Televes®

T.0X SERIES

EN DVBS2 - QAM CI

Ref. 563501

User Instructions

Televes

Contents

1. Technical specifications

Satellite Demodulator	Input Frequency		MHz	950 - 2150	Through losses (typ.)		dB	< 1.5
	Symbol rate	7.5	Mbaud	10 -30	Modulation	DVB-S2		QPSK, 8PSK
		DVB-S		2 - 42.5		DVB-S		QPSK
	Frequency Steps		MHz	1	FEC Inner code		LDPC	9/10, 8/9, 5/6, 4/5, 3/4, 2/3, 3/5, 1/2, 1/4, 1/3, 2/5
	Input and Output connectors		type	"F" female	FEC Outer code			Bose-Chaudhuri-Hocquenghem
	Input impedance		ohm	75	Roll-off Factor		%	20, 25, 35
	LNB power&tone control		Vdc/KHz	13-17- OFF / 22KHz (ON-OFF)	Return losses (min.)		dB	10
QAM Modulator	Modulation format		QAM	16, 32, 64, 128, 256	Scrambling			DVB ET300429
	Symbol Rate max.		Mbaud	6,9	Interleaving			DVB ET300429
	Roll-off Factor		%	15	Bandwidth (max.)		MHz	8.3
	Block Code			Reed Solomon (188, 204)	Spectral inversion (selec.)			Normal / Inverted
RF output	Output Frequency (selec.)		MHz	46 - 862	Through losses (typ.)		dB	< 1,5
	Frequency steps		KHz	250	Return losses (typ.)		dB	> 12
	Output level (max.) (selec.)		dBµV	80 ±5	Input and Output connectors		type	"F" female.
	Output level adjustment (progr.)		dB	> 15	Output Impedance		ohm	75
General	Consumption 24Vdc (with signal)*		mA	300 (no CAM inserted; LNB power OFF)				
				400 (CAM inserted; LNB power OFF)				
				550 (no CAM inserted; LNB power ON)				
				650 (CAM inserted; LNB power ON)				
	Protection index			IP20				

* The unit's consumption with CAM will depend on the type of CAM being used. For the LNB it is considered a standard consumption of 250mA.
The Power Supply Unit is able to powering up to seven DVBS2-QAM CI modules maximum.
Is necessary to use both PSU outputs when consumption of one of them exceeds 4A (maximum current in each output).
The technical characteristics described are defined for a maximum ambient temperature of 45°C (113ºF). Forced ventilation must be used for higher temperatures.

1.2. Broaband Amplifiers technical specifications

Amplifier 5575	Frequency range	MHz	46 ... 862	Connector	type	"F"
	Gain	dB	44 ± 2,5	Powering voltage	Vdc	24
	Regulation margin	dB	20	Consumption at 24 Vdc	mA	450
	Output level (60 dB) 42 CH CENELEC	dBμV	105	Test socket	dB	-30
Amplifier 451202	Frequency range [1]	MHz	47 ... 862	Connector	type	"F"
	Gain [1]	dB	40 - 53 (selectable)	Mains voltage	Vac/Hz	196 - 264 / 50-60
	Max. output level [1] DIN 45004B	dBμV	129	Max. Power	W	16
	Frequency range [2]	MHz	5 ... 30	Test socket	dB	-20
	Gain typ. [2]	dB	20/ -3			
	Maximum output level [2] DIN 45004B	dBμV	129/ ---			

(1) Forward channel   (2) Return channel (active/passive)

1.3. Power Supply Unit technical specifications

Power Supply Unit 5629	Mains voltage	Vac/Hz	196 - 264 / 50-60	Total current (max) (outpur 1 + output 2)	A	5
	Output voltage	Vdc	24	Max current per output	A	4

1.4. Blocks Diagram
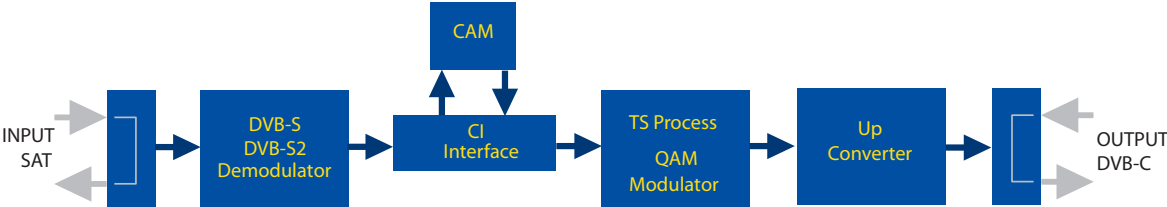
2. Description of references

Product Range	
563501	DVBS2-QAM CI T-0X
5575	T.0X Broadband Amplifier 44dB 120dBµV
451202	Amplifier DTKom (47 - 862 MHz)
5559	T.0X Headend Manager CDC-IP
555901	T.0X Headend Manager CDC-IP GSM
5629	T.0X Power Supply Unit 24VDC/5A

Accessories	
7234	Universal Programmer
5071	T03-T05-T.0X Wall mounting rail L=50 cm
5239	T03-T05-T.0X Wall mounting rail (12 Modules+PSU) L=56 cm
5301	19" Subrack frame
507202	T.0X Lockable cabinet with Ventilation Unit (7 Modules + PSU)
4061	75 Ohm DC-Block terminal load
4058	75 Ohm terminal load
422601	T05 to T.0X Power interconnection lead L=40 cm
422602	T05 to T.0X Management interconnection lead L=40 cm
422603	T.0X Management interconnection lead L=1m
5673	Blank plate

3. Mounting

3.1. Wall mounting

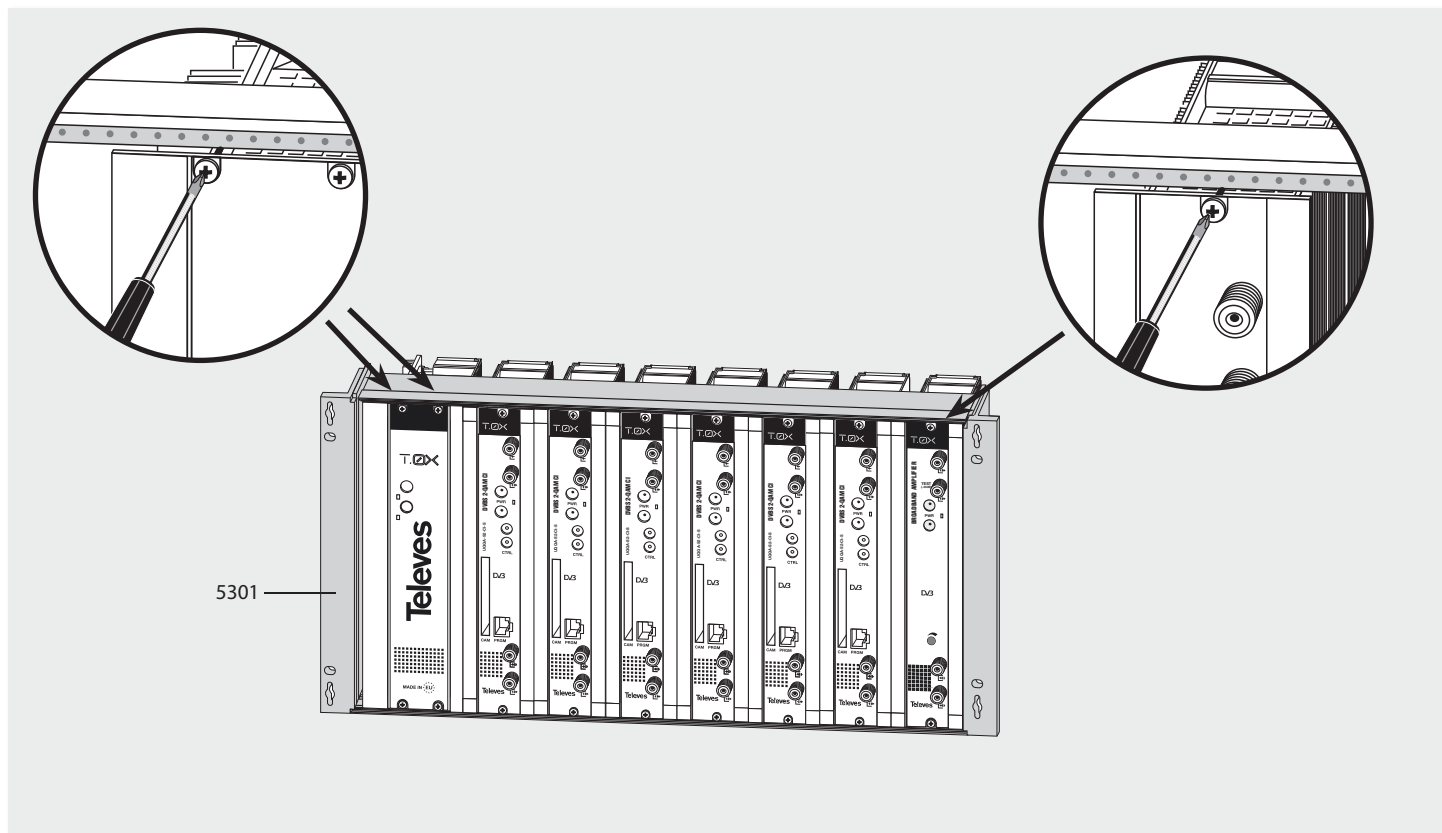5629   IF SAT input   563501   5575

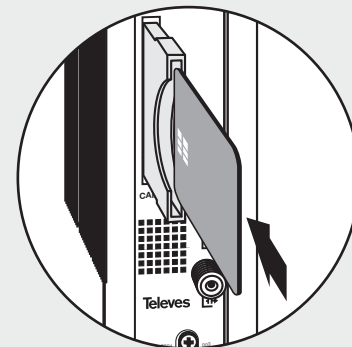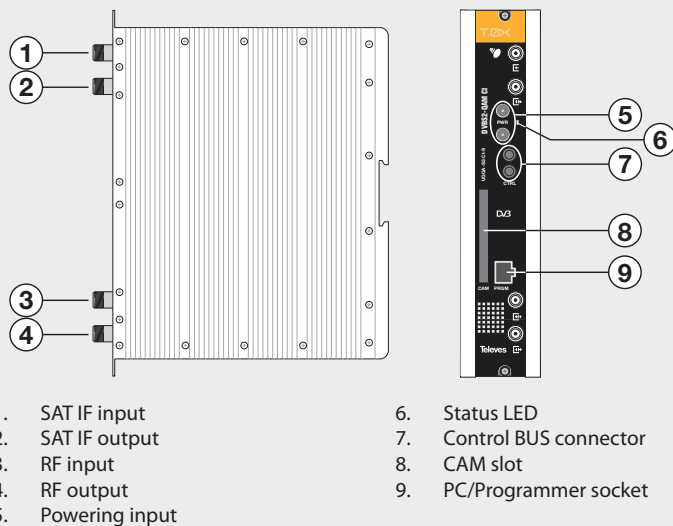5071 5239

QAM output

4061

7234
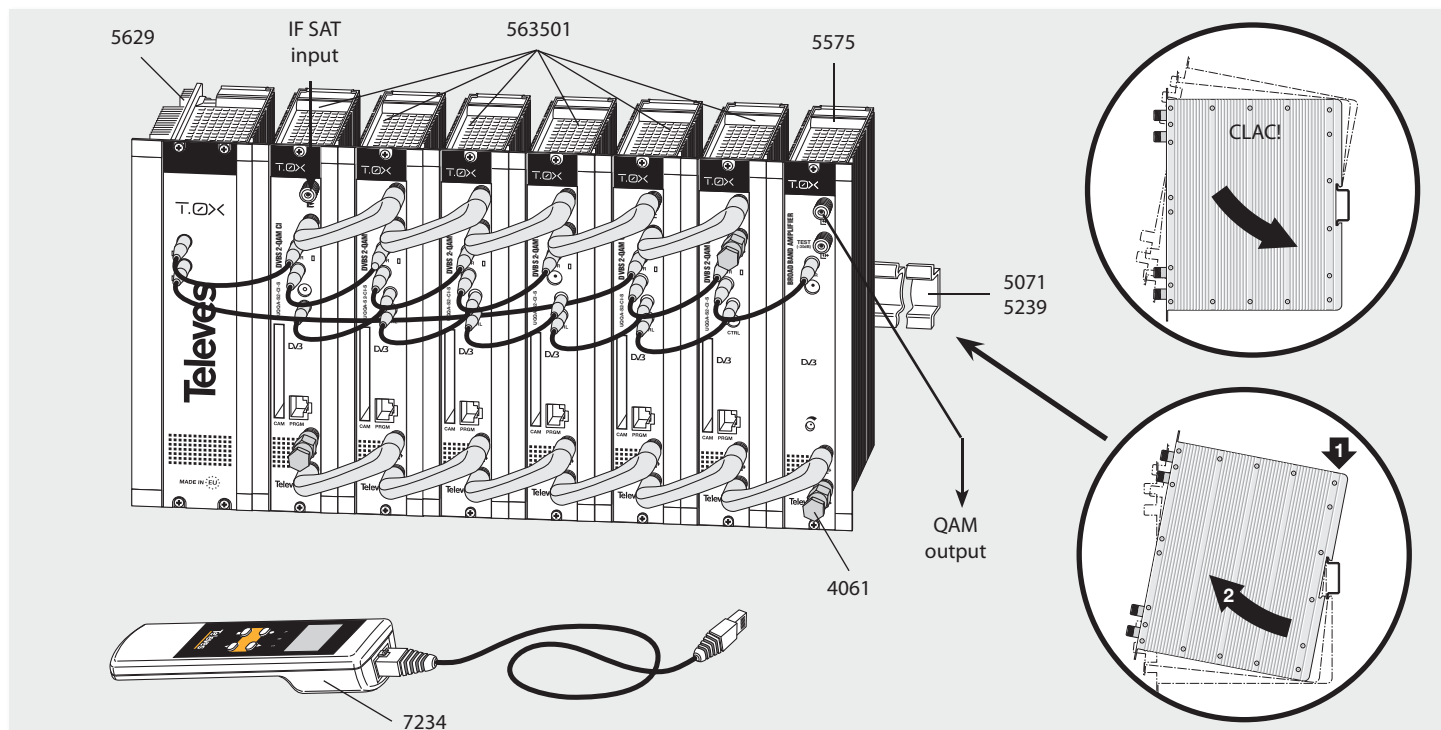
NOTE: The use of both PSU power outputs is recommended to balance the consumption. For example, 4+3 or 3+4

CLAC!

3.2. 19" rack mounting

5301

4. Elements' descriptions

4.1. DVBS2 - QAM CI

1. SAT IF input
2. SAT IF output
3. RF input
4. RF output
5. Powering input

6. Status LED
7. Control BUS connector
8. CAM slot
9. PC/Programmer socket

Insert the smartcard completely into the CAM slot before powering modules. Card contacts looking left and forwards when it is being inserted.
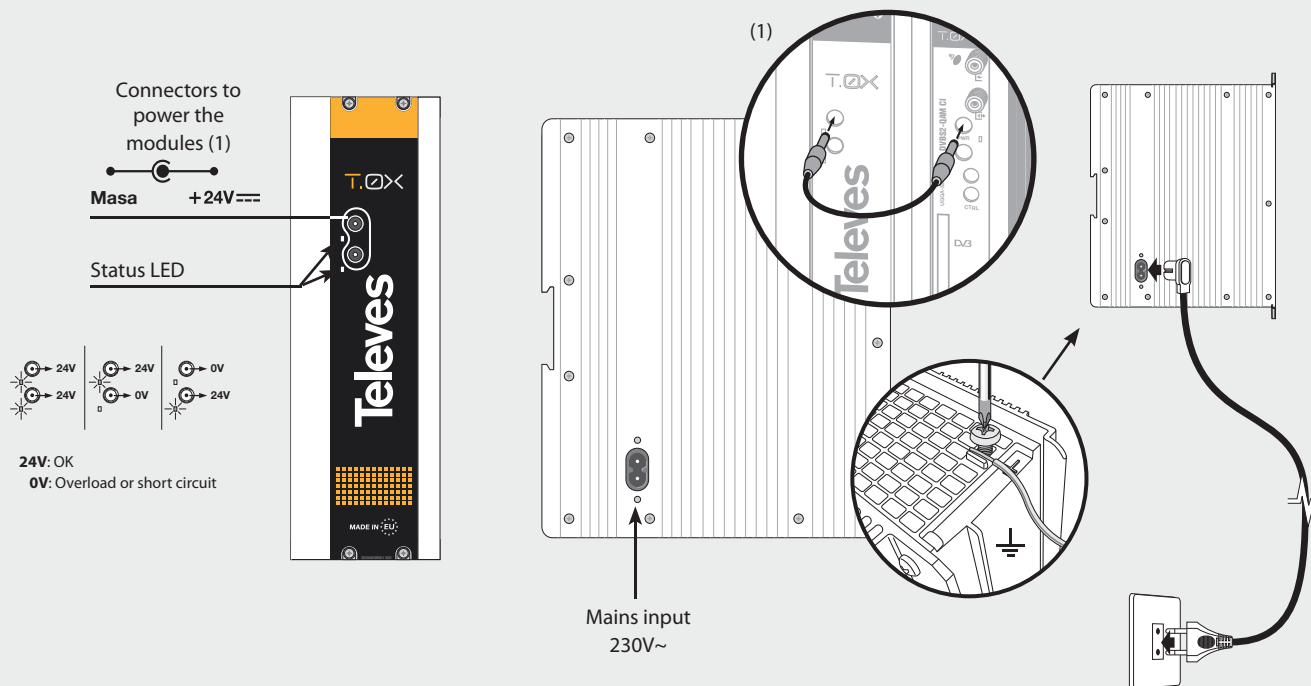
The DVBS2 to QAM transmodulator with CI receives a satellite transponder, in any of DVBS (QPSK) or DVBS2 (QPSK or 8PSK) modulation formats, and demodulates it to obtain a *transport stream* packet. Then, the *transport stream* packet is modulated in QAM format and converted to the output channel (UHF or VHF and with a maximum bandwidth of 8 MHz) using an *agile up-converter*.

Additionally, it incorporates a Common Interface slot for inserting a conditional access module (CAM) that permits the unscrambling of services. Programming of the transmodulator operating parameters (input frequency, output channel, modulation format and adaptation of services mainly) is performed by means of the universal programmer (ref. 7234).

EN

4.2. Power supply unit

(1)

Connectors to power the modules (1)

Masa   **+24V** ===

Status LED

24V / 24V   24V / 0V   0V / 24V

24V: OK
  0V: Overload or short circuit
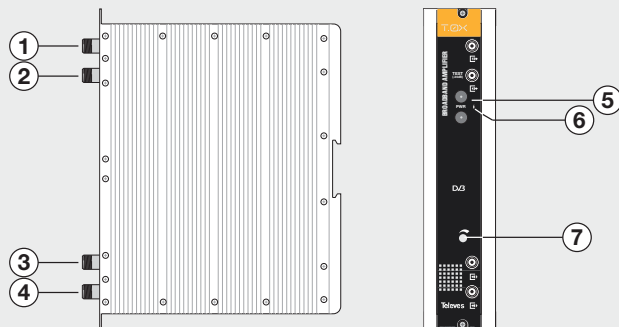
MADE IN · EU ·

Mains input
230V~

REMARK: - The Power Supply Unit is able to powering up to seven DVBS2-QAM CI modules maximum.
            - Whenever the demand of power exceeds 4A (max. current for each output), it is necessary to distribute it between the two powering outputs of the PSU.

4.3. Amplification options
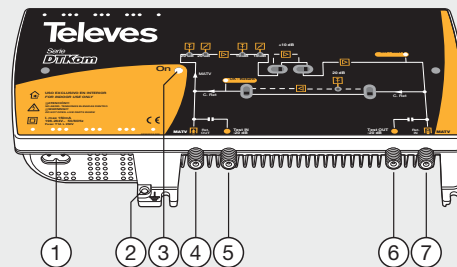
OPTION "A" - Amplifier ref. 5575

OPTION "B" - Amplifier ref. 451202

1. RF output	5. Powering input
2. Test output	6. Status LED
3. RF input 1	7. Attenuator
4. RF input 2	

It features two input connectors, to allow mixing of channels coming out from two different systems. If only one of the inputs is used, it is recommended to load the unused input with a 75 ohm terminator, ref 4061.
As the rest of T.0X units, this amplifier is powered via the 24 Vdc power BUS.

Input signals through connectors 3 & 4 are combined and amplified in the frequency band 47-862 MHz

1. Mains input (196- 64 V~ 50/60 Hz)
2. Ground terminal
3. ON/OFF LED
4. MATV input / Return channel output
5. MATV input test
6. MATV output test
7. MATV output / Return channel input

Broadband amplifier (47 a 862 MHz.) in shielded zamak chassis, with gain configured by the installer.

4.4. Universal Programmer PCT 5.0
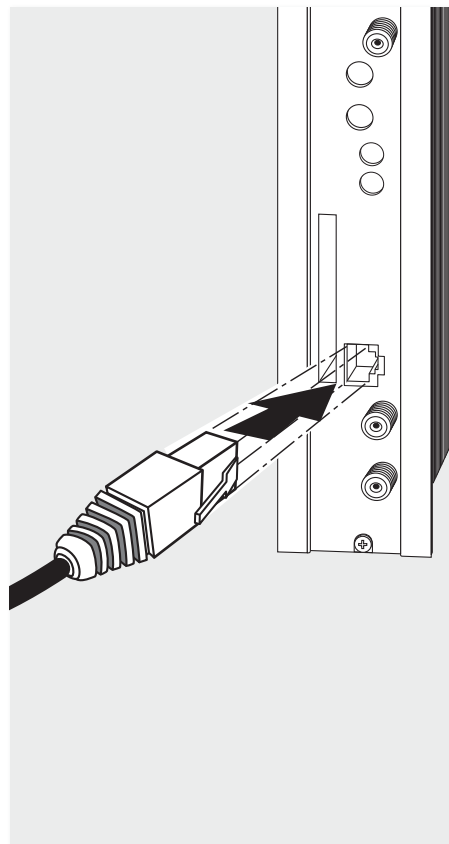
The programmer features 4 buttons:

●   (short press) - Selection of parameter (positioning of the cursor).

▲-▼   Modification of the parameter chosen by the cursor (flashing)

■   (short press) - Change menu

●   (long press) - Change between Principal and Extended menus

■   (long press) - Save changes to memory

● + ▲   Cloning menu.

■ + ● + ▲   Increases the contrast of the screen.

■ + ● + ▼   Decreases the contrast of the screen.

5. - How to use the product

Connect the controller to the front socket of the module ("PRGM").
At first, the controller's firmware version will appear:

```
 PCT firmware
    version
_____
V:5.3
```

Next, it is displayed the firmware version of the DVBS2-QAM CI module :

```
Unit
Firmware
version:
1.00.00016
```

5.1. Standard Menu

a. Input menu

The first main menu allows selection of **input frequency**, the **symbol rate,** and the LNB powering (0, 13 V-22KHz, 13 V, 17 V-22KHz, 17 V)

```
▶INPUT
Freq:1922MHz
27.500 Kbaud
LNB:13V22KHz
```

To modify the frequency, press ● until the cursor shifts over the desired digit. Then change its value using keys ▲ and ▼.
The range of allowed input frequency values is **950-2150 MHz**, whereas the range for symbol rate is **10 to 30 Mbaud** for DVB-S2 signals and **2 to 42.5 Mbaud** for DVB-S signals.

In the event that there is a "short circuit" in the input connector (LNB powering enabled), the LED will flash on the front of the module until the condition disappears.

b. QAM Modulation menu

The following standard menu displays the selectable **QAM modulation output parameters**:

```
▶QAM
Mod:  256QAM
IQ:   normal
Baud:6.900Mb
```

The available options for this menu as well as their possible values are:

- QAM modulation order: 16QAM, 32QAM, 64QAM, 128QAM and 256QAM.
- The **IQ** parameter is the modulation format selection and can be set to "normal" or "inversion".
- In the processing mode (see Versions menu) the user must select the baud rate of the QAM output, up to a maximum of 6.9 Mbaud.

  In transparent mode, this parameter is calculated automatically as a function of both input rate and modulation order you have selected, and can not be changed. If the selected QAM modulation is not able to make room to the input rate, it will show "OVF!" (Overflow) and the value of the QAM output rate. If the satellite input is not engaged, it will show "Baud: unlock".

Remark: The bandwidth required depends on the number of services present on the output (those selected as ON or DCY, see menu of services).

c. Output menu

The next standard menu shows the **frequency or output channel**, the **level control** and the selection of output **spectrum inversion**.

```
▶OUTPUT
Ch:C21
<474.000MHz>
Lev:99 Norm.
```
```
▶OUTPUT
Freq: 474.00
Level:    99
Output:Norm.
```

To change a parametre, press ● key until the desired parametre starts flashing. Then you can change its value by means of keys ▲ and ▼.

The output frequency range is 46 to 862 MHz
The output level control allows values between 00 and 99.

The available output values are:

- **Norm** Normal Output Mode
- **CW** Continuous Wave Mode. A continuous carrier is generated in the output frequency selected (useful for balancing the headend in the absence of an input signal).
- **OFF** No output is generated.

- **NULL** QAM output modulation with null packets only

d. Services menu

This menu shows the list of *transport stream* services selected. Each time the user selects a new input transport stream, the unit performs a search for services.

During the process, the unit will show the message below displaying the number of channels as soon as they are being found:

```
▶SERVICE

Scanning: 13
```

Once the search has completed, a list of services is displayed with the following information:

```
▶SERV  10125
2/8     18/25
France 2
          OFF
```

It is indicated the service order number as well as the total number of services in the *multiplex* (the figure indicates that the 2nd service out of 8 services, is available), the statistics (18/25) and the service name. In the processing mode (see Versions menu) it is shown if the user has selected it to: either **remove** its encryption from the output (OFF) by means of a module CAM (DCY), or to **pass through** without modification (ON).

Statistics information is the following: **first number** indicates the percentage of the output occupied by the displayed service; **second number** indicates the free percentage at the output.
In the example:
- Service "La2" would occupy the 18% of the output (since it is set OFF, means that it is being eliminated)
- There is a 25% of free room.
- So we can easily see that, in principle, this service could be activated (ON or DCY), since there is still sufficient capacity at the output. The free capacity percentage at the output is only updated once recorded the configuration of services.

Additionally, on the upper right corner of the window it is indicated the status of the service (scrambled or plain) at the input and at the ouptut:

- Service scrambled at the input and at the output.
- Service scrambled at the input and plain at the output.
- Service scrambled at the input.

If the service is set to OFF (removed) shows the service identifier (service_id) in decimal format.

In the transparent mode ((see Versions menu) it is not possible neither eliminate nor decode services, so no changes are allowed on this menu.

e. Measurements menu 1

The next menu provides an indication of the **quality of the input signal** by estimating the *C/N* (dB) and the *link margin* (dB).

```
▶MONITOR >>
C/N:14.1dB

L.M.: 7.7dB
```

f. Measurements menu 2

This menu shows the **occupancy rate** of the output of the module as well as the maximum reached. Exceeding the maximum occupancy rate will cause an overflow at the output, and this condition wil be indicated.

```
▶MONITOR
Occupancy:
76%
Max:80%
```
```
▶MONITOR
Overflow!!
```

It is not recommended occupancy values above 82%. This menu is "read only", therefore keys ▲ and ▼ are not operational.
You can reset the maximum occupancy by pressing ●.
In the transparent mode (see Versions menu), if the QAM modulation selected does not allow make room for the input rate, it will be indicated by "Overflow!" as well as indicating the actual QAM output rate.

5.2. Extended menu

When the ● key is held down for more than 3 seconds the unit displays a series of menus that are used less frequently, called *extended menus*.

a. Configuration Menu

This menu allows to:

- Set the **address** of the unit (it is needed whenever the unit has to be controlled by the Headend Manager CDC).

- It also selects the state of servicesonce the input scanning is finished :

  SERV ON: At the end of the scan all services are set to ON state.

  SERV OFF: At the end of the scan all services are set to OFF state.

- Either channel of the table to be used or the mode of operation using the channel frequency.

```
▶CONFIG.
CDC Adr: 001
SERV:     ON
CCIR N.Z.Ind
```

Tables of channels available for selection are:
- CCIR
- China
- Chile
- Italy
- France
- OIRT channels
- Irland
- South Africa
- Polond
- Australia

b. Identifiers menu

Some DVB-C receivers may have problems receiving transmodulated channels that share the same identifier (*transport_stream_id*). To avoid these cases, the user can change the following output multiplex identifiers:

- *transport_stream_id* (ts_id)
- *network_id* (n_id)
- *original_network_id* (on_id).

You can choose between **Auto** mode (identifiers are not changed) or **Manual** mode.
When switching from Auto mode to Manual mode, the display lists the identifiers received at the input and the user can change them.

```
▶NIT IDs
     Auto
```
```
▶IDs Manual
ts_id:0x04fc
n_id: 0x055f
on_id:0x055f
```
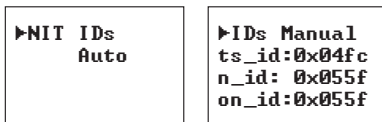
This menu is not displayed in Transparent mode.
Output tables are the same as the input ones.

c. Temperature measurement menu

The following menu indicates the unit's **current temperature** as well as the maximum recorded. It is possible to reset the maximum by pressing the ● key.

```
▶MONITOR
Now:   04
Max:   05
        ●reset
```
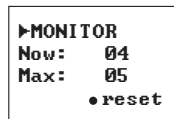
The recommended operational margins are as follows:

- Optimum Operation : **0-6**
- High Temperature: **7-8**
- Excessive Temperature: **9-10**

If the maximum recorded is outside the optimum margin, the installation should be revised in an attempt to reduce the temperature.

If the DVBS2-QAM CI modules have been installed in a housing ref. 5069 and the temperature of one of the modules is outside of the optimal operating range, the ventilation unit will have to be installed ref. 5334. To check whether this change is eff ective the maximum can be reset and its value checked after a given time.

d. Versions menu

This menu displays the firmware versions for the unit as well as the one of the QAM modulaor (FPGA).

```
▶VERSION
FW:1.00.4
Mod:1.00.9
Transparent
```
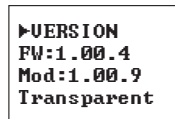
It also lets you select between two modes of operation:

- **Processing**: delete / decode services; generate output tables and LCNs. The user selects the baud rate of the QAM output.

- **Transparent**: The input data pass to the output, simply by changing the modulation. You can not neither delete/decode services nor adding LCNs. The QAM output rate is calculated from both satellite input rate and QAM modulation order selected.

e. CAM user interface menu (MMI)

This menu allows access to the user interface conditional access module (CAM), for example, check versions or rights of the card:

```
▶CAM  MMI
Press ● for
menus
```

f. LNC (Logical Channel Number) menu

This menu lets you assign a LCN (Logical Channel Number), between 1 and 1023, to the services that are present at the output (those marked ON or DCY).
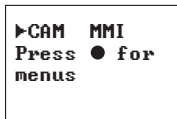
```
▶LCN           ▶LCN
1/4            3/4
Fashion TV     Soyuz TV
      N:0003         NO LCN
```
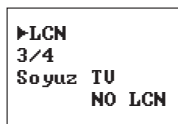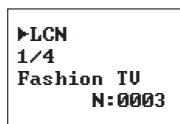
To change the LCN, make use of keys ●, and ▲ or ▼. If you select 0000 as the LCN, it will show "NO LCN."

This menu is not displayed in Transparent mode.

g. Language Menu

This last extended menu allows the selection of menu languages (Spanish / English / German/ French):

```
▶LANGUAGE

    English
```
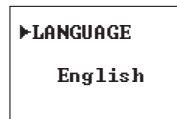
By pressing the keys ▲ and ▼, you change the selected language.

5.3. Saving of parameters

Once the desired value has been selected in any of the menus (normal or extended), in order to save the information, hold down the ■ key for approximately 3 seconds. The screen will display the following:

```
Saving
settings and
restarting
...
```
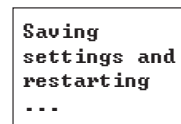
If you change the configuration data, but these have not been recorded, the previous settings are restored after 30 sec of elapsed time, ie, the changes are canceled.

6. - Controlling the Device

This version of the DVBS2-QAM CI allows configuration and monitoring via a PC, both locally and remotely.

a. Local control

The "Headend Management" programme (v2.14 or higher) is required, as well as a special lead (provided with the programme) that connects a PC serial port to the "PRGM" socket of the DVBS2-QAM CI module.
The programme can be used to set up and read all the operating parameters, as well as to monitor the correct operation of the device.

b. Remote control

It is necessary to have a Headend Control module (ref. 5559 or 555901) that includes the programme mentioned above.

Once the communication with the headend control has been established, all the controllable devices that have been installed in the headend can be accessed. In this case it is imperative that each module is programmed with a different device address selected between 1 and 254.

Menu Structure

```
▶INPUT
Freq:1922MHz
27.500 Kbaud
LNB:13V22KHz

▶QAM
Mod:   256QAM
IQ:    normal
Baud:6.900Mb

▶OUTPUT
Ch:C21
<474.000MHz>
Lev:99 Norm.

▶SERV  10125
2/8    18/25
France 2
          OFF

▶MONITOR >>
C/N:14.1dB
L.M.: 7.7dB

▶MONITOR
Occupancy:
76%
Max:80%
```

Long press ●

```
▶CONFIG.
CDC Adr: 001
SERV:      ON
CCIR N.Z.Ind

▶IDs Manual
ts_id: 0x04fc
n_id:  0x055f
on_id: 0x055f

▶MONITOR
Now:   04
Max:   05
      ●reset

▶VERSION
FW:1.00.4
Mod:1.00.9
Transparent

▶CAM  MMI
Press ● for
menus

▶LCN
1/4
Fashion TV
       N:0003

▶LANGUAGE
   English
```

7. Example of application

Distribution of 7 DVB S2 satellite channels in QAM format.

75 ohm
4061

451202

5629   7 x 563501

QAM Output

The diagram shows the reception and processing of 7 DVB S2 channels to be distributed as QAM channels.
At any situation, the limitation of 4 A per output of the PSU must be kept in mind.
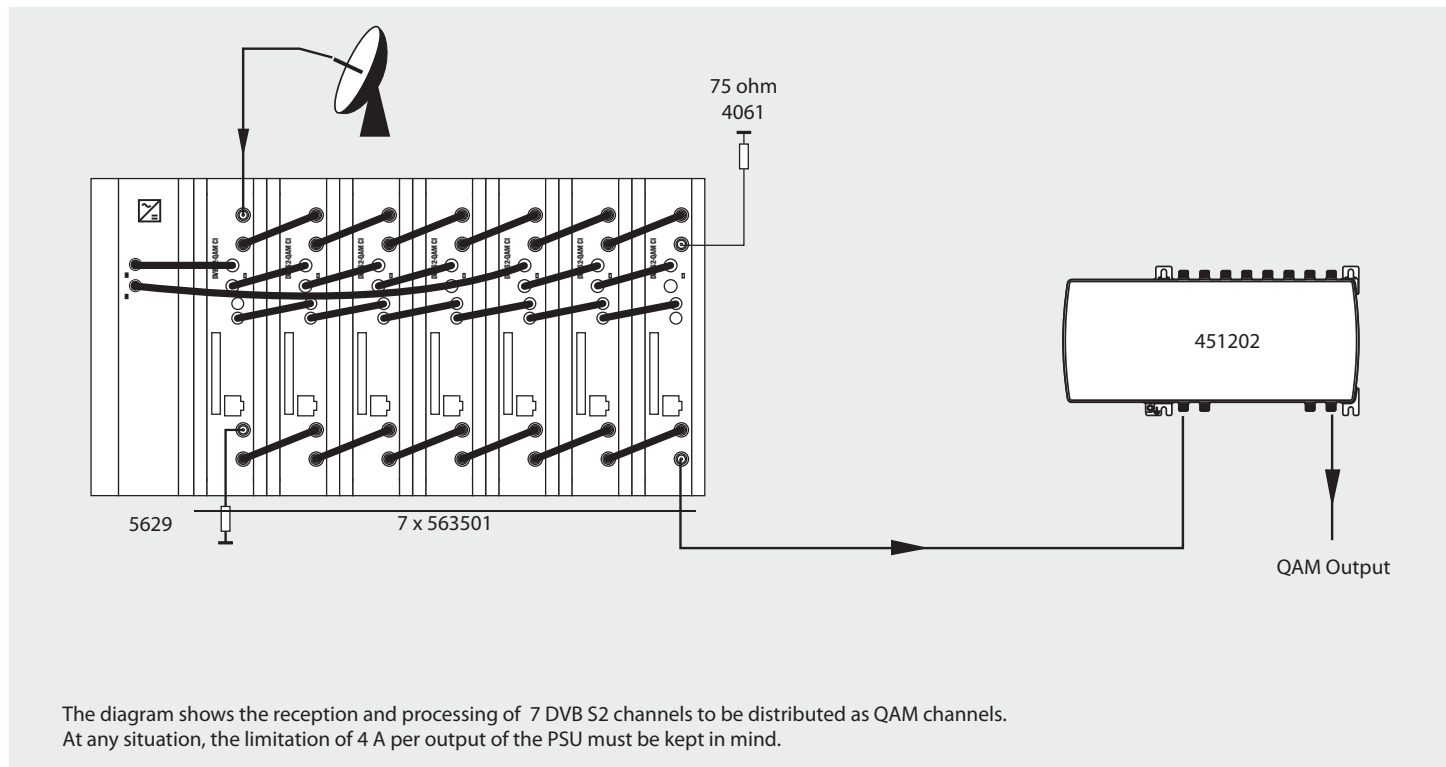
8. Rackmount Standards (max. 49 DVBS2-QAM CI - 7 subracks with 5U height - 8,7")

8.1. Installation of the rack with ventilation facilities

To facilitate the renewal and circulation of the air inside the rack, in order to reduce the temperature of the units and improving their performances, it is advisable to place 2 ventilation units of 25W, particularly when the rack with the DVBS2-QAM CI is located in warm places, with ambient temperatures higher than 45°C.
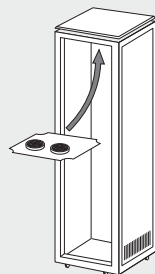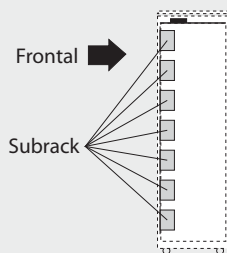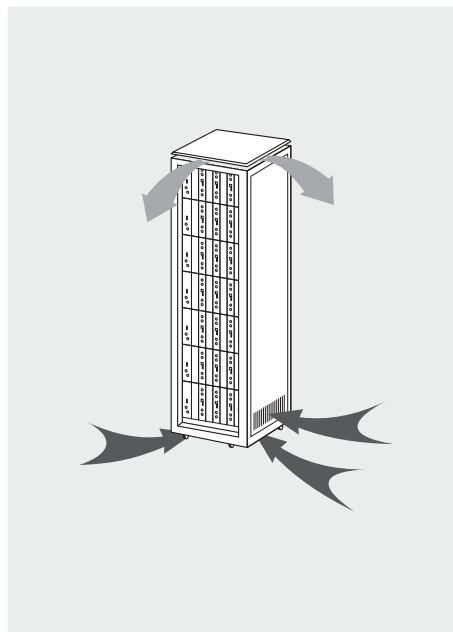
These ventilators will be installed on a tray that is fixed on top of the cabinet (fig. 1 & 2). This way, the fans are forcing circulate the cool air that enters through the base of the cabinet between the modules, which is expelled through slots on top of the cabinet (3-5 cm approx.). See fig. 3.

Frontal

Subrack

fig. 1

fig. 2
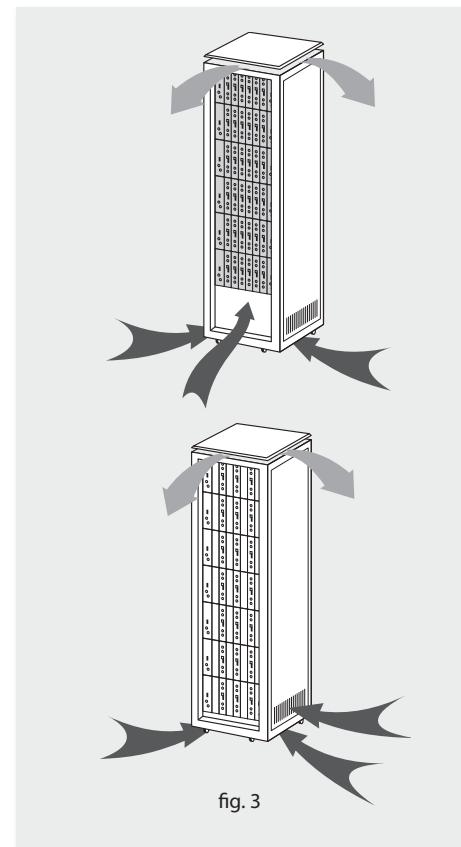
fig. 3

It is very important that this process operates correctly, therefore the following must be observed:
 - Do not open the side doors, as this would cause the ventilators to extract the air from the outside rather than the air inside the rack.

 - Do not place objects near the rack that could clog the ventilation inlets and outlets.

 - If the rack is not complete, the subracks must be placed from the top downwards without leaving any gaps in between, fig. 4.
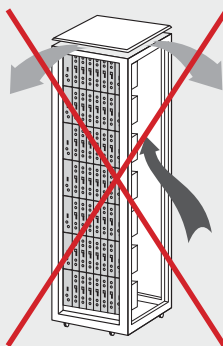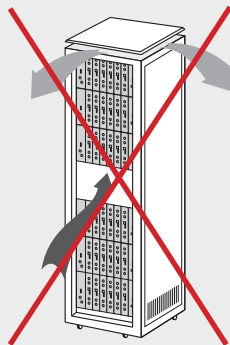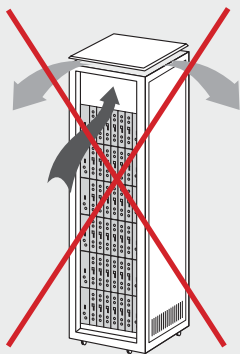
fig. 4

8.2. Installation of the rack without ventilation facilities

To install the units in racks without installation facilities, and when the rack is located in places with temperatures around 45°C, it is advisable to place the rack completely open; in other words, do not use the side doors. This is to facilitate the ventilation of the units , fig. 5.
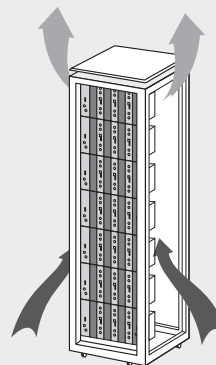
fig. 5

Standards for mounting cabinets

IMPORTANT

The scheme of recommended ventilation is the one shown in the figure, for any way of placement of the cabinet (horizontal or vertical).

Around the cabinet located higher, the maximum temperature permitted is 45ºC, either for cabinets placed horizontally or vertically.

EXTRACTOR for forced ventilation.
Must be located higher than the top module.

Maximum environment temperature: 45ºC.

Horizontal placement

Vertical placement

The lower grid may be located on any wall
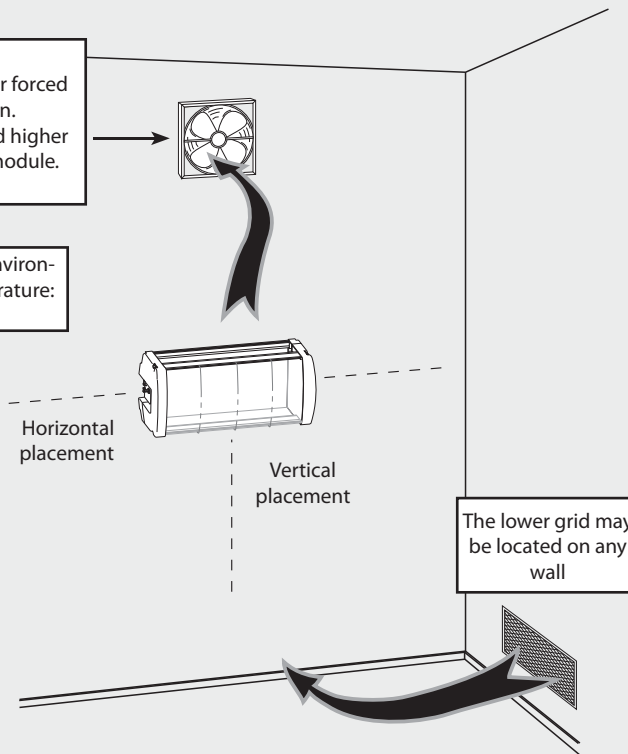
IMPORTANT

Horizontal placement of cabinets is strongly recommended by fixing them as near as possible to the floor .

If the horizontal placement is impossible, then vertical placement is allowed.

Respect the recommended minimum distances in the attached schemes.

$\geqslant 1$ m

HORIZONTAL

$\geqslant 0,2$ m

$\geqslant 0,2$ m

$\geqslant 0,8$ m

Maximum T^a: 45ºC.

Install the cabinet as low as possible

$\geqslant 0,2$ m

$\geqslant 0,2$ m

VERTICAL
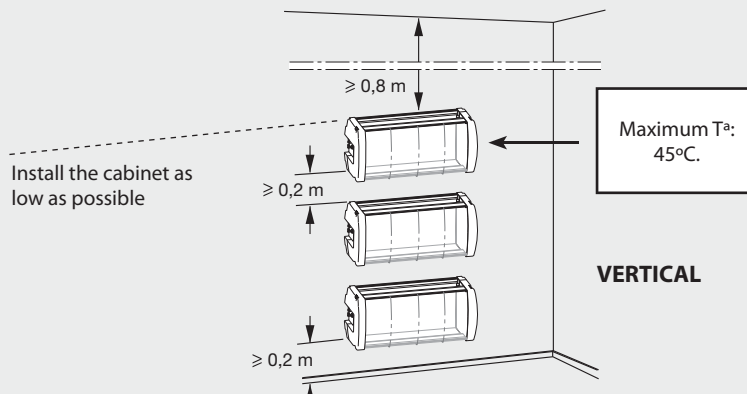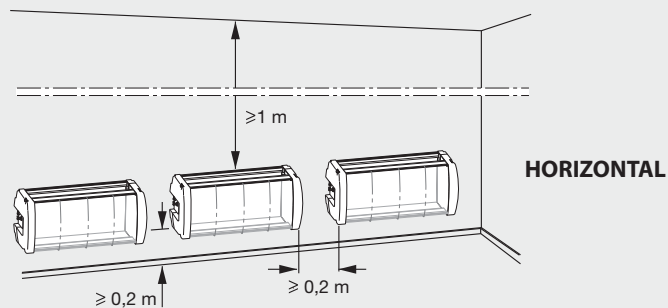
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