SES
Store Electronic Systems

Electronic Shelf Labels

Installer Manual
Radio installation
37120

COMPLIANCE INFORMATION

Product Description: this product, model 37120, is a transmitter operating in the 36kHz to 40kHz band to provide commercial data (e.g. pricing, serial number etc…) to RFID tags on store shelves.

Changes or modification not expressly approved by Store Electronic Systems SA can void the user's authority to operate the equipment.

This device complies with part 15 of the FCC rules. Operations is subject to the following two conditions :

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation

Note: this equipment has been tested and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The 37120 system is installed by trained professionals.

Antenna is subject to professional installation.

TABLE OF CONTENTS

CONNECTION TO THE TRANSMITTER

2 - REQUIRED TOOLS

Make sure the correct tools are available before starting the installation process.

List of required tools:

- 1 Torx T20 screwdriver
- 1 3 mm flat screwdriver (for slotted screw)
- 1 Phillips-head screwdriver
- 1 4mm wire stripper
- 1 ratchet crimping tool
- 10 yellow, crimp-type pin terminals
- 1 good quality ohmmeter
- 1 oscilloscope
- 1 current probe
- 1 calibration unit
- a dozen or so cable ties

These tools are essential!

Example of multimeter and oscilloscope

CONNECTION TO THE TRANSMITTER

3 - PRELIMINARY CHECKS

The checks to perform on the transmitter are very simple and quick, and this is why they are mandatory.

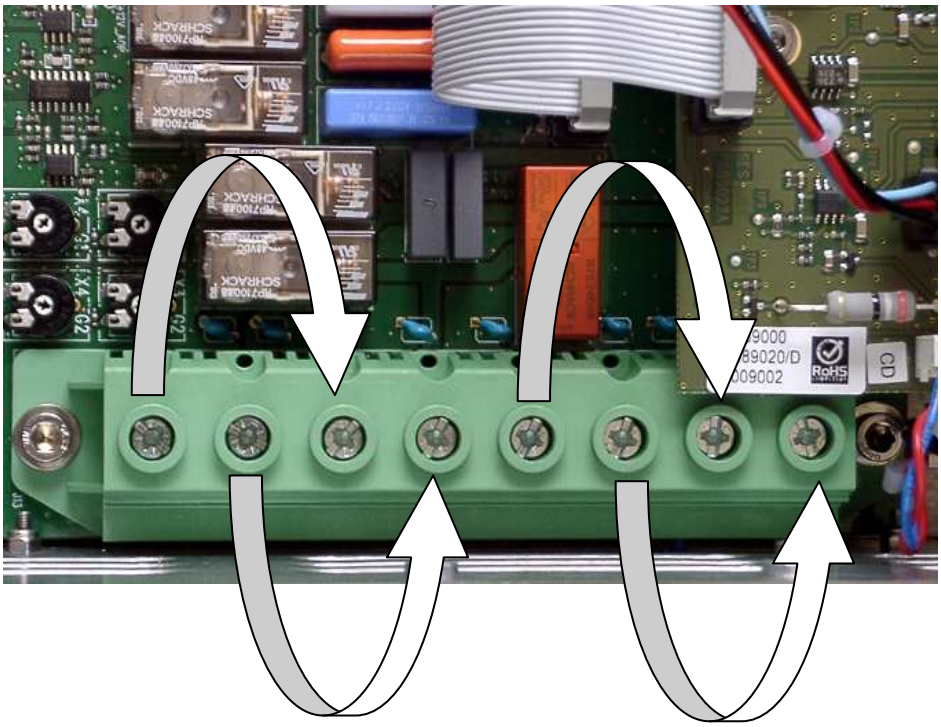
Using the Torx screwdriver, unscrew and remove the 4 screws securing the upper cover.

The **first check** consists of examining all of the transmitter's accessible **connectors**. Simply press them in to ensure that they are correctly connected.

The **second check** consists of ensuring that the internal connection on the terminal strip is performed correctly.

Using the ohmmeter, check the connections between the outputs.

1 & 3 **2 & 4** **5 & 7** and **6 & 8**.



= continuity

Each output on the antenna connector is to be tested individually to ensure that there is no continuity with the unit's ground.

Using the Phillips-head screwdriver, loosen all the terminal screws two complete turns.

The transmitter can now be connected.

Now the antenna cables must be prepared.

CONNECTION TO THE TRANSMITTER

4 - IDENTIFICATION

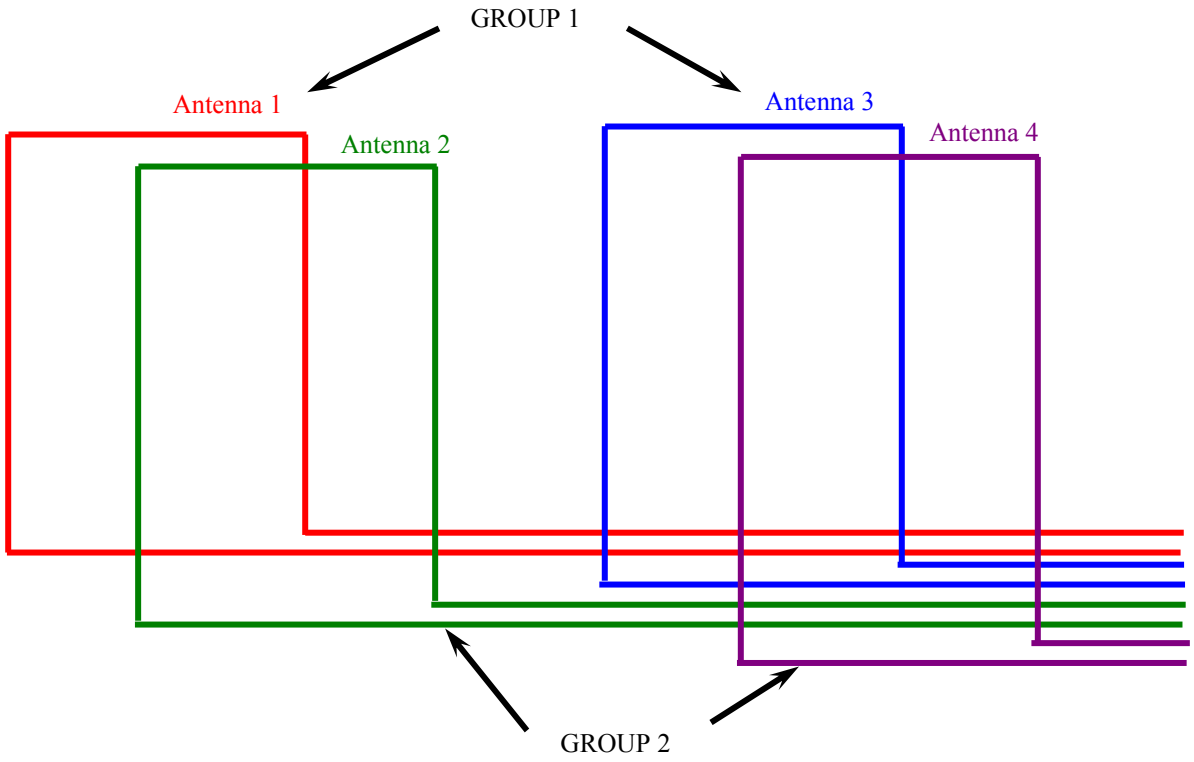
The **toggling principle** requires the use of two antenna groups **G1** and **G2**. This principle is based on that fact that the data will be sent successively **on one group, then on the other**.

This deserves a short explanation.

In fact, accepting that a metal obstacle located in the path between the antenna wire and the labels can disturb the data transmission, it is easily understood that by using a second antenna network, offset from the first, the problem caused by this obstacle can be resolved.

This assumption has been shown to be true and **is used today for optimal operation**.

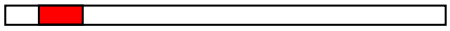
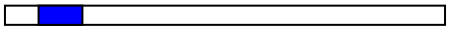
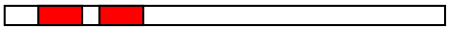
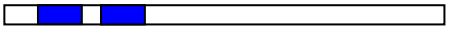
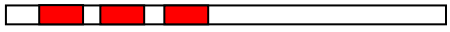
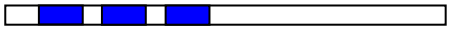
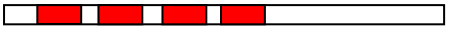
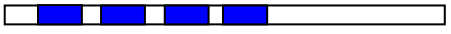
In reference to the diagram below, connecting the antennas in switching mode would appear to be the most simple.



CONNECTION TO THE TRANSMITTER

5 - MARKING

The antenna cables routed to the transmission system must be marked with colored stickers.

Group **1** output (hot point) =  = **TERMINAL 1**
Group **1** return =  = **TERMINAL2**
Group **2** output (hot point) =  = **TERMINAL 5**
Group **2** return =  = **TERMINAL 6**
Group **3** output (hot point) =  = **TERMINAL 3**
Group **3** return =  = **TERMINAL 4**
Group **4** output (hot point) =  = **TERMINAL 7**
Group **4** return =  = **TERMINAL 8**

A simple method is used to avoid errors; just take the antenna wires and connect the pairs in the order 1, 3, 2, 4.

In other words:
- Antenna **1** between **1** and **2**
- Antenna **3** between **3** and **4**
- Antenna **2** between **5** and **6**
- Antenna **4** between **7** and **8**

We recommend the use of colored marker rings according to the **color code** which enables permanent, effective and easy-to-understand marking.

The letter **E** is used to identify the transmitter.

EXAMPLE:

this code thus refers to antenna 4 of the 2nd transmitter.

CONNECTION TO THE TRANSMITTER

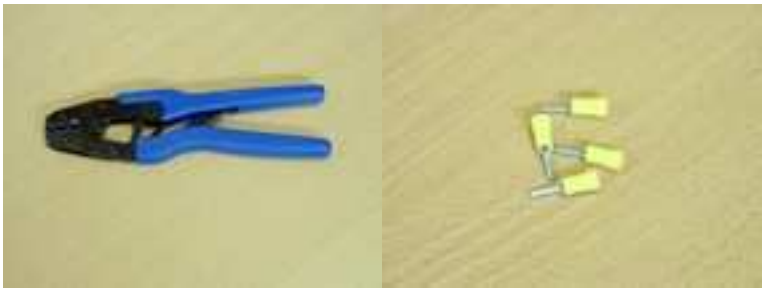
6 - CRIMPING

"**Stripping**" must be performed **carefully**, observing the following points:

- Strip only **8 mm** of sheath;
- Do not **cut or nick** the cable strands;
- Remove the sheath by "unscrewing" the conductor by a **counter-clockwise** rotation (twisting direction of the conductor wires);
- Be very careful when stripping so that the strands **remain in the twisted position**, otherwise it may be difficult to fit the terminal.

Place the marker rings on the cable, put the terminal completely in and crimp with the ratchet pliers, which are **the only tools guaranteeing correct crimping** as the pliers release their grip only once they have been totally closed.

We stress this point as we have often seen transmission problems caused by poor crimping.

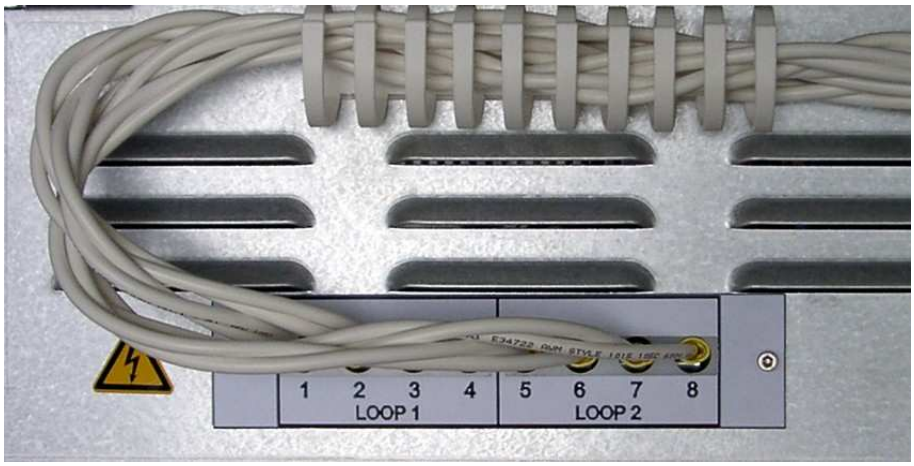


Ratchet crimping tool Terminals

Remember that **the cables must be twisted** two by two to avoid radiation that could disturb equipment located close to the strand.

Once crimped, each cable will be connected to the terminal block. Use the Phillips-head screwdriver to ensure **firm tightening**!

The cables will be curved so that the wire guide can route them.



Now the transmission system is ready for the last phase, **calibration**.

CALIBRATION

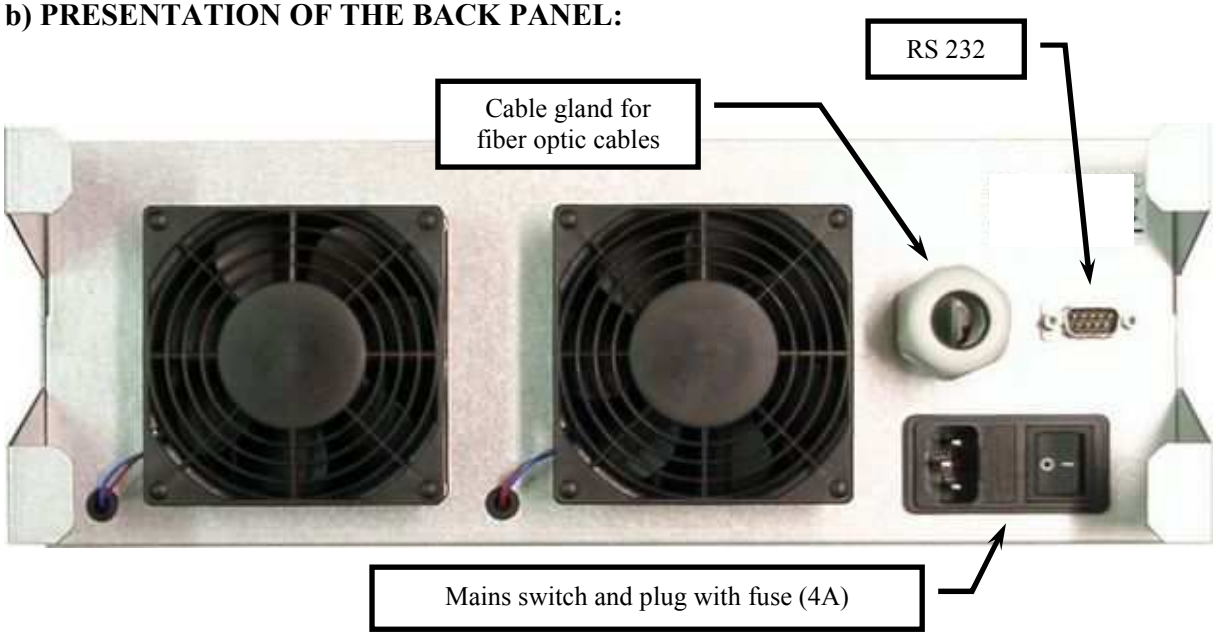
1 - TRANSMITTER

a) PRESENTATION OF THE FRONT PANEL:

The front panel of the transmitter features:

1) A "**Loop status**" zone, with:
   - Two green LEDs indicating the active group, "**Loop 1**" and "**Loop 2**";
   - Two rows of three red fault indicating LEDS "**High**", "**Leak**" and "**Low**";
   - An acknowledge button "**Ack**".
2) A "**Control**" zone, with:
   - A three-position switch: "**I**", "**φ**" and "**U**";
   - Two orange LEDs "**φC** " and "**φL** ", indicating the phase;
   - A green "**OK**" LED indicating the transmitter's functional system;
3) A "**Status**" zone with two "**State**" and "**CPU**" LEDs;
4) A "**Tuning**" zone with eleven orange tuning LEDS;

b) PRESENTATION OF THE BACK PANEL:



CALIBRATION

2 - GENERAL

Before going into the detail of this operation, it is necessary to understand its purpose.

Most electronic signal amplifiers operate with a fixed or relatively constant load.

A Hi-fi amplifier delivers its signal on an 8Ω load: the loud speaker. This load is identical, regardless of the loud speakers' brand or power rating.

On the other hand, as a CB transmitter operates with antennas, which may be different, adjustments must be made so that the assembly operates correctly.

The same is true for our transmission system.
This adjustment is called **calibration**.

Calibration is essential, as our transmitters operate in stores with different surface areas and with unequal antennas.
Furthermore, all the metal objects close to our antennas, which are very long and are found throughout the store, have a very high capacitive and inductive influence on the antenna values.

It is therefore necessary to adjust the amplifier to adapt to these differences.

If you power on the transmitter and send a data transmission order, you will not obtain an output current.

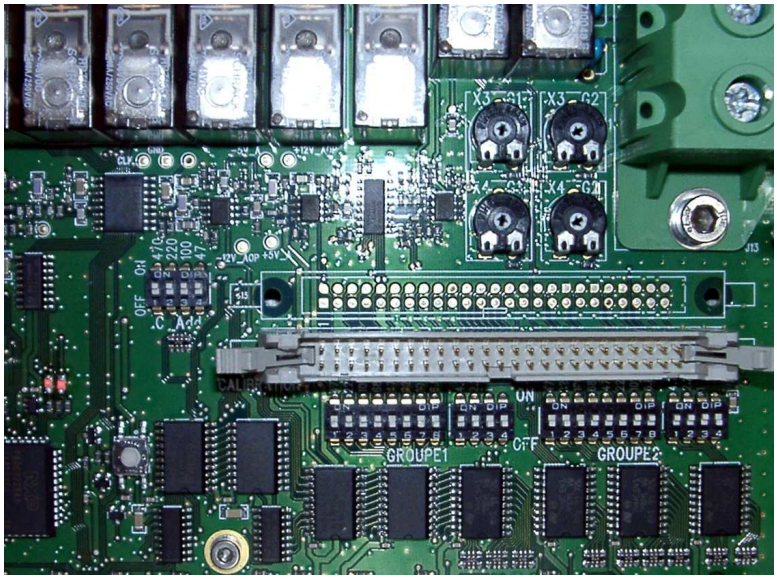
This underscores the importance of this operation.

Transmission quality depends on it!

Calibration is carried out by adding capacitors in the tuning circuit. This operation is performed using a calibration unit, the purpose of which is to select and validate the capacitor values corresponding to correct operation.

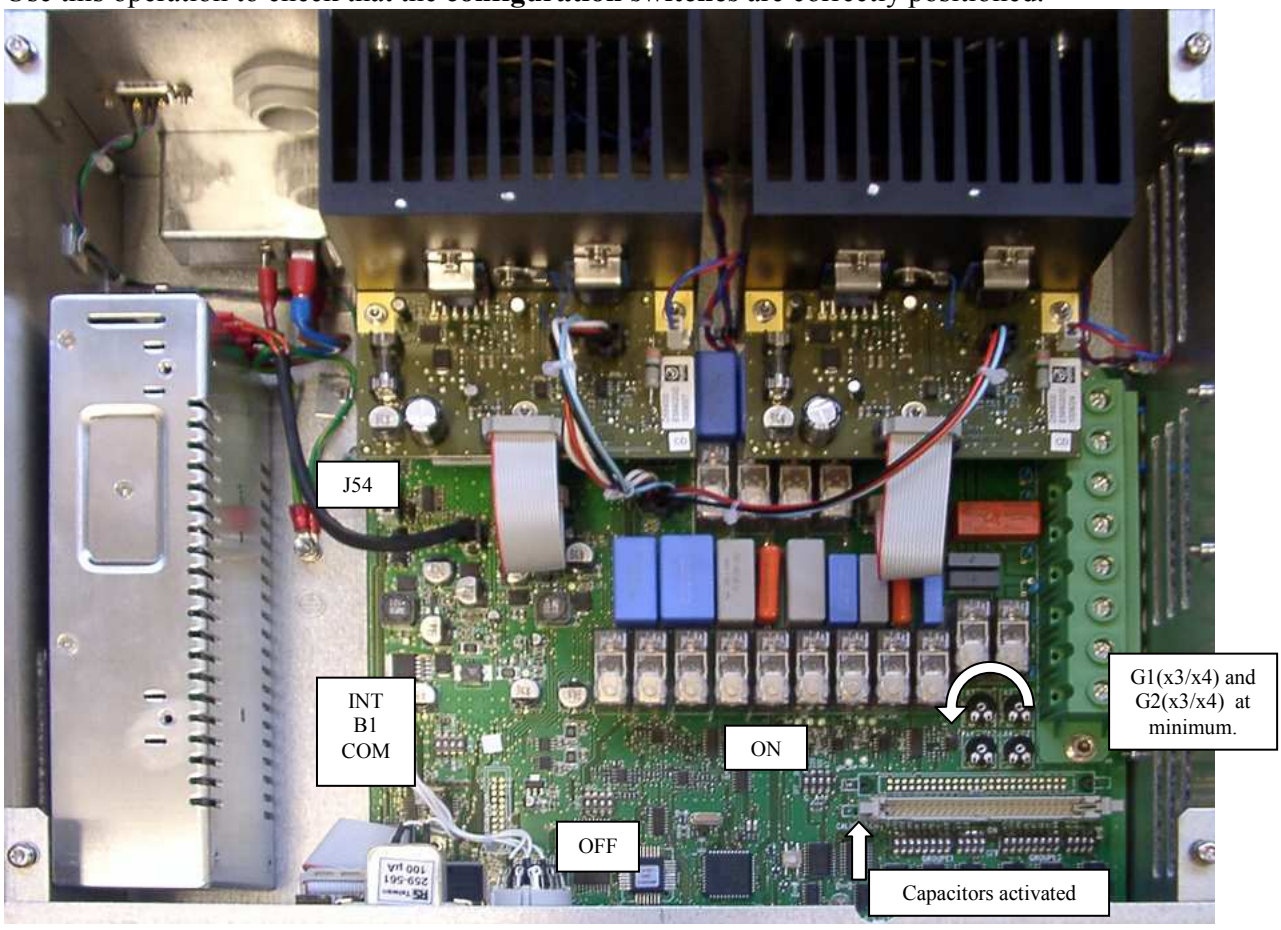
CALIBRATION

3 - FOREWORD



Connect the **calibration unit** to the transmitter (fool-proof connector).

Use this operation to check that the **configuration switches** are correctly positioned.



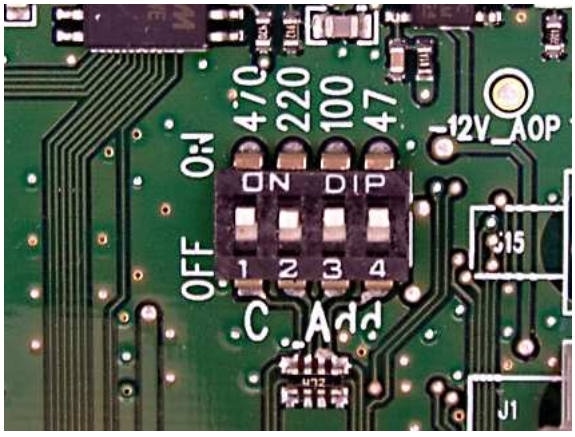
CALIBRATION

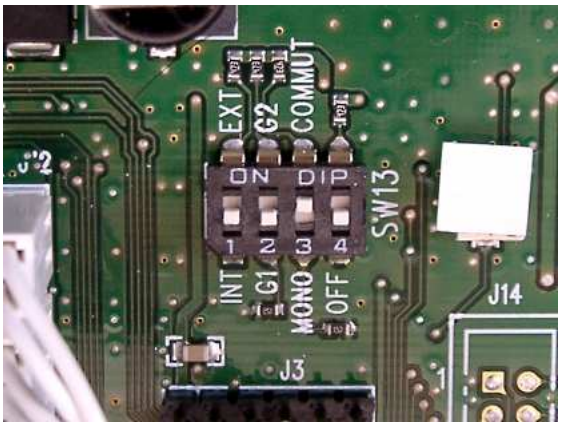
3 - FOREWORD

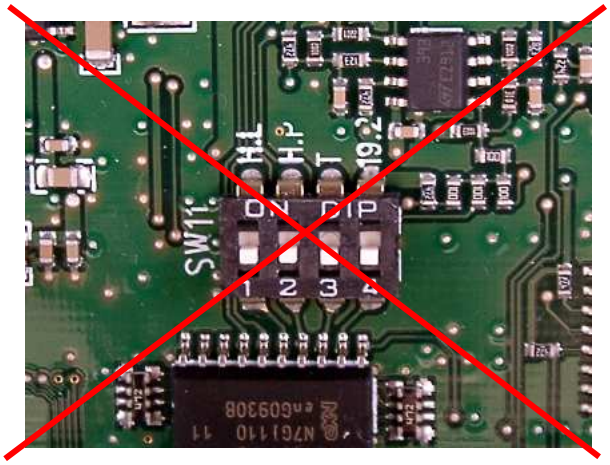
Please note that certain elements accessible inside the transmitter are supplied with potentially hazardous voltages.

We recommend that extreme care be observed to prevent an accident from occurring. Use plastic tools

Before you do anything, make sure that the switches of the additional capacitors are **in ON position** and that the configuration switches are in **INT/G1/COMMUT/OFF position.**



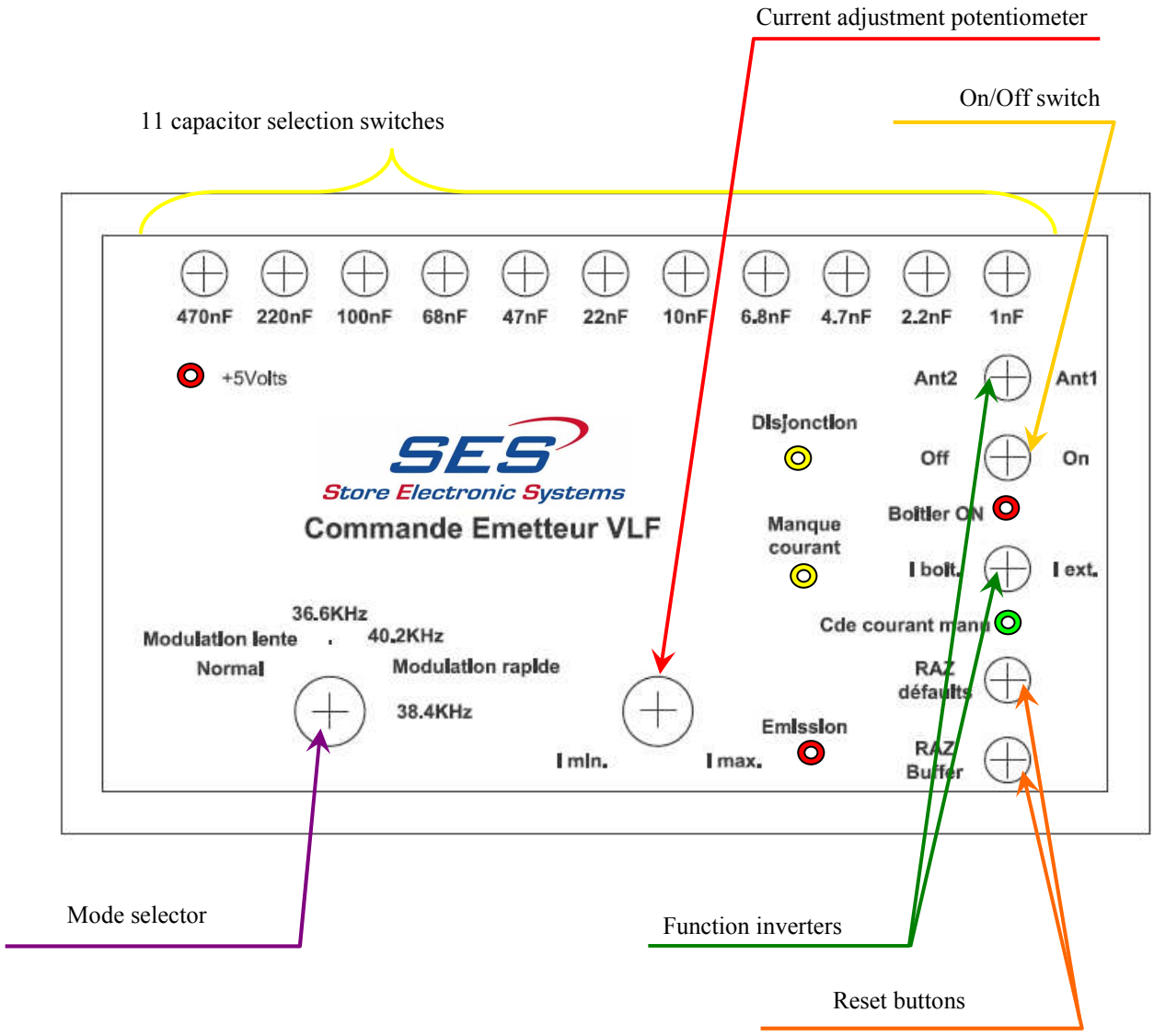




Factory setting,
switches **in OFF position**.

CALIBRATION

4 - CALIBRATION UNIT



LEDs:

- +5 Volts supplied, Transmission, Unit ON
- Manual current control
- Disconnection, No current

CALIBRATION

5 - PROCEDURE

After getting to know the calibration unit, let's start!

a) Power-on

Make sure you have a **measurement sheet** (attached at the end of the chapter).
Connect the calibration unit to the transmitter and set it to the initial configuration:

1) On/Off set to **Off**;
2) Ant 1 / Ant 2 selector on **Ant 1**;
3) I boît / I ext selector on **I Boît.**;
4) Current potentiometer on **I min**;
5) Mode selector on **38.4;**
6) All the capacitor switches set to **ON** (up);
7) Turn transmitter power **ON**(rear panel);
8) Press the "**Raz Buffer**" (Buffer reset) pushbutton.

b) Determination of additional capacitors

On the transmitter's front panel, in the "**Control**" zone, set the selector to **φ**.
Set the calibration unit's **On/Off switch** to **On**.
Press **RAZ Buffer** to initialize the transmitter with the calibration unit.
The transmission system is now operating.

The calibration procedure will be performed by the calibration unit and can be monitored on the Vu-meter and by whether or not the "**Control**" zone LEDs are illuminated.

Slowly increase the current until the indicator on the Vu-meter stabilizes in a position slightly to the right.

Only the **φC LED** must be illuminated.

Starting with the largest value **470 nF**, devalidate the capacitors one after the other.

For each value, if the **φL** LED is illuminated, check the last capacitor adjusted.
When the lowest value capacitor has been tested, record the values in the table on the measurement sheet.
Perform the same assessment for **group 2**.

Add the validated capacitors for each group.
Take the highest value of both groups and multiply it by **2** if it is less than **160** or by **3** if it is greater.
Attempt to reach this value as close as possible using four additional capacitors (**470 nF**, **220 nF**, **100 nF** and **47 nF**).
Configure your choice on the "dip switches" in the transmitter by devalidating the values not chosen.

The additional capacitor determination procedure is finished.

Note:

- The LEDs **φC** and **φL** are reversed when the Vu-meter changes directions.
- If the two LEDs **φC** and **φL** are illuminated at the same time, this means that the adjustment is nearly optimal. Do not try to seek this situation.

Warning, this could be made by "disconnection".

- Always make sure that the transmitter's "**High**" LED remains off. If this LED comes on, this means the current is too strong. In extreme situations, this may indicate a disconnection. A "**disconnection**" LED indicates calibration unit status. In this case, reduce the current slightly.
- In the same manner, ensure that the "**Low**" LED remains off. A "**Manque courant**" (Low current) LED on the calibration unit indicates that the current is too low. In this case, increase the current slightly.
- To turn off the "**High**" / "**Low**" indicator LEDs, press the "**Ack**" or "**Raz défauts**" (Fault reset) pushbutton on the calibration unit.

c) Definitive tuning adjustment

The previous operations were designed to **evaluate the value of the additional capacitors** common to both antenna groups. This operation must now be repeated, knowing that this adjustment will take into consideration the additional capacitors that were retained.
To do this:

- Set all capacitor switches upward;
- Select group "**Ant 1**";
- Repeat the deselection operation as in the previous step.

The new combination will approximately tune the transmitter on the center frequency. However, the values that you are going to select do not permit with certainty that the output current will be equivalent for the frequency modulated.

To reach this goal, it is necessary to **balance the currents**, as follows:

- Set the selector on **I** on the transmitter;
- On the control unit:
  1) Leave the capacitor switches in their current position;
  2) Mode selector on **36.6**;
  3) Using the potentiometer, bring the Vu-meter needle to **4**;
  4) Set the selector to **40.2** and observe the movement on the Vu-meter.

CAUTION: throughout the adjustment procedure, in the **36.6** position, the **φL LED** must be lit and in the **40.2** position, the **φC** LED must be lit. **Otherwise**, repeat the capacitor selection as the operation was not correct.

Now, find the larger of the two values. This is done by switching between the two frequencies several times. You thus have an idea of the current imbalance between the two frequencies.

CALIBRATION

5 - PROCEDURE

Select the highest frequency and adjust the current to **7** using the potentiometer.

Check the value for the other frequency.

Using the capacitor switches, starting with the smallest value, move the needle on the average current reading for each frequency.
If the variation is not large enough, move on to the next capacitor switch.

It is important to switch the two frequencies for each operation on the capacitor switches in order to observe the resulting effect. This operation is thus carried out with one hand on the mode selector and the other on the capacitor switches.

At any moment, it may occur that the strongest current becomes the weakest (and vice versa). This is because the correct value has been exceeded. This is where the capacitor combinations come into play.

For example: you have just checked the 220 nF switch and you notice that the value is too high, by de-validating the 220 and validating the 100, the 68 and the 47, you will obtain 215. If this value is still too high, de-validate the 47, validate the 22 and the 10, you will then obtain 200 nF and so on.

- Refine this adjustment until the difference between the two frequencies is less than one graduation,
- Then set the mode selector on the slow switch and observe the movement of the needle. This must be very slight.

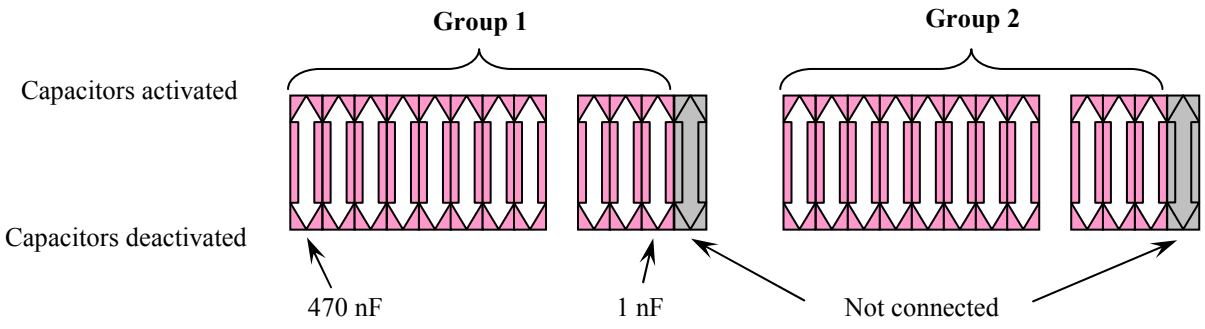
To ensure optimum adjustment, change the switch positions to the smallest combinations possible. If the indicator does not move, you can be sure of the best adjustment.

You must see alternating movement between the two **φC** and **φL** LEDs.

If this does not occur, repeat the current balancing procedure from the beginning.

The values that you obtain must be recorded on the **measurement sheet** as well as those of the group 1 "dip switches" of the transmitter.

Repeat the operation for **group 2**.



d) Current adjustment

Now that the second stage is completed and the current is balanced on both frequencies, the output level in the antennas remains to be set.

This point deserves **special attention**. In fact, the current adjustment that you're going to make depends solely on you! Set up the oscilloscope and the current probe.

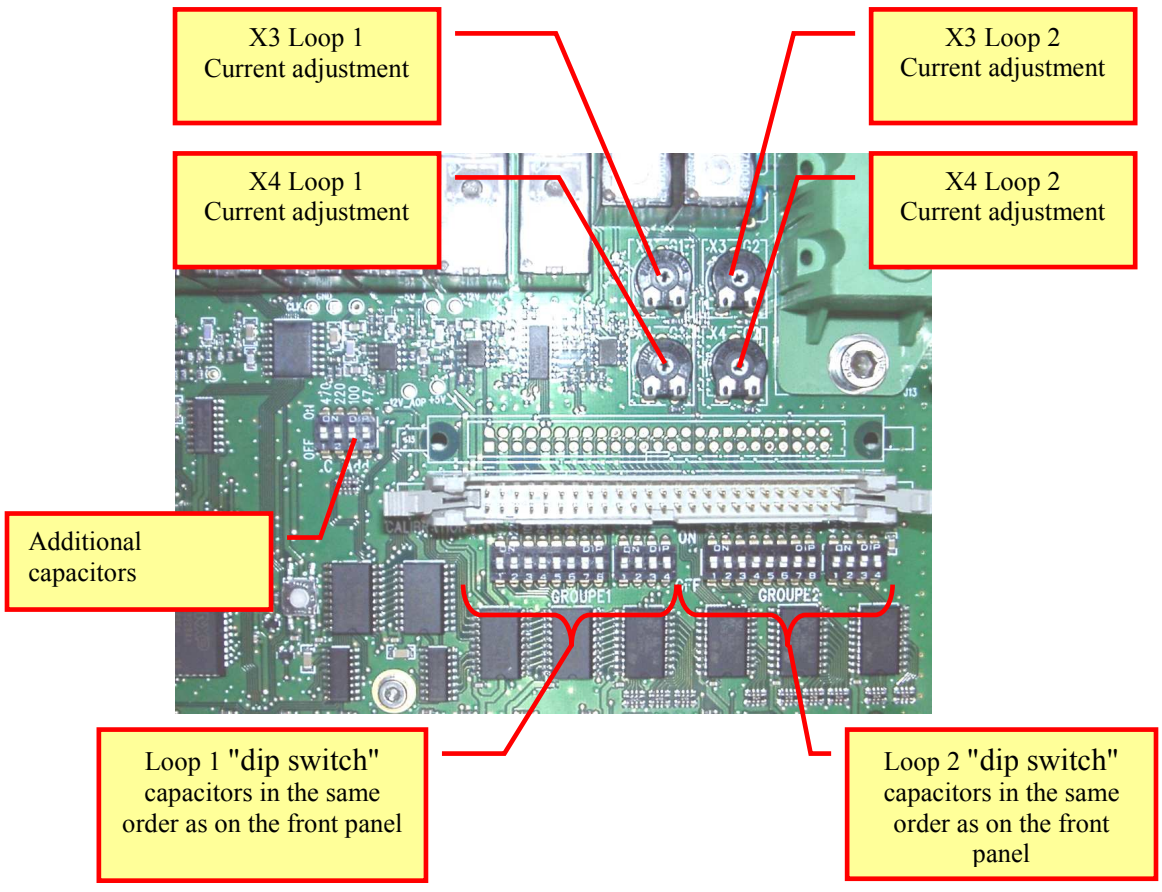
Our system must comply with current standards. The standards specify a **maximum permissible electromagnetic field** that is reached when a current of 2 Amperes, peak-to-peak, circulates in our antenna.
The adjustment will therefore be carried out so that the 2 Amperes Peak-to-Peak (0.7 A rms) is not exceeded.

The correct adjustment procedure is as follows:

1) Turn off the transmitter;
2) Disconnect the calibration unit;
3) Turn on the transmitter.

This step cannot be performed without the appropriate JEEGY management system.

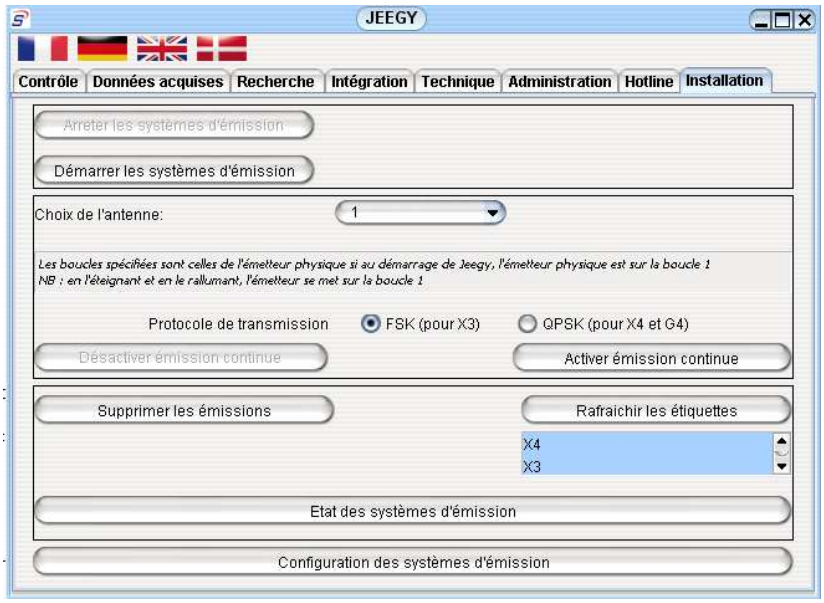
Adjustment points

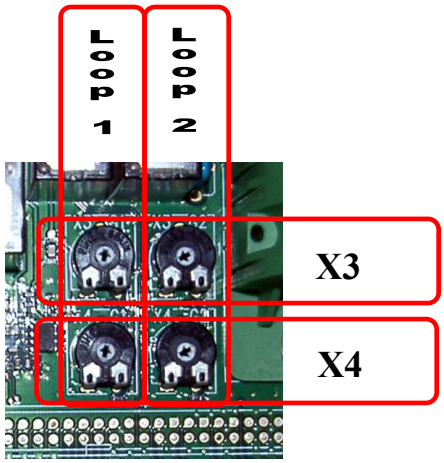


CALIBRATION

5 - PROCEDURE

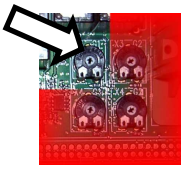
Current adjustment for each "Loop" and each protocol:



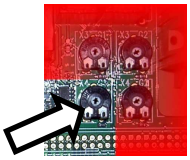


In the next phase, the measurement is systematically performed on both antennas of each group (LOOP) and the current will be adjusted on the antenna with the highest value.

- Go to the "Installation" tab;
- Stop the transmission system;
- Select Loop 1 in JEEGY;

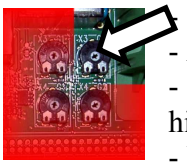


- Select the FSK transmission protocol;
- Activate continuous transmission;
- set the X3 Loop 1 potentiometer to obtain 2 Amp p-p on the antenna with the highest value.
- Deactivate continuous transmission;

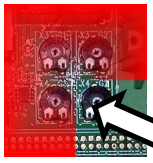


- Select the QPSk transmission protocol;
- Activate continuous transmission;
- set the X4 Loop 1 potentiometer to obtain 2 Amp p-p on the antenna with the highest value.
- Deactivate continuous transmission;

Repeat the same procedure for the second Loop.
- Select Loop 2 in JEEGY;



- Select the FSK transmission protocol;
- Activate continuous transmission;
- set the X3 Loop 2 potentiometer to obtain 2 Amp p-p on the antenna with the highest value.
- Deactivate continuous transmission;



- Select the QPSk transmission protocol;
- Activate continuous transmission;
- set the X4 Loop 2 potentiometer to obtain 2 Amp p-p on the antenna with the highest value.

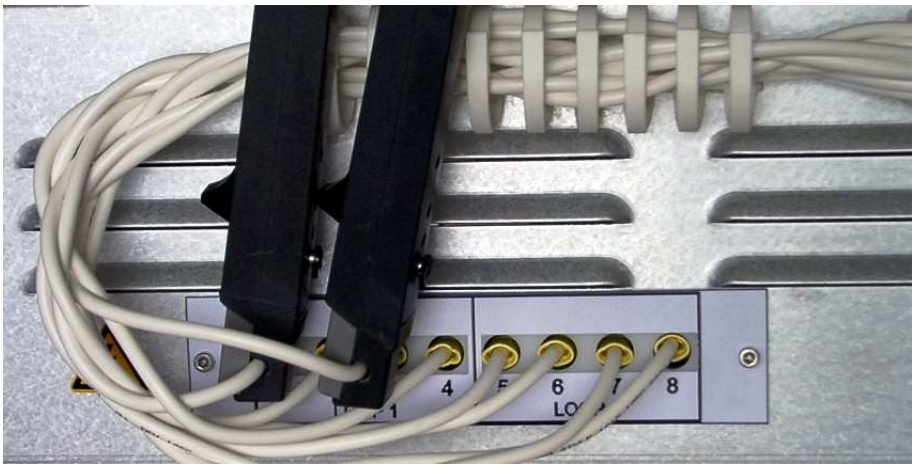
- Deactivate continuous transmission;

CALIBRATION

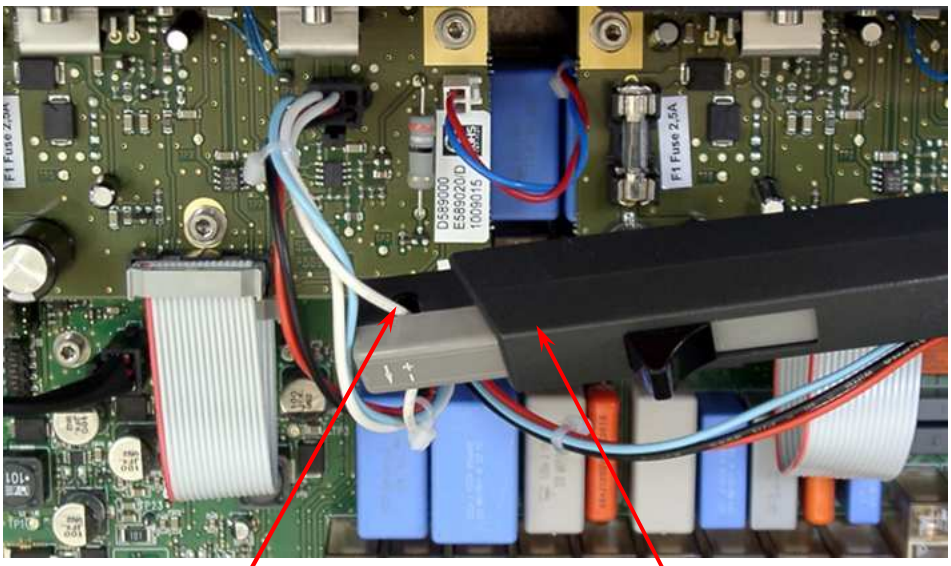
5 - PROCEDURE

CURRENT MEASUREMENT ON THE TWO ANTENNAS OF THE FIRST GROUP

Measurement of the output current for **2A peak-to-peak** maximum



MEASUREMENT OF TRANSMITTER GLOBAL OUTPUT CURRENT



Record the current values in the table.

CALIBRATION

5 - PROCEDURE

e) Final checks

The transmitter is ready to operate. However, a one final verification is performed.

Several RS232 tests are conducted using the JEEGY
On the buffer and on each transmitter, as required.

The transmitter is ready!

It is strongly recommended to keep an eye on the scope during this last step to ensure that the current is correctly adjusted and that its shape is correct.

CALIBRATION

6 - MEASUREMENT SHEET

Store name: .....

Department: ..... Telephone: ..... Fax: .....

Transmitter type: ..... Transmitter serial No.: ..... Transmitter qty: .....

Operator / Installer: .....

Antenna value, Ohms: Antenna 1: ..... Ω Antenna 3: ..... Ω
Antenna 2: ..... Ω Antenna 4: ..... Ω

Coarse capacitor tuning value:

	470	220	100	68	47	22	10	6.8	4.7	2.2	1
G1											
G2											

Sum calculation for each group: Gr1: ..... nF Gr2: ..... nF

If the highest value is below **160 nF**, it is multiplied by 2, otherwise by 3. This is the value of the additional capacitors.

Additional capacitor	470	220	100	47

Definitive capacitor tuning values:

	470	220	100	68	47	22	10	6.8	4.7	2.2	1
G1											
G2											

Loop current value (peak-to-peak value read on the oscilloscope, **2A peak-to-peak max.**):

X3: Antenna 1 : ..... A p-p Antenna 2 : ..... A p-p
Antenna 3 : ..... A p-p Antenna 4 : ..... A p-p
Loop 1 (sum) : ..... A p-p Loop 2 (sum) : ..... A p-p

X4: Antenna 1 : ..... A p-p Antenna 2 : ..... A p-p
Antenna 3 : ..... A p-p Antenna 4 : ..... A p-p
Loop 1 (sum) : ..... A p-p Loop 2 (sum) : ..... A p-p

Comments:
.....

.....

Note: Marking the antenna wires with numbered rings is mandatory and must be carried out for all transmitters.

RECORD OF CHANGES

Documents	Revision index	Date of modification	Author(s)
Initial document			**CAUMONT**
Entire document	**Preliminary documentation**	**03/05/2010**	**CAUMONT / LEGRAS / SCHLOSSER**
JEEGY screen revision			
Multi-transmitter revision			