Electromagnet handling installation on motor vehicle

Instructions for use

Important: Raoul Lenoir reserves the right to modify the characteristics of its products at all times to incorporate the latest technological developments. The information contained in this document is therefore liable to change without advance notice.
Raoul Lenoir disclaims all responsibility for the consequences of changes in characteristics or modifications made without its written approval.
Raoul Lenoir reserves the right to perform the installation and conduct the initial checks in order to ensure that the components of the handling system operate correctly.
Caution: For safety reasons and to benefit from the full guarantee, it is mandatory to use the parts and accessories recommended in these instructions.
■ It is formally prohibited to perform any operations other than those defined in these instructions.
■ On startup, the settings are optimised by the Raoul Lenoir personnel for a given product. However, if type of product is changed, it is advisable to request advice from Raoul Lenoir before making any modifications.
■ Before using, it is mandatory to check the batteries for correct operation and to conduct the preliminary checks.
■ No persons must be within the electromagnet operating area.
Warning: These instructions for use and recommendations are intended for electromagnets of the standard range as defined in the Raoul Lenoir catalogues.
It is mandatory, for safety reasons, not to use electromagnets of more than 8 kW and to periodically check the condition of the axles and the suspension chains.
For special electromagnets, that is manufactured according to specifications adapted to your requirements, certain statements and recommendations will not correspond or will not apply to the electromagnet in your possession. For specific operating conditions, we can produce sealed electromagnets for immersion or electromagnets for use at high temperatures (600°C). These are to be considered as special electromagnets and this must be specified on the order.

customer sheet

customer reference

Company: .....
Address: .....
phone: .....
fax: .....

name of person in charge: .....
function: .....

machine reference

type: .....
number: .....

installation

date: / /
technician(s): .....
.....
.....
remark(s): .....
.....
.....

to be performed by the customer

■ retighten the belt after first 24 hours of operation following installation.
■ check condition of belt each month.

belt reference

contents

to be read

before use

These instructions must be read, understood and applied before using the electromagnet.
The head of the user's plant and the operators must strictly comply with the following warnings:

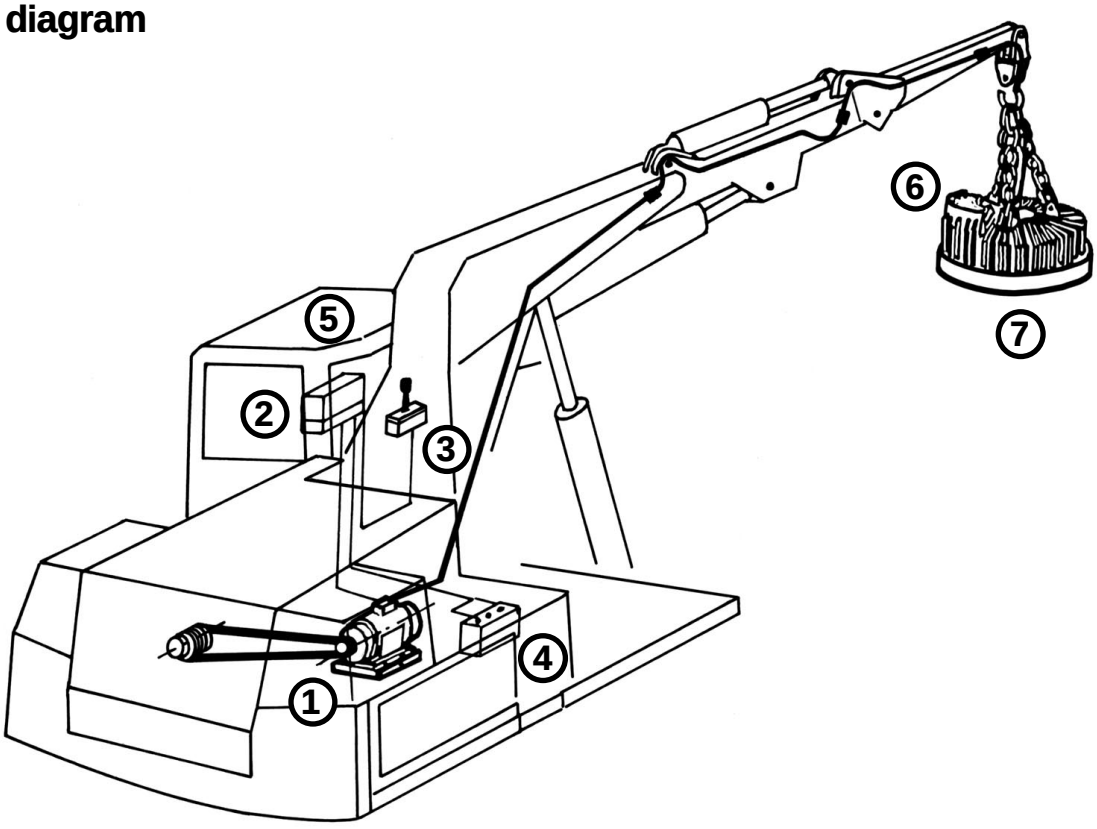
- the instructions for use are written for all operators in charge of installing, operating, adjusting, maintaining, repairing and transporting the electromagnet only for those operations which are authorised and left to user's initiative (see further on in text).
- the head of the plant must ensure that the operators know the recommendations given in these instructions.
- these instructions for use must be conserved for consultation purposes throughout the life of the electromagnet including cases of resale, change of user or manager.
- the head of the plant is responsible for the application of the prevailing user's regulations.

general instructions

- the electromagnet can only be used by suitably qualified and competent operators.
- the electromagnet must only be used in compliance with the conditions specified by Raoul Lenoir in these instructions concerning standard electromagnets.
- all uses not in compliance with these instructions may result in injury to the persons or damage to the equipment and reduce expected performance.
- before each use, the operator shall check that the electromagnets and the handling system are in good condition.
- for both the mechanical and electrical parts, Raoul Lenoir disclaims all responsibility for the consequences of changes to characteristics or modifications made without its written approval.
  If the customer wishes to modify the handling system, he must get in contact with the Raoul Lenoir technical departments.
- for safety reasons and to benefit from the full guarantee, it is mandatory to use the parts and accessories recommended in these instructions.
- **It is formally prohibited to perform operations other than those defined in these instructions.**

handling system layout

diagram



parts list

Item	Designation	Refer to
1	generator overall views general drawing overall dimensions	documentation in appendix drawing in appendix drawing in appendix drawing in appendix
2	electronic unit C S D	documentation in appendix
3	manipulator	
4	battery	
5	cab	
6	terminal box	
7	electromagnet	

acceptance, storage

preliminary checks

When taking possession, check that the handling system and its equipment have not been damaged during transport (cover bent, cables damaged, protection damaged, presence of foreign bodies, etc.) and check for presence of controlled accessories.

If the equipment has suffered damage:

- *make reserves to the carrier and confirm them by registered letter within 3 days (commercial law article 105).*
- *draw up a report and immediately send it to your supplier (Raoul Lenoir).*

storage

The electromagnet must be stored away from all dripping water and away from work generating dust (masonry work, sand blasting, welding, etc.).
The electromagnet can be stored in a room with an ambient temperature varying from -20°C to +60°C.
For prolonged storage, take all special measures required.

The electromagnet must not be in contact with humidity.

installing the handling system

This handling system is equipped with an electronic unit designed to operate in all positions using the 4 attachment points provided for this purpose (see drawing E9802/01 in appendix).

Its installation in the cab of the crane facilitates operations and adjustments during commissioning (cables easy to connect and crane controls within easy reach).

connecting external cables

- generator: 3 x 1.5 mm^2
- manipulator: 3 x 1.5 mm^2
- batteries: 3 x 1.5 mm^2

Use cables of 1.5 mm^2 maximum (terminals cannot take larger cables). Leave slack on these 3 cables to allow for removal of the unit (up to driver's seat), thus facilitating the opening of the unit, access for adjustments during commissioning and for the repair of possible failures.

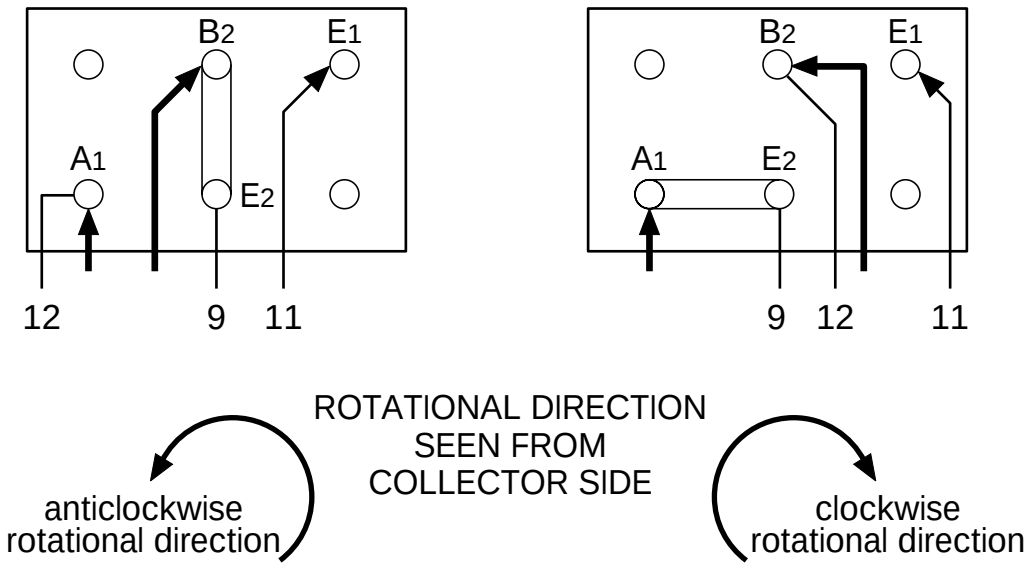
generator

Before connecting the generator terminal strip, check for self-excitation in rotational direction.

⇒ connect common point (terminal strip) to terminal 9,

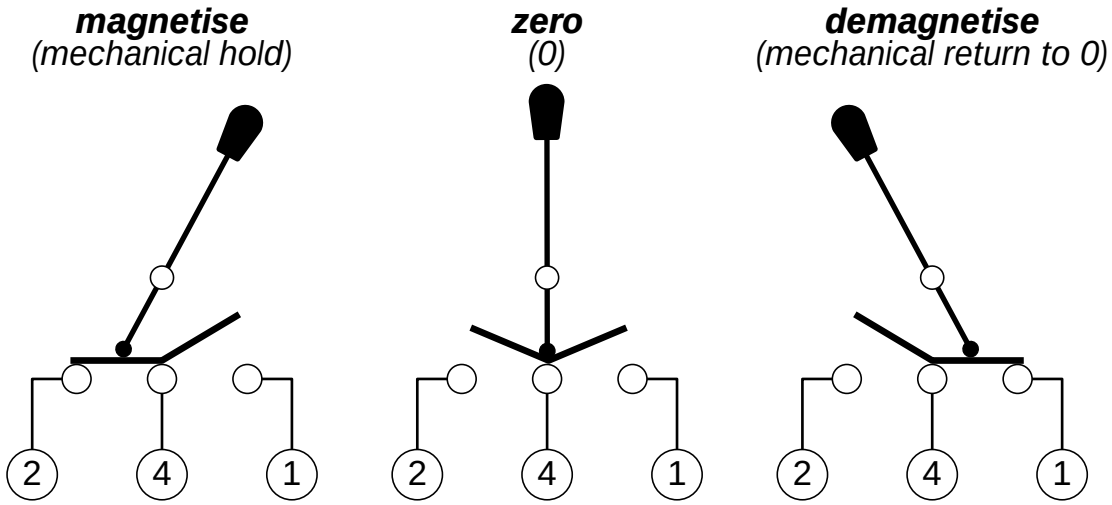
⇒ connect excitation to terminal 11,

⇒ connect armature to terminal 12.

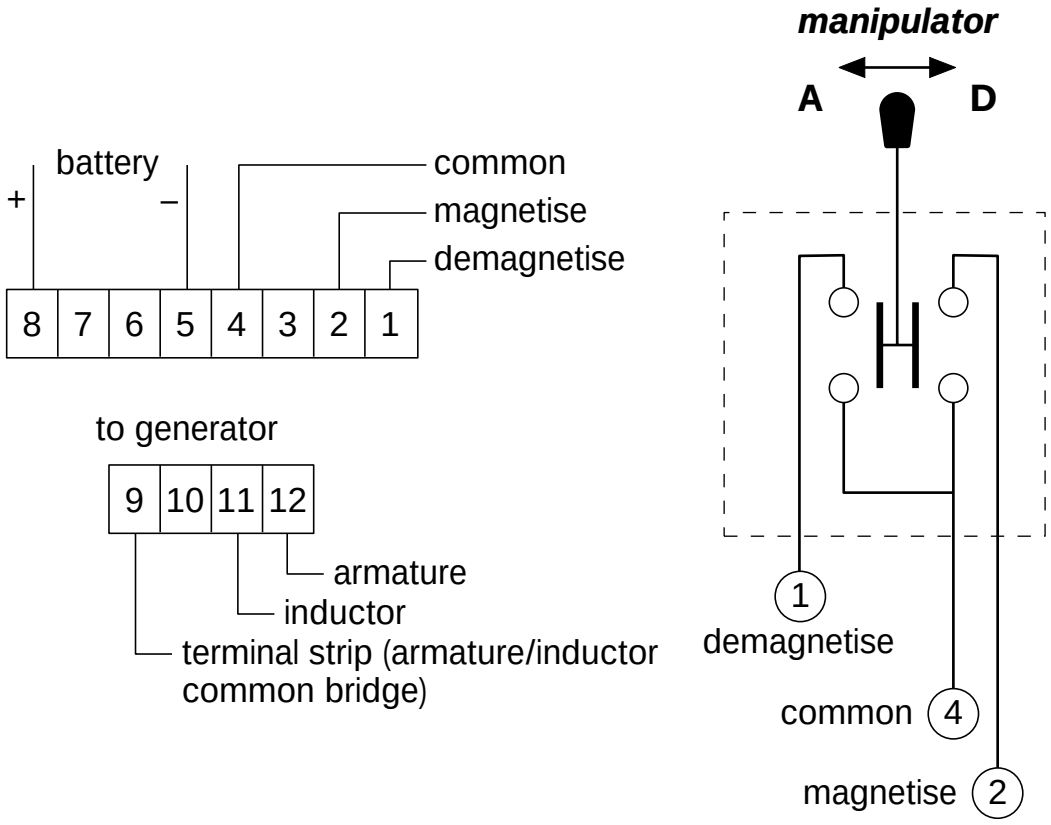


manipulator

manipulator function:



⇒ connect common point to terminal 4,
⇒ connect switch closed for magnetisation to terminal 2,
⇒ connect switch closed for demagnetisation to terminal 1.



batteries

Check that the voltage selector corresponds to crane battery voltage (12 V or 24 V):

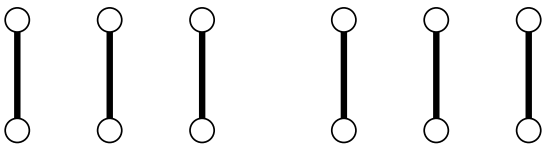
⇒ 12 V batteries: voltage selector lever towards bottom of box.
⇒ 24 V batteries: voltage selector lever towards inside of box.

Pay attention to polarities; may not operate (non-destructive protection): (see drawing E9802/02 in appendix)

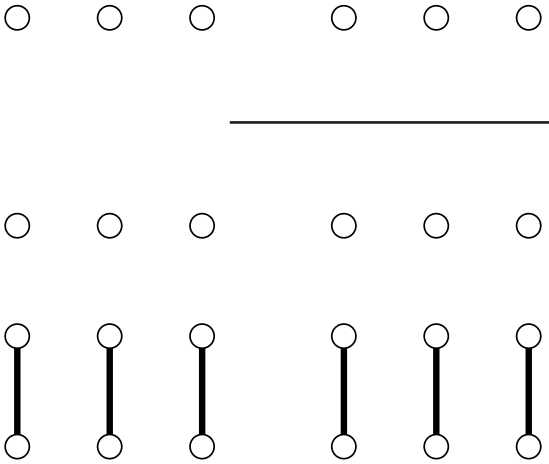
⇒ connect positive pole (+) to terminal 8,
⇒ connect negative pole (–) to terminal 5.

N.B.:

Since December 1993, selectors are replaced by soldered straps.



12 V battery



24 V battery

commissioning

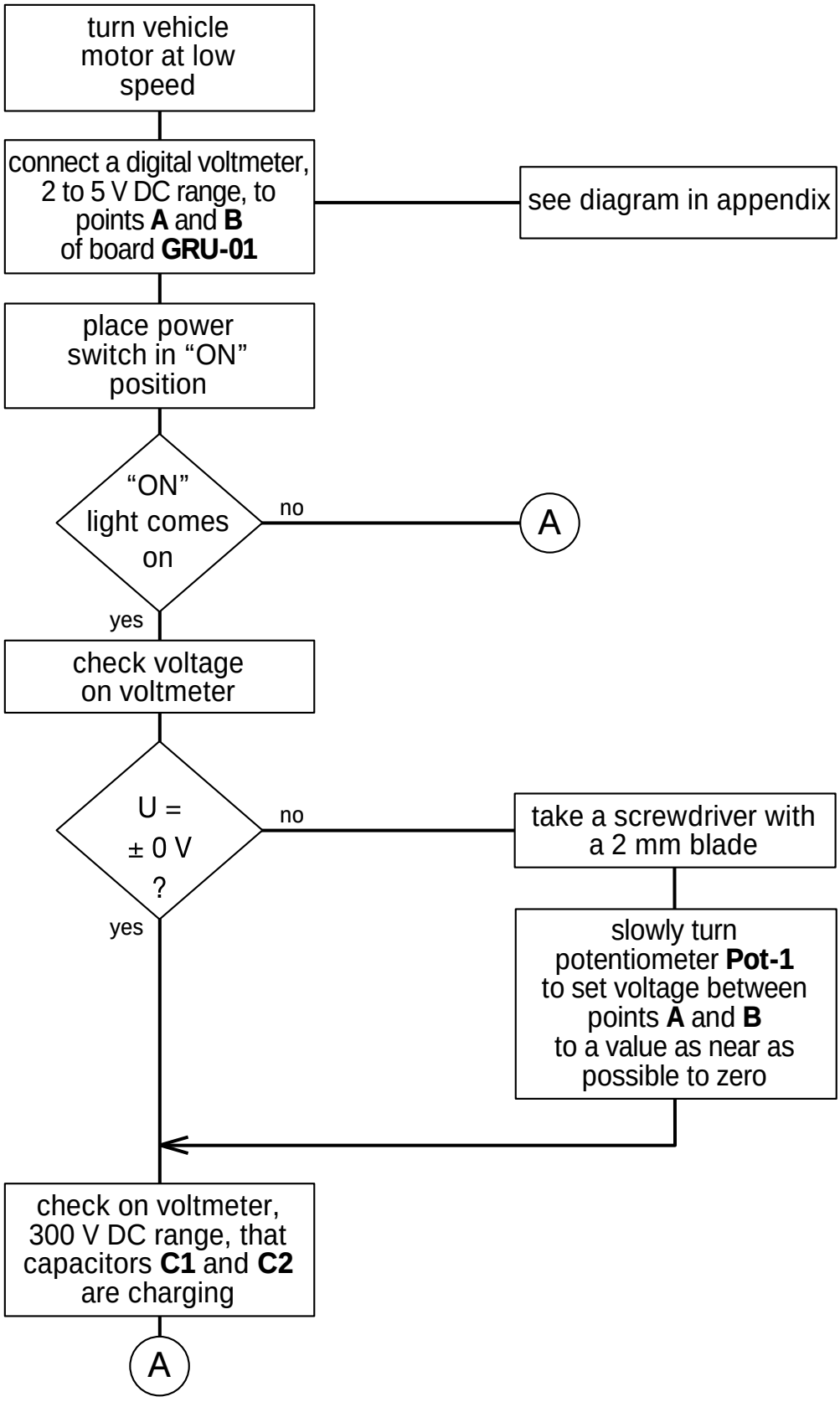
The electronic unit is checked and preset in the workshop and commissioning is limited to several inspections and checks and to adjusting the magnetise and demagnetise voltages.

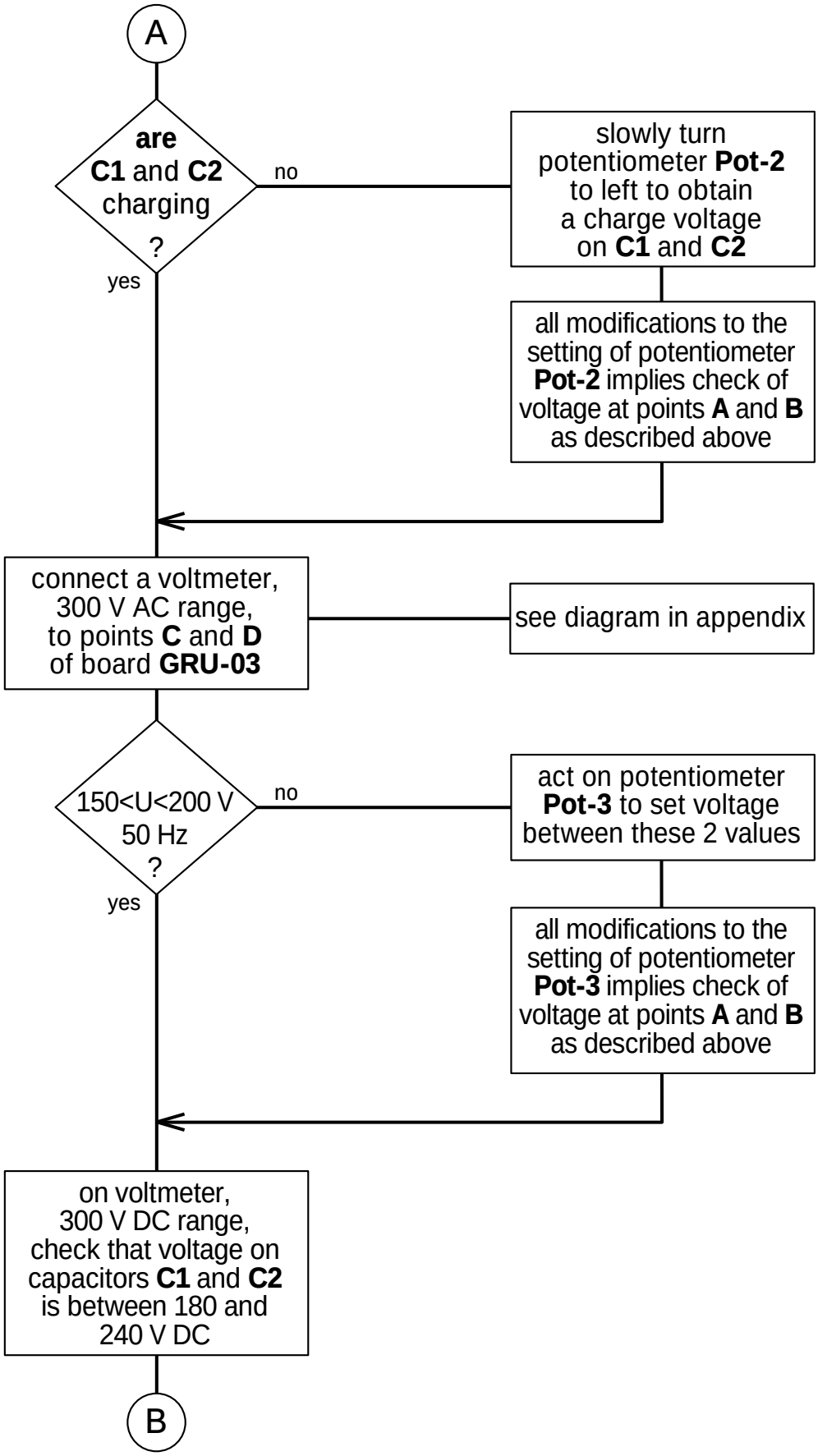
The adjustment potentiometers will only be reset if the checks described below indicate the need for this.

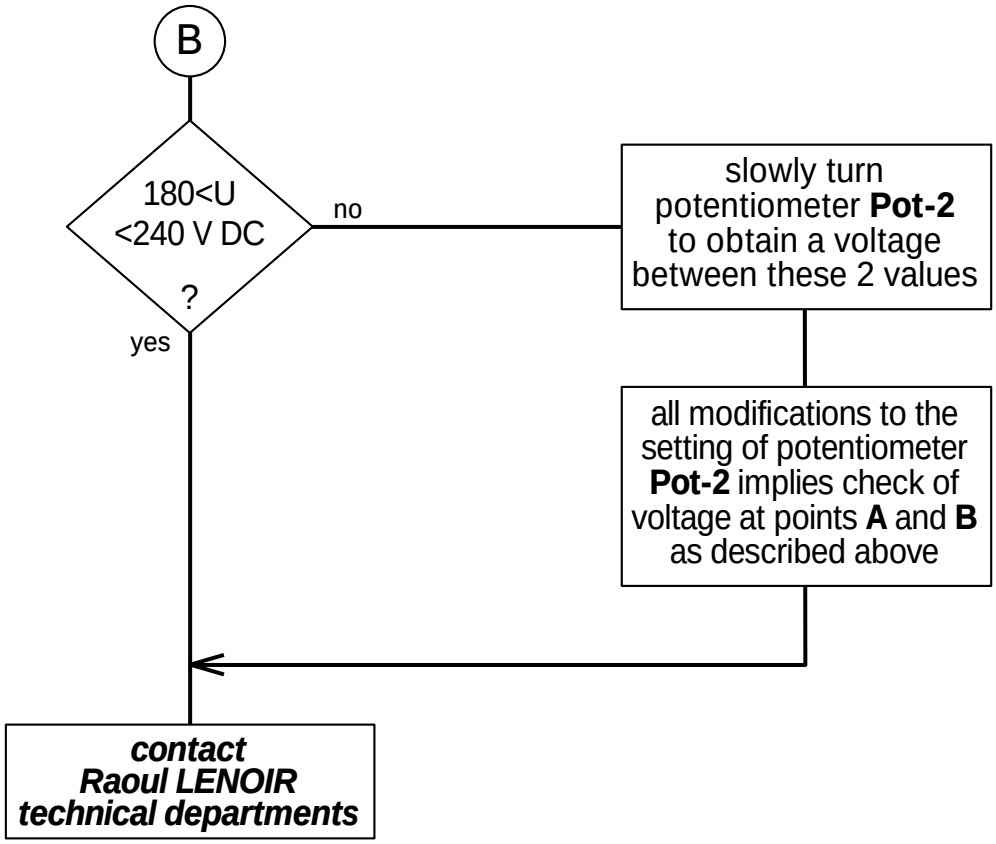
checks before power-up

- check that fuses Fu.1 and Fu.2 are installed:
  - ⇒ Fu.1 (battery protection): 6.3 A - size: 5 x 20 - glass enclosed (fast-blow).
  - ⇒ Fu.2 (inductor protections): rating around twice inductor current given on generator plate - size: 5 x 20 - glass enclosed (fast-blow).
- check that cables are correctly connected. (drawing E9802/02 in appendix)
- on voltmeter, check:
  - ⇒ voltage between terminals 5 (–) and 8 (+),
  - ⇒ battery voltage polarities.
- check the position of the battery voltage selector:
  - ⇒ 12 V batteries: voltage selector lever towards the bottom of the box.
  - ⇒ 24 V batteries: voltage selector lever towards the inside of the box.
- check that magnetise/demagnetise control manipulator is set to zero.

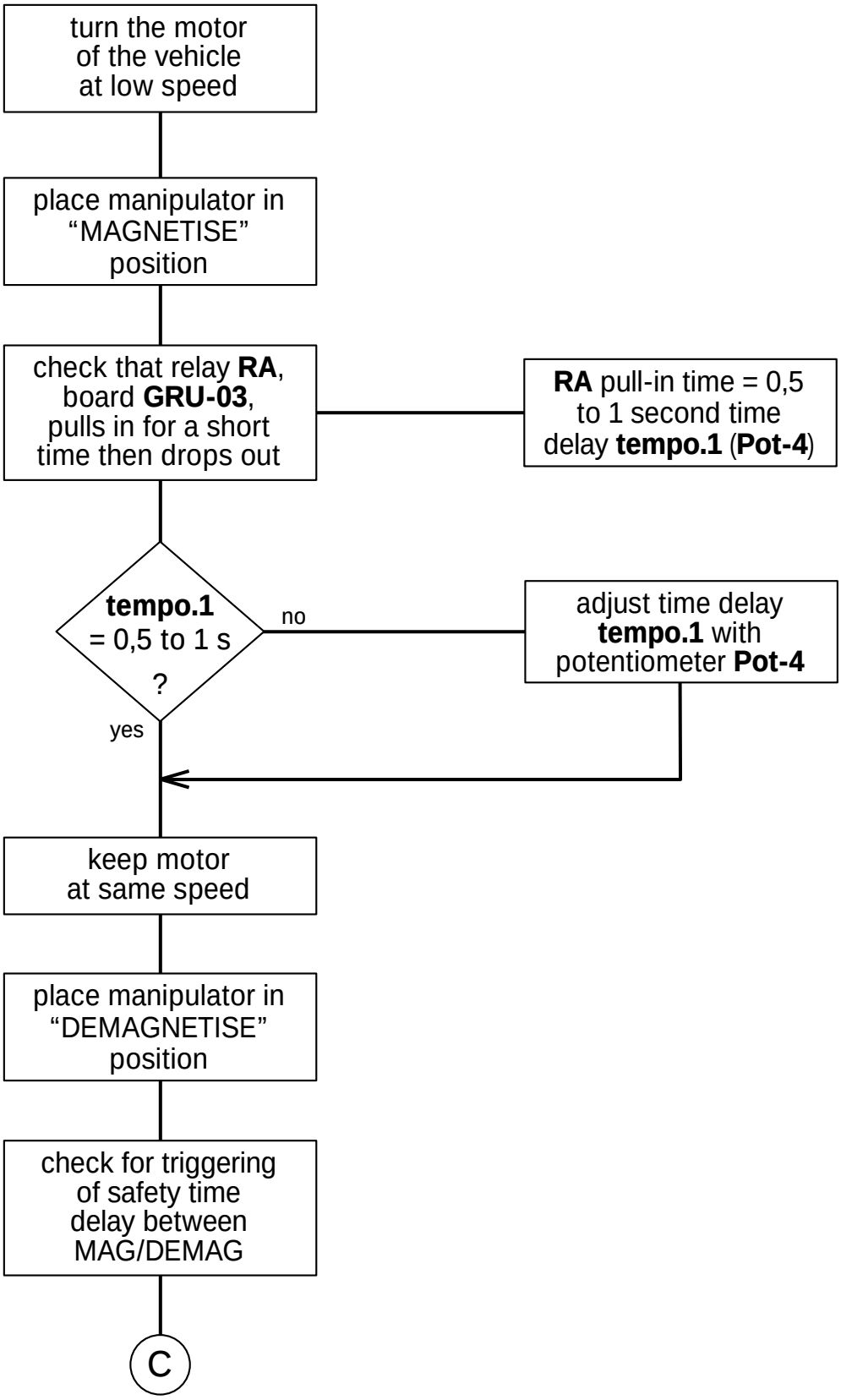
power-up

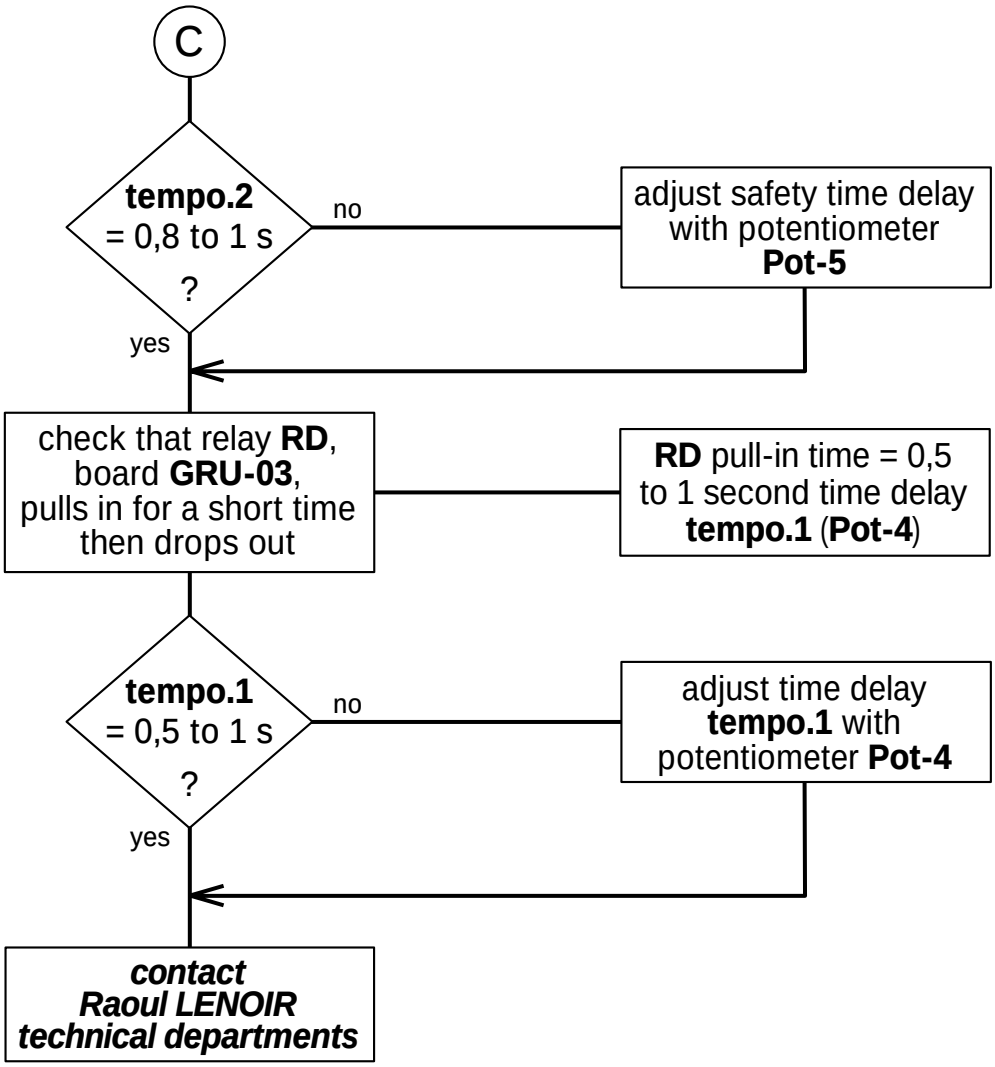

turn vehicle motor at low speed
connect a digital voltmeter, 2 to 5 V DC range, to points **A** and **B** of board **GRU-01**
see diagram in appendix
place power switch in "ON" position
"ON" light comes on
no
A
yes
check voltage on voltmeter
U = ± 0 V ?
no
take a screwdriver with a 2 mm blade
yes
slowly turn potentiometer **Pot-1** to set voltage between points **A** and **B** to a value as near as possible to zero
check on voltmeter, 300 V DC range, that capacitors **C1** and **C2** are charging
A


A
are C1 and C2 charging ?
no
yes
slowly turn potentiometer Pot-2 to left to obtain a charge voltage on C1 and C2
all modifications to the setting of potentiometer Pot-2 implies check of voltage at points A and B as described above
connect a voltmeter, 300 V AC range, to points C and D of board GRU-03
see diagram in appendix
150<U<200 V 50 Hz ?
no
yes
act on potentiometer Pot-3 to set voltage between these 2 values
all modifications to the setting of potentiometer Pot-3 implies check of voltage at points A and B as described above
on voltmeter, 300 V DC range, check that voltage on capacitors C1 and C2 is between 180 and 240 V DC
B


B
180<U
<240 V DC
?
no
yes
slowly turn potentiometer **Pot-2** to obtain a voltage between these 2 values
all modifications to the setting of potentiometer **Pot-2** implies check of voltage at points **A** and **B** as described above
contact Raoul LENOIR technical departments

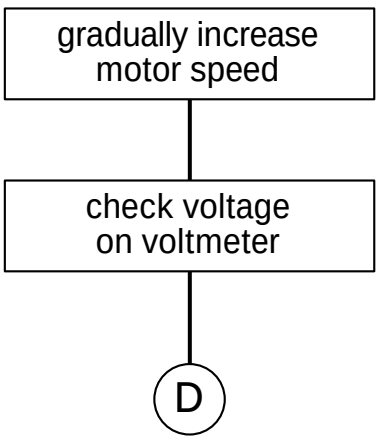
check of magnetise/demagnetise automatic operation

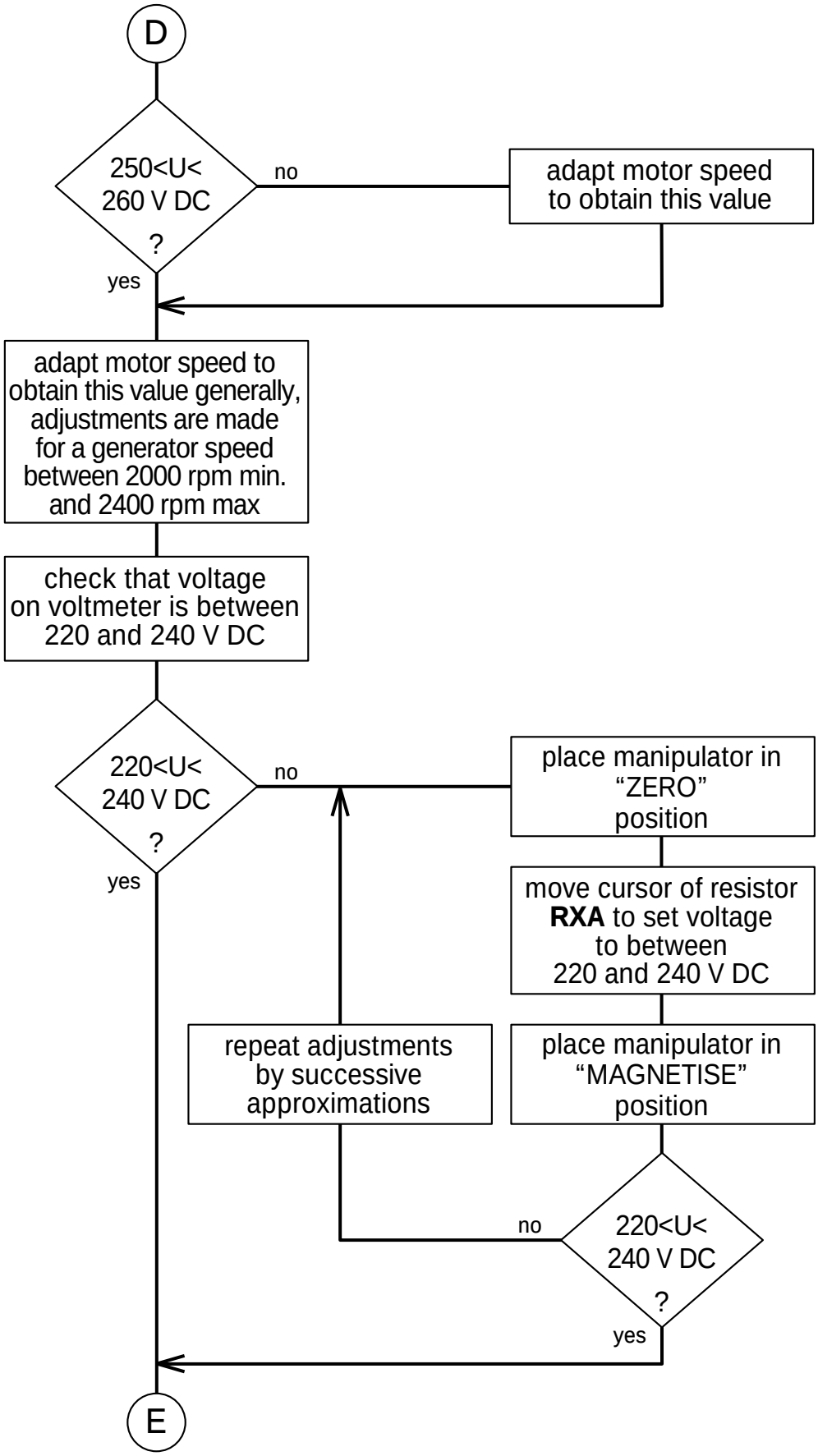


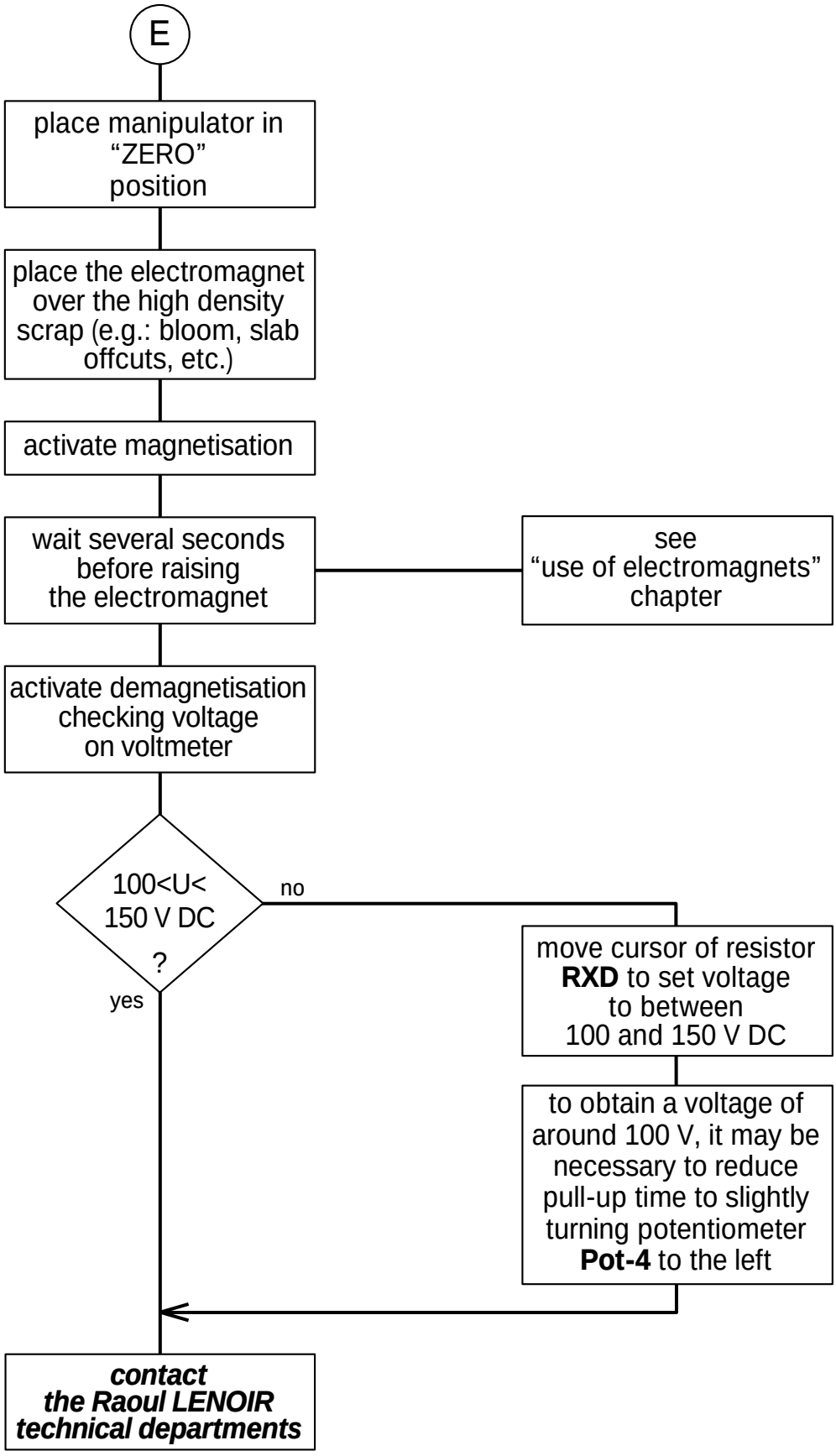


setting magnetise and demagnetise voltages

When the previous checks have been conducted and the electromagnet connected, motor at low speed and unit on, place manipulator in “MAGNETISE” position.




D
250<U< 260 V DC ?
no
adapt motor speed to obtain this value
yes
adapt motor speed to obtain this value generally, adjustments are made for a generator speed between 2000 rpm min. and 2400 rpm max
check that voltage on voltmeter is between 220 and 240 V DC
220<U< 240 V DC ?
no
place manipulator in "ZERO" position
yes
move cursor of resistor **RXA** to set voltage to between 220 and 240 V DC
repeat adjustments by successive approximations
place manipulator in "MAGNETISE" position
220<U< 240 V DC ?
no
yes
E


E
place manipulator in "ZERO" position
place the electromagnet over the high density scrap (e.g.: bloom, slab offcuts, etc.)
activate magnetisation
wait several seconds before raising the electromagnet
see "use of electromagnets" chapter
activate demagnetisation checking voltage on voltmeter
100<U< 150 V DC ?
no
yes
move cursor of resistor **RXD** to set voltage to between 100 and 150 V DC
to obtain a voltage of around 100 V, it may be necessary to reduce pull-up time to slightly turning potentiometer **Pot-4** to the left
contact the Raoul LENOIR technical departments

The adjustment of potentiometer Pot.4 determines the “height” of voltage increase during demagnetisation whereas the value of resistor RXD, acting on the generator excitation current enables the voltage to be maintained.

The manipulator must be held in “DEMAGNETISE” position for the time required to release the parts but not for too long (risk of REMAGNETISATION).

- Do several magnetise/demagnetise operations as described above on scrap of various densities and check that finally set demagnetise voltage enables correct release of raised parts.

use of delayed demagnetisation

To reduce REMAGNETISATION risks, a timer (demagnetise time) provided on board GRU-01can be used.

The time delay starts on pull-up of relay RD and, at the end of this time adjustable with potentiometer Pot.6, the demagnetisation voltage is cut off (effect visible on the voltmeter), even if the manipulator is held in “DEMAGNETISE” position.

With the demagnetisation voltage adjusted as described above, adjust potentiometer Pot.6 by successive approximations making several magnetise and demagnetise operations on scrap of different densities.

Final setting of potentiometer Pot.6 is generally between 2 and 4 seconds.

If you no longer wish to use delayed demagnetisation, turn potentiometer Pot.6 fully to the right to obtain maximum time (around 5 seconds).

adjustment potentiometer function

Pot.1: DC voltage ZERO setting at points A and B of board GRU-01.

Pot.2: self-starting setting of oscillator charging capacitors C1 and C2.

Pot.3: amplitude setting of AC voltage produced by the oscillator and controllable at points C and D of board GRU-03.
Adjust potentiometer Pot.3 to obtain an AC voltage between 150 and 200 V rms and check that DC voltage on capacitors C1 and C2 is between 180 and 240 V DC.

Modify these settings if no charge voltage is obtained on these capacitors or if battery voltage is changed.
If this setting is modified, it must be followed by a check of the voltage at points A and B of board GRU-01.

This setting is practically without effect for 12 V batteries.

Pot.4: setting of pull-up time of relays RA or RD
(generally 0.5 to 1 second).

Pot.5: safety time setting between “MAGNETISE” and “DEMAGNETISE” (in principle, 0.8 to 1 second when turned fully left).
This time delay starts each time manipulator changes to ZERO.

Pot.6: delayed demagnetisation time setting.To be adjusted on high-density scrap (turn fully to the right if you do not wish to use this automatic feature).

use of handling system

The handling system can only be used by competent operators. Before each use, the operator will check for correct operation of the handling system and will conduct the usual checks defined in the maintenance and servicing chapter of these instructions.

preliminary checks

These checks must be conducted before the handling system is used.

⇒ check belt wear,
⇒ check belt tension,
⇒ check alignment of motor pulley and fixed pulley on generator.

power off:

⇒ check general wiring,
⇒ check condition and tightening of connections,
⇒ check electrical connections and connectors,
⇒ check position of battery voltage selector.

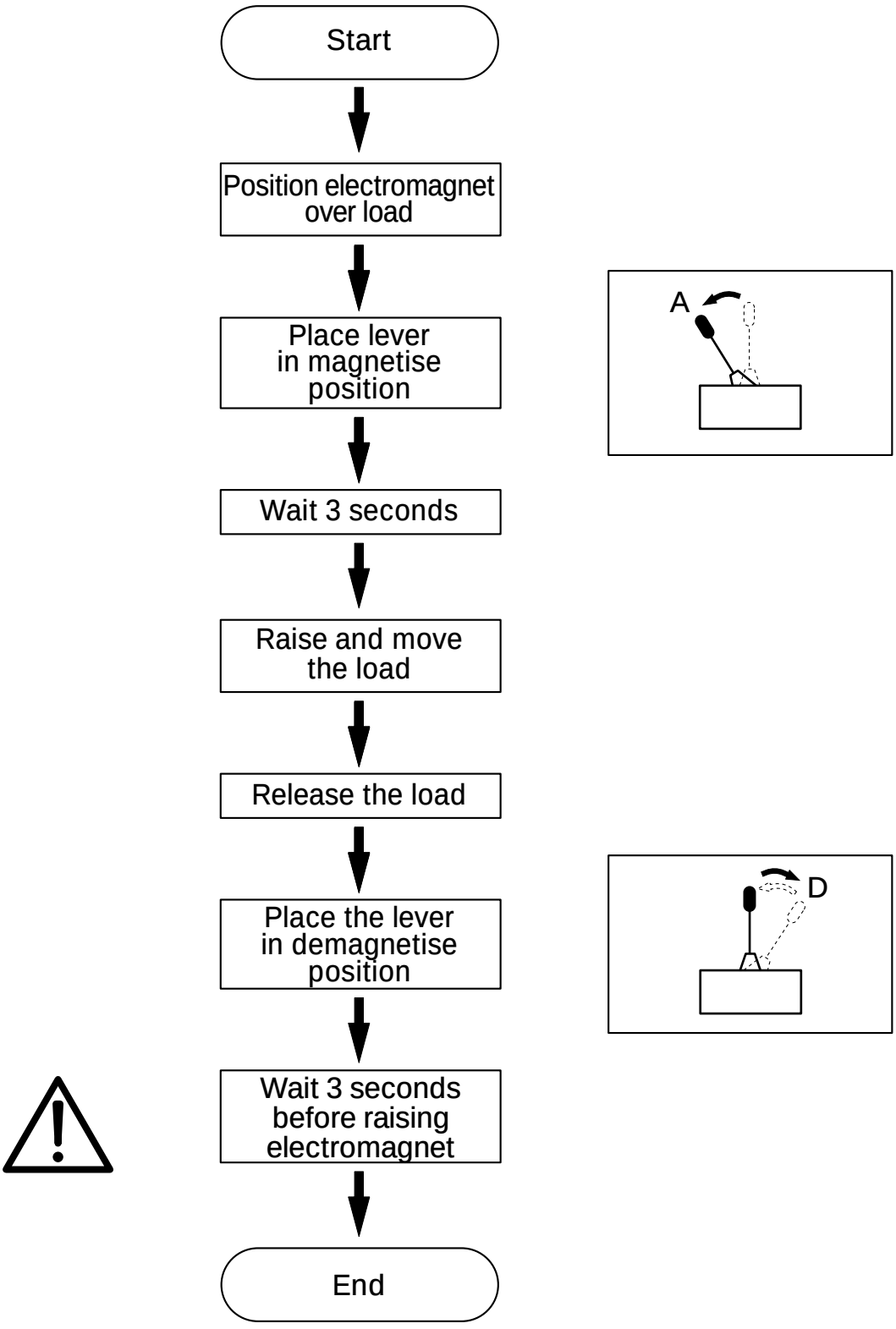
power on:

⇒ check value on voltmeter and battery voltage polarities,
⇒ test all protections.

Inform maintenance department of any malfunction observed.

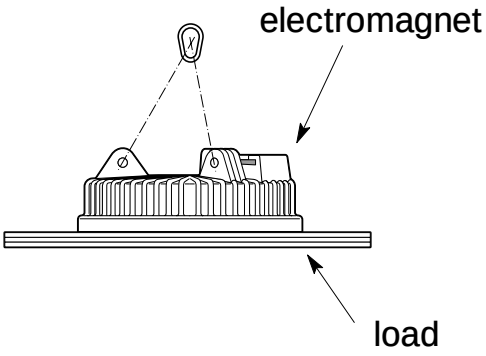
On-site commissioning and adjustments must be performed by qualified personnel.

Use of electromagnets

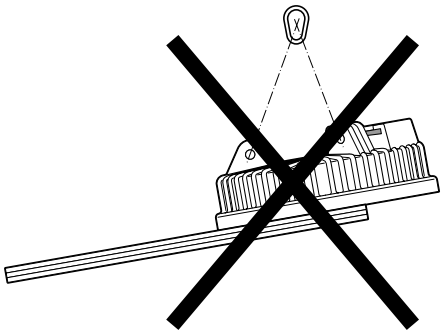


When positioning the electromagnet, make sure that the load is not unbalanced as this may cause it to fall.

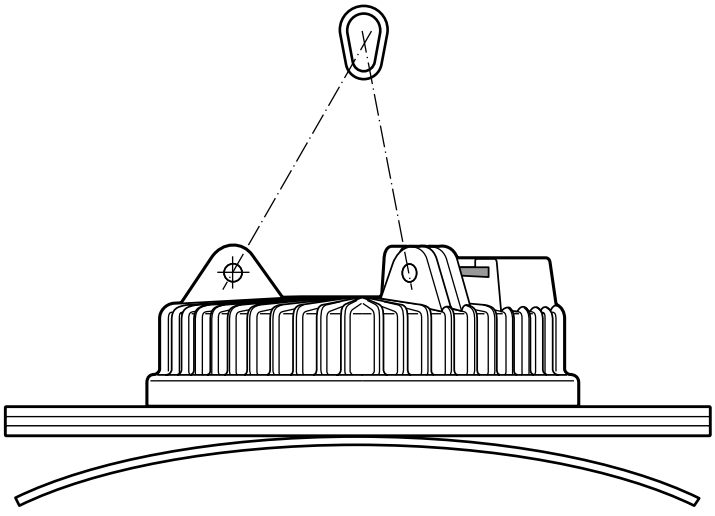
Correct position



Incorrect position



Nobody must be in the electromagnet operating range.



Items which may be insufficiently held must be eliminated.

Caution: hold the lever throughout demagnetisation as, in this position, the manipulator is returned to zero.

Do not exceed the nominal lifting capacities of the electromagnets.

maintenance and servicing

operating principle

Broken down into three main phases:

■ charge of capacitors C1 and C2 (300 mF - 315 V):
- ⇒ the crane battery voltage (12 V or 24 V) is transformed into AC voltage.
- ⇒ the voltage obtained is rectified to charge capacitors C1 and C2.

■ discharge of capacitors into generator inductor:
- ⇒ when the magnetise order is given (by the manipulator), relay RA is excited and enables discharge of C1 and C2 into the inductor.
- ⇒ when the demagnetise order is given (by the manipulator), relay RD is excited and enables discharge of C1 and C2 (in direction opposite to previous discharge).

■ generator self-excitation:
- ⇒ relays RA and RD are excited during an adjustable time (around 1 second), therefore the generator has been preexcited in one direction or the other.
  Then, when RA or RD, drops out, simply self-excite the generator by means of relay RE or transistor from 01/01/88.
- ⇒ with the generator self-excited, the magnetise voltage can be adjusted with resistor RXA (located in the perforated sheet metal cover) and the demagnetise voltage by means of resistor RXD (located in the box itself).

All these operations are performed electronically by boards GRU-01, GRU-02 and GRU-03.

preventive maintenance

servicing of the handling system:

■ check the condition of the cables and, in particular, the cable connecting the generator to the electromagnet (short circuit or break).

A short circuit in this cable will not damage the box.

■ check battery voltage on the box (terminals 5 and 8).

A voltage too low will prevent relays RA, RD or RE from being excited (12 V DC coils).

■ check the generator.

Take note that a voltage can only be measured on the armature when the manipulator is in magnetise or demagnetise position.

To check for good condition of the generator without the CSD box:

⇒ disconnect the wires leading to the terminal strip.

⇒ self-excite the generator: there is a permanent bridge between the armature and the inductor (copper terminal strip). Simply connect the two remaining terminals.

⇒ run the crane motor at moderate speed and check the voltage on the armature.

⇒ if no voltage is obtained, check inside the generator (brushes, collector, pole pieces, etc.).

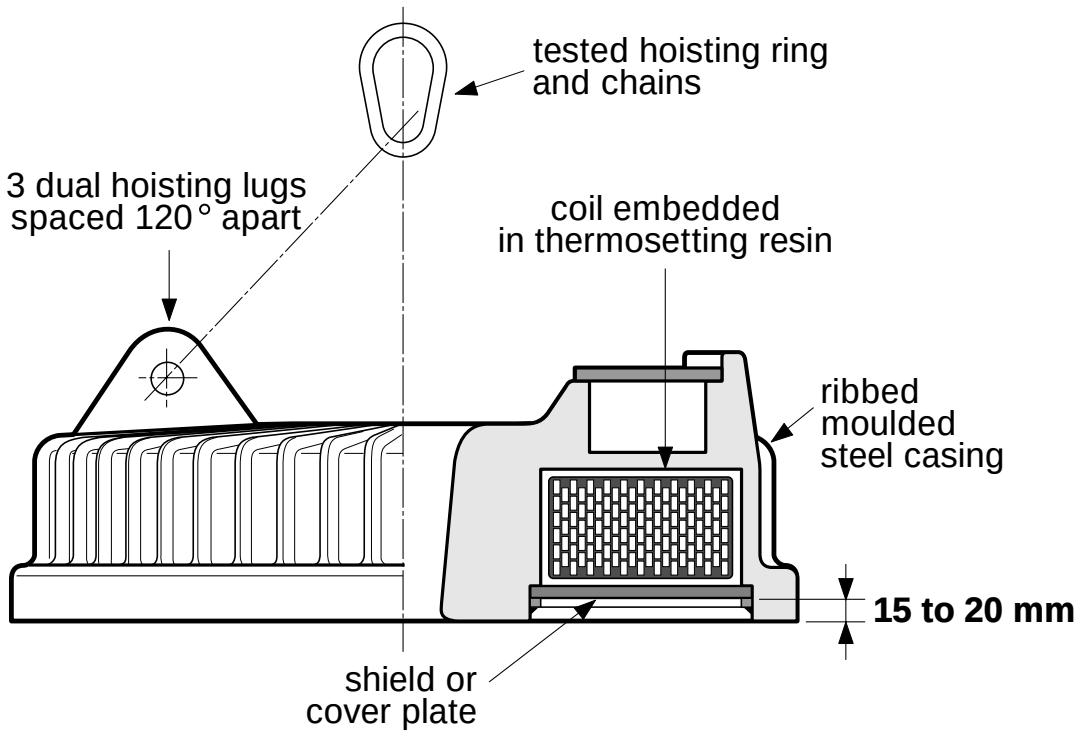
electromagnet maintenance:

■ monthly:

- check tightening of mechanical and electrical connections,
- check condition of power supply cables,
- check condition of connections,
- check tightness of terminal box.

■ ***three-monthly:***

- check wear of electromagnet poles.



■ ***yearly:***

- check the generator (wear of brushes and collector).
- check the manipulator.
- check wear of axles and suspension chains.
- check the insulation of the electromagnet:
  ⇒ disconnect the electromagnet,
  ⇒ check the insulation of the electromagnet coil with an ohmmeter.

The electromagnet must not be in contact with humidity.

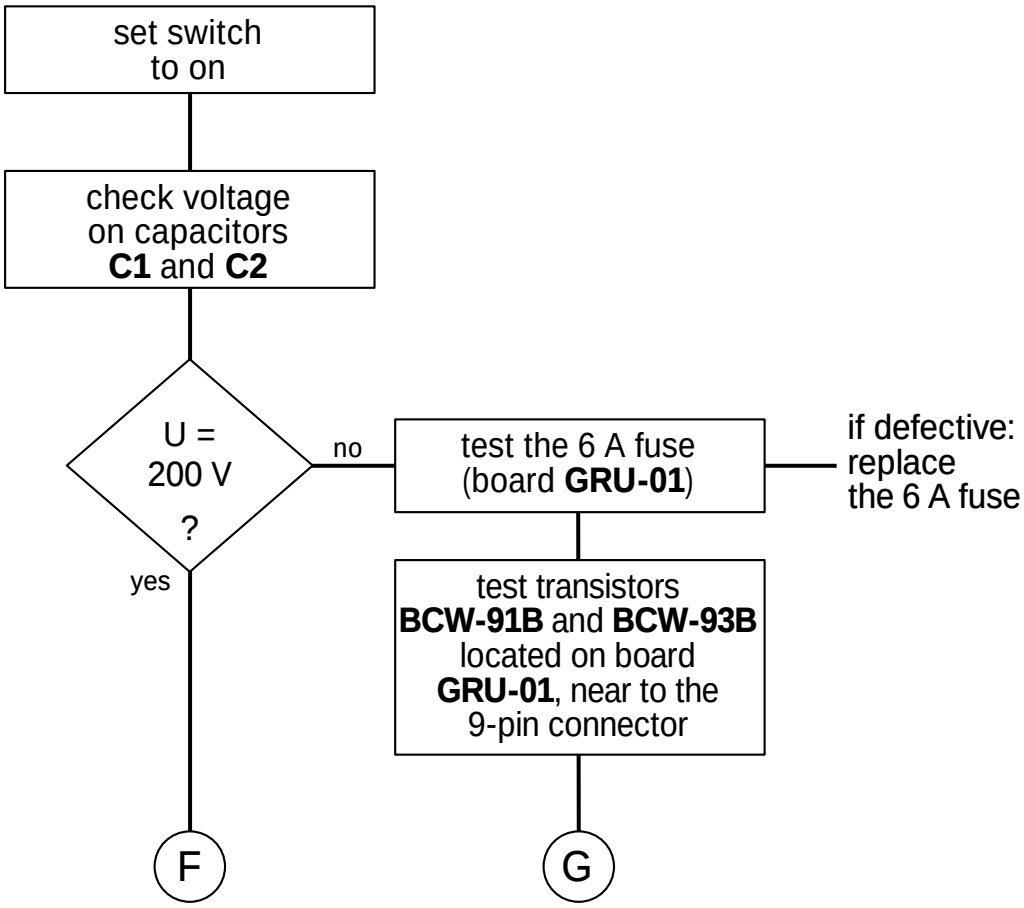
■ ***practical advice:***

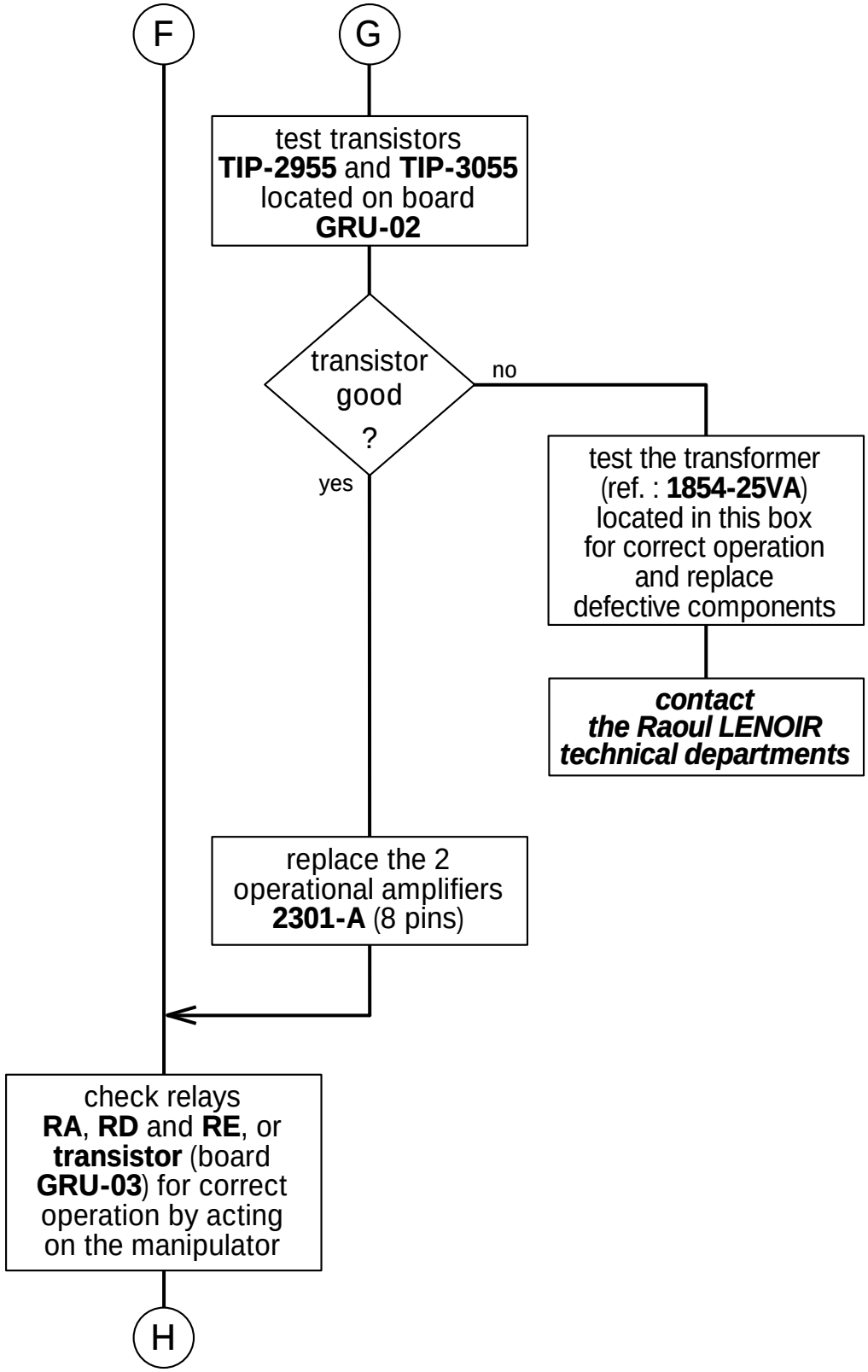
- do not let your electromagnet fall with force onto the load as this may indent the shield which protects the coil or cause premature wear of the casing.
- when the electromagnet is not in use, it must be placed in a sheltered location and insulated from the ground.
- always use the recommended suspension chains (in case of wear, change them before they rupture and cause an accident).
- the most fragile part of the electromagnet is the power supply cable: protect it against crushing over a length of around 2 metres with strong rubber tubing.

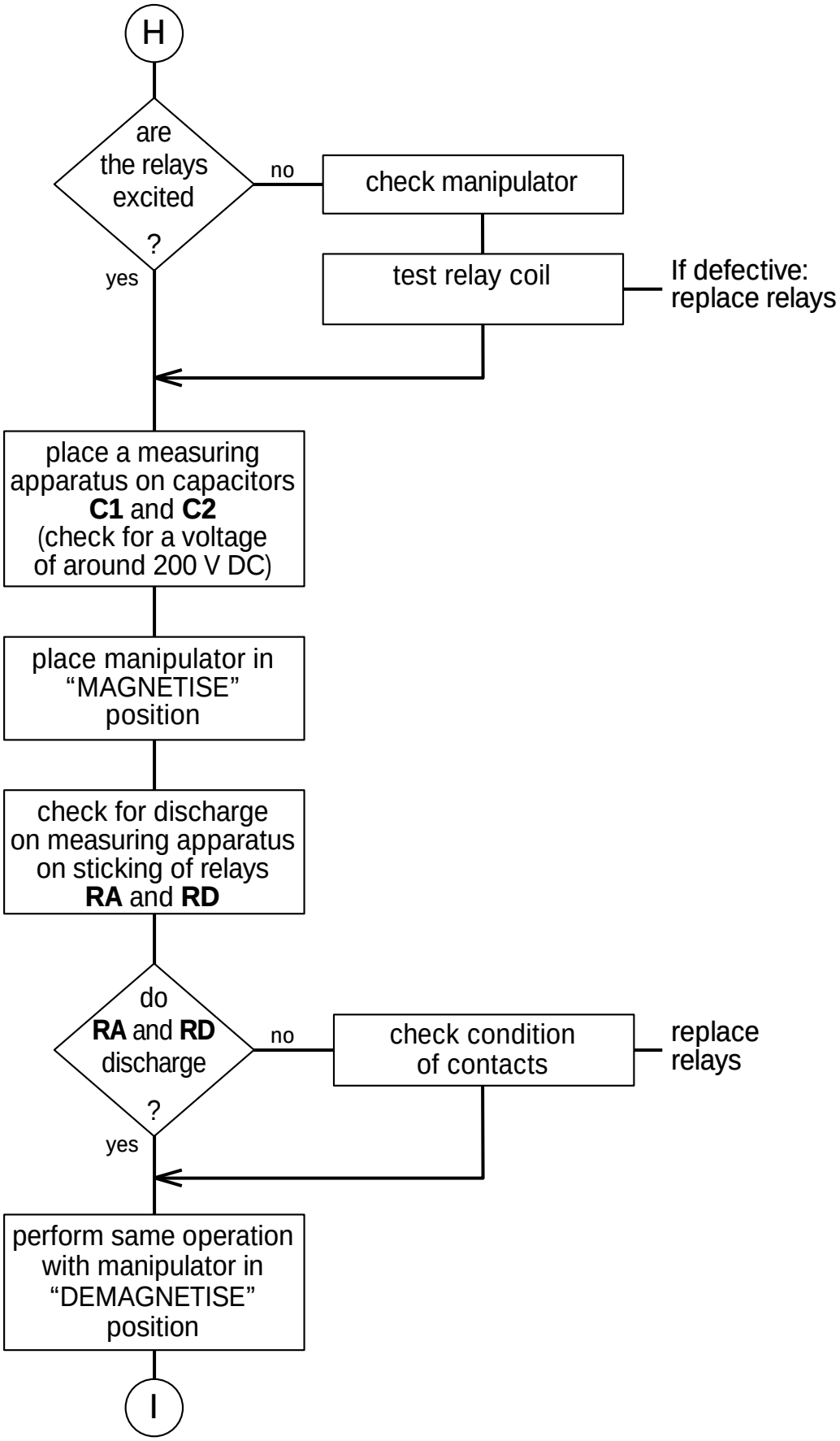
check of CSD box

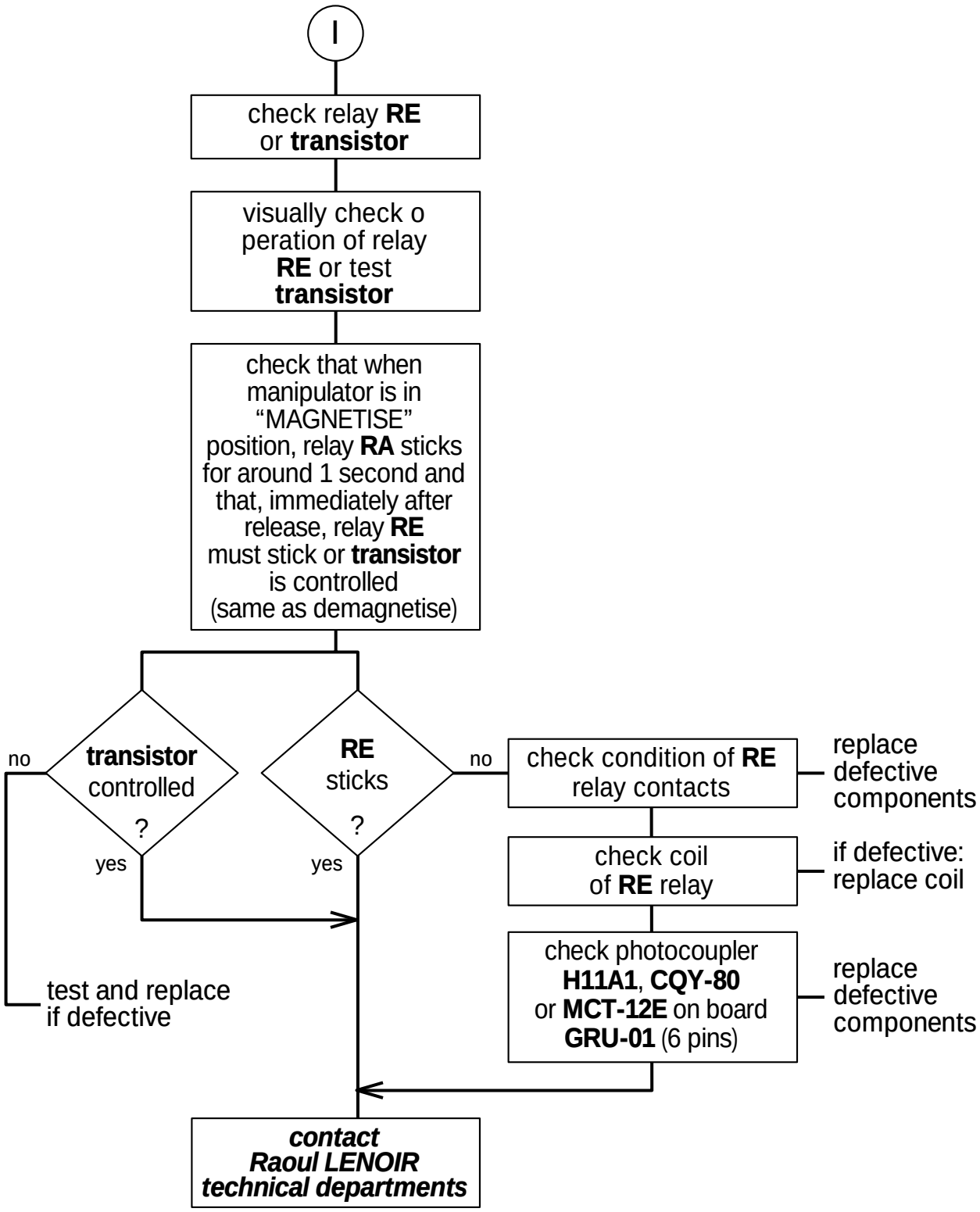
As boards GRU-01, GRU-02 and GRU-03, are the brain of the device, a standard replacement can be made.

For board troubleshooting, do not systematically change potentiometer settings.




F
G
test transistors **TIP-2955** and **TIP-3055** located on board **GRU-02**
transistor good ?
no
yes
test the transformer (ref. : **1854-25VA**) located in this box for correct operation and replace defective components
contact the Raoul LENOIR technical departments
replace the 2 operational amplifiers **2301-A** (8 pins)
check relays **RA**, **RD** and **RE**, or **transistor** (board **GRU-03**) for correct operation by acting on the manipulator
H


H
are the relays excited ?
no
check manipulator
test relay coil
If defective: replace relays
yes
place a measuring apparatus on capacitors **C1** and **C2** (check for a voltage of around 200 V DC)
place manipulator in "MAGNETISE" position
check for discharge on measuring apparatus on sticking of relays **RA** and **RD**
do **RA** and **RD** discharge ?
no
check condition of contacts
replace relays
yes
perform same operation with manipulator in "DEMAGNETISE" position
I

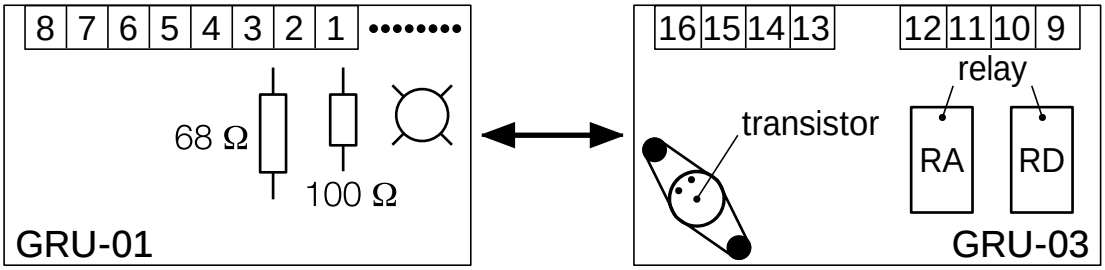

I
check relay **RE** or **transistor**
visually check o peration of relay **RE** or test **transistor**
check that when manipulator is in "MAGNETISE" position, relay **RA** sticks for around 1 second and that, immediately after release, relay **RE** must stick or **transistor** is controlled (same as demagnetise)
transistor controlled ?
no
yes
test and replace if defective
RE sticks ?
no
yes
check condition of **RE** relay contacts
replace defective components
check coil of **RE** relay
if defective: replace coil
check photocoupler **H11A1**, **CQY-80** or **MCT-12E** on board **GRU-01** (6 pins)
replace defective components
contact Raoul LENOIR technical departments

replacing boards

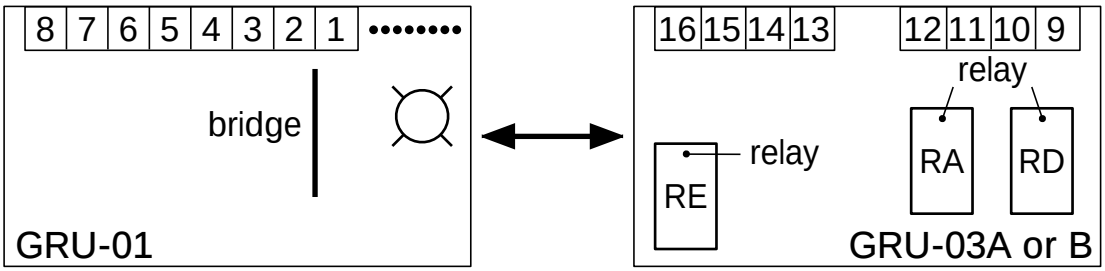
When replacing a board in the CSD box, it is very important to distinguish between the boards: GRU-01, GRU-02 and GRU-03 or GRU-03A, or GRU-03B.

These references are engraved on the board, copper side.

- from 1978 to 1982: board GRU-03 includes 2 relays and 1 transistor.
- one board GRU-03 must be associated with a board GRU-01 equipped with 2 resistors (68 Ω - 3 W and 100 Ω - 0,5 W).



- from 1983 to 1988: boards GRU-03A and GRU-03B include 3 relays.
- a board GRU-03A or GRU-03B must be associated with a board GRU-01 on which the 68 Ω - 3 W resistor has been replaced by a bridge and the 100 Ω - 0,5 W resistor has been removed.



All disagreements between these boards will lead either to the destruction of the transistor (GRU-03) or relay RE (GRU-03A or GRU-03B) will not work.

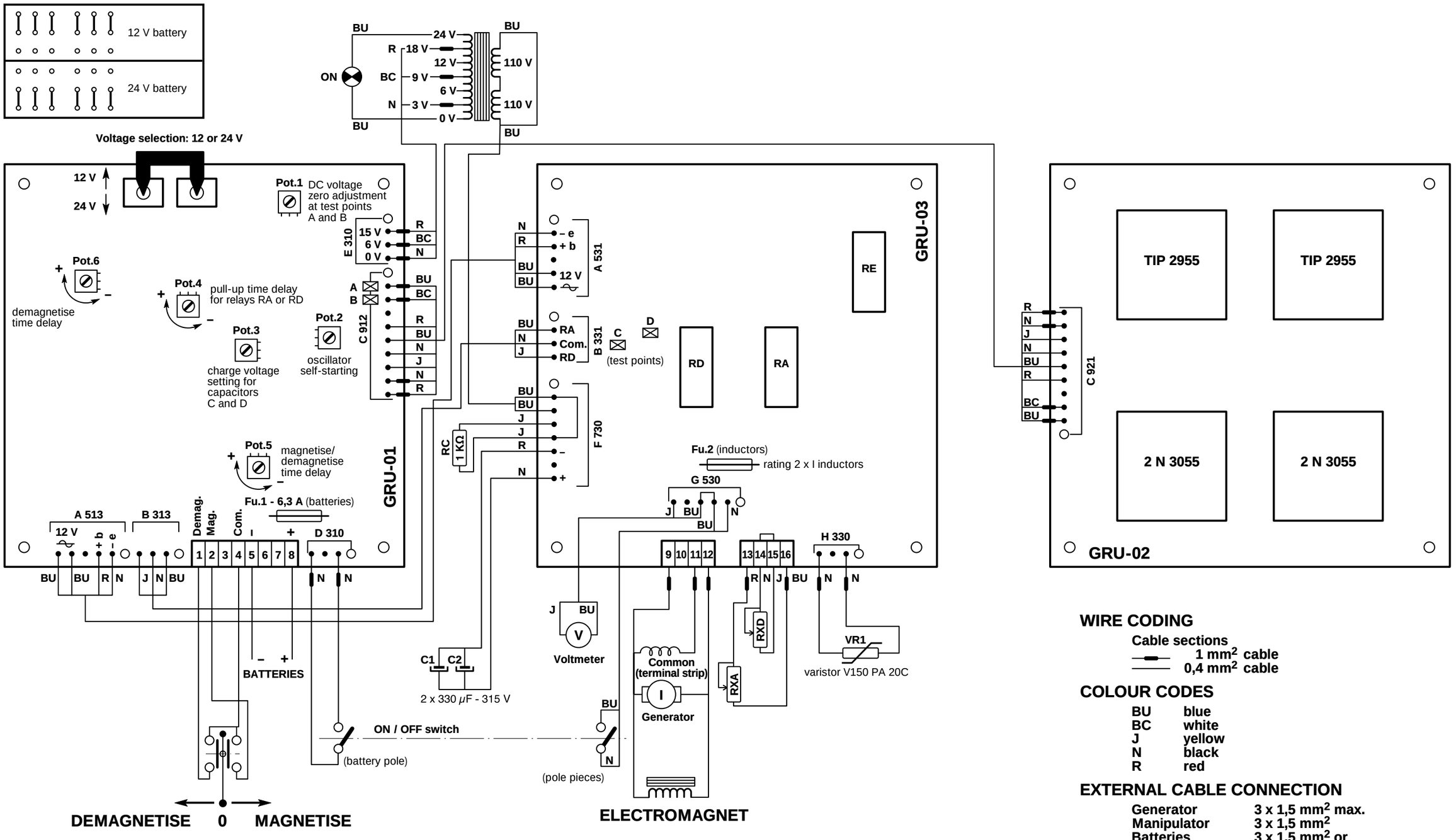
- modification on 01/88:
  - boards GRU-01 and GRU-03 become GRU-01N and GRU-03N (board GRU-03N includes 2 relays and 1 transistor CBU-5081).
  - a GRU-01N/02/03N set can replace in full a GRU-01/02/03 or GRU-01/02/03 A or B set and vice-versa.
  - mixing these references will cause the CSD box to malfunction.

Wiring diagram of modules GRU-01, GRU-02 and GRU-03

Instructions for use

E 9802

N.B. : from December 1993, selectors have been replaced by soldered straps.



WIRE CODING

Cable sections

- 1 mm² cable
- 0,4 mm² cable

COLOUR CODES

BU	blue
BC	white
J	yellow
N	black
R	red

EXTERNAL CABLE CONNECTION

Generator	3 x 1,5 mm² max.
Manipulator	3 x 1,5 mm²
Batteries	3 x 1,5 mm² or 2 x 1,5 mm² max.

USE 1,5 mm² CABLES MAX.

Ets Raoul LENOIR

Zone Industrielle du Béarn - 54400 COSNES & ROMAIN (FRANCE) - **phone**: +33 (0)3 82 25 23 00 - **fax**: +33 (0)3 82 24 59 19