Electronic Shelf Tagging

Installation Manual
Radio System Installation

TRANSMITTER 36120 X4

CONNECTING TO THE TRANSMITTER

2 - LIST OF TOOLS REQUIRED

Before making any connections, the right equipment is required.

List of equipment required:

- A Torx T20 screw driver
- A parallel pattern (split) screwdriver, size 1.5 mm
- A parallel pattern (split) screwdriver, size 3 mm
- A parallel pattern (split) screwdriver, size 6 mm
- A wire stripper for 4-mm diameter wire
- A pair of ratchet-operated insulated-connector crimping pliers
- Ten open-end crimp on connectors
- A good quality tester or ohmmeter
- An oscilloscope
- An ammeter probe
- A calibration unit
- 5/10 nylon clips

The listed equipment is essential!

Example of a tester and an oscilloscope

CONNECTING TO THE TRANSMITTER

3 - PRELIMINARY CHECKS

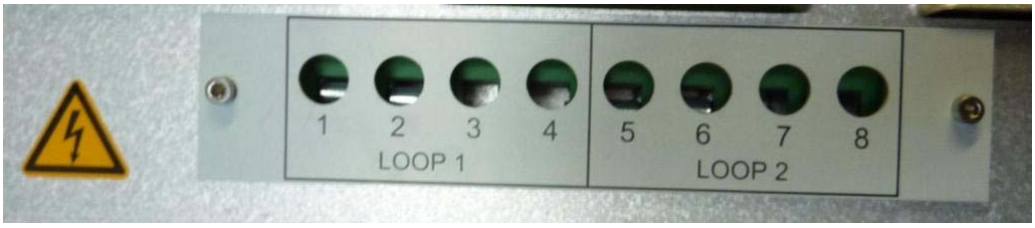
The checks to be performed on the transmitter are very simple and fast, and this is why they must be performed.

Using the Torx screwdriver, slacken and remove the four screws that close the top cover.

The **first check** comprises inspecting all of the **connectors** that are accessible on the main printed circuit board. You can ensure that they are connected correctly by simply pressing on them.

The **second check** comprises ensuring that the internal connection to the **connection terminal block** has been made correctly.

Right side of the transmitter



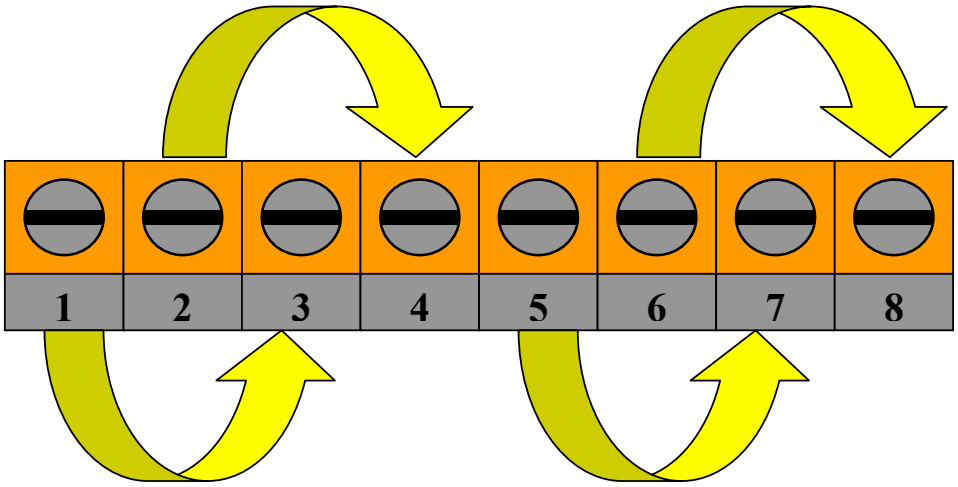
Connection terminal block

CONNECTING TO THE TRANSMITTER

3 - PRELIMINARY CHECKS

Using the ohmmeter, check for shorting between outputs.

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



= continuity

Then test each output individually to ensure that there is no continuity in relation to the device ground.

Using the 6-mm screwdriver, slacken all of the connectors by two full turns.

The transmitter is ready to be connected.

Now it is time to prepare the antenna cables.

CONNECTING TO THE TRANSMITTER

4 - IDENTIFYING

As described previously (refer to antenna installation), the **commutation principle** applied requires the use of two antenna groups G1 and G2.

Each group comprises **two antenna loops** which together ensure coverage of the entire sales floor surface.

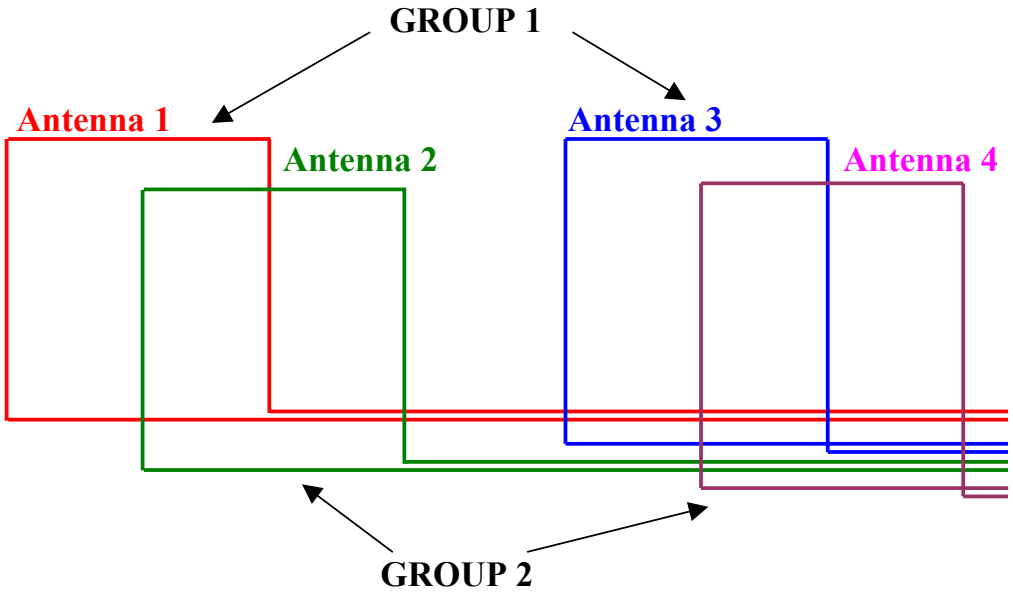
The commutation principle is based on the fact that data will be sent successively **to one group then to another**.

This requires a short explanation.

This is because if an obstacle, especially a metal one, located along the path between the antenna cable and the tag may affect data transmission, it is just as easy to understand that using a second antenna network, offset in relation to the first one, it becomes possible to overcome the problem caused by this obstacle.

This assumption has been proven true and **now ensures optimum operation**.

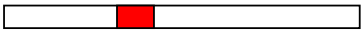
Referring to the diagram below, connecting the antennas in commuted mode will appear simpler.

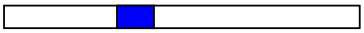


The antenna cables run to the transmission system have been identified by rings as described next using coloured tape (refer to antenna installation) and the definitive connections will be made to the terminal block as shown in the next diagram.

CONNECTING TO THE TRANSMITTER

5 - MARKING

Out to antenna **1** (hot point) =  = **TERMINAL 1**

Back from antenna **1** =  = **TERMINAL 2**

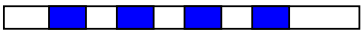
Out to antenna **2** (hot point) =  = **TERMINAL 5**

Back from antenna **2** =  = **TERMINAL 6**

Out to antenna **3** (hot point) =  = **TERMINAL 3**

Back from antenna **3** =  = **TERMINAL 4**

Out to antenna **4** (hot point) =  = **TERMINAL 7**

Back from antenna **4** =  = **TERMINAL 8**

Applying a simple method will avoid errors: simply take the antenna cables and connect the pairs in the following order: **1**, **3**, **2**, **4**.

This means:

- 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 using coloured rings using the following **colour code** to permanently mark the cables in an effective and easy to understand manner.

The letter T could be used to identify the transmitter.

EXAMPLE:

Meaning that this is the transmitter 2 output to antenna 4

CONNECTING TO THE TRANSMITTER

6 - CRIMPING

Always perform "**stripping" with care**, taking care to comply with the following points:

- Only strip away **8 mm** of insulation
- **Do not cut into** the cable strands
- Work delicately when stripping so that the strands **remain in their twisted pair position**, if not, it becomes hard to position the connector.

Position the marker rings on the cable, push the connector all the way onto the cable and crimp it using a pair of ratchet equipped crimping pliers, **the only tool that guarantees correct crimping** as the pliers will only open again after they have first been completely closed.

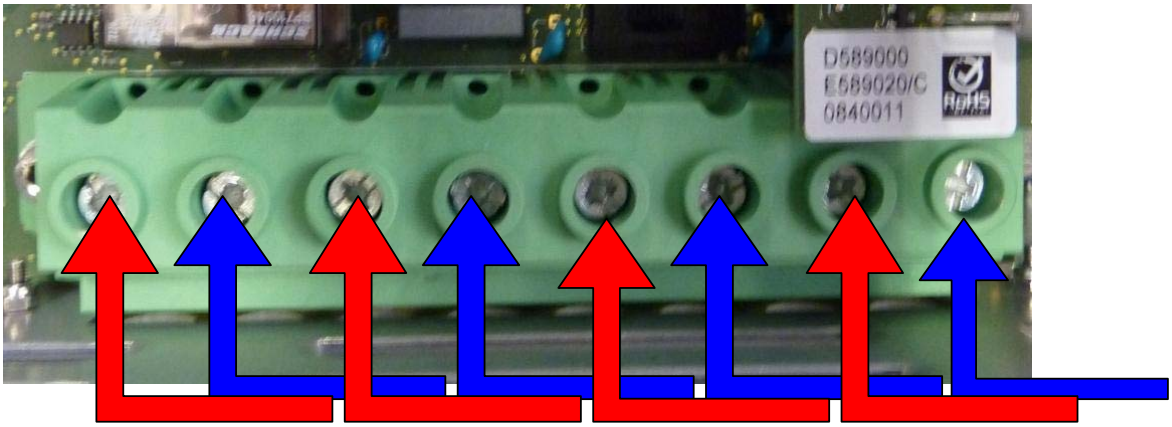
This point must be stressed for transmission problems caused by bad crimping are often observed.

Ratchet-operated crimping pliers

Never forget that **the cables must be in twisted pairs** to cancel out any radiated noise that could interfere with devices located close to the coil.

Once crimping is completed, each cable must be connected to the terminal block. Use the 6-mm screwdriver for **tightening down hard**!

The cables will have a 90° bend in them so that they can run through the cable guide.



Now the transmission system is ready for the last phase: calibration.

CALIBRATION

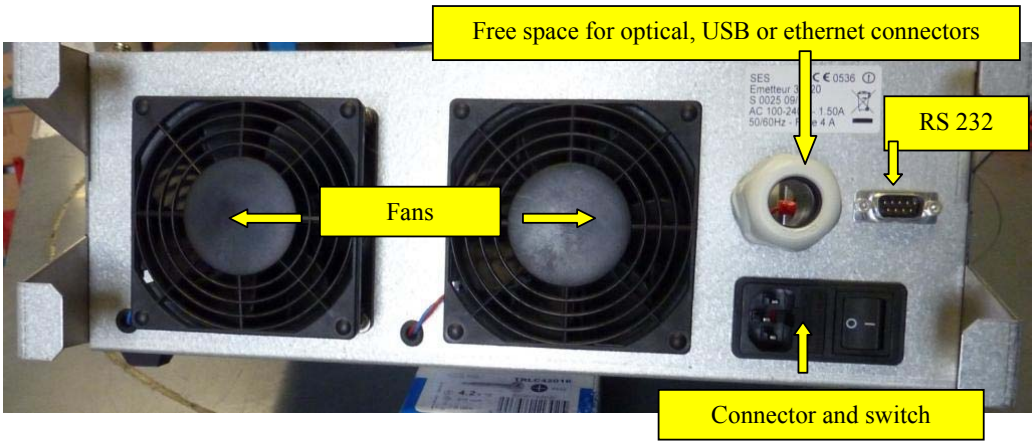
1 - TRANSMITTER

a) FRONT PANEL PRESENTATION:

The transmitter front panel comprises:

1) A three-position switch in the "Control" section: "I", "φ" and "U" positions.
2) Three green LEDs marked "φ C" , "φ L" and "OK" indicating the phase, in the "Phase" section.
3) Eleven yellow LEDs displaying the tuning level in the "Tuning" section.
4) Two green LEDs indicating: "Emit", "CPU", in the "Status" section.
5) Two green LEDs indicating the group: "Loop 1", "Loop 2".
6) Six red LEDs indicating "High","Low" and "Leak" fault conditions in the "Loop Status" section.
7) An "Ack" push button in the "Loop status" section.

b) BACK PANEL PRESENTATION



CALIBRATION

2 - GENERAL

Before going into the details of this operation, its role must be understood.

Most electronic devices whose role is to amplify a signal, in most cases work with a fixed load or at least one that is relatively constant.

A hi-fi amplifier produces its signal using an 8-Ohm load represented by the speaker. This load is an identical one regardless of the make and power level of the speakers.

On the other hand, a CB transmitter works with antennas which may be different, and an adjustment will be required for the complete system to work correctly.

In our transmission system, the same applies and **this action is called calibration**.

Its importance is significant as our transmitters operate in stores with different sale areas and therefore unequal antennas settings.
Furthermore, all of the metal masses are located close to our antennas which are very long and spread throughout the entire store, have a very significant inductive and capacitive influence on the antenna values.

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

If the transmitter is powered up and a data transmission order sent, no output current will be obtained.

This is the proof of the importance of this operation.

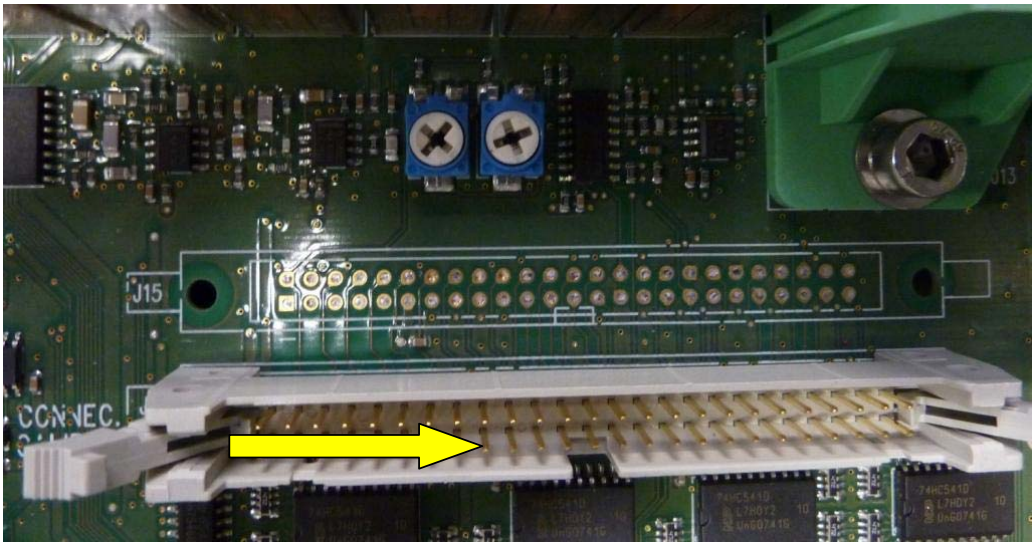
Transmission quality is dependent on this step!

Calibration is performed by adding capacitance into the tuning circuit. This operation is performed using a calibration unit, the purpose of which is to select and validate the capacitance values that correspond to correct operation.

Internal view of the transmitter

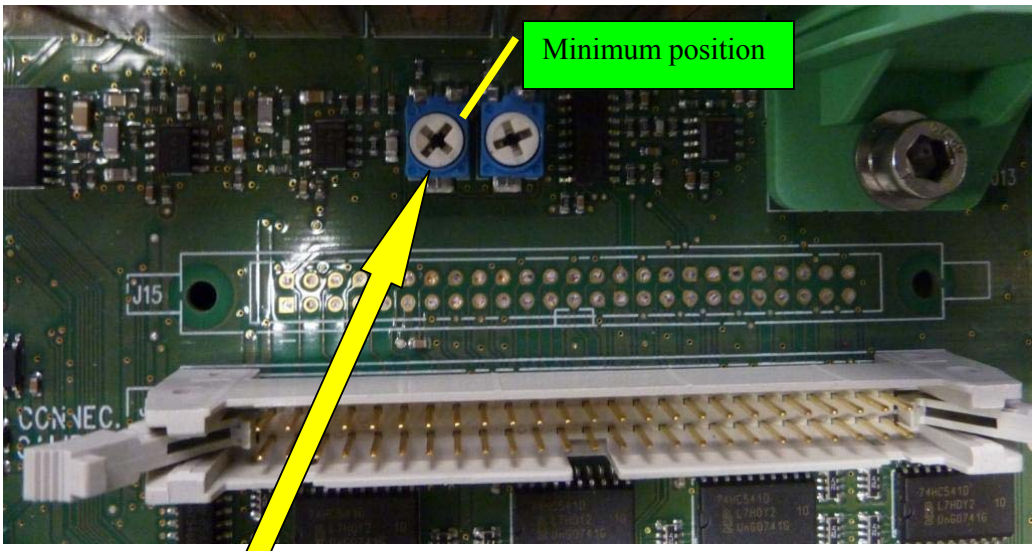
CALIBRATION

3 - PRELIMINARIES



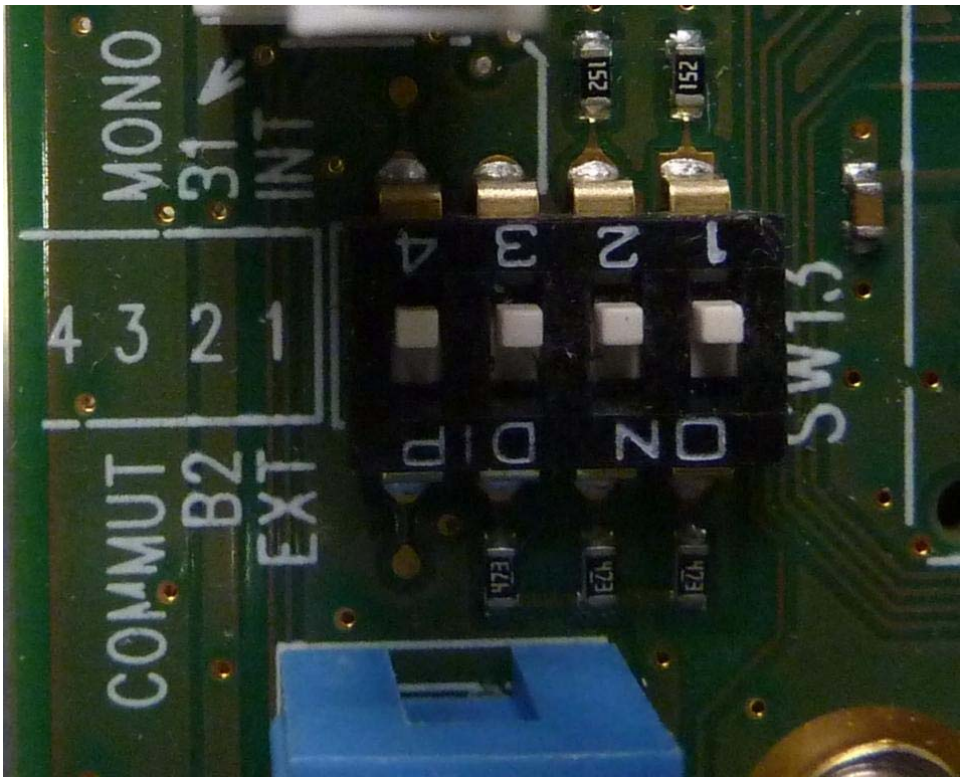
Connect the calibration unit to the transmitter (foolproof connector).

Advantage is taken of this operation to check whether the configuration switches are correctly set.



GR1 and GR2 to adjust the current at 2 Amps peak to peak

Detail of SW13



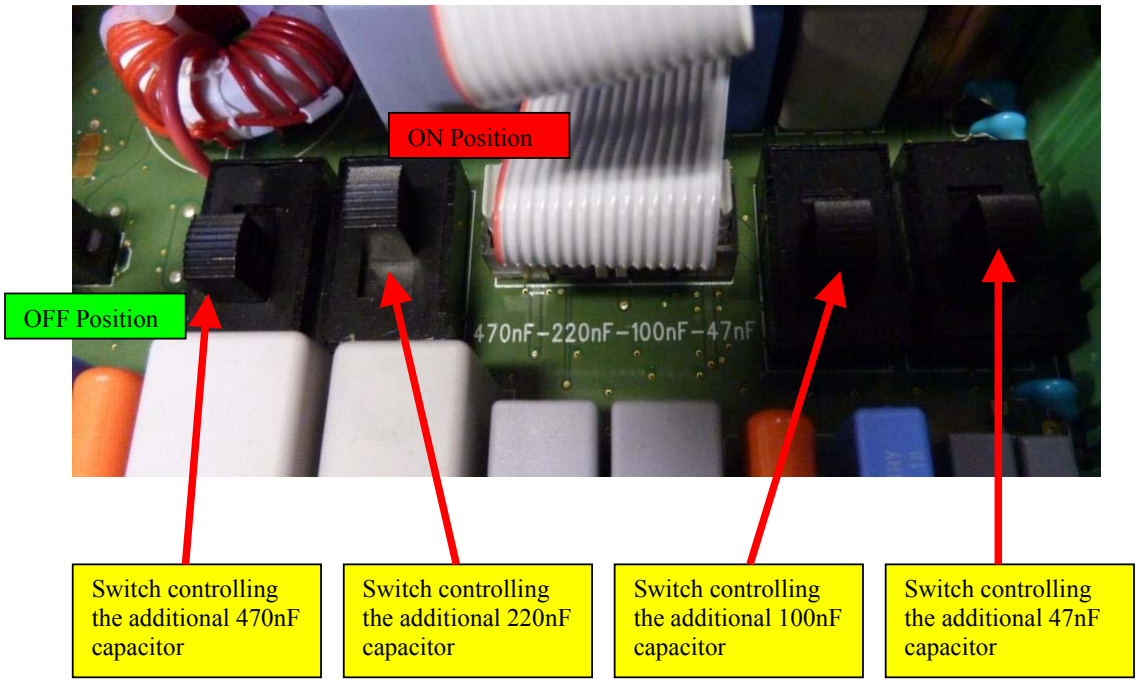
Standard use is 001X.

That means that the SW1 is OFF for INT modulation when the transmitter works alone . In case of 2 or more transmitters the SW1 have to be on Ext position to synchronize the transmitters with an external buffer.
The SW2 have to be on B1 in the standard configuration. This choice can be changed in cased of some troubles on the group 1 for example! This switch can force the use on group2 (B2)
The SW3 have to be on COMMUT position in the standard configuration. In case of trouble with one antenna or one group, the transmitter can transmit only on the group still usable.

CALIBRATION

3 - PRELIMINARIES

First of all, ensure that the additional capacitor switches are indeed in the up position.



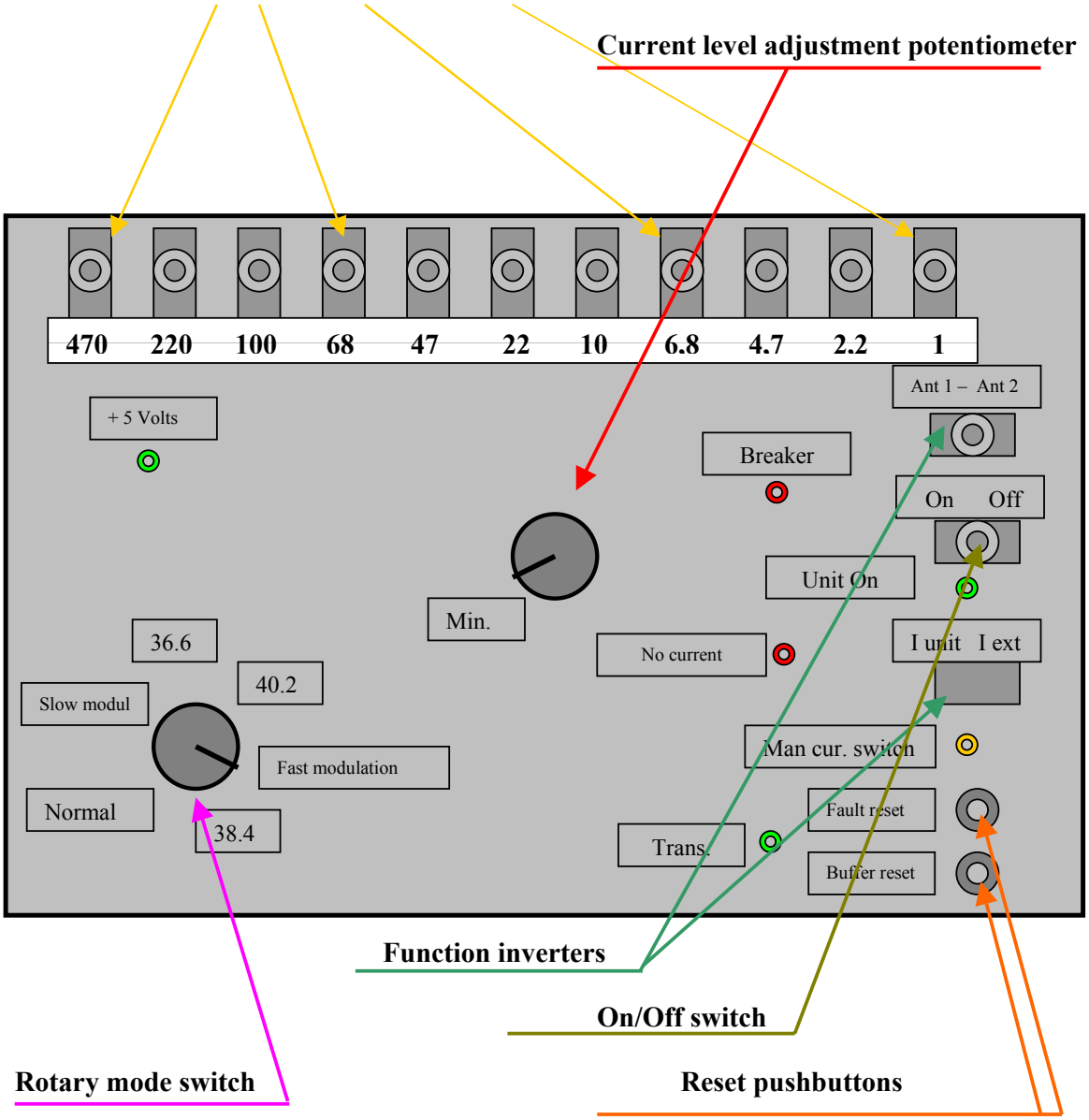
Warning: Some of the parts that are accessible within the transmitter are powered by potentially dangerous voltage level supplies.

We recommend always taking the utmost care to avoid unfortunate accidents.

CALIBRATION

4 - CALIBRATION UNIT

The eleven capacitor selection switches



LEDs: **+ 5 Volts presence, Transmission, Unit On**

Manual current command

Circuit breaker, no current

CALIBRATION

5 - PROCEDURE

After becoming familiar with the calibration unit, now is the time to start work!

a) Powering up

Use the **measurement sheet** (provided at the end of this chapter).

Call up the start configuration.

To do this, set:

1) The On/Off switch to **Off**,
2) The Antenna 1/Antenna 2 switch to **Antenna 1,**
3) The I unit/I ext switch to **I unit**,
4) The current level potentiometer to **I minimum**,
5) The Modes rotary switch to **38.4 kHz**,
6) All of the capacitor switches to **On** (out),
7) The **transmitter to power on** (back panel),
8) The "Buffer reset" switch to reset.

b) Determining the additional capacitor values required

From the transmitter front panel, in the Control section, set the switch to **φ**.
Set the On/Off switch on the calibration unit to **On**.
Now the transmission system is running.

The calibration procedure will be run using the calibration unit based on the observations taken from the Vu-meter in the "**Control**" section and on whether or not the "**Phase**" section LEDs come on.

Slowly increase the current level until the Vu-meter needle deviates slightly to the right (it must not go all the way to the right).
N.B.: Only the **φ C** LED should be lit.

Starting with the highest value **470 nF**, disable the capacitors one by one.

For each value, if the Vu-meter needle changes direction, re-enable the last capacitor switched off. Do not push too far!

When the lowest value capacitor has been tested, the procedure is completed for group 1.

Record the values in the measurement sheet table.

CALIBRATION

5 - PROCEDURE

N.B.:

- The φ C and φ L LEDs reverse when the Vu-meter needle changes direction.

- If the two φ C and φ L LEDs come on at the same time, this means that the setting is close to optimum. Never deliberately attempt to create this situation.

.

Warning, this may trigger the "breaker"

- Always ensure that the "**High**" LED on the transmitter stays off. If this LED comes on, this means that the current level is too high. At the extreme, this may indicate a circuit breaker triggering condition. The "**Breaker**" LED shows you this condition on the calibration unit. If this occurs, lower the current level a little.

- In the same way, ensure that the "**Low**" LED remains off. A "**No current**" indication on the calibration unit warns you that the current level is too low. If this occurs, raise the current level a little.

- To switch off the "**High**" or "**Low**" indicator LEDs, press the "**Reset**" button or the "**Fault reset**" button on the calibration unit.

Once the evaluation of antenna group 1 is completed, the same operation can be performed on group 2.

To do this, reset all of the capacitor level switches to the up position and repeat the previous procedure to **determine which additional capacitors** are needed.

Record the values obtained for group 2.

	470	220	100	68	47	22	10	6.8	4.7	2.2	1
G 1											
G 2											

Perform the short calculation shown on the measurement sheet.

This comprises **summing the capacitor values** retained for each group.

Take the highest value from each group.

Using the four additional capacitor values, look for the nearest sum level.

470	220	100	47

Record your choice using the switches on the transmitter by disabling the values not chosen.

The procedure for determining which additional capacitors are required is completed.

CALIBRATION

5 - PROCEDURE

c) Definitive adjustment

The previous operations are used to **evaluate the additional capacitor values** that are common to both antenna groups. Now it is time to repeat this operation knowing that this adjustment will take into account the capacitor values you have retained.

To do this:

- Return all of the capacitor switches to the up position,
- Move to the "Antenna 1" group
- Repeat the de-selection operation just like in the previous step.

The new combination will summarily tune the transmitter to a central frequency of 38.4 kHz. However the values that you have just selected do not provide any certainty that the output current level will be the same for both frequencies: 36.6 and 40.2 kHz.

To move in this direction, **current level balancing** is required.

To do this, proceed as follows:

- From the transmitter, move the rotary switch to **I**,
- From the control unit:
  a. The capacitor switches remain set,
  b. The two-way switch is set to I unit,
  c. The rotary switch is set to 36.6 kHz,
  d. Using the potentiometer bring the Vu-meter needle to **4,**
  e. Position the rotary switch to 40.2 kHz and observe the Vu-meter variation.

WARNING: During the entire adjustment procedure, when in the 36.6 kHz position, the **φ L** LED should be lit and when in the 40.2 kHz position, the **φC** LED should be lit. **If not**, repeat the capacitor selection process for operation is not correct.

Now seek out the larger of the two values. This process is performed by switching between the two frequencies a number of times.

Consequently, you now have an idea of the current imbalance between the two frequencies.

Move to the larger of the two and set the current level to **7** using the potentiometer.

Check the value for the other frequency.

Using the capacitor switches, starting with the lowest value, bring the needle up to the average current value read for each frequency.

CALIBRATION

5 - PROCEDURE

If the variation is not significant enough, move on to the next switch.

This operation is a fairly delicate one for it requires a proper understanding of what is going on. With a little experience it should be possible to complete it in 30 seconds.

It is important to switch between the two frequencies every time the capacitor switches are used in order to view the resulting action caused. This procedure is therefore performed with one hand on the rotary mode switch and the other on the capacitor switches.

If the current level is a little low for both frequencies, you can always increase the higher of the two up to a 7-8 setting.

It is also possible that the highest current at one time becomes the lowest, and vice-versa. This means that you have moved past the best value setting. This is where the capacitor combinations come in.

For example: You have just switched on the 22nF capacitor and you realize that this value is too high, switch off 22 and switch on 10, 6.8 and 4.7 to obtain 21.5 nF.
If this is not enough and 21.5 is still too high, switch off 4.7 and switch on 2.2 and 1 to obtain 20 nF and so on.

- Refine this adjustment until the difference between the two frequencies is less than one graduation,

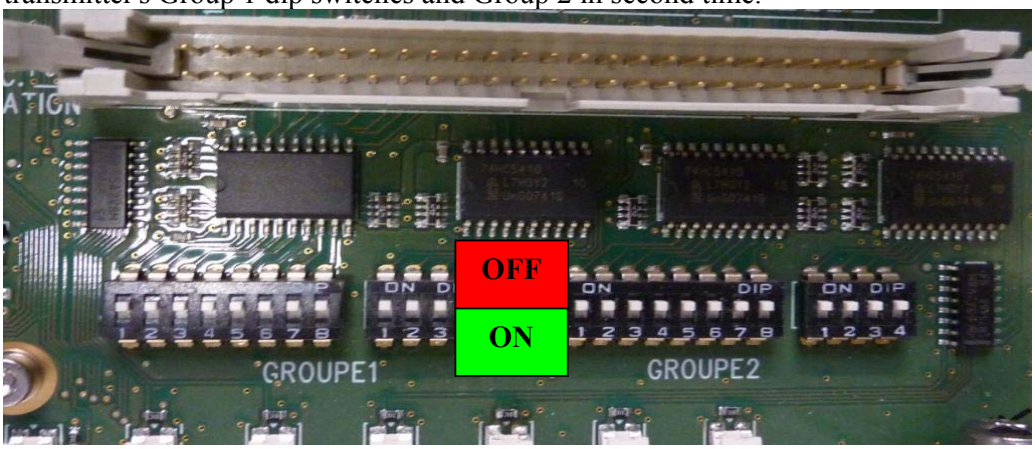
- Then position the rotary mode switch to slow commutation and observe the needle pulse. This should be a very low level one.

To ensure that the adjustment made is the optimum one, change the position of the switches for the smallest combinations possible. If the needle no longer deviates, you are sure to have found the best adjustment.

When observing the **φ C** and **φ L** LEDs, you should see the two LEDs pulse alternately.

If the adjustment fails, repeat the current balancing procedure from the beginning.

The newly obtained values should be recorded on the measurement sheet as well as on the transmitter's Group 1 dip switches and Group 2 in second time.



This means that the second step has been completed: the current level is balanced on both frequencies; all that remains is to set its output level on the antennas.

This point requires special care, for the current level adjustment that is about to be made is up to the user only! Connect up the oscilloscope and the current probe.

Note that the system must comply with applicable standards. These standards imply a maximum admissible magnetic field which is reached when a 2-Amp peak-to-peak current **runs through an antenna** like the ones used here.

The adjustment will therefore be made to not exceed 2 Amps peak-to-peak.

To perform a proper adjustment, proceed as follows:

1) Place the transmitter rotary switch on **I**,
2) Set the function two-way switch to I unit,
3) Adjust the current adjustment potentiometer to set the needle on **4**,
4) Connect a current probe to the first antenna in Group1,
5) Record the current level,
6) Connect the probe to the second antenna in the same group,
7) Record the current level,
8) Choose the antenna with the highest current level,
9) Place the probe on this antenna,
10) Using the small screwdriver, check that the current level is at minimum (13h),
11) Move the two-way switch from I unit to I ext,
12) Increase the current value by slowly turning the small potentiometer counter clockwise (12h). Note that this adjustment is a sensitive one! **Set to 2 A dc**,
13) Check the current level on the other antenna, it must never exceed 2 A,
14) Record these values on the measurement sheet.

At this stage, the transmitter is correctly calibrated for Group 1. Now repeat the same procedure for the **second group** (from the definitive adjustment on).

d) One last check

The transmitter is ready to operate; however one last check should still be performed.

Connect the computer system to the transmitter, and from the Manager, sent the following commands from the Buffer menu.

1) Click on "**Read status**"

   Response: "Buffer memory is empty"

2) Click on "**Ok**"

3) Choose " **Continuous transmission**"

   Response "Do not forget to switch off and restart the buffer before using it again."

4) Click on " **Ok**"

   - The transmitter changes to transmission mode: the "**Transmission**" and "**OK**" LEDs must be lit,

   - The **φ C** and **φ L** LEDs must blink, alternatively and fast,

   - The **Tuning** LEDs show the capacitor values that correspond to the antenna group,

   - In the "**I"** position, the Vu-meter needle should already be in the same position as when adjusting the current.

5) Choose "**Continuous transmission**"

   Response "Do not forget to switch off and restart the buffer before using it again".

6) Click on "**Ok**"

   - The transmitter changes to transmission mode on the other group,

   - The "**Transmission**" and "**OK**" LEDs must be lit,

   - The **φ C** and **φ L** LEDs must blink, alternatively and fast,

   - The **Tuning** LEDs show the capacitor values that correspond to the antenna group,

   - In the "**I"** position, the Vu-meter needle should already be in the same position as when adjusting the current.

7) Click on "**Read status**".

   Response: "the buffer memory is blank"

CALIBRATION

5 - PROCEDURE

8) Click on "**Confirm**"

Transmission stops and the "**Transmission**", "**φ C**" and "**φ L**" LEDs go out.

The transmitter is ready!

We strongly recommend keeping an eye on the oscilloscope during this last step to ensure that the current level is set correctly and that its signal shape is correct.

CALIBRATION

6 - MEASUREMENT SHEET

Fill in a measurement sheet for each transmitter!

Store name: ……..

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

Transmitter type: …… Transmitter serial no.: …… Number of transmitters: …

Operator/Installer: …….

Antenna ohm value levels:

Antenna 1: …… Ω Antenna 3: …… Ω

Antenna 2: …… Ω Antenna 4: …… Ω

Tuning capacitance levels:

	470	220	100	68	47	22	10	6.8	4.7	2.2	1
G 1											
G 2											

Calculate the sum for each group,
take the highest value.

470	220	100	47

If the number is less than 160 then it is multiplied by 2,
otherwise it is multiplied by 3.
These are the additional capacitor values.

Definitive tuning capacitance levels:

	470	220	100	68	47	22	10	6,8	4,7	2,2	1
G 1											
G 2											

Loop current value: (peak-to-peak value read off the oscilloscope **2 Amp dc max.**)

Group 1 (sum): ……Amp Group 2 (sum): ……Amp

Antenna 1: ……Amp Antenna 2: ……Amp

Antenna 3: ……Amp Antenna 4: ……Amp

Remarks:

……

……

N.B.: - Antenna wire marking using numbered rings is mandatory and must be performed for all of the transmitters.

REVISION LEVEL

Documents	Revision level	Modification date	Author(s)
Entire document	**2.0**	**21-Jan.-04**	**L.Caumont**
Calibration procedure	**2.0**	**21-Jan.-04**	**L.Caumont and P.Legras**
Calibration X4	**1.0**	**16-Nov-09**	**L.Caumont**