Teletext Inserter Firmware

User's Manual

Contents

The information in this manual was compiled with care and to our best knowledge; nevertheless there are probably some errors left in this document. We do not take legal or any other responsibility for the correctness of any information.

We are happy to receive your feedback. If you found an error or think that something should be explained in greater detail, don't hesitate to contact us.

0 Definition

The SR-Systems Teletext Inserter allows to extract analog Teletext from a ITU656 compatible video stream, convert the Teletext to the DVB Teletext format and insert it into the Transport Stream that is output by the SR-Systems MPEG encoder.

1 Frontpanel

The Teletext Inserter can be controlled via an optional LCD/keypad unit connected to the frontpanel connector. The frontpanel consists of a LC Display, several LEDs and buttons.
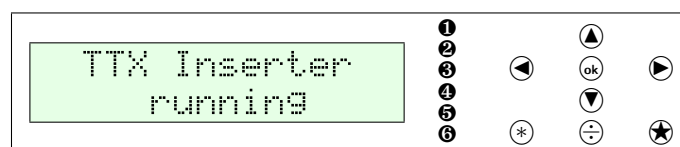
Figure 1: Frontpanel display and button arrangement

❶	Power LED
❷	not used
❸	not used
❹	FPGA Status LED
❺	not used
❻	not used

★	Enter and exit the menu, abort data entries
⊙ok	Edit the current menu item and commit the changes
▲ ▼	Browse menu categories, change character while editing an item
◄ ►	Browse menu items within a category, move cursor while editing an item
✳	Switch display backlight on and off
÷	not used

1.1 Status Screen

Under normal conditions, the frontpanel display shows the Teletext Inserter status screen. On this screen, the first line shows the product name. The second line shows the current status code. See the *Teletext Inserter Status Codes* in section 5 on page 14 for a list of possible messages and their meaning.
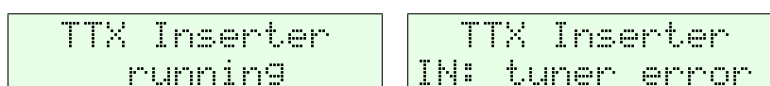
Figure 2: Teletext Inserter status screen without and with error message

1.2 Configuration Menu

Whenever you see the status screen on the frontpanel display, pushing the ✪ button enters the configuration menu. The menu items are grouped in various categories. To select a category, use the ▲ and ▼ buttons. The ◄ and ► buttons will browse the items within the selected category. Use the ▲ and ▼ buttons again to select a different category. See *Teletext Inserter Menu Structure* in section 3 on page 5 for a list of all available categories and menu items. Press the Ⓞ button to edit the menu item currently displayed. Press the ✪ button to exit the menu and return to the status screen.

```
Category              Video Format   ◄►
Encoder            ↕  PAL
```
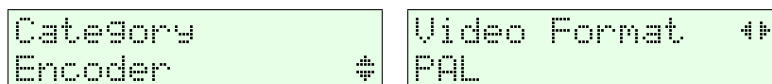
Figure 3: Category and menu item selection

After selecting an item for editing with the Ⓞ button, the value can be changed with the ◄ and ► buttons. If the item does not represent a distinct set of options but a number or a text string, the ◄ and ► buttons move the cursor and ▲ and ▼ change the character under the cursor. Use the Ⓞ button to save the changes and press the ✪ button to revert the modifications and return to the item selection.

```
Video Format          System Bitrate◄►
◄       PAL        ►  4000 kbps
```
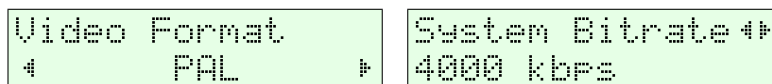
Figure 4: Editing an item with distinct options and a string item

2 Controlling the Teletext Inserter via RS232

All configuration options that are available on the frontpanel can also be modified via the RS232 interface on the Teletext Inserter PCB. Please refer to the Teletext Inserter hardware datasheet[1] for the pinout.

2.1 Establishing a Connection

The RS232 interface can be used with standard terminal software, e.g. HyperTerminal (included with some versions of the Windows operating system), Putty[2] or any other VT100 compatible terminal software. Set your PC serial port to 115200 Baud, eight bits per character, no parity, one stopbit (115k2–8N1) and disable any flow control.

When powering up your Teletext Inserter, you should see a boot message similar to this example:

```
TTX Inserter Firmware V16.7
(c) 2008-2010 maintech GmbH

FPGA Bus OK.
FPGA firmware v050 successfully uploaded
```

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[1]   Teletext Inserter hardware datasheet: http://www.maintech.de/DSTTX
[2]   Download Putty at http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html

2.2 Changing Settings

After the boot process is complete, the Teletext Inserter displays its main menu, which also can be re-displayed by pressing ⟦Enter⟧ in the terminal software.

```
TTX Inserter Mainmenu
1) show status
2) Input Settings
3) PSI Settings
4) Serial Bridge
> _
```

A menu option is selected by entering its number followed by pressing ⟦Enter⟧ .

3 Menu Structure

3.1 Input

3.1.1 Input Mode / Input Mode

The Teletext Inserter works only in combination with the SR-Systems MPEG Encoder – so the TS input mode is fixed to *Encoder* and cannot be changed. The TS input always latches data at the rising clock edge.

☞ The Teletext Inserter works only in combination with the SR-Systems MPEG Encoder V4 or later models. It does not work with the MPEG Encoder V3. The Teletext Inserter cannot be attached to MPEG Encoders that have the SDI Input option installed.

Selected Value	Description
Encoder	The Teletext Inserter will configure and control an SR-Systems MPEG2 encoder module connected to the TS input port.

3.1.2 Output Mode / Output Mode

This menu item allows to change the way the TS output works.

Selected Value	Description
automatic	The TS output clock direction is set automatically which means that TS clock for the encoder is generated by the Teletext Inserter and is also passed to the TS output port.

Selected Value	Description
ext. clock	The TS clock is not driven on TS output – the Teletext Inserter expects to receive the TS clock on the TS output port.
int. clock	The TS clock is driven on TS output and is the same clock signal as on the TS input port (same as *automatic*).

3.2 PSI Settings

The Teletext Inserter has a built-in PSI table generator which generates ETSI EN 300 468 compliant PSI and SI tables for the connected MPEG encoder or – in extended mode – for an arbitrary number of external services.

The configuration for the extended mode is created with the help of our maintech Mux Configurator[3] and uploaded to the multiplexer via XModem.

3.2.1 PSI Table Generator / PSI Tables

Selected Value	Description
disabled	The table generator in the Teletext Inserter is disabled.
simple	The simple table generator, which generates tables for the encoder directly connected to the Teletext Inserter, is enabled.
extended	The extended table generator, which is configured with the help of the maintech Mux Configurator, is enabled.

3.2.2 Stream ID

Set the transport stream ID that is transmitted in PAT, NIT and SDT for the encoded services.

3.2.3 Network ID

Set the network ID that is transmitted in the NIT for the encoded services.

3.2.4 Repetition

Set the PSI table repetition time in ms. Valid values are between 25 ms and 500 ms. Setting the repetition rate to 250 ms results in the transmission of the complete set of PSI tables 4 times per second.

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[3]   See http://www.maintech.de/en/support/information/ for the MuxConfigurator

3.2.5 Network Name

Set the network name that is transmitted in the NIT for the encoded services.

3.2.6 Upload PSI tables

☞ This menu item is only available if the extended table generator is enabled. It is only accessible via the serial port.

Select this menu item to upload a binary configuration file generated by the maintech MUX configurator. After selection, you need to upload the file via XModem.

3.3 Encoder Settings

The *Encoder* submenu is shown if the TS input port is configured to *Encoder* (see 3.1.1).

3.3.1 System Bitrate

Set the encoder's system bit rate (audio, video and tables) to the given value. The modulator does not check if your configured system bitrate fits into the bandwidth provided by the configured modulation settings. The user has to make sure that the system bitrate is at least 3% below the modulation bitrate. Please enter a bitrate value based on 188-byte-packets in kBit/s with possible values between 1000 kBit/s and 20000 kBit/s. If the given value is too low, the encoding process will stop at the first buffer overflow.

3.3.2 Video Input

This selects the used hardware input for the video signal.

Selected Value	Description
disabled	Do not encode a video signal. The stream will be announced as radio service.
CVBS	Encode signal from the encoder's CVBS input.
YC	Encode signal from the encoder's Y/C (S-Video) input.
YCbCr	Encode YCbCr signal from the encoder's external video connector. Pin 10 is Y, pin 12 is Cb, Pin 14 is Cr.
RGB	Encode RGB video signal from the encoder's external video connector. Pin 10 is green, pin 12 is blue, pin 14 is red.

Selected Value	Description
SCART	Encode RGBS (RGB with external sync) video signal from the encoder's external video connector. Pin 8 is sync, pin 10 is green, pin 12 is blue, pin 14 is red.
SDI	Encode signal from the attachable SDI input board.

☞ YCbCr, RGB and SCART are only available if a newer encoder board with TVP video decoder-chip is connected. Older encoders with SAA video decoder only support CVBS and Y/C. See the SR-Systems MPEG encoder datasheet for information about the external video connector: http://download.sr-systems.de/Desc/MPEG-Encoder-V4_Desc-en_075dpi.pdf

3.3.3 Video Format

The *Video Format* menu item configures the encoder to the format that is used on the input signal.

☞ The Video Format configuration is not available when SDI is selected on an encoder with a new SDI input extension board. The SDI extension board will autodetect the video format in that case.

Selected Value	Description
PAL	Standard PAL television signal
PAL-60	The video signal is interpreted as PAL-60 (PAL with 60 Hz and 525 lines)
PAL-M-60	The video signal is interpreted as PAL-M (PAL with 60 Hz and 525 lines)
PAL-N	The video signal is interpreted as PAL-60 (PAL with 60 Hz and 525 lines)
NTSC	The video signal is interpreted as NTSC
NTSC-4.43	NTSC with color carrier at 4.43 MHz
SECAM	The video signal is interpreted as SECAM

☞ PAL-60, PAL-M, PAL-N and NTSC-4.43 are only available if a newer encoder with TVP video decoder is connected. Older encoders with SAA video decoder only support PAL, NTSC and SECAM.

3.3.4 Video Resolution / Resolution

Selected Value	Description

Selected Value	Description
D1	The video image is encoded with full resolution: 720x576
HD1	The video image is encoded with half resolution: 360x576
CIF	The video image is encoded with quarter resolution: 360x288

3.3.5 Video GOP Mode / GOP Mode

The *GOP Mode* menu item defines how the encoder uses different frame types while encoding the video stream.

Selected Value	Description
I	Each GOP consists only of I-frames
IP	The encoder uses one I-frame and then only P-frames inside a GOP. For a GOP size of ten, the resulting GOP will look like this: IPPPPPPPPP.
IBP	The encoder uses an I-frame at the beginning of the GOP and encodes the rest in B and P frames. For a GOP size of ten, the resulting GOP will look like this: IBPBPBPBPB.
IBBP	The encoder uses an I-frame at the beginning of each GOP and encodes the rest in B and P frames. For a GOP size of ten, the resulting GOP will look like this: IBBPBBPBBP.

3.3.6 Video AGC

The *Video AGC* menu item controls the automatic gain control of the video input.

Selected Value	Description
disabled	The video gain is set manually using the *Video Gain* setting.
enabled	The automatic gain control of the video input is active.

☞ The video AGC and video gain settings are not available for older encoders with SAA video ADC. If the input is set to SDI, the video AGC is also not available.

3.3.7 Video Gain

The *Video Gain* menu item controls the video gain if the automatic gain control is disabled. Possible values are from 0 to 300 where 148 is the default value.

3.3.8 Audio Input / Audio

This menu item decides if audio is encoded and transmitted. For video-only mode, set this to *disabled*.

Selected Value	Description
disabled	No audio data is encoded and transmitted.
analog	Audio is encoded from the encoder's analog inputs.
SDI	Audio is extracted and encoded from the attached SDI input port.

3.3.9 Audio Channel

This menu item selects the audio channels for de-embedding from SDI. It is only available when a SDI input module with support for embedded audio is attached to the TS input port.

Possible values are: 1.12, 1.34, 2.12, 2.34, 3.12, 3.34, 4.12 and 4.34.

3.3.10 Audio Volume

The *Audio Volume* menu item lets the user attenuate the received SDI audio signal before encoding. It is only available when a SDI input module with support for embedded audio is attached to the TS input port. Possible values are in the range of 0 dB to -60 dB.

3.3.11 Audio Mode

Configures the audio channel mode for the encoded audio data.

Selected Value	Description
Stereo	The audio from the left and right input is encoded as stereo signal.
Joint Stereo	Stereo encoding with better quality but less stereo channel separation.
Dual Channel	The signal from the left and right input is encoded as two separate mono channels.
Single Channel	The audio is encoded as single mono channel.

3.3.12 Audio Samplerate / Samplerate

Configures the sample rate for analog audio input.

Possible values are: 32 kHz, 44.1 kHz, 48 kHz.

3.3.13 Audio Bitrate / Bitrate

Configures the bitrate that the encoder uses for audio encoding. More bitrate results in better audio quality. Possible values depend on the selected *Audio Mode* (see 3.3.11).

Possible values for **Stereo**, **Joint Stereo** and **Dual Channel**: 64, 96, 112, 128, 160, 192, 224 and 256 kBit/s. CD quality is reached at approx. 224 kBit/s.

Possible values for **Single Channel**: 32, 48, 56, 64, 80, 96, 112, 128, 160 and 192 kBit/s. CD quality is reached at approx. 160 kBit/s.

3.3.14 Program Video PID / Video PID

Set the DVB PID used to transmit the video data. Valid values are between 0x0020 and 0x1FFE. The video PID must be unique – make sure that it is not used for anything else (e.g. audio, PMT, etc.) If you plan to multiplex multiple streams, make sure that the video PID is unique among all other PIDs in the resulting multiplex.

3.3.15 Program Audio PID / Audio PID

Set the DVB PID used to transmit the audio data. Valid values are between 0x0020 and 0x1FFE. The audio PID must be unique – make sure that it is not used for anything else (e.g. video, PMT, etc.) If you plan to multiplex multiple streams, make sure that the audio PID is unique among all other PIDs in the resulting multiplex.

3.3.16 Program PMT PID / PMT PID

Set the DVB PID used to transmit the PMT for the encoded service. Valid values are between 0x0020 and 0x1FFE. The PMT PID must be a unique PID that is not used for video, audio or anything else. If you plan to multiplex multiple streams, make sure that the PMT PID is unique in the whole multiplex.

3.3.17 Program Teletext PID / TTX PID

Set the DVB PID used to transmit Teletext data for the encoded service. Valid values are between 0x0020 and 0x1FFE. The Teletext PID must be a unique PID that is not used for video, audio, PMT or anything else. If you plan to multiplex multiple streams, make sure that the Teletext PID is unique in the whole multiplex.

3.3.18 Program ID

Set the service ID transmitted in the PAT, PMT, NIT and SDT.

3.3.19 Program Provider / Program Prov.

Set the service provider name transmitted in the SDT.

3.3.20 Program Name

Set the service name transmitted in the SDT.

3.3.21 LCN mode

Determines if a Logical Channel Number for this service is sent in the NIT.

Selected Value	Description
disabled	No Logical Channel Number is signalled for the service.
visible	The Logical Channel Number is signalled as visible channel.
hidden	The Logical Channel Number is signalled as hidden command.

3.3.22 LCN number

Set the Logical Channel Number that is sent in the NIT for this channel.

☞ This menu item is only shown if *LCN mode* is set to *visible* or *hidden*.

4 Verbose Status Report

When controlling the Teletext Inserter via the RS232 serial port as described in section 2, you can get a verbose status report from the Teletext Inserter by choosing option 1 (*Show Status*) in the main menu.

The meanings of the different lines in the verbose status reports are explained in the sections below.

4.1 Product/Version Information

```
TTX Inserter CPU V16.7 FPGA 050
```

This line gives you information about the product (TTX Inserter), the CPU and the FPGA software versions.

☞ This line may be missing for older software versions. In that case, please look at the bootup messages for software version information.

4.2 Global Status

```
Current Status: running
```

This line gives you information about the current global status of the Teletext Inserter. The status message shown here is the same as shown on the frontpanel display. Detailed information about the possible status messages and their meaning can be found in section 5.

4.3 Encoder Status

```
IN: encoder running
```

This status line tells you about the status of the TS input port and the status of the connected MPEG-2 encoder module.

Status Display	Description
encoder error (BOOT)	The MPEG-2 encoder on the TS input port could not be booted. This could happen if there is no encoder connected, if there is a problem with the cable between encoder and Teletext Inserter or if the encoder is defective.
encoder error (...)	The MPEG-2 encoder on the TS input port was started but an error occured during configuration. The abbreviations in the round brackets indicate what part of counfiguration failed. Possible values are VID, AUD, BR and PID.
encoder running	The MPEG-2 encoder on the TS input port is running.

4.4 PSI Status

```
Basic PSI Generator Active
```

This line shows the status of the Teletext Inserter's built-in table generator.

Status Display	Description
PSI Generator disabled	The Teletext Inserter's PSI Generator was disabled. The Teletext Inserter will not generate any PSI or SI tables.
Basic PSI Generator active	The Teletext Inserter's Basic PSI Generator is active. The Teletext Inserter will generate PAT, SDT, NIT and PMTs for the connected MPEG-2 encoders.
Custom PSI/Filter active	The Teletext Inserter's Extended PSI Generator is active and a custom tableset and/or PID filter was uploaded and is now active.

Status Display	Description
Custom PSI/Filter incompatible	The custom tableset / PID filter you have uploaded is incompatible with this Teletext Inserter's firmware. Please use the latest version of the maintech Mux Configurator (see http://www.maintech.de/en/support/information/) to generate the .mbn-File and update the Teletext Inserter firmware to the latest version.
Custom PSI/Filter empty	The Teletext Inserter's Extended PSI Generator is active but no custom tableset and/or PID filter was uploaded. Use the maintech Mux Configurator to set up a custom table set and/or PID filter. Export this configuration as a .mbn file and upload this file to the Teletext Inserter.
Custom PSI/Filter error (...)	The Teletext Inserter's Extended PSI Generator is active and an error occured while executing the custom table set or filter program. Please ask for support.

5 Status Codes

Possible status codes that are reported by the Teletext Inserter on its frontpanel:

Status Display	Description
`booting`	The Teletext Inserter firmware is booting and initializing the hardware. This state is reported only for a short time during powerup.
`IN: loading...`	The Teletext Inserter is uploading firmware to an MPEG encoder connected to a TS input port. This state is reported for a short time during powerup and after changing the TS input mode to *MPEG Encoder*.
`FPGA boot error`	Loading the FPGA failed. This status probably indicates a hardware failure. Please ask for support.
`IN: encoder erro`	The TS input mode of the TS input port is set to encoder, but an MPEG encoder was not detected or an error occurred while starting the encoder. Please make sure that your encoder is connected properly or try a different encoder if you suspect a hardware problem.
`running`	The Teletext Inserter is working.
`<unknown>`	The Teletext Inserter is in an unknown state. This indicates a severe hardware or software error. Power-cycle your Teletext Inserter and, if the problem persists, ask for support.

6 Control by MiniMux/MidiMux

The Teletext Inserter can be controlled by a MiniMux or MidiMux if it is connected to one of the multiplexers' TS input ports. This means that you are able to control all encoder settings from the MiniMux/MidiMux's serial port or display/keypad unit.

To make the remote control feature work, you need to perform the following steps:

1. Make sure that multiplexer and Teletext Inserter are connected with a Type 1, 1X or 2 cable. We recommend using a Type 2 cable. A Type 3 cable will not work.[4]

2. Make sure that the multiplexers's TS input port is configured to *TTX*.

3. Make sure that your multiplexer has the latest firmware and your Teletext Inserter has at least Firmware Version 16.1. Contact us if your hardware has older firmware.

When the TTX inserter is controlled by a multiplexer, the PSI table generator will automatically be disabled as the multiplexer generates all necessary tables.

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[4] For information about the different cable types, see the maintech cable guide: http://www.maintech.de/ANCAB