Ground Bond Testing for Production and Maintenance

sefelec
Test & Measurement

Summary

- Why measure bonding resistance ?
- RCP2A Presentation
- RCP2APro software

Lightning strikes

- Danger for planes!
- Every transport aircraft is concerned
- Conditions: rainy zones, at 4000 meters and between -5°C and +5°C
- Way of strikes through the plane

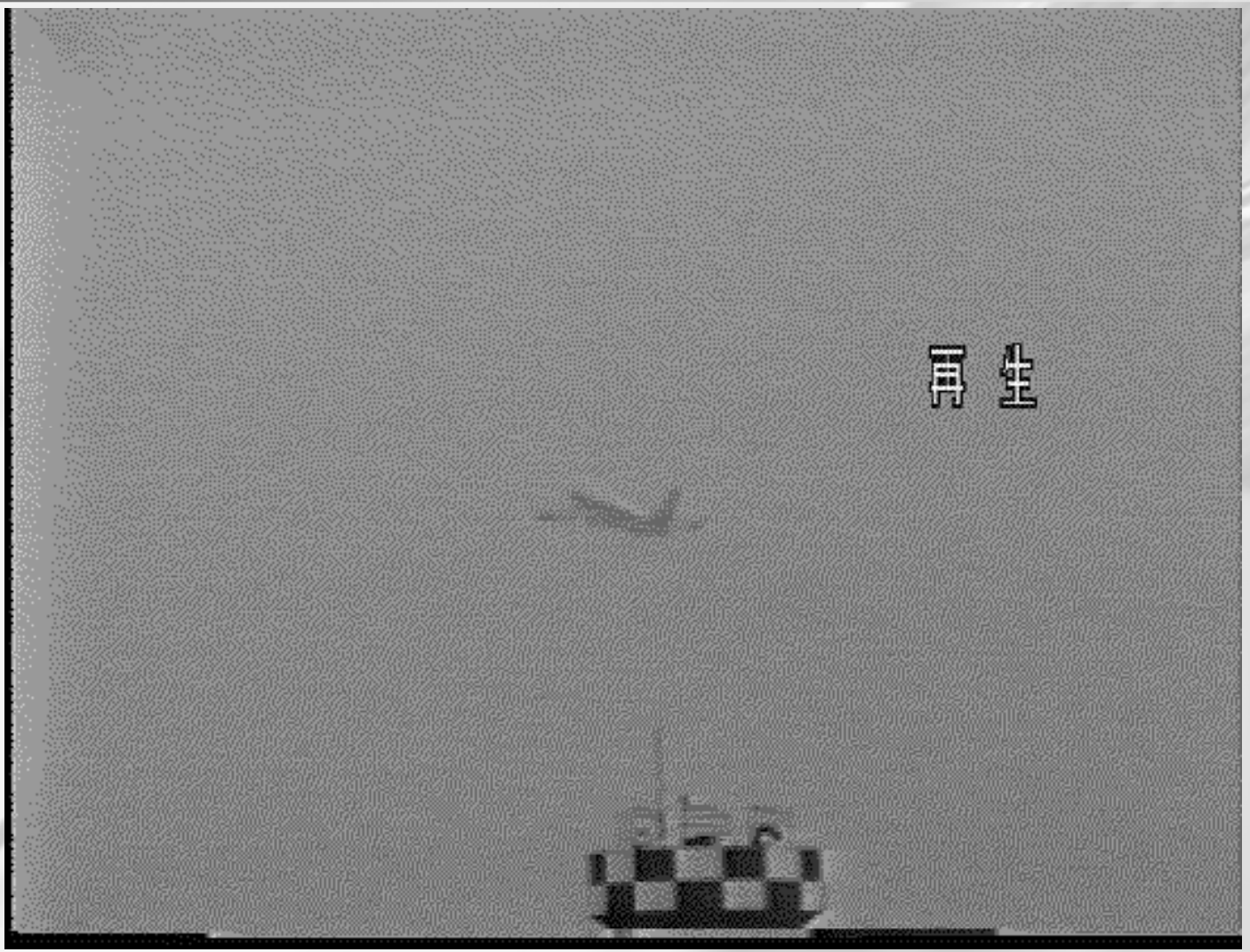
Direct Effects

- **Thermic** with perforation of walls by fusion
- **Dynamic** with rise of pressure
- **Electromagnetic** which perturbs the on board equipment

Cause:

- Effect of the discharge
- By conduction of the lightening strike current

Direct Effects



Why measure the bonding?

- Plane structure => excellent protection if continuity is insured
- Connection of dissimilar materials cause a weakness in conductivity
- Weakness can prevent the lightning transits through the aircraft skin

THE GOOD CONTINUITY OF THOSE BONDING IS **ESSENTIAL**

RCP2A Milliohmmeter

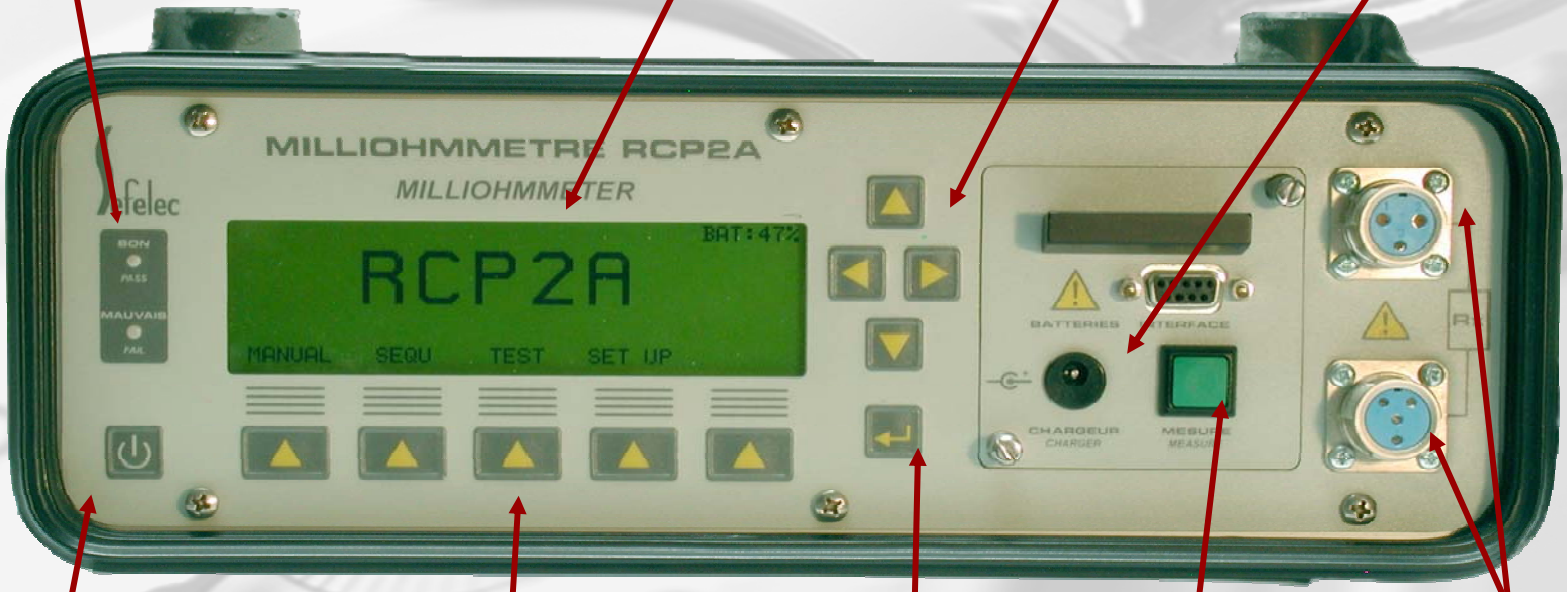
- Measurement resistance from 100µΩ to 6 Ω
- Measurement current of 0.1A, 1A or 10A
- Presented in a fiberglass and resin polyester box
- Placed on the ground or across one's shoulder
- Small dimension (340x120x220 mm)
- Weight: 4kg
- Wide back-lit LCD

Specifications

Range	*Current*	*Resolution*	*Precision*
6 mΩ	1A / 10A	1µΩ	(0,1% lect+0,1% PE)
60 mΩ	1A / 10A	10µΩ	(0,1% lect+0,1% PE)
600 mΩ	1A / 10A	100µΩ	(0,1% lect+0,1% PE)
6000 mΩ	0,1A / 1A	1mΩ	(0,1% lect+0,1% PE)

- RS232 interface
- 1000 measures with 10A
- Removable battery pack
- Remote control at distance
- Suite case
- A wide range of accessories

Front Panel



Red/Green light

LCD screen

Joystick

Battery

Start/Stop

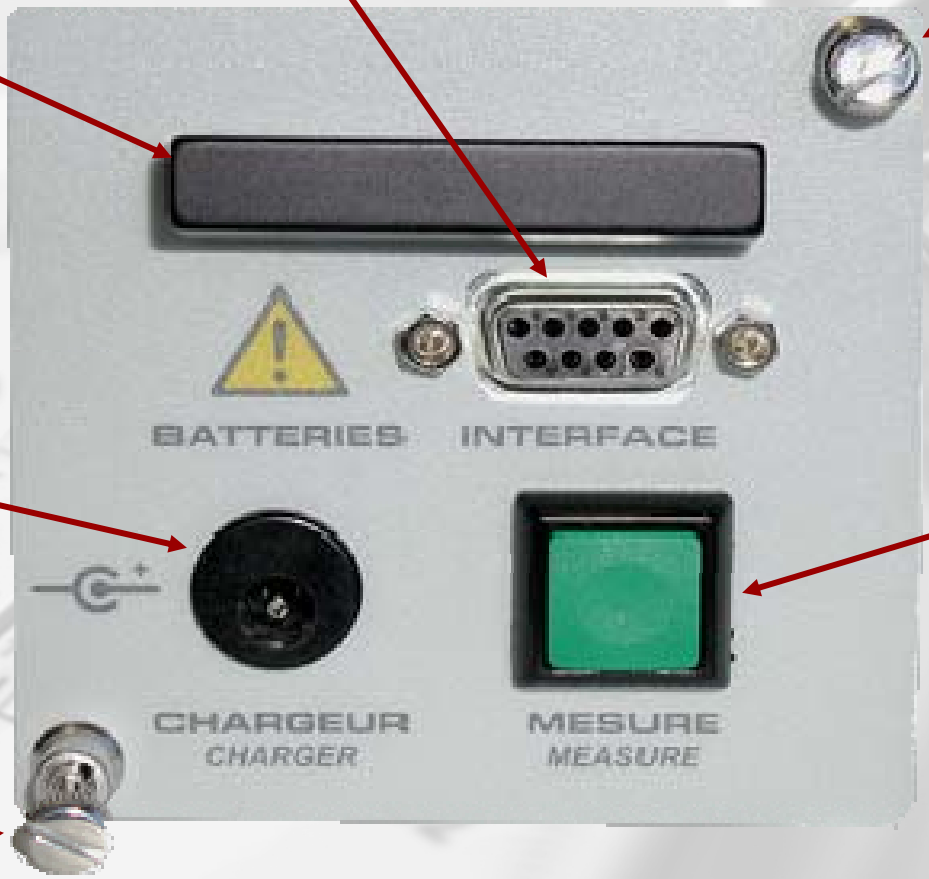
Function keys

Enter key

Measure

Measure terminals

Removable Battery Module



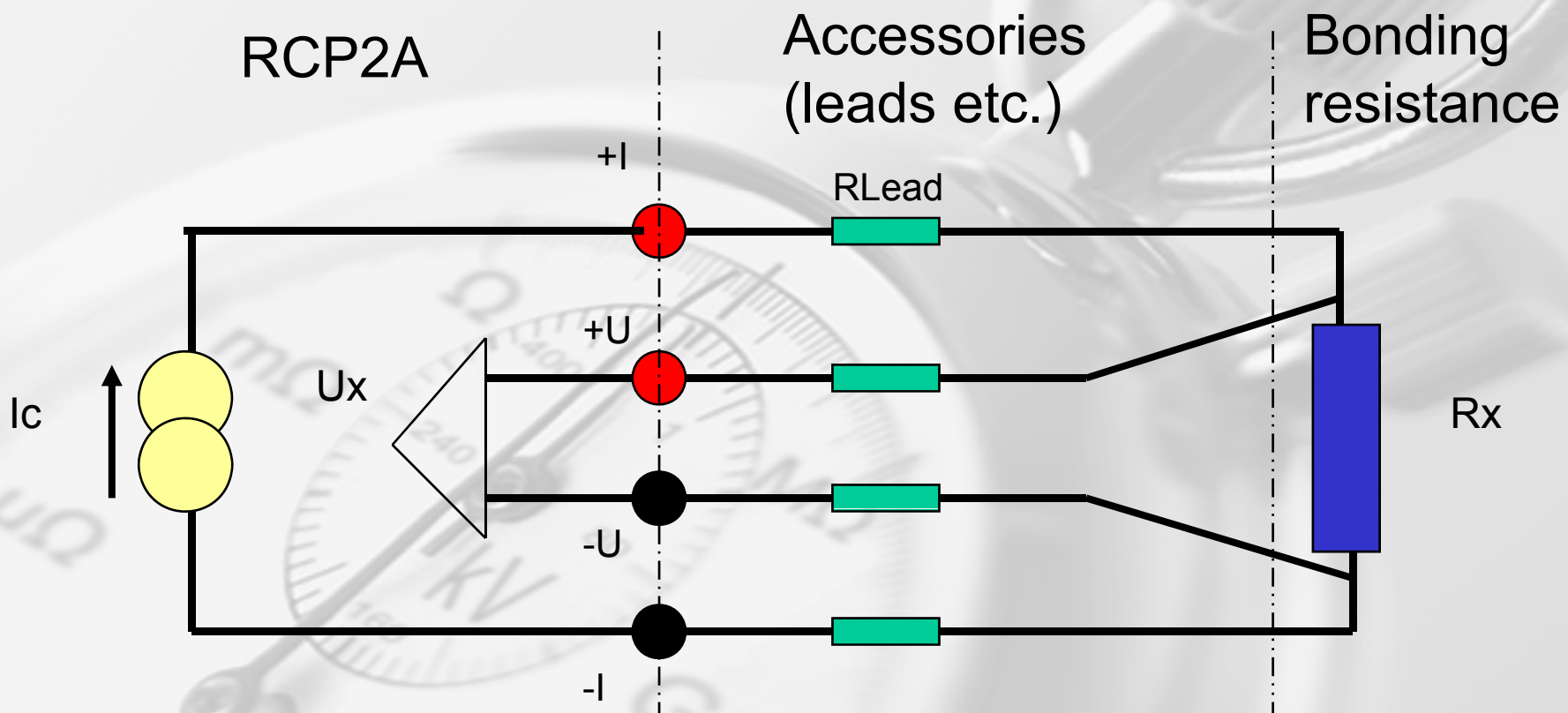
Measurement Method

How to measure low resistance with a high precision?

- RCP2A uses the 4 wire Kelvin method
- 2 wires used to connect a constant current source
- 2 additional wires used to measure the difference of potential

With this method, the resistance of the measuring leads does **not introduce any error**

Kelvin Method



$$Rx = Ux / Ic$$

RLead = Lead resistance

RCP2APro Software

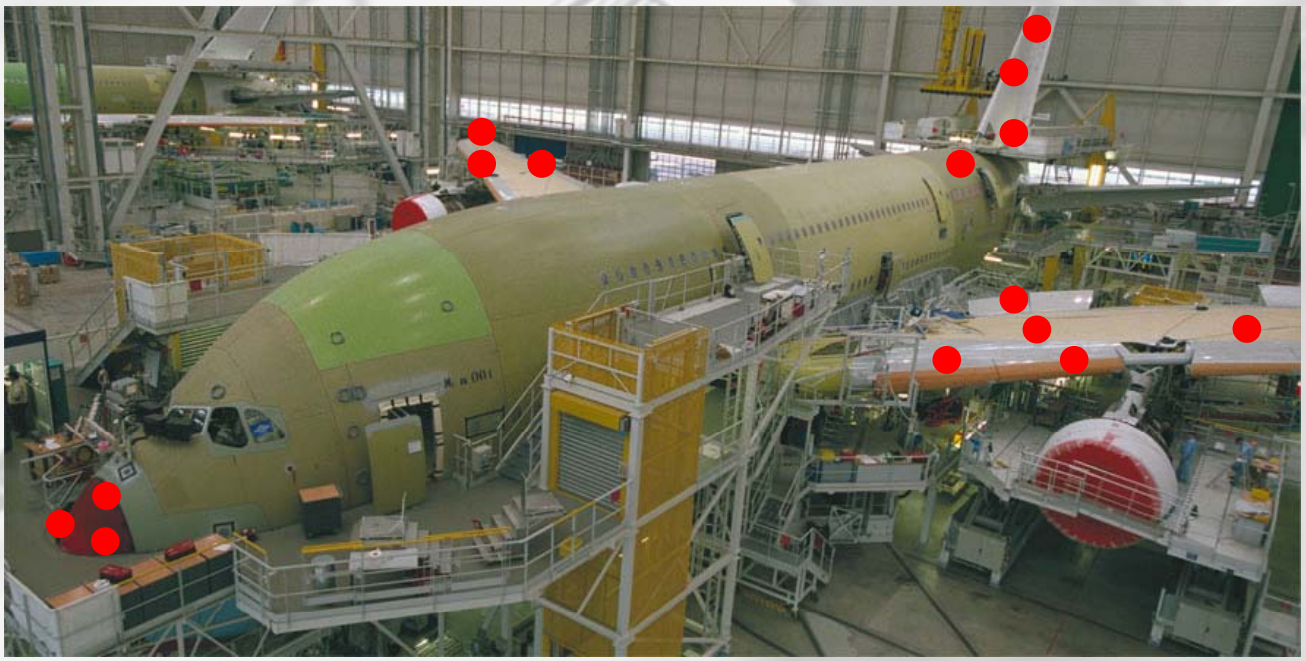
RCP2A Software

RCP2APro

- User-friendly software
- Creates the interface between RCP2A and PC

Sequence mode

- Program test sequences using EXCEL
- According to Ground Test Instructions
- Describes each point to be tested with its parameters



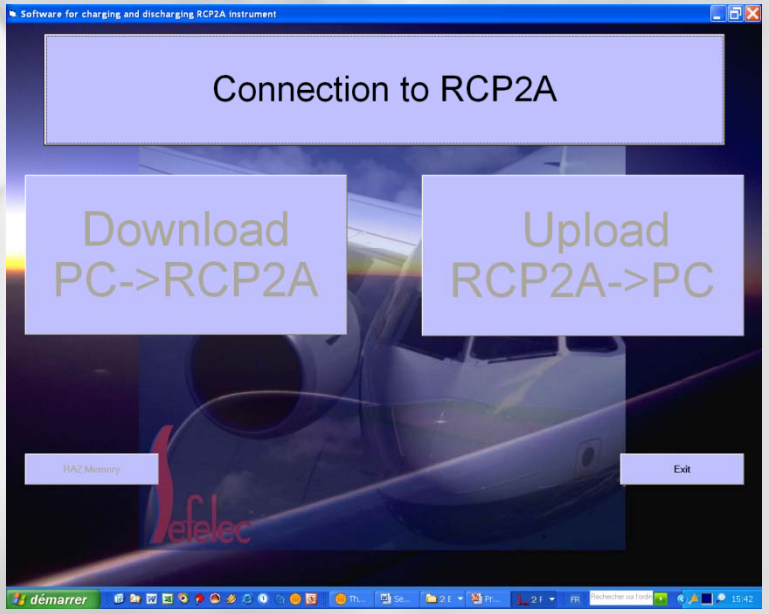
Sequence mode

- In this example, M. DUPONT has been programing 15 points for 4 different sections of an A380, with the below specifications

	A	B	C	D	E	F	G	H	I	J
1	Production reference	7.50.336								
2	Device under test	A380								
3	User name id	PV								
4	User name	DUPONT								
5										
6	Sub-assembly under test	Sub-assembly point number	Measured value (mOhm)	High limit (mOhm)	Current (A)	Result	Date	Time	User name id	Serial number
7	NOZE	20	7777,0	500	10,0	Point to be done				
8	NOZE	21	7777,0	200	1,0	Point to be done				
9	NOZE	22	7777,0	300	1,0	Point to be done				
10	NOZE	23	7777,0	100	1,0	Point to be done				
11	LEFT WING	32	7777,0	100	10,0	Point to be done				
12	LEFT WING	33	7777,0	100	1,0	Point to be done				
13	LEFT WING	34	7777,0	300	1,0	Point to be done				
14	RIGHT WING	35	7777,0	300	1,0	Point to be done				
15	RIGHT WING	40	7777,0	500	1,0	Point to be done				
16	RIGHT WING	41	7777,0	500	10,0	Point to be done				
17	RIGHT WING	42	7777,0	500	10,0	Point to be done				
18	TAIL	43	7777,0	300	10,0	Point to be done				
19	TAIL	44	7777,0	500	1,0	Point to be done				
20	TAIL	45	7777,0	500	1,0	Point to be done				
21	TAIL	46	7777,0	500	1,0	Point to be done				
22										

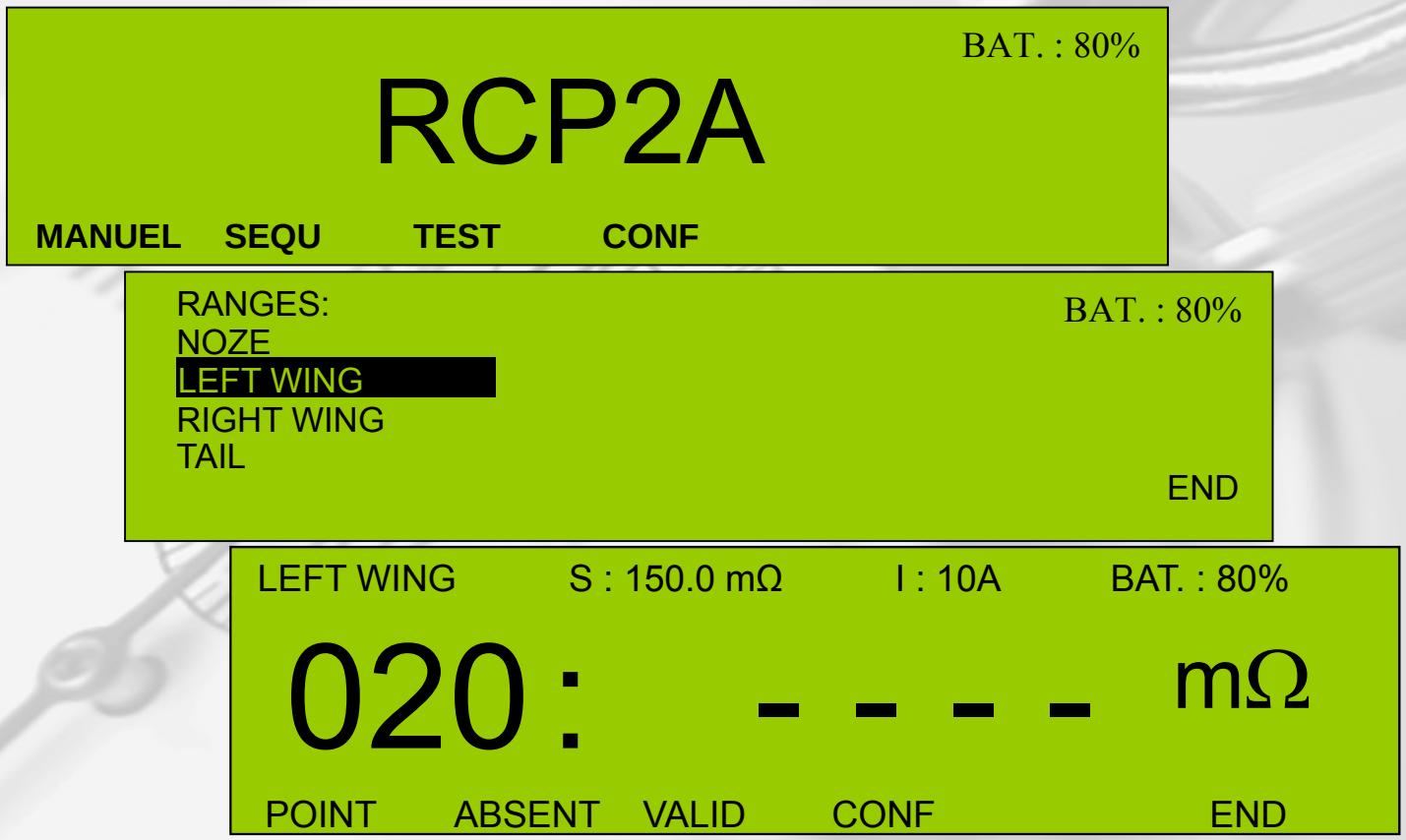
Sequence mode

- Load EXCEL sequence into the RCP2A with the RCP2APro interface



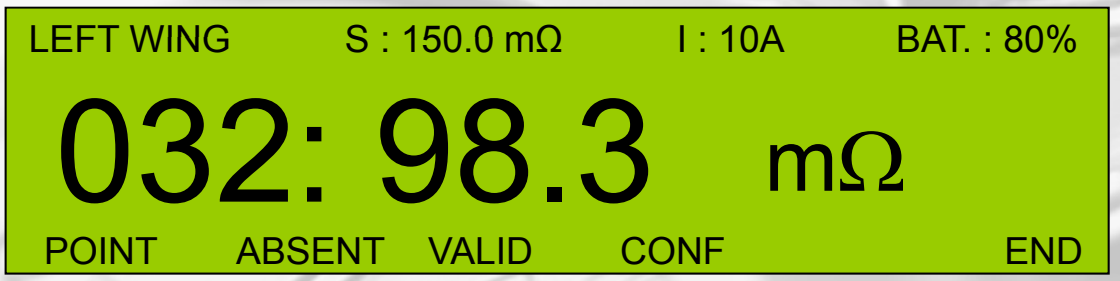
Sequence mode

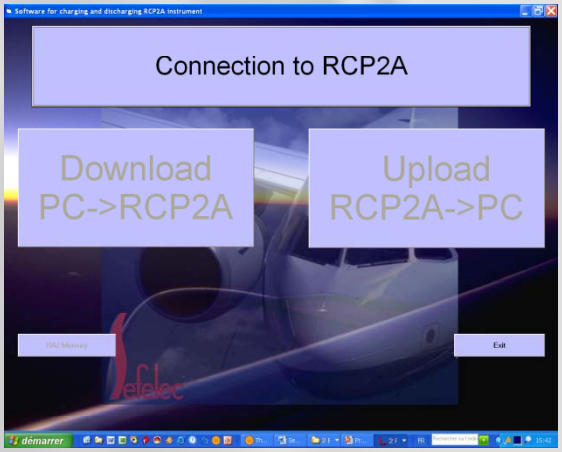
- The user clearly sees on the LCD Display the loaded sequence and the list of points he has to measure



Sequence mode

- Upload all the measurements, for direct saving, and results traceability





Sequence mode

- In this result example, M. DUPONT has been testing 15 points from 4 different sections of an A380, with the below results

	A	B	C	D	E	F	G	H	I	J
1	Production ref.	7.50.336								
2	Device under test	A380								
3	User name id	PV								
4	User name	DUPONT								
5										
6	Sub-assembly under test	Sub-assembly point number	Measured value (mOhm)	High limit (mOhm)	Current (A)	Result	Date	Time	User name id tag	Serial number
7	NOZE	20	101,0	500	10,0	Ok	06.08.2005	14.25	U1BG	64230
8	NOZE	21	197,0	200	1,0	Ok	06.08.2005	14.25	U1BG	64230
9	NOZE	22	284,0	300	1,0	Ok	06.08.2005	14.27	U1BG	64230
10	NOZE	23	600,0	100	1,0	Bad Point	06.08.2005	14.28	U1BG	64230
11	LEFT WING	32	84,0	100	10,0	Ok	06.08.2005	14.30	U1BG	64230
12	LEFT WING	33	9999,0	100	1,0	Absent point	06.08.2005	14.31	U1BG	64230
13	LEFT WING	34	254,0	300	1,0	Ok	06.08.2005	14.31	U1BG	64230
14	RIGHT WING	35	237,0	300	1,0	Ok	06.08.2005	14.40	U1BG	64230
15	RIGHT WING	40	449,0	500	1,0	Ok	06.08.2005	14.42	U1BG	64230
16	RIGHT WING	41	251,0	500	10,0	Ok	06.08.2005	14.42	U1BG	64230
17	RIGHT WING	42	8888,0	500	10,0	Measure not possible	06.08.2005	14.42	U1BG	64230
18	TAIL	43	7777,0	300	10,0	Point to be done	06.08.2005	14.44	U1BG	64230
19	TAIL	44	7777,0	500	1,0	Point to be done	06.08.2005	14.45	U1BG	64230
20	TAIL	45	7777,0	500	1,0	Point to be done	06.08.2005	14.45	U1BG	64230
21	TAIL	46	7777,0	500	1,0	Point to be done	06.08.2005	14.48	U1BG	64230
22										

RCP2A Advantages

- Measurement specifications
- Ergonomics > small weight and volume
- Replaceable batteries of big capacity
- Measurement traceability through the SEQUENCE mode
- RS232 interface with PC download/upload facility
- Wide accessory range
- Approval of the equipment by Airbus
- Partial testing

Typical Customers

Manufacturers of civil and military aircrafts

- AIRBUS
- BOEING
- DASSAULT
- EUROCOPTER
- EMBRAER
- FOKKER
- X.A.C., …

Typical Customers

The subcontractors

- SOGERMA
- TURBOMECA
- HISPANO SUISA
- INTERTECHNIQUE, BF GOODRICH, …

Typical Customers

Airlines & maintenance companies

- AIR FRANCE, LUFTHANSA TECHNIK
- AIA
- LABINAL
- JAL, AIR CHINA, KOREAN, INDIAN airlines,

ALITALIA, AUSTRIAN, THAI, TAP, SR TECHNICS,

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