GOING FUTURE TODAY.

U 159, U 159-X

IP to QAM converters

Operating Manual

Version 10-2023A

Contents

Before starting operation of the device

HINWEIS: Read this operating manual attentively! It contains important information about installation, ambient conditions and maintenance of the device. Keep this operating manual for future use and for handover in the event of a change of owner or operator. A PDF version of this manual is available to download on the ASTRO website (there may be a more recent version). The ASTRO company confirms that the information in this manual was correct at the time of printing, but it reserves the right to make changes, without prior notice, to the specifications, the operation of the device and the operating manual.

Symbols and conventions used

Symbols used in these instructions

Pictograms are visual symbols with specific meanings. You will encounter the following pictograms in this installation and operating manual:

Warning about situations in which electrical voltage and non-observance of the instructions in this manual pose a risk of fatal injuries.

Warning about various dangers to health, the environment and material.

Recycling symbol: indicates components or packaging materials which can be recycled (cardboard, inserts, plastic film and bags). Used batteries must be disposed of at approved recycling points. Batteries must be completely discharged before being disposed of.

This symbol indicates components which must not be disposed of with household rubbish.

Copyright information

Parts of the software used with this product originate from third-party vendors and were developed under a variety of licensing conditions. Detailed information on the licences can be found on the device's web user interface. If you select the menu item “Licensing” on the web browser interface of the device, you will find a link to a page with detailed information.
You can obtain the source code for licence-free parts of the software upon request and against payment of a processing fee.
Please contact us at:

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Proper use

The devices of the U 1xx- and U 2xx series are only used for converting signals of different modulation to / from IP data streams in multimedia cable networks. The power supply unit U 100 SNT eco / U 100 SNT eco+ may only be used for the power supply of the U 1xx- and U 2xx units within the base unit U 100-230. Modification of the devices or use for any other purpose is not permitted, and will immediately void any guarantee provided by the manufacturer.

Target group of this manual

Installation and starting operation

The target group for installation and starting operation of the ASTRO headend technology are qualified experts who have training enabling them to perform the work required in accordance with EN 60728-11 and EN 60065. Unqualified persons are not allowed to install and start operation of the device.

Device configuration

Target group for the configuration of the ASTRO headend are persons who have received instructions and have training enabling them to perform a configuration. Knowledge of EN 60728-11 and EN 60065 is not necessary for configuration.

Device description

The delivery is comprised of the following parts:

- ☐ U 159 Edge QAM module and backplane
- ☐ Operating manual

The U 159 plug-in module and the U 100 base unit feature a CE marking. This confirms that the products comply with the relevant EC directives and adhere to the requirements specified therein.

Figure 1, top:
U 159, installed in the U 100 base unit (fitted with three plug-in modules)

Figure 1, middle:
U 159, front panel
[1] Display for management IP addresses, data IP addresses, status messages, etc.
[2] Status display
[3] Control and data knob, menu switch

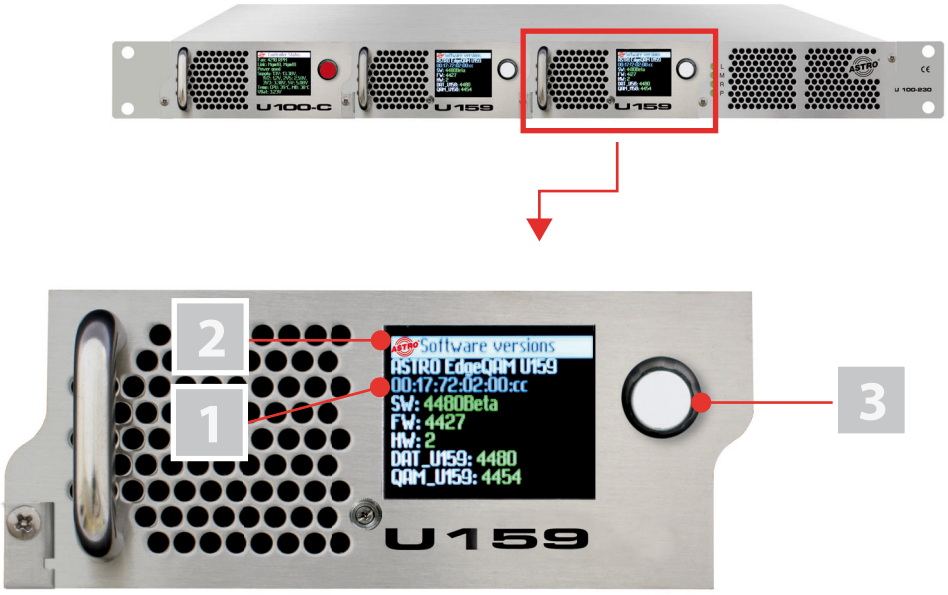
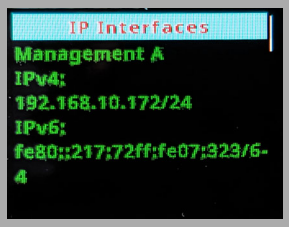
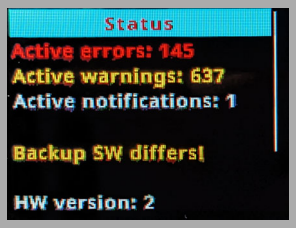
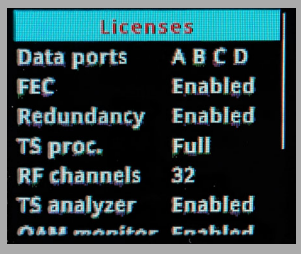


Figure 1: U 159







HINWEIS: Turn the data wheel [3] (Fig. 2, top) to navigate through the individual menu items on the U 159 display. If the display is in operation, you can activate scroll mode by pressing the rotary control. A scrollbar will then appear on the right-hand side of the display. Press the rotary control again to exit scroll mode..

The ASTRO logo will be the first display to appear following activation.

Turning the data knob clockwise allows to you access the individual displays:

- Management A / B: The data for both management ports is displayed.
- Status: The current hardware status and software status are both displayed.
- Active alarms: The current error messages are displayed.
- Licences: The licences currently installed are displayed.

Important safety information

To avoid any potential risks to the greatest extent possible, you must adhere to the following safety information:

ACHTUNG: ***Failure to observe this safety information may result in personal injury due to electrical and thermal dangers!***

Proper use

- ☐ Only use the device at the approved operating sites and in the ambient conditions allowed (as described in the following), and only for the purpose described in the section “Proper use”.

Before starting operation of the device

HINWEIS: *Read this operating manual attentively! It contains important information about installation, ambient conditions and maintenance of the device. Keep this operating manual for future use and for handover in the event of a change of owner or operator. A PDF version of this manual is available to download on the ASTRO website (there may be a more recent version).*

- ☐ Check the packaging and the device for transport damage immediately. Do not start operation of a device that has been damaged.
- ☐ Transporting the device by the power cable may damage the mains cable or the strain relief, and is therefore not permitted.

Installation and operation

- ☐ The device may only be installed and operated by qualified persons (in accordance with EN 60065) or by persons who have been instructed by qualified persons. Maintenance work may only be carried out by qualified service personnel.
- ☐ The module can only be installed in U 100-230 and U 100-48 base units. The safety information in the operating manuals of the base units must be obeyed in addition to the safety information described in this manual.
- ☐ The installation site must be planned in a way that prevents children from playing with the device and its connections.
- ☐ In order to prevent inadmissible operating statuses from occurring, only the components described in this manual, or components approved by the manufacturer for the base unit, may be used.
- ☐ The ambient temperatures specified in the technical data must be complied with, even when climatic conditions change (e.g. due to sunlight). If the device overheats, the insulation used to isolate the mains voltage may be damaged.
- ☐ The device and its cable may only be operated away from radiant heat and other sources of heat.
- ☐ To avoid trapped heat, ensure there is good ventilation on all sides (minimum interval of 20 cm to other objects). Installing the device in a niche or covering the ventilation openings is not permitted.
- ☐ The device does not feature protection against water and may therefore only be operated and connected in dry rooms. It must not be exposed to splash water or drip water, condensation or similar effects of water, as this may impair the isolation from the mains voltage.
- ☐ Do not install the unit in locations with excessive dust formation, as this may impair the isolation from the mains voltage.

Electromagnetic compatibility (EMC)
In order to avoid malfunctions from occurring when operating radio and telecommunications equipment, as well as other operating units or broadcasting services, the following points must be observed:

- ☐ Before installation, the device must be checked for mechanical damage. Damaged or bent covers or housings may not be used.
- ☐ During operation, the device must always be covered by the components provided for this purpose. Operation with an opened cover is not permitted.
- ☐ The braided line or the contact springs may not be damaged or removed.

Maintenance

- The operating display only shows whether the DC current, which supplies the device components, has been disconnected. However, operating displays (on the power supply unit or the device) that are not lit up in no way indicate that the device is completely disconnected from the mains. There may still be voltages in the device that are dangerous to touch. You may therefore not open the device.
- Read carefully: EN 60728-11 – Part 1, Safety requirements / No service tasks during electrical storms!

Repair

- Repairs may only be performed by the manufacturer. Improperly performed repairs may result in considerable dangers for the user.
- If malfunctions occur, the device must be disconnected from the mains and authorised experts must be consulted. The device may need to be sent to the manufacturer.

General information

- Store or use the device in a safe location, well out of reach of small children. It may contain small parts that can be swallowed or inhaled. Dispose of any small parts that are not needed.
- Plastic bags may have been used for packaging the device. Keep these plastic bags away from babies and children in order to avoid any danger of suffocation. Plastic bags are not toys.
- Do not store the device near chemicals or in places in which a leakage of chemicals may occur. Organic solvents or fluids in particular may cause the housing and/or cables to melt or disintegrate, presenting a danger of fire or electric shock. They may also cause device malfunctions.

Warranty conditions

The general terms and conditions of ASTRO Strobel GmbH apply. You will find these in the current catalogue or on the Internet under “www.astro-kom.de”.

Disposal

All our packaging materials (cardboard boxes, insert sheets, plastic films and bags) are fully recyclable. After use, this device must be disposed of as electronic waste in an orderly manner according to the current disposal regulations of your district / country / state.

ASTRO Strobel is a member of the Elektro system solution for the disposal of packaging materials. Our contract number is 80395.

Performance description

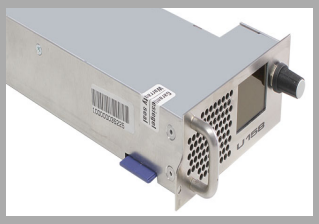
The U 159 is a plug-in module that is only intended for use in the base units U 100-230 and U 100-48. It can receive up to 1024 MPEG data streams encapsulated in accordance with Internet Protocol (IP). These are converted in up to 64 QAM channels and are output using the two HF outputs in the U 159.

To use the devices properly, read the following safety and operating instructions attentively.

The U 159 plug-in module features the following performance characteristics:

- Conversion of up to 1,024 IP gigabit Ethernet multicast groups
- QAM signals are fed out in 64 channels
- Outstanding output parameters provided by Direct Digital Technology

Connecting and installing the module



HINWEIS: The instructions for the base unit U 100 include a description of how to prepare the base unit for installation.
Observe that you need to insert an SD memory card into the module prior to installation in the base unit (see figure at left)

Coding and installing the backplane

A backplane is included with every U 1xx signal converter. This is used to establish a mechanical connection between the signal converter and the base unit. Both the mains HF connections and the network connections are connected to this
backplane.
To ensure the position of the backplane, and therefore the position of the respective signal converter in the U 100 base unit, is correct, you must plug a corresponding control dial onto the circuit board on the backplane. Proceed as described in the following.

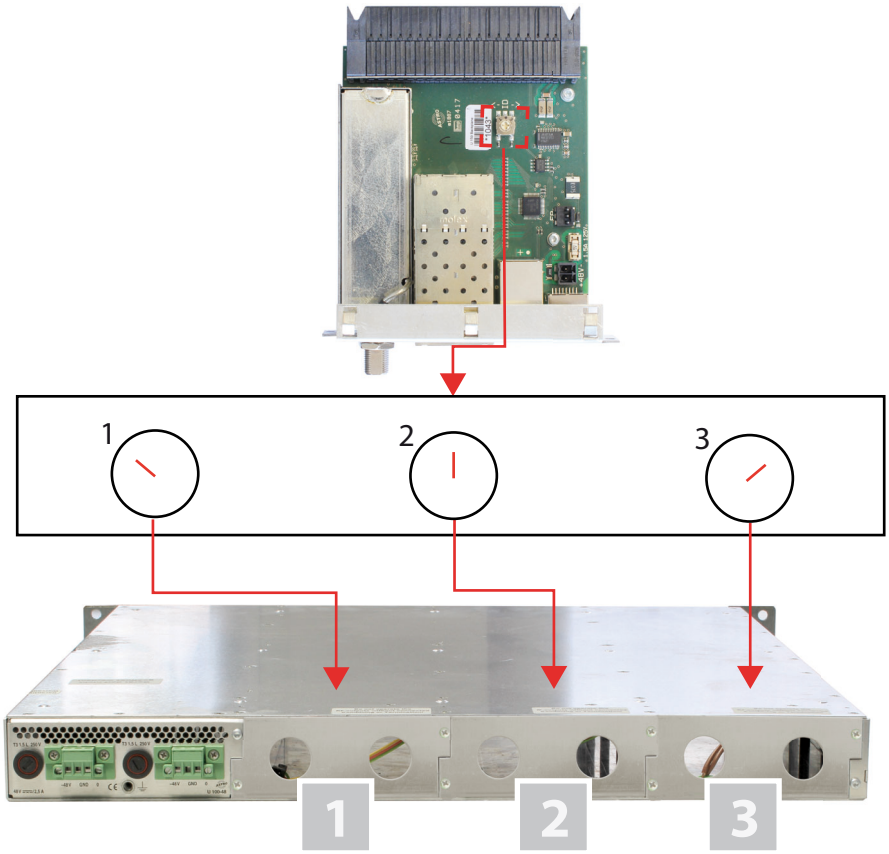


Figure 2: Coding the backplane

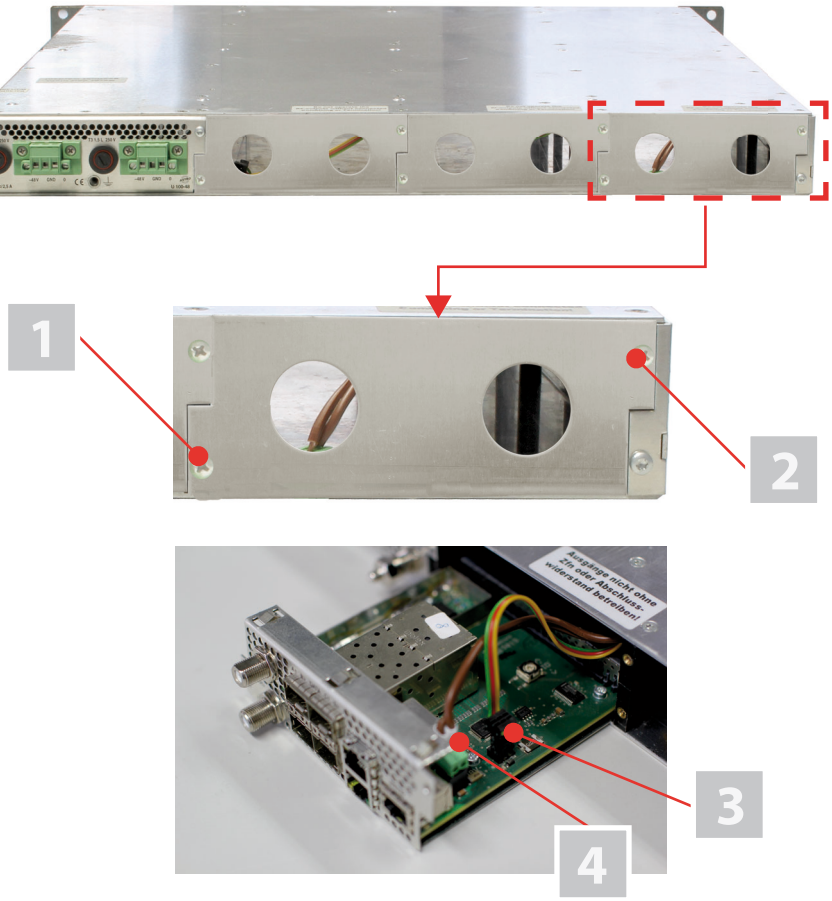
[1] Left slot
[2] Middle slot
[3] Right slot

To prepare the backplane for installation, proceed as follows:

Turn the control dial to the position required for the intended installation position in the way it is shown in figure 2.

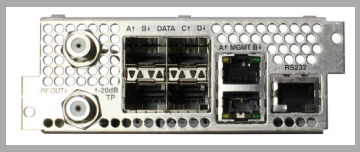
HINWEIS: A control dial that has not been correctly set to correspond to the installation position will result in incorrect LED displays on the front of the U 100 base unit (see section "Device description"). Furthermore, the correct position cannot be displayed on the web browser user interface.

You can now install the backplane in the base unit. To do so, proceed as follows:



[1, 2] Phillips-head screws
[3] Cable for signal supply
[4] Cable for power supply

Figure 3: Installing the backplane in the base unit



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1. When the U 100 base unit is in its delivery state, the three installation slots for the backplanes are covered by dummy plates (see figure 3, above). Start by removing the Phillips-head screws [1] and [2] from the dummy plate at the required installation position (left, middle or right) and remove the dummy plate.
2. You can now see the two connection cables for the selected slot (power supply and signal cable). Connect the cables to the backplane as shown in figure 3 (above).
3. Now carefully insert the backplane into the slot of the U 100. Make sure the cables are not jammed. You can push the backplane into the housing by applying light pressure.

ERGEBNIS:

The backplane is now connected and installed.

Concept of the device

The following overview shows possible signal folows within the U 159 and U 159-X modules:

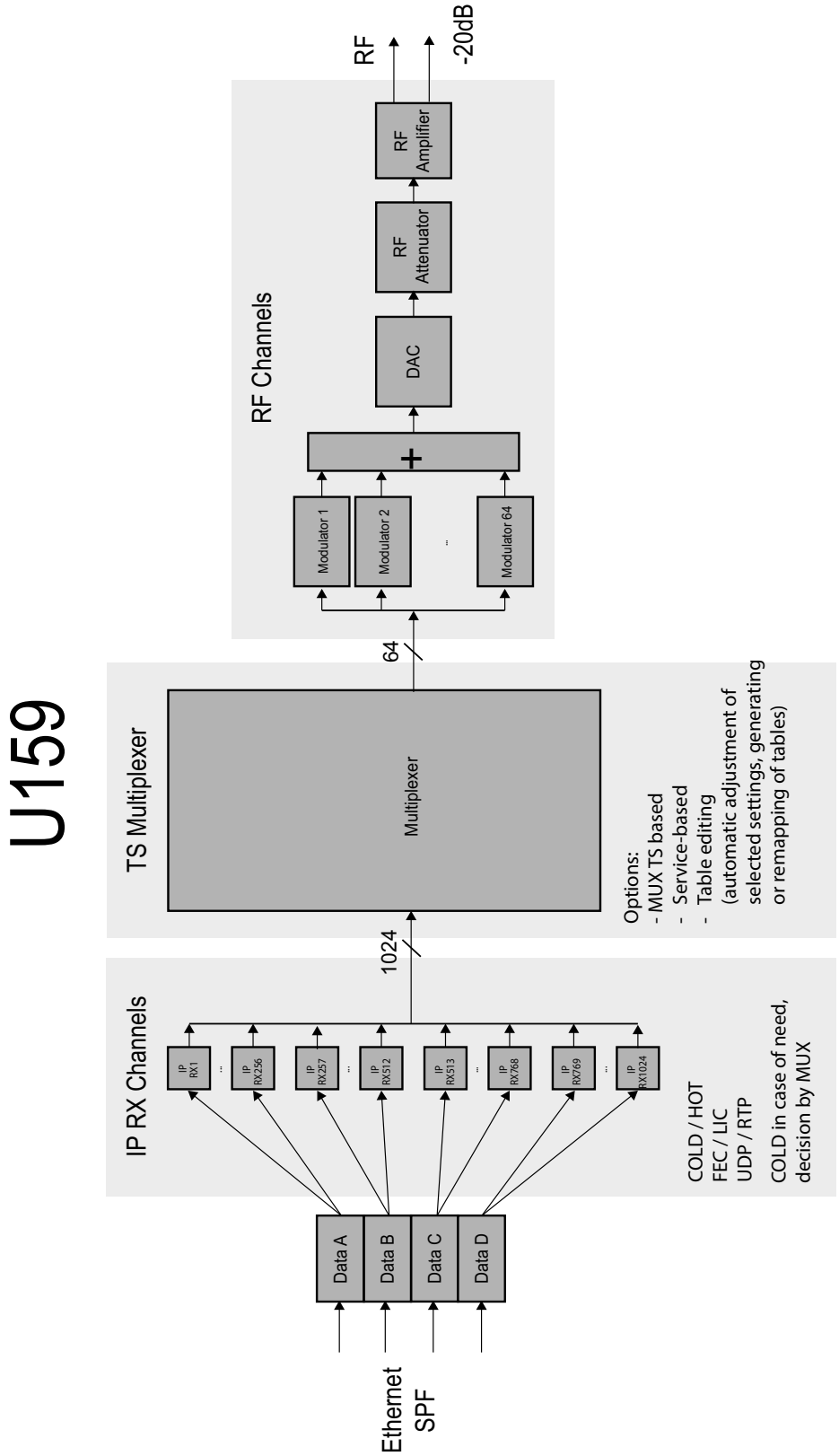
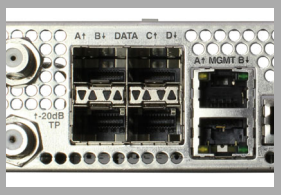


Figure 4: Signal flow within the U 159

Quick start – starting operation of the U 159



Connecting the U 159 to a PC or laptop

To be able to configure the U 159, you now need to connect the network sockets (Management A or Management B) on the backplane of the device (see figure at left) to your PC or laptop using a network cable.

Once you have connected the base unit to the power supply, the U 159 will switch on automatically. Once it has booted (approx. 90 seconds), the ASTRO logo initially appears in the display.
Turn the knob to the right of the display clockwise until the menu item “Interface settings” is displayed. The two management IP addresses (Management A and Management B) for the device now appear in the upper lines.
Make a note of the address of the management connection which you are using for your PC or laptop to ensure you can enter this in the address line of your web browser later on.

HINWEIS: Please note that your PC or laptop must be in the same sub-network as the U 159! The sub-network mask of the U 159 is set to 255.255.205.0 upon delivery. The PC or laptop which is connected must therefore be assigned an IP address with the following structure: 192.168.1.xx (whereby the digits for xx depend on the MAC address)
Net mask: /24

You can now start the configuration using the web browser user interface.

General information on the structure of the web browser interface

The configuration interface is divided into the following sub-areas:

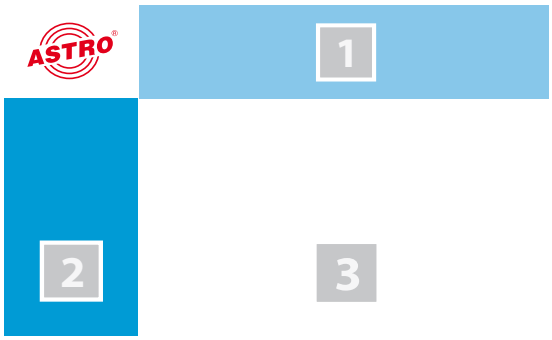


Figure 5: Structure of the web browser interface

- **Status line (header) [1]:** Displays general information on the module.
  SW: Software status
  HW: Hardware version
  Up: Runtime since the system was booted
  Time: Date and time
  Name, location, contact: corresponds to the settings which were made in the configuration area
- **Navigation menu [2]:** Displays the individual configuration areas which you can select by clicking the mouse. A detailed description of these areas can be found on the following pages of this chapter.
- **Content area [3]:** The respective configuration form – depending on the menu item selected – is displayed here.

Logging in

To log in, enter the IP address of the U 159, which appears in the device display, in the address line of the browser. The menu page “Status” will then appear. Select the item “Log in” from the navigation menu at the left. The input mask for the log in should then appear (see figure 6, below). In delivery state, you must use the following log-in data:

- **User name:** “user” or “admin” (input without inverted commas)
- **Password:** astro

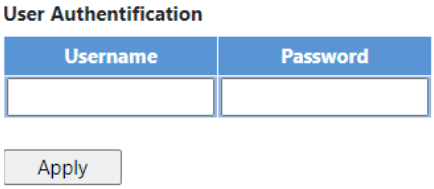


Figure 6: Log in

After logging in, the start page of the U 159 with all relevant system information will appear. The navigation menu and the log-in status display will appear at the left.

Only one user can be logged into the user interface of the U 159 at a time. The current user is displayed in the upper right corner.

The device status is indicated by a green or red circle besides the active alarms. If a green circle is displayed, the device is operational. If the circle is red, then a fault has occurred.

A list of current errors is available under the menu item “Active alarms”.

HINWEIS: For security reasons, you should change the access data valid upon delivery (user name and password) to prevent unauthorised access!
The procedure is described in the section “Changing user data”.

Changing the IP address

HINWEIS: If you wish to change the IP address, then the settings on the PC must be changed accordingly. IP addresses can only be changed by the administrator!

Start by changing the IP addresses for the data port and the management. To do so, click on the item “IP Interfaces” in the menu at the left. You will now see the following table in the content area:

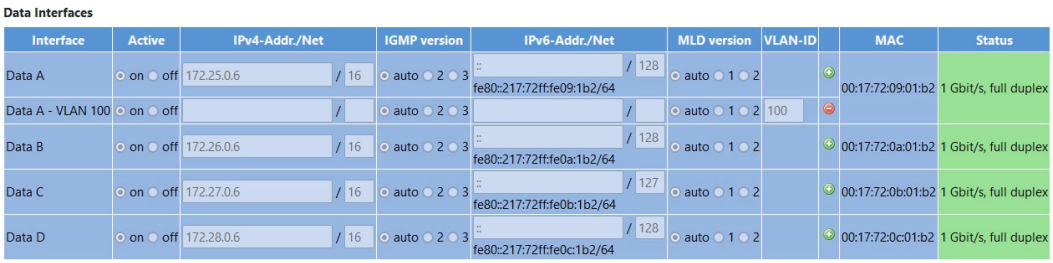


Figure 7: “Data Interfaces” table

You can enter the IP addresses for the data ports A, B, C and D in the “IPv4 Address/Subnet” line. Make sure that you activate the ports being used by activating the corresponding radio button in the “Active” line. You can also enter IP addresses in the “IPv6 Address/Subnet” line. Entering values for IPv4 or IPv6 only is also possible.

You can enter the IP addresses for both management ports in the “Management Interfaces” table further down. Make sure that you activate the ports being used in this case as well by activating the corresponding radio button in the line “Active”.

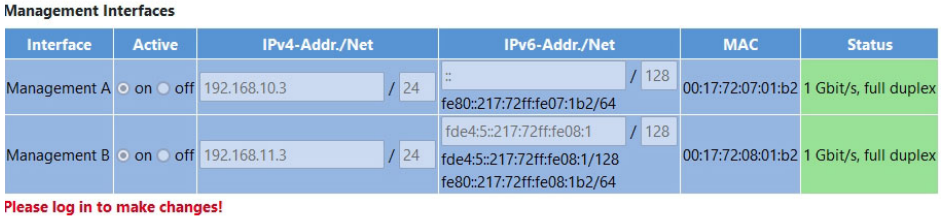


Figure 8: Changing the IP address

To save your changes, click on the “Apply” button at the top in the header.

Configuring the IP receiver

Now start configuring a signal path in the U 159. Start by clicking on the item “IP RX Channels” in the web browser interface menu. You will now see the following tables:

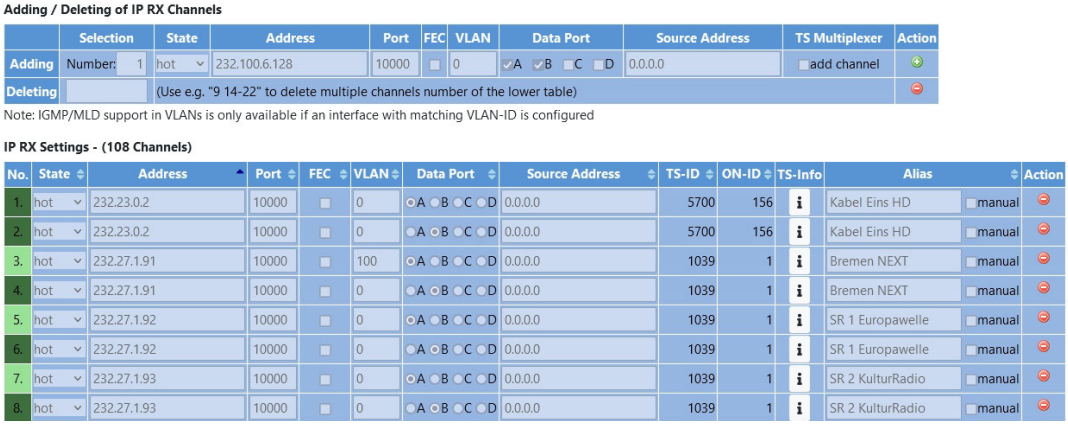


Figure 9: Setting the source for the data stream and activating the connection to the data port

Enter the IP address and the port for the data stream in the “Adding/Deleting of IP RX Channels” table. Optionally, you can also enter a source select address in the“Source Address” input field.
Important: Activate the checkbox in the “Add TS Channel” column.
Activate the “add channel” checkbox in the TS Multiplexer column.
Please keep in mind that you must create an output in order to route any other signals (see section “Configuring output channels”, page 17).

Now click on the plus symbol to activate the reception channel. The channel should now appear in the “IP RX Settings” table.

Checking the data reception rate

Now click on the menu item “Status” in the menu at the left. You will then see the following overview:

IP Interfaces

Interface	IPv4-Addr./Net	IPv6-Addr./Net	OS Transmit	OS Receive	Total Receive	Payload Receive	Status
Data A	172.25.0.6/16	fe80::217:72ff:fe09:1b2/64	0.00 MBit/s	0.00 MBit/s	514.70 MBit/s	498.50 MBit/s	1 Gbit/s, full duplex
Data A - VLAN 100	None	fe80::217:72ff:fe09:1b2/64	0.00 MBit/s	0.00 MBit/s			
Data B	172.26.0.6/16	fe80::217:72ff:fe0a:1b2/64	0.00 MBit/s	0.00 MBit/s	129.33 MBit/s	125.25 MBit/s	1 Gbit/s, full duplex
Data C	172.27.0.6/16	fe80::217:72ff:fe0b:1b2/64	0.00 MBit/s	0.00 MBit/s	0.00 MBit/s	0.00 MBit/s	1 Gbit/s, full duplex
Data D	172.28.0.6/16	fe80::217:72ff:fe0c:1b2/64	0.00 MBit/s	0.00 MBit/s	0.00 MBit/s	0.00 MBit/s	1 Gbit/s, full duplex
Management A	192.168.10.3/24	fe80::217:72ff:fe07:1b2/64	0.72 MBit/s	0.03 MBit/s			1 Gbit/s, full duplex
Management B	192.168.11.3/24	fde4:5::217:72ff:fe08:1/128 fe80::217:72ff:fe08:1b2/64	0.00 MBit/s	0.00 MBit/s			1 Gbit/s, full duplex

Figure 10: Displaying reception statistics

A data reception rate > 0 at data ports A, B, C or D should now appear in the “Payload Receive” line in the “IP Interfaces” table.

Configuring HF output channels

Start by defining the required number of output channels, the maximum overall level and the channel spacing. To do so, click on the item “RF Settings” in the menu at the left. You will now see the following table:

RF Main Settings

Property	Value	Description
Used RF Channels	up to 16 Channels	max. Channel Power: **114 dBµV**
Channel Power	110.0 dBµV	min. Channel Power: **80 dBµV**
RF Output	on off standby	
Modulation backoff	256QAM: 0.0 dB, 128QAM: 6.0 dB, 64QAM: 6.0 dB, 32QAM: 12.0 dB, 16QAM: 12.0 dB	
Current Channel Grid	D114-D874	Channel spacing: 8 MHz (114,0 - 874,0 MHz)

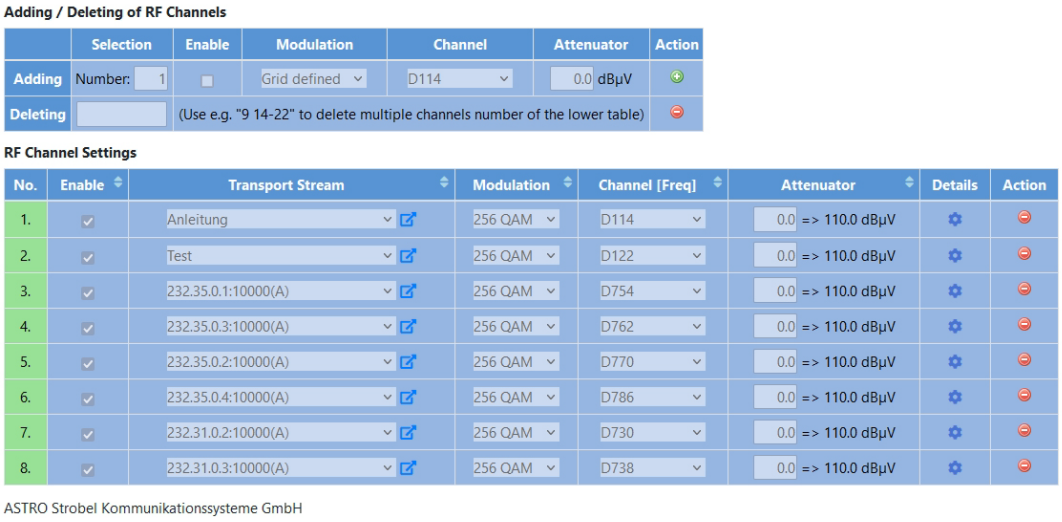
Figure 11: “RF Main Settings” table

You can select the required value from the drop-down list in the “Value” column in the “Used RF channels” line.
You can enter the required level in the input field in the “Channel Power” line.
You can select the required channel spacing from the drop-down list in the “Current Channel Grid” line.
If the channel grid you require is not available, please contact our customer service.

To save your changes, click on the “Apply” button at the top in the header.

To complete the process, you should configure and activate the HF output channels. To do so, click on

the menu item “RF Channels” in the web browser interface menu. You will now see the following table:



Adding / Deleting of RF Channels

	Selection	Enable	Modulation	Channel	Attenuator	Action
Adding	Number: 1	☐	Grid defined	D114	0.0 dBµV	⊕
Deleting		(Use e.g. "9 14-22" to delete multiple channels number of the lower table)				⊖

RF Channel Settings

No.	Enable	Transport Stream	Modulation	Channel [Freq]	Attenuator	Details	Action
1.	☑	Anleitung	256 QAM	D114	0.0 => 110.0 dBµV	⚙	⊖
2.	☑	Test	256 QAM	D122	0.0 => 110.0 dBµV	⚙	⊖
3.	☑	232.35.0.1:10000(A)	256 QAM	D754	0.0 => 110.0 dBµV	⚙	⊖
4.	☑	232.35.0.3:10000(A)	256 QAM	D762	0.0 => 110.0 dBµV	⚙	⊖
5.	☑	232.35.0.2:10000(A)	256 QAM	D770	0.0 => 110.0 dBµV	⚙	⊖
6.	☑	232.35.0.4:10000(A)	256 QAM	D786	0.0 => 110.0 dBµV	⚙	⊖
7.	☑	232.31.0.2:10000(A)	256 QAM	D730	0.0 => 110.0 dBµV	⚙	⊖
8.	☑	232.31.0.3:10000(A)	256 QAM	D738	0.0 => 110.0 dBµV	⚙	⊖

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Figure 12: Configuring HF output channels

Add a channel as an example by selecting a value for the QAM modulation from the drop-down list “Modulation” in the “Adding/Deleting of RF Channels” table, and then selecting a channel frequency from the drop-down list “Channel”. Now activate the “Enable” checkbox and click on the plus symbol. The channel should now be listed in the “RF Channel Settings” table. You then still need to select the required transport stream.

To save your changes, click on the “Apply” button at the top in the header.

Redundancy concept

The U 100 series offers all possible redundancy options, such as link redundancy, source redundancy and device redundancy. To make the desired settings, select TS Multiplexer in the main menu on the left. The further procedure is described in the following section "Multiplexing".
The illustration below shows a schematic overview of the interaction between multiplexing and redundancy:

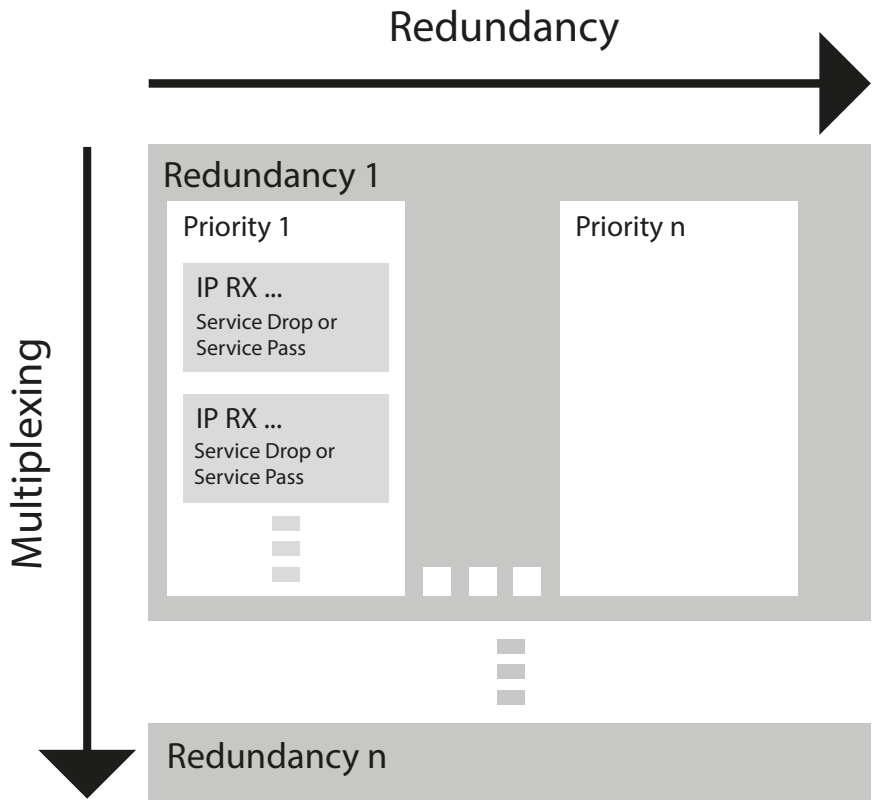


Bild 13: Aufbau des Multiplexing / Redundanz Schemas

You can choose between the following redundancy options:

- N+1 or 1+1 hardware redundancy, Control via U 100-C management module.
- Active link redundancy with monitoring of redundant signal links
- Active source redundancy with monitoring of redundant signal source.
- Every signal source can have different priority with adjustable hysteresis to avoid polling.
- Service based redundancy, e. g. a missing service wihtin the TS leads to switching to a redundant TS.
- All redundancy switching options can be performed manually or automatically.

Multiplexing

You can, when required, compile new transport streams from different sources (IP interfaces), and create redundancies for them. To do this, start by clicking on the item “TS Multiplexer” in the main menu at the left. The following table will then appear in the content area at the top:

Adding of TS Multiplexer

	Selection	Alias	Auto Redundancy	Switch Time	Switch Back Time	Action
Adding	Number: 1		☑	1 sec.	60 sec.	⊕
Deleting		(Use e.g. "9 14-22" to delete multiple multiplexer number of the lower table)				⊖

Figure 14: Table “Adding a TS Multiplexer”

You can use this table as an aid for creating new transport streams and/or redundancies. Each newly added TS multiplexer is then shown as a diagram, as indicated in figure 14. Within each respective redundancy, you can add any services from transport streams to a previously created priority level using “Service Drop” or “Service Pass”. The content of other priority levels created is then shown from left to right. You can then carry out multiplexing by adding additional redundancies. They can be configured in the same way as described above.

Adding or deleting a new Multiplexer transport stream

Use the “Adding a TS Multiplexer” table to create one, or several, new multiplexers. Start by entering the number of multiplexers to be created in the “Number” input field in the “Selection” column. Activate the “Auto Redundancy” checkbox if you would like automatic redundancy for the multiplexer. You can enter a time value in the “Switch Time” input fields after redundancy switchover was activated in the event of an error. You can also specify a time value in the “Switch Back Time” input field after which it switches back to a higher priority.
Once you have made these inputs, click on the plus symbol in the “Action” column to add the multiplexers. They then appear in the list in the following table, “TS Multiplexer Settings”.

You can delete previously created multiplexers using the “Deleting” line. To do so, you must enter the respective number of the multiplexer in the input field, which is allocated to this multiplexer in the “TS Multiplexer Settings” table (first column). You can enter a range, e.g. “9–22” or similar. To delete a multiplexer, click on the minus symbol in the “Action”
column.

HINWEIS: You can also delete individual multiplexers by clicking on the minus symbol in the “Action” column in the “TS Multiplexer Settings” table.

Configuring multiplexers

In order to enter detailed settings for the individual multiplexers, use the “TS Multiplexer Settings” table. You can see an overview of the previously entered parameters for the respective multiplexer.

TS Multiplexer Settings - (5 Channels)

No.	Alias	Auto Redundancy	Switch Time	Switch Back Time	TS-ID	ON-ID	Action
1.	3sat	Yes	5 sec.	300 sec.	1011	1	⊖
2.	Das Erste	Yes	5 sec.	300 sec.	1101	1	⊖
3.	Das Erste HD	Yes	5 sec.	300 sec.	1019	1	⊖
4.	TEST_MUX	No	3 sec.	60 sec.	65535	65535	⊖
5.	ZDF HD	Yes	5 sec.	300 sec.	1	1	⊖

Figure 15: Table “TS Multiplexer Settings”

In order to open the detailed view of a TS multiplexer, click on its alias name. A window then opens with the following header:

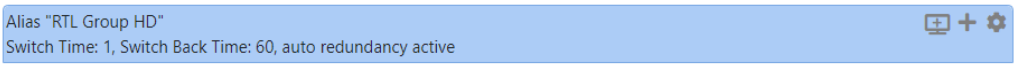


Figure 16: Detailed settings for the TS multiplexer – header

Important: Click on the “Apply” button above the content area to save your inputs for the multiplexer configuration. Click on “Discard” to restore the original settings.

HINWEIS: You can return to the overview of multiplexers from the detailed settings view by clicking on the “Return to output overview” link.

HINWEIS: An overview of the current output is displayed in the content area at the right. The view shows the current MUX output configuration and is updated shortly after the data is transferred.

Figure 17: Display of the current output

Defining output parameters for the multiplexer

The multiplexer parameters that you have defined so far are summarised in the header.
When you click on the gear symbol at the top right, a window opens in which you can define the TS-ID and ON-ID for the multiplexer. Enter the preferred values in the corresponding input fields.

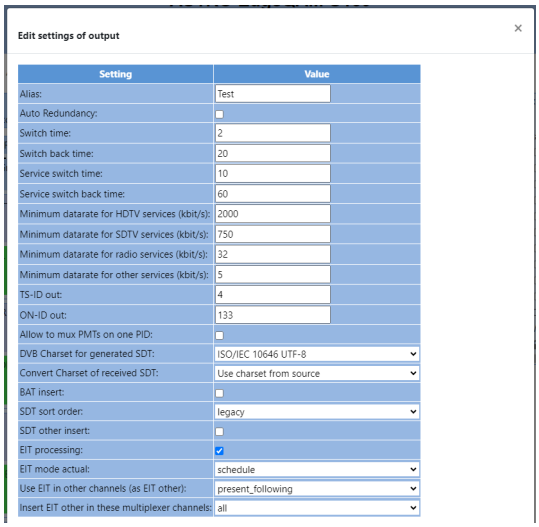


Figure 18: Defining the TS-ID and ON-ID

If required, you can also activate EIT processing by clicking the checkbox in the lower line. If you activate EIT processing, you can use a drop-down list to set the following respective parameters:

- `EIT mode actual:` Select either “off” to deactivate the function, “present_following” for the current and following station, or “schedule” to create a service schedule for this transport stream.
- `EIT mode other:` Select either “off” to deactivate the function, or “present_following” for the current and following station for other transport streams.
- `Multiplexer channels for EIT other:` Enter the multiplexer channels for the other transport streams.

Then click on “OK” to save your inputs, or on “Abort” if you wish to discard the inputs. When you save the inputs, they will also appear in the header.

HINWEIS: If you have activated EIT processing, an additional icon indicating this appears in the header.

Creating redundancy

In order to create a redundancy, click on the plus symbol in the header. You will then see the following entry below the header:

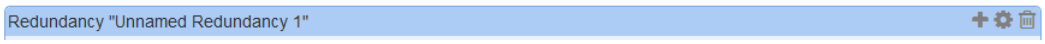


Figure 19: New redundancy

This is the header for the redundancy. Click on the gear symbol here to open the properties window for the redundancy:

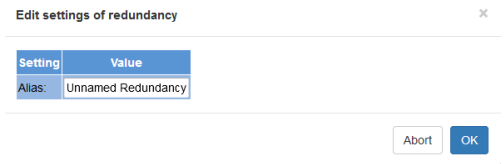


Figure 20: Properties window for the redundancy

Enter an alias name for the redundancy in the input field, and click on “OK” to save your input, or on “Abort” to discard your inputs.
You can delete a redundancy by clicking on the trashcan symbol.

Adding a redundancy group

Now click on the plus symbol in the header to create a new redundancy group. Then adds a new group within the redundancy. You will now see the following entry below the redundancy header:

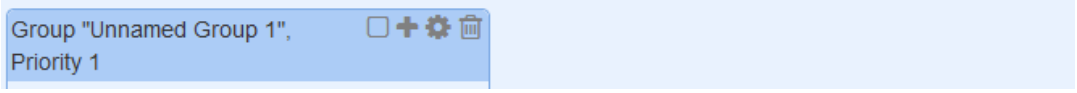


Figure 21: New redundancy group

HINWEIS: *The active redundancy group is marked by a dotted line.*

You can delete a redundancy group by clicking on the trashcan symbol.
Click on the gear symbol here to open the properties window for the redundancy group:

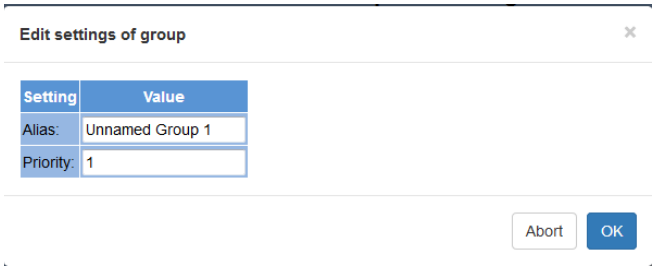


Figure 22: Properties window for the redundancy group

Enter an alias name for the redundancy group in the upper input field, and a numerical value for the priority of the group in the lower input field (“1” is equivalent to the highest priority, etc.).
Then click on “OK” to save your input, or on “Abort” in order to discard the inputs.

Adding a transport stream

You can now add a preferred transport stream within the group by clicking on the plus symbol in the header of the redundancy group.
(You can delete a transport stream by clicking on the trashcan symbol.)
The following window opens:

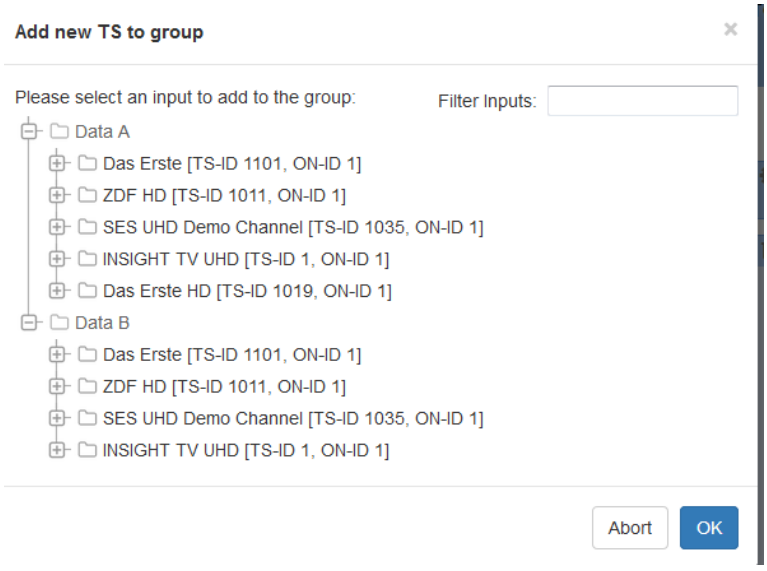


Figure 23: Window “Add new TS to group”

Select the transport steam from one of the four IP interfaces (Data A, Data B, etc.) by first clicking on the plus symbol for the respective interface. The transport streams then appear in a list. Mark the transport stream and then click on “OK” to confirm your selection, or on “Abort” to discard your selection. Once you have selected a transport stream, this is displayed below the header for the redundancy group:

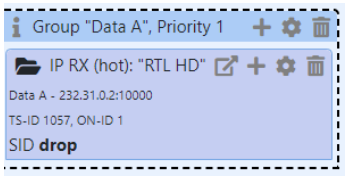
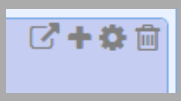


Figure 24: New transport stream in the redundancy group

HINWEIS: A link symbol can be found to the right of the plus symbol in the header for the redundancy group. Click on this symbol to access the IPRX menu. If you click on the i symbol, you will receive further status information.



Click on the gear symbol for the stream to enter detailed settings for the transport stream. The following window will then appear:

Figure 25: Window “Edit settings of input”

You can modify the following settings here:

- `SID mode:` Select the entry “pass” from the drop-down list if you wish to use individual services in the transport stream. Select the entry “drop” from the drop-down list if you wish to remove individual services in the transport stream.
- `Unreferenced PIDs mode:` Select the entry “pass” from the drop-down list if you wish to use individual, unreferenced PIDs. Select the entry “drop” from the drop-down list if you wish to remove individual PIDs.
- `Pass EIT other mode:` Select “present_following” from the drop-down list if you wish to activate the mode for the current and following events. Select the entry “schedule” if you wish to create an extended service schedule. Select “off” if you wish to switch off EIT processing.

Then click on “OK” to save your selection, or on “Abort” in order to discard your selection.

Filtering services and PIDs

You can now filter individual services or PIDs from the transport stream. Start by clicking on the plus symbol. The following window will now appear:

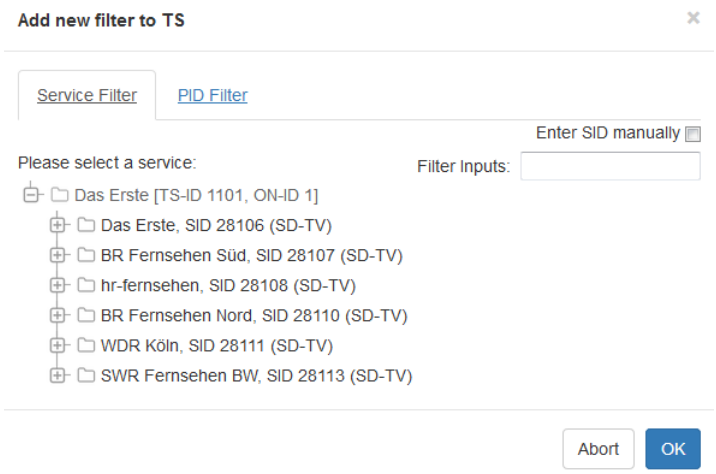


Figure 26: Window "Add new filter to TS"

You can start by selecting individual services from the transport stream here. These are then – according to the settings that you previously entered in the "Edit settings for input" table – selected or removed from the stream.
You can also select individual SIDs manually by activating the checkbox at the top right and then entering the service in the input field.

You can then, if required, filter individual PIDs by clicking on the "PID Filter" tab first. The following view will then appear:

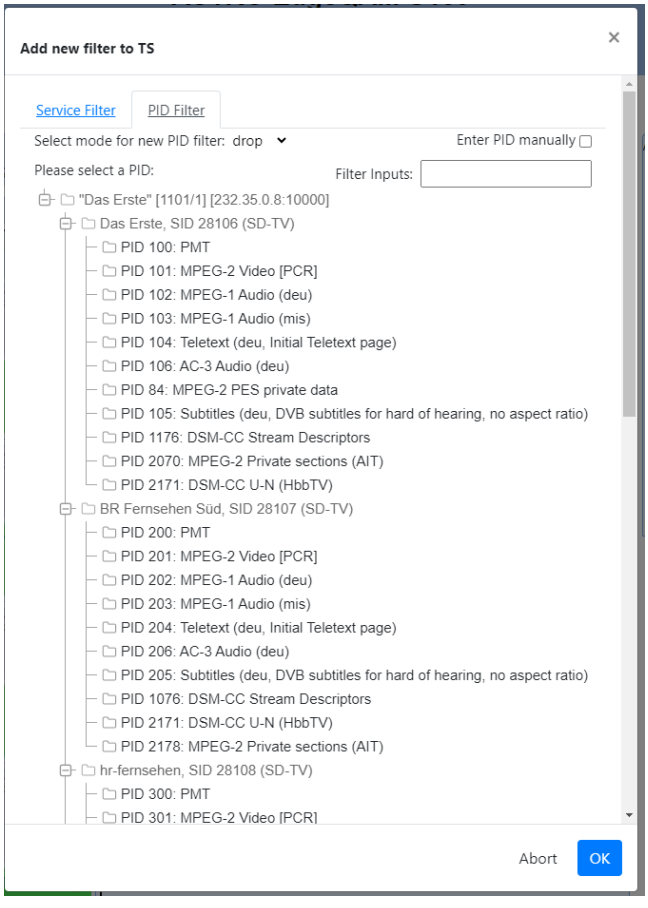


Figure 27: Window "Add new filter to TS – PID filter tab"

You can select individual PIDs here. These are then – according to the settings that you previously entered in the “Edit settings for input” table – selected or removed from the stream.
You can also select individual PIDs manually by activating the checkbox at the top right and then entering this in the input field.
Then click on “OK” to save your selection, or on “Abort” in order to discard your selection.

HINWEIS: If you click on the arrow symbol in the service header, the “IP RX Channels” menu is displayed, and the corresponding receiver is highlighted by a contour line.

HINWEIS: To create additional redundancy groups, start by clicking on the plus symbol in the header, and then proceed in the same way as described above. Please remember to set the priority level for the respective group.
In order to delete a redundancy group, click on the trashcan symbol.

Adding service redundancies

Instead of setting up a redundancy for a transport stream, you can alternatively create a redundancy for individual services as well. To do so, start by clicking on the symbol to the left of the plus symbol in the multiplexer header. The following window will now appear:

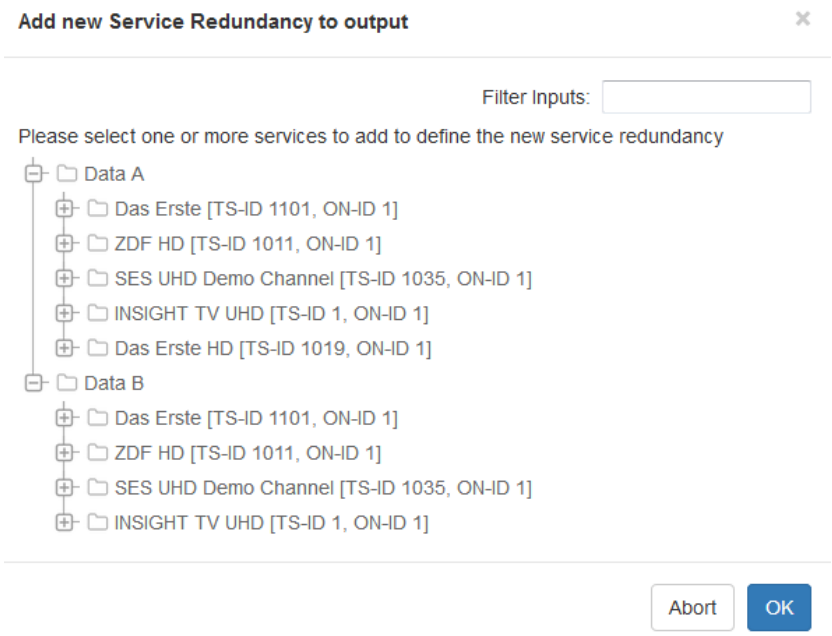


Figure 28: Window “Add new service redundancy to output”

You can start by selecting individual services from the transport stream here. These are then – according to the settings that you previously entered in the “Edit settings for input” table – selected or removed from the stream.
You can also select individual SIDs manually by activating the checkbox at the top right and then entering the service in the input field.
.
Then click on “OK” to save your selection, or on “Abort” in order to discard your selection.

You will now see the following entry in the content area:

Figure 29: Service redundancy

Click on the gear symbol to have the properties window for the service redundancy displayed:

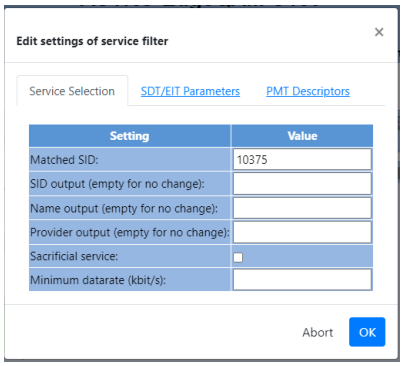


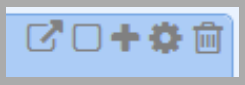
Figure 30: Window "Edit settings for service filter"

You can enter the following settings here:

- `Matched SID:` Enter the preferred service ID in the input field.
- `SID Output:` Enter the preferred service ID in the input field.
- `Name Output:` Enter the preferred name in the input field.
- `Provider Output:` Enter the preferred provider name in the input field.
- `Sacrificial Service:` Activate the checkbox, if .
- `Minimum datarate:` Enter the minimal data rate in kbit/s.

Then click on "OK" to save your selection, or on "Abort" in order to discard your selection.

When you save your inputs, then they will also appear in the header for the service redundancy.



Selecting the service source

In order to enter settings for the service source, start by clicking on the gear symbol in the “Service Source” section. The following window will now appear:

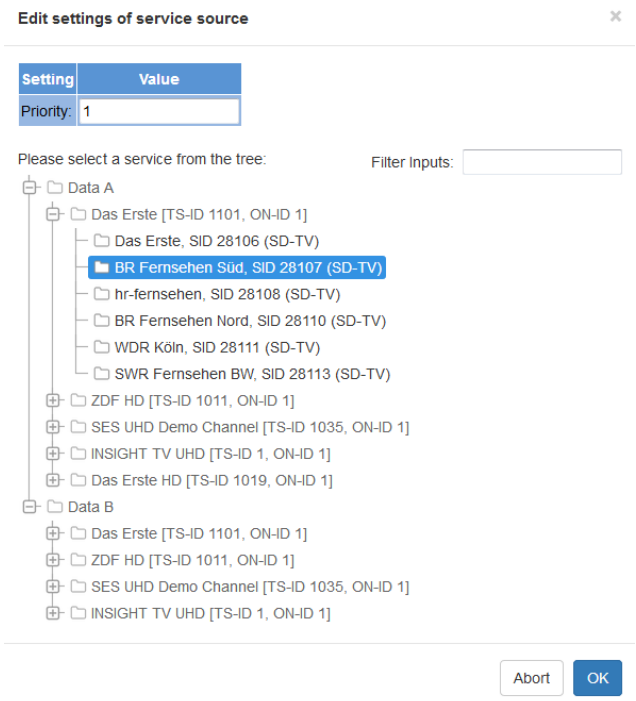
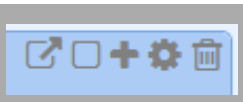


Figure 31: Window “Edit settings for service source”

Start by entering a numerical value for the priority of the source in the input field at the top (“1” for maximum priority, etc.).
You can then change the required service in the list, if preferred.
Alternatively, you can also enter a service in the corresponding input field (“filter inputs”) manually.
Then click on “OK” to save your selection, or on “Abort” in order to discard your selection.



Filtering PIDs

In order to filter individual PIDs out of the service, start by clicking on the plus symbol. The following window will now appear:

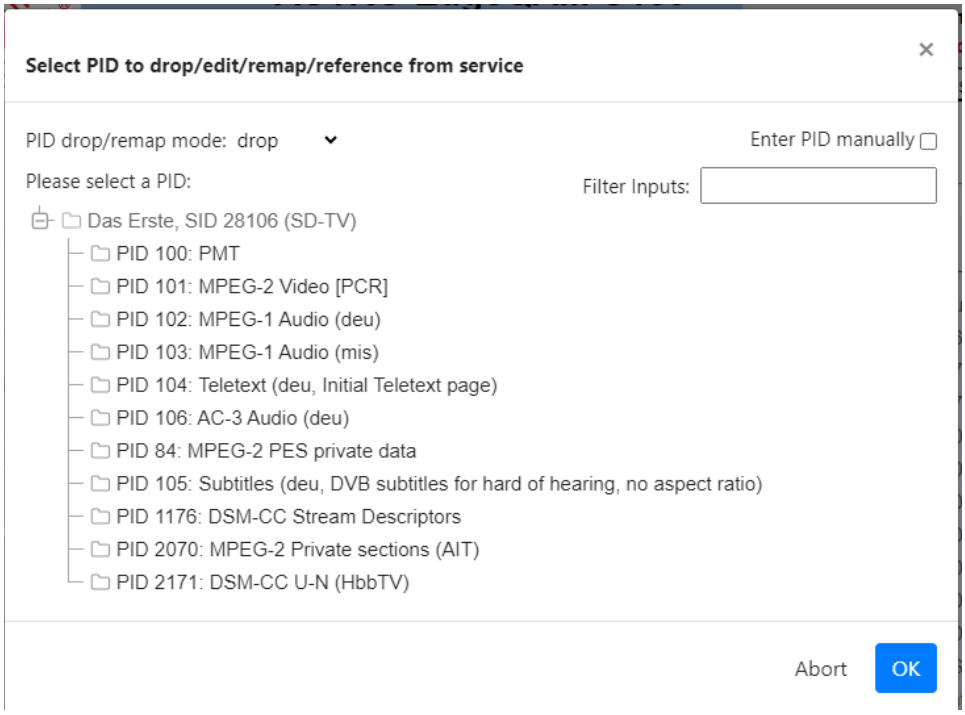


Figure 32: Window “Select PID to drop from service”

Now select the entry “drop” or “remap” from the drop-down list at the top. If you select “drop”, the PID selected will be removed from the service. If, in contrast, “remap” was selected, the values of the PID will be changed.
"Edit" allows you to edit the selected PID in the PMT. "Reference" creates a reference in the PMT to a PID already contained in the output (application: a radio sound is to be superimposed on the camera image).
You can then select the preferred PID from the list, or specify a PID manually. To do so, activate the “Enter PID manually” checkbox and enter the preferred PID in the “Filter Inputs” input field.

Then click on “OK” to save your selection, or on “Abort” in order to discard your selection.

Click on the “Apply” button above the content area to save your inputs.
Click on “Discard” to restore the original settings.

TS Processing

To make settings for TS Processing, first click on the "TS Processing" entry in the main menu on the left. You will now see the following tables in the upper part of the content area:

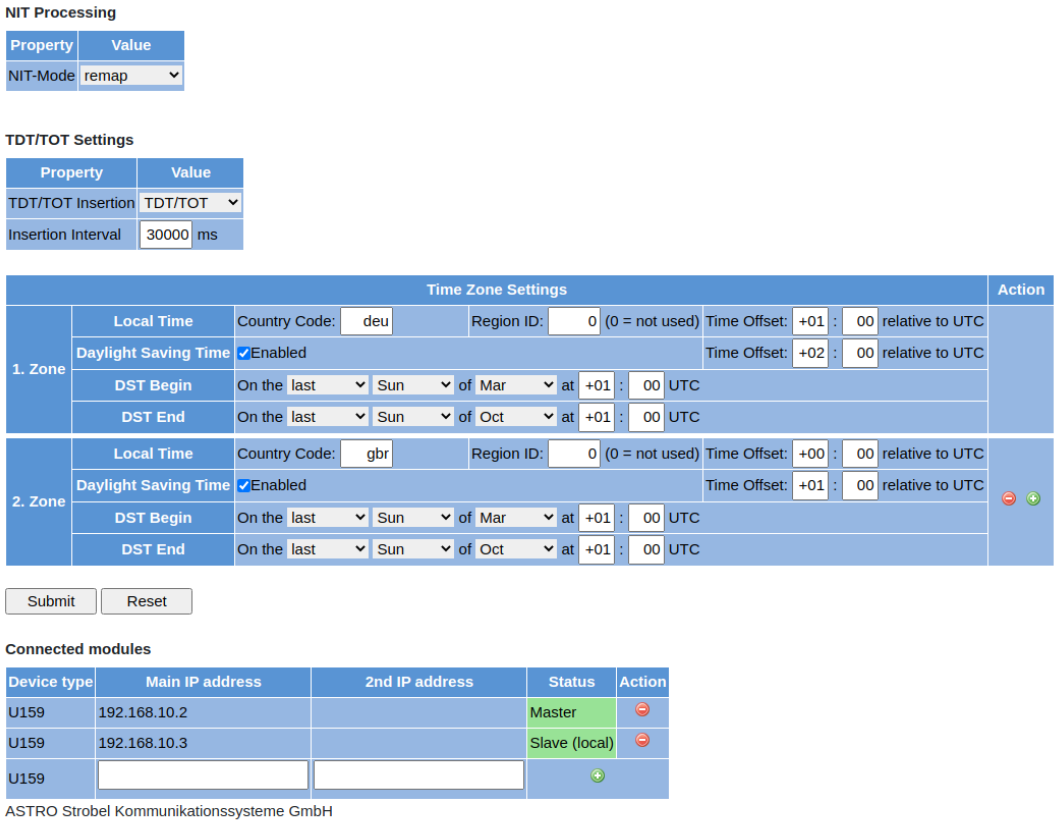


Figure 33: Adjustments for transportstream editing

Here you can select the desired NIT mode from the selection list in the "NIT Processing" table:

- `OFF:` No NIT is generated (transparent from input).
- `Static NIT:` If you select this mode, a static NIT is generated.
- `Dynamic NIT:` If you select this mode, a dynamic NIT is generated.
- `Remap NIT:` If you select this mode, you can play an NIT from the existing PIDs.

In the "TDT/TOT Settings" table below, you can select the following options from the selection list:

- `OFF:` transparent from input
- `TDT:` only TDT
- `TDT/TOT:` TDT + TOT

You can enter the IP addresses of connected modules in the "Connected Modules" table. You can also enter your own IP address.

Click on the "Apply" button at the top of the header to save the changes.

Click on "Discard" to restore the original settings.

Creating and remapping NITs

If you want to adjust the settings for NIT processing, click on the "NIT" entry in the main menu on the left. If you have previously selected one of the options "Static NIT" or "Dynamic NIT" in the "NIT Processing" table, you will now see the following table in the upper part of the content area:

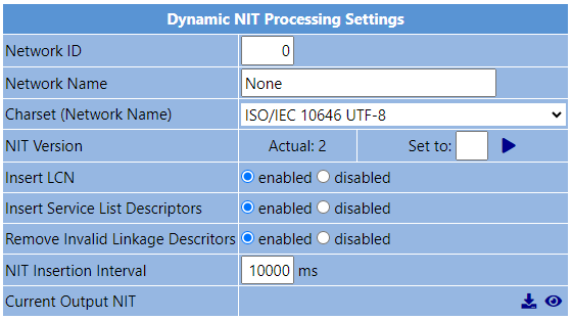


Figure 34: Table „Dynamic NIT Processing Settings“

Here you can make the following adjustments:

- `Network-ID:` Enter a network ID in the input field here.
- `Network Name:` Enter the network name in the input field.
- `NIT Version:` The current version is displayed. Enter the desired version in the "Set" input field.
- `Character Set (Network Name):` Select the character set from the selection list.
- `Insert LCN:` Activate the "enabled" radio button to insert an LCN. If you do not want this, activate the "disabled" radio button.
- `Insert Sevice List Descriptors:` Activate the "enabled" radio button to insert service list descriptors. If you do not want this, activate the "disabled" radio button.
- `Remove Invalid Linkage Descriptors:` Activate the "enabled" radio button to insert service list descriptors. If you do not want this, activate the "disabled" radio butto“.
- `NIT Insertion Interval:` Enter a time interval in ms for the insertion of the NIT in the input field.
- `Current Output NIT:` Click on the eye symbol to display the XML file of the NIT. Click on the symbol to the left to download the XML file.

The "Add External Transport Streams" table follows. Here you can add an external transport stream that is modulated by an external device.

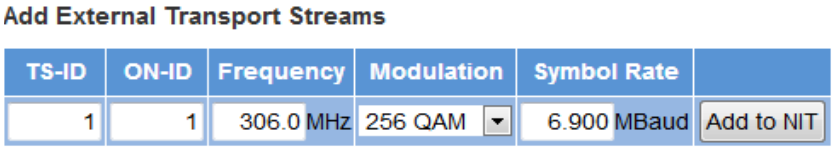


Figure 35: Table „Add External Transport Streams“

The following parameters can be modified:

- `TS-ID:` Enter the transport stream ID in the input field.
- `ON-ID:` Enter the ON-ID in the input field.
- `Frequency:` Select the desired output frequency from the selection list. If you select the "manual" option, you can enter the frequency manually in MHz in the input field.
- `Modulation:` Select the desired modulation type from the selection list.
- `Symbol Rate:` Enter the symbol rate in MS/s in the input field.

Once you have configured all the parameters, click on the Add to NIT button to add the transport stream.

Another table follows, in which all added transport flows are listed:

External Transport Streams

No.	TS-ID	ON-ID	Channel - Frequency	Modulation	Symbol Rate	Remove
1.	1	1	306.0 MHz	256QAM	6.900 MBaud	

Figure 36: Tabelle „External Transport Streams“

If you want to remove a transport stream, click on the minus sign.

If you have selected the "Remap NIT" option under the "TS Processing" menu item in the "NIT Processing" table, you will see the following input screen in the "NIT" submenu:

NIT Remap Settings

Name	Source	Source-PID	Sort	Add source (same priority)
Main	Kabel Eins HD - (Port B - 232.23.0.2:10000) - hot	4502	↓	
1. Redundance	Kabel Eins HD - (Port A - 232.23.0.2:10000) - hot	4502	↑	
2. Redundance	Not selected			

Property	Value
Automatic Redundancy	on / off
Timeouts	In case of failure switch after 0 seconds, switch back to higher priority after 0 seconds

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Figure 37: Tabelle „NIT Remap Settings“

Here you can add the desired sources by clicking on the plus sign in the right-hand column.

Click on the "Current NIT" submenu item in the menu on the left to display the current NIT:

Current NIT

Srvs	TS-ID	ON-ID	Freq. [MHz]	QAM	Rate [MSym/s]	Module	Alias	Info
⊟	8	133	114.00	256	6.9000	local: u159-testanlage3.labor.astro	Anleitung	OK

SID	LCN	visible	Service name (known from outputs)	Status
101	805	true	rbb Berlin HD, ARD	OK
123	806	true	rbb Berlin HD, ARD	OK
143	894	true	MDR Sachsen HD, ARD	OK
329	895	true	MDR S-Anhalt HD, ARD	OK
298	906	true	MDR Thüringen HD, ARD	OK
297	944	true	hr-fernsehen HD, ARD	OK
132	951	true	hr-iNFO, ARD HR	OK
122	952	true	MDR SACHSEN DD, ARD MDR	OK

Srvs	TS-ID	ON-ID	Freq. [MHz]	QAM	Rate [MSym/s]	Module	Alias	Info
⊟	4	133	122.00	256	6.9000	local: u159-testanlage3.labor.astro	Test	Service(s) missing

SID	LCN	visible	Service name (known from outputs)	Status
23	801	true		Service missing
140	858	true		Service missing
11	864	true		Service missing
308	907	true		Service missing
145	922	true		Service missing
307	945	true		Service missing

Figure 38: Tabelle „ Currnet NIT“

Click on the "Apply" button at the top of the header to save the changes.
Click on "Discard" to restore the original settings.

VLAN Support

ASTRO IP/QAM modulators already support so-called tagged VLANs (Virtual Local Area Networks) on the data interfaces. This means that several sub-networks can be controlled on one physical port. The VLAN support includes both the subscription to the selected multicast streams via IGMP/MLD and the extraction of the MPEG transport streams from the received IP streams.

To make the VLAN settings, select the IP Interfaces entry in the main menu on the left. Then click on the plus symbol in the VLAN ID column in the Data Interfaces table to add a VLAN (see image below).

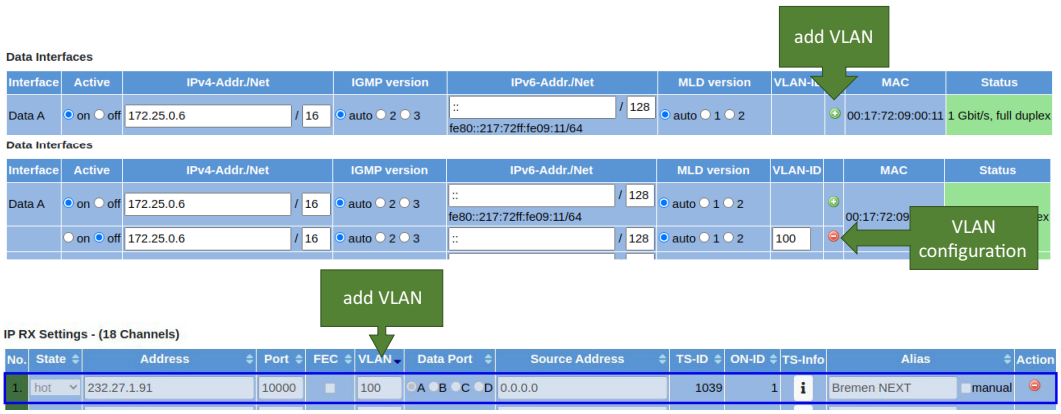


Figure 39: VLAN configuration

Now enter the VLAN ID in the input field.

You must now add the ID to the output channel. Select the IP RX Channels entry in the main menu on the left. Here you can enter the ID in the IP RX Settings table in the VLAN column.

Monitoring (only U 159-X)

Each U159-X module has an internal, central real-time transport stream analyzer (TS analyzer). Measurement probes for each input and output signal of the ASTRO IP/QAM modulators feed this with the transport streams to be monitored. The input signals are first „unpacked“ (decapsulated) from the IP data stream into an MPEG-2 transport stream. All output signals are converted into the MPEG-2 transport stream using a QAM demodulator. With the help of its onboard QAM demodulator, the ASTRO IP/QAM modulator in the U159-X can not only record the quality of its output transport streams, but also other quality parameters (e.g. SNR) of its self-generated QAM output signal. Errors and deviations in the MPEG-2 transport streams and in the QAM signal are clearly displayed with regard to the time of occurrence and the error pattern and are also saved in a data container. In this way, you can evaluate both the current signal quality and the signal quality for previous times.

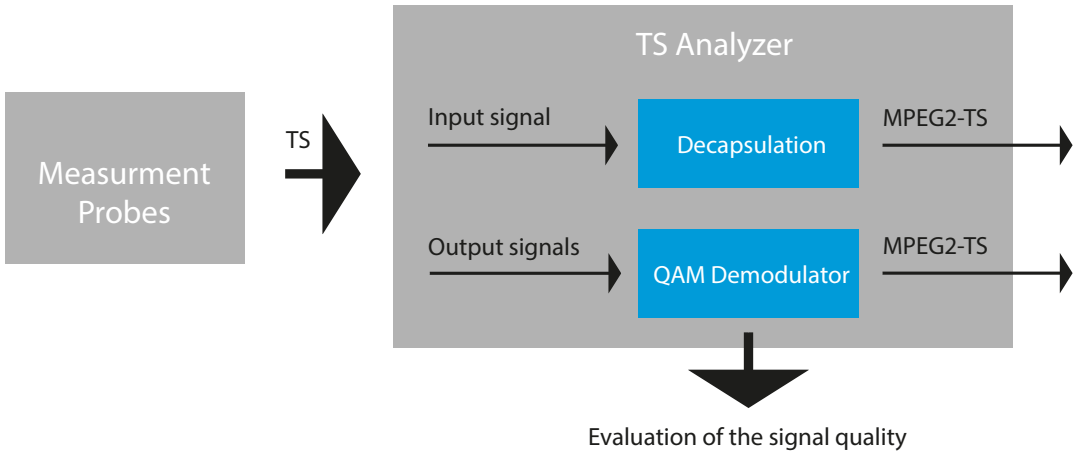


Figure 40: Monitoring

Overview of all input and output measuring probes

Under menu item „Monitoring“ the number of conconfigured measurement probes and their status are displayed. Click on the thumbnail of a measurement sample to view the status of the last 24 hours individually.

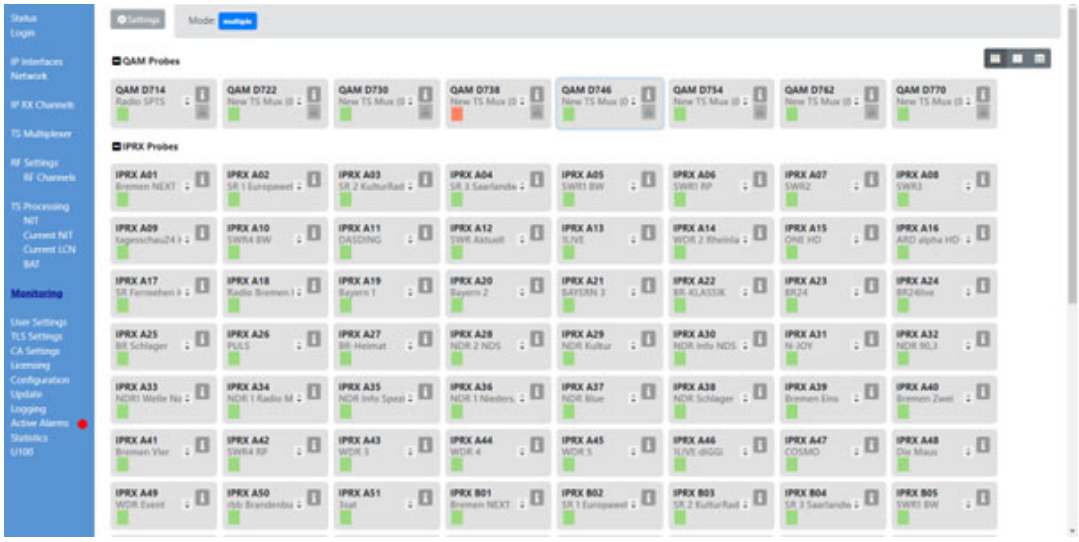


Figure 41: Measuring probes

Status indication for measuring probes

Points in time at which an error was detected are highlighted in color in the respective timeline.

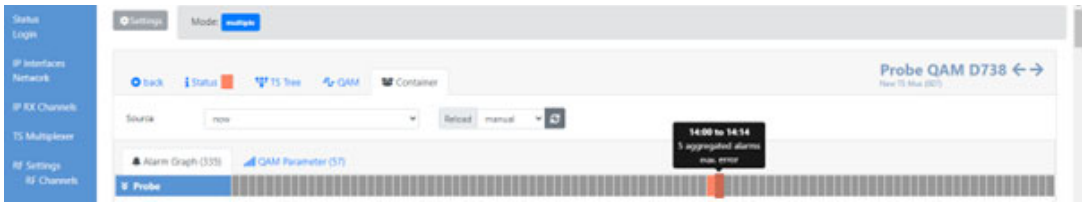


Figure 42: Status indication

An alarm table provides more in-depth information as to which service was or is specifically affected by which error. An alarm table assigned to it can be called up for each measurement sample.

Figure 43: Alarmt table for each measuring probe (output measuring probe)

Example: Alarm table for the input sample (multicast 232.27.0.5).

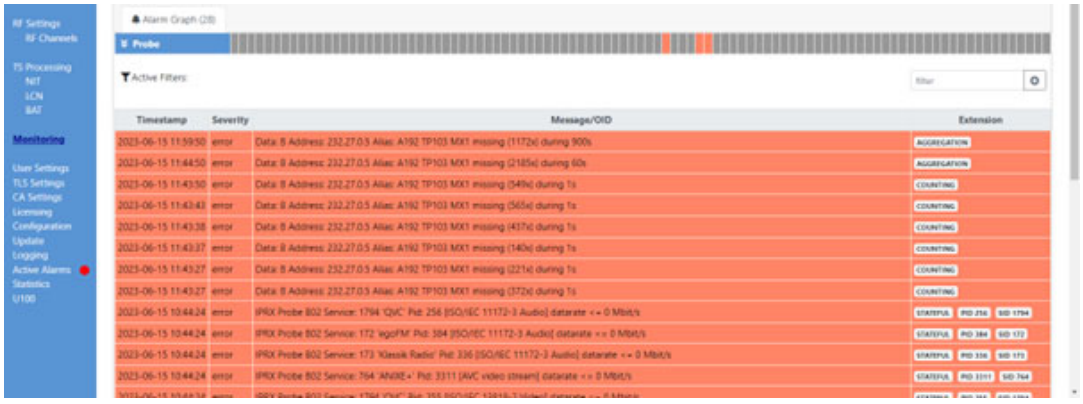


Figure 44: Alarm table for each measuring probe (input measuring probe)

Internal transportstream analyzer

The internal transport stream analyzer monitors and displays a large number of parameters. The following parameters are essentially monitored: CC error, service interruption, data rate, PAT, PMT, missing service components (e.g. PIDs), SNR , bit error, output level.

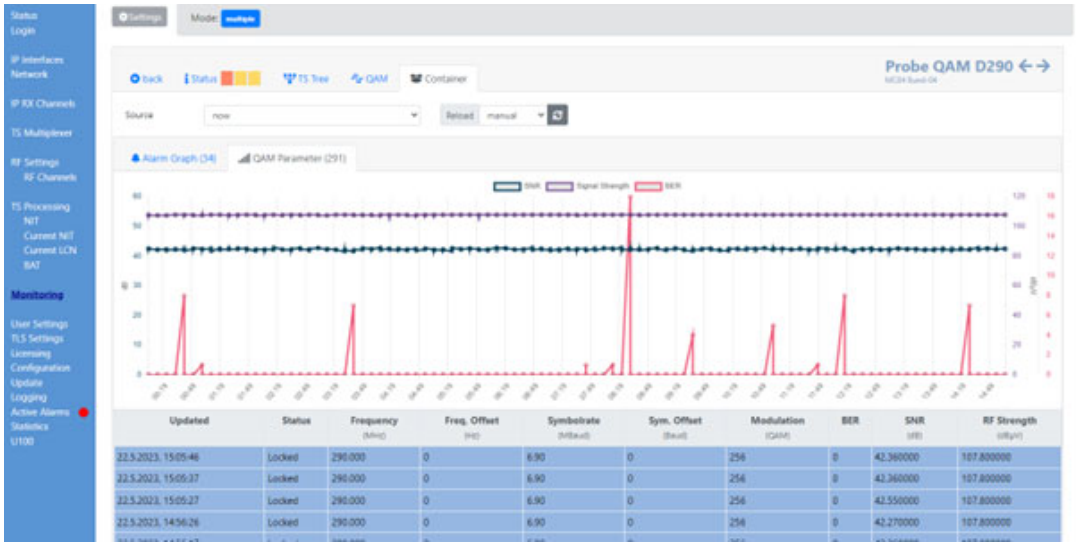


Figure 45: Output measuring probe

The components of a transport stream are clearly displayed in a tree structure, including the determined data rates and PIDs.

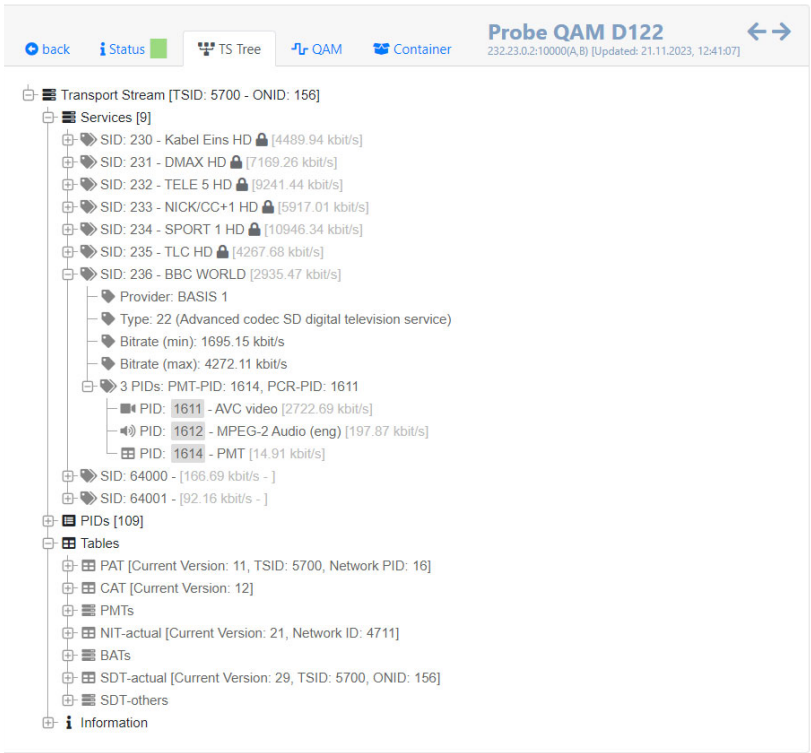


Figure 46: Transportstream components

You can freely define the input and output signals to be included in the monitoring. In addition, the ASTRO IP/QAM modulator in the U159-X offers the option of feeding an MPEG-2 transport stream back into the network using IP multicast. In this way, error patterns reported „live“ at another location can be traced and, if necessary, further measurements can be carried out on the returned transport stream at this location.

Licenses

By purchasing licenses, the functionality of the U 159 modules can be extended. Below you can see an overview of the currently available licenses:

Modules

U 159

U 159-X

	U 159	U 159-X
Order number	380 159	380 305
Annex Support	Annex A,C	Annex A,C
Base unit	separate module, up to3 in U 100-230 or U 100-48	separate module, up to 3 in U 100-230 or U 100-48
Number of carriers	16 (max. 64*)	16 (max. 64*)
Maximum number of input signals per data port	255	255
Number of data ports	1 (max. 4*)	1 (max. 4*)
data rate per data port	ca. 850 Mbit/s	ca. 850 Mbit/s
extended storage for increased performance	–	☑
U 159 B: only Annex B (w/o Annex A, C); order number 380 270	–	☑

Licenses *)

U 159 TS: Activation of transport stream analyzer; order no. 380 306	–	☑
U 159 D: Internal QAM demodulation and monitoring function; order no. 380 279	–	☑
U 159 MON: Monitoring of QAM output channel; order no. 380 307	–	☑
U 159 CSA: Scrambling of QAM ch. according CSA; order no. 380 253	–	☑
U 159 8QCH: Extension of 8 QAM ch. (max. 64); order no. 380 259	☑	☑
U 159 DP: Extension of 1 data port (max. 4); order no. 380 258	☑	☑
U 159 FEC: Forward Error Correction (FEC); order no. 380 257	☑	☑
U 159 MUX: Multiplexer; order no. 380 254	☑	☑
U 159 RED: Internal redundancy for input signal; order no. 380 256	☑	☑
U RADIUS: Activation of RADIUS client server protocol; order n. 380 136	☑	☑
U SSL: Activation of TLS Protocol (SSL); order no. 380 133	☑	☑

* License key required

Accessories

U 159 SFP: SFP module, 1 Gbit; order no. 380 255	☑	☑

Figure 47: Licenses

Troubleshooting

If the device is not functioning correctly, please perform the following checks:

- ☐ Check whether the device is connected to the required grid voltage (230 V~, 50 Hz for the U 100 base unit, and 48 V for the U 100-48 base unit).
- ☐ Check whether the signal cable is connected correctly, and that there are no breaks or short circuits in the connectors.

If the problem cannot be resolved, please contact the ASTRO customer service.

Maintenance and repair

The device must not be opened other than for repair purposes. Repairs may only be carried out at the factory or at workshops, or by persons, authorised by ASTRO Strobel GmbH.
Read carefully: EN 60728-11 Safety requirements: No service work during thunderstorms.

*HINWEIS: In the event of repairs, **DIN VDE regulations 0701 - 0702**, where applicable, must be adhered to, and these are secondary to the relevant data specifications in DIN EN 60950-1. **You must disconnect the power plug before opening the base unit!***

Service tasks

The following tasks, which involve the removal of screw connections, can be performed by appropriately instructed service personnel: Removal and installation of signal converters
(e.g. U 116) and power modules, even when the U 100 is operating.

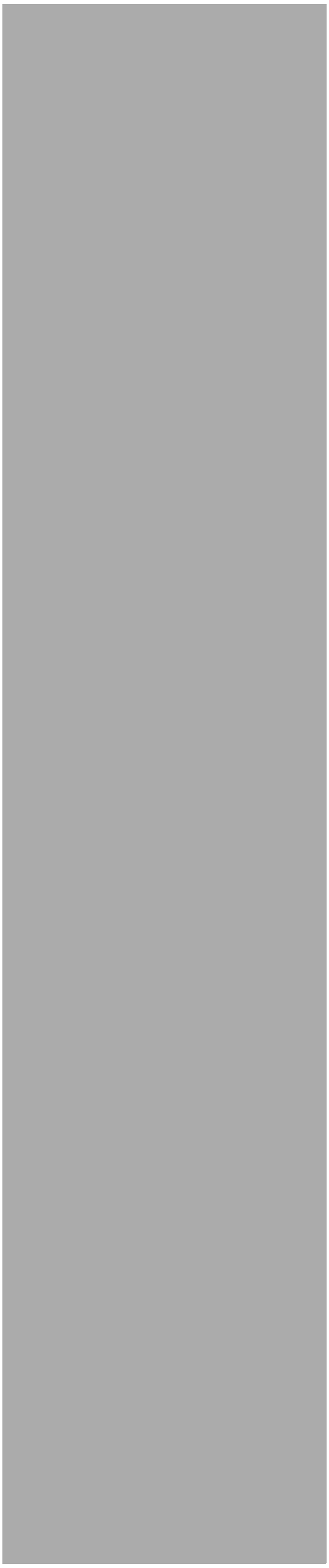
Replacing converter modules

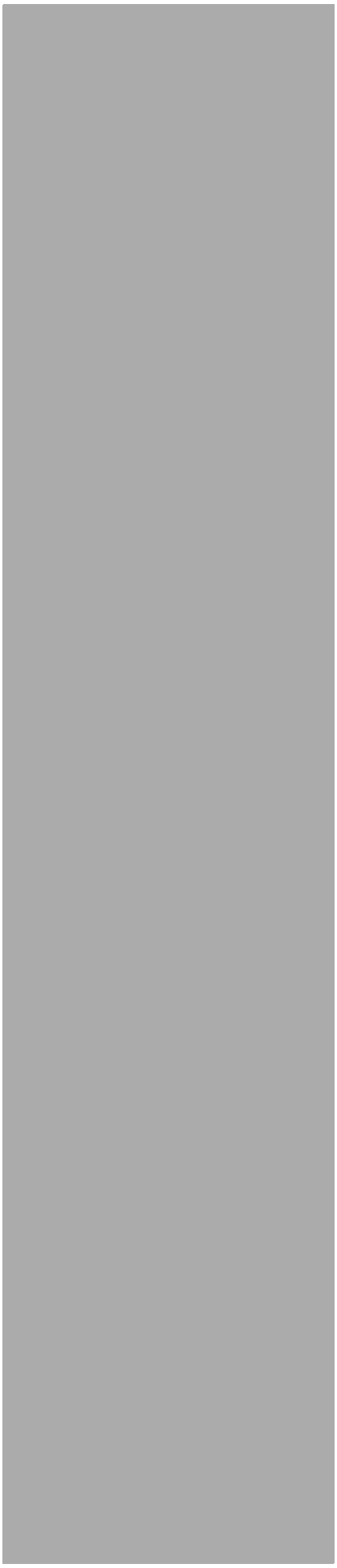
Converter modules can be pulled out to the front after removing the safety screw in the front covers (see section “Connecting and installing the module”)

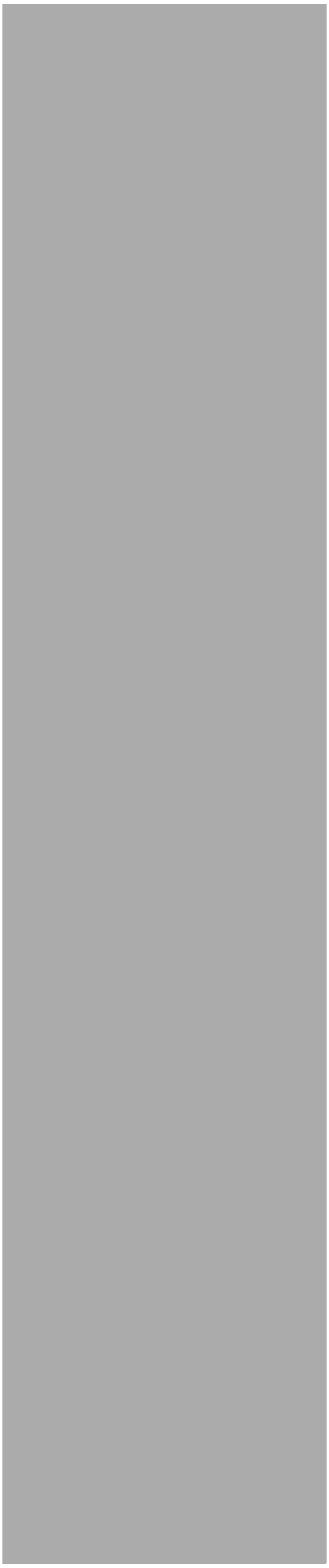
Technical data

Type		U 159
Order Number		380 159
EAN-Code		4026187193270
Network interfaces (passive routing to U 1xx)		
Management		2 x 1000 Base-T Ethernet (RJ 45)
Data		4 x SFP (1000 Base-X or SGMII)
Input Bitrate per Data Port	[Mbit/s]	1000/1000/900/750 @1/2/3/4 Ports
Protocol		Ethernet, ARP, IPv4, IPv6, UDP, RTP, TCP, HTTP(S), SNTP, SNMP v2c/v3, Syslog, IGMP v2/v3, MLD v1/v2
Serial		1x RJ 45, 115200 kbit/s, 8N1
Transport Stream Processing		
TS Decapsulation		UDP, UDP/RTP, 1-7 packets, FEC (SMPTE 2022-1, -2)
Packet Length	[Bytes]	188
Data rate adjustment		☑
PCR-Correction (< 500 ns acc. DVB)		☑
NIT Handling		static, NIT from PID, dynamic
QAM-Modulator		
Modulation		16-, 32-, 64-, 128-, 256-QAM
Signal processing		DVB EN 300 429, ITU J.83 Annex A/C
Spectrum shape cos-roll-off	[%]	12, 13, 15, 18
FEC		Reed-Solomon (204, 188) Code
Symbol rate	[Msymb/s]	1 - 7,14
Channel Bandwidth	[MHz]	1,12 - 8 (depends on symbol rate)
Maximum number of channels		64
Maximum bitrate per output channel	[Mbit/s]	52,64
Phase error dynamic	[°]	0,3
MER (Equalizer)	[dB]	≥ 44
Shoulder attenuation	[dB]	> 56
RF-Modulator		
Connectors	[Ω]	75, 2 x F-jack (1 x RF, 1 x Test point -20 dB)
Frequency range	[MHz]	47 - 1006, digital modulation
Frequency drift	[kHz]	< 10
Output level	[dBµV]	114/111/108 @16/32/64 Channels
Intermodulation distance	[dB]	> 60
Return loss	[dB]	> 14
Spurious frequency distance	[dB]	> 60
Intercarrier Signal-to-Noise ratio	[dB]	> 60
Common data		
Current consumption at 48 VDC	[mA]	830
Power consumption	[W]	45
Input voltage	[V]	36 - 60 VDC or 230 VAC
Dimensions		1 RU, 19 inch
Ambient temperature	[°C]	0…+45

Type		U 159-X
Order Number		380 305
EAN-Code		4026187270711
Network interfaces (passive routing to U 1xx)		
Management		2 x 1000 Base-T Ethernet (RJ 45)
Data		4 x SFP (1000 Base-X or SGMII)
Input Bitrate per Data Port	[Mbit/s]	1000/1000/900/750 @1/2/3/4 Ports
Protocol		Ethernet, ARP, IPv4, IPv6, VLAN, UDP, RTP, TCP, HTTP(S), SNTP, SNMP v2c/v3, Syslog, IGMP v2/v3, MLD v1/v2
Serial		1x RJ 45, 115200 kbit/s, 8N1
Transport Stream Processing		
TS Decapsulation		UDP, UDP/RTP, 1-7 packets, FEC (SMPTE 2022-1, -2)
Packet Length	[Bytes]	188
Data rate adjustment		☑
PCR-Correction (< 500 ns acc. DVB)		☑
NIT Handling		static, NIT from PID, dynamic
QAM-Modulator		
Modulation		16-, 32-, 64-, 128-, 256-QAM
Signal processing		DVB EN 300 429, ITU J.83 Annex A/C
Spectrum shape cos-roll-off	[%]	12, 13, 15, 18
FEC		Reed-Solomon (204, 188) Code
Symbol rate	[Msymb/s]	1 - 7,14
Channel Bandwidth	[MHz]	1,12 - 8 (depends on symbol rate)
Maximum number of channels		64
Maximum bitrate per output channel	[Mbit/s]	52,64
Phase error dynamic	[°]	0,3
MER (Equalizer)	[dB]	≥ 44
Shoulder attenuation	[dB]	> 56
RF-Modulator		
Connectors	[Ω]	75, 2 x F-jack (1 x RF, 1 x Test point -20 dB)
Frequency range	[MHz]	47 - 1006, digital modulation
Frequency drift	[kHz]	< 10
Output level	[dBµV]	114/111/108 @16/32/64 Channels
Intermodulation distance	[dB]	> 60
Return loss	[dB]	> 14
Spurious frequency distance	[dB]	> 60
Intercarrier Signal-to-Noise ratio	[dB]	> 60
Common data		
Current consumption at 48 VDC	[mA]	830
Power consumption	[W]	50
Input voltage	[V]	36 - 60 VDC or 230 VAC
Dimensions		1 RU, 19 inch
Ambient temperature	[°C]	0…+45







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