



SF6000 AC MOTOR SOFT STARTER CONTROL CARD

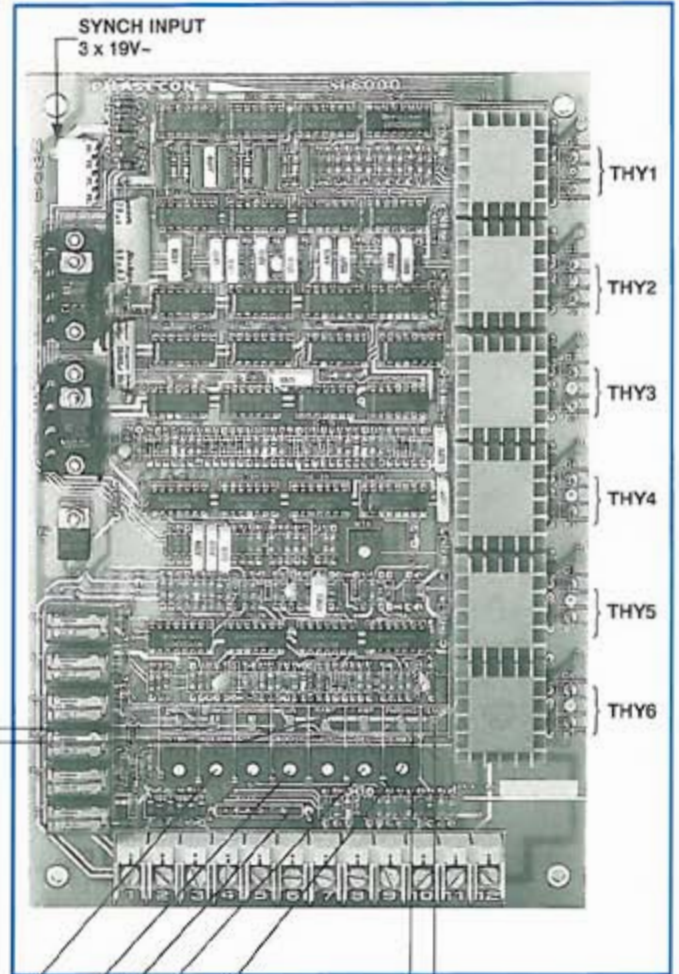
Cost savings through standardisation.
The SF6000 control card is used in 3-phase motor soft starters.

APPLICATIONS

- Direct in line
- Open Delta
- Slipping stator
- Reactor in line for high voltage motors
- DC injection braking

UNIQUE FEATURES

- Digital CMOS counters for accurate balance phase control
- High frequency pulse trains to thyristors
- Minimum and maximum clamp of phase shift
- On-board instantaneous overcurrent trip
- Motor stall protection
- Running overcurrent trip
- Auto/Manual phase shift control
- Through-hole plated PCB with solder mask and component layout silk-screen
- Phase rotation protection



TRIP LEDs
Motor stall, overcurrent in run and overcurrent in start indications
on = tripped

RAMP & RUN LEAD
Status of run relay and ramp.
ON = starting or running
On = fully ramped

R-CURR & S-CURR
Trip current level adjustment

R-123
Burden resistor for current transformers
Value (Ω) = $\frac{2,5 (V) \times CT \text{ rating } (:1)}{\text{Starting current (A)}}$

PHASING LED
Indicates direction of phase rotation. Card only works in clockwise phase rotation
LED = ON

BOOST
Minimum voltage adjustment → Set to breakaway point of motor

ACC & DECC
Independent adjustments of soft start and soft stop times

I-MAX
Maximum starting current
Set when starting to lowest current

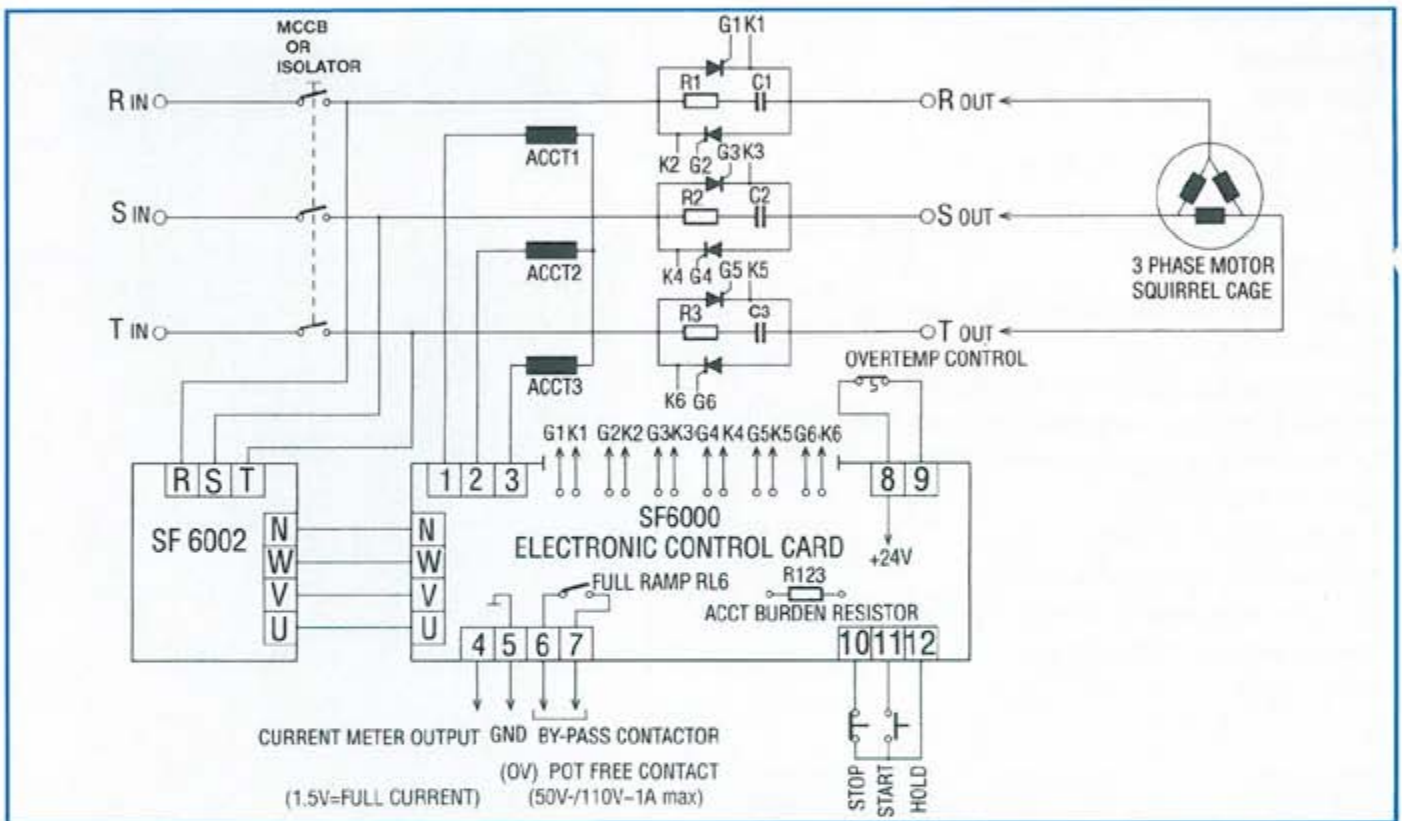
TEMP LED
Status of input 8 & 9
on = not inhibited



SPECIFICATIONS

- Supply : 18V, 4 wire from Phasecon synchronisation/supply transformer
- Thyristor gate pulses : 500 mA repetitive pulse generated over 1 ms. The first pulse being 200 μ s followed by 100 μ s pulses
- Current feedback : 3CTs star or Delta connected.

APPLICATION DETAILS



OUR MANUFACTURING PROGRAMME INCLUDES

- 1 phase and 3 phase variables speed drivers
- 1 phase and 3 phase regenerative drivers
- AC motor soft starters
- Furnace control panels
- Transformer primary power controllers
- DC injection braking of AC motors
- Welding equipment current ramp up and down controllers



PHASECON

FOR THYRISTOR CONTROLLERS

T | 011 462 2100
F | 011 462 3227
info@phasecon.co.za
www.phasecon.co.za
28 Staal Street, Kya Sand
PO Box 28, Kya Sand 2163

We would like to introduce ourselves to your company with our manufacturing program. We manufacture single phase and three phase controllers for all kinds of applications. Listed below are a few applications that are the most common. We can supply these items in a chassis mount format or in boxes/panels; or with switch gear per your requirement.

- Primary / Secondary control of transformers
- Controlling of DC motors in single and bi-directional control
- Field controllers
- Controlled high voltage DC supplies
- Controlled low voltage supplies (with low ripple)
- Induction heaters (high frequency) i.e. hardening / melting
- Soft starters
- Slipring motor starters
- Furnaces controllers
- Battery charges
- Flying saw / shear croppers
- Controlling of tube mills
- Rectifiers
- Traction rectifiers
- Anodizing plants
- Vibrators
- Magnetizers

PHASECON SF6000 SPECIFICATION

The SF6000 control card can be used to start these three phase squirrel cage AC induction motors or slipring motors. The motors are started on the reduced voltage principles using thyristors as the switching elements. The SF6000 is therefore essentially a thyristor trigger card with motor control and motor protection features incorporated in the electronics. The SF6000 features digital firing pulse generation on all six thyristors resulting in a balance firing on all three phases.

The digital circuit is more reliable and accurate than analogue pulse generation methods. The control section is analogue circuit comprise essentially of an operational amplifier which control the current of the motor. Current control input is derived from the three AC current transformers whose signal is rectified on the card and transformed into a feedback signal to the OP AMP. The "GO" signal is generated by the acceleration / deceleration circuit. There is an output for connection of A by pass contactor.

1. Specifications

- Input power supply 3x17, 5VAC from Phasecon synchronization and supply transformer
- Stop/start pushbutton control or PLC link
- 3XAC CT inputs related to line current when starting
- OUTPUT full ramp potential free contact
- 6xPULSE trains to thyristors

2. Controls available on PCB

- R-CURR Running current trip level
- S-CURR Starting current trip level
- BOOST Adjustable motor breakaway point 0-28V
- ACC Acceleration
- DEC Deceleration (soft top)
- I-MAX Maximum allowable starting current

3. LED indications on PCB

- TRIP STALL Motor stalled on start
- TRIP RUN Motor overloaded or single phased during running
- TRIP START Motor overloaded or single phased during starting
- RUN Motor starting or running
- RAMP Starting cycle completed
- I-AMP Current amplifier output level
- PHASING Phase rotation correct indication
- TEMP Over temperature indication

When constructing a soft starter using the SF6000 card, a fully protected motor starter combined with voltage reduction starting is possible. The parts needed are:

1. SF6000 thyristor control card
2. SF6000 transformer board
3. Six (6) thyristor with heatsinks rated for motor start current
4. Three (3) current transformers rated for motor start current
5. Suitable enclosure
6. Motor protection rated fuses
7. Isolator (optional)
8. By-pass contactor (optional)



4. Set-up procedure for current feedback:

If current transformers are fitted to card

- Switch power on
- Check that temp capital and phase lamp is on
- Choose correct burden resistor with calculation above if not the same as required from factory
- Sat I-MAX anti-clockwise
- Put tong tester one phase
- Start card
- Check rotation of motor
- Adjust I-MAX until motor breaks away
- Adjust rate acceleration with ACC pot
- Adjust rate of deceleration with DEC pot
- On start up adjust S-current
- Check that normal starting current are on all three phases
- After full ramp adjust R-current
- Check that normal running current is the same on all three phases

5. Set-up procedure for voltage lamp:

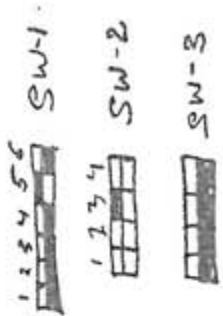
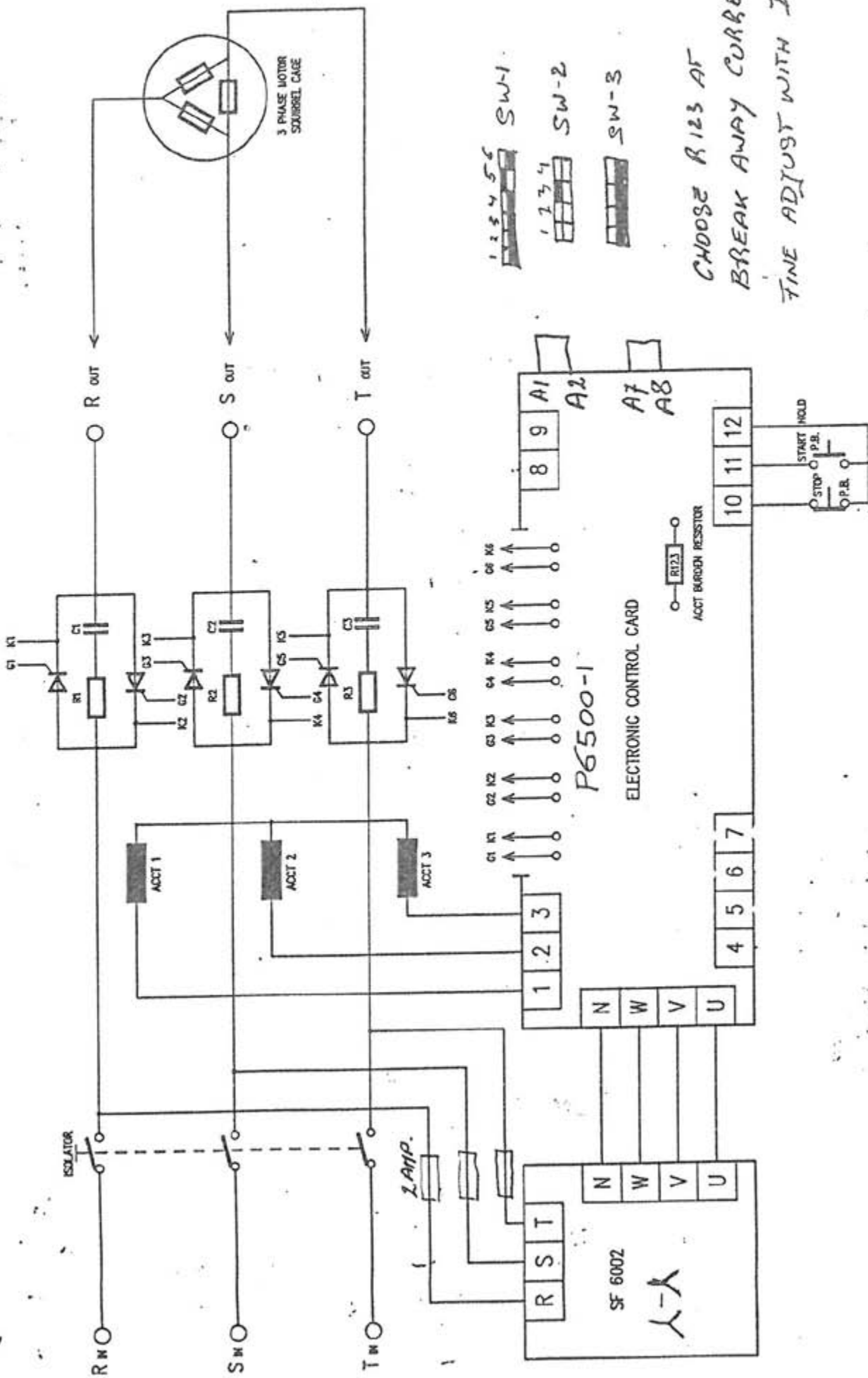
If voltage ramp needed to start

- Fit 100k-ohm resistor in place on 2,2uf 63VOLT cap that are on gold pins (middle right side of PCB)
- Switch power on
- Check that temp and phase lamp is on
- A burden resistor is not needed for this operation – set I-MAX clock-wise
- Put tong tester on one phase
- Start card – check rotation of motor – adjust rate of acceleration
- Adjust rate deceleration – on start-up adjust S-current – after full ramp adjust R-current

6. Fault finding:

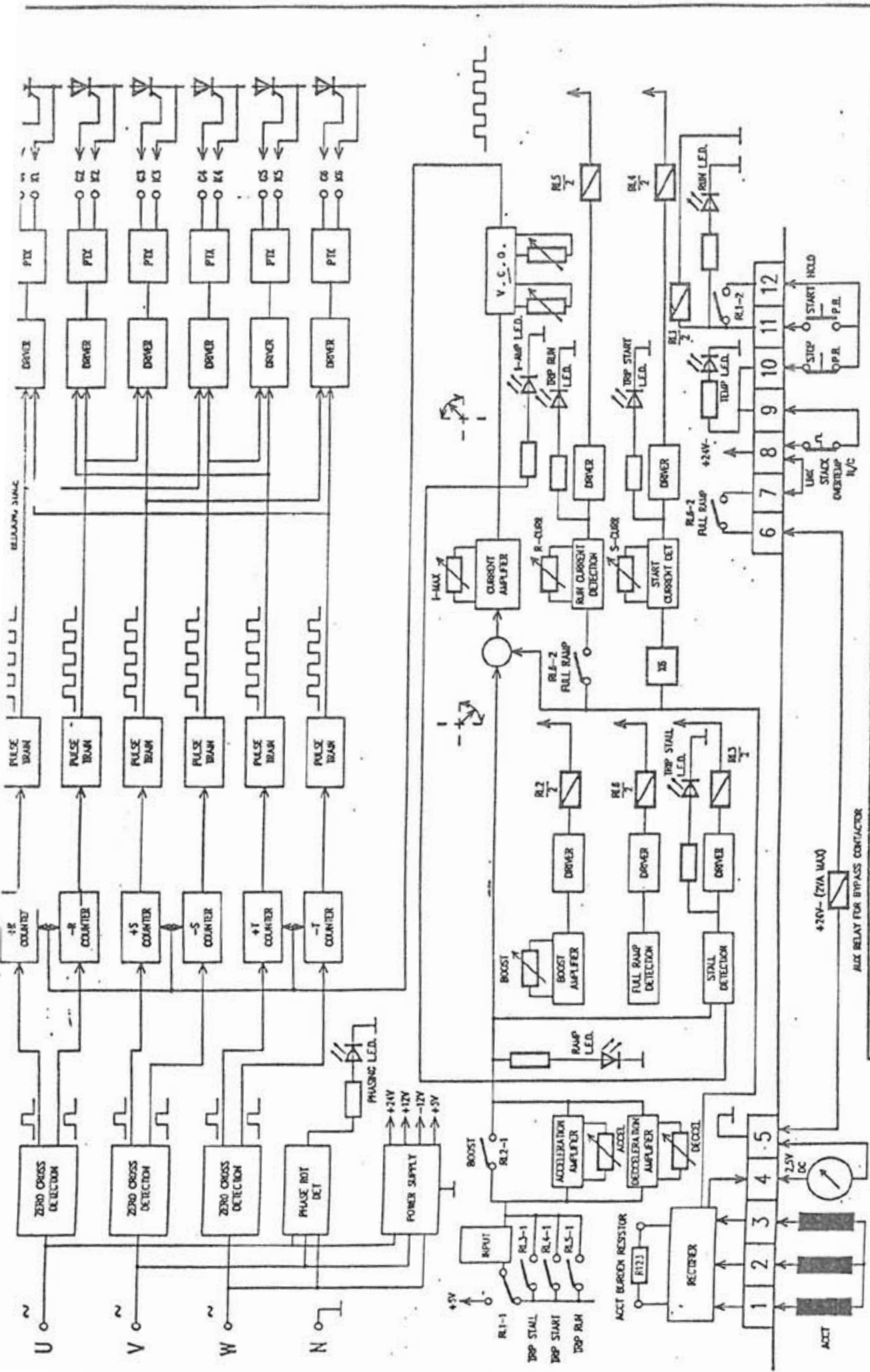
FAULT	CHECK
No lights on control card phase	Check incoming power supply
Lock light off	Check all three phases for voltage
	Check synchronising transformer for 18 volts AC at terminal U, V, W to terminal N on control card
Not operating	Is temp light on, is run light on, is stall light on, is trip run on, is trip start on
POWER FAULTS	CHECK
Still drawing power when run light is off	Thyristor blown
Not drawing current on phase while under normal running operation	Load faulty





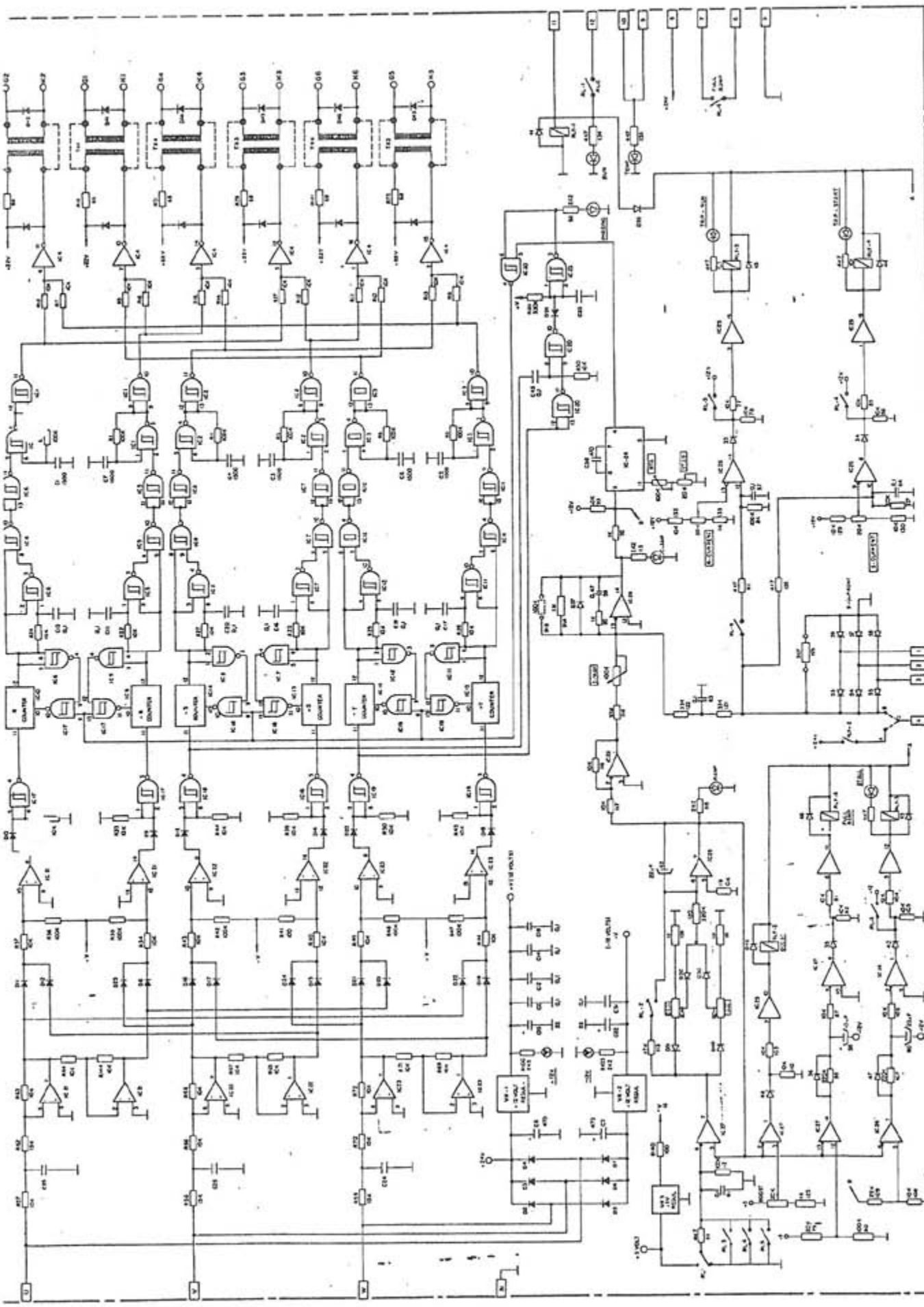
CHOOSE R123 AT
BREAK AWAY CURRENT
FINE ADJUST WITH I-MAX

DRAWING No. P010007		SHEET No. 1 OF 2		SIZE A3	
TITLE TYPICAL LINE DIAGRAM FOR MOTOR STARTER		DRAWING No. P010007			
CUSTOMER		Phasecon (PTY) LTD			
DESIGNED: P.R.R.	APPROVED:	REVISIONS:	DATE CKD.:	DATE 11/05/89	
DEMAN: EZENTGRAF		Po Box 124 Strubens Valley, 1735.		475-1693	



DRAWN: E.ZERTHOF		Po Box 124 Strubens Valley, 1755. 475-1693	
DESIGNED: P.P.R.	APPROVED:	REVISIONS	DATE CHG.
TITLE: TYPICAL LINE DIAGRAM FOR MOTOR STARTER		SCALE: A3	DATE: 13/05/89
DRAWING No. P00000	SHEET No. 2 OF 2	SIZE	
Phasecon (PTY) LTD		CUSTOMER	

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PHASECON (Pty) Ltd.	
TITLE - SOFT START - THYRISTOR CONTROL CARD	
COPYRIGHT RESERVED	DRAWN - REFNO Y.G. N.
FIG. NO. - SF 6000 - 1	CHECKED - H.H.J.
SHEET	DATE - FEB 1968

PHASECON SF6000

N
W
V
U

VR
1

VR
2

VR
3

RLY
1

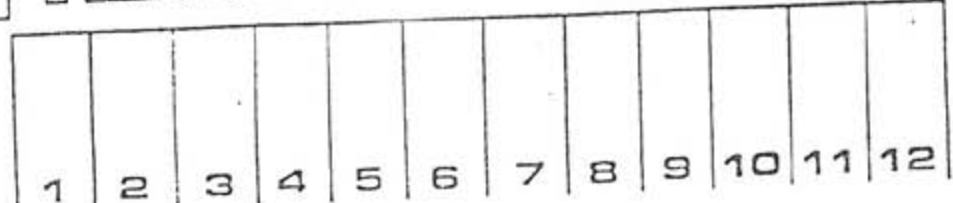
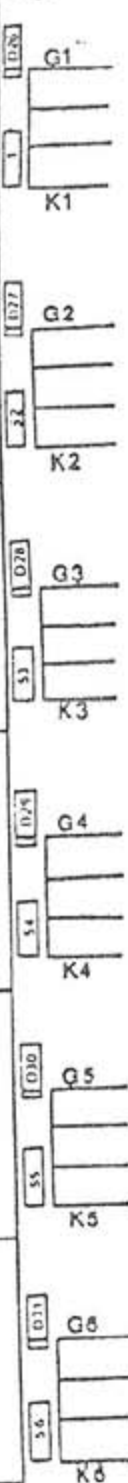
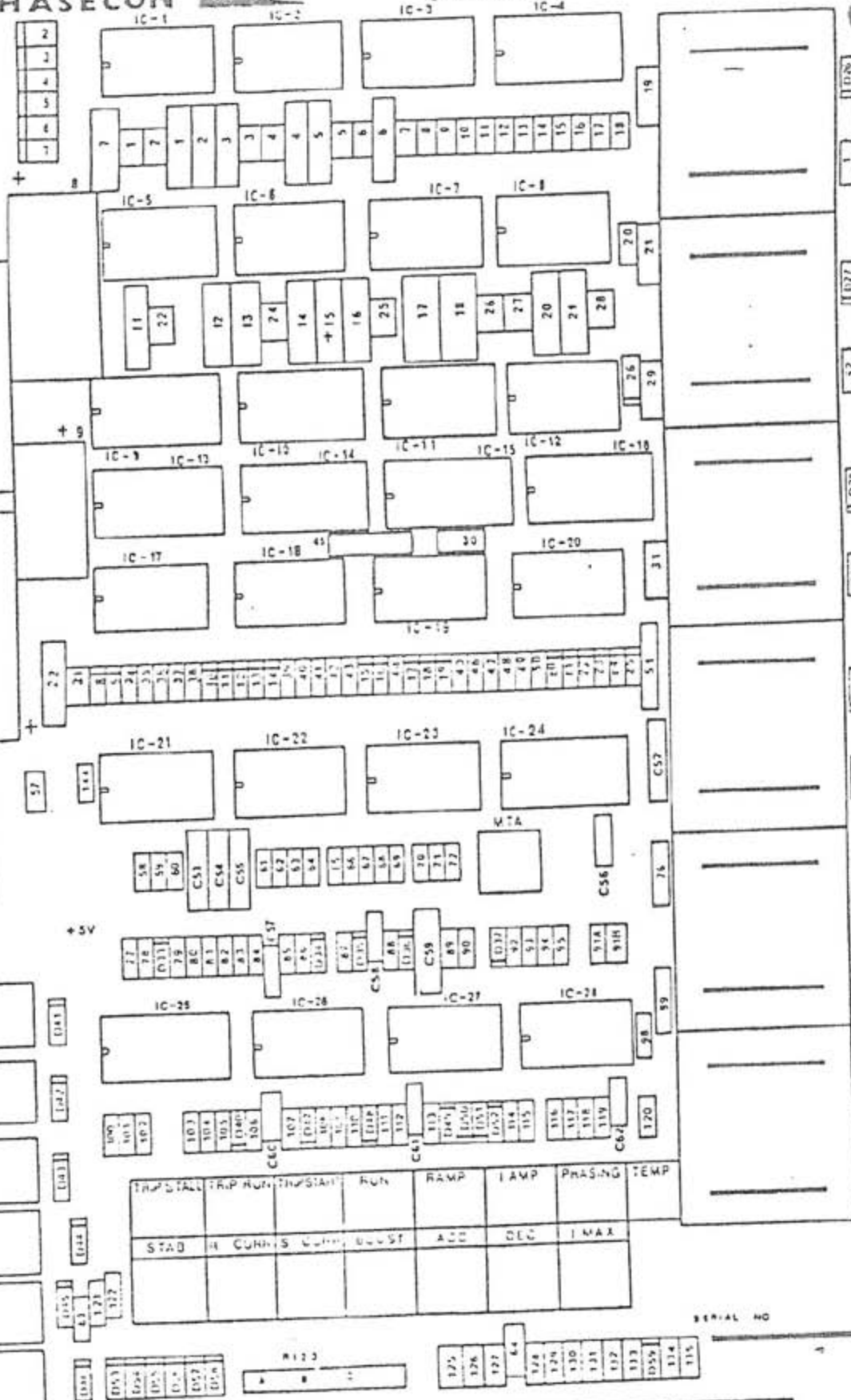
RLY
2

RLY
3

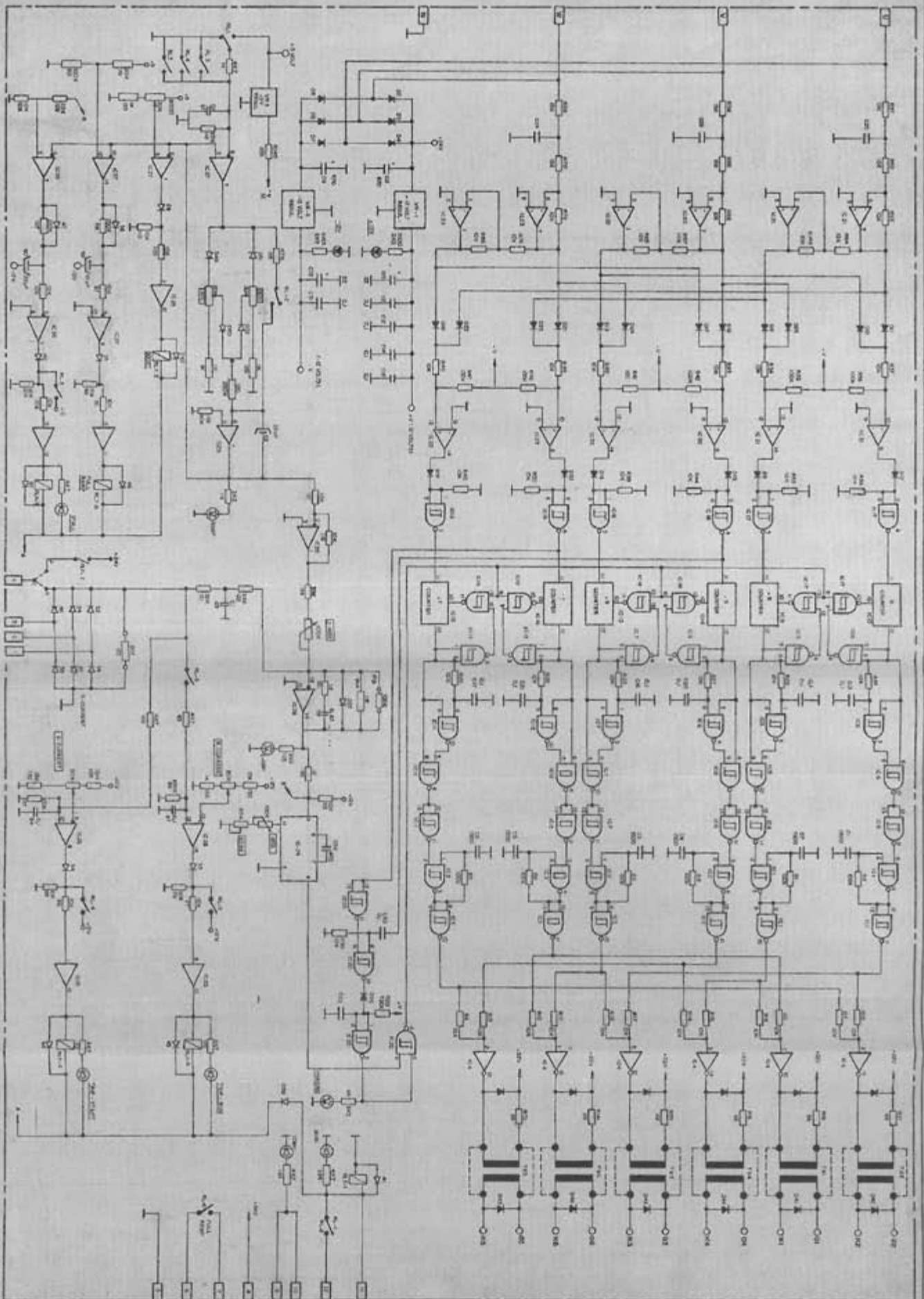
RLY
4

RLY
6

RLY
8



SERIAL NO _____



PHASECON (Pty) Ltd

TTL.C.
SOFT START - TRANSISTOR CONTROL CARD

DESIGNED BY	SALES MGR V.C. W.
DRAWN BY	ENGINEER H.N.J.
DATE	FEB 1968

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SERIAL NO. SF 6000-1