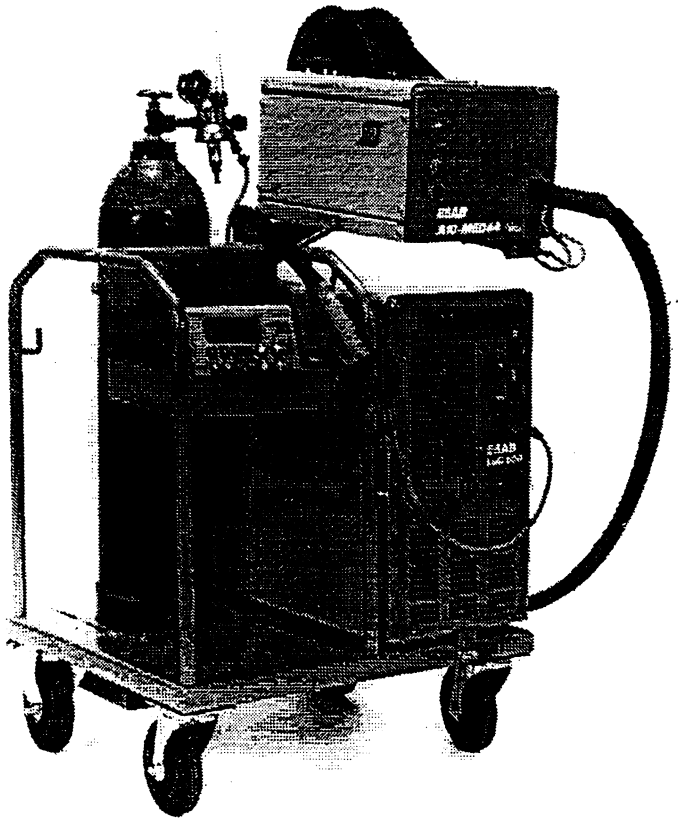
ESAB

LUC 500
Aristo 500

Welding power source



Service manual

740 800-073 9010 - 1

LIST OF CONTENTS

INTRODUCTION

This service manual is intended for use by personnel with appropriate technical training, to provide assistance with fault-tracing and maintenance.

This service manual consists of four separate documents, a service manual, a copy of the English part of the LUC 500 instruction manual, spare parts list and a service information which contains information about exchange of switch units.

The instruction manual for the MED 44A wire feed unit is included in a separate service manual for the wire feeder (ordering number 740 800-076).

This service manual contains details of all design changes incorporated up to and including October 1990. The spare parts list contains details of all design changes up to and including May 1996.

The edition date on the front page is followed by a one (9010 – 1), this means that the layout has been altered, the contents are still the same as in the 9010 edition, however the spare parts list is updated and includes all design changes up to May 1996.

The Aristo 500 has been designed and tested in accordance with the international EN 60 974-1 standard (IEC 974-1).

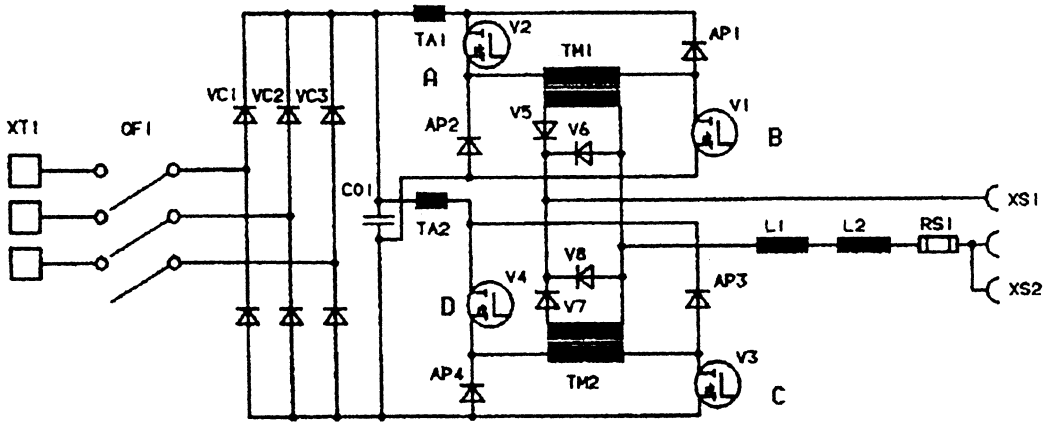
On completion of service or repair, it is the responsibility of the person(s) performing the work to ensure that the product still complies with the requirements of the above standard.

DESCRIPTION

THE INVERTER PRINCIPLE

ARISTO 500 is a transistor controlled power source which is operating according to the inverter principle. The mains supply, 3-phase 400V, is rectified by the rectifier bridges VC1 - VC3 and smoothed by capacitor CO1.

PRINCIPLE DIAGRAM



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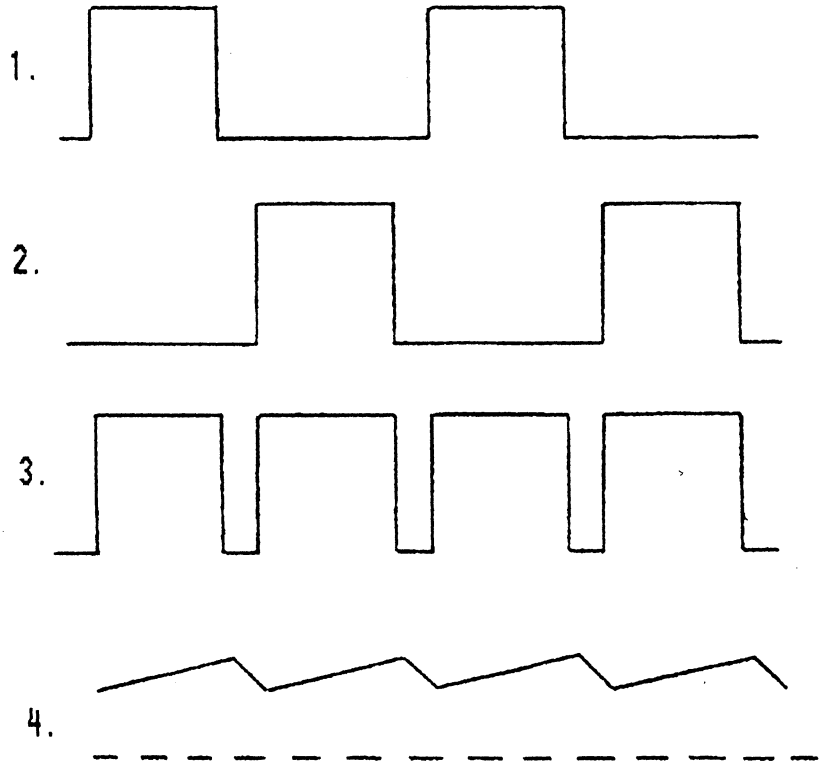
The voltage on CO1 is 565V in no load condition, at a mains voltage of 400V. This voltage is switched to the primary side of the main transformer (TM1) during very short periods of time which are regulated by the control circuit board AP5. This board transmits the control pulses to the gates of the MOSFET-transistors, an operation which is performed in counter phase between the transistor packets A, B and C, D. See figure below.



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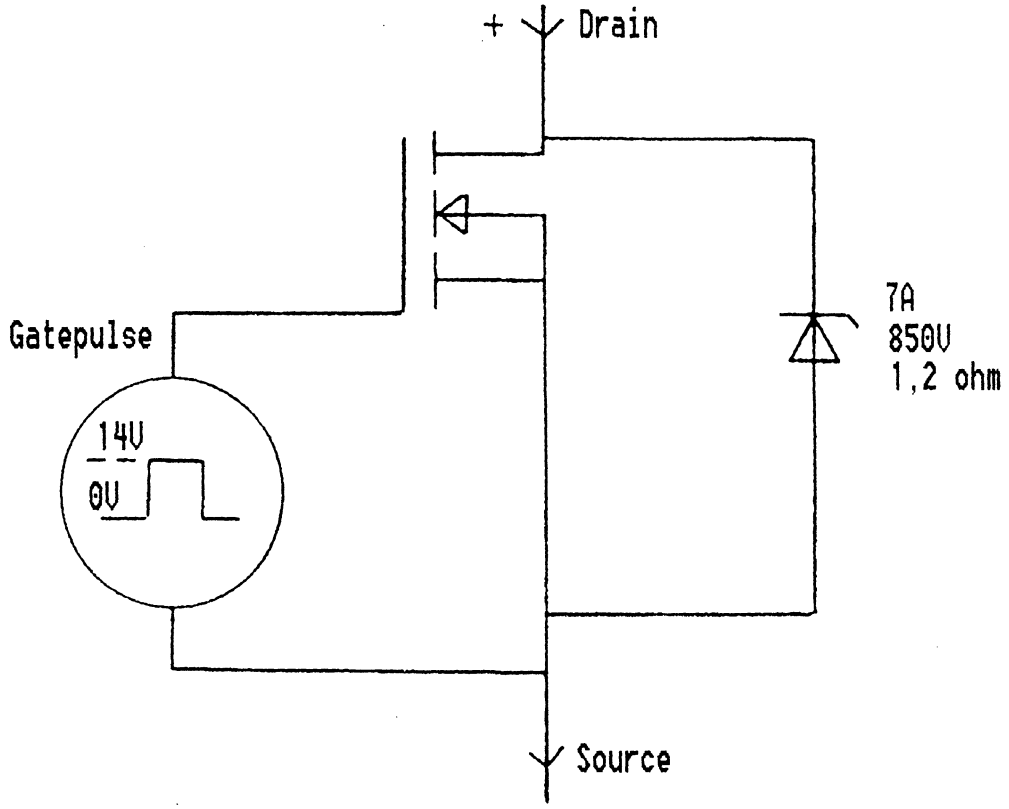
1. Output voltage from the upper transistor packet (42% duty cycle)
2. Output voltage from the lower transistor packet (42% duty cycle)
3. Output voltage from the two transistor packets, before the inductor (84% duty cycle)
4. Current in the welding circuit

The transistors have an over voltage protection which make them conducting at about 850V. The purpose of the transistors is to control the current. The max. saturation is 40.5% - 43.5% of the cycle time, the principle is shown in the figure below.



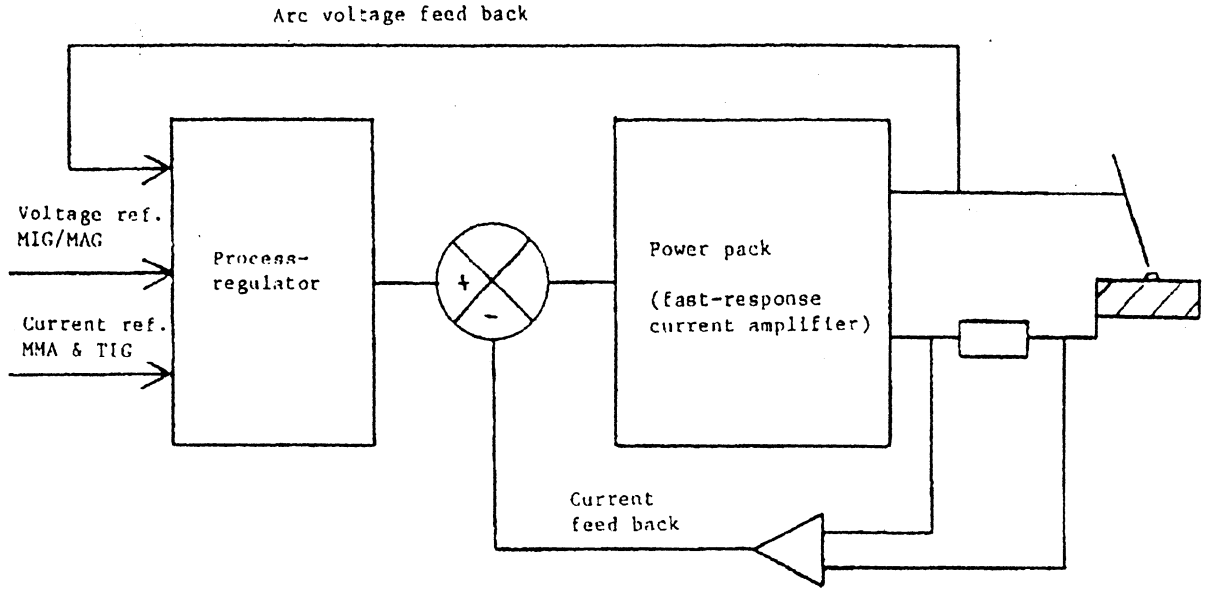
cny0ap02

Each control pulse can be regulated with the Data setting box by a regulation of the current setting.

The control pulses can be regulated between 0 and 17 microsec. The switch frequency is 24 kHz per transistor packet and the connection in counter phase gives the frequency 48 kHz on the welding side.
Each control pulse on the primary side of the transformer results in a corresponding voltage pulse on the secondary side. These pulses are then rectified by the welding diodes V5, V7. The current goes through the welding arc, the shunt (RS1) and the welding inductors L1 and L2. The voltage is fed back to the control PC-board AP5 via the shunt. The feed back voltage is proportional to the current, 120 mV at 500 A.

The control pulses should be within 40.5% - 43.5% of a full cycle and the transistor packets are operating in counter phase. This means that the current ought to flow during 87% of the time only. This is not the case, however, since the current is maintained by the welding inductors (L1 and L2) and by the free-wheeling diodes V6 and V8.

DESCRIPTION



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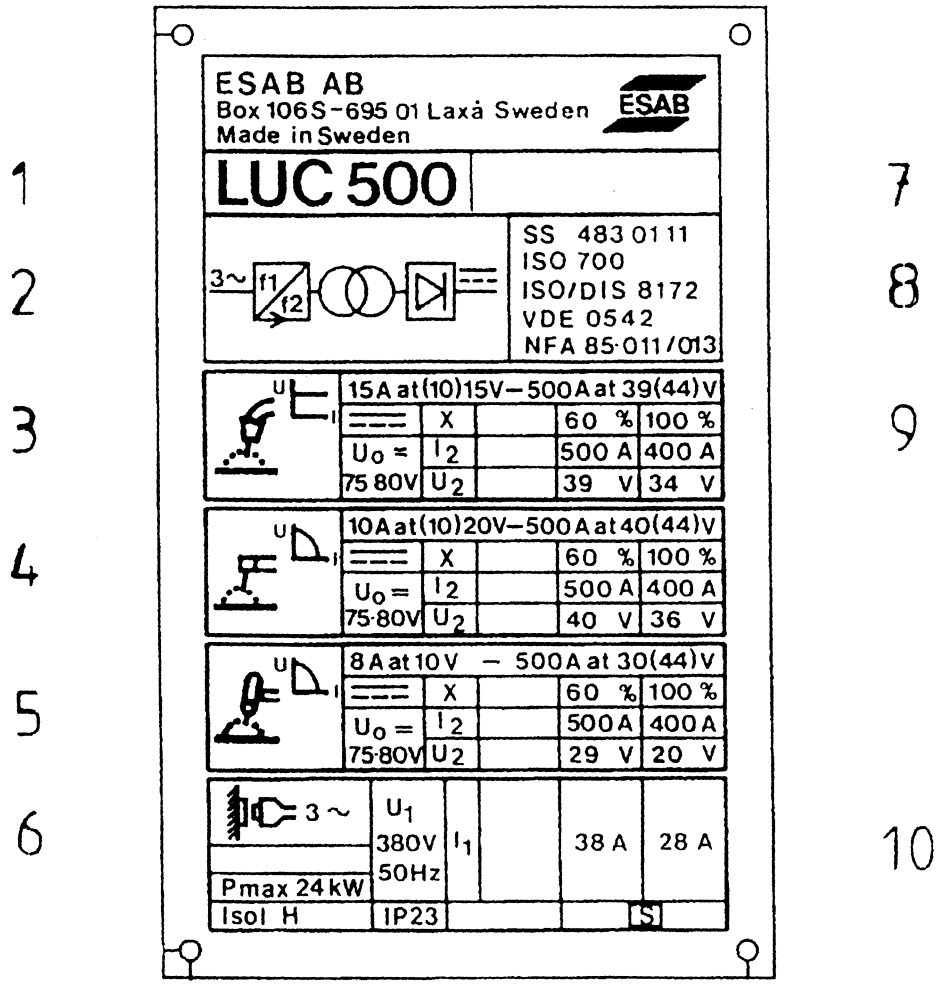
Feedback of the references to the process regulator

RATING PLATE



1 2 3 4 5 6 7 8 9 10

cny0ap04

1. LUC 500 is an internal ESAB reference for ARISTO 500.
2. The symbols indicate that the ARISTO 500 has an inverter, a transformer and a rectifier.
3. Indicate current/voltage characteristics at MIG/MAG welding.
4. Indicate current/voltage characteristics at MMA welding.
5. Indicate current/voltage characteristics at TIG welding.
6. This means that the unit is designed for connection to a 380V (±10%) 3-phase mains supply with a frequency of 50 Hz.
   From 1990 the mains voltage is rated as 400V (+6 -15%).
7. Indicate date of manufacturing and machine number.
8. The letter and number combinations indicate that ESAB follows international and national standards. This means an important protection for you, since standards are guidelines, which manufacturers are under no obligation to observe.

SEN	Swedish standards
VDE	German standards
ISO	International standards
NF	French standards

9. X indicates duty cycle, I indicates current at relevant duty factor, U indicates voltage according to the arc line, Uo indicates the open circuit voltage. The duty cycle indicates how long welding can be carried out with the specified data. The duty cycle is expresses as % of a 5-minute period.
10. Indicate mains supply voltages and primary currents at different duty factors.

WATER COOLED TORCH

When a water cooled torch shall be used it is necessary to connect a jumper between 1 and 2 on terminal XT5. The water flow guard shall be connected between 3 and 4 on pin plug XP1. See the connection diagram on page 60 .
This is already made on the plug which is delivered together with the cooling unit.

LIFT ARC, 2-STROKE / 4-STROKE, BURN BACK TIME

Lift Arc

ARISTO 500 is equipped with a function called "Lift Arc". This means an automatic control of the welding current in the moment of short circuit, which optimizes the start characteristics.

Via the built in slope up function the current gradually rises to its pre-set value. When the torch switch is released the current is gradually reduced according to the, by the computer, automatically set slope down time.

MMA: In this position the machine is prepared for welding with coated electrodes. The Lift-Arc function is disconnected and the Hot-start function is activated to give a current peak in the moment of the start.

Switch M11 for 2-Stroke / 4-Stroke, Burn back time

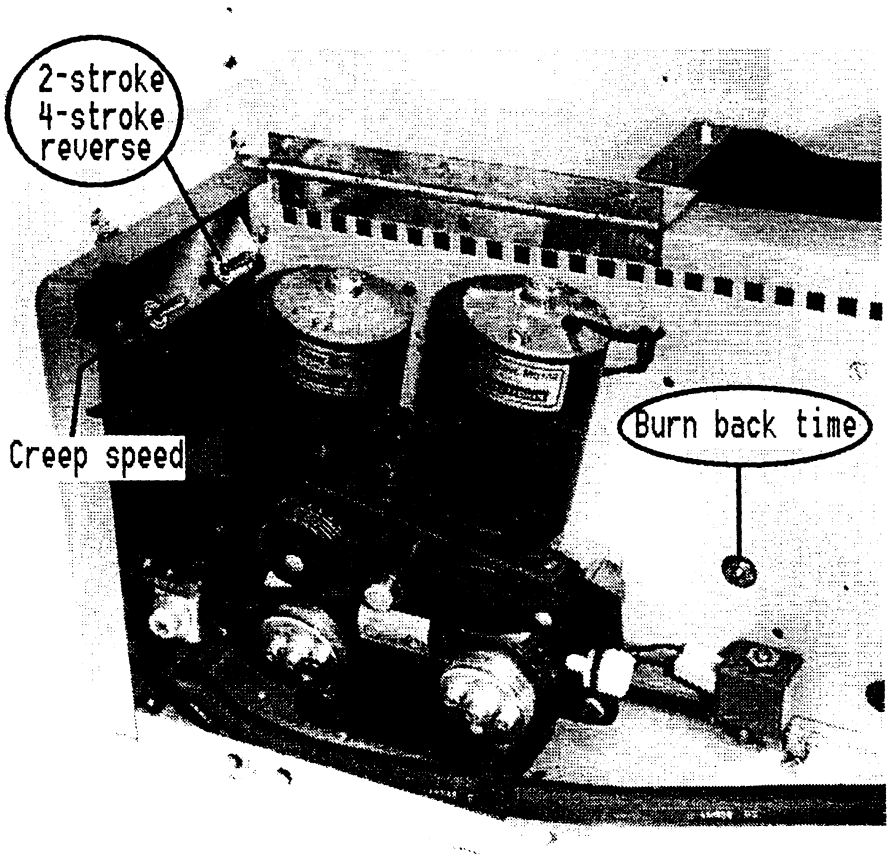
Functions on the wirefeeder MED 44A

2-Stroke: Means that the arc is struck when the torch switch is pressed, the welding stops when the switch is released.

4-Stroke: Means that the torch switch does not have to be held pressed during continuous welding. Press and release the switch and the welding starts, press and release it again and the welding stops.

- Creep start: The wire is fed with 40% of its pre-set value until the short circuit occurs. Then the wire feed speed is increased to the pre-set value.
- Normal start: The wire is fed with its pre-set value from start.

The potentiometer inside the wire feed unit controls the Burn back time, see the figure below.



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DESCRIPTION WIRE FEEDER MED 44A

This description consists of two parts, first the main PCB M8 is described, then a description of the printed circuit board M35 follows.

PRINTED CIRCUIT BOARD M8

The following abbrevations and expressions have been used in this description:

A1-A15 Connection points on the PCB connected to the 15 pole pin plug

G1-G15 Connection points on the PCB connected to the 15 pole sleeve plug

B1-B4 Connection points on the PCB connected to the 9 pole pin plug

A-F Flat pin connections on the PCB

Components on the PCB

R Resistor

C Capacitor

D Diode, zenerdiode

Q Transistor

IC Integrated circuit

Br Rectifier bridge

Vr Voltage regulator

MP Measuring point

RE Relay

Other abbreviations are referring to the connection diagram on page 20 .

The M8 block diagram is on page 12, the measuring points mentioned in the description are marked in the component layout on page 16 .

- **POWER SUPPLY**

  Converts 2 x 19V AC from the control transformer M13 into ±15V DC and +25 V unstabilized DC. The +15V is trimmed by means of the trimming potentiometer R82.
  Electronic zero has been co connected to the positive welding terminal of the power source through terminal A13.

- **START CIRCUIT WITH LOCKING FUNCTION**

Br2 recieves 19V AC from a separate winding on the control transformer M13 when RE1 on PCB M35 is activated. This will energize RE2 and **MP1**, IC3;5, and **MP2**, IC3;11, will be +15V.

The start circuit includes a blocking function that prevents the main thyristors from receiving ignition pulses when the braking thyristor is still conducting in connection with restarting.

MP3, IC6;14, will change over from +15V to -15V. **MP7**, IC4;4, will be +15V and **MP8**, D24 anod, will change over from +15V to -15V, which means that the locking function across the regulator will be released.

- **REFERENCE CIRCUIT**

The reference voltage is input to connection G2. The reference voltage can be between 0 och +8,3V, where 8,3V corresponds to a wire speed of 22m/min.

When switch M1, connected to G4, is in the normal start position the voltage is 0V on G4.
If M1 is set to the inching speed start position the reference voltage will be reduced. This means that the inching speed reference amounts to some 40% of the reference voltage. Current relay M10 is energized by the welding current when the welding arc is struck, connection G3 is brought to 0V by the closing contact in M10, this sets the reference voltage to the regulator back to the preseted normal value.

- **REGULATOR**

An AC tachometer is connected to the motor M31. The tachometer frequency varies with the motor speed. 588 Hz from the tachometer corresponds to a wire feed speed of 18 m/min.
The tachometer is connected to A1 and A2. The frequency is converted into a DC voltage. The DC voltage is trimmed to -1,8V, by potentiometer R143, at a tachometer frequency of 588 Hz. The DC voltage can be measured at connection A5.

The signal, is-value, is compared with the should-value at the summing point. The speed regulator will produce a speed reference between -15V and +15V, depending on the error in the summing point.
The speed reference can be measured at IC7 pin8, **MPa**.

- **SAWTOOTH GENERATOR**

This unit produces a mains syncronized sawtooth voltage. The voltage can be measured on IC7;13, **MPb**.
On **MPe**, D27 anode, the pulsing DC voltage which syncronizes the sawtooth generator can be measured.

- **MOTOR FEED**

TY1, TY2 and D31 - D34 form an angulary controlled rectifier bridge for control of the speed of the wire feed motor. The striking angle of the thyristors is determined in that the reference signal from the speed regulator is compared with the sawtooth voltage in the comparator IC7; 12, 13, 14.
When the level of the reference signal is higher than the sawtooth voltage **MPc**, IC7;14, will change over from -15V to +15V. The ignition pulses will be emitted to the thyristors by a transistor circuit, the ignition pulses can be seen in the connection point between R90 and R91, **MPd**.

42V AC is supplied to the rectifier bridge through the connections B2 and C. The wire feed motor is connected to A and E1.

- **BURN BACK TIME**

As the wire feed is acivated **MP3**, IC6;14, will be -15V. **MP4**, IC4;3, will then change over from 0V till +15V and the back burn time capacitor C21 will be charged.
MP5, IC8;8, will change over from -15V to +15V, which means that RE1 is energized. RE1 in turn energizes the welding contactor in the power source. The voltage over RE1 can be measured between +25V and **MP6**.

When the torh switch is released MP3 = +15V, MP4 = 0V and C21 is discharged via potentiometer R55. When the voltage over C21 has dropped to +7,5V, MP5 will change over to -15V and RE1 is deenergized.
The back burn time is adjustable from 20 to 500 ms by means of potentiometer R55.

- **TRANSISTOR BRAKE**

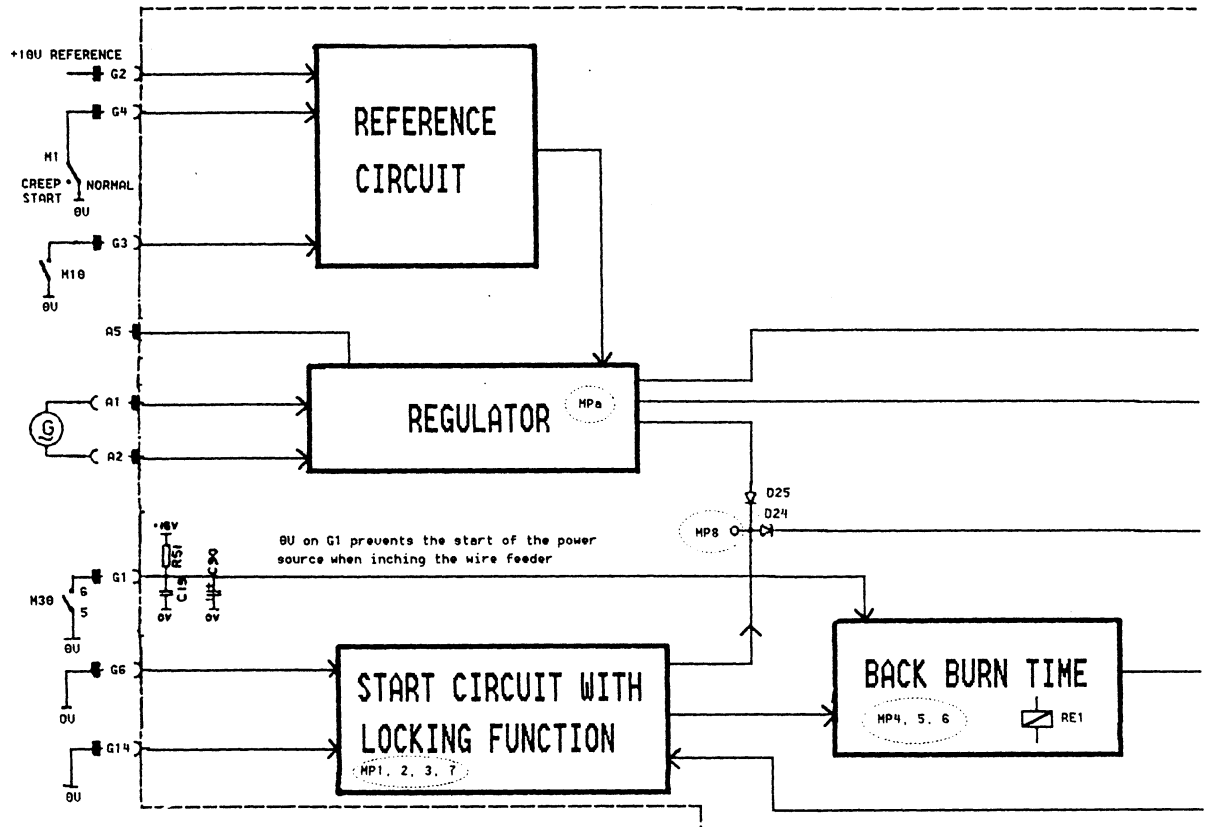
This circuit operates when the torch switch is released and at a sudden speed change.

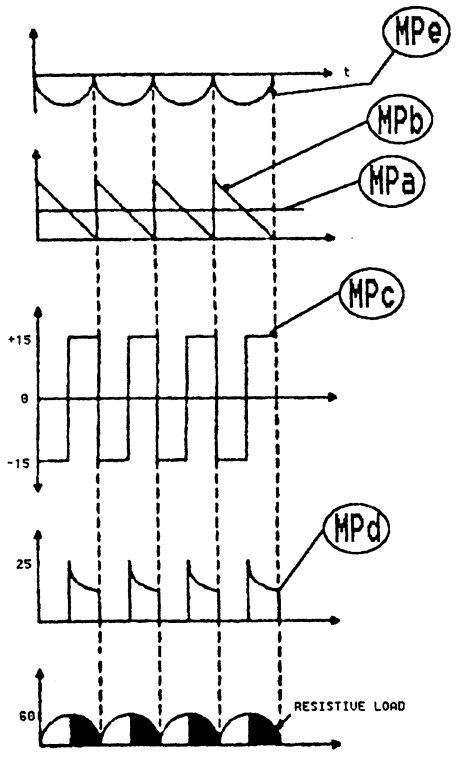
When **MP8**, D24 anode, changes over from -15V to +15V, if the torch switch is released, **MP9**, IC8;7, will change over to -15V. **MP10**, IC8;12, will change over to 0V, which means that **MP11**, IC8;14, will be -15V. The brake transistor M18 is supplied with base current, M18 will retard the wire feed motor through resistor M24. At the same time the speed regulator is blocked so as not to let any ignition pulses through to TY1 and TY2.

- **THYRISTOR BRAKE**

This circuit is operative only when the torch switch is released. MP4 will be 0V, which means that **MP12**, IC2;4, changes over to 0V.
TY3 receives ignition pulses, that means that TY3 will short circuit the wire feed motors, which will then be rapidly retarded to 0. At the same time the speed regulator is blocked so as not to let any ignition pulses through to TY1 and TY2.

BLOCK DIAGRAM PCB M8



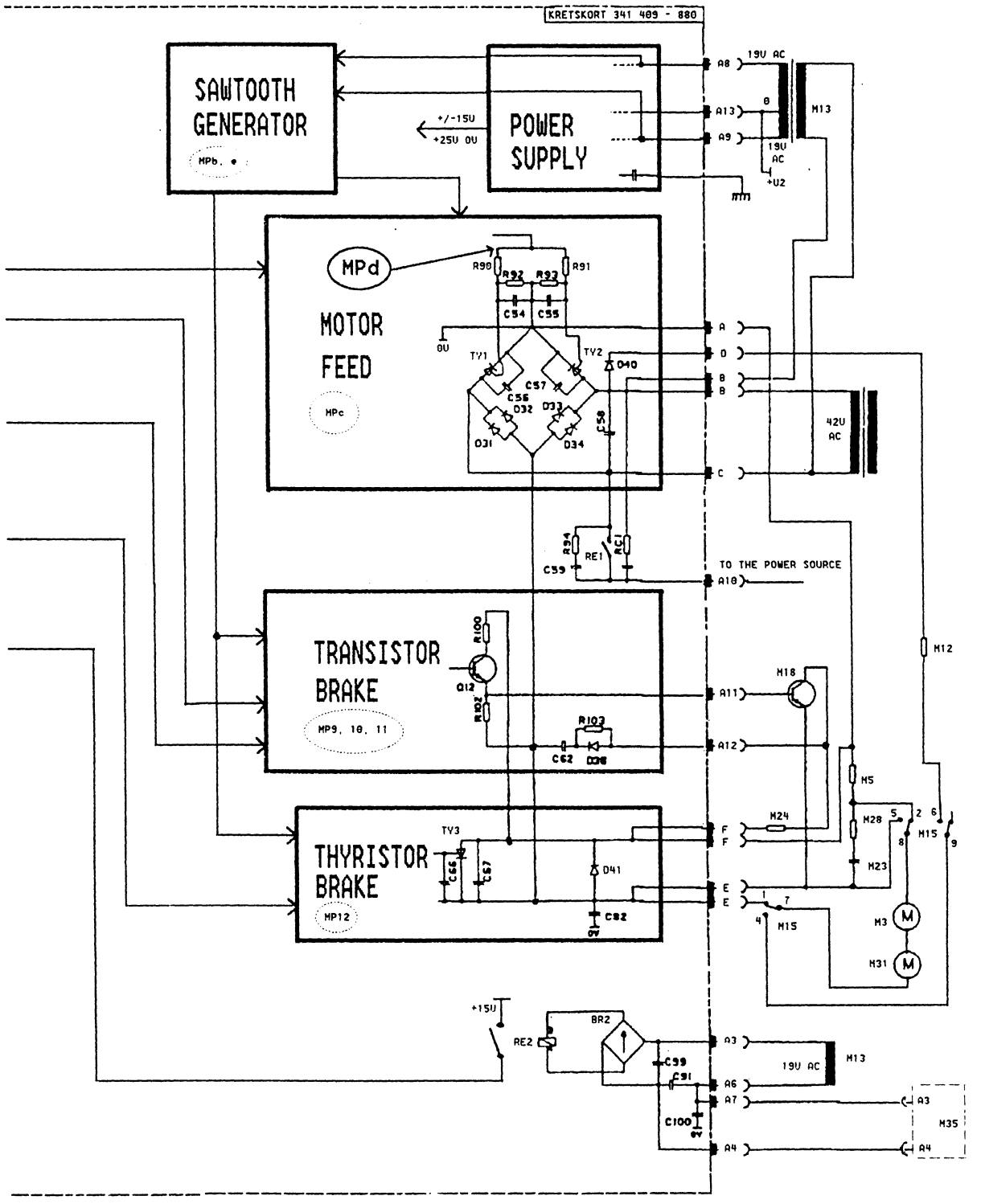


M1 NORMAL
M11 2-STROKE

MP	GUN TRIGGER	
	OFF(U)	ON(U)
1	0	+15
2	0	+15
3	+15	-15
4	0	+15
5	-15	+15
6	+25	0
7	0	+15
8	+15	-15
9	-15	+15
10	0	+15
11	-15	+15
12	0	+15

FOR THE POSITIONS OF THE MEASURING POINTS
PLEASE SEE THE COMPONENT LAYOUT

cny0aem1


KRETSKORT 341 409 - 880
SAWTOOTH GENERATOR
MPb
+/-15U
+25U 0U
POWER SUPPLY
A8
19U AC
A13
0
A9
19U AC
+U2
M13
MPd
MOTOR FEED
MPc
R90
R92
R93
R91
C54
C55
0U
TV1
TV2
D40
C57
C56
D32
D33
C58
D31
D34
A
D
B
B
C
42U AC
R94
RE1
RC1
C59
TO THE POWER SOURCE
A10
TRANSISTOR BRAKE
MP9, 10, 11
R100
Q12
R102
R103
C62
D36
A11
A12
M18
M12
M5
M24
M28
M15
M23
F
F
E
E
M3
M31
TV3
THYRISTOR BRAKE
MP12
C66
C67
D41
C82
+15U
RE2
BR2
C99
C91
C100
A3
19U AC
A6
A7
A4
M35

cny0aem2

DESCRIPTION PRE AND POST FLOW M35

GENERAL DESCRIPTION

The pre and post flow circuit board is a supplement to MED 30/44 to obtain gas pre and post flow functions. These functions are steplessly adjustable between 0 and 5 seconds by way of external switchable rheostats.

CIRCUIT DESCRIPTION

The measuring points in this description are marked with **MP** . The measuring points are marked in the component layout 481 306 on page 18.

- **POWER SUPPLY**

  A 19V AC voltage is connected to inputs A13 and A14. This AC voltage is rectified through the BR1 rectifier bridge and the voltage is smoothened by capacitor C3.
  There are two DC voltage levels, +15V and +25V. +25V is used to energize relays RE1 and RE2, while +15V is used e.g. for the operation of IC2, IC3 and IC4.

- **2-STROKE / 4-STROKE**

  Two or four stroke operation is selected through an external switch connected to inputs A8 and A10. +15V is avilable in **MP4** when the switch is in the 2-stroke position, while the voltage level in MP4 is 0V when the switch is set to 4-stroke operation.

- **START AND STOP**

  The torch switch is connected to inputs B1 and B2, and it provides an ON/OFF function for the 19V AC supply to the BR2 rectifier bridge which in turn operates the LED in the IC1 opto switch.
  When the torch switch is depressed **MP1** will change from +15V to 0V, **MP2** from 0V to +15V and **MP3** also from 0V to +15V. When the 2-/4-stroke switch is in the 4-stroke position +15V is available in MP3 also when the torch switch is released, and will be 0V when the switch is depressed a second time.

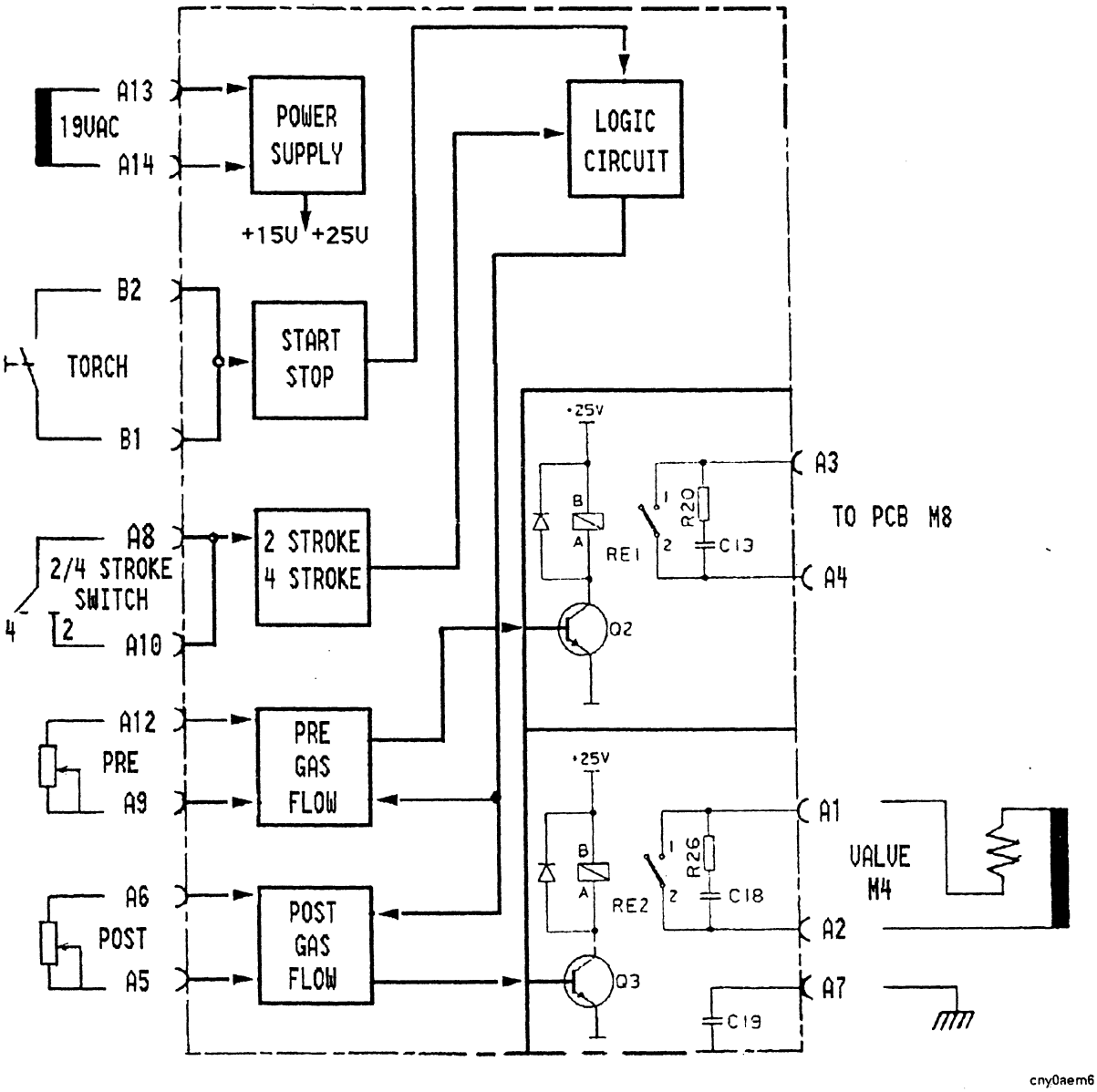
- **GAS PRE FLOW**

  When the torch switch is depressed **MP3** will change to +15V, which means thath capacitor C12 is charged through the external potentiometer connected to inputs A12 and A9. When C12 has been charged until the voltage level at input 9 on IC4 is 7,5V **MP5** will change from 0V to +15V and Q2 will be conductive to energize relay relay RE1.
  When the torch switch is released **MP3** will change to 0V, C12 will be discharged direct through D4, **MP5** will change to 0V, Q2 will be cut out and RE1 will be deenergized.

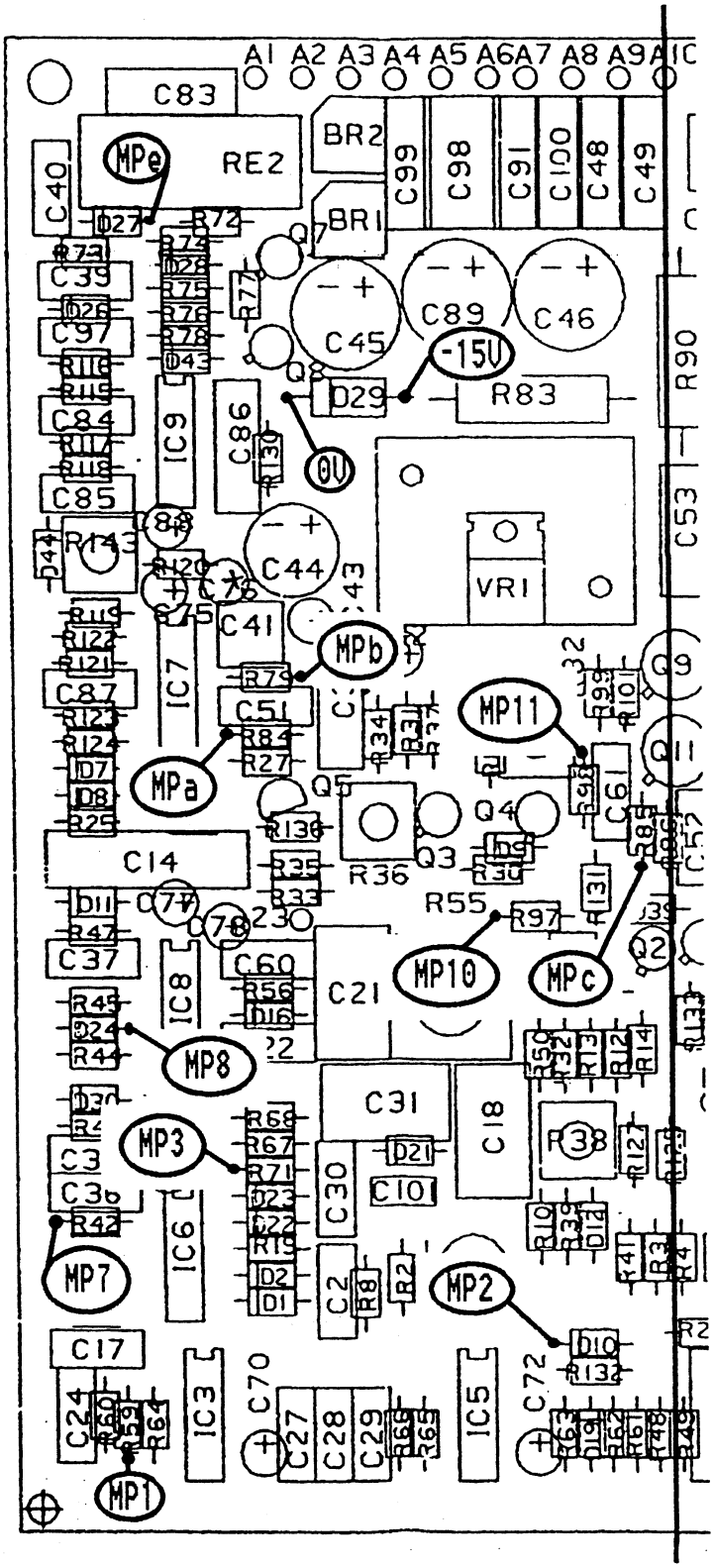
- **GAS POST FLOW**

When the torch switch is depressed **MP3** will change to +15V, capacitor C17 will be charged direct through D7, and **MP6** will change to +15V. Q3 will be conductive to energize relay RE2.
When the torch switch is released **MP3** will change to 0V and C17 will be discharged through the external potentiometer connected to the inputs A5 and A6 until the level at input 7 has been reduced to 7,5V. This means that **MP6** will change to 0V, Q2 will be cut out and RE2 will be deenergized.

BLOCK DIAGRAM PCB M35



COMPONENT LAYOUT PCB M8



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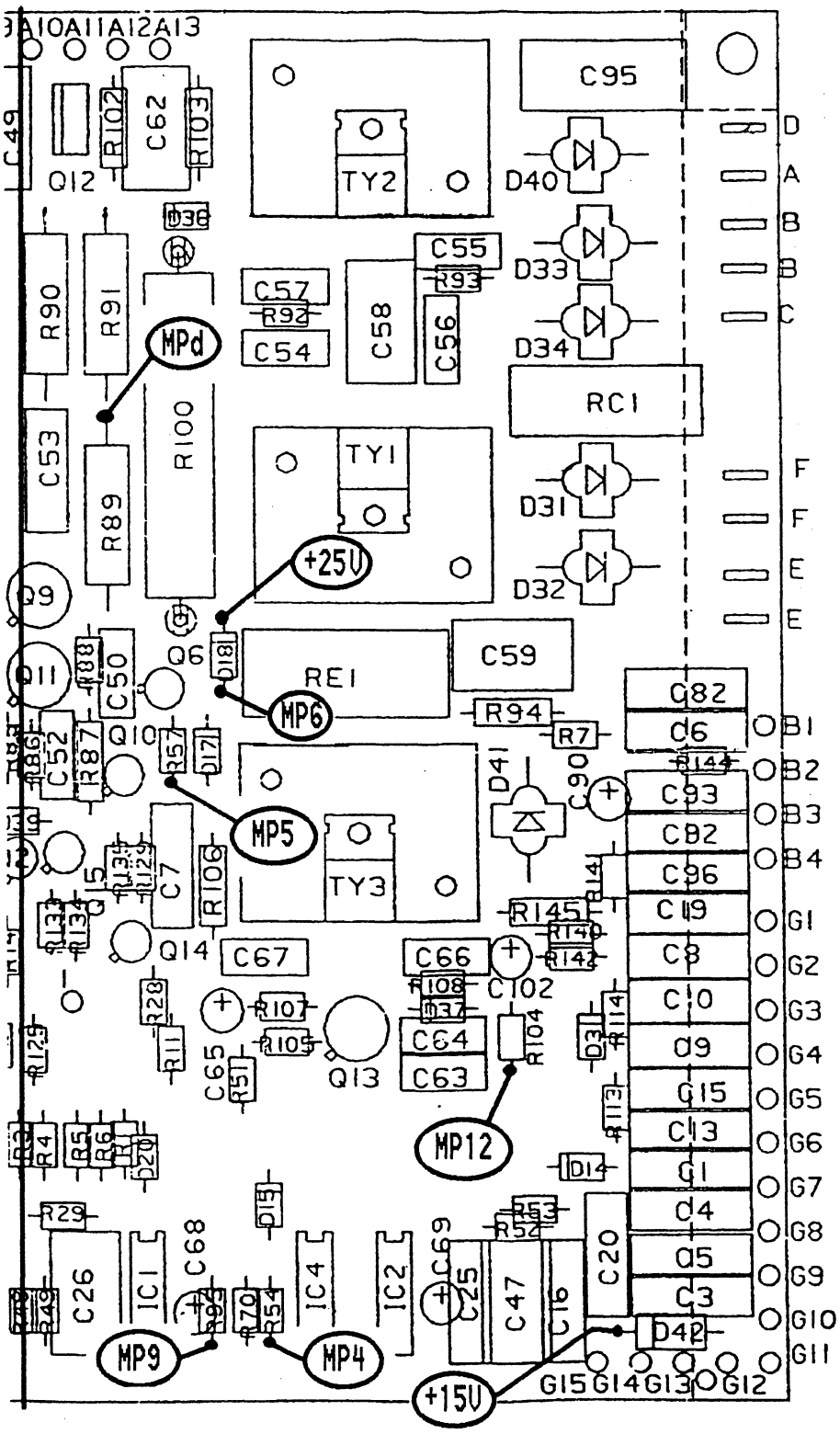

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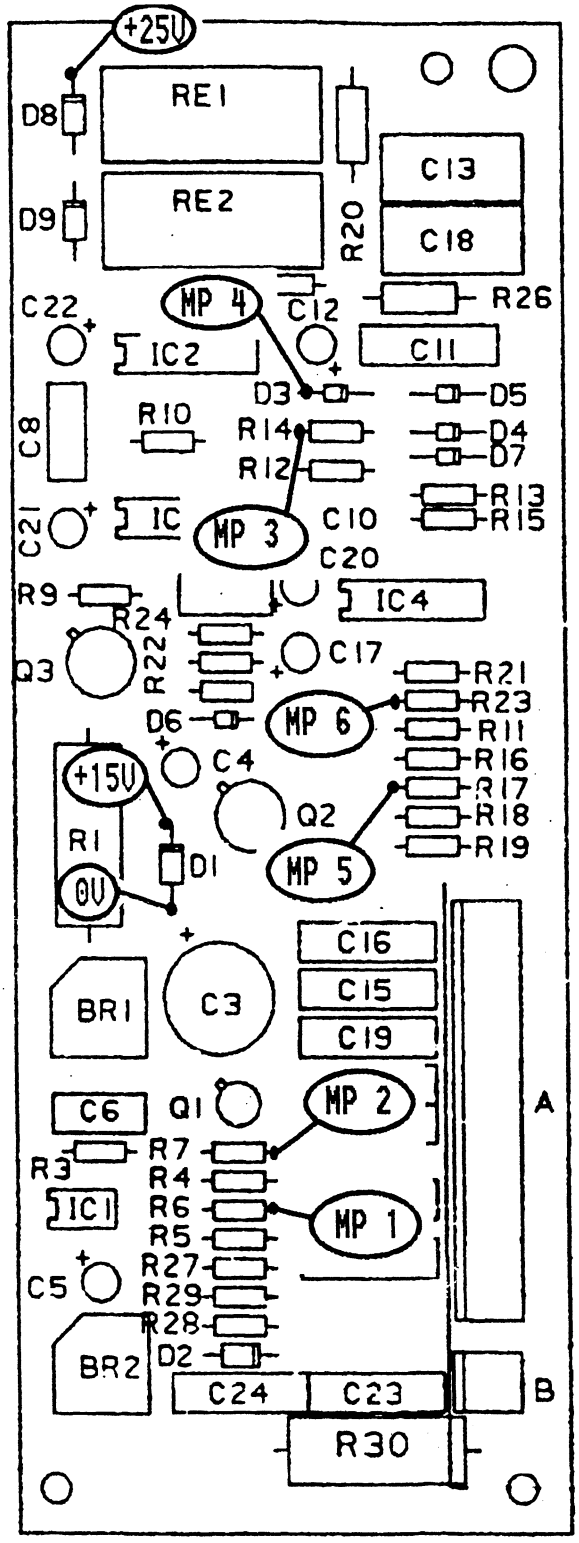
COMPONENT LAYOUT PCB M35



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CONNECTION DIAGRAM WIRE FEEDER MED 44A

Component description connection diagram MED 44A

M10 Current relay

G AC tachometer

M30 Inching, cold wire feed

M24 Transistor brake, brake resistor, 0,75Ω 50W

M5 Start resistor (limits the start current), 0,3Ω 50W

M23 Smoothing capacitor, 2200µF 63V

M28 Resistor reducing the charge current to M23, 0,5Ω 50W

M12 Resistor reducing the motor reversing current, 0,75Ω 50W

M29 Manual gas prepurge

M15 Forward/reverse

M11 4-stroke / 2-stroke / reverse

Connections

Contacts, on PCB M8, only marked with a letter are flat pin connections.

M6 Remote control connection

M72 Connection to the power source

M7;10,11 42V AC from the power source

M7;9 Start power source

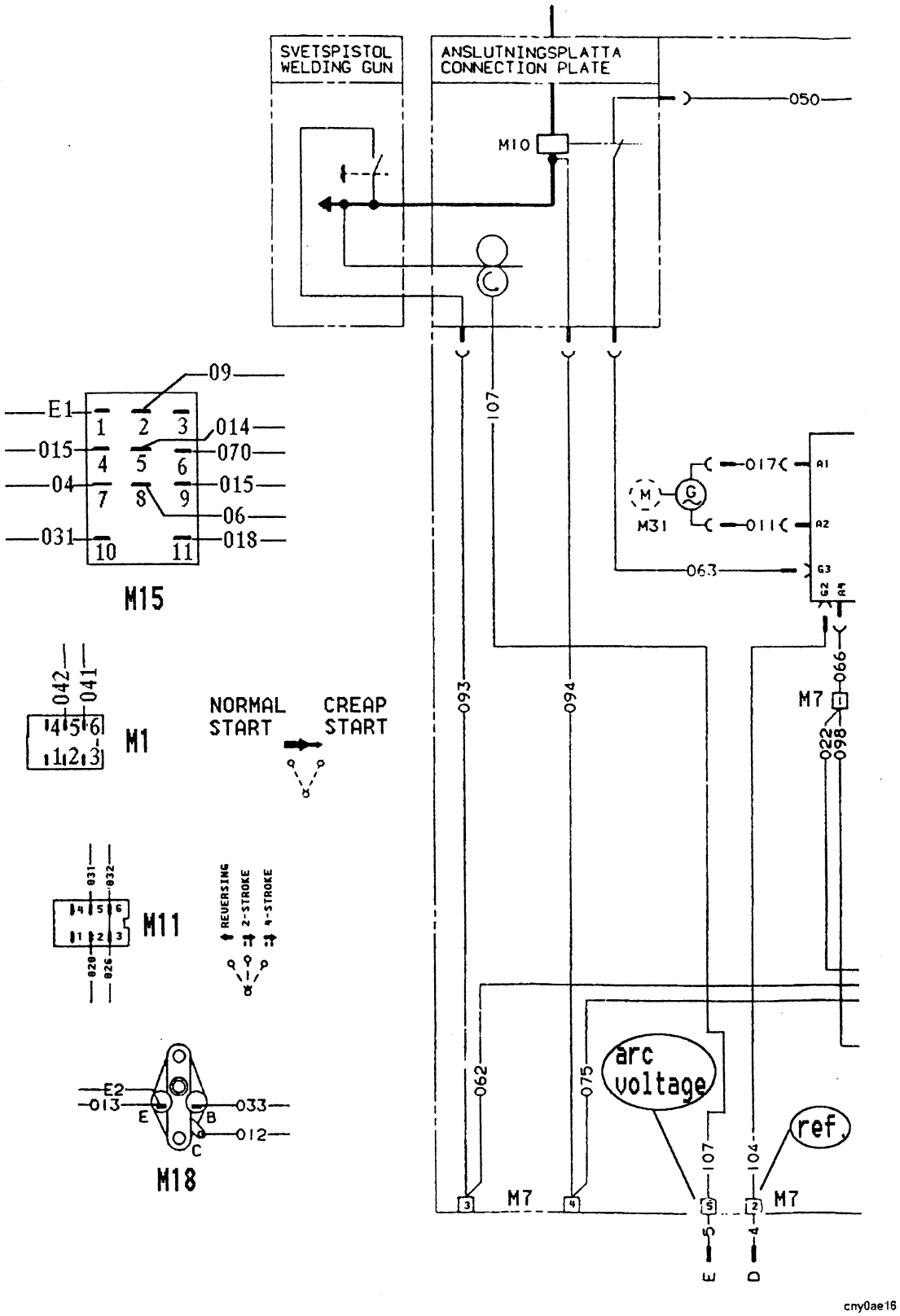
M7;6,7 0V electronics

M7;2 Wire feed reference from the welding power source

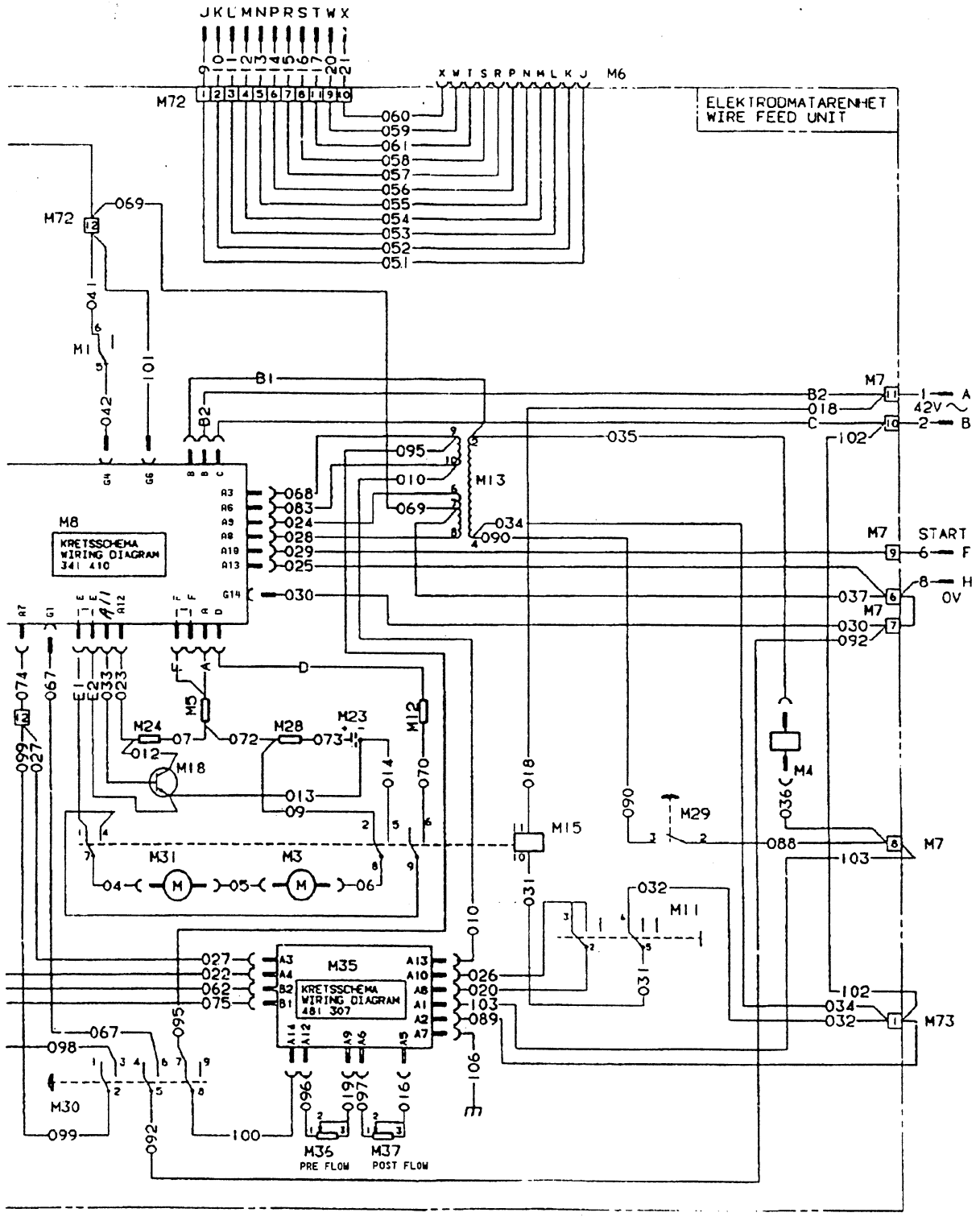
M7;5 Is-value, arc voltage to the power source

M7;3,4 Remote start, wire feeder

CONNECTION DIAGRAM WIRE FEEDER MED 44A



CONNECTION DIAGRAM WIRE FEEDER MED 44A



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CONNECTION DIAGRAM WIRE FEEDER MED 44A

SPECIAL TOOLS

These special tools can be ordered from ESAB Service, Dept. HQS, in Laxå.

Transistor tester, power MOS

This tester is powered by a 9V dry battery. The use of the tester is described in the chapter fault tracing, on page 34 .

Pin removal tool

Three types are available. One type for AMP-contacts and one for Burndy-connectors. There is also a universal type, crimp pliers, which can be used for all types of contacts.

Tool for BNC-contacts

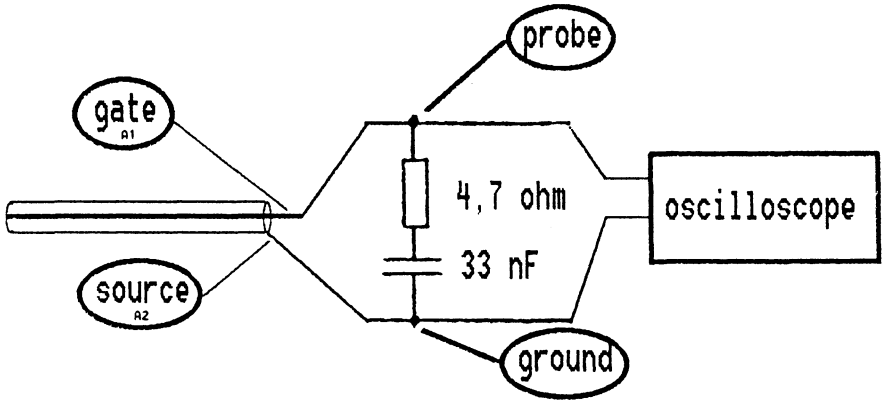
For the mounting of BNC-contacts on a shielded cable a press tool and a tool to peal off the insulation is required.

DC power supply

WARNING: MAINS VOLTAGE ON THE CONTACTS. Mains voltage is connected to the machine when the DC power supply is used.
The DC power supply should be rated 40V with a current limit of 0.5A.

Special gate load

WARNING: MAINS VOLTAGE ON THE CONTACTS. In order to measure the control pulses a special gate load must be used.
This consists of a capacitor and a resistor in series (R = 4,7Ω ½W, C = 33 nF.
The gate load shall be connected to PC-board AP5 via the sleeve plug. Connect the probe to the gate and the ground to the source. The measuring procedure of the control pulses is described in detail on page 35.



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Measuring of the gate pulses with a separate gate load

MEASURING POINTS

On the first pages of this service manual there is a description of the function of the Aristo 500. It is recommended to read it before you start to fault trace in the machine.

NOTE **Many parts on the control board and in the power units have mains voltage. Be very carefully when fault tracing**

General

The greater part of control PC-board AP5 is connected to the welding circuit. However a minor part up to the right hand side is connected to the mains voltage, e.g. the gate control and the over voltage protection. A yellow warning plate is mounted over this part. The insulation between the parts is arranged with pulse transformers and opto connectors. They can withstand a test voltage of 4.5 kV.

The electronical zero is connected to the mounting screws, the plate behind the PC-board and to the negative terminal of the shunt. The Remote control unit has a separate voltage supply and its zero is connected to L2.

The contacts on the PC-board are designated with the letters A - L with A on top and L down below. Each contact is numbered from above.

WARNING

The shiny part of the coaxial contacts (A, B, C and D) to the MOSFET-transistors are connected to the full mains voltage. The contacts must not hang loose or bounce together since this will result in a transistor failure.

Terminals E1 - E4 also have mains voltage potential.

In this description voltages shall be measured relative to electronical zero (mounting screws) if nothing else is specified.

INPUT SIGNALS TO THE CONTROL PC BOARD

1. AC voltage supply to the PCB

The measuring points mentioned below are marked on page 64 and on page 66.

9V between L6 - L7	gives +5V on the PCB **Mp1** (heatsink on VR1)

22V between L8 - L9	gives +22V **Mp2**, (casing on VR2) +15V **Mp3**, (the anode on D2) -13V **Mp4**, (VR3 pin 5) on the PCB
15V between L4 - L5	gives 10,4V between L2 - L3 on the PCB, voltage supply to the remote control unit

Note The data setting box is supplied with 9V AC from a separate winding on the control transformer, TC1. The voltage can be measured on terminal XT4 close to the front of the machine. The voltage is stabilized to 5V DC in the data setting box (can be measured on C12).

2. **The arc voltage** is connected to K1 (outer sensing of the electrode, via the cabinet of the feeder), and to K3 (inner sensing on welding outlet+). The negative outlet (electronical zero) is used as a zero point for sensing of the arc voltage in case a and b below.
There are three different sensing principles of the arc voltage:

   a. Inner sensing on the positive outlet (TIG and MMA). Here the voltage is measured between the positive outlet, (connected to K3) and the electronical zero.

   b. Outer sensing on the wire, positive polarity, (MIG/MAG). Here the voltage is measured between the wire in the feeder and the negative outlet on the machine. The voltage enters via the control cable from the feeder, pin E in the 23-pin plug at the rear of the machine, and to K1 on the PC-board.

   c. Outer sensing of the wire, negative polarity, (MIG/MAG cored wire). Here the voltage is measured between the wire in the feeder (K1) and the positive outlet of the machine (K3).

   The electronics on the control circuit board automatically measure the correct arc voltages in these three cases, without any manual switching. Check that the voltage to the PC-board is the same as the real arc voltage.

3. **Remote control: ARISTO CONTROL SYNERGIC**

   The voltage supply to this input is galvanicly separated and has a separate zero (0V A connected to L2). It is connected to the rest of the electronics via differential inputs.
   The input can withstand a short circuit of the supply voltage and a connection with the arc voltage circuit without failure.

   The remote reference for the arc voltage (MIG/MAG), can be measured between L1 - L2, (min: 0V max: 10.4V).

   The remote reference for feed speed can be measured between J11 - L2, (min: 0V max: 10.4V).
   At MMA welding this is the remote reference for welding current.

4. Remote control: ARISTO CONTROL 5 PROGRAM

This input is galvanicly separated from the rest of the electronics. It thus has a separate zero (0VA, connected to L2) which the voltages below are referring to.
The input can withstand a short circuit of the supply voltage and a connection with the arc voltage circuit without failure.

Selection of welding parameters	Parameters 1 on input J6
	Parameters 2 on input J5
	Parameters 3 on input J4
	Parameters 4 on input J2
	Parameters 5 on input J3

The voltage can be measured between any of the inputs and L2 and it is normally 10,4V. The input selected, is reduced to 0VA via the Remote control unit.

Increase/decrease function

Increase on input I14, normally 10.4V between I14 - L2; 0V = increase.
decrease on input J1, normally 10.4V between J1 - L2; 0V = decrease.

5. Torch input, MIG/MAG, TIG

Torch switch ON gives 42V AC between I9 - I10, (OFF gives 0V).

6. The shunt response is best measured when the machine is loaded to approx. 100A with a power resistor.
Measure on the shunt input (H1 - H2) or on R107 on the control circuit board. Ground the instrument on the metal casing of the shunt terminal and measure the voltage in the lower part of R107. Use a digital voltmeter and measure in position MMA when the machine is loaded.
24mV at 100A and 120mV at 500A respectively, linear function. (Plus on the mid conductor in the coaxial cable, H1 on the control circuit board).

If the shunt voltage is faulty, the error is either in the shunt or in the coaxial cable.

7. Thermal switch

If the thermal switch has tripped out, the error message "MACHINE ERROR: HEATSINK TEMP" is shown on the setting box, the red LED on the front of the machine and D19 on the circuit board are alight.

Switch OFF the machine and measure the resistance between I3 - I4.
Thermal switches closed (cold machine) = 0 ohm.
Thermal switches open/defective = 1 - 20 kohm, depending on the charge of the capacitors on the circuit board.

If the thermal switch is measured while the machine is ON, the voltage on I3 will be:

+9V when the thermal switch is closed
0V when the thermal switch is open

8. Cooling unit ON/OFF

Cooling unit ON gives 0V on G3, OFF gives +28V.

9. Water flow guard

Flowing water gives +15V on I1, the contact is closed in the guard.
No flow gives 0V on I1, the contact is open in the guard.

The signals from the switch of the cooling unit and the water flow guard are compared on the control PC-board. The green LED on the front of the machine indicates the water flow.

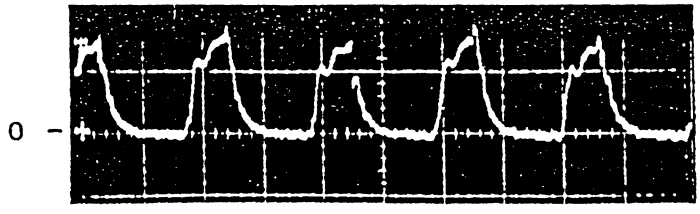
The supply voltage to the diode can be measured on G5. It is +2V when flow guard senses the flow, if not the voltage is 0V.
If the cooling unit is ON and the flow guard is open the following error message is shown: "MACHINE ERROR: NO WATER FLOW". Then the green LED on the front is not lit and the red one is alight. Also D18 on the circuit board is alight.

10. Over current protection, primary

The primary currents to the two transistor packets are measured with two current transformers (400:1). The signals come in between I5 - I7 and I6 - I8, and can be measured on the PC-board as one signal in **Mp14**, the top of R131.
The protection trips out at 8,2V, corresponding to 1400A welding current and 200A current in the transistor circuit.
It also trips out if the difference in current from the two transistor packets exceeds approx. 150A. If the protection has tripped out, error message "MACHINE ERROR: HIGH CURRENT" is shown and the red LED on the machine front is alight. Also D20 on the control circuit board is alight.

Reset the over current protection by switching OFF the machine for a moment.
The polarity of the input signals is important. Make sure that the cables are connected correctly and that the current transformers are turned in the right direction.

The signal of the current transformer can be measured with an oscilloscope on Mp14. Load the machine with a power resistor and measure at 100A/24V see the figure below. Use an isolation transformer to the oscilloscope.



cny0ap20

11. Over voltage protection, primary

WARNING: MAINS VOLTAGE

The protection is supplied from the smoothing capacitor (C01) in the main circuit via resistor (R2), 50W. The voltage supply is connected between E3 - E4 and is about 10V. The protection senses the capacitor's voltage between E1 and E4.
When this voltage exceeds 650V the gate pulses are blocked and the red LED on the front goes ON. Error message "MACHINE ERROR: HIGH VOLTAGE" is shown and D21 on the control circuit board goes ON.

The voltage protection is automatically reset when the voltage drops.

OUTPUT SIGNALS FROM THE CONTROL CIRCUIT BOARD

1. The reference signal of the wire feed speed can be measured on J9 and it shall be +4,0V at 10 m/min. Max. voltage is +8,8V which is corresponding to 22 m/min. The relation is linear.
   Set a wire feed speed on the data setting box and measure the reference voltage on J9.

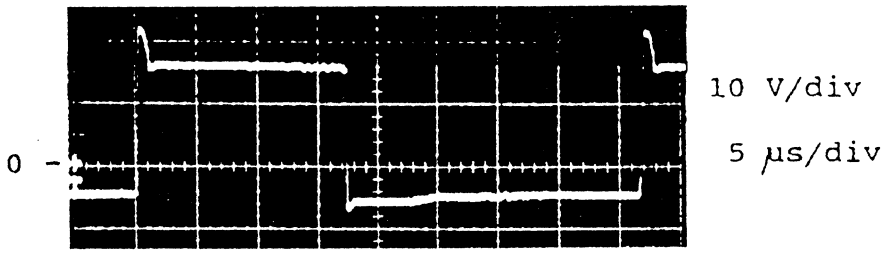
2. The gate pulses from the control PC board can be checked with an oscilloscope.

WARNING: MAINS VOLTAGE ON THE CONTACTS

Switch OFF the machine and disconnect the gate contacts (A, B, C and D) from the control circuit board and insulate them thoroughly.
Then connect the special gate load and switch ON the machine. Select MMA welding, a current setting on the box and measure the pulses between A1 - A2, B1 - B2 etc. Also see chapter 'SPECIAL TOOLS' on page 23 and the instructions on page 35.

pulse time/cycle time = 40,5 - 43,5%

Cycle time 40,8 - 42,6 µsec.
Measured at the +5V level



cny0ap21

When the shape of the pulse is rounded and it is falling rather slowly the PC-board is defective and must be replaced.
When there has been a failure in the transistor packets the gate pulses always have to be checked since the gate outputs can be damaged.

3. The gas valve for TIG welding is controlled by RE1 on the control PC-board. When the relay opens, 42V AC is switched to the solenoid which causes the valve to open. Select TIG on the setting box. When the torch switch is pressed, the gas valve will open.
   In case the machine is equipped with HF-ignition at TIG, the HF-ignition is controlled by the relay RE2 on the control board. RE2 is, via the contacts F1 and F3 on the control board, connecting 230V AC to the HF-unit.
   All machines equipped with HF-ignition must have a control board with part number 481 764-880.
   Machines without HF-ignition may be equipped with this control board or control board 481 435-880.

4. The yellow LED on the front indicates that the machine is ON.
   The voltage to the diode is +2V and it can be measured on G4.

5. The green LED on front indicates water flow and has been described earlier in connection with the flow guard.

6. The red LED on the front of the machine will be described later in this chapter, in connection with measuring point 13 (Mp13).

MEASURING POINTS ON THE CONTROL CIRCUIT BOARD

Measuring points 1 - 4 and 14 are already described under 'INPUT SIGNALS TO THE CONTROL PC BOARD' on page 24 item 1, AC voltage supply to the PC-board. The positions of the mesuring points on the PC board are shown on page 64 and on page 66. On PC board 481 764 measuring pins are mounted, **Mp0** is connected to electronic zero.
On PC board 481 435 there are no measuring pins mounted, the voltages should be measured to electronic zero if nothing else is declared.

- **Mp5** Signal from the opto-fibre receiver to the welding process regulator.

  Mp5 is connected to IC8 pin 2.
  The signal is pulsating between 0 and +5V when the data setting box transmits information to the control circuit board in the machine, for instance when changing welding methods on the box. Least pulse time and time between the pulses are 0,1 seconds.

- **Mp6** Signal from the welding process regulator to the opto-fibre transmitter.

  Mp6 is connected to the collector of Q4.
  The signal is pulsating between +1,5V and +5V when the PCB transmits information to the data setting box, e.g when changing welding methods on the box. Least pulse time and time between the pulses are 0,1 seconds.

- **Mp7** Signal from the opto-fibre receiver to the welding data memory.

  Mp7 is connected to IC2 pin 1 on the PC-board in the data setting box. The connection point for Mp7 is marked on page 68.
  The signal is pulsating between +1.5V and +5V, just as for Mp5.

- **Mp8** Signal from the welding data memory to the opto-fibre transmitter.

  Mp8 is connected to IC2 pin 8 on the PCB in the Setting box. The connection point for Mp8 is marked on page 68.
  The signal is pulsating between 0 and +3,8V, just as for Mp6. When there is a break in the opto-fibre communication, any of the following error messages can be shown, when the machine has been switched ON:

  - "WAITING FOR MACHINE IDENTIFICATION"

    Which means that the communication from the machine to the box is broken. For instance a break in the fiber, or that the fiber has slipped in a fraction of an inch in any of the contacts. In that case there will be a gap between transmitter/receiver and the fiber.

  - "COMM. ERROR: TIMEOUT"

    Which means that the communication from the box to the machine is broken.

  If any of these errors appears the opto-fibre and its contacts must be checked and replaced if necessary. If the cable seems to be correct but the communication still doesn't function, the +5V voltage on the control PC-board must be checked. Mp5 - Mp8 can be measured with an oscilloscope which might help to identify the fault.

- **Mp9** Reference to the control amplifier for welding current.

  Mp9 is connected to IC13 pin 4.
  The reference voltage can be checked at MMA and ARC FORCE = 0V. In order to switch over to ARC FORCE it is first necessary to switch to independent settings (see the INSTRUCTION MANUAL).

  The machine must be loaded with a power resistor so that the arc voltage is 15 - 40V.
  The reference voltage shall be -4,61V at 500A, the function is linear which means that 100A is corresponding 0,92V.
  The reference voltage is controlled by the data setting box and the welding process regulator.

- **Mp10** Input to the pulse width modulator which is controlling the lead time for the transistors in the transistor packet.

  Mp10 is connected to IC22 pin 4.
  The area of control is from +1,8V (min. pulse time) to +4,5V (max. pulse time).
  The signal comes from the control amplifier the signal can be measured in Mp10. Max. power gives +7V and min. power gives -0,3V.

  E.g.:
  If the reference to the control amplifier is greater than the shunt response, the amplifier supplies max. power (+7V).
  If the reference to the control amplifier is less than the shunt response, the amplifier goes low (-0,3V).

  At constant load 100A; 24V the signal in Mp10 is approx. +2,8V.

- **Mp11** Feed back from the arc voltage for control of the open circuit voltage at MMA welding.

  Mp11 is connected to IC22 pin 7.
  When the open circuit voltage exceeds 58V the pulse width modulator is blocked. An arc voltage of 58V gives 2,5V in Mp11, this is the same as the switching level for the pulse width modulator (blocked over +2,5V).
  When the current flows in the the circuit, Mp11 is triggered to a level below +1V by the welding process regulator, and a higher arc voltage is permitted.
  The system reverts back to open circuit control when the welding current is switched OFF, the mean value of the open circuit voltage then becomes 60V.
  The control of the open circuit voltage is also connected at MIG/MAG welding from the moment when the torch switch is pressed, until the arc is struck.
  When the torch switch is released the open circuit voltage is switched OFF.

- **Mp12** Blocking signal from the pulse width regulator to the pulse width modulator.

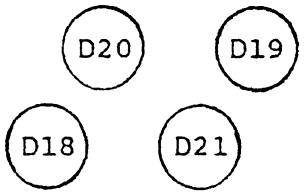
  Mp12 is connected to IC22 pin 6.
  When the welding process regulator triggers the current down to zero, the pulse width modulator is blocked since Mp12 is reduced to 0V. The blocking is active at MIG/MAG and TIG welding as long as the torch switch is not pressed. When there is current in the welding circuit, the level of Mp12 is +3,4V. Below 2,5V the pulse width modulator is blocked.

- **Mp13** Blocking signal from the error sensing circuits to the pulse width modulator.

  Mp13 is connected to IC22 pin 9.
  The switching level is +2,5V. Normally the level of Mp13 is +3,3V. At any of the following errors, Mp13 is reduced to a level below 1,5V and the pulse width modulator is blocked. Each error is indicated by a red LED on the control circuit board. The errors are also indicated by one LED on the front of the machine and by error messages on the setting box.

Error	**Error message**	**LED**
Over temperature in the secondary rectifier	MACHINE ERROR: HEATSINK TEMP	D19
No water flow although the pump is switched ON	MACHINE ERROR: NO WATER FLOW	D18
Too high primary current to the transistor switch circuits	MACHINE ERROR: HIGH CURRENT	D20
Too high transistor voltage, rectified mains voltage over C01.	MACHINE ERROR: HIGH VOLTAGE	D21

The diodes position on the control circuit board:



cny0ap22

The red LED on the front of the machine is controlled by output G1 on the control PC-board. This output supplies approx. +1,7V when the diode is alight and 0V when it is OFF.

If the machine does not supply any current, the following points should be checked:

1. Error messages on the data setting box.
2. The LED's on the front of the machine and on the control PC-board.
3. The supply voltages on the control PC-board.
4. Measuring points (Mp) 10, 11, 12 and 13 etc.

MEASURING POINTS IN THE WIRE FEEDER MED 44A

The measuring points are described in the chapter 'DESCRIPTION WIRE FEEDER MED 44A' on page 9.

FAULT TRACING

SYMPTOMS

1. Mains fuse blows
2. No welding current: indicating lamp K38.2 (green) on the PC-board is alight, cooling fan is running
3. Welding current too low
4. Machine operates only intermittently
5. Open circuit voltage too low or to high
6. The machine trips out too late
7. Difficulty in striking the arc and/or the arc is too short
8. The machine is noisy
9. The arc is too "cold"
10. Special problems at MIG/MAG welding
11. Excessive pores in the weld
12. Uneven welding / unstable arc
13. The arc does not strike, though the wire feeding functions normally
14. The wire feeding does not function
15. The arc voltage is too low
16. Shielding gas is flowing continuously
17. Max. wire feeding
18. Creep start does not function
19. The electrode burns back into the contact tip
20. The electrode freezes in the molten pool when the welding stops
21. 2-Stroke / 4-Stroke does not function
22. Error messages on the data setting box
    a. Errors in the power electronic circuits
    b. Storage error
    c. Communication error
23. The display of the Setting box is black
24. Storage error

The symptoms above are listed on the following pages together with possible error causes and fault tracing advises.

1. Mains fuse blows

In connection with faults where the mains fuse is blown (transistor failure or faults in mains rectifier) the mains contactor always must be replaced. The contacts can be burnt, which may lead to additional faults.

Then check the following:

a. That the mains fuse is adequately rated. Move the power supply cable to a socket protected by a 35A anti surge fuse (at 400V), see the INSTRUCTION MANUAL.

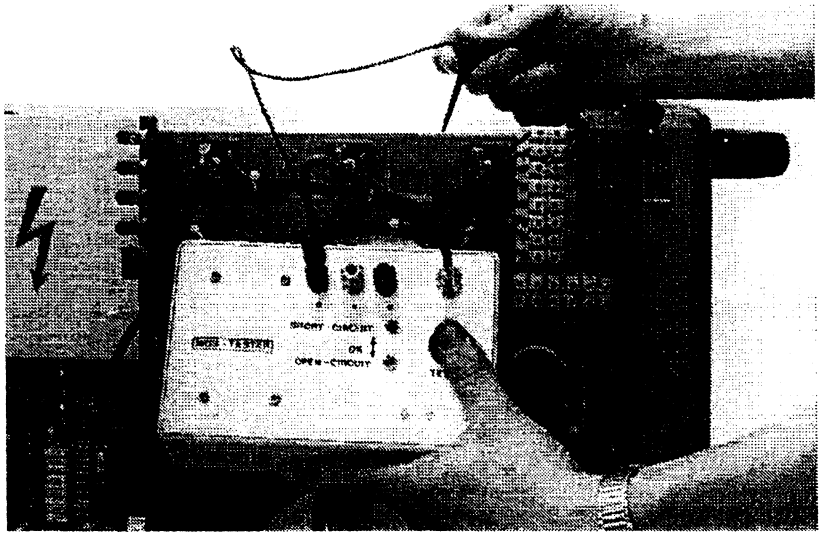
b. That capacitor CO1 is not short-circuited. Dismount the capacitor and check with a Megger, max. 600V, that it receives and hold charge.

c. Measure all the diodes in the rectifier bridges VC1 - VC3 with a multimeter, or a Megger, 250V. First, however, disconnect the cables from the bridges. The resistance should be at least 20 Mohm in the inverse direction. When replacing the diodes, do not tighten them more than 2.0 - 2.5 Nm.

d. Check that there are no burnt components or circuits on the suppressor board AP8.

e. Check that resistor R1 on mains contactor is not burnt. The resistor should be rated 10Ω 10W.

f. Check the transistor packets with a transistor-tester, power MOS, see 'SPECIAL TOOLS' on page 23 and the picture below.



cny0ap06

Disconnect the shielded cables (source and gate) of the transistor packets from circuit board AP5 and connect them to the tester.

Connect the black cable (drain) of the tester to the transistor packet.

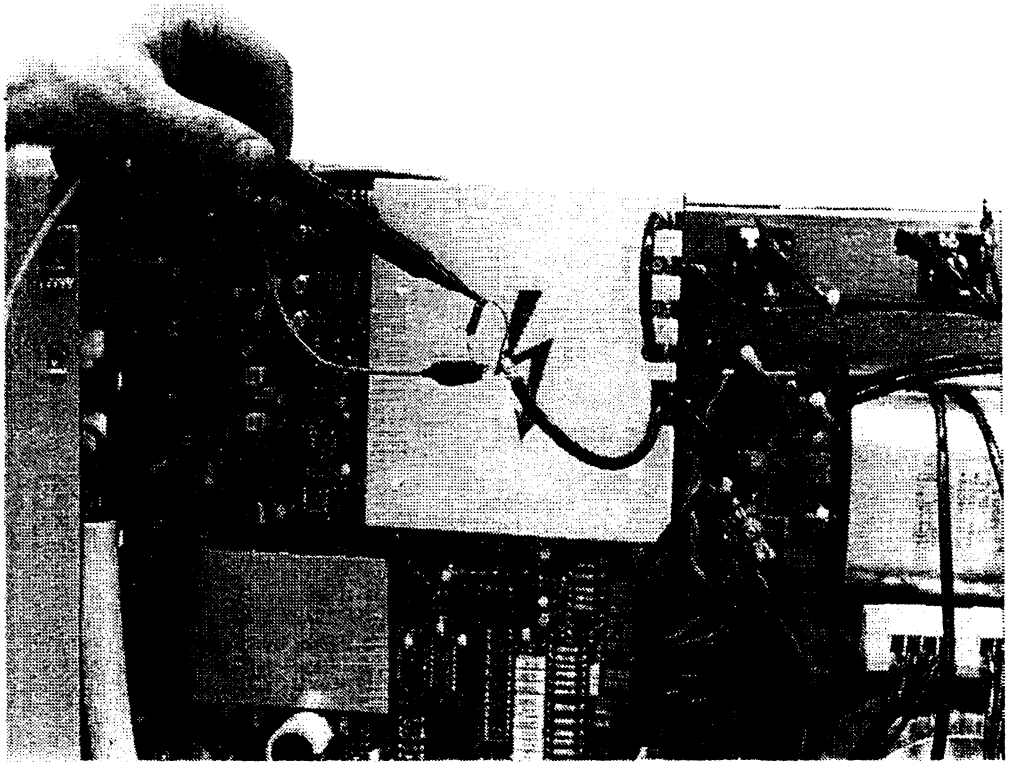
Press the red button on the tester and keep it pressed a few seconds. The red and yellow LED's should flash alternately if the transistor packet is intact. **Note** the red LED is never completely off, but the light intensity must decrease considerable.
Disconnect the transistor packets one by one from the power source and check them once more before replacing them.

If one transistor packet is defective, the two in the same pair must be replaced. See 'DISMANTLING' on page 49

g. Check the control pulses from PC-board AP5 with an oscilloscope.

WARNING: MAINS VOLTAGE ON THE CONTACTS

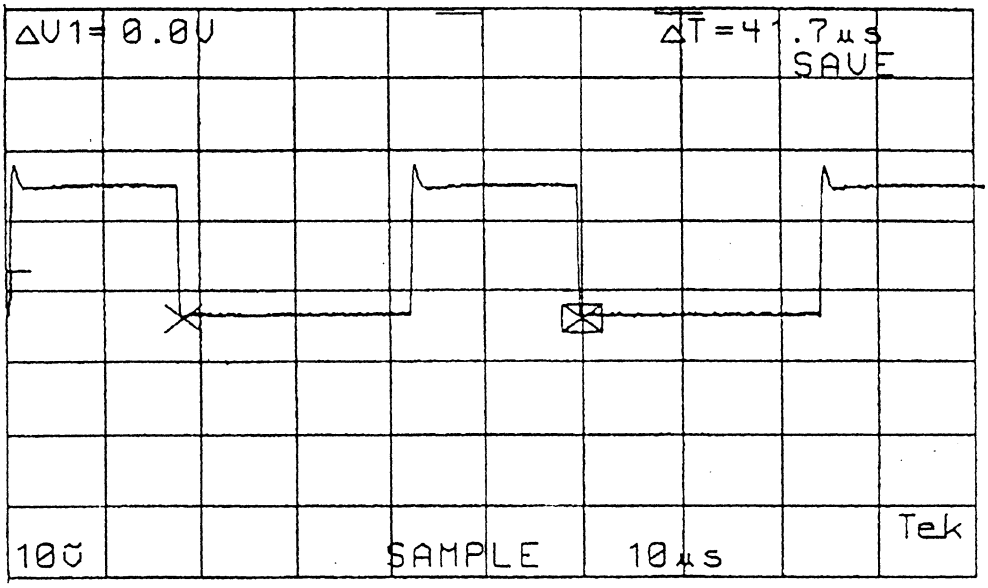
The machine must be switched OFF. The control pulses should be measured when the transistors are conducting.
Disconnect cables 07 - 012 from the rectifier bridges VC1 - VC3 to avoid high tension to the oscilloscope. Insulate the cables thoroughly.
Disconnect the shielded cables (gate contacts A, B, C and D) from the circuit board AP5 and connect the special gate load, see 'Special gate load' on page 23.
Connect the probe to gate (A1) and the ground to source (A2). See the picture below.



cny0ap07

Switch ON the machine when the connection is ready. Select MMA, and a current setting on the data setting box. The control pulses will now appear on the display. Check that the pulses occupy between 40.5% - 43.5% of the cycle time and that the total cycle time is within 40.8 - 42.6 µsec.
Move the gate load and measure the pulses between A1 - A2, B1 - B2, C1 - C2 and D1 - D2.

The shape of the control pulses are shown in the figure below. If the requirements are not met, circuit board AP5 must be replaced.



cny0ap08

The measurement is made with an oscilloscope and a separate gate load.

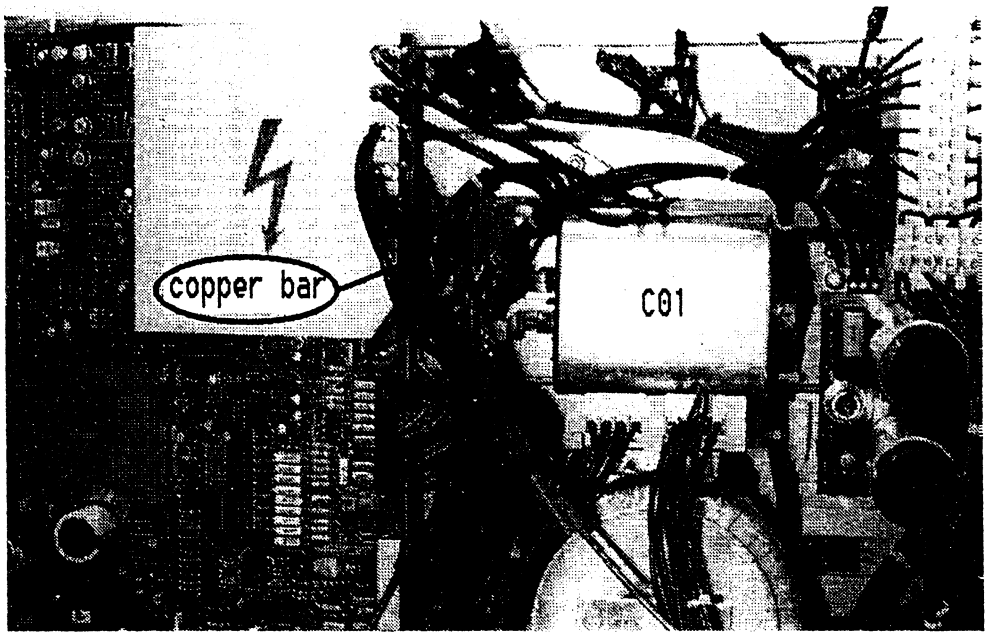
h. Measure the welding diodes and the free-wheeling diodes (V5, V6, V7 and V8) with a Multimeter. Disconnect the welding cables and measure the voltage between the welding outlets. The anodes of the diodes are connected to the negative outlet. There is a discharge resistor connected between the outlets (2,2 Ω), which might in some cases interfere with the measurement.

i. When the tests indicate a positive result, it is time to "soft start" the machine with the help of a 40V DC power supply.

WARNING: MAINS VOLTAGE ON THE CONTACTS

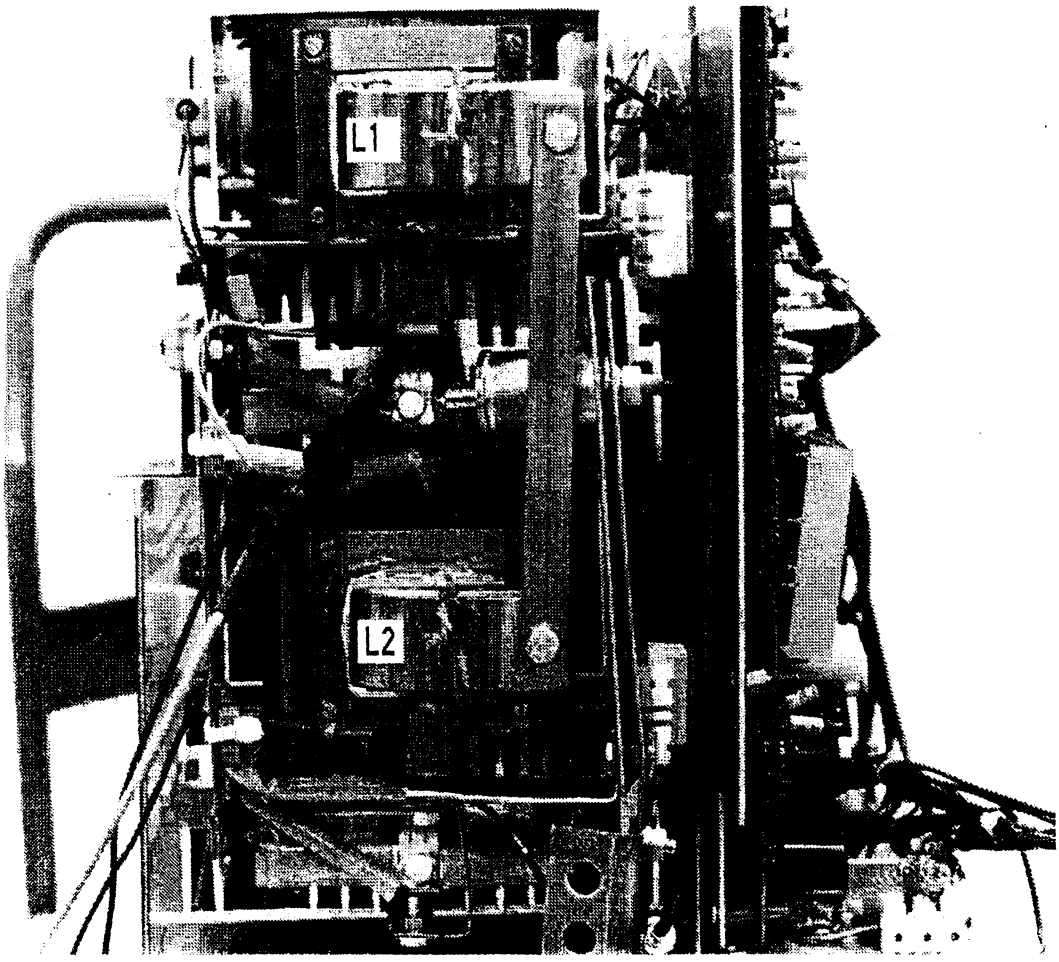
Assemble the machine, connect the gate cables (A, B, C and D) and connect the smoothing capacitor. The cables 07, 08, 09, 010, 011 and 012 must still be disconnected and thoroughly insulated.

Connect the DC power supply to capacitor CO1, plus to cable 019 (= the copper bar between the heatsinks of the transistors). Set the power supply on 40V and **0.5A** current limit, see the picture at the top of next page. **Note** it is important that the power supply has an adjustable current limit.



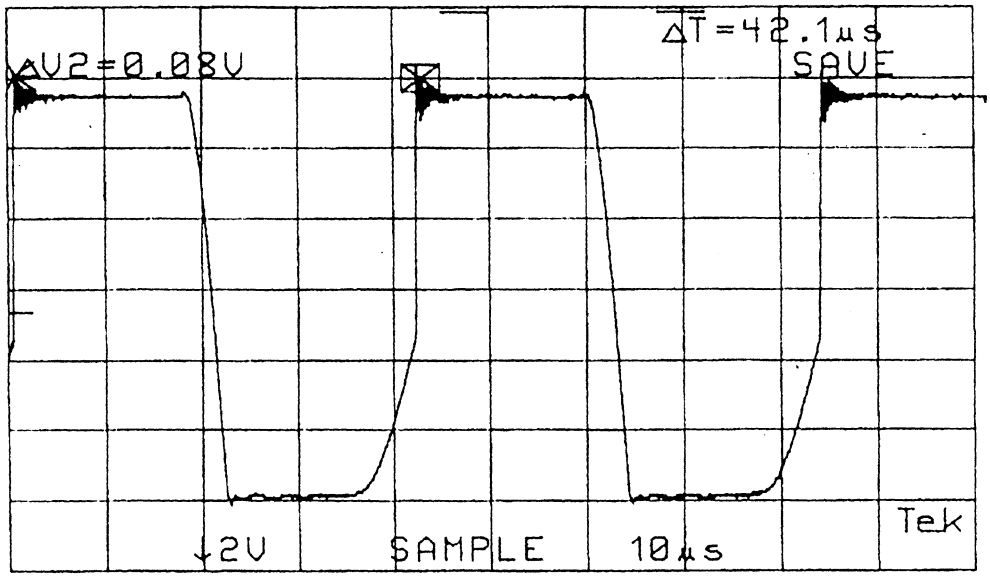
cny0ap09

Switch ON the mains voltage. Select MMA and 20A current setting on the data setting box. Check that the power supply is not overloaded. Measure the secondary voltage on the two main transformers TM1 and TM2 with an oscilloscope. The ground should be connected to the outlet towards the welding inductor, see the connection diagram on page 63 and the picture below.



cny0ap16

If the voltage display from the transformers looks like the one in the figure below, the machine is very probably in order and can be connected to the full mains voltage.



cny0ap10

Switch OFF the mains voltage, disconnect the DC power supply and re-connect the mains voltage cables 07 - 012.

Connect a power resistor, RC 500, to the machine, a shunt and instruments to measure voltage and current on the welding outlets. Start the machine with the resistor disconnected (open circuit). Set MMA, Arcforce = 0 and 10A welding current on the data setting box.
The open circuit voltage shall be 55 - 65V.
Connect the power resistor.
Increase the current and check that it is corresponding to the set value.

Load the machine with the max. rated power according to the arc line, 500A - 40V and make a test welding as a final control.

2. No welding current, indicating lamp K38.2 (green) on PC-board AP5 is alight, cooling fan is running

Cause Contactor QF1.

Remedy If the resistor R1 is burnt, or if the contactor does not spring back when pressed, the contactor should be replaced.

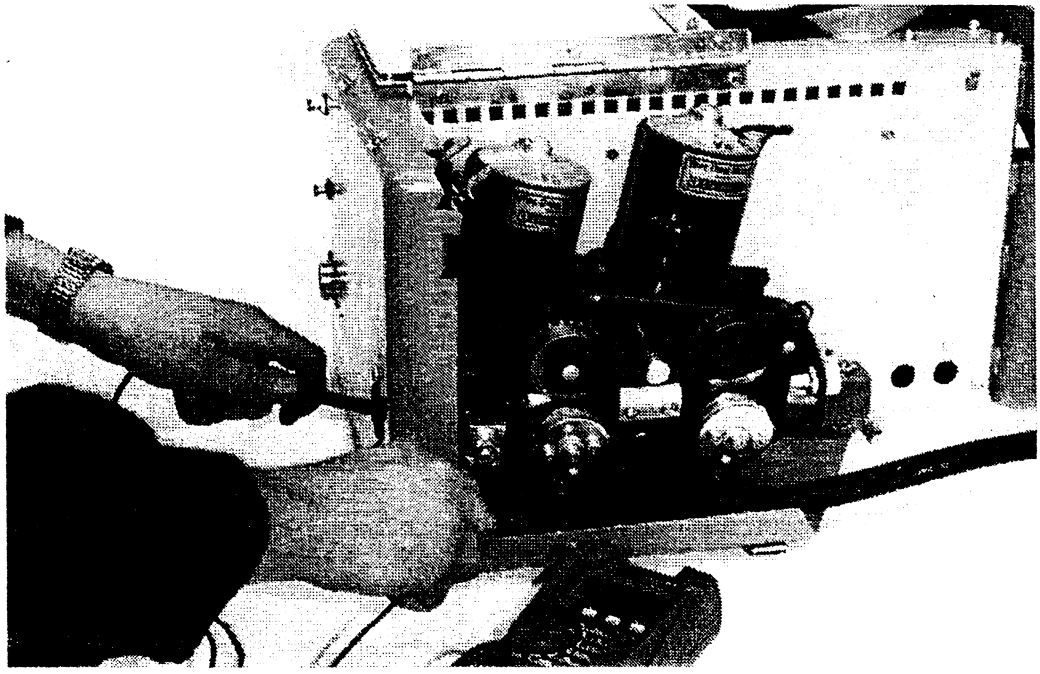
Cause PC-board AP5

Remedy Check the supply voltage to the PC-board, 22V between L8 and L9, 9V between L6 and L7, 15V between L4 and L5.
42V between I9 and I10 at MIG/MAG and TIG if the torch switch is pressed, if not - it should be 0V.
Replace the board if there are no control pulses when the voltage supply to the board is correct. See above "Mains fuse blows", item g on page 35.

Cause Control transformer TC1.

Remedy Check with a multimeter that the secondary voltages are correct according to the Wiring diagram.
The primary voltage shall be 400V between brown and orange and 230V between brown and red. Also check the connections to the transformer.

Cause Error in the control circuit of the welding torch.
Set pos. MIG/MAG on the setting box. Check that the equipment functions if the torch lead is removed and the contact spring is connected to the torch lead connection on the connecting plate. See the picture below.



cny0ap11

Remedy Adjust the contact spring on the connecting plate. Repair the control circuit of the torch. Adjust the contact spring of the torch switch and clean the contact surfaces.

3. Welding current is too low

Cause Low mains voltage.

Remedy Check with a multimeter that the mains voltage is 3x400V and within the prescribed tolerances +6 -15%.

Cause Excessively long and/or inadequately sized mains extension cable.

Remedy If possible place machine closer to the socket outlet. Try not to use extension cable, but if unavoidable, it must be as short as possible. Conductor cross-sectional area must be at least 6.0 mm^2 at 400V, see the INSTRUCTION MANUAL.

Cause PC-board AP5.

Remedy Replace the circuit board, also see item 2. on page 38

Cause Shunt RS1.

Remedy Measure the shunt voltage between terminals H1 and H2 on PC-board AP5. The shunt voltage should be 120 mV at 500A, if not replace the shunt.

4. Machine operates only intermittently

Cause Poor mechanical contact.

Remedy Measure the resistance of the mains cable and the welding cables. Check that the connections are tightly screwed, in particular the machine contacts XS1 and XS2. Also check the terminals so there are no pins out of contact.

Cause PC-board AP5.

Remedy Check that the PC-board receives control voltage all the time. Also during the periods when the machine does not function. If the voltage is present, replace the PC-board.

5. Open circuit voltage is too low or too high

WARNING: MAINS VOLTAGE ON THE CONTACTS

Cause PC-board AP5.

Remedy Check the voltage between K3 (on AP5) and the zero of the electronics with a multimeter. If this voltage is the same as the open circuit voltage between the welding terminals for MMA welding, the PC-board must be replaced.

6. The machine trips out too late

Cause Thermostats ST1 and ST2.

Remedy Check that the thermostats are solidly fixed/riveted and that they are firmly pressed against the surface.

7. Difficulty in striking the arc and/or the arc is too short

See "Mains fuse blows", item g on page 35.

8. The machine is noisy

Cause The fan blades are touching the fan casing.

Remedy Replace the fan.

Cause Play in the fan hub.

Remedy Replace the fan.

9. The arc is too "cold"

Cause Wrong welding parameters.

Remedy At MIG/MAG welding: Increase the wire feed speed (current). Increase the dynamics.
At MMA welding: Reduce the arc voltage, decrease Arcforce.

Cause Faulty connections, XS1 and XS2.

Remedy Check that the connections are tightly screwed.

Cause Wrong shielding gas.

Remedy Use 80/20 (80% Ar and 20% CO2) or 100% CO2 for welding of steel and 100% Ar for welding of aluminum.

Cause Wrong polarity.

Remedy Change the outlets on the power source. The return cable should normally be connected to the negative outlet at MIG/MAG and MMA welding and to the positive outlet at TIG welding.

10. Special problems at MIG/MAG welding

Cause The pins in Burndy connector XP3 are not sufficiently pressed in.

Remedy Check the connector, press in the pins.

11. Excessive pores in the weld

Cause A break in the gas supply. Solenoid valves YV1/M4 or PC-boards M35/AP5 are defective. The reduction valve is not opened.

Remedy Check the solenoid valve. At MIG/MAG welding: Press switch M29. If the voltage (42V AC) is present and the solenoid valve M4 does not operate, the solenoid valve should be replaced. Replace PC-board M35 if the solenoid valve is OK.
At TIG welding: If relay RE1 is activated, but not solenoid valve YV1, the latter must be replaced. If relay RE1 is not activated, replace the PC-board AP5. Open the reduction valve.

Cause Draught at the working place.

Remedy Shield the working place from draught.

Cause The gas nozzle is congested by spatter and dirt.

Remedy Clean the gas nozzle.

Cause The gas distributor is defect.

Remedy Replace the gas distributor.

Cause Gas leakage.

Remedy Check hoses and O-rings in the connecting piece mounted in the connecting plate.

12. Uneven welding /unstable arc

Cause The wire conduit is worn out.

Remedy Clean, or replace the wire conduit.

Cause The electrode clogs in the outlet nozzle of the wire feeder.

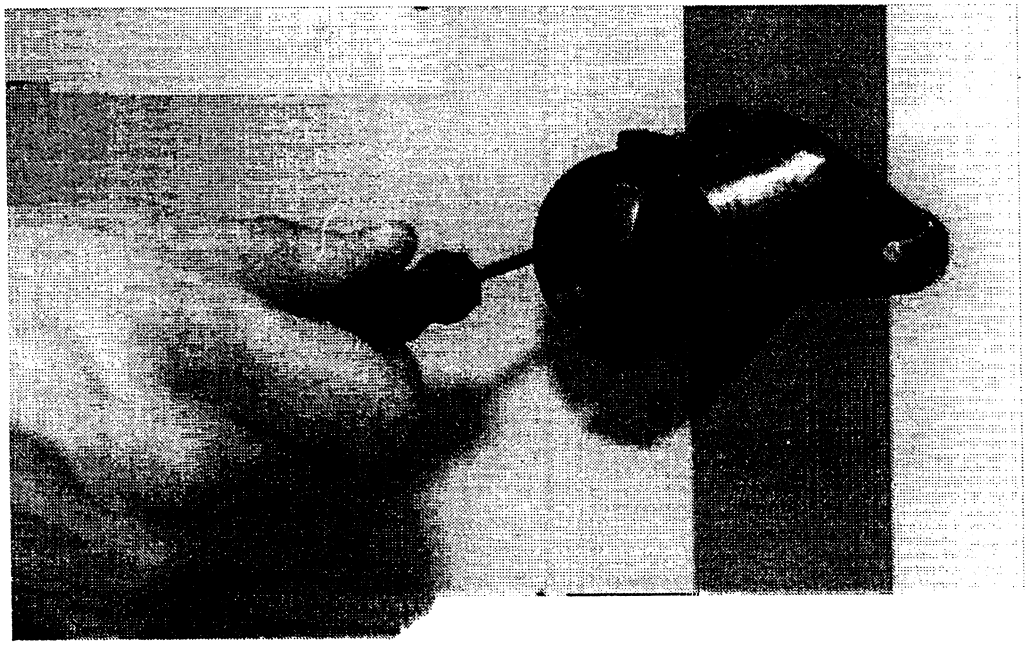
Remedy Clean or replace the outlet nozzle.

Cause The electrode is not placed in the groove on the feed roller.

Remedy Lift the spring arm and adjust the feed roller, see the INSTRUCTION MANUAL.

Cause Too great breaking moment on the spool.

Remedy Adjust the brake hub by screwing the two springs in the hub, see the picture below.
Check that the wire is not crossed on the spool.



cny0ap12

Cause Uneven speed of the motors.

Remedy Check the carbon brushes.

Cause The wire conduit is to big, resulting in an unstable arc and occasional short circuits at short-arc welding.

Remedy Replace the wire conduit, see the INSTRUCTION MANUAL.

Cause The metallic nozzle at the end of the wire conduit causes a small error in the arc voltage feed back signal. This might lead to an unstable arc.

Remedy Measure the resistance between the electrode and the cable connector (+), the electrode ends between the wire feeder and the torch. When there is a short circuit, replace the metallic nozzle.

Cause The return cable is too long at MIG/MAG welding. When there is a short circuit the rise time and the fall time of the pulses can be affected so the arc becomes unstable and short circuits occur.
Up to 20 meter cable do not normally cause any problems as long as it is fairly straight. However the pulse data may have to be adjusted to longer pulses and shorter rise time and fall time.
For other welding methods there are no problems as long as the voltage drop can be accepted.

Remedy Change to a bigger return cable, 95 mm^2 is the recommended cross sectional area.

13. The arc does not strike, though the wire feeding functions normally

Cause The return cable is wrongly connected.

Remedy Connect the return cable to the negative terminal at MIG welding, also see item 9. on page 40.

Cause Bad contact between the return clamp and the workpiece.

Remedy Clean the clamp and the contact surfaces of the workpiece.

Cause Control transformer TC1.

Remedy Check the primary voltages of the control transformer with a multimeter, see the wiring diagram on page 60.
The primary voltage shall be 400V between brown and orange and 230V between brown and red.

Cause PC-board AP5.

Remedy Check the supply voltage to the PC-board, see item 2. on page 38. Also check the control pulses.

14. The wire feeding does not function

Cause The breaking moment on the spool is to great.

Remedy The moment can be adjusted by screwing the two springs in the brake hub, see the picture on page 42.

Cause Wrong pressure on the feed rollers.

Remedy Adjust the pressure on the electrode with the screw on the spring arm. See the INSTRUCTION MANUAL.

Cause The electrode clogs in the wire conduit.

Remedy Clean or replace the wire conduit.

Cause The electrode clogs in the contact tip or the outlet nozzle.

Remedy Clean or replace the nozzles.

Cause No supply voltage to MED-circuit board M8.

Remedy Check the supply voltage 42V (AC) between 10 and 11 on terminal M7, see the connection diagram on page 21.
If there is no voltage, check fuse FU2 and control transformer TC2 and its connections, see the connection diagram on page 60.

Cause PC-board M8/Motors M3 and M31 do not function.

Remedy Measure the voltage between pin 7 and 8 on relay M15 at 22 m/min wire feed speed. If the voltage is 0V, replace the PC-board. If the voltage is 45V, check the carbon brushes and replace the motor(s) if necessary. See the connection diagram on page 60.

15. The arc voltage is too low

Cause One of the mains fuses is blown.

Remedy Replace the mains fuse.

16. Shielding gas is flowing continuously

Cause Solenoid valve YV1/M4 or PC-boards AP5/M35 are defect.

Remedy At TIG welding: Solenoid valve YV1 is activated when the voltage is zero (42V AC) and the torch switch is released. If not, replace the solenoid valve.
If the voltage does not change, replace PC-board AP5, see the diagram on page 60.
At MIG/MAG welding: solenoid valve M4 is activated when the voltage is zero (42V AC) and the torch switch is released. If not, replace the solenoid valve.
If the voltage does not change, replace PC-board M35,
see the drawing on page 21.

17. Max. wire feeding

Cause MED-PC-board M8.

Remedy Measure the tachometer frequency on PC-board M8 between A1 and A2, see the diagram on page 20. The frequency should be approx. 719 Hz at 22 m/min wire feed speed. If not, replace PC-board M8.
If the frequency is zero, check the cables and/or replace the tachometer.

18. Creep start does not function

Cause Relay M10 in the wire feeder.

Remedy Check that M10 functions at MIG/MAG welding, diagram on page 20.

Cause Switch M1 is defect.

Remedy Measure the resistance of M1 and replace it if necessary.

19. The electrode burns back into the contact tip

Cause Too low wire feed speed and/or too high arc voltage.

Remedy Increase the wire feed speed, decrease the voltage.

20. The electrode freezes in the molten pool when the welding stops

Cause The burn back time is wrongly set.

Remedy Adjust the Burn back time with the potentiometer in the wire feeder. See the picture on page 8.

21. 2-Stroke / 4-Stroke does not function

Cause Switch M11/PC-board M35 are faulty, see the diagram on page 21.

Remedy Measure the voltage between 11 on terminal M7 and 1 on terminal M73.
Check that 42V is present on relay M15 when switch M11 is in pos. rewinding. Replace M11 if the voltage is missing. If the relay is OK replace PC-board M35.

22. Error messages on the data setting box

a. Errors in the power electronic circuits

As a general rule an error message is shown on the display until you press any of the keys on the setting box, or until the machine is switched OFF and then ON again.

Error When error message "MACHINE ERROR: HIGH VOLTAGE" is shown on the display, the reason is that the voltage is too high after the rectifier. The cause can be a too high mains voltage, or that the inductance of the power cables is too high.

Remedy Check the mains voltage with a multimeter, 3x400V.

Error "MACHINE ERROR: HIGH CURRENT" Too high primary current to the transistor switch circuits, or an uneven current distribution between the transistor packets.
The limit values correspond to about 1400A secondary current, or to a 300A difference in current between the two packets. The error might be due to defective components or to faulty connections in power electronic circuits.

Remedy Disconnect the machine from the mains supply. Check the shunt response to AP5 by measuring the voltage over resistor R107, 120mV at 500A. See the component layout diagram on page 64 and on page 66 .
The shunt response is linear and proportional to the welding current. It can be recalculated to other current settings, e.g. to 24mV at 100A.

Error "MACHINE ERROR: HEATSINK TEMP" Too high temperature in the diode heatsinks (transistor packets). It may be caused by overload, a defective cooling fan or defective thermostats.

Remedy If this error message is shown and the machine does not show any obvious sign of overheating, check the thermostats (ST1 and ST2) and their connections. Measure the resistance of the thermostats and replace them if there is a break. See "Replacement of thermostats" on page 50. Check that the fan is functioning.

Error "MACHINE ERROR: NO WATER FLOW" No water supply to the welding gun.

Remedy Check that there is enough of water in the cooling unit.
check the voltage supply to the motor, that the pump functions correctly, that the pump wheel is not worn out and that the hoses are not silted up.
This error message is blocked when the pump is switched off, e.g. when using an air cooled welding gun.
Qmax = 7,5 l/min.

b. Storage error

All the storage cells are tested when the machine is switched ON.
The program storage is tested by means of a check sum. If any storage cell is defective one of the following error messages are shown on the display. They will only come up directly after switching on the machine. The machine can be in working order despite the error message. Caution must be used, however, as the welding result might be affected even though the machine seems to behave perfectly normal.

Error When "RAM ERROR IN POWER SOURCE" is shown on the display it is caused by a defective storage cell in the read/write storage of the machine.

Remedy Replace PC-board AP5.

Error "RAM ERROR IN CONTROL UNIT" A defective storage cell in the read/write storage of the data setting box. This storage contains, among other things, stored welding data.

Remedy Replace the computer PC-board in the data setting box.

Error "ROM ERROR IN POWER SOURCE" A defective storage cell in the program storage of the machine, EPROM.

Remedy Replace PC-board AP5.

Error "ROM ERROR IN CONTROL UNIT" A defective storage cell in the program storage of the data setting box, EPROM.

Remedy Replace program storage IC5 in the setting box.

Error "CONTROL UNIT WELD DATA ERROR" The 3V battery in the setting box is finished.

Remedy Replace the battery, see "Replacement of battery" on page &cny0ap18a .

c. Communication error

All these errors are concerned with the series communication between the machine and the setting box. The error messages may appear only occasionally. Reset by switching the machine OFF and ON. If the messages appear more frequently, the machine must be seen to.

Error "COMM. ERROR: RECEIVE CH. SUM" The wrong check sum has been detected 5 times in succession during transmission of data from the machine to the setting box.

Remedy Check that the ends of the opto-fibre are properly placed in the contacts.

Error "COMM. ERROR: TRANSM. CH. SUM" The wrong check sum has been detected 5 times in succession during transmission of data from the setting box to the machine.

Remedy Check that the ends of the opto-fibre are properly placed in the contacts.

Error "COMM. ERROR: TIMEOUT" The setting box has sent a message to the machine, the receipt of which has not been acknowledged by the machine.

Remedy Check that the blue contacts of the opto-fibre are correctly connected in the setting box and on PC-board AP5. Also check that the opto-fibre has not slipped into the contact so there is a small gap between the end of the fiber and the transmitter/receiver.

Error "COMM. ERROR: RECEIVE BUFFER" The setting box has failed to handle incoming messages at the same pace as they come in, therefore the receiving buffer store has been filled.
The error message may occur if the machine is provoked by an uninterrupted change between the end positions of the 5-choice control unit. In other cases see the remedy below.

Remedy Error in the soft ware, contact ESAB Service.

Error "COMM. ERROR: SEND BUFFER" The machine has failed to receive incoming messages from the setting box at the pace new messages are added to the sending buffer storage of the setting box. Therefore the sending buffer storage has been filled.
The error message may occur if the machine is provoked by an uninterrupted change between the end positions of the 5-choice control unit. In other cases see the remedy below.

Remedy Error in the soft ware, contact ESAB Service.

Error "WAITING FOR MACHINE IDENT" The setting box has not received the message from the machine which opens the commu-

nication between the two computers, the message from the machine always comes when the mains is switched on.
The error message above always comes for a short moment when the mains is switched on.

Remedy Check that the grey contacts of the opto-fibre are correctly connected in the setting box and on PC-board AP5. Also check the control transformer and its connections by measuring between L6 and L7 on AP5.

23. Storage errors

When storage errors occurs it is advisable to erase all programmed data. Do this by removing the battery in the data setting box and install it again, see replacement of the battery on page &cny0ap18a.
Also if the software has been exchanged it is recommended to erase all stored data.

24. The display of the setting box is black

Error The ribbon cable in the setting box is loose.

Remedy Check the connection of the ribbon cable.

Error Fuse FU3 is blown, diagram on page 61.

Remedy Replace the fuse, 2A.

Error Control transformer TC1 is defective, diagram on page 60.

Remedy Measure the control voltages with a multimeter. Measure the secondary voltages on the screws by the rating plate and the primary voltages between brown and red cable 230V and between brown and orange 400V.

Error A break in the mains cable.

Remedy Measure the resistance of the cable, shorten it or replace it if necessary.
NOTE it is not allowed to lengthening the mains cable.

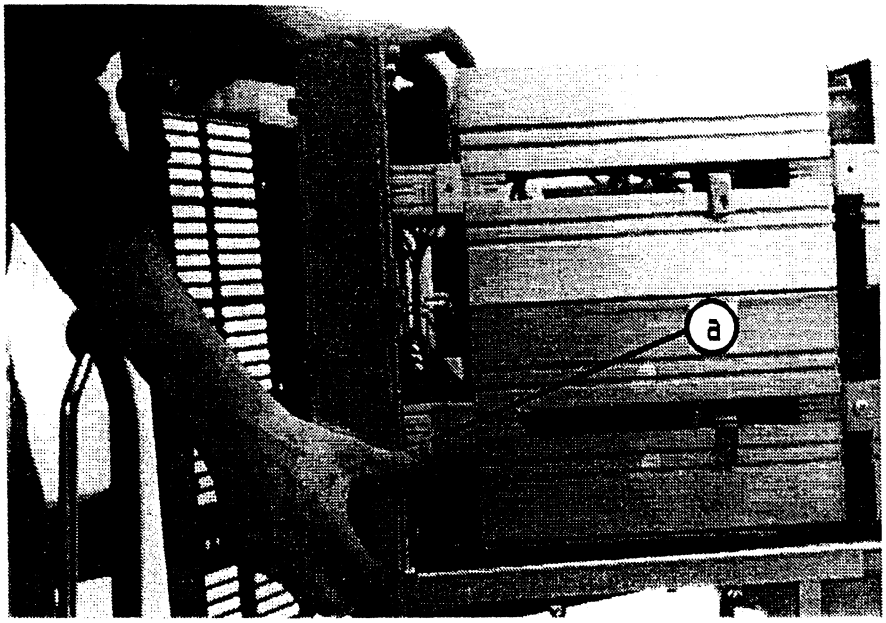
Error Circuit breaker FU1 has tripped out, diagram on page 60.

Remedy Check that the contactor springs back when pressed and that resistor R1 is intact, its rating is 10Ω, 10W. Reset the circuit breaker.

DISMANTLING

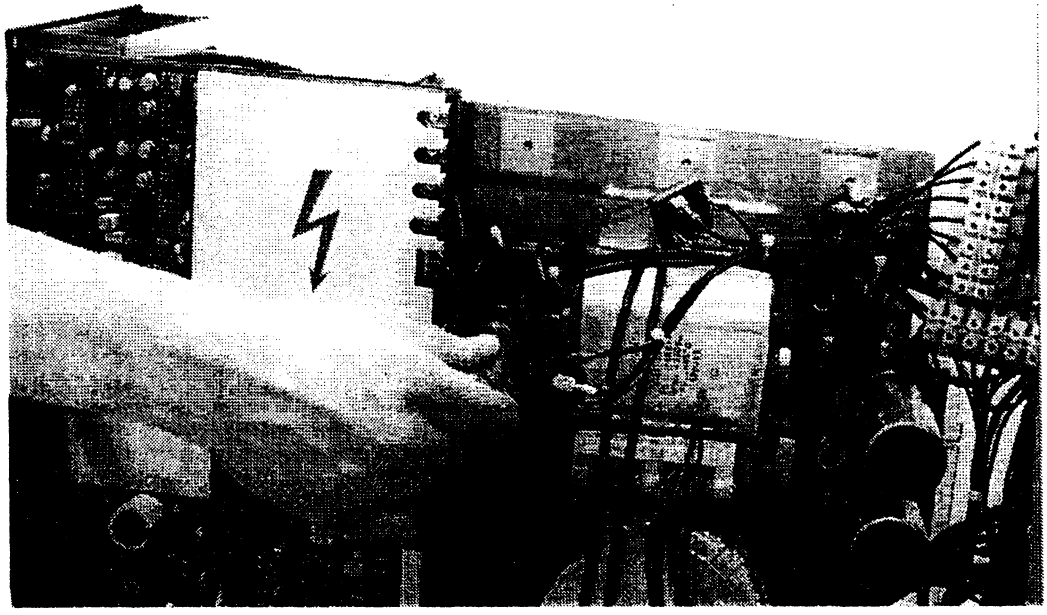
REPLACEMENT OF TRANSISTOR PACKETS

Remove the side panels and the rear panel from the machine, be careful so the centre panel doesn't fall into the machine. Remove the nipple on the water tank and press the rear panel slightly back. Take away the rectifier bridges VC1 - VC3. Remove the insulating plate (a) and take away the copper bar from the side of the lower transistor packet. Remove the screws from the supports close to the fans. Bend the insulating plate slightly out so the fan plate doesn't lie in the groove of the plate, see the picture below.



cny0ap13

Pull the transistor packets and the fan plate apart so the supports can be removed. Then take away the screw going through the current transformer TA1. See the picture below.



cny0ap14

DISMANTLING

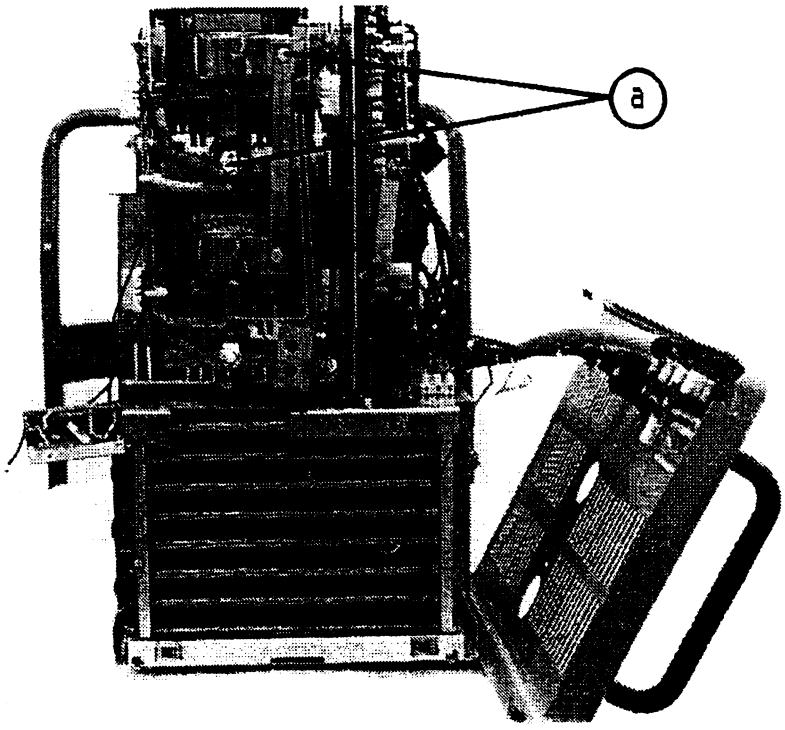
Remove the copper bar of the main transformer from the transistor packets and push it backwards. Take away the nut, remove the cables and remove the main transformer's lower copper bar from the transistor packet.

NOTE Always replace the transistor packets as a pair. The lower pair can be replaced in the same way. Do the assembly in the reversed order.

WARNING:NEVER REPLACE SINGLE TRANSISTORS.
STATIC ELECTRICITY (ESD) MAY CAUSE
ADDITIONAL TRANSISTOR FAILURES.

REPLACEMENT OF DIODES AND THERMOSTATS

Remove the side panels, the cover, the front panel and take away the air grid. Remove PC-board AP12, the screws from the welding current terminal and the plate for the PC-board. Loosen the front supports and bend out the insulating plate so the front panel can be removed. Loosen the screws **a**, according to the picture below, and remove the insulting plate so the copper bar on the side of the lower transistor packet can be taken out.

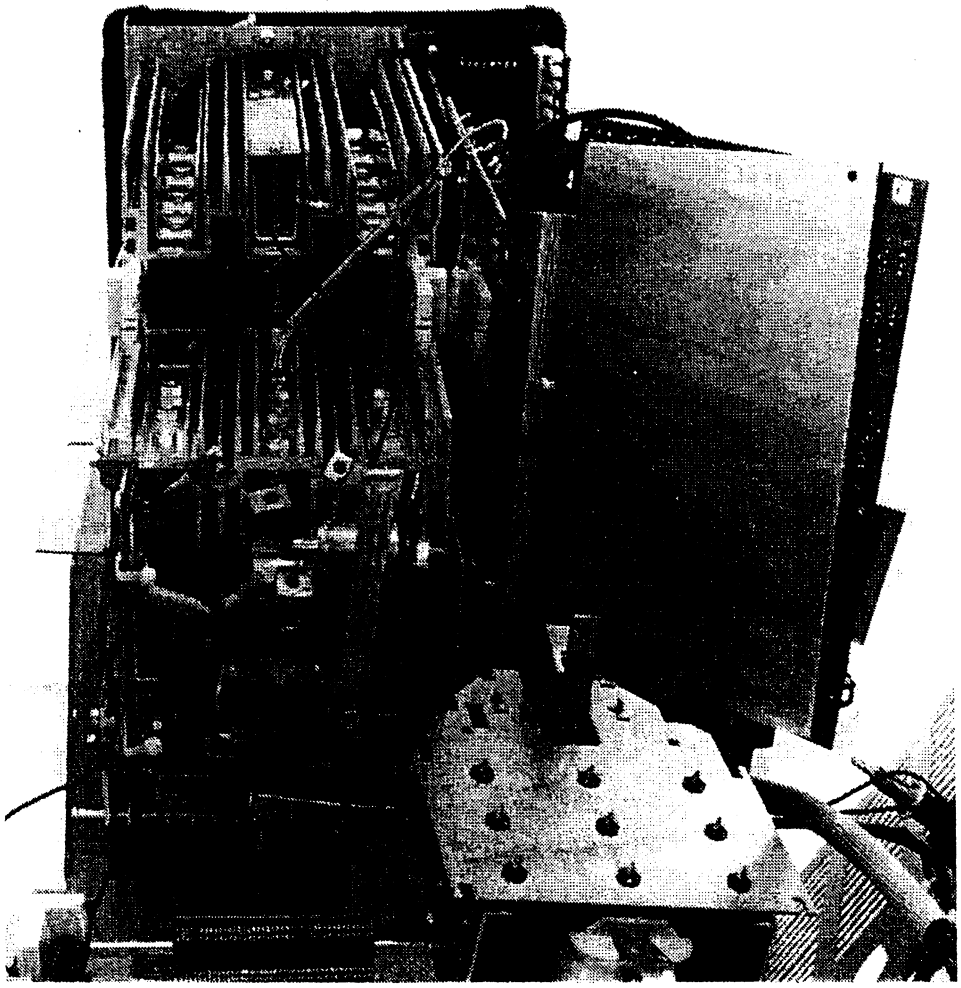


cny0ap15

Loosen the insulating late from the other side and push it out. Remove the nut from the current transformer, see the picture at the bottom on page 49 .

Then loosen the copper bar of the main transformer from the transistor packet and bring it to the rear of the machine. Remove the nut, the cables and the main transformer's lower copper bar from the transistor packet. Remove the support by pressing apart the main transformer and the transistor packets.

Check with a multimeter which row of diodes that are defective. Be careful not to let the copper bars to get in contact with each other. Lift the main transformer to get access to the thermostats and the diodes, se the picture below.



cny0ap17

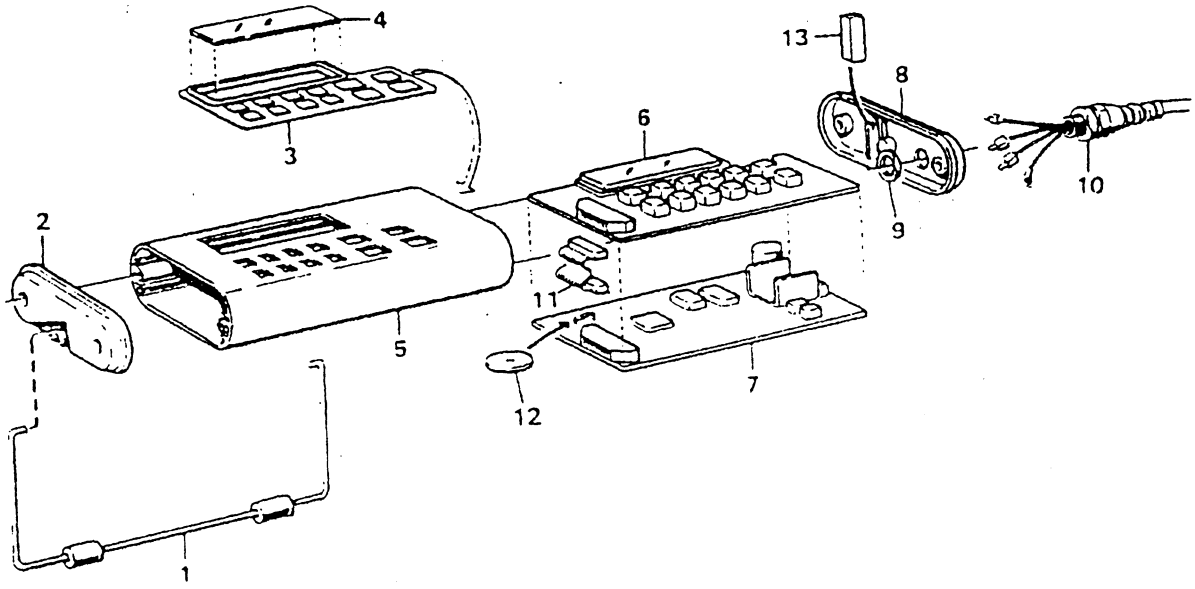
Carefully unscrew the anodes from the copper bar and then remove the defective diodes from the cooling element.

NOTE: When replacing the diodes, do not tighten them more than 2.0 - 2.5 Nm.

The lower row of diodes can be replaced in the same way.

Be careful so no short circuit occurs between the shunt and the chassie and between the bar from the free-wheeling diodes and the bottom panel.

REPLACEMENT OF THE BATTERY



cny0ap18.

Remove the clamp 1 from the setting box and unscrew the right hand side panel 8. Remove the earth cable from the casing and push out the PC-boards 6 and 7. Fold the PC-boards apart in order to get access to the battery.

When changing batteries all the programmed data will be deleted unless the voltage (3V) can be maintained. Make sure that the voltage from the old battery is connected until the new one is in its proper place.

Lithium batteries will last for approx. 5 years in normal operation.

Designation of battery: BR 2325 - 1HC

REPLACEMENT OF FUSES

Fuses on the rear panel

FU1 circuit breaker 5A

FU2 quick blow fuse 10A (42V AC)

FU3 quick blow fuse 2A

Fuses inside the machine

The supply to the over voltage protection on the primary side is protected by an 0.5A quick blow fuse (FU4). The fuse is mounted on the cable between E4 on PCB AP5 and the negative terminal of the capacitor.

On the control circuit board there are seven fuses. The three down to the right (S1, S2 and S3) are 2.5A slow blow fuses. S1 is for the computer and also some other circuits, S2 is for the remaining electronics and S3 is for the remote control unit. Four fuses up to the right (S4, S5, S6 and S7) are quick blow fuses, 1A, and they are for the transistor packets.

S1 2,5A slow blow fuse

S2 2,5A slow blow fuse

S3 2,5A slow blow fuse

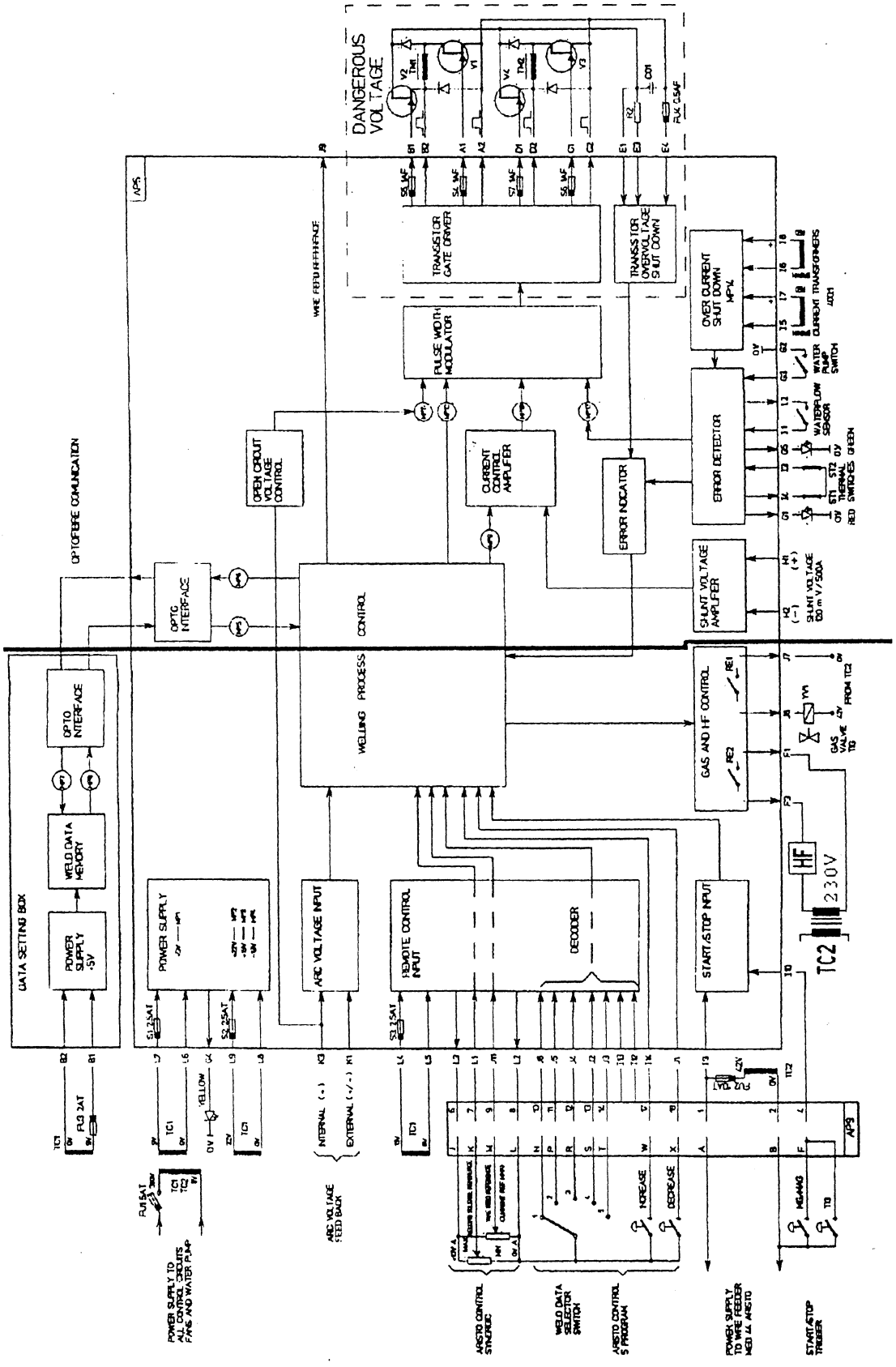
S4 1A quick blow fuse

S5 1A quick blow fuse

S6 1A quick blow fuse

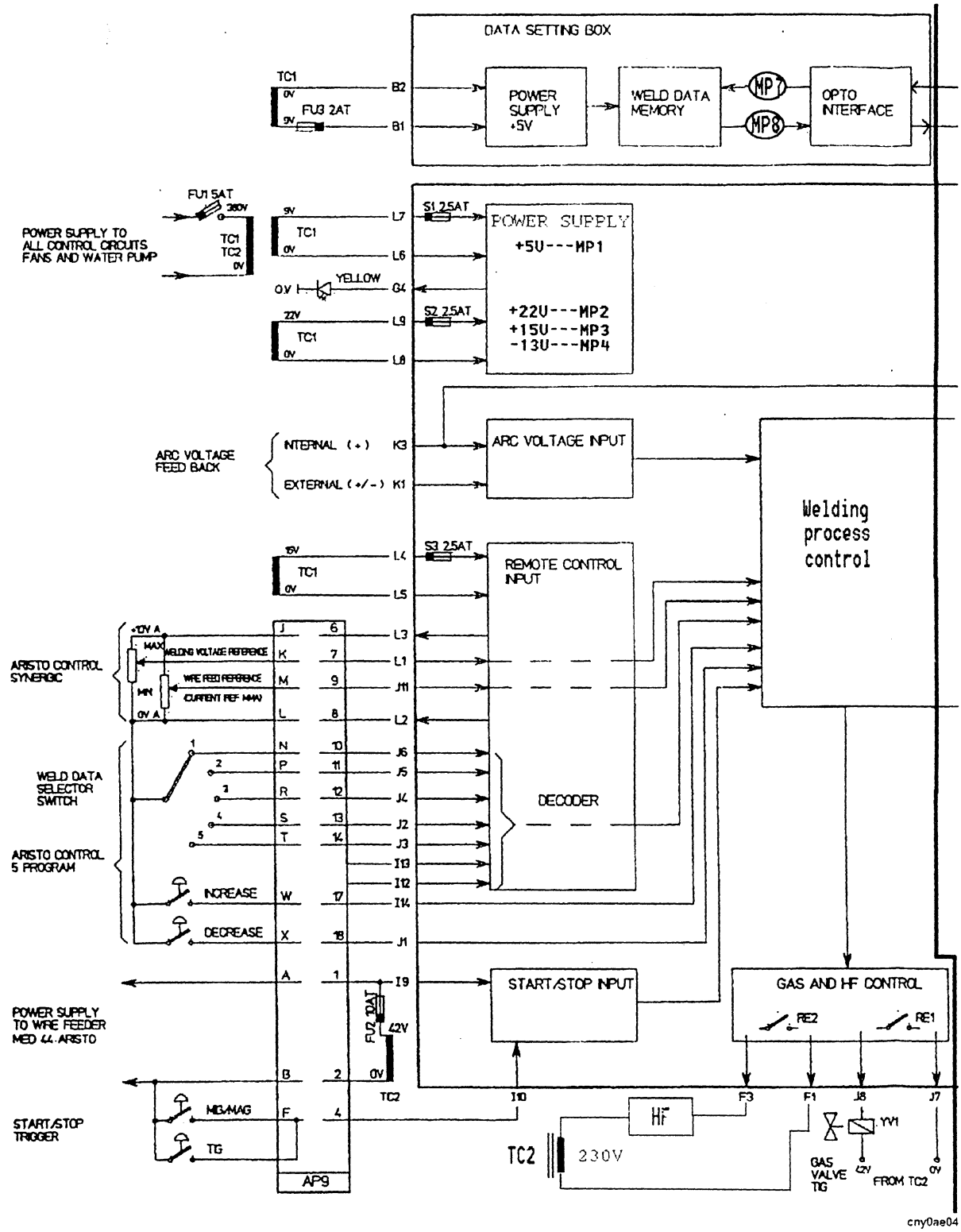
S7 1A quick blow fuse

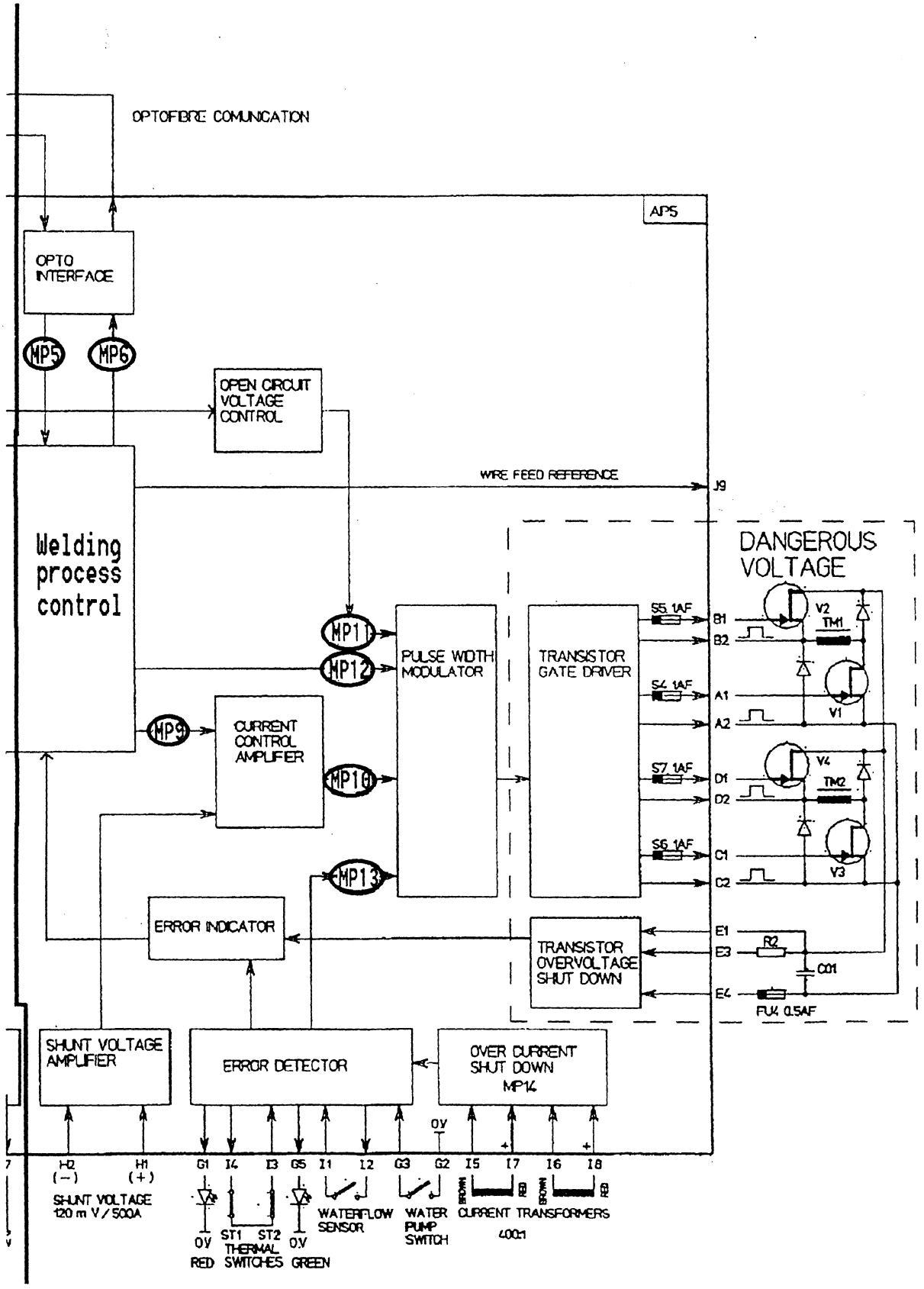
FUNCTION DIAGRAM see page 56, 57



cnv0ae03

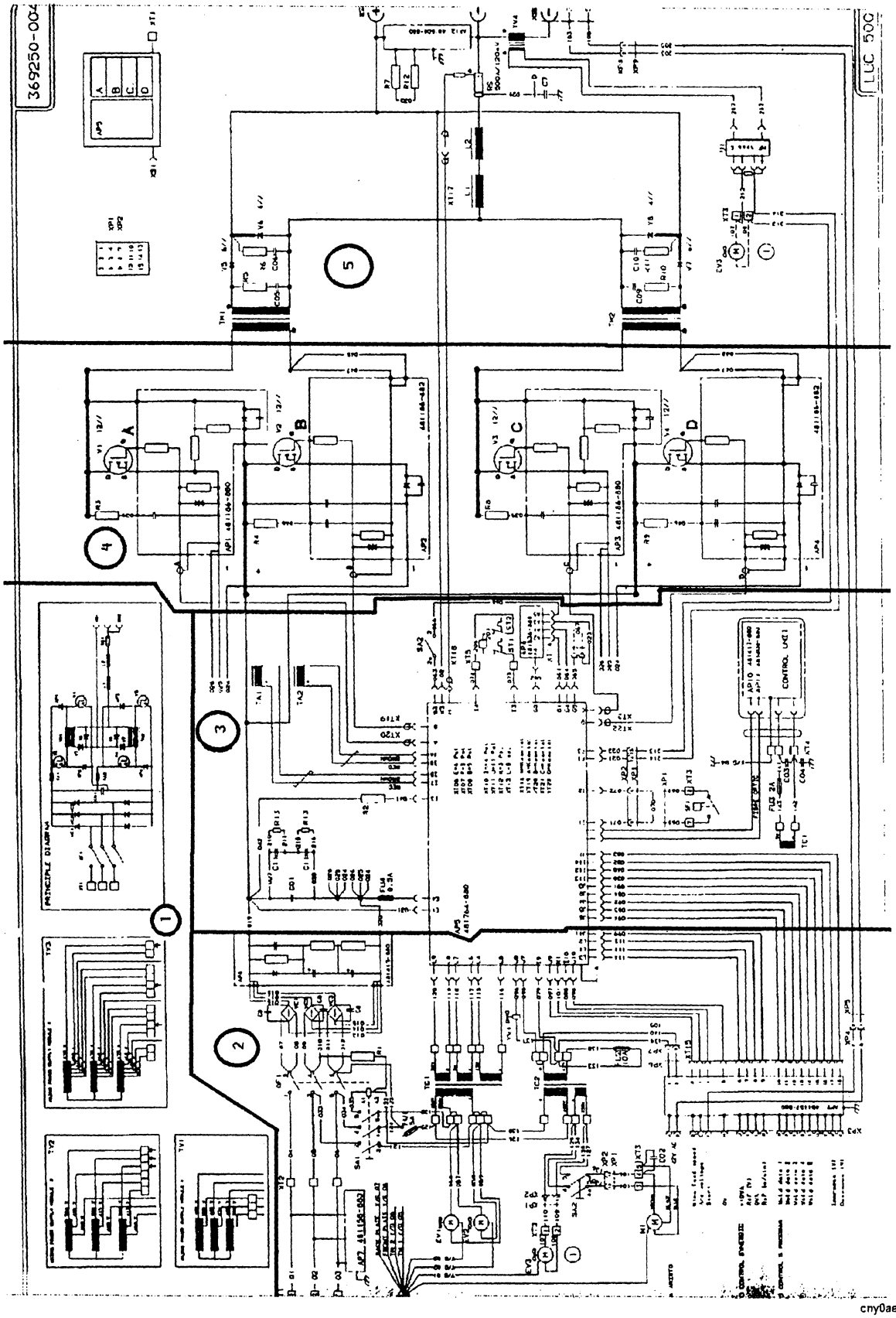
FUNCTION DIAGRAM



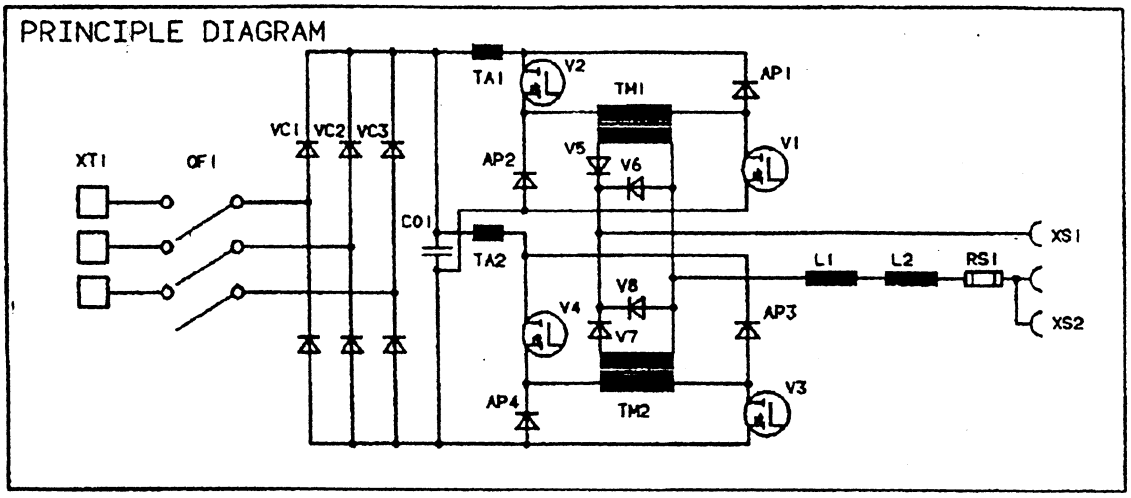

OPTOFIBRE COMUNICATION
AP5
OPTO INTERFACE
MP5
MP6
OPEN CIRCUIT VOLTAGE CONTROL
WIRE FEED REFERENCE
J9
Welding process control
DANGEROUS VOLTAGE
MP11
MP12
PULSE WIDTH MODULATOR
TRANSISTOR GATE DRIVER
S5 1AF
S4 1AF
S7 1AF
S6 1AF
B1
B2
A1
A2
D1
D2
C1
C2
V2
TH1
V1
V4
TH2
V3
MP9
CURRENT CONTROL AMPLIFIER
MP10
MP13
ERROR INDICATOR
TRANSISTOR OVERVOLTAGE SHUT DOWN
E1
E3
E4
R2
C01
FU4 0.5AF
SHUNT VOLTAGE AMPLIFIER
ERROR DETECTOR
OVER CURRENT SHUT DOWN MP14
0V
H2 (-)
H1 (+)
SHUNT VOLTAGE 120 m V / 500A
G1
I4
I3
G5
I1
I2
G3
G2
I5
I7
I6
I8
0V RED
ST1 ST2 THERMAL SWITCHES
0V GREEN
WATERFLOW SENSOR
WATER PUMP SWITCH
BROWN
RED
CURRENT TRANSFORMERS 400:1

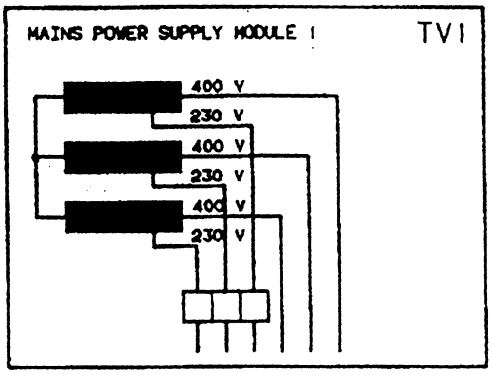
cny0ae05

CONNECTION DIAGRAM LUC 500 see also page 59-63

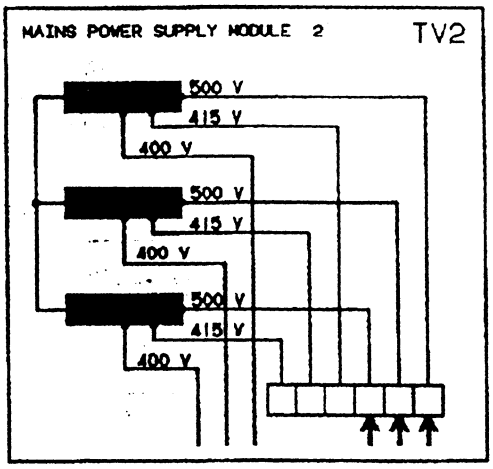


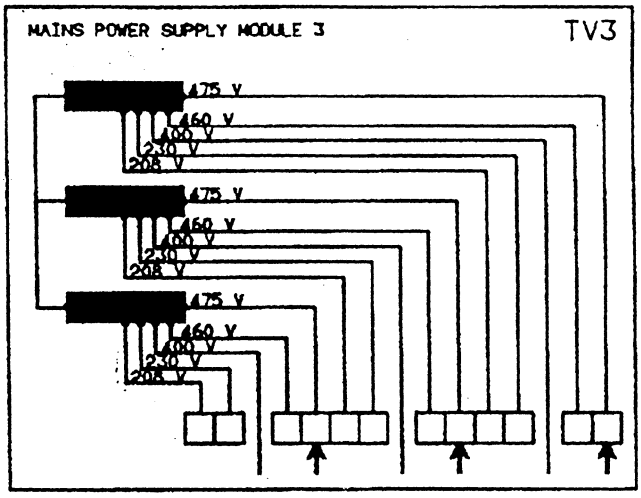
cny0ae06


PRINCIPLE DIAGRAM
XT1
QF1
VC1
VC2
VC3
C01
TA1
TA2
V2
TH1
AP1
AP2
V5
V6
V1
V8
V4
V7
AP3
AP4
TH2
V3
L1
L2
RS1
XS1
XS2


MAINS POWER SUPPLY MODULE 1
TV1
400 V
230 V
400 V
230 V
400 V
230 V

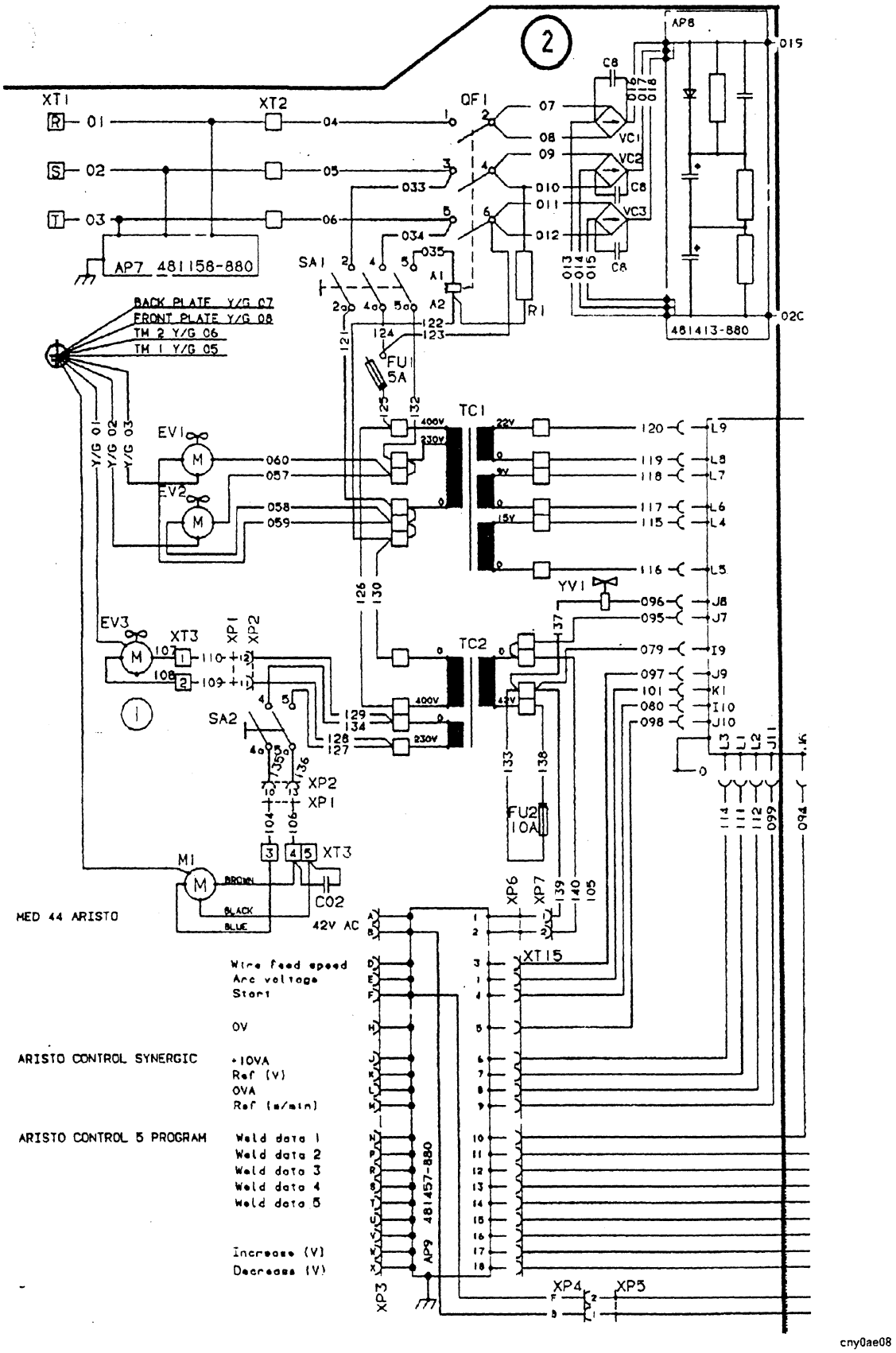
1


MAINS POWER SUPPLY MODULE 2
TV2
500 V
415 V
400 V
500 V
415 V
400 V
500 V
415 V
400 V

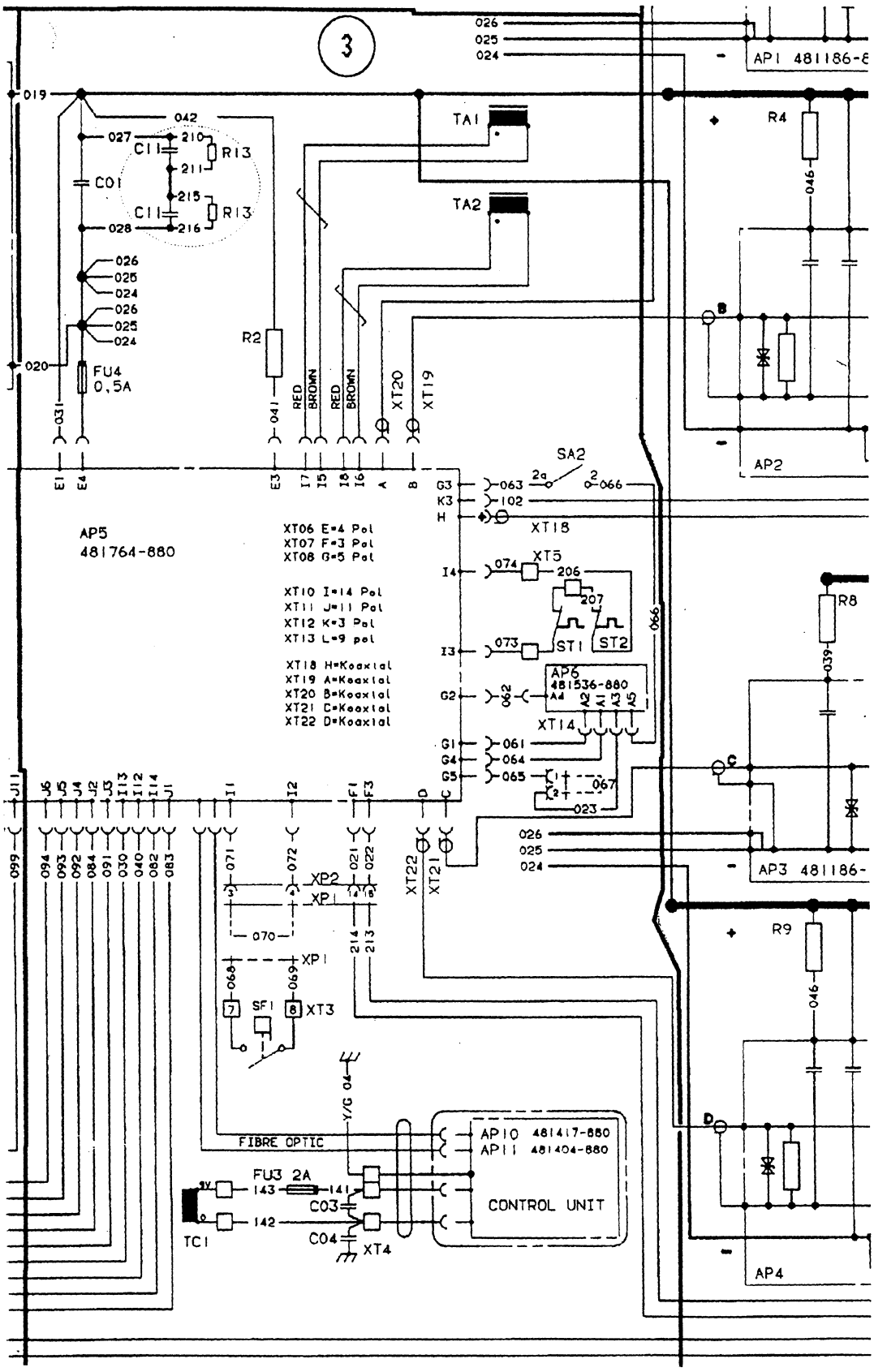

MAINS POWER SUPPLY MODULE 3
TV3
475 V
460 V
400 V
230 V
208 V
475 V
460 V
400 V
230 V
208 V
475 V
460 V
400 V
230 V
208 V

cny0ae07

CONNECTION DIAGRAM LUC 500



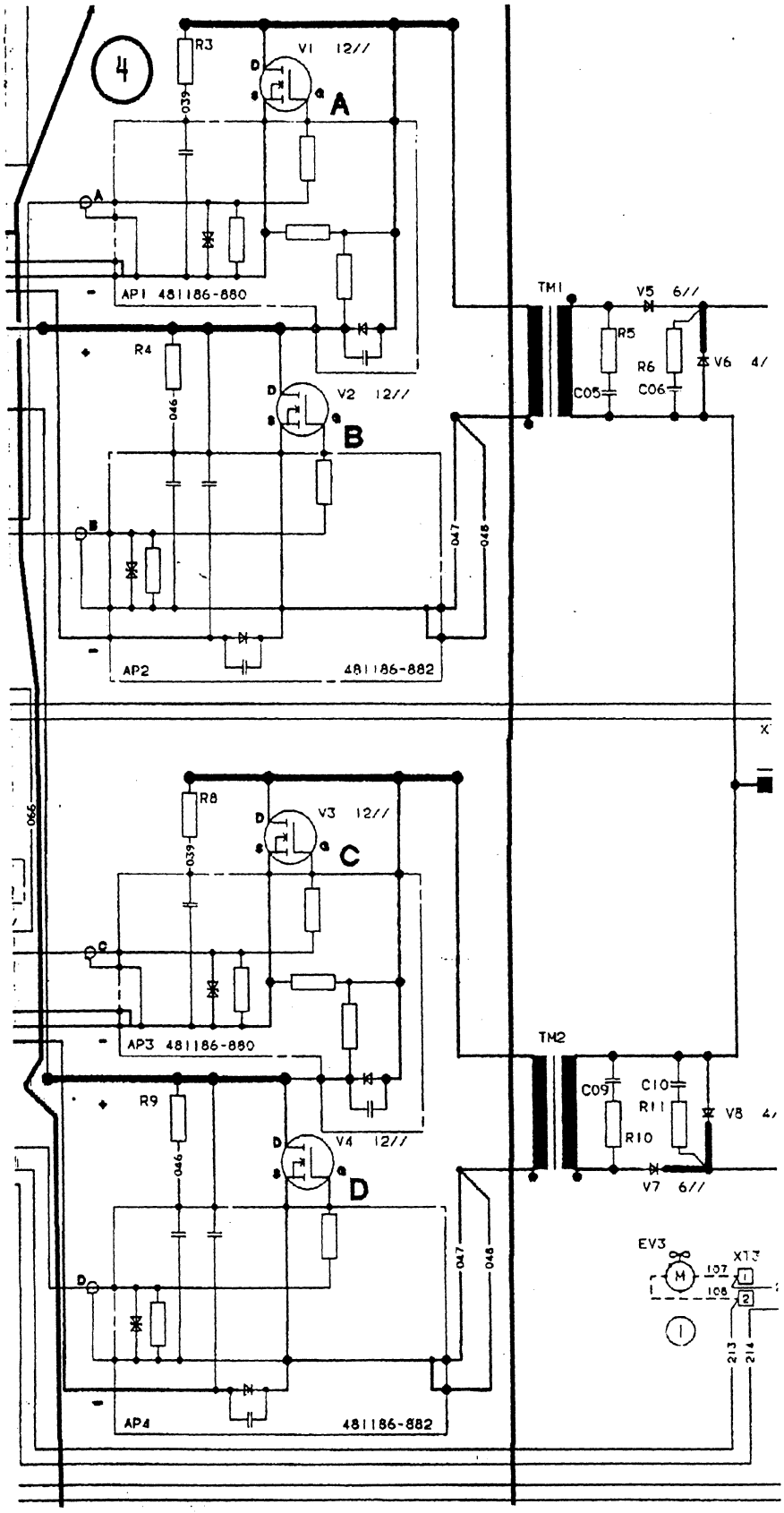
cny0ae08



cny0ae09

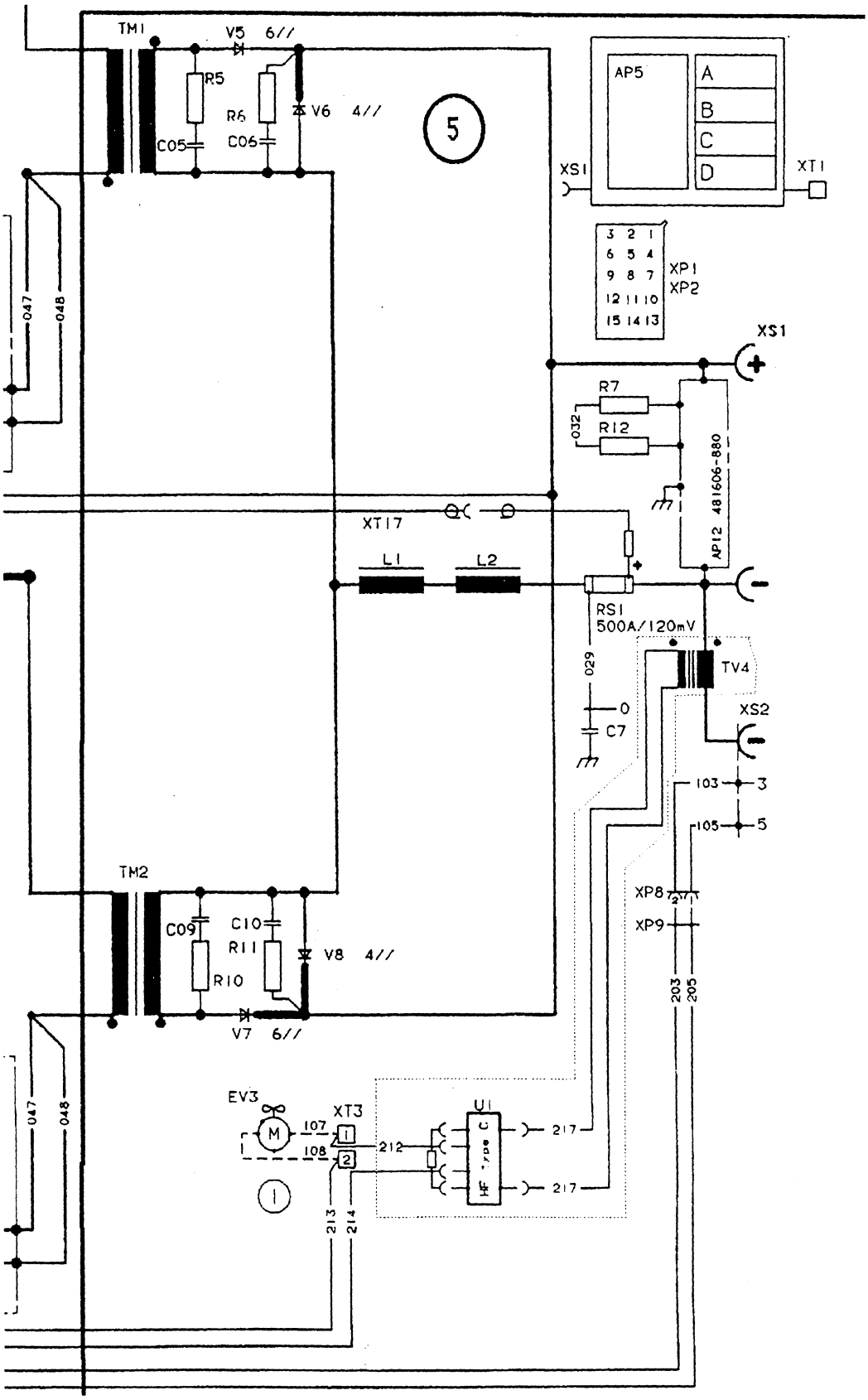
The circled components above, C11 and R13, are only mounted in machines having voltage module TV1 - TV3 (on page 59).

CONNECTION DIAGRAM LUC 500



cny0ae10

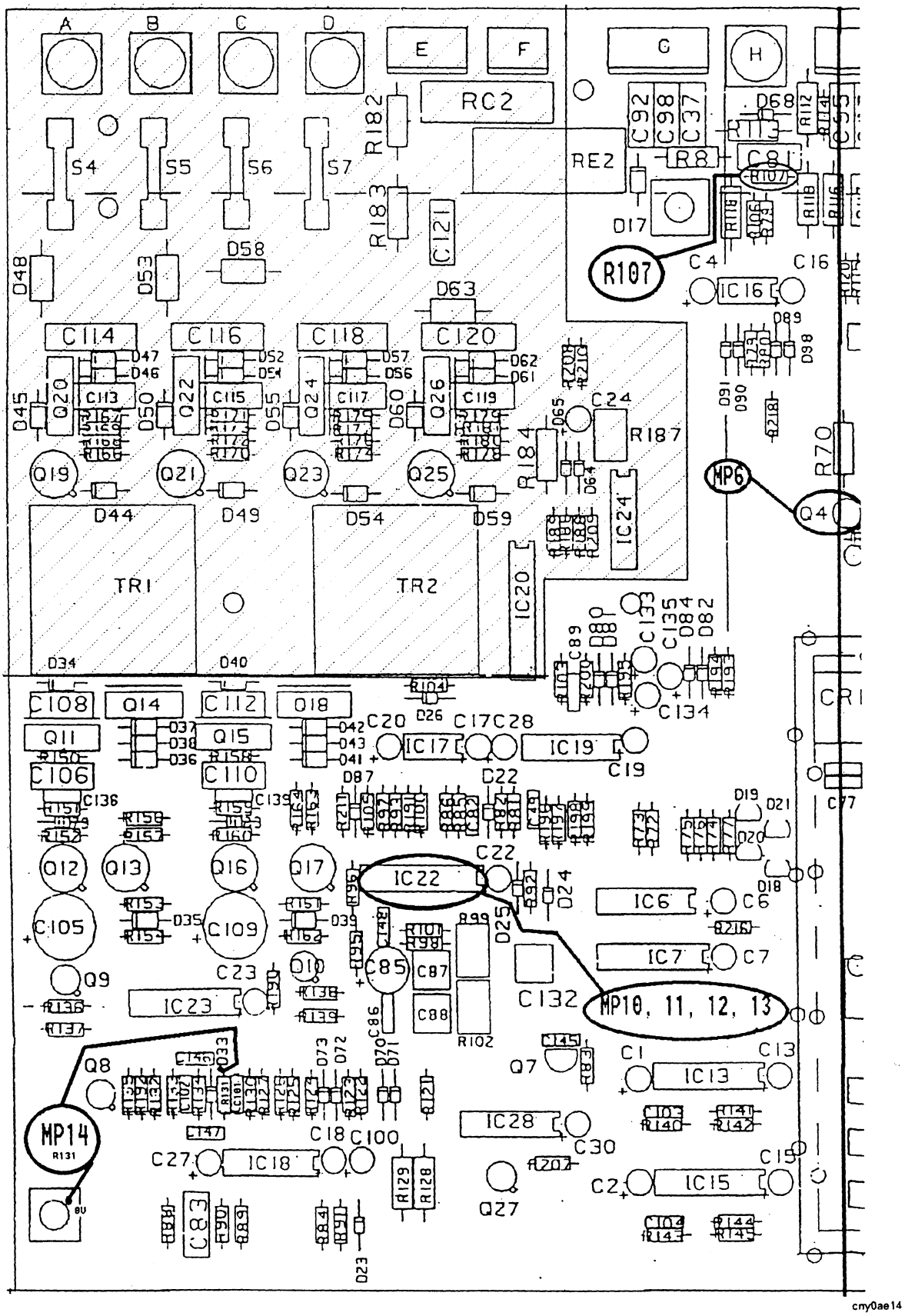
cnv0aae1 900924



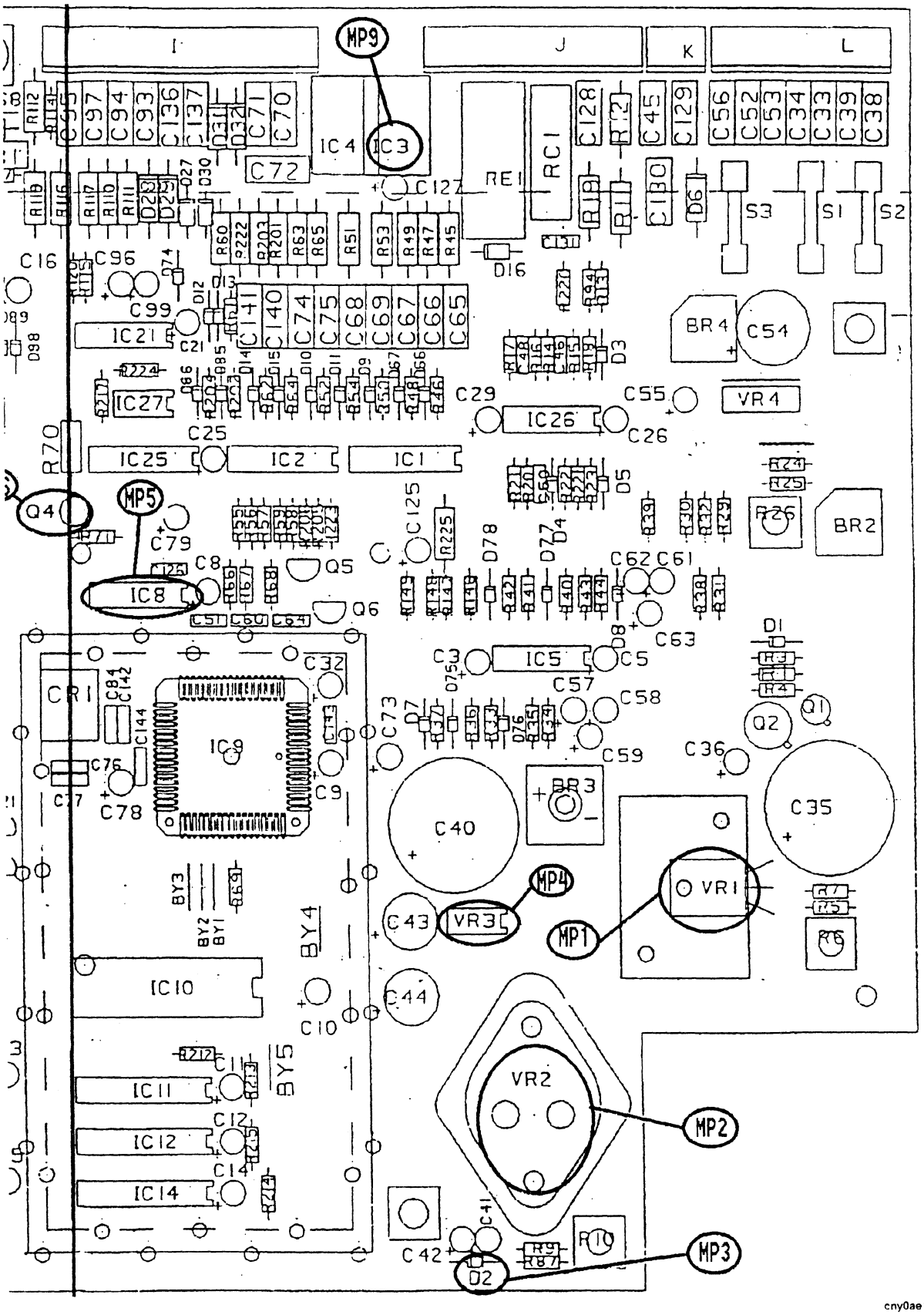
cny0ae11

The above circled components, TV4 and U1, are only mounted on machines having HF-ignition.

COMPONENT LAYOUT CONTROL UNIT AP5 481 435



cny0aae1 900924


I
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C34
C33
C39
C38
C71
C70
C97
C94
C93
C136
C137
S3
S1
S2
C16
C96
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IC21
C141
C140
C74
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C67
C66
C65
D16
BR4
C54
C29
C55
VR4
IC26
C26
C25
IC25
IC2
IC1
R70
Q4
MP5
C79
C8
IC8
Q5
Q6
C125
D78
D77
D4
D5
C62
C61
C63
BR2
C3
IC5
C5
C57
C58
C59
C36
D1
Q2
Q1
C73
D7
C32
IC9
C9
C78
C76
C77
C40
BR3
C35
MP4
VR1
MP1
C43
VR3
BY3
BY2
BY1
BY4
IC10
C44
C10
VR2
MP2
IC11
IC12
IC14
C12
C14
C11
BY5
C42
D2
R10
MP3

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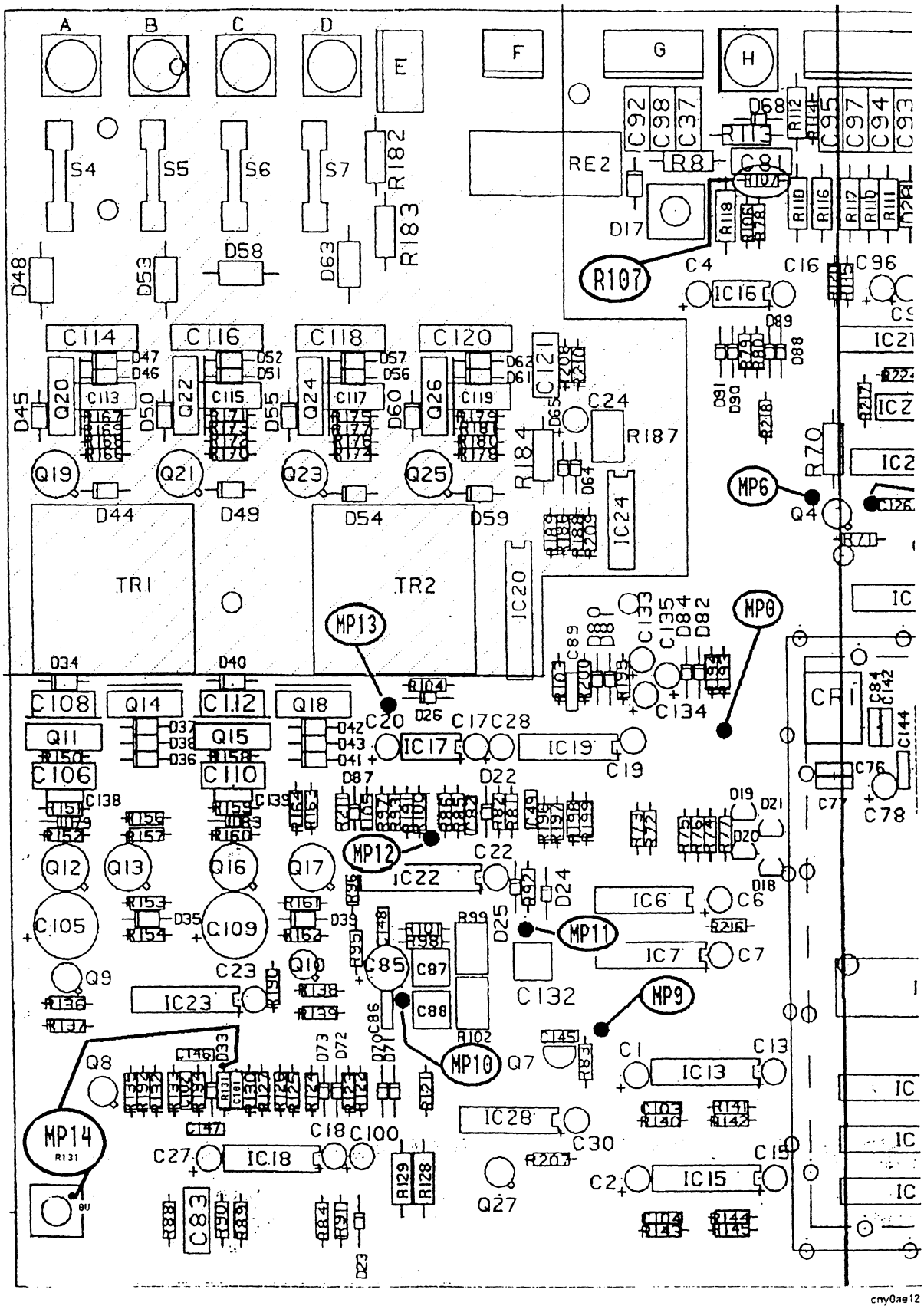
COMPONENT LAYOUT CONTROL UNIT AP5 481 764



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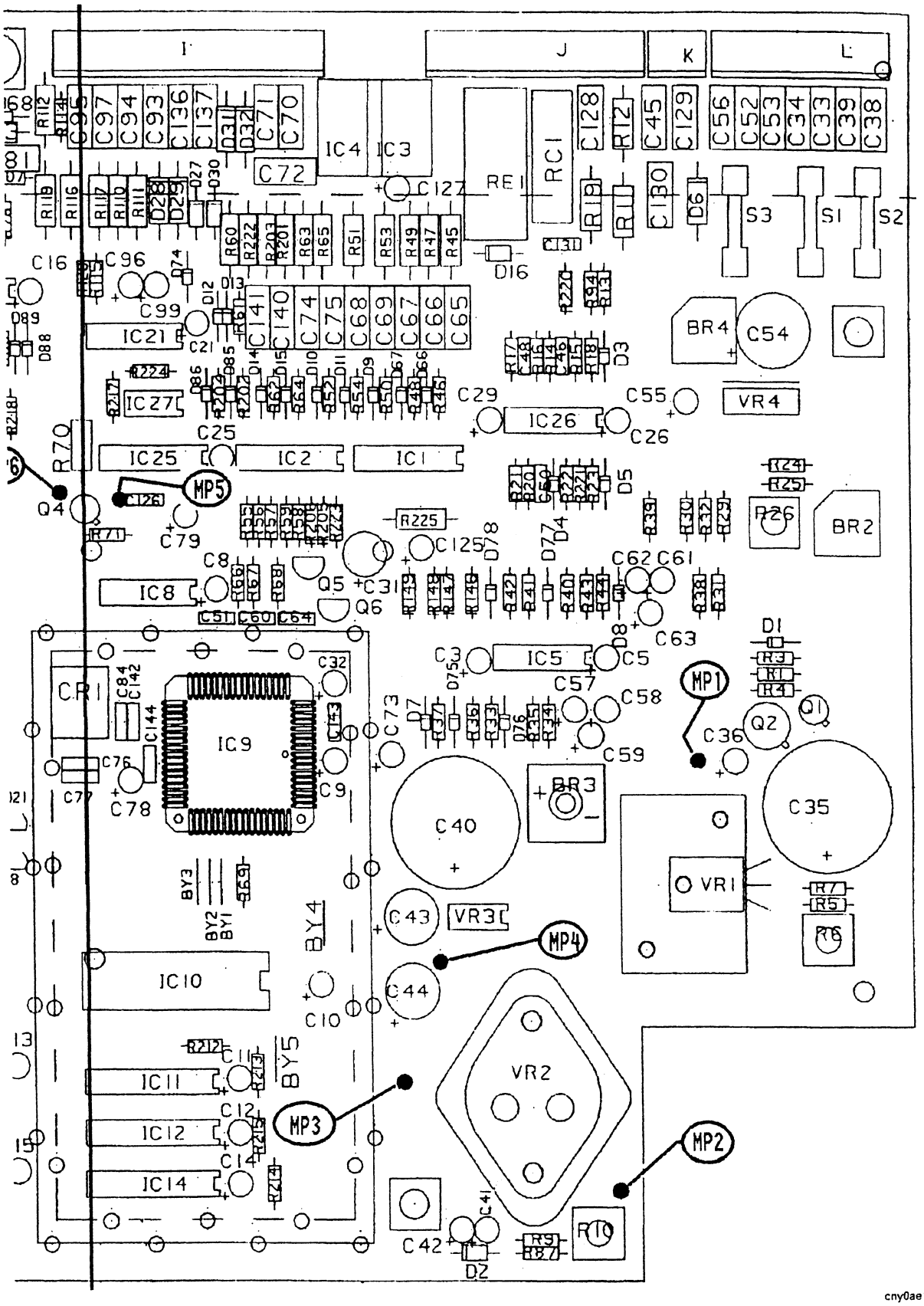

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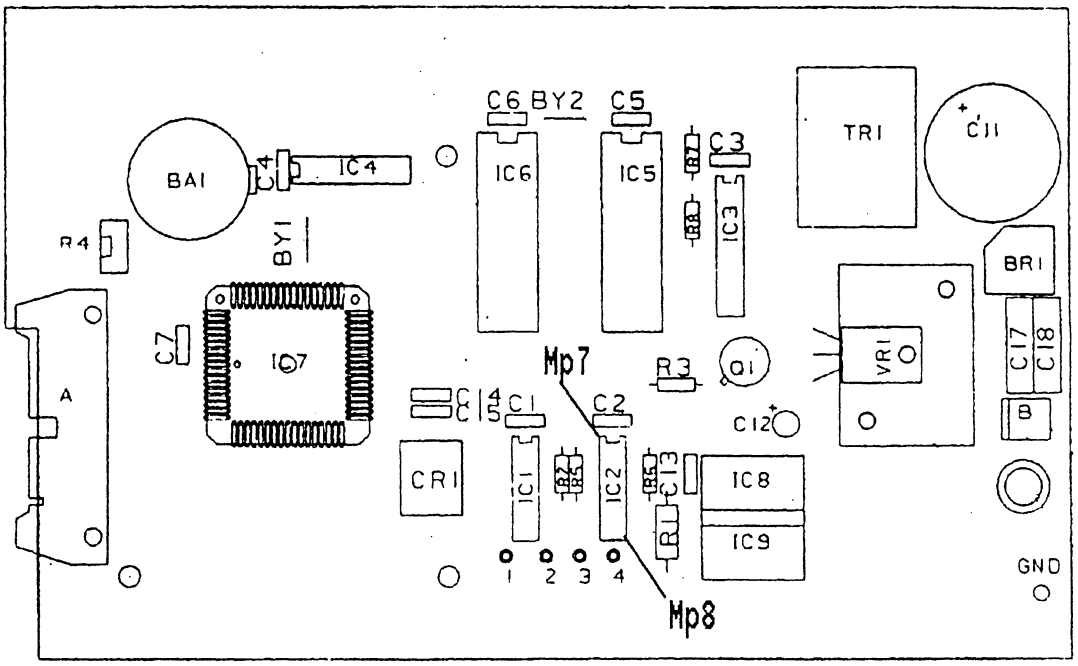
COMPONENT LAYOUT COMPUTER PC-BOARD SETTING BOX



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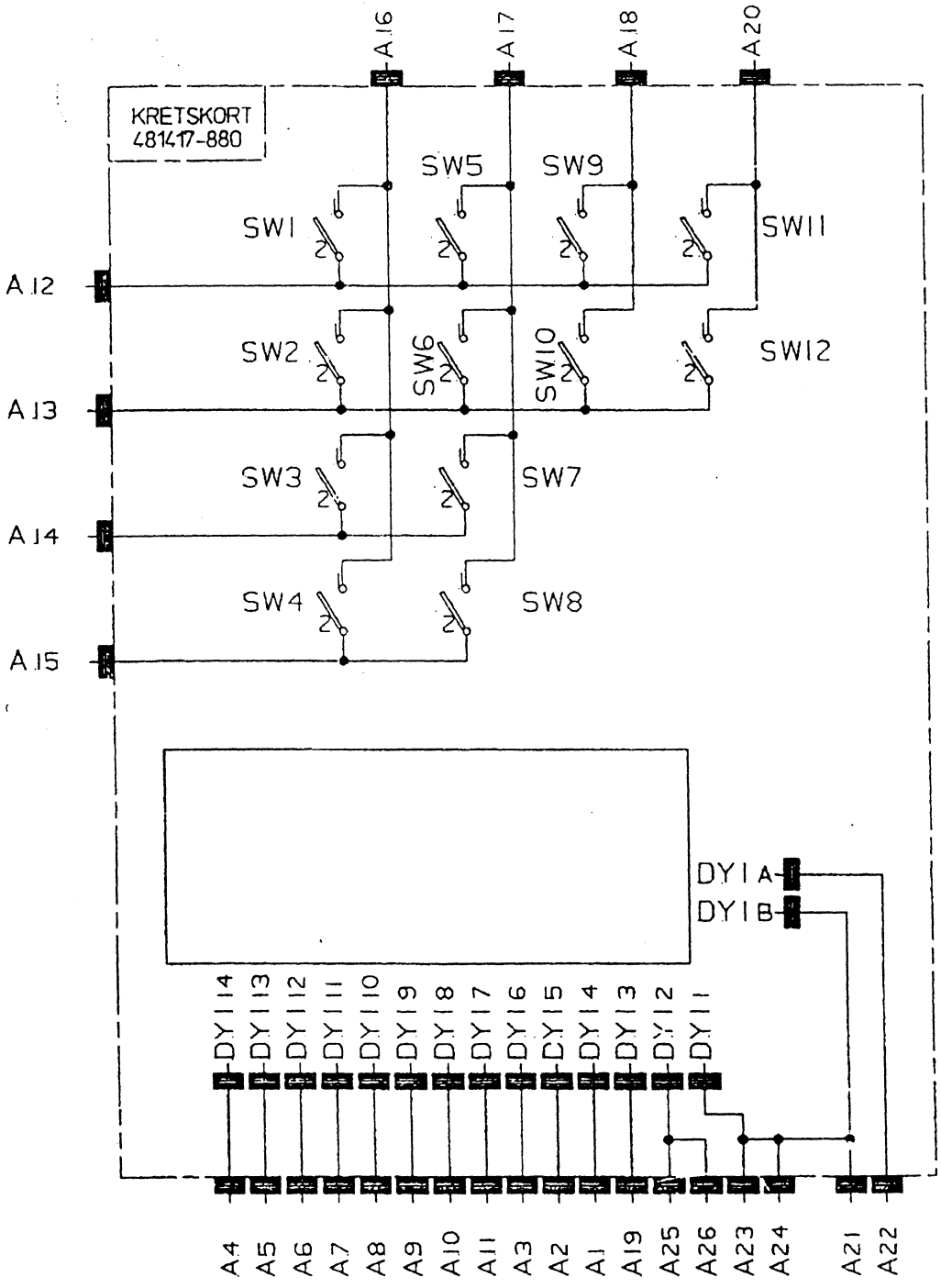
CIRCUIT DIAGRAM DISPLAY PC-BOARD



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ESAB

ARISTO 500

Universal Power Source

Instruction manual and spare parts list

Reg. nr 300 865 059

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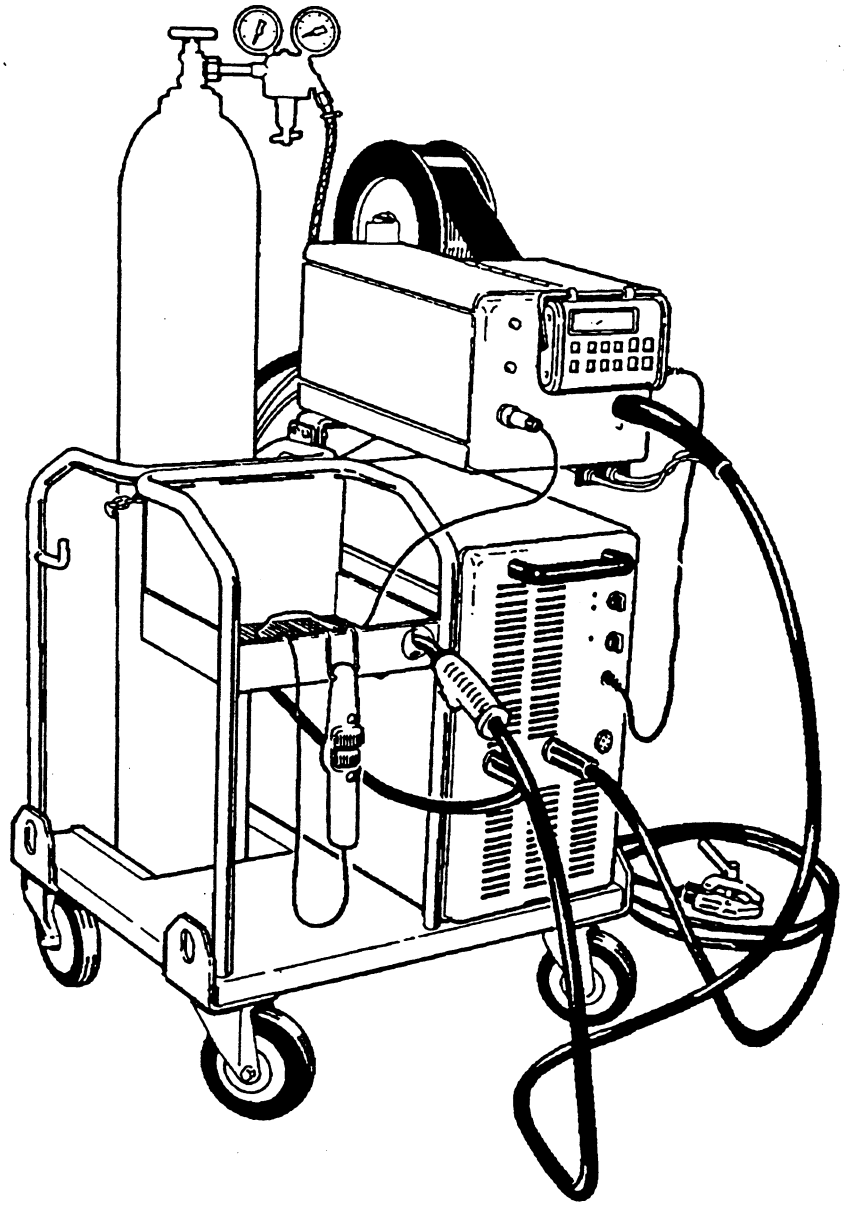
För innehållet i denna trycksak ansvarar Dep. HM
Responsible for contents of this publication Technical
Verantwortlich für den Inhalt dieser Publikation Documentation
Responsable du contenu de cet imprimé ESAB Laxaa S

BA-TEKNIK


ARISTO 500
MEM
MEM No
Aristo
500
ESAB
ESAB
LUC 500



TECHNICAL DESCRIPTION

ARISTO 500 is a transistor-controlled welding power source of universal type, built in modules to facilitate erection, handling and accessibility at the work place.

It is programmable, adapted for co-operation with a welding robot and can be controlled by way of a PC system.

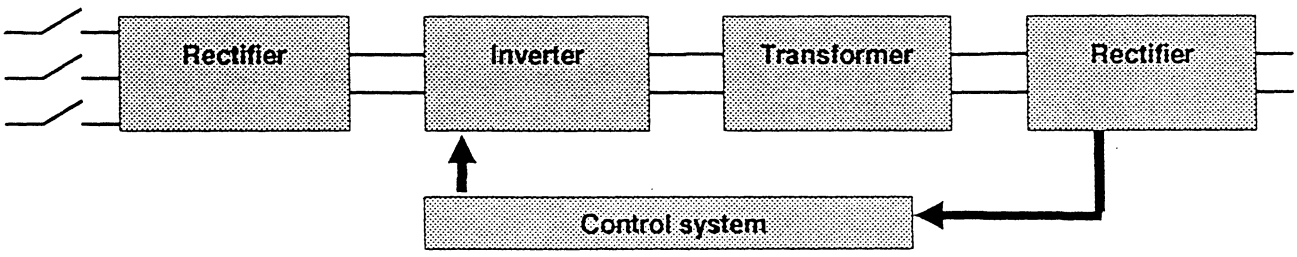
ARISTO 500 is programmed and controlled directly from the work place by way of small portable cable-connected boxes.

With ARISTO 500 the following arc welding methods can be applied:

MMA	Welding with coated electrodes
MIG/MAG	Semi-automatic welding
TIG	Welding with non-fusible electrodes
CAC	Carbon arc gouging

ARISTO 500 is a machine of inverter type, which means that the mains voltage first is rectified and then converted back to alternating current of very high frequency. After this occurs the transformation to welding current.

The size of the transformer depends on the frequency: the higher the frequency, the smaller the transformer needed to obtain a given power. The same is applicable to the inductor.



In other words, welding machines of inverter type are considerably smaller and lighter than conventional machines supplying the same power.

The inverter principle makes it possible to control every sequence of the welding process by means of electronics, which results in better welding properties.

The ARISTO 500 microcomputer is of type Siemens 80515. It is programmed to provide good starting properties for each one of the welding methods. When the desired values have been set, the micrcomputer supervises the welding procedure and provides for the right static and dynamic properties.

ARISTO 500 is a flexible system composed of the following units that can be built together in accordance with your needs:

Power source, containing:

- **Power module** with power units and control electronics.

  Here the incoming mains voltage is transformed to high-frequency alternating voltage that is then transformed to welding voltage.

  The following controls can be found on the front panel:
  - Main switch and ON/OFF switch for the cooling unit. Light-emitting diodes indicate the operating position of the switches.
  - Welding current terminals, (+) and (-).
  - Central connection for TIG welding gun.
  - Grommet for the setting box cable.

  On the rear panel is:
  - Grommet for the mains cable.
  - Connection for feed unit, (or remote control unit for MMA).
  - 2 fuses (glass tube).
  - 1 circuit breaker.

  The cooling unit contains:
  - Quick-couplings for cooling water.
  - Inlet for water filling with deaeration.

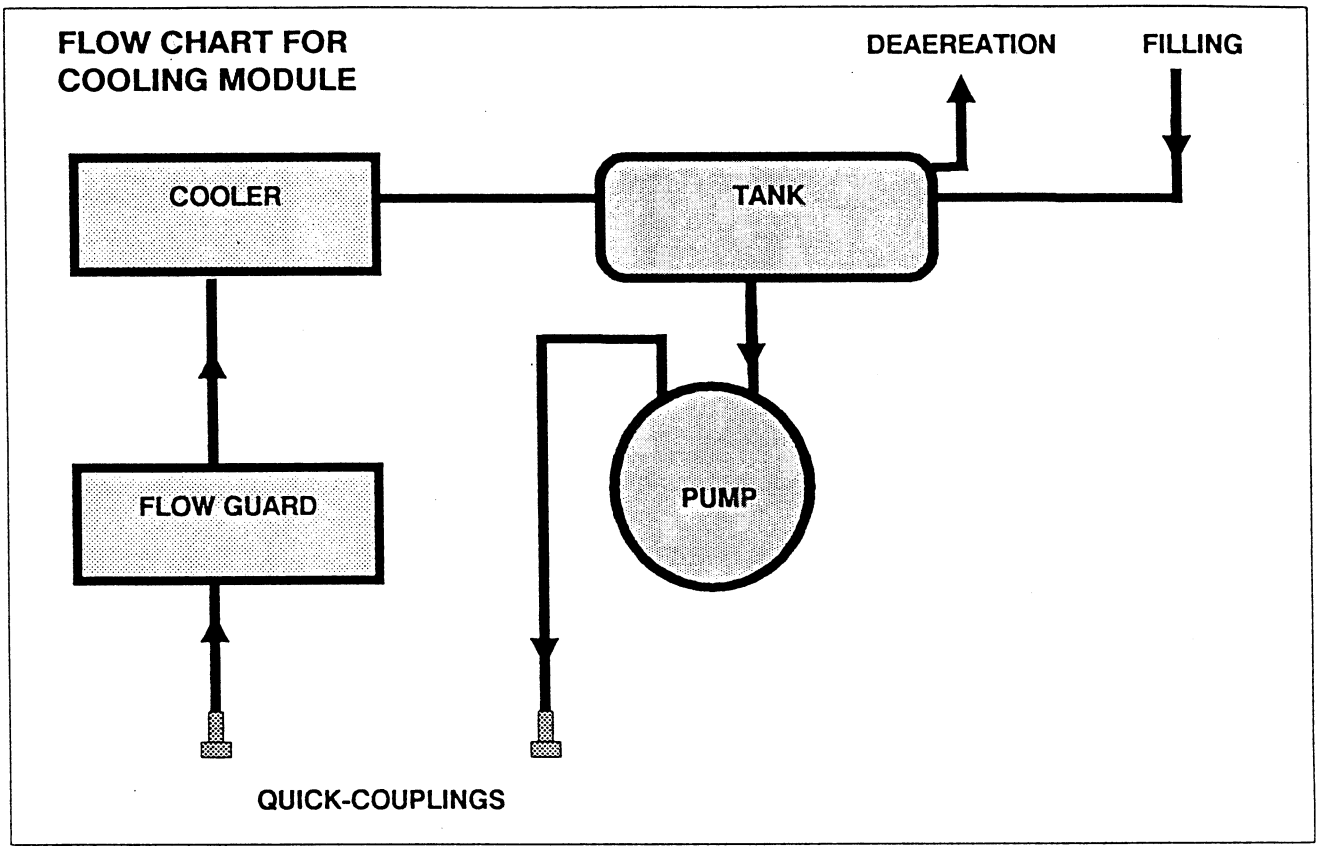
- **Setting box** for welding methods and parameters, measuring and storing.

- **Module for water-cooling** of the welding gun. The module is to be built into the same casing as the power module and consists of the following main components:

  - Tank for 1.5 - 1.7 l cooling medium.
  - Pump of turbine type, energized by a direct-coupled induction motor The motor is to be connected to a 220 V single-phase terminal on a control transformer in the power module and it is provided with a starting capacitor. The pump is started with a rotary switch on the front panel. A green light-emitting diode goes on.
  - Flow-guard which breaks the current supply to the pump if the cooling water flow is lower than 1 l/min. The green light-emitting diode, which indicates operation status, goes out and the red one goes on.
  - Cooler of copper tubes and cooling flanges of aluminium.
  - Fan for forced air-cooling.

  Working principle:

  The pump sucks the the cooled water from the tank and forces it out into the welding gun cooling system which is connected to the unit by means of quick-couplings. After return, the heated water first passes the flow-guard, then the cooler before it goes back to the tank. (See picture.)



- **Mains adaptation module**
  To be built into the casing of the power module. Connected manually for the right mains voltage.

  Water cooling and mains adaptation are normally built in before delivery. (Can also be delivered separately.)

- **Feed unit**
  for MIG/MAG welding, MED 44 ARISTO. Can be mounted on the power unit or be hung up separately. See special instruction manual, ordering number 154 138-031.

- **Remote control unit**
  To be connected to the feed unit (MIG/MAG welding) or to the power source (MMA welding).

  - ARISTO CONTROL 5 PROGRAM.
    For shifting between 5 pre-programmed sets of parameters. Possible to change voltage in MIG/MAG position.

  - ARISTO CONTROL SYNERGIC.
    With stepless setting of:
    Wire feed speed and voltage for MIG/MAG welding
    Welding current for MMA and TIG welding.

TECHNICAL DATA:

Enclosure type		IP 23 AF		
Temperature class		F (155° C)		
Mains connection		3-phase		
Mains voltage		380	V	
Mains frequency		50/60	Hz	
Primary current		38	A	
Mains fuses		35	A	
The machine is independent of phase sequence.				
Mains adaptation module, variant 1 (-882, -885):		50/60	Hz	
		220	V	
		380	V	
Mains adaptation module, variant 2 (-883, -886)		50	Hz	
		380	V	
		500	V	
Mains voltage compensation: +/-10% resulting in +/-0.2% variation in welding data				
Permissible load				
- at 60% duty cycle		500	A	
		40	V	
- at 100% duty cycle		400	A	
		36	V	
Open-circuit voltage		65	V	
No-load power		<350	W	without cooling unit
		<500	W	with cooling unit
Power factor	400 A	0.96		
	500 A	0.97		
Efficiency	400 A	0.83		
	500 A	0.83		
Weight	-880	380V	65 kg	without cooling unit
	-881	380V	72 kg	with cooling unit
	-882	220-380V	104 kg	with cooling unit
	-883	415/500-380	92 kg	with cooling unit
	-885	220-380V	98 kg	without cooling unit
	-886	415/500-380V	86 kg	without cooling unit

For MIG/MAG welding

Current range	30 - 500	A
Arc voltage (mean value)	10 - 46	V
Wire feed speed	0 - 22	m/min

For TIG welding

Arc strike	Lift Arc	
Current range	8 - 500	A
Arc voltage (mean value)	10 - 46	V

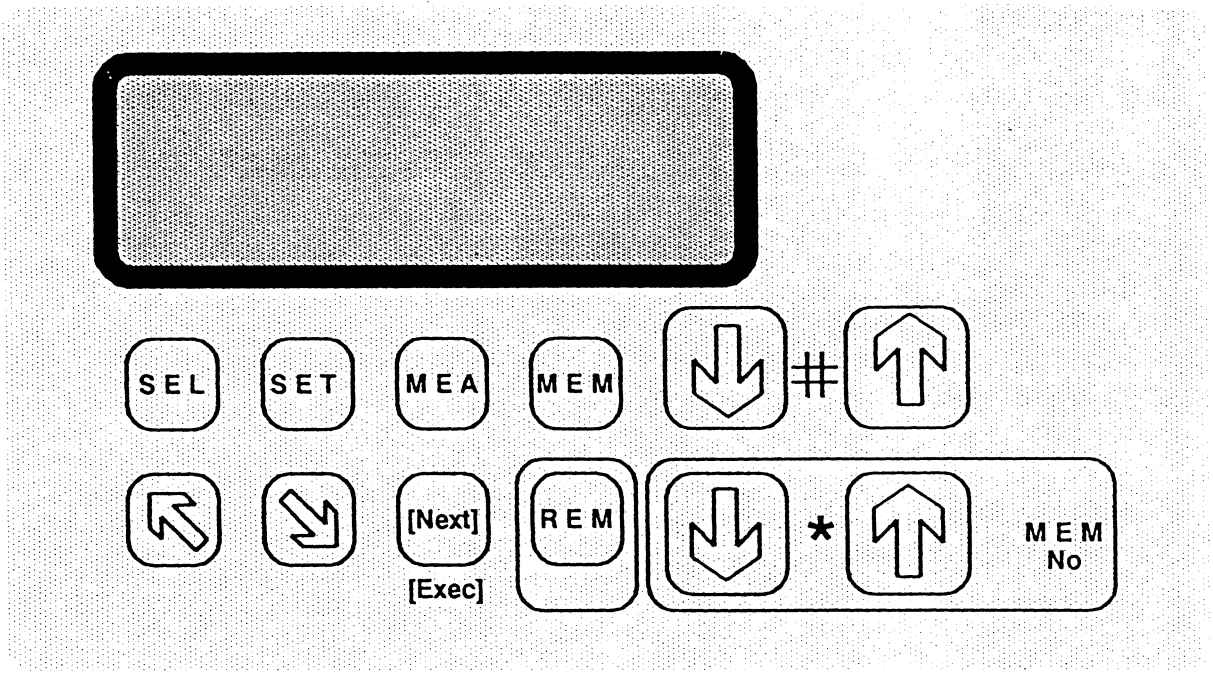
For MMA welding and **CAC** (carbon arc gouging)

Current range	8 - 500	A
Arc voltage (mean value)	10 - 46	V

Cooling module

Mains voltage	220	V
Mains frequency	50/60	Hz
Power	130	W
Cooling capacity	1.5	kW
Fluid volume	1.5 - 1.7	l

SETTING BOX



ARISTO 500 is programmed for welding by way of a portable box, connected to the machine with a 5 m cable.

The setting box has four main areas of application , represented by the keys SEL, SET, MEA and MEM. The other keys are used for the selection of settings after activation of one of the main keys.

SEL (select)	for description of methods and materials.
SET (set)	for setting of welding data.
MEA (measure)	for measuring of real welding data, which also can be adjusted.
MEM (memory)	for storing, call-back and deletion of above settings. The memory can hold 100 complete sets of welding data.

SEL: Shows alternatives within a number of different levels, which are shown on the display in a certain order. First come the welding methods. The alternatives are called with the key NEXT. With the desired alternative on the display, the selection is done by going over to the following level, using the key with the arrow pointing diagonally downwards.
Depending on the selected welding method, the levels will appear in the following order:

	MIG/MAG	**MMA (and CAC)***	**TIG**
2	Arc type	Electrode quality	Arc strike
3	Electrode quality	Electrode diameter	
4	Shielding gas		
5	Electrode diameter		

* CAC (carbon arc gouging) is found under "Electrode quality".

For available alternatives, see table on page 38.

SET: After completed selection, welding data are to be set according to the following. Parameters within brackets can be adjusted.

MIG/MAG: Wire feed speed
(voltage)

MMA: Welding current

TIG: Welding current
(slope up)
(slope down)
(pre-flow)
(post-flow)

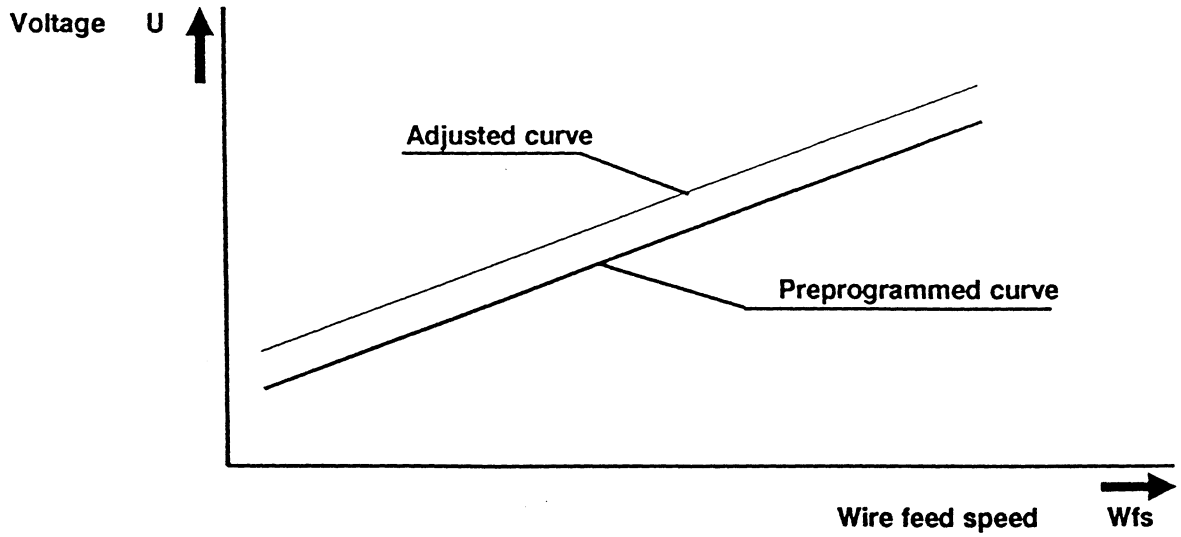
The values are presented on the display on two horizontally parallel lines and can be adjusted by way of the four large arrow keys.

SYNERGIC FUNCTIONS

Based on the settings made, the computer calculates a number of further welding parameters to control the power source.

The following is valid for the voltage in MIG/MAG mode:
The computer calculates a suitable value with regard to the settings made under SEL and the selected wire feed speed.

When adjusting the voltage, other values will not be affected. It simply involves an adjustment of the preprogrammed relation between current and voltage. The adjustment concerns only the one program.



The SEL key functions.

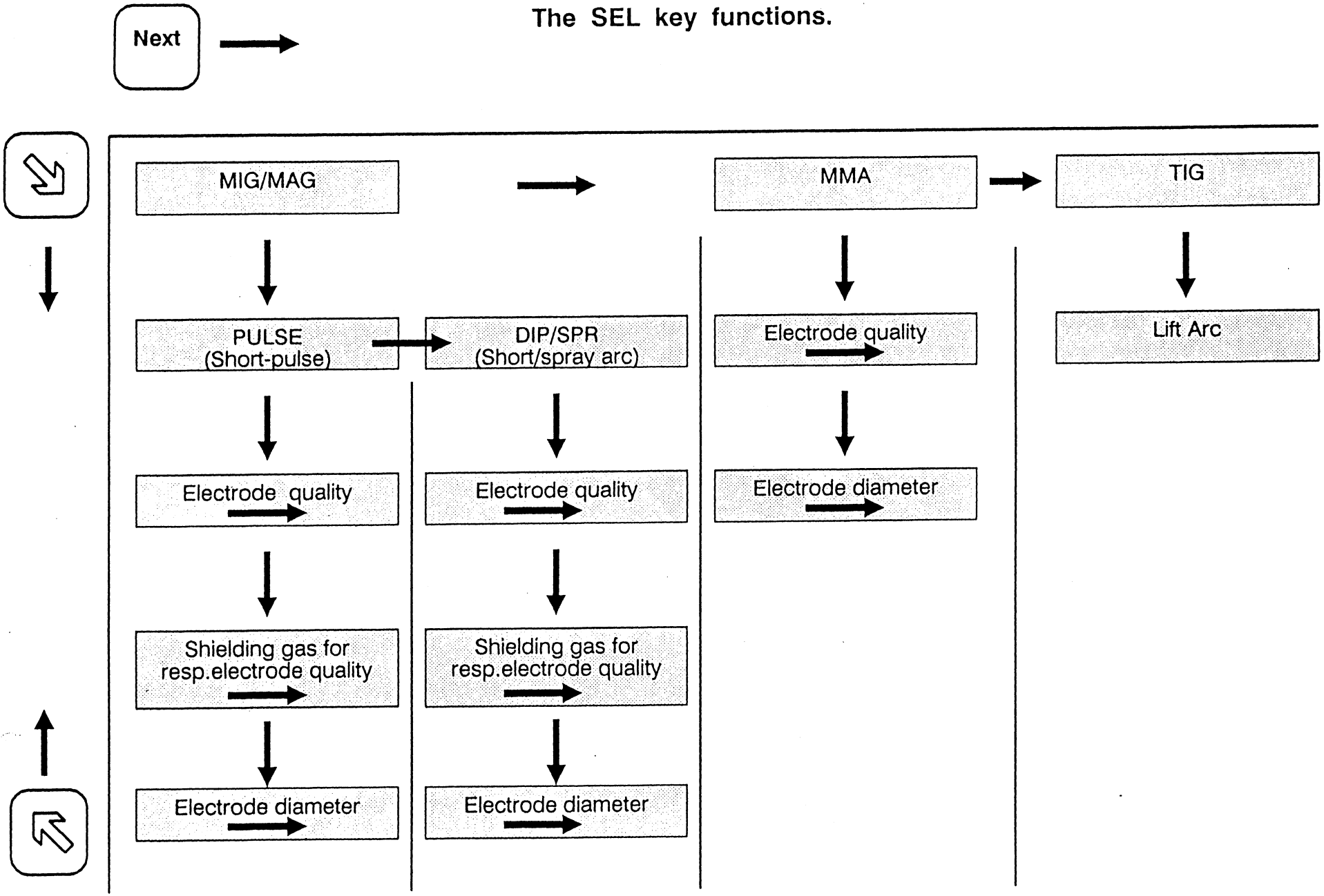


TABLE OF SYNERGIC DATA IN THE SETTING BOX

WELDING METHOD	ARC-TYPE	ELECTRODE QUALITY	SHIELDING GAS	ELECTRODE DIAMETER
MIG/MAG	Pulse	AlSi (OK 18.04)	Ar	1.0 1.2 1.6
		AlMg(OK 18.15)	Ar	1.0 1.2 1.6
		Ss (OK 16.32)	Ar 2%O_2	0.8 1.0 1.2
			Ar 2%CO_2	0.8 1.0 1.2
			Ar 30%He 1%O_2	0.8 1.0 1.2
			Ar 1%H 3%CO_2 32%He (Noxalic)	0.8 1.0 1.2
			Ar 1%H 3%CO_2	0.8 1.0 1.2
		Fe (OK 12.51)	Ar 2%CO_2	0.8 1.0 1.2 1.6
			Ar 20%CO_2	0.8 1.0 1.2 1.6
			Ar 5%CO_2 5%O_2	0.8 1.0 1.2 1.6
		FCW (OK 15.00)	Ar 5%CO_2	1.2
		MCW,Fe (OK 14.00)	Ar 5%CO_2	1.2
	DIP	AlSi (OK 18.04)	Ar	1.0 1.2
		AlMg (OK 18.15)	Ar	1.0 1.2
		Ss (OK 16.32)	Ar 2%O_2	0.8 1.0 1.2
			Ar 2%CO_2	0.8 1.0 1.2
			Ar 30%He 1%O_2	0.8 1.0 1.2

The synergic data are based on the electrode qualities indicated within brackets.

WELDING METHOD	ARC-TYPE	ELECTRODE QUALITY	SHIELDING-GAS	ELECTRODE DIAMETER
MIG/MAG	Pulse		Ar 1%H 3%CO_2 32%He (Noxalic)	0.8 1.0 1.2
			Ar 1%H 3%CO_2	0.8 1.0 1.2
	DIP	Fe(OK 12.51)	CO_2	0.8 1.0 1.2 1.6
			Ar 20%CO_2	0.8 1.0 1.2 1.6
			Ar 5%CO_2 5%O_2	0.8 1.0 1.2 1.6
		FCW (OK 15.00, 15.15, 15.18)	Ar 20%CO_2	1.2 1.4 1.6
		MCW, Fe (OK 14.00, 14.03)	Ar 20%CO_2	1.2 1.4 1.6
MMA		FCW, Ss (OK 14.30)	Ar 20%CO_2	1.2
		Carbon Arc Air		4.0 5.0 6.0 8.0
		Cellulose		2.5 3.25 4.o 5.0
		Rutile		1.6 2.5 3.25 4 5 6 7
		Basic		1.6 2.5 3.25 4 5 6 7
TIG	Lift Arc			

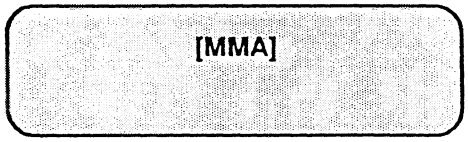
The synergic data are based on the electrode qualities indicated within brackets.

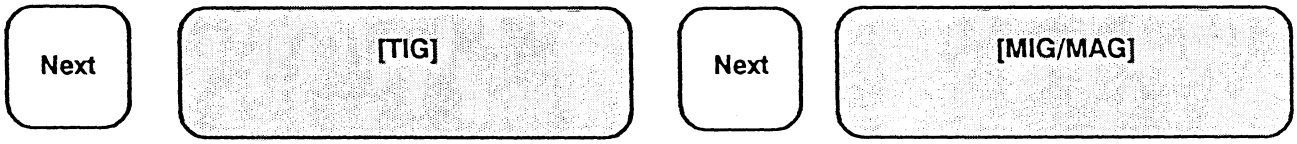
SEL. Selection of welding method

Example:
(This is to show the principle of the selection of welding method. The pictures vary in accordance with the program of the computer.)
For MIG welding with 1 mm stainless electrode, pulsed arc and a shielding gas of 69% argon, 30% helium och 1% carbon dioxide, proceed as follows:

Press 

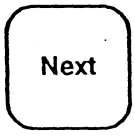
The following picture turns up. The actual alternative is indicated within brackets. Press NEXT for other alternatives, see below.



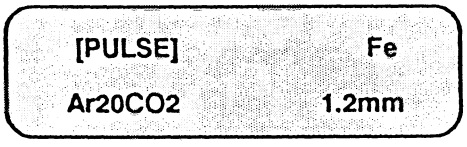


Now go to the next level of selections. Press 

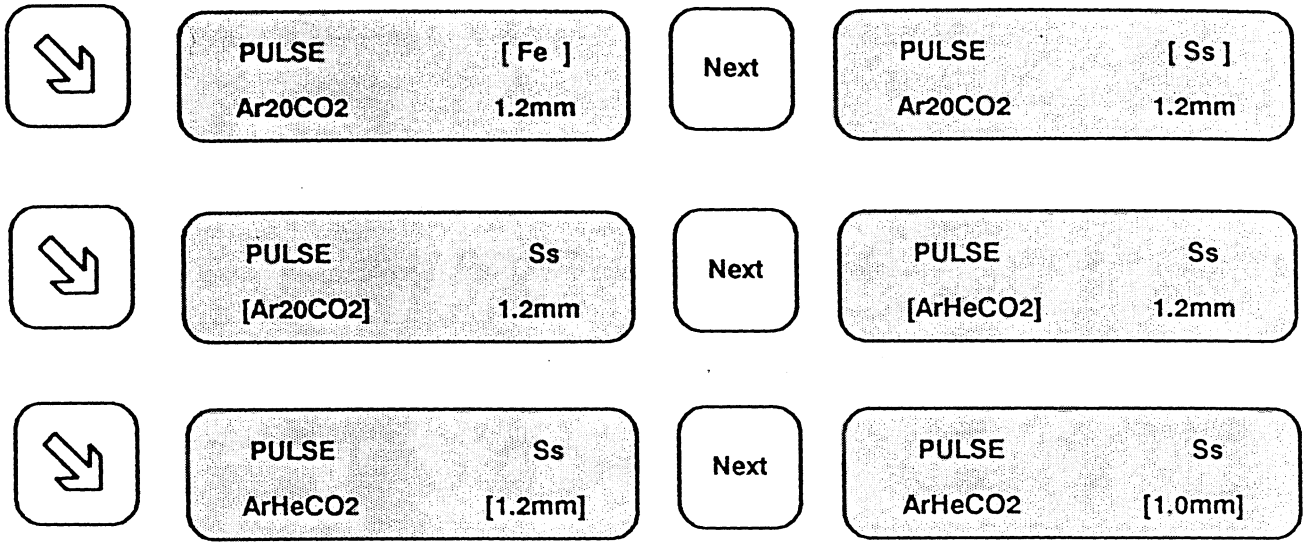
Brackets indicates short and spray arc.

Press 

The right type of arc has now been selected, and the computer suggests a new type of shielding gas.



Change the other settings accordingly.
Proceed as follows:



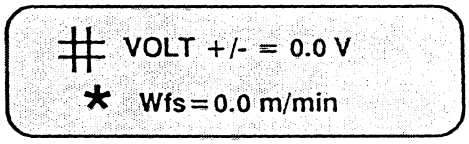
The selection of welding method, gas and electrode is now finished. Go to SET.

SET. Setting of welding data.

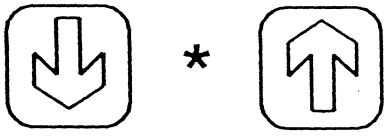
Example:

Press SET

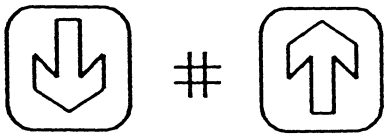
The picture indicates one value for the voltage and one for the wire feed speed (Wfs).



The wire feed speed value, Wfs = , remains from the previous setting. Based on the Wfs value and the selections made under SEL, the computer calculates the voltage.

Adjust the Wfs value with the keys 

The computer calculates a new voltage value. If desired, the voltage can be adjusted without the Wfs being affected.

This is done with the decrease/increase keys for voltage 

Measuring of real data is ordered with the MEA key.

Short arc/spray arc (DIP/SPRAY)

Voltage
= Length of arc.

A higher voltage gives a longer arc and hotter welding.

Wire feed (Wfs)
Corresponds to the joint and material thickness.

Dynamic (Dyn)
Inductance. Higher dynamic gives hotter welding and a need for increased voltage.

Standard value 80 %

Short pulsing (PULSE)

The machine is current controlled by short pulsing. (That's to say that the machine holds the current constant with the pulses independent of changes in cable length, stick-out or other changes in resistance).

In addition there is an arc length regulating function which aims to hold a constant arc length. The arc length regulator will maintain the arc length independent of the parameter settings. (That's to say, maintain the melt-off rate).

After completing the setting of the parameters for a work piece the set voltage and the measured voltage should not fluctuate more than 1 volt from each other.

With changes in stick-out the power source will change the pulse frequency and adjust the back ground current to maintain a constant arc length.

Voltage
Decides the length of the arc. Higher voltage = longer arc.

Wire feed (Wfs)
Corresponds to joint and material thickness.

Pulse amplitude (Ip)
The top of the current pulse cuts off a drop from the end of the wire and transports it to the weld pool.

The pulse amplitude is dependent on the selection of wire type, wire diameter, and type of gas used.

The amplitude should be held as low as possible. If it is too high the pressure from the arc will be too high which can cause problems with thinner plate; too low amplitude will either cause a short-circuit or large hanging drops on the tip of the electrode.

Pulse time (Tp)
The width of the current pulse. An increase of Tp results in a frequency reduction.

Background current (Ib)
The size of the current in between the pulses. A higher Ib gives hotter welding. A low Ib gives rise to the risk of the arc being extinguished.

The background current acts as pre-heating of the electrode.

Frequency (FREQ)
The number of pulses per second. An increased wire feed needs a higher frequency.

Slope-time
Inclination of the pulse rise and fall. A lower number gives a steeper inclination and results in a higher sound level and a harder arc.

Arc length- (Ka and Ki)
regulator-factors
Decides to what degree the power source shall react when the welder tries to change the arc length.

Standard values Ka approx. 40 %
Ki = 0 %

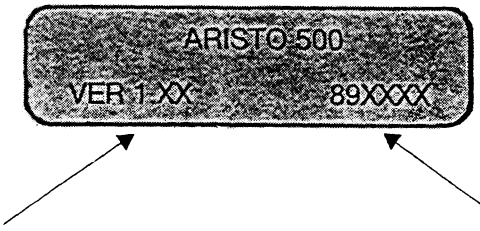
MMA

Current
Welding current.

Arc-force
High arc-force gives a higher current with short circuiting and a harder arc.

A too high setting gives a risk of spatter.

Start display

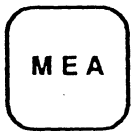


Number of program version in the setting box

Date of program version in the setting box.

MEA. Measuring of welding data.

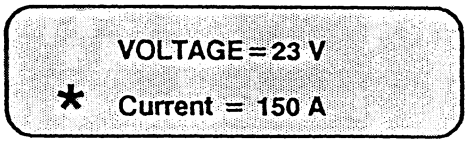
Example:

Press 

before welding, while welding or after finished welding.

The real values are measured during the welding process. After completed welding, the values last used come up on the display.

These values can be adjusted in the same way as has been described above under SET.



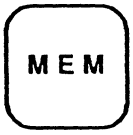
MEM. Store handling.

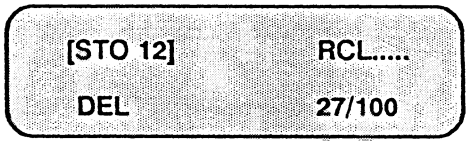
Example:

Data can be stored [STO], recalled [RCL] or deleted [DEL]. The memory can take up to 100 sets of welding parameters. For storing, the parameter set is given a registration number. The computer chooses the lowest free number available, but it is also possible to choose any optional number not occupied.

The brackets are moved to the intended function with the adjoining keys in the direction STO-RCL-DEL or DEL-RCL-STO.

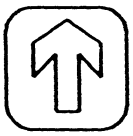

Store:

Press 

Picture 

The brackets are already in store position, STO, and the figure 12 is the number that will be given to the data to be stored. A higher registration number can be chosen with the arrow keys in the lower key row.

In the memory handling these keys are used for selection of registration numbers:


* 

To the right at the bottom, the figure 27/100 indicates that 27 out of the 100 spaces are occupied.

Storing is ordered with [Exec] 

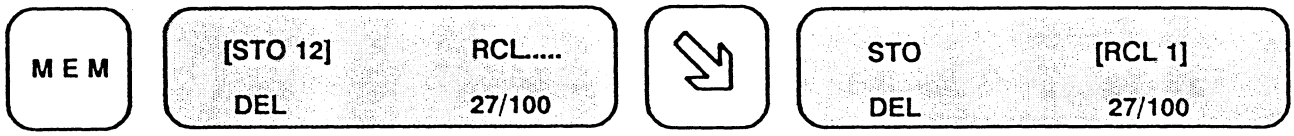
[Exec]

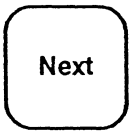
Memory 0.

If welding data are stored in memory 0 they will automatically be recalled when the power source is switched on. If no welding data are stored in memory 0, the data last used will automatically be recalled.

Recall:

When recalling e.g. data set no. 35, activate the memory function and move the brackets to RCL.

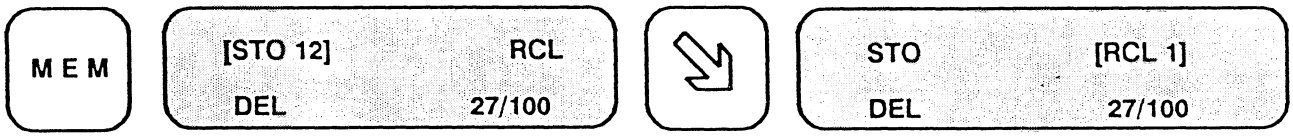


Press till 35 appears  *  and execute with 

The computer confirms that searching is going on, and after a couple of seconds the desired welding data are shown on the dispaly.

Delete:

To delete a data set, proceed as follows (if the memory function is not already activated):



The brackets have now moved to DEL.

Call the desired registration number with  * 

Execute the deletion with 

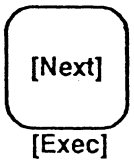
Settings without synergy functions

ARISTO 500 can be disconnected from the synergy functions, e.g. when welding with electrodes or gas mixtures which are not specified in the setting box. This means, however, that a great number of parameters will have to be manually set at their right values in relation to one another.

Disconnection: 

After SET, press the adjoining keys at the same time for a couple of seconds  

When this picture appears 

press 

Now the synergy function is disconnected.

Note that the parameter values last used remain until adjusted.

The parameters concerned are:

For MIG/MAG welding with short-pulsed arc:

Voltage
Background current
Frequency
Strengthening factors for the arc length regulator of the power souce (Ki, Ka)

Pulse amplitude
Pulse time
Slope time for the pulse

For MIG/MAG with DIP/SPR arc:

Voltage

Dynamics

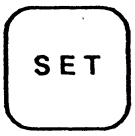
For MMA

Arc-Force

Return to synergy functions

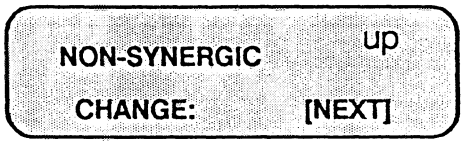
Return to synergy functions can be executed in two different ways.

Alternative 1.

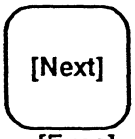


After SET, press the adjoining keys at the same time for a couple of seconds.

When this picture comes up



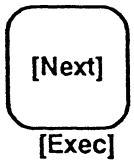
press



Alternative 2.

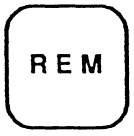
Press

and then



Return to synergy functions can also be made by connecting a remote control unit.

Connect the unit and press

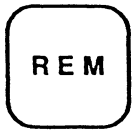


REMOTE CONTROL UNIT

Two types of remote control units are available for ARISTO 500.

1. A 5-program unit - ARISTO CONTROL 5-PROGRAM.

For shifting between 5 different programs with adjustable voltage.
Connect the unit to the wire feed mechanism and press



The display shows

U and I indicate measured (real) values for voltage and current.
REM WELD DATA 1 indicates the number of the actual program.

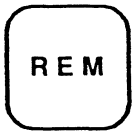
Shifting between the programs 1-5 in the setting box and adjustment of the voltage can now be done with the resp. knobs on the remote control unit.

2. Current and voltage device - ARISTO CONTROL STANDARD.

For setting of voltage (U) and wire feed speed (Wfs) for MIG/MAG welding and voltage (U) and current (Current) for MMA and TIG welding.

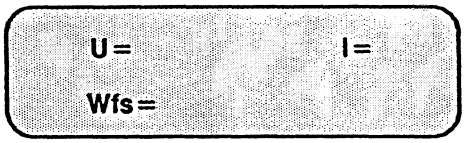
Connect the remote control unit to the wire feed mechanism, if used, otherwise directly to the power source.

Select method with 

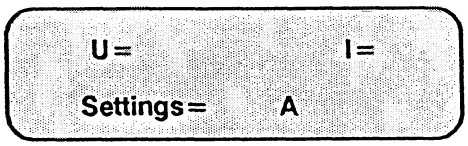
Press 

Set the desired values with the remote control unit. The resultat can be read off on the setting box.

The display shows for MIG/MAG:



For MMA and TIG



NOTE! If a remote control unit is connected, the key functions of the setting box will be blocked.

ERROR MESSAGES

Generally the errorr message remains on the screen until any key on the setting box is pressed, or the machine is switched off and on again.

1. Error in the electronic circuits of the power supply

1.1 "MACHINE ERROR: HIGH VOLTAGE"
1.2 "MACHINE ERROR: HIGH CURRENT"
1.3 "MACHINE ERROR: HEAT SINK TEMP."
1.4 "MACHINE ERROR: NO WATER FLOW"

2. Storage error

2.1 "RAM ERROR IN POWER SOURCE"
2.2 "RAM ERROR IN CONTROL UNIT"
2.3 "ROM ERROR IN POWER SOURCE"
2.4 "ROM ERROR IN CONTROL UNIT"
2.5 "CONTROL UNIT WELD DATA ERROR"

3. Communiaction error

3.1 "COMM. ERROR: RECEIVE CH. SUM"
3.2 "COMM. ERROR: TRANSM. CH. SUM"
3.3 "COMM. ERROR: TIMEOUT"
3.4 "COMM. ERROR: RECEIVE BUFFER"
3.5 "COMM. ERROR: SEND BUFFER"
3.6 "WAITING FOR MACHINE IDENT"

1. Error in the electronic circuits of the power supply

1.1 "MACHINE ERROR: HIGH VOLTAGE"

Too high voltage in the machine after the rectifier, which might be due to overtension on the mains or high inductance in the voltage supply cables.

1.2 "MACHINE ERROR: HIGH CURRENT"

Too high primary current to the transistor switch circuits or irregular current distribution between the two transistor packets. The limit values correspond to about 1400 A secondary current or 300 A difference in current between the two packets. The error might be due to defective components or to faulty connections in the electronic circuits of the power supply.

1.3 "MACHINE ERROR: HEAT SINK TEMP."

Too high temperature in the diode heatsinks, which may be caused by overload, defective cooling fan or other defective component.

1.4 "MACHINE ERROR: NO WATER FLOW"

No water supply to the welding gun. May be due to silted-up hoses, defective pump for the cooling water or lack of cooling water. If the pump has been switched off (e.g. when using an air-cooled welding gun) this error message will be blocked.

2. Storage error

Each time the machine is switched on and voltage is supplied, all the storage cells are tested. The program storage is tested by means of a checking sum. If any storage cell is defective, one of the following four messages comes up on the screen. Thus they can only appear directly after switching on the machine. The machine can be in working order despite the error message. Caution must be used, however, as the welding result might be affected even though the machine seems to behave perfectly.

2.1 "RAM ERROR IN POWER SOURCE"

Defective storage cell in the read/write storage of the machine.

2.2 "RAM ERROR IN CONTROL UNIT"

Defective storage cell in the read/write storage of the setting box. This storage contains, among other things, stored welding data.

2.3 "ROM ERROR IN POWER SOURCE"

Defective storage cell in the program storage of the machine.

2.4 "ROM ERROR IN CONTROL UNIT"

Defective storage cell in the program storage of the setting box.

2.5 "CONTROL UNIT WELD DATA ERROR"

3 V battery in the setting box is used up.

3. Communication error

All these error messages have got something to do with the series communication between the machine and the setting box. The error messages may appear only occasionally. Reset by switching the machine off and on. When the messages appear more frequently, the equipment must be seen to.

3.1 "COMM. ERROR: RECEIVE CH. SUM"

The wrong checking sum has been detected 5 times in a row during transmission from the machine to the setting box.

3.2 "COMM. ERROR: TRANSM. CH. SUM"

The wrong checking sum has been detected 5 times in a row during transmission from the setting box to the machine.

3.3 "COMM. ERROR: TIMEOUT"

The setting box has sent a message to the machine, the receipt of which has not been acknowledged by the machine.

3.4 "COMM. ERROR: RECEIVE BUFFER"

The setting box has failed to handle incoming messages at the pace they come in, and therefore the receiving buffer storage has been filled.

3.5 "COMM. ERROR: SEND BUFFER"

The machine has failed to receive incoming messages from the setting box at the pace new messages are added to the sending buffer storage of the setting box, and therefore the sending buffer storage has been filled.

3.6 "WAITING FOR MACHINE IDENT"

The setting box has failed to send a message to the machine.

EXPLANATION OF ABBREVIATIONS AND CONCEPTS

SEL	SELECT DATA
MMA	Hand welding
MIG/MAG	Semi-automatic welding
TIG	TIG
Basic	Basic electrode
Rutile	Rutile electrode
Cellul.	Cellulose electrode
Carbon.Arc/Air	Carbon arc gouging
Dip/Spr	Short-arc/Spray-arc
Pulse	Short-pulse welding
Fe	Non-alloy steel OK 12.51
Ss	Stainless steel OK 16.32
Al	Aluminium, AlSi OK 18.04 AlMg OK 18.15
MCW Fe	Metal cored wire, iron OK 14.00, OK 14.03
FCW Ss	Flux cored wire, stainless OK 14.30
Ar	100% argon
Ar CO_2 H_2	96% Argon, 3% carbon dioxide, 1% hydrogen
Ar 2 O_2	98% argon, 2% oxygen
Ar 2 CO_2	98% argon, 2% carbon dioxide
Ar 20 CO_2	80% argon, 20% carbon dioxide
Ar CO_2 O_2	90% argon, 5% carbon dioxide, 5% oxygen
CO_2	100% carbon dioxide
Ar He O_2	69% argon, 30% helium, 1% oxygen
Noxalic	63% argon, 33% helium, 3% carbon dioxide, 1% hydrogen
Liftarc	Built-in Liftarc ignition for TIG welding
B FCW Fe	Basic Flux cored wire, OK 15.00
R FCW Fe	Rutile Flux cored wire, OK 15.15, OK 15.18

SET	Setting of welding data
TIG	
Slope up	Gradual increase up to set value (0-10 sec)
Slope dn	Gradual decrease down to set value (0-10 sec)
Pre-flow	Gas pre-flow (0-5 sec)
Post-flow	Gas post-flow (0-25 sec)
MIG/MAG	
Voltage	Set voltage (8-50 V MIG/MAG, 10-50 V Pulse)
Wfs	Set wire feed speed (0-22 m/min)

MIG/MAG

SYNERGIC	The computer calculates welding data
NON SYNERGIC	Manual setting of welding data
I_p	Pulse amplitude (100-640 A)
T_p	Pulse time (Max 1.75-25.5 ms)
I_b	Background current (12-300 A)
Freq	Pulse frequency (max 20-332 Hz)
Slope time	Flank inclination of the pulse (1-9)
Ka	Arc length regulation factor, short time (2-100%)
Ki	Arc length regulation factor, longer time (0-100%)
Dyn	Dynamic (stepless inductance) for MIG/MAG (0-100%)

MMA

Arc force	Arc pressure for MMA (1-100%)

MEA = MEASURE **Measuring of welding data**

Current	A	Real welding current (ampere)
Voltage	V	Real arc voltage (volt)

MEM = MEMORY **Storage handling**

STO	Store welding data/program
RCL	Recall welding data/program
DEL	Delete welding data/program
19/100	19 out of 100 programs are used

REM = REMOTE **Connection and disconnection of remote control unit**

(5-program unit)	ARISTO CONTROL 5-PROGRAM
U = V	Real arc voltage
I = A	Real welding current
REM WELD DATA	Set welding data, number
Adjusting equipment for current and voltage	ARISTO CONTROL SYNERGY
U = V	Real arc voltage
I = A	Real welding current
Wfs = m/min	Set wire feed speed for MIG/MAG
Current = A	Set wire feed speed for MMA and TIG

INSTALLATION

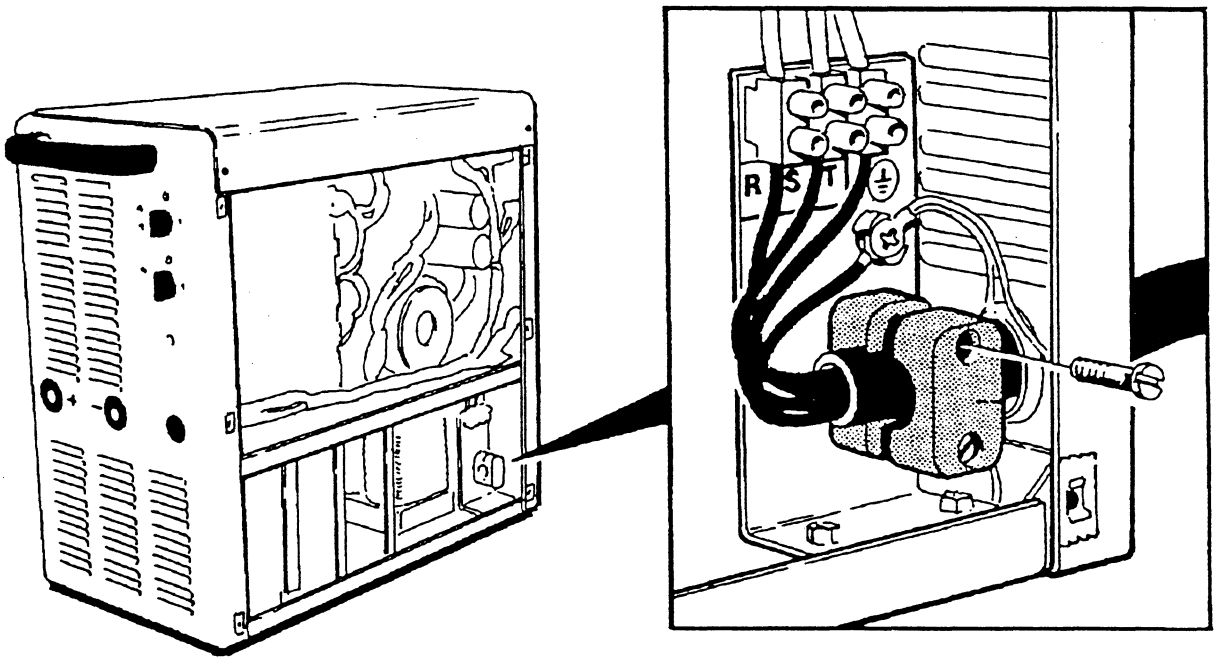
1. Place the machine so that there is nothing to prevent the cooling air from passing through it.

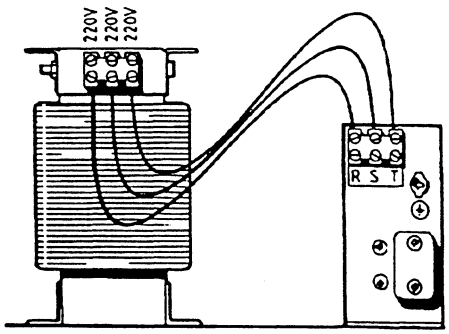
2. Connection should be made to 3-phase terminals. Phase sequence is unimportant.

3. Recommendations:

Mains voltage		Cable area	Fuse size
50 Hz	220 V	10 mm^2	50 A
	380	6	35
	415	6	35
	500	6	35

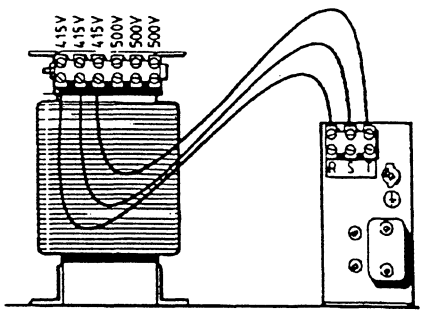
4. Dismount the right side panel.
   Check the connection of the mains adaptation unit.





50 Hz

220 V -380 V



50 Hz

380 V -415 V -500 V

OPERATION

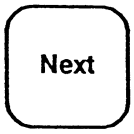
1. Set the starting switch to position 1. The indicating lamp goes on to show that mains voltage is supplied.

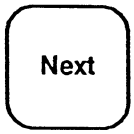
2. Connect the return cable between the workpiece and the machine terminal. Make sure that good contact is obtained!

3. Select welding mode on the setting box.

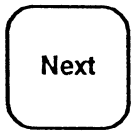
4. Set welding data by means of the setting box. Press the keys in accordance with the following until the desired data appear on the dispaly:

   a) Select welding mode with 

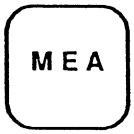
and 

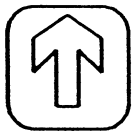
   b) For MIG/MAG:
   select pulsed arc, short arc or spray arc with 
and 

   c) Select electrode quality with 
and 

   d) Select electrode diameter with 
and 

   e) Set the wire feed speed (Wfs). The voltage that is dependent on the wire feed speed will change automatically. When the value of the voltage is adjusted the wire feed speed will not be affected. 

   f) For check-up of real welding current after finished welding 

   To change the values press the up or down keys  

   g) If welding data are stored in Memory 0 they will automatically be recalled when the power source is switched on. If no data are stored in Memory 0 the data last used will automatically be recalled.

   See also the chapter "SETTING BOX".

MAINTENANCE

ARISTO 500 is to be cleaned regularly with dry compressed air at reduced pressure. No further maintenace is needed.

Ordering numbers for components

- Power source with setting box and built-in cooling unit

400 V	50 Hz	368 570-881
220/400 V	50 Hz	368 570-882
400/415/500 V	50 Hz	368 570-883

- Carriage

Chassis	369 580-880
ARISTO TROLLEY SEMI	369 580-884
ARISTO TROLLEY MAXI	369 580-885
ARISTO TROLLEY MAXI 2 BOTTLES	369 580-886

- Remote control unit

ARISTO CONTROL 5 PROGRAM BOX	466 801-~~880~~ -881
ARISTO CONTROL SYNERGIC BOX	466 801-~~881~~ -880
ARISTO CONTROL 5 PROGRAM TORCH	466 515-~~880~~ -881
ARISTO CONTROL SYNERGIC TORCH	466 515-~~881~~ -880

For MIG/MAG

- Wire feed unit MED 44 ARISTO — 369 341-880
  Turning device for mounting of the feed unit on the power source — 156 681-880

- Torch with cable bundle

PSF 500 3 m	366 400-884
PSF 500 4,5 m	366 400-885
PSF 501 W 3 m	366 800-884
PSF 501 W 4,5 m	366 800-885

- Counterbalancing arm for torch with cable bundle — 156 682-880
- Mast for torch with cable bundle — 156 746-880

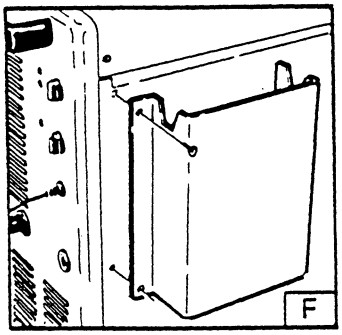
For MMA

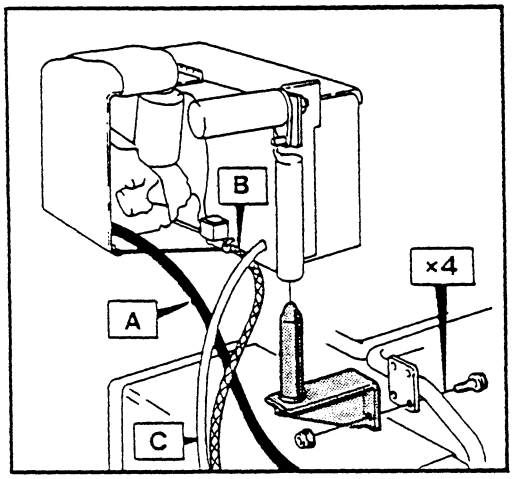
- Welding accessories — 160 302-883

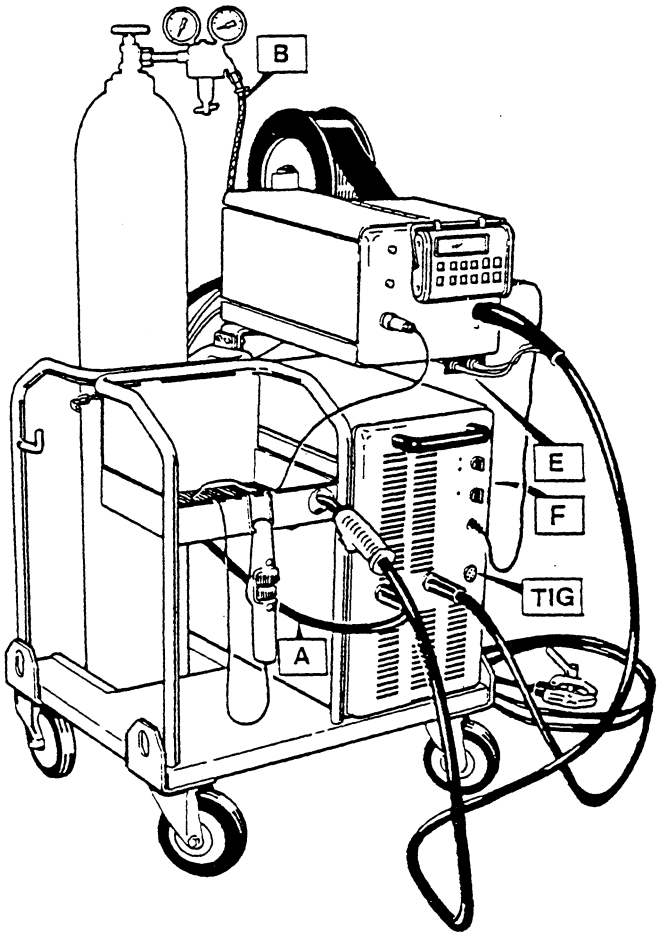
For TIG

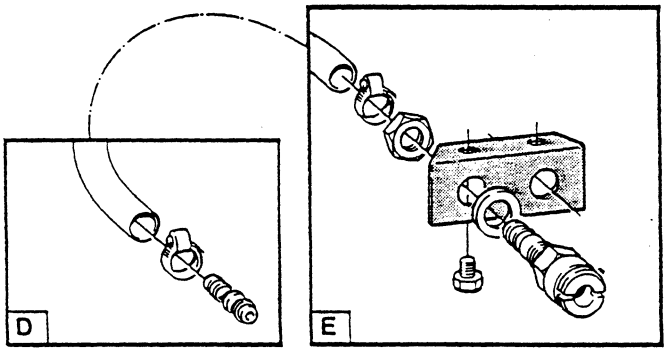
- Torch with cable bundle

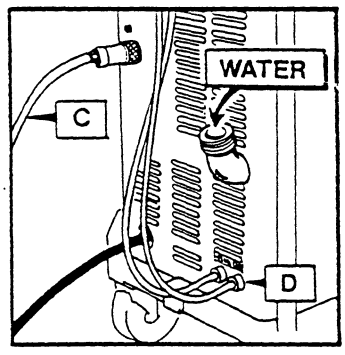
BTD 253 4m	368 350-884
BTD 253 8m	368 350-885
BTD 403 4m	368 350-886
BTD 403 8m	368 350-887





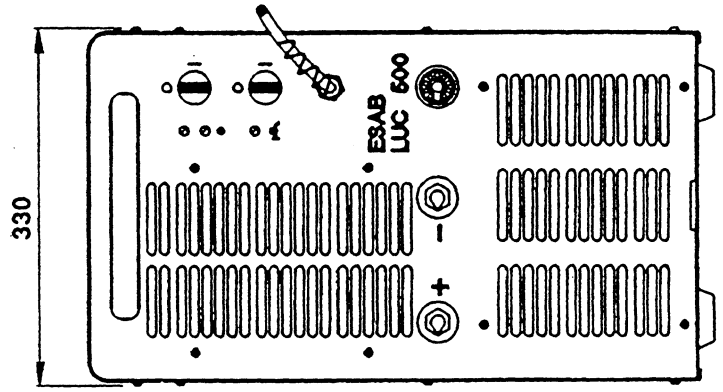


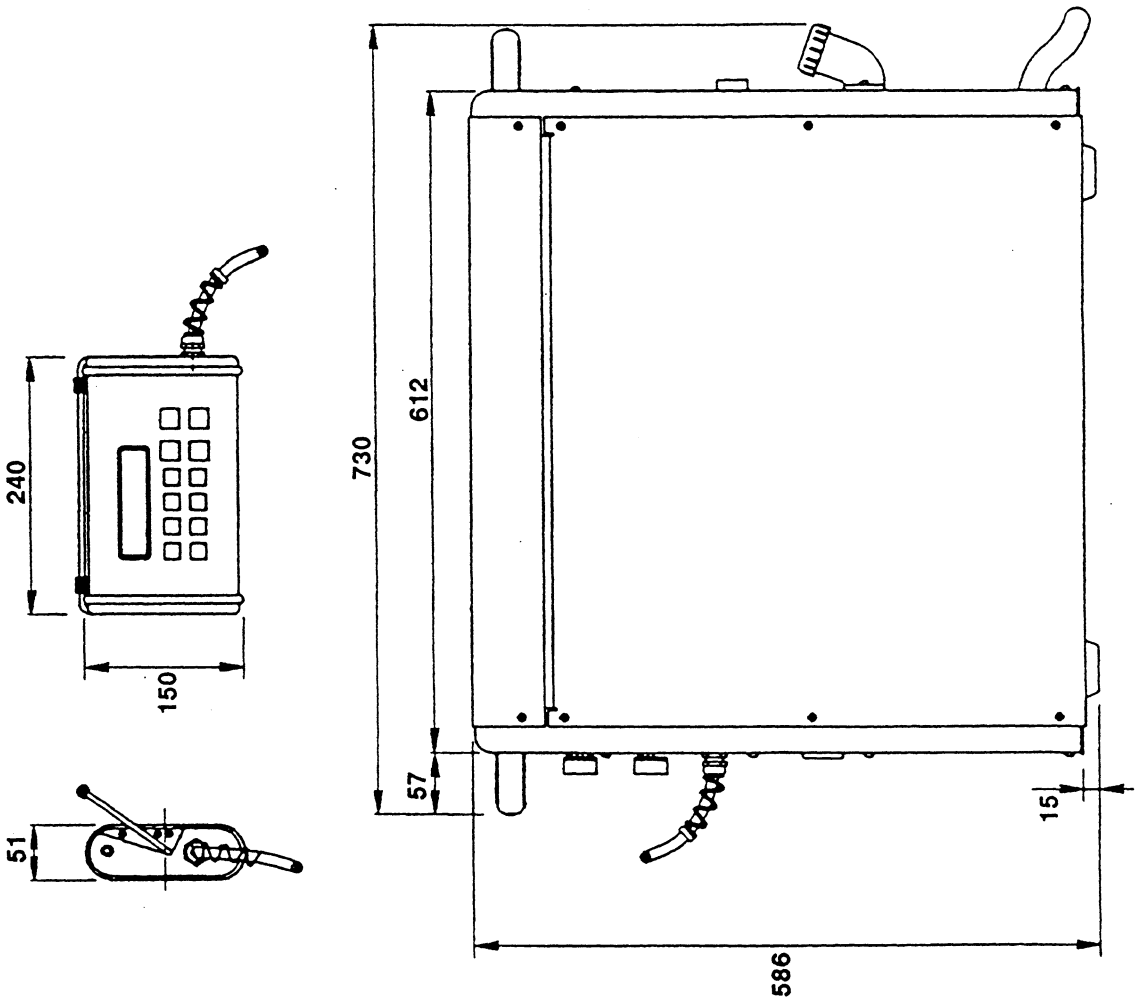




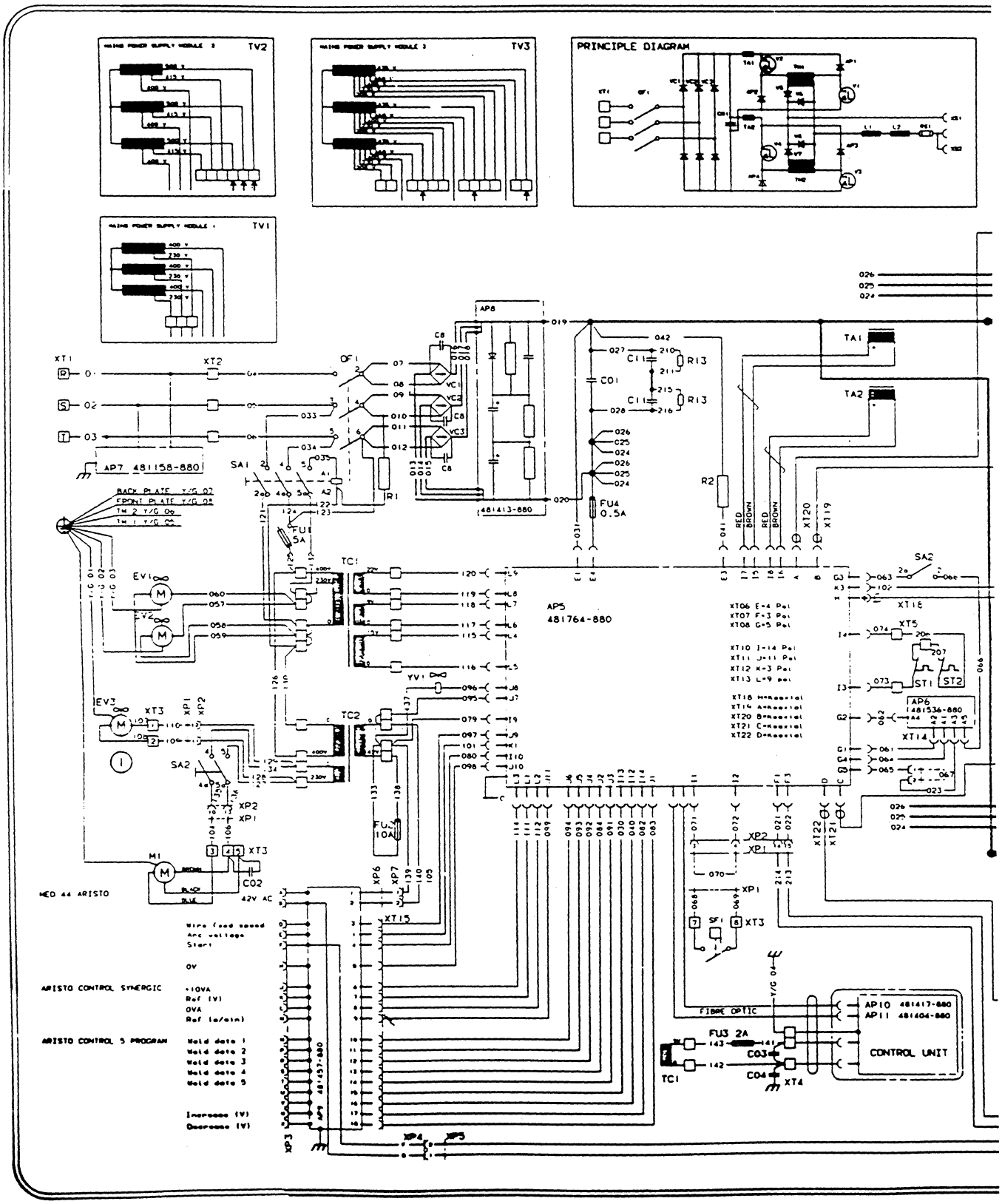
AH 0050

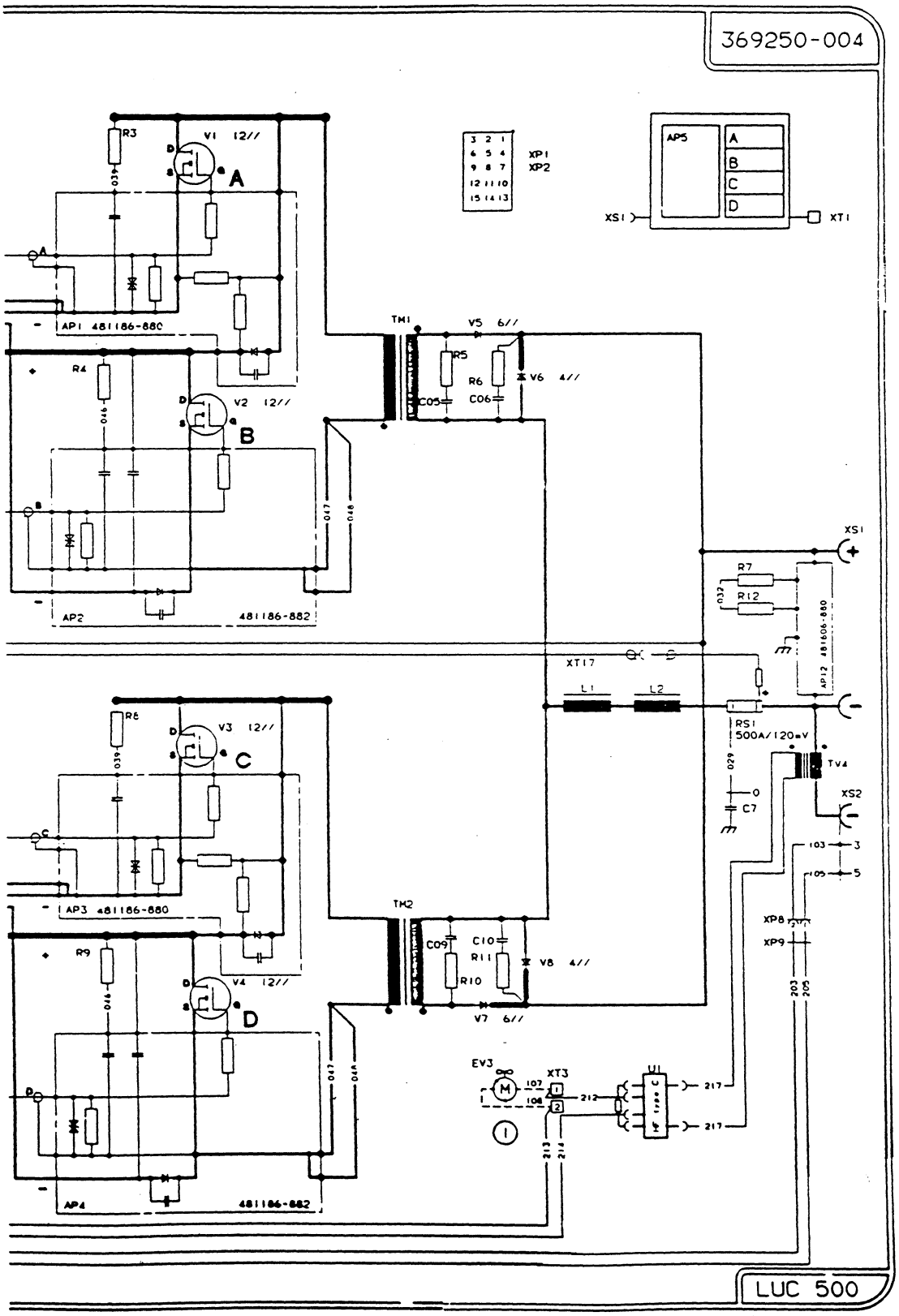
MÅTTSKISS
DIMENSION DRAWING
MASSBILD
COTES D'ENCOMBREMENT





SCHEMA
CIRCUIT DIAGRAM
SCHALTPLAN
SCHEMA DE CABLE



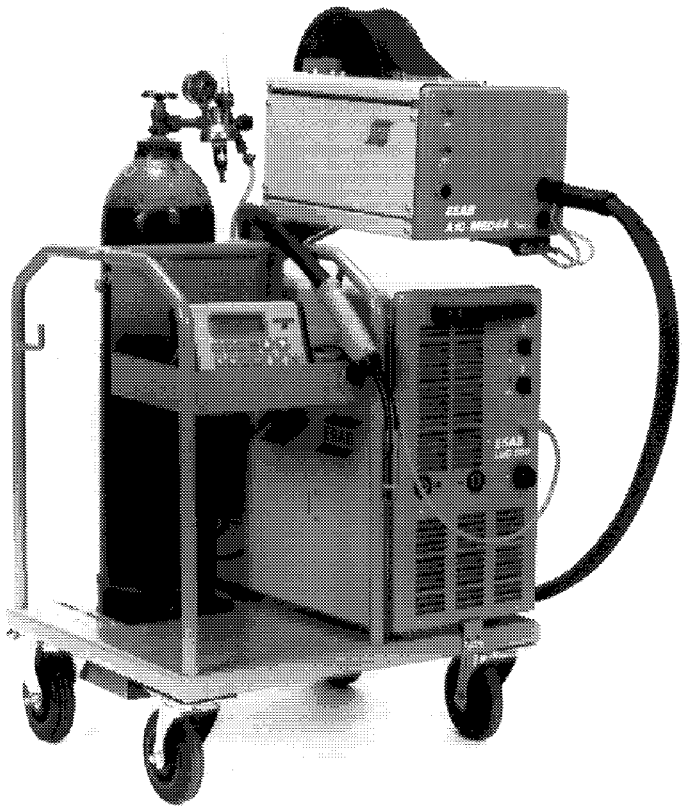

369250-004
R3
V1 12//
A
AP1 481186-880
R4
V2 12//
B
AP2
481186-882
TM1
V5 6//
R5
R6
V6 4//
C05
C06
XP1
XP2
AP5
A
B
C
D
XS1
XT1
XS1
R7
R12
XT17
L1
L2
RS1
500A/120mV
TV4
XS2
C7
R8
V3 12//
C
AP3 481186-880
R9
V4 12//
D
AP4
481186-882
TM2
C09
C10
R11
R10
V8 4//
V7 6//
XP8
XP9
EV3
XT3
LUC 500

	Benämning	Denomination	Bezeichnung	Désignation
AP1	Kretskort	PC-board	Platine	Circuit imprimé
AP2	Kretskort	PC-board	Platine	Circuit imprimé
AP3	Kretskort	PC-board	Platine	Circuit imprimé
AP4	Kretskort	PC-board	Platine	Circuit imprimé
AP5	Kretskort	PC-board	Platine	Circuit imprimé
AP6	Kretskort	PC-board	Platine	Circuit imprimé
AP7	Kretskort	PC-board	Platine	Circuit imprimé
AP9	Kretskort	PC-board	Platine	Circuit imprimé
AP10	Kretskort	PC-board	Platine	Circuit imprimé
AP11	Kretskort	PC-board	Platine	Circuit imprimé
AP12	Kretskort	PC-board	Platine	Circuit imprimé
C1	Kondensator	Capacitor	Kondensator	Condensateur
C2	Kondensator	Capacitor	Kondensator	Condensateur
C3	Kondensator	Capacitor	Kondensator	Condensateur
C4	Kondensator	Capacitor	Kondensator	Condensateur
C5	Kondensator	Capacitor	Kondensator	Condensateur
C6	Kondensator	Capacitor	Kondensator	Condensateur
C7	Kondensator	Capacitor	Kondensator	Condensateur
C9	Kondensator	Capacitor	Kondensator	Condensateur
C10	Kondensator	Capacitor	Kondensator	Condensateur
C11	Kondensator	Capacitor	Kondensator	Condensateur
EV1	Fläkt	Fan	Gebläse	Ventilateur
EV2	Fläkt	Fan	Gebläse	Ventilateur
EV3	Fläkt	Fan	Gebläse	Ventilateur
FU1	Säkring 5A	Fuse	Sicherung	Fusible
FU2	Säkring 10A	Fuse	Sicherung	Fusible
FU3	Säkring 2A	Fuse	Sicherung	Fusible
FU4	Säkring 0,5A	Fuse	Sicherung	Fusible
L1	Induktor, övre	Inductor, upper	Drossel, obere	Bobine d'inductance, supérieure
L2	Induktor, undre	Inductor, lower	Drossel, untere	Bobine d'inductance, inférieure
M1	Pump	Pump	Pumpe	Pompe
QF1	Kontaktor	Contactor	Schütz	Contacteur
RS1	Shunt 500A 120 mV	Shunt	Messwiderstand	Shunt
R1	Motstånd	Resistor	Widerstand	Résistance
R2	Motstånd	Resistor	Widerstand	Résistance
R3	Motstånd	Resistor	Widerstand	Résistance
R4	Motstånd	Resistor	Widerstand	Résistance
R5	Motstånd	Resistor	Widerstand	Résistance
R6	Motstånd	Resistor	Widerstand	Résistance
R7	Motstånd	Resistor	Widerstand	Résistance
R8	Motstånd	Resistor	Widerstand	Résistance
R9	Motstånd	Resistor	Widerstand	Résistance
R10	Motstånd	Resistor	Widerstand	Résistance
R11	Motstånd	Resistor	Widerstand	Résistance
R12	Motstånd	Resistor	Widerstand	Résistance
SA1	Strömställare	Switch	Schalter	Interrupteur
SA2	Strömställare	Switch	Schalter	Interrupteur
ST1	Termovakt	Thermal switch	Temperaturwächter	Rupteur thermique
ST2	Termovakt	Thermal switch	Temperaturwächter	Rupteur thermique
SF1	Flödesvakt min. 1 l/min	Flow guard	Durchfluss-Wächter	Capteur de débit

	Benämning	Denomination	Bezeichnung	Désignation
TA1	Strömtrafo	Current transformer	Stromtrafo	Transform. de courant
TA2	Strömtrafo	Current transformer	Stromtrafo	Transform. de courant
TM1	Huvudtrafo	Main transformer	Leistungstrafo	Transform. principal
TM2	Huvudtrafo	Main transformer	Leistungstrafo	Transform. principal
TC1	Manövertrafo	Control transformer	Steuertrafo	Transf. de commande
TC2	Manövertrafo	Control transformer	Steuertrafo	Transf. de commande
TV1	Spartrafo 220V	Auto-transformer	Spartrafo	Transf. à autocommande
TV2	Spartrafo 415/500V	Auto-transformer	Spartrafo	Transf. à autocommande
TV3	Spartrafo 208/230/460/ 475V, 50 Hz	Auto-transformer	Spartrafo	Transf. à autocommande
V1	Transistor	Transistor	Transistor	Transistor
V2	Transistor	Transistor	Transistor	Transistor
V3	Transistor	Transistor	Transistor	Transistor
V4	Transistor	Transistor	Transistor	Transistor
V5	Diod	Diode	Diode	Diode
V6	Diod	Diode	Diode	Diode
V7	Diod	Diode	Diode	Diode
V8	Diod	Diode	Diode	Diode
VC1	Likriktare	Rectifier	Gleichrichter	Redresseur
VC2	Likriktare	Rectifier	Gleichrichter	Redresseur
VC3	Likriktare	Rectifier	Gleichrichter	Redresseur
XT1	Plint	Connection block	Klemmenleiste	Plaque à bornes
XT2	Plint	Connection block	Klemmenleiste	Plaque à bornes
XT3	Plint 3 pol	Connection block	Klemmenleiste	Plaque à bornes
XT4	Plint 3 pol	Connection block	Klemmenleiste	Plaque à bornes
XT5	Plint	Connection block	Klemmenleiste	Plaque à bornes
XT6	Kontaktdon E=4 pol	Connector	Stromrohr	Connecteur
XT7	Kontaktdon F=3 pol H-F (H-F-tändning)	Connector (H-F-ignition)	Stromrohr (H-F-Zündung)	Connecteur (Allumage H-F)
XT8	Kontaktdon G=5 pol	Connector	Stromrohr	Connecteur
XT10	Kontaktdon I=14 pol	Connector	Stromrohr	Connecteur
XT11	Kontaktdon J=11 pol	Connector	Stromrohr	Connecteur
XT12	Kontaktdon K=3 pol	Connector	Stromrohr	Connecteur
XT13	Kontaktdon L=9 pol	Connector	Stromrohr	Connecteur
XT14	Kontaktdon	Connector	Stromrohr	Connecteur
XT15	Kontaktdon 18 pol	Connector	Stromrohr	Connecteur
XT17	Kontaktdon H koaxial	Connector	Stromrohr	Connecteur
XT18	Kontaktdon H koaxial	Connector	Stromrohr	Connecteur
XT19	Kontaktdon B koaxial	Connector	Stromrohr	Connecteur
XT20	Kontaktdon A koaxial	Connector	Stromrohr	Connecteur
XT21	Kontaktdon C koaxial	Connector	Stromrohr	Connecteur
XT22	Kontaktdon D koaxial	Connector	Stromrohr	Connecteur
XP1	Stiftpropp 15 pol	Pin plug	Stiftstecker	Fiche mâle
XP2	Hylspropp 15 pol	Sleeve plug	Buchsenstecker	Fiche femelle
XP3	Hylsuttag 23 pol	Sleeve plug	Buchsenstecker	Fiche femelle
XS1	Svetsuttag	Welding current terminal	Schweisstromanschluss	Borne de courant de soudage
XS2	Centralanslutning TIG	Central connection	Zentralanschluss	Connexion centrale
YV1	Magnetventil	Solenoid valve	Magnetventil	Électrovanne

SPARE PARTS LIST LUC 500

Edition 9605



Ordering numbers for LUC 500 welding rectifiers

368 570-881	LUC 500	400 V 50 Hz
368 570-882	LUC 500	230/400 V 50 Hz
368 570-883	LUC 500	400/415/500 V 50 Hz
368 570-884	LUC 500	208/230/400/460/475 V 60 Hz
368 570-888	LUC 500	400 V 50 Hz with HF unit

Spare parts list - Reservdelsförteckning - Ersatzteilverzeichnis - Liste de pièces détachées

Spare parts are to be ordered through the nearest ESAB agency as per the list on the back of the cover. Kindly indicate type of unit, serial number, denominations and ordering numbers according to the spare parts list.

Reservdelar beställs genom närmaste ESAB-representant, se sista sidan. Vid beställning var vänlig uppge typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

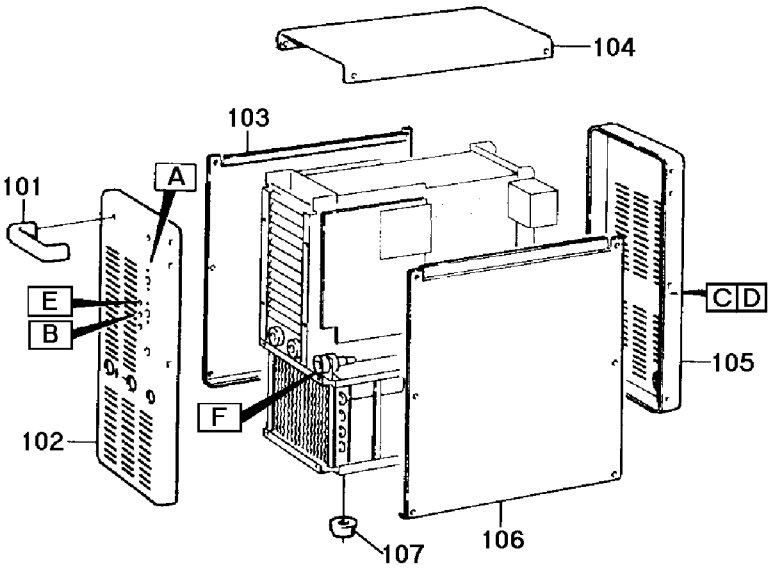
Die Ersatzteile können bei der nächsten ESAB-Vertretung bestellt werden, siehe letzte Seite. Bitte geben Sie Typenbezeichnung und Herstellungsnummer sowie Bezeichnungen und Bestellnummern laut Ersatzteilverzeichnis an.

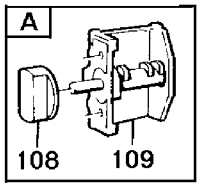
Au dos de la brochure, vous trouverez l'adresse du représentant ESAB le plus proche. Prière de lui adresser votre commande, après avoir pris le soin de mentionner le type et le numéro de série de l'unité ainsi que le numéro de commande et la désignation conformément á la liste de pièces détachées.

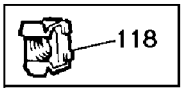
Spare parts list - Reservdelsförteckning - Ersatzteilverzeichnis - Liste de pièces détachées

C = component designation in the circuit diagram

Item no.	Qty	Ordering no.	Denomination	Notes	C
101	2	368 557-002	Handle		
102	1	369 249-001	Front panel		
103	1	369 324-001	Side panel, left		
104	1	368 560-001	Cover		
105	1	368 563-880	Rear panel		
106	1	369 326-001	Side panel, right		
107	4	319 455-002	Foot		
108	2	366 296-002	Knob		
109	2	366 295-005	Switch		SA1, SA2
110	1	486 108-880	Circuit board	From machine no. 216	AP6
	1	481 536-880	Circuit board	Before machine no. 216	AP6
111	1	193 669-006	Connector	From machine no. 216	XT14
	1	193 669-005	Connector	Before machine no. 216	
112	1	193 586-101	Circuit breaker	5 A	FU1
113	2	466 484-001	Fuse holder		
114	1	567 9001-16	Fuse	10 A	FU2
	1	567 9001-11	Fuse	2 A	FU3
115	1	367 258-880	Central connection	For Tig, female (Before machine no. 917 . . . . . the central connection was fitted in the front panel)	XS2
116	1	193 759-001	Indicating lamp	From machine no. 216	HL1
117	1	193 260-150	Connector	From machine no. 216	XT9
118	14	192 562-103	Cage nut ”low”	M5	
	26	192 562-104	Cage nut ”high”	M5	
	2	192 562-105	Cage nut ”low”	M6	
	8	192 562-106	Cage nut ”high”	M6	


104
103
101
A
E
B
F
C D
105
102
107
106


A
108
109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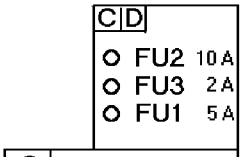
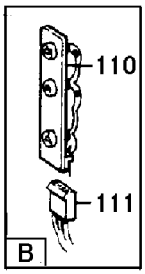
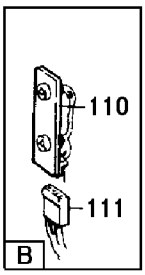
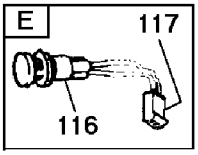
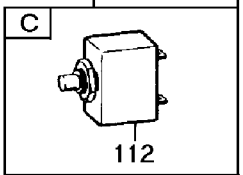
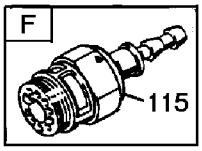

C D
FU2 10A
FU3 2A
FU1 5A


110
111
B


110
111
B


E
117
116


C
112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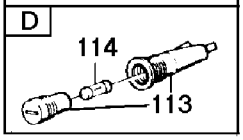
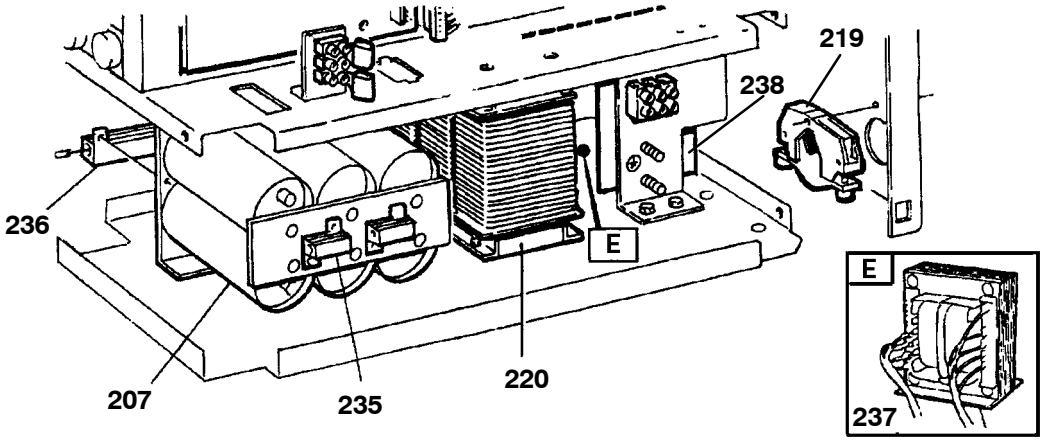
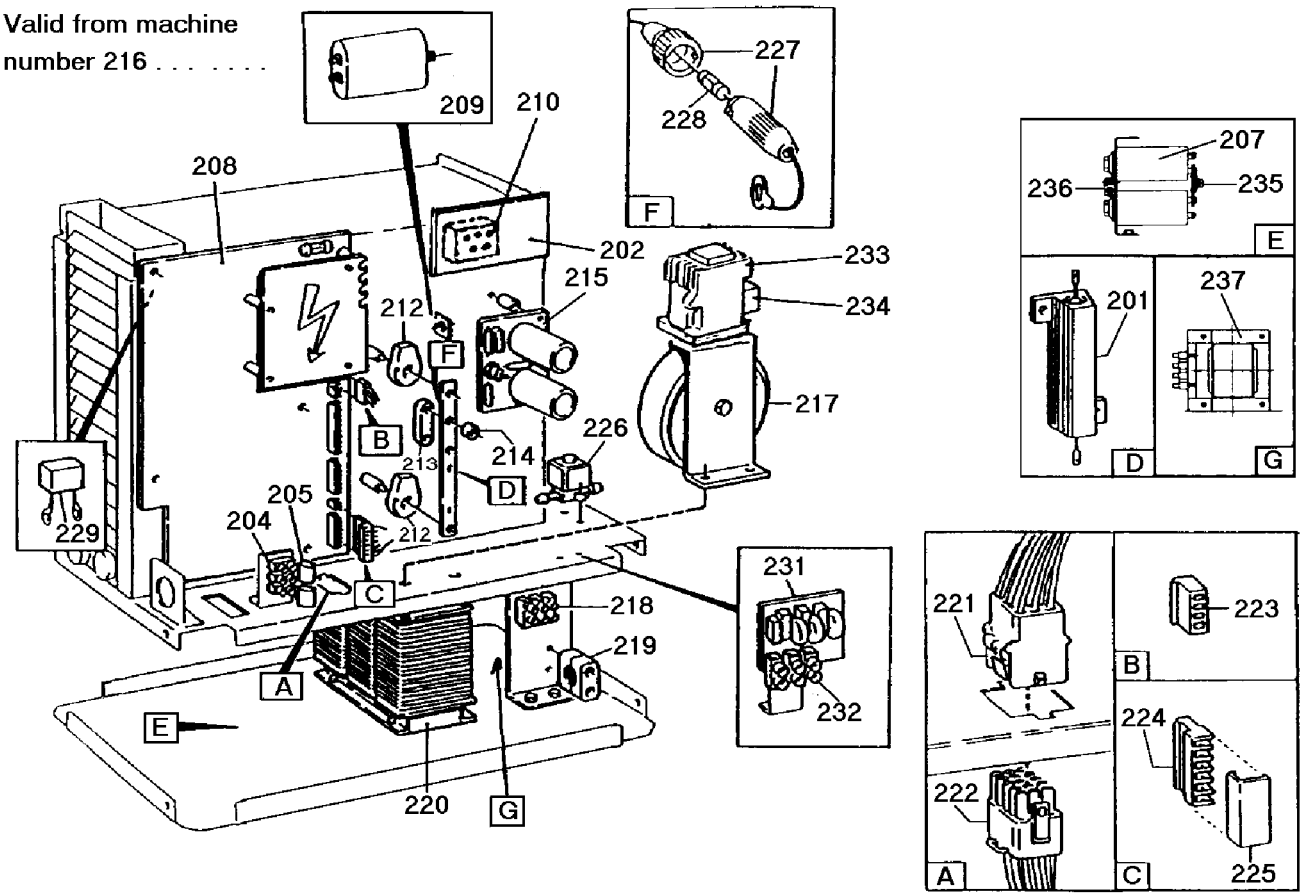

D
114
113

C= component designation in the circuit diagram

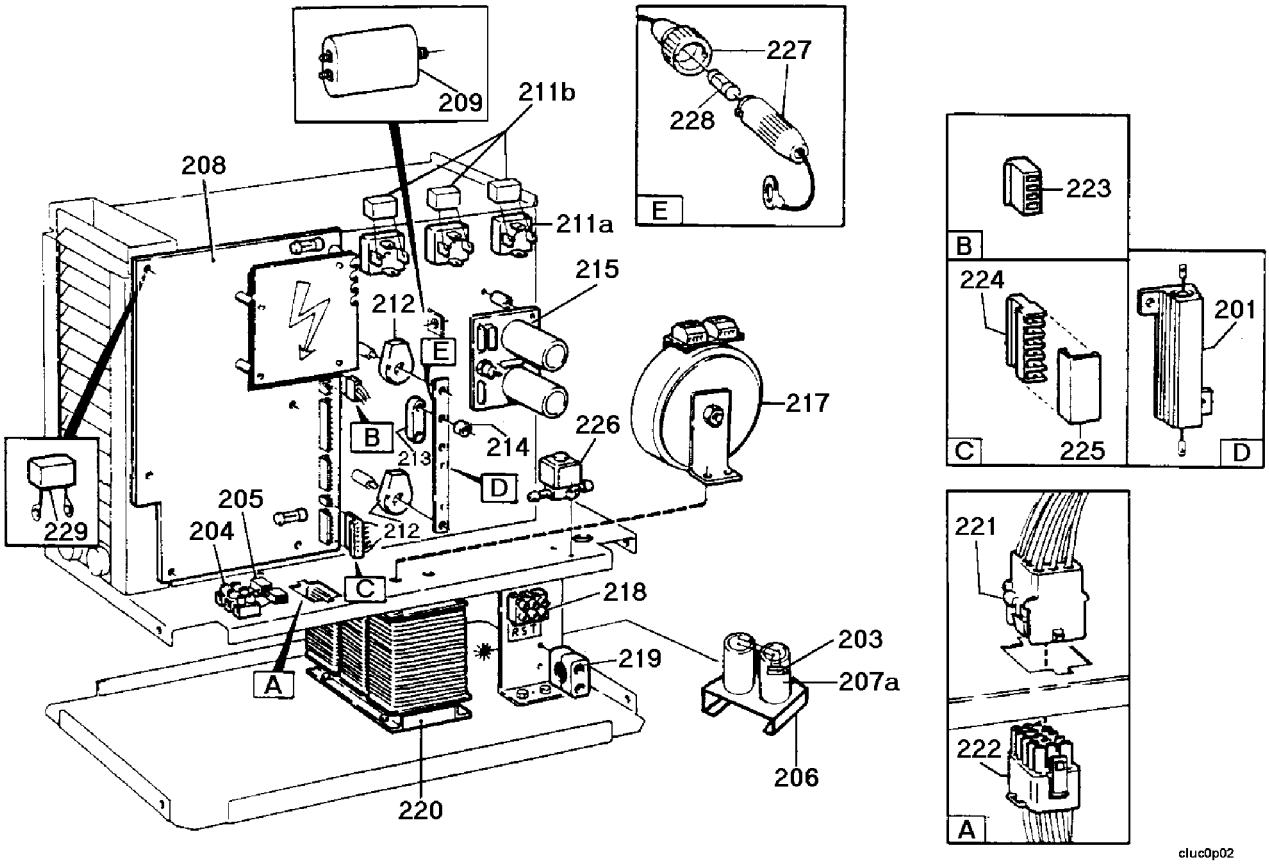
Item no.	Qty	Ordering no.	Denomination	Notes	C
201	1	192 579-538	Resistor		R2
202	1	481 948-880	Circuit board	From machine no. 216	AP13
203	2	192 579-137	Resistor	25 W. See item 206	R13
204	1	193 045-002	Terminal block		XT4
205	2	369 325-880	Capacitor	Transient protection	C03, C04
206	1		Capacitor kit	Before machine no. 216 . . . . . Only when item 220 is fitted	
207	2	192 903-505	Capacitor	Included in item 206	C11
	6	192 903-505	Capacitor	From machine no. 216 . . . . . Only when item 237 is fitted	C11
208	1	481 764-884	Circuit board	From Machine no. 216 . . . . . See also the cross reference list	
209	1	193 661-110	Capacitor		C01
210	3	193 769-001	Rectifier bridge	From machine no. 216	VC1
211a	3	193 316-208	Rectifier bridge	Before machine no. 216	VC1, VC2, VC3
211b	3	192 883-050	Capacitor	Before machine no. 216	C8
212	2	320 729-001	Current transformer		TA1, TA2
213	1	366 589-001	Insulation		
214	1	162 532-001	Bushing		
215	1	481 413-880	Circuit board		AP8
217	1	468 943-001	Control transformer	From machine no. 216	TC2
	1	369 243-001	Control transformer	Before Machine no. 216	TC2
218	1	162 781-002	Terminal block		XT1
219	1	469 950-880	Cable inlet	From machine number 550 . . .	
	1	191 309-110	Clip	Before machine number 550 . . . D=22 for versions with auto transformer TV1 or TV3	
	1	191 309-107	Clip	Before machine number 550 . . . D=16 for versions without auto transformer or with auto transformer TV2	
220	1	467 753-001	Auto transformer	230/400 V 50 Hz	TV1
	1	369 245-001	Auto transformer	400/415/500 V 50 Hz	TV2
	1	369 246-001	Auto transformer	208/230/400/460/475 V 60 Hz	TV3



Valid from machine number 216 . . . . . .

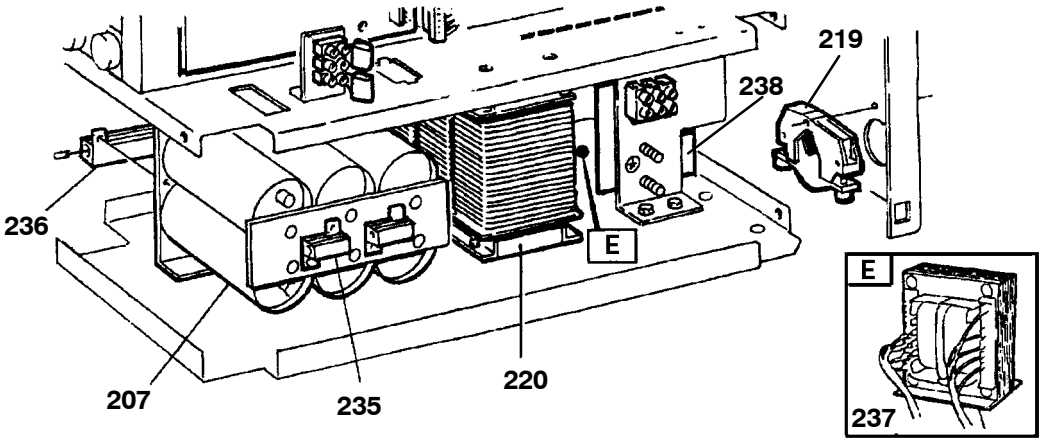


Valid before machine number 216 . . . . . .

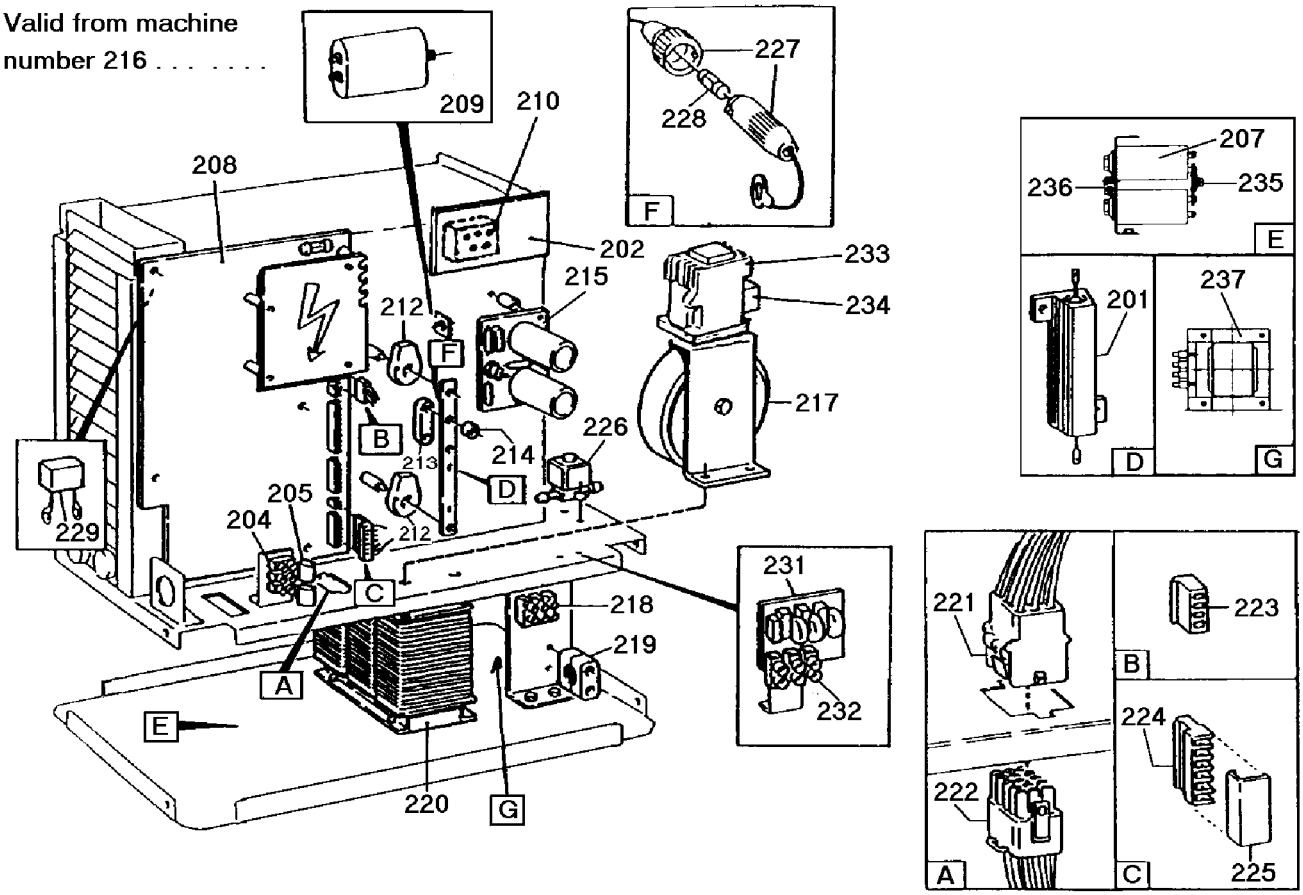


C= component designation in the circuit diagram

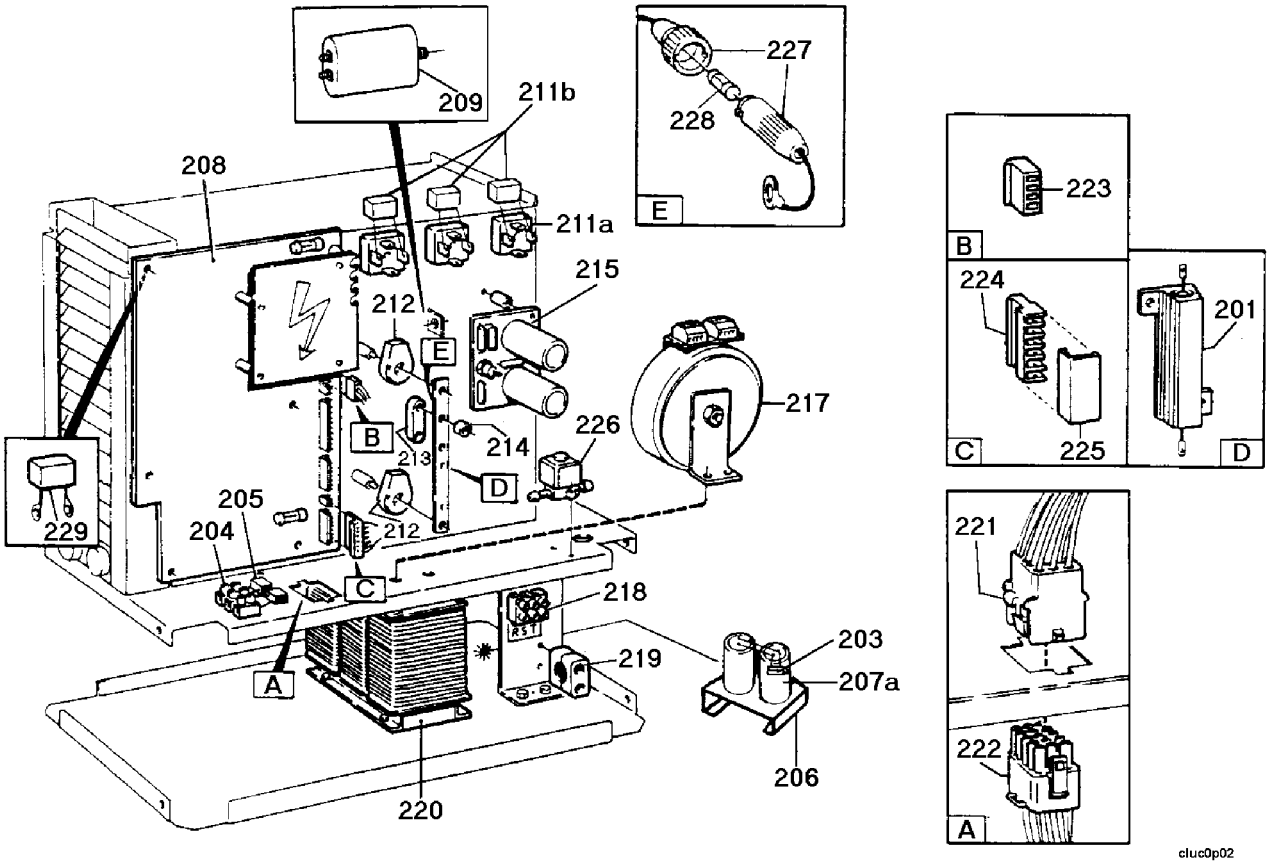
Item no.	Qty	Ordering no.	Denomination	Notes	C
221	1	192 784-016	Sleeve plug	Without sleeves	XP2
222	1	192 784-015	Pin plug	Without pins	XP1
223	1	193 669-004	Connector	4-pole	E - XT06
224	1	193 260-151	Connector	3-pole	K - XT12
	1	193 260-153	Connector	5-pole	G - XT8
	1	193 260-157	Connector	9-pole	L - XT13
	1	193 260-159	Connector	11-pole	J - XT11
	1	193 260-162	Connector	14-pole	I - XT10
225	1	369 124-181	Cover		XT12
	1	369 124-183	Cover		XT8
	1	369 124-187	Cover		XT13
	1	369 124-189	Cover		XT11
	1	369 124-192	Cover		XT10
226	1	193 054-002	Solenoid valve	YV1	
227	1	466 517-880	Fuse holder		
228	1	5679 001-23	Fuse	0.5 A	FU4
229	1	466 837-880	Capacitor	0.1 µF	C7
231	1	481 158-880	Circuit board	Before machine no. 550 . . .	AP7
232	1	162 781-002	Terminal block	Before machine no. 550 . . .	XT2
233	1	193 502-103	Contactor	From machine no. 216	QF1
234	1	193 502-104	Time relay	From machine no. 216	KT1
235	2	192 579-136	Resistor	From machine no. 216 . . . . . Only when item 237 is fitted	R13
236	2	192 579-315	Resistor	From machine no. 216 . . . . . Only when item 237 is fitted	R1b, R1c
237	1	193 758-001	Inductor	From machine no. 216 . . . . . When item 220 is fitted or option	L3
	1	468 925-880	Filter kit	From machine no. 216 . . . . . Can be fitted in all versions exept versions with HF-ignition	C11, L3, R1b, R1c
	1	468 930-880	Filter kit	Before machine no. 216 . . . . . Can be fitted in all versions exept versions with auto transformer	C11, L3, R1b, R1c
238	1	486 360-880	Suppressor board (EMC)	From machine no. 550 . . .	AP7



Valid from machine
number 216 . . . . . .



Valid before machine
number 216 . . . . . .

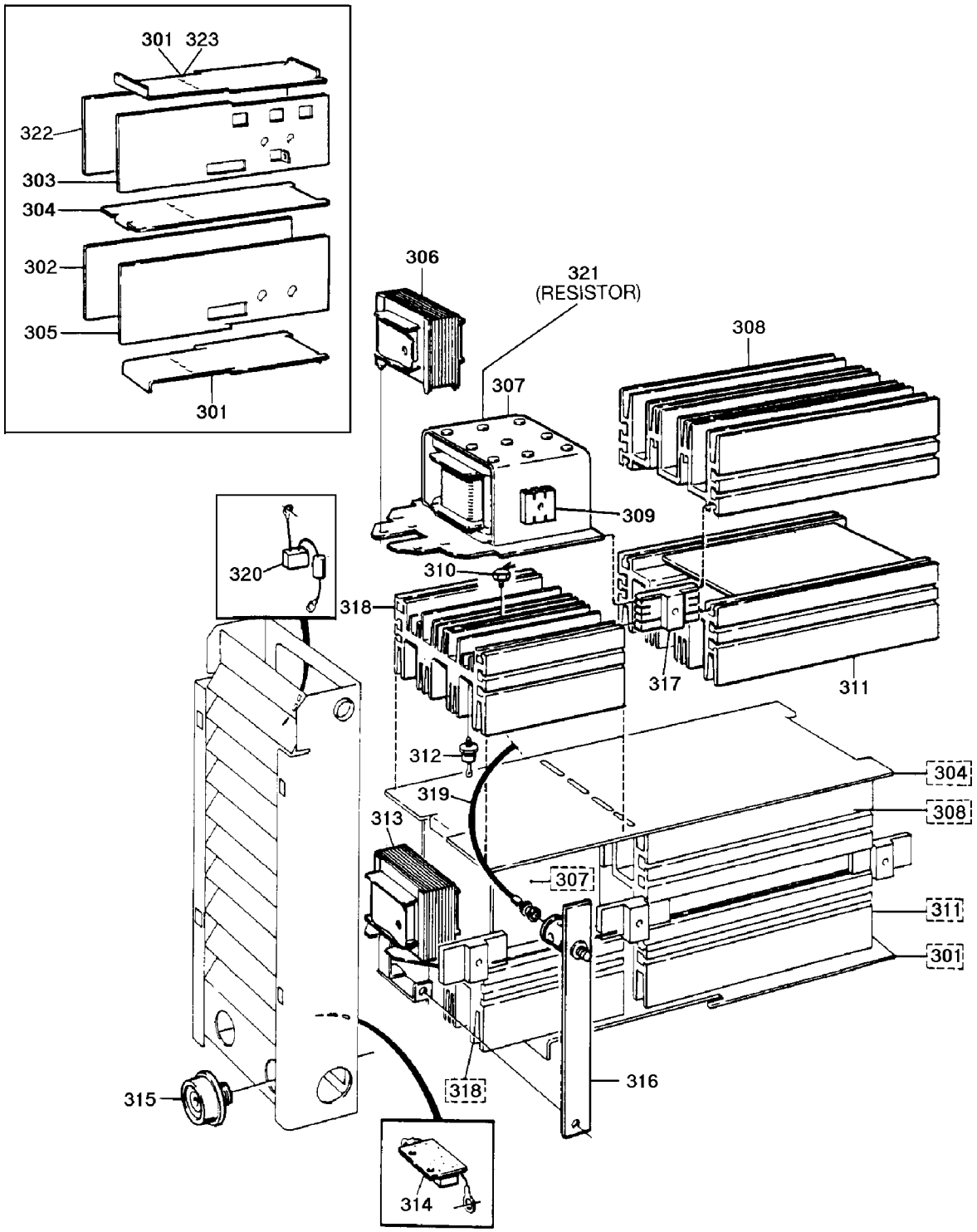


C= component designation in the circuit diagram

Item no.	Qty	Ordering no.	Denomination	Notes	C
301	1	369 228-001	Insulating plate	From machine no. 216	
	2	369 228-001	Insulating plate	Before machine no. 216	
302	1	369 230-001	Insulating plate	From machine no. 216	
	2	369 230-001	Insulating plate	Before machine no. 216	
303	1	468 944-001	Insulating plate	From machine no. 216	
	1	466 831-001	Insulating plate	Before machine no. 216	
304	1	369 229-001	Insulating plate		
305	1	369 227-001	Insulating plate		
306	1	368 827-880	Inductor	Upper	L1
307	2	368 824-880	Main transformer		TM1, TM2
308	2		Switching unit	See item 350	V1, V3
309	1	192 753-003	Terminal block		XT5
310	2	320 655-001	Thermal cutout		ST1, ST2
311	2		Switching unit	See item 350	V2, V4
312	20	320 759-003	Diode		V5, V6, V7, V8
313	1	368 827-881	Inductor	Lower	L2
314	1	481 606-880	Circuit board		AP12
315	2	160 362-881	Welding current terminal	OKC	XS1
316	1	368 830-880	Shunt		RS1
317	1	466 658-001	Support		
318	2	368 260-880	Rectifier unit	Items 310 and 312 are included	
319	1	369 327-148	Shunt cable		
320	4	369 335-880	RC-filter		R5, R6, R10, R11 C5, C6, C9, C10
321	2	192 579-221	Resistor		R7, R12
322	1	468 941-001	Insulating plate	From machine no. 216	
323	1	468 942-001	Insulating plate	From machine no. 216	

SPARE PARTS SET

Item no.	Ordering no.	Denomination	Notes
350	468 515-889	Set of switch units	Contains items 308 and 311, one of each. The thermal cutouts fitted on the upper switch unit (308) in each pair should not be connected when the machine has a serial no. prior to 216 . . . . . See the service manual for fitting instructions.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(RESISTOR)
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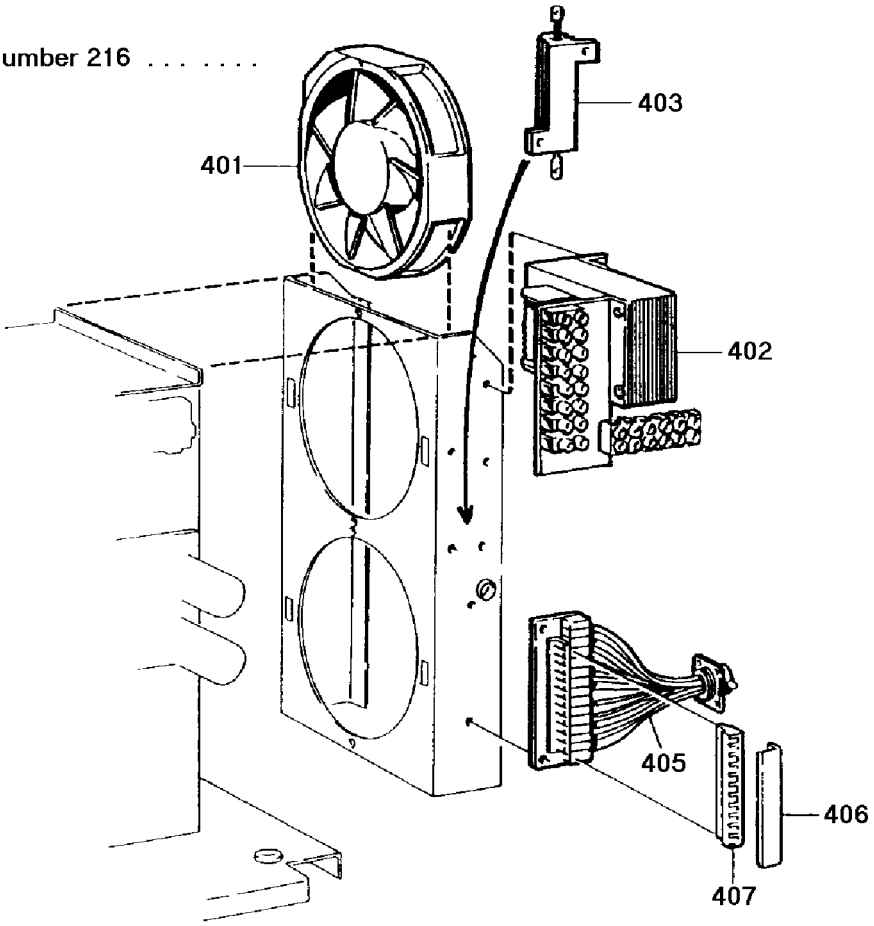
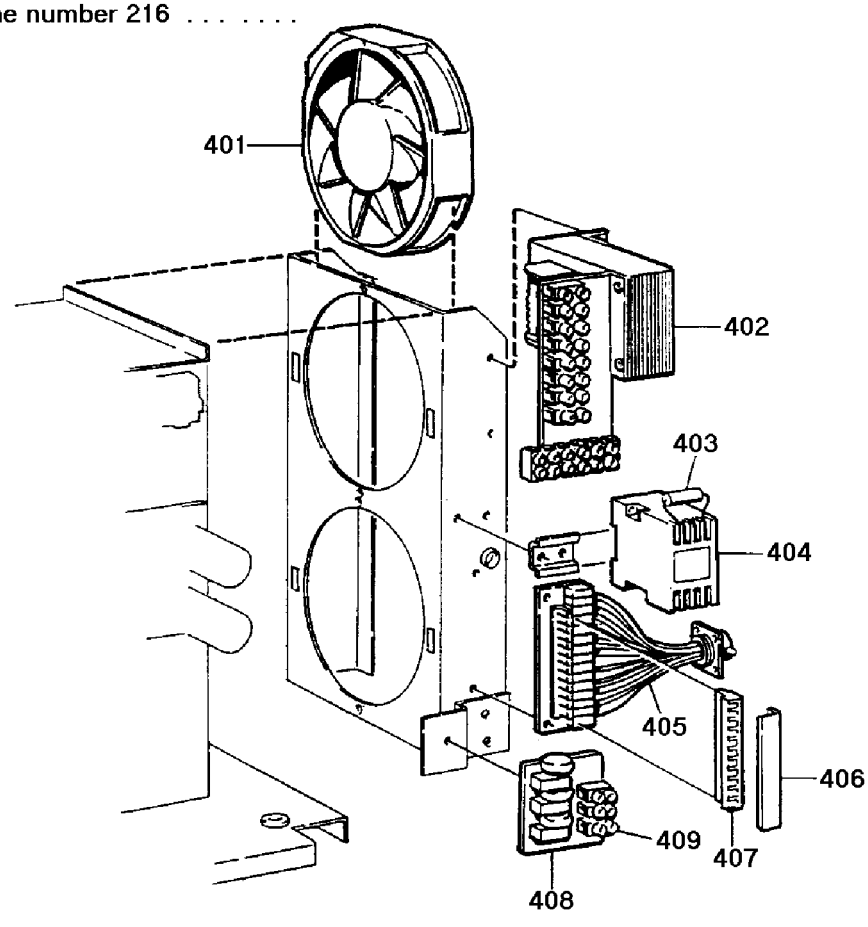
C= component designation in the circuit diagram

Item no.	Qty	Ordering no.	Denomination	Notes	C
401	2	318 731-001	Fan		EV1, EV2
402	1	193 318-006	Control transformer		TC1
403	1	192 579-315	Resistor	From machine no. 216	R1a
	1	191 094-113	Resistor	Before machine no. 216	R1a
404	1	193 356-102	Contactor	Before machine no. 216	QF1
405	1	486 183-880	Circuit board	Connector XP3 included	AP9
406	1	369 124-196	Cover		
407	1	193 260-166	Connector	18-pole	XT15
408	1	481 158-880	Circuit board	Before machine no. 550 . . .	AP7
409	1	162 781-002	Terminal block	Before machine no. 550 . . .	XT2

Valid from machine number 216 . . . . . .



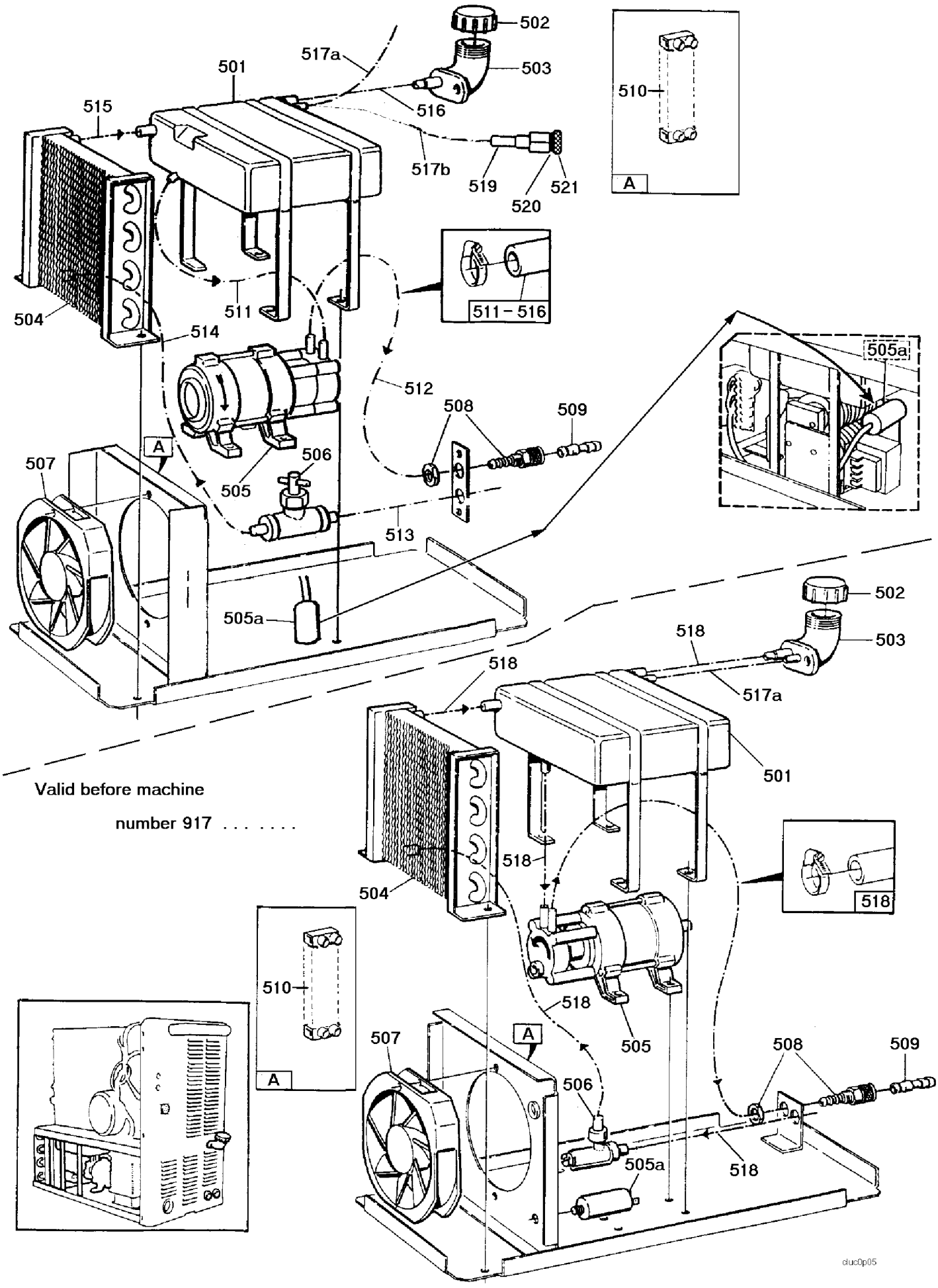
Valid before machine number 216 . . . . . .



cluc0p04

C= component designation in the circuit diagram

Item no.	Qty	Ordering no.	Denomination	Notes	C
501	1	467 031-001	Water tank	From machine no. 216 403 . . . . Item 517 is deviating from the earlier version	
502	1	369 241-001	Cover		
503	1	368 568-001	Water filling tube	From machine no. 038	
504	1	368 556-001	Radiator		
505	1	369 233-001	Pump	Incl. motor	M1
		443 042-001	Sealing	For the water pump	
		443 043-880	Assembling tool	For the sealing	
505a	1	191 085-106	Capacitor	For the pump motor	C02
506	1	467 118-001	Flow guard	From machine no. 038 . . . . . . Min. flow 0.7 l/min	SF1
	1		Flow guard	Before machine no. 038 . . . . . . Min. flow 1.0 l/min Replaced by the flow guard above	SF1
507	1	318 731-001	Fan		EV3
508	1	365 803-008	Quick coupling	Red	
	1	365 803-009	Quick coupling	Blue	
509	1	365 803-001	Slip-in nipple		
510	1	193 045-007	Terminal block		XT3
511	1	467 861-001	Water hose	From machine no. 917	
512	1	467 862-001	Water hose	From machine no. 917	
513	1	321 030-002	Water hose	From machine no. 917	
514	1	321 030-004	Water hose	From machine no. 917	
515	1	321 030-001	Water hose	From machine no. 917	
516	1	321 030-003	Water hose	From machine no. 917	
517a	1	191 954-101	Water hose	Before machine no. 216 403	
517b	1	321 030-011	Water hose	From machine no. 216 403	
518	1	190 343-104	Water hose	Before machine no. 917 . . . . . . To be ordered per meter	
519	1	467 030-001	Nipple	From machine no. 216 403	
520	1	2152 012-08	O-ring	15.1/10.3 x 2.4 mm From machine no. 216 403	
521	1	467 029-001	Screw	From machine no. 216 403	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number 917 . . . . . .
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505a
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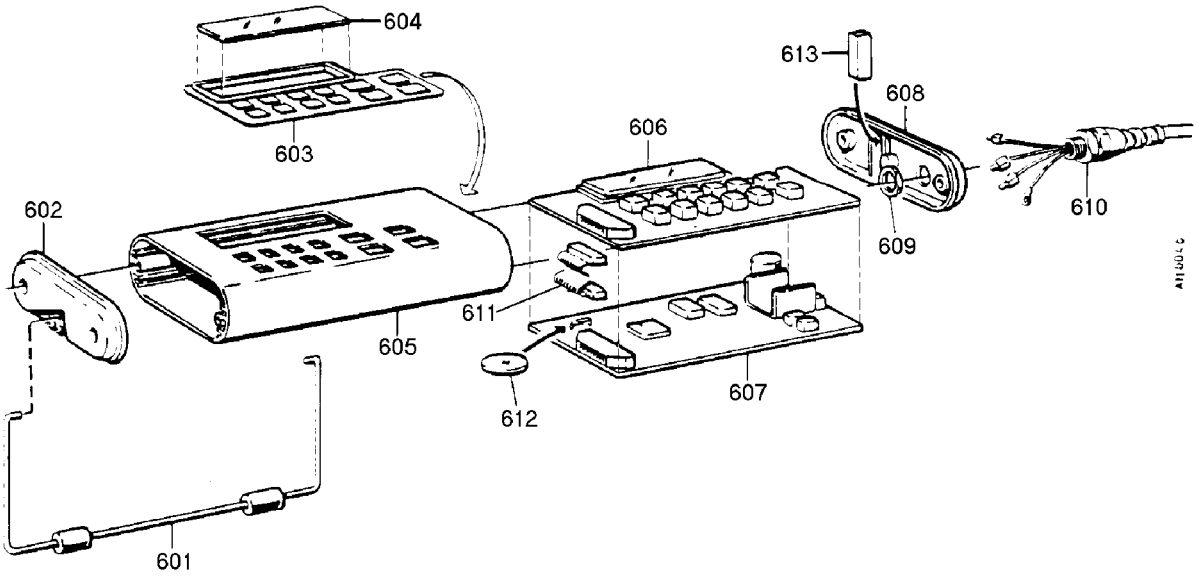
cluc0p05

C= component designation in the circuit diagram

Item no.	Qty	Ordering no.	Denomination	Notes	C
	1	369 139-882	Data setting box	Complete From machine no. 216	
	1	369 139-880	Data setting box	Complete Before machine no. 216	
601	1	369 138-880	Clamp	Complete	
602	1	369 130-001	Side panel	Left	
603	1	369 329-880	Key plate		
604	1	369 134-001	Display window		
605	1	369 506-880	Casing	Complete	
606	1	481 417-880	Circuit board		AP10
607	1	481 404-890	Circuit board	From machine no. 216	AP11
	1	481 404-880	Circuit board	Before machine no. 216	AP11
608	1	369 129-001	Side panel	Right	
609	1	2126 022-01	Nut		
610	1	369 143-880	Cable		
611			Ribbon cable	Included in item 606	
612	1	193 069-201	Battery		
613	1	369 135-001	Rubber stud		

NOTE

When ordering a complete data setting box the machine number must be indicated as well as the PROM version of the main circuit board (AP5) in the machine.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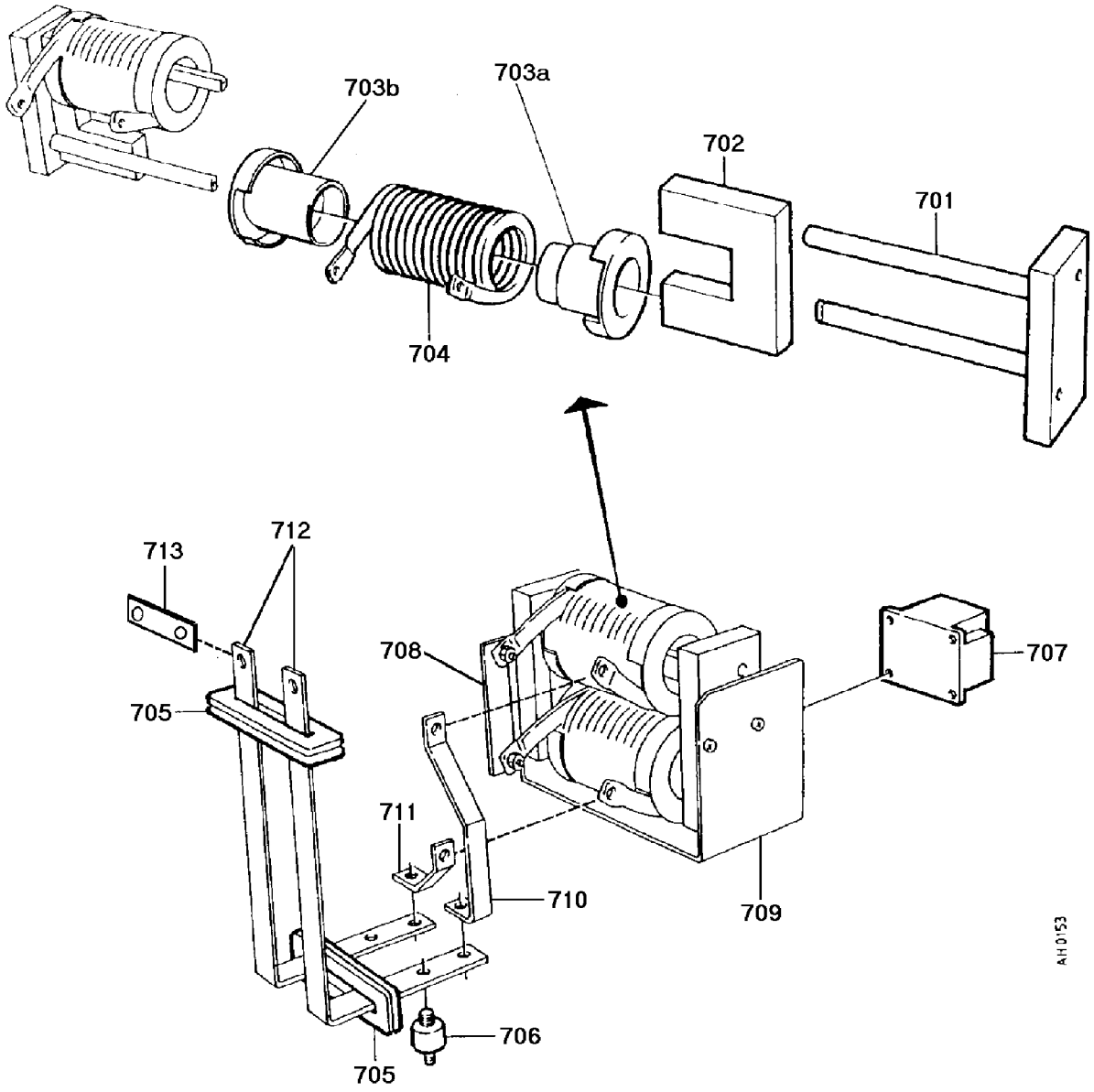
C= component designation in the circuit diagram

Item no.	Qty	Ordering no.	Denomination	Notes	C
701	2	467 755-001	Fitting device		
702	2	466 895-001	Ferrite core		
703a	2	466 598-001	Spool half		
703b	2	466 598-002	Spool half		
704	2	467 350-001	HF coil		TV4
705	2	369 033-001	Sealing bushing		
706	2	193 609-102	Insulator		
707	1	367 268-002	HF unit	Type C	U1
708	1	467 757-001	Busbar		
709	1	467 347-001	Attachment plate		
710	1	467 759-001	Busbar		
711	1	467 758-001	Busbar		
712	2	467 858-001	Busbar		
713	1	467 348-001	Busbar		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AH 0153

SERVICE INFORMATION

On the following pages you can find service information and/or extracts from service information concerning this machine.

The information contained here is only service information published after the edition date of this service manual.

EXTRACT FROM SERVICE INFORMATION 92-5

LUC 500

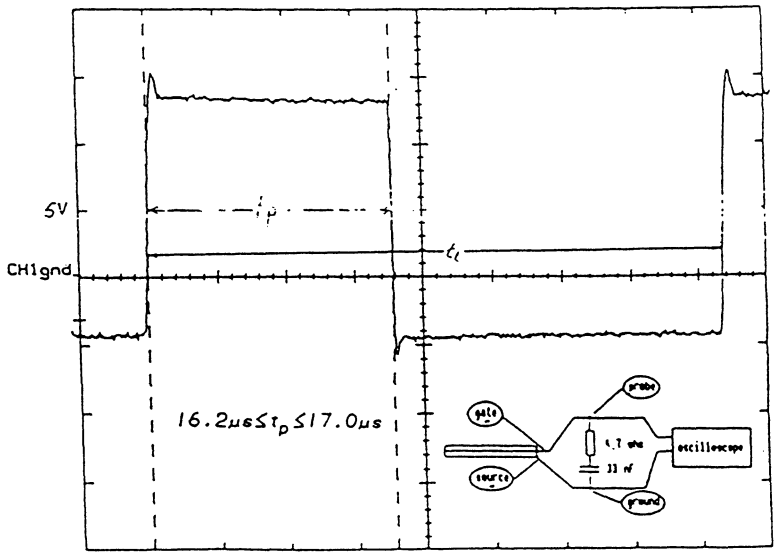
New switch units are introduced to all LUC 500 from serial no. 216 ..... When repairing an old machine with new switch units it is very important to check the "on time" for the gate pulses. The pulse time must be within 39.5 to 41.5 % of the cycle time measured at the +5 V level, when not, the pulse time must be adjusted. **Otherwise the new switch units may break down.**

Order number for one pair of switch units 468 515-889

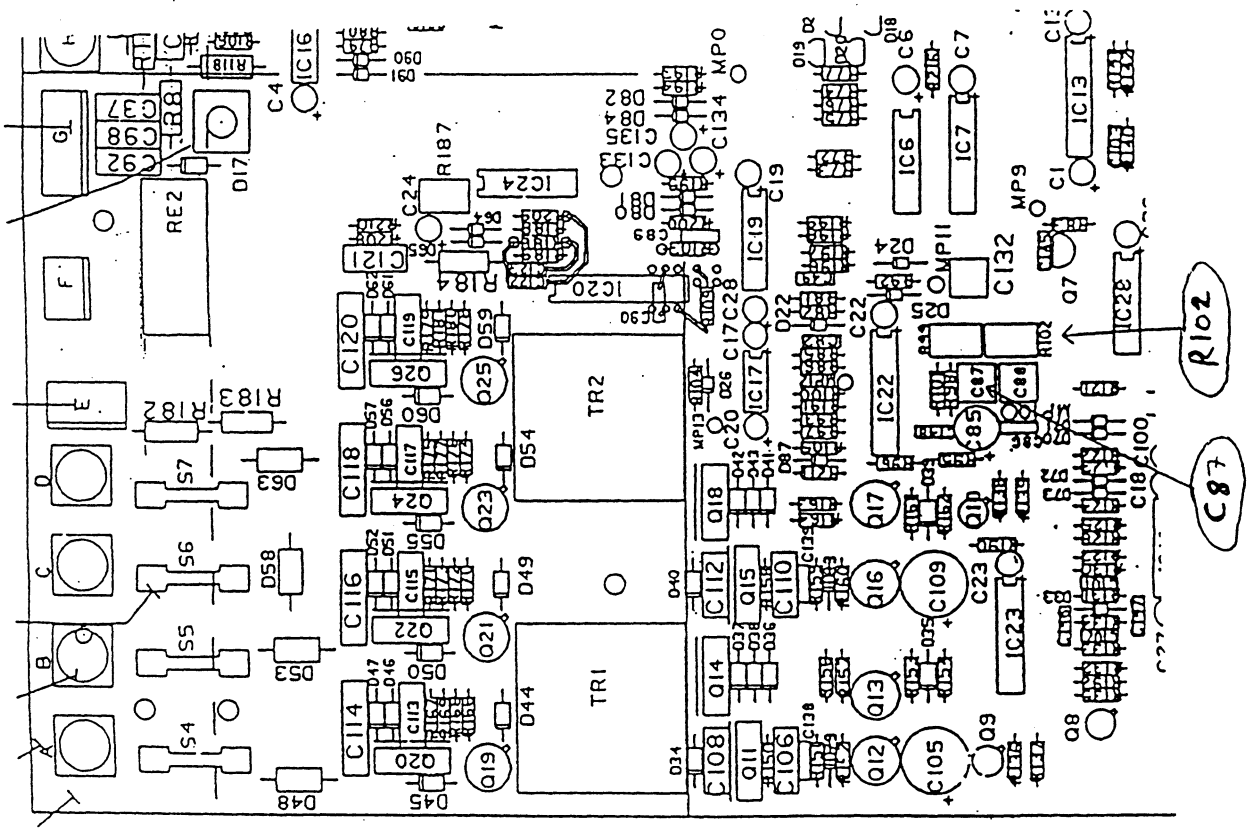
Adjusting instruction for the main circuit board (AP5)

Measure the "on time" t_p from circuit board AP5 with a separate gate load connected according to the picture below.
If t_p is outside the tolerance (39.5 - 41.5 %) adjust the circuit board as described in the instruction on next page.

$$\frac{t_p}{t_t} \times 100 = 39.5 - 41.5\ \%$$



Circuit board AP5 481 435-880, 481 764-880, 481 764-882



1. Change capacitor C87 to 3.16 nF, part no. 193 521-362

2. Adjust the frequency with potentiometer R102 to 24 kHz (23.5 - 24.5 kHz).

3. Check the "on time"

$$\frac{t_p}{t_t} \times 100 = 39.5 - 41.5\ \%$$

4. If t_p is to short (below 39.5%) change C27 to 2.87 nF, part no. 193 521-354.

5. Repeat the procedure according to 2 and 3 above.

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