

EQUIPMENT UNDER TEST :

APPARECCHIO IN PROVA :

TRANSMITTER mod. TSC-4

DERIVED MODELS :

MODELLI DERIVATI :

**TXC-2, TXC-2B, TXC-2G, TXC-2N, TXC-4B, TXC-4G,
TXC-4N, TXP-4, TXP-2, TXP-2B, TXP-2G, TXP-2N,
TXP-4B, TXP-4G, TXP-4N, TX-KEY, TRC-4, TRC-4B,
TRP-4, TOV-4, TOP-4, TXC-4, TSP-4, TSR-4, PPS**

REFERENCE STANDARDS :

NORME DI RIFERIMENTO :

FCC 47CFR Part 15

CUSTOMER:

RICHIEDENTE:

- **Dept. / Firm :** V2 ELETTRONICA S.p.A.
Ente / Società:
- **Mr.:** MINETTI
Sig.:
- **Address:** C.SO PRINCIPI DI PIEMONTE, 63 – 12035 RACCONIGI (CN) - ITALY
Indirizzo:
- **Tel. :** ++39 0172/81.24.11 • **Telefax:** ++39 0172/84.050 • **E-mail:** info@v2elettronica.com
Telefono : **Fax :** **e-mail**

Site of test execution:

Località esecuzione prove:

Via Campagna, 92 - 22020 Gaggino Faloppio (CO)

Date of test samples receipt:

Data ricevimento campioni:

12/10/03

Date of start test:

Data inizio prove:

13/10/03

Date of end test:

Data fine prove:

14/10/03

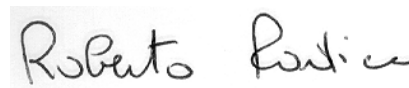
Witness to the test:

Presenti alle prove:

Nobody / Nessuno
.....

Signature of the engineers:

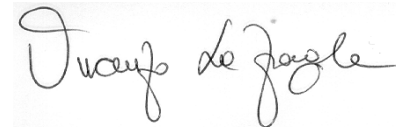
Firma esecutore prove:



R. Radice
.....

Signature of the Laboratory Director:

Firma Direttore Laboratori:



V. La Fragola
.....

The test results recorded in this Test Report are exclusively referred to the tested samples.

I risultati del presente rapporto di prova si riferiscono esclusivamente al campione sottoposto a prova.

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0. CONTENTS

	Page	Rev	Date
0. CONTENTS	2	0	18/12/03
1. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)...	3	0	18/12/03
1.1 Identification	3	0	18/12/03
1.2 Technical data	3	0	18/12/03
1.3 Transmitter technical data	4	0	18/12/03
1.4 Modifications incorporated in E.U.T.....	4	0	18/12/03
1.5 Ports identification	5	0	18/12/03
1.6 Auxiliary equipment	5	0	18/12/03
2. TEST CONDITIONS	6	0	18/12/03
2.1 Operating test modes and test conditions	6	0	18/12/03
2.2 Test overview	6	0	18/12/03
3. REFERENCE STANDARD FOR PERFORMED TESTS	7	0	18/12/03
4. Summary of test results	8	0	18/12/03
4.1 Tests.....	8	0	18/12/03
4.2 Emission limits.....	9	0	18/12/03
5. TEST RESULTS	10	0	18/12/03
6. EUT TECHNICAL DOCUMENTATION.....	20	0	18/12/03
6.1 Wiring diagrams.....	20	0	18/12/03
6.2 Technical manual	20	0	18/12/03
6.3 Photographic documentation	21	0	18/12/03
7. TECHNICAL REPORT OF ANALYSIS OF DERIVED PRODUCTS	23	0	18/12/03

1. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

1.1 Identification

Brand name:	V2 ELETTRONICA S.p.A.
Equipment :	TRANSMITTER
Model name or No. :	TSC-4
Serial number :	Not present
FCC ID :	RSK-V2-TSC-4
Country of manufacturer:	ITALY

1.2 Technical data

FCC class:	Intentional Radiators
Supply voltage:	Internal Alkaline Battery A23 12V
Input Power / Current :	10 mA
Typical usage :	Remote control of vehicular gates, rolling shutters or rolling curtains
EUT single or system:	Single
EUT dimensions :	7,1 x 4,2 x 1,8 cm.

1.3 Transmitter technical data

TRANSMITTER

- Working Frequency : 433,92 MHz
- Frequency Range of Operation : 433,05 ÷ 434,79 MHz
- Rated power : 1,23 μ W
- Antenna type : integral
- Modulation : OOK

1.4 Modifications incorporated in E.U.T.

The following items are the modifications introduced in the equipment under test :

- None

1.5 Ports identification

This section contains descriptions of all signal ports and AC/DC power input/output ports, the length and the type of the cable provided by manufacturer needed for the tests.

Moreover it is specified if the ports are ever or optionally connected.

Port		Description	Connection
1	Enclosure	Plastic surface	By pressure
2	AC power input/output ports	Line not present	*****
3	DC power input/output ports	Internal alkaline battery A23 12V	Battery support
4	Signals ports	Line not present	*****

Note: During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.

1.6 Auxiliary equipment

No auxiliary equipment

2. TEST CONDITIONS

2.1 Operating test modes and test conditions

The equipment has been tested according to the operative conditions described in the user/installation manual provided by the manufacturer and by following reference standards :

Reference Standard:

- FCC Part 15, Subpart C, Section 15.231

In the following table there are the operating conditions adopted during tests identified by an indicator (#..) at which has been referred the item "Operating condition of the equipment under test" of all technical sheets of the tests (see Section 4)

Operating condition	Description
#1	<i>Continuous transmission of bit stream.</i>

2.2 Test overview

Sample tested is the main model of a complete set of 433,92 MHz RF transmitters (see also Section 7).

The appliance is classified as "*intentional radiator*" in conformity to FCC Part 15 Sub. A §15.201, and it is subject to "*Certification*" procedure.

The application is mainly used as remote control for automatic gate and door openers, activated pushing its buttons; the deactivation of RF signal happens releasing the command pressure.

It is possible to declare that the appliance it is subject to additional requirements stated in §15.231.

3. REFERENCE STANDARD FOR PERFORMED TESTS

<i>Reference standard :</i>	<i>Title :</i>
FCC Part 15 part A	Code of Regulations Part 15 (Radio Frequency Devices), Subpart A (General) of the Federal Communication Commission (FCC)
FCC Part 15 part C	Code of Regulations Part 15 (Radio Frequency Devices), Subpart C (Intentional Radiators) of the Federal Communication Commission (FCC)
ANSI C63.4	American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz

4. SUMMARY OF TEST RESULTS

4.1 Tests

Port		Phenomena	Operating condition ¹	Result
1	Enclosure	Radiated emission	#1	Within the limit
		Frequency stability	#1	Within the limit
2	AC mains Input ports	RF Disturbance voltage: • continuous	Not applicable ²	
		Bandwidth of emission	Not applicable ²	
3	DC Power supply and Battery	Bandwidth of emission	#1	Within the limit

¹ Ref. Tab. of Section 2

² Not applicable: port not present in acc. To §15.207 (d)

4.2 Emission limits

Acc. to §15.231 (b) the field strength of emission from intentional radiator with periodic operation in the band 40.66-40.70 MHz and above 70 MHz are as follows:

Frequency (MHz)	Field Strength of fundamental at a distance of 3m ($\mu\text{V/m}$)	Field Strength of spurious emission at a distance of 3m ($\mu\text{V/m}$)
40,66 – 40,70	2250	225
70 – 130	1250	125
130 - 174	1250 – 3750 (linear interpolations)	125 – 375 (linear interpolations)
174 – 260	3750	375
260 – 470	3750 – 12500 (linear interpolations)	375 – 1250 (linear interpolations)
Above 470	12500	1250

According to §15.209 all the other emission of the appliance shall not exceed the following levels:

Frequency (MHz)	Field Strength at a distance of 3m ($\mu\text{V/m}$)
30 - 88	100 **
88 – 216	150 **
216 – 960	200 **
Above 960	500

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

5. TEST RESULTS

TX – RADIATED FIELD 30 - 1000 MHZ	11
TX – SPURIOUS EMISSION 1000 - 5000 MHZ	14
TX – RANGE OF MODULATION BANDWIDTH	17

**TEST
1.****TX – RADIATED FIELD 30 - 1000 MHZ****REFERENCE
DOCUMENT**

FCC PART 15 subpart C

- **TEST LOCATION:** Semi-anechoic chamber
- **TEST EQUIPMENT USED FOR TEST:** EMI receiver Rohde & Schwarz Mod. ESMI
Biconical Antenna Rohde & Schwarz Mod. HK116
Log-periodic Antenna Rohde & Schwarz Mod. HL223
Chase Antenna Mod. CBL 6111 A
- **TESTED PORT:** Enclosure
- **EMISSION LIMITS:** Acc. to Section 15.209 & 15.231 of reference document
- **UNCERTAINTY OF MEASURE:** Combined uncertainty = ± 1.75 dB
Total uncertainty = $(k=2) \pm 3.5$ dB

TEST CONDITIONS:			MEASURED
Ambient temperature :	15 - 35 °C		24 $\pm$ 3 °C
Ambient humidity :	25 - 75 %rH		40 $\pm$ 5 %rH
Pressure :	85 - 106 kPa	(860 mbar - 1060 mbar)	950 $\pm$ 50 mbar
Voltage :	12 Vdc		12 Vdc

OPERATING CONDITION (Rif. Section. 2) : #1**RESULT: WITHIN THE LIMIT**

SCAN TABLE : "Radiated Emission"

Unit: dB μ V/m

Curve1: Max Peak ClearWrite
Curve2: Avg ClearWrite

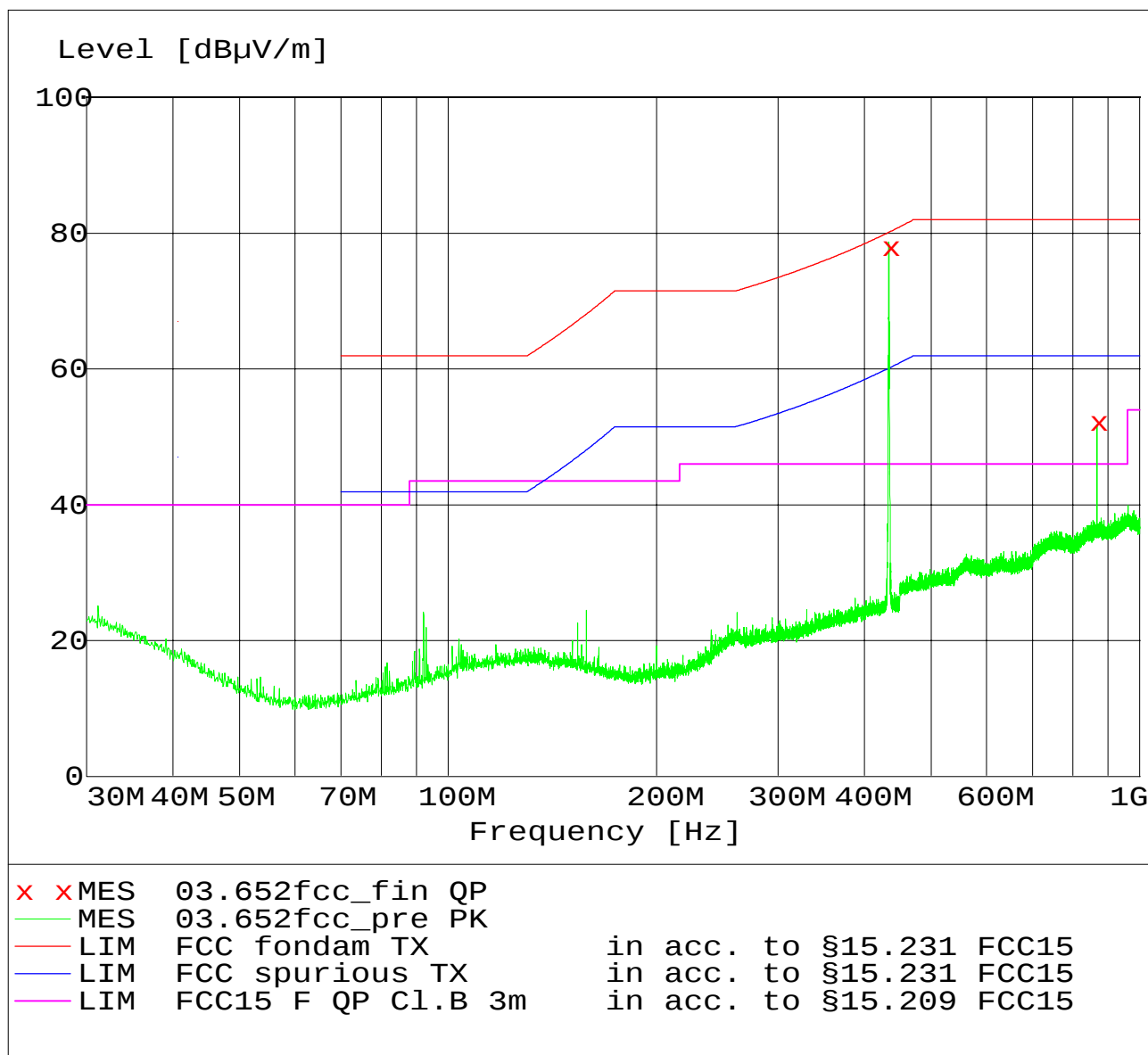
Subrange1:

Start Frequency: 30.0 MHz Step Size: 80 kHz
Stop Frequency: 1000.0 MHz
Measure Time: 0.01 sec.
IF Bandwidth: 120 kHz

Receiver: ESXI Probe Transducer: CHASE_6111_PRC
Signal Path: Path 4 System Transducer: RFin2-CP1/X11
Scan Mode: Lin Add. Transducer: W71.01
Tracking Gen.: Off
Input: 2 DC

Preamplifier: 10 dB Demodulation: FM Broad
RF att.: Coupled Volume: 0.0%
Ref. Level: -50 dBm Squelch: --
Min. RF att.: 0 dBm Option: None
Autorange: On

Curve 1: On Repetition: Single
Curve 2: On Stop Mark: On
Stop Message: On
Text: Connect antenna



Frequency [MHz]	Remark	QP Level [dBμV/m]	Limits [dBμV/m]	Measured level - Antenna Polarisation
433.92000	Fundamental	77.90	81.24	HORIZONTAL
867.84000	Spurious	52.10	61.94	HORIZONTAL

**TEST
2.****TX – SPURIOUS EMISSION 1000 - 5000 MHZ****REFERENCE
DOCUMENT**

FCC PART 15 subpart C

- **TEST LOCATION:** Semi-anechoic chamber
- **TEST EQUIPMENT USED FOR TEST:** EMI receiver Rohde & Schwarz Mod. ESMI
Double Ridged Guide Antenna Electro-metrics mod. EM-6961
Log-periodica Broadband Antenna mod. HL025
- **TESTED PORT:** Enclosure
- **EMISSION LIMITS:** Acc. to Section 15.209 of reference document
- **FREQUENCY BAND :** Fundamental Frequency to 10th harmonics acc. to §15.33 (a)
- **UNCERTAINTY OF MEASURE:** Combined uncertainty = ± 1.75 dB
Total uncertainty = $(k=2) \pm 3.5$ dB

TEST CONDITIONS:		MEASURED
Ambient temperature :	15 - 35 °C	24 $\pm$ 3 °C
Ambient humidity :	25 - 75 %rH	40 $\pm$ 5 %rH
Pressure :	85 - 106 kPa (860 mbar - 1060 mbar)	950 $\pm$ 50 mbar
Voltage :	12 Vdc	12 Vdc

OPERATING CONDITION (Rif. Section. 2) : #1**RESULT: WITHIN THE LIMIT**

SCAN TABLE : "Radiated Emission"Unit: dB μ V/m

	Detector :	Mode:
Curve1:	Max Peak	ClearWrite
Curve2:	--	ClearWrite

Subrange:

Start Frequency:	1000.0 MHz
Stop Frequency:	5000.0 MHz
Measure Time:	0.01 sec.
IF Bandwidth:	1000 kHz

Step Size:	kHz
Probe Transducer:	HL025

Receiver:	ESXI
Signal Path:	Path 4
Scan Mode:	Lin
Tracking Gen.:	Off
Input:	2 DC

System Transducer:	RFin2-CP1/X11
Add. Transducer:	W71.01

Preamplifier:	10 dB
RF att.:	Coupled
Ref. Level:	-50 dBm
Min. RF att.:	0 dBm
Autorange:	On

Demodulation:	FM Broad
Volume:	0.0%
Squelch:	--
Option:	None

Curve 1:	On
Curve 2:	Off

Repetition:	Single
Stop Mark:	On
Stop Message:	On
Text:	Connect antenna

MEASUREMENT RESULTS

<i>Frequency</i> <i>[MHz]</i>	<i>Remark</i>	<i>PK Level</i> <i>[dBμV/m]</i>	<i>AV Limit*</i> <i>[dBμV/m]</i>	<i>Margin</i> <i>[dB]</i>
1301,7	Spurious	30.43	54.00	23,57
1735,65	Spurious	34.66	61.94	26.16
2169,54	Spurious	33.87	61.94	26.85
2603.49	Spurious	32.39	61.94	28.43
f>2700	Spurious	No signal above noise level	---	----

* In acc. to §15.231 limit

**TEST
3.****TX – RANGE OF MODULATION BANDWIDTH****REFERENCE
DOCUMENT**

FCC PART 15 subpart C

- **TEST LOCATION:** Semi-anechoic chamber
- **TEST EQUIPMENT USED FOR TEST:** EMI receiver Hewlett Packard Mod. 8542E
- **TESTED PORT:** AC Mains, DC Port and Battery
- **EMISSION LIMITS:** Acc. to Section 15.231 of reference document

TEST CONDITIONS:		MEASURED
Ambient temperature :	15 - 35 °C	24 ± 3 °C
Ambient humidity :	25 - 75 %rH	40 ± 5 %rH
Pressure :	85 - 106 kPa (860 mbar - 1060 mbar)	950 ± 50 mbar
Voltage :	12 Vdc	12 Vdc

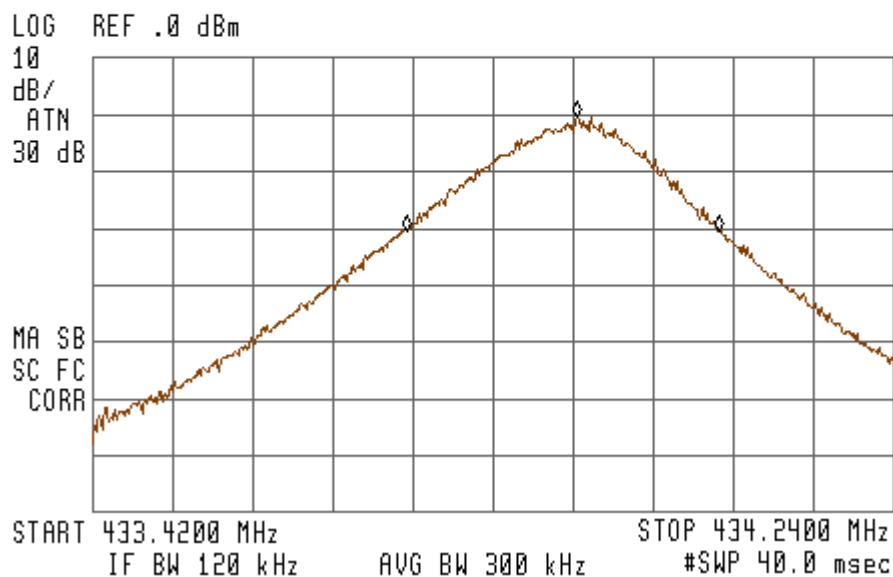
OPERATING CONDITION (Rif. Section. 2) : #1**RESULT: WITHIN THE LIMIT**

MEASUREMENT RESULTS

TEST CONDITIONS		Occupied frequency range (at 20 dB point)		
		f_L [MHz]	F_C [MHz]	f_H [MHz]
T _{amb} : + 24 °C	V _{nom} : 12 Vdc	433,7419	433,9161	434,0617
Incertezza di misura / Measurement Uncertainty : ± 0.1 Hz				
Legenda / Abbreviations : f_L : Lowest frequency at 20dB point F_C : Central frequency f_H : Highest frequency at 20dB point				
Bandwidth at 20dB points: 319,8 kHz				



ACTV DET: PEAK
MEAS DET: PEAK QP AVG



LIMITS	
	Permitted operating frequency range
Normal test conditions	Nominal frequency $\pm 0,25\%$ = 1084,8 kHz

6. EUT TECHNICAL DOCUMENTATION**6.1 Wiring diagrams**

	<i>Document reference (n., edition, date, ...)</i>
WIRING DIAGRAM	TXPTXC_RG80 - CF11901 07/03/2003
PART LIST	TXPTXC_RG80 – CF11901

6.2 Technical manual

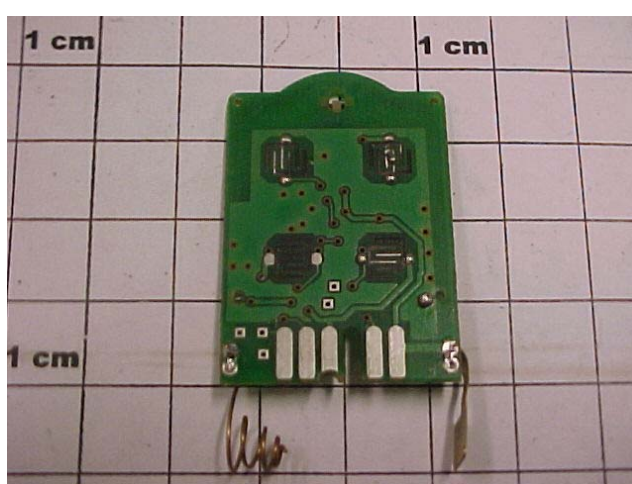
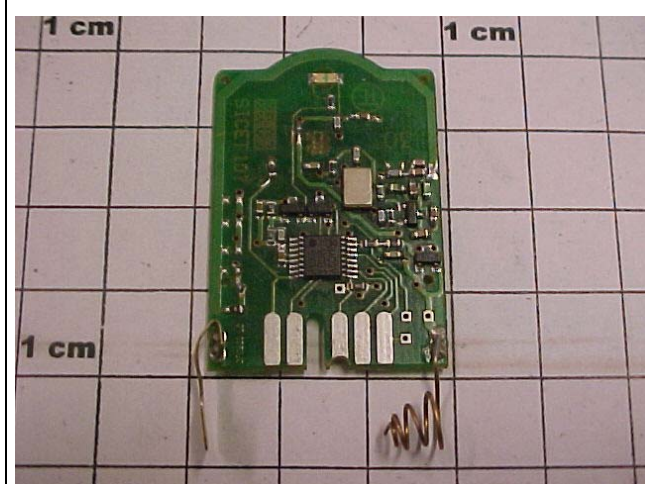
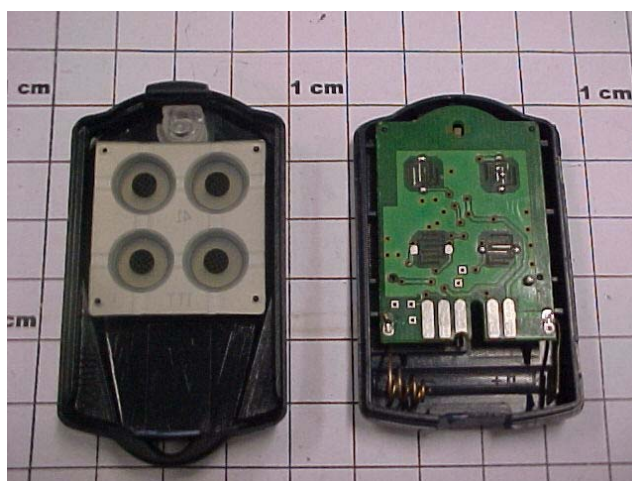
	<i>Document reference (n., edition, date, ...)</i>
TECNICAL FEATURES	086 – Ed. 21-01-03
TECHNICAL CONSTRUCTION FILE	Doc. 01, 18 July 2003

6.3 Photographic documentation

PHOTO N° 1 – E.U.T. IDENTIFICATION



PHOTO N° 2 – INTERNAL VIEW



7. TECHNICAL REPORT OF ANALYSIS OF DERIVED PRODUCTS

EQUIPMENT under ANALYSIS :		BRAND NAME
BASIC MODEL	TRANSMITTER TSC-4	V2 ELETTRONICA
DERIVED MODELS	TXC-2, TXC-2B, TXC-2G, TXC-2N, TXC-4B, TXC-4G, TXC-4N, TXP-2, TXP-2B, TXP-2G, TXP-2N, TXP-4, TXP-4B, TXP-4G, TXP-4N, TX-KEY, TRC-4, TRC-4B, TRP-4, TOV-4, TOP-4, TXC-4, TSP-4, TSR-4, PPS	

Prima Ricerca & Sviluppo, just on the basis of the following technical documents :

1.	Wiring diagram	• TXPTXC_RG80 - CF11901 07/03/2003
2.	Mounting plain	• CF11900.PCB 14/07/2003
3.	PCB layout	• CF11900.PCB 14/07/2003
4.	Part list	• TXPTXC_RG80 - CF11901
5.	Photographic documentation	• no documentation
6.	Client declaration	• ANALYSIS OF DERIVED PRODUCT (Point 3 of Technical Construction File)

States as follows :

ANALYSIS OF DERIVED PRODUCT

Different colours and shapes of the shells make different code designations.

The B, G or N letter, present in the model name, refers to the shell colour (B= blue, G= reddish purple, N= black)

All the versions employ the same p.c.b. and the same b.o.m.

Only the digital structure code (modulation) may be different from model to model.

The following table shows the detailed differences:

BASIC MODEL	BASIC MODEL TSC-4		
	Shell shape	• Shell colour • Push button colour	Digital code
TSC-4	D type	• Blue • Grey	A type

DERIVED MODEL	DERIVED PRODUCT: DISTINCTIONS		
	Shell shape	• Shell colour • Push button colour	Digital code
T X C – 2	A type	• Grey • Red	A type
T X C – 2 B	A type	• Blue • Red	A type
T X C – 2 G	A type	• Reddish purple • Red	A type
T X C – 2 N	A type	• Black • Red	A type
T X C – 4	A type	• Grey	A type

		Red	
T X C – 4 B	A type	- Blue - Red	A type
T X C – 4 G	A type	- Grey - Red	A type
T X C – 4 N	A type	- Black - Red	A type
T X P – 2	A type	- Grey - Red	B type
T X P – 2 B	A type	- Blue - Red	B type
T X P – 2 G	A type	- Reddish purple - Red	B type
T X P – 2 N	A type	- Black - Red	B type
T X P – 4	A type	- Grey - Red	B type
T X P – 4 B	A type	- Blue - Red	B type
T X P – 4 G	A type	- Reddish purple - Red	B type
T X P – 4 N	A type	- Black - Red	B type
T X – K E Y	A type	- Blue - Red	A type
T R C – 4	B type	- Dark Grey - Bright Orange	A type
T R C – 4 B	B type	- White - Bright Orange	A type
T R P – 4	B type	- Dark Grey - Bright Orange	B type

TOV - 4	C type	• Black • Bright Orange	A type
TOP - 4	C type	• Black • Bright Orange	B type
TSP - 4	D type	• Blue • Grey	B type
TSR - 4	D type	• Black • Grey	C type
PPS	A Type	• Blue • Red	A type

DETAILS

Shell shape

- A TYPE:



- B TYPE:



- C TYPE:



- D TYPE:



Digital code :

- A TYPE: 52 bit code (programmed and serialized by v2elettronica)
- B TYPE: 52 bit code (programmed by v2elettronica and serialized by the customer)
- C TYPE: 13 or 21 bit code (programmed by V2elettronica and serialized by the customer)

Glossary:

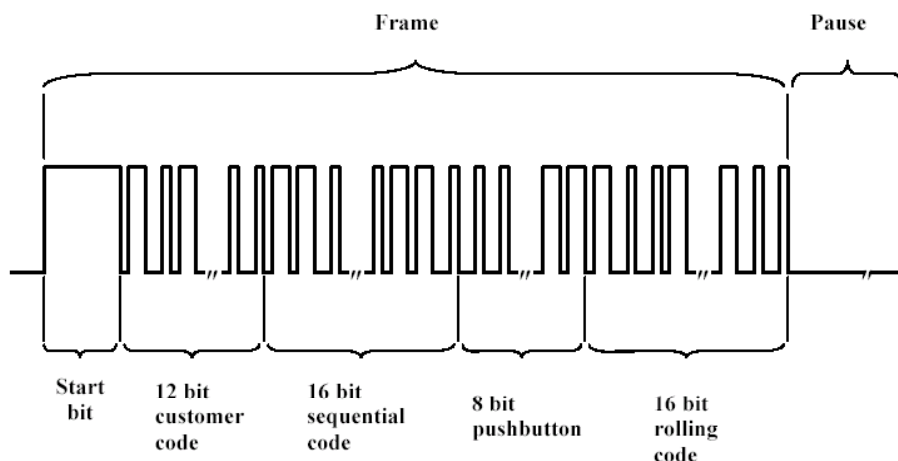
Programmed: V2elettronica put the software into the micro controller, the transmitter can transmits but no useful information will be attached

Serialized: V2elettronica or the customer set the digital code with personalized information (customer ID and sequential key)

52bit code:

Personal Pass code:

- Frame length: 63,2 ms (tolerance: from 55 up to 80 ms)
- Pause lenght: 24,5 ms
- Start bit: 2,34 ms (1/3 bit x 6)
- Bit length: 1,17 ms
- 1/3 bit length: 390 us



On these basis, Prima Ricerca & Sviluppo considers all the measures performed on the basic model and carried in this test report, completely extendable to the derived models.