

Televés®



T.O.X
SERIES

EN HDTV TRANSMODULATOR - DUAL ATSC/QAM to QAM

Ref. 565301

User manual

HDTV TRANSMODULATOR - Dual ATSC/QAM to QAM

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Important safety instructions

Caution Statements

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with a dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Only use attachments/accessories specified by the manufacturer.
10. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
11. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

Warning

- Reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
- Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.

Safe operation

- Should any liquid or object fall into the equipment, please refer to qualified personnel for service.

Safe installation

- Ambient temperature should not be higher than 45°C.
- Do not place the equipment near heat sources or in a highly humid environment.
- Do not place the equipment in a place where it can suffer vibrations or shocks.
- Please allow air circulation around the equipment.
- Do not place naked flames, such as lighted candles on or near the product.

Simbology



Equipment designed for indoor use.



The equipment complies with the CE mark requirements.



This symbol indicate the maximum and minimum temperature limits at which the equipment shall be used.

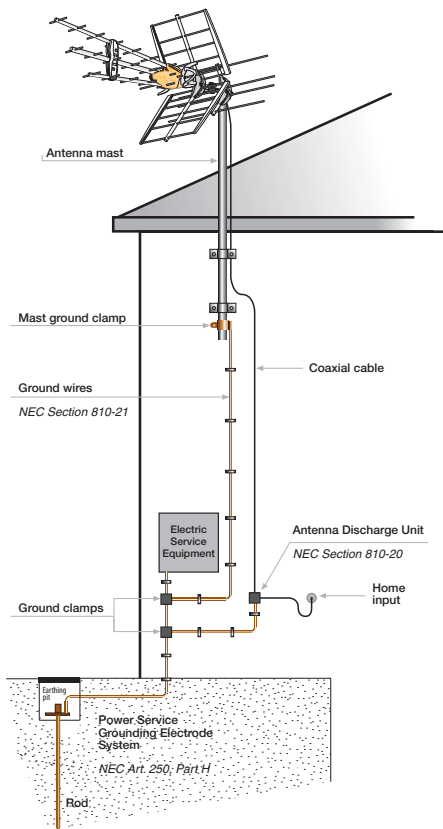
2 - Description

- The T.OX Series is a complete family of digital cable headend products. These products include satellite QPSK/8PSK to QAM and ATSC/QAM to QAM transmodulators, universal modulators and fiber optic transmitters/receivers, amplifiers, and splitters. The T.OX family of products all fit in a standard 19" rack chassis that contains a power supply and room for 7 modules.
- Each of the T.OX DUAL ATSC/QAM to QAM modules contain 2 completely independent transmodulators with output frequencies able to be set independently across the entire range in order to provide maximum flexibility.
- Three **working modes** are provided for maximum flexibility and easy of use: transparent, processing and multiplexing. Each one provides different processing levels of the input signal. In **transparent mode** each QAM output signal is the same as the corresponding input ATSC or QAM signal, except for baud rate adaptation. In **processing mode** some edition is possible in the PSIP information (service name and virtual channel number). In **multiplexing mode**, in addition to PSIP edition, each input service can be directed to any of the two outputs or eliminated if not desired.
- Additionally, both inputs and outputs can be daisy-chained with the input/output of a module being added to the input/output of all the preceding modules thus eliminating the need for RF splitters and combiners.

- Configuration and Control of the modules can either be done through the handheld controller or from any Internet connection with the use of the CDC headend controller module. The remote control of the system provides two easy to use options with the TSuite computer application or through any internet browser for maximum customer choice.

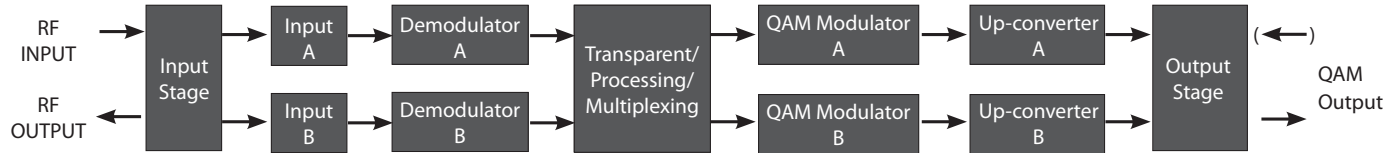
3 - Main features

- TWIN modules (two independent tuners per module) allowing up to 14 transcoded transponders/channels per chassis.
- User friendly interface allowing simple selection of which ATSC or QAM input transponder is output on which QAM channel including the service list of each input (names and channel numbers).
- Two completely independent and fully agile outputs from 12 to 1002 MHz for easier organization of wider-than-6MHz QAM carriers.
- Edition of PSIP information including selection of output VCT table (original, TVCT or CVCT) and edition of channel names and virtual channel numbers (processing and multiplexing modes).
- Multiplexing of input services allowing two input ATSC / QAM Annex B signals to be transmodulated into a single QAM output (multiplexing mode) deleting services if necessary.
- 64/256 QAM annex B and up to 1024 QAM annex A.
- Remotely upgradeable firmware allows for future updates without having to visit the headend.
- Carrier wave and null packets output mode for easy system balancing without an input signal or without a digital meter.
- Extensive monitoring information for easy troubleshooting (current and lowest input SNR, current and highest temperature reached, number of lock loss conditions over a period of time, etc.) with LED indicators on the front of the unit.
- Back-lit LCD display handheld programmer or TSuite PC application options for both on-site and remote configuration and troubleshooting.
- Copy configurations from one module to another with the handheld programmer for fast and easy module swaps (copy/paste).
- Web page configuration and remote management using the CDC system.
- Input/Output daisy-chain architecture to avoid external splitters/ combiners.
- RF output loop disable to increase output level if necessary (external combiner required).
- High performance, MER>40dB over the full frequency range of 12 - 1002 MHz.
- High output level, greater than 43 dBmV (loop) or 55 dBmV (no loop) with over 20dB of attenuation margin for easy balance and integration.



4. Technical Specifications

4.0 Block diagram



4.1 DUAL ATSC/QAM to QAM transmodulator

Table 1 . Technical specifications

Input	Input impedance	Ohm	75	Loop-through losses	dB	<1.5
	In/Out connectors	type	"F" female			
ATSC input	Input modulation		8-VSB	Input Level	dBmV	-26 to +35
	Input frequency	MHz	57 ... 803	Frequency steps	MHz	1
QAM input	Input modulation	QAM	64, 256 (annex B)	Input Level	dBmV	-23 to +35 (64QAM)
	Input frequency	MHz	42 ... 1002			-18 to +35 (256QAM)
	Frequency steps	MHz	1			
QAM Modulator Annex B	Output modulation	QAM	64, 256 j83B	Symbol rate	Mbaud	5.056 (64QAM)
						5.360 (256QAM)
QAM Modulator Annex A	Modulation format	QAM	16, 32, 64, 128, 256, 512, 1024	Symbol rate (max)	Mbaud	7.2
				Roll-off factor	%	15 (12 for 1024 QAM)
RF Output	Frequency range (agile)	MHz	12 ... 1002	Loop-through losses	dB	< 1.5
	Frequency steps	MHz	1	MER	dB	> 40
	Output level	dBmV	43 (Loop ON) / 55 Loop OFF	In/Out connectors	type	"F" female.
	Adjustable level (min.)	dB	20	Out Impedance	ohm	75
General	Powering voltage	Vdc	24	Consumption 24V	mA	620
	Protection index	IP	20	Working temperat.	°F	<113 (use forced ventilation at higher temp)

4.2 Broadband Amplifier

Table 3 . Technical Specifications

Amplifier ref 5575	Frequency range	MHz	46 to 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	dBmV	45	Test socket	dB	-30

EN

4.3 Power Supply Unit

Table 4.- Technical Specifications

Power Supply Unit ref 563901	Mains voltage	V~	108 to 132	Output voltage	V=	24±1 ⁽¹⁾
	Mains frequency	Hz	50/60	Output current (max.)	A=	5 ⁽²⁾
	Current consumption (max.)	A~	1.5	Output power	W	120
	Working temperature (max.)	°F	113	Protection level		IP20

(1) Provides protection voltage variation from 21 to 27 V=

(2) Maximum current limited to 4A=

5. Quick start guide

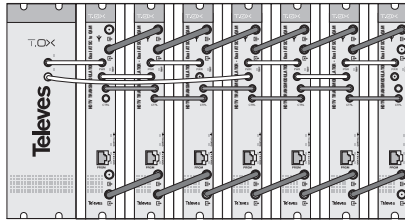


WARNING:

Do not apply power to the headend until all the connections have been completed and double checked. Failure to do so may result in irreparable damage to the equipment.

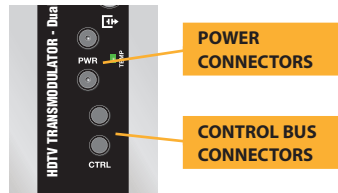
1. The headend must be installed in a well ventilated room, free of humidity and with the necessary facilities. Forced ventilation or an HVAC system will need to be installed when ambient temperature is over 113°F at the headend location.
2. Before installing the units, take into account the 19" subrack is 5RU height, so size rack appropriately. A 1RU spacing plate is recommended between every 2 subracks for easier wiring access.
3. Unpack the units and the PSU. Check that all accessories such as jumpers, coax bridge bars, power cords, etc., have been provided. If not, contact your distributor immediately.
4. Arrange the PSU and units of each subrack from left to right, starting by the PSU, followed by the CDC. Remote Headend Controller (if used) and the transmodulators.
5. Interconnect the units with the power and control bus jumpers supplied **before applying power to the system**. Use the long control bus jumpers to connect different subracks together.
 - Each PSU output provides up to 4A and both must be used in order to balance the

consumption of the 7 transmodulators in a subrack (for example: 4+3 or 3+4).

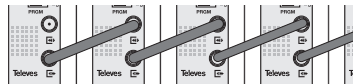


WARNING:

Never connect control bus jumpers to power connectors or vice versa. Doing so will cause irreparable damage to the units when power is applied.



6. Connect the supplied RF input and output coax bridge bars as needed.



7. Be sure that all connections are secured, properly terminated and tightened **before applying power to the system**.



WARNING:

Unterminated input and output ports are a common source of ingress noise. Be sure to terminate all unused input and output ports with 75 ohm loads (ref. 4061) for optimum performance.

8. Each subrack should be treated as a standalone module in terms of power and RF output.
 - Each daisy-chained output does incur some loss.
 - Balance the final output of the subrack appropriately.
 - Use an external combiner to combine the outputs of all subracks together.
9. Proceed with the configuration of each unit as detailed in this User Manual.
 - Start by configuring the inputs of each unit to the desired ATSC or QAM signals.
 - Set the output level accounting for the losses due to the unit's loop-through.
 - If remote control is used, follow the instructions in the corresponding User Manual of the CDC Remote Headend Controller.

6. Product description

6.1. Introduction

The HDTV TRANSMODULATOR - Dual ATSC/QAM to QAM allocates the information contained in two independent input multiplexes (ATSC or 64/256 QAM annex B modulations) in two completely independent cable channels in the 42-1002 MHz range (Ch 2 to 158). Both QAM annex A and annex B are supported for the output modulation.

The digital transmodulation process starts with the demodulation of the input signals to obtain the MPEG-2 transport streams which are then remodulated into QAM format.

In **transparent mode** each QAM output signal is the same as the corresponding input ATSC or QAM signal, except for baud rate adaptation. In **processing mode** limited edition is possible in the PSIP information (service name and virtual channel number). In **multiplexing mode**, in addition to PSIP edition, each input service can be directed to any of the two outputs or eliminated.

The HDTV TRANSMODULATOR - Dual ATSC/QAM to QAM features two F-type input connectors allowing a loop through output to daisy-chain the whole subrack, thus avoiding the use of an external splitter. The input signal feeds both tuners.

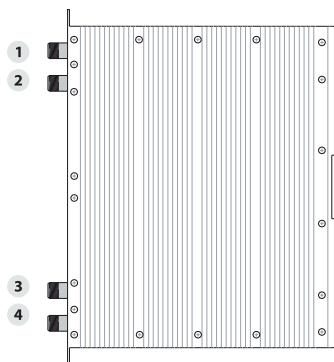
Two output RF connectors are also available, the bottom one is the QAM output and the top one is the QAM input (loop-through) that allows to mix the output signal of previous modules installed in the same subrack.

The RF loop-through can be disabled to obtain an increased output level (+12dB typ).

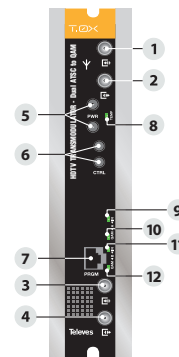
The universal Programming Unit (ref. 7234) is used to program the operating parameters of the HDTV TRANSMODULATOR - Dual ATSC/QAM to QAM unit.

6.2. Front panel elements description

The next figure shows the location of all the ports, status and alarm indicators, existing in the front of the unit.



Side view



Front view

Connector 1 is the ATSC/QAM input F connector.

Connector 2 is the output loop-through of the input signal.

Connector 3 is the daisy chain QAM input from a previous QAM output.

Connector 4 outputs the combined QAM output. Loop-through losses are very low allowing to combine the output of all the units in a subrack.

1. ATSC/QAM input
2. ATSC/QAM loop-through output
3. RF QAM input (loop-through input)
4. RF QAM output (loop-through output)
5. Power bus connectors
6. Control bus connectors
7. Computer/Programmer connector
8. Temperature status LED
9. IN(PUT) A status LED
10. QAM A output status LED
11. IN(PUT) B status LED
12. QAM B output status LED

The unit also features 2 sets of daisy-chain connectors for the power and control buses.

Special care must be taken so as to never connect control bus jumpers to power connectors or vice versa. **Doing so will cause irreparable damage to the units.**

Connector 7 is the handheld programmer unit (ref. 7234) connection.

Front light indicators 8 to 12 are alarm/status LEDs that give monitoring information about the unit status, as follows:

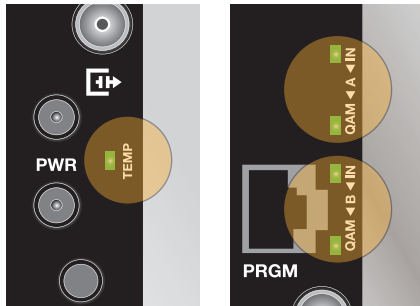
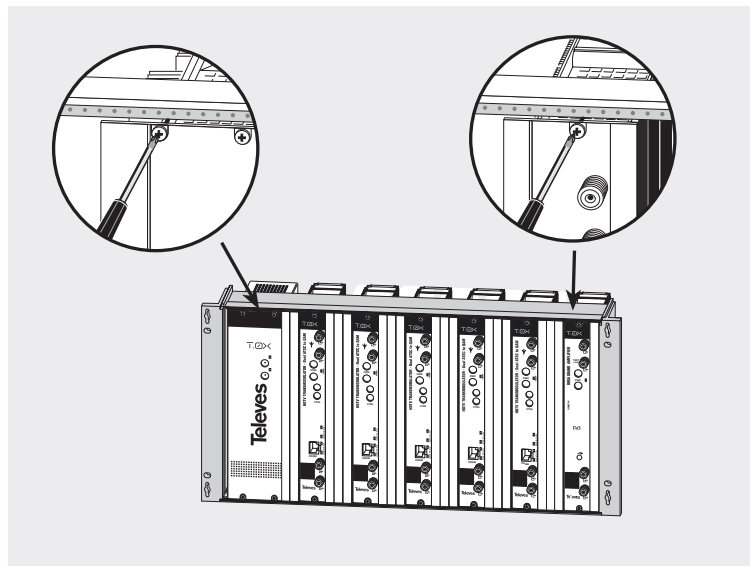
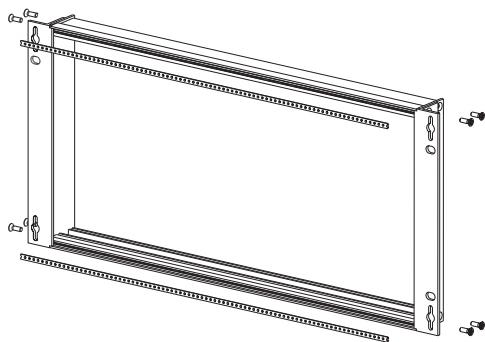


Table 5.- FRONT UNIT LED ALARMS

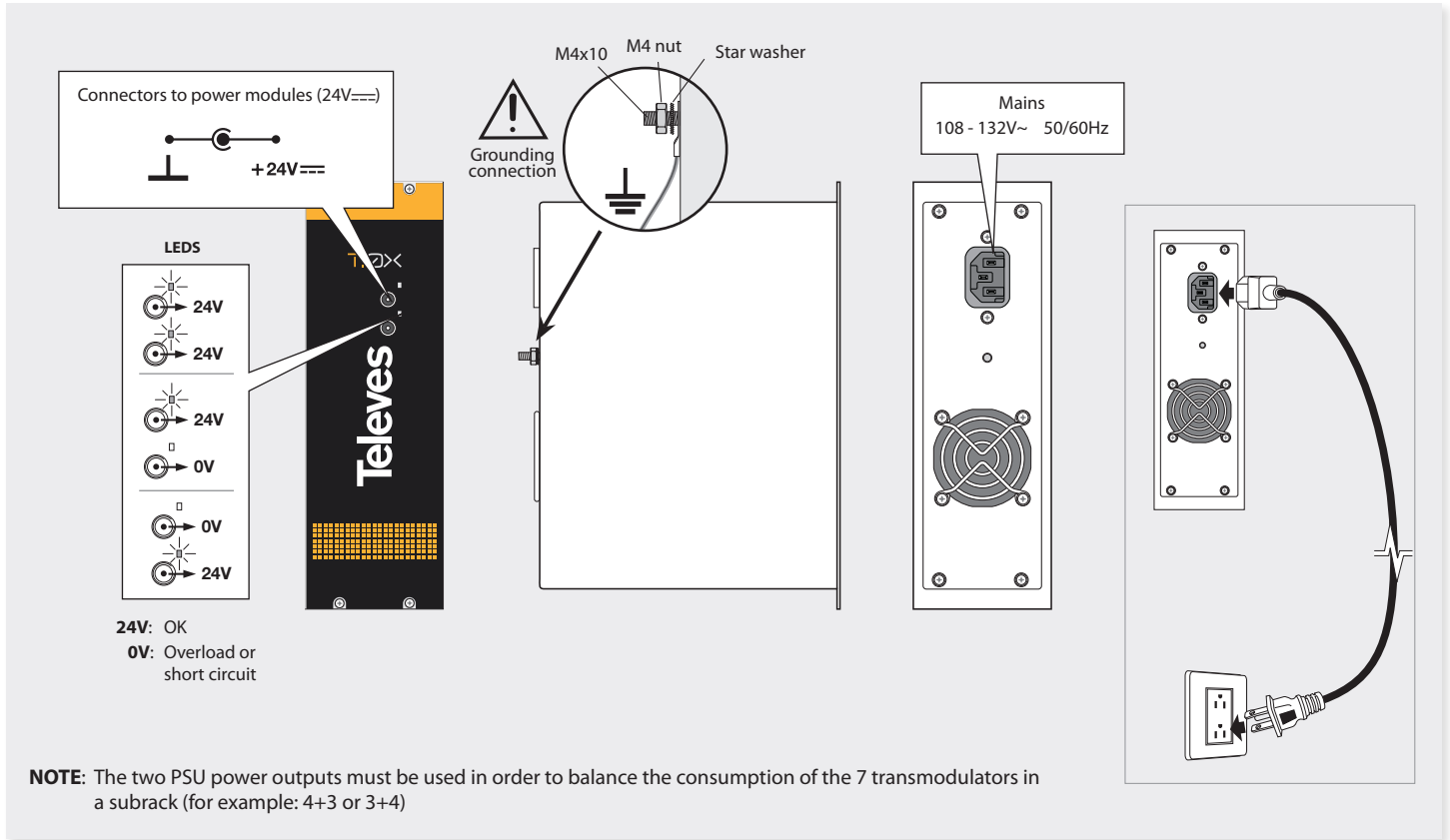
TEMPERATURE (LED no. 8)		
LED Colour	Unit internal temperature (°F)	Comments
Solid green	under 149	SAFE
Slow blink orange	between 149 ...185	WARNING
Fast blink red	over 185	OVER TEMP
SATELLITE INPUT STATUS - for A and B tuners (LEDs no. 9 &11)		
LED Color	Tuner status	Comments
Solid green	LOCKED	Good input SNR
Solid orange	LOCKED	Low input SNR
Solid red	UNLOCKED	-
OFF	INPUT DISABLED	-
QAM OUTPUT SIGNALS (LEDs no. 10 &12)		
LED Color	QAM channel status	Comments
Solid green	LOCKED	NORMAL mode
Fast blink green	SPECIAL MODE	CW, MUTED, & NULL modes
Solid orange	OVERFLOW	-
Fast blink orange	OVERLAP	between QAM output carriers
Solid red	UNLOCKED	-

7. Installation

7.1 - 19" subrack mounting

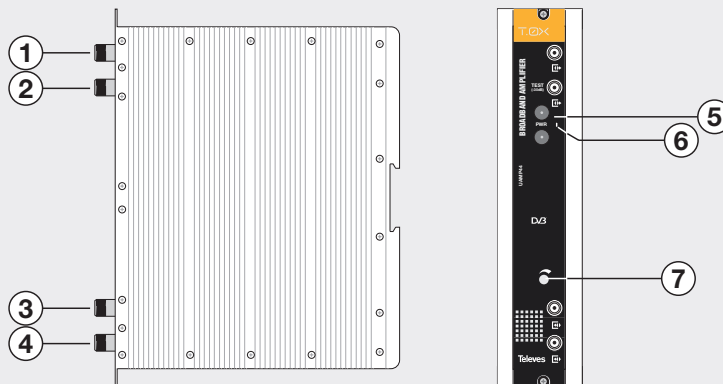


7.2 Power Supply Unit



7.3 Broadband Amplifier

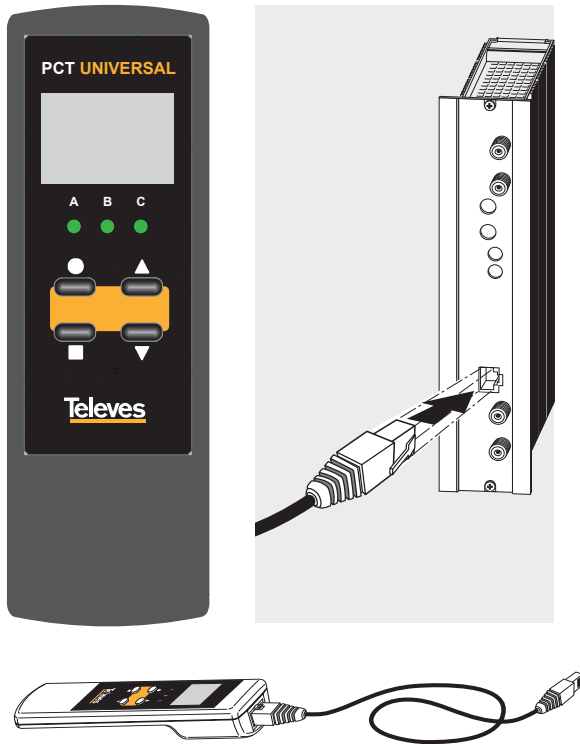
Ref. 5575



- | | | | |
|----|-------------|----|-----------------------|
| 1. | RF output | 5. | Power input |
| 2. | Test output | 6. | Status LED |
| 3. | RF input 1 | 7. | Attenuator adjustment |
| 4. | RF input 2 | | |

This unit features two RF input connectors (3 & 4), to allow mixing signals coming from two different systems or subracks. When only one of the two inputs is used it is advisable to terminate the unused input port with a 75 ohm load (ref 4061). As with all T.OX units, this amplifier is powered via the 24 Vdc power bus. The unit combines and amplifies input signals in the 46-862 MHz frequency band.

7.4. Programming Unit



The handheld programmer has an LCD display, three LED indicators and four buttons:

Table 8.- Programmer key functions

Key	Keystroke	Function description
●	short	Enable / Disable "Edit mode" Move Cursor in "Edit mode"
●	long	Default configuration Reset unlock counters Reset minimum SNR Reset maximum temperature
▲ ▼	short	Change parameter value (when in "Edit mode"). Change menu (when not in "Edit mode").
■	short	Change menu type A, B or C
■	long	Save changes to memory
■ + ● + ▲	long	Increase screen contrast
■ + ● + ▼	long	Decrease screen contrast
● + ▼	long	Copy configuration (see page 25)
● + ▲	long	Paste configuration (see page 25)

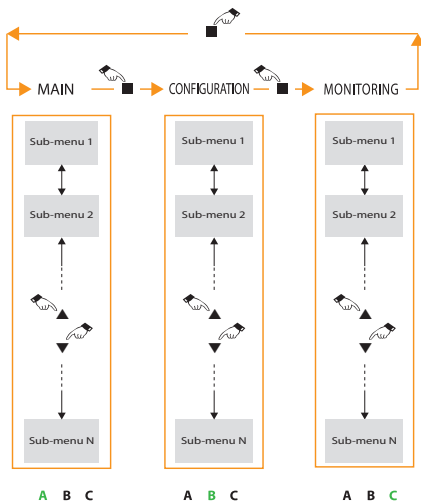
8. Instructions for use



The first item displayed after connecting the Programming Unit to the front of the transmodulator is the Programming Unit's firmware version:

PCT firmware
version

V:5.03.00001



The configuration screens are organized in three main sections as shown in the figure (refer to Appendix 4 for a detailed diagram):

- Section A: MAIN (TRANSCODER) MENU
- Section B: CONFIGURATION (COMMON) MENU
- Section C: MONITORING MENU

LEDs A, B and C will light up indicating the currently selected section.

The button toggles between sections.

To move up and down a section press the and buttons .

To save data, press and hold the button.

In each individual screen, pressing the button enables the "Edit mode" and the selected parameter can then be modified by using the or buttons.

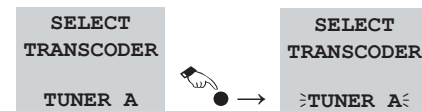
In those cases where the cursor may be placed in more than one position (for example an input frequency with several digits) press the button as many times as needed to position the cursor over the desired field.

To move to a different screen, press the button until the cursor stops blinking (cursor is OFF, leaving "Edit mode").

8.1 - MAIN menu (LED A is ON)

Transcoder selection

The first menu allows the selection of one of the unit's tuners, A or B. Once selected, the remaining submenus in this section will refer to the parameters of the selected tuner.



Press the button to enter "Edit mode" so the last line of the display starts to blink (cursor ON). You can now select one of the tuners (A or B) using the and buttons. To exit "Edit Mode" press the button until the cursor stops blinking (cursor OFF)

An indication of the input and output status is provided in each sub-menu of section A (main menus). The top leftmost character will be "A" if the input is locked and "-" otherwise. Similarly, the top rightmost character will be "A" when the output is locked and "-" otherwise.

Input frequency/channel selection

Use this menu to select the input frequency/channel according to the mode selected in the corresponding CONFIGURATION menu.

The display will show the following information in each case:

```

• TUNER A -
SELECT INPUT
FREQUENCY
473 MHz

```

```

• TUNER A -
SELECT INPUT
CHANNEL
14 = 473MHz

```

Press ● to enter the “Edit mode” and the last line of the display will start to blink (cursor ON).

In manual mode (setting by frequency), you can move the cursor to any of the 4 frequency digits by pressing the ● button.

In channel mode, the channel number will blink displaying the corresponding input frequency.

The valid input frequency ranges are:

- 42 to 1002 MHz in case on QAM input
- 57 to 803 MHz in case of 8-VSB (ATSC) input

If the edited value is out of range a “!” will appear at the leftmost part of the last line as a warning indication. If the user tries to save an out-of-range value, it will be discarded and the last saved value will be restored.

This menu will not be displayed if the input is disabled

Input modulation selection

This menu allows the user to select the input modulation or to disable the input. The possible choices are DISABLED, 8-VBS (ATSC), 64-QAM (B) and 256-QAM (B).

```

• TUNER A •
SELECT INPUT
MODULATION
256-QAM (B)

```

Output VCT table type selection

This menu only appears when the user has selected PROCESSING or MULTIPLEXING in the WORKING MODE menu, the input is not DISABLED and the selected QAM output mode is annex B. It allows the selection of the type of VCT table that will be generated at the output.

```

• TUNER B •
SELECT OUT
VCT TABLE
ORIGINAL (T)

```

The options are:

- ORIGINAL: the table type is the same as the one found in the input, either (T)VCT or (C)VCT.
- TVCT: a terrestrial (TVCT) table will be generated.
- CVCT: a cable (CVCT) table is selected.

Be aware that the VCT table type limits the options for the virtual channel number format. In the CVCT table two possible formats are allowed: one-part (VCT1) and major-minor (VCT2), whereas in the

TVCT table only major-minor (VCT2) format is permitted.

Service list

This menu shows the input services for this tuner.

```

• TUNER A •
1/3 03/97
WMAR HD ONB
VCN: 2-1

```

The following information is provided:

- The service index and the total number of services detected.
- The service name: the short-name field of the input VCT table.
- The service Virtual Channel Number (VCN) read from the input VCT table.
- In case of MULTIPLEXING mode, the output to which the service is directed (ONA, ONB) or if the service is filtered out (OFF). In this working mode the user can edit this field to configure the services.
- In case of MULTIPLEXING mode, the occupancy of the service in the selected output along with the free space in this output.

In the example, the service WMAR HD from input A is directed to output B. It occupies a 3% of the output baud rate, leaving a 97% free.

After entering "edit mode" with the ● key, the user can move through the list with the help of the ▲ and ▼ keys.

The service selected in this menu can be edited in the following menus if the unit is working in PROCESSING or MULTIPLEXING mode.

This menu will not be displayed if the input is DISABLED.

Service name edition

This menu is available in PROCESSING and MULTIPLEXING modes. The user can edit the output service name (the 7 character *short_name* field in the output VCT table, in case of annex B output, or the *service_name* field in the output SDT table in case of annex A output). The edited service must be selected in the previous menu.

```

• TUNER B •
Serv. name
IN: WMAR HD
OUT: SERVHD
  
```

The input service name is provided as a reference. After the scan of a new input transponder, the output names are set to be the same as the input names.

This menu will not be displayed if the input is DISABLED.

Service virtual channel number edition

This menu is available when the QAM output mode is annex B and the unit is in PROCESSING or MULTIPLEXING mode. The user can edit the output service's virtual channel number and format.

The edited service must be selected in the service list menu.

```

• TUNER A •
WMAR HD VCT2
IN: 2-1
OUT: 002-001
  
```

The input service name and VCN are provided as a reference.

The possible options for the format of the VCN are :

- VCT1: one-part channel number. This option is only possible when the type of VCT output table is CVCT (cable).
- VCT2: major-minor. This option is possible for both TVCT and CVCT output tables.

Valid ranges for VCNs are :

- 999-999 for major-minor format (VCT2)
- 0-16383 for one-part format (VCT1)

After the scan of a new input signal, the output VCNs are set to the input values.

This menu will not be displayed if the input is DISABLED.

Output frequency/channel selection

This menu allows the user to select the output frequency/channel according to the mode selected in the corresponding CONFIGURATION menu.

<pre> • TUNER A • SELECT OUT CHANNEL 2 = 57MHz </pre>	<pre> - TUNER A - SELECT OUT FREQUENCY 245MHz </pre>
---	--

In channel mode, the output QAM channel is selected (see Appendix 1). The last line of the display will show both the output channel number and its center frequency (Channel # = center frequency).

In frequency mode, the user can select any frequency value between 12 and 1002 MHz.

The two outputs in an HDTV TRANSMODULATOR - Dual ATSC/QAM to QAM are completely agile, so the two QAM channels can be positioned anywhere in the spectrum allowing for maximum flexibility.

Output modulation selection

Using this menu, the user selects the desired constellation of the output QAM modulation. The possible options available depend on the QAM output mode selected in the CONFIGURATION menu:

- 16, 32, 64, 128, 256, 512 and 1024 QAM for annex A
- 64 and 256 QAM for annex B

```

• TUNER A •
SELECT OUT
MODULATION
256 QAM (A)

```

If the QAM order selected is not able to accommodate the data rate of the input signal, it will cause an overflow condition. This will be indicated on the display with a "QAM OVF!!" alert message alternating with the selected QAM modulation. The corresponding QAM LED will blink in orange in the front of the unit.

```

• TUNER A -
SELECT OUT
MODULATION
QAM OVF!!

```

Output interleaving selection

The user can select the interleaving format. This menu is only available when the output QAM format selected is annex B, as the interleaving is fixed for annex A QAM modulation.

```

• TUNER A •
SELECT OUT
INTERLEAVING
(128, 3)

```

The possible options are:

(128,1), (128,2), (64,2), (128,3), (32,4), (128,4), (16,8), (8,16).

Output baud rate selection

This menu allows the user to set the output QAM baud rate and is only available when the output QAM format selected is annex A, as the baud rates are fixed in annex B QAM modulation.

```

• TUNER A •
SELECT OUT
BAUD RATE
5.156 Kbaud

```

The valid output baud rates are in the range 1000 to 7.200 Kbaud.

Output level selection

This menu lets you select the QAM channel output level, between 00 and 99. A setting of "99" means no attenuation is applied to the output and thus the output level is the maximum ($43 \pm 2\text{dBmV}$ or $55 \pm 2\text{dBmV}$ if loop is OFF). A setting of "00" means the output level is attenuated by 20 dB (approx.) below its maximum output level. By changing this value the user can select the amount of attenuation applied and therefore balance the system as needed.

```

- TUNER A -
SELECT OUT
LEVEL
69

```

Output mode selection

Use this menu to select the desired output mode:

```

- TUNER A -
SELECT OUT
MODE
NORMAL

```

- NORMAL: The output signal is a QAM transmodulated signal. This is the normal functioning mode.
- NULL: Null packets are modulated. This mode generates a well-formed QAM output carrier even when the demodulator is not locked and can be used to balance the system in absence of input signal (off-site).
- MUTED: There is no output signal. This mode can be used to turn off the output of certain channels or to leave hot spares prepared in the headend.
- CARRIER WAVE: The unit generates an unmodulated carrier wave on the output frequency that has the same level as the power of the corresponding QAM carrier. This mode can be used to balance the RF output levels with a simple SLM when a QAM digital meter is not available.

8.2 - Configuration menus (LED B is ON)

This section includes a number of less frequently used configuration options and is indicated by LED B on the Programming Unit.

Every parameter configured in this section applies to both tuners.

Working mode selection

Use this menu to set the desired working mode of the unit.

SELECT
WORKING
MODE
PROCESSING

The possible options are:

- TRANSPARENT. No processing is done on the input signal, which is transparently transmodulated from ATSC or QAM into the desired QAM output modulation. No service name or VCN edition is allowed.
- PROCESSING. If QAM annex B is selected as output standard, limited PSIP edition is possible. This includes the selection of the output VCT table type, VCN format, service name and VCN. If the selected output standard is QAM annex A, only the service name will be editable.
- MULTIPLEXING. In addition to the PSIP edition of PROCESSING mode, the user can select the output for each input service, or if the service will be eliminated, thus enabling the multiplexing/removal of services. When entering this mode,

output B is automatically set to MUTED and all services are directed to output A.

Input frequency mode

Using this menu the user can select one of the modes available to program the input frequency:

SELECT
INPUT FREQ
MODE
BROADCAST

- MANUAL: The user has to manually enter the input frequency in MHz.
- CATV: The US standard cable TV channel plan is selected.
- BROADCAST: Over-The-Air US channel plan.
- T-CHANNELS: channels T-13 and T-14 can be selected as QAM inputs. This option is provided only when both tuners are set to QAM modulation input.

Output QAM mode selection

Use this menu to select the desired QAM standard mode, annex A or annex B.

SELECT
OUTPUT QAM
MODE
ANNEX B

The unit will reboot after a change in the QAM output mode.

If the selected standard is annex B and the unit is in PROCESSING or MULTIPLEXING mode, the output VCT table type, VCN format, service name and VCN can be modified.

In case of annex A and PROCESSING or MULTIPLEXING mode, only the service names will be editable.

Output frequency mode

Using this menu, the user can select one of the modes available to program the output frequency:

SELECT
OUTPUT FREQ
MODE
BROADCAST

- MANUAL: The user has to manually enter the output frequency, between 12 and 1002MHz.
- CATV: The US standard cable TV channel plan is selected.
- BROADCAST: Over-The-Air US channel plan.
- T-CHANNELS: channels T-8 to T-14 can be selected as QAM output.

Output loop mode selection

Use this menu to select whether the output RF

loop is enabled (ON), to allow the cascading of modules without external combiners, or disabled (OFF) to obtain a greater output level (+12dB typ).


```
SELECT
OUTPUT LOOP
MODE
ON
```

Remote control address

Use this menu to change the remote control address when the unit is connected to a CDC Remote Headend Controller (ref. 555902) via its control bus. It is the user's responsibility to ensure that each unit in the bus has been assigned a different and unique address in the bus.

```
SELECT
REMOTE CTRL
ADDRESS
001
```

The valid address range goes from 1 to 254 (maximum number of devices controllable from a single headend controller module).

	<p>WARNING: Duplicated addresses will cause data collision on the bus and the transmodulators will not be able to communicate with the Remote Headend Controller.</p>
---	--

Restore default settings


To return the unit to its default factory configuration enter this menu and then press and hold down the ● button for a few seconds.

```
SELECT
DEFAULT
SETTINGS
HOLD ● key
```

The Programming Unit will display the following message:

```
Restoring
default
values
...
```

Once finished it will go back to the first MAIN menu (transcoder selection).

	<p>WARNING: The remote control address parameter will default to 1 after restoring the unit to factory settings.</p>
---	---

8.3 - MONITORING menus (LED C is ON)

This set of menus displays firmware versions and monitoring information, and is indicated by LED C on the Programming Unit.

Versions menu

This menu displays the unit's reference number, Firmware and FPGA (QAM Modulator) versions and the hardware (PCB) revision.

```
HW: 565301
FW: 1.00.0009
FPGA: 1.00.04
PCB: 1
```

Input status

This menu displays the status of the input signal, indicating its lock status. When locked, the input modulation and input BER rate are displayed. The input SER (Segment Error Rate) is also provided when the input modulation is 8-VSB.

```
- INPUT A -
8-VSB LOCK
SER: 0.00e+00
BER: 2.34e-04
```

```
- INPUT A -
UNLOCKED
```

The SER value should always be 0, otherwise uncorrected errors will get into the transmodulation chain, leading to artifacts in the output.

Input measurements

This menu displays the current input SNR, the minimum input SNR recorded, and the number of tuner unlock conditions.

```
SNR INPUT A
NOW: 20.1dB
MIN: 14.3dB
#Unlock: 03
```

This menu will not be displayed if the input is DISABLED.

The minimum SNR and unlock counters can be reset by pressing and holding the ● button for approximately 2 seconds. These values are stored in nonvolatile memory so they are not erased otherwise, even when the unit loses power or is turned off.

Any change to the input parameters (frequency, modulation, channel table, etc.) automatically resets these counters.

Output status

This menu displays the status of the output signal, indicating the output QAM constellation, the QAM symbol rate and the bandwidth occupied by the output carrier.

```
- OUTPUT A -
MOD: 256QAM-B
SR: 5.360Mb
BW: 6.003MHz
```

```
- OUTPUT A -
MOD: 256QAM-B
QAM Unlock
```

In case of QAM annex A as output mode, the QAM constellation and baud rate have to be manually selected. It might not be possible for a given combination to accommodate the data rate of the input signal. The same can happen in case of annex B, if the input modulation is 256QAM and the output is 64QAM. In that case an overflow condition will occur and the alarm message “**QAM OVF!!**” will be displayed.

```
- OUTPUT A -
MOD: 16QAM-A
SR: 5.264Mb
QAM OVF!!
```

```
- OUTPUT A -
MOD: 256QAM-A
SR: 5.264Mb
OVERLAP !!
```

If both output QAM signals overlap each other in frequency, the alarm message “**OVERLAP !!**” will be displayed.

When the user has selected one of the special modes (CARRIER WAVE, MUTED or NULL MODE) a message will also be displayed to signal this condition.

Output measurements

This menu shows the occupancy of the output, i.e., the percentage of the output baud rate occupied by useful data. The rest of the output transport capacity is filled up with null packets.

```
- OUTPUT A -
Occupancy:
56%
Max: 56%
```

The maximum registered occupancy is also shown and can be reset by pressing and holding the ● key for a few seconds.

If the selected output modulation or baud rate (in case of QAM annex A) does not provide enough output capacity to accommodate the input data rate and overflow condition will occur and a warning message “**Overflow!**” will be displayed.

This menu will not be displayed if the output is in CARRIER WAVE, NULL or MUTED mode.

EN

Temperature menu

This menu shows the current internal temperature and the maximum internal temperature recorded (F).

The maximum value is stored in nonvolatile memory for monitoring purposes.

```
- TEMP -
NOW: 103°F
MAX: 125°F
Hold ● reset
```

```
- TEMP -
NOW: 193°F
MAX: 195°F
WARNING TEMP
```

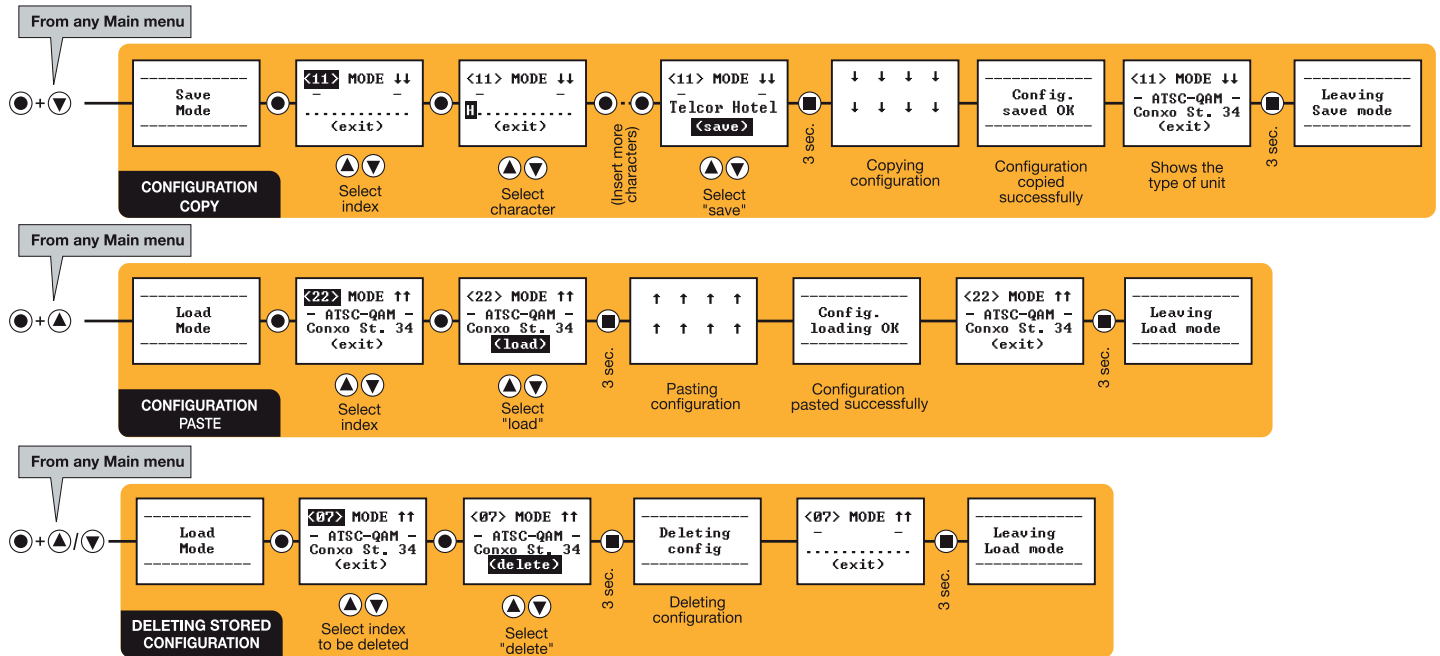
If the current internal temperature exceeds 149°F (65°C) the screen will display the message “**WARNING TEMP**”.

If the current internal temperature exceeds 185°F (85°C) the screen will display the message “**OVER TEMP**”.

The maximum registered temperature may be reset by pressing and holding the circle button for a few seconds.

8.4 - Configuration Copy/Paste using the Programming Unit

To enter copy/paste mode, press and hold the ● and ▼ buttons at the same time from any MAIN menu. Then follow the flowchart below to copy/paste configurations to/from the handheld Programming Unit.



9. Distribution Bandwidth considerations

In TRANSPARENT or PROCESSING mode

- 8-VSB (19.39 Mbps) can always be transmodulated into 64QAM-B (26.9 Mbps) or 256QAM-B (38.8 Mbps) without overflow.

If annex A is selected the minimum baud rate which can be configured for each constellation is:

16QAM	5.261 Mbaud
32QAM	4.209 Mbaud
64QAM	3.508 Mbaud
128QAM	3.007 Mbaud
256QAM	2.631 Mbaud
512QAM	2.339 Mbaud
1024QAM	2.105 Mbaud

- 64QAM-B (26.97 Mbps) can be transmodulated into 64QAM-B or 256QAM-B without overflow, or into QAM annex A provided the minimum bad rate is configured:

16QAM	> 7.200, out of range. 16QAM cannot be used
32QAM	6.887 Mbaud, BW 7.92 MHz > 6MHz will overlap adjacent channel
64QAM	5.7384 Mbaud, BW 6.6 MHz > 6MHz will overlap adjacent channel
128QAM	3.006 Mbaud
256QAM	4.304 Mbaud
512QAM	3.826 Mbaud
1024QAM	3.444 Mbaud

- 256QAM-B (38.81 Mbps) can be transmodulated into 256QAM-B or into QAM annex A, with the following minimum bad rates:

16QAM	10.529 Mbaud > 7.200, out of range. 16QAM cannot be used
32QAM	8.423 Mbaud > 7.200, out of range. 32QAM cannot be used
64QAM	7.019 Mbaud BW 8.07 MHz > 6MHz will overlap adjacent channel
128QAM	6.017 Mbaud BW 6.92 MHz > 6MHz will overlap adjacent channel
256QAM	5.265 Mbaud
512QAM	4.680 Mbaud
1024QAM	4.212 Mbaud

In MULTIPLEXING mode

The user can discard some of the input services, thus reducing the required output baud rate and therefore the output bandwidth.

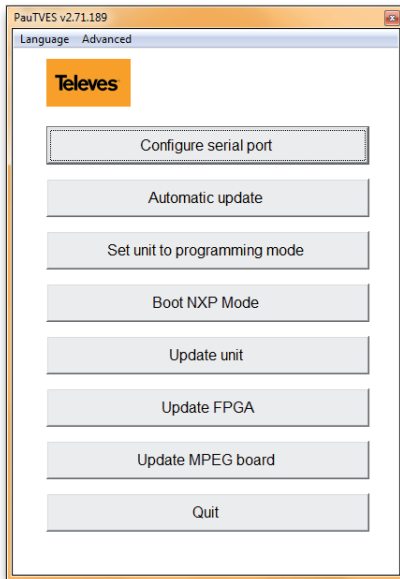
10. Firmware Updates

Introduction

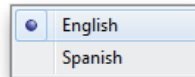
To update the Firmware of the unit you will need additional hardware and a software package:

- **USB - Serial Port adapter.**
- Cable **DB-9 to RJ45.**
- **PauTves** software package.

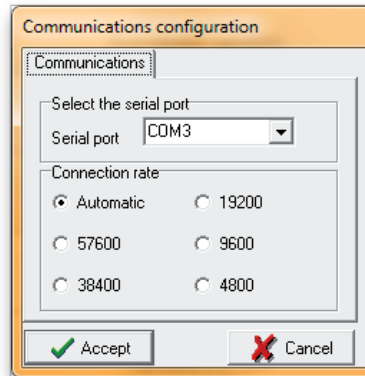
Unzip the PauTves tool to a known location and run the program:



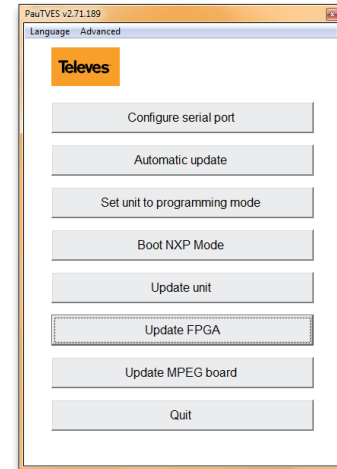
Select English as preferred language if needed:



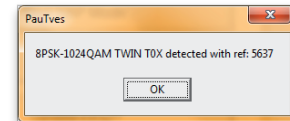
Verify the port configured in the program ("Configure Serial Port") is the one you have your COM/SERIAL adaptor connected to:



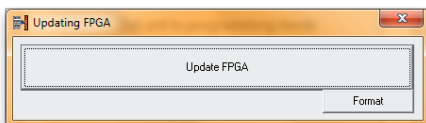
Then click on "Update FPGA":



The program will detect the connected unit as a 565301:



Press OK and the following window will appear:

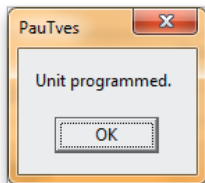


Select "Update FPGA" and browse for the .rbf file stored in your computer (see the example screenshot on the right).

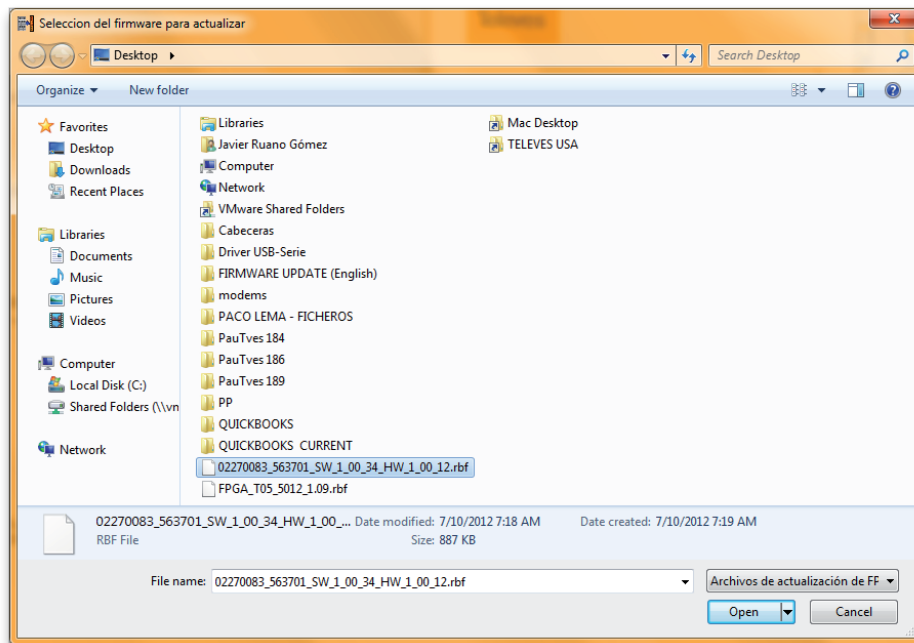
Click Open and the update will begin:



When it is finished the following message will appear on the screen:



If an unexpected failure occurs during programming, a default version of the firmware that is stored in the boot sector will get reloaded automatically, thus preventing a permanent failure.



Repeat going back to the "Update FPGA" step to update more units.

11. TSuite - CDC SOFTWARE

This software allows remote or local control of a T.OX headend, via a control module either ref. 555902 (CDC IP) or ref. 555901 (CDC IP/GSM).

Main features

- Compatible with T05 headends.
- Adjustment, maintenance, control, management and monitoring of new T.OX headends from anywhere in the world via the internet.
- Designed to support new services.
- Plug and play.
- Allows the use of a PC as local programming unit.

TSuite offers, through Televés Services, a private portal for each user enabling centralized management of all headends.

- Allows monitoring headend communication status.
- Provides connection alerts and record of user sessions.

Remote monitoring of a headend and connection to Televés Services

An alternative to the TSuite software is the web based Televés Services. This web interface will allow you to check the status of and configure a headend.

Steps to follow

- 1** Register a user account on Televés Services.
 - 2** Once an account is created, login to Televés Services to register a T.OX CDC. The data required are the MAC and Serial Number of the module.
- The control of a headend using the TSuite program can be done in three different ways:
- ◆ In local mode, programming modules one by one performing the function with the Programming Unit.
 - ◆ In local mode, programming the headend via the CDC module.
 - ◆ In remote mode, programming the headend by using a CDC module connected to the Internet.

Whatever the method, it is necessary that each module has been assigned with different CDC addresses. Refer to section 8 for detailed instructions.



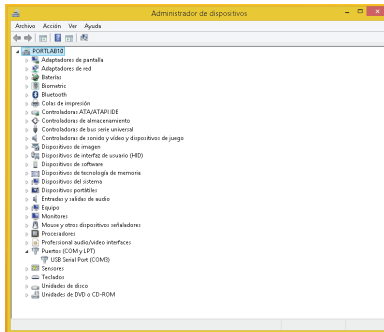
Using TSuite software in local mode, programming modules one at a time.

Preliminary considerations

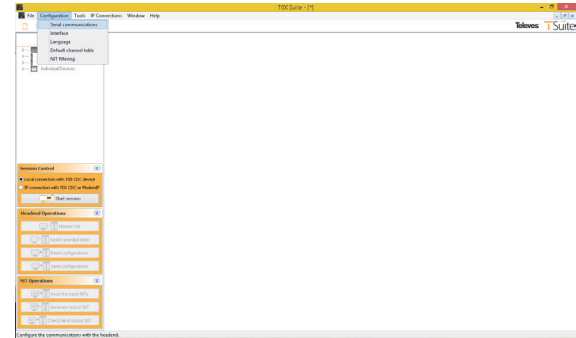
1. The connection between the PC and the module to be configured is made via the serial port and a cable RS232 - RJ45.
2. If you do not have a serial port, you can use a USB-RS232 adapter ref. 216801 (which includes the RS232-RJ45 cable).

Steps to follow

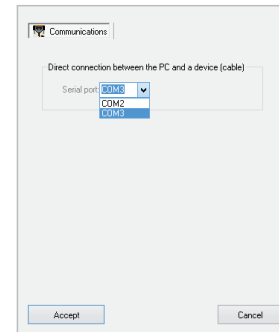
- 1 When using a USB 2.0 RS-232 adapter (ref. 216801), check availability of the serial port, and make note of the active COM port.



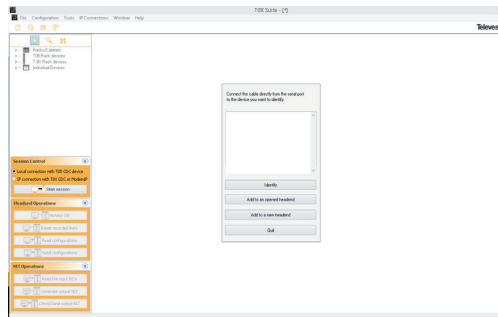
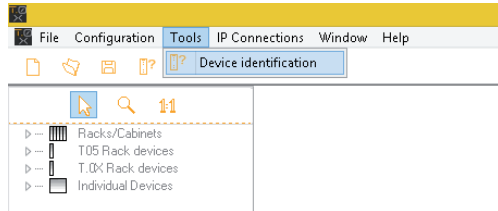
- 2 To set the port used, select Configuration, Serial communications.



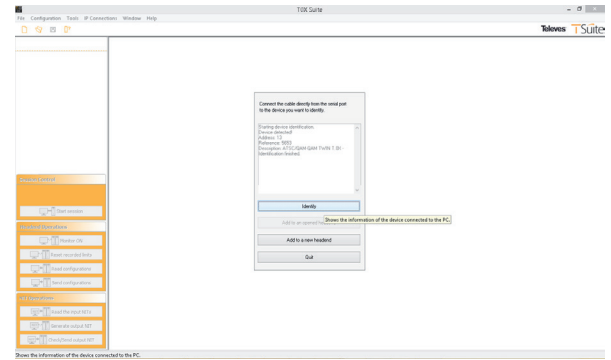
- 3 Specify the port used in the drop down window and click Accept.



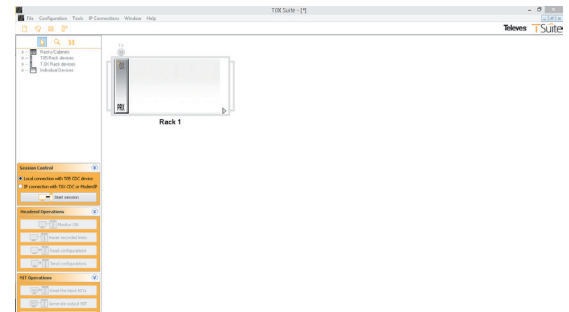
- 4 Activate the Identify Device function by selecting the icon in the menu bar.



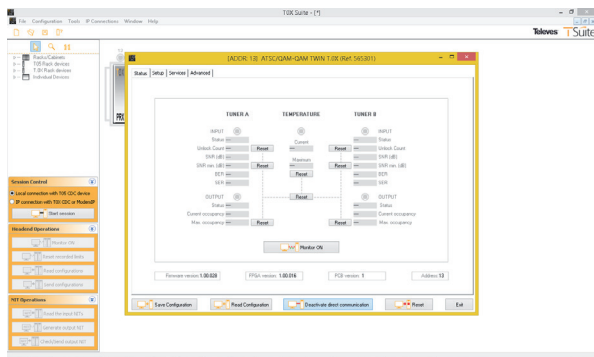
- 5 The program will identify the device connected, then select Add to a new headend.



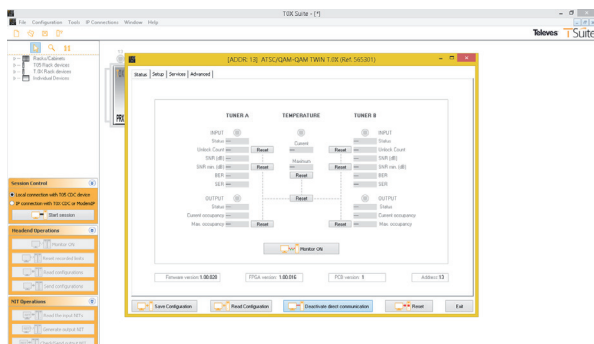
- 6 The program will place a graphic of the module within a headend frame.



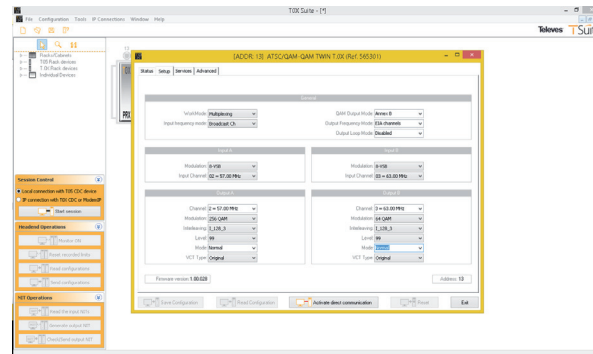
7 Double clicking on the module opens its management window. You can now perform all the functions you would with the programmer. To do this, activate the Enable / Disable direct communication.



8 There are 4 tabs, Status, Setup, Services and Advanced. A sample Status screen is shown.

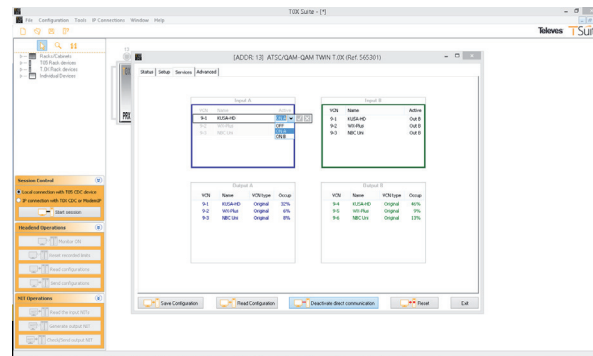


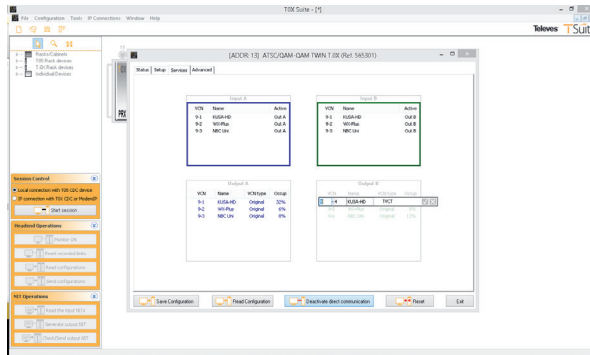
9 Setup function: You can modify all the input and output parameters here.



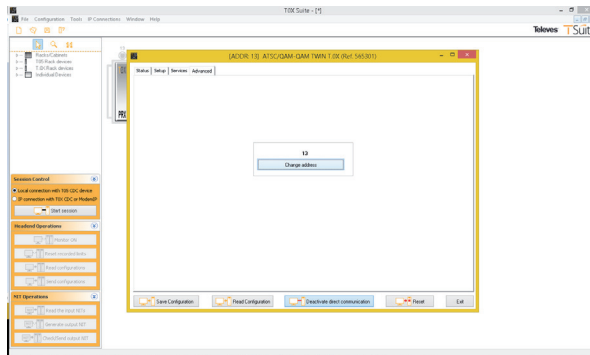
EN

10 Services allow you to configure the services in the unit (filtering, multiplexing, VCN's, etc).





11 Advanced functions allow you to change the address of the module.



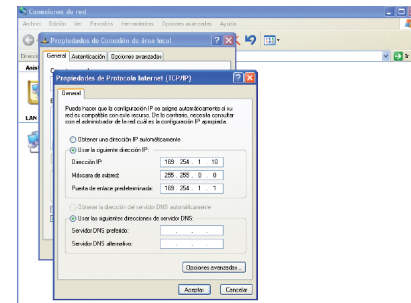
Using TSuite software in local mode, programming modules through the CDC.

Preliminary considerations

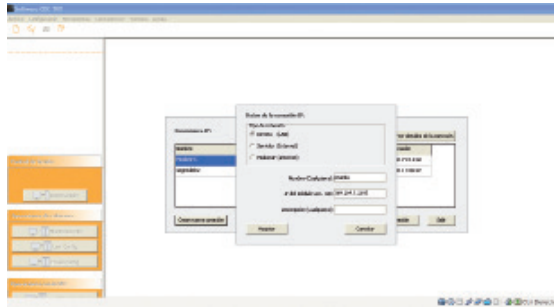
1. Direct connection between the PC and the CDC module with a data cable RJ45-RJ45.
2. The transmission of information is done through a network interface. To do this, configure the computer's IP to be on the network of IP CDC module. The CDC IP module can be configured by the programmer, but by default is 169.254.1.253.
3. The remote configuration of a module through the CDC is only possible when neither the handheld programmer nor the RS232-RJ45 cable is connected to the module.

Steps to follow

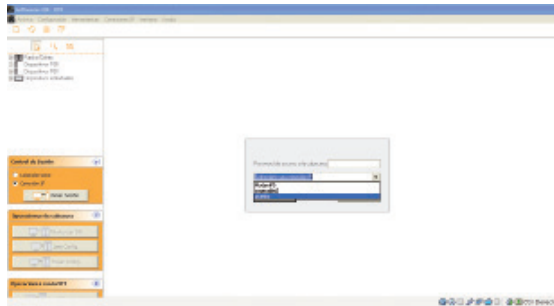
- 1 Assign the computer an IP address on the network of the CDC.



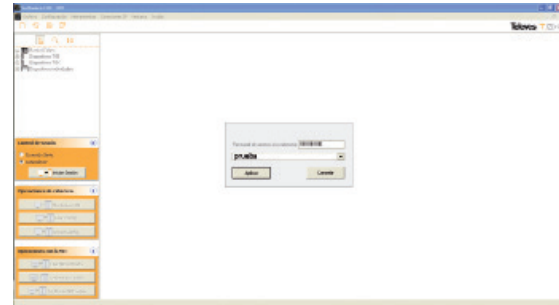
2 Select New File with the icon or the menu File, New IP Connections, IP Connections management, select **Create new connection** and select the **direct** option (LAN) in the Connection Type. Then enter a name and the IP address of the CDC module.



3 In Session Control box, select IP Connection, then Start session. Then select the name of the connection made in step 2.

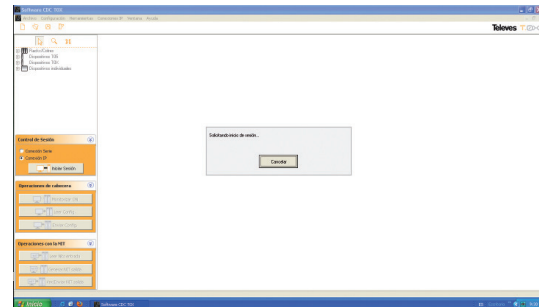


4 Enter Password for the headend and select Apply.

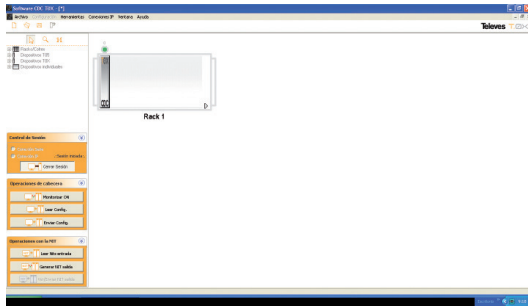


The default password is "Televes1"

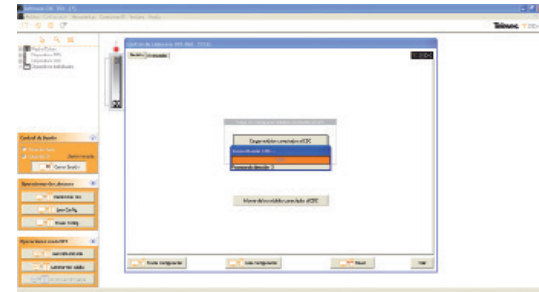
5 You will see the status screen as the session is started.



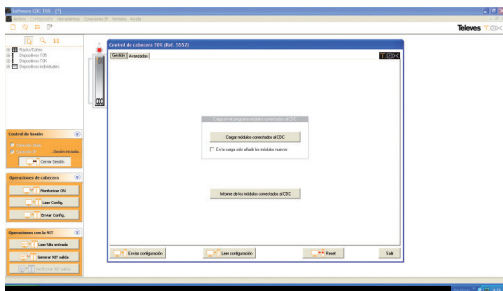
6 Once connected, you will see a graphic representation of the headend.



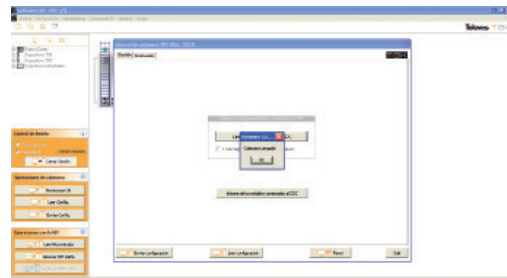
8 Status will be displayed as the program is loading information for the modules.



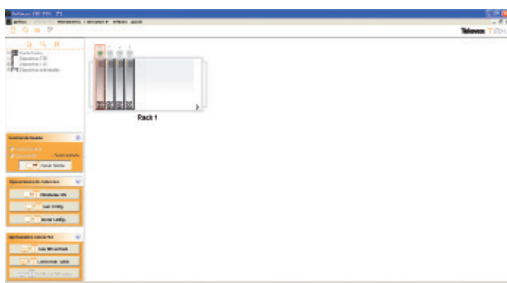
7 Double clicking on the CDC module displays the CDC management window. Selecting "Load modules connected to the CDC," will load all modules connected to and recorded in the CDC.



9 Once all modules are loaded, a pop up "Headend loaded!" will be displayed.



10 After exiting the CDC screen, all the recognized modules will be displayed. You can double click on a module to monitor or configure it in the same way as described in section “Using TSuite software in local mode, programming modules one at a time”.



Using TSuite software in remote mode, programming modules through the CDC connected to the internet.

Preliminary considerations

1. The connection between the CDC module and Internet can be accomplished in two ways: through a LAN; or using the GPRS modem built into a module ref. 555901. In the latter case, we need an active SIM card with a data plan.
2. If using a LAN, an internet connection is needed that does not block outbound ports. The CDC will connect to a Televes server and this connection

3. will provide a link back to the CDC.

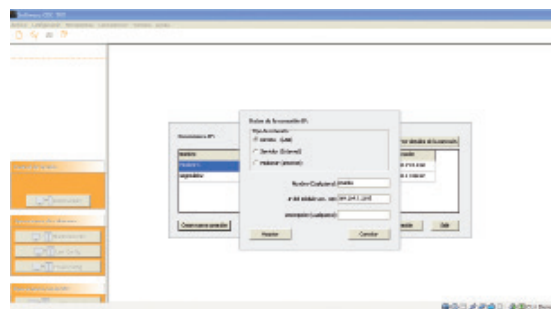
Steps to follow

1 In IP Connections, IP Connections management, select create new connection, and select the Server option in the Connection Type. Then enter the Name and the MAC Address of the module (found on the label).

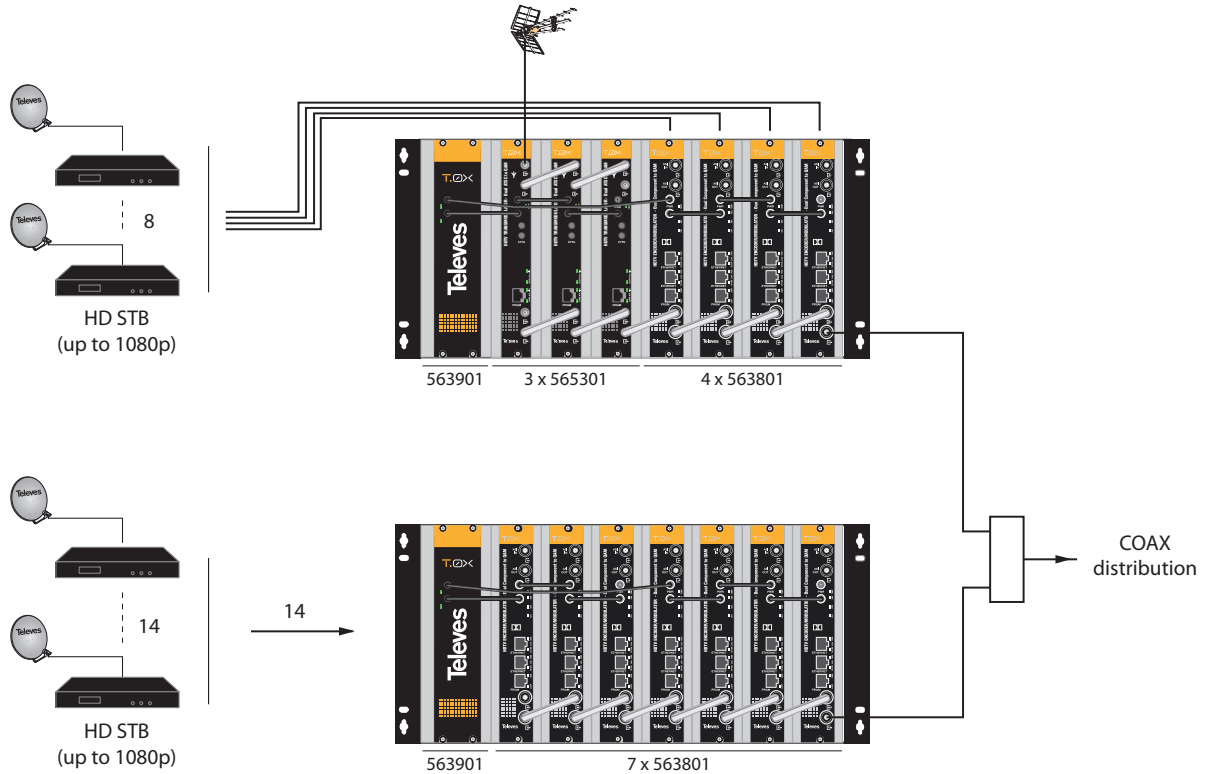
EN

2 In Session Control box, select IP Connection, then Start session. Then select the name of the connection created in the previous step and enter the headend password.

3 The rest of the steps are identical to the previous section.



12. Example installation



13. Rackmount Standards (max. 49 - 7 subracks with 5RU height - 8'7")

13.1. Installation of the rack with ventilation facilities

To aid in cooling for proper operation, especially in warm locations (>113°F ambient), installation of 2 25W or greater fans is recommended at the top of the rack. See fig 1 and 2.

Be sure to leave approximately 3-5 cm of ventilation slots at the top for proper air flow. See fig 2 and 3.

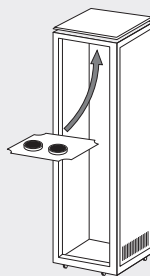


fig. 1

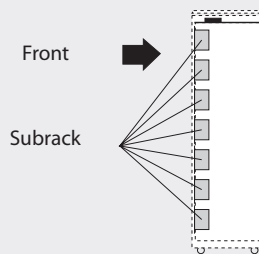


fig. 2

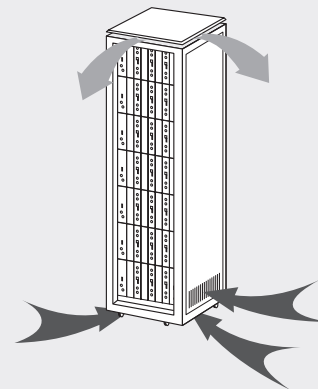
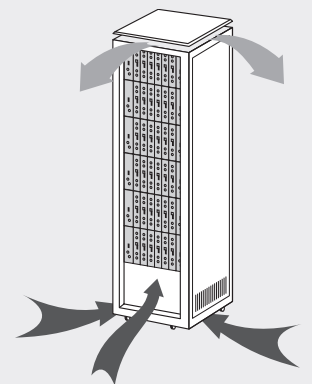


fig. 3

In order to provide adequate cooling, proper airflow must be established. As such, the following items must be observed:

- Do not open the side doors. This could cause fans to move air from outside rather than through 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 large gaps in between, fig. 4.

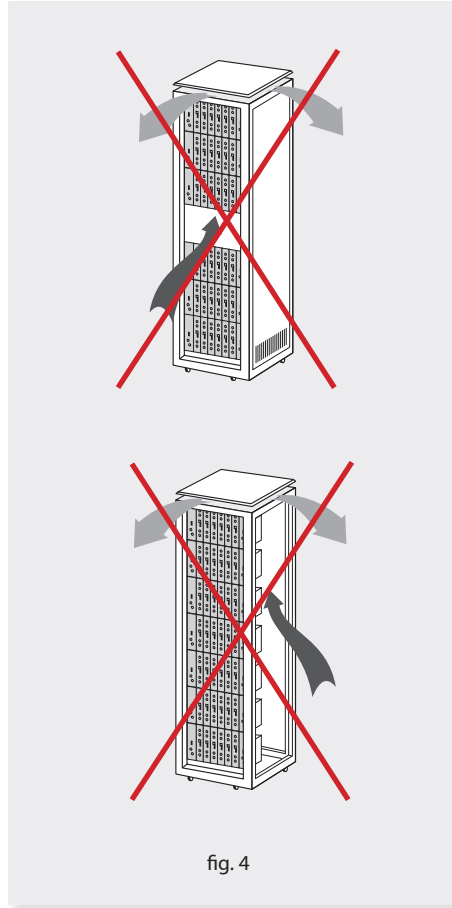
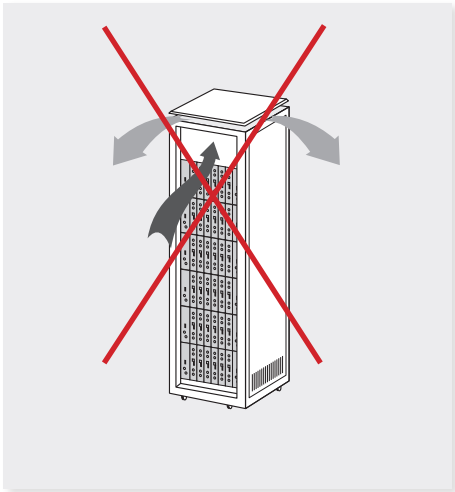


fig. 4

13.2. Installation of the rack without fans

If fans are not available and the rack is installed in ambient temperatures near 113°F, it is advisable to leave the rack sides completely open. See fig 5.

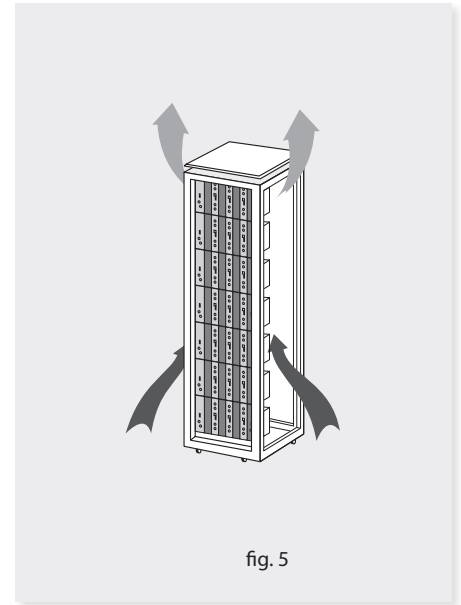


fig. 5

Appendix 1.- CATV QAM channel frequencies

CH#	QAM center frequency (MHz)
2	57.00
3	63.00
4	69.00
5	79.00
6	85.00
95	93.00
96	99.00
97	105.00
98	111.00
99	117.00
14	123.00
15	129.00
16	135.00
17	141.00
18	147.00
19	153.00
20	159.00
21	165.00
22	171.00
7	177.00
8	183.00
9	189.00
10	195.00
11	201.00
12	207.00
13	213.00
23	219.00

CH#	QAM center frequency (MHz)
24	225.00
25	231.00
26	237.00
27	243.00
28	249.00
29	255.00
30	261.00
31	267.00
32	273.00
33	279.00
34	285.00
35	291.00
36	297.00
37	303.00
38	309.00
39	315.00
40	321.00
41	327.00
42	333.00
43	339.00
44	345.00
45	351.00
46	357.00
47	363.00
48	369.00
49	375.00
50	381.00

CH#	QAM center frequency (MHz)
51	387.00
52	393.00
53	399.00
54	405.00
55	411.00
56	417.00
57	423.00
58	429.00
59	435.00
60	441.00
61	447.00
62	453.00
63	459.00
64	465.00
65	471.00
66	477.00
67	483.00
68	489.00
69	495.00
70	501.00
71	507.00
72	513.00
73	519.00
74	525.00
75	531.00
76	537.00
77	543.00

CH#	QAM center frequency (MHz)
78	549.00
79	555.00
80	561.00
81	567.00
82	573.00
83	579.00
84	585.00
85	591.00
86	597.00
87	603.00
88	609.00
89	615.00
90	621.00
91	627.00
92	633.00
93	639.00
94	645.00
100	651.00
101	657.00
102	663.00
103	669.00
104	675.00
105	681.00
106	687.00
107	693.00
108	699.00
109	705.00

CH#	QAM center frequency (MHz)
110	711.00
111	717.00
112	723.00
113	729.00
114	735.00
115	741.00
116	747.00
117	753.00
118	759.00
119	765.00
120	771.00
121	777.00
122	783.00
123	789.00
124	795.00
125	801.00
126	807.00
127	813.00
128	819.00
129	825.00
130	831.00
131	837.00
132	843.00
133	849.00
134	855.00
135	861.00
136	867.00

CH#	QAM center frequency (MHz)
137	873.00
138	879.00
139	885.00
140	891.00
141	897.00
142	903.00
143	909.00
144	915.00
145	921.00
146	927.00
147	933.00
148	939.00
149	945.00
150	951.00
151	957.00
152	963.00
153	969.00
154	975.00
155	981.00
156	987.00
157	993.00
158	999.00

Appendix 2.- Broadcast channel frequencies

CH#	QAM center frequency (MHz)
2	57.0000
3	63.0000
4	69.0000
5	79.0000
6	85.0000
7	177.0000
8	183.0000
9	189.0000
10	195.0000
11	201.0000
12	207.0000
13	213.0000
14	473.0000
15	479.0000
16	485.0000
17	491.0000
18	497.0000
19	503.0000
20	509.0000
21	515.0000
22	521.0000
23	527.0000
24	533.0000
25	539.0000
26	545.0000
27	551.0000
28	557.0000

CH#	QAM center frequency (MHz)
29	563.0000
30	569.0000
31	575.0000
32	581.0000
33	587.0000
34	593.0000
35	599.0000
36	605.0000
37	611.0000
38	617.0000
39	623.0000
40	629.0000
41	635.0000
42	641.0000
43	647.0000
44	653.0000
45	659.0000
46	665.0000
47	671.0000
48	677.0000
49	683.0000
50	689.0000
51	695.0000
52	701.0000
53	707.0000
54	713.0000
55	719.0000

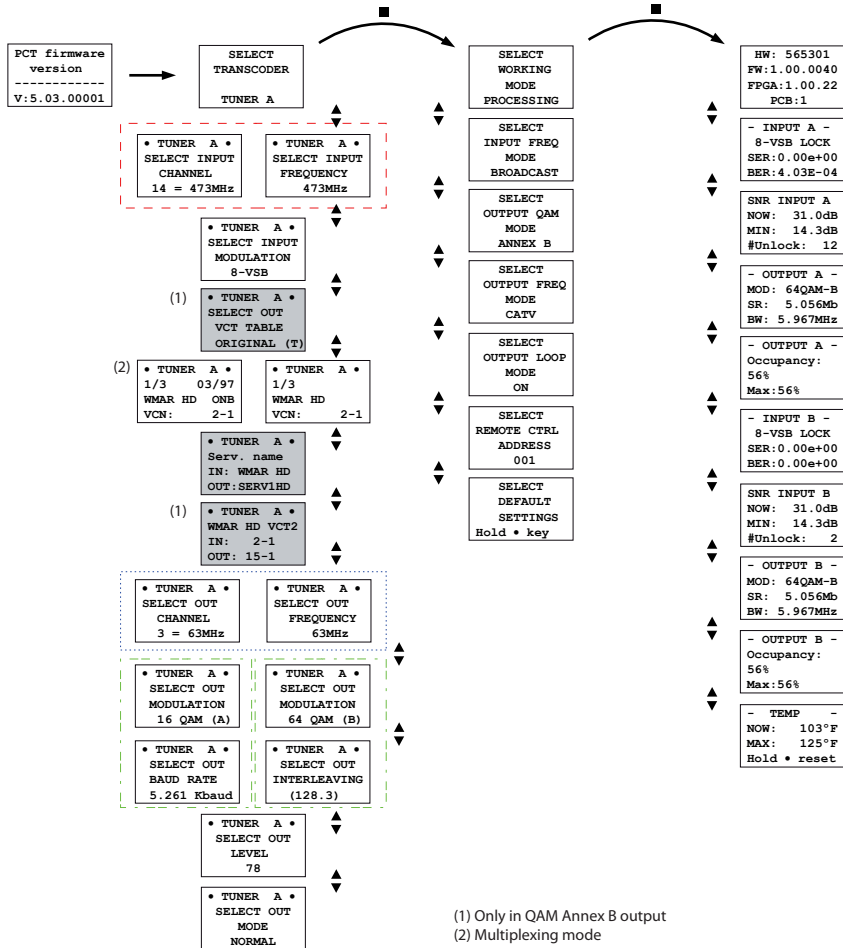
CH#	QAM center frequency (MHz)
56	725.0000
57	731.0000
58	737.0000
59	743.0000
60	749.0000
61	755.0000
62	761.0000
63	767.0000
64	773.0000
65	779.0000
66	785.0000
67	791.0000
68	797.0000
69	803.0000

Appendix 3.- T-Channels frequencies

CH#	QAM center frequency (MHz)
7	8.7500
8	14.7500
9	20.7500
10	26.7500
11	32.7500
12	38.7500
13	44.7500
14	50.7500

Appendix 4.- Programming unit Menus and Sub-menus

MENUS AND SUBMENUS					
	MAIN MENU		CONFIGURATION MENU		MONITORING MENU
	<ul style="list-style-type: none"> Transcoder selection Input frequency / Channel selection Input modulation selection Output VCT table selection Service selection Service name configuration Service VCN configuration Output frequency / Channel selection Output modulation selection Output baud rate (Annex A) / Interleaving (Annex B) Output level selection Output mode selection 		<ul style="list-style-type: none"> Working mode selection Input frequency mode selection Output QAM selection (Annex A / B) Output frequency mode selection Output loop mode selection Remote control address Restore default settings 		<ul style="list-style-type: none"> Versions menu Input status Input measurements Output Status Output Occupancy Temperature menu



Menu not available if Working mode: TRANSPARENT

Input frequency or channel depending on input freq. mode

Output frequency or channel depending on out freq. mode

QAM modulation parameters depending on selected QAM mode

●: Enable edit mode / Cursor in edit mode / Disable edit mode / reset measurements (press and hold for 3 sec.)

▲▼ Change menu / modify value (in edit mode)

■ Change branch / save parameters (press and hold for 3 sec.)

(1) Only in QAM Annex B output
(2) Multiplexing mode

Televes Limited Warranty

Televes S.A guarantees this product as per legislation applicable for this type of product at the time and in the country of purchase.

- (A) Televes warrants, only to the original Purchaser, all Products be free from any defect in materials or workmanship for a period of two (2) years from the date of original purchase, unless otherwise specified.
- (B) Televes shall, free of charge and in its sole discretion, either repair, replace with a new or factory reconditioned equivalent, or refund the purchase price of the Product(s), that has been determined by Televes to be defective in material or workmanship, subject to the limits of this warranty.
- (C) This warranty excludes any damage or inoperability resulting from:
 - (I) use or installation that is not in strict compliance with the written instructions and specifications;
 - (II) any modification or alteration performed by any third party not authorized in writing by Televes;
 - (III) service or repair performed by any third party not authorized in writing by Televes;
 - (IV) misuse, abuse, intentional harm, or lack of reasonable care;
 - (V) fire, ice, snow, rain, wind, water, volcano, excessive heat or cold, lightning, flood, power surge, earthquake, or any other acts of God;
 - (VI) war, crime, strike, riot, electro-magnetic pulse, or any other acts beyond the control of Televes;
 - (VII) shipping.
- (D) All claims under the terms of this warranty must be made in writing, by the original Purchaser, within fourteen (14) days of the defect being known to the Purchaser. Such claims shall be accompanied by a description of any material facts related to the claimed defect and the invoice or other proof of original purchase date and price. If Televes so requests, the Purchaser shall, at Purchaser's expense, deliver the claimed Product(s) to Televes, within 14 days of the date of the return authorization. Under no circumstances shall the Product(s) be returned to Televes without a return authorization.
- (E) Any refund to the Purchaser, shall be limited to the purchase price of the Product(s), excluding any applicable taxes, duties, freight costs, removal costs, installation costs, or any other charges incident to the purchase of the product.
- (F) Any damage caused by shipper shall be claimed with the shipper in accordance with the shipper's policies and procedures.
- (G) Televes shall in no event and under no circumstances be liable or responsible for any consequential, indirect, incidental, punitive, direct or special damages based upon breach of warranty, breach of contract, negligence, strict tort liability or otherwise or any other legal theory, arising directly or indirectly from the sale, use, installation or failure of any product acquired by Purchaser from Televes.
- (H) This limited warranty extends to the original Purchaser and cannot be assigned or transferred to any other party without the prior express written permission of Televes, which permission Televes may withhold for any reason or for no reason at all.
- (I) Televes will not assume any liabilities for any other warranties, whether statutory, express or implied, made by any other person.
- (J) Televes reserves the right to modify or discontinue this warranty at Televes' sole discretion without notification. No other warranties are expressed or implied.

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