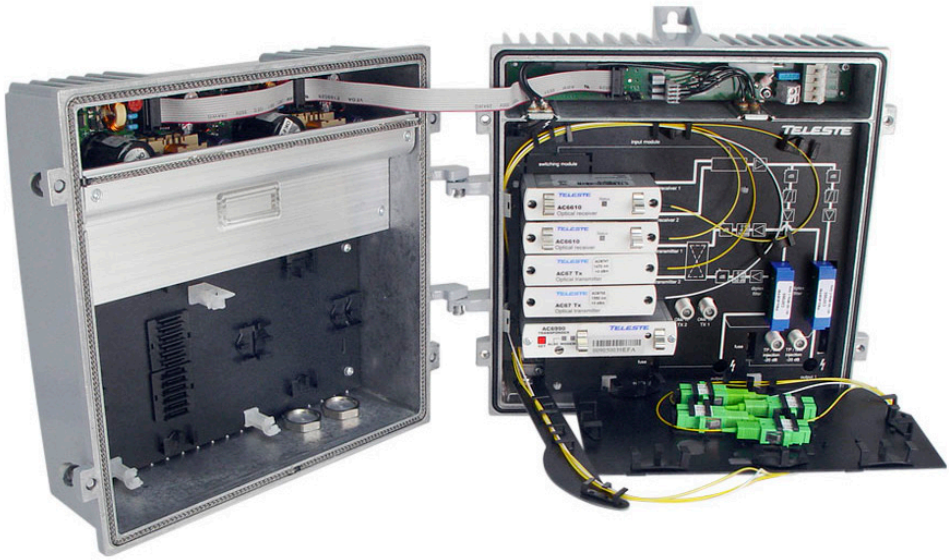

Figure 17. Termination tray removed from the fibre organiser

Front panel

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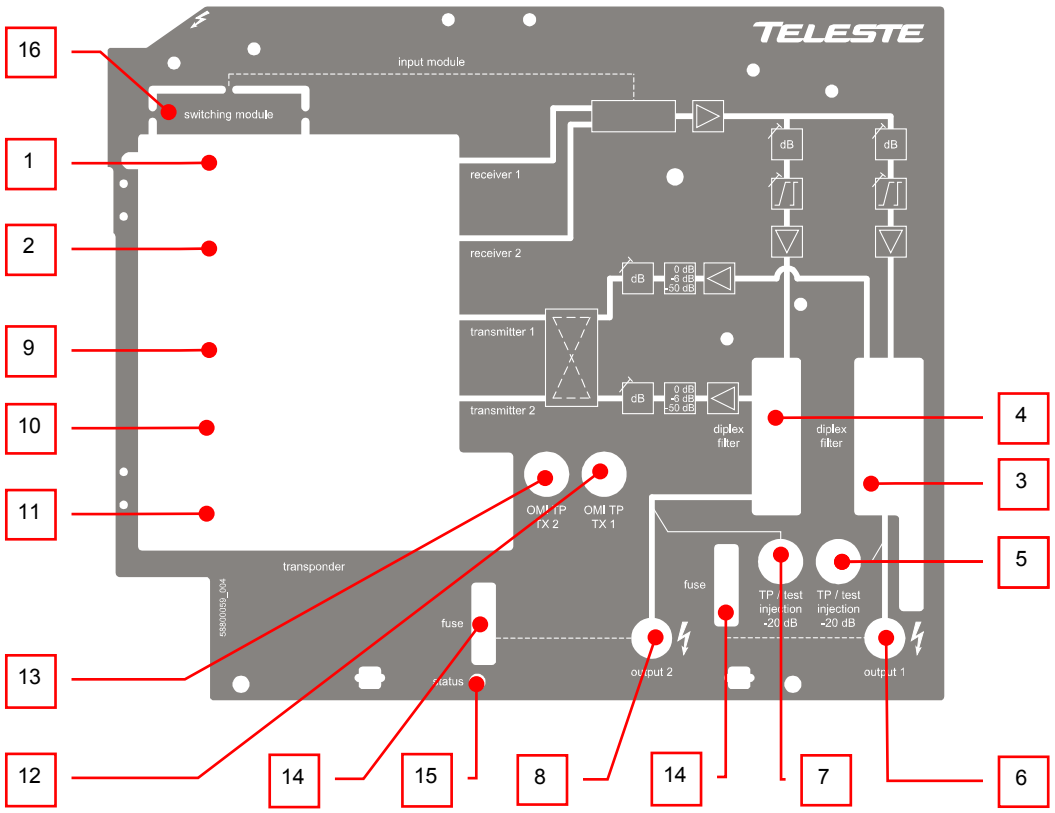

Figure 18. AC8800 front panel

1) Slot for optical receiver 1
2) Slot for optical receiver 2 (backup)
3) Output 1 diplex filter
4) Output 2 diplex filter
5) Output 1 test / injection point -20 dB directional coupler
6) Output 1
7) Output 2 test / injection point -20 dB directional coupler
8) Output 2
9) Slot for optical transmitter 1
10) Slot for optical transmitter 2
11) Slot for transponder
12) OMI test point for optical transmitter 1
13) OMI test point for optical transmitter 2
14) Fuse(s)
15) Status indicator
16) Reserved for future use

Features

Diplex modules

The AC8800 node is delivered according to the specifications defined in the ordering code. Optional return path operation needs plug-in diplex filters (Figure 18, positions 3 and 4). The available diplex filter types are CXF000 (0 dB jumper), CXF030 (30/47 MHz), CXF042 (42/54 MHz), CXF050 (50/70 MHz), CXF055 (55/70 MHz) CXF065 (65/85 MHz), CXF065 18 (65/85 MHz) and CXF085 (85/108 MHz). It is also possible to order the node without diplex filters. Note that the return path transmitters' bandwidth setting in the user interface should be set according to the installed diplex filters.

Forward path

The input and output amplifier stages are both based on high performance solutions which allow the user to set AC8800 outputs for high and low output levels. The output stage uses a GaAs hybrid to improve RF performance over the entire 47 to 1006 MHz pass band. Note that AC8800 must have a proper matching at output port to ensure optimal and reliable operation.

Optical receiver modules

Optical receiver module optical input power is measured and monitored. The low major alarm limits are also used in backup switching logic.

Optical receivers in AC8800 can be independently disabled via the user interface. Disabled optical receiver's RF stages are shut down, it does not generate optical input power alarms and is not used in backup switching. This feature can be used e.g. when two receivers are installed but only the first one has a fibre connected.

When "Automatic" is selected as optical input selection mode, it uses the following logic:

- If receiver 1 is missing or disabled or its optical input power is below low alarm limit, and receiver 2 is installed and enabled and its optical input power is above low alarm limit + deadband, receiver 2 is switched on.
- If receiver 1 is installed and enabled and its optical input power exceeds low alarm limit + deadband, receiver 1 is switched on.

When "Automatic (manual restore)" is selected, the backup switching takes place in the same way as described above but AC8800 will not switch back to receiver 1 when the signal returns. The user has to reset the switch back to receiver 1 by manually selecting "Manual: Rx #1" and after that "Automatic (manual restore)" again.

Forward path level control

AC8800 has two level control elements in its forward path signal route:

1) Gain control in optical receiver module, usually controlled by OLC. Adjustable in 0.5 dB steps between -30 and 0 dB.
2) Interstage level control in node motherboard with separate controls for both outputs. Output 1 is adjustable in 0.2 dB steps between -13 and 0 dB. Adjustment for Output 2 is functionally identical but it follows output 1 with user specified offset, adjustable in 0.2 dB steps between -10 and + 10 dB.

The forward path level control elements and thus the resulting forward path output level can be controlled with three different adjustment methods:

1) "Manual" mode: Optical module gain controls and interstage level controls are all available to the user with no restrictions. This mode should be used only if "OLC" or “ALC + OLC” mode doesn't give wanted results, or level fine-tuning is required.

2) "OLC" mode: Interstage level controls can be adjusted by the user. The node software adjusts optical receiver module gain controls based on the measured optical input power so that node performance is optimised.

3) "ALC + OLC" mode, available with transponders: The node software adjusts optical receiver gain as in “OLC” mode and interstage level controls based on pilot levels.

Regardless of the selected adjustment mode, output 1 slope, output 2 level offset and output 2 slope offset values can be adjusted by the user.

OLC offset

The “OLC offset” parameter is used in “OLC” and “ALC + OLC” adjustment modes. Its value is added to the optical module gain value calculated from optical input power and can thus be used to adjust the balance between optical input module gain control and interstage level control.

OLC offset is normally 0. If necessary, it is adjusted in 0.5 steps between -10 dB and +5 dB by pilot based or OMI based automatic alignment to optimise RF performance. The OLC offset has no effect in “Manual” mode.

Note that positive OLC offset values cause minimum optical input level for OLC operation to shift up by half of OLC offset value. For example, if optical receiver normal OLC operation range starts from -7 dBm, then with +4 dB OLC offset OLC operation range starts from -5 dBm.

Forward path slope control

Forward path slope is controlled by separate controls for both outputs in the same way than interstage level. Output 1 is adjustable in 0.5 dB steps between 0 and 14 dB. Adjustment for Output 2 is functionally identical but it follows output 1 with user specified offset, adjustable in 0.5 dB steps between -10 and +10 dB.

ALC

ALSC (Automatic Level and Slope Control) in AC8800 adjusts only level, not slope, thus the term ALC is also used. Forward path slope is automatically adjusted only during pilot based automatic alignment.

AC8800 uses the transponder RF level measurement unit to sequentially measure signal levels of output 1 at user defined pilot frequencies and, if enabled, also the forward path spectrum and return path ingress frequencies.

ALC keeps the output 1 signal level stable irrespective of input signal level variations by adjusting the interstage level control based on the pilot(s). Level is adjusted slowly in small steps to guarantee stable operation in long amplifier cascades. If output 1 interstage level is adjusted against its limit, AC8800 gives "ALC saturated" alarm and stops adjusting.

Output 2 follows output 1, i.e. interstage level control is adjusted so that the offset to output 1 interstage level remains unchanged. If output 2 interstage level is adjusted against its limit, AC8800 continues to adjust output 1 but gives “ALC saturated” alarm to indicate that output 2 can no longer follow output 1.

AC8800 has both high and low pilots and reserve pilots for both. The high pilot controls interstage level. The low pilot is not used by ALC. It is, if specified, only used for slope control during pilot based forward path automatic alignment. Pilot target levels for all four pilots can be independently configured by the user.

If the high main pilot is lost, i.e. its level falls below "Lost level", AC8800 uses the respective reserve pilot for ALC and gives "ALC main pilot missing" alarm.

If both high main and reserve pilots are lost, AC8800 gives "ALC all pilots missing" alarm and, depending on user selection, either freezes level control or slowly steps it to predefined value.

Forward path pilot based alignment

The forward and return paths can be automatically aligned with a single pushbutton, provided that transponder is installed and the feature is enabled with correct Product Key. Correct pilot settings and output 2 level and slope offset values need to be programmed, either at the factory or by the user.

If low main pilot is enabled, i.e. its frequency is >0 MHz, it will be used for slope adjustment during pilot based alignment. If it is disabled, i.e. its frequency is 0 MHz, slope will not be adjusted during pilot based alignment.

Pilot based alignment can be activated with transponder front panel “Set” button, if it is enabled in software. This button also activates return path OMI based alignment after forward path alignment has been successfully completed. It is also possible to activate forward or return path automatic alignment procedures separately via the user interface.

The pilot based alignment adjusts the optical receiver module gain and OLC offset together with node level and slope settings so that pilot targets are reached while simultaneously optimising node performance and making sure ALC has enough adjustment range.

The pilot backoff values need to be set for correct slope adjustment during automatic alignment in intelligent AC amplifiers. They are not used in AC8800.

When forward path pilot based alignment starts, the “ALSC” led starts blinking in green. If the alignment completes successfully, the calculated level/slope values are taken into use, ALC is activated and the led returns to its normal status dictated by ALC related flags, i.e. usually green. If the alignment stops due to an error, the led flashes in red for a couple of seconds, all controls return to their original values and ALC is not activated.

Possible pilot based alignment error reasons and their explanations, which are displayed in the dialog box when the alignment is started via the user interface:

- “*Pilot target out of range*”: Main pilot target levels are outside 80…120 dBµV range, low pilot target level is above high pilot target level, or high and low pilots have less than 100 MHz between them.
- “*Optical input power out of range*”: Measured optical input power is below -8 dBm.
- “*Pilot not found*”: Measured high main or low main pilot (if enabled) level is below 75 dBµV. Pilot frequency may be incorrect.
- “*Interstage slope out of range*”: Calculated output 1 interstage slope is outside 0…14 dB range.
- “*Interstage 2 slope out of range*”: Calculated output 2 interstage slope is outside 0…14 dB range.
- “*Gain out of range*”: Calculated value for optical input module gain, output 1 level or output 2 level is outside adjustment range or interstage level control is less than 1 dB from adjustment range limit, not leaving room for ALC adjustments.

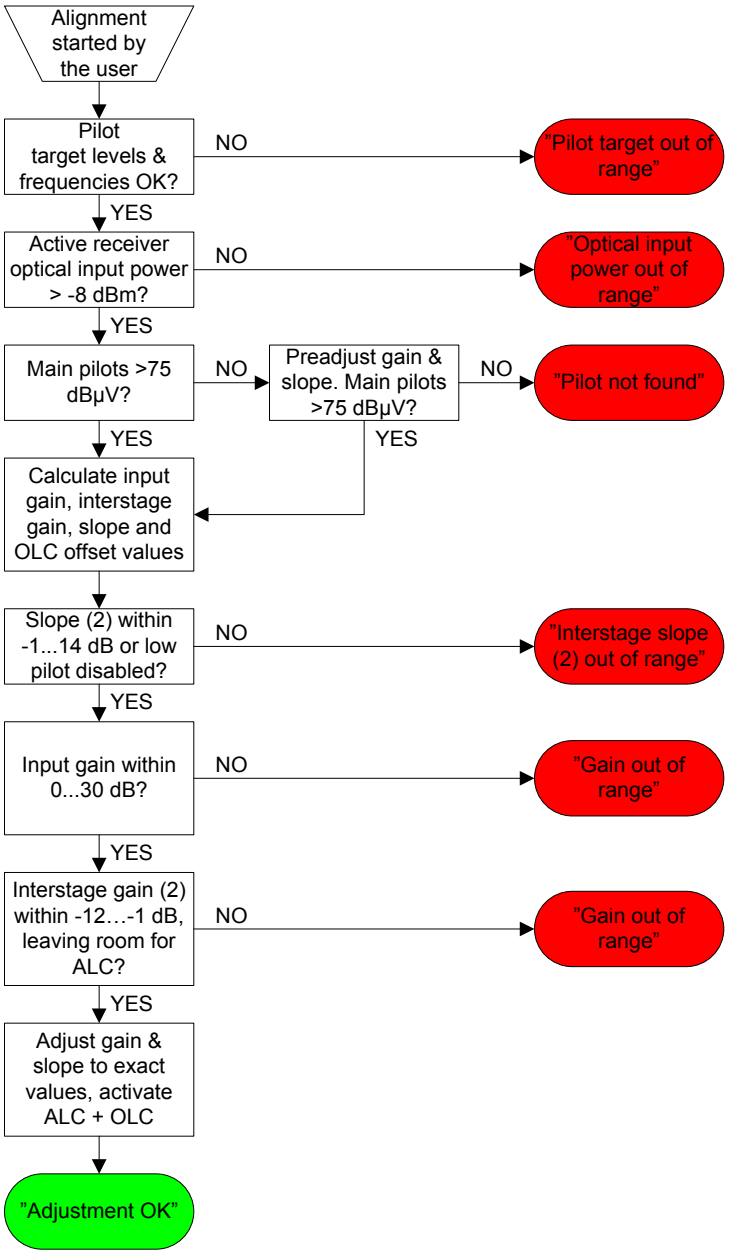

Figure 19. Simplified forward path pilot based alignment flowchart

Forward path OMI based alignment

Forward path can be also aligned based on the desired output 1 level and the OMI of the optical transmitter feeding forward path signal to AC8800. This feature does not need transponder module and Product Key activation.

The OMI based alignment adjusts only optical receiver module gain and OLC offset and interstage level controls. Slope control is not adjusted. OMI based alignment accuracy is typically worse than with pilot based alignment.

The transmitter OMI, output 1 target level and output 1 slope and output 2 level and slope offset values need to be programmed, either at the factory or by the user.

If the alignment completes successfully, the calculated level and level values are taken into use and OLC is activated. If the alignment stops due to an error, all controls return to their original values and OLC is not activated.

Possible OMI based alignment error reasons and their explanations, which are displayed in the dialog box when the alignment is started via the user interface:

- "*Optical input power out of range*": Measured optical input power is below -8 dBm.
- "*Gain out of range*": Calculated value for optical input module gain, output 1 level or output 2 level is outside adjustment range.

Spectrum analyser

AC8800 spectrum analyser can be used to measure and monitor output 1 forward path signals, provided that transponder is installed and the spectrum analyser feature is enabled with correct Product Key.

Up to 100 measurement frequencies with individual peak / average detector (for PAL / QAM signals, respectively) selection and high / low limits can be specified by the user.

The spectrum analyser uses the same tuner unit than ALC pilot measuring and ingress analyser. Pilot measurements have higher priority, but when pilots are stable and no level adjustment is needed, spectrum and ingress analysers get more time, resulting in ~3…4 measurements/s speed.

Each measurement frequency can have both, either or no alarm limits. The measurement result is compared against its limits. When all frequencies have been measured the number of measurements exceeding their limits is compared to the "Tolerance" parameter and the "Spectrum out of limits" alarm status is updated. The "Tolerance" parameter can be used to fine-tune alarm sensitivity; default value 0 activates the alarm even if only one measurement result exceeds its limits.

Return path

Optical transmitters

Optical transmitter modules have an internal pilot generator which can be controlled via user interface separately from the transponder return path pilot generator. The optical modules' pilot generator can be disabled or set to 4.5/5.5 MHz (depending on HW version) or 6.5 MHz. See spec sheet for details.

Optical transmitter module laser bias current is measured and monitored. The major alarm limits are also used in backup switching logic.

The "Bandwidth" setting of the optical transmitter module should be set according to installed diplex filters.

Return path signal routing

AC8800 supports four return path signal routing modes:

- "Separate RF paths": Return path input 1 signals are routed to transmitter 1 and input 2 signals are routed to transmitter 2.
- "Combined RF paths": Return path input 1 and 2 signals are combined and the combined signal is fed to both transmitters.
- "Separate with backup": As in "Separate RF paths", but changes to "Combined RF paths" if any of the following is true:
    - Optical transmitter 1 is missing or its laser bias current is not between low and high major alarm limits
    - Optical transmitter 2 is missing or its laser bias current is not between low and high major alarm limits
    - Optical receiver 1 is installed and enabled and its optical input power is below low major alarm limit.
    - Optical receiver 2 is installed and enabled and its optical input power is below low major alarm limit.
- "Separate with backup and manual restore": As "Separate with backup", but the user has to manually switch back to separate RF paths by selecting "Separate RF paths" and after that "Separate with backup" again.

Return path power save

AC8800 supports three power save modes in return path transmitters:

- "Disabled": Both transmitters' RF stages and lasers always on.
- "RF stages": The RF stages of transmitter 2 (or 1) are turned off to save power when optical receiver 1 (or 2) is selected, if the return path RF paths are combined, and both return transmitters are installed, and their bias currents are within limits. This feature has no effect when return path RF paths are separate. It only turns off RF, not the laser.
- "RF+laser": Special mode in which the RF stages and also laser activation follows the status of forward path optical level. See Table 3 for details. The return path must be set to "Combined RF paths" mode for correct operation. Laser bias current is not monitored when the laser is shut down.

Rx 1 optical level	Rx 2 optical level	Tx1	Tx2
Above low major alarm limit + deadband	Above low major alarm limit + deadband	On	On
Above low major alarm limit + deadband	Below low major alarm limit	On	Off
Below low major alarm limit	Above low major alarm limit + deadband	Off	On
Below low major alarm limit	Below low major alarm limit	On	Off

Table 3. Return path power save operation in "RF+laser" mode.

Return path level adjustment

Input 1 and input 2 level can be adjusted independently in 0.5 dB steps between -20 and 0 dB.

Ingress control switches

Ingress control switches are independent for both inputs and can be used to attenuate return path or to cut it off completely. Ingress measurement and modem communication are not affected by ingress switch, thus it is possible to monitor incoming ingress and communicate with RF modem even when return path is cut off.

Ingress control switches can also be controlled automatically based on detected ingress, separately for each input. When automatic attenuation during ingress alarm is enabled, ingress control switch is disabled from the user and AC8800 software operates it between “on” and “attenuated” values.

When “Ingress alarm” alarm of an input is active for at least “activation delay” time, ingress control switch for that input will go to attenuated state. When “Ingress alarm” is not active for at least “deactivation delay” time, ingress control switch will return to 0 dB state. These delays allow fine-tuning the operation and prevent unwanted switching on spurious signals. Note that ingress alarm status is only updated after each ingress measurement cycle.

The default attenuation value 6 dB can be adjusted separately for both inputs between 3 and 10 dB to further fine-tune the automatic ingress attenuation feature.

Return path OMI based alignment

The return path OMI based alignment is done after the user has pressed transponder front panel “Set” button and forward path alignment has completed successfully. It is also possible to start return path OMI based alignment via user interface, also when transponder is not installed. See “Forward path” chapter for details on forward path, ALC and automatic alignment.

Return path OMI based alignment adjusts input 1 and input 2 level controls based on the target OMI-% of the optical transmitter and the estimated RF level at return path input port. The target OMI and RF input level values need to be programmed either at the factory or by the user before starting the alignment.

If the alignment completes successfully, the level control values are taken into use and the “ALSC” led flashes in green for a couple of seconds. If the alignment stops due to an error, the level controls are set to closest possible value and “ALSC” led flashes in yellow for a couple of seconds.

Possible OMI based alignment error reasons and their explanations, which are displayed in the dialog box when the alignment is started via the user interface:

- "*Gain out of range*": Calculated value for output 1 level control is outside adjustment range.
- "*Gain 2 out of range*": Calculated value for output 2 level control is outside adjustment range.

Ingress analyser

AC8800 ingress analyser can be used to measure and monitor return path signals, provided that transponder is installed and the ingress analyser feature is enabled with correct Product Key.

Up to 30 measurement frequencies with individual peak / average detector (for signals / noise, respectively) selection and high warning / high alarm limits can be specified by the user. The measurement files containing frequencies, detector types and alarm limits can be specified separately for each input port. It is also possible to measure and monitor only one port.

The ingress analyser uses the same tuner unit than ALC pilot measuring and spectrum analyser. Pilot measurements have higher priority, but when pilots are stable and no level adjustment is needed, spectrum and ingress analysers get more time, resulting in ~3…4 measurements/s speed.

Each measurement frequency can have both, either or no alarm limits. Each measurement result is compared against its limits. When all frequencies have been measured the number of measurements exceeding limit is compared to "Tolerance" parameter and "Ingress warning (2)" and "Ingress alarm (2)" statuses are updated. The "Tolerance" parameter can be used to fine-tune alarm sensitivity; default value 0 activates the alarm even if only one measurement result exceeds its limits.

When ingress is to be measured, measurement frequencies should be selected so that there are no other return path signals nearby. Selecting a measurement frequency close to other signals will affect the dynamic range of the ingress analyser.

Ingress analyser alarm can also be used to trigger automatic return path ingress switch attenuation.

Return path pilot generator

AC8800 return path pilot generator can be activated when transponder is installed and the feature is enabled with Product Key. It is supported by AC6990 and AC6991 transponders.

There can be up to 4 user programmable pilot frequencies in the frequency range of 5…65 MHz (0.1 MHz steps). The pilot generator signal (and also the RF modem transmit signal) is fed to both return transmitters regardless of the return path signal routing settings. Pilot levels are specified at the transponder output as with modem transmit levels, and restricted to 75…100 dBµV range. The viewer displays resulting equivalent input level, i.e. the level at which a signal should be injected to return path input 1 or 2 to appear at equivalent level with the generated pilot signal at return path output.

When the pilot generator is enabled, AC8800 outputs one of the pilot signals for a user defined pilot duration, then switches to the next pilot signal and then repeats again. The pilot duration parameter is ignored if only one pilot signal is activated.

Possible RF modem transmissions occur asynchronously, i.e. in the middle of any pilot transmission. Pilot output is switched off during modem transmission and resumes after the modem transmission has been completed.

Pilot signals closer than 0.3 MHz from modem transmit frequency are not generated. Pilot signals can cause problems to modem communication if the pilot is close to modem frequency and pilot level is high compared to modem transmit level. Thus it is recommended to keep pilots at least 0.5 MHz from modem frequency.

Detection of these time domain multiplexed return path pilot signals can be accomplished at head end with e.g. a standard spectrum analyser instrument used in "Max hold" mode, or with another amplifier/node capable of return path signal measurement.

Remote communication

The transponder module is used for remote communication. Software version 3.0 and above supports AC6990, AC6991 and AC6980 transponders and CATVisor, HMS and DOCSIS communication protocols.

With AC6990 and AC6991 it is possible to set the communication protocol to CATVisor or HMS via the user interface. CATVisor protocol is compatible with Teleste CATVisor Commander and EMS system. HMS protocol uses SNMP for remote communication and can thus be used also with 3rd party management software. It is possible to change between CATVisor and HMS also remotely. All modem related settings should be carefully reviewed before changing the protocol to avoid loss of remote communication.

With AC6980 the remote communication protocol is SNMP. CATVisor protocol is also supported and thus e.g. CATVisor SmartLoader can be used.

The reported modem receive and transmit levels are measured at transponder RF input and output ports. The receive level is directly related to amplifier forward path output level. Transmit level vs. amplifier return path input level varies with return path gain as depicted in technical specification.

Transponder “Modem” led is dark while the unit is scanning for communication channel and blinks while it is establishing the communication link. During normal communication the led colour is decided from modem-related alarms.

CATVisor modem functionality

After reset the transponder starts scanning for HEC (HeadEnd Controller, e.g. Teleste HDM100 T) carrier within the user specified frequency range. When a communication channel is found, it waits for registration slot and sends its registration request. If the HEC accepts the registration, transponder enters normal communication mode where it is periodically polled by the HEC.

If the registration fails, or transponder is in normal communication mode but doesn’t receive any packets from the HEC it starts scanning again. During registration the HEC sends communication parameters such as transmitter frequency and transmitter level.

All communication between the transponder and CATVisor Commander, EMS or SmartLoader is done with UDP/IP packets via the HEC. This means that transponder IP address has to be unique and match HEC’s subnet settings.

HMS modem functionality

HMS mode is similar to CATvisor mode. The transponder scans for HMTS (Hybrid Management Termination System, e.g. Teleste HDM100 H) carrier. Transmit level is not set by the HMTS and thus has to be adjusted manually. In HMS the behaviour when forward communication is lost is controlled by the HMTS settings.

For details on HMS modem functionality, please refer to HMTS documentation and HMS standards.

DOCSIS modem functionality

AC6980 transponder acts as a standard DOCSIS 2.0 cable modem. It scans through the whole forward path band. There are no communication settings available for user, everything is done automatically as commanded by the CMTS (Cable Modem Termination System). Depending on the CMTS and headend LAN settings it is usually necessary to configure the transponder MAC address to DHCP server and allow SNMP (UDP ports 161 and 162) and CATVisor (UDP port 2500) traffic to transponders.

Establishing connection

All the needed configurations and adjustments can be carried out locally or remotely by using the CATVisor Commander software. Detailed CATVisor Commander hardware requirements and installation instructions can be found from the User Manual supplied with Commander.

Connection to AC8800 is possible using the following methods:

Local configuration with PC through standard USB port

Commander 2.7 or later is needed for USB support.

Connection to AC8800 USB port can be done with a standard USB A plug to USB mini B plug cable, or via AC6901 USB to Bluetooth adapter. The cable or adapter should be disconnected when not in use to avoid possible EMC problems caused by the cable acting as an antenna.

Windows may ask for USB driver when connecting to AC8800 via USB for the first time. If not found automatically, the driver can be found in '`C:\Program Files\Common\Teleste\Drivers`', select '`telestecdc.inf`' file. During the installation Windows may ask if it should stop the installation because the installation file is not signed. Select 'Continue Anyway'.

AC8800 will draw power from the USB connector for its microcontroller and memory if no external power supply is available. This makes it possible to configure AC8800 settings and update the software without any power supply.

Note that as only the CPU part of the unit is powered via USB and many parameters visible via the user interface may display incorrect values. Installing and removing plug-in modules while the unit is USB powered is not recommended and may lead to unexpected behaviour.

The USB connector in AC6980 transponder front panel is reserved for remote management connection.

Remote CATVisor connection

Remote IP connection via a HEC (e.g. Teleste HDM100 T) with AC6990/AC6991 transponder. Transponder IP address has to be correctly set before remote IP communication is possible. It has to match the subnet settings of the HEC's HFC network interface and it must also be unique for each transponder.

Note that it is also possible to set the IP address remotely via the HEC, see HEC documentation for details.

Remote HMS connection

Remote SNMP connection via a HMTS (e.g. Teleste HDM100 H) with AC6990/AC6991 transponder. AC8800 can be accessed remotely using an SNMP Manager application. Usually there is no need to pre-configure any communication parameters to establish connection with the HMTS. However, the selected installation procedure may include presetting e.g. the IP address, transmit level and the forward path frequency scanning limits.

Remote DOCSIS connection

Remote SNMP connection via a CMTS with AC6980 transponder. AC8800 can be accessed remotely using an SNMP Manager application. The CMTS system must be preconfigured to accept the transponder and the used protocols.

Alarms

The module alarms, also known as "flags", displayed in CATVisor Commander and EMS are described in the table below. Equivalent SNMP traps are also available via remote connection with HMS and DOCSIS protocols.

The affected led and factory default severity settings are presented next to each alarm in Table 4. All alarm severities (Major / Minor / Notification / Disabled) and alarm limits can be fully configured by the user. See the 'Monitoring' chapter for more details.

Note that some alarm limits (e.g. remote AC supply voltage) are factory configured so that alarms will only appear when hardware specifications are exceeded. The alarm limits should be reconfigured to match network parameters if more precise monitoring is needed.

Alarm text	Description & suggested corrective action	Led	Default severity
Temperature high	Temperature is above high limit.	Status	Major & Minor
Temperature low	Temperature is below low limit.	Status	Minor
AC voltage high	AC voltage is above high limit.	Status	Minor
AC voltage low	AC voltage is below low limit. As some units are equipped with mains power supply, this alarm is disabled as factory default and should be enabled by the user if AC voltage is to be monitored.	Status	Disabled
+24V voltage high	+24V voltage is above high limit. Common for both power supplies.	Status	Major & Minor
+24V voltage low	+24V voltage is below low limit. Common for both power supplies.	Status	Major & Minor
+12V voltage high	+12V voltage is above high limit.	Status	Major & Minor
+12V voltage low	+12V voltage is below low limit.	Status	Major & Minor
Optical Rx#1 level high	Optical receiver #1 power level is above high limit.	OptRx1	Major
Optical Rx#1 level low	Optical receiver #1 power level is below low limit. The major alarm is used for backup switching logic.	OptRx1	Major
Optical Rx#2 level high	Optical receiver #2 power level is above high limit.	OptRx2	Major
Optical Rx#2 level low	Optical receiver #2 power level is below low limit.	OptRx2	Major
Optical Tx#1 laser current high	Optical transmitter #1 laser current is above high limit.	Status	Minor
Optical Tx#1 laser current low	Optical transmitter #1 laser current is below low limit.	Status	Minor
Optical Tx#2 laser current high	Optical transmitter #2 laser current is above high limit.	Status	Minor
Optical Tx#2 laser current low	Optical transmitter #2 laser current is below low limit.	Status	Minor
Unknown module	Device is not able to recognize other module(s). Possible reason is old embedded software or bad installation of the transponder or optical modules. If the embedded software is up to date and removing and reinstalling the modules doesn't help, it should be sent to service.	Status	Major
Internal error	Device has an internal error. If resetting the unit does not help, it should be sent to service.	Status	Major
Lid open	Transponder's light sensor light level has been above limit during last minute. Generated only if transponder is installed.	Status	Notification
Return path off	Return path is turned off by user. Common for both return paths.	Status	Notification

Return path attenuated	Return path is attenuated, either by user or automatically due to ingress. Common for both return paths.	Status	Notification
Settings changed	Unit's settings have been modified by user during last minute.	Status	Notification
Application started	Unit was reset or rebooted during last minute.	Status	Notification
Service terminal connected	There has been activity on local USB connector during last minute.	Status	Notification
Modem receive level low	RF modem receive level is too low for reliable communication. Generated only if transponder is communicating. Not generated with AC6980 DOCSIS transponder.	Modem	Minor
Modem not connected	RF modem is not communicating. Generated only if transponder is installed.	Modem	Notification
Modem transmit level saturated	Commanded transmit level is outside range. RF modem transmit level is saturated at minimum or maximum value. Generated only if transponder is communicating and minimum < maximum. Not generated with AC6980 DOCSIS transponder.	Modem	Notification
Tuner module error	Internal error in transponder's level measurement unit. May be due to out-of-range measurement frequencies. If resetting the unit doesn't help, it should be sent to service. Generated only if transponder is installed.	Status	Major
ALC all pilots missing	All pilots are missing. Generated only if transponder is installed and ALC is enabled	ALSC	Major
ALC saturated	ALC is saturated, i.e. level adjustment limits have been reached. Generated only if transponder is installed and ALC is enabled.	ALSC	Minor
ALC main pilot(s) missing	One or both main pilot(s) are missing; ALC uses backup pilot(s). Generated only if transponder is installed and ALC is enabled.	ALSC	Notification
ALC off	Transponder is installed but ALC is switched off by user. Or ALC is switched on by user but transponder is missing	ALSC	Notification
Spectrum out of limits	Spectrum analyser measurement results are not within high/low limits.	Status	Minor
Ingress 1 warning	Return path ingress measurement results of port 1 are above warning limits.	Status	Minor
Ingress 1 alarm	Return path ingress measurement results of port 1 are above alarm limits.	Status	Major
Powered from USB	Processor powered from USB, rest of motherboard not alive.	Status	Notification
Ingress 2 warning	Return path ingress measurement results of port 2 are above warning limits.	Status	Minor
Ingress 2 alarm	Return path ingress measurement results of port 2 are above alarm limits.	Status	Major
Backup activated	Forward path is using receiver 2 due to problem with receiver 1.	Status	Notification

Table 4. AC8800 alarms in CATVisor / HMS

Led usage

Modem related alarms are indicated with transponder "Modem" led, ALC related alarms are indicated with transponder "ALSC" led, other alarms are indicated with AC8800's “Status” led with the exception of optical alarms which are indicated with optical receiver’s status led. The affected led and factory default severity settings are presented next to each alarm in Table 4. Alarms with "notification" severity do not affect leds.

ALSC led	Description
red	ALC enabled, ≥1 major alarm
yellow	ALC enabled, ≥1 minor alarm
green	ALC enabled, no alarms
green blink	Automatic alignment running
yellow blink	Automatic alignment targets not fully achieved
red blink	Automatic alignment stopped due to an error
dark	ALC off

Modem led	Description
red	Modem connected, ≥1 major alarm
yellow	Modem connected, ≥1 minor alarm
green	Modem connected, no alarms
green blink	Modem registering
dark	Modem not connected

Optical receiver led	Description
red	Optical power high major alarm
yellow	Optical power low major alarm
green	Optical power within major alarm limits
dark	Optical receiver disabled

Status led	Description
red	≥1 major alarm (other than modem/ALC/OptRx)
yellow	≥1 minor alarm (other than modem/ALC/OptRx)
green	No alarms (other than modem/ALC/OptRx)
red blink	Software cannot start
dark	Software / CPU / power failure

Product key activation of advanced features

Some AC8800 software features need to be activated with correct product key:

- Automatic forward and return path alignment
- Forward path spectrum analyser
- Return path ingress analyser with automatic ingress control and filtering
- Return path pilot generator

The activation can be done when ordering the product and also later by contacting Teleste support. CATVisor Commander user manual provides more details on entering the product key.

Transferring AC8800 settings

All user accessible settings are stored on the motherboard memory. Thus plug-in modules can be changed without losing any settings.

A “Settings Saver” DLL component for AC8800 is included in the latest DUS100 viewer packet release. It can be used with CATVisor Commander and CATVisor SmartLoader to transfer partial or complete device settings between a file and AC8800. This feature can be accessed through Commander > “Tools” > “Load/Save element configuration” when it has been activated with correct serial number. SmartLoader supports also transferring settings from/to multiple units simultaneously.

Note that the Settings Saver component uses CATVisor protocol and cannot thus be used remotely with HMS communication protocol.

The settings are stored as *.ECML files in XML format. These files can be also edited with standard text editors, provided that the XML tags and structure are maintained. Tags can be removed to create partial settings files. This makes it easy to download e.g. new pilot target levels to multiple units simultaneously.

The settings saver ECML files can also be edited in user-friendly format with an Excel tool. This tool can be downloaded from Teleste Club. The settings saver ECML files can also be used for specifying factory settings when ordering preconfigured AC8800 .

AC8800 will draw power from the USB connector for its microcontroller and memory if no external power supply is available. This makes it possible to configure AC8800 settings and update the software without any power supply.

Note that as only the CPU part of the unit is powered via USB, many parameters visible via the user interface may display incorrect values. Installing and removing plug-in modules while the unit is USB powered may lead to unexpected behaviour.

Settings download and upload is possible only to installed and enabled modules. This means that it is not possible to set the optical input power alarm limits of a disabled optical receiver module or read the pilot settings of a missing optical transmitter module.

Downloading device settings containing modem parameters over remote connection may cause loss of remote connection. Thus some settings may be not written correctly. If modem parameters need to be written, it is recommended to put them into a separate ECML file which is downloaded after other settings.

Updating AC8800 software

New software versions for AC8800 are published at Teleste Club. These may contain bug fixes, enhancements and completely new features. For details see "AC8800 software release history" document also available in the Club.

AC8800 software can be updated locally via USB using CATVisor Commander or remotely via modem connection using CATVisor Commander or SmartLoader or 3rd party download tool. AC8800 stays fully operational during the update, i.e. RF paths are not affected, ALSC continues to operate etc. During the update no other communication except software update is replied, so the management system may report the AC8800 as missing during the update.

The new software is taken into use after it has been completely downloaded and the device is reset. The reset takes a couple of seconds after which the device is fully functional and running the new software. If the download fails, AC8800 continues to use its previous software.

For CATVisor updates the same file is used for both local and remote update.

For remote SNMP update a different file must be used.

Local update

AC8800 software can be updated locally via USB using CATVisor Commander. Local software update of AC8800 takes ~1 minute.

AC8800 will draw power from the USB connector for its microcontroller and memory if no external power supply is available. This makes it possible to configure AC8800 settings and update the software without any power supply.

Remote update – CATVisor protocol

Remote update for CATVisor is done using CATVisor Commander or SmartLoader. It is also possible to download new software to multiple devices simultaneously without resetting them and take the new software into use later by sending a broadcast reset with CATVisor SmartLoader.

Remote update – HMS protocol

Remote update for HMS is done using SNMP protocol according to the standard HMS-DOWNLOAD-MIB. Special software tools are available for this purpose. Please refer to the documentation of the specific tool in use.

Remote update – DOCSIS protocol

AC8800 software can be updated remotely with either CATVisor or HMS protocols as described above.

Updating transponder software

AC6991 and AC6980 transponders have their own tuner software which handles the pilot / spectrum / ingress measurements. The tuner software can be updated locally or remotely by using the methods above.

When the tuner software transfer has completed, it can take up to 1 minute for the transponder software to be updated by AC8800. Wait until the new software version appears in the user interface before removing power or the transponder.

AC6980 transponder DOCSIS software update

AC6980 transponder has its own DOCSIS software which handles the remote communication. This software is updated by using the standard DOCSIS methods, i.e. TFTP file download initiated by DHCP server configuration.

SNMP MIBs

The parameters of a unit in HMS or DOCSIS mode can be accessed remotely using SNMP MIBs (Management Information Base). Should they be needed for e.g. integration with 3rd part management systems, the Teleste-proprietary MIBs are available for download in Teleste Club. SCTE MIBs can be downloaded from SCTE website.

Supported MIBs for AC product family:

- RFC1213-MIB
- SNMPv2-MIB
- TELESTE-ROOT-MIB
- TELESTE-ACX-MIB
- TELESTE-COMMON-MIB
- TELESTE-HE-STATUS-MIB
- TELESTE-HMSMODEM-MIB
- TELESTE-ANALYSER-MIB
- TELESTE-PILOTGENERATOR-MIB
- TELESTE-ALARMS-MIB
- SCTE-HMS-PROPERTY-MIB
- SCTE-HMS-ALARMS-MIB
- SCTE-HMS-COMMON-MIB
- SCTE-HMS-FIBERNODE-MIB
- SCTE-HMS-DOWNLOAD-MIB

Viewer pages

This chapter presents AC8800 viewer pages used with local or remote CATVisor protocol connection. The viewer pages used with SNMP remote connection with HMS or DOCSIS protocols slightly different in layout but contain all the same parameters.

The viewer pages used to control AC8800 using CATVisor Commander or EMS are explained in this chapter. For a complete description of each feature, see corresponding “Features” chapter.

Some features may be greyed out, indicating that they can not be used at the moment due to e.g. missing plug-in module.

AC8800 viewer pages in CATVisor Commander / EMS:

- Status
- Forward path
- Return path
- Transponder (different pages for CATVisor / HMS / DOCSIS)
- Monitoring
- Spectrum
- Ingress
- Properties

Some viewer pages have fields with coloured background, e.g. "Temperature" on "Status" page. These colours indicate the alarms related to this field. Green means no alarms or notifications; red is major alarm, yellow is minor alarm and blue is notification.

Status viewer page

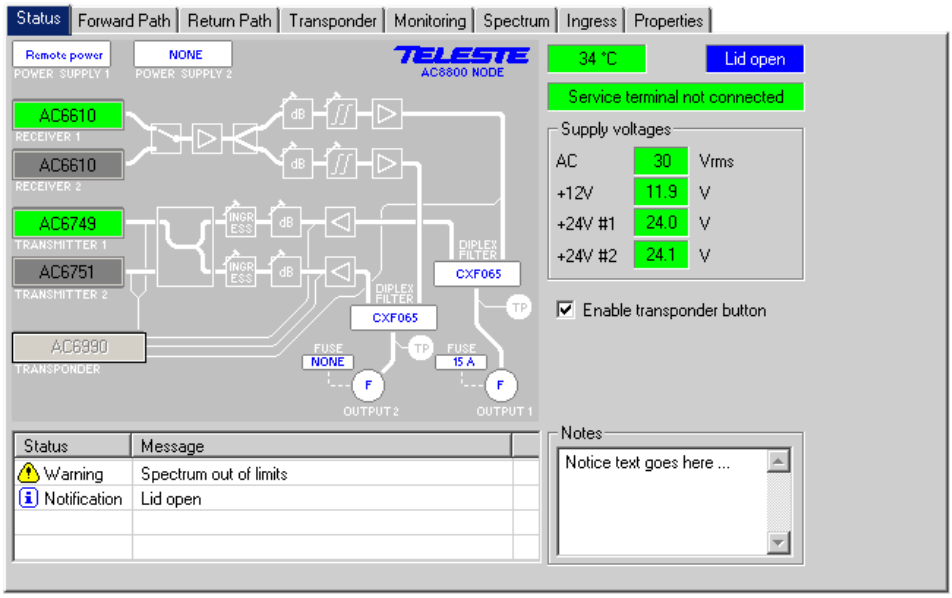

Figure 20. The Status page

The Status page displays unit's alarm list together with measurement data and a graphical view of the current configuration similar to the actual station layout.

Alarm list

Each alarm in the alarm list on the bottom left corner is colour coded according to its severity. The severities can be configured through "Monitoring" viewer page. For additional information about alarms, see table of module alarm descriptions in the "Alarms" chapter.

Station layout

The transponder is detected automatically and represented as grey box. Some modules and plugs, e.g. fuses, cannot be detected automatically. These are presented with blue texts. Selecting a text tag representing a passive device will open a pull down selection list in which an appropriate device according the assembly can be selected. The user can also type in the desired information (up to 12 characters, 6 characters for fuses). The information entered in these fields does not affect unit operation in any way, it's just a "checklist".

See “Features” chapter for details on plug-in modules and configuration.

Measurements

The background colour of each field shows the parameter's alarm status. Alarm limits and severities can be configured through "Monitoring" page.

AC8800's internal temperature is displayed in top-left field next to layout view.

Lid status information is based on a light sensor in the transponder's front panel. "Lid open" is displayed if light level has been above limit during the last minute. In dark environment "Lid closed" may be displayed even if the lid is open. "Lid unknown" indicates that the transponder is not installed.

The “Service terminal” field shows whether there has been activity on the local USB service connector during the last minute.

The "Supply voltages" frame displays measured supply voltages of the station.

The “AC voltage” field shows true RMS value (DC+AC component) of the remote supply voltage. This value is calculated using sliding average and thus reacts quite slowly to changes. The factory default limit values are based on AC8800's power supply specifications and are thus quite broad. They should be adjusted to match the network's AC supply voltages if accurate monitoring is needed.

+12 V and +24 V factory default alarm limits are based on power supply specifications and usually shouldn't be altered.

Transponder front panel has a “Set” button which starts automatic alignment for both forward and return paths. The button can be disabled to prevent accidental presses by clearing the "Enable transponder button" checkbox.

Notes

The “Notes” field allows storing up to 100 character message into AC8800 non-volatile memory. It can be used e.g. as a reminder for the pilot settings.

Forward path viewer page

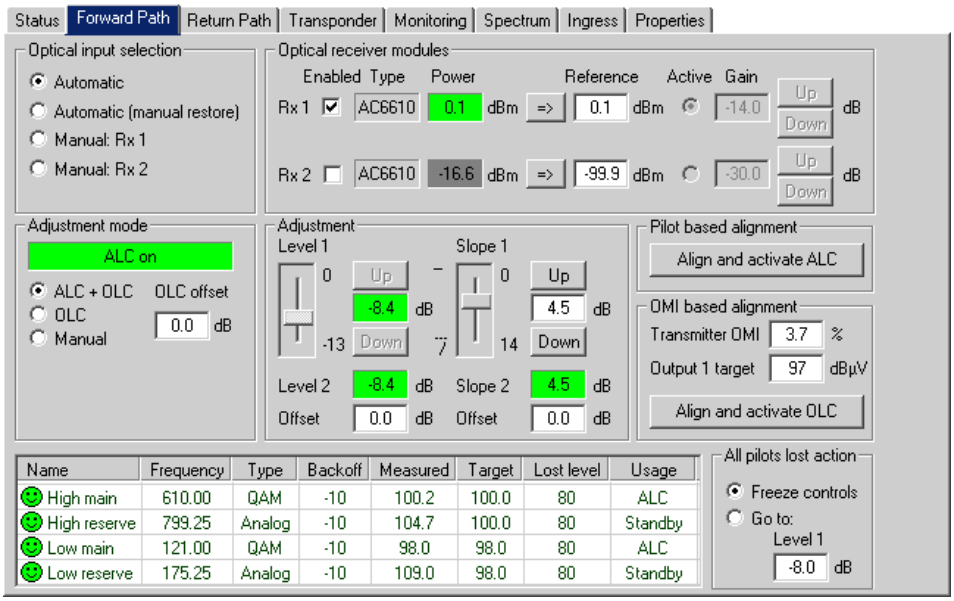

Figure 21. The Forward path page

The Forward path page displays all settings related to forward path adjustment. See “Forward path” chapter for details on forward path, ALC and automatic alignment.

Optical input selection

This selection controls how RF from the optical receiver modules is routed on the node. See “Optical receivers” section in “Forward path” chapter for details on backup switching logic. The alarm limits and deadband can be configured through "Monitoring" viewer page.

Optical receiver modules

Clearing the “Enabled” checkbox disables the optical receiver and forces the node to function as if the receiver module was not installed. The optical input power is still measured and displayed, but no alarms nor backup switching is done.

The type of the receiver module as well as the measured optical input power is displayed in the “Optical receiver modules” frame. The background colour of the “Power” data field changes to indicate alarms.

The "Reference" field can be edited to store the optical input power value for future reference. The "=>" button opens a dialog box which allows copying the current value to reference value. In the dialog it is also possible to enable optical input power minor alarm limits and set them according to the current value with user specified marginal, default ±1.0 dBm.

The “Active” radio button indicates which receiver module is in use.

The "Gain" field and up and down buttons can be used to adjust the level values in 0.5 dB steps in “Manual” adjustment mode. In “ALC + OLC” and “OLC” adjustment modes OLC has the control and this field is read-only.

Adjustment mode

The “Adjustment mode” controls how the forward path level is adjusted:

- ALC + OLC: This is a combination of adjustment functions where ALC (Automatic Level Control) measures the levels of pilot signals and adjusts interstage level control accordingly while OLC (Optical Level Control) adjusts optical receiver output level based on the optical input level. The OLC offset parameter is added to the optical receiver output level. The ALC functionality only measures output 1. Output 2 follows output 1 changes with the offset values. OLC circuitry compensates for changes in input level as long as input power is within the nominal range of -7…+3 dBm.
- OLC: OLC (Optical Level Control) circuitry provides optical receiver output level control that compensates for changes in input level caused by external variations as long as input power is within the nominal range of -7…+3 dBm. The OLC offset parameter is added to the optical receiver output level.
- Manual: All level and slope controls can be adjusted by the user. OLC offset has no effect.

See “Forward path level control” section under “Forward path” chapter for details on adjustment modes and OLC offset parameter.

The data field displays the ALC status:

- “ALC on”: ALC is enabled and works properly.
- "ALC off": ALC is disabled by user.
- "ALC saturated": ALC is saturated (=adjustments limits reached), interstage 1 and/or 2 level is adjusted to limit.
- "ALC main pilot missing": Main pilot is missing. ALC uses reserve pilot.
- "ALC all pilots missing": All pilots are missing. ALC is frozen or using “go to” values.
- "No transponder": No transponder unit installed. ALC is disabled.
- "Tuner module error": Error in transponder tuner module. ALC is disabled.

Adjustment

Level and slope controls can be adjusted by clicking the up and down buttons, dragging the sliders or typing a value into the fields. The availability of these controls depends on the selected adjustment mode. Output 2 automatically follows output 1 changes with the offset values specified in the “Offset” field. The resulting level and slope for output 2 are shown as read-only information with green background when the value is within adjustment range and with yellow background when the adjustment has saturated. Maximum control range for both offset values is -10…10 dB depending on value of the adjustment control.

Pilot based alignment

Clicking the “Align and activate ALC” button will start forward path pilot based alignment, provided that transponder is installed and the automatic alignment feature is enabled with correct Product Key. A dialog box is opened which displays the status of the alignment.

OMI based alignment

Clicking the “Align and activate OLC” button will start forward path OMI based alignment. A dialog box is opened which displays the status of the alignment. The adjustment procedure is based on the desired “Transmitter OMI” (0…20%) and “Output 1 target” (80…120 dBµV) values given by the user.

Pilot table

If transponder is installed, each pilot measurement is shown in the table with the following information:

Pilot name: Icon and pilot name colour coding indicates pilot status: green for pilot OK, red for pilot lost.

Frequency (MHz): Pilot signal frequency, adjustable in 0.25 MHz steps. If 0 MHz is entered as pilot frequency, the pilot is disabled and thus it is not used in adjustment and no alarms of missing pilot are generated.

Type: Detector type. The measurement detector can be individually selected for each frequency to be either peak detect (“Analog”) or averaging (“QAM”).

Backoff (dB): Pilot signal backoff. For information only.

Measured (dBµV): Measured level of pilot signal.

Target (dBµV): Pilot signal target level for ALC operation.

Lost level (dBµV): Limit below which the pilot is considered as lost.

The pilot signal frequency, type, backoff, target level and lost level can be edited by double-clicking a row in pilot table. This will open a dialog box with pilot's properties that can be edited by users with at least "Service" level user rights. After editing the pilot settings they must be taken into use by clicking "Apply" button.

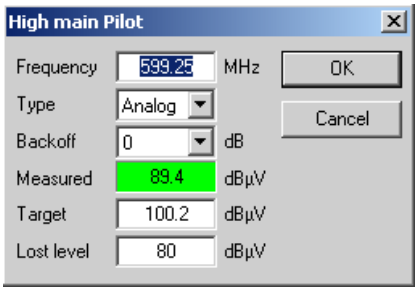

Figure 22. The pilot signal configuration dialog box

All pilots lost action

When all pilots are lost, AC8800 gives "ALC all pilots missing" alarm and operates as selected by "All pilots lost action" radio buttons:

- Freeze controls: Interstage level controls will keep the values they had immediately before the pilot signals were lost.
- Go to: “Level 1” level control will slowly step towards user defined value and output 2 follows with the specified offset.

Return path viewer page

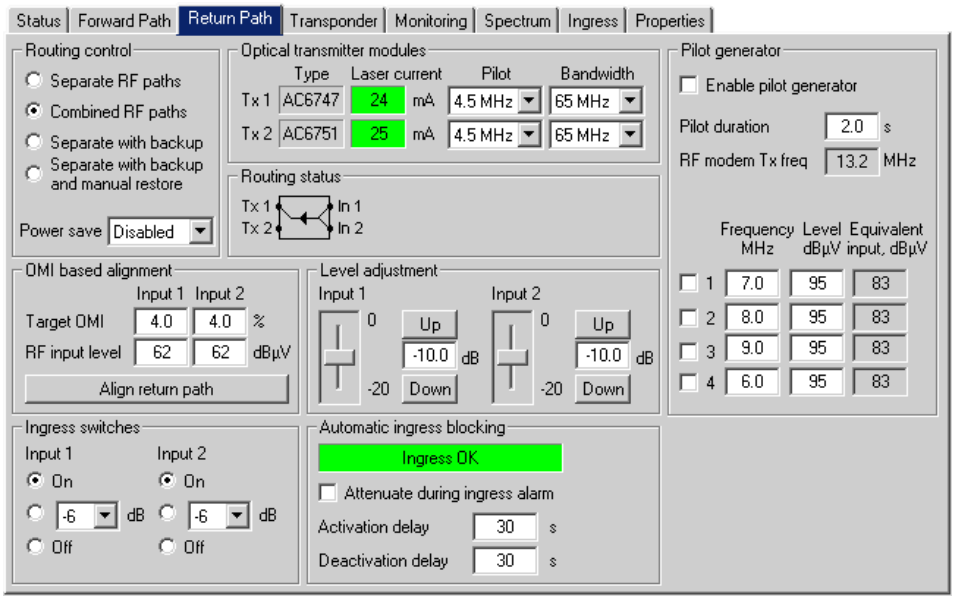

Figure 23. The Return path page

The Return path page displays all settings related to return path adjustment. See “Return path” chapter for details on return path and ingress control.

Routing control

The “Routing control” settings provide manual or automatic control of return paths in case the signal is lost. There are four possible selections.

Separate RF paths: Each RF upstream signal is routed for transmission to a corresponding return path transmitter.

Combined RF paths: RF upstream signals are combined, and routed for transmission to both return path transmitters.

Separate with backup: If any of the following conditions is met, the routing is switched to the “Combined RF paths” mode.

- A hardware failure. Any of the two return path transmitters or forward path receivers is missing or broken.
- A change in conditions: Laser current is not within the acceptable range on either of the return transmitters or optical input power of either the forward path receiver drops below -7.0 dBm.

When normal operation status is resumed, the routing is switched automatically back to the “Separate RF paths” mode.

Separate with backup and manual restore: The routing takes place in the same way as before, but it continues to master even after the operation status has been successfully resumed. The user has to manually restore the routing status by selecting the “Separate RF paths” and after that again the “Separate with backup and manual restore”

Power save: Both optical transmitters' RF stages and lasers are always on when power save is set to "Disabled". When set to "RF stages", the RF stage activation follows the optical receiver, provided that RF paths are combined, and both return transmitters are installed, and their bias currents are within limits. This feature has no effect when return path RF paths are separate. Laser

is always on. "RF+laser" is a special mode in which the RF stages and also laser activation follows the status of forward path optical level.

See "Return path signal routing" and “Return path power save” sections under “Return path“ chapter for details on routing control and power save functionality.

Routing status

Graphical representation of the selected “Routing control” option.

Optical transmitter modules

The type of transmitter modules as well as measured laser currents are displayed in this frame. The background colour of the “Laser current” field changes to indicate alarms. The desired pilot signal frequency (4.5 MHz (or 5.5 MHz in later HW versions, but shown as 4.5 MHz) or 6.5 MHz) is defined individually for each transmitter. The pilot signal can also be disabled. The “Bandwidth” selection controls return path low pass filters. It has to be set to match the installed diplex filters. If the installed diplexers and “Bandwidth selection” do not match, the performance of the node may be severely deteriorated. The default value is 65 MHz.

OMI based alignment

Clicking the “Align return path” button will start automatic alignment of the return path, a dialog box is opened which displays the status of the alignment. The adjustment procedure is based on the desired “Target OMI” (0…20%) and “RF input level” (30…90 dBµV) values given by the user.

Level adjustment

The "Input 1” and “Input 2” fields, sliders and up and down buttons can be used to control the return path gain independently in 0.5 dB steps.

Ingress switches

The radio buttons are used to control the behaviour of ingress switches. The “Off” selection cuts off the incoming return path RF signal and thus disconnects all transponders behind this node, but the AC8800 itself can still measure return path ingress and communicate with its modem.

The ingress switch attenuation value can be adjusted between 3…10 dB. This can be used to fine-tune the automatic ingress attenuation feature.

Automatic ingress blocking

The Ingress measurement status is displayed on the top of the frame:

- "Ingress OK": Ingress measurement results are within limits.
- "Ingress warning": Ingress measurement results are above warning limits.
- "Ingress alarm”: Ingress measurement results are above alarm limits.
- "Ingress analyser off": Analyser is disabled by user.
- "No transponder": No transponder module installed.
- "Tuner module error": Error in transponder tuner module.

When “Attenuate during ingress alarm” checkbox is selected, ingress switches are controlled by AC8800 based on “Ingress alarm” / “Ingress alarm 2” status and activation and deactivation delays. The activation and deactivation delays can be used to fine-tune this feature.

Pilot generator

The “Pilot generator” frame is active when AC6990 or AC6991 transponder is installed and the pilot generator feature is enabled with correct Product Key

The “Enable pilot generator” checkbox is the master switch for return path pilot generator. When the pilot generator is enabled, AC8800 outputs one of the pilot signals for a user defined “Pilot duration”, then switches to the next pilot signal and then repeats again. The “RF modem Tx frequency” data field shows as read-only information the used transmitter frequency commanded by the HEC.

Pilot frequency, level and enabling can be controlled for all four pilots separately. Equivalent input level is shown next to each pilot. It takes into account return path losses, gain setting and ingress switch setting. When ingress switch is set to “Off” the equivalent input level is not valid and shown as “N/A”.

Transponder viewer page (CATVisor)

This page is visible with AC6990 / AC6991 transponder in CATVisor mode.

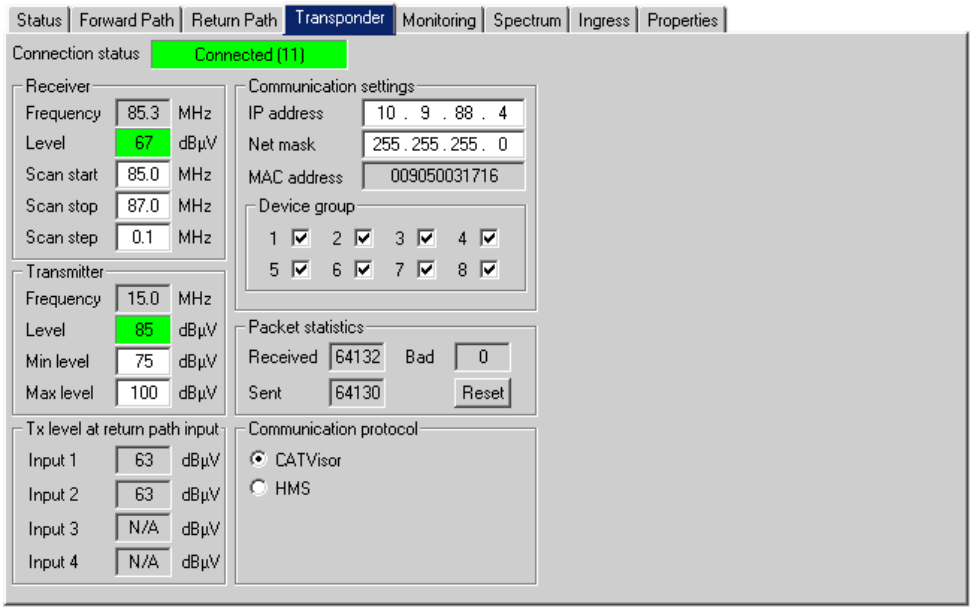

Figure 24. The Transponder (CATVisor) page

The “Transponder” page displays all the data and settings of the transponder’s RF modem and remote communication. See “Remote communication” chapter for details.

Connection status

The current communication status between the transponder and HEC is shown in the “Connection status” field with

- “Scanning: searching for the HEC carrier.
- “Data carrier found”: waiting for communication parameters.
- “Registering”: registration in progress.
- “Connected”: registration complete, communication OK.

The number in parenthesis is a more detailed status indicator for diagnostics purposes, ranging from 0 to 11.

Receiver

The “Frequency” data field shows the used receiver frequency.

The “Level” data field shows the measured signal level.

The “Scan start” and “Scan stop” fields determine the frequency band that the unit scans through when searching for the HEC carrier. Scanning can be disabled by setting the start and stop frequencies to the same value. Scanning speed can be improved by limiting the scanning range. The default and maximum range is 80…155 MHz. The scan will start from the last known HEC carrier frequency.

The “Scan step” field sets the frequency increments of the scanning process, default and minimum value is 0.1 MHz.

Changing any of these fields will reset RF modem communication.

Transmitter

The “Frequency” data field shows the used transmitter frequency commanded by the HEC. The “Level” data field shows the transmitter signal level.

The range for transmit signal level can be set in the “Min level” and “Max level” fields. The default range is 75…100 dBµV and maximum range is 75…104 dBµV. If the HEC commands transponder to use transmit level outside this range, nearest allowed value is used and "Modem transmit level saturated" alarm is activated.

Changes in these values will not reset RF modem communication and will be taken into use immediately if HEC’s ALC is enabled.

Tx level at return path input

These fields show the calculated equivalent input level for the transponder transmit level. This is the signal level that needs to be injected to return path input to appear at return path output at same level than transponder signal.

Communication settings

The “IP address” field is used to define the IP address of the unit. The address has to be unique and match the HEC’s IP subnet settings to ensure proper operation and IP level communication with the HEC.

If the IP address is set incorrectly, e.g. 0.0.0.0, the transponder can still communicate with the HEC on MAC level, but IP traffic (i.e. viewer / EMS messages) is not possible. It is possible to set the IP remotely via the HEC.

The “Net mask” field defines the corresponding IP subnet. It is only needed for broadcast software updates and has to be set according to the HFC subnet of the HEC; otherwise it can be left as 255.255.255.255.

The “MAC address” is the unit’s unique, read-only hardware address that is also printed on the transponder front panel sticker.

Manageable devices in the same HFC network can be divided into different device groups. The “Device group” check boxes can be used to group transponders under multiple HECs. For more information, consult HEC user manual.

Changing any of these fields will reset RF modem communication.

Packet statistics

The “Received” field displays the total number of IP packets addressed to and received by this unit.

The “Sent” field displays the total number of IP packets sent by this unit.

The “Bad” field displays the number of all bad packets received and is a good indicator of the forward path condition.

Packet counters wrap around at 65535, so absolute values are not meaningful.

The "Reset" button will reset all packet counters to zero.

Communication protocol

It is possible to change between CATVisor and HMS on the fly. Careful planning is needed in e.g. HEC / HMTS setup for successful change, especially over remote connection. Changing the setting and clicking "Apply" will open a dialog for entering parameters specific for the selected protocol. After accepting the values the unit will reset and start communication using the new protocol.

Transponder viewer page (HMS)

This page is visible with AC6990 / AC6991 transponder in HMS mode.

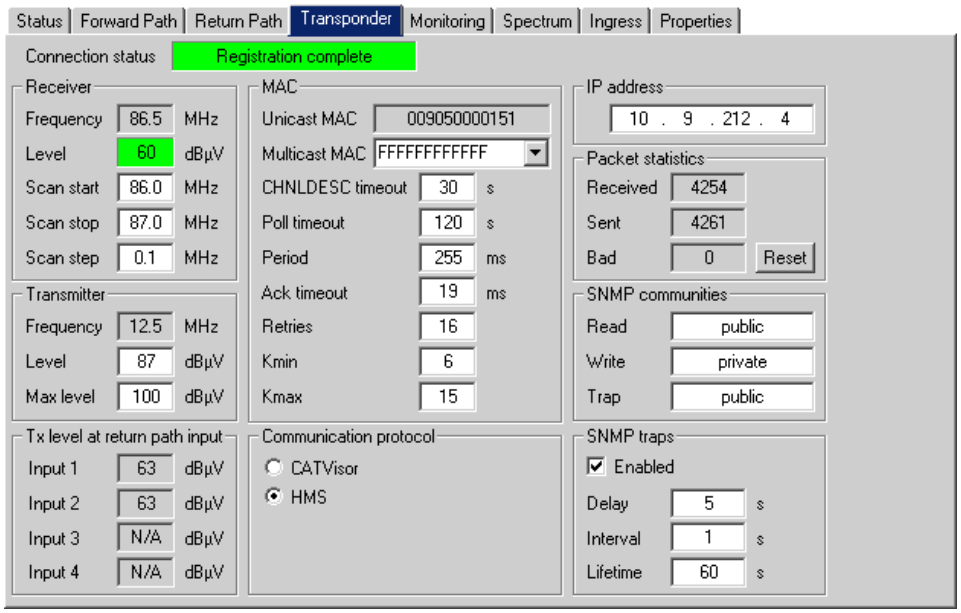

Figure 25. The Transponder (HMS) page.

The " **Connection status** ", "**Receiver**", "**Transmitter**", "**Packet statistics**", "**Tx level at return path input**" and "**Communication protocol**" frames are the same as in the CATVisor version of this page and are described in the preceding chapter. However, HMS standard does not support automatic transmit level alignment and therefore the transmit level is manually adjusted in the HMS version.

IP address

This is the transponder's IP address. In HMS the this field is just a storage place. Depending on the used addressing method, the HMTS may or may not use this value. It may also change this value using MAC layer commands.

MAC

Unicast MAC: The transponder's globally unique MAC layer address.

Multicast MAC: The transponder supports up to four (4) multicast addresses that can be used for setting parameters in groups of devices. Note that not all HMTS's support multicast.

CHNLDESC timeout: HMTS broadcasts periodically the CHNLDESC datagram that informs the transponders about data channel frequencies. This timeout defines how long the transponder waits for an eventual CHNLDESC datagram, to define whether the carrier is an HMS channel. After the transponder is registered, it uses a timeout twice as long as the set value, to avoid the transponder from leaving the channel in case the reception of one CHNLDESC is unsuccessful. The HMTS should be set to broadcast CHNLDESC 0.5…0.9 x CHNLDESC timeout.

Poll timeout: If the transponder receives no datagrams to its own MAC address, it will wait up to this timeout, before declaring itself as 'forgotten' by the HMTS. After this timeout expires, the transponder will start reregistration.

"Period", **"Ack timeout"**, **"Retries"**, **"Kmin"**, **"Kmax"**: These values are used by the backoff calculation algorithm, in case a collision happens in the return path transmission (two or more transponders transmitting simultaneously). These values are for experts only and should be changed only in very special cases. The default 'Period' value is 60 ms.

SNMP communities

SNMPv1 community strings. The transponder will only accept SNMP GET/GET NEXT commands containing the Read or Write community string and SET commands containing the Write community string. Traps are sent containing the Trap community string. Communities can be adjusted **only locally**.

SNMP traps

Enabled: Enables/disables sending of HMS SNMP traps.

Delay: The time to wait before sending an HMS alarm trap, once an alarm is detected. This parameter can be used to control trap storms in amplifier cascades. By setting a longer delay deeper in the cascade, traps can be set to arrive on due order.

Interval: The minimum time between successive traps. This parameter applies only if several alarms are detected simultaneously.

Lifetime: The time the transponder keeps an HMS alarm trap in the transmit queue, if it cannot be sent for some reason (controlled by HMTS).

All trap parameters are adjustable also remotely via TELESTE-COMMON-MIB. Teleste MIBs are available at Teleste Club.

Transponder viewer page (DOCSIS)

This page is visible with AC6980 transponder.

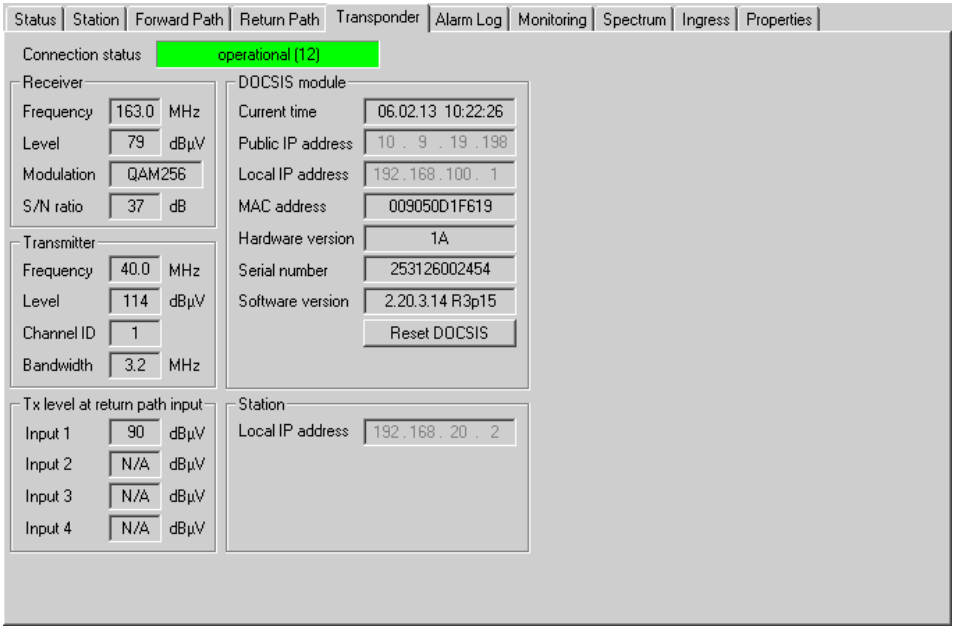

Figure 26. The Transponder (DOCSIS) page

The “Transponder” page with AC6980 transponder displays read-only status information on the DOCSIS communication. See “Remote communication” chapter for details.

Connection status

The current communication status between the transponder and CMTS is shown in the “Connection status” field. The number in parenthesis is a more detailed status indicator for diagnostics purposes, ranging from 1 to 13.

Receiver

The used forward path frequency, receive level at transponder input and modulation are shown in respective fields. "S/N ratio" is the measured signal to noise ratio at DOCSIS receiver.

Transmitter

The return path frequency, transmit level at transponder output, channel ID and bandwidth are shown in respective fields.

DOCSIS module

The current time and public IP address obtained from CMTS are shown in respective fields together with DOCSIS module hardware version, serial number and software version. DOCSIS module software can be updated only remotely via CMTS (DHCP/TFTP).

The local IP addresses are shown for reference only.

The MAC address is the unit’s unique, read-only hardware address that is also printed on the transponder front panel sticker.

The "Reset DOCSIS" button forces the module to re-establish the communication link.

Monitoring viewer page

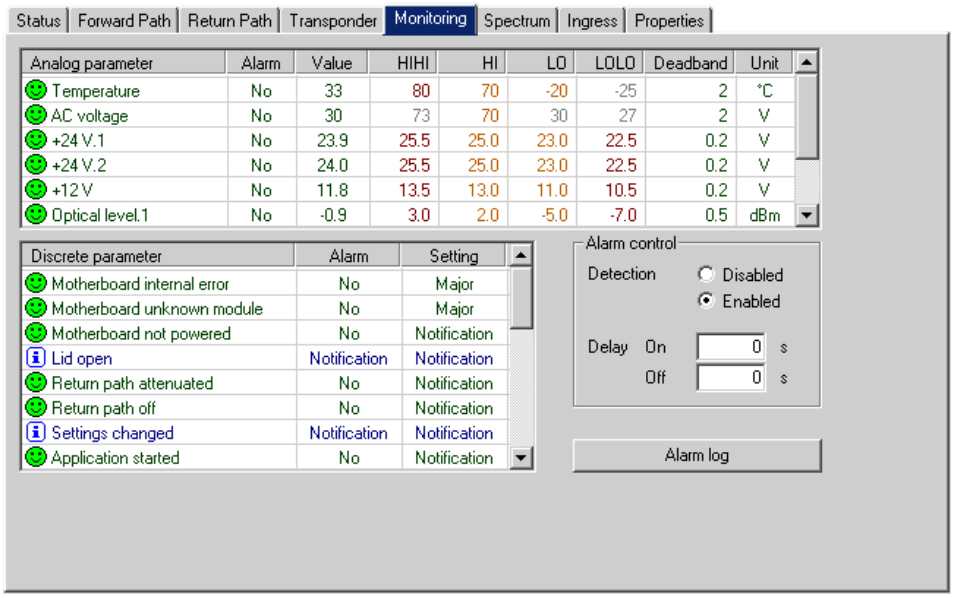

Figure 27. The Monitoring page

The "Monitoring" page displays all monitored parameters and their values as well as alarm limits, statuses and severity settings.

See "Alarms" chapter for descriptions of individual AC8800 alarms.

Analog parameters

Each monitored analog parameter of the unit is displayed in the upper half of the frame with following information in the list:

Analog parameter: Name of the monitored parameter.
Alarm: Alarm status of the parameter: No / HIHI / HI / LO / LOLO
Value: Current measured value.
HIHI: High major alarm limit
HI: High minor alarm limit.
LO: Low minor alarm limit
LOLO: Low major alarm limit.
Deadband: Specifies how much the measured value has to be on the "safe" side of alarm limit before turning off the alarm.
Unit: Unit of the measured parameter.

The colour of each list entry and the icon next to parameter name indicate alarm status:

- green for nominal value
- red for major alarm
- yellow for minor alarm
- grey for disabled alarm

The alarm settings are user configurable by double-clicking an analog parameter. This will open a dialog box with parameter's alarm limits and deadband that can be edited by users with at least "Service" level user rights. For others this is read-only information.

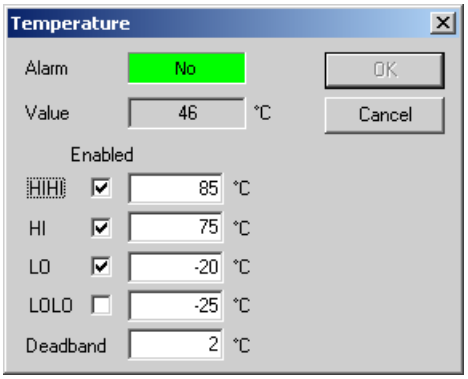

Figure 28. The analog alarm configuration dialog box

Each alarm limit can be individually enabled/disabled and configured. The alarm limits should be in decreasing order for correct alarm processing, preferably with more than "Deadband" units between each limit.

Discrete parameters

Each monitored discrete parameter of the unit is displayed in the lower half of the frame with following information in the list:

Discrete parameter: Name of the monitored parameter.

Alarm: Alarm status of the parameter: No / Notification / Minor / Major. If the alarm is disabled, but parameter is in alarming state, "Yes" is shown.

Setting: Alarm severity can be configured to Major, Minor, Notification or Disabled.

The colour of each list entry and the icon next to parameter name indicate alarm status:

- green for nominal value
- red for major alarm
- yellow for minor alarm
- blue for notification
- grey for disabled alarm

The alarm severity setting is user configurable by double-clicking a discrete parameter. This will open a dialog box which can be edited by users with at least "Service" level user rights. For others this is read-only information.

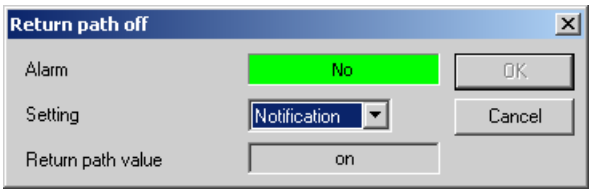

Figure 29. The discrete alarm configuration dialog box

Alarm control

Alarm control frame provides independent on-delay and off-delay timers. The time delay feature can be used to eliminate false alarm triggering due to momentary disturbances. An alarm is only active when “Detection” is enabled and the monitored parameter has been over limit longer than "Delay On" time.

Alarm goes off when the parameter has been inside limits longer than "Delay Off" time.

The settings on the “Alarm control” frame can be edited by a user with at least Service level user rights. For others this is read-only information. It is recommended not to change these values from their factory default value 1 s without fully understanding the effects on EMS system performance.

Alarm log

Clicking the "Alarm log" button on "Monitoring" page opens alarm log dialog.

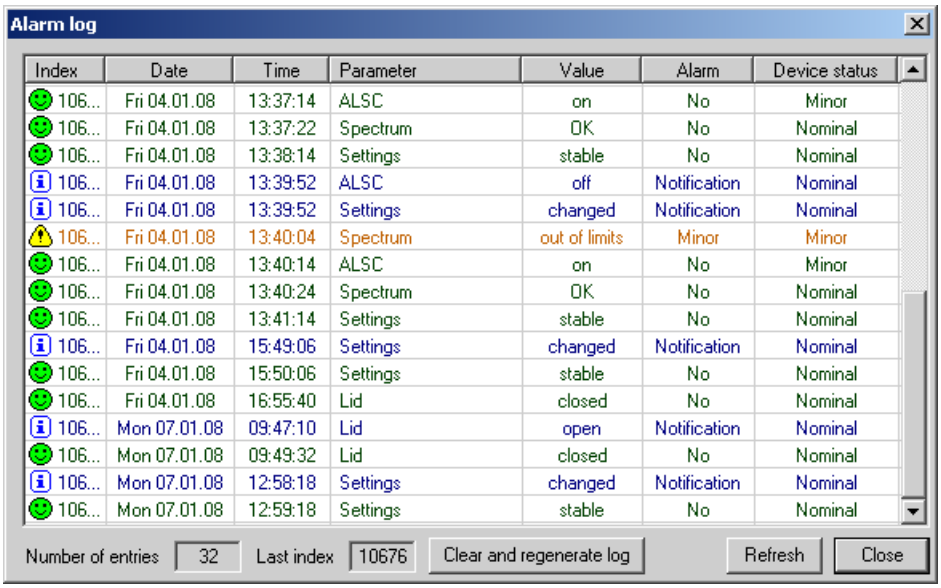

Figure 30. The Alarm log dialog

The “Alarm log” dialog box displays the alarm history for latest 32 events. The list is stored in non-volatile memory. All entries are date and time stamped with the most current entry at the bottom. Note that date/time information may not be correct for events that occurred before latest reset.

The icon and colour of each list entry indicate alarm status:

- green for nominal value
- red for a major alarm
- yellow for a minor alarm
- blue for a notification

The total number of entries in the alarm log list is shown in the “Number of entries” field. The index number of the last entry is displayed in the accompanying field. Total number of entries is limited to 32. The oldest entry is overwritten when the log becomes full.

To update “Alarm log” page, click the “Refresh” button.

“Clear and regenerate log” button clears alarm log and restarts alarm detection.

Spectrum viewer page

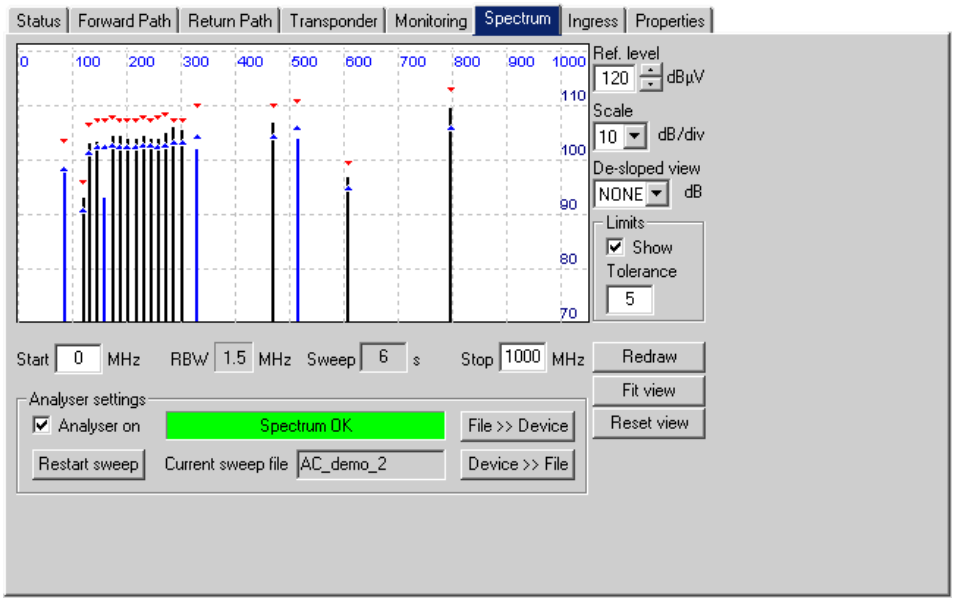

Figure 31. The Spectrum page

When the spectrum analyser feature is enabled with correct Product Key, the "Spectrum" viewer page presents forward path level measurements in a graphical “spectrum analyser” display. Up to 100 measurement frequencies with individual peak / average detector selection and alarm limits can be specified with a simple text file. The measurement results can be saved back to a text file.

Display settings

When the viewer page is opened, the measurement results are retrieved from the device and displayed. The display can be zoomed or re-centred by entering new values into start and stop frequency, reference level and scale dialogs and clicking “Redraw” button. The "Fit view" button scales the display so that all measurement frequencies are visible; "Reset view" button restores full-scale display.

The RBW (resolution bandwidth) is fixed by transponder HW and depends on the installed transponder type, see transponder spec sheet.

The "Sweep" field displays the last elapsed time it took to scan through the complete set of measurement frequencies.

The “De-sloped view” drop-down box can be used to simulate a view of a flat frequency response by reducing the level at the high end of the node’s response. Signal level at 1006 MHz is displayed with the attenuation specified in "De-sloped view", signal level at 47 MHz is not affected at all and attenuation of the frequencies between these two are calculated using a standard coaxial cable model. The “De-sloped view” function acts only as a visual aid for making adjustments and does not affect device operation in any way.

If the graphical display is clicked with mouse the frequency, measured level, detector mode and possible alarm limit values of the clicked measurement are displayed next to the clicked point.

Limits

When "Show" is checked the alarm limits for each measurement frequency are shown in the graphical display with blue triangles for low limit and red triangles for high limit. If a measurement is over high limit it will be drawn in red; in blue if it is below low limit; otherwise in black.

The "Tolerance" field specifies how many measurements are allowed to be outside limits before the "Spectrum out of limits" alarm is generated. The default value 0 will generate the alarm even if only one value is outside limits. "Tolerance" allows fine-tuning the limit testing so that e.g. it doesn't react to one missing TV channel. The alarm is set or cleared at the end of each measurement cycle.

Analyser settings

The “Analyser on” is the master switch for spectrum analyser feature.

The data field next to “Analyser ON” check box displays the ingress status: Spectrum OK / Spectrum out of limits / Spectrum analyser off.

The “Restart sweep” button clears the measurement results table and restarts the sweep. The “Current sweep file” field displays the first 15 characters of the filename of the last sweep file downloaded to the device.

The “File >> Device” and “Device >> File” buttons open a file dialog for transferring a sweep / result file to / from the device.

Sweep and result file formats

The sweep file is a simple text file than can be edited with any text editor and most spreadsheet applications. Each line in the sweep file defines one measurement frequency, preferably in ascending order. Each line has 2-4 fields separated with tab characters and dot (.) as the decimal separator:

1. The measurement frequency in multiples of 0.25 MHz.

2: The detector mode as “P” or “PAL” for peak detection or “Q” or “QAM” for averaging measurement. Detector mode designation is not case sensitive.

3: Optional low limit in multiples of 0.5 dBµV.

4: Optional high limit in multiples of 0.5 dBµV.

Comments can be inserted at the end of the line, preceded with a tab character, or on a separate row which starts with a non-numeric character. Comments are for information only and will not be downloaded into the device and so they are lost if result table is uploaded back from device.

An example of a valid sweep file:

```
113     QAM     98.0    103.5   Channel S2
121.00  Q               101     Channel S3
126.25  P                       Another comment
133.25  PAL     95
```

The result file format is identical to the sweep file format, except that it has a header row and a 5th column which contains the measurement results. An example of a result file produced by the above sweep file could be like this:

```
MHz     Type    LoLimit HiLimit dBµV
113.00  Q       98.0    103.5   100.5
121.00  Q               101     99.5
126.25  P                       101
133.25  P       95              98
```

Ingress viewer page

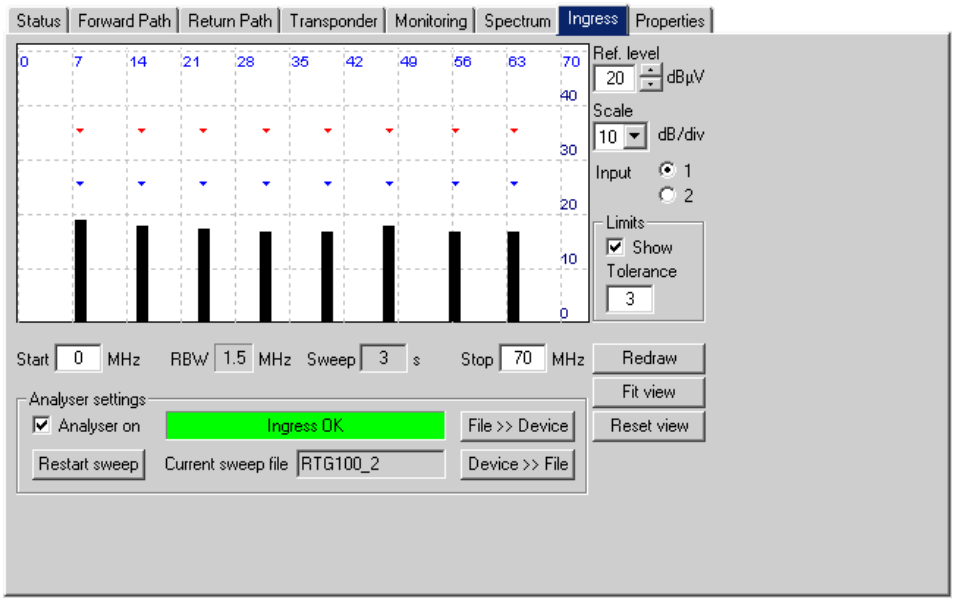

Figure 32. The Ingress page

When the ingress analyser feature is enabled with correct Product Key, the "Ingress" viewer page presents return path level measurements in a graphical “spectrum analyser” display. Up to 30 measurement frequencies with individual signal / noise detector selection and alarm limits can be specified with a simple text file. The measurement results can be saved back to a text file.

Display settings

When the viewer page is opened, the measurement results are retrieved from the device and displayed. The display can be zoomed or re-centred by entering new values into start and stop frequency, reference level and scale dialogs and clicking “Redraw” button. The "Fit view" button scales the display so that all measurement frequencies are visible; "Reset view" button restores full-scale display.

The “Input” radio button selects the displayed return path input. The ingress measurement file, tolerance and all display settings are individual for each channel, but the ingress analyser main switch is common for both inputs.

The RBW (resolution bandwidth) is fixed by transponder HW and depends on the installed transponder type, see transponder spec sheet. Note that due to the roll off of the RBW filter, a payload-free area is needed if noise levels are to be measured.

The "Sweep" field displays the last elapsed time it took to scan through the complete set of measurement frequencies.

If the graphical display is clicked with mouse the frequency, measured level, detector mode and possible alarm limit values of the clicked measurement are displayed next to the clicked point.

Limits

When "Show" is checked the alarm limits for each measurement frequency are shown in the graphical display with red triangles for alarm limit and blue triangles for warning limit. If a measurement is over alarm limit it will be drawn in red; in blue if it is over warning limit but not over alarm limit; otherwise in black.

The "Tolerance" field specifies how many measurements are allowed to be over limits before the "Ingress warning" or "Ingress alarm" alarm is generated. The default value 0 will generate alarm even if only one value is outside limits. The alarms are set or cleared at the end of each measurement cycle.

Analyser settings

The “Analyser on” is the master switch for ingress analyser feature.

The data field next to “Analyser ON” check box displays the ingress status: Ingress OK / Ingress alarm / Ingress warning / Ingress analyser off.

The “Restart sweep” button clears the measurement results table and restarts the sweep. The “Current sweep file” field displays the first 15 characters of the filename of the last sweep file downloaded to the device for selected input.

The “File >> Device” and “Device >> File” buttons open a file dialog for transferring a sweep / result file to / from the device. Files for each input are transferred separately.

Sweep and result file formats

The sweep file is a simple text file than can be edited with any text editor and most spreadsheet applications. Each line in the sweep file defines one measurement frequency, preferably in ascending order. Each line has 2-4 fields separated with tab characters and dot (.) as the decimal separator:

1. The measurement frequency in multiples of 0.25 MHz.

2: The detector mode as “P” or “PAL” for peak detection of return path payload signals or “Q” or “QAM” for averaging measurement of return path ingress noise. Detector mode designation is not case sensitive.

3: Optional warning limit in multiples of 0.5 dBµV.

4: Optional alarm limit is in multiples of 0.5 dBµV.

Comments can be inserted at the end of the line, preceded with a tab character, or on a separate row which starts with a non-numeric character. Comments are for information only and will not be downloaded into the device and so they are lost if result table is uploaded back from device.

An example of a valid sweep file:

```
Measures return path lowest frequencies
5.00    Q       35.0    40.0    Comment
7.50    Q       35.0    40.0    Another comment
10.00   Q       35.0    40.0
12.50   Q       35.0    40.0
```

The result file format is identical to the sweep file format, except that it has a header row and a 5th column which contains the measurement results. An example of a result file produced by the above sweep file could be like this:

```
MHz     Type    HiLimit HIHILimit    dBµV
5.00    Q       35.0    40.0    48.0
7.50    Q       35.0    40.0    49.0
10.00   Q       35.0    40.0    44.5
12.50   Q       35.0    40.0    44.0
```

Properties viewer page

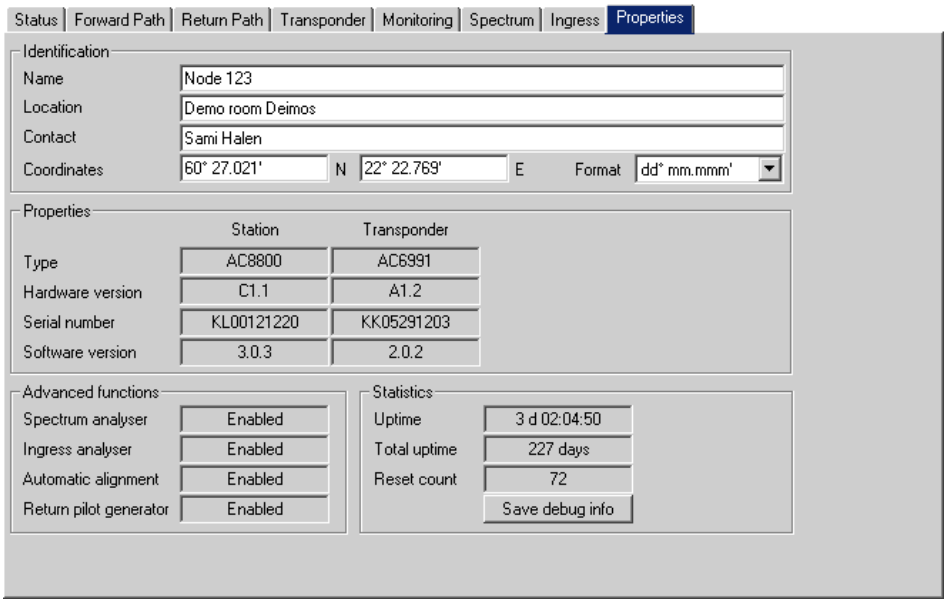

Figure 33. The Properties page

The “Properties” page displays unit identification and statistics data.

Identification

A descriptive alias name for the station can be entered into the “Name” field, site location into “Location” field and contact information into “Contact” field. All these fields can contain up to 63 characters.

The geographical coordinates can be entered into respective latitude and longitude fields. The preferred format for the coordinates can be selected from the "Format" drop-down field. When entering coordinates, special characters (°/'/") can be simply omitted.

Properties

The type (and generation, if applicable), hardware version, serial number and software version (if applicable) are shown for both station and transponder.

Advanced functions

The statuses of advanced functions associated with Product Key are shown. These fields only indicate that the function is possible in the software, but does not display whether correct transponder module is installed for that function.

Statistics

The “Uptime” field shows the time since the last reset or power up. The format is days, hours, minutes and seconds, with ±5 s/day accuracy.

The "Total uptime" field shows the total number of full operating days. The "Reset count" field shows the total number of resets.

The "Save debug info" button reads the unit's non-volatile memory contents and opens a dialog for saving it into "*devicetype-serial-date.fun*" and "*.sad*" files which can then be sent to Teleste support to help troubleshooting problems.

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WEEE Notice

This product complies with the relevant clauses of the European Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE). The unit must be recycled or discarded according to applicable local and national regulations.

European Conformity

This equipment conforms to all applicable regulations and directives of European Union which concern it and has gone through relevant conformity assessment procedures.

CE

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