PHASECON
FOR THYRISTOR CONTROLLERS

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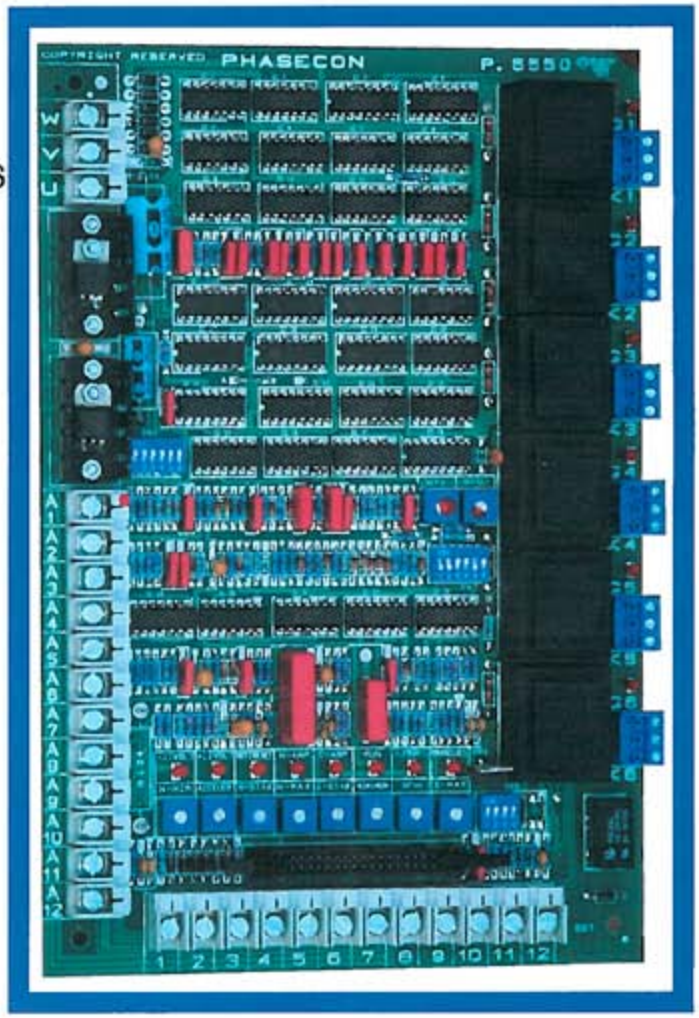
P6550 PROGRAMMABLE MULTI-FUNCTION THYRISTOR CONTROL CARD

Cost saving through standardisation
The P6550 Control card, is used for 3-phase AC and DC controllers.
Ideal for replacement of existing obsolete thysistors control electronics and variacs

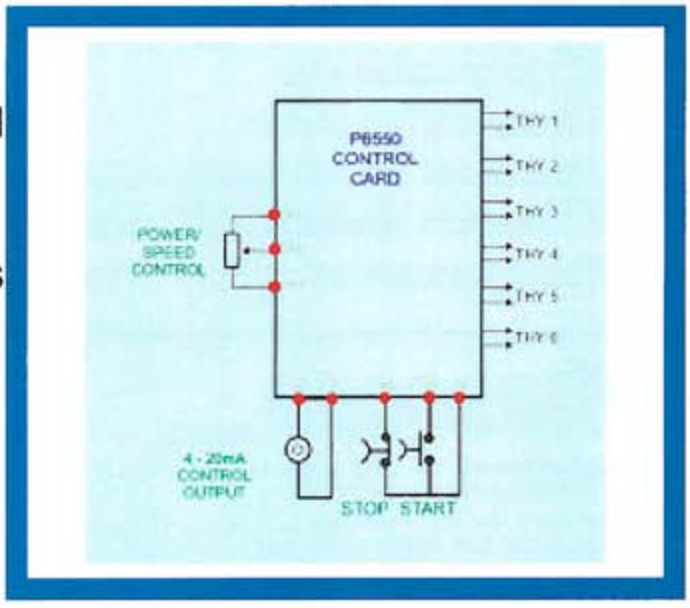


APPLICATIONS

- DC Variable speed drivers
- AC Power controllers
- AC Motor soft starters
- Furnace heat controllers
- Slipring motor control
- Transformer primary control
- Planting rectifier control
- DC Motor field control
- Vibrator feeder control
- Crane control
- Battery chargers
- Magnet energisers

UNIQUE FEATURES

- Digital CMOS counters for accurate balanced phase control
- High frequency pulse trains to thyristors
- Switch programming for required applications
- Minimum and maximum clamp of phase shift
- Process instrumentation interface 4-20 mA
- On-board instantaneous overcurrent trip
- Multi-plug connection for easy connection
- Auto/manual phase shift control
- Through-hole plated PCB with solder mask and component layout silk-screen



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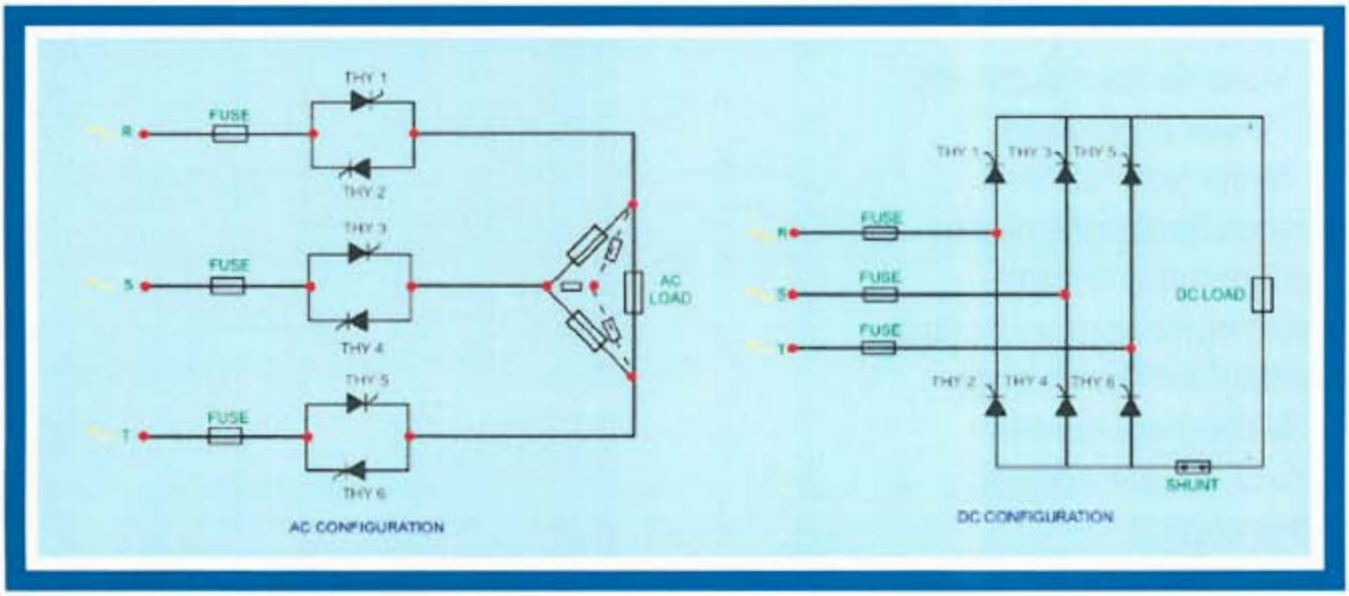
SPECIFICATIONS

- Supply : 18V, 4 wire from Phasecon synchronisation/supply transformer
- Thysistor gate pulse : 500 mA repetitive pulses generated over 1ms. The first pulse being 200us followed by 100us
- Speed/voltage reference : 0 to +5 V DC
- Torque/current reference : 0 to +5 V DC
- Process control input : 0 to +5 V DC or, 1-5 mA or 2 to 10 mA or 4 to 20 mA
- Voltage/speed feedback : 0 to 100 V AC or DC, programmable
- Current feedback : From 3 CT s of from DC shunt 50 or 60 mV

APPLICATION DETAILS



OUR MANUFACTURING PROGRAMME INCLUDES

- 1 phase and 3 phase variable speed drives
- 1 phase and 3 phase regenerative drives
- AC motor soft starter
- Furnace control panels
- Transformer primary power controllers
- DC injection branking of AC motors
- Welding equipment current ramp up and down controllers

PHASECON
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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

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Basic description of P6550

1. SWTITCH DESCRIPTION:

- SW1-1 Voltage feedback (20VDC)
- SW1-2 Voltage feedback (20VDC)
- SW1-3 Voltage feedback (20VDC)
- SW1-4 Voltage feedback (20VDC)
- SW1-5 Voltage amplifier loop (up = 1:1, down = 10:1)
- SW1-6 Thyristors enable (up firing engine)

Switches 1,2,3,4 when in the OFF position will have a voltage drop of 20 Volts per switch. The voltage (DC) feedback is determined by the input of A4.
Switch 5 in the ON position has a gain/reaction of 1:1 and in the OFF position has a gain/reaction of 10:1.
Normal mode is for switch 6 to be on the ON position which will enable firing of the thyristors.

- SW2-1 Start boost
- SW2-2 Stall trip
- SW2-3 Current stability
- SW2-4 Current amplifier loop (up = 1:1, down = 10:1)
- SW3-5 Auxillary process loop
- SW2-6 Main control loop

Switch 4 in the ON position has a gain/reaction of 1:1 and in the OFF position has a gain/reaction of 10:1.

- SW3-1 Input signal loading resistor of 1k
- SW3-2 Input signal loading resistor of 1k
- SW3-3 Input signal loading resistor of 1k

2. USER POT DESCRIPTION:

- N-MIN Level above zero volts (A11)
- ACCEL Ramp up and down time
- N-STAB Voltage stability
- N-MAX Maximum voltage
- I-STAB Current stability
- MINIMUM Signal processing minimum adjustment
- SPAN Signal processing maximum adjustment
- I-MAX Maximum current

3. FACTORY POT:

- MTA Maximum trigger angle (factory set)
- OFFSET Minimum trigger angle (factory set)

4. C.T. CURRENT CALACULATION:

It should be noted the SHUNT feedback and CT feedback may not be used together.

The resistor for the maximum demand current R124 (named BURDEN_RESISTOR) which is a 5 Watt resistor on the bottom right hand side of the control card is fitted by the factory for current that has been requested if you wish to change the burden resistor you must follow the following procedure:

$$\text{CURRDEM} = \frac{\text{CURRENT REQUIRED}}{\text{CT_RATIO}}$$

EXAMPLE:

$$\text{CURRDEM} = \frac{45\text{A}}{200/1}$$

$$= 0.225$$

$$\text{BURDEN_RESISTOR} = \frac{3.0\text{V}}{\text{CURRDEM}}$$

$$= \frac{3\text{V}}{0.224}$$

$$= 13.3\text{R}$$

The BURDEN-RESISTOR needed to run is 10ohms or a resistor as close as possible. If the voltage of the burden is higher than 5.23 volts the electronic trip will trip the card off.

If you need to fit CT's always choose a CT value above maximum demand value.
Note: if you are having any problems, please do not hesitate to contact us.

Tel: 011 462 2100
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DETAILED APPLICATION PROCEDURES

Three phase DC controller using PHASECON complete units

SET UP PROCEDURE

Using P6555MB POWER card
Switch settings – ARMATURE FEEDBACK

SW1

SW1:1	SW1:2	SW1:3	SW1:4	SW1:5	SW1:6
ON-UP	ON-UP	ON-UP	ON-UP	OFF-DWN	ON-UP

SW2

SW2:1	SW2:2	SW2:3	SW2:4	SW2:5	SW2:6
OFF-DWN	OFF-DWN	ON-UP	OFF-DWN	OFF-DWN	ON-UP

Using P6555MB connection card or PH1083.
Witch setting (TACHO feedback (terminal 17 and 18))

SW1

SW1:1	SW1:2	SW1:3	SW1:4	SW1:5	SW1:6
OFF-DWN	OFF-DWN	OFF-DWN	OFF-DWN	OFF-DWN	ON-UP

SW2

SW2:1	SW2:2	SW2:3	SW2:4	SW2:5	SW2:6
OFF-DWN	OFF-DWN	ON-UP	OFF-DWN	OFF-DWN	ON-UP

Note that PHASECON light indication is: ON equals healthy state

Connect incoming supply

1. Check that the PHASELOCK lamp comes ON (lamp on bottom right hand side of the control card) if the lamp is off, switch power off, swap incoming phases r and t and switch on
2. Check that the TRIP lamp is ON
3. Check the +12VOLTS, -12VOLTS lamp is ON
4. Set I-MAX pot anti-clockwise
5. Control pot REFERENCE VOLTAGE in the zero position
6. Start the card by enabling the start – RUN light comes on
7. Turn control pot up slowly
8. With control pot at maximum position input adjust N-MAX for maximum voltage required if voltage remains the same you are running in current limit adjust N-MAX back to original position and adjust I-MAX
9. With control pot at maximum position input adjust I-MAX for maximum current required
10. If trip lamp goes off, reduce the size of the BURDEN-RESISTOR on the unit (the unit has tripped on over current)
11. Do not exceed the maximum current rating of the thyristors unit check rating plate for maximum rating
12. If you have a oscillation effect adjust N-STAB to optimise stability
13. System is now set for working condition

FURNACE SETUP PROCEDURE – AC DRIVE SETUP:

With current feedback only.
Note: if the control card is connected via the ribbon cable then all control signals and connecgtions to be made on connection cards otherwise you will bypass built in protection. Connections to the connection card as per relevant drawings.

Switch settings:

SW1

SW1:1	SW1:2	SW1:3	SW1:4	SW1:5	SW1:6
ON-UP	ON-UP	ON-UP	ON-UP	ON-UP	ON-UP

SW2

SW2:1	SW2:2	SW2:3	SW2:4	SW2:5	SW2:6
OFF-DWN	OFF-DWN	ON-UP	OFF-DWN	OFF-DWN	ON-UP

Check that the connections have been done as per drawings depending on which interface card has been used as listed: PH1083 P6851

Note that PHASECON light indication is ON equals healthy state.

1. Check switch settings for correct setup
2. Power up
3. Check that the PHASELOCK lamp comes on (lamp on bottom right hand side of control card) if the lamp is off switch power off swap incoming phases R and T and switch on
4. Check that the following lights are on after powering up: TRIP, +12V, -12V and PHASELOCK
5. Set I-MAX pot anti-clockwise
6. All measurements to be made on P6550 control card
7. The 4-20mA is set correctly when the cards leaves the factory but if it needs to be set follow these procedures. You do not need to be in run mode to setup 4-20mA input range measure with a DC volt meter at terminals A3 (0 volts) and terminal A2 (+ signal) abd adjust MINIMUM and SPAN to halfway mark between max and min position
8. Set controller to 4mA output adjust MINIMUM pot)measure -0.05
9. Set controller to 20mA outpur adjust SAPN pot (measure positive 5.11V)
10. Start the card by enabling the run/start sicrcuit
11. RUN light is now on
12. At 20mA input adfjust I-MAX pot to maximum demanded current
13. Aty maximum demand measure DC volts on terminal 4 (+) and 7 (-) that the voltage is between +2 volts and 3.5 volts (ideal). If you exceed 5.23 VDC the card will trip due to over current.
11. Do not exceed the maximum current rating of the thyristors unit check rating plate for maximum rating
12. If you have a oscillation effect adjust N-STAB to optimise stability
13. System is now set for working condition

RECTIFIER SETUP:

Switch settings:

SW1

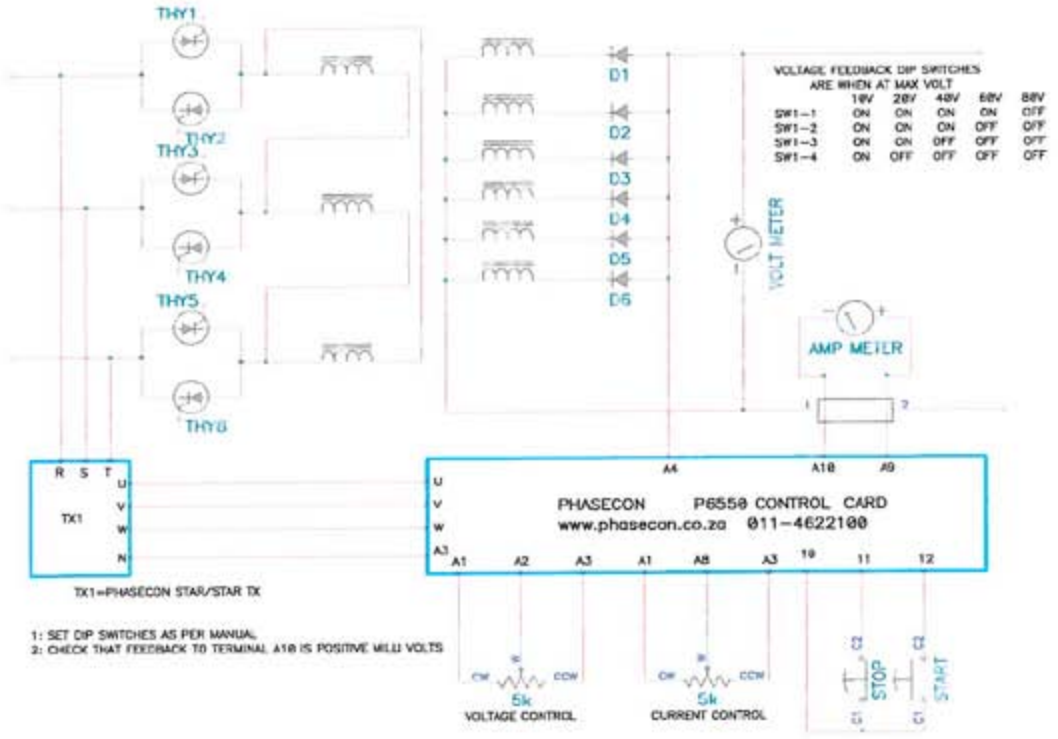
SW1:1	SW1:2	SW1:3	SW1:4	SW1:5	SW1:6
ON-UP	ON-UP	ON-UP	ON-UP	OFF-DWN	ON-UP

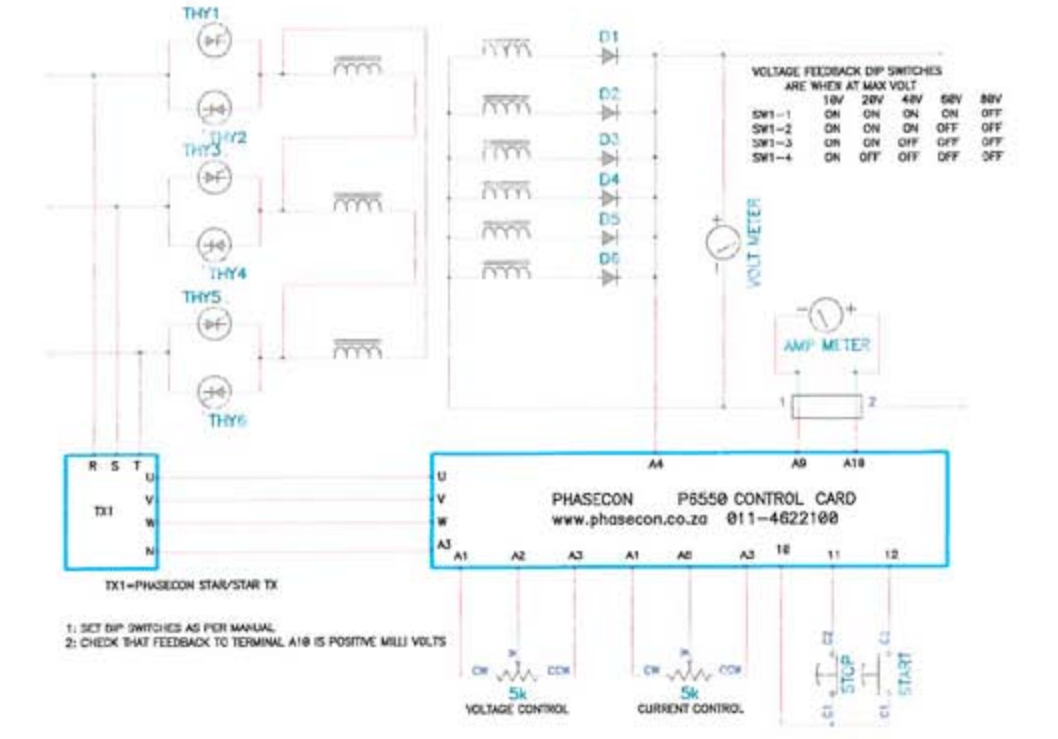
SW2

SW2:1	SW2:2	SW2:3	SW2:4	SW2:5	SW2:6
OFF-DWN	OFF-DWN	ON-UP	OFF-DWN * note	OFF-DWN	ON-UP

Note 1: ON for testing, normal operation = OFF

1. Connect control card as per drawing of a typical plating type rectifier
2. Before you power up make sure that K2 and R on the SYNC transformer is zero ohms and K4 and s, K6 and T respectively
3. Disconnect the wire from the shunt to A10 and check that you have positive mV on the wire going to terminal A10 (if the shunt feedback used) and put SW2:4 in the ON position and I-MAX clockwise
4. Lamps that must be ON, on power up -12V, +12V, PHASELOCK, TRIP lamps in the ON state are healthy
5. Set switches as indicated above
6. Switch power ON
7. Voltage control pot at zero
8. Current control pot at zero
9. No load must be connected
10. Start card
11. RUN lamp must be on
12. Turn current control pot up slowly to maximum
13. Turn voltage control pot up slowly to maximum
14. Adjust N-MAX pot to required maximum voltage read with multimeter on the bussbars to check meter on rectifier
15. Turn voltage control pot down slowly to minimum
16. Stop card
17. Connect the macximum load
18. Start card
19. Turn voltage control pot up slowly, until amo meter indicates a small load, measure to ensure you get positive mV from wire that goes to A10 (shunt)
20. Power off
21. If positive feedback from the shunt connect to A10. Turn I-MAX pot anti clockwise and switch SW2:4 OFF current feedback ON
22. Start card
23. Turn voltage and current pots to maximum
24. Adjust I-MAX to maximum allowed current of rectifier
25. Turn current control pot down and up and check that current follows pot
26. System is now ready for use
27. If oscillation occurs adjust N-STAB





Note: if you have any problem please do not hesitate to call us at 011-4622100 (tel) 011-4623227 (fax) info@phasecon.co.za (e-mail)

FAULT FINDING:

It is advisable to connect lamps/bulbs in star configuration with the star point connected to neutral (when testing AC config). If available and the other side of the globe to the output of the thyristors.

No lights on control card of PHASELOCK light OFF:

1. Ribbon cable not plugged in
2. Check incoming power
3. Check all three phases for voltage
4. Check fuses
5. Check synchronising transformer for 18 volts AC at terminal U, V, W to terminal A9 on control card

PHASELOCK light off:

1. Incoming fuses blown
2. Phase rotation wrong
3. Check synchronising transformer for 18 Volts AC at terminal U, V, W to terminal A9 on control card

Not operating:

1. Is PHASELOCK not on
2. Is TRIP light on
3. Is RUN light on
4. Is instrument giving output
5. Has the thermal cut-out opened due to heatsink overheating or fan stopping

Power faults:

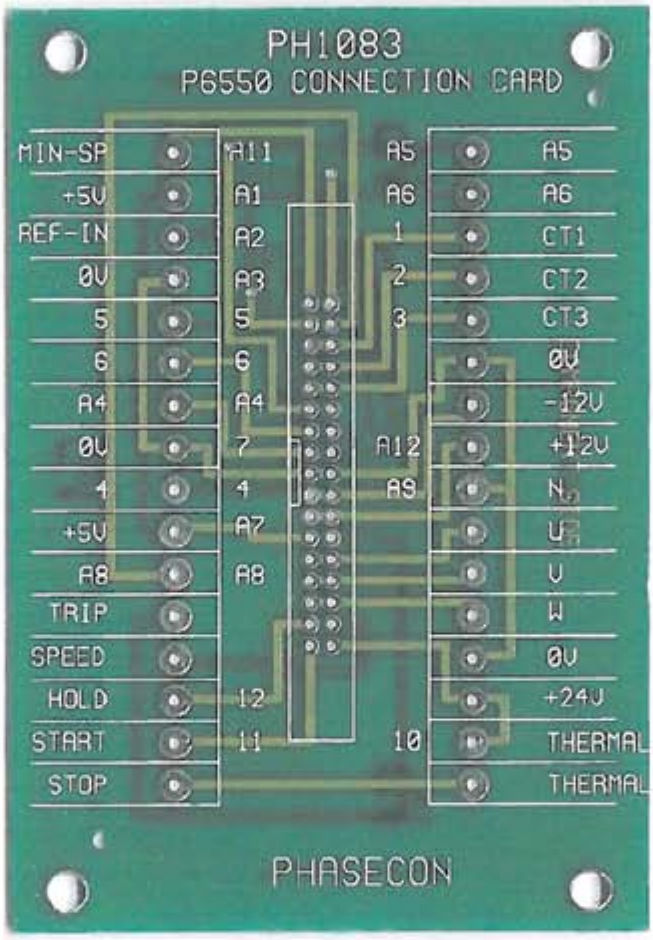
Still drawing power (current) when the run light is off
1. Thyristor blown
2. To check that the thyristor is blown measure with the power off, measure with an ohm meter and if it measures almost zero ohms the thyristor is blown (the measurement must be on the incoming of the thyristor and the output or measure K1 to K2, K3 to K4 and K5 to K6).

Not drawing current on a phase while under normal running operation:

1. Load faulty
2. Thyristor faulty
3. Control card faulty

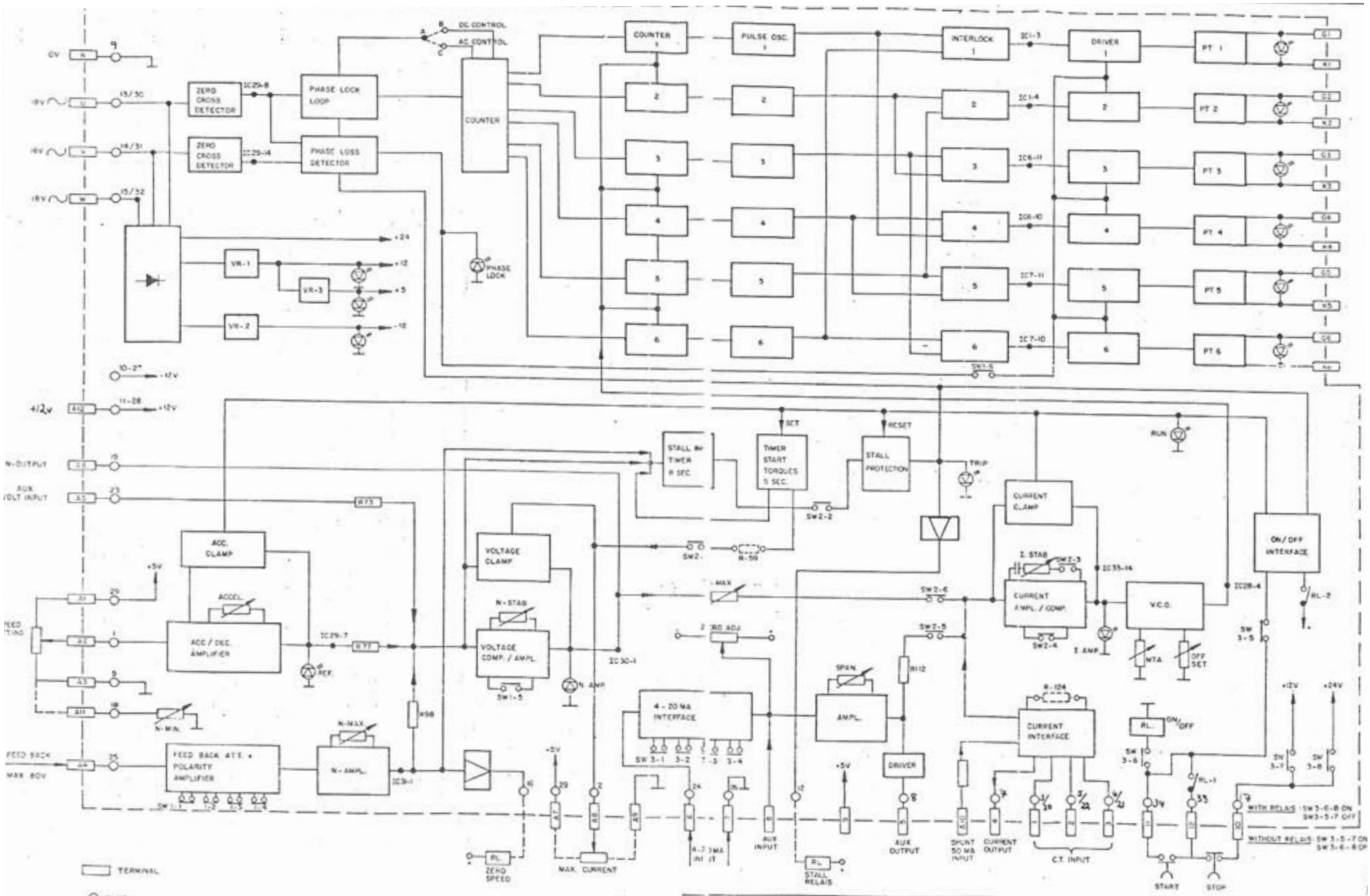
If you are still having problems please phone us as we can fix most faults over the phone with the following information:
What lights are on or how bright they are shining

DC volts on A2 and A3; note that A3 = 0V (reference pot input 0-5V)
DC volts on A8 and A3 (current pot input 0-5V)
DC volts on 4 and A3 (with reference, and current pot maximum)
AC volts K1 to K2 (with reference, and



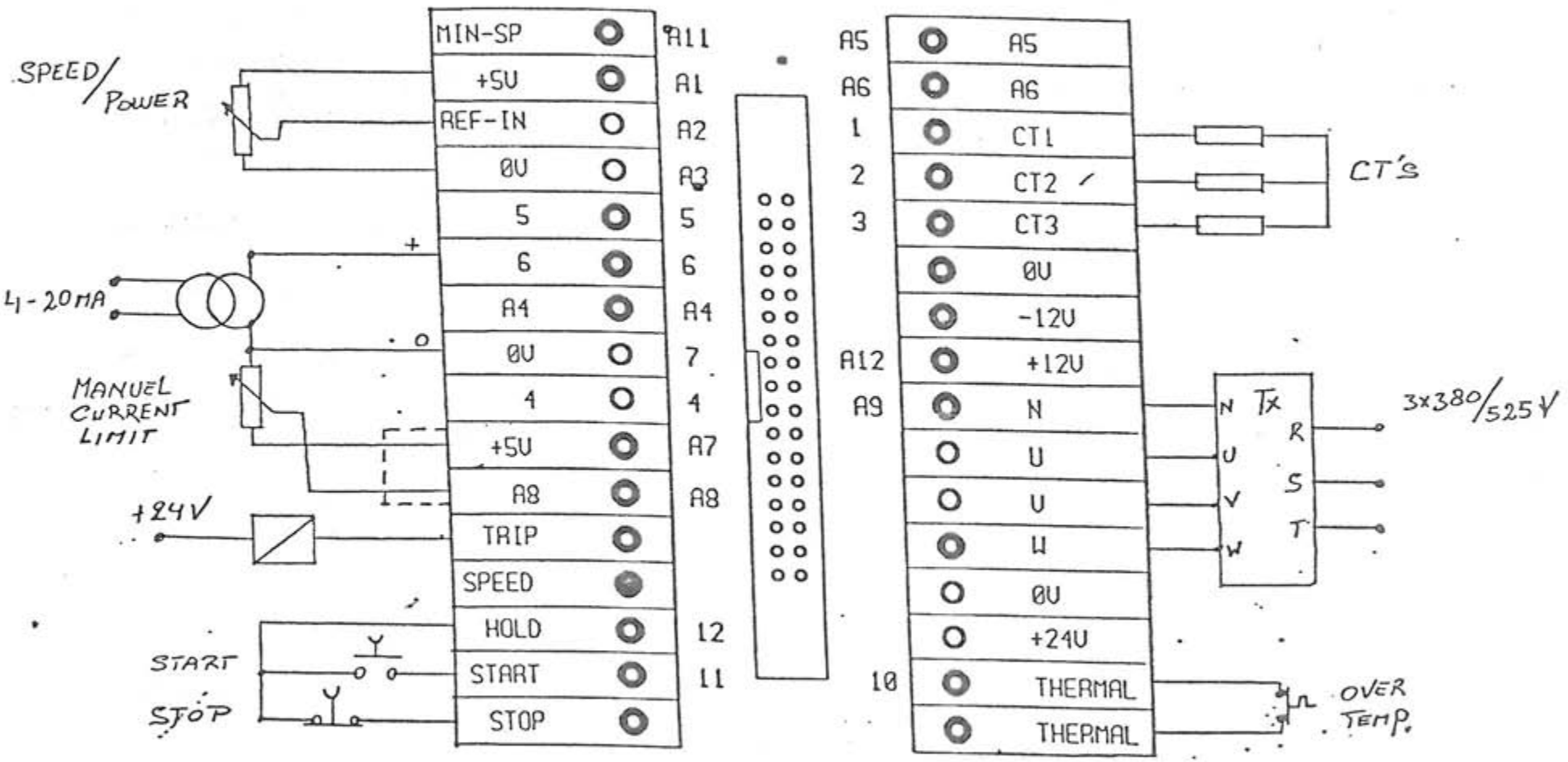
P6550 PIN DESCRIPTION:

PIN NUMBER	DESCRIPTION
W	18V SYNCH WITH R
V	18V SYNCH WITH S
U	18V SYNCH WITH T
A1	5V
A2	VOLTAGE REFERANCE INPUT
A3	GND
A4	VOLTAGE FEEDBACK
A5	CORRECTION SIGNAL FOR SPEED SYNCHRONIZATION
A6	OUTPUT INDICATING DIFFERENCE BETWEEN REFERANCE AND FEEDBACK
A7	5V
A8	CURRENT REFERANCE
A9	GND
A10	POSITIVE SHUNT CONNECTION
A11	MINIMUM SPEED OUTPUT
A12	24V
1	CT1 CONNECTION
2	CT2 CONNECTION
3	CT3 CONNECTION
4	CT VOLTAGE OUTPUT
5	REFERANCE OUTPUT OF 4-20mA INPUT
6	POSITIVE INPUT OG 4-20mA CONTROL SIGNAL
7	GND
8	NOT USED
9	5V
10	STOP
11	START
12	HOLD
G1-G6	THYRISTOR GATE LEADS
K1-K6	THYRISTOR CATHODE



PHASECON (PTY) LTD.	COPYRIGHT RESERVED	FUNCTIONAL BLOCK DIAGRAM
	DRG. NO. : P6550-BLK	DRAWN :
TITLE : MULTI-FUNCTION 3 PHASE	SHEET :	

PH1083
P6550 CONNECTION CARD



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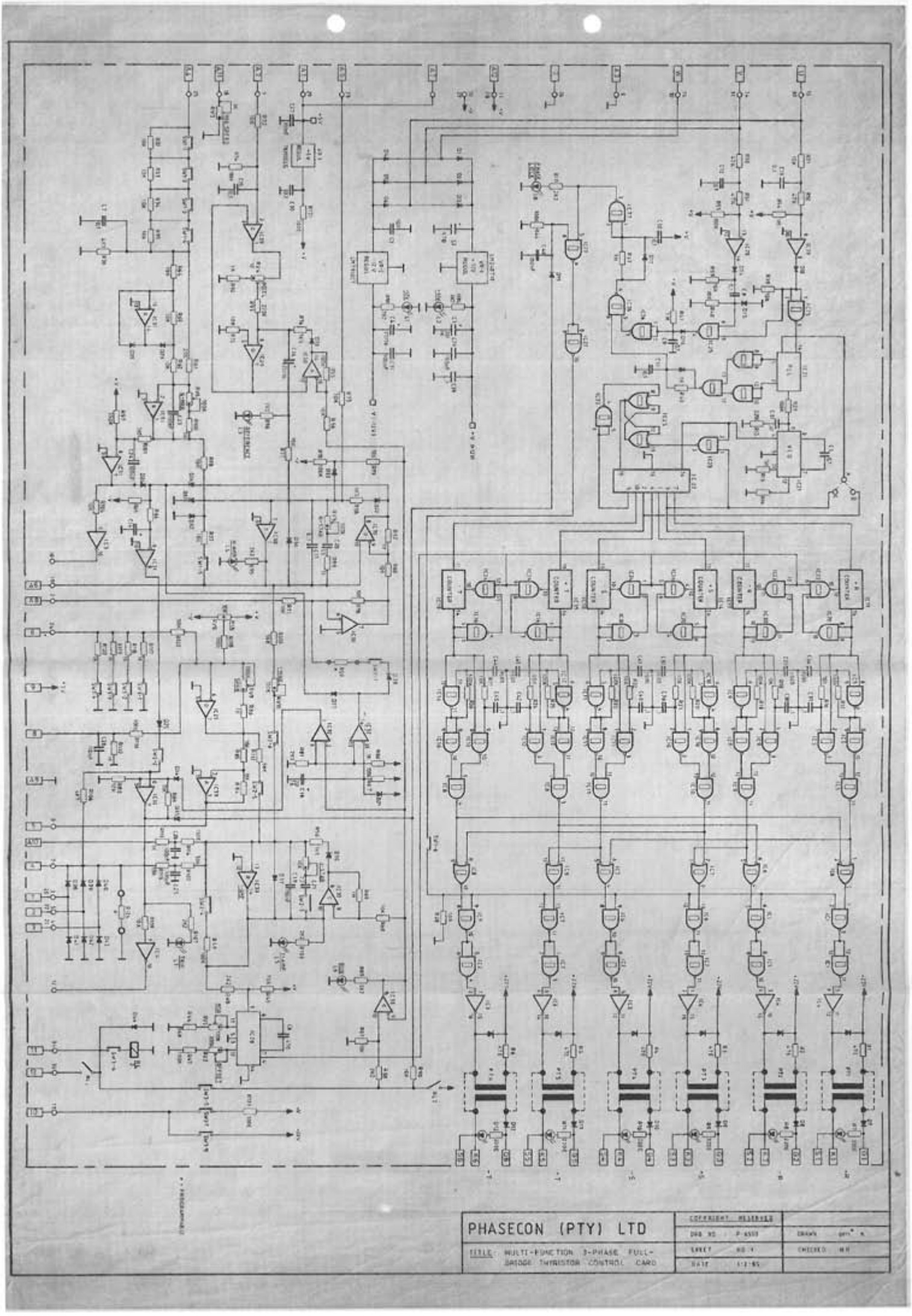

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DRG NO: P-6559

SHEET: 60.4

DATE: 1-2-85

DRAWN: grm* A.

CHECKED: A.H.