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LINK THESLA 950 TX & RX

USER MANUAL
VOLUME 1



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LINK THESLA 950 TX & THESLA 950 RX - User manual version 1.0

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Notification of intended purpose and limitations of product use

This product is a FM transmitter intended for FM audio broadcasting. It utilizes operating frequencies not harmonised in the intended countries of use. The user must obtain a license before using the product in intended country of use. Ensure respective country licensing requirements are complied with. Limitations of use can apply in respect of operating frequency, transmitter power and/or channel spacing.

Declaration of Conformity

Hereby, Biquad Tecnologia Ltda, declares that this FM transmitter is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.



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IMPORTANT


The symbol of lightning inside a triangle placed on the product, evidences the operations for which is necessary gave it full attention to avoid risk of electric shocks.




The symbol of exclamation mark inside a triangle placed on the product, informs the user about the presence of instructions inside the manual that accompanies the equipment, important for the efficacy and the maintenance (repairs).


1. Preliminary Instructions

• General Warnings


This equipment should only be operated, installed and maintained by “trained” or “qualified” personnel who are familiar with risks involved in working on electric and electronic circuits. “Trained” means personnel who have technical knowledge of equipment operation and who are responsible for their own safety and that of other unqualified personnel placed under their supervision when working on the equipment. “Qualified” means personnel who are trained in and experienced with equipment operation and who are responsible for their own safety and that of other unqualified personnel placed under their supervision when working on the equipment.

 **WARNING: Residual voltage may be present inside the equipment even when the ON/OFF switch is set to Off. Before servicing the equipment, disconnect the power cord or switch off the main power panel and make sure the safety earth connection is connected. Some service situations may require inspecting the equipment with live circuits. Only trained and qualified personnel may work on the equipment live and shall be assisted by a trained person who shall keep ready to disconnect power supply at need.**


R.V.R. Elettronica shall not be liable for injury to persons or damage to property resulting from improper use or operation by trained/untrained and qualified/unqualified persons.


 **WARNING: The equipment is not water resistant. Any water entering the enclosure might impair proper operation. To prevent the risk of electrical shock or fire, do not expose this equipment to rain, dripping or moisture.**

Please observe local codes and fire prevention rules when installing and operating this equipment.

 **WARNING: This equipment contains exposed live parts involving an electrical shock hazard. Always disconnect power supply before removing any covers or other parts of the equipment.**

Ventilation slits and holes are provided to ensure reliable operation and prevent overheating; do not obstruct or cover these slits. Do not obstruct the ventilation slits under any circumstances. The product must not be incorporated in a rack unless adequate ventilation is provided or the manufacturer’s instructions are followed closely.

 **WARNING: This equipment can radiate radiofrequency energy and, if not installed in compliance with manual instructions and applicable regulations, may cause interference with radio communications.**

 **WARNING: This equipment is fitted with earth connections both in the power cord and for the chassis. Make sure both are properly connected.**

Operation of this equipment in a residential area may cause radio interference, in which case the user may be required to take adequate measures.

The specifications and data contained herein are provided for information only and are subject to changes without prior notice. **Biquad Tecnologia Ltda** disclaims all warranties, express or implied. While **Biquad Tecnologia Ltda** attempts to provide accurate information, it cannot accept responsibility or liability for any errors or inaccuracies in this manual, including the products and the software described herein. **Biquad Tecnologia Ltda** reserves the right to make changes to equipment design and/or specifications and to this manual at any time without prior notice.

• Notice concerning product intended purpose and use limitations.

This product is a radio transmitter suitable for frequency-modulation audio radio broadcasting. Its operating frequencies are not harmonised in designated user countries. Before operating this equipment, user must obtain a licence to use radio spectrum from the competent authority in the designated user country. Operating frequency, transmitter power and other characteristics of the transmission system are subject to restrictions as specified in the licence.

2. Warranty

Biquad Tecnologia Ltda warrants this product to be free from defects in workmanship and its proper operation subject to the limitations set forth in the supplied Terms and Conditions. Please read the Terms and Conditions carefully, as purchase of the product or acceptance of the order acknowledgement imply acceptance of the Terms and Conditions. For the latest updated terms and conditions, please visit our web site at www.biquadbroadcast.com. The web site may be modified, removed or updated for any reason whatsoever without prior notice. The warranty will become null and void in the event the product enclosure is opened, the product is physically damaged, is repaired by unauthorised persons or is used for purposes other than its intended use, as well as in the event of improper use, unauthorised changes or neglect. In the event a defect is found, follow this procedure:

- 1 Contact the seller or distributor who sold the equipment; provide a description of the problem or malfunction for the event a quick fix is available.

Sellers and Distributors can provide the necessary information to troubleshoot the most frequently encountered problems. Normally, Sellers and Distributors can offer a faster repair service than the Manufacturer would. Please note that Sellers can pinpoint problems due to wrong installation.

- 2 If your Seller cannot help you, contact **Biquad Tecnologia Ltda** and describe the problem; if our staff deems it appropriate, you will receive an authorisation to return the equipment along with suitable instructions;
- 3 When you have received the authorisation, you may return the unit. Pack the unit carefully before shipment; use the original packaging whenever possible and seal the package perfectly. The customer bears all risks of loss (i.e., Biquad shall not be liable for loss or damage) until the package reaches the Biquad factory. For this reason, we recommend insuring the goods for their full value. Returns must be sent on a C.I.F. basis (PREPAID) to the address stated on the authorisation as specified by the Biquad. Service Manager.



Units returned without a return authorisation may be rejected and sent back to the sender.

- 4 Be sure to include a detailed report mentioning all problems you have found and copy of your original invoice (to show when the warranty period began) with the shipment.

Please send spare and warranty replacement parts orders to the address provided below. Make sure to specify equipment model and serial number, as well as part description and quantity.



BIQUAD TECNOLOGIA LTDA.
 Rua Marcos Flávio e Dias, 260 - Jardim Beira Rio,
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3. First Aid

All personnel engaged in equipment installation, operation and maintenance must be familiar with first aid procedures and routines.

3.1 Electric shock treatment

3.1.1 If the victim is unconscious

Follow the first aid procedures outlined below.

- Lay the victim down on his/her back on a firm surface.
- the neck and tilt the head backwards to free the airway system (**Figure 1**).

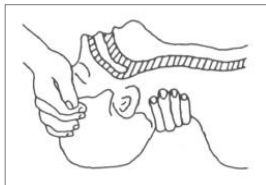


Figure 1

- If needed, open the victim's mouth and check for breathing.
- If there is no breathing, start artificial respiration without delay (**Figure 2**) as follows: tilt the head backwards, pinch the nostrils, seal your mouth around the victim's mouth and give four fast rescue breaths.



Figure 2

- Check for heartbeat (**Figure 3**); if there is no heartbeat, begin chest compressions immediately (**Figure 4**) placing your hands in the centre of the victim's chest (**Figure 5**).

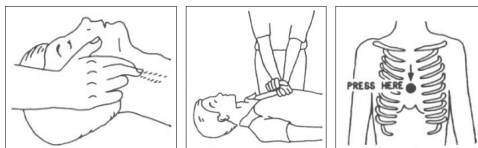


Figure 3

Figure 4

Figure 5

- One rescuer: give 2 quick rescue breaths after each 15 compressions.
- Two rescuers: one rescue breath after each 5 compressions.
- Do not stop chest compressions while giving

artificial breathing.

- Call for medical help as soon as possible.

3.1.2 If the victim is conscious

- Cover victim with a blanket.
- Try to reassure the victim.
- Loosen the victim's clothing and have him/her lie down.
- Call for medical help as soon as possible.

3.2 Treatment of electric burns

3.2.1 Large burns and broken skin

- Cover affected area with a clean cloth or linen.
- Do not break any blisters that have formed; remove any clothing or fabric that is stuck to the skin; apply adequate ointment.
- Administer adequate treatment for the type of accident.
- Get the victim to a hospital as quickly as possible.
- Elevate arms and legs if injured.

If medical help is not available within an hour, the victim is conscious and is not retching, administer a solution of table salt and baking soda (one teaspoon of table salt to half teaspoon of baking soda every 250 ml of water).

Have the victim slowly drink half a glass of solution for four times during a period of 15 minutes.

Stop at the first sign of retching.

Do not administer alcoholic beverages.

3.2.2 Minor burns

- Apply cold (not ice cold) strips of gauze or dress wound with clean cloth.
- Do not break any blisters that have formed; remove any clothing or fabric that is stuck to the skin; apply adequate ointment.
- If needed, have the victim change into clean, dry clothing.
- Administer adequate treatment for the type of accident.
- Get the victim to a hospital as quickly as possible.
- Elevate arms and legs if injured.

4. General Description

The THESLA 950 TX and THESLA 950 RX, are respectively, a broadband radio transmitter and receiver for the transport of audio signals as an auxiliary to the frequency modulation sound broadcasting.

This type of equipment is often called STL (Studio-to-Transmitter Link).

The THESLA 950 TX is designed to work in an optimum way when connected to the receiver THESLA 950 RX.

Externally, it is a box to mount in a 19" rack, each one being 2HE high.

4.1 Unpacking

The package contains:

- 1 THESLA 950 TX and/or THESLA 950 RX;
- 1 User Manual;
- 1 Mains power cable;

The following accessories are also available from Your Biquad Dealer:

- **Accessories, spare parts and cables**

4.2 Features

The standard working frequency bands are the following:

THESLA 950 TX	937.5 - 940 MHz / 946 - 952 MHz.
THESLA 950 RX	937.5 - 940 MHz / 946 - 952 MHz.



Note: the working frequency (and therefore the band) should be indicated when the order for such product is placed.



Warning: upon request, these links are available at other frequency bands and steps, please contact RVR in order to check the availability of modules at the required frequency.

The **THESLA 950 TX** is available with internal stereo coder which can guarantee an optimum stereophonic separation as well as a low level of harmonic distortion. In function of your own requirements it can be configured for the functioning under the Mono/MPX mode (that is to say when excluding the stereo coder and when using the “left” inputs as a “mono” input or the BNC, which is always on, as “MPX”). The configuration can be done by the user with the help of software. It has also two inputs (SCA1 and SCA2) for signals which are modulated on sub-carriers by appropriated external coders, normally used in Europe for the RDS transmission (Radio Data System).

In the standard version of the **THESLA 950 RX**, the demodulated signal is available in the MPX form (that is to say the complete basis signal band) and in the mono version. Moreover there are two connectors used for the respective SCA outputs. As an option, the **THESLA 950 RX** can be equipped with a stereo decoder option. Also when this option is present, apart from the outputs for the LEFT and RIGHT channels, the outputs for the MPX signal are present and for the possible sub-carriers.

The important audio characteristics of this equipment are the low distortion and intermodulation values and the high S/N level; another important quality both of the **THESLA 950 TX** and the **THESLA 950 RX** is its very simple construction and its easy use.

Both the **THESLA 950 TX** and the **THESLA 950 RX** were designed in a modular way: the different functions are executed by modules connected directly with male and female connectors or with flat cables with connectors at both ends. This type of design makes the maintenance and the possible replacement of modules an easy operation.

The microprocessor system includes an LCD display and an encoder that enable the interaction with the user, and implements the following functions for the transmitter:

- Setting of the output power
- Setting of the working frequency
- Activation and switch off of the power distribution
- Measurement and display of the working parameters of the transmitter
- Communication with external devices

These functions are implemented for the receiver:

- Display of the modulation
- Setting of the working frequency
- Setting of the muting
- Measurement and display of the working parameters of the receiver
- Communication with external devices

The system of the management software is composed of several menus.

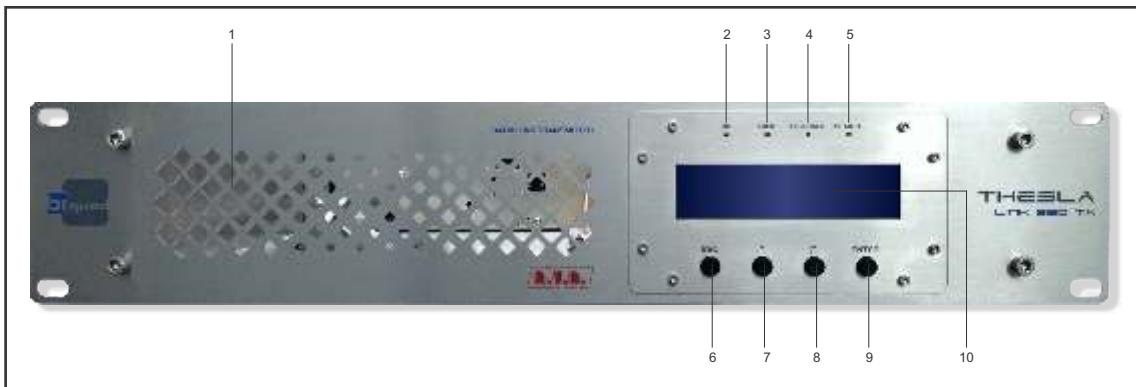
The user can navigate between the different submenus by using four push-buttons: ESC, LEFT/HIGH, RIGHT/LOW, and ENTER.

The status of the unit is indicated by four LEDs which are present on the front panel:

- ON, LOCK, FOLDBACK, RF MUTE for the **THESLA 950 TX**
- ON, LOCK, PILOT, MUTE for the **THESLA 950 RX**

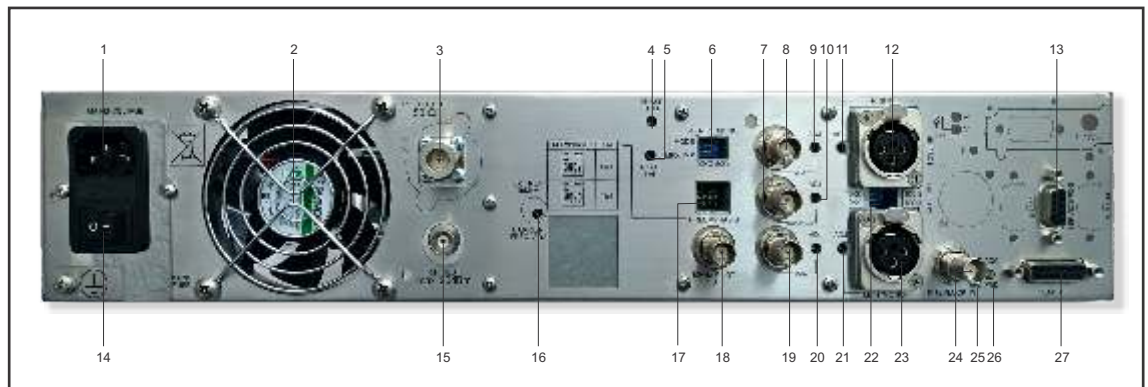
Both the transmitter and the receiver have an input for the external 24 Vcc supply. This auxiliary supply source, that can be realized by the user with the help of rescue batteries, is automatically used in case of AC voltage absence.

4.3 THESLA 950 TX Frontal Panel Description



- | | |
|----------------|---|
| [1] AIR FLOW | Grid for the air flow. |
| [2] ON | Green LED, lit when the transmitter is feeded. |
| [3] LOCK | If it is on, indicates that the PLL is locked at the reference frequency. |
| [4] FOLDBACK | Yellow LED, lit when the foldback function is operating (automatic reduction of the delivered RF power). |
| [5] R.F. MUTE | If it is flashing, it indicates that the exciter is not erogating power because it is inhibited by an external interlock. |
| [6] ESC | Push-button to press to exit from a menu. |
| [7] LEFT/DOWN | Push-button for the navigation in the system composed of several menus and for the modification of the parameters. |
| [8] RIGHT/DOWN | Push-button for the navigation in the system composed of several menus and for the modification of the parameters. |
| [9] ENTER | Push-button for the confirmation of a parameter and to enter the menus. |
| [10] DISPLAY | Liquid crystal display. |

4.4 THESLA 950 TX Rear Panel Description

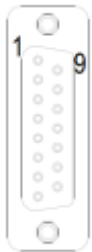


- | | |
|--|--|
| <p>[1] PLUG & FUSE BLOCK</p> <p>[2] FAN</p> <p>[3] R.F. OUTPUT</p> <p>[4] PHASE ADJ</p> <p>[5] PILOT LVL</p> <p>[6] MODE/MPX IMP</p>
<p>[7] SCA 1/RDS</p> <p>[8] MPX</p> <p>[9] MPX ADJ</p> <p>[10] SCA 1/RDS ADJ</p> <p>[11] RIGHT ADJ</p> <p>[12] RIGHT</p> <p>[13] SERVICE/RDS</p> <p>[14] POWER</p>
<p>[15] R.F. TEST POINT</p> <p>[16] CARRIER FREQ. ADJ</p> <p>[17] PRE ENPHASIS</p>
<p>[18] 19KHZ PILOT OUT</p>
<p>[19] SCA 2</p> <p>[20] SCA2 ADJ</p> <p>[21] LEFT/MONO ADJ</p> <p>[22] LEFT/MONO</p> <p>[23] IMPEDANCE</p>
<p>[24] INTERLOCK IN</p> <p>[25] RFL EXT. AGC</p> <p>[26] FWD EXT. AGC</p> <p>[27] REMOTE</p> | <p>VDE plug for AC voltage and fuse-holder. Contains the protection fuse for the 3,15 A.power supply.</p> <p>Blower for the forced cooling.</p> <p>RF Output connector N type, 50Ω</p> <p>Trimmer for the regulation of the pilot tone phase.</p> <p>Trimmer for the fine regulation of the pilot level.</p> <p>Dip-switch for the selection both of the transmission mode (STEREO or MONO) and the impedance of the MPX input MPX, selectable at 50Ω or 10kΩ.</p> <p>BNC connector of the unbalanced SCA 1/RDS input..</p> <p>BNC connector of the unbalanced MPX input.</p> <p>Trimmer for the regulation of the levels of the MPX input..</p> <p>Trimmer for the regulation of the SCA 1/RDS input levels.</p> <p>Trimmer for the regulation of the levels of the Right input.</p> <p>XLR connector for the input of the Right audio channel.</p> <p>DB9 connector for the programmation made by the factory.</p> <p>ON/OFF switch. It switches off the exciter without disconnecting the AC supply.</p> <p>Maximum 20dBm output at the output power level.</p> <p>Trimmer for the fine regulation of the carrier frequency.</p> <p>Dip-switch for the setting of the pre emphasis 50 or 75</p> <p>The preemphasis has an influence on the right and left inputs in stereo and on the mono input. The MPX inputs are not influenced by the setting of the preemphasis.</p> <p>BNC output connector for the pilot tone, which can be used for the synchronisation of the external devices such as RDS coder, etc...</p> <p>BNC connector for the SCA2 input.</p> <p>Trimmer for the regulation of the SCA2 input levels.</p> <p>Trimmer for the regulation of the LEFT/MONO input levels.</p> <p>XLR connector for the LEFT/MONO audio channel input.</p> <p>Dip-switch for the selection of the impedance of the balanced audio inputs, selectable at 600Ω or 10kΩ.</p> <p>BNC interlock connector: When the main conductor is grounded, the transmitter is forced to go in stand-by mode.</p> <p>Trimmer for the control of the erogated power in function of the RFL Fold input.</p> <p>Trimmer for the control of the erogated power in function of the FWD Fold input.</p> <p>DB15 connector for the telemetry of the device.</p> |
|--|--|

4.5 TESLA 950 TX Connector Description

4.5.1 Remote

Type: DB15 female



Pin	Name	Type	Meaning
1	Interlock	IN	Pull-up 5V (if GND then RF MUTE)
2	FWD Foldback	IN	Ext. signal, 1÷12V, for power limitation (AGC)
3	GND		GND
4	SDA IIC	IN/OUT	IIC communication serial data
5	VPA TIm	OUT	3,9V P.F.S.
6	FWD tIm	OUT	3,9V P.F.S.
7	Status Good	OUT	Open or closed relay collector, internally selectable.
8	GND		GND
9	GND		GND
10	RFL Foldback	IN	Ext. signal, 1÷12V, for power limitation (AGC)
11	SCL IIC	IN	IIC communication clock
12	IPA TIm	OUT	3,9V P.F.S.
13	RFL TIm	OUT	3,9V P.F.S..
14	On cmd	IN	Pull-up 5V(one grounded pulse of 500ms enables power supply
15	OFF cmd	IN	Pull-up 5V(one grounded pulse of 500ms disables power supply

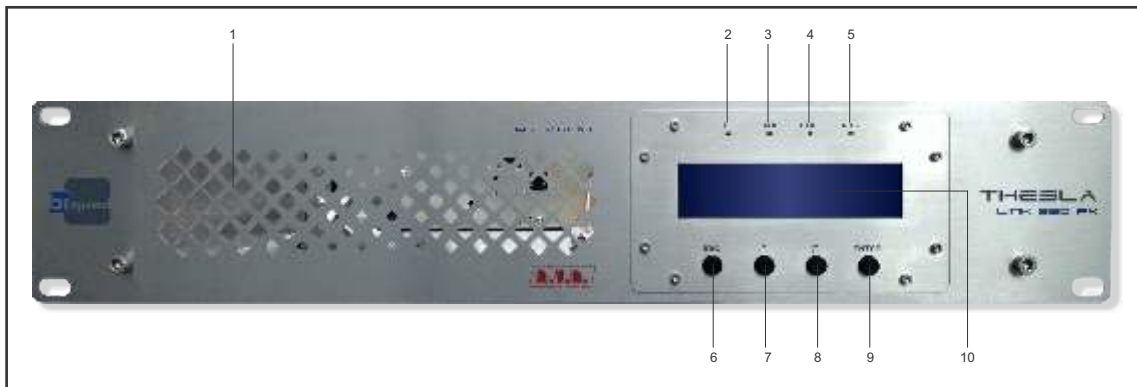
4.5.2 Left (MONO) & Right

Type: XLR male



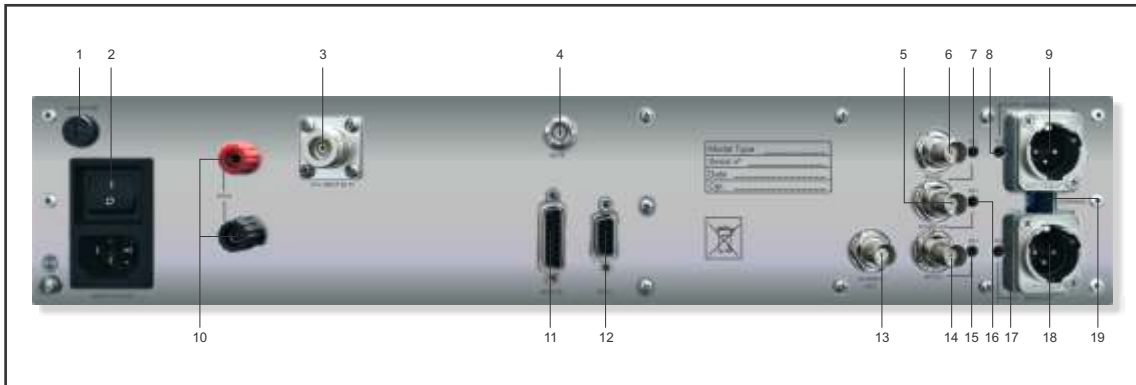
1	GND
2	Positive
3	Negative

4.6 THESLA 950 RX Frontal Panel Description



- | | |
|----------------|--|
| [1] AIR FLOW | Grid for the air flow. |
| [2] ON | Green LED, lit when the transmitter is feeded |
| [3] LOCK | If it is on, indicates that the VCO is locked at the reference frequency. |
| [4] PILOT | Yellow LED, if it is flashing, it indicates that there is a disfunction in the demodulated signal. |
| [5] MUTE | Yellow LED, if it is flashing, it indicates that the muting is activated, which means that the input signal has decreased under the defined threshold. |
| [6] ESC | Push-button to press to exit from a menu. |
| [7] LEFT/UP | Push-button for the navigation in the system composed of several menus and for the modification of the parameters. |
| [8] RIGHT/DOWN | Push-button for the navigation in the system composed of several menus and for the modification of the parameters. |
| [9] ENTER | Push-button for the confirmation of a parameter and to enter the menus. |
| [10] DISPLAY | Liquid crystal display. |

4.7 THESLA 950 RX Rear Panel Description

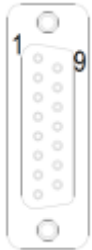


- | | |
|---|---|
| <p>[1] MAINS VOLTAGE
[2] POWER</p> <p>[3] R.F. INPUT 50Ω
[4] MUTE</p> <p>[5] SCA/MPX OUT
[6] SCA OUT
[7] SCA OUT ADJ
[8] RIGHT/MONO ADJ
[9] MONO/RIGHT
[10] 24VDC IN</p> <p>[11] REMOTE
[12] SERVICE
[13] 10.7 MHz IF OUT
[14] MPX OUT
[15] MPX OUT ADJ
[16] SCA/MPX OUT ADJ
[17] MONO/LEFT ADJ
[18] MONO/LEFT
[19] DE ENPHASIS</p> | <p>Plug for the AC voltage, 85-264V 50-60Hz.
ON/OFF switch. It switches off the exciter without disconnecting the AC supply.</p> <p>RF input connector N type, 50Ω
BNC interlock connector for the muting of the audio outputs with an external command.</p> <p>BNC connector for the unbalanced SCA or MPX output.
BNC connector, for the unbalanced SCA OUT output.
Trimmer for the regulation of the SCA OUT output.
Trimmer for the regulation of the RIGHT/MONO output levels.
XLR connector for the audio channel Mono or Right output.
Connectors for the external 24V power supply. Positive (red) and negative (black).</p> <p>DB15 connector for the telemetry of the device.
DB9 connector for the programming made by the factory.
BNC output connector for the 10.7 MHz sampling for tests.
BNC output connector for the unbalanced MPX.
Trimmer for the regulation of the MPX OUT input levels.
Trimmer for the regulation of the SCA/MPX input levels.
Trimmer for the regulation of the MONO/LEFT input levels.
XLR connectors for the MONO or LEFT audio channel input.
Dip-switch for the setting of the presence of de emphasis. The de emphasis has an influence on the right and left outputs in stereo mode and on the mono input. The MPX outputs are not influenced by the setting of the pre emphasis.</p> |
|---|---|

4.8 THESLA 950 RX Connector Description

4.8.1 Remote

Type: DB15 Female



Pin	Name	Type	Meaning
1	Audio OFF	IN	Pull-up 5V(if grounded, it inhibits the Audio)
2	N.C.		
3	GND		GND
4	SDA IIC	IN/OUT	IIC communication serial data
5	RF Input Level	OUT	4V P.F.S. (R.S.S.I.)
6	LEFT Output Level	OUT	2V F.S.
7	Muting TLS	OUT	Open or closed relay collector selectable, contact to GND
8	GND		GND
9	GND		GND
10	N.C.		
11	SCL IIC	IN	IIC communication clock
12	MPX Output Level	OUT	2V F.S.
13	RIGHT Output Level	OUT	2V F.S.
14	N.C.		
15	N.C.		

4.8.2 Left (MONO) & Right

Type: XLR male



1	GND
2	Positive
3	Negative

4.9 Technical Description

Parameters		U.M.	THESLA 950 TX	THESLA 950 RX	Notes
GENERAL'S					
Frequency range	work bandwidth is 20MHz	MHz	937.5 + 942, 946 + 952		
Rated output power		W	10		Continuously variable by software from 0 to maximum *: 10W only in 937.5 - 940MHz / 946 - 952MHz
Sensitivity RF	@ 25dB S/N Mono	dBm		-100	
Modulation type			Direct carrier frequency		
Intermediate Frequency		MHz		70, 10.7, 0.35	
Operational Mode				Mono, MPX	
Ambient working temperature		°C		<10 to +50	Without condensing
Frequency programmability				From software, with 5 kHz steps	
Frequency stability	WT from -10°C to 50°C	ppm		±1	
Modulation capability		KHz	130		
Pre-emphasis mode		µS	0, 50, 75		
De-emphasis mode		µS		0, 50, 75	
Spurious & harmonic suppression		dBc	<70		
Asynchronous AM S/N ratio	Referred to 100% AM, with no de-emphasis	dB	≥ 60		
Synchronous AM S/N ratio	Referred to 100% AM, FM deviation 7.5 kHz by 40kHz sine, without de-emphasis	dB	≥ 50		
MONO OPERATION					
S/N FM Ratio	RMS @ ± 75 kHz peak, HPF 20Hz - LPF 23 kHz, 50 µS de-emphasis	dB	> 75	> 75	
	Cpk @ ± 75 kHz peak, CCIR weighted, 50 µS de-emphasis	dB	> 68		
	Cpk @ ± 40 kHz peak, CCIR weighted, 50 µS de-emphasis	dB	> 63		
Frequency Response	30Hz - 15kHz	dB	better than ± 0.3 dB	± 0.3	
Total Harmonic Distortion	THD+N 30Hz - 15kHz	%	< 0.04	< 0.1	
Intermodulation distortion	Measured with a 1 kHz, 1.3 kHz tones, 1:1ratio, @ 75 kHz FM	%	< 0.02		
Transient intermodulation distortion	3.18 kHz square wave, 15 kHz sine wave @75 kHz FM	%	< 0.1 (typical 0.05)		
MPX OPERATION					
Composite S/N FM Ratio	RMS @ ± 75 kHz peak, HPF 20Hz - no LPF, 50 µS de-emphasis	dB	> 75	> 68	
Frequency Response	30Hz - 53kHz	dB	± 0.2	± 0.2	
	53kHz - 100kHz	dB		± 0.6	
Total Harmonic Distortion	THD+N 30Hz - 53kHz	%	< 0.1		
	THD+N 53kHz - 100kHz	%	< 0.15	< 0.2	
Intermodulation distortion	Measured with a 1 kHz, 1.3 kHz tones, 1:1ratio, @ 75 kHz FM	%	< 0.05		
Transient intermodulation distortion	3.18 kHz square wave, 15 kHz sine wave @75 kHz FM	%	< 0.1		
Stereo separation	30Hz - 53kHz	dB	> 50	> 45	
STEREO OPERATION					
Stereo S/N FM Ratio	RMS @ ± 75 kHz peak, HPF 20Hz - LPF 23 kHz, 50 µS de-emphasis, L & R demodulated	dB		80 + 260 (*)	
	Cpk @ ± 75 kHz peak, CCIR weighted, 50 µS de-emphasis, L & R demodulated	dB		25	
	Cpk @ ± 40 kHz peak, CCIR weighted, 50 µS de-emphasis, L & R demodulated	dB		20	
Frequency Response	30Hz - 15kHz	dB		0.8	
Total Harmonic Distortion	THD+N 30Hz - 15kHz	%		VDE IEC Standard	
Intermodulation distortion	Measured with a 1 kHz, 1.3 kHz tones, 1:1ratio, @ 75 kHz FM	%		24	
Transient intermodulation distortion	3.18 kHz square wave, 15 kHz sine wave @75 kHz FM	%		< 2A	
Stereo separation	30Hz - 15kHz	dB		483 (19")	
SCA OPERATION					
Frequency response	40kHz - 100kHz	dB	± 0.5	394	
Crosstalk to main or to stereo channel	RMS, ref @ ± 75 kHz peak, no HPF/LPF, 0µS de-emphasis, with 67 kHz tone on SCA input @ 7.5kHz FM deviation	dB	> 75	372	
	RMS, ref @ ± 75 kHz peak, no HPF/LPF, 0µS de-emphasis, with 92 kHz tone on SCA input @ 7.5kHz FM deviation	dB	> 78	about 5	
POWER REQUIREMENTS					
AC Power Input	AC Supply Voltage	VAC		80 + 260 (*)	(*) Full range (**) Internal switch
	AC Apparent Power Consumption	VA	120	25	
	Active Power Consumption	W	70	19	
	Power Factor		0.5	0.8	
DC Power Input	DC Supply Voltage	VDC		24	
	DC Current	ADC	5	< 2A	
MECHANICAL DIMENSIONS					
Physical Dimensions	Front panel width	mm		483 (19")	
	Front panel height	mm		88 (2HE)	
	Overall depth	mm		394	
	Chassis depth	mm		372	
Weight		kg	about 7	about 5	
VARIOUS					
Cooling			Forced, with internal fan	Convection cooling	
Acoustic Noise		dBA	< 58	/	
AUDIO INPUTS / OUTPUTS					
Left / Mono	Connector		XLR F	XLR F	
	Type		Balanced	Balanced	
	Impedance	Ohm	10 k or 600	100 Ohm	
	Input Level / Adjust	dBu	-13 to +13	-10 to +16	
Right	Connector		XLR F	XLR F	
	Type		Balanced	Balanced	
	Impedance	Ohm	10 k or 600	100 Ohm	
	Input Level	dBu	-13 to +13	-10 to +16	
MPX	Connector		BNC	2 x BNC	
	Type		unbalanced	Unbalanced	
	Impedance	Ohm	10 k or 50	100	
	Input Level / Adjust	dBu	*-13 to +13	-20 to +13	
SCARDS	Connector		2 x BNC	2 x BNC	
	Type		unbalanced	Unbalanced	
	Impedance	Ohm	10 k	100	
	Input Level / Adjust	dBu	*-8 to +13	-20 to +7	
OUTPUTS / INPUTS					
RF Output	Connector		N type		
RF Input	Connector		50	N type	
RF Monitor	Connector		BNC		
Pilot output	Impedance	Ohm	50		
	Output Level	dB	approx. -30		
	Connector				
	Impedance	Ohm			
AUXILIARY CONNECTIONS					
Interlock	Connector		BNC		
Remote Interface	Connector		DB15F		
Service	Connector			DB9 F	
Telemetry	Connector			DB15F	
FUSES					
On Mains				1 External fuse F 3.15 T - 5x20 mm	
HUMAN INTERFACES					
Input device				4 pushbutton	
Display				Alphanumerical LCD - 2 x 16	
TELEMETRY / TELECONTROL					
Remote connector inputs	Analogical level		FWD fold		
	Analogical level		REF fold		
	pulse		RF ON		
	pulse		RF OFF		
Remote connector outputs	ON/OFF level		Interlock		
	Analogical level		FWD		
	Analogical level		REF		
	Analogical level		VPA		
	Analogical level		PA		
	ON / OFF level		Power Good		

5. THESLA 950 TX quick guide for installation and use

This chapter contains the necessary instructions for the installation and use of the equipment. In case some aspects are not totally clear, for instance when a user is using this equipment for the first time, we advise the new user to read carefully the entire description contained in this manual.

5.1 Preparation

Unpack the exciter and before doing any other operation, be sure it has not been damaged during transport. In particular check that all the connectors are in perfect condition.

The main fuse can be accessed from the outside on the rear panel. Extract the fuse carrier with a screwdriver to check its integrity or for replacement, if necessary. The fuse to be used is this type:

- **MAIN FUSE** 3.15 A ; 5mmx20mm

Check that the supply voltage value coincides with the AC voltage available.

The input supply field is of:

- **THESLA 950 TX** 80-260 V_{AC}

Check that the **THESLA 950 TX** mains switch is in the “OFF” position, it is placed on the rear panel and inhibits the switching power supply of the machine.

Connect the RF output of the exciter to the antenna cable or to a dummy load able to dissipate the power generated by the **THESLA 950TX**.



Note: in case the load is not present, don't touch the RF output connector during the equipment operation to avoid electric shock and electrocution.

Connect the mains cable to the proper standard IEC plug, placed on the rear panel.



Note: It is necessary that the mains system being provided with grounding to ensure both the operators' safety and correct operation of the equipment.

If the user intends to use external batteries in case of AC supply interruption, connect them to the clamps situated at the back of the equipment being careful to respect the polarity.



WARNING: Keep in mind that the general switch of the transmitter has an effect on the AC supply, and not on the possible auxiliary supply. If you use an external supply with continuous current, it is then necessary to have an external switch for this purpose.

Connect the audio cable and RDS/SCA of the signal source to the proper input connectors of the **THESLA 950 TX**.

5.2 Operation

Switch on the transmitter by putting the selector on the position “I” (on) the switch situated on the panel, and switch it on thanks to the switch situated on the rear panel.

Enter the menu “Set” and set the working frequency desired.

With the help of the switches and trimmers situated on the rear panel, set the characteristics (impedance, preemphasis, and possibly stereo/mono) and the levels of the audio inputs and RDS (if used).



Note: When it comes out of the factory, the output power of the unit is regulated at the minimum and is setted on the OFF position. Anyway we always advise to check the setted level before you select the output power, especially when the unit is used as modulator of a power amplifier.

From the predefined menu, set the desired power level.

From the menu “Fnc”, set the power output.

5.3 Setting and Calibration

The only regulations that should be done manually on the **THESLA 950 TX** are the regulations of the levels and audio functioning modes.

On the rear panel of the unit there is a trimmer for each input of the exciter; the silkscrenn of the panel indicated to which input each trimmer refers to. The sensitivity of the different inputs can be regulated with the trimmers as indicated in the following tables:

Sensitivity of the inputs:

Input	Chap. 7.2	Trimmer	Sensitivity	Notes
MPX/RDS	[10]	[11]	-20 ÷ +13 dBm	Input level for 2.0 kHz (-30 dB) of deviation
SCA1	[9]	[24]	- 8 ÷ +13 dBm	Input level for 7.5 kHz (-20 dB) of deviation
SCA2	[22]	[23]	- 8 ÷ +13 dBm	
Left - Mono/MPX	[26]	[25]	-13 ÷ +13 dBm	Input level for 75 kHz (0 dB) of deviation
Right/Mono	[13]	[12]	-13 ÷ +13 dBm	

In order to regulate the sensitivity level of the inputs, it is important to keep in mind that the instantaneous modulation level is indicated in the predefined menu and that indicates that the level is at 75 kHz. For a correct regulation, we advise to bring a signal equivalent to the signal level of your own audio programme into the input of the unit and regulate the corresponding trimmer until the instantaneous deviation coincides with the 75 kHz indication.

For the regulation of the levels of the sub-carriers' inputs, a similar procedure can be followed, with the help of the option "X10" which can be selected from the menu Fnc. With this option, the indicated modulation level is multiplied per the factor 10, so that the hachured indication of the predefined menu coincides with a deviation value of 7,5 kHz.

PAs for the stereo version, there is an appropriate menu in which the levels of the right and left channels with the corresponding nominal level indicators for the maximum 75Khz deviation are indicated separately.

The position of the DIP switches that are needed to select the available options is indicated on the silk-screen.

- Preenphasis:



- Impedance of L&R inputs (XLR type):



Switch 1: Impedance of R XLR ON input = 600 Ω, OFF = 10 kΩ

Switch 2: Impedance of L XLR ON input = 600 Ω, OFF = 10 kΩ

- Functioning modes / Impedance of MPX input:



Switch 1: Functioning mode ON = Mono, OFF = Stereo

Switch 2: impedance of MPX ON input = 50 Ω, OFF = 10 kΩ

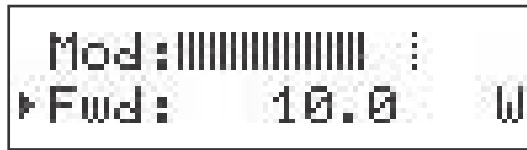
5.4 Software

The machine is provided with a two-line LCD display where a set of menus is shown. An overall view of the machine's menus is given in figure .

One of the following symbols may be present on the left side of the display, depending on the case:

- _ (Cursor) - The cursor indentifies the selected menu where you can have access.
- ▶ (Full arrow) - The parameter highlighted by the arrow can be modified. This symbol is present in menu composed of more than two lines as an help in the scroll menu.
- ▶▶▶ (Three empty arrows) - The parameter highlighted by the arrows is in phase of modification.
- ▷ (Empty Arrow) - The arrow points out the current line, the parameter of which cannot be modified. This symbol is present in the menus made up of more than two lines to help scroll the menu.

When turned on, the LCD display shows the “Main Menu” with the graphic representation of the instantaneous modulation level and indication of the forward power supplied:



The vertical bars near the title “Mod” indicate the progress of the modulation in real time; the hachured bar indicates the maximum 75 kHz nominal modulation level (100%).

In order to change the power level setted, select with the push-button GIU’ the line which corresponds to the power and keep the ENTER button pressed until you enter the modify mode.

The above line displays the instantaneous power reading (in this example 10W), while the bar indicates the setted level. In order to increase the level, keep the RIGHT/DOWN button pressed, in order to reduce it press the LEFT/UP button. As the setted level increases or decreases, the bar gets longer or shorter in order to enable the display of the current setting. Once the desired level is reached, press ENTER to confirm and exit the predefined menu. Please note that the setted value is anyway memorized, therefore when you press ESC or when the timeout period is passed and no button was pressed, the power will remain on the last setted level.

When you press twice on the ESC button while you are in the predefined menu, the following selection view is displayed, and from this view it will be then possible to enter to all the other menus:



To enter one of the submenus, select the name (that will be enhanced by a flashing cursor) with the RIGHT or LEFT push-buttons and then press the ENTER button.

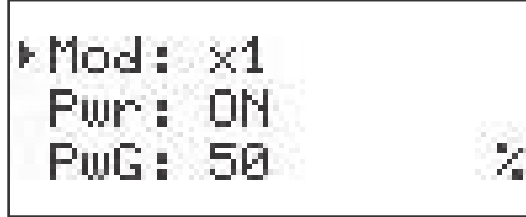
If on the contrary, you wish to return to the predefined menu, you just have to press again the ESC push-button.

In some cases, on the left side of the menu an arrow can appear. It means that it is necessary to indicate the current line selected. When the arrow is full, the parameter can be modified, while when it is empty, the parameter can only be viewed.



Note: The “L&R” menu is available only in the stereo version. In the mono version the “L&R” inscription do not appear.

5.4.1 Functioning menu (Fnc)



From this menu the user can set the deviation display mode, he can switch on or inhibit the power erogation of the transmitter and he can modify the attention threshold.

In order to intervene on one of the three keys, select the corresponding line with the “UP” and “DOWN” buttons and then press and keep the ENTER button pressed until the order is accepted. In this way the Pwr setting will go from On to Off or vice versa and the Mod setting will go from “X1” to “X10” or vice versa.

In “X10” mode the indication of the instantaneous deviation is multiplied by 10, this is why the hachured indicator on the predefined menu coincides with the 7,5 kHz value instead of 75 kHz. This visualization mode is useful when the user wants to have low deviation levels displayed, for instance when they are provoked by the pilot tone or the subcarriers.

As indicated in the introduction, the transmitter offers the possibilly to the user to set the attention threshold. This latter is compared to the level of one of the functioning parameters of the unit. The result of the comparison is available on the telemetry connector, and can be read on the display as “O” (which means open, that is to say the result is wrong) or “C” (which means closes, therefore the result is true).

The threshold that can be setted (Power Good) refers to the transmitted power level.

The threshold is expressed in percentage of the full scale of the considered size.

The full-scale of the monitored size of the attention threshold for the THESLA 950 TX is:

- Forward Power 10 W

In order to change the values of the attention thresholds, the following procedure should be followed:

- Select the line that should be modified (with the 'UP' and 'DOWN' buttons)
- Press the ENTER button
- Modify the value of the threshold ('UP' and 'DOWN' buttons)
- Press the ENTER button

In this example, the alarm threshold is:

- PwG 9 W (90% x 10 W)

5.4.2 Pwr menu (Pwr)

This view shows to the user the measurements corresponding to the power erogation of the exciter:

- Forward Power (Fwd)
- Reflected Power (Rfl)

```

▶ Fwd:    45.5    W
  Rfl:     0.3    W
    
```

The values indicated are “readings”, and therefore cannot be modified (remark the empty triangle). In order to modify the power setting, use the predefined menu as described formerly.

5.4.3 Power Amplifier menu (P.A)

This view, composed of three lines that can be scrolled with the 'UP' and 'DOWN' buttons, shows to the user the values corresponding to the power amplifier of the unit:

- Voltage (VPA)
- Absorbed current (IPA)

```

▶ VPa:    12.0    V
  IPa:     0.8    A
    
```

5.4.4 Set menu (Set)

This menu enables to read and set the working frequencies.

```

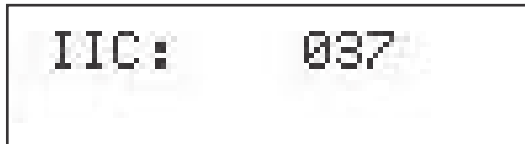
▶ F1 :  98.000MHz
.....
    
```

When you press the ENTER button, it will be possible to modify the setted frequency with the 'UP' (the frequency increases) and 'DOWN' (the frequency decreases).

After a new frequency value was set, press the ENTER button to confirm the choice; the exciter will unlock from the current frequency (the LED LOCK switches off) and will lock to the new working frequency (the LOCK LED lits up). On the contrary when you press ESC or when you let the timeout passes by, the frequency will remain setted at the last value memorized.

5.4.5 Mix menu (Mix)

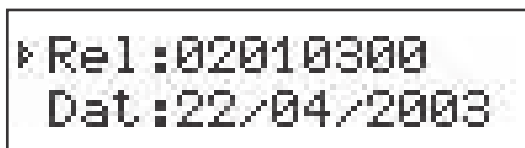
This menu enables to set the path of the unit on a serial bus connection of the type I²C:



The I²C AC path is important when the exciter is connected to an RVR transmission system which allows the use of this protocol. We recommend not to modify it with no reason.

5.4.6 Versions Menu (Vrs)

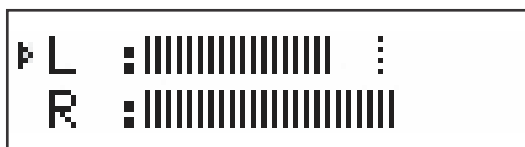
This view shows the version of the unit and the date to the software release:



5.4.7 Channels menu (L&R)

This menu works on stereo version units.

The input levels of the right and left channels are represented by vertical bars as indicated in the following illustration:



The hachured bar indicates the level which corresponds to the global deviation of 100% of the channels.

6. THESLA 950 RX quick guide for installation and use

This chapter contains the necessary instructions for the installation and use of the equipment. In case some aspects are not totally clear, for instance when a user is using this equipment for the first time, we advise the new user to read carefully the entire description contained in this manual.

6.1 Preparation

Unpack the receiver and before doing any other operation, be sure it has not been damaged during transport. In particular check that all the connectors are in perfect condition.

The main fuse can be accessed from the outside on the rear panel. Extract the fuse carrier with a screwdriver to check its integrity or for replacement, if necessary. The fuse to be used is this type:

- **MAIN FUSE** 1.6 A ; 5mmx20mm

Check that the supply voltage value coincides with the AC voltage available.

The input supply field is of:

- **THESLA 950 RX** 80-260 V _{AC}

Check that the switches of the **THESLA 950 RX** are in the position "0" (off).

The **THESLA 950 RX** has a switch which interrupts completely the AC supply of the unit.

Connect the RF output of the exciter to the antenna cable .

Connect the AC cable to the corresponding VDE socket.



Note: It is essential that the AC network has an accurate grounding system in order to ensure both the safety of the users and the correct functioning of the unit.

If the user intends to use external batteries in case of AC supply interruption, connect them to the clamps situated at the back of the equipment being careful to respect the polarity.



WARNING: Keep in mind that the general switch of the transmitter has an effect on the AC supply, and not on the possible auxiliary supply. If you use an external supply with continuous current, it is then necessary to have an external switch for this purpose.

Connect the audio cables of your own audio signal to the appropriate connectors situated at the back of the exciter.

6.2 Operation

Switch on the receiver by putting the selector on the position “I” (on) the switch situated on the rear panel.

Enter the menu “Set” and set the working frequency desired. For the description of the different menus.

With the help of the switches and trimmers situated on the rear panel, set the characteristics (de emphasis) and the levels of the audio outputs.

From the predefined menu, set the desired power level.

From the menu “Fnc”, set the power output.

6.3 Settings and calibration

The only regulations that should be done manually on the THESLA 950 RX are the regulations of the levels and audio functioning modes.

On the rear panel of the unit there is a trimmer for each output of the receiver. The sensitivity of the different outputs can be regulated with the trimmers as indicated in the following tables:

Sensitivity of the outputs:

Output	Chap. 7.5	Trimmer	Sensitivity	Notes
MPX	[13]	[14]	-20 ÷ +13 dBm	Output level for 2.0 kHz (-30 dB) of deviation
SCA	[5]	[6]	- 8 ÷ +13 dBm	Output level for 7.5 kHz (-20 dB) of deviation
SCA/MPX	[4]	[15]	- 8 ÷ +13 dBm	Output level for 7.5 kHz (-20 dB) of deviation
Left-Mono/MPX	[17]	[16]	-10 ÷ +14 dBm	Output level for 75 kHz (0 dB) of deviation
Right/Mono	[8]	[7]	-10 ÷ +14 dBm	Output level for 75 kHz (0 dB) of deviation

In order to regulate the sensitivity level of the outputs, it is important to keep in mind that the instantaneous modulation level is indicated in the predefined menu and that an indicator indicates that the level is at 75 kHz. For a correct regulation, we advise to bring a signal equivalent to the signal level of your own audio programme into the input of the unit and regulate the corresponding trimmer until the instantaneous deviation coincides with the 75 kHz indication.

For the regulation of the levels of the sub-carriers’ outputs, a similar procedure can be followed, with the help of the option “X10” which can be selected from the menu Fnc. With this option, the indicated modulation level is multiplied per the factor 10, so that the hachured indication of the predefined menu coincides with a deviation value of 7,5Khz.

As for the stereo version, there is an appropriate menu in which the levels of the of the right and left channels with the corresponding nominal level indicators for the maximum 75Khz deviation are indicated separately.

The position of the DIP switches that are needed to select the available options is indicated on the silk-screen.

- Deemphasis:



6.4 Software

The machine is provided with a two-line LCD display where a set of menus is shown. An overall view of the machine's menus is given in figure .

One of the following symbols may be present on the left side of the display, depending on the case:

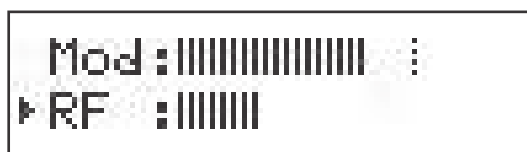
_ (Cursor) - The cursor identifies the selected menu where you can have access.

(Full arrow) - The parameter highlighted by the arrow can be modified. This symbol is present in menu composed of more than two lines as an help in the scroll menu.

(Three empty arrows) - The parameter highlighted by the arrows is in phase of modification.

(Empty Arrow) - The arrow points out the current line, the parameter of which cannot be modified. This symbol is present in the menus made up of more than two lines to help scroll the menu.

When the unit is switched on, the LCD display shows the predefined view, with the graphical representation of the instantaneous modulation level and the indication of the value of the direct power erogated:



The bottom line gives the instantaneous reading of the received signal level on analog scale, while the bar indicates the squelch level set. To increase the level, press the RIGHT / DOWN button or decremented by pressing LEFT / UP button. As the set level increases or decreases, the bar lengthens or shortens to display the current setting. Once you reach the desired level, press ENTER to confirm and exit the default menu. Note that the set value is stored anyway, so if you press ESC or if you leave the timeout time without pressing a button, the power will remain to the last set level.

In case the RF signal is lower than the squelch threshold set, the receiver outputs are placed in MUTE and BNC interlock is closed.

When you press twice on the ESC button while you are in the predefined menu, the following selection view is displayed, and from this view it will be then possible to enter to all the other menus:



```
Fnc Set Aud Mix
Urs
```

To enter one of the submenus, select the name (that will be enhanced by a flashing cursor) with the RIGHT or LEFT push-buttons and then press the ENTER button.

If on the contrary, you wish to return to the predefined menu, you just have to press again the ESC push-button.

In some cases, on the left side of the menu an arrow can appear. It indicates that it is necessary to indicate the current line selected. When the arrow is full, the parameter can be modified, while when it is empty, the parameter can only be viewed.

6.4.1 Functioning menu (Fnc)



```
Mod: x1
AF: MUTE OFF
```

From this menu the user can set the deviation display mode, he can switch on or inhibit the muting mode.

In order to intervene on one of the three keys, select the corresponding line with the “UP” and “DOWN” buttons and then press and keep the ENTER button pressed until the order is accepted. In this way the Pwr setting will go from On to Off or vice versa and the Mod setting will go from “X1” to “X10” or vice versa.

In “X10” mode the indication of the instantaneous deviation is multiplied by 10, this is why the hachured indicator on the predefined menu coincides with the 7,5 kHz value instead of 75 kHz. This visualization mode is useful when the user wants to have low deviation levels displayed, for instance when they are provoked by the pilot tone or the subcarriers.

As indicated in the introduction, the transmitter offers the possibility to the user to set the muting mode. “MUTE OFF” indicates that the muting was not activated, therefore the received signal is situated at the audio outputs. “MUTE ON” indicates that the muting is activated, therefore the audio outputs are muted.

6.4.2 Set menu (Set)

This menu enables to read and set the working frequencies.

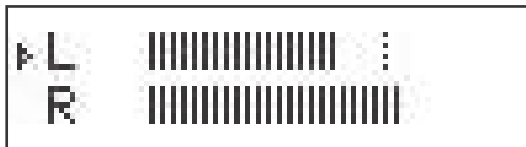


When you press the ENTER button, it will be possible to modify the setted frequency with the 'UP' (the frequency increases) and 'DOWN' (the frequency decreases).

After a new frequency value was setted, press the ENTER button to confirm the choice; the exciter will unlock from the current frequency (the LED LOCK switches off) and will lock to the new working frequency (the LOCK LED lits up). On the contrary when you press ESC or when you let the timeout passes by, the frequency will remain setted at the last value memorized.

6.4.3 Aud menu (Aud)

The levels of the inputs of the left and right channels are represented by vertical bars as indicated in the following illustration.



The hachured bar indicates the level which corresponds to the global deviation of 100% of the channels.

6.4.4 Mix menu (Mix)

This menu enables to set the path of the unit on a serial bus connection of the type I²C:



The I²C main path is important when the exciter is connected to an RVR transmission system which allows the use of this protocol. We recommend not to modify it with no reason.

6.4.5 Versions menu (Vrs)

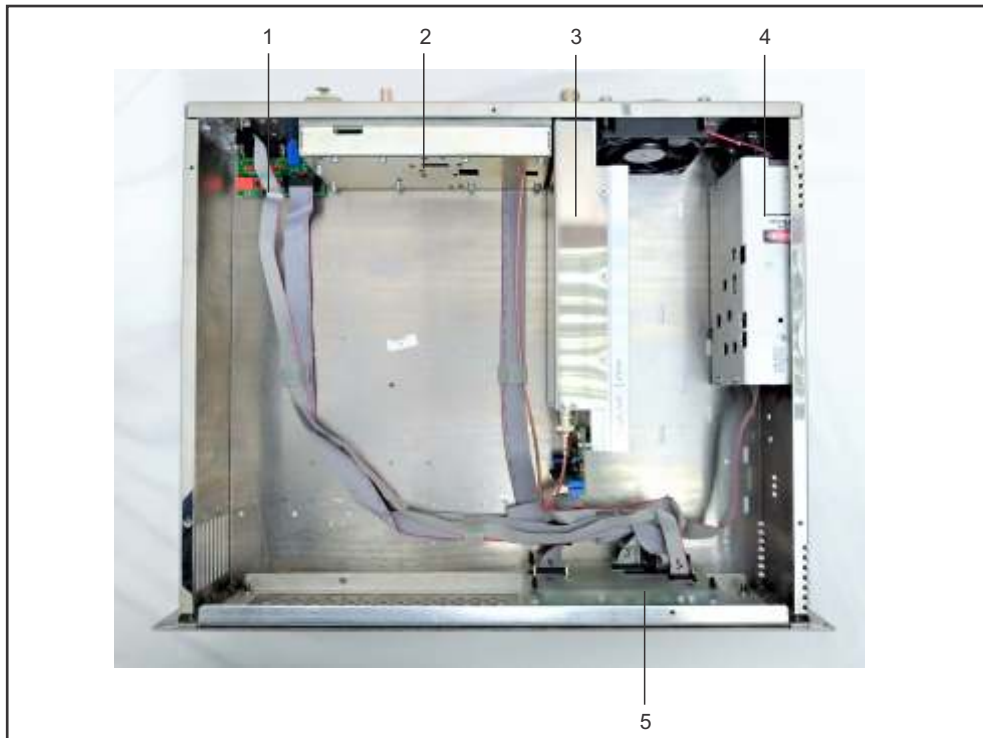
This view shows the version of the unit and the date to the software release:

```
Rel:02010300  
Dat:22/04/2003
```


7. Functioning principles of the THESLA 950 TX

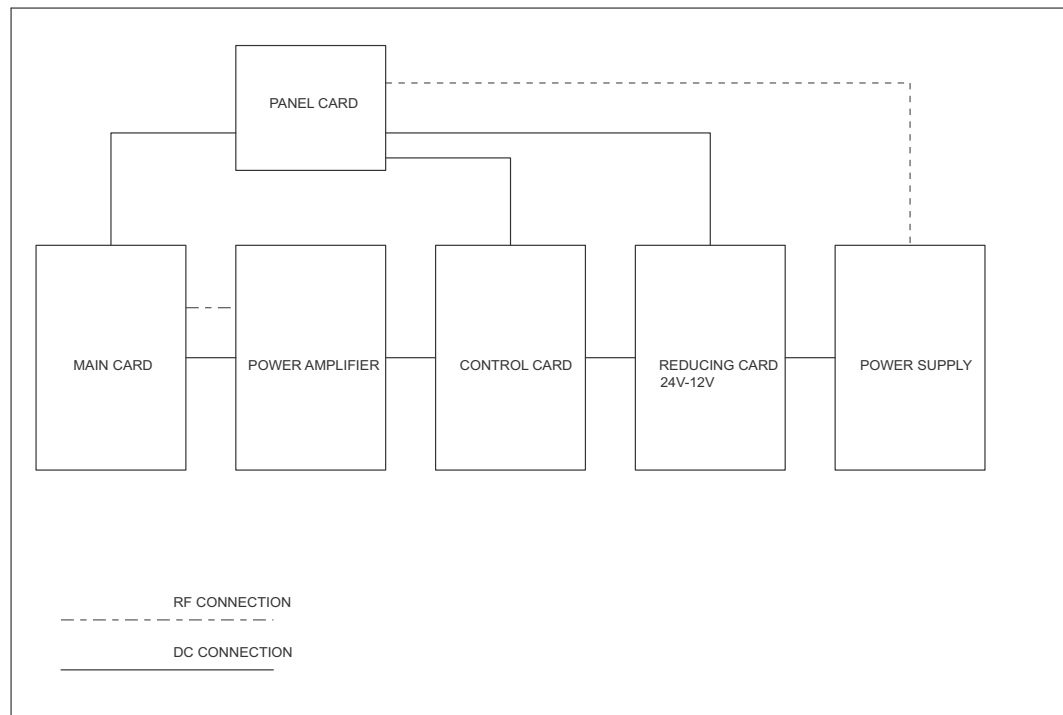
The THESLA 950TX is composed of several modules connected between them with the help of connectors, with the aim to ease the maintenance and the possible replacement of the modules.

The above description shows the top view of the unit with the indication of the different components.



- [1] Telemetry card
- [2] VCO/PLL/AUDIO IN Card
- [3] Power Amplifier
- [4] Power Supply Card
- [5] Panel Card

A schematic view of the modules and of the connections which compose the **THESLA 950 TX** is shown in the following illustration.



A brief description of the functions of each module will follow, while the complete schemes and the layouts of the cards are shown in the appendix.

7.1 Power supply

The power supply of the **THESLA 950 TX** is a switching unit whose 24V main output will formerly be reduced in order to supply the RF stage of the unit.

The stabilizers for the 5V and 18V continuous voltage generation for the supply of the other circuits of the unit are present on the power supply. Please note that the power supply is “direct from the AC line”, therefore without transformer, and it can be connected to any of the voltages comprised between 100 and 230 V without making any regulations or manual settings. The auxiliary 24V continuous voltage inputs are connected to the power supply and intervene automatically in order to collide with possible AC supply absences.

7.2 Reducing card

The reducing card transforms the voltage, coming from the switching power supply, from 24V to 12 V which is the necessary voltage for the supply of the RF power stage of the unit.

7.3 Panel card

The panel card contains the microprocessor (PIC16F877Q) which implements the monitoring software of the unit, the display and the other elements which are necessary for the interface with the user.

This card is the interface with the other modules of the unit, both for the distribution of the supply units and monitoring and for the measurements.

7.4 Monitoring card

The monitoring card provides for the management of the readings and the regulation of the parameters referring to the direct and forward power, monitors the gain and the "FOLDBACK" input and it surveys the internal temperature of the unit.

The card works as an interface between the panel card and the final stage for the power regulation, the protection, the readings and the remote monitorings.

7.5 Main card

The main card has the following functions:

- Processing of the audio and SCA inputs
- Generation of the carrier
- Modulation
- R.F. Amplifier (Driver)

The difference between the Mono and Stereo versions of this card is the audio stage, since the stereo version contains a stereophonic coder.

7.5.1 Audio input stage (mono version)

The audio input stage contains the circuits which realize the following functions::

- Selection of the input impedance
- 15 kHz filtering of the mono channel
- Preenfasis of the mono channel
- Mixing of the mono, MPX and SCA channels
- Clipper (limits the level of the modulating signal so that the frequency deviation does not exceed the 75 kHz level)
- Measurement of the modulating signal

7.5.2 Audio input stage (stereo version)

Two 15Khz filters are present in this card for the filtering of both Left and Right channels, and an integrated stereophonical generator. The other functions are the same in the mono version.

7.5.3 PLL/VCO stage

This stage of the card generates the modulated radiofrequency signal. It is based on a PLL scheme which uses an integrated PLL model MB15E06.

7.5.4 Driver stage section

Before going through the final stage (power amplifier), the RF signal is preamplified in this stage by the BFR540 transistor. When the exciter is in stand-by, the driver is inhibited.

7.6 Power Amplifier

The power stage is mounted on a heatsink which enables the dissipation of the generated heat which is contained in a totally shielded metallic box fixed in the central part of the bottom back of the unit.

The RF signal coming from the VCO at a level of around 10mW reaches the pilot stage (BFG35) and is amplified from the final stage (MRFE6S9060NR1) up to 10W.

The signal goes through a low-pass filter which provides the elimination of the armonic emissions.

A directional coupler enables the reading of the direct and forward power of the load, such signals are then sent to the monitoring card for the necessary controls.

The reading of the direct power is also indicated on the panel card in order to enable the display of the data on the LCD screen situated on the front panel.

7.7 Telemetry card

This device was designed to give indications to the user concerning the functioning status of the unit. All the available input and output signals of the unit are indicated on the DB15 connector.

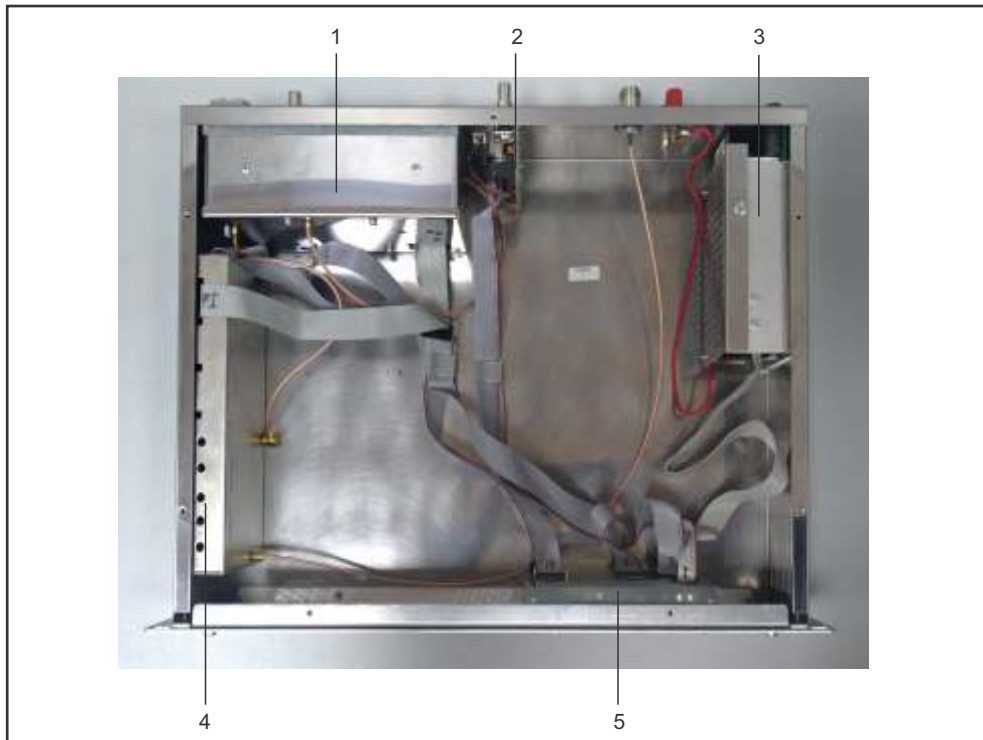
On the same card there is an "INTERLOCK" BNC connector which switches off the device. When the central pin is grounded, the output power is reduced to zero until the connection is removed.

When it is used with an Biquad amplifier, this connector is connected to the REMOTE or INTERLOCK of the power amplifier with a BNC-BNC connector. In case of failure of the amplifier, the central wire is grounded by forcing the unit to enter in stand-by mode.

8. Functioning principles of the THESLA 950 RX

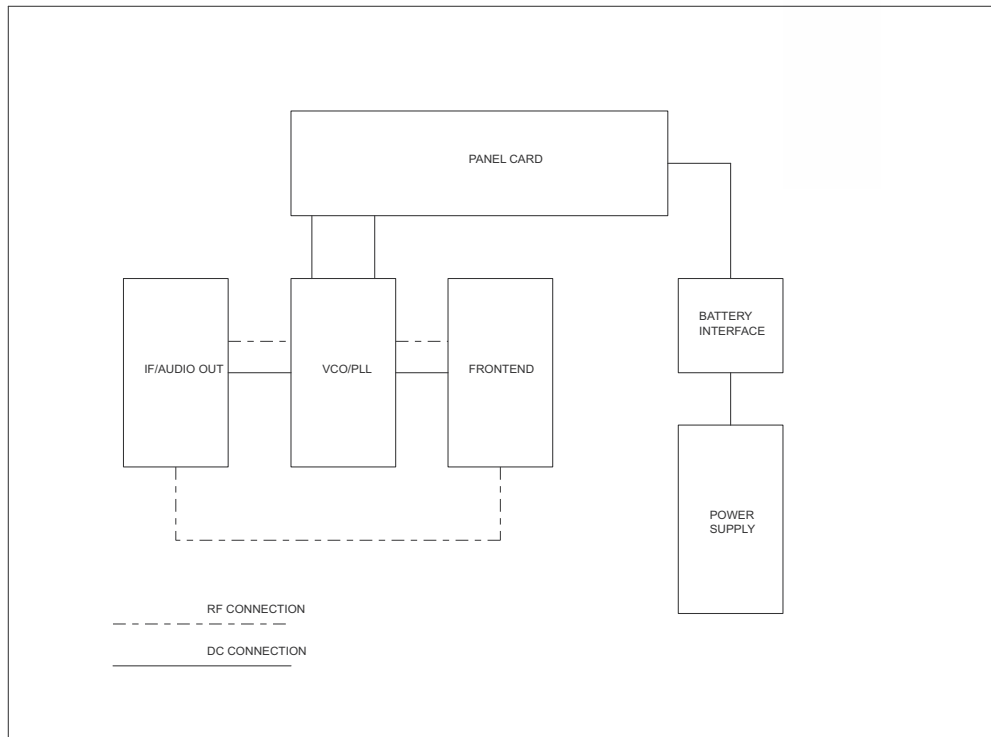
THESLA 950 RX is composed of several modules connected between them with the help of connectors, with the aim to ease the maintenance and the possible replacement of the modules.

The above description shows the top view of the unit with the indication of the different components.



- [1] IF Card
- [2] Telemetry card
- [3] Power Amplifier
- [4] Front-end VCO Card
- [5] Panel Card

A schematic view of the modules and of the connections which compose the **THESLA 950 RX** is shown in the following illustration.



A brief description of the functions of each module will follow, while the complete schemes and the layouts of the cards are shown in the appendix.

8.1 Power supply

The power supply of the **THESLA 950 RX** is a switching type unit, with 5V, 18V and -15V main outputs which will be adapted to supply the different electronic boards which compose the unit. Please note that the power supply is “direct from the AC line”, therefore without transformer, and it can be connected to any of the voltages comprised between 85 and 264 V_{AC} without making any regulations or manual settings.

8.2 Power supply interface

The interface card filters and stabilizes the voltages coming from the power supply, to the 5 VDC and 18 VDC continuous voltages which are necessary for the supply in the circuits of the unit, the 24V auxiliary continuous voltage inputs are connected on the power supply interface, which is used automatically in order to collide with possible AC supply absences.

8.3 Panel card

The panel card contains the microprocessor (PIC16F877Q) which implements the monitoring software of the unit, the display and the other elements which are necessary for the interface with the user.

This card is the interface with the other modules of the unit, both for the distribution of the supply units and monitoring and for the measurements.

8.4 IF card

The IF card realizes the following functions:

- Processing of the audio and SCA outputs
- Amplification of the 10.7MHz signal
- Demodulation

This circuit receives the 70MHz signal, which is filtered, amplified and then passed into a mixer which presents a signal coming from a 59.3MHz crystal oscillator to the other input. The signal (10.7MHz) obtained from the difference between these two signals is filtered and amplified and once it is processed it is sent to the front-end.

This card also processes the different audio MONO, MPX, SCA and RDS signals, and sends them, together with the muting signal, to the Front-end card.

8.4.1 Audio output stage (mono version)

The audio input stage contains the circuits which realize the following functions:

- 15KHz filtering of the mono channel
- De emphasis of the mono channel
- Separation of the mono, MPX and SCA channels.
- Measurement of the demodulating signal

8.4.2 Audio output stage (stereo version)

There are two 15KHz filters for the filtering of both L and R channels, and an integrated stereo. The other functions are the same as in the mono version.

7.5 Front End

This card receives the RF signal, filters it, amplifies it and mix it in the mixer section with the signal coming from the VCO/PLL.

The signal obtained comes sended to IF card for successive elaborations.

7.6 VCO/PLL

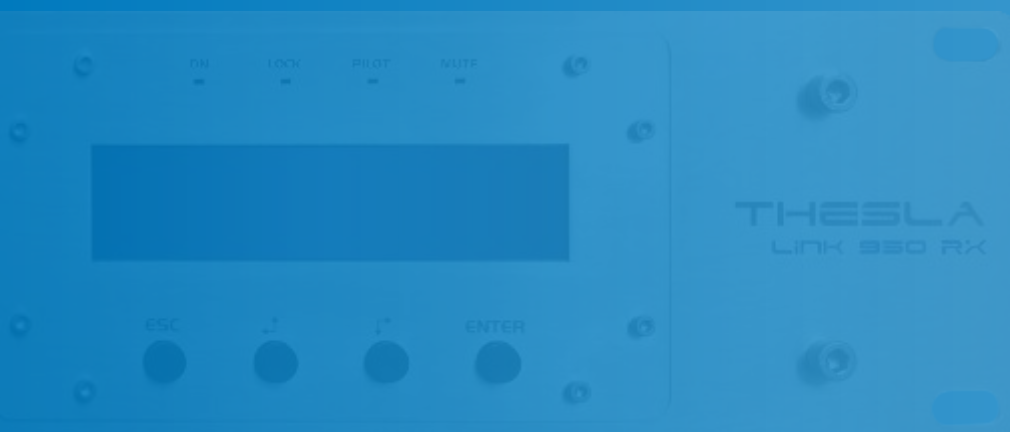
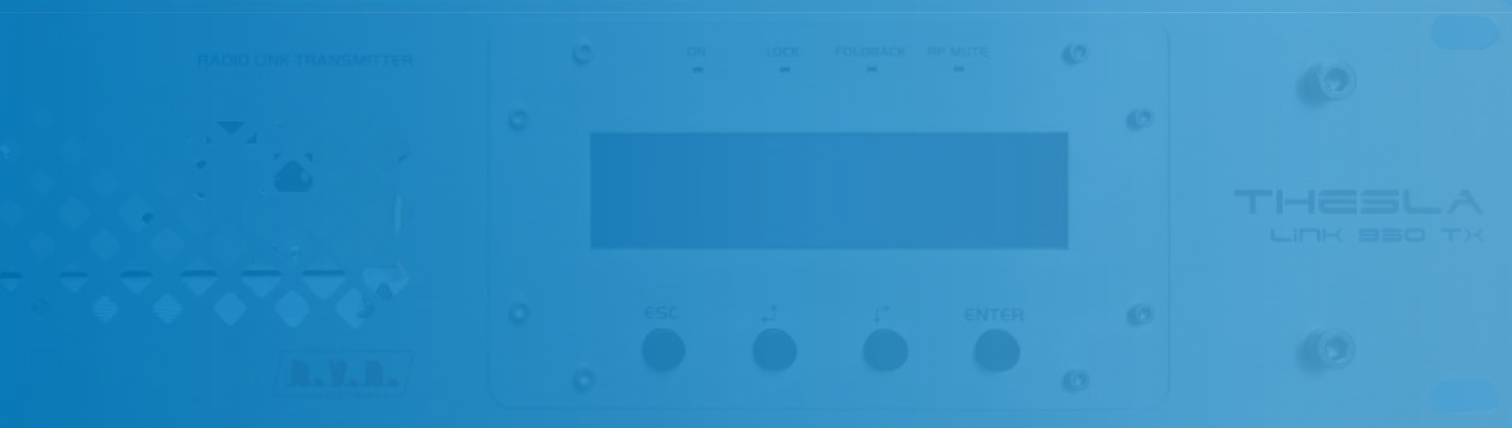
This card receives the signal which is equivalent to the setted frequency which comes from the CPU of the panel card.

In order to realize the operations, it is necessary to have a splitter which processes the information received and sends them back to the PLL stage.

7.7 Telemetry card

This device was designed to give indications to the user concerning the functioning status of the unit. All the available input and output signals of the unit are indicated on the DB15 connector.

On the same card there is an "INTERLOCK" BNC, it is closed in output in case of the RF signal is under the squelch threshold.



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