

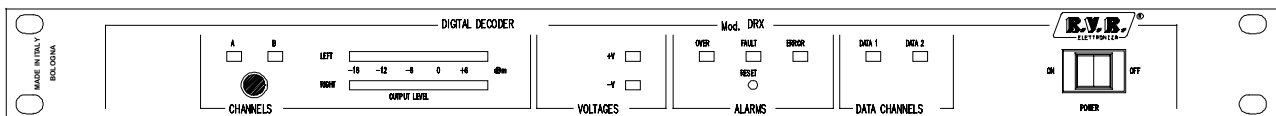
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# DRX/2 & DRX/4

2- or 4-Channel Digital Decoder

Technical and Maintenance Manual



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Manufactured by



ELETTRONICA

ITALY



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## 1. PRELIMINARY INSTRUCTIONS

This manual is a general guide for trained, qualified personnel, aware of the hazards involved in working with electrical and electronic circuits.

It does not contain a full description of all safety precautions to be observed by personnel using this or other devices.

The installation, functioning, maintenance and use of this device involve risks for both the personnel and the device itself, which must be operated only by qualified personnel.

R.V.R. Elettronica declines all responsibility for injury or damage resulting from improper or incorrect use of the device by any personnel.

Always observe works and fire prevention regulations during installation and use.

This device has been tested and lies within the limits established for Class A electronic devices, as at art.15 of the provisions of the Federal Communications Commission. Said limits are designed to guarantee a reasonable level of protection against interference when the device is used in a commercial area.

This device generates, uses and may radiate radio frequency energy: it may interfere with radio and television communications unless installed and used in accordance with the directions in the present manual.

Use of this device in a residential area may cause interference, in which case the user may be asked, at his/her own expense, to adopt the most suitable measures for reducing said interference.

**CAUTION:** always disconnect the power supply before opening the covers or removing any part of the device. Use appropriate grounding to discharge the capacitors and high voltage points before any maintenance operations.

R.V.R. Elettronica reserves the right to modify the design and technical specifications of the device and the content of the present manual without prior notice.

## 2. GUARANTEE

The 12 (twelve) month guarantee covers all R.V.R. Elettronica products.

The manufacturer's guarantee covers products such as valves for terminals.

R.V.R. Elettronica also extends all transferable manufacturing guarantees. These shall be held by R.V.R. Elettronica to guarantee the fastest, most precise assistance possible; complaints must be made directly to R.V.R. Elettronica in accordance with established procedures.

The guarantee does not cover:

- damage caused during shipment of the machine to R.V.R. for repairs;
- any unauthorized modification or repair;
- incidental damage not due to faults in the device;
- non-incidental nominal damage;
- costs for shipment and insurance of the device and for substituting parts or units.

Any damage to the device caused during transportation must be brought to the attention of the haulier and recorded on the delivery receipt. R.V.R. Elettronica must be informed of any difference or damage discovered after delivery within 5 (five) days of delivery.

Using the guarantee:

1. Contact the dealer or distributor from which the device was purchased. Describe the problem or fault to check whether there is a simple solution. Dealers and Distributors can supply information about the most common problems; they can normally repair the device much more quickly than the manufacturer.
2. If your dealer is unable to help, contact R.V.R. Elettronica and explain the problem; if necessary, you will receive authorization to send the device, together with the necessary instructions.
3. When you receive said authorization, return the device carriage-free to the address indicated. Package the device carefully, if possible using the original packaging, and seal it in a parcel. **Do not return the device unless you have received authorization to do so, or it may be returned to the sender.**
4. Quote the device type, model and serial number; attach a written technical diagnosis listing all problems and faults encountered and a copy of the purchase invoice.

Substitution of parts under guarantee or spare parts can be requested at the following address:

R.V.R. Elettronica  
via del Fonditore, 2/2c  
40138 BOLOGNA – ITALY  
Tel.: +39 051 6010506  
Fax: +39 051 6011104

Always indicate the type, model and serial number of the device.

### 3. FIRST AID

Personnel who install, use or maintain the device must have a basic knowledge of first aid.

#### 3.1. Treating electric shocks

##### 3.1.1 If the casualty has lost consciousness

- Lie the casualty on his/her back on a firm surface.
- Clear the airway by lifting the neck and pushing the forehead back (Figure 1). If necessary, open the mouth and check that the casualty is breathing.

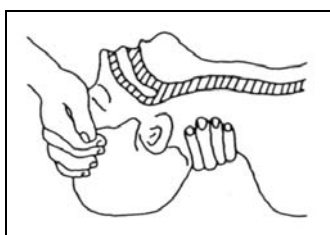


Figure 1

- If the casualty is not breathing, start artificial respiration immediately (Figure 2): tilt the head back, pinch the nostrils, place your mouth over the casualty's and breathe out quickly 4 times.



Figure 2

- Check the casualty's pulse (Figure 3); if there is no pulse, begin heart massage immediately (Figure 4), compressing the sternum near the centre of the chest (Figure 5).

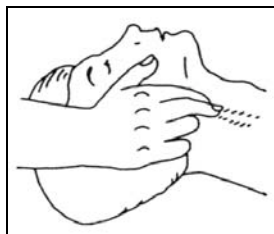


Figure 3

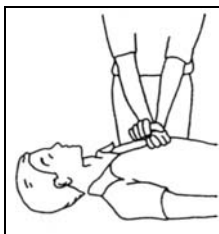


Figure 4

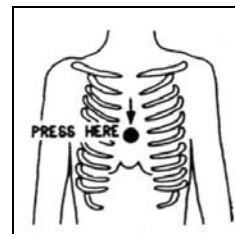


Figure 5

If there is only one first-aider, alternate 15 compressions with 2 breaths.

If there are two first-aiders, alternate one breath for every 5 compressions. Do not stop the heart massage during artificial respiration.

Call a doctor as soon as possible.

### 3.1.2 If the casualty is conscious

- Cover the casualty with a blanket.
- Reassure the casualty.
- Loosen the casualty's clothing and lie him/her in a comfortable position.

## **3.2. Treating electrical burns**

### 3.2.1 Extensive burns and cuts

- Cover the area affected with a clean sheet or cloth.
- Do not burst blisters; remove the cloth and any clothing stuck to the skin; apply a suitable cream.
- Treat the casualty for the type of injury sustained.
- Take the casualty to hospital as soon as possible.
- If arms and legs are affected, keep them in a raised position.

If medical assistance is not available within one hour and the casualty is conscious and not nauseous, administer a solution consisting of one teaspoon of salt and half a teaspoon of bicarbonate of soda per 250 ml water.

Have the casualty slowly drink around half a cup of the solution four times for a period of 15 minutes.

Stop administering the solution at the first signs of retching.

**Do not administer alcohol.**

### 3.2.2 Minor burns

- Apply cold (but not freezing) gauze compresses using a clean cloth.
- Do not burst blisters; remove any clothing stuck to the skin; apply a suitable cream.
- If necessary, help the casualty into clean, dry clothes.
- Treat the casualty for the type of injury sustained.
- Take the casualty to hospital as soon as possible.
- If arms and legs are affected, keep them in a raised position.

## 4. THE DTX – DRX SYSTEM

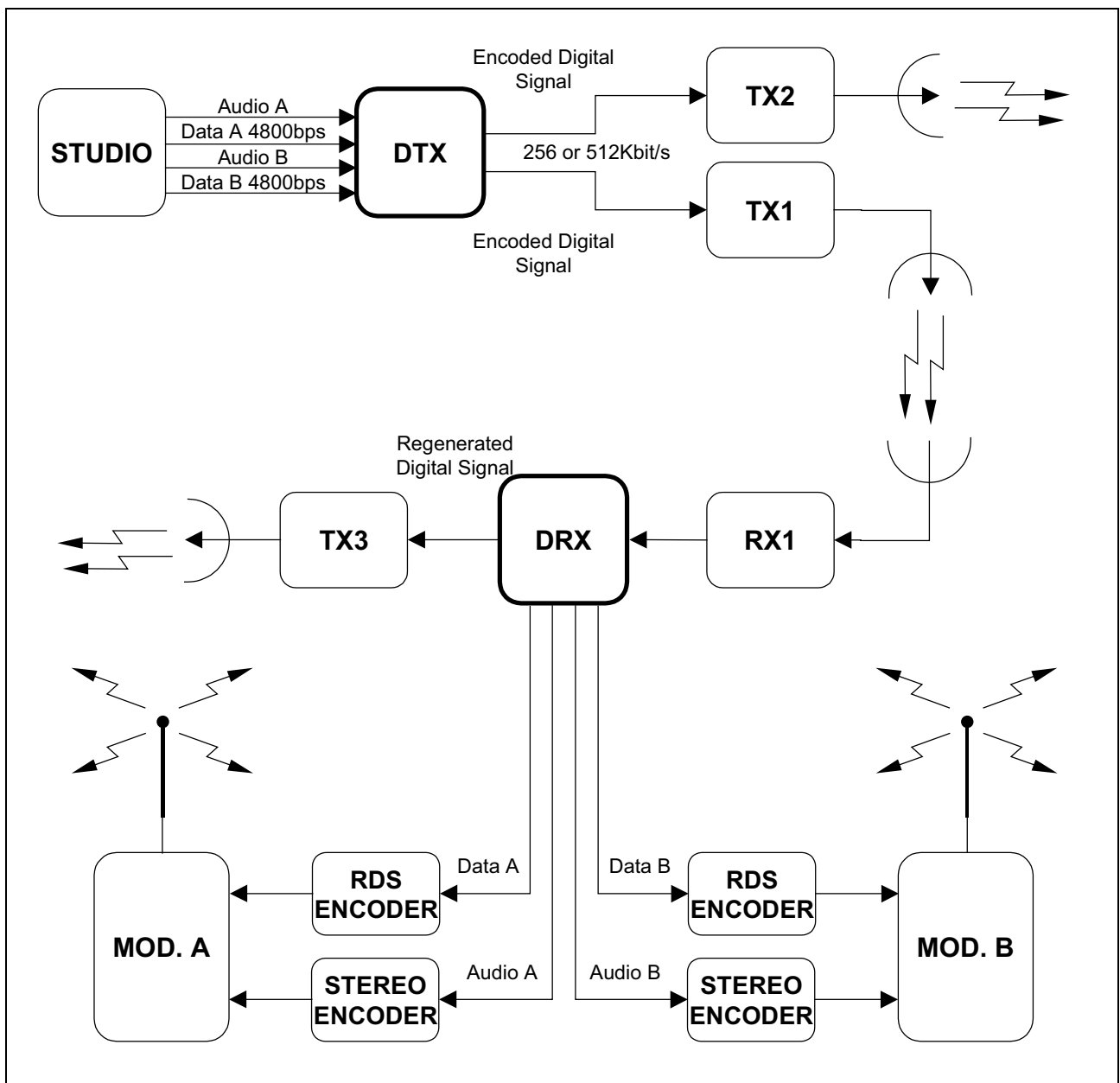


Figure 6

### 4.1. Range of applications

The DRX is part of a digital encoding and decoding system designed to enhance the performance of conventional analogue radio links, in order to obtain audio quality comparable to that of CDs in extreme reception conditions.



The main features of digital technology, such as cleaner sound and greater immunity to interference, are the mainstays of the encoder–decoder system designed and manufactured by R.V.R. Elettronica: with a S/N ratio of just 30 dB on the demodulated baseband signal, or with a signal level at the antenna up to 20 dB lower than the operating threshold just acceptable for an analogue transfer, the DTX – DRX pair continues to provide top performance. This system will finally allow multiple connections in a daisy-chain fashion without any degradation of the audio signal between relay stations.

In addition to the above-mentioned advantages, the system is compatible with most existing analogue radio links on the market and is highly versatile, so that it is easily adapted to specific user requirements.

## **4.2. External features**

The DRX is housed in a 19" rack.

On the front panel are the power On/Off switch and the reset pushbutton.

The indicator lights include two LED bars for measurement of the level of the right-hand and left-hand audio signals, the lights which indicate the presence of the +15 V and –15 V direct current voltages, reset circuit intervention, loss of synchronization and the passage of auxiliary data through the RS232 interfaces.

On the 4-channel version, the selector switch for the pair of channels whose activity levels are to be indicated by the relative LEDs is also enabled.

On the rear panel there is the socket with switch for selection of the alternating current voltage, sockets for the 24 VDC power supply, DB9 male connectors for the auxiliary data channel, telemetry and relay contacts, a BNC input for the baseband digital signal to be decoded and an output for the regenerated digital signal, two XLR male connectors for the output of the two audio channels.

On the 4-channel version, the rear panel has an additional DB9 male connector for auxiliary data and another pair of XLR male connectors for the other two audio outputs.

### 4.3. Technical specifications

#### 4.3.1 System

- Audiofrequency response: 2 [4] channels, 20 Hz – 15 kHz,  $\pm 0.7$  dB
- Preemphasis (for DTX)/Deemphasis (for DRX): 50  $\mu$ s applied internally
- Data: 1 [2] RS-232 channels, max. 8000 baud
- Sampling rate: 32 kHz
- Source encoding: ADPCM Sub-band  
(Adaptive Differential Pulse Code Modulation)
- Channel encoding: PAM (Pulse Amplitude Modulation)  
2 levels, partial response
- Bit rate: 256 Kbit/s [512 Kbit/s]
- Total delay: <5 ms
- Dynamic range: >90 dB
- Total harmonic distortion @ 1 kHz: <0.05%
- Audio band Signal/Noise ratio: 80 dB

#### 4.3.2 General

- Audio input/output connectors: XLR (female for DTX, male for DRX)
- Audio input impedance (for DTX): 600  $\Omega$ /10 K $\Omega$  balanced/unbalanced
- Audio output impedance (for DRX): 100  $\Omega$  balanced/unbalanced
- Encoded signal input/output connector: BNC
- Encoded signal input impedance (for DRX): 470 K $\Omega$
- Encoded signal output impedance: 100  $\Omega$
- Auxiliary data input/output connector: DB9 (female for DTX,  
male for DRX)
- Power supply: 100-120-220-240V, 50-60 Hz, single-phase
- Consumption: approx. 15 W
- Panel dimensions: 483 mm (19") L x 42.5 mm (1.7") H
- Depth: 371.5 mm (14.6")
- Weight: 7 kg
- Operating temperature: 0  $^{\circ}$ C – 50  $^{\circ}$ C

#### 4.3.3 RF system minimum specifications

- Peak deviation: 53 kHz [38 kHz]
- Passband: 200 kHz [350 kHz]
- S/N: >30 dB

## 5. OVERVIEW

### 5.1. Description of the device

#### 5.1.1 Front panel

Figure 7 shows the front panel of the DRX/2 and DRX/4.

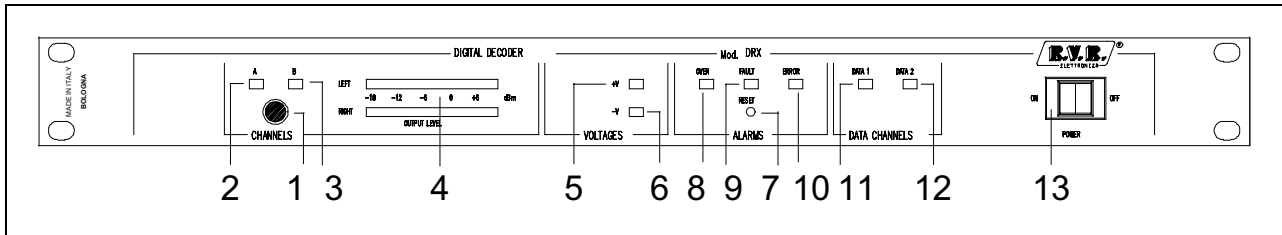


Figure 7

Ref. in Figure 7	Label	Function
1	CHANNELS	Audio input level selector switch (*)
4	INPUT LEVEL	Input level measurement
7	RESET	Reset pushbutton
13	POWER	Power On/Off switch

Table 1

(\*) Not enabled on the DRX/2.

#### 5.1.2 Indicator lights

Table 2 summarizes the meaning of the LEDs.

Ref. in Figure 7	Label	Colour	Meaning
2	A	Green	Channel A level measurement (*)
3	B	Green	Channel B level measurement (*)
5	+V	Green	Presence of positive power
6	-V	Green	Presence of negative power
8	OVER	Red	Channel A loss of synchronization
9	FAULT	Red	Reset circuit triggered
10	ERROR	Red	Channel B loss of synchronization (**)
11	DATA 1	Green	Channel A passage of aux. data
12	DATA 2	Green	Channel B passage of aux. data (**)

Table 2

(\*) Have no meaning on the DRX/2; (\*\*) not enabled on the DRX/2.

5.1.3 Rear panel

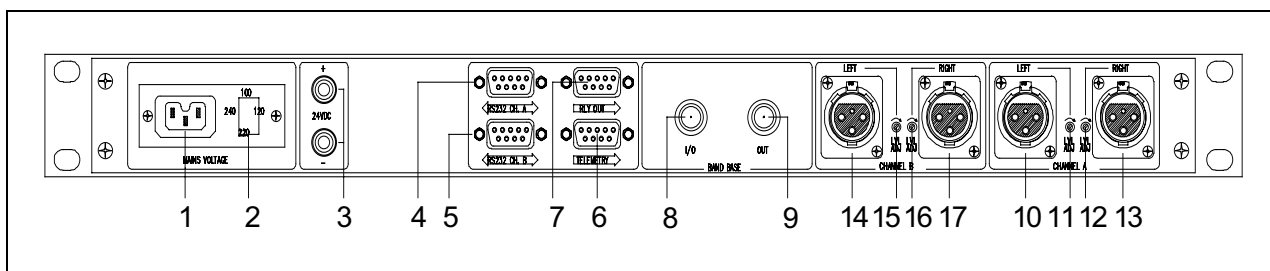


Figure 8

Ref. in Figure 8	Label	Function	Direction
1	MAIN VOLTAGE	Power supply unit	Input
2	–	Power supply voltage selector switch	–
3	24VDC	24 V <sub>DC</sub> power sockets	Input
4	RS232 CH. A	Channel A auxiliary data	Output
5	RS232 CH. B	Channel B auxiliary data (*)	Output
6	TELEMETRY	Telemetry connector	Input/Output
7	RLY OUT	Relay switch contacts	Output
8	I/O	Encoded digital signal	Input
9	OUT	Regenerated digital signal	Output
10, 13	CHANNEL A	Audio channel A	Output
11, 12	ADJ LVL	Channel A audio level adjustment	–
14, 17	CHANNEL B	Audio channel B (*)	Output
15, 16	ADJ LVL	Channel B audio level adjustment (*)	–

Table 3

(\*) If present on the DRX/2, replicate channel A outputs.

5.1.4 Audio Output Card

The compressed audio data is decoded by the APTX100ED, one of the most famous and widely used DSPs in this field, which uses an ADPCM algorithm.

The DSP also executes demultiplexing between compressed audio data and auxiliary data when selected in the corresponding encoding circuit.

The reliable and precise digital/analogue conversion uses a 32 kHz sampling rate with 16 bit PCM format data.

The analogue output section has a balanced configuration and uses optimum quality, low noise components and integrated circuits.

### 5.1.5 Main Card

All of the main functions are controlled by a programmable digital logic, guaranteeing reliability and great versatility.

This integrated circuit controls:

- commands for recovery of the clock frequency;
- generation of all timers necessary for the various devices;
- control and recognition of data input;
- transmission of audio data to the DSPs;
- transmission of auxiliary data to RS232 serial ports;
- control of automatic switching relays;
- generation of commands for synthesis of the regenerated digital signal.

## 6. SETTINGS

The following sections indicate the logical sequence of operations to be effected on the DRX in order to set the various operating parameters.

Some of these adjustments require a DTX which generates the encoded digital signal, to be connected directly to the DRX input.

### 6.1. Power supply voltage

Remove the fuse holder from the power supply unit (2 in Figure 8) with a small screwdriver and replace it with the value of the mains voltage available next to the arrow.

The device factory setting is 220 V.

### 6.2. Main card

#### 6.2.1 I/O connector

Jumper JP16 (IN/OUT) selects the direction of the baseband I/O connector (8 in Figure 8).

JP16	Position	Direction
DTX/2 and DTX/4	2-3	Output
DRX/2 and DRX/4	1-2	Input

Table 4

#### 6.2.2 EPROM program selection

Jumper JP8 (PROGRAM) selects the device operating mode, by selecting a program stored in the EPROM from a maximum of 16 possible programs.

The standard operating modes are shown in Table 5.

JP8	DRX/2	DRX/4
no jumper	2-channel standard	2-channel standard
pos. 1-2	–	4-channel standard

Table 5

Other operating modes, implemented at the customer's request, can be selected with appropriate jumper configurations on JP8.

#### 6.2.3 Digital signal baseband operating level

Use trimmer RV2 (I/O LEVEL) to adjust the amplitude of the digital signal.

The device factory setting is such that the level measured at test point TP8 (I/O–2) is 7 V<sub>pp</sub>.

### 6.2.4 Clock frequency recovery

Jumper JP15 (2CH/4CH) selects the clock frequency with which the DRX must be synchronized in order to decode the data in arrival.

System	JP15	Clock frequency
DTX/2 – DRX/2	pos. 1-2	256 kHz
DTX/4 – DRX/4	pos. 2-3	512 kHz

Table 6

To fine tune the synchronization, adjust MF1 until TP6 (CLOCK) displays a square wave which is as clean as possible at the frequency indicated in Table 6.

### 6.2.5 Regenerated digital signal output level

Use trimmer RV1 (OUT LEVEL) to adjust the amplitude of the regenerated digital signal at the output OUT (9 in Figure 8).

The output level factory setting is 2.2 V<sub>PP</sub>.

### 6.2.6 RS232 interface

Jumpers JP10 (RX1/TX1) and JP11 (RX2/TX2) select the direction of the serial ports, respectively for the pairs of channels A and B (RS232 CH. A and RS232 CH. B, 4 and 5 in Figure 8).

JP10 and JP11	Position	Direction
DTX/2 and DTX/4	2-3	Input
DRX/2 and DRX/4	1-2	Output

Table 7

## 6.3. Audio Output Card

### 6.3.1 Position

In a DTX/2 – DRX/2 system, the Audio Output Card may be connected to the Main Card by either connector JP5 (CH. A), JP6 (CH. B) or both.

### 6.3.2 Audio channel pair selection

Jumper JP4 (CH. A/B) selects the synchronization word used by the APTX100ED during encoding of the pair of audio channels.

JP4	Selected pair
pos. 1-2	A
pos. 2-3	B

Table 8

The printing on the rear panel and the Main Card establishes a hardware connection, without putting any constraints on this selection.

When setting this jumper, remember that:

- in order to transmit and receive correctly, the selection, A or B, must be the same on the DTX Audio Input card and on the DRX Audio Output card from which the pair of channels is to be obtained;
- when using a DTX/4 – DRX/4 system, the two Audio Input cards must be set on different synchronization words to prevent transmission conflicts and reception errors.

### 6.3.3 Deemphasis

Jumpers JP3 (DE–L) and JP7 (DE–R) apply a 50  $\mu$ s deemphasis respectively for the Left-hand (LEFT) and Right-hand (RIGHT) channel.

JP3 and JP7	Deemphasis
pos. 1-2	Off
pos. 2-3	On

Table 9

Other deemphasis values, for example 75  $\mu$ s, are possible on request.

### 6.3.4 Balanced/unbalanced output

Jumpers JP4 and JP5 (BAL/UNBAL) select the audio output balanced or unbalanced mode respectively for the Left-hand (LEFT) and Right-hand (RIGHT) channel.

JP4 and JP5	Output
pos. 1-2	balanced
pos. 2-3	unbalanced

Table 10

### 6.3.5 Audio output level

Use trimmers RV1 (L-ADJ, 11 and 15 in Figure 8) and RV2 (R-ADJ, 12 and 16 in Figure 8) to adjust the nominal output levels respectively for the Right-hand and Left-hand channels.

The nominal output level factory setting is 0 dBm (775 mV<sub>RMS</sub> or 2.2 V<sub>PP</sub>, yellow LEDs on LED bar lit) at 400 Hz when there is a 0 dBm tone at 400 Hz at the DTX input.

## 6.4. Panel Card

### 6.4.1 Display settings

Jumpers JP2 (R-2/4CH) and JP3 (L-2/4CH) enable the selector push button (1 in Figure 7) respectively for the Right-hand and Left-hand channel.

JP2 and JP3	Position
DRX/2	1-2
DRX/4	2-3

Table 11



## 7. INSTALLATION

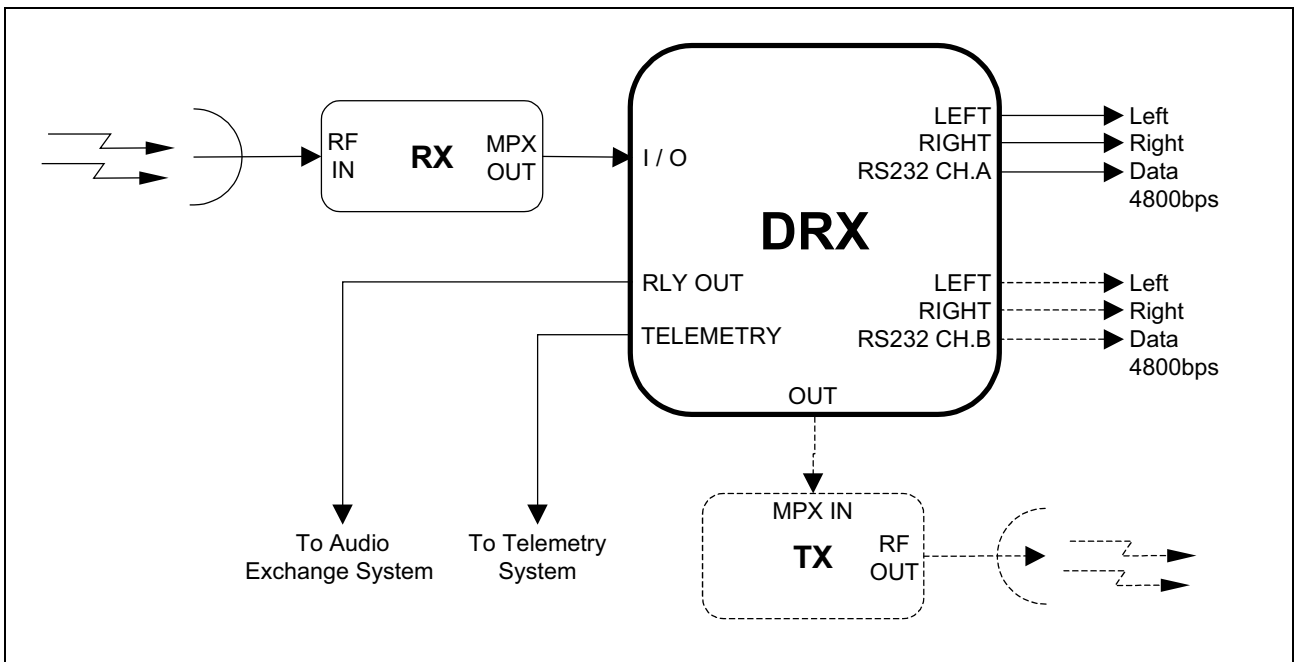


Figure 9

### 7.1. FM Receiver

#### 7.1.1 Phase equalization

For correct reception of the digital signal, audio section phase equalization must be Off.

With an R.V.R. receiver, move jumper JP5 on the Audio Process Card to position 2-3 (Figure 10).

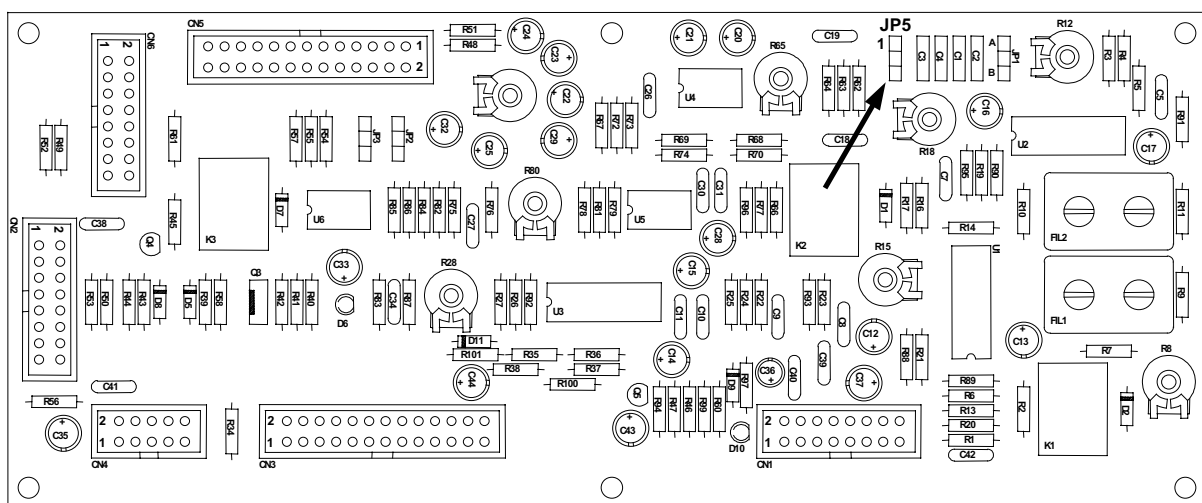


Figure 10

7.1.2 Passband (DRX/4 only)

The DTX/4 – DRX/4 system requires a reception band which is noticeably bigger than that required by the DTX/2 – DRX/2 system.

With an R.V.R. receiver, remove the ceramic filters FC1 and FC2 from the 70 MHz IF Card (Figure 11), substituting them with filters with 470 pF capacity.

7.1.3 Fine tuning

Adjust the tuning coils of the intermediate frequency stage to obtain a signal at the receiver MPX output which is as similar as possible to the signal at the DTX output.

This operation is necessary with a DTX/4 – DRX/4 system, but may not be required when using a DTX/2 – DRX/2 system.

With an R.V.R. receiver, the coils to be adjusted are TR1 and TR2 on the 70 MHz IF Card (Figure 11).

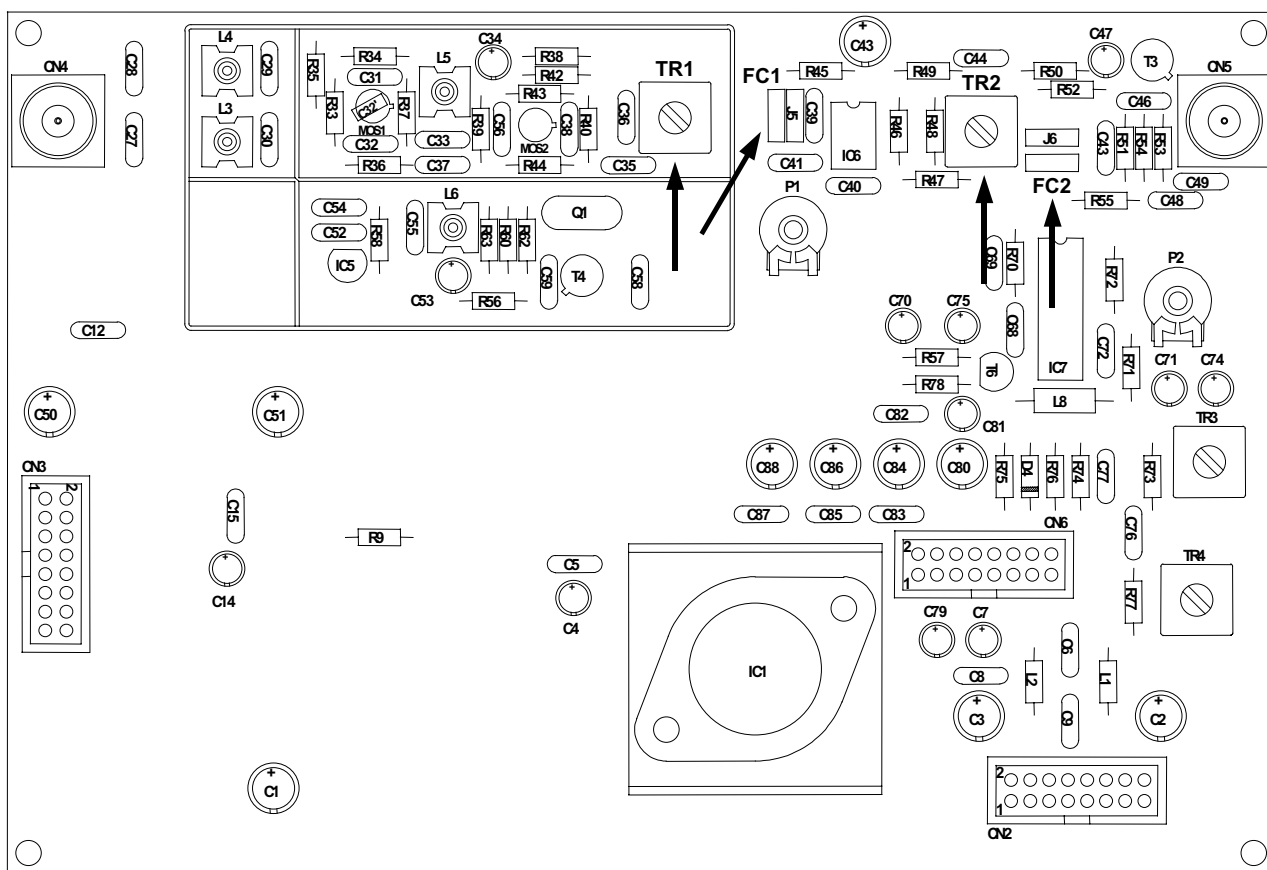


Figure 11

7.1.4 Output level

Adjust the receiver MPX output level so that the amplitude is 2.2 V<sub>PP</sub>.

7.1.5 Baseband output

Connect the receiver MPX output to the DRX baseband input (I/O, 8 in Figure 8).

## 7.2. FM Transmitter

### 7.2.1 Baseband input

Connect the transmitter MPX input to the DRX baseband output (OUT, 9 in Figure 8).

### 7.2.2 Peak deviation

Adjust the transmitter according to the system used to obtain the peak deviation indicated in Table 12.

System	Recommended deviation
DTX/2 – DRX/2	±53 kHz
DTX/4 – DRX/4	±38 kHz

Table 12

## 8. CONNECTIONS

### 8.1. Audio output connector

Pin	Balanced	Unbalanced
1	Ground	Ground
2	Positive	Positive
3	Negative	Not connected

Table 13

With a balanced audio output, if the connection has network noise, disconnect the screening braid on both the Right-hand and Left-hand output connectors.

If the problem persists, reconnect the screening braid to the output connectors and disconnect it at the other end of the audio cables.

If, after this operation, there is still interference, carefully check the length and arrangement of the audio connection cables.

### 8.2. Regenerated digital signal output

The DRX makes available an output with the regenerated digital signal, which can be used for controlling a transmitter and for multiple hops.

The baseband regenerated signal must be connected to the transmitter MPX input.

### 8.3. Telemetry interface

The DB9 connector labelled 6 in Figure 8 (TELEMETRY) is the connector for device telemetry signals.

All signals and commands are in negative logic (low active).

The meaning of the signals at the pins is indicated in Table 14.

Pin	Meaning	Direction
1	External reset	Input
2	OVER	Output
3	ERROR	Output
4	FAULT	Output
5	Ground	–
6, 7, 8, 9	Not connected	–

Table 14

### 8.4. RS232 Interface

The DB9 connectors labelled 4 (RS232 CH. A) and 5 (RS232 CH. B) in Figure 8 are the serial lines for the auxiliary data associated respectively with pair A and B.

The meaning of the signals at the pins, indicated in Table 15, is immediate.

Pin	Meaning
2	TXD
3	RXD
5	Ground
6	+5V
1, 4, 7, 8, 9	Not connected

Table 15

### 8.5. Relay interface

The DB9 connector labelled 7 in Figure 8 (RLY OUT) makes available the contacts of two monostable relay switches, which can be used to control an automatic audio exchange system.

Figure 12 is a schematic illustration of one of the relays in the home position (not switched). Table 16 indicates the meaning of the signals at the connector pins.

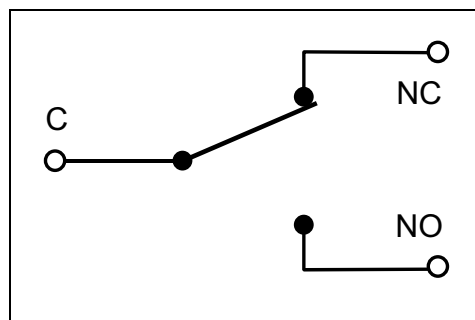


Figure 12

Pin	Meaning
1	Channel B NC
2	Channel B C
3	Channel B NO
7	Channel A NC
8	Channel A C
9	Channel A NO
4, 5, 6	Not connected

Table 16

## 9. OPERATION

### 9.1. Normal operation

When powered up, the circuit automatically loads the desired programmable logic configuration and initializes the Audio Output card DSPs.

Recovery of the synchronization regenerates a square wave at the source clock frequency at which the DRX connects through the PLL.

The DSPs then start to scan the bitstream at input, searching for the selected synchronization word. When the word is detected, the relative LED goes out (OVER for CH. A and ERROR for CH. B, 8 and 10 in Figure 7).

After around 1 second the D/A conversion begins. After around 5 seconds, the switching command for the relative relay is issued.

The DSPs constantly search for the synchronization word, even during normal operation. Therefore, when the word is missing, the D/A conversion is interrupted and the relay switch returns to the home position.

For this reason, attention must be paid to the setting of JP8 (Table 8) otherwise there is the risk that the wrong pair will be decoded (if using a DTX/4 – DRX/4 system) or nothing will be decoded at all.

### 9.2. Reset circuit

The reset command forces machine initialization again and is triggered when the configuration was not loaded correctly, or was partly or totally compromised by external events (overvoltage, discharge of static electricity, etc.).

The device can be reset in three different ways:

1. automatically: by means of an integrated circuit which is triggered if it detects the absence of a control signal which must always be present at its input;
2. manually: by pressing the RESET pushbutton on the front panel (7 in Figure 7) with a sharp object;
3. remotely: with a negative pulse through the telemetry interface.

## 10. SUMMARY OF TABLES

### 10.1.1 Front panel

Ref. in Figure 7	Label	Function
1	CHANNELS	Audio input level selector switch (*)
4	INPUT LEVEL	Input level measurement
7	RESET	Reset pushbutton
13	POWER	Power On/Off switch

Table 1

### 10.1.2 Front panel – Indicator lights

Ref. in Figure 7	Label	Colour	Meaning
2	A	Green	Channel A level measurement (*)
3	B	Green	Channel B level measurement (*)
5	+V	Green	Presence of positive power
6	-V	Green	Presence of negative power
8	OVER	Red	Channel A loss of synchronization
9	FAULT	Red	Reset circuit triggered
10	ERROR	Red	Channel B loss of synchronization (**)
11	DATA 1	Green	Channel A passage of aux. data
12	DATA 2	Green	Channel B passage of aux. data (**)

Table 2

(\*) Have no meaning on the DRX/2; (\*\*) not enabled on the DRX/2.

### 10.1.3 Rear panel

Ref. in Figure 8	Label	Function	Direction
1	MAIN VOLTAGE	Power supply unit	Input
2	–	Power supply voltage selector switch	–
3	24VDC	24V <sub>DC</sub> power sockets	Input
4	RS232 CH. A	Channel A auxiliary data	Output
5	RS232 CH. B	Channel B auxiliary data (*)	Output
6	TELEMETRY	Telemetry connector	Input/Output
7	RLY OUT	Relay switch contacts	Output
8	I/O	Encoded digital signal	Input
9	OUT	Regenerated digital signal	Output
10, 13	CHANNEL A	Audio channel A	Output
11, 12	ADJ LVL	Channel A audio level adjustment	–
14, 17	CHANNEL B	Audio channel B (*)	Output
15, 16	ADJ LVL	Channel B audio level adjustment (*)	–

Table 3

(\*) If present on the DRX/2, replicate channel A outputs.

10.1.4 Main card – I/O connector setting

JP16	Position	Direction
DTX/2 and DTX/4	2-3	Output
DRX/2 and DRX/4	1-2	Input

Table 4

10.1.5 Main card – EPROM program selection

JP8	DTX/2	DTX/4
no jumper	2-channel standard	2-channel standard
pos. 1-2	–	4-channel standard

Table 5

10.1.6 Main card – Clock frequency recovery

System	JP15	Clock frequency
DTX/2 – DRX/2	pos. 1-2	256 kHz
DTX/4 – DRX/4	pos. 2-3	512 kHz

Table 6

10.1.7 Main card – RS232 Interface setting

JP10 and JP11	Position	Direction
DTX/2 and DTX/4	2-3	Input
DRX/2 and DRX/4	1-2	Output

Table 7

10.1.8 Audio Output Card – Audio channel pair selection

JP4	Selected pair
pos. 1-2	A
pos. 2-3	B

Table 8

10.1.9 Audio Output Card – Deemphasis setting

JP3 and JP7	Deemphasis
pos. 1-2	Off
pos. 2-3	On

Table 9



10.1.10 Audio Output Card – Balanced/unbalanced output

JP4 and JP5	Output
pos. 1-2	balanced
pos. 2-3	unbalanced

Table 10

10.1.11 Panel Card – Display settings

JP2 and JP3	Position
DRX/2	1-2
DRX/4	2-3

Table 11

10.1.12 FM Transmitter – Peak deviation setting

System	Recommended deviation
DTX/2 – DRX/2	±53 kHz
DTX/4 – DRX/4	±38 kHz

Table 12

10.1.13 Audio output connector

Pin	Balanced	Unbalanced
1	Ground	Ground
2	Positive	Positive
3	Negative	Not connected

Table 13

10.1.14 Telemetry interface connections

Pin	Meaning	Direction
1	External reset	Input
2	OVER	Output
3	ERROR	Output
4	FAULT	Output
5	Ground	–
6, 7, 8, 9	Not connected	–

Table 14

10.1.15 RS232 Interface connections

Pin	Meaning
2	TXD
3	RXD
5	Ground
6	+5V
1, 4, 7, 8, 9	Not connected

Table 15

10.1.16 Relay interface connections

Pin	Meaning
1	Channel B NC
2	Channel B C
3	Channel B NO
7	Channel A NC
8	Channel A C
9	Channel A NO
4, 5, 6	Not connected

Table 16

## 11. DIAGRAMS AND LAYOUTS

The following pages include the wiring diagrams and assembly layouts of:

- Main card;
- Audio Output card;
- Power supply unit card.

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First Edition – April '99  
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Tutti i diritti sono riservati.

Stampato in Italia.

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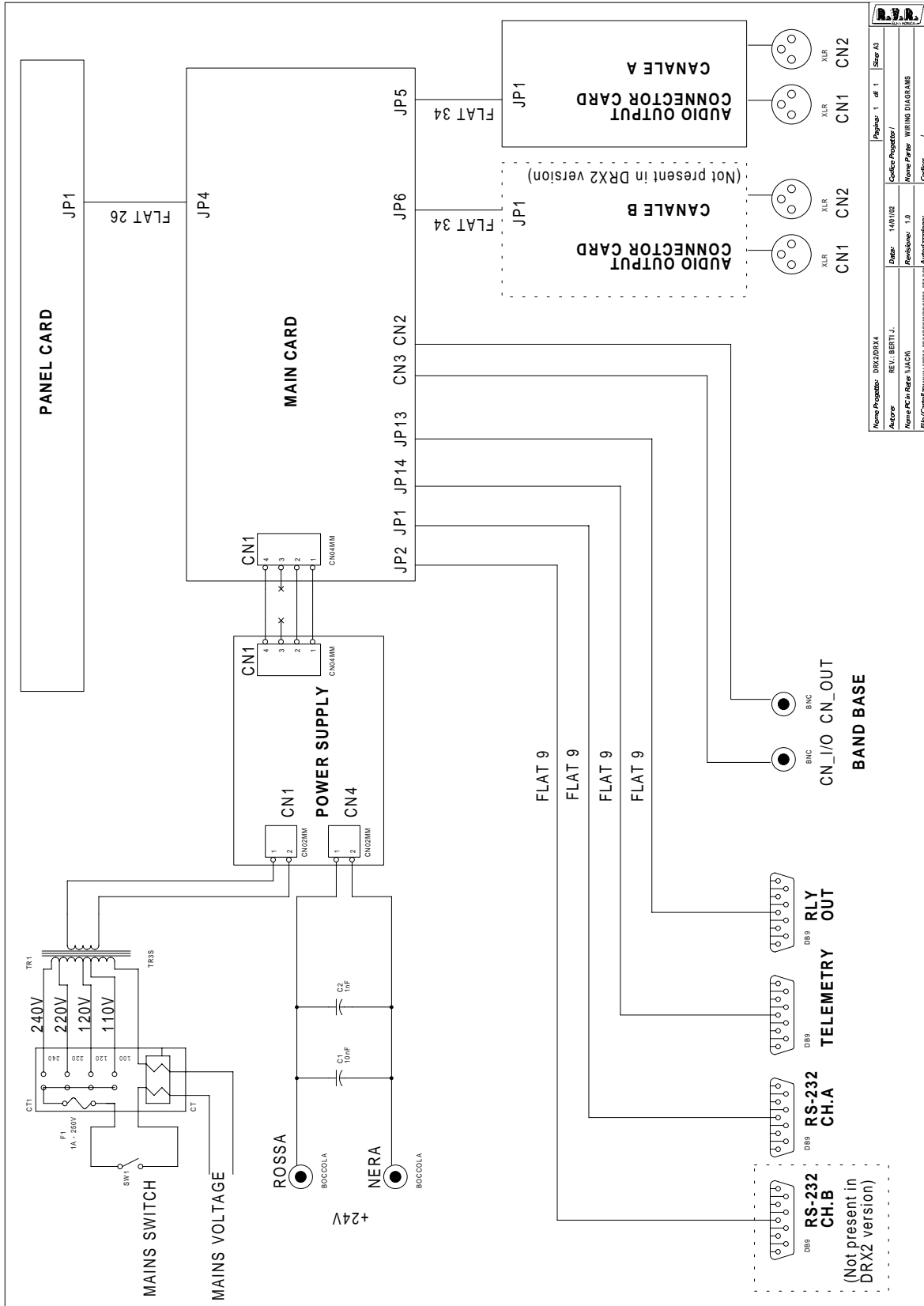
## **Appendix A Piani di montaggio, schemi elettrici, liste componenti / *Component layouts, schematics, bills of material***

Questa parte del manuale contiene i dettagli tecnici riguardanti la costruzione delle singole schede componenti il DRX2/DRX4. L'appendice è composta dalle seguenti sezioni:

*This part of the manual contains the technical details about the different boards of the DRX2/DRX4. This appendix is composed of the following sections:*

Description	RVR Code	Vers.	Pages
Wiring diagram	/	1.0	2
Power supply card	CSSWPSUP0003	1.0	4
Pannel card	SLPANDIG0002	1.0	4
Digital Decoder Main board	SLMOD512K002	1.0	6
Audio Output Card	SLOUTAPT002/SLSC8DIL8	1.0	4

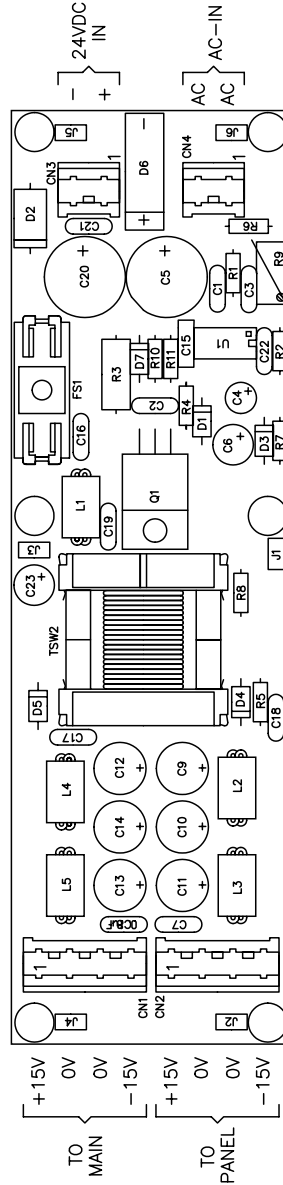
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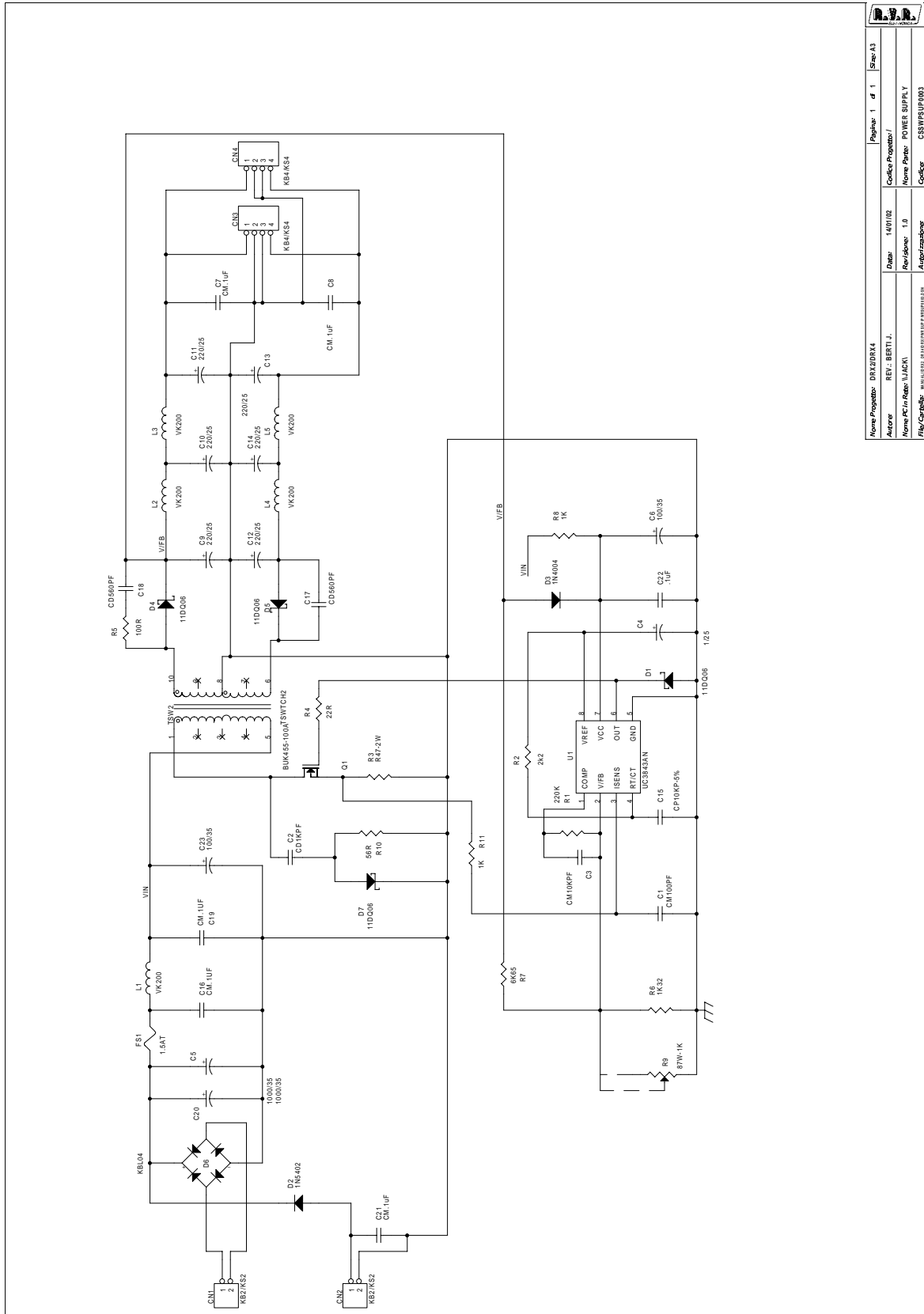
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Autore:	REV. BERTI J.	Revisione:	1.0	Nome File:	WIRING DIAGRAMS
File: C:\Programmi\R.V.R. ELETTRONICA\DRX2\DRX4\WIRING DIAGRAMS\WIRING DIAGRAMS					
Page: 1 of 1 Size: A3					

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		Pagina: 1	di 1	Size: A4
Nome Progetto:	DRX2/DRX4	Data:	14/01/02	Codice Progetto: /
Autore:	REV.: BERTI J.	Revisione:	1.0	Nome Parte: POWER SUPPLY COMPONENT LAYOUT
Nome PC in Rete:	\\JACK\	Autorizzazioni:		Codice: CSSWFSUP0003
File/Contatti:	MANUAL\DRX2_DRX4\DRX4\PMSSUP\VALU.DWG	Trattamento:	/	Profilo: /
Scala:	/			



Nome Progetto:	DRX2/DRX4	Page:	1	di	1	Scale:	A3
Autore:	REV. BERTI J.	Data:	14/01/02	Colore Progetto:			
Nome PC in Rete:	UJACK	Revisione:	1.0	Nome Parte:	POWER SUPPLY		
File/Caricatore:	multisim: DRX2/DRX4.PWT	Autore/Disegnatore:		Colore:	CSSWPSUP003		

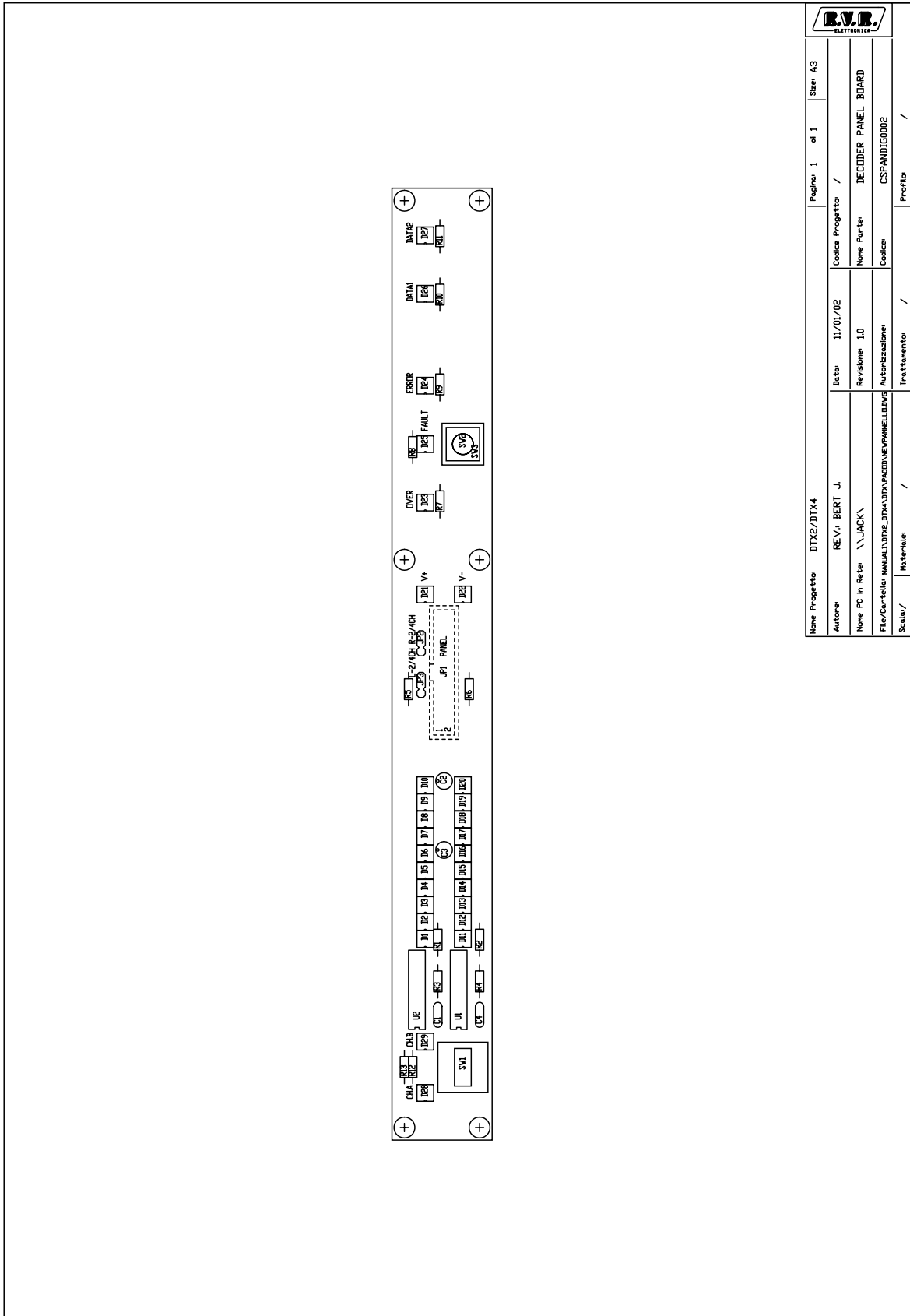
CSSWPSUP0003

Bill Of Materials

Page1

Item	Q.ty	Reference	Part
1	2	CN1 ,CN2	KB2/KS2
2	2	CN3 ,CN4	KB4/KS4
3	1	C1	CM100PF
4	1	C2	CD1KPF
5	1	C3	CM10KPF
6	1	C4	1/25
7	2	C5 ,C20	1000/35
8	2	C6 ,C23	100/35
9	5	C7 ,C8 ,C16 ,C19 ,C21	CM.1uF
10	6	C9 ,C10 ,C11 ,C12 ,C13 ,C14	220/25
11	1	C15	CP10KP-5%
12	2	C18 ,C17	CD560PF
13	1	C22	.1uF
14	4	D1 ,D4 ,D5 ,D7	11DQ06
15	1	D2	1N5402
16	1	D3	1N4004
17	1	D6	KBL04
18	1	FS1	1.5AT
19	5	L1 ,L2 ,L3 ,L4 ,L5	VK200
20	1	Q1	BUK455-100A
21	1	R1	220K
22	1	R2	2k2
23	1	R3	R47-2W
24	1	R4	22R
25	1	R5	100R
26	1	R6	1K32
27	1	R7	6K65
28	2	R11 ,R8	1K
29	1	R9	87W-1K
30	1	R10	56R
31	1	TSW2	TSWTCH2
32	1	U1	UC3843AN

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Nome Progetto: DTX2/DTX4		Pagina: 1 of 1		Size: A3
Autore: REV. BERT J.	Data: 11/01/02	Codice Progetto: /		
Nome PC in Rete: \JACK\	Revisione: 1.0	Nome Parte: DECODER PANEL BOARD		
File/Carrello: MANUALDTX2.DTX\DTX\PC\BIN\NEW\PANNELLIDIG	Autorezzazione:	Codice:		CSPANDIG0002
Scala: /	Note: /	Trattamento: /		Profilo: /



SLPANDIG0002

Bill Of Materials

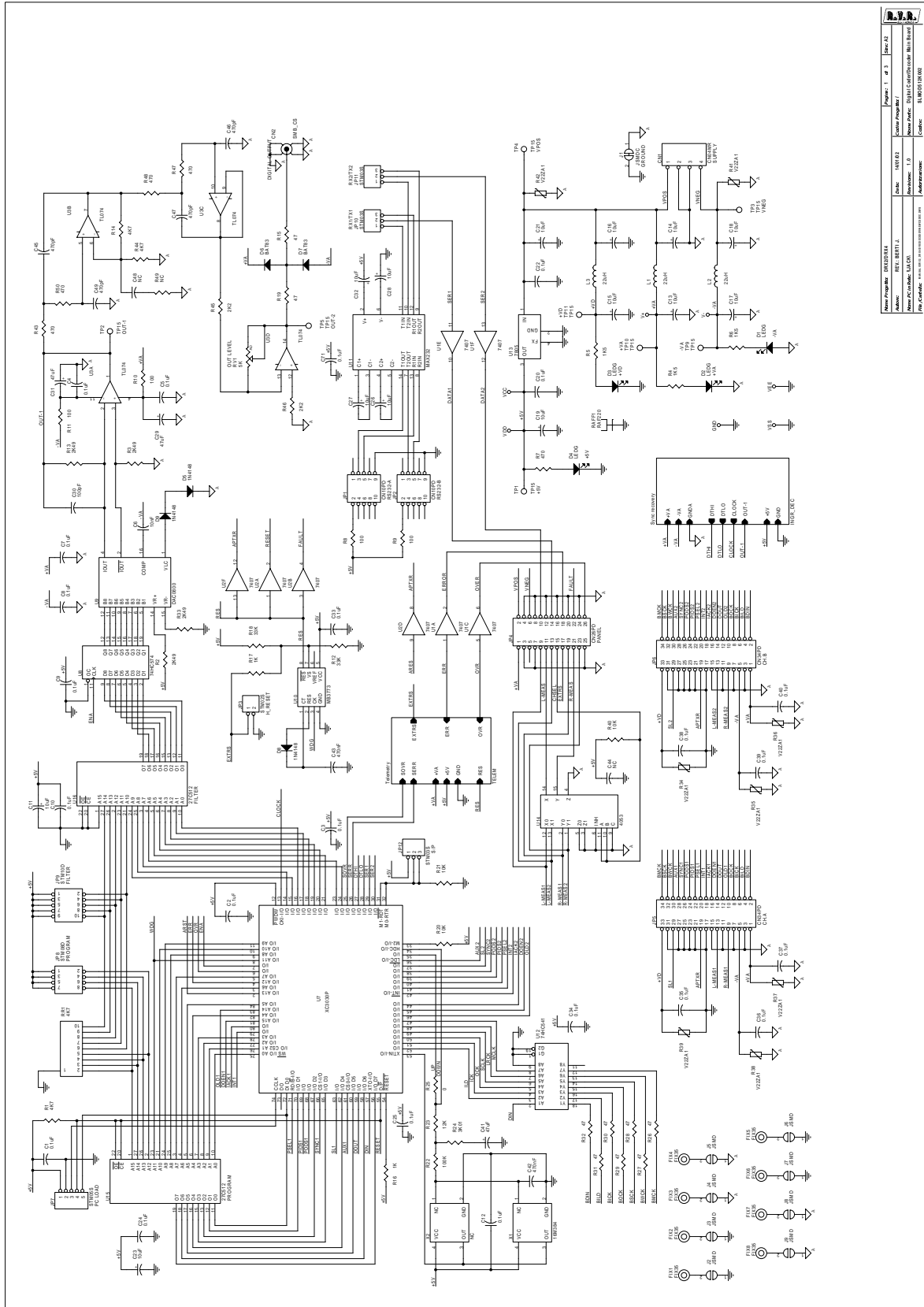
Page1

Item	Q.ty	Reference	Part
1	2	C4,C1	0.1uF
2	2	C3,C2	10uF
3	18	D1,D2,D3,D4,D5,D6,D11, D12,D13,D14,D15,D16,D21, D22,D26,D27,D28,D29	LEDG
4	2	D17,D7	LEDY
5	9	D8,D9,D10,D18,D19,D20, D23,D24,D25	LEDR
6	6	FIX1,FIX2,FIX3,FIX4,FIX5, FIX6	FIX35
7	1	JP1	CN26PD
8	2	JP2,JP3	STM03S
9	4	R1,R2,R3,R4	3K3
10	9	R5,R6,R7,R8,R9,R10,R11, R12,R13	1K2
11	1	SW1	SWMEC4
12	1	SW2	PMEC3E
13	1	SW3	PULCS
14	2	U2,U1	LM3915

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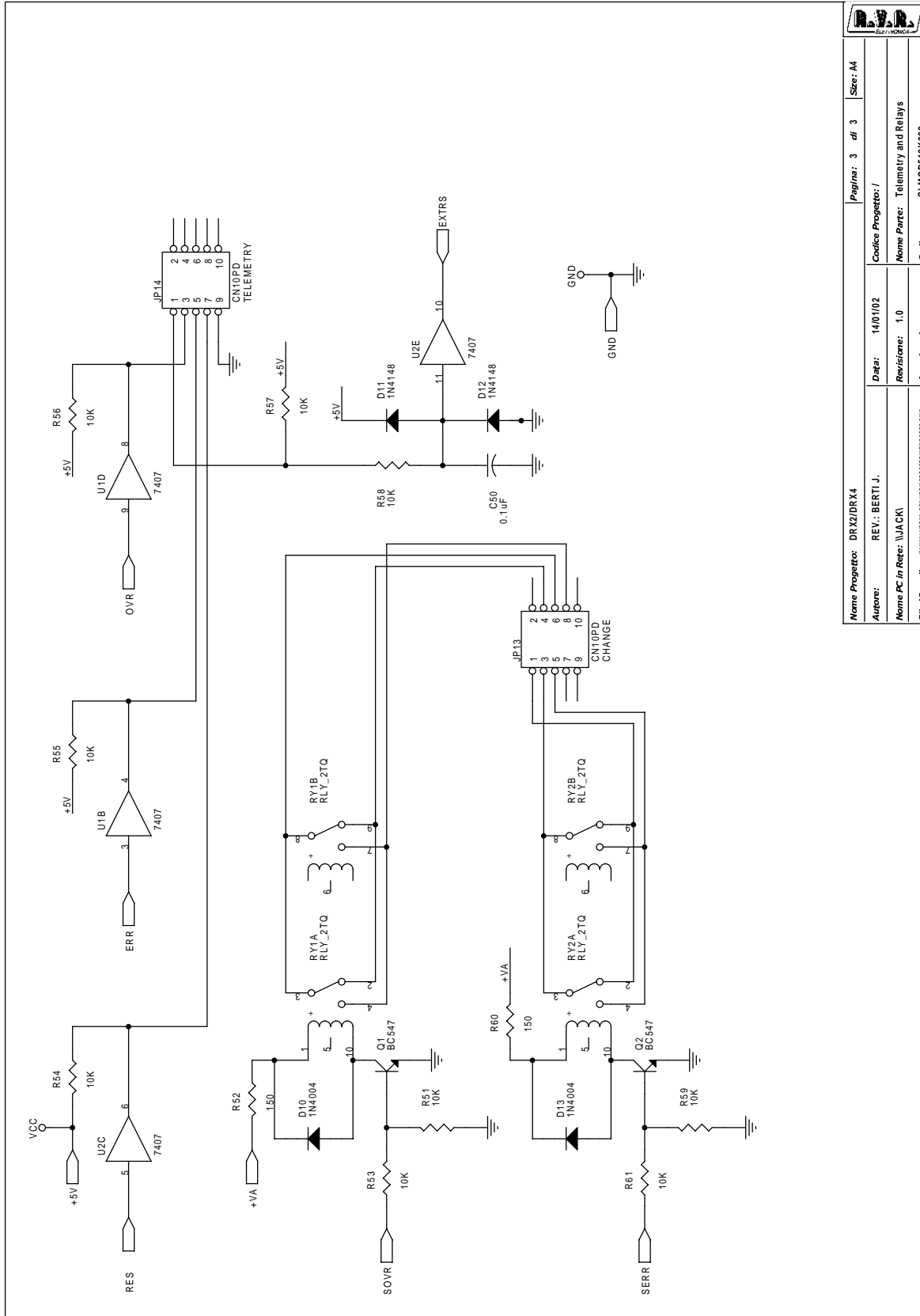






Author	REV: 001/1.0	Date	03/07/02	Sheet number	1 of 3
Project	DRX2/DRX4	Drawn by	U.S. Srinivas	Checked by	U.S. Srinivas
Company	R.V.R. Electronics	Project name	DRX2/DRX4	Project no.	SLMOD512K002





Nome Progetto:	DRX2/DRX4
Autore:	REV.: BERTI J.
Nome PC in Rete:	\\JACK
File/Cartella:	MANUALI/DRX2/DRX4/DRX2DRX4.DWG
Revisione:	1.0
Autore:	TELEMETRY and Relays
Codice Progetto:	/
Nome Perc:	SLMOD512K002
Codice:	
Pagina:	3 di 3
Size:	A4

SLMOD512K002

Bill Of Materials

Page1

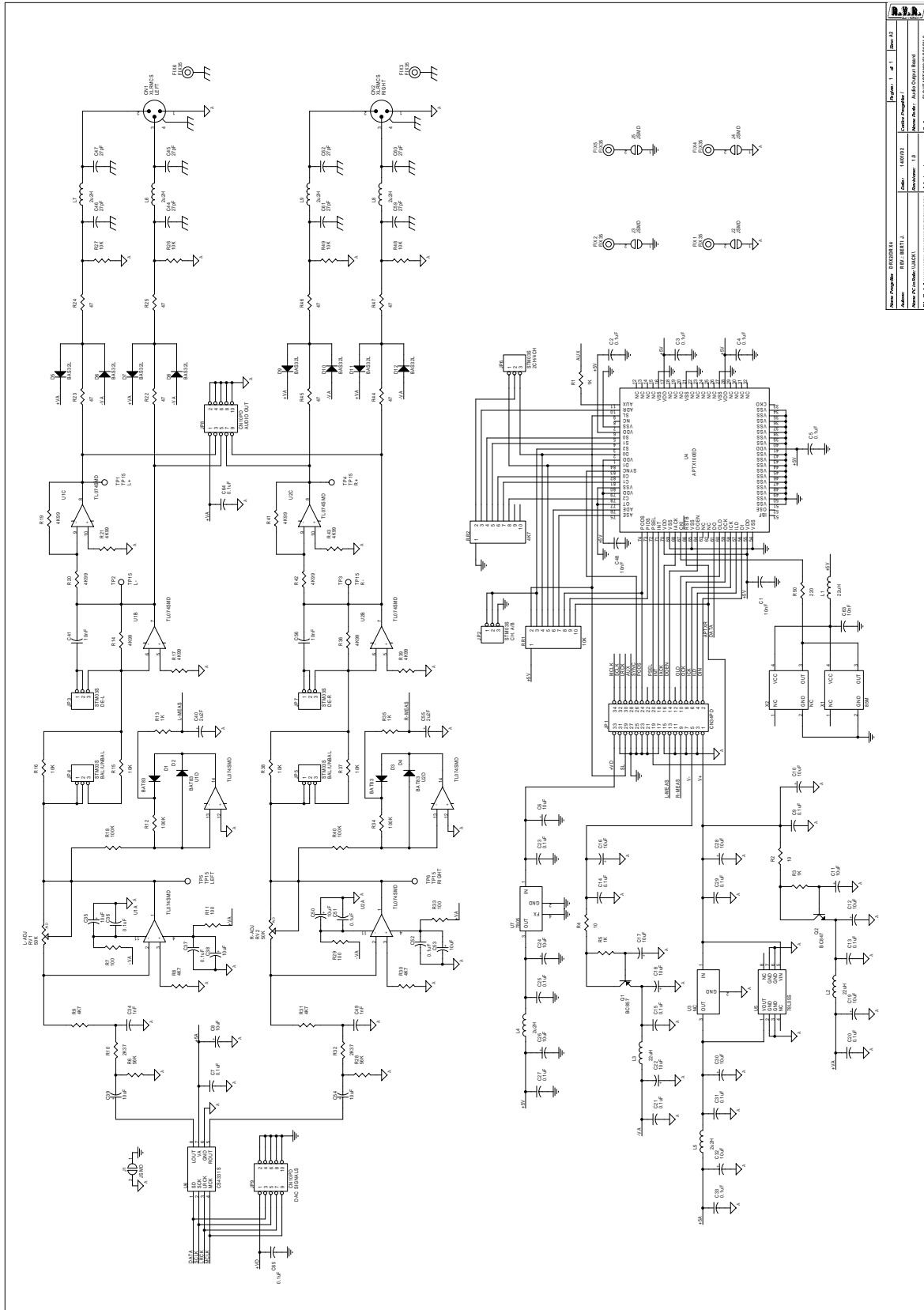
Item	Q.ty	Reference	Part
1	1	CN1	CN04MR
2	2	CN3,CN2	SMB_CS
3	32	C1,C2,C3,C4,C5,C7,C8,C9, C10,C12,C20,C22,C24,C25, C33,C34,C35,C36,C37,C38, C39,C40,C50,C56,C58,C62, C63,C64,C65,C69,C70,C71	0.1uF
4	1	C6	10nF
5	14	C11,C13,C14,C15,C16,C17, C18,C19,C21,C23,C26,C27, C28,C32	10uF
6	3	C29,C31,C41	47uF
7	1	C30	100pF
8	2	C43,C42	470nF
9	16	X2,D18,D19,D20,D21,D22, D23,C44,C48,R49,C59,R62, R63,R68,R89,R91	NC
10	8	C45,C46,C47,C49,C55,C57, C60,C61	470pF
11	2	C51,C54	1uF
12	1	C52	220pF
13	1	C53	820pF
14	2	C66,C67	2u2F
15	1	C68	1nF
16	4	D1,D2,D3,D4	LEDG
17	5	D5,D8,D9,D11,D12	1N4148
18	6	D6,D7,D14,D15,D16,D17	BAT83
19	2	D13,D10	1N4004
20	8	FIX1,FIX2,FIX3,FIX4,FIX5, FIX6,FIX7,FIX8	FIX35
21	4	JP1,JP2,JP13,JP14	CN10PD
22	1	JP3	STM02S
23	1	JP4	CN26PD
24	2	JP5,JP6	CN34PD
25	1	JP7	STM05S
26	1	JP8	STM08D
27	1	JP9	STM10D
28	5	JP10,JP11,JP12,JP15,JP16	STM03S
29	1	J1	JSMDC
30	8	J2,J3,J4,J5,J6,J7,J8,J9	JSMD
31	3	L1,L2,L3	22uH
32	1	MF1	MF5
33	2	Q2,Q1	BC547
34	1	Q3	2N3904
35	1	RAFF1	RAF220
36	6	RR1,R1,R14,R44,R67,R69	4K7
37	2	RV2,RV1	5K
38	13	R7,R43,R47,R48,R50,R64, R66,R70,R71,R78,R79,R90, RXX	470
39	2	RY2,RY1	RLY_2TQ
40	4	R2,R3,R13,R33	2K49
41	3	R4,R5,R6	1K5
42	5	R8,R9,R10,R11,R86	100

43	4	R12 ,R18 ,R76 ,R81	33K
44	9	R15 ,R19 ,R26 ,R27 ,R28 ,R29 , R30 ,R31 ,R32	47
45	5	R16 ,R17 ,R75 ,R82 ,R87	1K
46	12	R20 ,R21 ,R40 ,R51 ,R53 ,R54 , R55 ,R56 ,R57 ,R58 ,R59 ,R61	10K
47	5	R22 ,R74 ,R83 ,R84 ,R85	100K
48	1	R23	12K
49	1	R24	3K01
50	1	R25	0
51	8	R34 ,R35 ,R36 ,R37 ,R38 ,R39 , R41 ,R42	V22ZA1
52	4	R45 ,R46 ,R72 ,R73	2K2
53	2	R60 ,R52	150
54	1	R65	470K
55	2	R80 ,R77	56K
56	1	R88	220
57	11	TP1 ,TP2 ,TP3 ,TP4 ,TP5 ,TP6 , TP7 ,TP8 ,TP9 ,TP10 ,TP11	TP15
58	2	U2 ,U1	7407
59	2	U4 ,U3	TL074
60	1	U5	TL072
61	2	U17 ,U6	LM319
62	1	U7	XC3030P
63	1	U8	74HC574
64	1	U9	DAC0800
65	1	U10	MB3773
66	1	U11	MAX232
67	1	U12	74HC541
68	1	U13	7805
69	1	U14	4053
70	2	U16 ,U15	27C512
71	1	X1	16M384









Nome Progetto	DRX2/DRX4	Program	1	di	1	Doc	A2
Autore	R.V.R. - R.V.R.	Colla	1	di	1	Doc	A2
Nome PC	Windows 10	Nome Autore	Autore: R.V.R. - R.V.R.				
Nome PC	Windows 10	Versione	1.0				
Nome PC	Windows 10	Descrizione	Scheda di progetto				
Nome PC	Windows 10	Autore	R.V.R. - R.V.R.				

Item	Q.ty	Reference	Part
1	2	CN1,CN2	XLRMCS
2	5	C1,C41,C48,C56,C63	10nF
3	23	C2,C3,C4,C5,C7,C9,C13, C14,C15,C20,C21,C23,C25, C27,C29,C31,C33,C36,C37, C51,C52,C64,C65	0.1uF
4	21	C6,C8,C10,C11,C12,C16, C17,C18,C19,C22,C24,C26, C28,C30,C32,C35,C38,C39, C50,C53,C54	10uF
5	2	C34,C49	1nF
6	2	C40,C55	2u2F
7	8	C44,C45,C46,C47,C59,C60, C61,C62	27pF
8	4	D1,D2,D3,D4	BAT83
9	8	D5,D6,D7,D8,D9,D10,D11, D12	BAS32L
10	6	FIX1, FIX2, FIX3, FIX4, FIX5, FIX6	FIX35
11	1	JP1	CN34PD
12	6	JP2,JP3,JP4,JP5,JP6,JP7	STM03S
13	2	JP9,JP8	CN10PD
14	5	J1,J2,J3,J4,J5	JSMC
15	3	L1,L2,L3	22uH
16	6	L4,L5,L6,L7,L8,L9	2u2H
17	1	Q1	BC857
18	1	Q2	BC847
19	9	RR1,R15,R16,R26,R27,R37, R38,R48,R49	10K
20	5	RR2,R8,R9,R30,R31	4K7
21	2	RV1,RV2	50K
22	5	R1,R3,R5,R13,R35	1K
23	2	R2,R4	10
24	2	R6,R28	56K
25	4	R7,R11,R29,R33	100
26	2	R10,R32	2K37
27	4	R12,R18,R34,R40	100K
28	10	R14,R17,R19,R20,R21,R36, R39,R41,R42,R43	4K99
29	8	R22,R23,R24,R25,R44,R45, R46,R47	47
30	1	R50	220
31	6	TP1,TP2,TP3,TP4,TP5,TP6	TP15
32	2	U1,U2	TL074SMD
33	2	U3,X2	NC
34	1	U4	APT100ED
35	1	U5	78L05S
36	1	U6	CS4331S
37	1	U7	7805
38	1	X1	85M

## **Appendix B Setting Operation of RXRLNV Digital radio Link**

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## FM Receiver

### Phase equalization

For correct reception of the digital signal, audio section phase equalization must be Off.

With an R.V.R. receiver, move jumper JP5 on the Audio Process Card to position 2-3 (Figure 1).

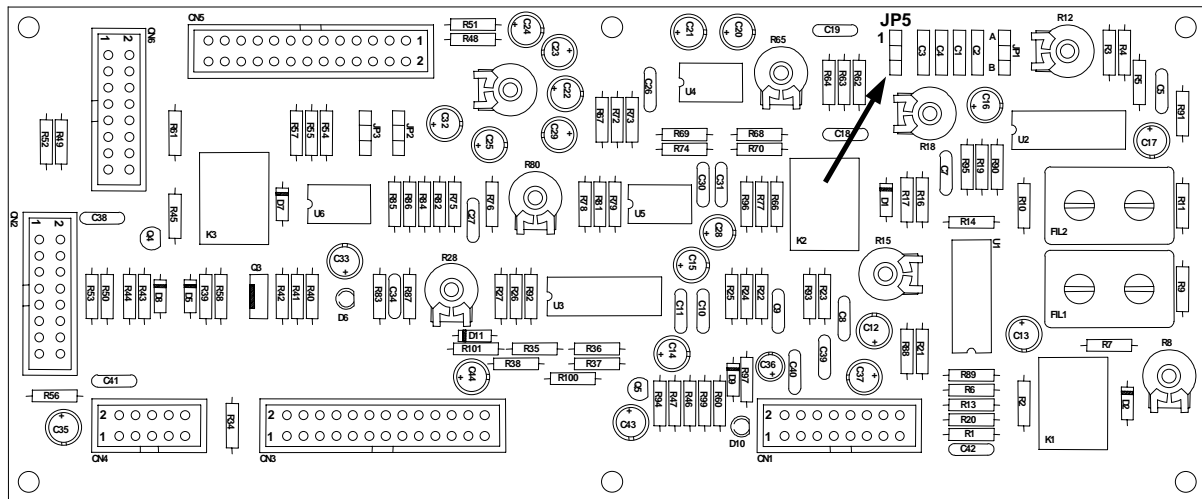


Figure 1

### Passband (DRX/4 only)

The DTX/4 – DRX/4 system requires a reception band which is noticeably bigger than that required by the DTX/2 – DRX/2 system.

With an R.V.R. receiver, remove the ceramic filters FC1 and FC2 from the 70 MHz IF Card (Figure 2), substituting them with filters with 470 pF capacity.

### Fine tuning

Adjust the tuning coils of the intermediate frequency stage to obtain a signal at the receiver MPX output which is as similar as possible to the signal at the DTX output.

This operation is necessary with a DTX/4 – DRX/4 system, but may not be required when using a DTX/2 – DRX/2 system.

With an R.V.R. receiver, the coils to be adjusted are TR1 and TR2 on the 70 MHz IF Card (Figure 2).

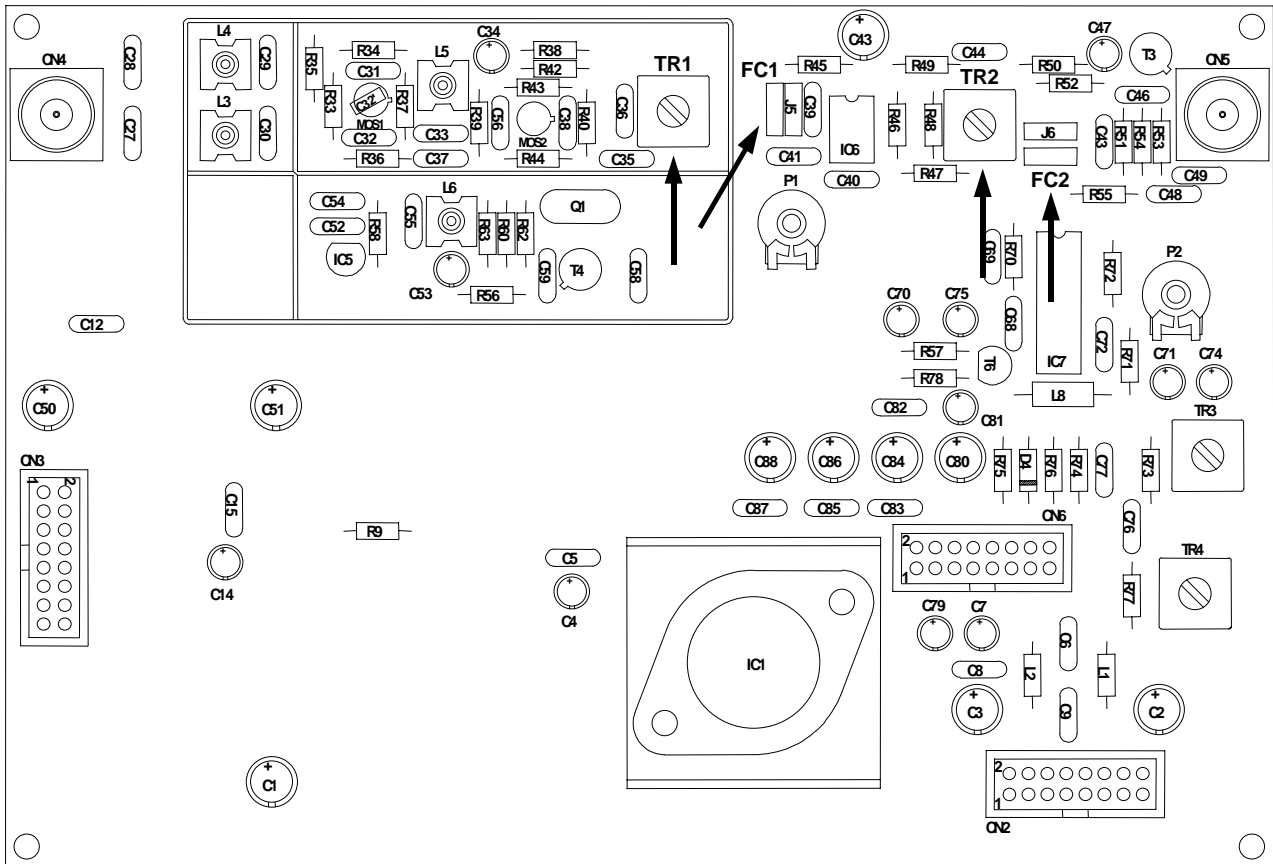


Figure 2

**Output level**

Adjust the receiver MPX output level so that the amplitude is 2.2 V<sub>pp</sub>.

**Baseband output**

Connect the receiver MPX output to the DRX baseband input (I/O).