S02
Stereo Generator

User Manual

April 2017

V01.08

Content

1. Symbols in this manual

1.1. References and Hyperlinks in this PDF File

The original text document of this manual uses bookmarks for reference purposes. If you read this manual as a non-print version, please note that this PDF file also contains all bookmarks! So you can navigate through the document via the content overview in your PDF viewing software if you activate "bookmarks view".

All references to pages, sections, figures and tables as well as hyperlinks in the text identify a location within this PDF file. Just click the reference to find the referred passage in the text!

1.2. Warning signs and their meaning

The following warning signals are used in this user manual:

	Warning of general danger location
	Warning of electric shock
	Warning of hot surface
	Warning of fire hazard

1.3. Tags and their meaning

The following signal words are used in the product documentation in order to warn the reader about risks and dangers. The tags described here are always used only in connection with the related product documentation and the related product.

⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
NOTICE	Describes precautions necessary to protect the equipment.
	**NOTE:** Useful information for the user.

2. Introduction

Description

The Stereo Generator is a 19”, 1 height unit device, used for stereophonic broadcasts according to recommendation ITU-R BS.450 (pilot tone system). It is intended for professional continuous usage on unmanned broadcasting stations. The integrated limiter functions* of the S02 Stereo Generator make it possible to reliably meet international valid modulation attributes, like peak deviation and modulation power. The modulation source monitoring with automatic audio input switching function enables a stable operation.

*Not applicable on version without signal limiters

Control

The S02 can be operated either directly via front panel access or via PC remote software access.

Additionally to the left-channel and right-channel analog AF inputs, the S02 comes with an AES/EBU digital input, two inputs for additional signals (e.g. RDS/RBDS) as well as additional interfaces.

User

Only experienced technical personal or engineers should operate the S02 Stereo Generator. Basic knowledge is required.

NOTE: Please read this instruction carefully before attempting to operate the unit. Save this instructions manual carefully – it contains important safety and operating instructions for the device.

NOTE: The S02 model on the cover graphic may differ from the supplied S02 model.

NOTE: Configurations, functions and specifications may change for further development without prior notice.

3. Safety Instructions

For a secure operation of the device the user should read and hold on all safety instructions mentioned in this manual before the first operation.

WARNING	Non-compliance with the safety instructions can lead to serious injury.

Any changes on the device or operation of the parts not having been proved and released by the manufacturer can lead to unforeseen damage.

Every improper use of the device and all actions on the device not mentioned in this user manual are regarded as a not allowed misuse outside the statutory limits for liability of the manufacturer.

If you sell the device or give it to another person, attach this user manual to the device.

Never operate the device, if it does not function properly. If the device or its part is out of order, put it out of operation. Never repair the device by yourself. If there are any damages in the device, send it immediately to 2wcom Systems for maintenance or dispose it professionally according to the regional disposal regulations.

Keep the device away from unauthorized persons.

DANGER	
	**DANGER of electric shock** Plug the device into a grounded power socket only. Never remove the grounding wire/contact. Never open the housing of the device by yourself. Never touch open electrical parts. Dangerously high voltages are present inside the housing. Even after disconnecting the mains supply, dangerously high voltage levels may be present for a certain time. Do not touch the device with wet hands. Never expose the device to liquids. If any liquid comes inside the housing, immediately disconnect the device completely from the power supply. Do not continue operating the device.

	**FIRE HAZARD of overheating or electric shock** Ensure sufficient heat dissipation during operation. Avoid following when installing the device: – non-ventilated environment, for example a narrow shelve or built-in rack; – extremely warm or cold place; – direct sunlight exposure; – too high or too low temperature; – extremely wet or dusty environment. Do not operate the device in the presence of flammable gases. Do not cover the ventilation openings of the device to avoid heat accumulation. Do not put objects with open flames such as burning candles on the device. Do not put heavy objects on the supply cord. A damaged cord can lead to fire or electric shock hazards. To disconnect the supply cord, drag always the plug and never the cable to avoid the cord damage.

⚠ WARNING	
	**WARNING of explosive atmosphere** Risk of the explosion hazard. Do **not** use the device in an explosive environment.
	**WARNING of hot surface** The surface of the device can heat up during operation. The device is equipped with a passive cooling system. Do not touch the surface of the device during operation.

NOTICE	
	CAUTION: Risk of equipment damage *Before the first operation:*

	Check the housing, the front panel, the supply cord and the plug for visible damage (e.g. scratches, cracks, damaged isolation and abrasion) In case of damage, unplug immediately the supply cord. Never operate device with a damaged supply cord. All damaged components must be replaced immediately. *Installation:* Use only a grounded three-wire power supply cord and -plug that complies with the national regulations. If necessary, another than the supplied supply cord has to be used, in compliance with the regulations of the country where the device is operated. Make sure that the AC power outlet is next to the device and readily accessible to the user. *Installation of other devices:* External devices which are connected to the device could be damaged by the device or damage the device itself if the output levels exceed the specified limits. *Cleaning:* Do not use corrosive detergents on the device such as benzine, thinner, alcohol or acetone. Clean the surface of the device only with a soft dry cloth.

4. Supplied Parts

- S02 Stereo Generator
- Power supply cord*
- RJ45-patchcable
- On request, free: 2x 25-pol D-Sub connector (soldering) for GPIO ([Optical Coupler Input]/ [Relay Output])
- PC Software to download: “S02Config” for Win98, 2000, XP and Vista for configuring and remote operation
- User manual in PDF format to download; on request by paper

*available for different countries

NOTE: The scope of delivery may deviate in special cases.

5. Manufacturer

2wcom Systems GmbH • Am Sophienhof 8 • 24941 Flensburg • Germany

Phone (+49) 461 – 662830-0 • Fax (+49) 461 – 662830-11

contact@2wcom.com • www.2wcom.com

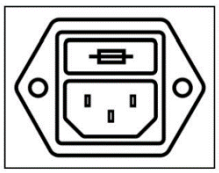
6. Installation

Best setup location

The device should be installed in a 19” rack. Avoid direct sunlight, proximity to radiators and air conditioning, dust, water, and chemicals. Choose a rack location that permits a clear view of the indicators on the device and ensure a sufficient heat dissipation of the device.

Mains supply connection

The device is designed for operation with 100 to 240 V AC, 50 to 60 Hz. Check the corresponding device labeling for compatibility to the domestic line voltage and frequency before connecting the IEC power connector to the mains supply!



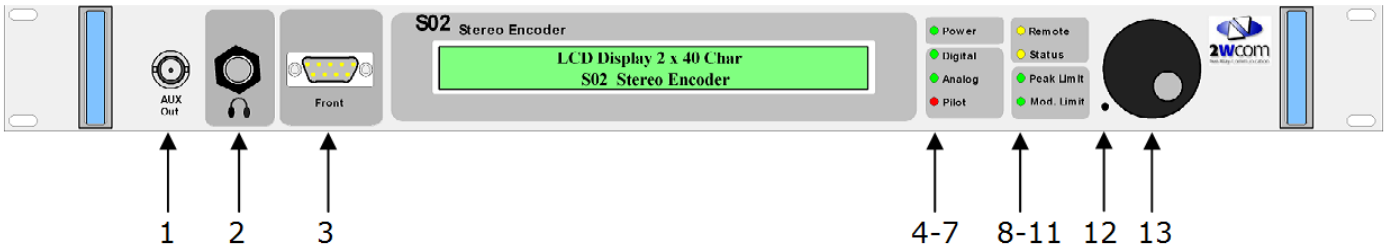
No power switch is available; unplug mains supply connector to remove power. Keep the mains supply plug readily accessible to the user.

⚠ WARNING

WARNING
Disconnect mains power plug before you open the housing.
Repair of the equipment must only be carried out by authorized and qualified personnel.
Read also Section “Safety Instructions” 7.

7.Control Elements and Connectors

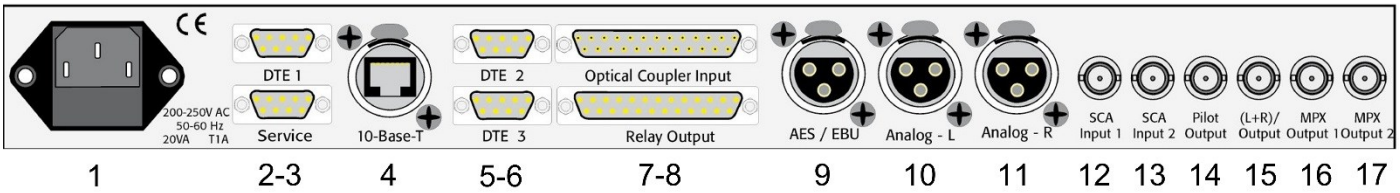
7.1. Front Panel



1	[AUX out]	The BNC female connector is a MPX test output, usable for diagnostic purposes, depending on the current configuration of the S02. Different signals are available at this connector.
2	Headphone connector [Headphone]	For test purposes the audio signal is available at the headphone connector.
3	[Front]	9-pole D-Sub connector for serial communication with S02config software
4	[Power]	LED indicator (green), active if mains supply is ok (LED #1)
5	[Digital]*	LED indicator (green), active if [AES/EBU] input is selected (LED #2)
6	[Analog]*	LED indicator (green), active if [Analog-L/R] input is selected (LED #3)
7	[Pilot]*	LED indicator (red), active if Pilot is deactivated (LED #4)
8	[Remote]*	LED indicator (yellow), active if there is remote access activity (LED #5)
9	[Status]*	(LED #6, no function assigned)
10	[Peak Limit]*	LED indicator (green), active if peak limiter is activated (LED #7, on S02 version w/o limiters no function assigned)
11	[Mod. Limit]*	LED indicator (green), active if modulation limiter is activated (LED #8; on S02 version w/o limiters no function assigned)
12	Reset-Taster (via hole)	Initiate warm start (use paperclip or similar)
13	[Jogwheel]	Navigate (rotate) and activate (push) in displayed menu structure

*Indicator functions can be changed prior to delivering on customers request. Therefore indicator functions may vary.

7.2. Back Panel



1	Power supply connector	Standardized supply connector with intergraded fuse holder. Fuse rating depends on main supply voltage: 100-120 V: T1.6 A (time lag); 5x20 mm; IEC; 250V 220-240 V: T1.0 A (time lag); 5x20 mm; IEC; 250V
2	[DTE 1]	9-pole D-Sub male connector for serial communications to the stereo generator
3	[Service]	This serial interface can be used for serving the TCP/IP-module only, not for configuring the stereo generator.
4	[10/100-Base-T]	RJ-45 connector for TCP/IP connections
5-6	[DTE 2/3]	9-pole D-Sub male connector for serial communications to the stereo generator
7	[Optical Coupler Input]	25-pole D-SUB female connector; floating inputs for switching signals. Functions can be assigned by customer via S02Config software.
8	[Relay Output]	25-pole D-Sub male connector is used to gain access to the relay contacts. Functions can be assigned by customer via S02Config software.
9	[AES/EBU]	XLR female; Digital audio input interface. • AES-EBU interface (up to 96 kHz sample rate) • Other formats: IEC60958, S/PDIF, EIAS CP1201
10	[Analog – L]	XLR female; Left channel analog audio input connector
11	[Analog – R]	XLR female; Right channel analog audio input connector
12	[SCA Input 1]	BNC female; Input for add-on signals like RDS or DARC
13	[SCA Input 2]	BNC female; Input for add-on signals like RDS or DARC
14	[Pilot Output]	BNC female; Sync output; 19 kHz pilot (sinus or square wave signal)
15	[(L+R)/2 Output 1]	BNC female; (L+R)/2 modulation output incl. pre-emphasis.
16	[MPX Output 1]	BNC female; Independent MPX output from stereo generator
17	[MPX Output 2]	BNC female; Independent MPX output from stereo generator

8. Operation

8.1. Status screen – display of configuration

The LED [Power] on the front panel turns on immediately when the power is on. Then, a configuration overview screen appears on the display.

The status screen shows four values:

Mode	Signal mode of the left and the right audio channel processing
Pilot	Level of the pilot signal in dBu or kHz
Peak-Dev	Level of the peak deviation limiter*
Peak-Mod	Level of the modulation power limiter*

*Stereo Generator models without included limiter functions display the selected signal source mode and the selected SCA additional signal input mode instead of [Peak-Dev] and [Peak-Mod].

Press Enter	Mode	Pilot	Peak-Dev	Peak-Mod
	xxx	xxx	xxx	xxx

NOTE: The displayed unit can be changed for specific values. If [kHz] is chosen, the adjustable value range depends on the adjusted signal/deviation relation.
The stated ranges relate to a signal/deviation relation setting of 6 dBu/40 kHz. See also configuration on page 31 and Signal / FM transmitter frequency deviation relation configuration on page 31.

8.2. Menu navigation introduction

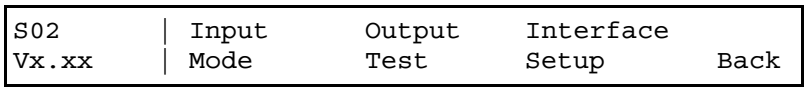
The S02 has an easy to handle menu structure. The [Jogwheel] can be rotated left and right to highlight displayed menu buttons. A highlighted menu button is indicated by a "→" cursor symbol left to the button. To navigate into the highlighted menu button, the [Jogwheel] has to be pushed one time. This can also be done to navigate into submenus. To navigate to the previous menu, the "Back" menu button has to be highlighted and selected (rotate and push the [Jogwheel]). To change settings or values, the part to be changed has to highlighted and selected. The configurable part is indicated by the symbols ">" and "<" and can be adjusted by rotating the [Jogwheel]. To confirm the configuration, the [Jogwheel] has to be pushed. Afterwards, the [Jogwheel] can be used for navigation as before.

For a better overview during navigation through the menu, every listed entry below shows the corresponding menu path.

8.3. Main menu

All S02 functions are accessible via a menu structure. The available functions are described in the following section. The order of the described menu parts is given by the menu structure of the S02.

Main menu appears after status screen:



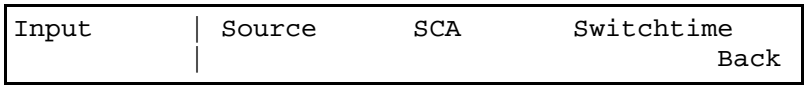
The indication in the left part of the main menu shows the firmware version number.

9.Signal input

9.1. Signal input configuration

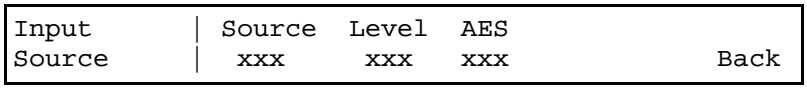
Main menu>Menu [Input]

A selection menu appears after selecting the [Input] menu. The audio source, SCA and the switching delay for the AutoDig mode can be chosen.



Main menu>Menu [Input]>Menu [Source]

This menu shows the signal source, the level in dBu or kHz, and the digital input (AES) in dBFS. All menu parts can be adjusted.



9.2. Signal source selection

Signal menu>Menu [Input]>Source

Possible settings are:

[Off]	Analog and Digital inputs deactivated
[Analog]	Analog-Input [Analog-L] and [Analog-R] activated
[Digital]	Digital-Input [AES/EBU] activated
[AutoDig]	Automatic signal source selection. See text.

In the Auto Digital mode (AutoDig) the S02 does take over the selection of the input source, where digital input has a higher priority and will be activated preferably.

The switching delays, switching criteria, and the corresponding signaling can be configured individually. Details of the configuration can be found in section Configuration of the modulation source monitoring on page 18. Details of the monitoring function can be found from page 34.

9.3. Analog Input reference level configuration

Main menu>Menu [Input]>[Source]>[Level]

Configuration of the analog input reference level. All other levels of the stereo generator are in reference to it.

Select [Level]. Adjustable values are between -18.1 and +18.0 dBu or 2.5 and 159.2 kHz.

9.4. Digital input reference level configuration

Main menu>Menu [Input]>[Source]>[AES]

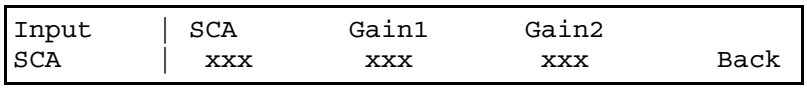
Configuration of the digital input (AES) reference level. All other levels of the stereo generator are in reference to it.

Select [AES]. Adjustable values are between -20 and 0dBFS.

9.5. [SCA] additional signal inputs configuration

Main menu>Menu [Input]>SCA

This menu displays the SCA configuration and the levels. The SCA input for RDS and DARC signals as well as the corresponding input levels can be adjusted.



Main menu>Menu [Input]>Menu [SCA]>[SCA]

Select [SCA]. Selectable settings are:

[Off]	SCA inputs deactivated
[SCA1]	[SCA1] input activated
[SCA2]	[SCA2] input activated
[SCA1+2]	[SCA1] and [SCA2] input activated

9.6. [SCA] gain configuration

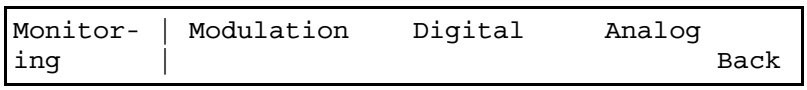
Main menu>Menu [Input]>Menu [SCA]>[Gain1] or [Gain2]

Select [Gain1] or [Gain2]. Selectable values are between -6.0 and +6.0 dB.

9.7. Configuration of the modulation source monitoring

Main menu>Menu [Input]>Menu [Monitoring]

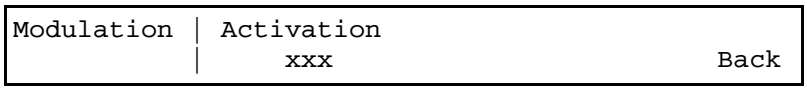
This menu can be used to configure the audio source monitoring.



9.8. Signaling configuration of the modulation source monitoring

Main menu>Menu [Input]>Menu [Monitoring]>[Modulation]

The submenu [Modulation] can be used to activate/deactivate the signaling of the modulation source monitoring.



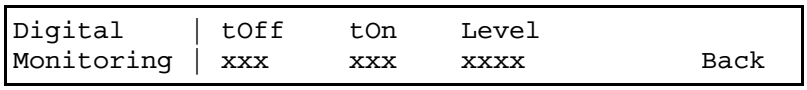
The following configuration is possible:

On	"Below limit" signaling active.
Off	No signaling of level falls below the limit. If the automatic input selection is activated, this function is still working.

9.9. Configuration of the digital input monitoring

Main menu>Menu [Input]>[Monitoring]>[Digital]

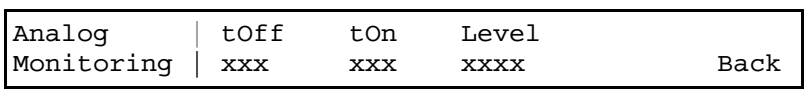
The submenu [Digital] is for the configuration of the delay time and the expected minimum level of the digital input. A signaling and an eventually input switching occurs if the present averaged level continuously falls below the specified limit for the specified time t_{Off}. A signaling and an eventually input reverse switching on a signal return works correspondingly with the time t_{On}. Possible values for the delay time are between 1 and 600 s, and for the minimum level between -55.0 and 0.0 dBFS.



9.10. Configuration of the analog input monitoring

Main menu>Menu [Input]>[Monitoring]>[Analog]

The submenu [Analog] is for the configuration of the delay time and the expected minimum level of the analog input. A signaling and an input switching occurs, if the present averaged level continuously falls below the specified minimum limit for the specified time t_{Off}. A signaling and an eventually input switch-back on a signal return works correspondingly with the time t_{On}. Possible values for the delay time are between 1 and 600 s, and for the minimum level between -40.0 and -6.0 dBu.



10. Signal output

10.1. Sinal output configuration

Main menu>Menu [Output]

This menu can be used to configure settings of the MPX outputs [MPX-Output 1] and [MPX Output 2], the AUX output [AUX-Out], the pilot output [Pilot], the signal limiters [Limiter] and the [Headphone] output.

```
Output   | MPX-Out      AUX-Out      Pilot
         | Limiter         Headphone          Back
```

10.2. MPX output configuration

Main menu>Menu [Output]>Menu [MPX-Out]

This menu can be used to configure the signal gain of the MPX Outputs [MPX Out1] and [MPX Out2]. The gain is adjustable between -6.0 and +6.0 dB.

```
Output    | MPX-Out
MPX-Out   | xxx                                Back
```

10.3. AUX output configuration

Main menu>Menu [Output]>Menu [AUX-Out]

This menu can be used to choose the type of signal at the [AUX-Out] output.

```
Output    | AUX-Out
AUX-Out   | xxx                                Back
```

Possible settings are:

[L]	Equivalent to the signal of the left input
[R]	Equivalent to the signal of the right input
[M]	(Main signal) equivalent to the signal for the monophonic receiver
[S]	(Side signal) enables a stereo receiver to decode the Land R signal in combination with the M signal
[Pilot]	Signal necessary to recover the stereo support carrier in stereo receivers
[SCA1]	Additional signal of [SCA1] input
[SCA2]	Additional signal of [SCA2] input
[SC1+2]	Combined signal of inputs [SCA1] and [SCA2]
[MPX]	Complete multiplex signal
[Off]	[AUX-Out] output deactivated

10.4. Pilot signal configuration

Main menu>Menu [Output]>Menu [Pilot]

This menu can be used to view and configure the level and the phase (phase in reference to 38 kHz signal) of the pilot signal.

Output	Pilot	Level	Phase	
Pilot	xxx	xxx	xxx	Back

10.5. [Pilot] waveform and operating state selection

Main menu>Menu [Output]>Menu [Pilot]>Submenu [Pilot]

Possible settings are:

[Off]	Pilot signal deactivated (in mode Stereo the M, S and SCA are still
[Sine]	Sine signal in MPX and sine signal on [Pilot output]
[Rect]	Sine signal in MPX and rectangular signal on [Pilot output]

The LED [Pilot] on the front panel is active if the pilot is deactivated.

10.6. Set up [Level]

Main menu>Menu [Output]>Menu [Pilot]>Submenu [Level]

Adjustment of the pilot level. Possible values are between -18.0 and -6.1 dBu or 2.5 and 10.0 kHz.

10.7. Set up [Phase]

Main menu>Menu [Output]>Menu [Pilot]>Submenu [Phase]

Adjustment of the pilot phase. Possible values are between -5.0° to +5.0°

10.8. Limiter configuration

Main menu>Menu [Output]>Menu [Limiter]

This menu can be used to view and adjust the peak deviation limiter [Peak-Dev] and the modulation power limiter [Mod-Limit] values (not applicable for model w/o limiter functions). For details of the limiter operation see section Peak deviation limiter and modulation power limiter of the S02on page 32.

Output	Peak-Dev		Mod-Limit		
Limiter	xxx	xxx	xxx	xxx	Back

Main menu>Menu [Output]>Menu [Limiter]>[Peak-Dev]*

This menu can be used to activate/deactivate the peak deviation limiter or to adjust the peak deviation limit. Possible values are between 0.0 and 100.00 kHz. The LED [Peak-Dev] on the front panel is active if the peak deviation limiter is activated.

Main menu>Menu [Output]>Menu [Limiter]>[Mod-Limit]*

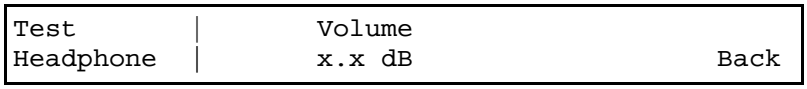
This menu can be used to activate/deactivate the modulation power limiter or to adjust the modulation power limit. Possible values are between -6 and +6 dBr. The LED [Mod.-Limit] on the front panel is active if the modulation power limiter is activated.

*Not applicable on version without signal limiters.

10.9. Headphone volume adjustment

Main menu>Menu [Output]>Menu [Headphone]

This menu can be used to adjust the level of the [Headphone] output. Possible values are between -60.0 and 0.0 dB.

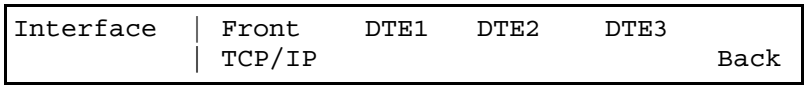


11. Interface

11.1. Interface configuration

Main menu>Menu [Interface]

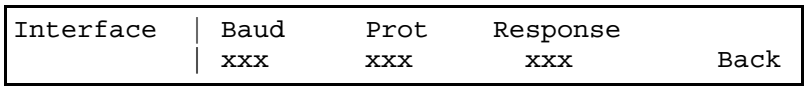
This menu can be used to choose the port to be configured. These are the serial front port [Front], the serial RS232 ports [DTE1], [DTE2], [DTE3] and the [TCP/IP] interface.



11.2. Serial RS-232 interface configuration

Main menu>Menu [Interface]>Submenu [Front] and [DTE1] – [DTE3]

The menu [Front] is for configuring the serial port on the front panel. The menus [DTE1], [DTE2] and [DTE3] are for configuring the serial ports on the rear side of the unit. The baud rate and other operating settings are adjustable for each port. For configuring the serial port timeout settings, please see Interface timeout configuration on page 31.



11.3. [Baud] [Baud] Baud rate configuration

This menu is for adjusting the communication speed on the serial RS-232 ports. Adjustable values see table:

1200	Baud
2400	Baud
4800	Baud
9600	Baud
19200	Baud
38400	Baud

11.4. [Prot] Display of UECP (Fixed interface protocol)

[Response]

This menu is for adjusting the operating mode of the serial RS-232 ports. The following modes can be chosen:

[None]	Stereo Generator receives data and sends no response
[Request]	Stereo Generator only answers the requests of the control software
[Spontan]	Stereo Generator confirms every incoming UECP frame by sending a response.

11.5. TCP/IP network interface configuration

Main menu>Menu [Interface]>Submenu [TCP/IP]

This menu is for viewing and configuring of the internal 10/100 Mbit TCP/IP interface. The settings are stored in the internal EEPROM.

```
Interface  | IP Address =255.255.255.255
           | Netmask    =255.255.255.255
```

Configurable settings are as follows:

[IP-Address]	Address, which is necessary for every component in an IP-network like the internet or intranet.
[Netmask]	Bitmask, which separates an IP-address into a network part and a host part.
[Gateway]	Address of the gateway computer, which routes the data traffic between intranet and internet.
[Port]	TCP port that is used for the data communication with the PC software “S02Config”.

The settings of the TCP/IP interface depend on the network, which us connected to the stereo generator. Therefore a responsible network administrator should provide all corresponding settings.

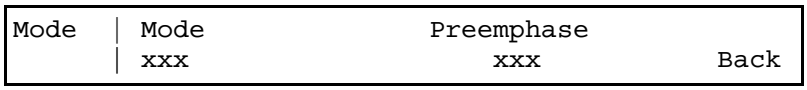
Menu navigation is done by highlighting the menu button, selecting it by pushing the [Jogwheel] and toggle from value to value by pushing the [Jogwheel]. One additional push of the [Jogwheel] leads back to menu navigation.

12. Generator

12.1. Generator configuration

Main menu>Menu [Mode]

This menu is for configuring the mode and the pre-emphasis of the S02 stereo generator.



12.2. Mono/Stereo mode configuration

Main menu>Menu [Mode]>[Mode]

Following modes can be chosen:

Stereo	Normal stereo operation with left and right channel
Mono-L	Mono operation, only left channel is used as M-signal
Mono-R	Mono operation, only right channel is used as M-signal
Testtone	Test mode operation

NOTE: That status screen of the display shows [Mode Test] to indicate the activated test mode operation. An interruption of the mains supply forces the S02 to switch back to the previous normal mode – test mode is then deactivated.

12.3. Pre-emphasis configuration

Main menu>Menu [Mode]>[Mode]>[Preemphase]

The S02 offers to choose different modes of pre-emphasis. The following modes can be chosen:

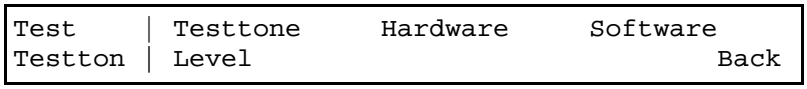
[Off]	Pre-emphasis off
[50µs]	Pre-emphasis on with time constant 50µs
[75µs]	Pre-emphasis on with time constant 75µs

13. Test function

13.1. Test function configuration

Main menu>Menu [Test]

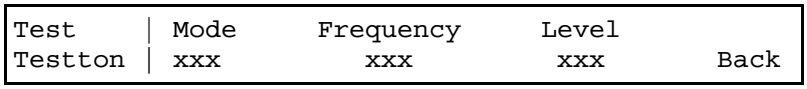
This menu is for choosing specific test functions of the S02 stereo generator. The menus [Testtone], [Hardware], [Software] and [Level] can be chosen.



13.2. Test tone configuration

Main menu>Menu [Test]>Submenu [Testtone]

This menu is for activating and adjusting a test tone. This test tone has a specific frequency and level. It is intended for analysis purposes.



13.3. Test tone mode configuration

Main menu>Menu [Test]>Submenu [Testtone]>[Mode]

[Off]	Test tone off
[L]	Test tone on left channel only
[R]	Test tone on right channel only
[R=L]	Test tone on left and right channel
[R=-L]	Test tone on right channel complementary to the left channel

13.4. Test tone frequency configuration

Main menu>Menu [Test]>Submenu [Testtone]>[Frequency]

The S02 offers specific frequencies for the test tone generation. Adjustable frequencies see table.

400 Hz
500 Hz
1 kHz
4 kHz
8 kHz
15 kHz

13.5. Test tone frequency configuration

Main menu>Menu [Test]>Submenu [Testtone]>[Level]

This menu is for adjusting the level of the generated test tone. Adjustable values are between -18.0 and +18.0 dBu or 2.5 and 159.2 kHz.

14. Hardware tests

14.1. Hardware test selection

Main menu>Menu [Test]>Submenu [Hardware]

This menu is for selecting a test of specific S02 functions. These are the LEDs, opto-isolated inputs, relay and the real-time clock.

14.2. Display and I/O test

Main menu>Menu [Test]>Submenu [Hardware]>[I/O Test]

This test mode activates the LED´s (all cycle but power LED is continuously on), the relay and the opto-isolated inputs processing for testing purposes.

14.3. Real-time clock display

Main menu>Menu [Test]>Submenu [Hardware]>[Clock]

This test mode displays the date and the time of the real-time clock without offset.

14.4. Opto-isolated input status

Main menu>Menu [Test]>Submenu [Hardware]>[Remote In]

This test mode displays the status of the opto-isolated inputs. Displayed inputs are 1 to 9 and A to C. A corresponding value of 0 means the input is open, a value of 1 means the input is pulled to ground.

14.5. Firmware version display

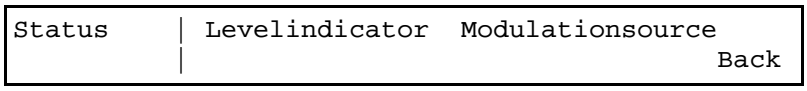
Main menu>Menu [Test]>Submenu [Software]

This menu displays firmware version information.

14.6. Level and status display selection

Main menu>Menu [Test]>Menu [Status]

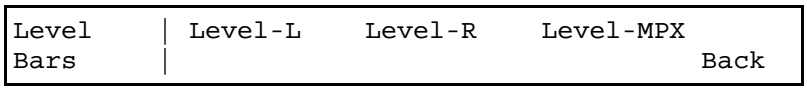
This menu contains submenus for showing displays of the modulation monitoring and the signal inputs and output.



14.7. Input and output level display

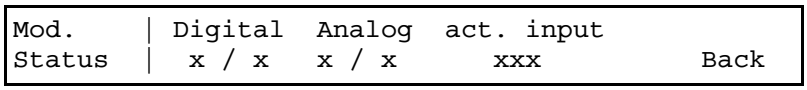
Main menu>Menu [Test]>Menu [Status]>[Levelindicator]

The submenus display the input level of the left [Level-L] and right [Level-R] channel and the output level of the MPX signal [Level-MPX]. The corresponding levels are displayed as a bar. If the level is lower than –48 dBu, a clear value will be displayed instead.



14.8. Analog and digital inputs state display

Main menu>Menu [Test]>Menu [Status]>[Modulationsource]



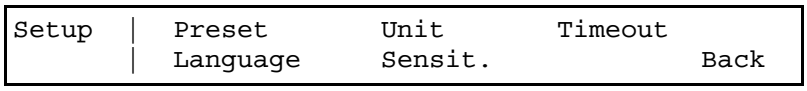
The submenu [Modulationsource] displays the active input ([Digital] or [Analog]). Additionally it is displayed, which channel of the corresponding input is active. An [R] or [L] indicates an active channel and a [-] an inactive channel.

15. Basic settings

15.1. Menu settings

Main menu>Menu [Setup]

The menu is for configuring basic settings of the S02 stereo generator. Configurable settings are [Preset] (stored user settings), [Unit] (unit of level displays), [Language] (menu language) and [Sensit.] (sensitivity - relation between signal level and transmitter FM signal deviation).



15.2. Preset configuration settings

Main menu>Menu [Setup]>[Preset]

This menu is for loading and saving preset configurations of the S02 stereo generator. 8 memories are available. The configurations of the following settings are stored:

Input	**Output**	**Limiter***
Source	MPX gain	Peak deviation limiter
Level	AUX output	Max. level
AES sensitivity	Pilot status	Modulation power limiter
SCA	Pilot level	Max. level
SCA gain	Pilot phase	

Mode	**Test**
Mode	Test tone
Pre-emphasis	Test tone level

* Not applicable on version without signal limiters.

Loading a preset memory: Highlight [Preset] and choose one of the memories 1 to 8.

Saving a preset into the memory: Highlight [Save Set] and select the memory to store in. ([in 1] to [in 8]) by rotating the [Jogwheel] and confirm the selection by pushing the [Jogwheel] - the present settings are now stored.

15.3. Level display unit configuration

Main menu>Menu [Setup]>[Unit]

This menu is for selecting the displayed unit of specific levels. Possible settings are [dBu] and [kHz].

15.4. Interface timeout configuration

Main menu>Menu [Setup]>[Timeout]

This menu is for setting the timeout of the serial RS-232 ports [DTE1], [DTE2], [DTE3] or [Front] to notify inactivity. In the case of an interruption on a serial port a notification will be generated after the timeout delay. Delays between 1 and 254 minutes are possible. The inactivity can be indicated via relay.

15.5. Menu language configuration

Main menu>Menu [Setup]>[Language]

This menu is for selecting the menu language. Possible languages are [Deutsch] (German) or [English].

15.6. Signal / FM transmitter frequency deviation relation configuration

Main menu>Menu [Setup]>[Sensit.]

This menu is for configuring the relation between the signal level and the effective FM transmitter frequency deviation, to have a correct display of dBu values. Possible levels are between -18.0 and +18.0 dBu related to a FM transmitter frequency deviation of 40 kHz.

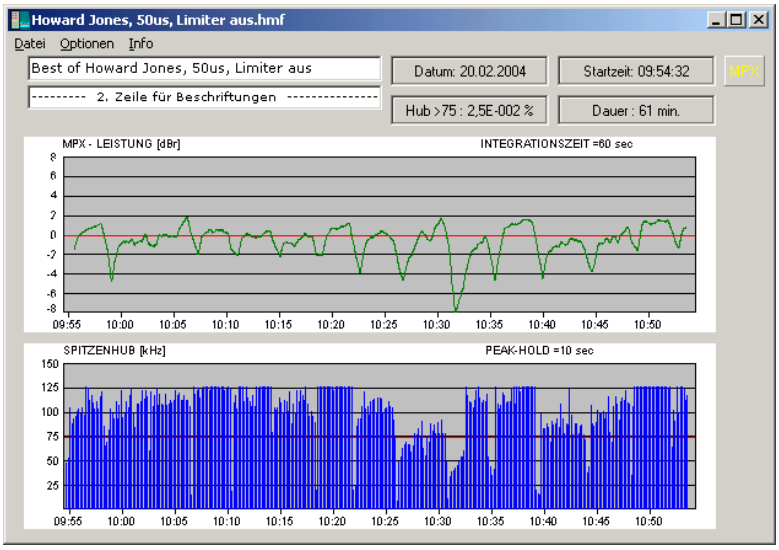
16. Limiter functions

16.1. Peak deviation limiter and modulation power limiter of the S02

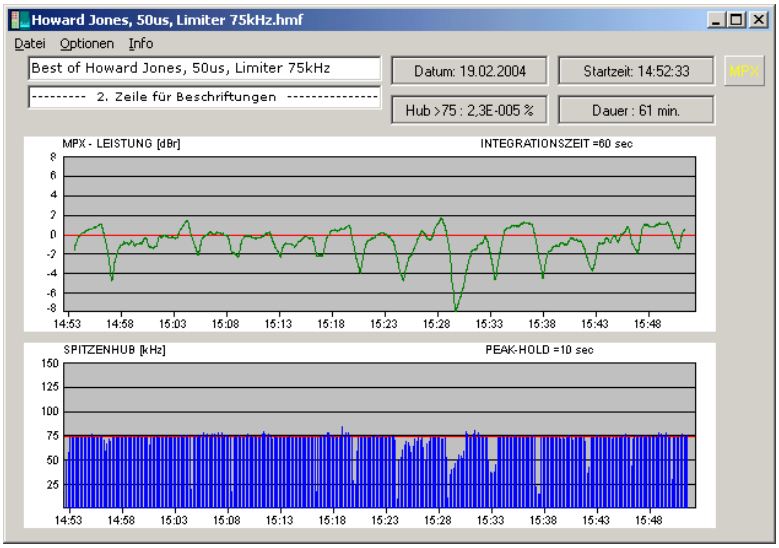
The S02 stereo generator contains a peak deviation limiter and a modulation power limiter. These limiter functions make it possible to reliably comply with mandatory parameter restrictions. The peak deviation limiter can be configured to limit the deviation of the output signal to a maximum of 0.0 to 100.0 kHz. The modulation power limiter can be configured to limit the modulation power of the output signal between -6 and +6 dBr.

A measurement was carried out to demonstrate the function and the advantages of the integrated limiters:

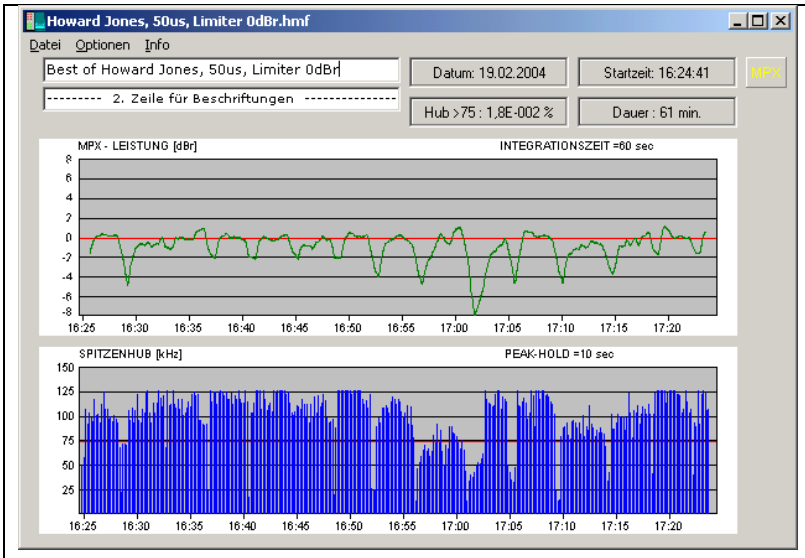
A signal with a reference level of -9 dBFS = 40 kHz was applied to the analog input of the S02. Pre-emphasis was set to 50 µs. The output signal was measured with a FM-power-meter, supplied by RBT (Technical service center of a public German broadcast association).



The measurement without any limiters shows a peak FM signal deviation far beyond the range of the used FM-power-meter (127 kHz). The peak modulation power is approx. +2 dBr.

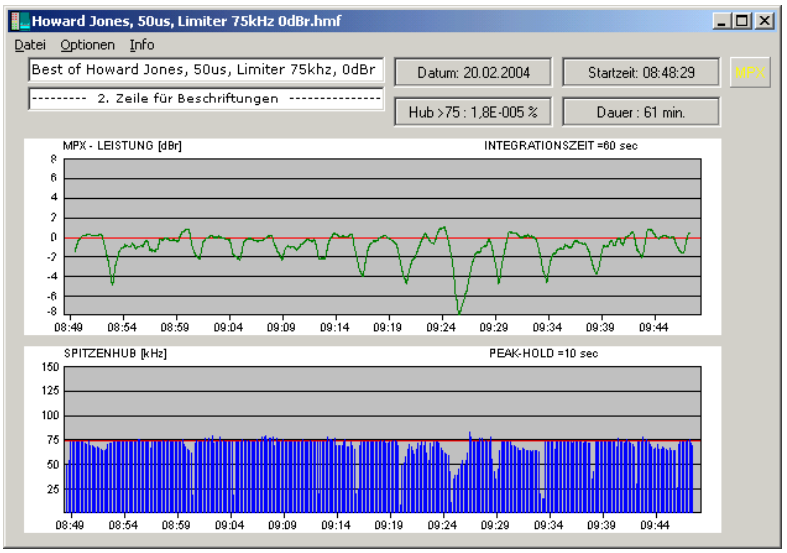


Here the activated peak dev¬iation limiter reliably limits the peak FM signal deviation (modul¬ation level) at the configured level (here it is 75 kHz / 100%). The modulation power is nearly unaffected.



If only the modulation power limiter is activated, the peak FM deviation (modulation level) of the signal is nearly unaffected but the modulation power is reduced significantly.

The exceeding of the configured modulation power limit relates to the extended integration time (60 sec). Therefore the limiter does not limit abrupt changes, but limits with a time delay as intended.



The combination of both limiter functions makes it possible to reliably comply with mandatory parameter limits according to ITU-R BS.412-9.

NOTE: The functions above are not available on device versions without signal limiter functions.

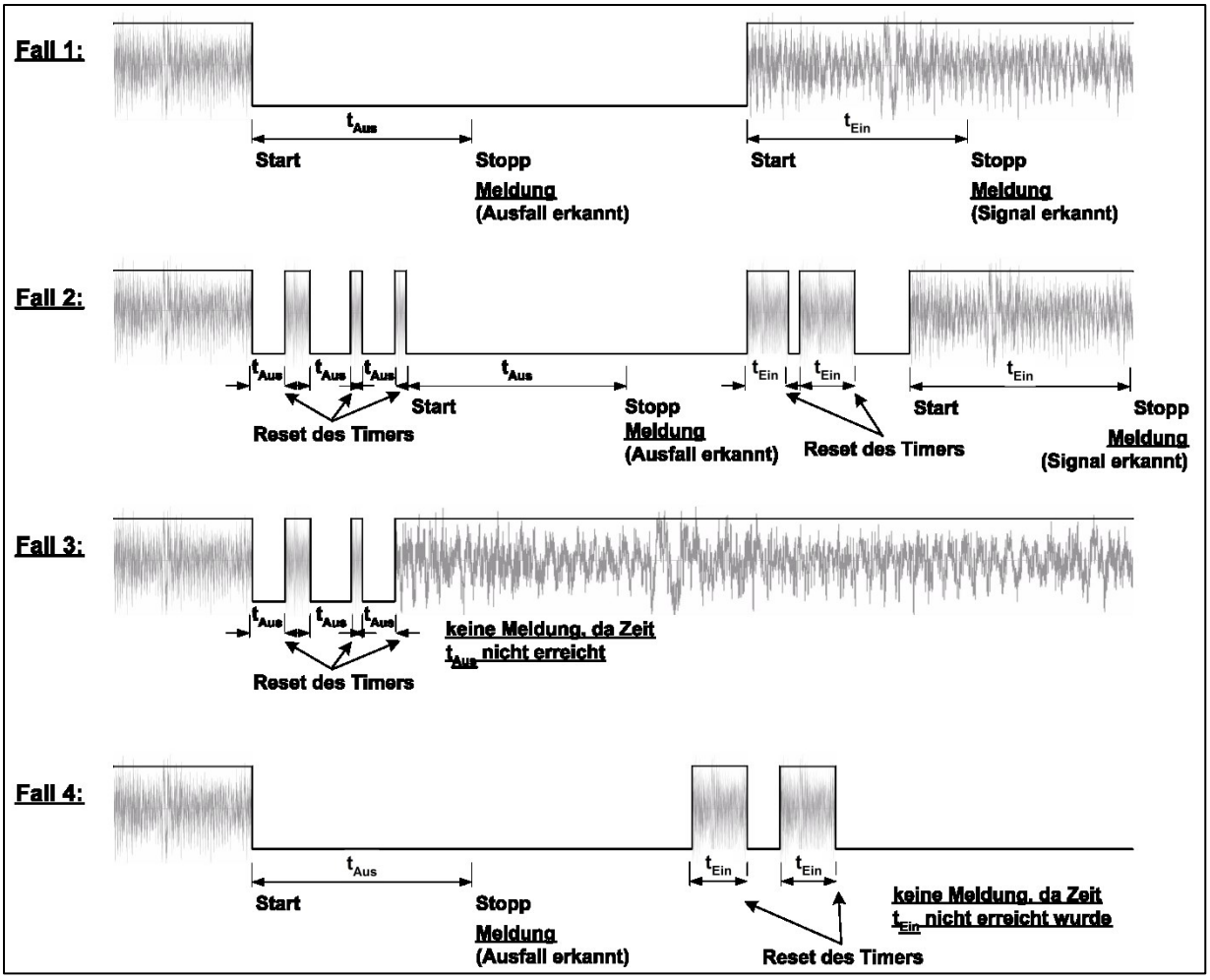
17. Modulation source monitoring

The S02 offers a monitoring of the audio sources. This works by monitoring the input levels of each channel (L / R) against a minimum value. The signal levels are determined by an averaging calculation. A signaling function is activated and, if AutoDig is activated, a switching on the inputs takes place if the value is continuously below or afterwards above the minimum value for a specific delay time.

The delay time until the signal is considered invalid (t_{Off}) or valid (t_{On}) can be configured for the digital source and the analog source individually. The delay time until the state changes starts every time when the signal falls below or is again above the minimum value. Therefore short pauses during speech or just short repeated signal recovering during signal lost are correctly evaluated.

The description for the configuration of the minimum value, the delay time t_{Off}, the delay time t_{On}, and the modulation source monitoring can be found starting on page 18.

The following figure illustrates the monitoring operation:



17.1. Switching action on automatic source selection (AutoDig)

Digital Input		Analog Input		Active Input
-	-	-	-	Digital
-	-	-	R	Analog
-	-	L	-	Analog
-	-	L	R	Analog
-	R	-	-	Digital
-	R	-	R	Digital
-	R	L	-	Digital
-	R	L	R	Analog
L	-	-	-	Digital
L	-	-	R	Digital
L	-	L	-	Digital
L	-	L	R	Analog
L	R	-	-	Digital
L	R	-	R	Digital
L	R	L	-	Digital
L	R	L	R	Digital
No Frame		L	R	Analog
No Frame		L	-	Analog
No Frame		-	R	Analog
No Frame		-	-	Digital

A switching from digital to analog input occurs, if the AutoDig mode is activated, and at least one channel of the digital audio signal is detected as invalid. An additional criteria for switching is that the analog input offers more channels than the digital input. So no switching occurs, if one channel is missing on both inputs.

This means that e.g. switching occurs if the analog signal provides valid left and right channels while the digital signal just provides a valid left channel.

But if both, the analog and the digital signal just provide e.g. the left channel, the digital input stays activated or is reactivated.

The switching follows the configured delay times and threshold levels of the modulation source monitoring function, even if the monitoring function itself is turned off.

If the frame of the digital signal is missing and an analog signal is detected at the analog inputs, the device switches immediately to the analog input (switching delay time is then ignored).

The table above shows, which input is activated depending on valid input channels.

17.2. Signaling of the monitoring

Status indication via display

The monitoring status of the digital and the analog input can be indicated via the display. The corresponding menu entry can be found at:

`Main menu>Menu [Test]>Menu [Status]>Submenu [Modulationsource]`

Details can be found in the section “Operation” on page 15.

Status indication via relay

The monitoring status of the digital and the analog input can be indicated via relay. The relays need to be programmed. Details can be found in the section "Programmable device functions" on page 40.

The following events can be indicated by the relays:

1.	Loss of the left channel of the analog input
2.	Loss of the right channel of the analog input
3.	Loss of the left channel of the digital input
4.	Loss of the right channel of the digital input
5.	Loss of at least one channel of the analog input
6.	Loss of at least one channel of the digital input
7.	Loss of both channels of the analog input
8.	Loss of both channels of the digital input
9.	Loss of digital frame

18. Interfaces

The stereo generator S02 has several interfaces for the external communication and the input and output of various signals. If the S02 is accessed via remote control, a LED on the front panel [Remote] is active.

18.1. Serial ports (RS-232)

NOTE: A null modem cable is necessary for a connection between a serial port of the S02 and a computer.

18.2. Front port [RS-232]

On the front panel is a 9 pole D-SUB connector. This connector can be connected to a computer with installed S02 configuration software. This software enables the configuration of the S02 internal parameters. The serial protocol is UECP.

18.3. Rear port [DTE1], [DTE2], [DTE3]

On the rear side there are three serial RS-232 ports with a 9 pole D-SUB connector, a service port for configuring the TCP/IP module.

The [Service] port is for servicing the TCP/IP module only and cannot be used for configuring the S02 or data communication to the S02.

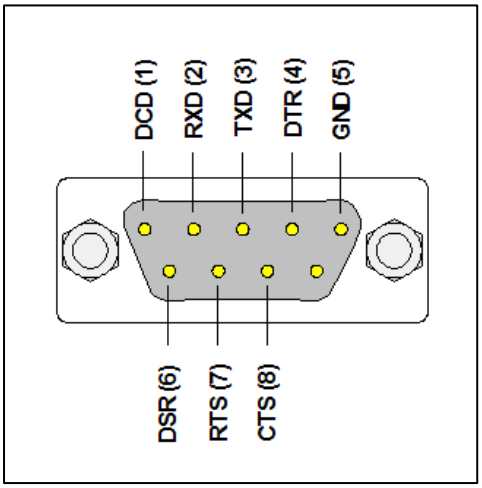


Figure 1: 9 pole D-Sub connector

18.4. Pin assignment

The pin assignment of the serial ports is being displayed on the figure to the right. All serial ports do provide handshake signals.

18.5. IP network connector

The S02 has a 10/100 MBit TCP/IP port [10/100-Base-T]. Connection to a network can be established with an RJ-45 cable.

18.6. BNC connectors

Front panel:
[AUX out]
The [AUX out] BNC connector is an output for various configurable test signals.

Rear panel:
[Pilot Output]
The pilot output is a sync output. It provides the 19 kHz pilot signals as sine or rectangular waveform.

[SCA Input 1] and [SCA Input 2]
Inputs with 0 dB insertion loss for additional signals like RDS, ARI or DARC

[(L+R)/2 Output]
Provides the M signal (L+R)/2 with included pre-emphasis.

[MPX Output 1] and [MPX Output 2]
Provide the MPX signal, generated by the stereo generator.

18.7. XLR connectors

On the rear side are 3 XLR female connectors.

[XLR-L] and [XLR-R]
Input connectors (female) for the left and the right audio channel.

Configuration: balanced
Impedance: 20 kOhm
Nominal input level: adjustable between –18 dBu and +18 dBu
Resolution: 24 Bits

[XLR Dig.]
Input connector (female) for a digital audio signal.

AES-EBU interface (up to 96 kHz sample rate)
Other formats: IEC60958, S/PDIF, EIAS CP1201
Nominal input level: adjustable between –10 dBFS and 0 dBFS

18.8. Relay / Opto-isolated input connectors

[Optical Coupler Input]
The S02 provides 12 opto-isolated inputs and 11 floating relay switches. The functions of these inputs can be configured by the user. For configuration details see section Opto-isolated input functions on page 41.

[Relay Output]
The S02 provides 8 floating SPST and 3 SPDT relay contacts. The functions of these contacts are user configurable. For configuration details see section Relay functions on page 40.

18.9. Headphone connector

On the front panel is a 6.3 mm output connector for a headphone. It provides the audio signal of the selected input. The audio signal is provided in stereo or mono, corresponding to the related settings. The output level can be adjusted – see section Headphone volume adjustment on page 22.

19. Programmable Device Functions

The S02 stereo generator provides several user programmable device functions. This enables individual functions suited to user demand.

19.1. Relay functions

Caution

The relay contacts are accessible at the [Relay Output] (25 pole D-Sub connector) on the rear side of the unit. The relay contacts number 1 to 8 are floating SPST switches (NO) wired to the pins A and B. The relay contacts number 9 to 11 are SPDT switches, switching pin A between pin B and C (non active state is A to C). The relay functions are user programmable. This means that the user can assign specific functions to the contacts.

NOTE: Relay 11 is active in the case of mains power loss and cannot be reassigned.

The figure below shows the pin assignment of the [Relay Output] connector.

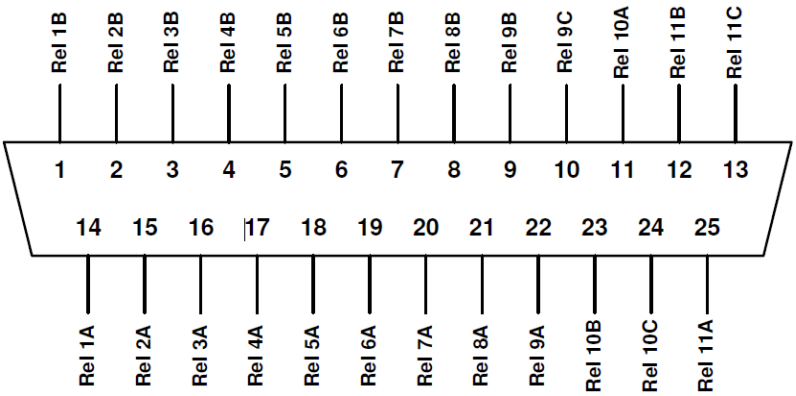


Figure 2: 25 pole D-Sub connector (view onto the rear side of the S02)

Relay functions are programmable by MEC commands. The specific command contains the relay number, function and an additional parameter.

Format: „2D, 06, 4d, 49, 81, Relay No., Function, Add. Parameter"

NOTE: Available are the relay number 1 to 10. The relay number has to be entered in hex format. Therefore relay 10 is represented by the value 0A.

Function	Add. Parameters	Comment
0 = FCT_MANUEL	None	w/o function
1 = FCT_PRESET	Preset 1 to 8	Preset X active
2 = FCT_PEAK_LIMITER*	1=ON, 0=OFF	Peak-Limiter active
3 = FCT_MOD_LIMITER*	1=ON, 0=OFF	Mod-Limiter active
5 = FCT_INPUT	3=AutoDigital, 2=Digital, 1=Analog, 0=OFF	Source active
7 = FCT_UECP	PortNo: 1 to 4, 0=all ports	Timeout active
8 = FCT_PILOT	2=Rectangle, 1=Sine, 0=OFF	Pilot active
B = FCT_OPERATION_MODE	3=Test tone, 2=Mono-R, 1=Mono-L, 0=Stereo	Mode active
C = FCT_MOD_MONITOR	0=Loss of left analog channel 1=Loss of right analog channel 2=Loss of left digital channel 3=Loss of right digital channel 4=Loss of at least one analog channel 5=Loss of at least one digital channel 6=Loss of both analog channels 7=Loss of both digital channels 8=Loss of digital frame	Condition fulfilled (Modulation source monitoring function needs to be turned on.)

Example: "2D, 06, 4d, 49, 81, 02, 03, 01" assigns Relay-No. 2 to the function [Mod-Limiter] to active state

* Not applicable for devices without signal limiter function

19.2. Opto-isolated input functions

Caution

The S02 has 12 opto-isolated inputs. A function can be assigned to every input.

The opto-isolated inputs are accessible at the connector [Optical Coupler Input] on the rear side of the S02. The opto-isolated inputs are active if the corresponding pin is pulled to ground. The following figure shows the pin assignment of the [Optical Coupler Input] connector.

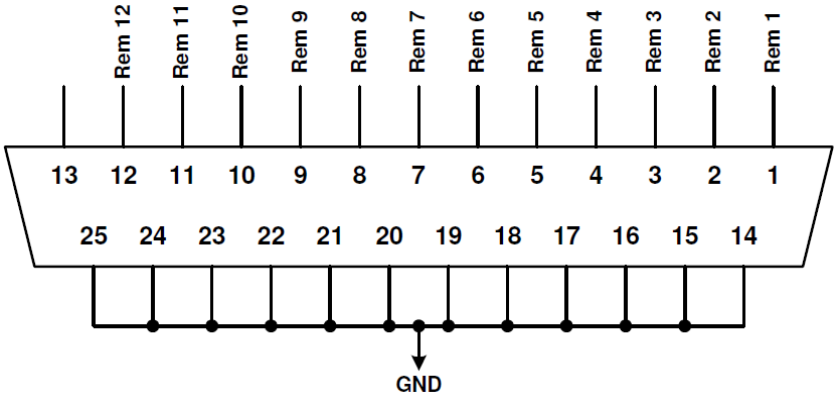


Figure 3: 25 pole D-Sub female connector (view onto the rear side of the S02)

Opto-isolated input functions are programmable by MEC commands. The specific command contains the input number, function and an additional parameter.

Format: „2D, 06, 4d, 49, 81, Input No., Function, Add. Parameter"

NOTE: Available are the opto-isolated inputs 1 to 12. The input number has to be entered in hex format. Therefore input 10 to 12 are represented by 0A to 0C.

Function	Add. Parameters	Comment
0 = FCT_MANUEL	None	w/o function
1 = FCT_PRESET	Preset 1 to 8	Preset X active
2 = FCT_PEAK_LIMITER*	1=ON, 0=OFF	Peak-Limiter active
3 = FCT_MOD_LIMITER*	1=ON, 0=OFF	Mod-Limiter active
5 = FCT_INPUT	3=AutoDigital, 2=Digital, 1=Analog, 0=OFF	Source active
8 = FCT_PILOT	2=Rectangle, 1= Sine, 0=OFF	Pilot active
B = FCT_OPERATION_MODE	2=Mono-R, 1=Mono-L, 0=Stereo	Mode active

Example: "2D, 06, 4d, 49, 82, 02, 03, 01" assigns Input-No. 2 to the function Mod-Limiter to active state.

* Not applicable for devices without signal limiter function

20. Troubleshooting

The following chart is designed to help you to correct minor problems with the use of the device prior to contact our service department (report failures by email to *contact@2wcom.com* or fax to +49 461-662830-11). Also be sure to read the entire manual carefully, as this often helps in understanding and fixing typical problems.

Problem	**Possible cause**	**Solution**	**Ref.**
Power does not come on	• Power cable is improperly connected • Mains supply failure • Blown fuse	• Check supply cord • Check mains supply • Replace fuse by same type	
No audio output	• Wrong or no audio input selected • No audio signal at the input • Input level too low	• Select correct audio input • Feed proper audio signal to input • Feed sufficient audio level to input	Page 17
Audio signal distorted	• Improper audio cable • Defect audio cable	Use appropriate cable corresponding to application	
Low treble on audio signal	• Analog cable too long • Cable has high capacity load	Use shorter or low-capacity cable	
MPX modulation power is not/wrong limited	Modulation power limiter is turned off or limit configuration is wrong	Turn limiter on or configure limit of modulation power limiter function	Page 21
Modulation peaks are not limited by limiter function	Limiter has integration time of 60 sec	No failure. Limiter works according to specification BS.412-9	Page 32
MPX deviation is not/wrong limited	MPX peak deviation limiter is turned off or limit configuration is wrong.	Turn limiter on or configure limit of peak deviation limiter function	Page 21

Display of level is in kHz not in dBu or vice versa	Level unit is configured to alternative unit	Configure level unit display to desired unit (dBu or kHz)	Page 31
Data communication to connected units doesn't work	• Data cable not properly connected • Type of data cable is wrong • Interface configuration wrong	• Check data cable connectors • Use null modem cable on serial ports • Check configuration	Page 23, 31, 37
TCP/IP communication doesn't work	• TCP/IP settings (IP-address, Netmask, Gateway) wrong • Network does not work at all. • Computer Network settings not correct • Firewall / Protection software configuration on computer not correct	• Check TCP/IP settings • Check network • Check settings • Check configuration; enable port 6666.	Page 24, 37
Function of a relay output is not correct	Programming of the relay function is not correct	Check programming of the relay function, configure if necessary	Page 23
Function of a opto-isolated input is not correct	Programming of the opto-isolated input function is not correct	Check programming of the opto-isolated input function, configure if necessary	Page 41

21. Maintenance and servicing

Maintenance

No special maintenance is necessary on the device. Dust can be removed with a dry duster. For cleaning use only neutral, non-corrosive detergents applied to a cloth - not the device.

Servicing

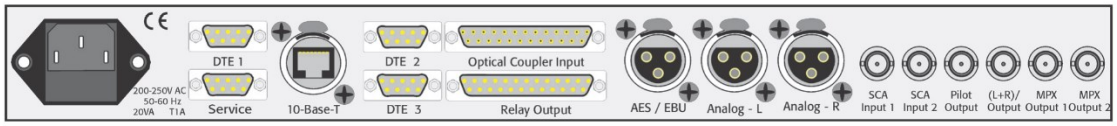
The modules of the device are complex and should be serviced only by authorized personnel.

The 2wcom Systems GmbH is equipped with special measurement and repair kits. Therefore a repair by the user is not intended.

Calibration

Due to the design and construction of the device, no calibration is necessary.

22. Technical data



S02 Stereo Generator – Technical Details

Inputs	
Digital	AES/EBU, 16...96 kHz sample rate
Impedance	110 Ω balanced, XLR
Analog	L/R analog balanced, XLR
Input impedance	20 kΩ
Input level	+6 dBu (1.55 Vrms)
Modulation control (optional)	audio input
Analog / Digital switching	Automatic selection of analog or digital input. Based on input level
Priority	on digital signal
Failure time adjustable	1...600 s
Digital input limit	-50 dBFS...0 dBFS
Analog input limit	-34 dBu...-6 dBu
SCA	2x analog unbalanced, BNC 10 kΩ, -12...+12 dBu

Outputs	
MPX	2x analog unbalanced BNC -12...+12 dBu
Frequency response	20 Hz...15 kHz <0.15 dB
Channel separation	L<->R >70 dB at 1 kHz L<->R >60 dB at 20 Hz...15 kHz M<->S >60 dB
Pilot rejection	>70 dB
Signal/Noise	S/N: >80 dB THD: <0.05 %
Pilot frequency	19 kHz +/-1 Hz
Pilot magnitude	2.5 kHz...10 kHz
Pilot phase	-5...+5° in steps of 0.1° adjustable to 38 kHz-subcarrier
Preemphasis	off/50 µs/75 µs
Output impedance	<10 Ω
(L+R) / 2	analog unbalanced BNC -12...+12 dBu
Pilot	Pilot analog unbalanced, BNC 1 V
Output impedance	<10 Ω

Limiter (optional)	
Peak - limiter	0...100 kHz
Mod - limiter	-6...+6 dBr acc. to BS.412-9

Front panel	
LCDisplay	2x 40 characters
Jog wheel	impulse, ENTER button
8 LED's	Power, Pilot, Status, Peak Limit, Mod. Limit, Digital, Analog, Remote

Interfaces	
Remote control input	12 opto isolated inputs
Connector	25 pole sub-D female
Remote control output	8 standard relays (SPST)
(Messages)	3 change-over relays (SPDT) (for DC: max. 24 V, 1 A, 10 W),
Connector	25 pole sub-D male
Data Interfaces	Input/output and setup functions 5 serial interfaces, RS-232C (1 front, 3 rear)
Connector	9 pole sub-D male
Transmission rate	1200 to 38400 baud, asynchronous
Data format	binary
TCP/IP data interface	Input/output setup functions
Connector	Neutrik Ethercom/RJ45 (rear)
Type	full duplex 10/100 BASE-T
Data format	binary, SMTP, UDP, Telnet, FTP, SNMP

General data	
Power consumption	20 VA
Case dimensions	19", 1 HU, depth: 310 mm, width: 424 mm, front panel: 484 mm
Weight	3 kg
Housing	aluminium chromated
Operating temp. range	0...+45°C
Storage temp. range	-40...+70°C
Power supply	internal, 90...260 V, 47...63 Hz

Version: 22.09.2015
These data are subject to modifications and amendments.
Errors excepted.

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