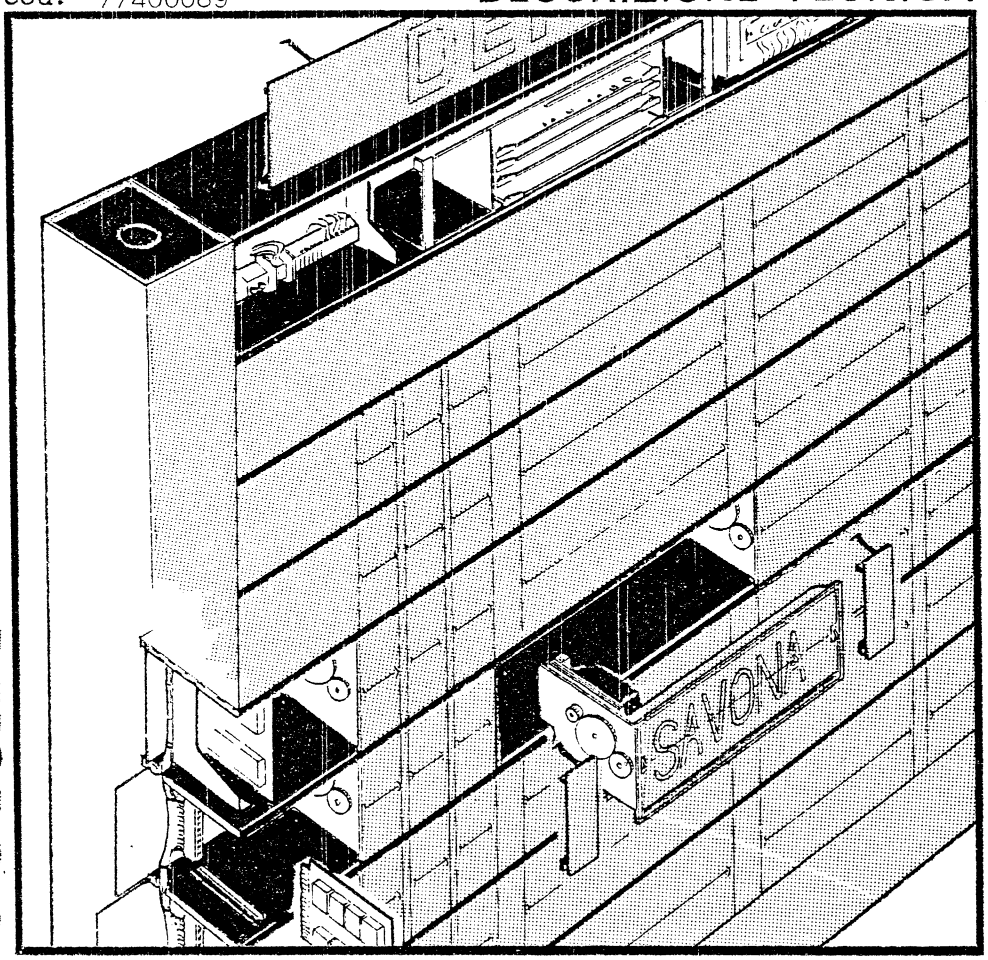
Series 90 Display
Informations System

Boards

TECHNICAL DESCRIPTION
DESCRIZIONE TECNICA

cod: 77400089

solari & c./udine



READERS

This description has didactic purposes. It completes but does not replace the manufacturer's drawings and diagrams. It addresses all who wishes to know the performances of the module in question, its internal organization and its operation principles.

CONTENTS

The first section describes the basical components and main optional services of any SBC/BOARD.
The second section delivers instructions for installation and troubleshooting of SBC/BOARDS. The repair always is considerated as faulty module or card replacement:

BIBLIOGRAPHY

- 77400062 CE FLAP UNIT DESCRIPTION
- 77400038 SINGLE BOARD CONTROLLER DESCRIPTION

REVISIONS

NOVEMBER 1984 - Second issue

REMARKS

Solari & C./Udine policy, is one of continuous research and development. The right is reserved to alter specifications and detail at any time without prior notice.
Specifications of Solari modules shall be mutually agreed between Customer and Factory at the order confirmation time.

CONTENTS

1. GENERAL DESCRIPTION

1.1. Purpose of the handbook

The purpose of this handbook is to describe the operation of the information visualizing units, hereafter called BOARD and INDICATORS, based upon the use of silk-screened flap units controlled by a microprocessing device called S.B.C. (Single Board Controller).

For a detailed description of the flap units, refer to Solari "C.E. Flap Unit - Technical Description" cod. 77400062.

For a detailed description of the S.B.C. see Solari "Single Board Controller - Technical Description" cod. 77400038.

1.2. Definition of BOARDS and INDICATORS

A BOARD is meant as a visualizing unit which, variable as it is in its dimensiones and composition, always consists of the following standard components:

- a mechanical carrying structure suitable for containing the flap units and the electromechanical and electronic components necessary for their operation;
- a number of flap units for visualizing the information;
- a set of components, electromechanical (replay plates, lighting units, etc.) and electronic (SBC, feeders, etc.) for the control of the flap units and for services (blinking, lighting, heating, etc.).

The INDICATORS are meant as visualizing units different from the BOARD since they contain neither the electronics (SBC) nor the power supply for the control of the flap units.

1.2.1. Board physical structure

As regards the physical structure, a board is made of the following components (see fig. 1):

a) a modular metal supporting and containing structure, usually consisting of the following parts:

1. a base beam of suitable dimensions to support the whole weight of the board, so that the bending of the inner component is prevented

2. two side stanchions to stiffen the whole board structure and, if necessary, to fasten it in the position of installation

3. a range of sections set on top one of another, at a suitable distance, by means of special "C" shaped spacers. The purpose of this structure is to contain and separate the flap units forming the different lines of the board

4. a set of covering plates, which are fitted into special grooves of the sections mentioned in item 3. above, to form the back shutter of the board

5. a set of metal sections (spacers) or of tables to cover the spaces between the flap units or the areas with no flap units. These sections and tablets have a twofold function: their purpose is, actually, to produce an even reading surface and to keep the flap units in their position

b) the information-giving flap units

c) an interconnecting cable between the connectors of the flap units and the feeding and controlling devices

d) a number of printed circuit plates inserted at the level of the lines, and of boxes (SBC, feeders) inserted in the top line. (The top line is usually meant as the first line of the board which must contain the board control and power components and on which covering tablets are usually silk-screen processed with the standing writings such as: type of board, meaning of the pieces of information, etc.).

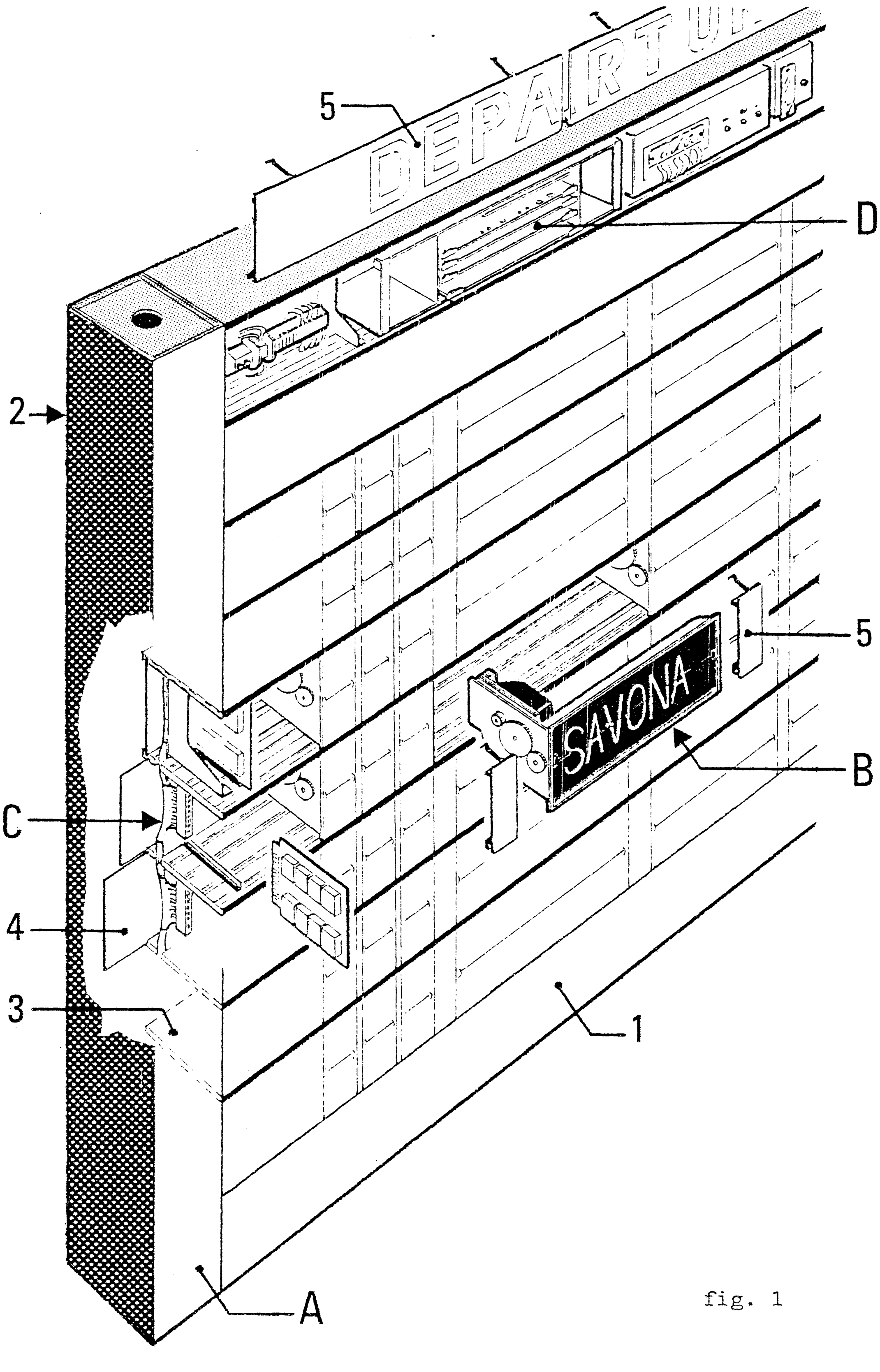


fig. 1

1.2.2. Small-size boards

In the case of a board with a low number of lines and a limited number of pieces of information, the structure of the board described in 1.2.1. a) may be simplified.

In such boards the base beam is removed and two covering plates take the place of both side stanchions.

1.2.3. Outdoor boards

If boards have to be placed out of doors, the structure described in paragraphs 1.2.1. or 1.2.2. is put into a semi dust-proof box, usually provided with a thermostat-controlled heating and light.

1.3. Physical structure of an indicator

As it has already been pointed out in paragraph 1.2. an indicator differs from a board insomuch as it does not have the flap unit control device (SBC) and the power feeder. Instead, these devices are centralized to control and feed a whole series of indicators and can be put either in a locker placed in a remote room or on a board set at the beginning of a chain or indicators or on a special container.

As regards the mechanical parts, the indicator has the same structure as the board as shown in paragraphs 1.2.1., 1.2.2. and 1.2.3.

As regards the electric components, besides those related to the line of the board (selecting and flickering plates) and to the service, it has one or more printed-circuit plates on which up to 16 rheostat are fitted.

1.4. Logic structure of a board

As regards the motor feeding and control, all flap units are identified by means of two coordinates:

a) the number of electrical line the flap unit belongs to (from 1 to 99)

b) the number of column (or information) the flap unit belongs to (from 1 to 128). This system is shown in Fig. 2.

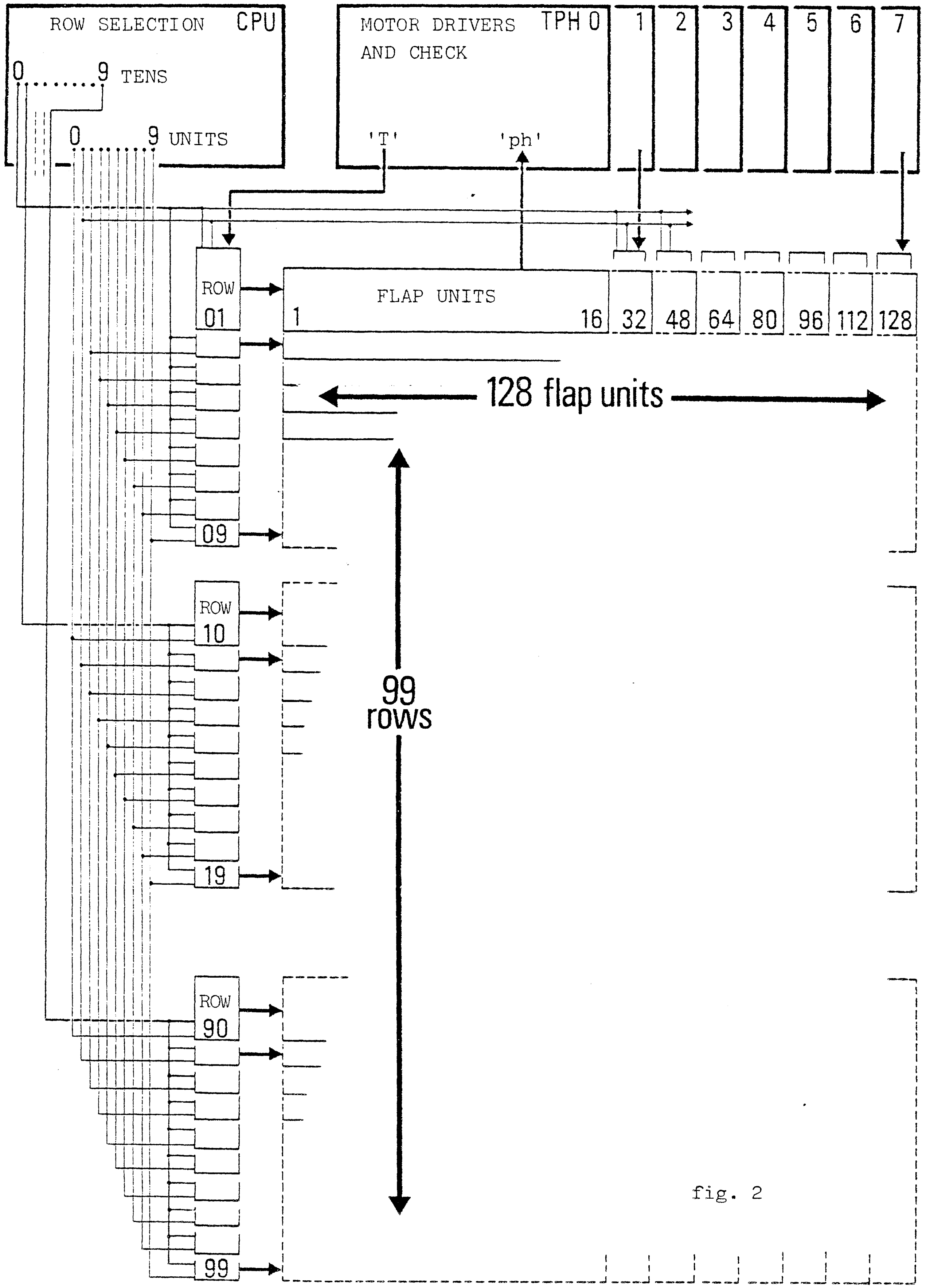

ROW SELECTION
CPU
0
9
TENS
0
9
UNITS
MOTOR DRIVERS
AND CHECK
TPH 0
1
2
3
4
5
6
7
'T'
'ph'
ROW
01
FLAP UNITS
1
16
32
48
64
80
96
112
128
128 flap units
09
ROW
10
99
rows
19
ROW
90
99

fig. 2

1.4.1. Definition of line

An electrical (or logical) line of flap units is the ensemble of flap units that can be made to rotate and be controlled contemporarily.

A physical line is, instead, the ensemble of flap units visualizing a set of pieces of information related to one object (train, airplane, etc.). A physical line can be develop vertically as well as horizontally.

One physical line not necessarily corresponds to one electric line since, dimensioning the control logic and the power feeders adequately, it is possible to pilot and control at the same time up to 128 flap units placed on several physical lines. This case is described as contemporary line-writing. Usually, this kind of board management is used to cut down the up-dating time for the whole board. Therefore a board can also be composed of several physical lines but of one electric line only.

1.4.2. Definition of column (or information)

Since each flap unit of an electric line must be individually controllable, a circuit has been designed at SBC level for the motor control and the flap unit feed-back (circuits T & Ph). Instead, these circuits can be common to the same type of flap unit (e.g. the "hours" unit) belonging to different lines, since these flap units will be made to totate at different times.

Therefore all flap units fed and controlled by means of the same T & Ph circuits from one column or information.

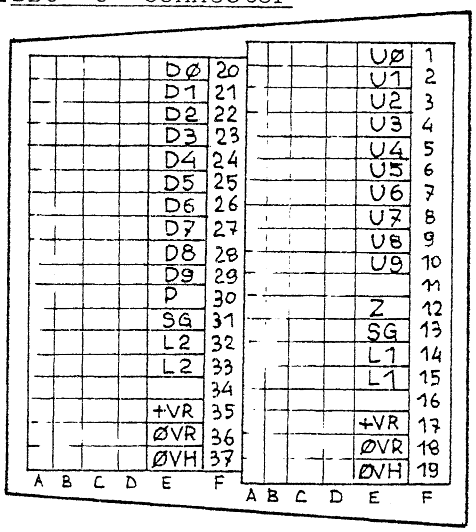
1.4.3. Selection of a line

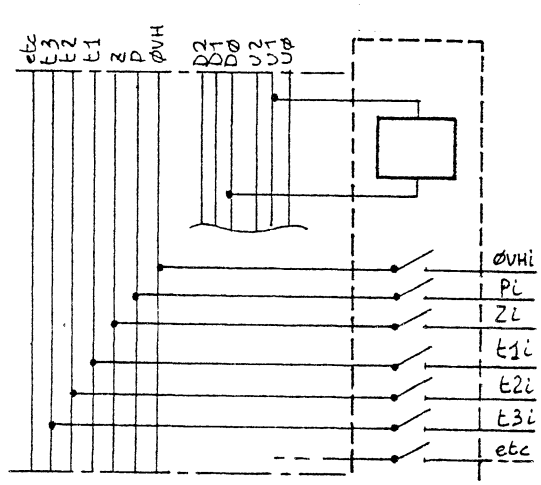
To separate the lines one from another electrically, network contacts are used, set in series with the motor wires of the flap units and to the wires belonging to the control circuit. These relays are fitted on one or more printed circuit plates called "selecting card".

The selecting relays are fed directly from the CPU plate of the SBC by means of a unit wire (positive signal) and a tens wire (negative signal).

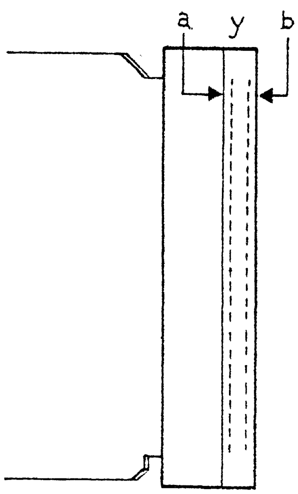
Figure 3 shows the feeding circuit of the line selecting relays and their contacts use.

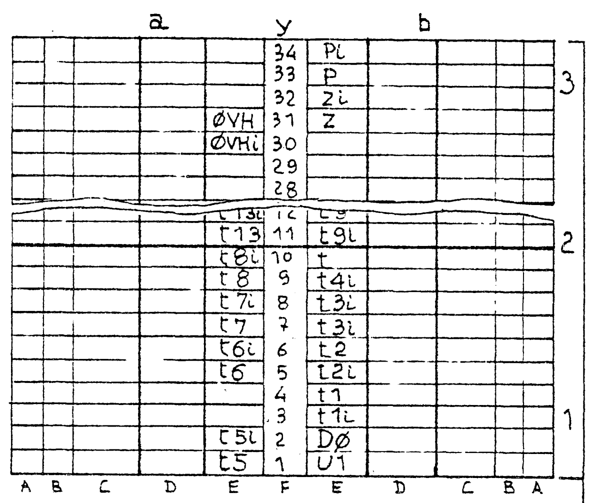
■ SBC 'C' connector



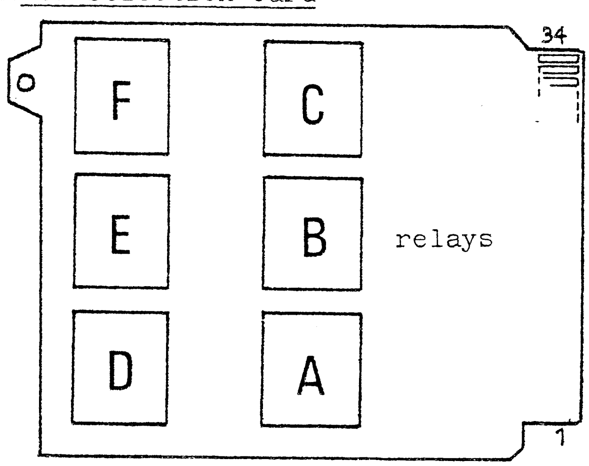


■ ROW selection connector

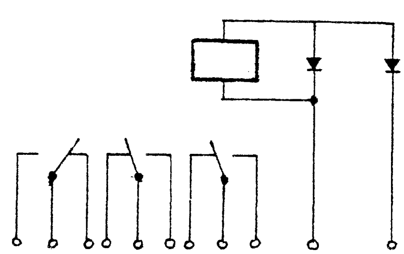




■ ROW selection card



(sample of T 60 full-equipped card)



(repeated for each relay)

fig. 3

1.5. Logic structure of an indicator

As regards logics, an indicator can be compared to an electric line of a board, the only difference being the length of wire existing between the motor feeder and the indicator.

Taking into account the wire resistance, the feeder tension is usually increased to a value that can ensure the reception of adequate power even by the flap units of the farthest indicator.

To prevent the flap units of the nearest indicators from being over-fed, a rheostat is set in series to the motor wire of each flap unit. These rheostat are assembled on one or more plates called "adjustment resistances".

The logic setting of an indicator is shown in figure 4.

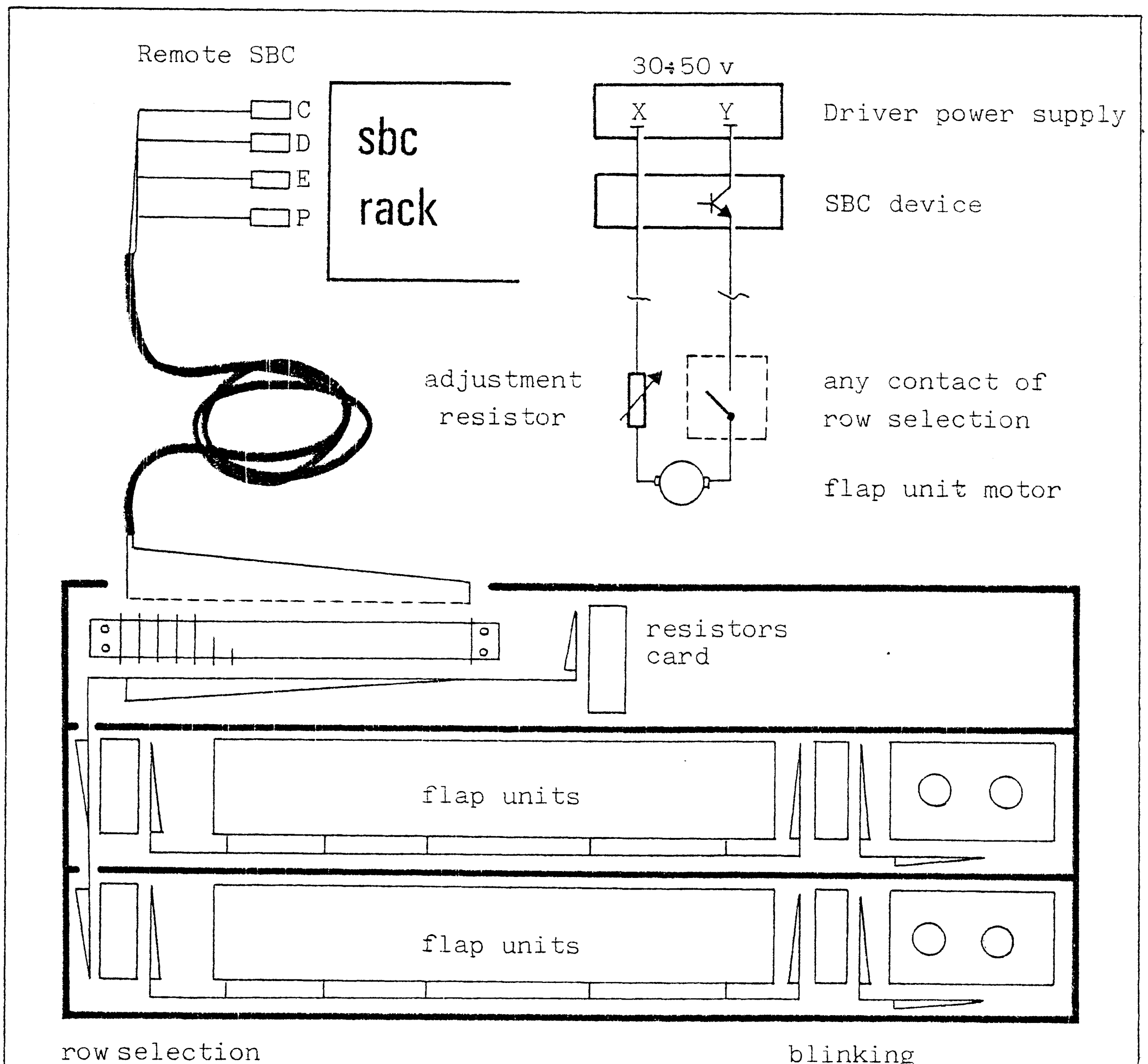


fig. 4

2. FLAP UNIT THEORY OF OPERATIONS

2.1. General description

An SBC-equipped board is always controlled through an external unit by means of a set of messages that have to specify:

a) the type of operation to be carried out, i.e. zero-ing, absolute or relative writing

b) the line on which the operation must be carried out

c) the number of steps that each flap unit must make, either after the passage for the zero position or from the position where it is at present

d) the length of the motor impulse to be conveyed to the flap units.

In case of a zero-ing operation it is not necessary to indicate the parameters mentioned in point c) above.

2.2. Zero-ing operation

This operation begins with a selection of the line concerned, thanks to the operation of the relay set on the "line selection" plate.

Then the SBC sends a positive signal of +12V amplitude on the Zi wire to feed in this way, the Hall effect sensor related to the zero control of all the flap units in the selected line.

If some flap units of the line are already zero-ed, the Ph wire is brought to ØV, signalling to the SBC that some flap units are already in the requested position. Then the CPU puts in conduction all the T circuits of the non-zero-ed- flap units and begins to send Ip and Id commands to the power driver within the feeder. After each Ip impulse, a Zi test impulse is sent to check if some flap unit has reached the zero position. As soon as a flap unit has been zero-ed its T-circuit is disabled, to stop the flap unit.

The operation ends when the last flap unit has been zero-ed or, in any case, after 180 impulses, if some flap units have not signalled their passage through zero.

In such a case, the CPU memorizes that the operation came to an end because of "steps end", also storing the number of the first flap unit of the line that has not been zero-ed (see figure 5).

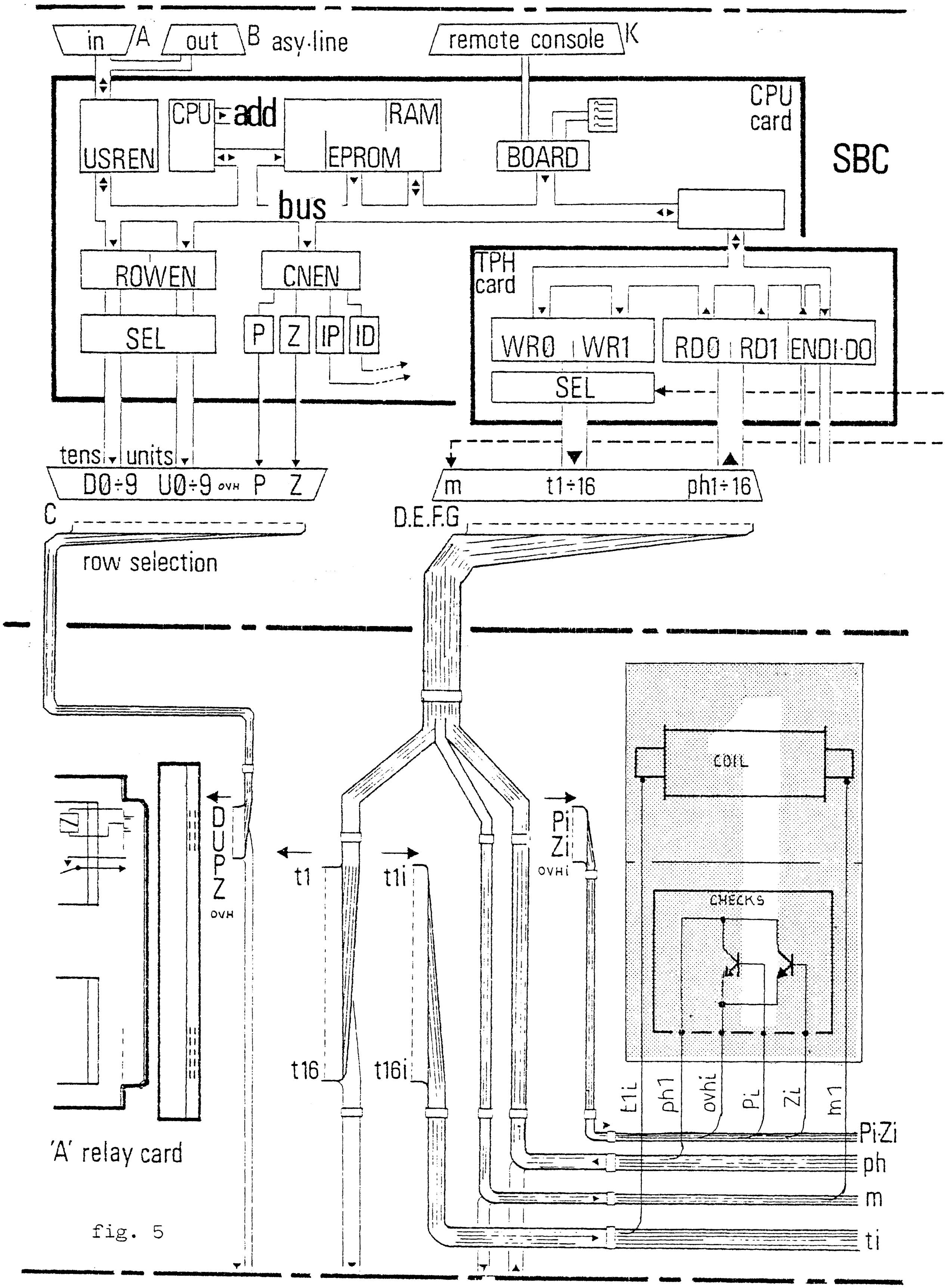
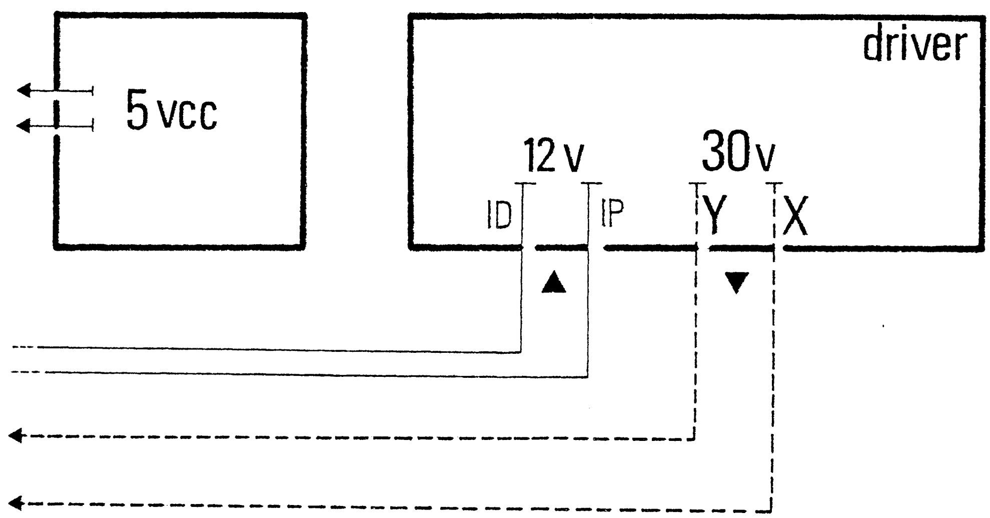

in
A
out
B
asy-line
remote console
K
CPU
add
RAM
EPROM
USREN
BOARD
CPU card
bus
SBC
ROWEN
CNEN
SEL
P
Z
IP
ID
TPH card
WR0
WR1
RD0
RD1
ENDI-DO
SEL
tens
units
D0÷9
U0÷9
OVH
P
Z
m
t1÷16
ph1÷16
C
D.E.F.G
row selection
COIL
CHECKS
D
U
P
Z
OVH
t1
t1i
t16
t16i
Pi
Zi
OVHi
t1i
ph1
ovhi
Pi
Zi
m1
Pi-Zi
ph
m
ti
'A' relay card

fig. 5


5vcc
driver
12v
30v
ID
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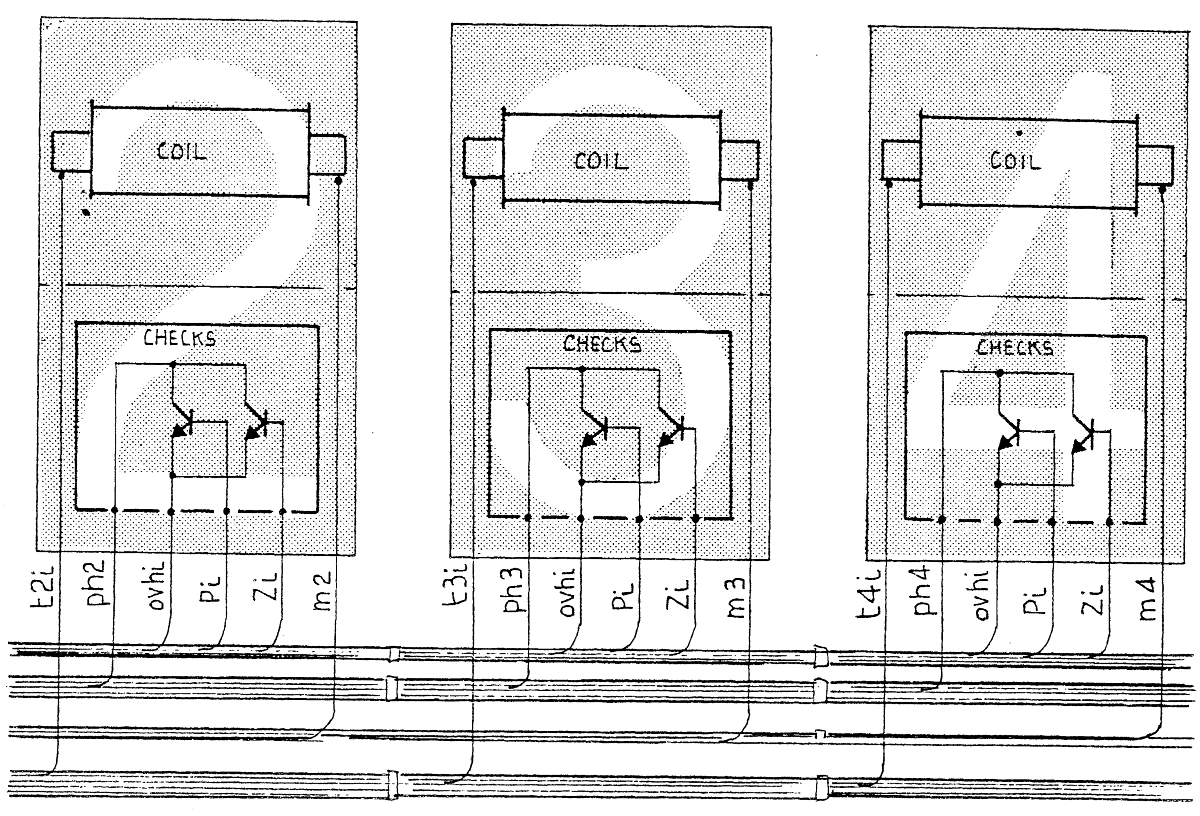
COIL
CHECKS
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ovhi
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Zi
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COIL
CHECKS
t4i
ph4
ovhi
Pi
Zi
m4

2.3. Writing operation

The writing of a line can be of two kinds: absolute writing or relative (or differential) writing, both kinds belonging to the type with simultaneous start of the flap units and differentiated stopping.

2.3.1. Absolute writing

The absolute writing is that kind of writing which does not take into account the position of the flap unit; the position the flap unit has to reach is therefore calculated starting from the zero-position. Therefore, in this case, the message the SCB receives from the computer must contain the number of steps each flap unit must make, starting from the zero-position.

A line selection is carried out before beginning the writing operation (See paragraph 1.4.3.).

After the line selection, the CPU sends a zero-control Zi signal to check if some flap units are in the zero position already. Then it begins to send Ip and Id impulses. After each control impulse, a positive impulse of +12V ampitude and 8/15 ms length is sent on the Pi wire, to check if all flap units are operating correctly.

As units are reaching the required position, the CPU stops the corresponding "T", cutting out the flap unit motor feeding, and causing its stoppage. The operation ends when the last flap unit gets to the requested position.

As a rule, the absolute writing in used after a power failure or alarm recovery, since in these conditions the position of the flap units is not known. Figure 5 shows all the board components related to the absolute writing operation.

2.3.2. Relative writing

It is possible to carry out this operation only when the position of each flap unit is positively known. Therefore, during this operation, only the necessary number of impulses is sent to the flap units to bring them from their initial position to the requested one.

Before beginning the writing operation a line selection is carried out (see paragraph 1.4.3.).

After the line selection, the CPU enables all the circuits connected to the "T" wires of the flap units which must be made to rotate; then it begins to send Ip and Id impulse. After each control impulse, the test signal is sent on the Pi wire. As each flap unit gets to the required position, the CPU cuts its "T" circuit, causing its stopping. The operation ends when the last flap unit has reached the requested position.

Fig. 5 shows all the board components related to the relative writing operation.

2.4. Error conditions

To check the regular running of the flap units, two controls are scheduled: a zero-control and a synchronism control. For more information on how the latter is carried out on the flap units, see the pertinent description.

The zero-control is carried out during the zeroing and the absolute writing operations, and the possible error noticed during this control is called "step-end error".

The synchronism control is carried out during the relative and absolute writing operations. In this case the flap unit answer is examined only after the unit has passed the zero position.

The possible error noticed during this control is called "synchronism error".

2.4.1. Zero-control

Fig. 5 shows all the components related to a zero-control. The Zi test signal is a positive signal with a +12V amplitude used to feed the Z sensors of the flap units. The length of this impulse is about 8 ms if the SBC is within the board, while it is about 15 ms if the SBC controls a series of indicators. The different lengths (that can be selected by means of a bridge placed on the CPU) have been planned to take into account the way the wires capacity affects the signals.

If the flap unit is not zero-ed, the Ph wire always remains at a positive level. Only when the unit gets to zero, there is a ØV signal on this Ph wire for a time equal to the length of the Zi signal. This signal is interpreted by the CPU as indicating the passage of the flap unit through zero.

If one or more flap units do not signal their passage through zero after having received 120 impulses, the operation ends out of "step-end error". If this error happens during a zero-ing operation the final situation of the line is that all flap units are zero-ed except the one which has originated the alarm.

If the error happens during an absolute writing operation, the final situation of the line is that all the flap units are in their right position except the one which has originated the alarm, as it can be in any possible position. Now it is the turn of the processor, after having received the alarm signal from the SBC, to send a new message for another attempt to be made to recover the alarm ot to zero the line which, as a consequence, is put out of service.

2.4.2. Synchronism control

Figure 5 shows all the components related to the synchronism control. The Pi test signal is a positive signal with a +12V amplitude used to feed the P sensors of the flap units. The length of the impulse is variable, according to what has been pointed out in paragraph 2.4.1.

The signal Pi is sent after each impulse. The Ph wire must be alternatively positive and ØV according to the even or odd position of the flap unit, respectively. Then the CPU checks the alternance of the states of Ph level in phase with the beginning of the Ip and Id impulses.

In this alternance does not occur, it is understood as a non-progress of the flap unit; therefore the operation is stopped. Then the CPU tries to make the faulty unit work sending a sequence of 8 control impulse with the same polarity as the last impulse sent before the alarm.

If the error condition persists at the end of the attempt of recovery , the operation ends and the SBC memorizes the number of the first flap unit that has generated it.

Therefore the line remains written with the flap units positioned at random; now it is the turn of the processor, after having received the alarm signal from the SBC, to send a new message for another attempt to be made to recover the alarm or to zero the line which, as a consequence, is put out of service.

Zero-ing Operation

The SBC sends impulses to the flap units and checks only the passage through zero (check on Zi signal; answer on Ph...signal).

Relative writing

The SBC sends impulses to the flap units and checks the step made only (check on Pi signal; answer on Ph... signal).

Absolute writing

This operation consists into two phases :

1. Zero-ing

2. Relative writing

The SBC sends impulses to the flap units and on the first phase it checks the passage through zero (Zi + Ph...); on the second phase it only checks the step made (Pi + Ph...).

3. OPTIONAL GENERAL SERVICES

A board or an indicator may be supplied with optional services, the most used are:

- blinking
- fixed luminous writing with controlled lighting
- "Out of Service" arm
- general lighting
- heating
- connection to D.I. (Digital Input)

3.1. Blinking

As a rule, this service is connected at line level in a board or indicator and is used to attract the public's attention on a particular visualized piece of information. There are usually two lamps that are alternatively switched on and off according to a fixed frequency directly generated by the CPU of the SBC. The lamps can be fed either by direct or by alternate current. Figure 6 shows the circuit belonging to this option.

Blinking set

This operation must be always preceded by a line selection. Then the SBC sends a Digital Output of about 150 ms to operate the SL memory relay. Two contacts of this relay are used to connect the feeding wires of the L1 and L11 lamps either to the outputs of the power relay placed on the CPU or to the outputs of the alternate current feeding module.

A third contact is used to issue the +30V signals to the L relay placed on the CPU place that, in this way, can start to operate.

Blinking reset

This operation must be always preceded by a line selection. Then the SBC sends a Digital Output of about 150 ms to operate the SL memory relay. When the contact or SL are opened the blinking operation ends.

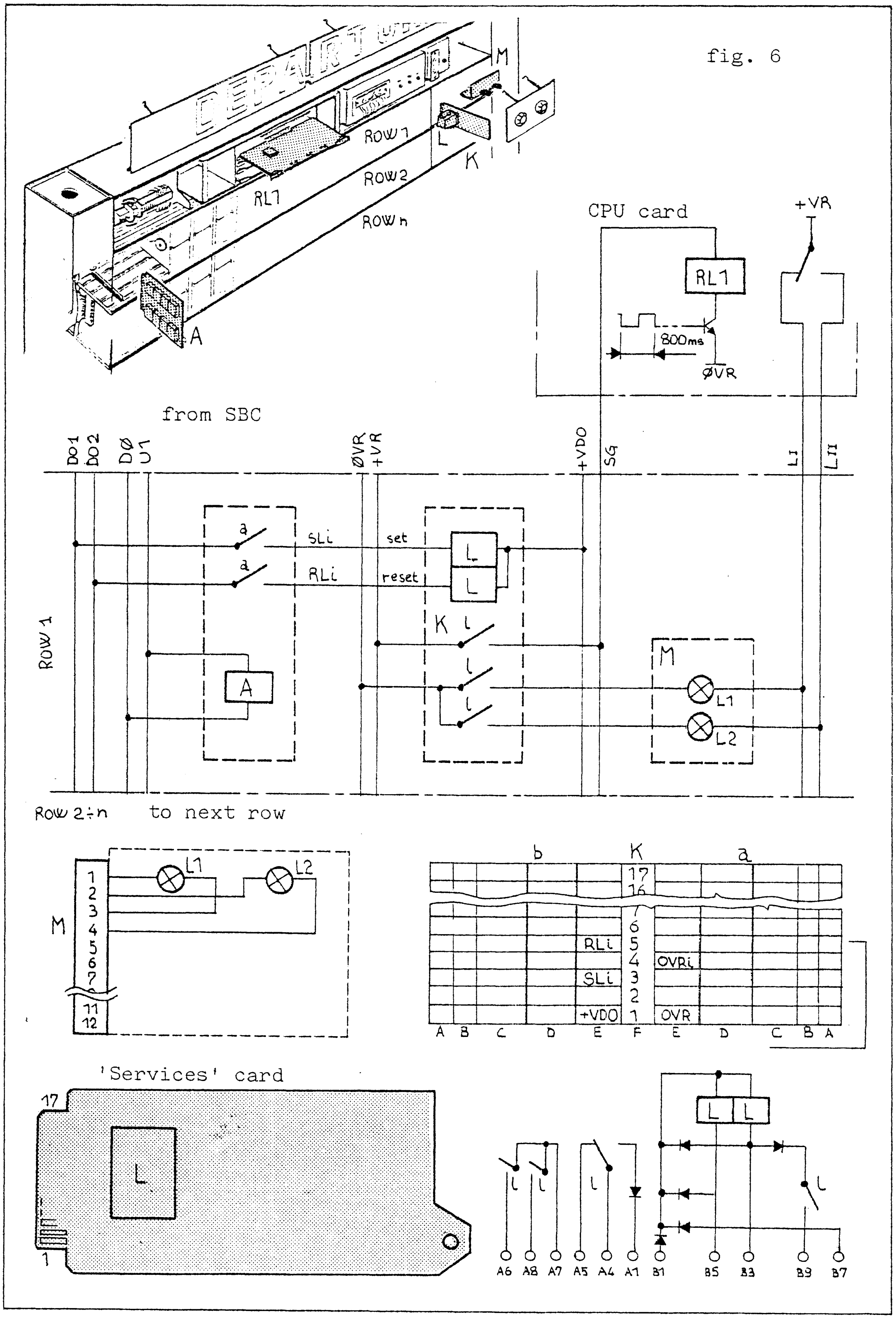
M
L
K
ROW 1
ROW 2
ROW n
RL1
A
CPU card
+VR
RL1
800ms
ØVR
from SBC
DO1
DO2
DØ
U1
ØVR
+VR
+VDO
SG
LI
LII
ROW 1
SLi
RLi
set
reset
K
M
L1
L2
Row 2÷n
to next row
M
1
2
3
4
5
6
7
11
12
L1
L2
b
K
a
17
16
6
RLi
5
4
OVRi
SLi
3
2
+VDO
1
OVR
A B C D E F E D C B A
'Services' card
17
1
L
A6 A8 A7 A5 A4 A1 B1 B5 B3 B9 B7

fig. 6

3.2. Fixed luminous writing with controlled lighting

Usually the illumination of the writing is made by means of power lamps, so that the contacts of the magnetic relay are used to control a circuit made of a static switch that, in its turn, controls the lamp feeding voltage.

- Turning on the lamp

This operation must be always preceded by a line selection. Then the SBC sends a Digital Output of about 150 ms to operate the SL memory relay.

- Turning off the lamp

This operation must be always preceded by a line selection. Then the SBC sends a Digital of about 150 ms to let the memory relay drop.

3.3. "Out of service" arm

This is a particular option used to point out that a board or an indicator is completely out of service in case of defects. This option consists of a movable arm, with the writing "out of service", which is driven by means of a motor. This can have different voltages and the unit can be fed by means of alternate or direct current. In the latter case an inverter circuit transforms the direct current into a 50 Hz alternate current.

A cam integral with the shaft moves some microswitches that determine the positions of stoppage of the motor. Since one of the defects can be the complete out of use of the board, the out-of-service arm is controlled by means of a key-board located outside the same board.

The control can be performed by means of a key with 2 fixed positions. Once the out-of-service arm has reached its limit stop position, on the feed-back wire a direct current is available to light on a possible control lamp.

3.4. General lighting

This option is usually present in indicators or boards in boxes.

Usually, the static switch is operated by means of an external control of the "Day/Night" type. The on/off operations are the same of those described in paragraphs 3.2. In this case the line selection is not necessary.

3.5. Heating

This is an option often present in indicators and boards in boxes for outdoor use.

The heating resistances are of the low superficial temperature type and their capacity is dimensioned each time, according to the volume to heat and to the foreseen external temperature. The feeding voltage is usually the power line voltage and is controlled by an adjustable thermostat.

3.6. Connection to D.I.

Keys that can be outside or inside the board and that have rôle of digital inputs can be connected to the SBC. In any case, their meaning depends upon the central processor software.

4. BOARD INSTALLATION

4.1. Preliminary verifications

■ Visual controls

Verify that the board has not suffered damages during the transport, that all flap units and the printed circuit cards are inserted in their right positions and that the connectors are not disconnected.

Furthermore verify that the connections of the connection and signal cables are workmanlike performed.

Verify that the connections of the line correspond to the one foreseen in the wiring diagrams in conformity with the board connected in multi drop or it is the only one of that line.

■ Verification of the address

Control that the address of the SBC is the one foreseen during the drawing up of the system's documentation and that in any case it must correspond to the one foreseen by the software of the computer.

■ Predisposition of the speed

The transmission speed is function of more parameters, the most limitative of which is the one regarding the length of the connection cable to the computer.

On the ground of this the most appropriate speed has to be chosen in order to minimize the number of the line errors.

An example is given in the following table:

Speed	Max. distance
300 baud	1600 m
600 baud	1300 m
1200 baud	800 m
2400 baud	600 m
4800 baud	300 m

In any case, the final verification of the exact choise of the speed is given by the number of message which have not been recognized by the SBC or computer.

4.2. Switching on and Test

Feed the SBC and verify that the led RUN, placed on CPU, switches on.

Note: the led RUN does not switch on if the 20 mA line in input is not fed. If this is not possible in this phase, inhibit the "line breack" operating on the P6 bridge placed on the CPU. Put the CPU in the "ON LINE" condition and push RESET.

We suggest, at this point, to carry out a test of the board starting from the cable, which connects it to the remote processor.

The test can be carried out with the manual procedure (see chapter 6: Description of the SBC working), or with a test working in remote processor environment.

If this processor is like Computer Automation 4/90 or 4/30 with Expanded Instruction Set, the MUXSOL test is at disposal.

Also documentation is available.

Since this test stresses the board completely, at the end of all verifications the board can be put definitively in service.

If the manual procedure is used and a feeder of the current loop lines is not at disposal, it is necessary to realize a temporary connection between the input/output unit and the SBC according with the indications of the SBC Description, active connection point to point.

5. INDICATOR INSTALLATION

5.1. Preliminary verifications

■ Visual controls

Verify that an indicator has not suffered damages during the transport, that all flap units and connectors are well inserted in their positions and workmanlike performed.

■ Connection of the sections

If several equal indicators are foreseen in a system, the wiresof line selection are never wired so that their position is not bound during the installation phase.

According with the position, in which the indicator is placed, is therefore necessary to give it its selection. The number of selection, that must be assumed by each indicator, is deducible by the specific documentation of the system.

■ Verification of the connections

It is very important to carry out a verification of the correct wiring, since an error at level of cables drawing up could damage the Hall effect sensor of the flap units and therefore require their replacement.

■ Verification of the insulation

Verify, with an appropriate instrument, the insultation of each wire toward all others and toward ground.

The most international rules foresee that this measure is carried out at 500 V for the signal wires (continuous low tension) and at 1500 V for the wires of network feeding.

■ Calibration of the power feeders

In the power feeders for indicators it is possible to carry out a tripping regulation of the power voltage. This regulation is obtained chang ing the exit of the transformer; in this way it is possible to calibrate the voltage starting from about 30 V until about 55 V.

■ Calibration of the regulation resistances

For a correct working, a flap unit must be feeded at 24 V.

The calibration of the resistances placed inside each indicator must be carried out, therefore, in such a way as to reach the wished result.

For carring out the calibration, the following formula can be used:

$$RT = \frac{VA}{24} \cdot RR - (RL + RR)$$

where:

RT = value which must be assumed by the calibration resistance

VA = value to which the power feeder has been set

RR = value of the flap unit bobbin resistance (in case of flap units with double motor the two bobbins are in parallel)

RL = resistance of the line, given by the sum of the wire "m" and wire "t" resistance.

If the result would be negative or in any case under the lower value of the resistances calibration it will be necessary to increase ulteriorly the exit voltage of the feeder.

5.2. Switching on and Test

Since an indicator is assimilable at a line of a board, proceed according with indications given in paragraph 4.2.

6. TROUBLESHOOTING

The possible failures in a board can be divided into two groups according to the sympton they present:

- the whole board results defect
- only some elements of the board result defect.

6.1 Whole board failures

Some kinds of failure, the way to follow for their location and repair are indicated in the following paragraphs. The cases which can present are two and identificable from the kind of defect signaled.

(a) The board results in alarm without any signalization of alarm at line level.

Possible causes:

a) the whole board has no feeding

b) the +5V feeding is missing

c) the 20 mA voltage is missing on the loop of reception

d) the reception or transmission lines are defect

e) the CPU of the SBC does not work regularly.

Verifications and repairs:

a1) measure the network voltage in input

a2) verify the fuses placed inside the input clamps of the network voltage. If they go on jumping after having been replaced, research the short on the line and avoid it.

b1) control the +5V in output at the feeder, disconnecting the connection wire to the SBC box.
If the +5V is missing, replace the feeder. If the voltage is missing only reconnecting the wire, replace the SBC box

c1) the CPU is not in RUN. Verify that the current in line is 20 mA ± 10%. If the current is out of tolerance, the failure does not depend from the board. If the is missing, verify that from the board side there exists continuity between the RX+ and RX- wires. If there exists continuity, the failure is outside the board. If there does not exist continuity, verify the interconnection cable; if it goes well, replace the CPU card or the SBC box

d1) verify the board in"manual mode" by connecting the video set directly to the input connector of the SBC box and realizing the active connection point to point for the SBC. If the test has a positive result, the defect is outside the board.
If the test has a negative result, replace the CPU card

e1) carring out a test in "manual mode" normally, it is possible to identify all bad workings of the CPU, that are not described in points a,b. Than teplace the CPU card.

(b) The board results in alarm with signalization of all lines in alarm.

It is necessary to verify the alarm message to identify to which of the possible kinds of alarm the one signaled belongs.

The possible kinds of alarm are as follows:

a) error of steps end on all lines and all flap units

b) error of steps end on all lines of one or more flap units

c) error of synchronism on all lines and on all flap units

d) error of synchronism on all lines of one or more flap units.

It is necessary to consider that if all flap units in error are more than one, there is always given the number of the first one defect, starting from the position 1.

In all kinds of error it is furthermore necessary to know if the defect flap units are doing some steps or not, in order to reduce the investigation field.

(c) Error of steps end on all lines and on all flap units, which do not make any step.

Possible causes:

a) the +30V is missing on the power feeder

b) one or both exits of the X and Y power driver are missing

c) the line selections are not carried out

d) the T & Ph cards are not qualifyed.

Verifications and repairs:

a) verify the respective fuse; if the fuse is O.K., replace the feeder. If the fuse, after having been replaced, goes on breaking, verify a possible short circuit disconnecting the many elements of the board feeded at +30V

b) verify the respective fuses. If the fuses, after having been replac-ed, goes on breaking, replace the feeder.
Verify if the commands Ip and Id in input at the feeder are correct; if one of both or both are not present, replace the CPU of the SBC. If the commands Ip and Id are correct, but one or both exits of the driver remain fixed at +V, replace the feeder.

- if one or both exits are fixed to zero, detach the wire connected to the junction box and verify that the X and Y exits, in absence of the commands Ip and Id, are at +V

- if one or both remain to zero volt replace the feeder.

- if detaching the wires connected to the junction box, there verifies a change of the tensions, verify a possible short circuit disconnec-ting progressively the many elements of the board connected to the X and Y board

c) it is possible only if the lines are less or equal to 9. Verify the exit of the zero ten. If it is missing, replace the CPU

d) the qualification signal of the motor circuits coming from the CPU is missing. Replace the CPU card or verify the continuity of the con-nection.
If there only one T & Ph card, exists the qualification circuit insi-de the card can be damaged. Replace this card.

(d) Error of steps end on all lines and on all flap units rota-ting however regularly.

Possible causes:

a) the +12V tension is missing

b) the Zi signal is missing

c) the Ph signal are not readed regularly.

Verifications and repairs:

a) verify the fuse regarding the feeding +12V; if after having been re-placed it goes on breaking replace the feeder

- verify a possible short circuit in line disconnecting the wire from the junction box of the feeder

- if the defect remains, replace the feeder
- if there is a short circuit, avoid it, disconnecting progressively all elements of the board feeded at +12V

b) verify the connection in output at the SBC box. Replace the CPU card.

c) verify the OV wire in output at the SBC box

- if there only one T & Ph card, exist replace it
- replace the CPU.

(e) Error of steps end on all lines of one or more flap units, which do not made any step.

Possible causes:

The motor pulses are missing to one or more columns of flap units.

Verifications and repairs:

- the card T & Ph is defect. Replace it.
- verify the continuity of the wires "m" and "t" starting from the connector of the T & Ph card. (In the case of the wire "t", till the selection card of the line 1).

(f) Error of steps end on all lines of one or more flap units rotating however regularly.

Possible causes:

The crossing trough the zero of the flap units is not detected.

Verifications and repairs:

- the card T & Ph is defect. Replace it
- verify the continuity of the wire Ph starting from the connector of the card T & Ph till the interested flap unit of the first line.

(g) Synchronism error on all lines and on all flap units, which are not making any step.

This kind of failure signalization can happen only on a board which is working with relative writing. Each alarm for synchronism error must be followed by an alarm of steps end.

The possible causes and the verifications to be carried out are the same already seen at point "c".

(h) Synchronism error on all lines and on all flap units which making at least one step or in any case they are on rotation during the operation of putting-out-of service.

Possible causes:

If the blanking operation following the alarm finishes positively, the Pi signal is missing.

If the alarm is given even in blanking:

1) the +12V is missing

2) the Ph signals are not readed regularly.

Verifications and repairs:

Verify the presence of the Pi signal.

Verify the connection, starting from the connector of the CPU till the first line selection card.

Replace the CPU.

For the points 1 and 2 proceed according to point "d".

(i) Synchronism error on all lines of one or more flap units which are not making any step.

The possible causes and verifications to be carried out are the same already seen at point "e".

(l) Synchronism error on all lines of one or more flap units, which however are rotating regularly.

Possible causes:

The signal on the Ph wires is not correctly verifyed.

Verifications and repairs:

See at point "f".

6.2. Partial board failure

The failures at line level are included in this category, they interest normally the following elements: flap unit, line selection card, wiring.

Even in this case we can distinguish the defects which interest one complete line or only one or more flap units of the line.

m) Steps end or synchronism error of all flap units of one line, which do not make any step.

Possible causes:

The relays of line selection are not feeded.

Verifications and repairs:

Failure at line selection card level. Replace this card.

From the CPU the signal identifying the interested line selection unit does not go out. Replace the CPU card. There exists an interruption in the continuity of the wiring. Verify.

n) Steps end error or synchronism error of all flap units of one line rotating instead regularly.

Possible causes:

The Zi or Pi signals are missing at line level.

Verifications and repairs:

Failure at relay level on the line selection card. Replace this card.

There exist an interruption in the continuity of the wiring. Verify.

o) Steps-end error or synchronism error of one or more flap units of one line, which do not make any step.

Possible causes:

a) the flap unit is jamed

b) the motor of the flap unit is not feeded.

Verifications and repairs:

a) replace the defect flap unit

b) failure at relay level on the line selection card. Replace this card.

There exist an interruption in the continuity of the wiring of "m" and "t" wires. Verify.

(p) Steps end error or synchronism error of one or more flap units of one line, which rotate regularly.

Possible causes:

The sensor of the flap unit interested to the test (Z or P) does not work.

Verifications and repairs:

Replace the defect flap unit.

Verify the welding points on the connector of the flap unit.