



BLUES30NV BLUES50NV

USER MANUAL
VOLUME 1



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BLUES30NV BLUES50NV - User Manual
Version 1.2

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R.V.R. Elettronica

Via del Fonditore 2/2c - 40138 - Bologna (Italia)

Telefono: +39 051 6010506

Fax: +39 051 6011104

Email: info@rvr.it

Web: www.rvr.it

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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, R.V.R. Elettronica, declares that this FM transmitter is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.



Technical Specification

Parameters		U.M.	BLUES 30 NV Value	BLUES 50 NV Value
GENERALS				
Frequency range		MHz	87.5 ± 108	87.5 ± 108
Rated output power		W	30	50
Modulation type			F3E Direct carrier frequency	F3E Direct carrier frequency
Operational Mode			Mono, Stereo, Multiplex	Mono, Stereo, Multiplex
Working temperature		°C	-5 to +50	-5 to +50
Working Humidity		%	95 (Without condensing)	95 (Without condensing)
Working Altitude		mt	2000	2000
Frequency programmability			From software, with 10 kHz steps	From software, with 10 kHz steps
Frequency stability	Working Temp. from -5°C to 50°C	ppm	±1	±1
Modulation capability		kHz	150 Stereo, 180 Mono/MPX	150 Stereo, 180 Mono/MPX
Pre-emphasis mode		µS	0, 50 (CCIR), 75 (FCC)	0, 50 (CCIR), 75 (FCC)
Spurious & harmonic suppression		dBc	<75 (80 typical)	<75 (80 typical)
Asynchronous AM S/N ratio	Referred to 100% AM, with no de-emphasis	dB	e 65 (typical 70)	e 65 (typical 70)
Synchronous AM S/N ratio	Referred to 100% AM, FM deviation 75 kHz by 400Hz sine, without de-emphasis	dB	e 50 (typical 60)	e 50 (typical 60)
MONO OPERATION				
S/N FM Ratio	RMS @ ± 75 kHz peak, HPF 20Hz - LPF 23 kHz, 50 µS de-emphasis	dB	> 80 (typical 85)	> 80 (typical 85)
	Qpk @ ± 75 kHz peak, CCIR weighted, 50 µS de-emphasis	dB	>73	>73
	Qpk @ ± 40 kHz peak, CCIR weighted, 50 µS de-emphasis	dB	>68	>68
Frequency Response	30Hz ± 15kHz	dB	better than ± 0.5 dB (typical ± 0.2)	better than ± 0.5 dB (typical ± 0.2)
Total Harmonic Distortion	THD+N 30Hz ± 15kHz	%	< 0.1 (Typical 0.07%)	< 0.1 (Typical 0.07%)
Intermodulation distortion	Measured with a 1 KHz, 1.3 KHz tones, 1:1ratio, @ 75 kHz FM	%	< 0.05	< 0.05
Transient intermodulation distortion	3.18 kHz square wave, 15 kHz sine wave @75 kHz FM	%	< 0.1 (typical 0.05)	< 0.1 (typical 0.05)
MPX OPERATION				
Composite S/N FM Ratio	RMS @ ± 75 kHz peak, HPF 20Hz - LPF 23 kHz, 50 µS de-emphasis	dB	> 80 (typical 85)	> 80 (typical 85)
Frequency Response	30Hz ± 53kHz	dB	± 0.2	± 0.2
	53kHz ± 100kHz	dB	± 0.5	± 0.5
Total Harmonic Distortion	THD+N 30Hz ± 53kHz	%	< 0.1	< 0.1
Intermodulation distortion	THD+N 53kHz ± 100kHz	%	< 0.15	< 0.15
	Measured with a 1 KHz, 1.3 KHz tones, 1:1ratio, @ 75 kHz FM	%	< 0.05	< 0.05
Transient intermodulation distortion	3.18 kHz square wave, 15 kHz sine wave @75 kHz FM	%	< 0.1 (typical 0.05)	< 0.1 (typical 0.05)
Stereo separation	30Hz ± 53kHz	dB	> 50 dB (typical 60)	> 50 dB (typical 60)
STEREO OPERATION				
Stereo S/N FM Ratio	RMS @ ± 75 kHz peak, HPF 20Hz - LPF 23 kHz, 50 µS de-emphasis, L & R demodulated	dB	> 75 (78 typical)	> 75 (78 typical)
	Qpk @ ± 75 kHz peak, CCIR weighted, 50 µS de-emphasis, L & R demodulated	dB	> 65 dB	> 65 dB
	Qpk @ ± 40 kHz peak, CCIR weighted, 50 µS de-emphasis, L & R demodulated	dB	> 58 dB	> 58 dB
Frequency Response	30Hz ± 15kHz	dB	± 0.5	± 0.5
Total Harmonic Distortion	THD+N 30Hz ± 15kHz	%	< 0.05	< 0.05
Intermodulation distortion	Measured with a 1 KHz, 1.3 KHz tones, 1:1ratio, @ 75 kHz FM	%	d 0.03	d 0.03
Transient intermodulation distortion	3.18 kHz square wave, 15 kHz sine wave @75 kHz FM	%	< 0.1 (typical 0.05)	< 0.1 (typical 0.05)
Stereo separation		dB	> 50 (typical 55)	> 50 (typical 55)
Main / Sub Ratio	30Hz ± 15kHz	dB	> 40 (typical 45)	> 40 (typical 45)
SCA OPERATION				
Frequency response		dB	± 0.5	± 0.5
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 (typical 78)	> 75 (typical 78)
	RMS, ref @ ± 75 kHz peak, no HPF/LPF, 0µS de-emphasis, with 92 kHz tone on SCA input @ 7.5kHz FM deviation	dB	> 78 (typical 80)	> 78 (typical 80)
POWER REQUIREMENTS				
AC Power Input	AC Supply Voltage	VAC	80 ± 260	80 ± 260
	AC Apparent Power Consumption	VA	120	200
	Active Power Consumption	W	70	100
	Power Factor		0.5	0.5
	Overall Efficiency	%		
DC Power Input	Connector		VDE IEC Standard	VDE IEC Standard
	DC Supply Voltage	VDC	24	***
	DC Current	ADC	3.5 (*)	***
MECHANICAL DIMENSIONS				
Physical Dimensions	Front panel width	mm	483 (19")	483 (19")
	Front panel height	mm	44 (3 1/2") 1HE	44 (3 1/2") 1HE
	Overall depth	mm	394	394
	Chassis depth	mm	372	372
Weight	kg		about 5,5	about 5,5
VARIOUS				
Cooling			Forced, with internal fan	Forced, with internal fan
Acoustic Noise		dBA	< 58	< 58
AUDIO INPUTS				
Left / Mono	Connector		XLR F	XLR F
	Type		Balanced	Balanced
	Impedance	Ohm	10 k or 600	10 k or 600
Right	Input Level / Adjust	dBu	-13 to +13	-13 to +13
	Connector		XLR F	XLR F
	Type		Balanced	Balanced
MPX	Impedance	Ohm	10 k or 600	10 k or 600
	Input Level	dBu	-13 to +13	-13 to +13
	Connector		BNC	BNC
SCA/RDS	Type		unbalanced	unbalanced
	Impedance	Ohm	10 k or 50	10 k or 50
	Input Level / Adjust	dBu	*-13 to +13	*-13 to +13
AES/EBU (optional)	Connector		2 x BNC	2 x BNC
	Type		unbalanced	unbalanced
	Impedance	Ohm	10 k	10 k
TOS/Link (optional)	Input Level / Adjust	dBfs	*-8 to +13	*-8 to +13
	Connector		Balanced	Balanced
	Type		110	110
OUTPUTS	Connector		N type	N type
	Impedance	Ohm	50	50
	Connector		BNC	BNC
RF Monitor	Impedance	Ohm	50	50
	Output Level	dB	approx. -30	approx. -30
	Connector		BNC	BNC
Pilot output	Impedance	Ohm	>5 k	>5 k
	Output Level	Vpp	1	1
AUXILIARY CONNECTIONS				
Interlock	Connector		BNC	BNC
Service	Connector		DB9 F	DB9 F
Remote Interface	Connector		DB15F	DB15F
FUSES				
On Mains			1 External fuse F 3,15 T - 5x20 mm	1 External fuse F 6,3 T - 5x20 mm
On services				
On PA Supply				
On Driver Supply				
HUMAN INTERFACES				
Input device			Mechanical encoder with pushbutton	Mechanical encoder with pushbutton
Display			Alphanumerical LCD - 2 x 16	Alphanumerical LCD - 2 x 16

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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 foreword

The equipment in object is to considering for uses, installation and maintenance from "trained" or "qualified" staff, they conscious of the risks connected to operate on electronic and electrical circuits electrical.

The "trained" definition means staff with technical knowledge about the use of the equipment and with responsibility regarding the own safety and the other not qualified staff safety place under his directed surveillance in case of works on the equipment.

The "qualified" definition means staff with instruction and experience about the use of the equipment and with responsibility regarding the own safety and the other not qualified staff safety place under his directed surveillance in case of works on the equipment.

 **WARNING: The machine can be equipped with an ON/OFF switch which could not remove completely voltages inside the machine. It is necessary to have disconnected the feeding cord, or to have switched off the control panel, before to execute technical operations, making sure himself that the safety connection to ground is connected.**

The technical interventions that expect the equipment inspection with circuits under voltage must be carry out from trained and qualified staff in presence of a second trained person that it is ready to intervene removing voltage in case of need.

R.V.R. Elettronica doesn't assume responsibility for injury or damage resulting from improper procedures or practices by untrained/unqualified personnel in the handling of this unit.

 **WARNING: The equipment is not water resistant and an infiltration could seriously compromise its correct operation. In order to prevent fires or electric shocks, do not expose the equipment to rain, infiltrations or humidity.**

Please observe all local codes and fire protection standards during installation and use of this unit.

 **WARNING: The equipment has to its inside exposed parts to risk of electric shock, always disconnect power before opening covers or removing any part of this unit.**

Fissures and holes are supplied for the ventilation in order to assure a reliable efficacy of the product that for protect itself from excessive heating, these fissures do not have to be obstructed or to be covered. The fissures doesn't be obstructed in no case. The product must not be incorporated in a rack, unless it is supplied with a suitable ventilation or that the manufacturer's instructions are been followed.

 **WARNING: This equipment can irradiate radio frequency energy and if it's not installed following the instructions contained in the manual and local regulations it could generate interferences in radio communications.**

 **WARNING: This device has a connection to ground on the power cord and on the chassis. Check that they are correctly connected.**

Operate with this device in a residential ambient can cause radio disturbs; in this case, it can be demanded to the user to take adequate measures.

Specifications and informations contained in this manual are furnished for information only, and are subject to change at any time without notice, and should not be construed as a commitment by **R.V.R. Elettronica**.

The **R.V.R. Elettronica** assumes no responsibility or liability for any errors or inaccuracies that may appear in this manual, including the products and software described in it; and it reserves the right to modify the design and/or the technical specifications of the product and this manual without notice.

• **Warning regarding the use designated and the use limitations of the product.**

This product is an transmitter radio indicated for the audio broadcasting service in frequency modulation. It uses working frequencies that are not harmonized in the states of designated user.

The user of this product must obtain from the Authority for spectrum management in the state of designated user the appropriate authorization to use the radio spectrum, before putting in exercise this equipment.

The working frequency, the transmitter power, let alone other specifications of the transmission system are subject to limitation and defined in the authorization obtained.

2. Warranty

R.V.R. Electronics guarantees absence of manufacturing defect and the good operation for the products, within the provided terms and conditions.

Please read the terms carefully, because the purchase of the product or acceptance of order confirmation, constitutes acceptance of the terms and conditions.

For the last legal terms and conditions, please visit our web site (WWW.RVR.IT) wich may also be changed, removed or updated for any reason without prior notice.

Warranty will be void in cases of opened products, physical damage, misuse, modification, repair by unauthorised persons, carelessness and using the product for other purpose than its intended use.

In case of defect, proceed like described in the following:

- 1 Contact the dealer or distributor where you purchased the unit. Describe the problem and, so that a possible easy solution can be detected.

Dealers and Distributors are supplied with all the information about problems that may occur and usually they can repair the unit quicker than what the manufacturer could do. Very often installing errors are discovered by dealers.

- 2 If your dealer cannot help you, contact **R.V.R. Elettronica** and explain the problem. If it is decided to return the unit to the factory, **R.V.R. Elettronica** will mail you a regular authorization with all the necessary instructions to send back the goods;

- 3 When you receive the authorization, you can return the unit. Pack it carefully for the shipment, preferably using the original packing and seal the package perfectly. The customer always assumes the risks of loss (i.e.,

R.V.R. is never responsible for damage or loss, until the package reaches R.V.R. premises. For this reason, we suggest you to insure the goods for the whole value. Shipment must be effected C.I.F. (PREPAID) to the address specified by R.V.R.'s service manager on the authorization



DO NOT RETURN UNITS WITHOUT OUR AUTHORIZATION AS THEY WILL BE REFUSED

- 4 Be sure to enclose a written technical report where mention all the problems found and a copy of your original invoice establishing the starting date of the warranty.

Replacement and warranty parts may be ordered from the following address. Be sure to include the equipment model and serial number as well as part description and part number.



R.V.R. Elettronica
Via del Fonditore, 2/2c
40138 BOLOGNA ITALY
Tel. +39 051 6010506

3. First Aid

The personnel employed in the installation, use and maintenance of the device, shall be familiar with theory and practice of first aid.

3.1 Treatment of electrical shocks

3.1.1 If the victim is not responsive

Follow the A-B-C's of basic life support.

- Place victim flat on his back on a hard surface.
- Open airway: lift up neck, push forehead back (**Figure 1**).

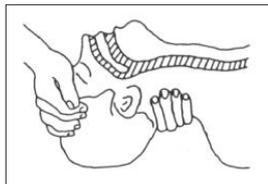


Figure 1

- clear out mouth if necessary and observe for breathing
- if not breathing, begin artificial breathing (**Figure 2**): tilt head, pinch nostrils, make airtight seal, four quick full breaths. Remember mouth to mouth resuscitation must be commenced as soon as possible.



Figure 2

- Check carotid pulse (**Figure 3**); if pulse is absent, begin artificial circulation (**Figure 4**) depressing sternum (**Figure 5**).

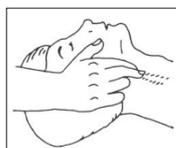


Figure 3



Figure 4

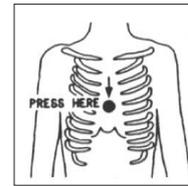


Figure 5

- In case of only one rescuer, 15 compressions alternated to two breaths.
- If there are two rescuers, the rhythm shall be of one breath each 5 compressions.
- Do not interrupt the rhythm of compressions when the second person is giving breath.
- Call for medical assistance as soon as possible.

3.1.2 If victim is responsive

- Keep them warm.
- Keep them as quiet as possible.
- Loosen their clothing (a reclining position is recommended).
- Call for medical help as soon as possible.

3.2 Treatment of electrical Burns

3.2.1 Extensive burned and broken skin

- Cover area with clean sheet or cloth.
- Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
- Treat victim for shock as required.
- Arrange transportation to a hospital as quickly as possible.
- If arms or legs are affected keep them elevated.

If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold).

Allow victim to sip slowly about 4 ounces (half a glass) over a period of 15 minutes.

Discontinue fluid if vomiting occurs.

DO NOT give alcohol.

3.2.2 Less severe burns

- Apply cool (not ice cold) compresses using the cleansed available cloth article.
- Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
- Apply clean dry dressing if necessary.
- Treat victim for shock as required.
- Arrange transportation to a hospital as quickly as possible.
- If arms or legs are affected keep them elevated.

4. General Description

The **BLUES30/50NV** is an **exciter for** Frequency Modulated audio **broadcasting** in a frequency modulation able to transmit in the band between 87.5 and 108 MHz, in step of 10 KHz, with an RF output power adjustable up to a maximum of 30/50 W into a 50 Ohm standard load.

The **BLUES30/50NV** is designed to being contained into a 19" rack box of 1HE..

4.1 Unpacking

The package contains:

- 1 **BLUES30NV** or **BLUES50NV**
- 1 User Manual
- 1 Mains Power Cable

The following accessories are also available from Your R.V.R. Dealer:

- **Options for the machine:** /TLW-BLU-E
- **Spare Parts**
- **Cables**

4.2 Features

This exciter contains a low-pass filter that reduces the harmonic emissions to below the limits allowed by international regulations (CCIR, FCC or ETSI), and can therefore be used as a transmitter connected directly to the antenna.

Important features of the **BLUES30/50NV** are the extremely compactness, the great simplicity of construction and use, and the presence of built-in high-performance coder stereo. **BLUES30/50NV** furthermore was designed to be modular: its various functions are carried out from modules directly connected to each other with male and female connectors or with flat cables ending in connectors. This type of design makes maintenance operations and any required module replacement easier.

The machine is ready for both LEFT and RIGHT inputs, thanks to the stereo coder; or can be configured to operate in Mono/MPX mode, i.e. excluding the stereo coder and using LEFT inputs such as MONO input and BNC, always-on, such as MPX broadband input, which is useful when you want to transmit in stereo using an external stereo coder. La macchina è inoltre predisposta per ingressi digitali AES\EBU. The equipment comes with digital inputs AES\EBU.

The RF power section uses one MOSFET module able to deliver 30/50W.

The working frequency is assured by a thermally-compensated, reference oscillator working within a phase-locked loop (PLL). The **BLUES30/50NV** reaches frequency lock within a maximum of 30 seconds.

The **BLUES30/50NV** is able to work in all range frequency without calibration and setting operation.

The microprocessor system includes an LCD display and push-button panel for interaction with the user, and implements the following functions:

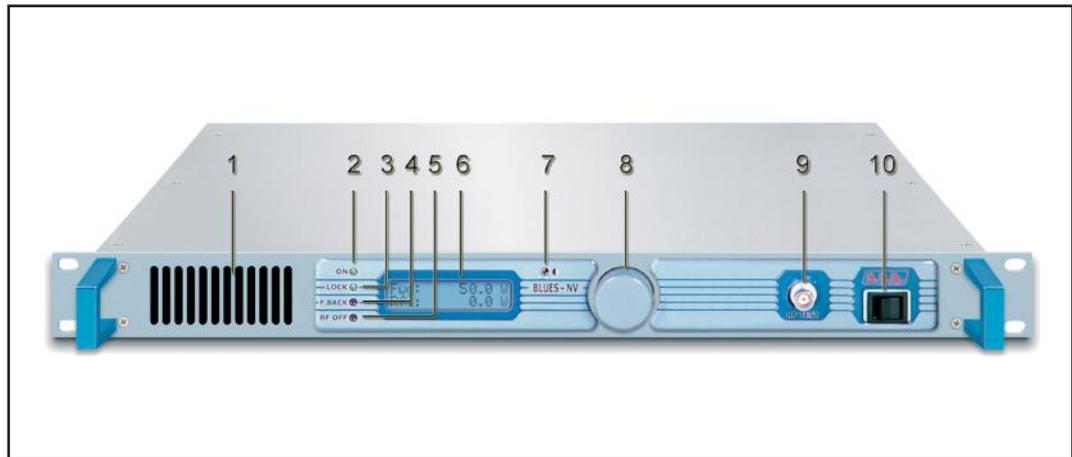
- Setting of output power
- Setting of working frequency
- Setting of Mono or Stereo operation
- Setting of preemphasis
- Setting of impedance on Left&Right and MPX channels.
- Activation and deactivation of power delivery
- Activation and deactivation of clipper operation
- Measurement and display of the working parameters of the exciter
- Communications with external devices

Four LEDs indicate the machine status and are found on the front panel: **ON, LOCK, FOLDBACK, RF OFF.**

The exciter's management software is based on a menu system. The user can navigate between the various submenus by using the knob (encoder) placed on front panel.

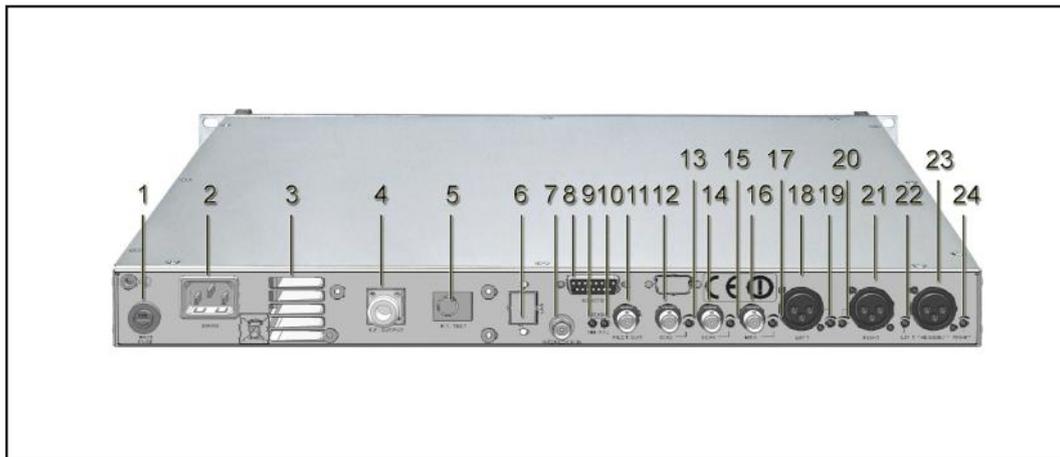
On rear panel there are Mains connector, audio input and RF output connectors, telemetry connector, protection fuse, two inputs for modulated signals on subcarriers from special external encoders normally used in Europe for RDS (Radio Data Systems) transmission.

4.3 Frontal Panel Description



[1] AIR FLOW	Grid for the passage of the air flow of the forced ventilation.
[2] ON	Green LED, lit when the exciter is working or that is ready in RF power.
[3] LOCK	Green led, lit when the PLL is locked on the working frequency
[4] F.BACK	Yellow LED, lit when the foldback function is operating (automatic reduction of the delivered RF power).
[5] RF OFF	Yellow LED, lit when the exciter's power output is inhibited by an external interlock command.
[6] DISPLAY	Liquid crystals display.
[7] CONTRAST	Display contrast adjusting trimmer.
[8] ENCODER	Knob and button in order to software control.
[9] RF TEST	BNC connector for RF test output.
[10] POWER	ON/OFF switch.

4.4 Rear Panel Description



[1] MAIN FUSE	Fuse for mains supply.
[2] MAINS	Standard IEC connector for mains supply.
[3] AIR FLOW	Grid for the passage of the air flow of the forced ventilation.
[4] R.F. OUT	RF output connector, N-type.
[5] RF TEST	Not used.
[6] LAN	RJ45 connector for TCP/IP communication.
[7] INTERLOCK IN	BNC input interlock connector: the exciter is forced in stand-by mode when the inner conductor is grounded.
[8] REMOTE	DB15 connector to telemetry the equipment.
[9] FWD EXT. AGC	Trimmer to control the limitation on delivered power in function of the FWD fold input (REMOTE connector).
[10] RFL EXT. AGC	Trimmer to control the limitation on delivered power in function of the RFL fold input (REMOTE connector).
[11] PILOT OUT	BNC output for the pilot tone. This can be used for external devices synchronization (e.g. RDS coders).
[12] SCA 2	BNC connector, for SCA2 input.
[13] SCA2 ADJ	Adjustment trimmer, for SCA2 input.
[14] SCA 1	BNC connector, for SCA1 input.
[15] SCA1 ADJ	Adjustment trimmer, for SCA1 input.
[16] MPX	BNCconnector, for MPX input.
[17] MPX ADJ	Adjustment trimmer, for MPX input.
[18] LEFT-MONO	XLR connector, for balanced LEFT-MONO channel input.
[19] LEFT-MONO ADJ	Adjustment trimmer for the LEFT-MONO channel input.
[20] RIGHT ADJ	Adjustment trimmer for the RIGHT channel input.
[21] RIGHT	XLR connector, for balanced RIGHT channel input.
[22] LEFT-MONO ADJ	Adjustment trimmer for the digital LEFT-MONO channel input.
[23] AES-EBU	Balanced XLR connector for input in AES/EBU digital audio format.
[24] RIGHT ADJ	Adjustment trimmer for the digital RIGHT channel input.

4.5 Connectors Description

4.5.1 Left (MONO) / Right / AES-EBU

Type: XLR Female



- 1 GND
- 2 Positive
- 3 Negative

4.5.2 Remote

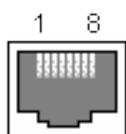
Type: DB15 Female



Pin	Name	Type	Meaning
1	Interlock	IN	By passes power if closed to GND
2	Ext AGC FWD	IN	Ext. signal, 1÷12V, for power limitation (AGC)
3	GND		GND
4	SDA IIC	I/O	IIC communication serial data
5	VPA TIm	OUT anal.	PA power supply voltage: 3,9V @ 39V
6	FWD tIm	OUT anal.	Forward power: 3,9V @ 30/50W
7	Power Good	OUT digit.	Open collector, enabled when power exceeds the set threshold.
8	GND		GND
9	GND		GND
10	Ext AGC RFL	IN	Ext. signal, 1÷12V, for power limitation (AGC)
11	SCL IIC	I/O	IIC communication clock
12	IPA TIm	OUT anal.	PA power supply current: 3,9V @ 4A
13	RFL TIm	OUT anal.	Reflected power: 3,9V @ 10W
14	On cmd	IN digit.	One grounded pulse (500 ms) enables power supply
15	OFF cmd	IN digit.	One grounded pulse (500 ms) disables power supply

4.5.6 LAN (option)

Type: RJ45 female



1	TX+
2	TX-
3	RX+
4	NC
5	NC
6	RX-
7	NC
8	NC

5. Quick guide for installation and use

This section provides a step-by-step description of equipment installation and configuration procedure. Follow these procedures closely upon first power-on and each time any change is made to general configuration, such as when a new transmission station is added or the equipment is replaced.

Once the desired configuration has been set up, no more settings are required for normal operation; at each power-up (even after an accidental shutdown), the equipment defaults to the parameters set during the initial configuration procedure.

The topics covered in this section are discussed at greater length in the next sections, with detailed descriptions of all hardware and firmware features and capabilities. Please see the relevant sections for additional details.



IMPORTANT: When configuring and testing the transmitter in which the equipment is integrated, be sure to have the Final Test Table supplied with the equipment ready at hand throughout the whole procedure; the Final Test Table lists all operating parameters as set and tested at the factory.

5.1 Preapation

5.1.1 Preliminary checks

Unpack the exciter and immediately inspect it for transport damage. Ensure that all 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:

	Mains Fuse
BLUES30NV @ 90÷260 Vac	(1x) 3.15A type 5x20
BLUES50NV @ 90÷260 Vac	(1x) 6.3A type 5x20

Table 5.1: Fuse

Provide for the following set-up (applicable to operating tests and putting into service):

- √ 90 VAC÷130 VAC or 180÷250 VAC mains power supply, with adequate earth connection.

- ✓ For operating tests only: dummy load with 50 Ohm impedance and adequate capacity (30/50W minimum).
- ✓ Connection cable kit including:
 - Mains power cable
 - Coaxial cable with BNC connectors for interlock signal connection
 - RF cable for output to load / antenna (50 Ohm coaxial cable with N-type connector)
 - Audio cables between transmitter and audio sources.

5.1.2 Connections

Connect the RF output of the transmitter to the antenna cable or a dummy load capable of dissipating amplifier output power. To begin with, set exciter to minimum output power and switch it off.

Connect the transmitter INTERLOCK IN input to the matching INTERLOCK OUT output fitted on R.V.R. Elettronica equipment to act as hybrid couplers. If your equipment is a different brand, identify an equivalent output.

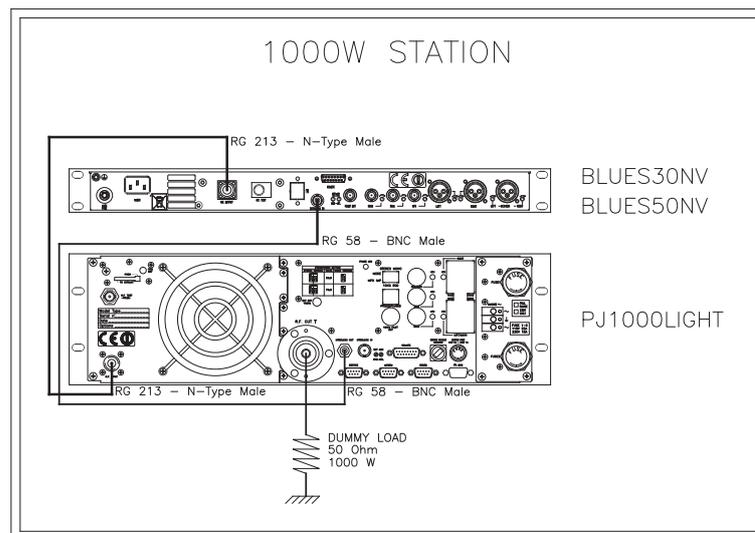


Figure 5.2: connections with amplifier



WARNING: Electric shock hazard! Never handle the RF output connector when the equipment is powered on and no load is connected. Injury or death may result. .

Ensure that the POWER switch on the front panel is set to “OFF”.

Connect the mains power cable to the MAINS connector on the rear panel.

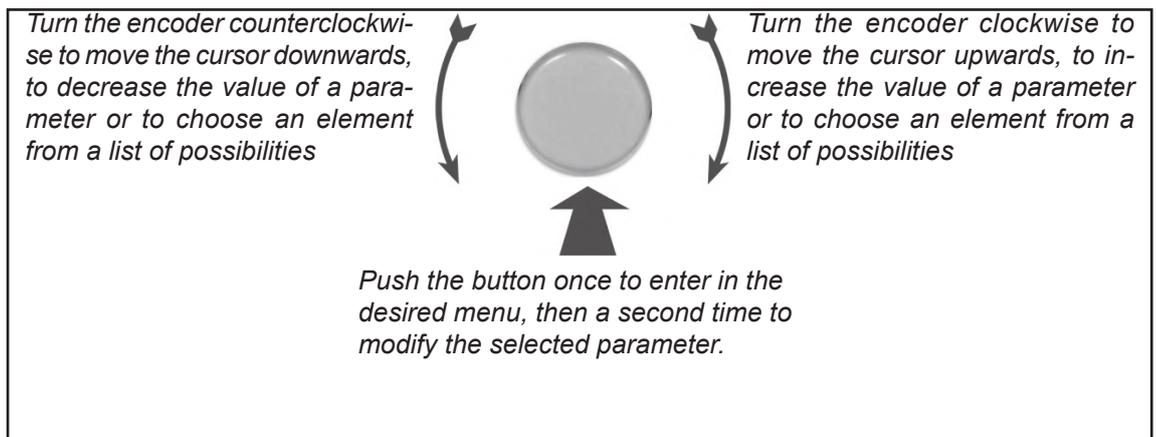


Note: the mains must be equipped with adequate earth connection properly connected to the equipment. This is a pre-requisite for ensuring operator safety and correct operation.

Connect the audio and RDS/SCA signals from user's sources to the transmitter input connectors.

5.1.3 Encoder

The interaction between the user and the exciter control software is performed using the encoder.



The operations that you can perform on the encoder are:

- **rotation:** moves the cursor shown on the display; if you turn the encoder to the left (counterclockwise), the cursor moves downwards, if you turn it right the cursor moves upwards; it also permits to increase or diminish the parameters (turning the encoder left diminishes the parameter).
- **pression:** push the button once when the cursor is on the name of a menu to enter in that menu, push it when the cursor is on the name of a parameter to enter in modification mode (the cursor starts blinking); after the modification of a parameter, push the button to save the new value.

After having modified the value of a parameter, the cursor goes on blinking for approximately 15 seconds, waiting for confirmation from the user. If the user doesn't confirm the new value (i.e., the button is not pressed), the parameter has not saved and remains on the selected parameter.

The first pressure of the encoder when the display is light out, or its rotation, serves in order to activate the retroillumination.

5.2 First power-on and setup

Perform this procedure upon first power-up and each time you make changes to the configuration of the transmitter this component is integrated into.



Note : *Standard factory settings are RF output power off (**Pwr OFF**) and regulated output power set to upper limit (unless otherwise specified by customer).*

5.2.1 Power-on

When you have performed all of the connections described in the previous paragraph, power on the exciter using the suitable power switch on the front panel.

5.2.2 Power check

Ensure that the **ON** LED turns on. Equipment name should appear briefly on the display, followed by forward power and modulation readings. If the RF output is disabled, those readings will be zero.

When the PLL locks to operating frequency, the LOCK LED will turn on.

5.2.3 How to enable the RF output

Check output power level and set it to maximum level (unless it has already been set) from the Power Setup menu that you will have accessed by pressing the following sequence of key: ENCODER (hold down for 5 seconds) ⇒ SET ⇒ rotate the encoder to set bar to upper limit.

Check the state of the **Pwr** output power by the **Fnc** menu. If it is set to **OFF**, press the ENCODER to bring the selection to **ON**.

5.2.4 Output power level control



NOTE: *The exciter incorporates Automatic Gain Control (AGC) and output power is modulated based on the power level set by the user and actual operating conditions, such as temperature, reflected power and other parameters. Please read section 5.3 for more details of RF power modulation.*

To change the power level set, hold for about 5 seconds the ENCODER until you can get into edit mode.

The screen in edit mode will look like this:

SET :	100	%
Fwd :	50	W

The bottom line gives the instantaneous power (50W in this example), to increase the level, turn to the right to turn to the left. Once you reach the desired level, press the ENCODER to confirm and exit to the default menu. Note that the set value is stored anyway, so if you leave the timeout without pressing any key, the power will be the last level set.

The value at the side of **SET** provides a percentage indication of power setting; please consider that the forward power readout provided on the display (**FWD: xxxx W**) reflects actual output power reading, **which may be lower than regulated power supply when Automatic Gain Control is running in power supply limitation mode** (please read section 5.3 about RF power supply modulation for more details).



NOTE: Output power may be set using the **Pwr OFF** control. In this condition, the output power readout (**Fwd**) on the display will read 0 (zero); the **SET** bar will reflect any adjustments you make using the keys and provides a graphic indication of how much power supply will be delivered the moment you return to **Pwr On** state.

5.2.5 Changing the *Power Good* alarm threshold

Change Forward Power Good alarm setting **PgD** from the **Fnc** menu as desired (factory setting is 50%).

5.2.6 Setting equipment I²C address

Change the **IIC** address in the **MIX** (Miscellaneous) menu as desired (factory setting is 01).

5.2.7 Adjustments and calibration

The only manual adjustments are the level adjustments and the audio mode adjustment.

The rear panel holds the trimmers for all transmitter inputs. Trimmer identification is printed on the rear panel. Input sensitivity can be set within the limits set out in the tables below through the trimmers:

Input sensitivity:

Input	Figure 6.2	Trimmer	Sensitivity	Notes
SCA1	[14]	[15]	- 8 ÷ +13 dBu	Input level for 7,5 kHz overall deviation (- 20 dB)
SCA2	[12]	[13]	- 8 ÷ +13 dBu	
MPX	[16]	[17]	-13 ÷ +13 dBu	
Left/ Mono	[18]	[19]	-13 ÷ +13 dBu	Input level for 75 kHz overall deviation (0 dB)
Right	[21]	[20]	-13 ÷ +13 dBu	
AES/EBU	[23]	[22] e [24]	-13 ÷ +13 dBu	

When setting input sensitivity, please consider that the default menu reports instantaneous modulation level and an indicator provides a 75 kHz reading. To ensure correct adjustment, apply a signal with the same level as user’s audio broadcast maximum level and then adjust using the trimmer until instantaneous deviation matches the 75 kHz reading.

To set subcarrier input levels, you may use the same procedure and option “x10” available in the **Fnc** menu. With this option, modulation level is multiplied by a factor of 10, which means that default menu bar meter reflects a 7.5 kHz deviation.

A special menu with separate indications of Left and Right channel levels and relating indicators of nominal levels for maximum deviation (75 kHz) is provided.

The settings of pre-emphasis, the impedance inputs of L & R, MPX and AES/EBU, and the operation mode of the machine are operation that you can perform through the **Set** menu.

5.3 Operation

- 1) Power on the exciter and ensure that the **ON** light turns on. Equipment name should appear briefly on the display, quickly followed by modulation and forward power readings (Menu 1), provided that the transmitter is delivering output power.



Menu 1: x10 is Off

Menu 1: x10 is On



NOTE: the indication **aMod** identifies that the audio input is set to **Analogue**; the indication **dMod** identifies that the audio input is **Digital**.



NOTE: **xMod** identifies that the modulation display mode is selected in **x10** through **Fnc** menu.

- 1b) To **modify power level setting**, hold down the **ENTER** button until opening the **power setup menu**.

The edit screen will look like this:

SET :	100	%
Fwd :	50	W

Menu 2

The bottom line gives the instantaneous reading of the power (50W in this example), to increase the level rotate towards right, to reduce it rotate towards left. When the desired level is reached, press the encoder to confirm and exit to the predefined menu. Note that the set value is stored anyway, so if you pass the time-out without pressing a key, the power will remain at the last set level.



NOTE: This feature prevents the equipment from delivering maximum power as soon as output is enabled from menu 4, or in the event the equipment is already set to **ON** when you energise it.

- 2) Ensure that the equipment is not in a locked-out state. Push the encoder to call up the selection screen (menu 3). Highlight Fnc and then confirm by pushing the encoder and access the selected menu (menu 4).

In the same menu, ensure that power limiting is disabled: if **PWR** is set to OFF, i.e. power output is disabled, move cursor to PWR. Press ENTER and label will switch to ON, i.e. power output enabled.

Press **ESC** twice to go back to the default menu (menu 1).

- 3) Fine tune power setting from menu 2 (see description of item 1b) until achieving the desired value.



WARNING: Equipment is capable of delivering more than rated output power of 30/50 W; however, never exceed the specified power rating.



NOTE: If power is set to 0 W in the **Power Setup Menu**, the **INTERLOCK OUT** contact is activated and any external appliances connected to it are immediately inhibited.

Next, you can review all operating parameters of the equipment through the management firmware.

Normally, the equipment can run unattended. Any alarm condition is handled automatically by the safety system or is signalled by the LED indicators on the panel or by display messages.



NOTE: Standard factory settings are output power set to upper limit (unless otherwise specified by customer) and **OFF**.

5.4 Management Firmware

The equipment features an LCD with two lines by 16 characters that displays a set of menus. The figure below provides an overview of equipment menus.

The symbols listed below appear in the left portion of the display as appropriate:

- ▬ (Cursor) - Highlights selected (i.e. accessible) menu.
- ▶ (Filled arrow) - Editable parameter marker. This symbol appears in menus that take up more than two lines to aid browsing.
- ▶▶▶ (Three empty arrows) - Parameter is being edited.
- ▶ (Empty arrow) - Current line marker; the parameter in this line cannot be edited. This symbol appears in menus that take up more than two lines to aid browsing.

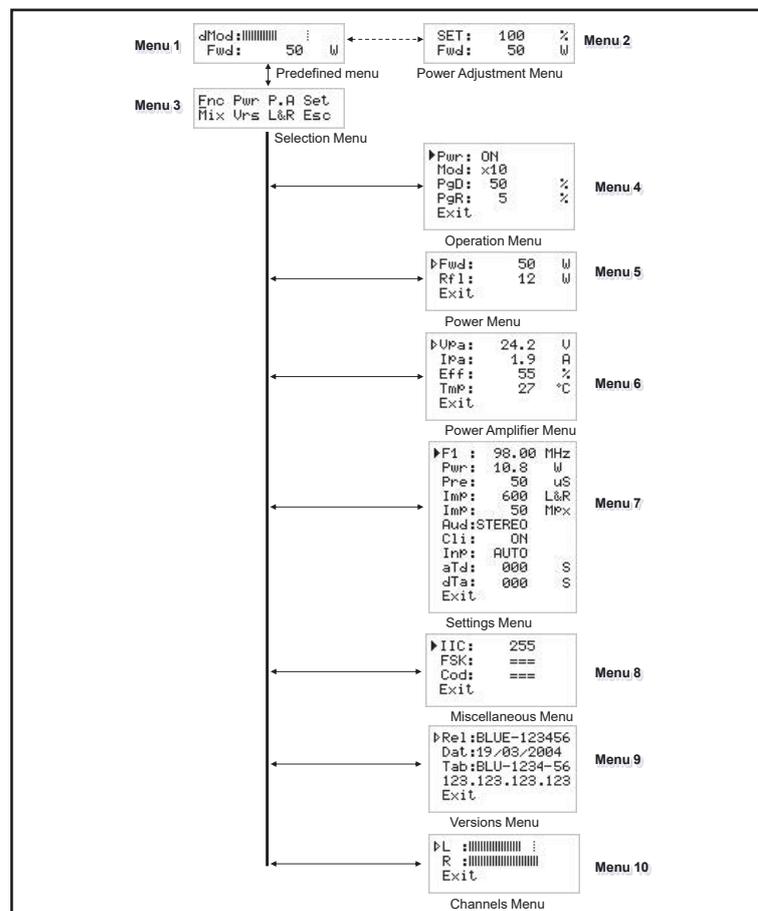


Figure 5.2

The first pressure of the ENCODER when the display is light out, or its rotation, serves in order to activate the retroillumination.

The pressure of encoder when the display is switched on, while you are in the predefined menu (menu 1), serves in order to shown the following **selection screen** (menu 3) from which you can access to all the other menus:

```

Enc Pwr P.A Set
Mix Urs L&R Esc
    
```

Menù 3

If you instead want to go back to the predefined menu, is sufficient select the **ESC** entry then push the encoder.

If the temperature alarm is enabled, the power supply will come inhibited in case of alarm threshold overcoming, and it will have displayed the following window only in case you are in the predefined screen:

```

!! ATTENTION !!
OVER TEMPERATURE
    
```

State 1

Once restored the normal operation conditions, the power supply will come rehabilitated with the same modalities antecedent the alarm.

If the modulation ran out, under 20 kHz, for a time of about 5 minutes (not modifiable) the NO AUDIO status comes displayed in the predefined screen, but the power does not comes inhibited.

```

Mod: NO AUDIO
Fwd:      0      W
    
```

State 2

To gain access to a submenu, select menu name (name is highlighted by cursor) using button or and press the encoder.

5.4.1 Operation Menu (Fnc)

From this menu the user can enable or disable the exciter **power supply**, set the **deviation display modality** and set up the percentage of **Forward (PgD)** or **Reflected Power Good (PgR)**.

To edit an item, highlight the appropriate line and then press and hold the encoder until the command is accepted. This way, Pwr setting is toggled between On and Off and Mod setting is toggled between “x1” and “x10”. To edit the Power Good rate, simply select item “PgD” or “PgR” and edit its value and press the encoder to confirm.

```

▶ Pwr:      ON
  Mod:      x10
  PgD:      50   %
  PgR:      5    %
  Exit

```

Menu 4

- Pwr** Enables (ON) or disables (OFF) exciter power output.
- Mod** Modifies modulation display (toggles between “x1” and “x10”). In “x10” mode, instantaneous deviation indication is multiplied by a factor of 10, and the bar meter on the default menu will reflect 7.5 kHz instead of 75 kHz. This display mode is convenient when you wish to display low deviation levels, such as those caused by pilot tone or subcarriers.
- PgD** M Regulation of the Power Good threshold relative to the forward power. The percentage value of Power Good is referred to the nominal power of the machine, that is 30/50 W, not to the supplied forward power. If a value equal to 50% is setted, it will correspond indifferently to 15/25 W from the set up power. The Power Good function is a control and alarm function on the supplied power. When the output power fall under the threshold value of Power Good set, the machine modifies the pin state [7] of “Remote” DB15 connector on the rear panel.
- PgR** M Regulation of the Power Good threshold relative to the forward power. The percentage value of Power Good is referred to the nominal power of the machine, that is 10W, not to the supplied forward power. If a value equal to 5% is set, it will correspond to 0,5 W indifferently from the set up power.
-  **NOTE:** This alarm does not have effect on any output signal on the DB15 “Remote” connector, and it works only in presence of systems equipped of telemetry.
- Exit** The entry allows to the user the prompt exit from current submenu and goes back to the **predefined menu**.

5.4.2 Power menu(Pwr)

This screen shows the user the measures relating to the exciter RF power output:

```

▶Fwd:      50      W
Rfl:      12      W
Exit
    
```

Menu 5

- Fwd Visualization of the Forward Power.
- Rfl Visualization of the Reflected Power.
- Exit The entry allows to the user the prompt exit from current submenu and goes back to the **predefined menu**.

The values shown are readings, and therefore cannot be modified (note the empty arrow). To modify the power setting, use the predefined menu, as described previously.

5.4.3 Power Amplifier Menu (P.A)

This screen, consisting of four lines that can be scrolled, shows to the user the measures relating to the final power amplifier of the equipment:

```

▶Vpa:      24.2    V
Ipa:       1.9    A
Eff:       55     %
TmP:       27     °C
Exit
    
```

Menu 6

Note that these are readings, rather than settings, and cannot be edited (note the empty arrow).

- VPA Visualization of the amplifier module voltages.
- IPA Visualization of the amplifier module current.
- Eff Visualization of the efficiency as ratio between the forward and reflected power of the amplifier module, expressed in percentage (FWD Pwr/(Vpa x Ipa) %).
- Tmp Equipment internal temperature reading.
- Exit The entry allows to the user the prompt exit from current submenu and

goes back to the **predefined menu**.

5.4.4 Settings Menu (Set)

This menu lets to read the working power to read and set the working frequency.

```

▶F1 : 98.00 MHz
Pwr: 10.8 W
Pre: 50 uS
Imp: 600 L&R
Imp: 50 MPx
Aud:STEREO
Cli: ON
Inp: AUTO
aTd: 000 S
dTd: 000 S
Exit
  
```

Menù 7

F1	Regulation of set up frequency. After having set a new frequency value, press the encoder to confirm the choice. The exciter will release from the current frequency (the LOCK LED turns off) and it will latch onto the new operating frequency (LOCK turns back on). Instead, if you let the timeout go by, the frequency will remain set at the previous value.
Pwr	Visualization of the set up power. In order to modify the power regulation, use the predefined menu like previously described or the Set menu.
Pre	Regulation of the preemphasis, selectable between 0 μ s, 50 μ s and 75 μ s.
Imp	Regulation of the Left and Right channel input impedance, selectable between 10 k Ω or 600 Ω .
Imp	Regulation of the MPX channel input impedance, selectable between 10 k Ω or 50 Ω .
Aud	Regulation of audio modality selectable between STEREO and MONO.
Cli	Enable or disable the clipper operation.
Inp	Regulation of input mode selectable between AUTO (automatic mode), digital or analogic.
aTd	Regulation of exchange time between analog and digital.

- dTa Regulation of exchange time between digital and analog.
- Exit The entry allows to the user the prompt exit from current submenu and goes back to the **predefined menu**.

5.4.5 Miscellaneous Menu (Mix)

This menu allows you to set the machine's address in a serial bus connection (I²C type).

The FSK function, generates periodic shifts of the transmission carrier frequency, realizes in way to generate a Morse code that carried the Radio Identification Code.



NOTE: This function is typically used in the United States.

The factory setting for frequency shift is +10KHz and code repetition period is 60 minutes (please contact R.V.R. Elettronica if you need different settings), whereas station identified may be programmed by the user following the indications described below.

```

▶ IIC:      255
  FSK:      ON
  Cod: 012345
  Exit
    
```

Menu 8

- IIC Regulation of the I²C address. The I2C network address is important when the exciter is connected to a company's transmission system that envisages use of this protocol. We recommend you do not modify it without a good reason.
- FSK Enable or disable the transmission of the FSK code.
- Cod Regulation of the code normally transmitted.
- Exit The entry allows to the user the prompt exit from current submenu and goes back to the **predefined menu**.

5.4.6 Version Menu (Vrs)

This screen shows the version and the release date of the software:

5.5 Optional Functions

Optional functions can be added and/or modified for the equipment described in this manual. The available functions are carried in the continuation and can be requested to R.V.R. Elettronica at the moment of the order.

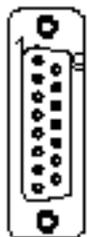
5.5.1 UP/DOWN Power Option

The UP/DOWN Power modifies the function to receive signals present on the telemetry connector.

In this particular situation the control signals uses to enable or to disable the RF section, become control signals of the RF power level, allowing one regulation of UP/DOWN type.

The UP or DOWN command is supplied connecting the relative signal on the Remote connector to the ground, at least for 500mS (the pin has an inner pull-up towards feeding).

Configuration of the telemetry DB15F connector (Remote):

	Pin	Standard Function	UP/DOWN Power Function
	14	On cmd Enables RF power supply	Up cmd Increases RF the Power supply
	15	Off cmd Disables RF power supply	Down cmd Reduces RF the Power supply

6. Identification of the Modules

The **BLUES30/50NV** is made up of various modules linked to each other through connectors so as to make maintenance and any required module replacement easier.

6.1 Upper view

The figure below shows the equipment upper view with the various components pointed out.



figure 8.1

- [1] Main, Stereo Coder & VCO Section Card
- [2] AES/EBU Card
- [3] Panel Card
- [4] RF Board
- [5] Control Card
- [6] Power Supply

7. Working Principles

A schematic view of the modules and connections making up the BLUES30/50NV with the telemetry board is shown in figure 7.1.

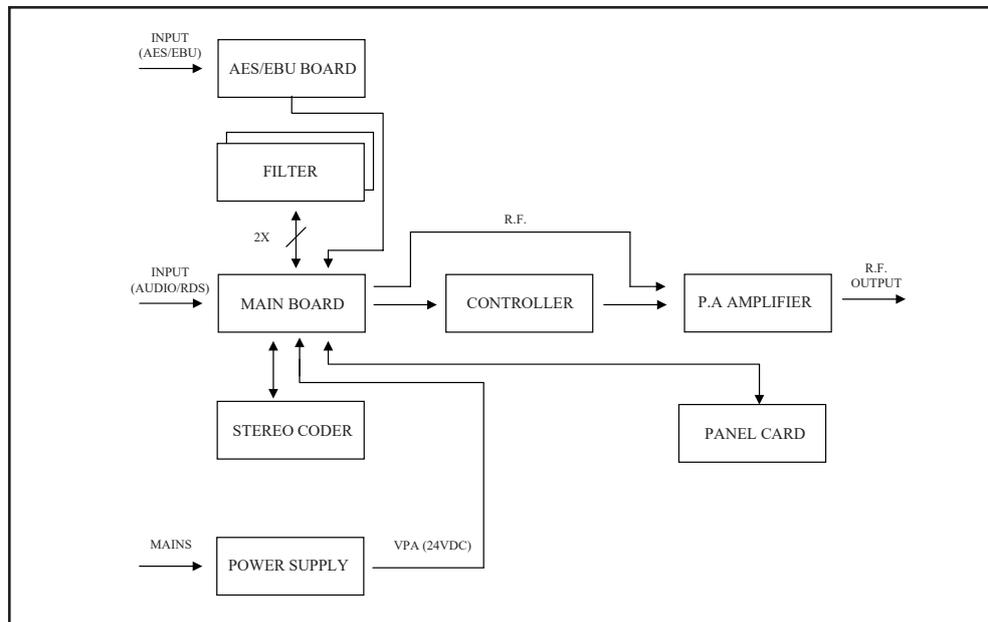


Figure 7.1

A brief description of each module's functions is given below, whereas the complete diagrams and layout of the cards are given in the "Technical Appendix" Vol.2.

7.1 Power Supply

The BLUES30/50NV power supply unit is a switching-type unit whose 28,5 V main output powers the machine's RF amplifier. The power supply also features stabilizers for generating continuous 5 V and 18 V voltages for supplying the other equipment circuits. Note that the power supply is a "direct from mains" type, or rather it is without a transformer, and it can be connected to any voltage between 95 and 250 V without any adjustments or manual settings.

7.2 Panel board - CPU

The panel board contains the microcontroller (PIC18F452) that implements the equipment control software, the display and the other components needed to interface with the user.

The board is connected with the other machine modules, both for power supply distribution and for the control and measures.

7.3 Main Board

The main board carries out the following functions:

- Audio and SCA input treatment
- Generation of carrier frequency
- Modulation
- R.F. amplification (Driver)

7.3.1 Audio input section

The audio input section contains the circuits that perform the following functions:

- 15 kHz filtering of the left and right channel
- Stereophonic Coding
- Preemphasis
- Mono, MPX and SCA channel mixing
- Clipper (limits the modulating signal level so that the frequency deviation does not exceed 75 kHz)
- Modulating signal measurement

7.3.2 PLL/VCO section

This board section generates the modulated radiofrequency signal. It is based on a PLL scheme that uses an integrated MB15E06 type.

The digital PLL section is composed of an high-stability oscillator controlled in temperature and of a digital circuit that carries out the division and the comparison of the working frequency. The oscillator generates a frequency of 10 Mhz that comes divided in order to generate a fixed signal at 1 kHz.

This signal comes sended to the comparator/divisor digital circuit who confront it with the signal generated from VCO, divided in base of exciter working frequency.

The AFC signal, in output of comparator, comes sended to the varicap diodes places on VCO card and added to audio signal coming from from the Coder card.

The Voltage Controlled Oscillator (VCO) generates the signal on the exciter working frequency, than in its turn it comes amplified to a level nearly 3/5mW (5/8dBm), necessary for being able to pilot the R.F. Power Amplifier block.

7.4 Power amplifier

The final power stage is enclosed in a totally shielded metal container fixed to the central part of the device.

The RF signal coming from the main board reached the pilot, it come amplified and sent to the final stage which takes care of final amplification up to 30/50W.

The amplifier is made in three stages. The first is made with one BFG35, the second with two BFG35 in parallel, and the last with two MRFE6US25NR1.

In addition to the actual RF amplification, this circuit carries out the following functions:

- Measures of the forward and reflected power by means of directional couplers
- Low-pass filtering of the RF signal in output

This board also features an RF sampling of approximately 7dBm at 30/50W with respect to the output, which is available on a BNC connector below the transmitter output connector. This sample is useful for verifying the characteristics of the carrier, but not for verifying those of upper harmonics.

7.5 Control board

The main function of this board is to check and correct the MOSFET polarization voltage of the RF amplifier section with a feedback mechanism based on the reading of the power really delivered (AGC).

The voltage is also affected by other factors, such as:

- Excess of reflected power.
- External AGC signals (Ext. AGC FWD, Ext. AGC RFL).
- Excess of temperature.
- Excess of absorbed current from the RF module.

It is also able to perform the reading, and the standardization, on different parameters measured such as: forward and reflected power, current absorbed by RF power amplifier and temperature.

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R.V.R Elettronica

Via del Fonditore, 2 / 2c
Zona Industriale Roveri · 40138 Bologna · Italy
Phone: +39 051 6010506 · Fax: +39 051 6011104
e-mail: info@rvr.it · web: <http://www.rvr.it>

Member of CISQ Federation



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