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SAFETY INSTRUCTIONS FOR EPA INJECTION AND EJECTION KICKERS

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1. INTRODUCTION

The EPA injection kickers provide the fast local orbit bump for injection of e^+ or e^- from the LIL linac to the EPA ring. The EPA ejection kickers are used to eject EPA bunches from the EPA ring toward the PS.

Section 4 to 6 of these instructions concern isolation of the EPA kicker system from all primary 3 phase supplies. Isolation at this level removes risk of high voltage and low voltage contact and permits access to the equipment to all categories of personnel.

Section 7 defines the procedures necessary to remove risk of HV contact when carrying out repair work on certain parts of the system with other parts still energized.

2. DESCRIPTION OF THE EPA KICKERS SYSTEM

A simplified block schematic is shown in Figure 1. The system comprises high and low voltage equipment in building 2002 (EB2), high voltage equipment in sections 11, 31, 49, 51, 71 and 91 of the EPA ring and high and low voltage transmission cables between these different locations.

Figures 2a) and 2b) are simplified plan views of the kicker equipment in building 2002 and in the EPA ring showing the physical location of the parts which are relevant to these safety instructions.

The 3 phase supplies to the EPA kickers system are obtained from the fused switchboard labeled "BT16-2-5", equipped with switches which may be padlocked in the "OFF" position. The connection and labeling of the 3 phase switched supplies is as shown in Figure 4.

The five injection (INJ) kicker generators consist each of one double main switch (MS) tank, one dump switch (DS) tank, and one HV transformer assembly as shown schematically in Figure 3a. Between these items are connected the red HV charging and pulse forming network (PFN) cables, and the cables supplying low voltage from the two racks associated with each generator. The MS of each injection generator is connected to the appropriate EPA ring magnet or to the local dummy load via four black HV transmission cables.

The three ejection (EJ) kicker generators consist each of four double series switch tanks and four transformer assemblies as shown schematically in Figure 3b. These items are linked together via red HV charging and PFN cables and are connected via low voltage cabling to the three control racks associated with each generator. Each ejection generator is connected via black HV transmission cables to either the local dummy load or to the appropriate EPA ring ejection magnet.

3. GENERAL PRINCIPLES TO BE OBSERVED FOR SAFE WORKING ON THE EPA KICKER SYSTEM

Because of the large number of interconnections which exist between different, sometimes remote, parts of the system and the very high voltages (up to 40 kV) which are present, certain principles must be laid down in order to guarantee safe working conditions during repair, modification or maintenance. The application of these rules may result in more equipment being isolated than is strictly necessary for access to a particular system but the principles must nevertheless be rigourously respected. The principles are as follows :

a) No work may be peformed on any ring installed equipment unless all pulse generators INJ and EJ, and the oil system have been isolated.

b) No work may be performed on any pulse generator until the generator has been isolated from the 3 phase electrical supply.

c) No work may be performed on the complete EPA kicker system until isolation has been made at the main 3 phase supply switchboard in building 2002.

d) In the absence of a complete isolation of the EPA kicker system according to c) above, individual electronic chassis, which are in some cases supplied with power from remote parts of the system, must be considered live until isolated by removal of all ingoing and outgoing cable connectors. Particular attention should be paid to the Trigger Pulse Amplifier chassis in which exist voltages of up to 4000 V.

e) The system contains a certain number of electronically operated HT and LT interlocks which are intended to prevent accidents involving personnel or damage to equipment in the event of faulty operation.

Under no circumstances are these interlocks to be relied upon to provide a safe environment for maintenance or repair work.

4. SAFE WORKING ON EPA KICKER EQUIPMENT INSTALLED IN BUILDING 2002

To work safely at any level on any or all of this equipment proceed as follows :

a) Put the main circuit breaker marked "AL-CP" on the main switchboard to "OFF" and padlock the breaker in this position with the padlock marked "AL-CP" provided for this purpose. Personally retain the padlock key.

b) Isolate all 3 phase circuits numbered 1 to 16 inclusive.

c) Affix a notice to the switchboard, giving the name of the person retaining the above mentionned key. The person holding the key obtained from a) above automatically assumes responsibility for the safety of the personnel involved in the work on the EPA kickers system.

5. SAFE WORKING ON THE EPA RING INSTALLED EQUIPMENT

To work safely on any or all of the EPA Ring installed equipment of the EPA kicker system.

Isolate and padlock in the "OFF" position the 3 phase switches marked INJ.1, INJ.2, INJ.3, INJ.4, INJ.5, EJ 1, EJ 2, EJ 3 and Oil and personally retain the keys. Affix a notice to the switchboard giving the name of the person holding the keys.

The keys must remain in possession of the person executing the work in the ring and must only be released when the work is terminated and the equipment safe to re-energize.

Note that the CERN standard "Danger High Voltage" warning signs will normally be illuminated when the EPA Oil system is energized. Extinction of the signs should however not be taken to mean that the ring equipment has been made safe and is not a substitute for possession of the key to the padlocked "Oil" isolator.

6. SIMULTANEOUS WORKING ON EQUIPMENT IN BOTH EPA RING AND BUILDING 2002

Should it be necessary for several persons to work at the same time on EPA kicker equipment in the EPA ring and in building 2002 the following precautions shall be taken :

a) The procedure laid down in Section 5 will be followed by the persons working on ring equipment.

b) The procedure defined in 4a) will be carried out by the person working in building 2002.

The person holding the keys from a) will be responsible for the safety of the persons working in the EPA ring. The person holding the key "AL-CP" will be responsible for those working on EPA kicker equipment in building 2002. Only when work in both ring and building 2002 is completed and the equipment safe to re-energize will power be reapplied to the system.

7. SAFE WORKING WITH THE SYSTEM PARTLY DE-ENERGIZED

Under certain circumstances it may be necessary that repair work be carried out on one or more generators with the other generators pulsing normally. In this case a risk of low voltages contact exists and the work must be carried out by a qualified operative in the presence of a second person as defined in the CERN Safety regulations. In order to eliminate the risk of high voltage contact and to minimize the risk of low voltage contact the following procedure must be strictly observed.

a) Isolate the generator to be worked on at the 3 phase supply switchboard and padlock the switch in the "OFF" position. Retain the padlock key until the generator is safe to re-energize.

b) Verify by inspection of the supply racks pertaining to the generator to be worked on that the primary capacitors are discharged.

c) Disconnect and cap off the HV transformer primary supply leads at the LV units in the appropriate rack.

Work on the generator thus de-energized may now proceed. If during repair work any parts normally at high tension become exposed these should be earthed, first with the earthing rod provided and then with permanent earth leads. The earth side of these leads should always be connected before the other end is attached to the component to be made safe.

Distribution :

Kickers Section, BT Group
D.C. Fiander

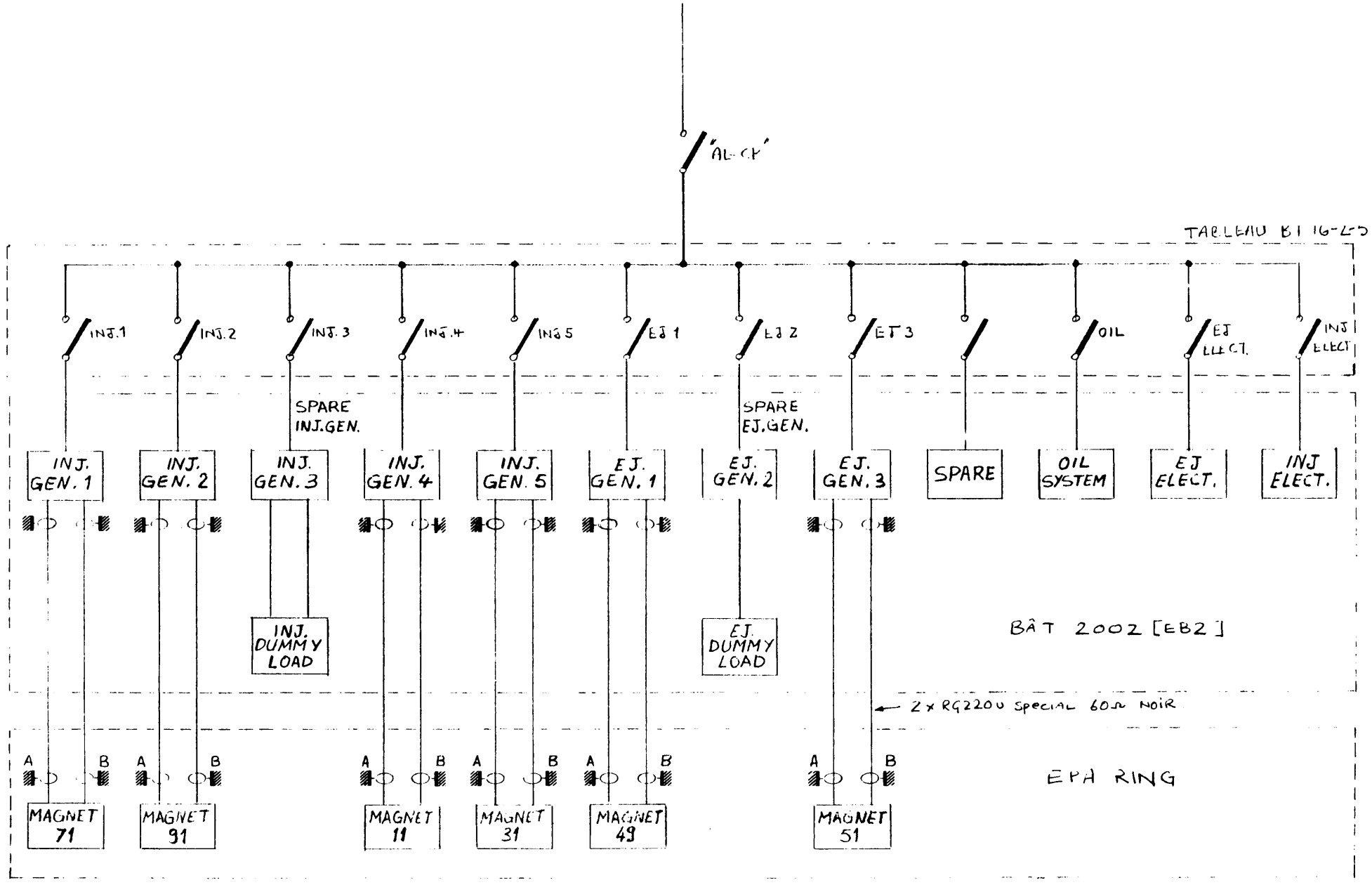

Fig.1 EPA KICKER SYSTEM SIMPLIFIED SCHEMATIC.

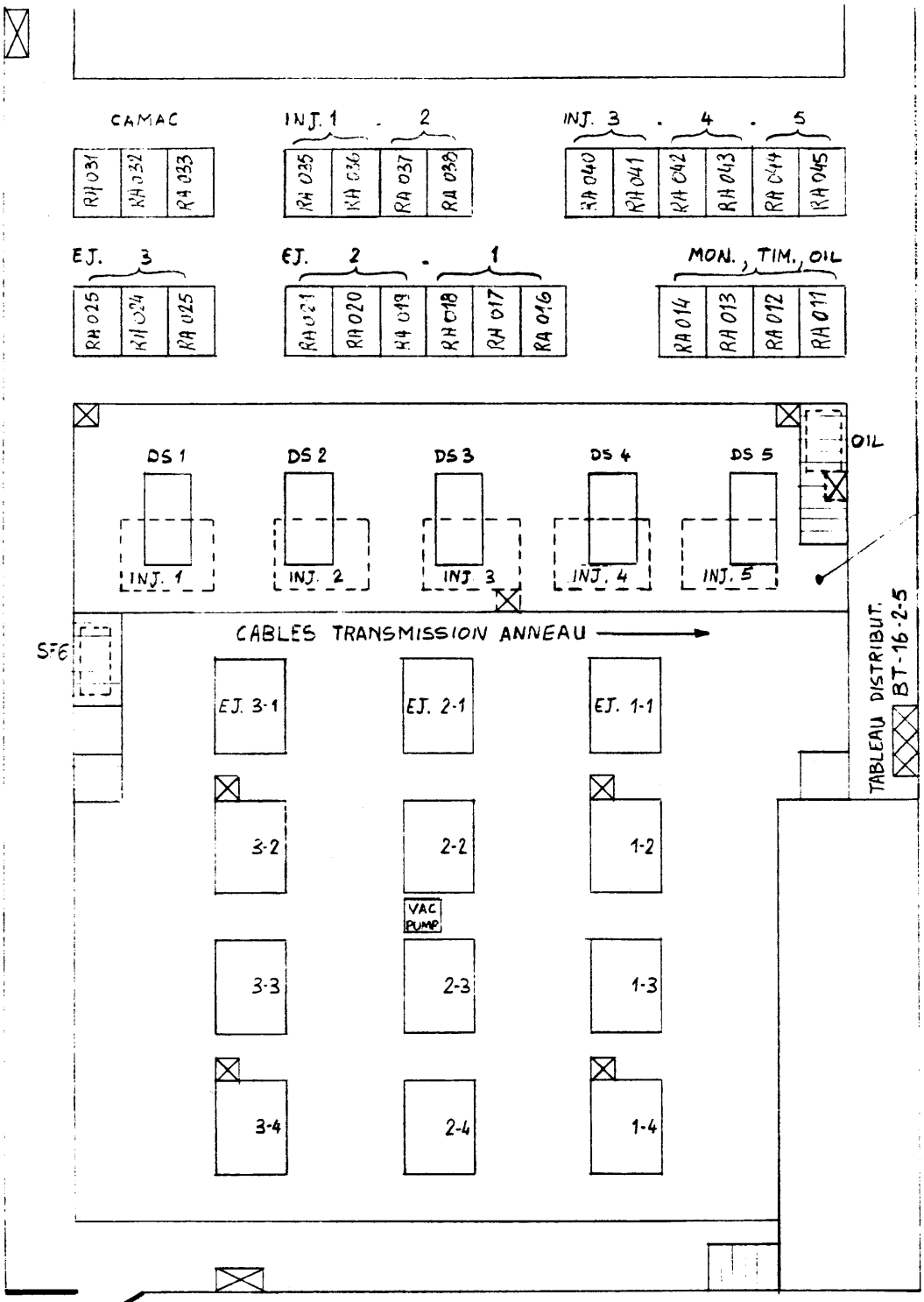

FIG 2a PLAN VIEW, EPA KICKERS BAT 2002

⊠ ARRÊT D'URGENCE EQUIPEMENTS

⊠ ARRÊT D'URGENCE GENERAL

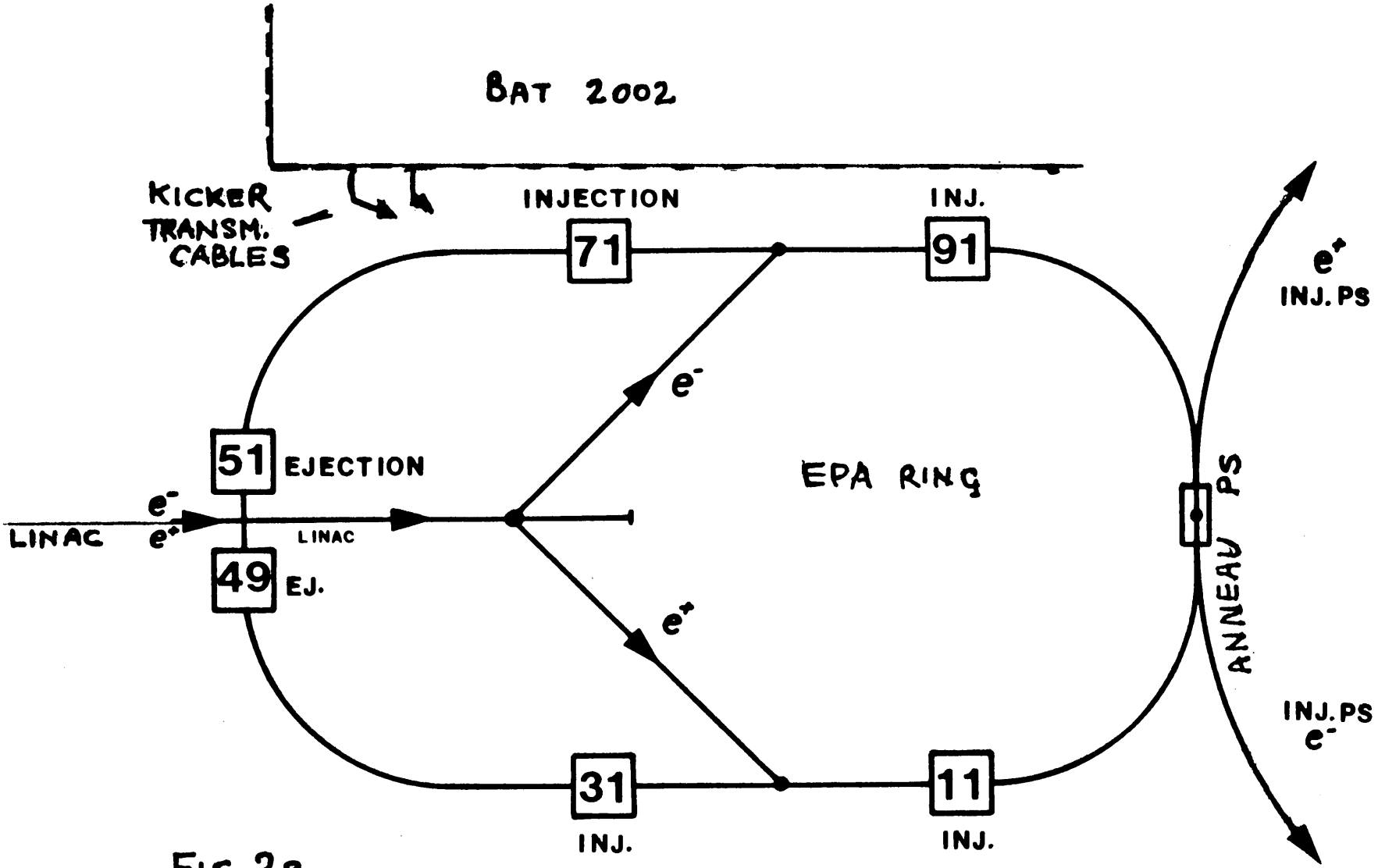
BAT 2002
KICKER TRANSM. CABLES
INJECTION
INJ.
71
91
e+ INJ. PS
e-
51 EJECTION
EPA RING
e-
LINAC
e+
LINAC
49 EJ.
e+
ANNEAU PS
INJ. PS e-
31
11
INJ.
INJ.

FIG 2B

EPA Injection

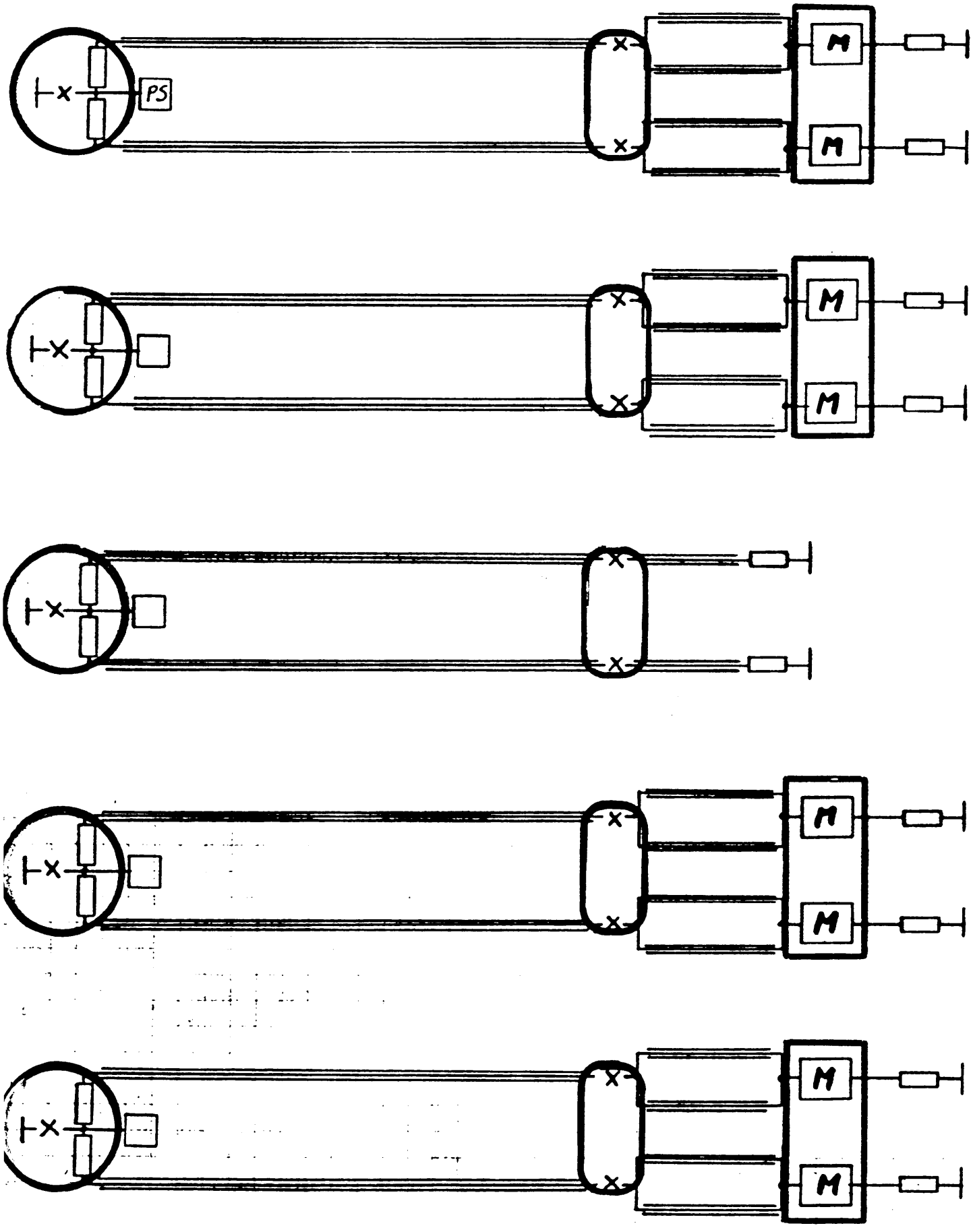

Figure 3a.

EPA Ejection

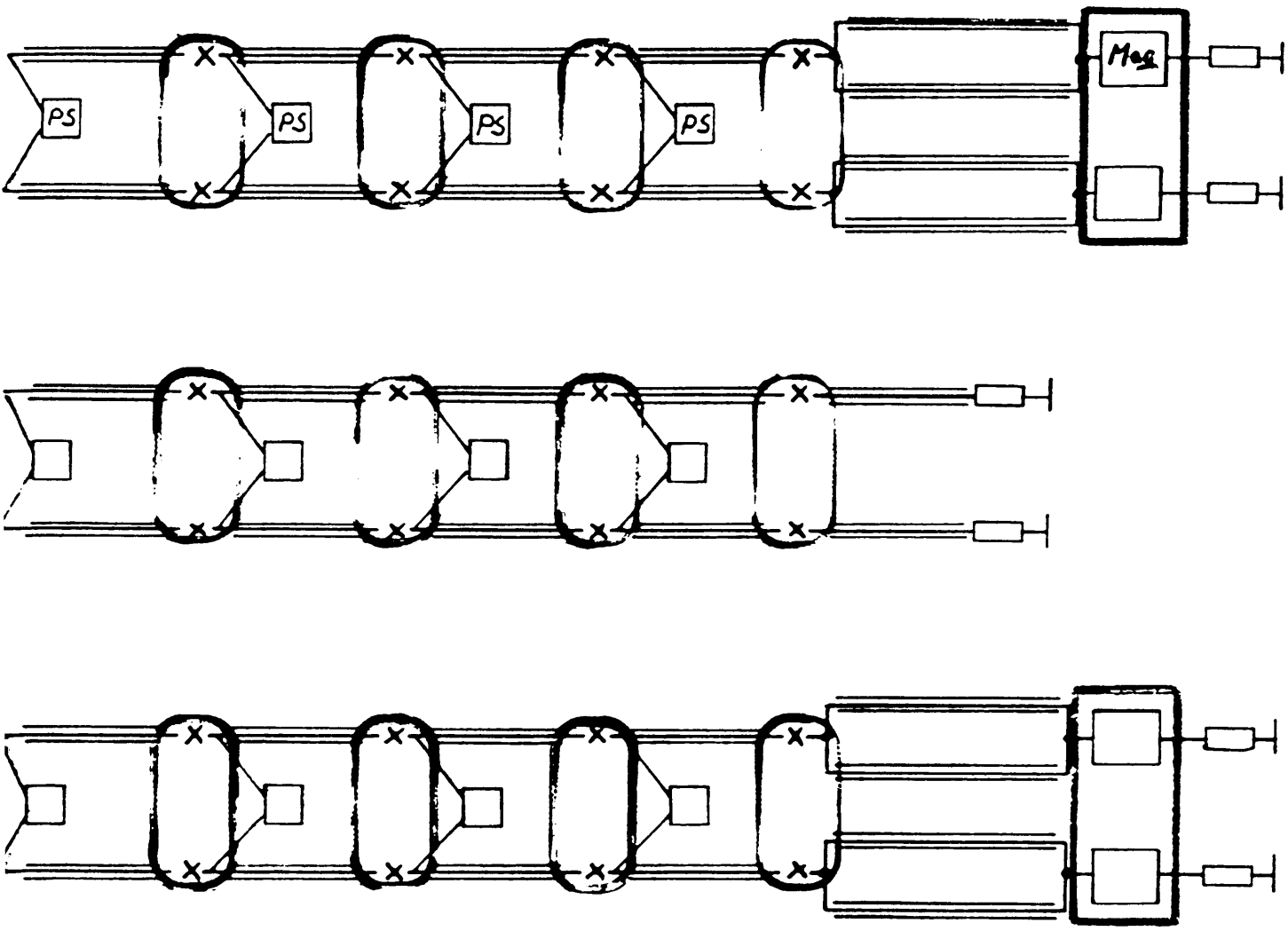

Figure 3b.

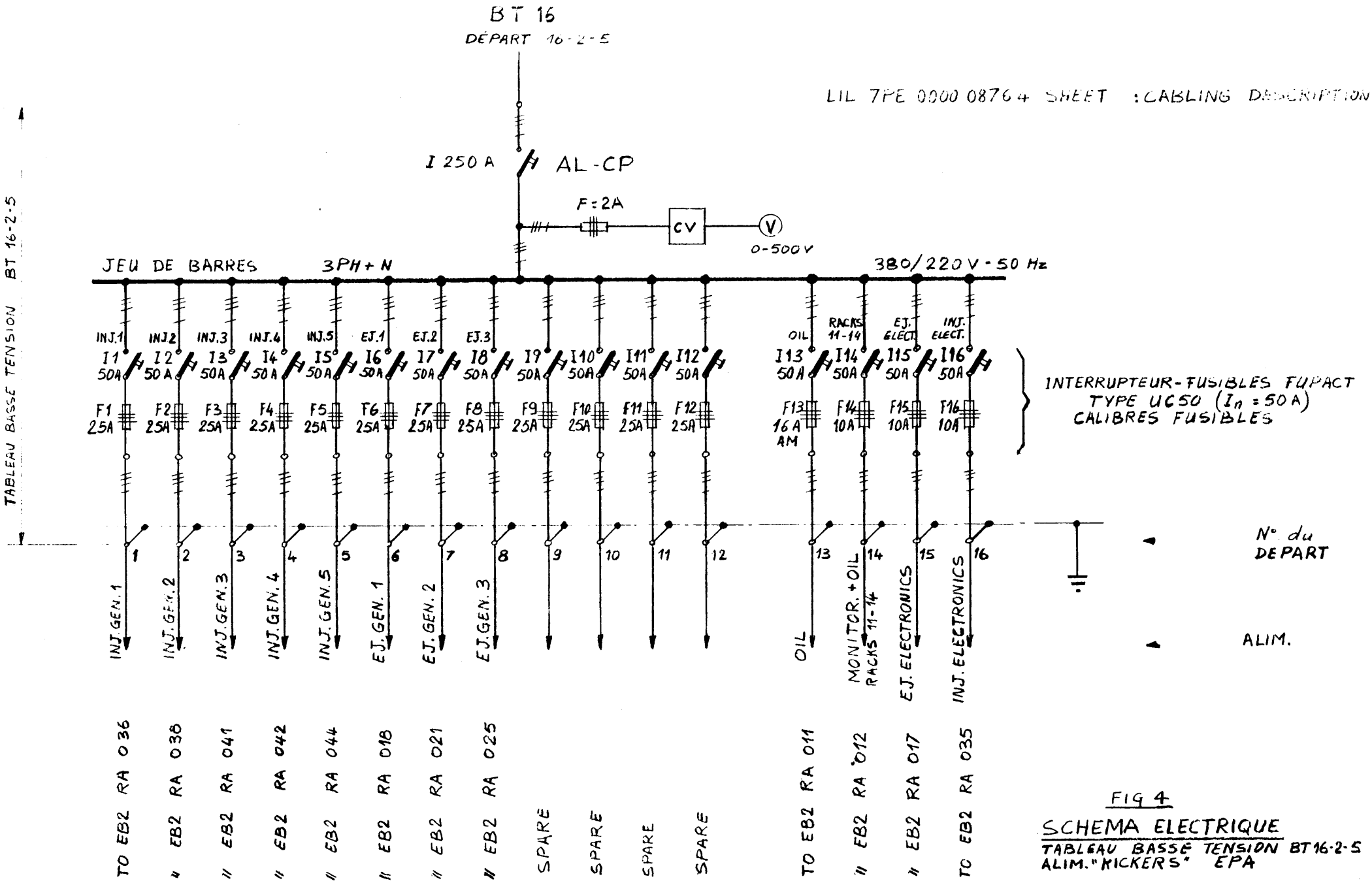

FIG 4

SCHEMA ELECTRIQUE

TABLEAU BASSE TENSION BT 16-2-5
ALIM. "KICKERS" EPA