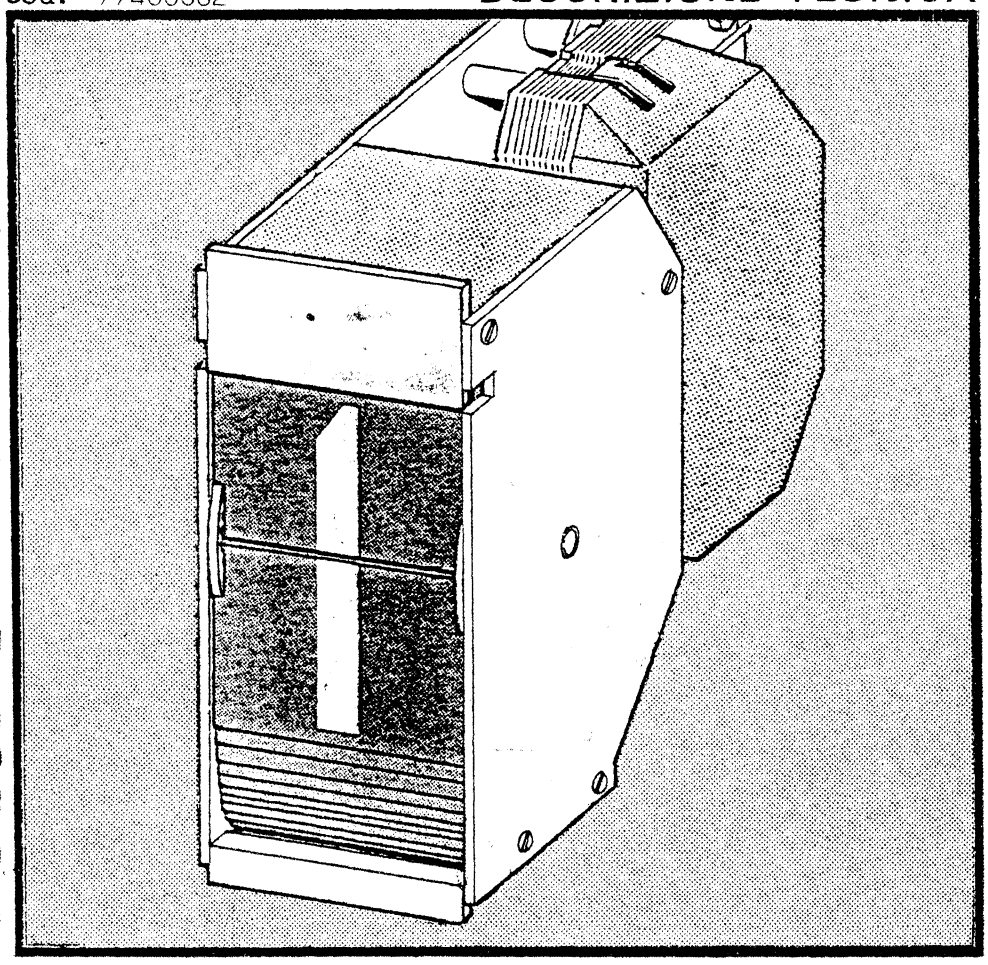
C.E.Flap Unit

TECHNICAL DESCRIPTION

DESCRIZIONE TECNICA

cod: 77400062



solari & c./udine

READERS

This thecnical description has didatic purposes only; it completes but does not replace the manufacturer's drowings and diagrams. It addresses all who wishes to know the performances of the flap units and their maintenance.

CONTENTS

First part emphasizes the modularity and readability of flap units.
Than a short theory of operations is available.
At last the maintenance operations and a test device are introduces.

BIBLIOGRAPHY

SERIES/90 BOARDS - thecnical description - 77400089.

REVISION

November 1984 - Second issue

REMARKS

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

CONTENTS

		Page
1.	C.E. FLAP UNITS	1- 1
2.	READABILITY	2- 1
3.	THEORY OF OPERATION	3- 1
4.	GENERAL CHARACTERISTICS	4- 1
5.	ADJUSTMENTS	5- 1
6.	FLAP UNIT TESTING DEVICE - p.n. 51060329	6- 1

1. C.E. FLAP UNITS

In Solari information display systems, the flap unit is the main component for the display of written information. It is used in multiples to make up the information lines of the boards in a display system.

The construction principle of the Solari flap units is modular and allows the height and width of the script to be varied.

A flap unit consists of a step-by-step motor which drives a flap drum through a set of gear wheels to change the displayed information, and a control system which uses electronic sensors based on the Hall effect (without sliding contacts).

If required, all mechanical parts can be treated with tropicalization processes for installation of the display systems in hostile environmental conditions.

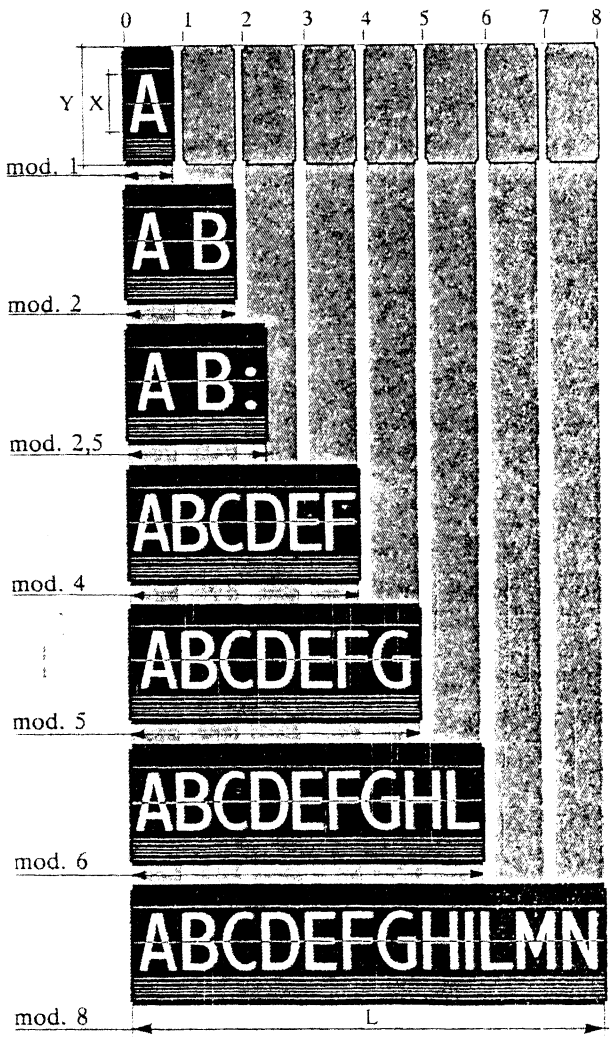
The material of the flaps may be plastic (PVC), thermoresistant material or aluminium according to the ambient conditions of temperature and incident sunlight.

The flap units may have 40 or 60 flaps. The width of each flap unit is modular and Table 1 shows the modules, the available sizes and letter capacity of the three types available (35, 60, 100 types).

The absence of any mechanical contacts guarantees a high reliability. None of the mechanical parts need lubrication and no preventive maintenance is required except for periodic cleaning of the flaps, according to environmental conditions.

Solari Flap Units characteristics

MODULES



GILL SANS BOLD
LETTER CAPACITY:

normal	narrow
1	1
2	3
2+1 sign	3+1 sign
6	7
7	9
9	11
12	15

TYPE:	MODULES:	1	2	2,5	4	5	6	8
T 35	X= 35mm Lmm	27	62	79,5	132	167	202	272
	Y= 68mm Kg	0,430	0,485	0,515	0,595	0,650	0,710	0,830
T 60	X= 60mm Lmm	47	106	136	226	286	346	466
	Y= 117,5mm Kg	0,905	1,065	1,145	1,410	1,600	1,735	2,080
T 100	X= 100mm Lmm	72	172	222	372	472	572	772
	Y= 155mm Kg	1,180	1,650	1,930	2,520	4,020	4,520	5,520

2. READABILITY

The characters are silkscreened on the flaps using flat, vinyl, antireflective and water-repellent paints.

The colour and style of characters may be of any type (Gill Sans Bold, Univers, Helvetica, etc.).

It is possible to write on half-flaps in reduced size, thereby increasing the letter capacity but decreasing the reading distance.

The reading angle and distance depend on the colours of the characters used.

Using Gill Sans Bold normal letters, white on black, the 35, 60 and 100 flap units allow a readability of 18, 35 and 60 metres respectively.

The most important characteristic of split flap displays it that the script is presented as continuous stroke printing. This provides up to double the active area of displayed information for the human eye compared with any system of dot matrix.

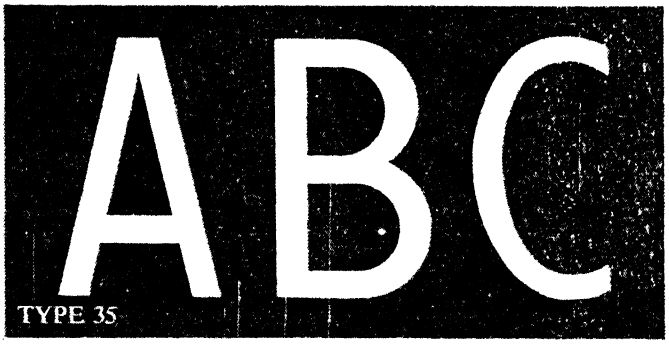
This feature means that viewing angle of up to 60° are possible without significant loss of legibility and there is no long or short range loss of legibility due to blurring or discontinuities.

Legibility is near perfect in most lighting conditions.

The silkscreening process guarantees a good definition of the letters and allows the reproduction of multi coloured symbols (such as airline logos) and pictograms.

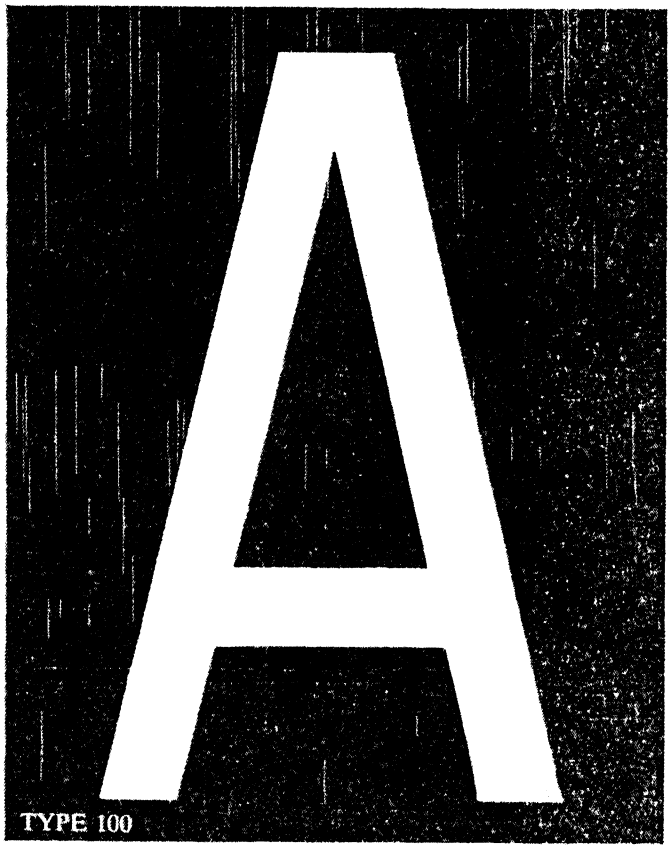
LETTERING

Example of
GILL SANS BOLD
characters



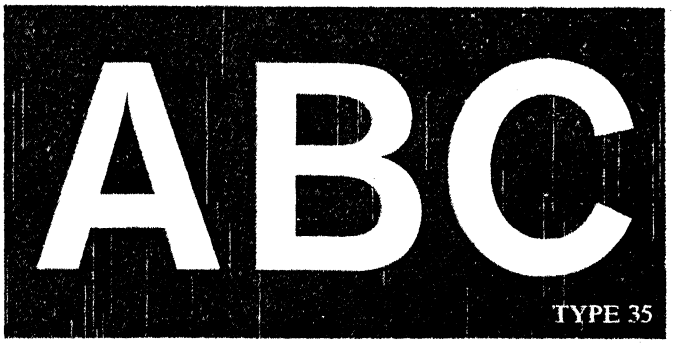
TYPE 35

TYPE 60



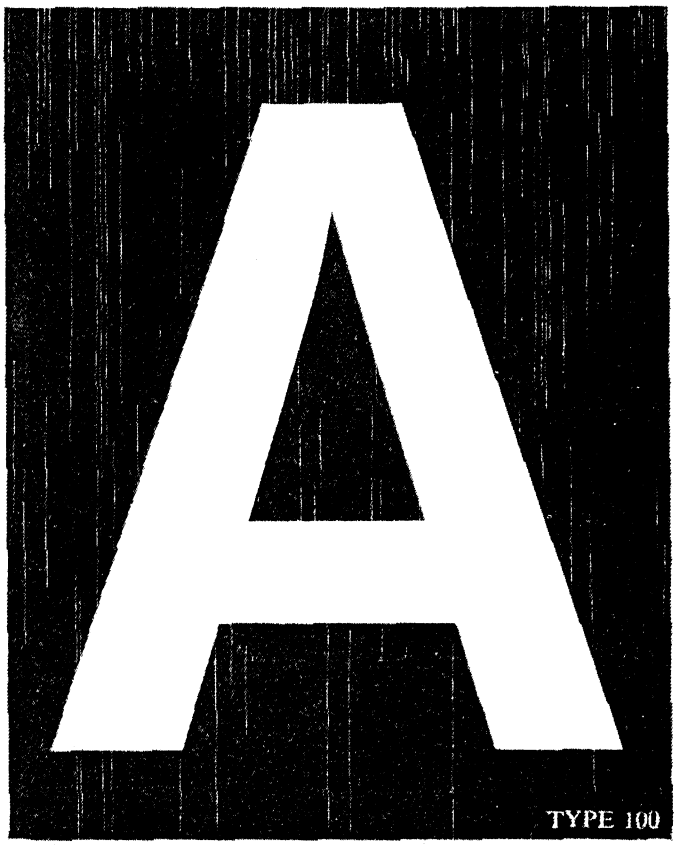
TYPE 100

TYPE	height mm	readable from mt
T35	35	18
T60	60	35
T100	100	60



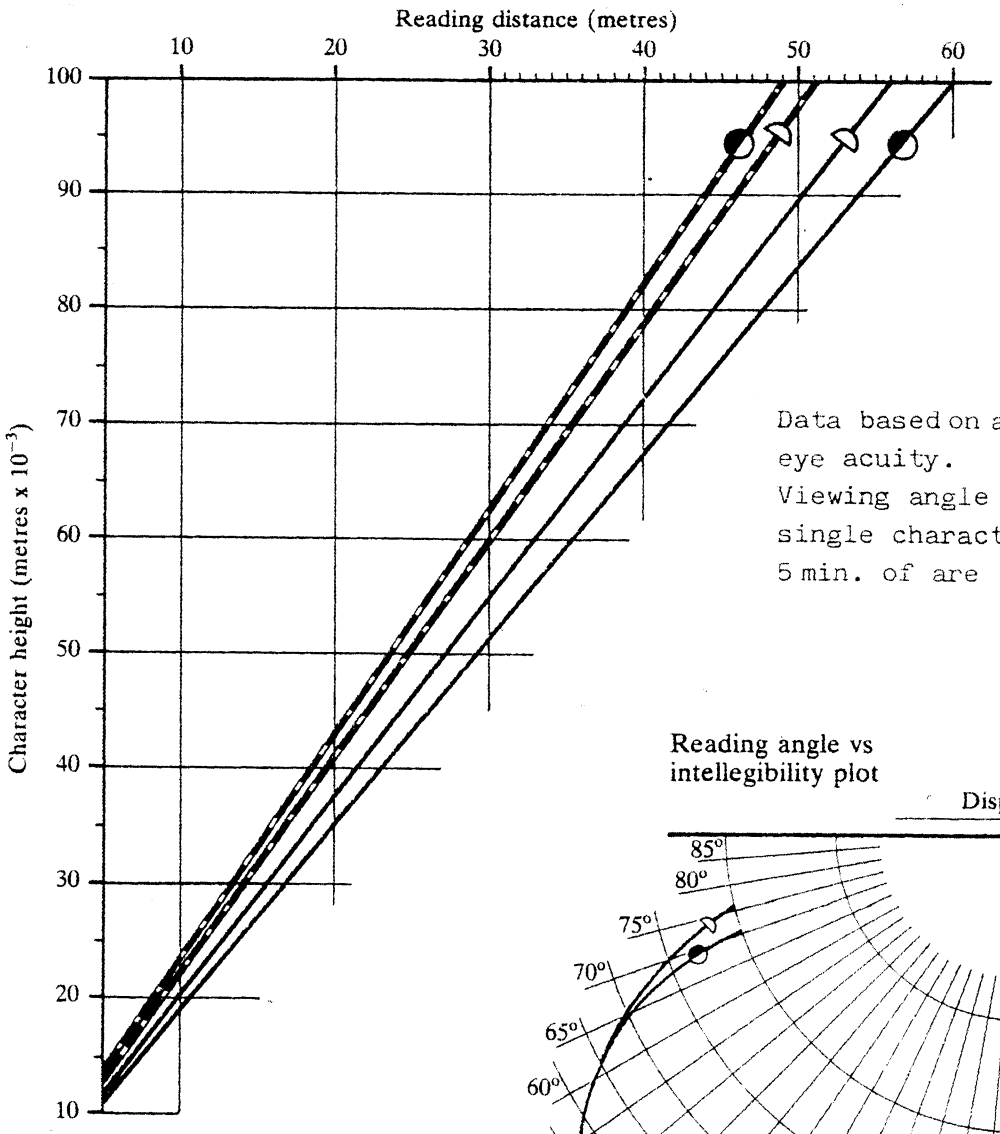
Example of
AKZIDENZ - GROTESK
characters

TYPE 60



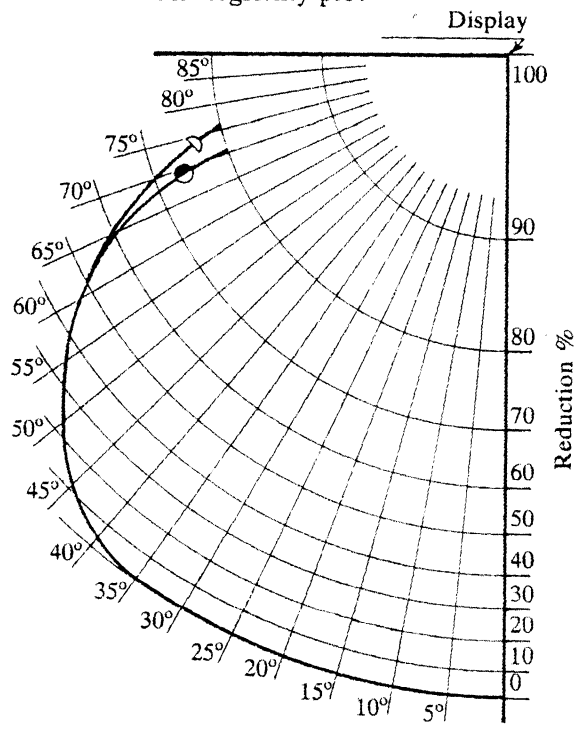
TYPE	height mm	readable from mt
T35	28	15
T60	54	30
T100	86	50

READABILITY DATA FOR 'GILL SANS BOLD' AND
'AKZIDENZ - GROTESK' MEDIUM FONTS



Data based on average eye acuity.
Viewing angle for single character 5 min. of are

Reading angle vs intellegibility plot



White on Black

Black on White

Gill Sans Bold

Akzidenz - Grotesk

3. THEORY OF OPERATION

The flap unit uses a step-by step motor which needs periodic pulses sent to the coil contacts will alternating polarity to drive it.

The pulse voltage is 24Vdc and the pulse length depends on the type of flap unit and may vary from 60 to 120 ms.

Power is only consumed when the flap units are moving to change the information, and there is no consumption when the information is displayed.

The rotor of the step-by-step motor consists of a ferromagnetic syntered and magnetized cylinder with alternating poles.

An elastic steel blade and a plastic touthed wheel installed on the driving shaft form the anti-reversal group of the motor.

The operation of the drive and control circuit is shown in the pulse diagram (page 3.4), where the relation between the drive pulses (IP and ID) and the test pulse (P) can be seen.

The control of the flap unit position (even step, odd step, zero position) is carried out by two integrated circuits (field detectors) (see page 3.3): A (synchronism control) and B (cancellation), which use the Hall effect.

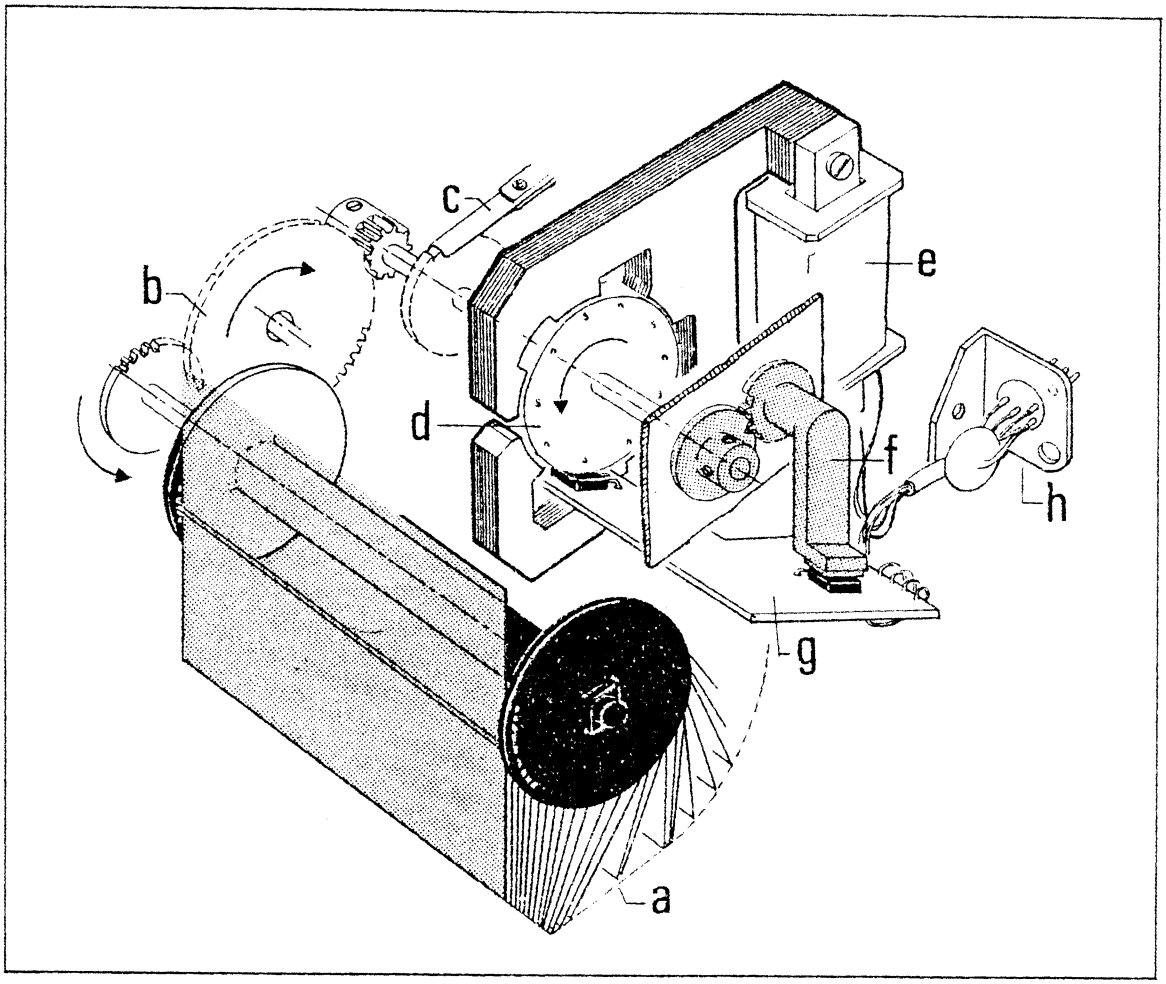
In normal operation (writing), before the end of the drive pulse, a flap unit controller sends a control pulse P. According to the polarity of the motor pulse, if the step has been done, the integrated circuit A detects the variation of the magnetic field generating a signal (Ph...) that is alternatively "1" and "0".

If the controller receives two consecutive pulses (Ph) of the same sign (step not carried out), it attempts to resend the drive pulse with the same polarity a fixed number of times.

If the flap unit does not move, it will be considered out of order.

In the operation of cancellation, after every odd step, the controller sends the test pulse Z.

When the flap unit reaches the blank position, the integrated circuit B transmits a pulse (Ph...) to the controller in order to stop the drive pulses.



Each Flap Unit consists of:

a. spool and flaps

b. gears transmission

c. antireversal wheel

d. rotor

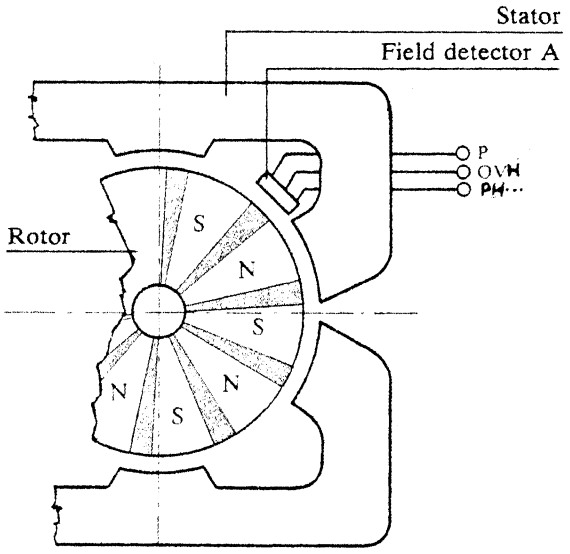
e. stator and coil

f. mechanical counter and zeroing detector arm

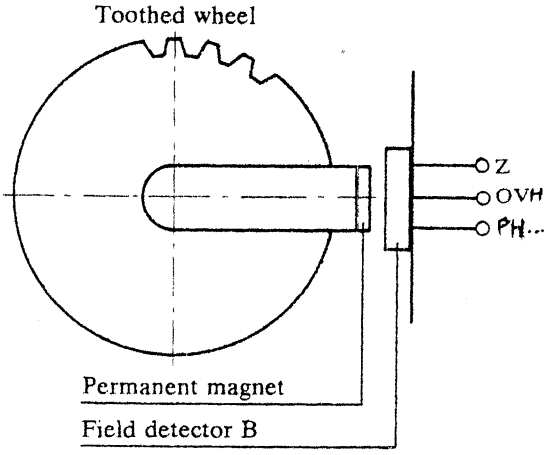
g. electronic controls card

h. standard plug connector

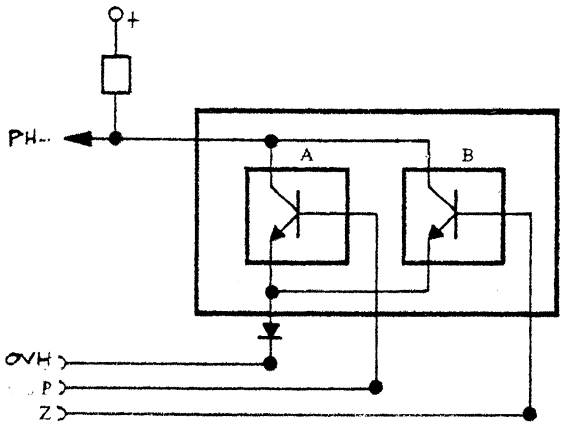
ELECTRONIC CONTROL SYSTEM



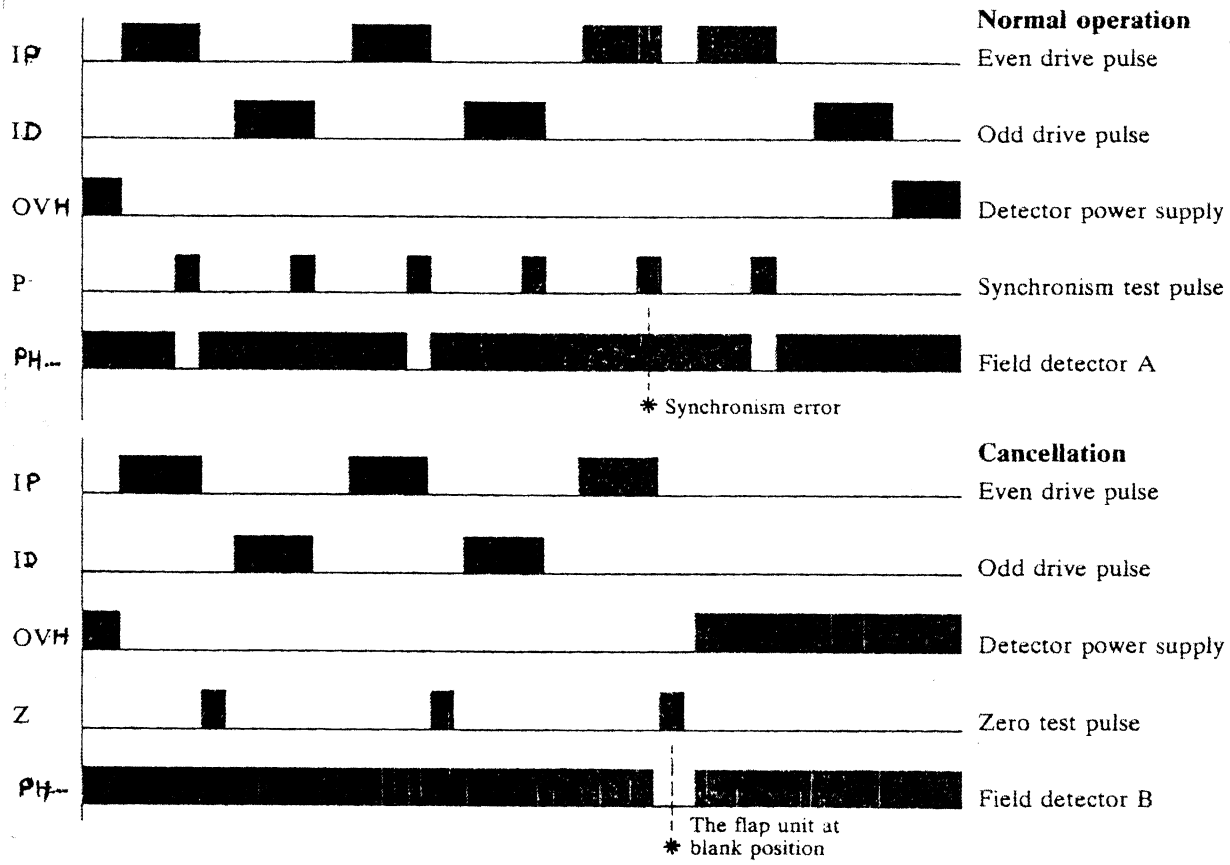
step by step detector



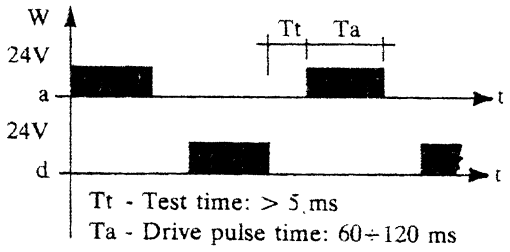
zeroing detector

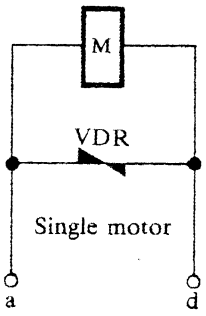


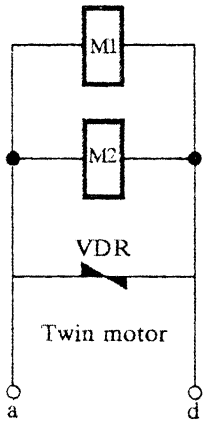
PULSES' DIAGRAM



ELECTRIC CIRCUIT







4. GENERAL CHARACTERISTICS

A flap unit has the following technical characteristics:

- code of the flap unit: P.N/p/m/CE, where:
  - . P : operating mode (step-by-step motor)
  - . N : height of characters (35, 60, 100 mm); it identifies the type
  - . p : number of flaps (40 or 60)
  - . m : module length
  - . CE: electronic control, without contacts
- available modules : 1, 2, 2.5, 4, 5, 6, 8
- flap material : PVC, thermoresistant material, aluminium
- style of characters : Gill Sans Bold (other on request)
- colour of characters : white on black (others on request)
- operating:
  - . step-by-step motor with drive pulses of 24 Vdc ± 10%
  - . drive pulse length: 60 to 120 ms according to the flap unit type and number of modules
  - . test pulse length: more than 5 ms
- relative humidity : up to 95% without condensation at 50°C
- temperature:
  - a) maximum surface radiation temperature that the flaps can tolerate without deformation:
    - . 50°C for PVC
    - . 70°C for thermoresistant material
    - . more than 70°C for aluminium
  - b) temperature range for the flap unit parts of a board installed in a place with uniform temperature:
    - . -20°C to + 50°C for PVC flap units
    - . -20°C to + 70°C for thermoresistant material flap units
    - . -20°C to + 60°C for aluminium flap units

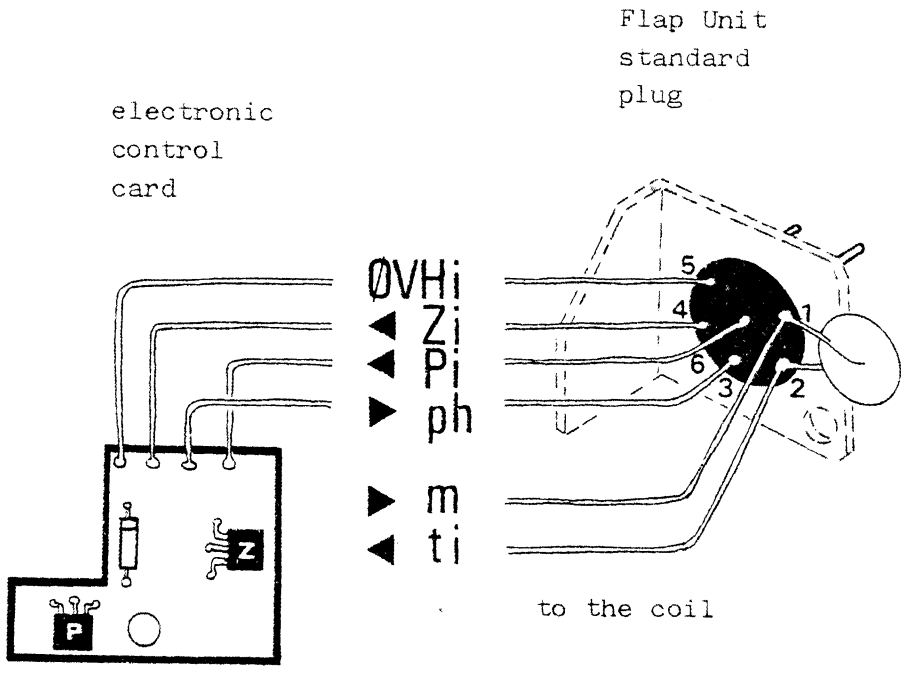
- reliability:

  . mechanics: useful life over $1x10^6$ rotations

  . electronics: MTBF = $3x10^6$ hours.

Sporadic failures of mechanical parts (flaps, etc.) with frequency less then 5% during the useful life period.

STANDARD FLAP UNIT CONNECTION



5. ADJUSTMENTS

The calibration and the final control of the flap unit running are made with the FLAP UNIT TESTING DEVICE, P/N 5.1.06032.9 and with other small tools which can be easily found on the market.
(For the use of the FLAP UNIT TESTING DEVICE see § 6).

- Regulation of the slack between pinion and side of flap unit

The screws blocking the anti-return wheel and the pinion to the sintherized rotor are unloosed.

The feeler gauge (0,15 mm) is put between the pinion and the side, then the rotor and the pinion are pressed against the side and the screws of the rotor and the anti-return wheel are tightened.

Taking off the feeler gauge, one must note a small slack of the group composed by the pinion and the anti-return wheel.

- Positioning of the flaps with the control circuit

Maintain the flap unit rotor electrically blocked, but free to rotate on its own gear and verify which one of the two leds of the testing device (LP or LD) is lit.

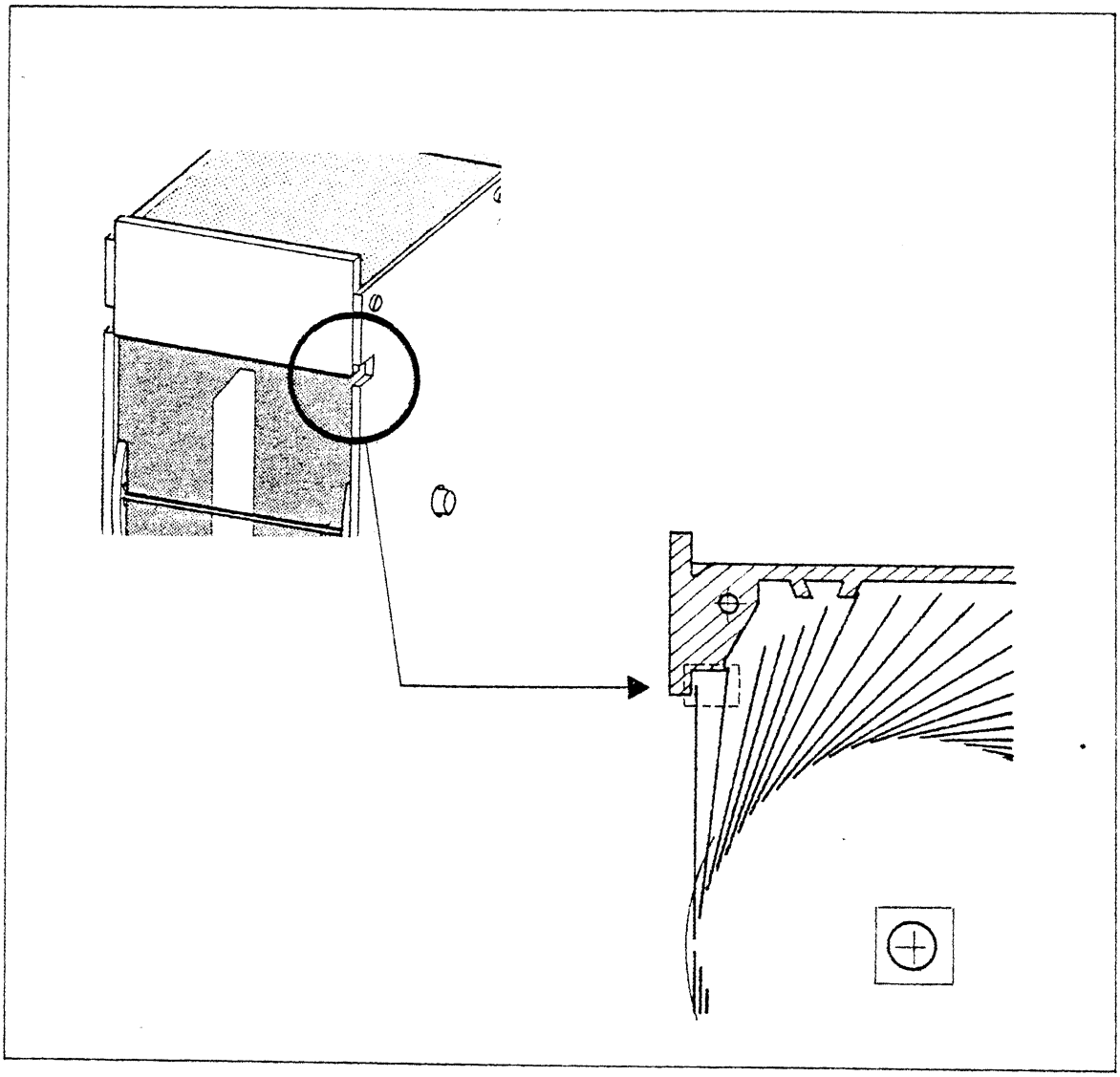
If the LP led, on the flap unit side, is lit an even flap (0,2,4 etc.) appears while if the LD led is lit an odd flap (1,3,5 etc.) appears.

- Regulation of the flaps fall

All the flap units of the Series 90 have a small window on the side allowing to control the flap position.

The situation is correct when, from the rest position, 7/8 cliks of the blade are necessary to make the next flap fall.

If this does not happen, there are 2 reasons for this; the flap is positioned too high (more than 8 clicks are necessary to the flap to fall) or too low (less than 7/8 clicks are necessary).

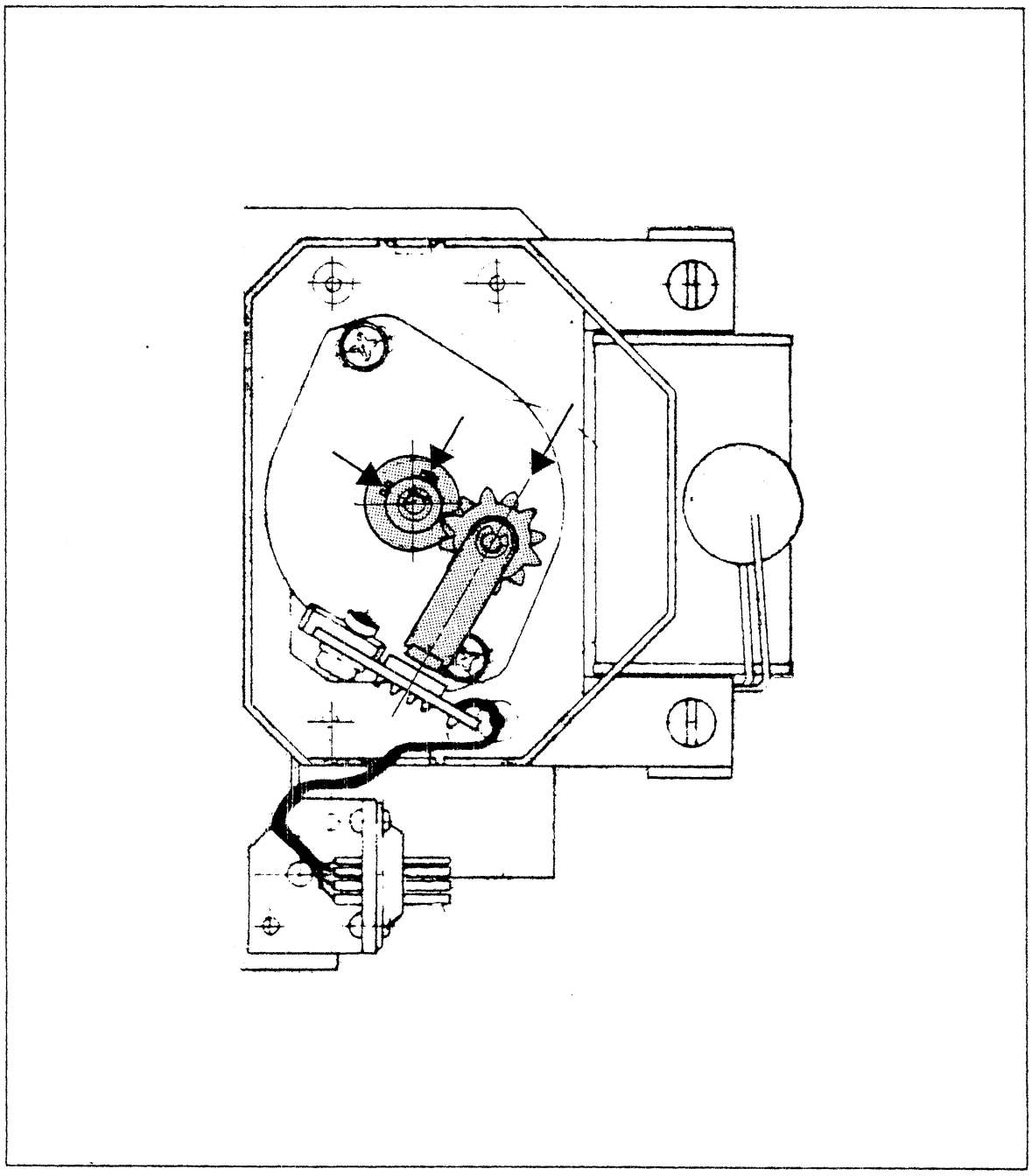


■ Regulation of the zero position

If there is a dephase between the zero position signaled by the Testing Device (LZ led lift) and the one indicated by the flap, it will be sufficient to make the neutral flap appear, by acting on the PP command of the flap unit testing device.

Then unloose the 2 screws which block the bearing arm of the zero magnet and put the arm in such a position that the magnet be in the middle with respect to the zero sensor.

Then block the screws.



■ Inspections

a) Control of external finishing:

no deformation or scratches must appear on the visible parts of the flap unit.

Particular attention must be given to the control of the printed circuits. An ohm control of continuity is suitable.

b) Flap control:

the flaps must not have spots, scratches or deformations.

Control of the inscriptions sequence.

Control of the good location of the flaps in order that one flap only falls at every step of the rotor.

Control of the status of the support stake.

The slack between flaps or reels must satisfy the values reported in the following table (measures in milimeters).

Module	1	2 2,5	4 5 6 8
T. 35	0,3 ÷ 0,5	0,3 ÷ 0,7	0,4 ÷ 0,8
T. 60	0,3 ÷ 0,7	0,4 ÷ 0,8	
T. 100	0,1 ÷ 0,5	0,4 ÷ 0,8	1,4 ÷ 0,8

It is necessary to control if the upper part of the flap is perfectly parallel to the upper part of the bow.

In order to make this it is necessary to bring black a flap just fal led and to verify if the light between same and the upper part of the bow is of 0,5 + 1 mm.

The slack between bow and side of flap unit must be of 0,1 ÷ 0,2 mm.

The bow must be perfectly in the middle: the light between flap and side, with the flap pushed alternatively at right and at left, must be equal.

Maximum difference allowed: 0,2 mm.

c) Control of the free rotation of the rotor and axial displacement: the rotation in the stator cavity must not present sensible friction but must be smooth running.

Verify that there are no filings residue depisited in the rotor.

The rotor axial displacement must be of 0,1 mm.

d) Control of the check spring:

control of the wheel profile on which is laid the anti-return spring.

Control of the spring pression, measured at the free extremity of same i.e.:

. for T. 35 flap unit: 13 to 16 gr.

. for T. 60-100 " " : 18 to 22 gr.

e) Control of electrical working:

apply to the motor a continuous tension of 24V and vary the polarity to the ends of the coil; then verify that the rotor moves of 36°.

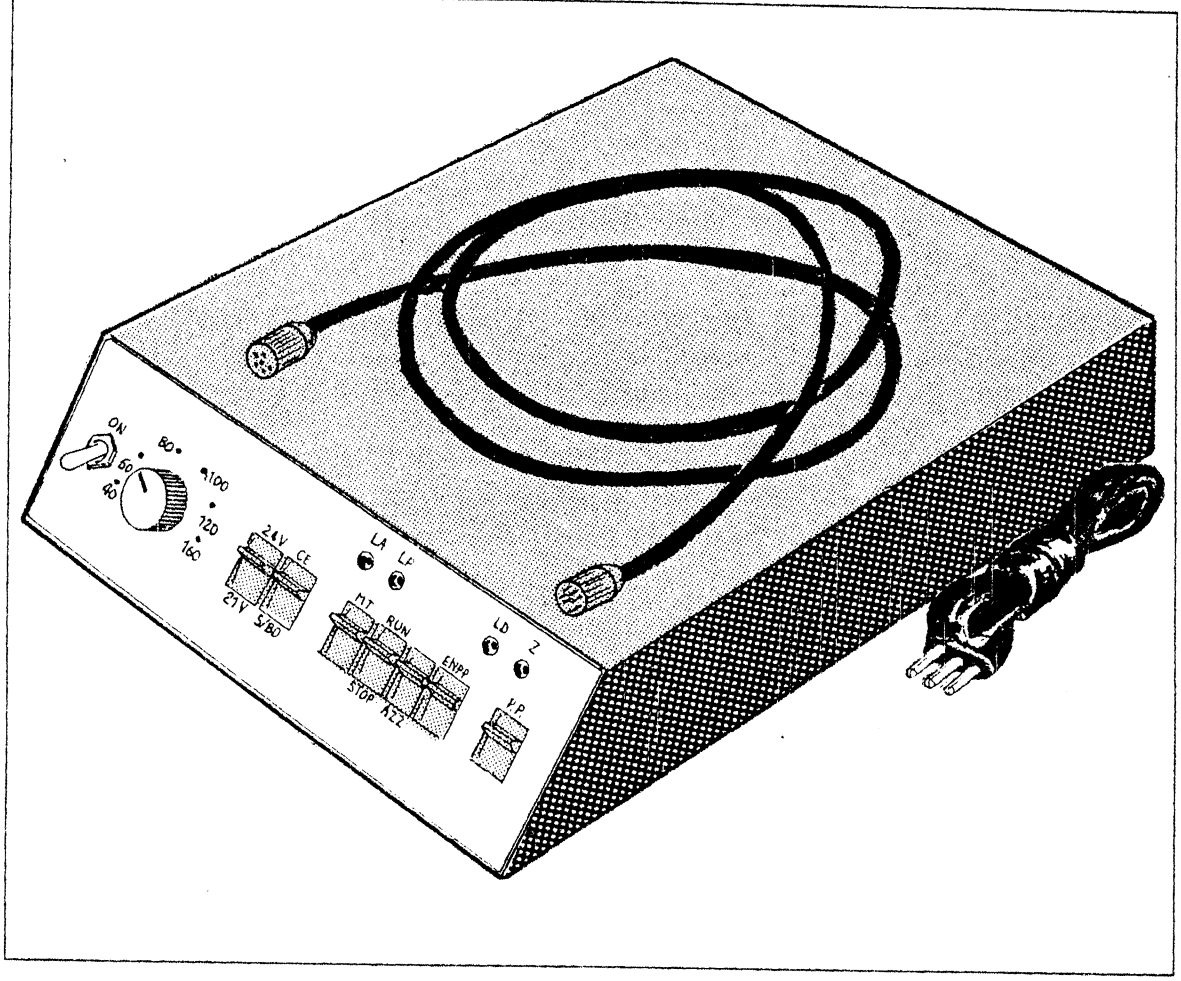
This movement must be net, without slipping or interruptions, with the flap unit in the zero position (i.e. presenting the 40 th neutral flap); by applying the positive tension to the point 2 of the connector and the negative one to the point 1, the motor must not move.

f) Isolant tests:

the printed circuits, the connector and the coil must be proved at the isolation towards the mass and between them. For this test use a megohm meter at 100 V.

Verify with the ohmmeter the coil resistance.

Its value must have a tollerance of ± 10% of the value indicated on same.



This testing device allows to control the operation of one flap unit only, at a time. The flap unit can be S80 or C.E. type.

According to the kind of flap unit to be controlled, S80 or C.E., the connector of this flap unit has to be inserted, (through to extension-cable), on the corresponding female connector placed on the back side of testing device and the respective key will be switched over appropriately on the frontal of this testing device.

The unit can be fed either with 110/220V - 50/60 Hz subject to the usual internal bridging on the primary side of the supply transformer.

The testing device contains a feeder, which supplies the following 3 voltages and currents, that are tension stabilized and protected against the short circuits: +5V 1A, +12C 0,2A, +V 0,5A.

The +V voltage supplies the flap unit motor and therefore the coil of the same flap unit. This voltage can be changed through the three - positions - switch placed on the frontal of the testing device from 18 to 21 or 24 V c.c.

The unit contains moreover a circuit, that controls and signals to the outside, through the LA lamp, the contemporary presence of all these voltages.

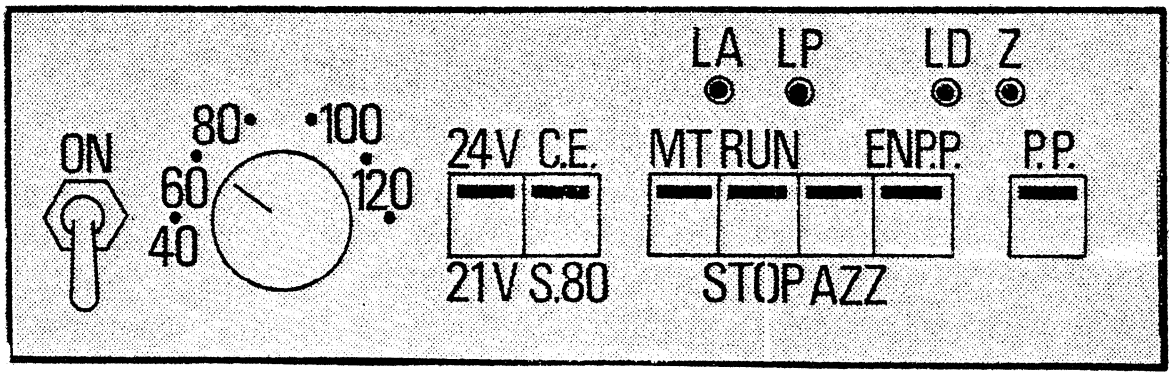
When the LA light is out, it means that one or more voltages are missing. The incorporated driver is similar to the one of a normal board and generates positive and negative pulses spaced among themselves by a 20 msec. pause.

The polarity of these pulses from the circuit, which is carrying out the synchronism control at each step and, in case of error, maintains the following pulse with the same polarity of the previous one.

The pulse lenght is established through a switch placed on the frontal of the testing device and it can be changed from 40 to 60, 80, 100, 120 and 1260 msec; the 1250 msec. speed is used normally only to control the silkscreening sequence of the flaps during a first flap unit test.

The lenght of the pulse, which will be selected, depends of course from the type and number of the modules of the flap unit under control.

This unit presents on the front side besides the switches, lamps, etc. already described, also the keys, switches, lamps etc.; their name and meaning is the following (fig. 8):



a) IG switch — is the main switch.

b) AZZ key — is the automatic zero key.

Pushing this key, the flap unit makes a set of steps until to go on the zero position (blank flap).

This operation is possible only in case the flap unit is not already on the zero position and in case the STOP/RUN key is on STOP position and ENPP is off.

c) STOP/RUN switch — is the key, which lets the flap unit to turn continuously or stop.

In STOP position, the flap unit can be run either pushing the automatic zero key in case the flap unit is out from zero position or step-by-step, as following described, if it is able to do this operation through the respective key.

d) ENPP switch — is the key which lets the flap unit rotation step-by-step, through the PP push.

This key, if on, interdicts in any case the RUN and automatic AZZ operation.

e) PP push — pushing this button, the flap unit motor proceeds only one step.

The length of the impulse, which lets the motor run, is indipendent from the length of the pressure on this button and depends instead only by the position of the corresponding switch.

f) LP-LD LZ lamps — segnalize that the flap unit is on even or odd or zero. position.

In case the flap unit is on zero position, the even polarity lamp switches on.

g) MT switch — with this switch the current on the flap unit motor coil can be taken off; it is used to let run by hand the flap unit motor, controlling always the polarity.