

Assembly Instructions

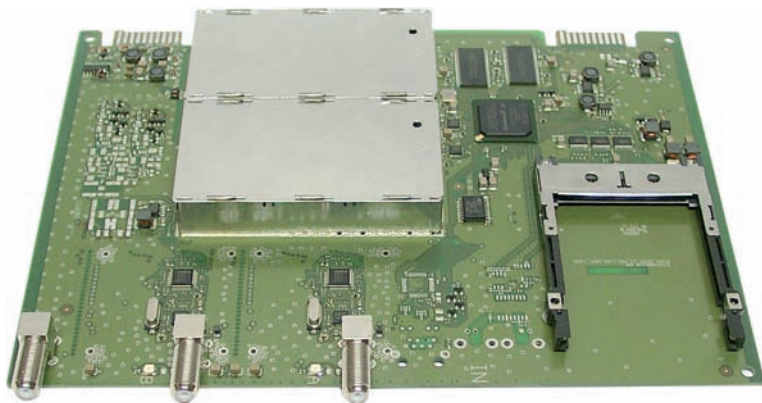
English



Grundig SAT Systems

STC 160 Head-End Station Head-End Digital Modulator COFDM

HDM 660 T



Notes on the Assembly Instructions.

As well as this supplementary Assembly Instructions, the Assembly Instructions for the STC 160 apply.



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Contents

1	Safety regulations.....	4
2	General information	4
2.1	Scope of delivery	4
2.2	Meaning of the symbols used	4
2.3	Technical data	5
2.4	Description	6
2.4.1	TPS module functions	7
3	Installation.....	8
3.1	Retrofitting a CA module	8
3.2	Installing the COFDM module	9
3.3	Connecting the COFDM module	10
4	The control panel at a glance	11
4.1	Menu items.....	11
4.2	Functions of the control panel buttons	11
5	Programming	12
5.1	Preparation	12
5.2	Notes on level setting	12
5.3	Programming procedure	13
5.3.1	Channel strip "A" (without CA module) and "B"	13
5.3.2	Channel strip "A" with CA module	15
5.4	Programming the COFDM module.....	16
	Selecting the module / channel strip	16
	Selecting channel / frequency setting	17
	Setting the output channel	18
	Setting the output frequency	18
	Switching the modulator of the channel strip off or on	19
	Adjusting the output levels of the channel strips.....	19
	Setting the LNB oscillator frequency	20
	Setting the input symbol rate	21
	Setting the input frequency	21
	Setting the station filter	23
	COFDM parameters	25
	Setting the output signal	28
	Setting the transmission parameters	29
	Setting the transmitter identification	30
	Stuffing	31
	Setting a substitute signal in the case of an incorrect input signal	32
	Network Information Table (NIT).....	33
	Deleting a PID.....	34
	Renaming a PID	34
	Saving data.....	35

5.4.1	Setting the CA module	36
	Setting the operating voltage for the CA module	36
	Setting the PID monitoring.....	36
	Configuring the CA module	37
	Selecting stations	38
6	Final procedures	40
7	Channel and frequency tables	41

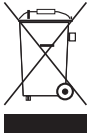
1 Safety regulations



Please read the safety regulations listed in the assembly instructions for the STC 160 head-end station which pertain to this module.



When working on the modules, please take measures to protect against ESD!



Electronic devices should never be disposed of in the household rubbish. In accordance with directive 2002/96/EC of the European Parliament and the European Council from January 27, 2003 which addresses old electronic and electrical devices, such devices must be disposed of at a designated collection facility. At the end of its service life, please take your device to one of these public collection facilities for proper disposal.

2 General information

2.1 Scope of delivery

- 1 Head-end Digital Modulator COFDM "HDM 660 T"
- 1 HF connection cable
- 1 CD (assembly instructions)
- 1 Brief Assembly Instructions

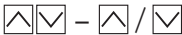
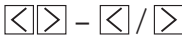
2.2 Meaning of the symbols used



Important note



General note



Optional use of the buttons



Performing works

2.3 Technical data

The requirements of the following EU directives are met:
2006/95/EC, 2004/108/EC

The product fulfils the guidelines and standards for CE labelling.

HF input (DVB-S):

Frequency range:	910 ... 2150 MHz
Input level:	60 dB μ V ... 80 dB μ V
Input impedance:	75 Ω
Return loss:	typ. 8 dB
Symbol rate:	2 ... 45 MSymb/s
Remote power supply:	12 V / 350 mA (via SAT inputs)

COFDM modulator

Signal processing:	DIN EN 300744
Transmission modes:	2k, 4k, 8k
Types of modulation:	QPSK, 16 QAM, 64 QAM
Code rates:	$1/2$, $2/3$, $3/4$, $5/6$, $7/8$
Guard intervals:	$1/4$, $1/8$, $1/16$, $1/32$

HF output:

Frequency range:	42.0 ... 860.0 MHz
Channels:	C5 ... C12, C21 ... C69
Output level:	typ. 82 dB μ V
Output impedance:	75 Ω

Connections:

SAT inputs:	2 F sockets
HF output:	1 F socket
Connection strip (20-pin):	for supply voltages and control circuits
Common Interface:	1 (several channels can be decoded)

2.4 Description

The Head-end Digital Modulator COFDM "HDM 660 T", in the following called COFDM module converts two DVB-S (QPSK) modulated data streams into two DVB-T (COFDM) modulated data streams. The COFDM module has two SAT-IF inputs and one HF output. Components (e.g. LNB) which are connected up-stream can be powered through the SAT-IF inputs.

The COFDM module is equipped with two channel strips ("**A**" and "**B**"). The channel strips consist of the digital SAT tuners, the digital signal processing levels and an output converter. The output channels are suitable for neighbouring channel assignment and free tuneable (no automatic neighbouring-channel assignment). The channel strips are indicated in the head-end station display with "**Bx ...A**" and "**Bx ...B**".

Using an adequate CA module encoded channels can be decoded via channel strip "**A**". The control of the module takes place via the control unit of the head-end station.

Two LEDs indicate if the respective channel strip is switched on (LED illuminates) or off, and also provide an indication of the signal quality based on their colour.

The integrated TPS module (Transport Stream Processing) processes the data from the demodulated transport streams.

The COFDM modulated HF output signals are sent through the HF output of the COFDM module to the output collector.

When the head-end station is switched on, the two-line LC display shows the "**SETUP**" menu and the software version of the control unit. The head-end station output level can be adjusted in this menu.

To operate the COFDM module the software version of the control unit (head-end station) must be "**V 7**" or higher. The operating software of the COFDM module and the head-end station can be updated using a PC or notebook and the software "**BE-Flash**" via the 9-pin D-SUB socket on the head-end station. You can find the current operating software for the head-end station and the COFDM module, the software "**BE-Flash**" and the current assembly instructions on the website "**www.gss.tv**".

The COFDM module is designed exclusively for use in the STC 160 head-end station.

2.4.1 TPS module functions

After decoding QPSK-modulated signals, the demodulated data streams can be accessed via the integrated TPS module. These data streams, also called transport streams, contain several stations in all their components (video, audio, data and service information), which can be changed using the TPS module. In the station filter individual stations can be activated to fill the output data rate defined with the COFDM settings.

The transport stream contains data in the form of tables which the receivers evaluate and require for convenient use. The TPS module can adjust the "Network Information Table" (NIT) to accommodate the new station data. The "NIT" contains data which is required by the set-top box for the automatic search feature.

3 Installation



- Ensure the head-end station is mounted so it will not be able to vibrate. Avoid, for example, mounting the head-end station onto a lift shaft or any other wall or floor construction that vibrates in a similar way.
- Before installing or changing a module, switch off the head-end station or unplug the power cable from the mains power socket.



Take measures to protect against ESD!

- Open the housing of the head-end station in accordance with the assembly instructions for the STC 160.

3.1 Retrofitting a CA module

The COFDM module is equipped with a common interface. It allows you to connect a CA module for various encryption systems and service providers. Encoded channels can only be decoded with a CA module suitable for the encoding system and the corresponding smart card. The smart card contains all the information for authorisation, decoding and subscription.



- Check with the distributor or manufacturer of the CA module to be used to ensure that it is suitable for the reception of several channels.

The hardware and software of the COFDM module have been thoroughly prepared and tested.

- **Any changes made by program vendors to the structures in the program data might impair or even prevent this function.**
 - When working with the CA module, please read the corresponding operating manual from the respective provider.
- Insert the smart card ① into the CA module ② so that the chip ③ on the smart card faces the thicker side (top) of the CA module (fig. 1).
 - Push the CA module ② without canting into the guide rails ④ of the common interface ⑤ according to the following picture and contact it to the common interface.

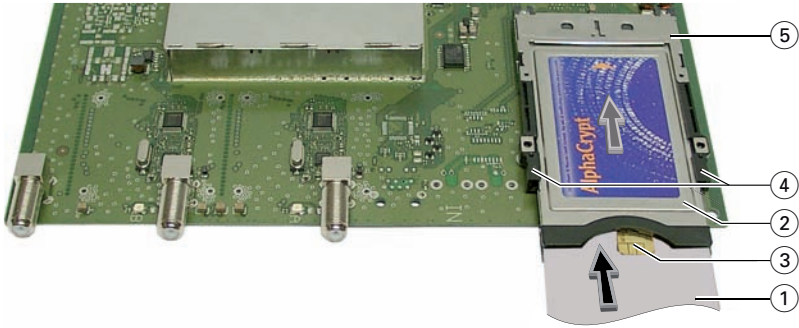


Fig. 1

3.2 Installing the COFDM module



- Check that the plug contacts of the CA module are tightly seated in the terminal strips on the common interface of the COFDM module and make sure there is reliable contact.
- When installing a module, make sure that it is inserted in one of the long, numbered grooves in front of the contact strip on the board at the rear wall of the housing.
- The shorter, non-numbered grooves without a contact strip on the board at the rear wall of the housing are for add-on modules only.

- Open the housing of the head-end station in accordance with the assembly instructions for the STC 160.
- Open the locking device ① in the direction of the arrow (fig. 2).

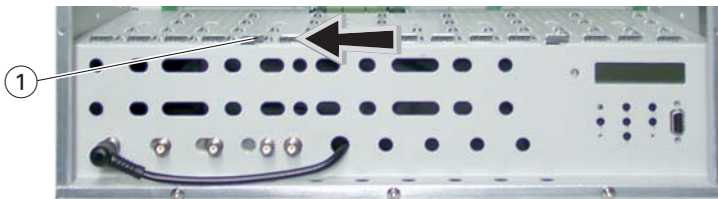


Fig. 2

- Insert the COFDM module in grooves (A) and (B) of an open slot (with contact strip on the board at the rear wall of the housing) and gently slide it into the head-end station until it makes contact with the board on the rear wall (fig. 3).
- After installing the COFDM module close the locking device ① in the direction of the arrow (fig. 3).

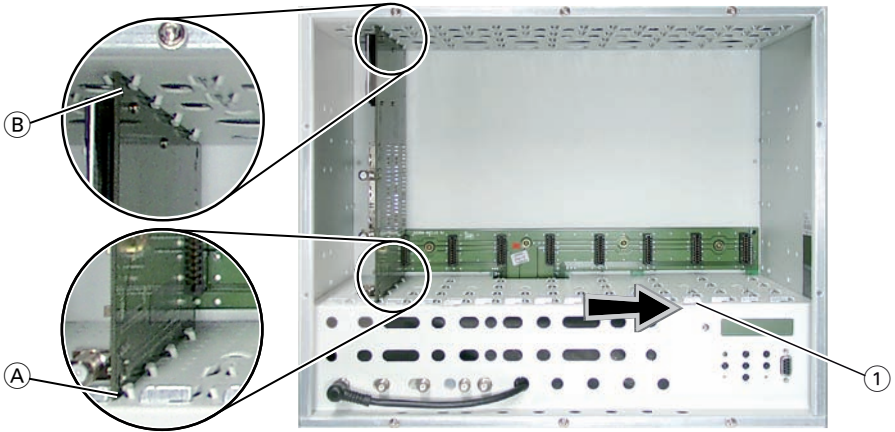


Fig. 3

3.3 Connecting the COFDM module

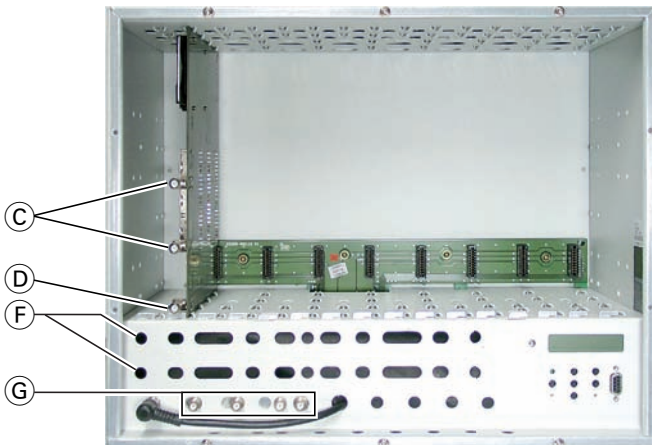


Fig. 4

- Connect SAT-IF inputs (C) on the COFDM module (fig. 4) to the preinstalled F terminals in the rear wall of the head-end station via the cable inlets (F) using HF cables made on-site (length approx. 80 cm) or if applicable connect each to one of the outputs of a retrofitted SAT-IF input distributor.
- After programming, connect the modulator output (D) to one of the input sockets (G) of the output collector.

4 The control panel at a glance

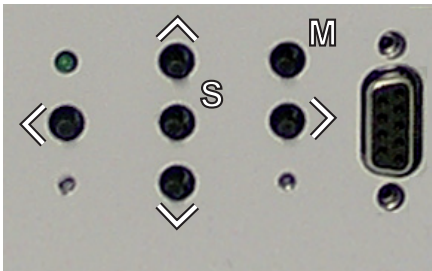
4.1 Menu items



Program the COFDM module using the buttons on the head-end station control panel. The menus appear on the two-line display of the control panel. The parameters and functions to be set are underlined.

You can use the **M** button to select the following menu items:

- Activating the module and channel strip
- Channel setting / frequency setting
- Output channel / output frequency
- Output level
- LNB oscillator frequency
- Input symbol rate
- Input frequency
- Station filter
- CA module (if available)
- Output signal
- Transmission parameters
- Station identification
- Stuffing
- Substitute signal
- Network Information Table (NIT)
- Deleting a PID
- Renaming a PID
- Save data

4.2 Functions of the control panel buttons

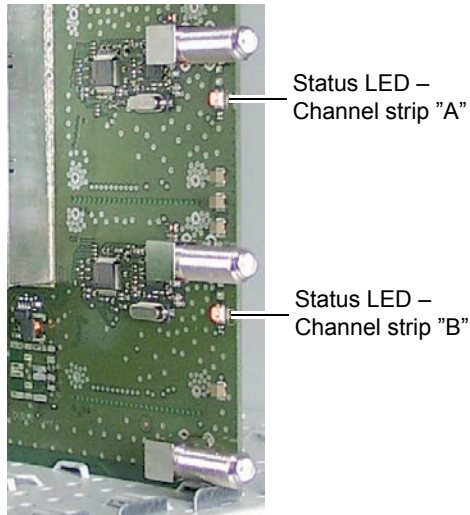


-  - To move the cursor, call up functions
-  - To adjust values and functions
- S** - To save the programmed data
- M** - To switch to the next menu

5 Programming

5.1 Preparation

- Test the software versions of the head-end station and the COFDM module and update them if necessary. The current software versions can be found on the website "www.gss.tv".
- Connect the test receiver to the modulator output on the COFDM module (D) or to the HF output on the output collector if it is already connected (s. page 10).
- Adjust the test receiver to the output channel / output frequency of the channel strip to be set.
- Switch on the channel strip (modulator) if necessary (s. page 19). For each channel strip, there is an status LED which indicates if the channel strip is switched on.



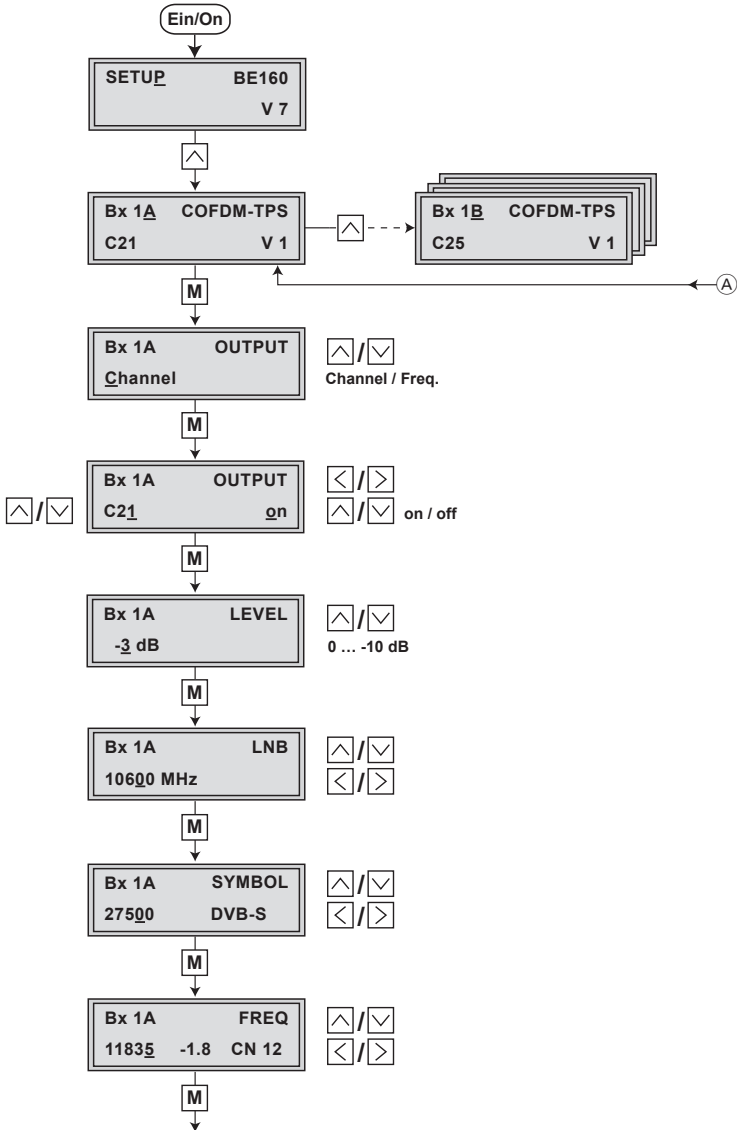
- Balance the output levels of the channel strips "A" and "B" and level them to the output levels of the modulators of other modules used if the difference in level is ≥ 1 dB (page 19).

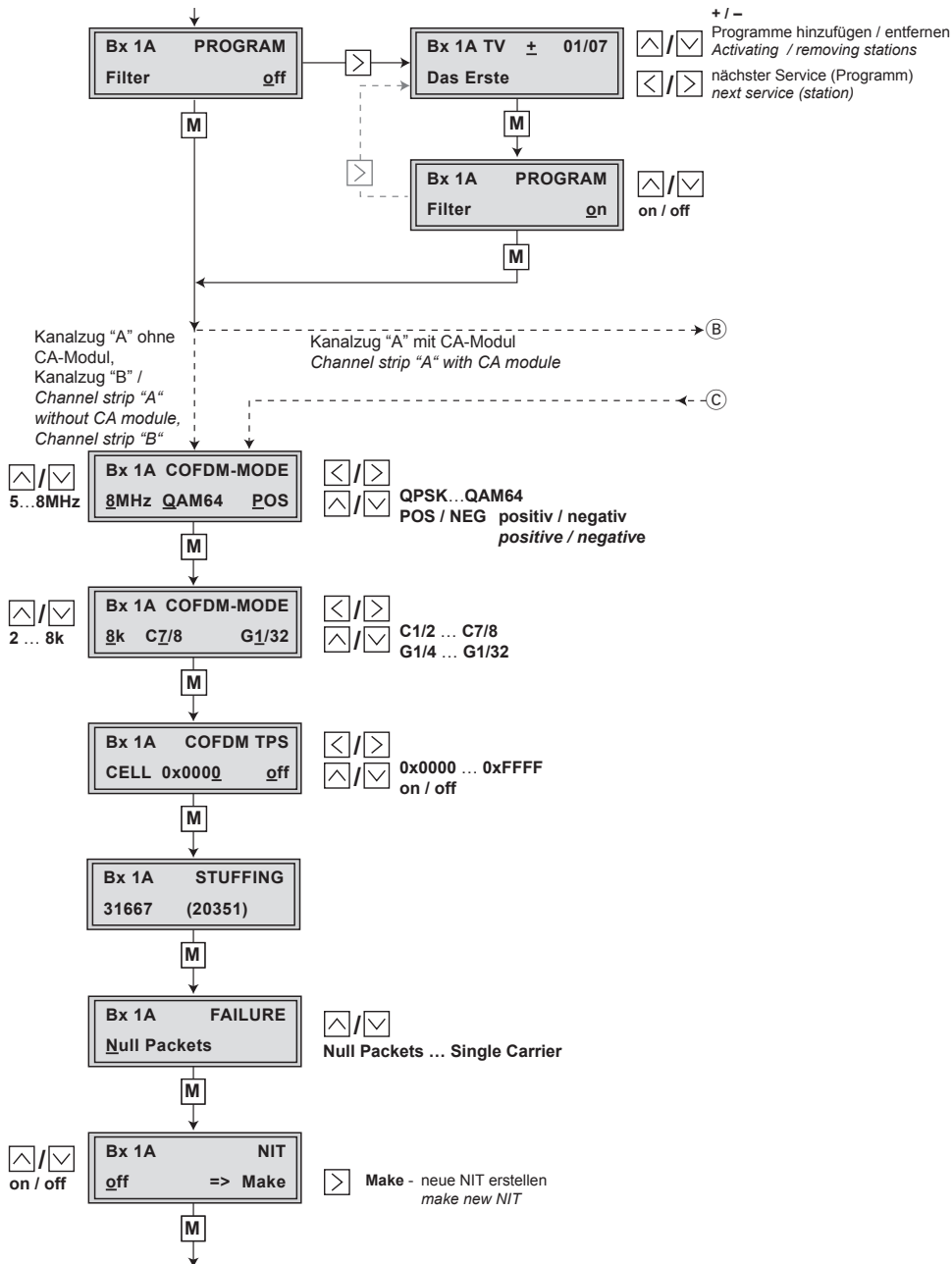
5.2 Notes on level setting

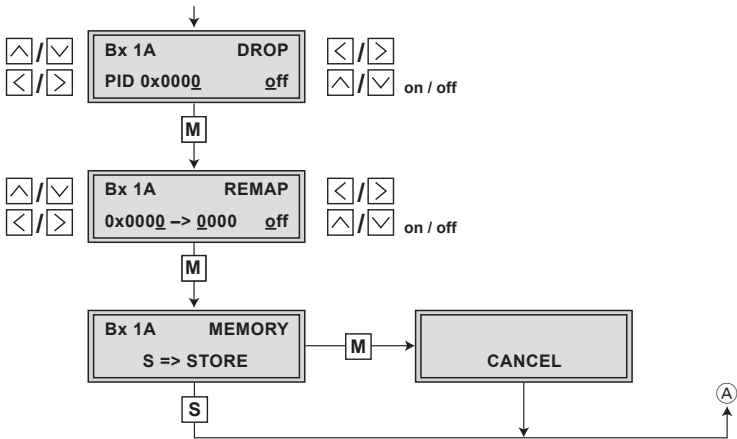
In order to prevent interference within the head-end station and the cable system, the output level of the COFDM module must be lowered by 8 dB compared to modules with analogue modulators.

5.3 Programming procedure

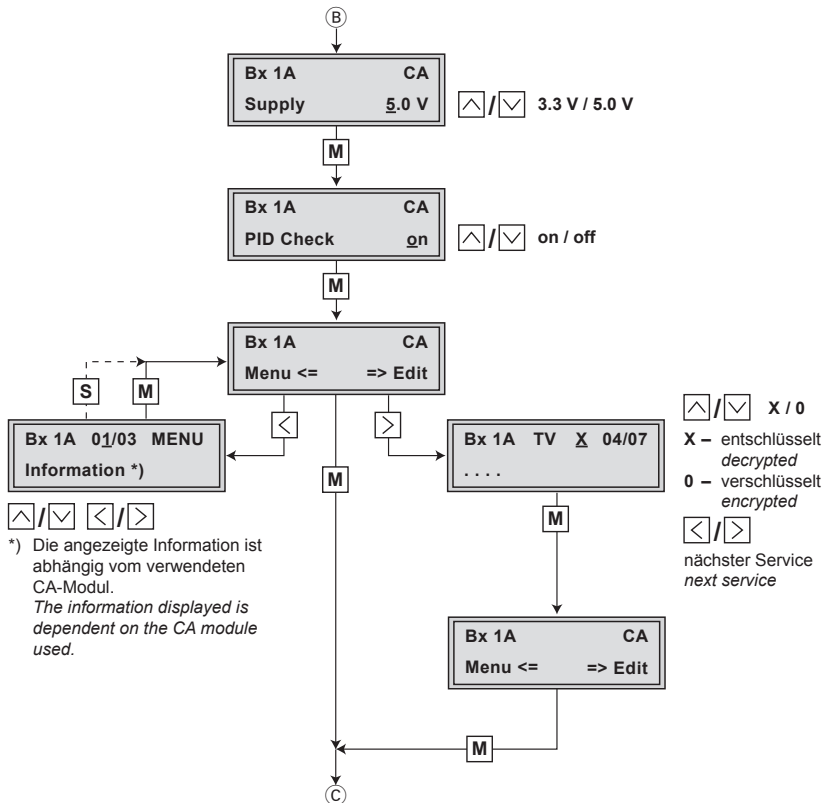
5.3.1 Channel strip "A" (without CA module) and "B"







5.3.2 Channel strip "A" with CA module

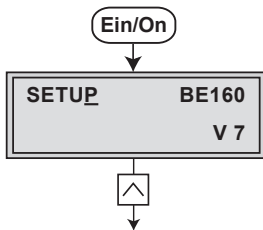


*) Die angezeigte Information ist abhängig vom verwendeten CA-Modul.
The information displayed is dependent on the CA module used.

/ X / 0
 X – entschlüsselt
 decrypted
 0 – verschlüsselt
 encrypted
 /
 nächster Service
 next service

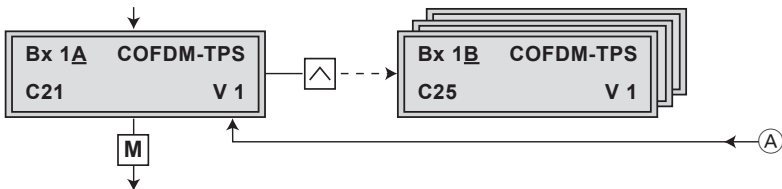
5.4 Programming the COFDM module

- > Pressing the **[M]** button for longer than 2 seconds cancels the programming procedure. This takes you back to the program item **“Selecting the module/channel strip”** from any menu. Any entries that have not been saved are reset to the previous settings.
- > Entries in the menus can be saved by pressing the **[S]** key. You are taken back to the **“Selecting the module/channel strip”** menu item.
 - Switch on the head-end station.
 - > The display shows **“SETUP BE160”** and the software version of the head-end station (e.g. V 7).
 - > In the **“SETUP”** menu, the output level of the output collector can be adjusted (see STC 160 assembly instructions).



Selecting the module / channel strip

- If necessary, press **[^]**/**[v]** repeatedly to select the particular module (**Bx ...**) or channel strip **“A”** or **“B”** to be programmed.



- > The display shows, e.g., the **“Bx 1A COFDM-TPS”** menu.

“Bx”	indicates the slot
“1”	indicates slot no. 1
“A”	indicates channel strip “A”
“COFDM-TPS”	Type of module
“C21”	channel set
“V 1”	software version of the module

→ If a channel strip is selected whose modulator is switched off, instead of the frequency or the channel “---” is displayed.



→ Programming the channel strips “A” and “B” is identical without a CA module. If a CA module is used mind the supplementary programming procedure described on page 36.

- Press the **M** button.
 - The “Selecting channel / frequency setting” – “**OUTPUT**” menu is activated.

Selecting channel / frequency setting

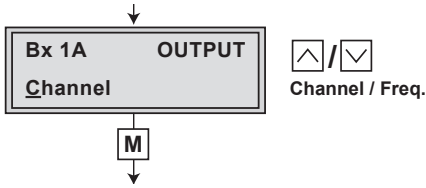
In this menu, you can choose whether you require the channel or frequency setting for the adjustment of the HF output. The channel setting covers the range of channels C5 ... C12 und C21 ... C69, the frequency setting covers the range from 42.0 MHz to 860.0 MHz.



The COFDM signal is normally transmitted with a bandwidth of 8 MHz. This means that you can only use the channel centre frequency of the existing channel raster in the range of channels C21 ... C69 (frequency raster 8 MHz). The CCIR channel raster is 7 MHz in the range of the lower frequency bands (channels C5 ... C12). If 8 MHz COFDM signal packages are transmitted in these channel ranges, this will result in interference (overlapping) and transmission problems.

For programming in these channel ranges and in the frequency ranges below them, we recommend to reduce the bandwidth of the COFDM signal to 7 MHz (page 28).

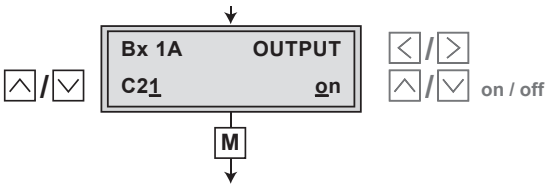
Please note thereby that many receivers cannot receive the channel ranges S21 ... S41 (306 ... 466 MHz).



- Use to select channel setting “**Channel**” or frequency setting “**Freq.**”.
- Press the button.
 - The “Setting the output channel” or “Setting the output frequency” – “**OUTPUT**” menu is activated.
 - If frequency setting is selected continue with “Setting the output frequency”.

Setting the output channel

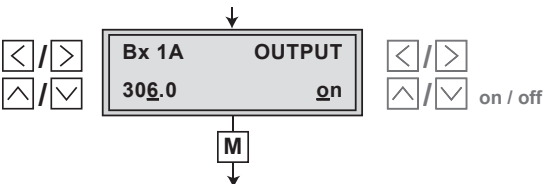
In this menu you set the output channel of the channel strip (C5 ... C12, C21 ... C69). Additionally the modulator of the channel strip can be switched off or on (page 19).







- Use the buttons to set the output channel.

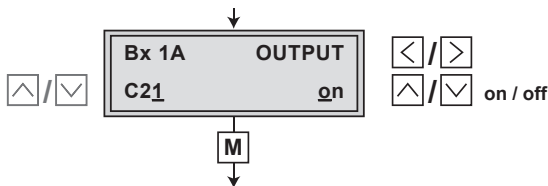
Setting the output frequency




In this menu you set the output frequency of the channel strip (42.0 ... 860.0 MHz). Additionally the modulator of the channel strip can be switched off or on (page 19).

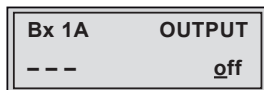



- Use the   buttons to position the cursor under the digit to be set for the frequency display then use   to set the output frequency wished.

Switching the modulator of the channel strip off or on



- Using the  button, move the cursor under “on” or “off” and then use the   buttons to switch off “off” the channel strip (modulator) or to switch it on “on” if necessary.
 - > When it is switched off, the status LED for the channel strip goes out (see page 22).
 - > The switched off channel strip is indicated in the display with “- - -” instead of the channel or frequency display.



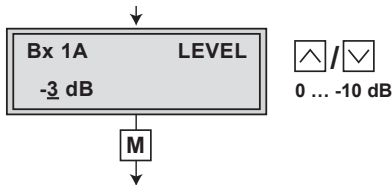
- Press the  button.
 - > The “Adjusting the output levels of the channel strips” – “LEVEL” menu is activated.

Adjusting the output levels of the channel strips

This menu item is used to set the output levels of the modulators of the module’s channel strips to the same value and to level them to the output levels of the modulators of other modules used.



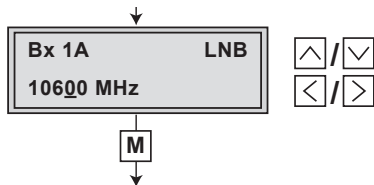
In order to prevent interference within the head-end station and the cable system, the output level of the COFDM module must be lowered by 8 dB compared to modules with analogue modulators.



- Use the test receiver to measure the output level of the channel strip and make note of the value.
- When adjusting the second channel strip, compare its value with the value noted for the first channel strip.
- Measure the output levels of the modulators of other modules used and make notes of their values.
- Use the buttons to balance the higher output level of the one channel strip to the lower output level of the other channel strip and the output levels of the modulators of other modules used ("0 dB" ... "-10 dB").
- Press the button.
 - The "Setting the LNB oscillator frequency" – "LNB" menu is activated.

Setting the LNB oscillator frequency

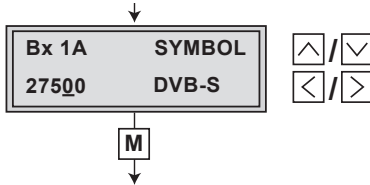
Set the oscillator frequency of the LNB used in this menu.



- Use the buttons to position the cursor under the digit of the frequency displayed.
- Press to enter the respective digit of the oscillator frequency of the LNB used.
- Repeat the procedure by the quantity of the digits to be set.
- Press the button.
 - The "Setting the input symbol rate" – "SYMBOL" menu is activated.

Setting the input symbol rate

The symbol rates of the satellite transponders can be found in the current transponder tables of the various satellite trade magazines or on the website of the respective service provider.



- Use the buttons to position the cursor under the digit of the symbol rate displayed to be set.
- Press to enter the respective digit of the desired symbol rate.
- Repeat the procedure by the quantity of the digits to be set.

—> The “**DVB-S**” logo has no function.

- Press the button.

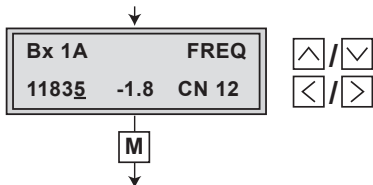
—> The “Setting the input frequency” – “**FREQ**” menu is activated.

Setting the input frequency

Once the HF receiver has synchronised to the input signal, any offset to the target frequency is displayed in MHz, e.g. “-1.8”.

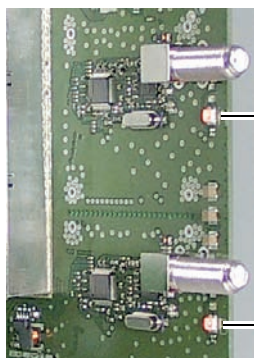
The “**CN...**” indicator in this menu provides an indication of the signal-to-noise ratio of the received carrier. If the value is below “**CN 5**,” this may result in loss of video.

If a question mark “(?)” appears in the second line of the display, there is no input signal present. Check the configuration of the antenna system and head-end station, as well as the previously adjusted module settings.



- Use the buttons to position the cursor under the digit of the frequency displayed to be set.
- Press to set the respective digit of the input frequency needed.
- Repeat the procedure by the quantity of the digits to be set.
- Set the frequency offset shown in the display (e.g. “- 1.8”) to less than 1 MHz by varying the input frequency using the buttons.

—> In addition to the indicator in the display, the quality of the transport stream received is indicated by a status LED:



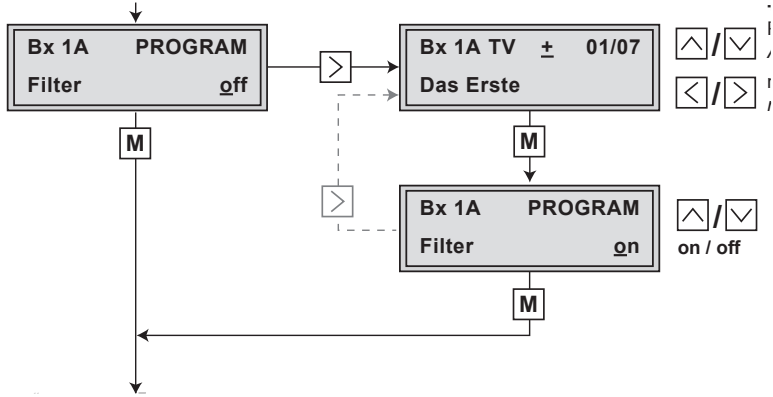
LED indicator	Indication
Green	Signal quality is good
Yellow	Signal quality is poor
Red	No signal
Off	The channel strip (modulator) is switched off


- Press the button.
 - > The “Setting the station filter” – “PROGRAM” menu is activated.

Setting the station filter

The default setting for the station filter is "off". In this menu you define the stations received to be transmitted.

If the station filter is switched off (factory default) all stations of the transport stream passes the station filter. As soon as the station filter is activated all stations are inactive and can be added to the transport stream selectively. If stations are activated the output data rate increases.



- Press the  button.
 - **All stations from the channel strip** will be read, and then displayed with name and station type.
 - If no station is found, the following error message will appear in the display "**FILTER no Service**".
In this case, check the configuration of the antenna system and head-end station, as well as the previously adjusted settings for the COFDM module.
 - The display shows e.g.: **Bx 1A TV + 01/07**
Das Erste






Meaning of the indicators in the example:

- "Bx 1A" Slot 1, channel strip "A"
- "TV" TV channel type
- " + " The currently selected station is activated.
- "01/07" The 1st of 7 stations is being displayed.
- "Das Erste" Station name

Further possible terms displayed:





- "RA"** Radio channel type
For radio stations, the background of the screen of the connected TV or test receiver is darkened.
- " - "** The currently selected station is switched off.
- " * "** The star means that the TV or radio station selected is encoded. To enable the stations, the CA module and the appropriate smart card of the station provider are required.

→ If a service number (e.g. **"131"**) appears instead of **"TV"** or **"RA"**, this indicates that an unnamed station or an undefined data stream is being received.

- Use the   buttons to call up the stations in sequential order, then use   to activate (indicated by **" + "**) or to deactivate them (**" - "**).
→ Factory default: All stations are deactivated.
- To save changes and to activate the station filter press the  button.
→ The display shows **"PROGRAM Filter on"**.
→ If stations are activated the corresponding PIDs (audio, video, text) are inserted into the data stream and the PAT and SDT tables are updated.
→ The station filter remains deactivated (**"off"**) if no station was activated.

Test the status of the individual stations:

If the station filter is switched on, press the  button.

In this mode you can use the   buttons to scroll through the station list, and   to deactivate activated stations or activate further stations.

- In the **"PROGRAM Filter on"** menu the station filter can be switched **"off"** using the buttons  .

- Press the **M** button.
 - The “Setting the output signal” – “**COFDM-MODE**” menu is activated when the channel strips “**A**” without a CA module installed and “**B**” are programmed. Please take note of the tables below before setting the COFDM parameters.
 - Programming the channel strip “**A**” with a CA module installed the “Setting the operating voltage for the CA module” – “**CA**” menu is activated (s. page 36).

COFDM parameters

The tables below show the dependence of the transmittable net data rate on the settings of the COFDM parameters.

		Net data rate [kbit/s] at a bandwidth of 8 MHz			
		Guard interval			
Modulation	Code rate	$1/4$	$1/8$	$1/16$	$1/32$
QPSK	$1/2$	4976	5529	5853	6031
	$2/3$	6635	7372	7805	8041
	$3/4$	7464	8294	8780	9047
	$5/6$	8294	9215	9756	10052
	$7/8$	8708	9676	10244	10554
16 QAM	$1/2$	9952	11058	11708	12063
	$2/3$	13270	14745	15611	16085
	$3/4$	14929	16588	17563	18095
	$5/6$	16588	18431	19514	20105
	$7/8$	17417	19352	20490	21111
64 QAM	$1/2$	14929	16588	17563	18095
	$2/3$	19905	22117	23417	24127
	$3/4$	22394	24882	26344	27143
	$5/6$	24882	27647	29272	30159
	$7/8$	26126	29029	30736	31667

If the bandwidth is decreased by 1 MHz the transmittable data rate is lowered by approx. $1/8$.

		Net data rate [kbit/s] at a bandwidth of 7 MHz			
		Guard interval			
Modulation	Code rate	$1/4$	$1/8$	$1/16$	$1/32$
QPSK	$1/2$	4354	4838	5122	5276
	$2/3$	5805	6450	6828	7036
	$3/4$	6531	7257	7683	7915
	$5/6$	7257	8063	8536	8795
	$7/8$	7619	8466	8963	9235
16 QAM	$1/2$	8708	9676	10245	10555
	$2/3$	11611	12901	13659	14074
	$3/4$	13063	14514	15367	15833
	$5/6$	14514	16127	17074	17592
	$7/8$	15239	16933	17928	18471
64 QAM	$1/2$	13063	14514	15368	15833
	$2/3$	17417	19352	20490	21111
	$3/4$	19594	21772	23052	23750
	$5/6$	21772	24191	25613	26389
	$7/8$	22860	25400	26894	27708

		Net data rate [kbit/s] at a bandwidth of 6 MHz			
		Guard interval			
Modulation	Code rate	$1/4$	$1/8$	$1/16$	$1/32$
QPSK	$1/2$	3732	4147	4390	4523
	$2/3$	4976	5529	5853	6030
	$3/4$	5598	6220	6585	6784
	$5/6$	6220	6911	7317	7538
	$7/8$	6531	7257	7683	7915
16 QAM	$1/2$	7464	8294	8781	9047
	$2/3$	9952	11058	11708	12063
	$3/4$	11197	12441	13171	13571
	$5/6$	12441	13823	14635	15078
	$7/8$	13063	14514	15367	15832
64 QAM	$1/2$	11197	12441	13171	13571
	$2/3$	14929	16588	17563	18095
	$3/4$	16795	18661	19758	20357
	$5/6$	18661	20735	21953	22619
	$7/8$	19594	21772	23051	23750

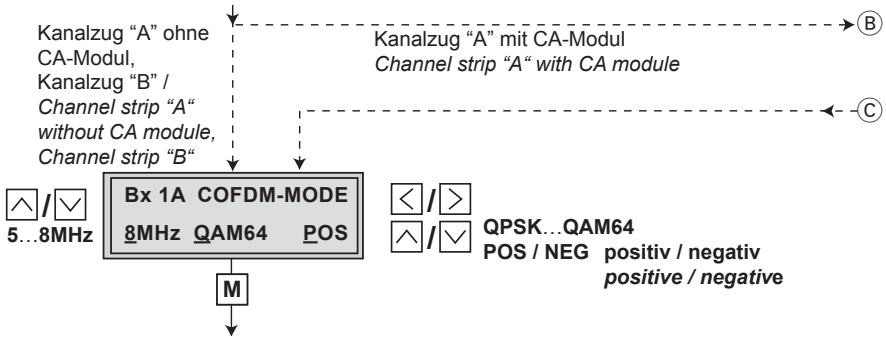
	Transmission parameters for DVB-T at a bandwidth of 8 MHz											
Transmission mode	2k				4k				8k			
Symbol duration T_S [μ s]	224				448				896			
Carrier space Δf [kHz]	4.4643				2.232				1.116			
$(n_{\text{carrier}})_{\text{theoretical}}$	2048				4096				8192			
$(n_{\text{carrier}})_{\text{real}}$	1705				3410				6817			
Used bandwidth [MHz]	7.61				7.61				7.61			
Total symbol duration T_{GS} [μ s]	280	262	238	231	560	504	476	462	1120	1008	952	924
Guard interval T_G [μ s]	56	28	14	7	112	56	28	14	224	112	56	28
T_G / T_S	$1/4$	$1/8$	$1/16$	$1/32$	$1/4$	$1/8$	$1/16$	$1/32$	$1/4$	$1/8$	$1/16$	$1/32$

	Transmission parameters for DVB-T at a bandwidth of 7 MHz											
Transmission mode	2k				4k				8k			
Symbol duration T_S [μ s]	224				448				896			
Carrier space Δf [kHz]	4.4643				2.232				1.116			
$(n_{\text{carrier}})_{\text{theoretical}}$	2048				4096				8192			
$(n_{\text{carrier}})_{\text{real}}$	1705				3410				6817			
Used bandwidth [MHz]	6.66				6.66				6.66			
Total symbol duration T_{GS} [μ s]	320	288	272	264	620	576	544	528	1280	1152	1088	1056
Guard interval T_G [μ s]	64	32	16	8	128	64	32	16	256	128	64	32
T_G / T_S	$1/4$	$1/8$	$1/16$	$1/32$	$1/4$	$1/8$	$1/16$	$1/32$	$1/4$	$1/8$	$1/16$	$1/32$

	Transmission parameters for DVB-T at a bandwidth of 6 MHz											
Transmission mode	2k				4k				8k			
Symbol duration T_S [μ s]	224				448				896			
Carrier space Δf [kHz]	4.4643				2.232				1.116			
$(n_{\text{carrier}})_{\text{theoretical}}$	2048				4096				8192			
$(n_{\text{carrier}})_{\text{real}}$	1705				3410				6817			
Used bandwidth [MHz]	5.71				5.71				5.71			
Total symbol duration T_{GS} [μ s]	373	336	317	308	767	672	634	616	1493	1344	1269	1232
Guard interval T_G [μ s]	74.7	37.3	18.7	9.3	149	75	37.4	18.6	298.7	149.3	74.6	37.3
T_G / T_S	$1/4$	$1/8$	$1/16$	$1/32$	$1/4$	$1/8$	$1/16$	$1/32$	$1/4$	$1/8$	$1/16$	$1/32$

Setting the output signal

In this menu, you can set the bandwidth, the carrier modulation and the spectral position of the output signal.



Bandwidth of the output signal

To transmit the output signal in the channel range of C21 ... C69 a bandwidth of 8 MHz can be used.

In the channel range of C5 ... C12 a bandwidth of ≤ 7 MHz must be set.

If frequency setting is selected you can set the bandwidth dependent on the frequency of the neighbouring-channel.

- Use the buttons to set the bandwidth of the output signal ("5 MHz" ... "8 MHz").

Carrier modulation

In this menu item the carrier modulation is set. At this the setting "QPSK" corresponds to the lowest and the setting "QAM64" to the highest output data rate.

- Use the buttons to place the cursor under "QPSK / QAM...".
- Set the carrier modulation of the output signal using the buttons ("QPSK", "QAM16", "QAM64").

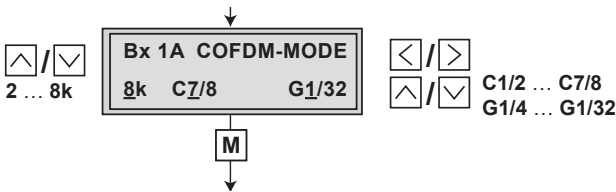
Inverting the user signal

For exceptional cases and "older" digital cable receivers, the spectral position of the user signal can be inverted "NEG" (negative). The default setting is "POS" (positive).

- Use the / buttons to place the cursor under "POS".
- Use the / buttons to set the spectral position to "NEG".
- Press the button.
 - The "Setting the transmission parameters" – "COFDM-MODE" menu is activated.

Setting the transmission parameters

In this menu you can set the transmission modes, the code rate ("C ...") and the guard interval ("G ...").



Transmission mode

In this menu item you set the quantity of carriers:

2k mode: 1512 carriers for user data (total 1705 carriers)

4k mode: 3024 carriers for user data (total 3410 carriers)

8k mode: 6048 carriers for user data (total 6817 carriers)





→ The standard modes for DVB-T are 2k and 8k.

- Using the / buttons set the transmission mode required ("2k" ... "8k").

Code rate






During a transmission data can be lost or changed. To recover this data redundancy is added to the signal to be transmitted (forward error correction). The factor of the quantity of redundancy contained in the bits transmitted is called code rate.

Using the setting “C7/8” you can get the highest output data rate at lowest redundancy.

- Use the   buttons to place the cursor under “C...”.
- Set the code rate required using the   buttons (“C1/2”, “C2/3”, “C3/4”, “C5/6”, “C7/8”).

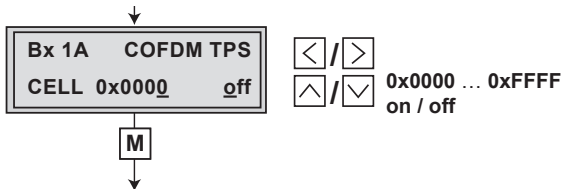
Guard interval





In this menu item you set the relation of the duration of the user symbols to the duration of the guard intervals to be transmitted. A high guard interval, e.g. “G1/4” causes a low output data rate. For cable networks the setting “G1/32” is adequate.






- Use the   buttons to place the cursor under “G...”.
- Set the guard interval required using the   buttons (“G1/4”, “G1/8”, “G1/16”, “G1/32”).
- Press the  button.
 - The “Setting the transmitter identification” – “COFDM TPS” menu is activated.

Setting the transmitter identification

At terrestrial transmission an identification is referred to each COFDM modulated transmitter. When COFDM modulated signals are fed into cable networks this identification is not necessary usually. If receiving problems should occur you must refer a transmitter identification (CELL ID) to each output channel and switch “on” the transmitter identification.

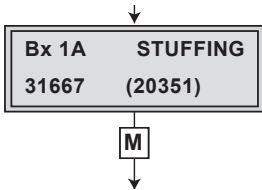


- Use the   buttons to position the cursor under the digit of the hexadecimal number to be set.
- Press   to set the respective digit of the hexadecimal number.

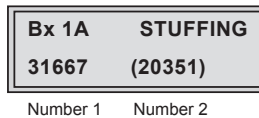
- Repeat the procedure by the quantity of the digits to be set.
- Using the  button place the cursor under "off" and switch "on" the transmitter identification using the   buttons.
 - By pressing the  button you return to the hexadecimal number setting.
- Press the  button.
 - The "Stuffing" – "STUFFING" menu is activated.

Stuffing

This menu shows the output data rate defined using the COFDM settings and the current measured output data rate.



31667 (= "Number 1"): Defined net output data rate

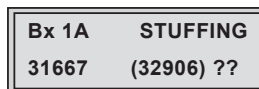


(20351) (= "Number 2"):

The current measured output data rate.

If the station filter is set correctly, this value is lower than the value of the "Number 1". The value fluctuates, since the data rates of individual stations are dynamically modified by the broadcasters.

→ Is the "Number 2" higher than "Number 1" question marks "??" appear in the display. In this case correct the COFDM settings (pages 25 ... 31) or the settings of the station filter (page 23).



- Press the **M** button.
 → The “Setting a substitute signal in the case of an incorrect input signal” – “**FAILURE**” menu is activated.

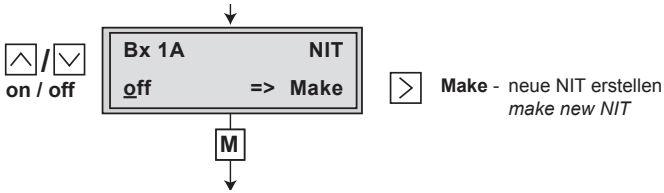
Setting a substitute signal in the case of an incorrect input signal

You use this menu to set whether a COFDM signal filled with “**Null Packets**”, a COFDM signal filled with null packets and self-made tables “**Tables**” or a “**Single Carrier**” signal should be provided as an output signal whenever an incorrect input signal occurs. Self-made tables are transmitted furthermore.



- Use the buttons to set the output signal required.
- Press the **M** button.
 → The “Network Information Table” – “**NIT**” menu is activated.

Network Information Table (NIT)

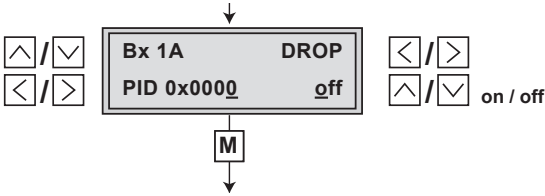


- To switch the NIT on or off (“on”/“off”) press the buttons.
- Press the button to activate the NIT (“Make”).
 - All active ...-COFDM modules must be set and ready for reception.
 - The NIT of all ...-COFDM modules are switched on.
 - The COFDM module fetches all the information (output frequencies, output symbol rates, etc.) it needs from all the ...-COFDM modules in order to generate the cable NIT. This process may take a few seconds. Then the NIT is generated, added and sent to all ...-COFDM modules. The other ...-COFDM modules also add this new cable NIT. The status of all ...-COFDM modules in the NIT menu changes to “on”.
- To switch off the new NIT (“off”) press the button.
 - The cable NITs of the other ...-COFDM modules will stay switched on. When the cable NIT of the COFDM module is switched on again (“on”) by pressing the button, the previously generated NIT is added again. If you have changed parameters in the meantime, you must first select “Make” to generate a new, up-to-date NIT.
- Press the button.
 - The “Deleting a PID” – “DROP” menu is activated.



Deleting a PID

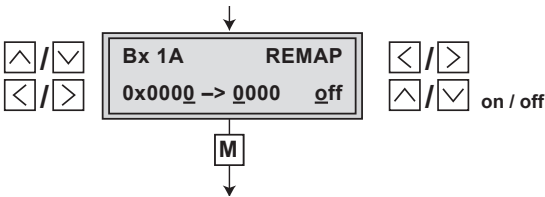
In this menu a PID of the transport stream can be deleted.



- Use the buttons to place the cursor under the respective digit of the hexadecimal number of the PID to be deleted ("0x0000") and set the hexadecimal number using .
- Use the button to set the cursor under "off" and delete the PID using the buttons ("on").
- Press the button.
→ The "Renaming a PID" – "REMAP" menu is activated.

Renaming a PID

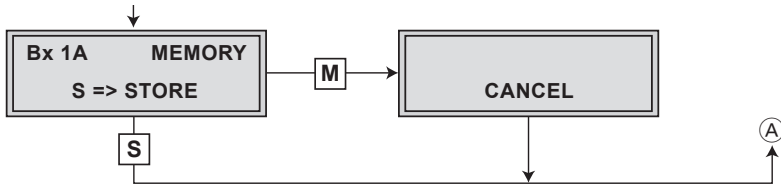
In this menu you can allocate a new address to a PID retaining the complete data content.



- Use the buttons to place the cursor under the respective digit of the hexadecimal number of the PID to be changed ("0x0000") and set the hexadecimal number using .
- Use the buttons to place the cursor under the respective digit of the hexadecimal number of the new PID ("-> 0000").
- Set the hexadecimal number using .
- Use the button to set the cursor to "off" and rename the PID using the buttons ("on").

- Press the **M** button.
→ The “Saving data” – “**MEMORY**” menu is activated.

Saving data



- All programmed data is saved by pressing the **S** button. You will be returned to the menu item “**Selecting the module / channel strip**” via **A** (page 16).
→ By pressing the **M** button, you will be returned to the menu item “**Selecting the module / channel strip**” via **A** **without** saving the programmed data.

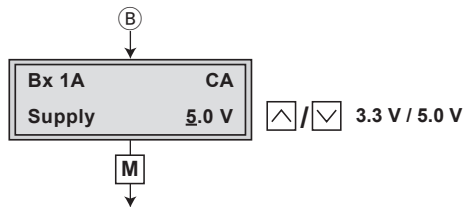
5.4.1 Setting the CA module

In order for this function of the CA module to be possible, stations capable of being decoded by the CA module you are using and your smart card must be selected in the "Setting the station filter" – "**PROGRAM**" menu (page 23).

Where both encrypted stations and unencrypted regional broadcasters are transmitted via a single channel, short-term picture loss may occur when switching between encrypted and unencrypted broadcasts.

Setting the operating voltage for the CA module

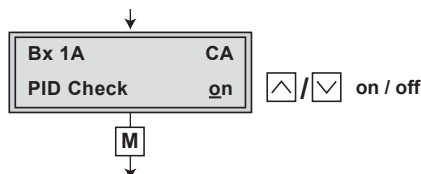
In this menu the operating voltage for the CA module can be set.



- Use the buttons to set the operating voltage for the CA module ("**3.3 V**" / "**5 V**").
- Press the button.
 - The "Setting the PID monitoring" – "**CA PID Check**" menu is activated.

Setting the PID monitoring

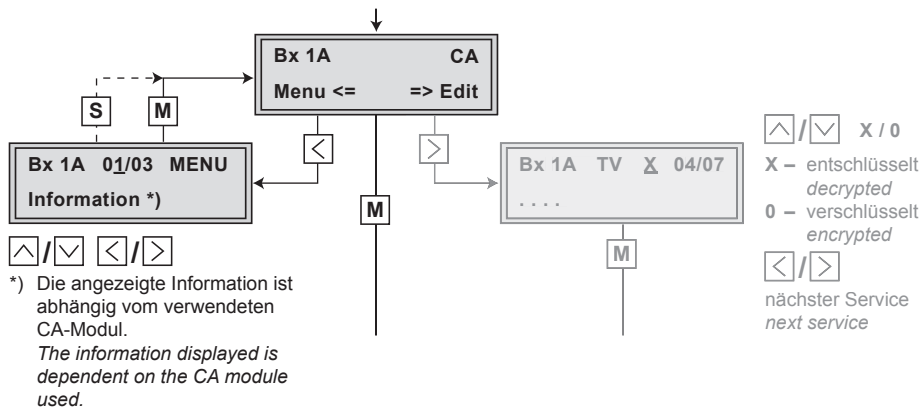
The factory default of the PID monitoring is switched on. If particular PIDs are not decrypted the CI module is reset. Additionally dropouts may occur if several stations are decrypted. To prevent this the PID monitoring can be switched off.



- Use the buttons to switch “off” or “on” the PID monitoring.
- Press the button.
 - The “Configuring the CA module” – “CA” menu is activated.

Configuring the CA module

A menu has been provided for these settings, which is displayed on your TV screen. The menu varies according to which CA module you are using. For this reason, please refer to the operating manual of your particular CA module. The menus are displayed on the TV screen whenever this is connected. The relevant information is shown in the head-end station. This may appear as a fixed display or as scrolling text according to display capabilities.









→ By pressing the button you can skip the “Configuring the CA module” – “CA” menu and activate the “Setting the output signal” – “COFDM-MODE” menu (page 28).

- Press the button to activate the menu of the CA module.
 - The display shows e.g.: **Bx 1A 01/03 MENU Information**

Meaning of the indicators:

- "Bx 1A" – Slot 1, channel strip "A"
- "01/03" – The first of three menu items is activated.
- "MENU" – The menu of the CA module is activated.

For the explanation of further details please use the operating instructions of the CA module used.

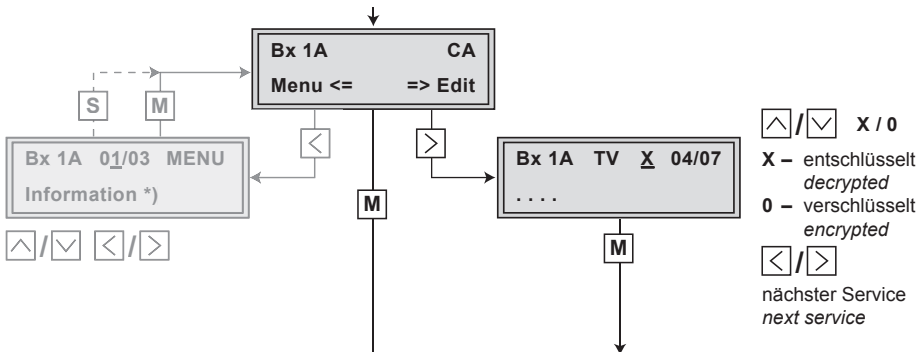
- Use the  buttons to activate the menu desired.
- Press the  button to activate the menu.
- Use the  buttons to select the function desired.
- To set the CA module use the  and  buttons.
- All settings are saved by pressing the **S** button.
 - You will be returned to the "Configuring the CA module" – "CA" menu item.
 - By pressing the **M** button you can cancel the settings in the menu of the CA module and are returned to the "Configuring the CA module" – "CA" menu.
- Press the  button.
 - The "Selecting stations" – "CA Edit" is activated.

Selecting stations

In this menu you select the stations wished from the encoded data stream, which are to be decoded.

→ The display shows e.g.: **Bx 1A TV X 04/07**

....



Meaning of the indicators in the example:

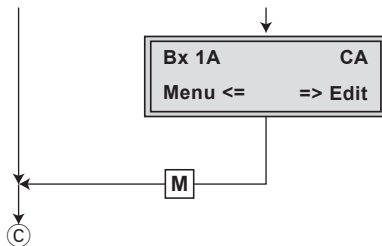
- "Bx 1A" – Slot 1, channel strip "A"
- "TV" – TV channel type
- "X" – The currently selected station is decrypted.
- "04/07" – The 4th of 7 stations read is being displayed.
- ". . . ." – Station name

Further possible terms displayed:

- "RA" – Radio channel type
- "O" – The currently selected station is encrypted.

- Use the buttons to call up the stations in sequential order which are to be decoded, then use to decrypt (" X ") or not to decrypt them (" O ").
- Save changes and activate the station filter:
Press the button.

→ The filter is activated. The display shows the "Configuring the CA module" – "CA" menu.



- Press the button.
→ The "Setting the output signal" – "COFDM-MODE" menu is activated (page 28).

6 Final procedures



After installing the head-end station, upgrading accessories or installing modules it is necessary to tighten all cable connections, F terminals and cover screws in order to maintain compliance with current EMC regulations.

- Securely tighten the cable connections using an appropriate open-ended spanner.
- After programming, connect the modulator output (D) to one of the input sockets (G) of the output collector (page 10, fig. 4).
- Test the output level of the output collector according to the STC 160 assembly instructions and set the output level required for the cable system.
- Mount the base plate and the front cover (see STC 160 assembly instructions).

7 Channel and frequency tables

Advice for a frequency raster (8 MHz) in the band I/III

Frequency Frequency [MHz]	Frequency Frequency [MHz]	Frequency Frequency [MHz]	Frequency Frequency [MHz]	Frequency Frequency [MHz]	Frequency Frequency [MHz]
42.00	82.00	146.00	186.00	226.00	266.00
50.00	114.00	154.00	194.00	234.00	274.00
58.00	122.00	162.00	202.00	242.00	282.00
66.00	130.00	170.00	210.00	250.00	290.00
74.00	138.00	178.00	218.00	258.00	298.00

Channel-/frequency raster for DVB-T (band III, bandwidth 7 MHz)

Kanal Channel	Frequenz Frequency [MHz]	Kanal Channel	Frequenz Frequency [MHz]	Kanal Channel	Frequenz Frequency [MHz]
C 5	177.5	C 8	198.5	C 11	219.5
C 6	184.5	C 9	205.5	C 12	226.5
C 7	191.5	C 10	212.5		

CCIR – Hyperband (frequency raster 8 MHz)

Kanal Channel	Kanalmittefrequenz Channel centre frequency [MHz]	Kanal Channel	Kanalmittefrequenz Channel centre frequency [MHz]	Kanal Channel	Kanalmittefrequenz Channel centre frequency [MHz]	Kanal Channel	Kanalmittefrequenz Channel centre frequency [MHz]	Kanal Channel	Kanalmittefrequenz Channel centre frequency [MHz]
S 21	306.00	S 26	346.00	S 30	378.00	S 34	410.00	S 38	442.00
S 22	314.00	S 27	354.00	S 31	386.00	S 35	418.00	S 39	450.00
S 23	322.00	S 28	362.00	S 32	394.00	S 36	426.00	S 40	458.00
S 24	330.00	S 29	370.00	S 33	402.00	S 37	434.00	S 41	466.00
S 25	338.00								

CCIR – Band IV/V (frequency raster 8 MHz)

C 21	474.00	C 31	554.00	C 41	634.00	C 51	714.00	C 61	794.00
C 22	482.00	C 32	562.00	C 42	642.00	C 52	722.00	C 62	802.00
C 23	490.00	C 33	570.00	C 43	650.00	C 53	730.00	C 63	810.00
C 24	498.00	C 34	578.00	C 44	658.00	C 54	738.00	C 64	818.00
C 25	506.00	C 35	586.00	C 45	666.00	C 55	746.00	C 65	826.00
C 26	514.00	C 36	594.00	C 46	674.00	C 56	754.00	C 66	834.00
C 27	522.00	C 37	602.00	C 47	682.00	C 57	762.00	C 67	842.00
C 28	530.00	C 38	610.00	C 48	690.00	C 58	770.00	C 68	850.00
C 29	538.00	C 39	618.00	C 49	698.00	C 59	778.00	C 69	858.00
C 30	546.00	C 40	626.00	C 50	706.00	C 60	786.00		

