MEASUREMENT/TECHNICAL REPORT

FCC Part 15 Section 15-231

SIT

FCC ID: QFA-FRC584001

February 3rd , 2003

This report concerns (check one): Original grant ____ Class II change__X__

Equipment type: RADIO TRANSMITTER (ex.: computer, printer, modem, etc.)

Deferred grant request per 47 CFR 0.457(d)(1)(ii)? yes _____ no __X__

If yes, defer until: _____
Date

Company Name agrees to notify the Commission by _____
Date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by: Giuseppe MECCHIA

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1 GENERAL INFORMATION

1.1 Product Description

Same as the unit described in RD 2002/131 of July 10th 2002;
Date of Grant July 30th 2002 with the following modifications:

- modification of antenna lenght from 50mm to 174mm
- resistor R15 removed

FRC is the new SIT RF Control for a Millivolt System to be used togheter with the SIT 820 NOVA mV system equipped with the 584.101 or 584.201 receiver.
With the FRC you can turn your gas fireplace on or off; use a timer to shut down the fireplace automatically at the desired time, increase or decrease flame height, set the fan speed and other useful functions.
Three pre-progammed flame time profiles are avilable.
A wide clear display gives you many information as room temperature, set temperature, flame height, fan speed level, timer condition, as well as a low battery indication.
This Owner's Guide describes in details how to use in the best way this product.
The surfing between the various options is achieved by functions sliding.
With reference to the four keys displaced in around, the upper and lower keys (functions sliding) allow the selection of the functions available in the remote control, while the left and right keys (decrement and increment of the set points) allow to modify the working levels/states of the selected function.
The device will transmit when a key is pressed and the transmission time will not be longer than 1 second even if the key is maintained pressed.

From the FCC point of view the EUT is a radio tranmitter operating at 433.92 MHz according to section 15.231.

1.2 Related Submittal(s)/Grant(s)

None

1.3 Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system (including inserted cards, which have grants) are:

Model & Serial No.	FCC ID	Description	Cable Descriptions
FRC 0.584.001 s/n EMC03012	**QFA-FRC584001**	**Radio transmitter**	**No cables connected**

(1) EUT submitted for grant.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the ANSI C63.4-1992 test procedures . Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

TÜV ITALIA test site No. 3 – semi-anechoich chamber

The semi-anechoic chamber test site and conducted measurement facility used to collect the radiated data are located at Via Montalenghe 12, Scarmagno, Italy. This site has been fully described in a report dated May 12, 2000 submitted to your office, and accepted in a letter dated May 30, 2000 (registration Number: 90860)

1.6 Test equipment list:

Description	Model	serial No.	Cal due date
Spectrum analyzer	HP 8568B+QP adapter	s/n 2601A02134	04/03
Spectrum analyzer	HP 8562A	s/n 3043A05627	10/03
Biconical antenna	Tensor 4104	s/n 2222	03/03
Log-periodic antenna	Electro-metrix LPA-25	s/n 1117	03/03
Doub.ridged g.horn ant.	EMCO 3115	s/n 3572	11/03

2 PRODUCT LABELING

Same as the unit described in RD 2002/131 of July 10th 2002;
- Date of Grant July 30th 2002

Figure 2.1 FCC ID Label

Not required.

Figure 2.2 Location of the Label on EUT

not required

3 SYSTEM TEST CONFIGURATION

3.1 Justification

The EUT was configured for testing in a typical fashion (as a customer would normally use it).

It has been tested in stand alone mode; EUT was forced to transmit continuously although in normal operation mode transmission stops after the button has been released.

Test conditions:

- a new battery has been installed
- modulation was fixed (no regulation are permitted by the operator or factory settings)
- during tests EUT has been rotate through the three ortogonal axes to determine which condition produces the highest emission with reference to the limits.

3.2 EUT Exercise Software

The EUT exercise program used during radiated testing was designed to exercise the various system components in a manner similar to a typical use.
EUT was forced to transmit continuously although in normal operation mode transmission stops after the button has been released.

3.3 Special Accessories

None.

EUT is housed in a plastic box.
No cables are connected to EUT.

3.4 Equipment Modifications

To achieve compliance to requested levels, no changes were made during compliance testing.

3.5 Configuration of the Tested System

Figure 3.1 Configuration of the Tested System

Transmitter unit FRC 0.584.001 – stand alone EUT

4 BLOCK DIAGRAM(S) OF THE EUT

- not required

4.1 Block Diagram Description

The Controller Board of the EUT is provided with:

Y1 = 32.768 kHz Crystal

Y2 = 4 MHz Ceramic oscillator

J1 RF Transmitter AUREL: SAW 433.92 MHz:

Fig. 4.1 - Block Diagram of the EUT

See attached file: Block_Diagram.pdf

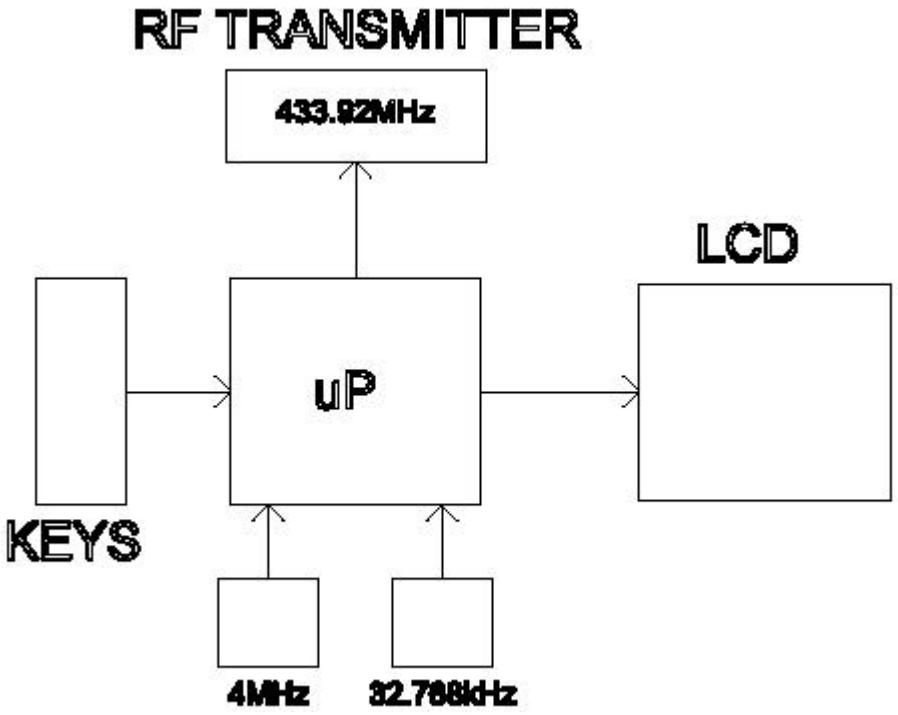
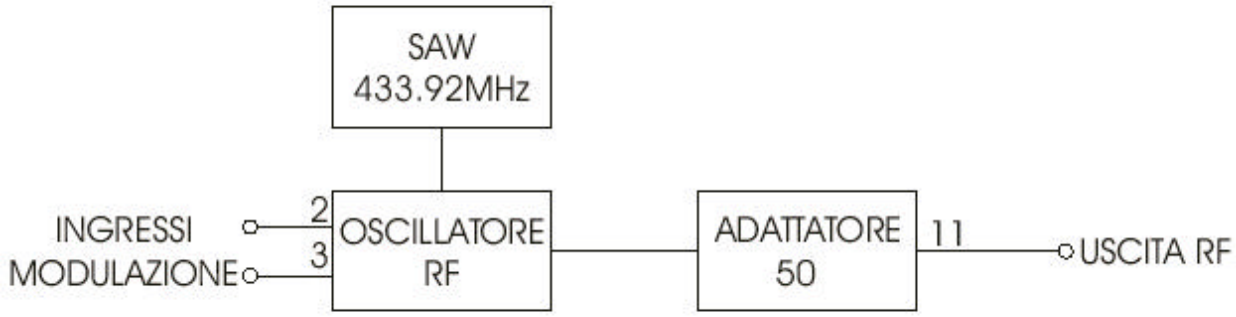


Fig. 4.2 - Block Diagram of the RF Transmitter

See attached file: Block_Diagram_Transmitter.pdf



5 RADIATED MEASUREMENT PHOTOS

7 RADIATED EMISSION DATA

- **(from 30 MHz to the 10th harmonic of the transmitter frequency. – EUT also includes a digital device.)**

7.1 Tests of the worst case configuration

The following data list the significant emission frequencies, measured levels, correction factors (including cable and antenna corrections), the corrected reading, plus the limit. Field strenght calculation is given in paragraph 7.2.

Fundamental and harmonics according to section 15.231

Judgement: Passed by 1.1 dB

Frequency (MHz)	Polarity (V/H)	Receiver* Reading (dBµV)	Correction Factor (dB/m)	Corrected Reading (dBµV/m)	3 Meter Limit (dBµV/m)
433.92	H	63.6	20.9	84.5 peak 72.5 average	100.8 80.8
867.8	H	29.6	30.1	59.7	60.8
1735.5	H	26.7	26.2	52.9	60.8
2169	H	21.6	27.7	49.3	60.8
3471.1	V	22.8	30.5	53.3	60.8

* below 1 GHz readings are peak, with an IF bandwidth of 120 kHz,
above 1 GHz are peak with an IF bandwidth of 1 MHz.

Spurious emissions according to section 15.209:
No emission detected above noise floor.

Restricted bands of operation - section 15.205

Frequency (MHz)	Polarity (V/H)	Receiver* Reading (dBμV)	Correction Factor (dB/m)	Corrected Reading (dBμV/m)	3 Meter Limit (dBμV/m)
1301.6	V	29.8	25	54.8 peak	74

Average reading – calculated value:

54.8 dBμV/m (peak) – 12 = 42.8 dBμV/m (average) refered to 54 dBμV/m 3m limit

duty cycle correction factor from paragraph 7.4 = 11.97dB (rounded to 12 dB)

Bandwidth of emission: requested 0.25% of 433.92 MHz = 1.085 MHz
measured 0.336 MHz

Test Personnel:

Tester Signature -  Date January 27, 2003

Typed/Printed Name Giuseppe MECCHIA .

7.2 Field Strength Calculation

7.2.1 The field strength is calculated by adding the Antenna and Cable Factor to the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF

where

FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

Assume a receiver reading of 29.8 dBμV is obtained. The Antenna and Cable Factor of 25 is added, giving a field strength of 54.8 dBμV/m. The 54.8 dBμV/m value was mathematically converted to its corresponding level in μV/m.

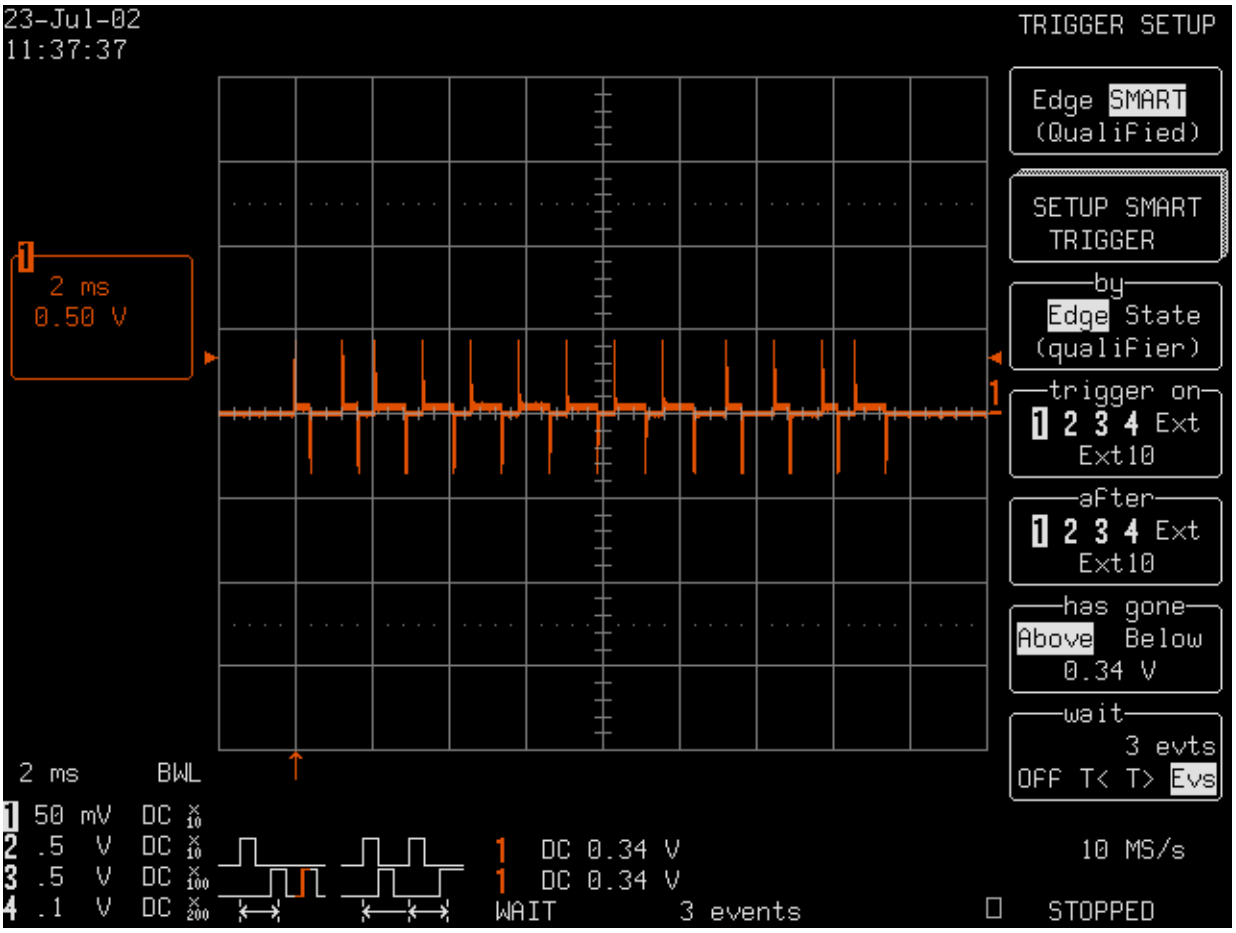
FS = 29.8 + 25 = 54.8 dBμV/m

Level in μV/m = Common Antilogarithm [(54.8 dBμV/m)/20]= 549.5 μV/m

7.3 Duty cycle measurements

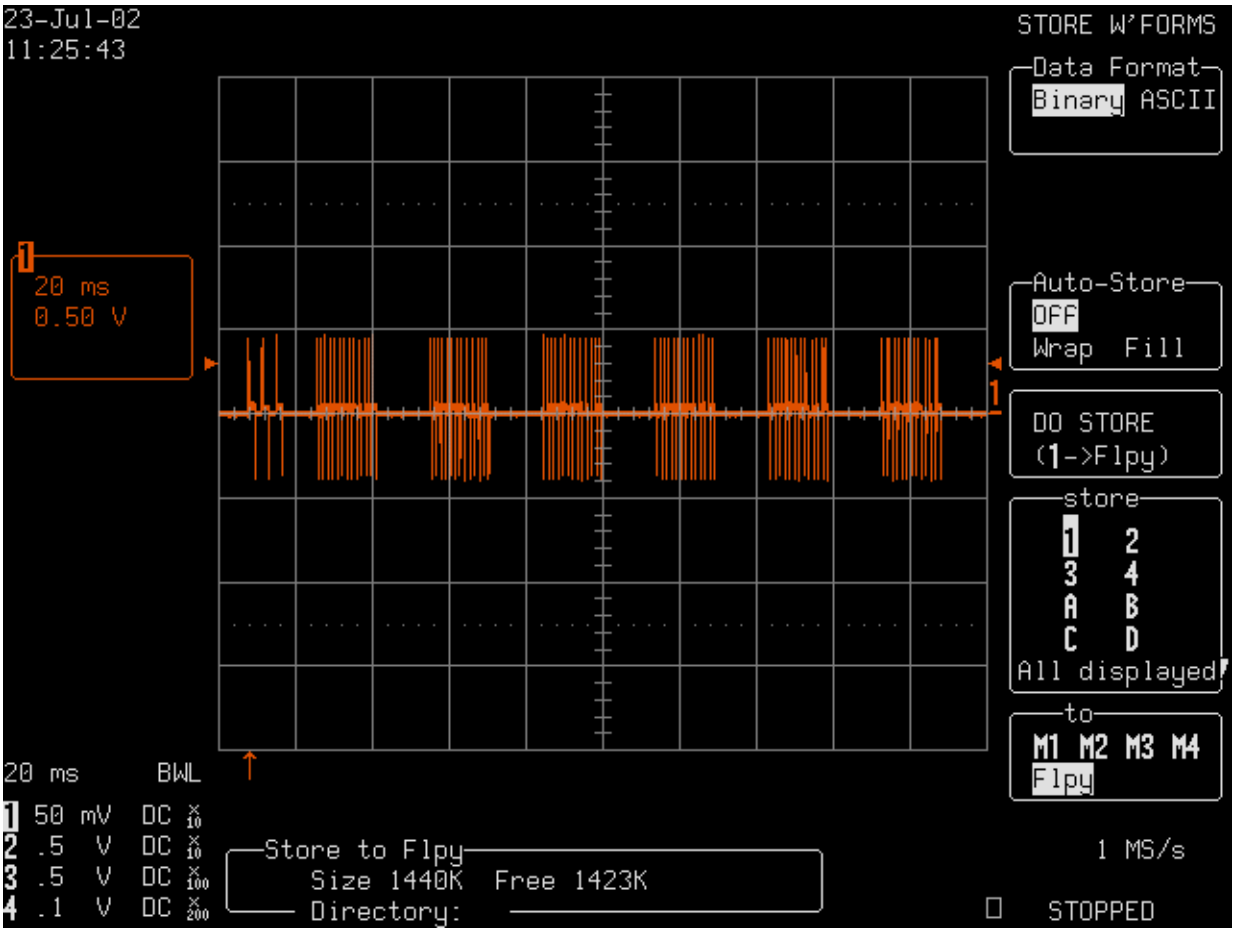
The transmission is coded 1/3, 2/3 with a baud rate of 833 bit per second.
Transmission pulses (bits) lasts 1.2ms and can be 400µs ON and 800µs OFF or viceversa.
Each command is formed by a start bit plus 12 bits for a total time of 15.6ms (see picture below); the transmission is repeated three times with an interval of about 15ms
In the attached picture (page 18) are shown 6 continuous transmission frames which are related to the sending of No. 2 logic commands (three transmission frames each) operating the switching ON of the fireplace and next the flame regulation.
SIT la Precisa consider a maximum use of radiotransmitter of about 5 times per our
In order to regulate the flame.

Picture 1: detail of 1 transmission frame



Picture 2: No.6 continuous transmission frames related to the sending of No. 2 logic commands:

- switching ON of the fireplace
- the flame regulation.



7.4 Duty cycle – sample calculation

from picture 1
we have 13 bit for a single lenght of 1.2ms total 15.6ms

picture 2 total view 200ms in the first half of the screen the field intensity has its maximum value: we see there No.3 starting bits (1.2ms each) plus No.3 transmission frames (15.6ms each)
So, in 100ms we consider a total transmission time of (3x1.2)+(3x15.6) = 50.4ms
The transmission bit is 1.2ms long and the on/off rate is typically 1/3 or 2/3; considering that transmission rate can never be always 1/3 nor 2/3 but always a mixture of them (as shown in picture 1), SIT considers typical for a transmission frame 50% on and 50% off.

The total on time becomes 50.4/2= 25.2 ms

The duty cycle correction factor would then be: 20 log 25.2/100 = 11.97dB

User Manual

Not required